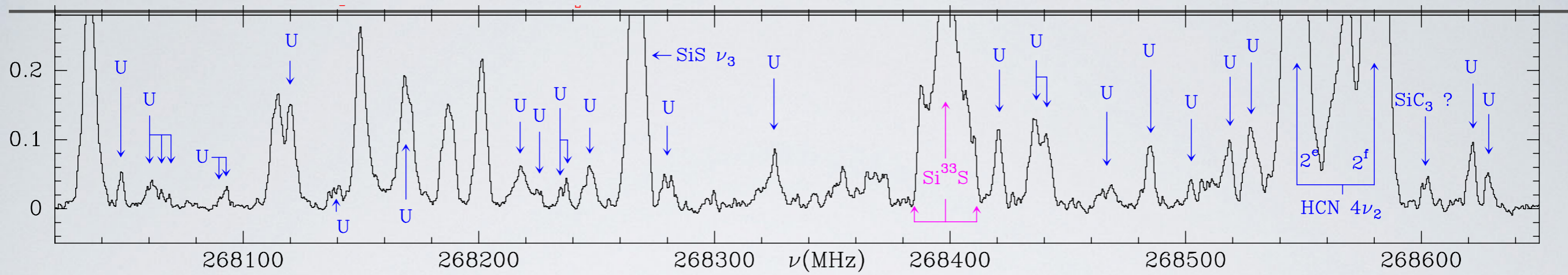


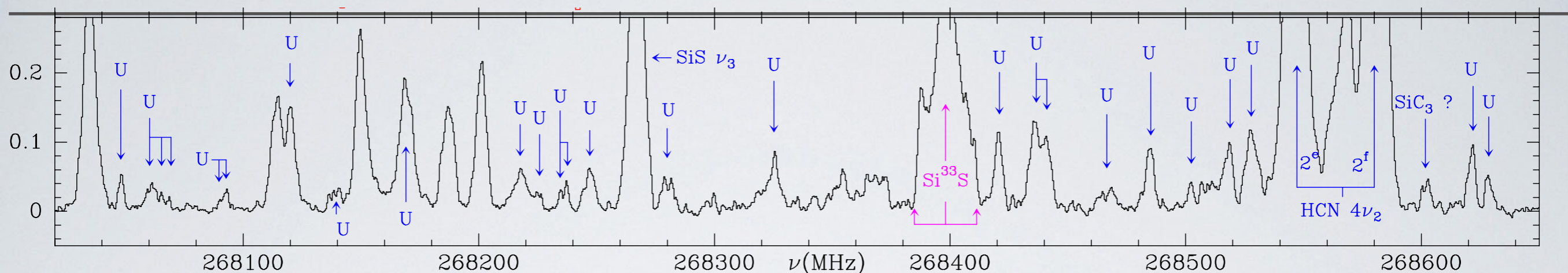
Microwave Spectral Taxonomy and Astronomical Searches for Vibrationally- Excited C_2S and C_3S



Brett A. McGuire, Marie-Aline Martin-Drumel, John F. Stanton,
Carl A. Gottlieb, and Michael C. McCarthy

Jansky Postdoctoral Fellow - NRAO/Harvard-CfA





THE ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES, **60**:357–374, 1986 January

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THE ROTATIONAL EMISSION-LINE SPECTRUM OF ORION A BETWEEN 247 AND 263 GHz

