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The musical, notational and codicological evidence of W_1 for an oral transmission of Notre Dame polyphony to Scotland

Joshua Joseph Stutter
MA (Hons)

Submitted in fulfilment of the requirements for the
Degree of Master of Music

Supervisors: Dr David McGuinness and Dr Joanna Tucker
School of Culture and Creative Arts
College of Arts
University of Glasgow

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Abstract

The repertory of thirteenth–century polyphony commonly known as the Notre Dame school has traditionally been thought of as one of the first repertories of music to have emerged through composition rather than improvisation. Often conceived of as a product of the work of two men, Léonin and Pérotin, who each contributed to the creation of a *Magnus Liber Organi* and began this tradition, Notre Dame polyphony is frequently discussed as the first polyphonic music to have been conceived in writing. Of the central manuscripts that contain this supposed *Magnus Liber Organi*, D-W Cod. Guelf. 628 Helmst. (W_1) is the most difficult to fit into the standard view of the repertory, as its provenance from St Andrews in Scotland places it far beyond the Parisian milieu that is usually associated with the repertory. The question of how this music came to be transmitted from Paris to St Andrews has never been satisfactorily answered, leaving open questions as to who, how, and why the music was transmitted to and written down in Scotland.

Reframing the discussion as an issue of cultural phenomena rather than literate music composition, I argue that indications of Notre Dame polyphony being transmitted orally rather than through exemplar manuscripts are not as far–fetched as many believe. This is due in part to our modern distrust of oral transmission, a conception of the Notre Dame repertory as a prototype of the Western art music tradition, as well as an academic failure to move beyond the flawed assumptions of much twentieth–century scholarship.

Analysing the music and notation of W_1 in comparison to concordant settings in other manuscripts, I bring to the forefront those large and small divergences between the music and its notation that indicate aspects of an oral tradition present in the writing of W_1. I argue that these differences provide evidence to support a theory that Notre Dame polyphony was transmitted orally and was not likely to have been transmitted by direct manuscript transmission between far–flung liturgical institutions such as Notre Dame and St Andrews; rather, that Notre Dame polyphony was a pan-European cultural and musical phenomenon that spread gradually throughout Europe through oral–formulaic processes.

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List of Manuscript Sigla

Cb-29 University Library, Cambridge, England, Ff.ii.29

CbJ1 Jesus College, Cambridge, England, MS QB1

D-Bs523 Staatsbibliothek zu Berlin — Preußischer Kulturbesitz, Berlin, Germany, MS Lat. 4° 523

F Biblioteca Medicea-Laurenziana, Florence, Italy, MS Pluteus 29.1

Hu Monasterio de las Huelgas, Burgos, Spain, s/n "Codex Las Huelgas"

LoA British Library, London, England, Egerton 2615

Ma Biblioteca Nacional, Madrid, Spain, 20486 "Codex de Madrid"

Mo Bibliothèque Interuniversitaire, Section Médecine, Montpellier, France, H 196

MüA Bayerische Staatsbibliothek, Munich, Germany, Cod. gall. 42

StGB Stiftsbibliothek, Saint Gall, Switzerland, MS 382

VT Biblioteca Apostolica Vaticana, Vatican City, Ottoboni lat. 3025

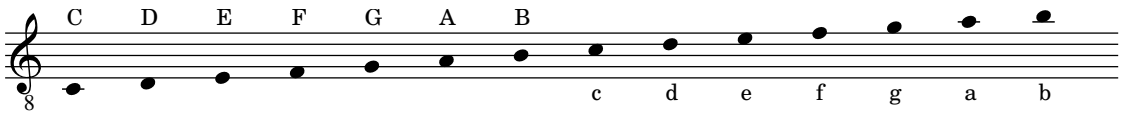
W_1 Herzog August Bibliothek, Wolftenbüttel, Germany, Cod. Guelf. 628 Helmst.

W_2 Herzog August Bibliothek, Wolftenbüttel, Germany, Cod. Guelf. 1099 Helmst.

Acknowledgements

Figure 1.1 is taken from *Wolfenbütteler Digitale Bibliothek* <http://diglib.hab.de/wdb.php?dir=mss/628-helmst&pointer=122>. Figure 3.1 is taken from Godt and Rivera, (1984, p.264). Figure 4.4b is taken from <https://imslp.org/wiki/Magnus_Liber_Organi_(Various)>, f.138v. Figure 4.4c is taken from <http://diglib.hab.de/wdb.php?dir=mss/628-helmst&pointer=90>. Figure 4.4d is taken from <http://diglib.hab.de/wdb.php?dir=mss/1099-helmst&pointer=175>. Figure 4.12 is taken from Smith, (1964, p.394).

The gamut used to reference pitch in this study (in italics) is as follows:



The foliation used to reference W_1 is the older, ink foliation throughout.

Rhythmic values are transcribed in sixteenth time, i.e. semibreves are transcribed as semiquavers, breves are transcribed as quavers, simplex longas as (dotted) crotchets, duplex longas as dotted minims. Square ligatures are indicated as square brackets over a group of notes and currentes as slurs. Plicae are notated as a note with a small notehead.

Facsimiles were sourced from: **Cb-29** from *DIAMM: GB-Cu Ff.ii.29* <https://www.diamm.ac.uk/sources/335/#/>; **CbJ1** from *DIAMM: GB-Cjec MS QB1* <https://www.diamm.ac.uk/sources/306/#/>; **D-Bs523** from *Digitalisierte Sammlungen der Staatsbibliothek zu Berlin: Grammatica: Ms. lat. qu. 523* (*PPN631238441 - {4} - Übersicht mit Inhaltsverzeichnis*) <https://digital.staatsbibliothek-berlin.de/werkansicht?PPN=PPN631238441>; **F** from *IMSLP: Magnus Liber Organi* (*Various*) <https://imslp.org/wiki/Magnus_Liber_Organi_(Various)>; **Hu** from Anglès, (1977); **LoA** from *The British Library MS viewer* <http://www.bl.uk/manuscripts/Viewer.aspx?ref=egerton_ms_2615_fs001r>; **Ma** from *Biblioteca Digital Hispánica* <http://bdh-rd.bne.es/viewer.vm?id=5661>; **Mo** from *BIU* <https://manuscrits.biu-montpellier.fr/vignettem.php?GENRE[]=MP>; **MüA** from Dittmer, (1966); **StGB** from *e-codices–Virtual Manuscript Library of Switzerland* <http://www.e-codices.unifr.ch/en/list/one/csg/0382>; **VT** from Godt and Rivera, (1984); **W_1** from *Wolfenbütteler Digitale Bibliothek* <http:

//diglib.hab.de/wdb.php?dir=mss/628-helmst>; $\mathbf{W_2}$ from *Wolfenbütteler Digitale Biblothek* <http://diglib.hab.de/wdb.php?dir=mss/1099-helmst>.

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Joshua Stutter

Chapter 1

Introduction

> …and yet I also feel aggrieved, whenever good Homer "nods," but when a work is long, a drowsy mood may well creep over it.[1]

It is this passage, from Horace's *Ars Poetica* (lines 358–360), that is the origin of the well–known phrase "even Homer nods".[2] It is a proverb commonly taken to mean that even the greatest artists are fallible: one cannot expect artistic perfection throughout each and every artwork. Indeed, the *Iliad* and the *Odyssey* are not, in a Romantic conception, perfect works — the famous example of these supposed imperfections is Homer's monotonous description of the "wine dark" sea — but Horace apologises for their perceived faults: to him the slight errors are inconsequential when seen through the lens of the entire work. A long work such as the *Iliad* or the *Odyssey* should not be criticised for its blemishes but praised for its qualities.

However, as far back as the eighteenth century the authorship of these two great poems to one man has been questioned, and modern scholarship now generally believes that the Homeric epics were not the work of one great poet, but in fact two fine examples of an Ancient Greek collection of orally–composed poetry (Graziosi, 2016, p.12; Fowler, 2004). When Homer "nods" therefore, he is not being inattentive, on the verge of sleep. Rather, he is not entirely responsible for the work as we receive it. It is true that the Homeric epics are repetitious, error–prone and variable, but it is not because Homer made continuity errors. It is instead because the epics are not just Homer's work: such ideas of consistency were not of great concern to the oral composers of the Ancient Greek world.

The same environment of orally–composed works forming part of a common culture

[1] Translation from Fairclough, (1926, pp.480–481): "et idem / indignor quandoque bonus dormitat Homerus / verum operi longo fas est obrepere somnum".

[2] Although the odd choice of the word "nods" in Fairclough's translation is attributable to Dryden's 1677 essay *The Author's Apology for Heroic Poetry and Poetic Licence*: 'Horace acknowledges that honest Homer nods sometimes: he is not equally awake in every line; but he leaves it also as a standing measure for our judgements' (Dryden, 1970, p.134).

of art has also been true for the vast majority of music made in human history. There are few exceptions, the most notable being that of the previous few centuries of the Western art music tradition, a tradition whose shadow still looms large over much musicological scholarship and whose study still influences the studies of music far removed from its usual apparatus, temporally as well as geographically and culturally.

Just as we have longed to see Homer as a Romantic poet, composing epic works from nothing and feeling disappointed when he does not live up to our expectations as a modern–day poet, musicology has falsely and failingly attempted to construct Beethovenian–myth figures in early, modern, folk, traditional, and non-European music. We can see this force at work in a practice commonly known as the Notre Dame school, a style of florid polyphonic singing that emerged in the twelfth century and flourished across Europe in the mid-thirteenth century.

The Notre Dame school is regularly held up as the true beginning of the Western art music tradition: named composers transforming 'polyphony from a performing practice into "composition" in the modern sense' (Roesner, 2001a). Much of this idea is due to the late–thirteenth–century writer Anonymous IV, who attributed the entirety of the music of the Notre Dame school to two men: Léonin and Pérotin. Léonin wrote a *Magnus Liber Organi* containing polyphony for the Mass and Office, then Pérotin later edited and abbreviated this book, adding more rhythmical compositions, or so the narrative goes. This rhythmical discant led to motet, motet led to the *ars nova*, which eventually led to the music of the Renaissance, where we can begin to pick up the story with more documentary evidence and lead to composers such as Bach. In this narrative, which persisted for much of the twentieth century, Léonin and Pérotin are the first true "composers" of music. They transformed a supposedly inferior practice of improvisation into a recognisably modern and superior compositional practice. The common consensus until more recently was that the work of Léonin and Pérotin was the first step on the road to the venerated history of Western art music, the first composers in the great men theory of history.

However, more recent scholarship has called into question this interpretation of the facts and the elevation of the names of Léonin and Pérotin to mythological status. Here, rather than two composers, we may in fact have two Homers: men who may have had a large part to play in the construction of their repertories, but whose names and importance have been inflated through time until they became fully–fledged composers.

Within the last few decades, multiple avenues of musicology have begun to question the role of composer in many kinds of music, most notably in music from before the seventeenth century. Recent authors have focused upon the teaching of counterpoint and how pedagogical treatises have been misinterpreted to draw a non-existent distinction between historical improvisation and composition. Wegman, (1996) looks for example

at Tinctoris' *Liber de arte contrapunti* and makes the important point that nowhere 'does Tinctoris imply that one must learn to devise correct successions of consonant intervals by actually writing out examples such as he provides' (Wegman, 1996, p.432). McGee, (2003) broadened this discourse, by documenting multiple examples and processes for the employment of improvisation in varying quantities across the arts until at least 1700. Morucci, (2013) has looked in detail at improvised vocal counterpoint in sixteenth–century Italian treatises and frames this discussion as not merely a sixteenth–century phenomenon but a practice that had been in continuation as 'a long–standing didactic tradition' (Morucci, 2013, p.2). The interest in considering early music in terms of its improvisatory content and processes is such that Guido, (2017, p.1) opens this recent contribution in relation to Renaissance and Baroque music by describing the field as 'like a wide river that has been accumulating momentum'. It is no surprise therefore that five further chapters in this same book open with sentences validating the recent surge in scholarly interest in historical improvisation.

Rejection of the idea of a modern composer role in early music and the associated priorities of the *Kunstwerk* and obedience to *Werktreue* has had a large impact on study of thirteenth–century music and the use of the traditional names of Léonin and Pérotin in connection with the Notre Dame school, such that many writers prefer to substitute the terms *Leoninian* or *Perotinian* (just as the works of Homer have become the *Homeric epics*), or indeed dispense with such names entirely unless thirteenth–century polyphony can be unequivocally attributed to composer figures. This study will take the latter route and will not deal with composers or authorial influences, and will attempt to reframe the discussion as a study of cultural phenomena.

"Notre Dame school" is also terminology with some heavy historical considerations. We know that polyphony of the manner described by Anonymous IV was performed at Notre Dame of Paris in the twelfth and thirteenth centuries, but no known manuscript (hereafter MS) is related to that institution (Baltzer, 1987), and Notre Dame is only one institution of many that are linked to the performance of this style of polyphony. Léonin and Pérotin however, are linked to Notre Dame by their presumably Parisian identities. What we do know is that this repertory was active, in some form or another, at various liturgical centres across Europe. It cannot be said therefore that this is an exclusively "Notre Dame school". Rather it is a repertory with some strong links to Notre Dame. As such, and in order to distance ourselves from the geographical and repertorial constraints that Notre Dame enforces upon the repertory, the entire practice will be referred to as the ND repertory and ND polyphony throughout this study.

Of the three central extant sources of the ND repertory (F, W_1 and W_2), the MS that has been most puzzling to those that study ND polyphony — and as a result by far the most discussed — is W_1. The other two main MSS are French in origin, perhaps even

Parisian, but W_1 has now been determined to be Scottish, most likely from St Andrews in the early to mid thirteenth century.

The Scottish provenance of W_1, far outside the usual continental sphere of the ND repertory, has become the greatest sticking point in the discussion of this MS. Perhaps the most important piece of evidence pointing towards St Andrews is the seemingly unequivocal *ex libris* "Liber monasterii Sanctii andree apostoli in scotia" (f.64, see Figure 1.1). Although this writing seems to clearly link W_1 with St Andrews, Ludwig, (1910, p.7), not conceiving that the MS could have originated outside of France, noted that this could be evidence of a Scottish owner at some point in its history. Flotzinger, (1969) cast doubt on the *ex libris* indicating a Scottish provenance of W_1, noting that it was added later to the MS neither at the beginning nor the end, but on an inner folio in a different hand and ink. With regard to the other main piece of evidence — two responsories for St Andrew that appear nowhere else in the repertory — Husmann, (1969, p.35) pointed out that 'both the South (Winchester) and East (Ely) of England have the same liturgical arrangement of the St Andrews responsories as W_1 presupposes',[3] indicating that the presence of these responsories does not rule out a provenance from these other insular institutions.

Roesner, (1974), in the first full–length study of W_1, dispensed with these claims, arguing fully for a St Andrews provenance. He re-evaluated the *ex libris*, arguing that its position in the MS alone is hardly enough evidence to disregard it, and it might instead be 'an internal mark of ownership to guard against theft' (Roesner, 1974, p.83). A perhaps more convincing argument is Roesner's noticing that the inscription may have been present before the copying of the work that currently fills the page — but likely after the staves had been ruled — written as it is between the systems of a page laid out for two–voice music but eventually filled with three–voice music. However, this theory relies on W_1 being dated sometime in the later fourteenth century in order to be written after the fourteenth–century *ex libris*, a date suggested by Roesner, (1974) that now seems much later than is likely.

Providing palaeographical evidence linking the initials and handwriting of W_1 to northern British scribal activity of the early fourteenth century, Roesner claimed that W_1, although not perhaps written at St Andrews, was 'prepared for that institution' (Roesner, 1974, p.94). He argued that the numerous marginalia and jottings present within the MS, especially the beginnings of letters, provide evidence that 'it must have spent some time in a scriptorium' (Roesner, 1974, p.88). This evidence was supplemented in Brown, Patterson and Hiley, (1981), who provided evidence from the handwriting, flourished initials and repertory of W_1 that it was likely copied at St Andrews. Furthermore, they

[3] "So zeigt sich, daß sowohl der Süden Englands (Winchester) wie die Osten (Ely) dieselbe liturgische Anordnung der Andreas-Responsorien besitzen wie die Handschrift W_1 sie voraussetzt".

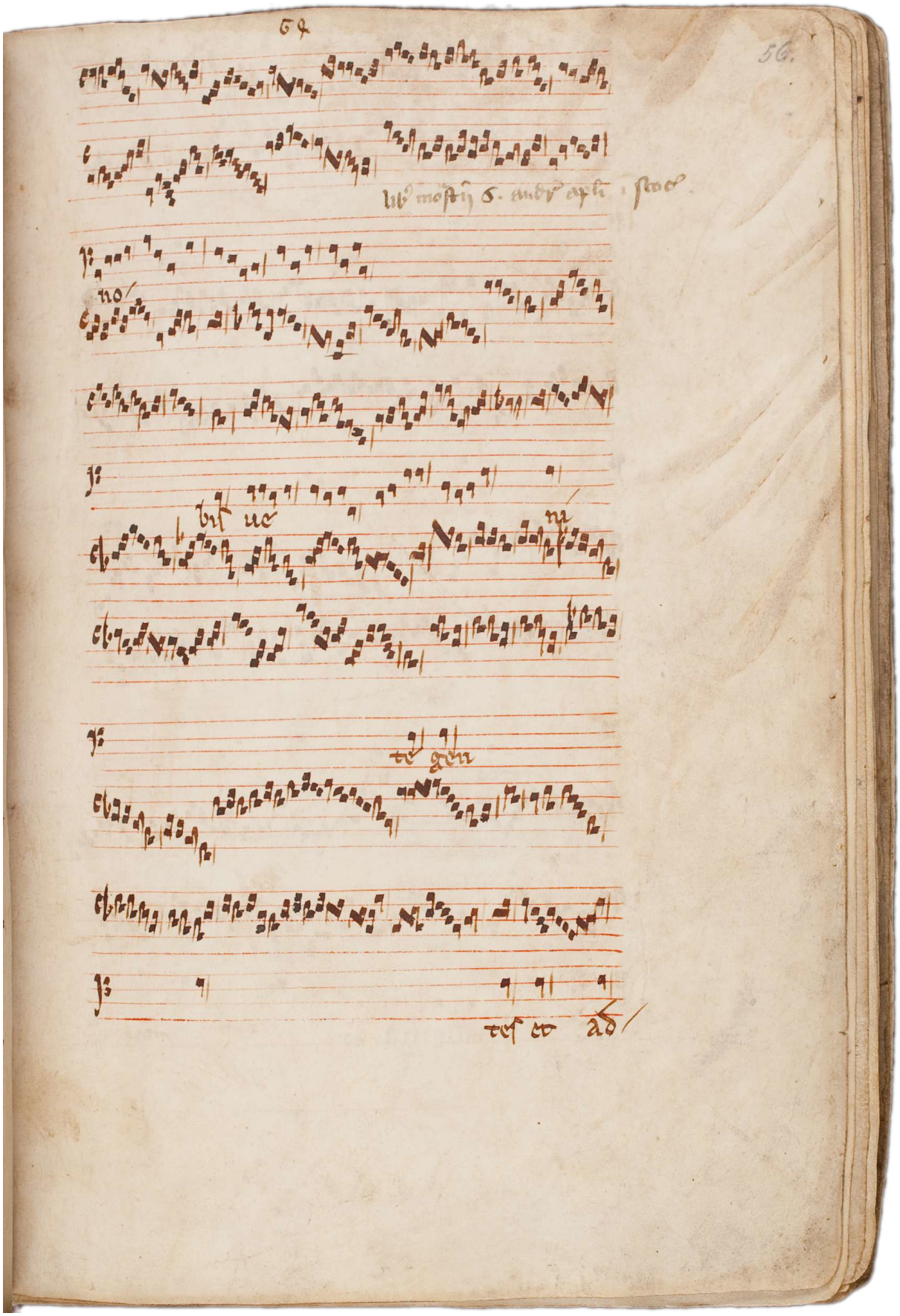


Figure 1.1: W_1 f.64, showing the *ex libris* and three–voice music on two–voice staves

attempted to link the creation of the MS with David Bernham, Bishop of St Andrews from 1240–1253, and suggested that it may have been Bernham or one of his familia that brought the exemplars from which W_1 was copied from Paris to Scotland (Brown, Patterson and Hiley, 1981, pp.59–66).

Everist, (1990) argued for an even earlier date, positioning the creation of W_1 in St Andrews as early as the 1230s, and linking the gathering of the exemplars from Paris not to Bernham, but to his predecessor William Malveisin, who began his episcopate as Bishop of St Andrews in 1202. Everist posited that Malveisin could have brought the exemplars to Scotland on his trip from Lyon in 1200, which would have necessarily passed through Paris. Everist argued that Malveisin, having heard the music, perhaps for the first time, in Paris at Christmastime in 1200, could have obtained the exemplars 'more of less off–the–peg from suppliers in Paris' that could have then been copied at St Andrews 'to form the nucleus of W_1' (Everist, 1990, p.28). Baltzer, (2008) broadly supports this early dating through analysis of the initials of W_1 and close comparison with other insular MSS of the thirteenth century.

However, this palaeographical evidence as concrete and exact proof of a 1230s date for W_1 has recently been called into question by Bull, (2017, pp.12–22), who argues that many of the examples used by Everist and Baltzer of other insular MSS contain markedly different initials, convincingly arguing that 'specific decades do not necessarily dictate how manuscripts' initials look' (Bull, 2017, p.17). A 1230s date for W_1 may be the most likely answer to the question of the period of its copying, but this should not be to the exclusion of all other possibilities. We should not attempt to pin down a dating to a specific year from palaeographical evidence alone, as such proof cannot be precise. Rather we should allow the net to be cast a little wider and use this manner of evidence to narrow down the possibilities, only eliminating a possible time and place when the palaeographical evidence can roundly disprove it. There is nothing in the initials, handwriting or repertory of W_1 that could not have also been true of a MS written decades before or after the 1230s: such scribal style does not change overnight, but is affected by other factors such as the location, culture, purpose and fashion of the places where it was written, written for, and kept at.

Nearly every refinement of the dating of W_1 has a purpose: to ascertain how the exemplar quires for the copying of W_1 made their way to Scotland, knowing as we know now that W_1 was not likely to have been copied on the continent. Indeed, it is this question that is contained in the titles of Roesner, (1976), Brown, Patterson and Hiley, (1981), Everist, (1990) and Baltzer, (2008). Most of what is written on the palaeography and codicology of W_1 is written to determine the *origin* of W_1, attempting to pinpoint the exact moment that it came into being, such that it can be linked to a person who provided the exemplars, usually direct from Paris, for its copying: Bernham, Malveisin,

or some other figure.

Intertwined here are three different processes: the creation of the music of W_1, the performance of this music, and its transmission. These are three distinct but related processes, and when discussing ND repertory at St Andrews, they do not all have to link directly to the "origin" of W_1. Often these three processes are conflated, such that the "origin" of W_1 is discussed as if the writing of the MS heralded the beginning of a new performance practice with the arrival of the ND repertory in Scotland. This thesis will argue that the writing of W_1 is not necessarily linked to the transmission of ND repertory, and a date of W_1 can only be used as a *terminus ante quem* for ND polyphony in Scotland.

Roesner mentions briefly, when describing the five exemplars that he detects in the copying of W_1, that he uses the word "exemplar" 'to mean "source complex" and "tradition" as well as "MS"' (Roesner, 1974, p.81). This is hinting at an idea that Roesner often mentioned in passing but never tackled in detail: that each "exemplar" he detects is not necessarily a single MS but could be a set of MSS or indeed an oral tradition. Everist, (1990, pp.27–28) does not believe that it is likely 'that one of Mauvoisin's [Malveisin's] *familia* memorized such an enormous corpus of music in Paris', and it is an idea 'with little appeal'. However, Everist simplifies the process of oral transmission so that it makes little sense, envisaging it as a direct memorisation of a written source followed by a copying from memory in St Andrews, rather like soaking up water with a sponge to deposit elsewhere. The reality is likely to be far more complex and the medieval methods for absorbing music, not simply memorising it, will be discussed in chapter 2. We know, from fragments of polyphony surviving from long–lost polyphonic MS, that the ND repertory was more common in Britain than the sole surviving complete source would have us believe. The ND repertory did not necessarily travel directly from Paris to St Andrews and could have arrived from some other liturgical centre.

Baltzer, (2008) hints at this, maintaining that W_1 is not simply a copy of an exemplar or set of exemplars. In her mind, the exemplars were edited heavily as they were copied into W_1. The 'less precise' rhythmic notations of the exemplars were edited such that 'their solutions had some local and personal idiosyncrasies' (Baltzer, 2008, p.118). In this, Baltzer imagines a complex series of mixed–up quires that formed the exemplars for W_1, hastily copied in Paris in completely different dimensions and in an imprecise notation, such that W_1's scribes struggled to comprehend and regularise them for fair copy. In this theory, the writing of W_1 was a poor affair, and the scribes were trying to make the best of a bad situation. However, this can all be explained more simply by the process of writing–down what had never been written down before, i.e. the transformation of an oral into a written practice. These issues that Baltzer detects can form evidence to support the ND repertory as an oral tradition. How this can occur will be discussed in chapter 3, and examples of orality in W_1 will be analysed in detail in chapter 4. Put

simply, the possibility that the "exemplars" for W_1 may not have been physical MSS should be taken seriously.

Of the two foliations of W_1, the older ink foliation that begins in Roman numerals and then swaps to Arabic numerals at f.30 was added no earlier than the early fourteenth century. It is clear therefore that by the time the foliation was added, the MS contained all that it does now in this same order, as well as some missing material that is implied by gaps in the older foliation, such as a few missing bifolios and gathering 23.[4] What we can take from this is that the writing and collation of W_1 are likely not to have occurred simultaneously if we believe that the writing of W_1 was begun as early as the 1230s. There may have therefore been a not insignificant span of time when the MS's fascicles were not bound in the order they are now, perhaps only being bound together and foliated once the repertory was redundant or considered "complete".

Although Roesner, (1974, p.26) argues that the MS is soiled and stained from 'heavy use', and it is clear that W_1 has not been perfectly preserved, it was neither so heavily used that it ever became unusable: for a MS supposedly intended 'for practical use', it is remarkably well preserved and legible throughout. The exception to this is the final page (f.214v) which has either become so scuffed and scratched from contact with an abrasive surface that it has become illegible, or has been ruined by being used as a pastedown for a previous binding.

In comparison to F or W_2, MSS that have a much cleaner and neater layout with more impressive illumination and more careful binding as singular MSS, W_1 cannot have been a grand testament to an old and stable tradition, but nor can it have been used daily for any serious period of time. W_1 appears to have been consulted seldom or at the most semi-regularly, never seeing daily use. It seems likely that W_1 was not written for the same purpose as F or W_2 for the preservation of a repertory in writing, but as a useful and perhaps didactic repository of polyphony for St Andrews. The words "repertory" and "repository" often bear the same meaning, but in modern usage it may be best to use both and define W_1 as a repertory–repository: a written repository of an oral repertory.

In relation to the order and organisation of W_1, Baltzer, (2008, p.111) postulates that the illuminator of W_1 had 'never seen a manuscript of polyphony before', as such items were presumably fairly rare in the twelfth and thirteenth centuries. Alternatively, Everist, (1990, p.28) argues that 'whoever assembled the music in W1 had seen such books as F, understood their structure, and imitated it, or that the exemplar for W1 was already organized that way and not as a collection of individual quires'. If we accept Roesner's assertation that W_1 was prepared from multiple "exemplars", then Everist's latter explanation cannot be correct, and the scribes of W_1 must have been aware of other polyphonic MSS.

[4] This can be seen in the collation diagram in Staehelin, (1995, pp.33–39).

On the other hand, perhaps it is not so odd that W_1 and books like F are organised in the same way. For example, W_2's cycle of organa is organised similarly to W_1 and F. Rather than come to the conclusion that this similarity must link all three together, it might be more sensible to say that organising a collection of music in descending number of parts in liturgical order was a common way to organise books of polyphony in the thirteenth century, just like graduals and antiphonals. Moreover, W_1 is not simply and strictly organised from grander to simpler music: fascicle VII breaks this order and returns to three–voice music after a long passage of two–voice music. Fascicle VIII begins with one two–voice piece but then continues with three–voice music, and fascicle IX mixes three– and two–voice conductus with seeming freedom. Similarly, fascicles V and VI freely mix music for the Office and for the Mass, in multiple cycles.

Furthermore, it is easy to assume, given the paucity of surviving thirteenth–century polyphony, that polyphonic MSS were rare items at that time. However, the notation of MSS like W_1 cannot be intuited from a basic knowledge of writing chant: the complex ligation structures and alignments of voices require a tradition of writing such music to learn from and, as Baltzer, (2008) infers, W_1 was not a MS that was simply copied "dumb" without any knowledge of the content being copied. We must assume therefore that the scribes of W_1 already knew how to write polyphony and were skilled at it. Indeed, the notation of polyphonic music in this style may have been an atypical, but not too extraordinary job for these scribes.

W_1 therefore cannot have been the beginning of written polyphonic music at St Andrews and, by extension, cannot have been the beginning of a performance practice either as the scribes already knew how this music operated. We may find more use in thinking of W_1 as a MS for the continuation of an already–present musical practice, an *aide memoire* for novice and veteran singers alike, to be consulted when their memories fail. The search for the person who "brought" the music to Scotland from Paris may be a red herring and Malveisin, or whomever we believe instigated the writing of W_1, may have arrived at St Andrews to find ND polyphony already there and the writing of W_1 perhaps already in progress. One can speculate that this may not have surprised Malveisin as much as it may surprise us, for he may have heard this music in use in the services of nearly all the large religious centres he passed through on his journey to Scotland. The ND repertory may have been more routine in Europe than previously thought, and this may be due to an effective oral tradition.

Chapter 2

Medieval Memories

> If we are asked to give directions for getting from one place to another we might do so by performing an internalized verbal script that we have repeated many times, or we might refer to a mental map that we have of the region and make up our directions as we go, being reinforced in our performance by the familiarity of critical turning points as we arrive at them (Treitler, 1991, p.78).

Memory haunts the study of medieval music. Musicology is a relatively new discipline if separated from the older studies of music theory and criticism, indeed the original idea of musicology as conceived in the nineteenth century was the German *Musikwissenschaft*, i.e. a science of music. It is well known that an all–too–narrow focus on notation is a problem with older and perhaps out–of–date literature, however it is only fairly recently — within the last 70 years even — that musicology has extended its domain beyond source studies and the notated representation of a piece of music to consider aspects of music such as performance, culture, and technology. Modern–day study too, often leans heavily upon literary thinking, partly because academic study is an intensely literate occupation, and partly because our thinking is magnified by our hyper-literate society in which nothing can be believed unless the event has been recorded and documented in a written form.

Processes of musicological analysis, i.e. the tools that are used to approach and discuss music, therefore eschew any notion of music having being created by forces other than familiar processes such as modern ideas of composition and how composers work today and in the recent, documented past. Literary forms, transmitted to the present day in a literary format have been understandably processed as literary texts conceived by minds that work within the same parameters as our own. However, this historical picture of literacy is being challenged, in words and in music. It may be possible that neither the creation nor transmission of these seemingly literary works was accomplished with literacy in mind by entirely literate minds.

The work of Friedrich Ludwig (1872–1930), perhaps the first modern–day scholar of medieval music, cannot be ignored in any study of medieval polyphony, and his writing continues to have a profound effect on the study of the music of the ND repertory. Ludwig was the first to study the main sources of ND polyphony as a single repertory, exhaustively cataloguing the settings contained both within the three main sources (W_1, W_2 and F) as well as other smaller and more fragmentary sources. He decoded modal rhythm, found concordances between clausulae, organum and motet, and was the first to establish a chronology of sources of the ND repertory, positioning each source within a development of the repertory and hypothesising dates of creation for each source. Ludwig's work on the ND repertory is found in his monumental *Repertorium organorum recentioris et motetorum vetustissimi stili* (Ludwig, 1910).

Ludwig's hypothesis in *Repertorium* was that the entirety of the ND repertory was composed in a short space of time, in two phases of development and two layers of repertory. The first phase of composition he assigned to Léonin and the second to Pérotin, the music having been fully composed and stabilised in sources by the mid-thirteenth century (Ludwig, 1910, p.4). By coming to this conclusion, it is obvious that Ludwig has taken the oft–cited words of the late–thirteenth–century English theorist Anonymous IV at face value:

> And note that Master Leonin, according to what was said, was the best composer of *organa*, who made the great book of *organum* from the gradual and antiphonary to elaborate the divine service. And it was in use up to the time of Perotin the Great, who edited it and made very many better *clausulae* or *puncta*, since he was the best composer of discant, and better than Leonin. But this is not to be said about the subtlety of the *organum*, etc. (Yudkin, 1985, p.39)

Indeed, Anonymous IV's words definitely indicate some kind of physical book being created, the *Magnus Liber Organi* which, according to Anonymous IV, Léonin created and Pérotin abbreviated as well as adding his own, strictly rhythmical compositions. Anonymous IV goes on to attribute many of the three– and four–voice settings to Pérotin. However, as discussed above, we cannot translate Anonymous IV's words literally as if he were a modern writer as we need to consider his words in the context of medieval culture, thinking instead of what it meant to "create" and "compose" a "book" in the Middle Ages.

Ludwig's hypothesis of a short period of composition eventually culminating in a "standstill" of transmission led him to create a chronology that explained this as well as the differences in repertory between the sources: W_1, the earliest source in Ludwig's conception, transmitted organum purum much as Léonin had conceived it, F being

written a little later incorporating Pérotin's discant clausulae, and finally W_2, written at the end of the thirteenth century, as a final and stable version of the *Magnus Liber Organi* that Anonymous IV had described (Ludwig, 1910, p.157). In Ludwig's view, the "earlier" form of organum purum as composed by Léonin was superseded by Pérotin's discant in modal rhythm, paving the way for the later genre of motet and the new fourteenth–century isorhythmic style.

Although issues of chronology and repertory have since been argued over by countless scholars, Ludwig's view of the music of the ND repertory largely remains unchallenged, his *Repertorium* still being of great use today, especially for the collation and concordance of sources, and his efforts not surpassed either in scope or in scale. However, Ludwig's literary conception of the music of the ND repertory, itself a product of early twentieth–century musicological practice, has only recently begun to be critiqued. Something a little more complicated than literate composition, performance, and transmission involved in medieval polyphony was hinted at as early as 1928 by Jacques Handschin: 'for the ancients, the feeling of the existence of a melody was much more secure than for us, because it corresponded to an existing memory picture…Here as well as there the composer sings by visualizing a Gregorian melody in his mind' (quoted in Busse Berger, 2005, p.37). However, Ludwig's work, and conception of a consistent progression of medieval music towards a zenith of sacred composition in the Renaissance, was much more attractive to the musicological practices of the early twentieth century and all but eclipsed the younger and less industrious Handschin's more nuanced and careful picture of the Medieval period.

The oral transmission of plainchant from before the ninth century however, has been long accepted: it is an obvious conclusion to make that before the invention of staff notation, neumatic notation required the reader to already be aware of the chant melody in order to sing it. The extant sources of ND polyphony, on the other hand, transmit their contents entirely in staff notation. Previously this has led to the study of chant being confined to the discussion of extant sources of staff–based notation and drawing literary concordances between them and previous, neumatic notation. In the second half of the twentieth century this has expanded to arguments outside of the content of sources, partly due to the pioneering work of Treitler, (1974) linking the oral–formulaic styles of epic poetry to Gregorian chant.

Treitler's main inspiration for linking the oral transmission of chant with epic poetry was the Parry–Lord oral–formulaic theory which was explained most fully and accessibly in Lord's *The Singer of Tales* (Lord, 1960). Lord introduces the concept of the singer, an oral poet who is performer, composer and redactor of all that he performs (Lord, 1960, p.13). Lord puts the singer at the centre of the oral–formulaic theory, a theory which he attributes almost entirely to his teacher Milman Parry, and uses this concept of the

singer continuously reinterpreting known oral texts to explain the composition and transmission of two main examples: the Homeric epics the *Iliad* and the *Odyssey*, and the performances of the modern–day Yugoslavian ballad singers.

In the first instance, Lord demonstrates, through Parry's analyses, that the Homeric epics could not be compositions of a literary tradition, passed down through writing from their conception. In short, the construction and transmission of both the epics display strikingly similar characteristics, both in composition and performance, to modern oral poetry. Instead of functioning like literary compositions, composed once and set in writing as an "original" version to be transmitted exactly, they have instead been constructed using composition formulae, i.e. oral formulae that exist within a framework of poetry that allow for a schematisation of a composition without the reliance on verbatim recall. The set formulae and repetitive phrases are linked together in an additive process to create the entire work, and Lord uses the lack of enjambement as an example of this. Each line is a metrical unit and the sense in a line rarely runs into the next. In fact, Lord explains the few examples of enjambement as being simple products of the length of the hexameter, sometimes too long for a single idea, such that occasionally a new idea must begin on the same line (Lord, 1960, p.145).

Lord draws parallels between the Homeric epics and the instance of Yugoslavian poetry to show how this composition and performance tradition is possible, the syntax of this poetry enabling a process of oral transmission of tens of thousands of lines of poetry. This transmission is not by verbatim recall but by a continuous process of recomposition and addition to what has come before. Lord demonstrates that it is possible to see this oral–formulaic method in action at every level, from small changes all the way to thematic recomposition by comparing performances of Yugoslavian poetry. The differences in composition through performance all achieve the same function, but by slightly different means. For example, the formula ' "By Allah," he said, he mounted the white horse' is found in other Yugoslavian epics with a slightly different transmission, from slight changes such as altering the colour of the horse from white to brown and whole recompositions while maintaining the sense, such as, 'And he said this, he mounted the animal' (Lord, 1960, p.48). Crucially, all interpretations and recompositions fit within the same poetical scheme. By this method, Lord argues, correct but not verbatim recall of hours of poetry can be made possible, and is possible as he has observed in a modern–day oral tradition.

Treitler observes the same process in plainchant. Instead of thinking of a medieval singer that 'memorized a melody as though we might be saying that he had swallowed a book' (Treitler, 1974, p.344), we should instead be thinking about the schemes that a singer used to memorise an orally–received melody. The same kind of oral poetry formulae that Parry recognised in the Homeric epics, Treitler pulls recurrent formulae out

of the composition of plainchant that occur across the chant repertory, from Old Roman to Gregorian repertories (Treitler, 1974, p.346), coming to the conclusion that plainchant repertories follow the same oral–formulaic style as oral poetry. Indeed, Treitler, (1981, p.484) eventually defines oral transmission as 'a process in which music is received and coded through hearing, retained *schematically* in memory and performed or transferred to writing from some mental idea of it'.

Recall of poetry or plainchant, then, is not a matter of pure memorisation when considered within the framework of the oral–formulaic theory, nor a series of sounds that a singer accesses and repeats exactly as they had remembered it. Rather it is a memorisation process that takes place in a context of oral formulae — well known to composer and performer alike — that can be selected and variegated at will to create a composition, be that poetry or music. Even this explanation is a little misleading: our strict terminologies of composer, transmission and performer not covering the subtleties of how these terms are merged and become meaningless in this context. Even in Anonymous IV's seemingly unequivocal passages apostrophising the composers of polyphony, Page, (1989, p.151) has argued convincingly that 'it is is impossible to draw a firm line between the singing, teaching and notating'. A singer that recalls poetry or melody that he has learned before from oral transmission is not recalling the literal words or the pitch steps but in fact the scheme, the blueprint that constructed those words or pitches, and is engaged in the composition, transmission and performance of the item. This is simultaneously a process of memorisation, recall, and composition.

This idea of constant recomposition as a process of oral transmission is supported by Finnegan, (1977). Finnegan challenges what she says are our flawed modern and literary conceptions of what oral poetry is, admitting that there 'is a special temptation to the scholar and those committed to "high culture" whose preconceptions all tend to direct attention towards written literature as the characteristic location of poetry' (Finnegan, 1977, p.5). In Finnegan's conception of the oral–formulaic theory, the singer is not just a 'recipient of the oral tradition' (Finnegan, 1977, p.53), but in fact an active participant in it, 'doing more than merely "juggling set phrases"…The formulaic technique was developed to serve him as a craftsman, not enslave him' (Finnegan, 1977, p.63). A singer of poetry — or indeed music — is involved in not just the performance of the repertory but in its ongoing and continuous reinvention through an implementation of the set formulae of discourse in poetical schemes. Variability between performances of the same piece of poetry, perhaps by the same performer, is not due to any ideas of 'faulty memorisation' (Finnegan, 1977, p.56), but is in fact a product of the mode of transmission. Our literary conception of how oral transmission should work is partly at fault here:

> The model of written literature with its emphasis on *the* text, *the* original and correct version, has for long bedevilled study of oral literature, and led

> researchers into unfruitful and misleading questions in an attempt to impose a similar model on *oral* literature (Finnegan, 1977, p. 69, original emphasis).

Instead of attempting to find errors in the transmission of oral poetry and compare these apparent errors in order to correct them and reach a singular "original composition" as we would with literature and music that we know was conceived in writing, or even attempt to construct stemma that demonstrate a narrative of relation and transmission between sources, perhaps falsely for orally–conceived works, we should concentrate instead upon the oral formulae behind the differing transmissions and trace the performance, cultural, and sociological changes that effected these different performances of an oral text. In an oral tradition, there may be no "original", only different renderings of a larger, virtual scheme.

It is within this context of reappraising literature and music of medieval as well as modern oral cultures in their own, perhaps oral, terms that Busse Berger, (2005, pp.9–44) comprehensively critiques Ludwig's highly literary conception of medieval music, and of the ND repertory in particular. Busse Berger takes a historiographic approach to Ludwig's work, considering his conclusions within the culture of early twentieth–century musicological study. In her view, Ludwig's conclusions are based on a faulty and idealised narrative of describing the music of the Middle Ages as leading directly to the "pure" music of the Renaissance, particularly that of Palestrina: 'he saw medieval polyphony as the first step on an evolutionary ladder leading up to the great master Palestrina…Notre Dame polyphony is considered important because only it will lead directly to Palestrina' (Busse Berger, 2005, p.21). She argues that Ludwig was not in search of a balanced idea of medieval thought about music, but in the construction of a narrative that will lead to Palestrina, necessarily finding the first named "composers" of medieval music: for Ludwig that was Léonin and Pérotin. Busse Berger goes further, accusing Ludwig's 'agenda' of making 'it possible to work in medieval music for one hundred years without ever seriously considering the role of memory in the composition and transmission of polyphony' (Busse Berger, 2005, p.44). In Busse Berger's view, we should be wary of Ludwig's conclusions and of importing his as well as our own assumptions into modern scholarship. This is seen regularly when talking about the "compositions" of the ND repertory. A well–received recent book concerning the ND repertory, although sceptical of Ludwig's conclusions, still opens with a passage revering 'the authorial identities of Léonin and Pérotin, and intimately connected with significant advances in written musical transmission and systems of rhythmic notation' (Bradley, 2018, p.1), a veneration of "composers" that could be lifted straight from Ludwig.

Busse Berger finds her way into thinking about medieval music in terms of oral culture mostly by using terms and ideas introduced in Carruthers, (1990). Carruthers introduces the term "memorial culture" to describe the processes by which medieval

memory operated, particularly the way in which a process of memoria was used to "chunk" large texts to be memorised into smaller and more digestible pieces. Like most other writers, Carruthers wisely warns us against a narrative approach to this study, mentioning that she is 'not concerned with what has traditionally been the subject of studies of the "rise of literacy" during the Middle Ages' (Carruthers, 1990, p.10), because in fact she has not found any evidence of 'the act of writing itself regarded as supplanter of memory' (Carruthers, 1990, p.16).

Carruthers is mostly interested in the memory for texts that ancient and medieval writers called "artificial memory" (Carruthers, 1990, p.15). The technique of artificial memory, as taught in the Middle Ages, follows directly on from Aristotle's *De memoria et reminiscentia* as well as Tullius' *Ad Herennium*. Carruthers concentrates mainly on the twelfth–century *De Tribus Maximis Circumstantiis Gestorum* of Hugh of St Victor. This text, 'addressed to very young students beginning their study of scripture' (Carruthers, 1990, p.81), gives a very basic introduction to the *ars memorativa* intended for absolute beginners. Hugh introduces the process of dividing and organising texts to be memorised thus:

> You see how a money–changer who has unsorted coins, divides his one pouch into several compartments, just as a cloister embraces many separate cells. Then having sorted the coins and separated out each type of money in turn, he puts them all in their proper places, since the differentiation of his compartments preserves the separation and distinction of the items, and thus keeps them unmixed (Carruthers, 1990, p.261).

Division and organisation appear to be the two main foundations of the memorisation of texts in the Medieval period. Yates, (1966, p.54) mentions that this technique stems directly from the ancient memory texts, and this technique is the first and most fundamental part of any memory system. Like with Parry and Lord's analysis of modern folk epics, the first step begins with an absorption of the repertory. For the singers in Lord's context, this is a listening experience, learning the tales as they are performed (Lord, 1960, p.21), but for Carruthers the medieval scholars learn by reading, as 'remembering what is aurally received is more difficult for more people than remembering what is visual' (Carruthers, 1990, p.27). Importantly though, *ars memorativa* in the Middle Ages is not just a tool for recall, but a process for new composition. Medieval scholars did not just read as we read today, but agonised over every sentence until fully absorbed, going from a mere interpretation of a text to the activity known as *cogitatio*. Carruthers distinguishes the naïve translation of *cogitatio* (thought) from the word as used by medieval writers, 'a small–scale composition, a bringing together…of various "bits"…in one's inventory' (Carruthers, 1990, p.34). When a medieval scholar has read and internalised

a text, dividing it up for memorisation, he is seeing how this new text can work with his own ideas, and therefore how to organise it in his mind. Busse Berger, (2005, p.214) labels this as oral composition, just like any other. This is because being creative in the Middle Ages differed drastically from how we define creativity. Our idea of creativity lies in original thought and moments of inspiration, whereas medieval creativity lies instead in 'richly retentive memories' (Carruthers, 1990, p.4).

Perhaps the best example of the memory being the seat of medieval creativity is St Thomas Aquinas. Testimony from Aquinas' canonisation hearings and the contemporary *The Life of St Thomas Aquinas* by Bernardo Gui say that:

> His memory was extremely rich and retentive: whatever he had once read and grasped he never forgot; it was as if knowledge were ever increasing in his soul as page is added to page in the writing of a book…stronger is the testimony of Reginald his *socius* and of his pupils and of those who wrote to his dictation, who all declare that he used to dictate in his cell to three secretaries, and even occasionally to four, on different subjects at the same time…he seemed simply to let his memory pour out its treasures… (quoted in Carruthers, 1990, p.3)

Even allowing for the exaggeration of veneration and hagiography, it seems clear that Aquinas was one of the best examples of an oral composer of text: learning what he has read, and using that knowledge to compose in his mind, subsequently being able to dictate his compositions to be written down. Aquinas was not an exception either, but an exemplar for others to aspire to.

Were men like Aquinas truly composing full texts and works of literature in their heads in a completed form, ready to be written down? The answer is not so simple, and echoing the Parry–Lord oral–formulaic theory, it appears that both reading and speaking were acts of memory and composition alike. *Ad Herennium* and many other texts make a clear distinction between two kinds of memory: "memory for things" and "memory for words" (Carruthers, 1990, p.87). Memory for words is exactly how we imagine memory working today: verbatim recall of texts learned "by heart". This is a skill that can be learned by rote. However, even *Ad Herennium* prefers memory for things, prioritising the learning of what Carruthers, (1990, p.87) calls the "gist" (res) of a text, but perhaps more precisely described as a condensed and schematised form of the text, ready to be made *ad verbum* again when it needs to be recalled. The memory for words is useful, primarily as an exercise for children in the memorisation of text, but the real power lies in memory for things because, according to the fourteenth–century writer Thomas of Waleys, 'words easily pass out of the memory…words, more readily than concepts, fail to hold together' (quoted in Carruthers, 1990, p.89). Memory for words is

certainly admired in medieval thought, but the memory for things is much more useful, as it allows access to the ideas of the text in a random–access fashion, not just the text itself from beginning to end (Carruthers, 1990, p.19). An intelligent medieval scholar was not just admired for his memory for texts, able to recount the works of rhetoric and grammar, but to be able to process the ideas of that text for use in further composition. St Augustine describes a school friend Simplicus:

> an excellent man of remarkable memory, who, when he might be asked by us for all the next–to–last verses in each book of Virgil, responded in order quickly and from memory. If we then asked him to recite the verse before each of those, he did. And we believed that he could recite Virgil backwards. If we desired a commonplace concerning any topic, we asked him to make one and he did (quoted in Carruthers, 1990, p.19).

Simplicus is not just a reader and memoriser of texts, nor a memory savant with an unnatural processing ability for text, but a man that knows Virgil inside and out. In other words, he has both the memory for words and memory for things. He has memorised the text (ad verbum) but also the ideas contained within it and the scheme which constructed the original (res). He can use the text, not just recall it, taking the original texts and using them as basis for compositions of his own.

Therefore, there appear to be three forms of memorisation and recall that we know could apply to the oral transmission of medieval polyphony. There is first the medieval memory for words, very similar to how we might go about memorising literate, fully–composed music today, repeating the text over and over again, akin to the murmur which was an 'apparently necessary feature of memory work' in the Middle Ages (Carruthers, 1990, p.6). Performing music from memory is one thing, but we have all encountered the issue of being able to perform a piece of music from the beginning, but not being able to pick it up from the middle, like a child that has learned their alphabet from their ABCs, but cannot yet tell you the letter that comes before another without reciting the entire song. This would be a perilous way in which to undertake a performance. Carruthers, (1990, p.76) uses the example of a Soviet case study into the mind of a twentieth–century Russian journalist who had problems learning long passages of text, but had no problems linking together short sections and quotations. In noisy situations, the journalist would misremember one single word and that would throw him off for the rest of the recall. His knowledge of the entire passage was there, but one slight error would force him to start again.

This is why ancient and medieval writers preferred the second form of memorisation: memory for things. Although the memory might not recall every word exactly as it was originally, this was not really a problem for medieval authors. Medieval authors

were more concerned with a retention of the sense of the work and the continued flow of ideas rather than the actual words used, as this memory for things led to a greater understanding of the meaning of the text. This is at odds with our literary sense of citation today, where the exact words of a writer are incredibly important, and a slightly inaccurate citation is a professional embarrassment.

Finally, there is the form of recall which is altogether alien to our literary sense of original work, the Parry–Lord theory of oral composition in the form of oral formulae, memorisation only being part of the scheme of the work at large, and a continued sense of composition and recomposition being the most active processes within recall. There is however no evidence to suggest that such a technique was regularly part of medieval literature, save for the parallels that Lord draws between his other examples and medieval epic (Lord, 1960, pp.198–221).

Busse Berger primarily concentrates on using Carruthers' framework to prove that it was possible for medieval musicians to memorise entire repertories of polyphony, much like Carruthers argues for text. Busse Berger argues this point cogently, but concentrates mostly on this "word–for–word" memorisation, separating the art of improvised polyphony and discant from the memorisation of completely premeditated and fully worked–out compositions. Busse Berger also takes inspiration from Owens, (1997, p.313), which argues that 'composers of complex vocal polyphony…neither needed nor used scores for composing', sometimes visualising notation in their heads and using a mental image as a virtual wax tablet. Busse Berger discusses in detail how improvisation of discant was a useful skill for medieval musicians, but then draws an unnecessary distinction between this discant practice and the 'composers of more complex polyphonic music' (Busse Berger, 2005, p.208). It is clear now that medieval polyphony was at least in part an oral tradition at the point of performance. Wright, (1989, p.335) surmised that ND polyphony was 'performed without the assistance of written notation', and perhaps the most powerful argument for this is Wright's insistence that most services would be sung 'in dim light' because candles were reserved for high feasts with unfamiliar chant (Wright, 1989, p.100). This is echoed in Page, (1997, pp.10–43), in his later rejection of a conception of medieval music centred around "light" and cathedralism. Is there anything special about the ND repertory that means that it must be created in a different way than the improvised music taught in discant treatises and clearly prevalent before the thirteenth century? It seems as if the assumptions of oral–improvised versus literate–composed are here too, although the "literate" is in fact a note–by–note memorisation of an "original'.[1]

It is at this point that we may realise that the Western classical canon and the still–

[1]This difficult distinction has largely been discussed in fifteenth–century and later music: see Bent, (1983), Wegman, (1996), Owens, (1997), Morucci, (2013), Canguilhem, (2015), Guido, (2017), among others.

present modern assumptions of "compositional intent" through notation may not be the best cognate to how music was made in the Middle Ages. "Improvisation" is a word rejected by many kinds of musician because of the historical associations that improvisation has carried within a musicology centred around the Western classical repertory. Academically, the use of the word "improvisation" to describe the practice in medieval music has been roundly repudiated by Treitler, (2015). However, there are no better words to replace improvisation that have not been similarly damaged by past associations, and Treitler does not offer any alternatives that can evoke this nuanced practice.

It is not a question of whether a repertory is improvisatory or not, but to what extent improvisation plays a role in its creation (Bailey, 1992, p.ix), as Boorman, (1999, p.406) correctly argues that notation 'carries no more than the minimal necessary information for a new performance'. Even the hallowed masters of the Western canon have been shown to be concerned with improvisation (Ferand, 1961; Borio and Carone, 2018), and the idea of performer merely a slave to the notation, along with the language of a performer being a composer's "interpreter" is a fairly modern concept, with an autonomous work existing apart from performance 'a peculiarly romantic conception of composition' (Cook, 2013, p.14; Goehr, 1992, p.113).

The term "improvisation" has come to imply a lack of plan, entering into performance without any prior knowledge of what to do. This is a misapprehension of what musicians that improvise do. There are some improvisatory practices that attempt to be completely free improvisations, but it is unknown whether this is a truly "free" skill or in fact 'a highly sophisticated, personal technique of virtuosic dimensions' (Bailey, 1992, p.85). The vast majority of musicians that would term themselves improvisers work within a musical practice with its own codes and improvisation formulae. I would argue that current musical practices outside of the Western classical repertory — such as popular, jazz and traditional music — are closer in their methods of music–making to medieval polyphony than the usual assumption, inherited from Ludwig, of ND polyphony being the beginnings of the tradition of European art music.

Green, (2002) has surveyed the methods through which popular musicians learn their repertories. Most prominent in her writing is the idea of "musical enculturation" which is 'the acquisition of musical skills and knowledge by immersion in the everday music and musical practices of one's social context' (Green, 2002, p.22). After a long period of enculturation, popular music becomes primarily an oral culture. Even with written notation in abundance, 'the notation has the status of a mere instruction', and it 'does not have the function of presenting or passing on the music for…these practices occur primarily through aural means' (Green, 2002, p.38). Similarly in jazz music, a novice musician begins by acquiring 'a jazz vocabulary', in order to 'work toward

fluency' (Berliner, 1994, p.176). Then, using the 'language of jazz' (jazz oral formulae), they can begin to improvise (Berliner, 1994, p.99). It is obvious here that to improvise in jazz or popular music, the musician needs to be intimately aware of the musical culture and how to formulate past music into new improvisation. To conceive of an improvisatory culture in literate compositional terms is a misunderstanding of how the musical culture operates. Improvisation has always been a part of European musical practice, and the classical practice which medieval polyphony has long been compared to was simply a particularly low ebb in that process.

Therefore, for medieval polyphony, Treitler comes closer to the likely truth here, using the oral–formulaic theory to get closer to an impression of what it meant to "compose" in the Medieval period. It is well known, after Clanchy, (1979) and Goody, (1987), that drawing a sharp line between "oral" and "literate" forms constructs a false dichotomy, but is that dichotomy any less fallacious when the literature is memorised and transmitted verbatim?

Much thinking about the ND repertory is also influenced by Edward Roesner, and rightly so given his dominating presence in the study of ND polyphony over the last half–century, but Roesner still operates within this context of "composers" composing "compositions" in original forms which are then disseminated as best as possible, by oral means or otherwise. Any small changes in the written notations can be simply dismissed as local performance practice (Roesner, 1981, p.393). Roesner's assumptions are clearest when he says that 'it is generally accepted that the Parisian repertory created by Leoninus and Perotinus represents the beginning of polyphonic composition in the modern sense' (Roesner, 2001b, p.232; see also Roesner, 1981), and these "generally accepted" terms, stemming once again from Ludwig's chronology, are cited and perpetuated in books such as Bradley, (2018, p.3). However, it is important to note that Bradley, (2018, p.256) then later acknowledges the possibility of some sort of 'collaborative compositional culture' contributing to the creation of the repertory. Roesner is happy to accept that pre-ND polyphony was 'created *ex tempore* in performance', but as soon as the repertory begins to show structure and a stable transmission, then it must have been 'conceived and disseminated in writing' (Roesner, 2001b, p.232). Both Busse Berger and Roesner's conceptions are similar: a "composition" in the modern sense of the word, completely premeditated down to the exactitude of the pitches and rhythm, conceived in full, and performed the same way each time. All that has changed is the technology: composition in the mind versus composition in writing.

Once again, Treitler is the only writer to have broken down these traditional barriers, to my mind correctly demonstrating how the barrier between oral–improvised and literate–composed is not so clear–cut, that it can be biased by our assumptions regarding composition. When discussing medieval music that has been traditionally positioned in

either the "composed" or "improvised" terms, 'we cannot conclude…that music that was not performed from score or from "memory"…was "improvised", if we mean by that to emphasize the absence of plan' (Treitler, 1991, p.68). No such difference can be identified in medieval music. It is highly possible that music we have previously thought of as "improvised" in fact proceeded with some plan, and that music we have discerned to be "composed" due to its stable transmission or strict structure, may have instead been partly composed in performance. Any divergences from a supposed "original" may have just been the proverbial nod of Homer, or a different conception of what the composition entailed. Then again, we must be careful to not ascribe style or state of an item as evidence for either written or oral transmission, as Jacobsson and Treitler, (1993, p.192) conclude elsewhere, 'there are no universal imperatives about either style or textuality that can be associated with either written or oral transmission'. Indeed, Immel, (2001) may have found evidence for these oral formulae in the Vatican Organum Treatise, discussed in the following chapter, but draws a literary conclusion of 'written composition based on written models', for he conceives the treatise as an example of how to compose in the style of the *Magnus Liber Organi*, not the other way around, concluding that the 'author [of the treatise] must have had direct access to the Magnus liber in some form' (Immel, 2001, pp.166, 155).

To return to the quote which began this chapter, the term "composition" is a difficult word to use in the context of medieval music, as we have seen the possibilities of its influence from performance, culture and technology. An oral transmission does not necessarily mean the rote memorisation of pitches and rhythm, just like we would attempt today in classical music, but may have rather involved the memorisation of a set of formulae for creating music (the visualisation of the map), and the particular schema that would construct compositions (the route to the destination).

Chapter 3

Oral Formulae

> There is nothing that commends a story to memory more effectively than that chaste compactness which precludes psychological analysis. And the more natural the process by which the storyteller forgoes psychological shading, the greater becomes the story's claim to a place in the memory of the listener, the more complete it is integrated into his own experience, the greater will be his inclination to repeat it to someone else someday, sooner or later (Benjamin, 1999, p.90).

As discussed in the previous chapter, the memorisation of words, i.e. verbatim recall of exactly what has been said, is a difficult skill to perfect and this has been known since ancient times in the writings of memory treatises. Attempts at word–for–word recall can potentially end disastrously when an item has been remembered serially and not "chunked" into bitesize pieces and tagged in memory for quick recall. One wrong word in serial recall can result in a completely failed attempt. Rather than attempting this difficult word–for–word recall, it is often easier and more productive to recall the scheme or "gist" of the story, and retain that instead. Then, when recall is needed the gist is put back into words. Verbatim recall, if required, follows on from this original gist where correctly–chunked items are tagged in memory to the gist and retrieved one–by–one during recall. However, for most instances of recall a gist–only recall is often sufficient. A gist recall may not be the same portrayal of the story as if it were told by someone else or as it was originally heard, but the ideas will be largely the same, shaded by each performer's own use of language.

This is the art of the storyteller as described by Benjamin. A story that is inherently idiomatic to the storyteller and therefore inflexible to the listener is not easily assimilated into the memory, but a story that is instead intuitive, building on themes easily manipulated by a new storyteller into a new story, can be effortlessly remembered because it exists within the framework of familiar stories, and can readily be transformed from story into gist. A new rendition of this story will be necessarily different, and its

effectiveness depends not only on the correct recall of the scheme but also the skill of the performer to read their audience and alter the story to fit, creating a memorable performance. A culture that remembers something by its gist rather than by its exact, original words clearly prioritises the function and content of a work over its superficial form or appearance.

It is easy to assume that our modern, academic, and Western conception of a work is the opposite of this, but the recognition of a work by its gist still survives today, for example in the way in which we can recognise derivative or plagiarised works. A work that has taken its ideas or structure from somewhere else but has dressed them up in its own language, perhaps phrases completely dissimilar to the original words, is still recognised as the same work. The difference lies in how we interpret what has occurred. A modern, academic interpretation is that this rewording of someone else's ideas, presented as a new original or a valid transformation of an original is inherently deceptive and a bad transmission of an original. It is not just intellectual theft and misappropriation, but also by using different words to the original the plagiariser has misrepresented the original by altering its verbal manifestation. By considering words immutable, the modern–academic interpretation guarantees that the ideas are themselves unalterable. A medieval interpretation sees this differently with regard to the words themselves: whether by memory or literacy, as long as the copy is recognisable in terms of its structure and ideas, then it is to all intents and purposes a fair copy. By making the oral transmission of ideas difficult by prioritising precise and literal transmission, the modern world can guarantee little variation in transmission, but the medieval mind aimed to make oral transmission simpler and more accessible by prioritising content and ideas over appearance.

In this way, the sense of "original" in medieval transmission is lost. Transmission of a story in gist form is determined not by the words that convey it but the ideas that construct it. Traditional tales are recognisable not by the words and the order of those words, but by the events portrayed in the story. Storytelling, according to Benjamin, (1999, p.90), is simply 'the art of repeating stories', such that any transmission of a story is bound up in its performance. There may be aspects such as the affectations that a storyteller uses to voice the different characters, as well as their facial expressions and gestures, but the most skilful part of being a good storyteller is weaving the ideas and events in the story into a convincing verbal narrative, in other words part–composing in performance using oral formulae. Our societies have a shared cultural knowledge of stories that are known to most members in that society. Each person could feasibly tell what is recognisably the same story, but they would use completely different words and sentence structures. Crucially, many of these stories we may never have read, but in fact have a history of oral transmission dating back centuries.

The classic example of the traditionally orally–transmitted item is the fairy-tale, where successive generations of parents have told the same stories to their children, although few can claim to have read and assimilated those stories from even extremely influential written versions such as *Grimms' Fairy Tales*. For the vast majority of instances of fairy-tale recall, the tales are recalled by their gist, such as the events that occur in the stories, rather than by a word–for–word recall of a written or composed version. Written versions, although often more elaborate and "composed" than their oral retellings, are not necessarily more legitimate than any version that a parent tells their child through oral processes.

Oral formulae are here too, in the tropes that we find across fairy-tales such as recurrent characters (e.g. damsels in distress, wizards, evil stepmothers), themes (e.g. the hero disfigured or transformed into a beast) and verbal formulae (e.g. "once upon a time", "happily ever after"). These tropes are so well known and critiqued in our stories that they have become targets for satire in countless fairy-tale parodies, but this only goes to show how prevalent and effective they are, successfully spanning the interface between the written and the oral.

Those that study folklore are very familiar with this issue, as there are still many oral traditions that are actively being transformed into literary traditions (Bula, 2017). Through this realisation of the transformative nature of literalising an oral text, folklore studies correctly criticise the ways in which an oral tradition is transformed into text. This is because 'oral traditions or "folklore" have mainly become accessible to modern scholarship in collections and through the means of writing' (Anttonen, 2012, p.325). This is in opposition to fields such as modern ethnomusicology that rely primarily on audio and video recording — a practice still transformative but to a lesser extent — in its collection of oral traditions. In folklore criticism it has long been known that committing an oral culture to a written form does more than just fixing its form in place. In fact it is a 'production of the text–artifact' (Bauman and Briggs, 2003, p.16), a new item that, even though it is a written version of an oral item, must be more literate than oral. The same is true of musical notation, where a notational dictation of a performance loses much of its original orality and performativity, but also simultaneously gains a new mimetic textuality and literacy.

Formulaic oral transmission of folklore and poetry has perhaps best been documented by I. Opie and P. Opie, (1959) in *The Lore and Language of Schoolchildren*, a book that began a whole new study of oral and children's folklore. They trace the transmission of hundreds of children's rhymes and tales from across Britain, for example demonstrating the development of a rhyme passed between children since the eighteenth century, morphing from two couplets about a drunken grenadier to a more rhythmically complex rhyme regarding in turn cats, frogs, monkeys, pigs, and even Mickey Mouse (I. Opie and

P. Opie, 1959, pp.10–11). These transmissions are often more volatile than fairy-tales and nursery rhymes because while the latter pass from generation to generation, children's rhymes circulate 'simply from child to child, usually outside the home, and beyond the influence of the family circle' (I. Opie and P. Opie, 1959, p.1). This leads to a situation where 'the behaviour and defects of oral transmission can be seen in operation during a relatively short period' (I. Opie and P. Opie, 1959, p.8). In all cases, even when metrical rhyme is concerned, the formulae that constructed an oral item can easily be altered or appropriated into another context, demonstrating that there is no item that cannot be conceived and transmitted orally and formulaically.

By way of further example, two forms of the same school rhyme separated in transmission by 130 years may be verbally dissimilar but formulaically identical:

Doctor! Doctor! how's your wife?
Very bad, upon my life.
Can she eat a bit of pie?
Yes she can, as well as I.
(quoted in I. Opie and P. Opie, 1959, p.3)

Little fatty doctor, how's your wife?
Very well, thank you, she's alright.
Can she eat a twopenny pie?
Yes sir, yes sir, and so can I.

This is recognisably the same rhyme with broadly the same story (the wife's condition has improved in the intervening century) but transmitted through countless generations of schoolchildren. To recognise or transmit this rhyme, the appearance of the words is seemingly unimportant, having been altered drastically, but the gist and story is much more stable. Which would we say is the original? The rhyme that came earlier, the rhyme that tells a better story or the rhyme that demonstrates greater textuality? If we were to say that the better–told rhyme or more textual rhyme is original, then we are making an assumption and value judgement about the composition of this rhyme: that it started as a pure, composed, and textual item that was then "corrupted" by oral transmission, which has frequently been shown to be a false assumption. On the other hand, if we pick the earlier rhyme by virtue of its chronology, we can be sure that the '12–year–old Spennymoor girl' who reported the later rhyme would disagree (I. Opie and P. Opie, 1959, p.3), for the rhyme which is contemporaneous with her is surely her original.

For oral transmission then, 'performance is transmission' and transmission cannot be separated from performance (Goody, 1992, p.15). In oral transmission, the gist of a story is its paramount aspect, because the gist is the story's essence and manner by which the story can be recognised. This is not to say that a story's verbal manifestation is unimportant. Rather the opposite is true, that the performance of the story is its sole output, and the performance is what is most appreciated. This changes through improvisation and extemporisation upon the formulae of the gist. Such elaboration is ubiquitous throughout all cultures and practices, and we can see this when 'transcribed

variants of the same type may run from half a page to 50 printed pages without the inclusion of new motifs or episodes' (Dégh, 1995, p.45).

This applies not just to stories that we have heard and are transmitting without conscious effort to transform, but also to stories of our own composition. In coming from the perspective of attempting to formulate thought through the stories that we tell, Schank, (1990) coincidentally alights on the same terminology of the creation and memorisation of a gist, which alters depending on context: 'our own personal stories are not identical each time we tell them with respect to the words that we say, but the ideas behind them are more or less the same' (Schank, 1990, p.25). Further to this, we engage in our own form of variation and transformation of a gist when we tell a story for a different effect. Schank uses the example of a car accident story to illustrate the difference in verbal manifestation. When the story is, alternately, intended to be cathartic, illustrate a point about poor vision, show vulnerability, or play down the situation to a parent or potential employer, the gist is completely transformed to change its purpose and final effect (Schank, 1990, pp.171–174). A transformation of an oral gist or formula therefore, is not necessarily accidental, but can be used in performance to further an agenda or make a point. The performance may not just change the surface appearance of the set of events in terms of the words used, but the gist itself can be transformed: events added, changed around, or even left out entirely.

Is it possible to detect this oral change of both the superficial and gist–altering varieties in repertories for which only written sources survive? O'Brien O'Keefe, (1990) in her study of this question in Old English verse argues that there is no such thing as a purely oral or purely literate text, but there are aspects of both in each such that distinctions between orality and literacy are in fact 'end points on a continuum' (O'Brien O'Keefe, 1990, p.13). Medieval texts contain a "residual orality" of the oral culture written on the page and it is possible to positively identify those qualities in literate texts that started as oral gists by picking out those instances where, as Lord speculates, 'the written text was dictated to a scribe by an oral traditional singer or poet' (Lord, 1995a, p.18).

A possibility arises then that if at least a portion of the music of the ND repertory was created in an oral–formulaic process, these oral formulae may be detected through residual orality and gist alteration in the *Magnus Liber Organi*. However, using the term *Magnus Liber Organi* sets up a detracting issue that must first be dealt with.

The term *Magnus Liber Organi* originates with Anonymous IV, the "great book of organum" that he attributed to Léonin. This convenient term was picked up by Ludwig, (1910) in *Repertorium*, who characterised it as 'not only the classic work of the twelfth century for polyphonic church music, but also continually stimulating to the more artistic polyphonic composition of Latin songs of the most varied content (conductus)' (Ludwig,

1910, p.2).[1] Without a reason to disregard this term, it has come to be used as a term that describes the repertory as a whole, or at the very least the union of music contained in the three central sources. The term is so pervasive and well recognised that the most authoritative edition of the music of the ND repertory is entitled simply "The Magnus Liber Organi" (Roesner, 1993), as if an edited collection of music contained within the sources is a good–faith reconstruction of an original book. On the contrary, the evidence of the central MSS, and W_1 in particular, suggest an underlying oral tradition of ND polyphony. It is important to argue therefore that the *Magnus Liber Organi* referred to by Anonymous IV can never have existed as one book, and that Anonymous IV's reference to a "Liber" may be a description not of a physical codex but of a repertory of music.

The manifold implications of considering the existence of a physical *Magnus Liber Organi* are drastically at odds with the evidence surrounding the repertory's creation, transmission, performance practice, and eventual preservation in writing, for the term *Magnus Liber Organi* indicates that the repertory was complete, stable, and conceived in writing. There is a large stability in the three central sources, such that it would be unfair to place the blame squarely on Ludwig's shoulders, as Busse Berger, (2005, pp.9–44) does, for theorising a stabilisation of the repertory in the thirteenth century. However, this evidence alone does not demonstrate that the repertory was ever complete, nearing a state of completion, or even was progressing towards a final state. It makes much more sense to consider an eventual maturation of the repertory from a constantly–changing and wholly improvised practice, through a gradual canonisation process to create the core of a memorised central and traditional repertory. In this way, there is not a moment of "creation" of the repertory, either in improvisation or in the work of Léonin, nor was there a progression to a final version. The central sources are more usefully conceived of as snapshots of their own contemporary performance practice of their own interpretation of a dynamic repertory, one that is contained geographically as well as temporally within their own scales.

An "original" form, the *Magnus Liber Organi* that Anonymous IV mentions, cannot have existed in a single source as the repertory was dispersed across multiple performance practices. The *Magnus Liber Organi* is instead a mythological construction of a text–artefact that Anonymous IV had heard of, or instigated from his retrospective nearly a century later, then taken at face value and literally imported without criticism by twentieth–century scholars. It is for this reason that efforts to reconcile the divergent sources into a corroborated singular and collective source will always be fruitless, as there is no evidence that any such source existed.

[1] "Sein „Magnus Liber Organi de Gradali et Antiphonario" bleibt aber nicht nur das klassiche Werk des 12. Jahrhunderts für die mehrstimmige Kirchenmusik, sondern wirkt weiter zunächst auch auf die kunstvollere mehrstimmige Komposition lateinischer Lieder verschiedensten Inhaltes (Conductus) höchst anregend ein".

There is evidence however, to show that polyphony was sung in up to four parts at Notre Dame long before the repertory was written down, and *Musica enchiriadis* demonstrates polyphony in two parts as early as the ninth century.[2] Decrees and endowments for Notre Dame explicitly mention singing organum in four parts by the end of the twelfth century (Handschin, 1932; Wright, 1989, p.339), but Baltzer, (1987) has shown that no written sources of ND polyphony — extant or now lost, records surviving only in library catalogues — could have been written until the early thirteenth century. It is clear therefore that a practice of singing organum in polyphony up to four parts was well underway before any *Magnus Liber Organi* could have existed. The *Magnus Liber Organi* then, is somewhat of a misnomer. It may have been a virtual concept of a book contained somewhere within the repertory as written at the time when it was eventually committed to parchment, but it does not tell the entire story.

Some "versions" of the repertory may be earlier than others, but this does not mean that they are in any way "unfinished", or represent the repertory before a Perotinian influence or a stabilisation process. Moreover, as previously discussed, no source is known to have ever been associated with Notre Dame itself (Baltzer, 1990), and the term "Notre Dame school" has only come to be used through the association of polyphonic singing as well as Léonin and Pérotin to the cathedral, disregarding the pan-European provenance of thirteenth–century MSS of polyphony and falsely indicating that they must all link back to Paris and Notre Dame in some way. *Magnus Liber Organi* and "Notre Dame school" are then both phrases that belie the evidence that we have available to us and make certain assumptions about the repertory.

However, oral formulae exist in nearly every oral repertory. It appears that it is much easier for orally–transmitted repertories to be transmitted as gists than by verbatim memorisation, what Lord, (1995b, p.183) terms "remembering" rather than "memorisation", although note–for–note memorisation has obviously played a part in extremely stable transmissions. In detecting oral formulae in the music of the ND repertory, an important source that has up until now been very much left out of consideration from the ND repertory is the *Vatican Organum Treatise* (VT).

The connection of VT to the central sources of the ND repertory has long been acknowledged, but its exact relationship to the repertory has for just as long been a point of contention. Wright, (1989, p.336) in fact describes VT as 'undoubtedly the most important, and at the same time most problematic, monument of early organum'. Bannister, (1913, p.156) failed to note the connection between VT and the ND repertory when he first included two pages of VT in his *Monumenti Vaticani di Paleografia Musicale Latina*, and it took until Ficker, (1932) to make this important connection. The connection was expanded upon by Jammers, (1955, p.39), who described VT as 'the beginning of

[2]Edited in Erickson, (1995).

Figure removed due to copyright restrictions

Figure 3.1: Biblioteca Apostolica Vaticana, Vatican City, Ottob. lat. 3025, f. 46v

the style' of the ND repertory,[3] but it was not until the full–length study of the MS by Zaminer, (1959) that an attempt was made at establishing an exact relationship between VT and the ND repertory. Zaminer termed VT a 'Vorstufe' of the ND repertory: an early stage of the ND repertory and a link between previous improvised organum in the manner of *Ad organum faciendum*[4] and the newer, ND "compositions".

Linking the earlier unwritten polyphony — known to have been completely improvised — to a later, written composition therefore found favour both from those that wished to cast the music of the ND repertory as emergent from oral improvisation, and those that wished to distinguish the written and composed ND repertory from earlier oral and improvised music. On the one hand, Treitler, (2003, p.77) describes the ND sources as 'late and in some sense edited versions', as opposed to an earlier and less edited VT, hence painting a progression from an oral practice based upon these oral formulae to a later, edited writing–down of a canonised oral repertory. On the other hand, Sanders, (1973, p.100) holds VT up as an example of 'a new shaping energy that caused the gradual replacement of improvisation by composition'. Here we have two conflicting hypotheses, both supported by the same evidence of repertorial similarity between VT and the sources of the ND repertory.

This hypothesis of VT being an earlier version of the ND repertory was firmly rebutted by Immel, (2001) in his extensive article on the MS. Immel describes in great depth the numerous concordances that VT shares with the central ND sources, formulae seemingly extracted from the ND repertory and placed into minimal examples to illustrate points of polyphony. Rather than being an early, formulaic version of the ND repertory, Immel proposes that VT is in fact a later distillation of the compositional style of the ND repertory, containing 'material contemporaneous with a relatively advanced stage of the Notre Dame repertory', a 'grammar' for organum, and therefore a MS with a focused and didactic purpose: to teach 'written composition based on written models' (Immel, 2001, pp.168, 166).

This temporal dichotomy issue is echoed by Wright, (1989, p.338) when he concludes his short survey of the MS — using Immel's findings — with a thought that 'it is not apparent whether the tradition of the treatise influenced the compositional process of Leoninus or whether it reflects a later distillation of formulae extracted from his *Magnus liber organi*'. I instead propose an alternative interpretation of these facts: that the two theories of the purpose of VT — an early stage of the repertory for improvisation versus a late stage contemporaneous with the *Magnus Liber Organi* for written composition — are not in direct opposition, and a third conception of VT lies between these two extremes if we consider the creation and transmission of the repertory as an eventual writing–down

[3] "Da die Art des Ottobonianus zwar musikalisch weniger rücksichtsvoll, aber graphisch primitiver ist, darf man wohl annehmen, daß wir uns beim Ottobonianus an den Anfängen des Stiles befinden".

[4] Edited in Huff, (1970).

of a stabilised oral tradition.

Immel's discovery of numerous concordances between VT and the extant sources of the ND repertory cannot be ignored: he is correct when he claims that the concordances inexorably link VT not with a primordial extemporised polyphony in the manner of early polyphony, but in fact with the ND repertory as it emerged fully–formed in the thirteenth century, especially since such florid and elaborate organum did not occur until the Aquitanian and Compostelan polyphony of the twelfth century (Fuller, 2011, p.47). However, this does not mean that VT is based upon written models as Immel claims because, as previously discussed, a stable version cannot be taken to imply a written genesis or transmission. Similarly, Immel's subsequent conclusion of VT being a distillation of the *Magnus Liber Organi*, a way of composing in a modern sense using the formulae of the *Magnus Liber Organi*, falls once again into modern assumptions of there being a stark difference between improvisation and composition.

VT, consisting of a mere five folios within a larger, composite MS, seems relatively unimportant in comparison to the central ND sources that contain hundreds of folios of written–out music, but it is precisely VT's compendious and taciturn description of an entire music–making practice in such a small space that is illuminating to this study of oral formulae. Early organum treatises, commonly acknowledged to begin with the *Musica enchiriadis* of the ninth century, are best understood not as models and rules for written composition, but as guidelines for extemporising polyphony by "organising" a second voice upon a well–known chant melody. For example, the author of *Ad organum faciendum* speaks to the performers themselves as a performer: 'I, an experienced singer, beg you to learn these «rules» perfectly' and admonishes 'the ludicrous buffoonery of bungling singers' (Huff, 1970, pp.50, 54). He does not speak to a composer who has composed organum incorrectly, but to the singers who extemporise it badly in performance.

Organum treatises are full of examples of how to move an organal voice against a tenor, truly oral formulae for how to *make* polyphony, not compose it. Like any good teacher, they teach not just by rules but by example. Even into the thirteenth century, the Anonymous of St Emmeram constructs his treatise on organum (*De musica mensurata*) not just by the versified and mnemonic central text, but also through glosses upon the text which explain the obscure rules with multiple examples.[5]

VT is no different, a MS consisting mostly of examples. Indeed only one page of ten contains any prose of more than a single sentence (Figure 3.1), the other nine pages are solely concerned with a terse rule and numerous educational examples. Whereas previous organum treatises in the vein of *Ad organum faciendum* — of which VT definitely takes its main inspiration — deal mostly with note–to–note organum and discant, harmonising

[5]Edited in Yudkin, (1990).

one tenor note with an organal note, VT deals instantly and directly with the florid organum style of the ND repertory and is the only organum treatise to consider in detail this particular style of organum singing. The sheer volume of examples contained within VT is part of the merit of its teaching by example and not by an arcane series of rules. Whereas *Musica enchiriadis* and *Ad organum faciendum* contain a few examples interleaved with the main text which describe how organum should proceed for each rule, and *De musica mensurata* contains a few examples within its gloss in order to fully explicate the intention of the author of the versified text, VT's main focus is upon example. VT begins with a short introduction of fewer than 400 words defining a few terms, then begins on a long series of examples demonstrating each of the rules in turn.

For example, in the first rule of how to proceed if the tenor rises a step, VT says that the organum should descend a third from the octave to the fifth. Rather than demonstrating this in a single simple example, VT then goes on to show eleven separate and contrasting ways to do this, on three different scale degrees. This provides the reader not just with a rule for how to proceed, but a further glimpse into the manner of putting the style into practice, i.e. oral formulae. For 31 rules, VT provides 251 examples, followed by 91 further supplementary examples and three full settings of organum: *Alleluia. Hic Martinus*, *Operibus sanctis* and *Petre amas me*.

The rules themselves are, without exception, short and formulaic: "If the chant…and the organum begins at…, let the organum…, and it will arrive at…". These rules are in reality redundant as they do not inform any more than what the examples are already demonstrating: it appears as if they serve only to separate one group of examples from another according to their rule, and to construct a structure in which to organise the examples into cohesive rules. The true value of VT is not in its didactic rules, but in its myriad examples that not only demonstrate the rules but also provide a flavour of the free yet particular style of the ND repertory. These examples are neither early versions of a repertory still in flux without a concrete musical style, nor are they a good complement to the succinct rules to teach written composition. They must therefore be examples of oral formulae.

Rather than the rules contained within the main text and supplementary material, Immel, (2001) is more interested in discussing concordances between the central ND sources and the three full settings that follow in VT, as they demonstrate a complex and interesting link between the style of VT as opposed to that of the central sources. Immel lists the remaining concordances in an appendix to his article, and most of these concordances are found between the rules of the treatise and full settings in central sources. Whereas Immel appears to find the minority concordances between VT's full settings and the central sources most interesting, to my mind it is the larger set of concordances to the rules within the treatise that can tell us more about how ND–style

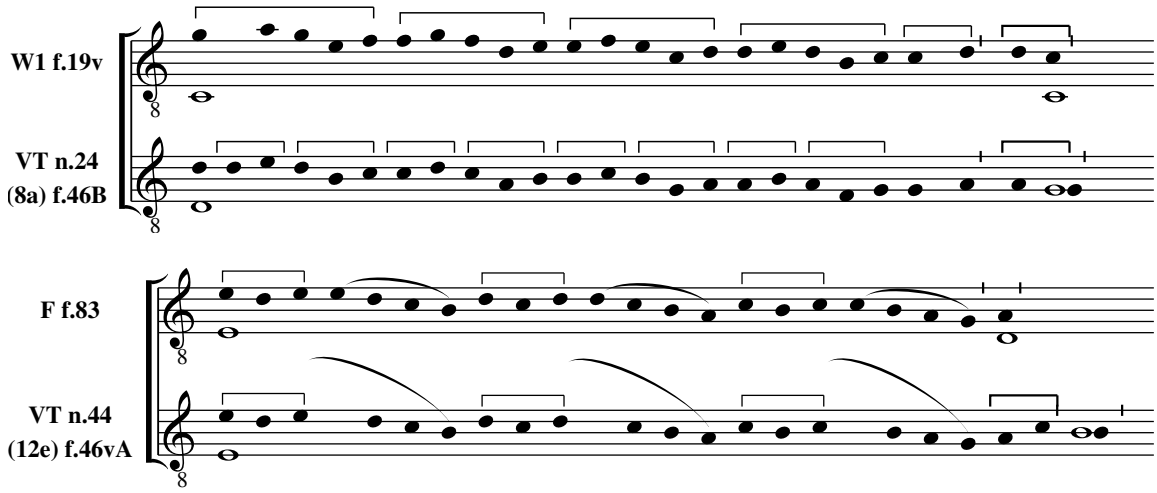


Figure 3.2: Identical concordances in VT from Immel, (2001, p.169).

polyphony was made. Immel's discussion, concentrating mainly upon the full settings in VT, tells us more about those full settings as if they were simply a fragmentary source of ND material, without the treatise with its hundreds of rules. This approach neglects to study how the formulae in the main body of the treatise are transformed from formulae into full settings, or perhaps vice versa. Furthermore, there are no concordances between the examples in the main body of the treatise to the full settings. Given what has already been discussed about medieval creative process being more akin to a remixing of previously assimilated material rather than moments of creative inspiration, the full settings do not follow the treatise as an implementation of what has already been learnt, but instead function as yet more models for the enculturation in the style through oral formulae.

However, concordances such as Immel's first and second concordances, where the pitch content of both VT rule and central source are identical (see Figure 3.2), are unique (Immel, 2001, p.169). Of the 31 examples that Immel proposes where he compares a VT extract to an extract from a central ND source, it is only these two where the succession of pitches is exact, and two further examples where there are only slight, superficial alterations. This is hardly strong enough evidence upon which to base his conclusion that 'the VT author must have had direct access to the Magnus liber in some form', and 'written composition based on written models' (Immel, 2001, pp.155, 166). This is not to say that Immel's examples are invalid and not true examples beyond mere coincidence, but the strength of the evidence cannot show anything more than a conclusion that the author of VT had a deep knowledge and enculturation of the formulae of the ND repertory practice.

Immel imagines the author of VT composing his rules by recalling formulae: 'how can I work this formula in — how can I provide greater symmetry or be more consistent — or how many times can I include this formula?' (Immel, 2001, p.166). However, the

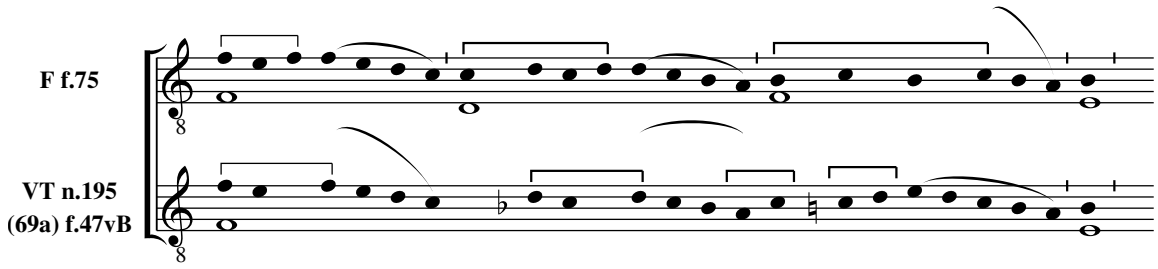


Figure 3.3: A more complex concordance in VT from Immel, (2001, p.171).

author of VT perhaps was not as conscious as this in the creation of his rules, and his practice may have been more of a process of improvisation based upon an enculturation within the polyphonic style of the ND repertory, rather than a premeditated practice of composition recalling well–known formulae in order to educate the reader. Like Lord's singer, the author of VT may have considered these formulae to be more like his originals within the style of ND polyphony instead of copied directly from the *Magnus Liber Organi*.

Rather than the identical concordances in Figure 3.2, a more interesting example is those concordances which are obviously concordant beyond coincidence, but could not have come about through a copying process, be that by accident or with a conscious purpose. In Figure 3.3 we can see one such concordance. This is clearly the same formula in both VT and the written–out source, but it has been transformed. Firstly, the repeated *f* ending the first, square ligature and beginning the currentes has been elided in VT. The same is true of the next phrase on *d*. Divisiones have been removed between the phrases, and a *c* which begins the second phrase is not present. So far these are small, superficial changes. However in VT, an extra ligature leading up from *A* to *c* causes another formula to be introduced, one that ends with a falling *cBA* figure, as in F, but first proceeds upwards to an *e* by step, eventually falling down to the *A*. This is in contrast to the formulae used in F, which pivots around an alternation of *Bc* before descending.

What we can see here therefore is the use of oral formulae to part–compose — to improvise using formulae — polyphony over a tenor. In the example from F, the formula of an alternating descending ternaria (let us ignore the extra *c* at the beginning of the second phrase as merely a transient note) followed by four falling currentes is followed by a cauda which leads to a cadence onto a fifth. Conversely in VT, the initial formula is interrupted — for one reason or another — by a sudden ascending third to end that particular phrase on a more consonant fifth. This change must have caused the performer of that polyphony to not select the same cauda as the creator of the polyphony in F, but a slightly different formula which begins on *c* instead of a *B*, yet still leads through a descending phrase to a fifth. These subtle differences in selected formulae can tell us more about the creation of polphony than any identical concordance can, because it enables

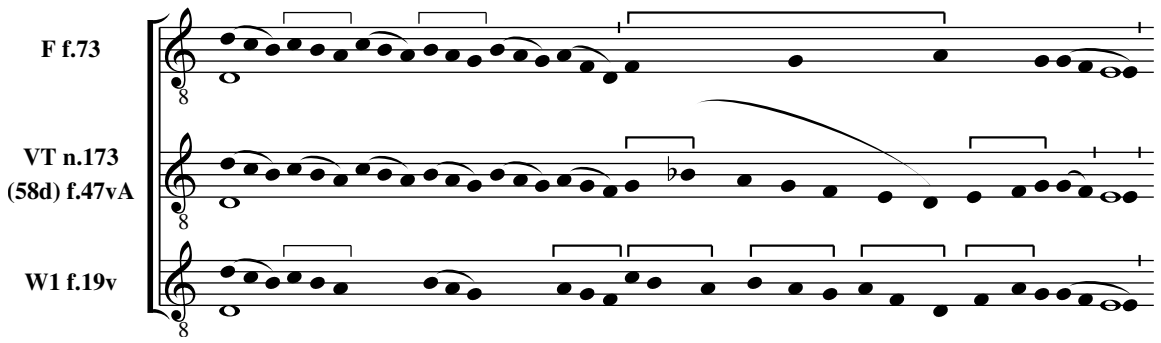


Figure 3.4: A transformative concordance in VT from Immel, (2001, p.170), with the same concordance from W_1

a glimpse into the length and construction of the oral formulae that this polyphony is created from.

One can only speculate as to the further evidence for this argument that could be found in the partial, highly transformed concordances that Immel must have found in his study, but did not deem important enough to include, as 'formulae consisting of fourteen notes or fewer have not been considered' (Immel, 2001, p.169). A prime example of this transformative concordance that we can only see hinted at in Immel's work is his fourth concordance in the appendix (Figure 3.4). This concordance has been superficially transformed through its notation (usual, square ligatures transformed to currentes), but it is actually two oral formulae. The first formula descends from the *d* down to the *F*, but then the second formula after the divisione in F is completely different. This is just like the complex concordance in Figure 3.3, but the most interesting item is left out by Immel: 'W_2 provides a slightly longer and somewhat monotonous version of this formula' (Immel, 2001, p.170). Unfortunately, Immel does not tell us where this was to be found, for W_2's extended and "monotonous" version would surely tell us much more about the formula which created this concordance. What we can see however, is how this formula is transmitted in another MS. The same concordance in W_1 is interesting both in its comparison to F as well as VT. It begins the same as both, but misses out a *cBA* ligature, proceeding directly to *BAG*, and again on the next step down. It then leaps back up to *cBA* before finally ending on the *E*. This is just as transformative as VT to F (or vice versa), and therefore just as valid for an appreciation as polyphony constructed from oral formulae. As Busse Berger, (2005, p.173) concludes, the examples in VT 'were not meant to be stitched together mechanically', but 'shortened, lengthened, and combined with each other in ever new ways'.

It is within this idea of VT being written not by a literate teacher of ND "composition", but by a member of that musical culture of ND polyphony that we can question both conclusions: VT being either a 'Vorstufe' of ND, or a written composition treatise. There is nothing in musical complexity — such as isoperiodicity, modal rhythm, or a general

regularity of style — that tells us that VT must be a later, written form. Nor is there anything in the tradition of organum treatises consisting of rules for extemporised polyphony that tells us that VT must be an earlier prototype for the ND style. The fallacy that more complex, regular music must be a later creation was realised by Handschin in relation to the eleventh fascicle of W_1 almost a century ago: 'it is a more modest flavour when compared to the Notre Dame school, but on the other hand it cannot be an earlier one' (Handschin, 1924, p.57).[6] Handschin emphasised his anti-progression stance again when considering the *Summer Canon*: 'modern musicians have perhaps been too impressed by the use of the canonic device in our composition, but this device is not in itself a sign of art' (Handschin, 1949, p.79).

VT is instead another process for encoding the practice of ND polyphony, one that stands in opposition to the literalising processes present in the central sources. However, we must be careful not to describe the central sources as compositions. Rather, the written–out sources preserve witnesses to acts of polyphony, written–out versions of oral performances, whether canonical or not. VT preserves the selfsame tradition, but instead of witnessing the act in a prescriptive notation of polyphony that has been performed, VT witnesses the ND style as a description of the processes with which to grasp and take part in the practice, simple recipes for making more of the same, and a series of examples using dynamic formulae from the ND repertory. VT is neither an early version of the ND repertory nor a composition treatise, but an alternative method of preserving the tradition through a taste of its style and oral formulae that could have been created by any member of that musical practice.

We can detect residual orality in thirteenth–century polyphony, by identifying oral formulae in written sources. VT is not just a good example of the style of the repertory, but a tool for the beginnings of enculturation within the practice, using oral formulae such as the examples notated in VT to generate new polyphony which is neither completely novel nor completely traditional, recalling previous acts of polyphony by their gist rather than by their notes. As we have seen with stories that are recalled through gist and recomposed using oral formulae, the line between transmission and creation — never "composition" in the modern sense — is further blurred. VT is just as valid a transmission of ND polyphony as a central source, such as W_1. It is unfair to place a value judgement upon VT as inferior or less important than a central source because it does not transmit much written–out music, or to concentrate almost solely on its written–out forms: these do not allow us to gain much insight into the *living* performance practice that surrounded this repertory. As seen through VT, orality is alive and well throughout the period of the ND repertory practice, from its inception to its eventual stabilisation. Rather than

[6] "Dies zeigt, daß es sich im Vergleich zur Notre Dame–Schule um eine bescheidenere *Geschmacksrichtung* handelt, daß aber andererseits die *Entwicklungsstufe* nicht eine frühere sein kann."

concordances between VT and central sources implying a literate connection between the *Magnus Liber Organi* and VT, we should instead conceive the concordances as betraying a thoroughly oral and living tradition within the written–out central sources.

Chapter 4

Formulae Analysis

"Residual orality" may be present in W_1, just as it may be present in any other medieval source. Through careful analysis of the construction of the musical text within the MS in relation to other sources of ND polyphony, it may be possible to shed some light on the aspects of orality in the ND repertory contained in W_1.

W_1 contains very few *unicae*: nearly every setting in the MS appears elsewhere in other sources from across Europe, and many are present in at least two other MSS, usually F and W_2. In a few cases, there are concordances within W_1 itself, either between clausulae or indeed similar organum settings. In general for this study, this means that for much of W_1, it is not the only "copy" of the music in existence. We can usually find a version of the same music reproduced in some form or another elsewhere. This affords ample opportunity within the MS to compare in minute detail these written down versions of each setting, to document how they differ, and analyse in detail how these differences can provide evidence for oral transmission. As seen in previous chapters, oral transmission can take place in three forms: rote memorisation (memory for words), gist memorisation (memory for things), and oral composition.

It is important to note that these three forms are only partially distinct: rather than three alternate methods that are selected to the exclusion of others, these processes are *aide memoire* tools that complement each other. A gist memorisation may be aided in part by aspects of rote memorisation, and a misremembered rote memorisation can be aided by gist memorisation and oral composition. This results in a complex process of memorisation which is difficult to untangle, and it is likely never to be known exactly how a certain passage was remembered because it may well have never been memorised in exactly the same way for each transmission. Lord, (1995b, p.183) prefers to maintain a useful distinction between what a singer has consciously memorised and what is simply remembered by 'a natural and informal mental process', especially when there is no fixed text to memorise. The same could be said of W_1, that it does not contain solely memorised, literate music nor does it contain only improvised, oral–composed music. W_1

is rather the artefact of a transmission that may be half–memorised, half–remembered.

It is also important to note that no method can guarantee, or even is much concerned with, precise transmission. These oral transmissions are more focused upon the act of transmission itself in performance, and transmitting the ideas contained in the item. The orally–transmitted item is never composed in full and therefore never reaches a completed state, but it is continuously being altered and renewed in each of its subsequent transmissions.

The first method to consider is rote memorisation. Music is memorised practically verbatim this way through a process of continuous repetition, and is recalled serially such that the item must be recalled from the beginning. Useful here is the etymology of the medieval Latin word "verbatim" (word for word). This is in contrast to the term "literatim" (letter for letter). Verbatim memorisation, unlike literatim, does not imply a written intermediary, as memorising speech is memorising the words that are said. The letters that are spoken, if we can say that "speaking letters" makes sense at all, is a literate construction that occurs only in the use of writing.

Academic writing that concerns the "defects" of oral transmission is usually referring to the verbatim memorisation method alone. Such "defects" can be found in the superficial changes between versions, for example alternative spellings and slight, inconsequential changes that do not alter or interrupt the broad flow of the item. Both large– and small–scale structure is likely to be identical in a memorised transmission, but minute changes can be seen, typically from a legitimate error in recall. Within the context of an oral repertory however, it is not fair to call such superficial changes "defects" as they are a wholly expected and perhaps desired feature of the items' transmission.

In musical terms for the ND repertory, these superficial changes would be manifest in settings that give themselves easily to rote memorisation, such as discant tripla and quadrupla, where the synchronicity of voices is key, modal rhythm is continuous, and there is no room for a voice to add or remove a phrase either by error or improvisation. We know that for words, rhythmic items are more conducive to rote memorisation, as can be seen in versified treatises (Busse Berger, 2005, pp.98–102), and this must be the case for music too, where a tightly regularised and rhythmic music ensures that nothing can be left out or altered. We can therefore expect the construction and individual phrases of pieces memorised by rote to be broadly identical in strict rhythm, but the written–down versions still to exhibit small, superficial changes in pitch and rhythm. Moreover, if each written–down version proceeds from an oral recall of the musical item, then we can expect the ambiguous ND musical notation to reflect this: different clefs, layout and ligation is to be expected as the scribes rewrite the music, much like attempting to spell a word that you have only heard spoken before.

The second method, gist memorisation, is perhaps a more interesting process to

analyse. Music is memorised this way through a combination of rote and gist. The item fits into and is known within an enculturation framework where an item is transformed from its manifestation (in this case a performance of the music) into a gist and plan of the item. In musical terms, the item is not known as a series of pitches, but as a route through a well–known map of the musical territory. Phrases are generalised and categorised into a general knowledge of common formulae, this being a more efficient method of remembering an entire corpus of music which builds upon the same formulae. Rather than committing a phrase to memory each time it occurs, the phrase is memorised once and tagged in memory. A performer, fully immersed in the culture of performing a repertory such as this, will have built up a bank of oral formulae, such that a piece of music is a memorised plan of how to navigate polyphony using these stock phrases.

We may however, find moments that become more like rote memorisation, either because they are especially rhythmic and therefore memorable, or because they do not fit neatly into the typical framework of oral formulae and must be added as a new formula for that particular instance. In ND repertory terms, this may be observed in differences that go beyond common superficial changes yet accomplish the same musical function. Oral formulae may be selected that are broadly similar and achieve the same aim — such as from one harmonic concord to another — but may be implemented in a different way. A simpler formula may be replaced by a more elaborate one or vice versa. A complex clausula may be replaced by a shorter paraphrase or vice versa. Even a completely different section of polyphony may be substituted, but crucially one that begins and ends at the same sense of place. These are not large–scale changes, but quick substitutions that have little overall effect on the musical flow.

The final method is that of oral composition. Here, all the previous processes of oral formulae still apply, but the gist becomes a much more fluid construction, transformable just as much as the individual notes. In ND terms, we would expect to see large–scale changes to the settings, whole new clausulae substituted in place, and settings that completely diverge from one another, becoming more like improvisations upon a theme rather than those settings that have been seen previously as examples of static and composed works. Sometimes, these alternate versions may appear in other clausulae cycles, but at other times these alternate sections of polyphony may be unique within the entire repertory.

In order to detect these elements of residual orality which may be present in W_1, an analysis of the overlapping settings of polyphony can be made, and the divergences between concordant settings may provide evidence for oral transmission by any of the processes described above, most likely through a combination of all three. By detailing differences, large and small, between settings that occur both in W_1 and other MSS, a comparative edition of W_1 can be made that aims not to hide those differences behind a

comprehensive editorial process, but instead bring them to the forefront of discussion. To my knowledge, there have been only two studies of the ND repertory that consider these differences between the MSS of the repertory as an important aspect of their transmission: Smith, (1964) and Tischler, (1988).

Smith, (1964) is concerned with cataloguing and defining clausulae, and as such divides each setting of organum into a conception of their constituent clausulae, theorising the broad delineation of those clausulae that may replace sections or organum by virtue of their tenors. Smith supplements his study with his findings in diagrammatic form, and fully shows those larger–scale differences between the versions contained in MSS.[1] Rather than the cataloguing and organisation of organa by setting, Smith conceives of the construction of the organa as 'essentially and overtly sectional' (Smith, 1964, p.20), and the ND organa as compositions of clausulae. However, Smith does not go much further than to find fault with the idea of organa as self–contained compositions.

Tischler, (1988) deals with these same issues of clausulae, but from a finer scale, taking as read the sectional construction of two–part organa and using Ludwig, (1910) and Smith, (1964)'s clausulae demarcations to create an entire edition of the two–part organa, demonstrating their differences in clausulae, pitch and ligation. Tischler endeavours to edit the original ligatures into modern notation, writing out every clausula rhythmically. However, small and seemingly inconsequential differences to Tischler's study, such as slight changes in ligation that do not alter the rhythm, are ignored in order to maintain the integrity of the clausula as an independent section of polyphony.

This study intends to take an even finer–grained look at the differences between the organa, concentrating on W_1 as a basis for study, considering all manner of differences between MSS as possible evidence for oral transmission. Taking after Tischler, (1988), this study will display those differences in the form of an edition, displaying the music in W_1 as a base text upon which divergences in other sources occur, but divergences can take any form: large differences in clausula to small changes in pitch and ligation are considered equally.

Using Ludwig, (1910)'s concordances as a basic indication of concordance, W_1 contains 198 settings of organa that have some form of concordance in other MSS. To calculate this figure, only concordances in *sine littera* notation have been considered, as *cum littera* concordances — for example in motet — are bound to be transformative, and their lack of ligation complicates the question of the indication of rhythm. Furthermore, divisiones are not always shown as they cannot be reliably placed in the text and an attempt at concordance with divisiones would needlessly clutter the result without much more information being displayed.

The edition was compiled using a shorthand markup language of my own creation

[1] An example pertaining to this study can be found in Figure 4.12.

```
#          // Begin source description
a Adam     // Source with identifier "a" has name "Adam"
e Eve      // Source with identifier "e" has name "Eve"
#          // End source description
{          // New ordo
 {         // Begin voice one
  !''      // C clef, second line
  [        // Begin square ligature
   g'      // Note g (jump up an octave)
   a       // Note a
  ]        // End square ligature
  a        // Note a
  |        // Divisione
 }         // End voice one
 {         // Begin voice two
  !'''     // C clef, third line
  a        // Note a
  |        // Divisione
 }         // End voice two
}          // End ordo
{          // New ordo
 {         // Begin voice one
  /"a"     // Source "Adam" has a divergence
  (        // New currentes ligature
   edc     // Notes c,d,e
  )        // End currentes ligature
  /"e"     // Source "Eve" does something different
  [        // New square ligature
   efe     // Notes e,f,e
  ]        // End square ligature
  /        // End divergences
  |        // Divisione
 }         // End voice one
 {         // Begin voice two
  a        // Note a
 }         // End voice two
}          // End ordo
$          // Begin syllable description
Con2       // Syllable "Con" has a duration of two ordines
$          // End syllable description
```

Figure 4.1: An example NDP file

called NDP (the Notre Dame Parser), which facilitated rapid entry of the differences between the sources. NDP is a file format that can concisely encode the pitch, text, ligation, and divergences between sources of the ND repertory. It is also a parser made using the common tools Lex and Yacc which define a grammar to read an NDP file and output a more verbose Lilypond typesetting code which can then be piped into Lilypond to generate editions in PDF. An explanatory example of NDP can be found in Figure 4.1, which demonstrates how most symbolic events can be represented using a single character, aiding concise and thereby rapid entry of the necessary data.

The musical text of W_1 was entered first, and then this base entry was compared against the concordances listed in Ludwig, (1910) one–by–one, noting any difference as it arose, until a complete NDP file for that setting was created. This NDP markup was then compiled into a written–out edition. The complete edition can be found in Appendix A. This full edition of W_1's concordances and, more importantly, divergences provides evidence in the slight differences between MSS that can point to oral transmission. These

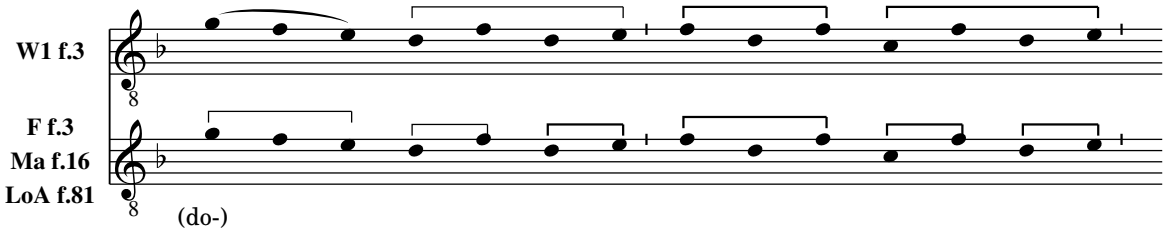
will be discussed, using examples from the full edition, and how these differences pertain to oral transmission will be highlighted.

By far the largest category of differences between each of the sources is those slight differences in ligation. There is not a single concordant setting that is identical in the presentation of its ligature configuration. A simple parallel can be found in the different spellings found within copies of medieval texts indicating an oral component playing a part in the copying of texts. A different spelling indicates that the word was not copied literatim, but verbatim. The word was read (decoded) and recognised before being re-encoded into a different and perhaps idiomatic spelling. Many of these ligature "spellings" are metaphorical homophones: they indicate an identical rhythm. These will not be discussed in depth as they can be seen from a cursory inspection of any page of the full edition, but it is worth mentioning that such alterations are commonplace and are in themselves good evidence for an oral transmission. Other changes in ligation alter the rhythmic interpretation, and it is these changes that will be discussed below.

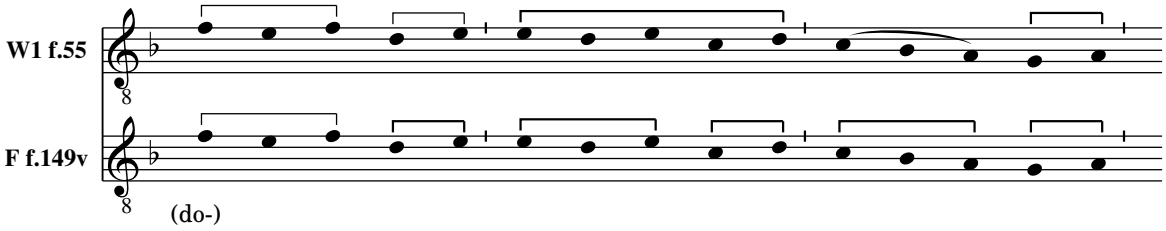
In W_1, ligatures can be split and joined at will, as can be seen in Figure 4.2. Modal rhythm operates using the grouping of ligatures to imply rhythm, such that this grouping is fundamental to the interpretation of rhythm in ND sources. It has long been known that the "rules" of modal rhythm as described by Anonymous IV cannot be strictly applied either to discant, copula or organum purum. Bull, (2017, p.44) rightly notes that we cannot be certain of W_1's indication of modal rhythm, considering that modern dating of the MS places the systematisation of modal rhythm 'at least ten years, and possibly twenty, after the creation of W_1'. Modal rhythm rules then, are more usefully interpreted as rules of thumb, and an open–minded interpretation is sometimes necessary to translate these groupings into a sane, synchronous rhythm, especially when such rhythms are irregular. Broadly speaking for the purposes of this study, it will be assumed that the ligation of W_1 follows the later systematisation where possible. Notwithstanding, it is surprising to see ligatures longer than ternaria split and joined seemingly at will.

In Figure 4.2a, two 2–note ligatures, typically indicating are written in W_1 as a single 4–note ligature, making its modal interpretation more difficult. It is clear that the rhythm implied is still the same, but this joining of ligatures complicates matters. The same is true in Figure 4.2b, where a 3–2 complex of ligatures is joined into a single 5–note ligature. However, this rather simple joining of ligatures is further complicated in Figure 4.2c where the prepending of a punctum into a 4–note ligature changes the implied rhythm, from into . Although it may seem therefore that the scribes of W_1 preferred to join ligatures where possible, Figure 4.2d demonstrates that this is not always the case, and that there are examples where ligatures joined in other sources are not joined in W_1.

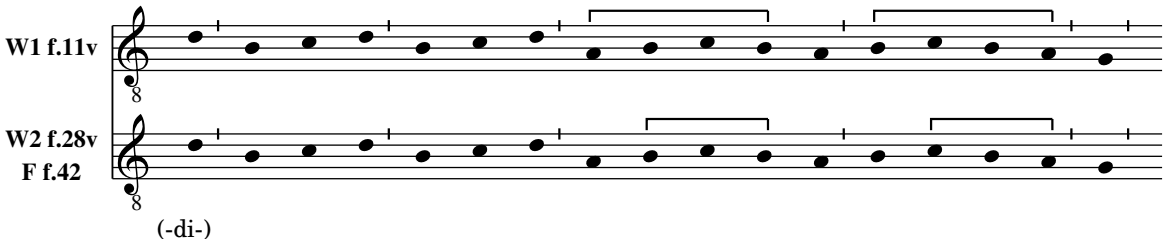
Binariae most often indicate an iamb in modal rhythm. Two longas at a cadence point



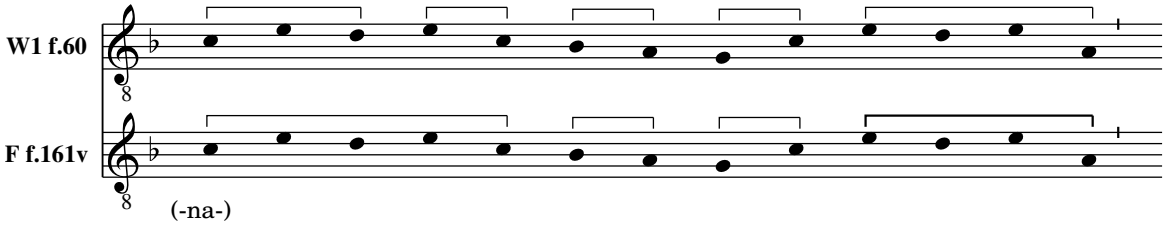
(a) 4–note ligature is equivalent to two 2–note ligatures



(b) 5–note ligature is equivalent to a 3– plus 2–note ligature



(c) 4–note ligature is equivalent to a puncta plus a 3–note ligature

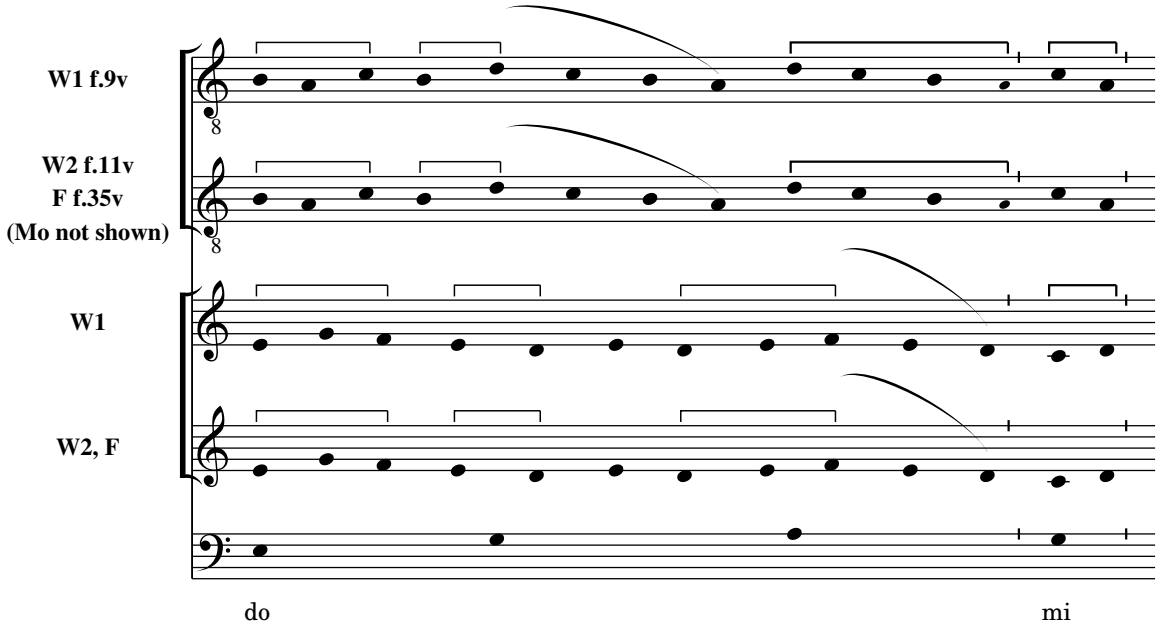


(d) W_1 splits ligatures

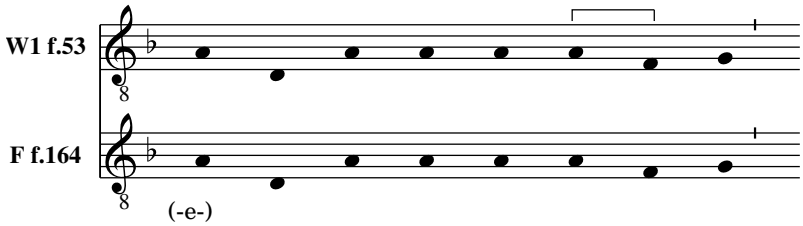
Figure 4.2: Split ligatures

are usually unligated, but the scribes of W_1 had a habit of ligating these longas together, which confuses any interpretation of the rhythm, as seen in Figure 4.3a. This is not just limited to cadence points, and sometimes longas are ligated in mode V (see Figure 4.3b), indicating a rhythm more complex than simplex longas.

There are two types of ligatures: square ligatures and currentes, and we can be certain in W_1 that these ligature forms are equivalent. There is not a more convincing example of this equivalence than Figure 4.4, where the order of square ligatures and currentes is switched between W_1, W_2 and F. The form of ligature written is therefore nothing more than a stylistic choice on the part of the scribe. Descending ternaria like in this example are altered between square ligatures and currentes interchangeably, but it seems

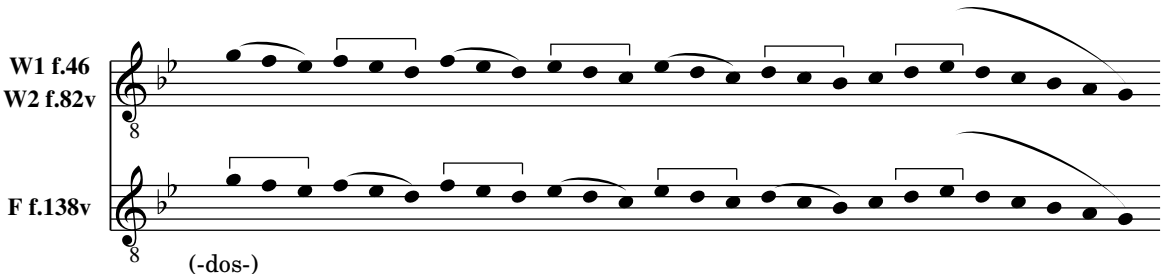


(a) At cadence points

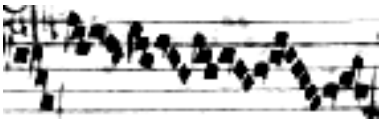


(b) In mode V

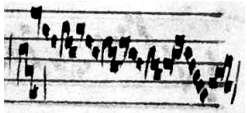
Figure 4.3: Equivalence of binariae



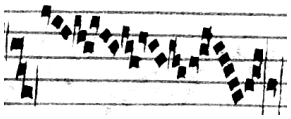
(a) Aligned notation of W_1, W_2 and F



(b) As notated in F, f.138v



(c) As notated in W_1, f.46

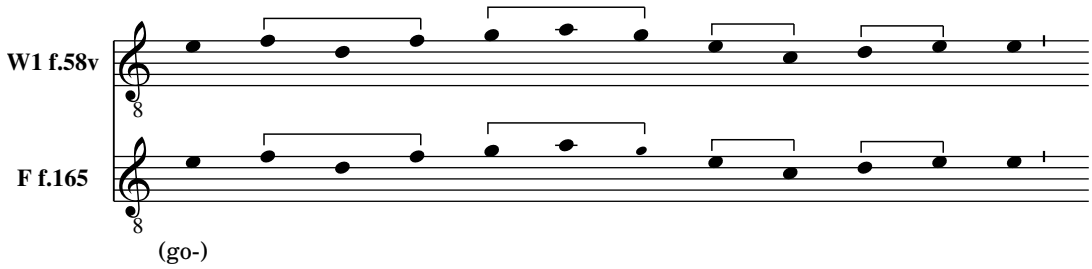


(d) As notated in W_2, f.82v

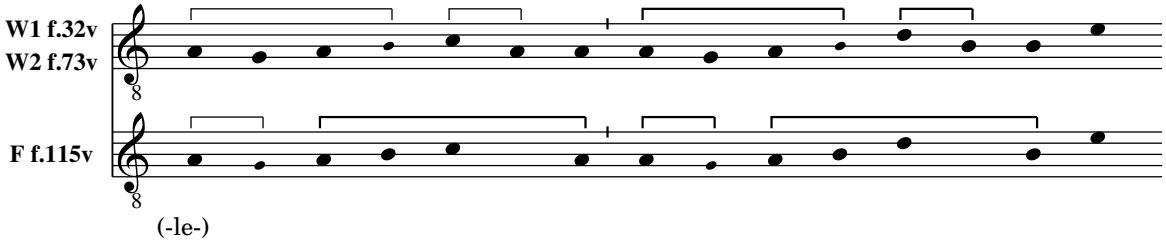
Figure 4.4: Equivalence of ligatures and currentes

apparent that stepwise descending ligatures of more than three notes are the most likely candidates to be written as currentes.

Plicae are notes that are not explicitly written, but implied by the position of a stem

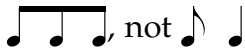


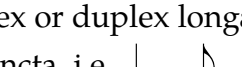
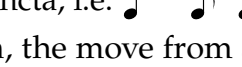
(a) Single written–out plica in W_1



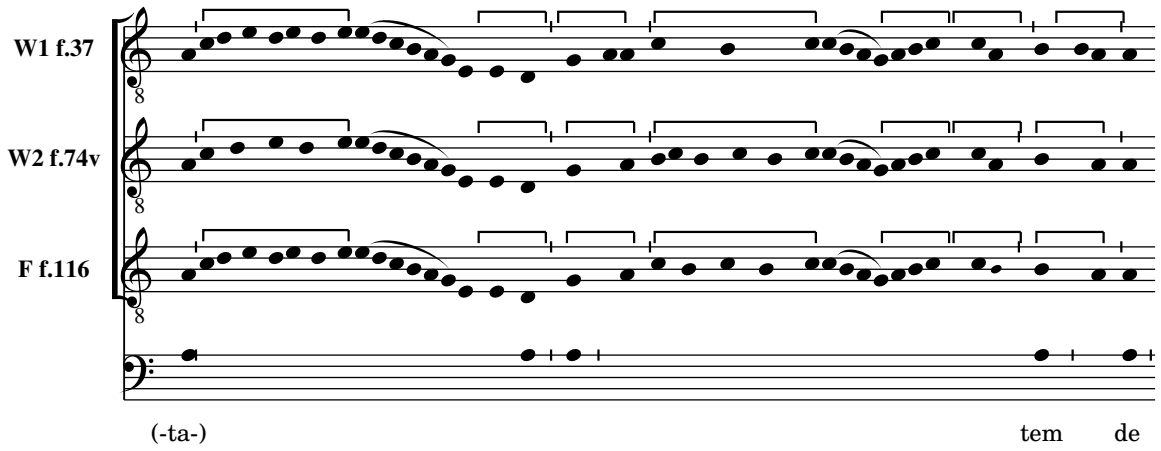
(b) A plica complex

Figure 4.5: Written–out plicae

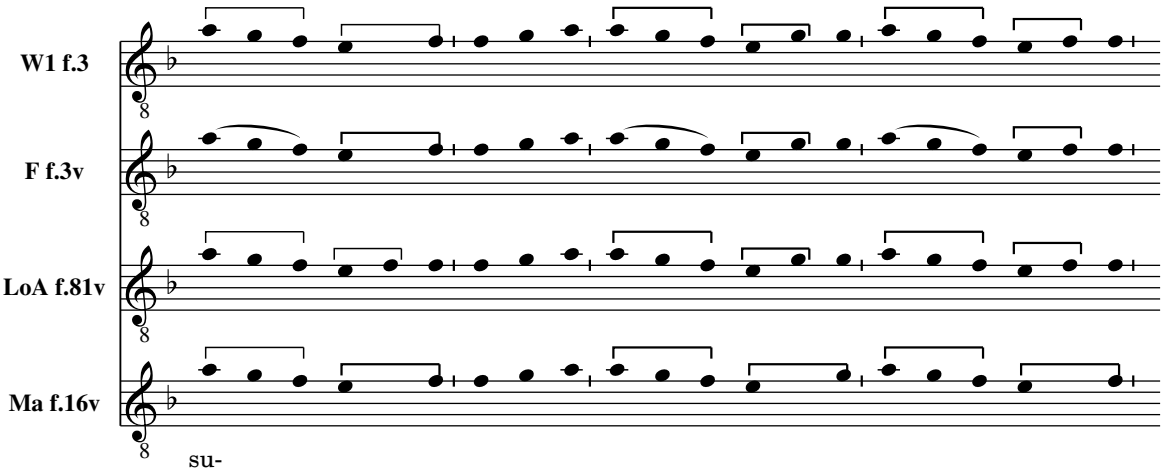
at the end of the ligature. We can be certain, too, that plicae are equivalent to their written–out forms, and are simply a scribal preference, not any kind of extraordinary note. Figure 4.5 demonstrates this: in Figure 4.5a, a *g* written as a plica in F is instead written out in W_1. Even more convincingly, Figure 4.5b presents a plica complex, where through re-ligation different notes have been chosen to become plicae. The purpose of plicae it seems in this case is not as a scribal shorthand like currentes may be, but they are in fact a way of better indicating the intended rhythm, especially when *fractio modi* is involved: the plica is a method of "tucking in" an extra, usually stepwise, note at the end of a longa without disturbing the regular grouping of ligatures and complicating the interpretation of rhythm. For example, in Figure 4.5a, the use of a plica in F better demonstrates that the intended rhythm is  , not ., a possible incorrect interpretation of W_1 or W_2.

Repeated notes are often substitued both in W_1 and in other MSS. The common binaria at cadences, often interpreted as two simplex or duplex longas (), can be subsituted for a binaria followed by a puncta, i.e.  . This can be seen in Figure 4.6, where in Figure 4.6a, the move from a lower auxiliary *G* to *A* is emphasised in W_1 with a repetition of the *A*, and again at the end of the extract. Another emphasis occurs in Figure 4.6b where Ma does not emphasise at all, W_1 and F emphasise all but the first cadence of the extract, and LoA chooses to emphasise each cadence.

Another divergence occurs in those ordines that are ligated differently in every source. Figure 4.7a demonstrates four different ways in which one ordo has been ligated in four MSS, including W_1. It is difficult to determine what has occurred here: perhaps the performance practices that fostered each MS had a different conception of the rhythm



(a) W_1 substituting rhythm

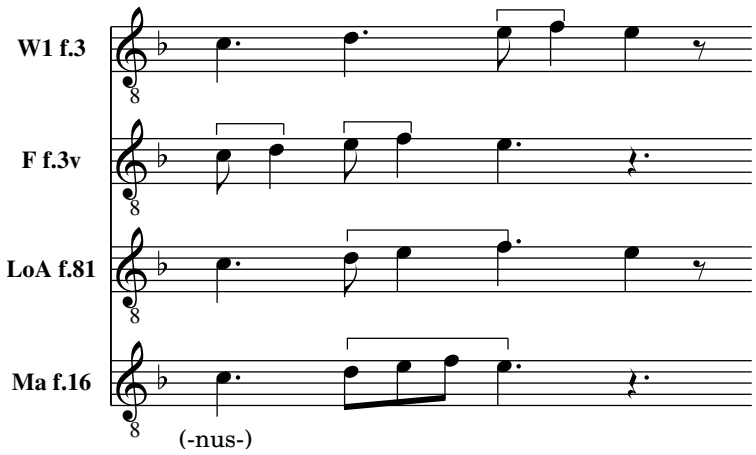


(b) Substituted rhythm in other MSS

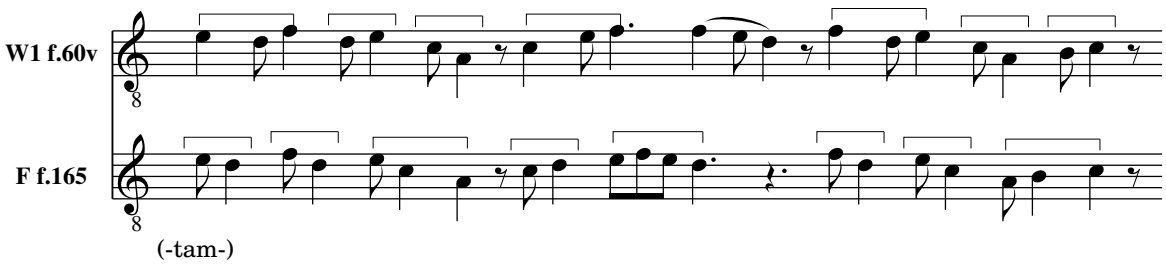
Figure 4.6: Substituted rhythm

of this ordo, the 'house style' that Roesner, (2001b, p.261) hinted at. Alternatively, the intended "original" rhythm of this ordo may have been either too complicated to be precisely notated in modal rhythm, leading to the skein of interpretations presented here, or this ordo is without measure, in organum purum. Taken as it is from a discant quadruplum, this last possibility seems unlikely as the interpretation must fit perfectly within four longas. It is my opinion that the answer probably lies somewhere between the first two possibilities: each performance practice had their own idiomatic way of performing, and this was complicated when those idioms fell outside the usual boundaries of modal notation.

Figure 4.7b provides more evidence for the possibility of house styles playing a part, and such examples are easy to find, listed in detail by Ludwig, (1910). Here the pitches are identical, but have been systematically re-ligated: W_1 in mode I, F in mode II. This example cannot be a simple "difficult rhythm" issue, as both ligations are fine models of their rhythmic mode, so there must have been an intended alteration at some point.



(a) Differently–ligated ordo



(b) Systematic re-ligation

Figure 4.7: Difficult–to–notate ordines

Many authors point towards a scribal practice of systematically re-ligating clausulae such as this, but there is no evidence to suggest that this process must have taken place at the moment of writing, and may have in fact been part of how that clausula was already performed in that practice.

These diverse styles of performing what is essentially the same polyphony are exemplified in Figure 4.8, where a confluence of systematic re-ligation and confusing ligature configurations have resulted in three different, yet unmistakably similar interpretations of the same music. W_1's interpretation is a systematic re-ligation of W_2 and F's interpretation, but even between W_2 and F, there are slight differences that occasionally alter their interpretation.

Some ligatures are more elaborate than others, having been ornamented to accommodate more notes. These may seem like small and superficial changes, but are not alterations that could commonly arise through the usual "defects". In Figure 4.9a, we can see that whereas W_2 and F employ a plica between two binariae, W_1 uses three currentes to add a passing *D*, subtly ornamenting the same music in the same space of time. In organum purum, ornamentation can be freer without the constrains of modal rhythm, and divergences such as those in Figure 4.9b occur, where a relatively simple ternaria in W_1 is replaced with a 5– and 6–note ligature in F and W_2 respectively, building on the

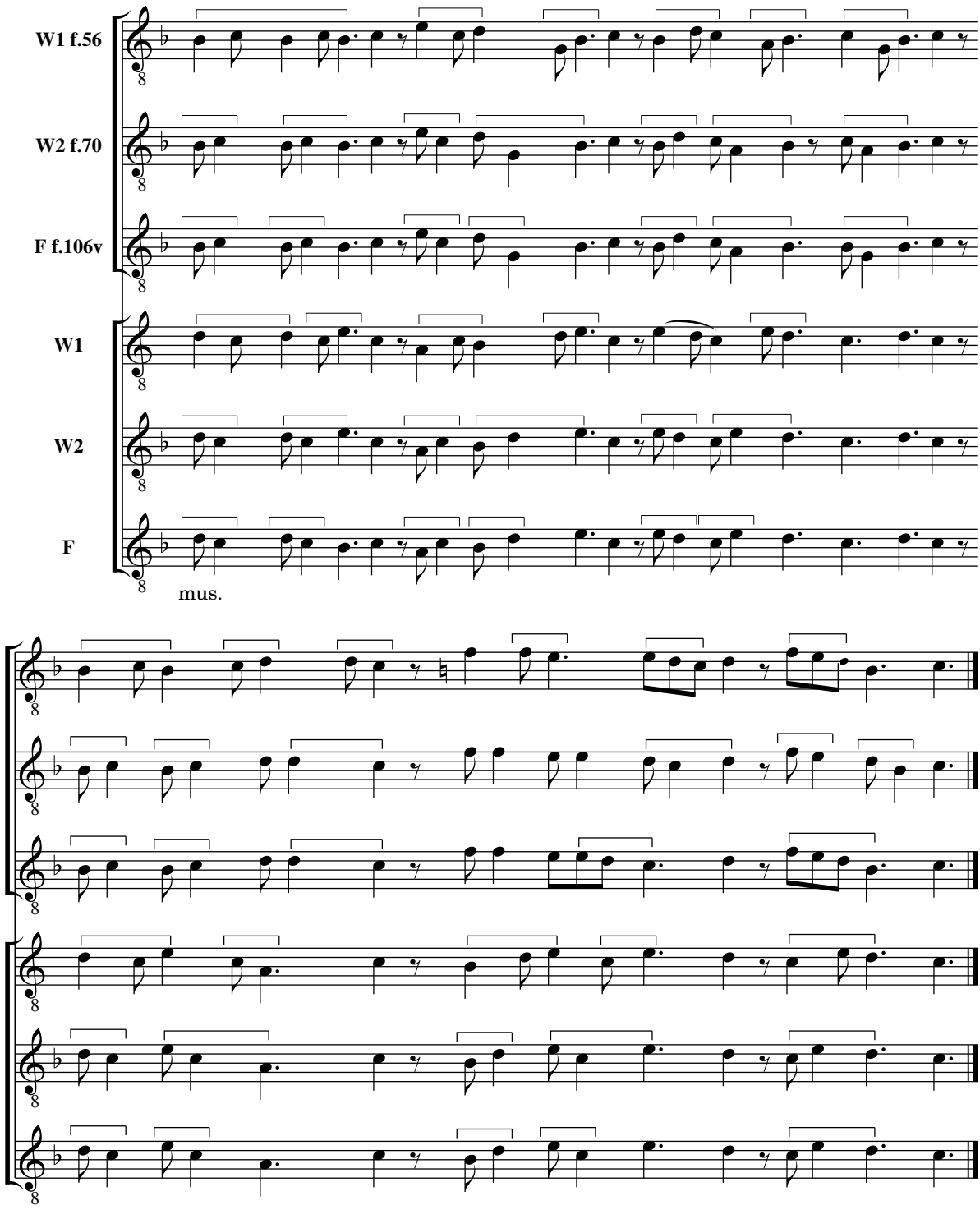
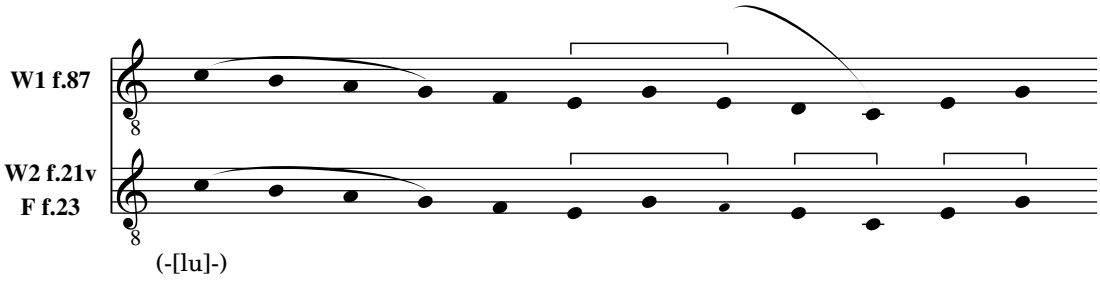


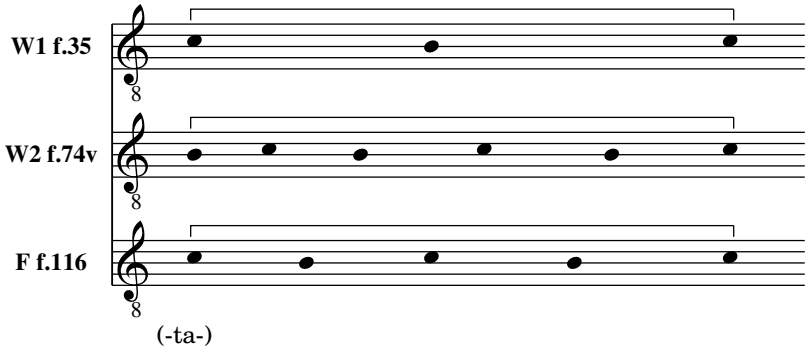
Figure 4.8: Difficult–to–notate clausula

same alternating *Bc* figure.

There is however, one kind of difference which must be the product of scribal error. That is the "third out" type of error, occurring a few times within W_1 (see example in Figure 4.10), where the music is copied two steps higher or lower than intended on the wrong staff line. We know that this must be an error and not some alternate way of



(a) Ornamentation through plicae



(b) Ornamentation through extra notes

Figure 4.9: Ornamented ligatures

performing because the organa creates many more dissonances than is normal, stopping at thirds and sevenths much more than the common fifths and octaves. One can see this mistake being made easily by a scribe: the sources employ C and F clefs exclusively and these can occur on any staff line.[2] Therefore, eyeskip could easily cause the scribe to write music beginning on the wrong staff line without changing the clef and this error could continue for a whole line or more. This does not imply that the scribe was copying from a written exemplar, rather the opposite: that a written exemplar presumably written in the same clefs as W_1 would surely alert the scribe sooner that he is copying on the wrong line, as the music copied a third out often goes much too far above or below the stave than is usual.

Rather than these small, sometimes insignificant differences, it is the large–scale differences that begin to show true oral formulae at work. There are many examples of this in W_1, but a few will suffice. The line between re-ligation and slight differences, and larger differences that can be termed a different ordo entirely is not particularly distinct. For example, slight alterations such as those in Figure 4.11a can quickly alter an ordo to a different rhythm and different length. It is tricky to say whether this ordo is concordant or is an example of a slightly different formula being selected.

What we can plainly see however are those ordines that have been transformed and the formula altered to achieve a slightly different result. Figure 4.11b demonstrates

[2] As with all things, there is a notable exception. W_1 uses a D clef once: f.69 III.

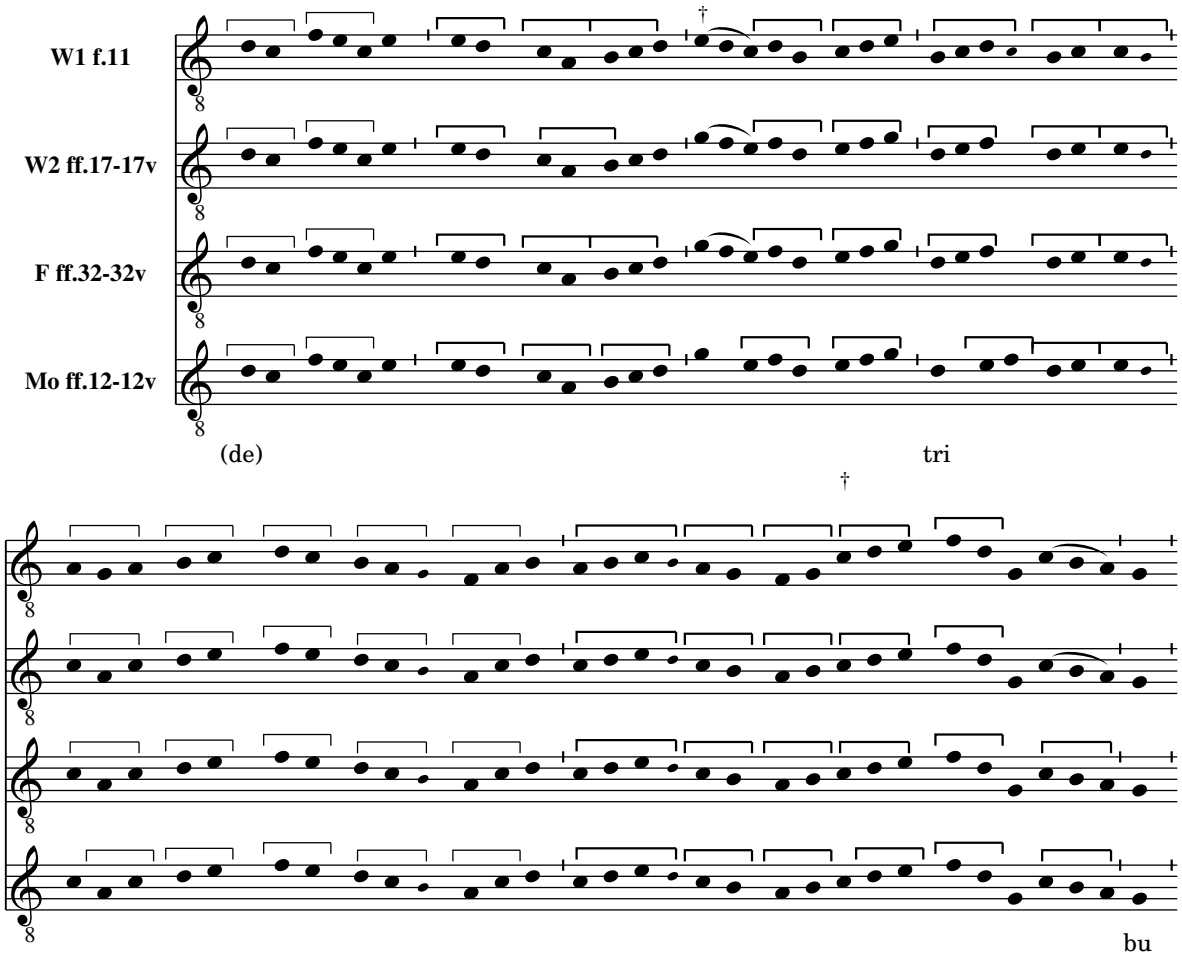
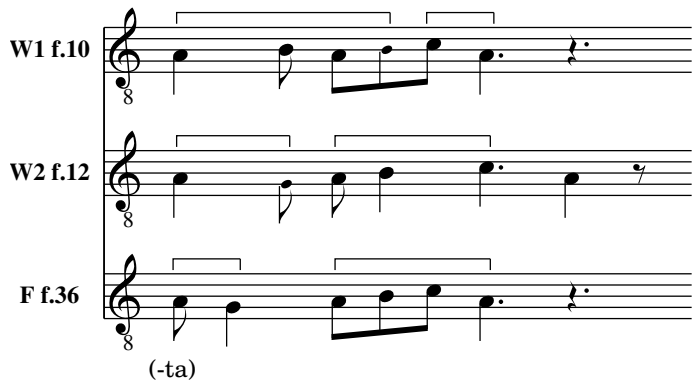


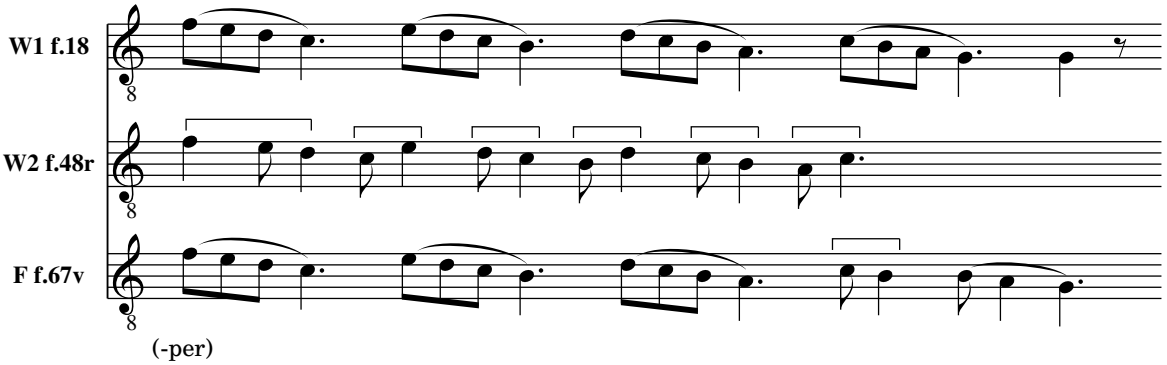
Figure 4.10: A "third out" error, shown here between † symbols

one example of this. W_1 and F are roughly the same, proceeding in groups of 4–note currentes. W_1 continues this formula all the way down to *G*, but F alters the formula with a repeated *B* for the final step, dispensing with the repeated *G* that W_1 employs. W_2 however, has re-ligated the formula in mode I, and ends its ordo two longas previous on a *c*: still concordant with the tenor, but at a different interval. All three sources use the same formula to achieve the same result, but they go about it in different ways: W_1 descends simply using the formula, F adds a slight twist at the end, and W_2 redefines the formula in a new rhythm and halts it before it gets to the *G*, effectively paraphrasing what is a longer ordo in the other MSS.

There are also entire sections of polyphony that are only roughly concordant with one another. An example can be seen in Figure 4.11c which divides roughly into two versions: the version in W_1 and F (f.147), and the version in W_2 and F (f.65). These two versions of the same polyphony achieve many of the same aims, their ordines often beginning and ending on the same pitches, and often rising and falling in similar patterns. However, the notes and melodic figures that make up these polyphonies can be very different. At times they are more elaborate, adding more passing and auxiliary notes, but at other



(a) Slight difference makes a different ordo



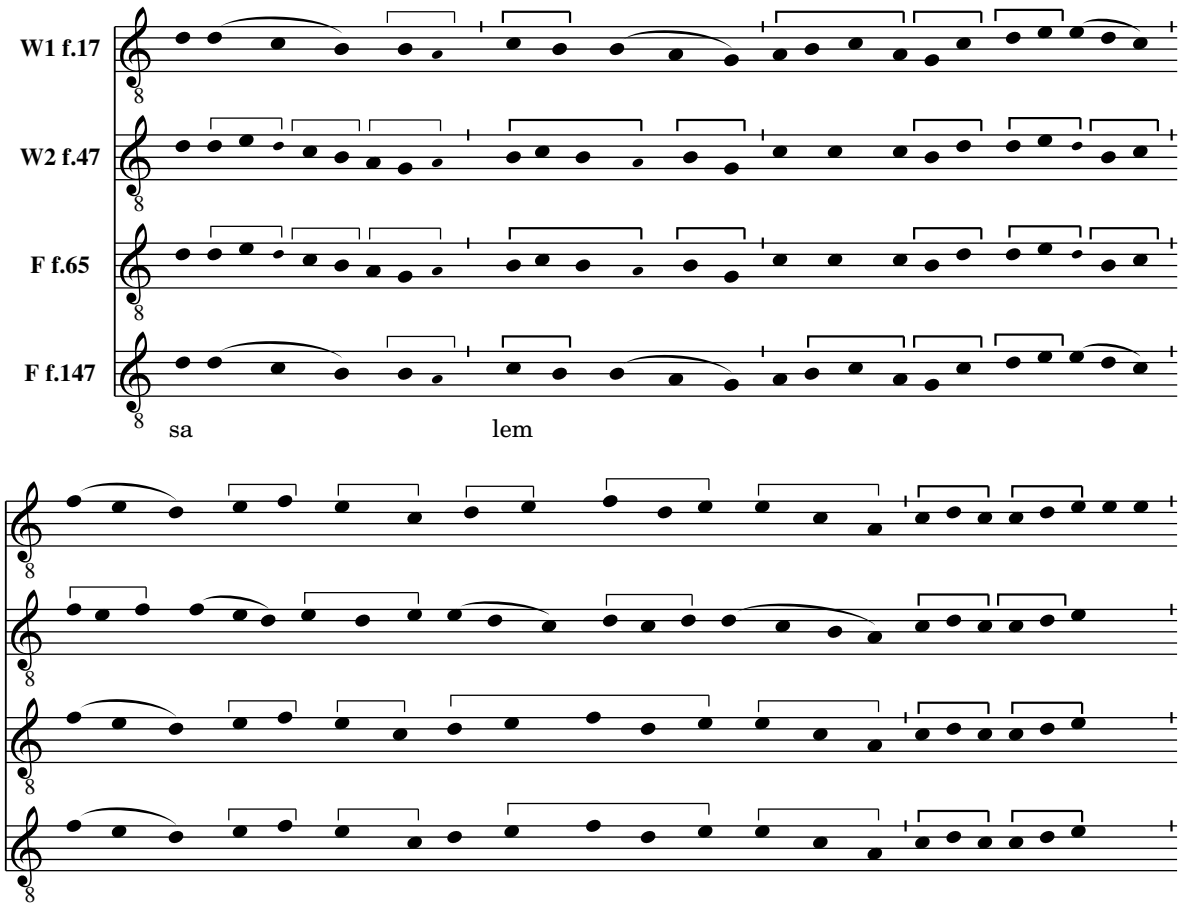
(b) Re-ligation plus a transformed formula

Figure 4.11: Different ordines

times the formula can be more utilitarian, proceeding from one concordance to another without much recourse to ornamentation.

Finally, there are those concordances that are much larger than any small example, and these are the largest set of divergences after small and insignificant alterations. Clausulae that construct the settings of organum are often selected and variegated at will, such as can be seen in *Alleluya. Adorabo* (p.221). Smith, (1964)'s diagram can help here (reproduced in Figure 4.12), as it details all the clausulae that he detects in the construction of this setting. We can see here that *Alleluya. Adorabo* is not a singular construction, but can be constructed out of clausulae. This diagram shows, for example, the numerous clausulae that can be selected for the setting of "et confitebor".

What Smith's diagram does not show, and what we can see in the edition in this study, is the intermittent concordance relationship W_1 has with the other sources. F is mostly concordant, but does not contain the same polyphony for the setting of "ad templum sanctum tuum". It is once again roughly concordant for the three short ordines of "et confite-", but then returns to its other clausula. W_2 tells a similar story. It begins similarly to W_1 and F but quickly uses its own clausula until "-lu-" where it becomes roughly concordant with W_1 and F again. However, it soon returns to its own clausula five ordines later, not returning until the final cauda. In the verse, W_2 is hardly concordant, returning



(c) Ordines of rough concordance

Figure 4.11: Different ordines

only for an odd ordo. It begins similarly, but then completely diverges into completely different music.

This final example, for which there are many similar examples in W_1 and throughout the repertory,[3] demonstrates true oral formulae and oral composition. For *Alleluya. Adorabo* and similar examples, there appears to be a rough plan, and the performances as seen in the various MSS — for the written down versions are performative — maintain this integrity of gist. There must have been myriad diverse ways of performing polyphony over this particular tenor, and each one was selected and improvised upon in performance. We can assume too that those singing the tenor were also aware of the polyphony and knew how to react to that clausula, perhaps rhythmically transforming the tenor in colores for discant clausulae.

[3]Many good examples can be found in W_1's fascicle IV, ff.25–48 (edition pp.179–349).

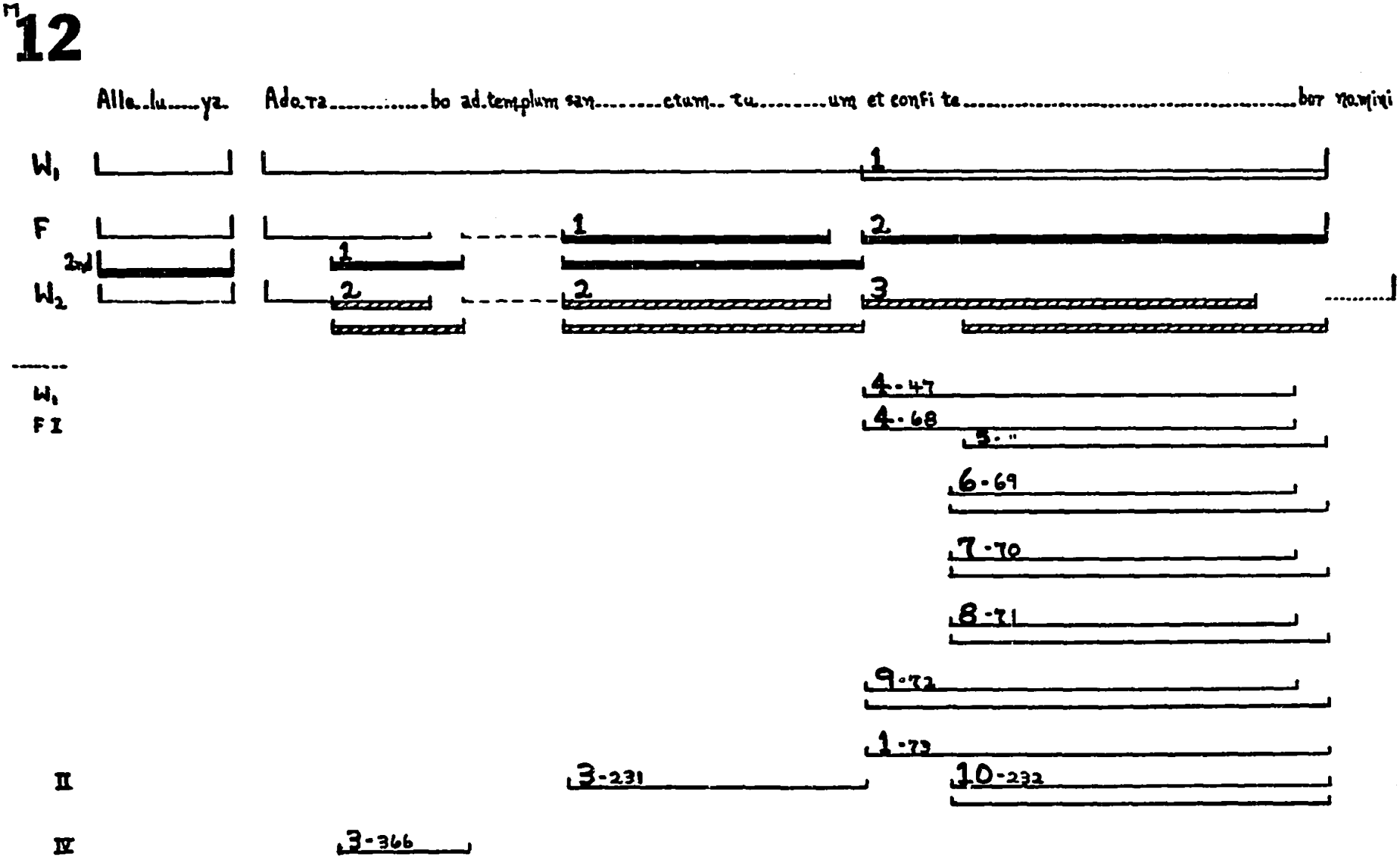


Figure 4.12: Diagram of *Alleluya. Adorabo* from Smith, (1964, p.394)

Chapter 5

Conclusion

There is an irony in considering long–lost oral practices through the artefacts that they leave behind, and in doing so using written sources to reveal an unwritten activity. It impacts how we approach, think about, and analyse the music contained within, using literate apparatus upon music that had a chance collision with the written page, perhaps a glancing blow that sent it spinning off in a new direction. However, these artefacts are all that remains of a living tradition, and we must be keenly aware of our own assumptions when approaching them. Page, (2010, p.443) writes that for a medieval singer, a 'melody principally existed as a feeling in the throat, a sensation in the ear and a penumbra of associations created by years of repetition', and this captures how notationally illiterate but musically virtuosic the vast majority of medieval singers must have been within their own traditions. Full reconstruction of a tradition is, of course, impossible as the music has been irreparably transformed in its writing–down.

What little we can discover about the possibility of an oral tradition can be found through detailed analysis of the artefact as well as its contents. Further to the usual concerns of palaeography, the codicology of the MS can inform as to the production, purpose and the history of the artefact after its writing. We can see that, contrary to Roesner, (1974), W_1 is not a MS that saw daily use, but neither was it preserved as a venerated monument of polyphony. It served a practical use, but was never used in performance. The most likely situation therefore, is that W_1 was a repertory–repository of polyphony for St Andrews, and served as a teaching aid and *aide memoire* for those that performed the ND repertory from memory.

The medieval mind, when trained for the memorisation of vast quantities of information, had a skill for memory that far outstrips the common skill for memorising information such as words and music that we find today, and this has caused many writers to disbelieve any evidence that implies oral transmission, instead considering the defects of a literate transmission just as Horace apologises for Homer's supposed faults. However, oral transmission is not as simple as memorising music note–by–note,

and can take three forms: memorisation, gist construction, and oral composition. None are particularly concerned with precision of transmission, but focus on the ideas behind the work. Smaller and larger changes may occur through each of the oral transmission processes, but this matters little without the idea of an "original" to deviate from.

Writing down an oral item changes and literalises it. In telling oral stories, all three processes of oral transmission are at work, and complement each other for an effective transmission. MSS such as VT demonstrate how the ND repertory may have been an orally–composed repertory throughout its existence, without reliance on writing. Each witness of ND polyphony in MS can only be a window with a view into one of many living practices, and never approach a true practice. Each window has a slightly different perspective on the repertory, transforming the music into local performance practices by virtue of geography, culture and local musical idioms.

Future work will be able to use the generated comparative edition from this study to find more divergences between the sources of the ND repertory that can provide evidence for oral processes at play. Rather than attempt to normalise the differences between the sources so that an *Urtext* can be found, future work should bring these differences to the foreground, and this study provides a methodology and tools for undertaking this. Further to the relatively small differences that have been studied here, it is possible that larger differences in the make-up of clausulae can also be studied using similar methods.

The music and notation of W_1 demonstrate a "residual orality", and this can be seen in the many levels of divergence between W_1 and the other sources of ND polyphony. Some differences, such as systematic re-ligation or errors in copying can easily be explained by the usual solutions of scribal error and idiomatic editing. However, this leaves many differences that cannot be explained away with literate processes, and this demonstrates that the transmission of ND polyphony to St Andrews must involve products of an oral transmission. Among those differences that W_1 in particular exhibits, the constant small alterations in ligature configuration and pitch are not merely 'background variation'[1] within a fully stable and literate repertory, but the result of respelling and re-notating the same music with subtle solutions.

Larger differences, too, can be evidence for oral transmission. Small differences in ligature groupings can result in large differences in implied rhythm, and where a complex rhythm may fall outside the usual bounds of modal rhythm, diverging solutions can be found in each MS. It is clear also that oral composition plays a part in those sections of polyphony that are only roughly concordant with one another, and common oral formulae demonstrate an interplay between a remembered polyphony and its manifest-

[1] A useful term used to describe these phenomena in seventeenth–century music, see Howard, (2012, p.97).

ation. Finally, divergent clausulae demonstrate oral transmission of a purely thematic variety, a powerful counterpoint to the idea of original form or original composition. W_1 demonstrates that the ND repertory was never a completely stable and finished set of compositions but, from its emergence to its eventual writing–down, ND polyphony consisted of a fluid repertory full of change and renewal.

References

Anglès, H., ed., 1977. *El codex musical de Las Huelgas: música a veus dels segles XIII–XIV*. 3 vols. New York: AMS Press.

Anttonen, P.J., 2012. Oral traditions and the making of the Finnish nation. In: *Folklore and nationalism in Europe during the long nineteenth century*. Ed. by T. Baycroft and D. Hopkin. Leiden: Brill, pp.325–350.

Bailey, D., 1992. *Improvisation: its nature and practice in music*. London: The British Library National Sound Archive.

Baltzer, R.A., 1987. Notre Dame manuscripts and their owners: lost and found. *The journal of musicology*, 5(3), pp.380–399.

Baltzer, R.A., 1990. How long was Notre–Dame organum performed? In: *Beyond the Moon: Festschrift Luther Dittmer*. Ed. by B. Gillingham and P. Merkley. Ottawa: Institute of Mediæval Music, pp.118–143.

Baltzer, R.A., 2008. The manuscript makers of W1: further evidence for an early date. In: *Quomodo cantabimus canticum?: studies in honor of Edward H. Roesner*. Ed. by D.B. Cannata. Middleton, WI: American Institute of Musicology, pp.103–120.

Bannister, H.M., ed., 1913. *Monumenti Vaticani di paleografia musicale Latina*. Leipzig: Otto Harrassowitz.

Bauman, R. and Briggs, C.L., 2003. *Voices of modernity: language ideologies and the politics of inequality*. Cambridge: Cambridge University Press.

Benjamin, W., 1999. The storyteller. In: *Illuminations*. Ed. by H. Arendt (H. Zorn, Trans.). London: Pimlico.

Bent, M., 1983. Resfacta and cantare super librum. *Journal of the american musicological society*, 36(3), pp.371–391.

Berliner, P.F., 1994. *Thinking in jazz: the infinite art of improvisation*. London: University of Chicago Press.

Boorman, S., 1999. The musical text. In: *Rethinking music*. Ed. by N. Cook and M. Everist. Oxford: Oxford University Press, pp.403–423.

Borio, G. and Carone, A., eds., 2018. *Musical improvisation and open forms in the age of Beethoven*. Abingdon: Routledge.

Bradley, C.A., 2018. *Polyphony in medieval Paris: the art of composing with plainchant*. Cambridge: Cambridge University Press.

Brown, J., Patterson, S. and Hiley, D., 1981. Further observations on W1. *Journal of the plainsong and mediæval music society*, 4, pp.53–80.

Bula, D., 2017. A complete edition of an oral tradition: text selection practices in the history of publishing Latvian folk songs. *Folklore*, 128(1), pp.37–56.

Bull, A.J.A., 2017. *The conductus of W1: an investigation into their history and rhythm*. Master's thesis. University of Glasgow.

Busse Berger, A.M., 2005. *Medieval music and the art of memory*. London: University of California Press.

Canguilhem, P., 2015. Improvisation as concept and musical practice in the fifteenth century. In: *The Cambridge history of fifteenth–century music*. Ed. by A.M. Busse Berger and J. Rodin. Cambridge: Cambridge University Press, pp.149–163.

Carruthers, M., 1990. *The book of memory: a study of memory in medieval culture*. Cambridge: Cambridge University Press.

Clanchy, M.T., 1979. *From memory to written record: England 1066–1307*. London: Edward Arnold Ltd.

Cook, N., 2013. *Beyond the score: music as performance*. Oxford: Oxford University Press.

Dégh, L., 1995. *Narratives in society: a performer–centred study of narration*. Helsinki: Suomailainen Tiedeakatemia.

Dittmer, L.A., 1966. The lost fragments of a Notre Dame manuscript in Johannes Wolf's library. In: *Aspects of medieval and Renaissance music: a birthday offering to Gustav Reese*. Ed. by J. LaRue. New York: W.W. Norton, pp.122–133.

Dryden, J., 1970. The author's apology for heroic poetry and poetic licence: prefixed to The State of Innocence an Opera. In: J. Kinsley and G. Parfitt, eds. *John Dryden: selected criticism*.

Erickson, R., 1995. *Musica enchiriadis and scolica enchiriadis*. Ed. by C.V. Palisca. London: Yale University Press.

Everist, M., 1990. From Paris to St Andrews: the origins of W1. *Journal of the american musicological society*, 43(1), pp.1–42.

Fairclough, H.R., ed., 1926. *Horace: satires, epistles and Ars Poetica*. London: Heinemann.

Ferand, E.T., 1961. *Improvisation in nine centuries of western music: an anthology with a historical introduction*. Cologne: A. Volk.

Ficker, R. von, 1932. Der Organumtraktat der Vatikanischen Bibliothek (Ottob. 3025). *Kirchenmusikalisches Jahrbuch*, 27, pp.65–74.

Finnegan, R., 1977. *Oral poetry*. Cambridge: Cambridge University Press.

Flotzinger, R., 1969. Beobachtungen zur Notre–Dame–Handschrift W1 und ihrem 11. Faszikel. *Anzeiger der phil.–hist. Klasse der Österreichischen Akademie der Wissenschaften*, 105, pp.245–262.

Fowler, R., 2004. The Homeric question. In: *The Cambridge companion to Homer*. Ed. by R. Fowler. Cambridge: Cambridge University Press, pp.220–232.

Fuller, S., 2011. Early polyphony. In: *The Cambridge companion to medieval music*. Ed. by M. Everist. Cambridge: Cambridge University Press, pp.46–66.

Godt, I. and Rivera, B., 1984. The Vatican organum treatise: a colour reproduction, transcription, and translation. In: *Gordon Athol Anderson (1929–1981) in memoriam*. Ed. by L.A. Dittmer. Binningen: Institute of Mediaeval Music, pp.264–345.

Goehr, L., 1992. *The imaginary museum of musical works: an essay in the philosophy of music*. Oxford: Oxford University Press.

Goody, J., 1987. *The interface between the written and the oral*. Cambridge: Cambridge University Press.

Goody, J., 1992. Oral culture. In: *Folklore, cultural performances, and popular entertainments: a communications–centered handbook*. Ed. by R. Bauman. Oxford: Oxford University Press, pp.12–20.

Graziosi, B., 2016. *Homer*. Oxford: Oxford University Press.

Green, L., 2002. *How popular musicians learn: a way ahead for music education*. Aldershot: Ashgate Publishing Ltd.

Guido, M., ed., 2017. *Studies in historical improvisation: from Cantare super Librum to Partimenti*. London: Routledge.

Handschin, J., 1924. Eine wenig beachtete Stilrichtung innherhalb der mitteralterlichen Mehrstimmigkeit. *Schweizerisches jahrbuch für musikwissenschaft*, 1, pp.56–75.

Handschin, J., 1932. Zur Geschichte von Notre Dame. *Acta musicologica*, 4(1), pp.5–17.

Handschin, J., 1949. The summer canon and its background I. *Musica disciplina*, 3, pp.55–94.

Howard, A., 2012. Understanding creativity. In: *The Ashgate research companion to Henry Purcell*. Ed. by R. Herissone. Farnham: Ashgate, pp.65–113.

Huff, J.A., ed., 1970. *Ad organum faciendum & item de organo*. New York: Institute of Mediæval Music.

Husmann, H., 1969. Zur Frage der Herkunft der Notre–Dame–Handschrift W1. In: *Musa-mens-musici: im Gedenken an Walther Vetter*. Ed. by E.H. Meyer. Leipzig: VEB Deutscher Verlag für Musik, pp.33–35.

Immel, S.C., 2001. The Vatican organum treatise re-examined. *Early music history*, 20, pp.121–172.

Jacobsson, R.M. and Treitler, L., 1993. Sketching liturgical archetypes: hodie surrexit leo fortis. In: *De musica et cantu: Studien zur Geschichte der Kirchenmusik und der Oper: Helmut Hucke zum 60*. Ed. by P. Cahn and A.-K. Heimer. Hildesheim: G. Olms, pp.157–202.

Jammers, E., 1955. *Anfänge der abendländische Musik*. Strasbourg: Heitz.

Lord, A.B., 1960. *The singer of tales*. London: Harvard University Press.

Lord, A.B., 1995a. Oral composition and 'oral residue' in the Middle Ages. In: *Oral tradition in the Middle Ages*. Ed. by W.F.H. Nicolaisen. Binghamton, NY: Medieval & Renaissance Texts & Studies.

Lord, A.B., 1995b. *The singer resumes the tale*. Ed. by M.L. Lord. London: Cornell University Press.

Ludwig, F., 1910. *Repertorium organorum recentioris et motetorum vetustissimi stili*. With an intro. by L.A. Dittmer. 3 vols. New York: Institute of Mediaeval Music.

McGee, T.J., 2003. *Improvisation in the arts of the Middle Ages and Renaissance*. Kalamazoo, MI: Medieval Institute Publications.

Morucci, V., 2013. Improvisation in vocal contrapuntal pedagogy: an appraisal of Italian theoretical treatises of the sixteenth and early seventeenth centuries. *Performance practice review*, 18(1), pp.1–19.

O'Brien O'Keefe, K., 1990. *Visible song: transitional literacy in Old English verse*. Cambridge: Cambridge University Press.

Opie, I. and Opie, P., 1959. *The lore and language of schoolchildren*. London: Oxford University Press.

Owens, J.A., 1997. *Composers at work: the craft of musical composition 1450–1600*. Oxford: Oxford University Press.

Page, C., 1989. *The owl and the nightingale: musical life and ideas in France 1100–1300*. London: J. M. Dent & Sons.

Page, C., 1997. *Discarding images: reflections on music and culture in medieval France*. London: Clarendon Press.

Page, C., 2010. *The Christian West and its singers: the first thousand years*. London: Yale University Press.

Roesner, E.H., 1974. *The manuscript Wolfenbüttel, Herzog–August–Bibliothek, 628 Helmstadiensis: a study of its origins and of its eleventh fascicle*. PhD thesis. New York University.

Roesner, E.H., 1976. The origins of W1. *Journal of the american musicological society*, 29(3), pp.337–380.

Roesner, E.H., 1981. The problem of chronology in the transmission of organum duplum. In: *Music in medieval and early modern Europe: patronage, sources, and texts*. Ed. by I. Fenlon. Cambridge: Cambridge University Press, pp.365–369.

Roesner, E.H., ed., 1993. *Le magnus liber organi de Notre–Dame de Paris: les quadrupla et tripla de Paris*. Vol. 1. Monaco: Éditions de L'Oiseau–Lyre.

Roesner, E.H., 2001a. *Notre Dame school*. In: S. Sadie, ed. *The new Grove dictionary of music and musicians*. 2nd ed. Vol. 18. London: Macmillan, pp.202–203.

Roesner, E.H., 2001b. Who 'made' the 'Magnus liber'? *Early music history*, 20, pp.227–266.

Sanders, E.H., 1973. Polyphony and secular monophony: ninth century – c.1300. In: *Music from the Middle Ages to the Renaissance*. Ed. by F.W. Sternfeld. London: Weidenfeld and Nicolson, pp.100–144.

Schank, R.C., 1990. *Tell me a story: a new look at real and artificial memory*. New York: Macmillan.

Smith, N.E., 1964. *The clausulae of the Notre Dame School: a repertorial study*. PhD thesis. Yale University.

Staehelin, M., 1995. Preface. In: *Die Mittelalterliche Musik–Handschrift W1: vollständige Reproduktion des "Notre Dame"–Manuskripts der Herzog August Bibliothek Wolfenbüttel Cod. Guelf. 628 Helmst*. Wiesbaden: Harrossowitz Verlag im Kommission, pp.29–50.

Tischler, H., ed., 1988. *The Parisian two–part organa: the complete comparative edition*. 2 vols. Stuyvesant, NY: Pendragon Press.

Treitler, L., 1974. Homer and Gregory: the transmission of epic poetry and plainchant. *The musical quarterly*, 60(3), pp.333–372.

Treitler, L., 1981. Oral, written and literate process in the transmission of medieval music. *Speculum*, 56(3), pp.471–491.

Treitler, L., 1991. Medieval improvisation. *The world of music*, 33(3), pp.66–91.

Treitler, L., 2003. The Vatican Organum Treatise and the organum of Notre Dame of Paris: perspectives on the development of a literate music culture in Europe. In: *With voice and pen: coming to know Medieval song and how it was made*. Oxford: Oxford University Press, pp.68–83.

Treitler, L., 2015. Speaking of the I-word. *Archiv für Musikwissenschaft*, 72(1), pp.1–18.

Wegman, R.C., 1996. From maker to composer: improvisation and musical authorship in the low countries, 1450–1500. *Journal of the american musiological society*, 49(3), pp.409–479.

Wright, C., 1989. *Music and ceremony at Notre Dame of Paris, 500–1550*. Cambridge: Cambridge University Press.

Yates, F., 1966. *The art of memory*. London: Routledge and Kegan Paul Ltd.

Yudkin, J., 1985. *The music treatise of Anonymous IV: a new translation*. Neuhausen-Stuttgart: American Institute of Musicology.

Yudkin, J., ed., 1990. *De musica mensurata: the Anonymous of St Emmeram*. Bloomington: Indiana University Press.

Zaminer, F., 1959. *Der Vatikanische Organum–Traktat:* (*Ottob. lat. 3025*). Tutzing: Hans Schneider.

Appendix A

W1 Comparative Edition

This appendix consists of a comparative, semi-diplomatic edition of the concordant settings of W_1. It is an attempt to represent the features of the musical content of the MS that can be used as evidence to further the case for an oral transmission of ND polyphony. It is neither an academic nor performing edition, but a musical display of the concordances and divergences between settings of W_1.

The title of each setting is a simple incipit of that setting, including missing word syllables in square brackets where necessary. The concordances for that setting are listed in the upper–left corner, and the folio range of the setting (older, ink foliation as used throughout this study) is noted in the upper–right.

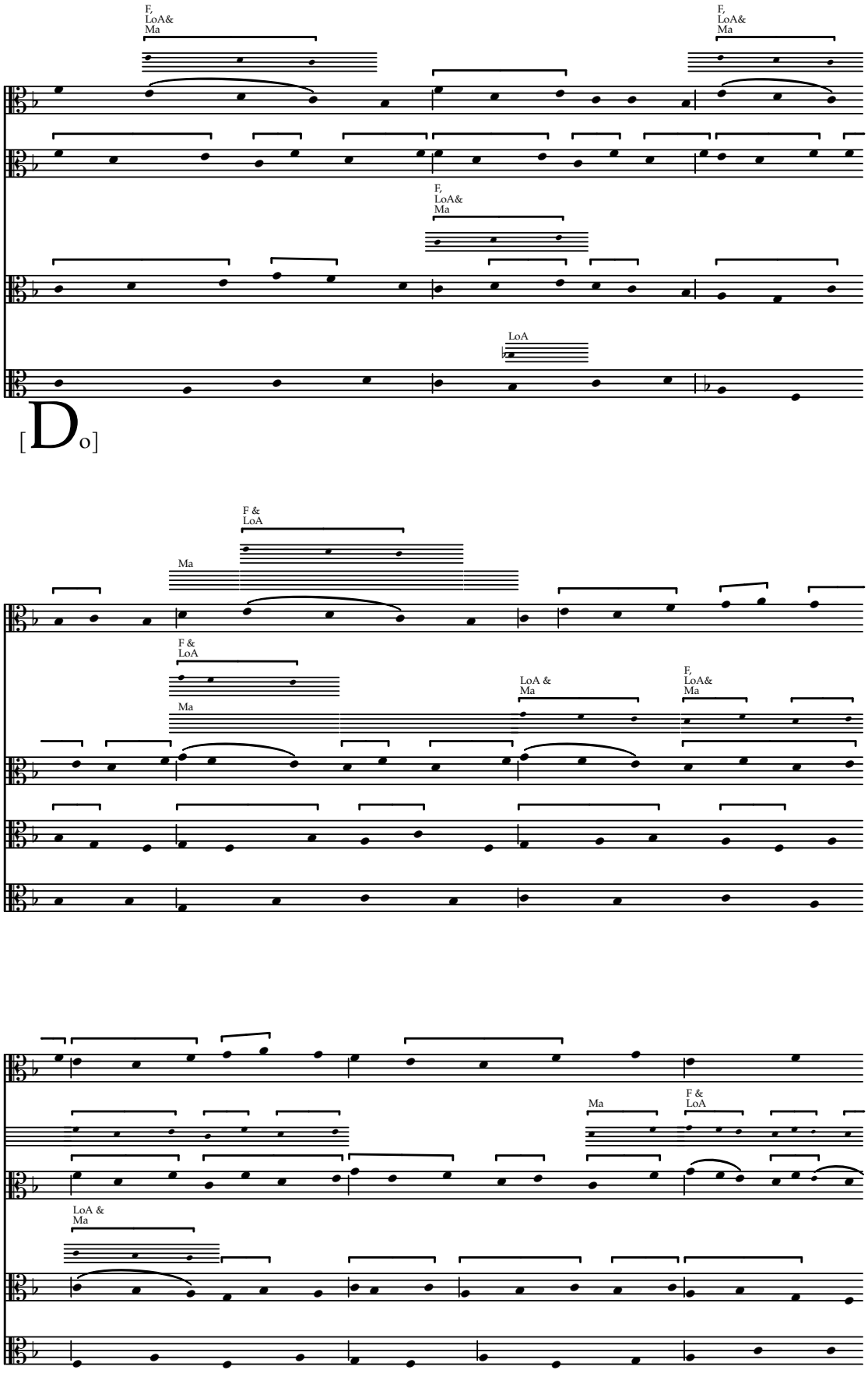
The main set of staves, joined by a single line, indicate the text of W_1. The word setting of W_1 is indicated by syllables below the tenor line. Ossia staves above the main staves indicate a divergence in another MS, and the sigla of those MSS is written above those ossia staves in small type. Blank staves indicate an ordo that is missing from one voice in the respective MS, and a dotted line drawn over a range of ordines indicates that that passage is missing in all voices in the MS. All clefs and accidentals are those in W_1, and they are not cancelled unless by an accidental or a line break. The exception to this is the clef of the tenor of *Benedicamus Domino* (p.577), which has been substituted as it is originally a *D* clef, of which no modern equivalent exists.

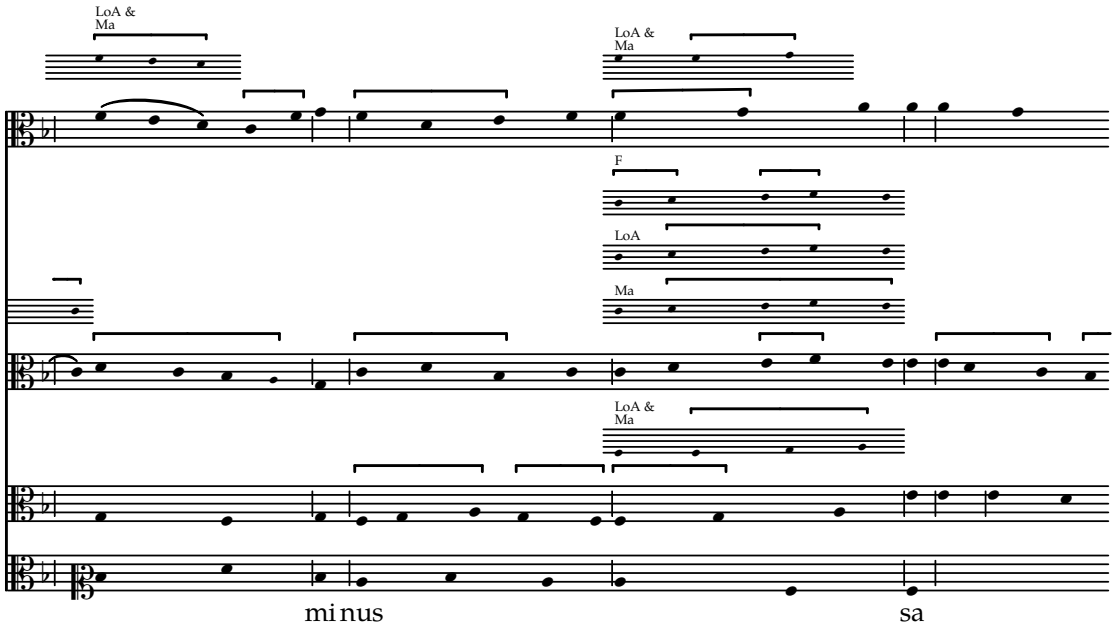
All notes are drawn as stemless filled notes, and no rhythm is inferred, save for that rhythm that must exist from the synchronicity of voices. The voices are roughly aligned according to their physical location in W_1, and no attempt has been made to organise them strictly by ordo or by modal rhythm. A square bracket drawn over a group of notes indicates a ligature, and a slur indicates currentes. Plicae are indicated with a small notehead. The divisiones of W_1 have largely been indicated, but divergences in divisiones have not been noted.

[Do]minus salutare

Concordances from F, LoA & Ma

f. 3–3v

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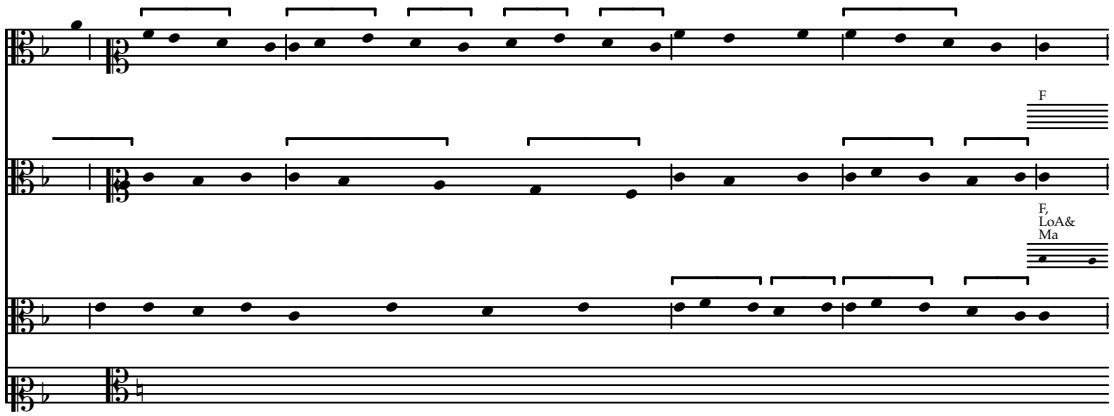
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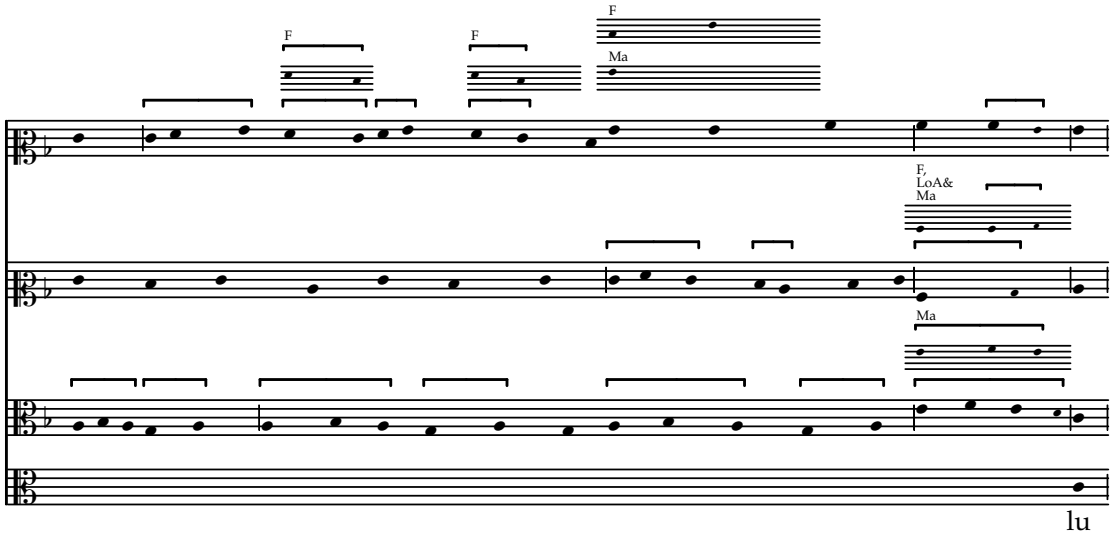
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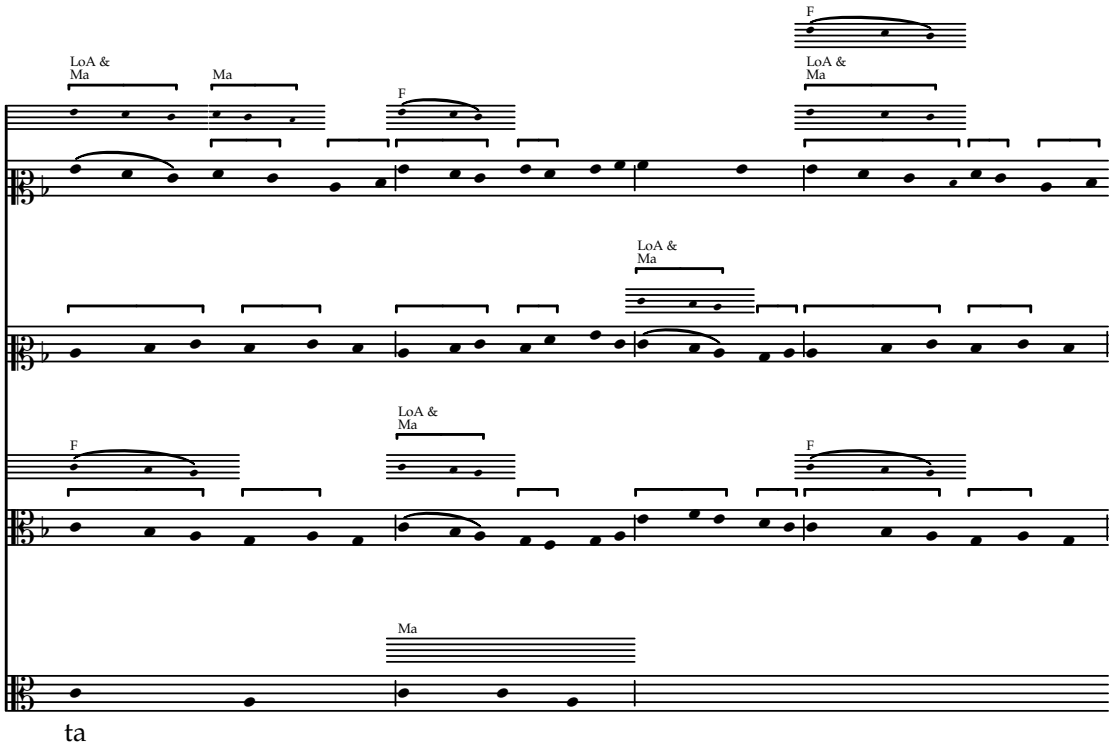

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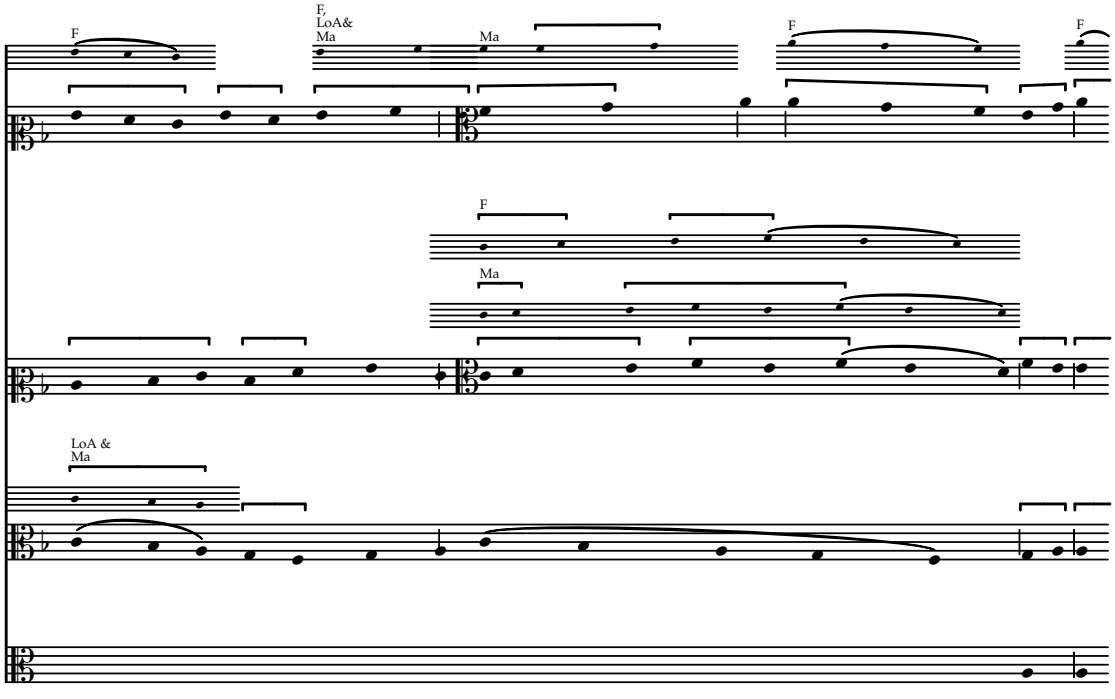

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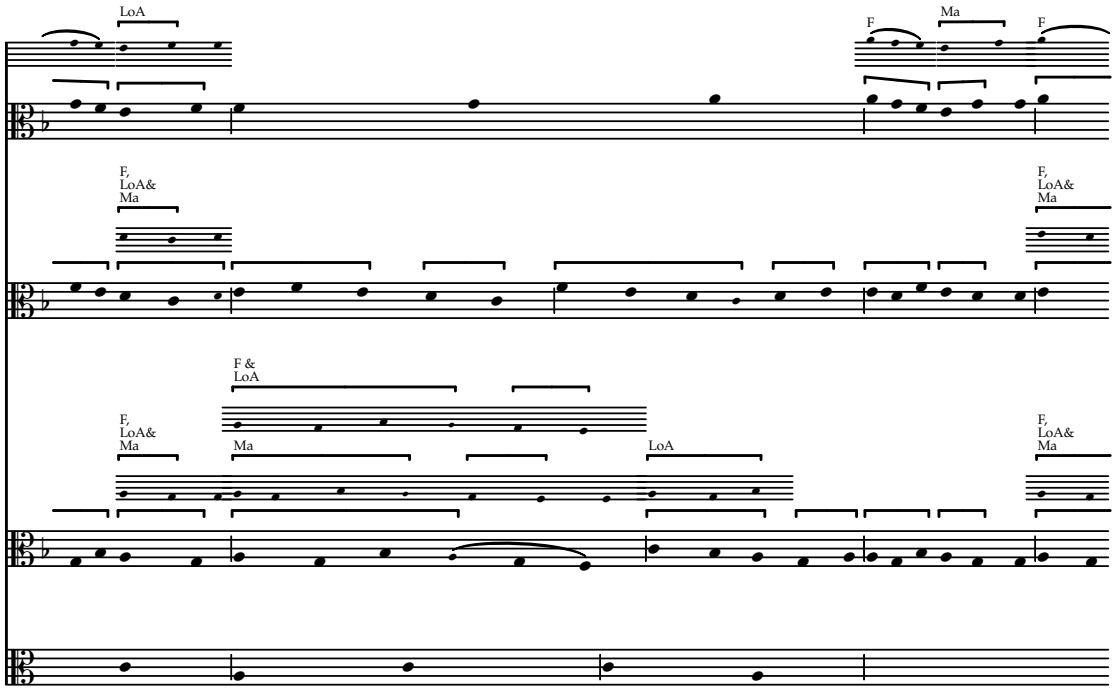
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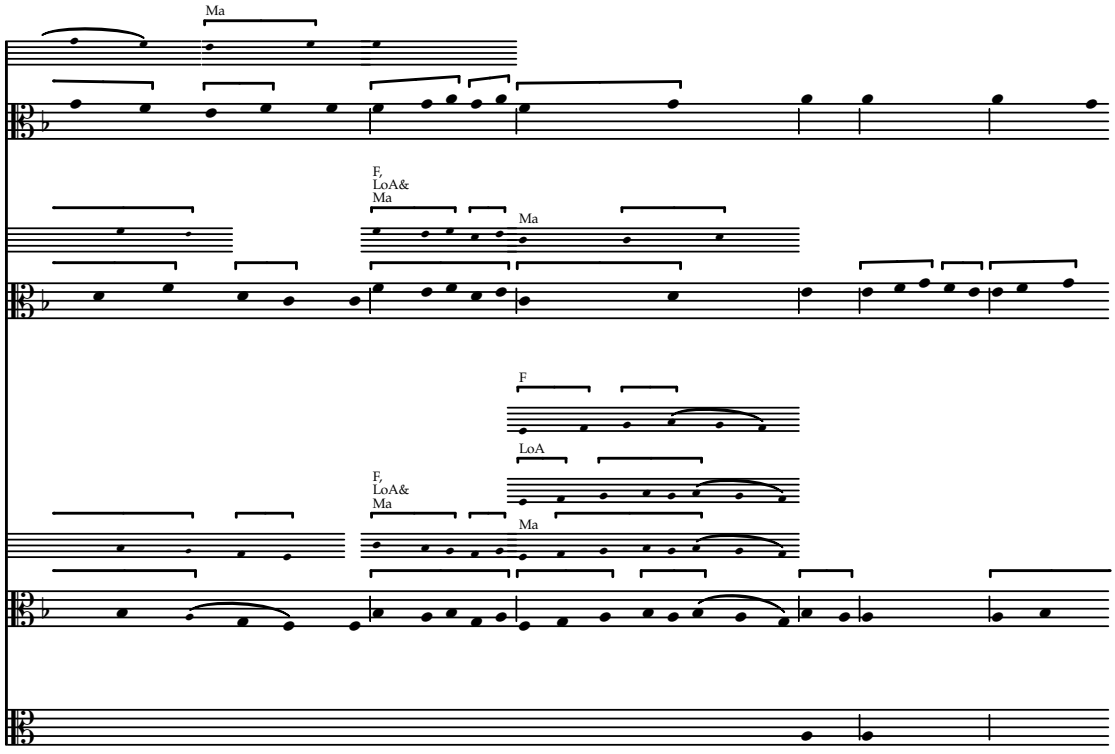
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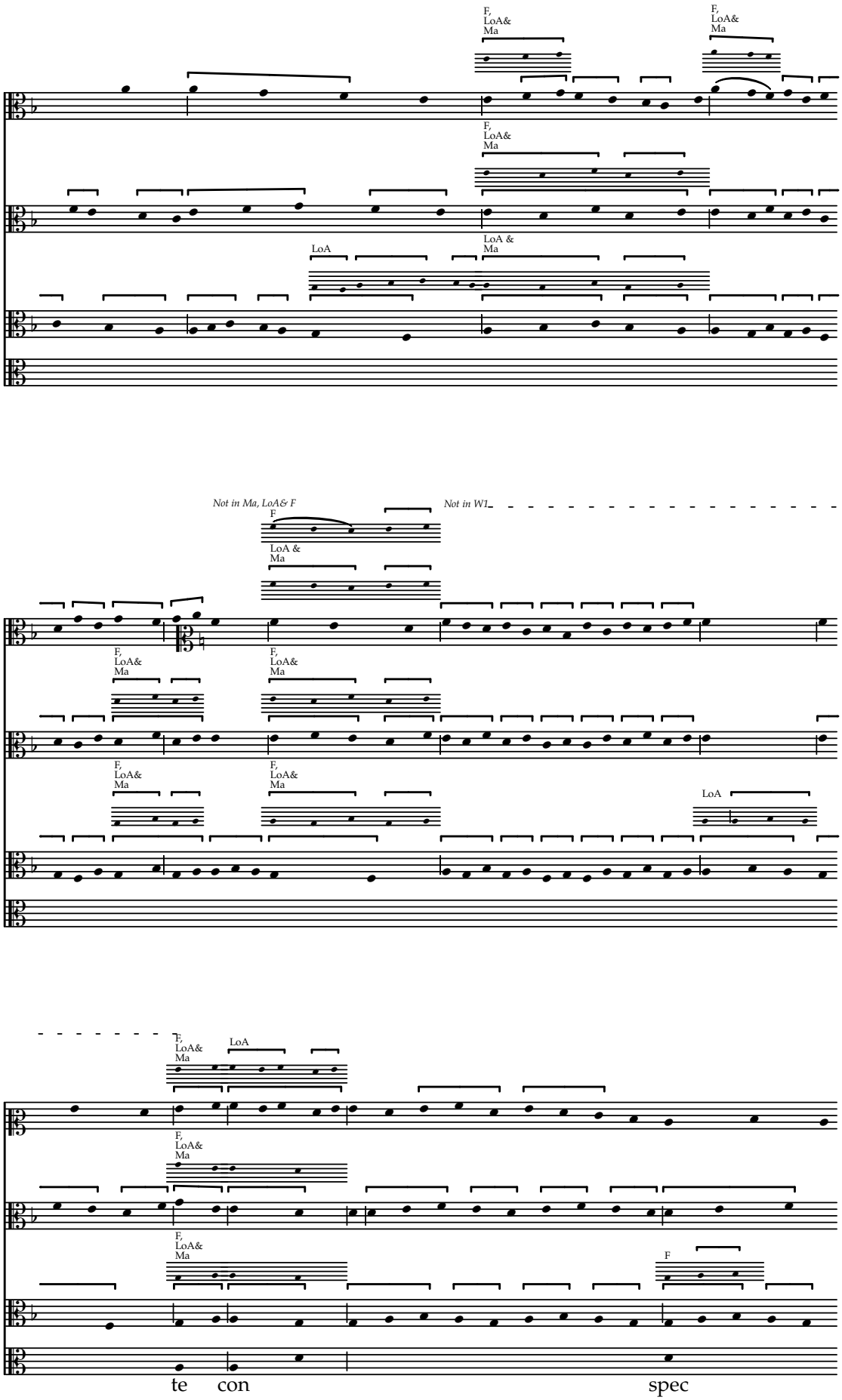
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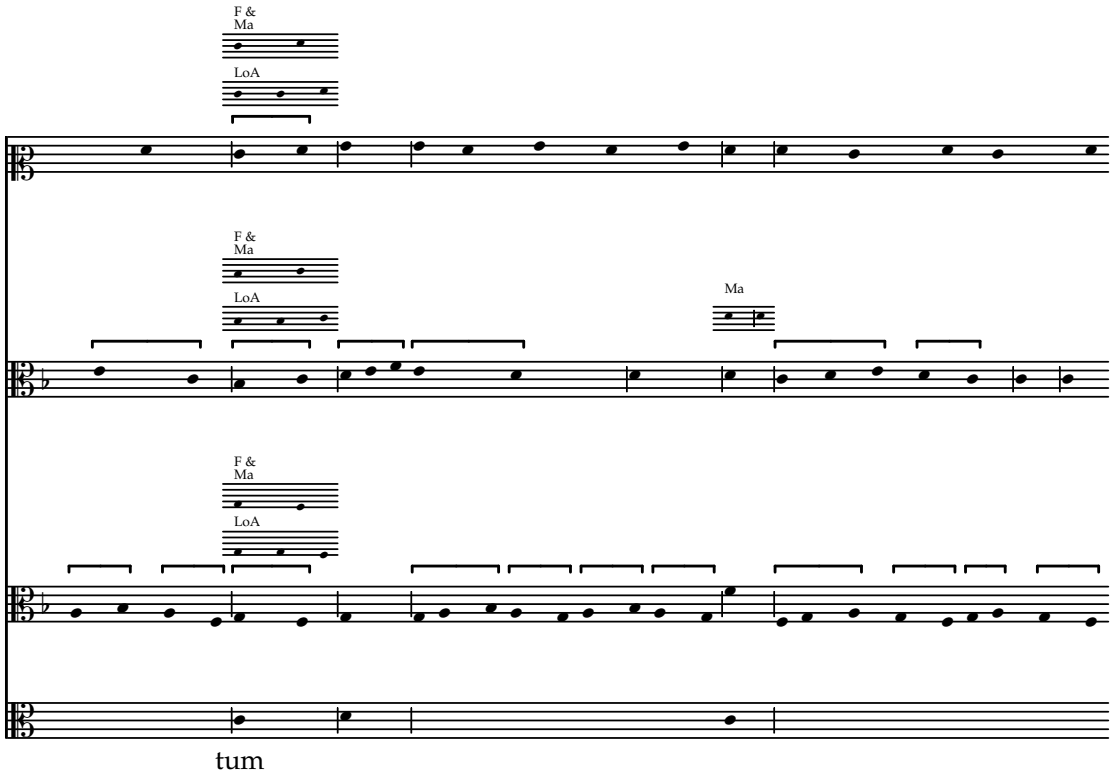
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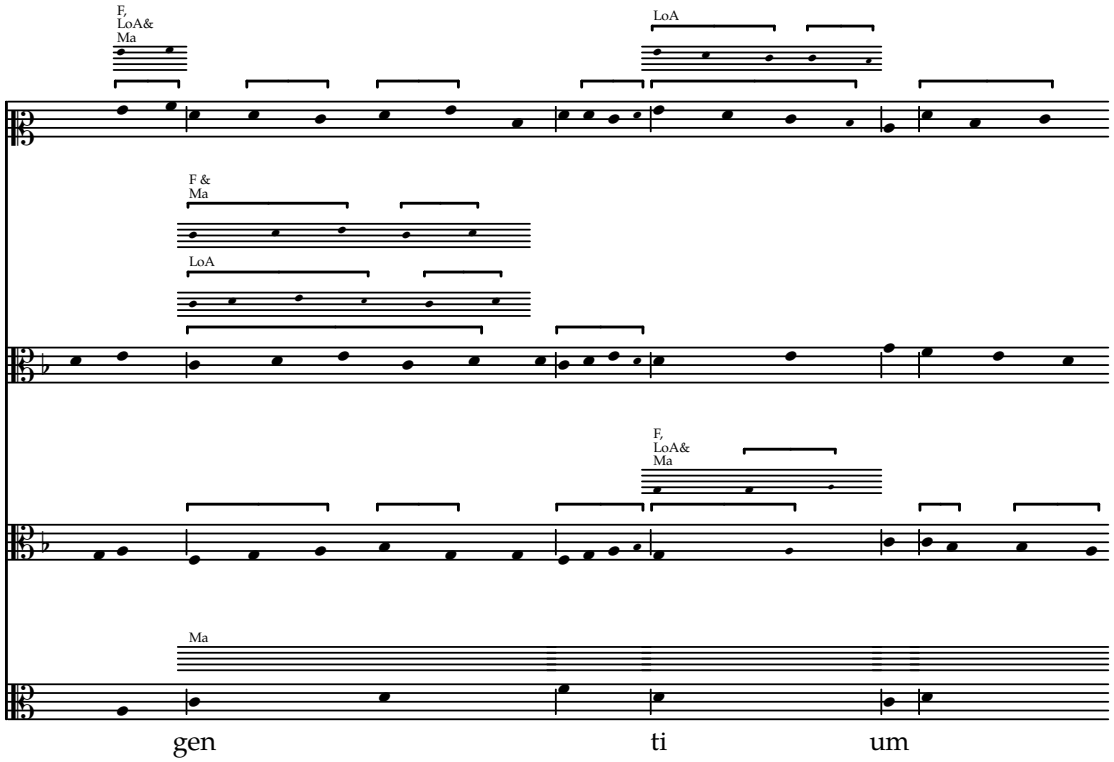
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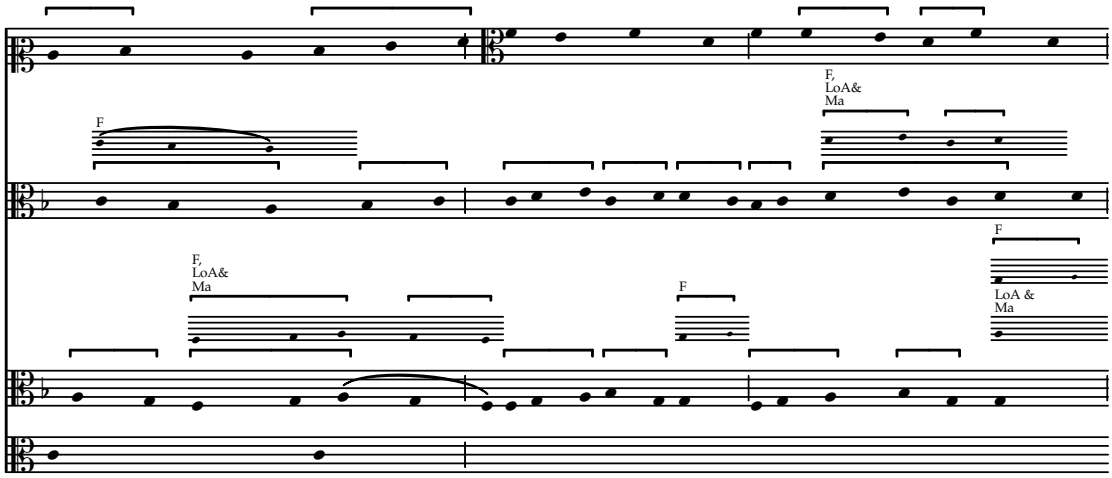
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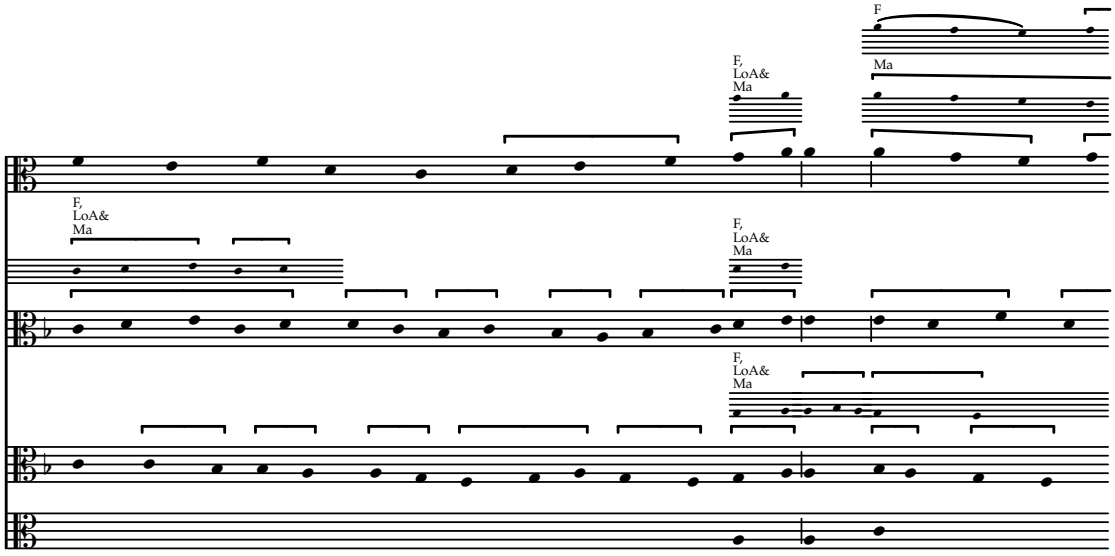
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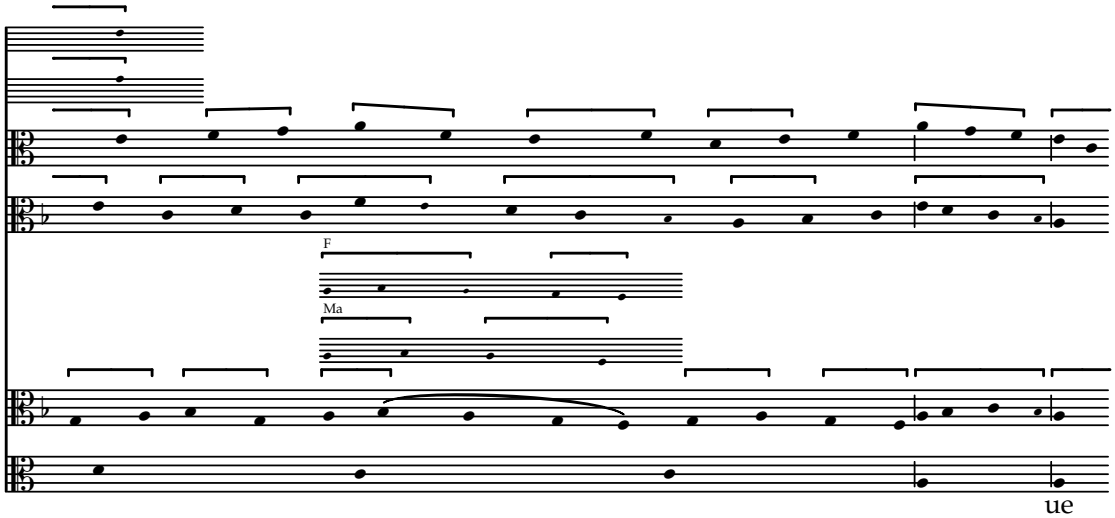
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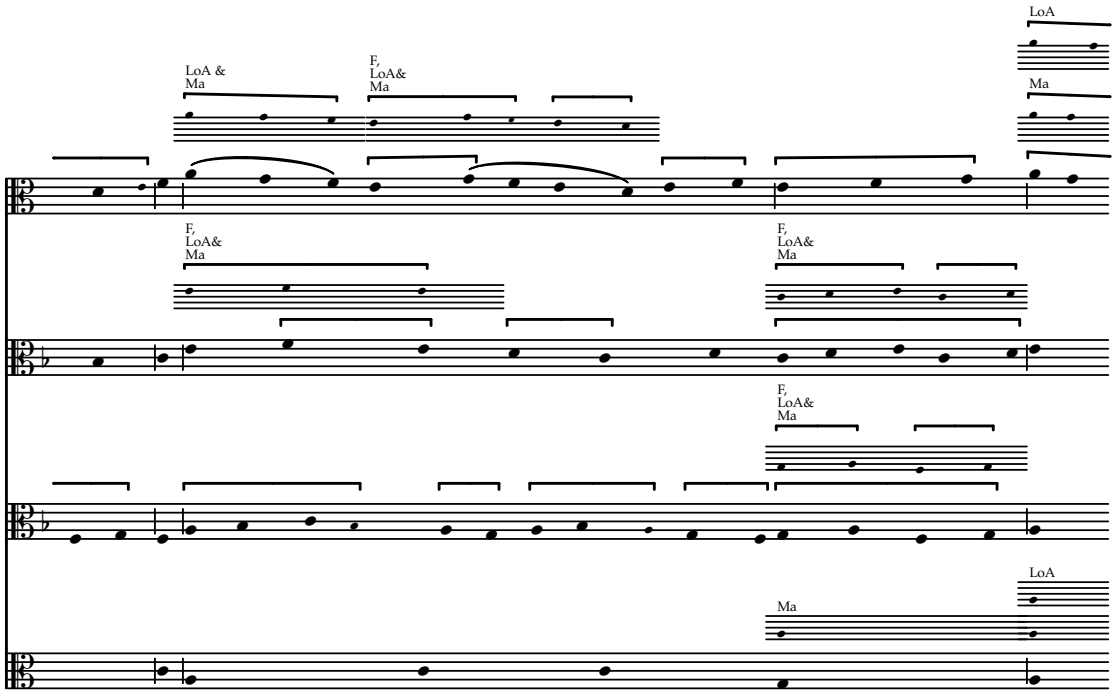
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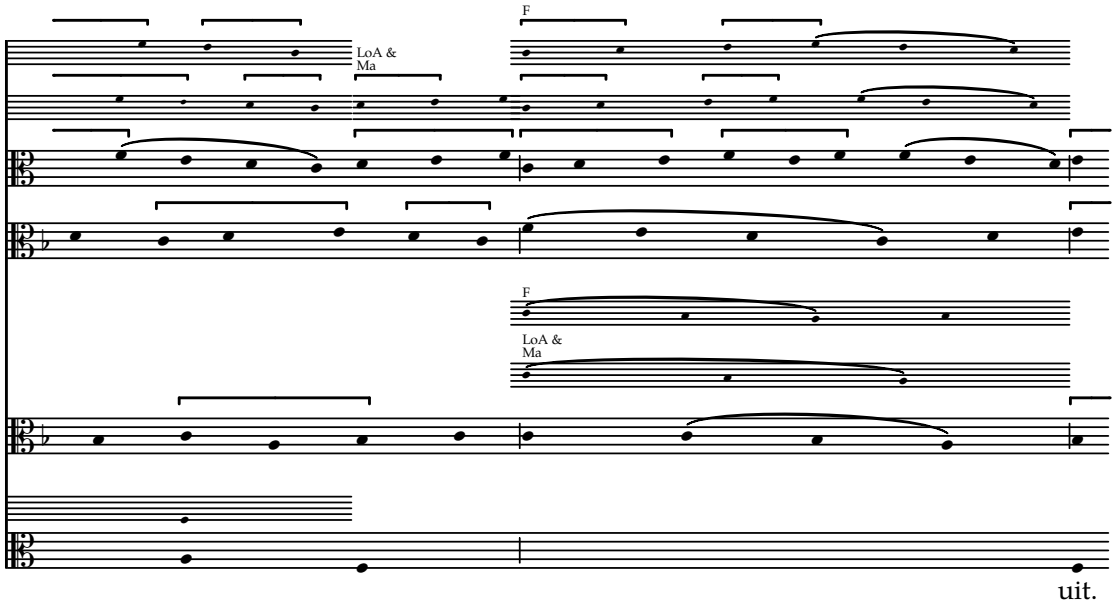
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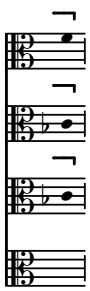
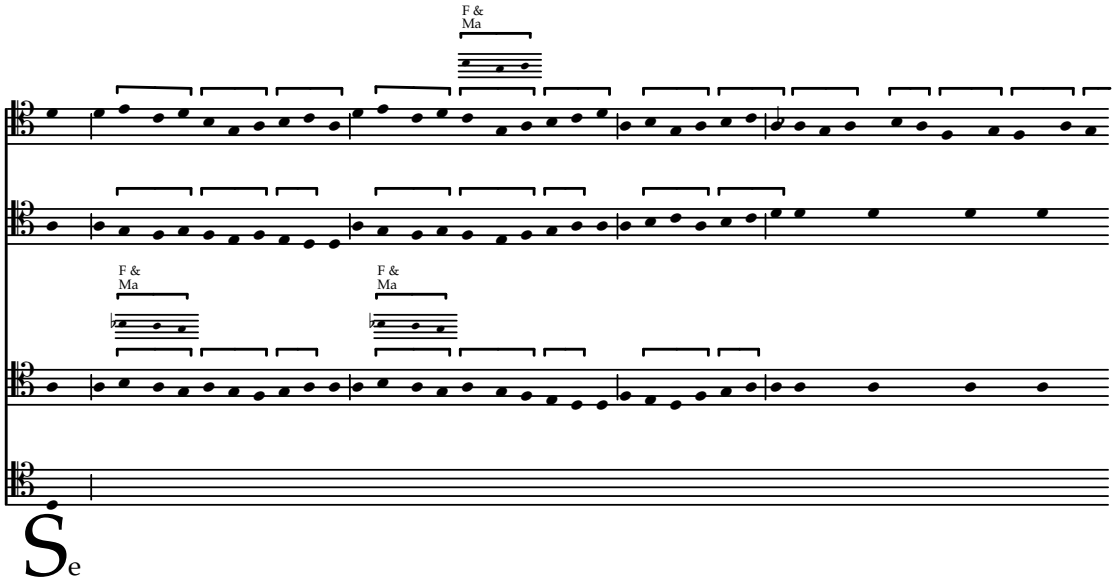
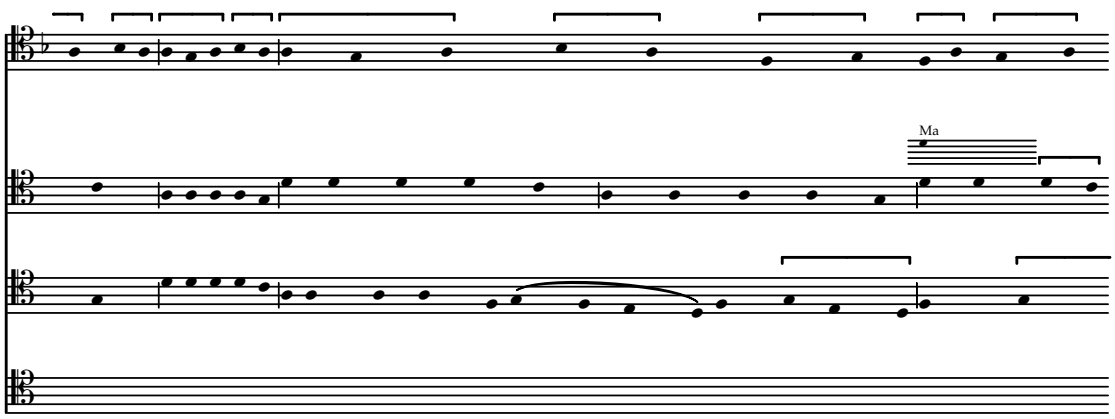


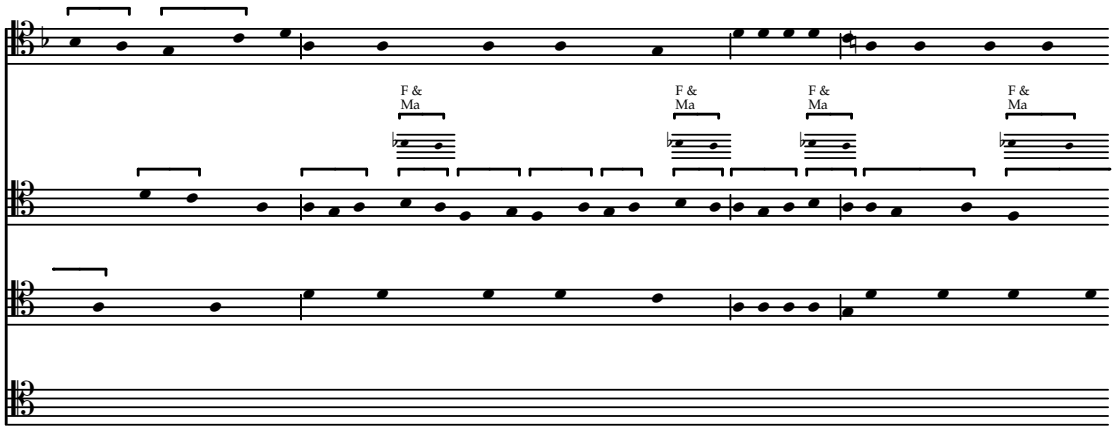
Sederunt

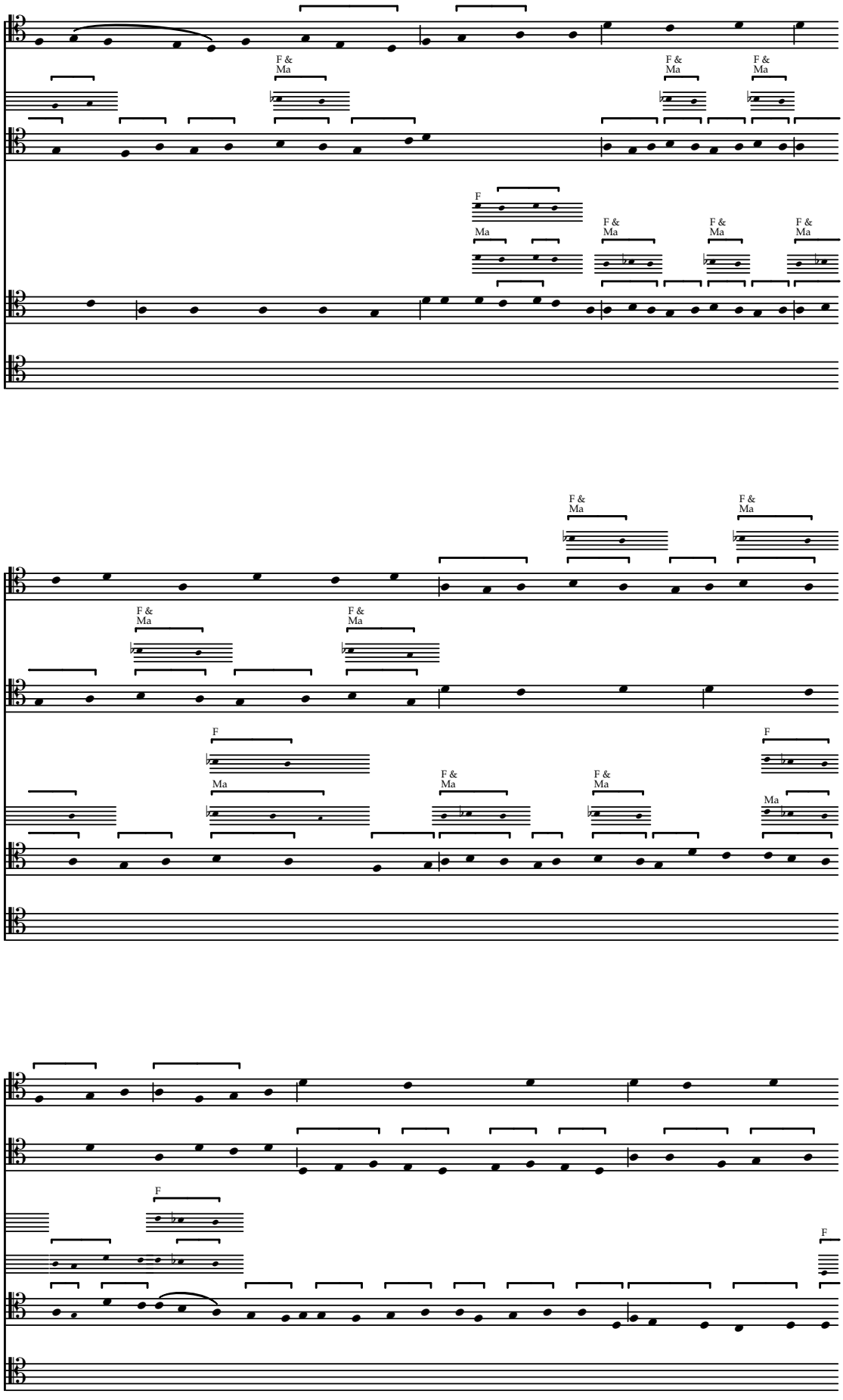
Concordances from F & Ma

f. 3v–4v





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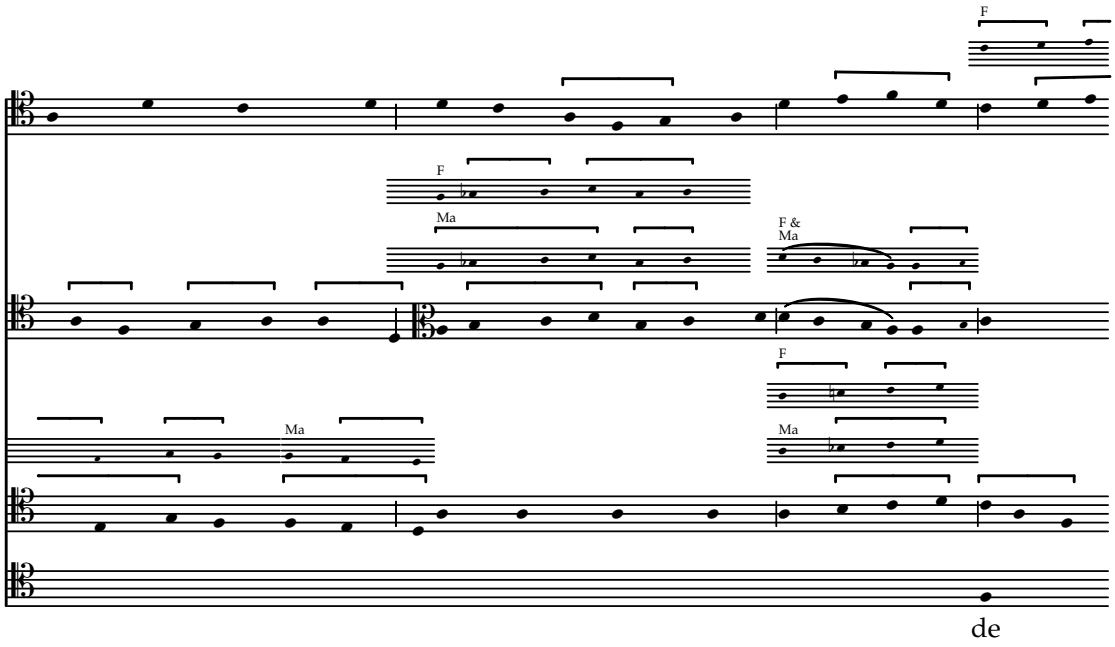
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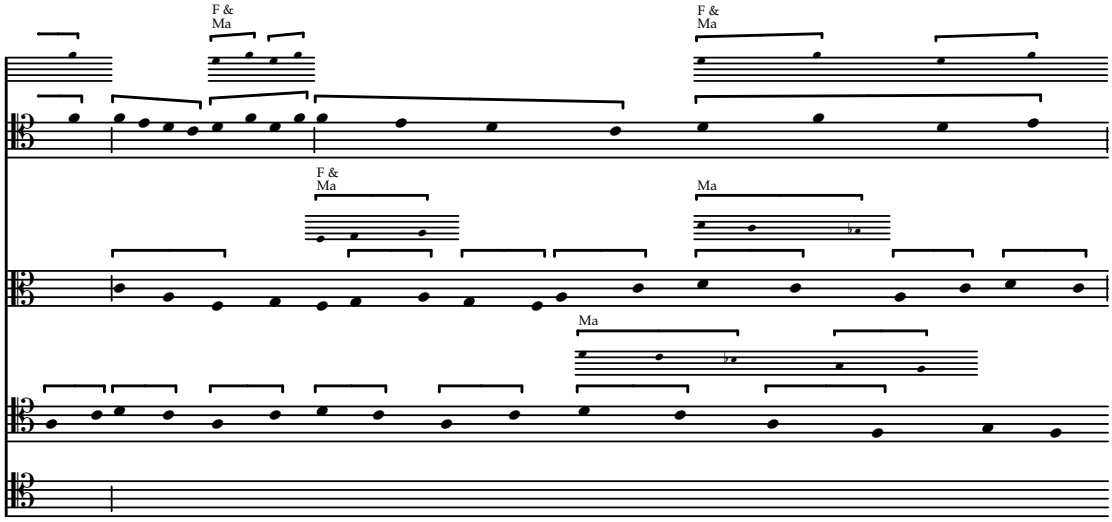
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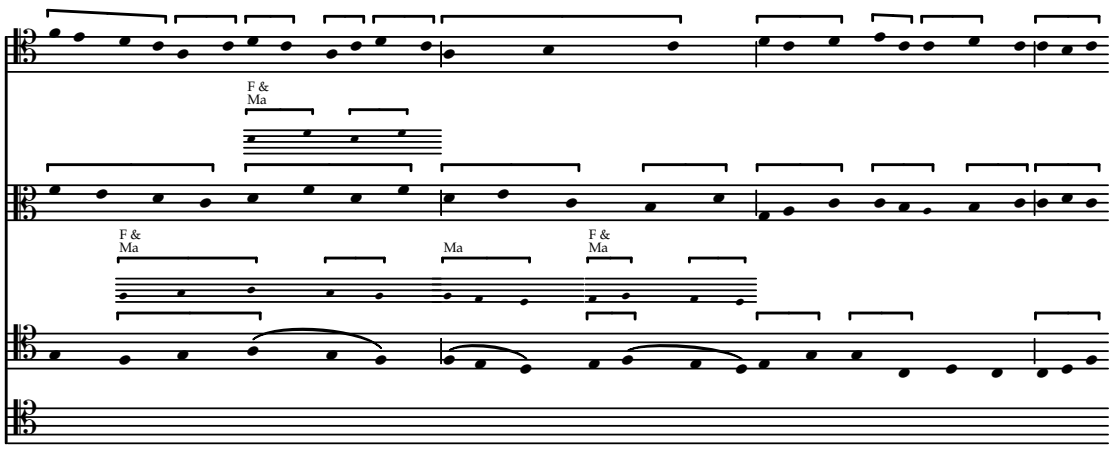
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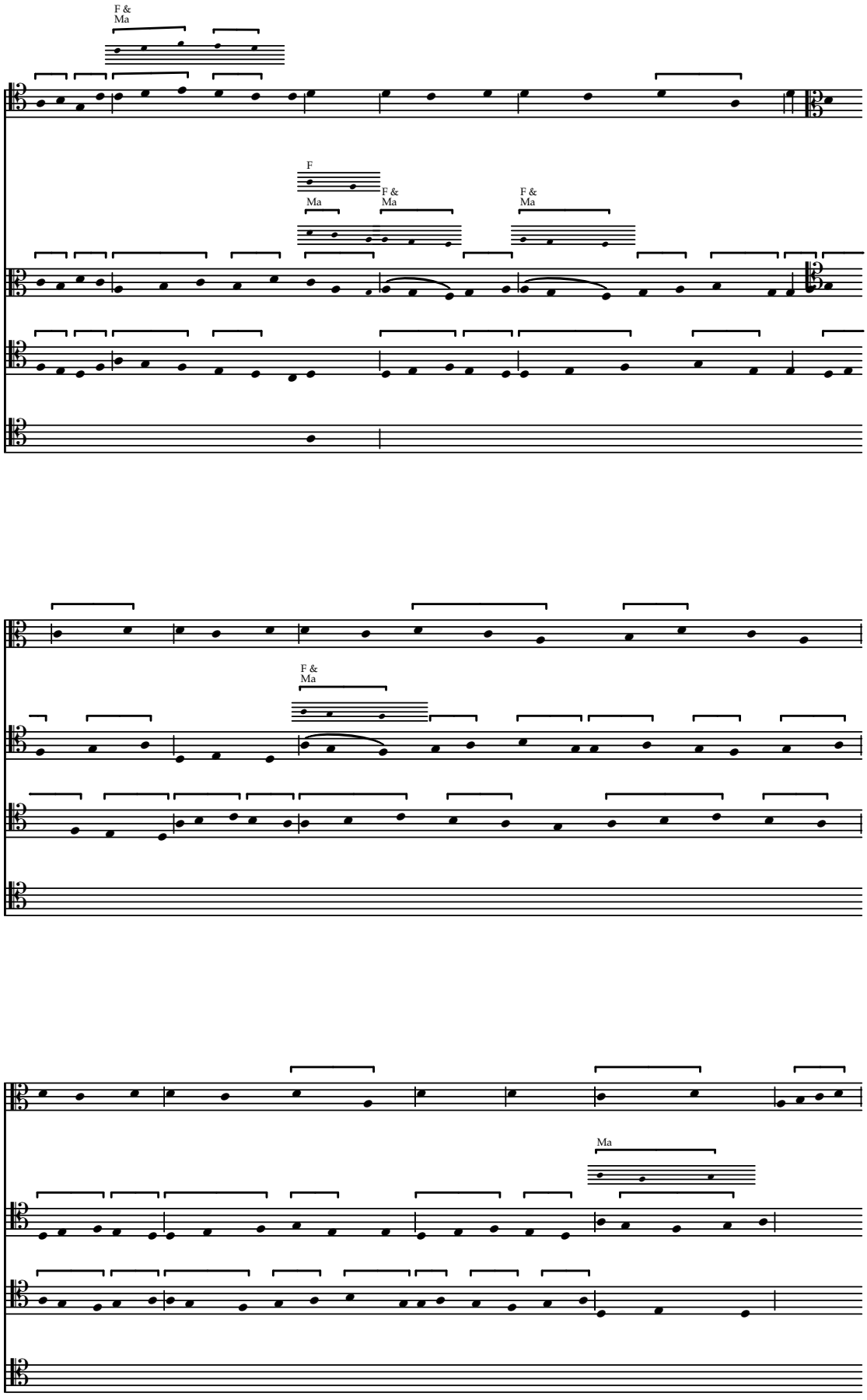
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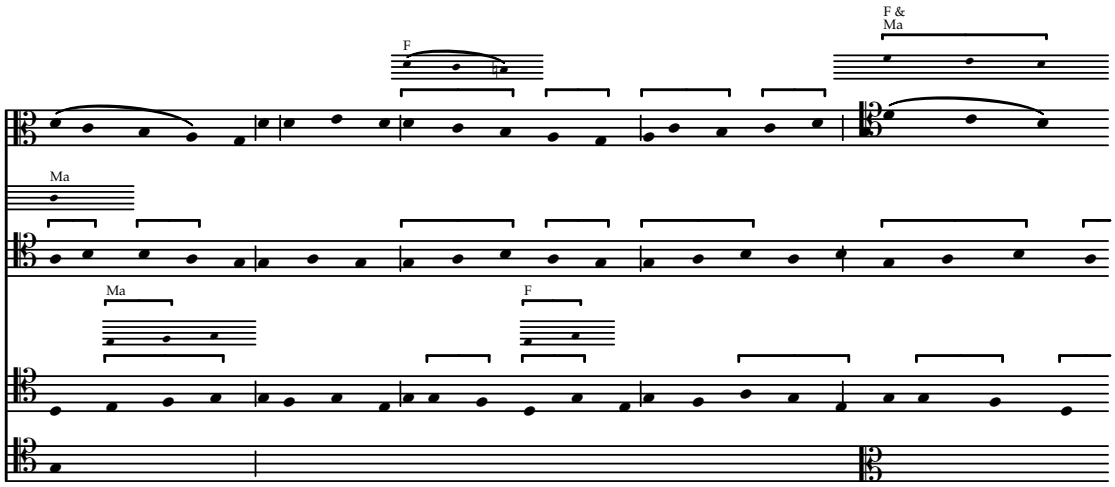
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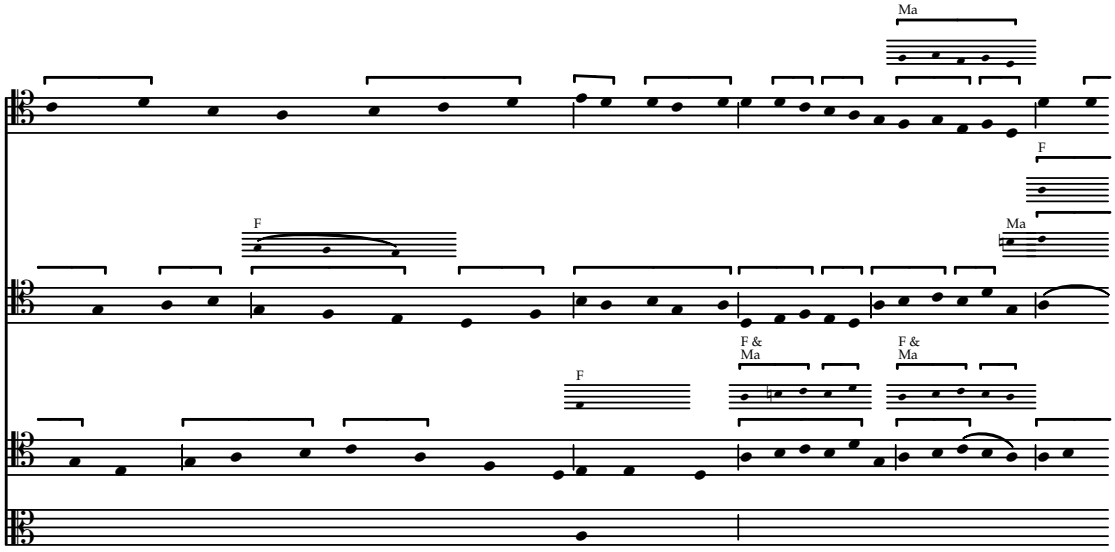
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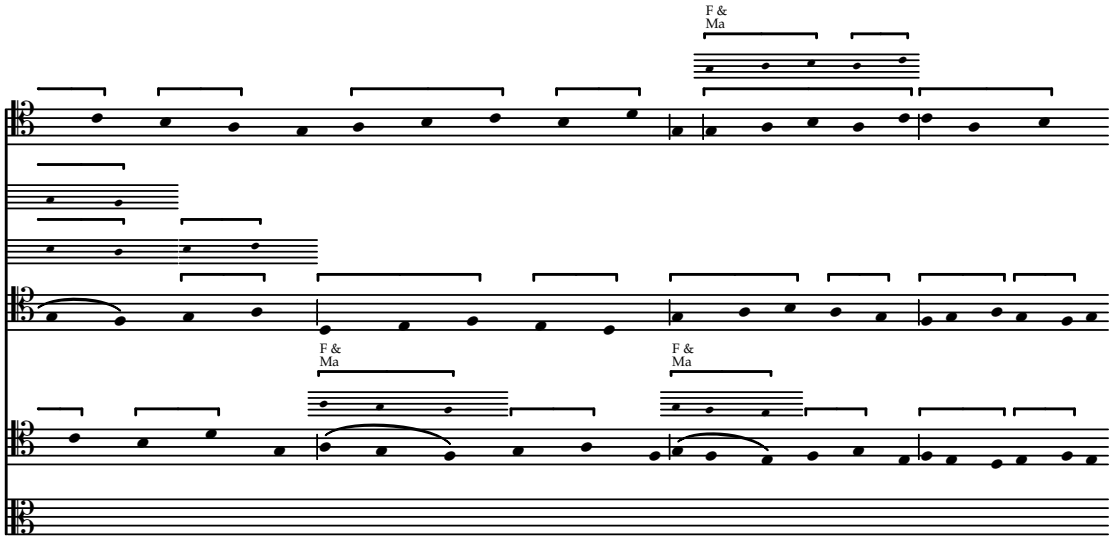
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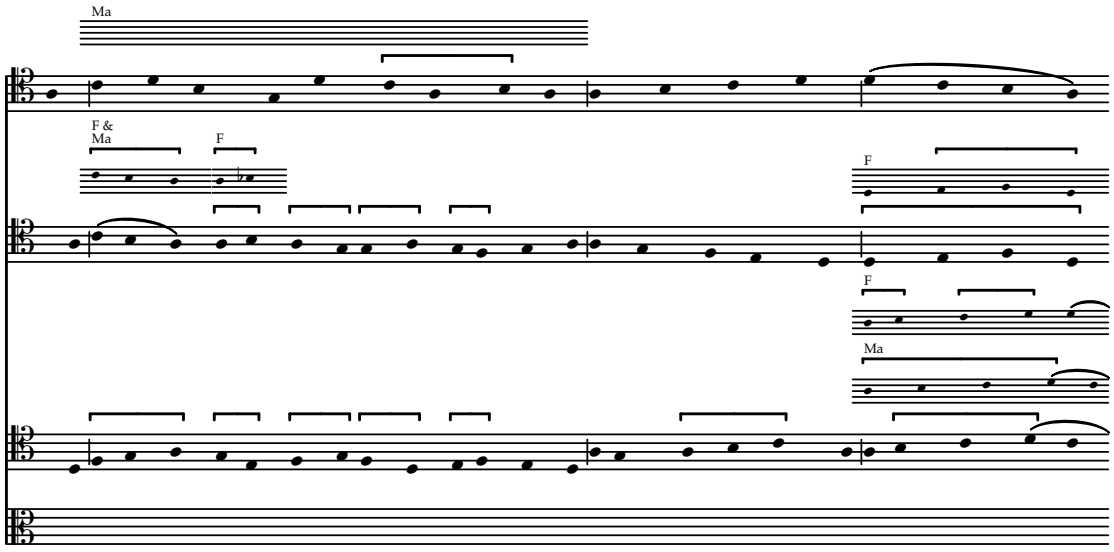

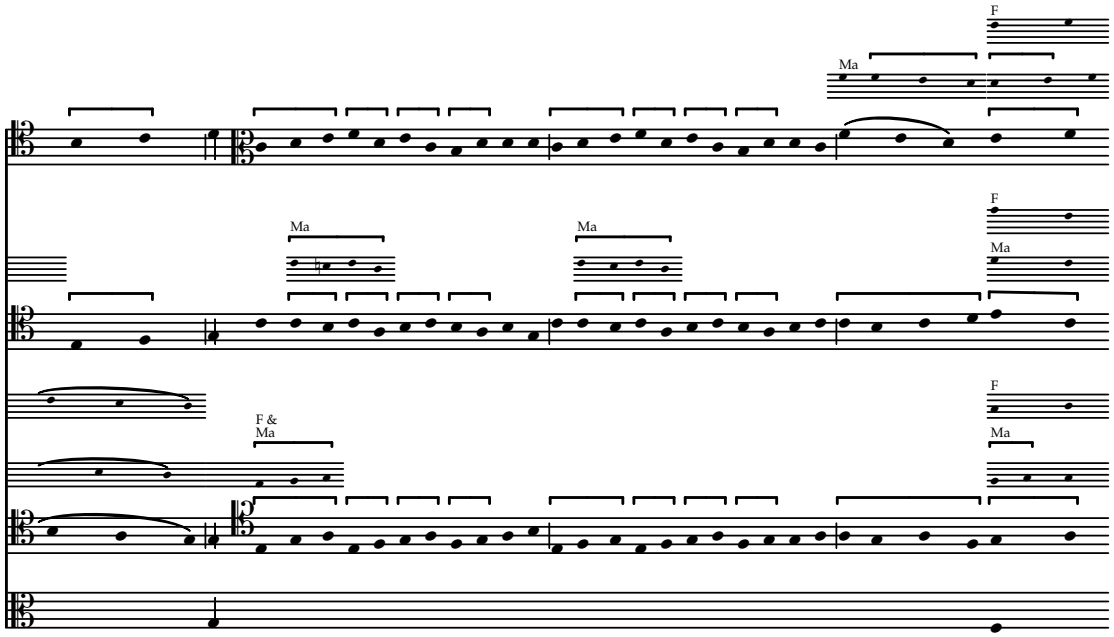

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Concordances from W2, F & Ma

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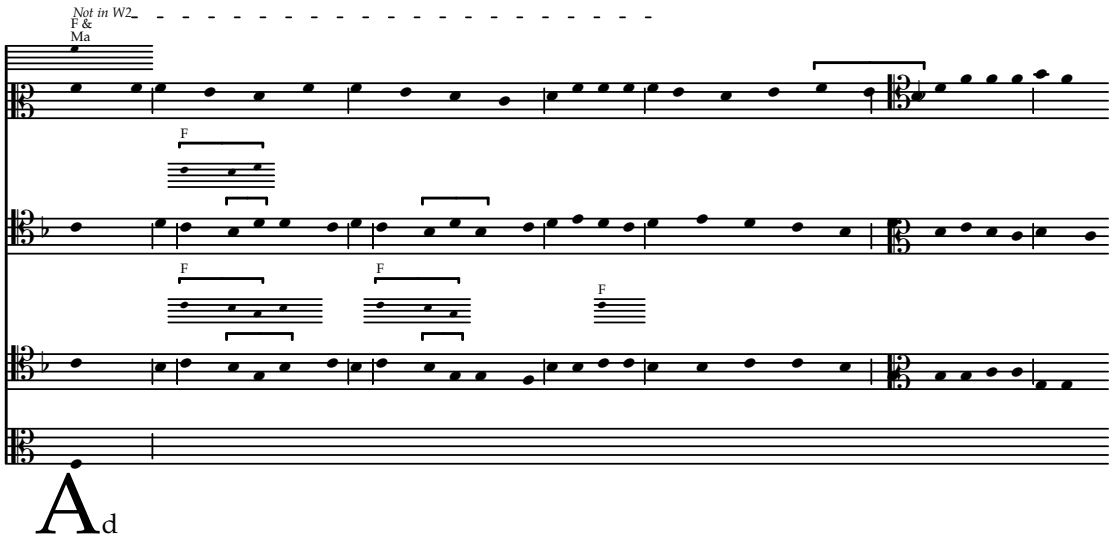

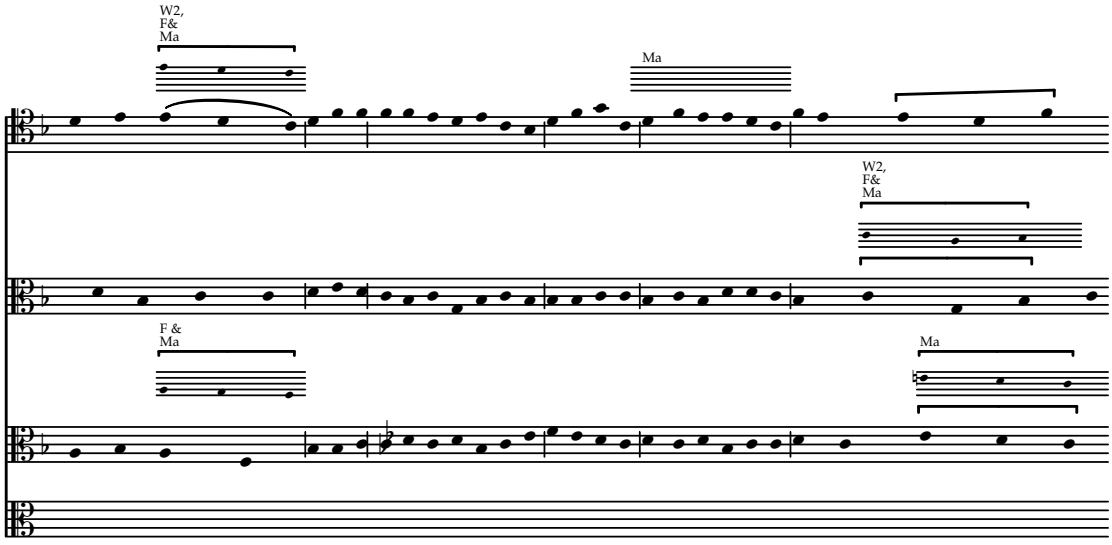

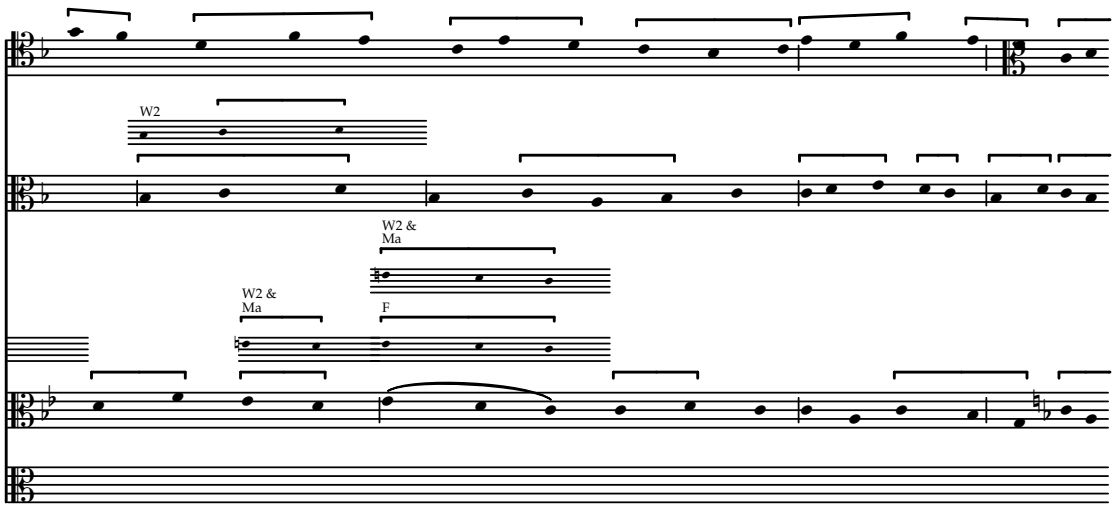

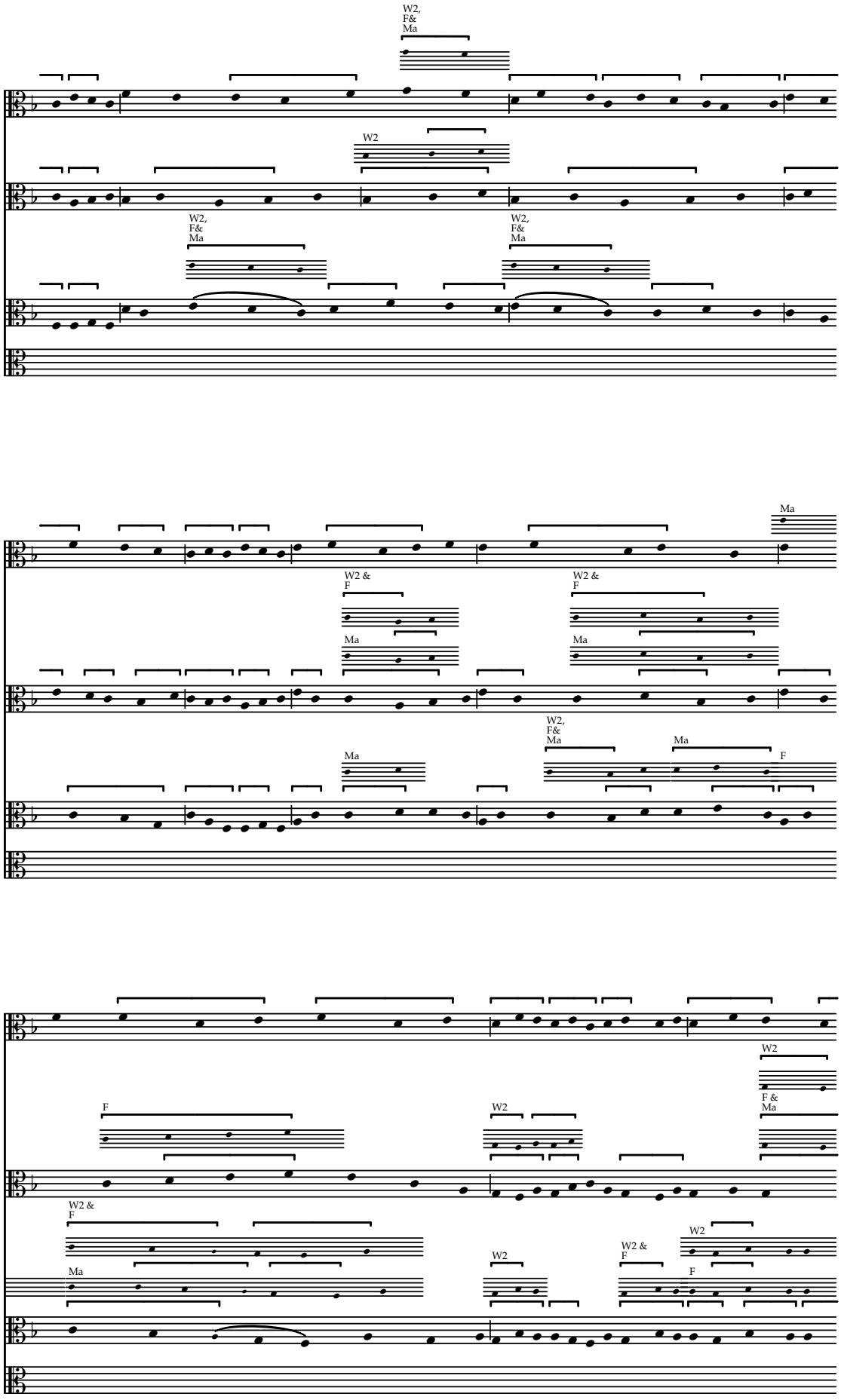
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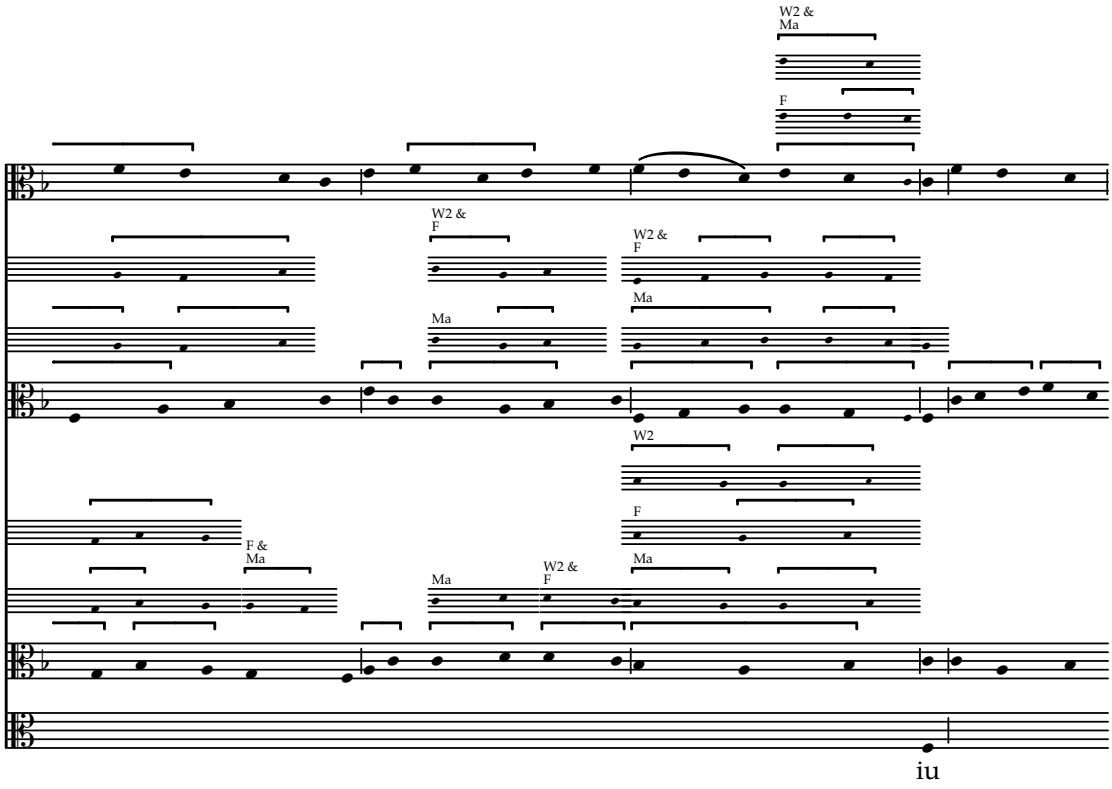
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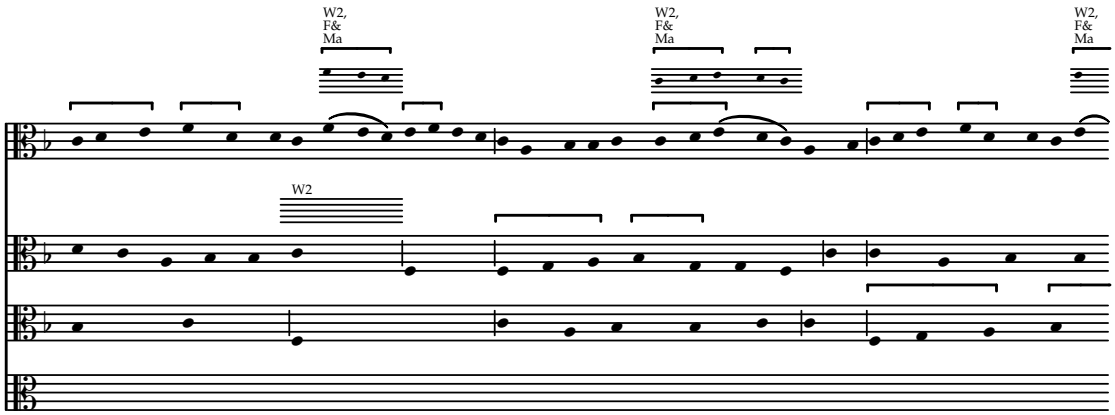
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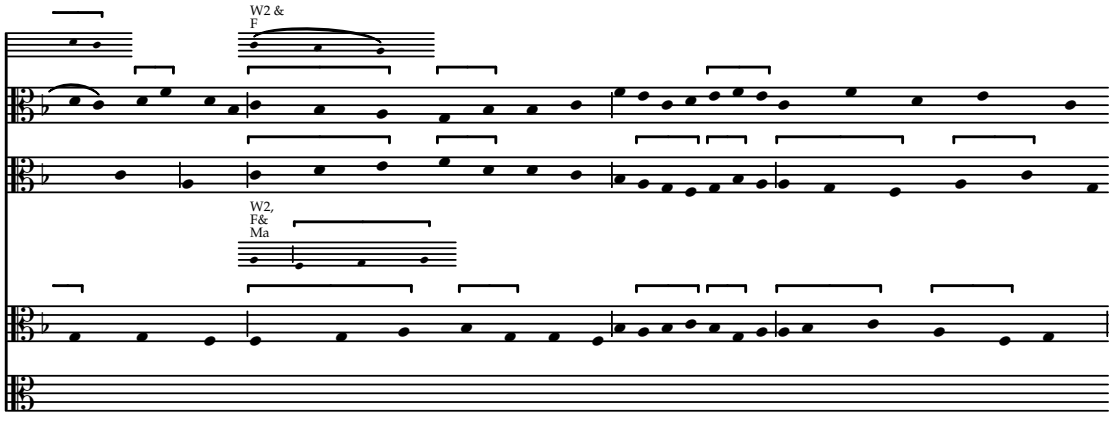
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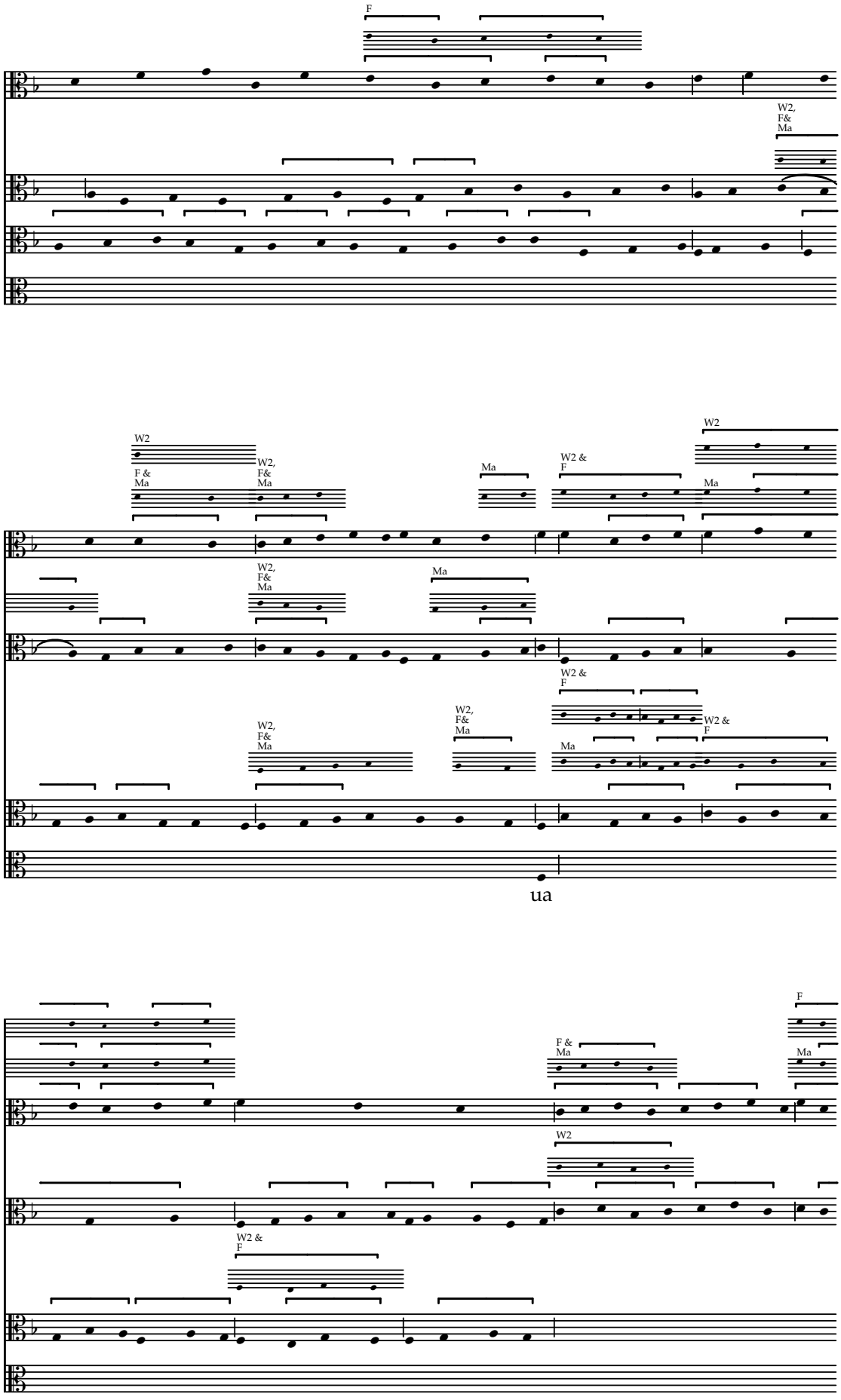
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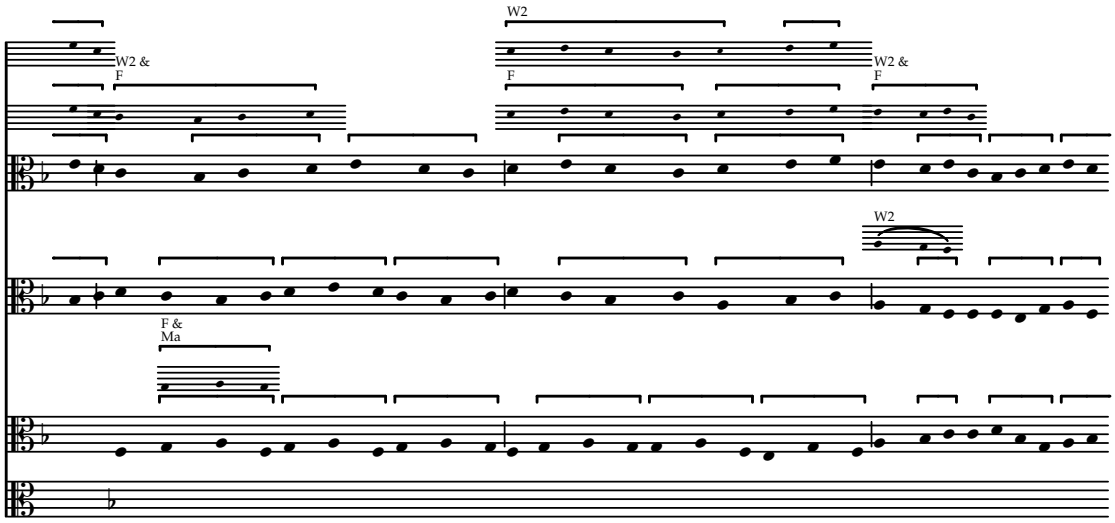
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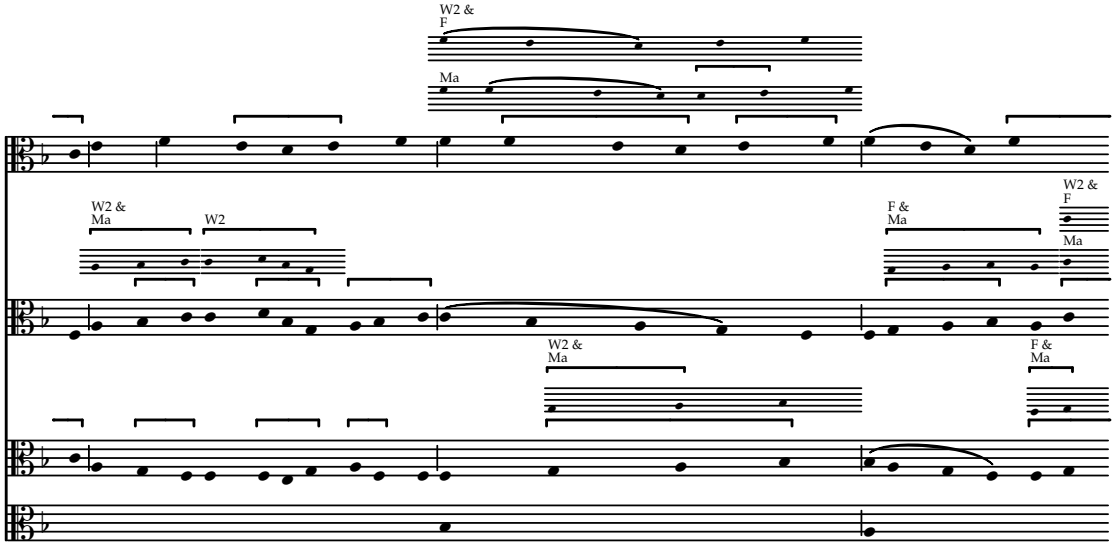
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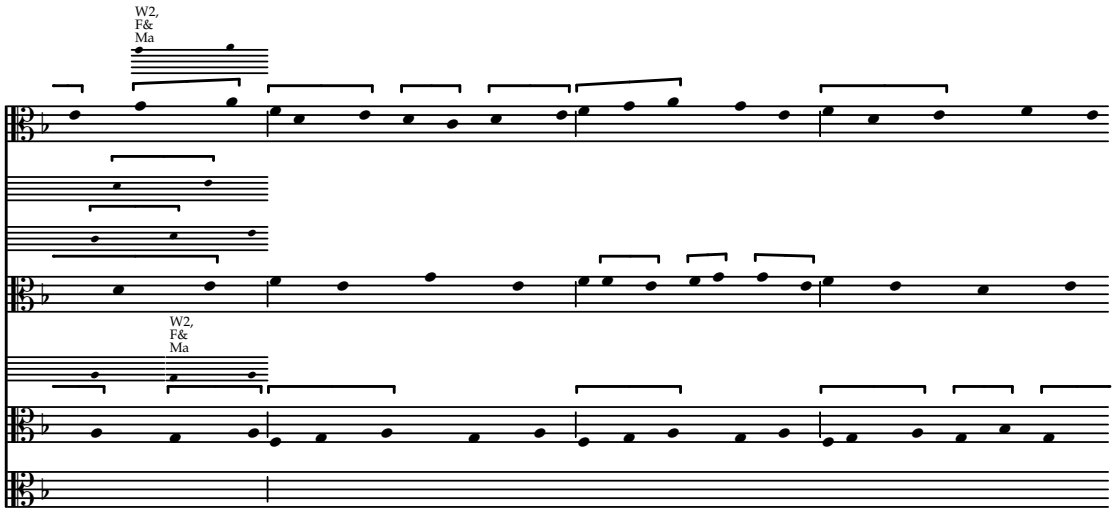
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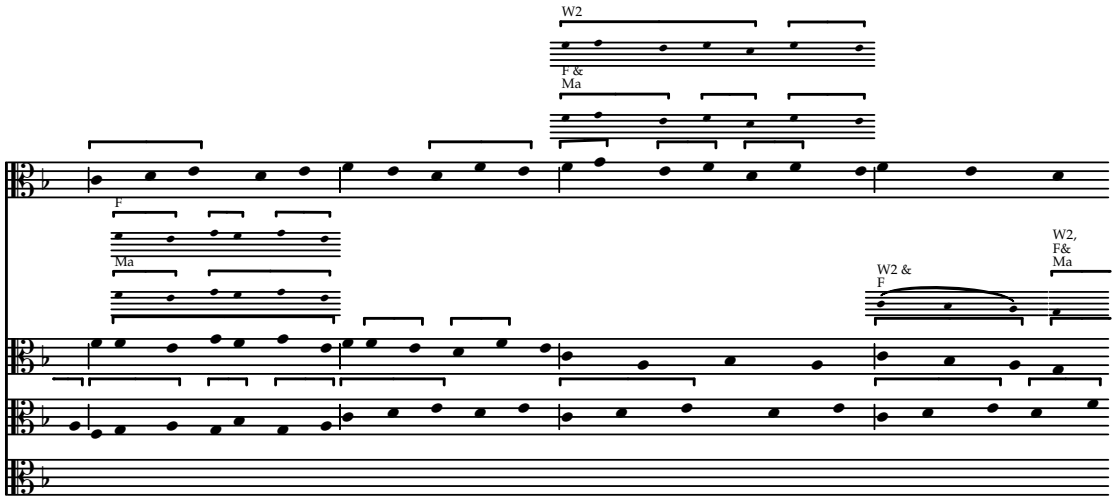
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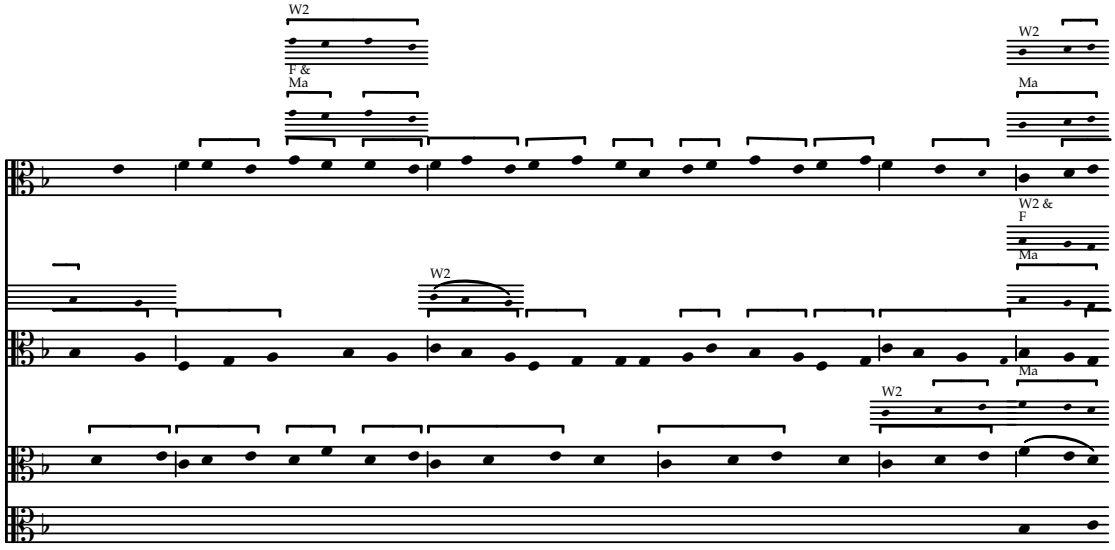
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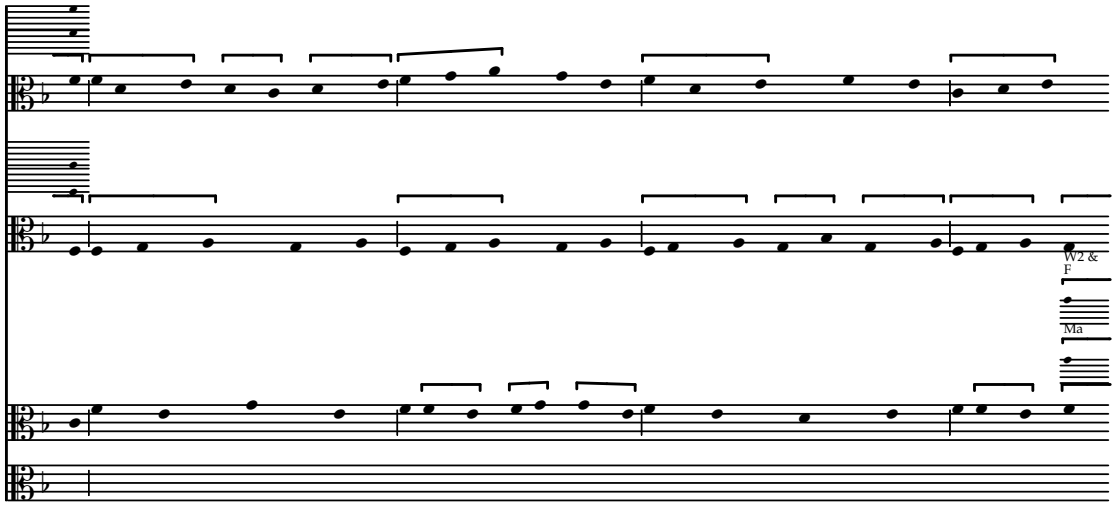
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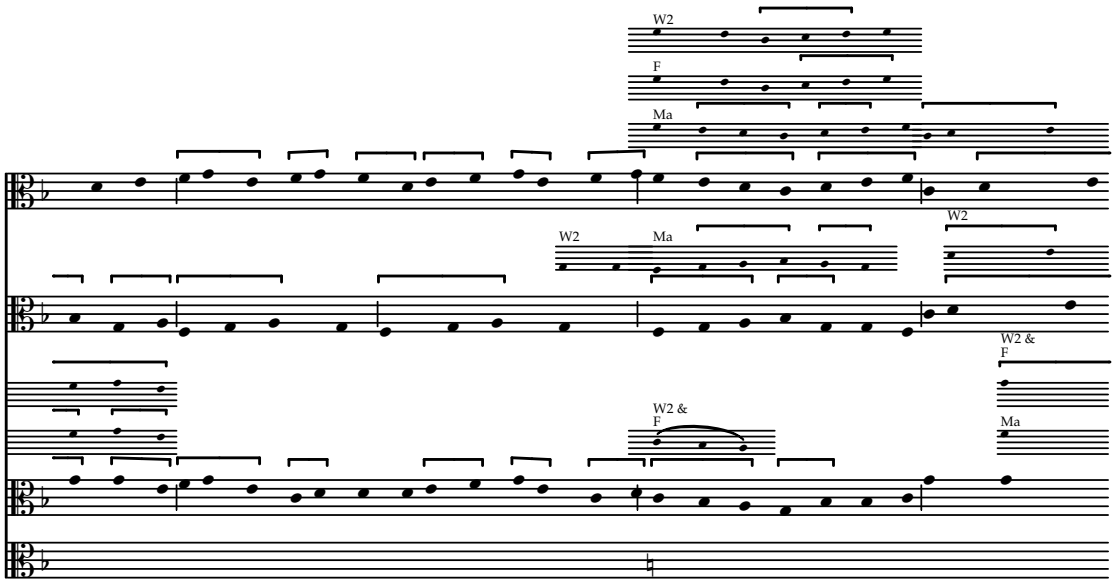
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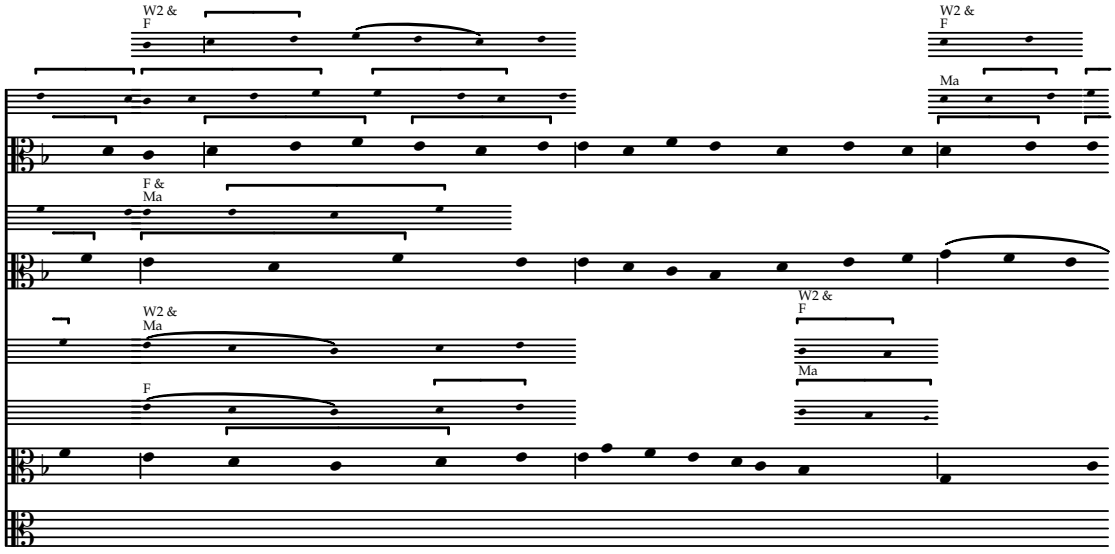
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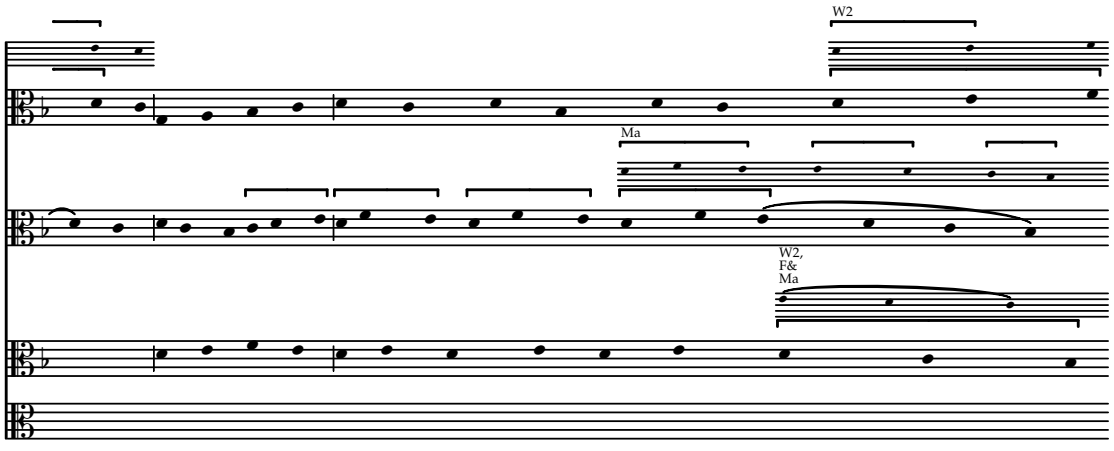
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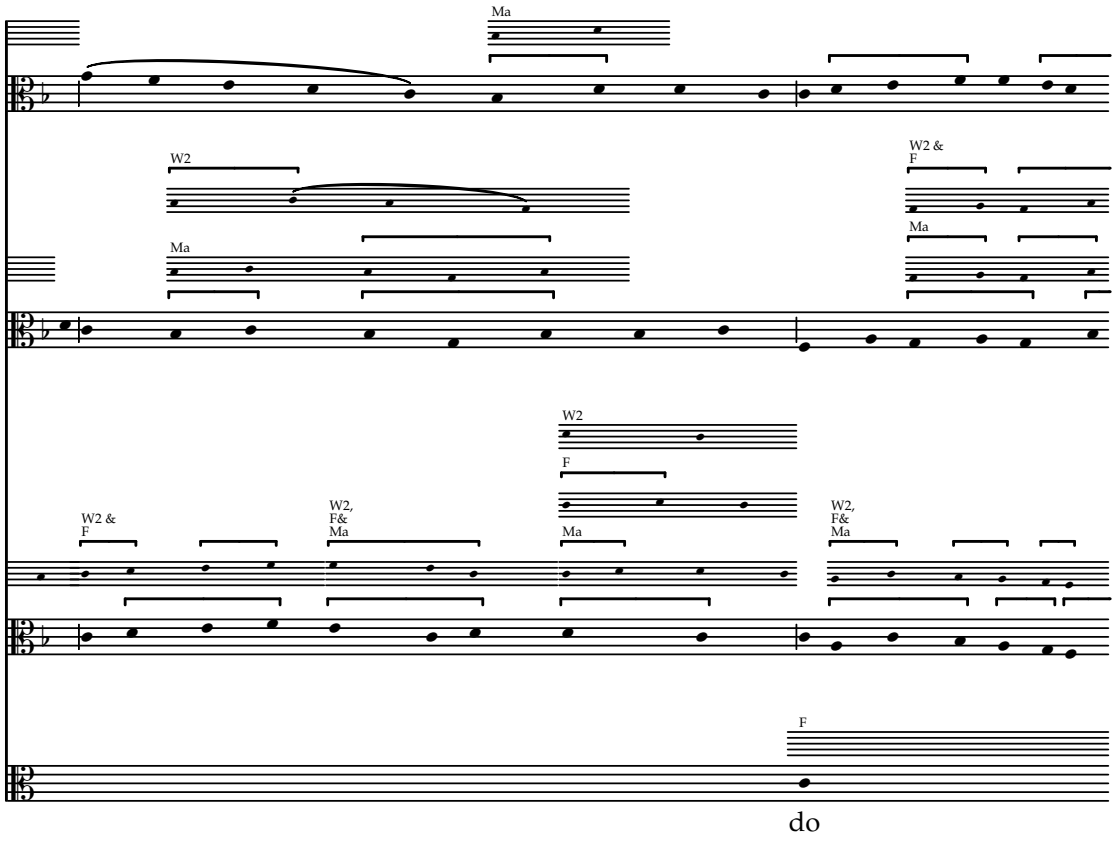
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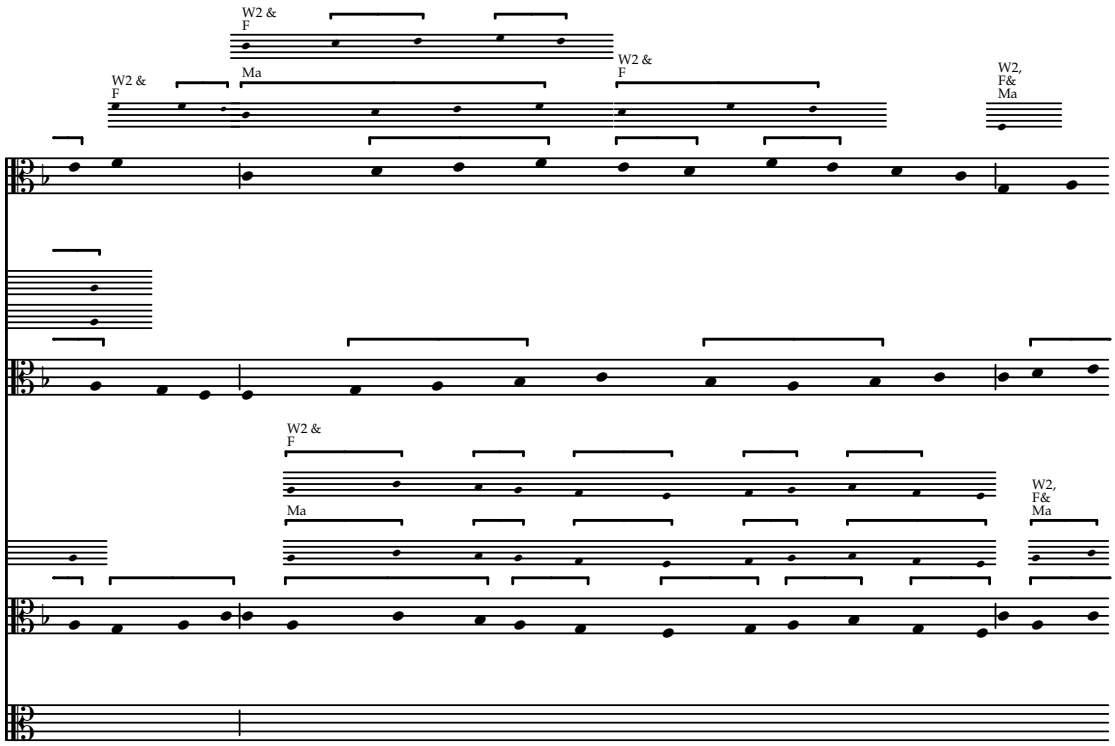
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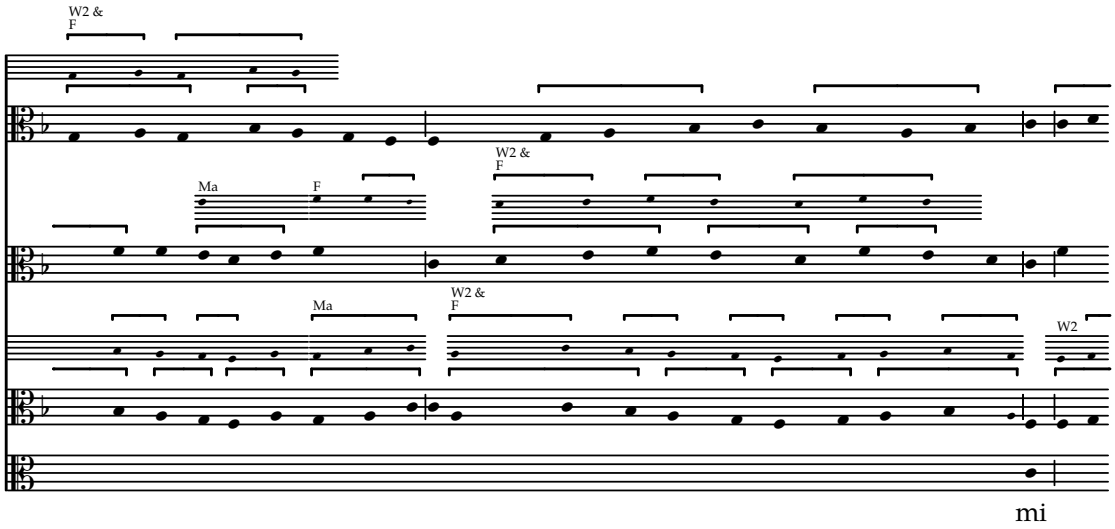
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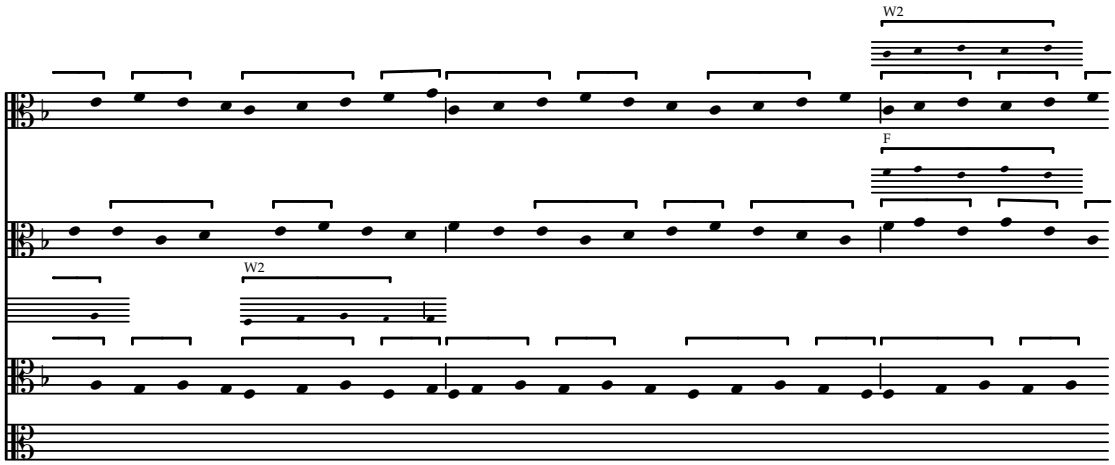
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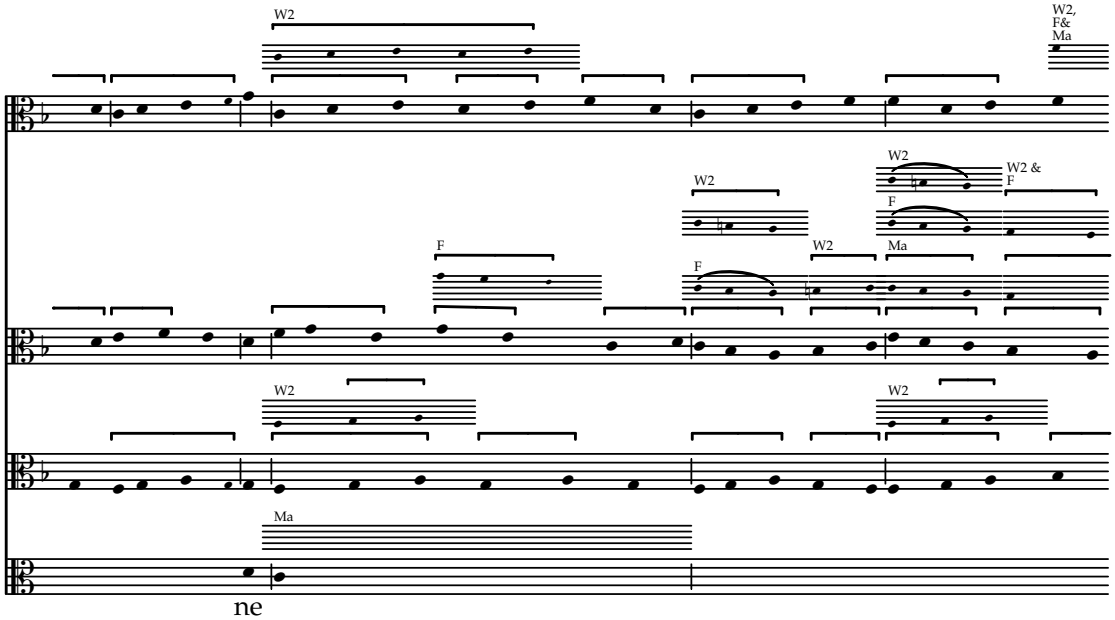
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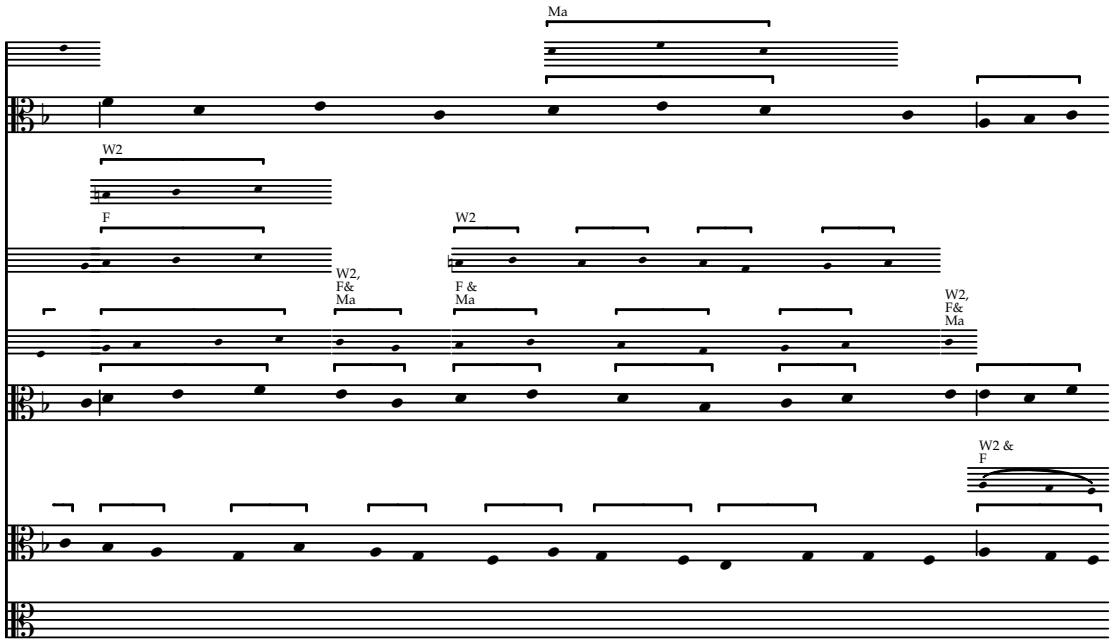
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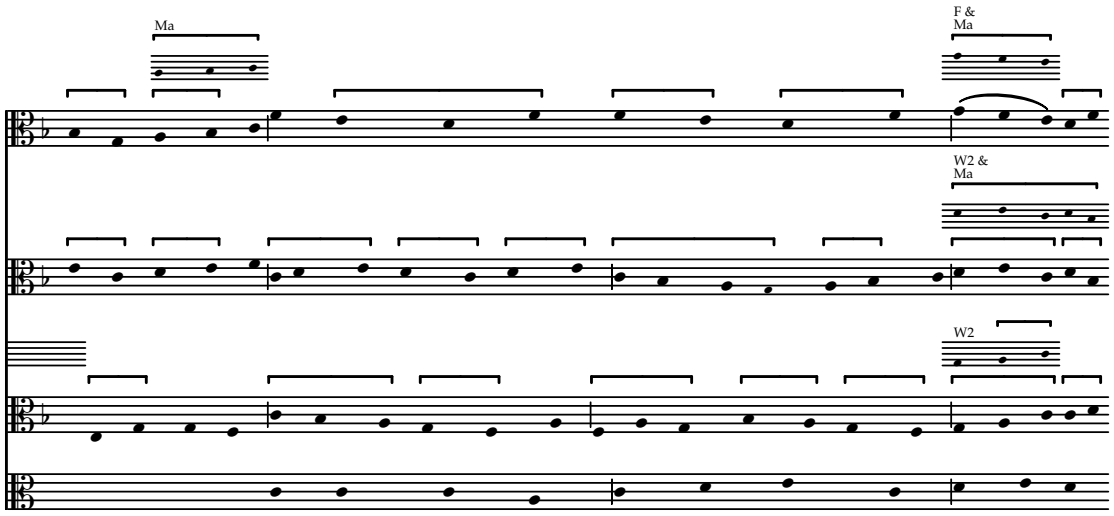
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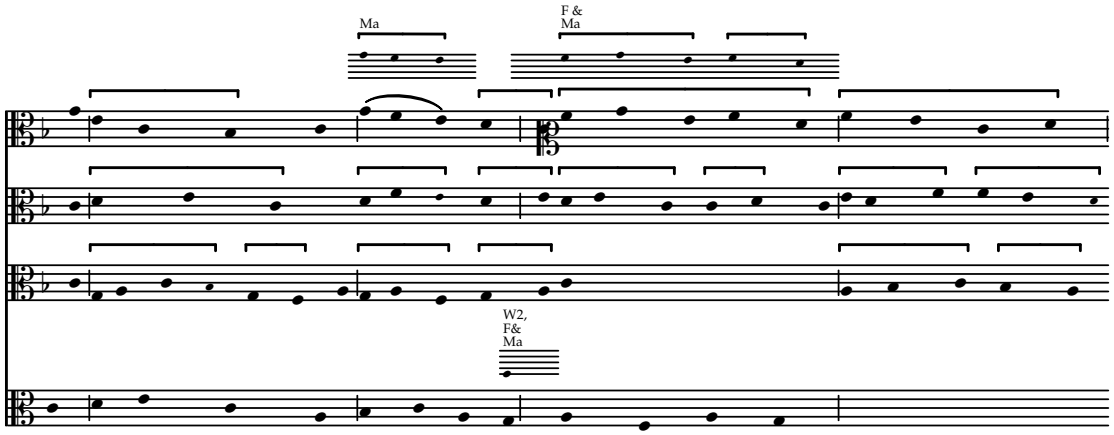
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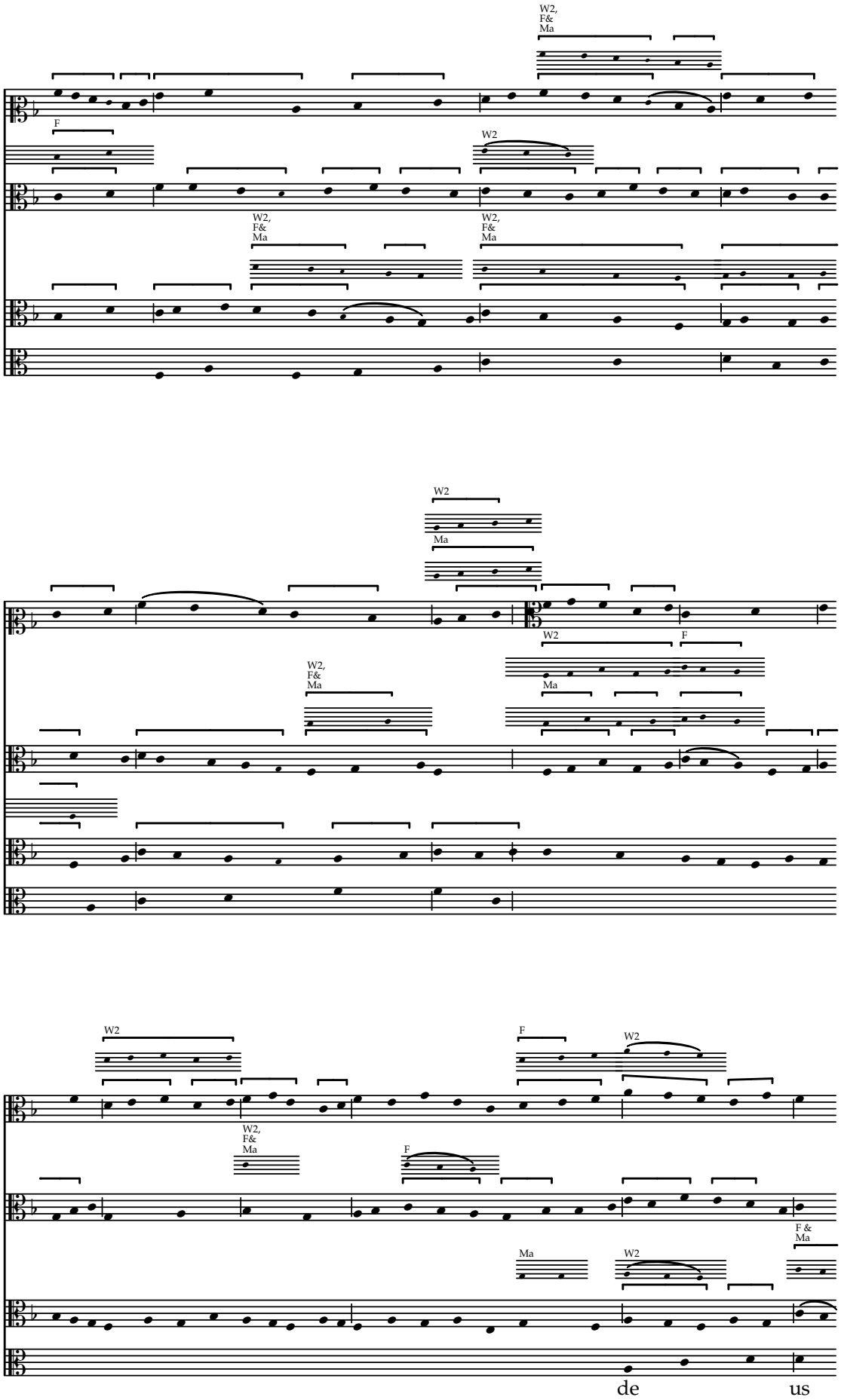
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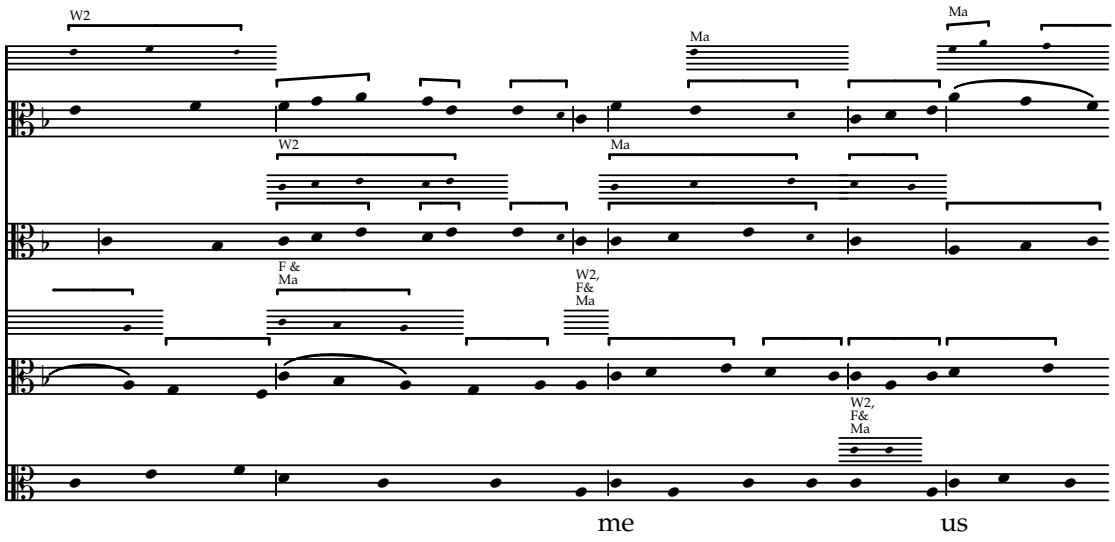
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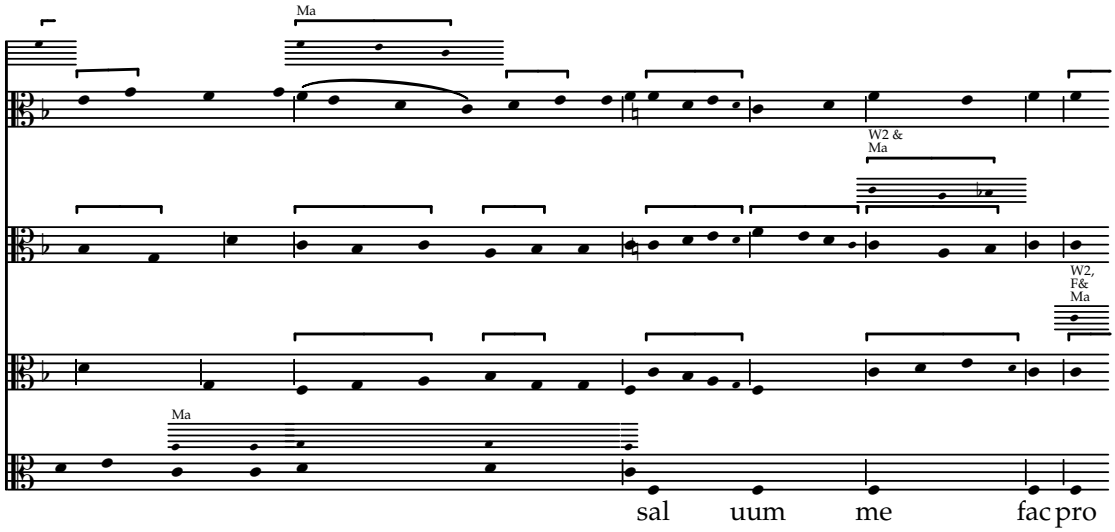
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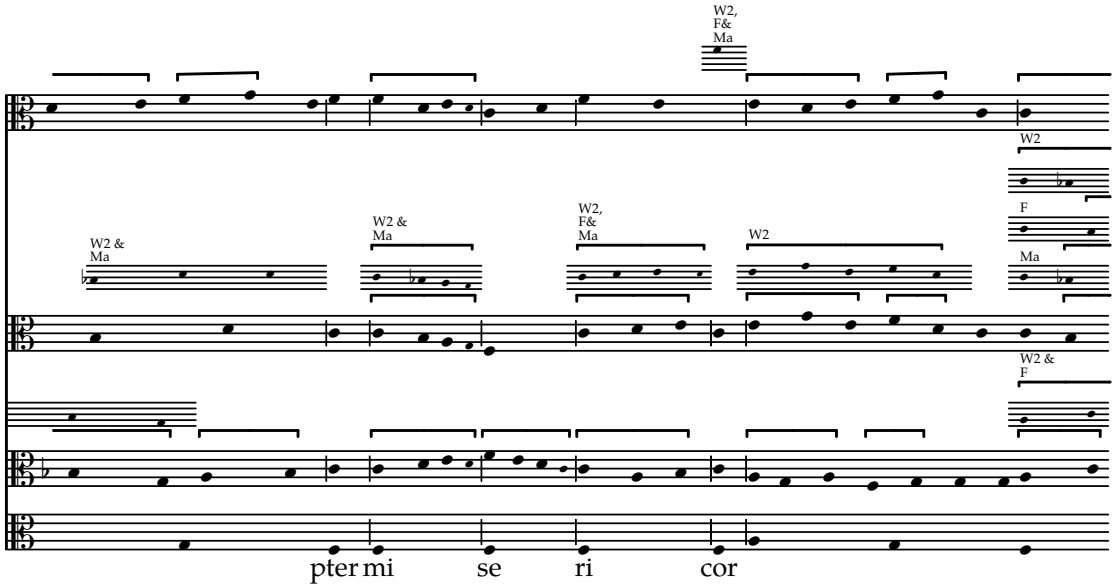
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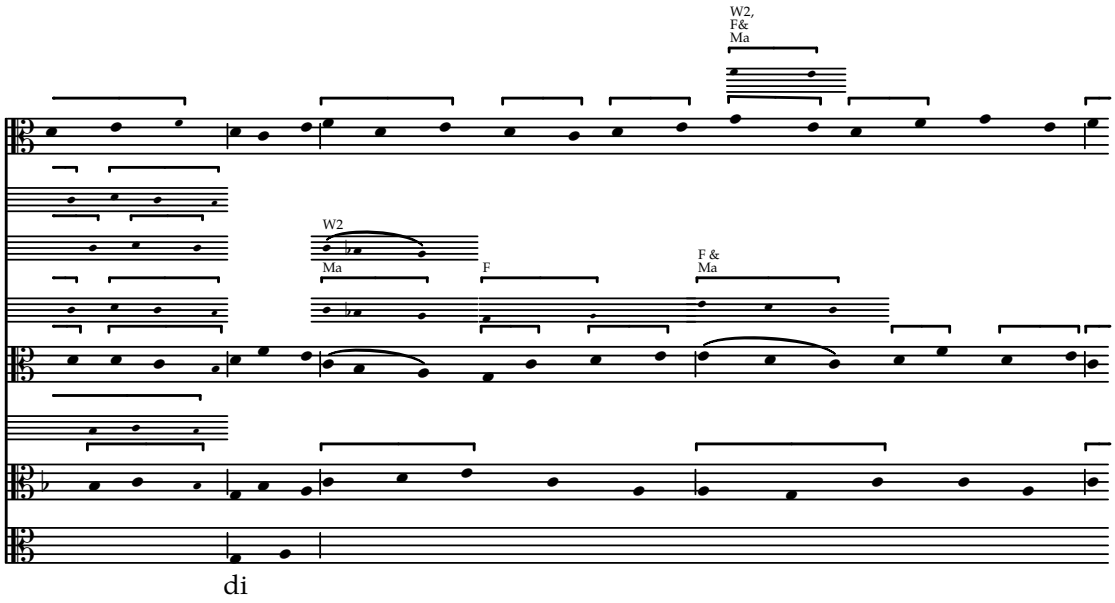

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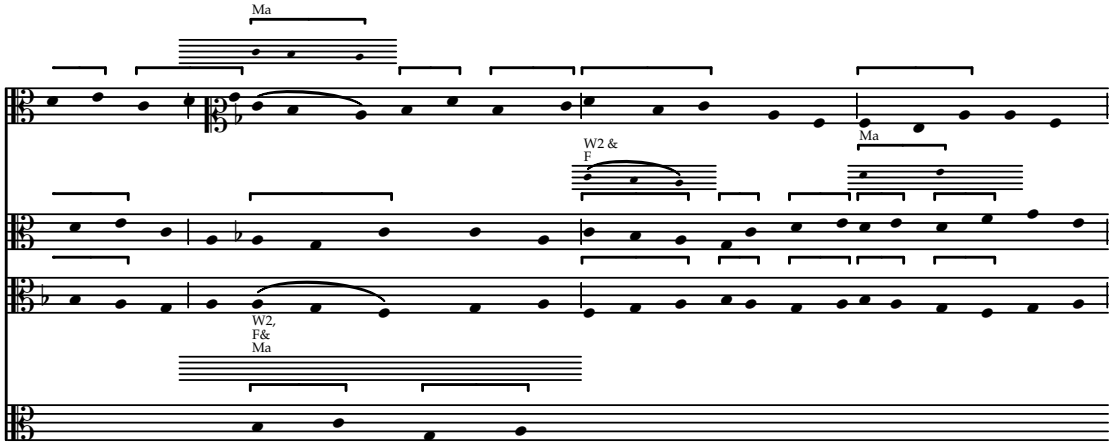

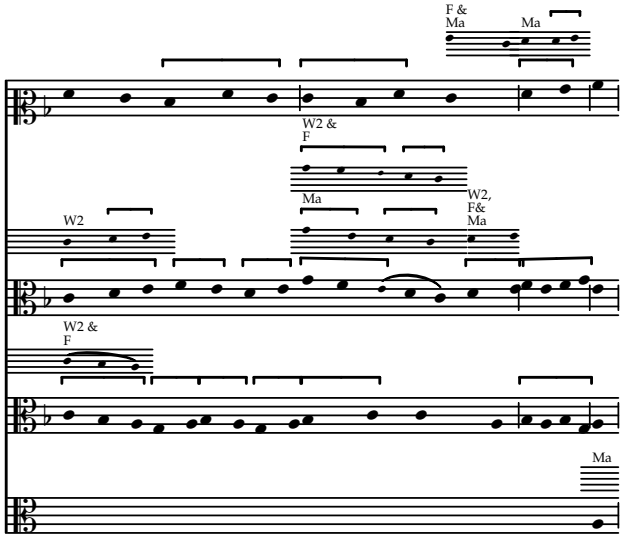

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Concordances from W2, F & Ma

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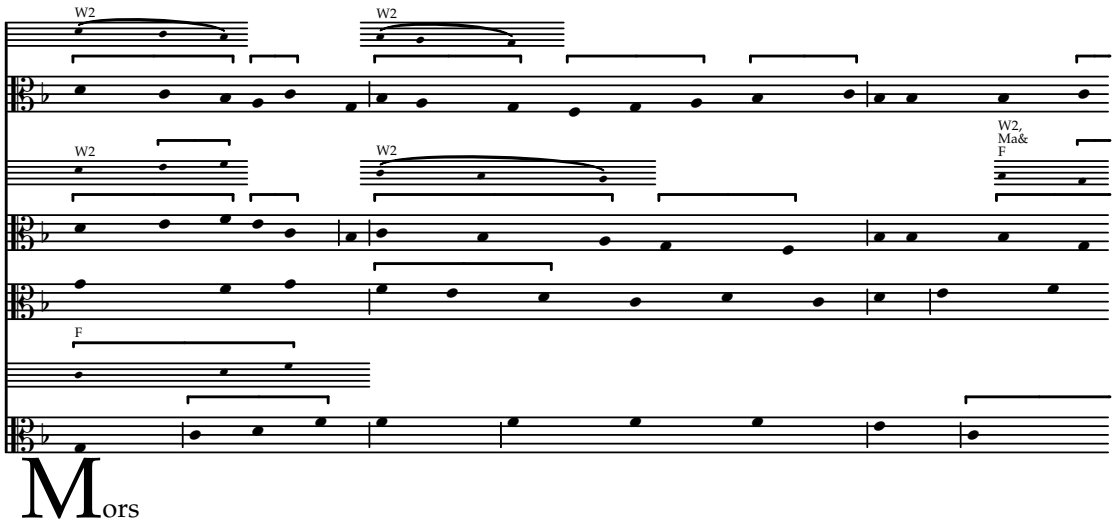

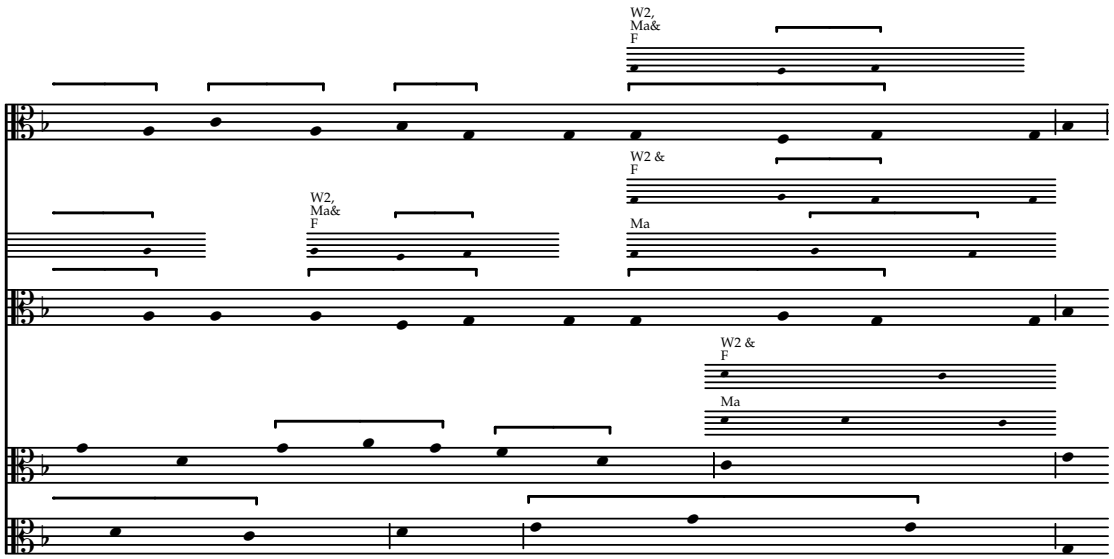

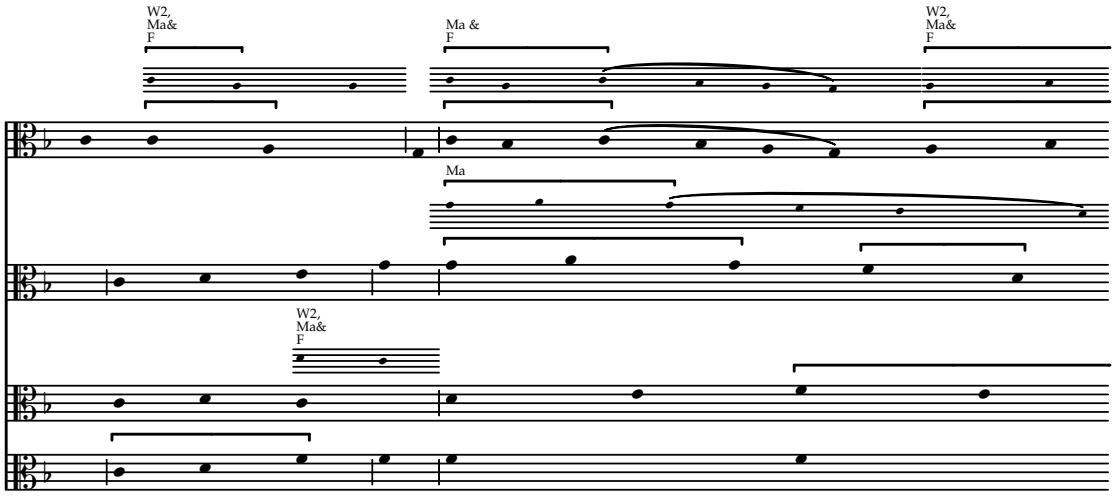

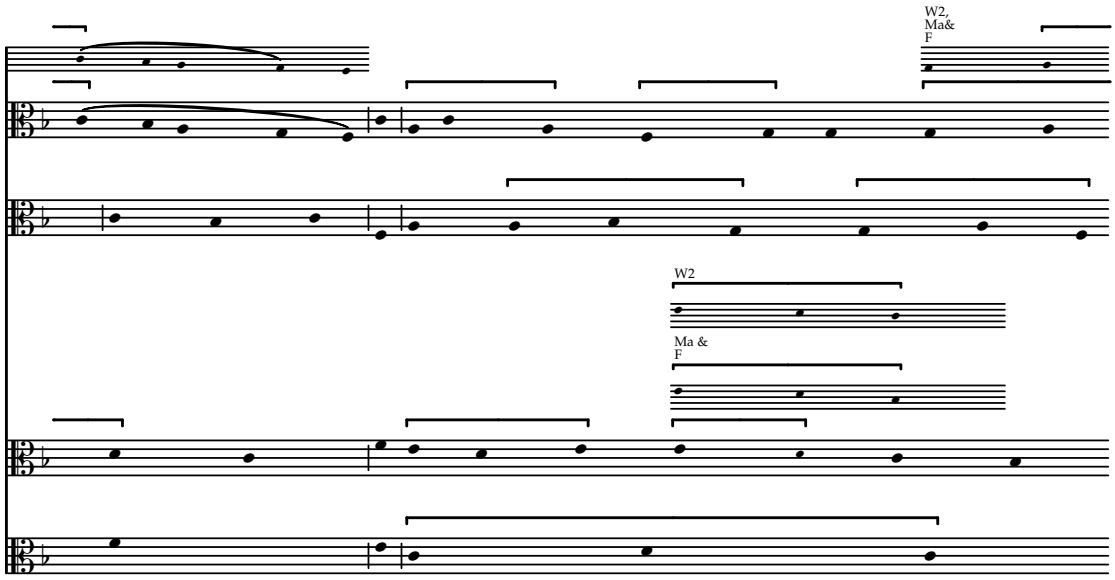
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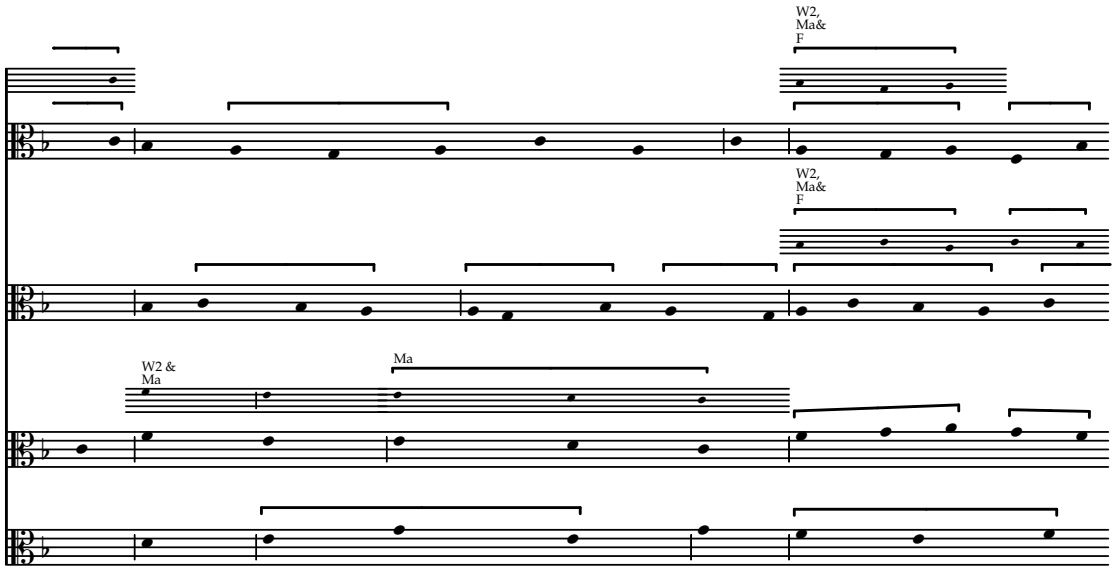
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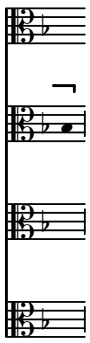

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Concordances from W2, F & Mo

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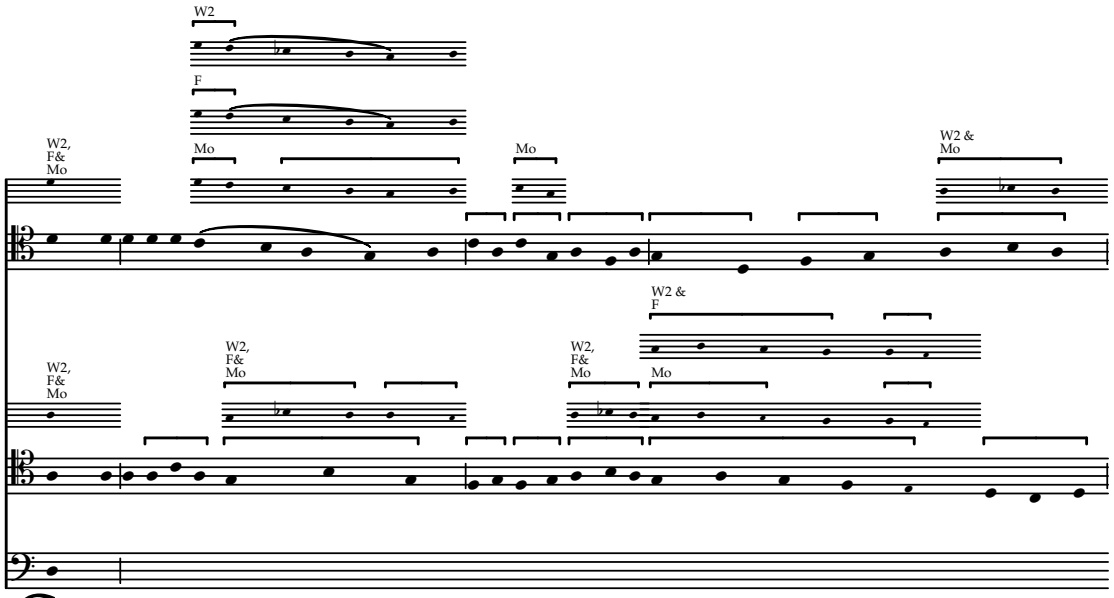

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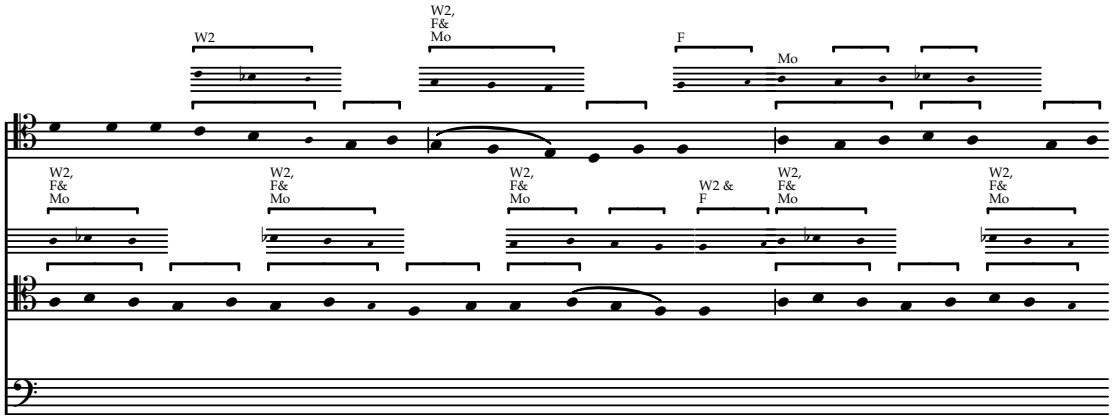

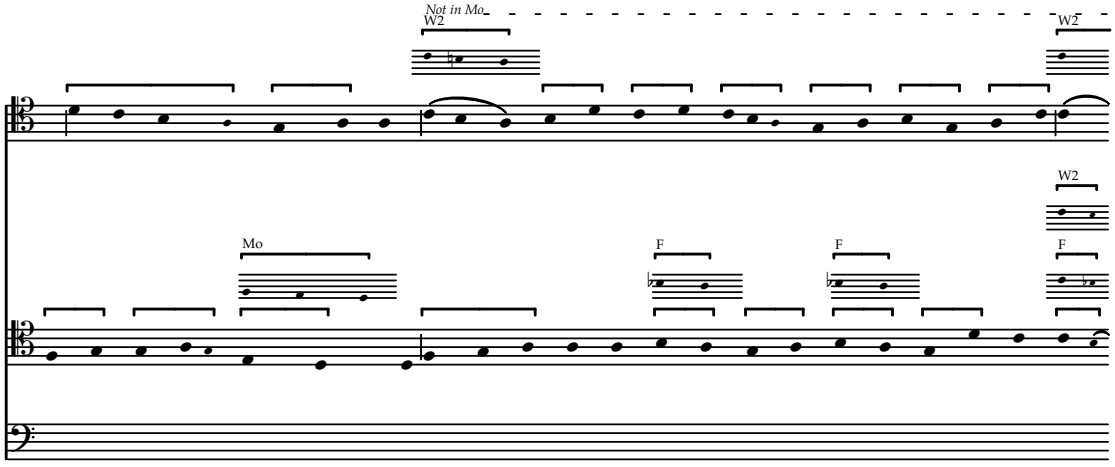

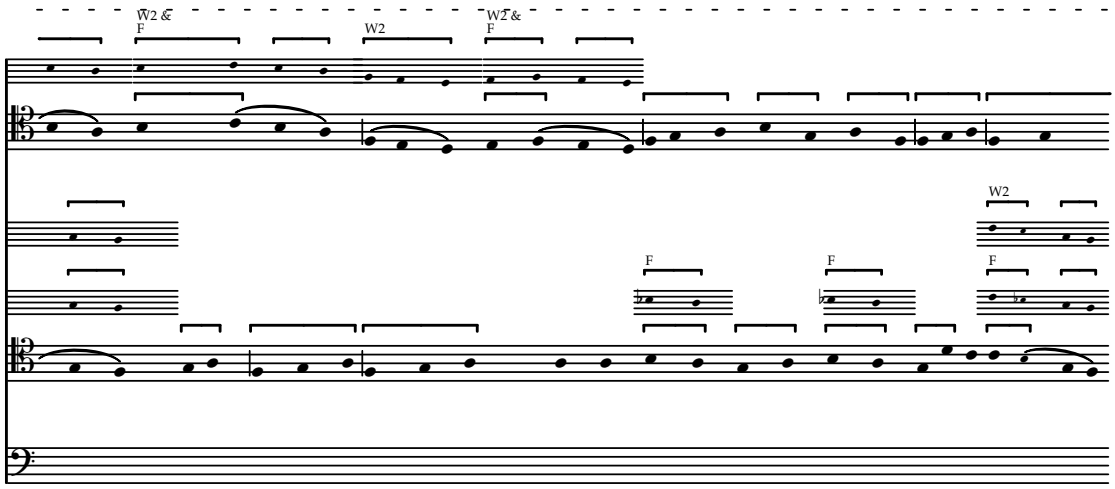
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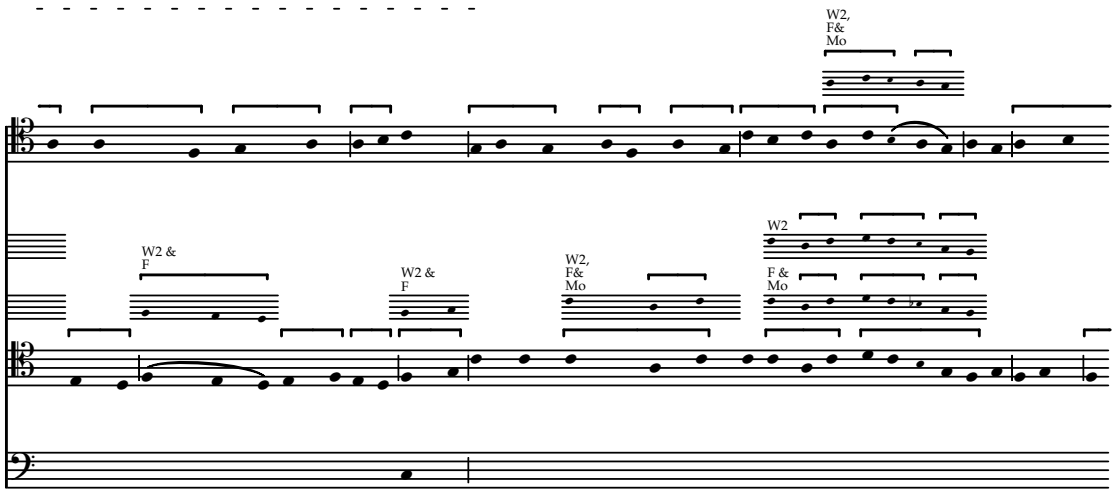
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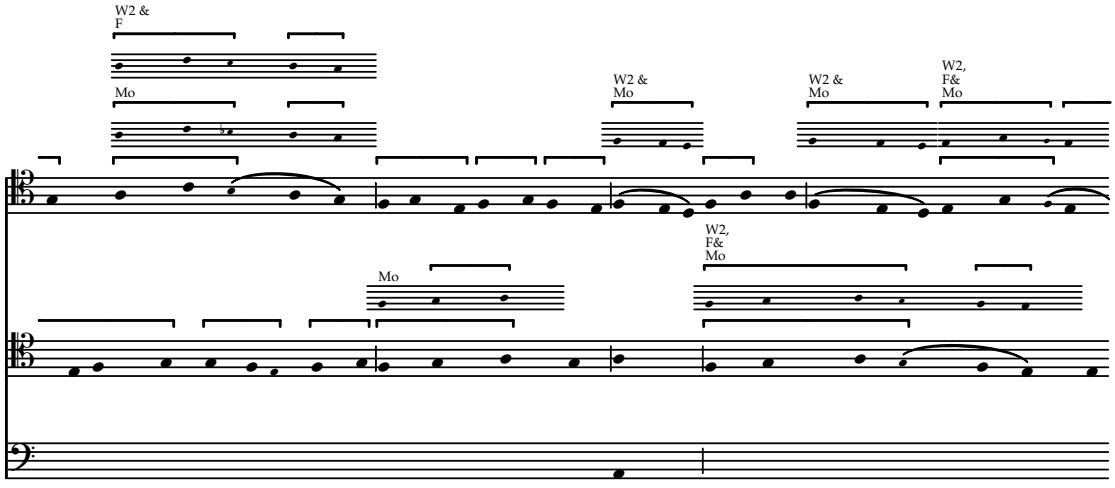
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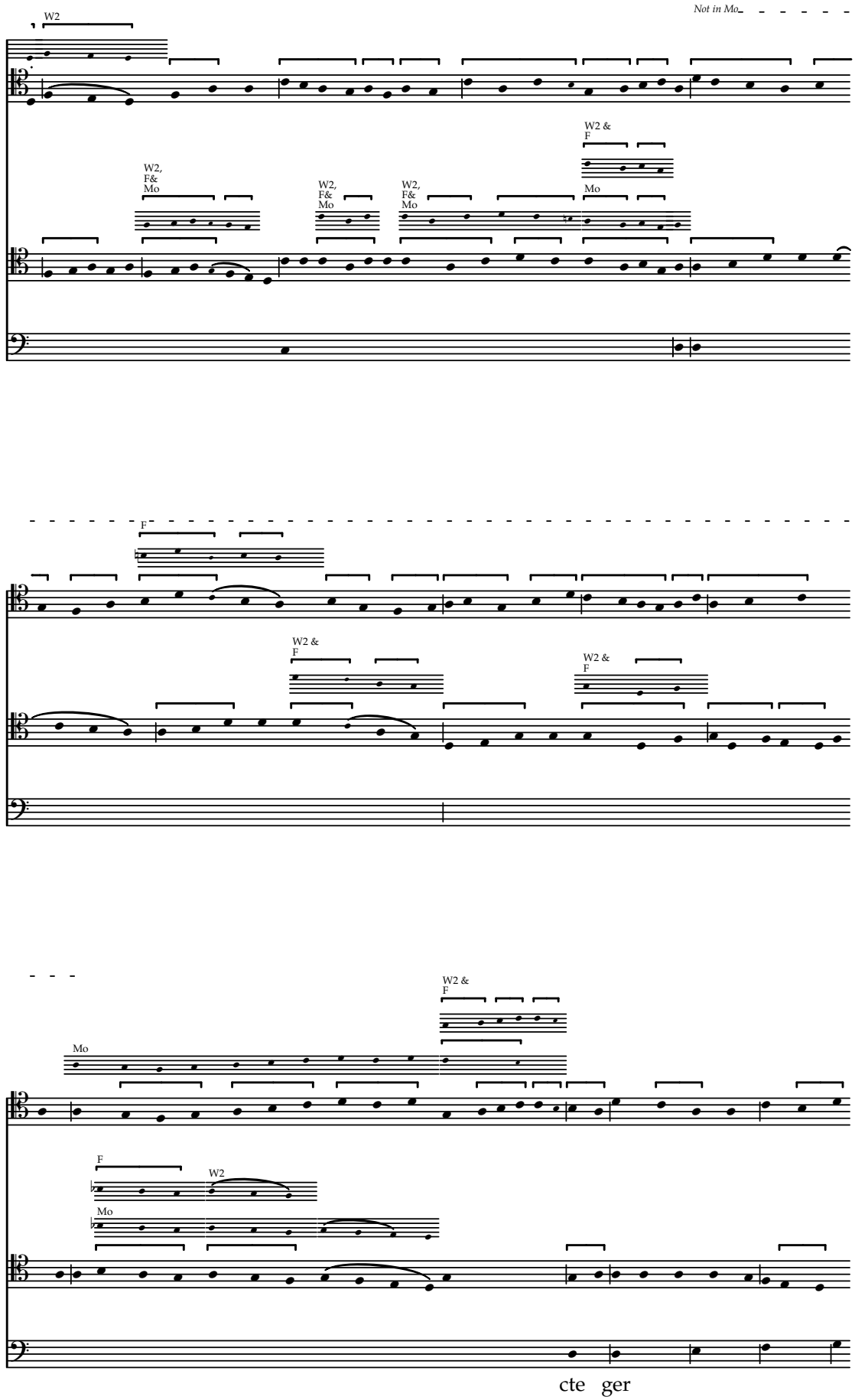
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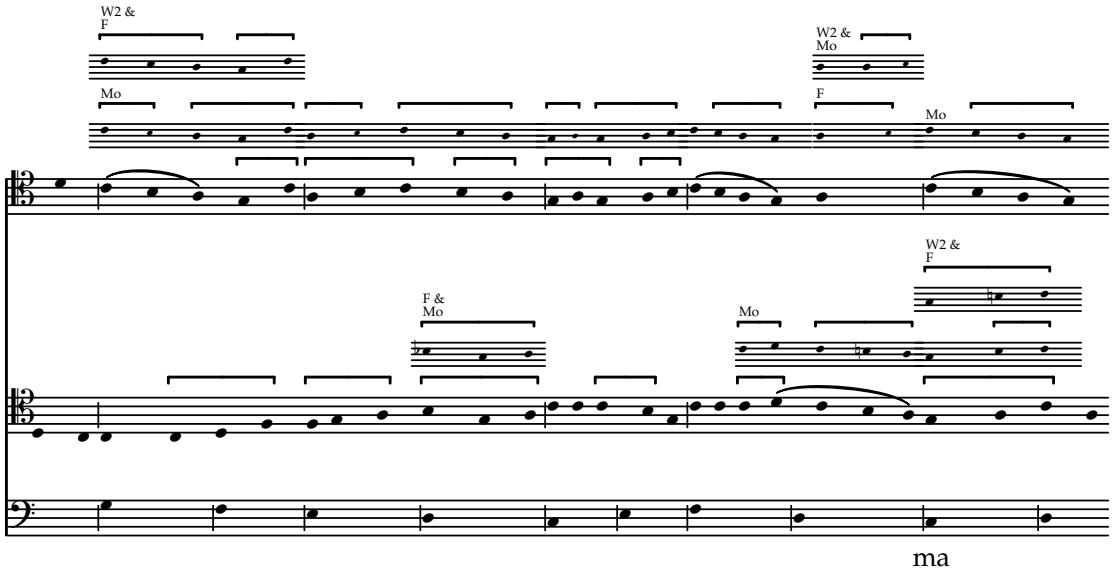
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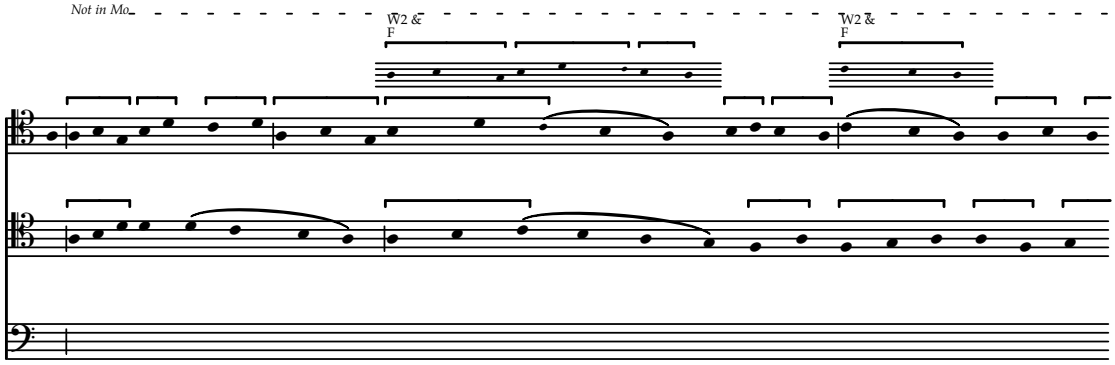
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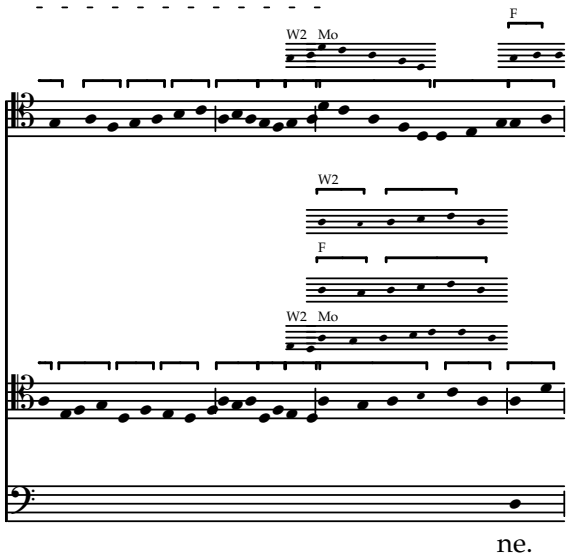
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Concordances from W2, F & Mo

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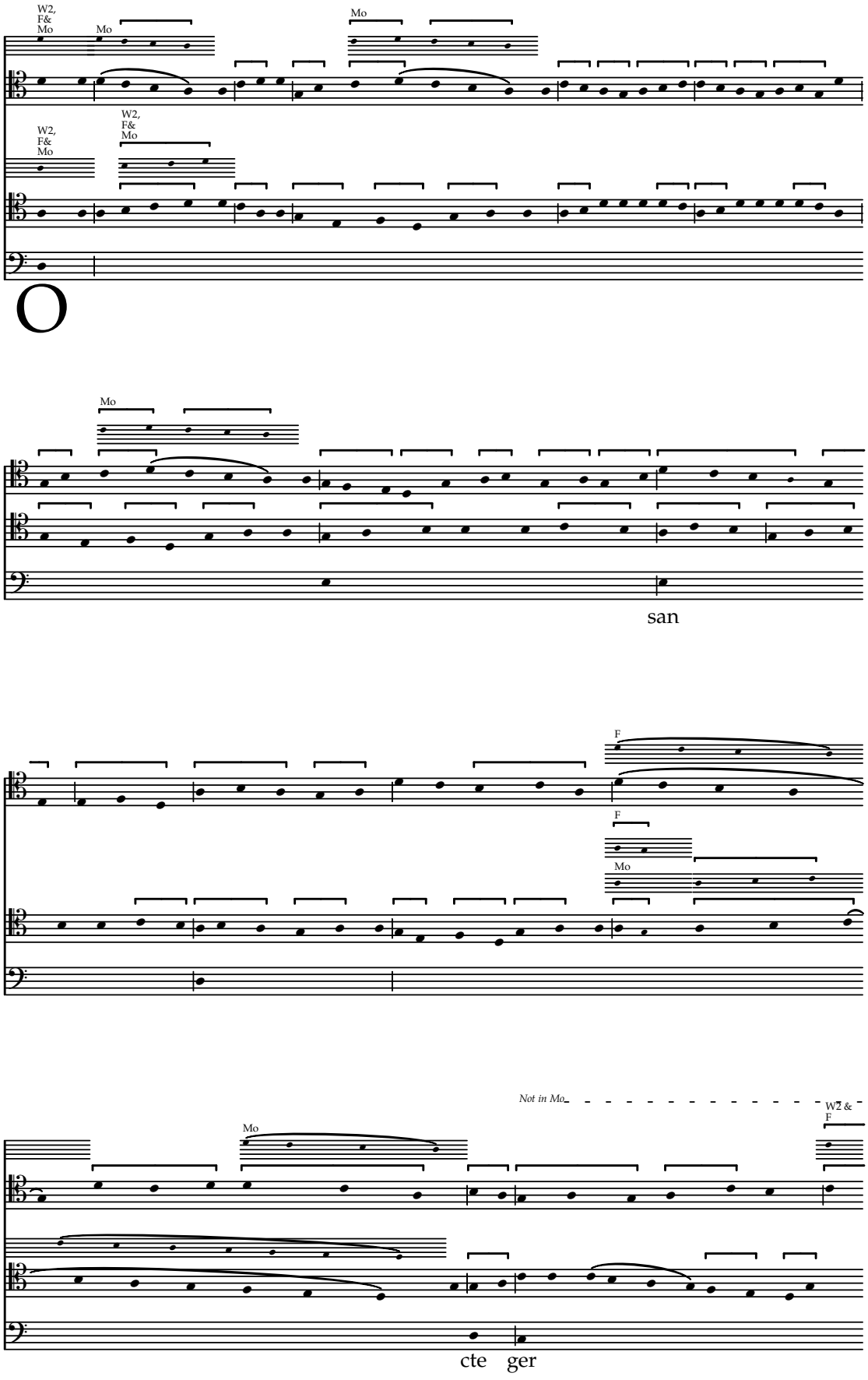

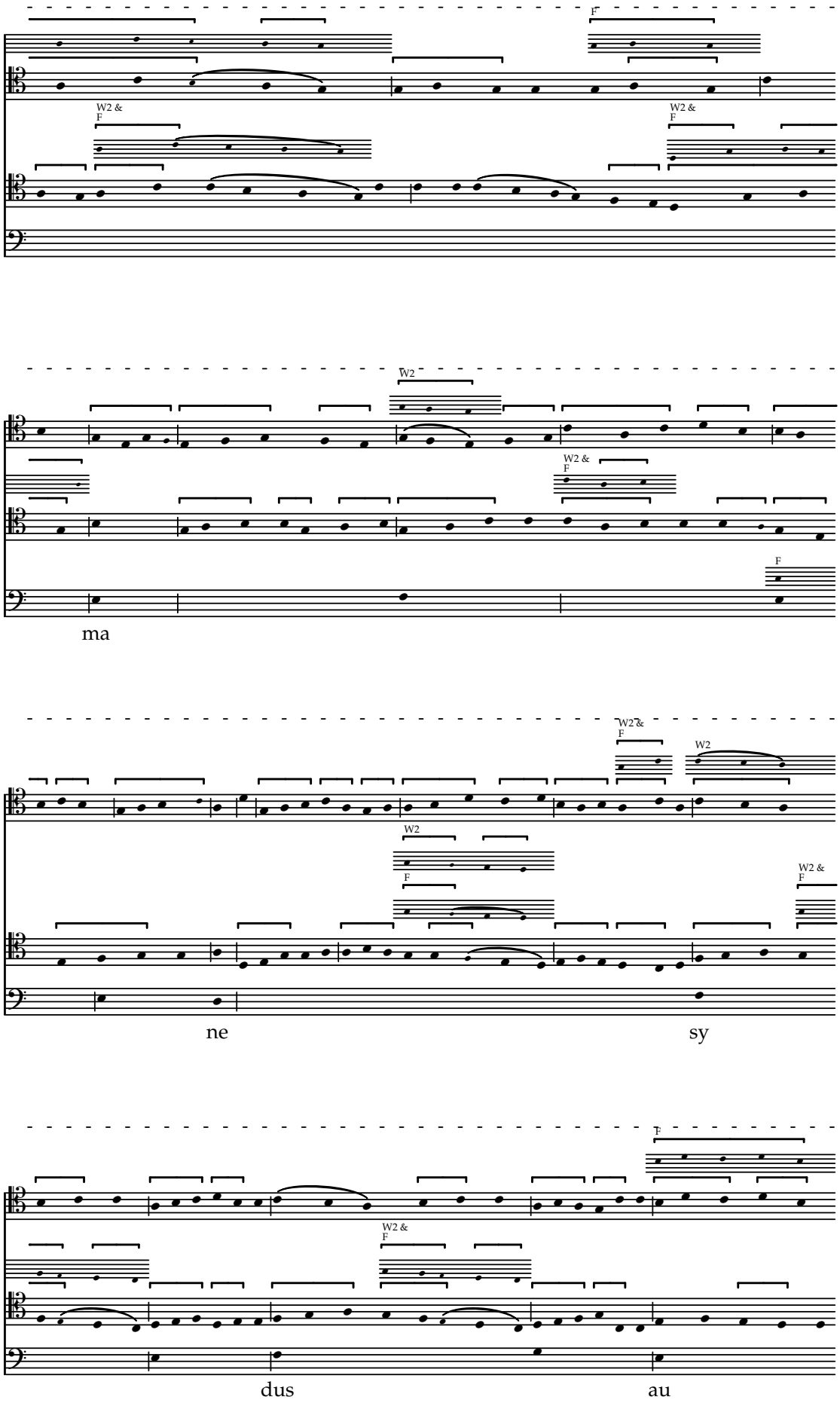
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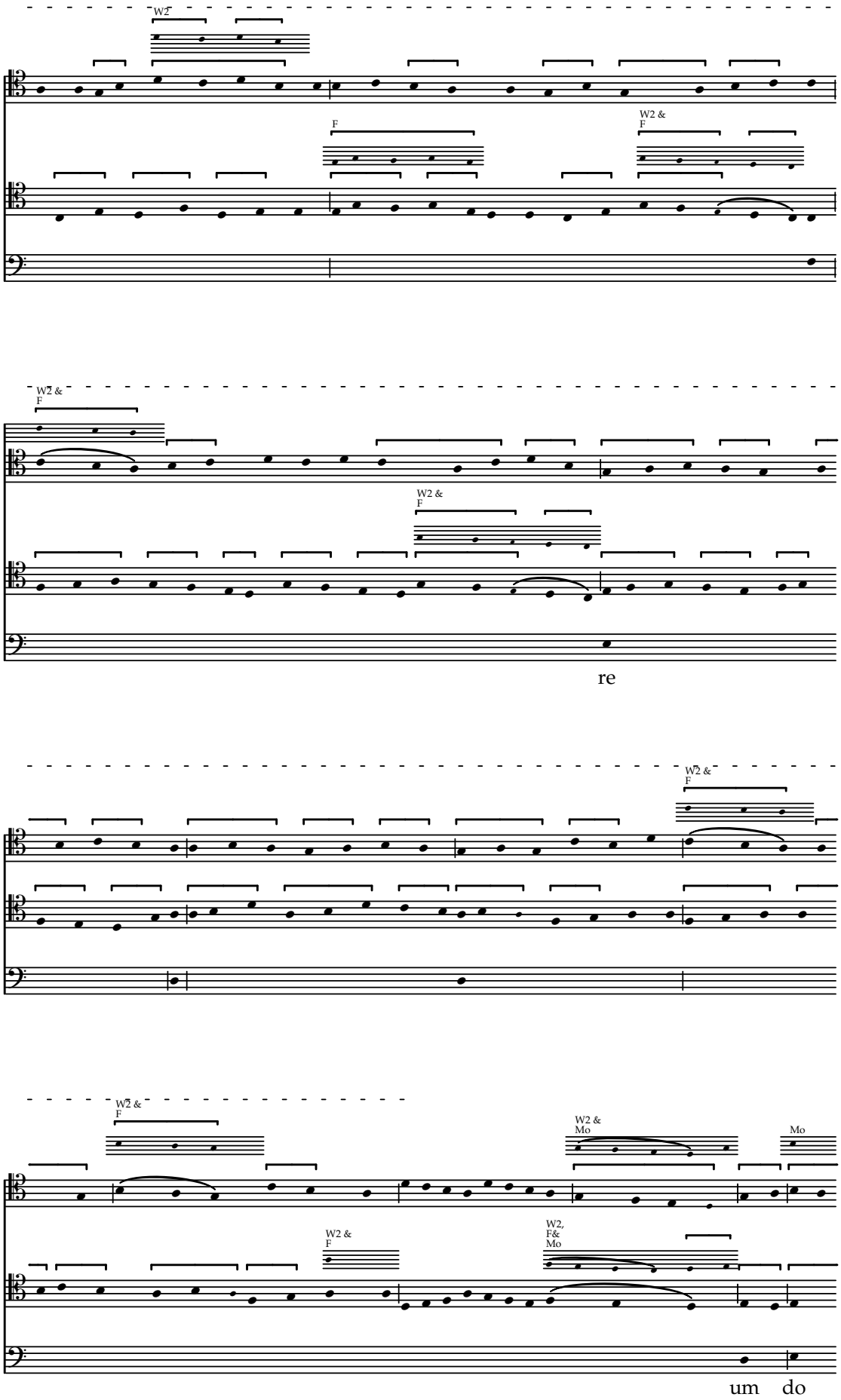
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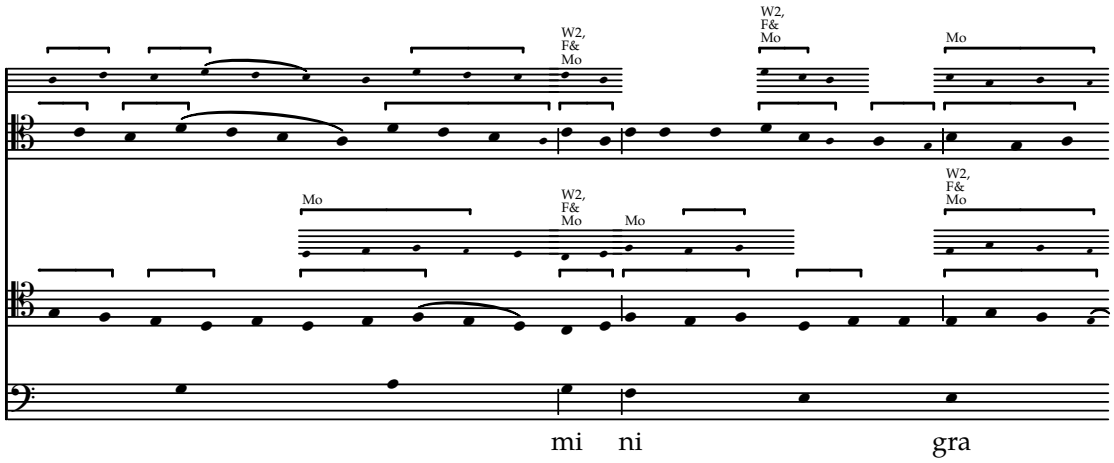
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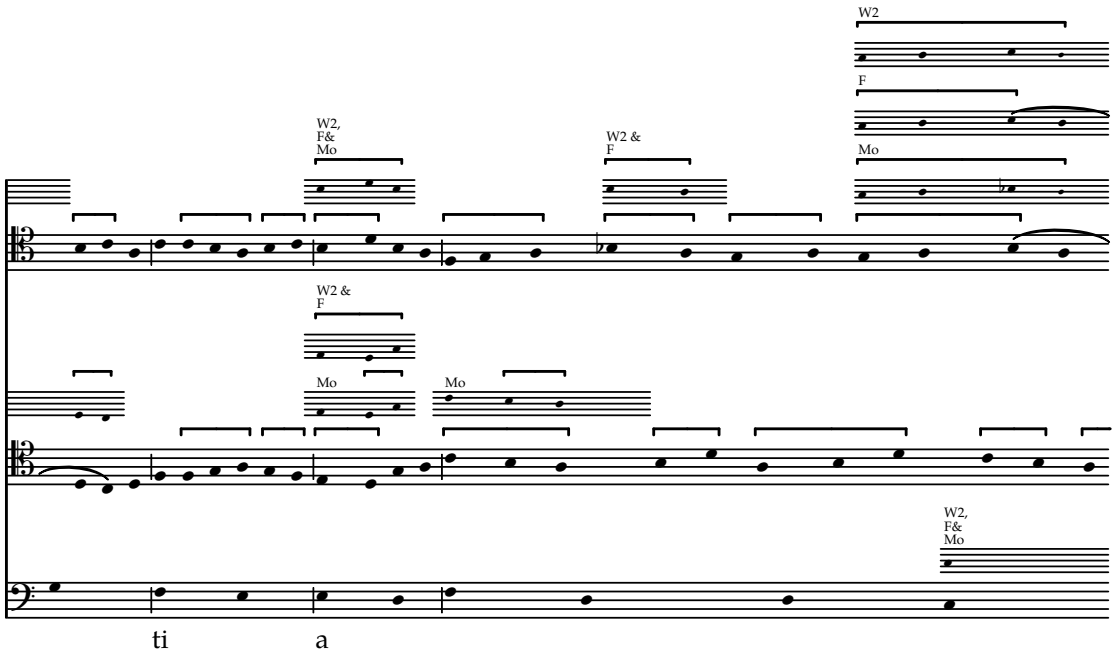
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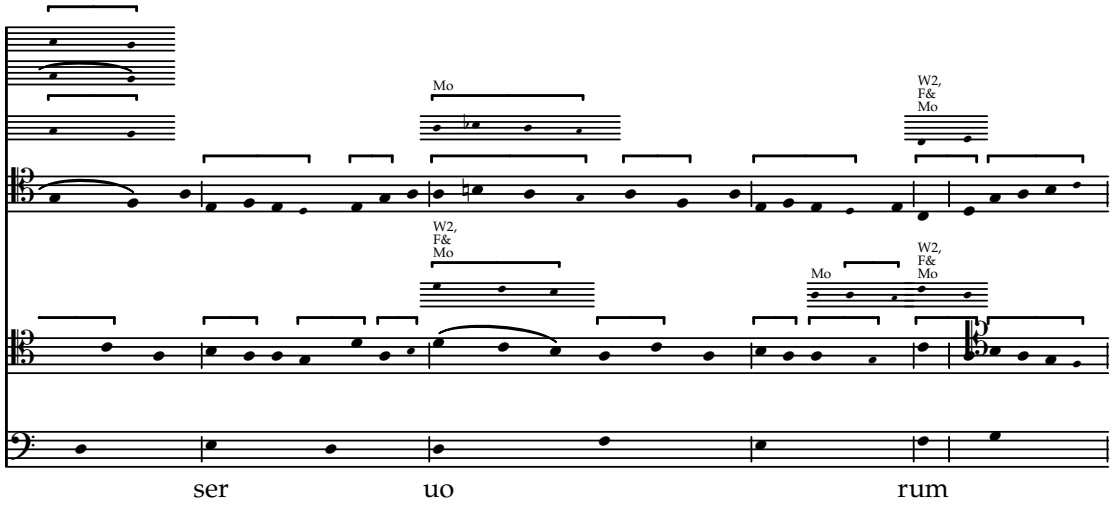
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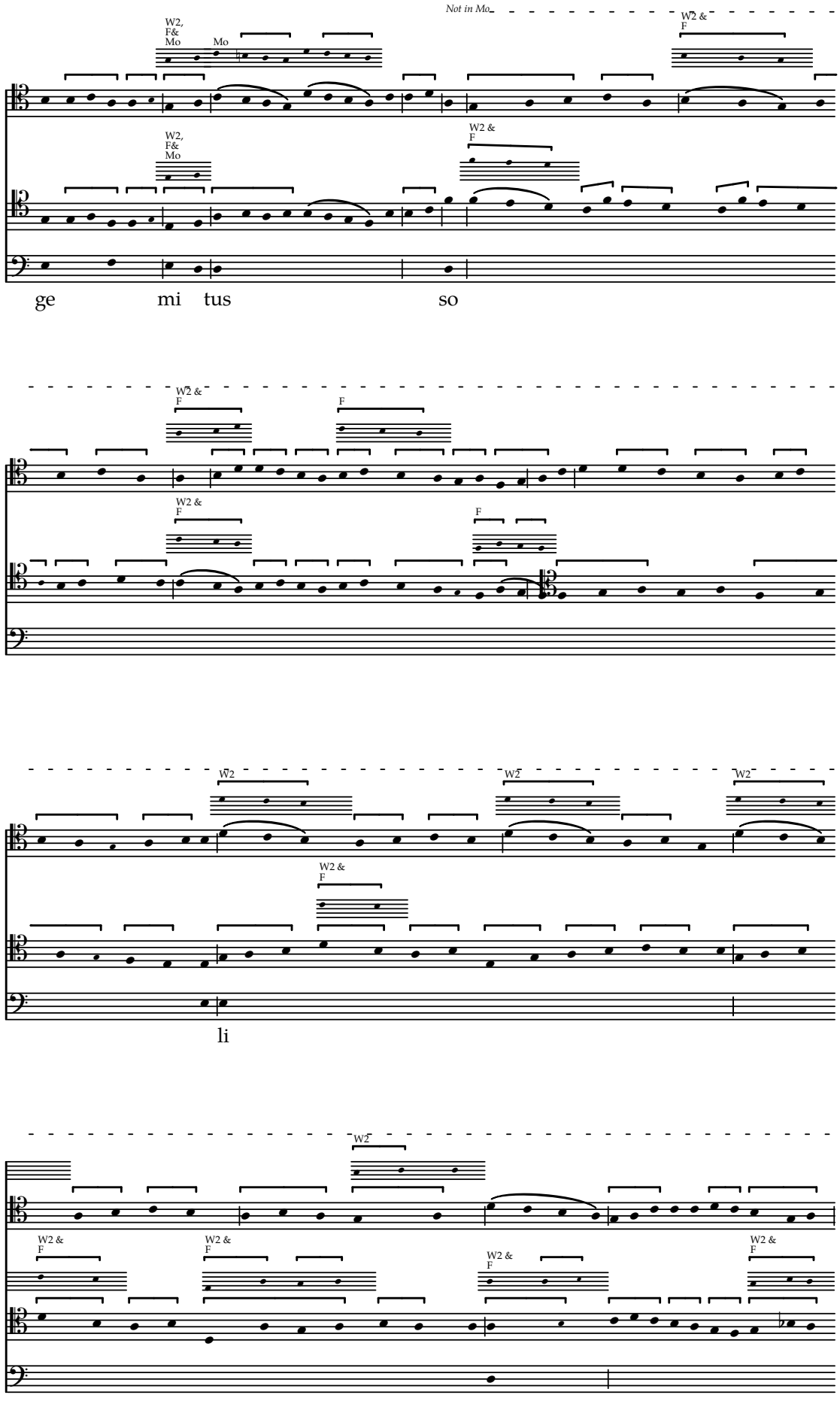
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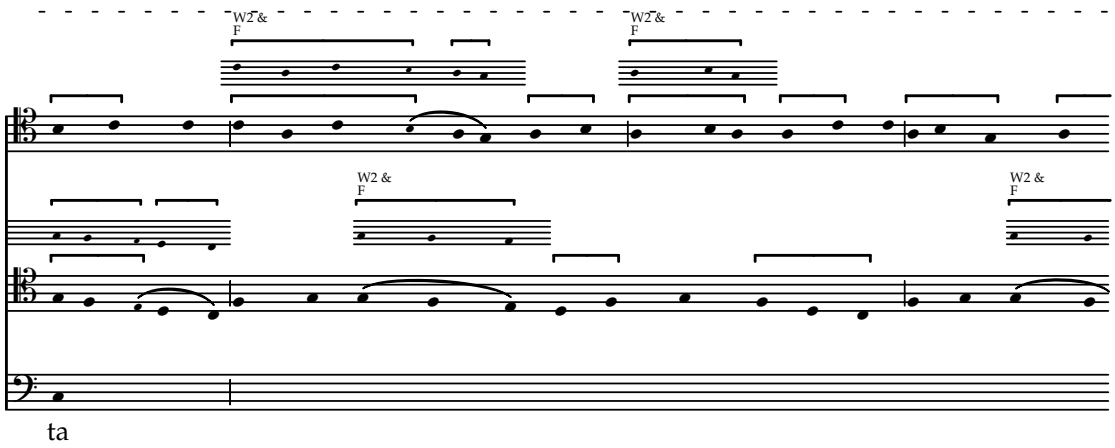
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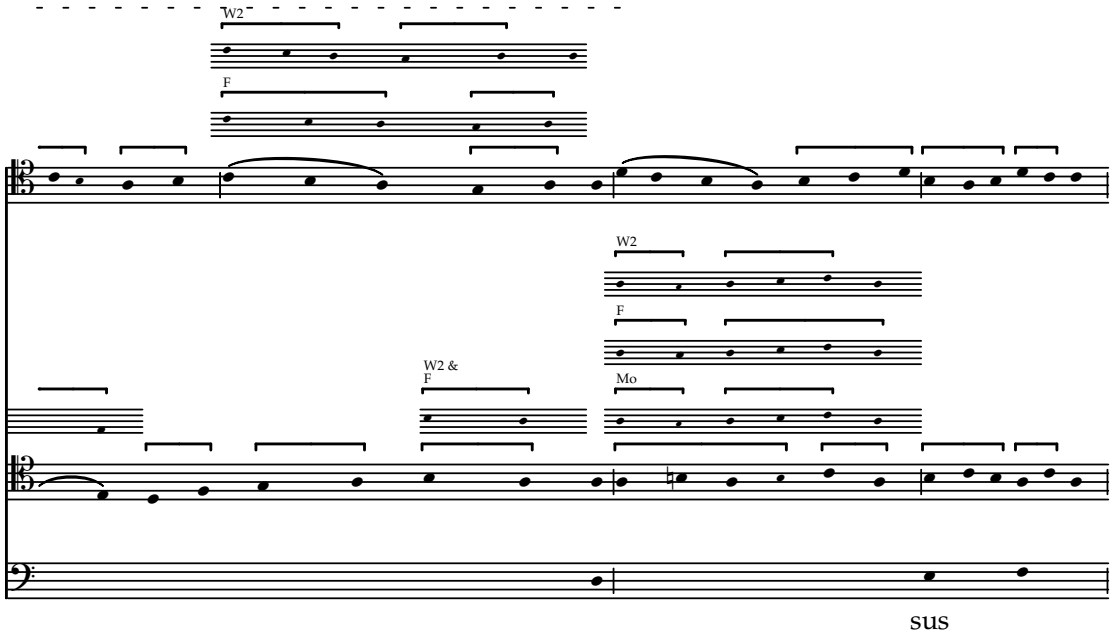
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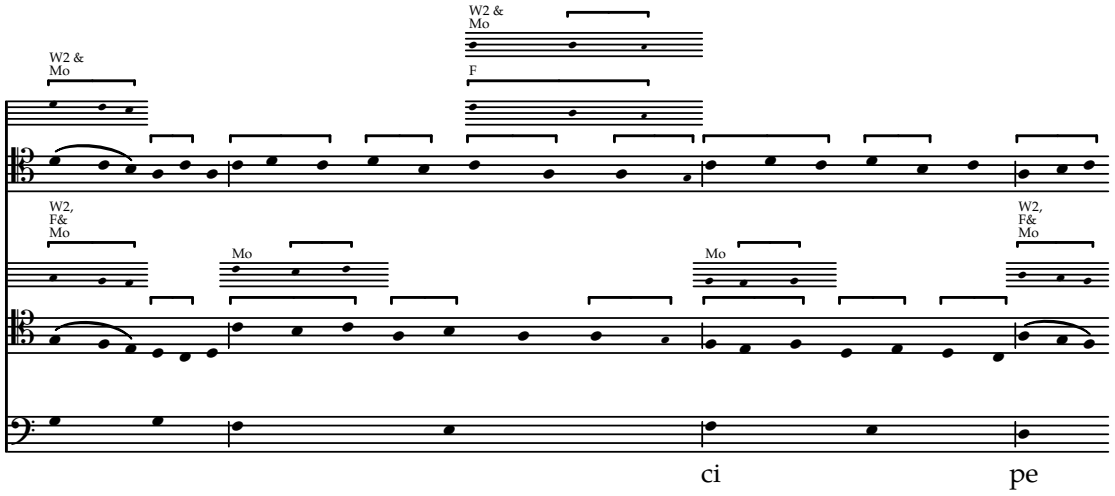
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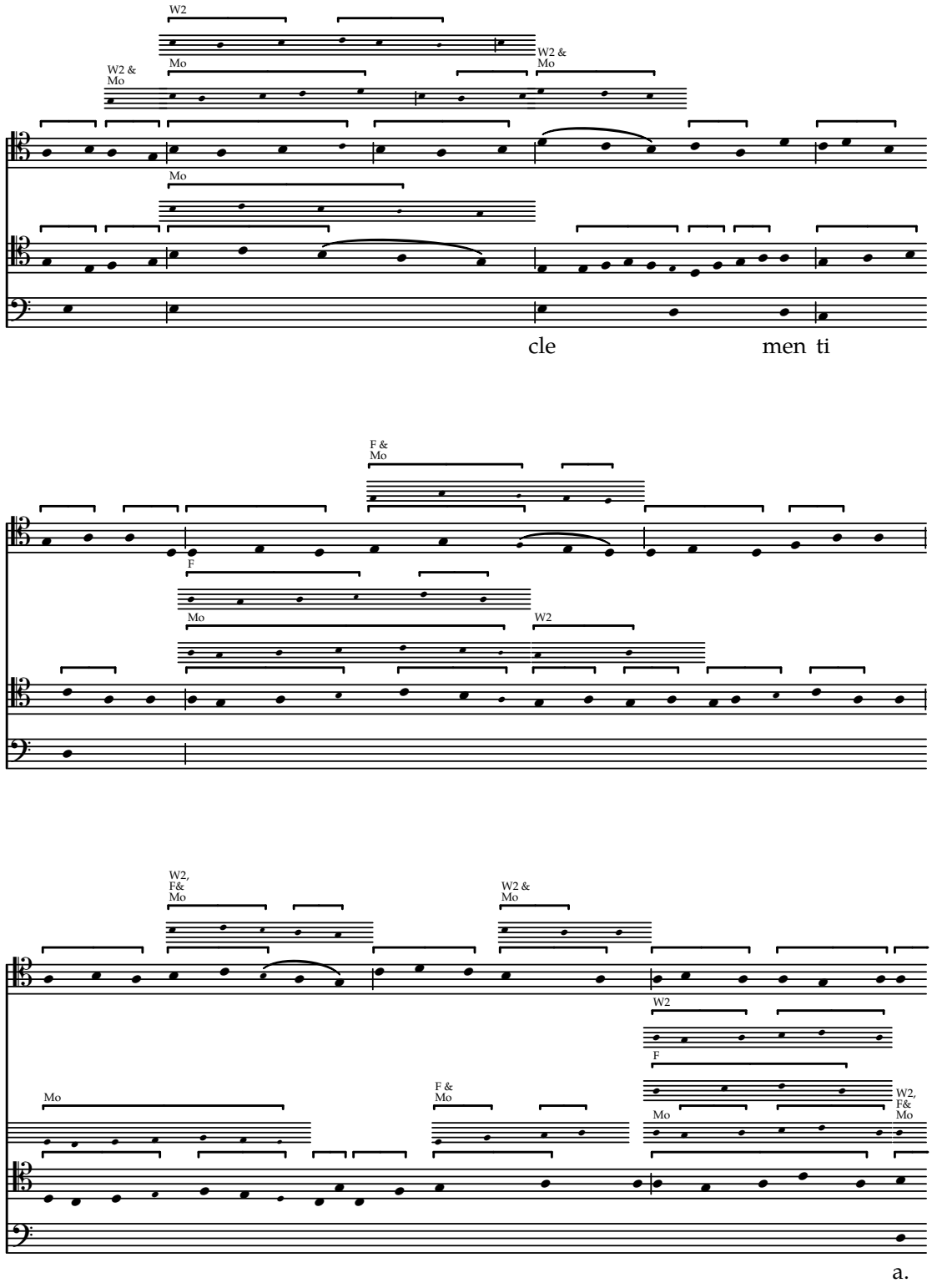
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Concordances from W2, F & Mo

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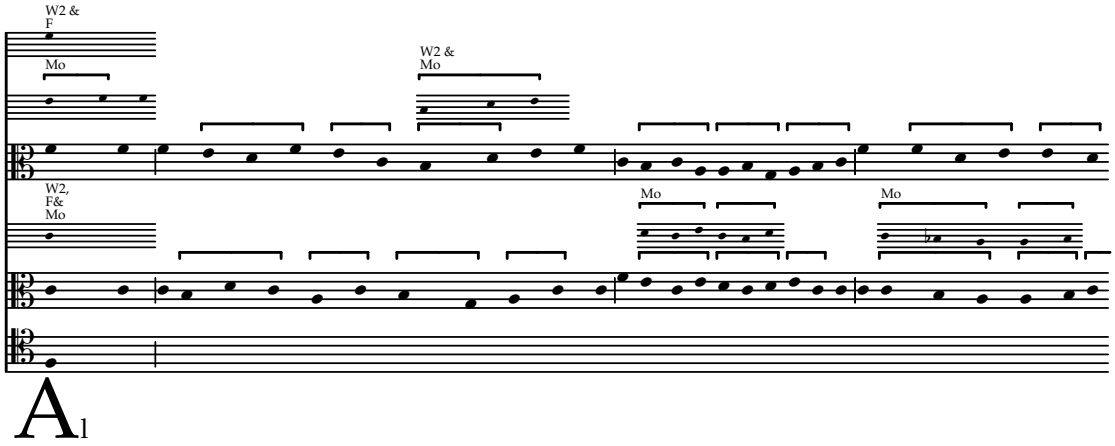

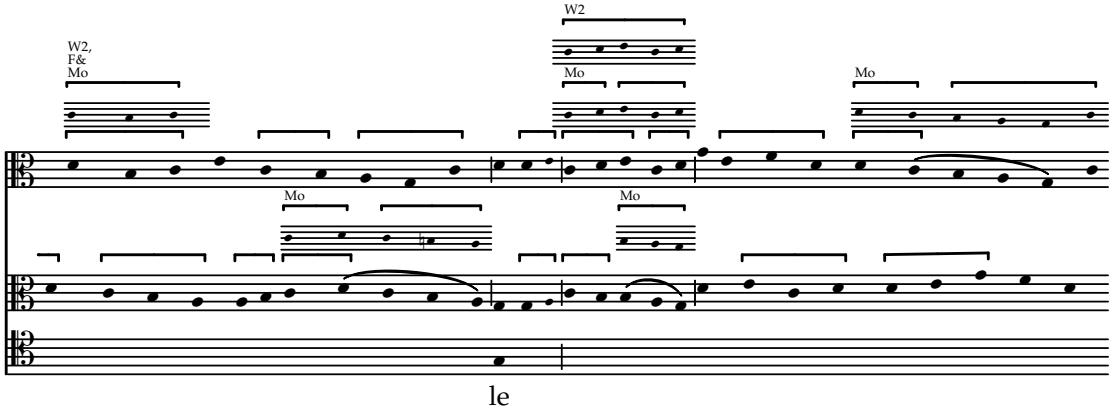

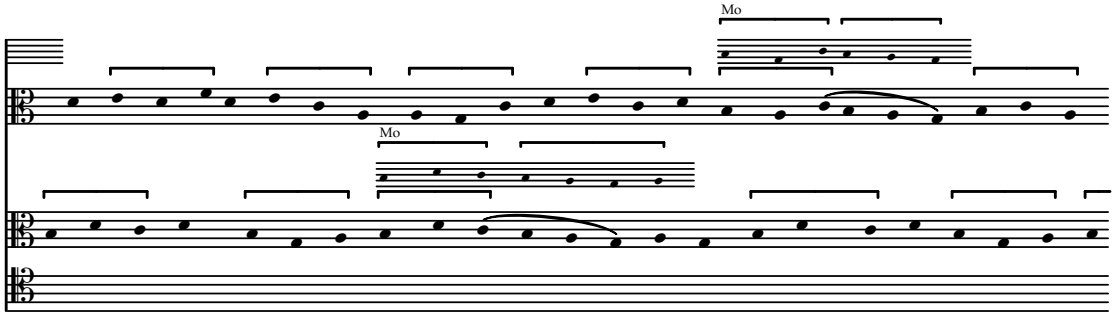

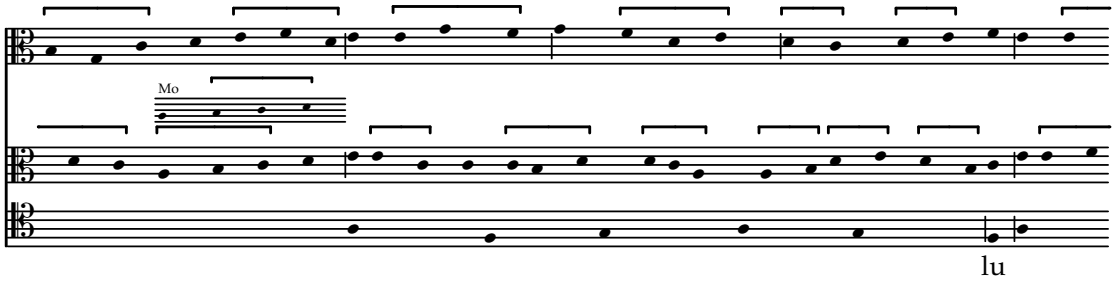

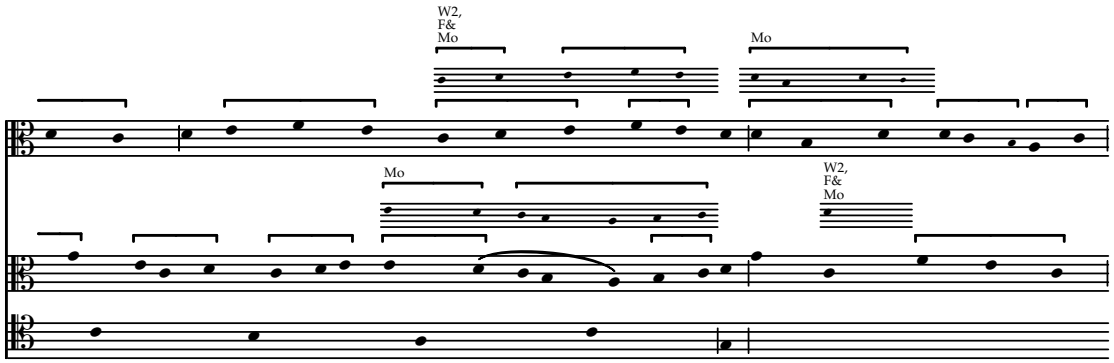
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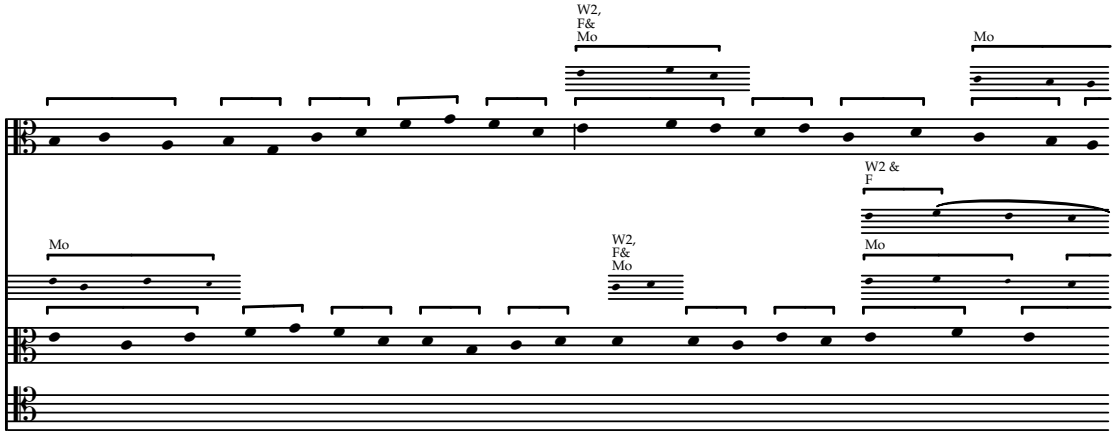
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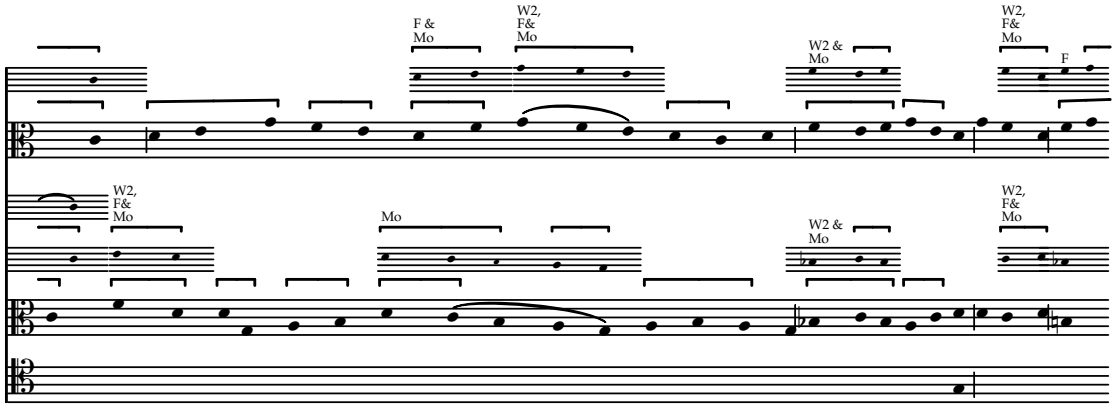
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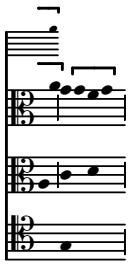

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Concordances from W2, F & Mo

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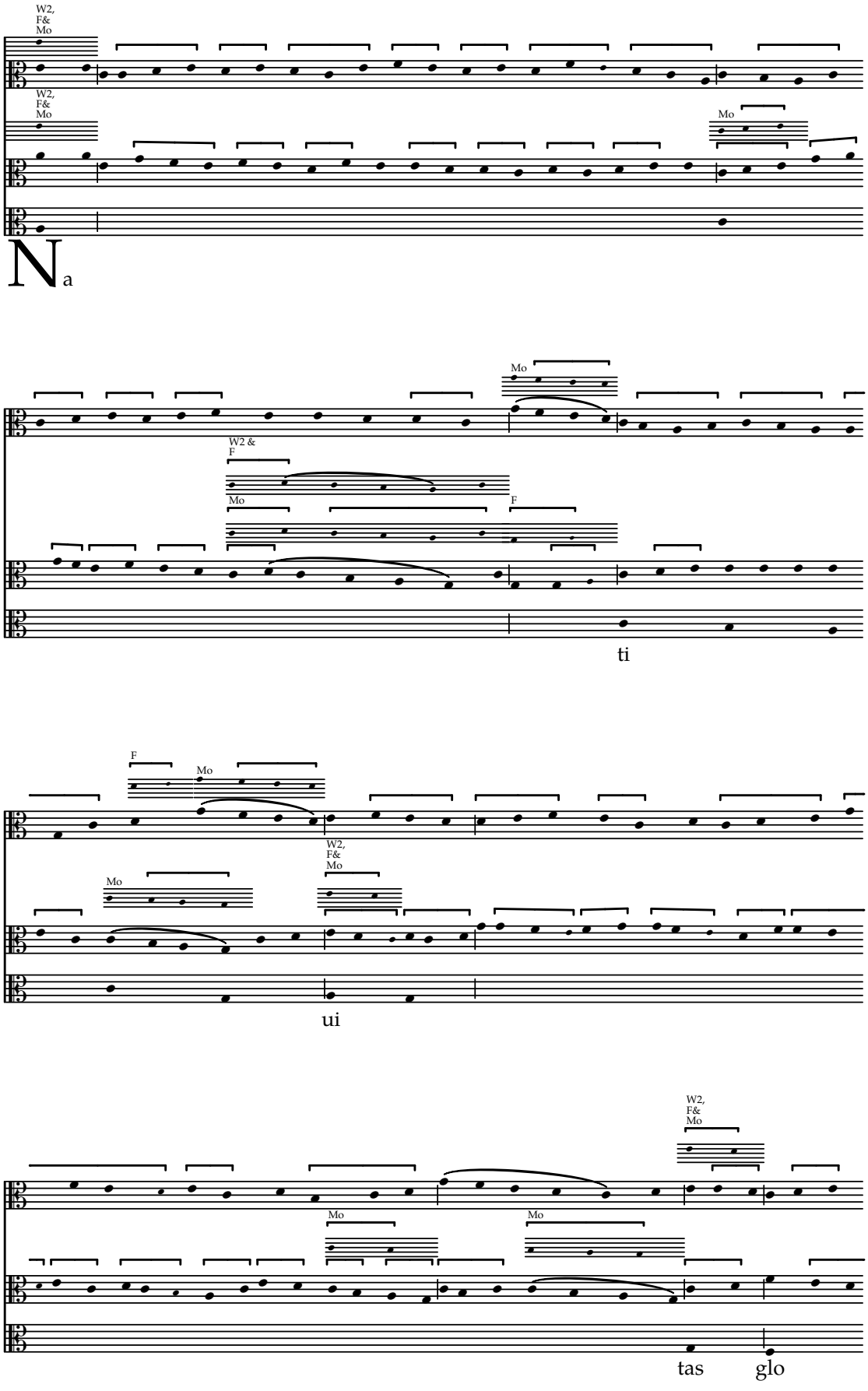

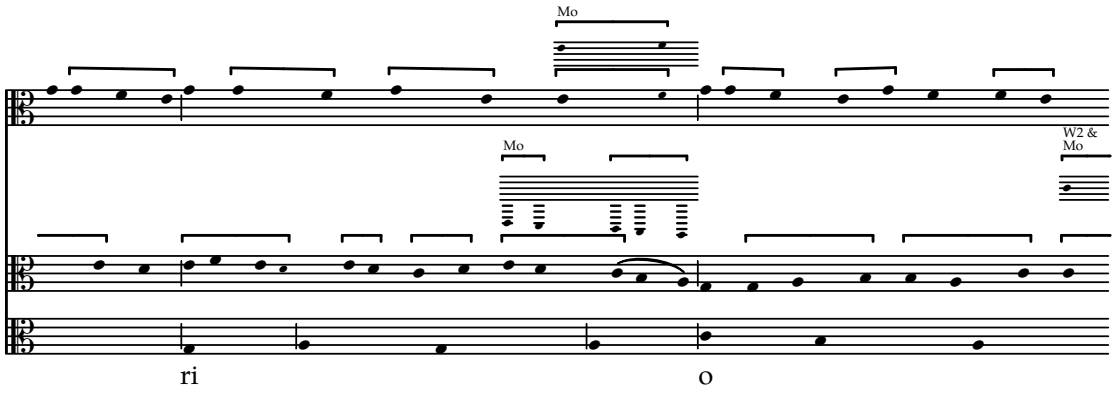
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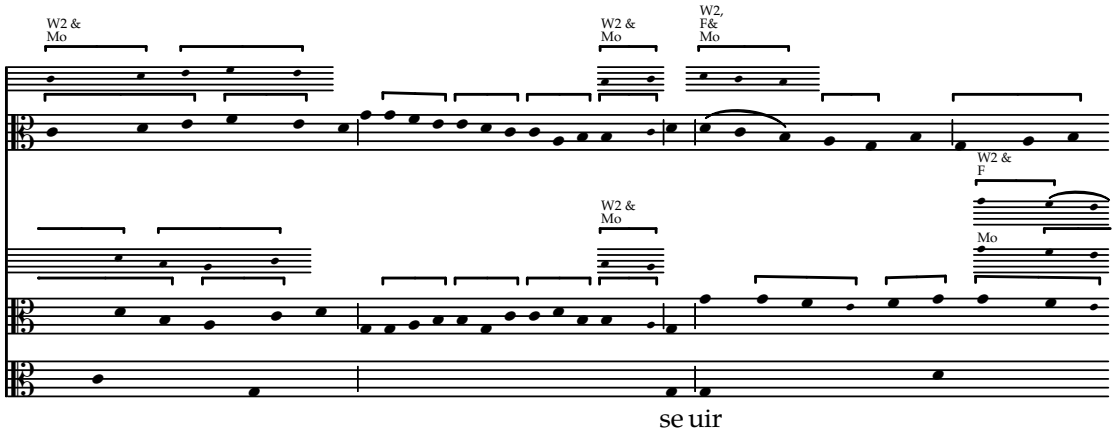
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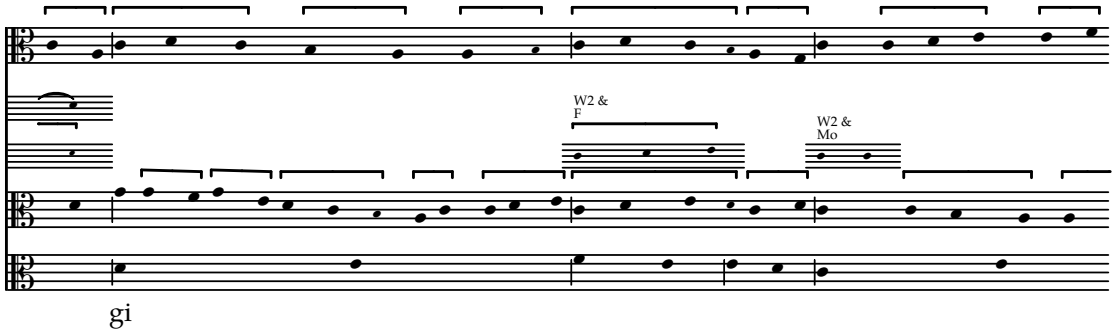
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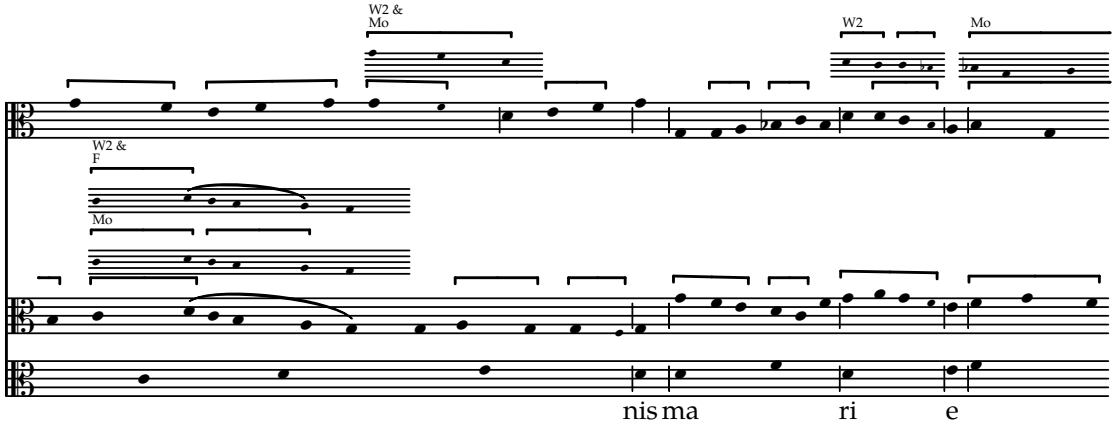
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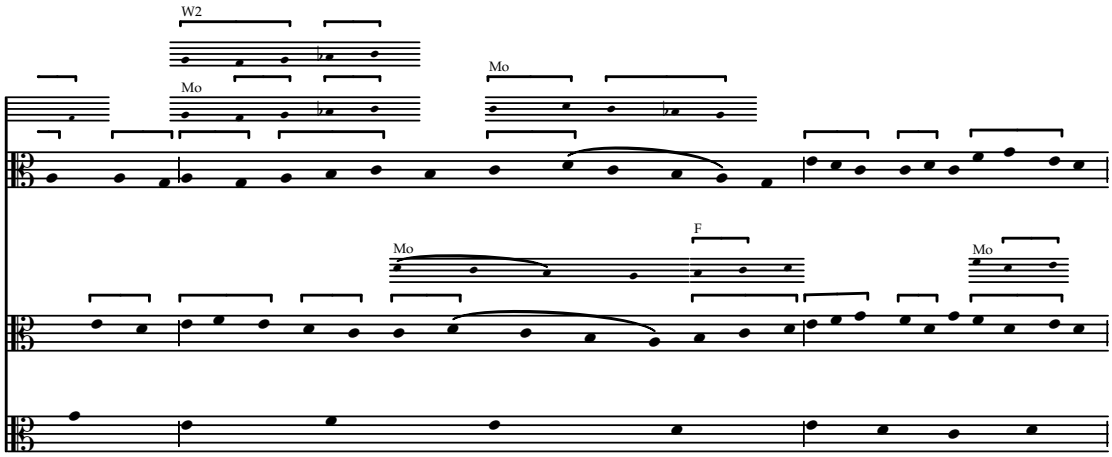
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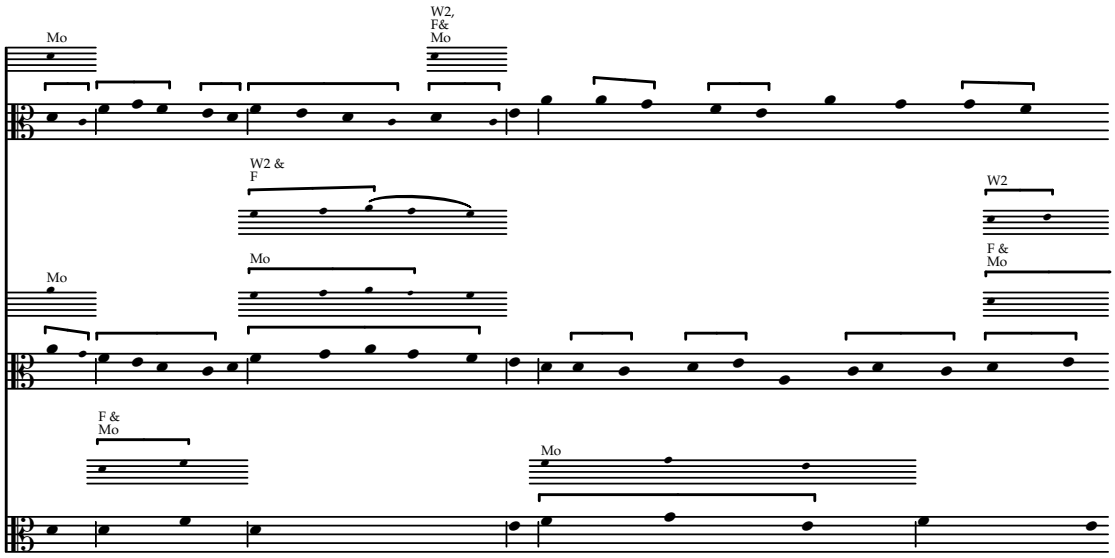
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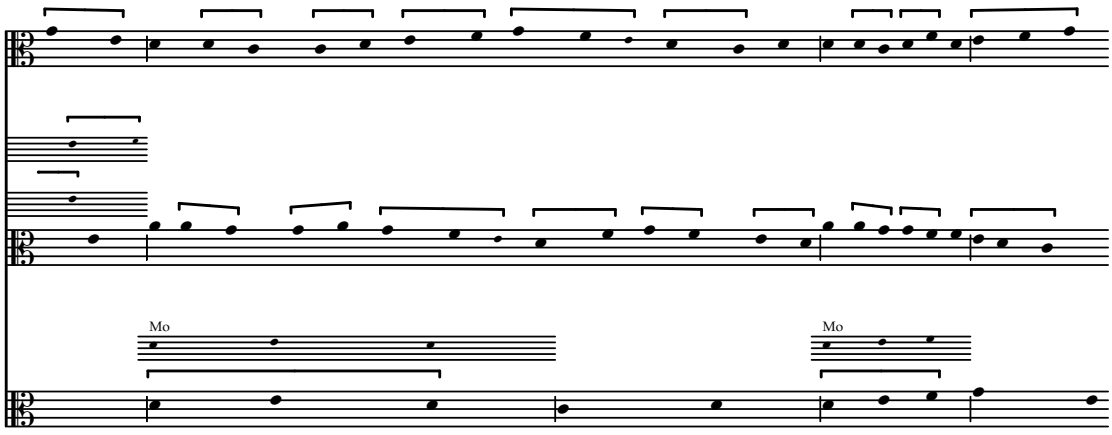
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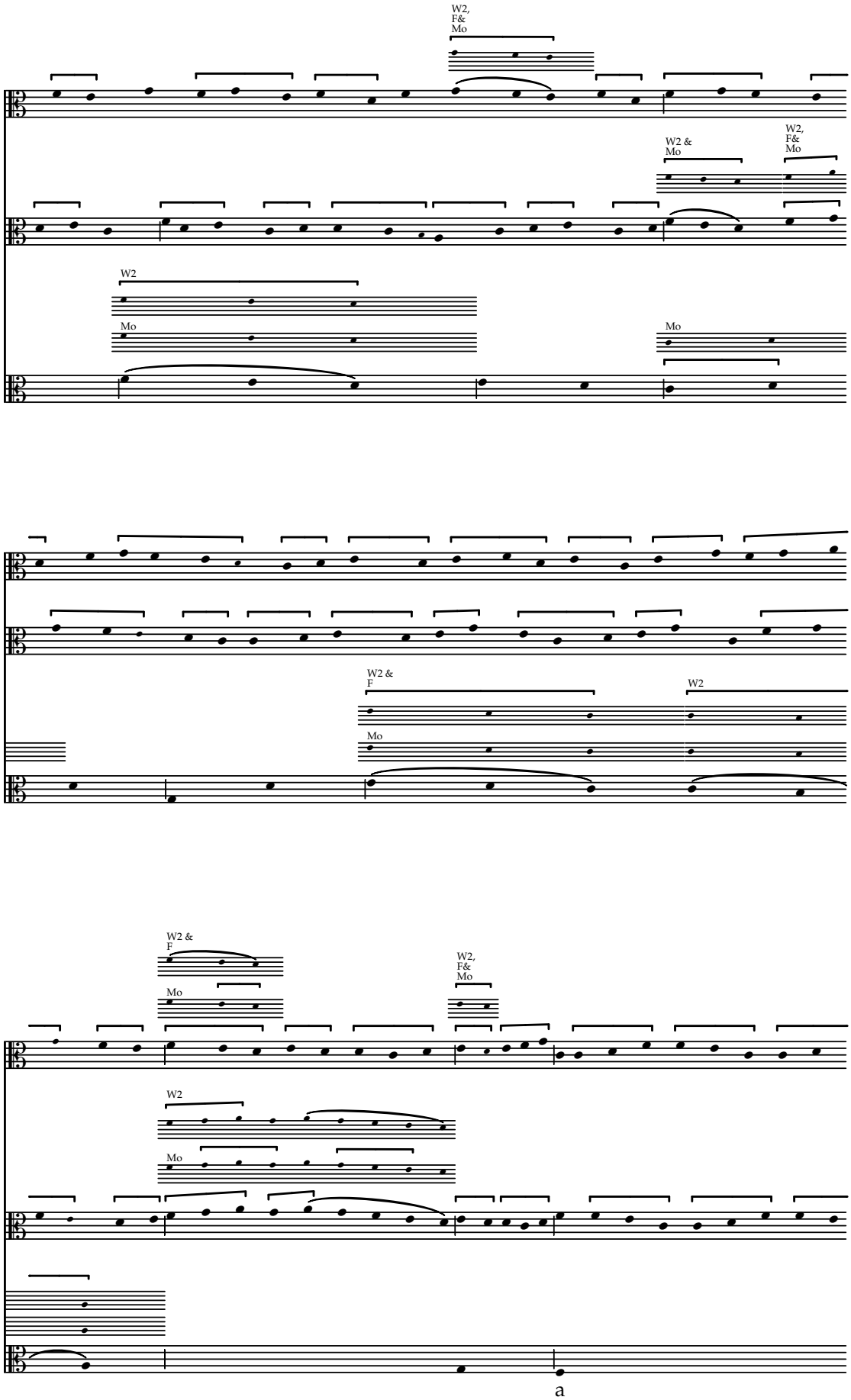

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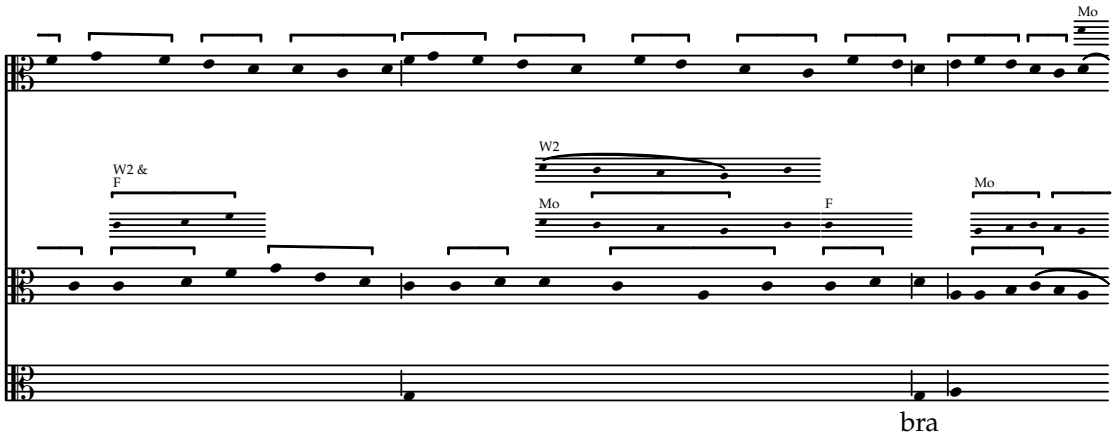
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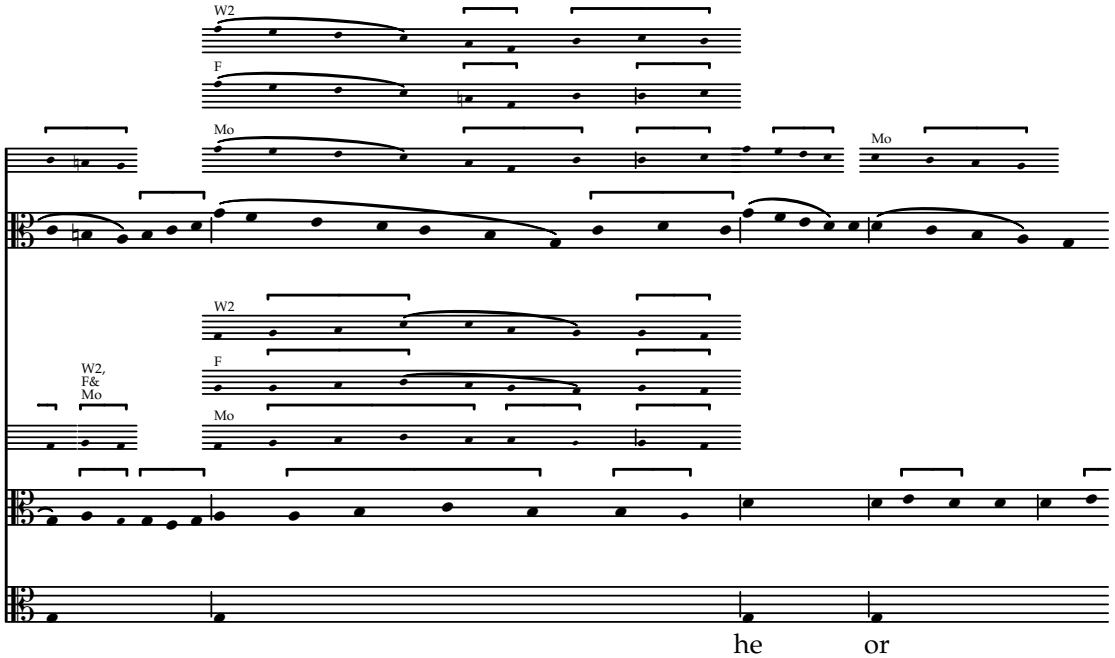
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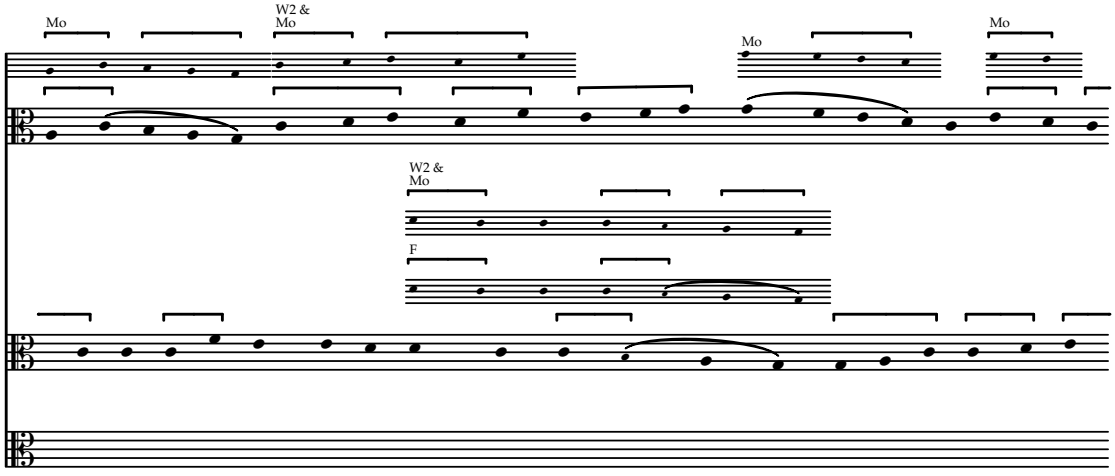
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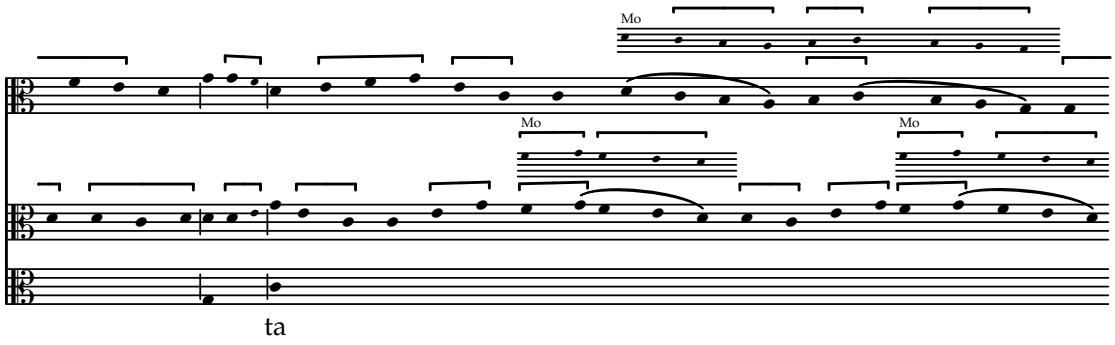
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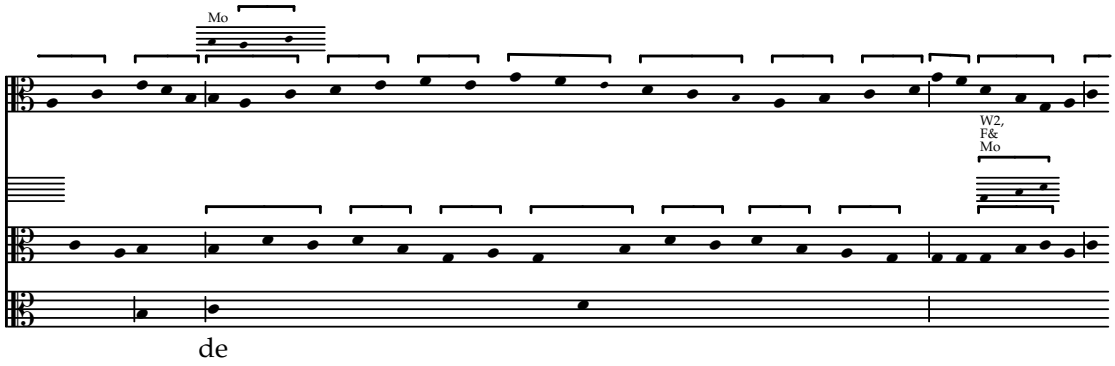
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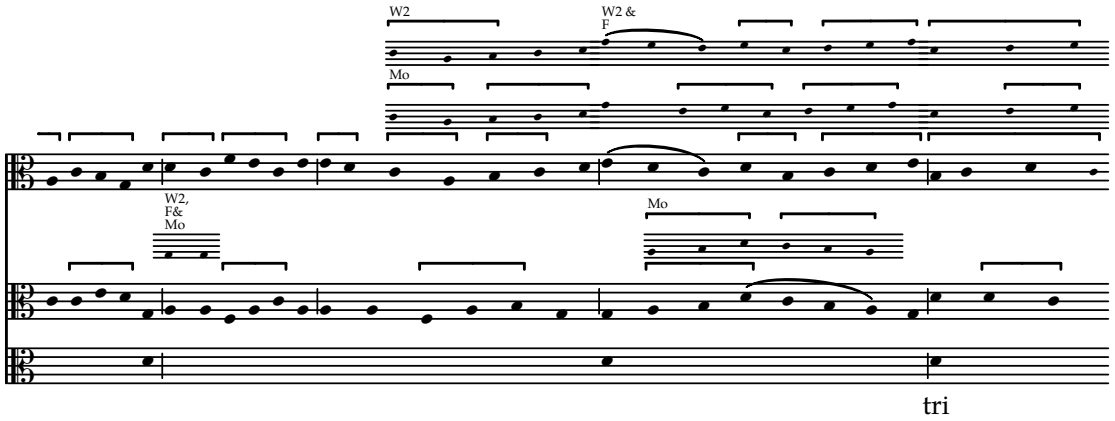
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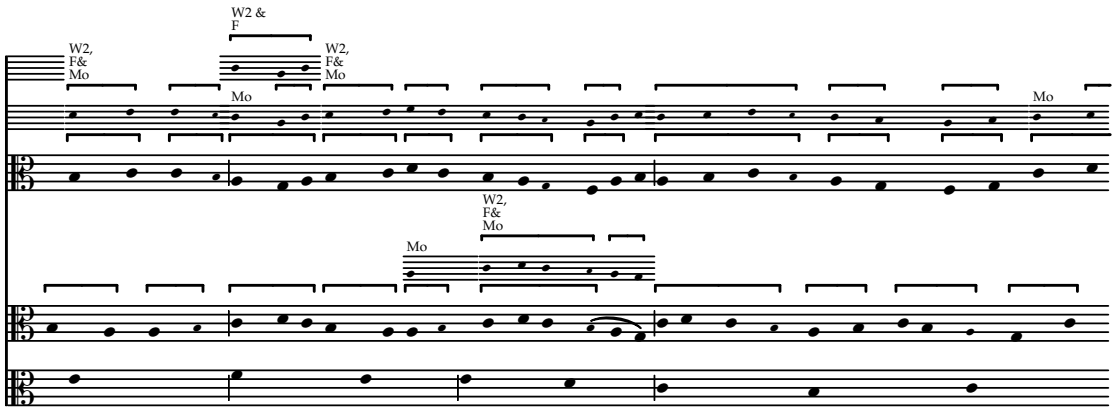
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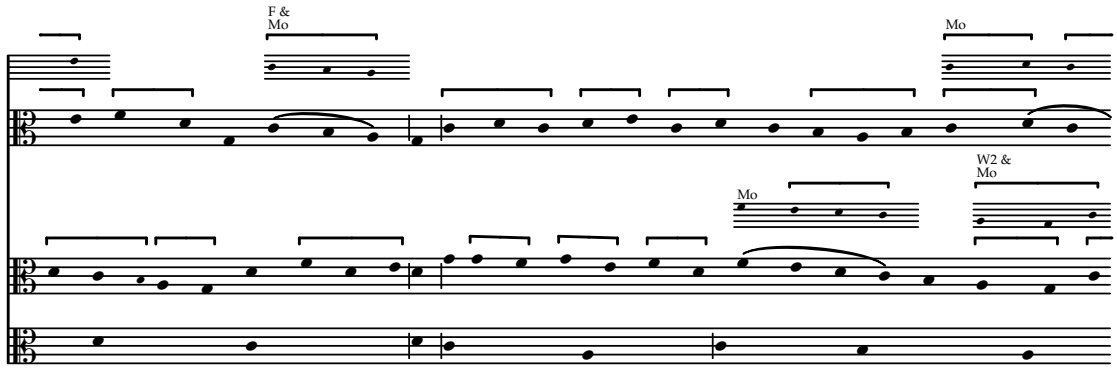

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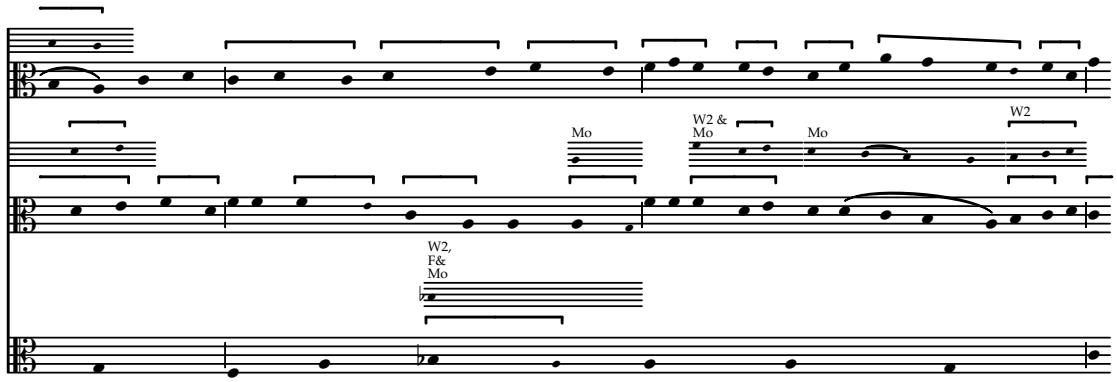

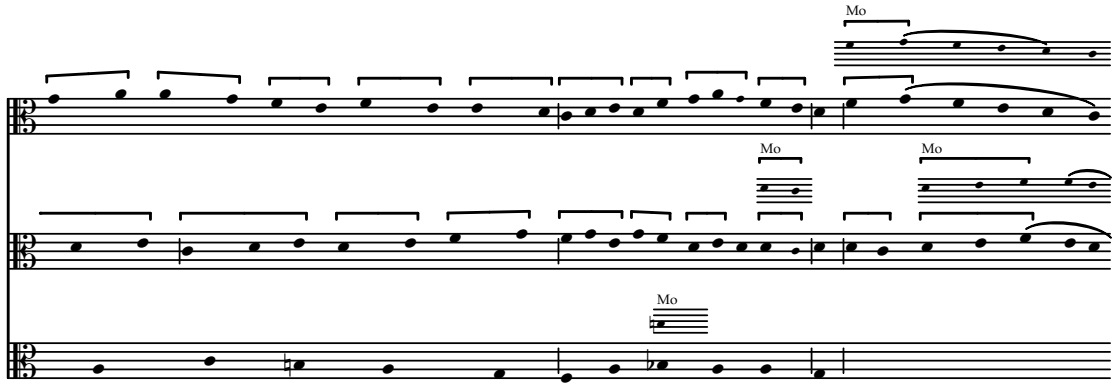

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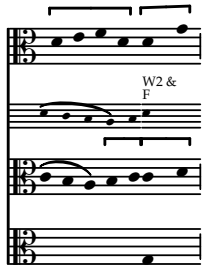
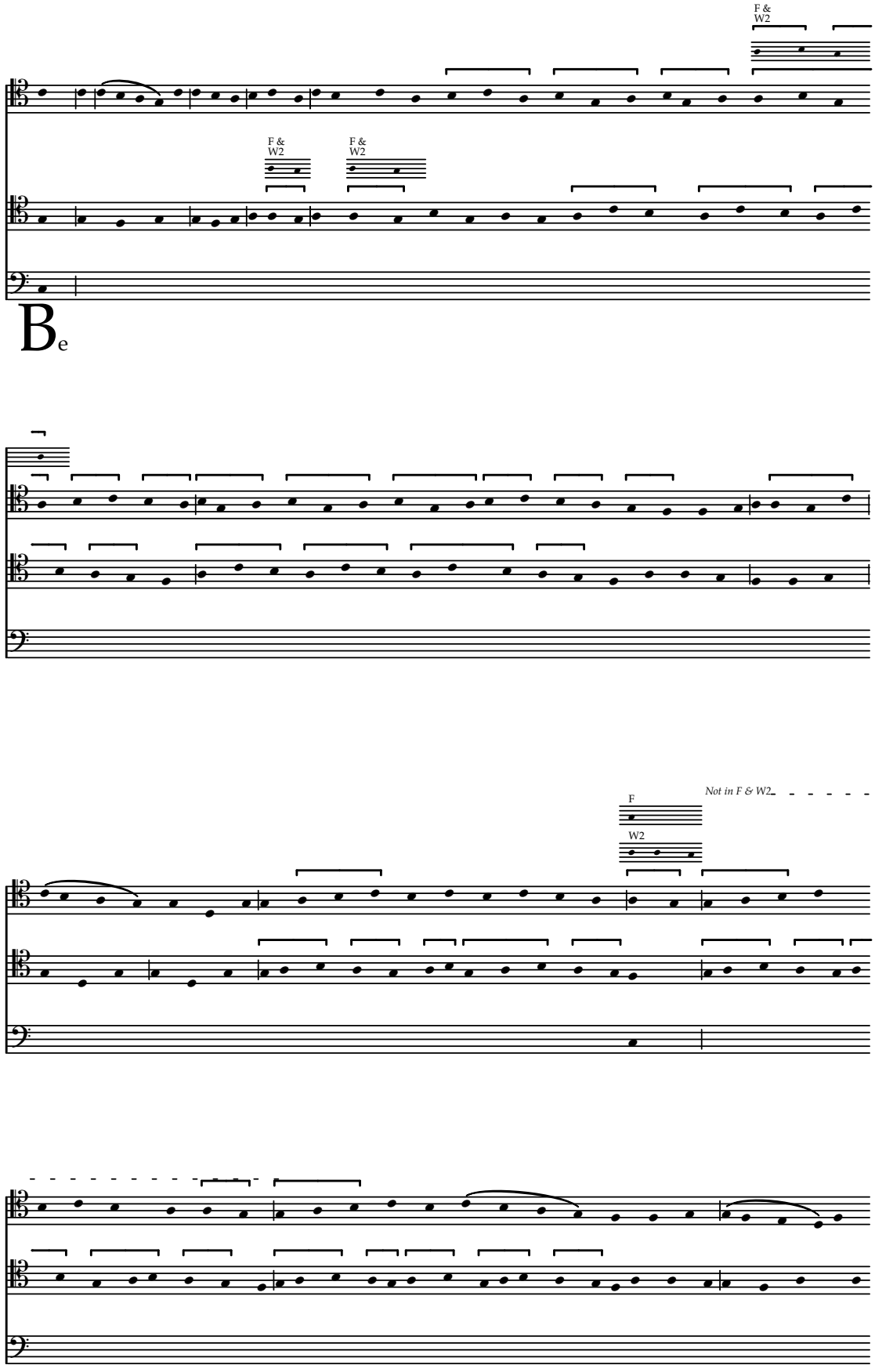
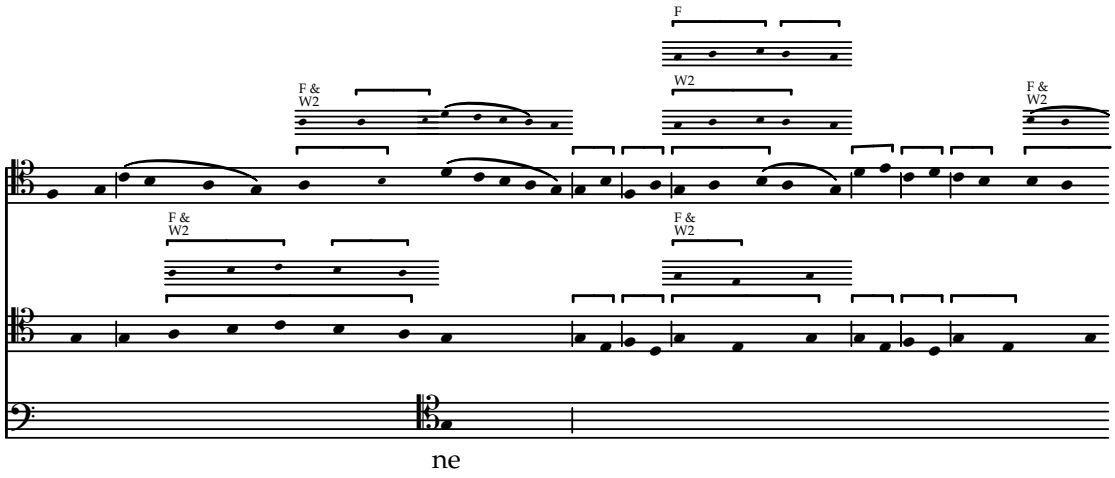


Benedicamus domino

Concordances from W2 & F

f. 11v–12





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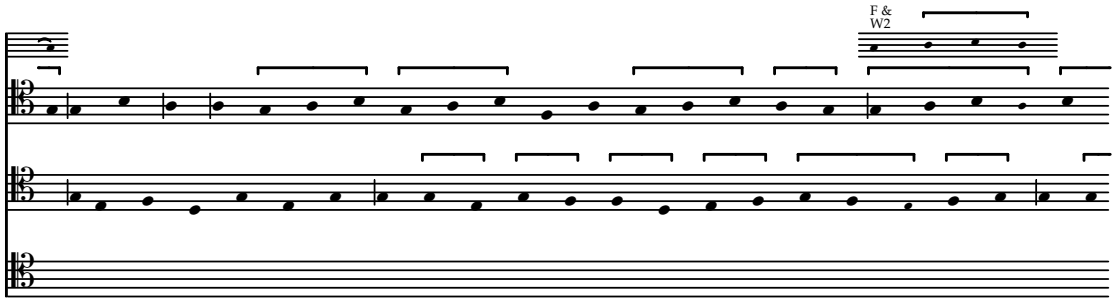

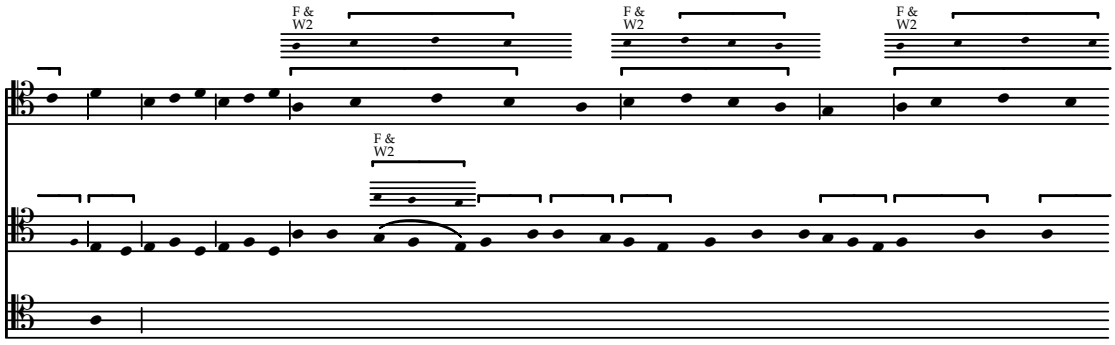

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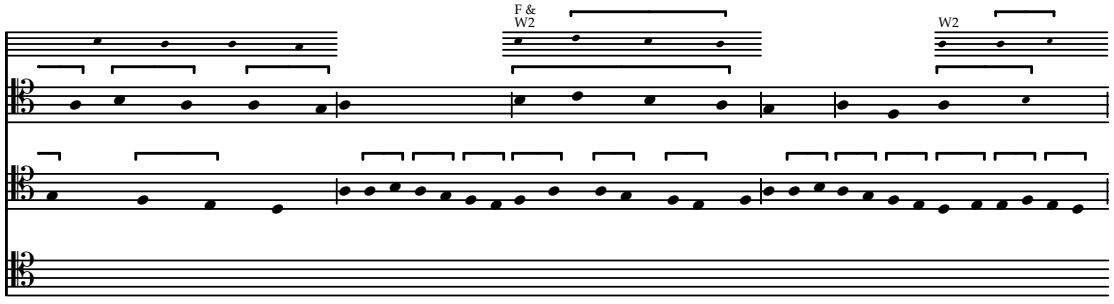

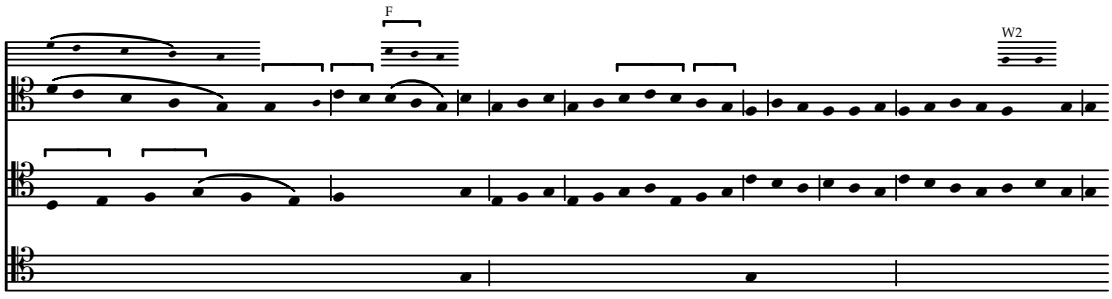

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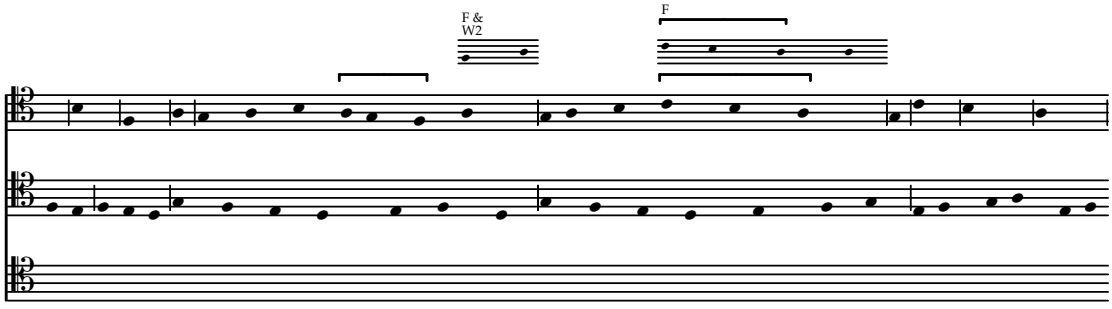

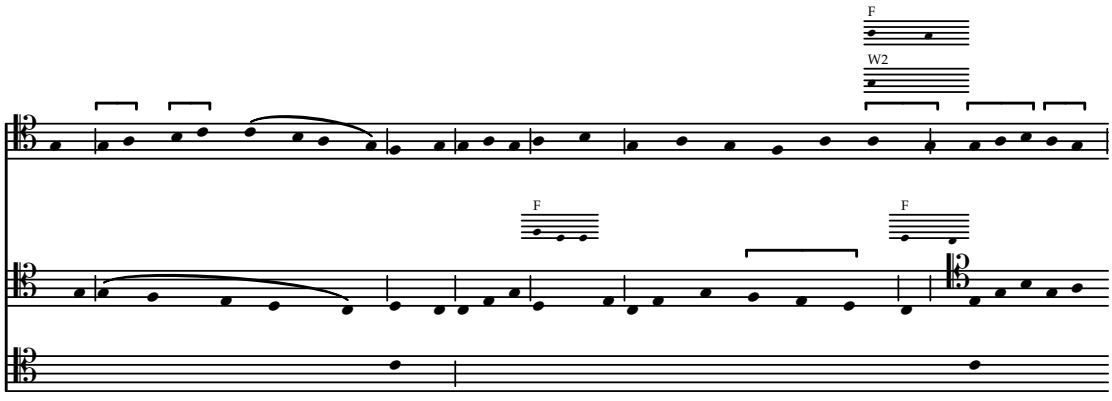

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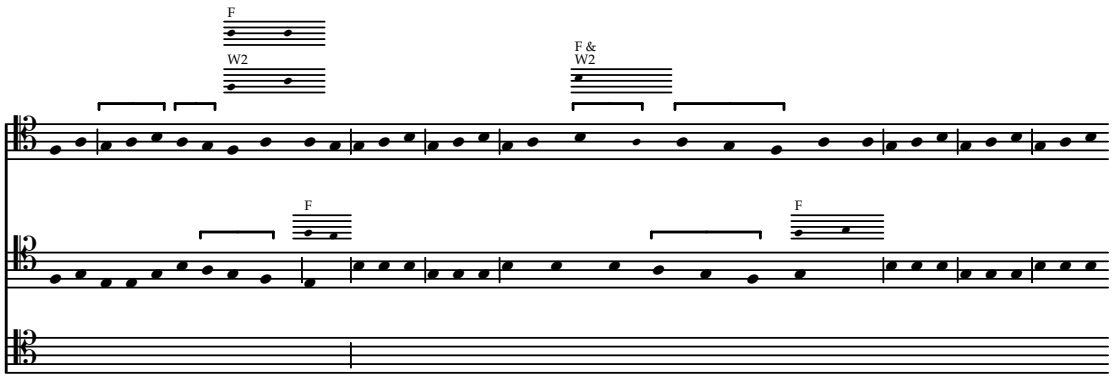

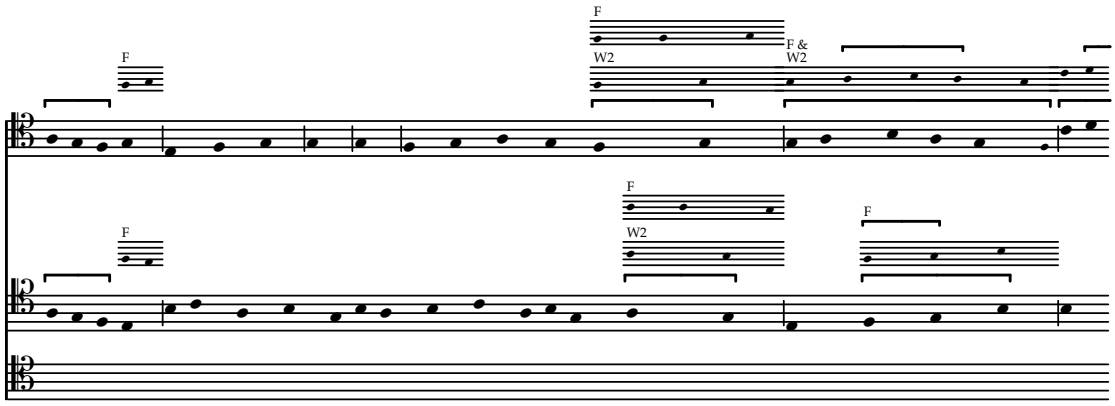
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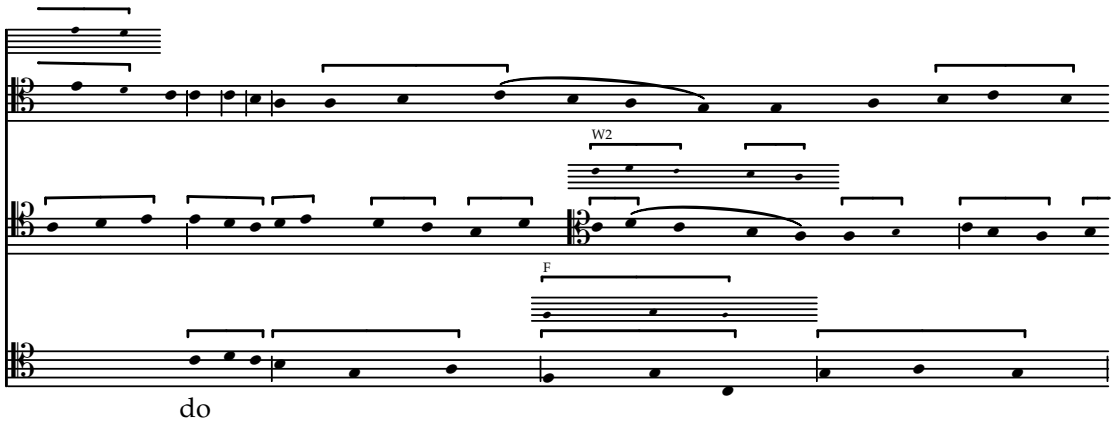
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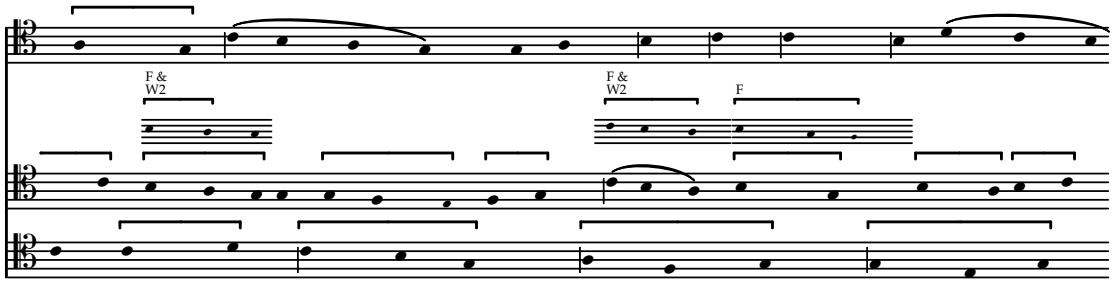
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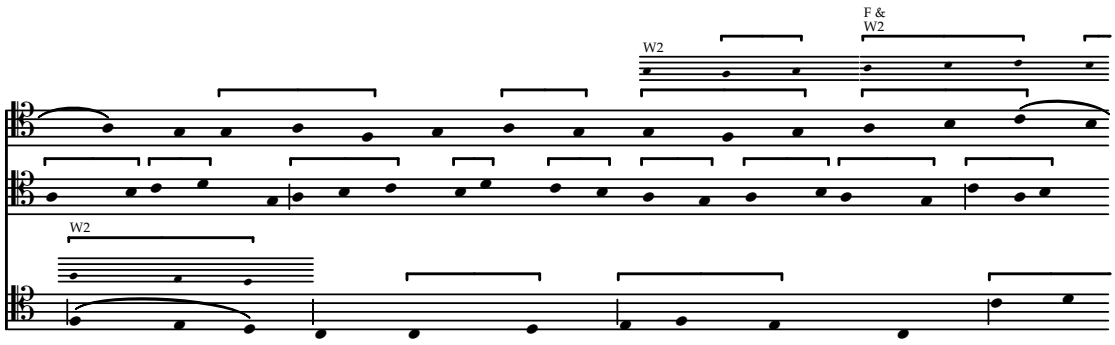
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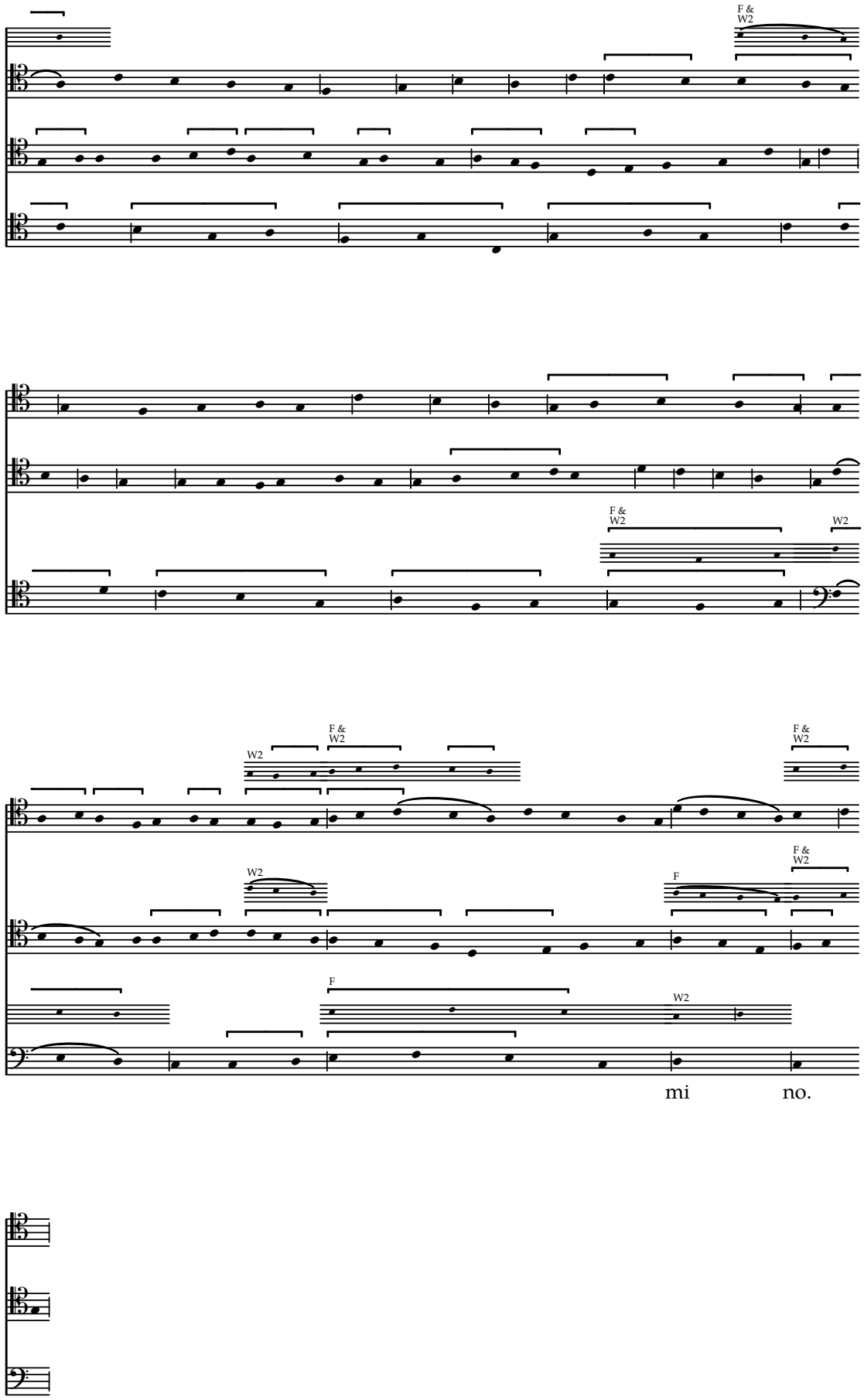
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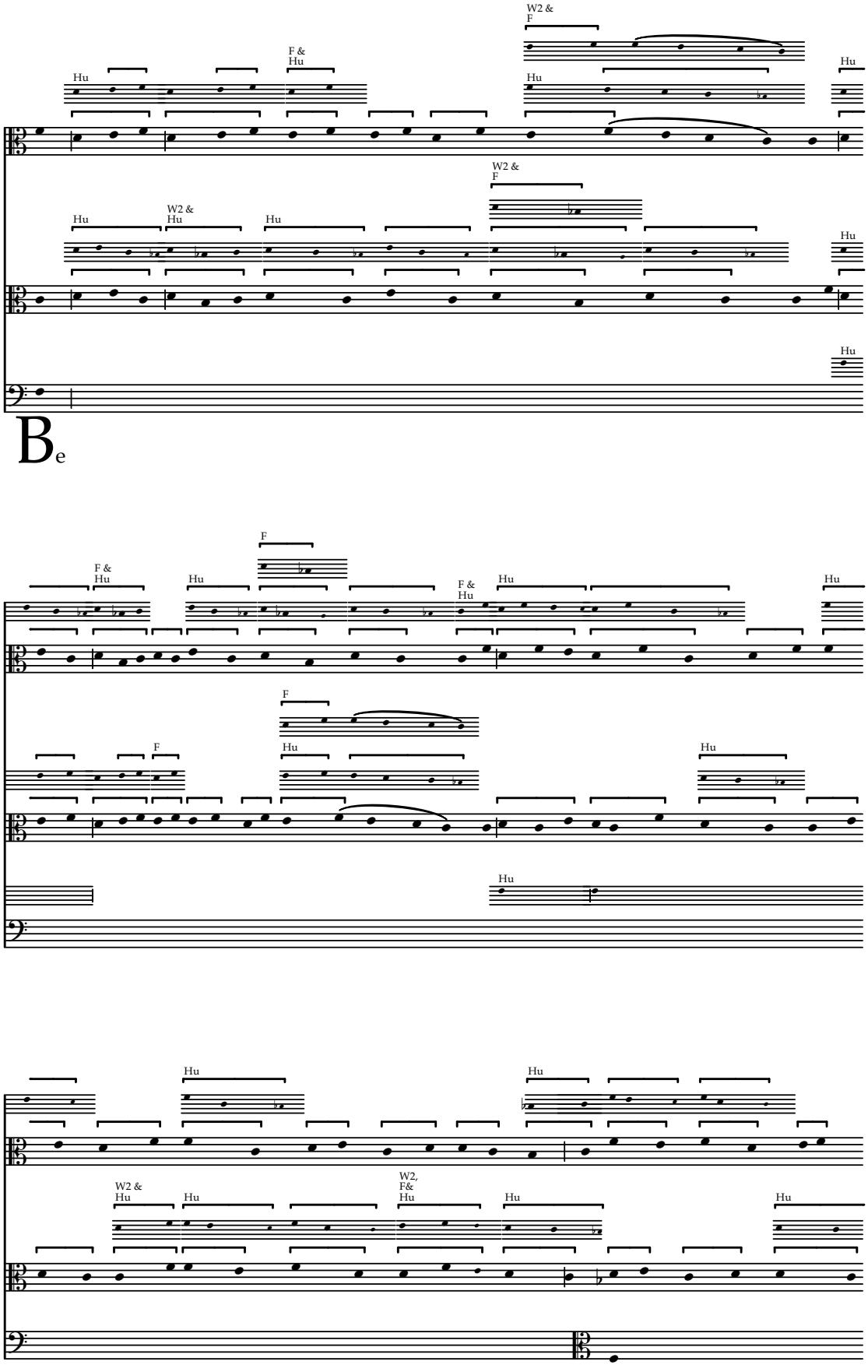
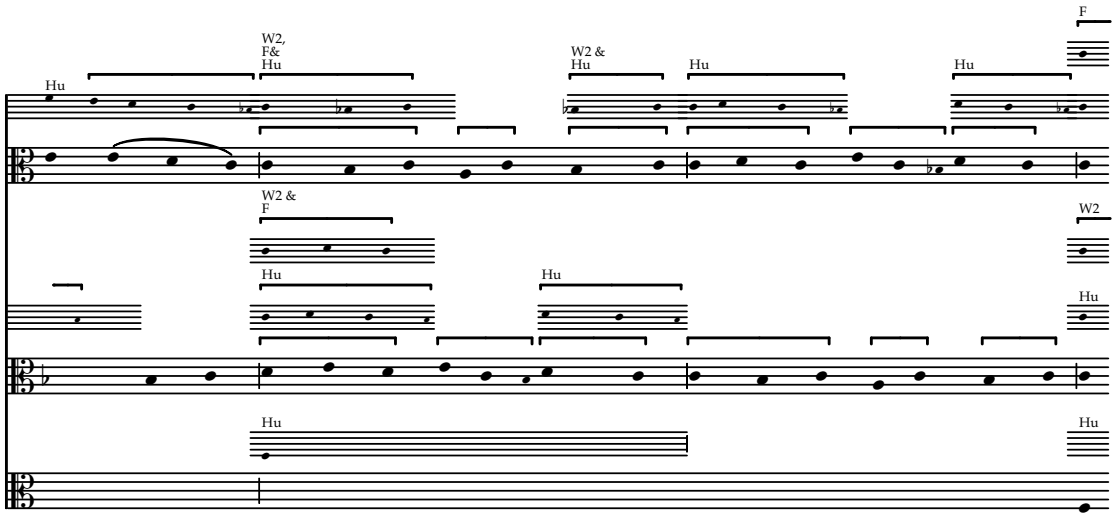
Benedicamus domino

Concordances from W2, F & Hu

f. 12–13

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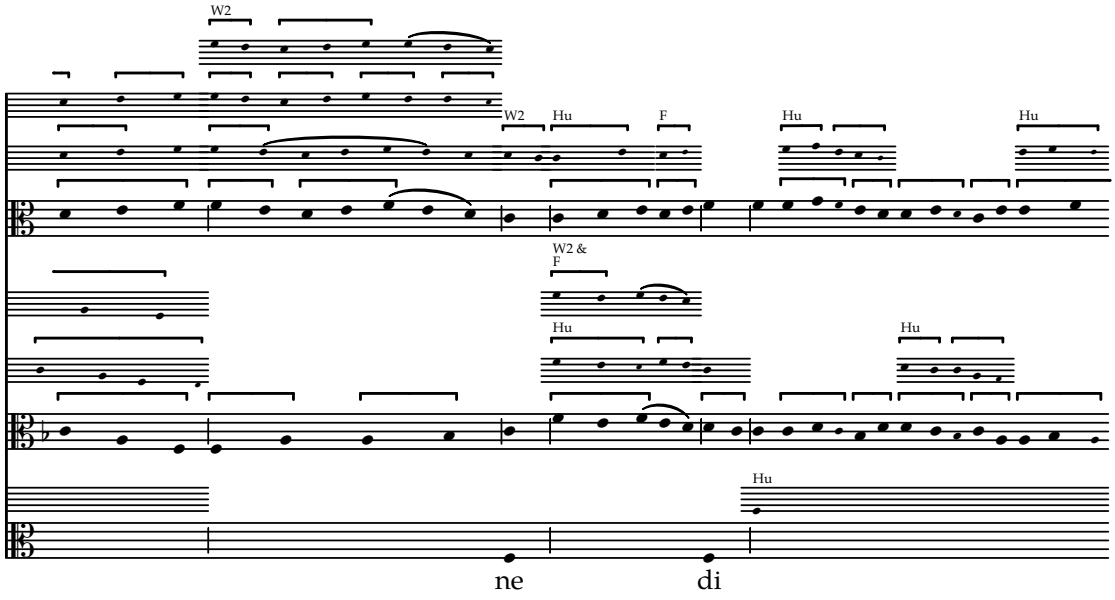
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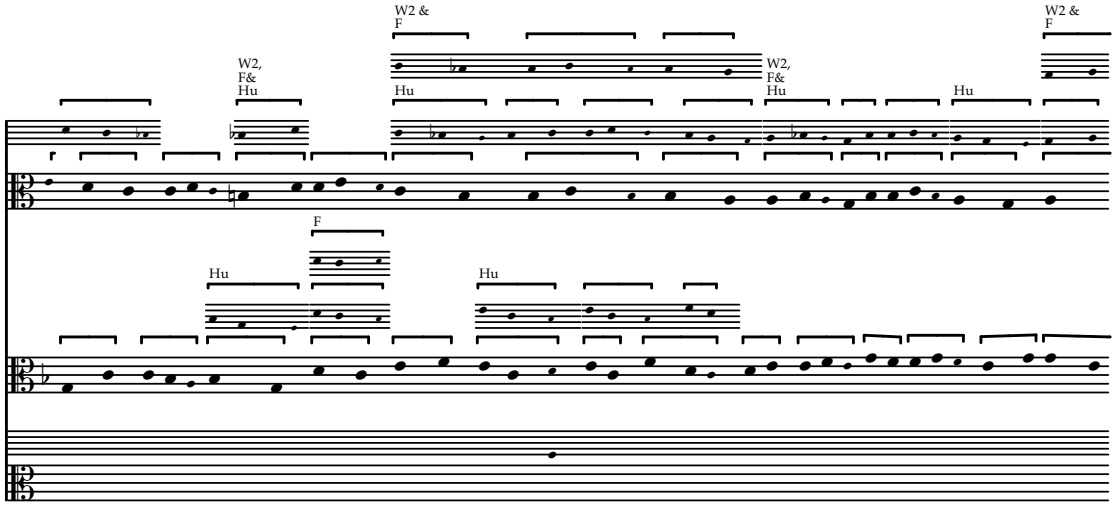
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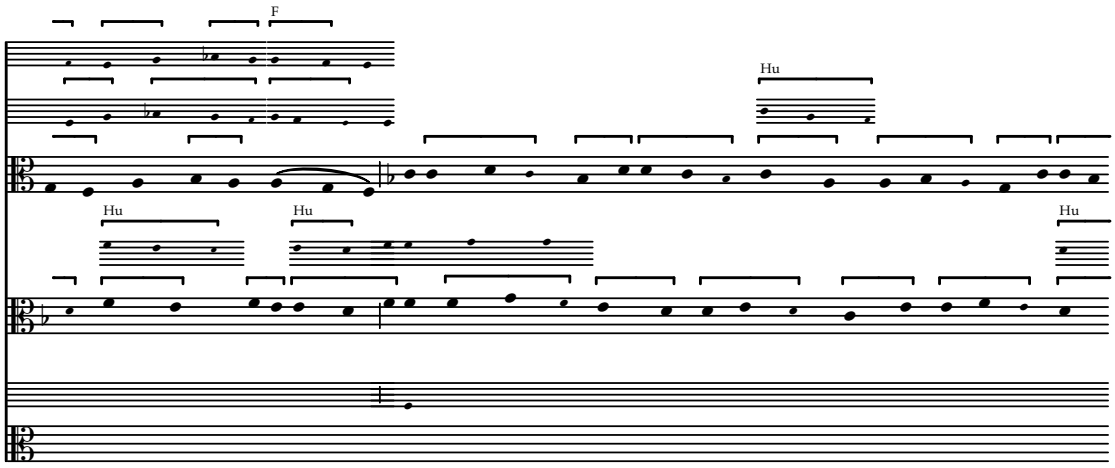
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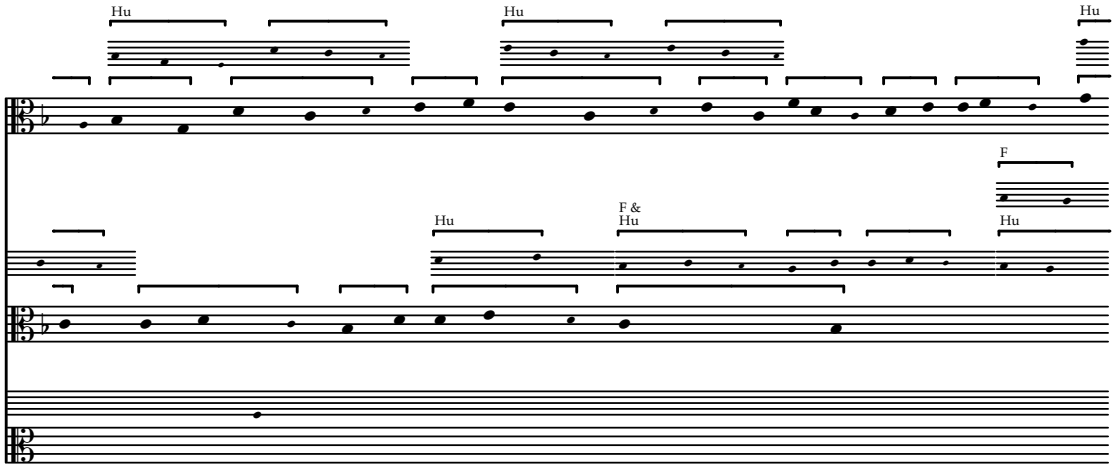
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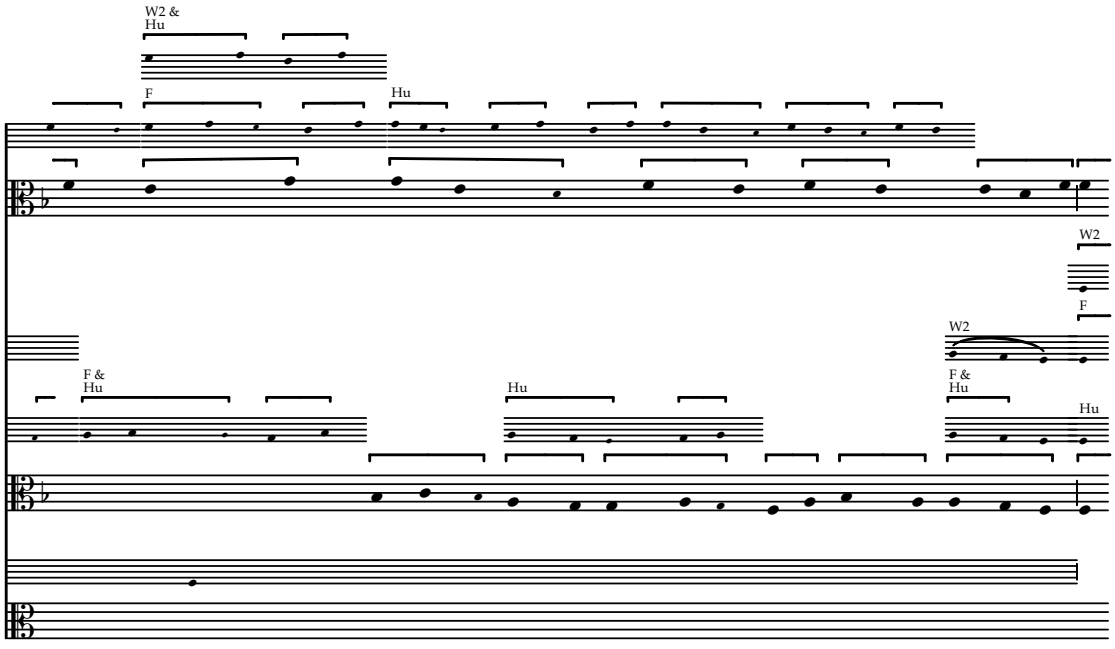
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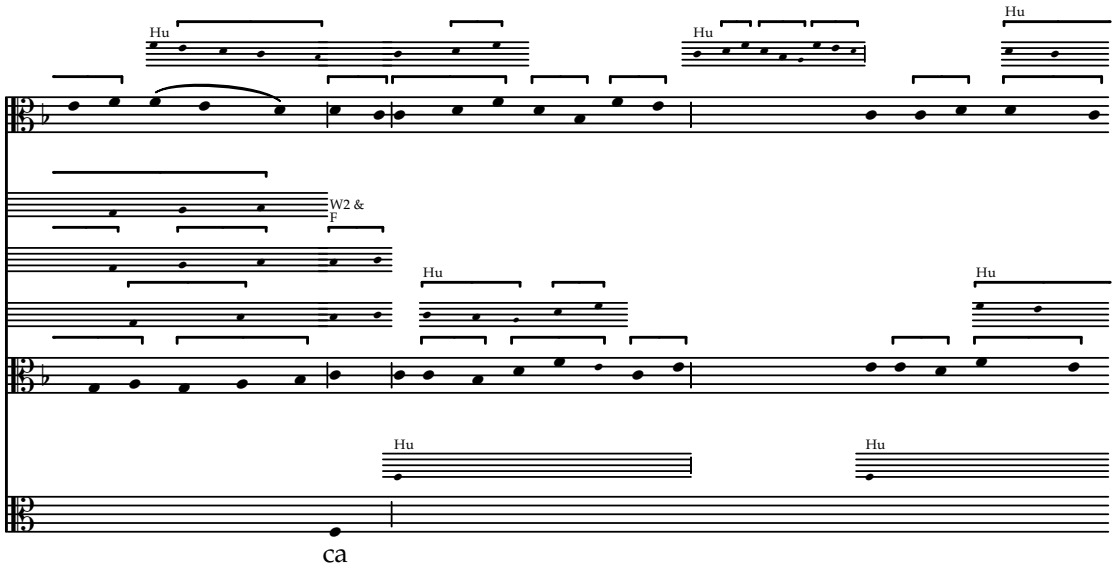
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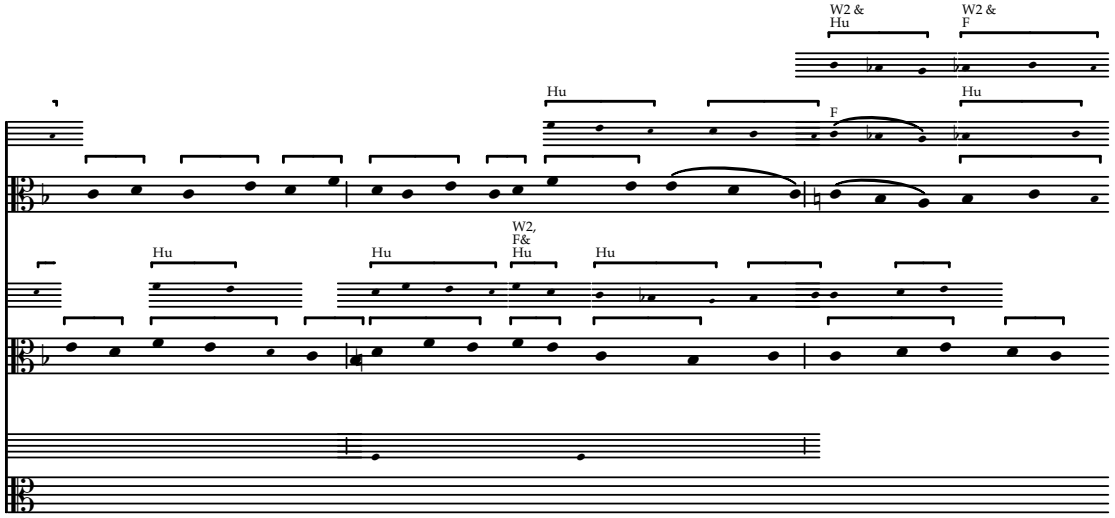
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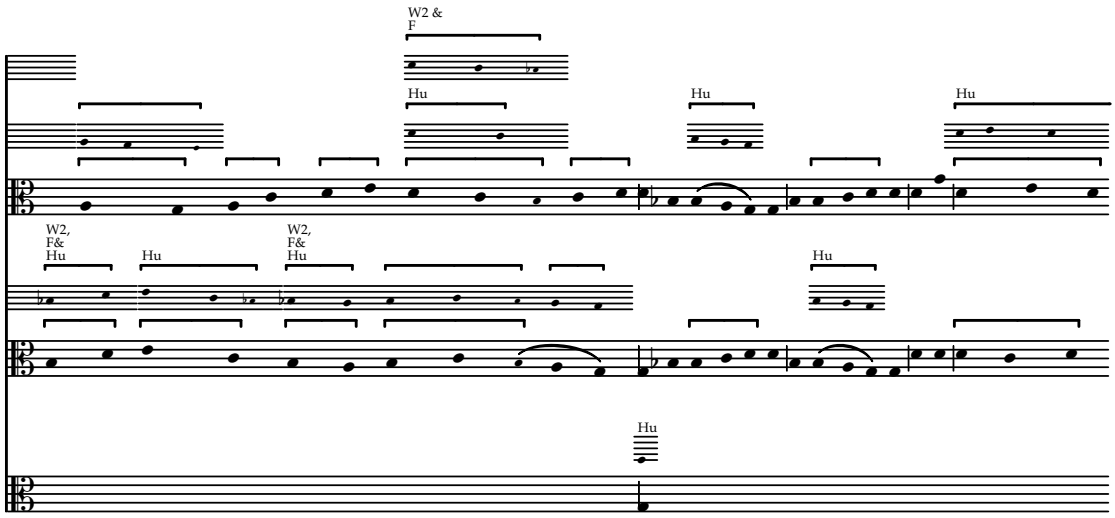
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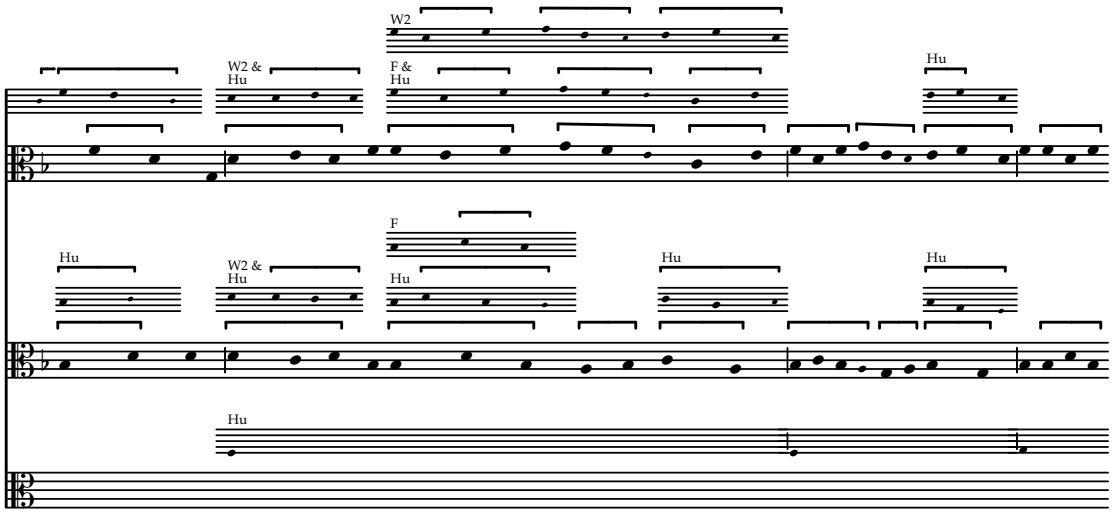
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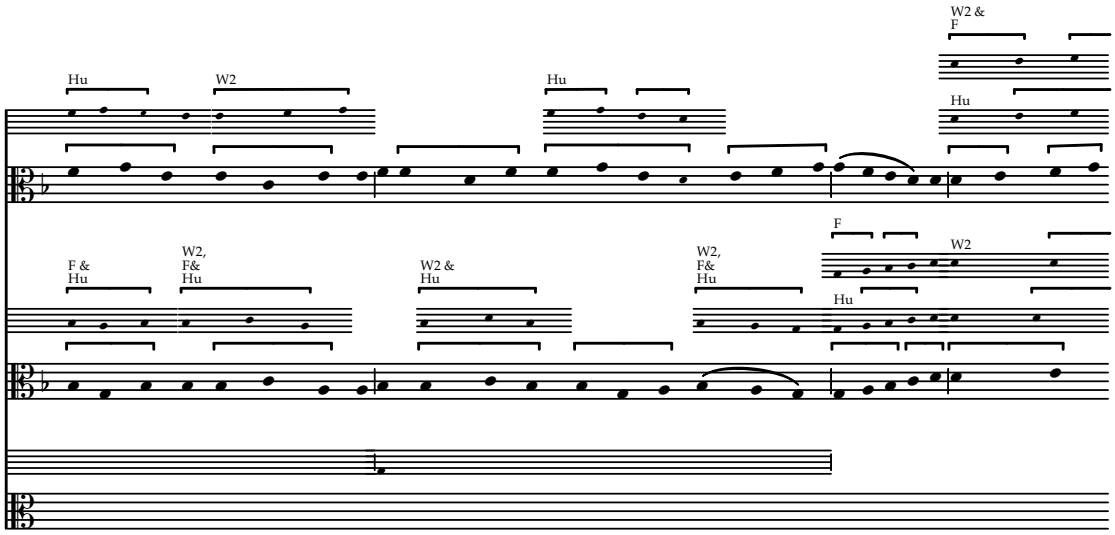
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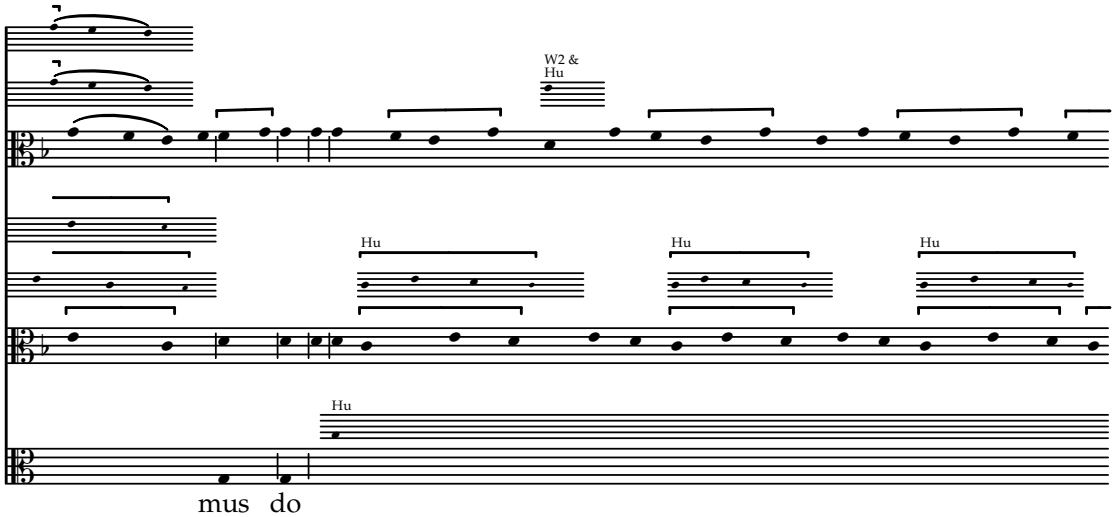
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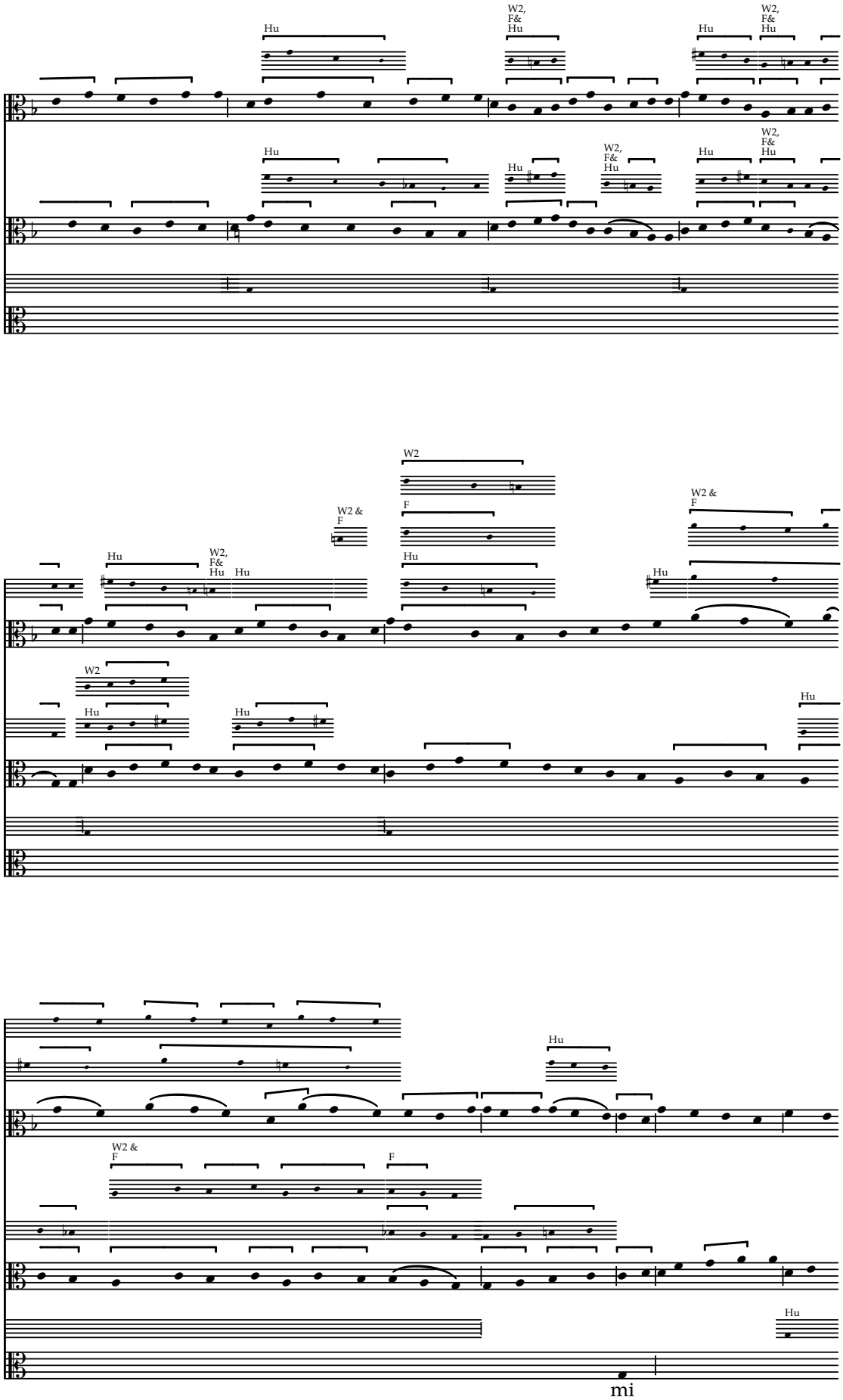
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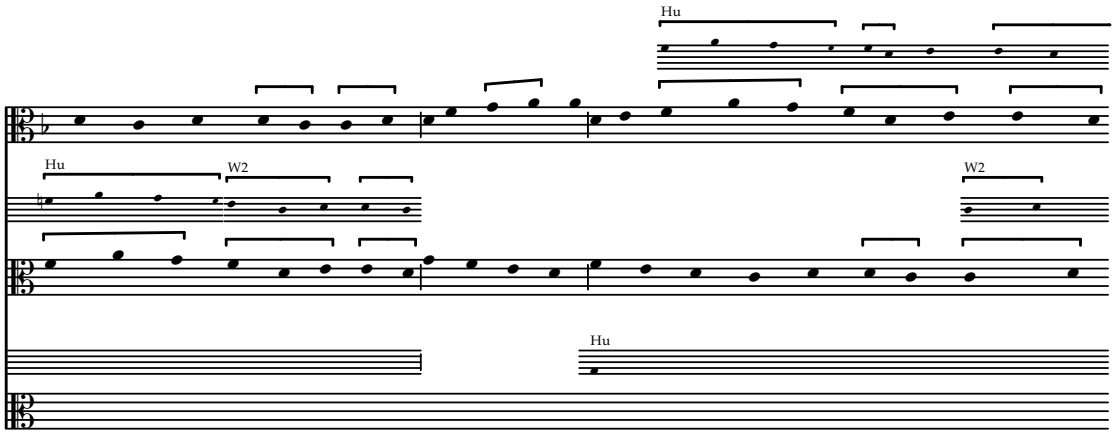
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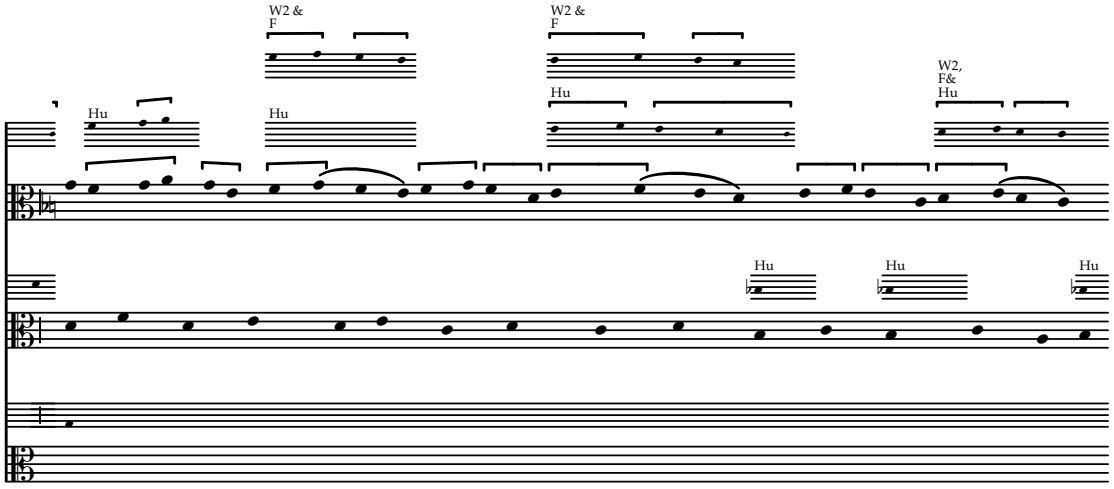
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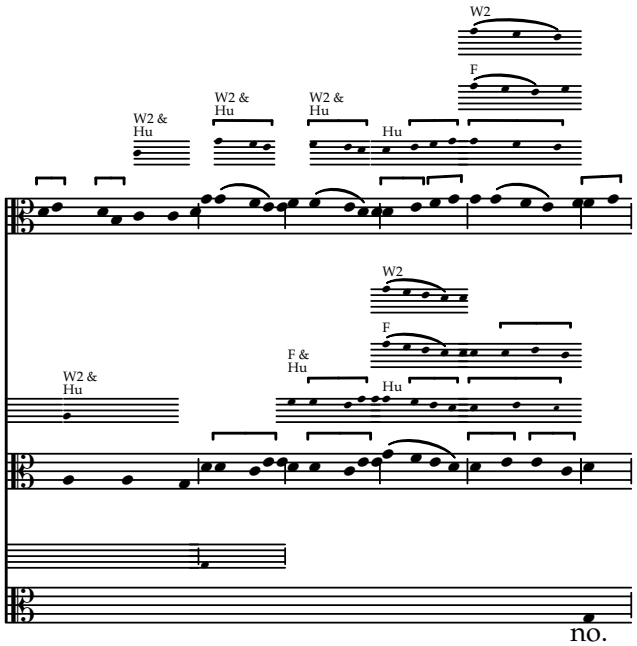
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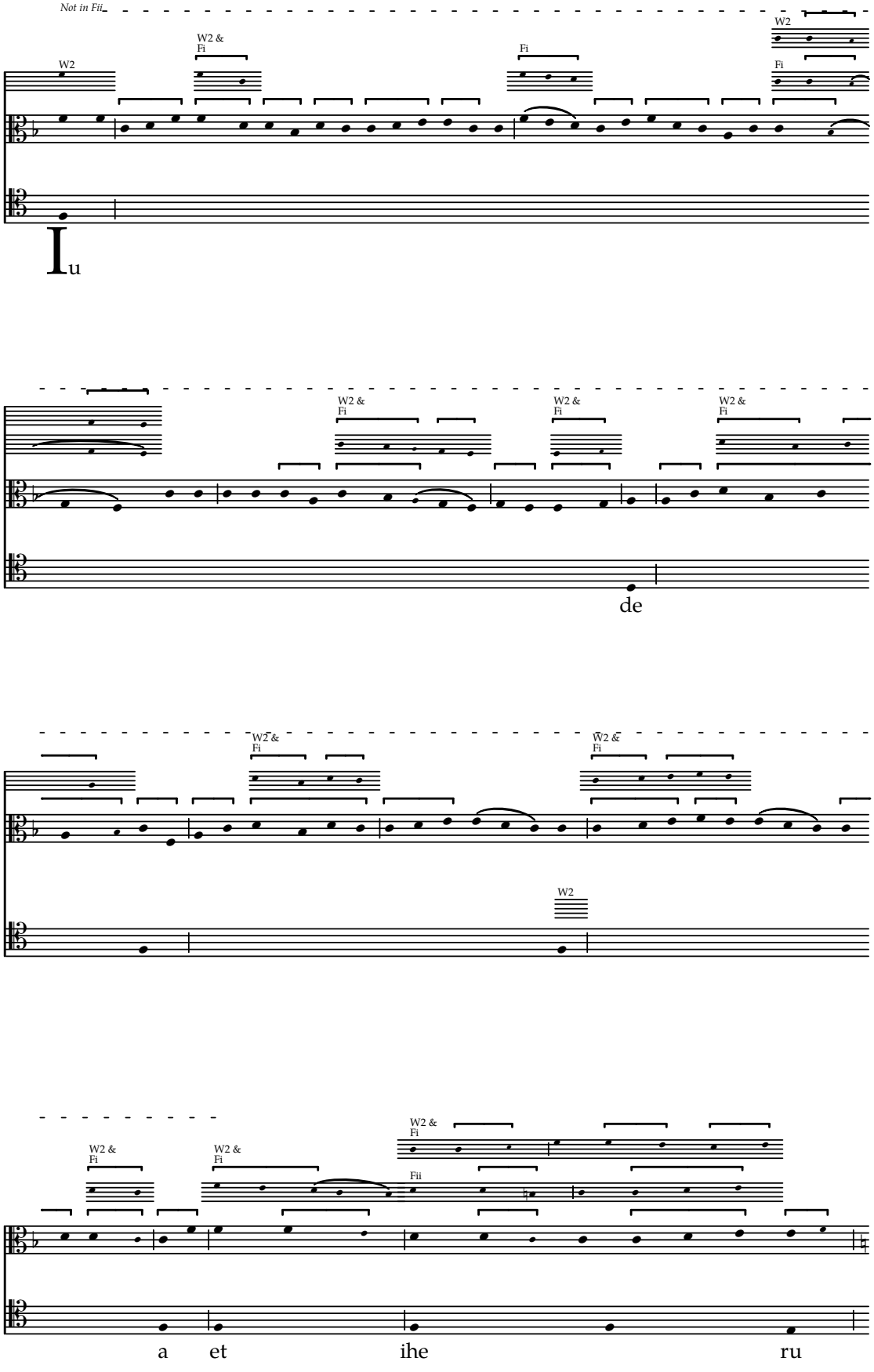
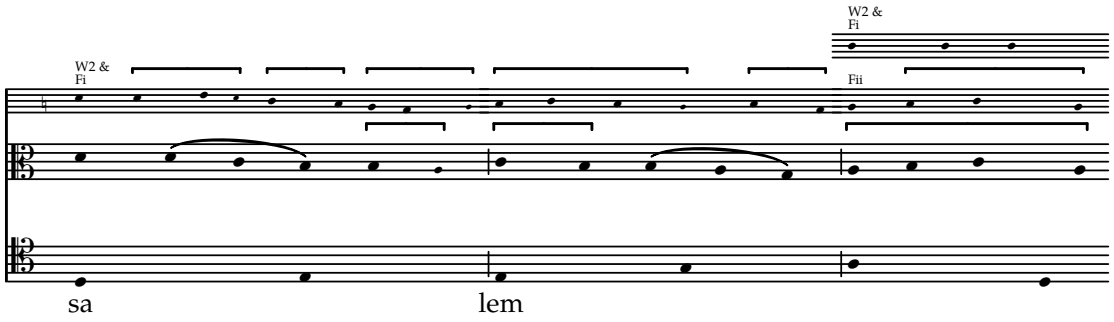
Iudea et iherusalem

Concordances from W2 & F (setting and clausula "et iherusalem"). LoD not considered

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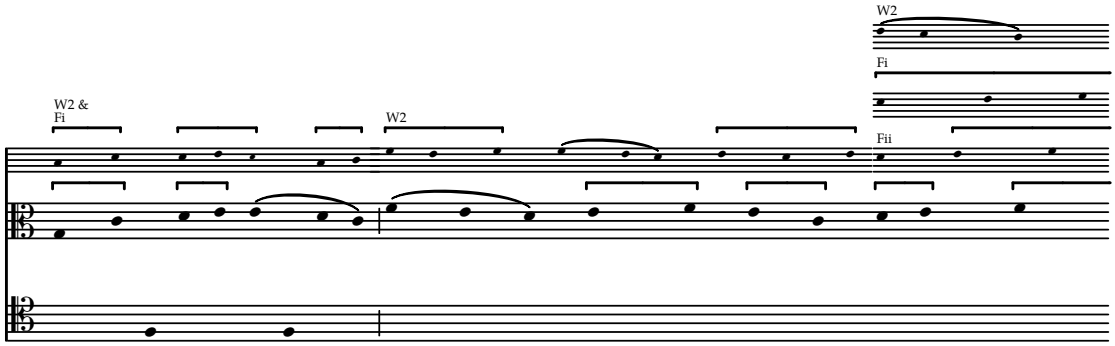
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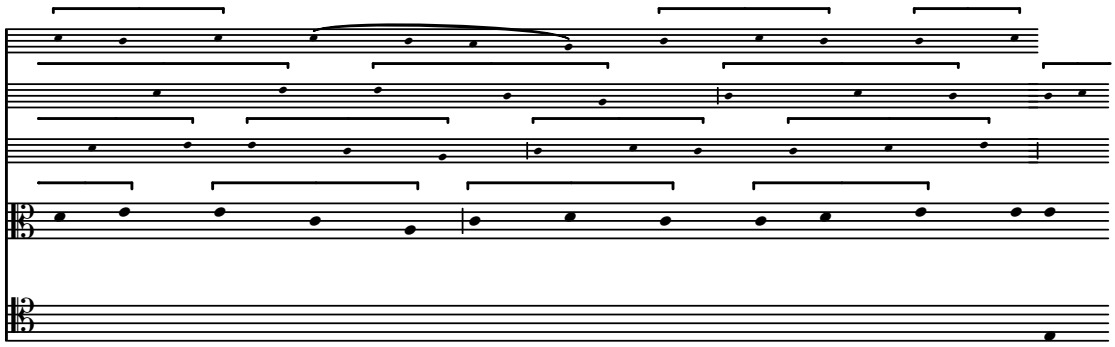
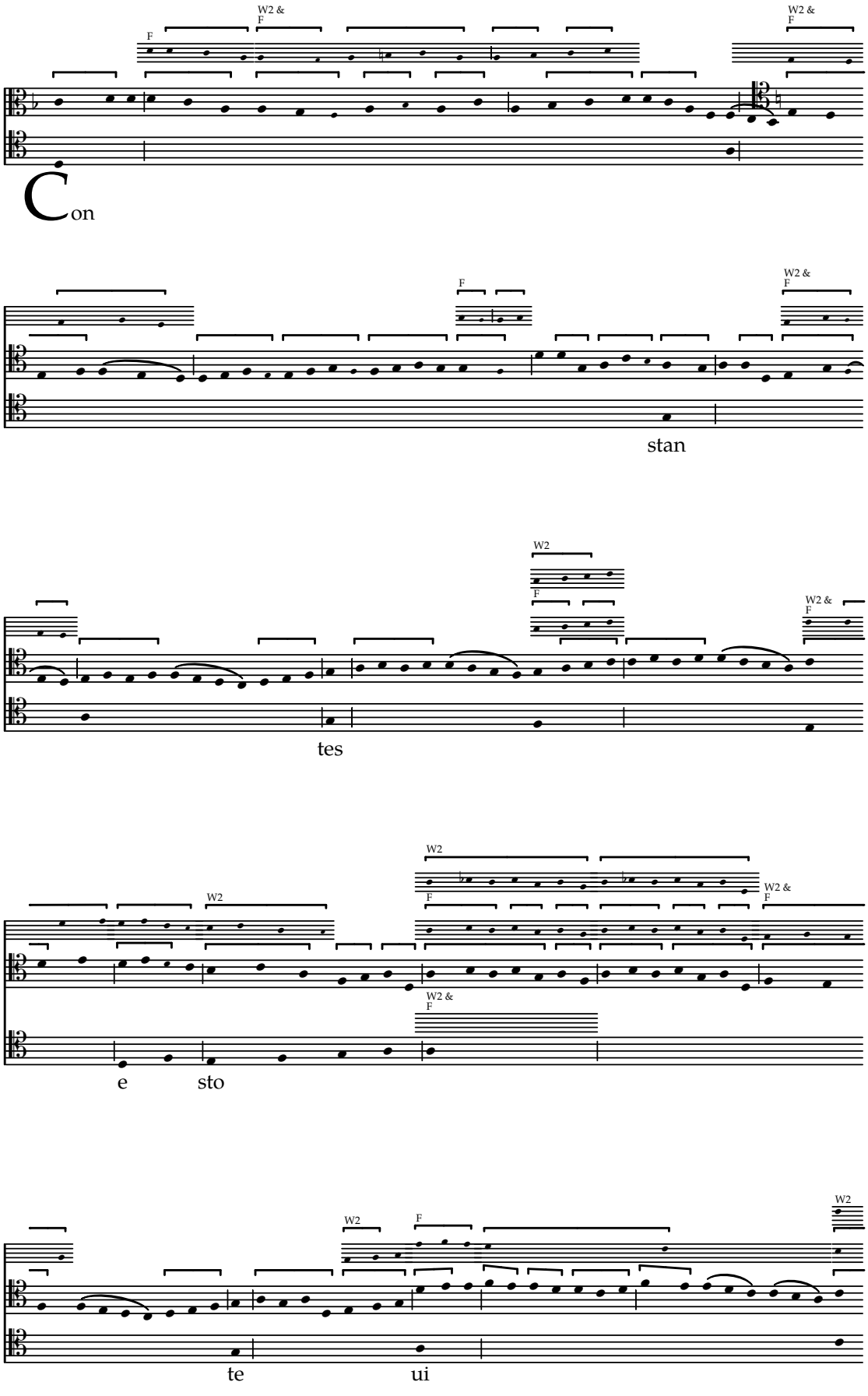
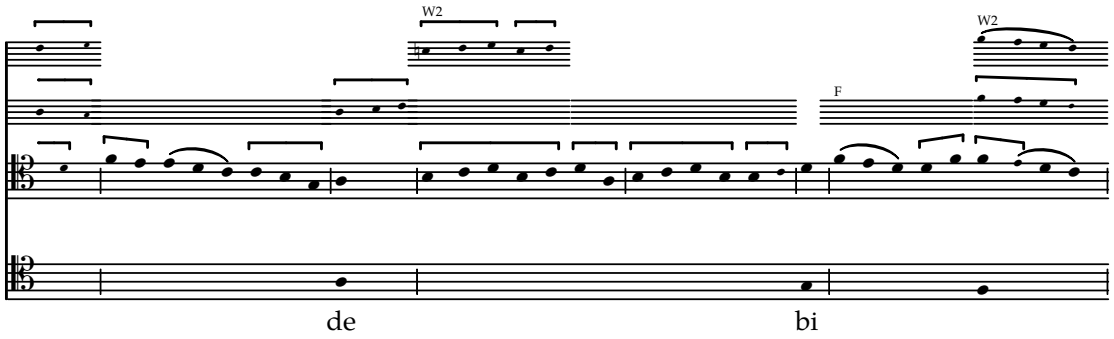