GEOFFREY A. BLAKE¹

Department of Chemistry, California Institute of Technology

E. C. SUTTON

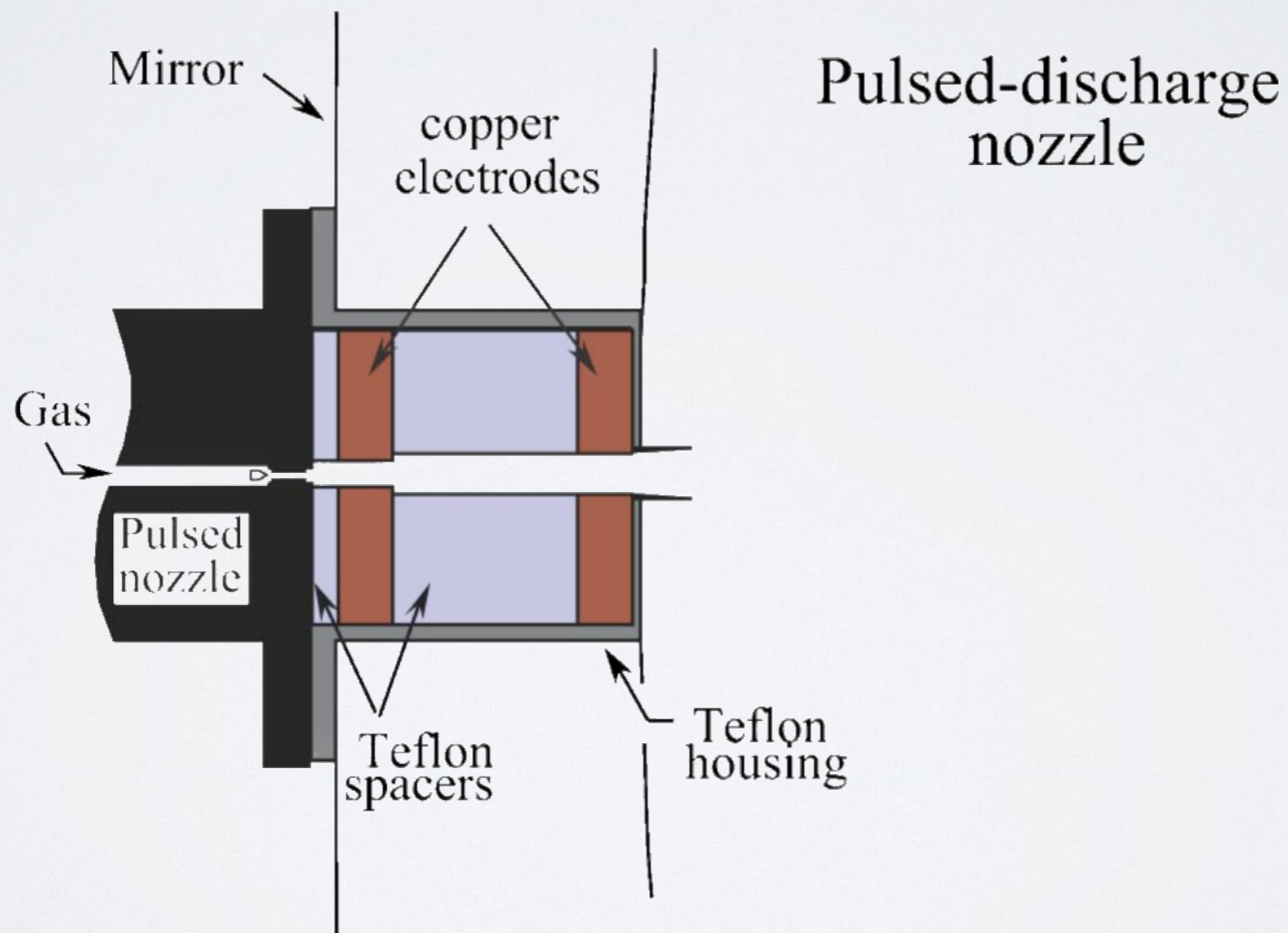
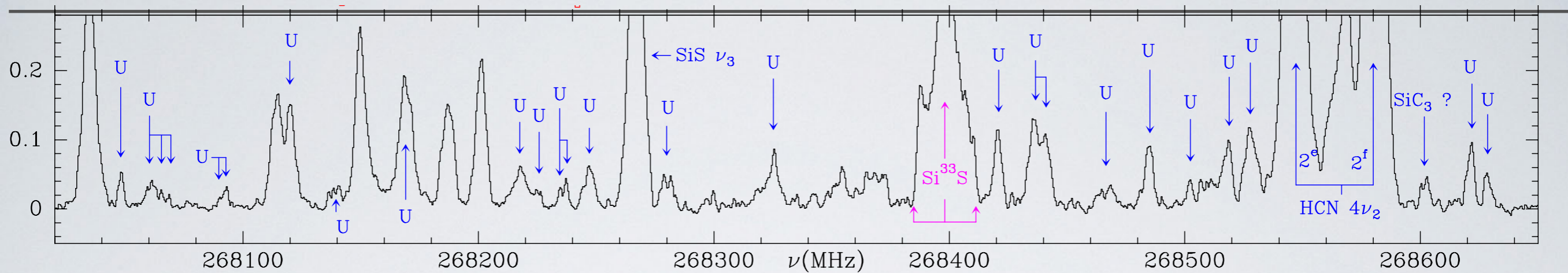
Space Sciences Laboratory, University of California, Berkeley