Constantes estote

Concordances from W2 & F. LoD not considered

f. 17–17v

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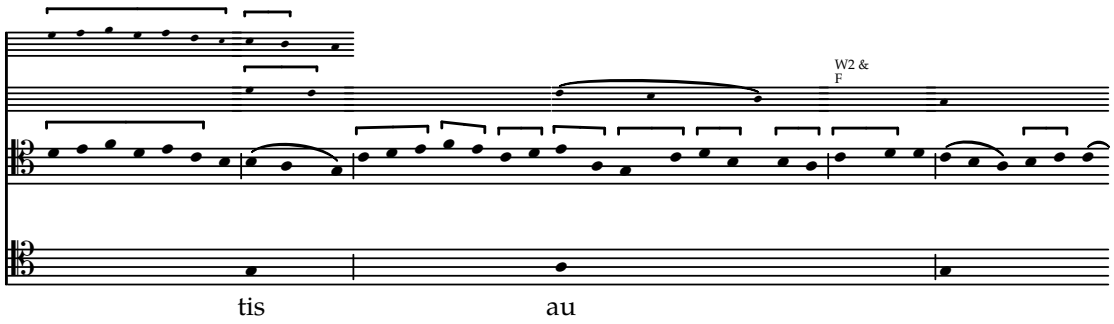
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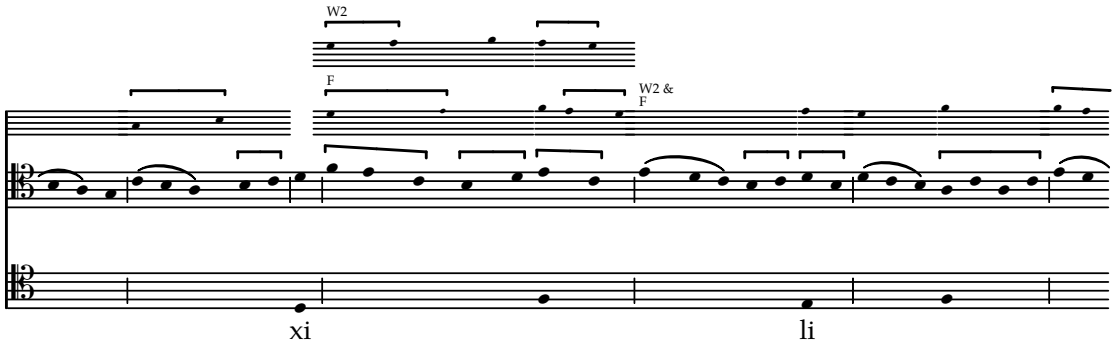
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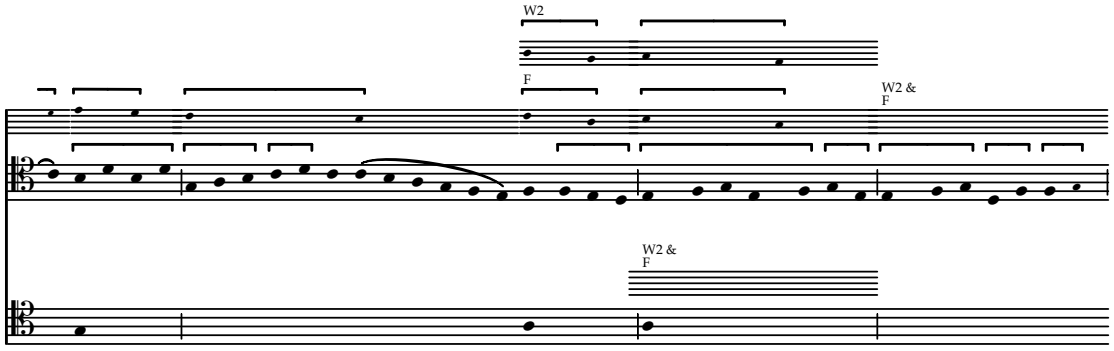
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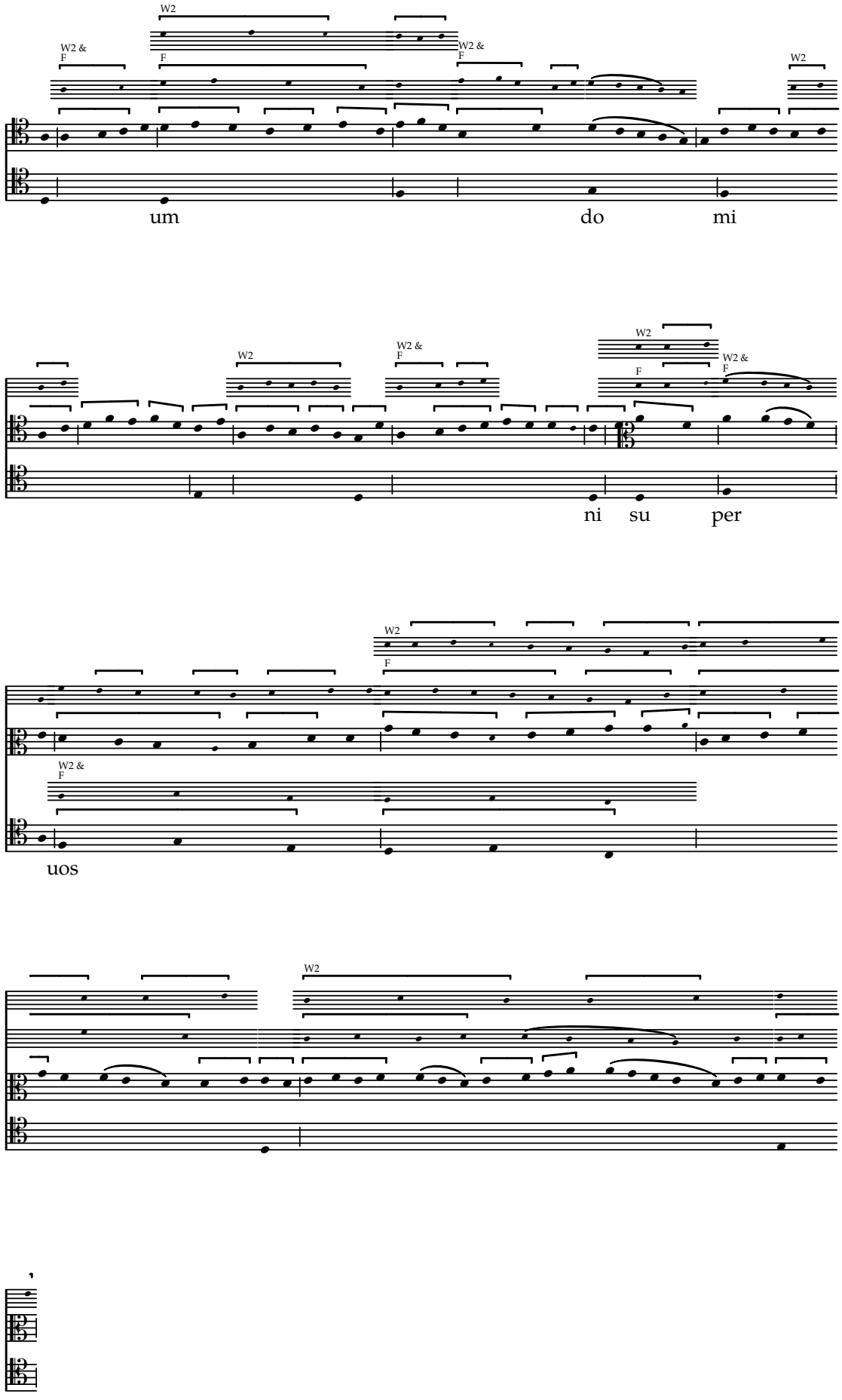
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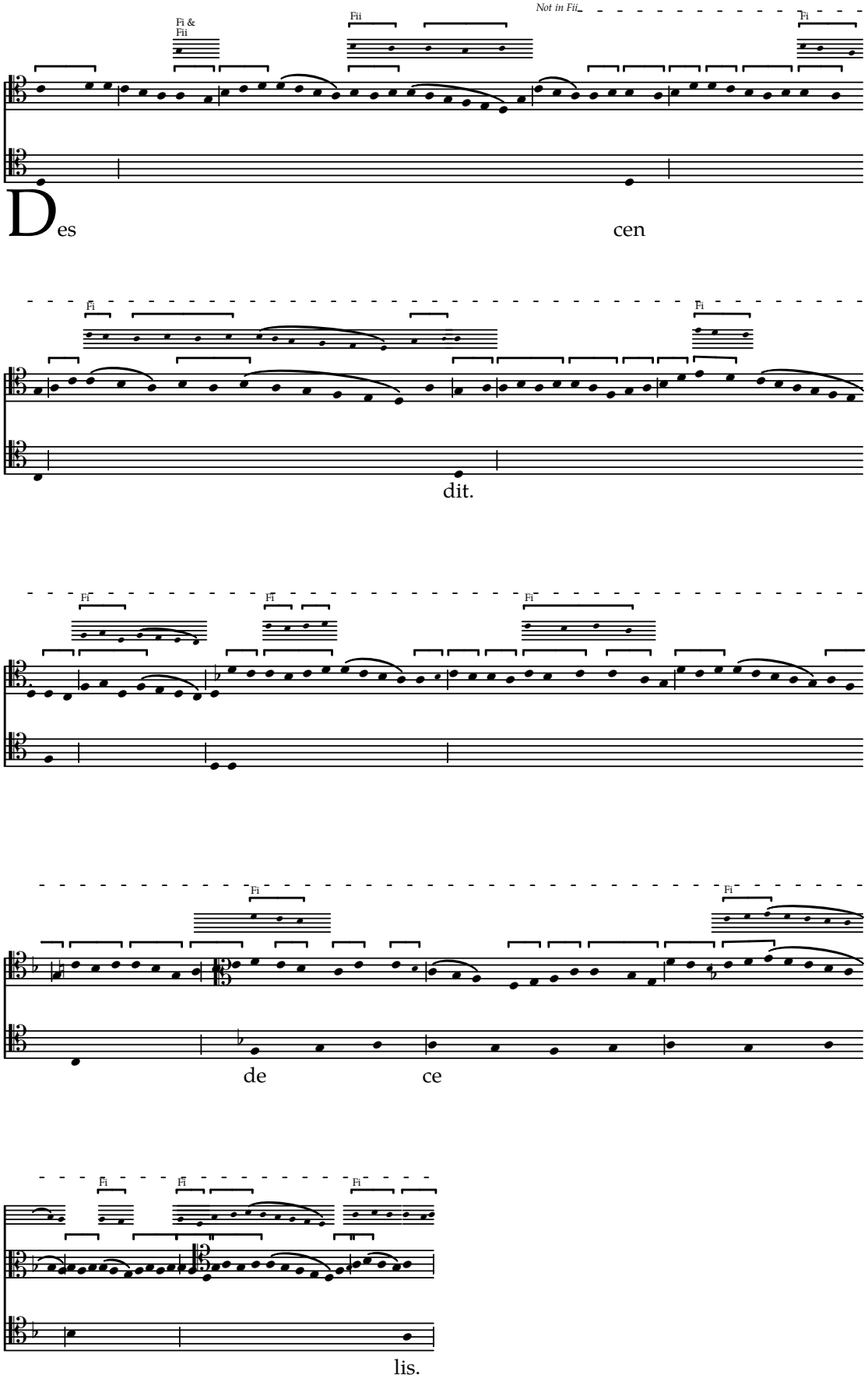
Concordances from F (setting and clausula "descendit de celis") f. 17v



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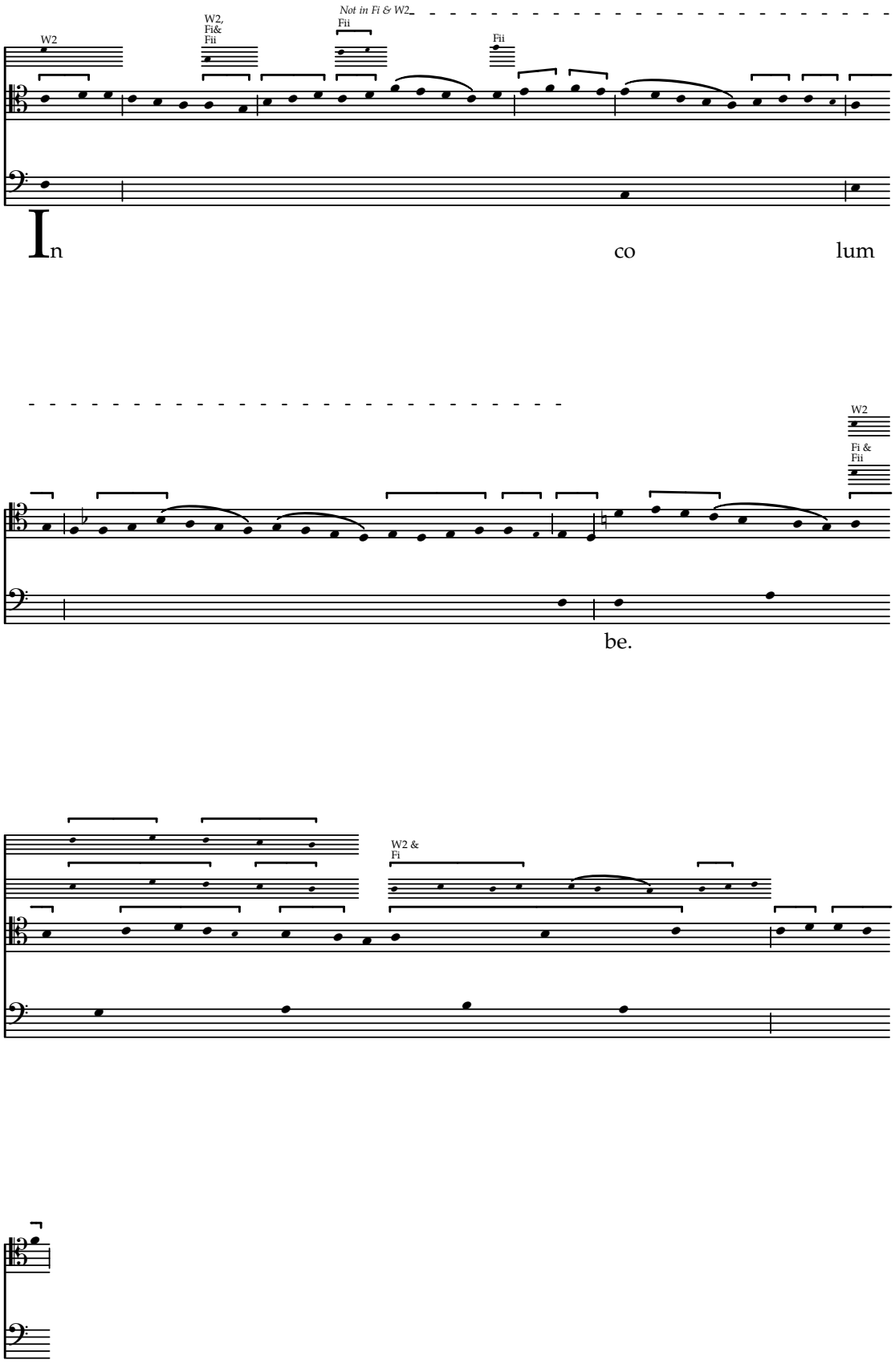
Concordances from F (two settings) & W2 f. 18



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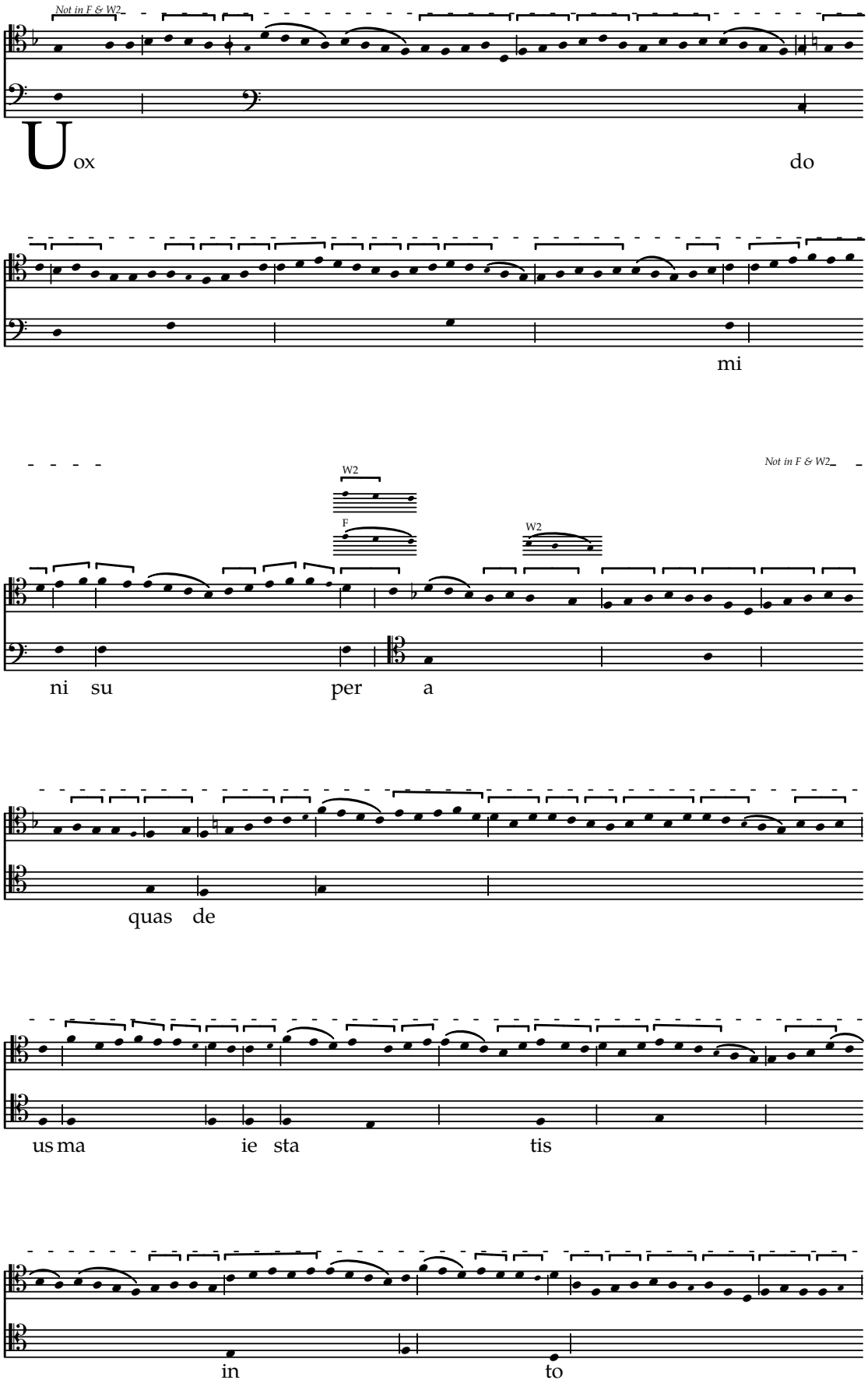
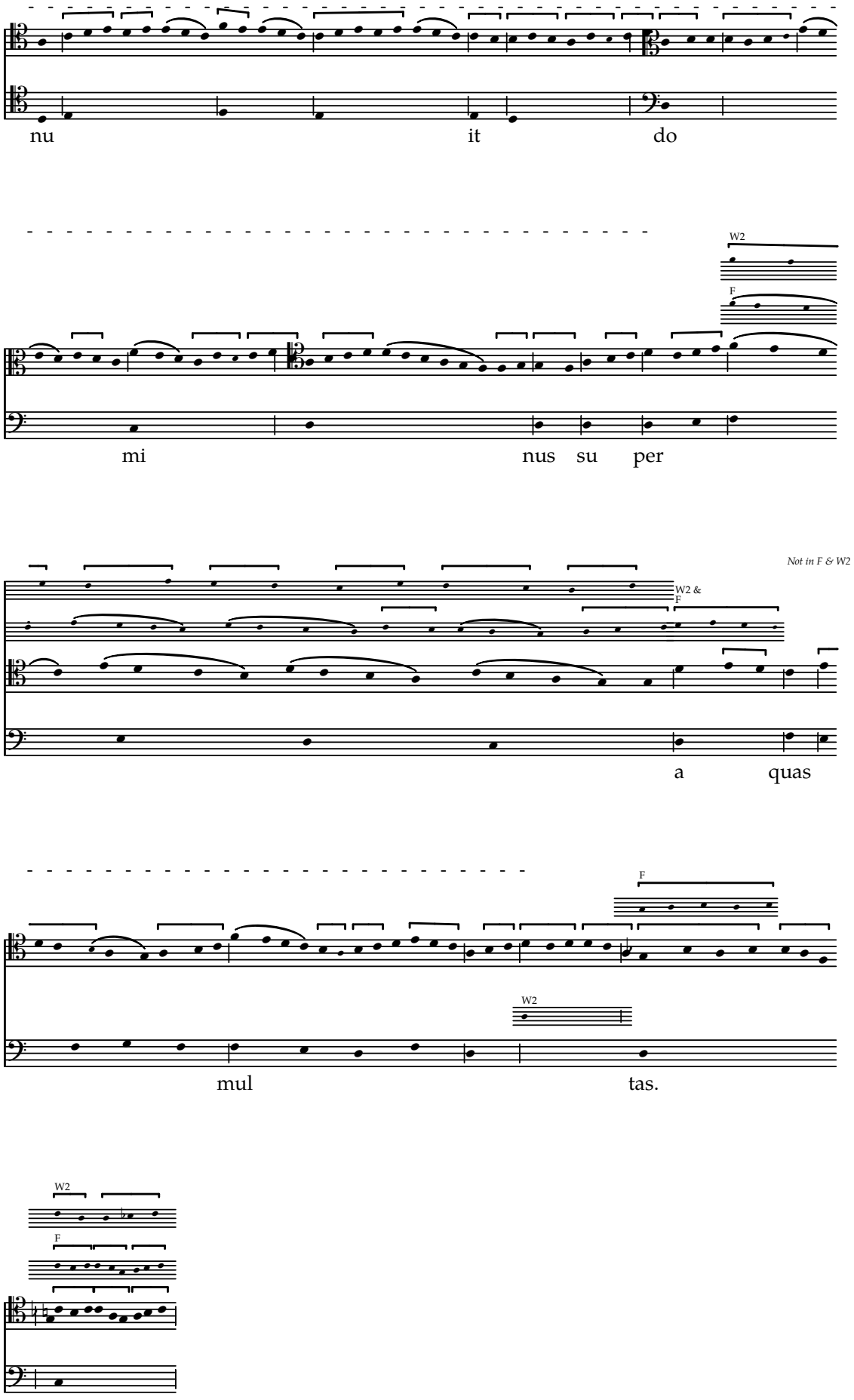
Concordances from W2 & F

f. 18

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Concordances from W2 & F

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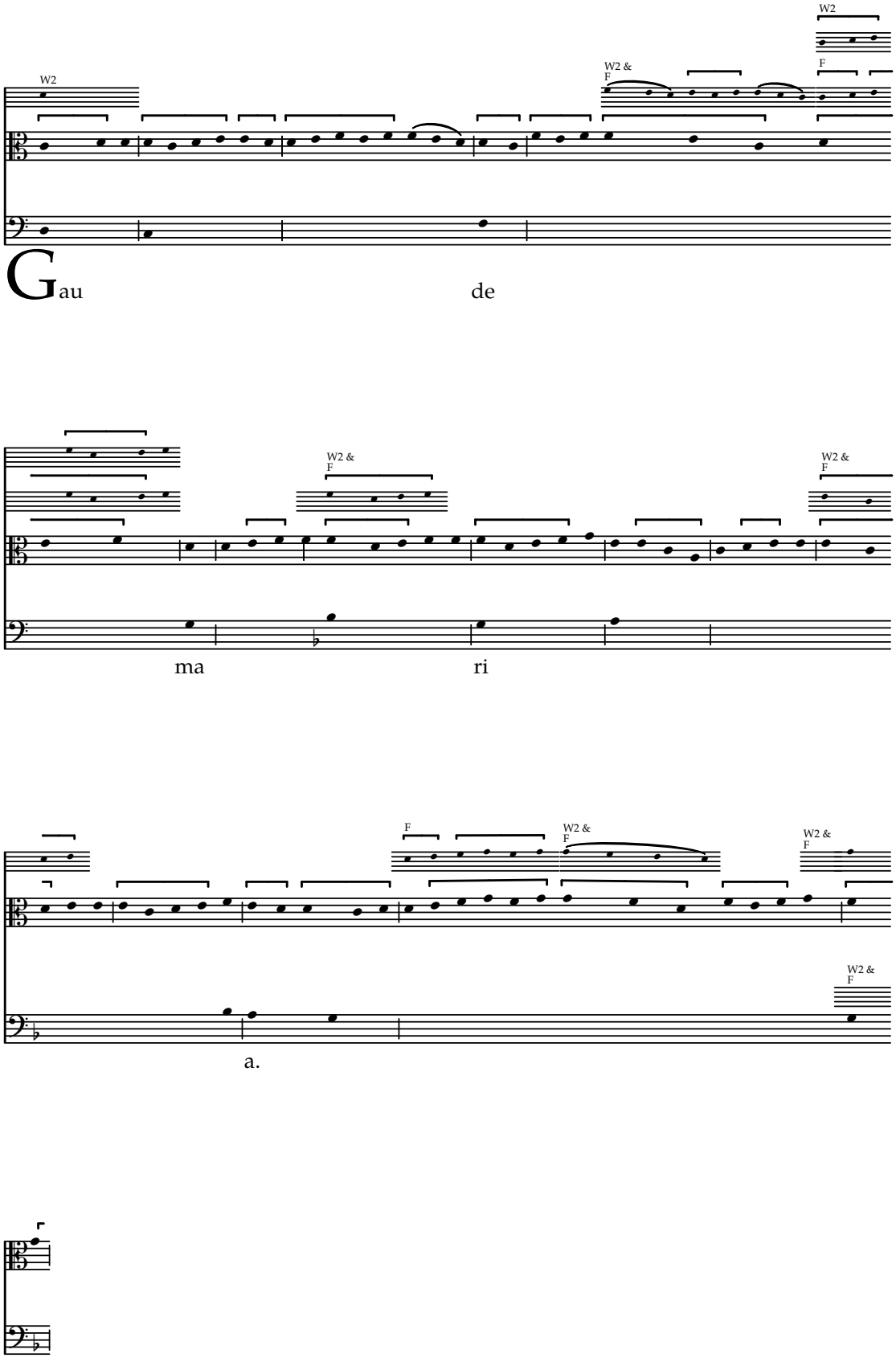

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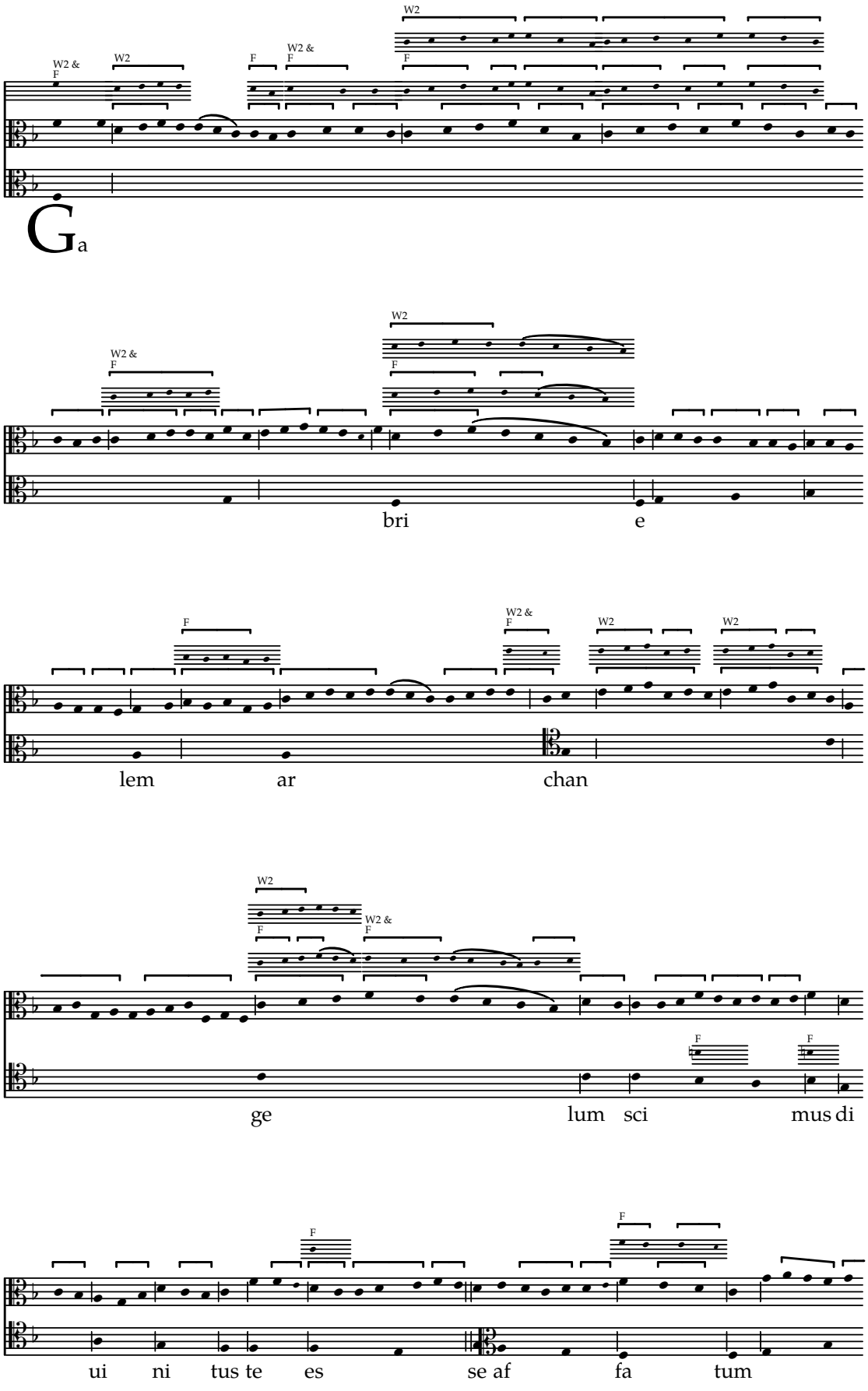
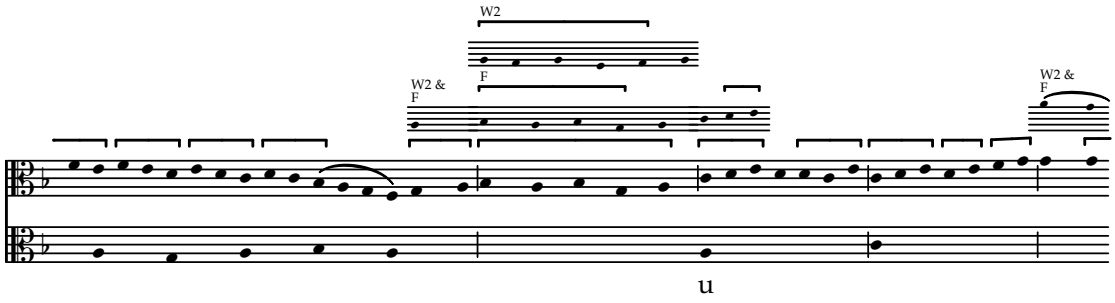
Concordances from W2 & F

f. 18v–19

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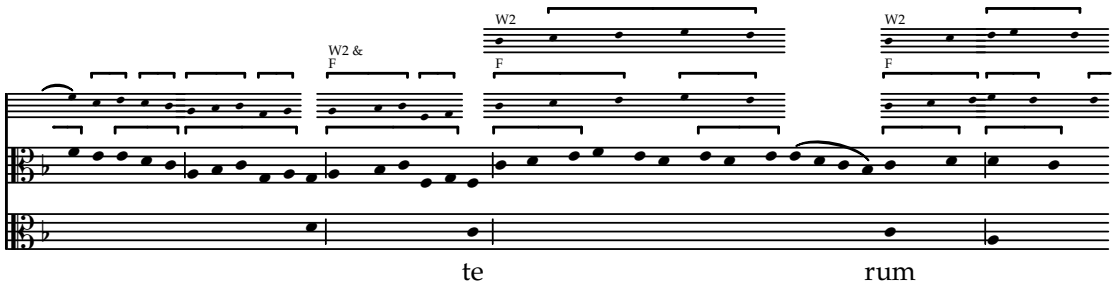
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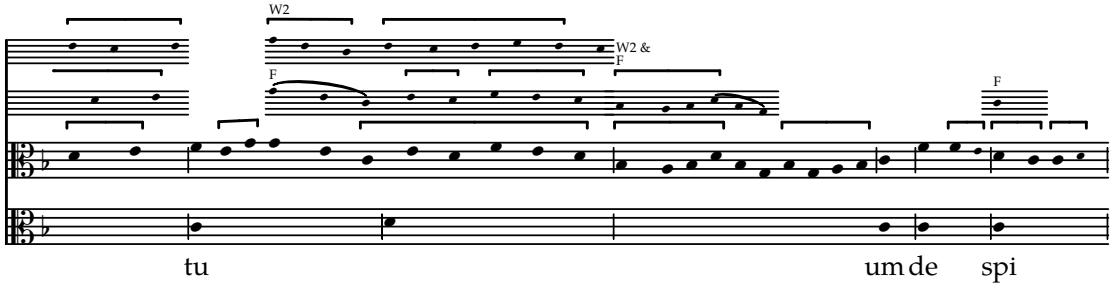
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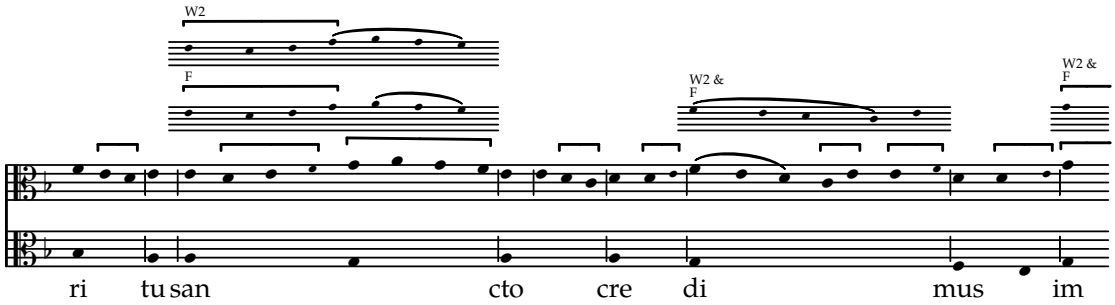
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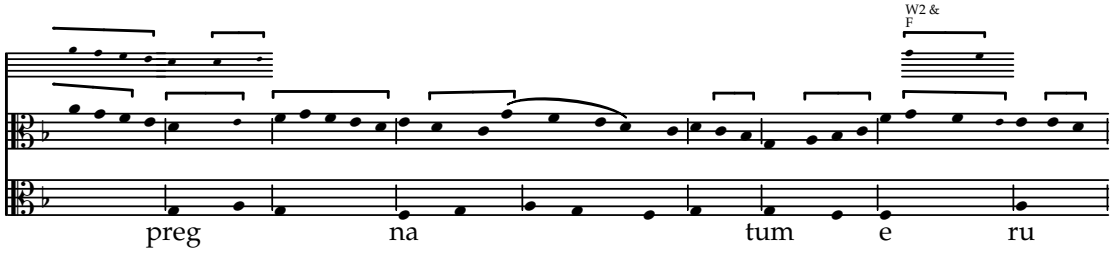
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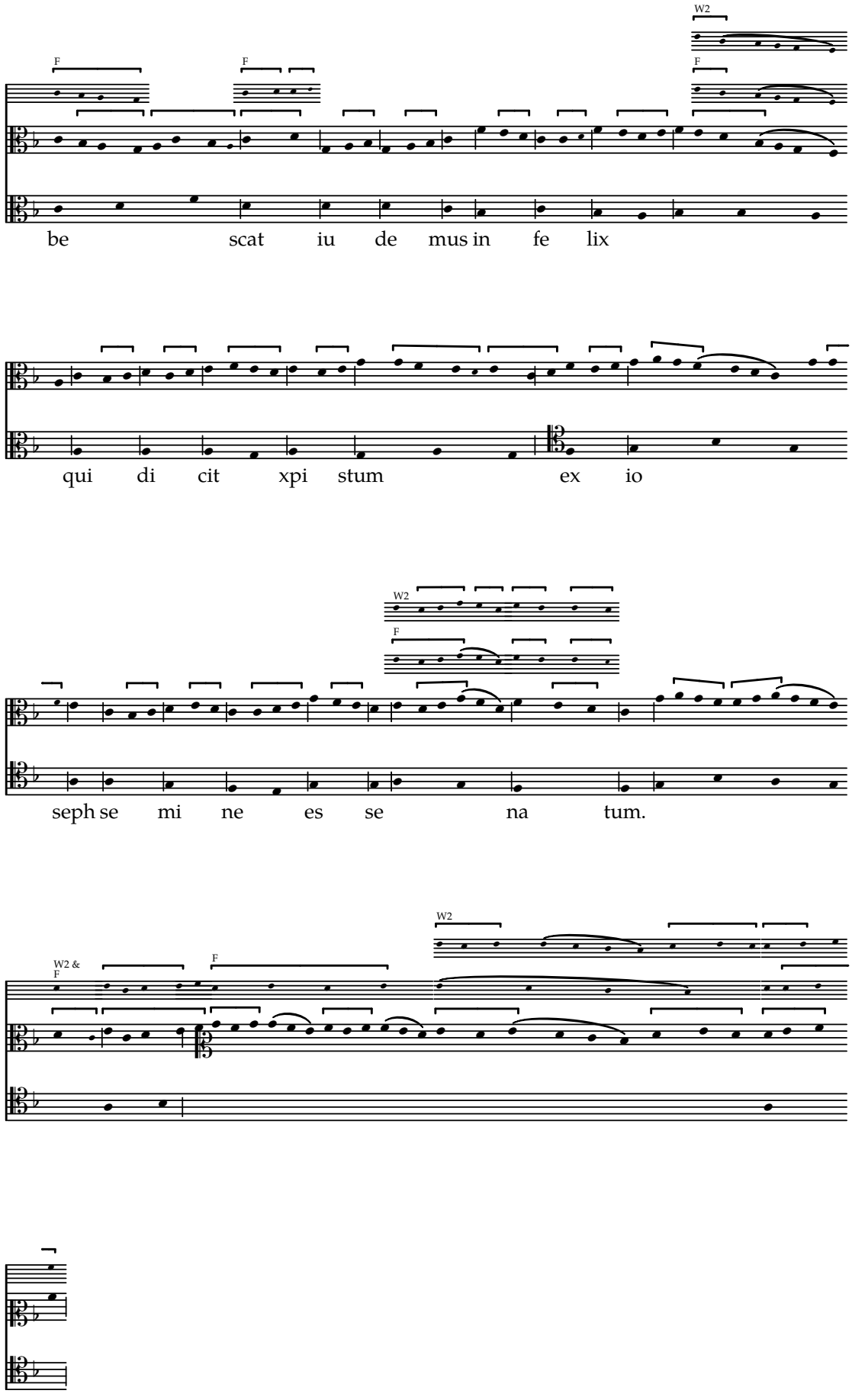
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Concordances from W2 & F. PL-Stk Muz 9 not considered

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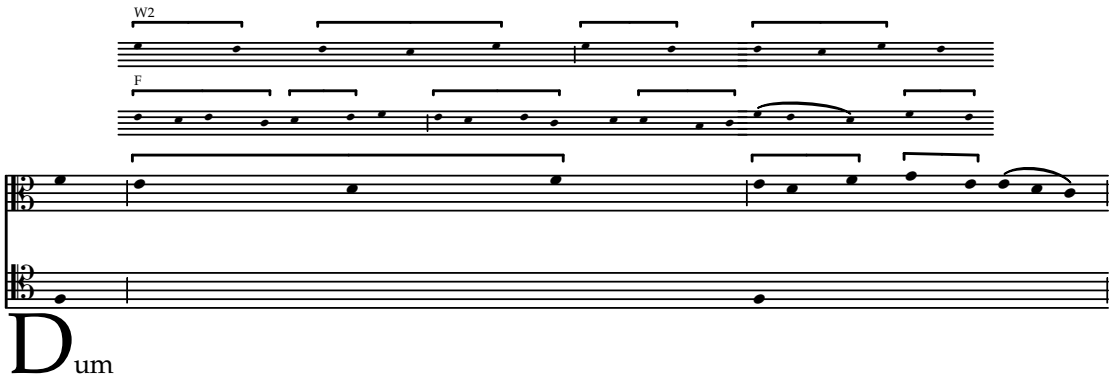

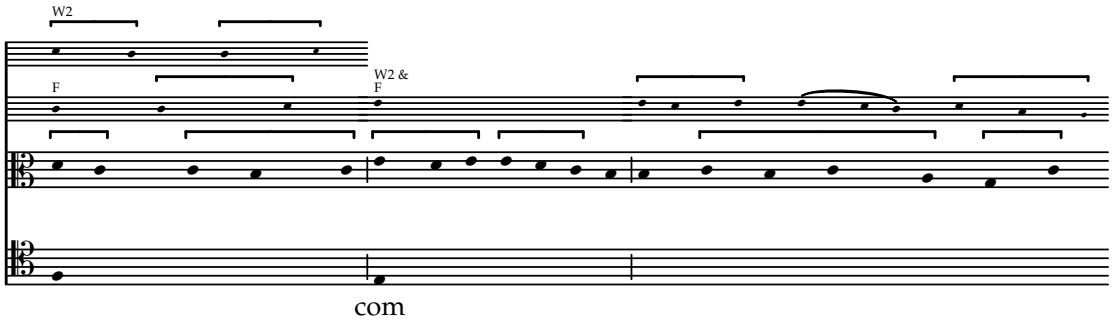

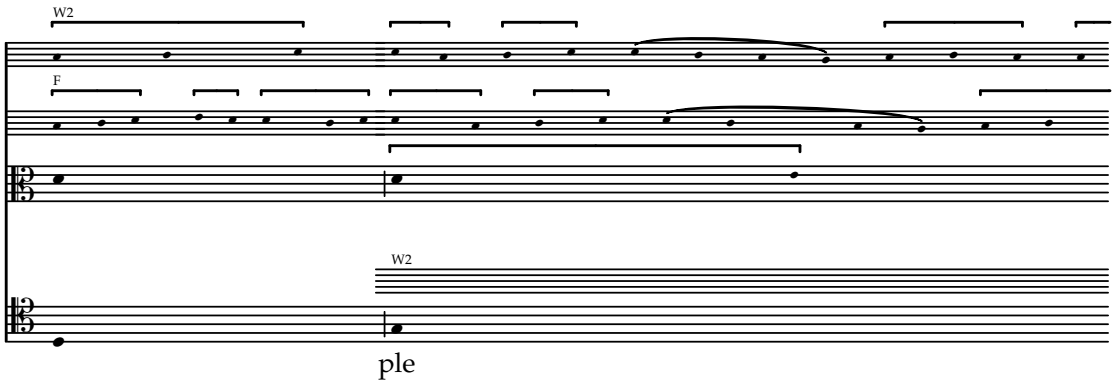

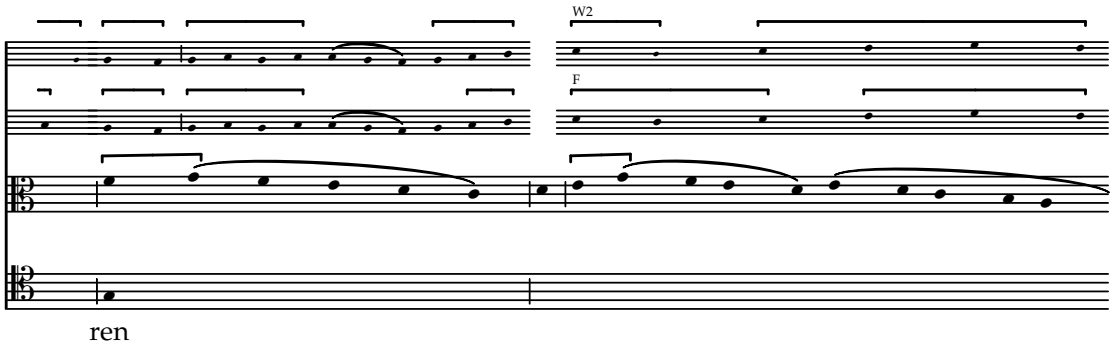

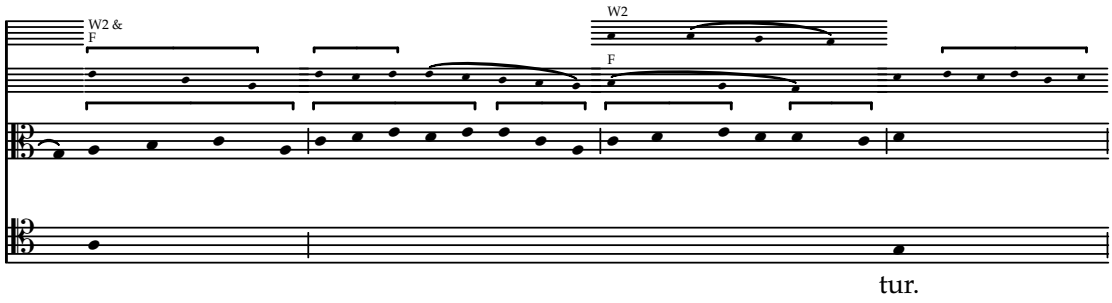
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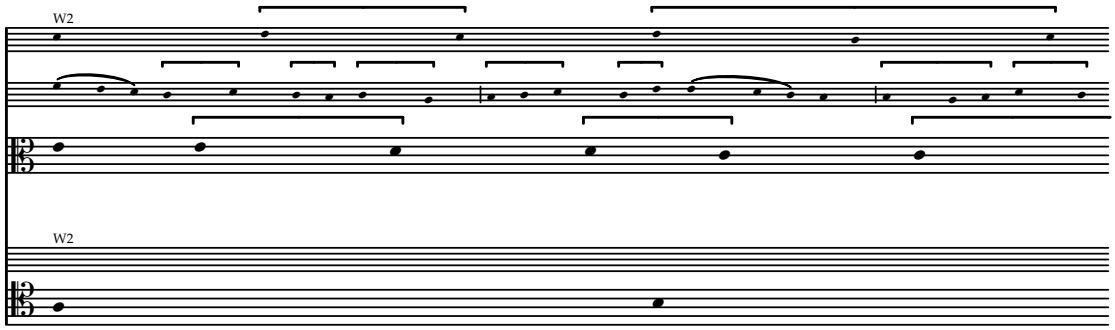
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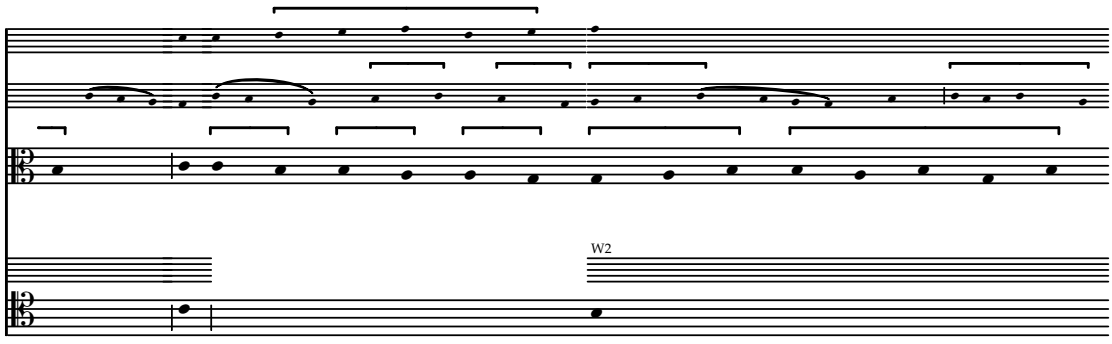
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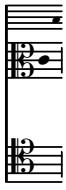

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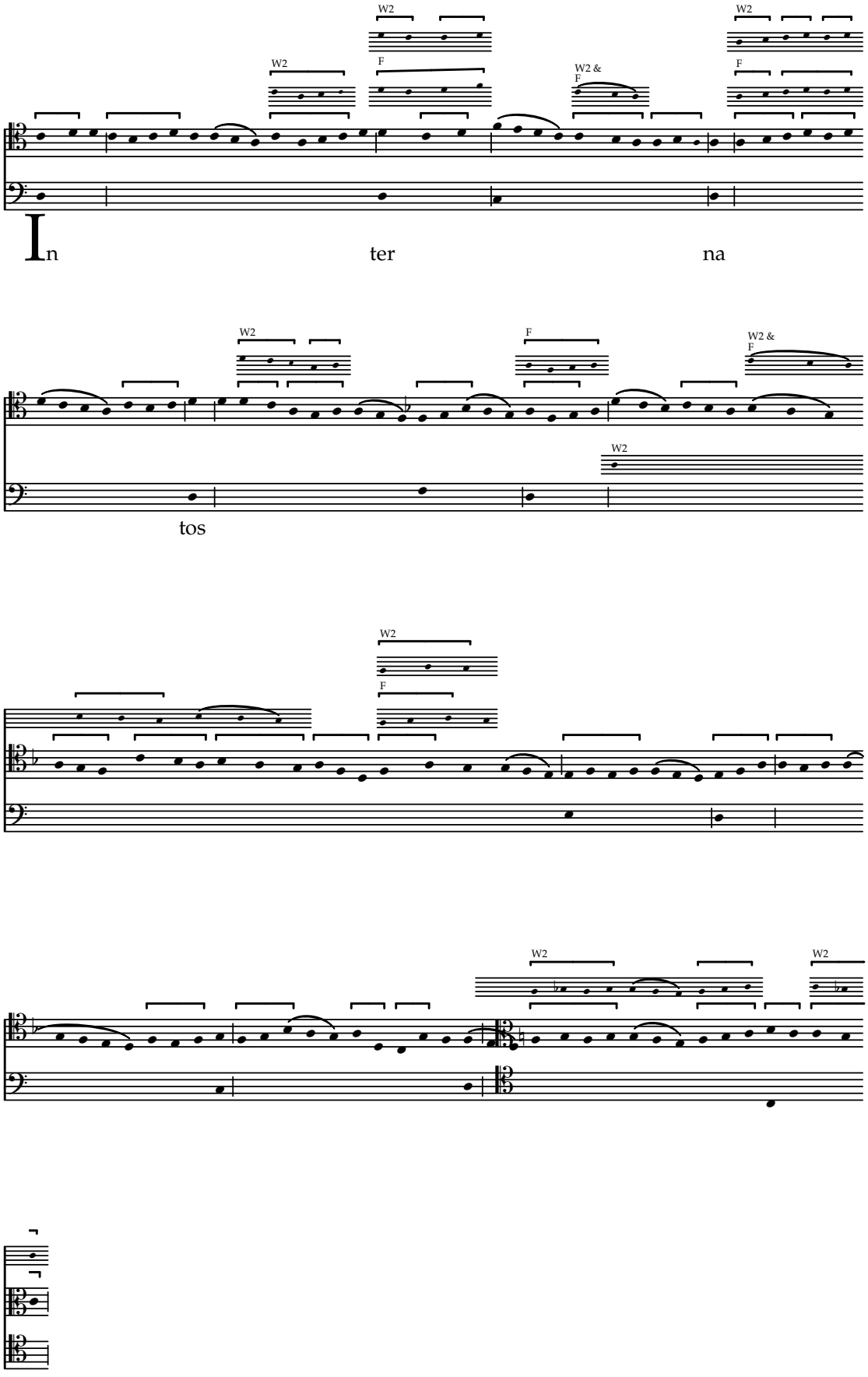
Concordances from W2 & F. PL-Stk Muz 9 not considered

f. 19v–20



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Concordances from W2 & F. PL-Stk Muz 9 not considered

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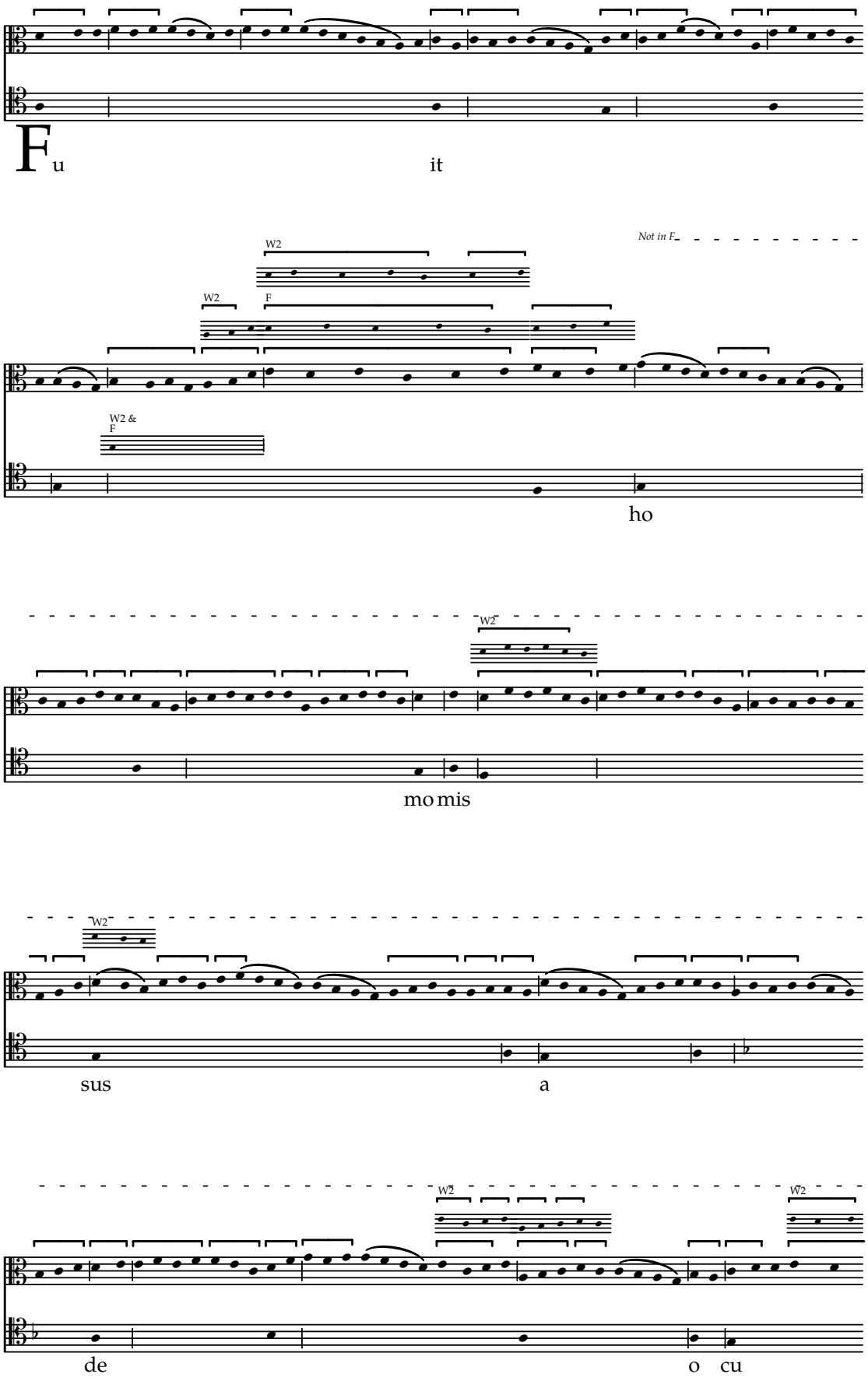

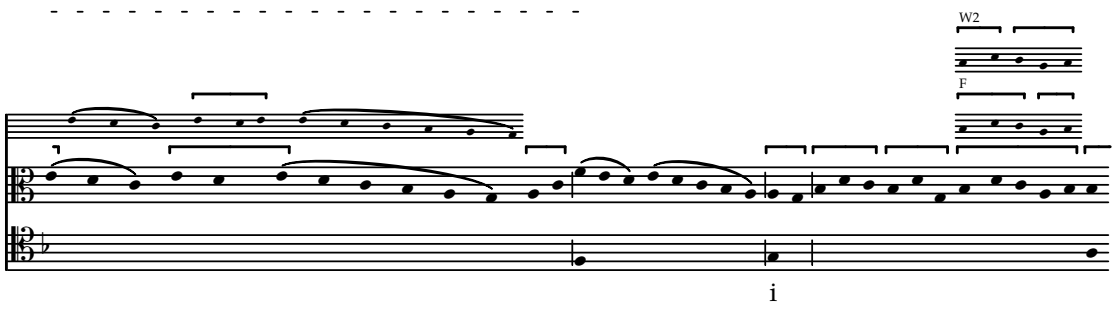
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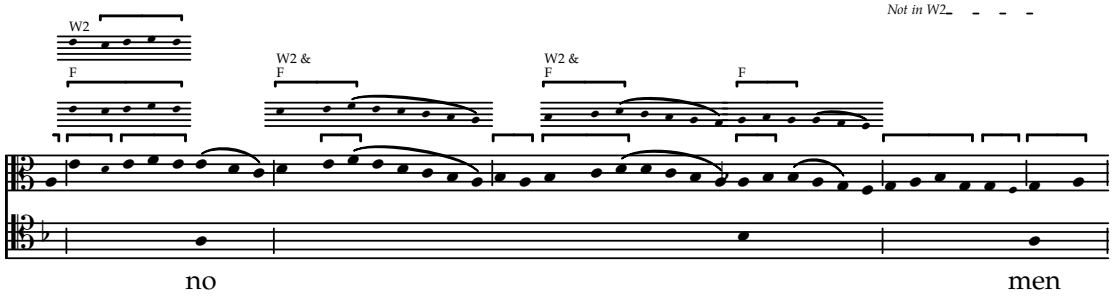
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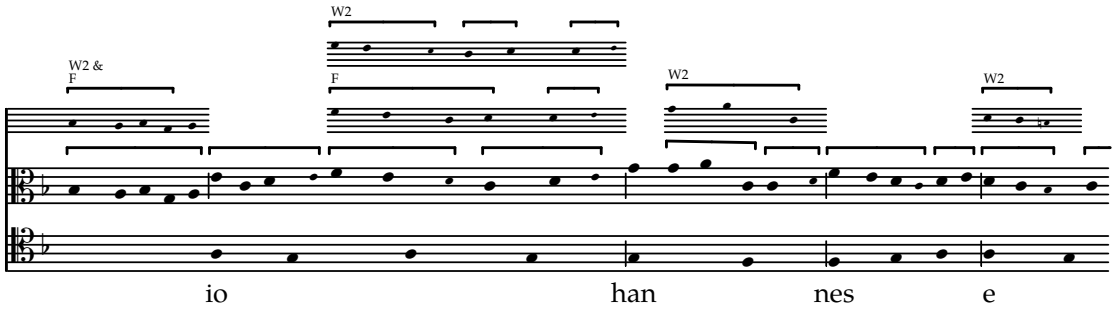
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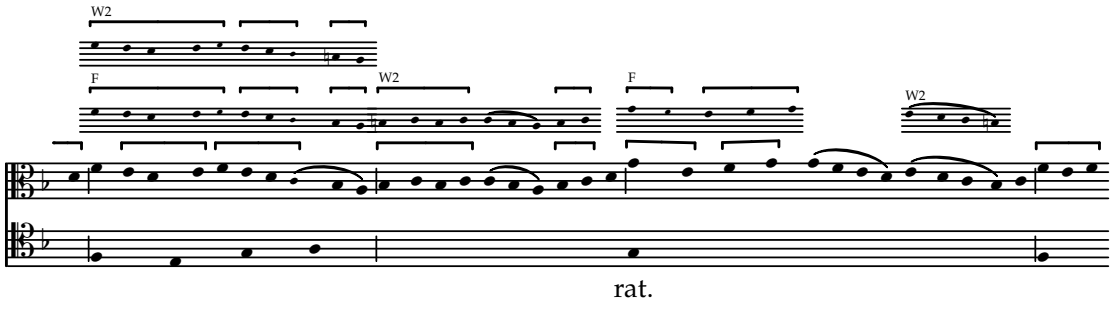
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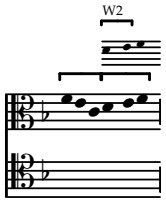
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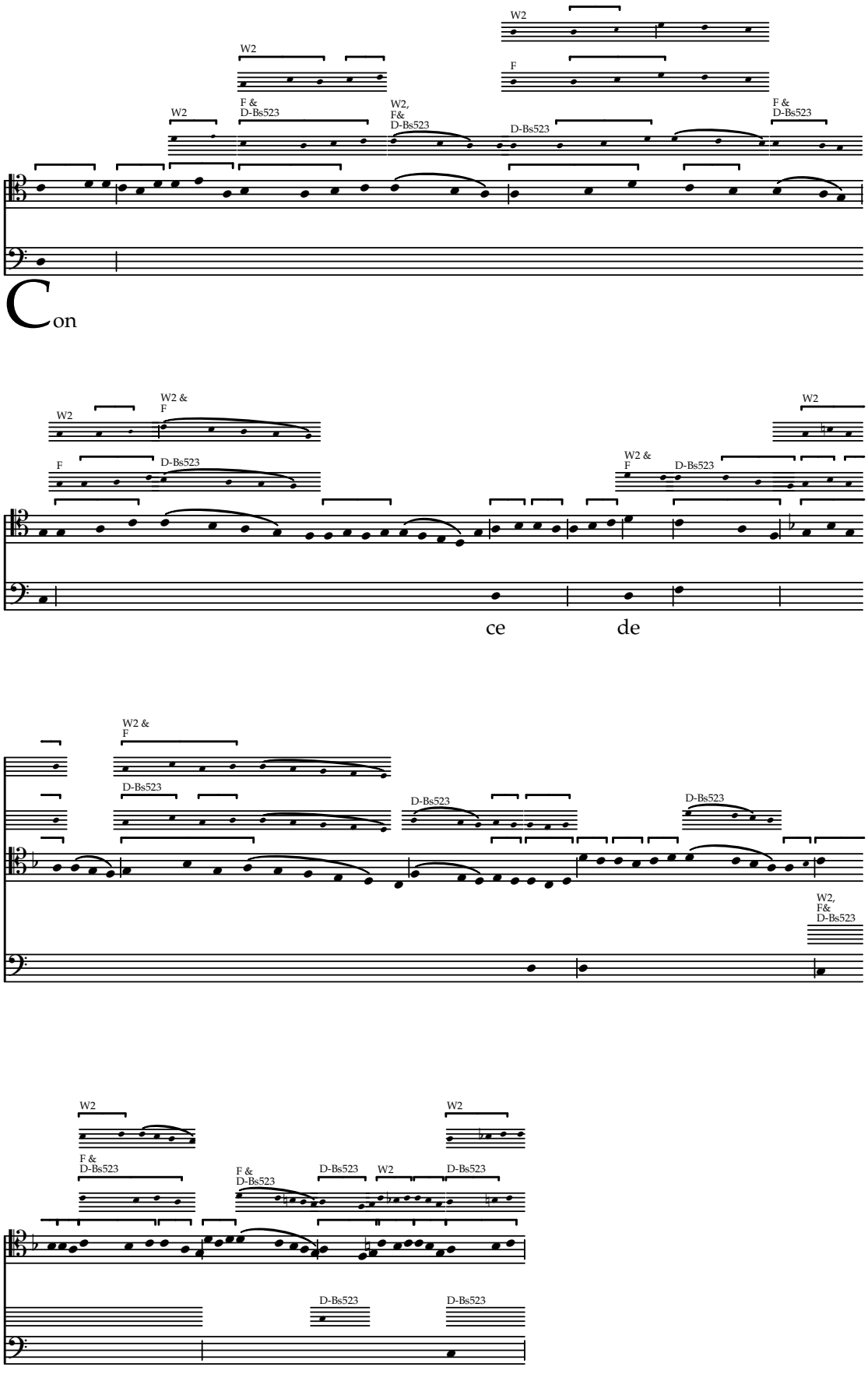
Concordances from W2, F & D-Bs523 f. 20



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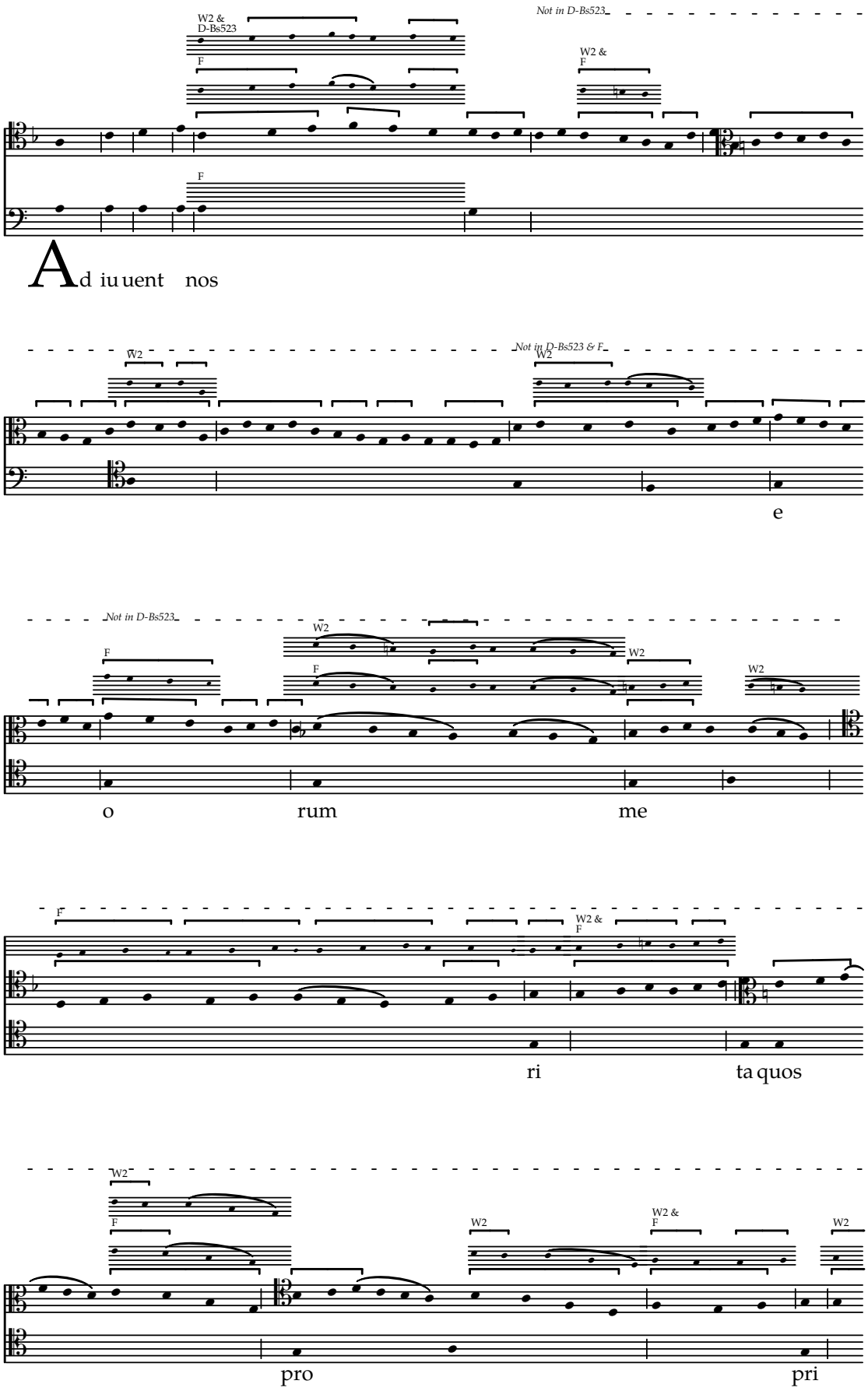
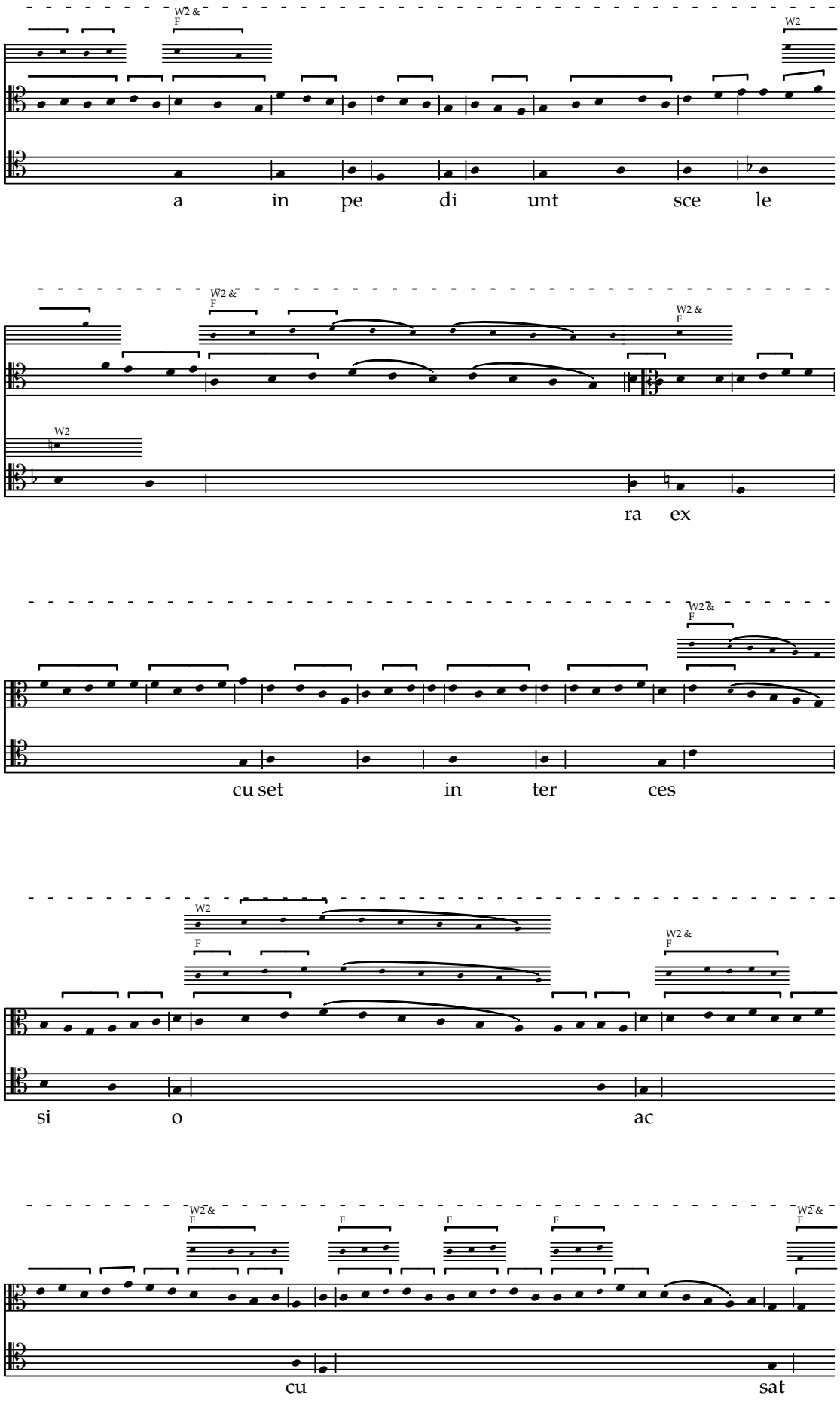
Concordances from W2, F & D-Bs523 f. 20–21

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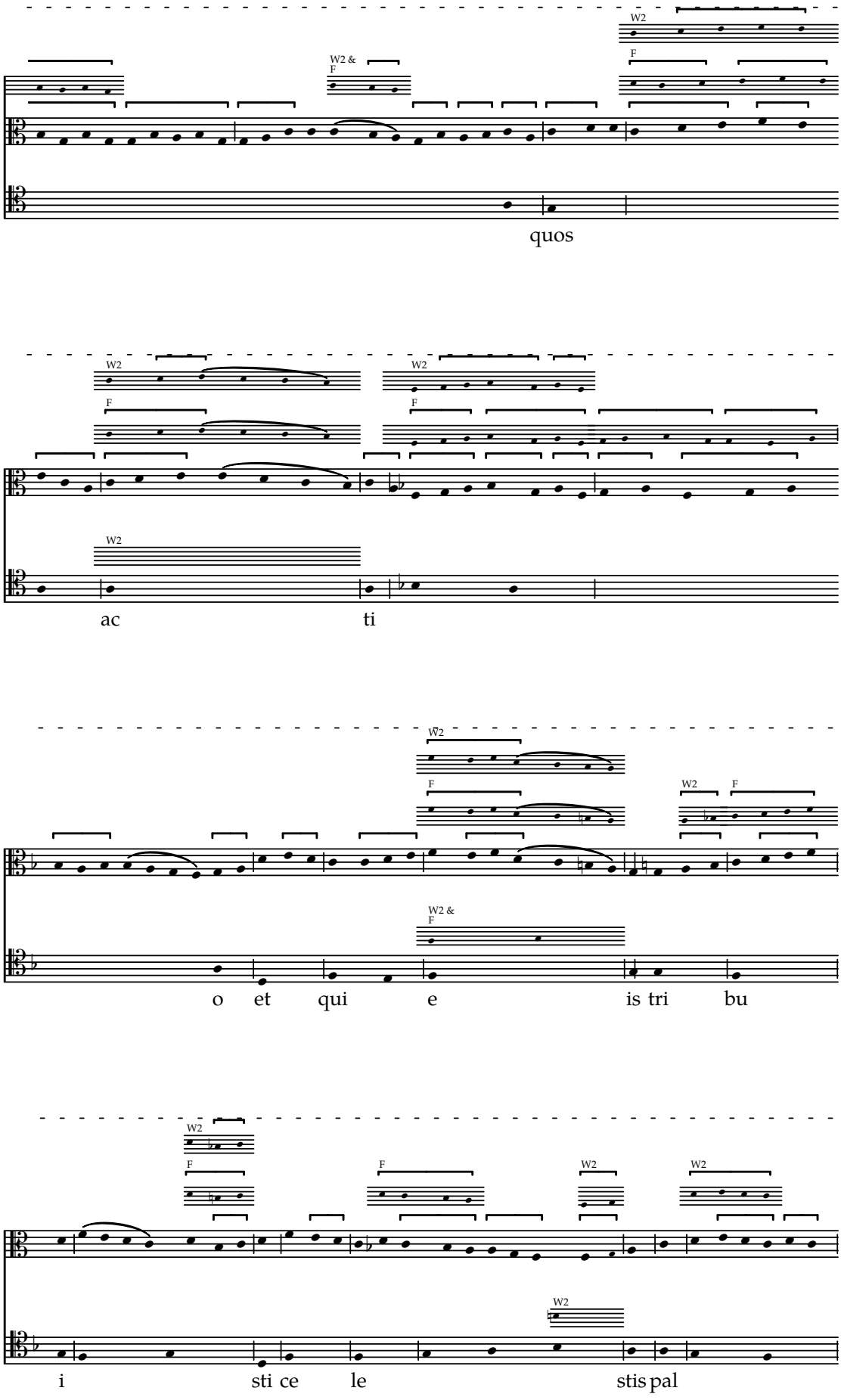
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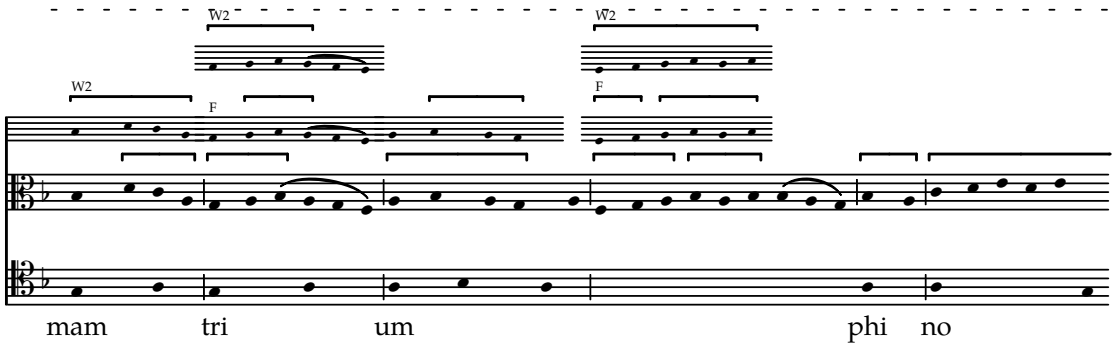
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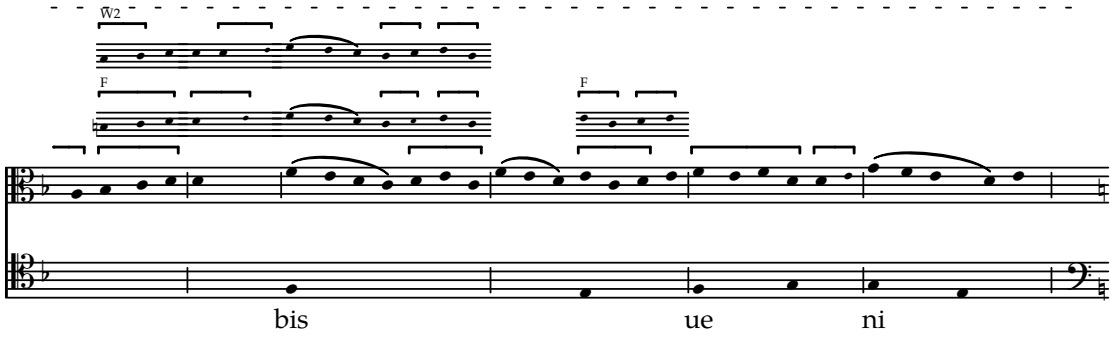
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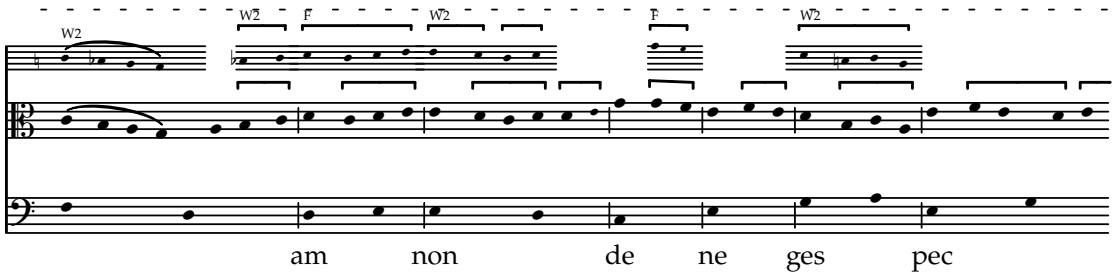
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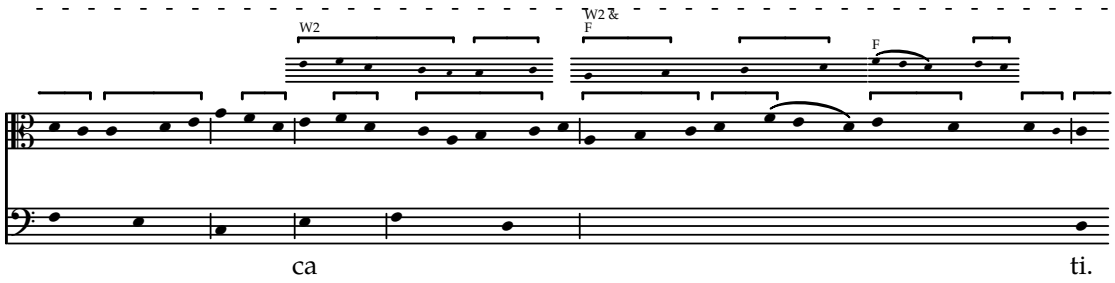
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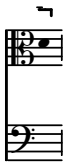

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Concordances from F

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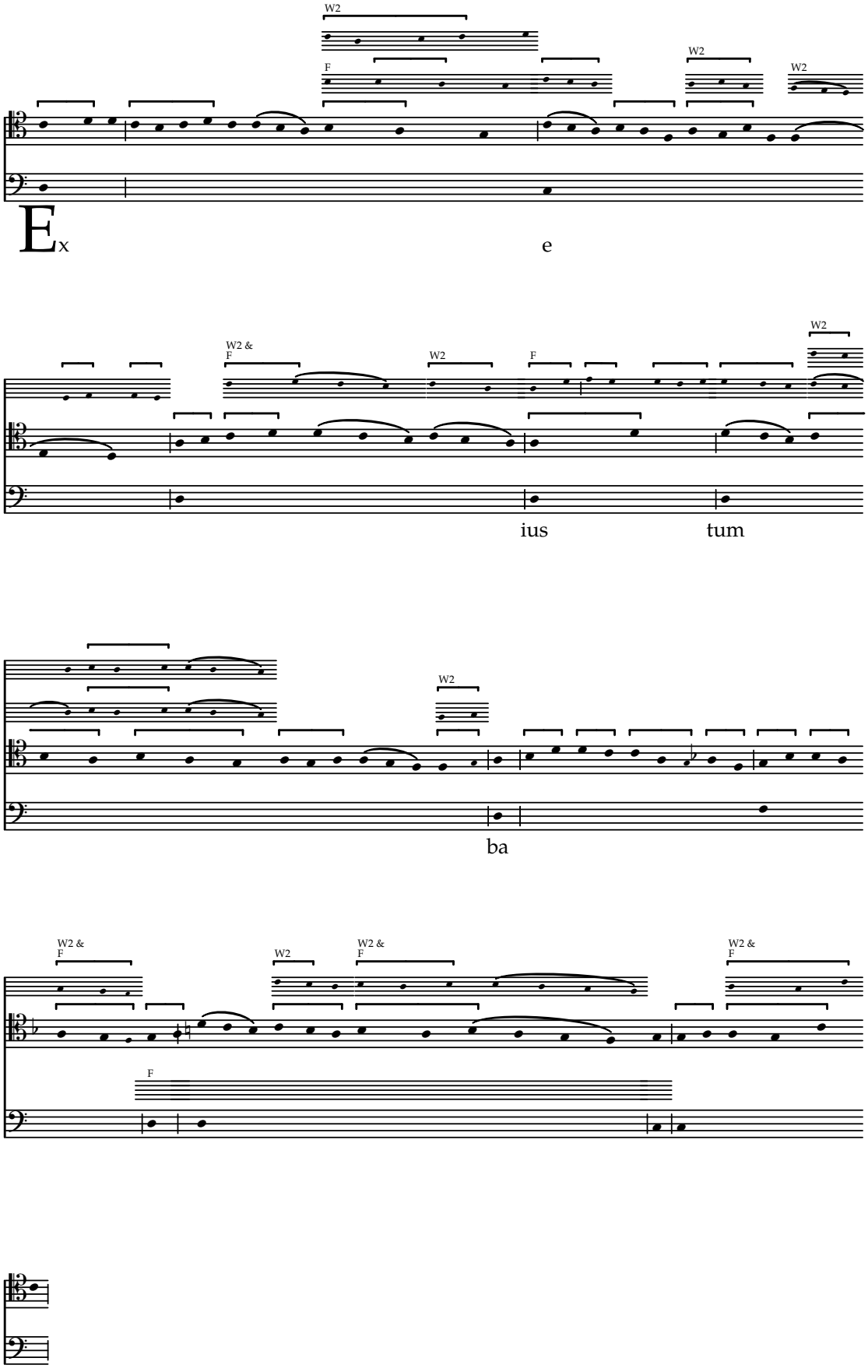

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Concordances from W2 & F

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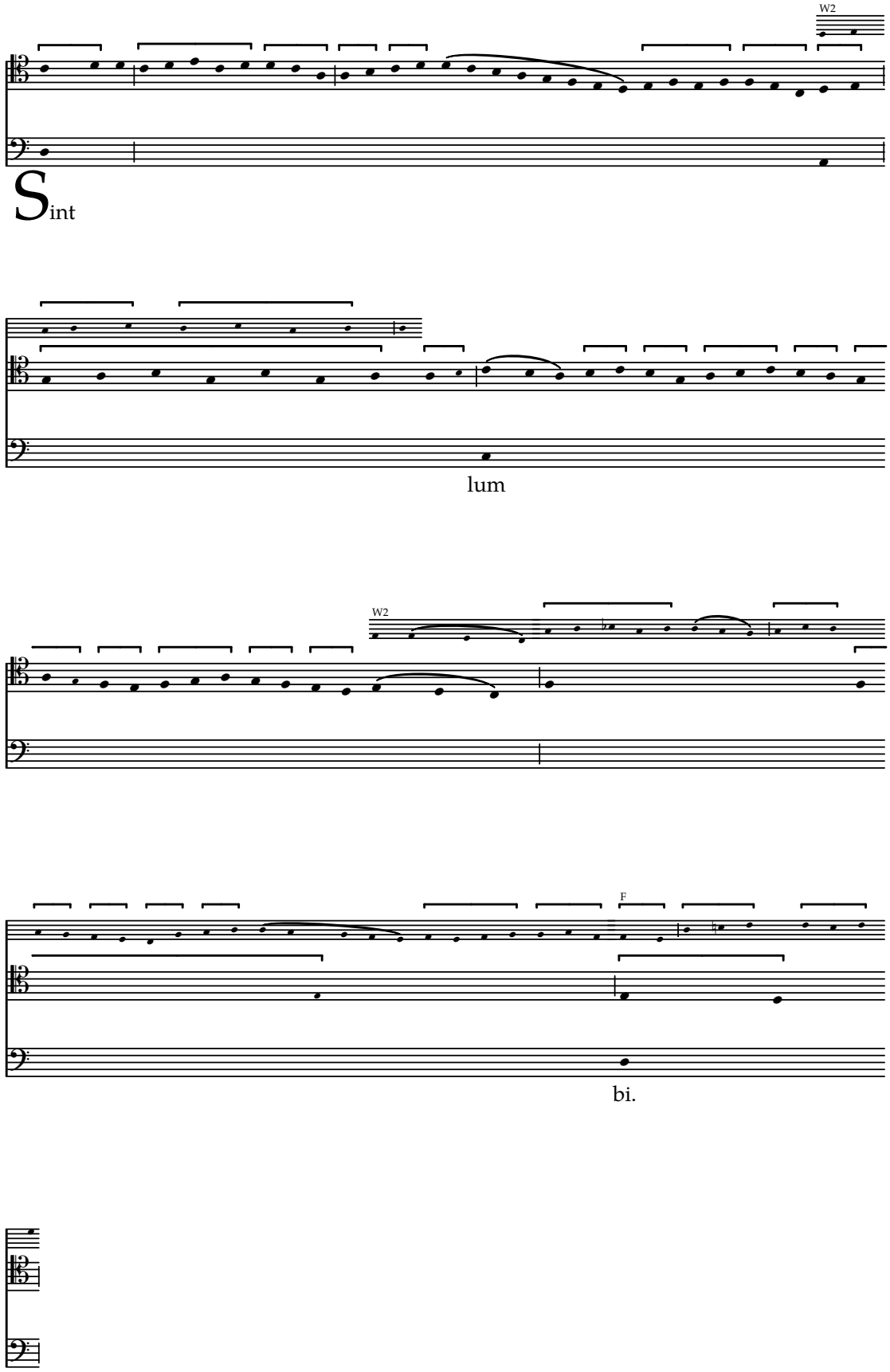

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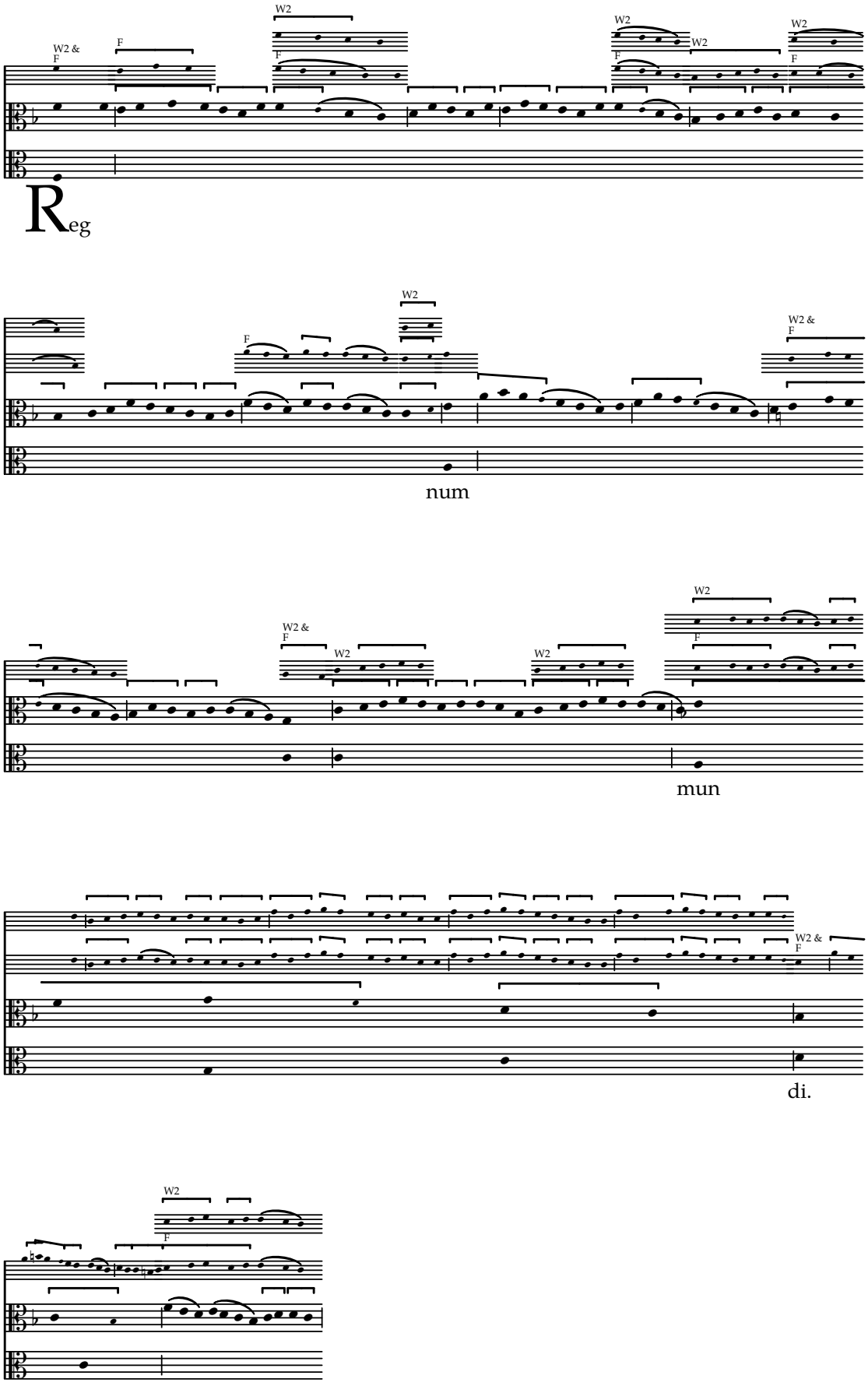
Concordances from W2 & F

f. 22



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Concordances from W2 & F

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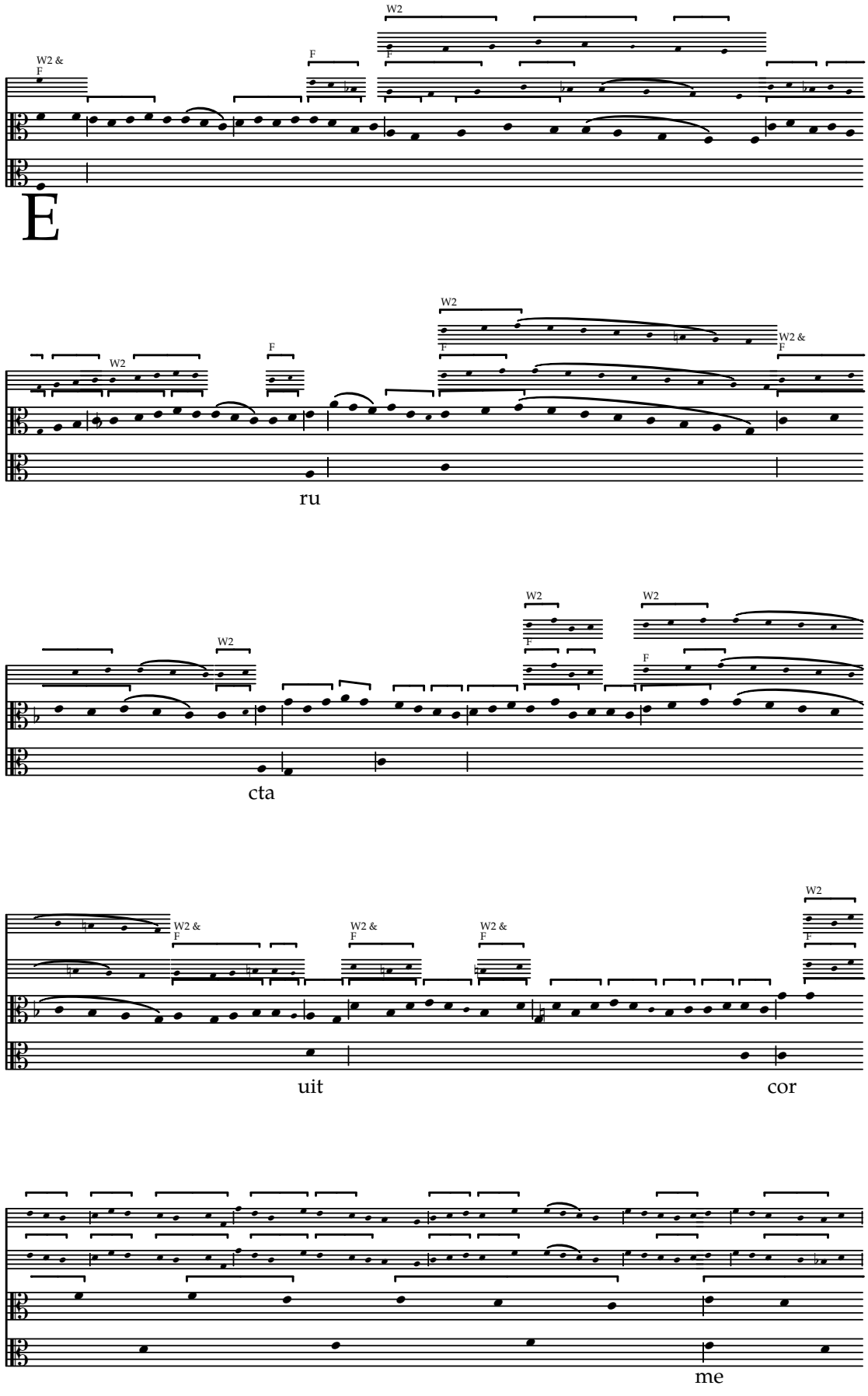

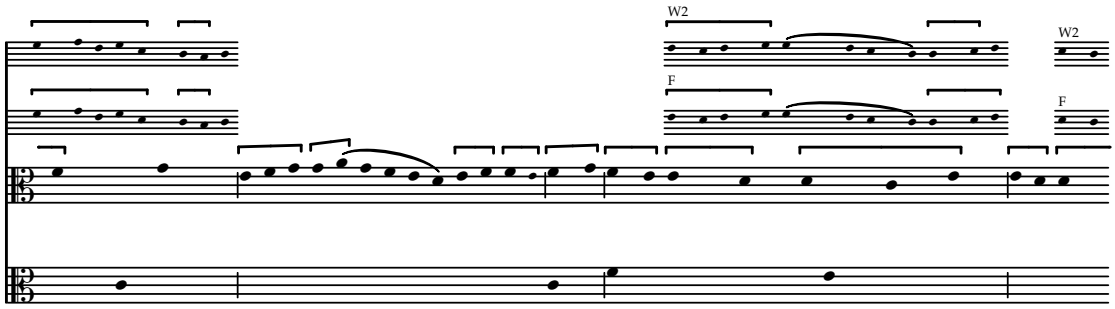
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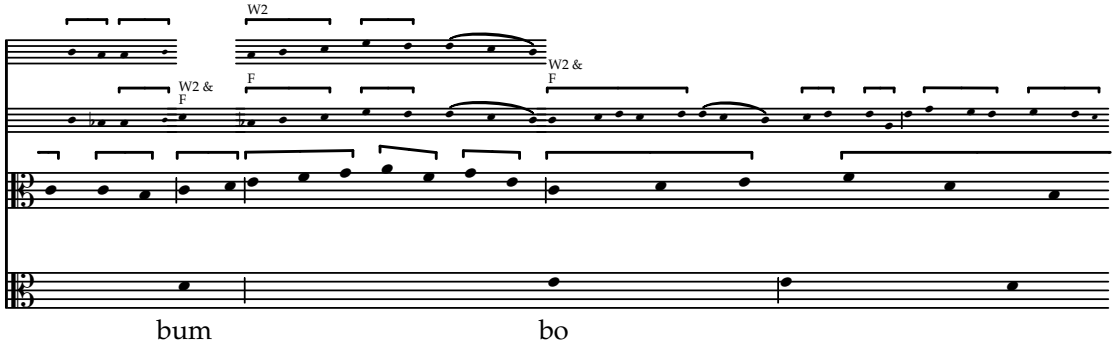
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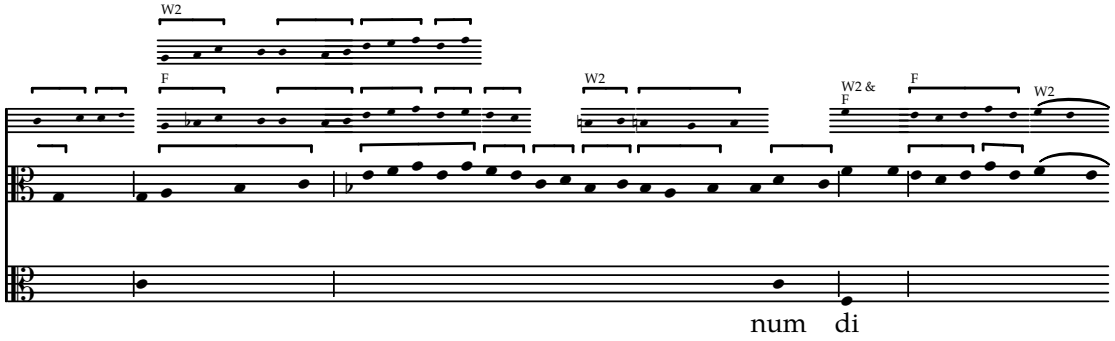
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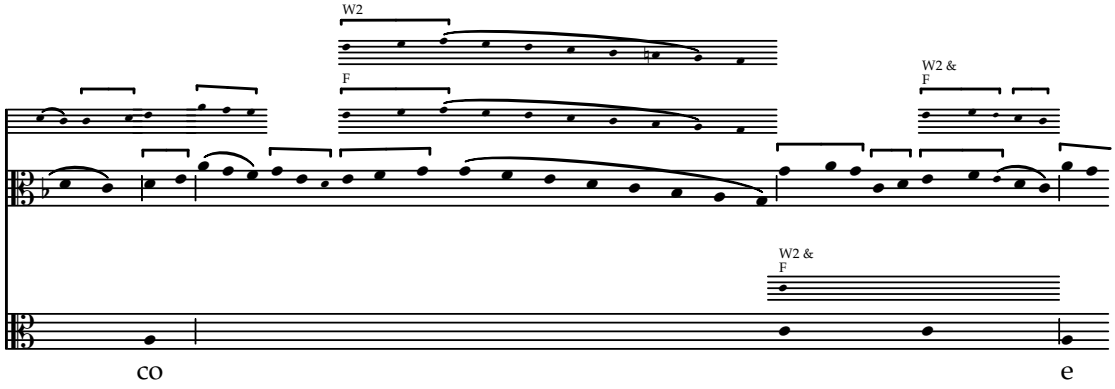
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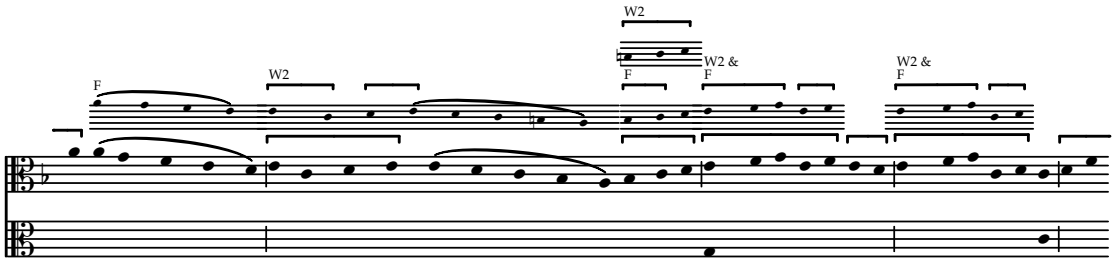
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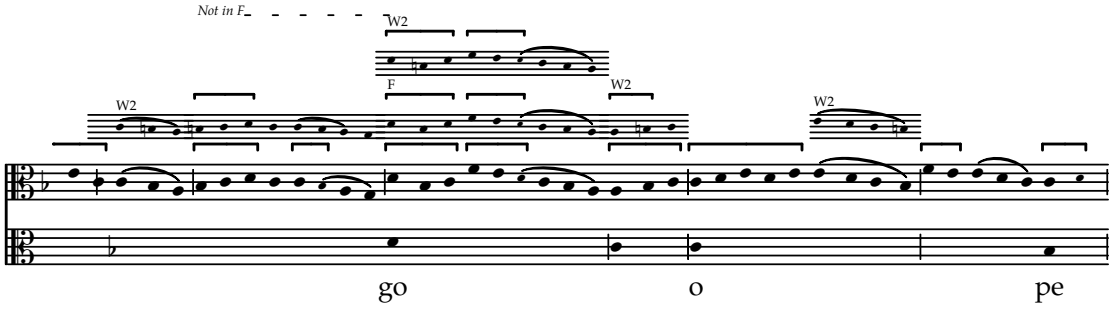
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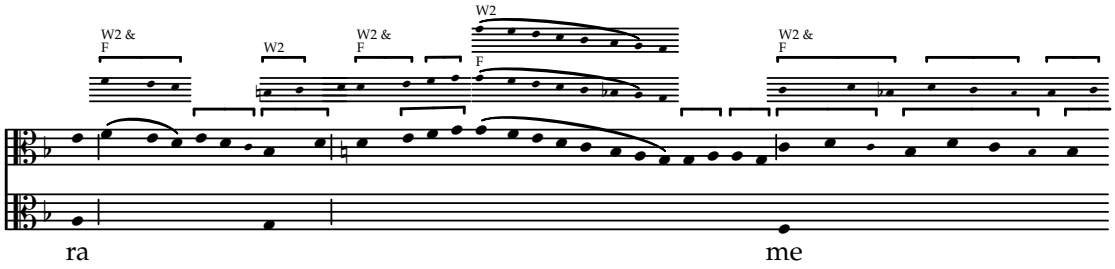
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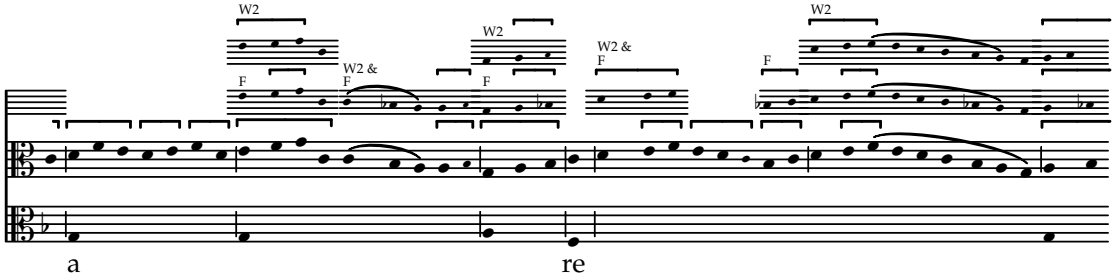
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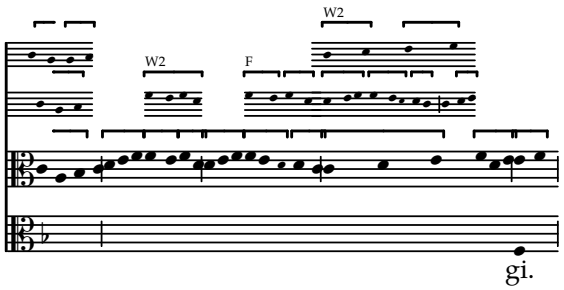
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Concordances from W2 & F

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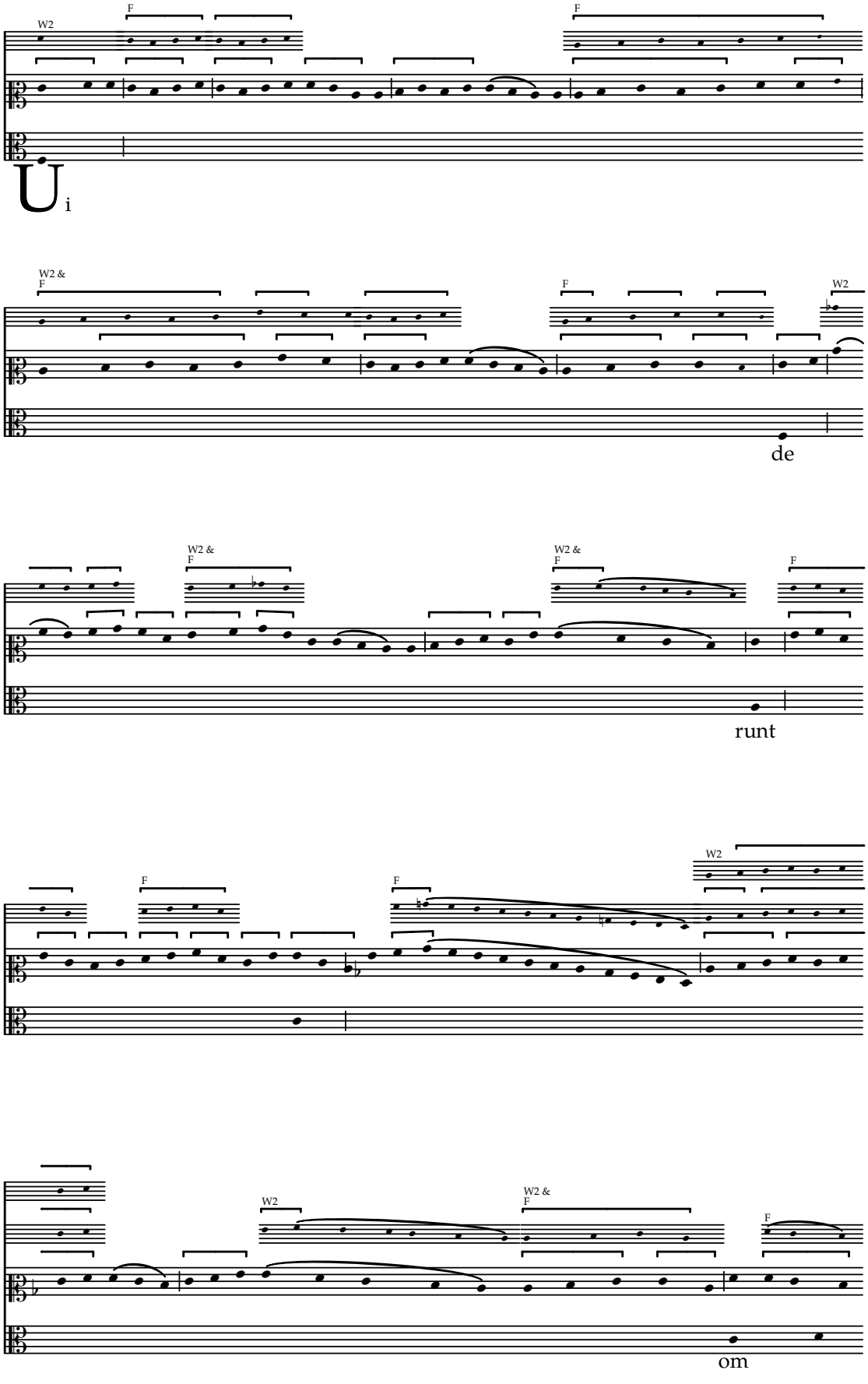

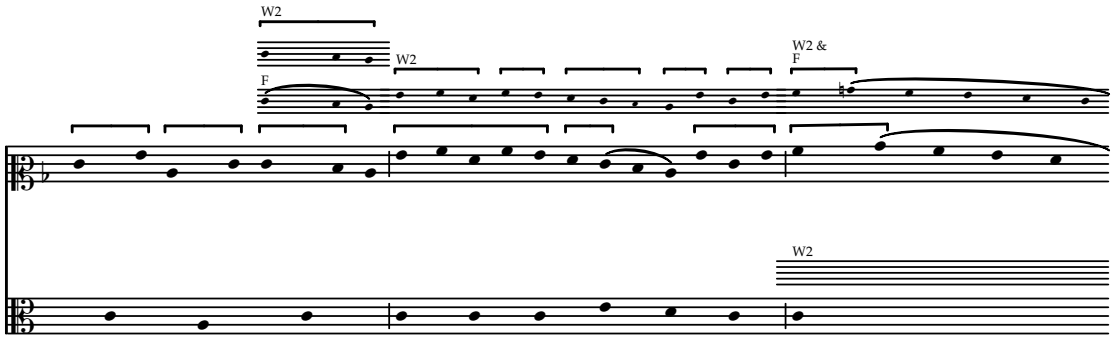

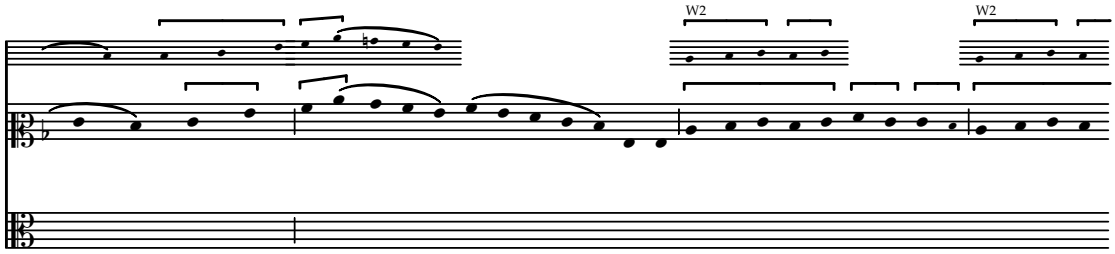

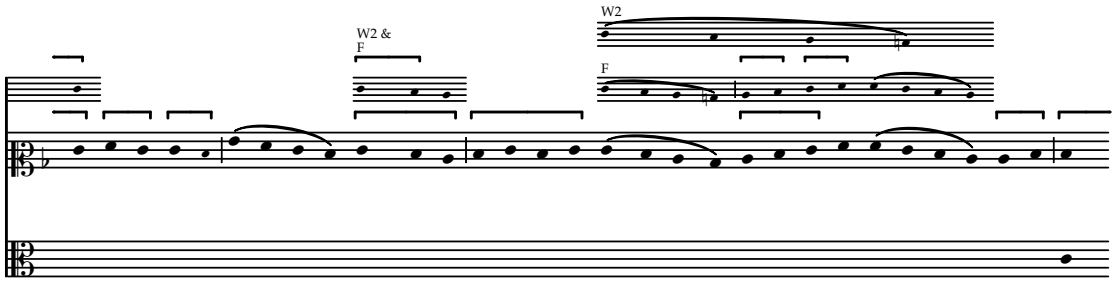

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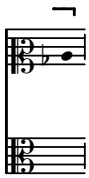

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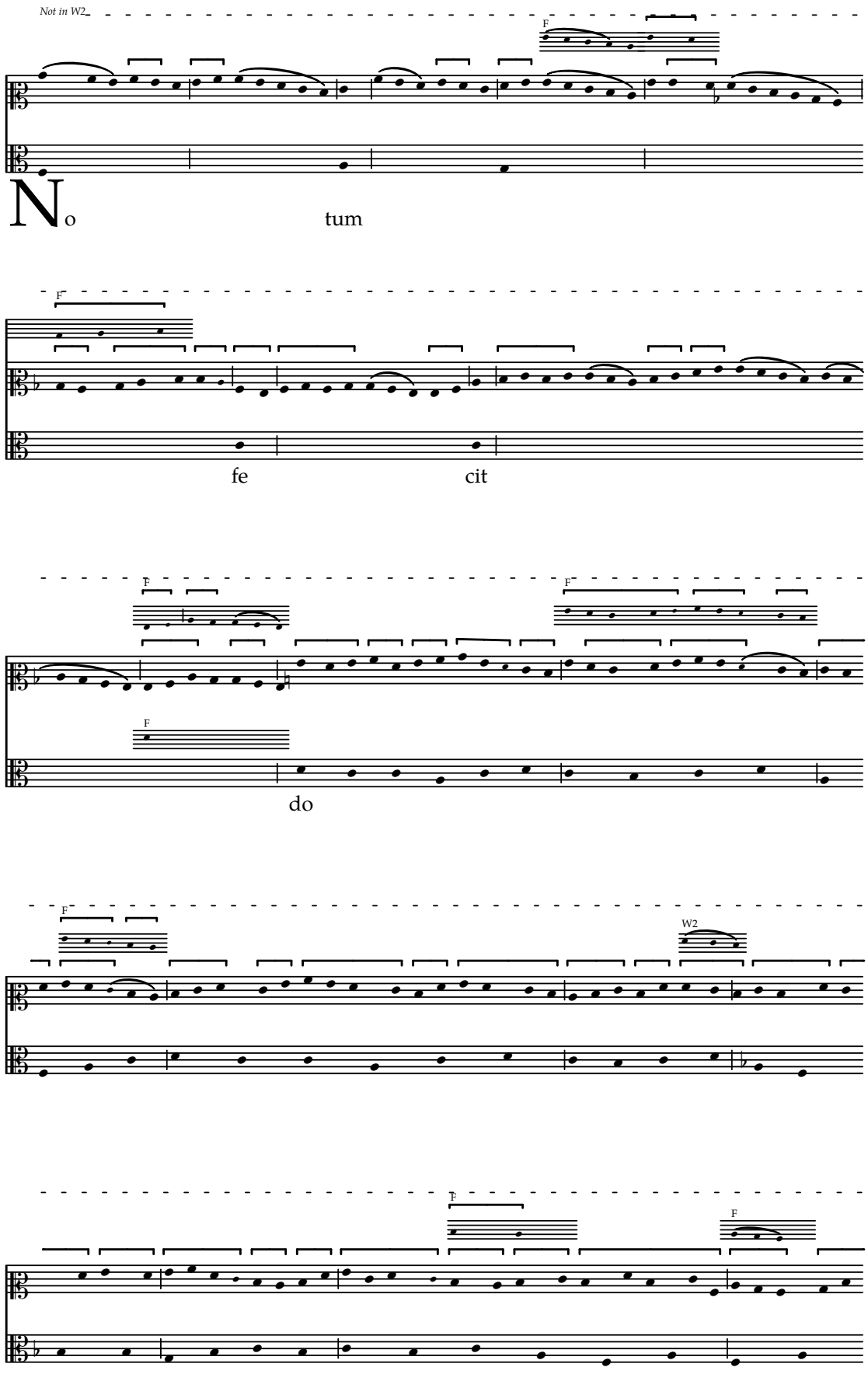
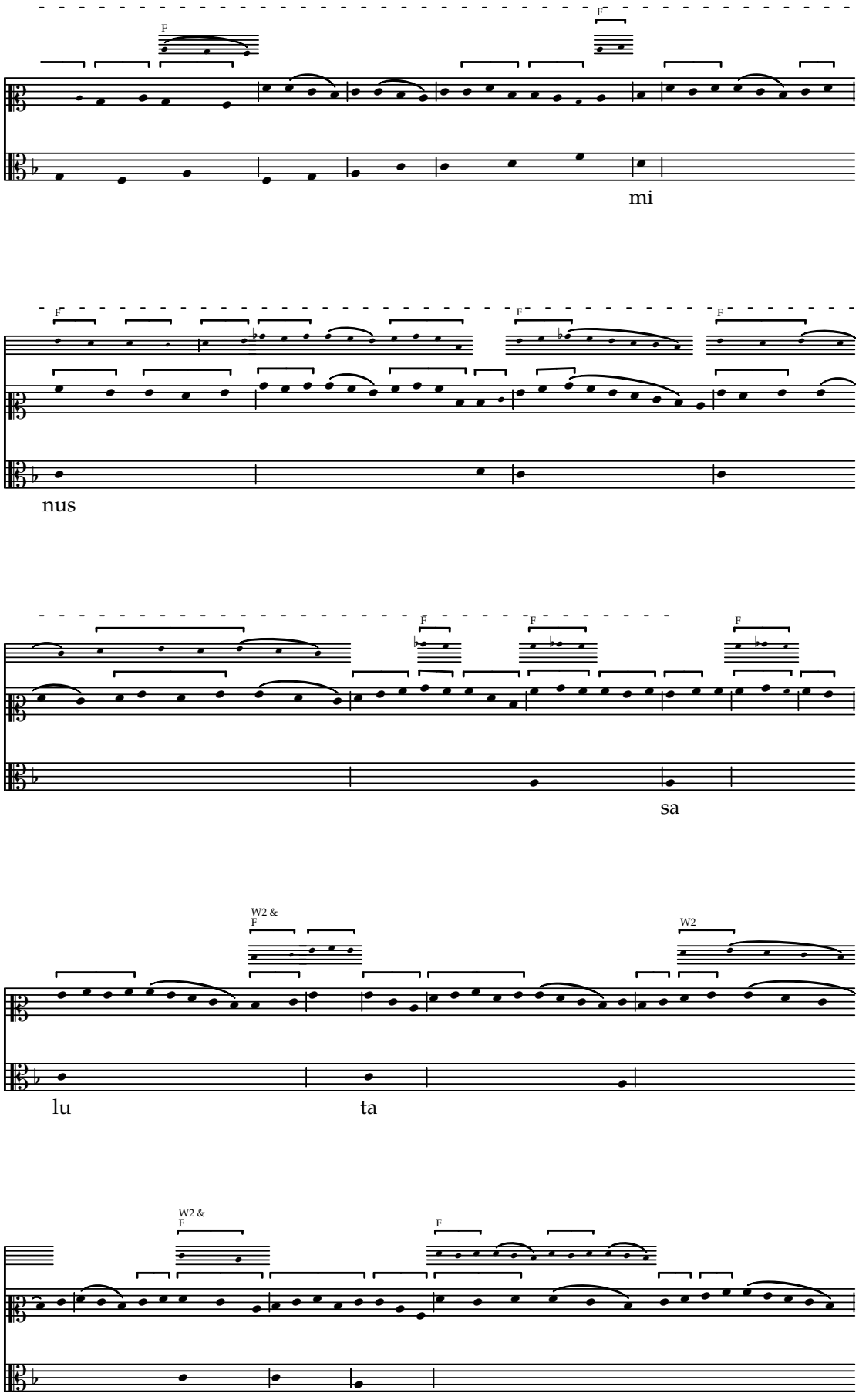
Concordances from W2 & F

f. 25–25v

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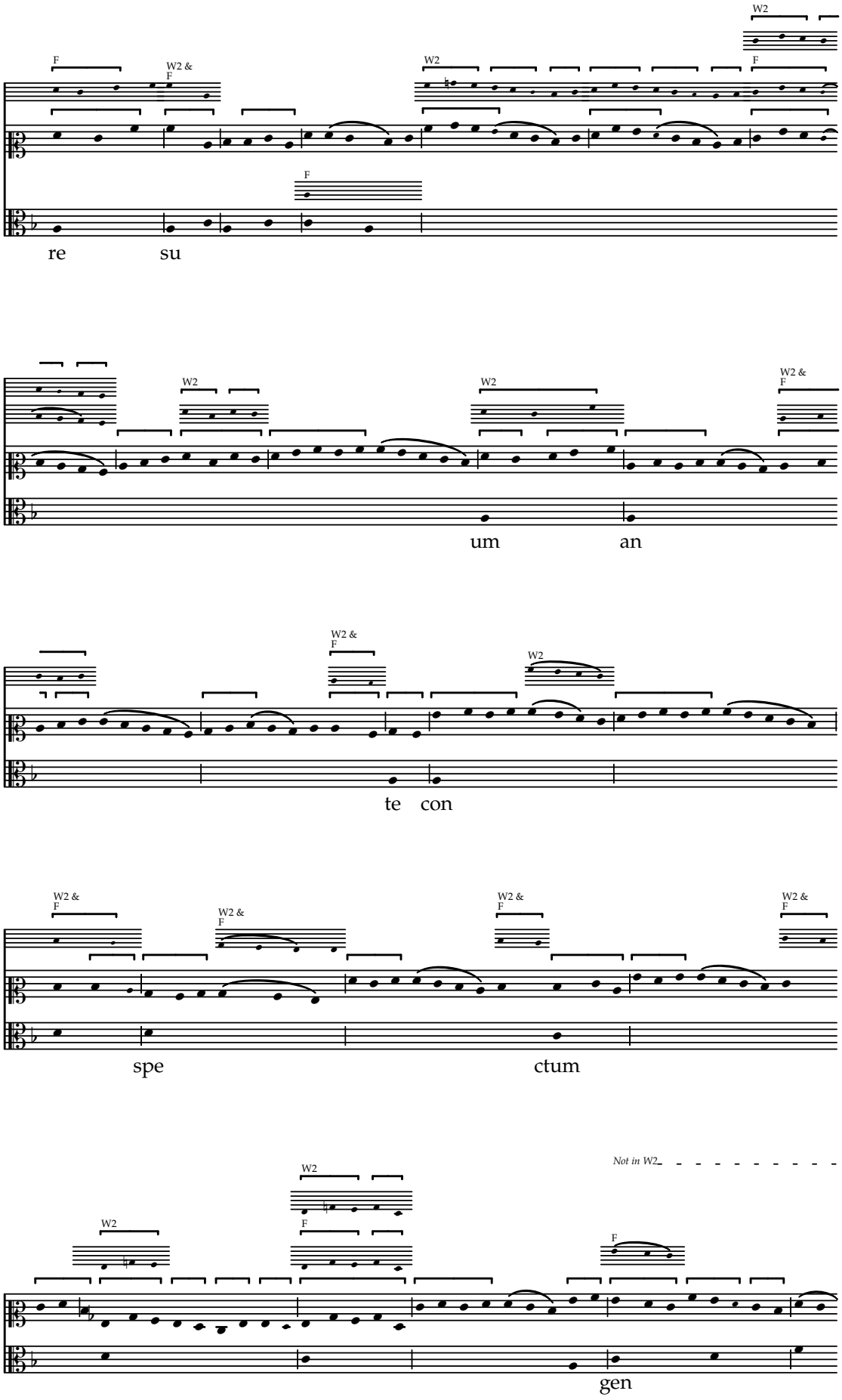
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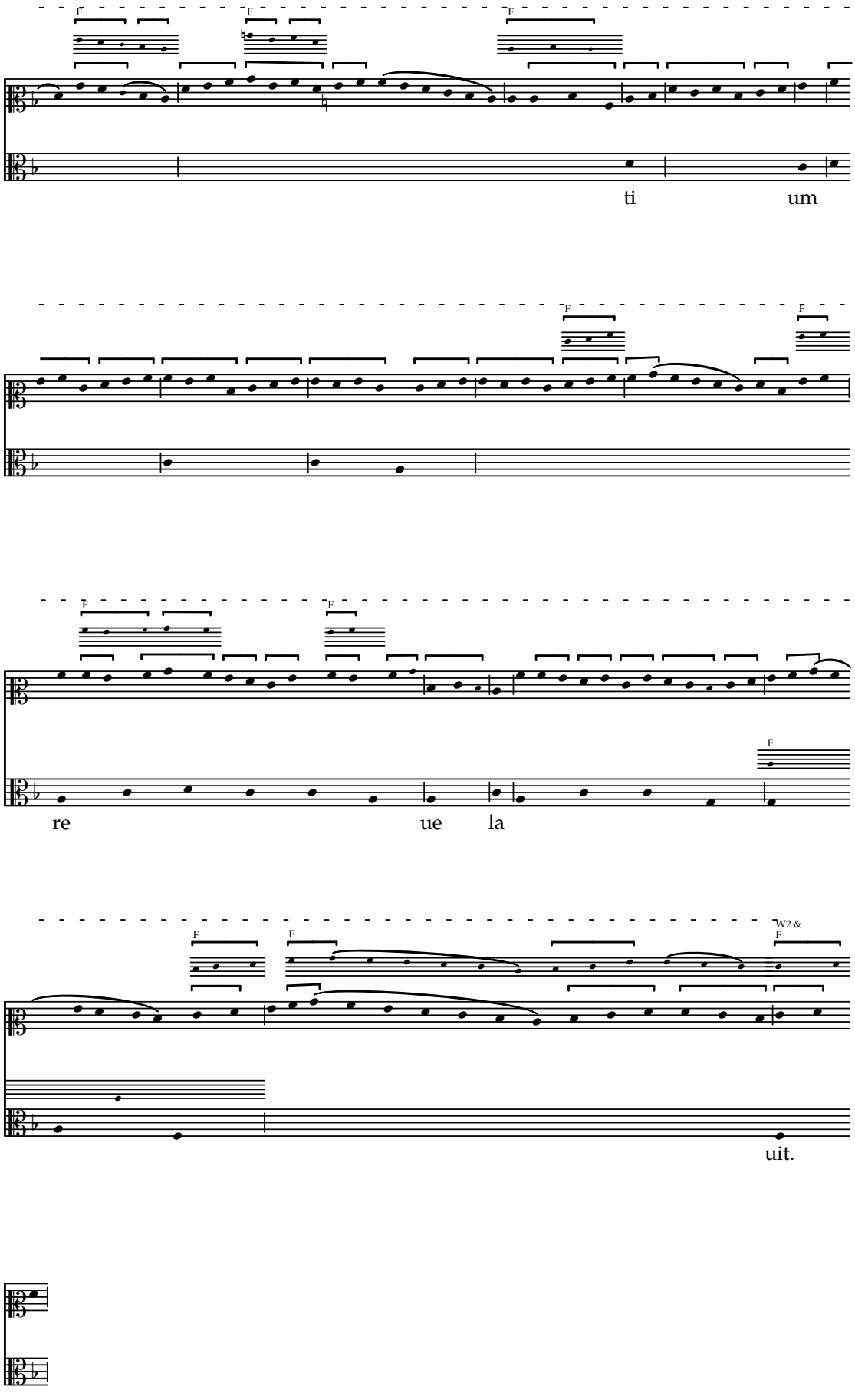
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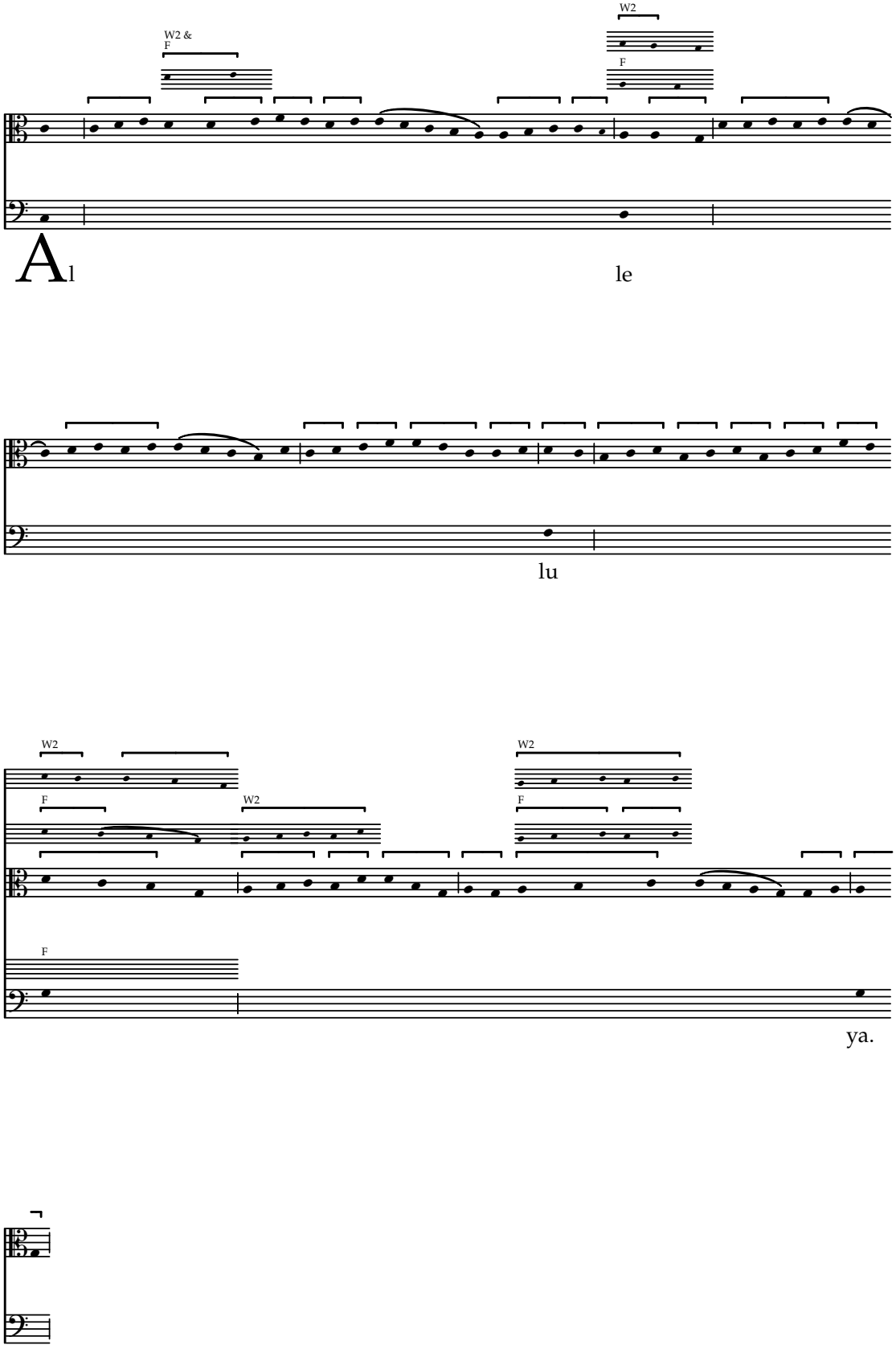
Concordances from W2 & F

f. 25v



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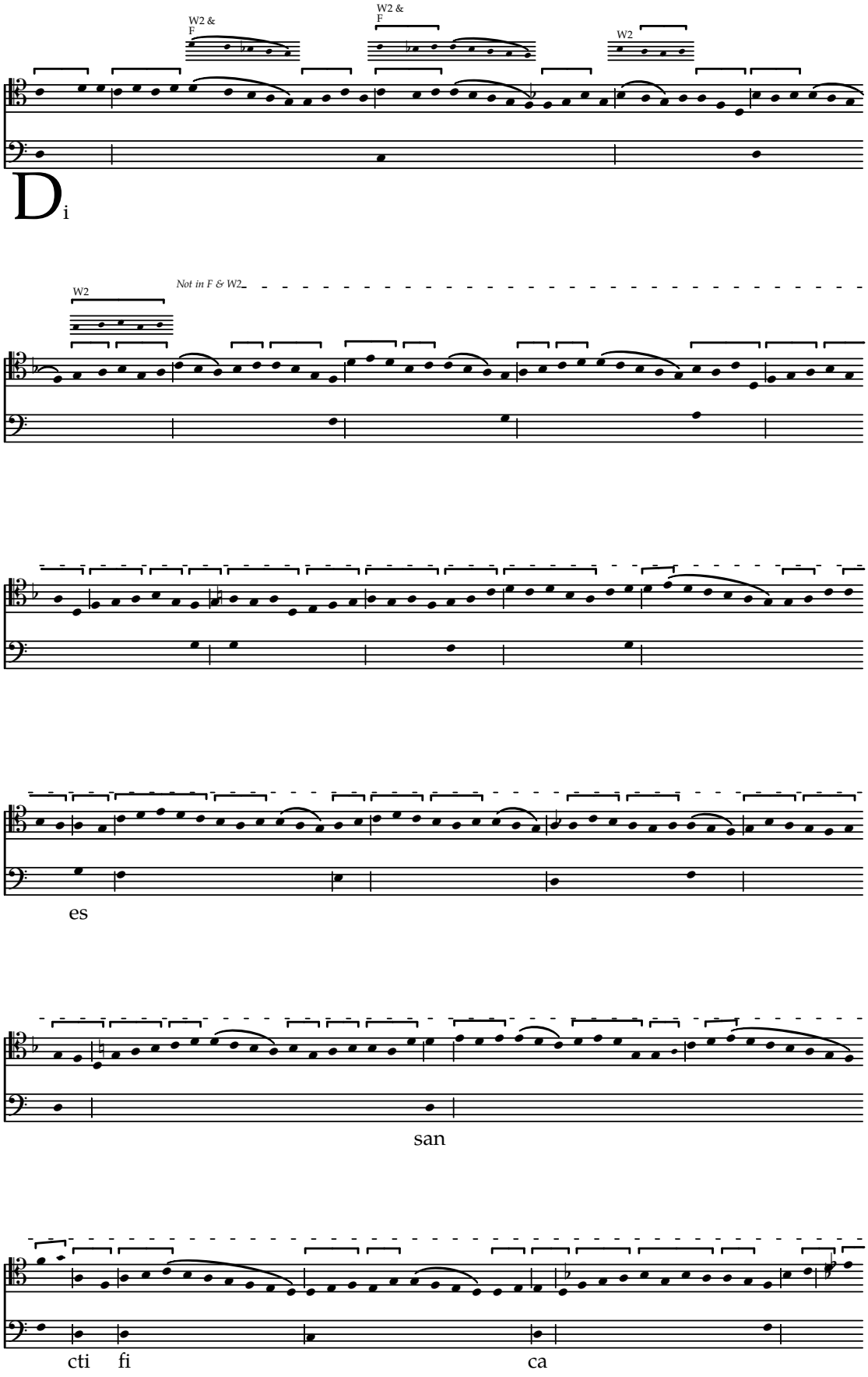
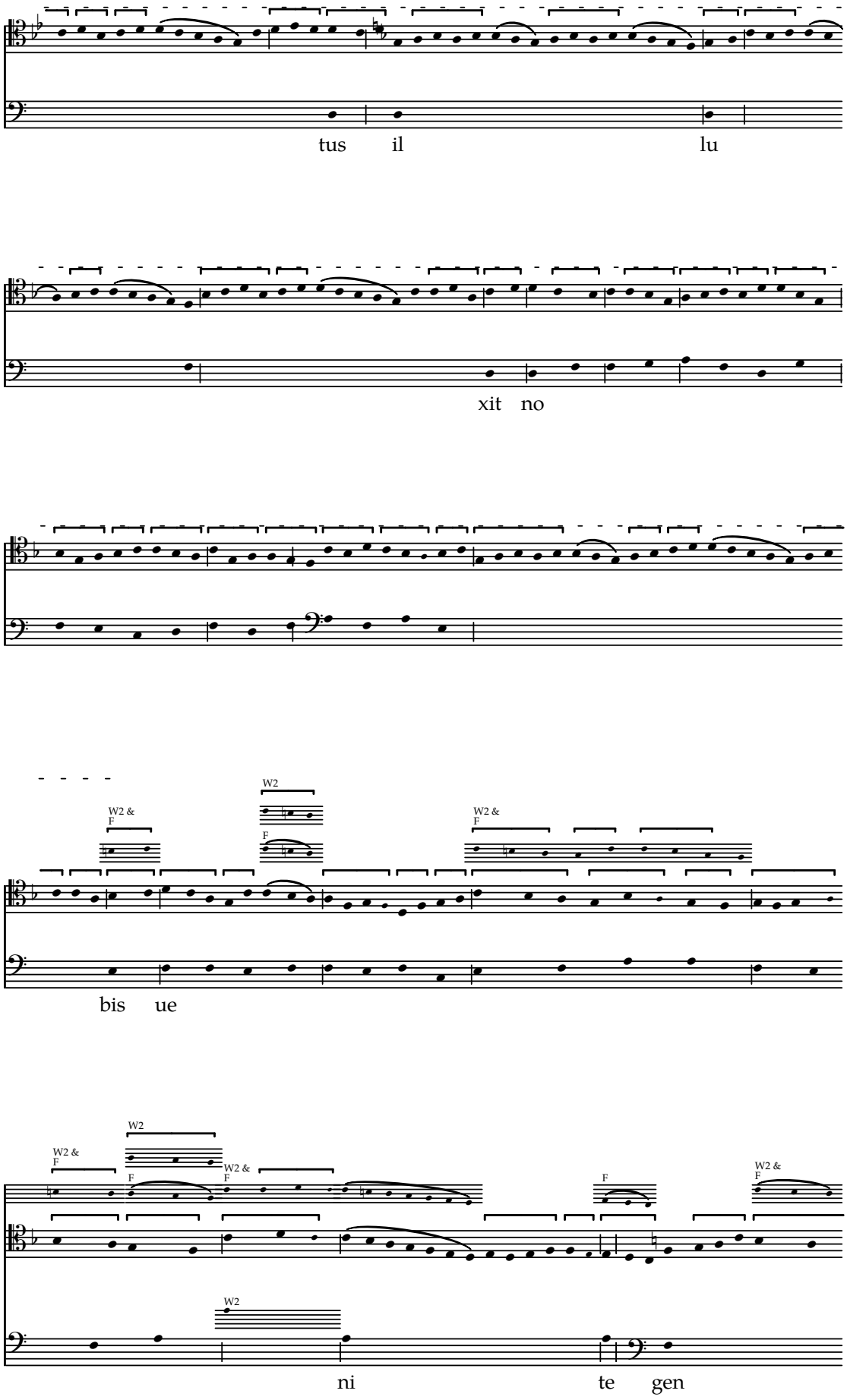
Concordances from W2 & F

f. 25v–26v

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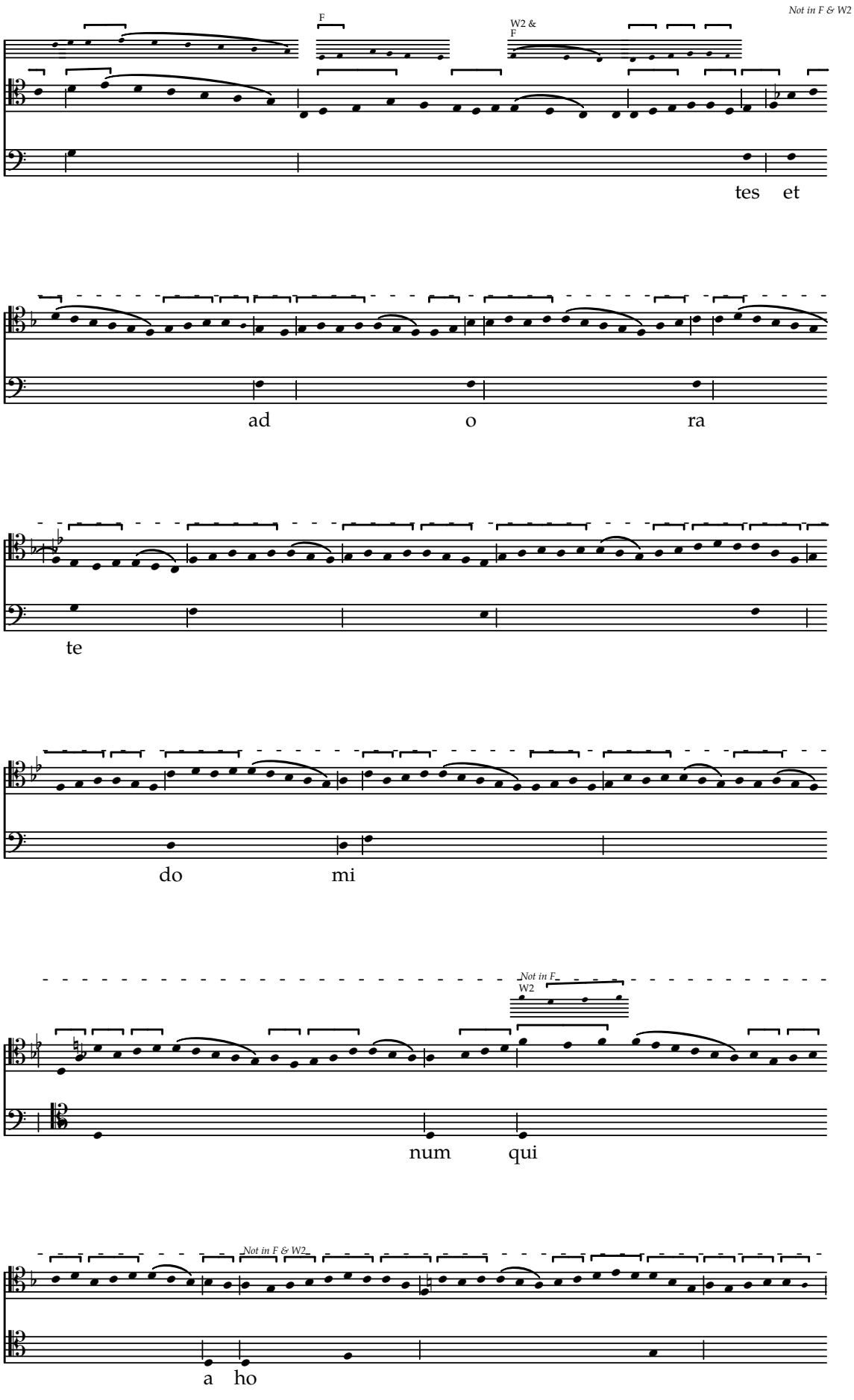
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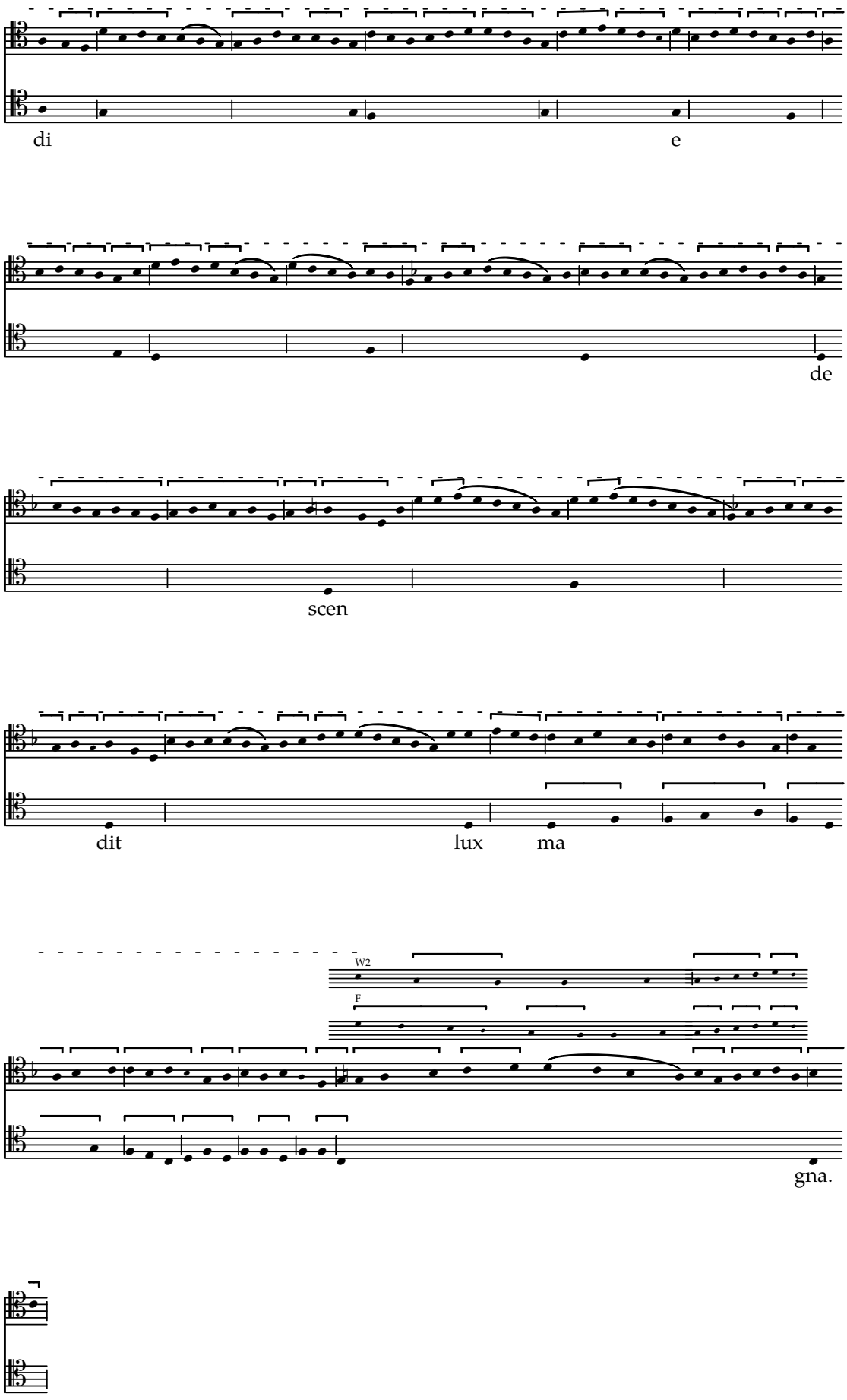
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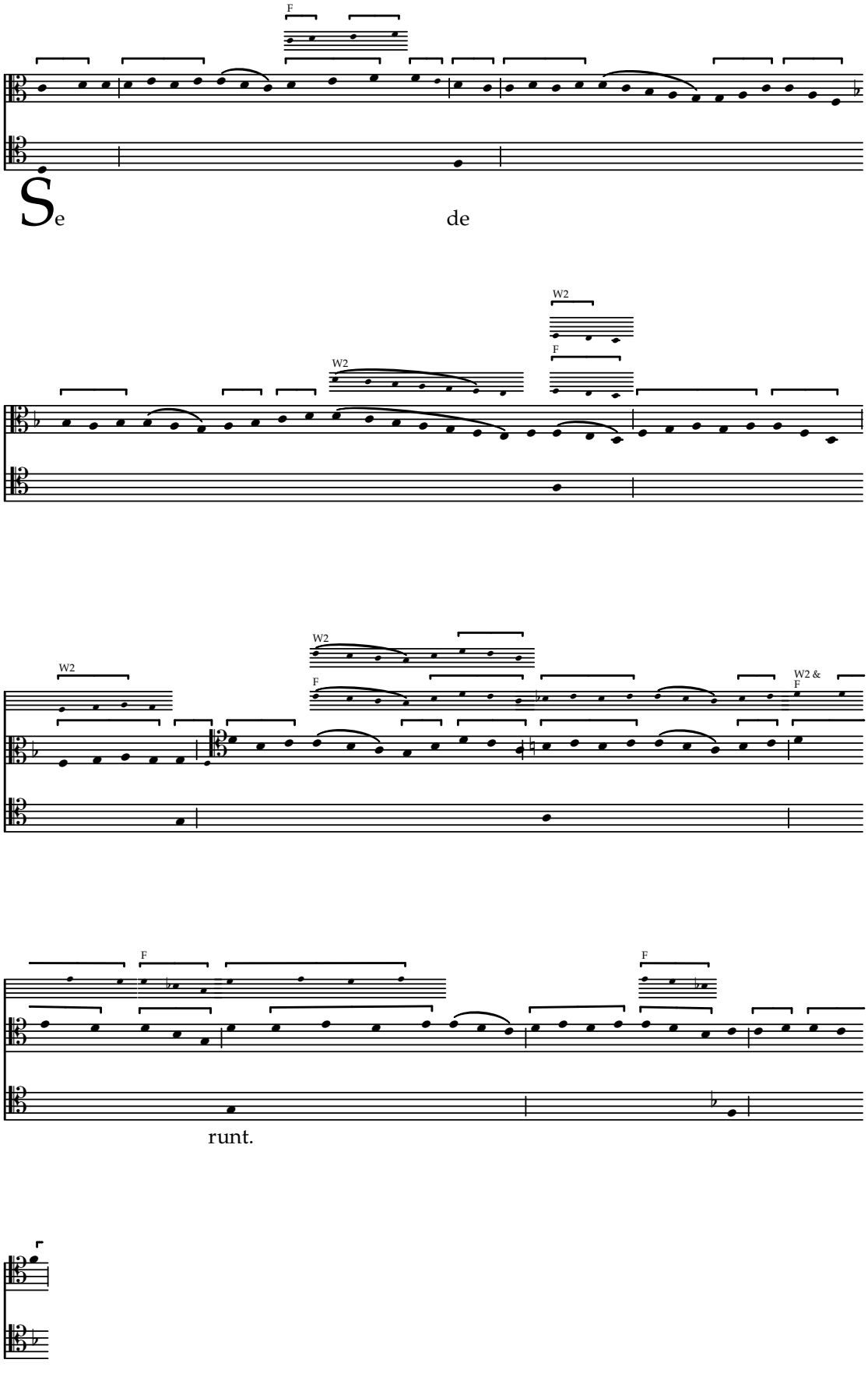
Concordances from W2 & F

f. 26v



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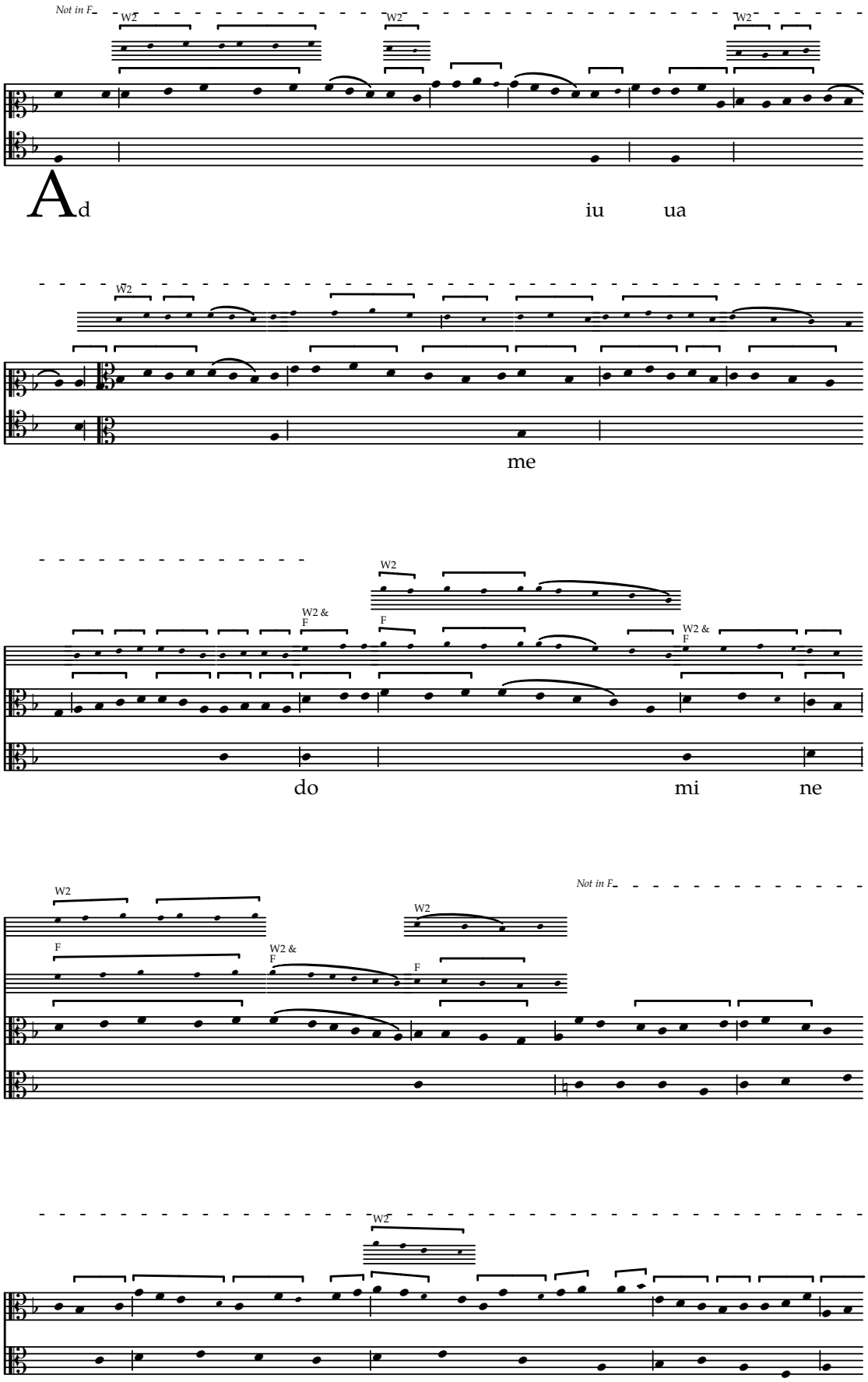
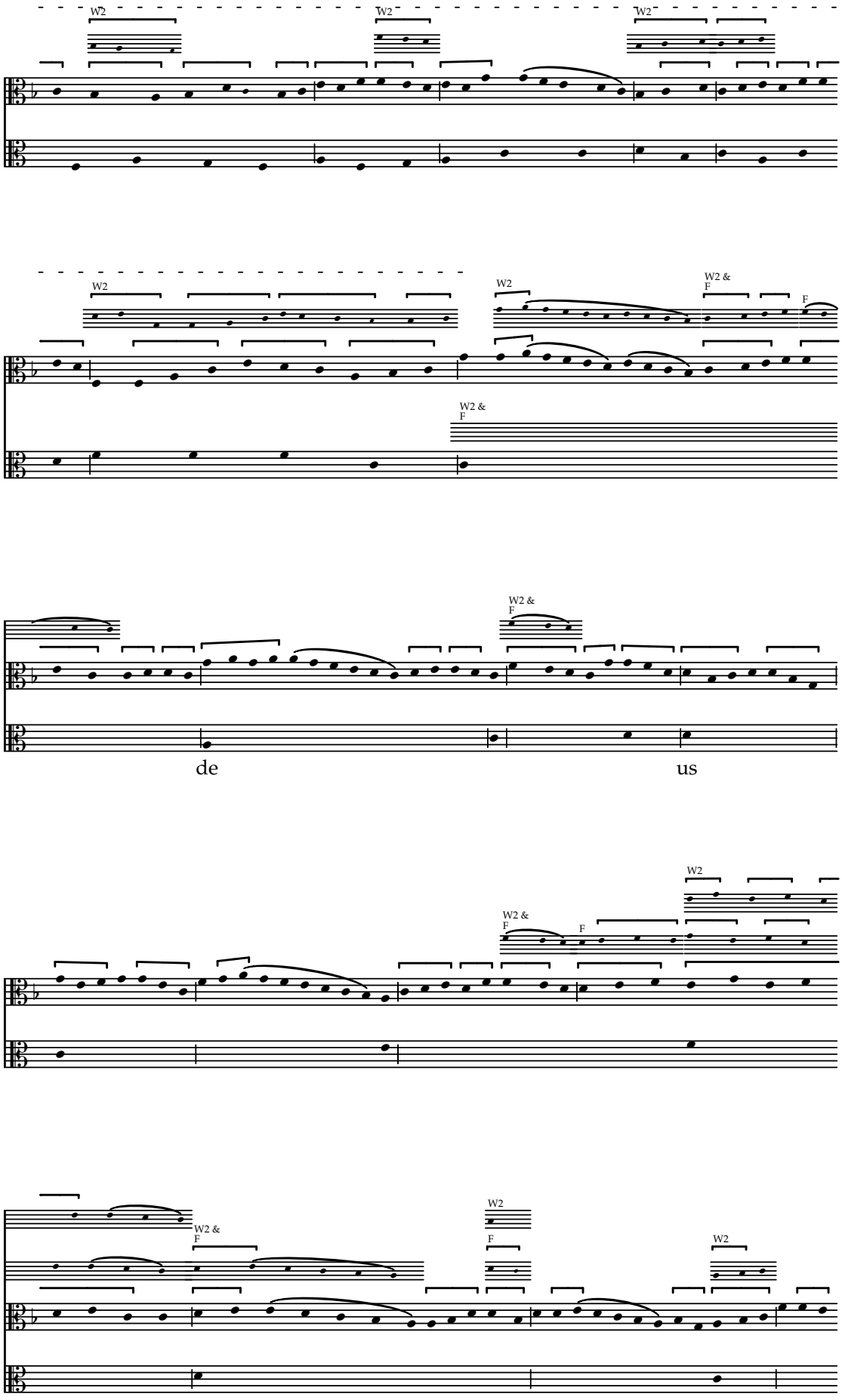
Concordances from W2 & F

f. 26v–27v

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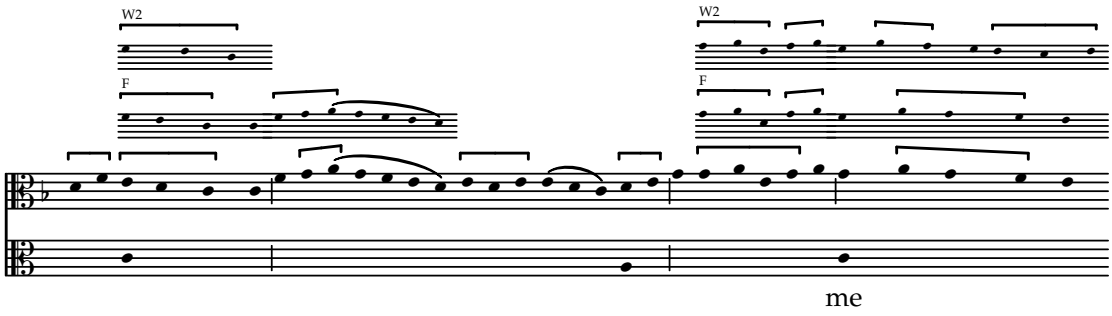
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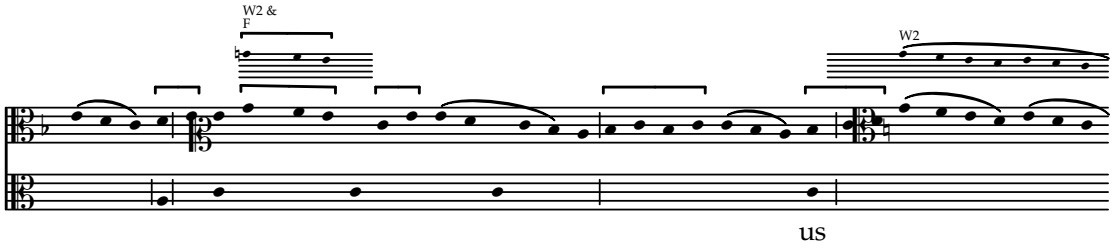
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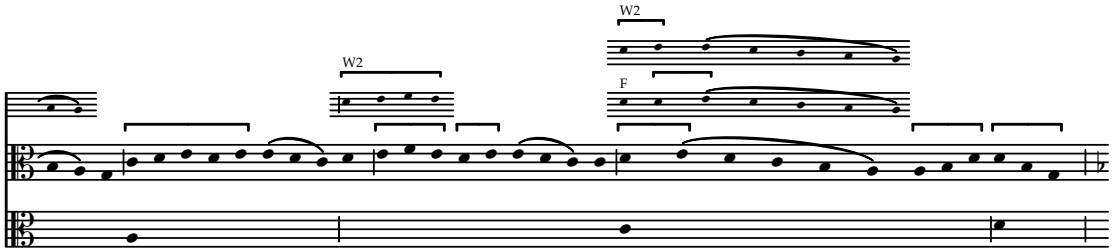
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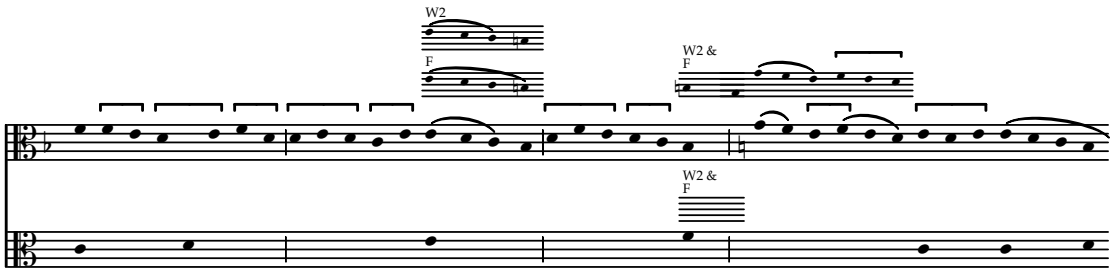
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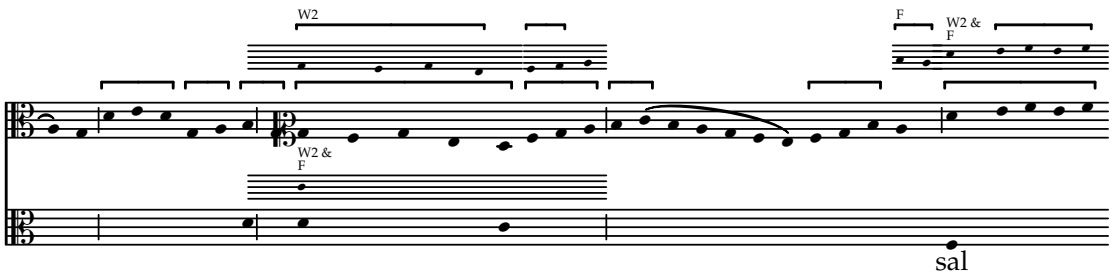
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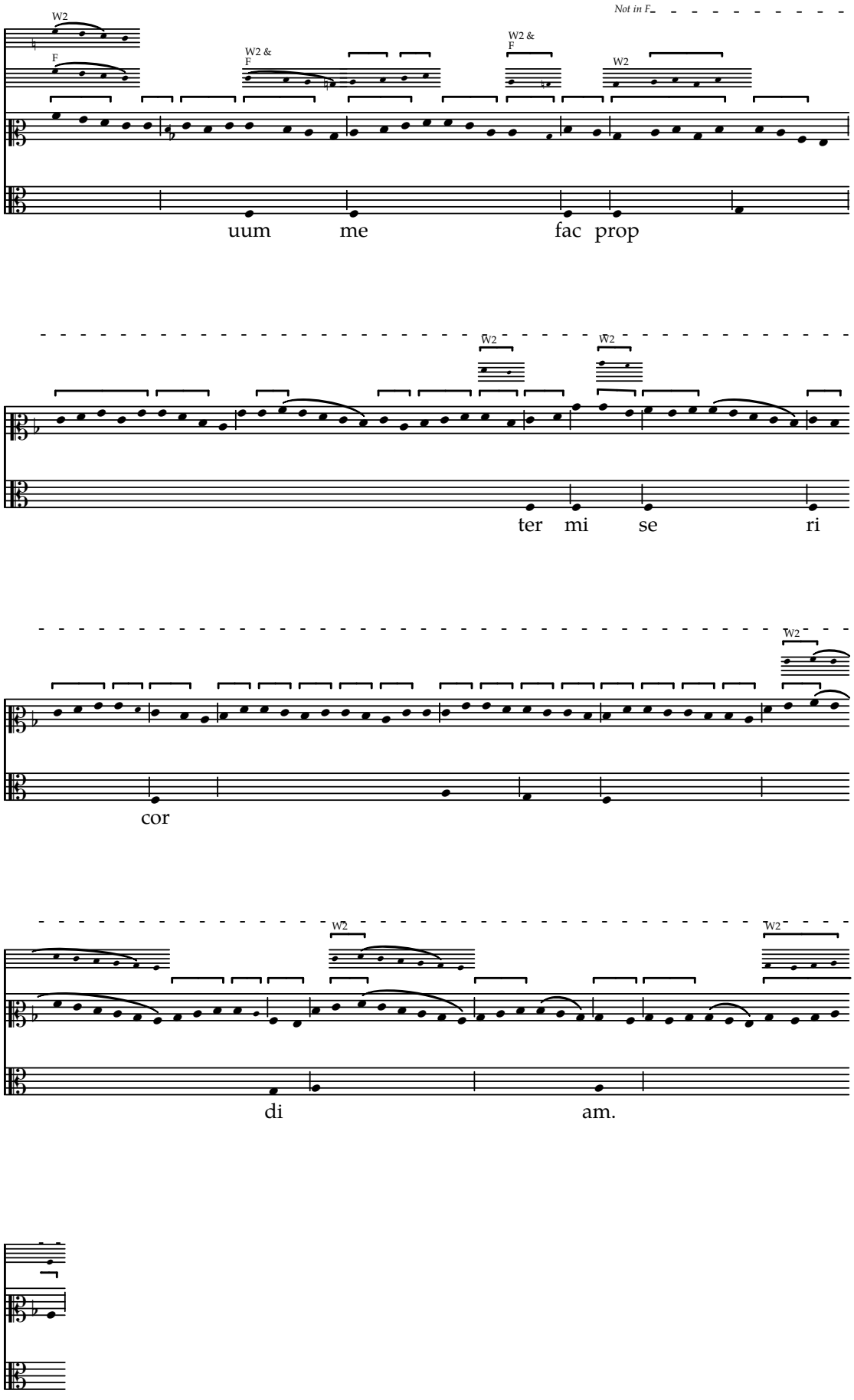
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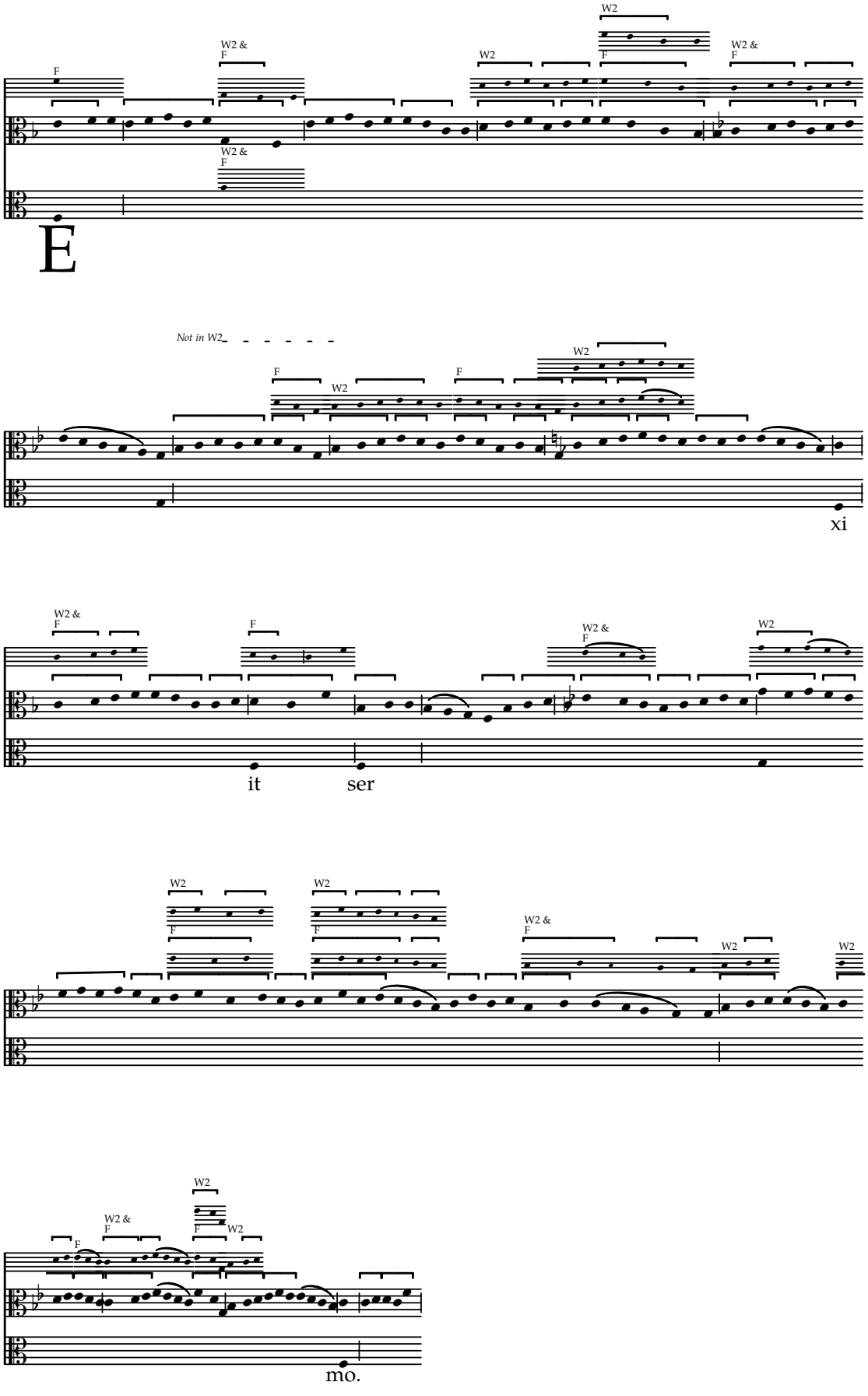
Concordances from W2 & F

f. 27v



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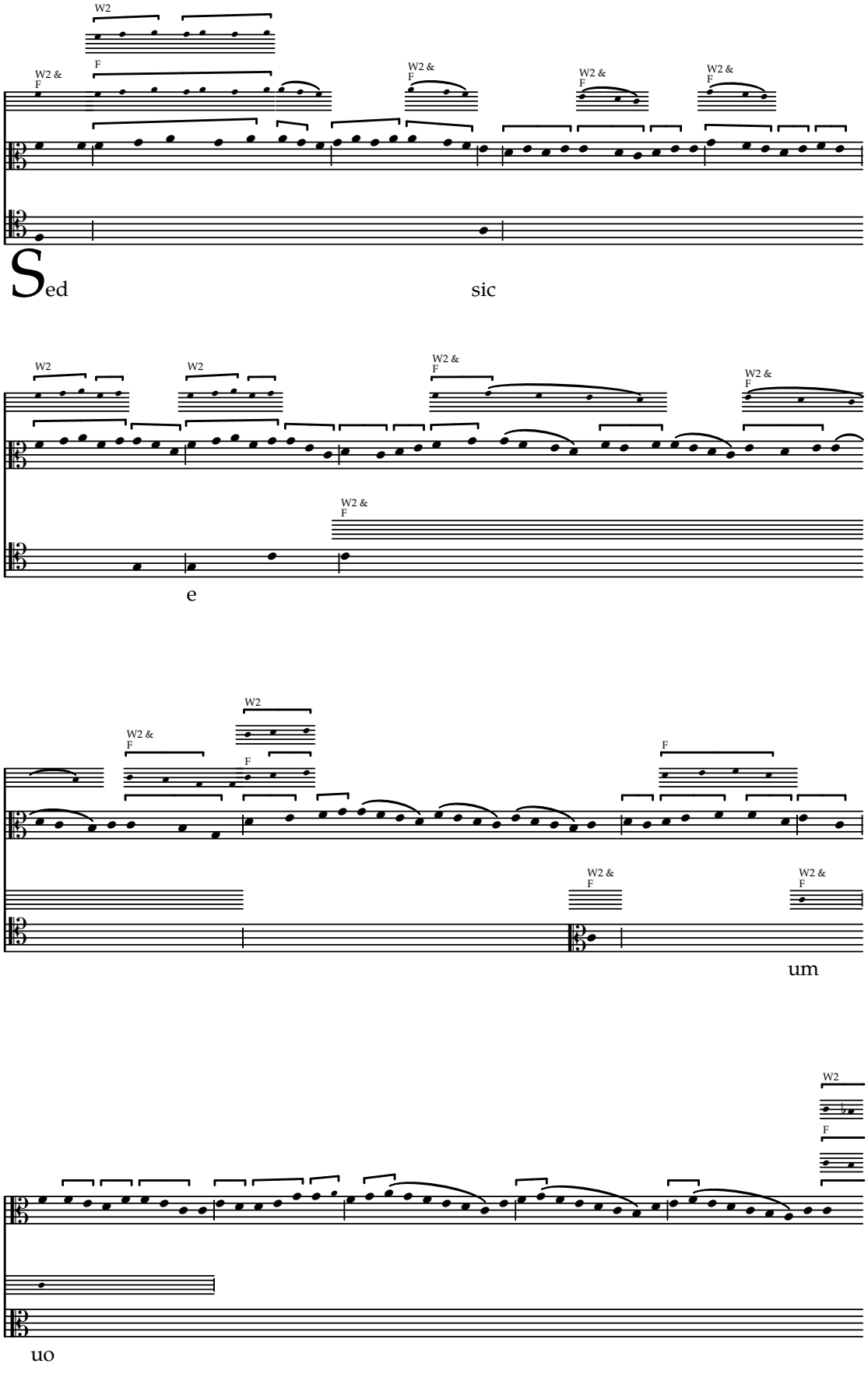
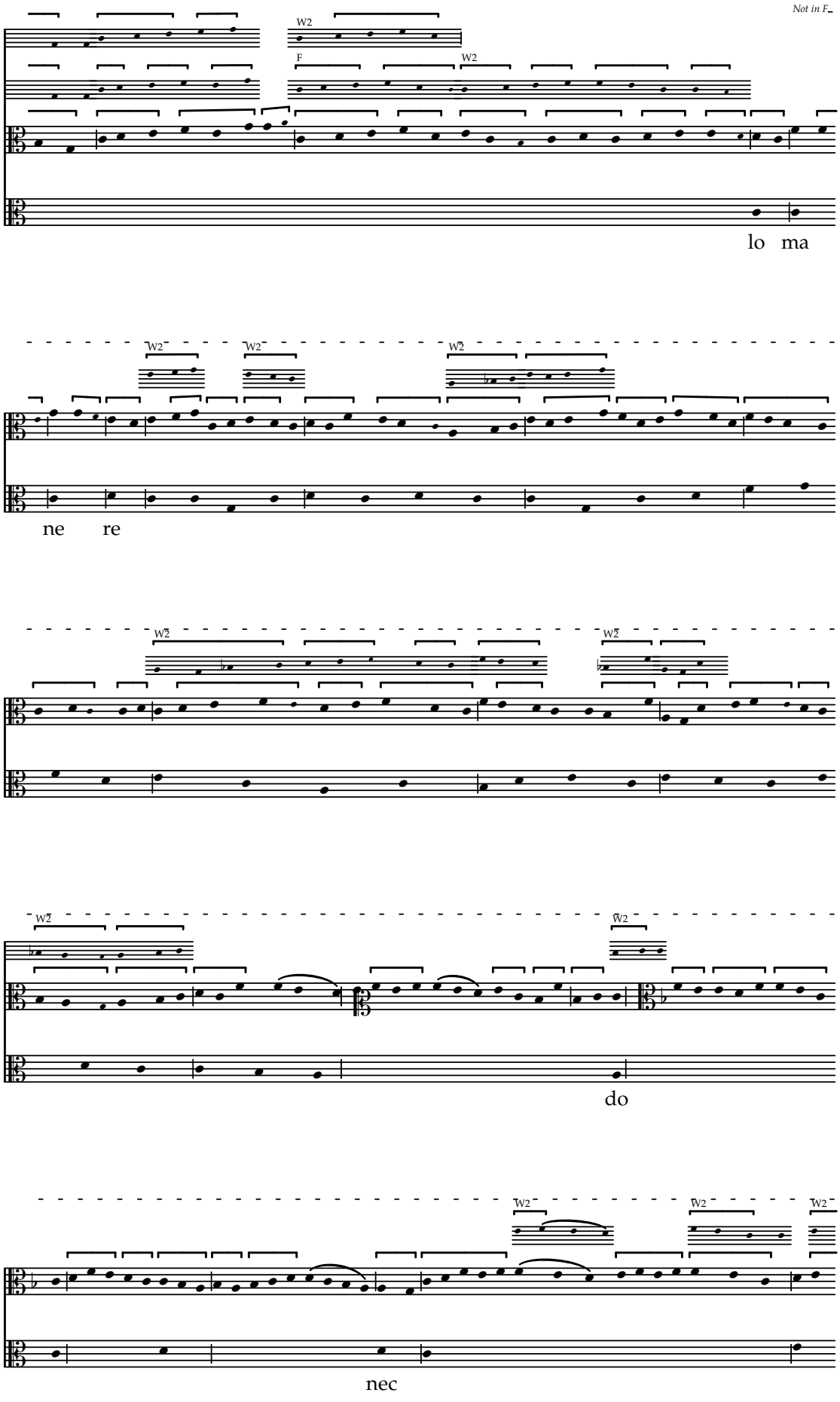
Concordances from W2 & F

f. 27v–28

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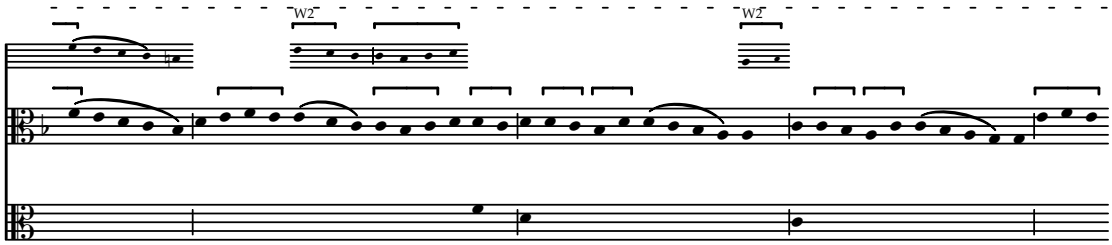
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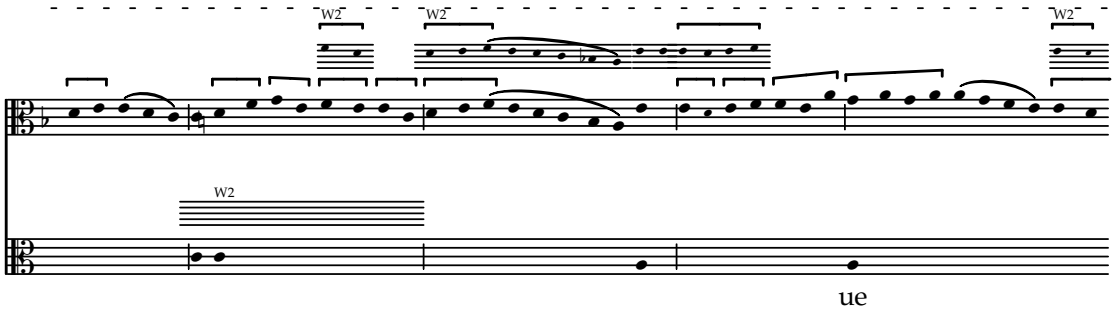
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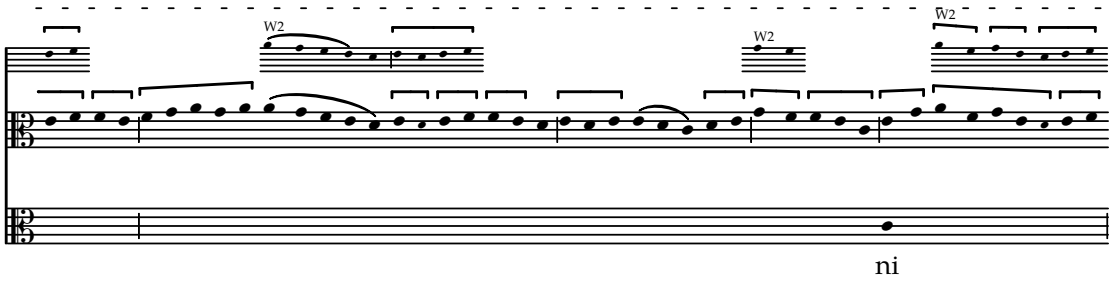
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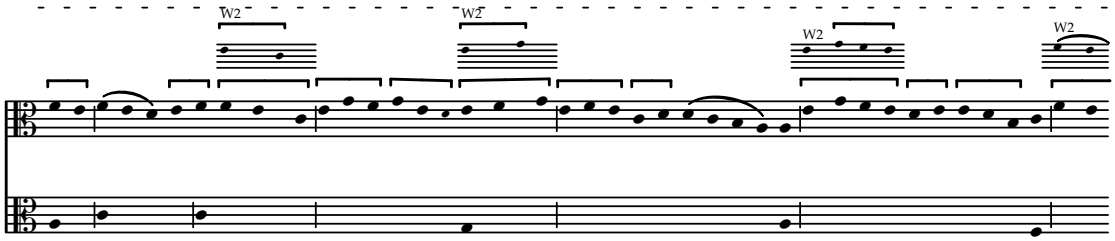
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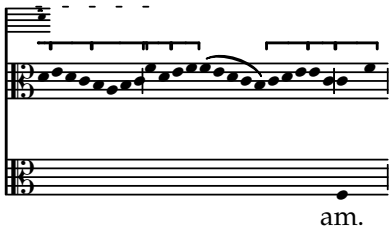
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Concordances from W2 & F

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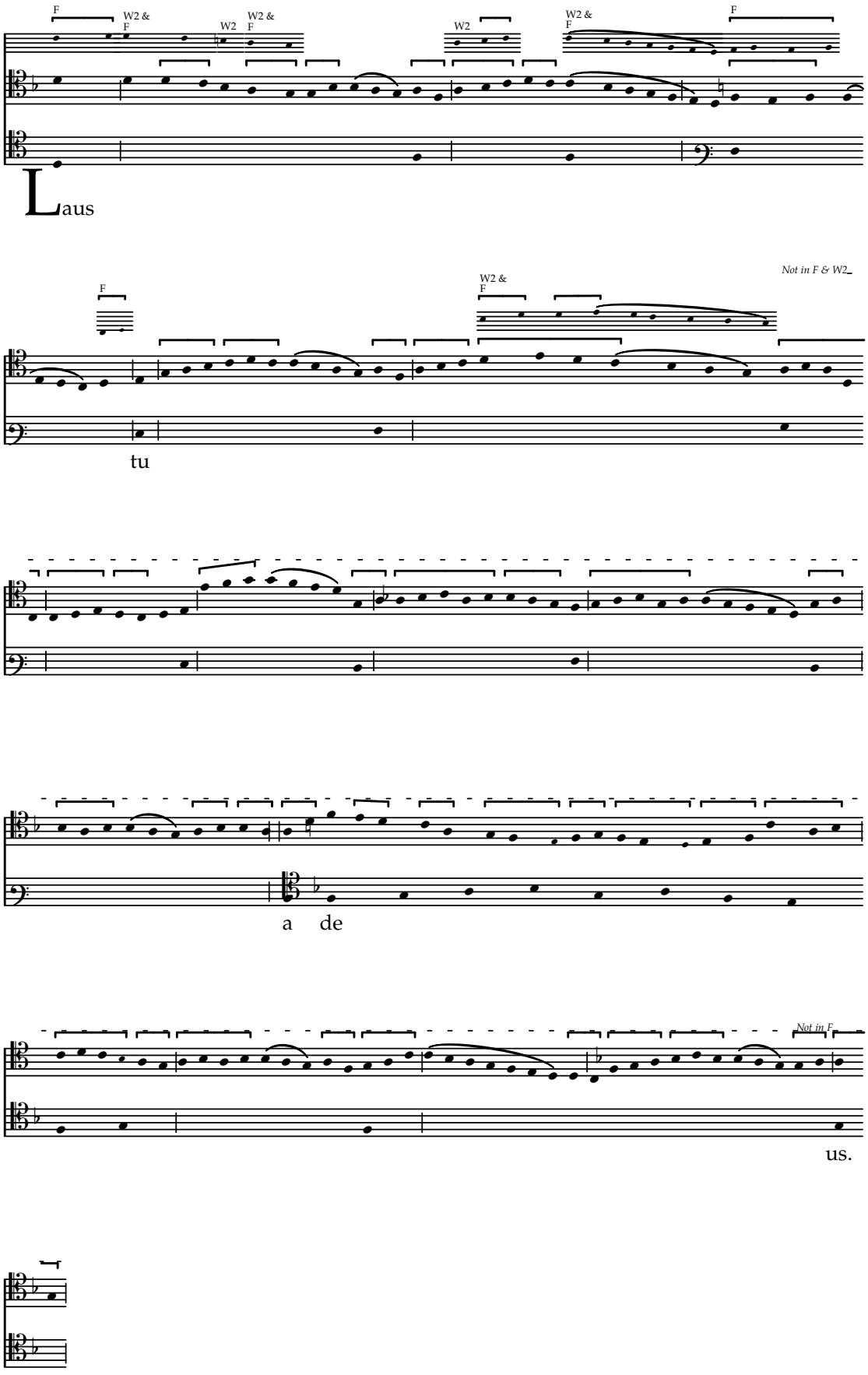

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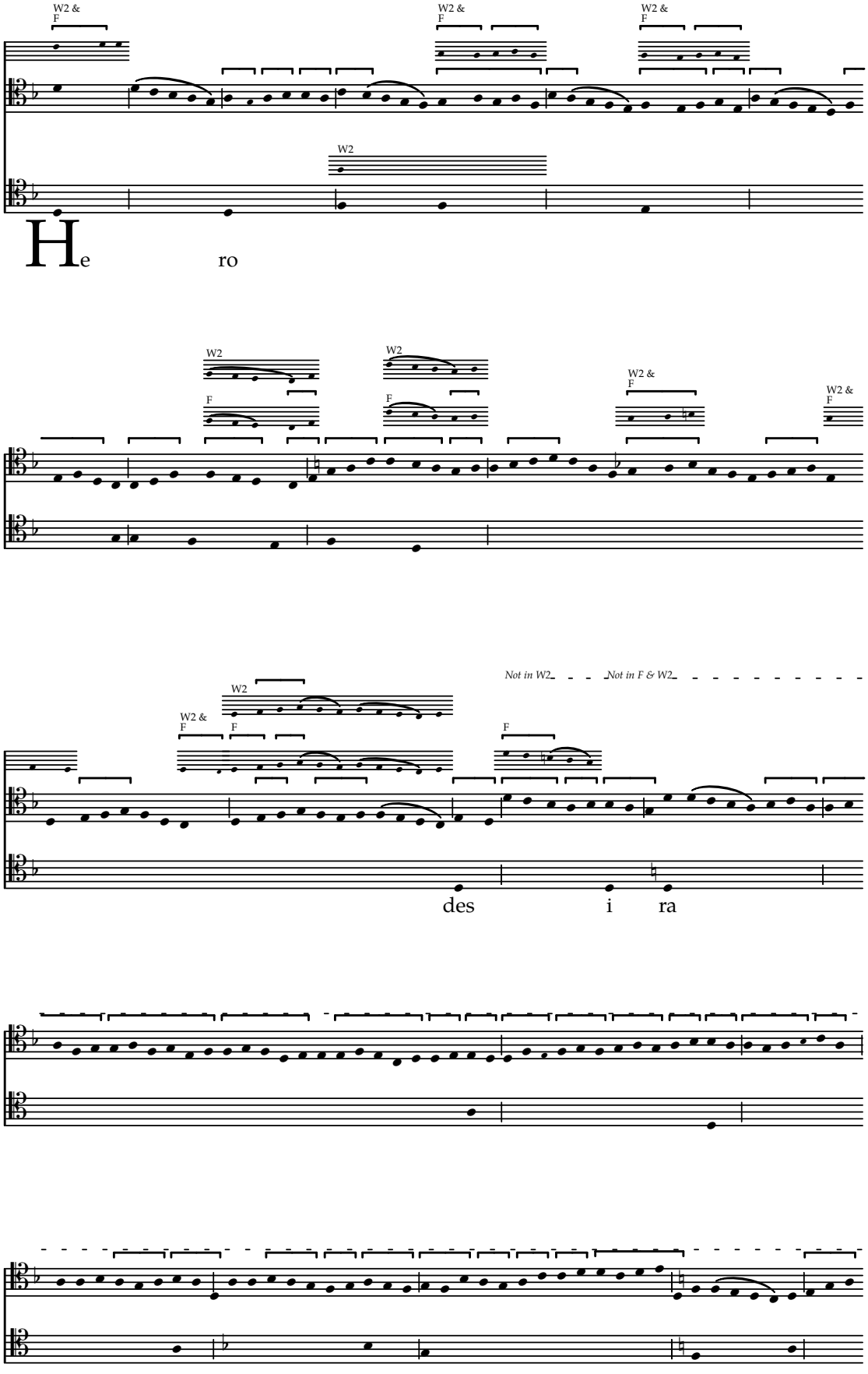
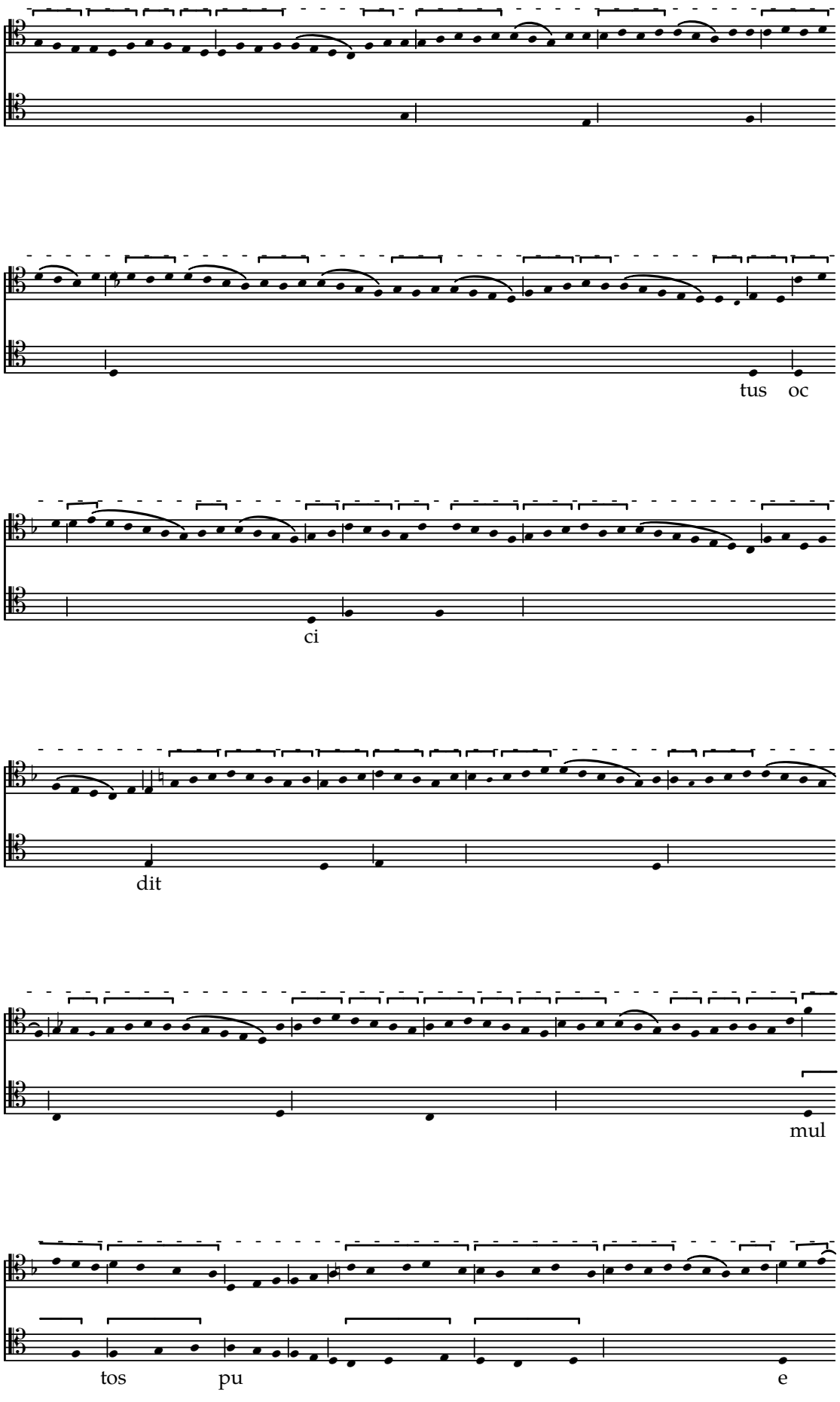
Concordances from W2 & F

f. 28–28v

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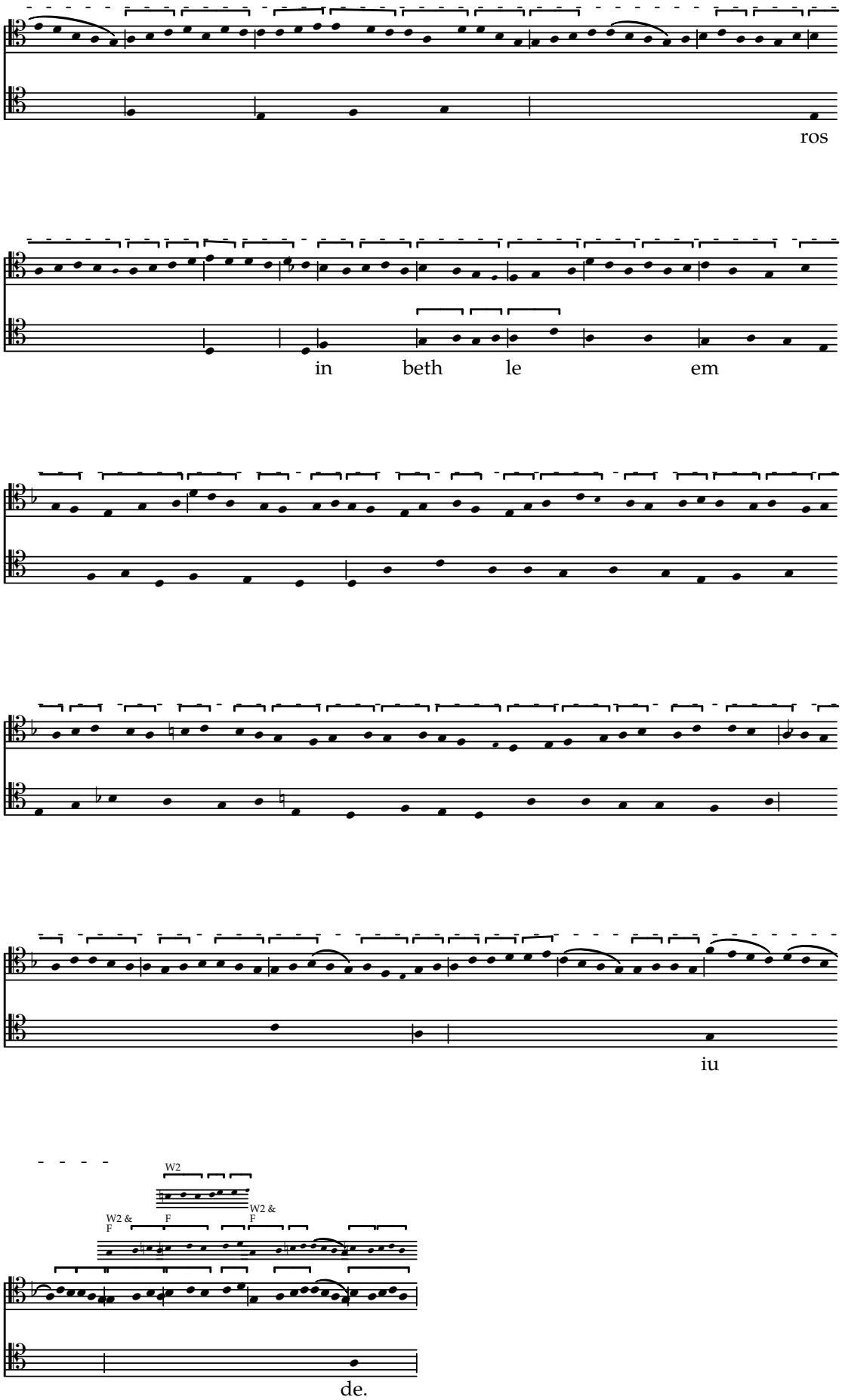
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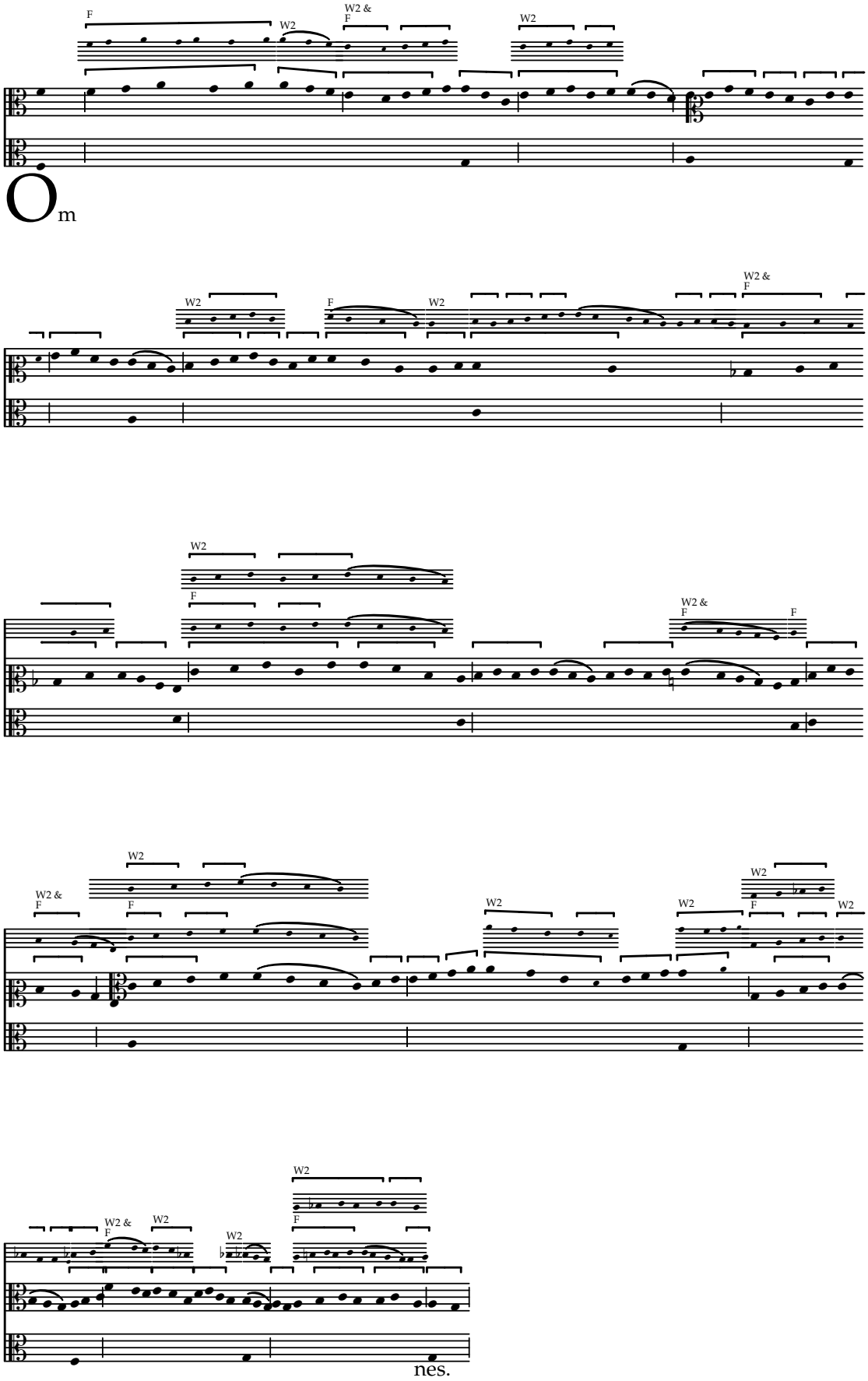

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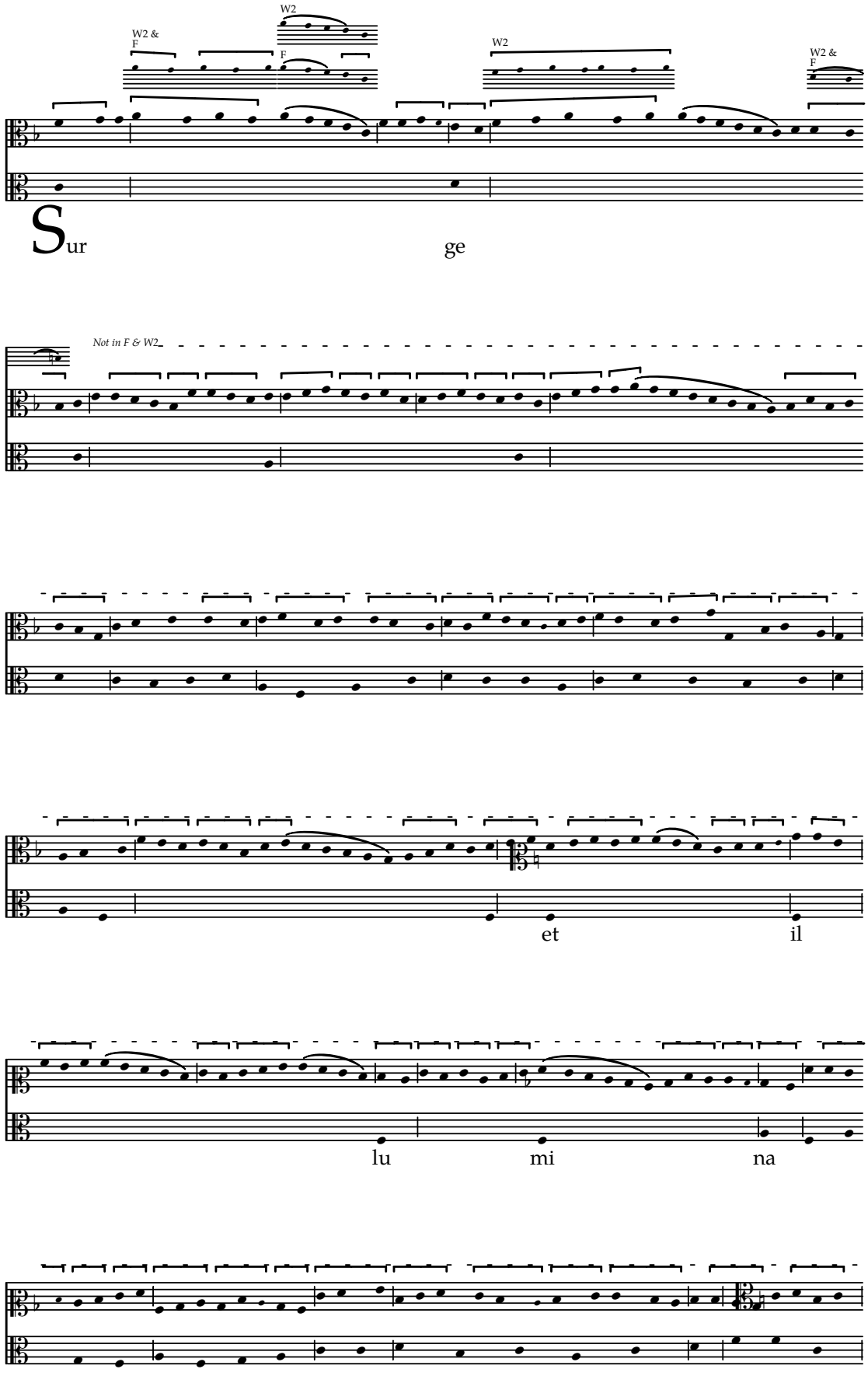
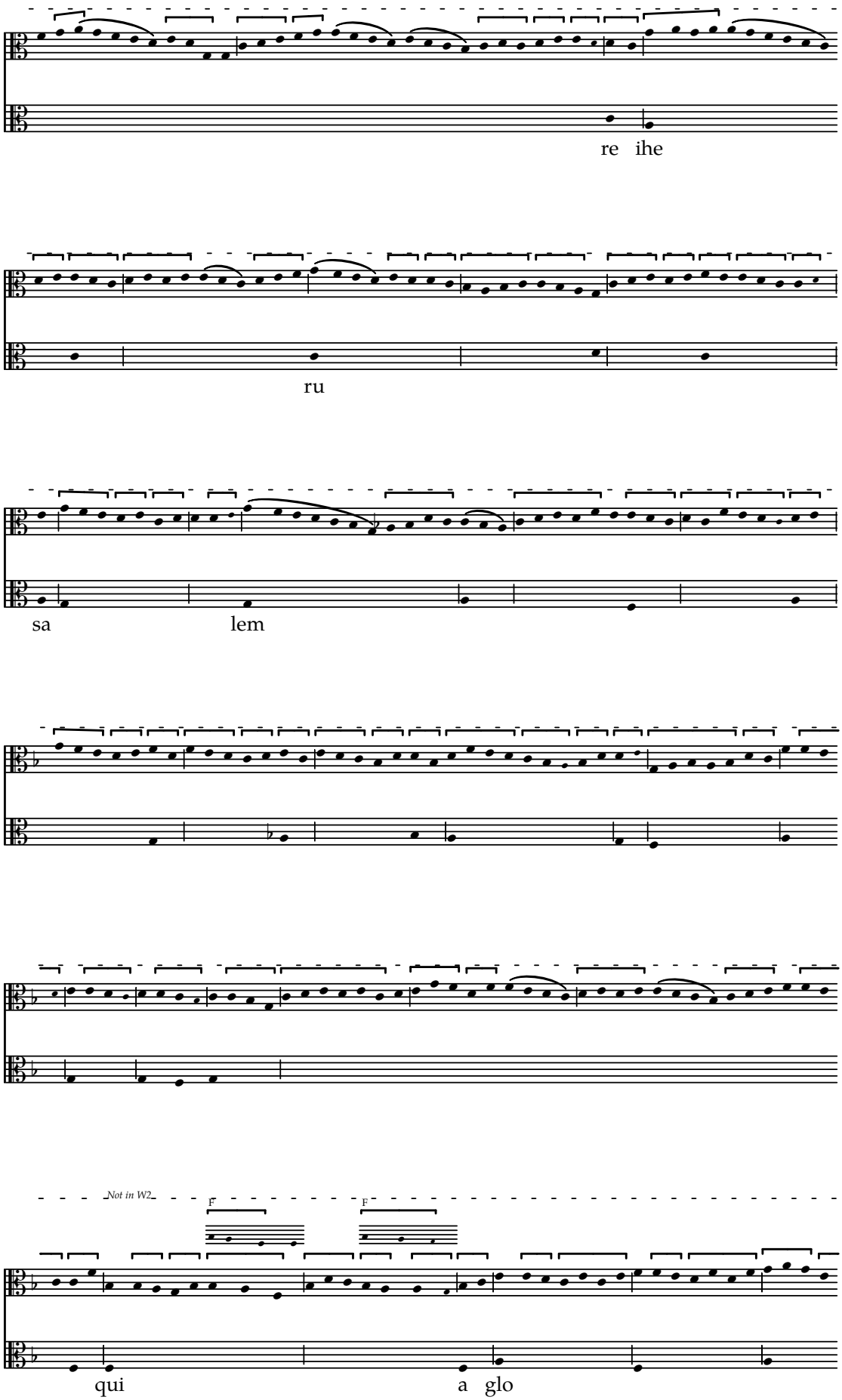
Concordances from W2 & F

f. 29–29v

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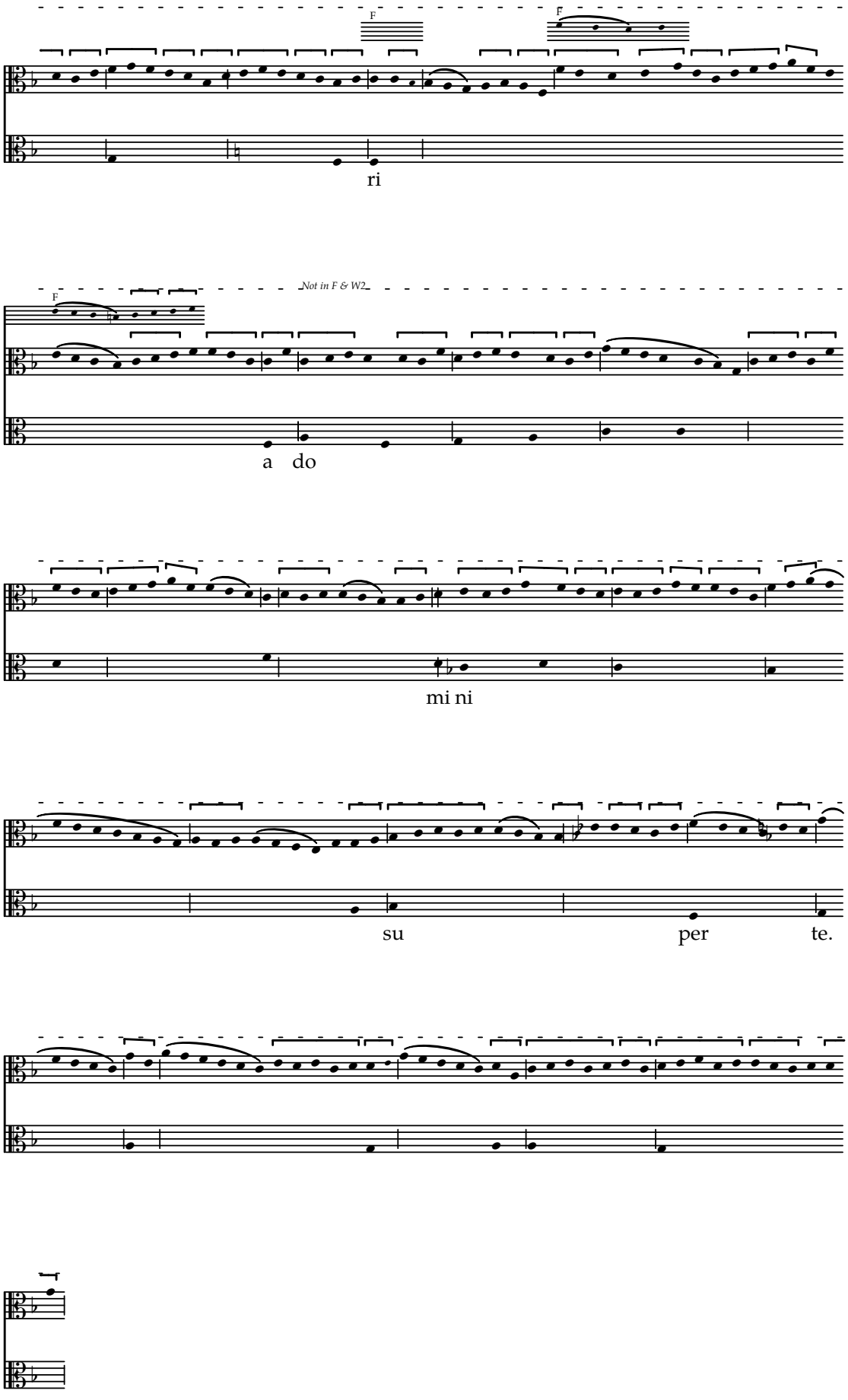
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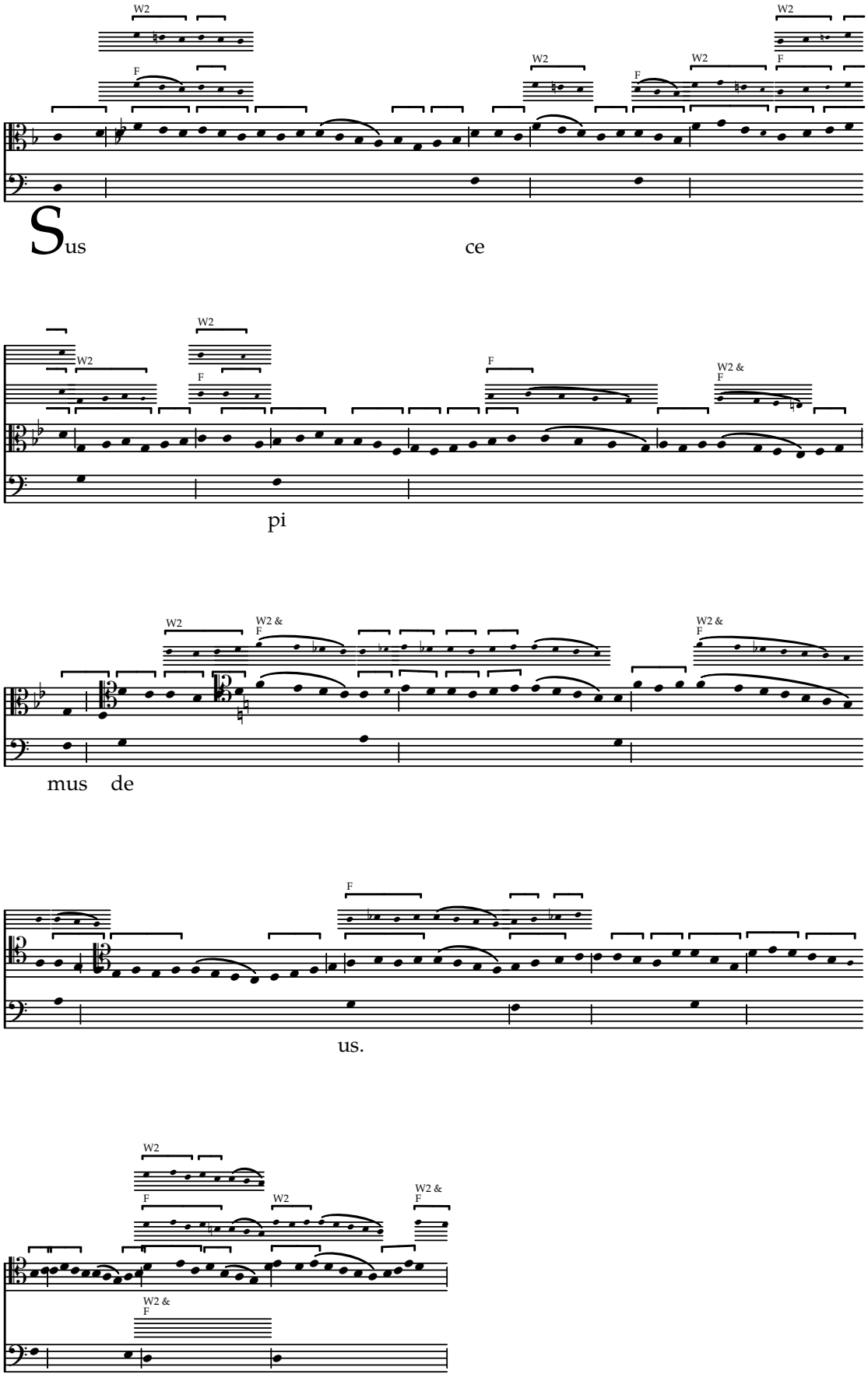
Concordances from W2 & F

f. 29v



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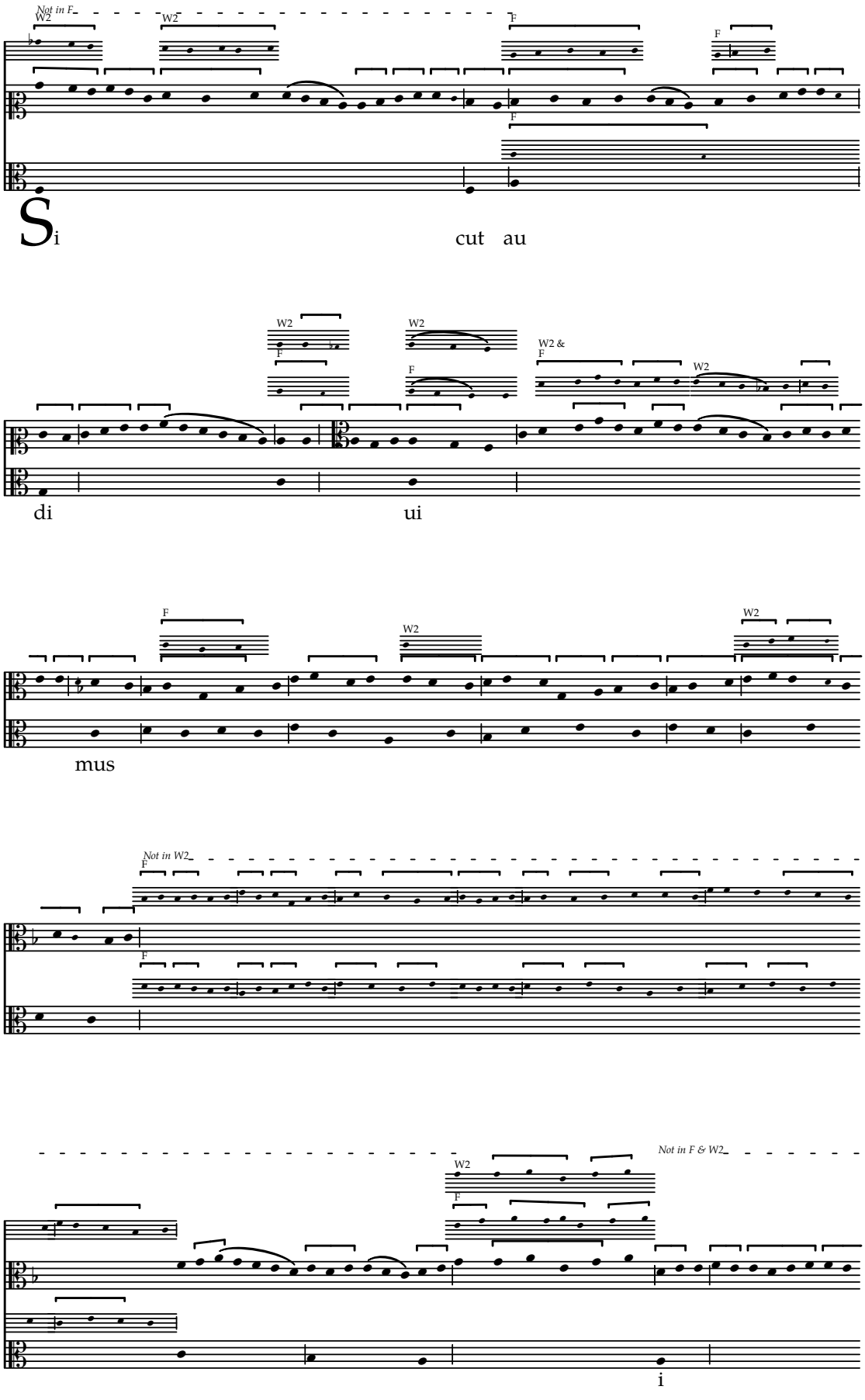
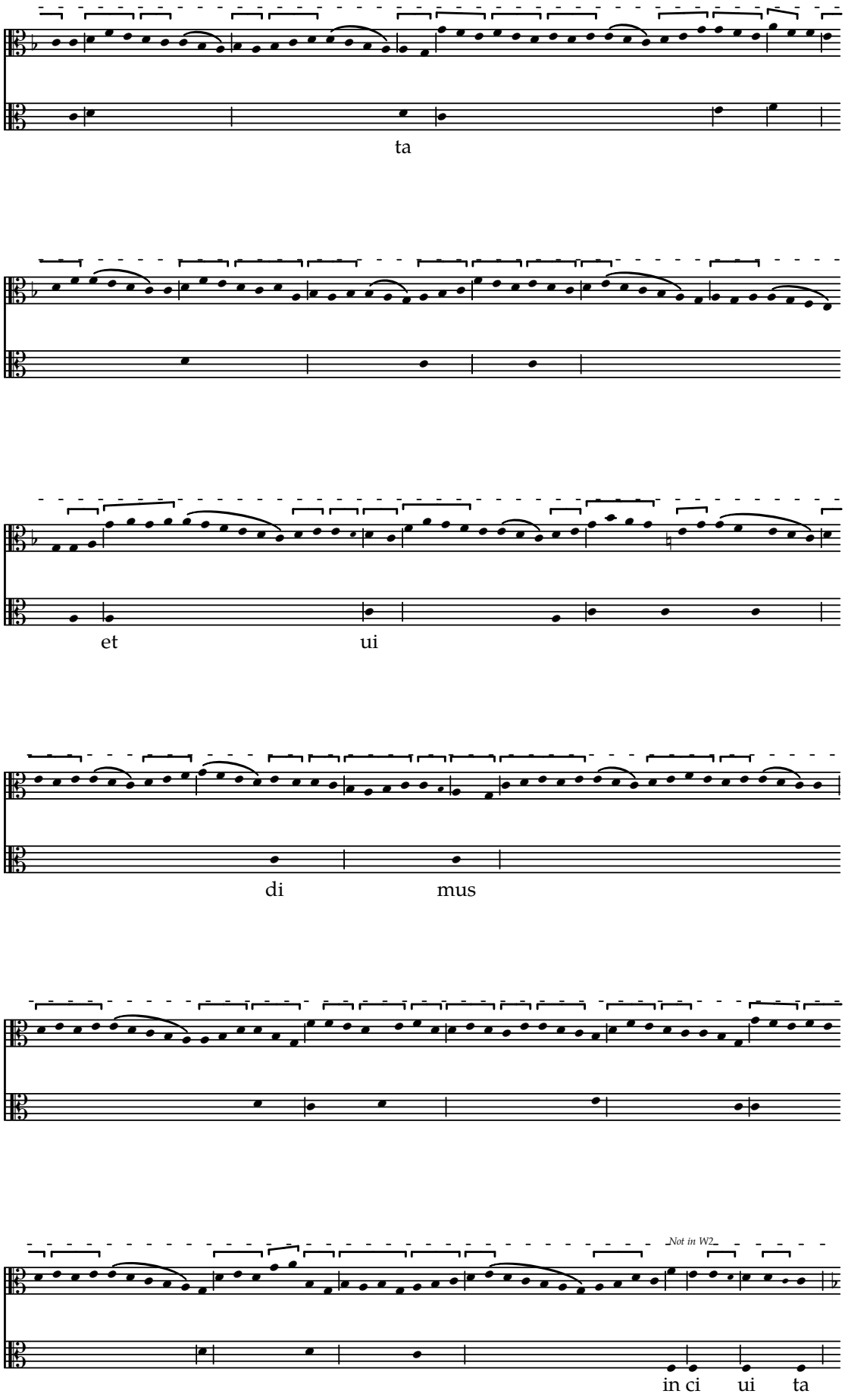
Concordances from W2 & F

f. 29v–30

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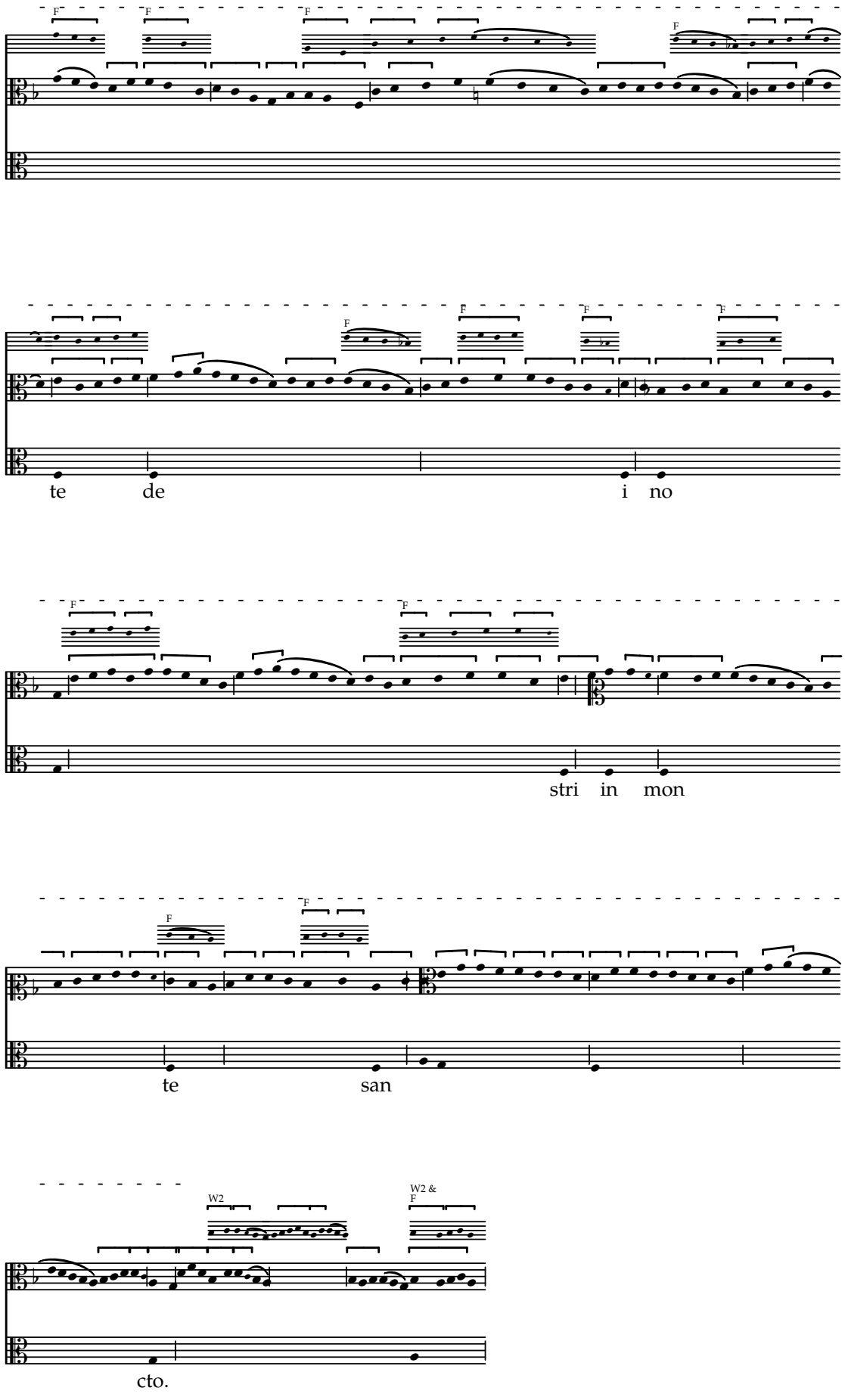
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Concordances from W2 & F

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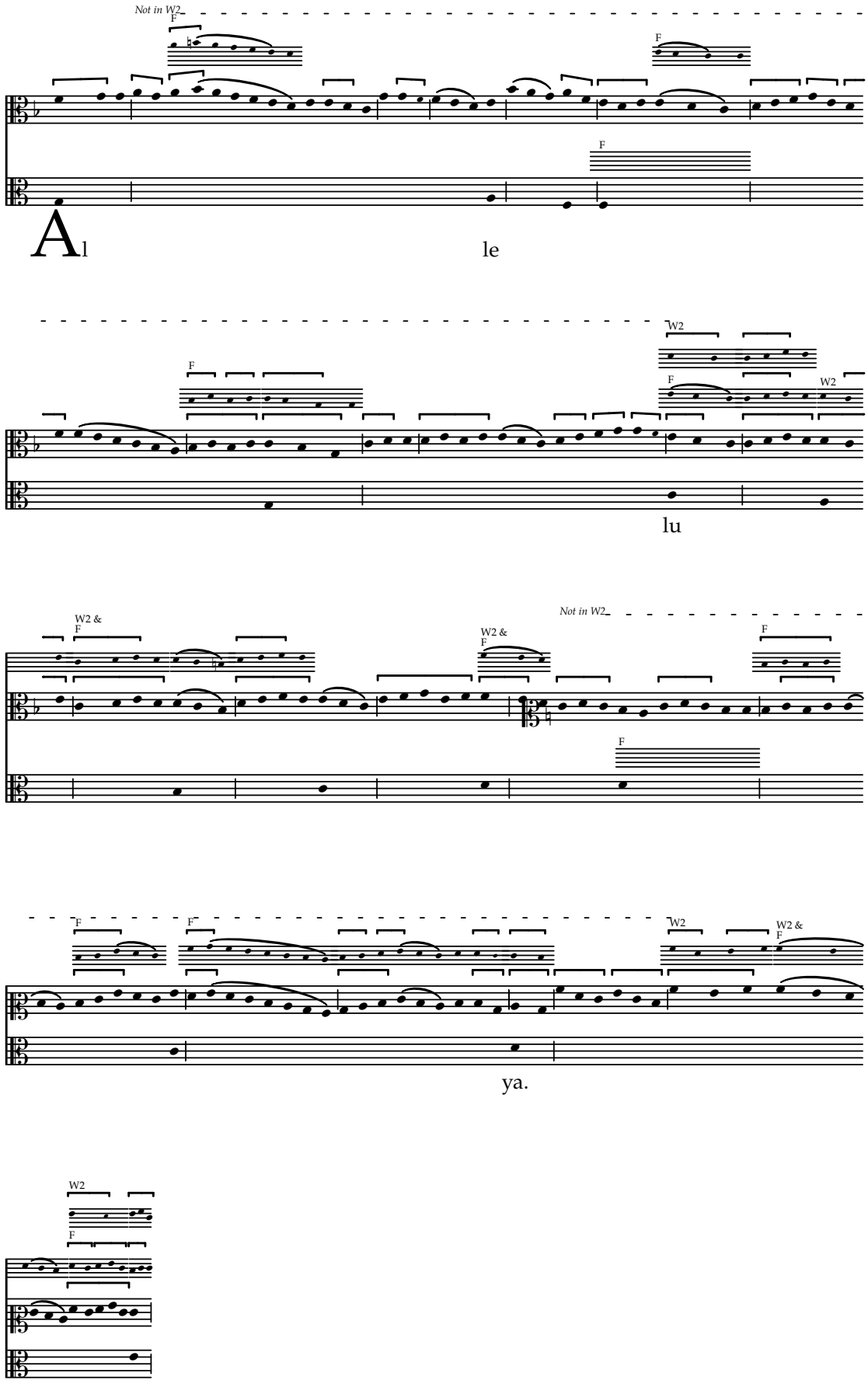

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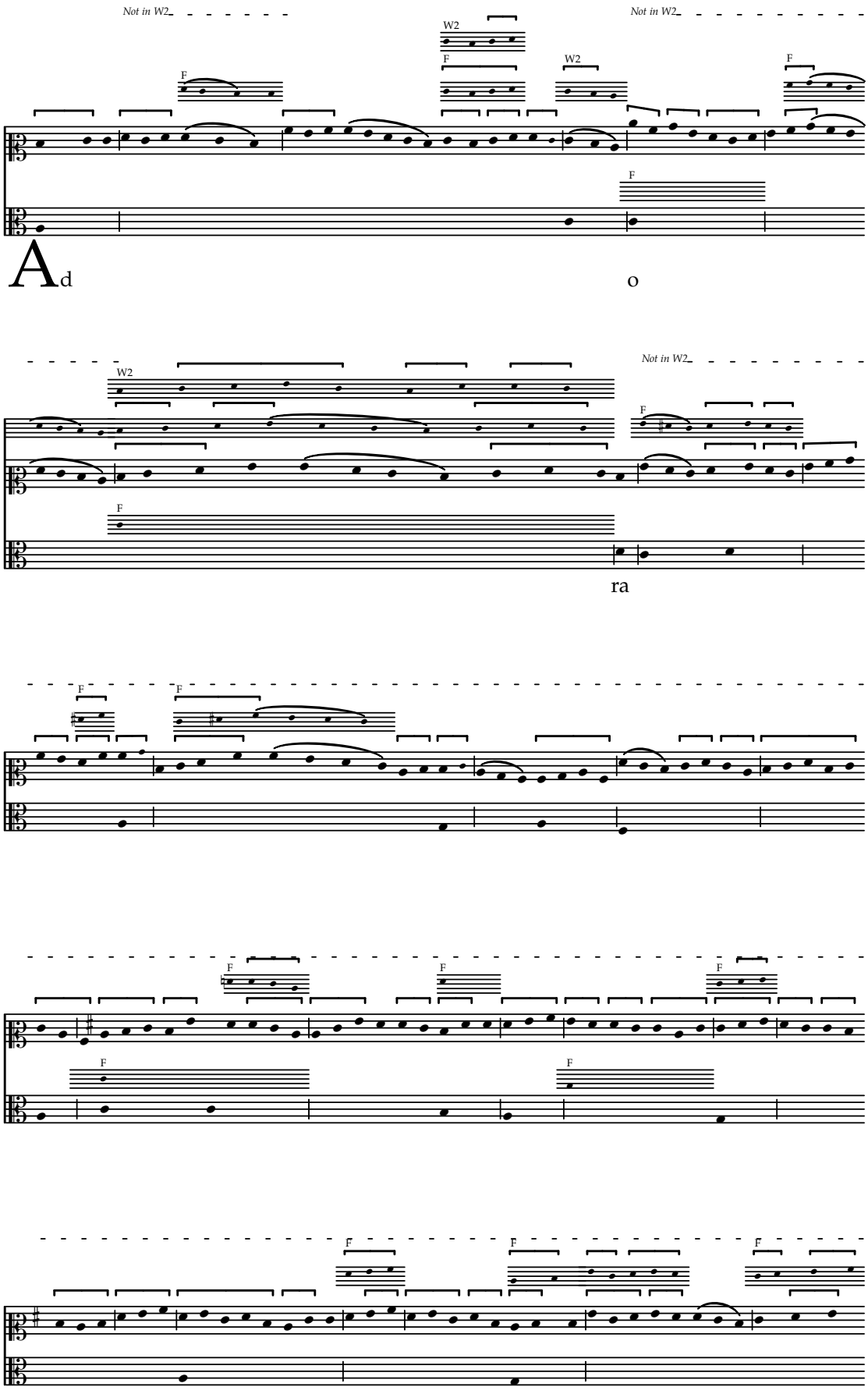
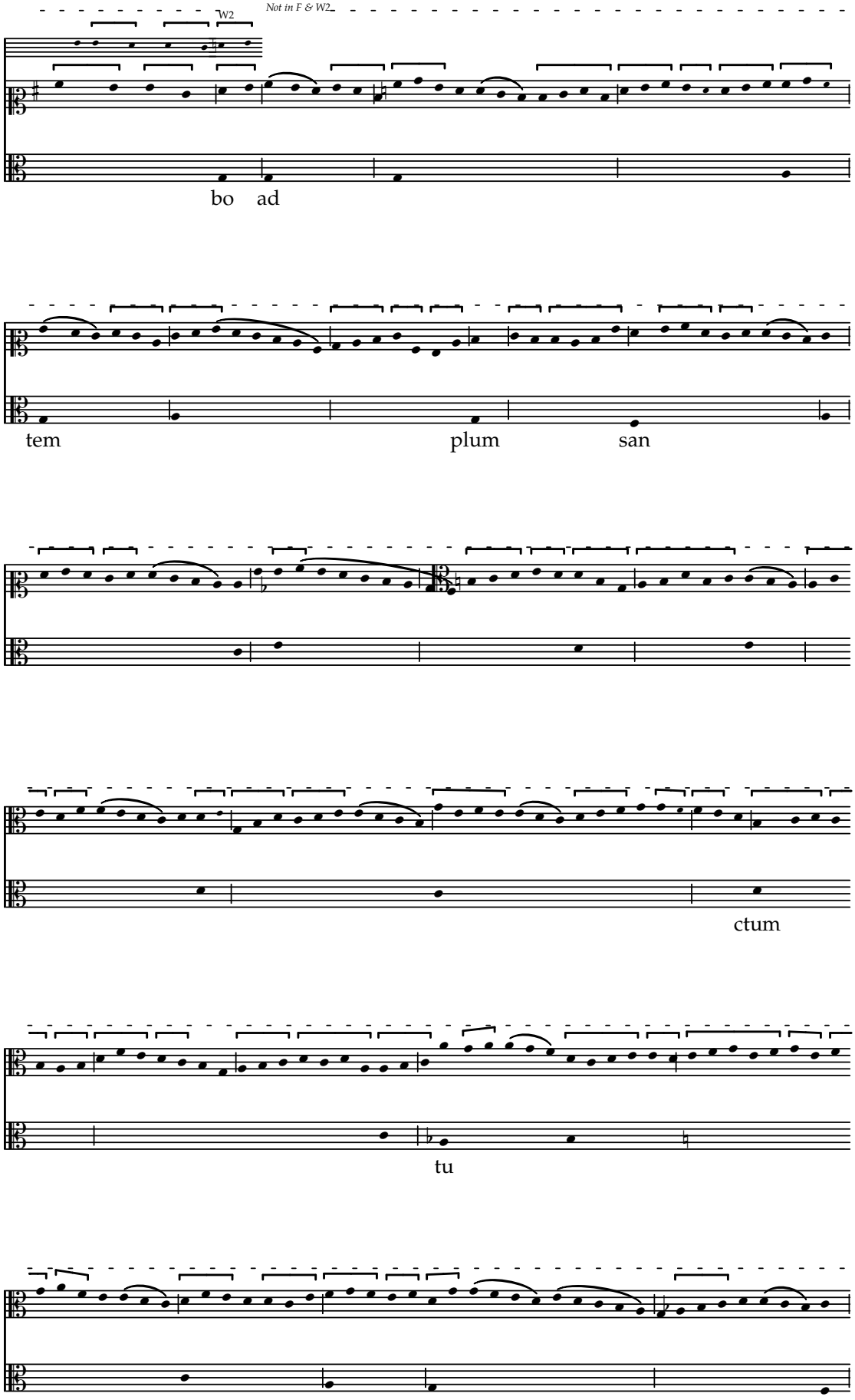
Concordances from W2 & F

f. 30v–31

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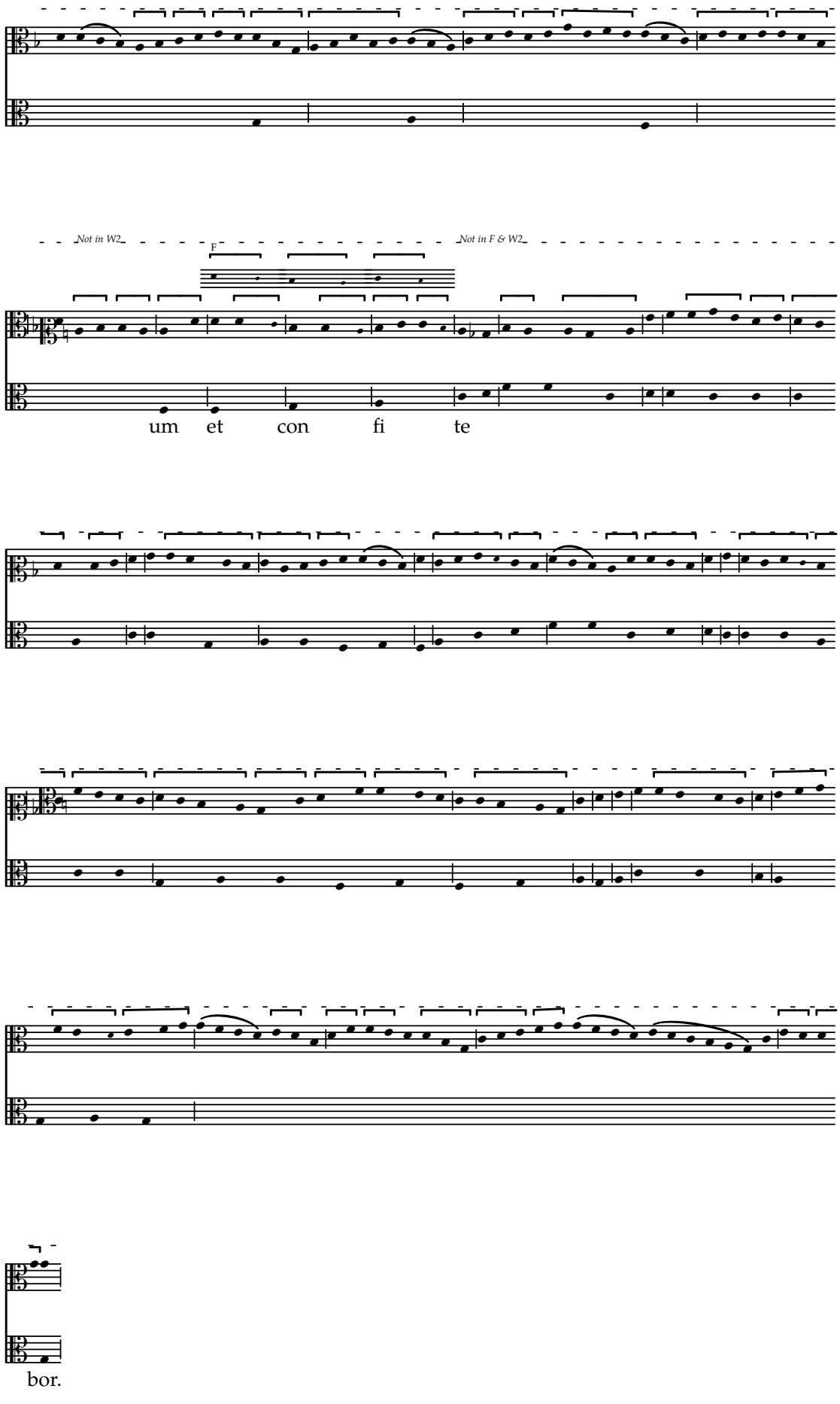
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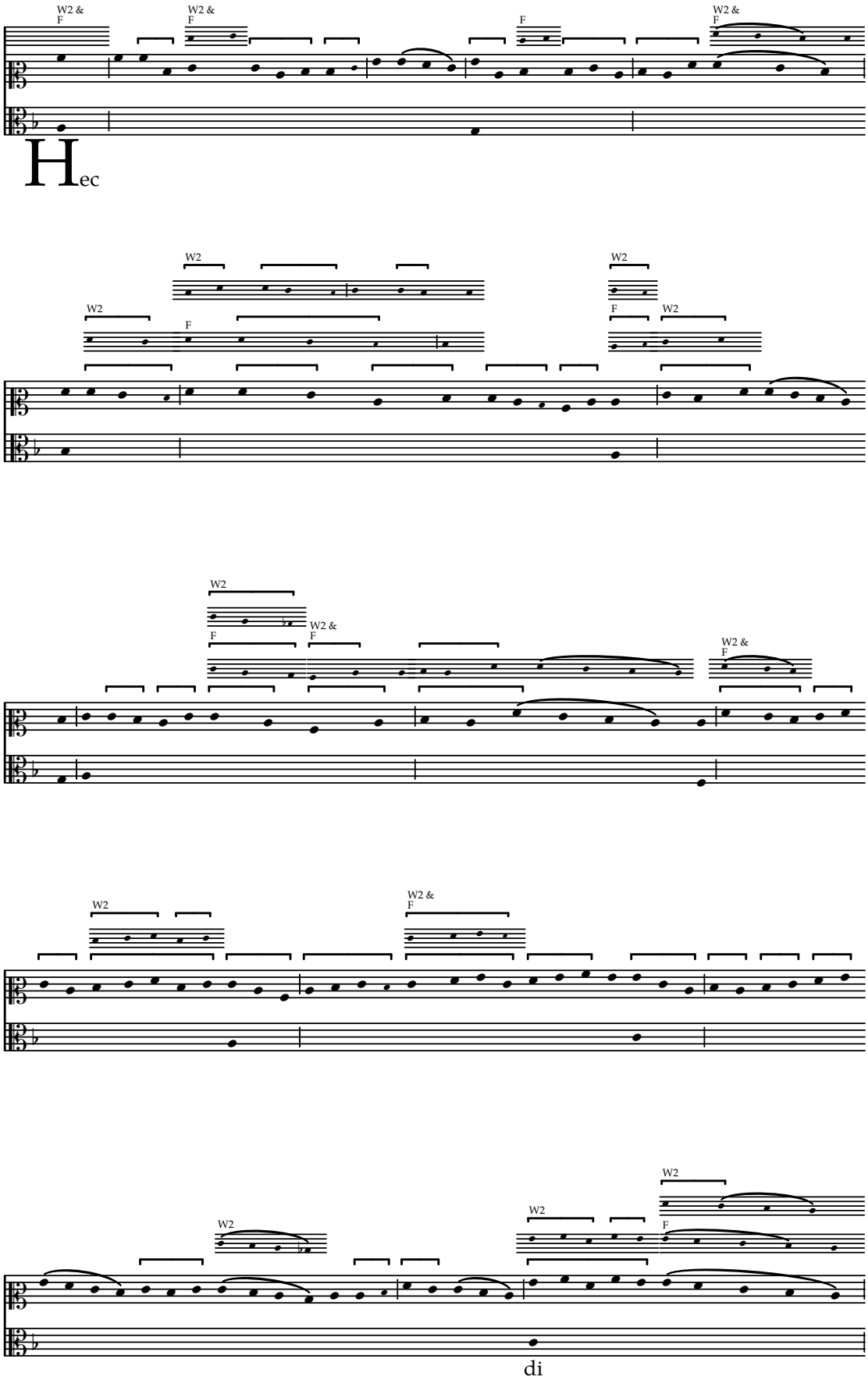
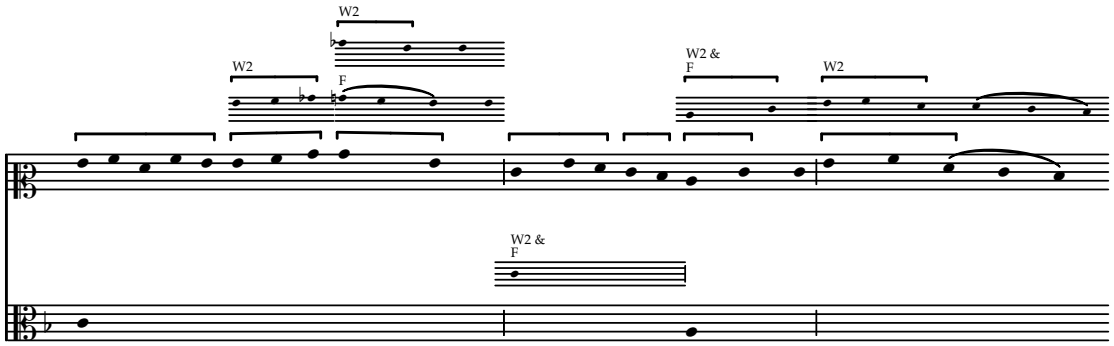
Concordances from W2 & F

f. 31

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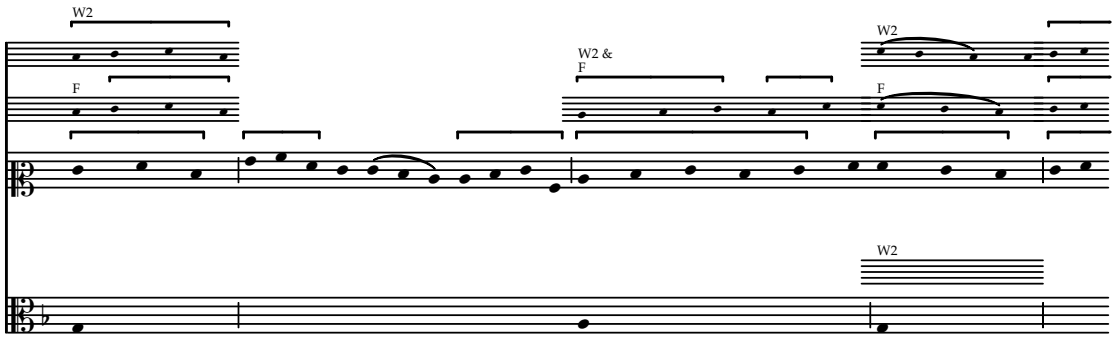
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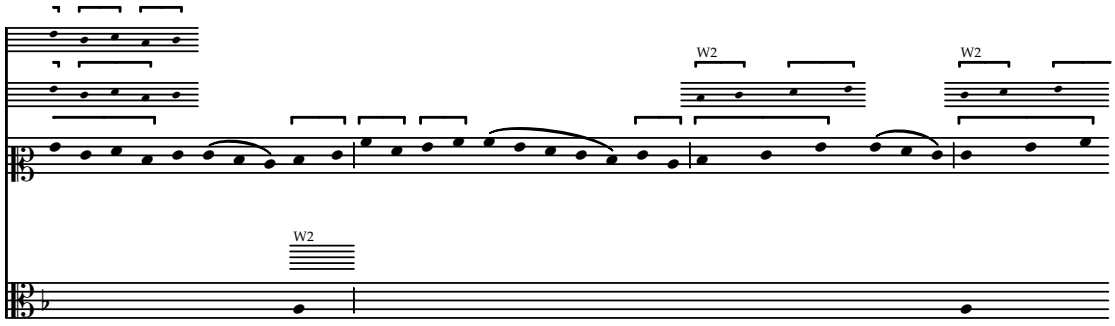
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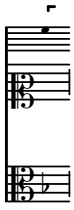

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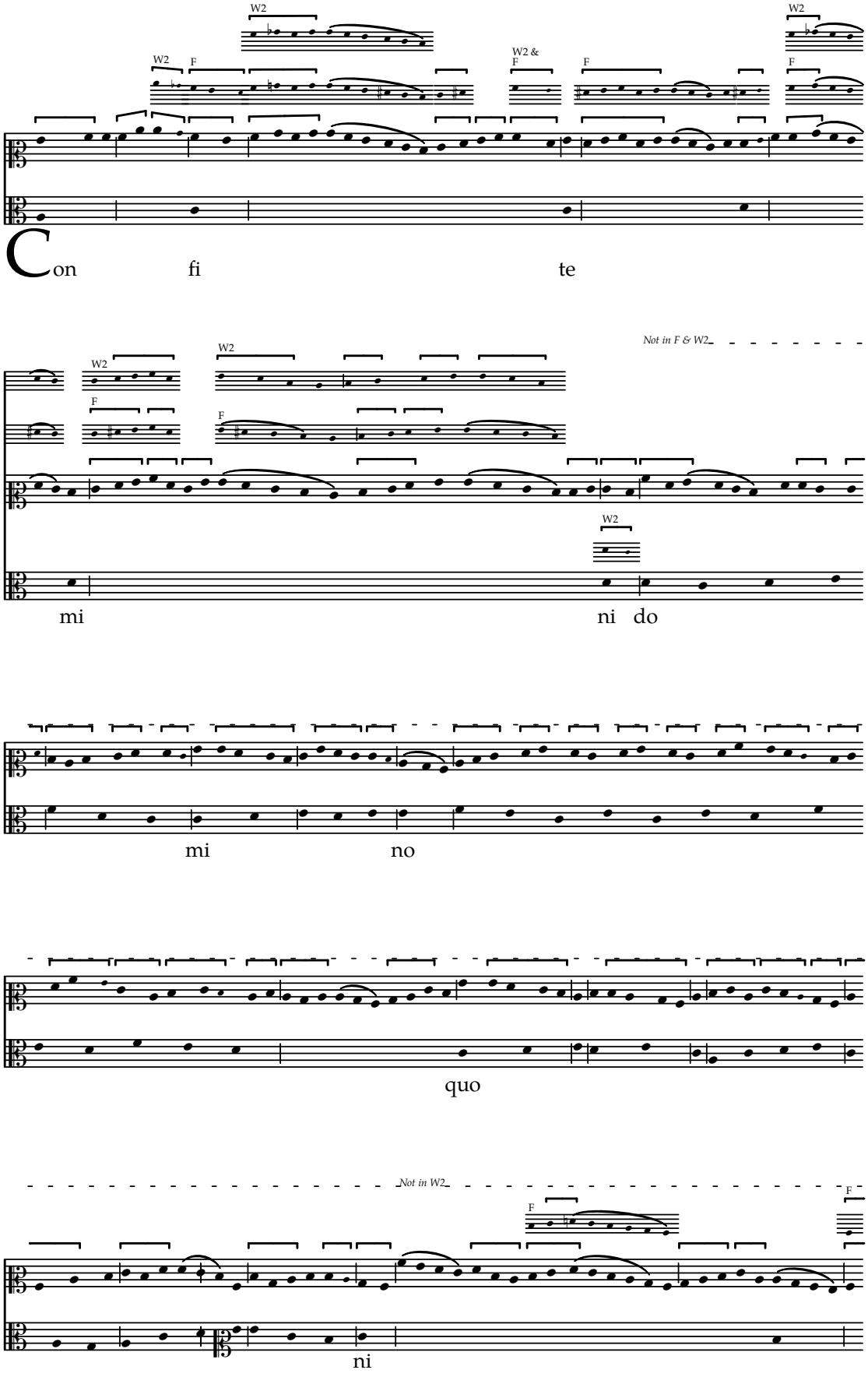
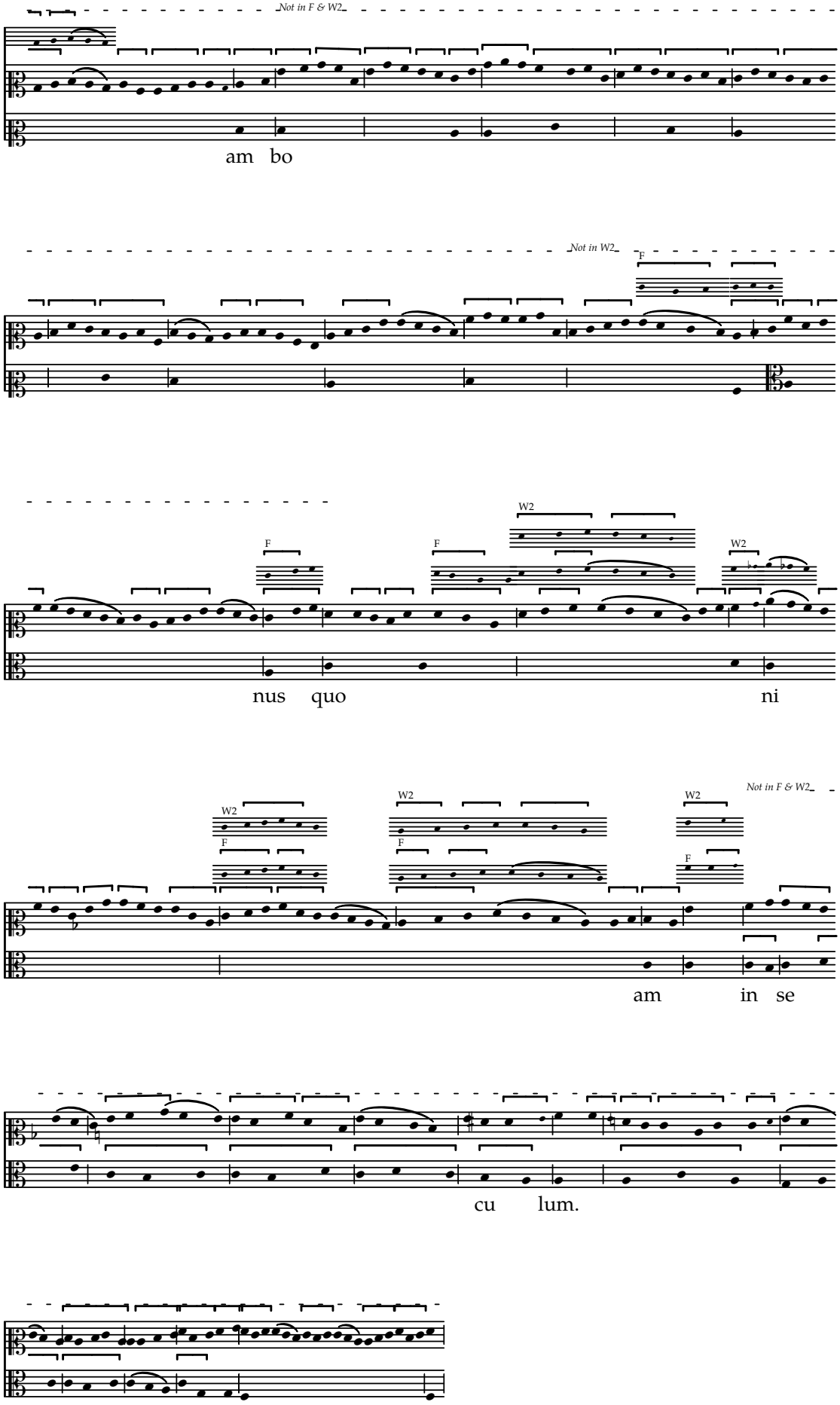
Concordances from W2 & F

f. 31–31v

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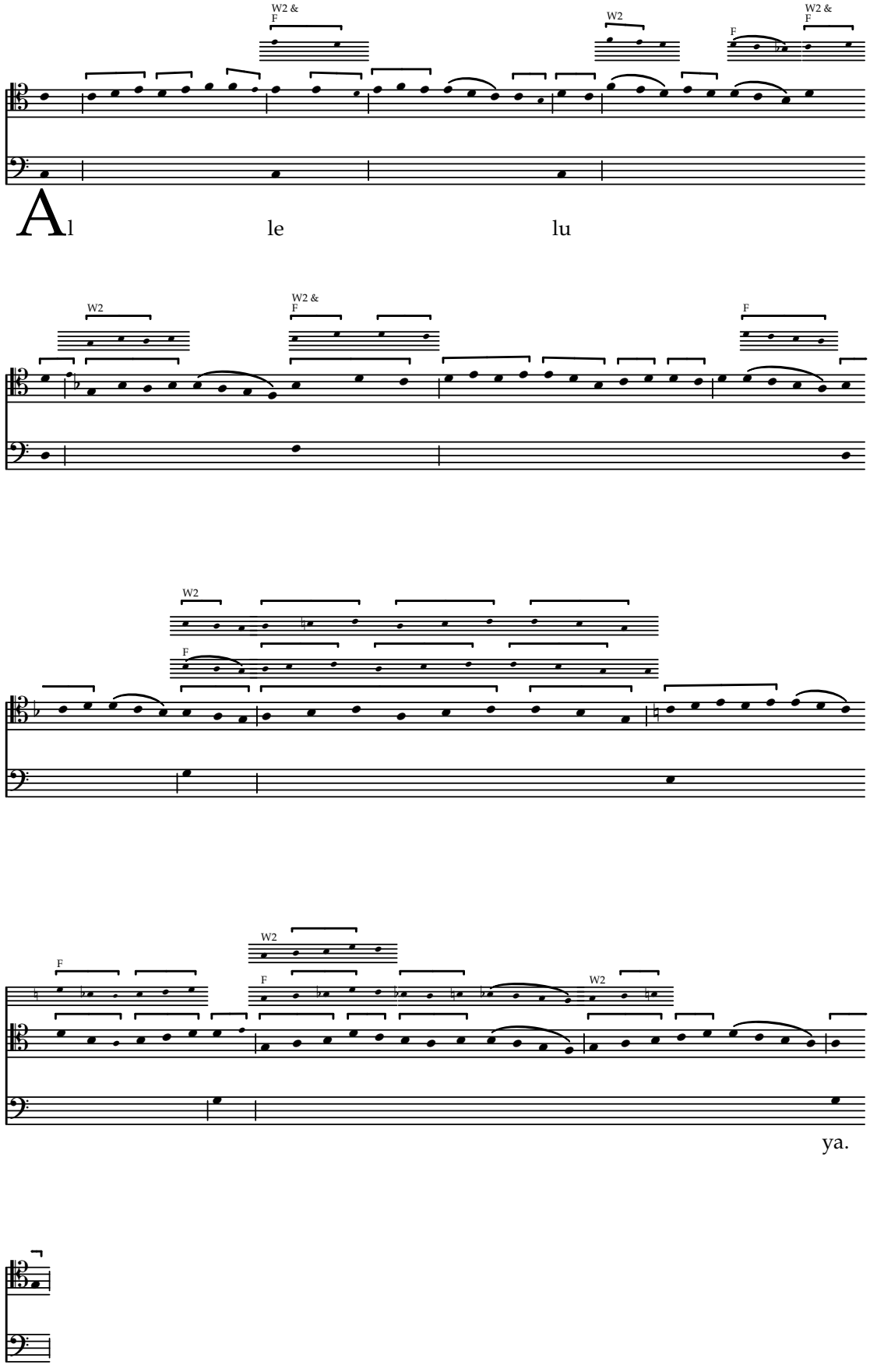
Concordances from W2 & F

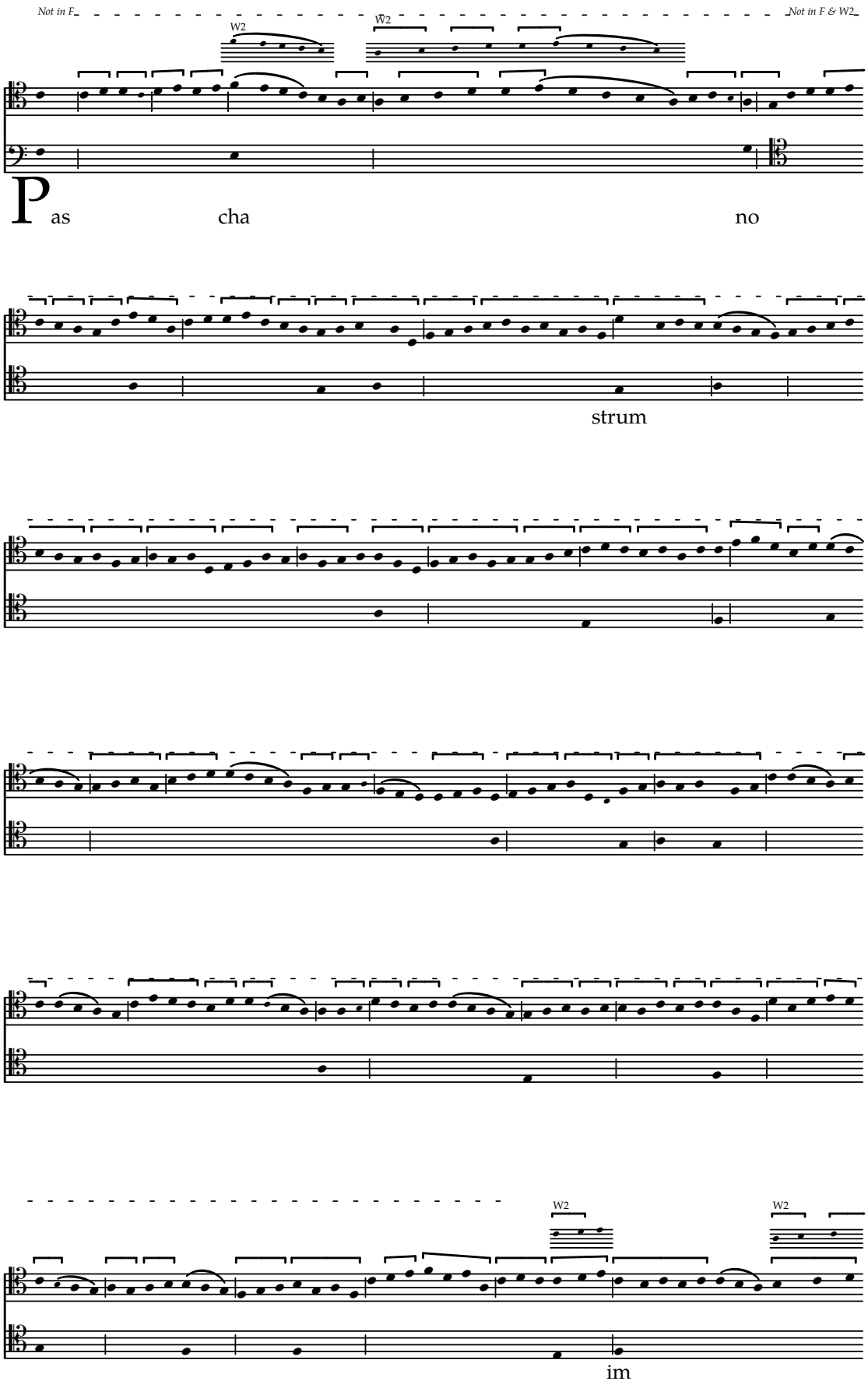
f. 31v–32

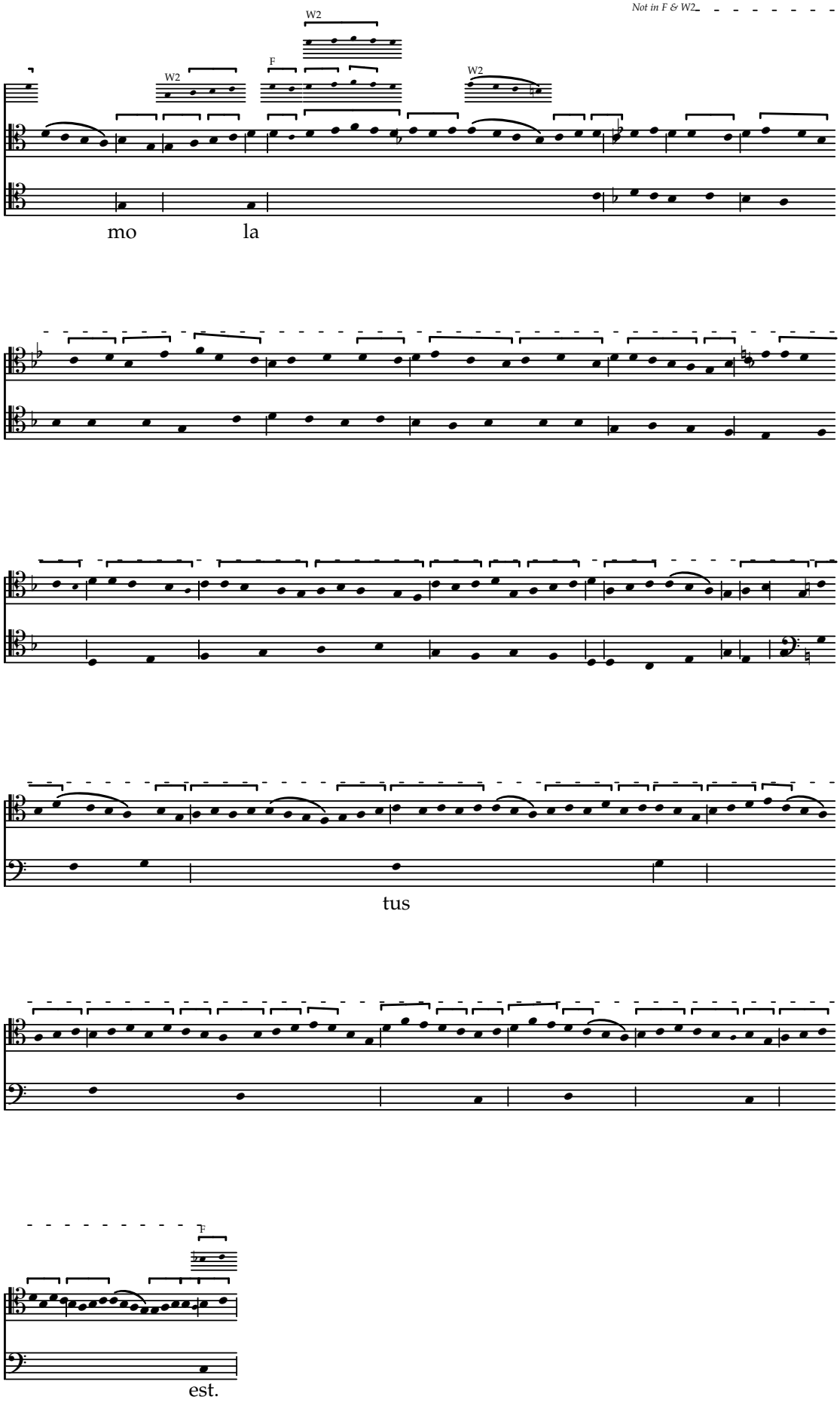


Pascha nostrum

Concordances from W2 & F

f. 32

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Concordances from F

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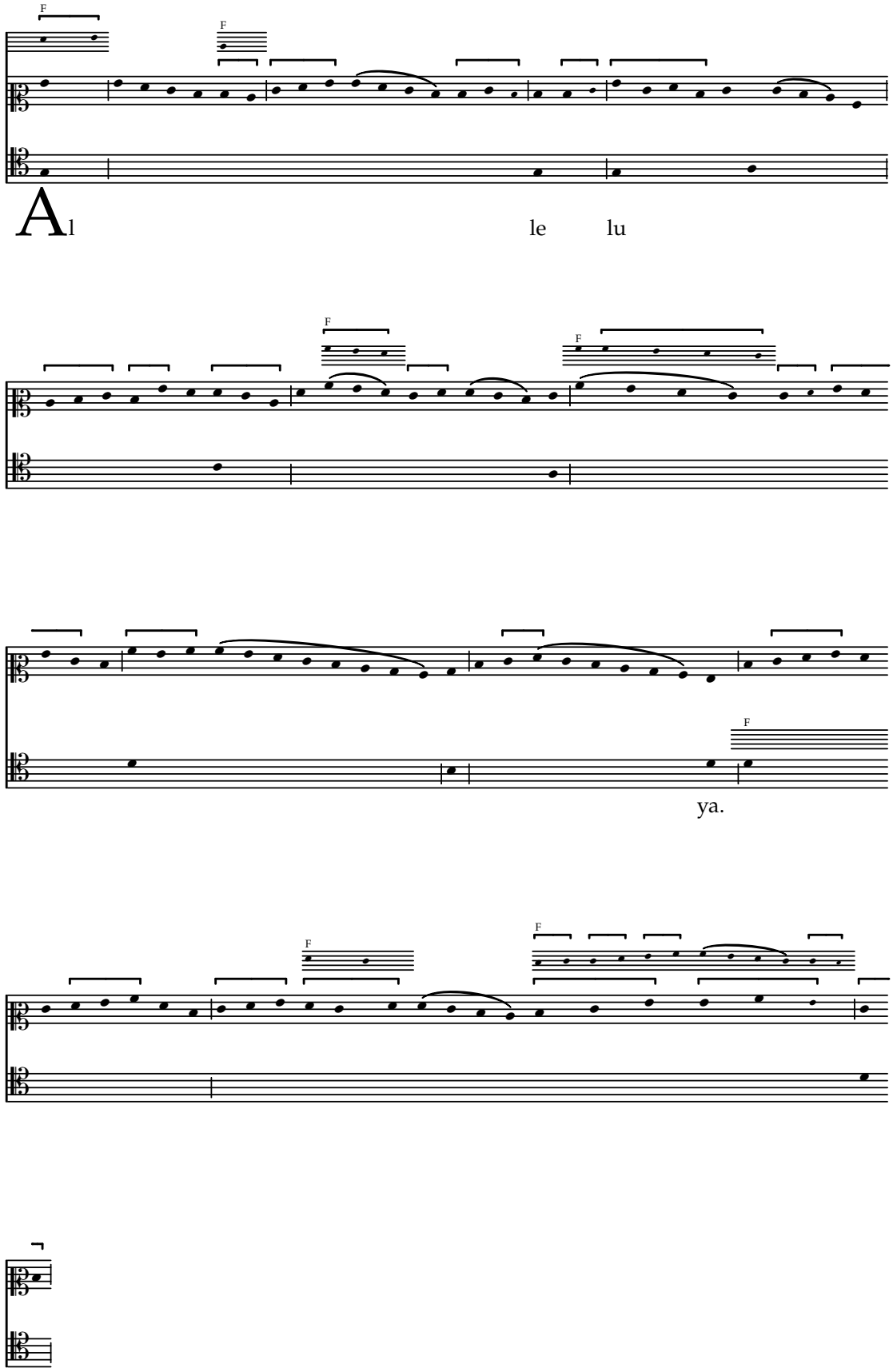

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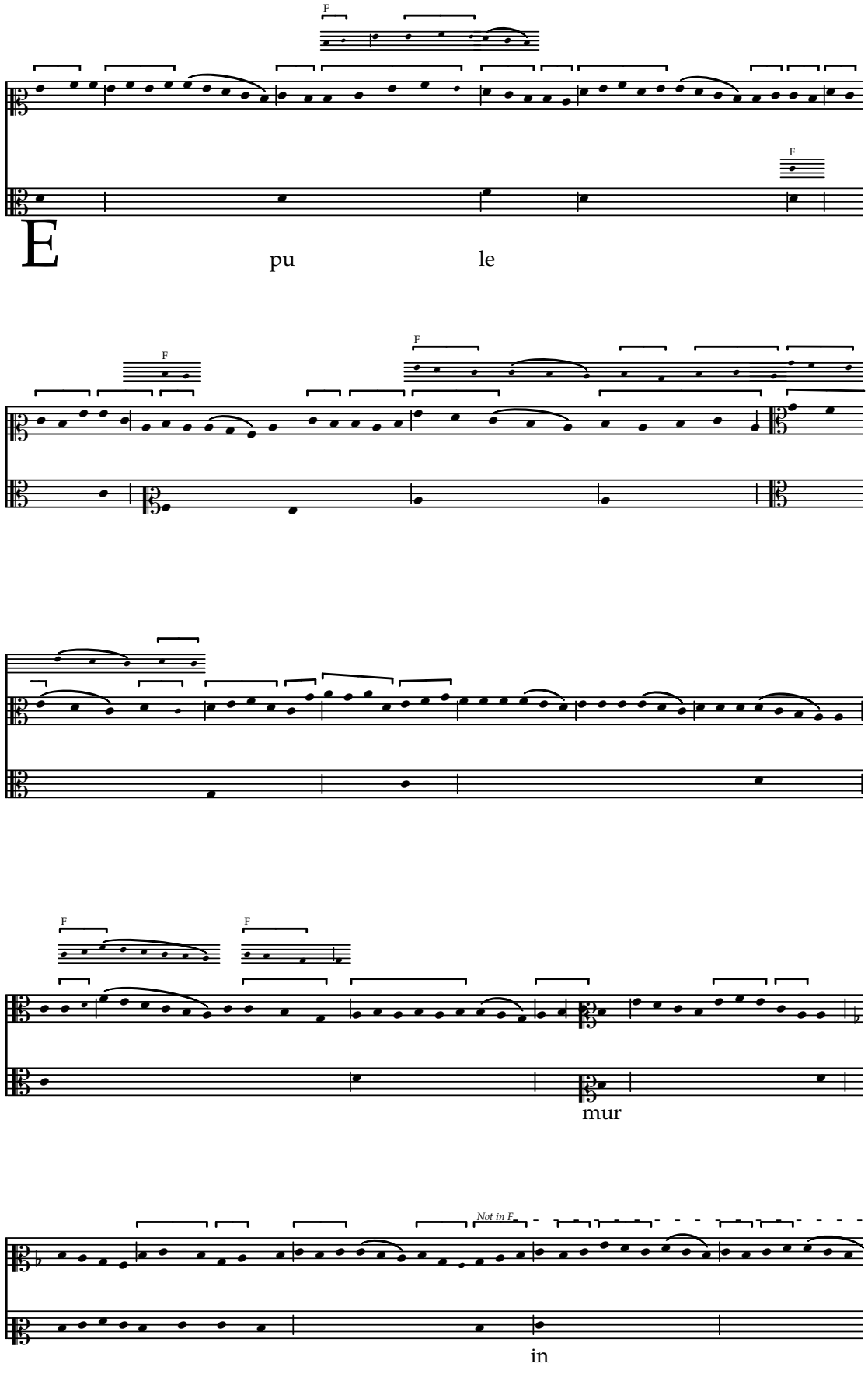
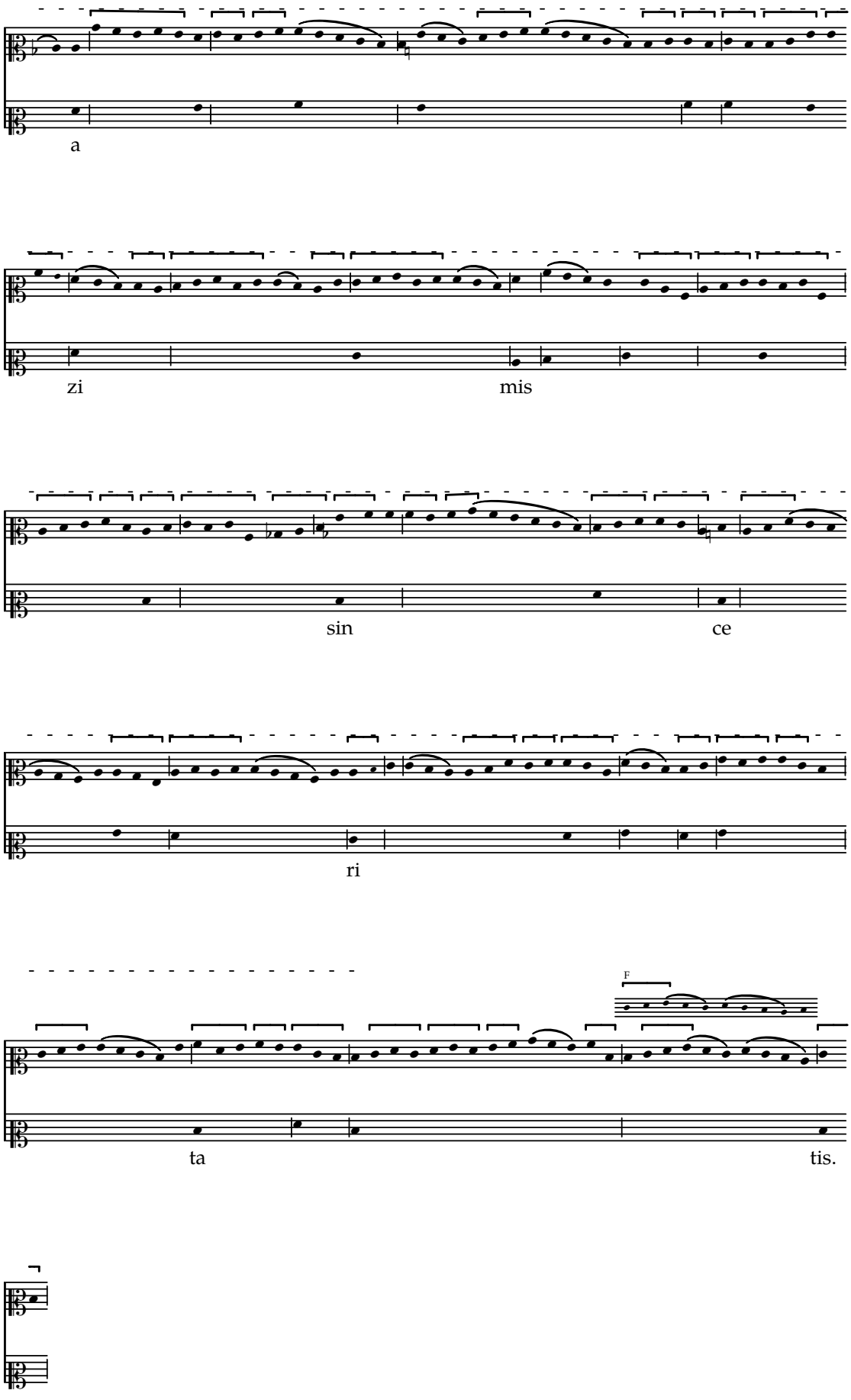
Concordances from F

f. 32v

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Concordances from F

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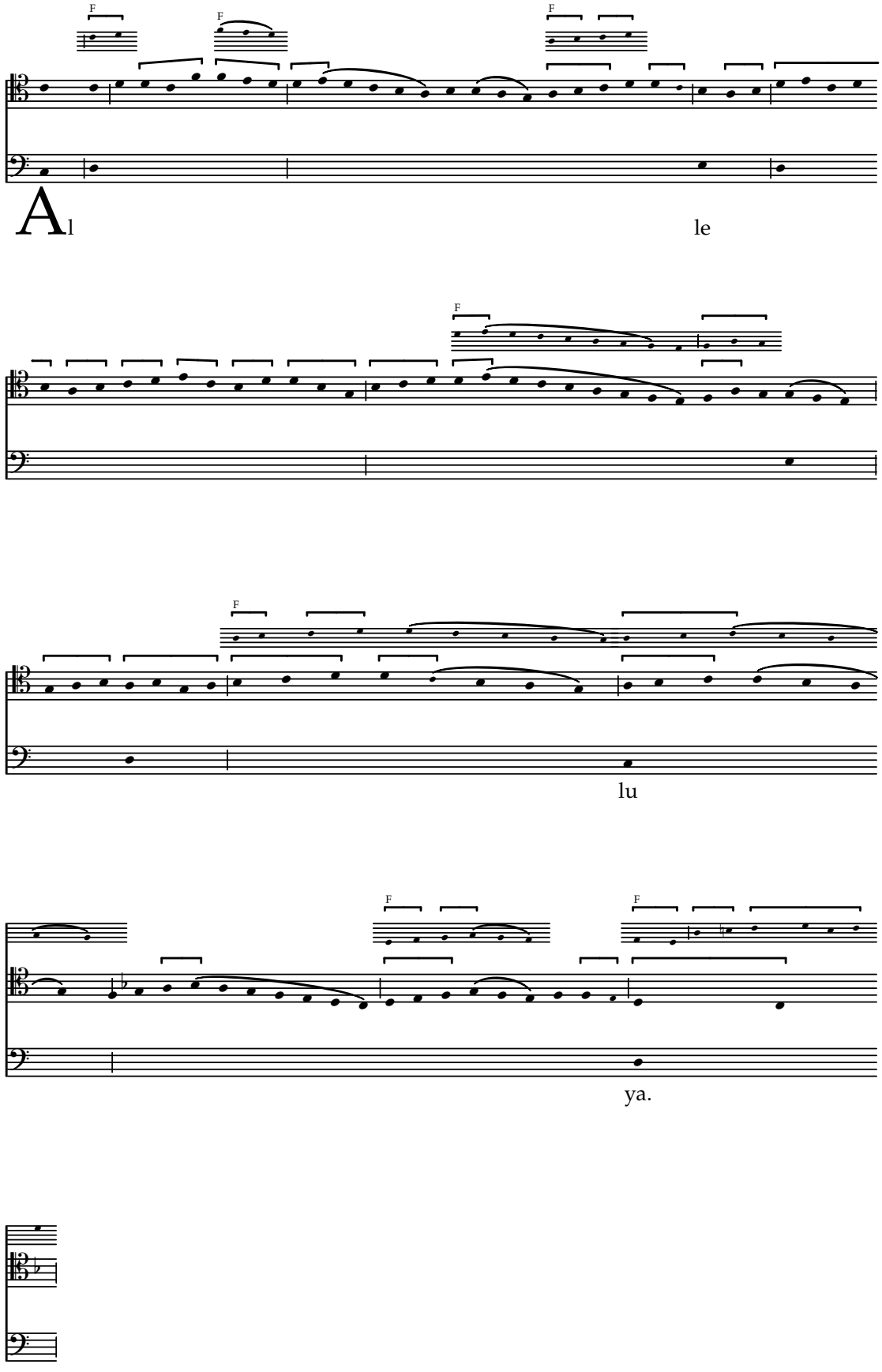
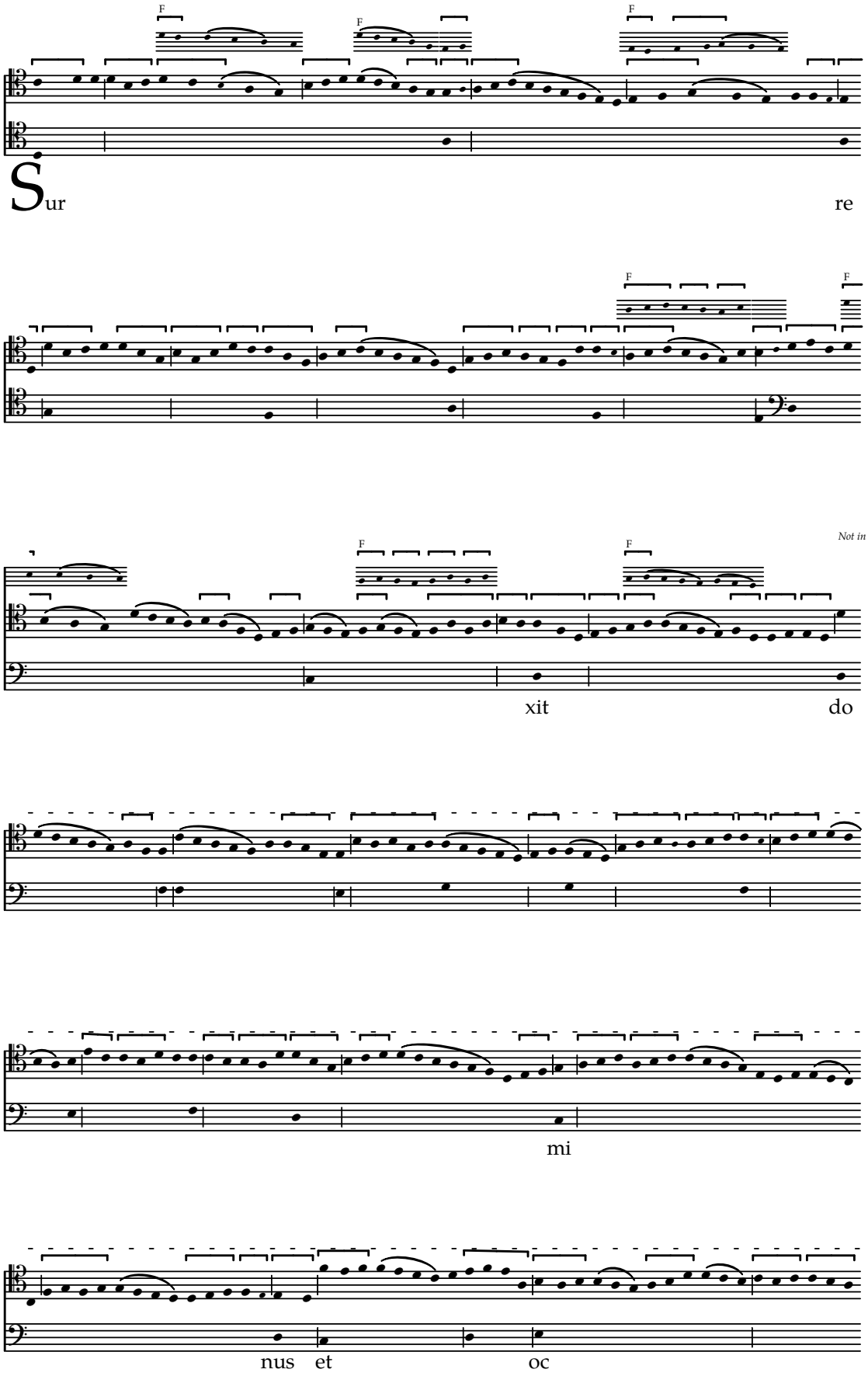
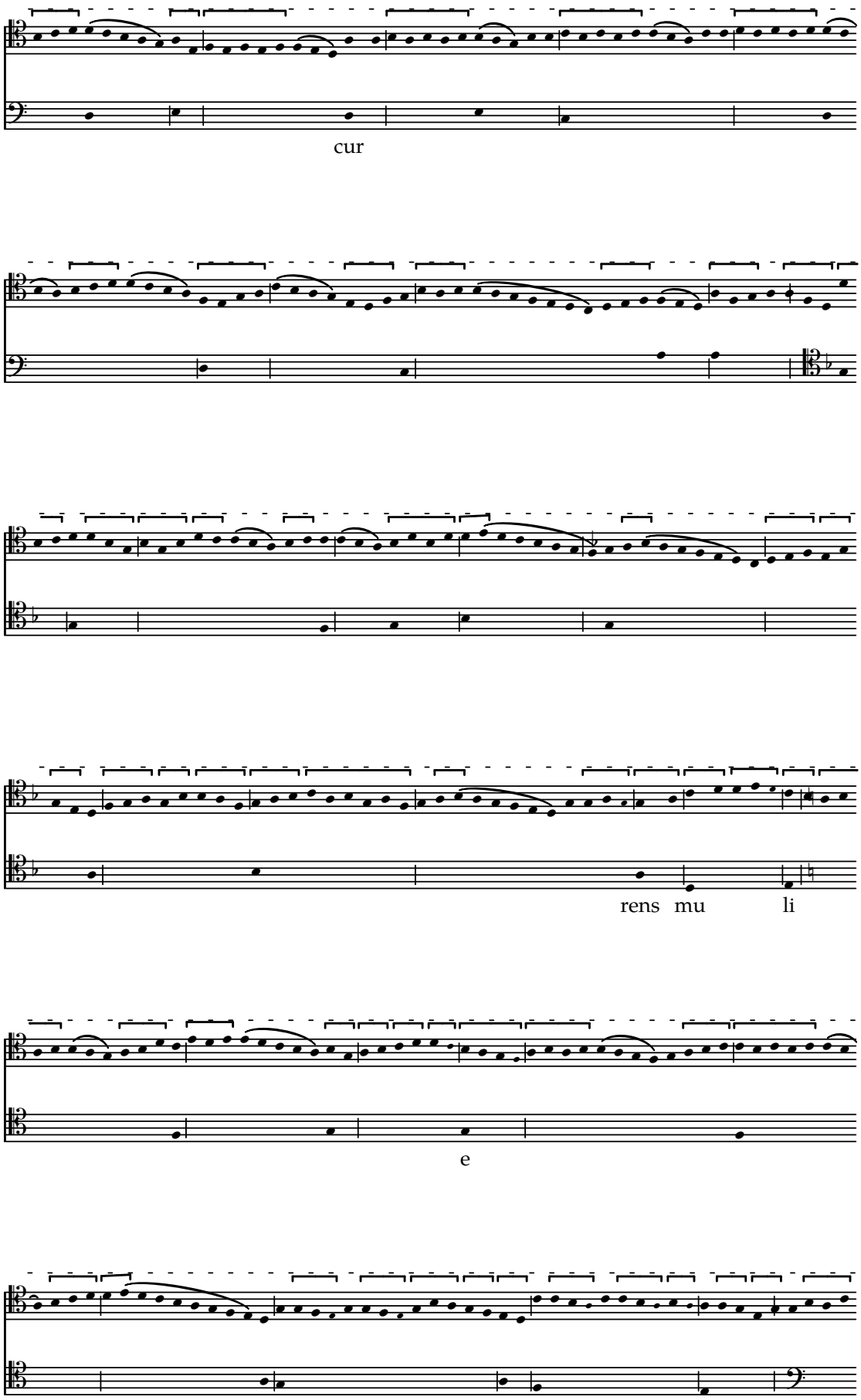


Surrexit dominus

Concordances from F

f. 33–33v

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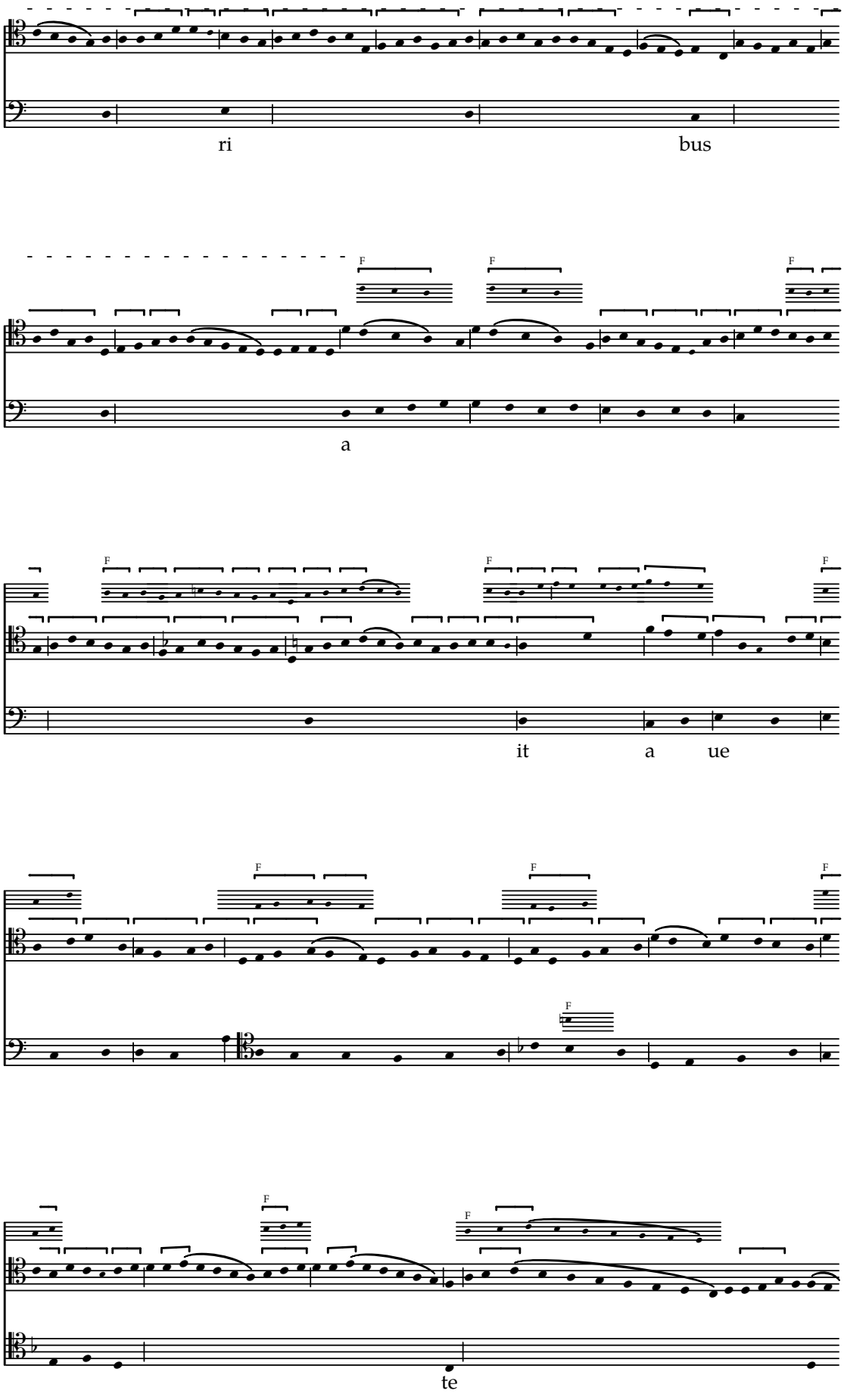
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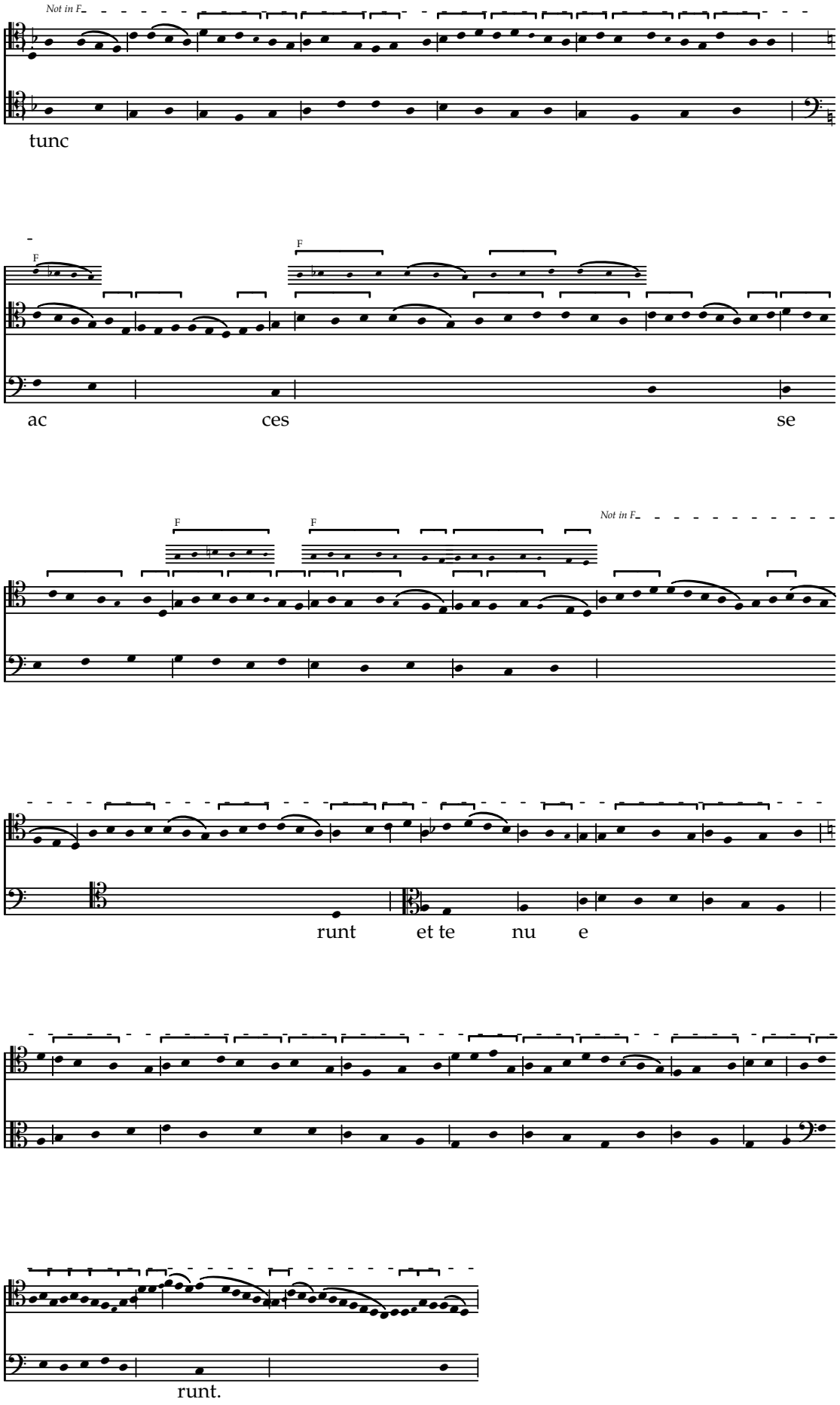
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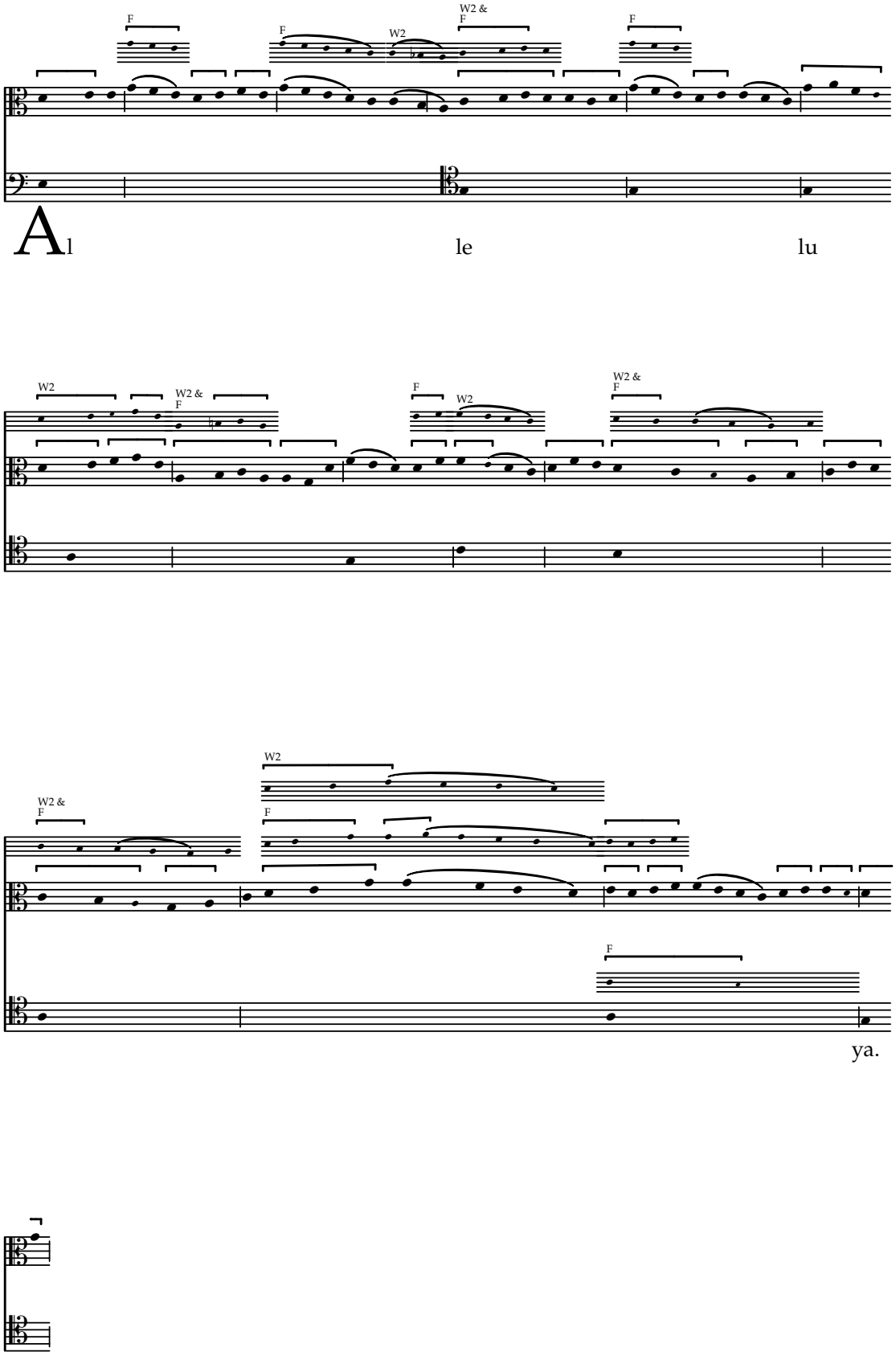
Concordances from W2 & F. E-Sl MS s/n not considered

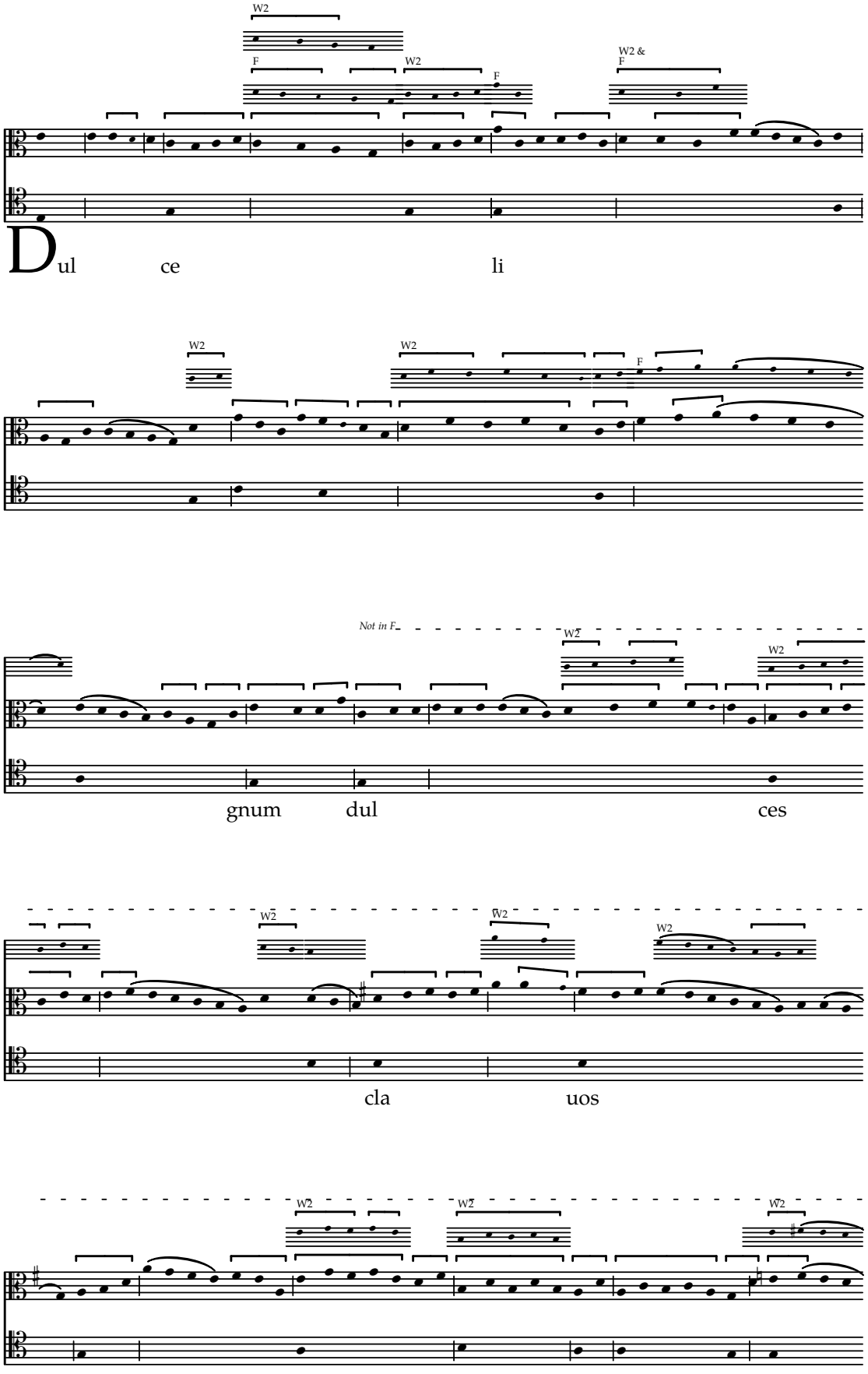
f. 33v–34

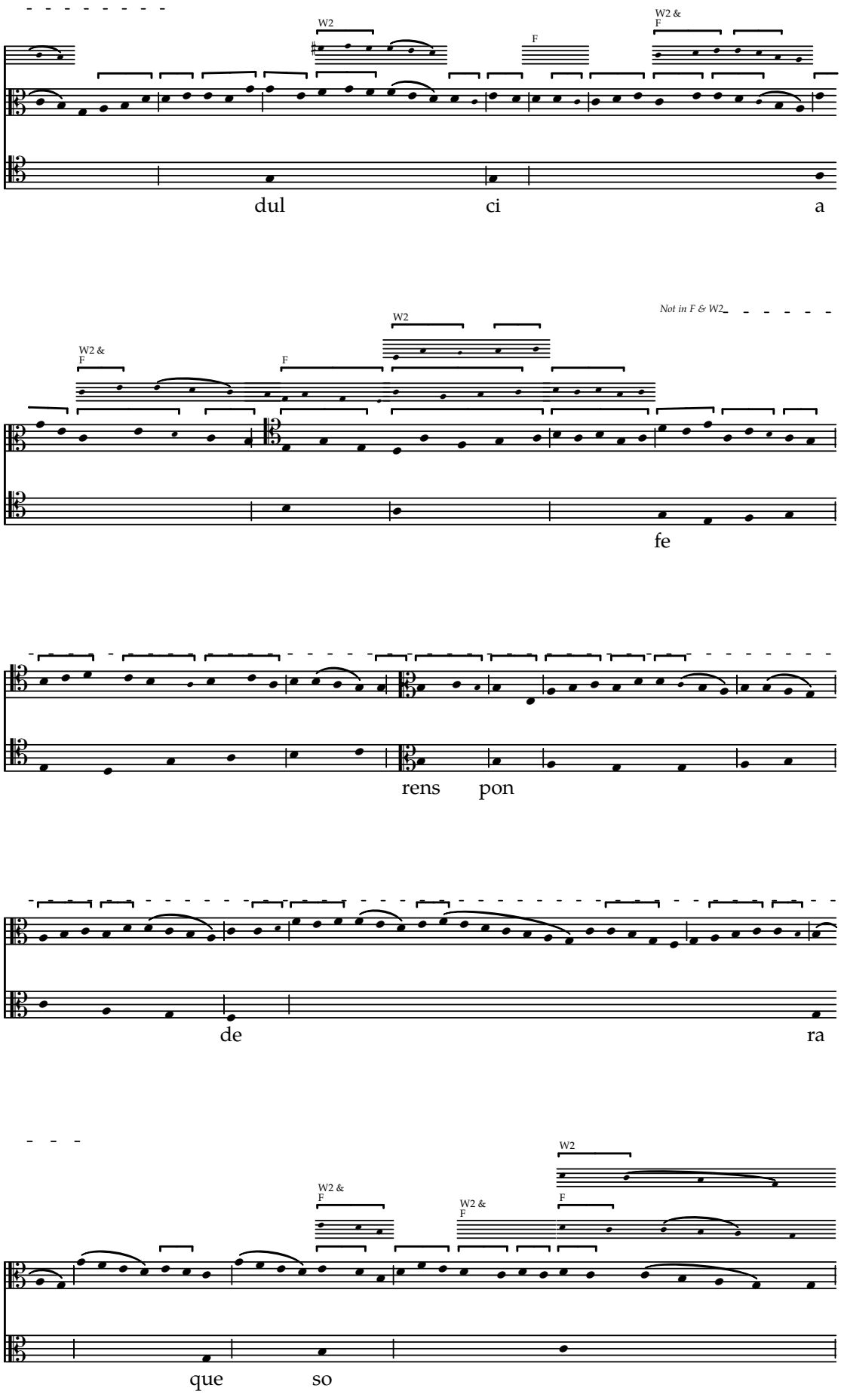


Dulce lignum

Concordances from W2 & F. E-Sl MS s/n not considered

f. 34–34v

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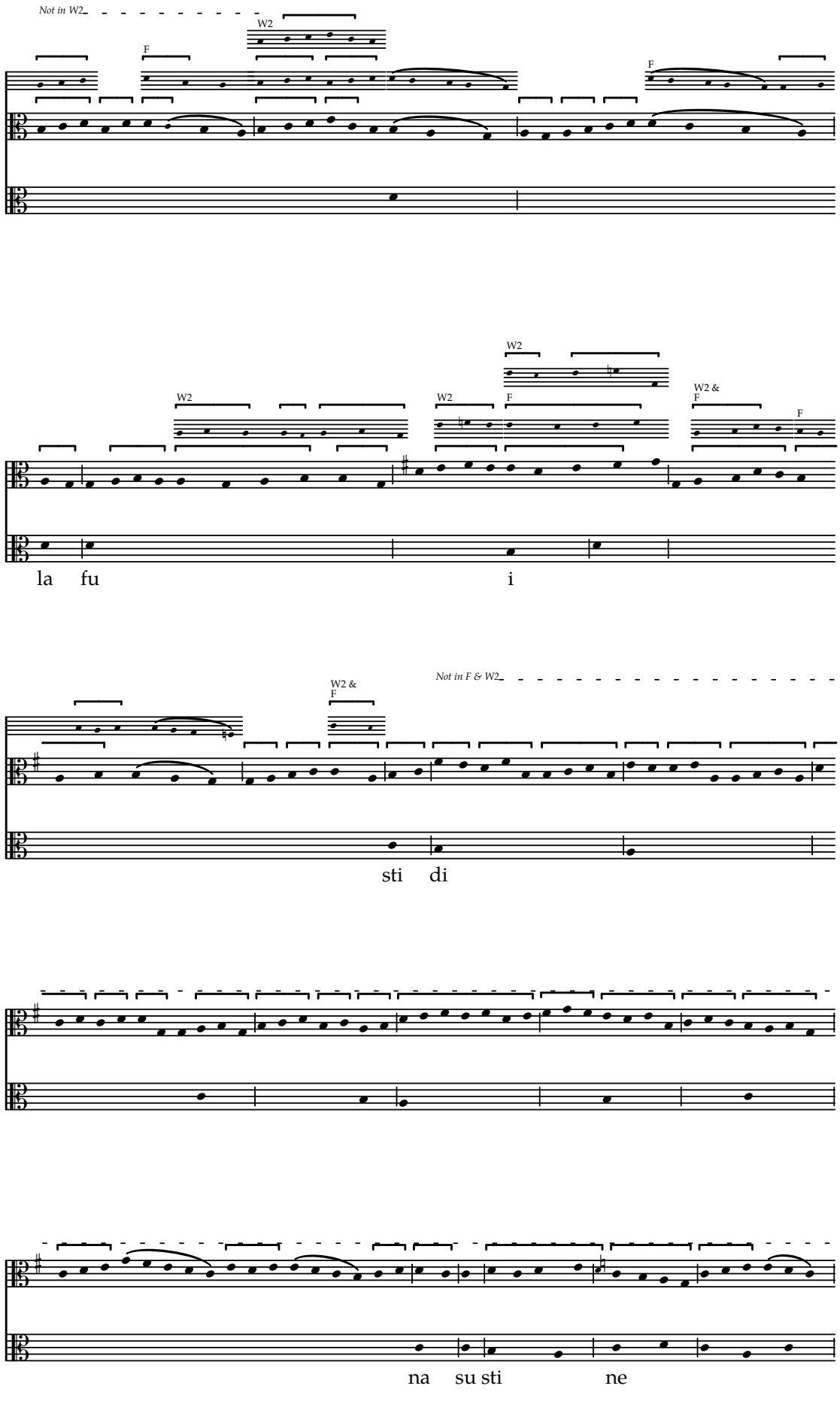
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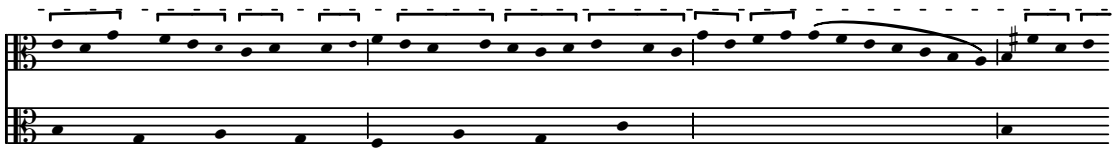

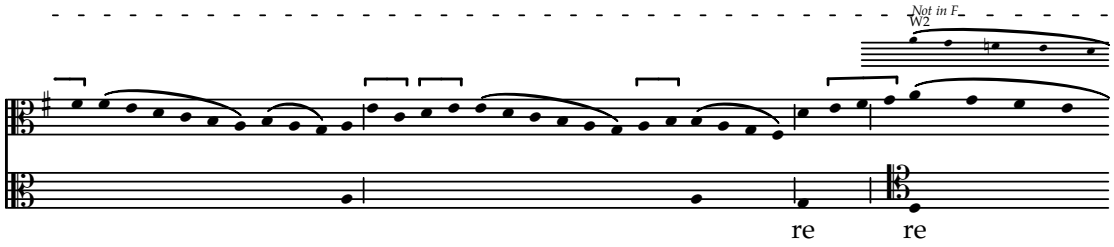
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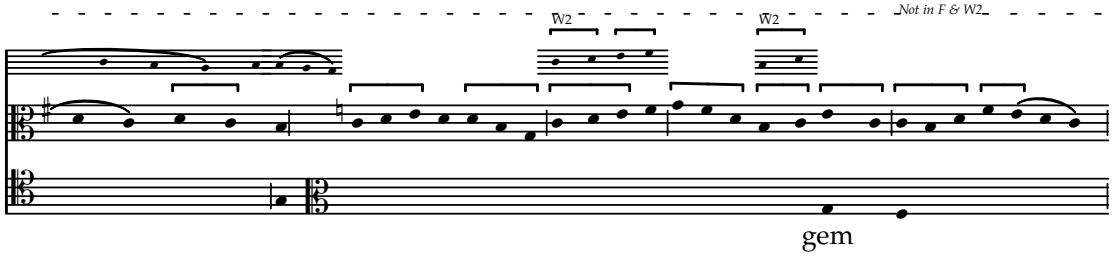
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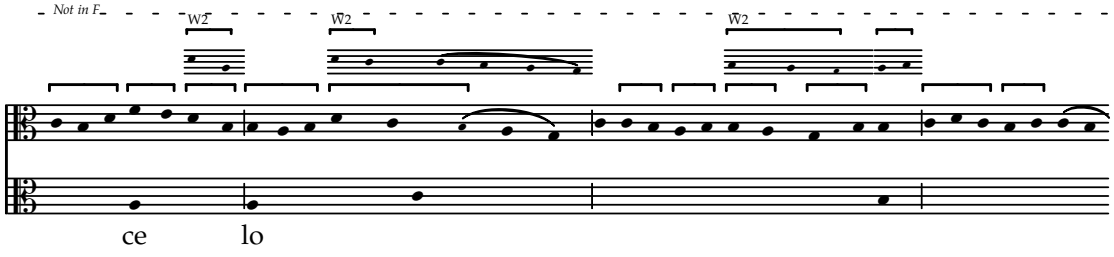
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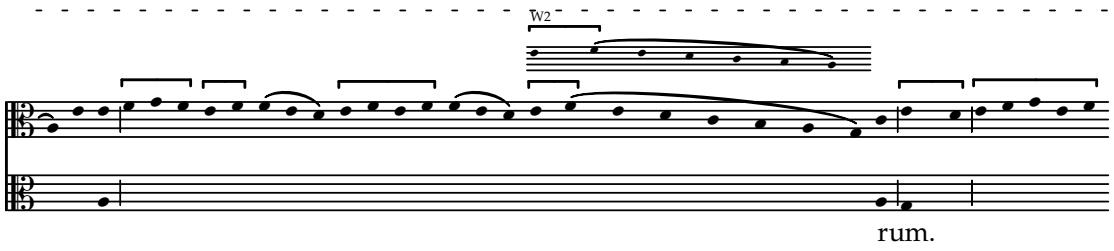
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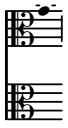
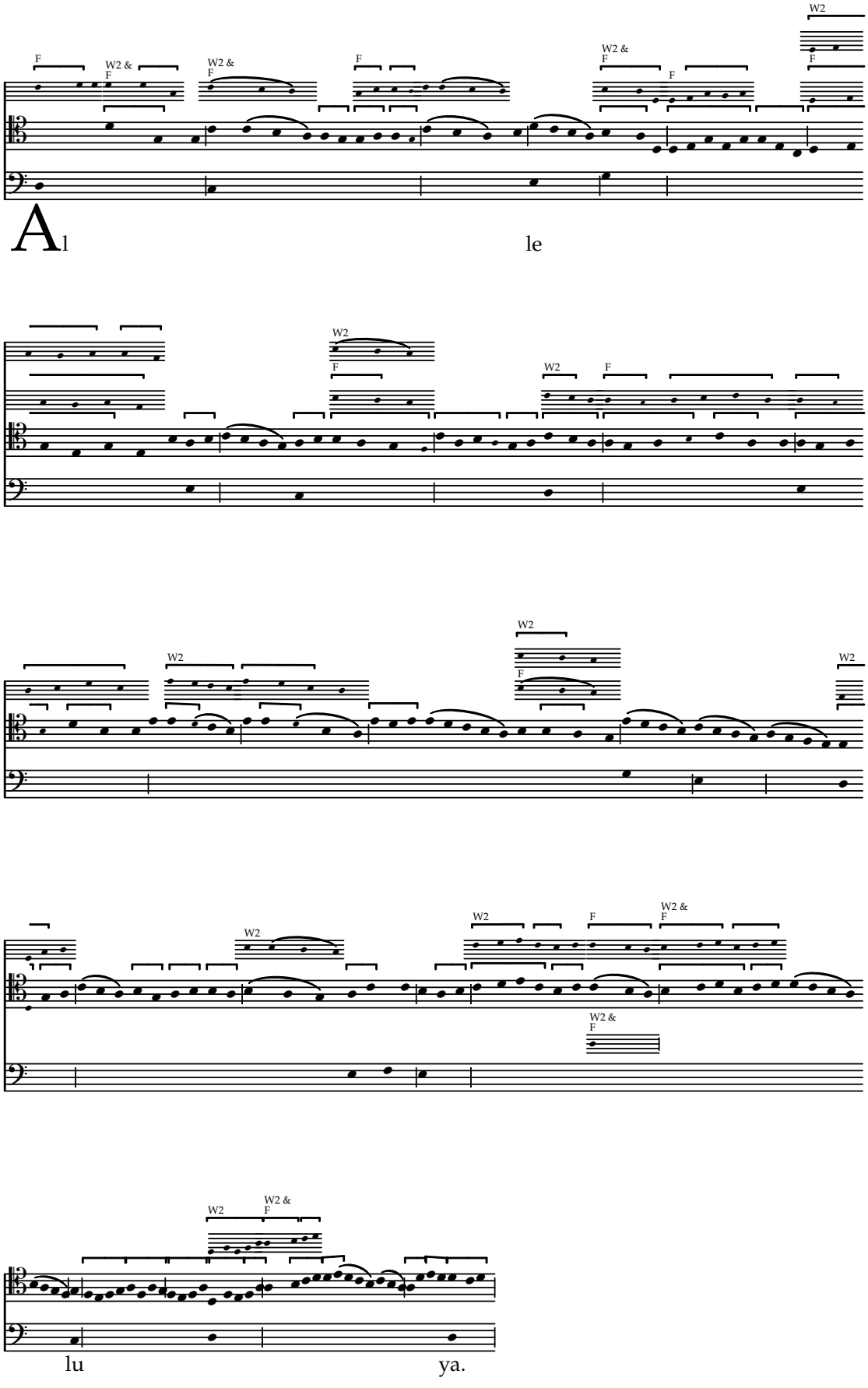


Alleluya

Concordances from W2 & F. E-Sl MS s/n not considered

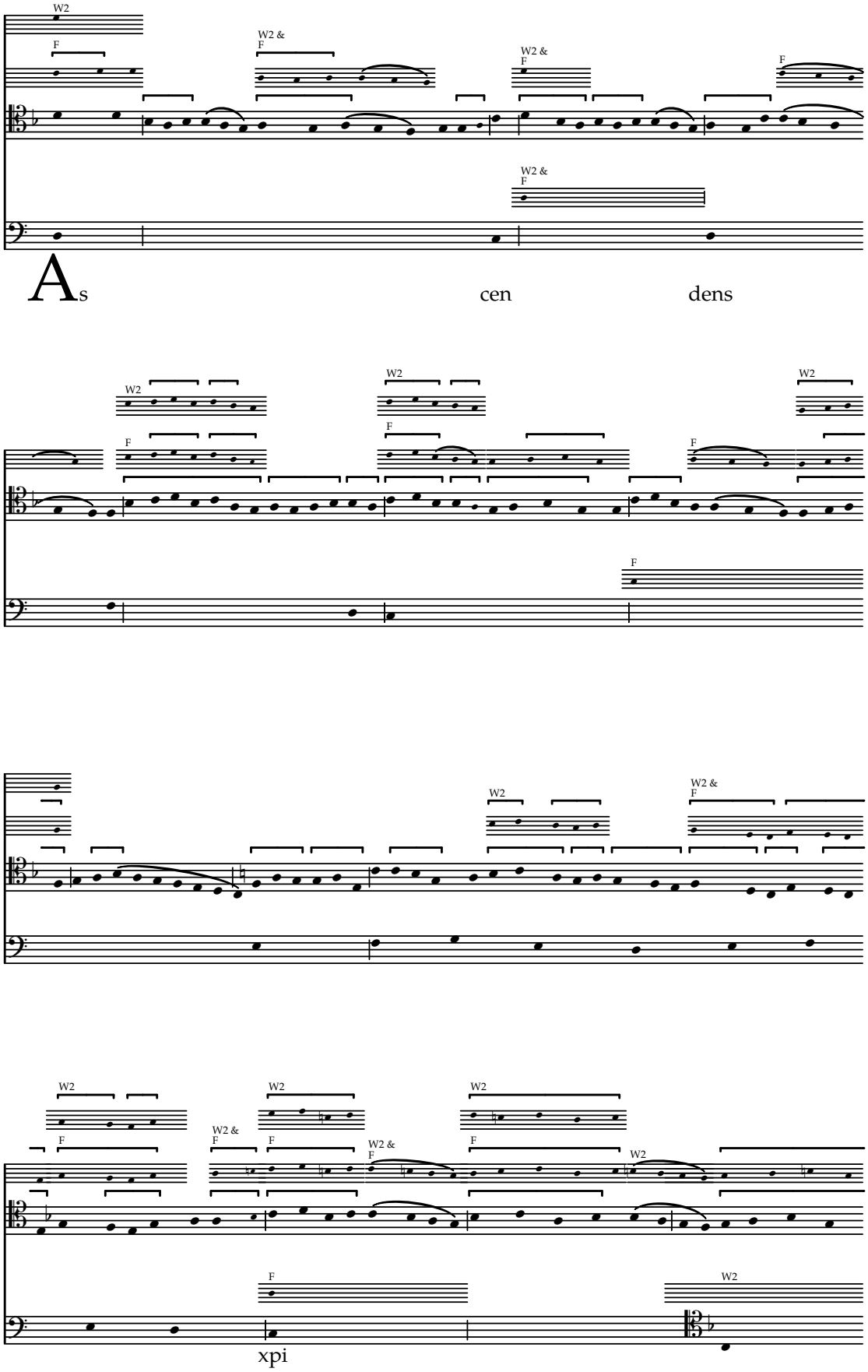
f. 34v

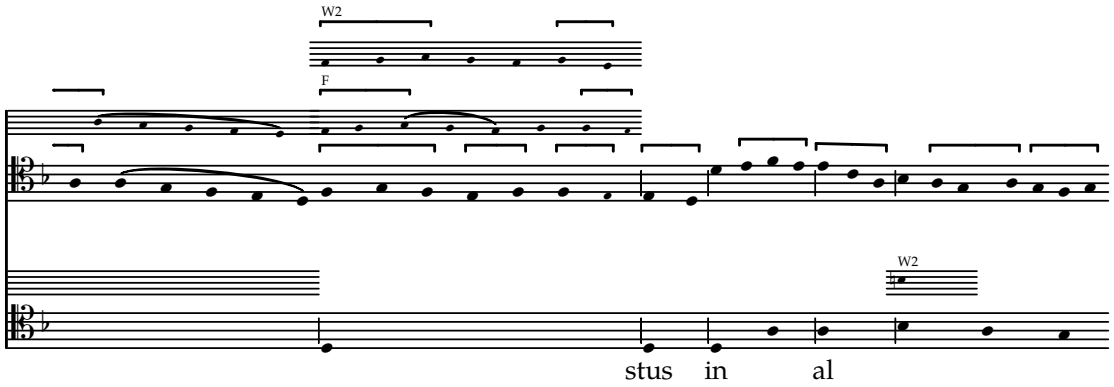


Ascendens xpistus

Concordances from W2 & F. E-Sl MS s/n not considered

f. 34v–35

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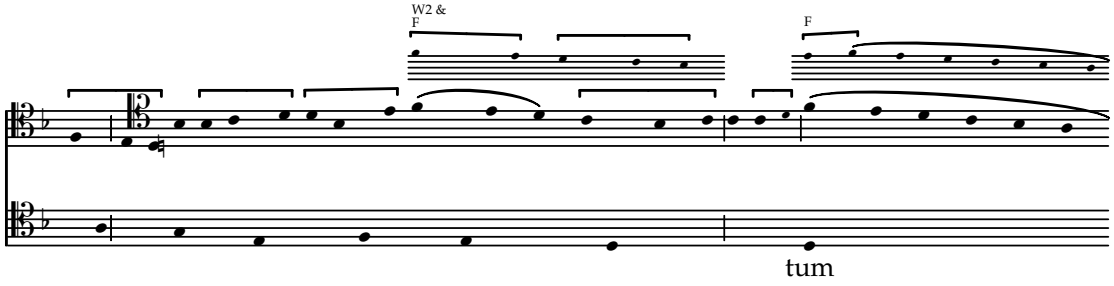
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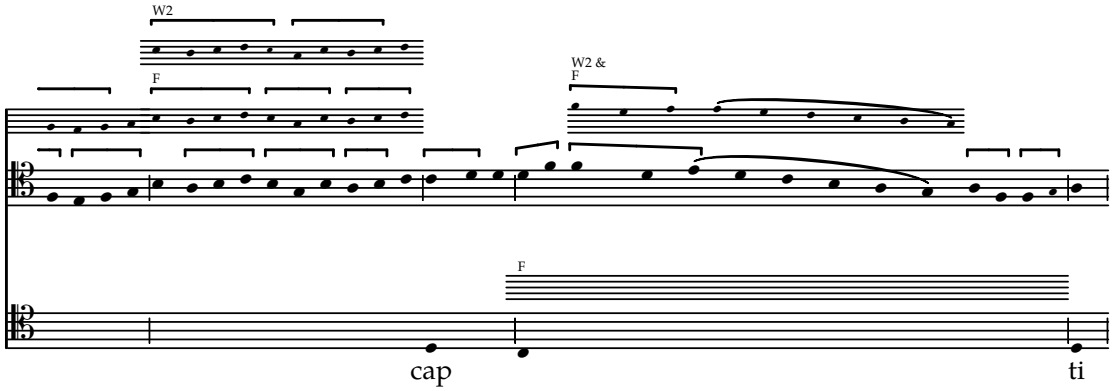
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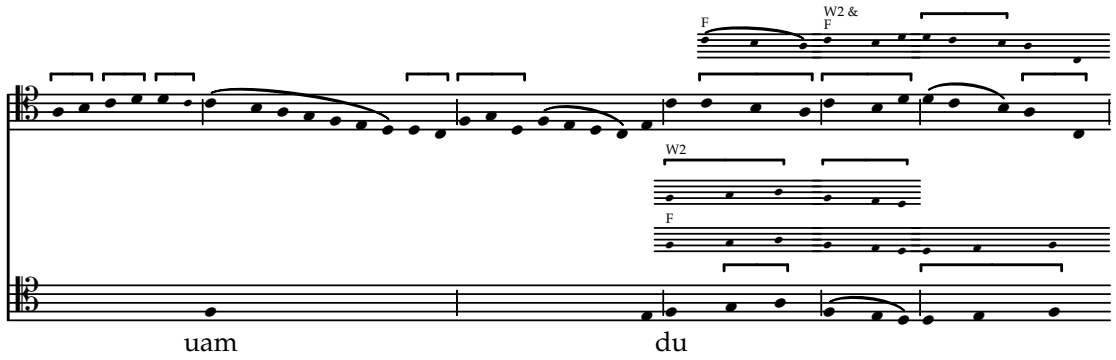
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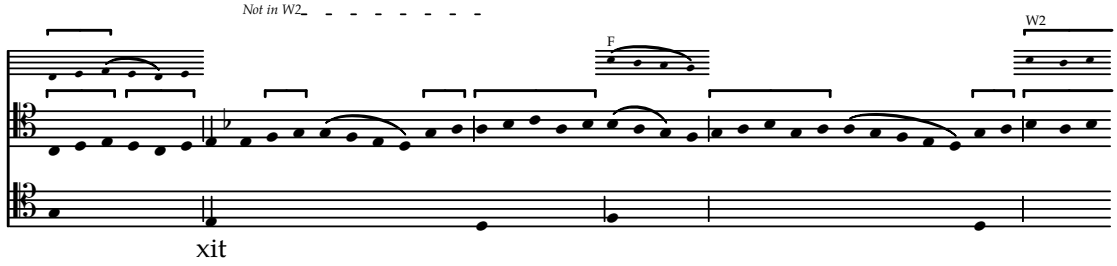
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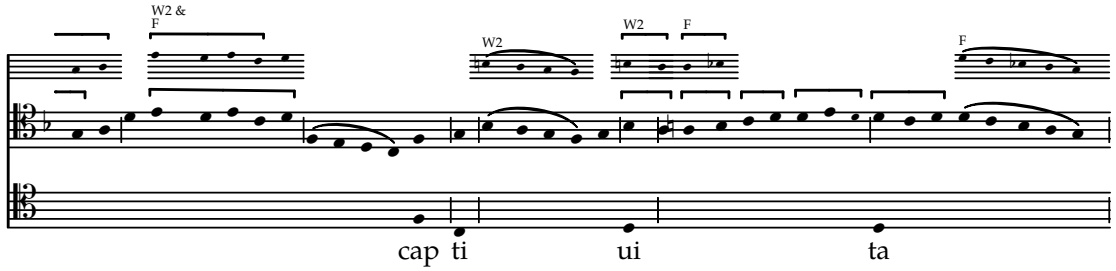
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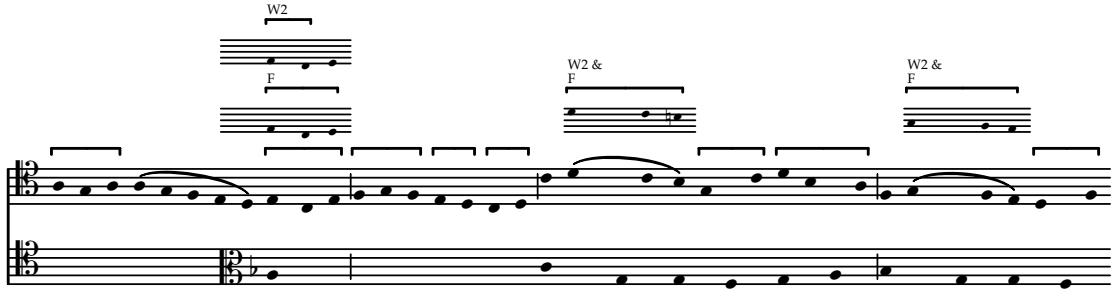
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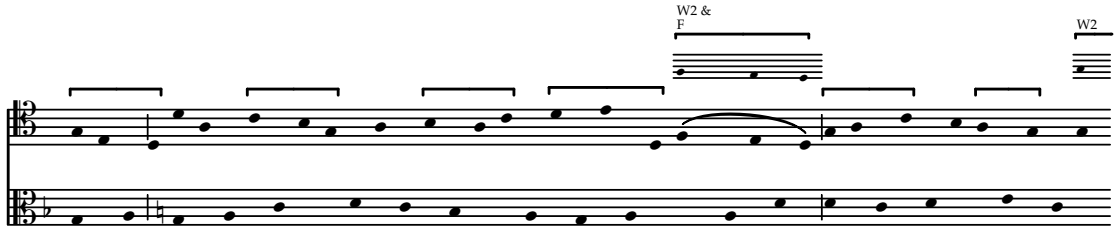
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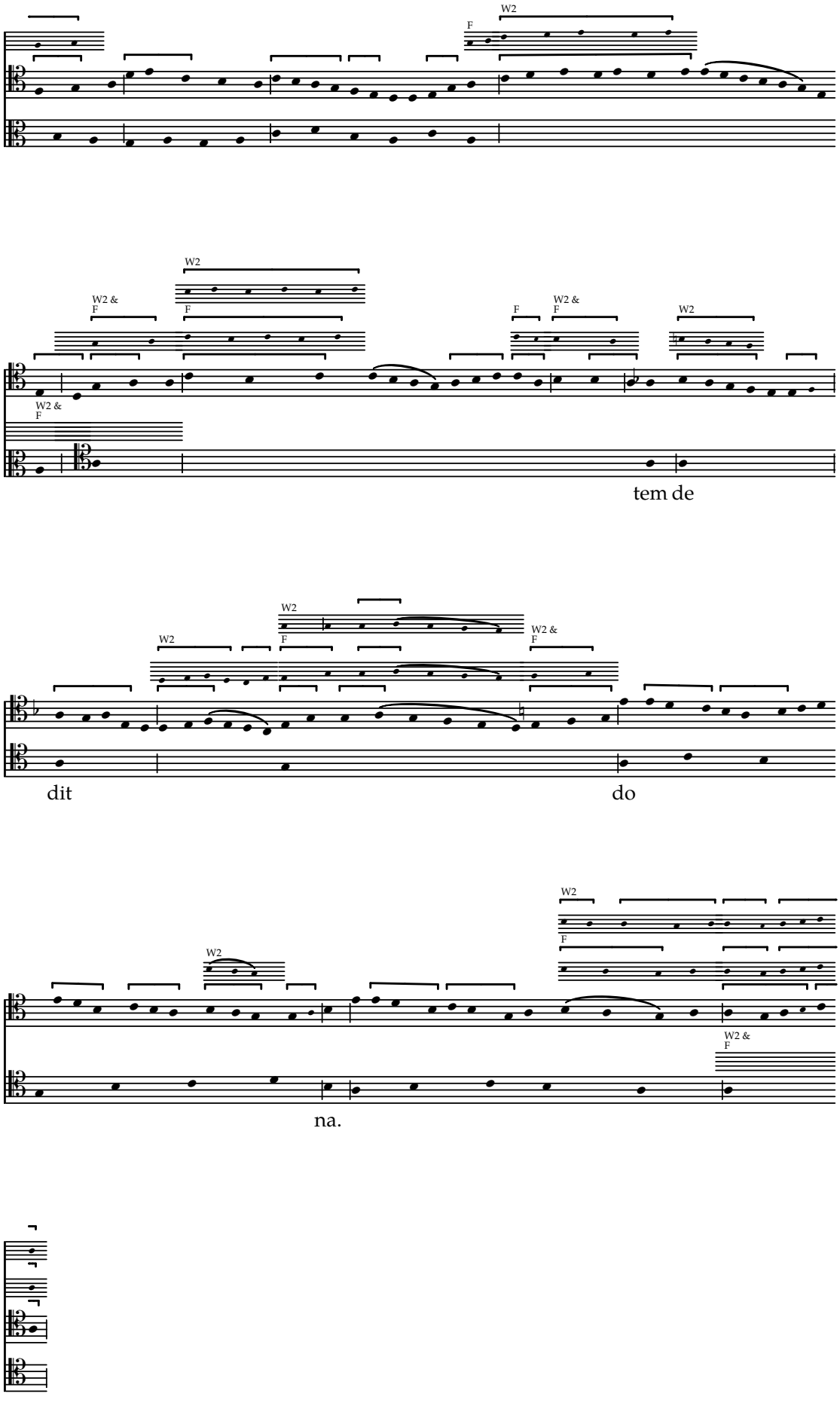
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Concordances from F

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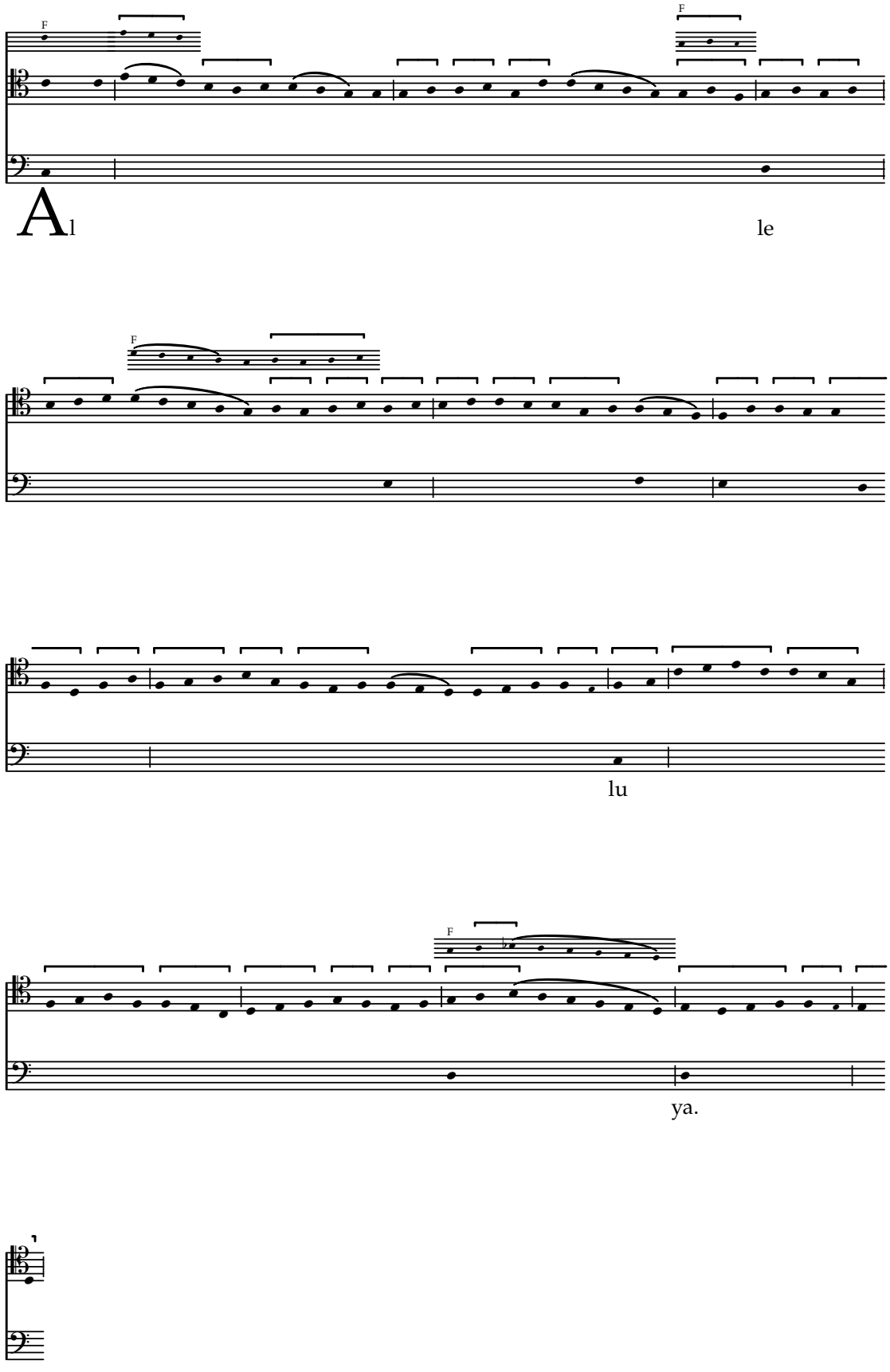
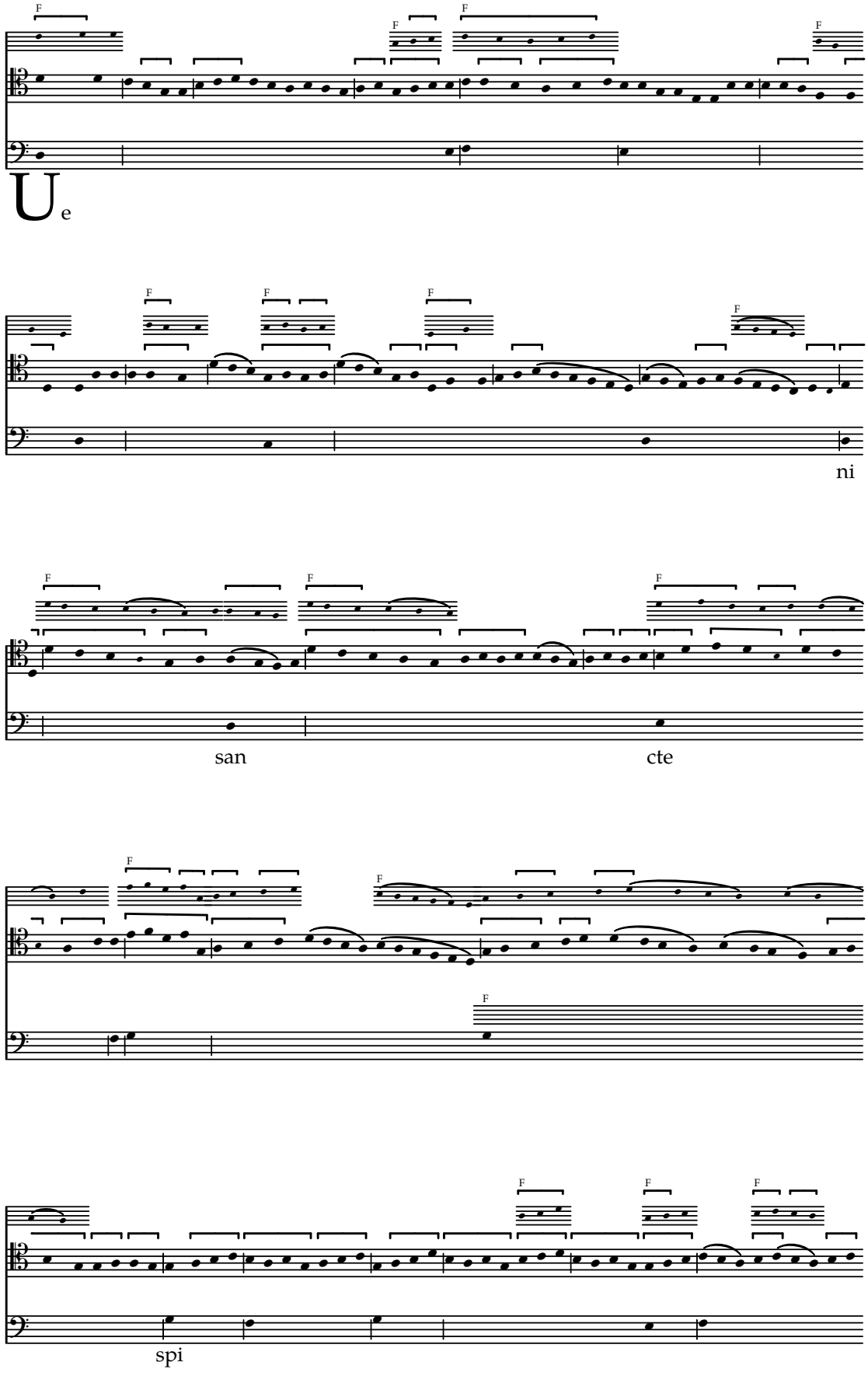
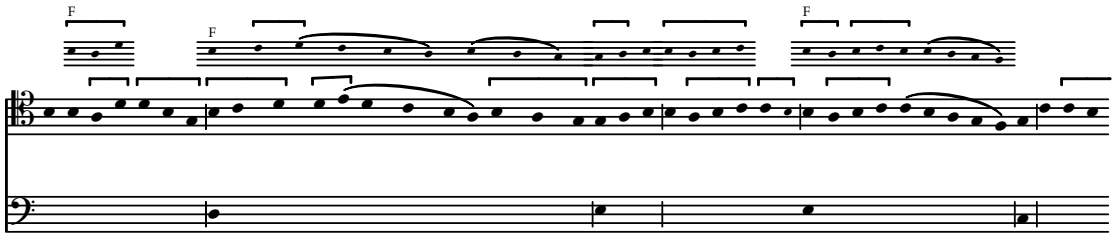


Ueni sancte spiritus

Concordances from F

f. 35v

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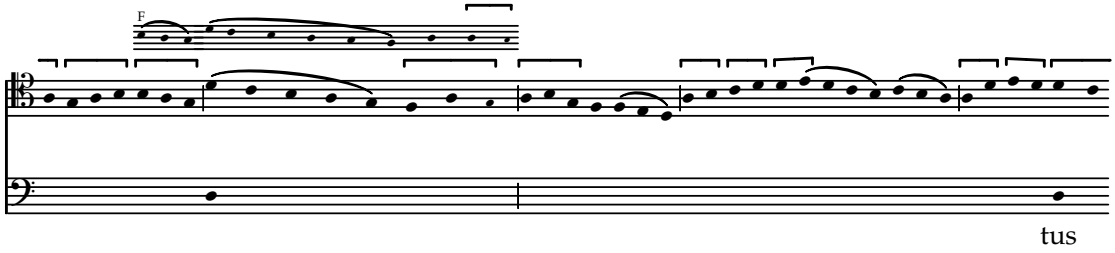
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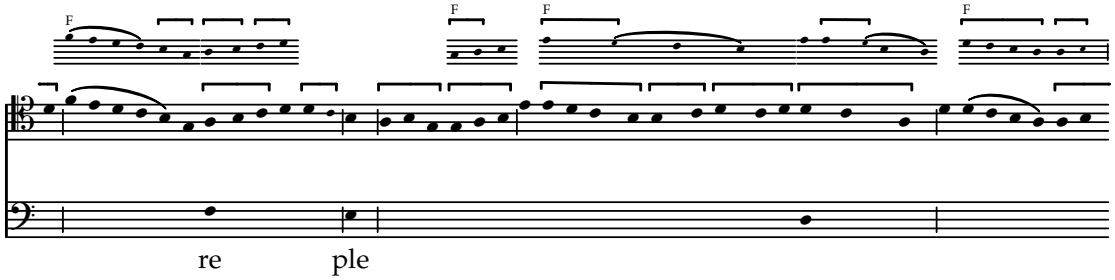
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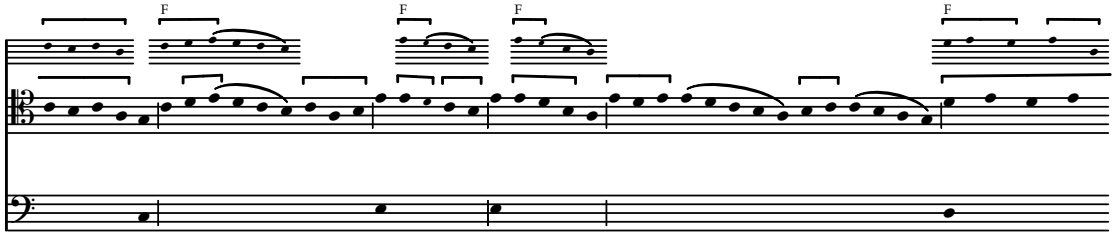

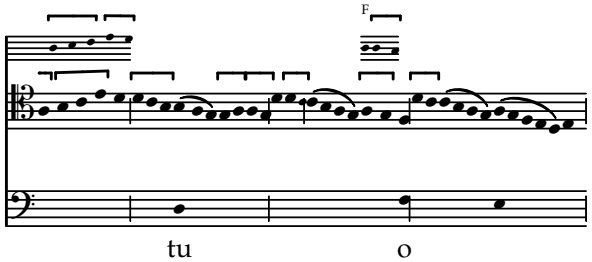
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Concordances from W2 & F

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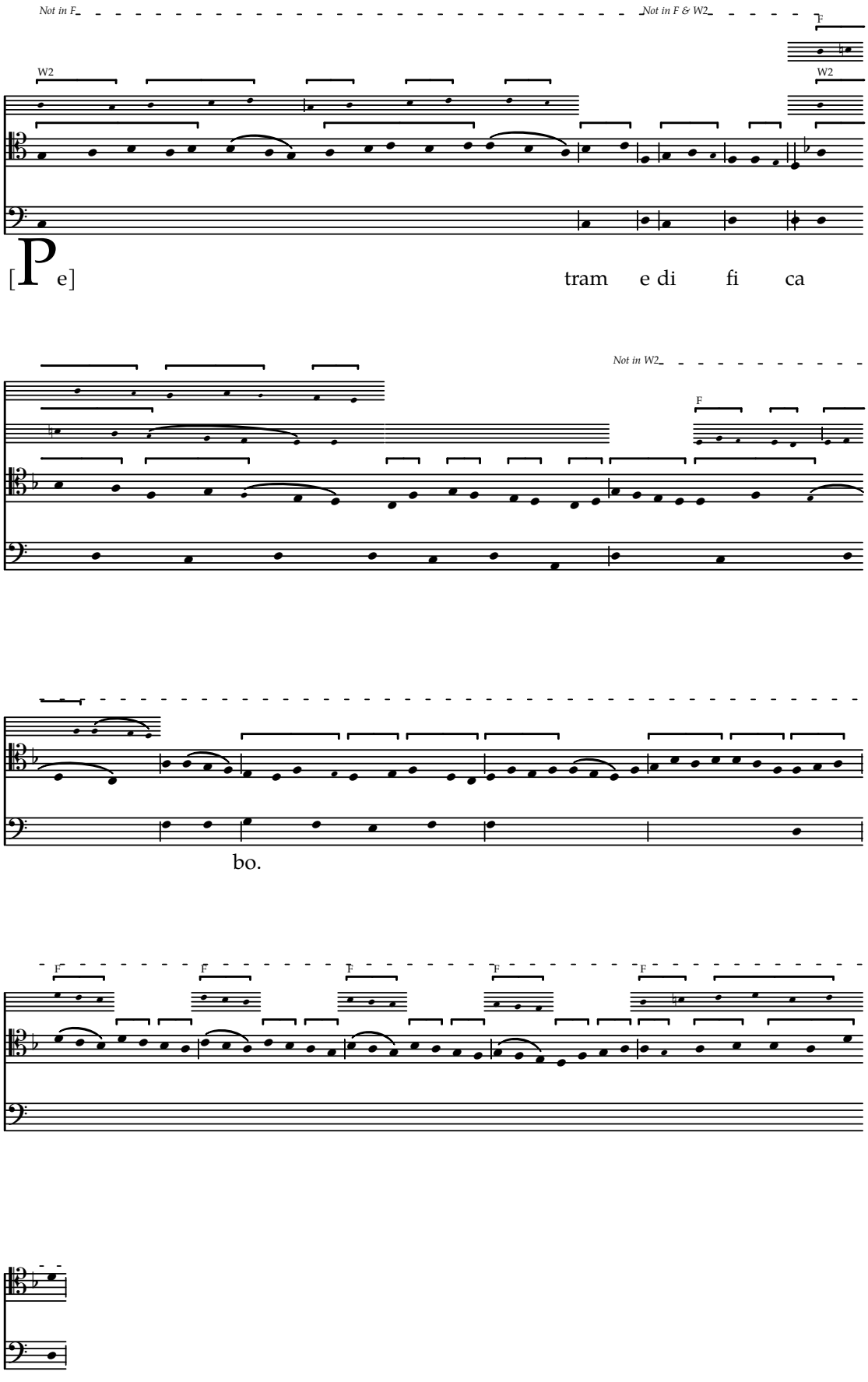

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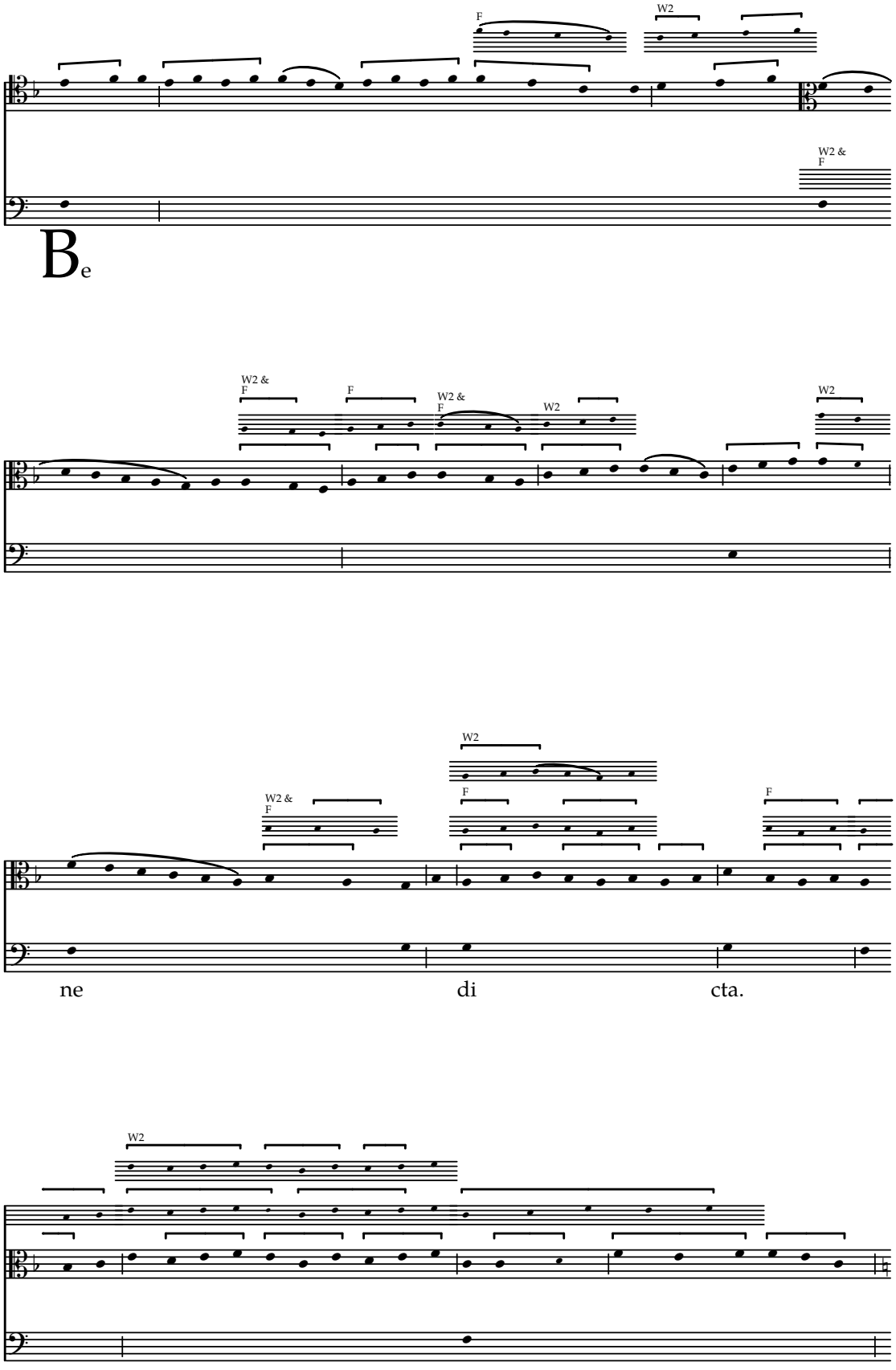
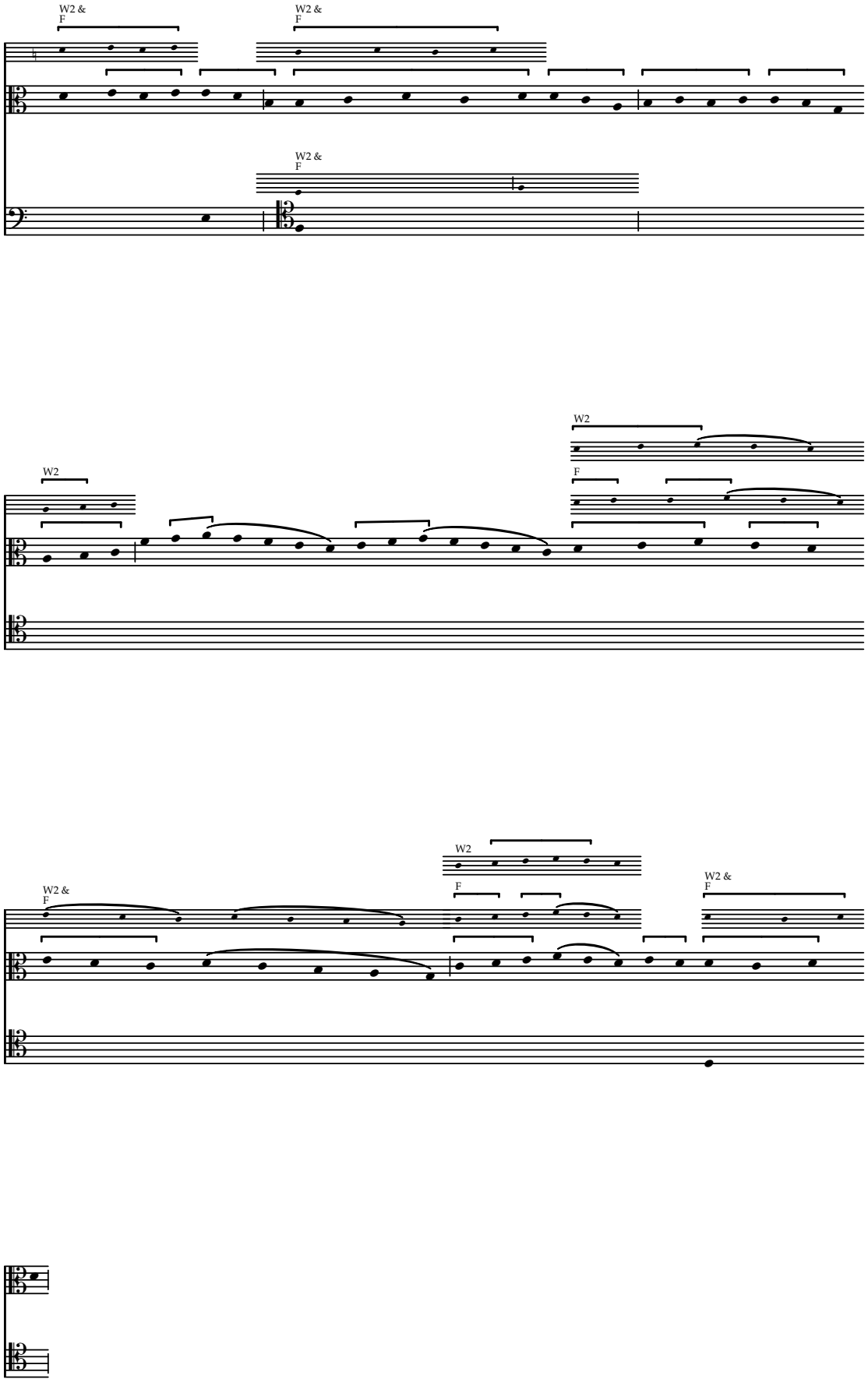
Concordances from W2 & F

f. 38

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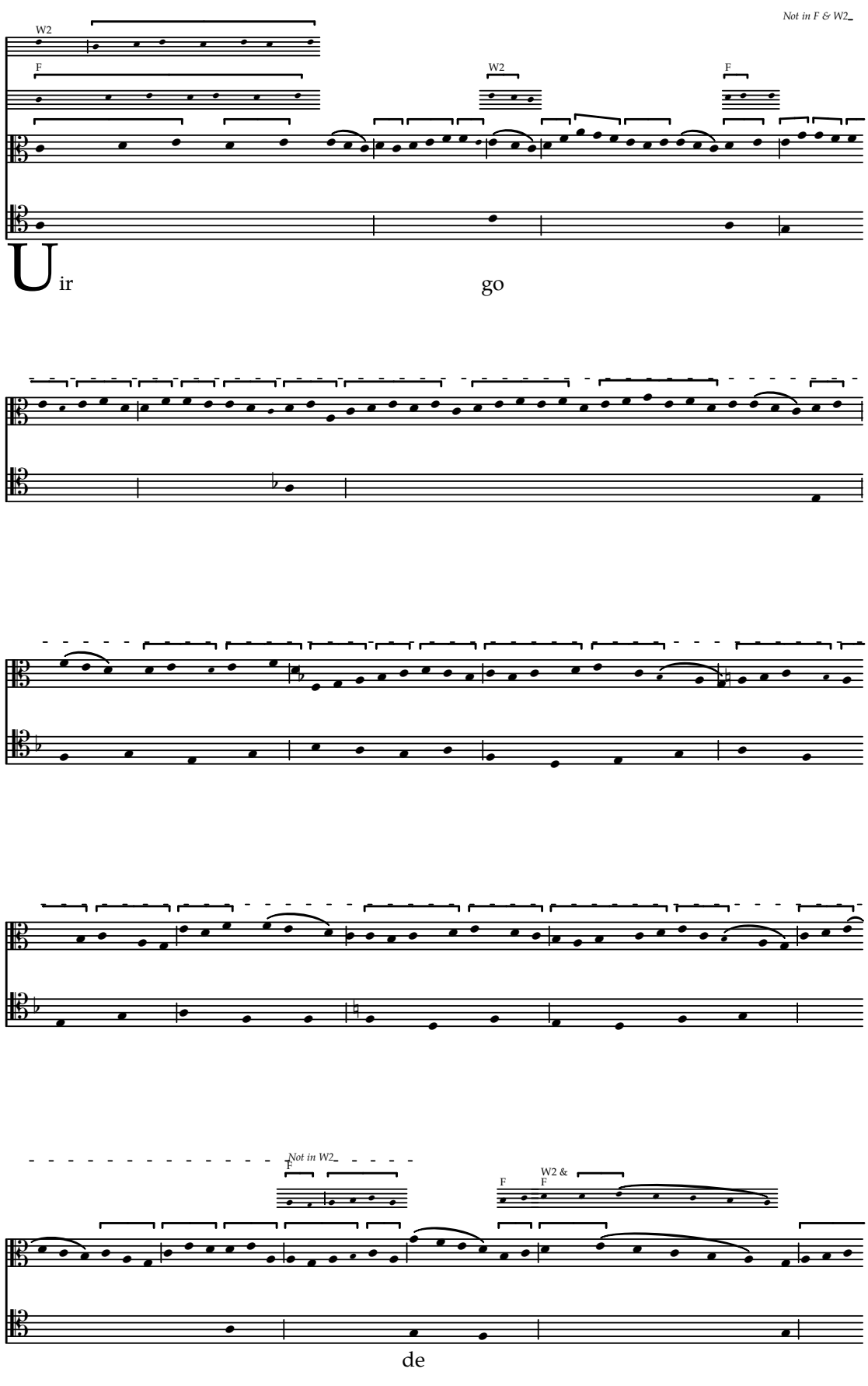
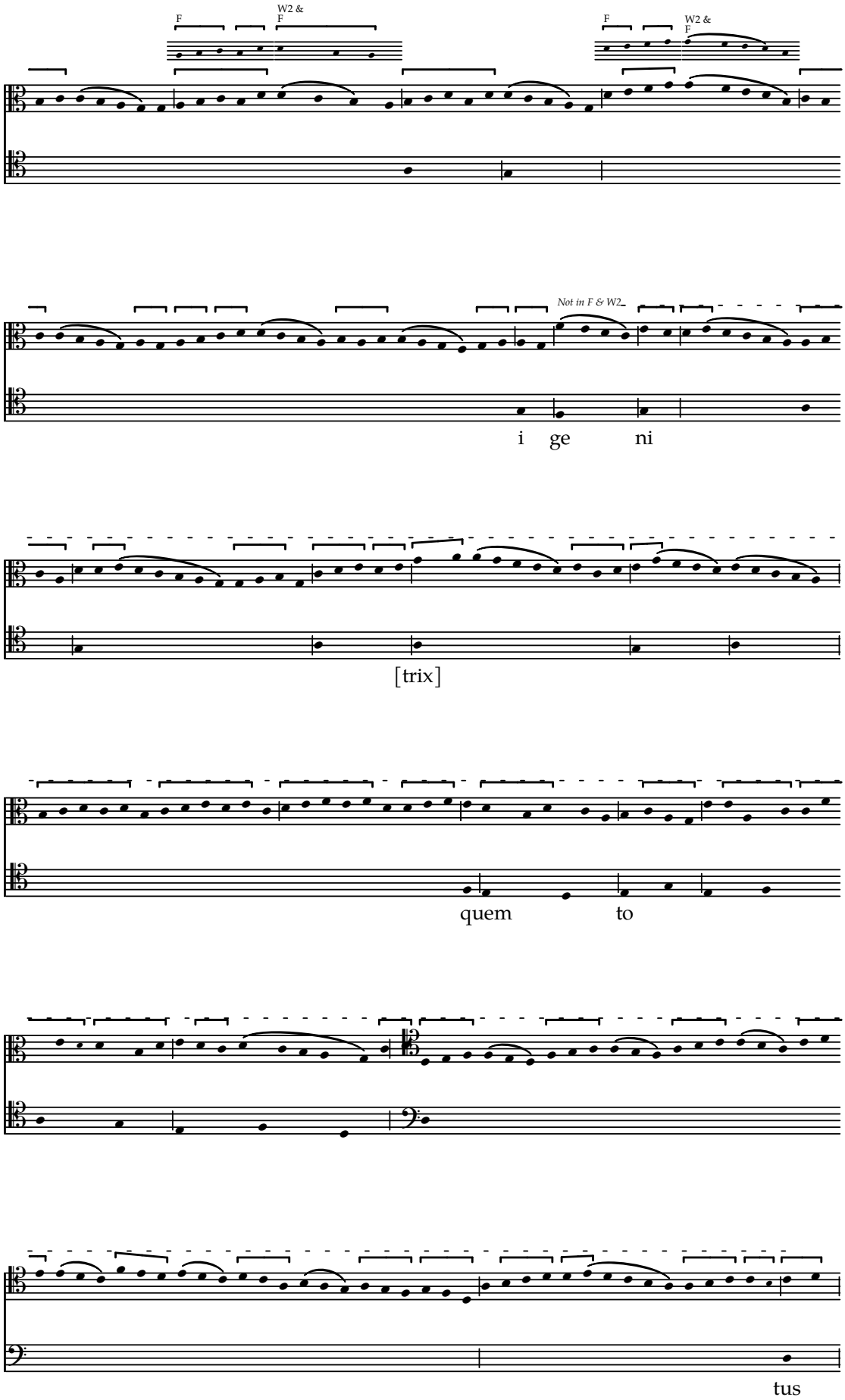
Concordances from W2 & F

f. 38–38v

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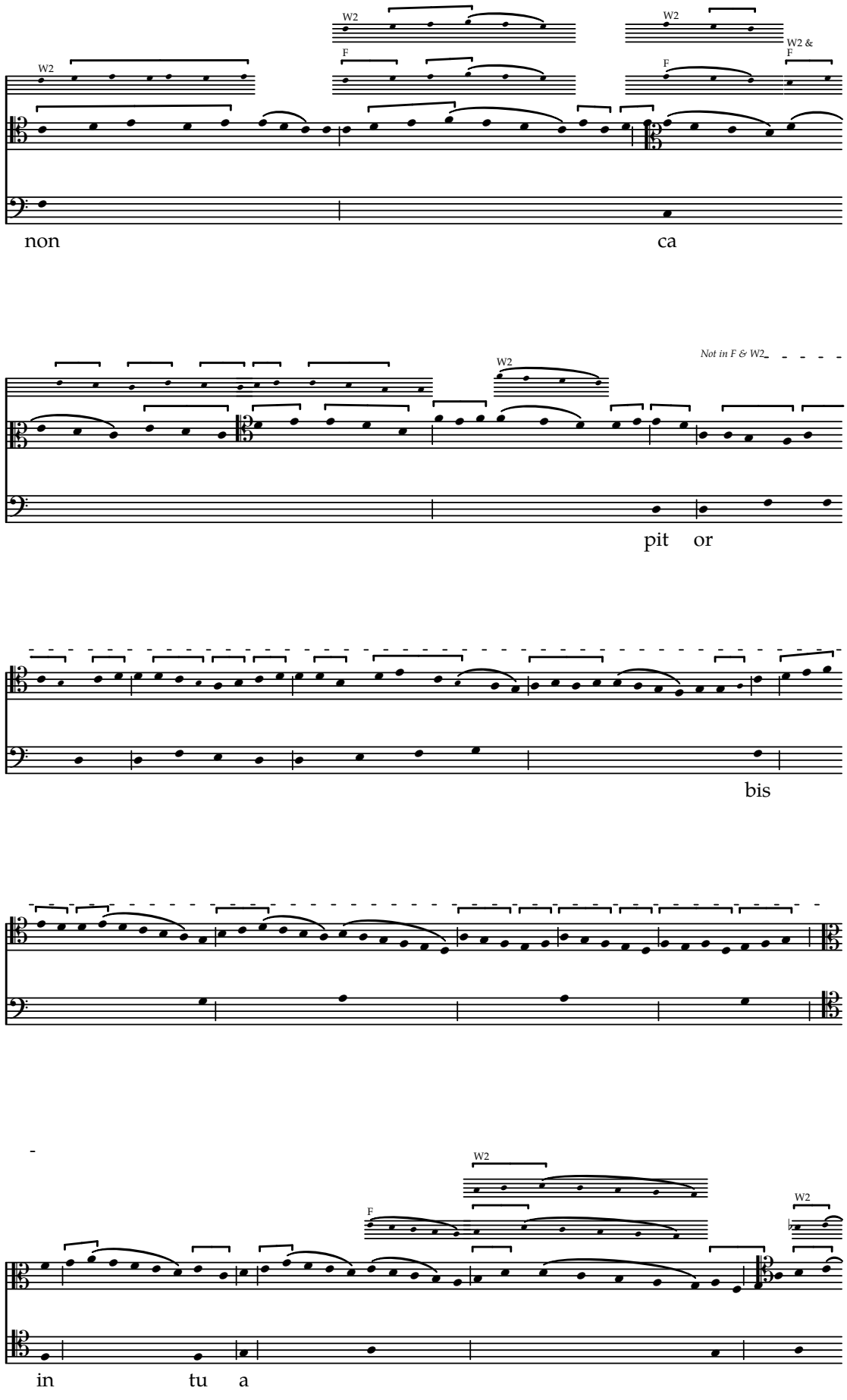
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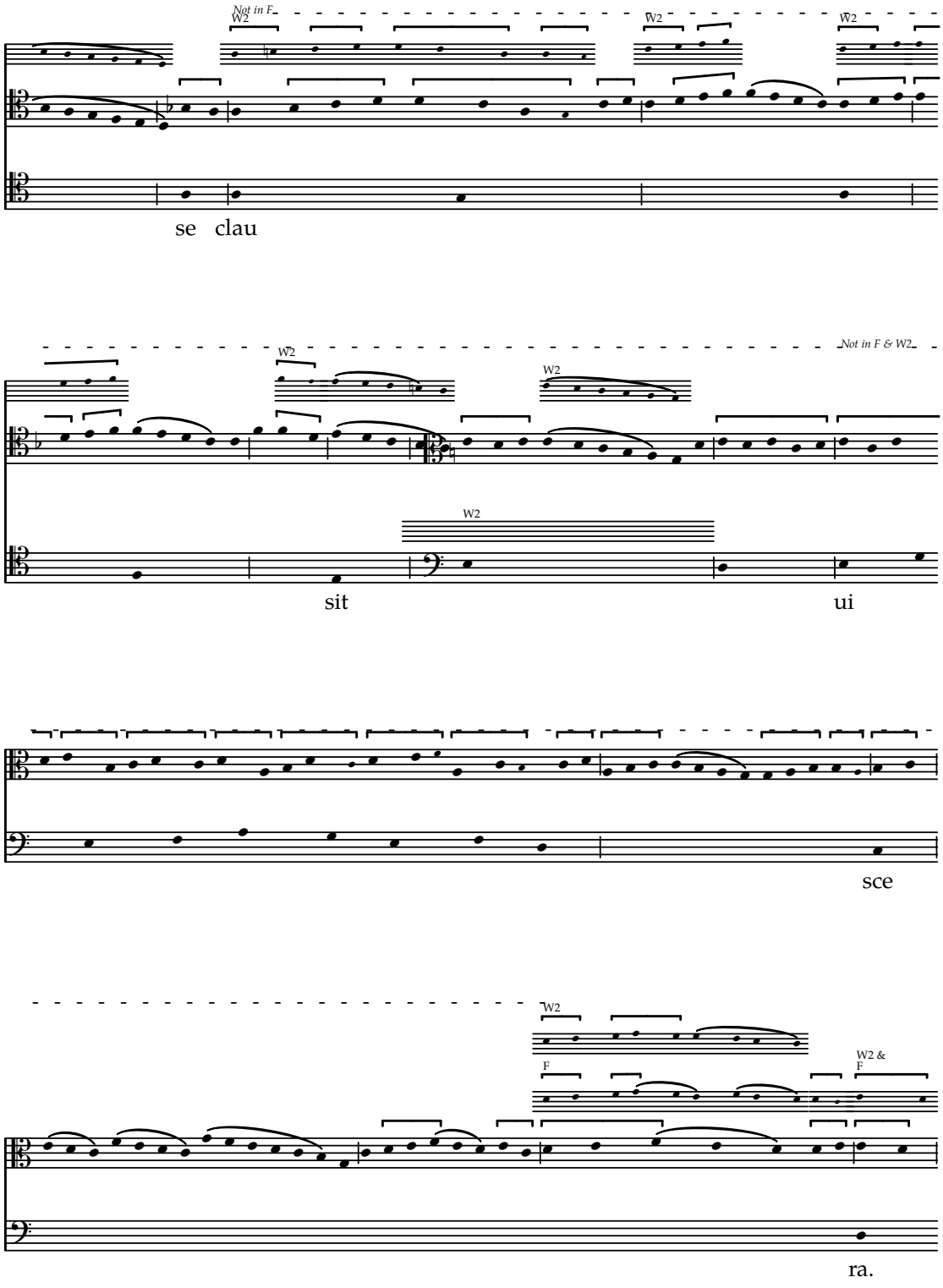
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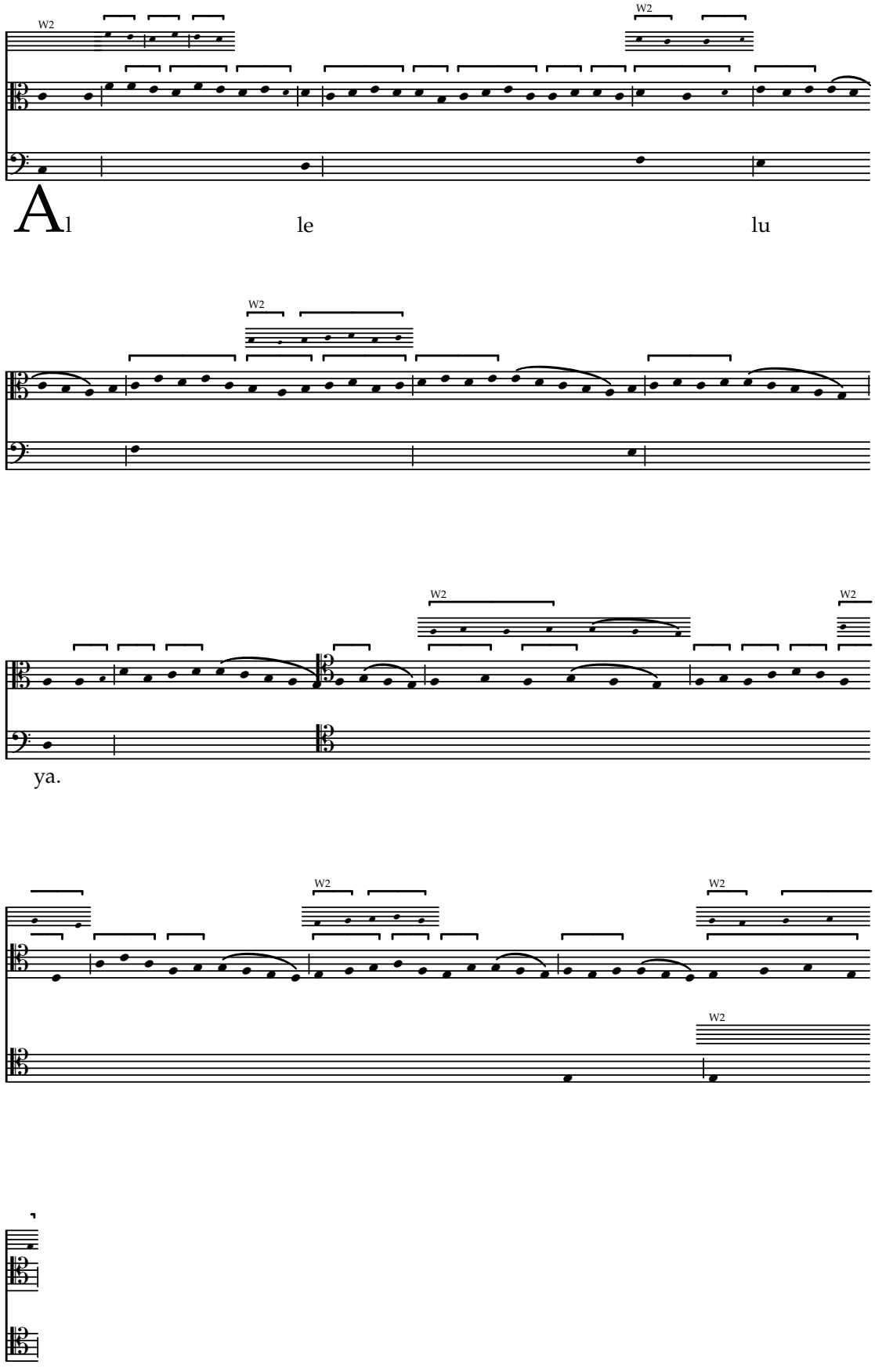
Concordances from W2

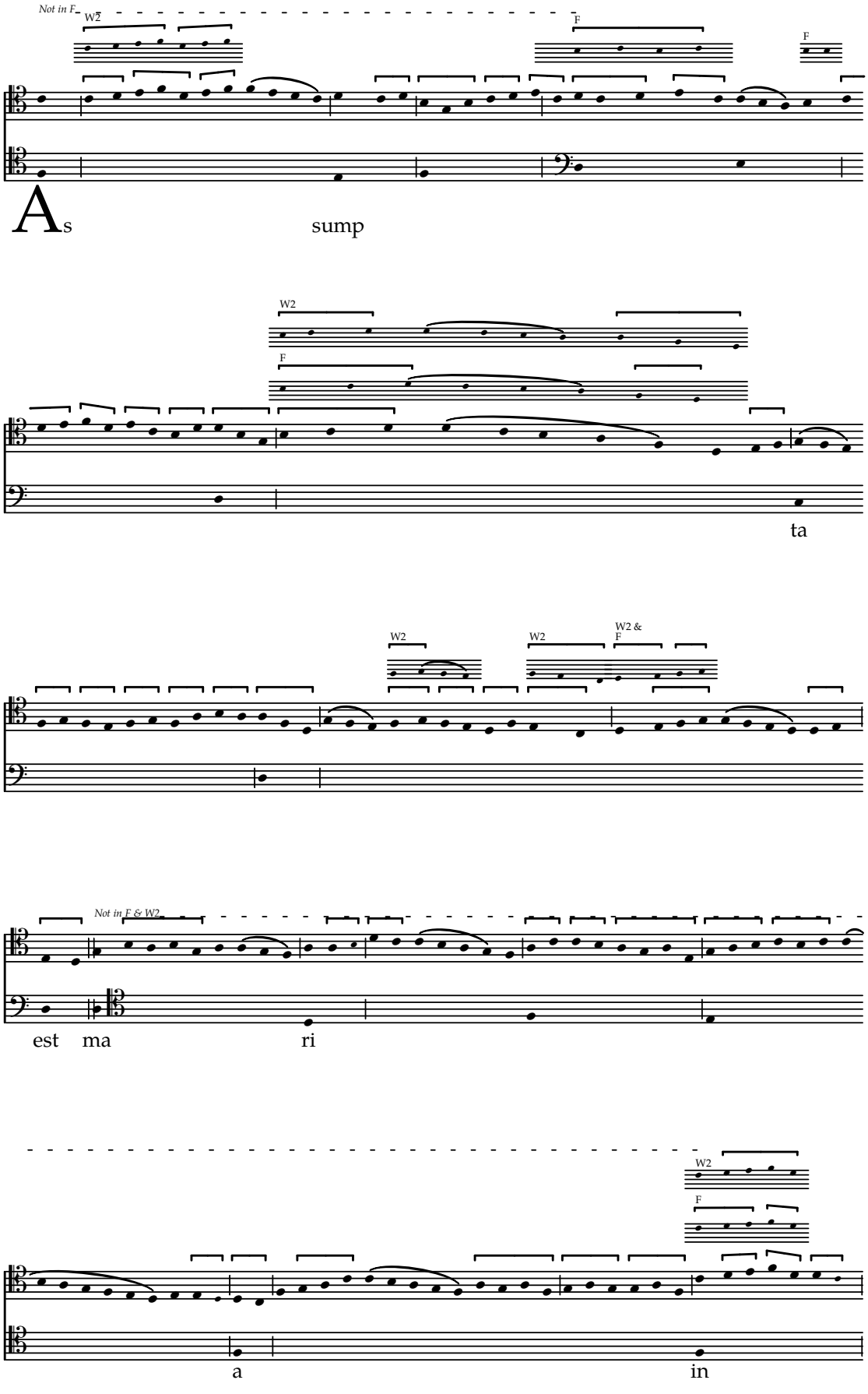
f. 38v–39

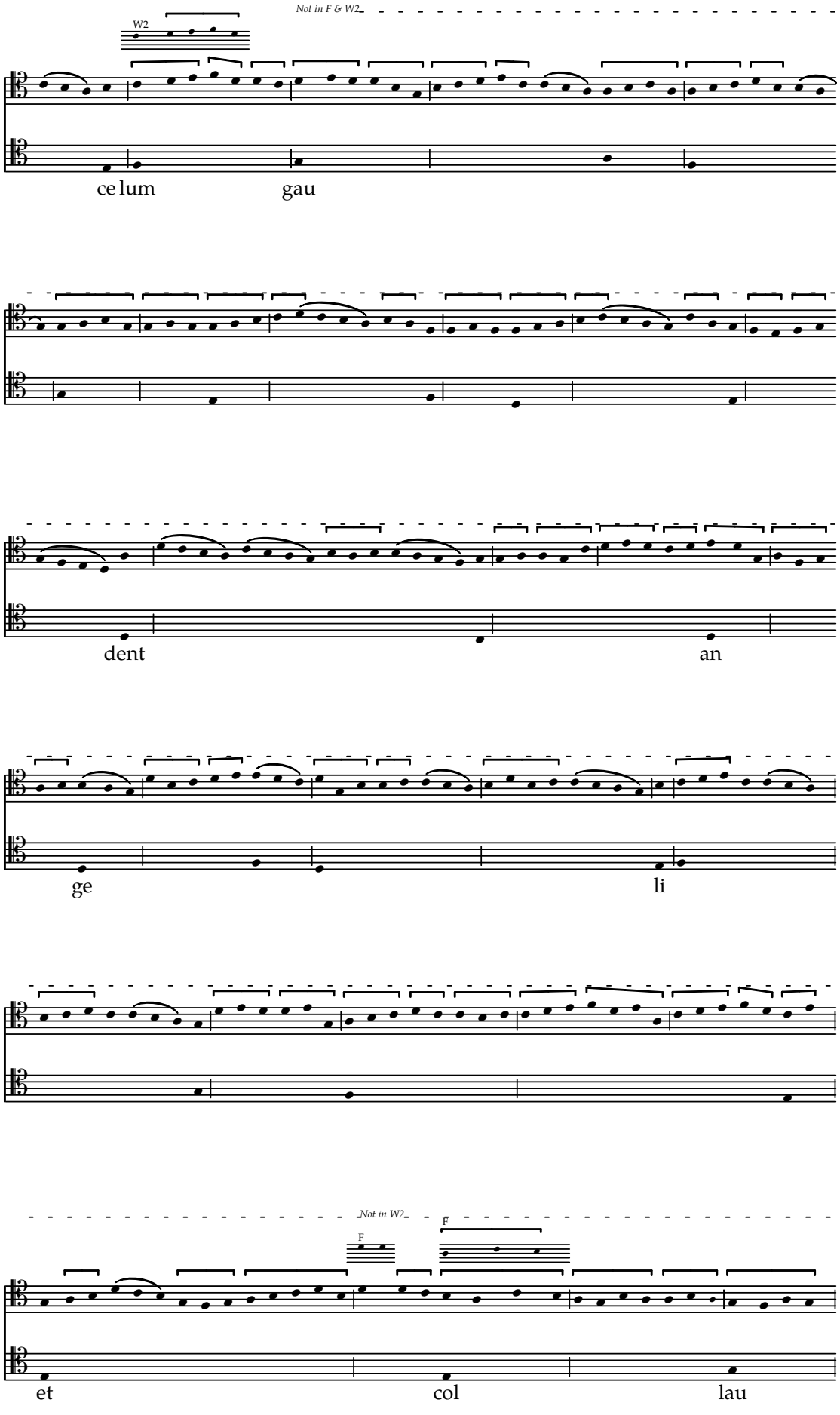


Assumpta est maria

Concordances from W2 & F

f. 39–39v

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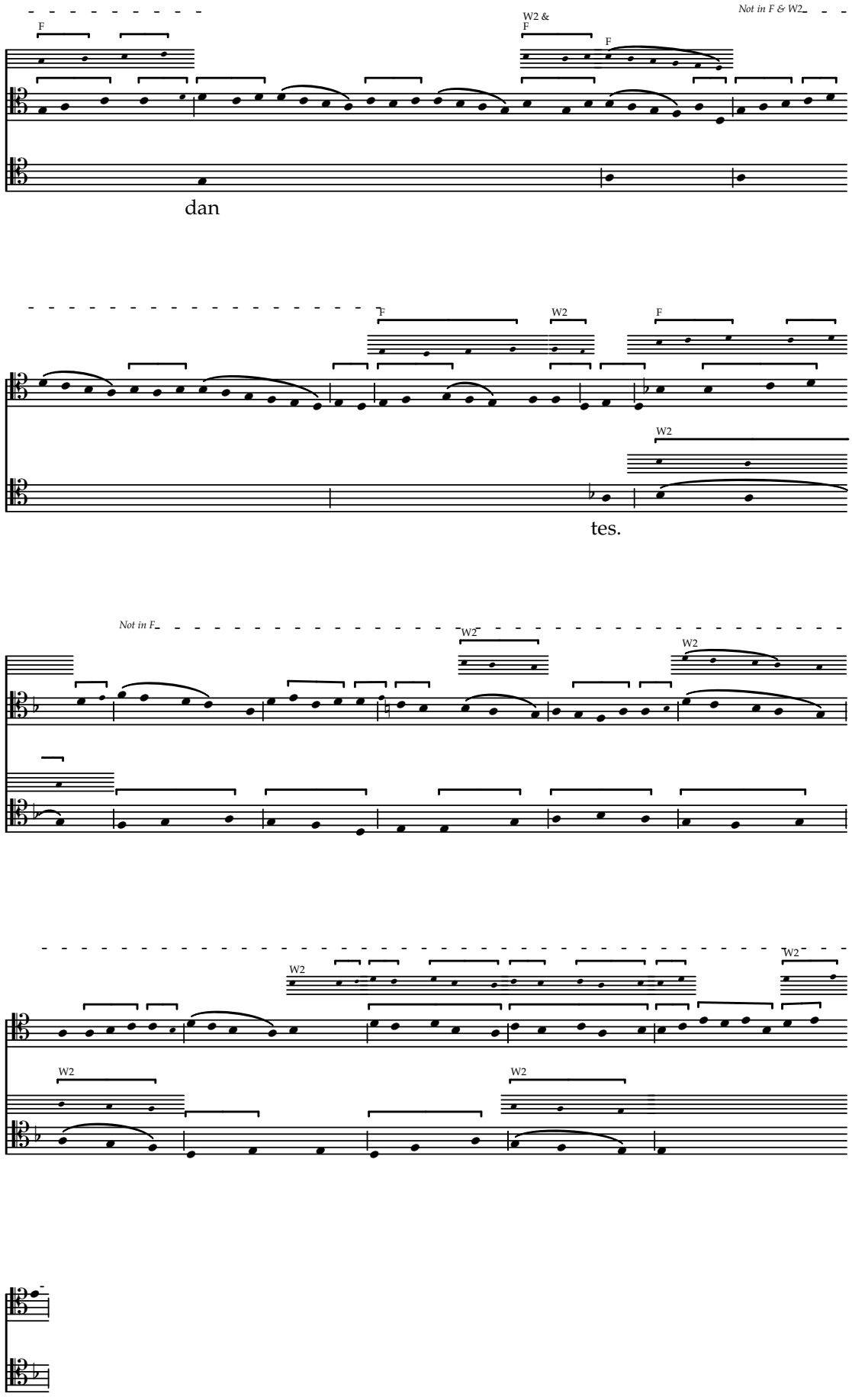
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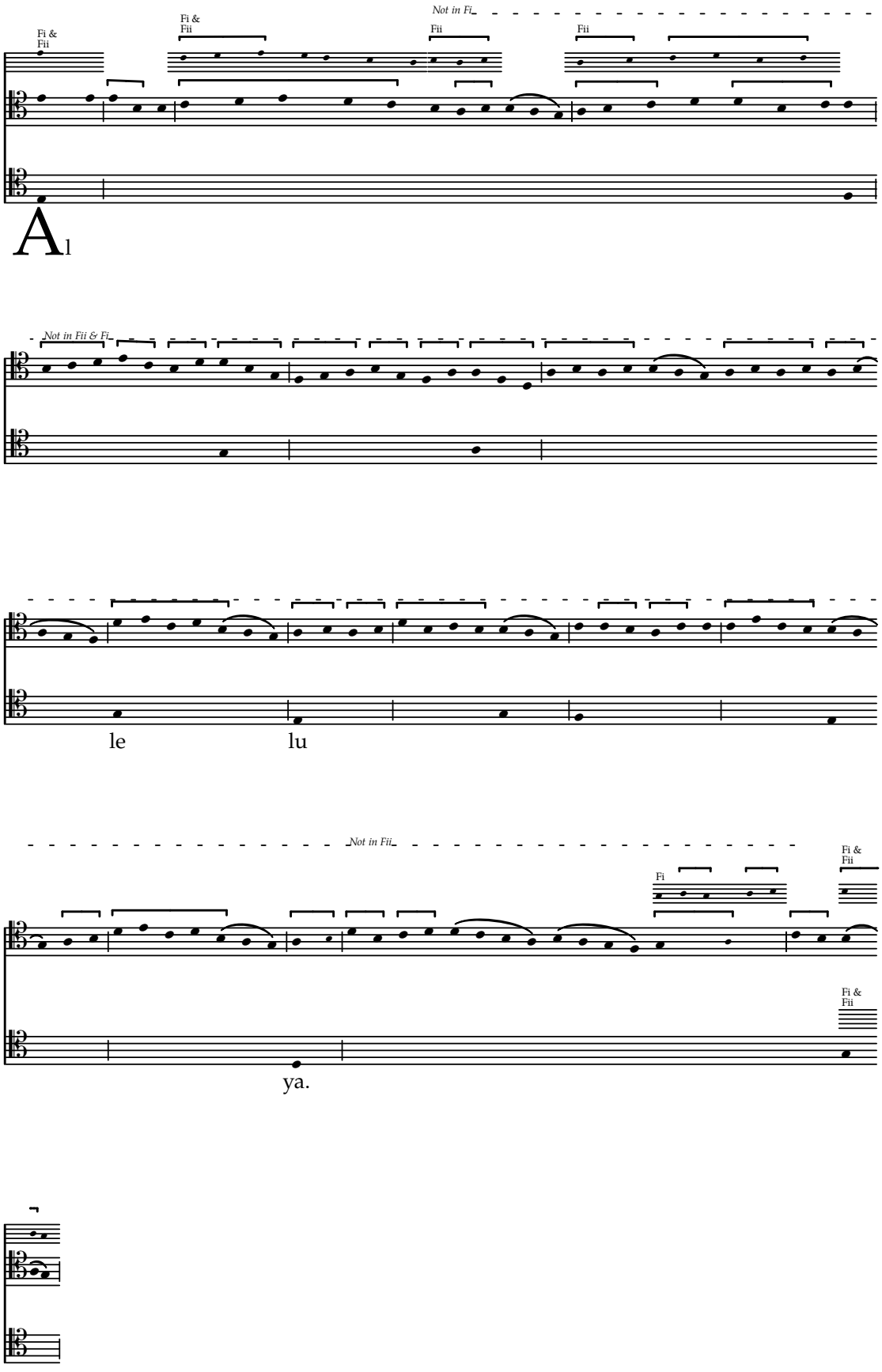
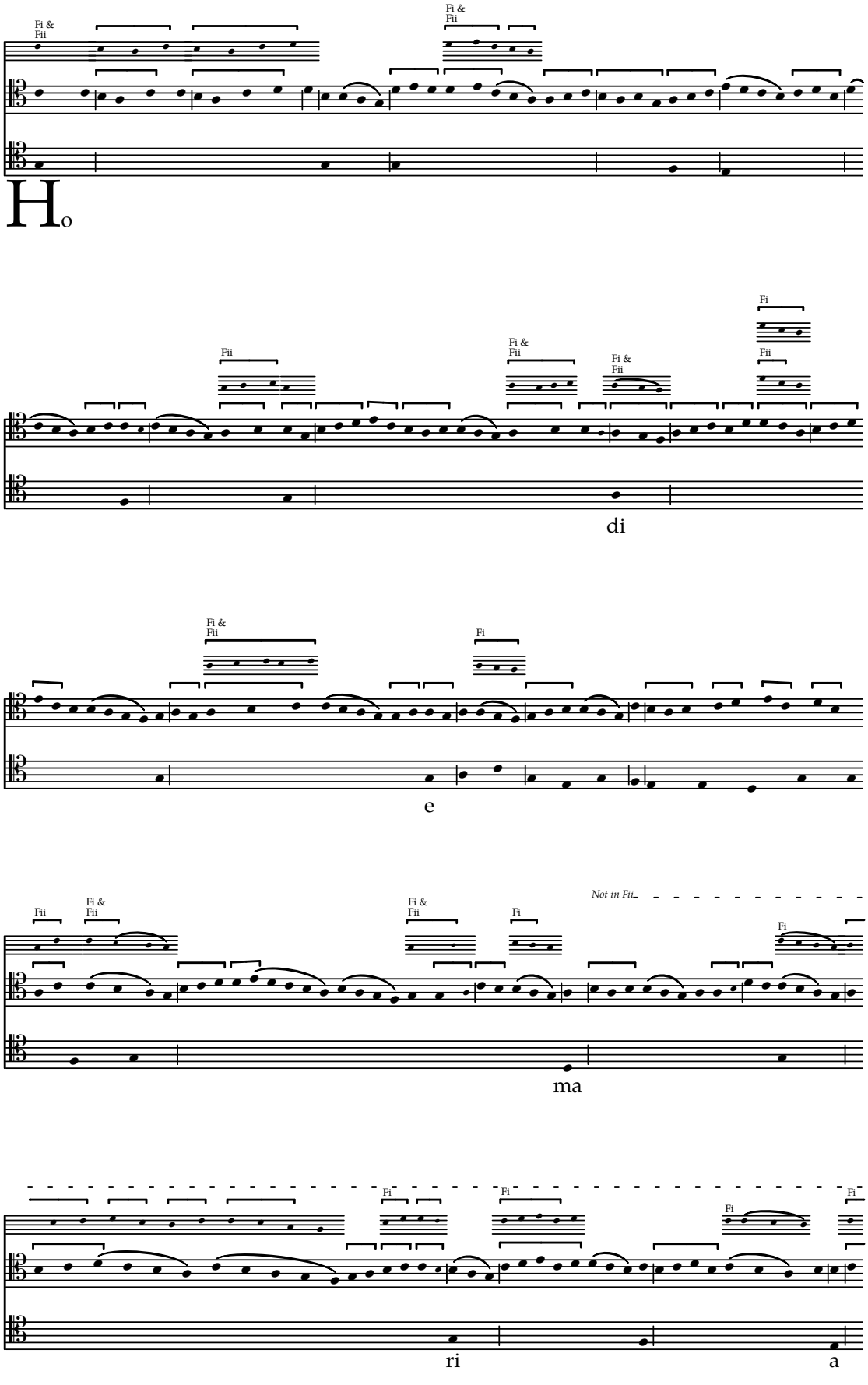
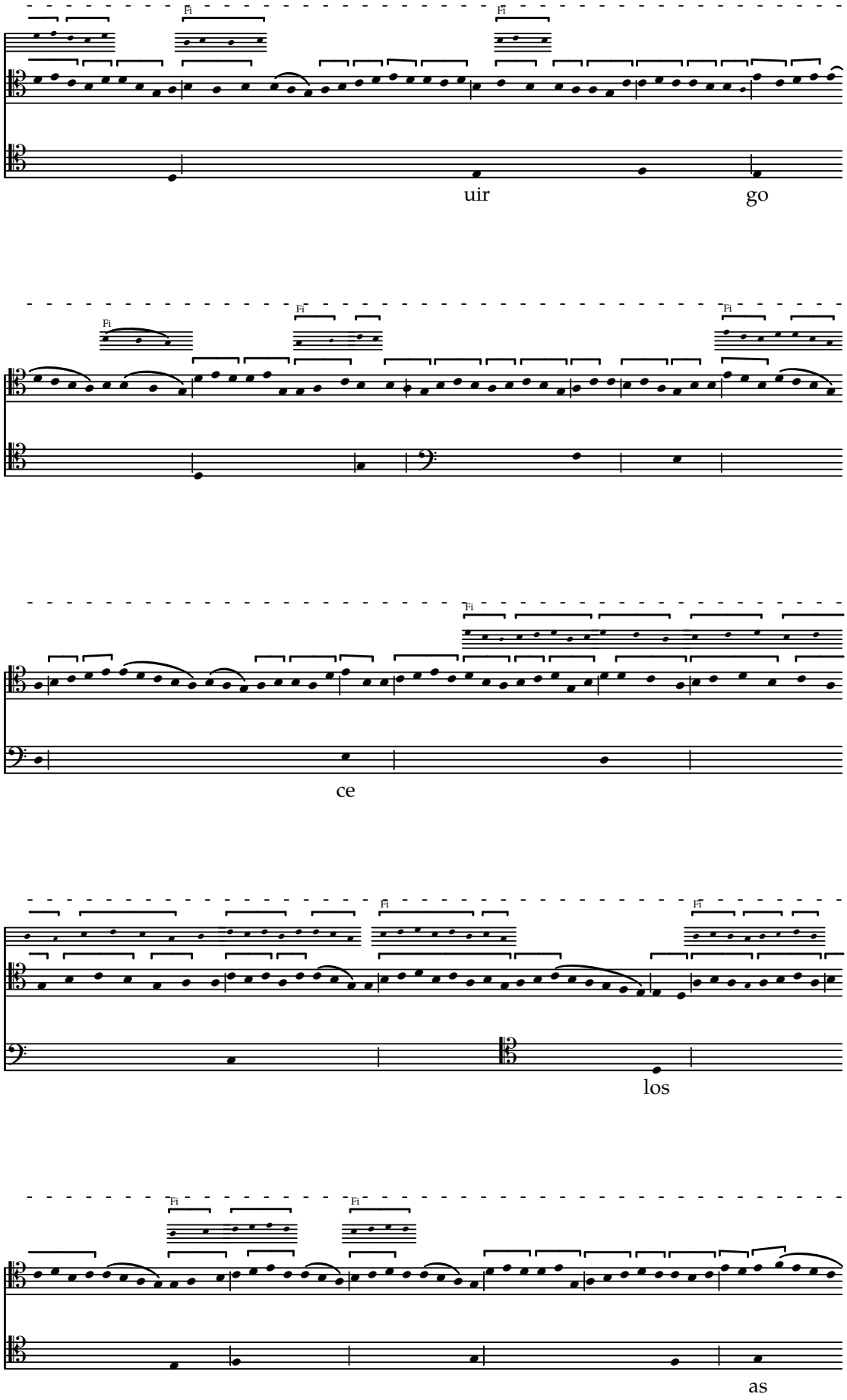
Concordances from F (two versions) f. 39v



Hodie maria uirgo

Concordances from F (two versions) f. 39v–40v

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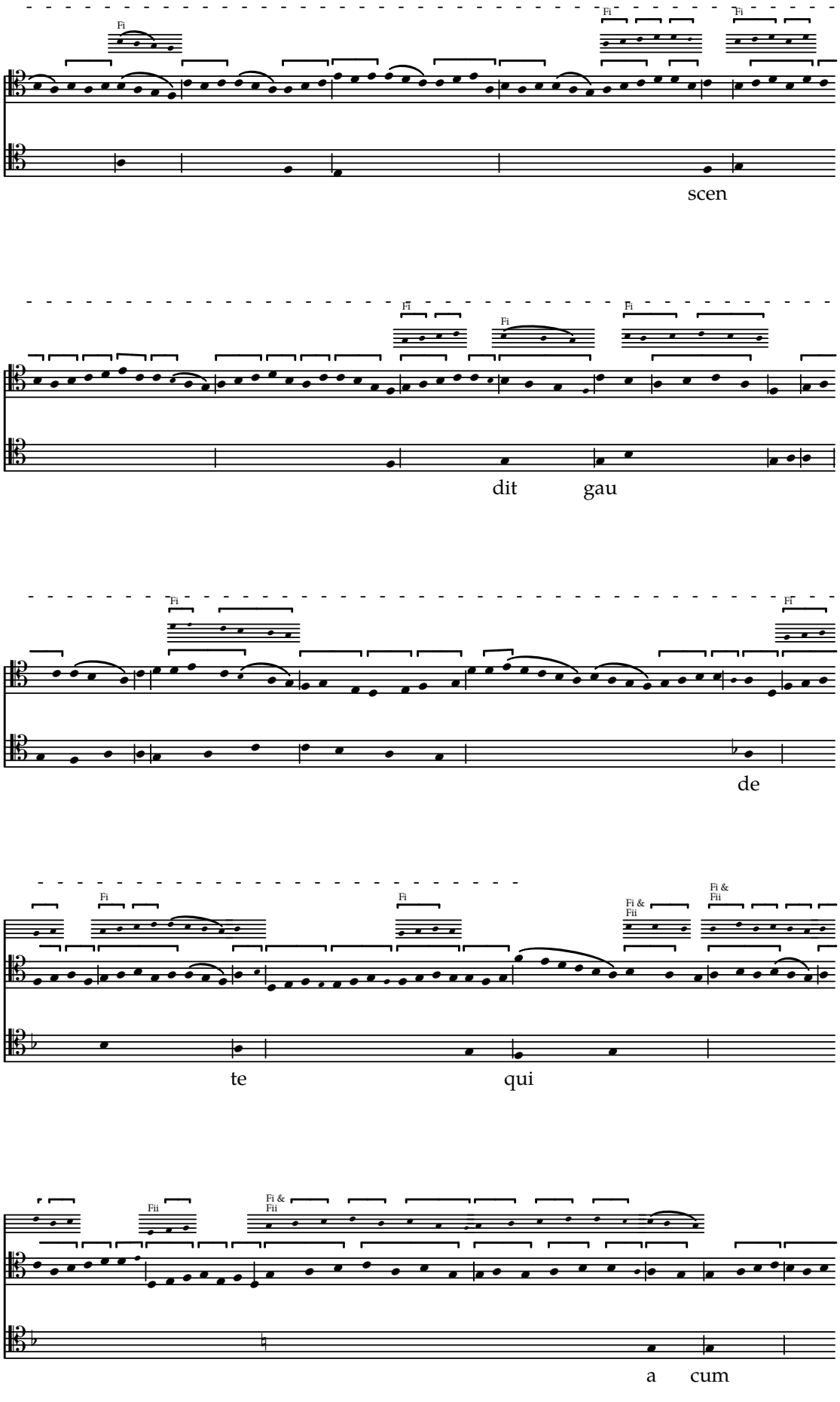
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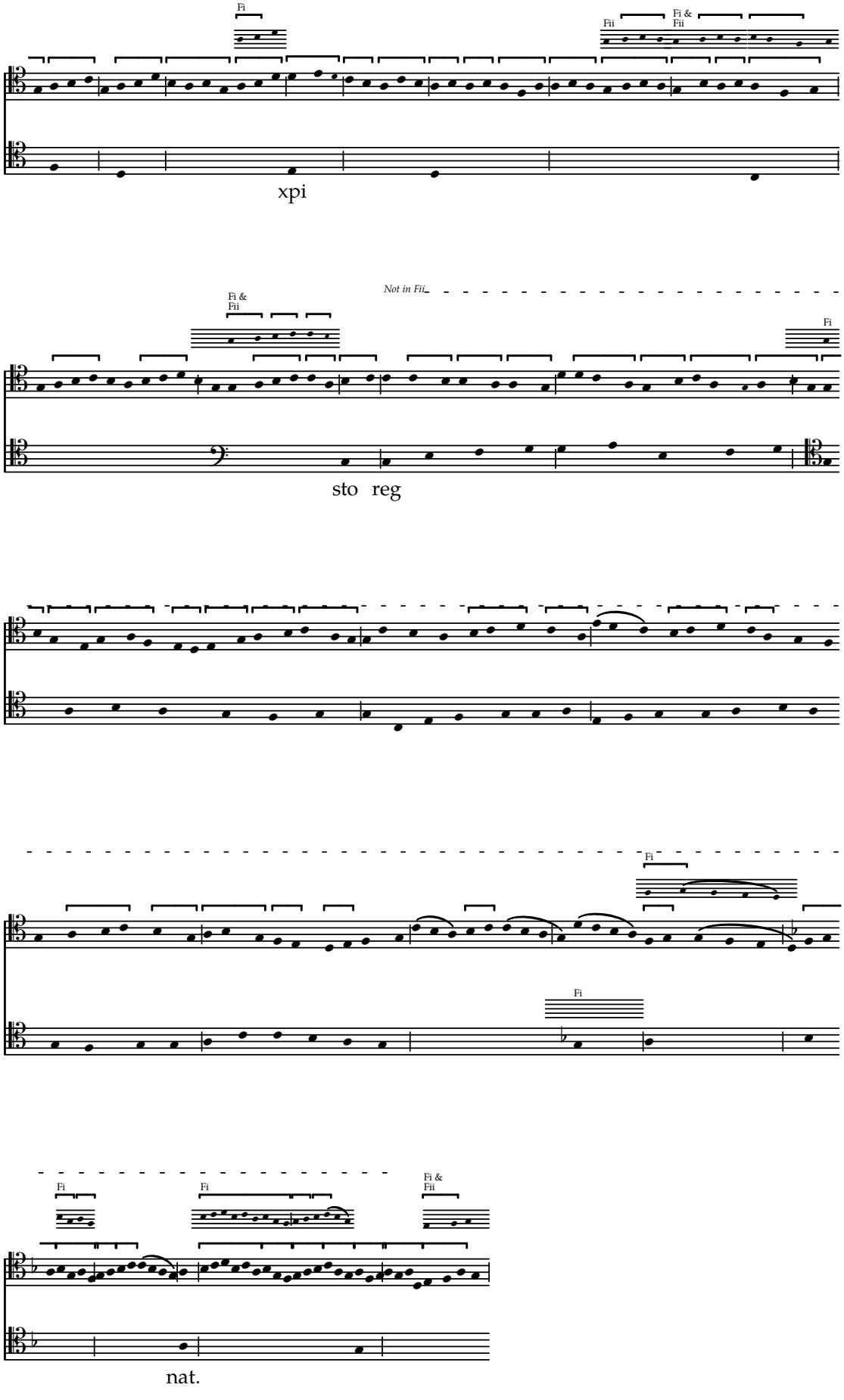
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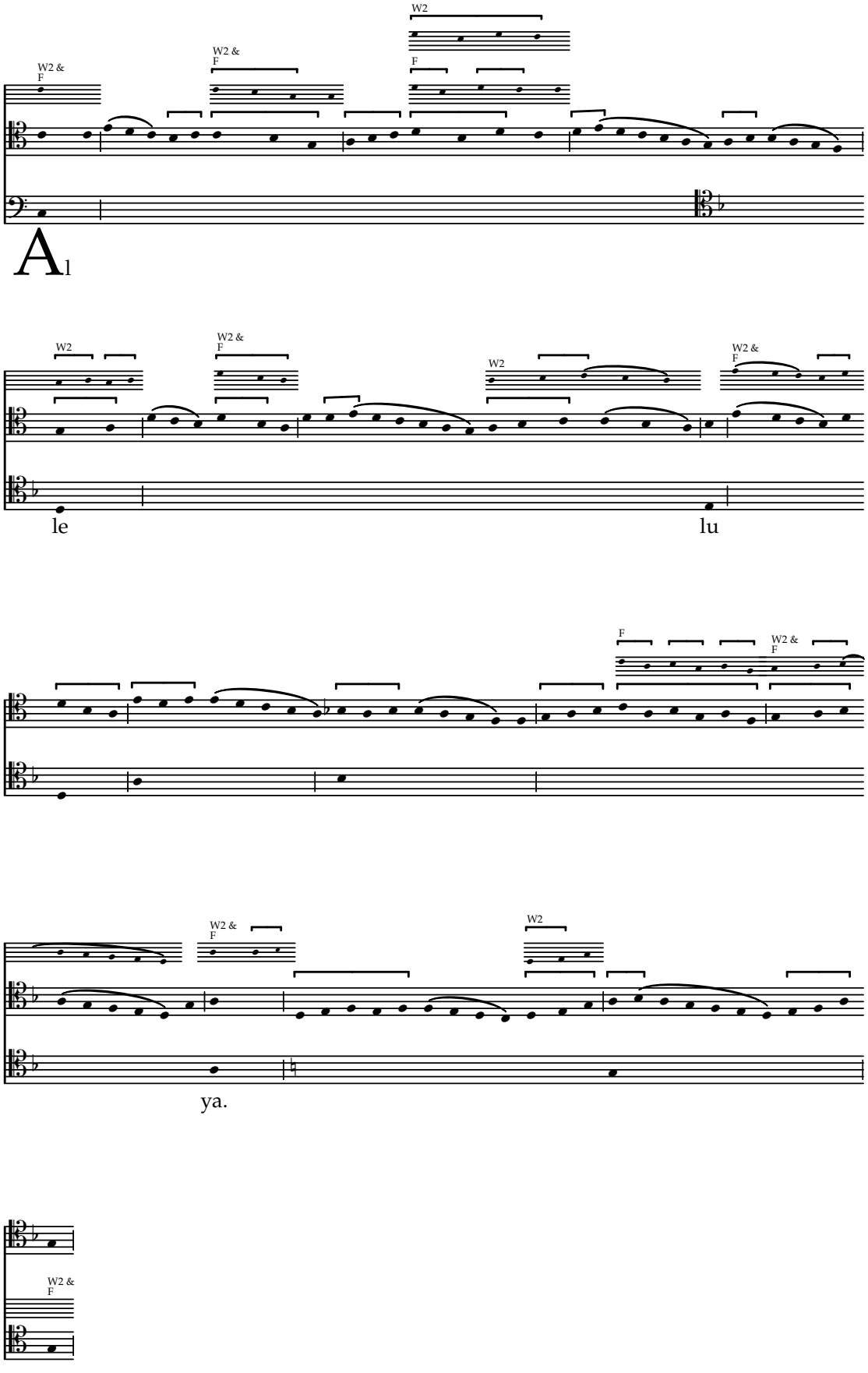
Concordances from W2 & F

f. 40v



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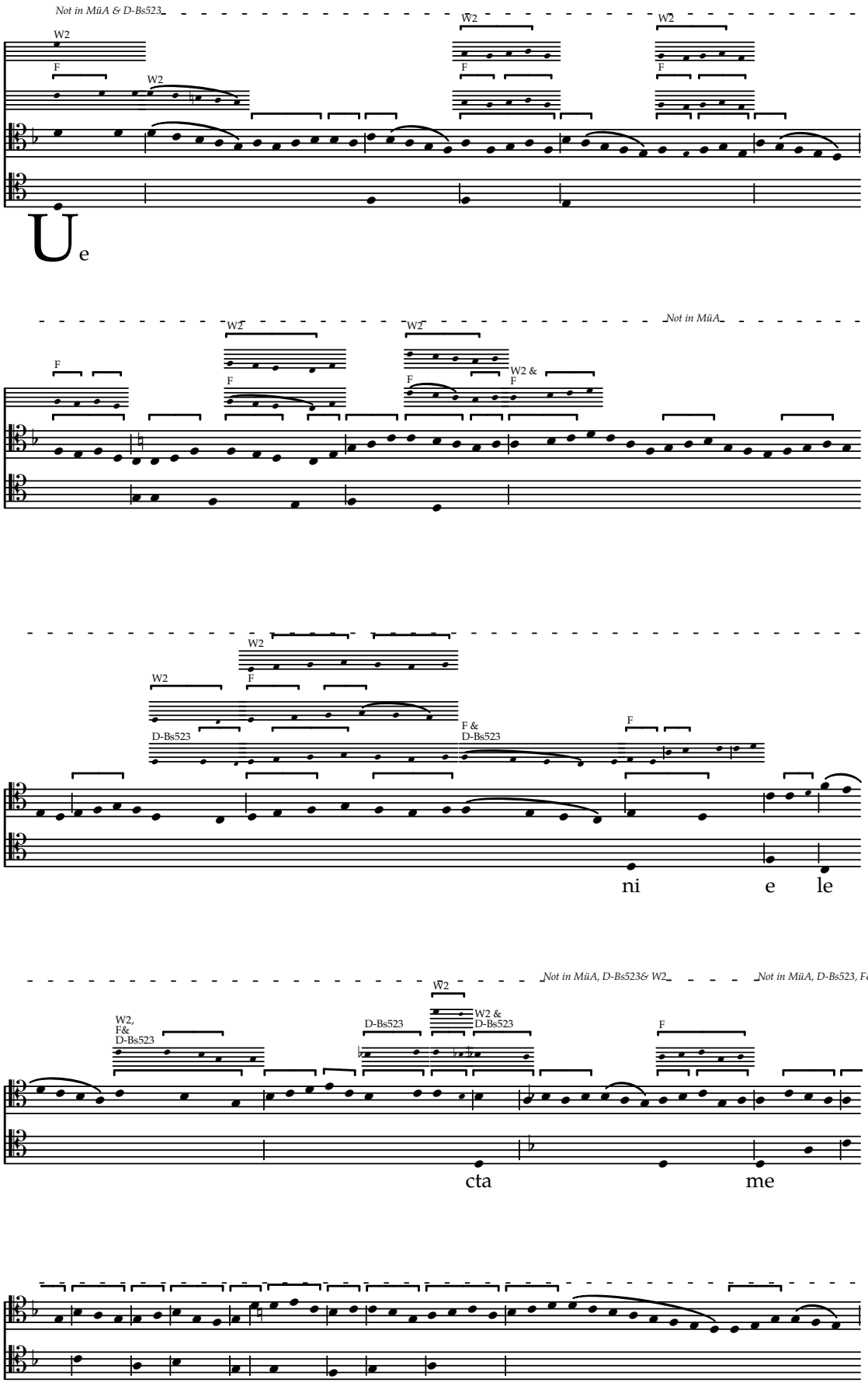
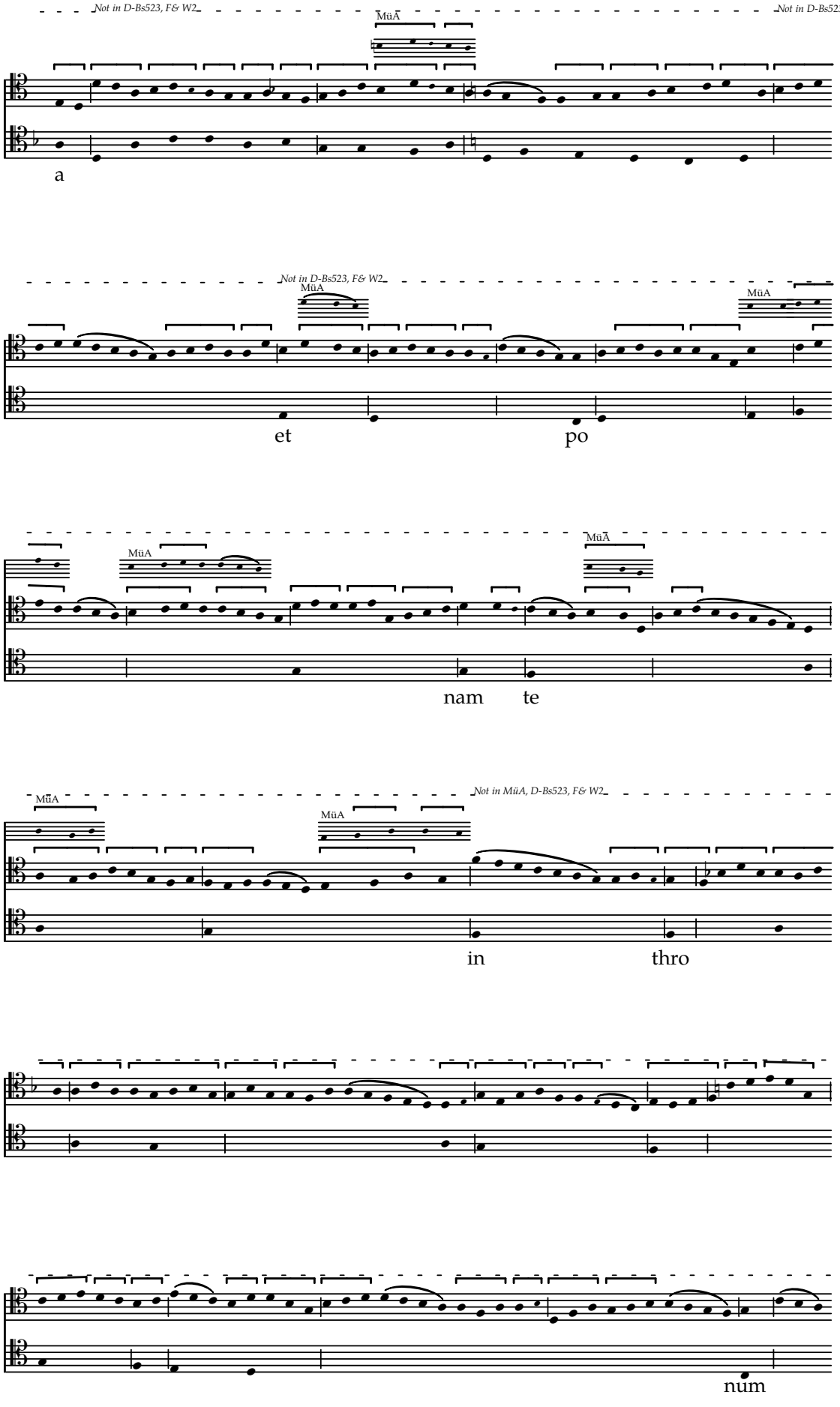
Concordances from W2, F, D-Bs523 & MüA

f. 40v–41




Not in D-Bs523, F& W2
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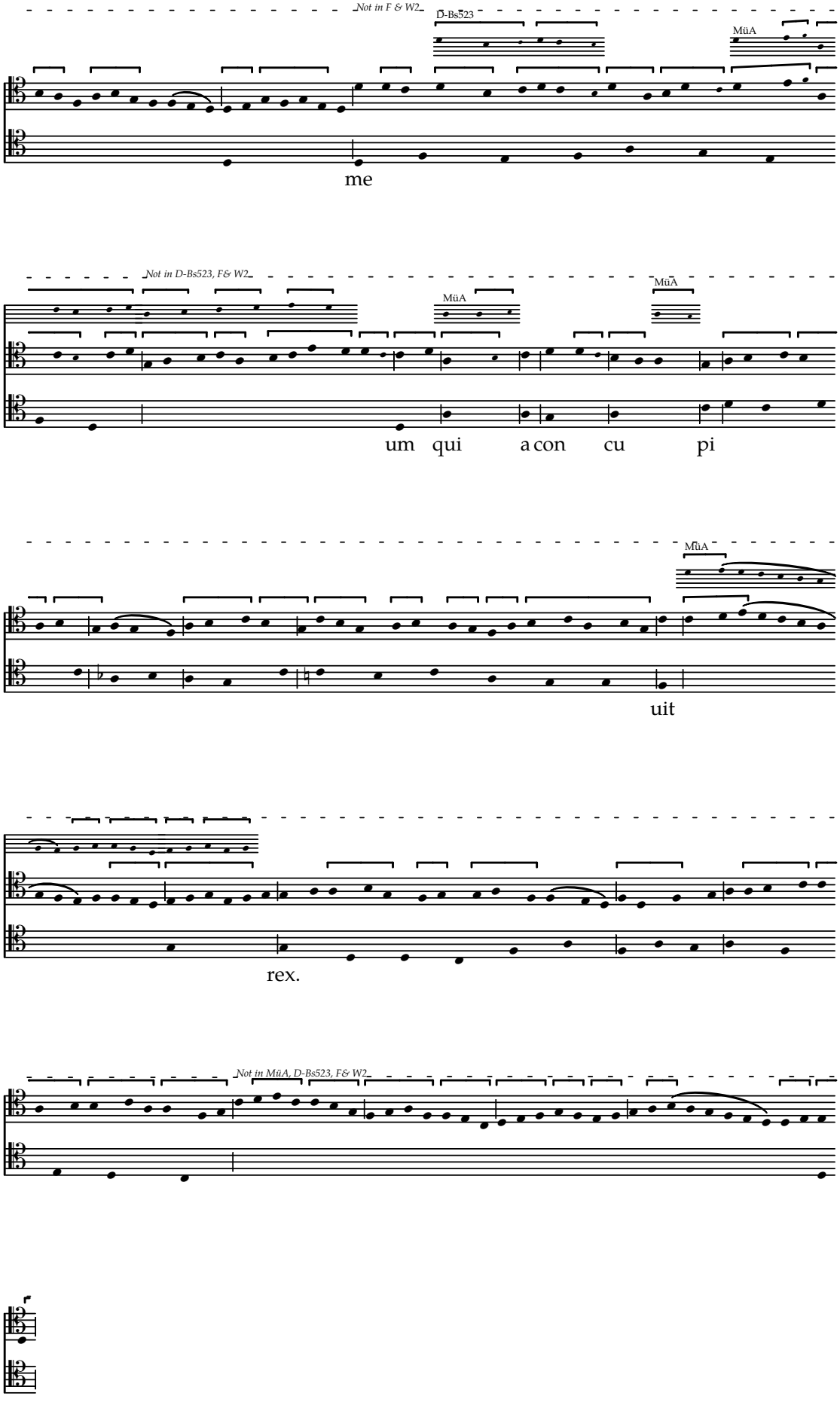
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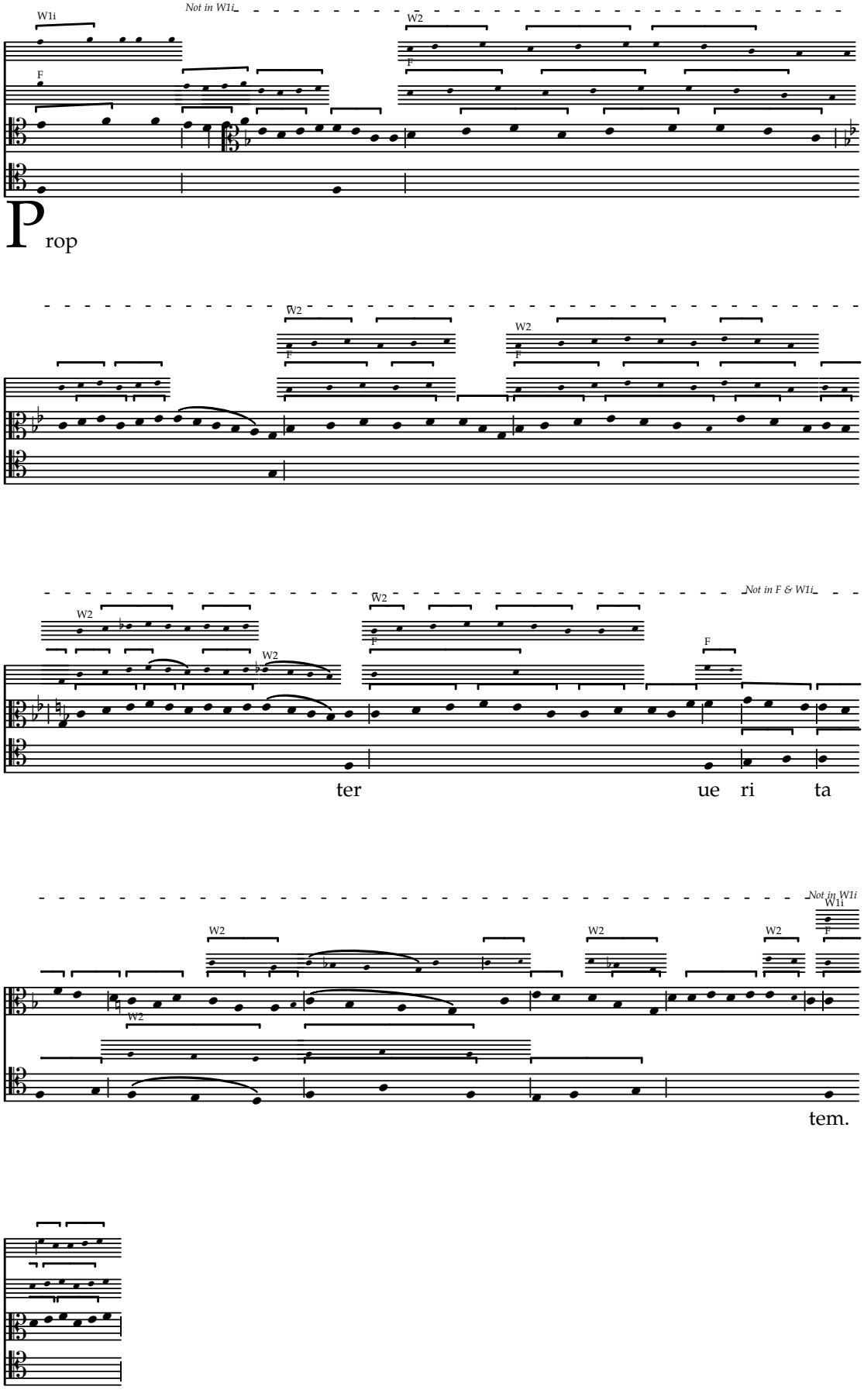
Concordances from W1 (first version), W2 & F f. 41



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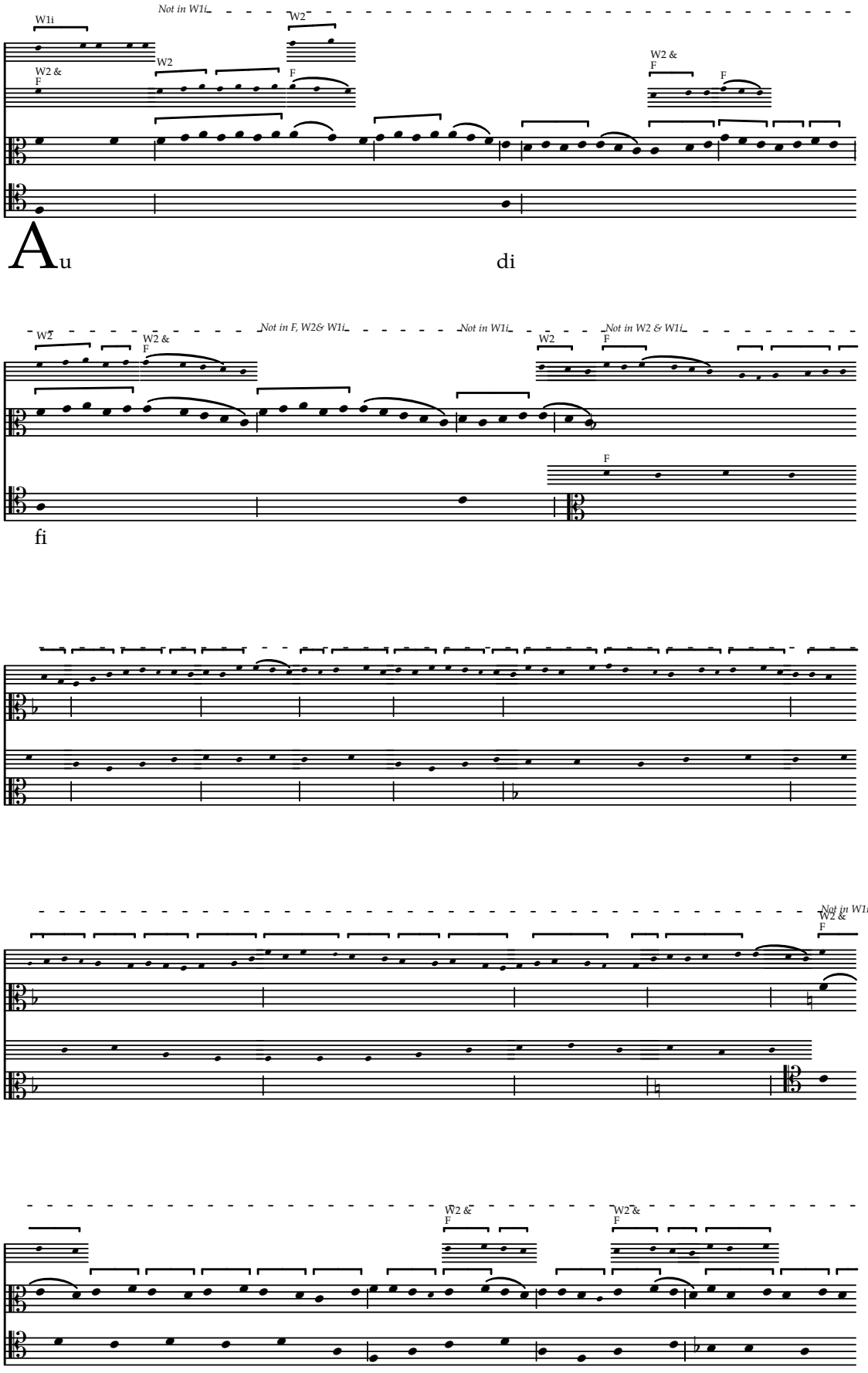
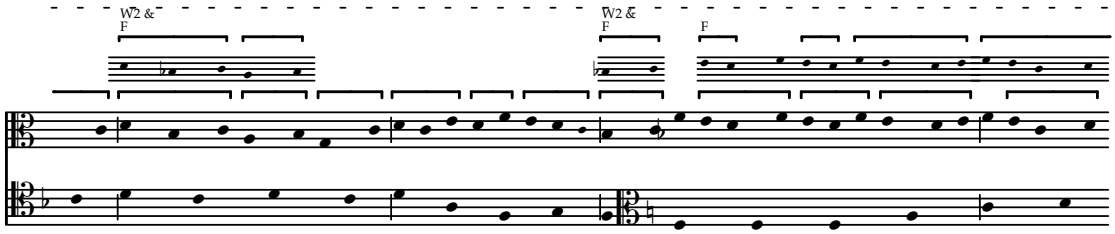
Concordances from W1 (first version), W2 & F

f. 41–42

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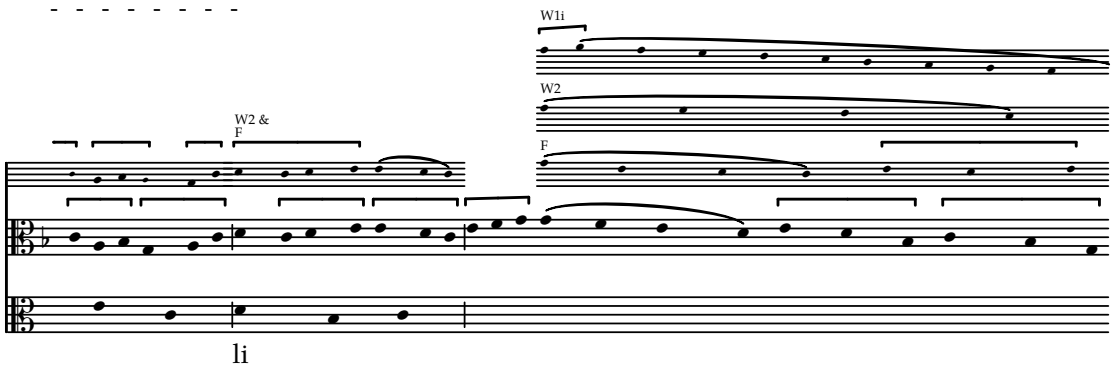
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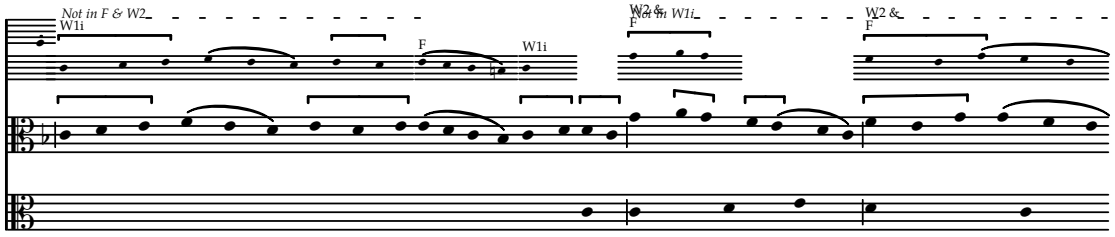
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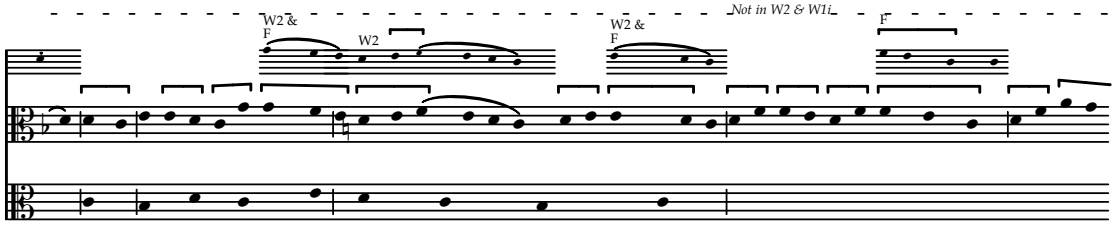
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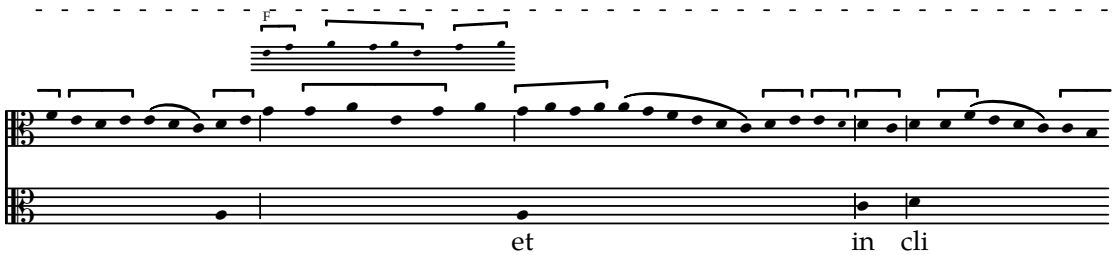
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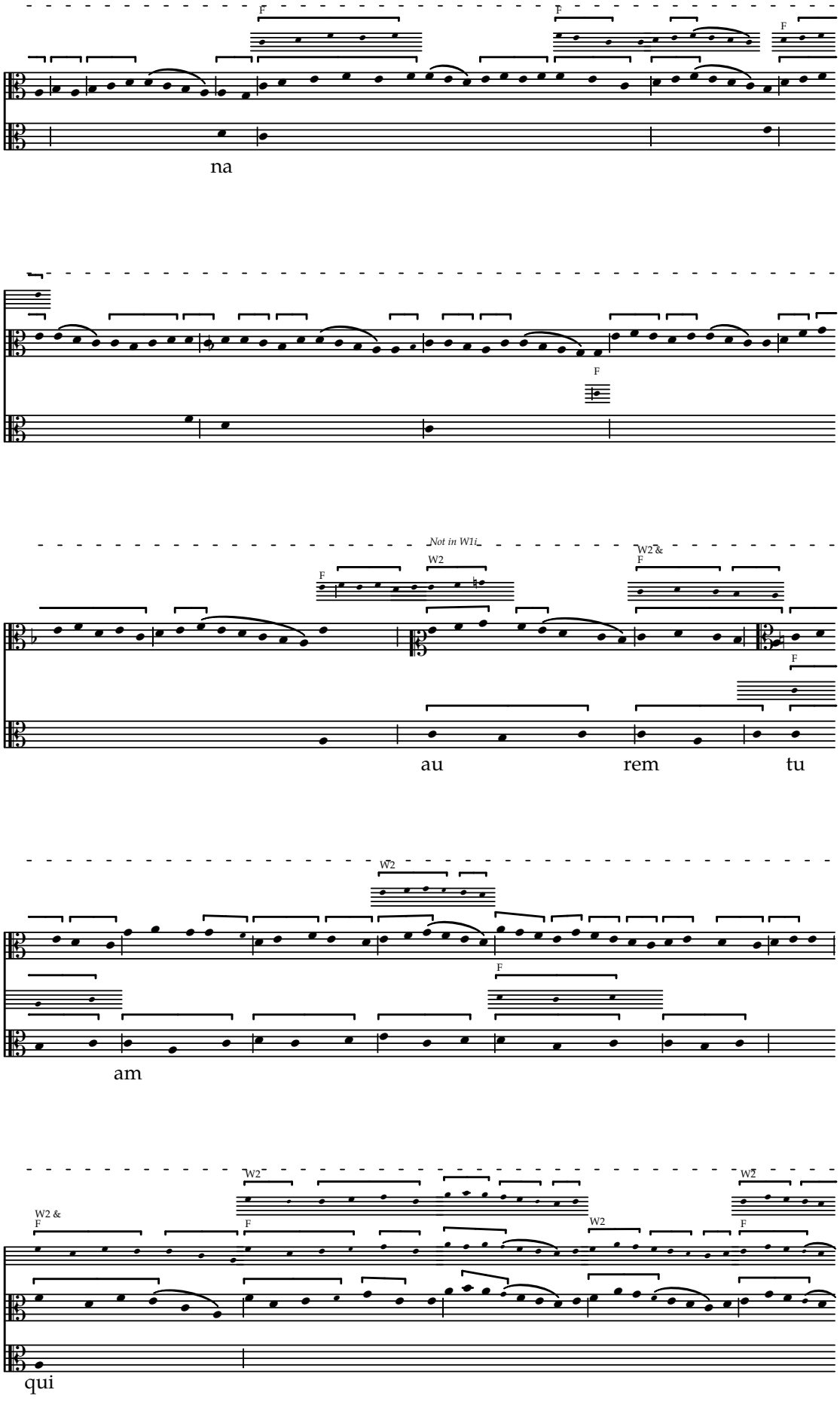
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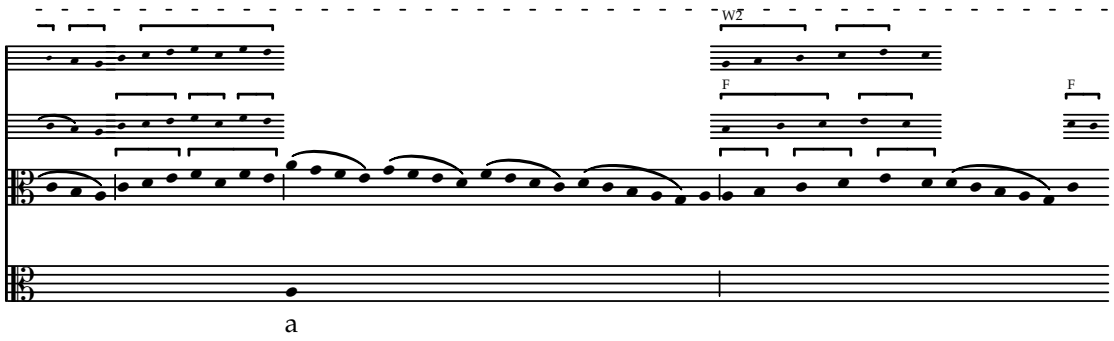
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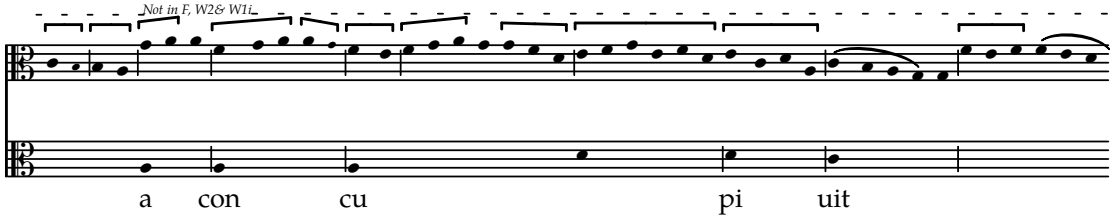
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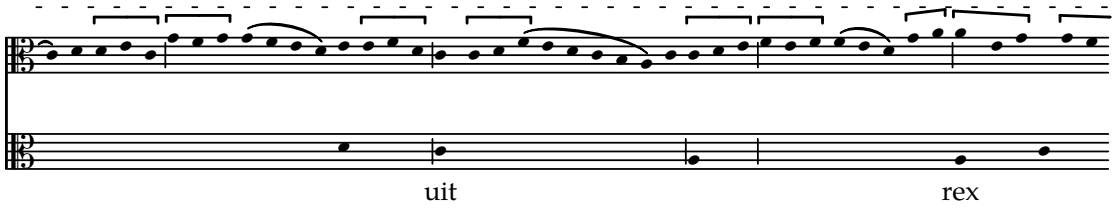
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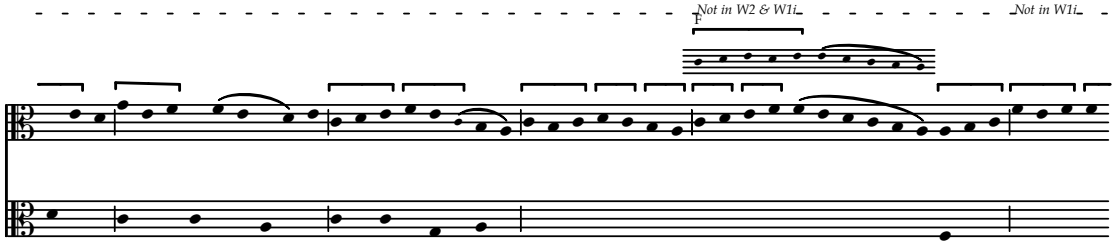
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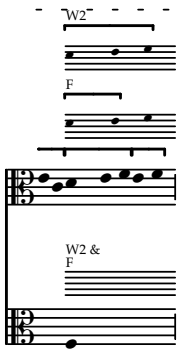
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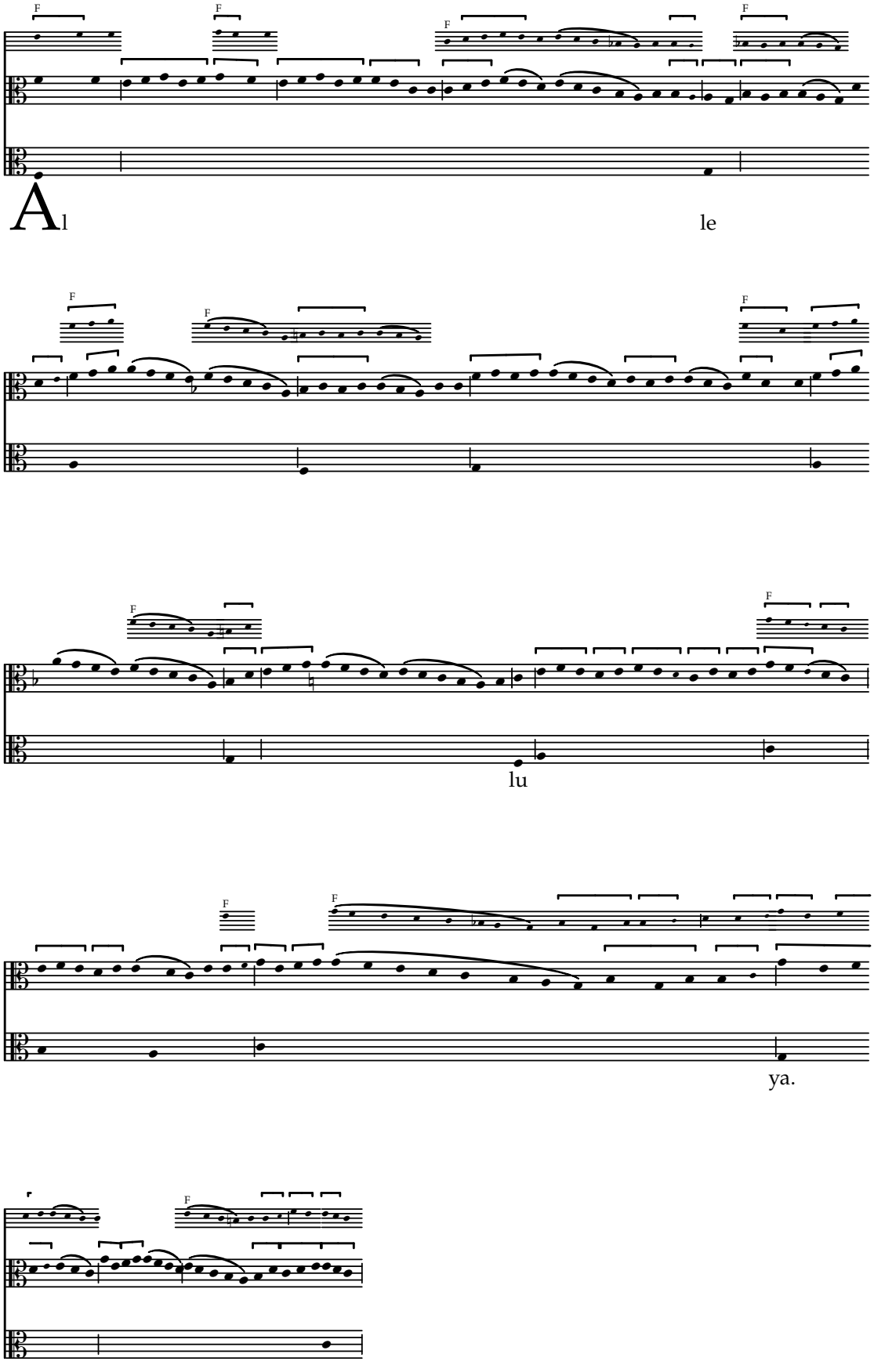
Concordances from F

f. 42



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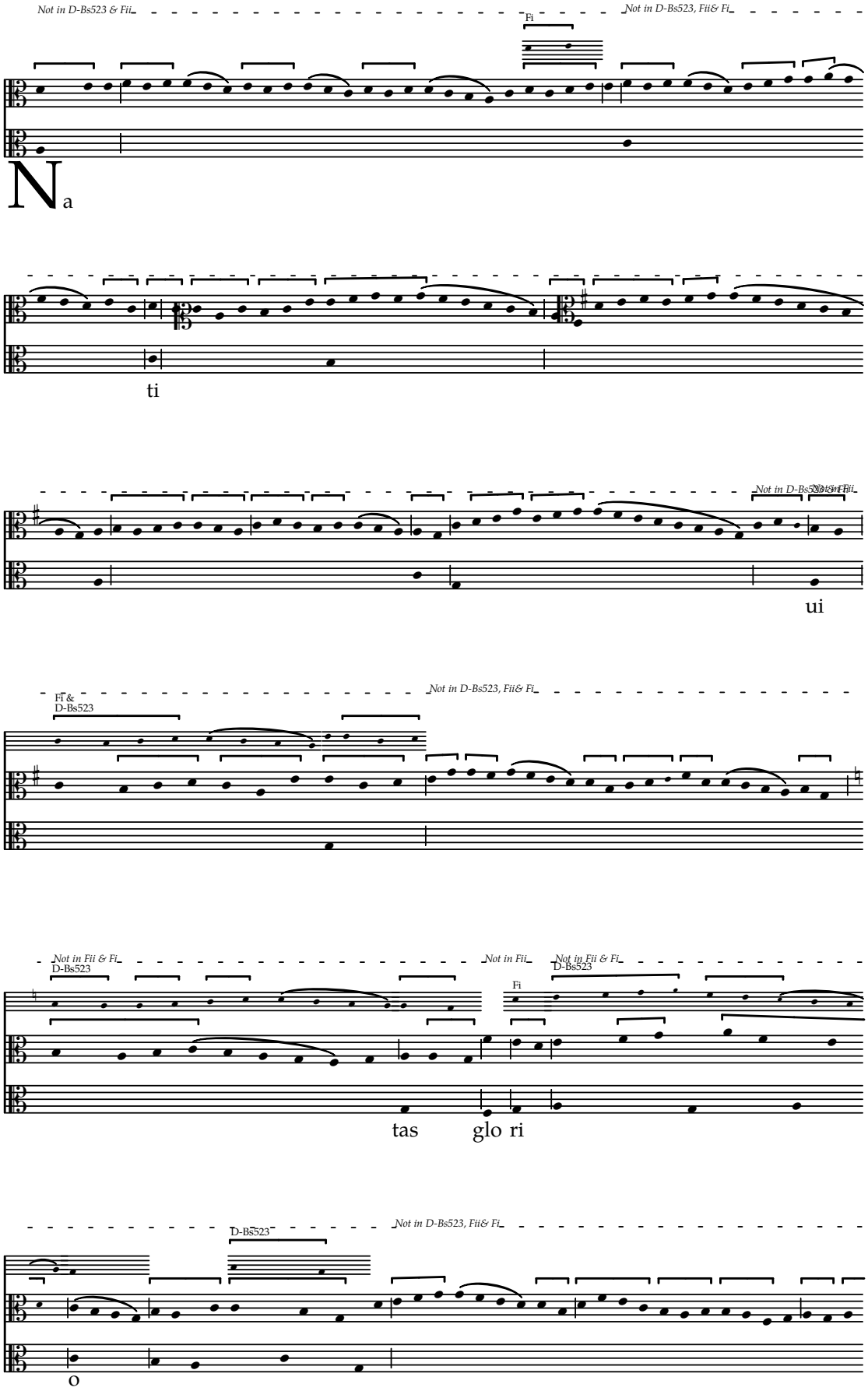
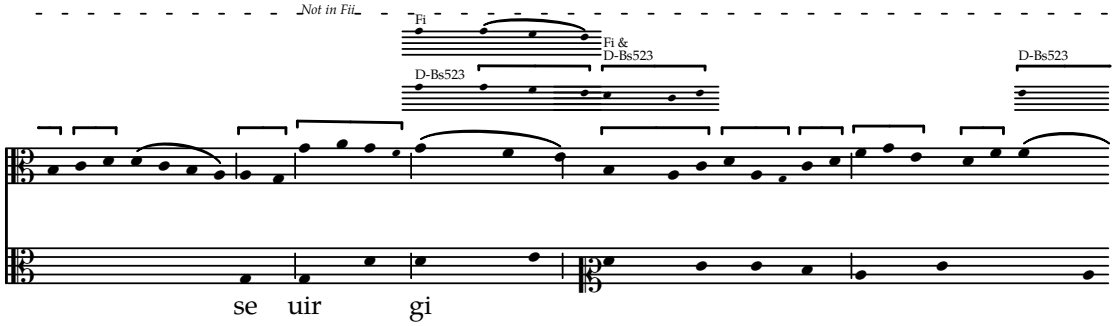
Concordances from F (setting and clausula “ex semine”) & D-Bs523 f. 42–42v

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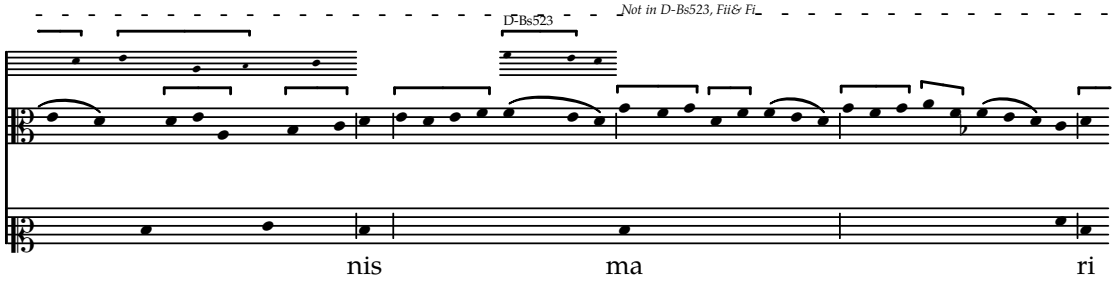
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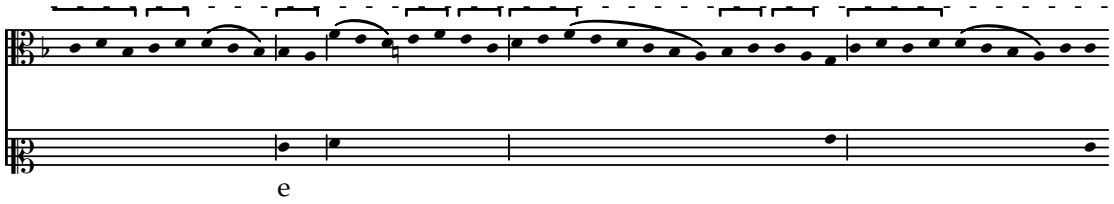
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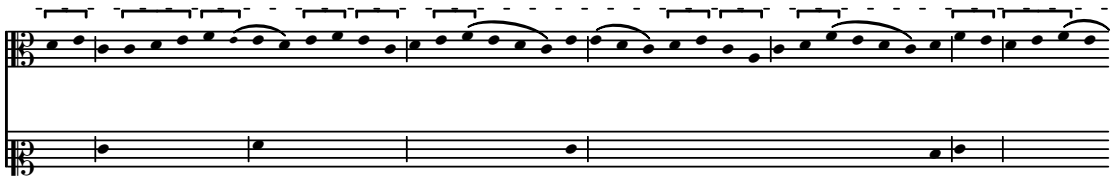

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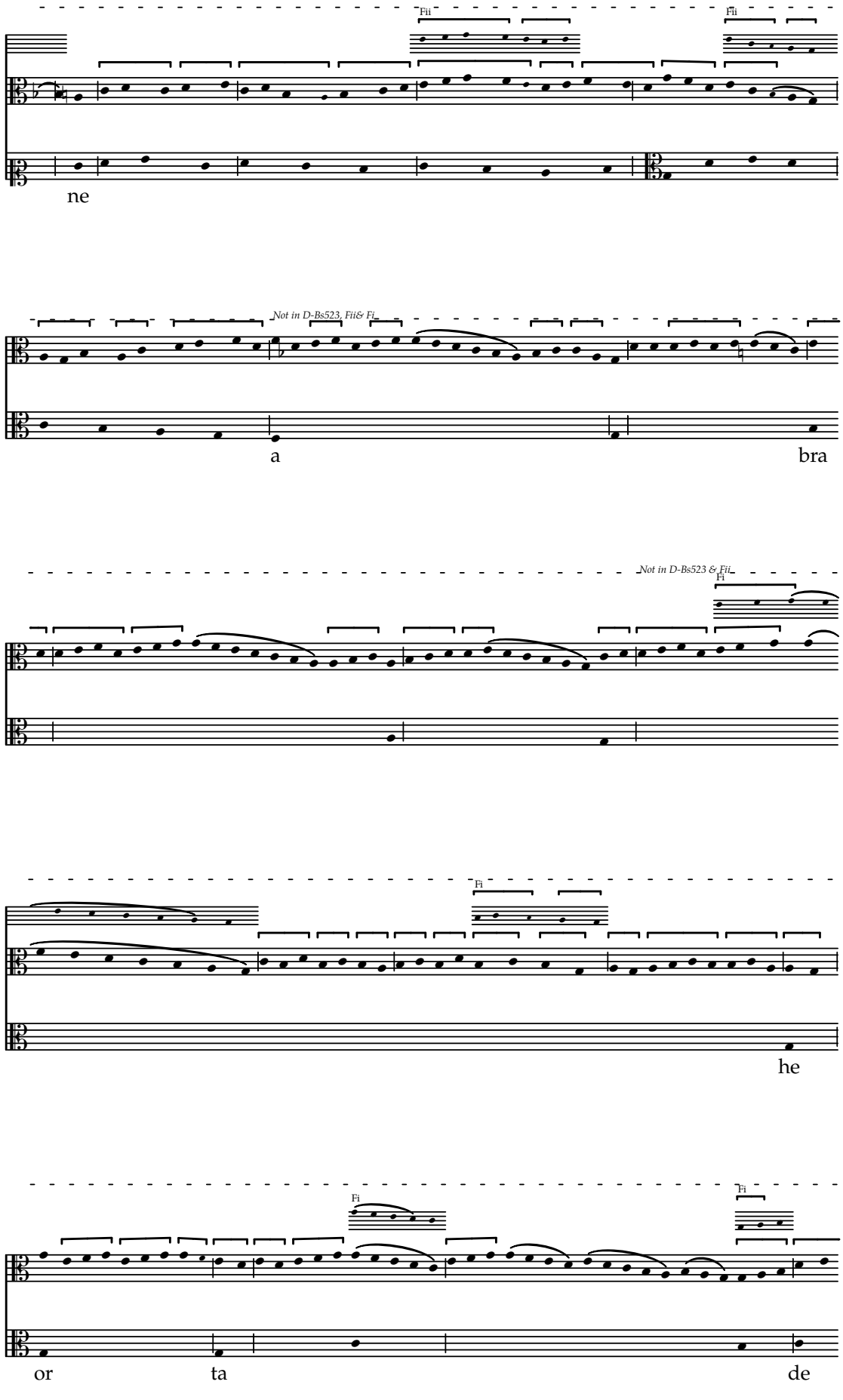
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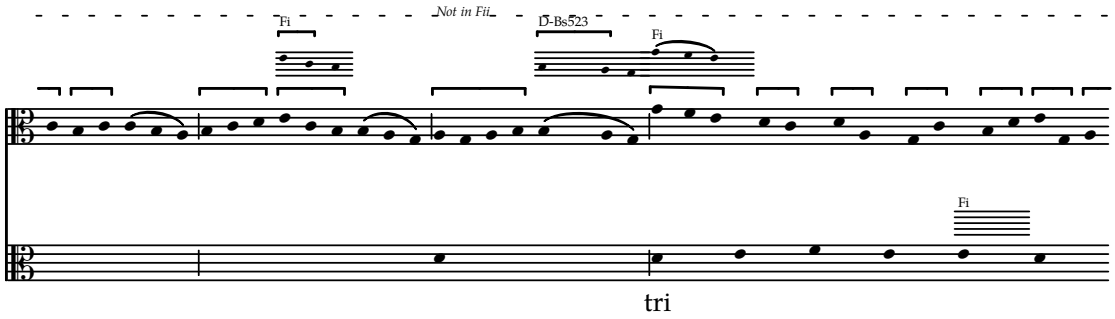
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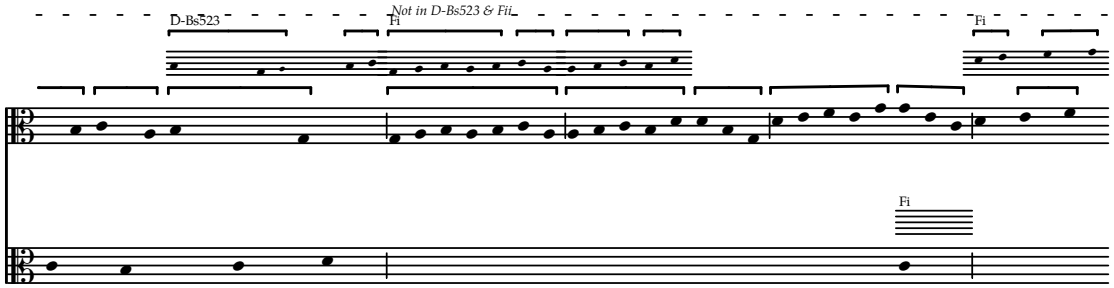
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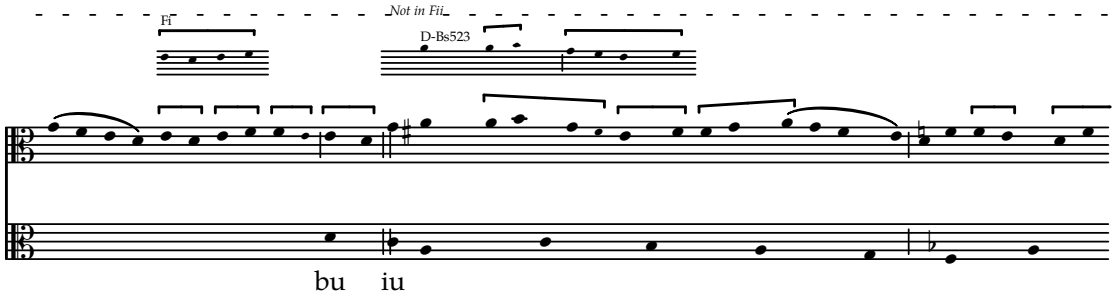
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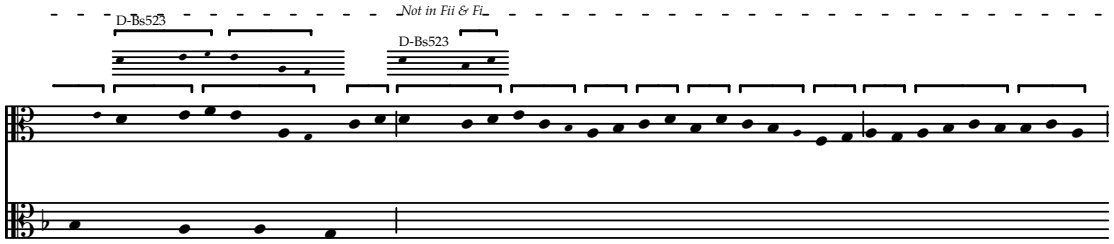
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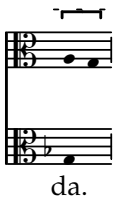
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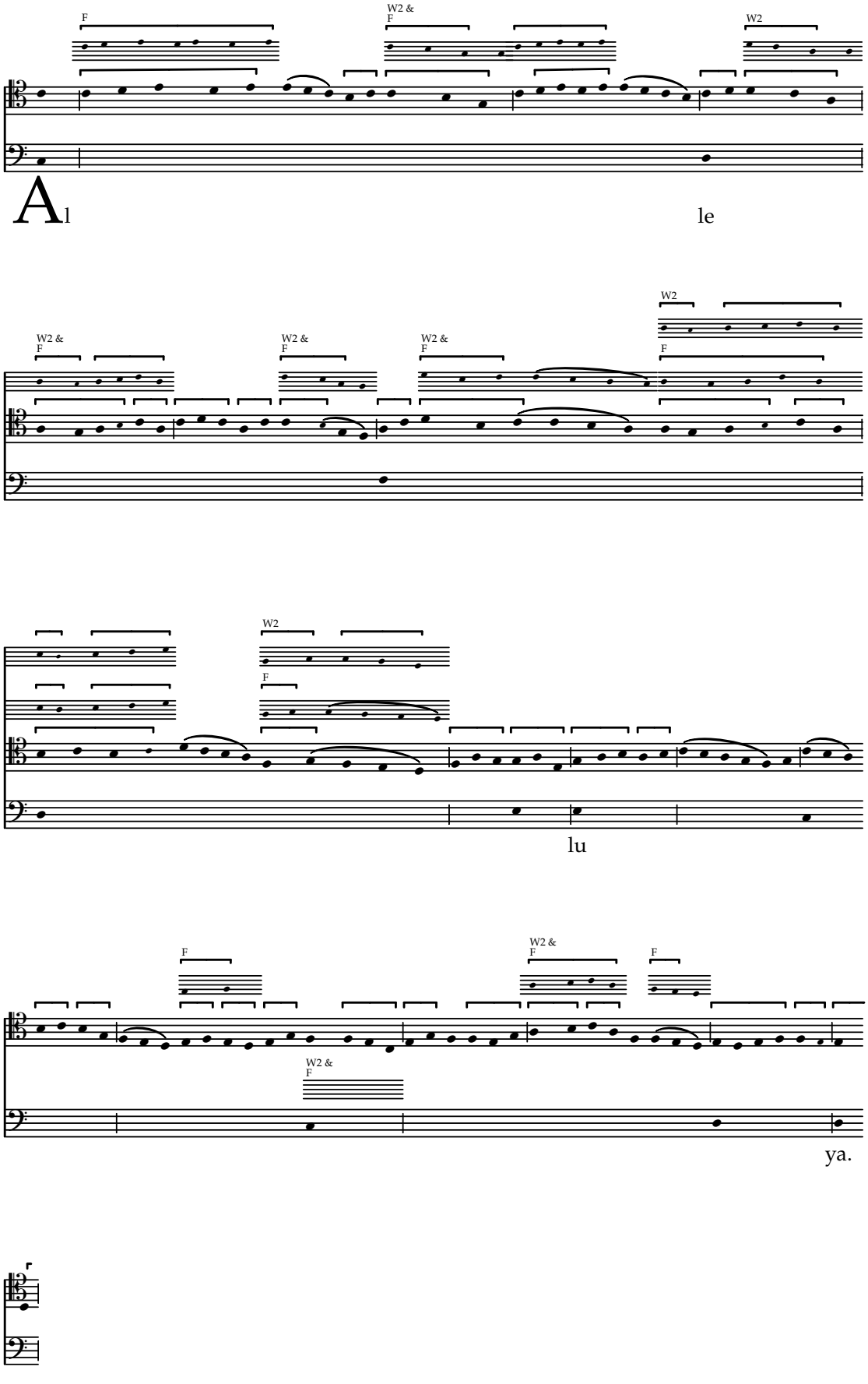
Concordances from W2 & F

f. 42v–43



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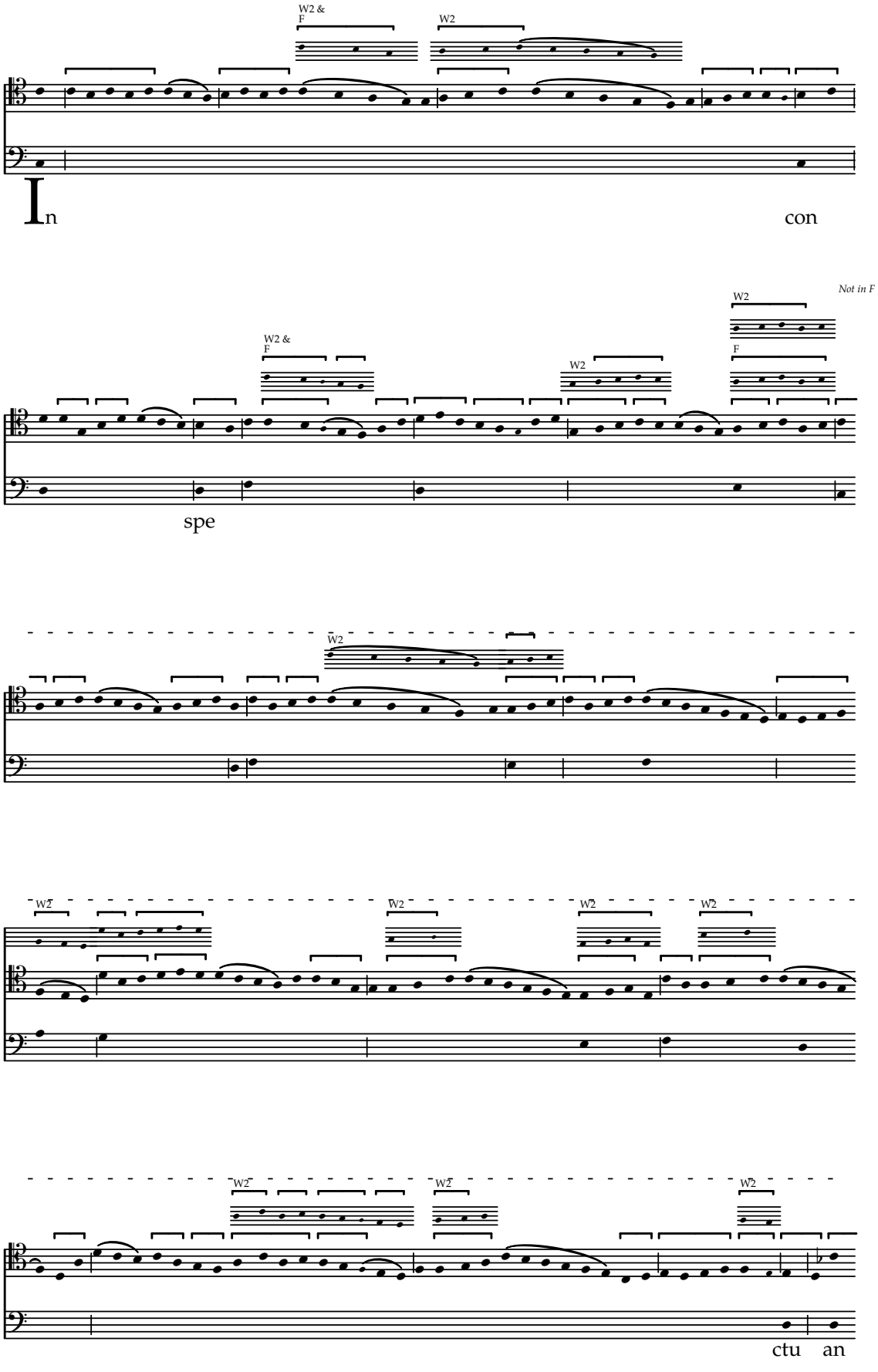
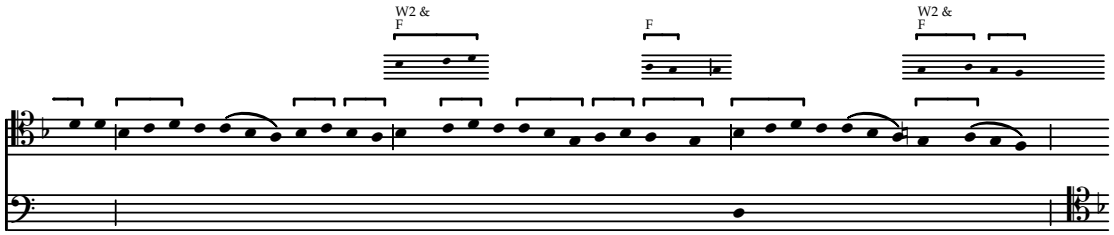
Concordances from W2 & F

f. 43–43v





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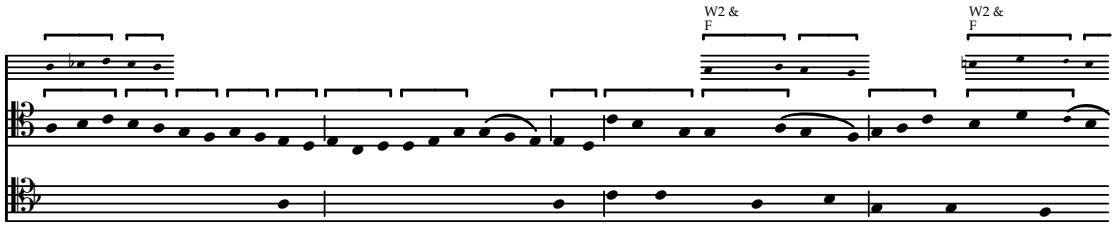

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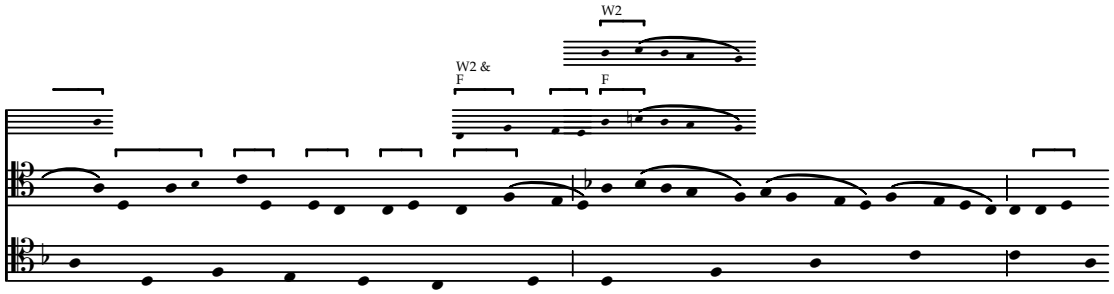