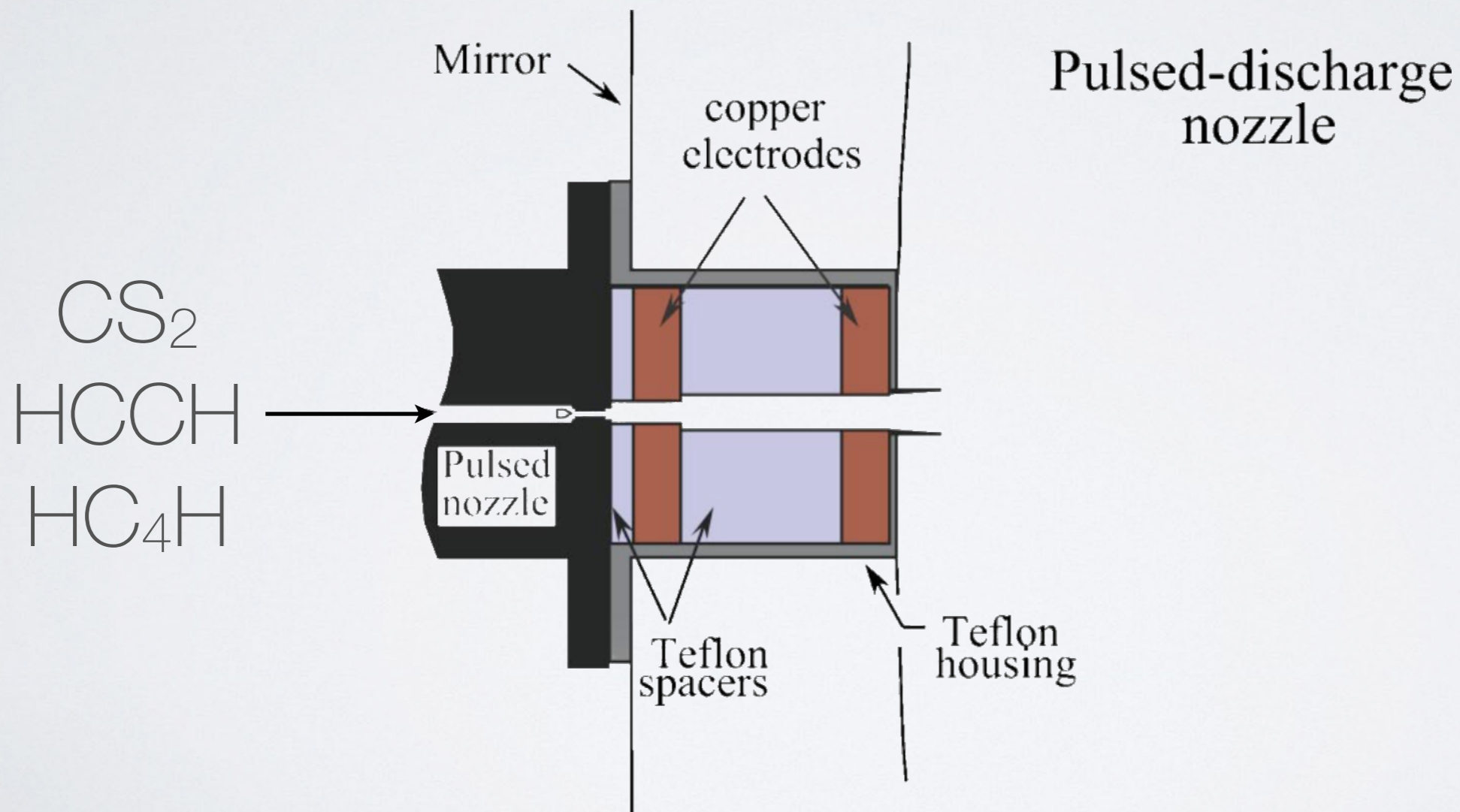
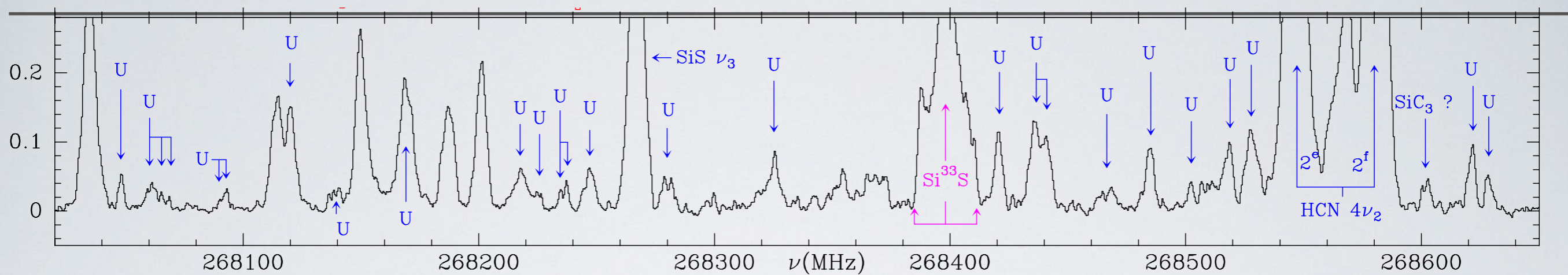