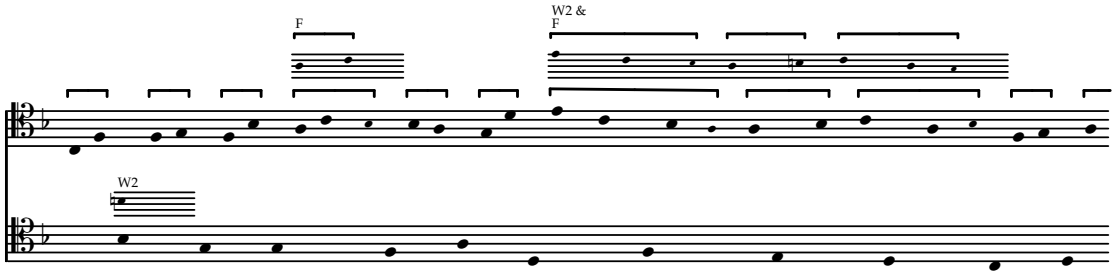

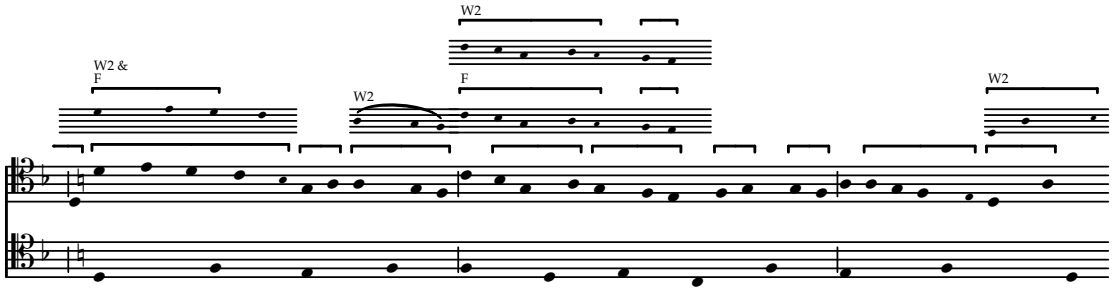

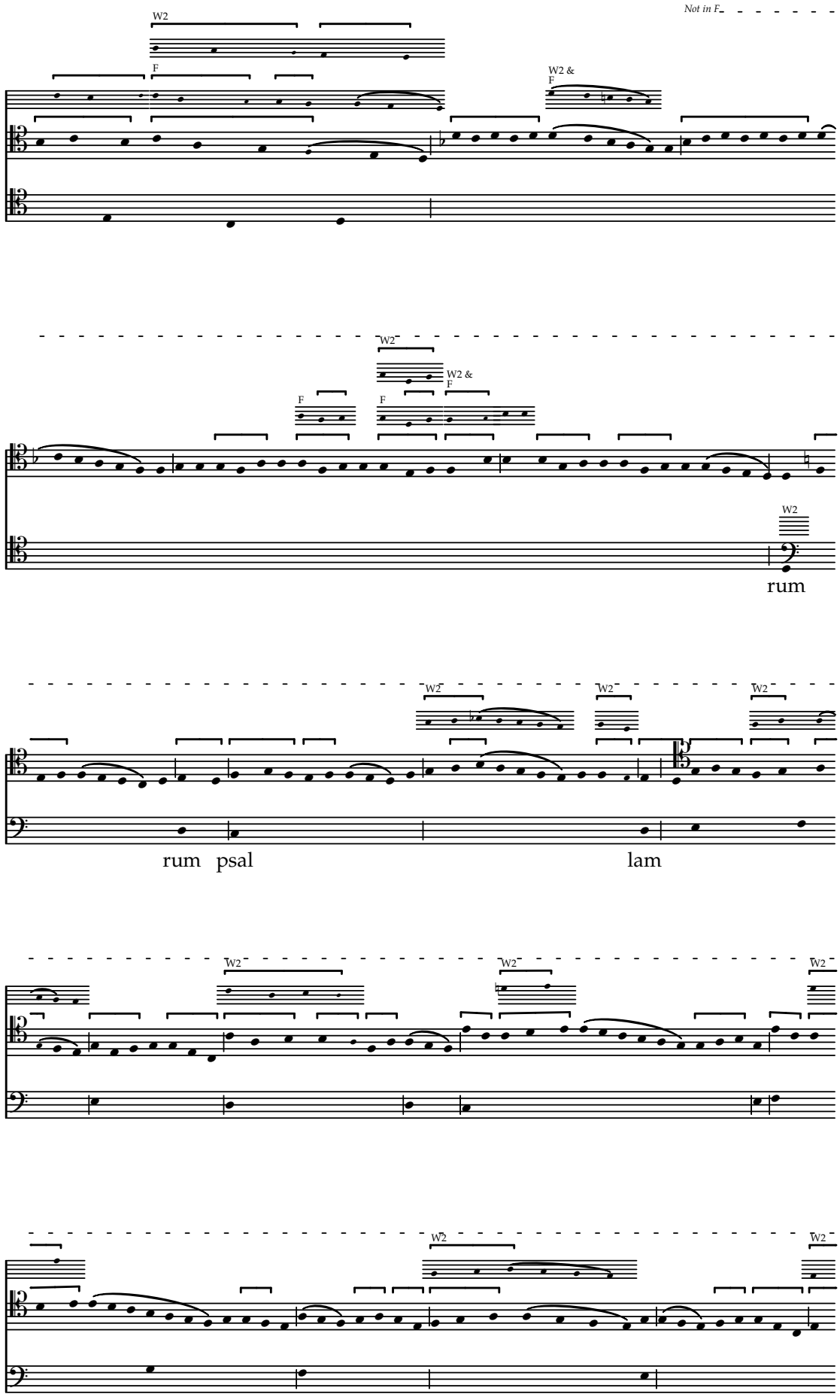
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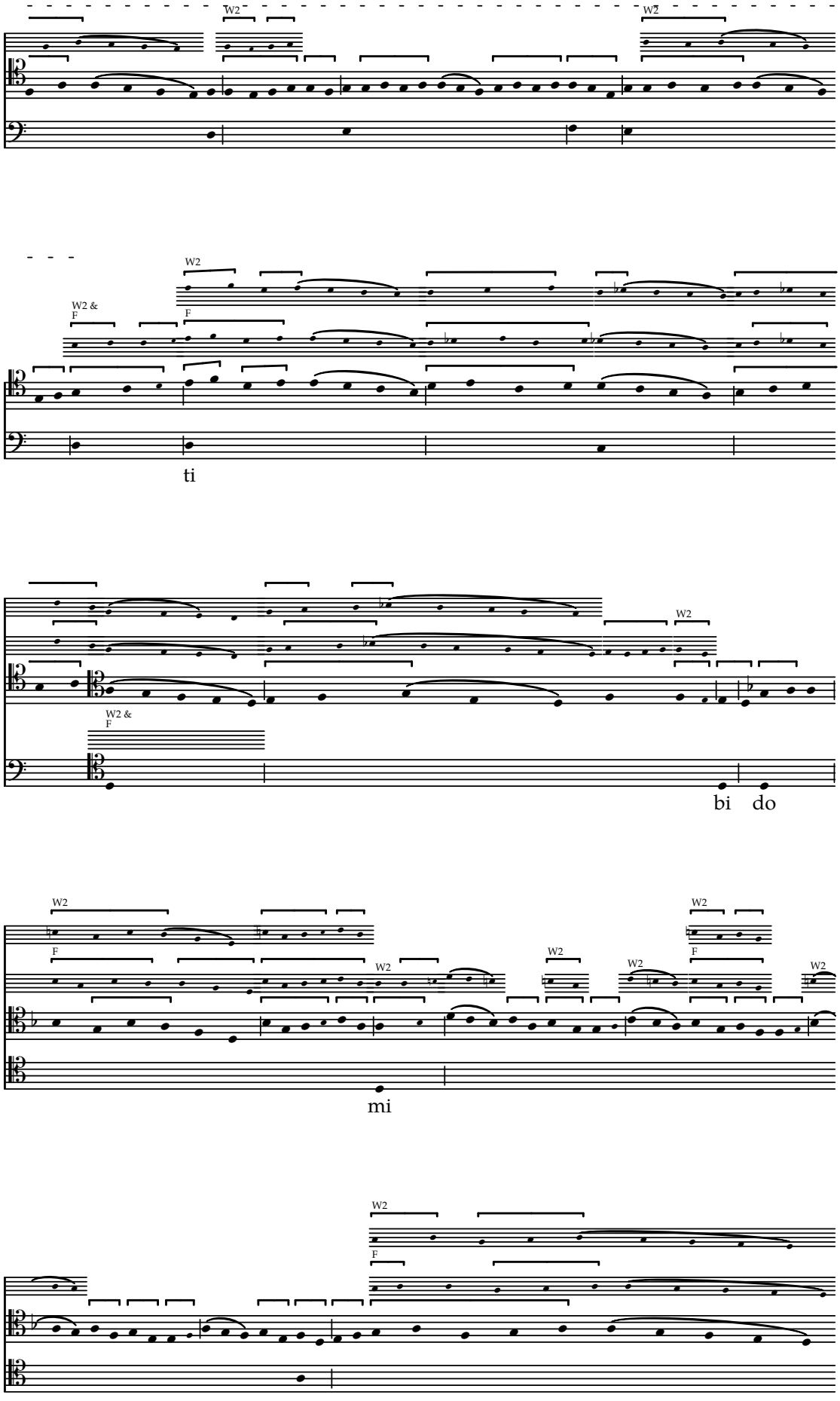
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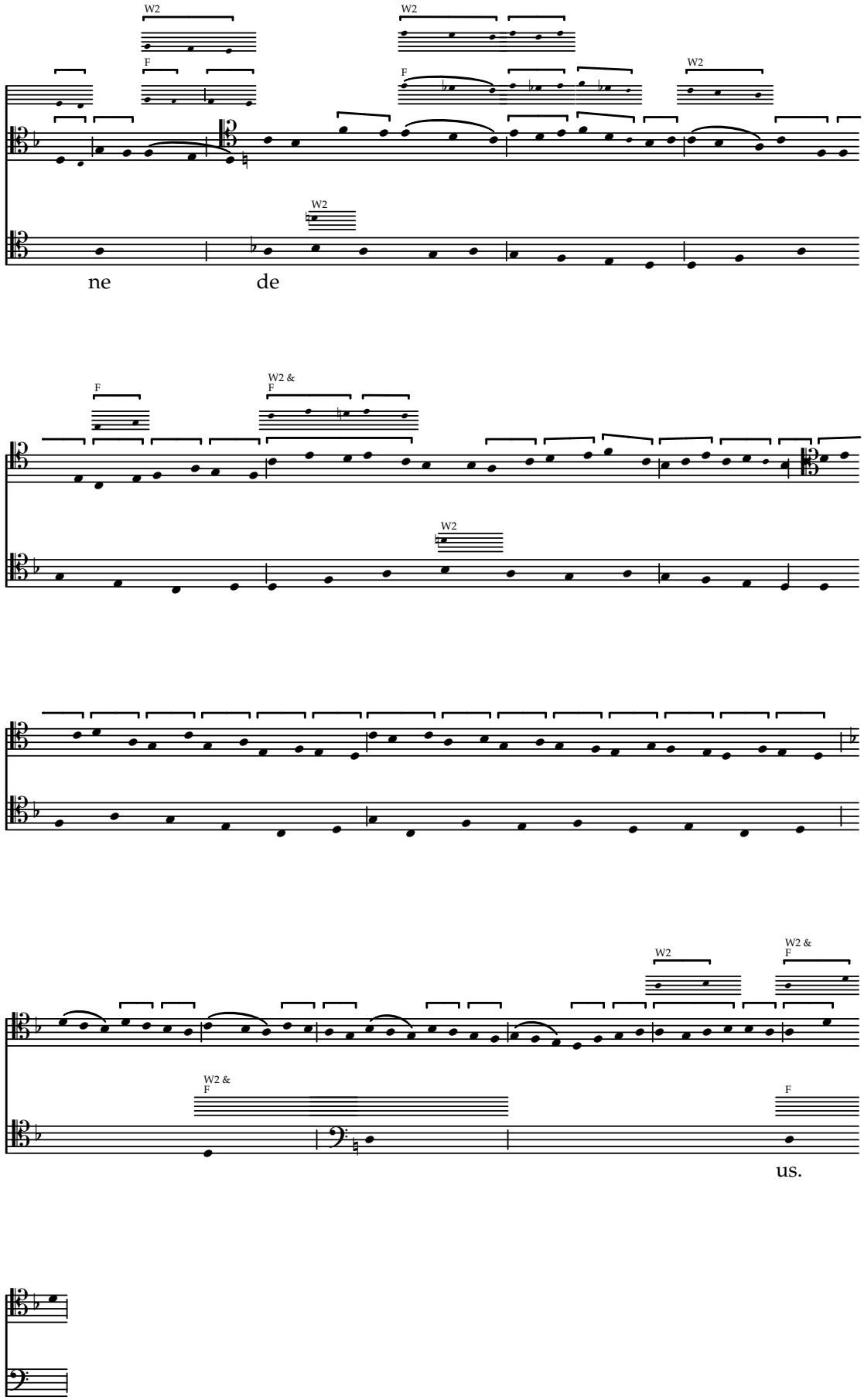
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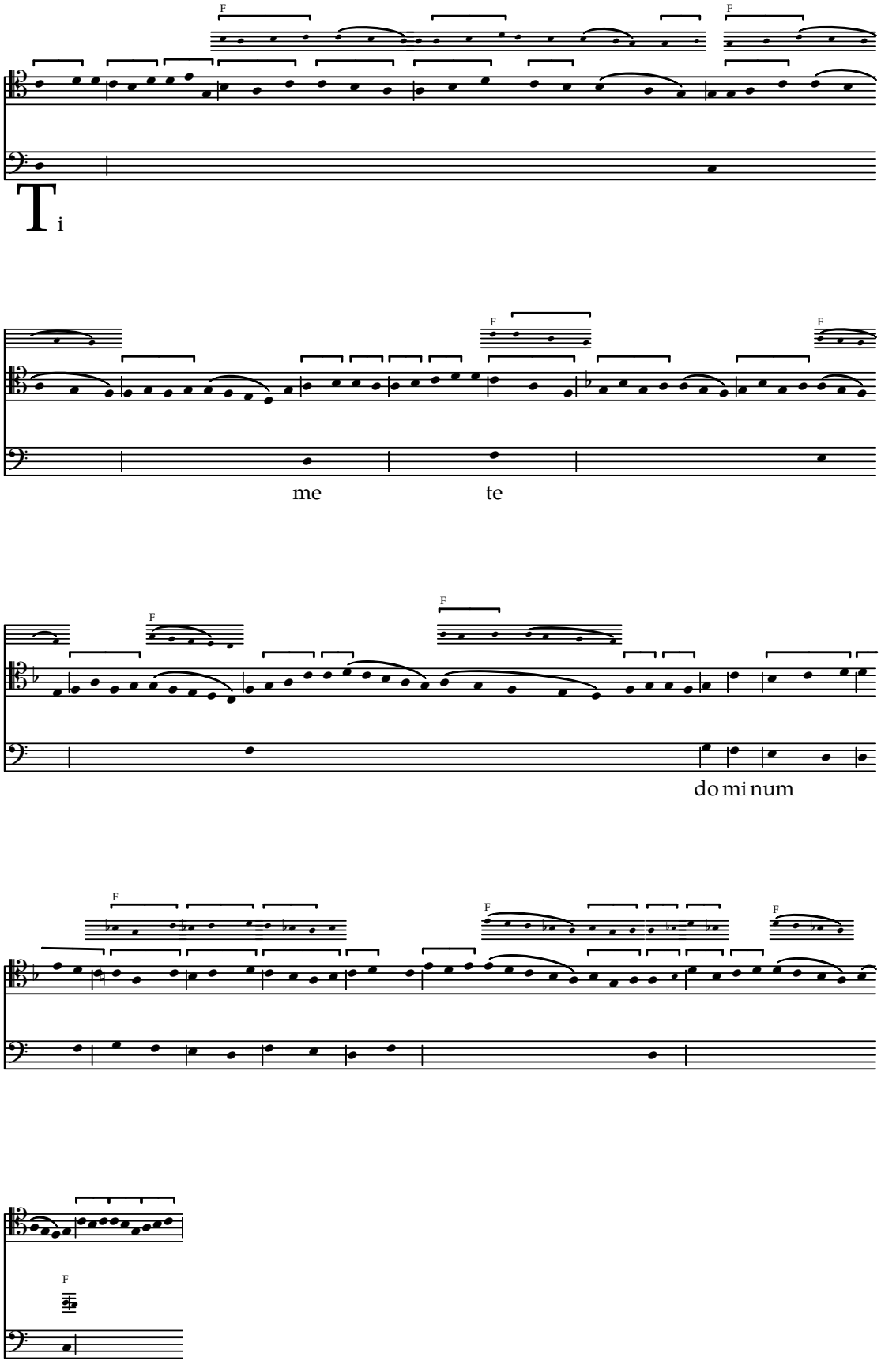
Concordances from F

f. 43v–44



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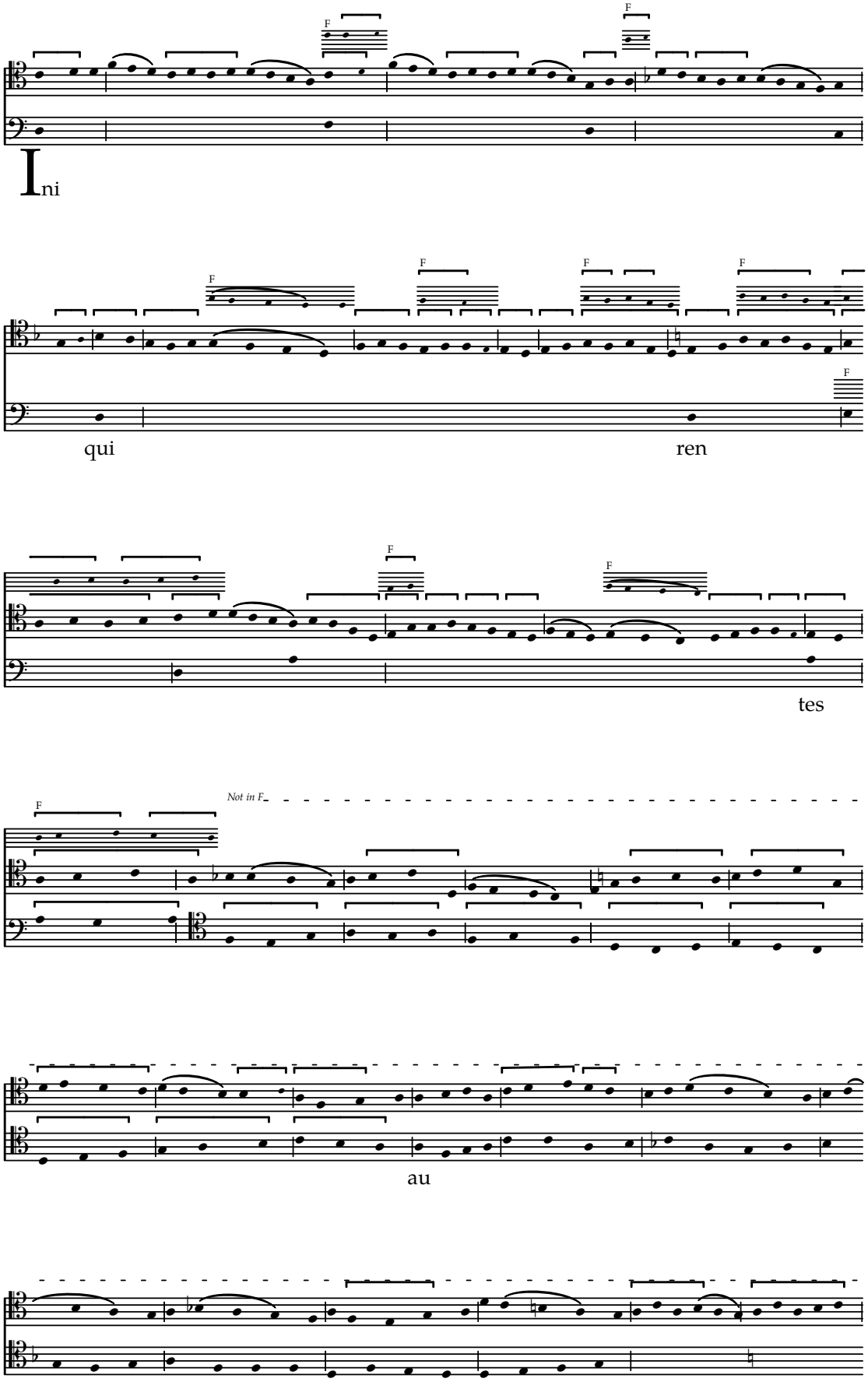
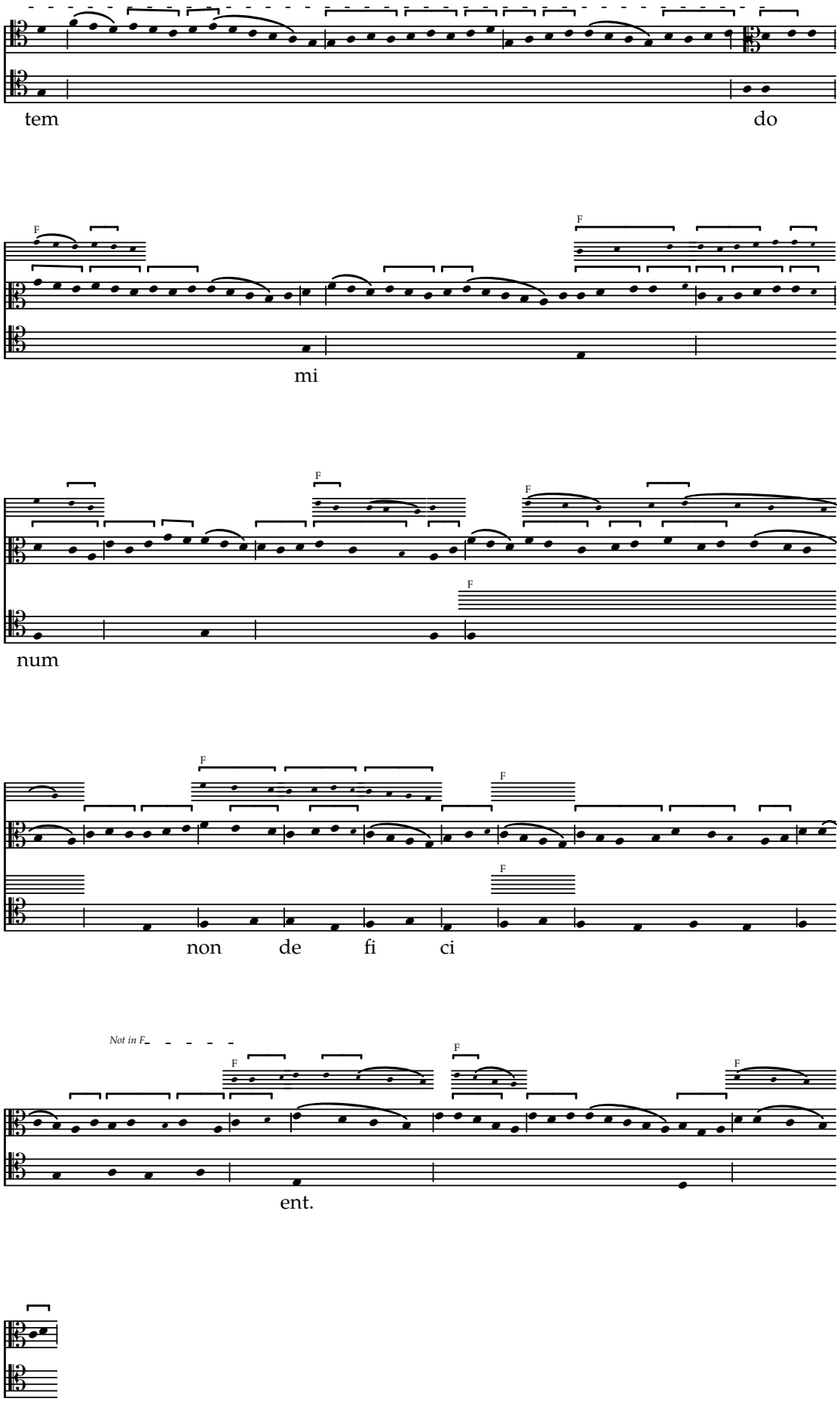
Concordances from F

f. 44

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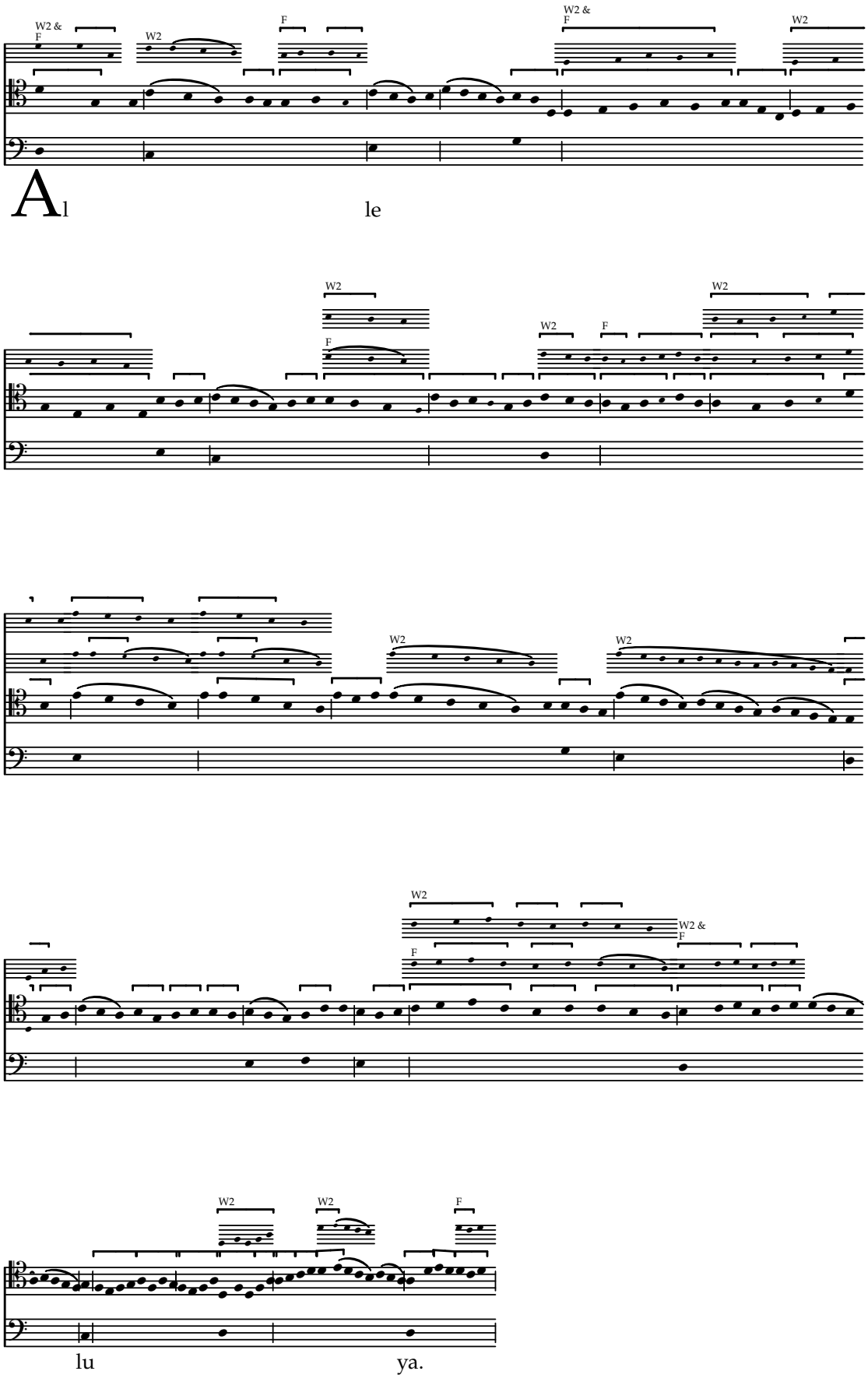
Concordances from W2 & F

f. 44–44v



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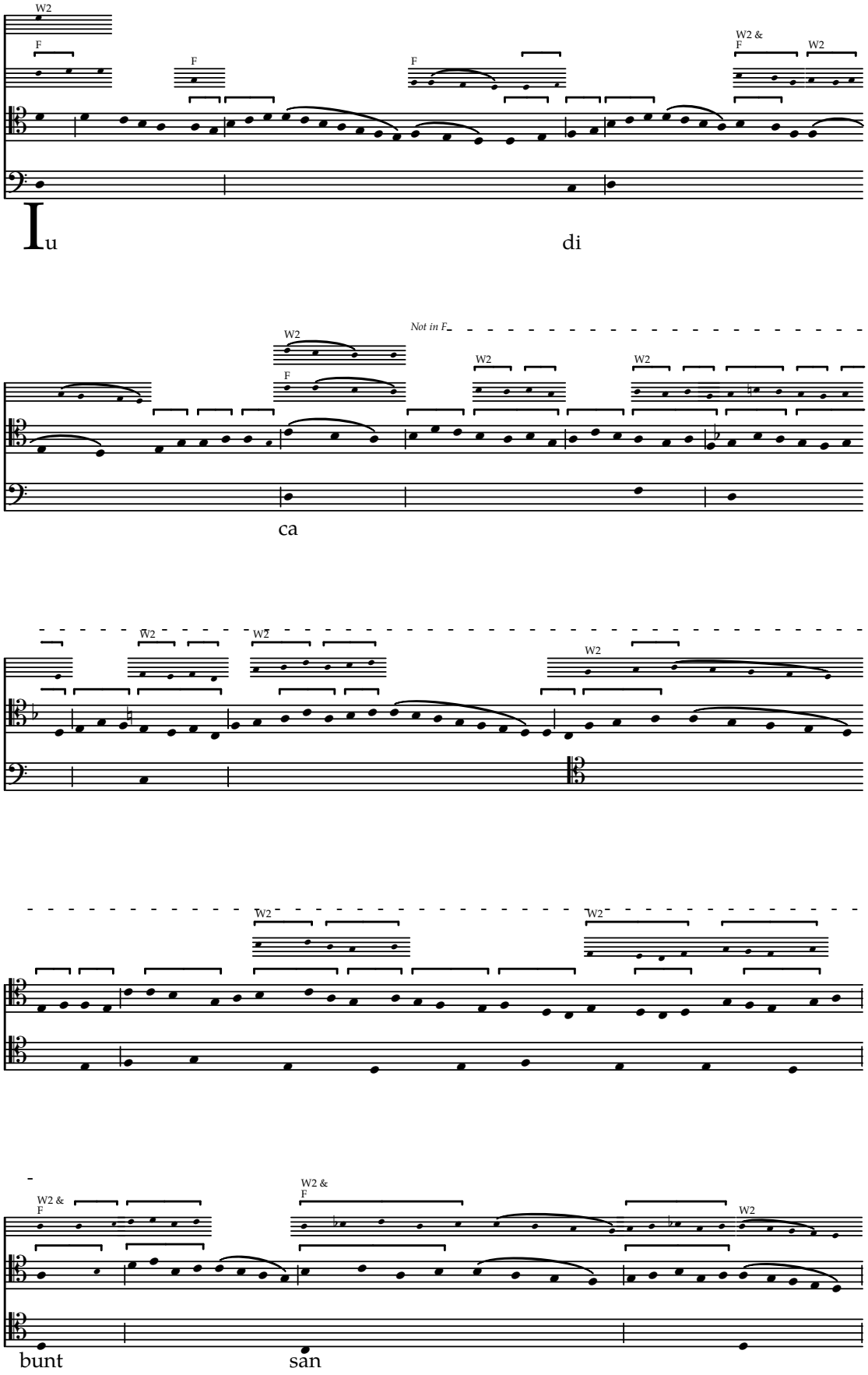
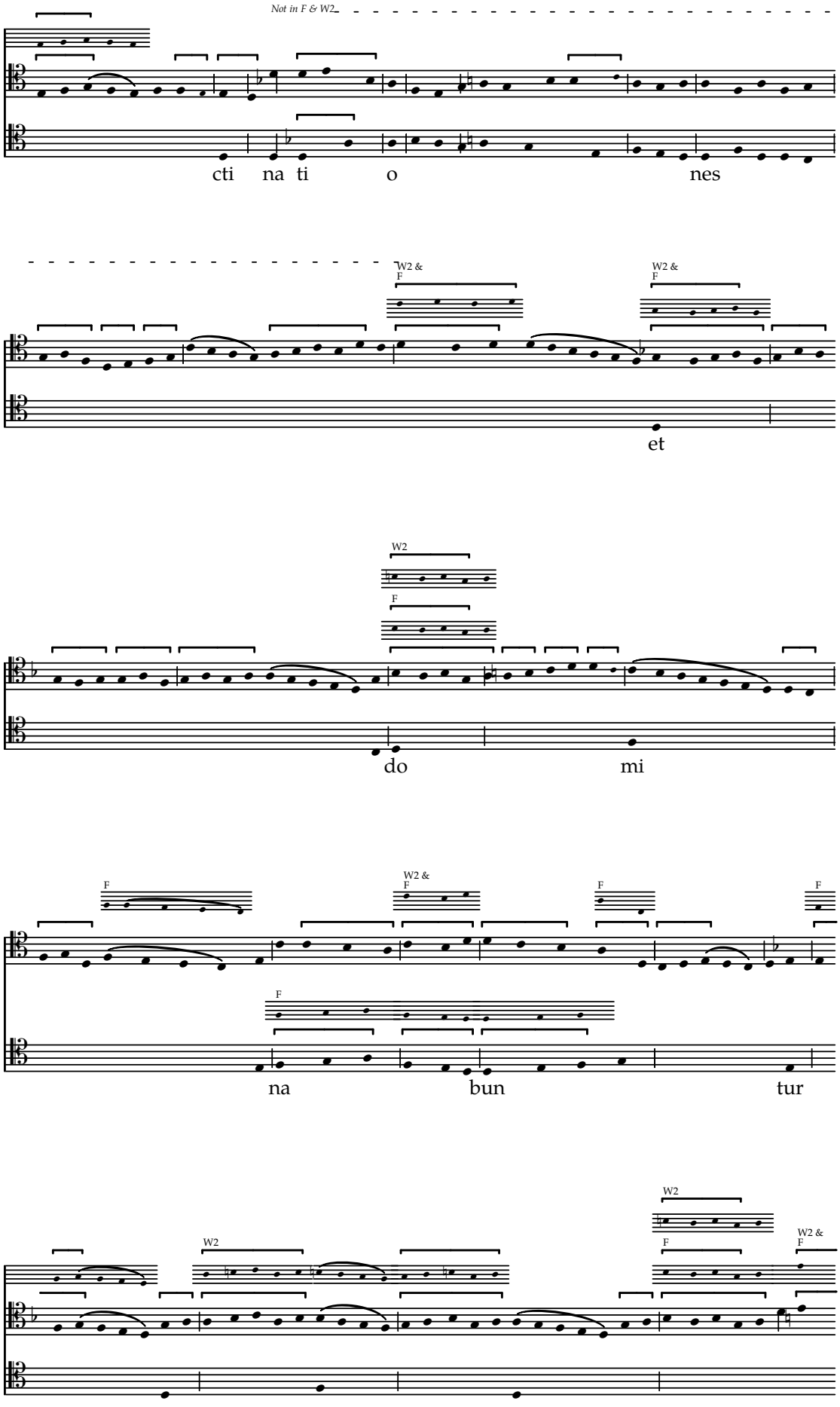
Concordances from W2 & F

f. 44v–45

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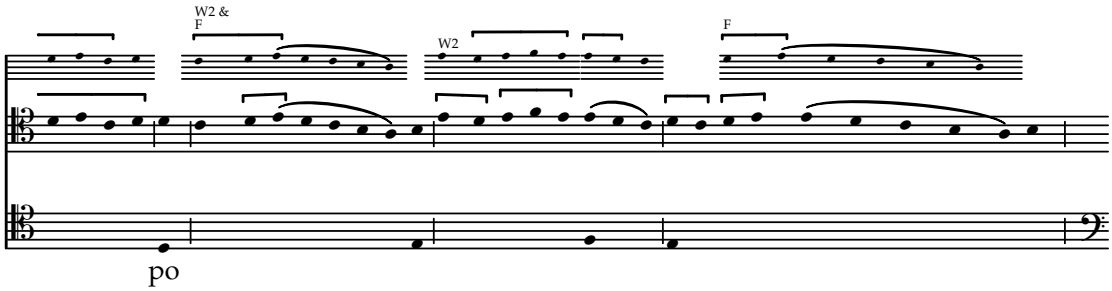
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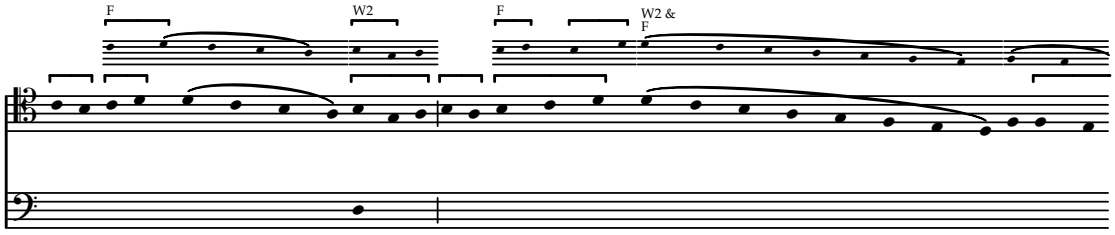
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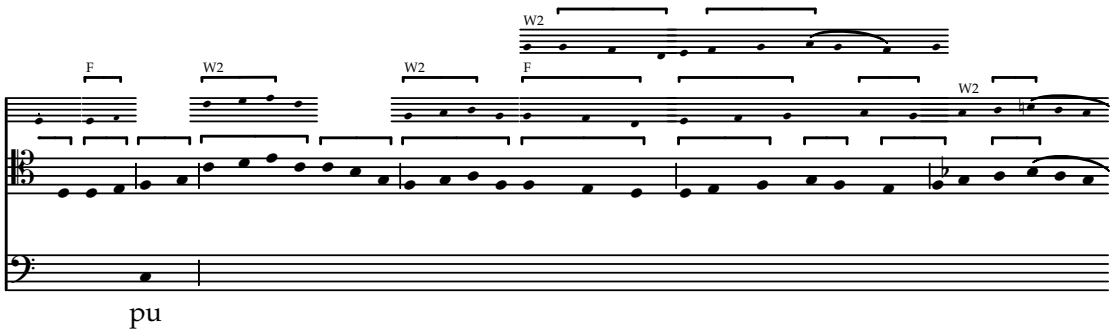
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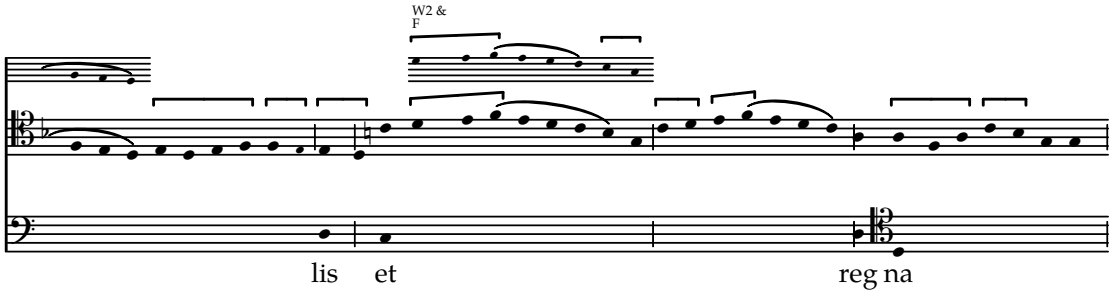
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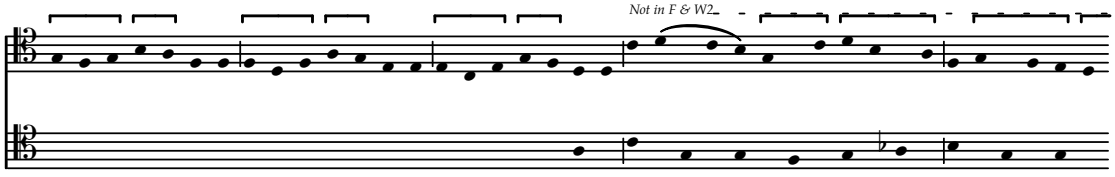
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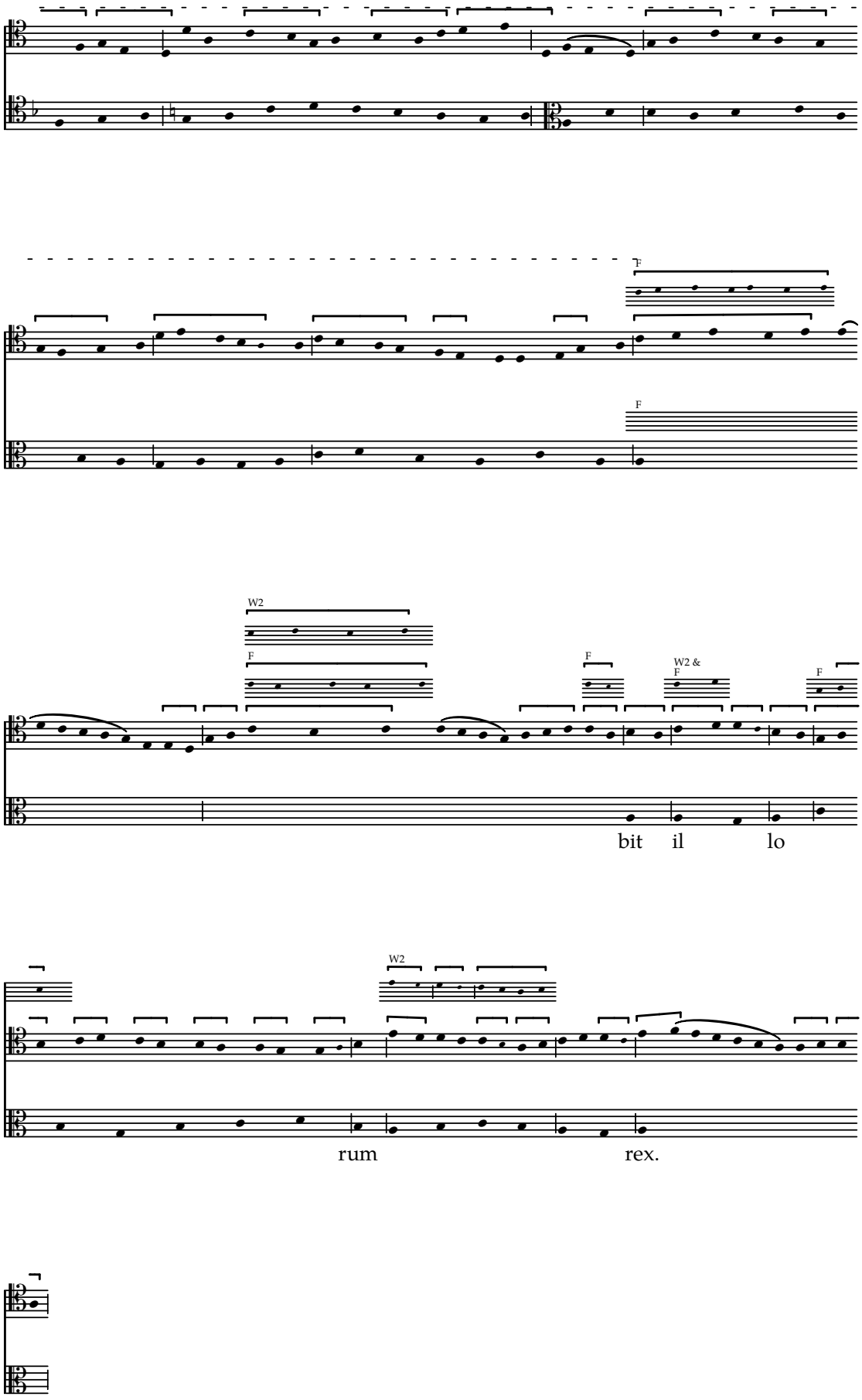
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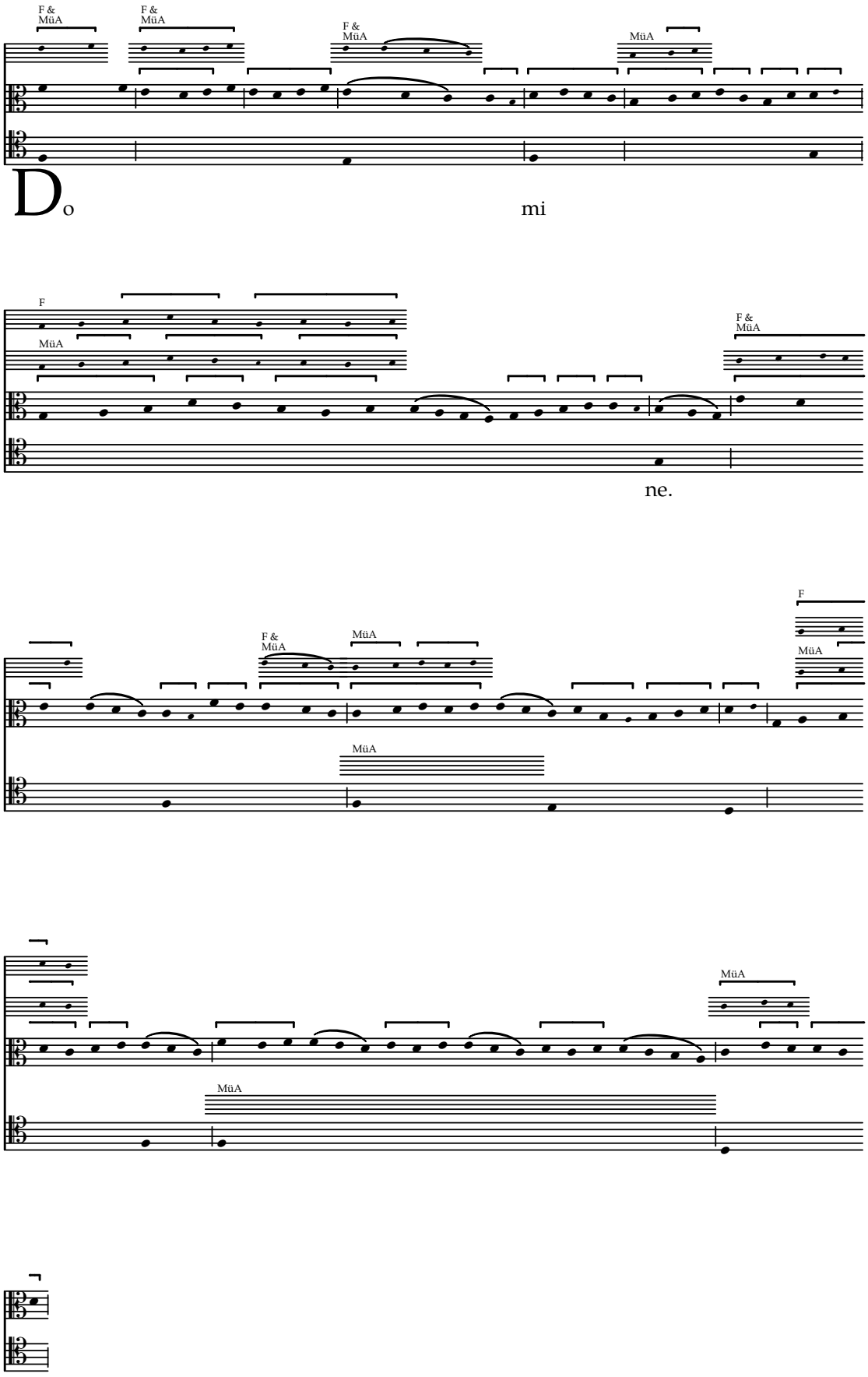
Concordances from F & MüA

f. 45



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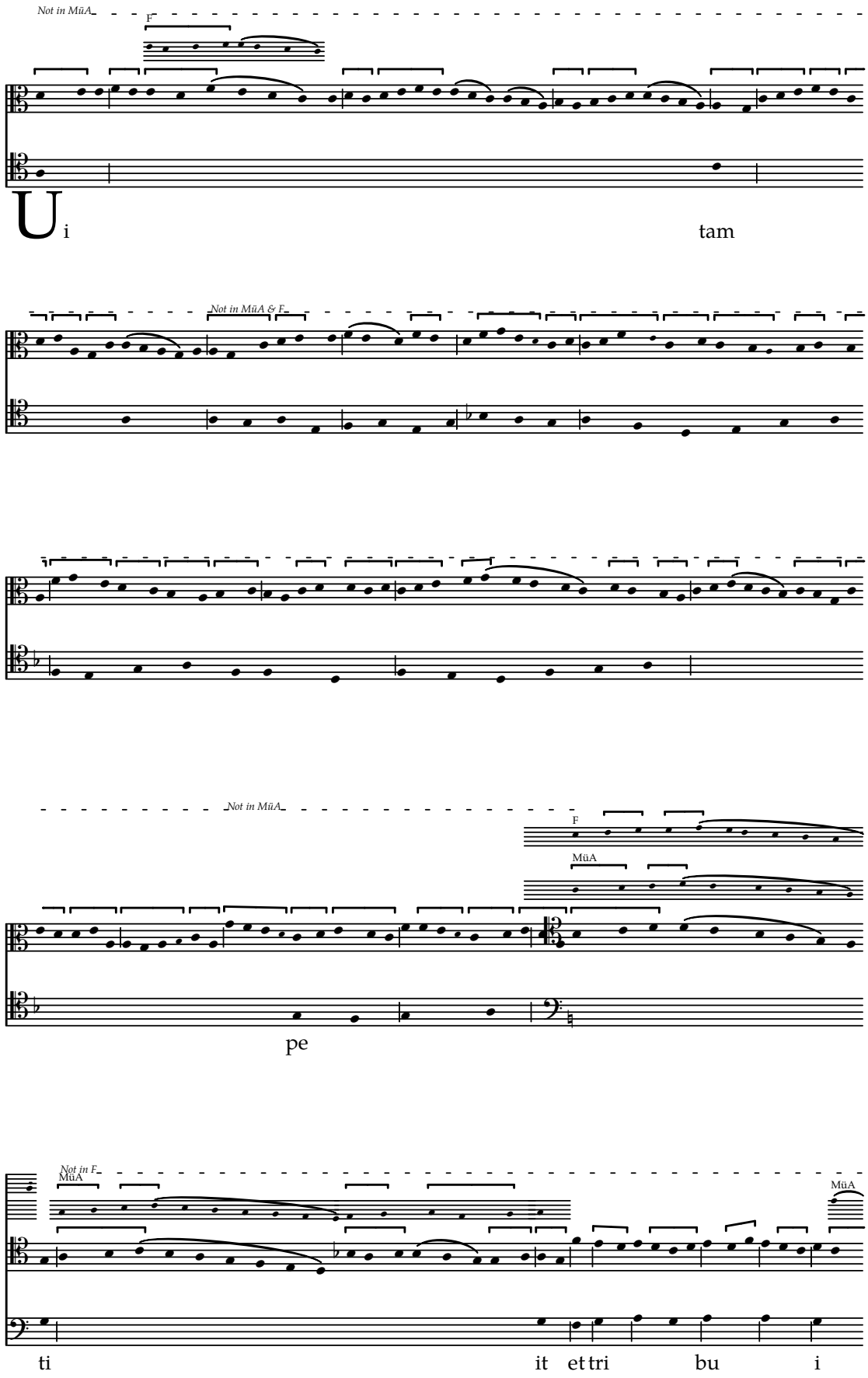
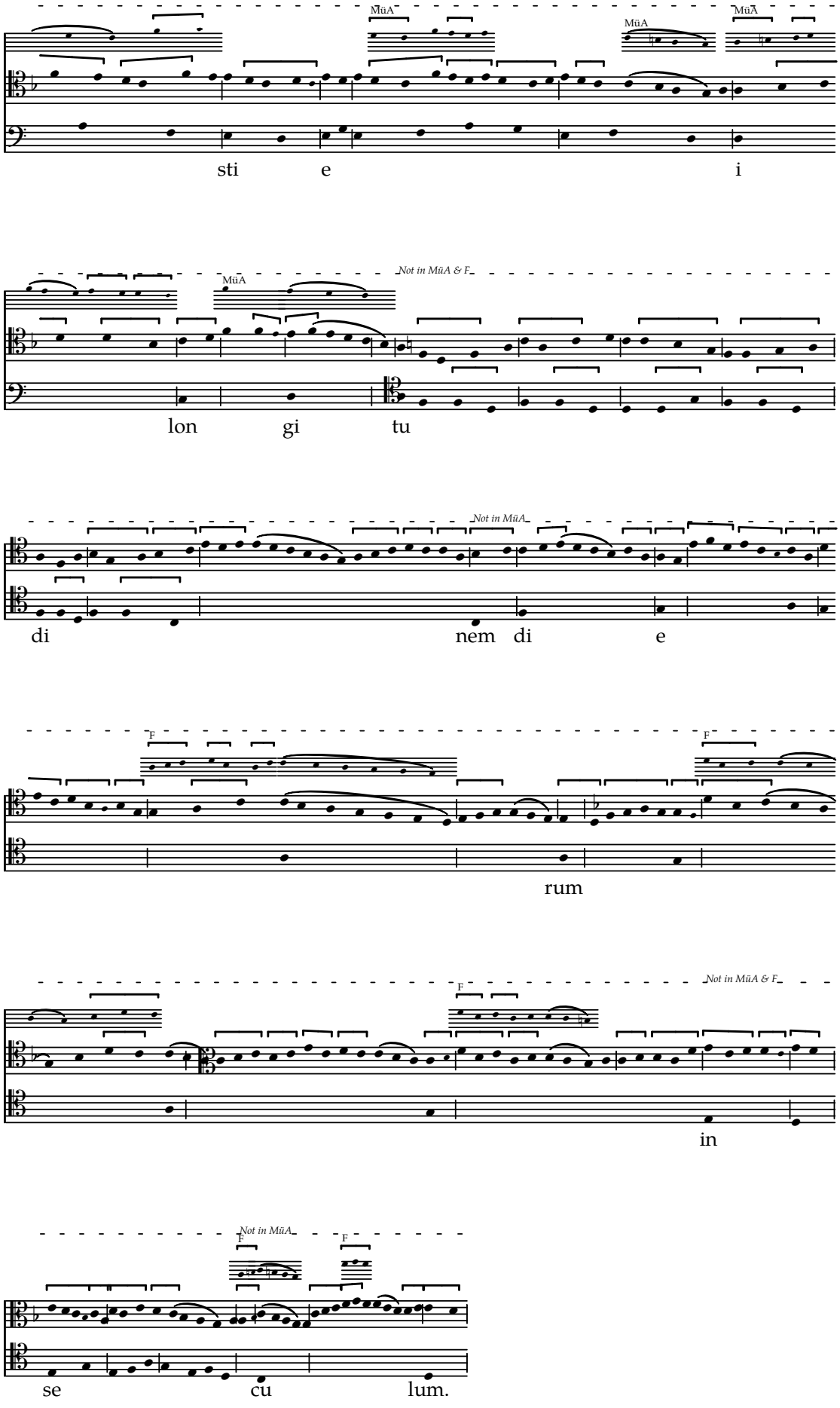
Concordances from F & MüA

f. 45–45v

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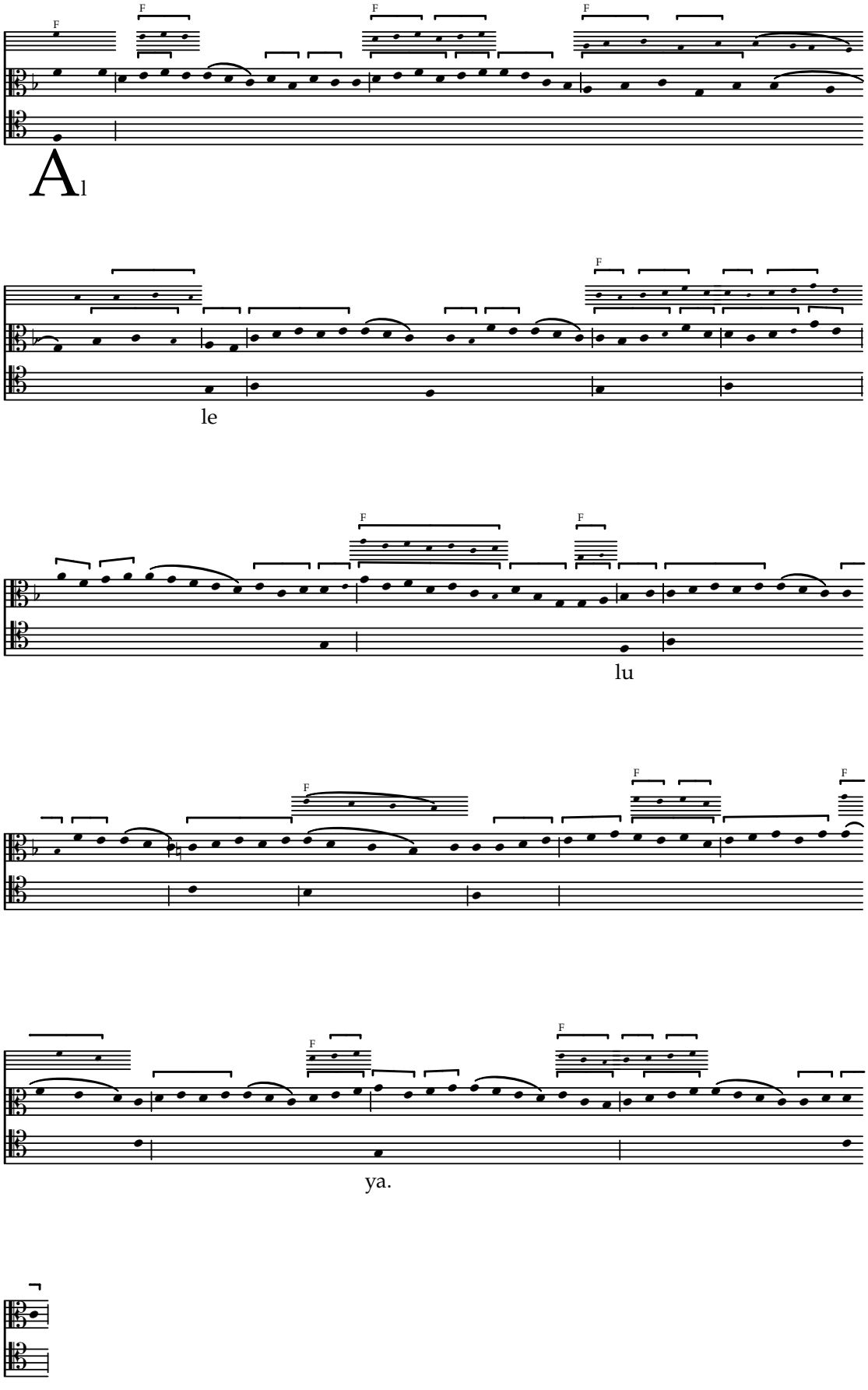
Concordances from F

f. 45v



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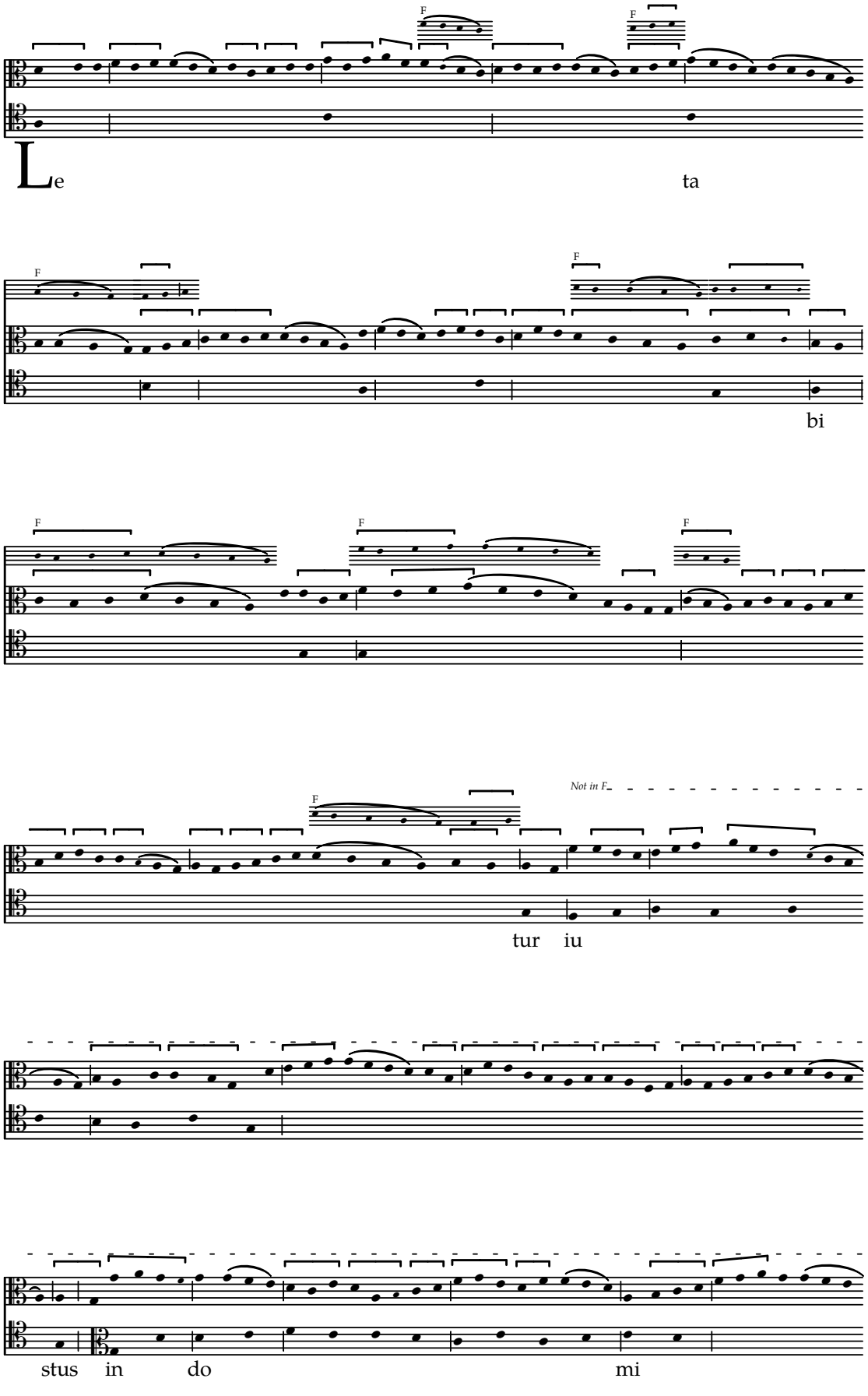
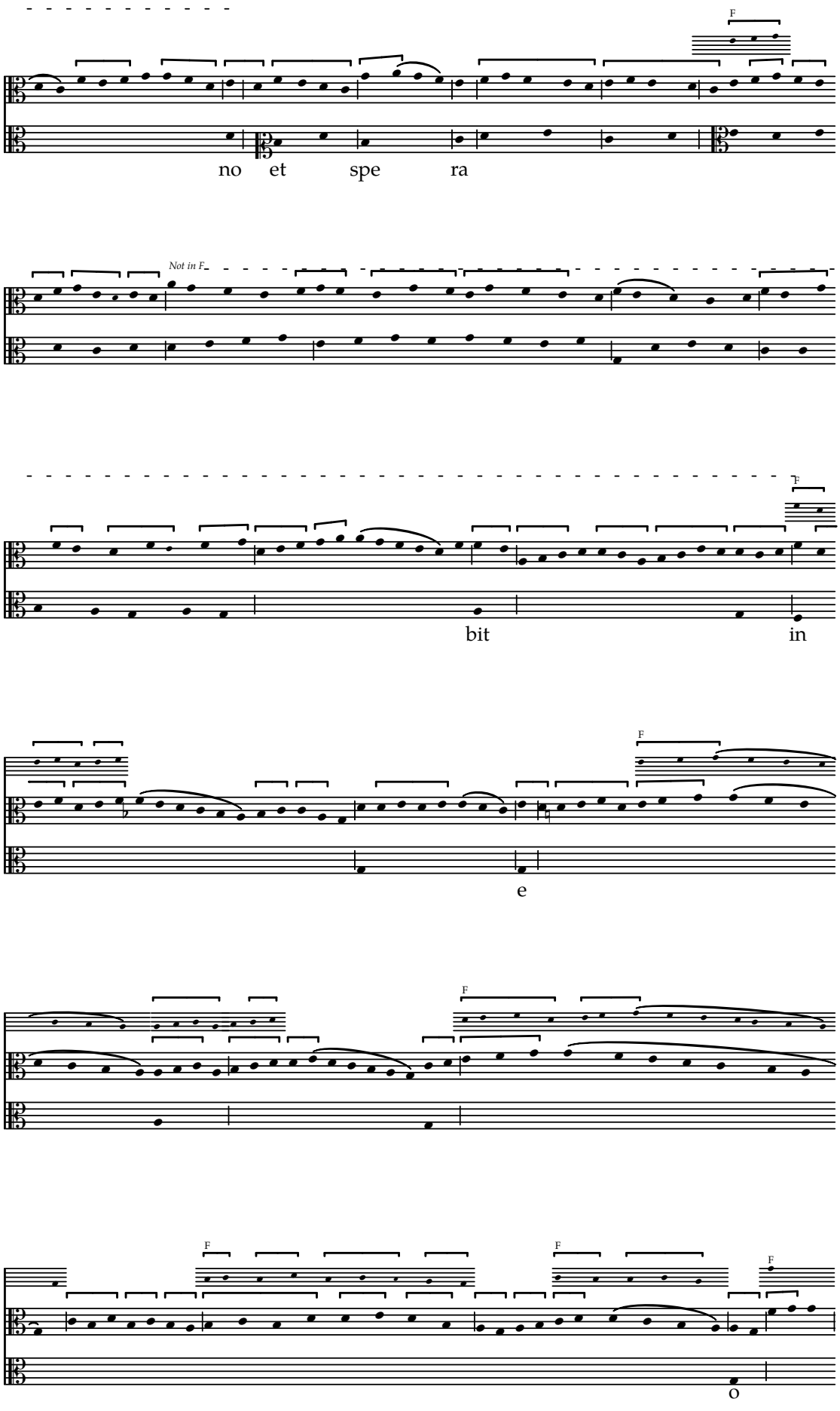
Concordances from F

f. 45v–46

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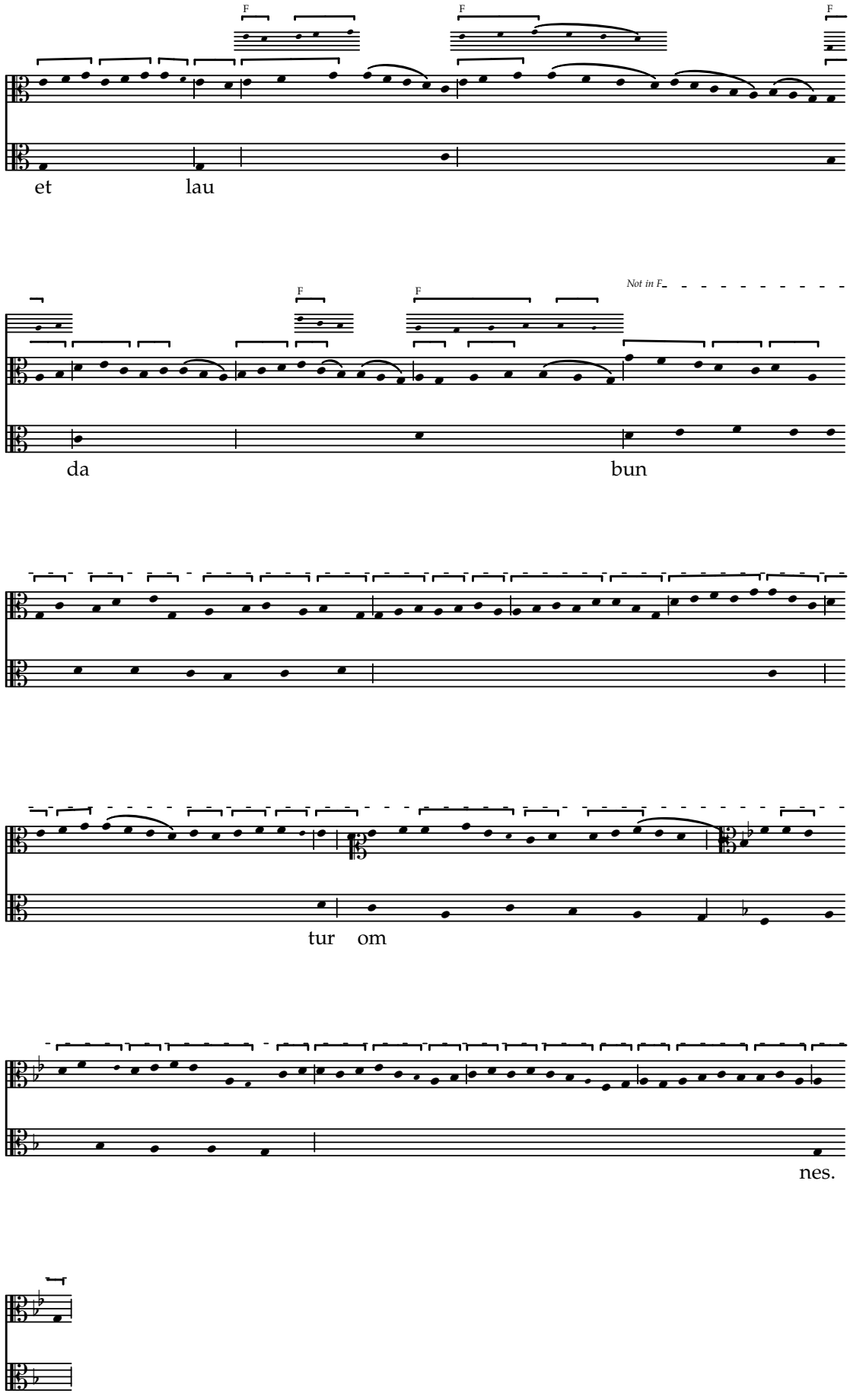
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Concordances from W2 & F

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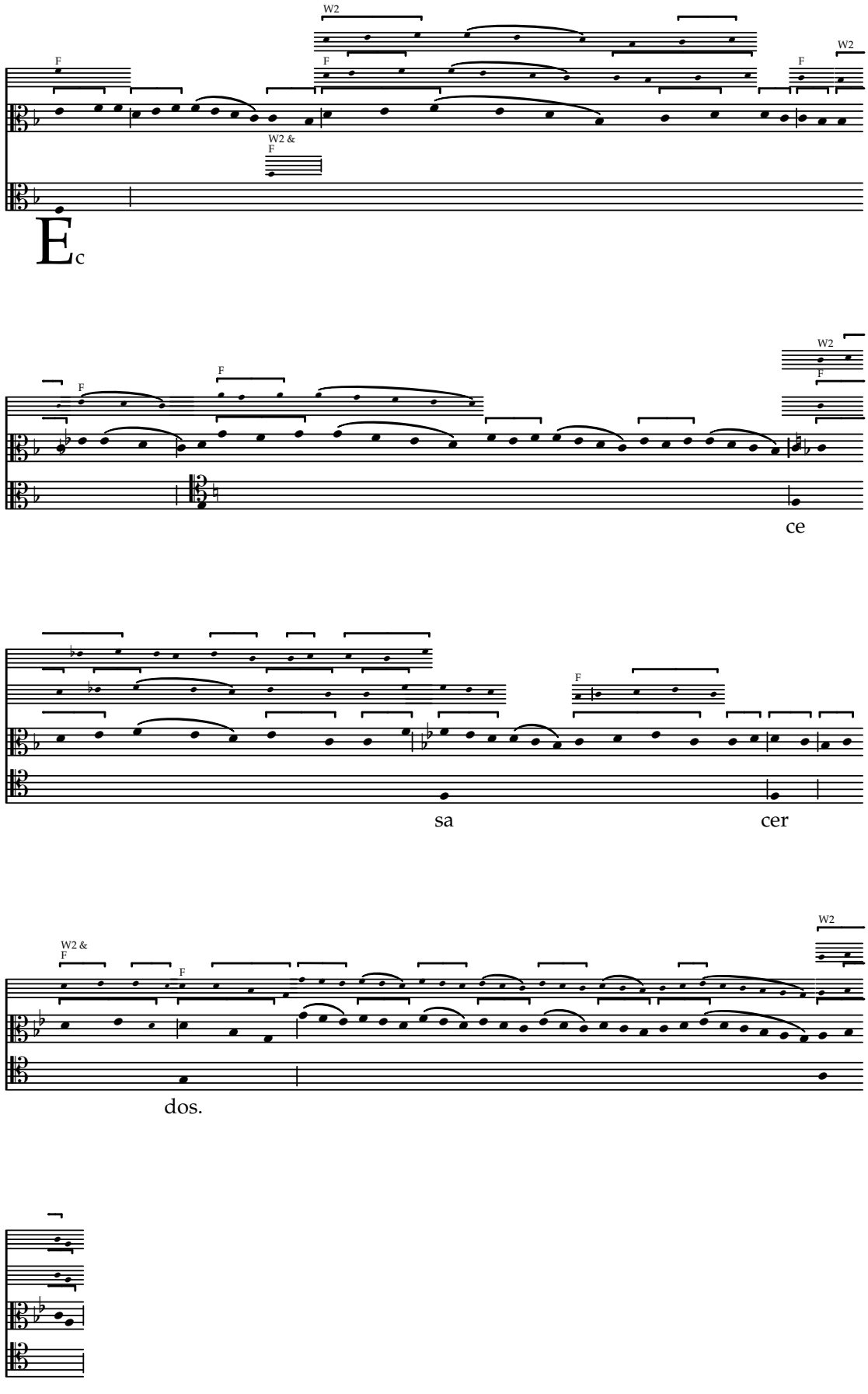

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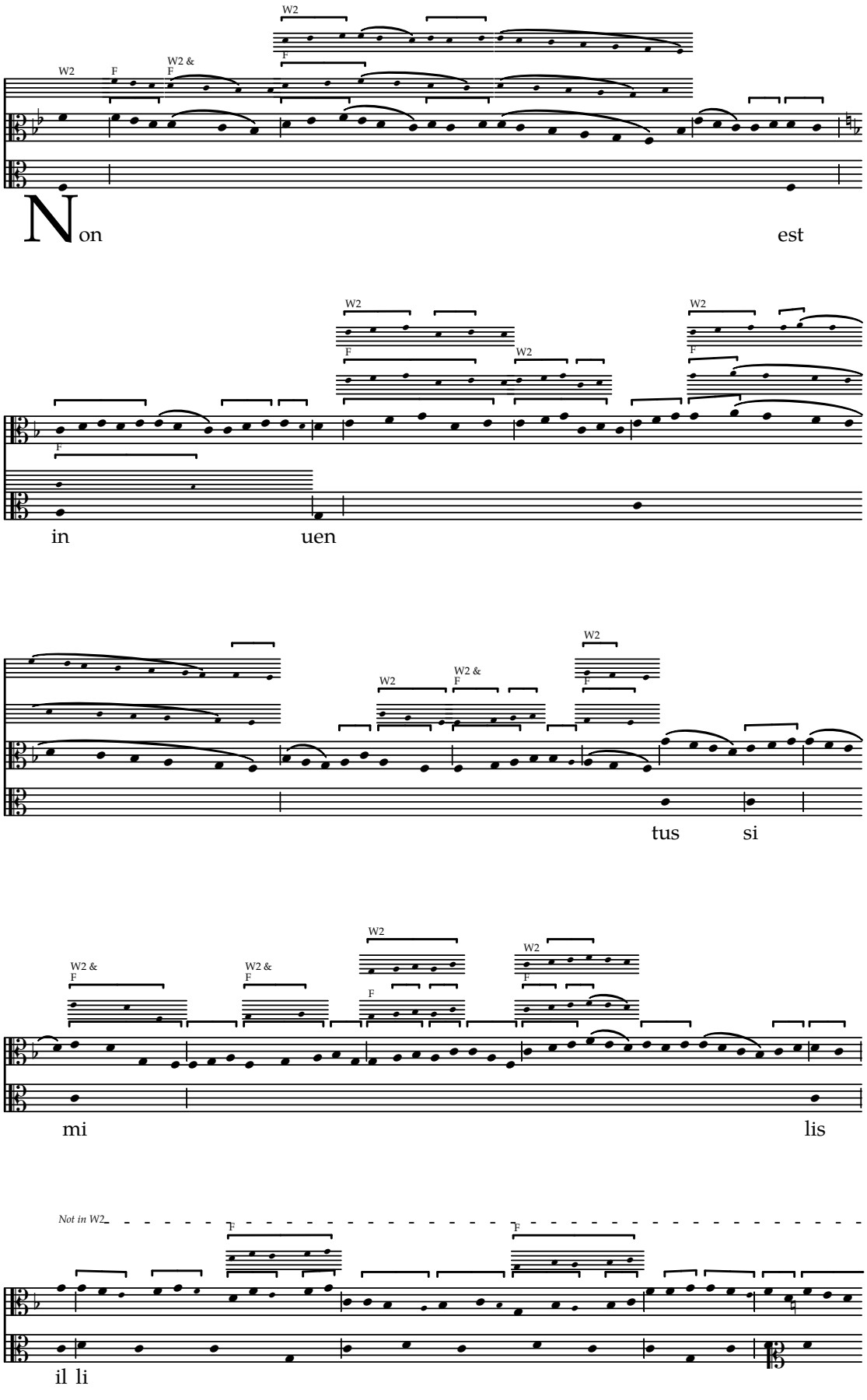
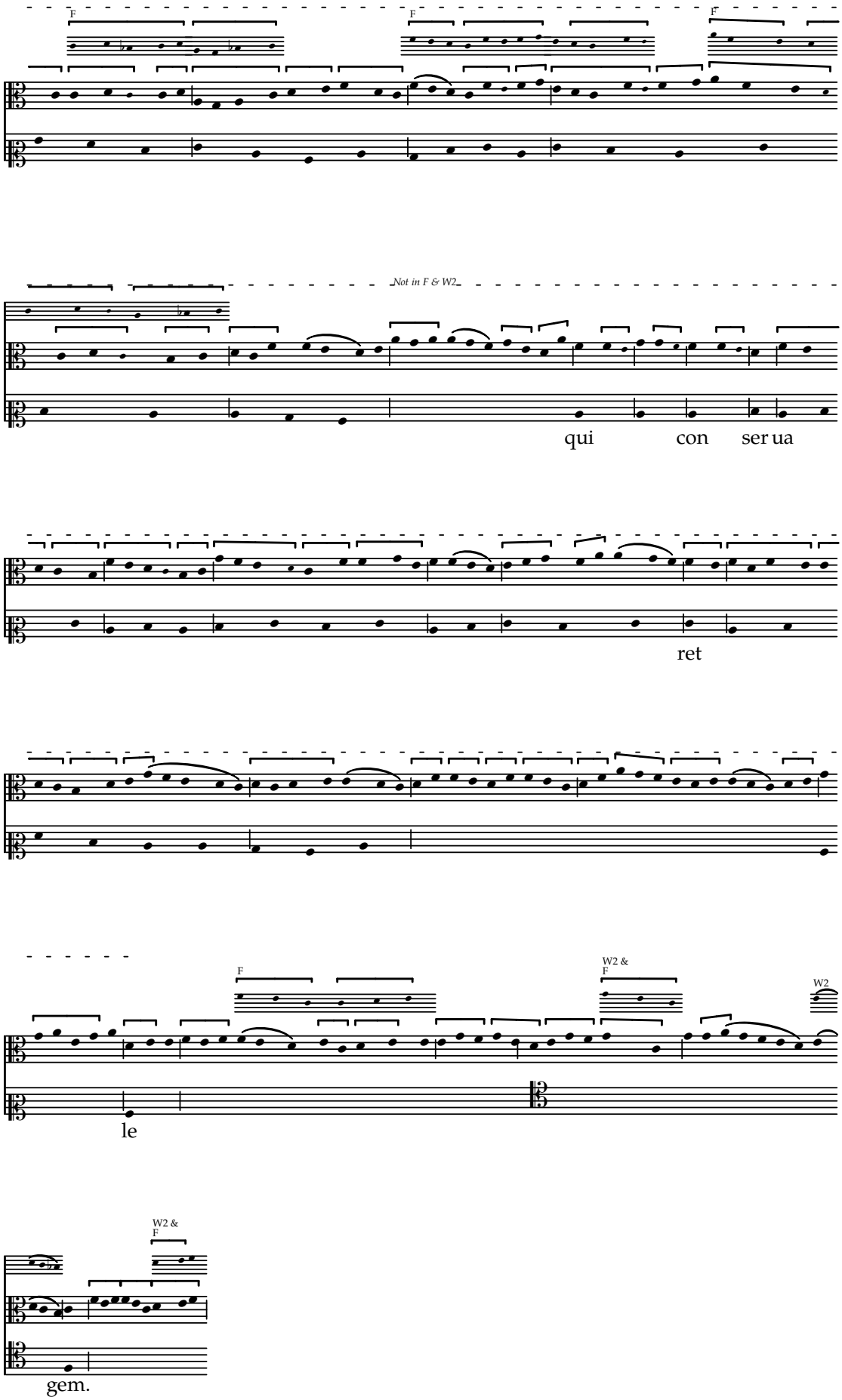
Concordances from W2 & F

f. 46v

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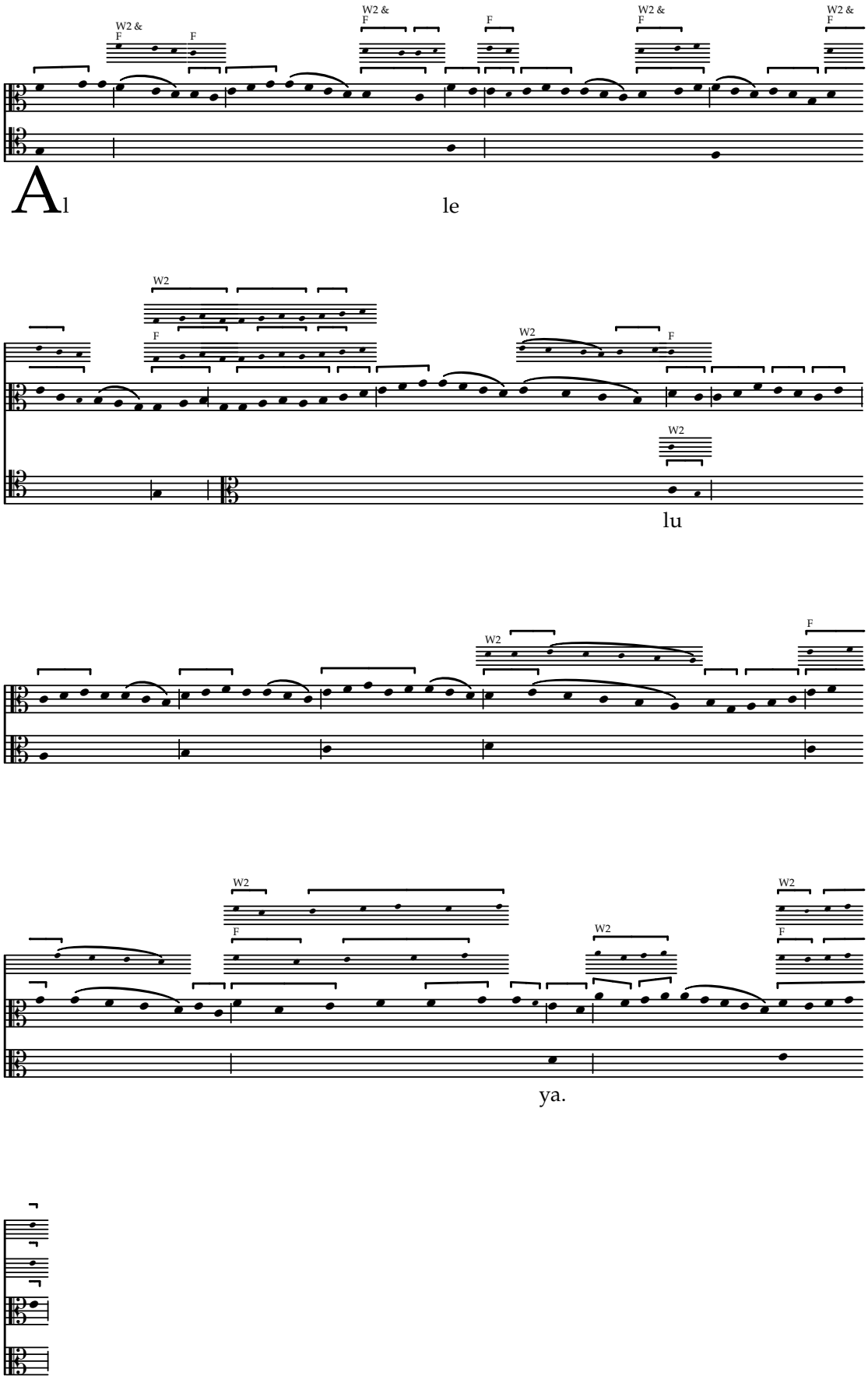
Concordances from W2 & F

f. 46v



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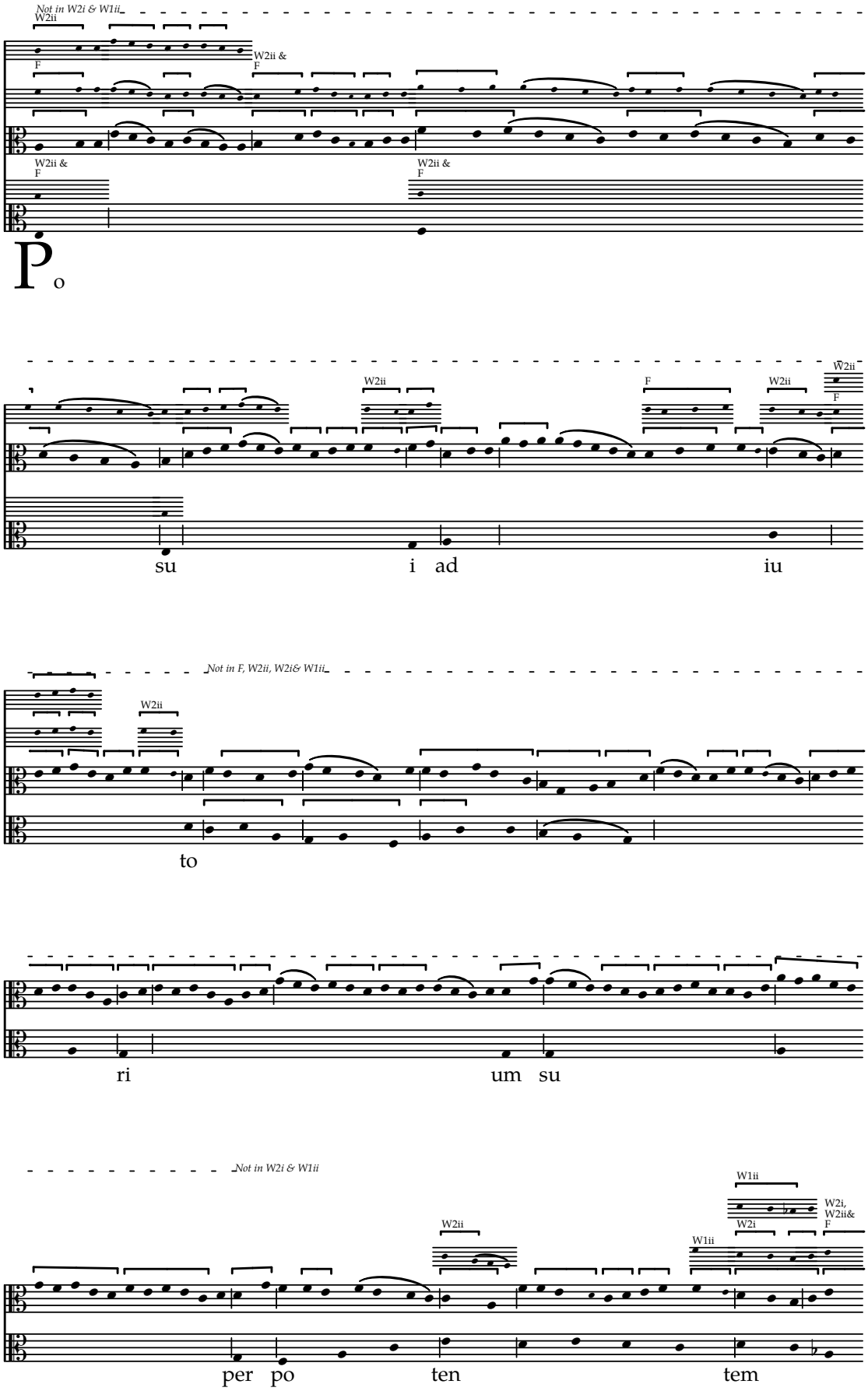
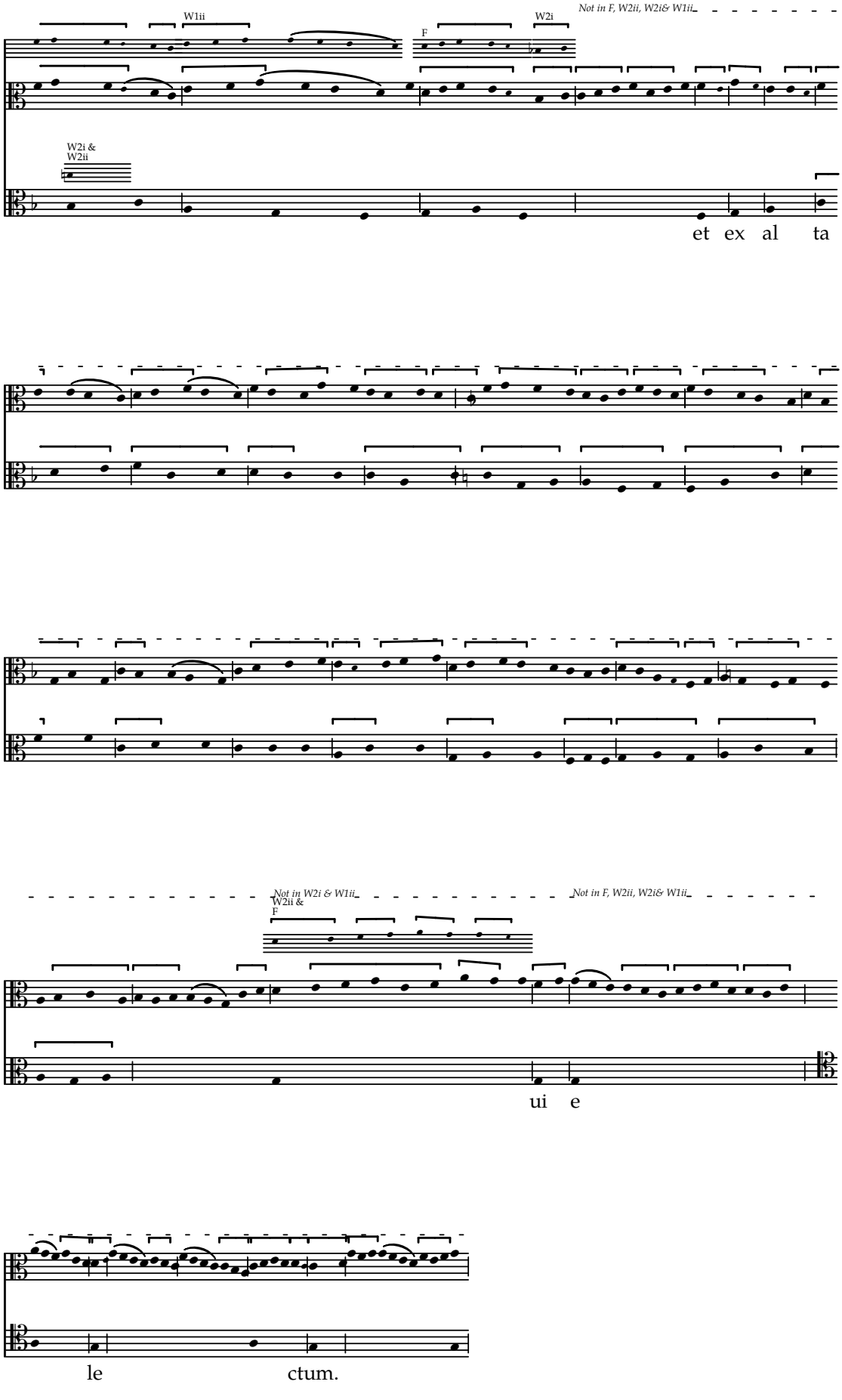
Concordances from W1 (clausula, f. 53v), W2 (setting and clausula “sanctum tuum”) & F

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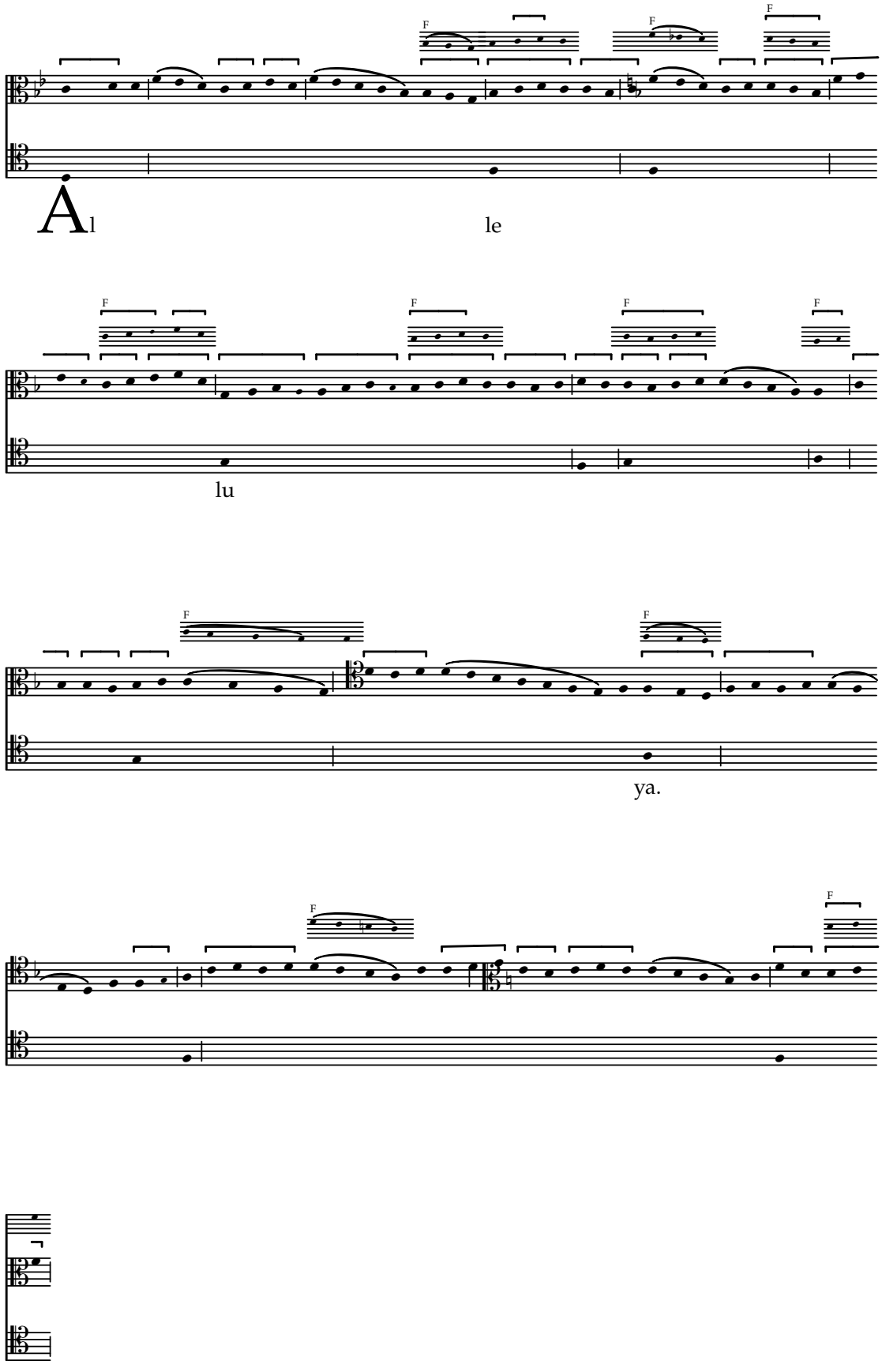
Concordances from F

f. 47–47v



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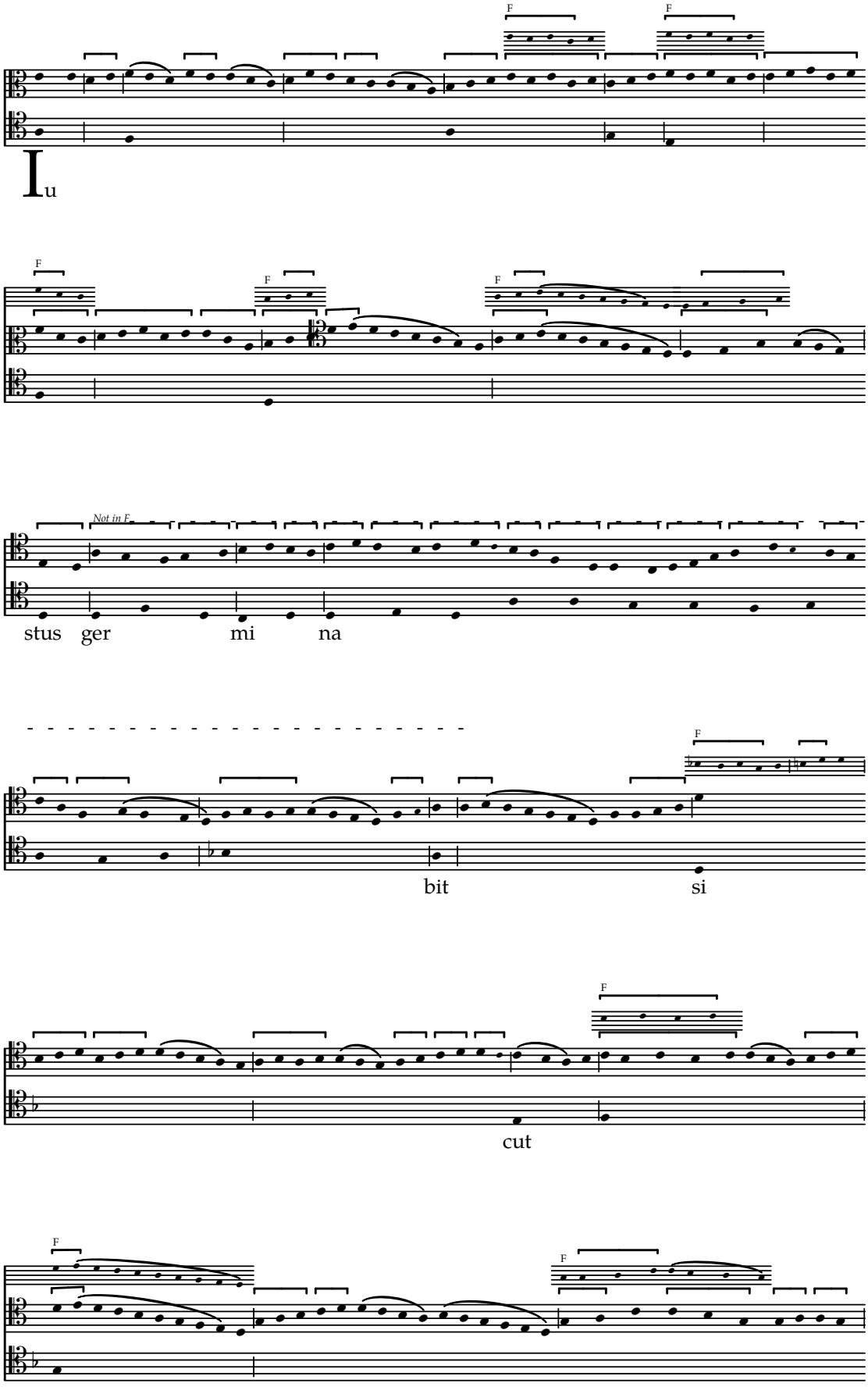
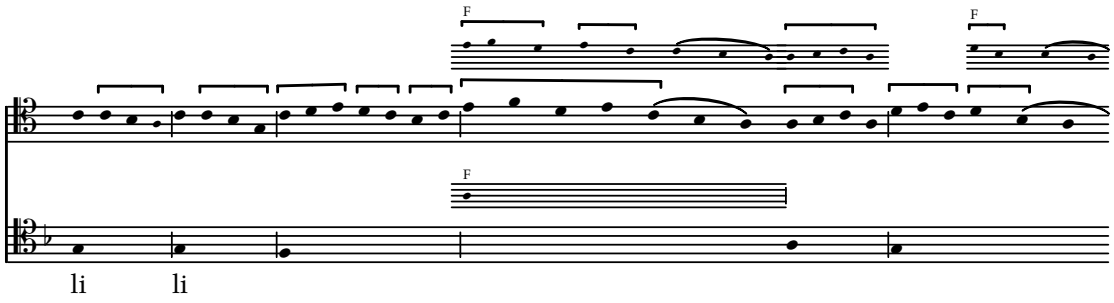
Concordances from F

f. 47v

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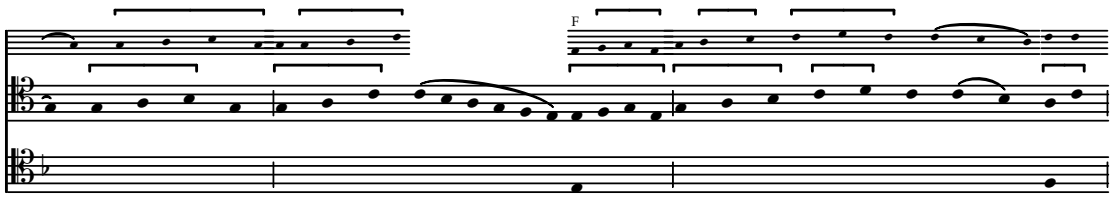
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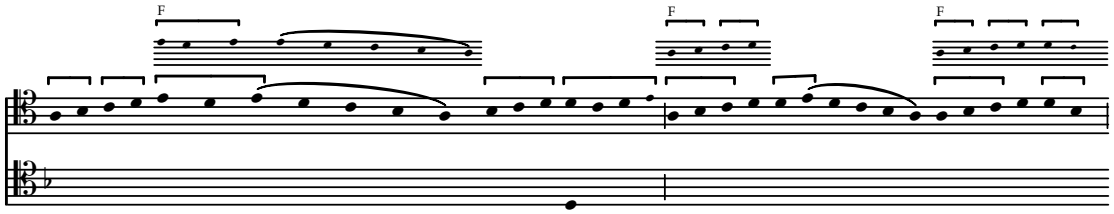
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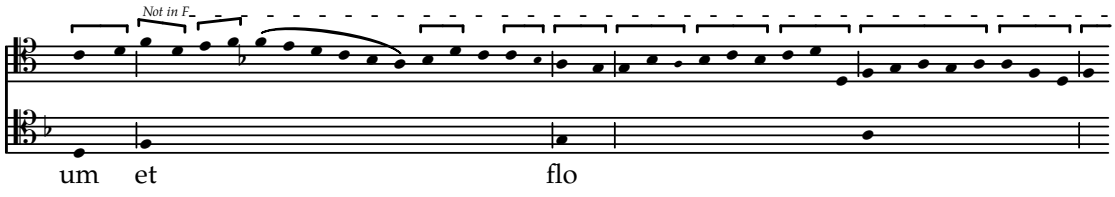
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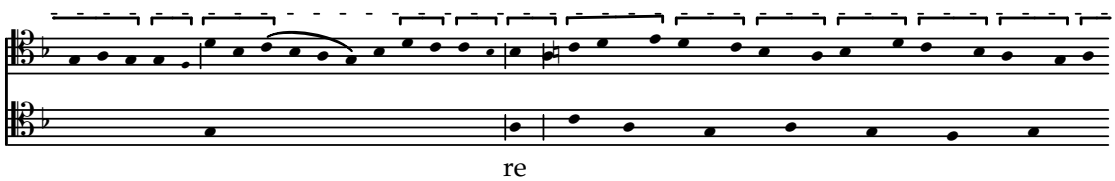
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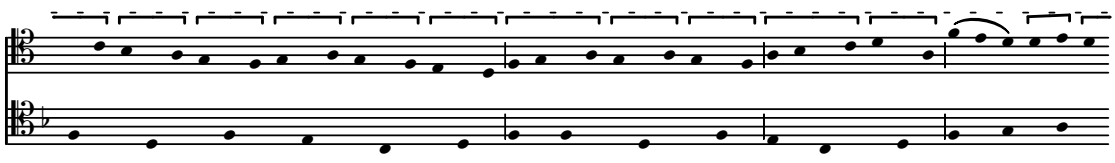

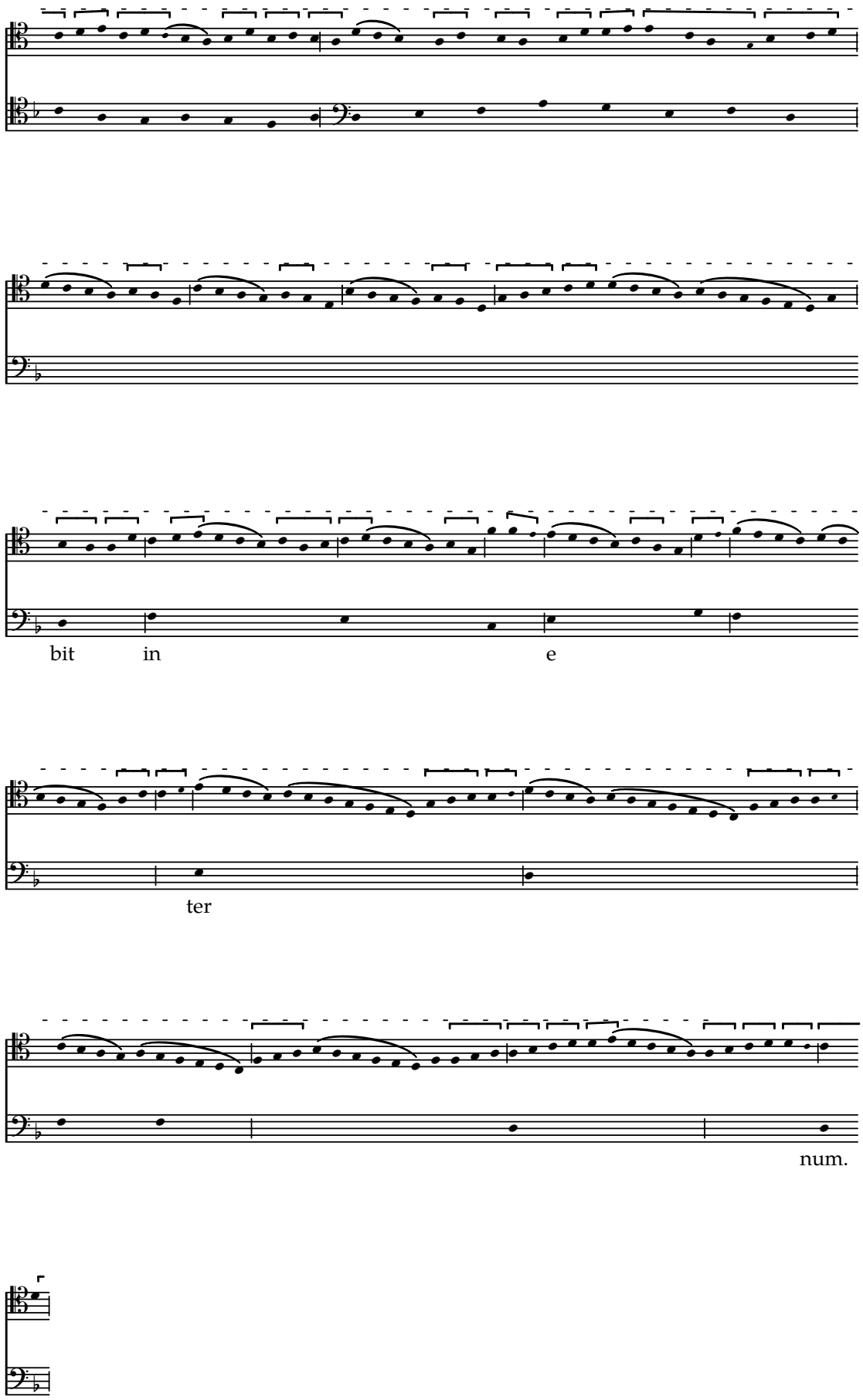
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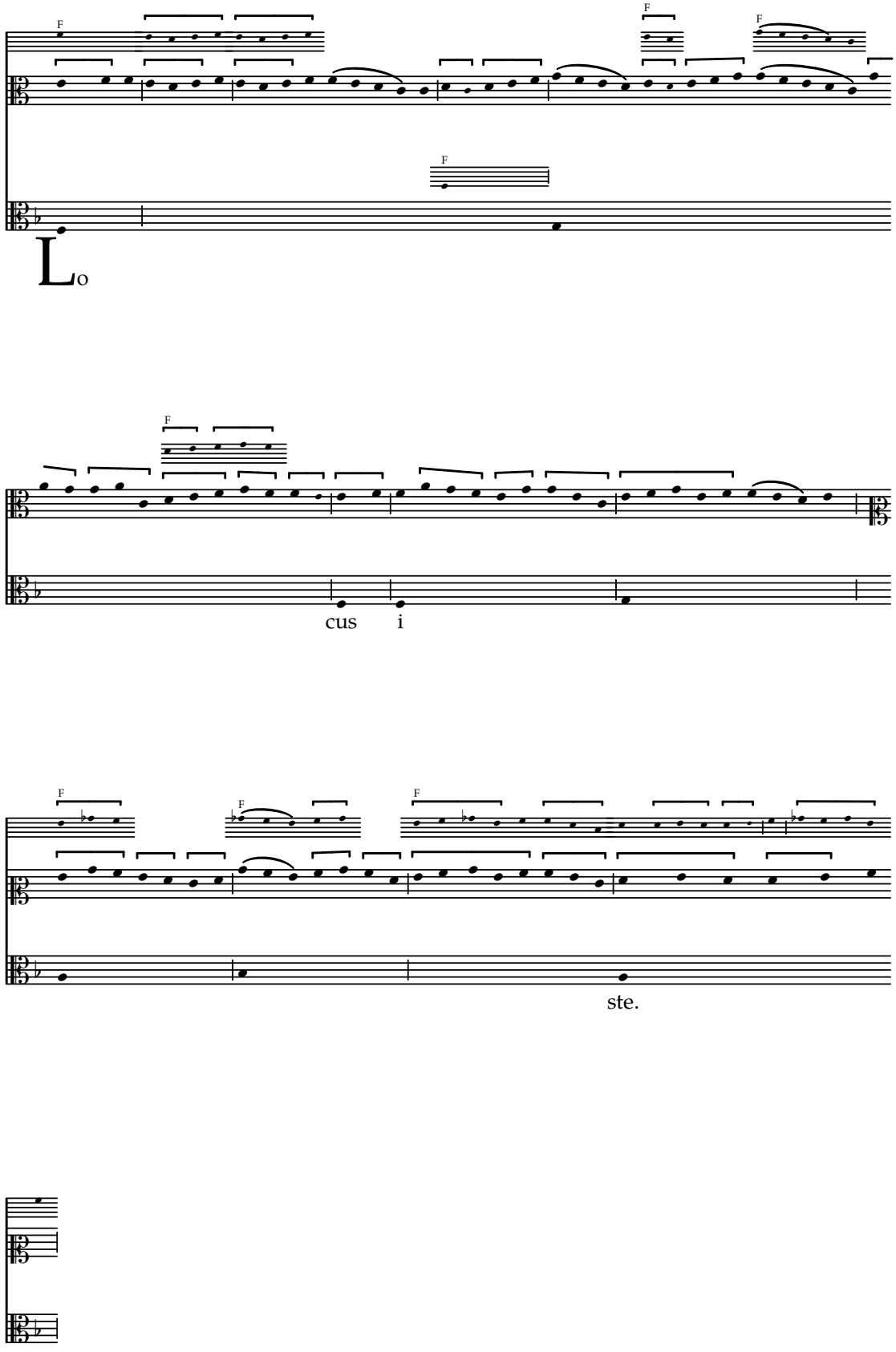
Concordances from F

f. 48



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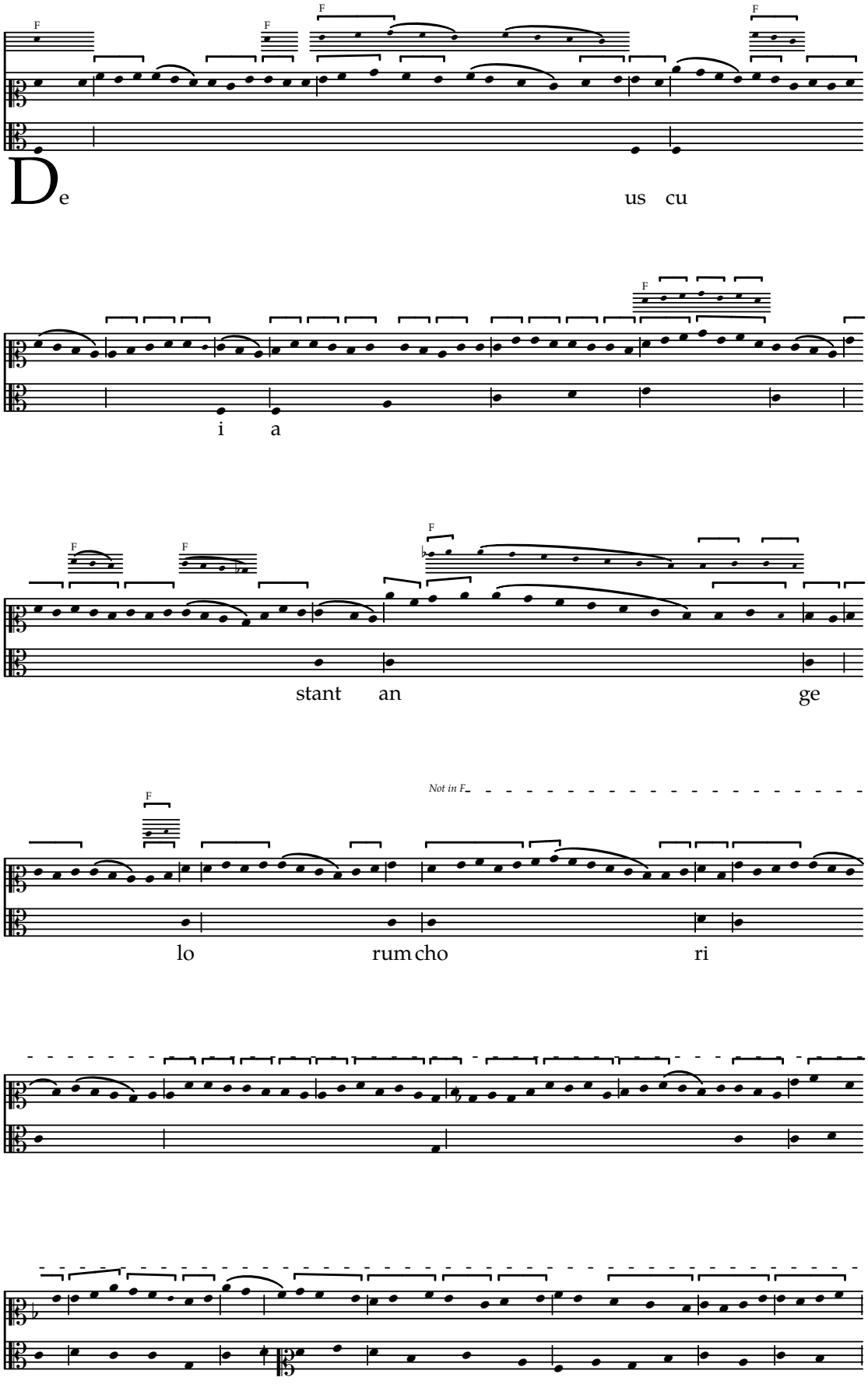
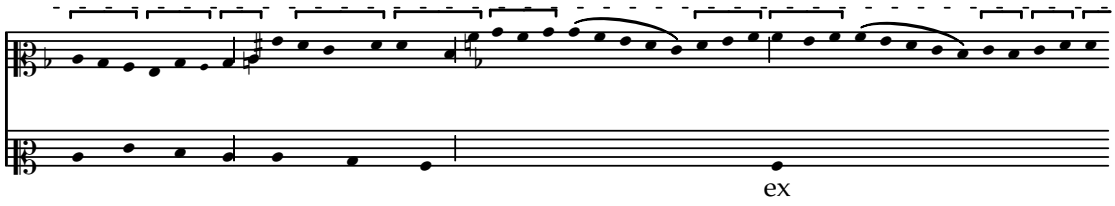
Concordances from F

f. 48–48v

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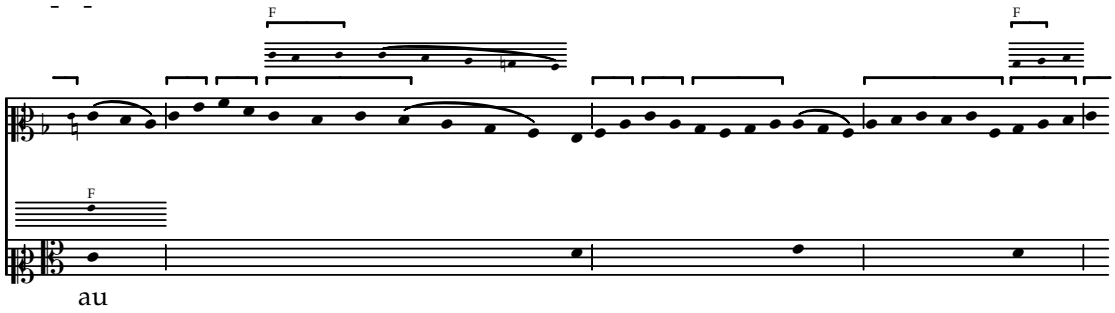
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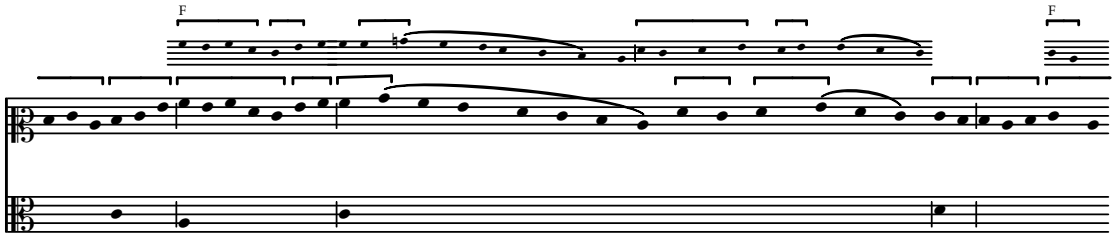
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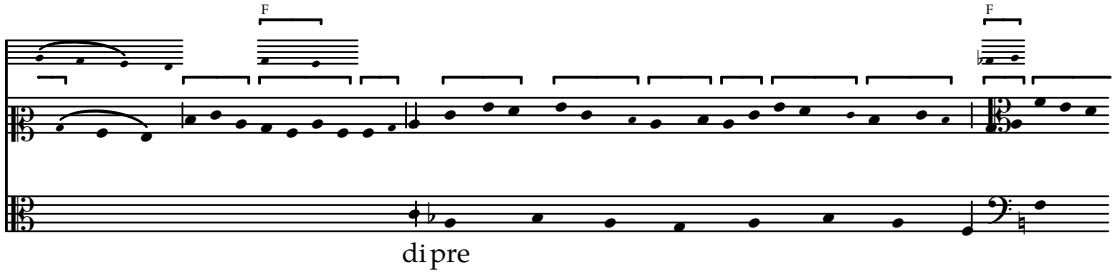
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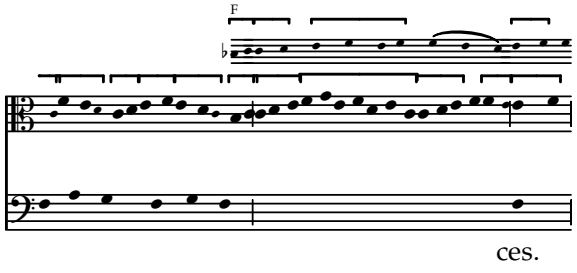
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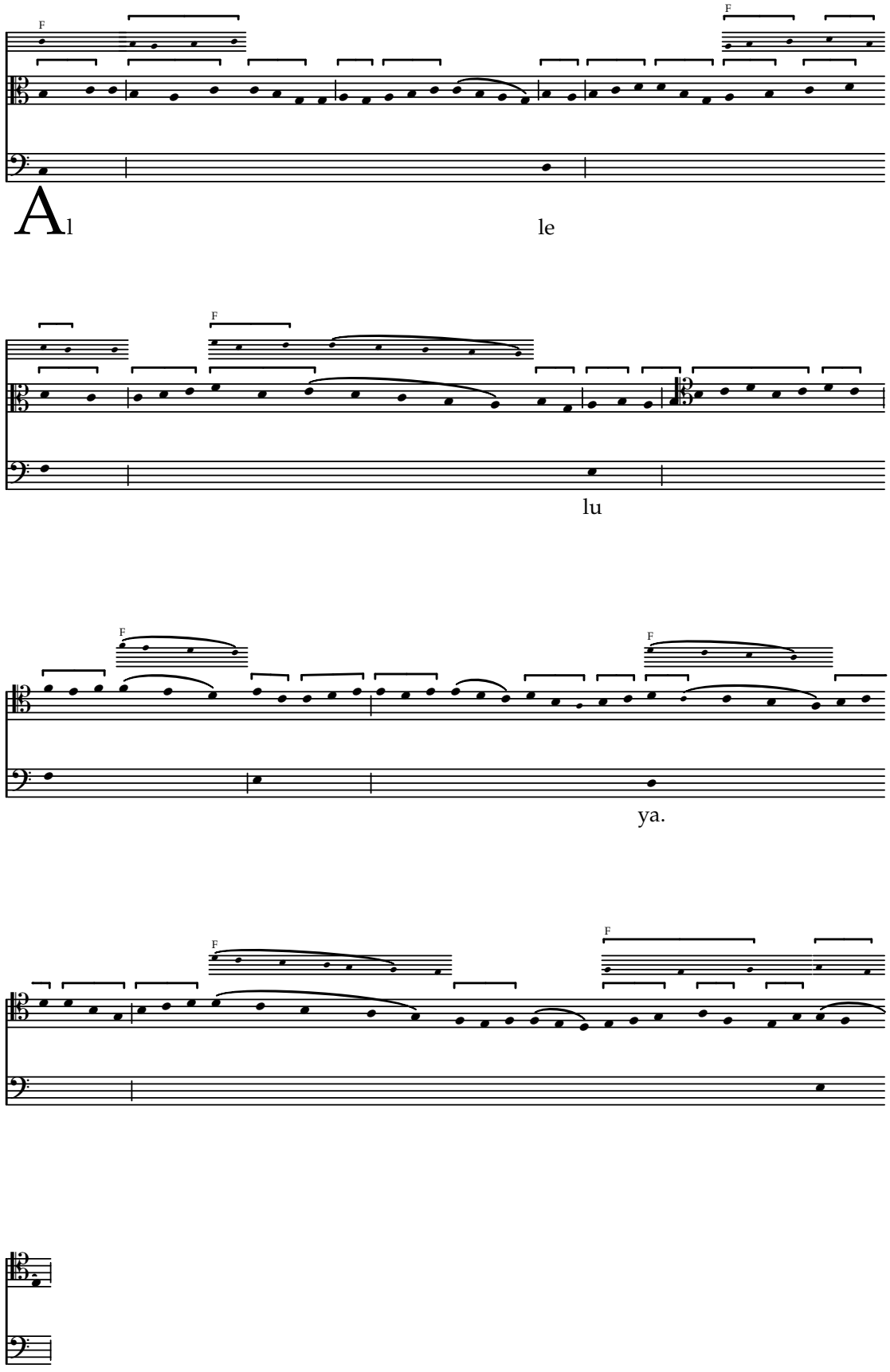
Concordances from F

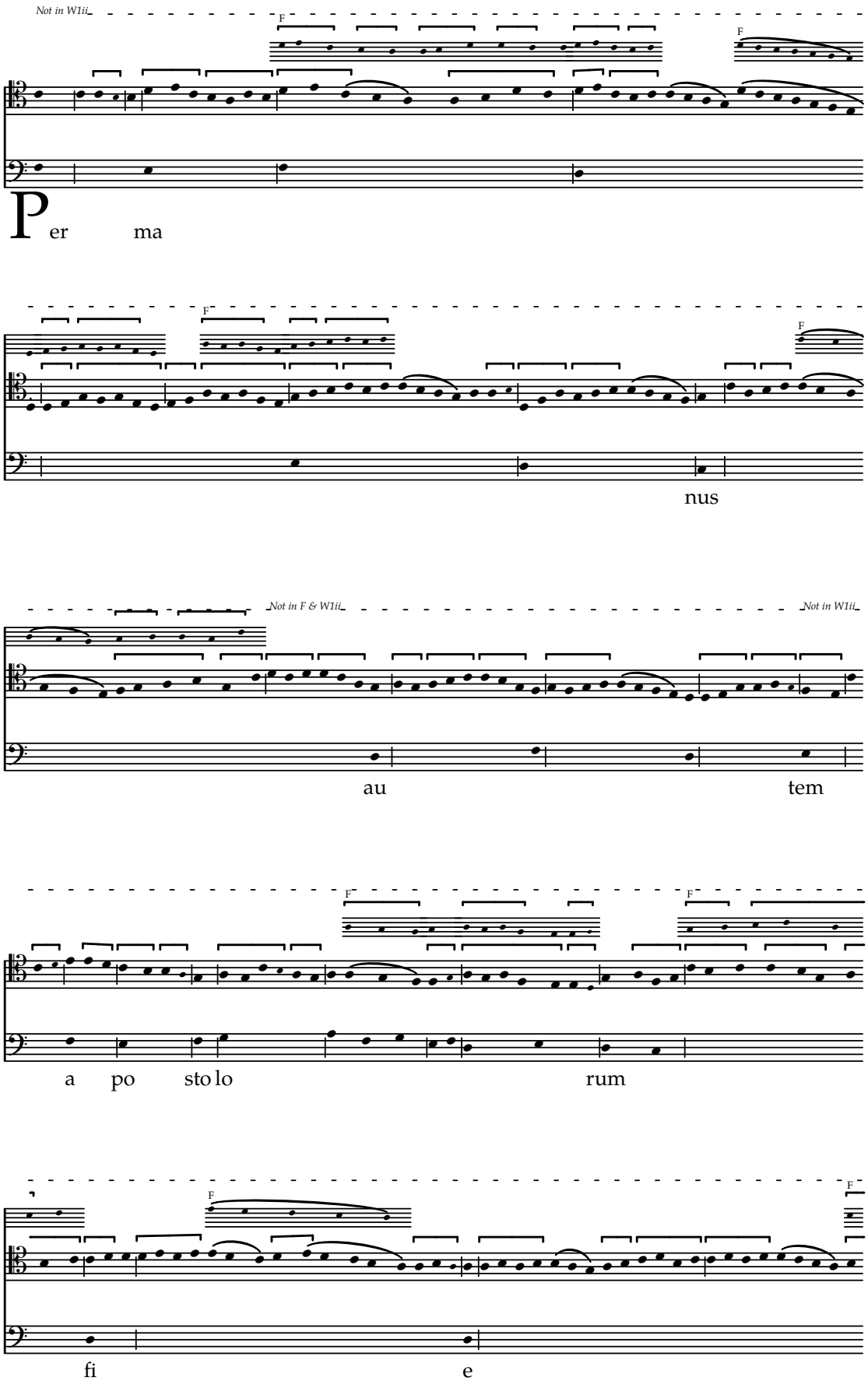
f. 48v

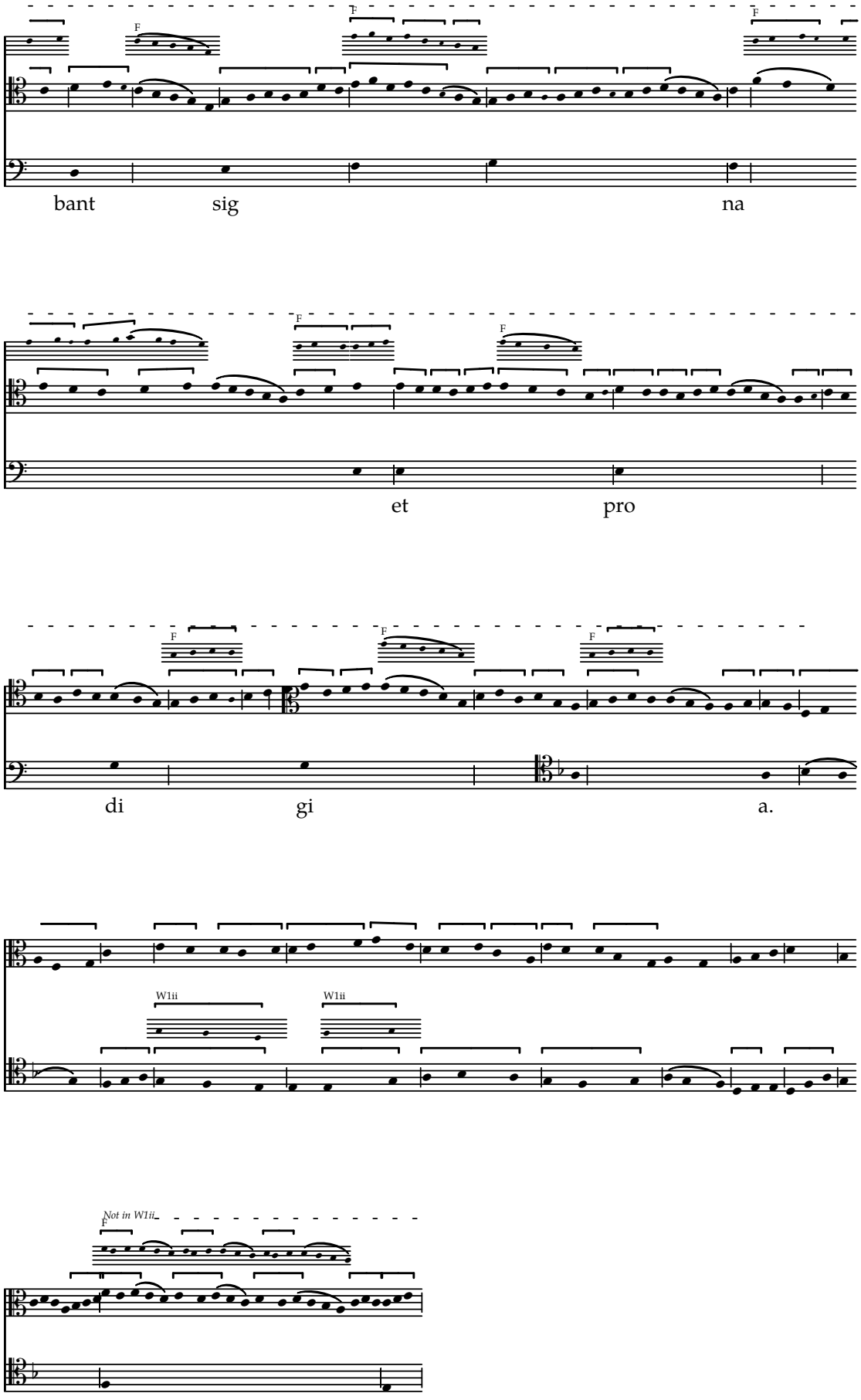


Per manus

Concordances from W1 (f. 50v) & F

f. 48v

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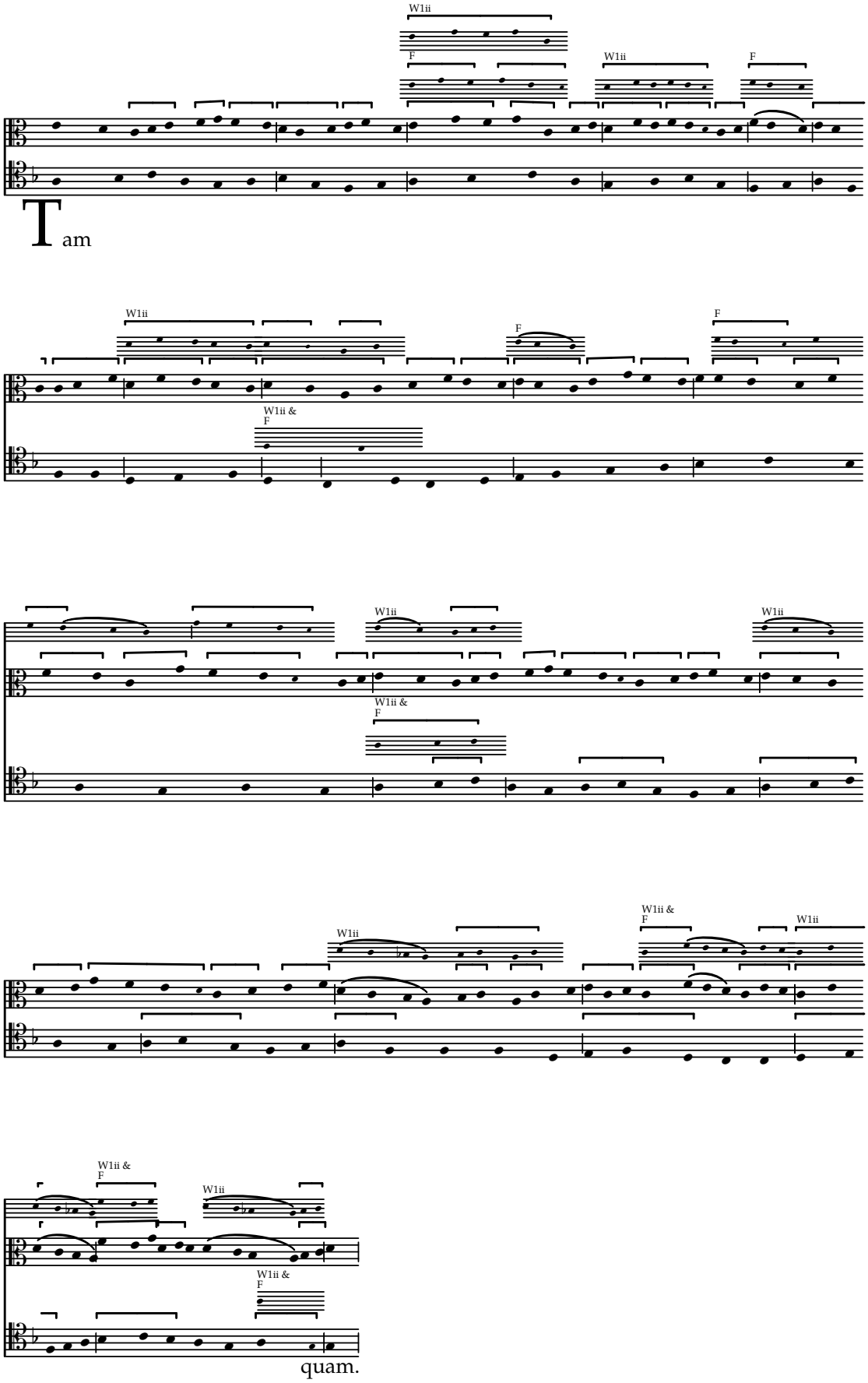
Concordances from W1 (f. 47) & F

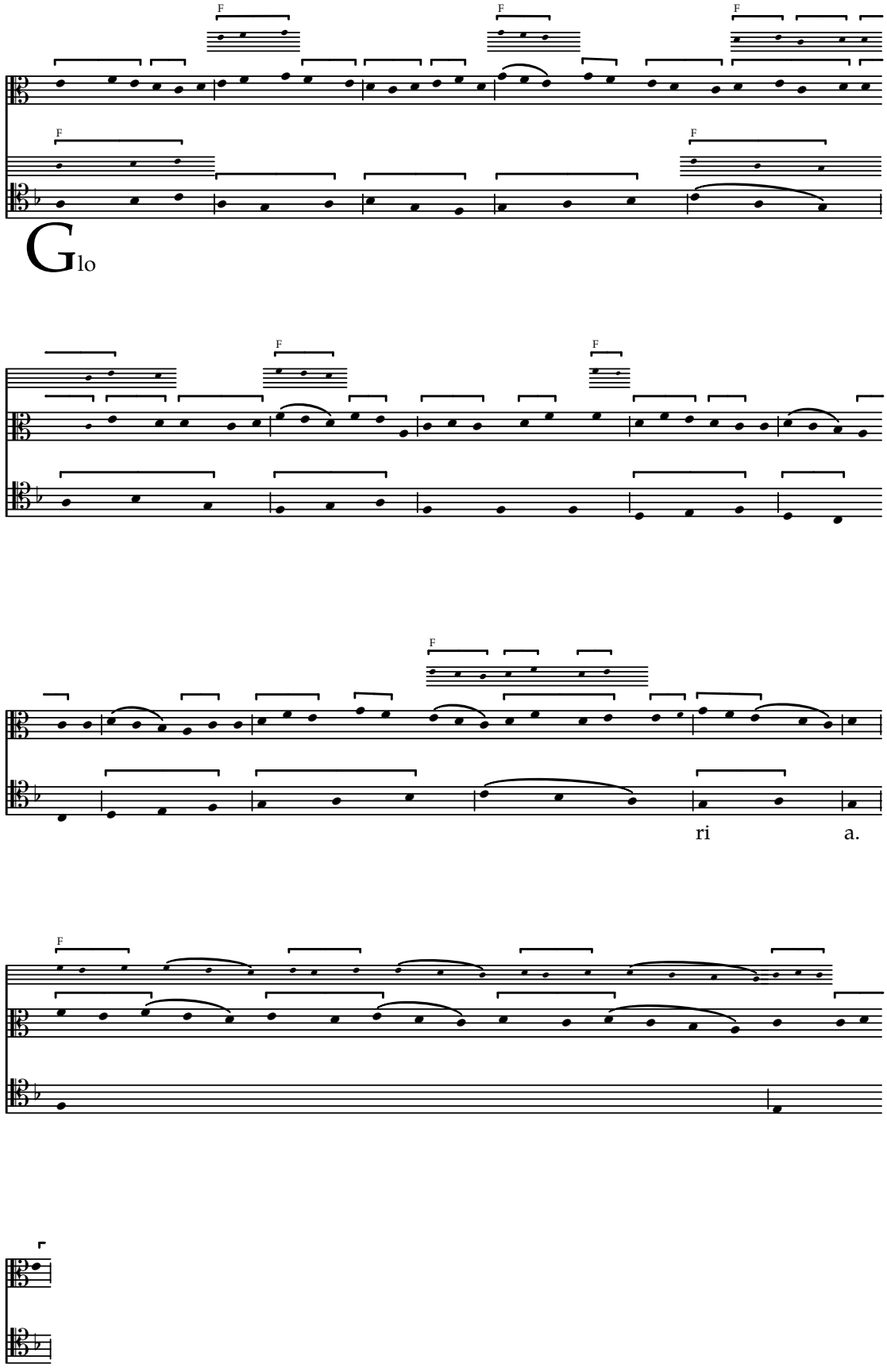
f. 49



Gloria

Concordances from F

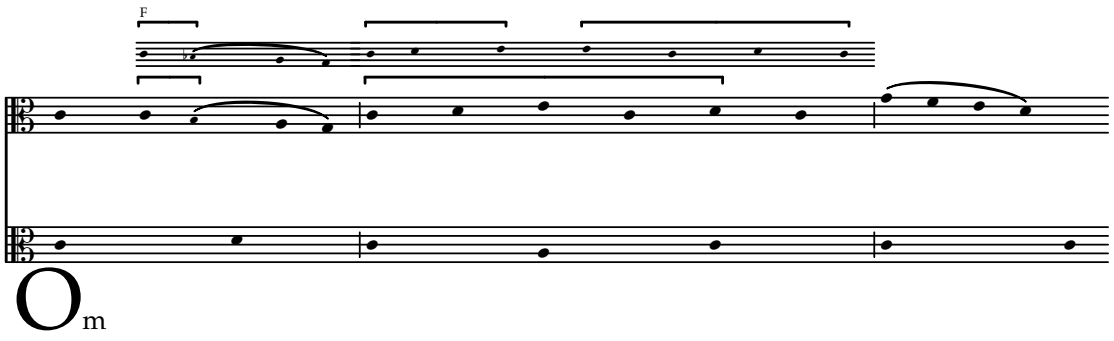
f. 49

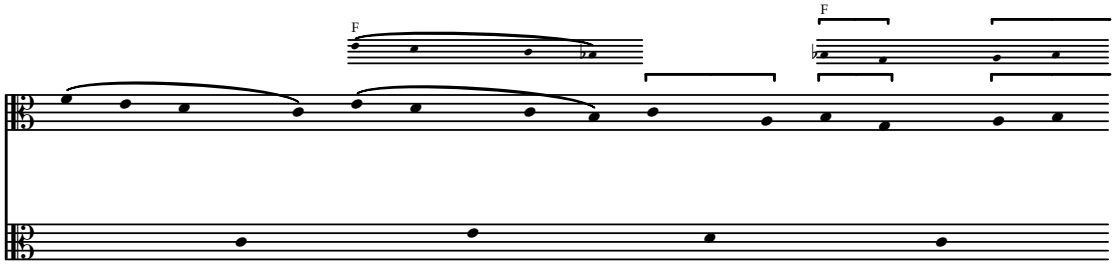


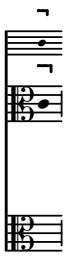
Omnes

Concordances from F

f. 49



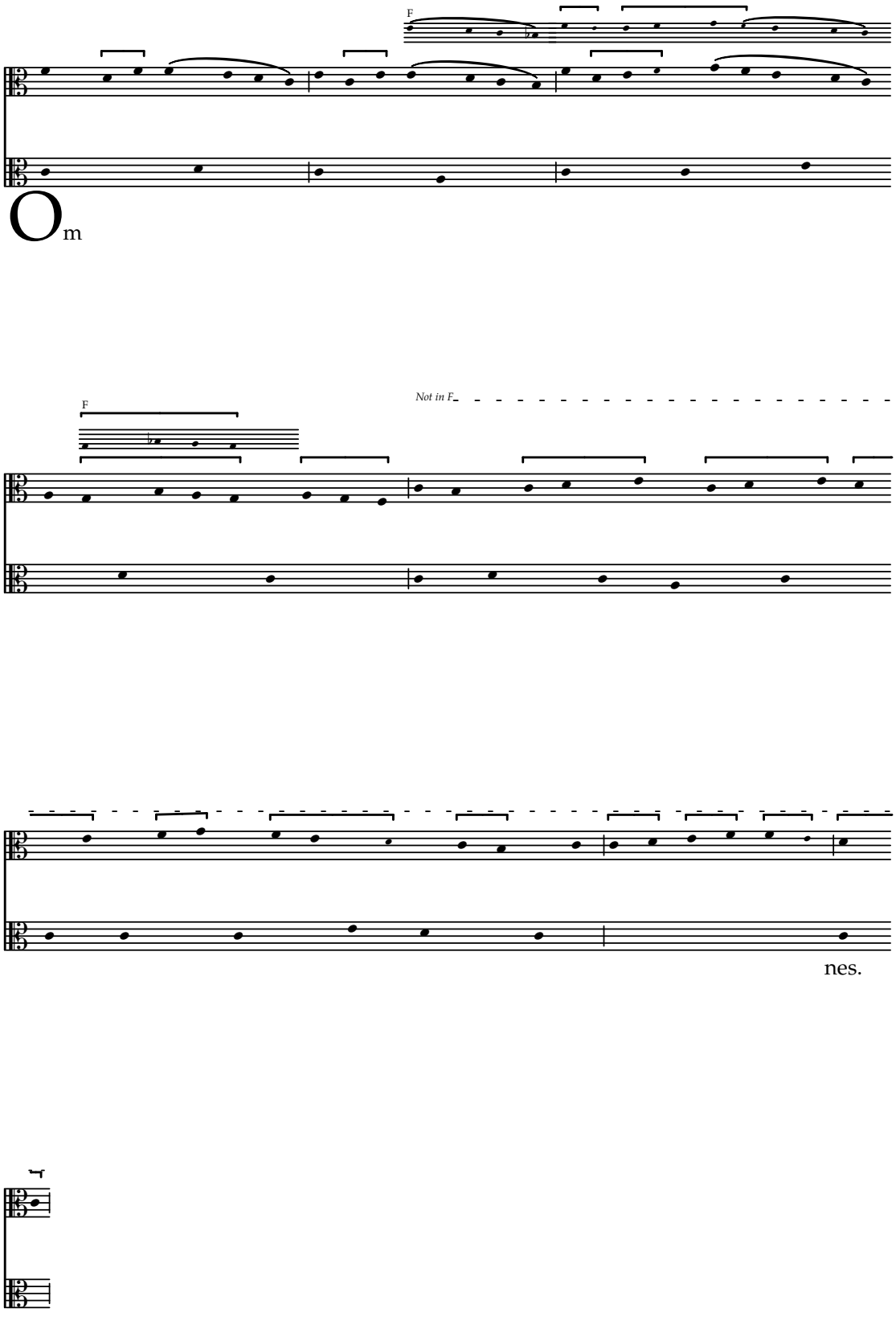




Omnes

Concordances from F

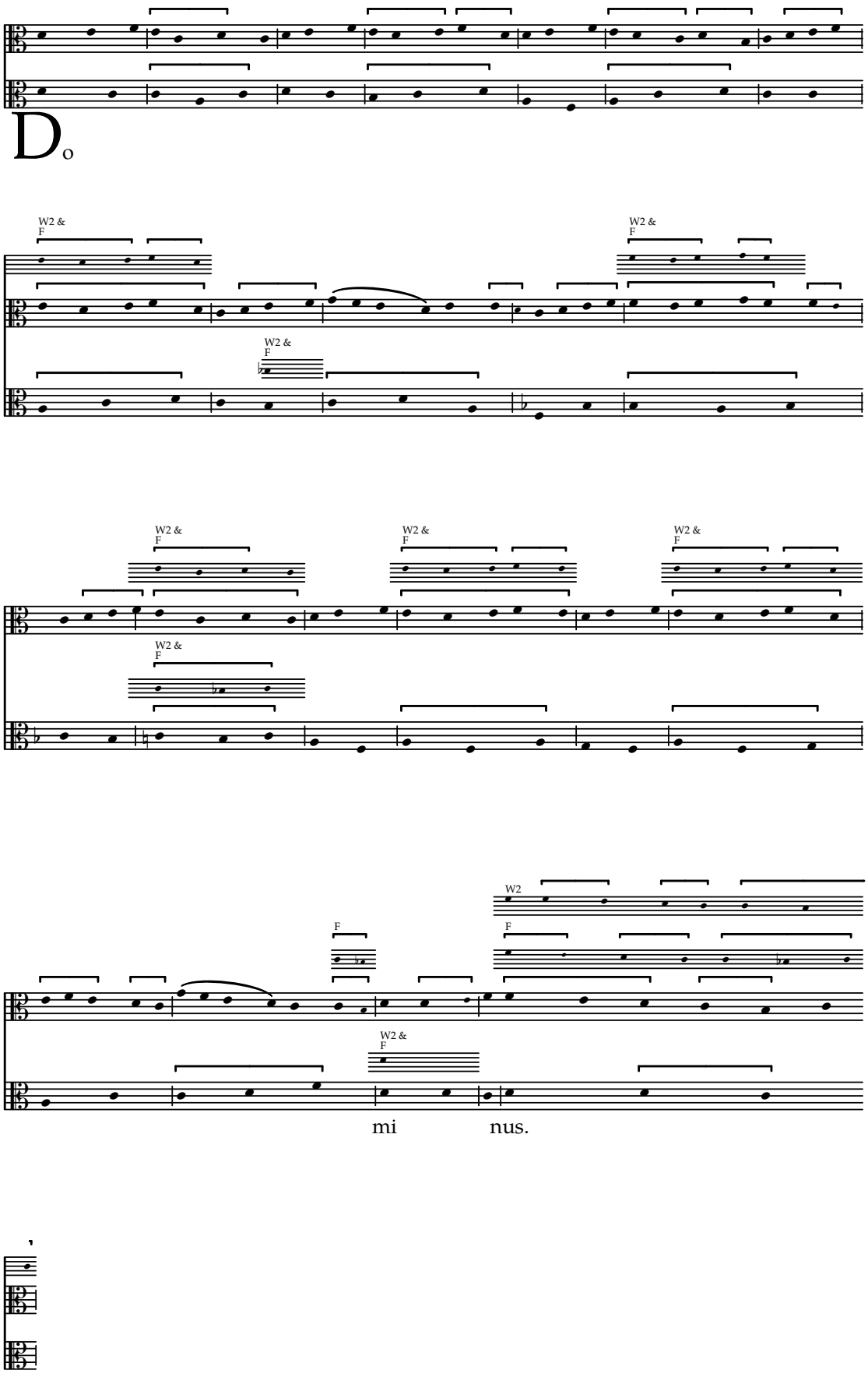
f. 49



Dominus

Concordances from W2 & F

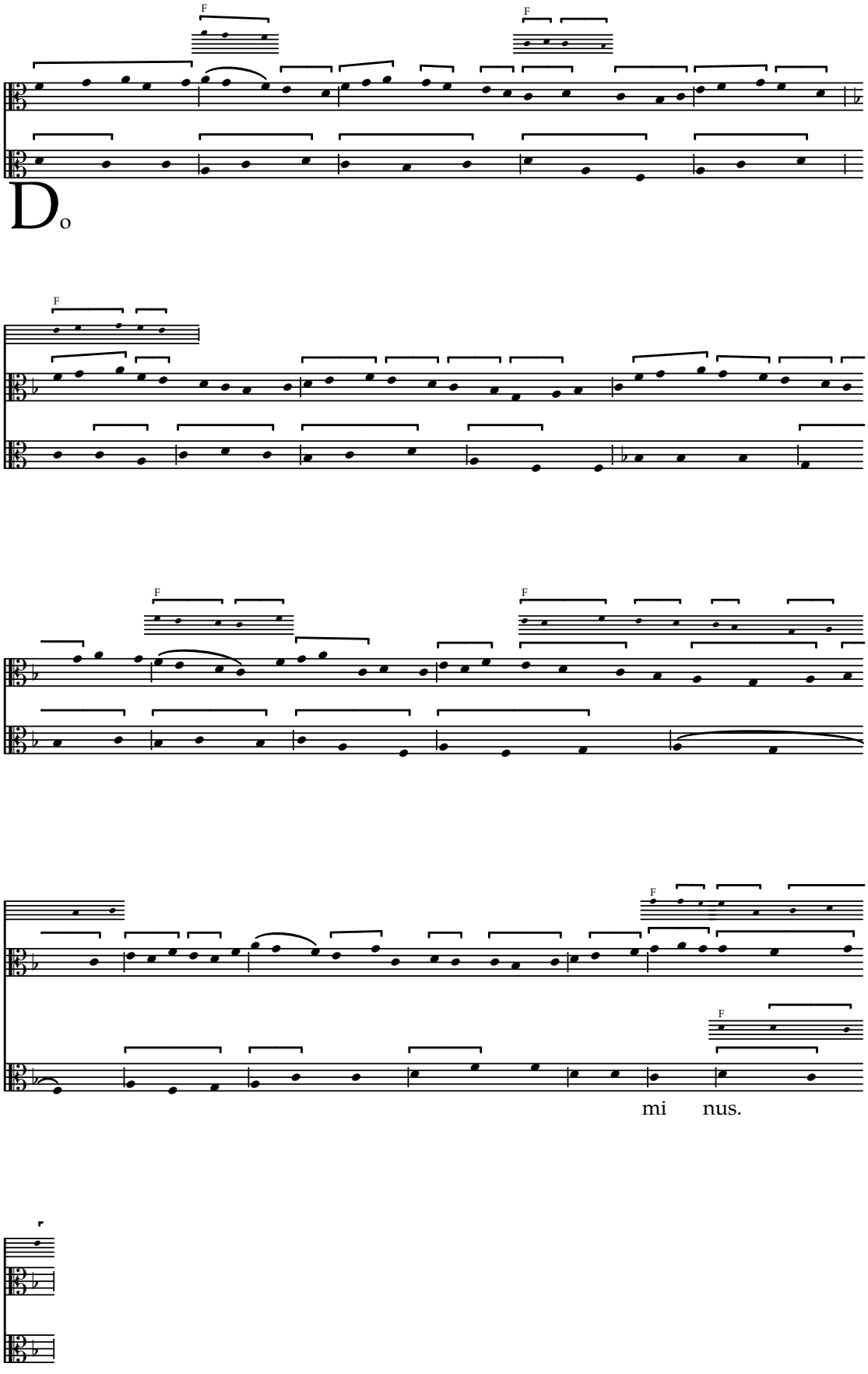
f. 49



Dominus

Concordances from F

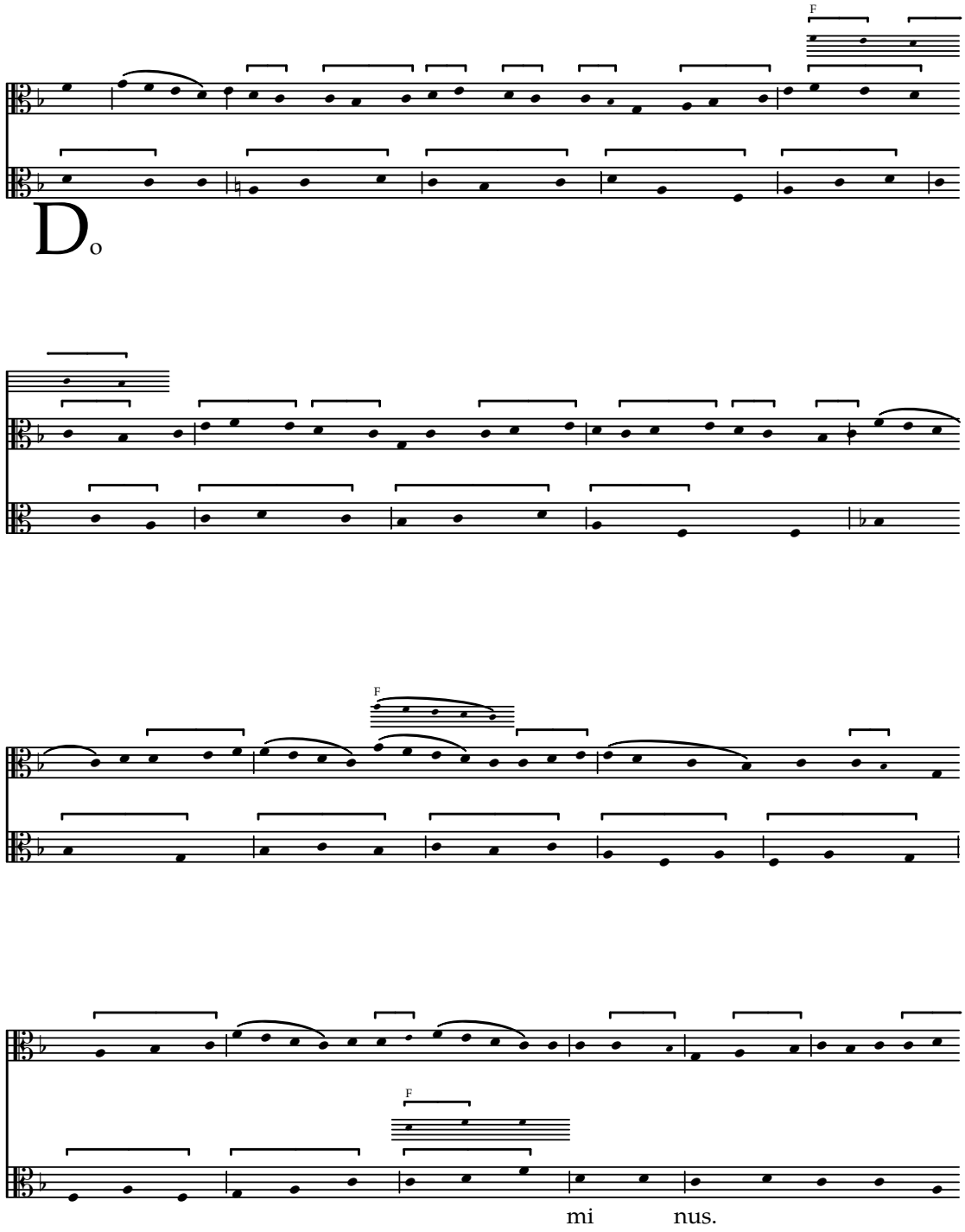
f. 49–49v



Dominus

Concordances from F

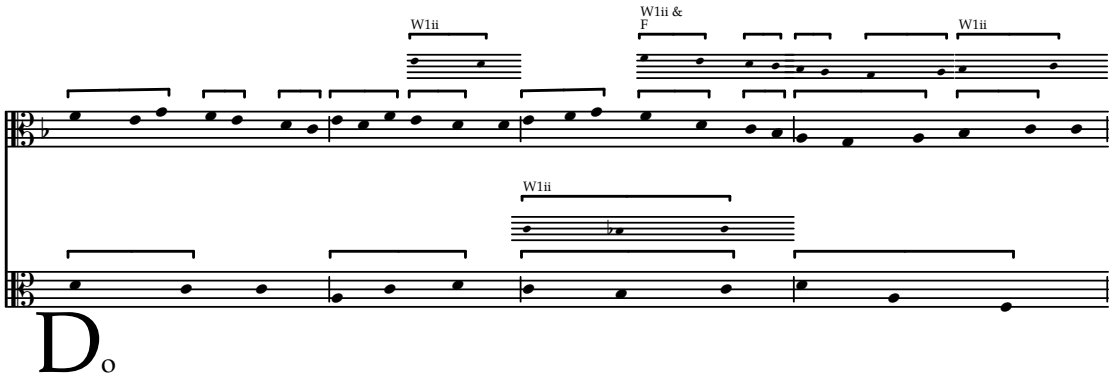
f. 49v



Dominus

Concordances from W1 (f. 47v) & F

f. 49v



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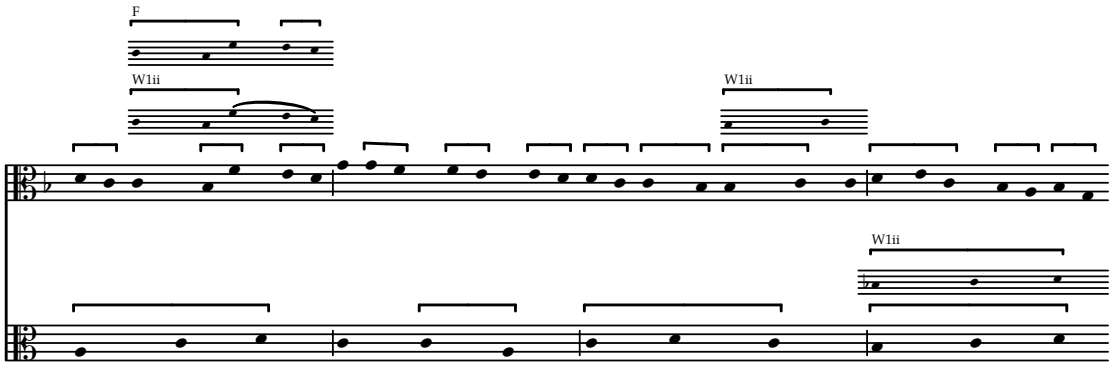

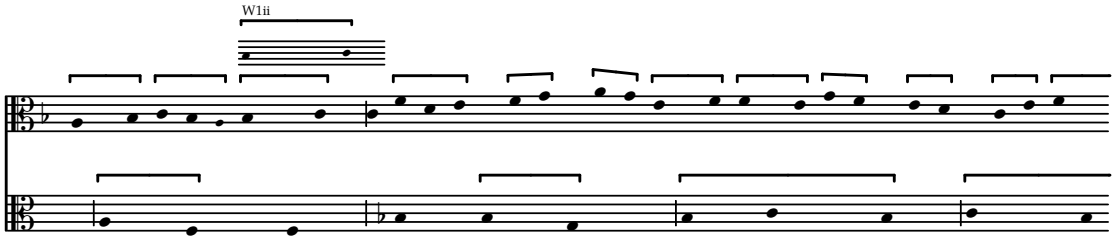

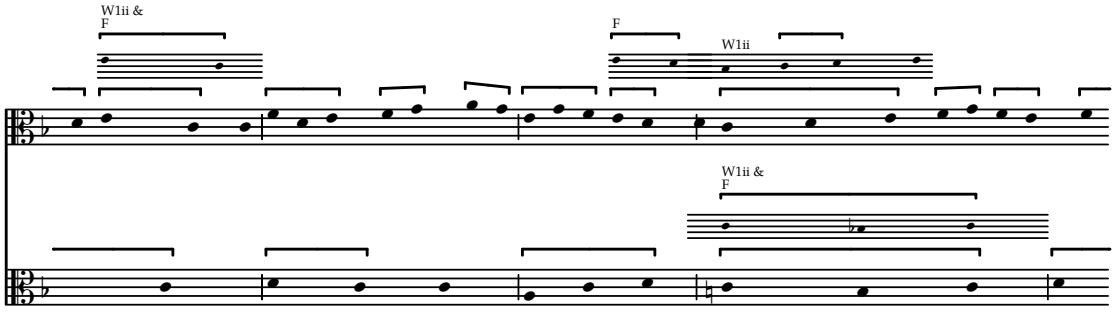

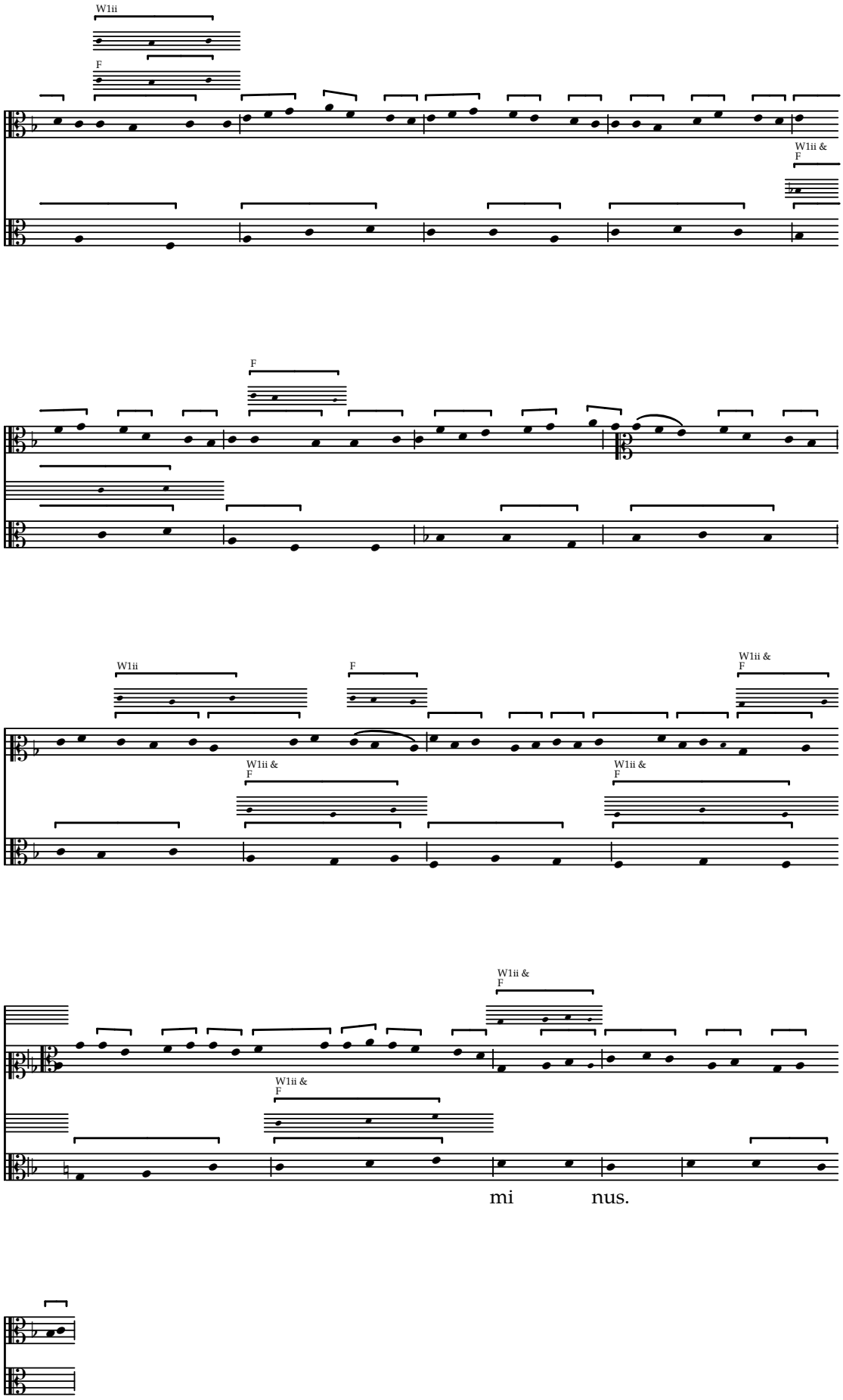
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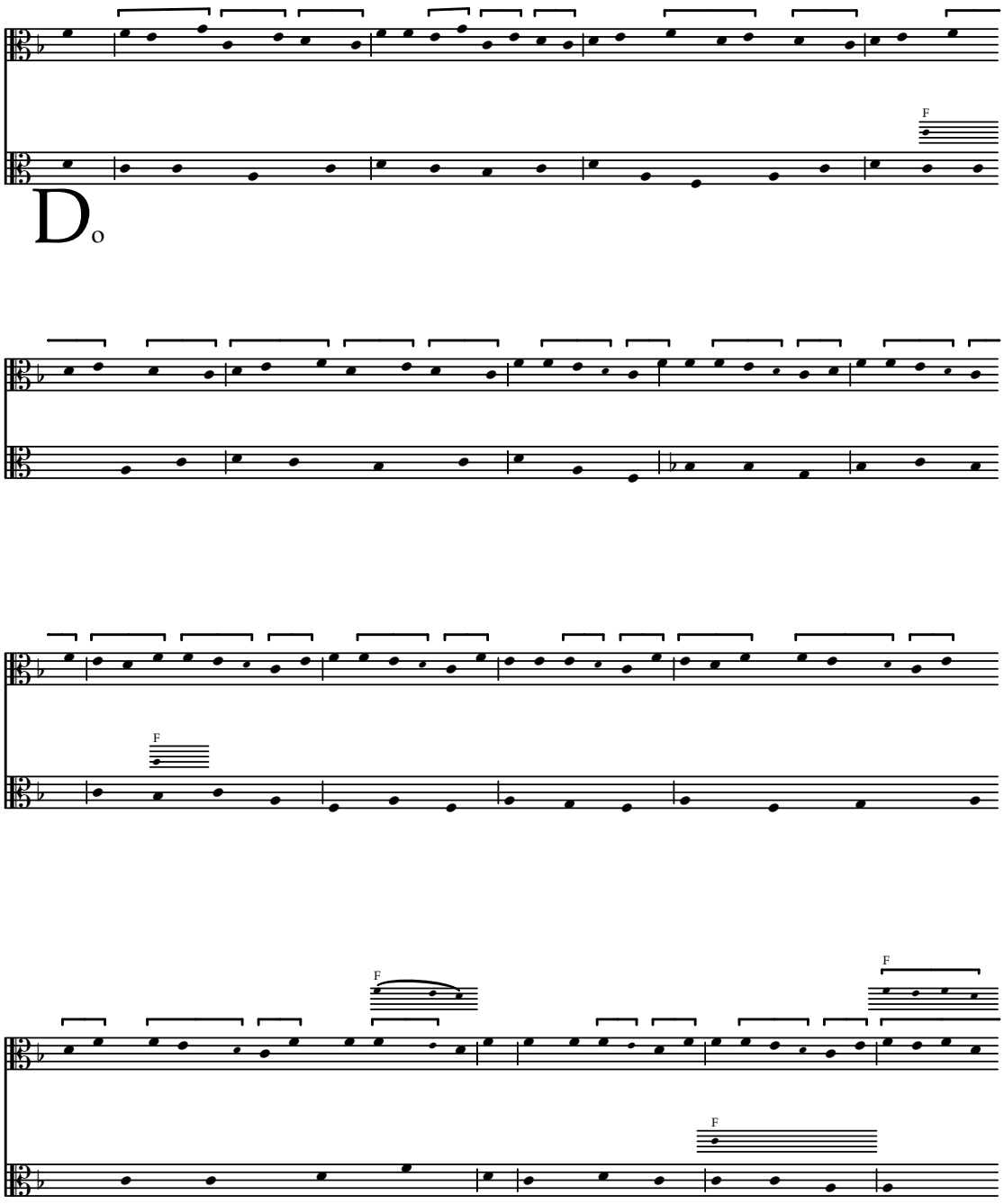
Dominus

Concordances from F

f. 49v



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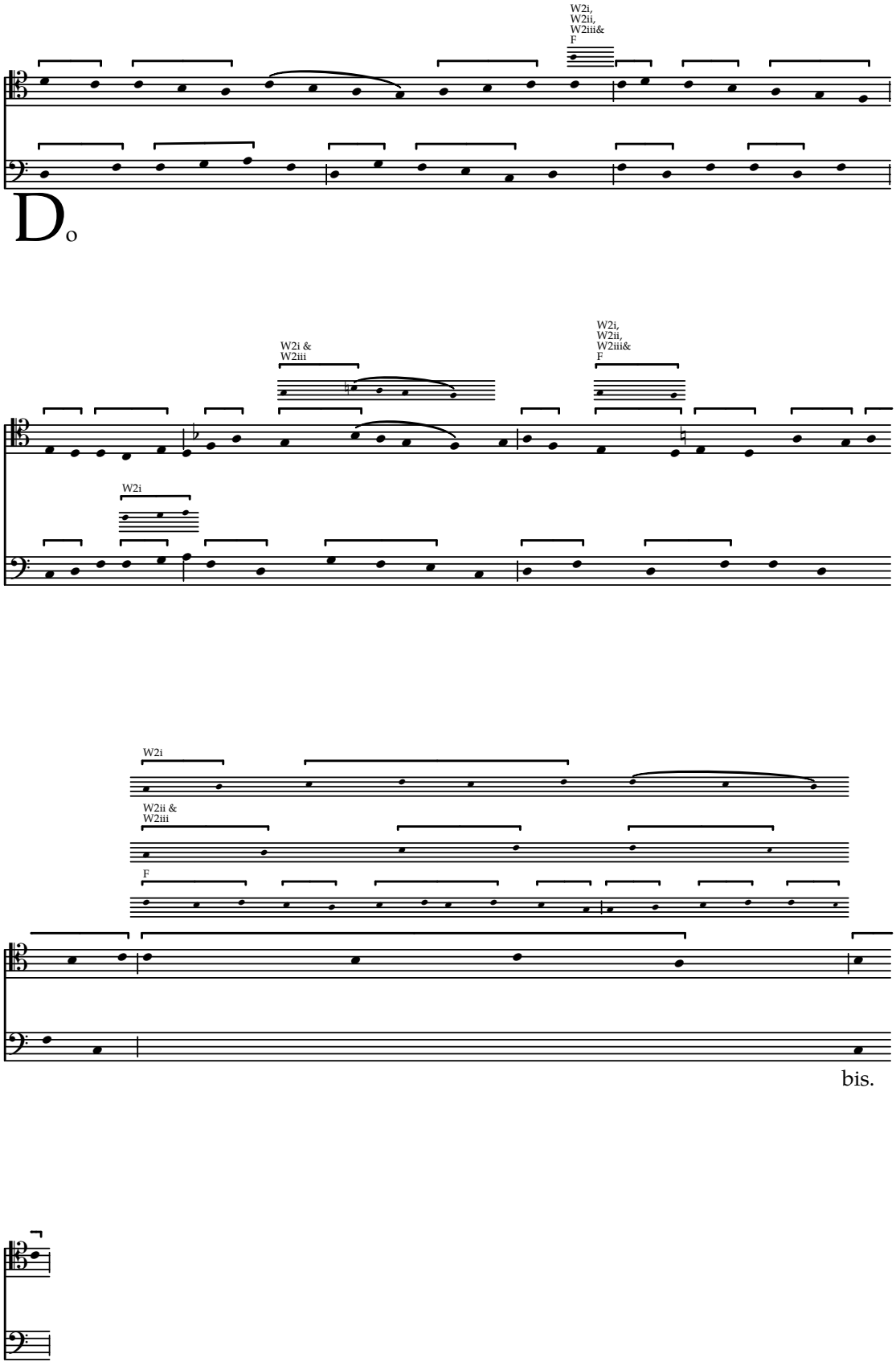
Concordances from W2 (three versions) & F

f. 49v–44



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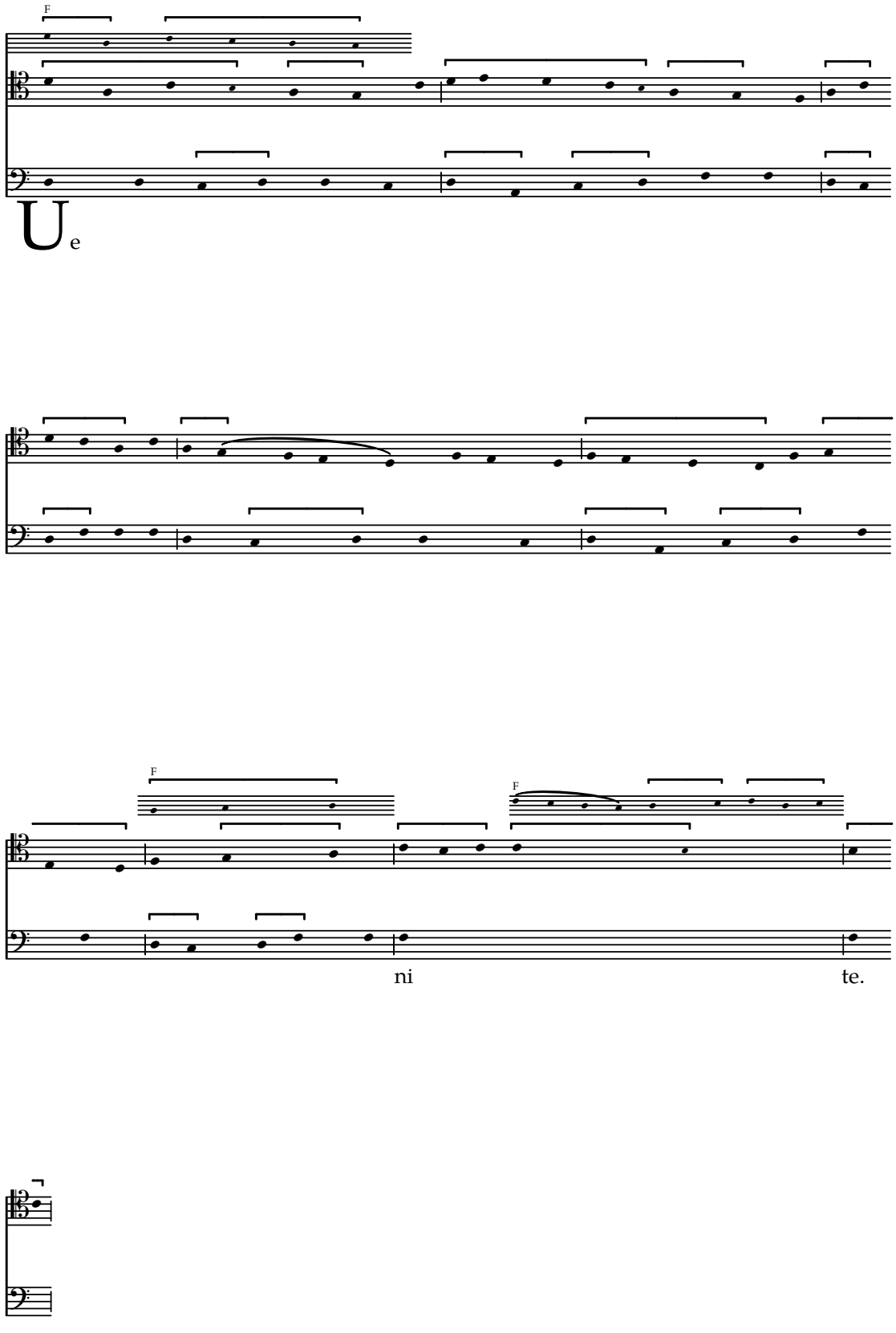
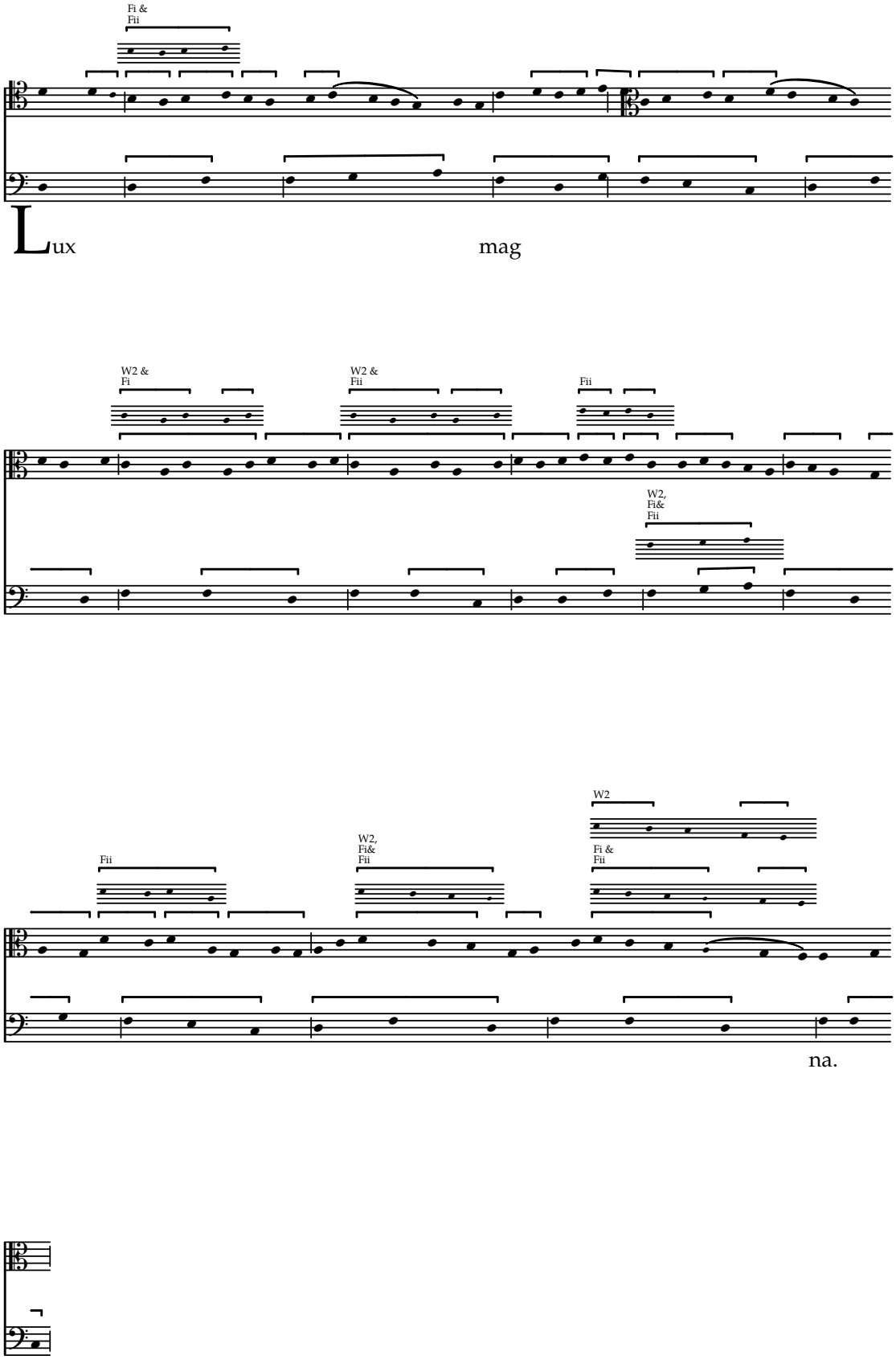
Concordances from F

f. 50



Lux magna

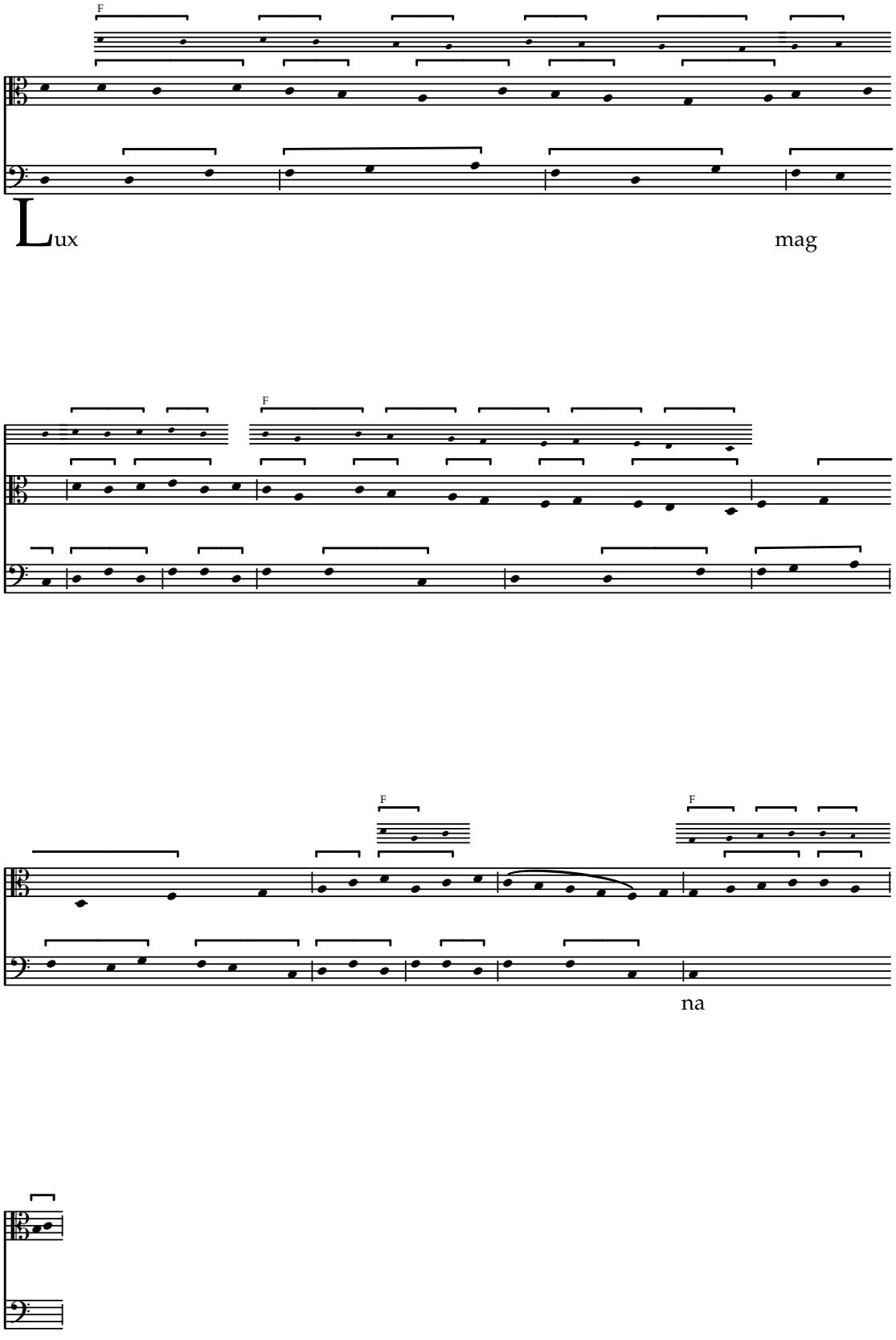
Concordances from W2 & F (two versions) f. 50



Lux magna

Concordances from F

f. 50



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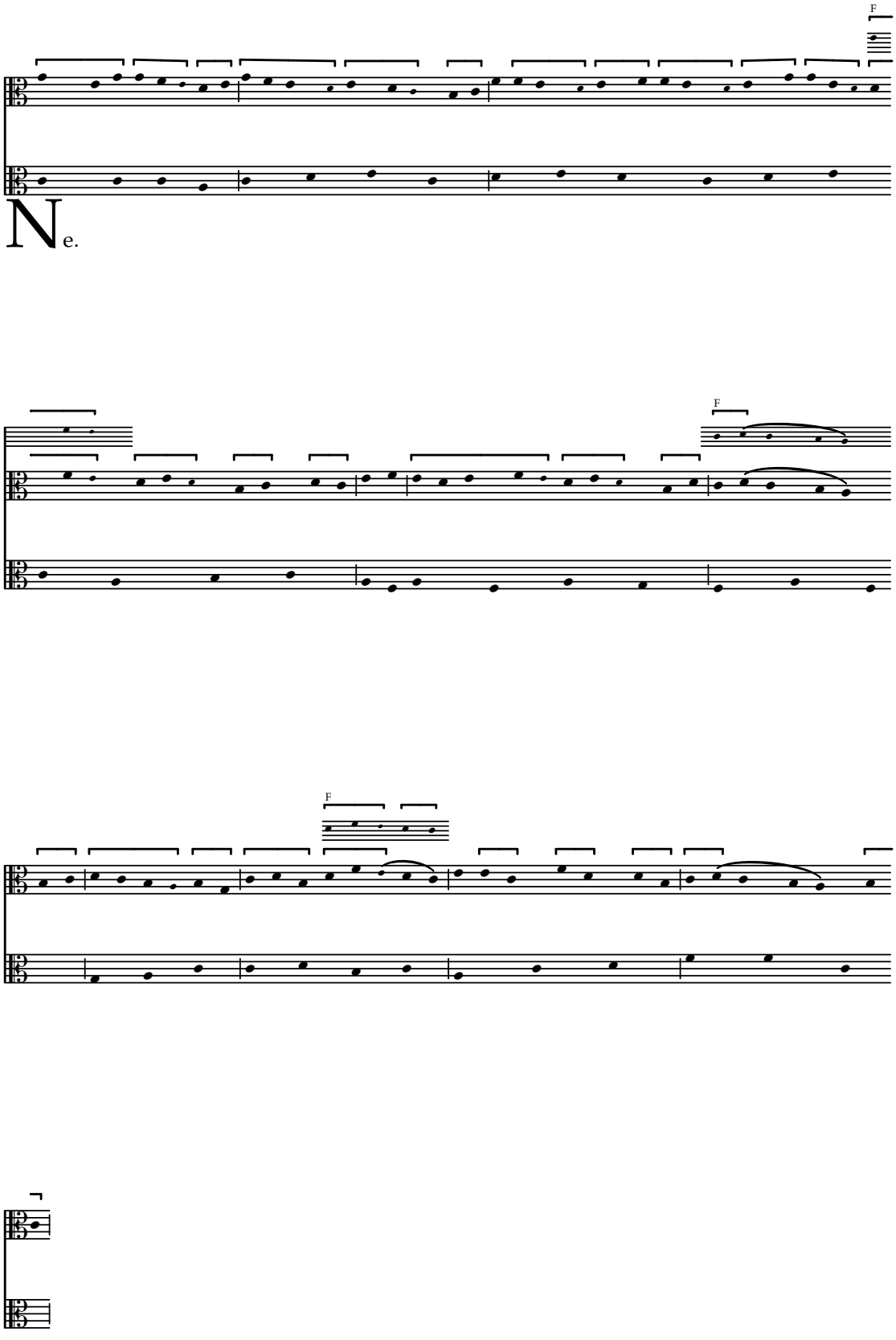
Concordances from F

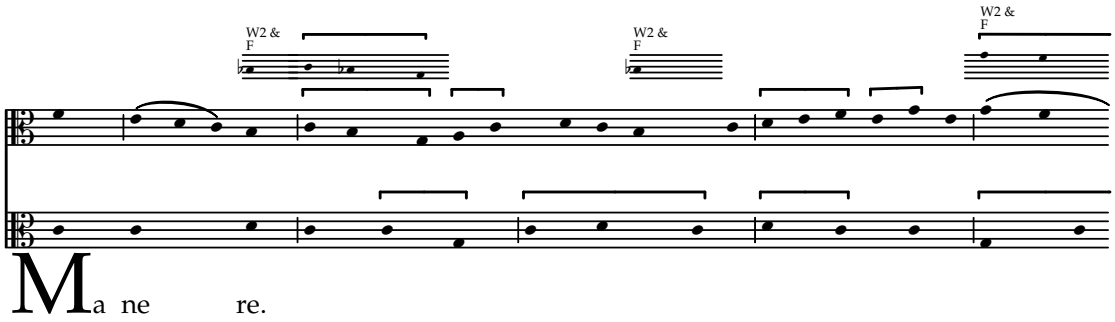
f. 50



Manere

Concordances from W2 & F

f. 50



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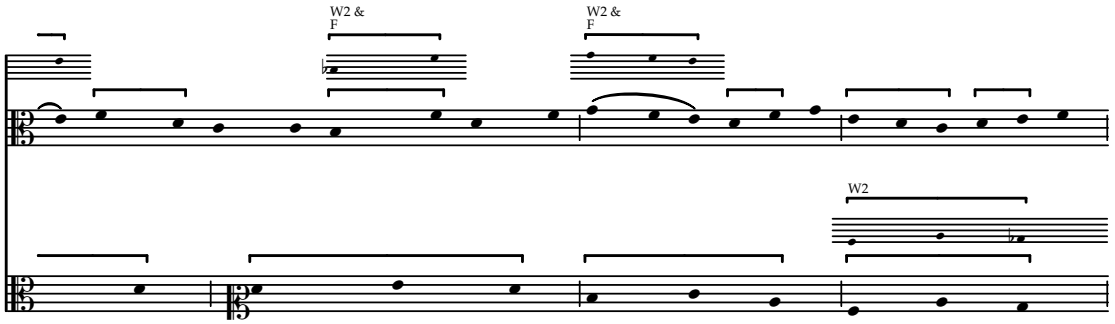
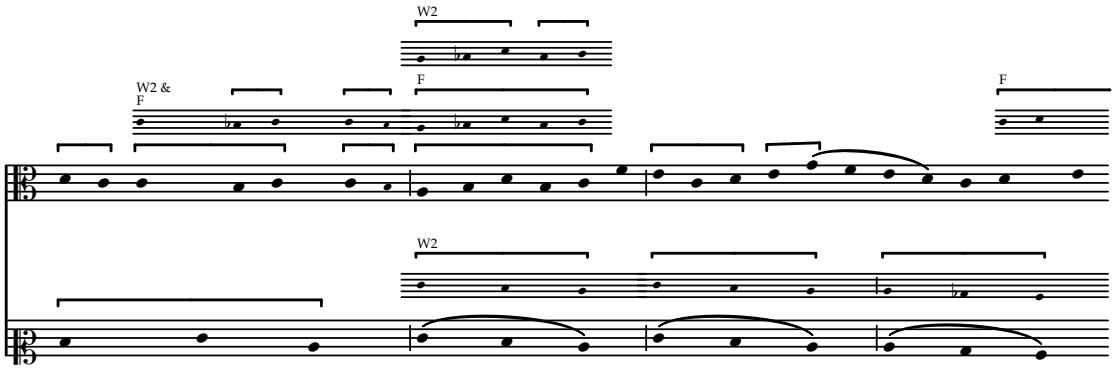
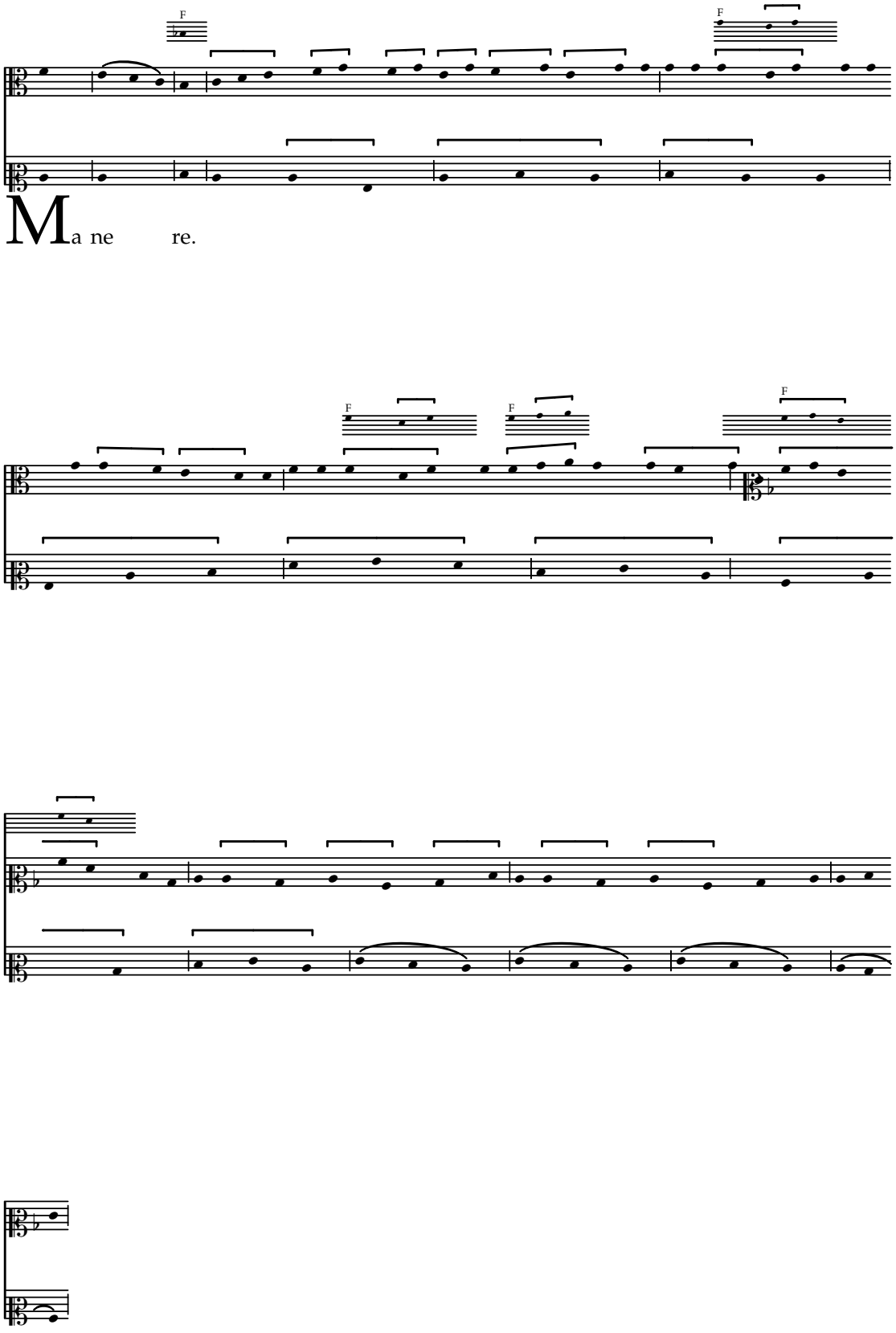




Manere

Concordances from F

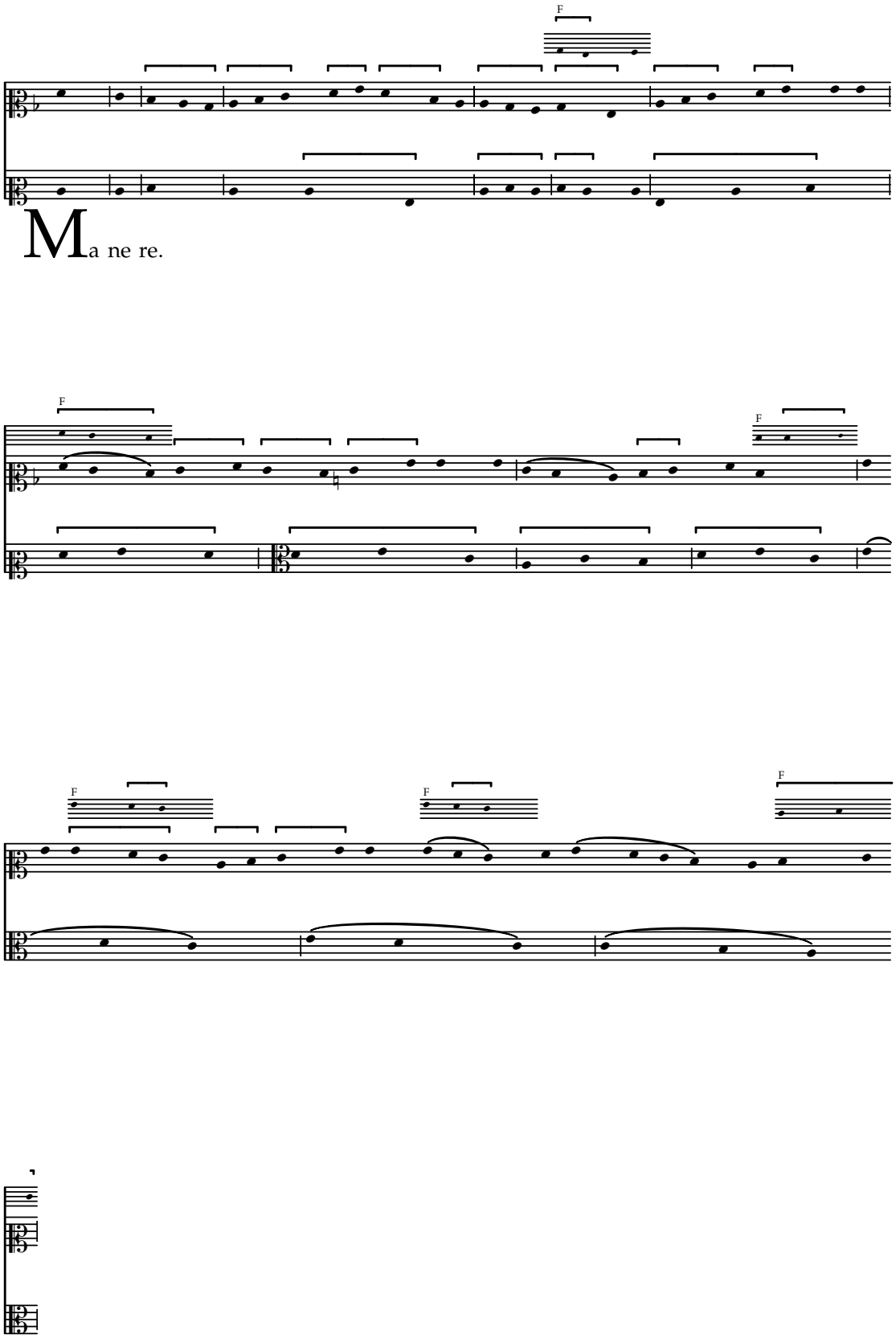
f. 50–50v



Manere

Concordances from F

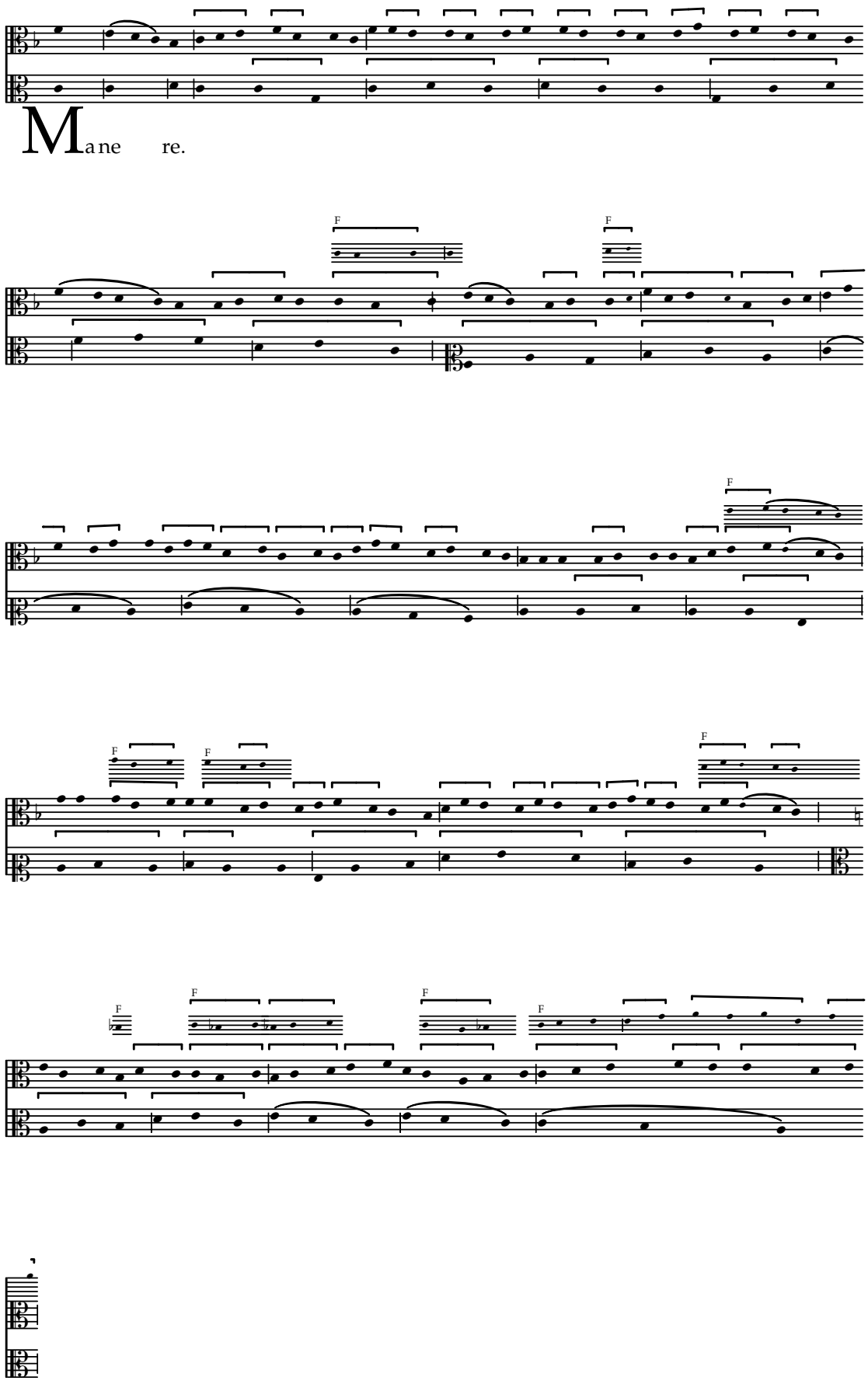
f. 50v



Manere

Concordances from F

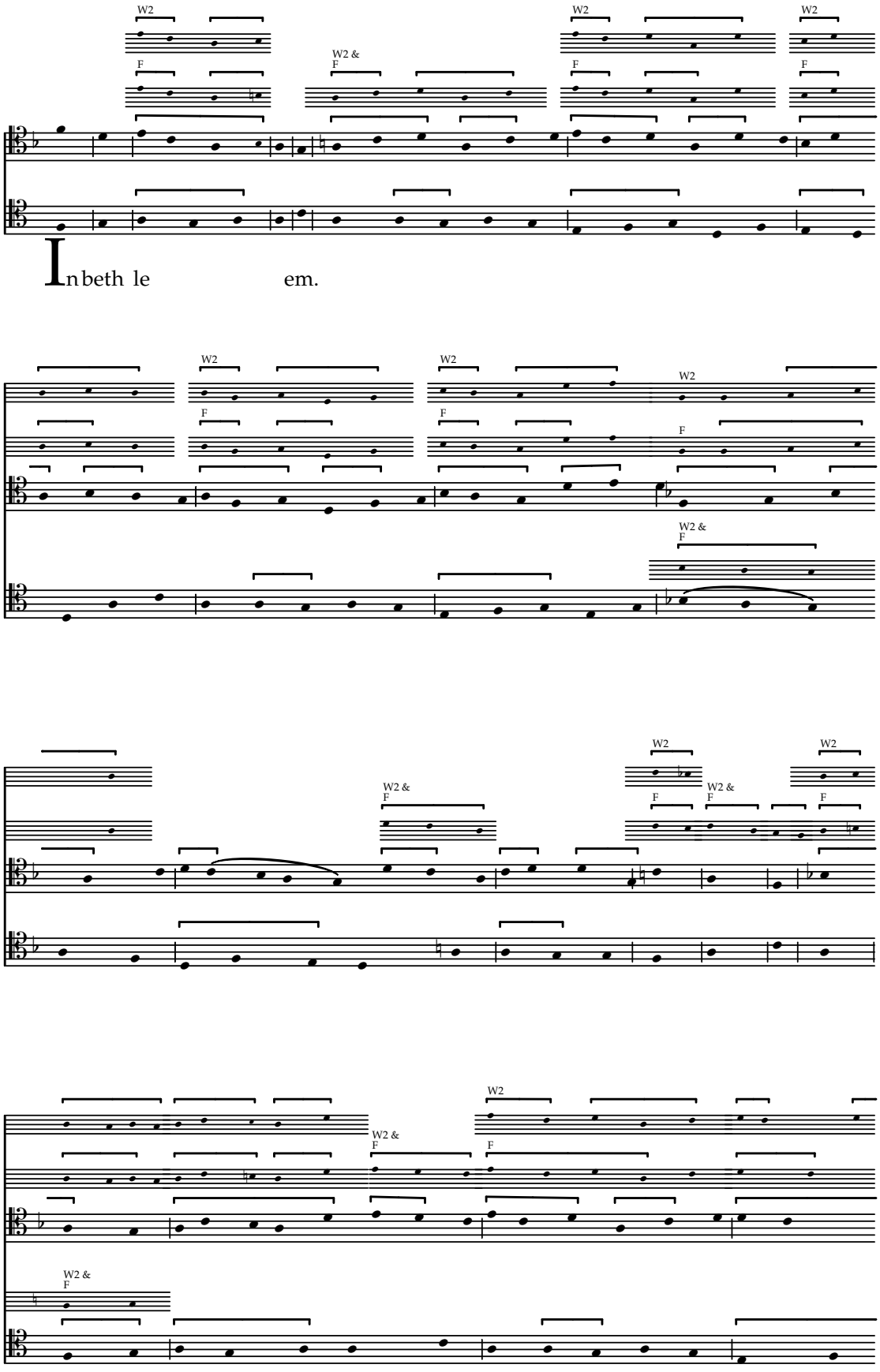
f. 50v

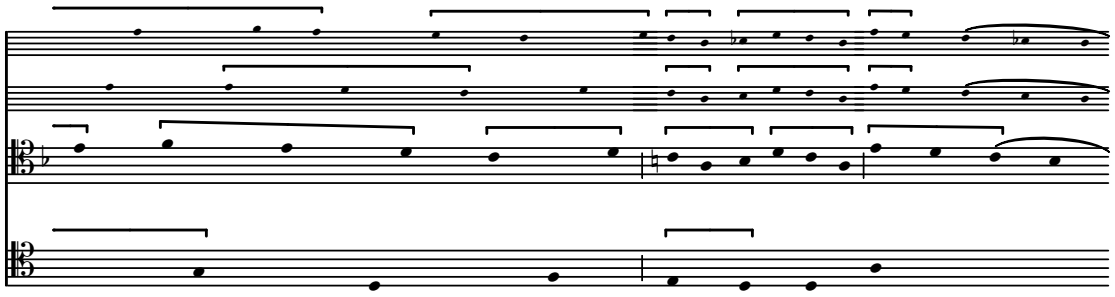


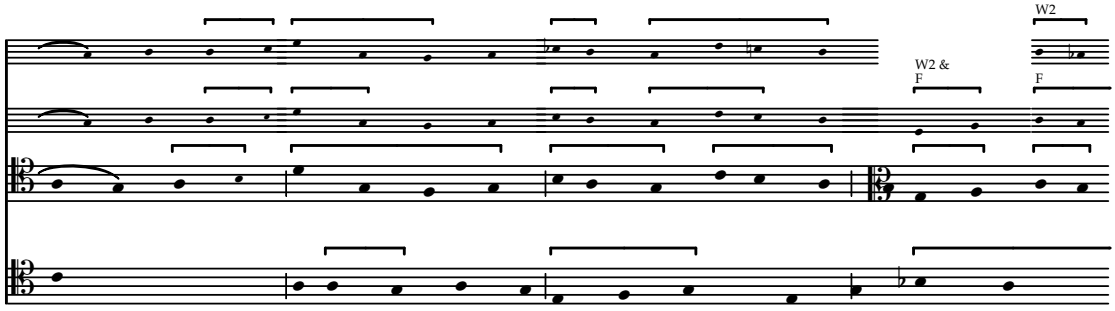
In bethleem

Concordances from W2 & F

f. 50v



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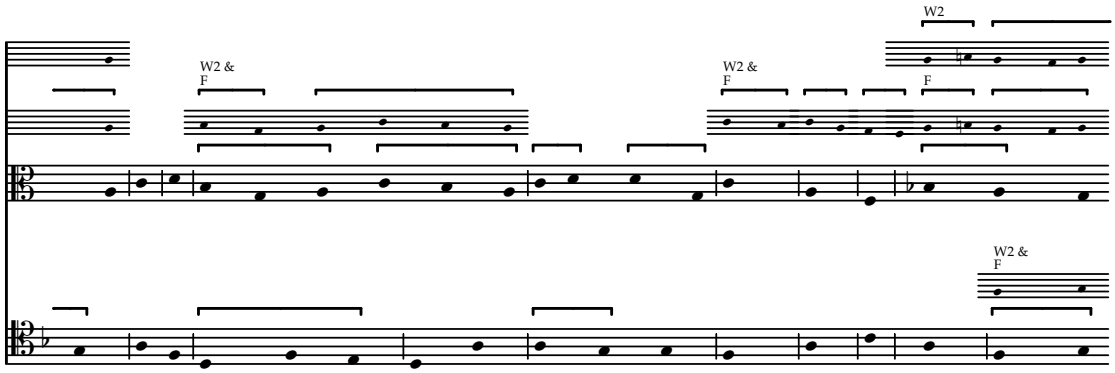
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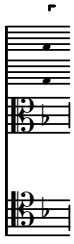

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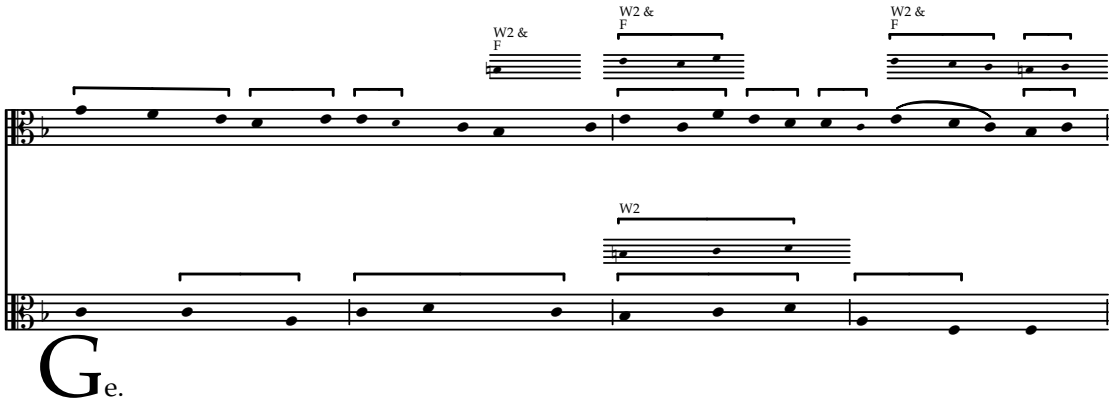
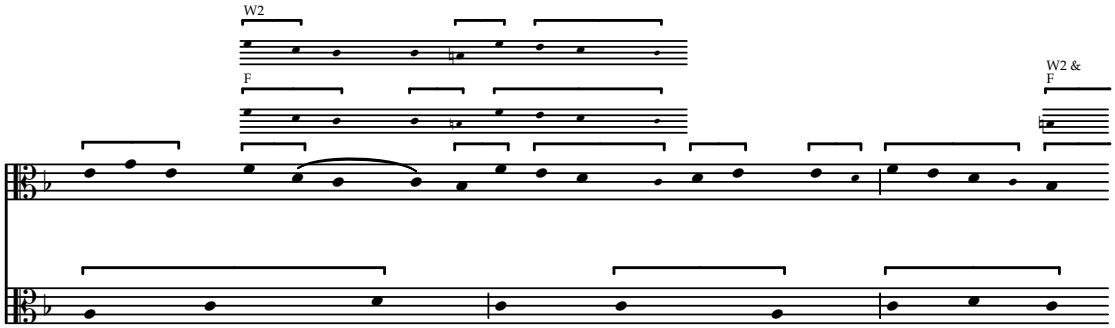
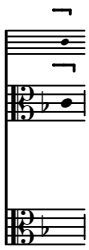
Concordances from W2 & F

f. 50v







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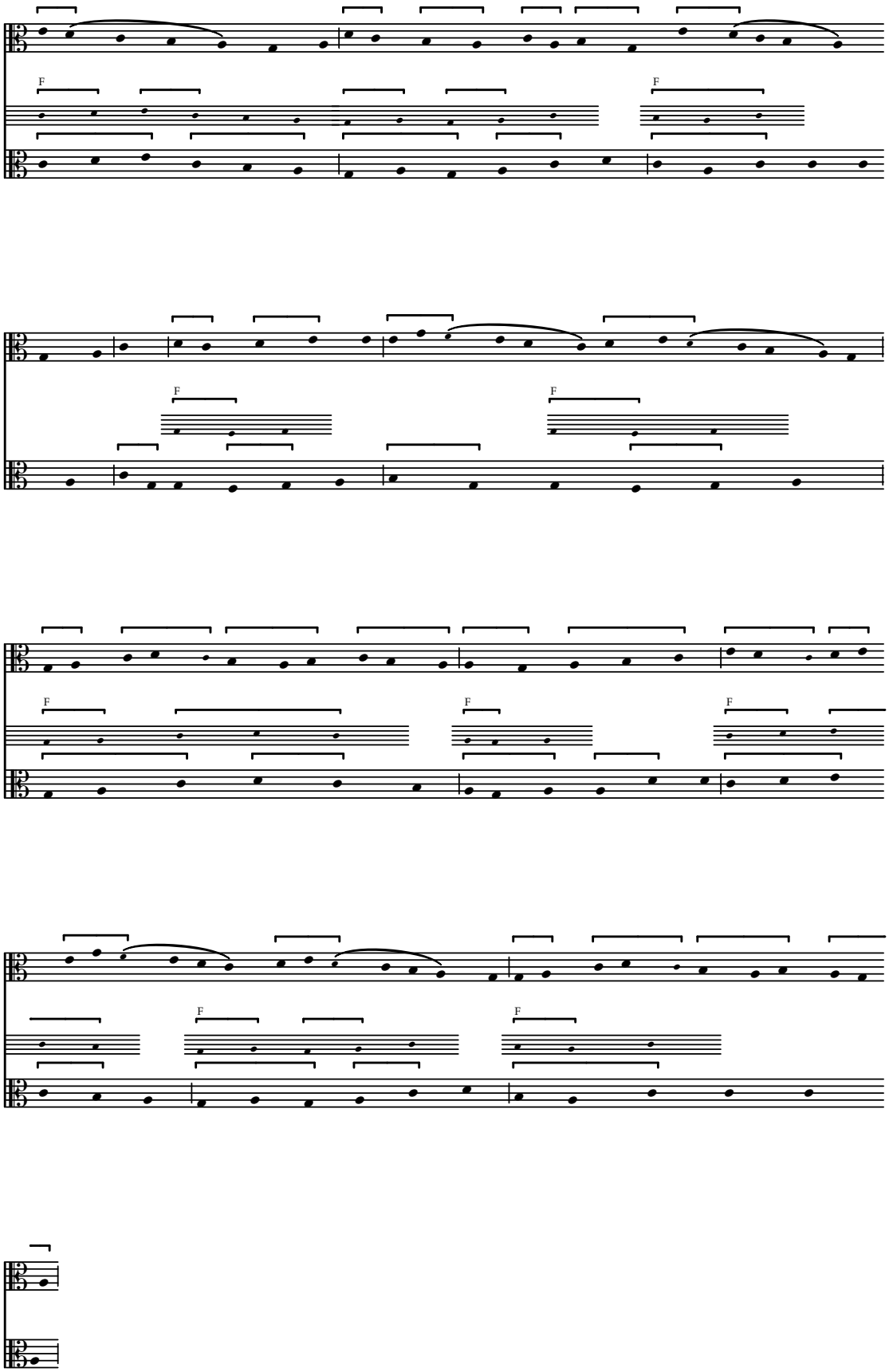
Concordances from F

f. 53



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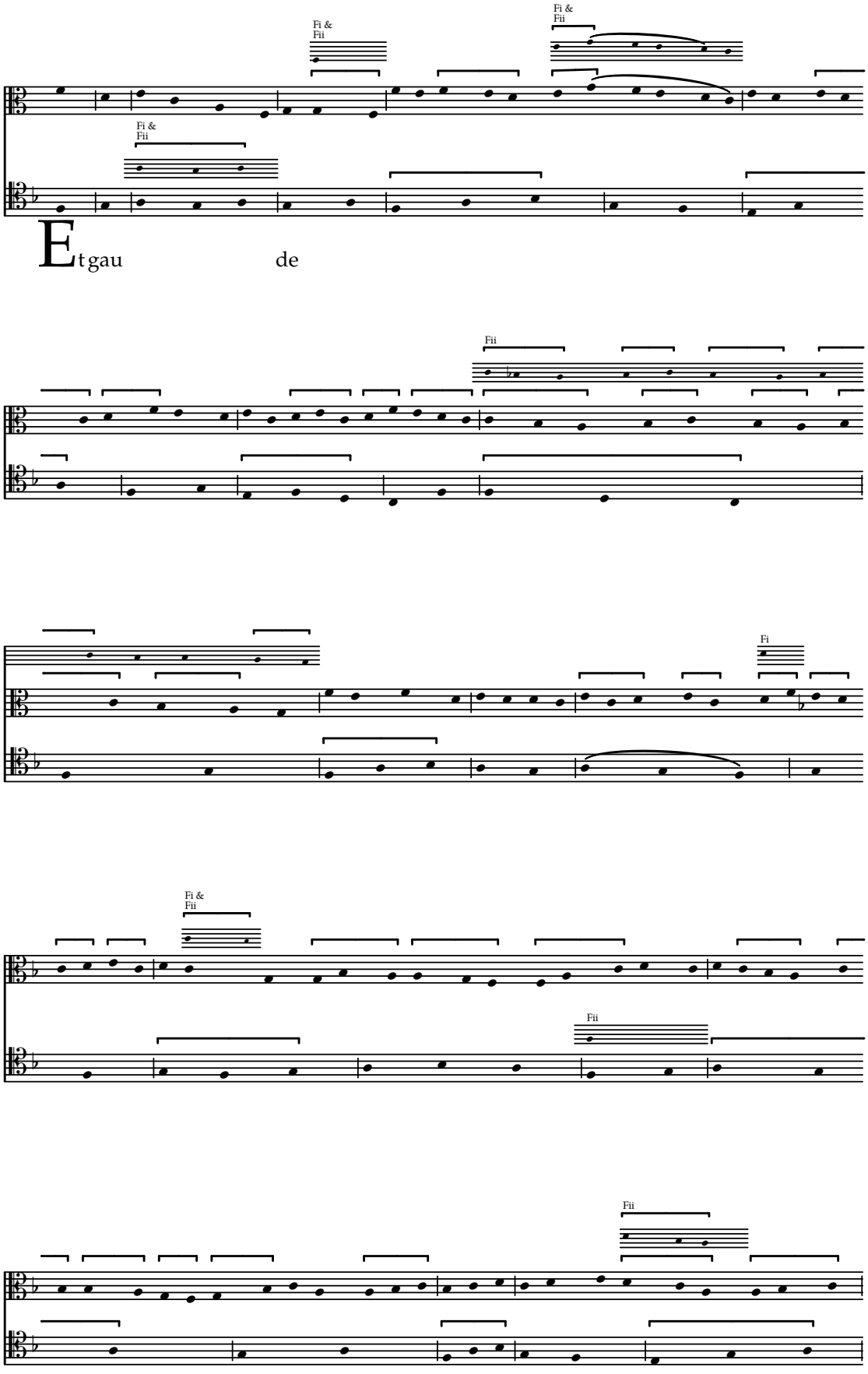
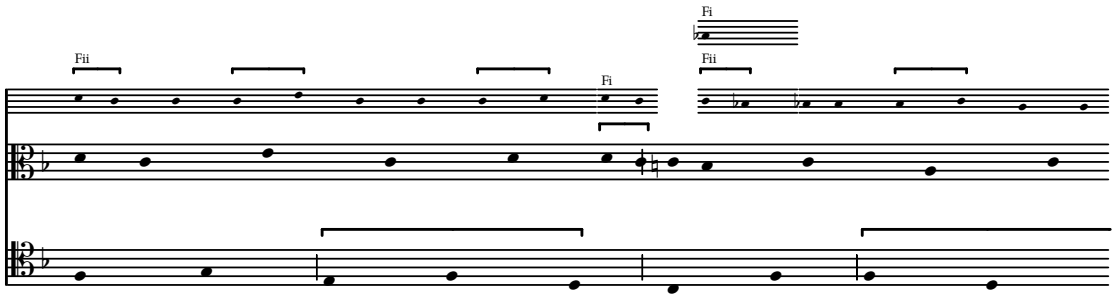
Concordances from F (two versions) f. 53

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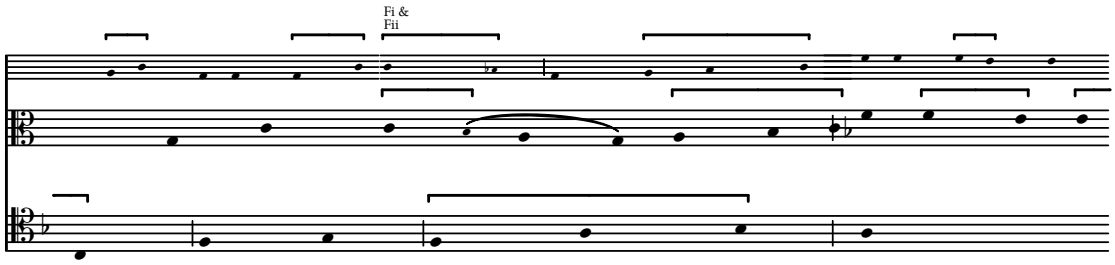
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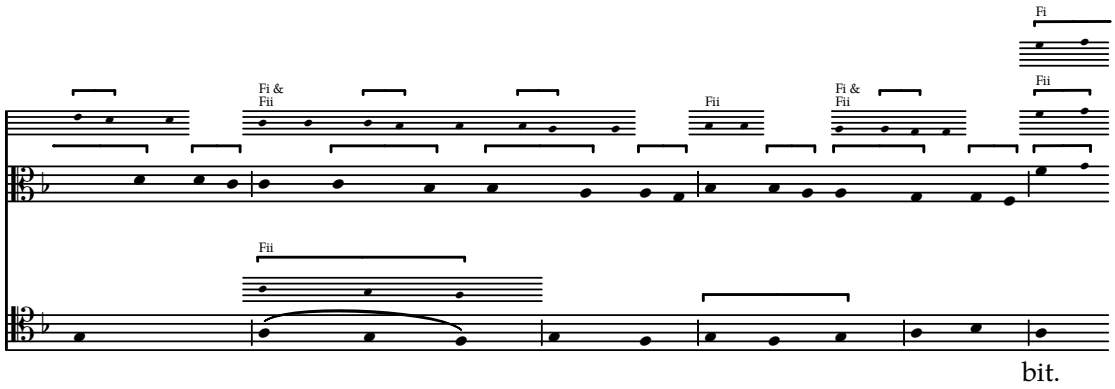
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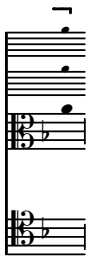
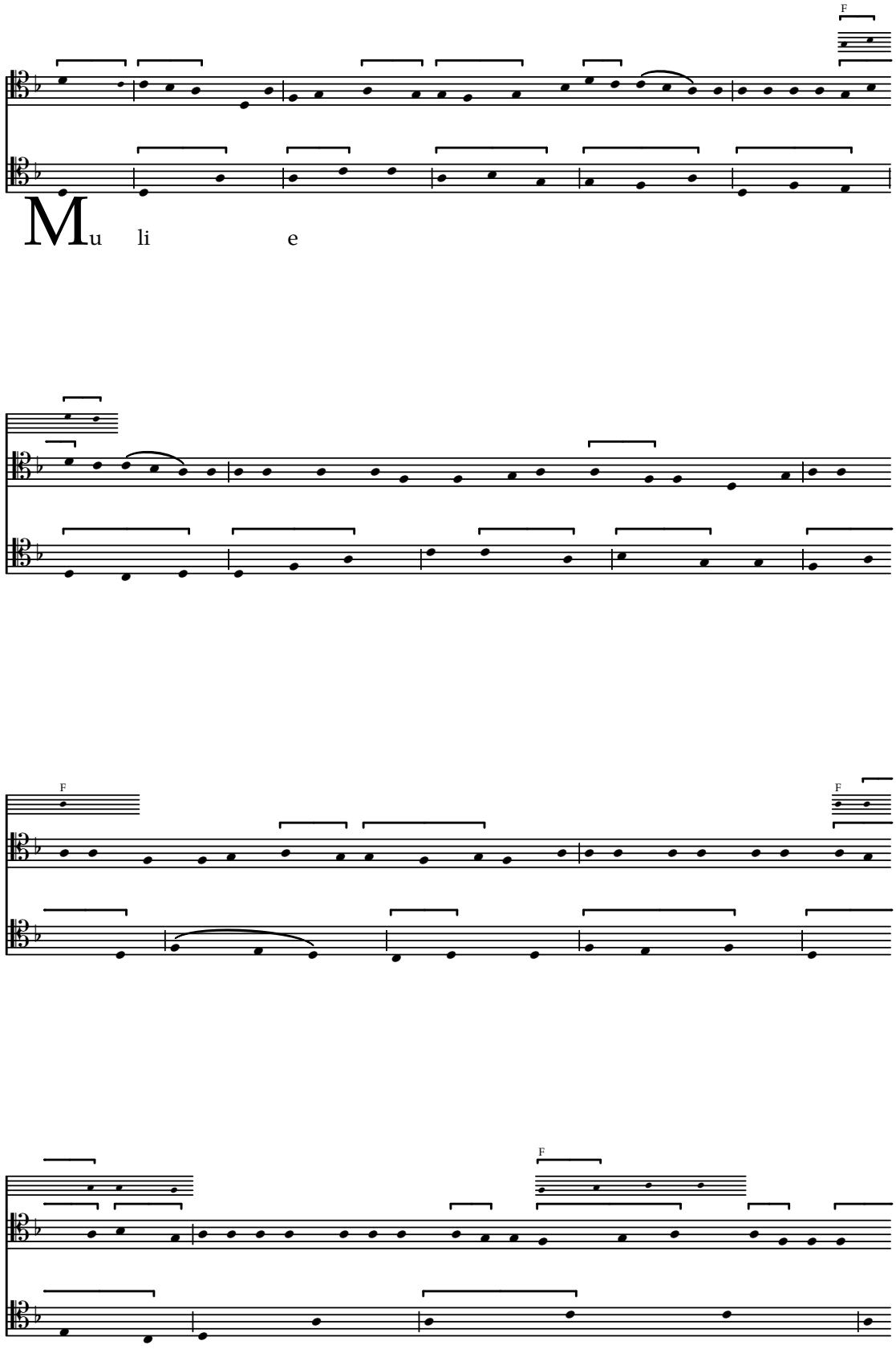
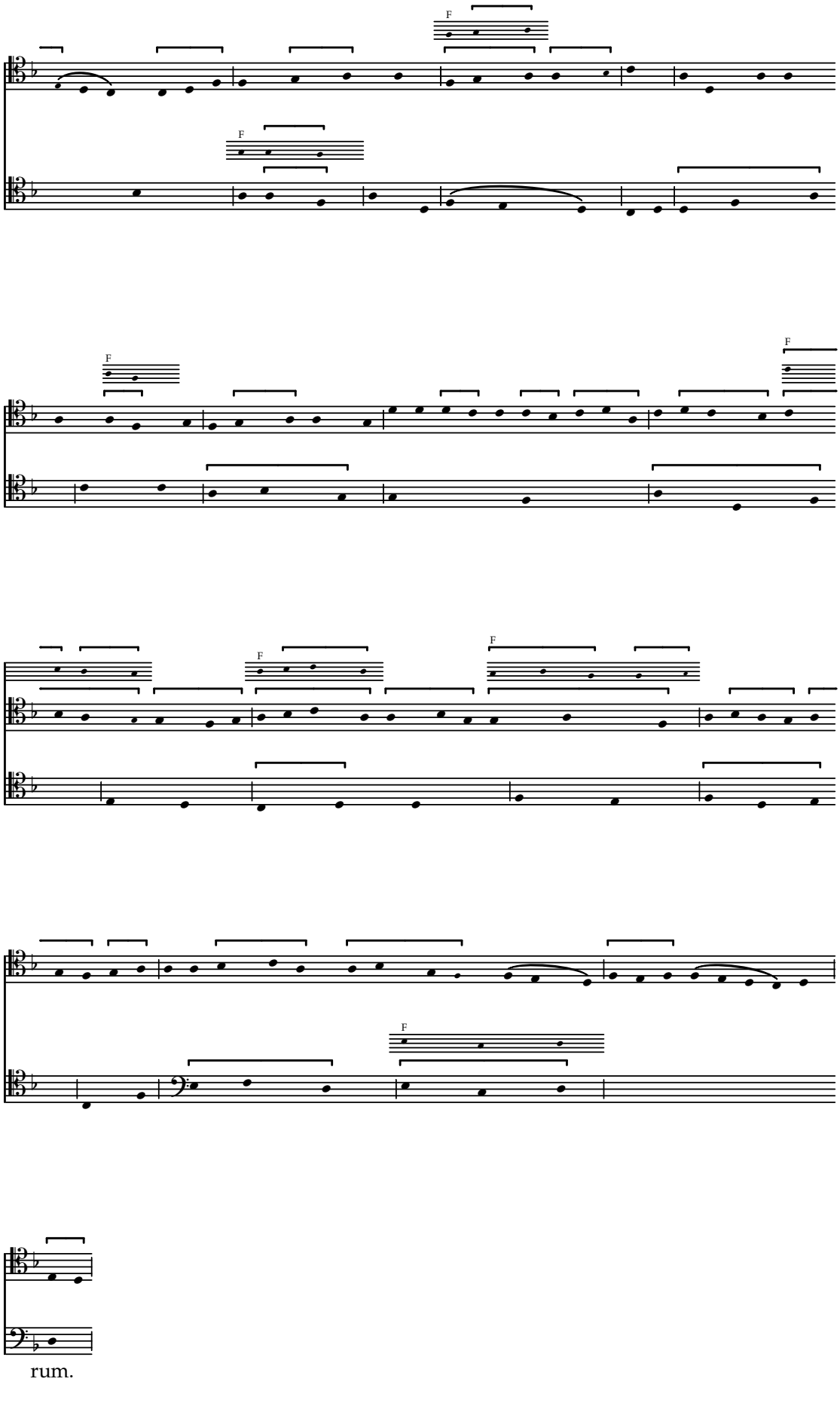


Mulierum

Concordances from F

f. 53–53v

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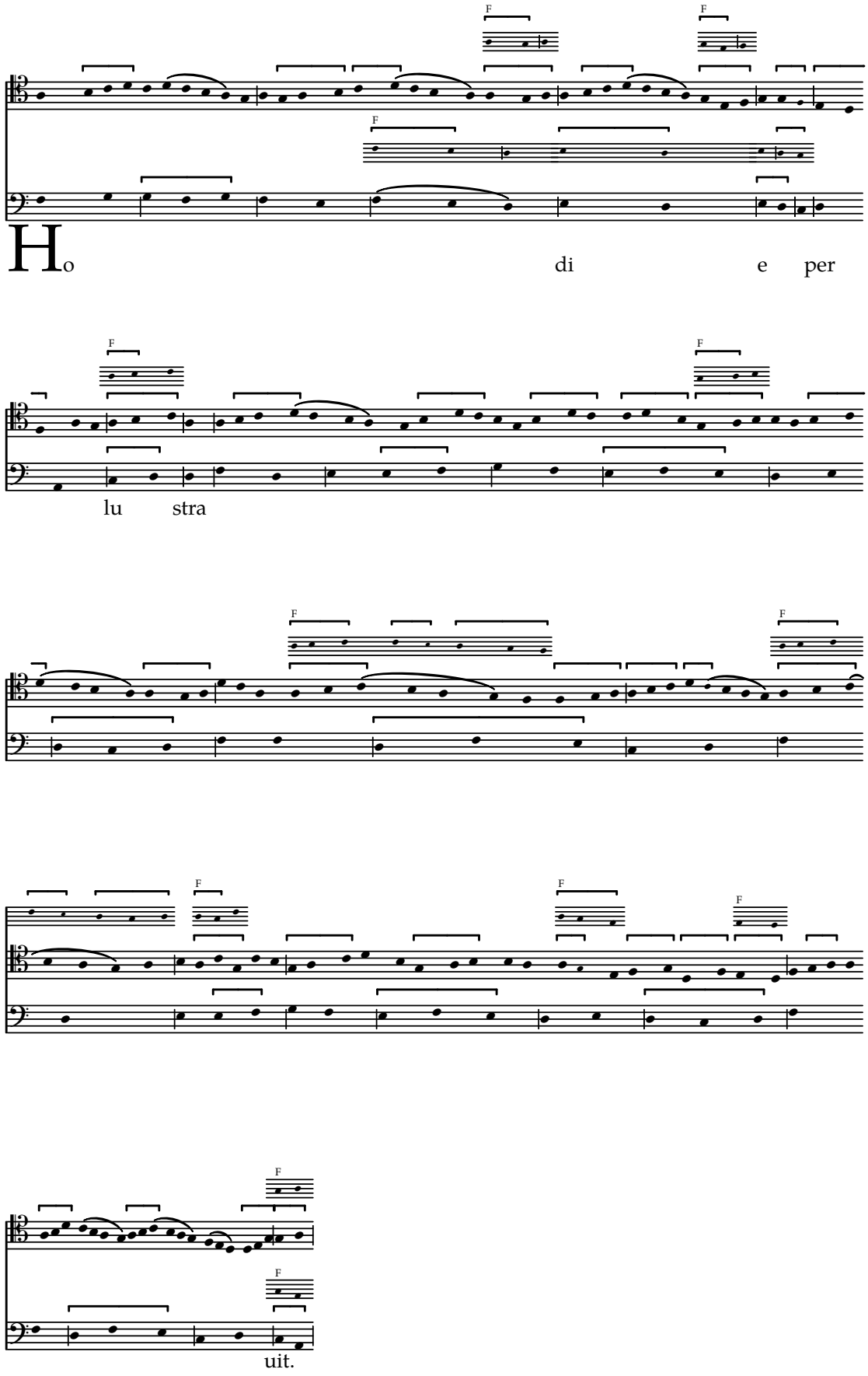
Concordances from F

f. 53v



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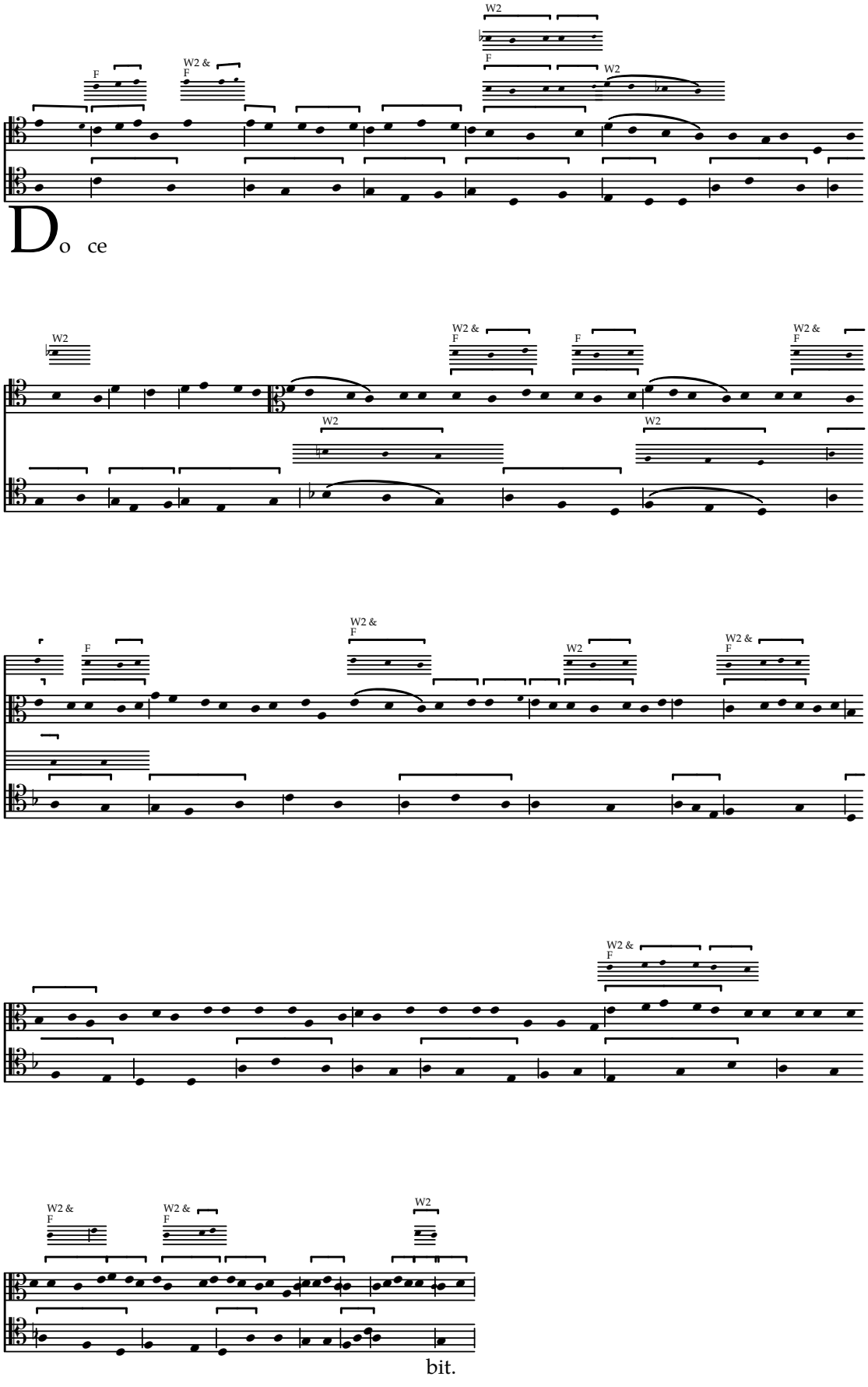
Concordances from W2 & F

f. 53v



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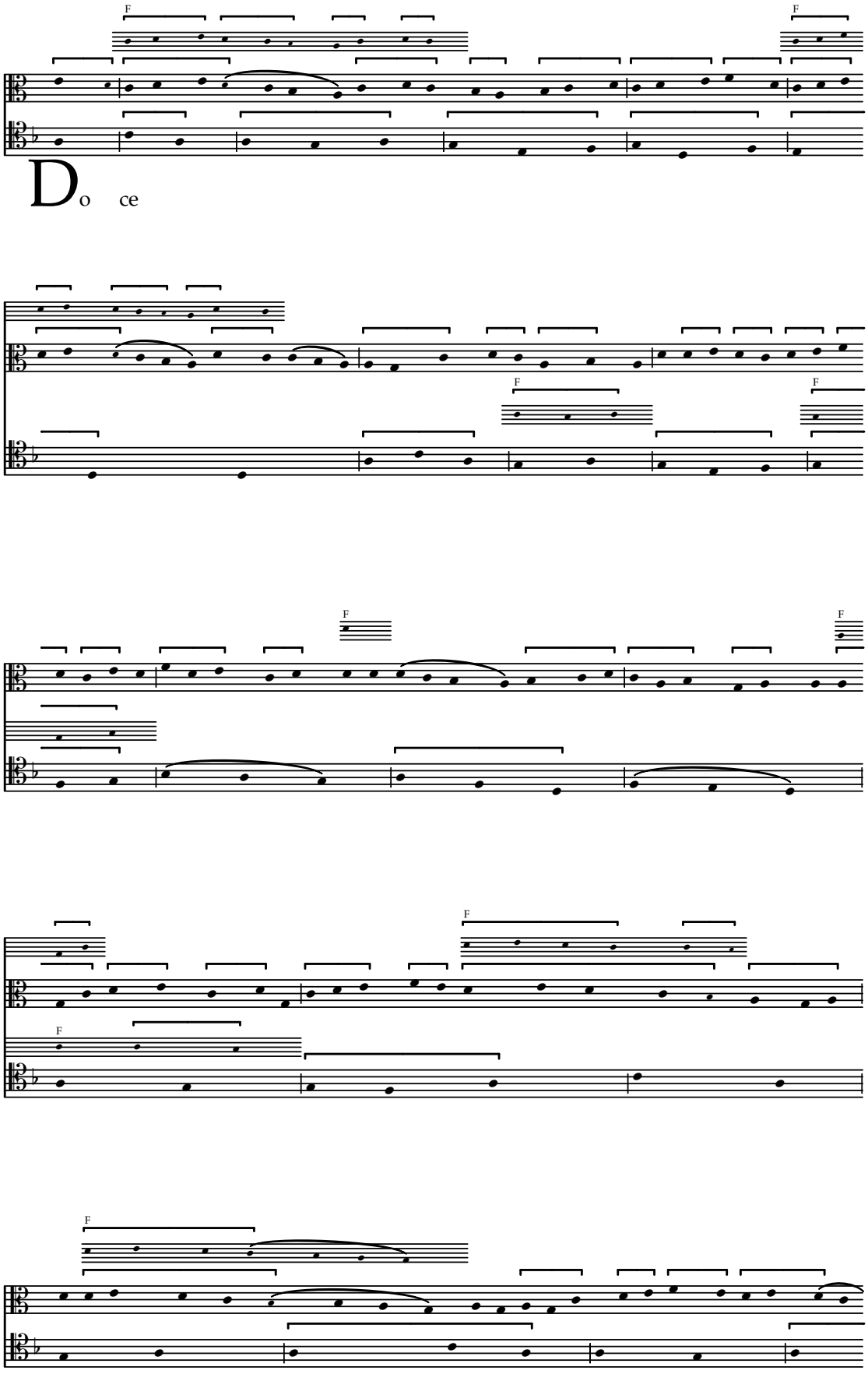
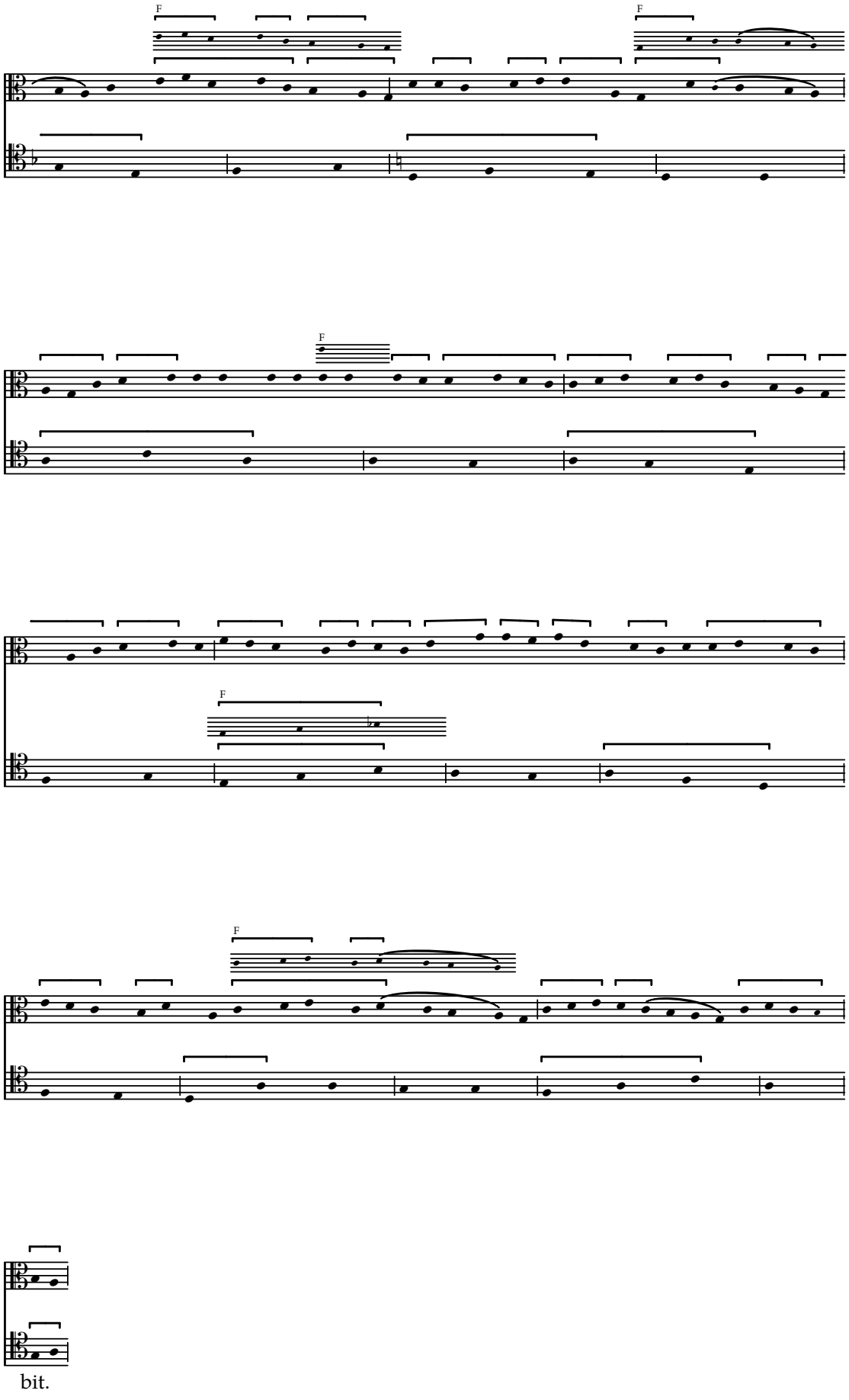
Concordances from F

f. 53v–54

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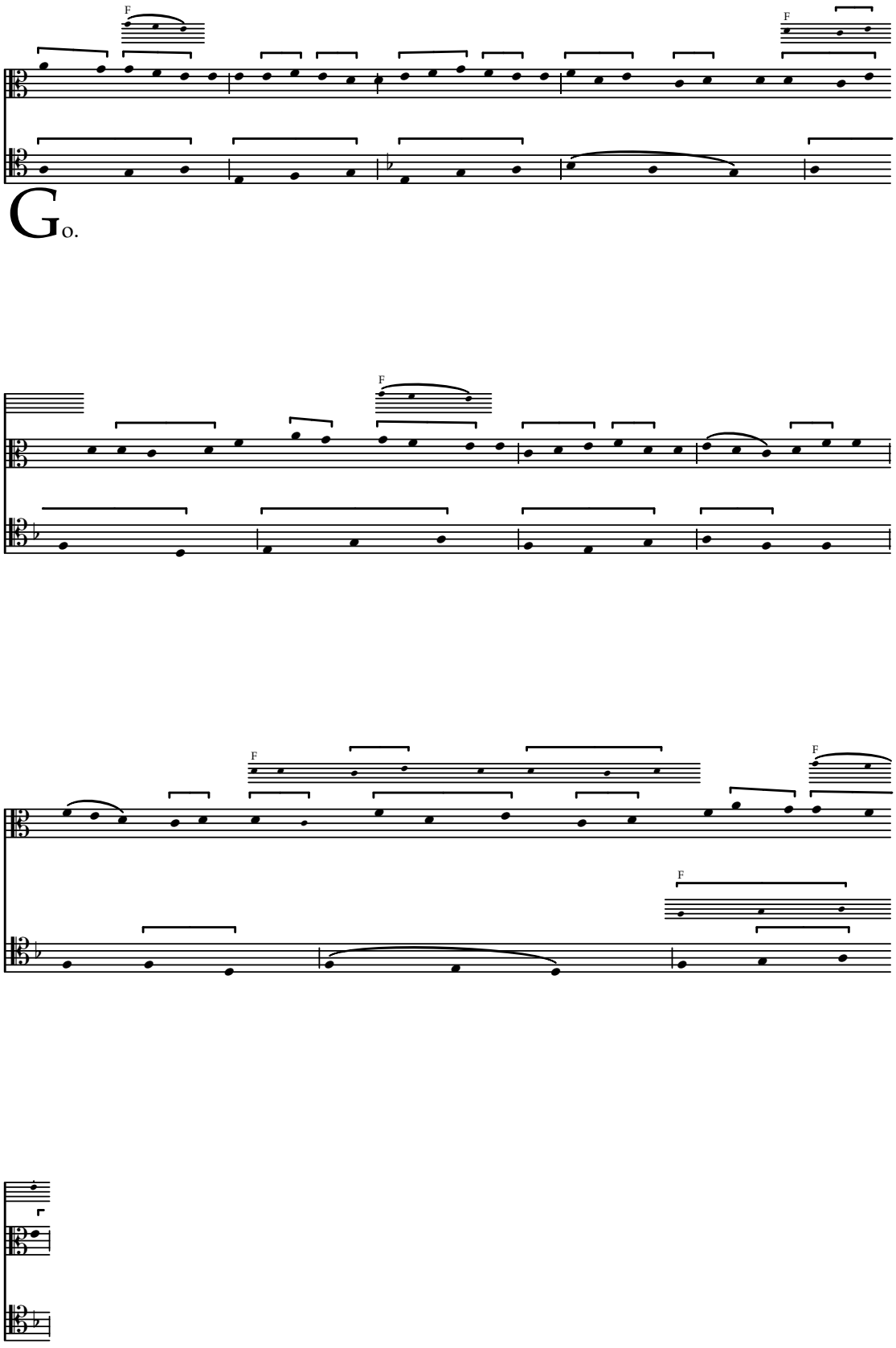
Concordances from F

f. 54



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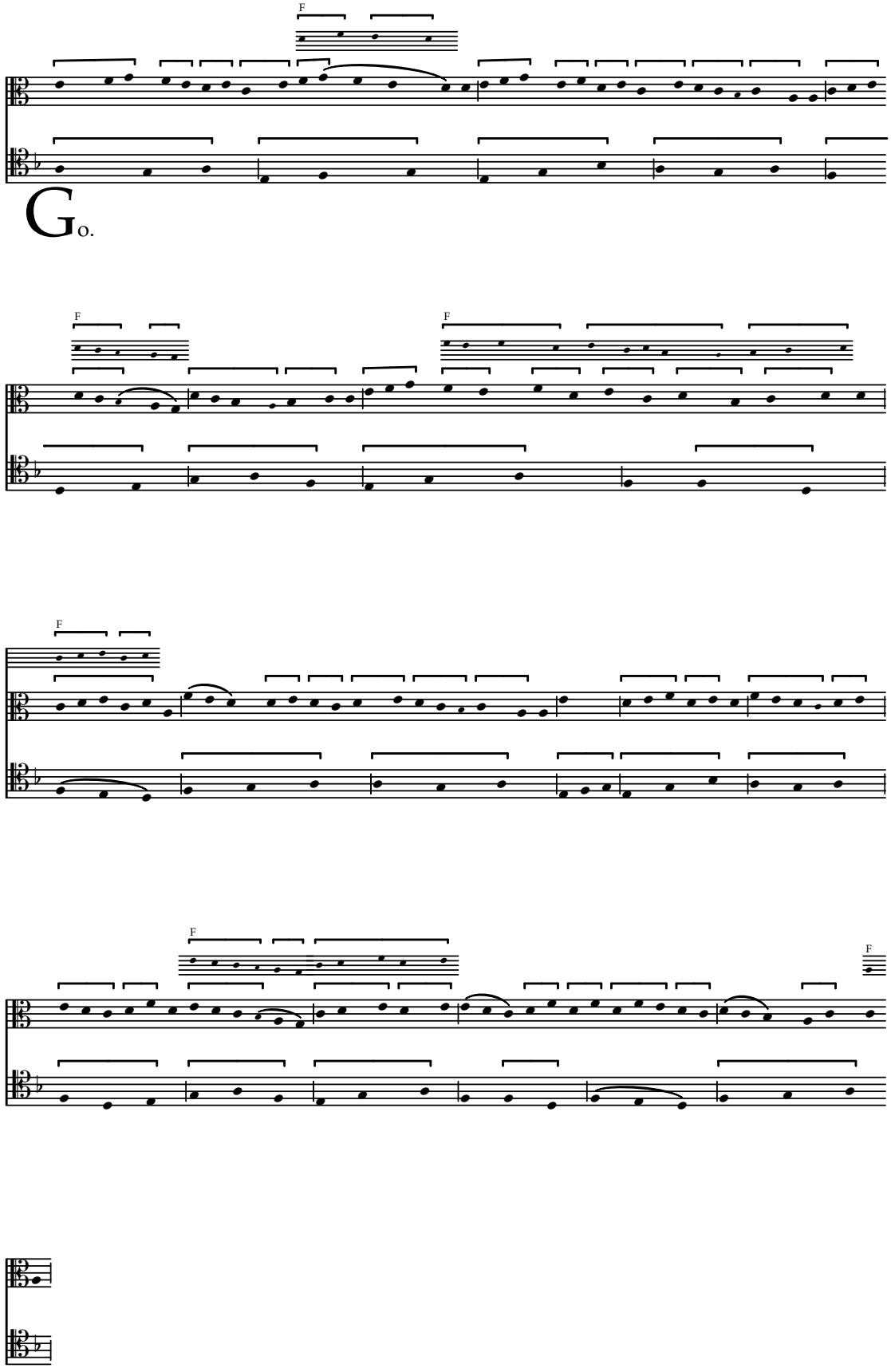
Concordances from F

f. 54



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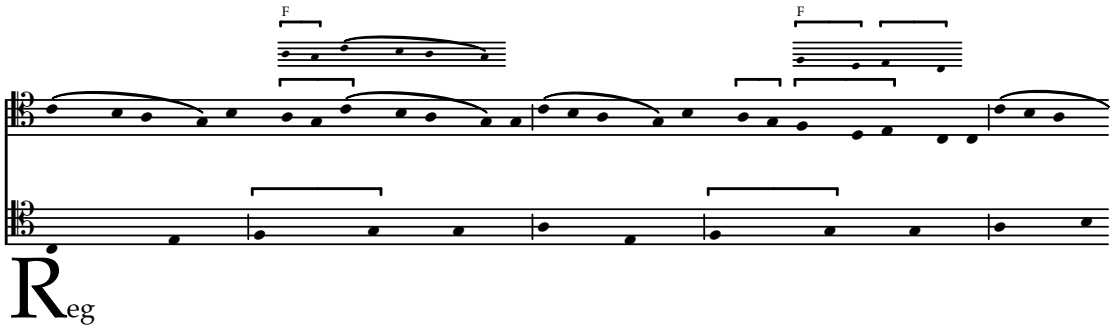
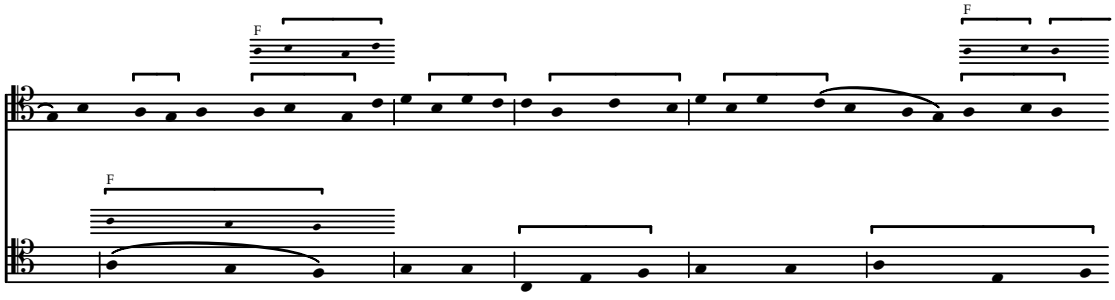
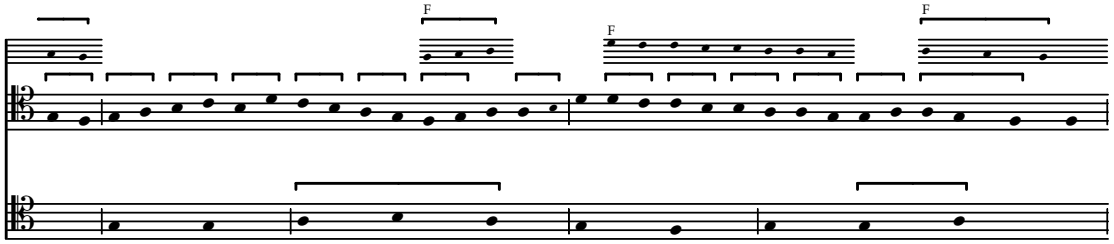
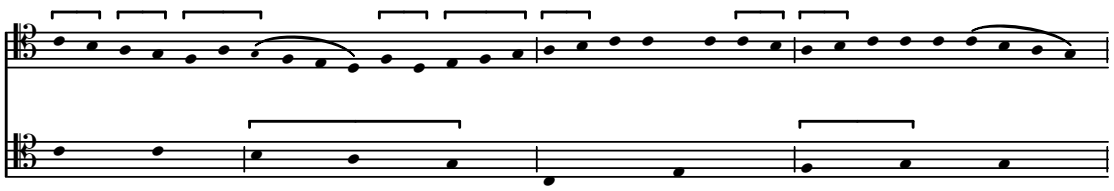
Concordances from F

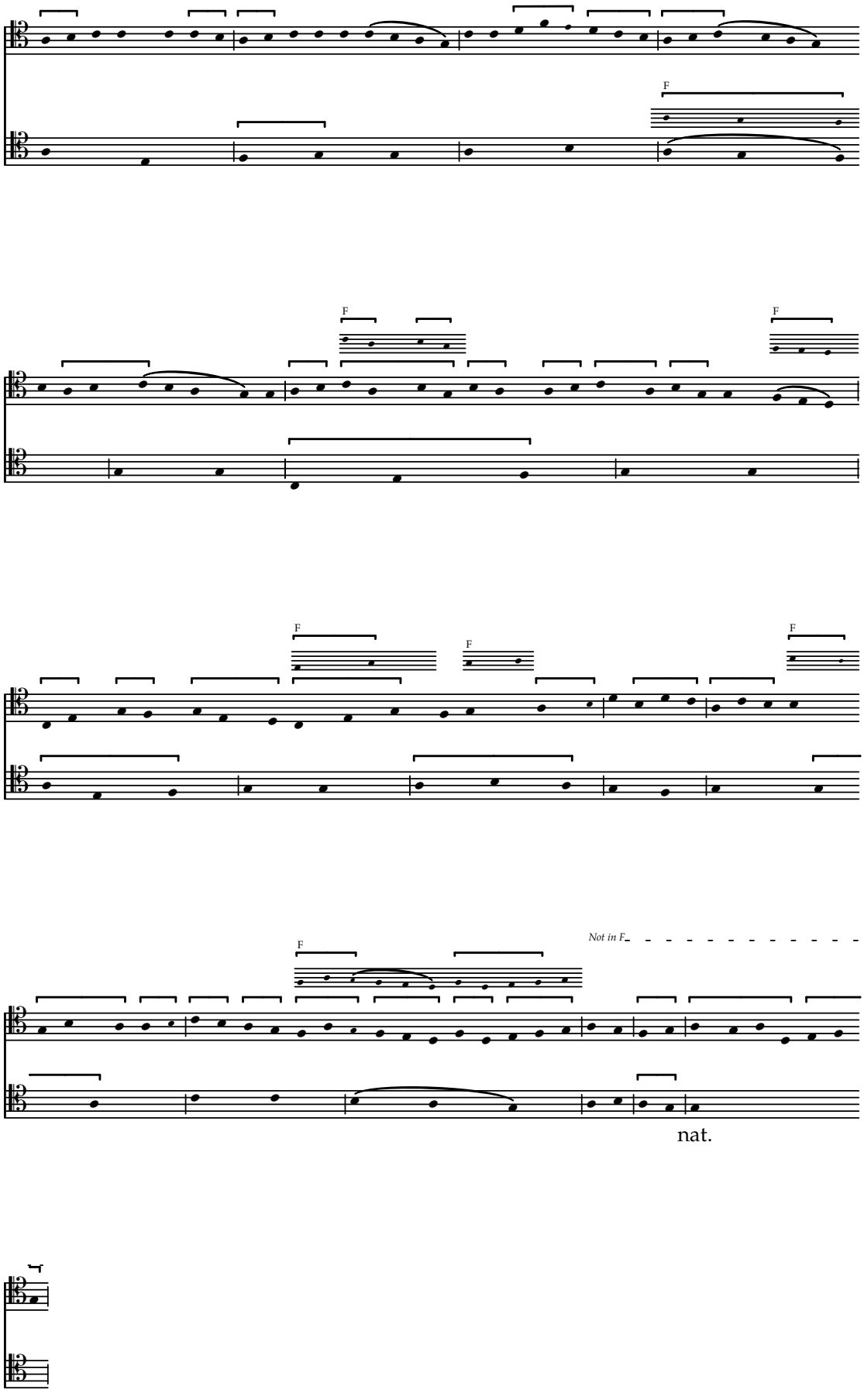
f. 54







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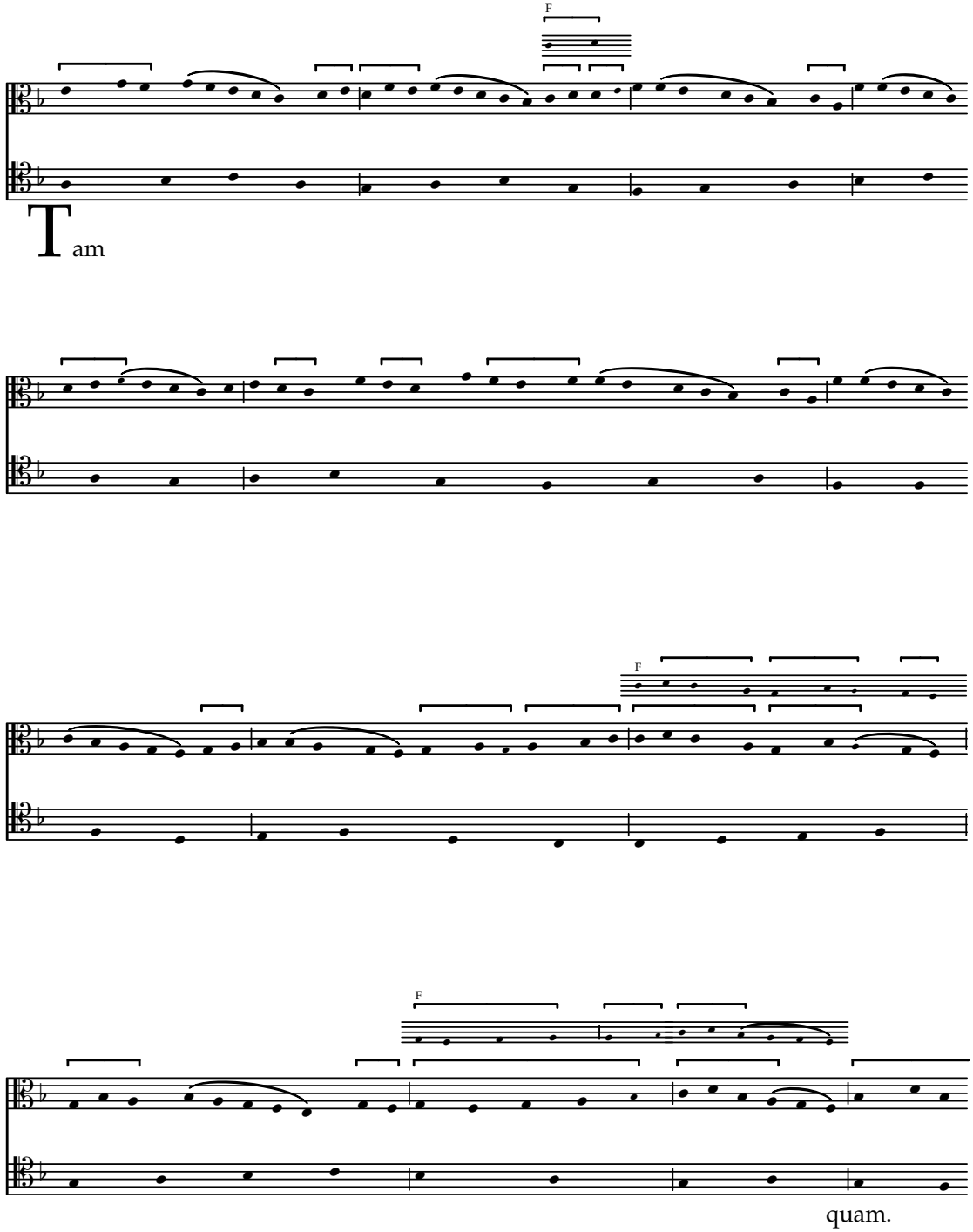
Tamquam

Concordances from F

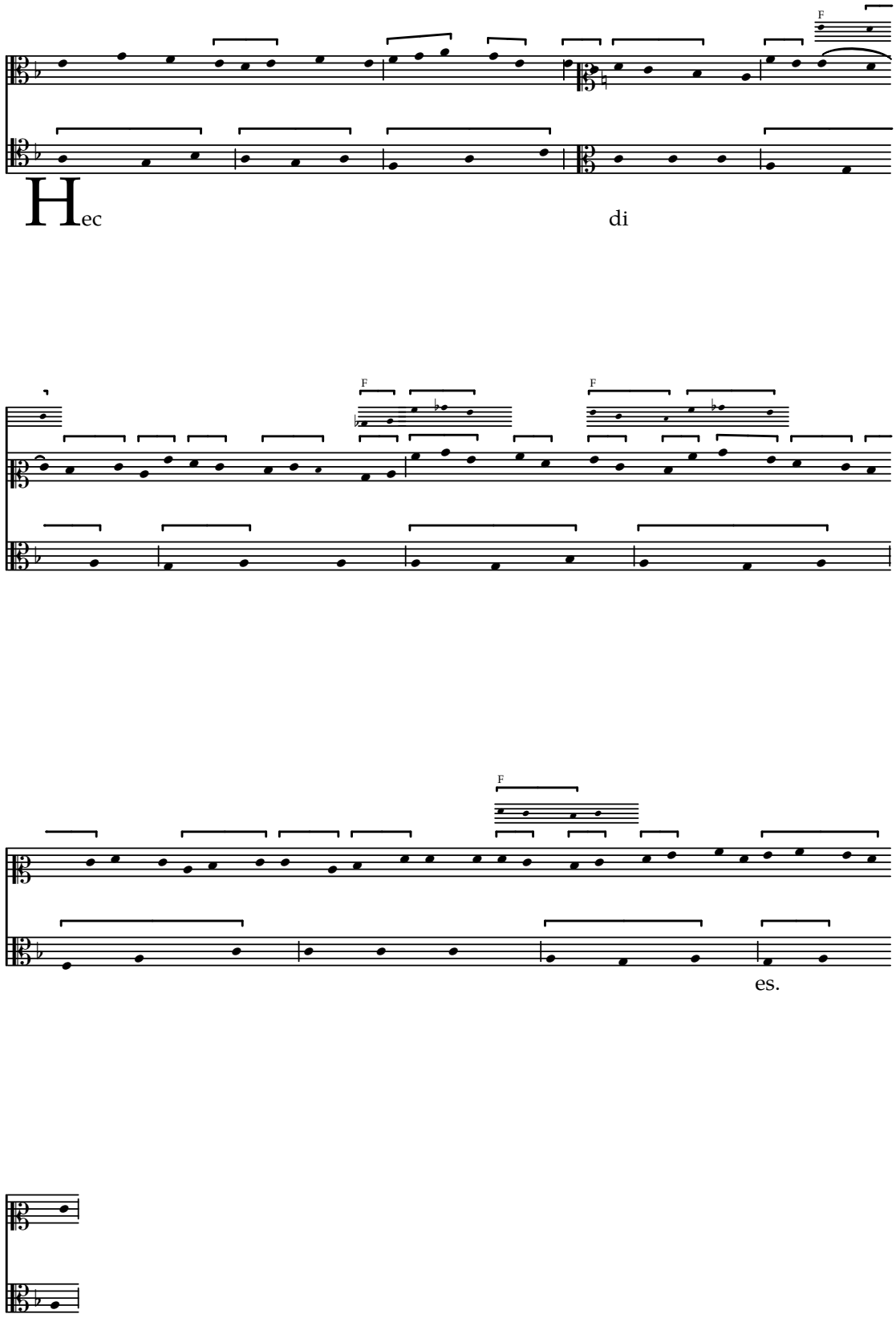
f. 54v



Hec dies

Concordances from F

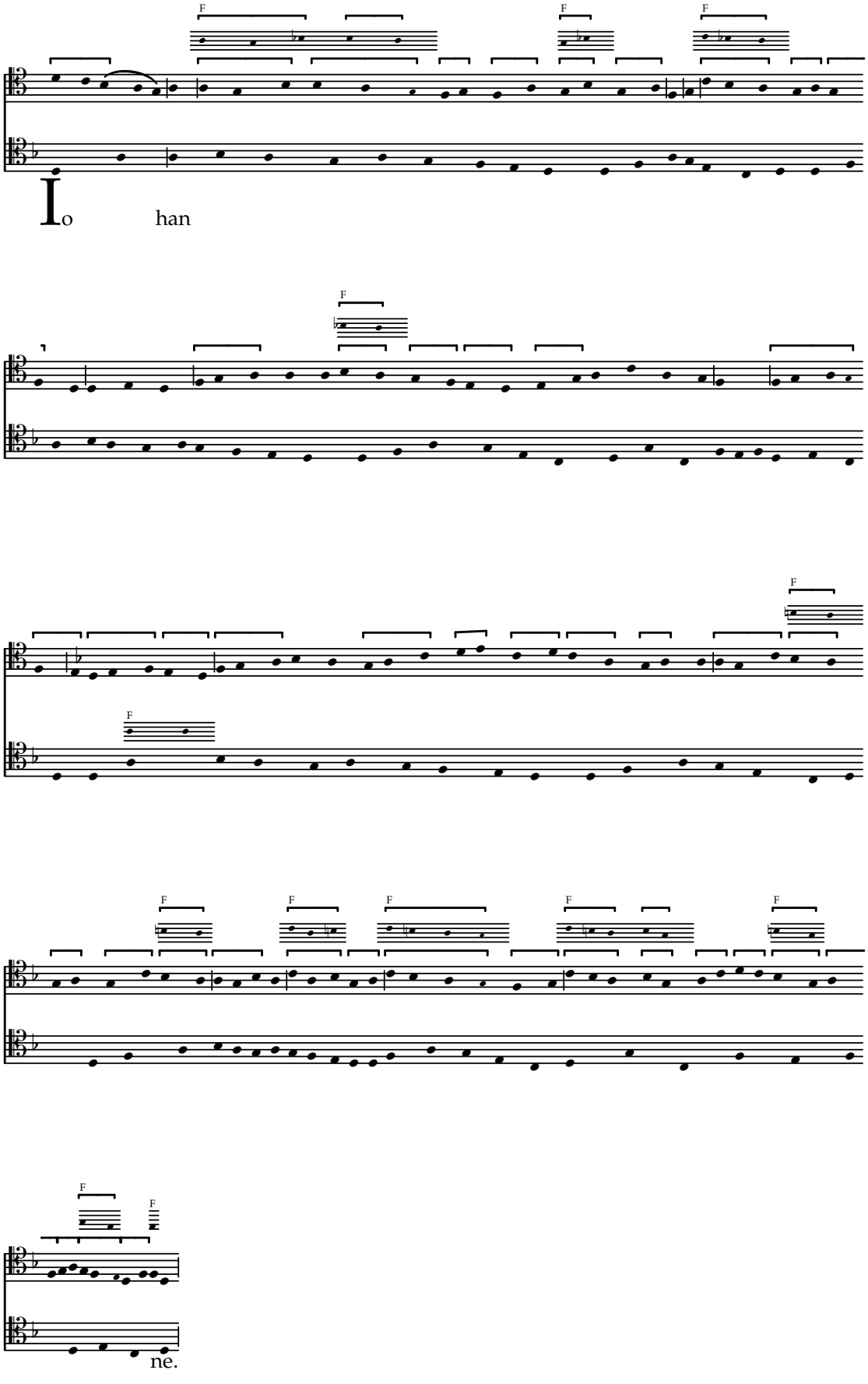
f. 54v



Iohanne

Concordances from F

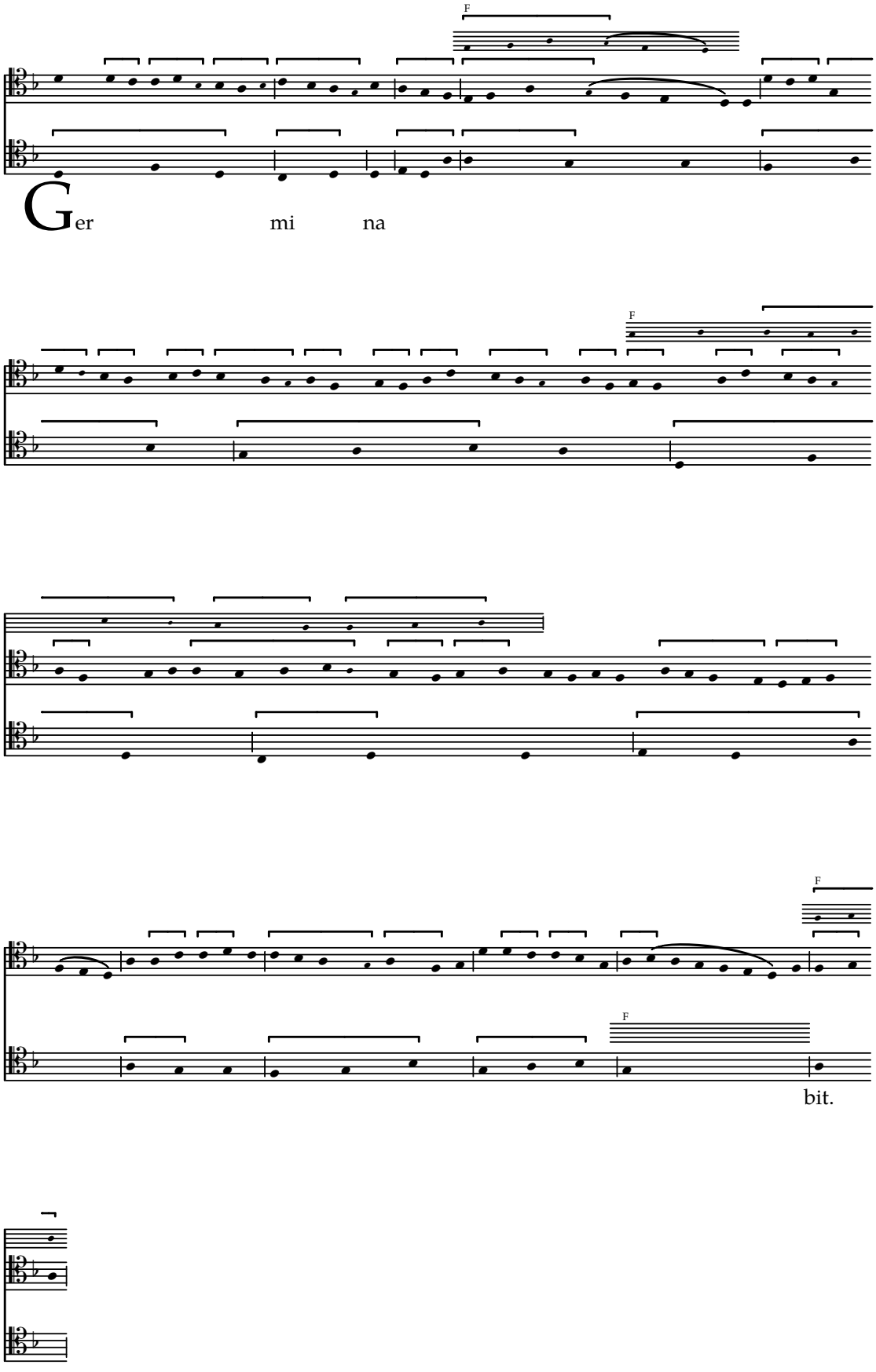
f. 54v



Germinabit

Concordances from F

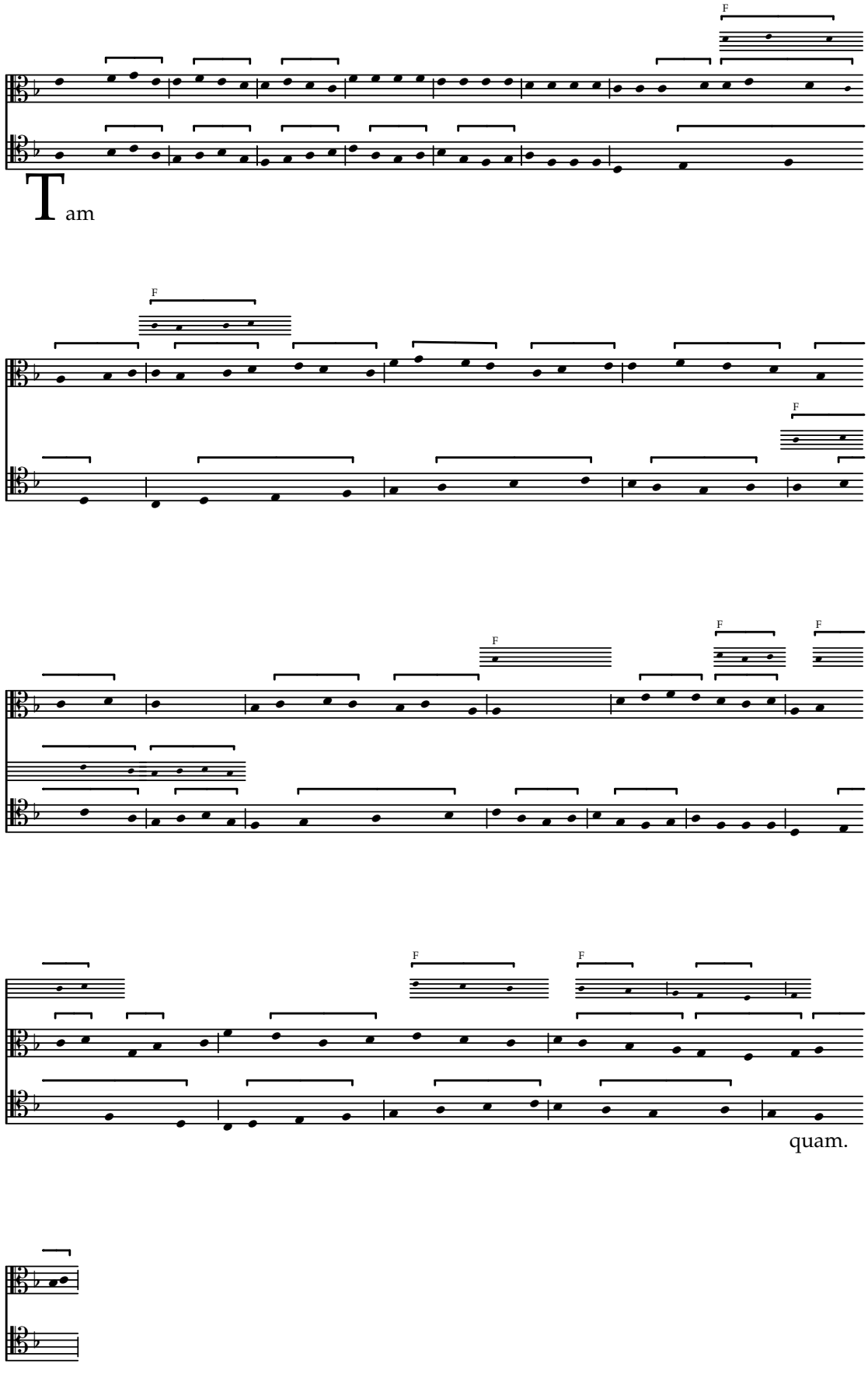
f. 54v



Tamquam

Concordances from F

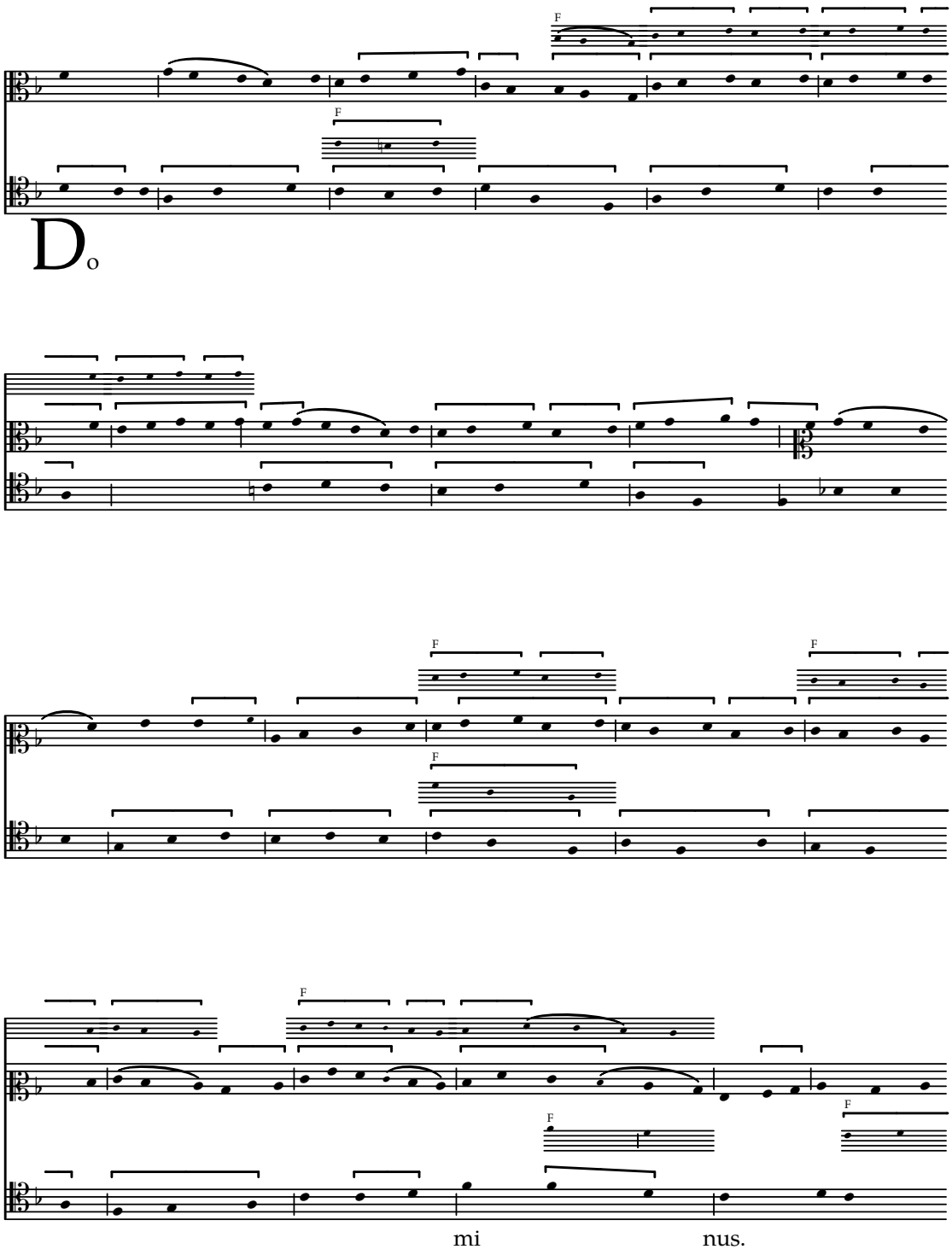
f. 55



Dominus

Concordances from F

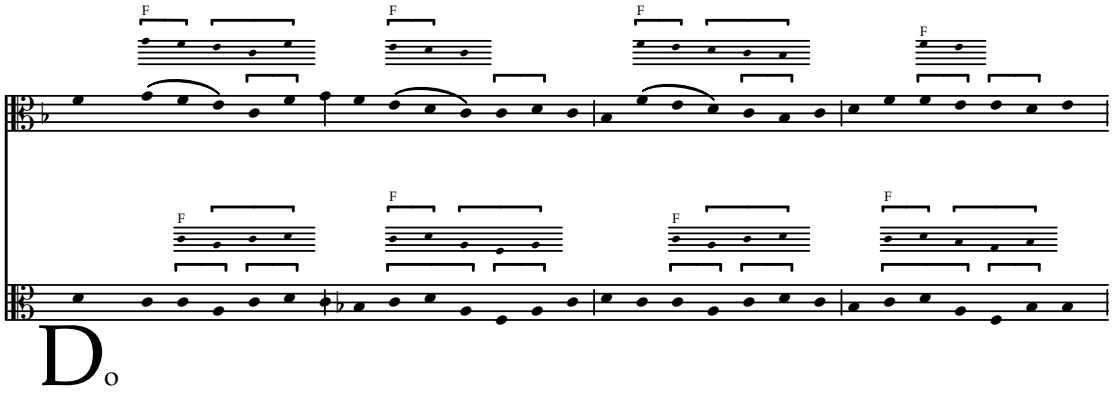
f. 55



Dominus

Concordances from F

f. 55–55v



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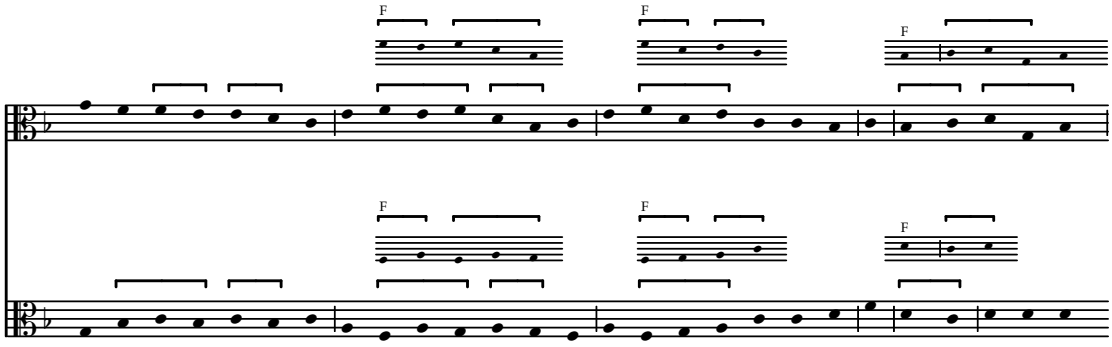

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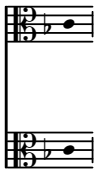
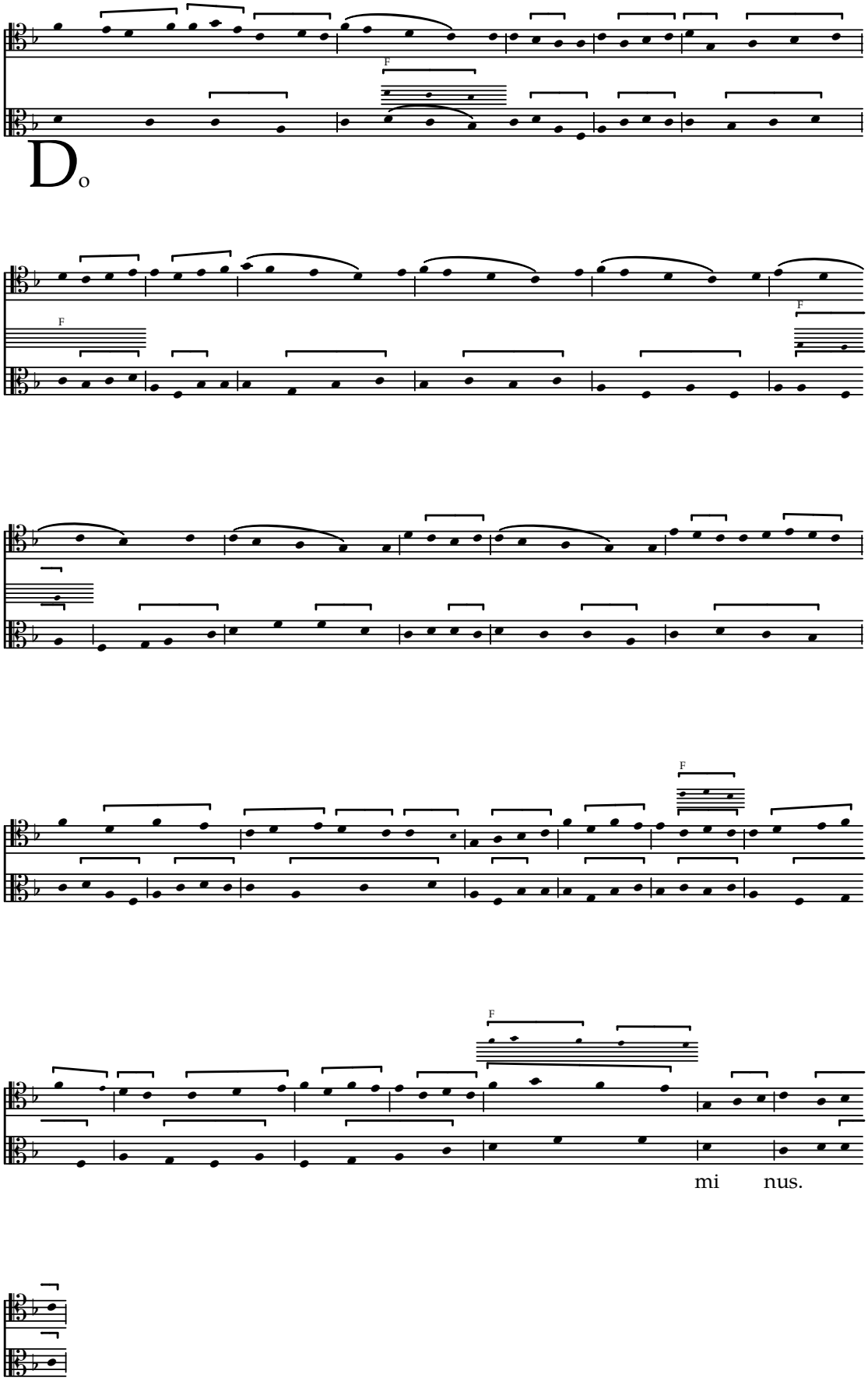


nus.

Dominus

Concordances from F

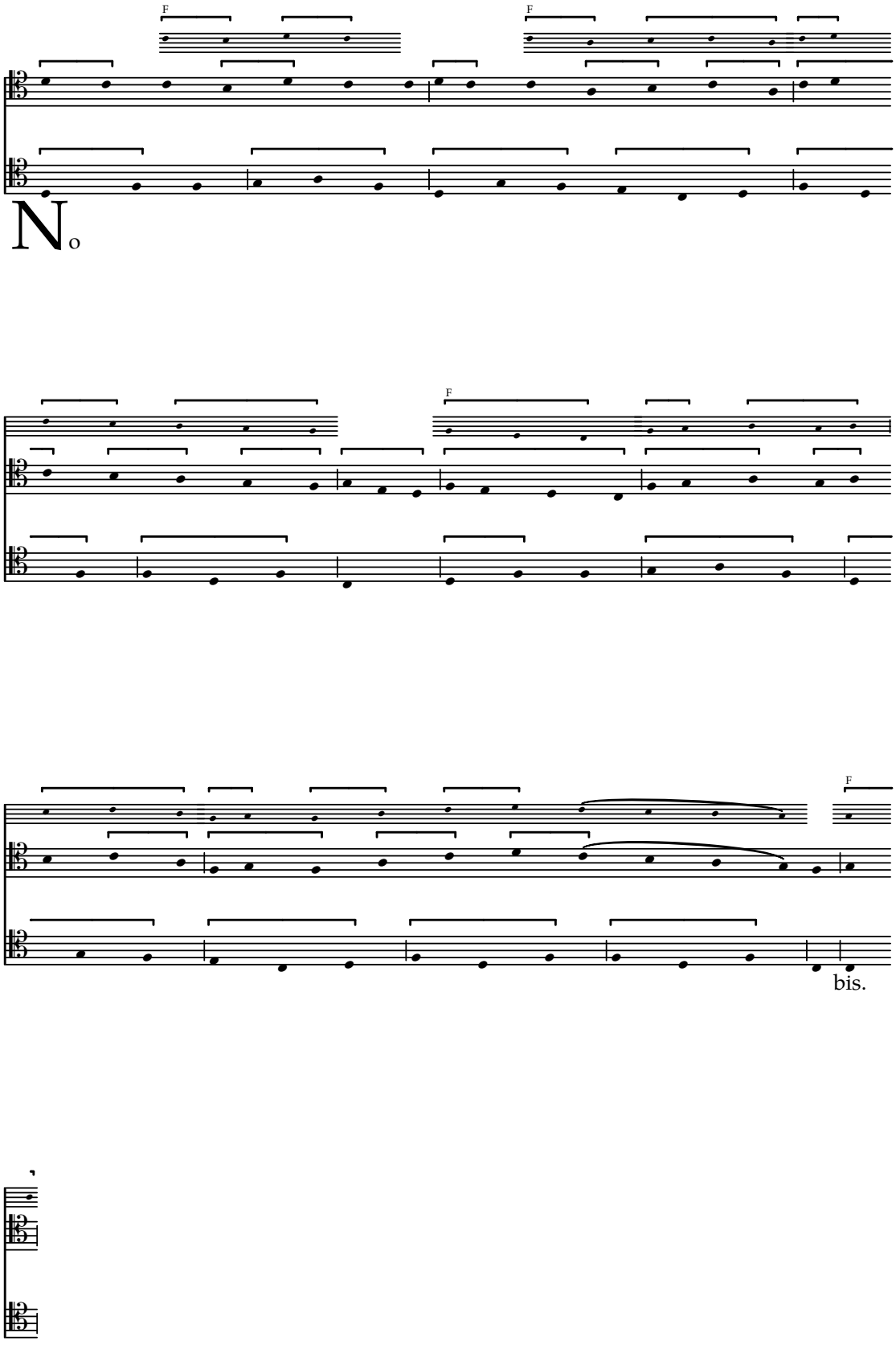
f. 55v



Nobis

Concordances from F

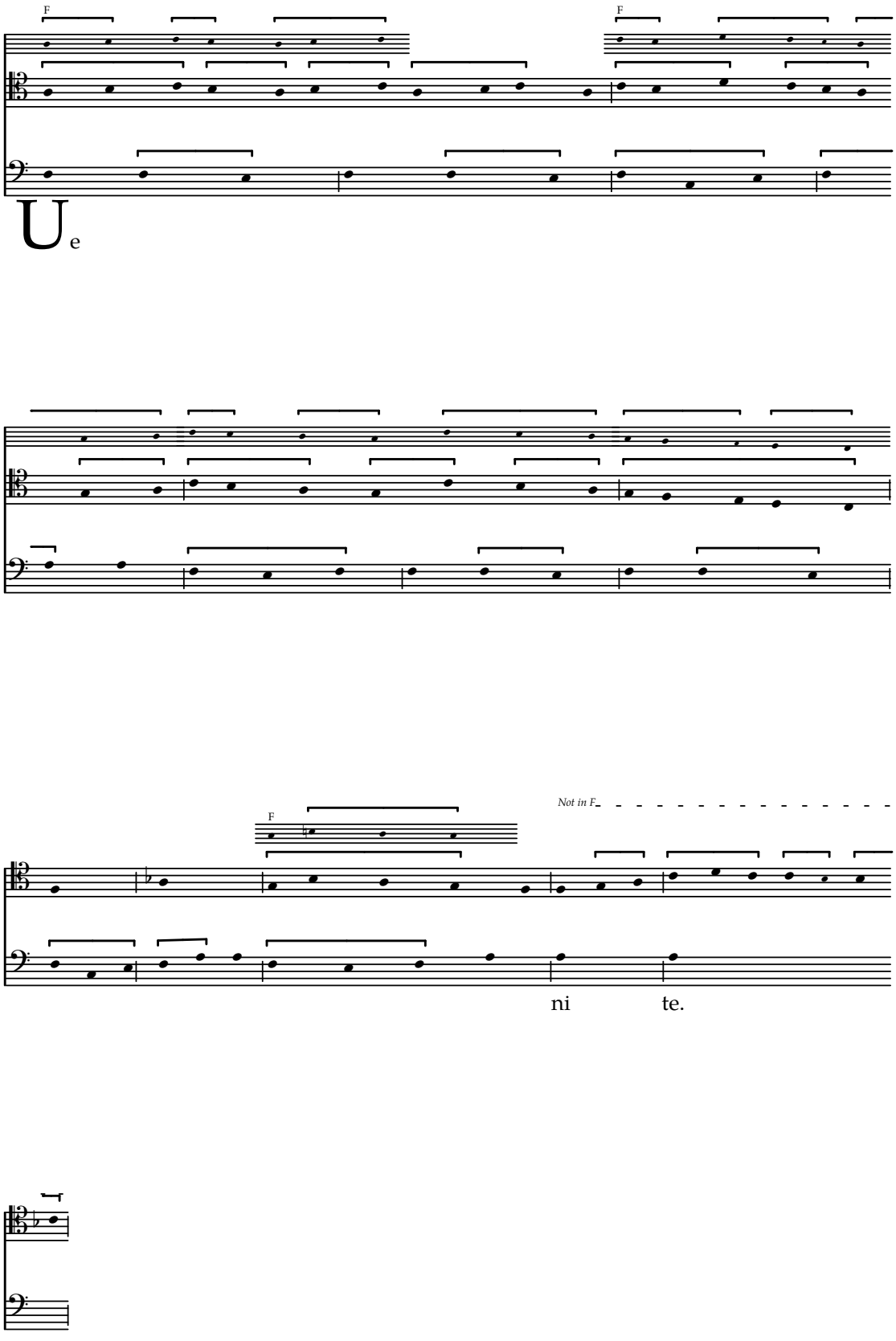
f. 55v



Uenite

Concordances from F

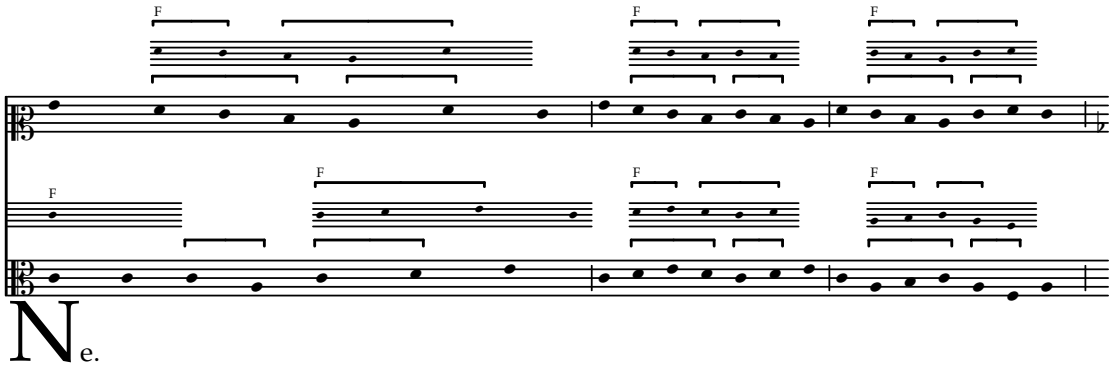
f. 56

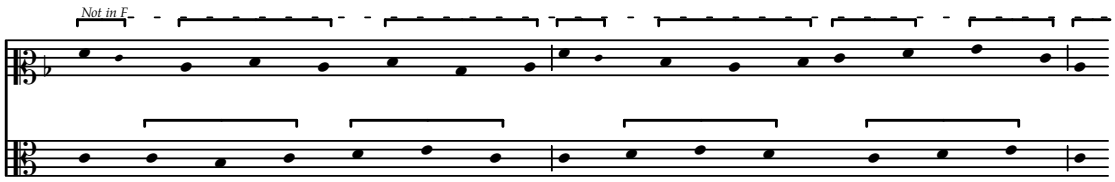


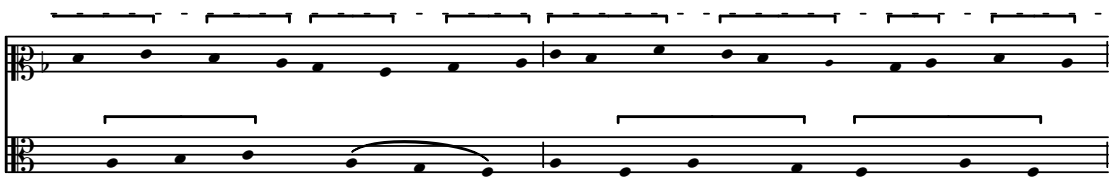
[Domi]ne

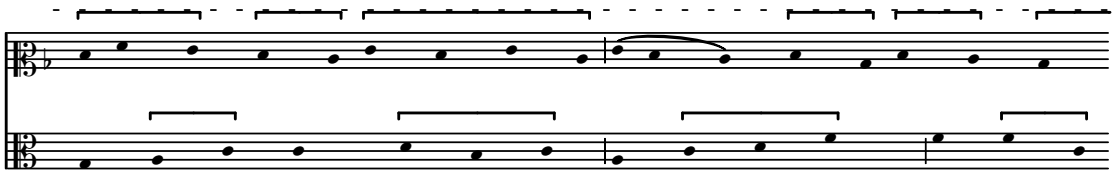
Concordances from F

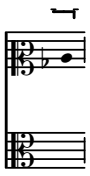
f. 56







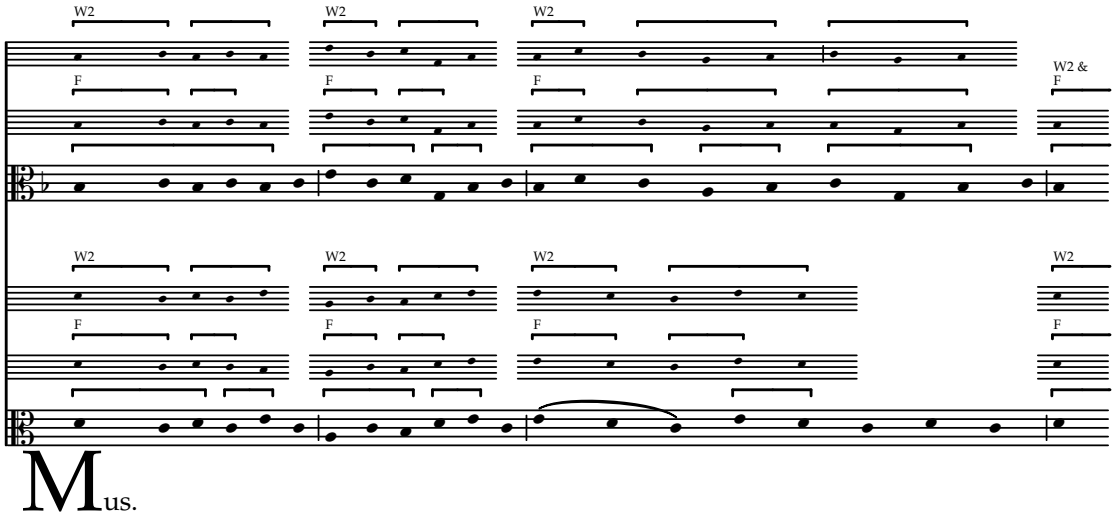


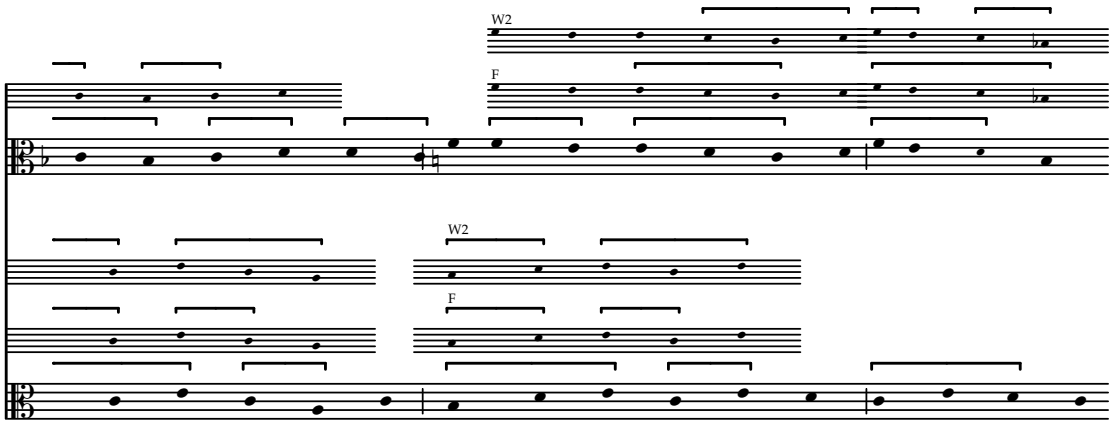


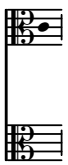
[Audiui]mus

Concordances from W2 & F

f. 56



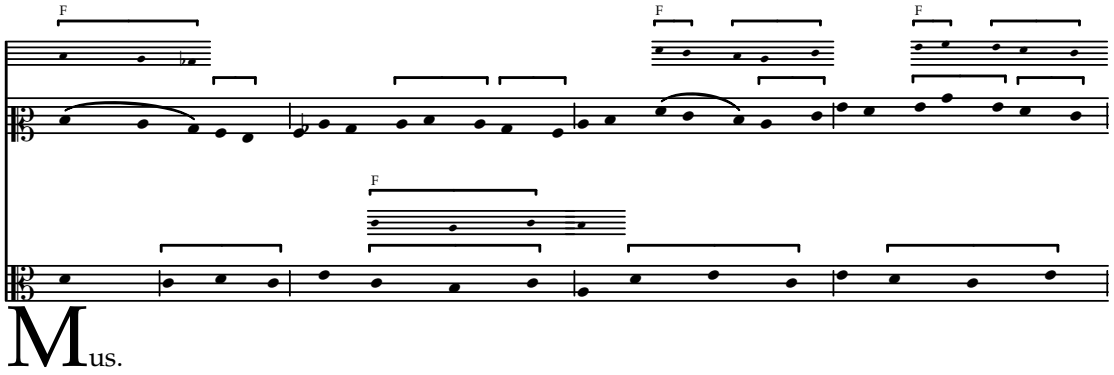




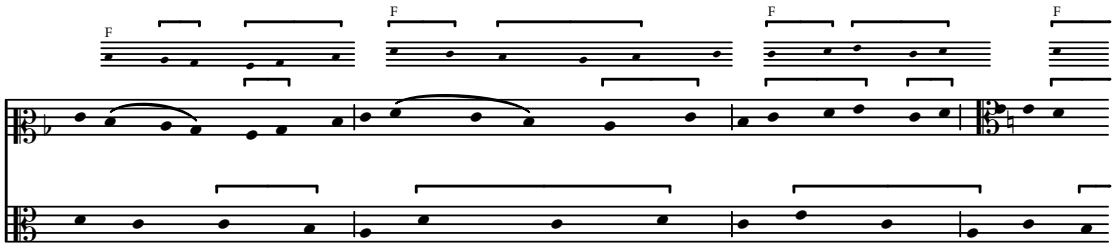
[Audiui]mus

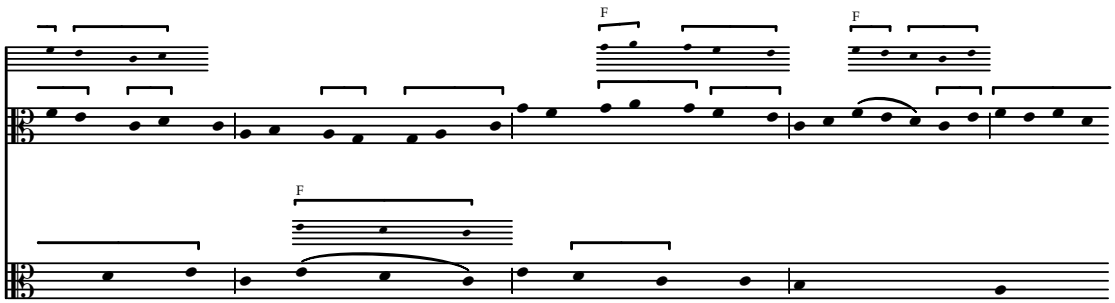
Concordances from F

f. 56



Mus.

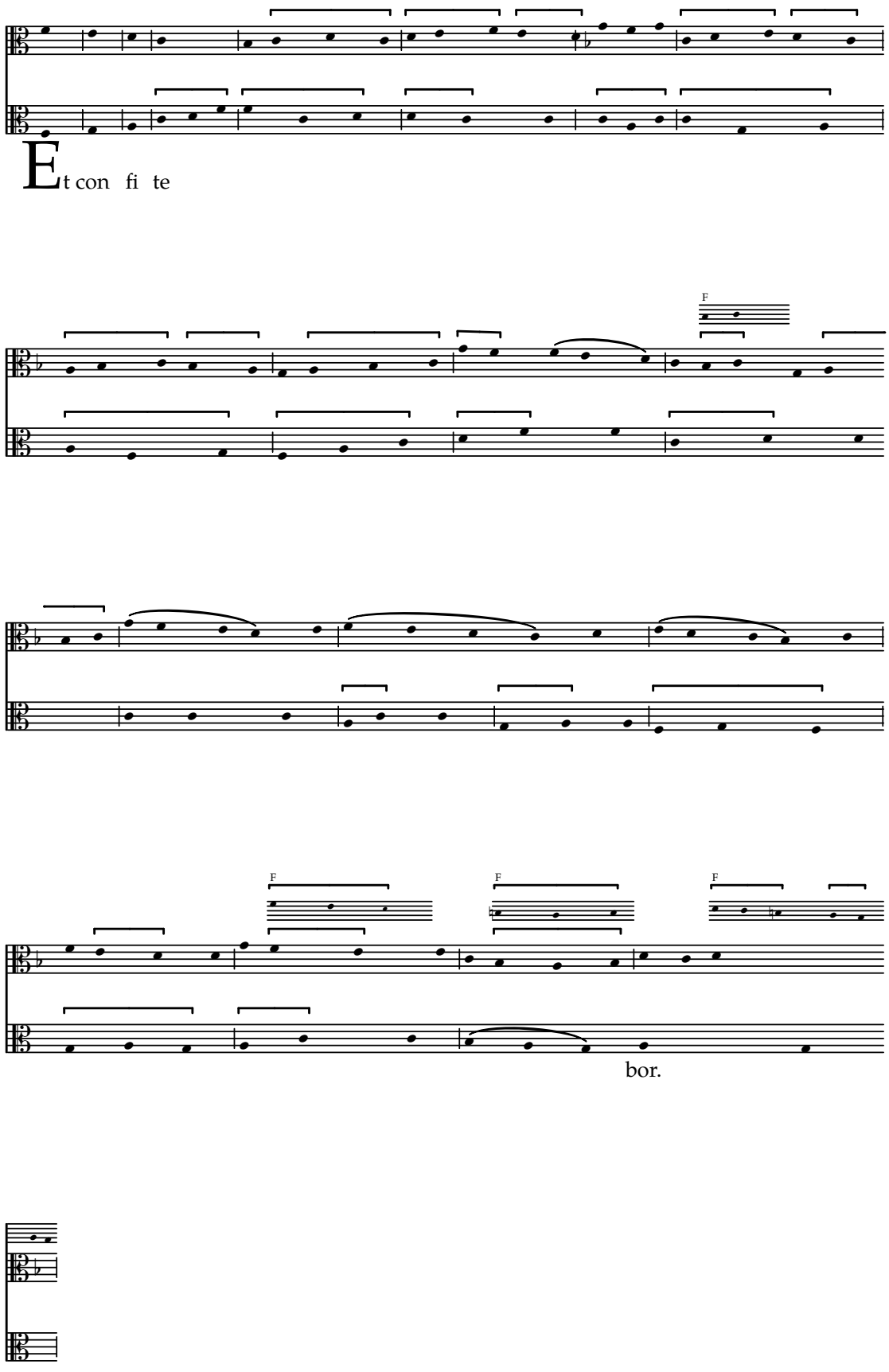




Et confitebor

Concordances from F

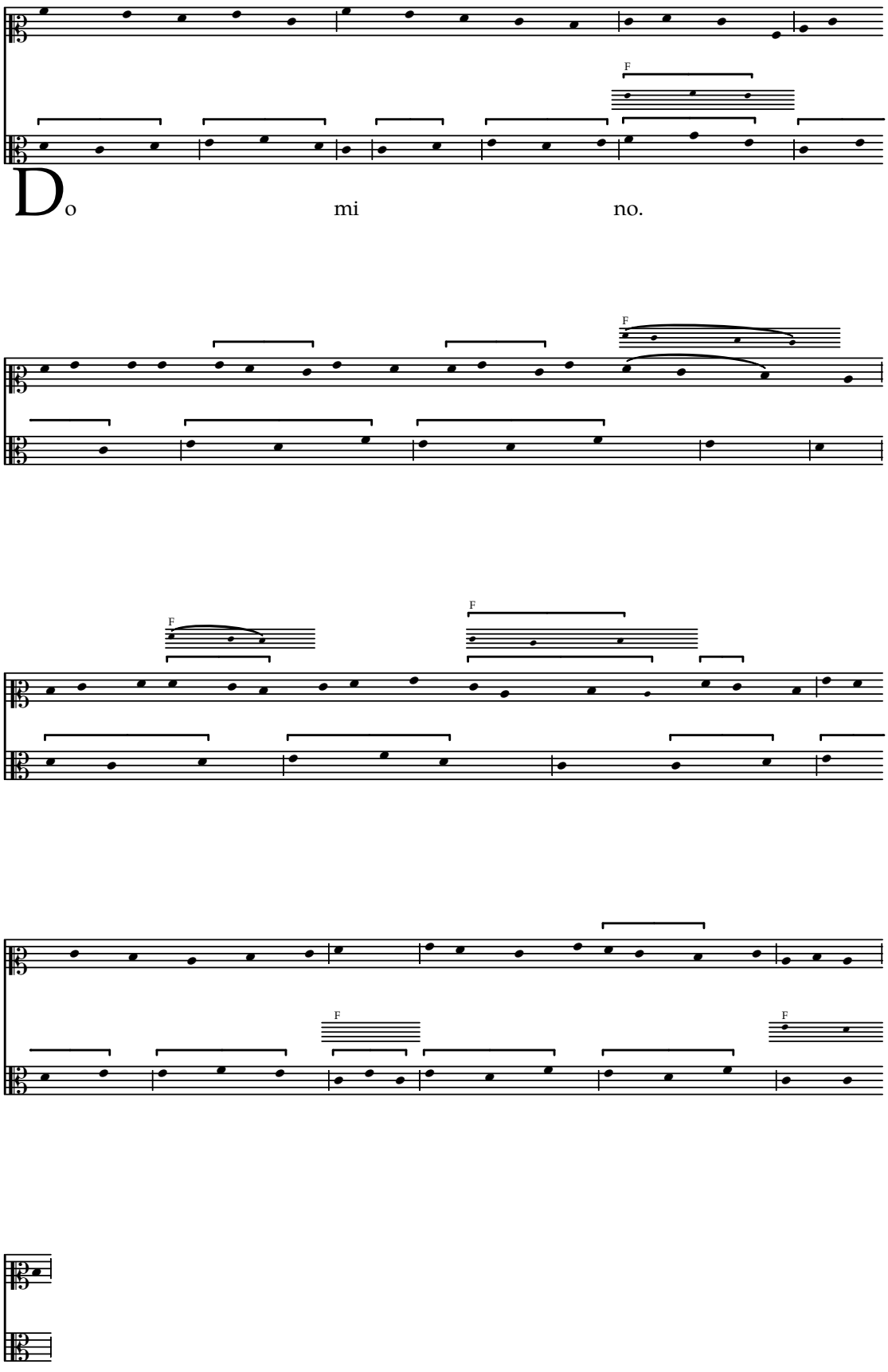
f. 56



Domino

Concordances from F

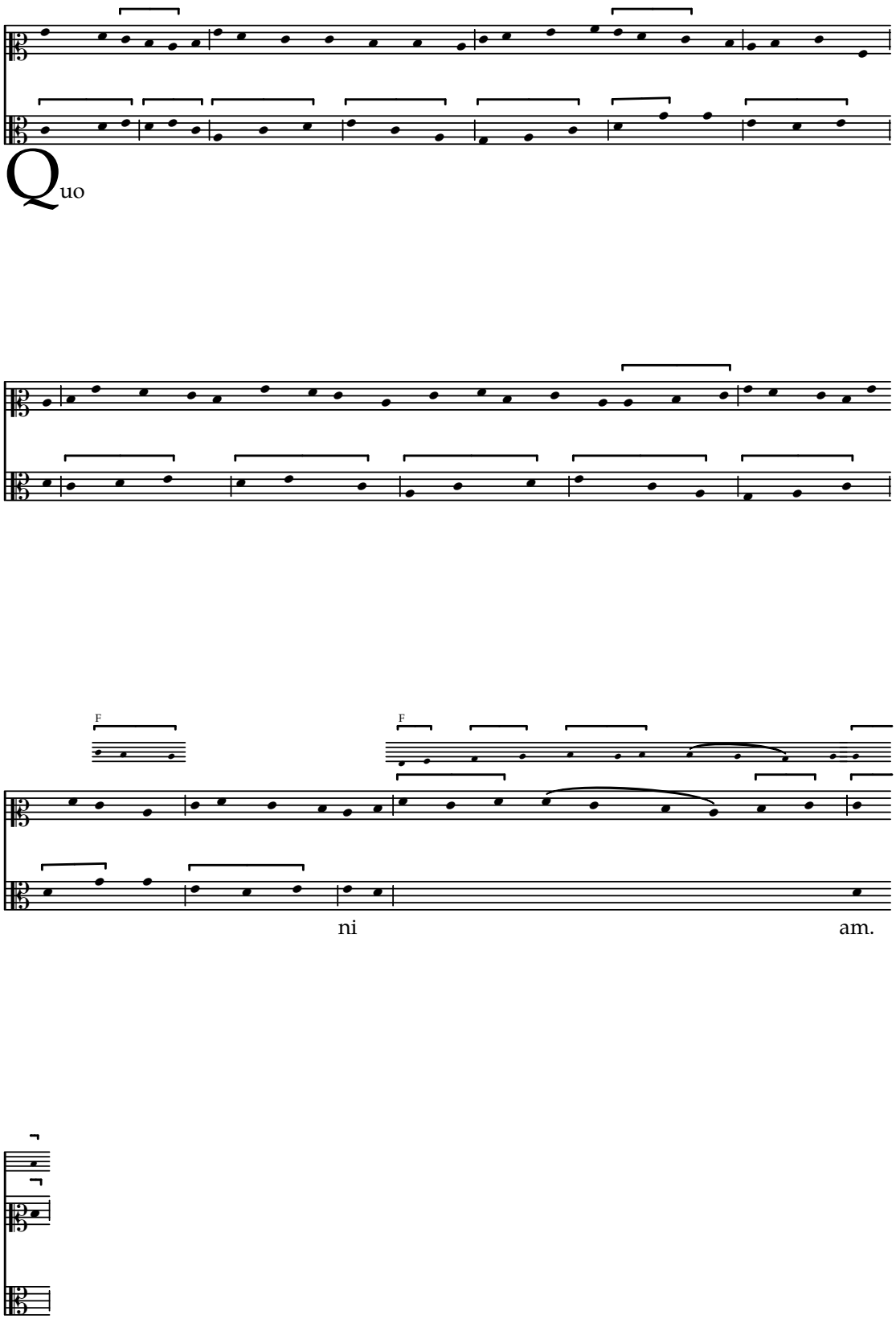
f. 56



Quoniam

Concordances from F

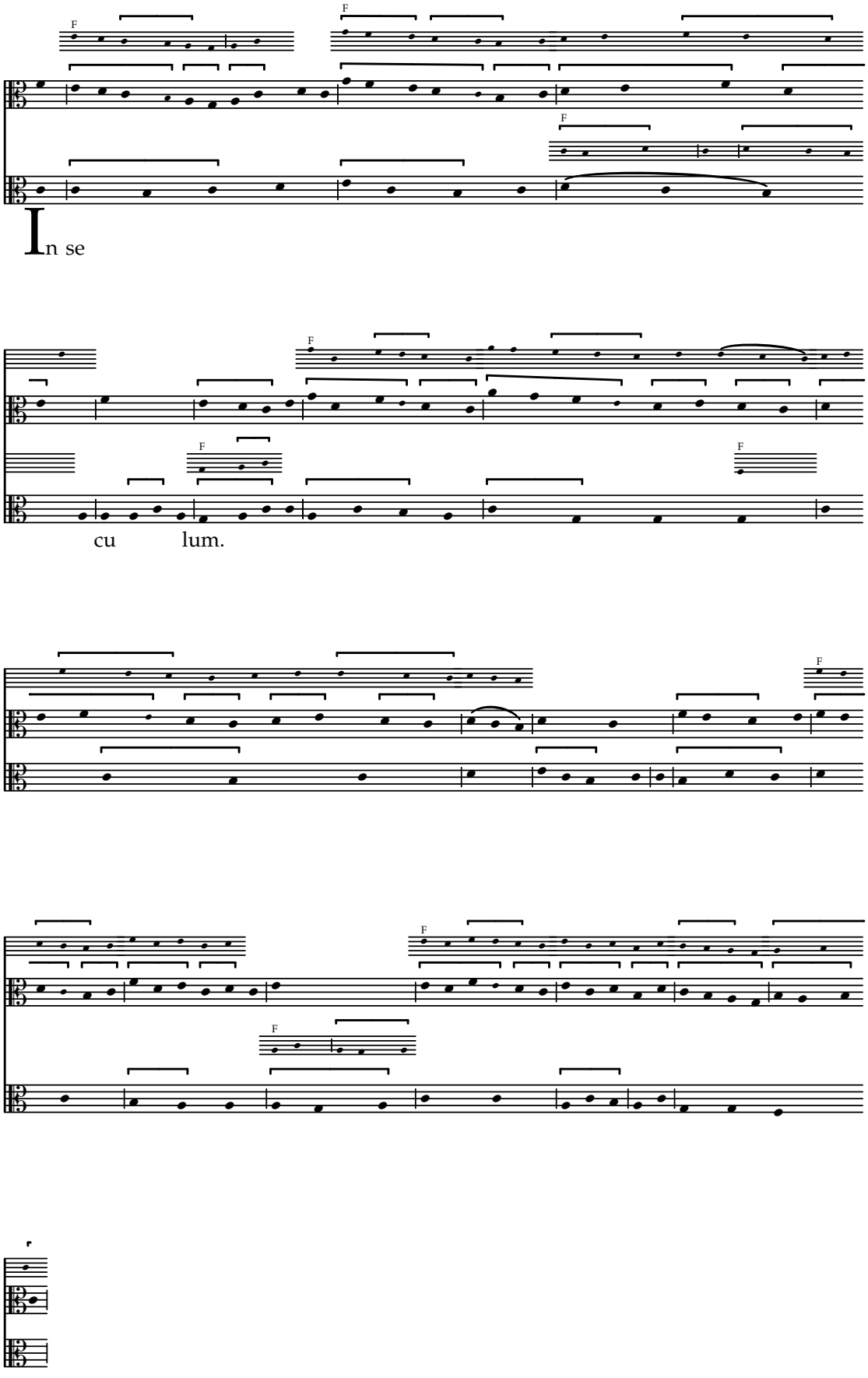
f. 56v



In seculum

Concordances from F

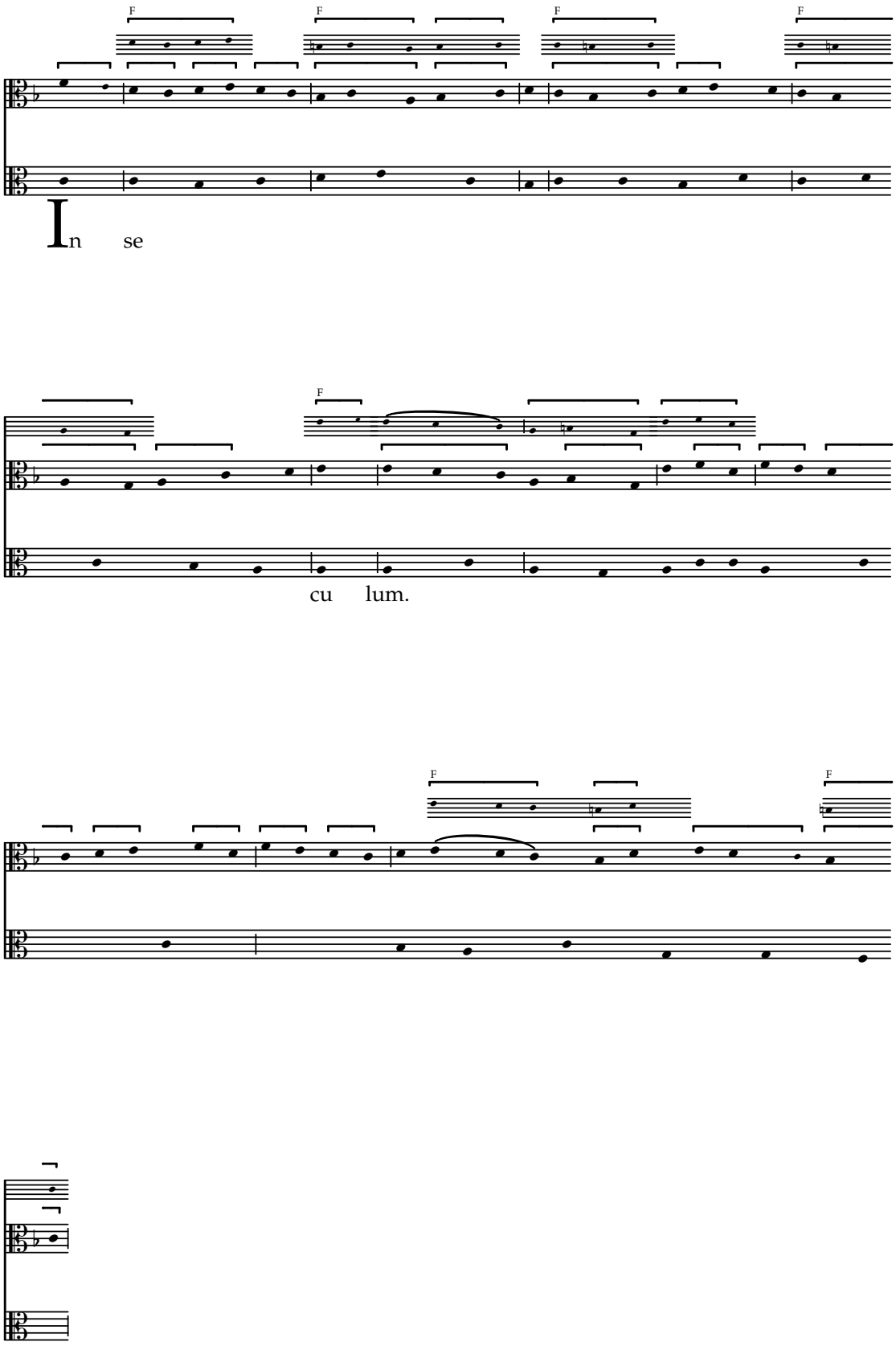
f. 56v



In seculum

Concordances from F

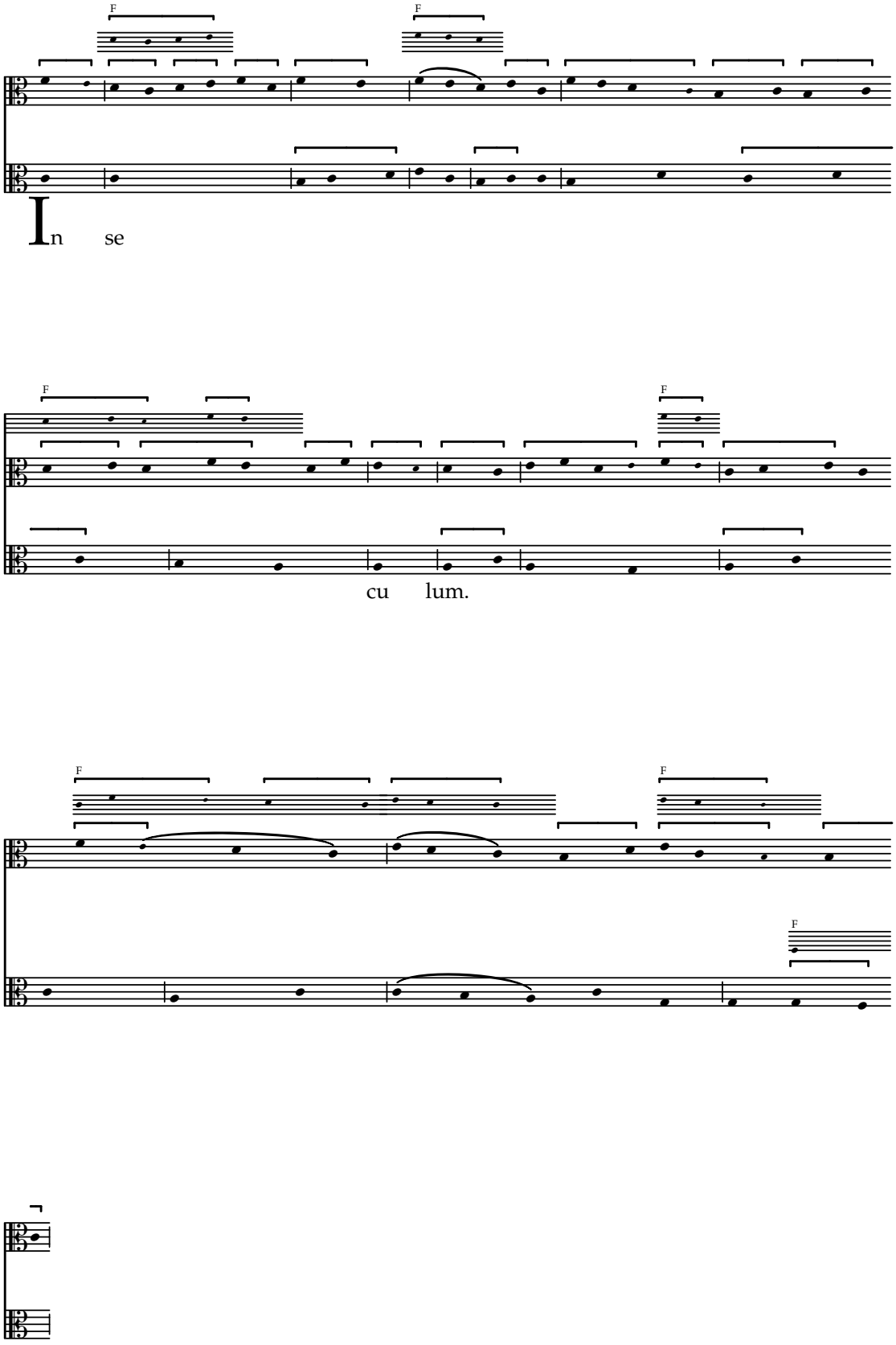
f. 56v



In seculum

Concordances from F

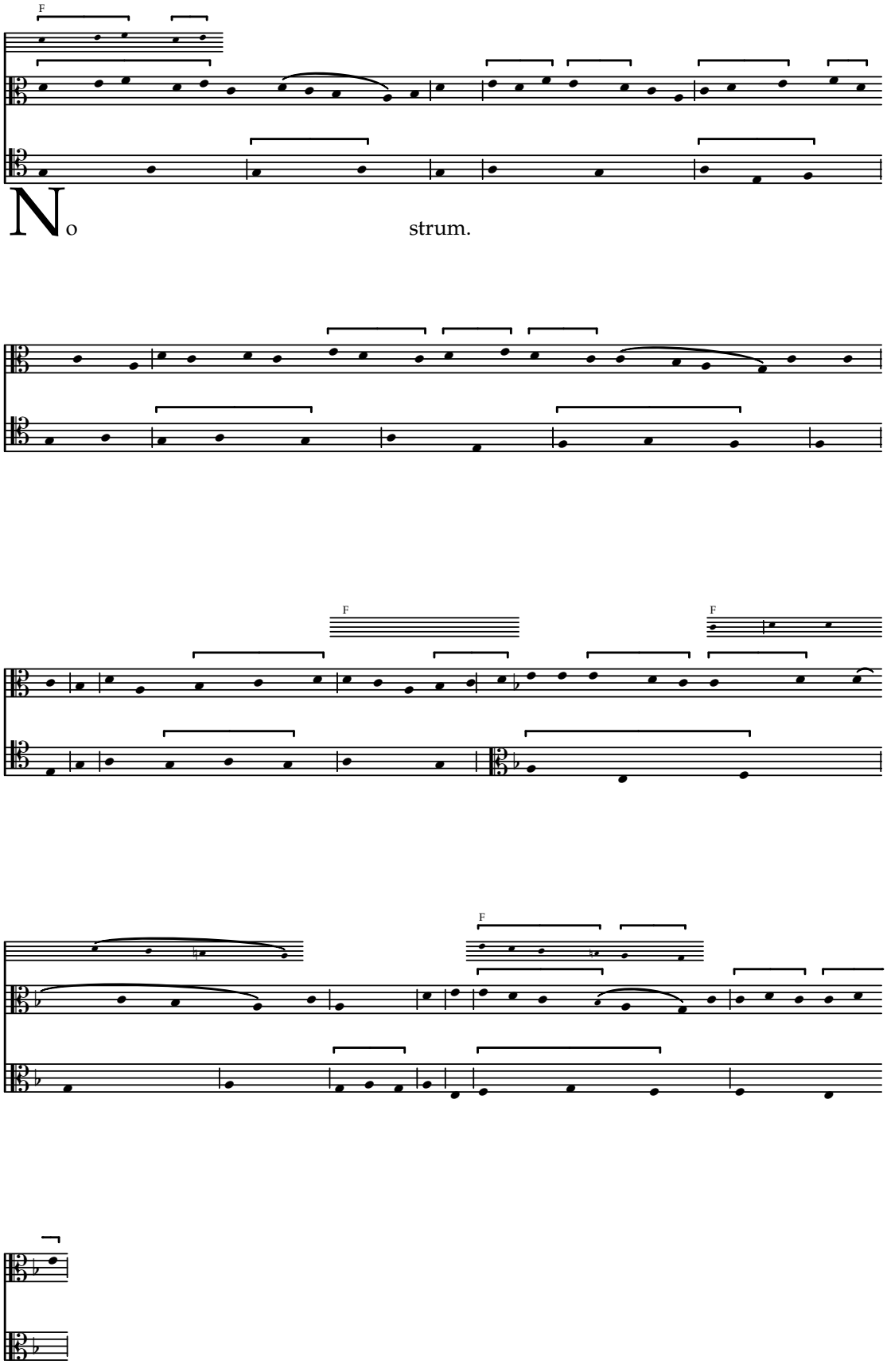
f. 56v



Nostrum

Concordances from F

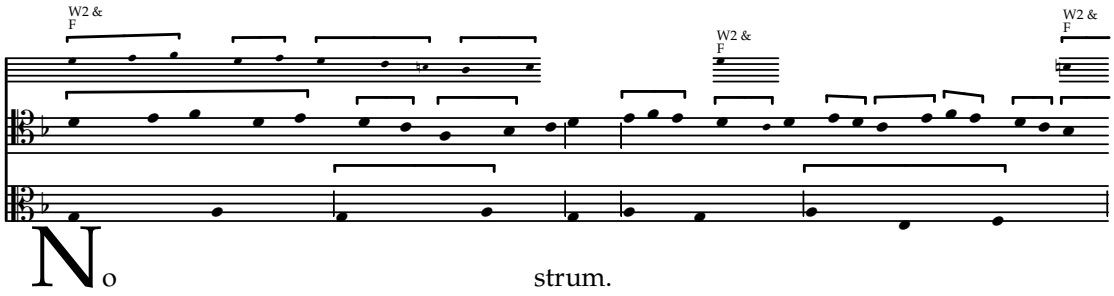
f. 56v–57

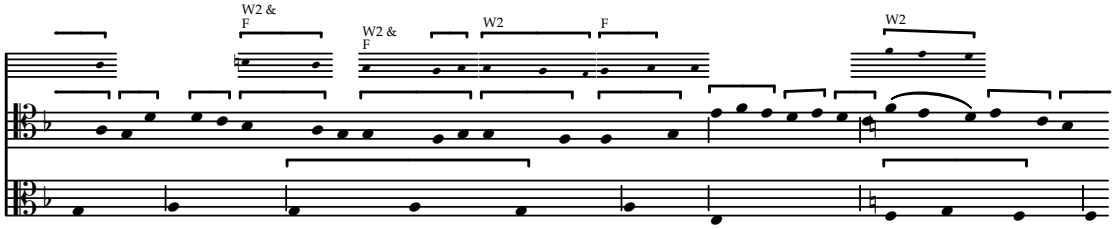


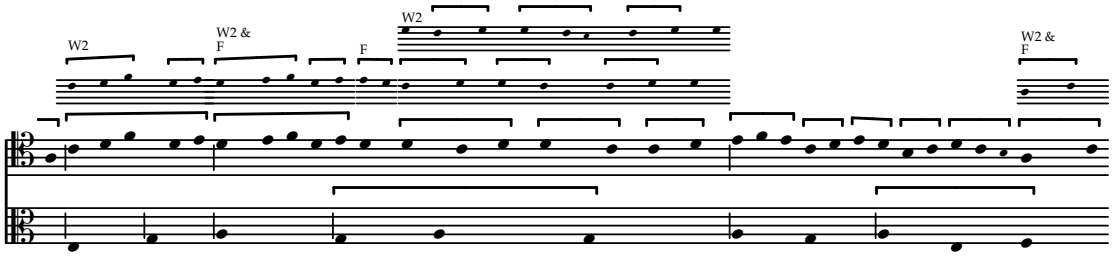
Nostrum

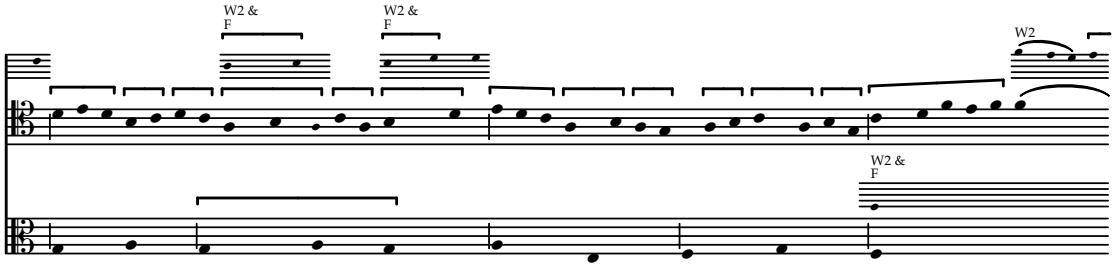
Concordances from W2 & F

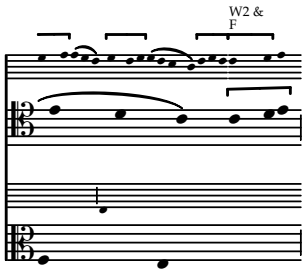
f. 57







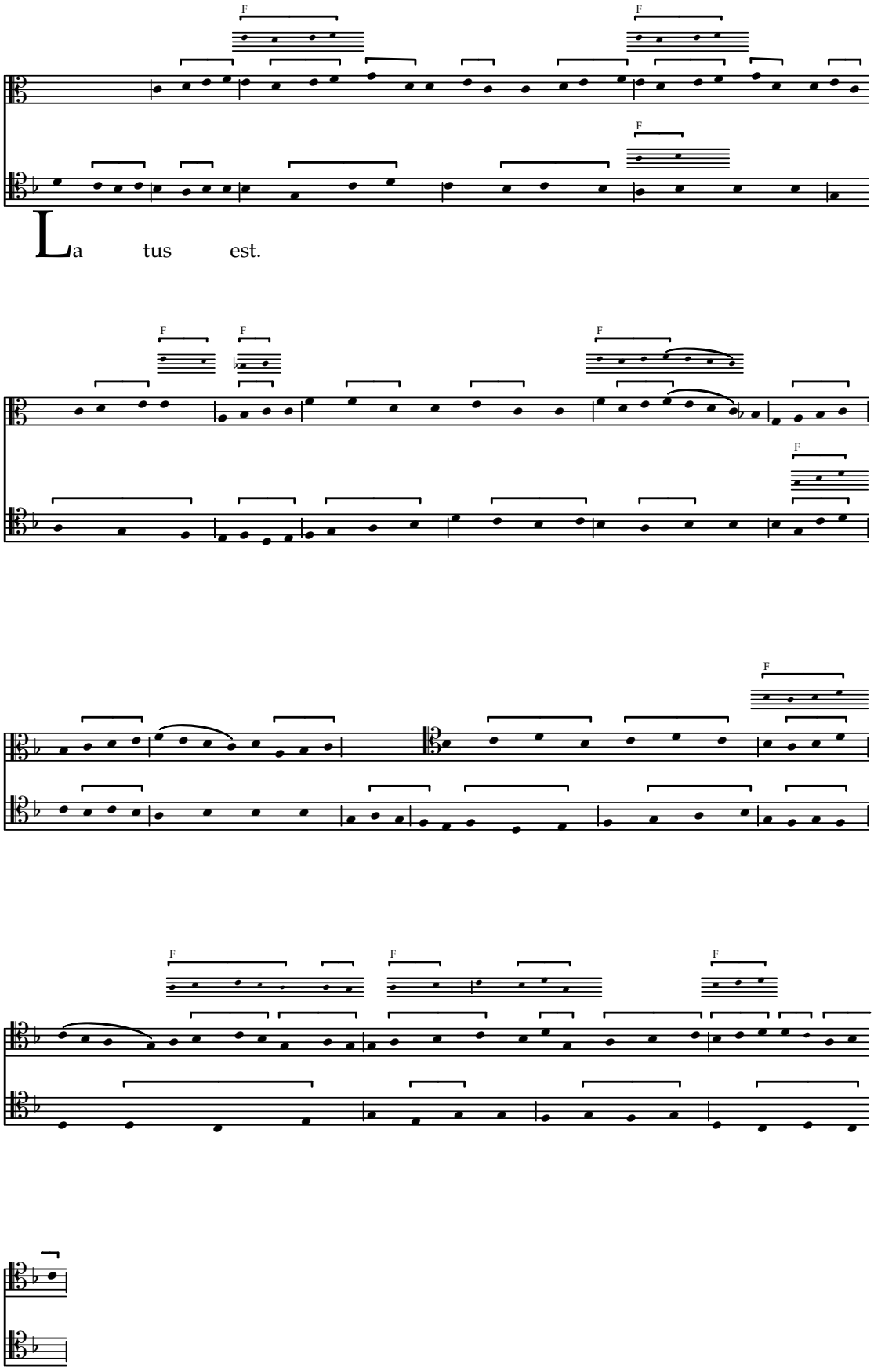




[Immo]latus est

Concordances from F

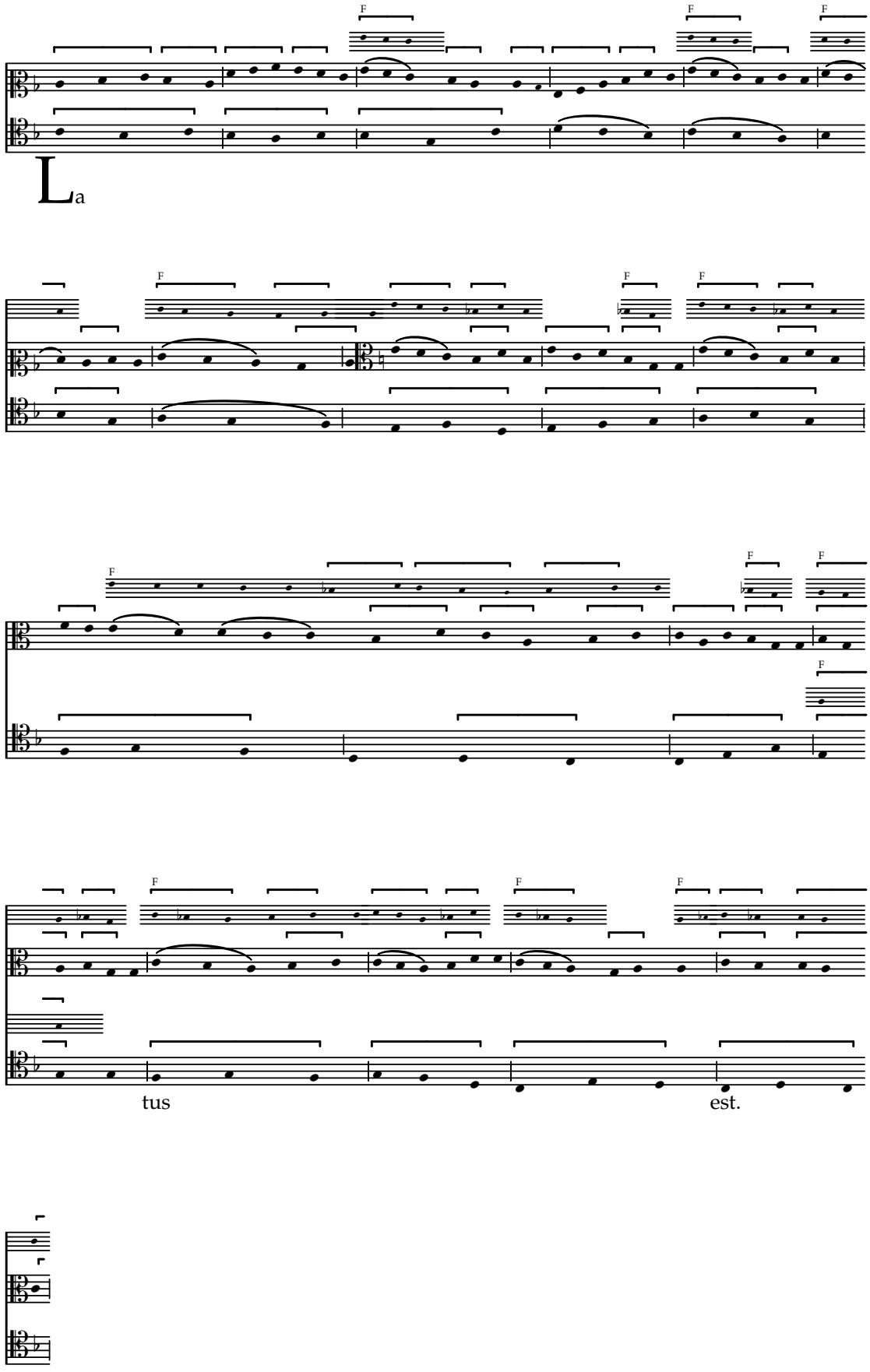
f. 57



[Immo]latus est

Concordances from F

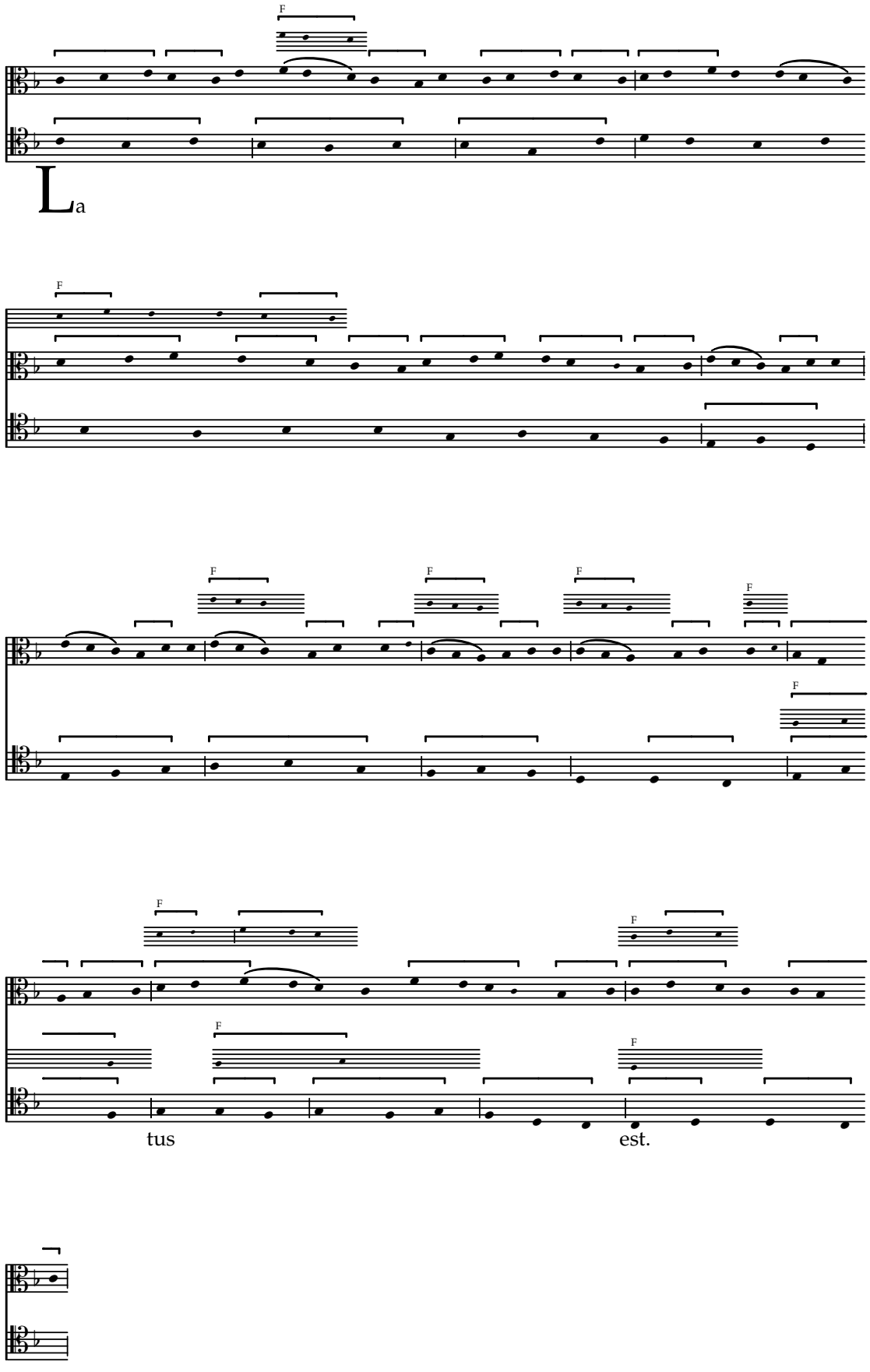
f. 57



[Immo]latus est

Concordances from F

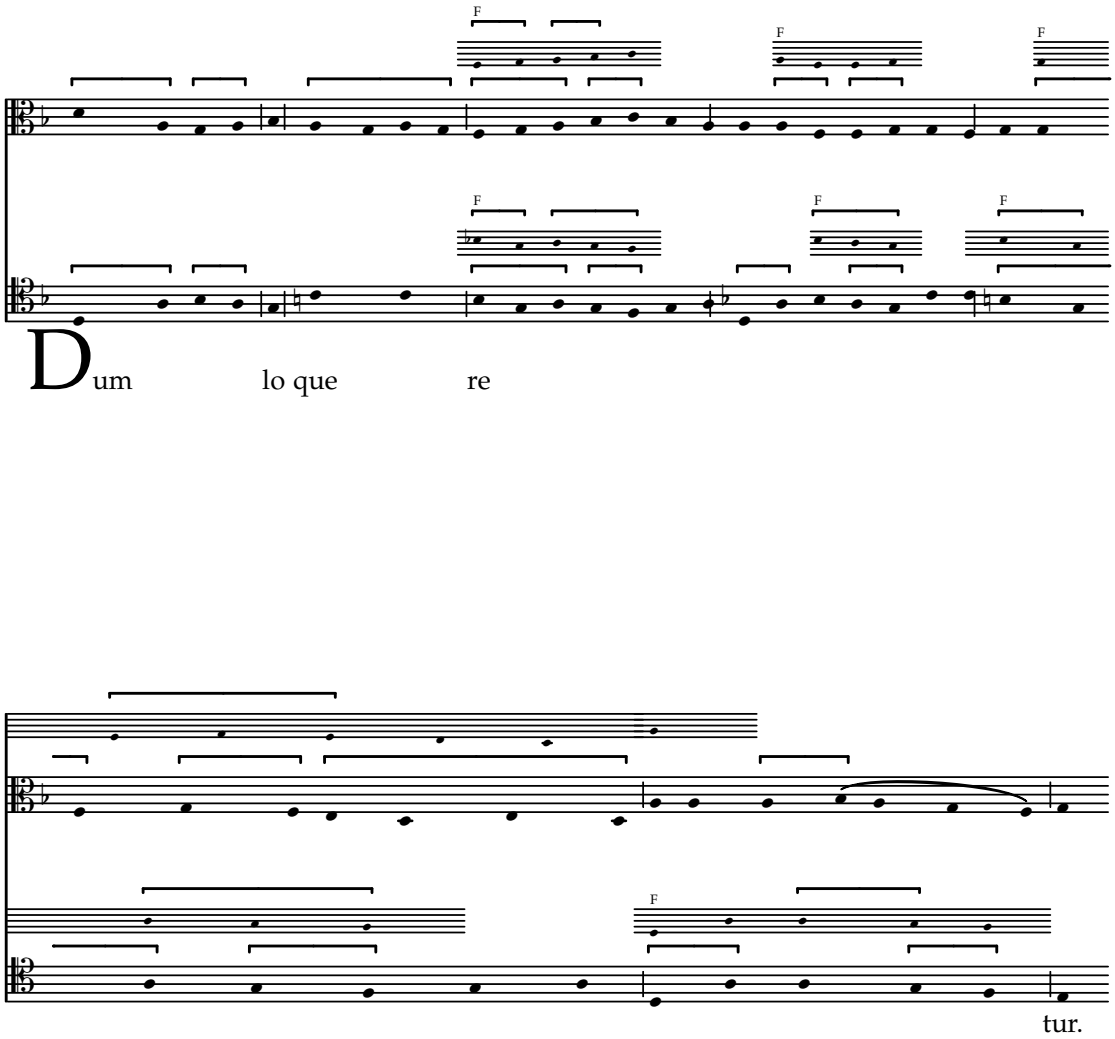
f. 57



Dum loqueretur

Concordances from F

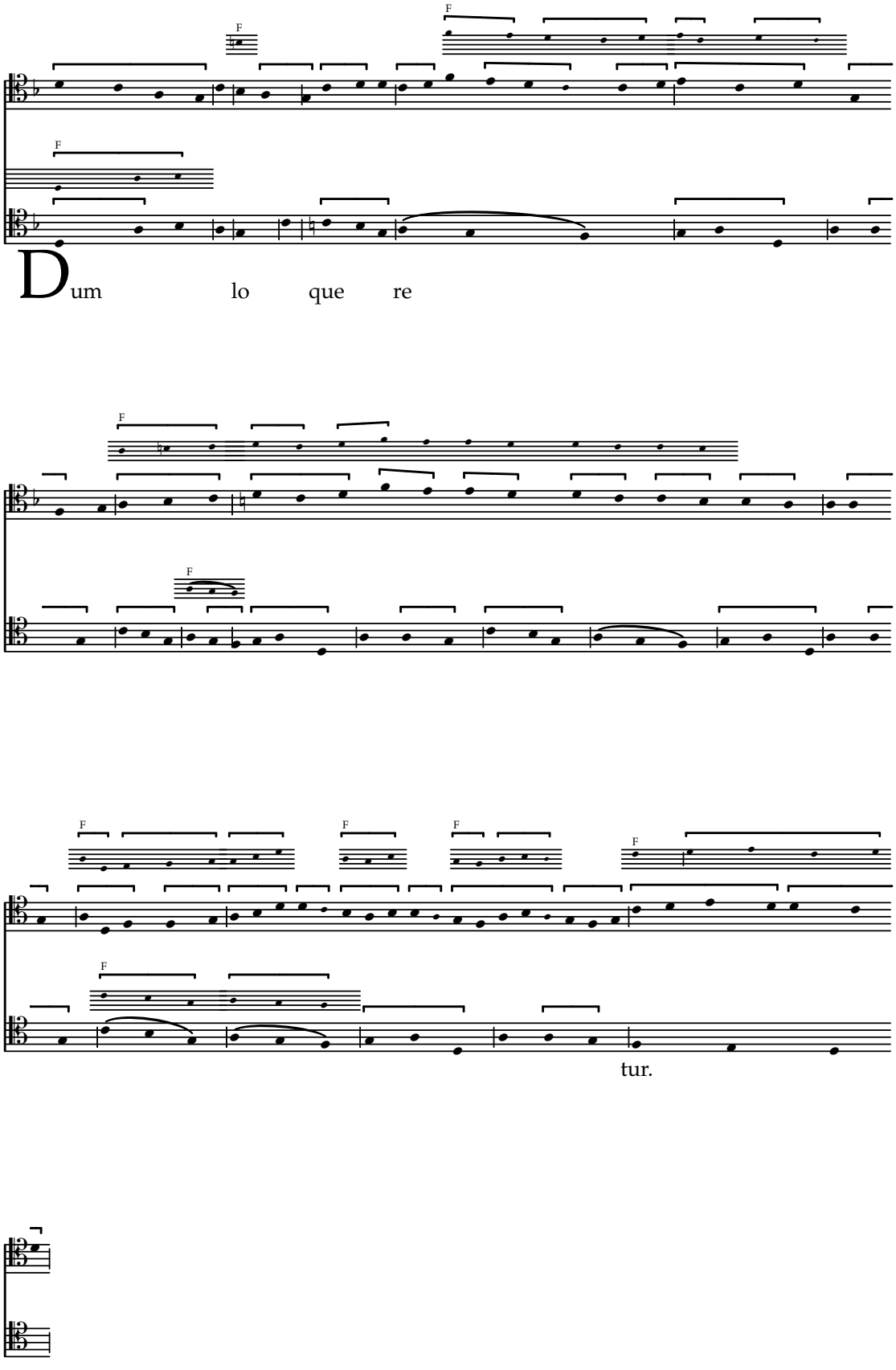
f. 57v



Dum loqueretur

Concordances from F

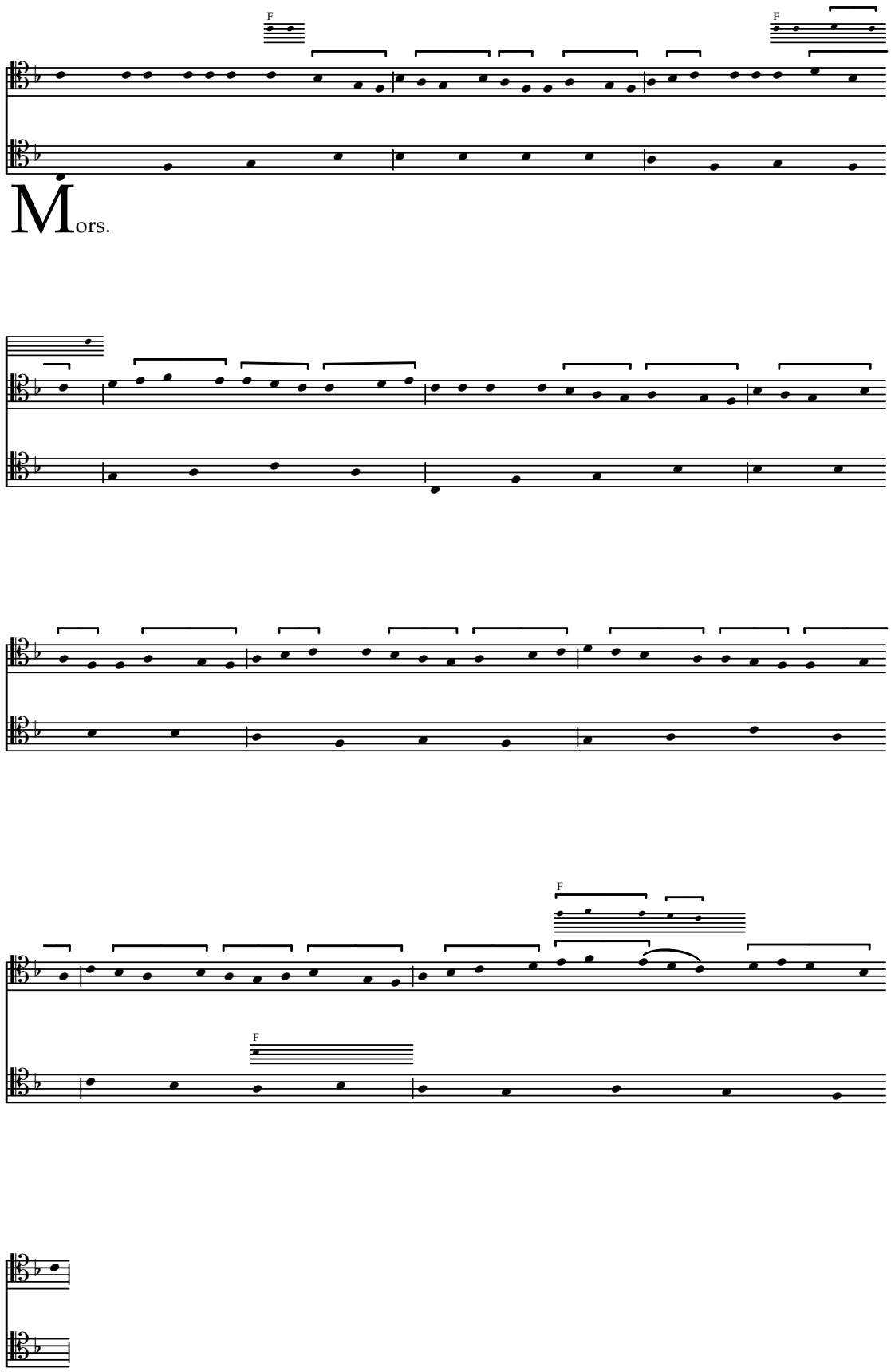
f. 57v



Mors

Concordances from F

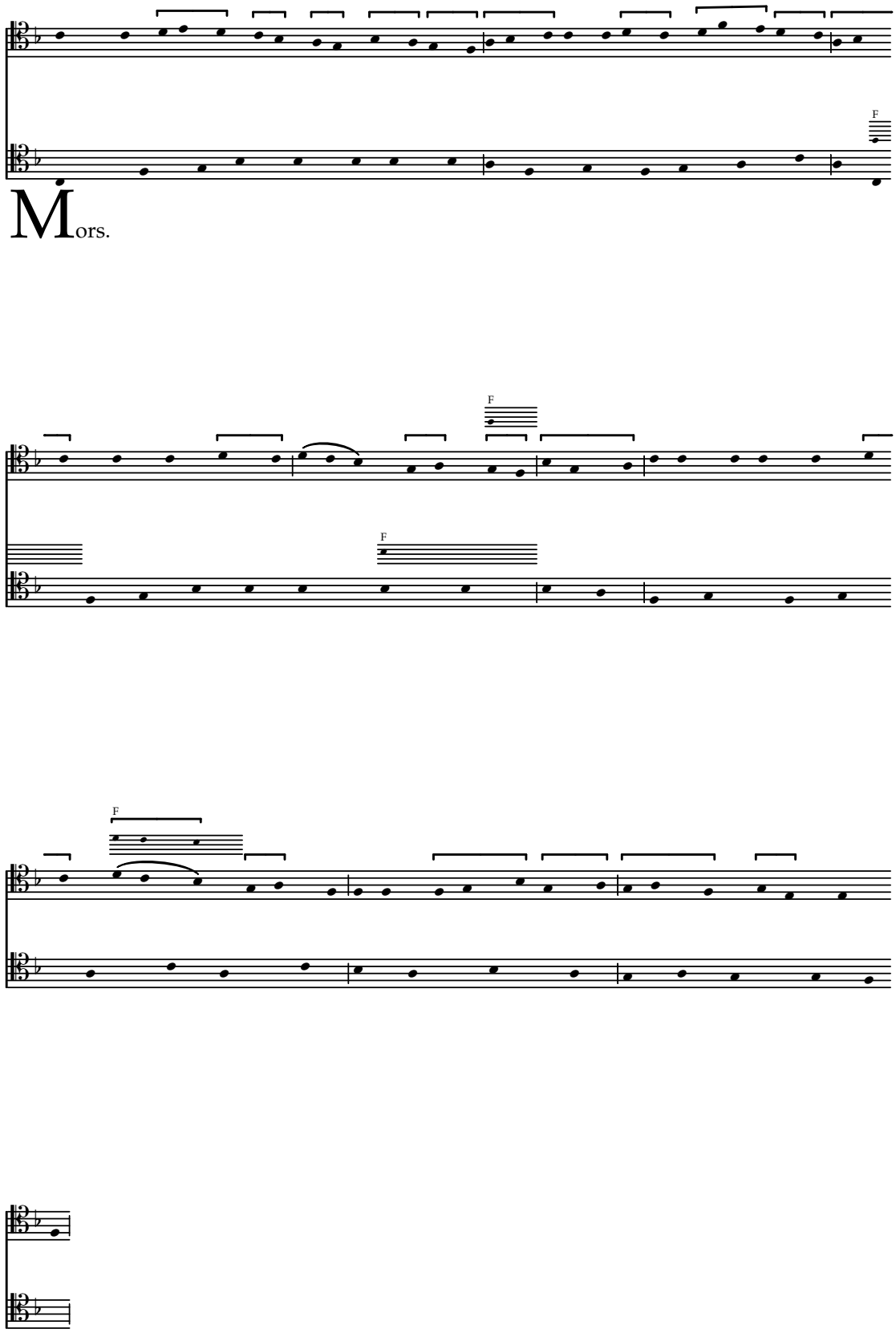
f. 57v



Mors

Concordances from F

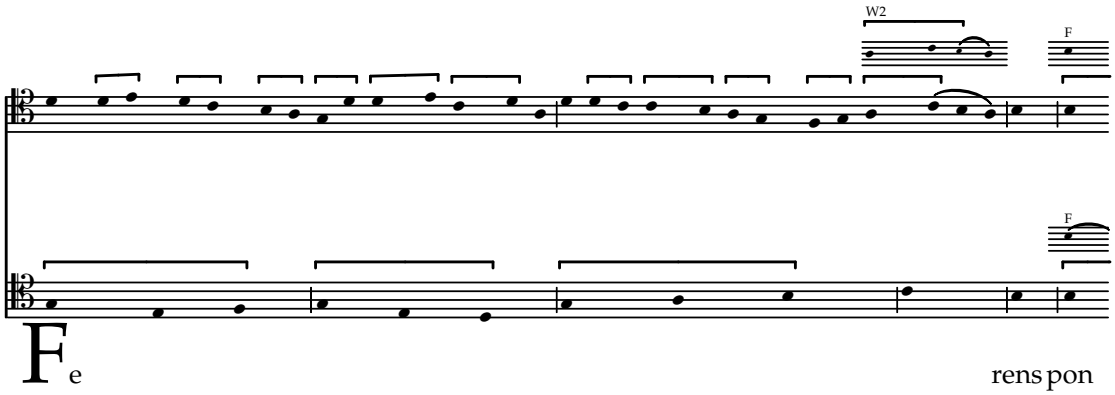
f. 57v

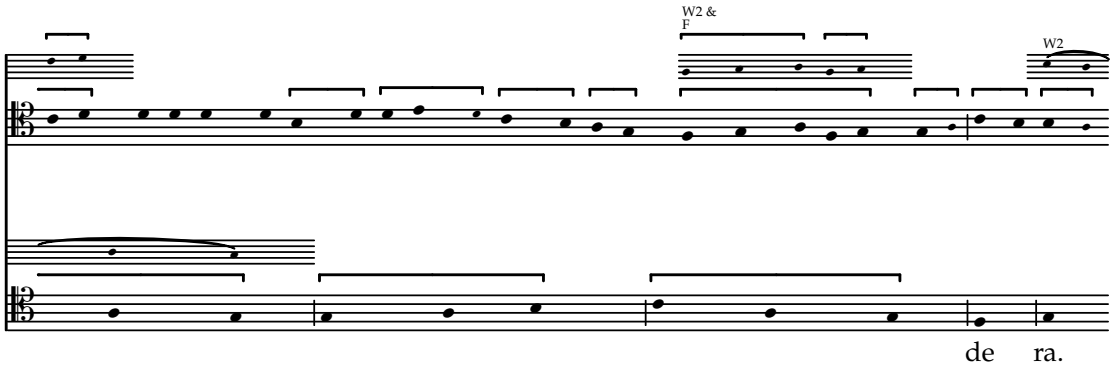


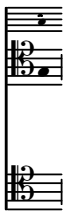
Ferens pondera

Concordances from W2 & F

f. 57v



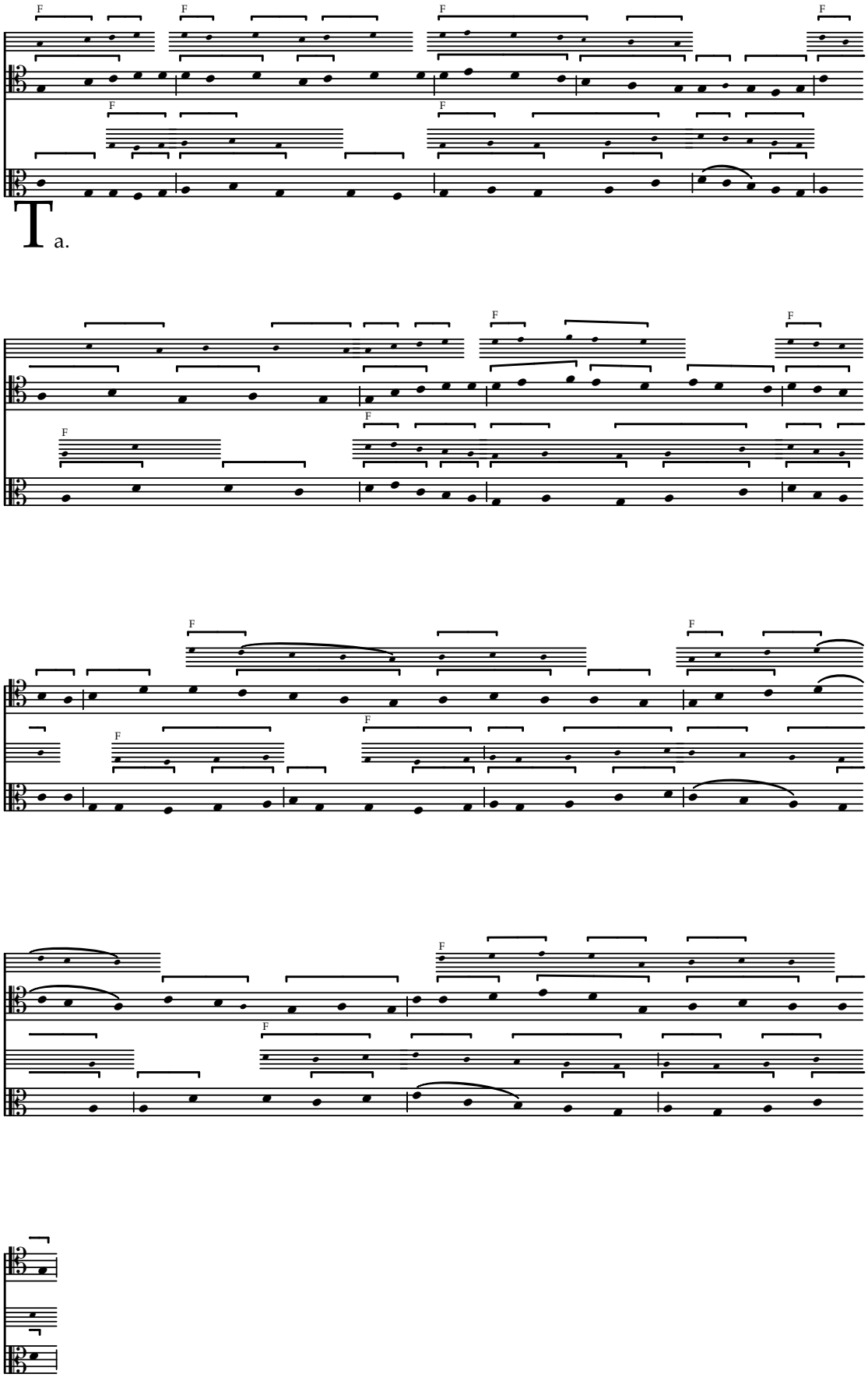




[Captiui]ta[tem]

Concordances from F

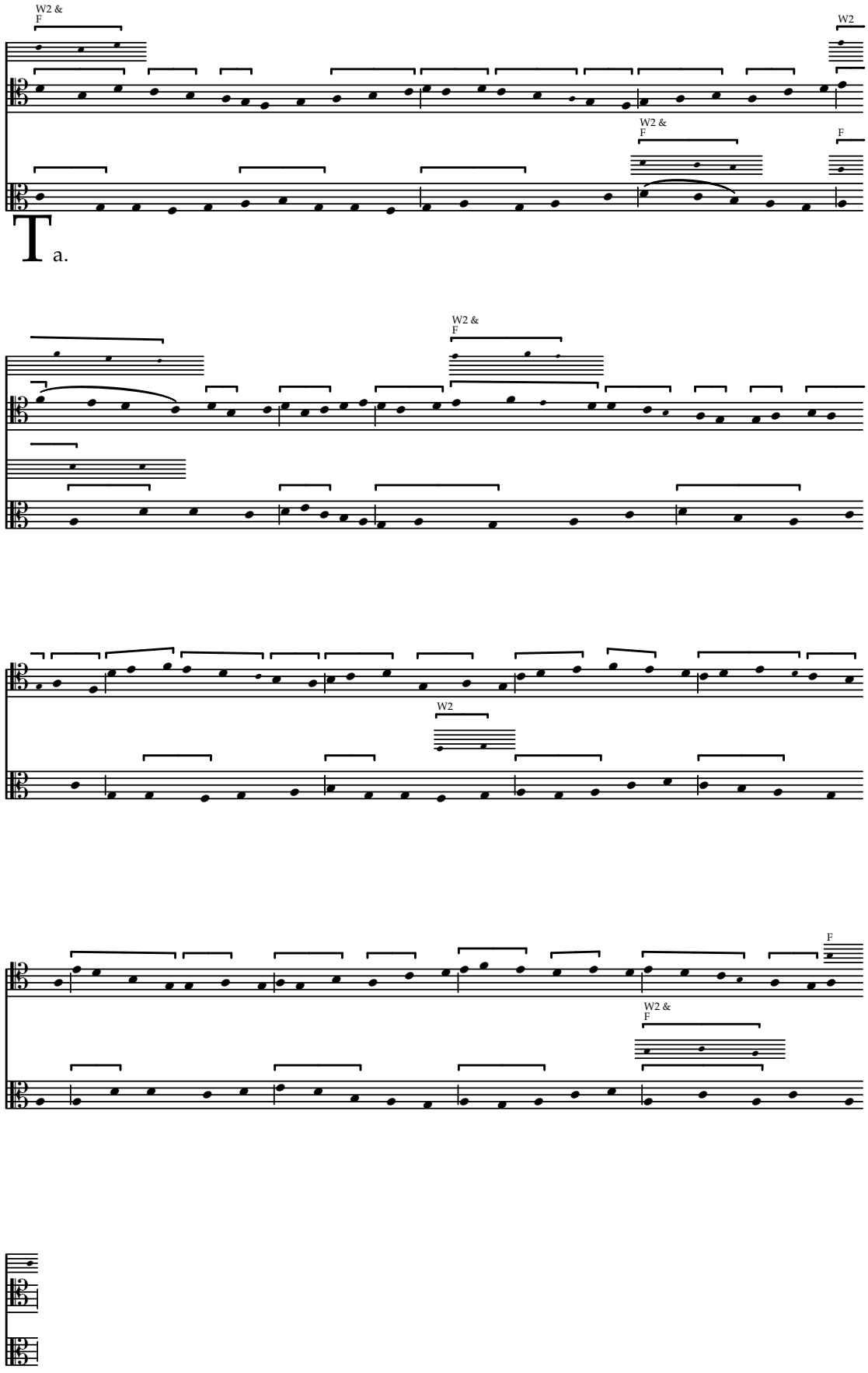
f. 57v



[Captiui]ta[tem]

Concordances from W2 & F

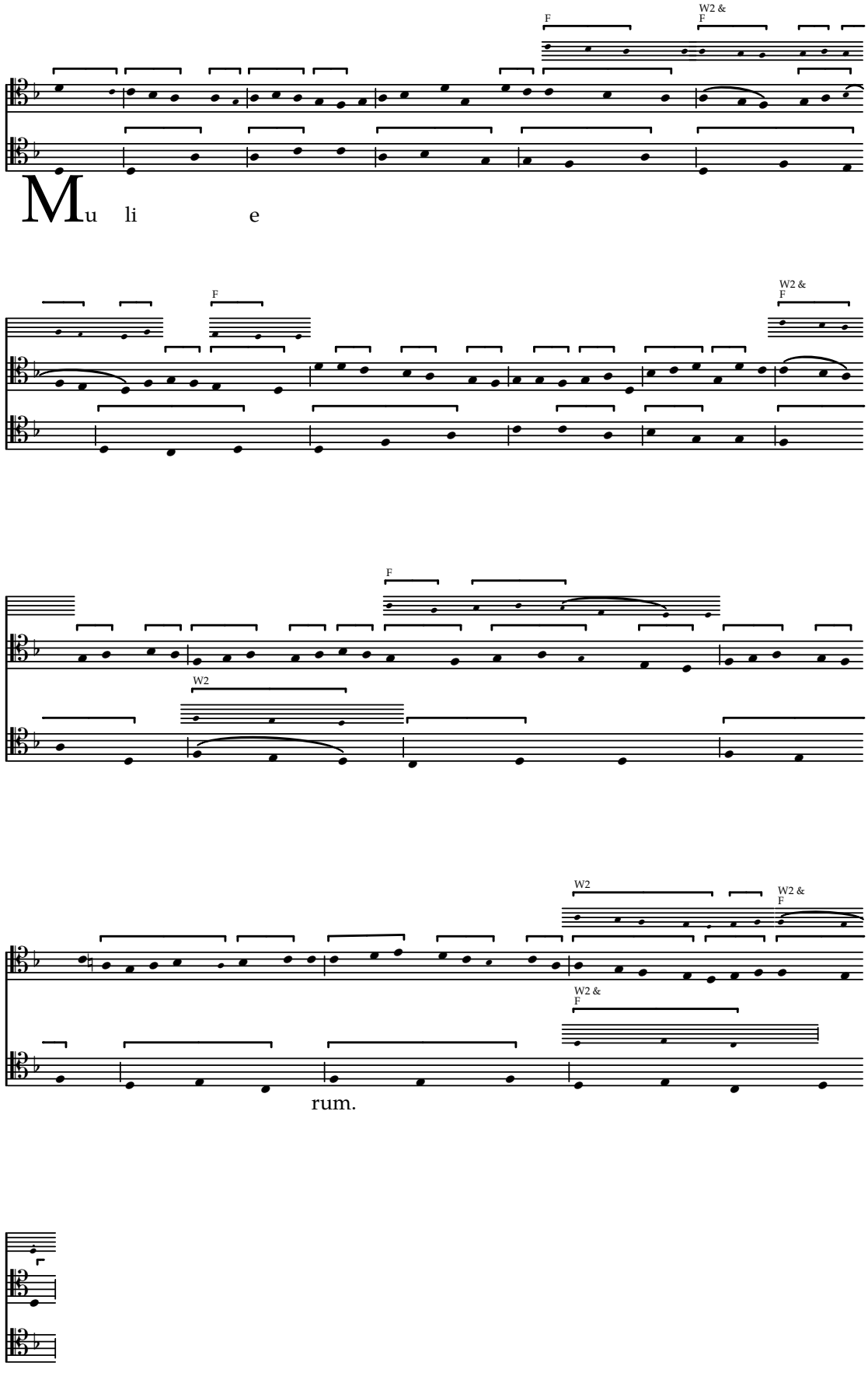
f. 58



Mulierum

Concordances from W2 & F

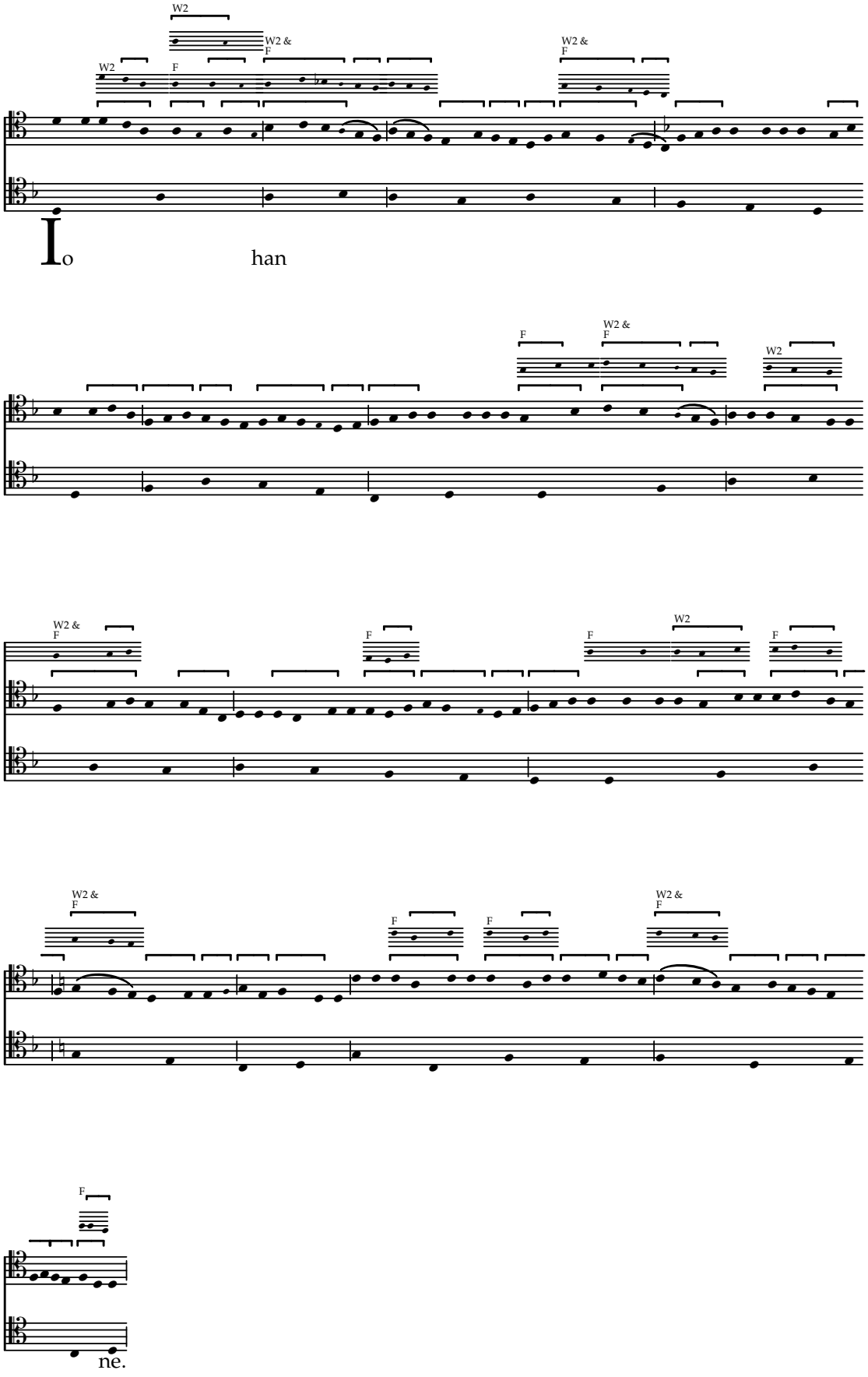
f. 58



Iohanne

Concordances from W2 & F

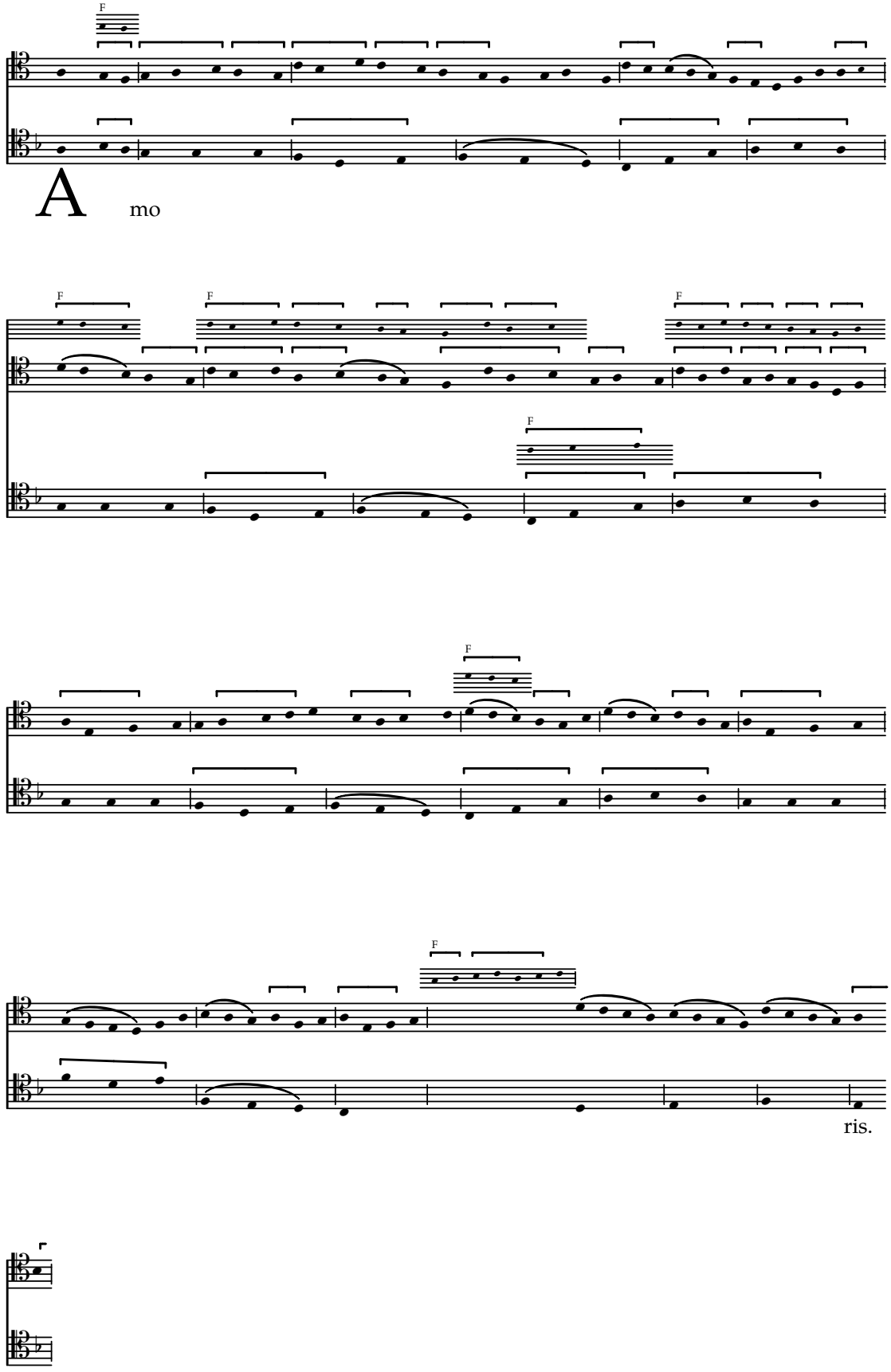
f. 58



Amoris

Concordances from F

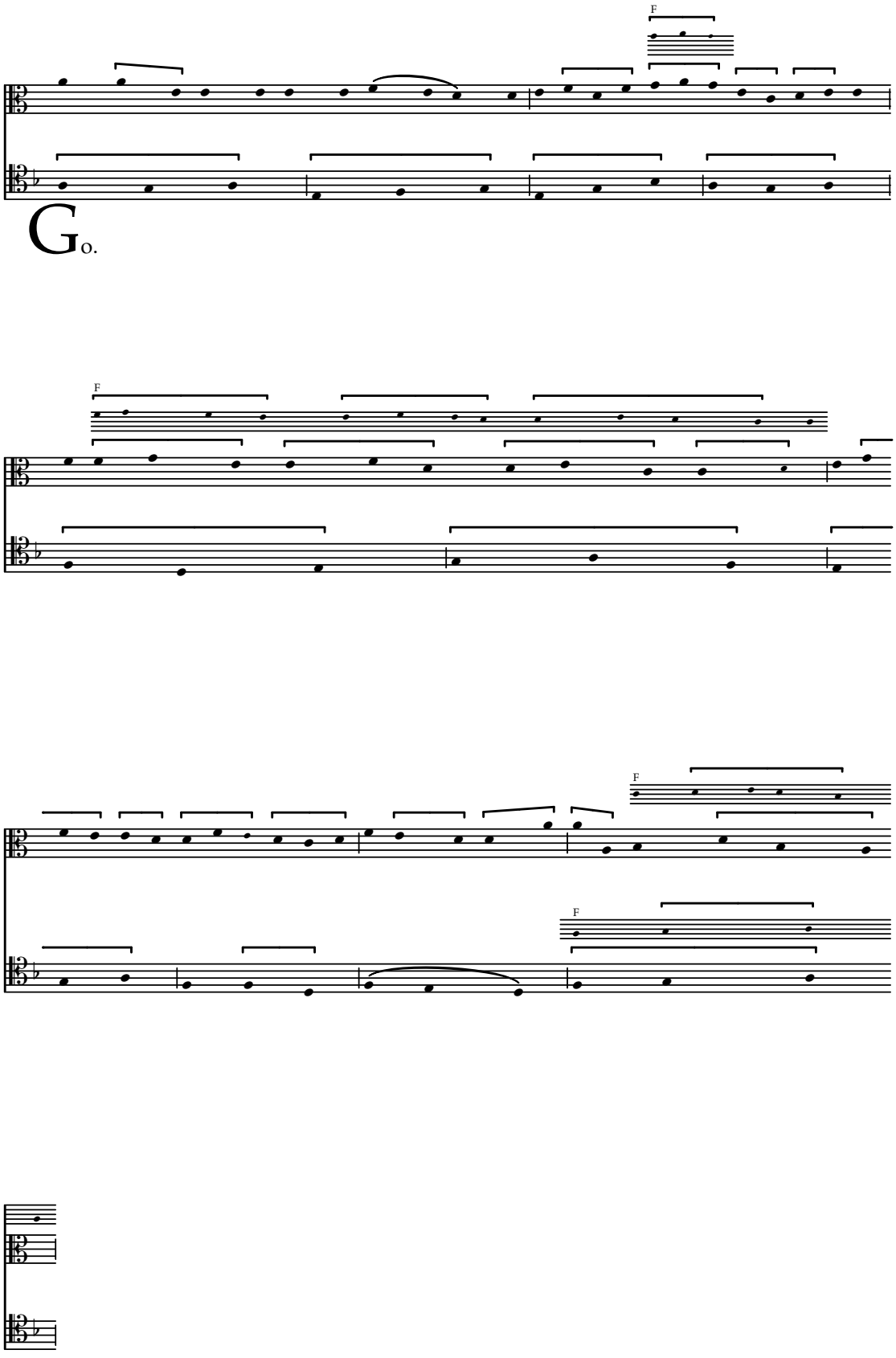
f. 58



[Uir]go

Concordances from F

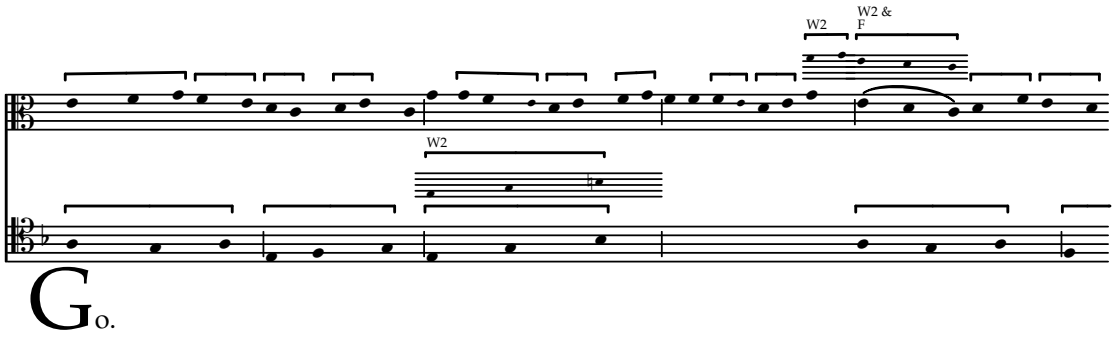
f. 58v

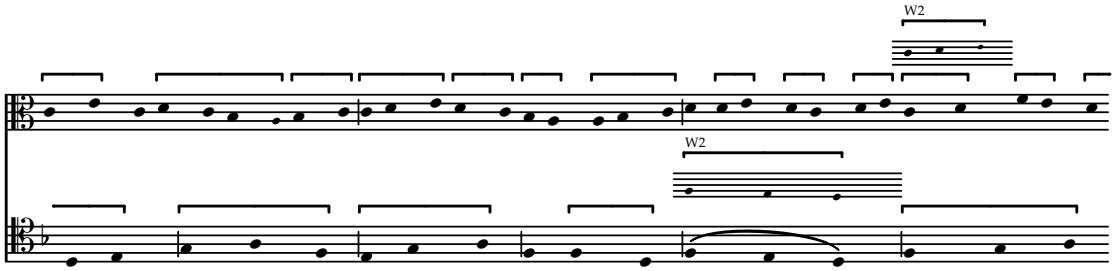


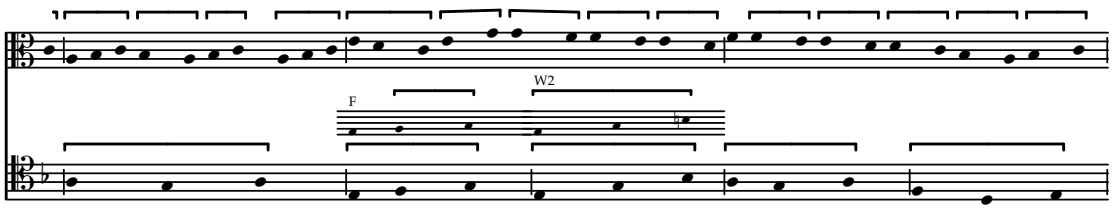
[Uir]go

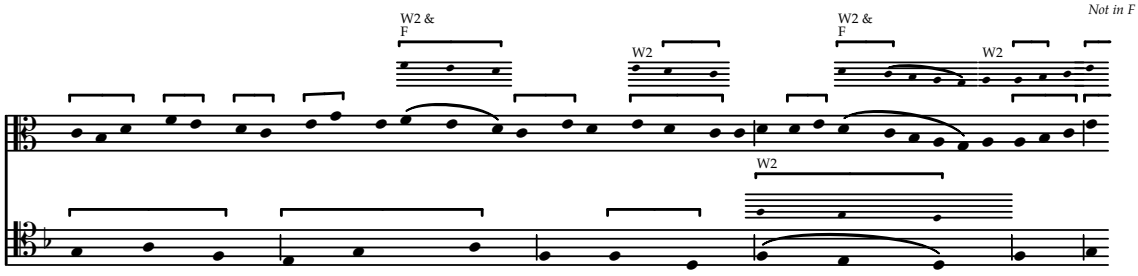
Concordances from W2 & F

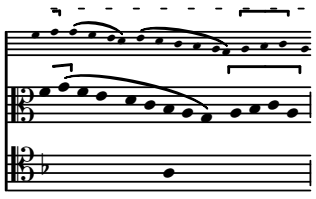
f. 58v







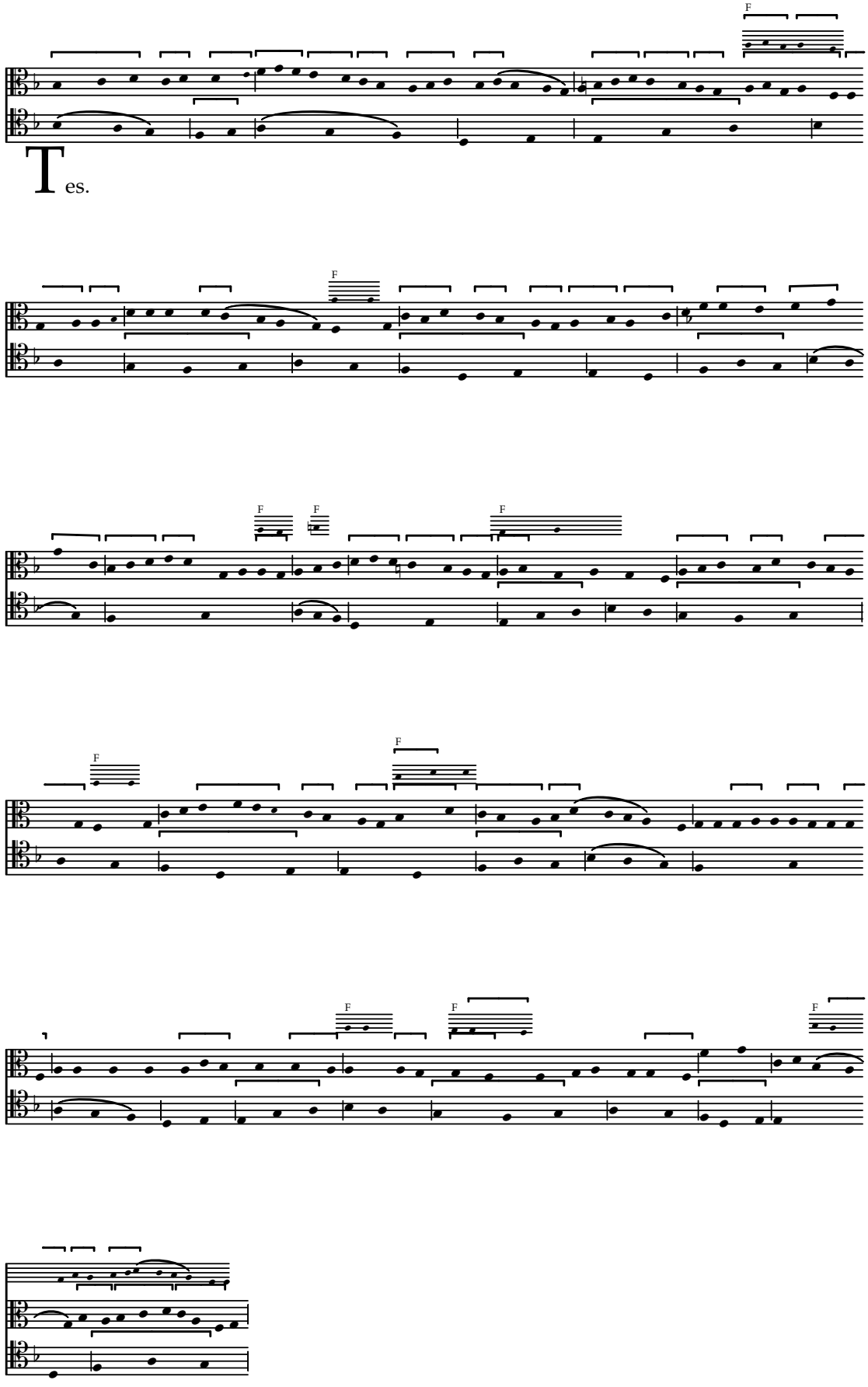




[Collaudan]tes

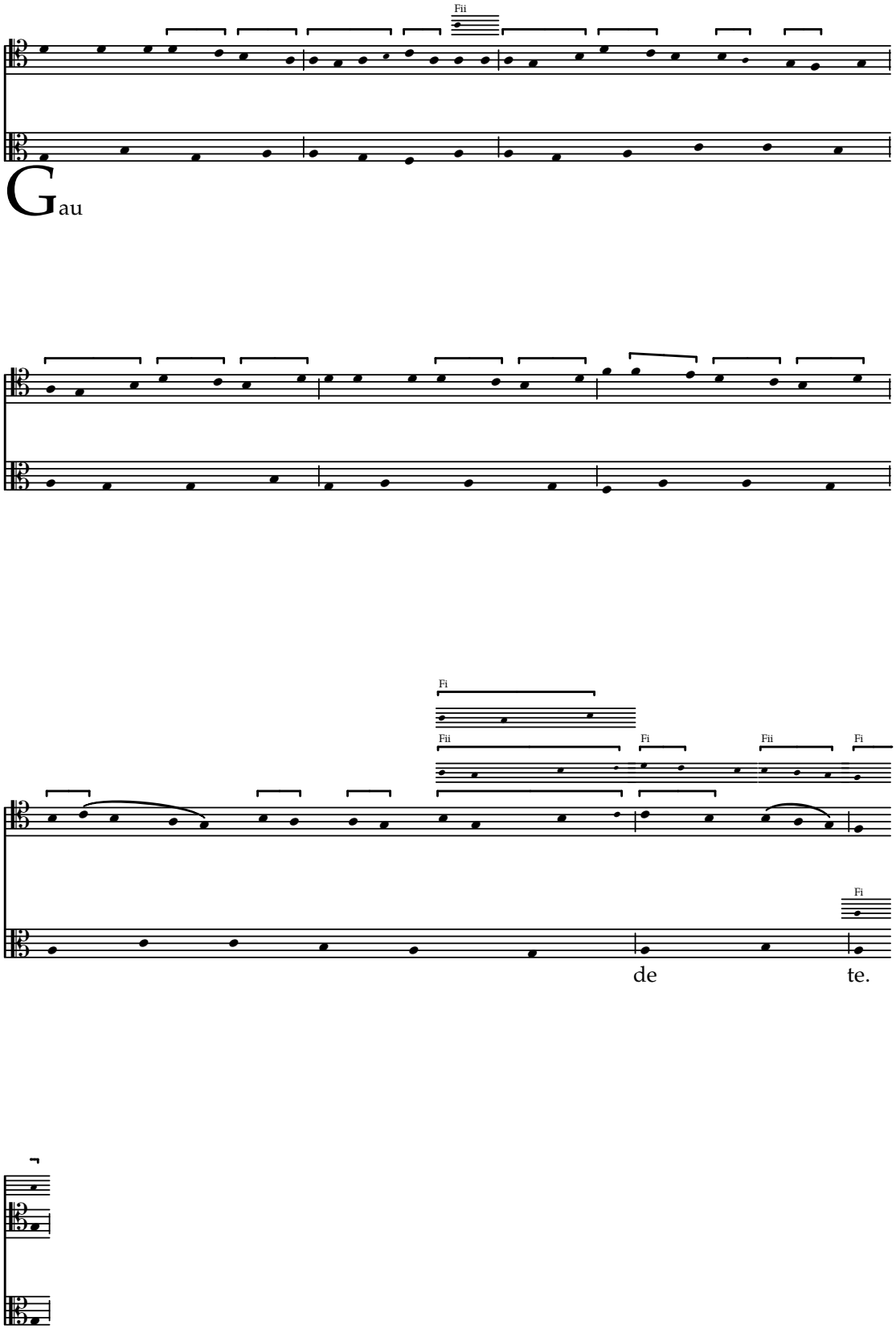
Concordances from F

f. 58v



Gaudete

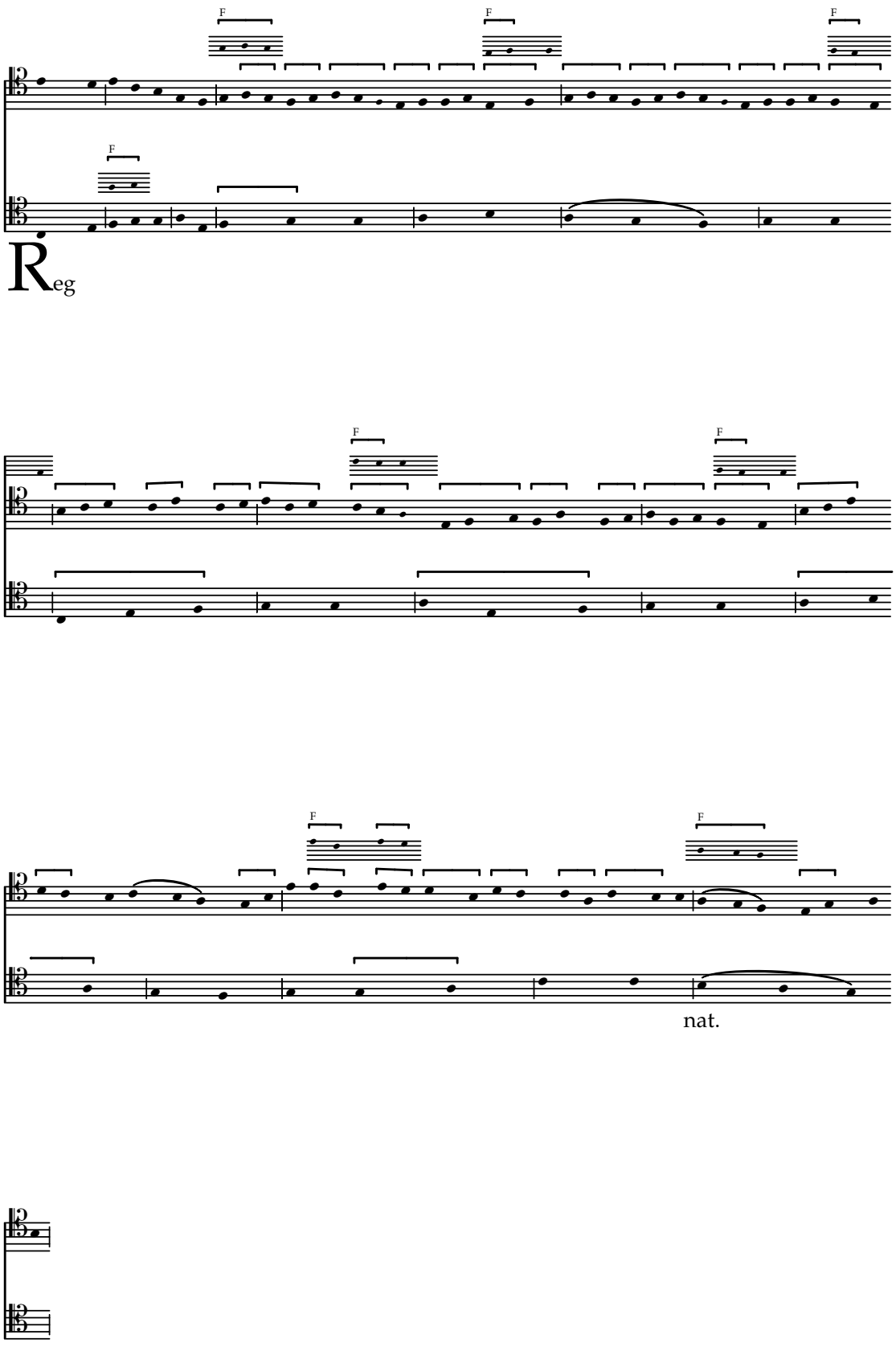
Concordances from F (two versions) f. 58v–59



Regnat

Concordances from F

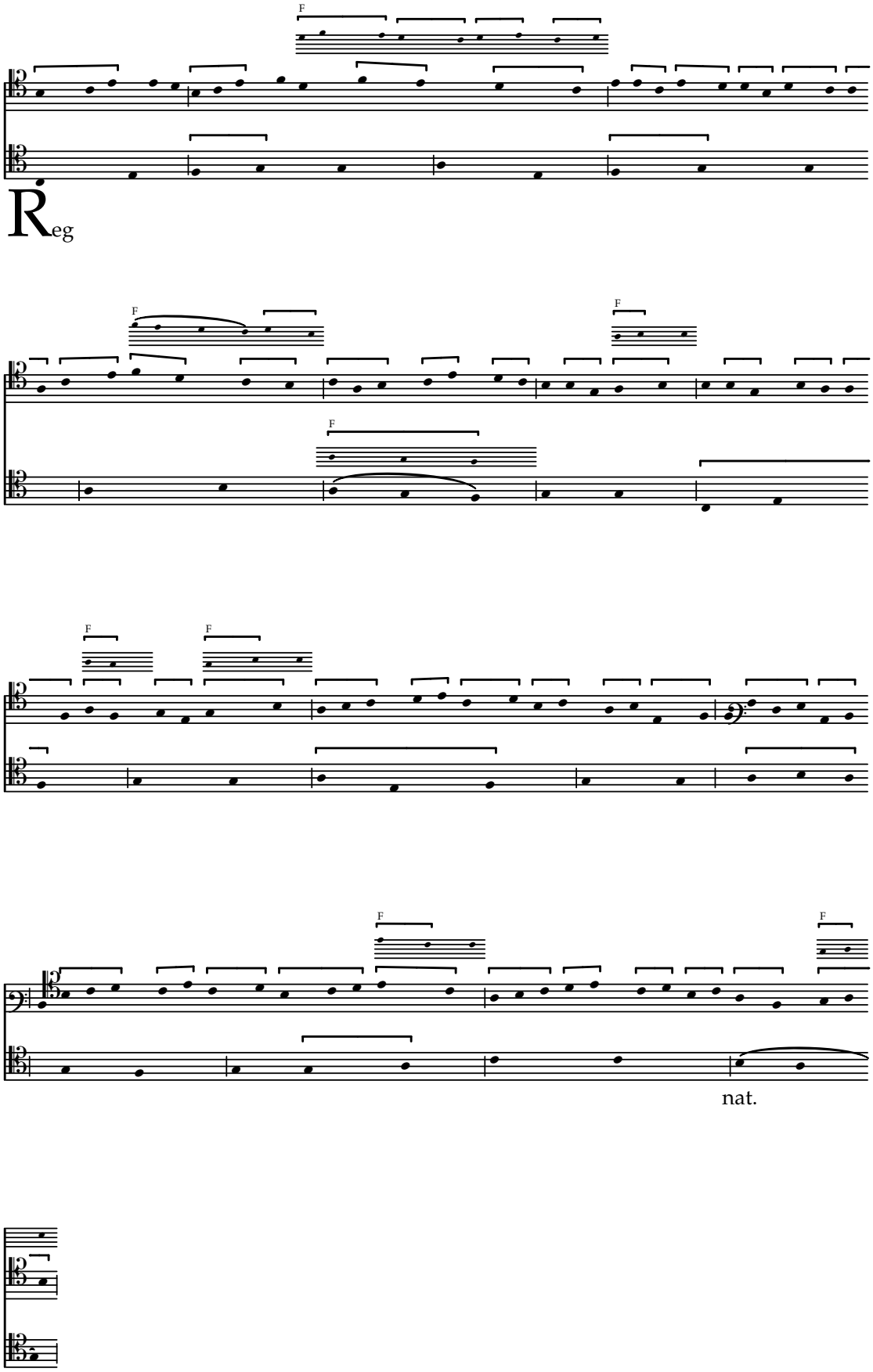
f. 59



Regnat

Concordances from F

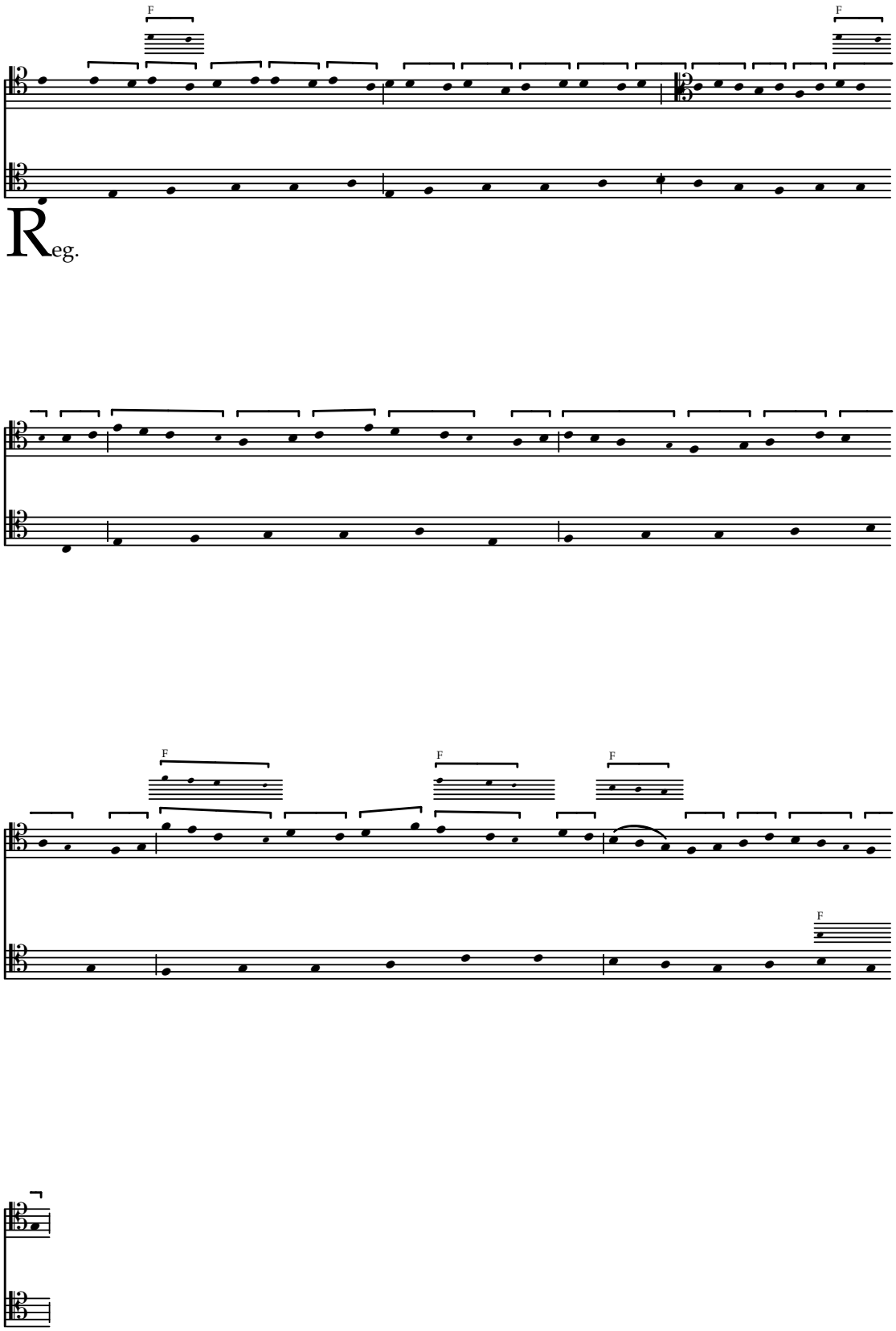
f. 59



Reg[nat]

Concordances from F

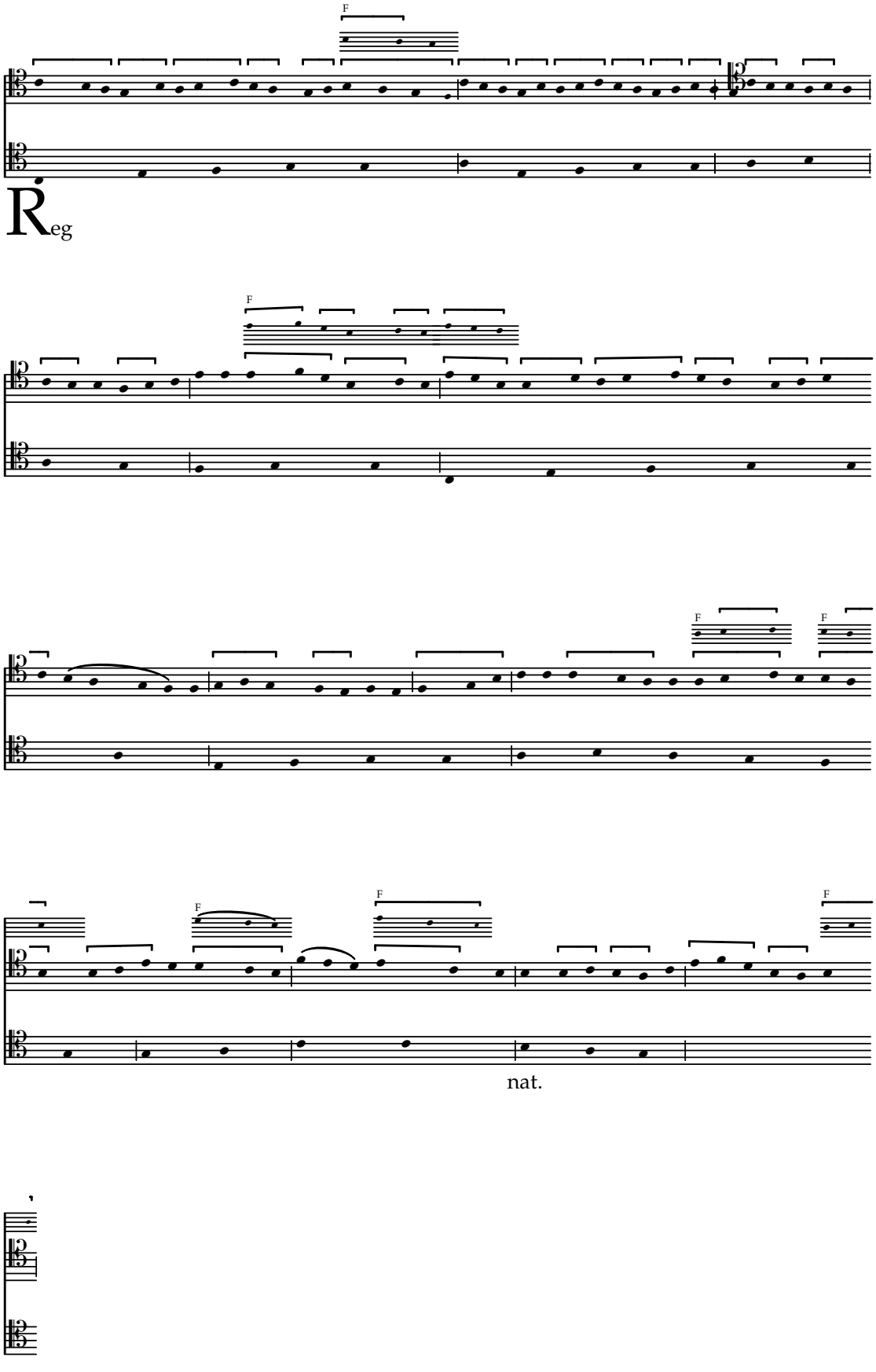
f. 59



Regnat

Concordances from F

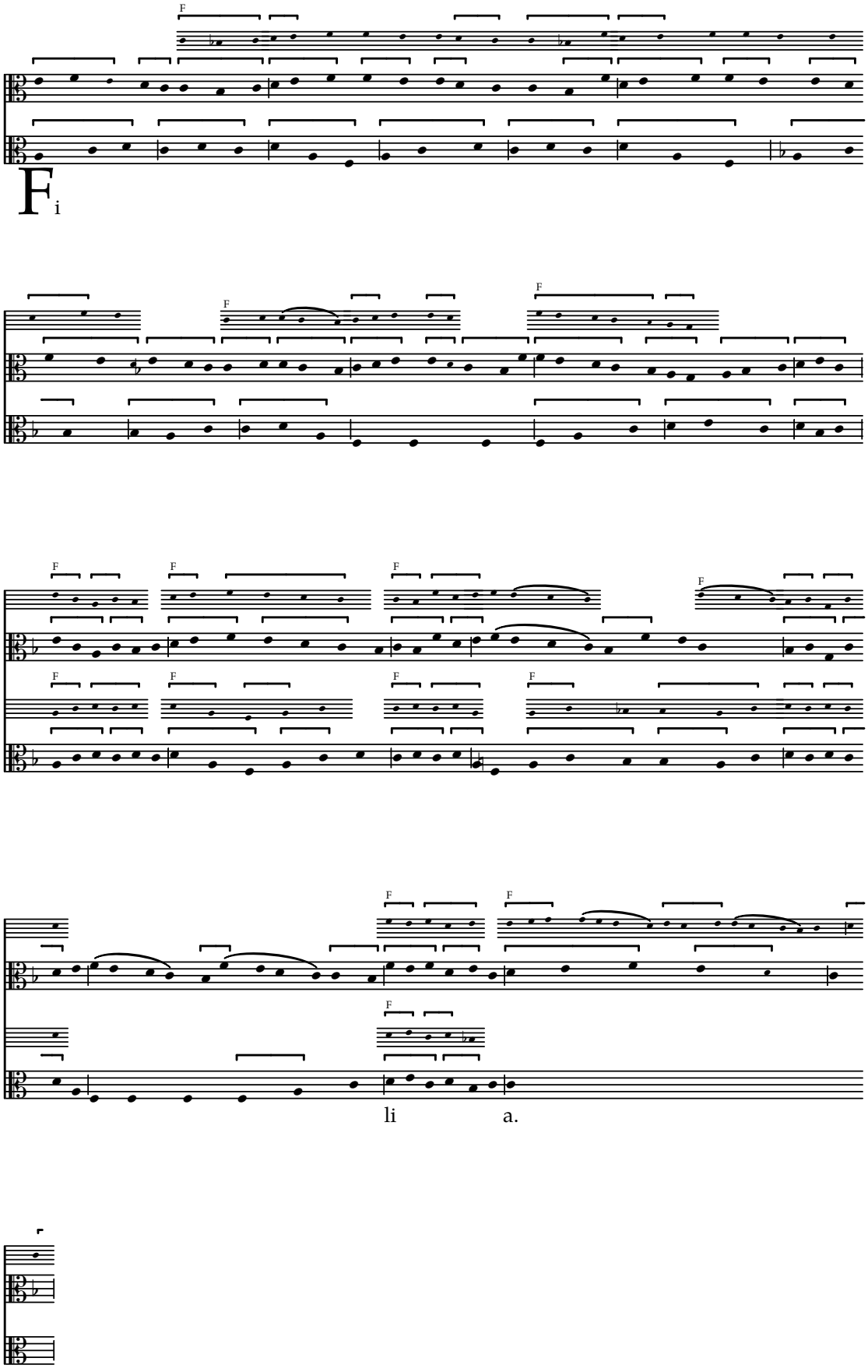
f. 59–59v



Filia

Concordances from F

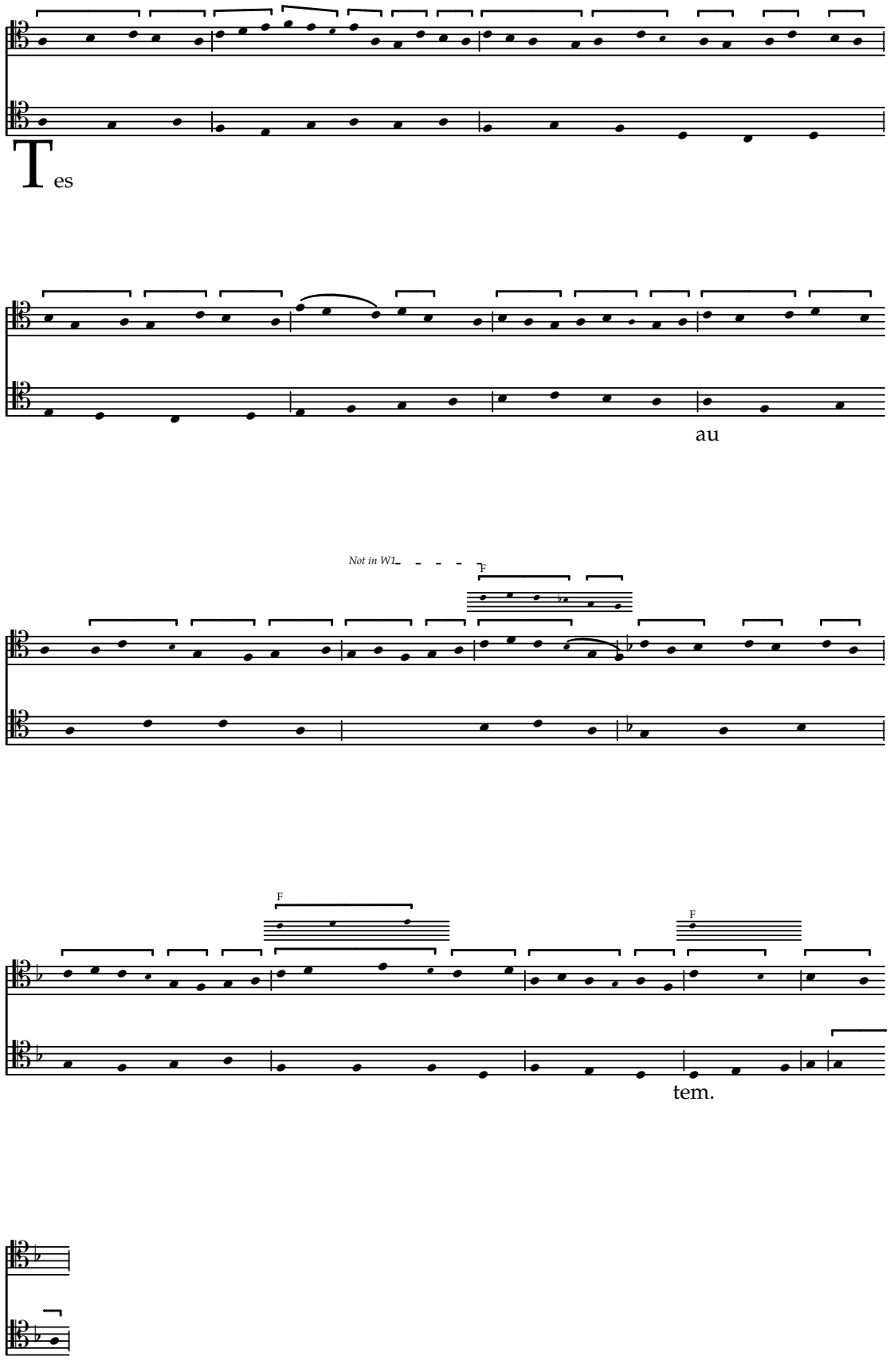
f. 59v



[Iniquiren]tes autem

Concordances from F

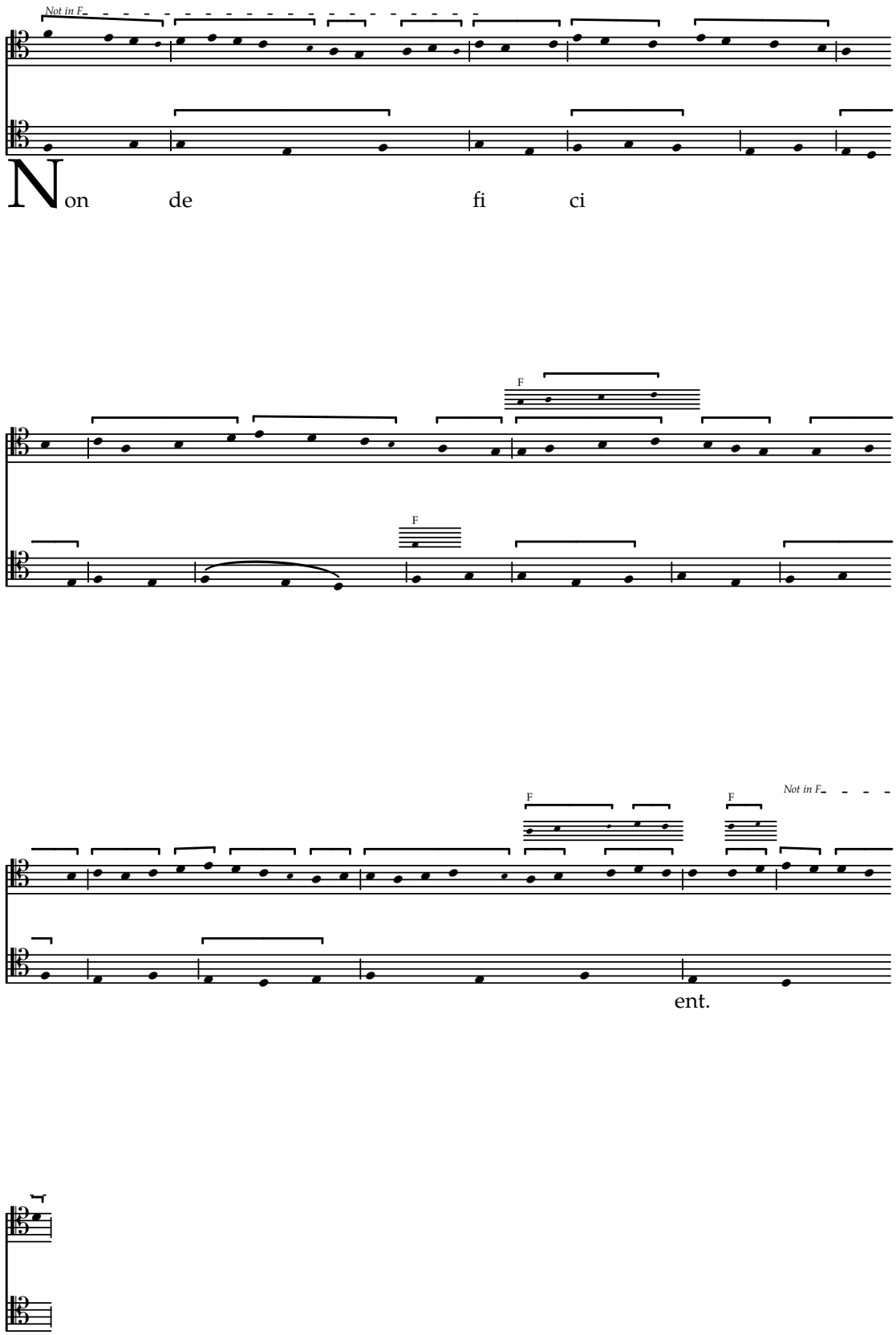
f. 59v



Non deficient

Concordances from F

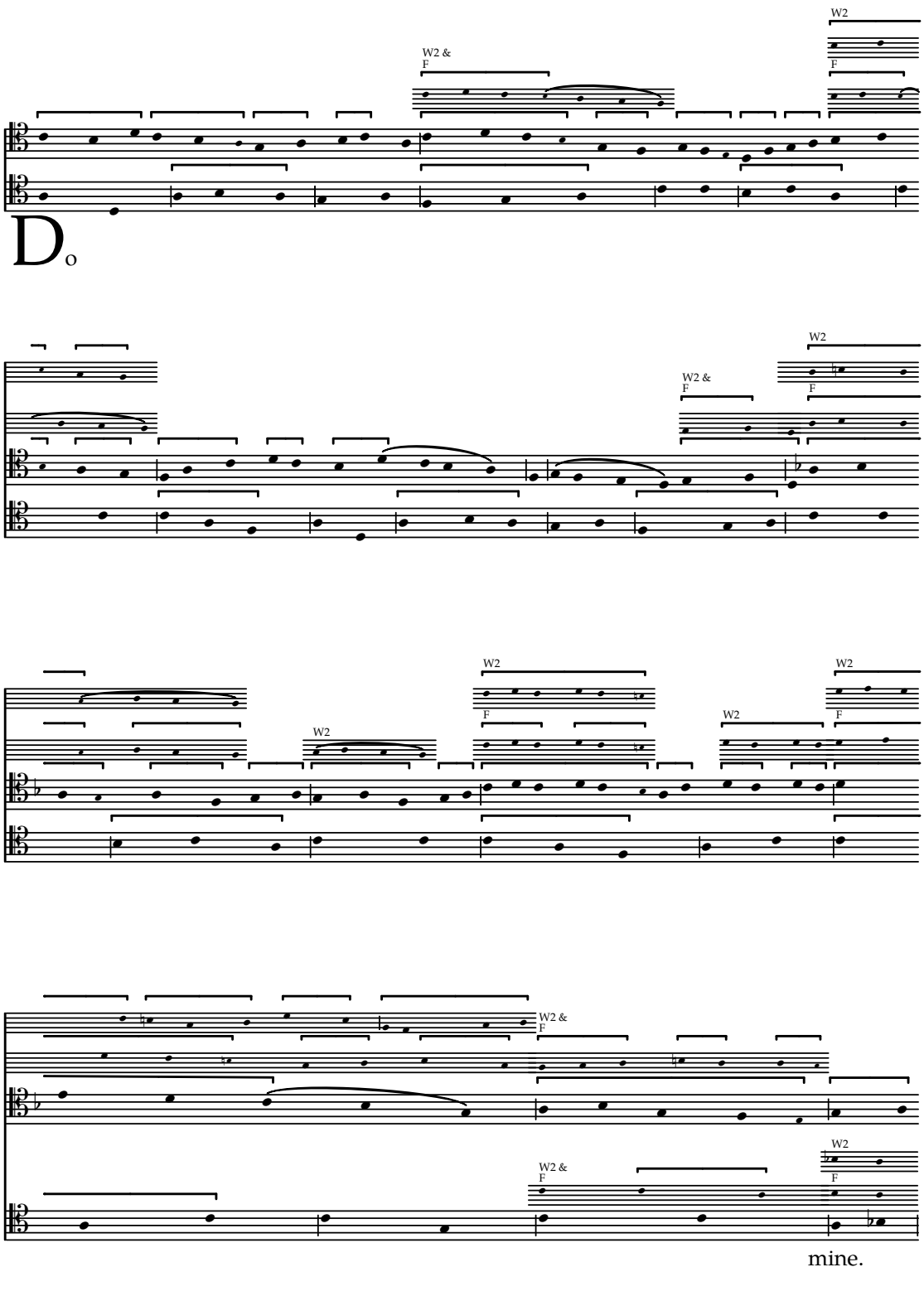
f. 59v



Domine

Concordances from W2 & F

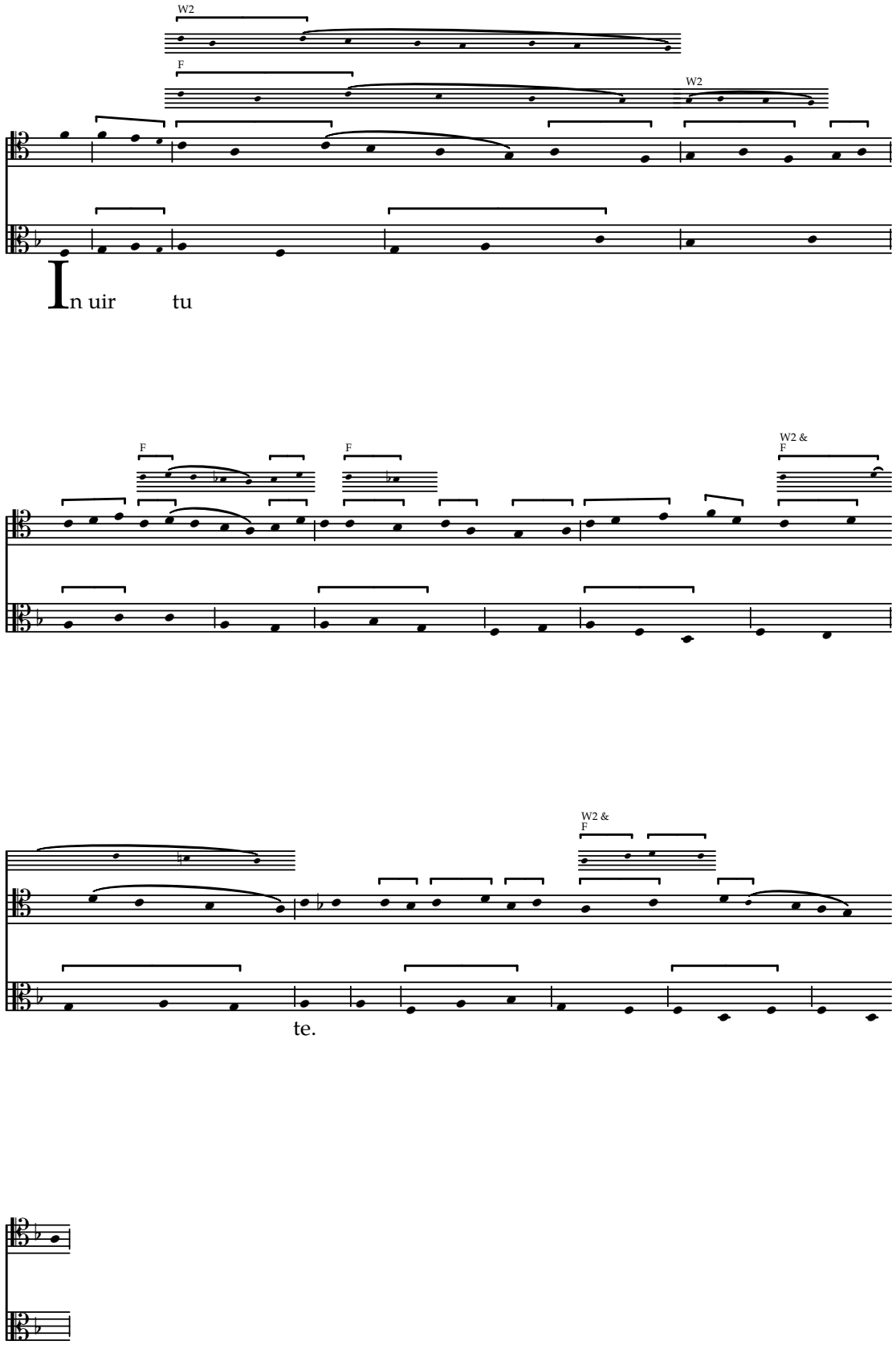
f. 60



In uirtute

Concordances from W2 & F

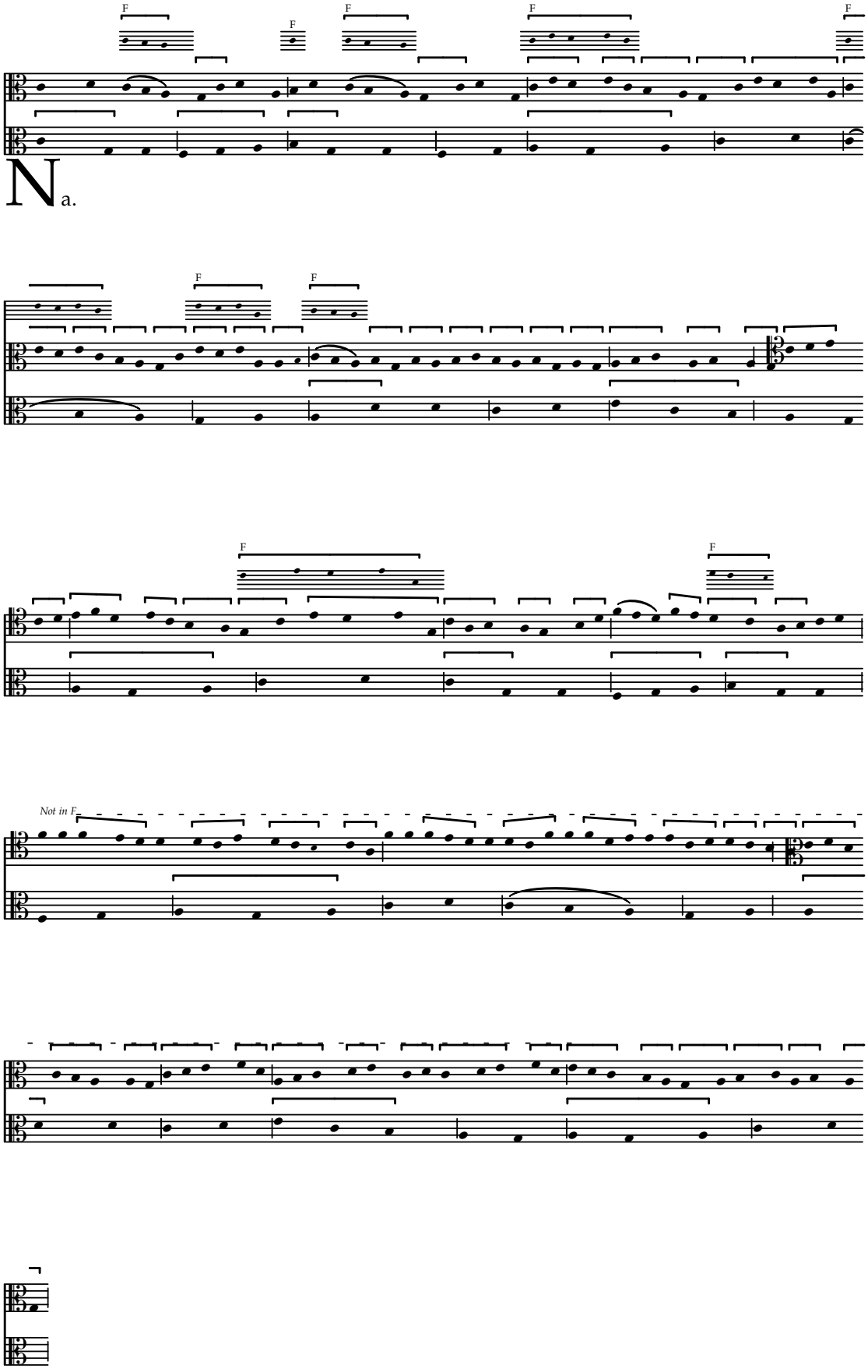
f. 60



[Reg]na[bit]

Concordances from F

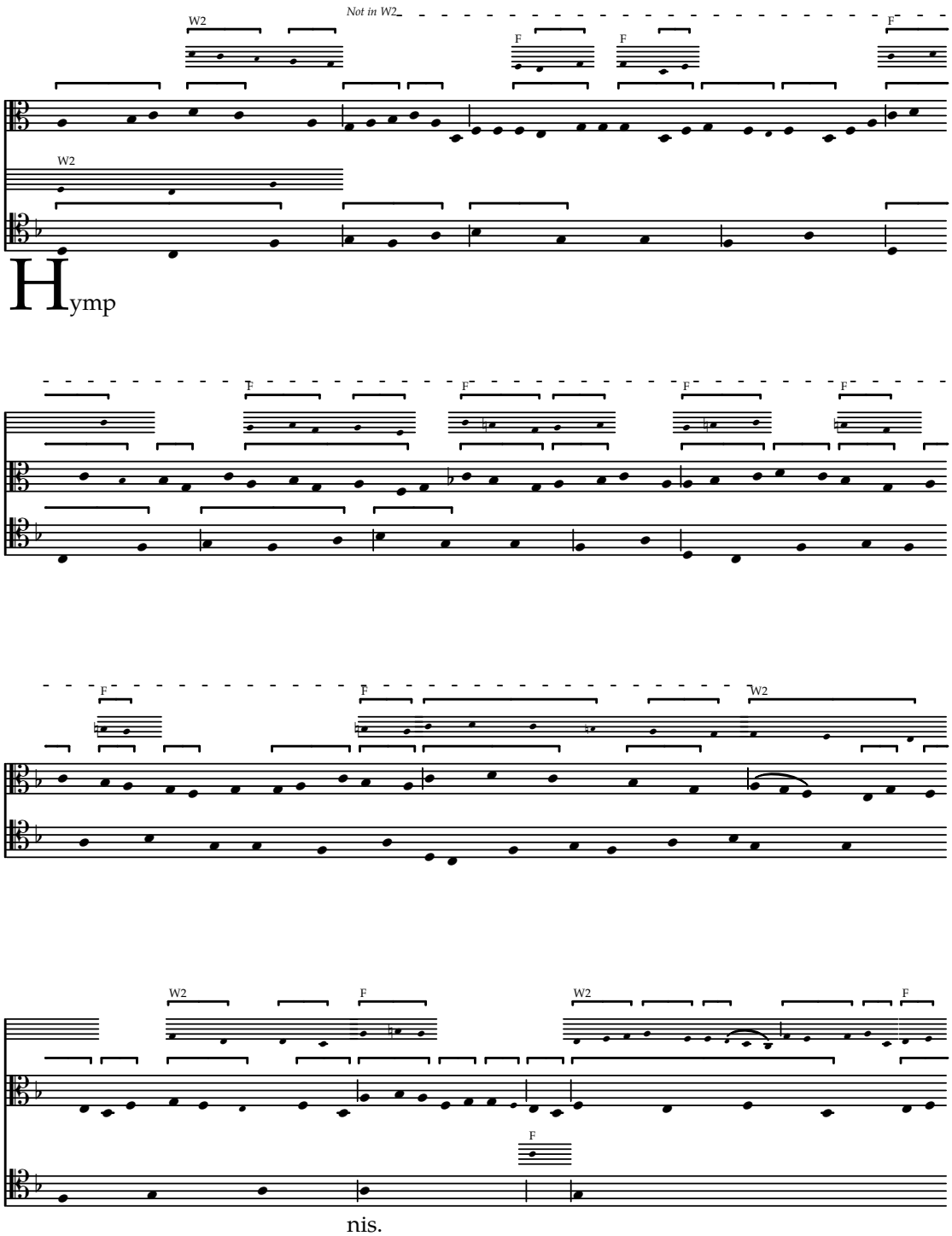
f. 60



Hympnis

Concordances from W2 & F

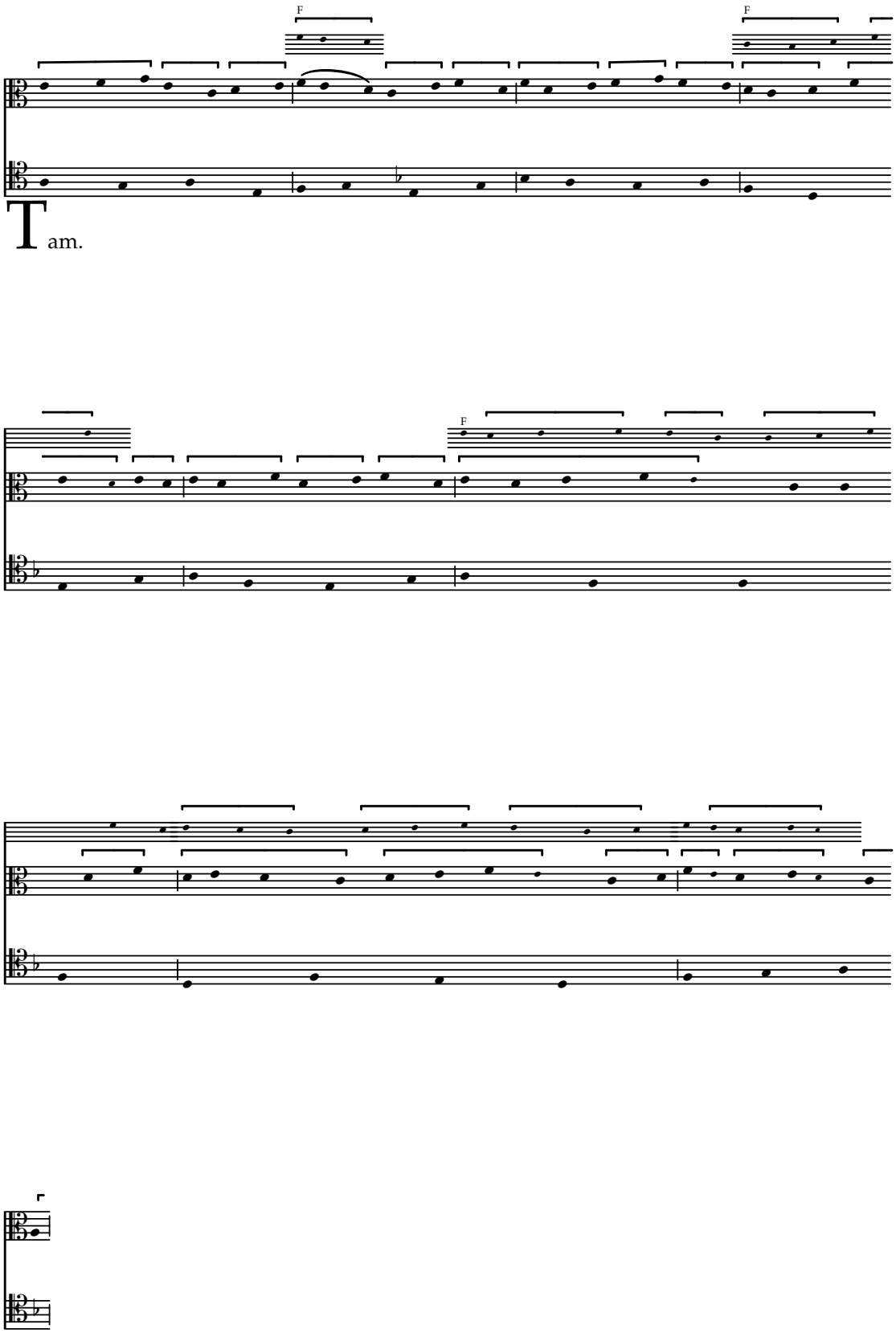
f. 60



[Ui]tam

Concordances from F

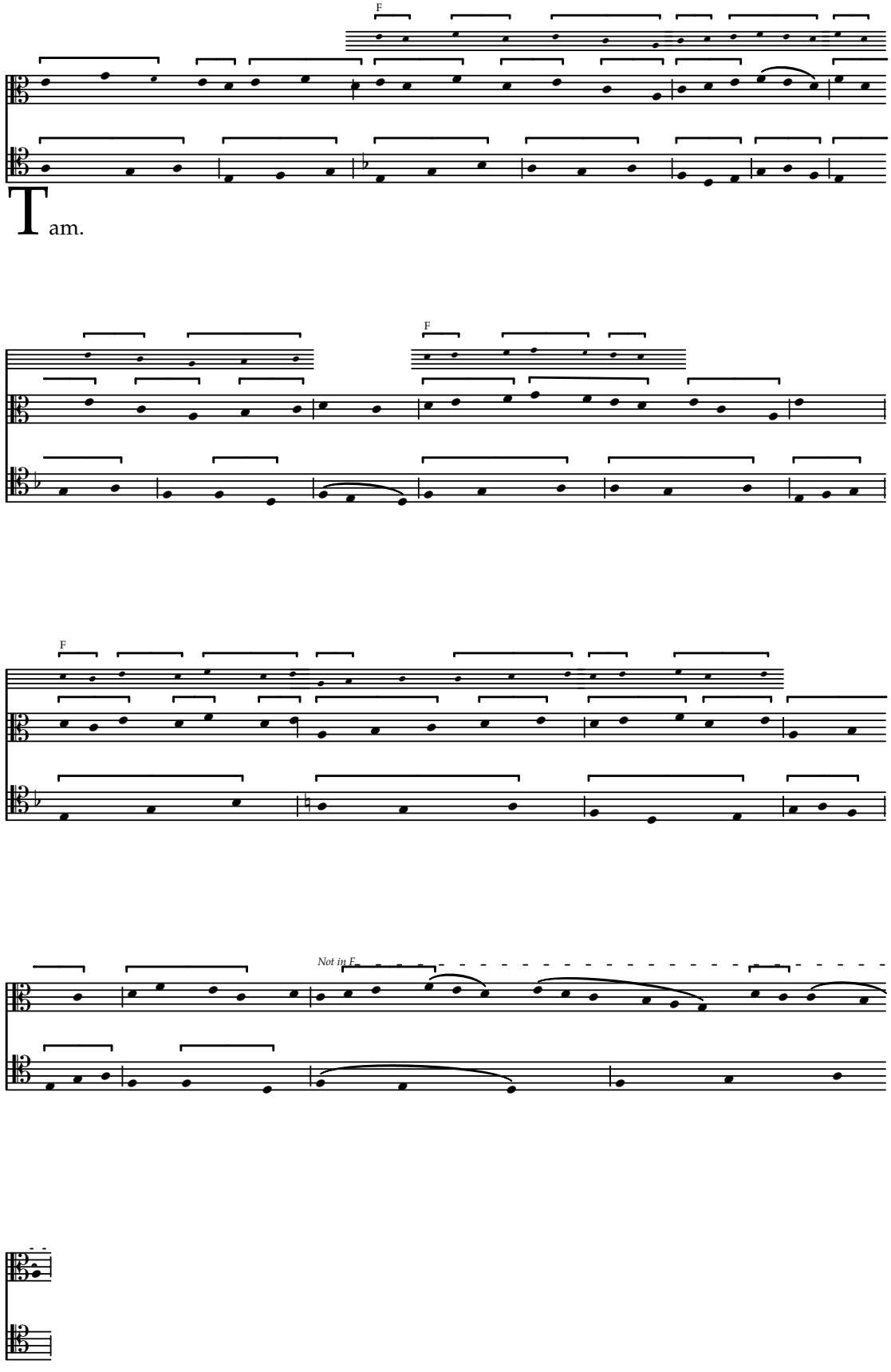
f. 60v



[Ui]tam

Concordances from F

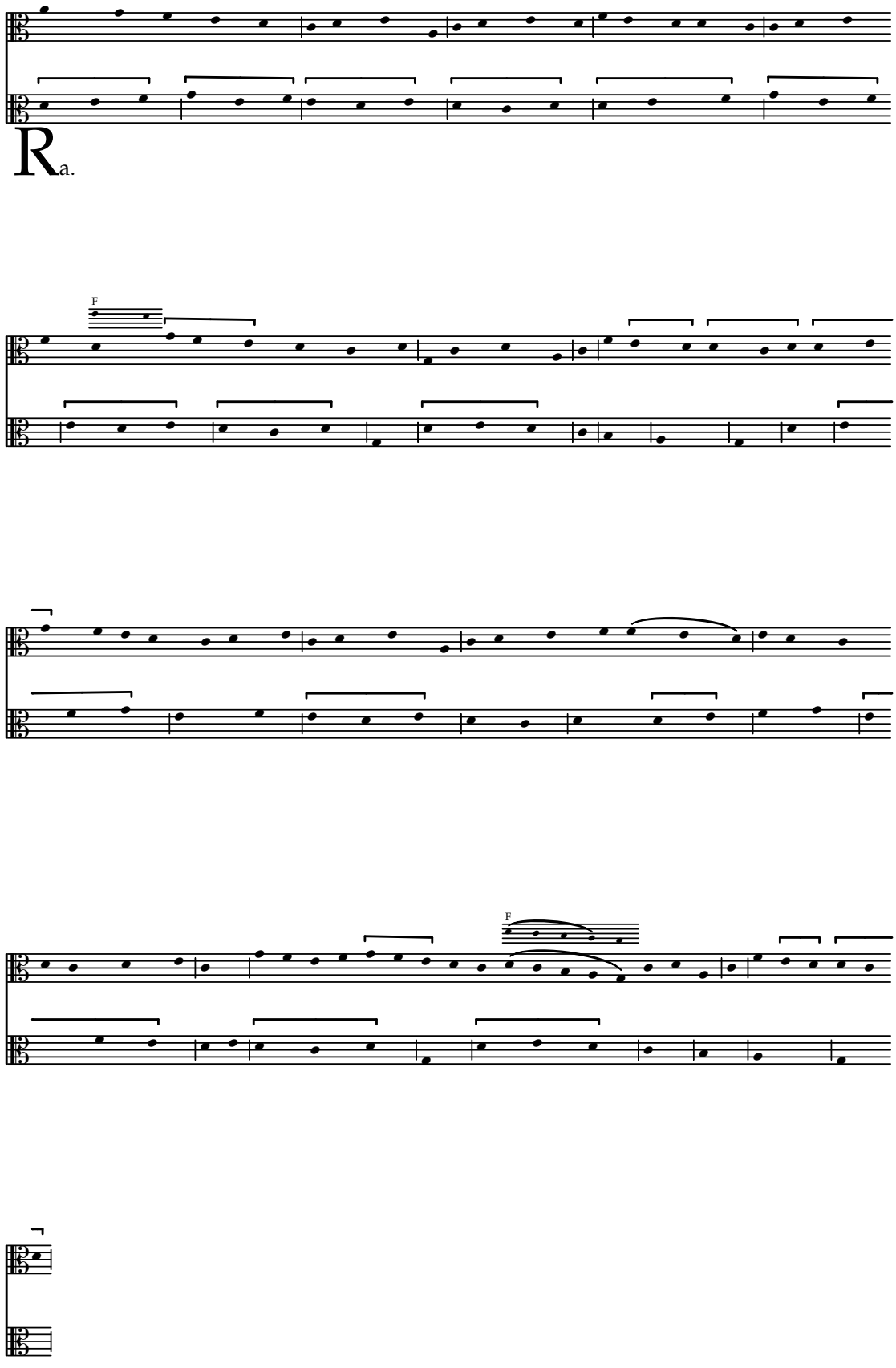
f. 60v



[Spe]ra[bit]

Concordances from F

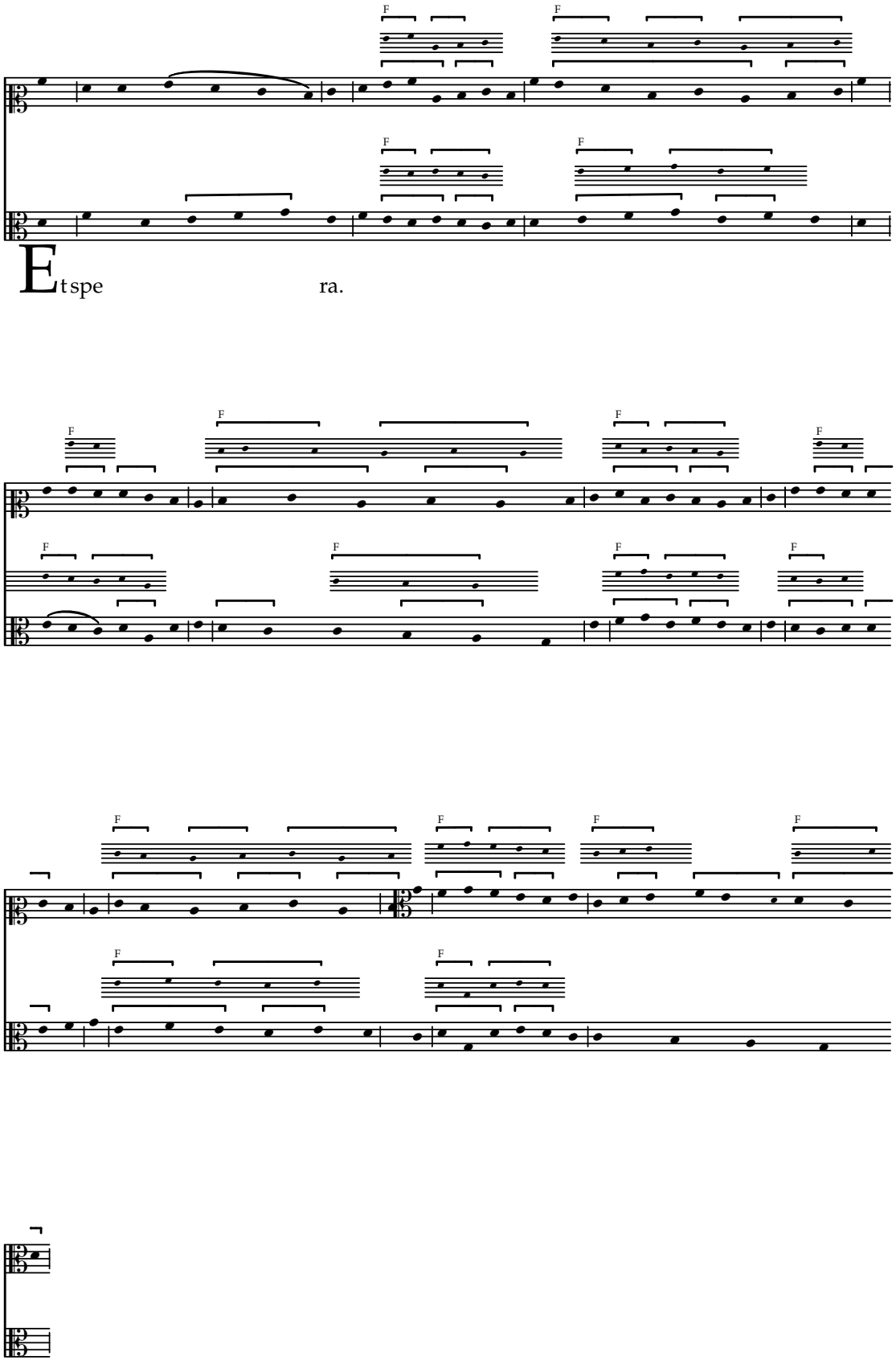
f. 60v



Et spera[bit]

Concordances from F

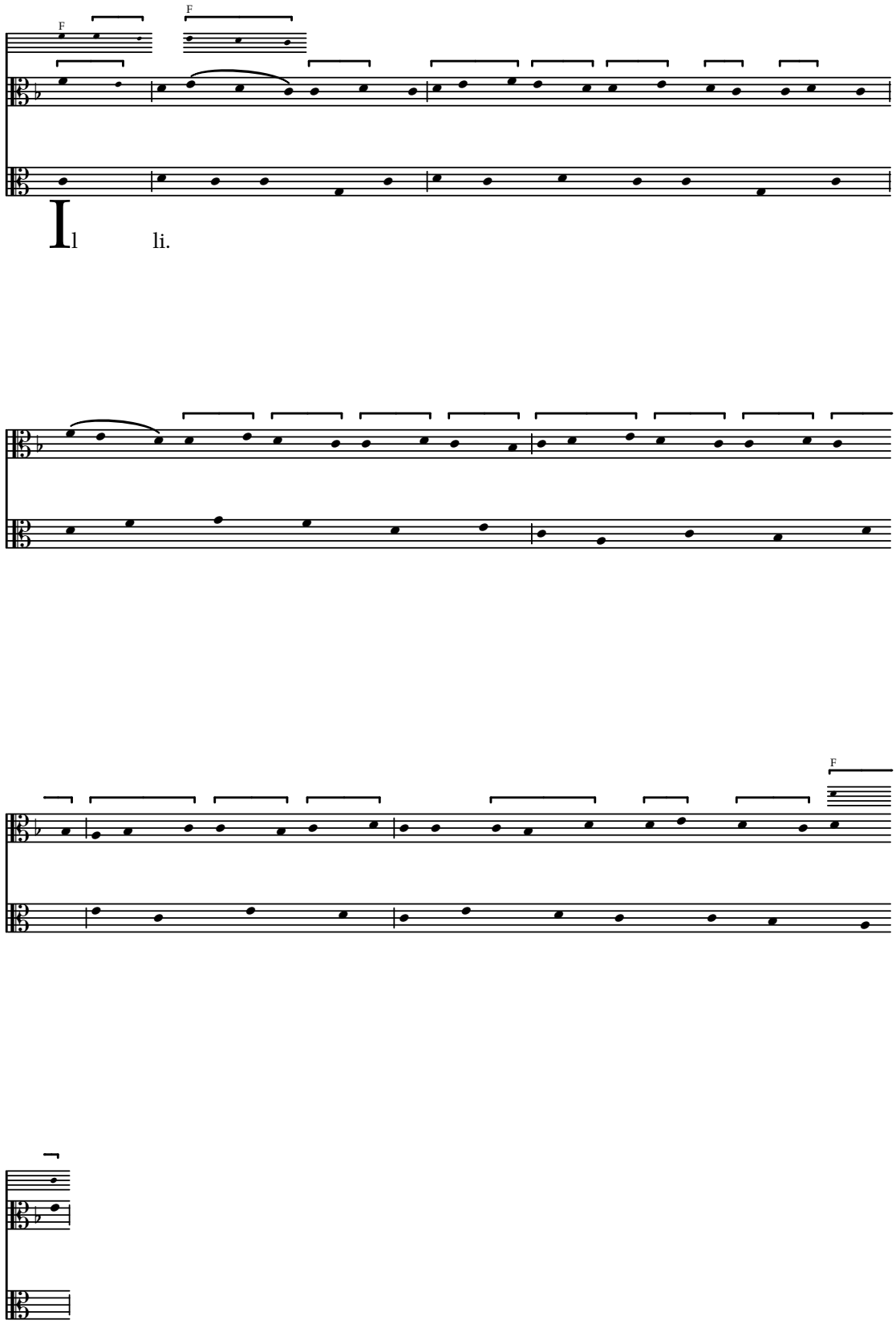
f. 60v



Illi

Concordances from F

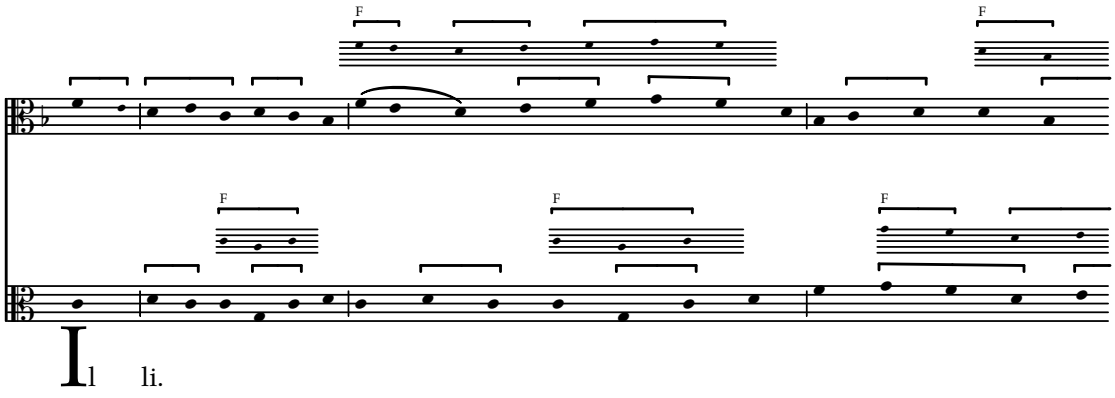
f. 60v

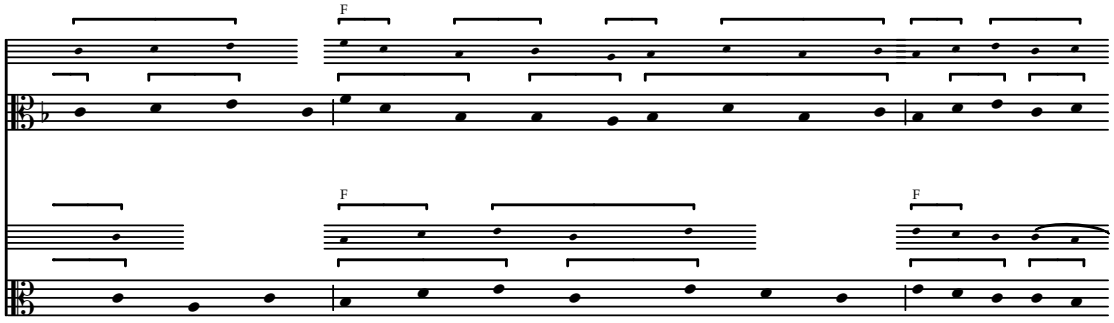


Illi

Concordances from F

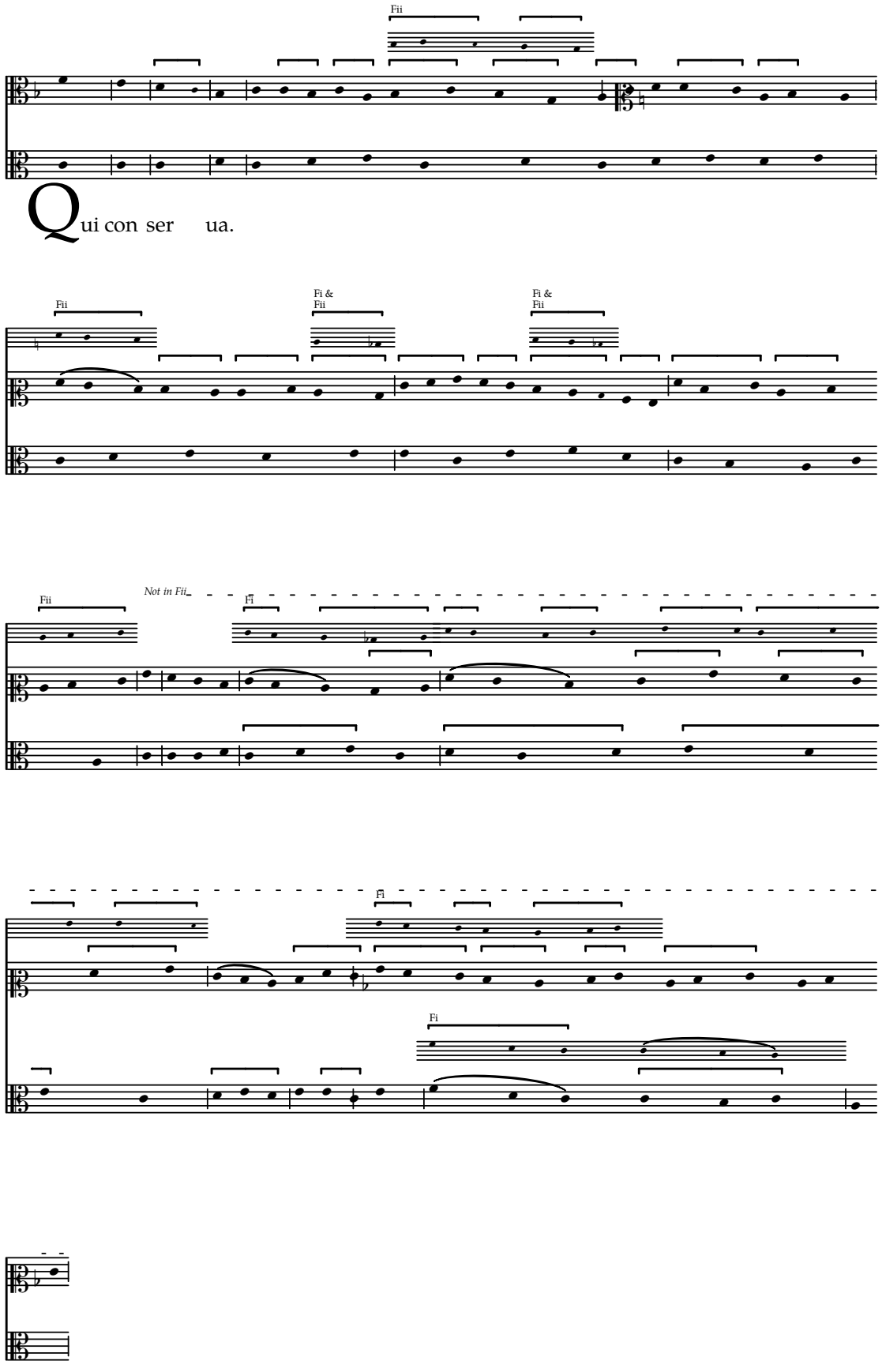
f. 61





Qui conserua[ret]

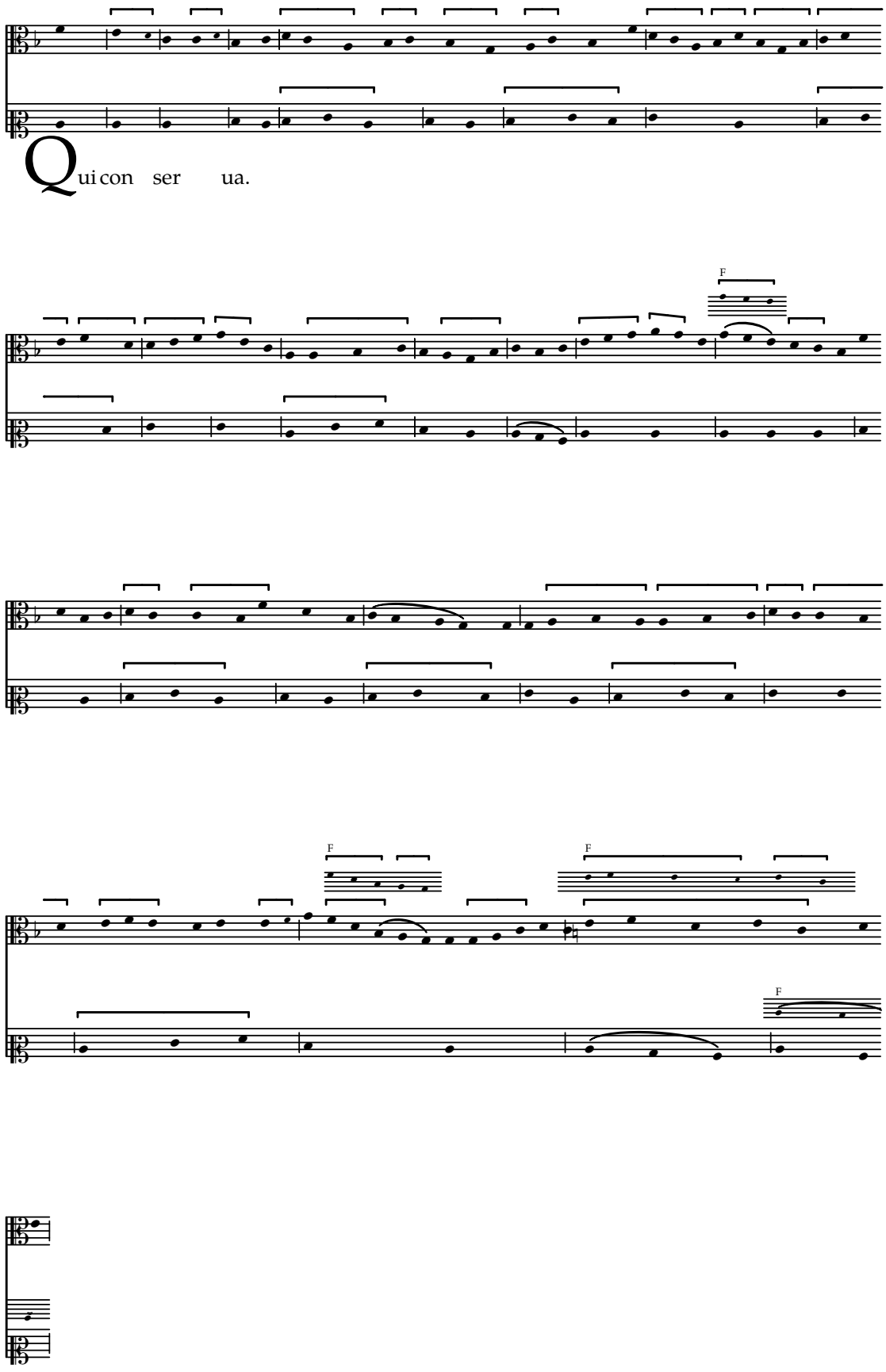
Concordances from F (two versions) f. 61



Qui conserua[ret]