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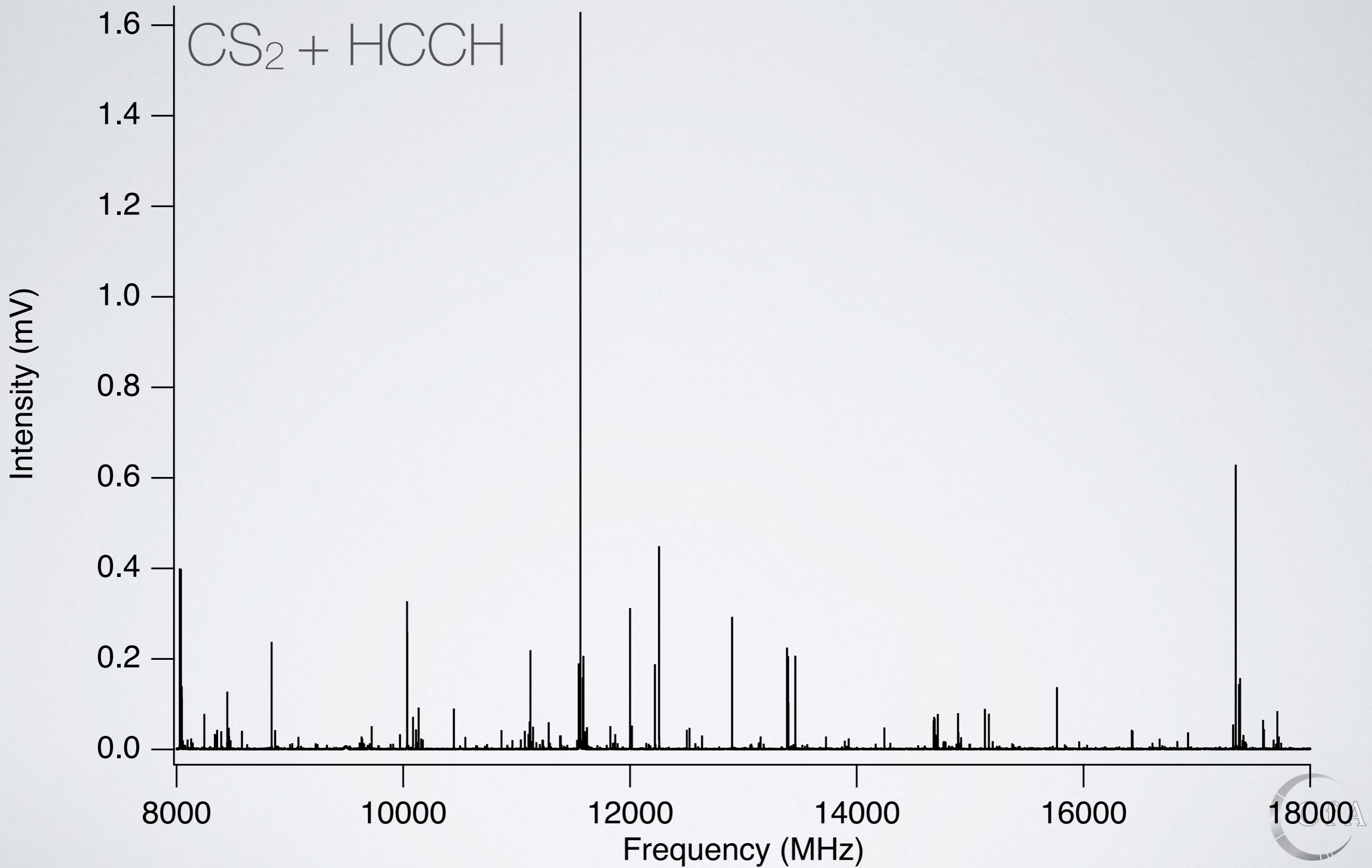
C. R. MASSON AND T. G. PHILLIPS