Concordances from F

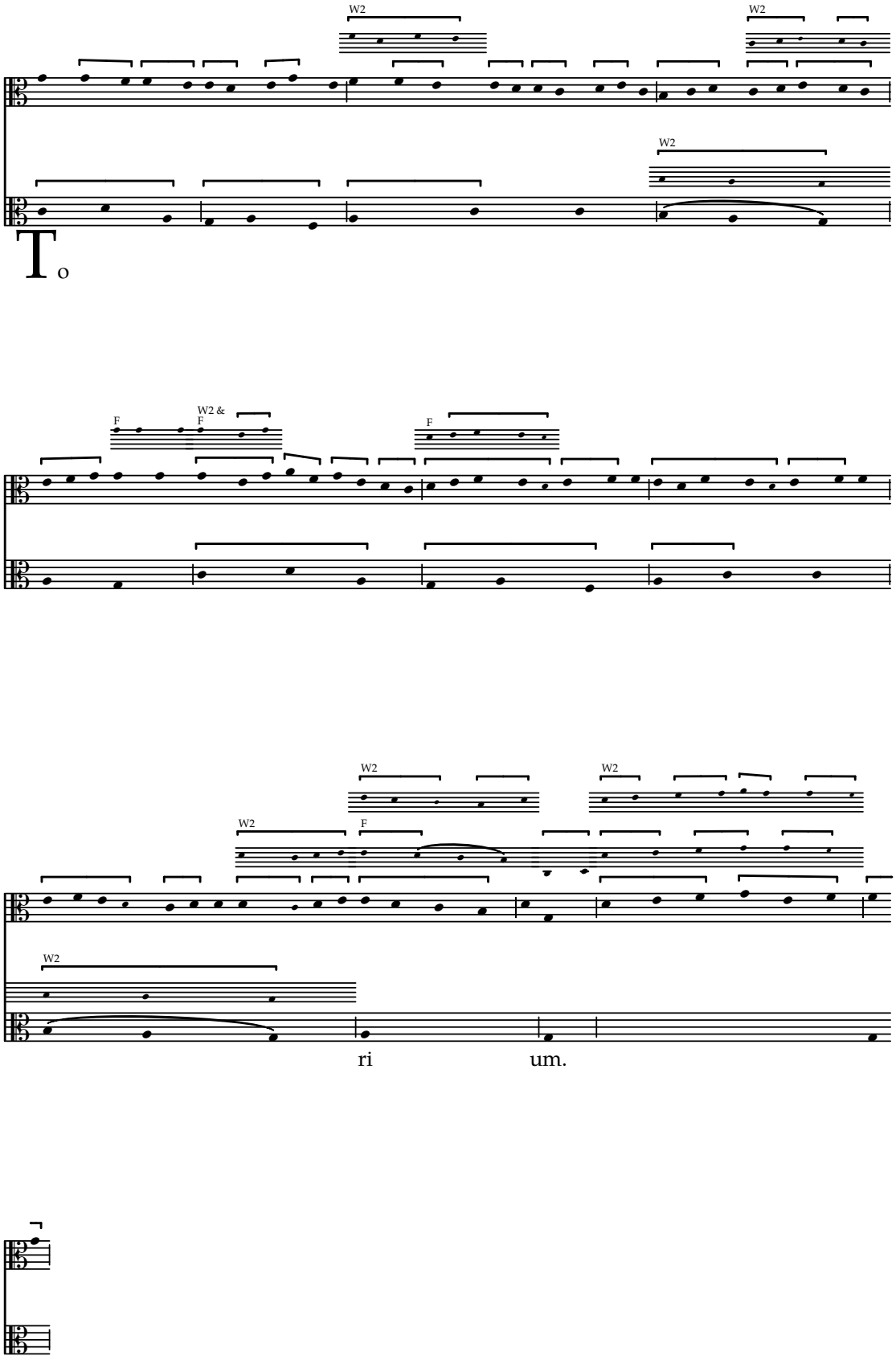
f. 61



[Adiu]torium

Concordances from W2 & F

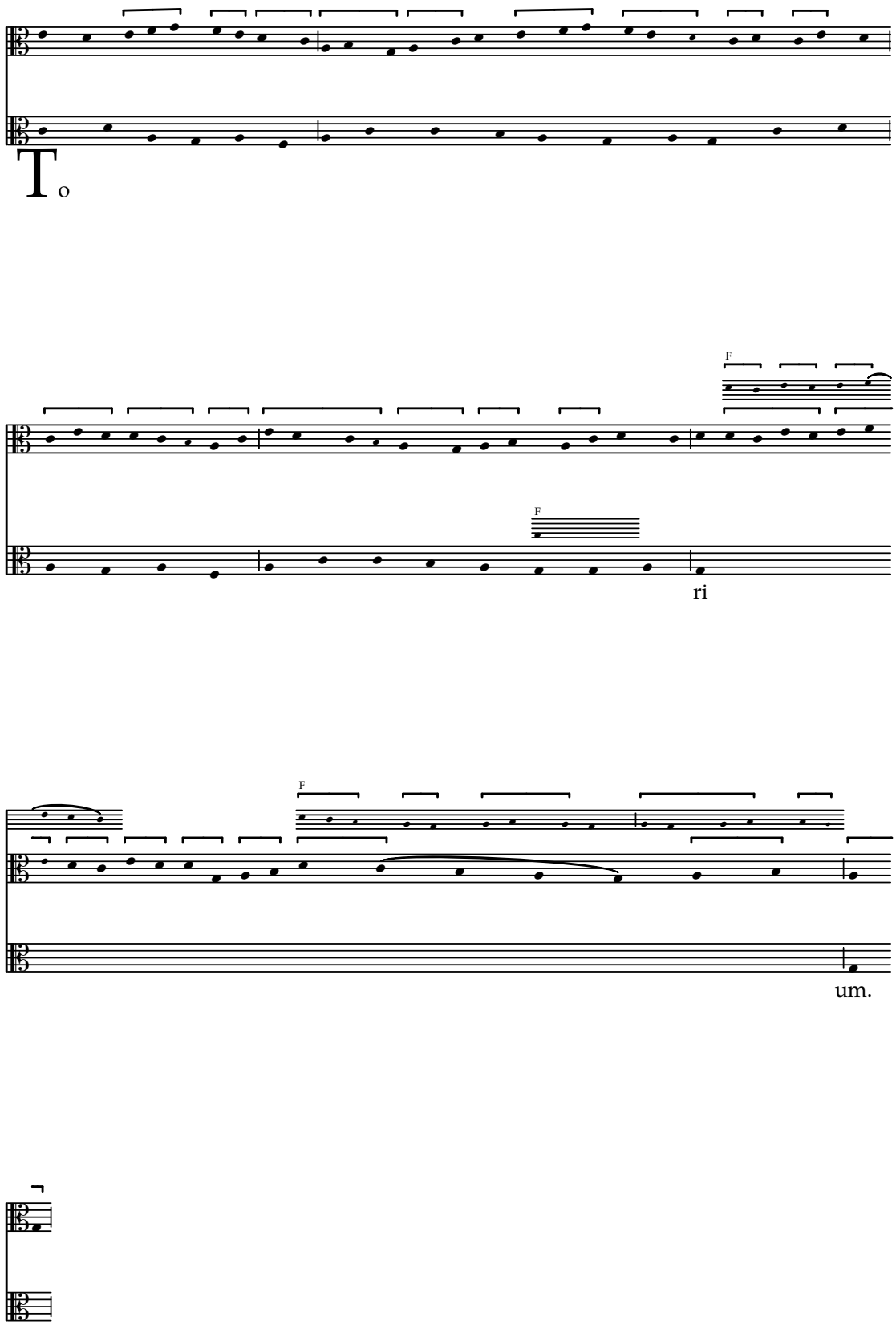
f. 61



[Adiu]torium

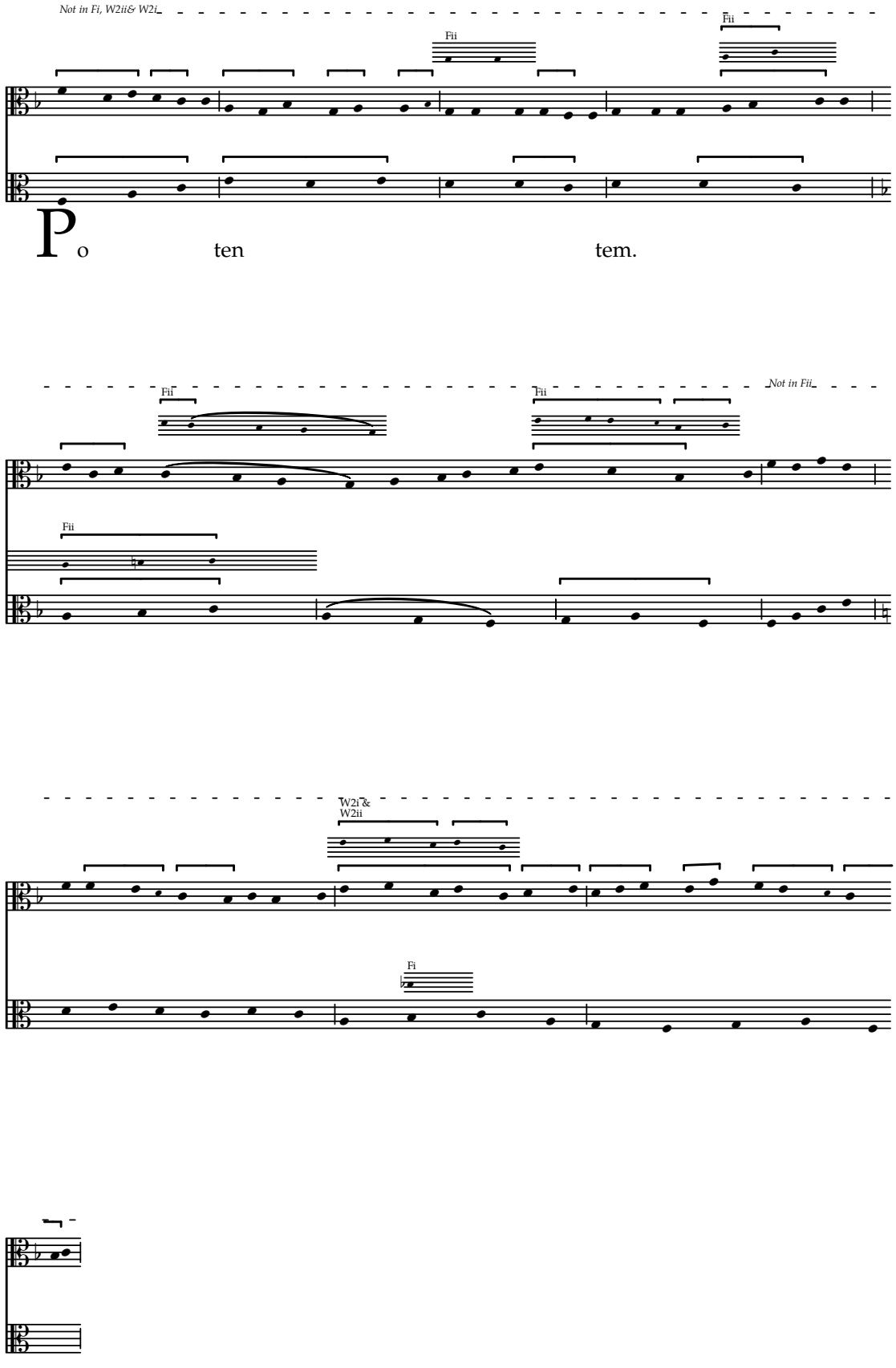
Concordances from F

f. 61–61v



Potentem

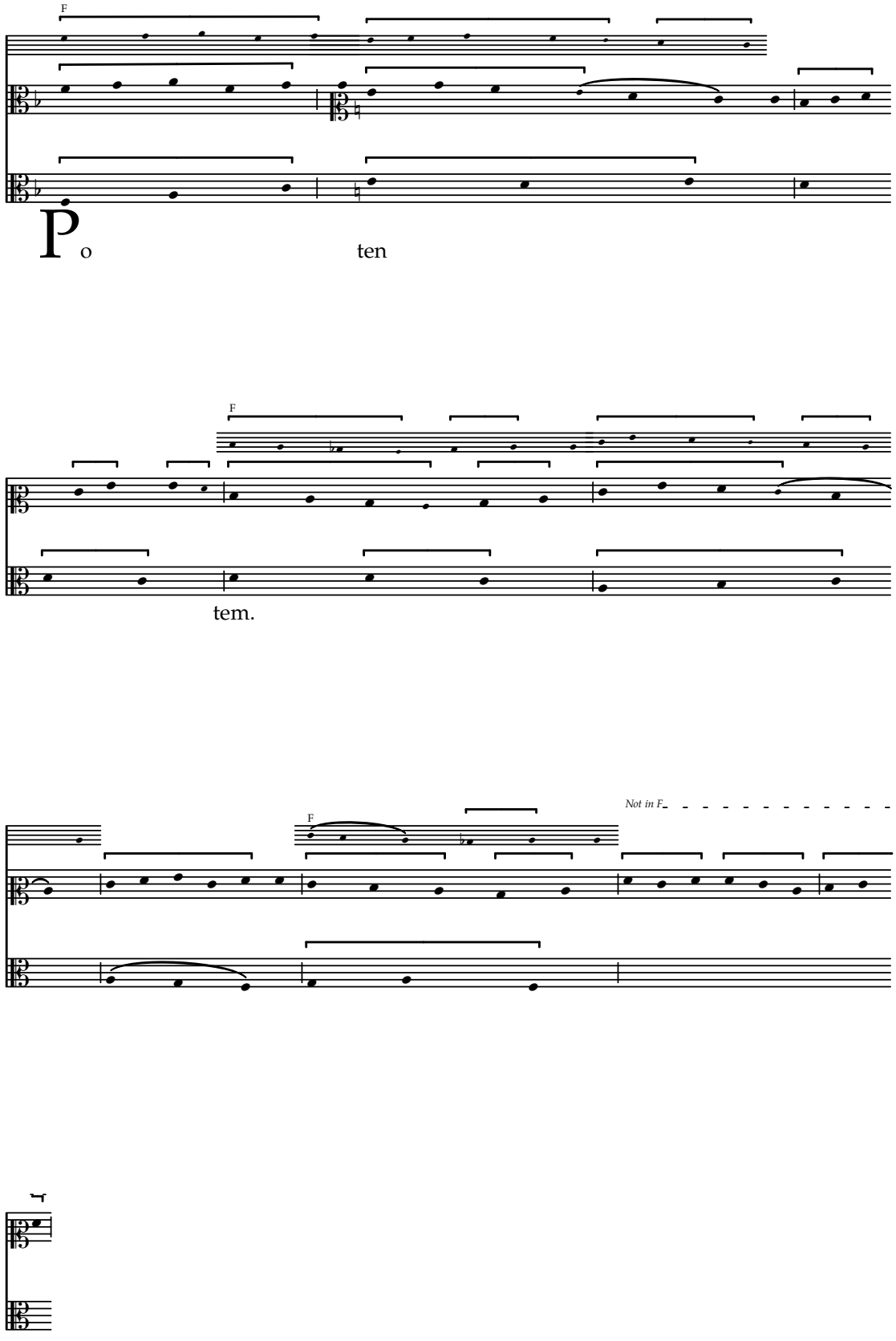
Concordances from W2 (two versions) & F (two versions) f. 61v



Potentem

Concordances from F

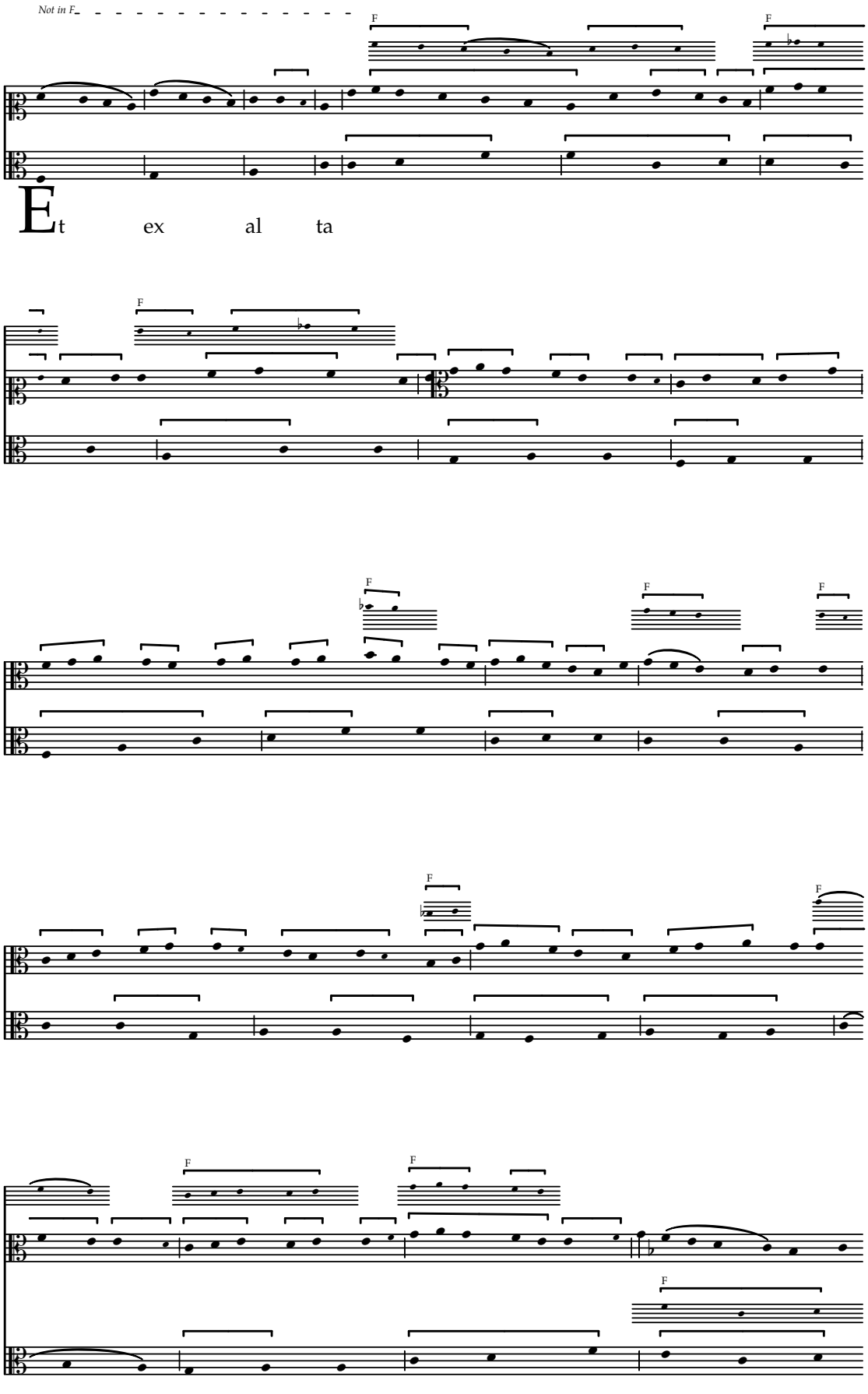
f. 61v

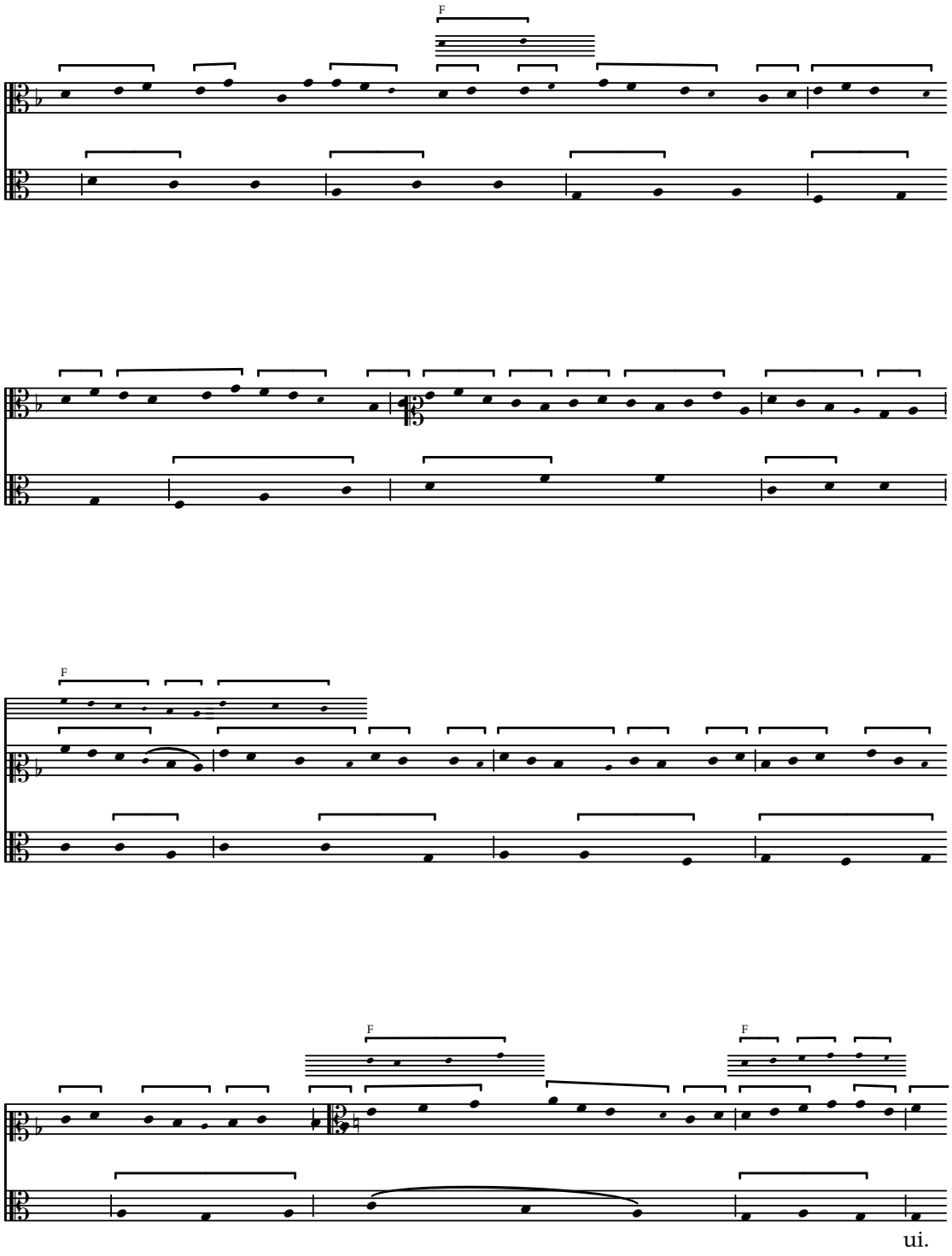


Et exaltaui

Concordances from F

f. 61v

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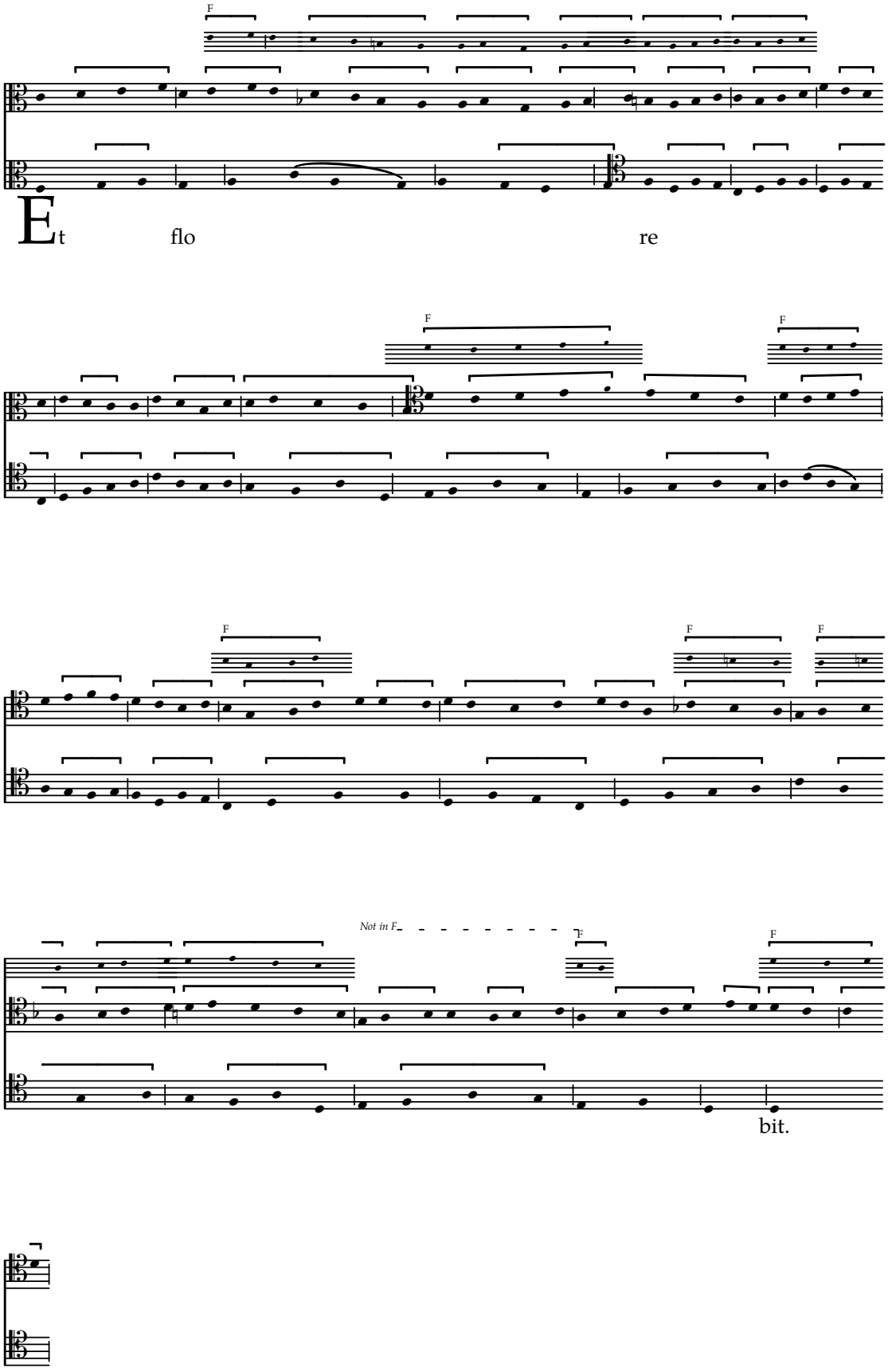
Et florebit

Concordances from F

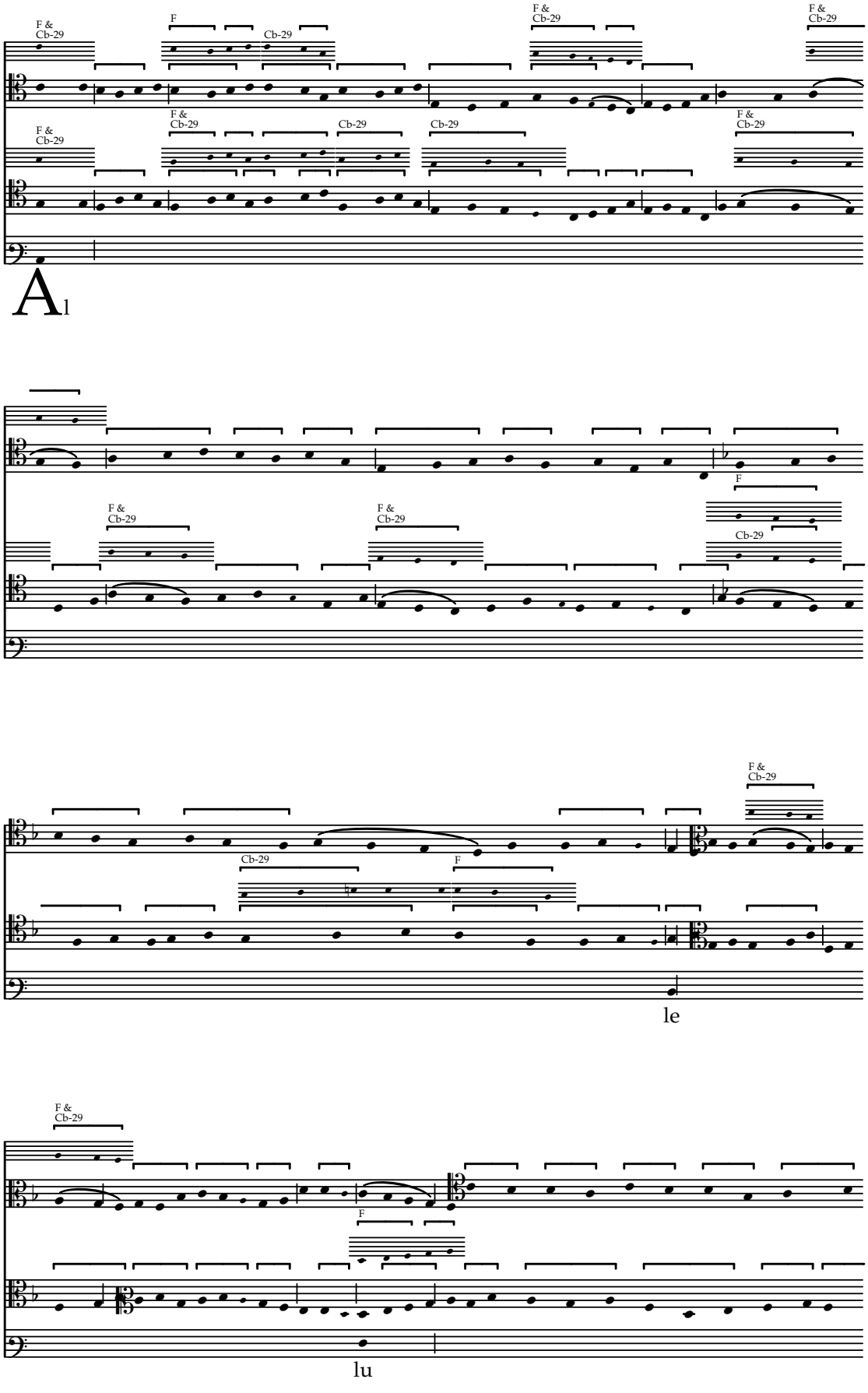
f. 61v–62

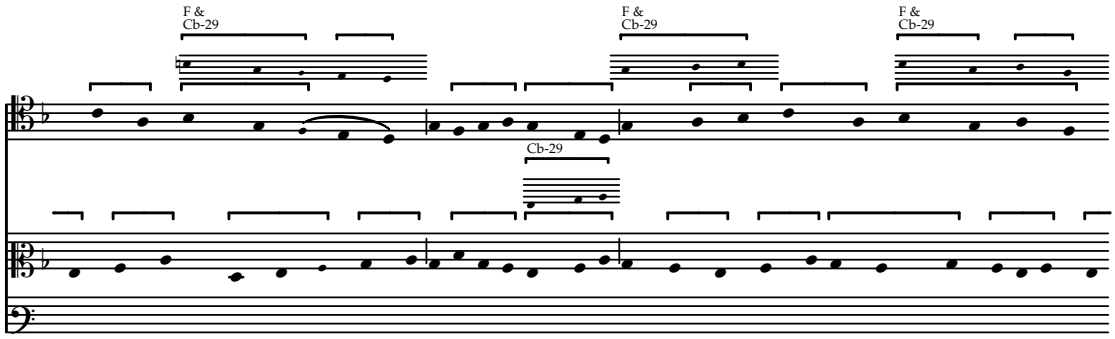


Alleluya

Concordances from F & Cb-29

f. 63

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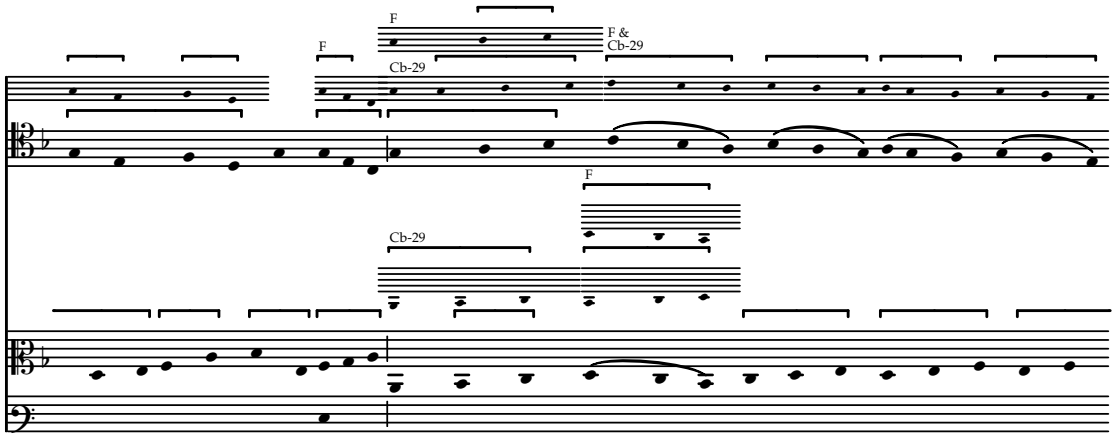
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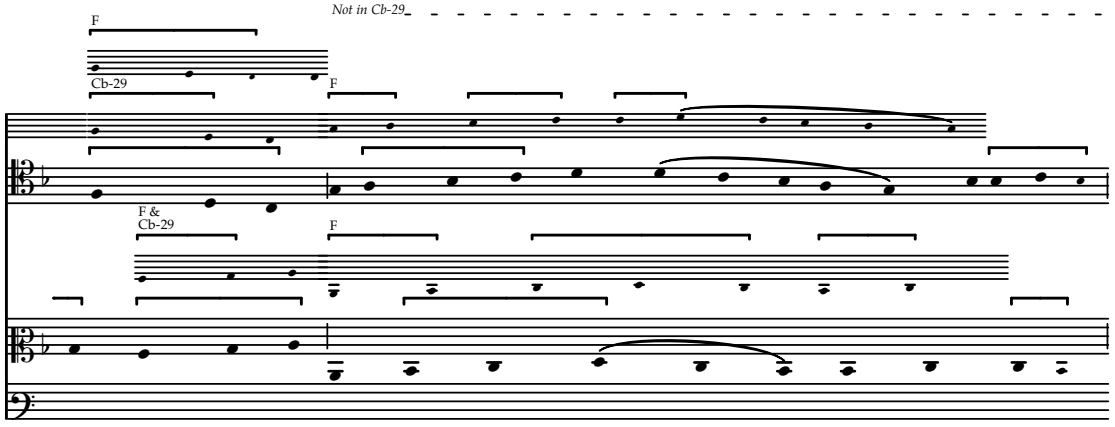
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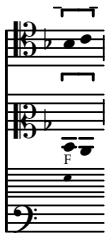
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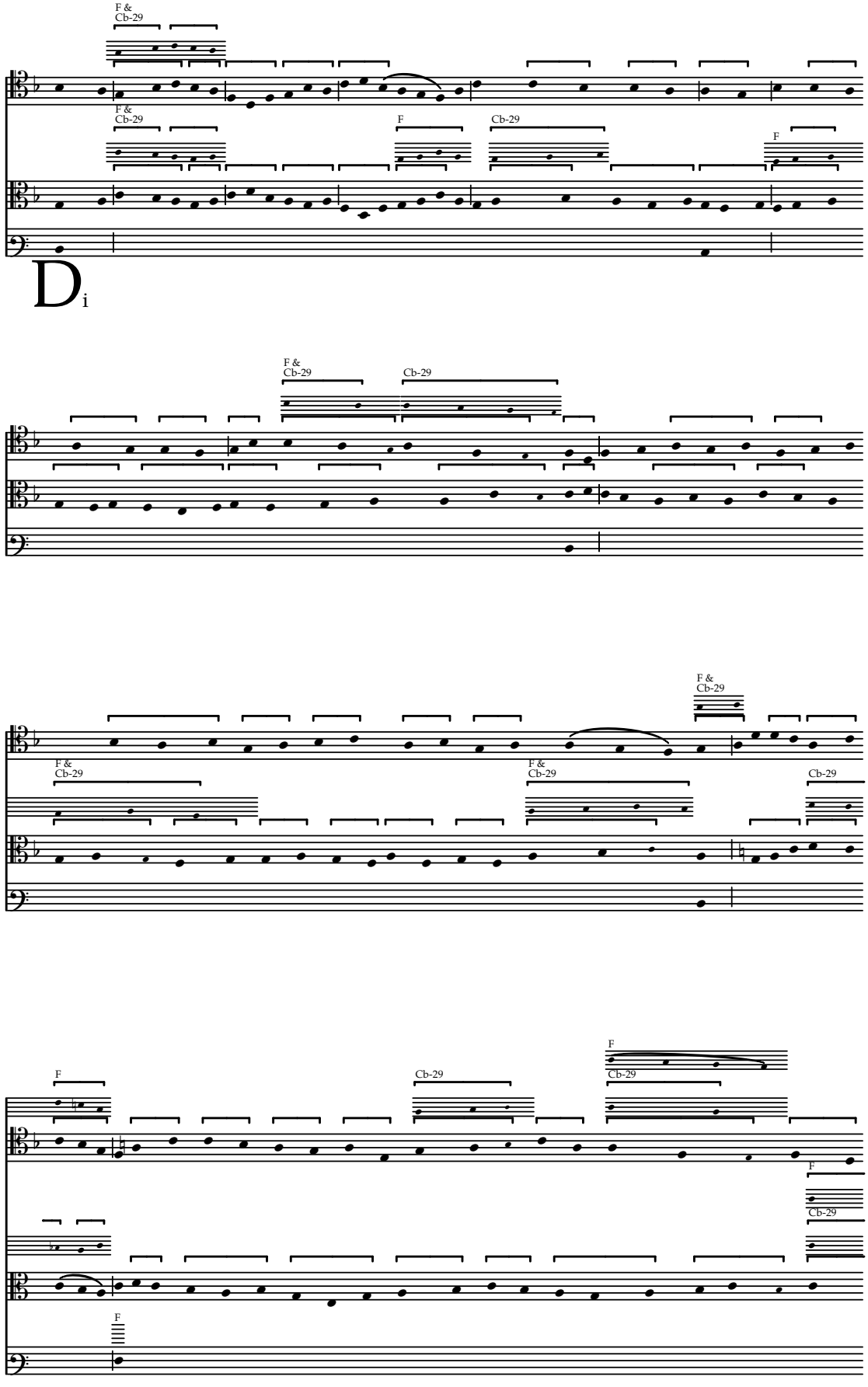
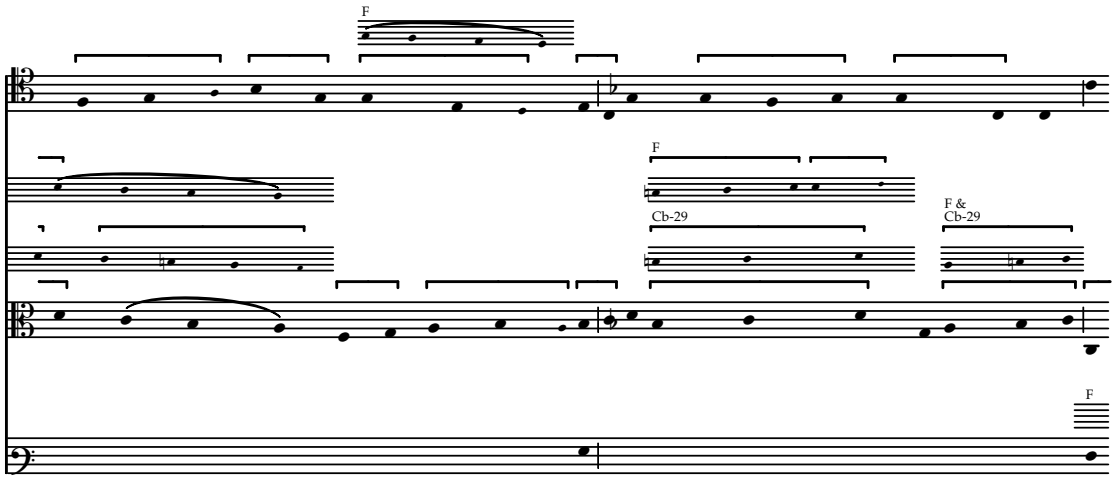
Concordances from F & Cb-29

f. 63–64

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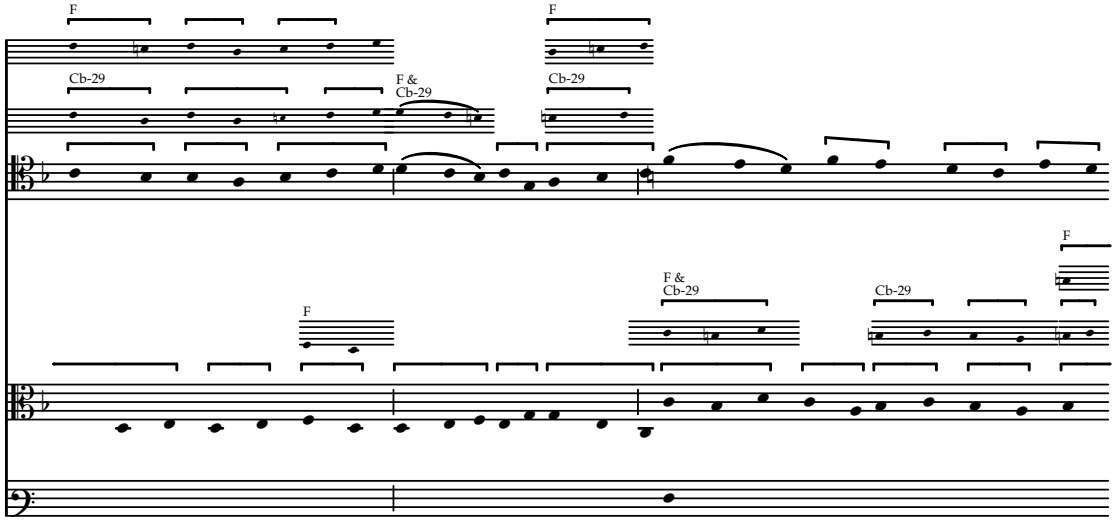
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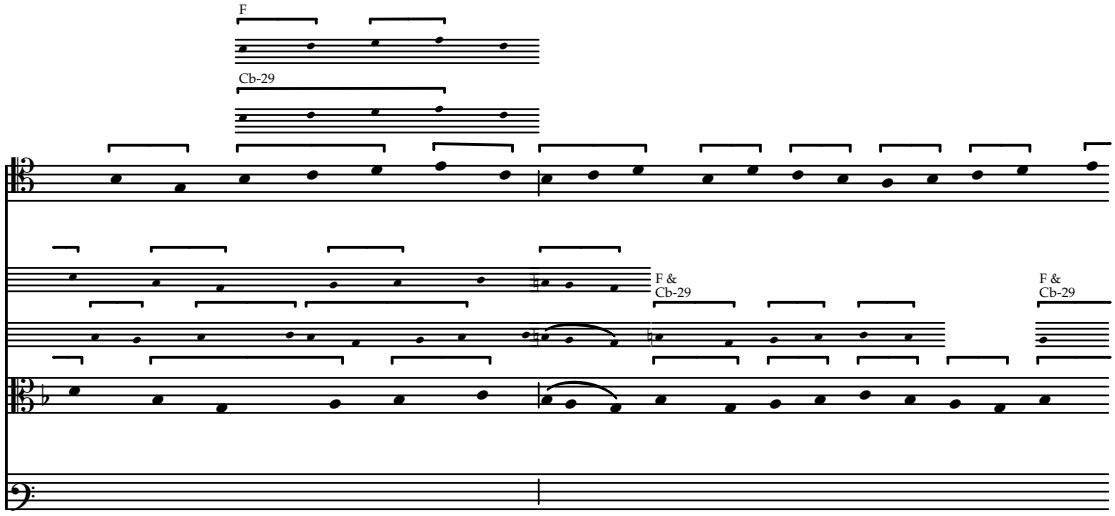
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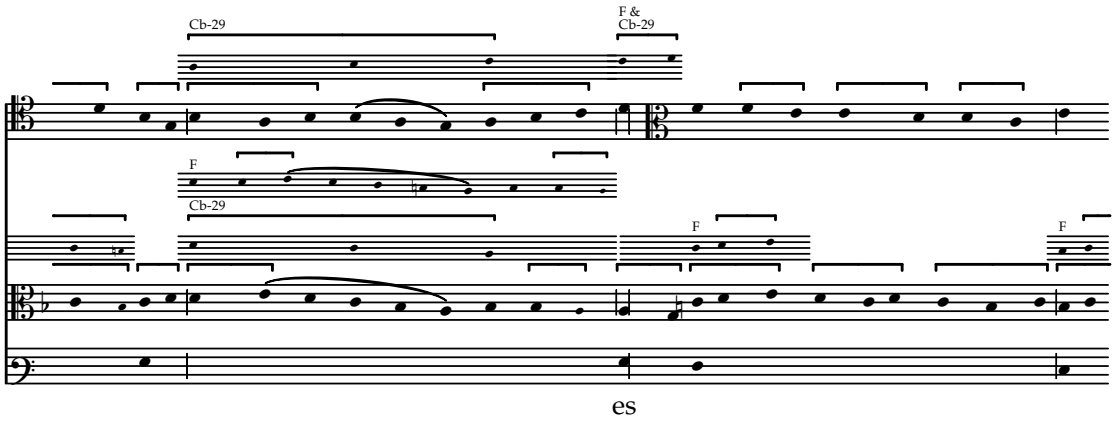
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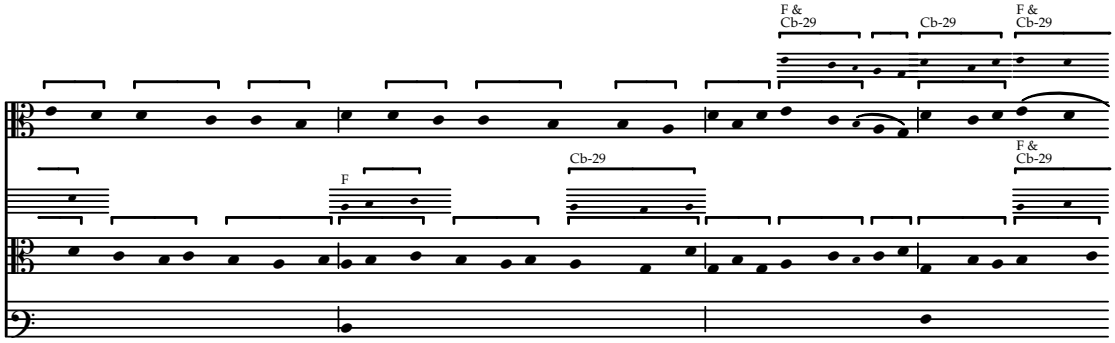
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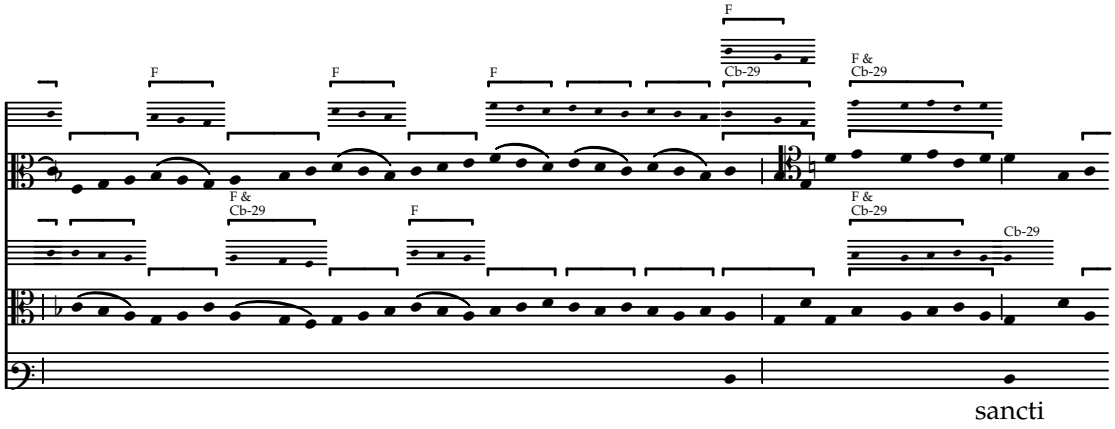
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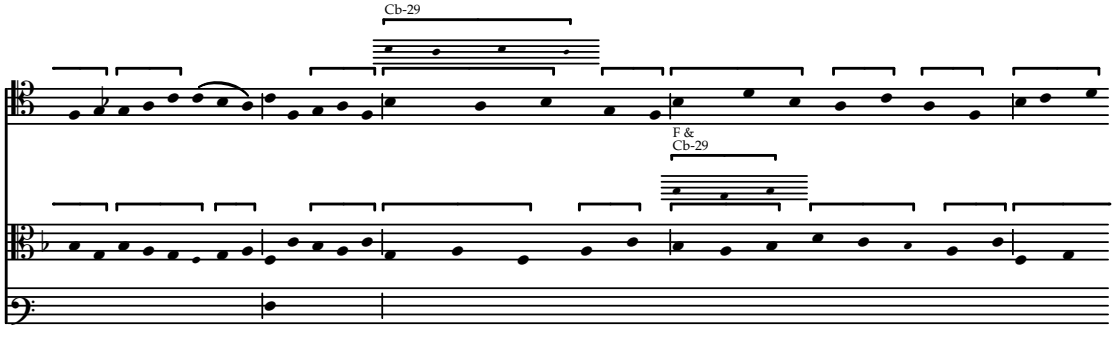
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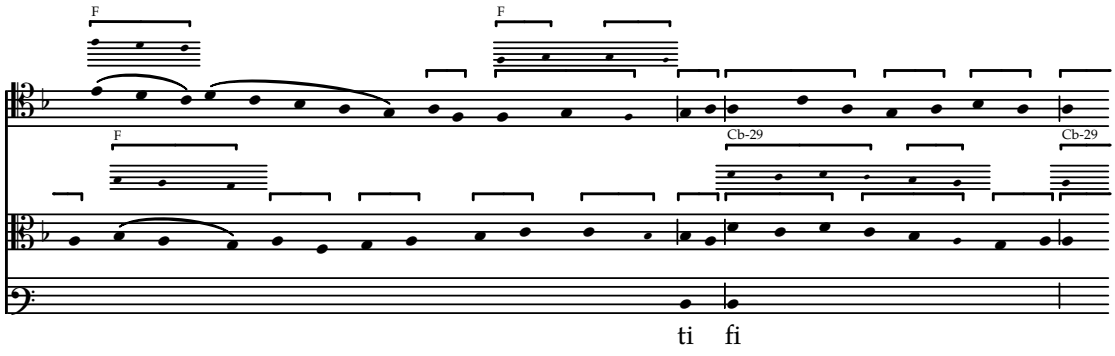
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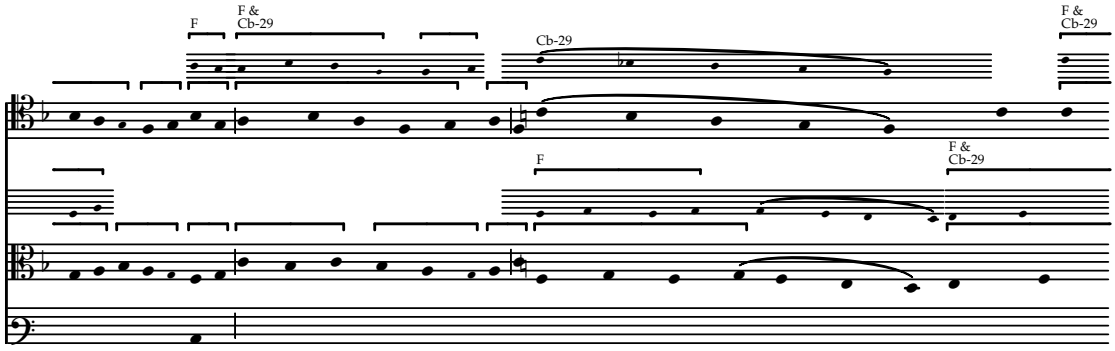
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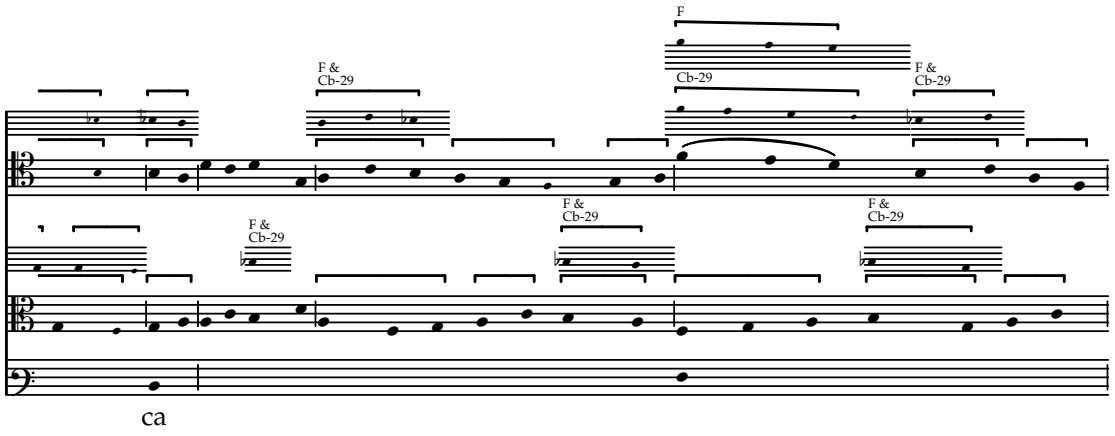
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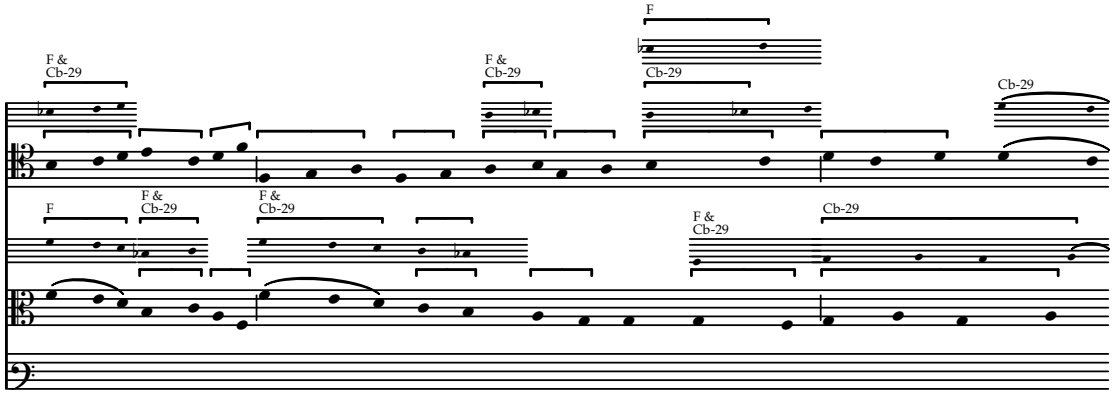
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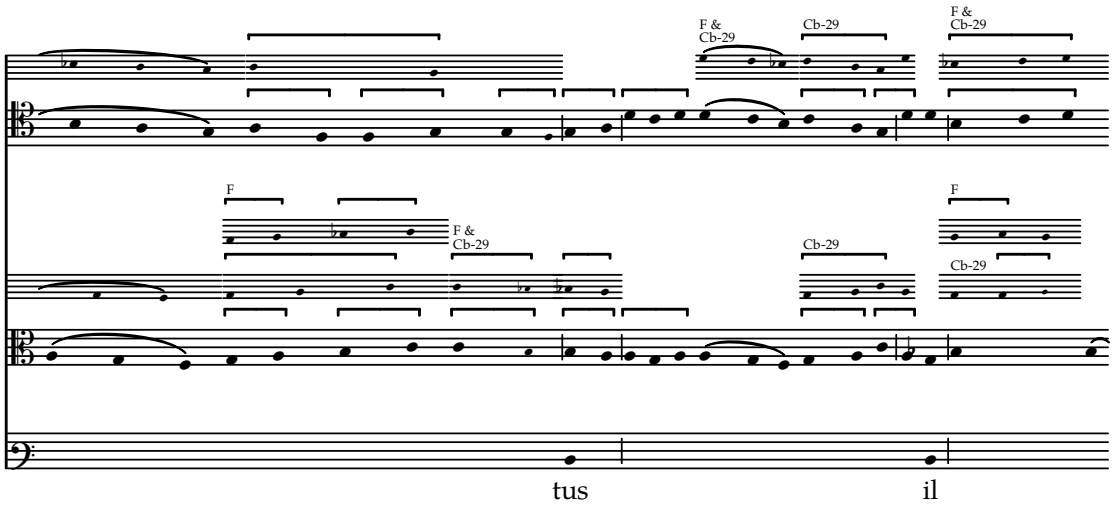
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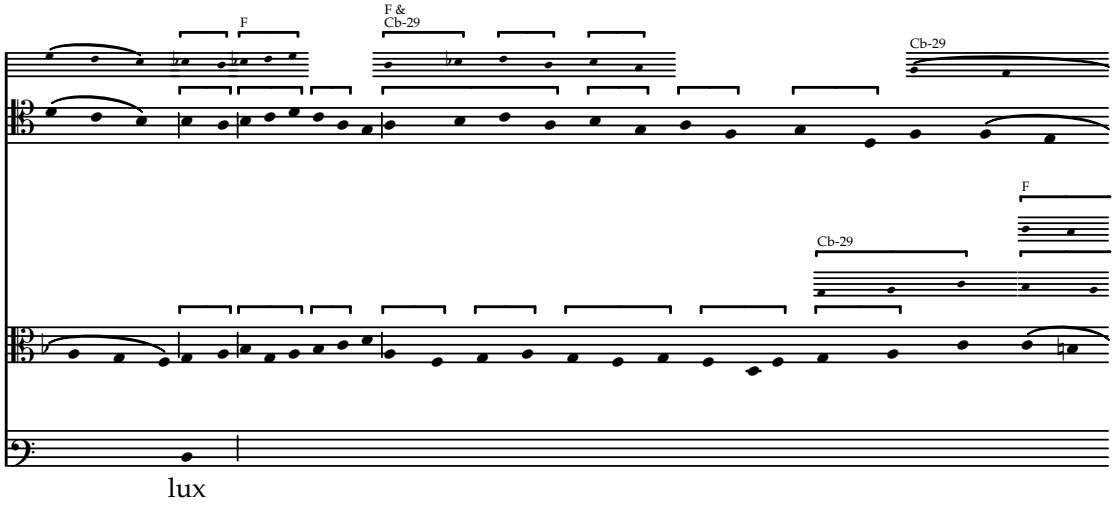
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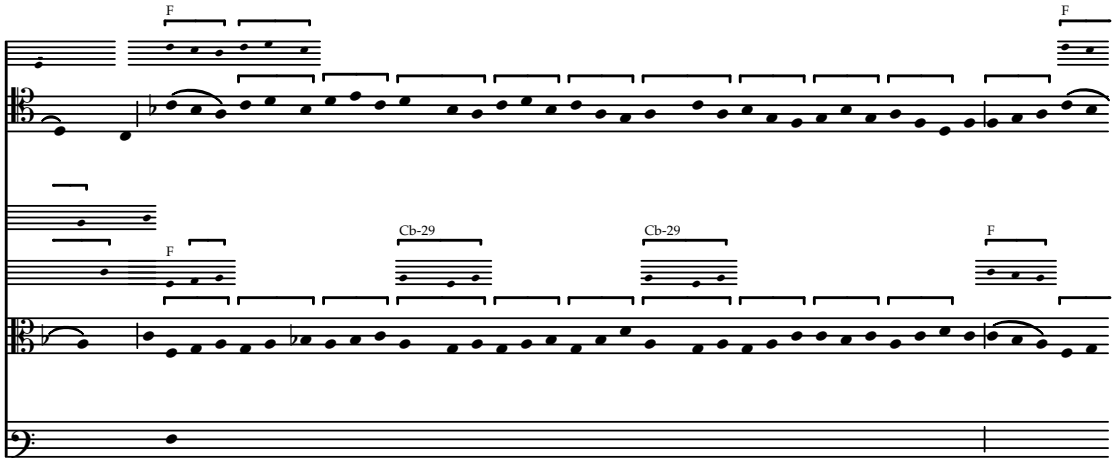
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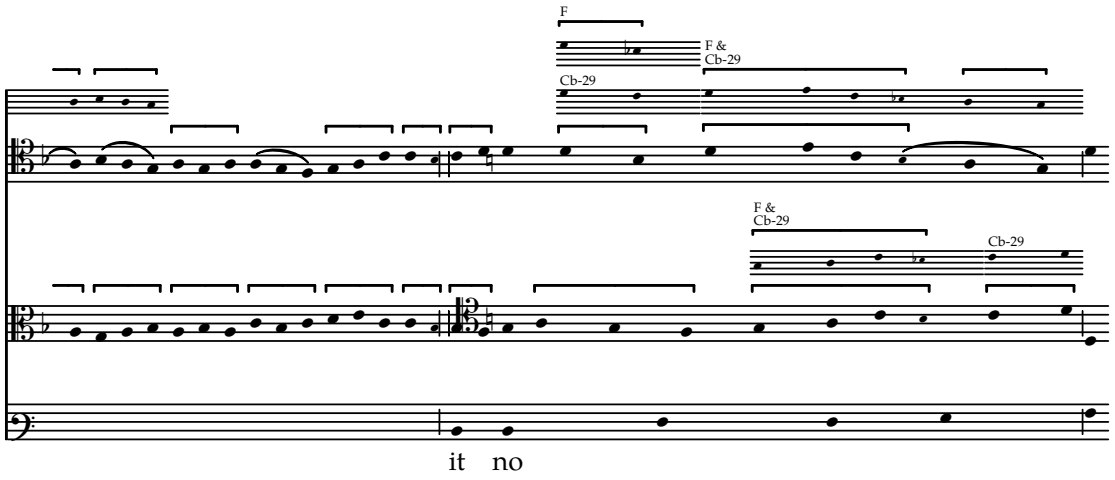
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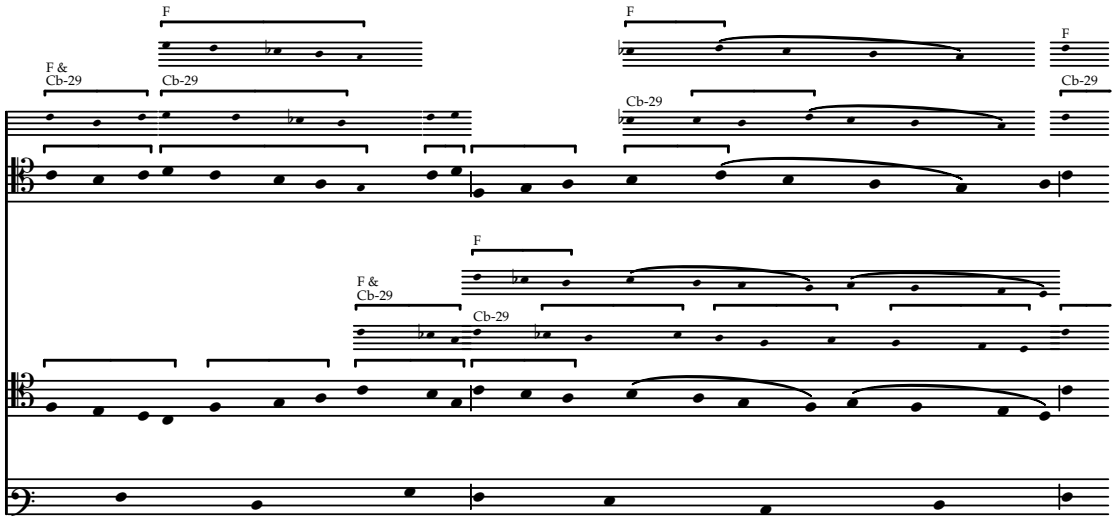
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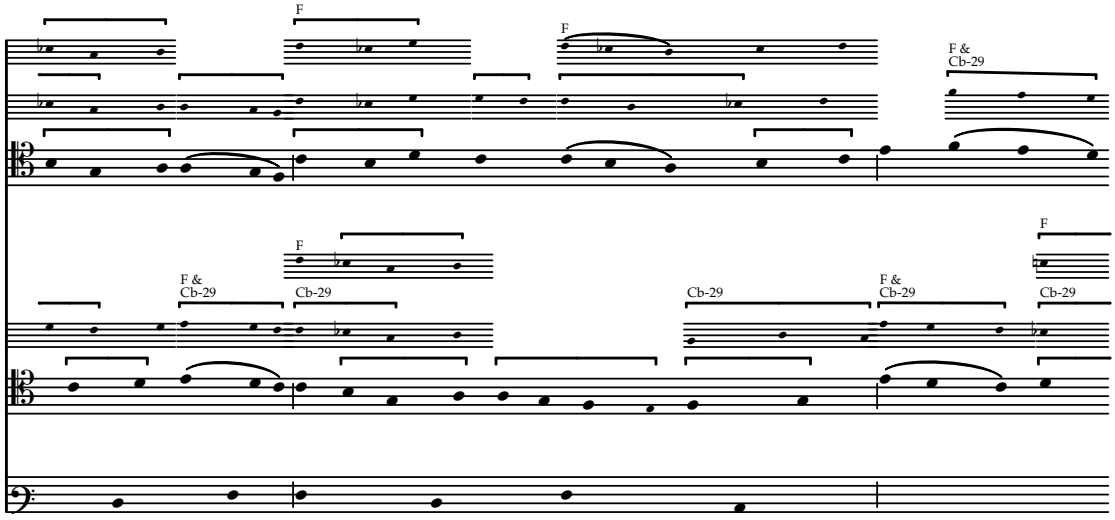
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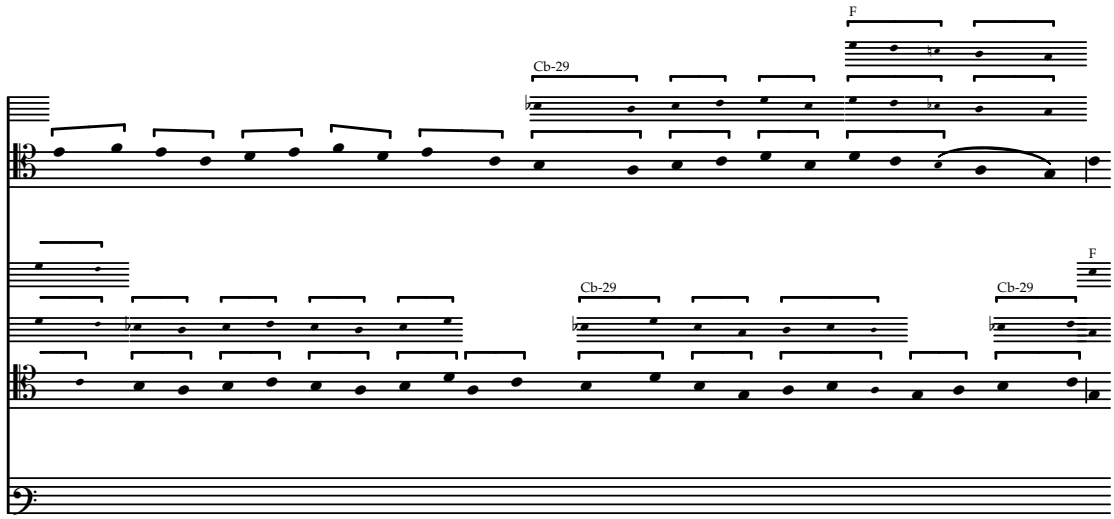
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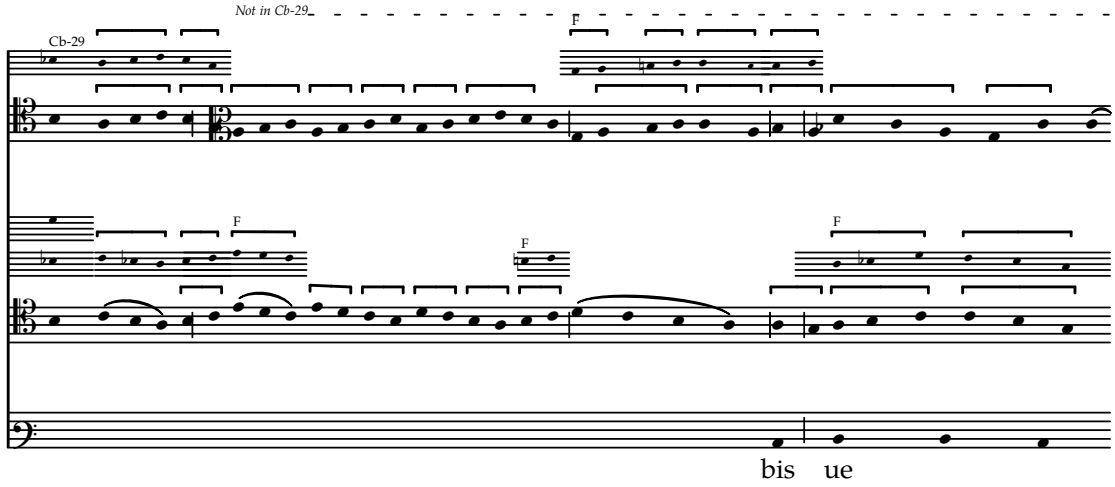
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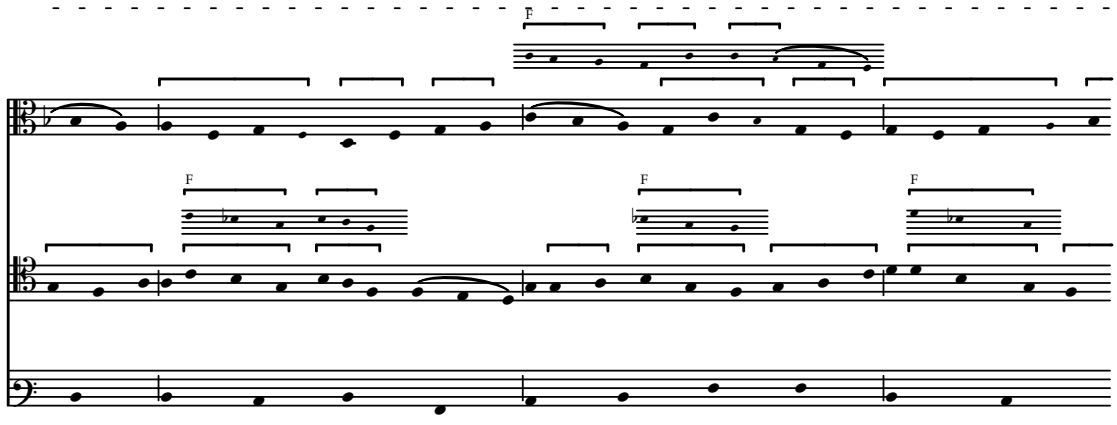
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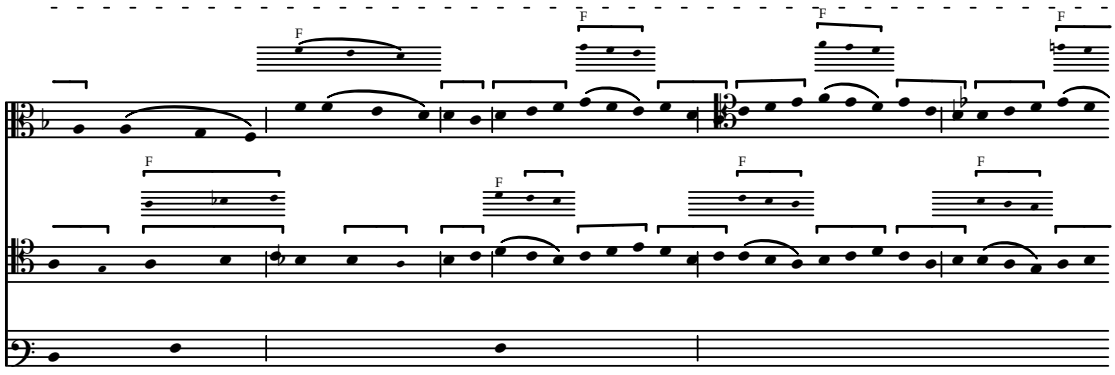
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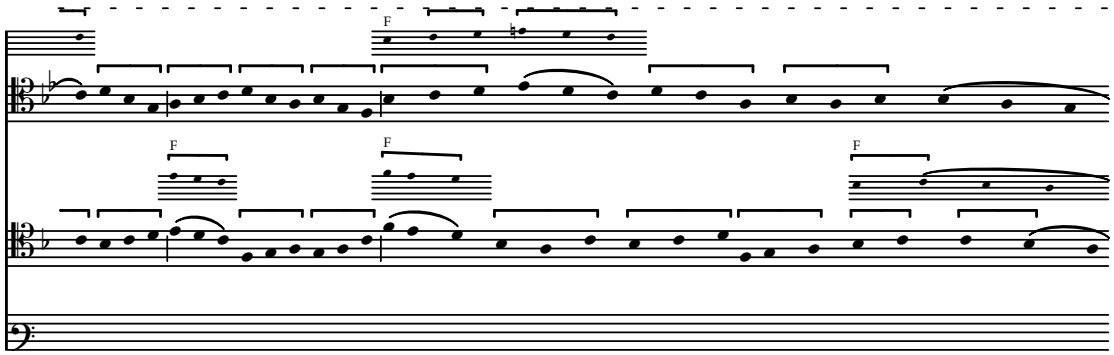

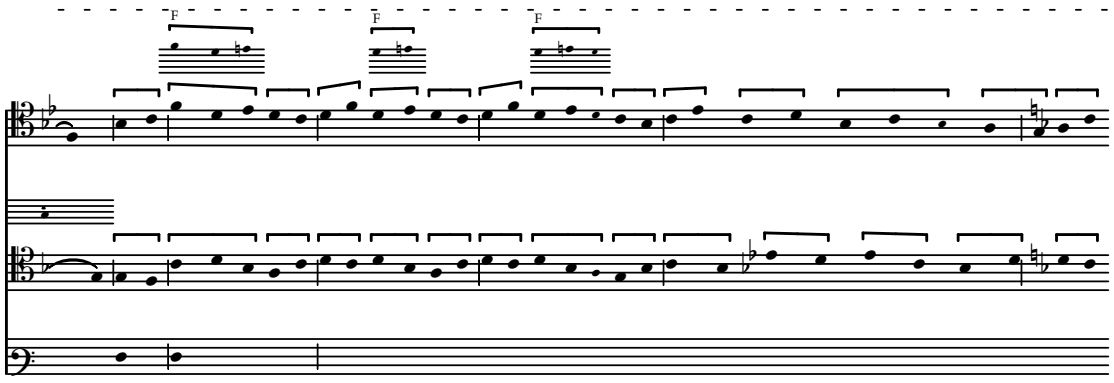
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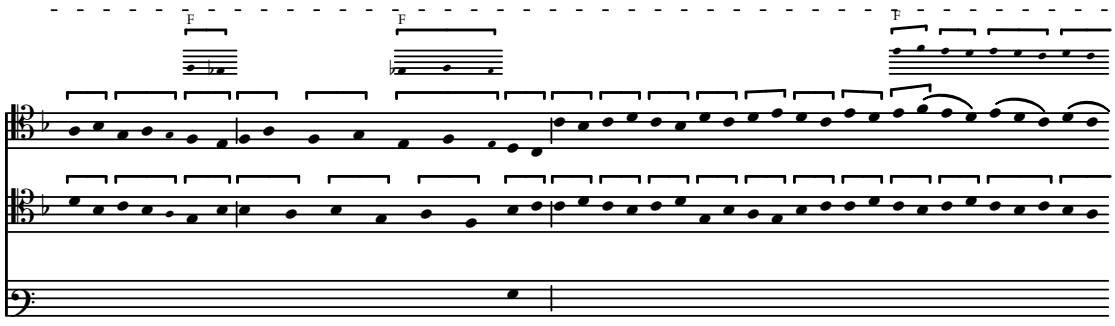

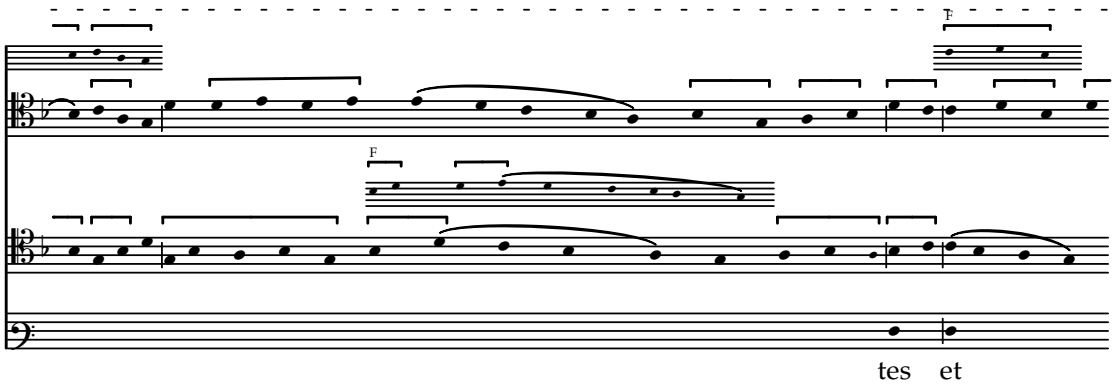
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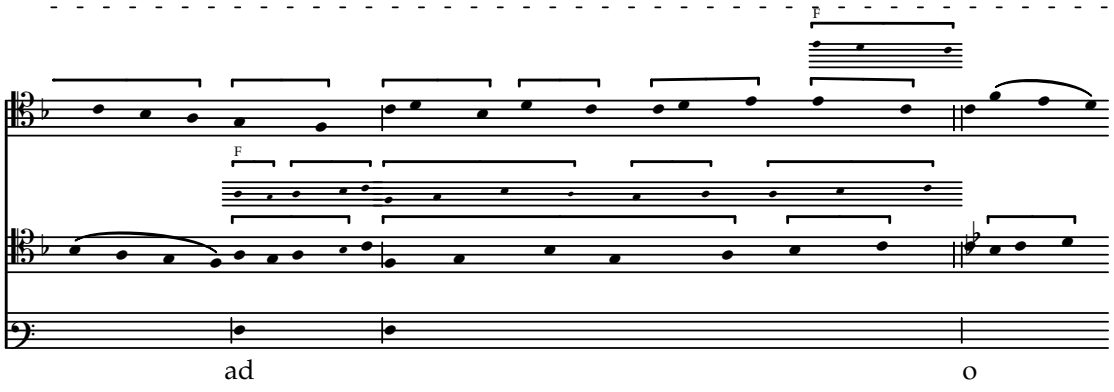
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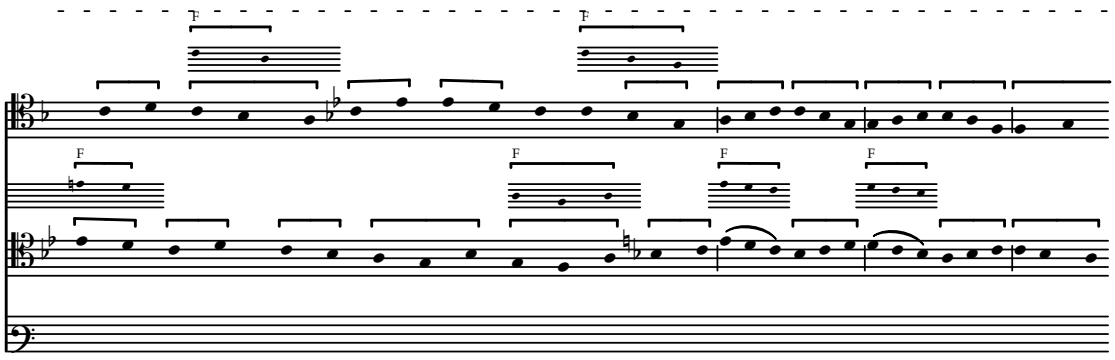
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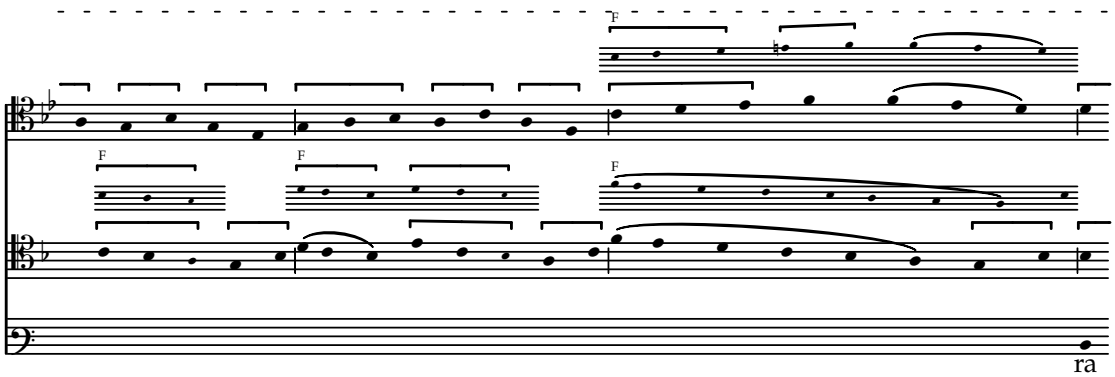
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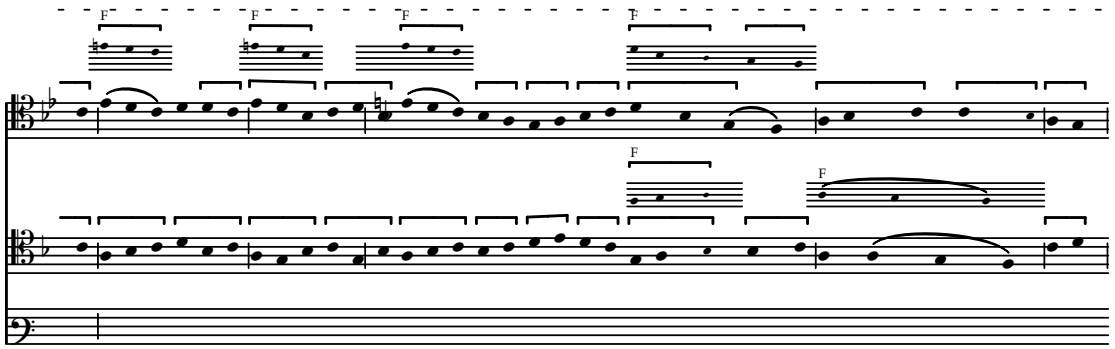

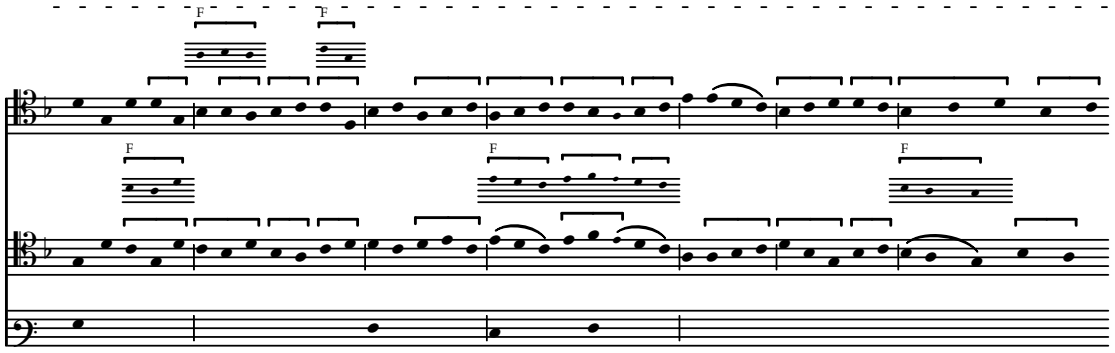
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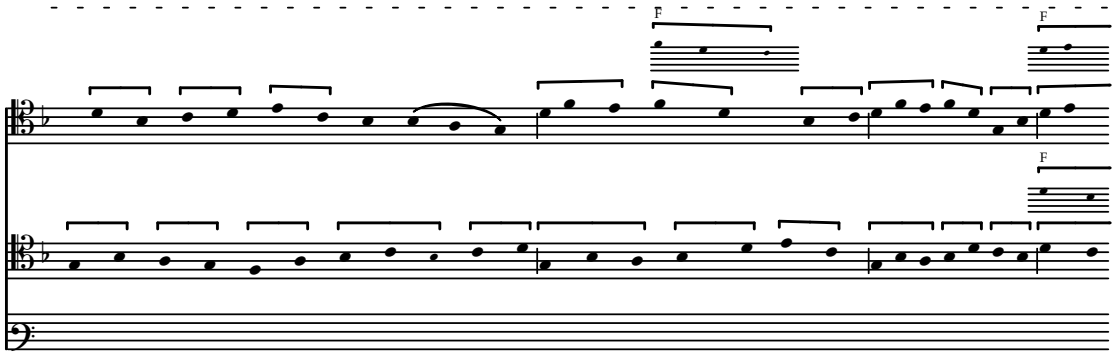

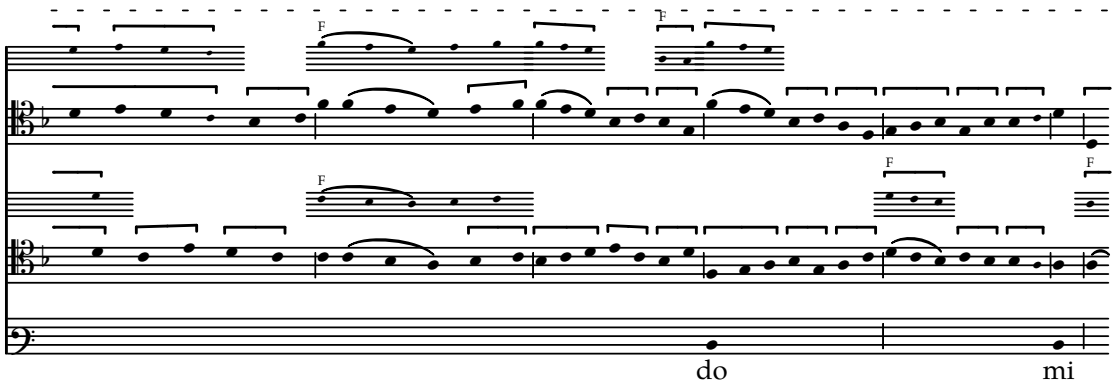
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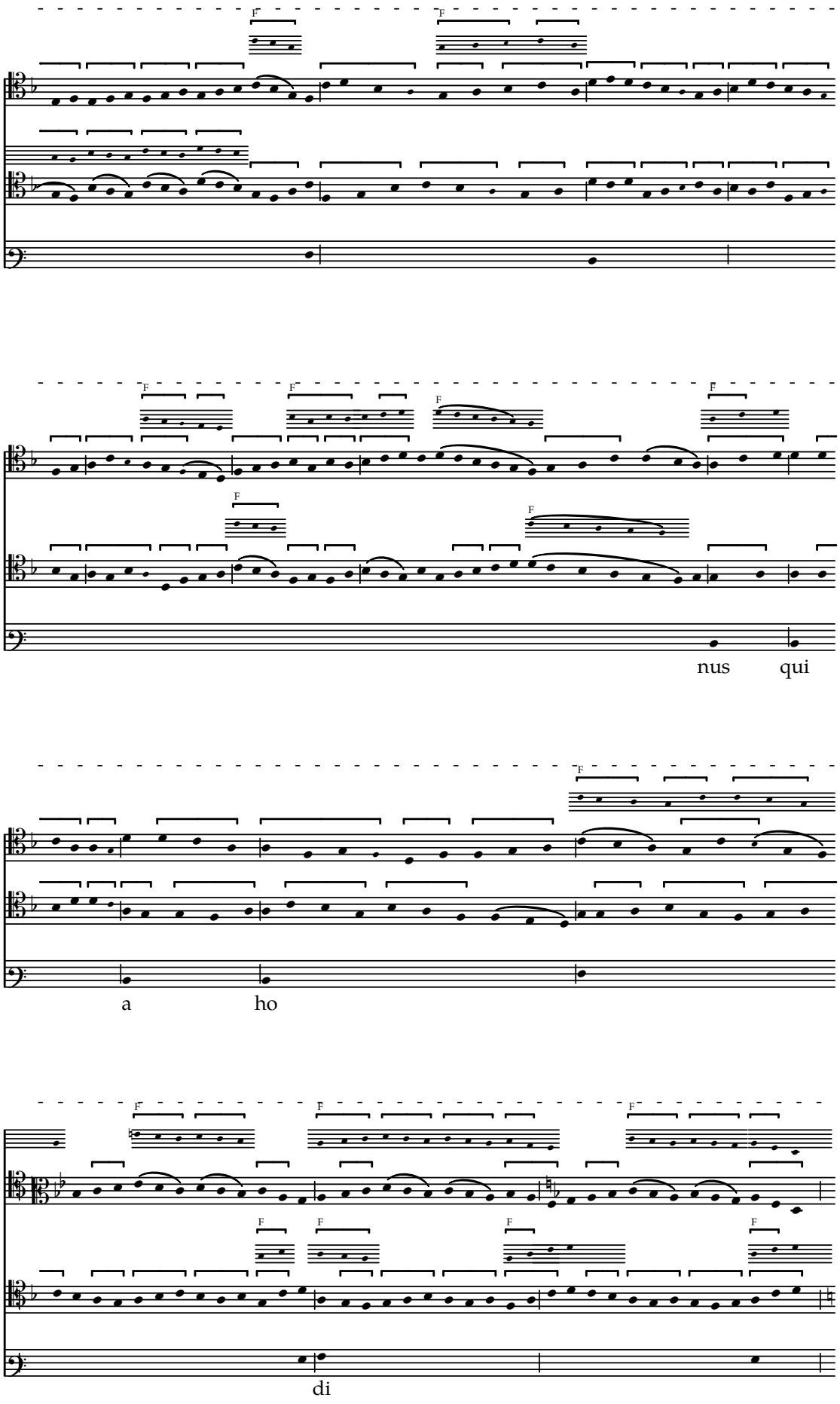
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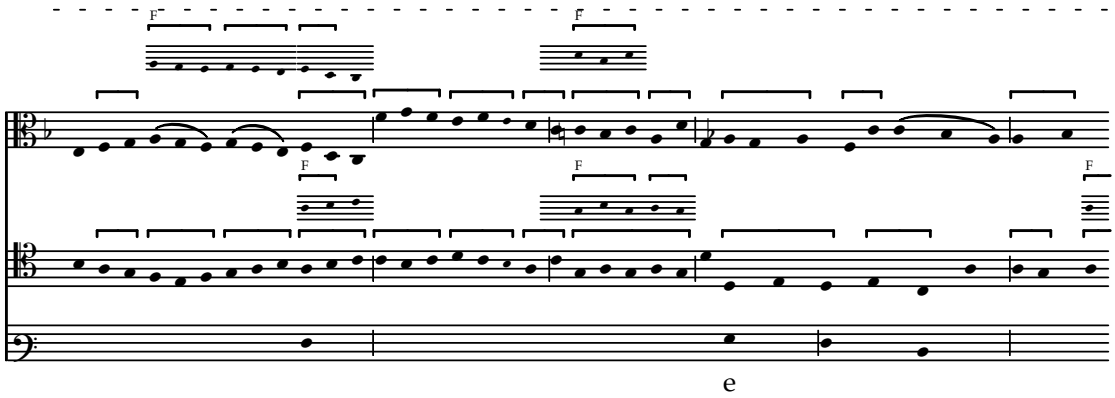

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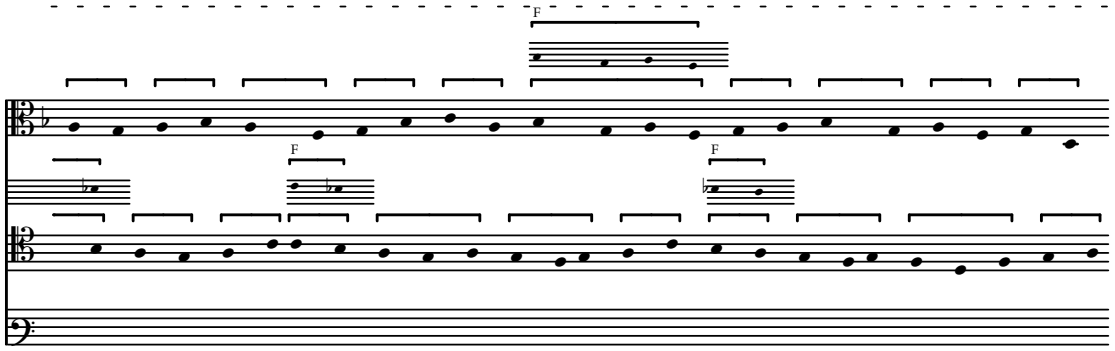

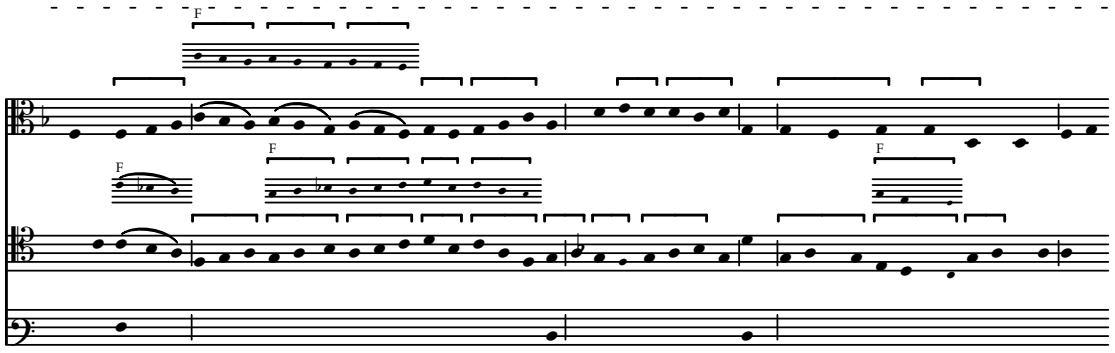

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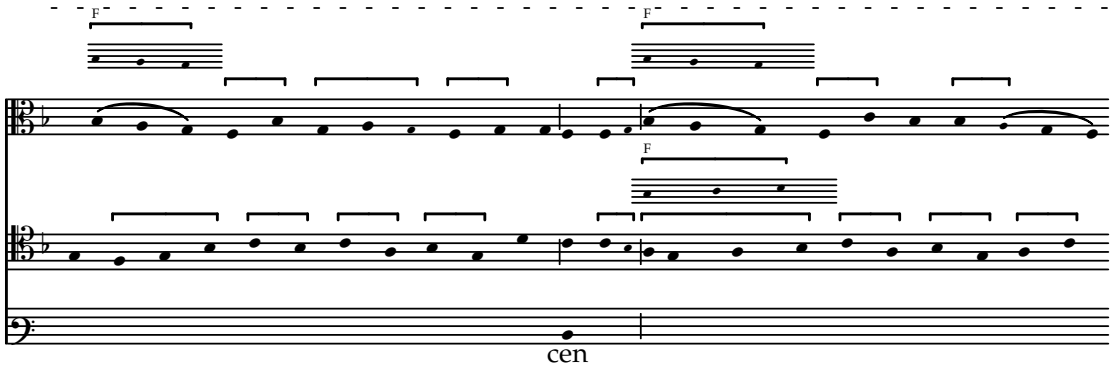

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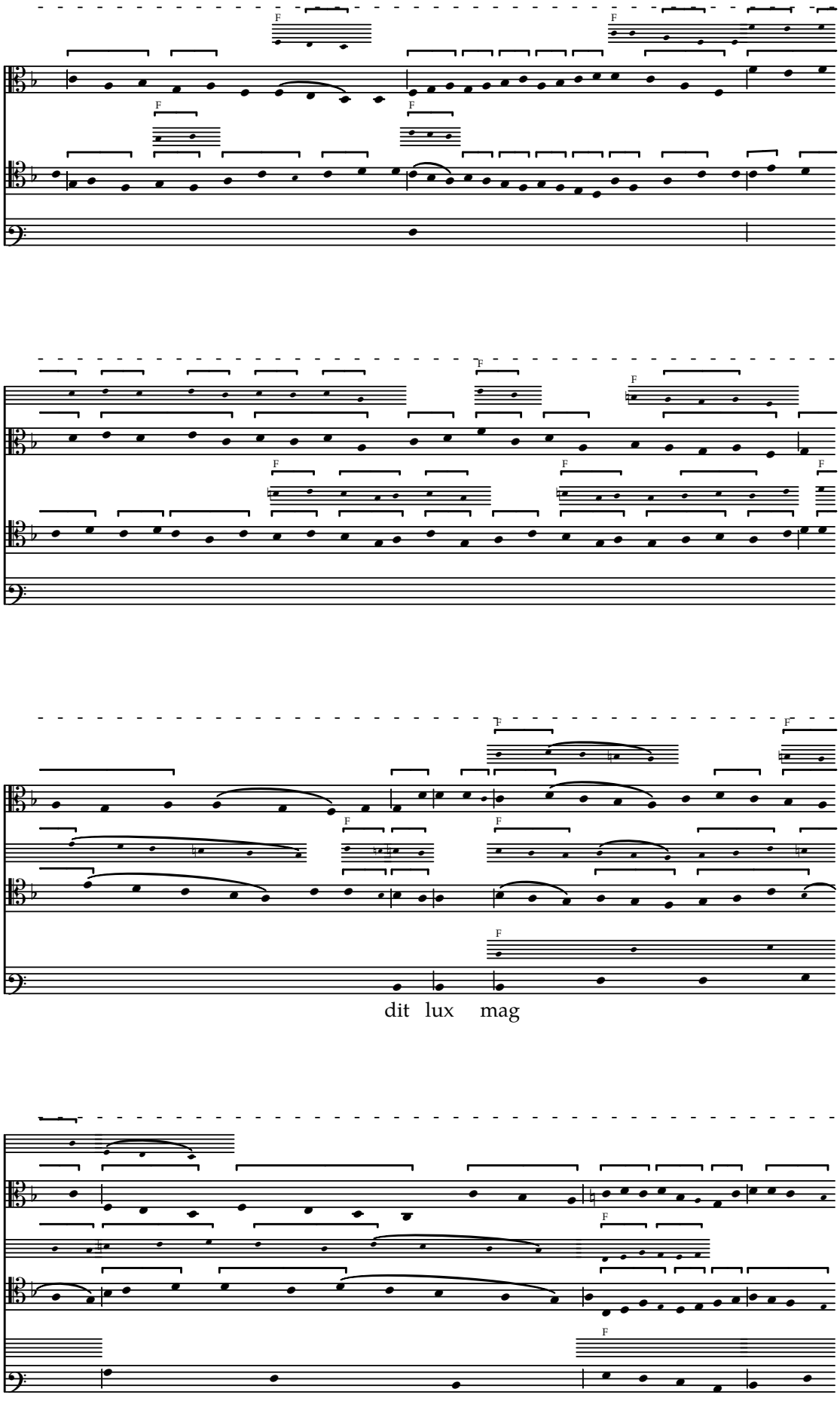
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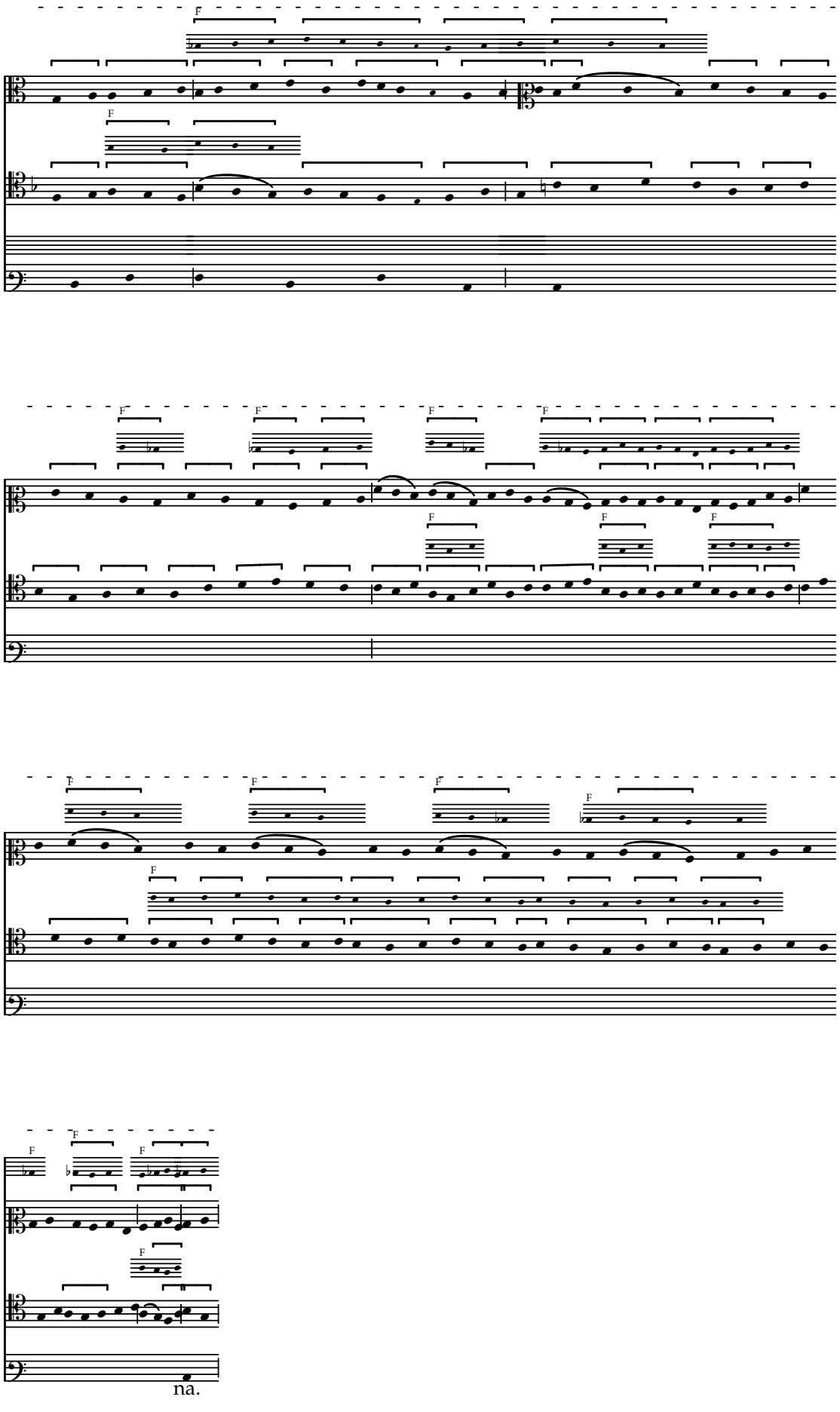
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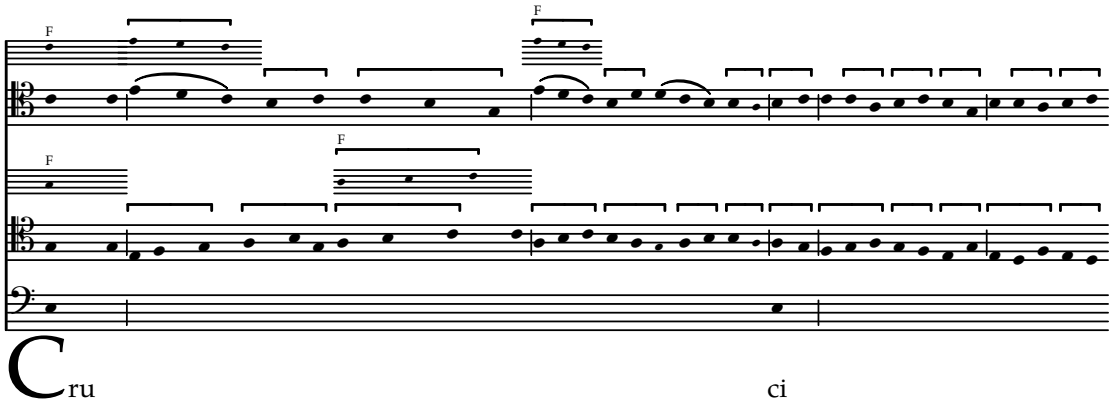

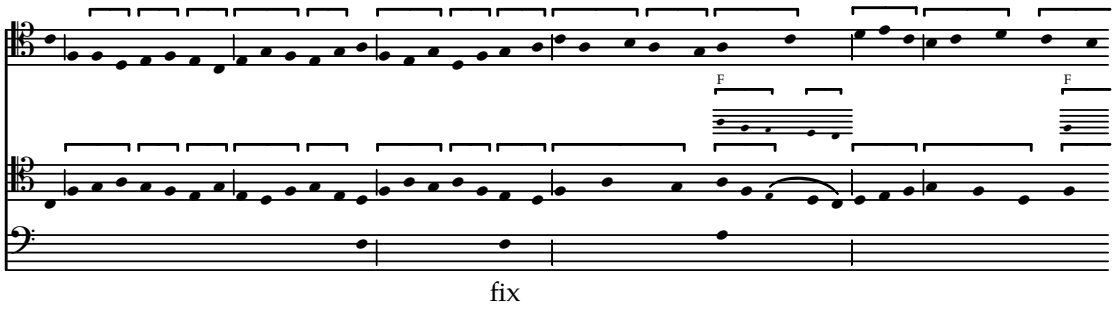

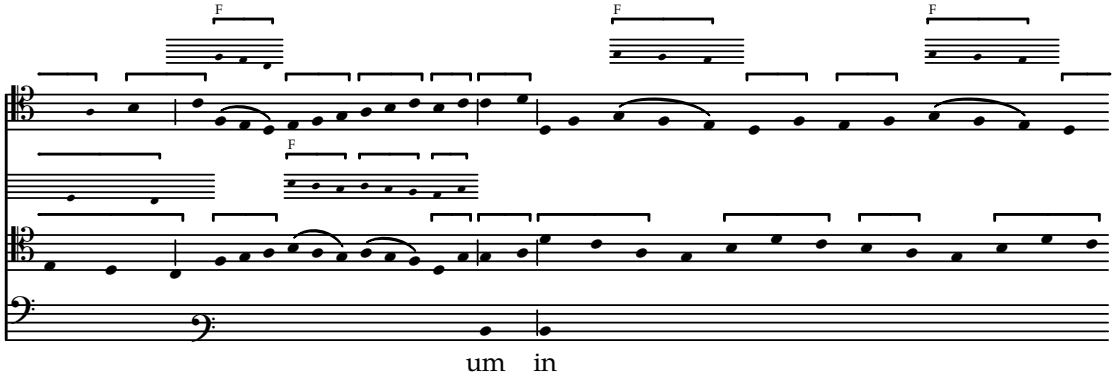

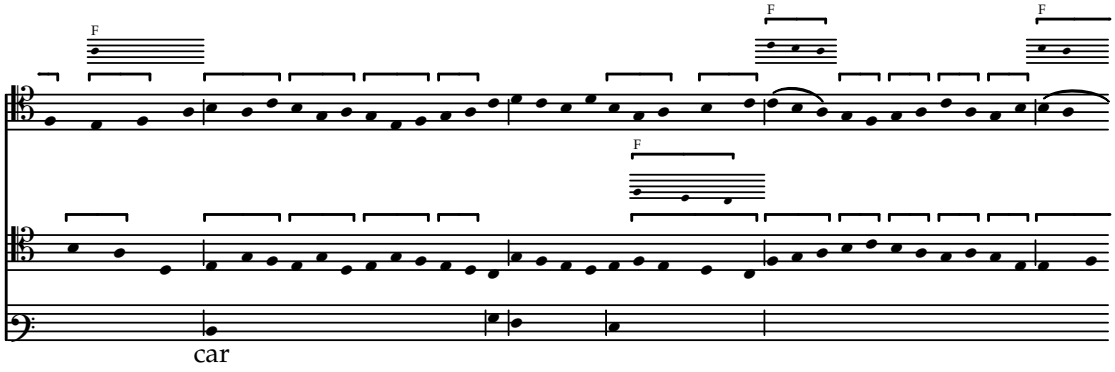

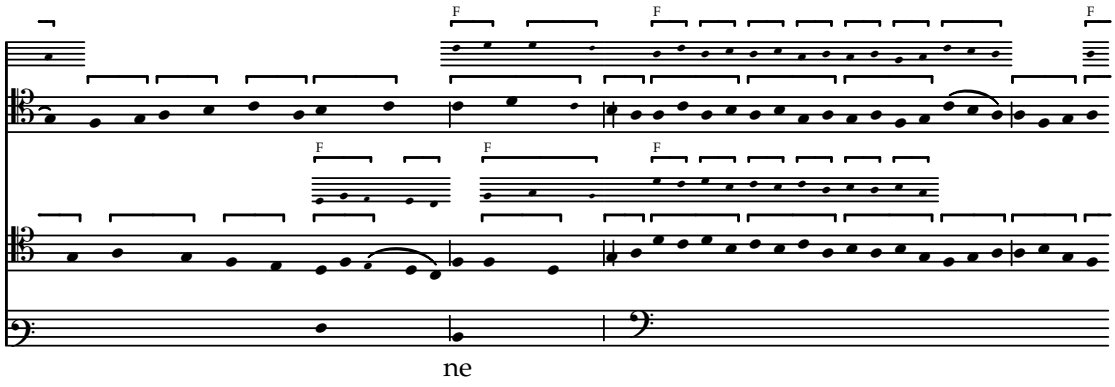
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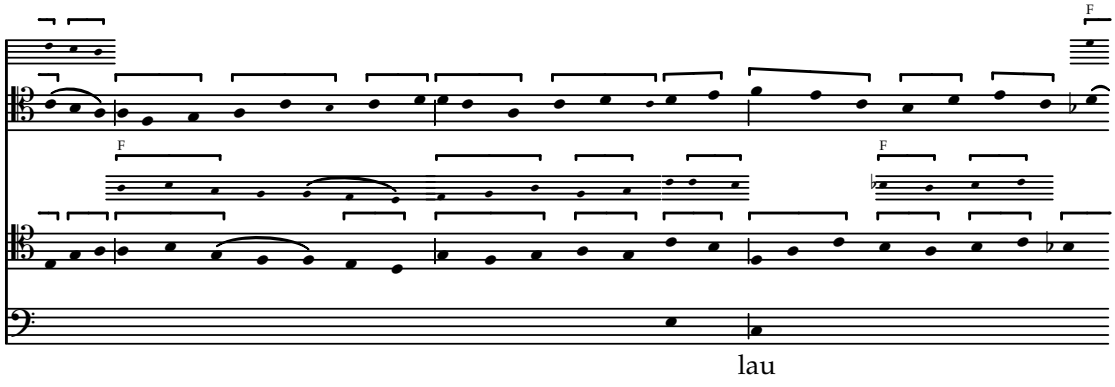
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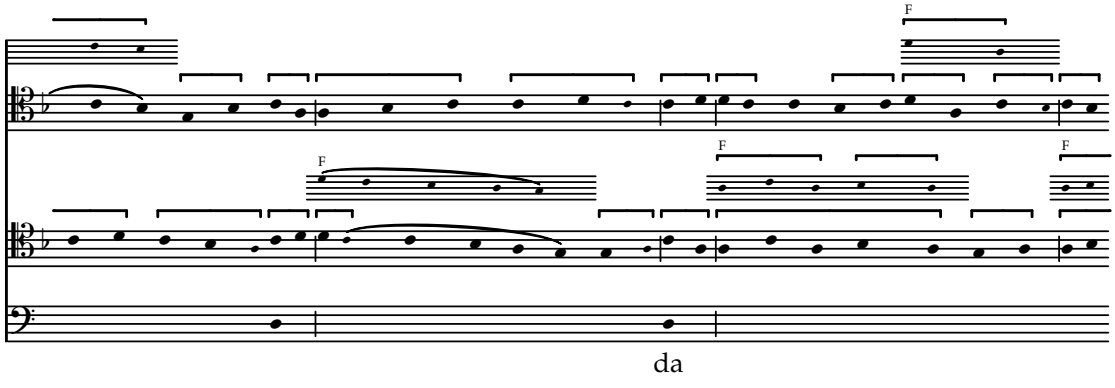
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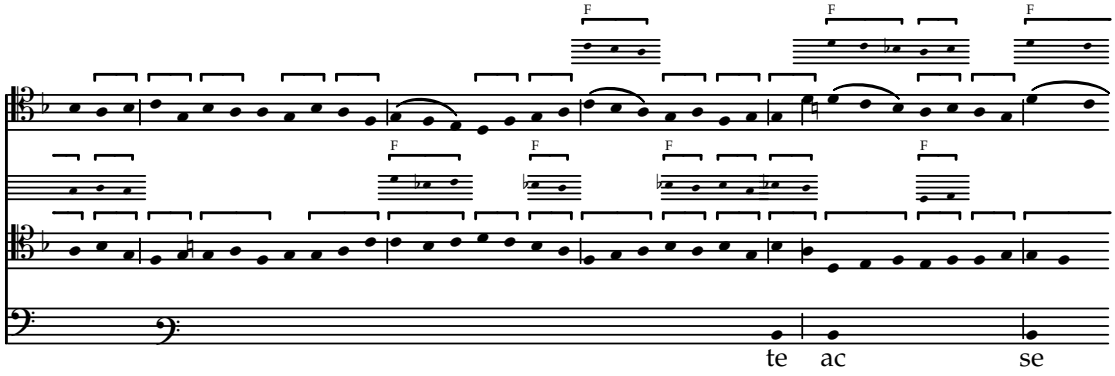
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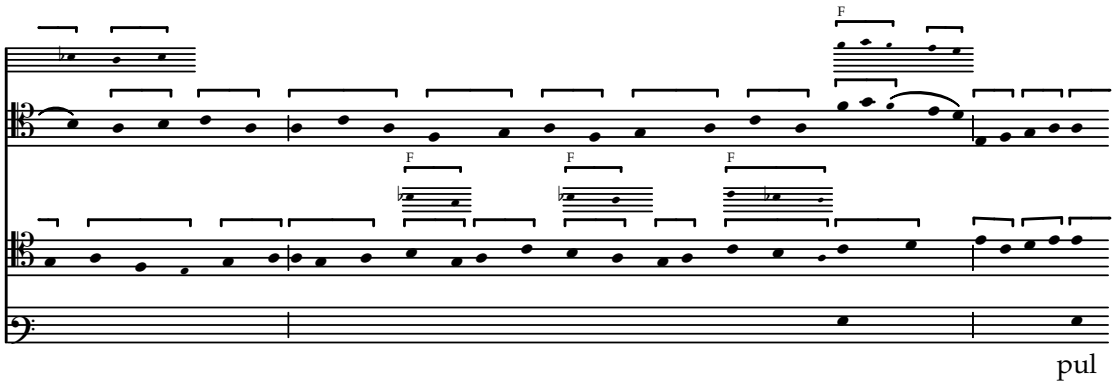
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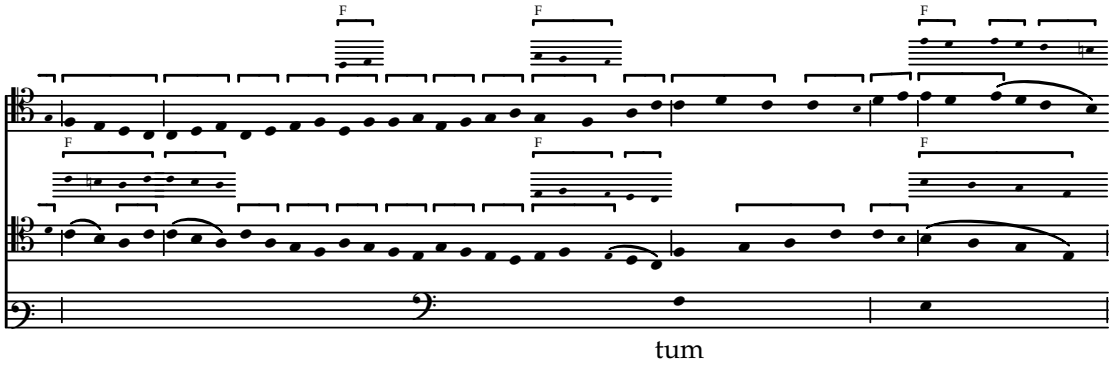
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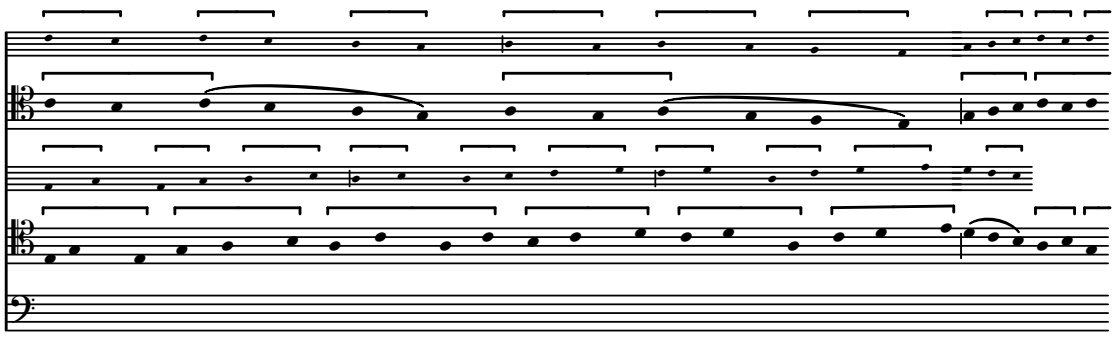

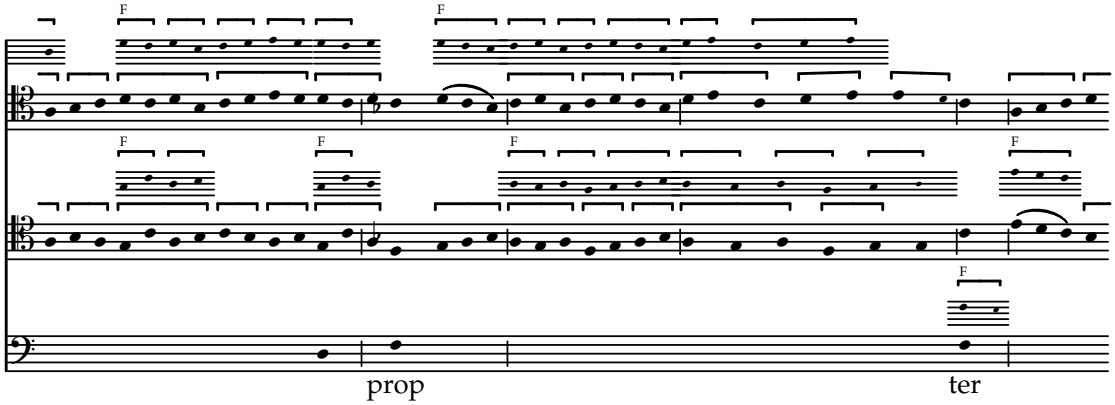
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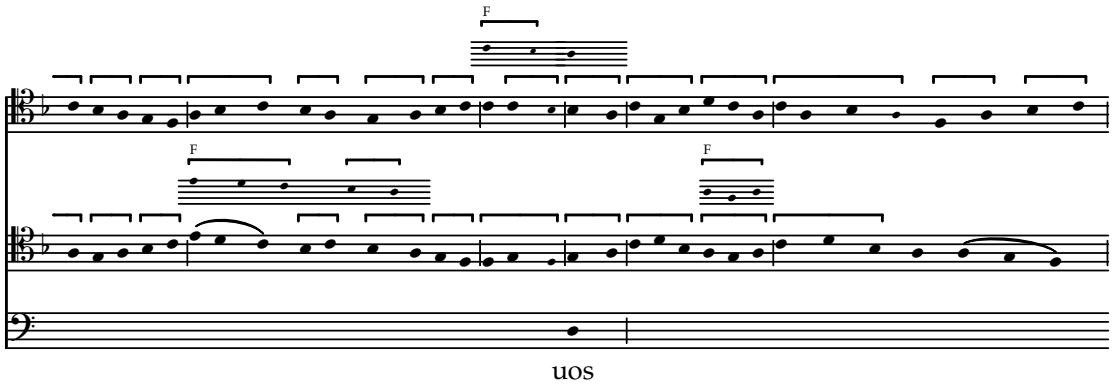
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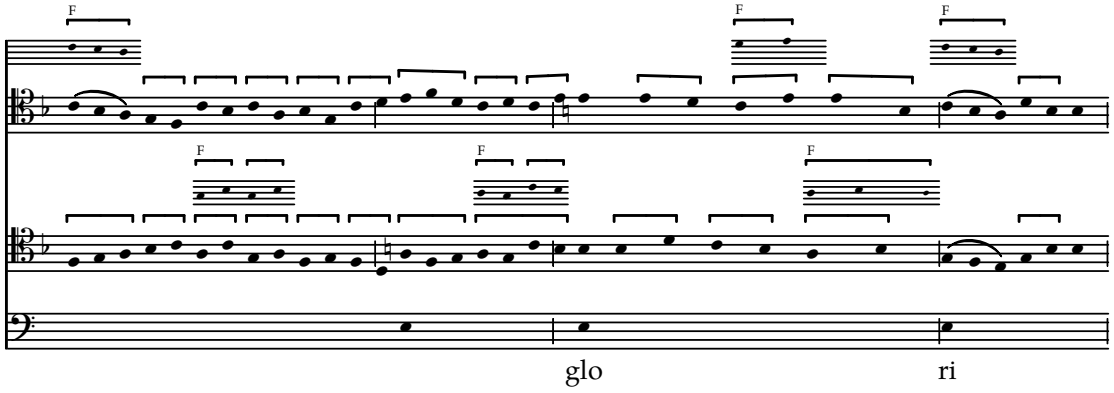
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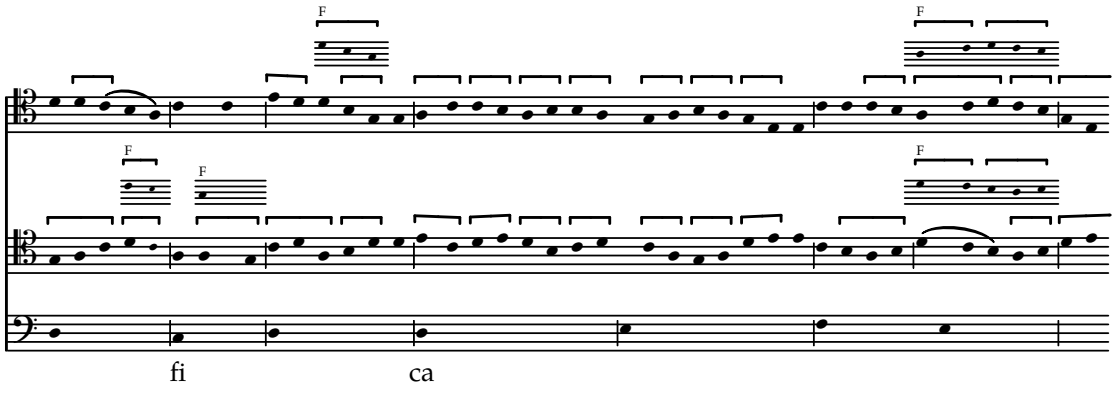
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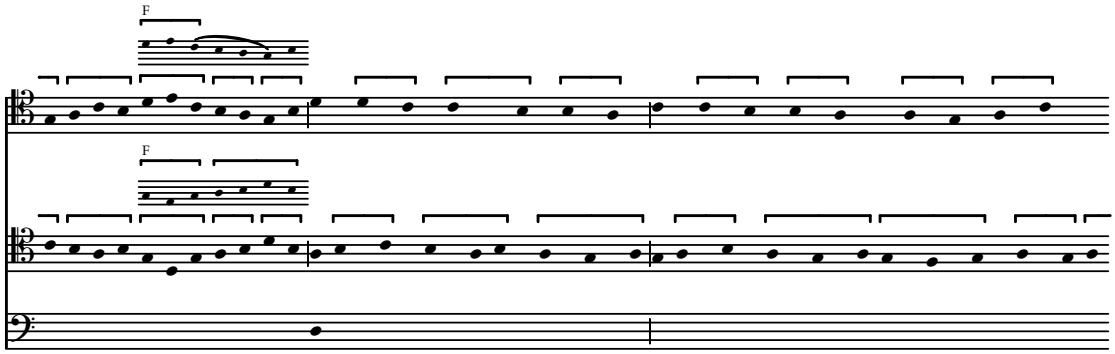

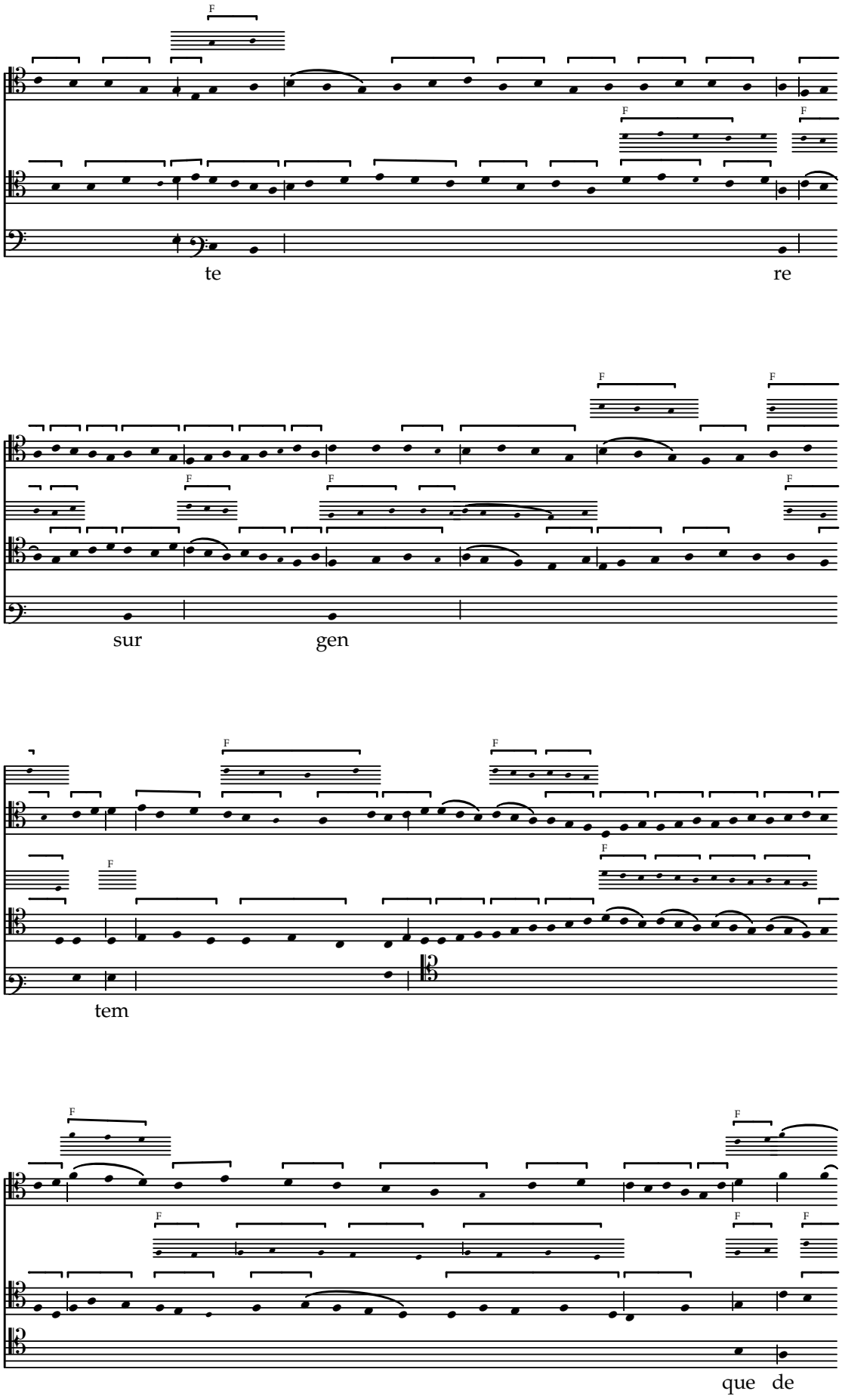
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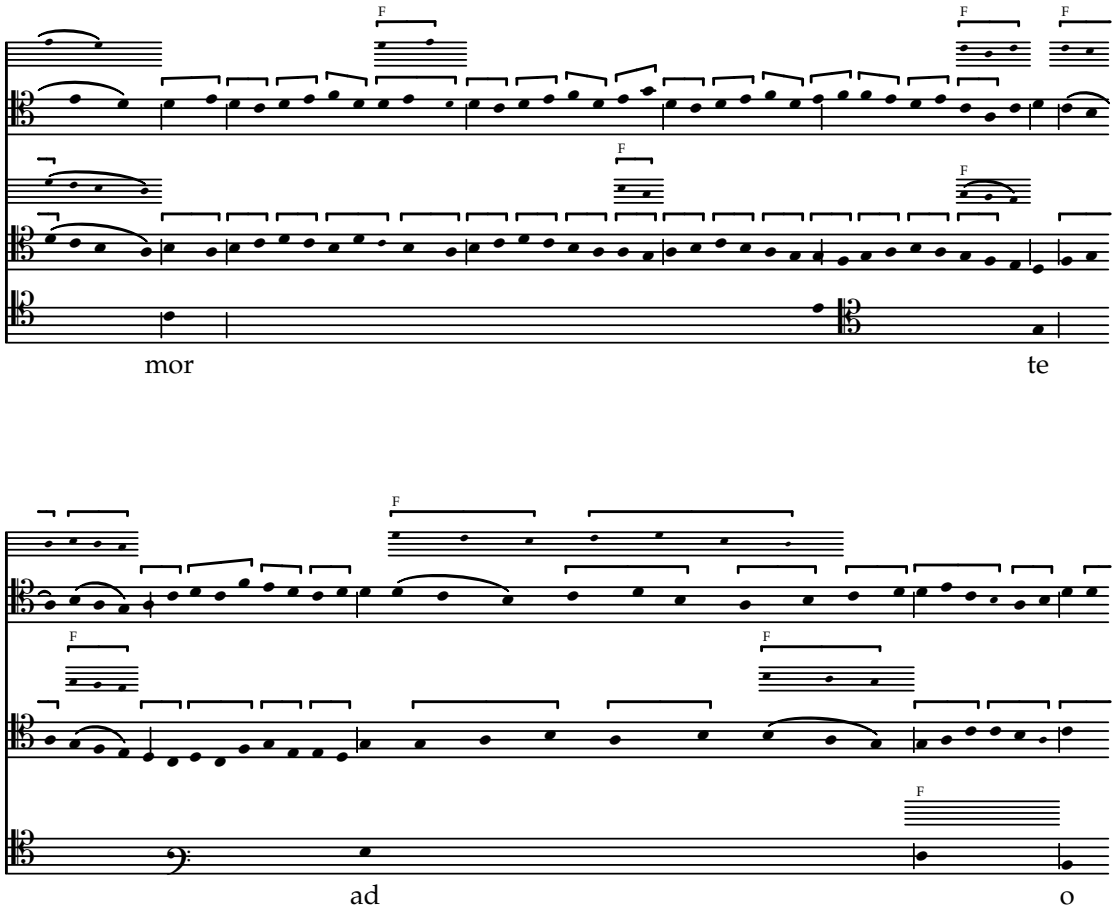
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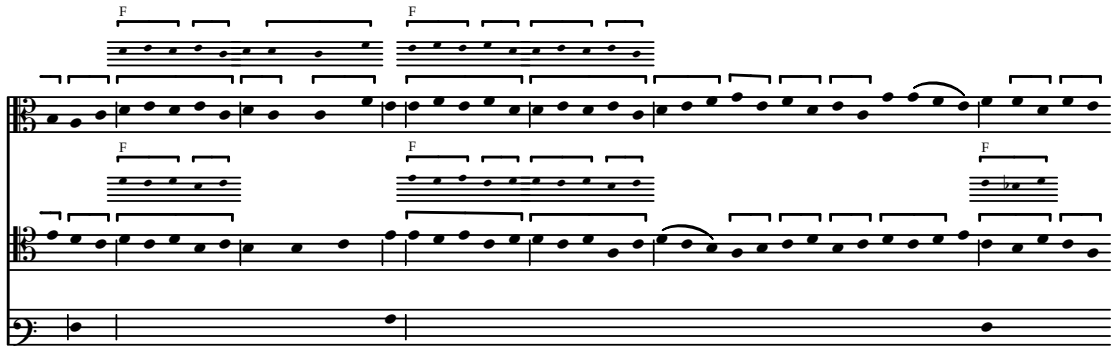

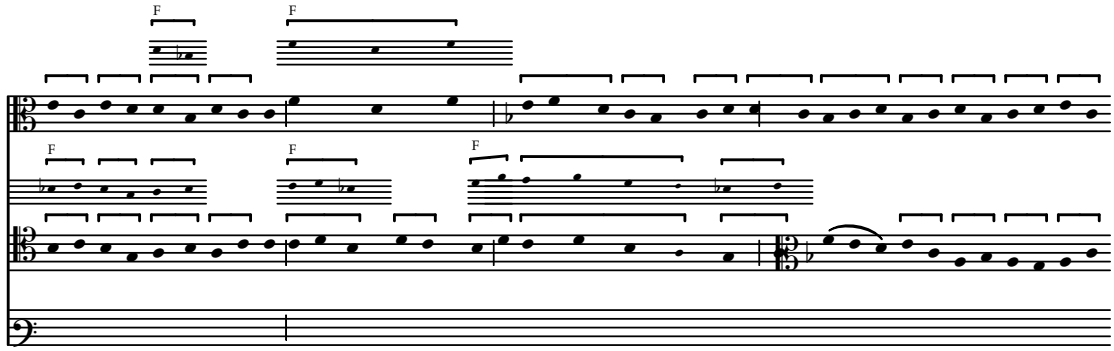

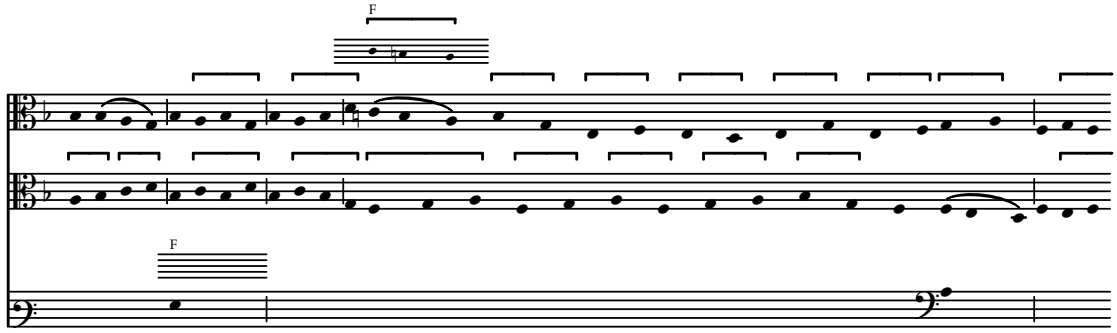

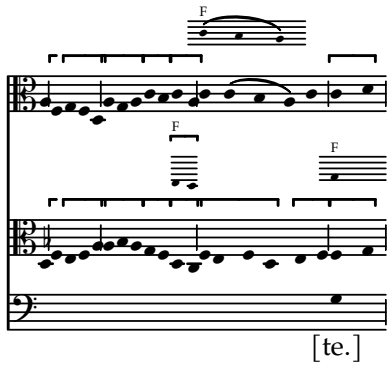

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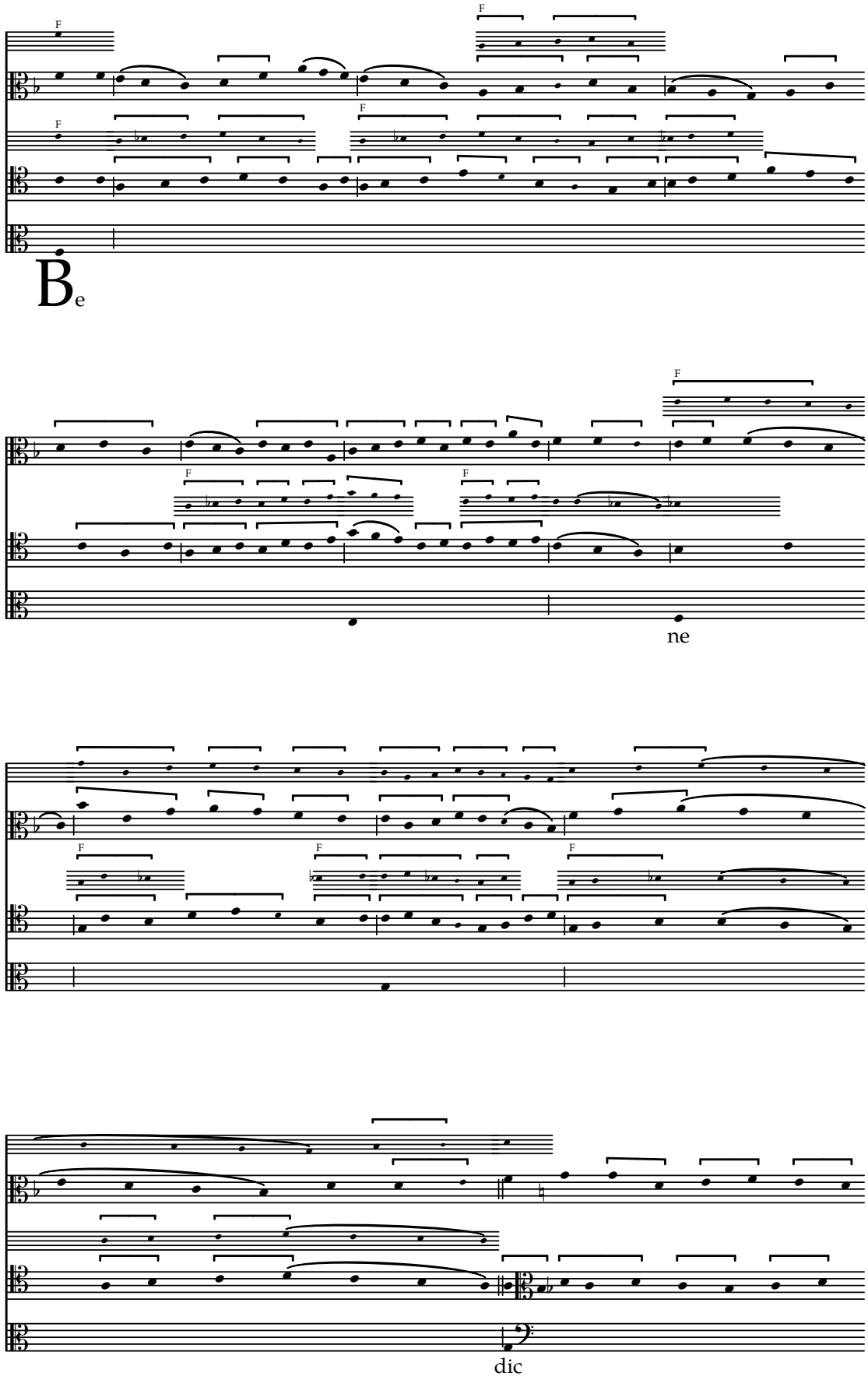

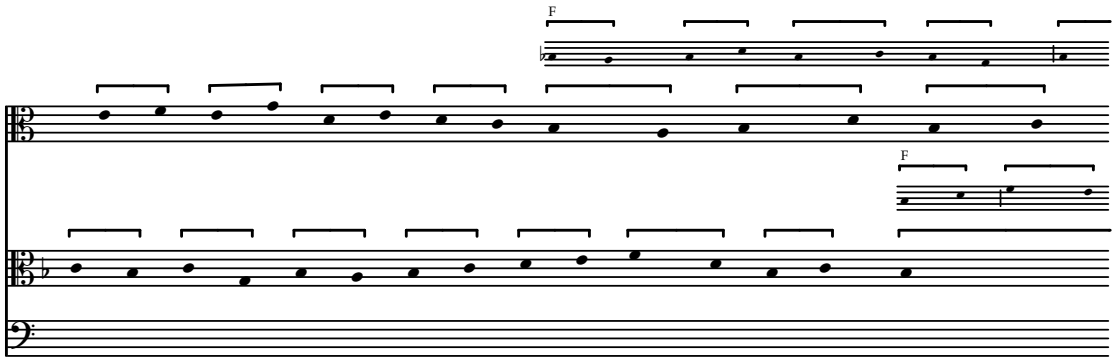

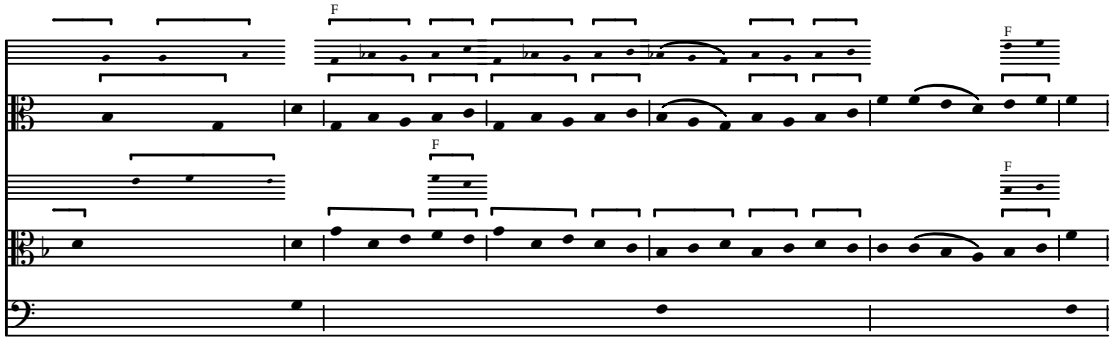

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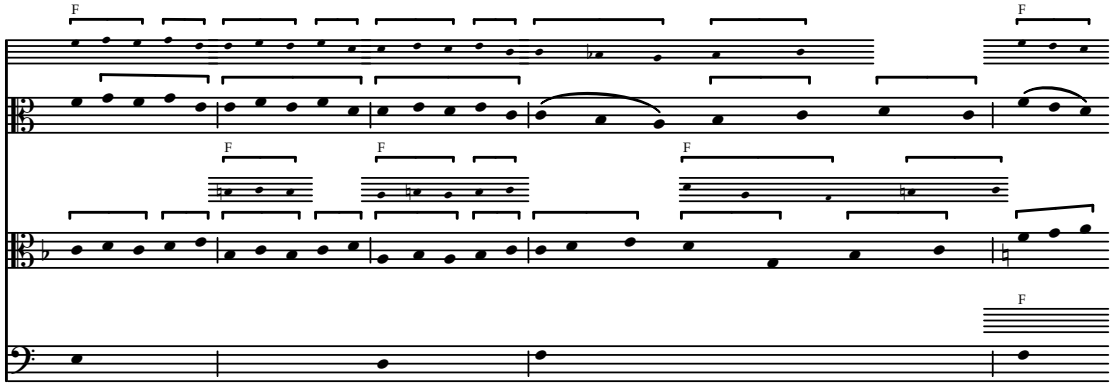

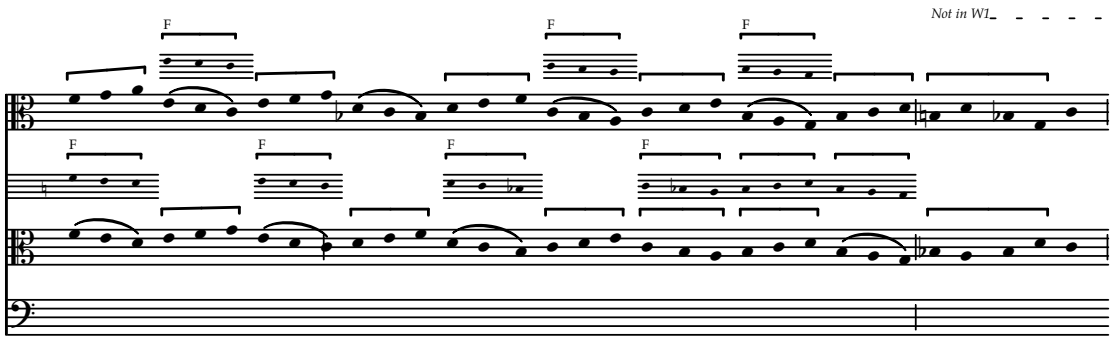

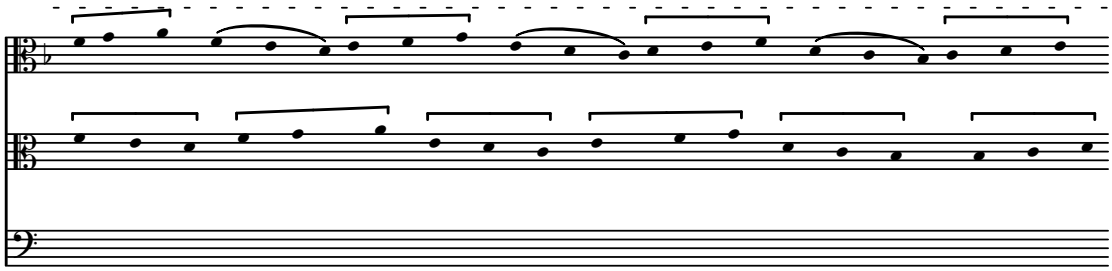

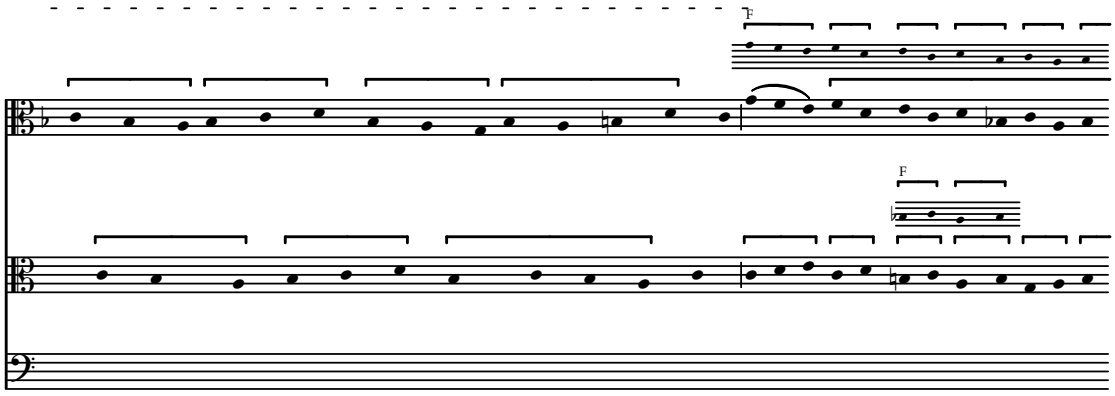
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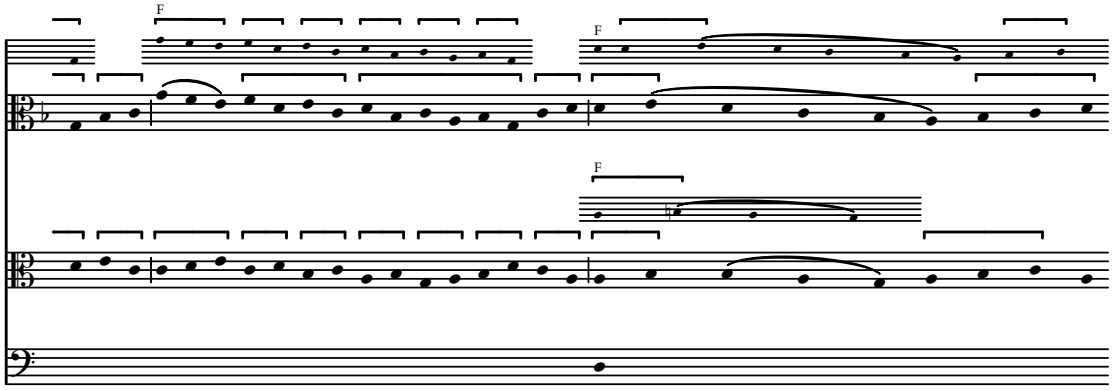
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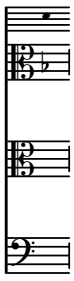

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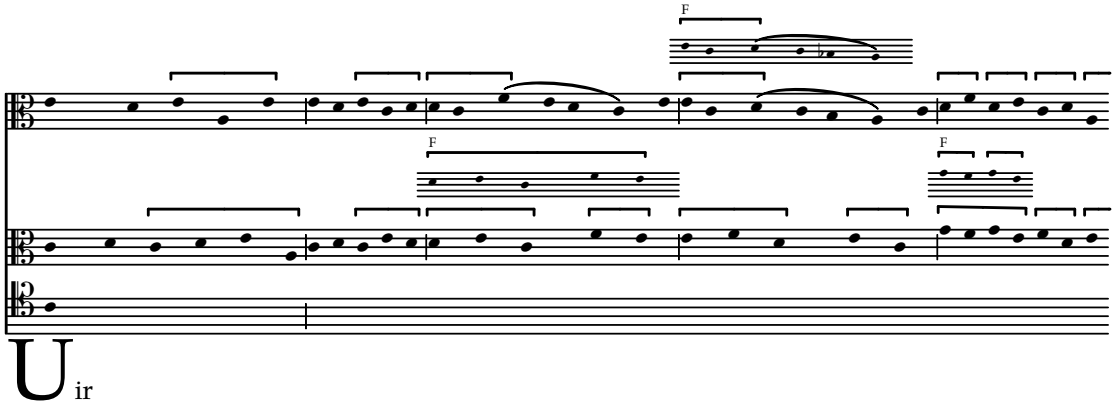

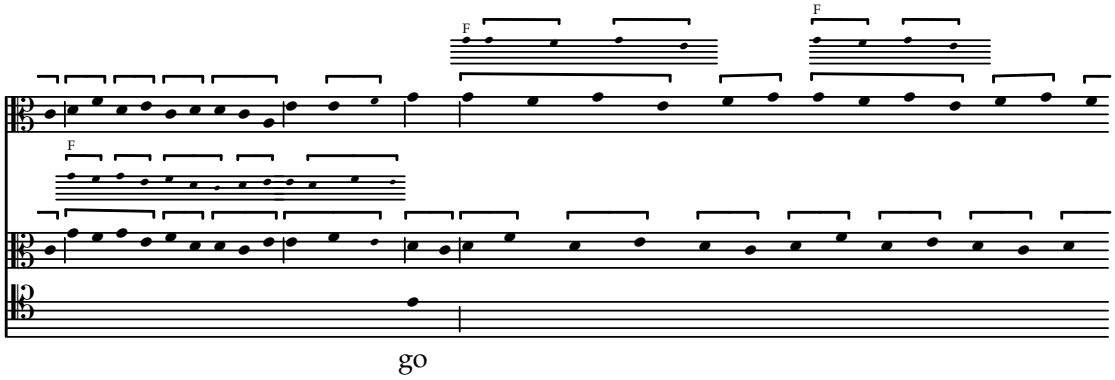

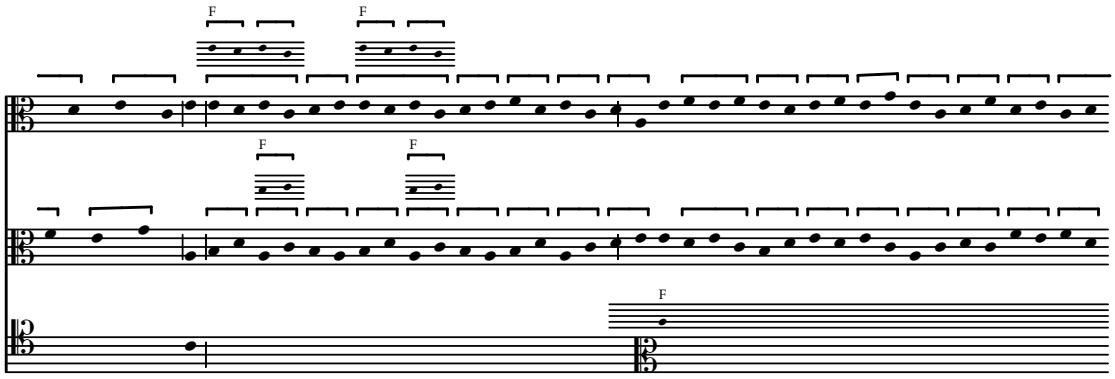

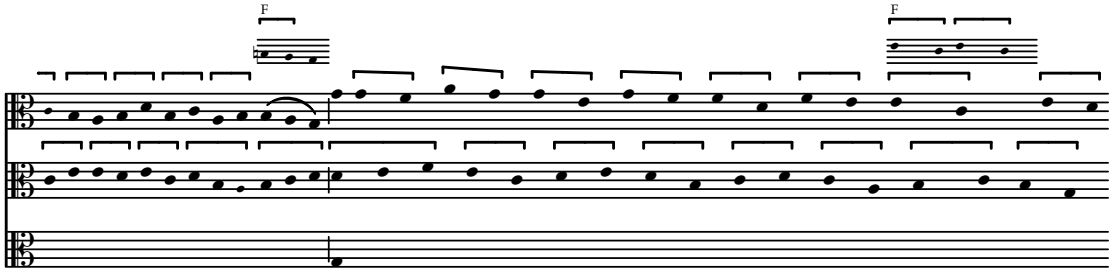

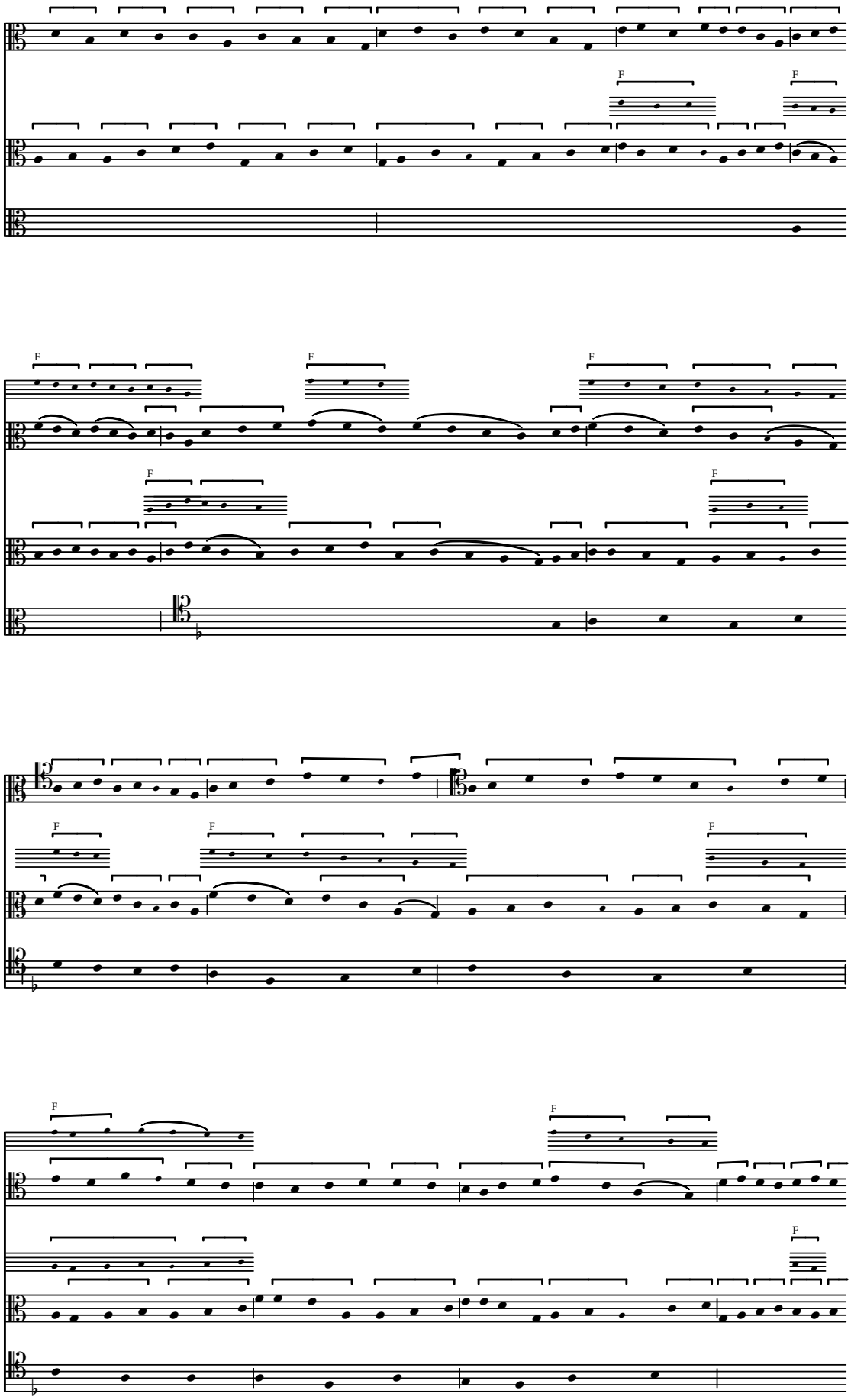

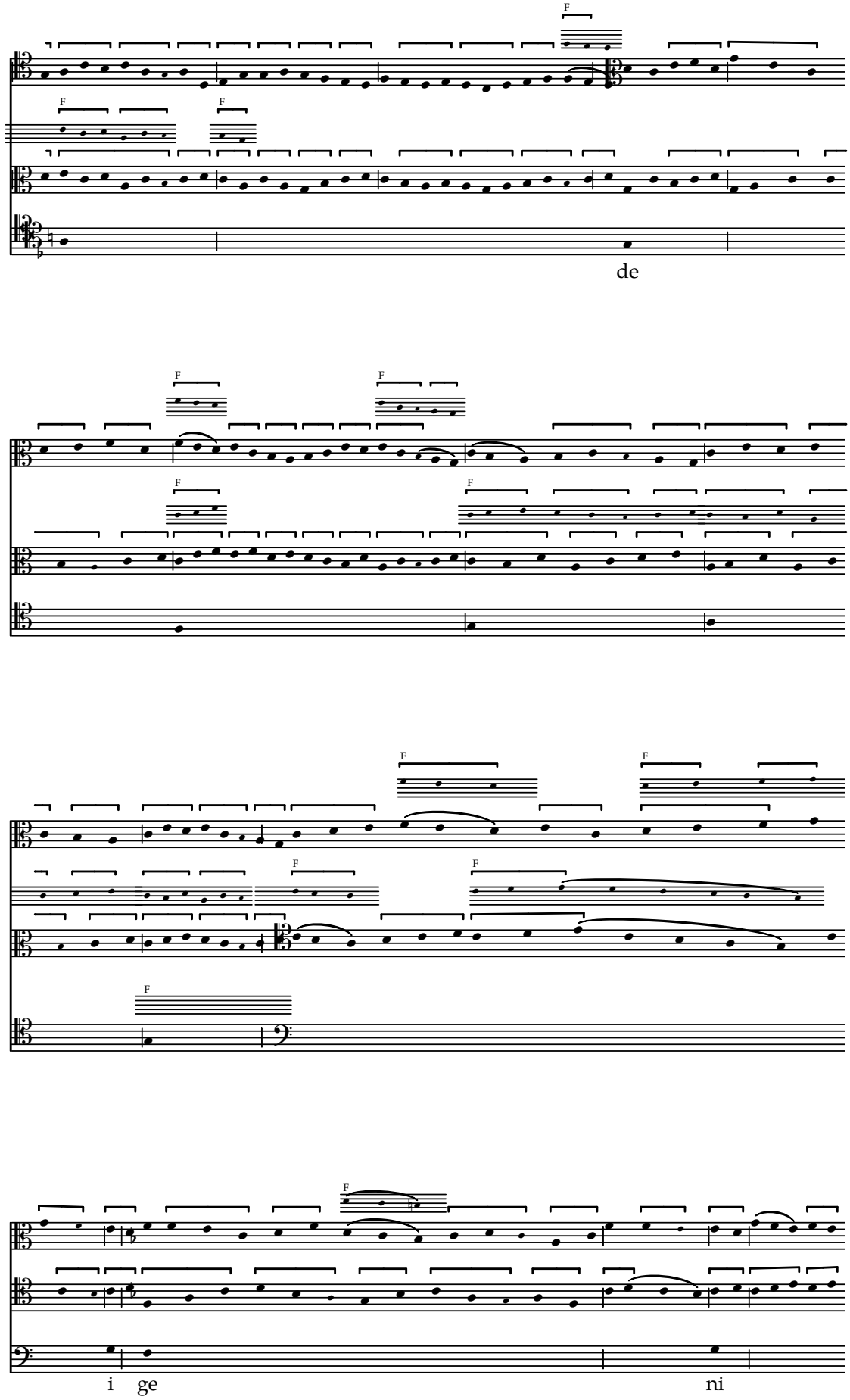
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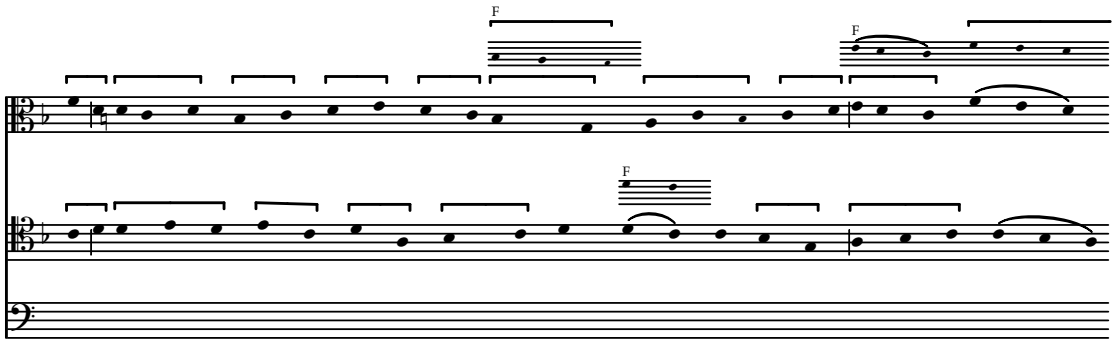

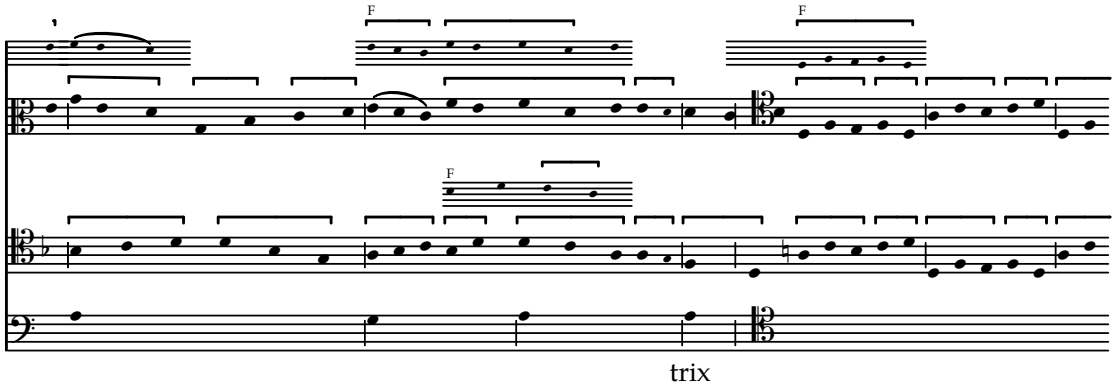
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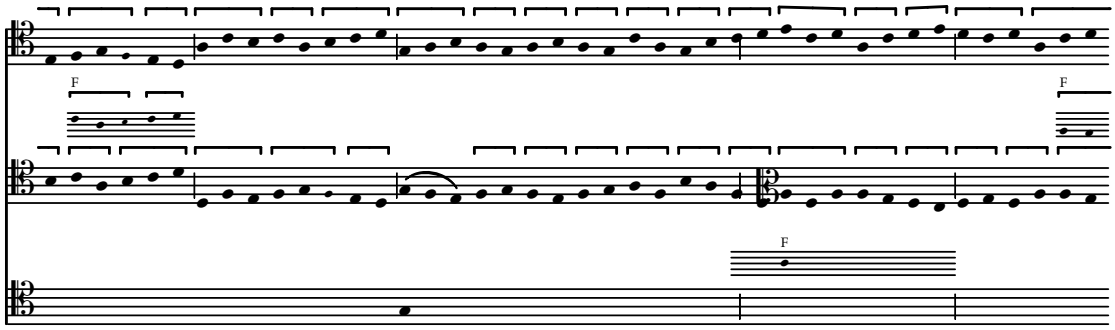

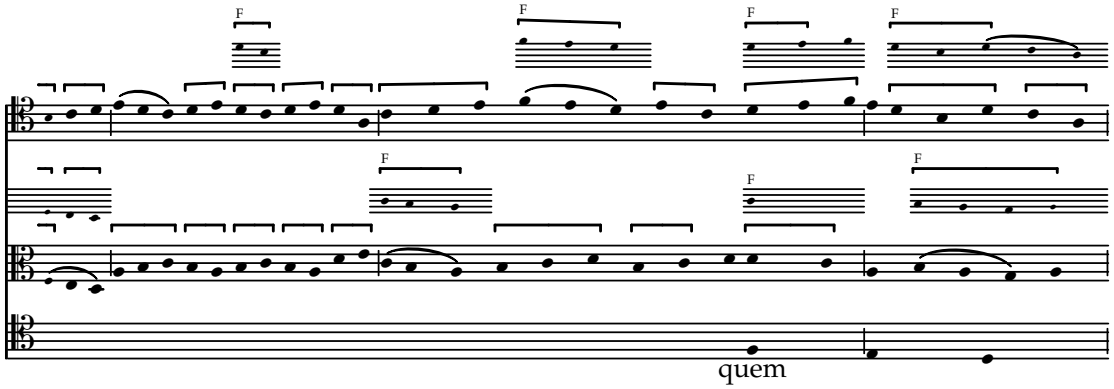
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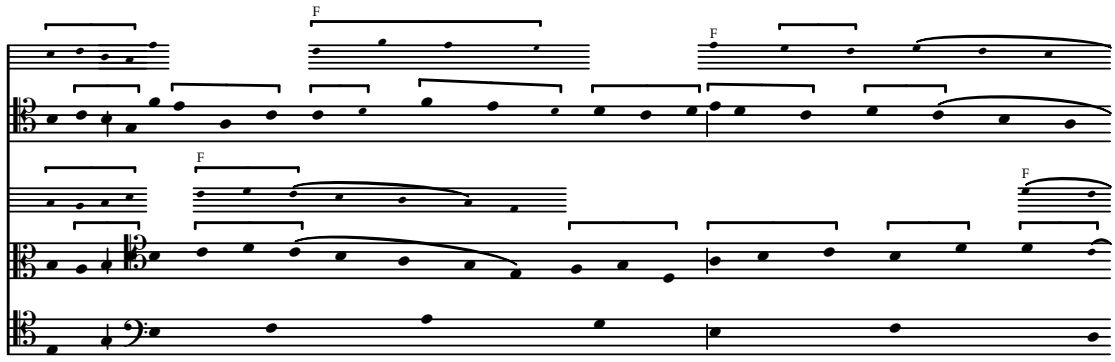
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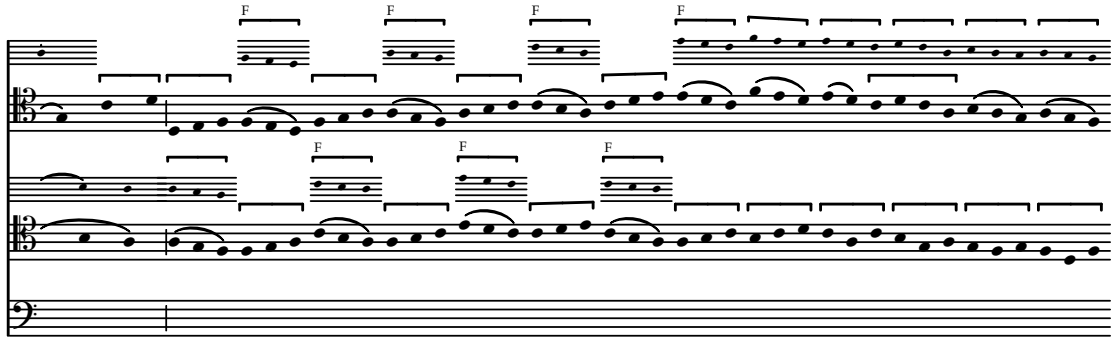
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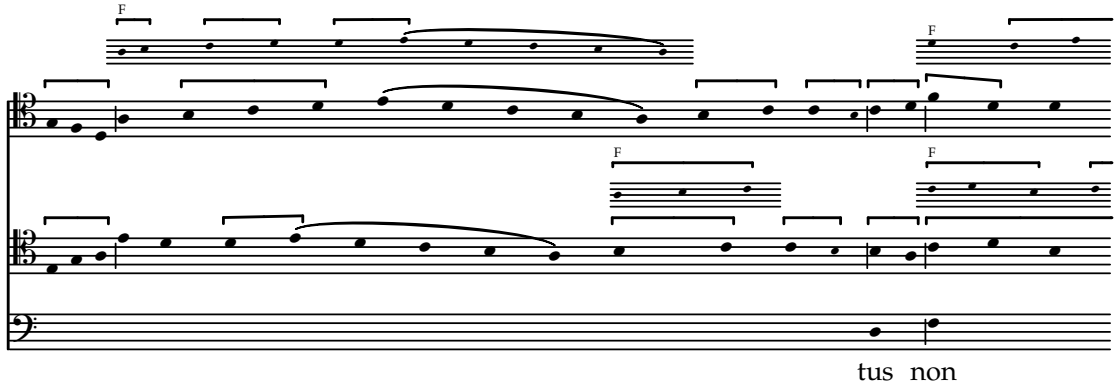
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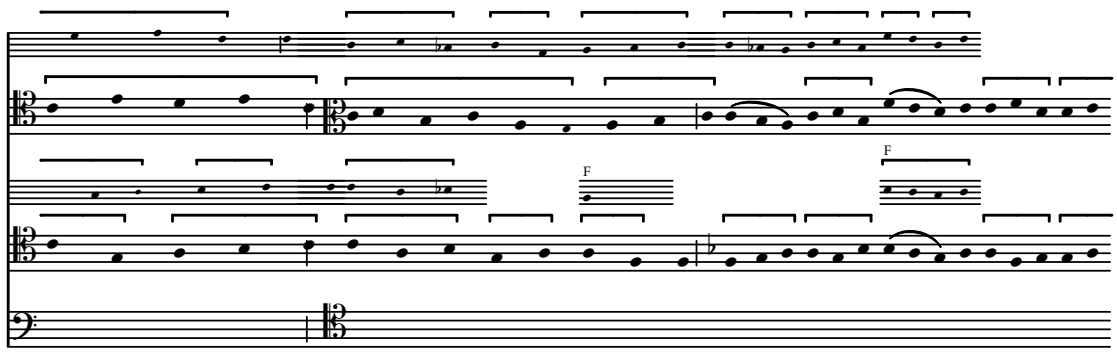
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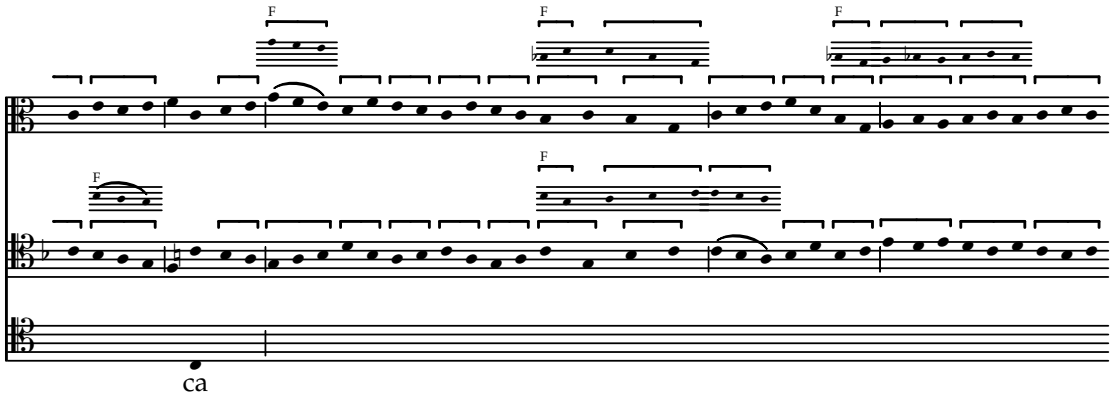
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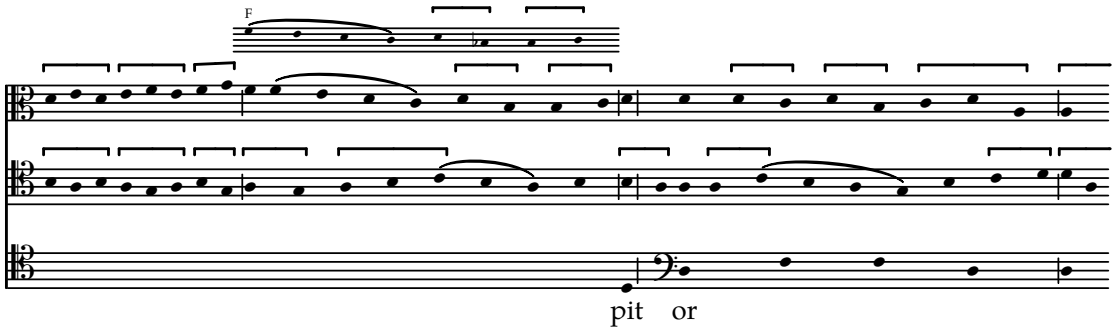
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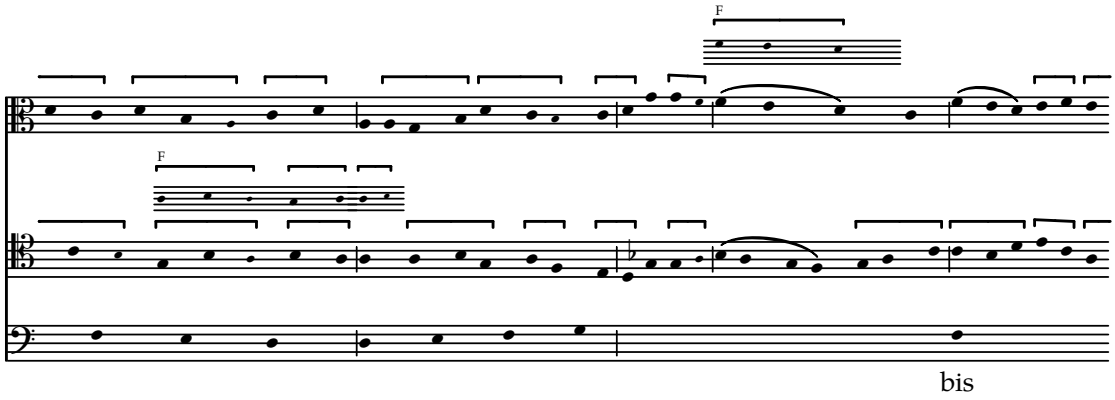
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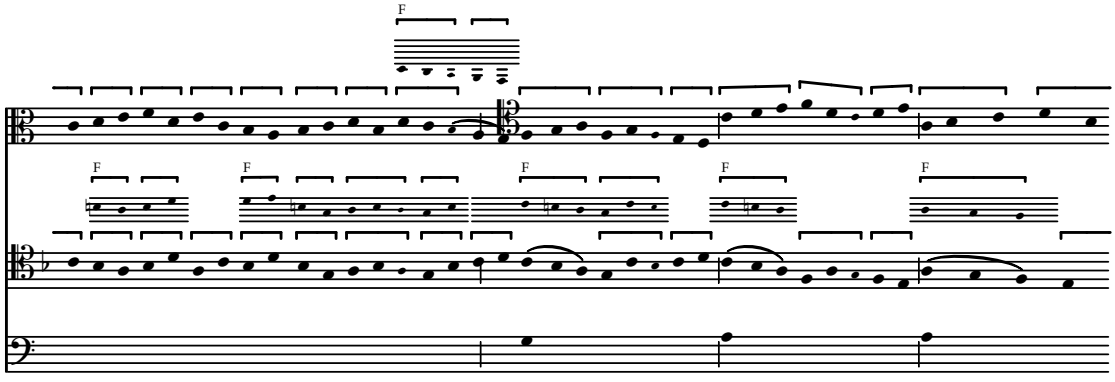
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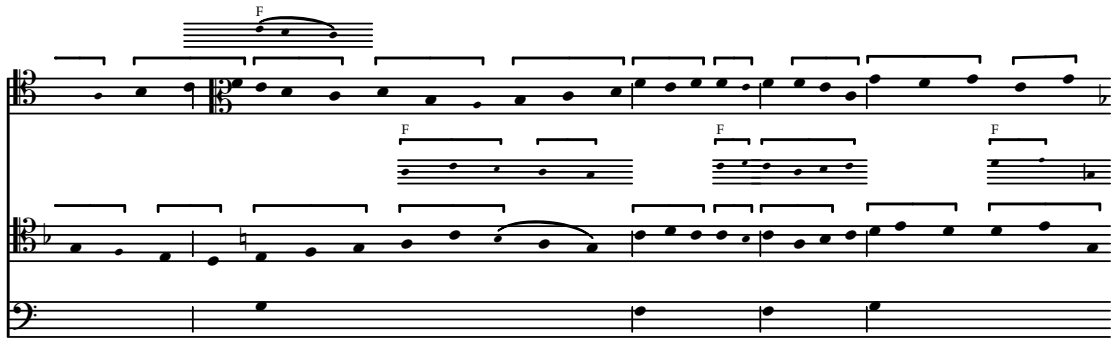
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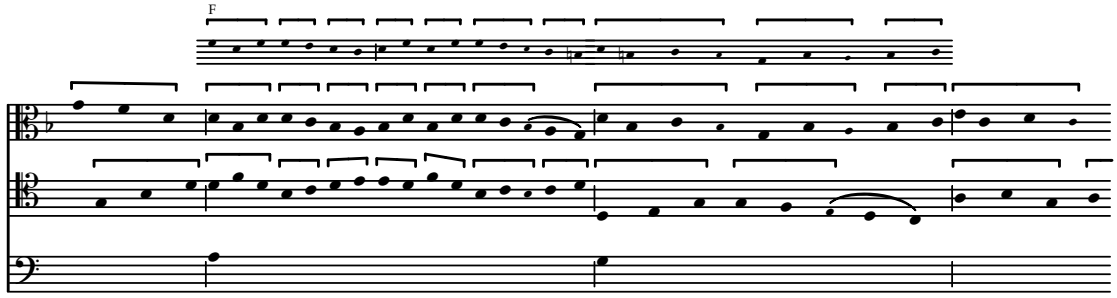
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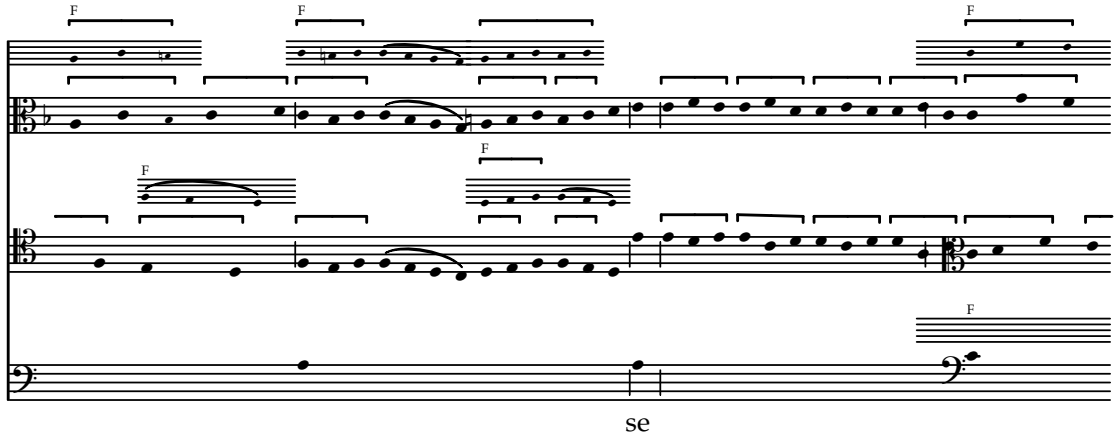
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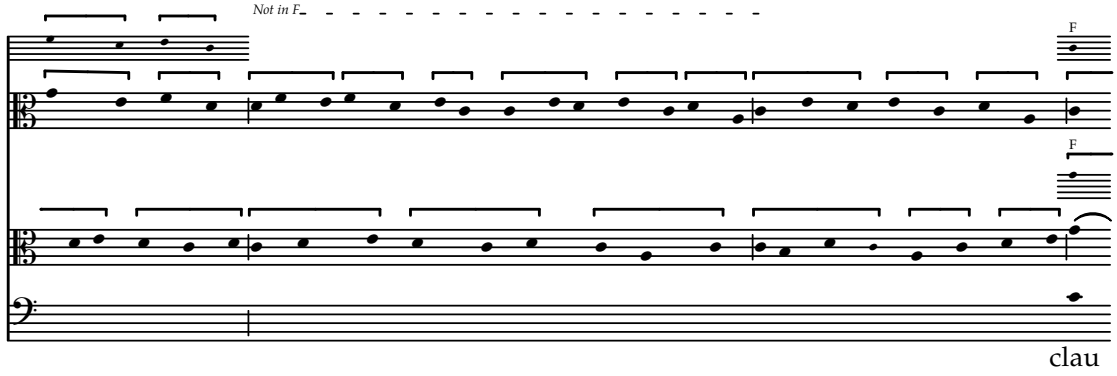
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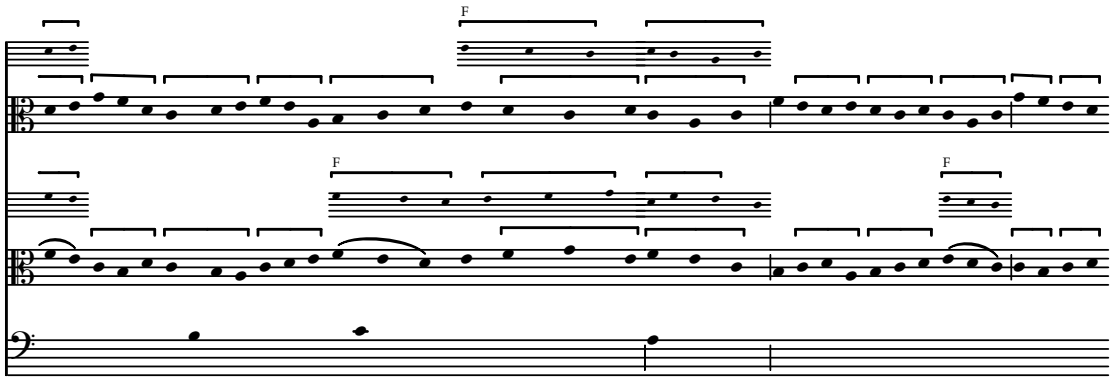
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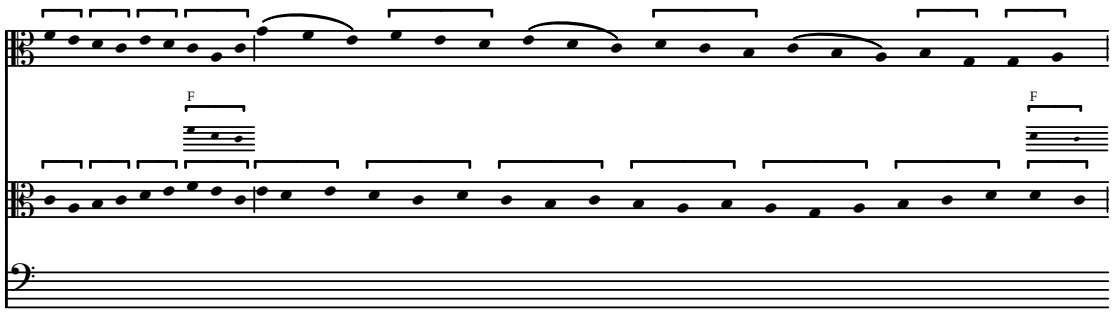
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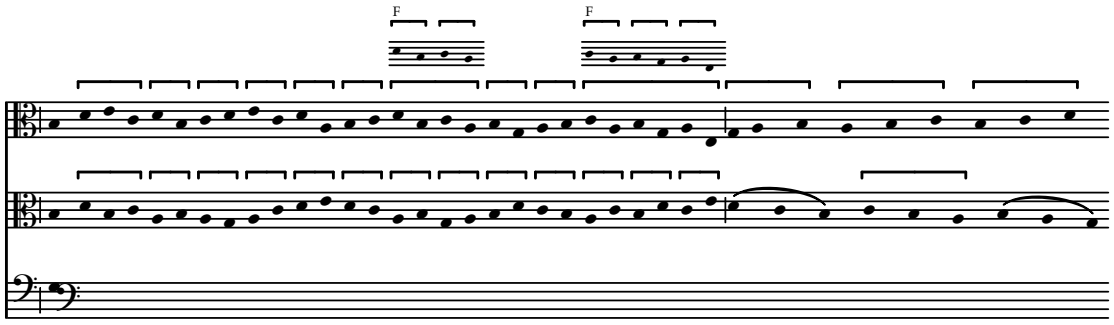
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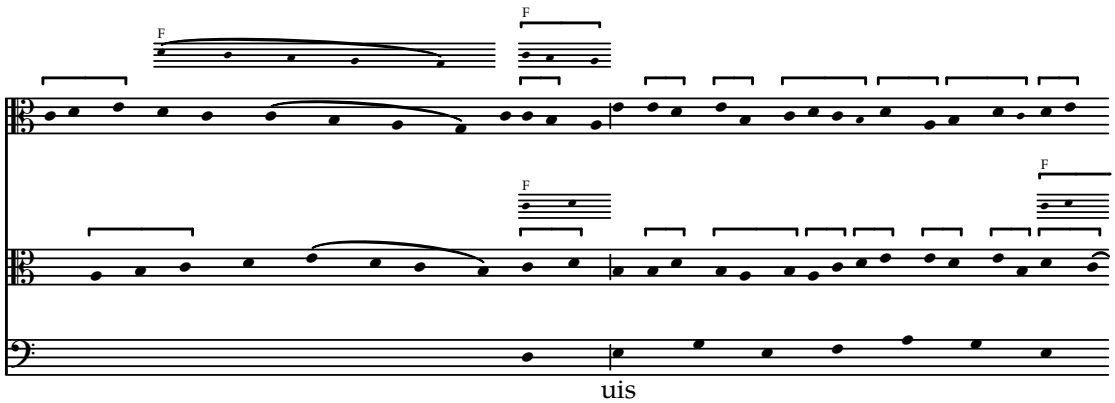
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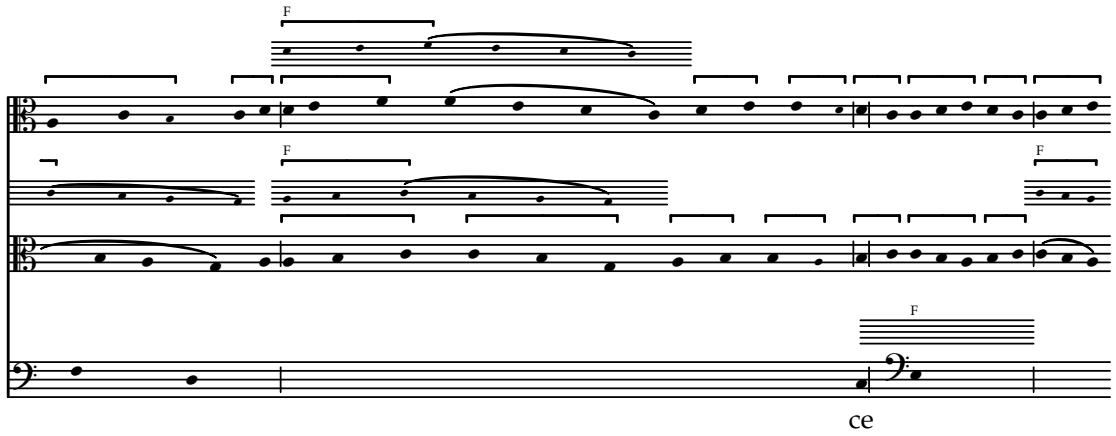
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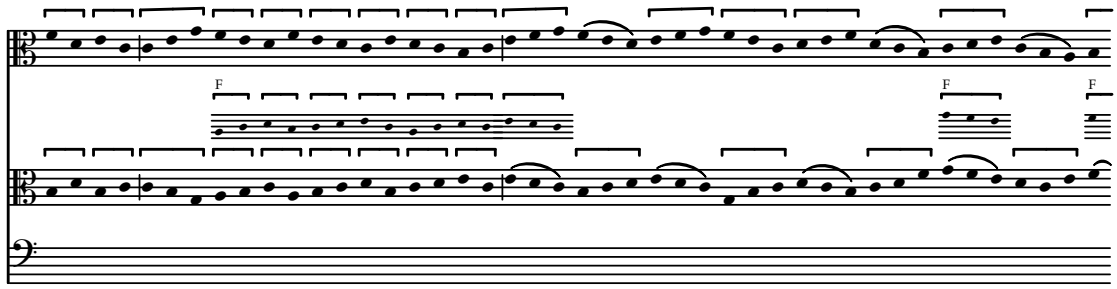
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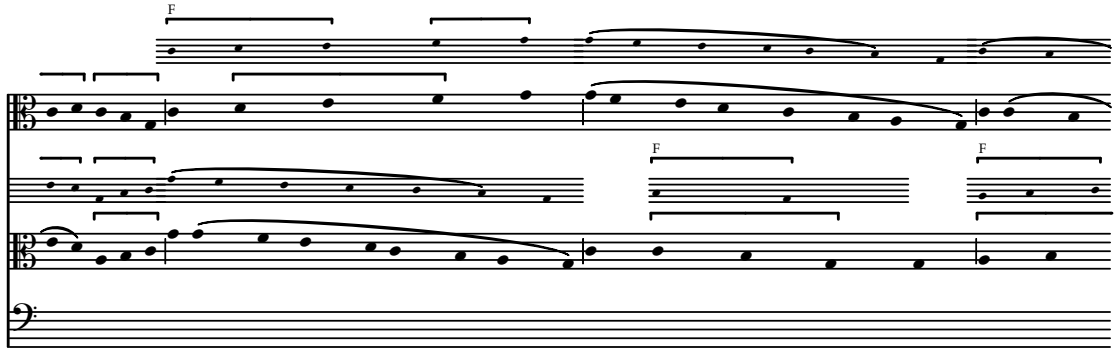
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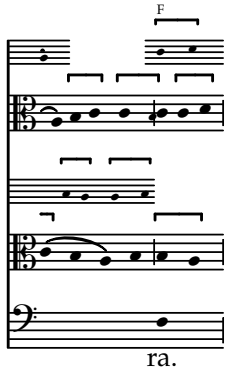
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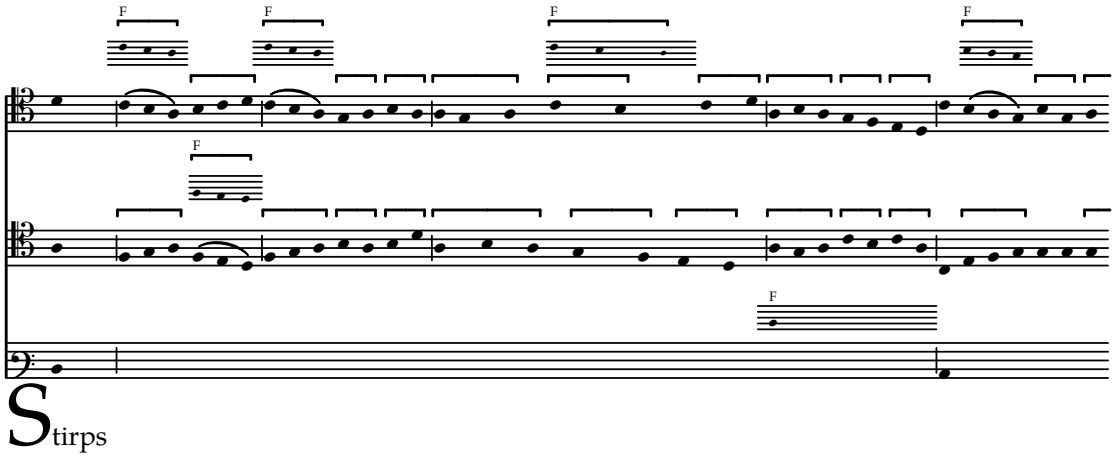

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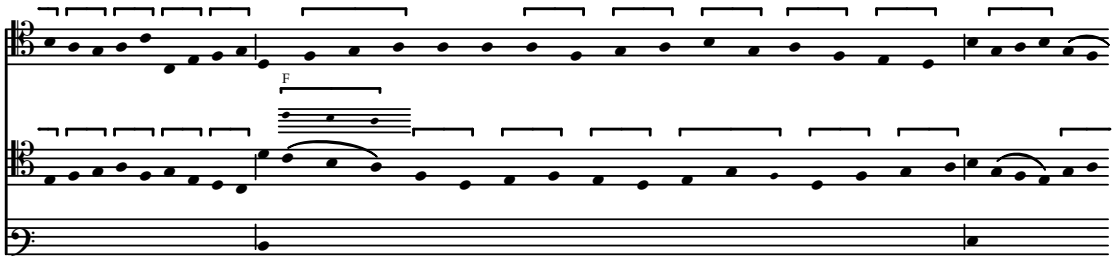

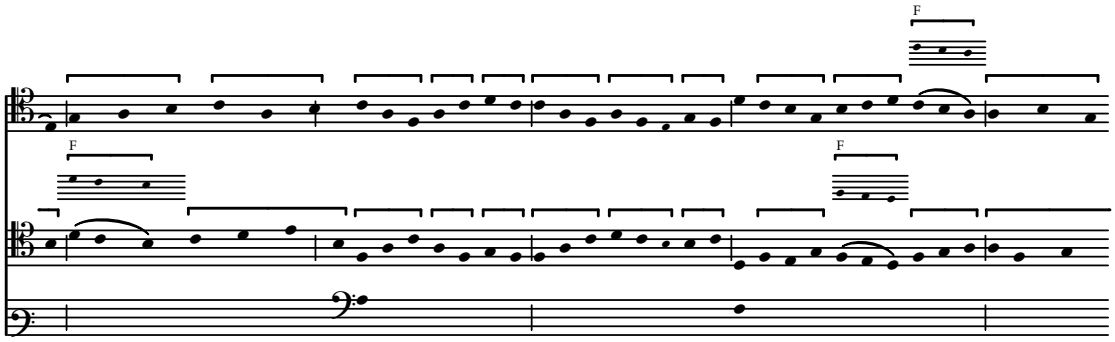

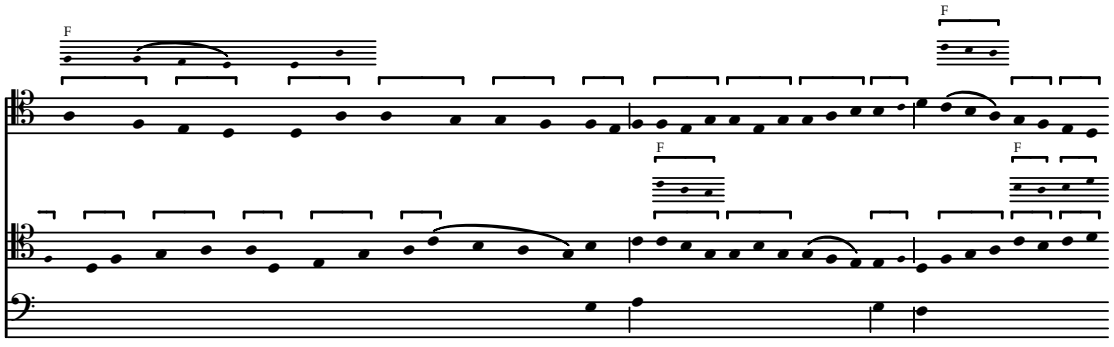

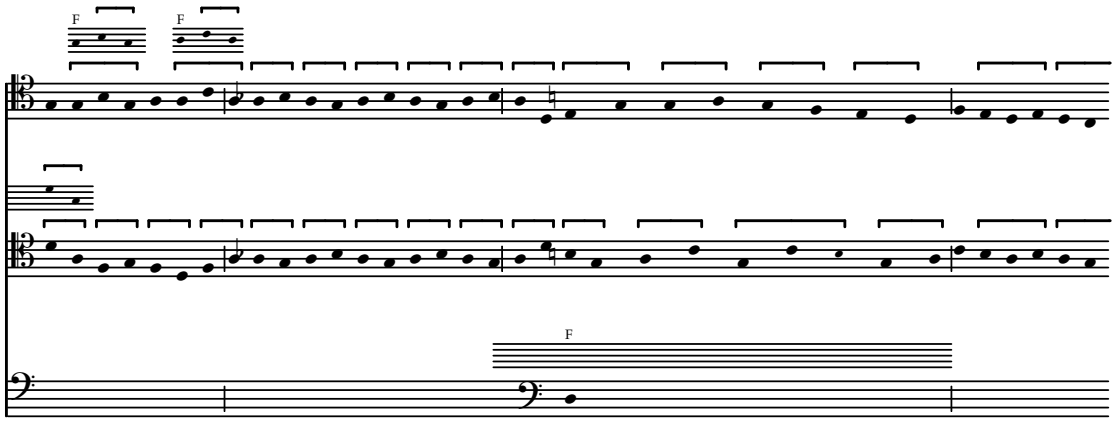
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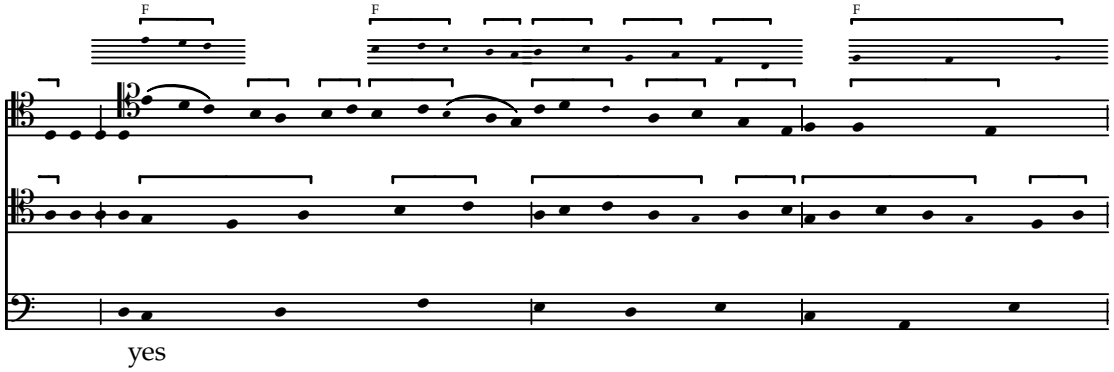
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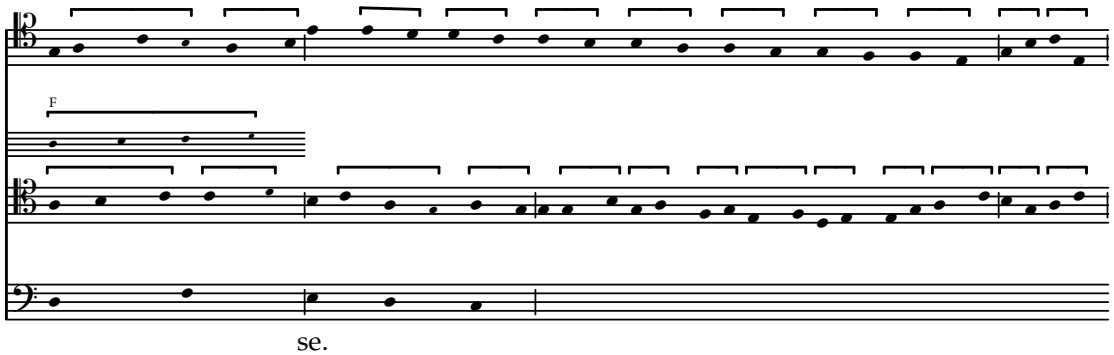
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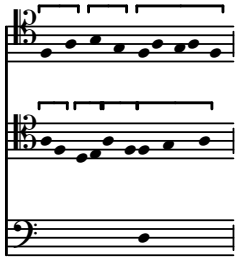

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Concordances from F

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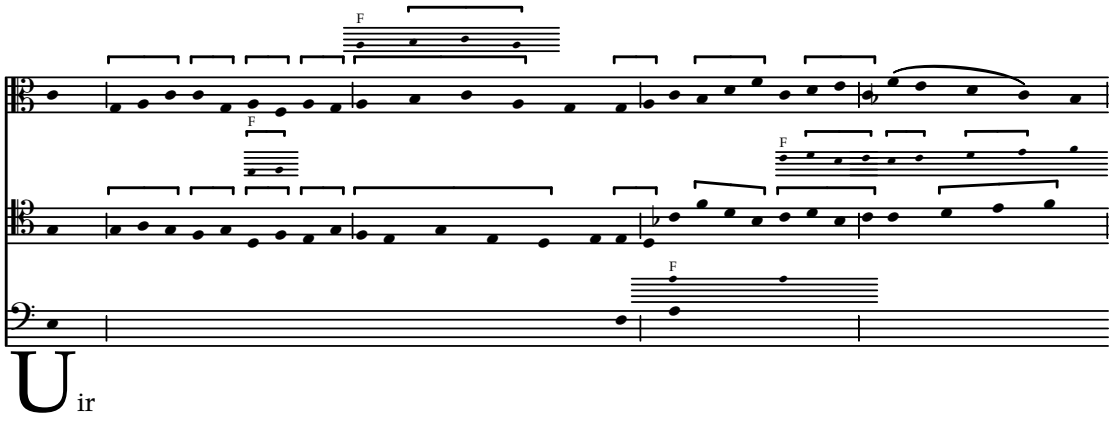

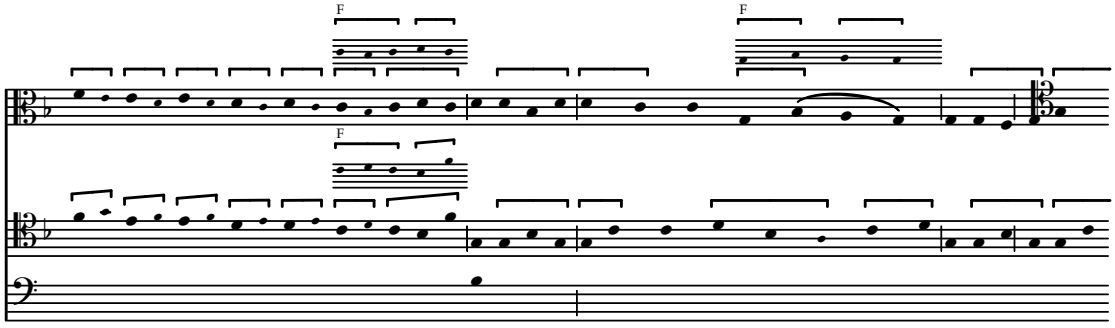

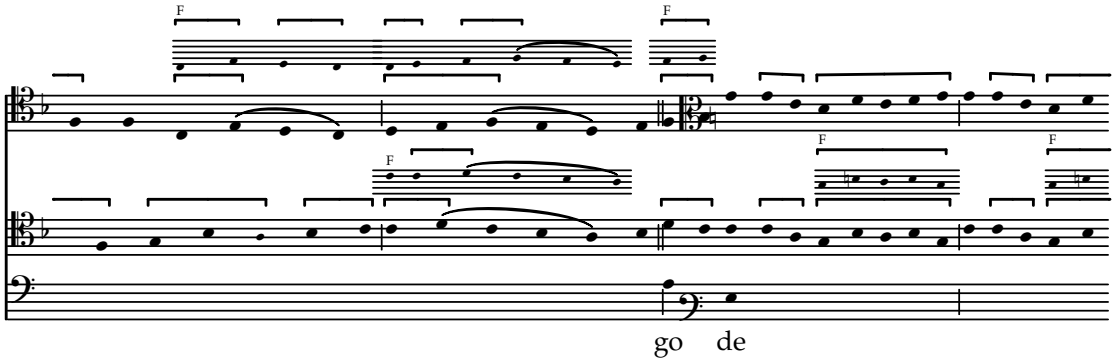

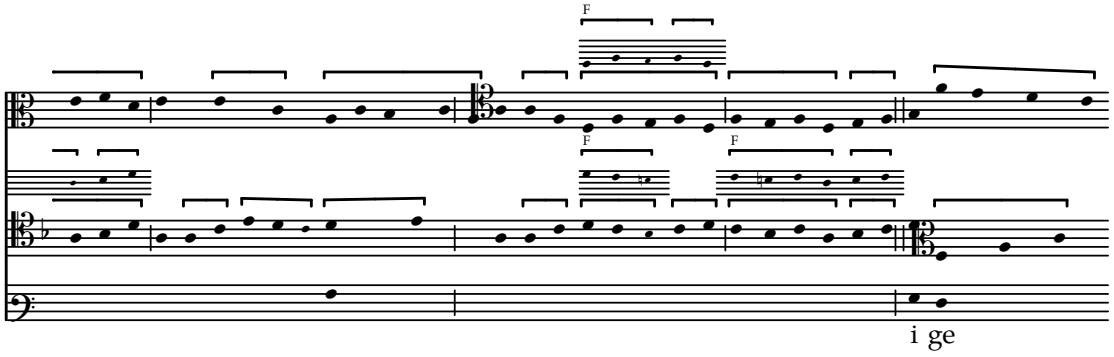

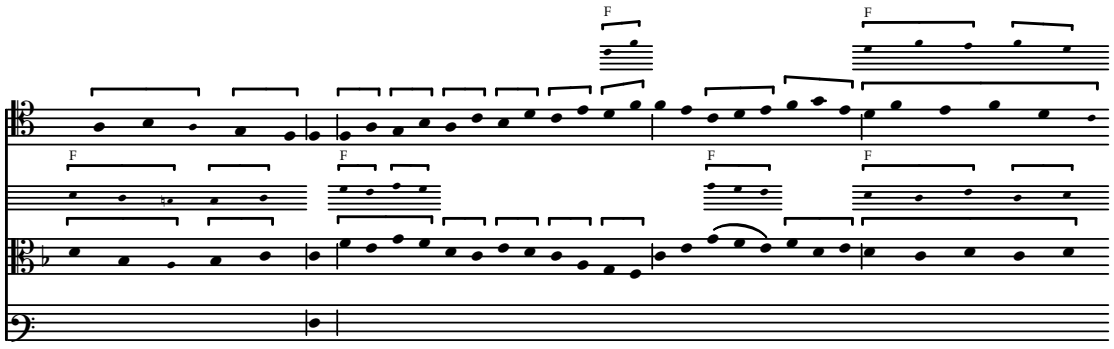
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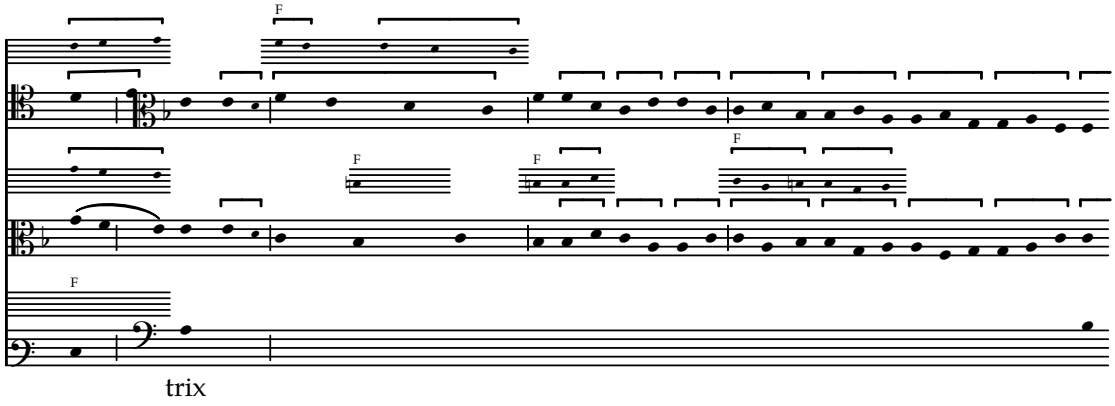
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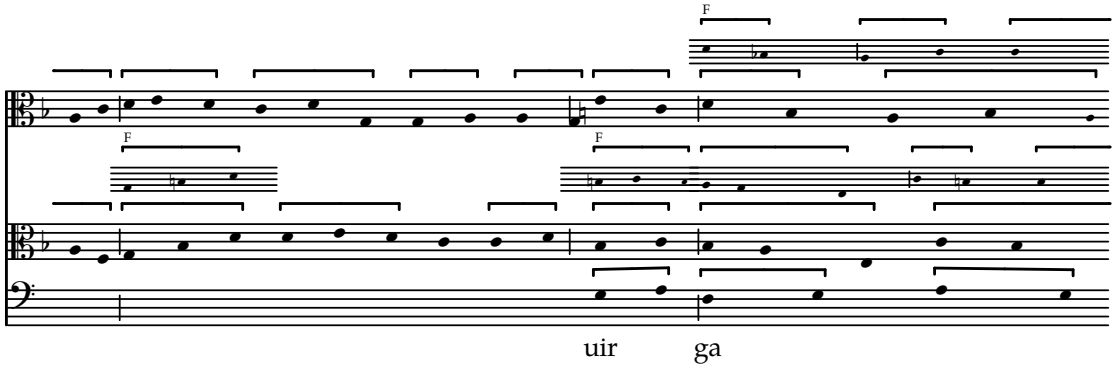
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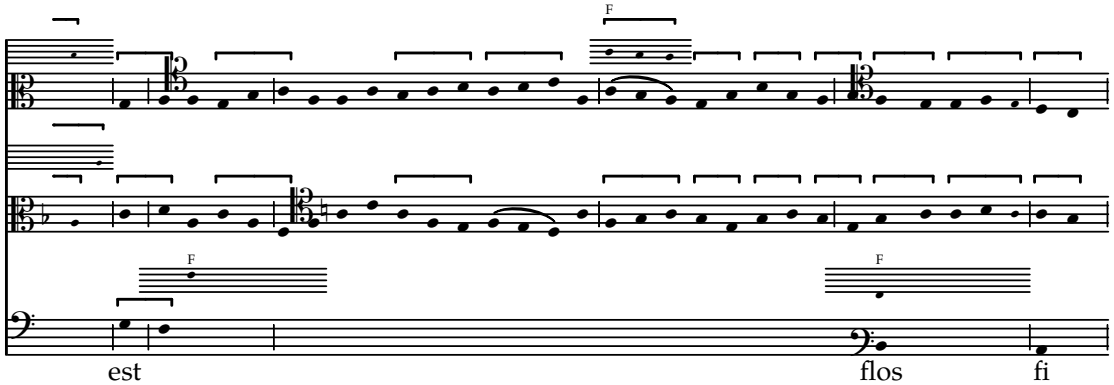
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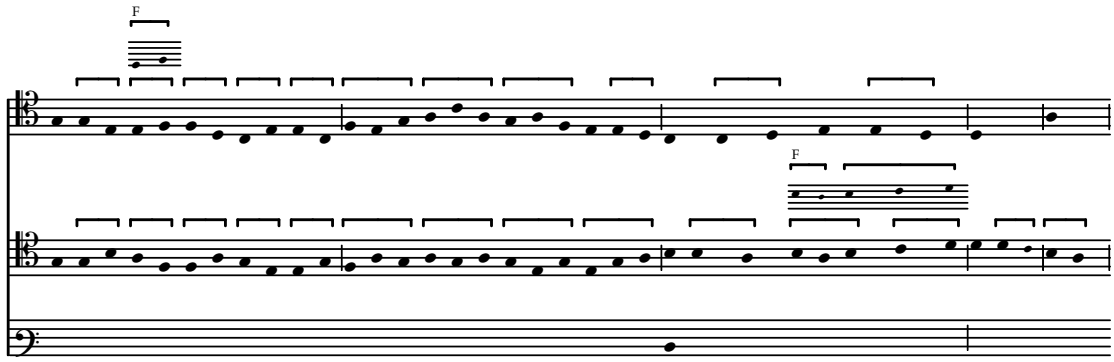
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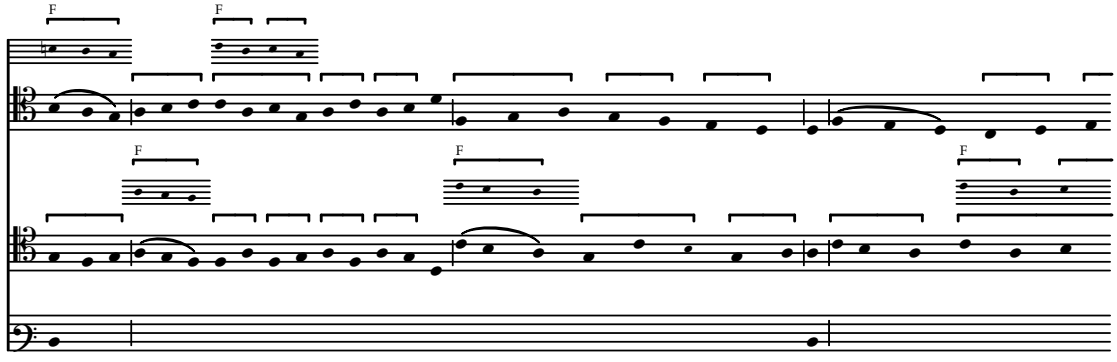
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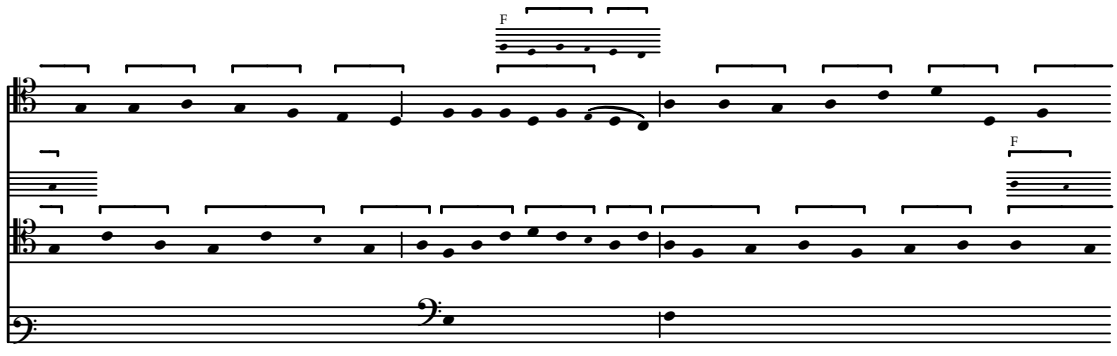
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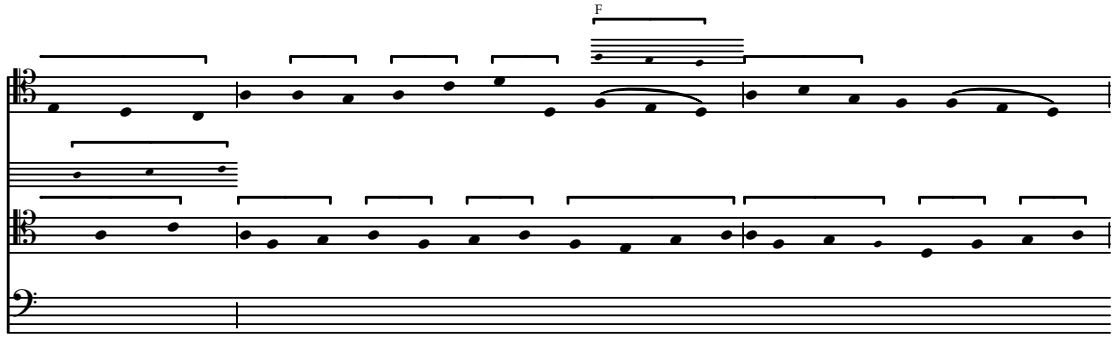
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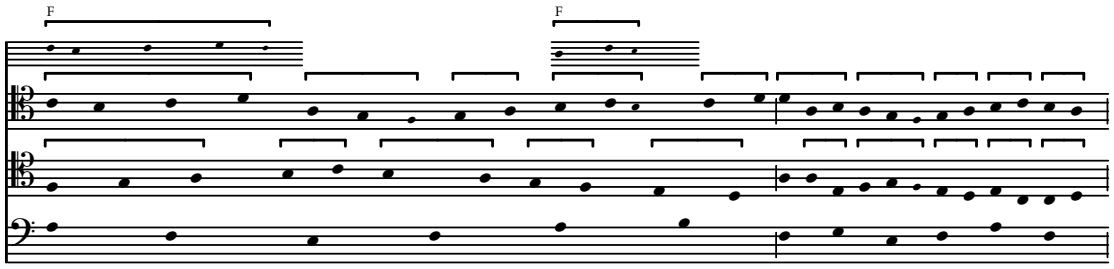

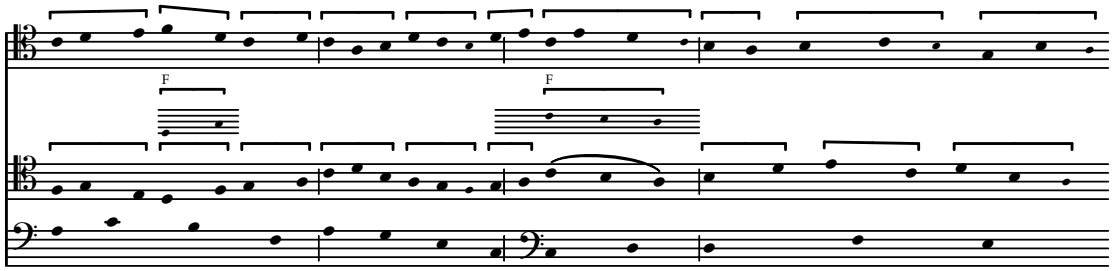

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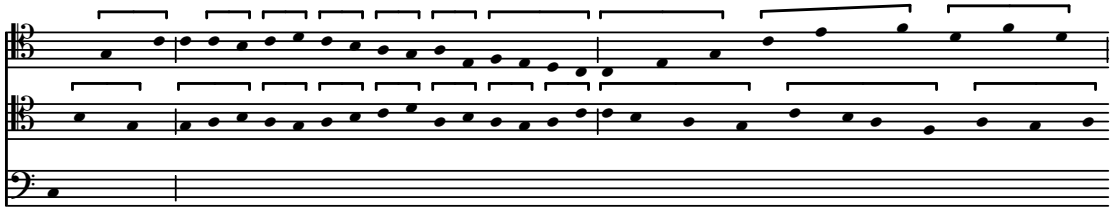

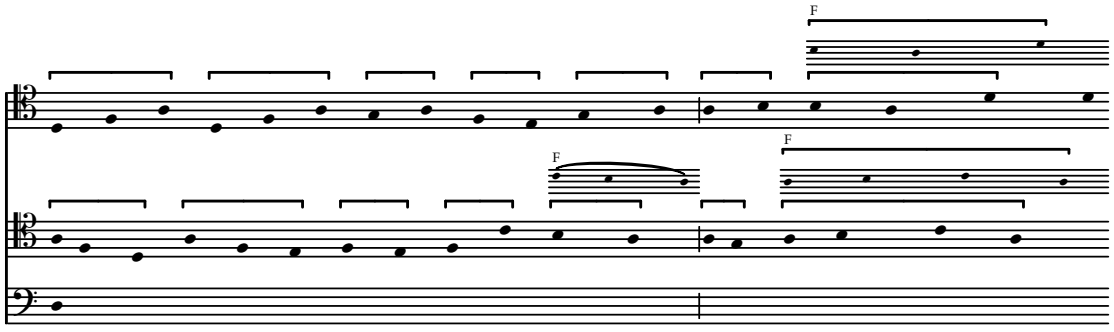

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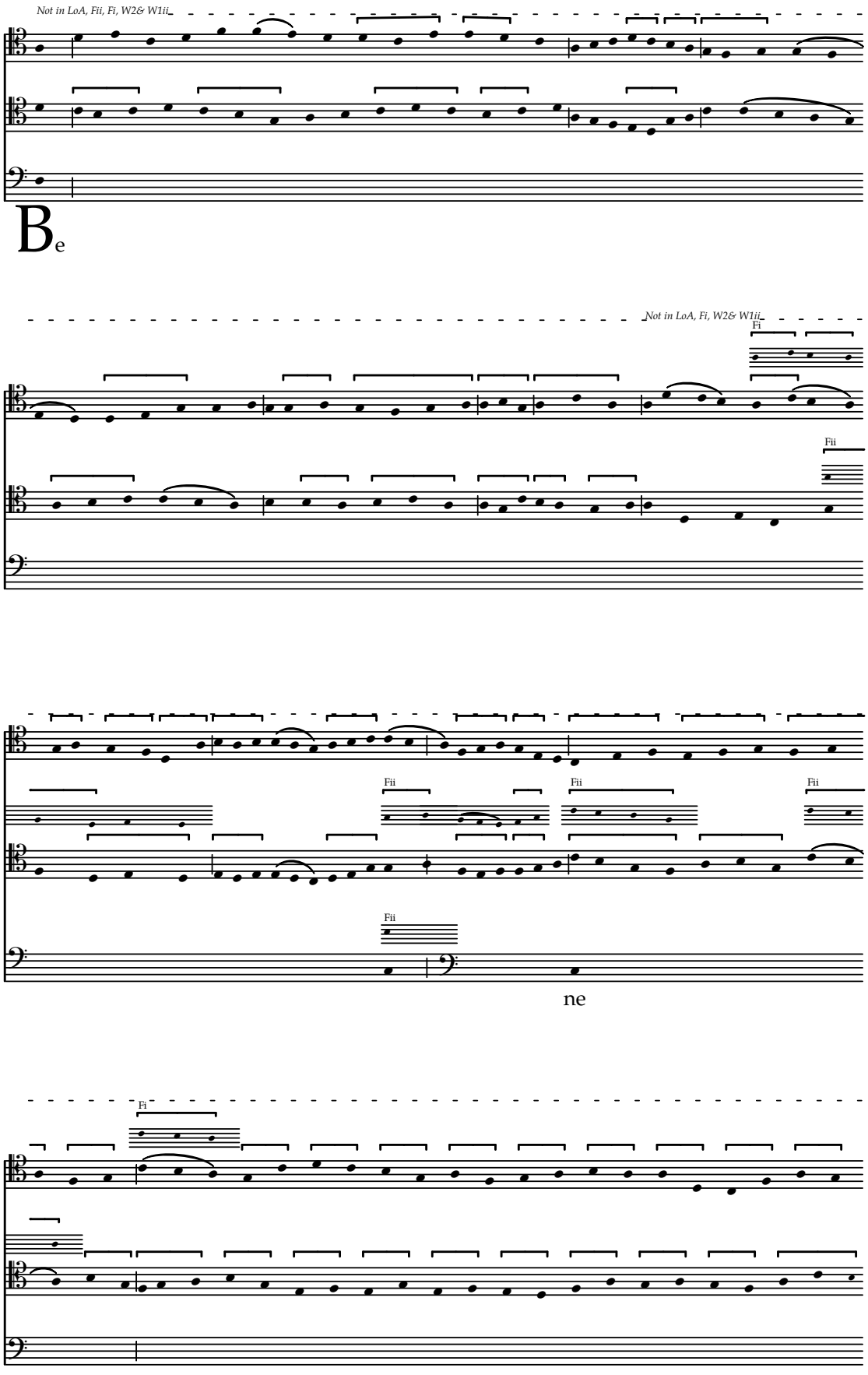
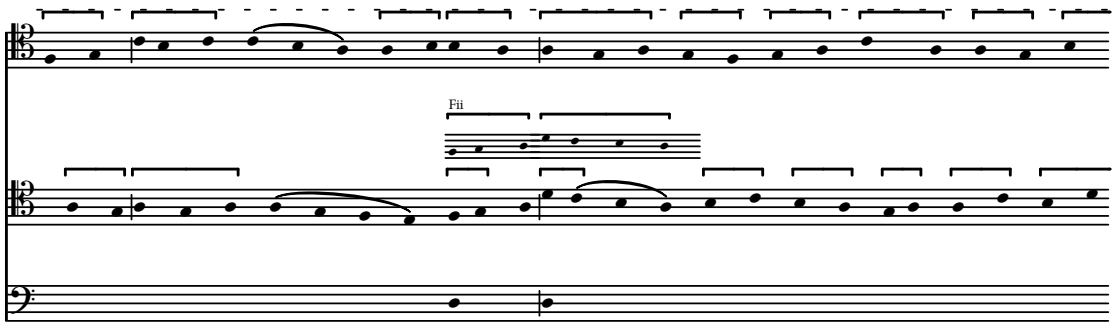
Concordances from W1 (part of other organum), W2, F (two versions) and LoA

f. 69–

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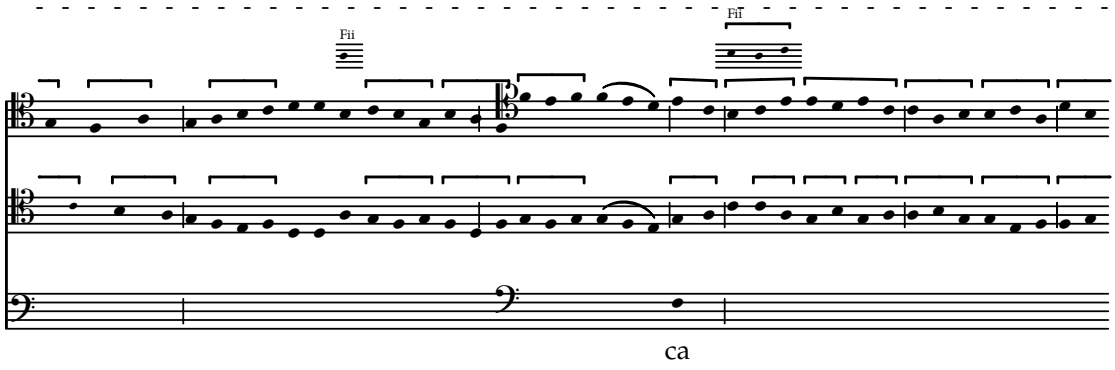
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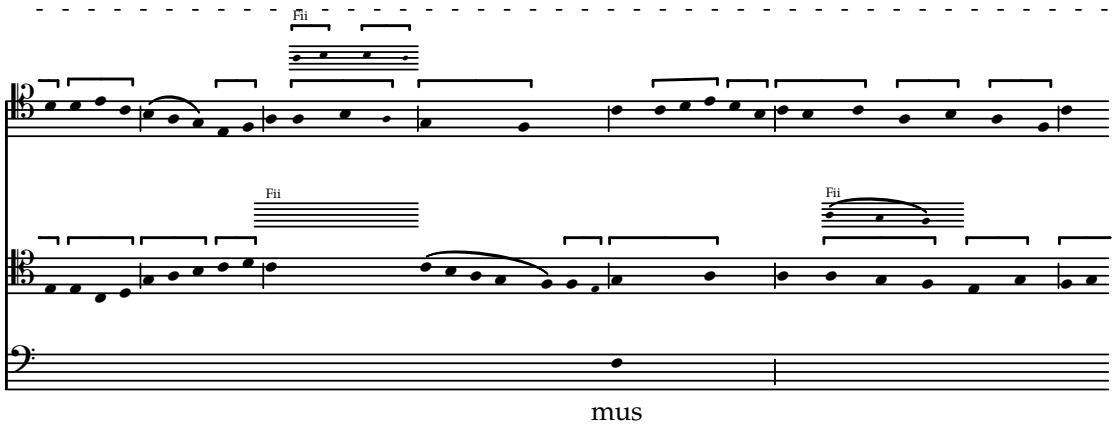
ca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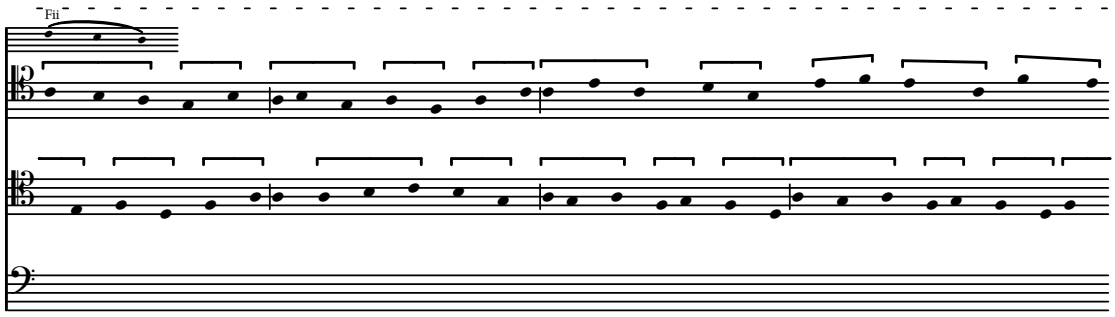
mus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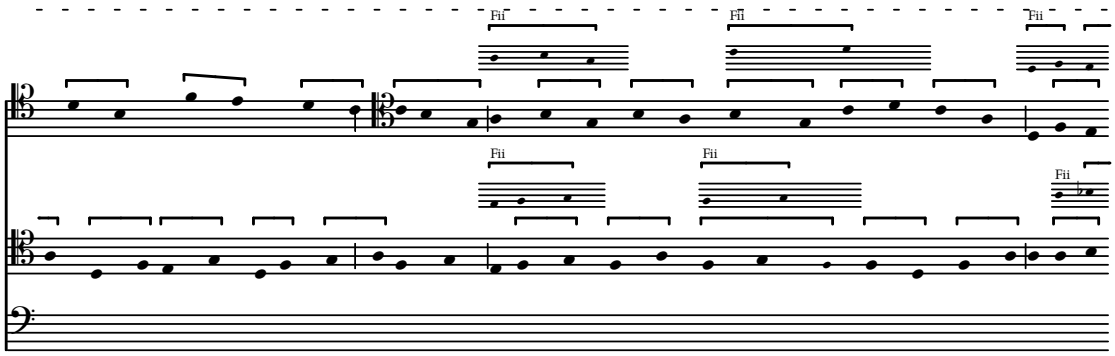
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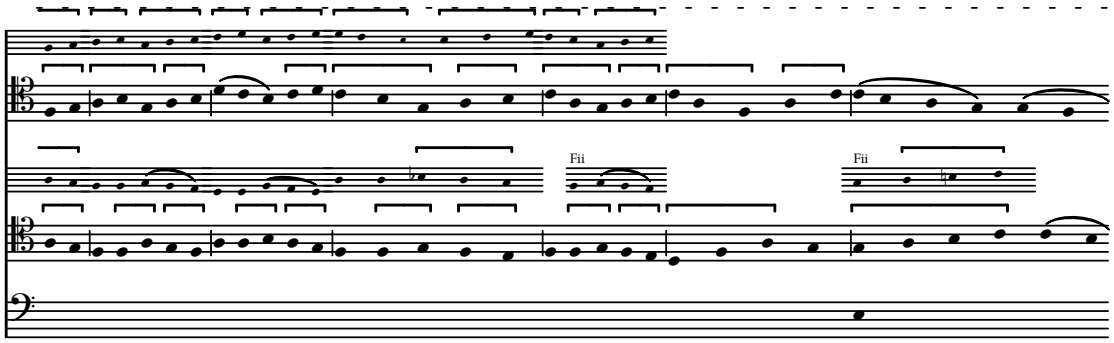
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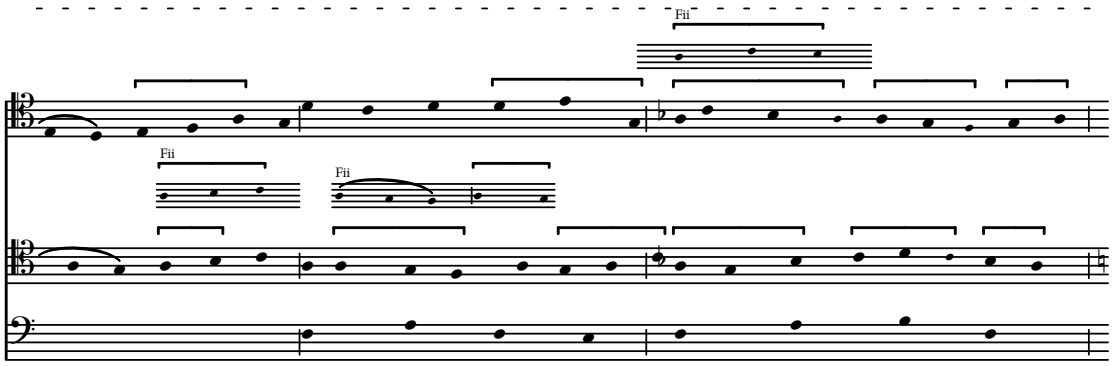
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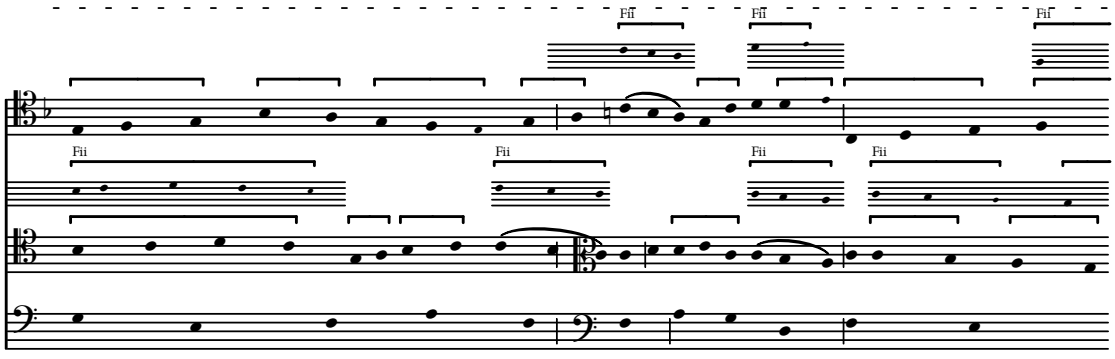
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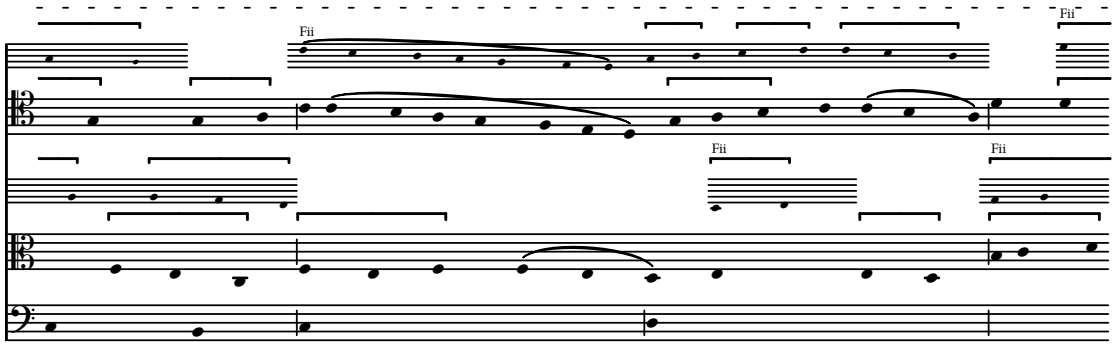
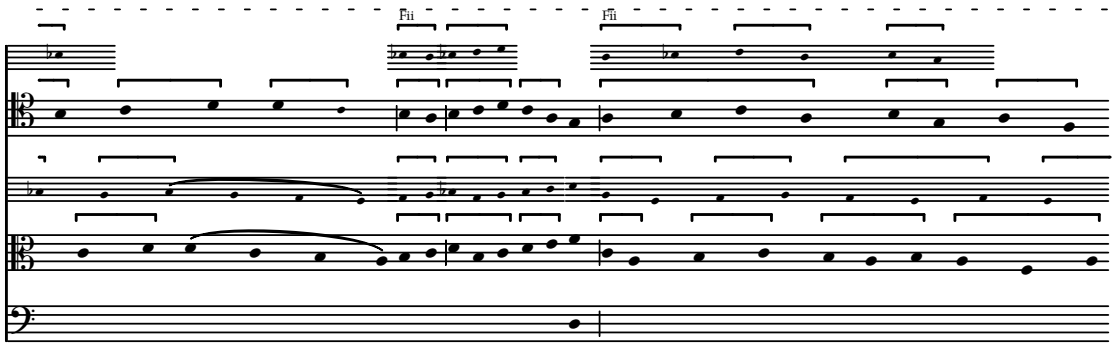
Fii





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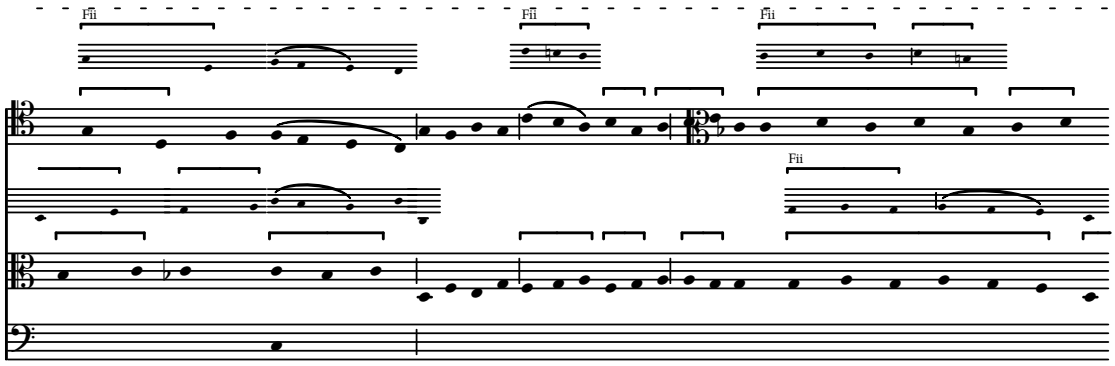

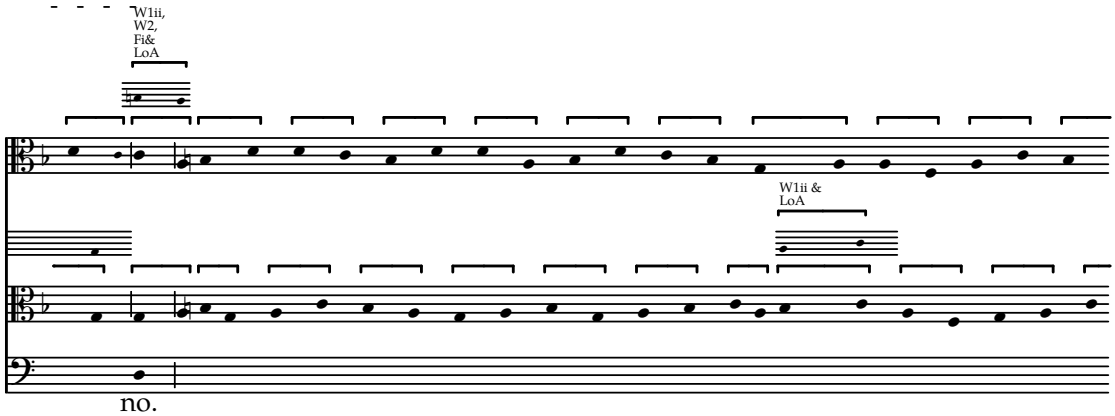

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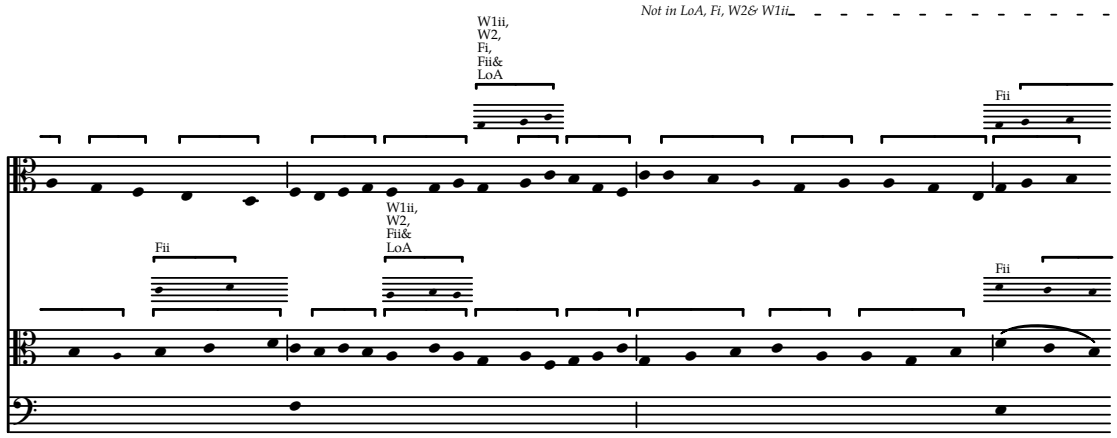
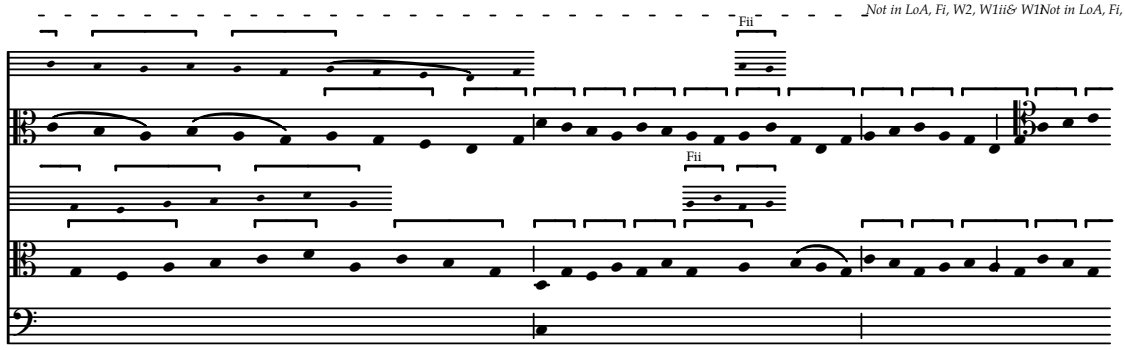
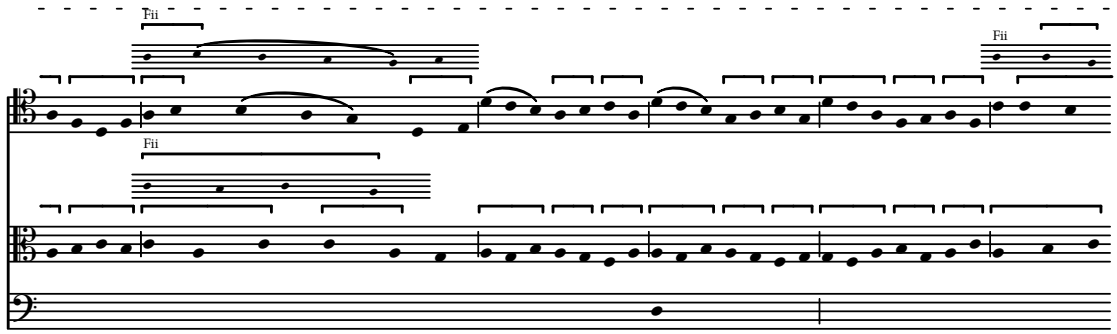

Not in LoA, Fi, W2& W1ii
W1ii,
W2,
Fi,
Fii&
LoA
Fii
W1ii,
W2,
Fii&
LoA
Fii
Fii


Not in LoA, Fi, W2, W1ii& W1INot in LoA, Fi, W2& W1ii
Fii
Fii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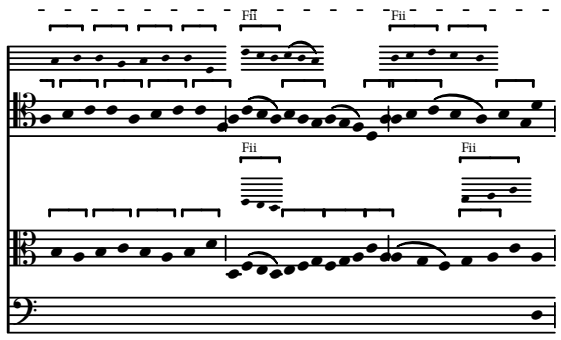
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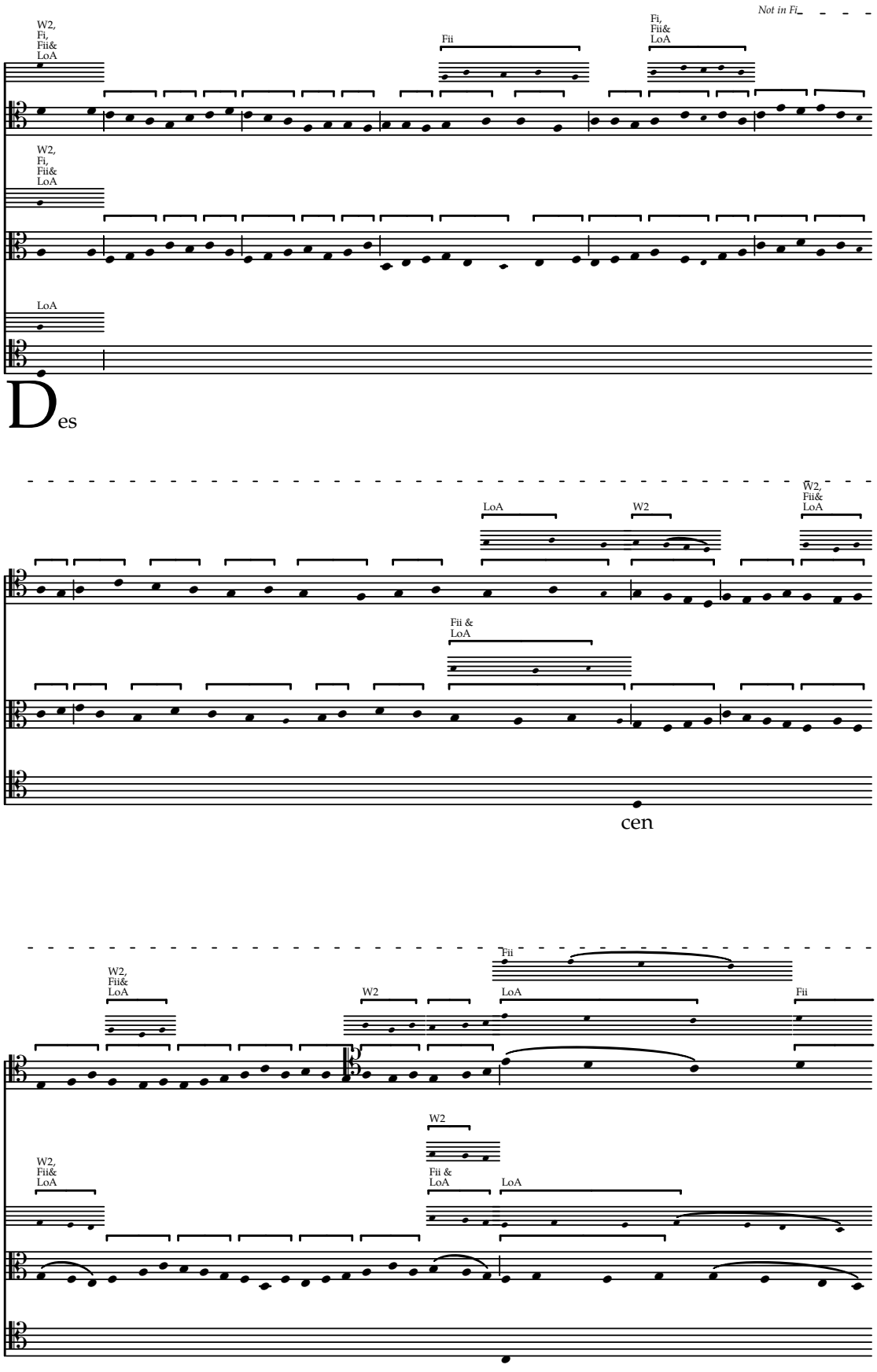
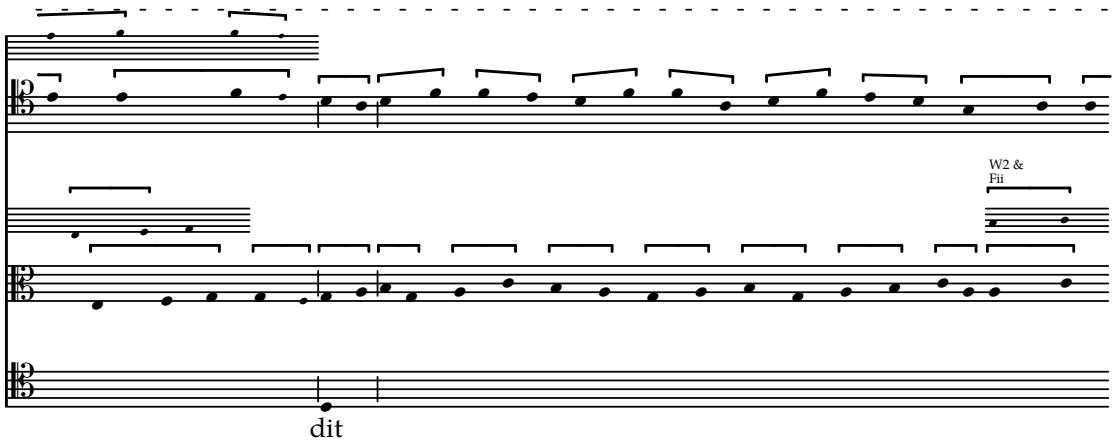
Concordances from W2, F (two versions) & LoA

f. 85v

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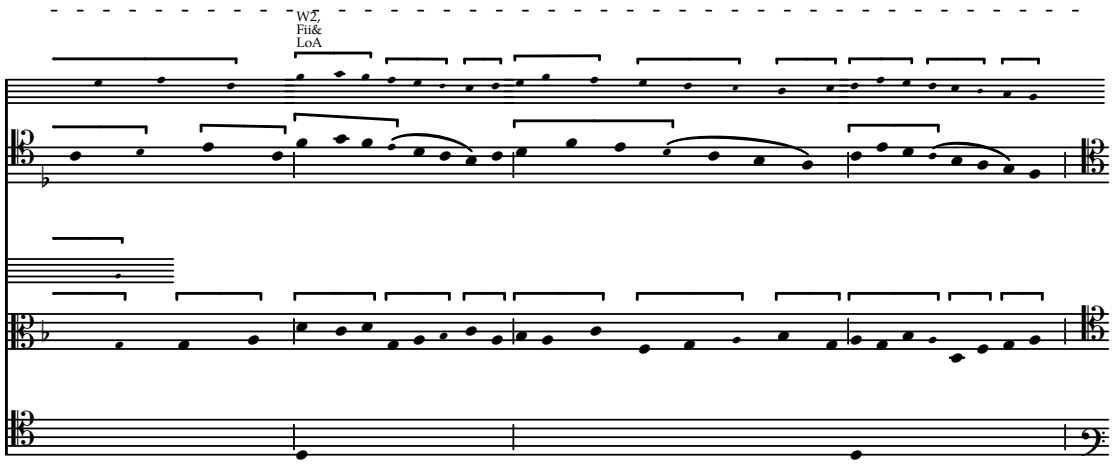
W2,
Fii&
LoA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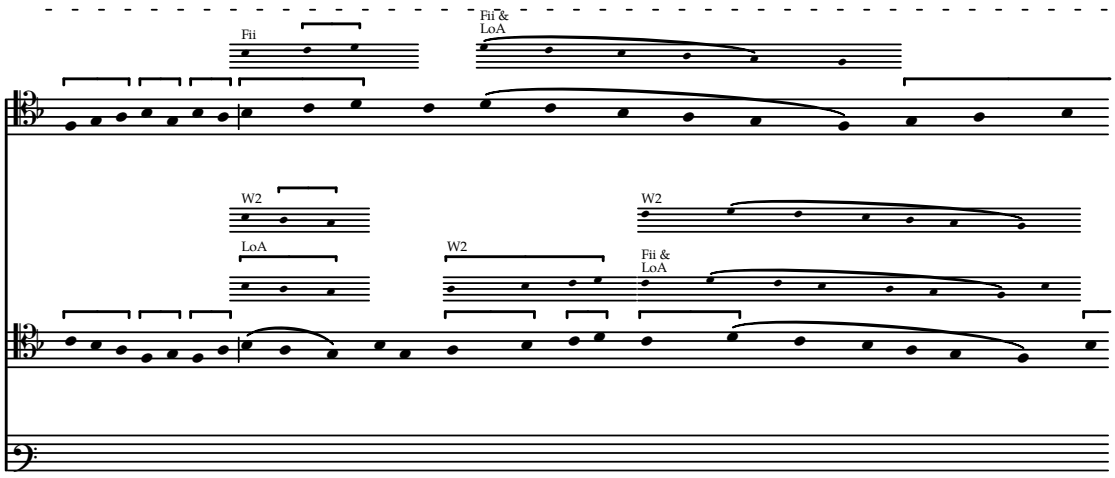
LoA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Fii &
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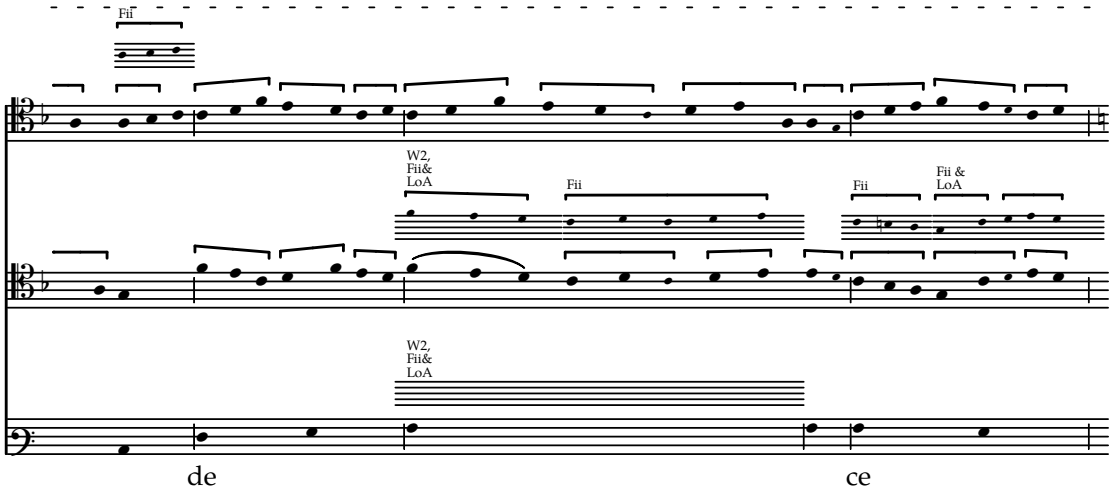
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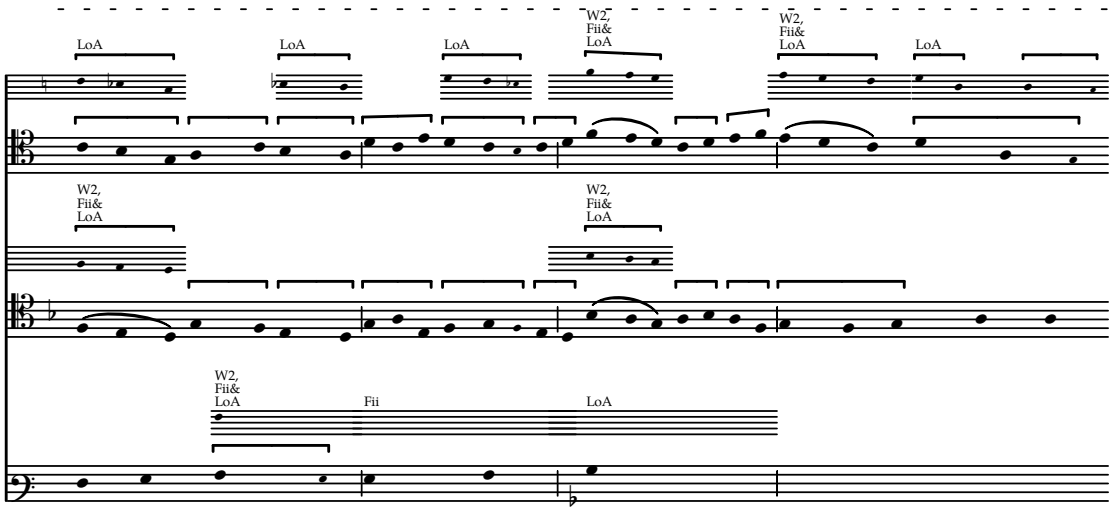
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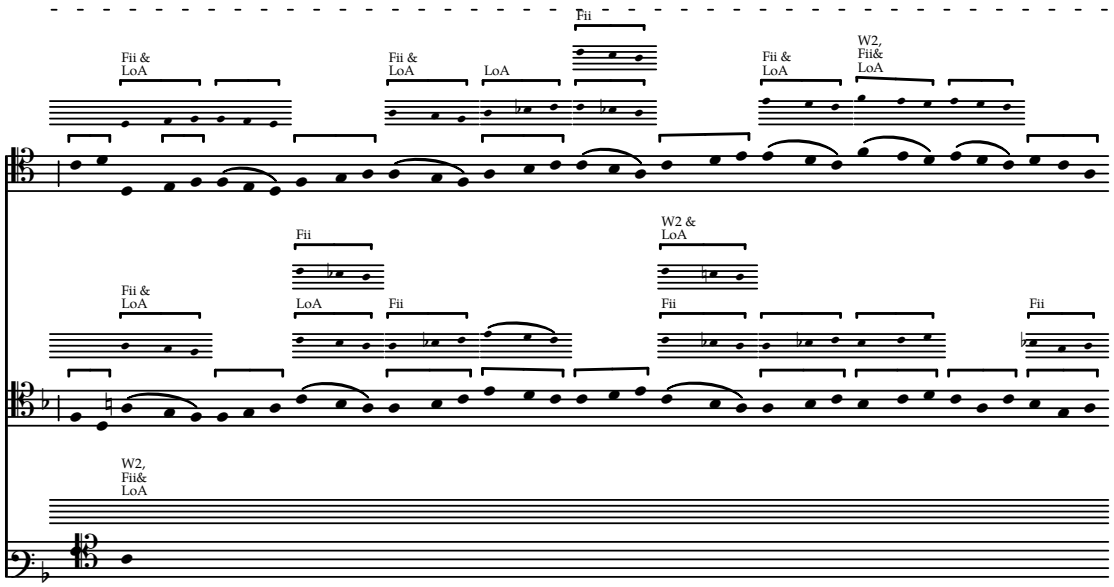
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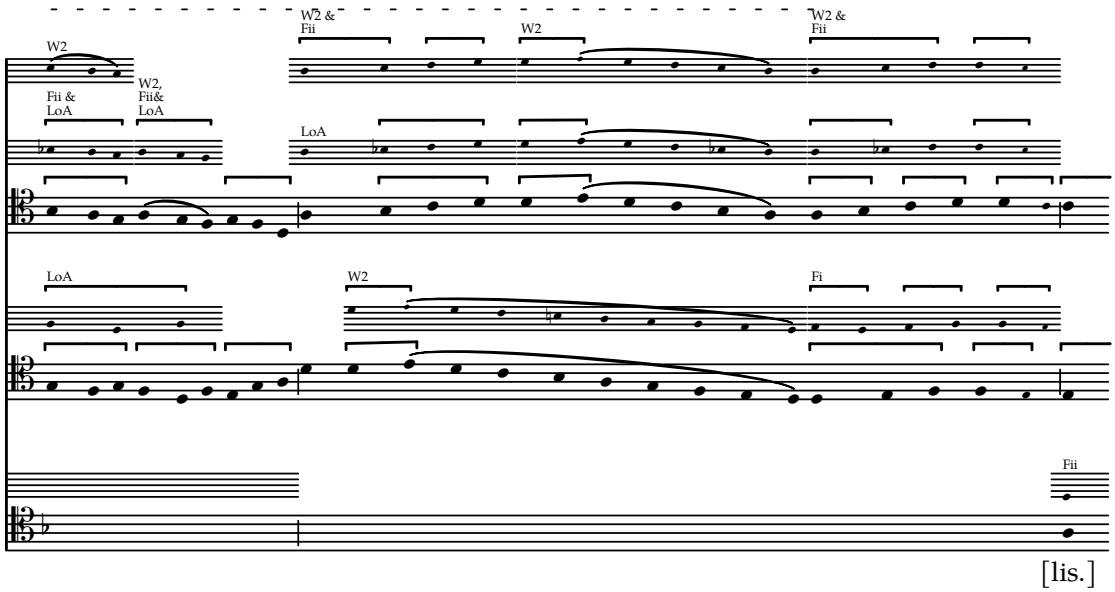
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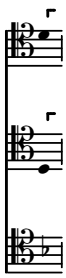

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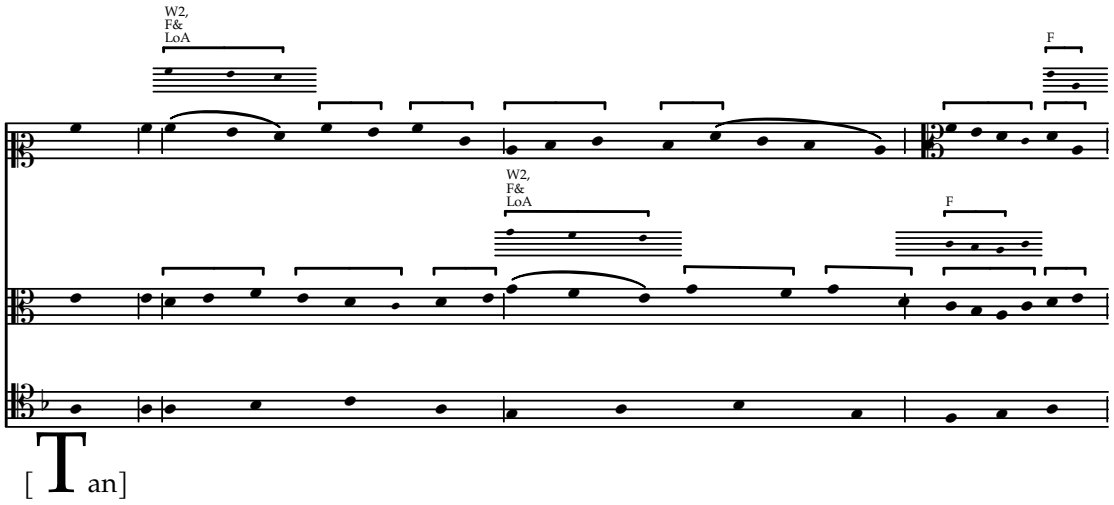
Concordances from W2, F & LoA

f. 85v–86v



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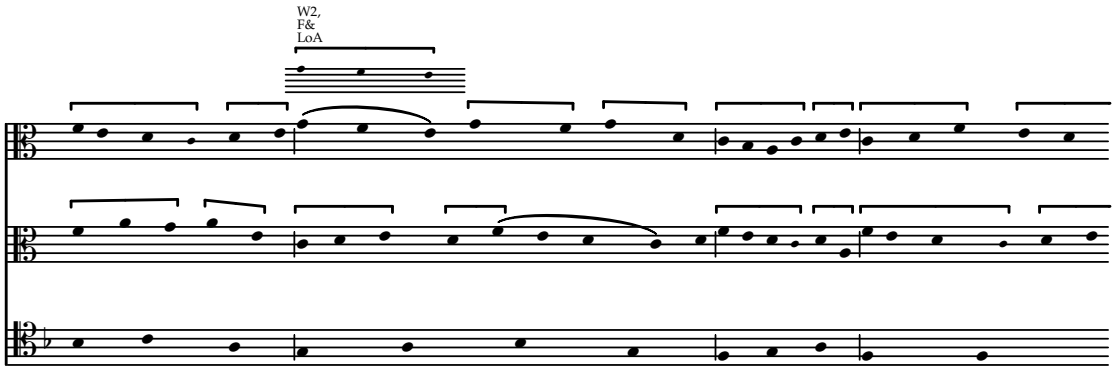

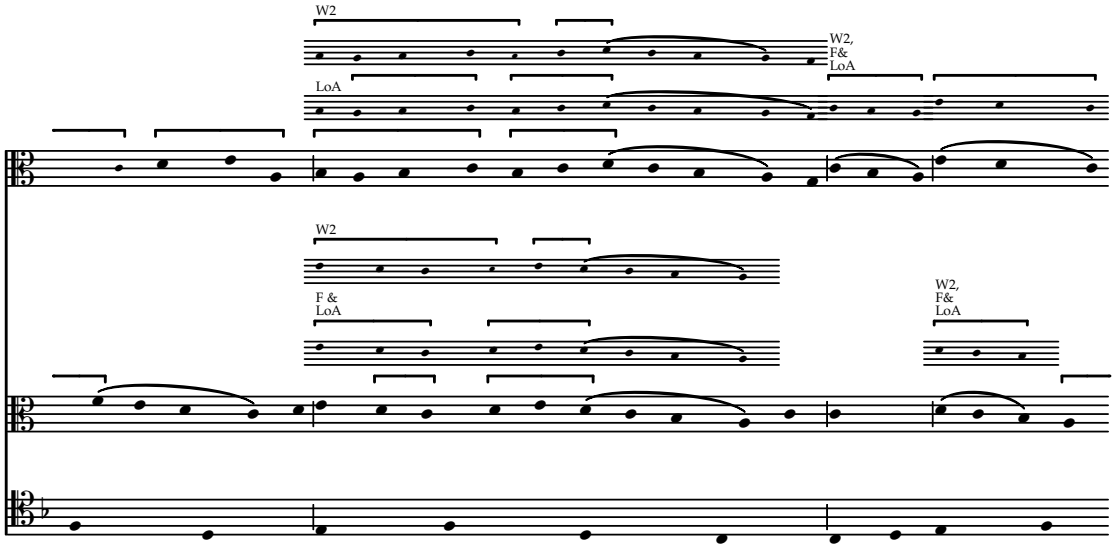

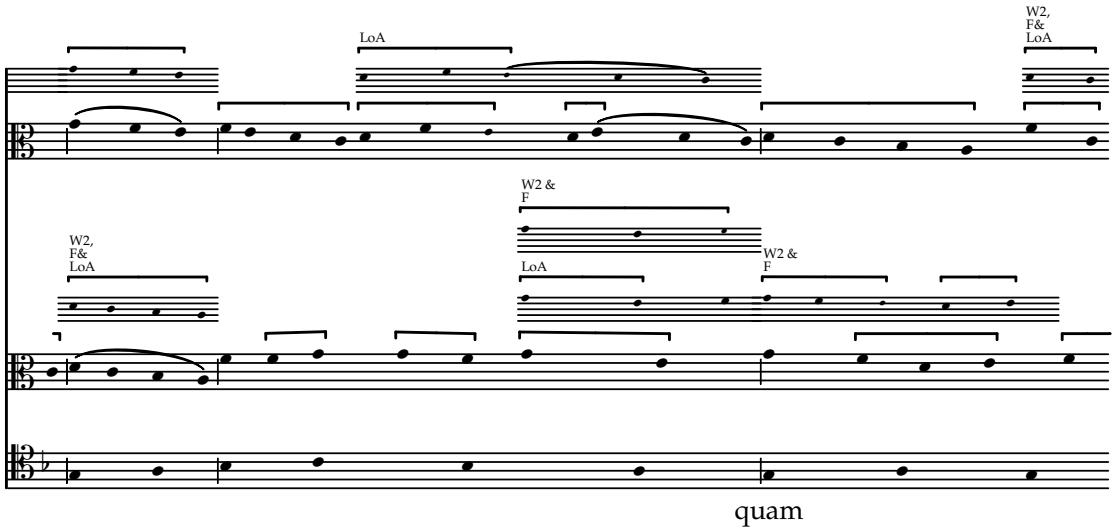
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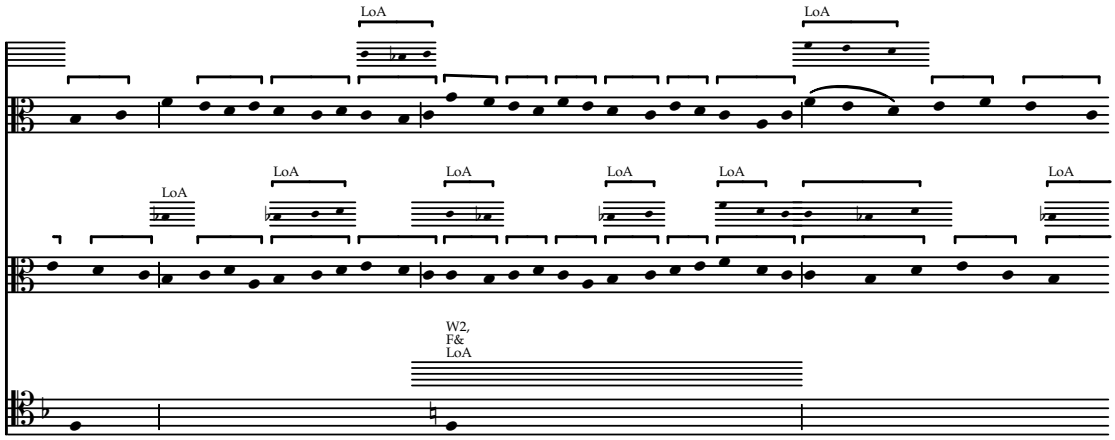
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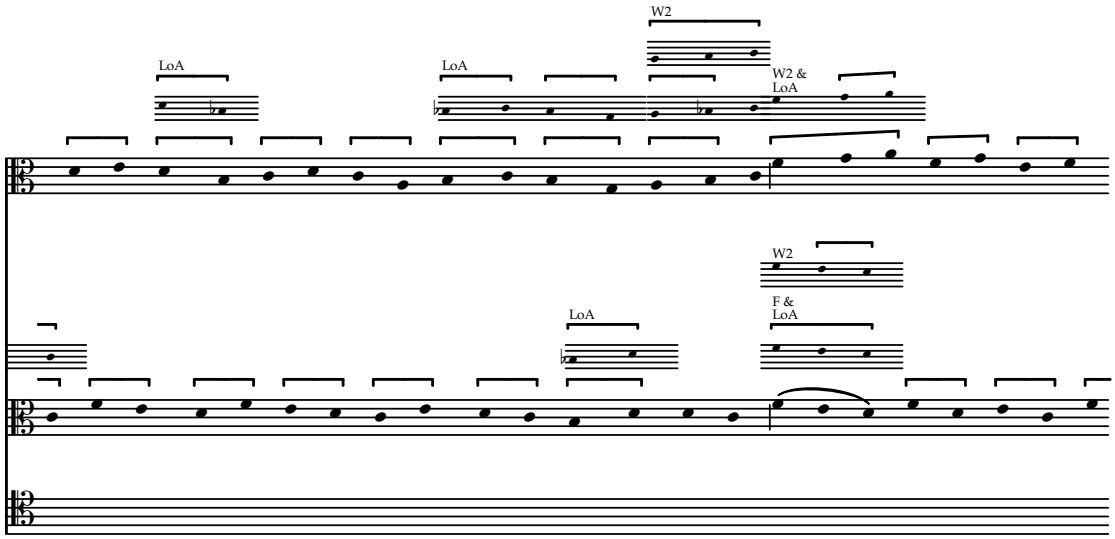
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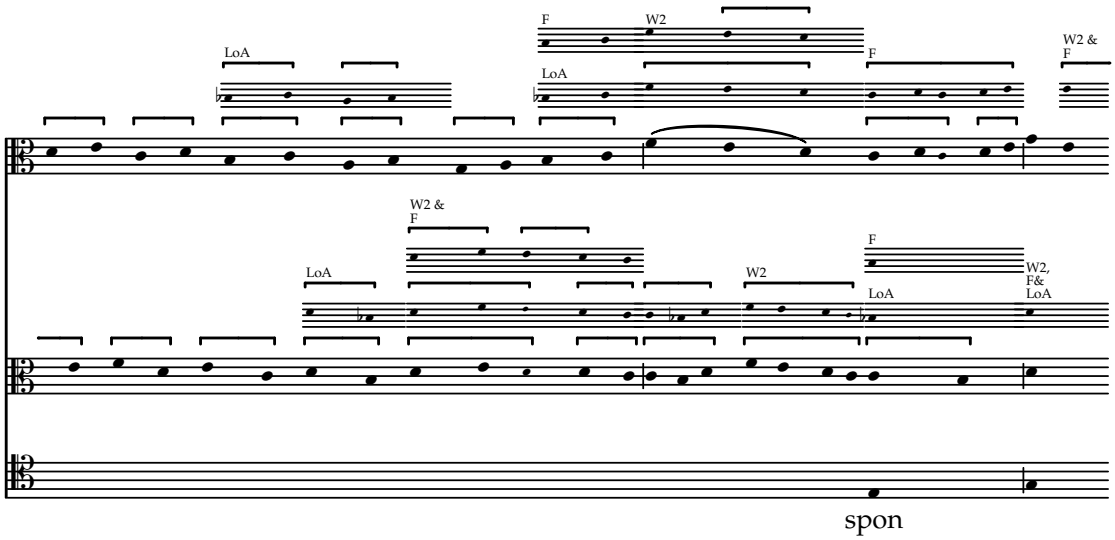
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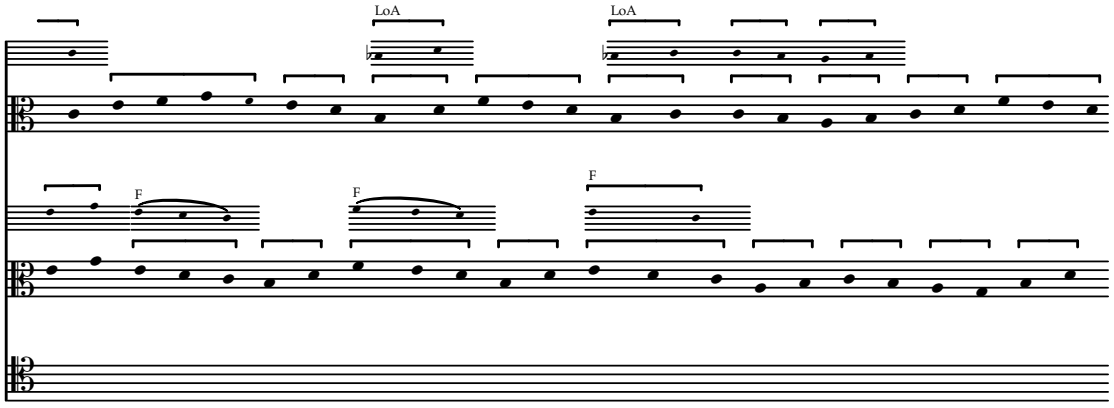
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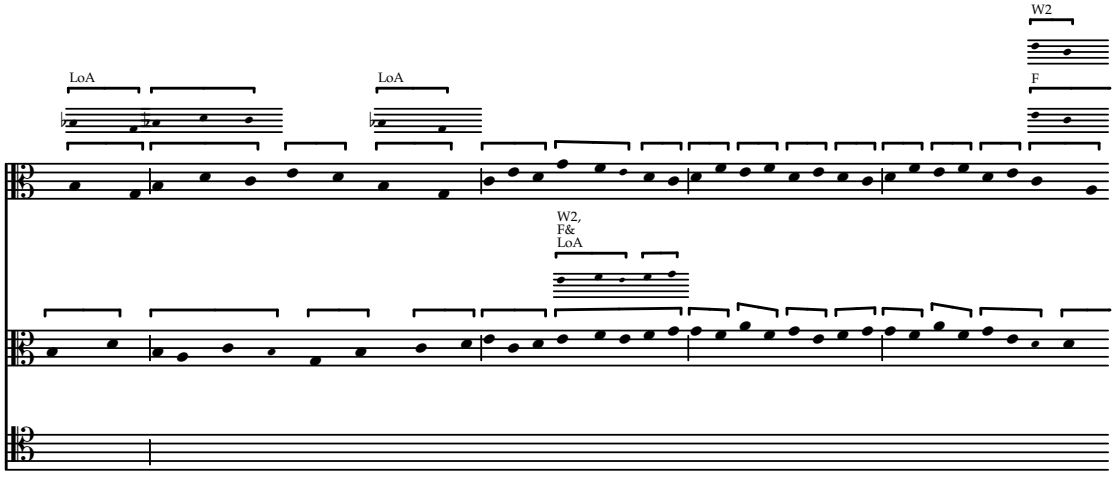
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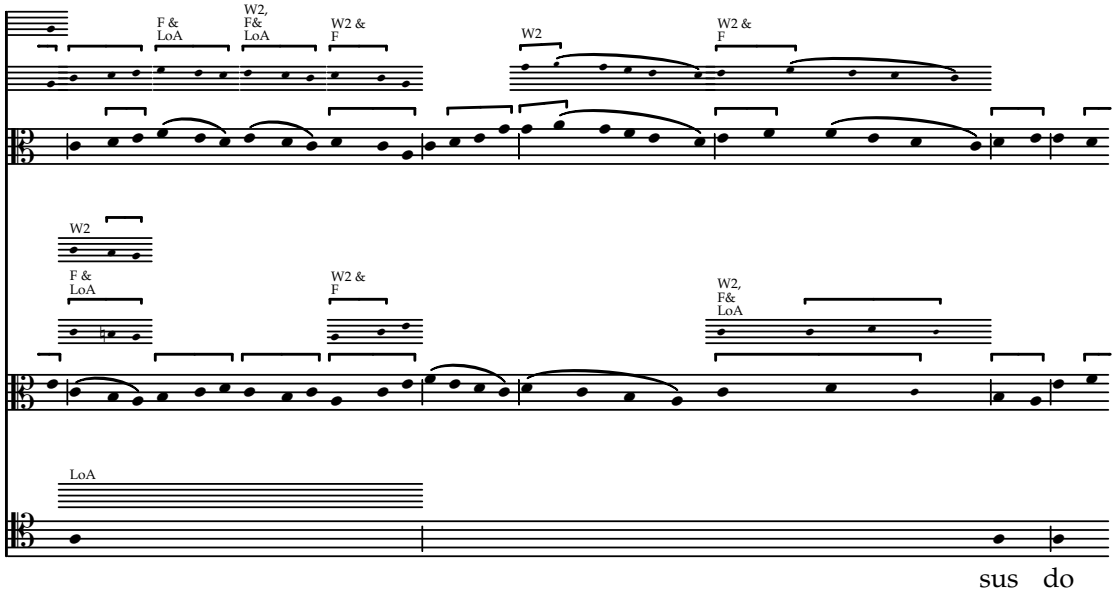
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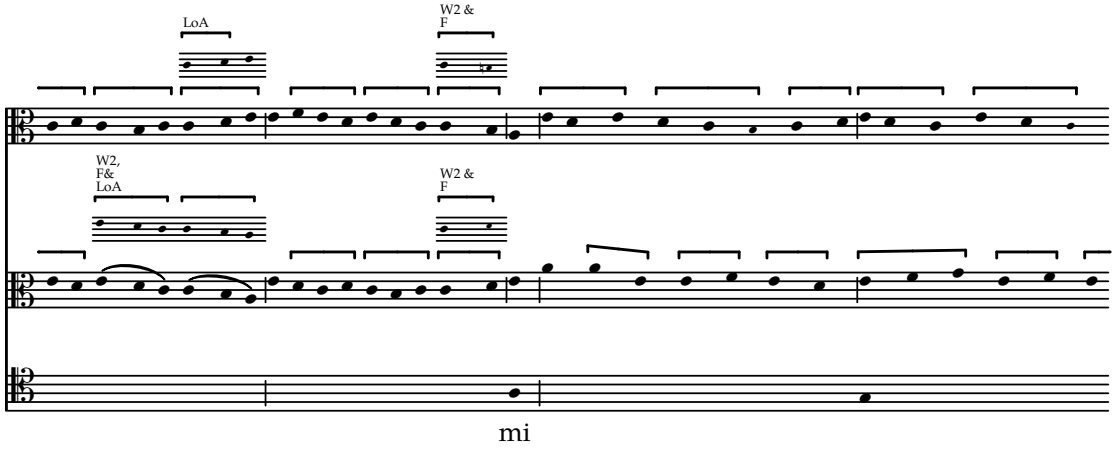
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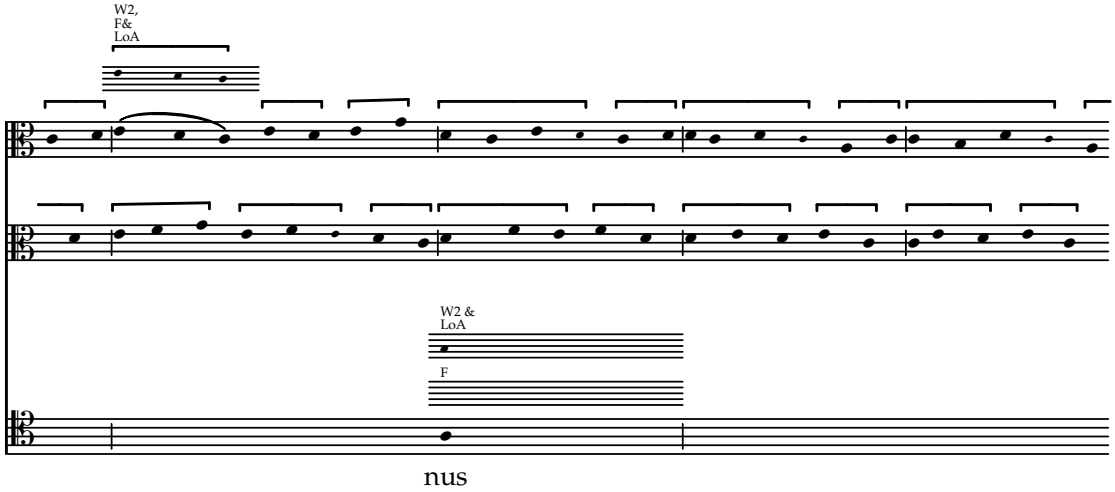
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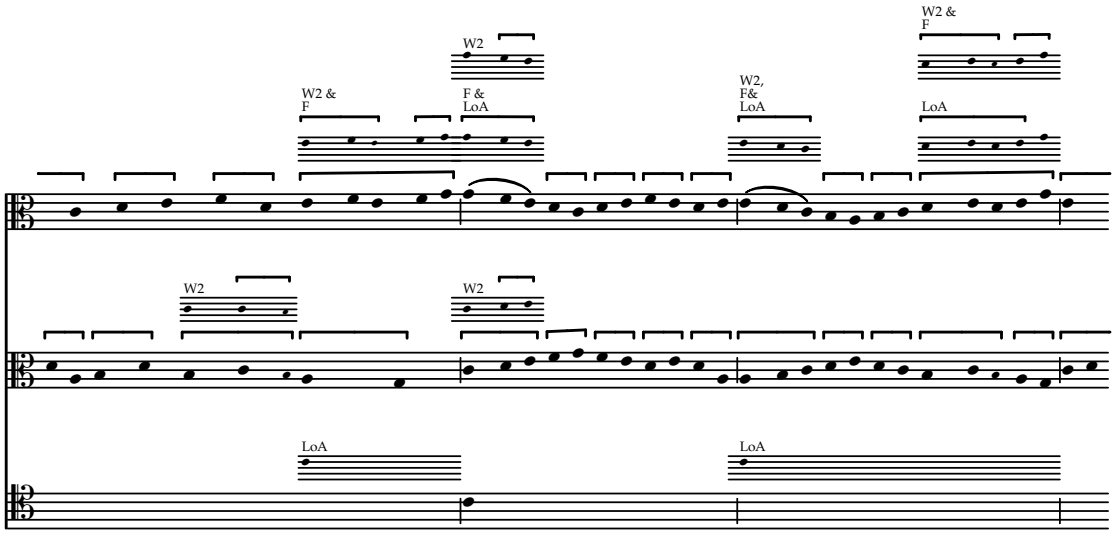
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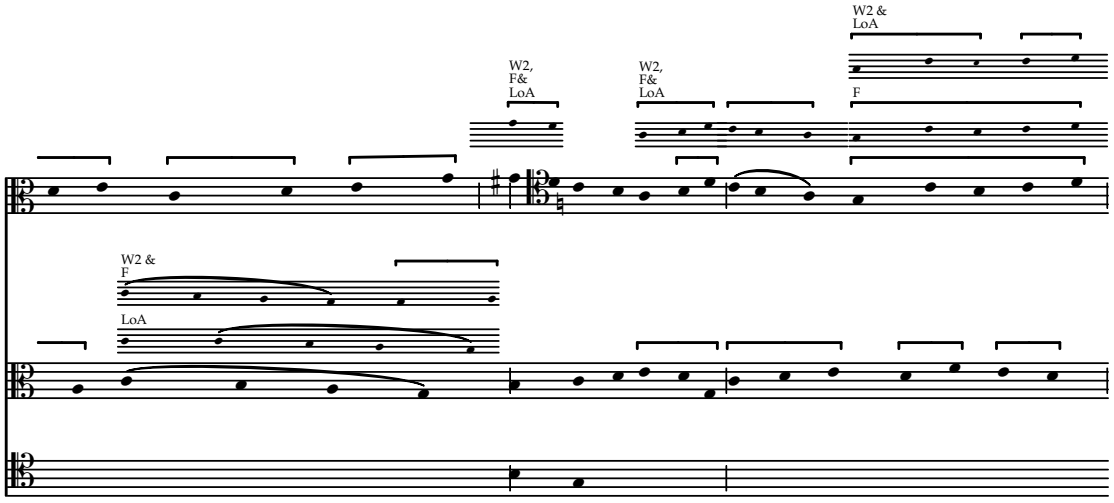
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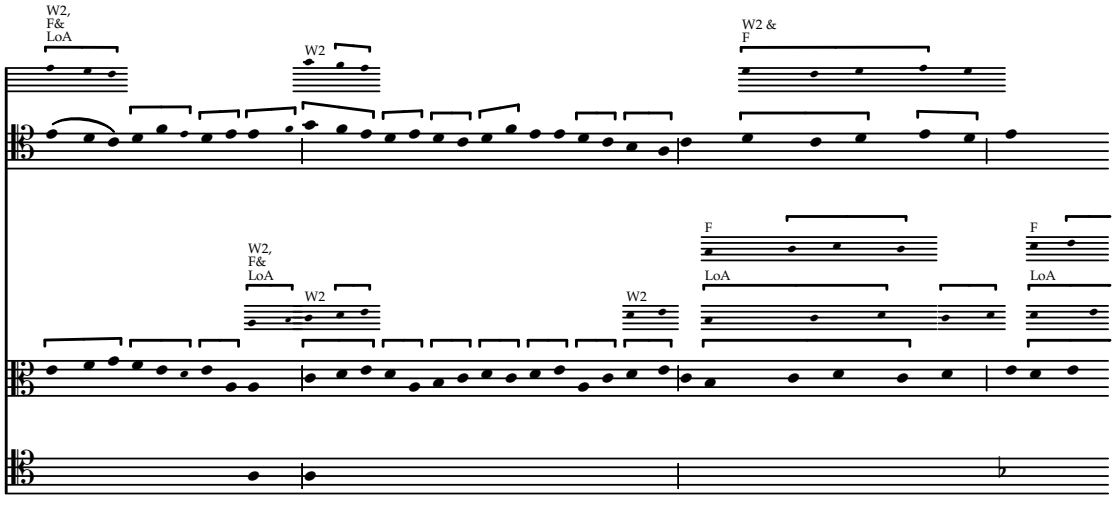
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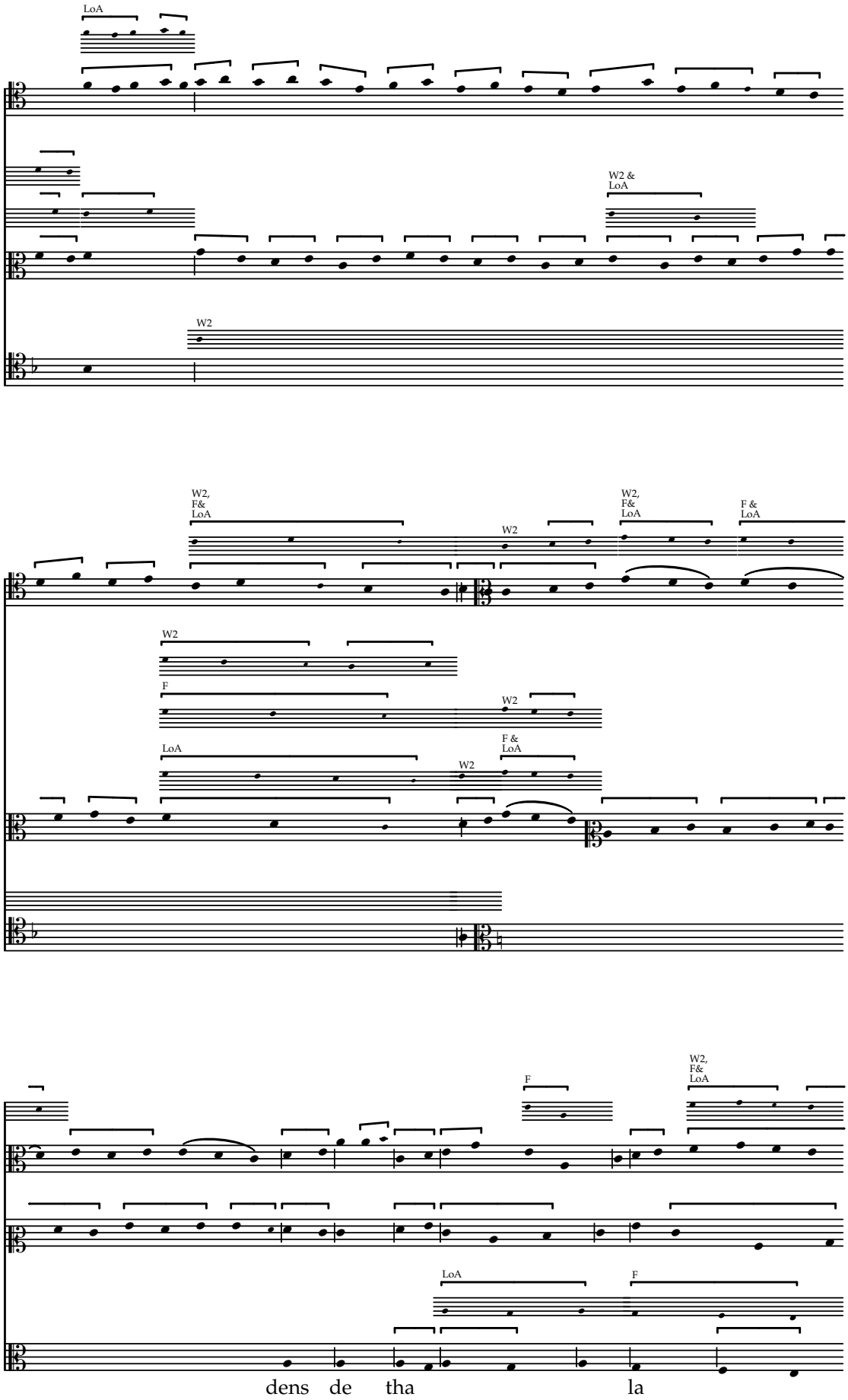
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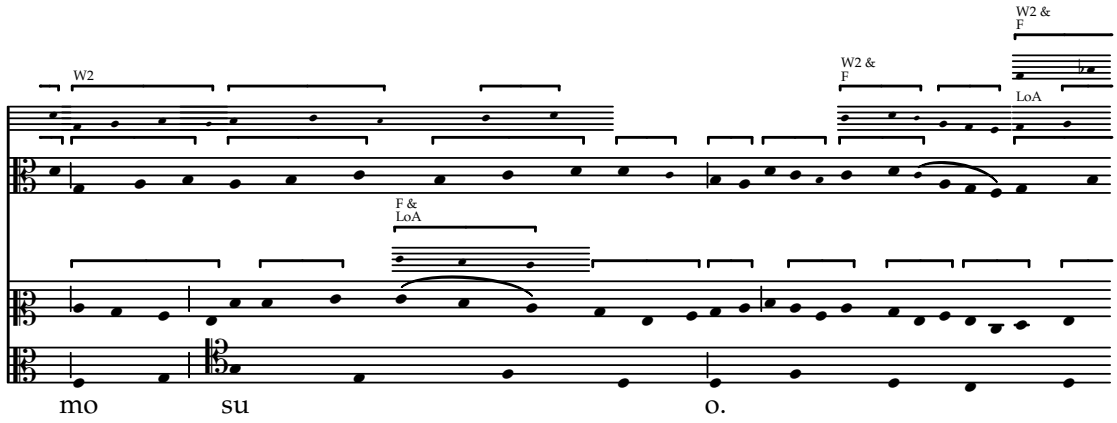
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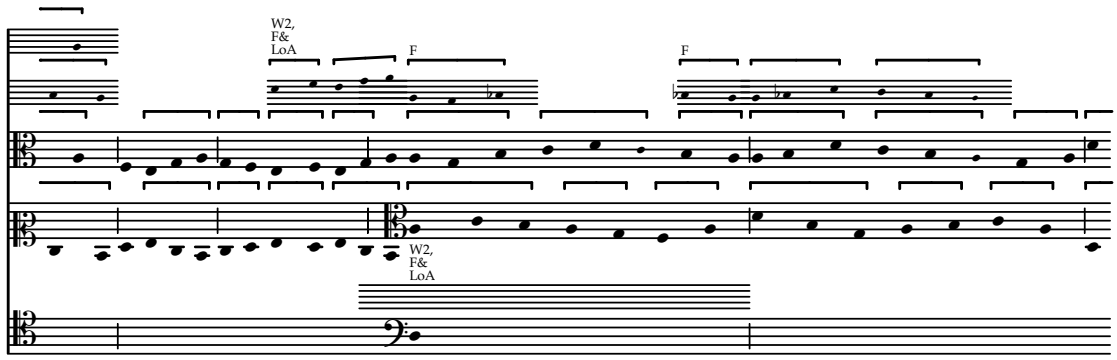
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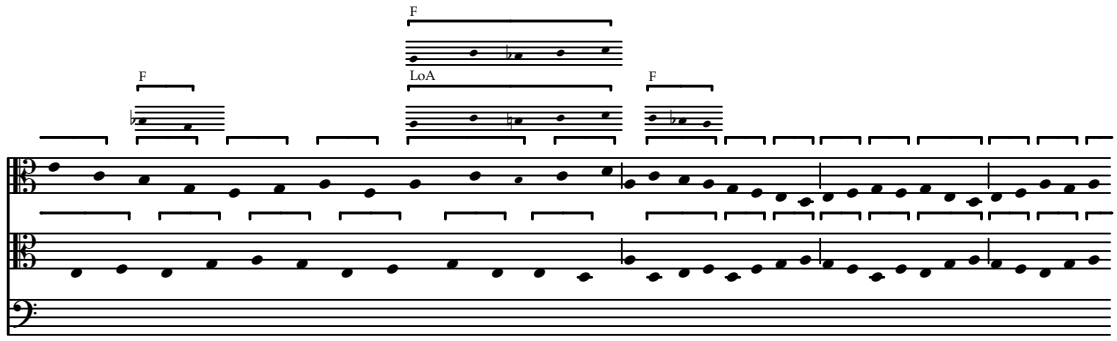
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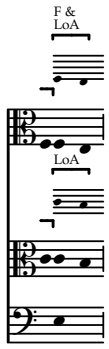
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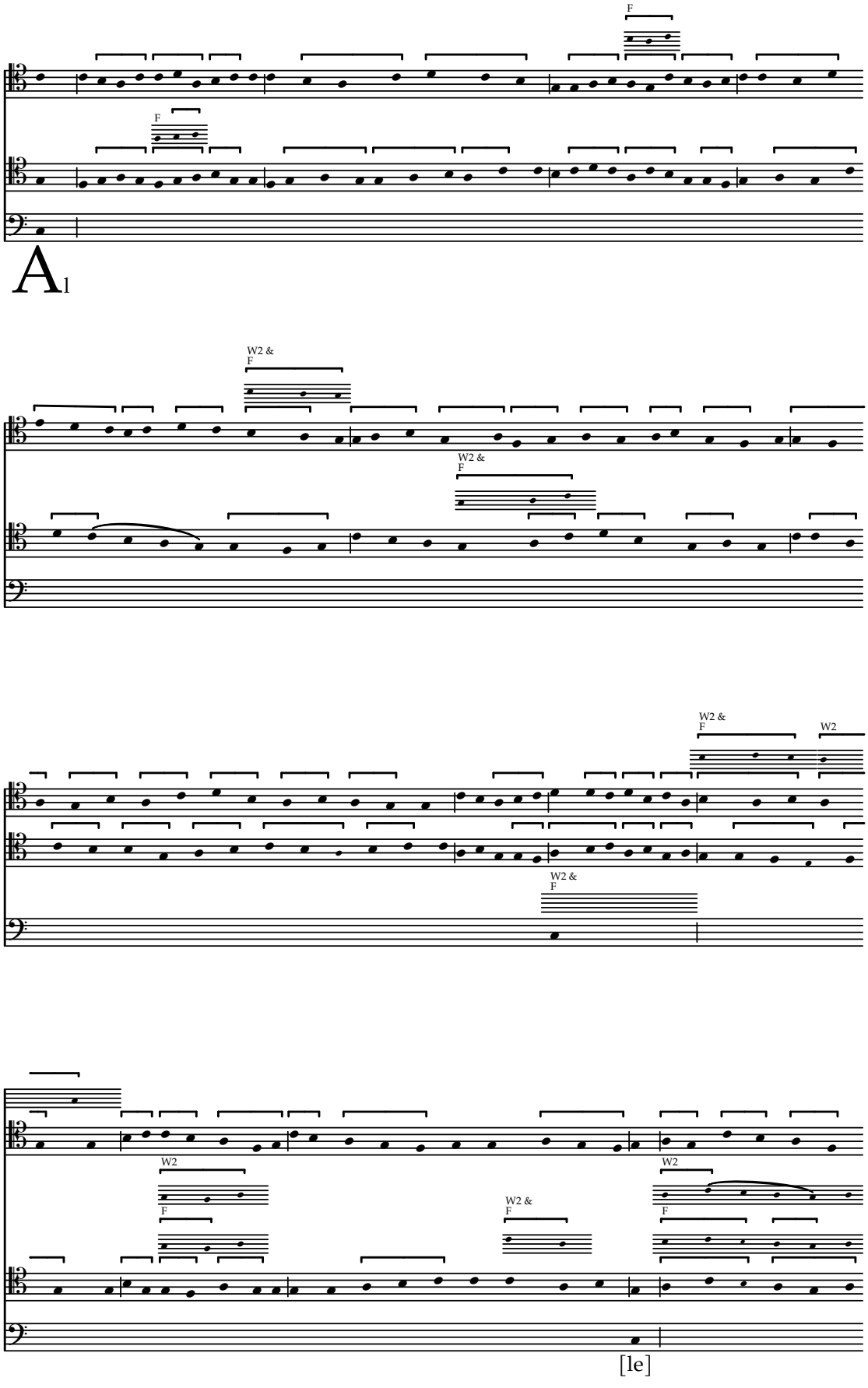
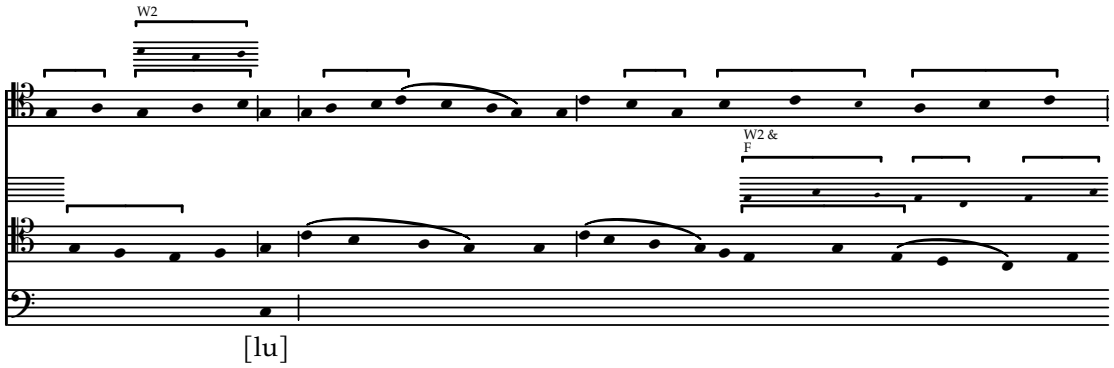
Concordances from W2 & F

f. 86v–87

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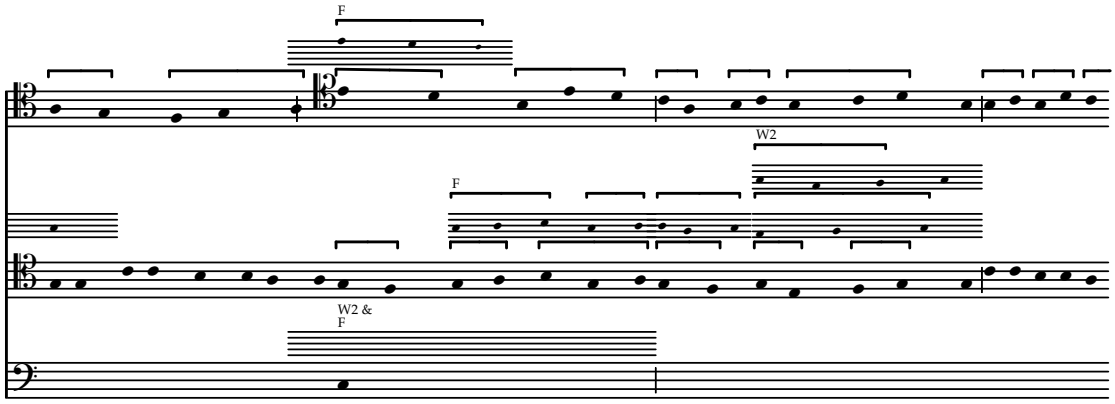
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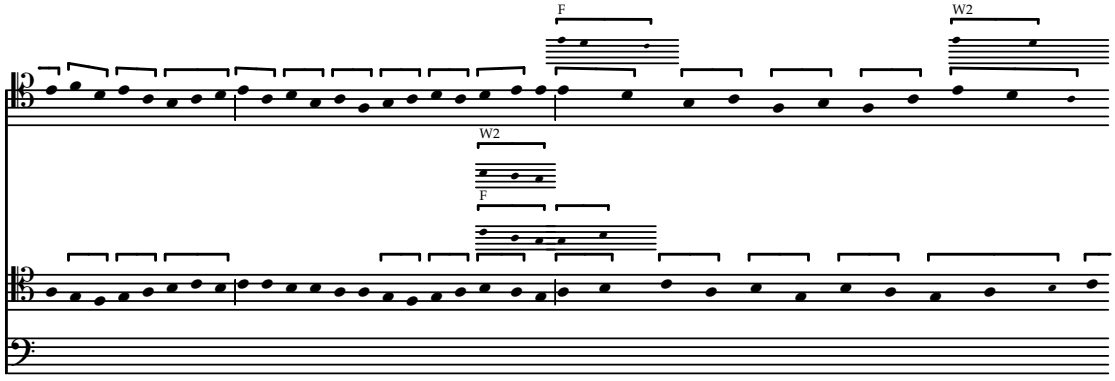
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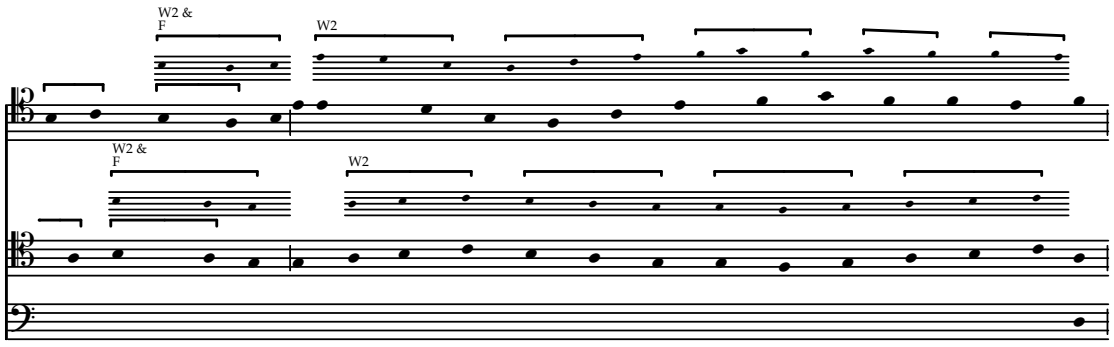
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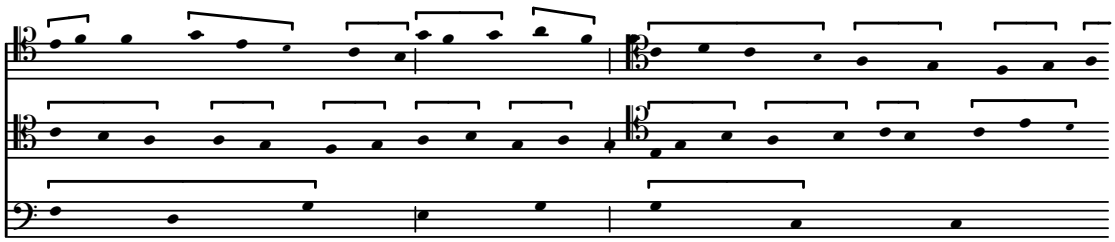

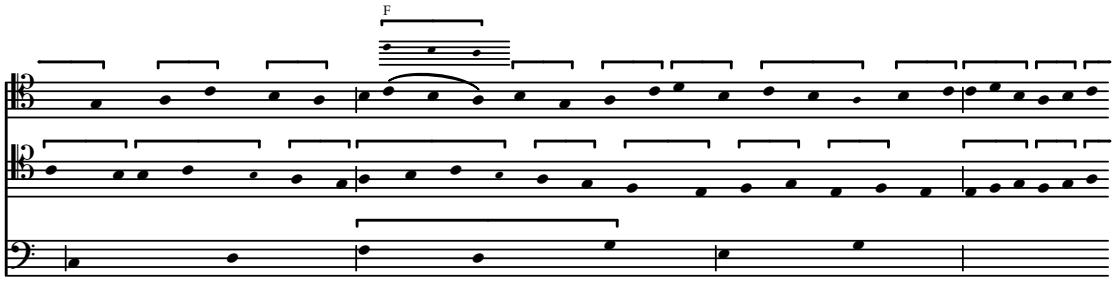

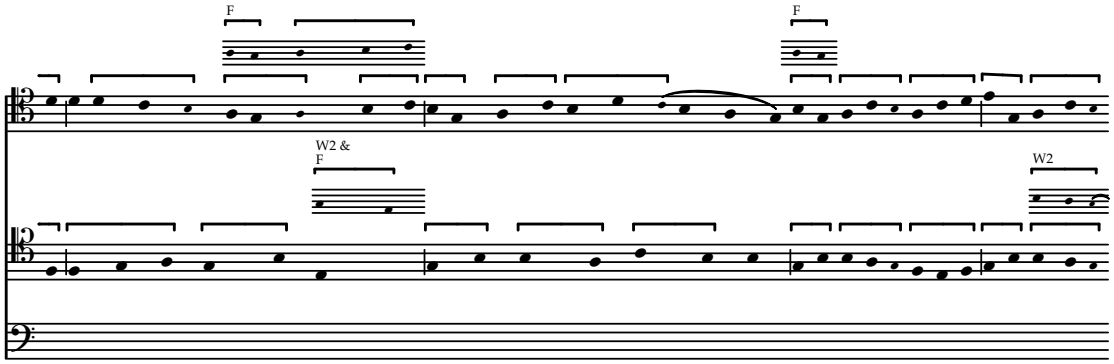

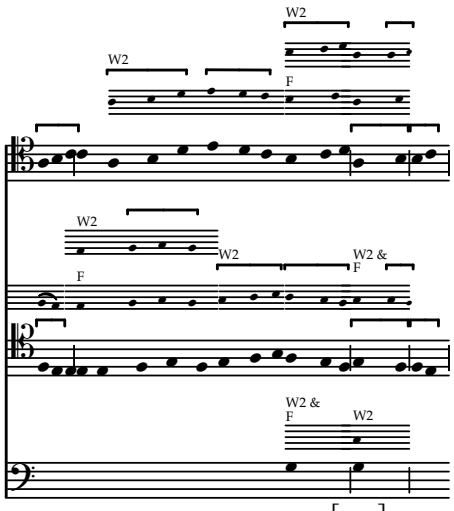

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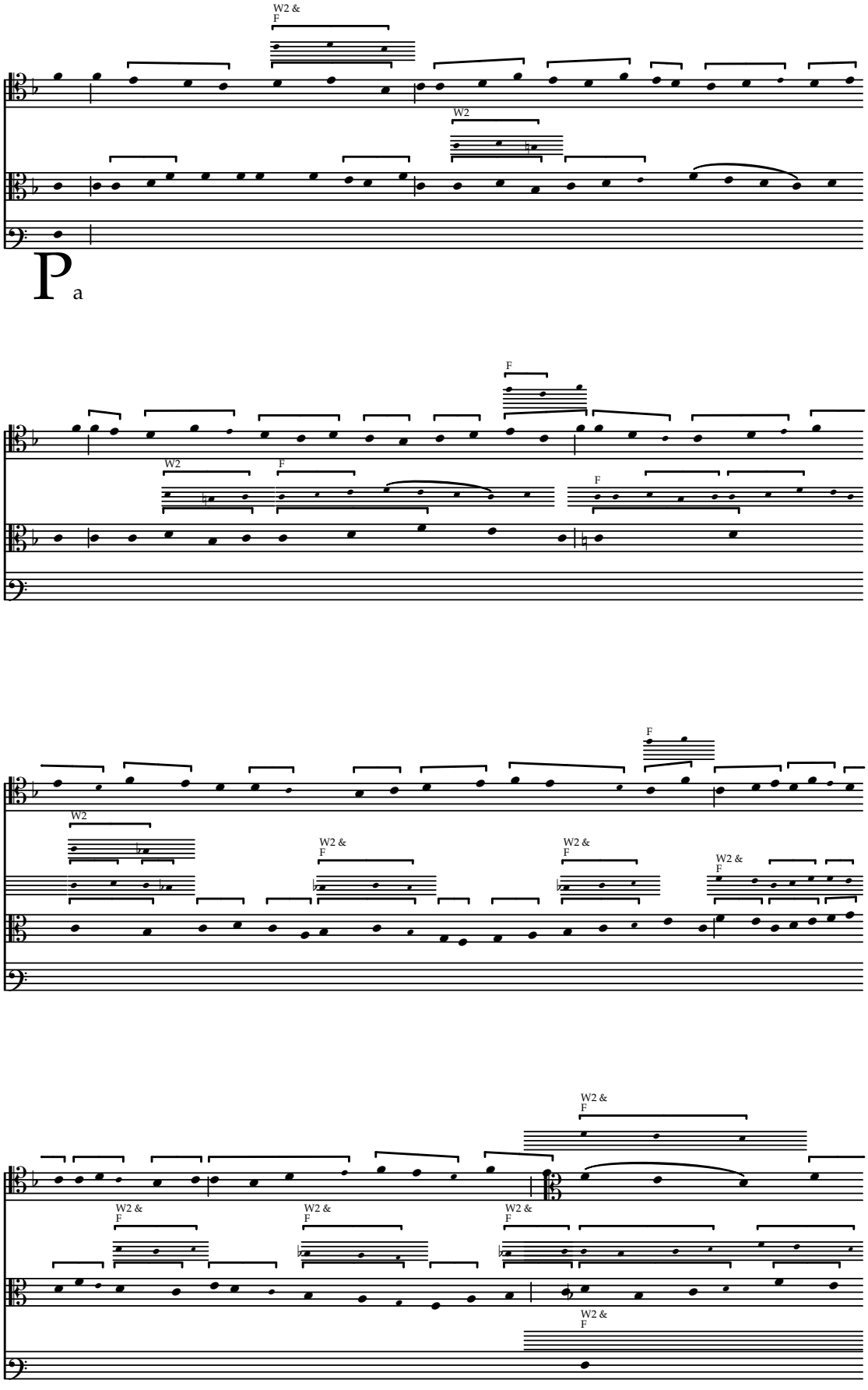
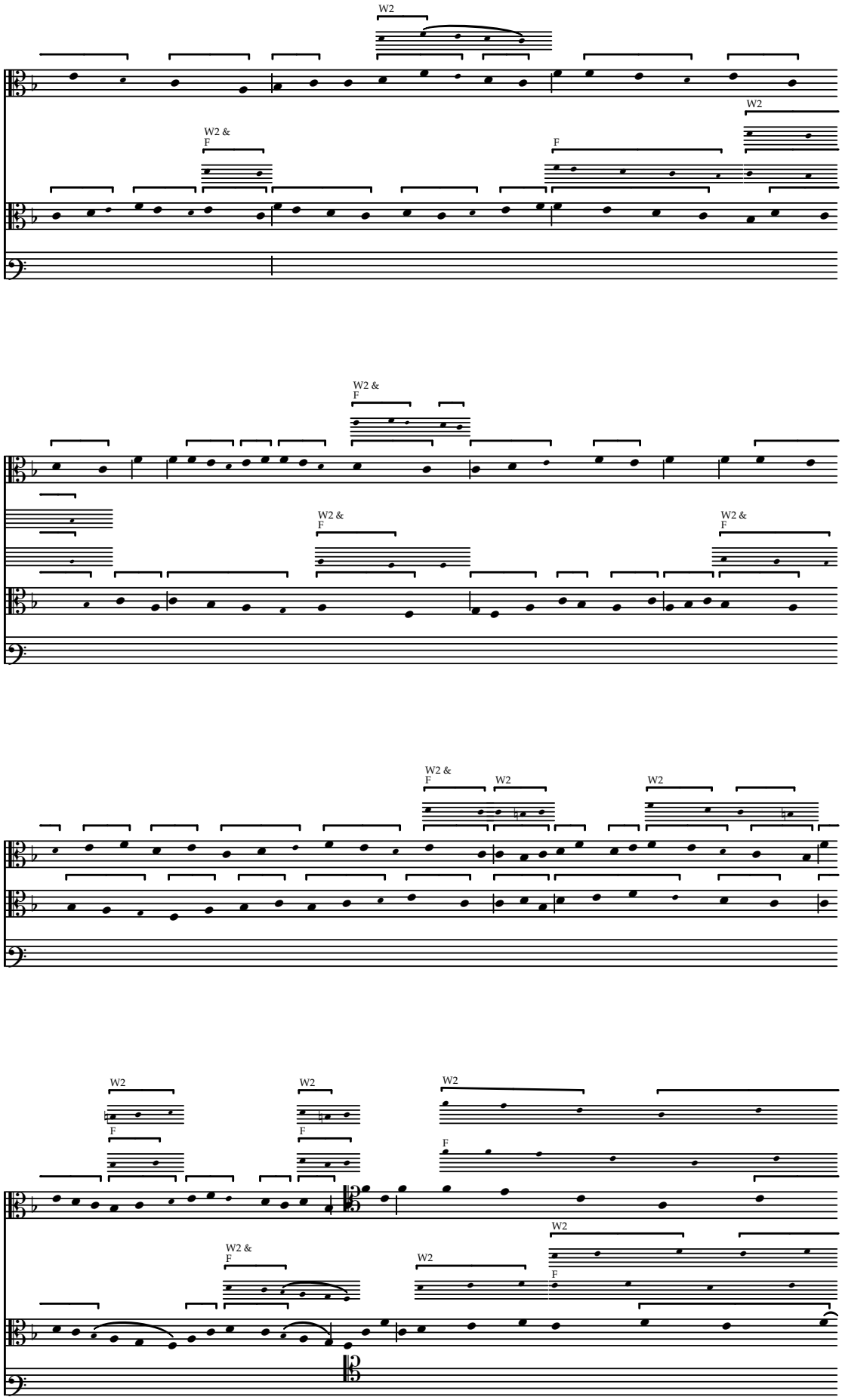
Pascha nostrum

Concordances from W2 & F

f. 87–88

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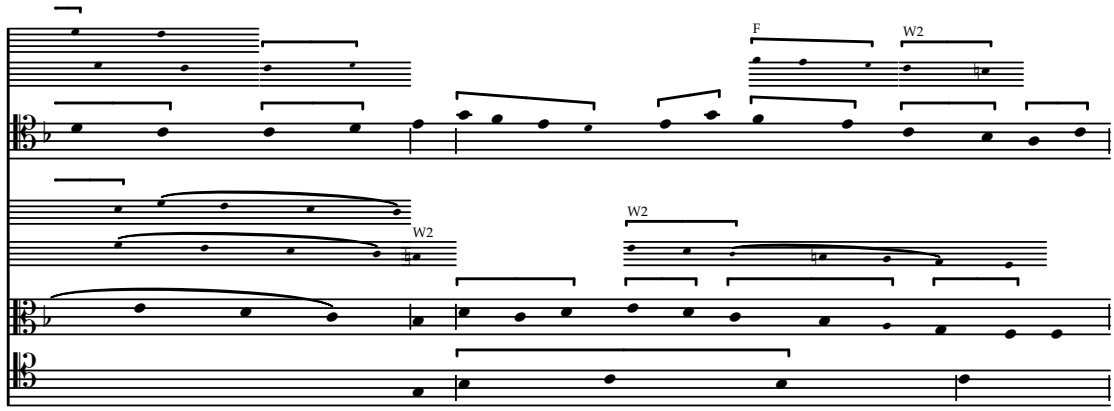

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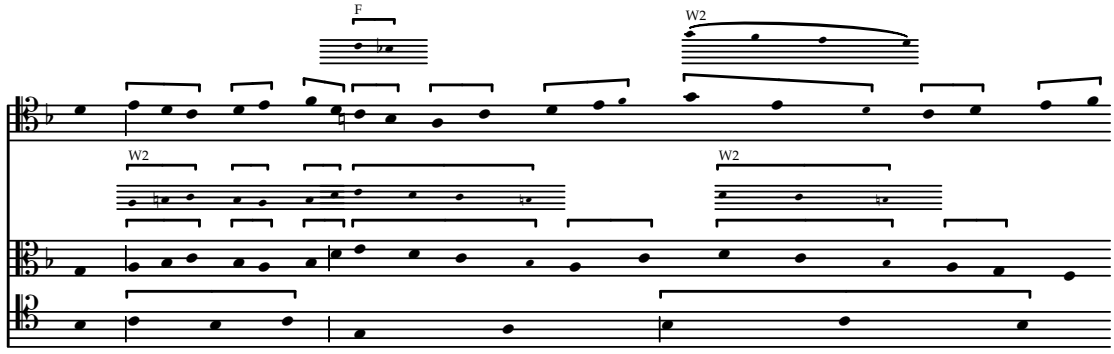

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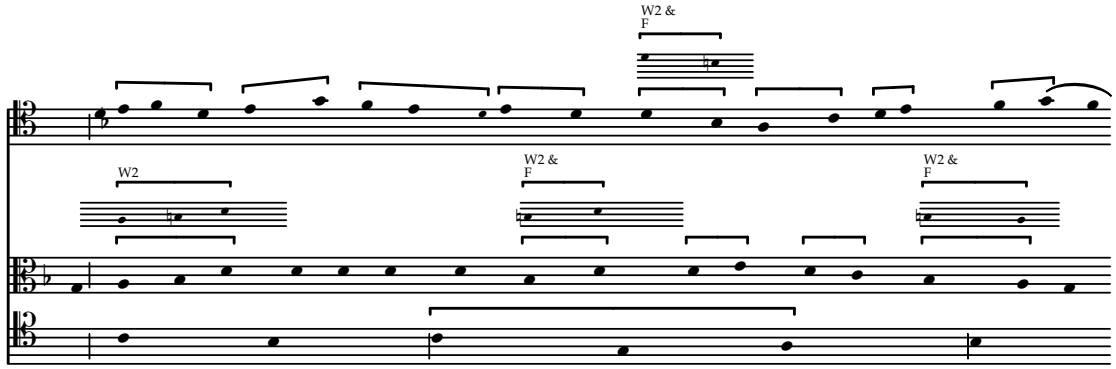

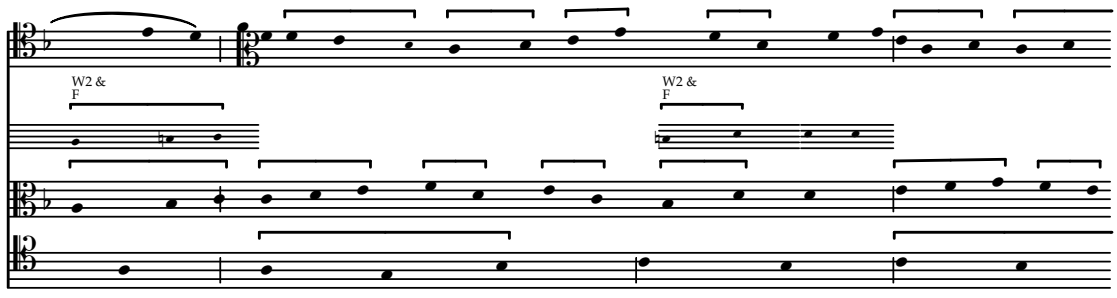

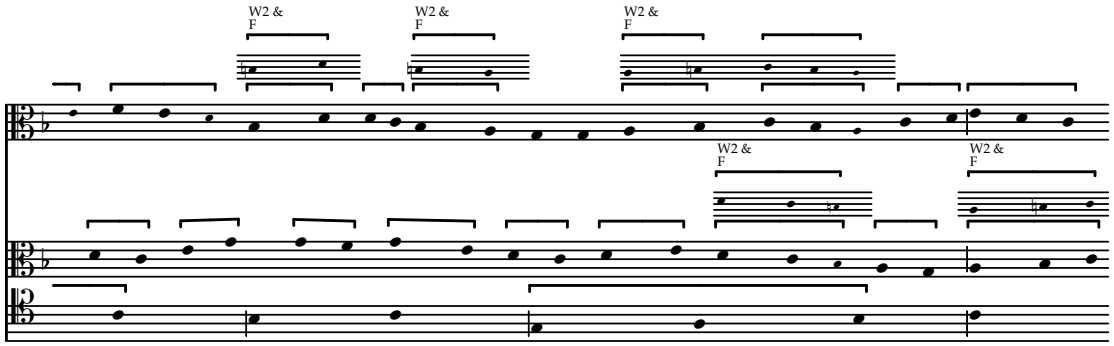

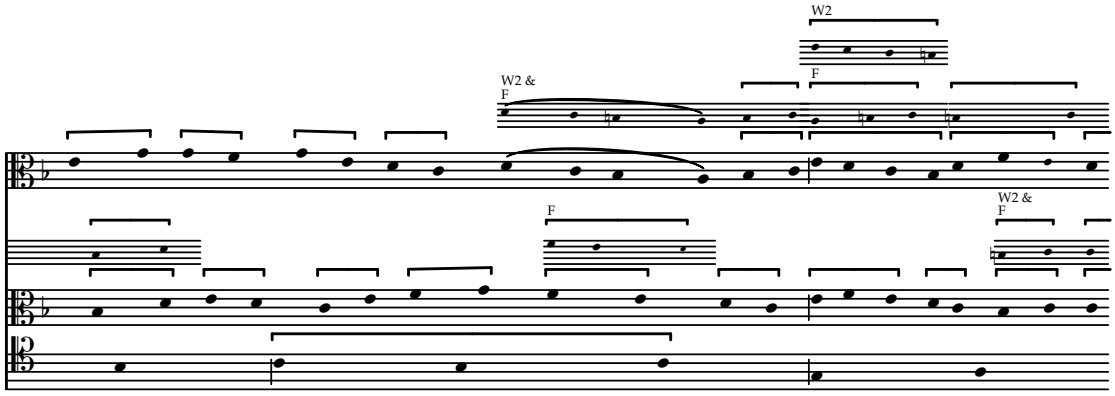

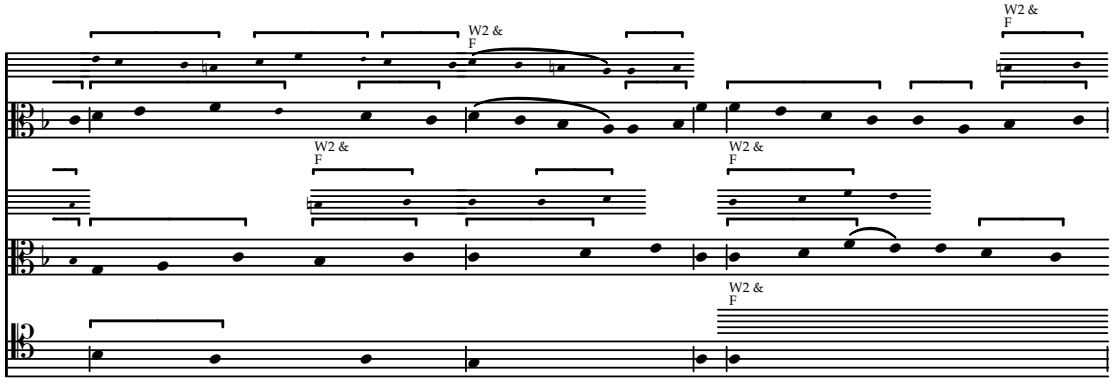

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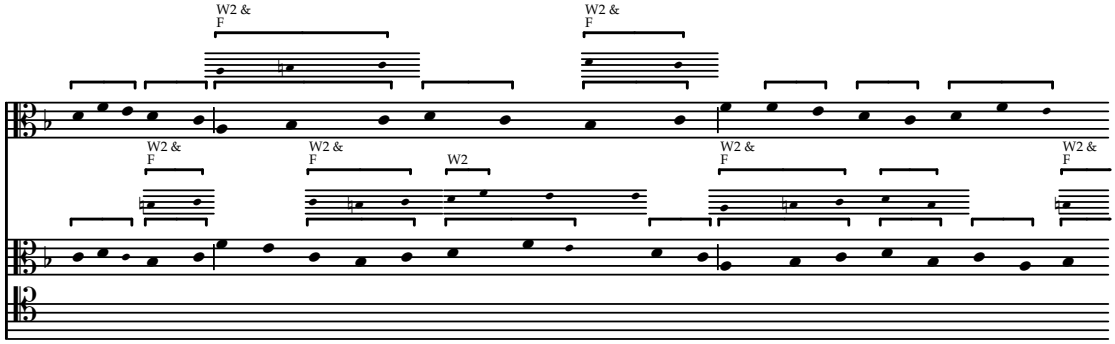

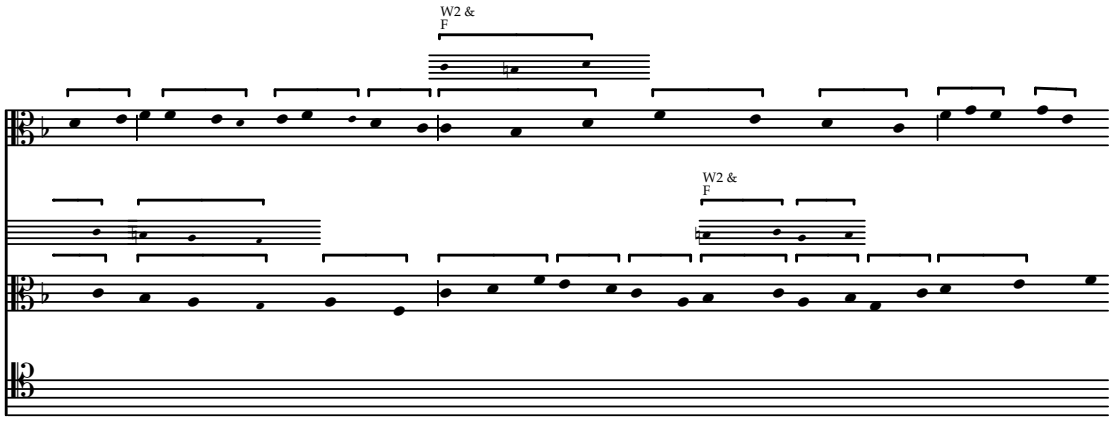
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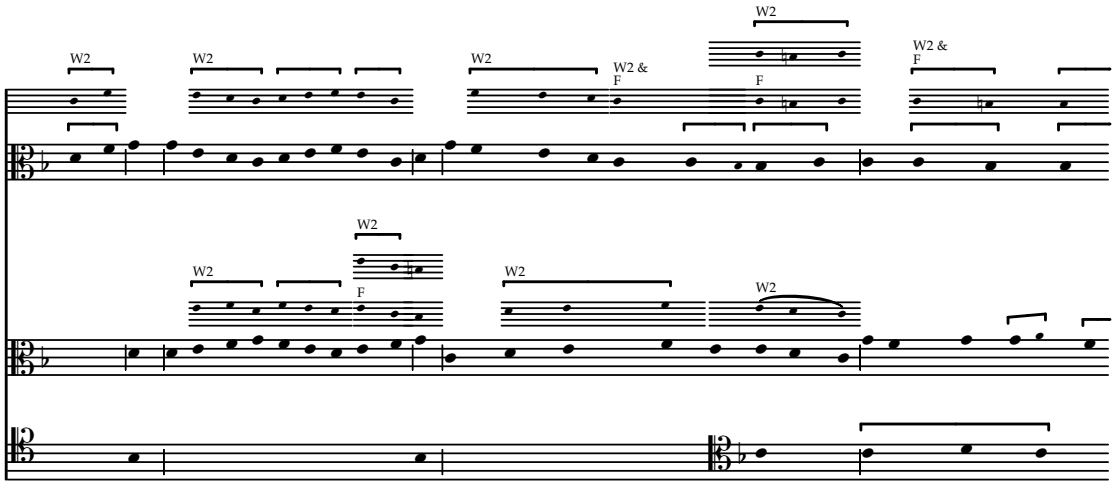
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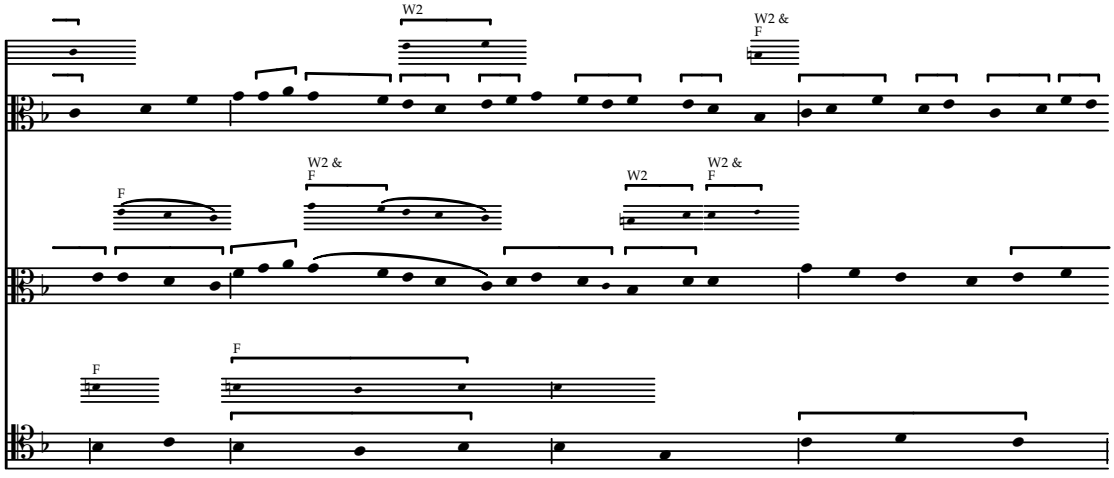
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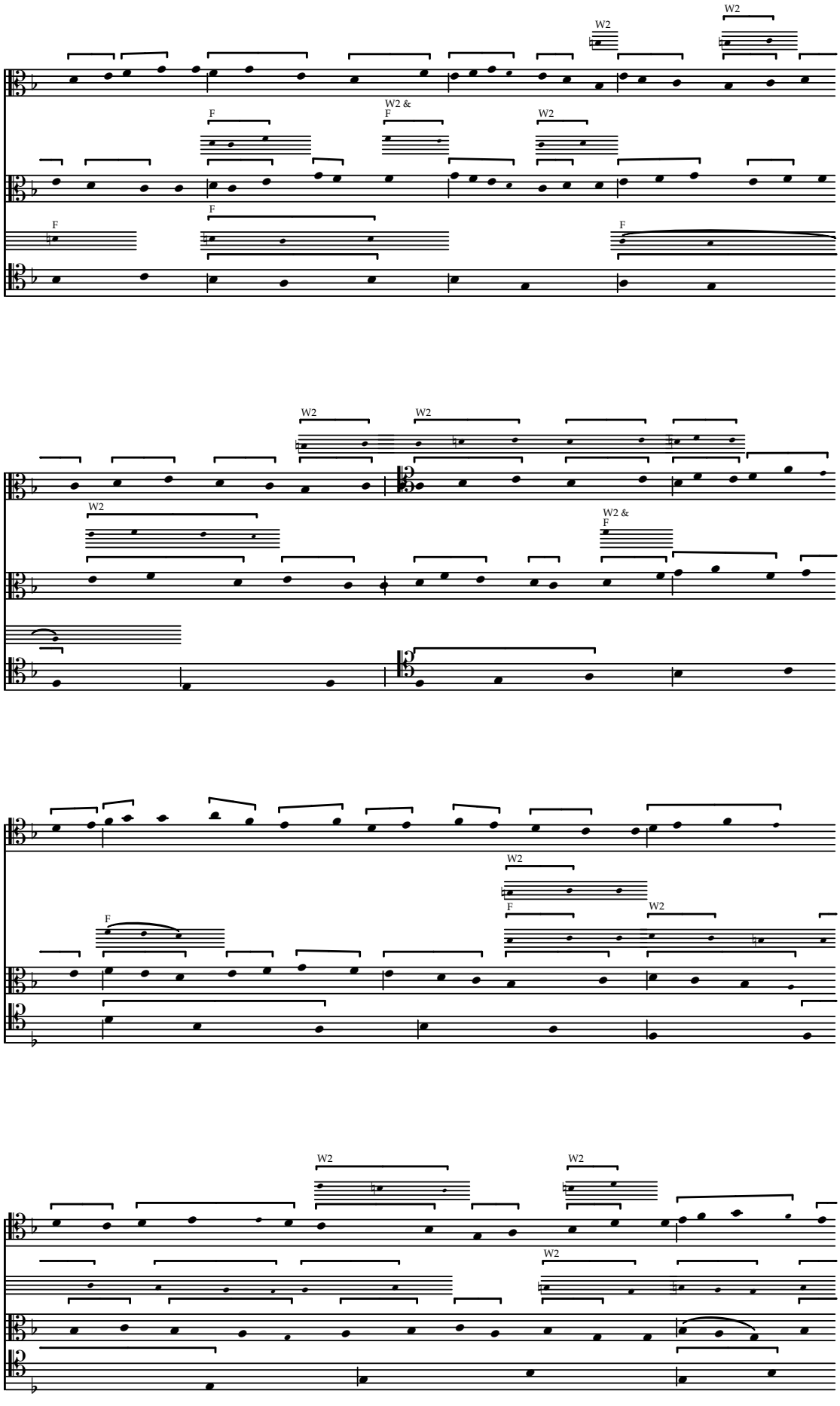
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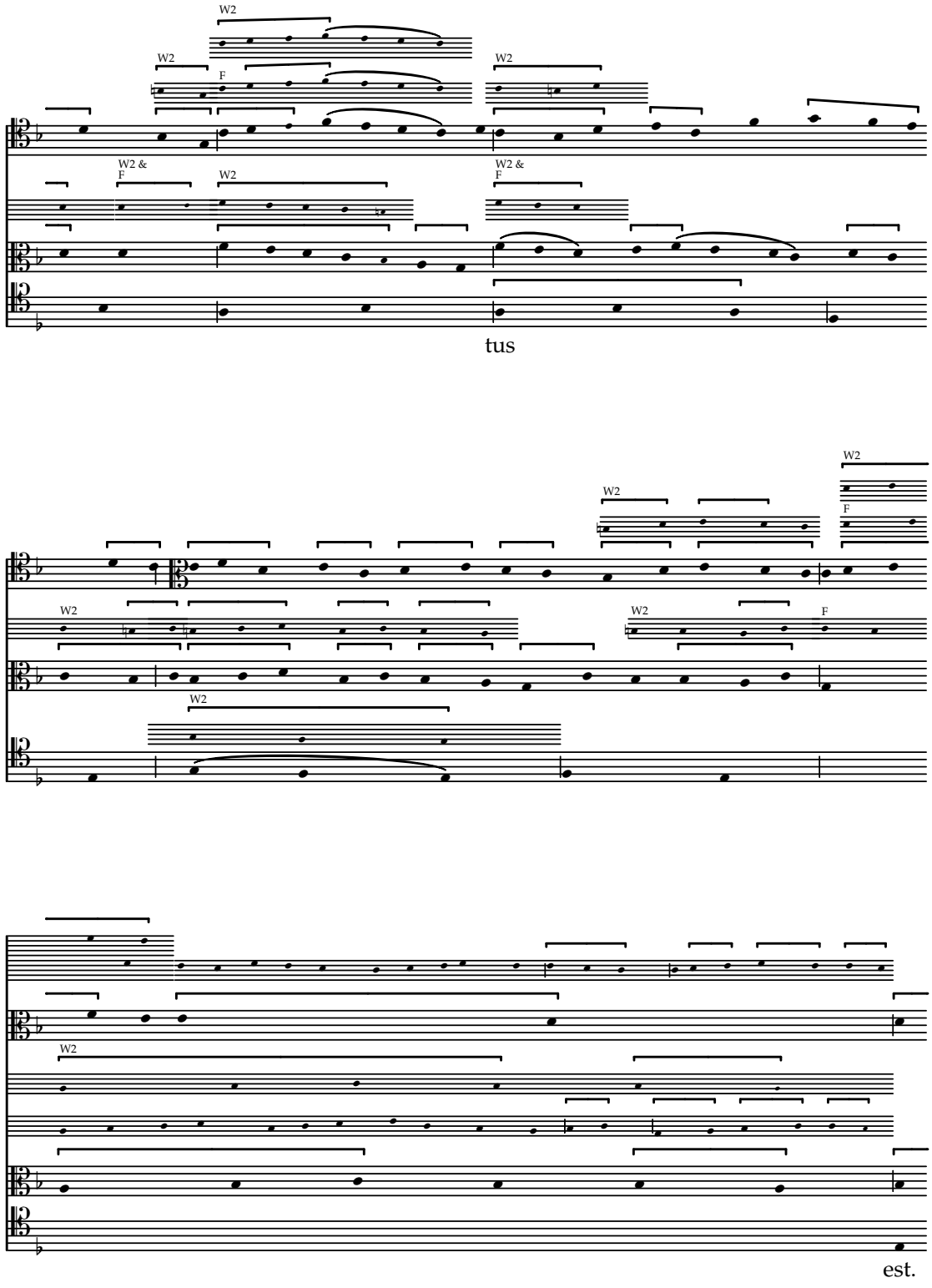
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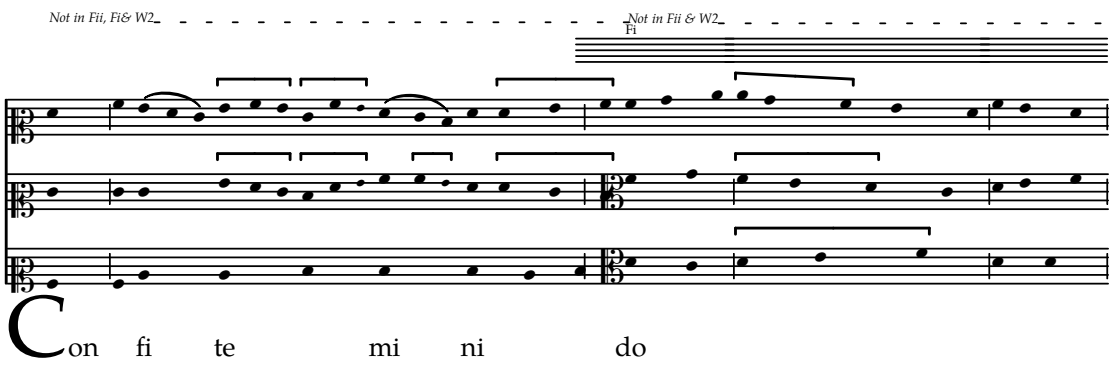
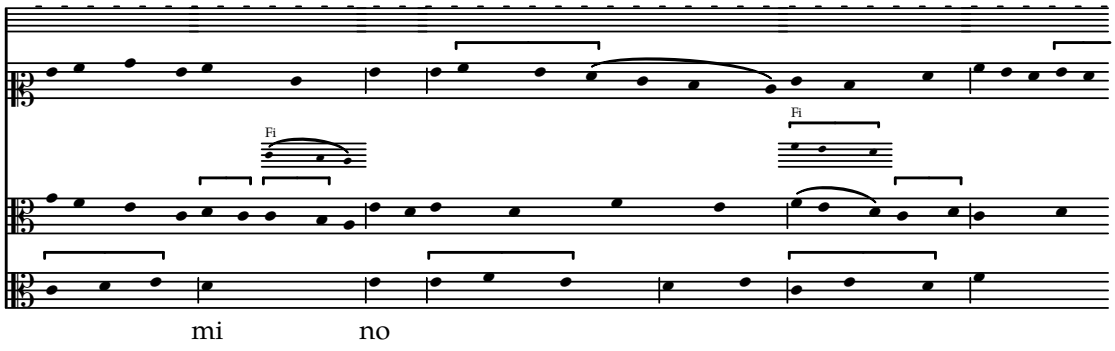
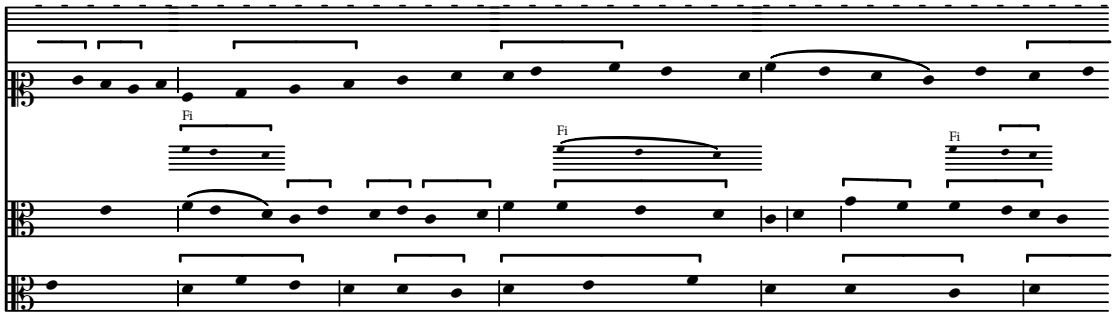
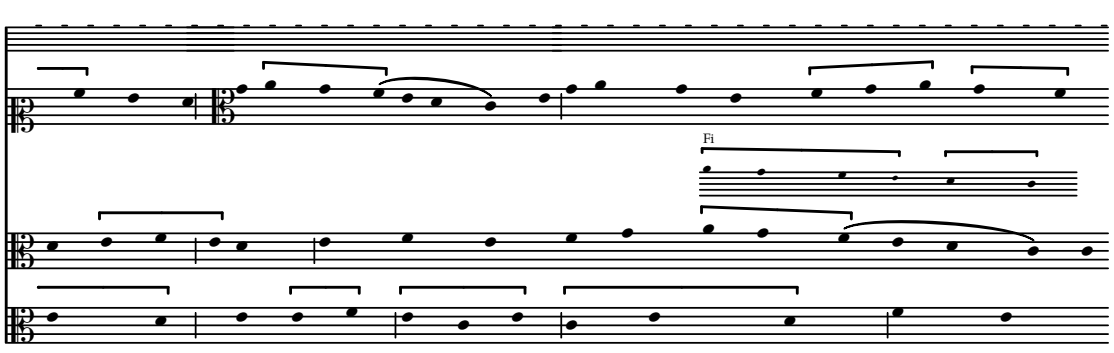
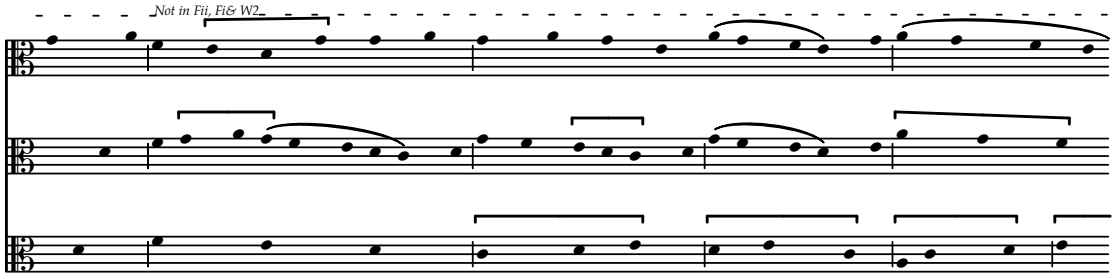
Concordances from W2 & F (two clausulae) f. 90–82







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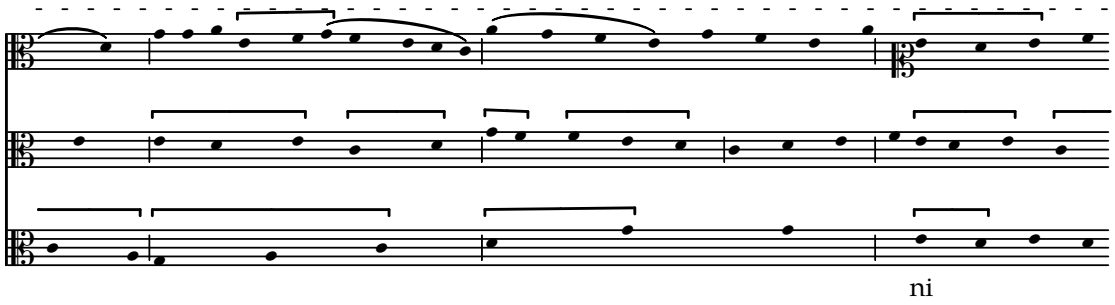
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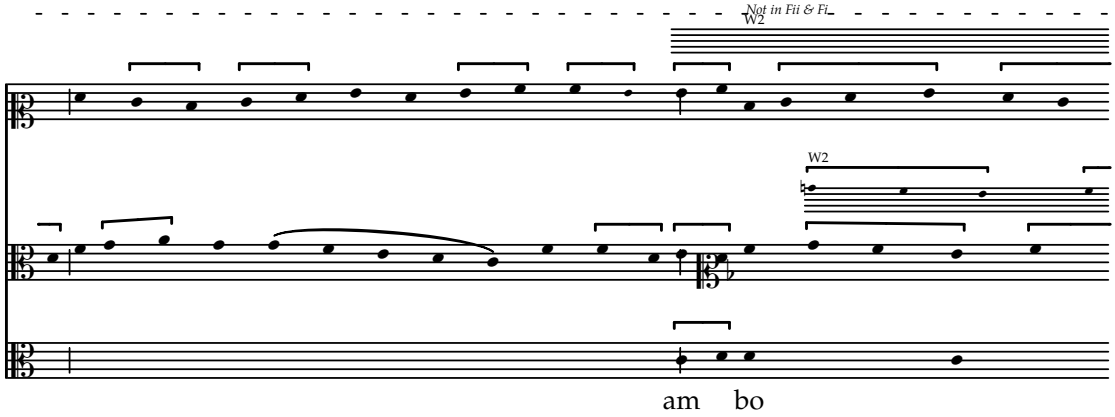
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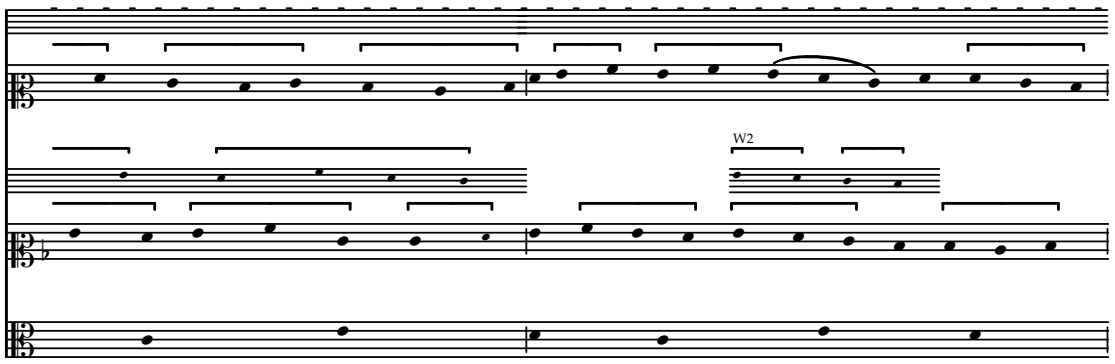
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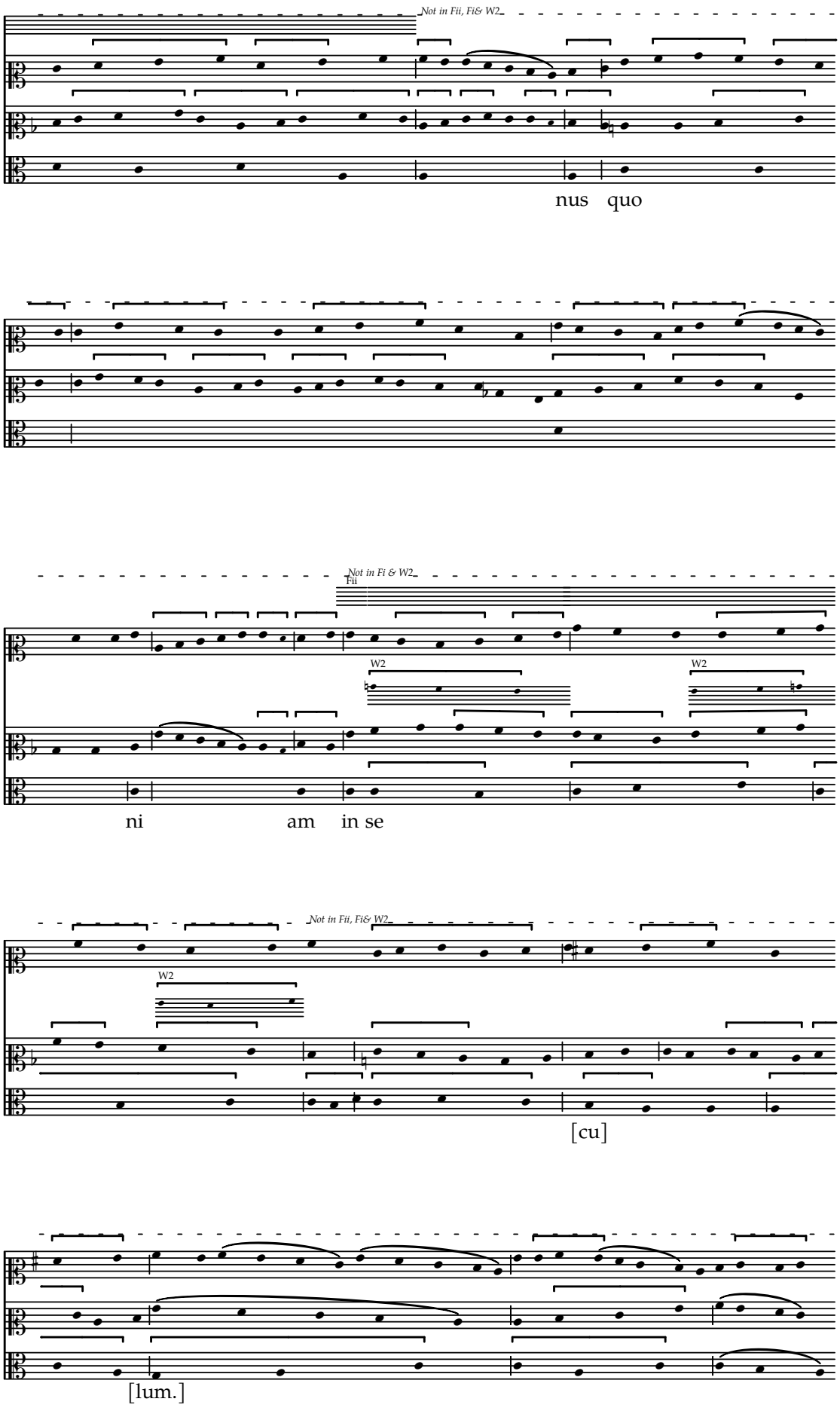
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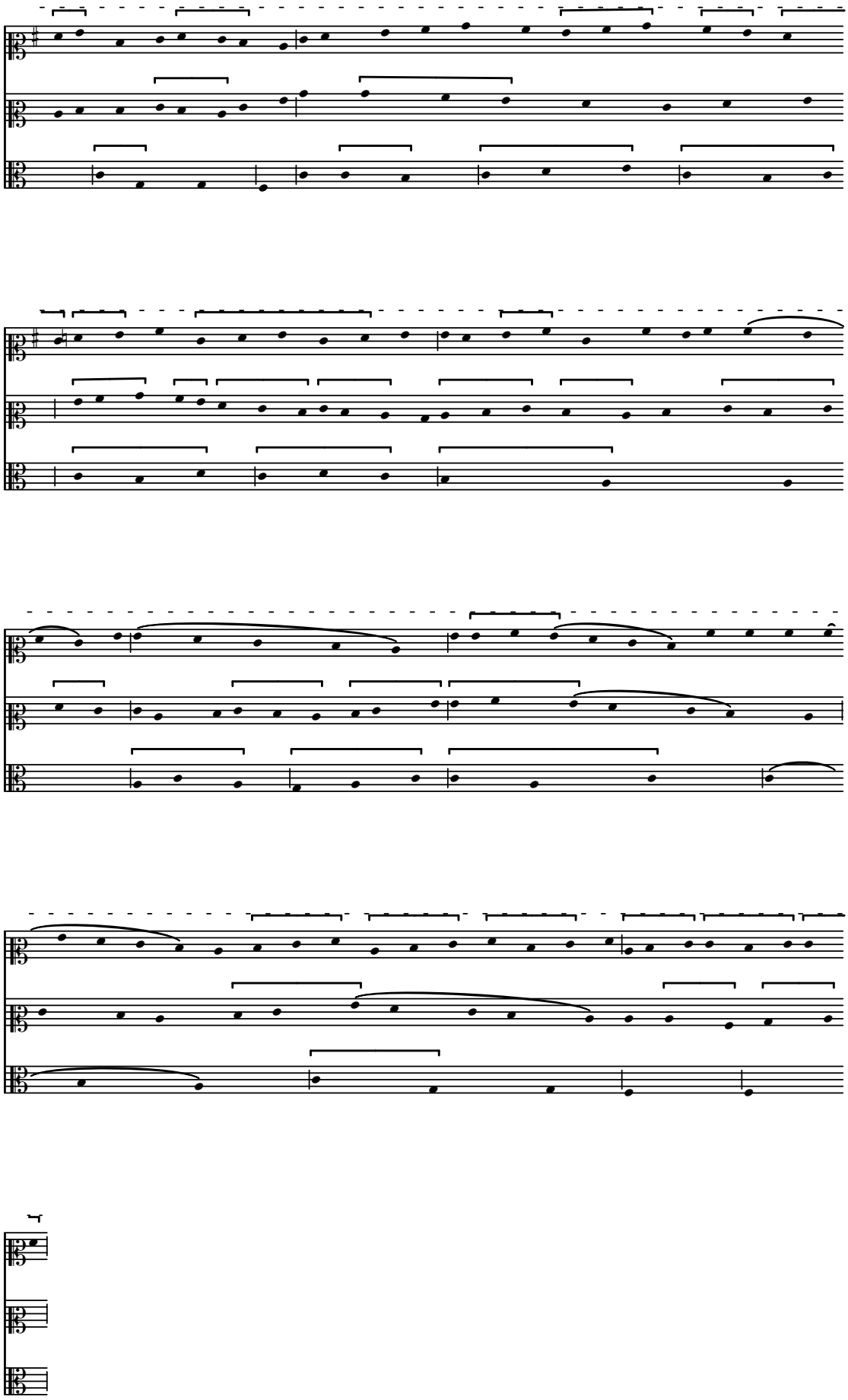

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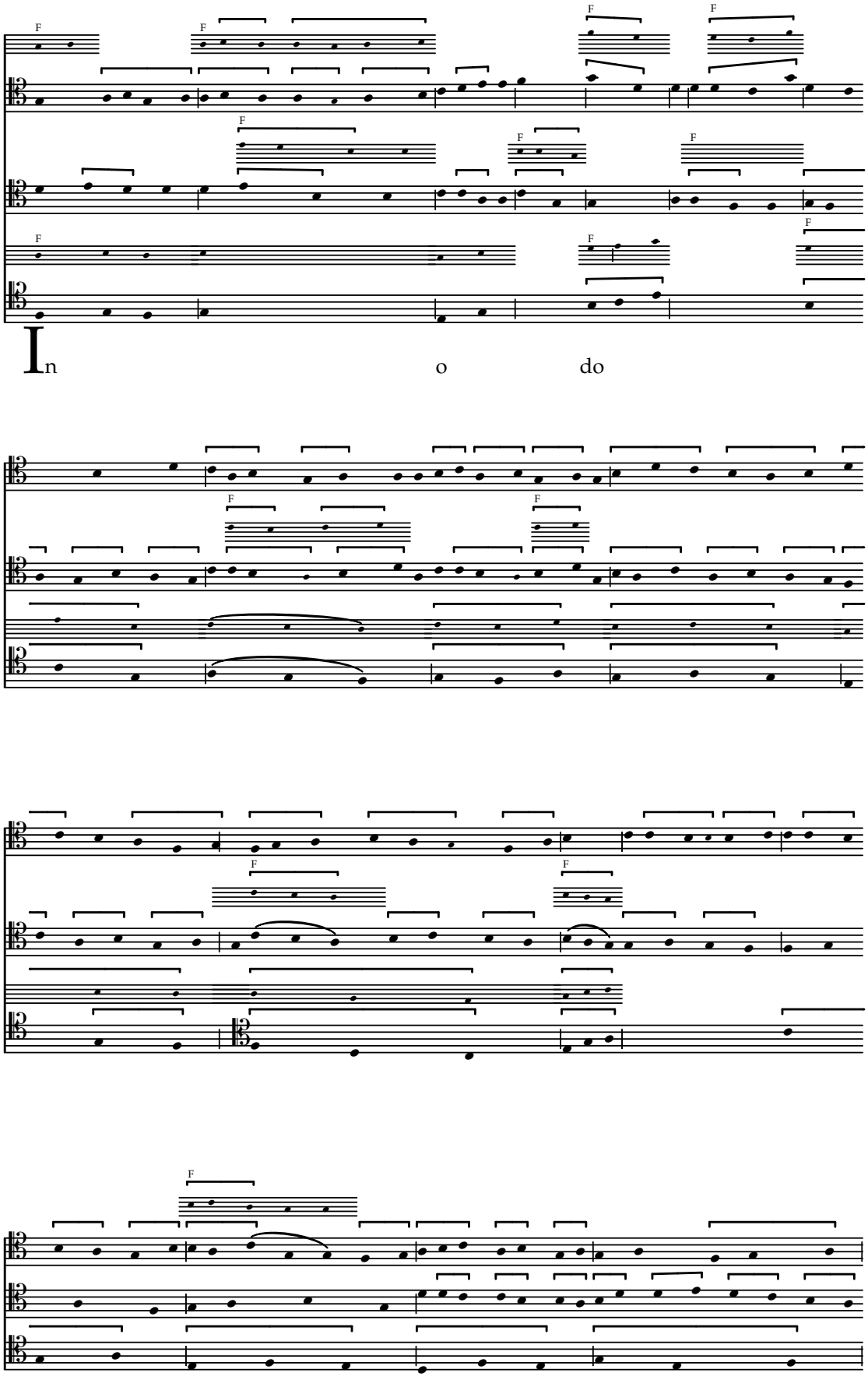
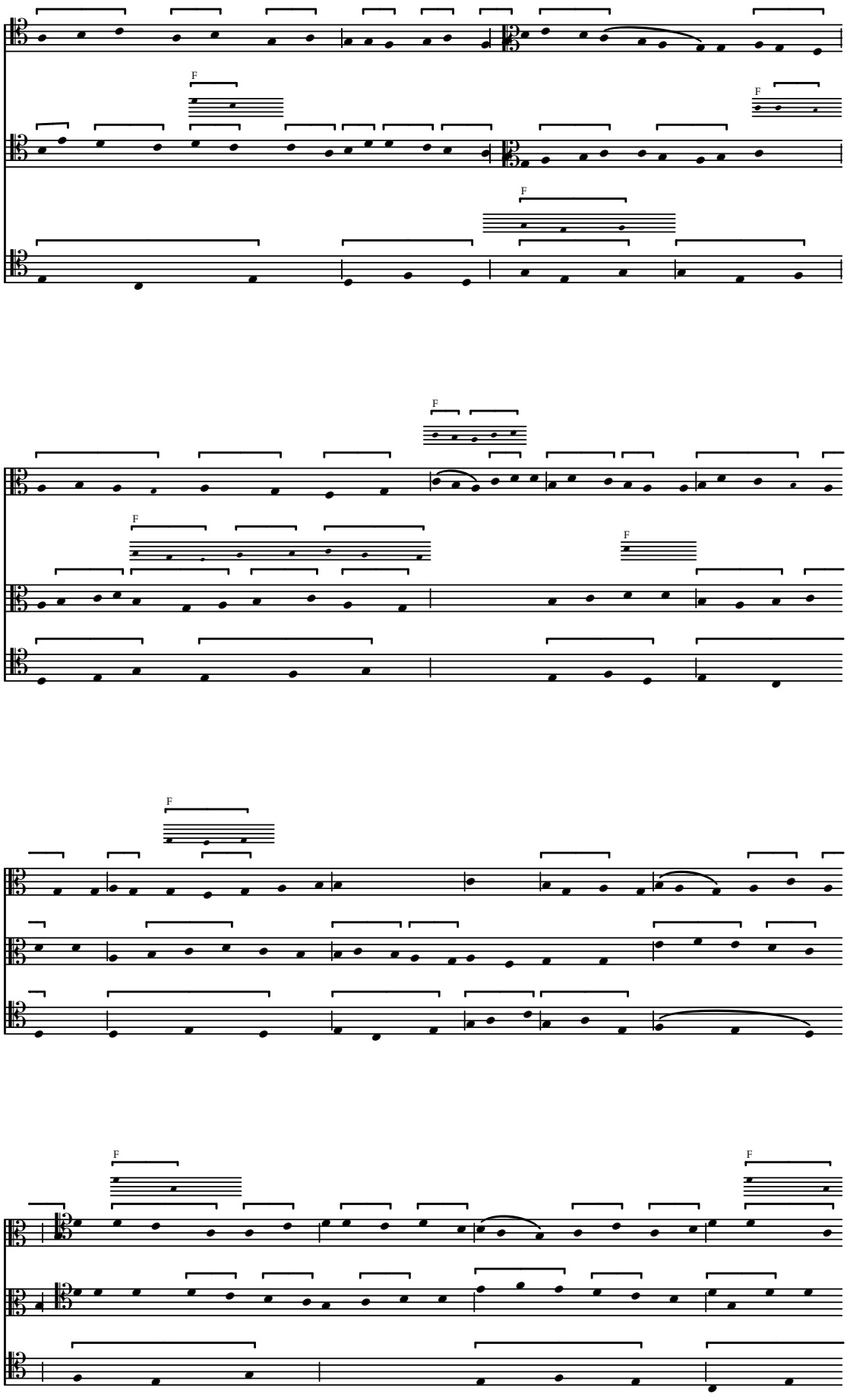
Concordances from F

f. 91–91v

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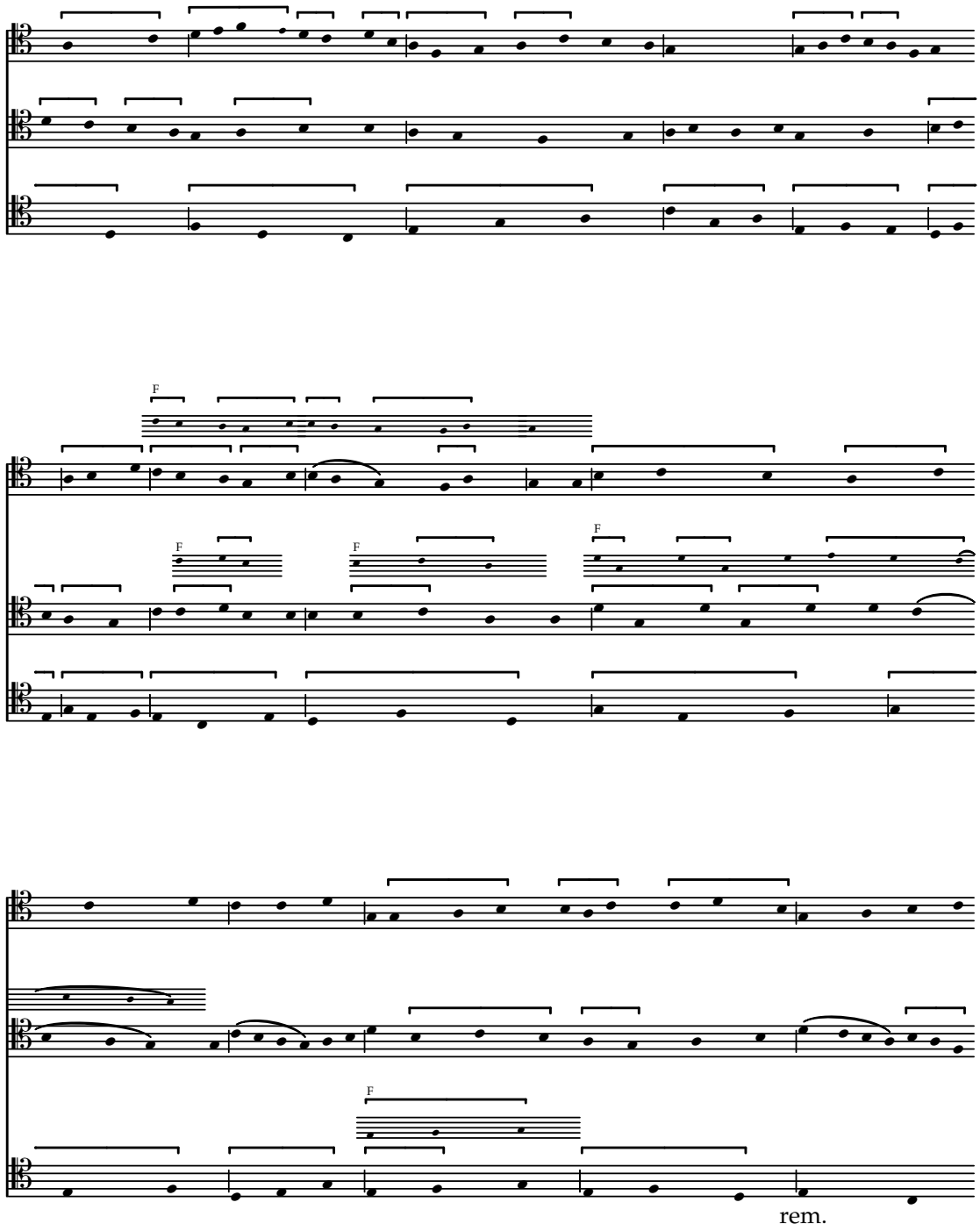
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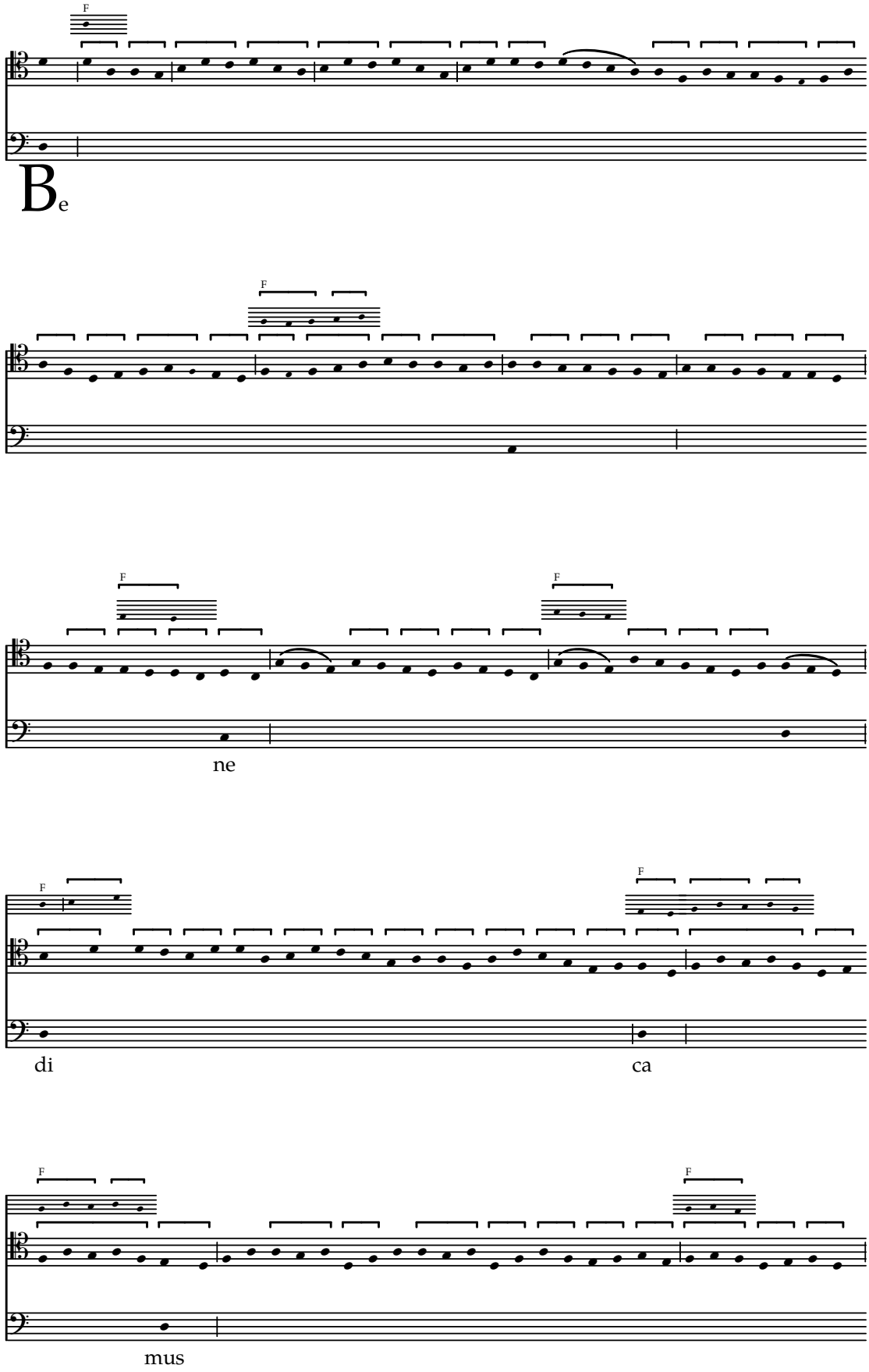
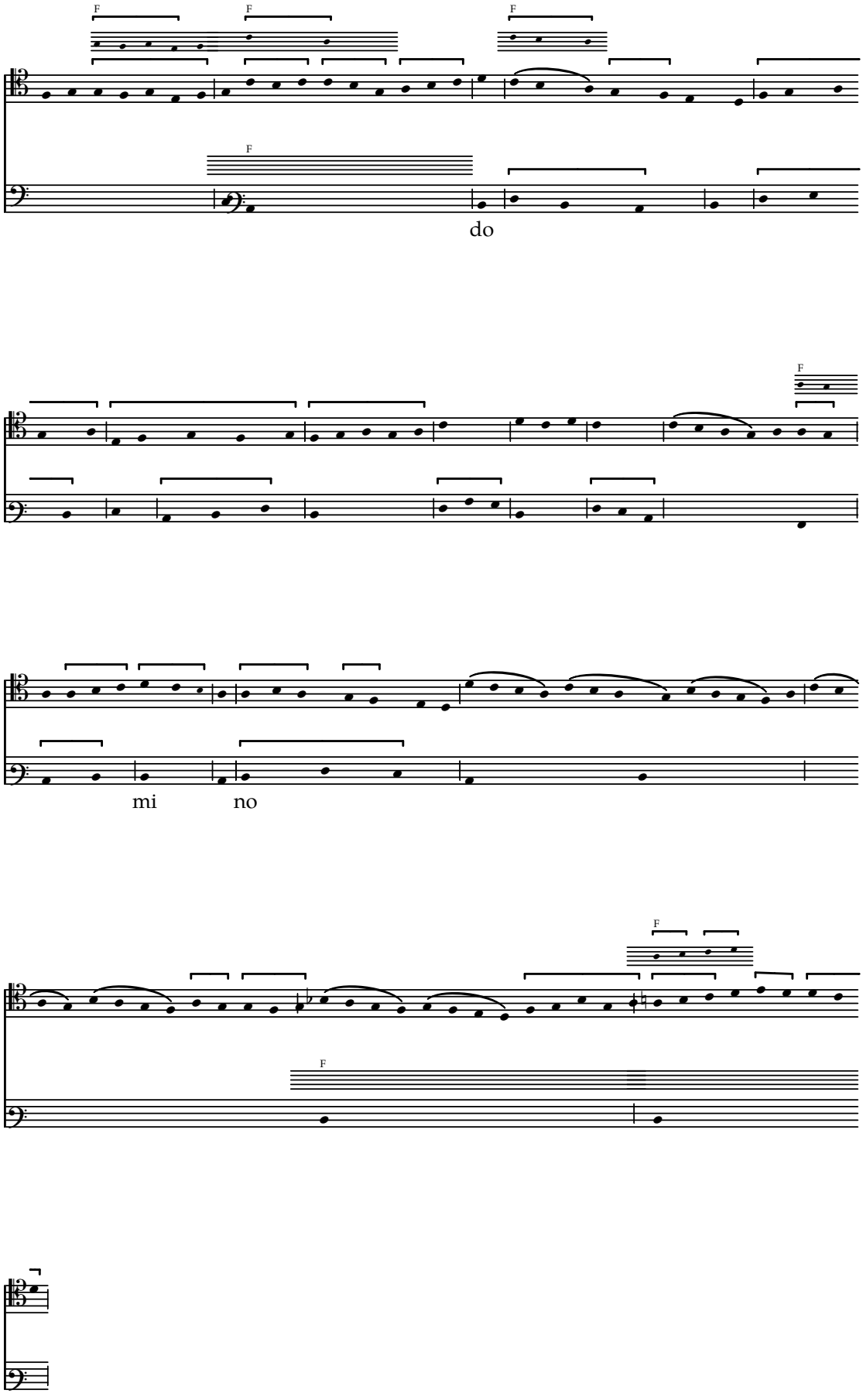
Benedicamus domino

Concordances from F

f. 103v

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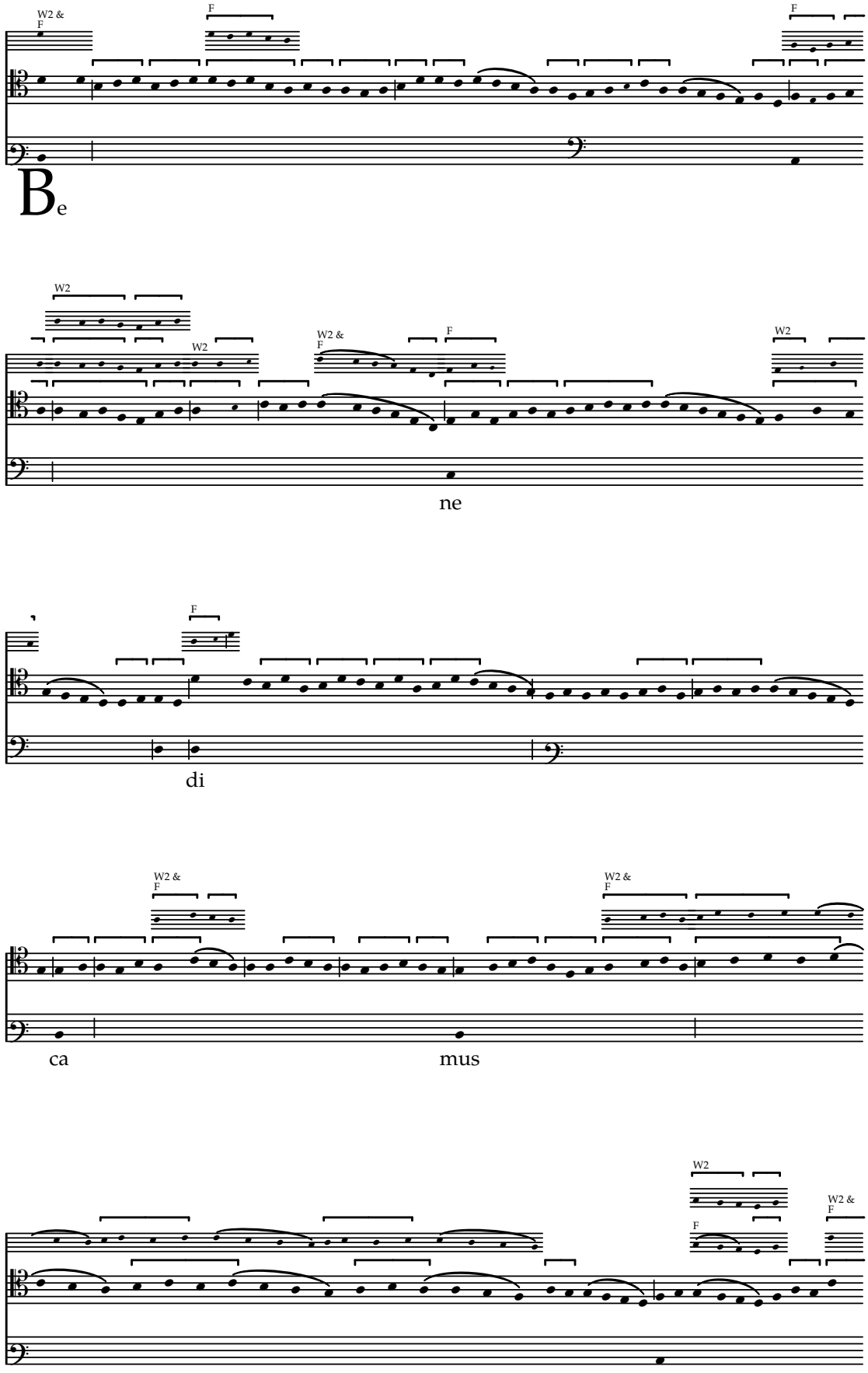
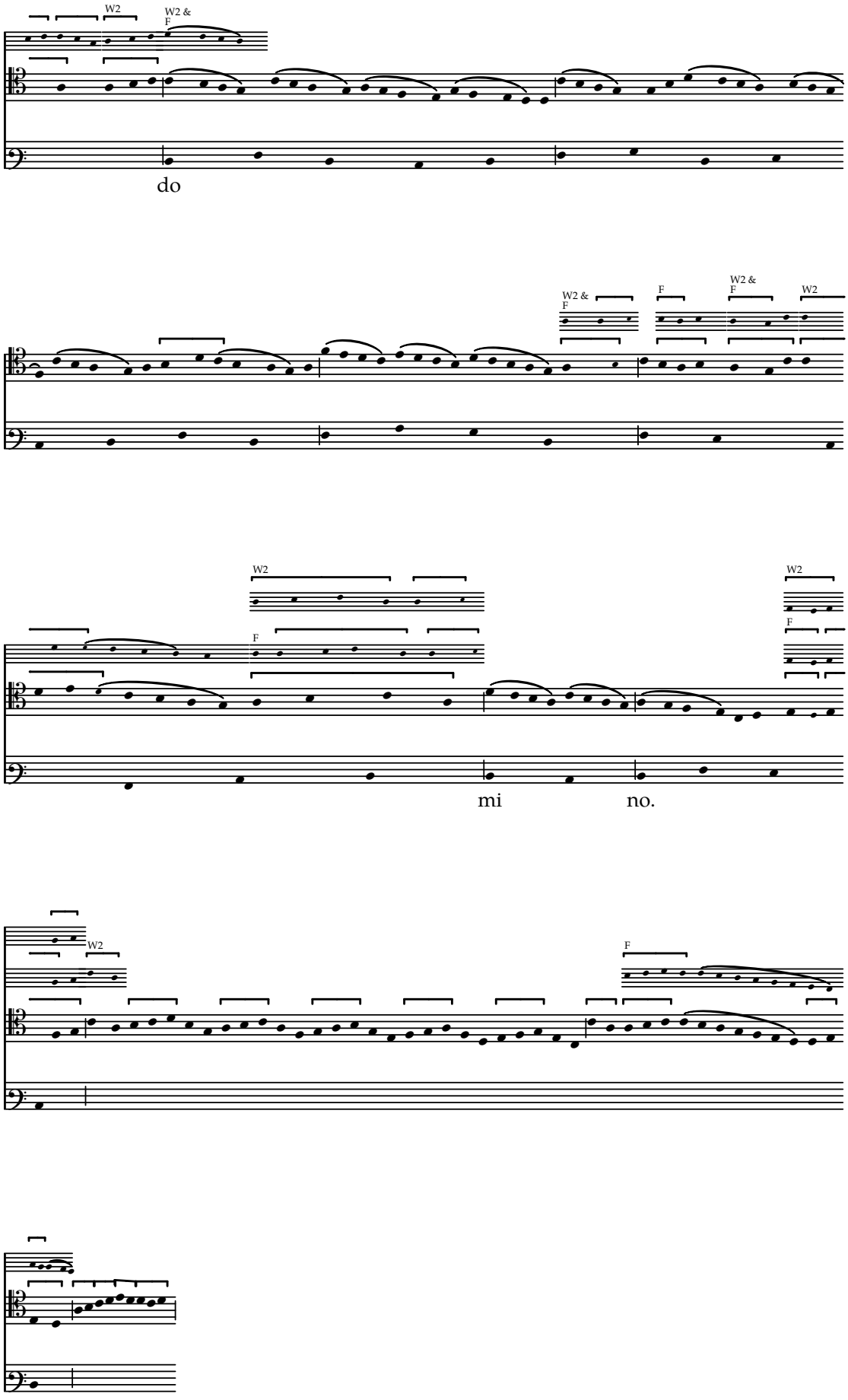
Benedicamus domino

Concordances from W2 & F

f. 103v–104

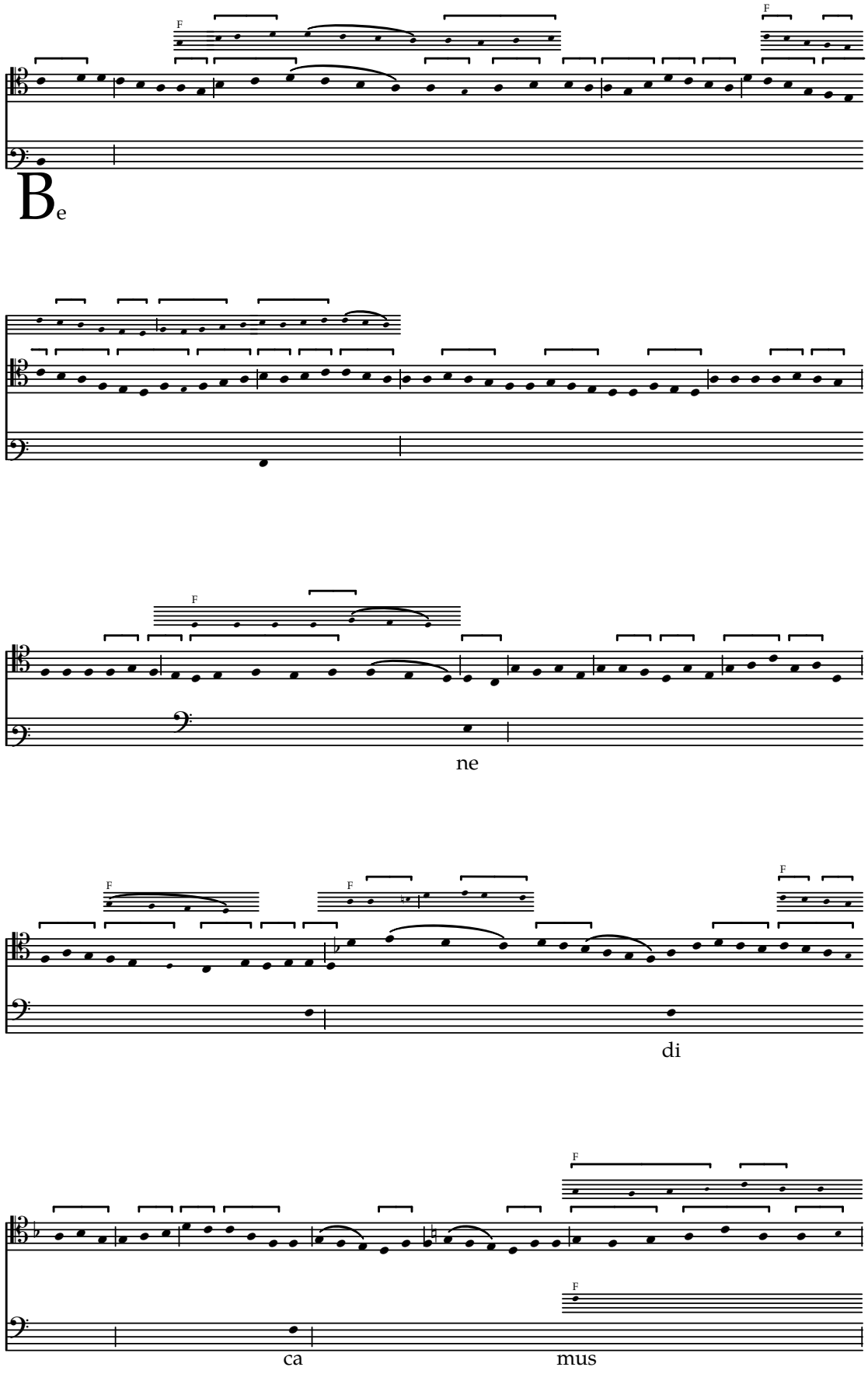


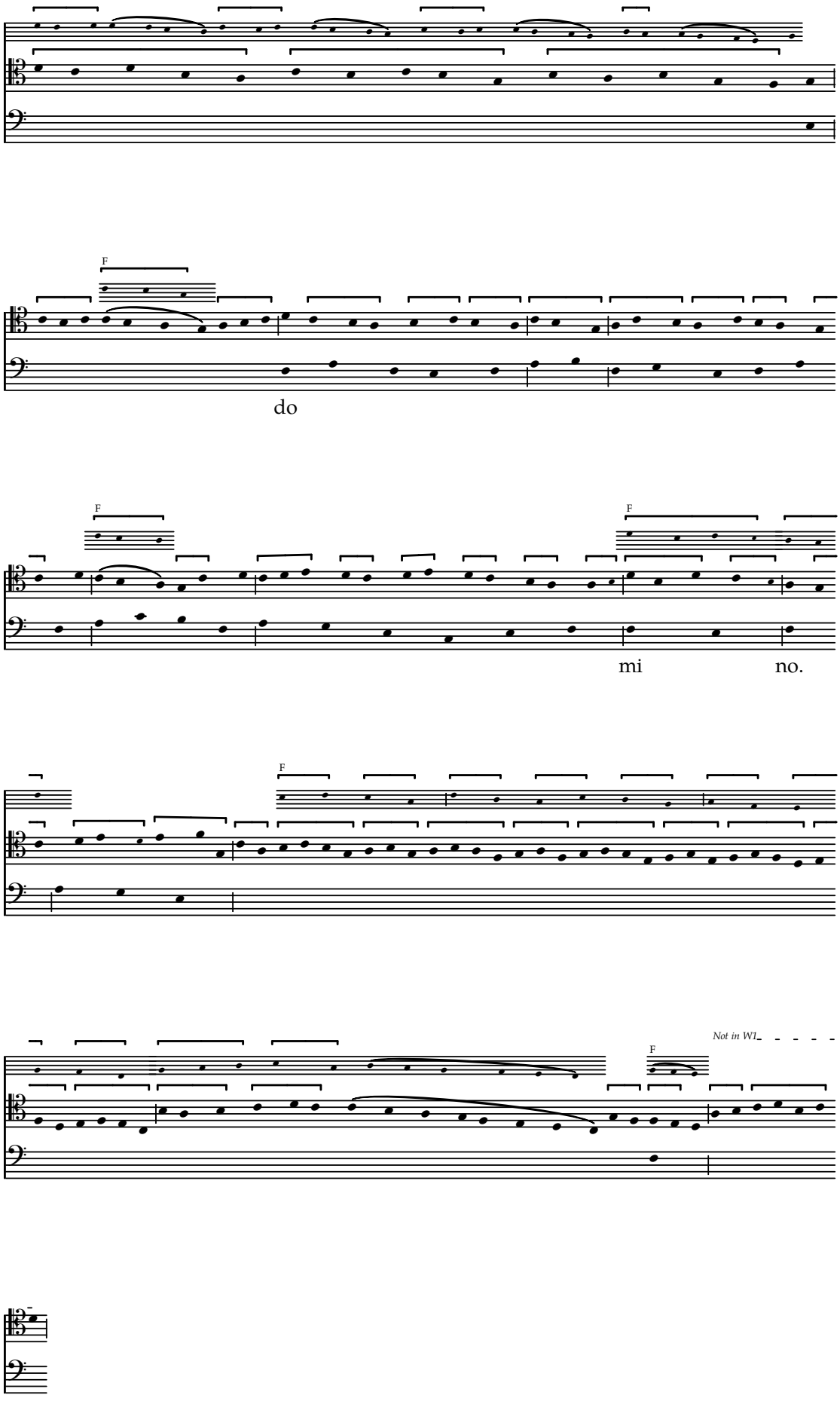

W2
W2 & F
do
W2 & F
F
W2 & F
W2
W2
F
W2
F
mi
no.
W2
F

Benedicamus domino

Concordances from F

f. 104–104v




F
do
F
F
mi
no.
F
Not in W1
F

Appendix B

NDP Source

The NDP code is attached to the PDF file as attachments. Click on the attachment links to access the files.

001-do-minus-salutare.ndp 002-sederunt.ndp 003-adiuua-me-domine.ndp 004-mors.ndp 005-sancte-germane.ndp 006-o-sancte-germane.ndp 007-alleluya.ndp 008-natiuitas.ndp 009-benedicamus-domino.ndp 010-benedicamus-domino.ndp 011-iudea-et-iherusalem.ndp 012-constantes-estote.ndp 013-descendit-de-celis.ndp 014-in-columbe.ndp 015-uox-domini.ndp 016-gaude-maria.ndp 017-gabrielem-archangelum.ndp 018-dum-complerentur.ndp 019-inter-natos.ndp 020-fuit-homo.ndp 021-concede.ndp 022-adiuuent-nos.ndp 023-ex-eius-tumba.ndp 024-sint-lumbi.ndp 025-regnum-mundi.ndp 026-eructauit-cor-meum.ndp 027-uiderunt-omnes.ndp 028-notum-fecit.ndp 029-alleluya.ndp 030-dies-sanctificatus.ndp 031-sederunt.ndp 032-adiuua-me.ndp 033-exiit-sermo.ndp 034-sed-sic-eum.ndp 035-laus-tua.ndp 036-herodes-iratus.ndp 037-omnes.ndp 038-surge-et-illuminare.ndp 039-suscepimus.ndp 040-sicut-audiuimus.ndp 041-alleluya.ndp 042-adorabo.ndp 043-hec-dies.ndp 044-confitemini.ndp 045-alleluya.ndp 046-pascha-nostrum.ndp 047-alleluya.ndp 048-epulemur-in-azimis.ndp 049-alleluya.ndp 050-surrexit-dominus.ndp 051-alleluya.ndp 052-dulce-lignum.ndp 053-alleluya.ndp 054-ascendens-xpistus.ndp 055-alleluya.ndp 056-ueni-sancte-spiritus.ndp 057-pe-tram-edificabo.ndp 058-benedicta.ndp 059-uirgo-dei-genitrix.ndp 060-alleluya.ndp 061-assumpta-est-maria.ndp 062-alleluya.ndp 063-hodie-maria-uirgo.ndp 064-alleluya.ndp 065-ueni-electa-mea.ndp 066-propter-ueritatem.ndp 067-audi-filia.ndp 068-alleluya.ndp 069-natiuitas.ndp 070-alleluya.ndp 071-in-conspectu.ndp 072-timete-dominum.ndp 073-iniquirentes-autem.ndp 074-alleluya.ndp 075-iudicabunt-sancti.ndp 076-domine.ndp 077-uitam-petiit.ndp 078-alleluya.ndp 079-letabitur-iustus.ndp 080-ecce-sacerdos.ndp 081-non-est-inuentus.ndp 082-alleluya.ndp 083-posui-adiutorium.ndp 084-alleluya.ndp 085-iustus-germinabit.ndp 086-locus-iste.ndp 087-deus-cui-adstant.ndp 088-alleluya.ndp 089-per-manus.ndp

090-tamquam.ndp 091-gloria.ndp 092-omnes.ndp 093-omnes.ndp 094-dominus.ndp 095-dominus.ndp 096-dominus.ndp 097-dominus.ndp 098-dominus.ndp 099-do-bis.ndp 100-uenite.ndp 101-lux-magna.ndp 102-lux-magna.ndp 103-domi-ne.ndp 104-manere.ndp 105-manere.ndp 106-manere.ndp 107-manere.ndp 108-in-bethleem.ndp 109-sur-ge.ndp 110-ta.ndp 111-et-gaudebit.ndp 112-mulierum.ndp 113-hodie-perlustrauit.ndp 114-docebit.ndp 115-docebit.ndp 116-uir-go.ndp 117-uir-go.ndp 118-regnat.ndp 119-tamquam.ndp 120-hec-dies.ndp 121-iohanne.ndp 122-germinabit.ndp 123-tamquam.ndp 124-dominus.ndp 125-dominus.ndp 126-dominus.ndp 127-nobis.ndp 128-uenite.ndp 129-domi-ne.ndp 130-audiui-mus.ndp 131-audiui-mus.ndp 132-et-confitebor.ndp 133-domino.ndp 134-quoniam.ndp 135-in-seculum.ndp 136-in-seculum.ndp 137-in-seculum.ndp 138-nostrum.ndp 139-nostrum.ndp 140-immo-latus-est.ndp 141-immo-latus-est.ndp 142-immo-latus-est.ndp 143-dum-loqueretur.ndp 144-dum-loqueretur.ndp 145-mors.ndp 146-mors.ndp 147-ferens-pondera.ndp 148-captiui-ta-tem.ndp 149-captiui-ta-tem.ndp 150-mulierum.ndp 151-iohanne.ndp 152-amoris.ndp 153-uir-go.ndp 154-uir-go.ndp 155-collaudan-tes.ndp 156-gaudete.ndp 157-regnat.ndp 158-regnat.ndp 159-reg-nat.ndp 160-regnat.ndp 161-filia.ndp 162-iniquiren-tes-autem.ndp 163-non-deficient.ndp 164-domine.ndp 165-in-uirtute.ndp 166-reg-na-bit.ndp 167-hympnis.ndp 168-ui-tam.ndp 169-ui-tam.ndp 170-spe-ra-bit.ndp 171-et-spera-bit.ndp 172-illi.ndp 173-illi.ndp 174-qui-conserua-ret.ndp 175-qui-conserua-ret.ndp 176-adiu-torium.ndp 177-adiu-torium.ndp 178-potentem.ndp 179-potentem.ndp 180-et-exaltaui.ndp 181-et-florebit.ndp 182-alleluya.ndp 183-dies-sanctificatus.ndp 184-crucifixum-in-carne.ndp 185-benedicta.ndp 186-uirgo-dei-genitrix.ndp 187-stirps-yesse.ndp 188-uirgo-dei-genitrix.ndp 189-benedicamus-domino.ndp 190-descendit-de-celis.ndp 191-tan-quam-sponsus.ndp 192-alleluya.ndp 193-pascha-nostrum.ndp 194-confitemini-domino.ndp 195-in-odorem.ndp 196-benedicamus-domino.ndp 197-benedicamus-domino.ndp 198-benedicamus-domino.ndp

Appendix C

NDP Parser

A parser for NDP, written in C using Lex and Yacc. Outputs Lilypond code.

format.txt

```
The ndp file format consists of three parts: source description, ordines and
text. All files consist of all three parts in this order.

SOURCE DESCRIPTION

Is begun and terminated with a '#'. Between these characters is a list of
sources. Each source description consists of an identifier for the source used
in the file and the name of the source, separated by whitespace.

Example:

#
a First
b Second
zztb Other
#

The above describes three sources. The source with the identifier 'a' is named
"First", ID 'b' is named "Second" and finally 'zztb' is named "Other".

ORDINES

Ordines follow directly from the source description. Each ordo begins with a
'{' and ends with '}'. An ordo is a collection of voices that line up together
and have the same duration in the source.

VOICES

Each ordo contains a list of voices, each started with '{' and ending with '}'.
Voices contain a list of notes, alternatives, ligatures and divisiones. Voices
directly follow one another until the ordo is terminated. Voices can contain a
different number of notes, but voices with a fewer number of notes will be
scaled to last the same duration as the voice with the maximum number of notes
in that particular ordo. Voices are described from the top voice down, and if a
lower voice is empty, it is not described.

NOTES

```

```
A note is a single lowercase letter from 'a' to 'g', centred around middle C.
Thus the notes gabcdef are the notes from G below middle C to F above middle C.
To access notes above and below these pitches, use combinations of '
(apostrophe) to raise a note and succeeding notes by an octave and , (comma) to
lower the note and succeeding notes by an octave. For example, g' describes the
G above middle C and f, the F below middle C. Furthermore, g'g describes two Gs
above middle C, even though the second G is not followed by an apostrophe. To
regain the G below middle C, you would have to lower the second G, e.g. g'g,.

SPACERS

To indicate an empty voice or empty alternative, use only a literal 's'.

LIGATURES

Notes can be combined into three kinds of ligatures: standard ligatures,
currentes and standard ligatures followed by currentes. Standard ligatures
envelop the notes within '[' and ']' respectively. Ligatures cannot contain any
other type of music but notes. Currentes operate the same but are enveloped
within parentheses '(' and ')'. The third kind works like this:
[LIGATEDNOTES(]CURRENTES)
Here, LIGATEDNOTES are written as ligated, followed directly by CURRENTES which
are shown as currentes.

DIVISIONES

Divisione maior is written as '|' and divisione maxima as '||'. These must
occur outside of ligatures.

CLEF

A clef is either a C-clef or F-clef. C-clefs are described by an exclamation
sign ('!') followed by a list of apostrophes describing the line on which the
middle C should lie. For example, !''' describes an alto clef and !'''' a tenor
clef. F-clefs are described by an exclamation sign followed by a list of
commas, counting the line the same but indicating where the F below middle C
lies, e.g. !,,, describes a traditional bass clef. N.B. clef changes are
relative although they begin at zero, so to change from an alto clef to a bass
clef, one must go from +3 to -3, requiring !,,,,,, (a relative change of six).

KEY SIGNATURE

Operates the same as clef above but on the number of sharps/flats. It is
described using the lowercase letter k, followed by a list of apostrophes or
commas. For example: k'' describes two sharps and k, describes one flat. Like
clef above, this is relative, so to go from two sharps to one flat, one must go
from +2 to -1, requiring k,,, (a relative change of three).

ALTERNATIVES

Divergences between sources are written in the voice context and must contain
whole ligatures, notes and other music. Alternatives cannot be nested or spread
across ordines. An alternative begins, ends and is differentiated  with a
forward slash '/'. Following each slash is a double-quoted string matching the
ID listed in the source description, then the music contained in that source.
Example:

/"a"abcde/"b"[abc][de]/"zztb"[ab][cde]/
```

```
97
98 The above, coupled with the source description above, describes the source
99 called "First" consisting of longas A, B, C, D and E. Alternatively, the source
100 "Second" describes the same notes ligated in a set of three and two. Finally,
101 the source "Other" describes the same notes ligated in a set of two and three.
102
103 TEXT
104
105 After the final ordo, there is a '$' (dollar sign) indicating the beginning of
106 the text section. The text section consists of a list of syllables, followed by
107 their duration, measured in ordines. Each syllable is separated by whitespace.
108
109 SYLLABLES
110
111 A string of characters, followed by a number indicating its duration.
112
113 Example file:
114
115 #
116 a First
117 b Second
118 zztb Other
119 #
120 {{!'''/"a"abcde/"b"[abc][de]/"zztb"[ab][cde]/}{!'''bcd|}{!,,,k,f|}}
121 {{a}{g'}{c,}}
122 $ Test1 file.1 $
```

LICENCE.txt

```
1                        GNU GENERAL PUBLIC LICENSE
2                           Version 3, 29 June 2007
3
4  Copyright (C) 2007 Free Software Foundation, Inc. <https://fsf.org/>
5  Everyone is permitted to copy and distribute verbatim copies
6  of this license document, but changing it is not allowed.
7
8                                Preamble
9
10   The GNU General Public License is a free, copyleft license for
11 software and other kinds of works.
12
13   The licenses for most software and other practical works are designed
14 to take away your freedom to share and change the works.  By contrast,
15 the GNU General Public License is intended to guarantee your freedom to
16 share and change all versions of a program--to make sure it remains free
17 software for all its users.  We, the Free Software Foundation, use the
18 GNU General Public License for most of our software; it applies also to
19 any other work released this way by its authors.  You can apply it to
20 your programs, too.
21
22   When we speak of free software, we are referring to freedom, not
23 price.  Our General Public Licenses are designed to make sure that you
24 have the freedom to distribute copies of free software (and charge for
25 them if you wish), that you receive source code or can get it if you
26 want it, that you can change the software or use pieces of it in new
27 free programs, and that you know you can do these things.
28
29   To protect your rights, we need to prevent others from denying you
30 these rights or asking you to surrender the rights.  Therefore, you have
```

```
certain responsibilities if you distribute copies of the software, or if
you modify it: responsibilities to respect the freedom of others.

  For example, if you distribute copies of such a program, whether
gratis or for a fee, you must pass on to the recipients the same
freedoms that you received.  You must make sure that they, too, receive
or can get the source code.  And you must show them these terms so they
know their rights.

  Developers that use the GNU GPL protect your rights with two steps:
(1) assert copyright on the software, and (2) offer you this License
giving you legal permission to copy, distribute and/or modify it.

  For the developers' and authors' protection, the GPL clearly explains
that there is no warranty for this free software.  For both users' and
authors' sake, the GPL requires that modified versions be marked as
changed, so that their problems will not be attributed erroneously to
authors of previous versions.

  Some devices are designed to deny users access to install or run
modified versions of the software inside them, although the manufacturer
can do so.  This is fundamentally incompatible with the aim of
protecting users' freedom to change the software.  The systematic
pattern of such abuse occurs in the area of products for individuals to
use, which is precisely where it is most unacceptable.  Therefore, we
have designed this version of the GPL to prohibit the practice for those
products.  If such problems arise substantially in other domains, we
stand ready to extend this provision to those domains in future versions
of the GPL, as needed to protect the freedom of users.

  Finally, every program is threatened constantly by software patents.
States should not allow patents to restrict development and use of
software on general-purpose computers, but in those that do, we wish to
avoid the special danger that patents applied to a free program could
make it effectively proprietary.  To prevent this, the GPL assures that
patents cannot be used to render the program non-free.

  The precise terms and conditions for copying, distribution and
modification follow.

                       TERMS AND CONDITIONS

  0. Definitions.

  "This License" refers to version 3 of the GNU General Public License.

  "Copyright" also means copyright-like laws that apply to other kinds of
works, such as semiconductor masks.

  "The Program" refers to any copyrightable work licensed under this
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"recipients" may be individuals or organizations.

  To "modify" a work means to copy from or adapt all or part of the work
in a fashion requiring copyright permission, other than the making of an
exact copy.  The resulting work is called a "modified version" of the
earlier work or a work "based on" the earlier work.
```

```
  A "covered work" means either the unmodified Program or a work based
on the Program.

  To "propagate" a work means to do anything with it that, without
permission, would make you directly or secondarily liable for
infringement under applicable copyright law, except executing it on a
computer or modifying a private copy.  Propagation includes copying,
distribution (with or without modification), making available to the
public, and in some countries other activities as well.

  To "convey" a work means any kind of propagation that enables other
parties to make or receive copies.  Mere interaction with a user through
a computer network, with no transfer of a copy, is not conveying.

  An interactive user interface displays "Appropriate Legal Notices"
to the extent that it includes a convenient and prominently visible
feature that (1) displays an appropriate copyright notice, and (2)
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extent that warranties are provided), that licensees may convey the
work under this License, and how to view a copy of this License.  If
the interface presents a list of user commands or options, such as a
menu, a prominent item in the list meets this criterion.

  1. Source Code.

  The "source code" for a work means the preferred form of the work
for making modifications to it.  "Object code" means any non-source
form of a work.

  A "Standard Interface" means an interface that either is an official
standard defined by a recognized standards body, or, in the case of
interfaces specified for a particular programming language, one that
is widely used among developers working in that language.

  The "System Libraries" of an executable work include anything, other
than the work as a whole, that (a) is included in the normal form of
packaging a Major Component, but which is not part of that Major
Component, and (b) serves only to enable use of the work with that
Major Component, or to implement a Standard Interface for which an
implementation is available to the public in source code form.  A
"Major Component", in this context, means a major essential component
(kernel, window system, and so on) of the specific operating system
(if any) on which the executable work runs, or a compiler used to
produce the work, or an object code interpreter used to run it.

  The "Corresponding Source" for a work in object code form means all
the source code needed to generate, install, and (for an executable
work) run the object code and to modify the work, including scripts to
control those activities.  However, it does not include the work's
System Libraries, or general-purpose tools or generally available free
programs which are used unmodified in performing those activities but
which are not part of the work.  For example, Corresponding Source
includes interface definition files associated with source files for
the work, and the source code for shared libraries and dynamically
linked subprograms that the work is specifically designed to require,
such as by intimate data communication or control flow between those
subprograms and other parts of the work.

```

```
  The Corresponding Source need not include anything that users
can regenerate automatically from other parts of the Corresponding
Source.

  The Corresponding Source for a work in source code form is that
same work.

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  4. Conveying Verbatim Copies.

  You may convey verbatim copies of the Program's source code as you
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keep intact all notices of the absence of any warranty; and give all
recipients a copy of this License along with the Program.

```

```
  You may charge any price or no price for each copy that you convey,
and you may offer support or warranty protection for a fee.

  5. Conveying Modified Source Versions.

  You may convey a work based on the Program, or the modifications to
produce it from the Program, in the form of source code under the
terms of section 4, provided that you also meet all of these conditions:

    a) The work must carry prominent notices stating that you modified
    it, and giving a relevant date.

    b) The work must carry prominent notices stating that it is
    released under this License and any conditions added under section
    7.  This requirement modifies the requirement in section 4 to
    "keep intact all notices".

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    License will therefore apply, along with any applicable section 7
    additional terms, to the whole of the work, and all its parts,
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    permission to license the work in any other way, but it does not
    invalidate such permission if you have separately received it.

    d) If the work has interactive user interfaces, each must display
    Appropriate Legal Notices; however, if the Program has interactive
    interfaces that do not display Appropriate Legal Notices, your
    work need not make them do so.

  A compilation of a covered work with other separate and independent
works, which are not by their nature extensions of the covered work,
and which are not combined with it such as to form a larger program,
in or on a volume of a storage or distribution medium, is called an
"aggregate" if the compilation and its resulting copyright are not
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  6. Conveying Non-Source Forms.

  You may convey a covered work in object code form under the terms
of sections 4 and 5, provided that you also convey the
machine-readable Corresponding Source under the terms of this License,
in one of these ways:

    a) Convey the object code in, or embodied in, a physical product
    (including a physical distribution medium), accompanied by the
    Corresponding Source fixed on a durable physical medium
    customarily used for software interchange.

    b) Convey the object code in, or embodied in, a physical product
    (including a physical distribution medium), accompanied by a
    written offer, valid for at least three years and valid for as
    long as you offer spare parts or customer support for that product
    model, to give anyone who possesses the object code either (1) a
    copy of the Corresponding Source for all the software in the
```

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    product that is covered by this License, on a durable physical
    medium customarily used for software interchange, for a price no
    more than your reasonable cost of physically performing this
    conveying of source, or (2) access to copy the
    Corresponding Source from a network server at no charge.

    c) Convey individual copies of the object code with a copy of the
    written offer to provide the Corresponding Source.  This
    alternative is allowed only occasionally and noncommercially, and
    only if you received the object code with such an offer, in accord
    with subsection 6b.

    d) Convey the object code by offering access from a designated
    place (gratis or for a charge), and offer equivalent access to the
    Corresponding Source in the same way through the same place at no
    further charge.  You need not require recipients to copy the
    Corresponding Source along with the object code.  If the place to
    copy the object code is a network server, the Corresponding Source
    may be on a different server (operated by you or a third party)
    that supports equivalent copying facilities, provided you maintain
    clear directions next to the object code saying where to find the
    Corresponding Source.  Regardless of what server hosts the
    Corresponding Source, you remain obligated to ensure that it is
    available for as long as needed to satisfy these requirements.

    e) Convey the object code using peer-to-peer transmission, provided
    you inform other peers where the object code and Corresponding
    Source of the work are being offered to the general public at no
    charge under subsection 6d.

  A separable portion of the object code, whose source code is excluded
from the Corresponding Source as a System Library, need not be
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  A "User Product" is either (1) a "consumer product", which means any
tangible personal property which is normally used for personal, family,
or household purposes, or (2) anything designed or sold for incorporation
into a dwelling.  In determining whether a product is a consumer product,
doubtful cases shall be resolved in favor of coverage.  For a particular
product received by a particular user, "normally used" refers to a
typical or common use of that class of product, regardless of the status
of the particular user or of the way in which the particular user
actually uses, or expects or is expected to use, the product.  A product
is a consumer product regardless of whether the product has substantial
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the only significant mode of use of the product.

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procedures, authorization keys, or other information required to install
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620
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622
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624
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634     <one line to give the program's name and a brief idea of what it does.>
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649
650 Also add information on how to contact you by electronic and paper mail.
651
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654
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656     This program comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
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658     under certain conditions; type `show c' for details.
659
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661 parts of the General Public License.  Of course, your program's commands
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```

ly/beginning.ily

```
\version "2.21.0"
\include "gregorian.ly"
#(set-global-staff-size 14)
\pointAndClickOff
\paper {
  ragged-last-bottom = ##f
  ragged-last = ##f
  ragged-bottom = ##f
  ragged-right = ##f
  print-all-headers = ##t
  #(define fonts
    (set-global-fonts
      #:music "gonville"
      #:brace "gonville"
      #:roman "TeX Gyre Pagella"
      #:sans "Latin Modern Sans"
      #:typewriter "Latin Modern Mono"
      #:factor (/ staff-height pt 20)))
  top-margin = 1.8\cm
  bottom-margin = 1.8\cm
  two-sided = ##t
  inner-margin = 4.0\cm
  outer-margin = 1.5\cm
  system-system-spacing.minimum-distance = #25
  print-page-number = ##f
}
\header {
  tagline = ##f
  title = ##f
  composer = ##f
  poet = ##f
}
setkey = #(define-music-function (sharps ctx) (integer? string?)
  (let*
    ((tranpitch (if (> sharps 0) (ly:make-pitch 0 4) (ly:make-pitch -1 3)))
     (absharp (abs sharps)))
    (begin
      (while (> absharp 0)
        (begin
    (assoc-set! pkey ctx (ly:pitch-transpose (assoc-ref pkey ctx) tranpitch))
    (set! absharp (- absharp 1))))
      #{ \undo \omit Staff.KeySignature \getkey #ctx #})))
getkey = #(define-music-function (idx) (string?)
#{ \key #(assoc-ref pkey idx) \major #})
setclef = #(define-music-function (line ctx) (integer? string?)
  (let
    ((newn (+ line (assoc-ref pclef ctx))))
    (begin
      (assoc-set! pclef ctx newn)
      #{ \getclef #ctx #})))
```

```
getclef = #(define-music-function (idx) (string?)
  (let
    ((str
       (case (assoc-ref pclef idx)
   ((1) "soprano")
   ((2) "mezzosoprano")
   ((3) "alto")
   ((4) "tenor")
   ((5) "baritone")
   ((-2) "varbaritone")
   ((-3) "bass")
   ((-4) "subbass")
   (else (ly:error "Unrecognised clef number '~a'" (assoc-ref pclef idx))))))
    #{ \clef #str #}))
#(define-markup-command (bar-markup layout props mkp) (markup?)
  (let*
    ((mkpstil (interpret-markup layout props mkp))
     (mkpxext (ly:stencil-extent mkpstil 0))
     (mkpwidth (cdr mkpxext))
     (mkpline (interpret-markup layout props #{\markup \draw-line #'(,mkpwidth
        . 0) #})))
    (ly:stencil-aligned-to (ly:stencil-combine-at-edge mkpline 1 -1 mkpstil
       0.5) Y -1)))
dI = \divisioMaior
dII = \divisioMaxima
teenify = \applyContext #(lambda (ctx)
                           (let ((fs (ly:context-property ctx 'fontSize 0)))
          (ly:context-set-property! ctx 'fontSize (- fs 3))))
unteenify = \applyContext #(lambda (ctx)
                             (let ((fs (ly:context-property ctx 'fontSize 0)))
            (ly:context-set-property! ctx 'fontSize (+ fs 3))))
plica = #(define-music-function (note) (ly:music?)
          #{
      \teenify
      #note
      \unteenify
    #})
ordo = #(define-music-function (ctx vox withkey) (list? ly:music-list? boolean
    ?)
         (let*
     ((moms (map (lambda (m) (ly:music-length m)) vox))
      (maxmom (fold (lambda (e p) (if (ly:moment<? p e) e p)) (ly:make-moment
          0) moms))
      (scales (map (lambda (m) (ly:moment-div maxmom m)) moms))
      (newmus (map (lambda (m s) (ly:music-compress m s)) vox scales))
      (ctxmus (map (lambda (m c) #{ \new Voice \relative c' { \global
         \change Staff = #c #(if withkey #{ \getkey #c #}) #m } #}) newmus ctx)
             ))
     (make-simultaneous-music ctxmus)))
dynskip = #(define-music-function (mus) (ly:music?)
             #{
        \omit Voice.MultiMeasureRest
        #(make-music
          'MultiMeasureRestMusic
    'duration
    (ly:make-duration 0 0 (ly:moment-main (ly:music-length mus))))
      #})
#(define (add-link url-strg)
```

```
    (lambda (grob)
      (let* ((stil (ly:grob-property grob 'stencil)))
        (if (ly:stencil? stil)
    (begin
      (let*
        ((x-ext (ly:stencil-extent stil X))
         (y-ext (ly:stencil-extent stil Y))
         (url-expr (list 'url-link url-strg `(quote ,x-ext) `(quote
                     ,y-ext)))
         (new-stil (ly:stencil-add (ly:make-stencil url-expr x-ext y-ext)
           stil)))
        (ly:grob-set-property! grob 'stencil new-stil)))
    #f))))
setl = #(define-music-function (file line chara charb) (string? integer?
    integer? integer?)
  #{ \once \override NoteHead.after-line-breaking = #(add-link (format #f "
      textedit://~a:~a:~a:~a" file line chara charb)) #})
#(define (ziplist . xss) (apply map list xss))
div = #(define-music-function (ctx div oids) (string? list? list?)
  (let*
    ((alts (fold (lambda (e prv)
       (if (if (list? (car e)) (not (memq src (car e))))
    (cons (cadr e) prv)
    prv)) '() div))
      (longest (cadr
        (assq 'm
          (cadr
      (car
        (sort div (lambda (a b)
          (ly:moment<?
      (ly:music-length
        (cadr
          (assq 'm
            (cadr b))))
      (ly:music-length
        (cadr
          (assq 'm
            (cadr a))))))))))))
      (srclist (fold (lambda (e prv)
        (if (if (list? (car e)) (not (memq src (car e))))
    (cons (car e) prv) prv)) '() div))
      (realmus (cadr
        (assq 'm
    (cadr
      (find
        (lambda (e)
          (or
      (eq? (car e) src)
      (and
        (pair? (car e))
        (memq src (car e)))))
          div)))))
      (realmusmom (ly:music-length realmus))
      (realmuscompratio (ly:moment-div (ly:music-length longest) realmusmom))
      (comprealmus (ly:music-compress realmus realmuscompratio))
      (ossias (fold
        (lambda (e prv)
    (let*
```

```
     ((thissrcs (caddr e))
      (thissrc (if (list? thissrcs) (car thissrcs) thissrcs))
      (kstr (cadr (assq 'k (car e))))
      (ksplit (string-split kstr #\space))
      (krejoin (fold-right
        (lambda (e prv)
    (if (and (pair? prv) (string=? "&" (car prv)))
      (cons (string-append e " &") (cdr prv))
      (cons e prv)))
        '() ksplit))
      (newk (make-column-markup krejoin))
      (thismus #{
        <<
          {
      \omit Staff.Clef
      \override Staff.KeyCancellation.break-visibility = #begin-of-line-visible
      \set Staff.explicitClefVisibility = #begin-of-line-visible
      \override Staff.KeySignature.break-visibility = #begin-of-line-visible
      \startStaff
      \set Staff.forceClef = ##t
      \global
      \shiftOff
      \voiceNeutralStyle
      \teeny \getclef #ctx \getkey #ctx #(cadr (assq 'm (car e)))
          } \new Voice {
      \shiftOff
      \voiceNeutralStyle
      \applyContext #(lambda (ctx)
           (let
             ((la (assoc-ref osslastactive (cadr e)))
              (lsrc (assoc-ref osssrc (cadr e)))
              (cm (ly:context-current-moment ctx))
              (srcs (if (list? thissrcs) thissrcs (list thissrcs)))
              (grob 'TextScript))
             (if (and (not (ly:moment<? la cm)) ; still at same moment
                (equal? srcs lsrc)) ; same sources as before
               (ly:context-pushpop-property ctx grob 'stencil #f)
               (assoc-set! osssrc (cadr e) srcs))))
      <>^\markup { \left-align \teeny \override #'(baseline-skip . 1.5) #newk }
    }
        >>
        \applyContext #(lambda (ctx) (assoc-set! osslastactive (cadr e) (ly:
            context-current-moment ctx)))
        #})
      (compratio (ly:moment-div (ly:music-length longest) (ly:music-length
          thismus)))
      (compmus (ly:music-compress thismus compratio)))
     (cons (make-music
       'ContextSpeccedMusic
       'property-operations '()
       'context-type 'Staff
       'context-id (cadr e)
       'element #{ \startStaff #compmus \stopStaff #}) prv)))
       '() (ziplist alts oids srclist))))
    (make-simultaneous-music (cons comprealmus ossias))))
global = {
  \override Staff.Clef.full-size-change = ##t
  \phrasingSlurUp
```

```
  \stemDown
  \hide Stem
  \omit Beam
  \override Stem.length = #0
  \omit Staff.BarLine
  \override Score.SpacingSpanner.packed-spacing = ##t
  \override Score.RehearsalMark.self-alignment-X = #RIGHT
  \override Score.FootnoteItem.annotation-line = ##f
  \override Score.TextSpanner.bound-details.left-broken.text = ##f
  \cadenzaOn
}
```

ly/layout.ily

```
\layout {
  \context {
    \Score
    \consists "Text_spanner_engraver"
    \override SpacingSpanner.packed-spacing = ##t
    \remove "Default_bar_line_engraver"
  }
  \context {
    \Staff
    \remove "Time_signature_engraver"
    \remove "Default_bar_line_engraver"
  }
  \context {
    \Voice
    \remove "Forbid_line_break_engraver"
    \remove "Text_spanner_engraver"
  }
}
```

Makefile

```
CFLAGS=-O2 -g -Wall -Wextra
ndp: lex.yy.c ndp-parser.c ndp-funcs.o
  cc $(CFLAGS) -o ndp ndp-funcs.o ndp-parser.c lex.yy.c -lfl
ndp-parser.c: ndp.y ndp-funcs.h
  yacc -vd -o ndp-parser.c ndp.y
lex.yy.c: ndp.l ndp-funcs.h
  lex ndp.l
ndp-funcs.o: ndp-funcs.c ndp-funcs.h ily-xxd.c usage-xxd.c licence-xxd.c format
    -xxd.c
  cc $(CFLAGS) -c -o ndp-funcs.o ndp-funcs.c
ily-xxd.c: ly/beginning.ily ly/layout.ily
  xxd -i ly/beginning.ily > ily-beginning-xxd.c
  xxd -i ly/layout.ily > ily-layout-xxd.c
usage-xxd.c: usage.txt
  xxd -i usage.txt > usage-xxd.c
format-xxd.c: format.txt
  xxd -i format.txt > format-xxd.c
licence-xxd.c: LICENCE.txt
  xxd -i LICENCE.txt > licence-xxd.c
clean:
  rm -f lex.yy.c ndp-funcs.o ndp ndp-parser.c ndp-parser.h ndp-parser.output
      ndp.tab.c ily-beginning-xxd.c ily-layout-xxd.c usage-xxd.c licence-xxd.c
```

ndp-funcs.c

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <ctype.h>
#include <assert.h>
#include <stdbool.h>
#include <stdarg.h>
#include "ndp-funcs.h"
#include "ndp-parser.h"
#include "ily-layout-xxd.c"
void set_outfile(FILE *stream) {
  outfile = stream;
  return;
}
void init_variables() {
  maxv = curv = maxalt = curalt = 0;
  ndp_sourcelist = NULL;
  fullpath = title = poet = composer = NULL;
  pointandclick = false;
  return;
}
void set_title(char *t) {
  assert(t != NULL);
  title = strdup(t);
  return;
}
void set_poet(char *p) {
  assert(p != NULL);
  poet = strdup(p);
  return;
}
void set_composer(char *c) {
  assert(c != NULL);
  composer = strdup(c);
  return;
}
void __ndp_message(YYLTYPE *yylloc, char *type, char *file, int line, char *fmt
    , ...) {
  va_list ap;
  va_start(ap, fmt);
  fprintf(stderr, "[%s (%s:%d)] ", type, file, line);
  if(yylloc)
    fprintf(stderr, "(@%d:%d-%d:%d) ", yylloc->first_line, yylloc->first_column
        , yylloc->last_line, yylloc->last_column);
  vfprintf(stderr, fmt, ap);
  fprintf(stderr, "\n");
  return;
}
/* wrapper around malloc to fail with info */
void *__ndp_malloc(size_t c, char *file, int line) {
  void *ret;
  ret = malloc(c);
  if(!ret)
    __ndp_message(NULL, "Error", file, line, "malloc() failed.");
  return ret;
}
/* wrapper around realloc to fail with info */
void *__ndp_realloc(void *ptr, size_t size, char *file, int line) {
```

```
  void *ret;
  ret = realloc(ptr, size);
  if(!ret)
    __ndp_message(NULL, "Error", file, line, "realloc() failed.");
  return ret;
}
void emit_base52(int i) {
  assert(i >= 0);
  static char alphabet[] = "abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQR\
STUVWXYZ";
  do {
    fputc(alphabet[i % (sizeof alphabet - 1)], outfile);
    i /= sizeof alphabet - 1;
  } while(i);
  return;
}
/* allocate note structure */
note_t make_note(int nn, int acc, int oct, bool plica, YYLTYPE yylloc) {
  note_t ret;
  ret = ndp_malloc(sizeof *ret);
  ret->notename = nn;
  ret->accidental = acc;
  ret->octave = oct;
  ret->plica = plica;
  ret->yylloc = yylloc;
  return ret;
}
/* allocate linked list of notes */
notelist_t make_notelist(note_t n, notelist_t c) {
  assert(n != NULL);
  if(!c) {
    c = ndp_malloc(sizeof *c);
    c->note = n;
    c->next = NULL;
    return c;
  }
  notelist_t new;
  new = ndp_malloc(sizeof *new);
  new->note = n;
  new->next = c;
  return new;
}
/* create wrapper for notelist describing the type of ligature */
ligature_t make_ligature(notelist_t c) {
  assert(c != NULL);
  ligature_t l;
  l = ndp_malloc(sizeof *l);
  l->type = LIGATURE;
  l->noteslen = 1;
  l->notes = ndp_malloc(sizeof *(l->notes));
  l->notes[0] = c;
  return l;
}
/* as above */
ligature_t make_currentes(notelist_t c) {
  assert(c != NULL);
  ligature_t l;
  l = ndp_malloc(sizeof *l);
```

```
115   l->type = CURRENTES;
116   l->noteslen = 1;
117   l->notes = ndp_malloc(sizeof *(l->notes));
118   l->notes[0] = c;
119   return l;
120 }
121 /* as above, but this function has two sets of notelists */
122 ligature_t make_ligcur(notelist_t a, notelist_t b) {
123   assert(a != NULL);
124   assert(b != NULL);
125   ligature_t l;
126   l = ndp_malloc(sizeof *l);
127   l->type = LIGCUR;
128   l->noteslen = 2;
129   l->notes = ndp_malloc(sizeof *(l->notes) * 2);
130   l->notes[0] = a;
131   l->notes[1] = b;
132   return l;
133 }
134 /* virga only has one note, create notelist for it first */
135 ligature_t make_virga(note_t n) {
136   assert(n != NULL);
137   notelist_t nl = make_notelist(n, NULL);
138   assert(nl != NULL);
139   ligature_t l;
140   l = ndp_malloc(sizeof *l);
141   l->type = VIRGA;
142   l->noteslen = 1;
143   l->notes = ndp_malloc(sizeof *(l->notes));
144   l->notes[0] = nl;
145   return l;
146 }
147 /* make a divisio */
148 ligature_t make_divisio_maior() {
149   ligature_t l;
150   l = ndp_malloc(sizeof *l);
151   l->type = DIVMAJ;
152   l->noteslen = 0;
153   l->notes = NULL;
154   return l;
155 }
156 ligature_t make_divisio_maxima() {
157   ligature_t l;
158   l = ndp_malloc(sizeof *l);
159   l->type = DIVMAX;
160   l->noteslen = 0;
161   l->notes = NULL;
162   return l;
163 }
164 ligature_t make_keychange(int sharps, int curvidx) {
165   ligature_t l;
166   l = ndp_malloc(sizeof *l);
167   l->type = KEYCHANGE;
168   /* bit of a hack to cast int pointer to notelist_t pointer */
169   int *hack;
170   hack = ndp_malloc(2 * sizeof *hack);
171   hack[0] = sharps;
172   hack[1] = curvidx;
```

```
173   l->notes = (notelist_t *)hack;
174   l->noteslen = 0;
175   return l;
176 }
177 ligature_t make_clefchange(int line, int curvidx) {
178   ligature_t l;
179   l = ndp_malloc(sizeof *l);
180   l->type = CLEFCHANGE;
181   int *hack;
182   hack = ndp_malloc(2 * sizeof *hack);
183   hack[0] = line;
184   hack[1] = curvidx;
185   l->notes = (notelist_t *)hack;
186   l->noteslen = 0;
187   return l;
188 }
189 /* build music from a list of ligatures */
190 music_t make_music(ligature_t l, music_t m) {
191   if(!m) {
192     m = ndp_malloc(sizeof *m);
193     m->ligature = l;
194     m->next = NULL;
195     return m;
196   }
197   music_t new;
198   new = ndp_malloc(sizeof *new);
199   new->ligature = l;
200   new->next = m;
201   return new;
202 }
203 source_t find_source(char *id) {
204   sourcelist_t h;
205   h = ndp_sourcelist;
206   while(h && strcmp(h->source->id, id))
207     h = h->next;
208   if(h)
209     return h->source;
210   ndp_error(NULL, "Could not find source with ID '%s'.", id);
211   return NULL;
212 }
213 size_t get_source_idx(char *id) {
214   sourcelist_t h;
215   h = ndp_sourcelist;
216   size_t i;
217   i = 0;
218   while(h && strcmp(h->source->id, id))
219     h = h->next;
220   if(h)
221     return i;
222   ndp_error(NULL, "Could not find source with ID '%s'.", id);
223   return 0;
224 }
225 void make_definition(char *id, char *name) {
226   sourcelist_t *h;
227   source_t new;
228   h = &ndp_sourcelist;
229   while(*h)
230     h = &((*h)->next);
```

```
231   *h = ndp_malloc(sizeof **h);
232   new = make_source(name, id);
233   (*h)->source = new;
234   (*h)->next = NULL;
235   return;
236 }
237 void print_definitions() {
238   sourcelist_t h;
239   h = ndp_sourcelist;
240   while(h) {
241     assert(h->source != NULL);
242     fprintf(stderr, "Source (ID: '%s', Name: '%s')\n", h->source->id, h->source
          ->name);
243     h = h->next;
244   }
245   return;
246 }
247 /* allocate container for arbitrary source */
248 alt_t make_alt(sourcelist_t s, music_t mus) {
249   assert(s != NULL);
250   assert(mus != NULL);
251   alt_t ret;
252   ret = ndp_malloc(sizeof *ret);
253   ret->src = s;
254   ret->mus = mus;
255   return ret;
256 }
257 voicelist_t make_nosrc(sourcelist_t s) {
258   assert(s != NULL);
259   altmus_t a;
260   a = ndp_malloc(sizeof *a);
261   a->type = NOSRC;
262   a->el = (void *)s;
263   a->idx = 0;
264   a->next = NULL;
265   voice_t v;
266   v = make_voice(a, NULL);
267   voicelist_t vl;
268   vl = make_voicelist(v, NULL);
269   return vl;
270 }
271 source_t sourcelist_source_intersection(sourcelist_t a, sourcelist_t b) {
272   assert(a != NULL);
273   assert(b != NULL);
274   sourcelist_t bcpy;
275   while(a) {
276     bcpy = b;
277     while(bcpy) {
278       if(bcpy->source == a->source)
279         return a->source;
280       bcpy = bcpy->next;
281     }
282     a = a->next;
283   }
284   return NULL;
285 }
286 bool sourcelist_contains(source_t needle, sourcelist_t haystack) {
287   while(haystack) {
```

```
288     if(haystack->source == needle)
289       return true;
290     haystack = haystack->next;
291   }
292   return false;
293 }
294 source_t alt_altlist_source_intersection(alt_t a, altlist_t al) {
295   assert(a != NULL);
296   assert(al != NULL);
297   while(al) {
298     /* fold through altlist */
299     assert(al->alt != NULL);
300     source_t intersect;
301     intersect = sourcelist_source_intersection(a->src, al->alt->src);
302     if(intersect)
303       return intersect;
304     al = al->next;
305   }
306   return NULL;
307 }
308 /* make a list of alternate versions */
309 altlist_t make_altlist(alt_t a, altlist_t al, YYLTYPE yylloc) {
310   assert(a != NULL);
311   if(!al) {
312     al = ndp_malloc(sizeof *al);
313     al->alt = a;
314     al->next = NULL;
315     return al;
316   }
317   source_t intersect;
318   intersect = alt_altlist_source_intersection(a, al);
319   if(intersect)
320     ndp_error(&yylloc, "Source with ID '%s' already described in alternatives."
          , intersect->id);
321   altlist_t new;
322   new = ndp_malloc(sizeof *new);
323   new->alt = a;
324   new->next = al;
325   return new;
326 }
327 sourcelist_t make_sourcelist(source_t s, sourcelist_t sl) {
328   assert(s != NULL);
329   if(!sl) {
330     sl = ndp_malloc(sizeof *sl);
331     sl->source = s;
332     sl->next = NULL;
333     return sl;
334   }
335   sourcelist_t new;
336   new = ndp_malloc(sizeof *new);
337   new->source = s;
338   new->next = sl;
339   return new;
340 }
341 /* make container for mus */
342 altmus_t make_altmus_from_mus(music_t m, size_t curvidx) {
343   assert(m != NULL);
344   altmus_t ret;
```

```
345   ret = ndp_malloc(sizeof *ret);
346   ret->type = MUS;
347   ret->el = (void *)m;
348   ret->idx = curvidx;
349   return ret;
350 }
351 /* make container for altlist */
352 altmus_t make_altmus_from_alt(altlist_t al, size_t curvidx) {
353   assert(al != NULL);
354   altmus_t ret;
355   ret = ndp_malloc(sizeof *ret);
356   ret->type = ALTLIST;
357   ret->el = (void *)al;
358   ret->idx = curvidx;
359   return ret;
360 }
361 /* voice contains both mus and altlist in an altmus container */
362 voice_t make_voice(altmus_t a, voice_t c) {
363   assert(a != NULL);
364   if(!c) {
365     c = ndp_malloc(sizeof *c);
366     c->altmus = a;
367     c->next = NULL;
368     return c;
369   }
370   voice_t new;
371   new = ndp_malloc(sizeof *new);
372   new->altmus = a;
373   new->next = c;
374   return new;
375 }
376 voicelist_t make_voicelist(voice_t v, voicelist_t vl) {
377   assert(v != NULL);
378   if(!vl) {
379     vl = ndp_malloc(sizeof *vl);
380     vl->voice = v;
381     vl->next = NULL;
382     return vl;
383   }
384   voicelist_t new;
385   new = ndp_malloc(sizeof *new);
386   new->voice = v;
387   new->next = vl;
388   return new;
389 }
390 /* list of voices */
391 ordo_t make_ordo(voicelist_t a, ordo_t c) {
392   assert(a != NULL);
393   if(!c) {
394     c = ndp_malloc(sizeof *c);
395     c->voicelist = a;
396     c->next = NULL;
397     return c;
398   }
399   ordo_t new;
400   new = ndp_malloc(sizeof *new);
401   new->voicelist = a;
402   new->next = c;
```

```
403   return new;
404 }
405 source_t make_source(char *name, char *id) {
406   assert(name != NULL);
407   assert(id != NULL);
408   source_t s;
409   s = ndp_malloc(sizeof *s);
410   s->name = name;
411   s->id = id;
412   s->toggled = true;
413   s->diffnotes = 0;
414   s->diffligs = 0;
415   return s;
416 }
417 syllable_t make_syllable(char *str, int len) {
418   assert(str != NULL);
419   assert(len > 0);
420   syllable_t s;
421   s = ndp_malloc(sizeof *s);
422   s->str = str;
423   s->len = len;
424   return s;
425 }
426 lyriclist_t make_lyriclist(syllable_t syl, lyriclist_t ll) {
427   assert(syl != NULL);
428   if(!ll) {
429     ll = ndp_malloc(sizeof *ll);
430     ll->syllable = syl;
431     ll->next = NULL;
432     return ll;
433   }
434   lyriclist_t new;
435   new = ndp_malloc(sizeof *new);
436   new->syllable = syl;
437   new->next = ll;
438   return new;
439 }
440 void emit_note(note_t n) {
441   if(pointandclick) {
442     fputs(ADDURLSTR, outfile);
443     fprintf(outfile, "#\"%s\" #%d #%d #%d ", fullpath, n->yylloc.first_line, n
          ->yylloc.first_column, n->yylloc.last_column);
444   }
445   if(n->plica)
446     fputs(PLICASTR, outfile);
447   fputc(n->notename, outfile);
448   if(n->accidental > 0)
449     for(int i = 0; i < n->accidental; ++i)
450       fputs(SHARPSTR, outfile);
451   else if(n->accidental < 0)
452     for(int i = n->accidental; i < 0; ++i)
453       fputs(FLATSTR, outfile);
454   if(n->octave > 0)
455     for(int i = 0; i < n->octave; ++i)
456       fputs(UP8STR, outfile);
457   else if(n->octave < 0)
458     for(int i = n->octave; i < 0; ++i)
459       fputs(DOWN8STR, outfile);
```

```
460   fputs("4 ", outfile);
461   return;
462 }
463 size_t emit_notelist(notelist_t n) {
464   size_t l;
465   l = 0;
466   while(n) {
467     emit_note(n->note);
468     ++l;
469     n = n->next;
470   }
471   return l;
472 }
473 size_t emit_ligature(ligature_t l) {
474   size_t len;
475   len = 0;
476   if(!l) {
477     fputs(EMPTYDIVSTR, outfile);
478     return 0;
479   }
480   switch(l->type) {
481     case VIRGA:
482       assert(l->noteslen == 1);
483       len += emit_notelist(l->notes[0]);
484       break;
485
486     case LIGATURE:
487       assert(l->noteslen == 1);
488       fputs(OLIGSTR, outfile);
489       len += emit_notelist(l->notes[0]);
490       fputs(CLIGSTR, outfile);
491       break;
492
493     case CURRENTES:
494       assert(l->noteslen == 1);
495       emit_note(l->notes[0]->note);
496       ++len;
497       fputs(OCURSTR, outfile);
498       len += emit_notelist(l->notes[0]->next);
499       fputs(CCURSTR, outfile);
500       break;
501
502     case LIGCUR:
503       assert(l->noteslen == 2);
504       fputs(OLIGSTR, outfile);
505       len += emit_notelist(l->notes[0]);
506       fputs(OCURSTR, outfile);
507       fputs(CLIGSTR, outfile);
508       len += emit_notelist(l->notes[1]);
509       fputs(CCURSTR, outfile);
510       break;
511
512     case DIVMAJ:
513       assert(l->noteslen == 0);
514       assert(l->notes == NULL);
515       fputs(DIVMAJSTR, outfile);
516       break;
517
```

```
518     case DIVMAX:
519       assert(l->noteslen == 0);
520       assert(l->notes == NULL);
521       fputs(DIVMAXSTR, outfile);
522       break;
523
524     case KEYCHANGE:
525       assert(l->noteslen == 0);
526       fputs(KEYCHANGESTR, outfile);
527       fprintf(outfile, "%d #\"staff", ((int *)l->notes)[0]);
528       emit_base52(((int *)l->notes)[1]);
529       fputs("\" ", outfile);
530       break;
531
532     case CLEFCHANGE:
533       assert(l->noteslen == 0);
534       fputs(CLEFCHANGESTR, outfile);
535       fprintf(outfile, "%d #\"staff", ((int *)l->notes)[0]);
536       emit_base52(((int *)l->notes)[1]);
537       fputs("\" ", outfile);
538       break;
539   }
540   return len;
541 }
542 bool source_toggled(source_t s) {
543   return s->toggled;
544 }
545 size_t emit_music(music_t m, bool countdiff) {
546   size_t l, ligs;
547   l = ligs = 0;
548   while(m) {
549     l += emit_ligature(m->ligature);
550     m = m->next;
551     ++ligs;
552   }
553   if(countdiff) {
554     sourcelist_t n = ndp_sourcelist->next;
555     while(n) {
556       if(!source_toggled(n->source)) {
557         /*
558           * ndp_warning(NULL, "Source '%s' not toggled,
559           * add\
560           * ing %lu notes and %lu ligatures (total: %lu
561           * notes, %lu ligatures).",
562           *  n->source->name, l, ligs,
563           *  n->source->diffnotes, n->source->diffligs);
564           */
565         n->source->diffnotes += l;
566         n->source->diffligs += ligs;
567       }
568       n = n->next;
569     }
570   }
571   return l;
572 }
573 void add_diffs(sourcelist_t src, size_t notes, size_t ligs) {
574   assert(src != NULL);
575   bool addall = true;
```

```
576   if(sourcelist_contains(ndp_sourcelist->source, src))
577     addall = false;
578   while(src) {
579     if((addall == false) && (src->source != ndp_sourcelist->source)) {
580       src = src->next;
581       continue;
582     }
583     source_t s = src->source;
584     s->diffnotes += notes;
585     s->diffligs += ligs;
586     /*
587       * ndp_warning(NULL, "Source '%s' is described as differing by
588       * %lu\
589       * notes and %lu ligatures (total: %lu notes, %lu ligatures).",
590       * s->name, notes,
591       *  ligs, s->diffnotes, s->diffligs);
592       */
593     src = src->next;
594   }
595   return;
596 }
597 size_t count_ligs(music_t mus) {
598   size_t ret = 0;
599   for(ret = 0; mus;) {
600     if(mus->ligature &&
601        (mus->ligature->type != DIVMAJ) &&
602        (mus->ligature->type != DIVMAX) &&
603        (mus->ligature->type != KEYCHANGE) &&
604        (mus->ligature->type != CLEFCHANGE))
605       ++ret;
606     mus = mus->next;
607   }
608   return ret;
609 }
610 /*
611   * \div #'(((src) ((k "SRC NAME") (m ,#{ MUSIC #}))) ((src)) ((k "SRC NAME") (
        m
612   * ,#{ MUSIC #}))))) \staffalts
613   */
614 size_t emit_altlist(altlist_t al, size_t idx) {
615   size_t l, maxl, ligs;
616   maxl = l = 0;
617   fputs("\\div #\"staff", outfile);
618   emit_base52(idx);
619   fputs("\" #'(", outfile);
620   while(al) {
621     alt_t a;
622     bool countdiffs = false;
623     a = al->alt;
624     fputs("((", outfile);
625     emit_sourcelist_ids(a->src, outfile);
626     fputs(") ((k \"", outfile);
627     emit_sourcelist_names(a->src, outfile);
628     fputs("\") (m ,#{ ", outfile);
629     ligs = count_ligs(a->mus);
630     if(sourcelist_contains(ndp_sourcelist->source, a->src))
631       countdiffs = true;
632     l = emit_music(a->mus, countdiffs);
```

```
633     add_diffs(a->src, l, ligs);
634     if(l > maxl)
635       maxl = l;
636     fputs("#})))", outfile);
637     al = al->next;
638   }
639   fputs(") \\ossias", outfile);
640   emit_base52(idx);
641   fputc(' ', outfile);
642   return maxl;
643 }
644 void emit_sourcelist_ids(sourcelist_t s, FILE *fp) {
645   while(s) {
646     fputs(s->source->id, fp);
647     fputs(" ", fp);
648     s = s->next;
649   }
650   return;
651 }
652 void emit_sourcelist_names(sourcelist_t s, FILE *fp) {
653   assert(s != NULL);
654   fputs(s->source->name, fp);
655   s = s->next;
656   if(!s)
657     return;
658   if(!s->next)
659     fputs(" ", fp);
660   while(s->next) {
661     fputs(", ", fp);
662     fputs(s->source->name, fp);
663     s = s->next;
664   }
665   fputs("& ", fp);
666   fputs(s->source->name, fp);
667   return;
668 }
669 void free_sourcelist_no_rec(sourcelist_t s) {
670   while(s) {
671     sourcelist_t p;
672     p = s;
673     s = s->next;
674     free(p);
675   }
676   return;
677 }
678 void toggle_source(source_t s) {
679   s->toggled = !(s->toggled);
680   return;
681 }
682 void emit_nosrc(sourcelist_t s) {
683   sourcelist_t h, os;
684   h = ndp_sourcelist;
685   os = NULL;
686   while(s) {
687     toggle_source(s->source);
688     s = s->next;
689   }
690   while(h) {
```

```
691     if(!source_toggled(h->source))
692       os = make_sourcelist(h->source, os);
693     h = h->next;
694   }
695   if(os) {
696     fputs(NOSRC_BEGIN, outfile);
697     emit_sourcelist_names(os, outfile);
698     fputs(ONOSRC, outfile);
699     free_sourcelist_no_rec(os);
700   } else
701     fputs(CNOSRC, outfile);
702   return;
703 }
704 size_t emit_altmus(altmus_t a) {
705   assert(a != NULL);
706   size_t l, ligs;
707   l = 0;
708   switch(a->type) {
709     case MUS:
710       ligs = count_ligs((music_t)a->el);
711       ndp_sourcelist->source->diffligs += ligs;
712       l = emit_music((music_t)a->el, true);
713       ndp_sourcelist->source->diffnotes += l;
714       /*
715         * ndp_warning(NULL, "Input %lu notes and %lu ligatures
716         * fo\
717         * r all sources (total: %lu notes, %lu ligatures).",
718         * l, ligs,
719         *  ndp_sourcelist->source->diffnotes,
720         *  ndp_sourcelist->source->diffligs);
721         */
722       break;
723
724     case ALTLIST:
725       l = emit_altlist((altlist_t)a->el, a->idx);
726       break;
727
728     case NOSRC:
729       emit_nosrc((sourcelist_t)a->el);
730       break;
731   }
732   return l;
733 }
734 size_t emit_voice(voice_t v) {
735   size_t l;
736   l = 0;
737   while(v) {
738     l += emit_altmus(v->altmus);
739     v = v->next;
740   }
741   return l;
742 }
743 size_t emit_ordo(ordo_t o) {
744   size_t maxl, l;
745   maxl = l = 0;
746   fputs("\\ordo \\vox #(list ", outfile);
747   voicelist_t ov;
748   ov = o->voicelist;
```

```
749   while(ov) {
750     fputs("#{ ", outfile);
751     l = emit_voice(ov->voice);
752     if(l > maxl)
753       maxl = l;
754     fputs("#} ", outfile);
755     ov = ov->next;
756   }
757   fputs(") ##f \\bar \"\"\n", outfile);
758   return maxl;
759 }
760 size_t *emit_ordines(ordo_t o, size_t *l) {
761   *l = 0;
762   size_t *r;
763   r = NULL;
764   while(o) {
765     size_t thisl;
766     thisl = emit_ordo(o);
767     o = o->next;
768     if(thisl) {
769       ++(*l);
770       r = ndp_realloc(r, *l * sizeof *r);
771       r[*l - 1] = thisl;
772     }
773   }
774   return r;
775 }
776 void emit_syllable_skip(int slen, size_t *ordo_l, size_t *ordo_ptr) {
777   size_t minus;
778   minus = 1;
779   for(int i = 0; i < slen; ++i) {
780     size_t skip;
781     skip = ordo_l[*ordo_ptr] - minus;
782     fprintf(outfile, " \\skip 4*%lu ", skip);
783     ++(*ordo_ptr);
784     if(minus)
785       minus = 0;
786   }
787   --(*ordo_ptr);
788   return;
789 }
790 void emit_large_syllable(syllable_t s, size_t *ordo_l, size_t *ordo_ptr) {
791   int alpha;
792   assert(s->len > 0);
793   fputs("\\markup \\concat { ", outfile);
794   alpha = (int)strcspn(s->str, ALPHANUM);
795   if(alpha < (int)strlen(s->str))
796     fprintf(outfile, "\"%.*s\" ", alpha, s->str);
797   fputs("\\fontsize #10 \"", outfile);
798   fputc(toupper(s->str[alpha]), outfile);
799   fputs("\" \"", outfile);
800   fputs(s->str + alpha + 1, outfile);
801   fputs("\" }", outfile);
802   emit_syllable_skip(s->len, ordo_l, ordo_ptr);
803   return;
804 }
805 void emit_syllable(syllable_t s, size_t *ordo_l, size_t *ordo_ptr) {
806   assert(s->len > 0);
```

```
807   fprintf(outfile, "\"%s\" ", s->str);
808   emit_syllable_skip(s->len, ordo_l, ordo_ptr);
809   return;
810 }
811 void emit_lyrics(lyriclist_t lyr, size_t *ordo_l, size_t ordo_l_len) {
812   assert(ordo_l != NULL);
813   assert(ordo_l_len > 0);
814   size_t ordo_ptr;
815   if(!lyr) {
816     fputs("\\lyricmode { }\n", outfile);
817     return;
818   }
819   ordo_ptr = 0;
820   fputs("\\lyricmode {\n\\set fontSize = #2\n\\override LyricText.self-a\
821 lignment-X = #CENTER\n", outfile);
822   emit_large_syllable(lyr->syllable, ordo_l, &ordo_ptr);
823   ++ordo_ptr;
824   lyr = lyr->next;
825   while(lyr) {
826     assert(ordo_ptr < ordo_l_len);
827     emit_syllable(lyr->syllable, ordo_l, &ordo_ptr);
828     ++ordo_ptr;
829     lyr = lyr->next;
830   }
831   assert(ordo_ptr <= ordo_l_len);
832   fputs("\n}\n", outfile);
833   return;
834 }
835 bool stronly(char *s) {
836   char *c;
837   while((c = strchr(s, '\\')) != NULL) {
838     if(c[1] != '\\')
839       return false;
840     s = c + 1;
841   }
842   return true;
843 }
844 void emit_file(ordo_t o, lyriclist_t lyr) {
845   fputs("\n#(define src '", outfile);
846   fputs(ndp_sourcelist->source->id, outfile);
847   fputs(")\n", outfile);
848   fputs("#(define pkey '(", outfile);
849   for(size_t i = 0; i < maxv; ++i) {
850     fputs("(\"staff", outfile);
851     emit_base52(i);
852     fputs("\" . ,(ly:make-pitch 0 0)) ", outfile);
853   }
854   fputs("))\n#(define pclef '(", outfile);
855   for(size_t i = 0; i < maxv; ++i) {
856     fputs("(\"staff", outfile);
857     emit_base52(i);
858     fputs("\" . 0) ", outfile);
859   }
860   fputs("))\n", outfile);
861   for(size_t i = 0; i < maxv; ++i) {
862     fputs("ossias", outfile);
863     emit_base52(i);
864     fputs(" = #'(", outfile);
```

```
    if(maxalt > 0)
      for(size_t j = 0; j < maxalt - 1; ++j) {
        fputs("\"ossia", outfile);
        emit_base52(i);
        fputs("vs", outfile);
        emit_base52(j);
        fputs("\" ", outfile);
      }
    fputs(")\n", outfile);
  }
  fputs("osssrc = #'(", outfile);
  for(size_t i = 0; i < maxv; ++i)
    if(maxalt > 0)
      for(size_t j = 0; j < maxalt - 1; ++j) {
        fputs(" (\"ossia", outfile);
        emit_base52(i);
        fputs("vs", outfile);
        emit_base52(j);
        fputs("\" . '())", outfile);
      }
  fputs(")\nosslastactive = #`(", outfile);
  for(size_t i = 0; i < maxv; ++i)
    if(maxalt > 0)
      for(size_t j = 0; j < maxalt - 1; ++j) {
        fputs(" (\"ossia", outfile);
        emit_base52(i);
        fputs("vs", outfile);
        emit_base52(j);
        fputs("\" . ,(ly:make-moment 0))", outfile);
      }
  fputs(")\nvox = #'(", outfile);
  for(size_t i = 0; i < maxv; ++i) {
    fputs("\"staff", outfile);
    emit_base52(i);
    fputs("\" ", outfile);
  }
  fputs(")\nmus = {\n", outfile);
  size_t *ordo_lengths, ordo_lengths_len;
  ordo_lengths = emit_ordines(o, &ordo_lengths_len);
  fputs("<>\\stopTextSpan\n}\n\\score{\n\\header {\n", outfile);
  if(title) {
    fputs("  title = ", outfile);
    if(stronly(title))
      fprintf(outfile, "\"%s\"\n", title);
    else
      fprintf(outfile, "%s\n", title);
  }
  fputs("  poet = ", outfile);
  if(poet) {
    if(stronly(poet))
      fprintf(outfile, "\\markup \\column { \\wordwrap { %s }\
\" \" }\n", poet);
    else
      fprintf(outfile, "%s\n", poet);
  } else
    fputs("\\markup \" \"\n", outfile);
  if(composer) {
    fputs("  composer = ", outfile);
```

```
923     if(stronly(composer))
924       fprintf(outfile, "\\markup \\column { \\wordwrap { %s }\
925 \" \" }\n", composer);
926     else
927       fprintf(outfile, "%s\n", composer);
928   } else
929     fputs("\\markup \" \"\n", outfile);
930   fputs("}\n<<", outfile);
931   for(size_t i = 0; i < maxv; ++i) {
932     if(maxalt > 0)
933       for(size_t j = maxalt; j > 0; --j) {
934         fputs("\\new Staff = \"ossia", outfile);
935         emit_base52(i);
936         fputs("vs", outfile);
937         emit_base52(j - 1);
938         fputs("\" \\with { \\magnifyStaff #2/3 \\overri\
939 de VerticalAxisGroup.remove-first = ##t \\override VerticalAxisGroup.staff-staf
    \
940 f-spacing = #'((basic-distance . 0) (minimum-distance . 0) (padding . 1)) \\Rem
    \
941 oveEmptyStaves } { \\stopStaff \\omit Staff.KeySignature \\omit Staff.Clef \\gl
    \
942 obal \\dynskip \\mus }\n", outfile);
943       }
944     fputs("\\new Staff = \"staff", outfile);
945     emit_base52(i);
946     fputs("\" { \\global", outfile);
947     if(i)
948       fputs(" \\dynskip", outfile);
949     fputs(" \\mus }\n", outfile);
950   }
951   fputs("\\new Lyrics ", outfile);
952   emit_lyrics(lyr, ordo_lengths, ordo_lengths_len);
953   fputs(">>\n", outfile);
954   fwrite(ly_layout_ily, 1, ly_layout_ily_len, outfile);
955   fputs("}\n", outfile);
956   return;
957 }
958 void output_stats() {
959   sourcelist_t n = ndp_sourcelist;
960   size_t orignotes, origligs;
961   orignotes = n->source->diffnotes;
962   origligs = n->source->diffligs;
963   fprintf(stderr, "Original contained %lu notes, %lu ligatures.\n",
964           orignotes, origligs);
965   n = n->next;
966   while(n) {
967     double similarity;
968     similarity = 1.0 - (n->source->diffnotes / (double)orignotes);
969     fprintf(stderr, "Source '%s': %lu notes different (%.0lf%% simi\
970 larity).\n", n->source->name, n->source->diffnotes, similarity * 100);
971     similarity = 1.0 - (n->source->diffligs / (double)origligs);
972     fprintf(stderr, "Source '%s': %lu ligatures different (%.0lf%% \
973 similarity).\n", n->source->name, n->source->diffligs, similarity * 100);
974     n = n->next;
975   }
976   return;
977 }
```

ndp-funcs.h

```
#include <stdio.h>
#include <stdlib.h>
#include <stdbool.h>
#include "ndp-parser.h"
#define ndp_malloc(c) __ndp_malloc(c, __FILE__, __LINE__)
#define ndp_realloc(p, c) __ndp_realloc(p, c, __FILE__, __LINE__)
#define ndp_warning(yylloc, fmt, ...) __ndp_message(yylloc, "Warning", __FILE__, __LINE__, fmt, ## __VA_ARGS__)
#if YYDEBUG == 0
# define ndp_debug(yylloc, fmt, ...) ;
#else
# define ndp_debug(yylloc, fmt, ...) __ndp_message(yylloc, "Debug", __FILE__, __LINE__, fmt, ## __VA_ARGS__)
#endif
#define ndp_error(yylloc, fmt, ...) {\
    __ndp_message(yylloc, "Error", __FILE__, __LINE__, fmt, ## __VA_ARGS__);\
    exit(1);\
}
#define ALPHANUM "0123456789
    abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ"
#define SHARPSTR "is"
#define FLATSTR "es"
#define UP8STR "'"
#define DOWN8STR ","
#define OLIGSTR "\\[ "
#define CLIGSTR "\\] "
#define OCURSTR "\\( "
#define CCURSTR "\\) "
#define DIVMAJSTR "\\dI "
#define DIVMAXSTR "\\dII "
#define KEYCHANGESTR "\\setkey #"
#define CLEFCHANGESTR "\\setclef #"
#define PLICASTR "\\plica "
#define ADDURLSTR "\\setl "
#define NOSRC_BEGIN "\n\\override Score.TextSpanner.bound-details.left.text = \\markup \\teeny \"Not in "
#define ONOSRC "\"\n\\textLengthOn<>\\stopTextSpan\\startTextSpan"
#define CNOSRC "\n\\stopTextSpan"
#define EMPTYDIVSTR "\\once \\omit Dots \\once \\omit NoteHead \\once \\override NoteHead.no-ledgers = ##t \\once \\omit Stem \\once \\omit Accidental \\once \\omit Rest \\once \\omit TabNoteHead a4 "
FILE *outfile;
void set_outfile(FILE *stream);
void init_variables();
void *__ndp_malloc(size_t c, char *file, int line);
void *__ndp_realloc(void *ptr, size_t size, char *file, int line);
void __ndp_message(YYLTYPE *yylloc, char *type, char *file, int line, char *fmt, ...);

typedef enum ligaturetype {
  LIGATURE, CURRENTES, VIRGA, LIGCUR, DIVMAJ, DIVMAX, KEYCHANGE, CLEFCHANGE
} ligaturetype_t;
typedef enum altmustype {
  MUS, ALTLIST, NOSRC
} altmustype_t;

typedef struct note {
```

```
51    int notename;
52    int accidental;
53    int octave;
54    bool plica;
55    YYLTYPE yylloc;
56  } *note_t;
57  typedef struct notelist {
58    note_t note;
59    struct notelist *next;
60  } *notelist_t;
61  typedef struct ligature {
62    ligaturetype_t type;
63    notelist_t *notes;
64    size_t noteslen;
65  } *ligature_t;
66  typedef struct music {
67    ligature_t ligature;
68    struct music *next;
69  } *music_t;
70  typedef struct source {
71    char *name;
72    char *id;
73    bool toggled;
74    size_t diffnotes;
75    size_t diffligs;
76  } *source_t;
77  typedef struct sourcelist {
78    source_t source;
79    struct sourcelist *next;
80  } *sourcelist_t;
81  typedef struct alt {
82    sourcelist_t src;
83    music_t mus;
84  } *alt_t;
85  typedef struct altlist {
86    alt_t alt;
87    struct altlist *next;
88  } *altlist_t;
89  typedef struct altmus {
90    altmustype_t type;
91    void *el;
92    size_t idx;
93    struct altmus *next;
94  } *altmus_t;
95  typedef struct voice {
96    altmus_t altmus;
97    struct voice *next;
98  } *voice_t;
99  typedef struct voicelist {
100   voice_t voice;
101   struct voicelist *next;
102 } *voicelist_t;
103 typedef struct ordo {
104   voicelist_t voicelist;
105   struct ordo *next;
106 } *ordo_t;
107 typedef struct syllable {
108   char *str;
```

```
  int len;
} *syllable_t;
typedef struct lyriclist {
  syllable_t syllable;
  struct lyriclist *next;
} *lyriclist_t;

syllable_t make_syllable(char *str, int len);
lyriclist_t make_lyriclist(syllable_t syl, lyriclist_t ll);
note_t make_note(int nn, int acc, int oct, bool plica, YYLTYPE yylloc);
notelist_t make_notelist(note_t n, notelist_t c);
ligature_t make_ligature(notelist_t c);
ligature_t make_currentes(notelist_t c);
ligature_t make_ligcur(notelist_t a, notelist_t b);
ligature_t make_virga(note_t n);
ligature_t make_divisio_maior();
ligature_t make_divisio_maxima();
ligature_t make_keychange(int sharps, int curvidx);
ligature_t make_clefchange(int line, int curvidx);
music_t make_music(ligature_t l, music_t m);
alt_t make_alt(sourcelist_t s, music_t mus);
altlist_t make_altlist(alt_t a, altlist_t al, YYLTYPE yylloc);
altmus_t make_altmus_from_mus(music_t m, size_t curvidx);
altmus_t make_altmus_from_alt(altlist_t al, size_t curvidx);
voice_t make_voice(altmus_t a, voice_t c);
voicelist_t make_voicelist(voice_t v, voicelist_t vl);
voicelist_t make_nosrc(sourcelist_t s);
ordo_t make_ordo(voicelist_t a, ordo_t c);
source_t make_source(char *name, char *id);
source_t find_source(char *id);
sourcelist_t make_sourcelist(source_t s, sourcelist_t sl);
void make_definition(char *id, char *name);

void emit_file(ordo_t o, lyriclist_t lyr);
void emit_sourcelist_ids(sourcelist_t s, FILE *fp);
void emit_sourcelist_names(sourcelist_t s, FILE *fp);
void set_title(char *t);
void set_poet(char *p);
void set_composer(char *c);
void output_stats();

sourcelist_t ndp_sourcelist;
size_t maxv, curv, maxalt, curalt, curvidx;
char *title, *poet, *composer, *fullpath;
bool pointandclick;
```

ndp.l

```
%{
  #include <stdio.h>
  #include <string.h>
  #include "ndp-parser.h"
  #include "ndp-funcs.h"
  #define YYTEXT_DEBUG() ndp_debug(yytext, __FILE__, __LINE__)
  #define YY_USER_ACTION {\
    yylloc.first_line = yylloc.last_line;\
    yylloc.first_column = yylloc.last_column;\
    for(int i=0;yytext[i] != '\0';++i) {\
      if(yytext[i] == '\n') {\
```

```
12          yylloc.last_line++;\
13          yylloc.last_column = 0;\
14        } else {\
15          yylloc.last_column++;\
16        }\
17      }\
18    }
19    int input();
20  %}
21  %x DEFS SRCNAME LYRIC NOSRC
22  %option noinput
23  %%
24  "#"[ \t\n]*    { YYTEXT_DEBUG(); BEGIN DEFS; }
25  <DEFS>[^ \t\n#]+   { YYTEXT_DEBUG(); yylval.ptr = (void*)strdup(yytext); return
        STR; }
26  <DEFS>[ \t\n]+     { YYTEXT_DEBUG(); return DEFSPACE; }
27  <DEFS>"#"      { YYTEXT_DEBUG(); BEGIN INITIAL; }
28  "{"        { YYTEXT_DEBUG(); return OBRACE; }
29  "}"        { YYTEXT_DEBUG(); return CBRACE; }
30  [a-g]        {
31          YYTEXT_DEBUG();
32          yylval.val = (int)*yytext;
33          return NOTENAME;
34        }
35  "s"        { YYTEXT_DEBUG(); return SPACER; }
36  "k"        { YYTEXT_DEBUG(); return KCHANGE; }
37  "!"        { YYTEXT_DEBUG(); return CCHANGE; }
38  "p"[a-g]     {
39          YYTEXT_DEBUG();
40          yylval.val = (int)yytext[1];
41          return PLICA;
42        }
43  "^"        { YYTEXT_DEBUG(); return SHARP; }
44  "_"        { YYTEXT_DEBUG(); return FLAT; }
45  "'"        { YYTEXT_DEBUG(); return UP8; }
46  ","        { YYTEXT_DEBUG(); return DOWN8; }
47  "/"        { YYTEXT_DEBUG(); return ALT; }
48  "["        { YYTEXT_DEBUG(); return OLIG; }
49  "]"        { YYTEXT_DEBUG(); return CLIG; }
50  "("        { YYTEXT_DEBUG(); return OCUR; }
51  ")"        { YYTEXT_DEBUG(); return CCUR; }
52  "|"        { YYTEXT_DEBUG(); return DIV; }
53  "/\""        { YYTEXT_DEBUG(); BEGIN SRCNAME; return OQUO; }
54  <SRCNAME>"\""    { YYTEXT_DEBUG(); BEGIN INITIAL; return CQUO; }
55  <SRCNAME>[A-Za-z0-9]+    {
56          YYTEXT_DEBUG();
57          yylval.ptr = (void*)strdup(yytext);
58          return SRCID;
59        }
60  <SRCNAME>","     { return COMMA; }
61  "~\""        { YYTEXT_DEBUG(); BEGIN NOSRC; return ONOS; }
62  <NOSRC>[A-Za-z0-9]+    {
63          YYTEXT_DEBUG();
64          yylval.ptr = (void*)strdup(yytext);
65          return SRCID;
66        }
67  <NOSRC>","     { return COMMA; }
68  <NOSRC>"\""      { YYTEXT_DEBUG(); BEGIN INITIAL; return CNOS; }
```

```
"$"       { YYTEXT_DEBUG(); BEGIN LYRIC; return LYRDELIM; }
<LYRIC>[^0-9$ \t\n]+  { YYTEXT_DEBUG(); yylval.ptr = (void*)strdup(yytext);
    return SYLLABLE; }
<LYRIC>[0-9]+     { YYTEXT_DEBUG(); yylval.val = atoi(yytext); return SYLLEN; }
<LYRIC>"$"    { YYTEXT_DEBUG(); BEGIN INITIAL; return LYRDELIM; }
<LYRIC>[ \t\n]+   { YYTEXT_DEBUG(); /* do nothing */ }
[ \t\n]+    { YYTEXT_DEBUG(); /* do nothing */ }
.       { YYTEXT_DEBUG(); /* do nothing */ }
<<EOF>>     { YYTEXT_DEBUG(); return EOFF; }
```

ndp.y

```
%{
  #include <stdio.h>
  #include <stdlib.h>
  #include <unistd.h>
  #include <stdbool.h>
  #include <string.h>
  #include <errno.h>
  #include "ndp-funcs.h"
  #include "ily-beginning-xxd.c"
  #include "usage-xxd.c"
  #include "licence-xxd.c"
  #include "format-xxd.c"
  int yylex();
  void yyerror(char *s);
  FILE *yyin;
#ifdef YYDEBUG
  int yydebug = 1;
#endif
%}
%locations
%token OBRACE CBRACE NOTENAME SHARP FLAT UP8 DOWN8 ALT OLIG CLIG OCUR CCUR
%token SRCID EOFF DIV DEFSPACE STR OQUO CQUO COMMA LYRDELIM SYLLABLE SYLLEN
%token KCHANGE CCHANGE PLICA ONOS CNOS SPACER
%union {
  int val;
  void *ptr;
}
%type <val> up8list down8list NOTENAME ottavalist accidentallist sharplist
%type <val> flatlist SYLLEN PLICA
%type <ptr> altlist alt altmus mus ordolist SRCID ligature note lig cur
%type <ptr> ligcur notelist voice voicelist voiceinner exprs ordo fullalt
%type <ptr> divisio definition definitions STR srcidlist SYLLABLE lyrics
%type <ptr> lyriclist syllable keychange clefchange nosrc
%%
exprs
  : definitions ordolist lyrics EOFF
    { emit_file($2, $3); $$ = $2; }
  ;
lyrics
  : LYRDELIM LYRDELIM
    { $$ = NULL; }
  | LYRDELIM lyriclist LYRDELIM
    { $$ = $2; }
  ;
lyriclist
  : syllable
    { $$ = (void*)make_lyriclist($1, NULL); }
```

```
48    | syllable lyriclist
49      { $$ = (void*)make_lyriclist($1, $2); }
50    ;
51  syllable
52    : SYLLABLE SYLLEN
53      { $$ = (void*)make_syllable($1, $2); }
54    ;
55  definitions
56    : definition
57    | definition definitions
58    ;
59  definition
60    : STR DEFSPACE STR DEFSPACE
61      { make_definition((char*)$1, (char*)$3); $$ = $1; }
62    ;
63  fullalt
64    : altlist ALT
65      {
66        if(curalt > maxalt)
67          maxalt = curalt;
68        $$ = $1;
69      }
70    ;
71  altlist
72    : alt
73      { curalt = 1; $$ = (void*)make_altlist($1, NULL, yylloc); }
74    | alt altlist
75      { ++curalt; $$ = (void*)make_altlist($1, $2, yylloc); }
76    ;
77  alt
78    : OQUO srcidlist CQUO mus
79      { $$ = (void*)make_alt((sourcelist_t)$2, $4); }
80    ;
81  srcidlist
82    : SRCID
83      {
84        source_t s;
85        s = find_source((char*)$1);
86        free($1);
87        $$ = (void*)make_sourcelist(s, NULL);
88      }
89    | SRCID COMMA srcidlist
90      {
91        source_t s;
92        s = find_source((char*)$1);
93        free($1);
94        $$ = (void*)make_sourcelist(s, $3);
95      }
96    ;
97  nosrc
98    : ONOS srcidlist CNOS
99      { $$ = (void*)make_nosrc((sourcelist_t)$2); }
100   ;
101 altmus
102   : mus
103     { $$ = (void*)make_altmus_from_mus($1, curvidx); }
104   | fullalt
105     { $$ = (void*)make_altmus_from_alt($1, curvidx); }
```

```
106   ;
107 mus
108   : ligature
109     { $$ = (void*)make_music($1, NULL); }
110   | ligature mus
111     { $$ = (void*)make_music($1, $2); }
112   | SPACER
113     { $$ = (void*)make_music(NULL, NULL); }
114   ;
115 up8list
116   : UP8
117     { $$ = 1; }
118   | UP8 up8list
119     { $$ = $2 + 1; }
120   ;
121 down8list
122   : DOWN8
123     { $$ = -1; }
124   | DOWN8 down8list
125     { $$ = $2 - 1; }
126   ;
127 ottavalist
128   : up8list
129   | down8list
130     { $$ = $1; }
131   ;
132 note
133   : NOTENAME accidentallist ottavalist
134     { $$ = (void*)make_note($1, $2, $3, false, yylloc); }
135   | NOTENAME accidentallist
136     { $$ = (void*)make_note($1, $2, 0, false, yylloc); }
137   | NOTENAME ottavalist
138     { $$ = (void*)make_note($1, 0, $2, false, yylloc); }
139   | NOTENAME
140     { $$ = (void*)make_note($1, 0, 0, false, yylloc); }
141   | PLICA accidentallist ottavalist
142     { $$ = (void*)make_note($1, $2, $3, true, yylloc); }
143   | PLICA accidentallist
144     { $$ = (void*)make_note($1, $2, 0, true, yylloc); }
145   | PLICA ottavalist
146     { $$ = (void*)make_note($1, 0, $2, true, yylloc); }
147   | PLICA
148     { $$ = (void*)make_note($1, 0, 0, true, yylloc); }
149   ;
150 keychange
151   : KCHANGE ottavalist
152     { $$ = (void*)make_keychange($2, (int)curvidx); }
153   ;
154 clefchange
155   : CCHANGE ottavalist
156     { $$ = (void*)make_clefchange($2, (int)curvidx); }
157   ;
158 accidentallist
159   : sharplist
160   | flatlist
161     { $$ = $1; }
162   ;
163 sharplist
```

```
164   : SHARP
165     { $$ = 1; }
166   | SHARP sharplist
167     { $$ = $2 + 1; }
168   ;
169 flatlist
170   : FLAT
171     { $$ = -1; }
172   | FLAT flatlist
173     { $$ = $2 - 1; }
174   ;
175 ligature
176   : lig
177   | cur
178   | ligcur
179   | divisio
180   | keychange
181   | clefchange
182     { $$ = $1; }
183   | note
184     { $$ = (void*)make_virga((note_t)$1); }
185   ;
186 divisio
187   : DIV
188     { $$ = (void*)make_divisio_maior(); }
189   | DIV DIV
190     { $$ = (void*)make_divisio_maxima(); }
191   ;
192 lig
193   : OLIG notelist CLIG
194     { $$ = (void*)make_ligature((notelist_t)$2); }
195   ;
196 cur
197   : OCUR notelist CCUR
198     { $$ = (void*)make_currentes((notelist_t)$2); }
199   ;
200 ligcur
201   : OLIG notelist OCUR CLIG notelist CCUR
202     { $$ = (void*)make_ligcur((notelist_t)$2, (notelist_t)$5); }
203   ;
204 notelist
205   : note
206     { $$ = (void*)make_notelist($1, NULL); }
207   | note notelist
208     { $$ = (void*)make_notelist($1, (notelist_t)$2); }
209   ;
210 voice
211   : OBRACE voiceinner CBRACE
212     {
213       ++curvidx;
214       ++curv;
215       if(curv > maxv)
216         maxv = curv;
217       $$ = $2;
218     }
219   ;
220 voiceinner
221   : altmus
```

```
222     { $$ = (void*)make_voice($1, NULL); }
223   | altmus voiceinner
224     { $$ = (void*)make_voice($1, $2); }
225   ;
226 voicelist
227   : voice
228     { $$ = (void*)make_voicelist($1, NULL); }
229   | voice voicelist
230     { $$ = (void*)make_voicelist($1, $2); }
231   ;
232 ordo
233   : OBRACE voicelist CBRACE
234     { curv = 0; curvidx = 0; $$ = $2; }
235   ;
236 ordolist
237   : ordo
238     { $$ = (void*)make_ordo($1, NULL); }
239   | nosrc
240     { $$ = (void*)make_ordo($1, NULL); }
241   | ordo ordolist
242     { $$ = (void*)make_ordo($1, $2); }
243   | nosrc ordolist
244     { $$ = (void*)make_ordo($1, $2); }
245   ;
246 %%
247 int main(int argc, char **argv) {
248   FILE *outputfile;
249   FILE **inputfiles = NULL;
250   char **titles, **poets, **composers;
251   size_t i, ninputs, ntitles, npoets, ncomposers;
252   ninputs = ntitles = npoets = ncomposers = 0;
253   titles = NULL;
254   poets = NULL;
255   composers = NULL;
256   outputfile = stdout;
257   int c;
258   yyin = stdin;
259   while((c = getopt(argc, argv, "t:p:c:i:o:k?hlH")) != -1)
260     switch(c) {
261       case 't':
262         ++ntitles;
263         titles = ndp_realloc(titles, ntitles * sizeof
264 *titles);
265         titles[ntitles-1] = strdup(optarg);
266         break;
267       case 'p':
268         ++npoets;
269         poets = ndp_realloc(poets, npoets * sizeof
270 *poets);
271         poets[npoets-1] = strdup(optarg);
272         break;
273       case 'c':
274         ++ncomposers;
275         composers = ndp_realloc(composers, ncomposers *
276 sizeof *composers);
277         composers[ncomposers-1] = strdup(optarg);
278         break;
279       case 'i':
```

```
280         ;
281         long pathmax;
282         FILE *tmp;
283         pathmax = pathconf(optarg, _PC_PATH_MAX);
284         fullpath = ndp_malloc(pathmax+1);
285         fullpath = realpath(optarg, fullpath);
286         if(!fullpath) {
287           fprintf(stderr, "Error: %s\n",
288 strerror(errno));
289           exit(1);
290         }
291         tmp = NULL;
292         ++ninputs;
293         inputfiles = ndp_realloc(inputfiles,
294 ninputs * sizeof *inputfiles);
295 
296         tmp = fopen(fullpath, "r");
297         if(!tmp) {
298           fprintf(stderr, "Error: %s\n",
299 strerror(errno));
300           exit(1);
301         }
302         inputfiles[ninputs-1] = tmp;
303         break;
304       case 'o':
305         outputfile = fopen(optarg, "w");
306         if(!outputfile) {
307           fprintf(stderr, "Error: %s\n",
308 strerror(errno));
309           exit(1);
310         }
311         break;
312       case 'k':
313         pointandclick = true;
314         break;
315       case 'h':
316       case '?':
317         ;
318         char *buf;
319         buf = ndp_malloc(usage_txt_len + 1);
320         memcpy(buf, usage_txt, usage_txt_len);
321         buf[usage_txt_len] = '\0';
322         printf(buf, argv[0]);
323         free(buf);
324         return 0;
325       case 'l':
326         fwrite(LICENCE_txt, 1, LICENCE_txt_len, stdout);
327         return 0;
328       case 'H':
329         fwrite(format_txt, 1, format_txt_len, stdout);
330         return 0;
331       default:
332         fprintf(stderr, "Unknown option: -%c.\n", c);
333         fprintf(stderr, "Type %s -h for usage.\n",
334 argv[0]);
335         return EXIT_FAILURE;
336     }
337   set_outfile(outputfile);
```

```
338   if(!((ninputs == ntitles) && (ntitles == npoets) && (npoets ==
339 ncomposers))) {
340     fprintf(stderr, "Error: number of titles (%lu) must equal numbe\
341 r of composers (%lu) must equal number of poets (%lu) must equal number of inpu
    \
342 ts (%lu).\n", ntitles, ncomposers, npoets, ninputs);
343     return EXIT_FAILURE;
344   }
345   fwrite(ly_beginning_ily, 1, ly_beginning_ily_len, outfile);
346   if(ninputs)
347     for(i = 0;i < ninputs; ++i) {
348       init_variables();
349       set_title(titles[i]);
350       set_poet(poets[i]);
351       set_composer(composers[i]);
352       yyin = inputfiles[i];
353       yyparse();
354       fprintf(stderr, "Max voices was %lu\n", maxv);
355       output_stats();
356       fclose(yyin);
357     }
358   else {
359     init_variables();
360     yyparse();
361     fprintf(stderr, "Max voices was %lu\n", maxv);
362     output_stats();
363     fclose(yyin);
364   }
365   fclose(outputfile);
366   return EXIT_SUCCESS;
367 }
368 void yyerror(char *s) {
369   fprintf(stderr, "Error %d:%d-%d:%d: %s\n", yylloc.first_line,
370 yylloc.first_column, yylloc.last_line, yylloc.last_column, s);
371 }
```

usage.txt

```
1  Usage: %s [OPTION]...
2
3  Parse .ndp files into Lilypond.
4
5  Options:
6   -c COMPOSER        Set 'composer' header field
7   -i FILE            Set input file (default stdin)
8   -k                 Set point and click on in PDF output (-i required for
        meaningful links)
9   -l                 Display the licence for this software (GPL-3.0)
10  -o FILE            Set output file (default stdout)
11  -p POET            Set 'poet' header field
12  -t TITLE           Set 'title' header field
13  -h
14  -?                 Display this usage message
15  -H                 Display description of the ndp format
16
17 Bug reports to josh@yokermusic.scot
```