Department of Physics, California Institute of Technology

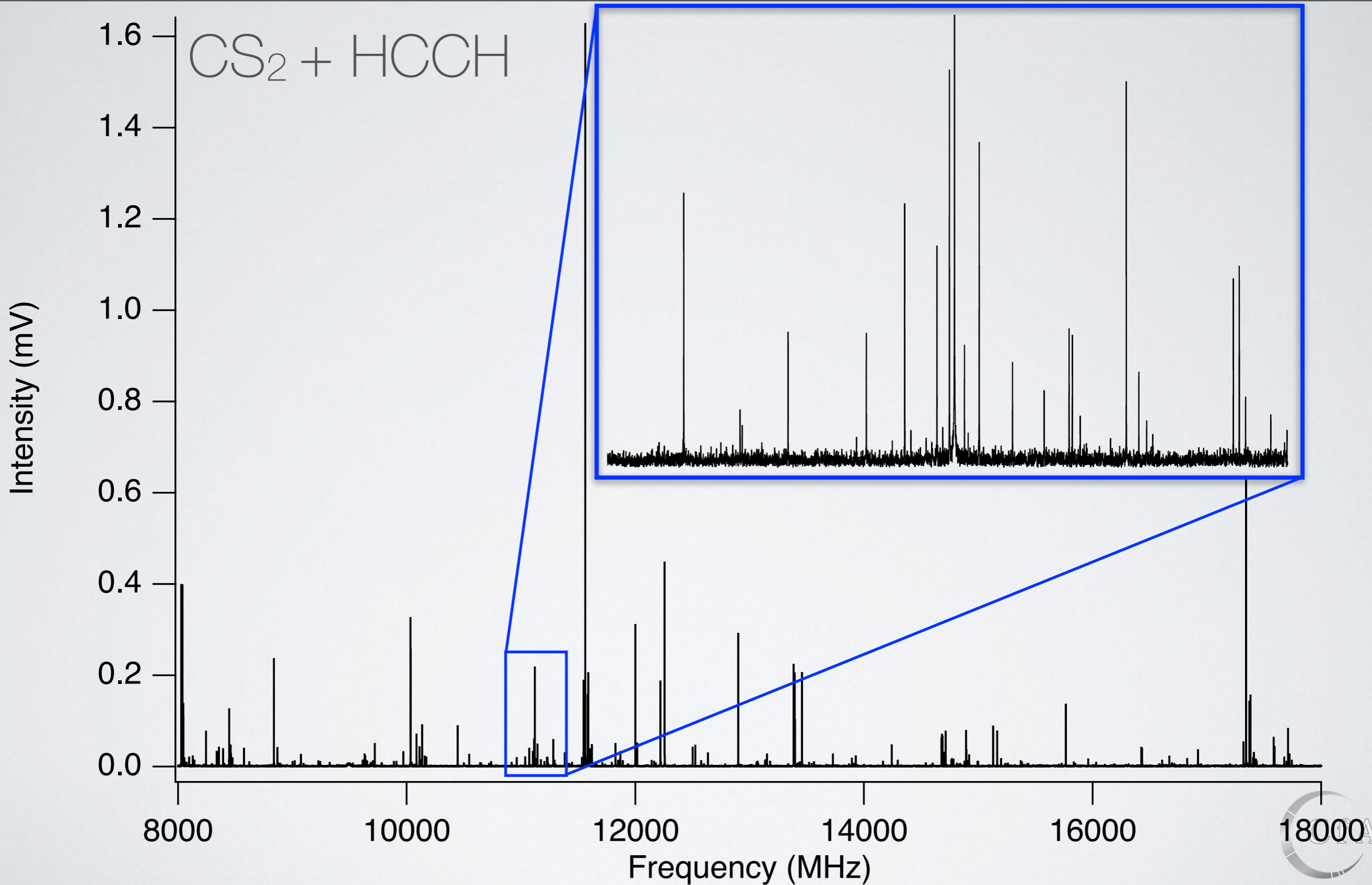
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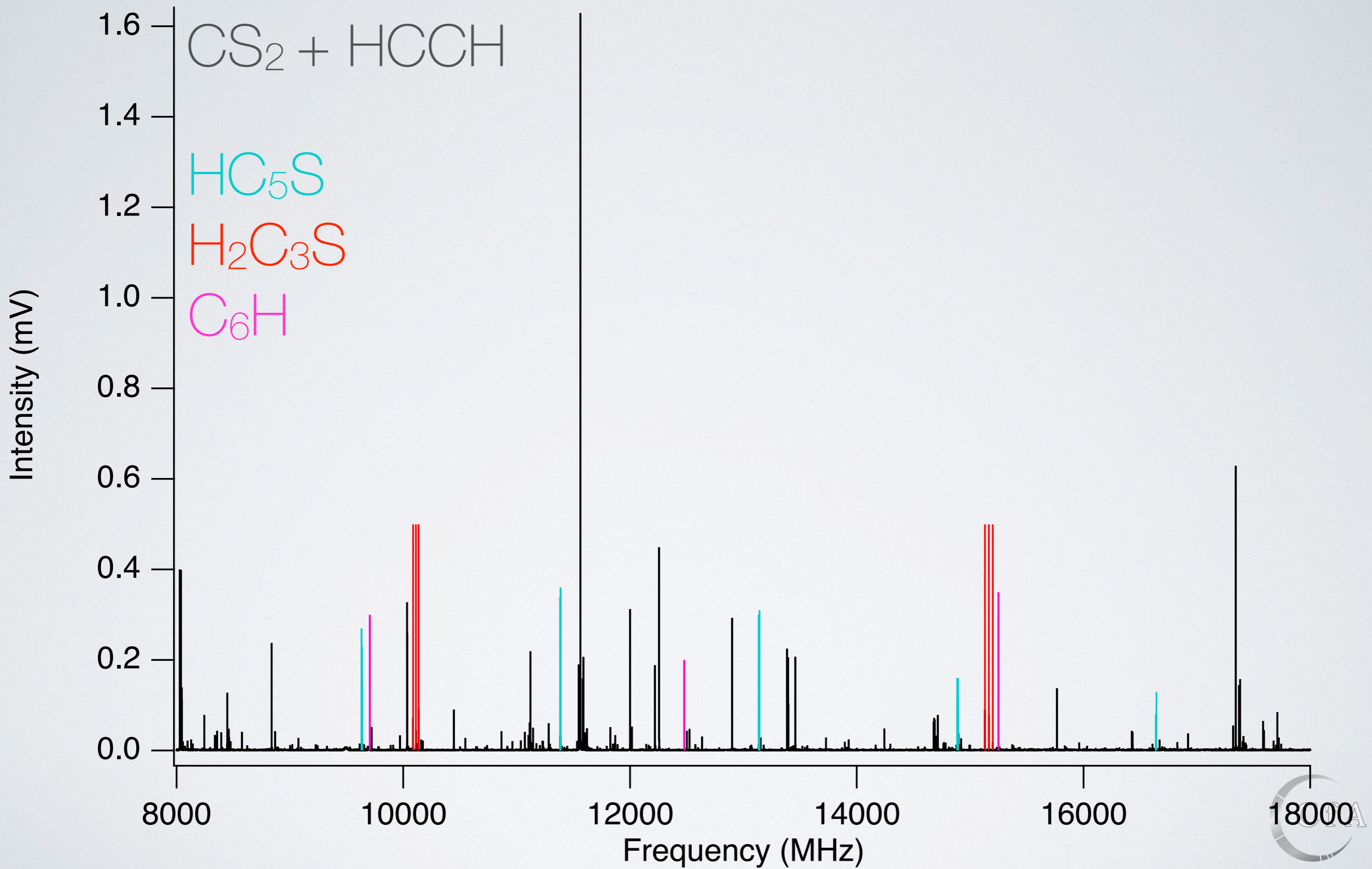






CS₂ + HCCH





THE JOURNAL OF CHEMICAL PHYSICS **144**, 124201 (2016)

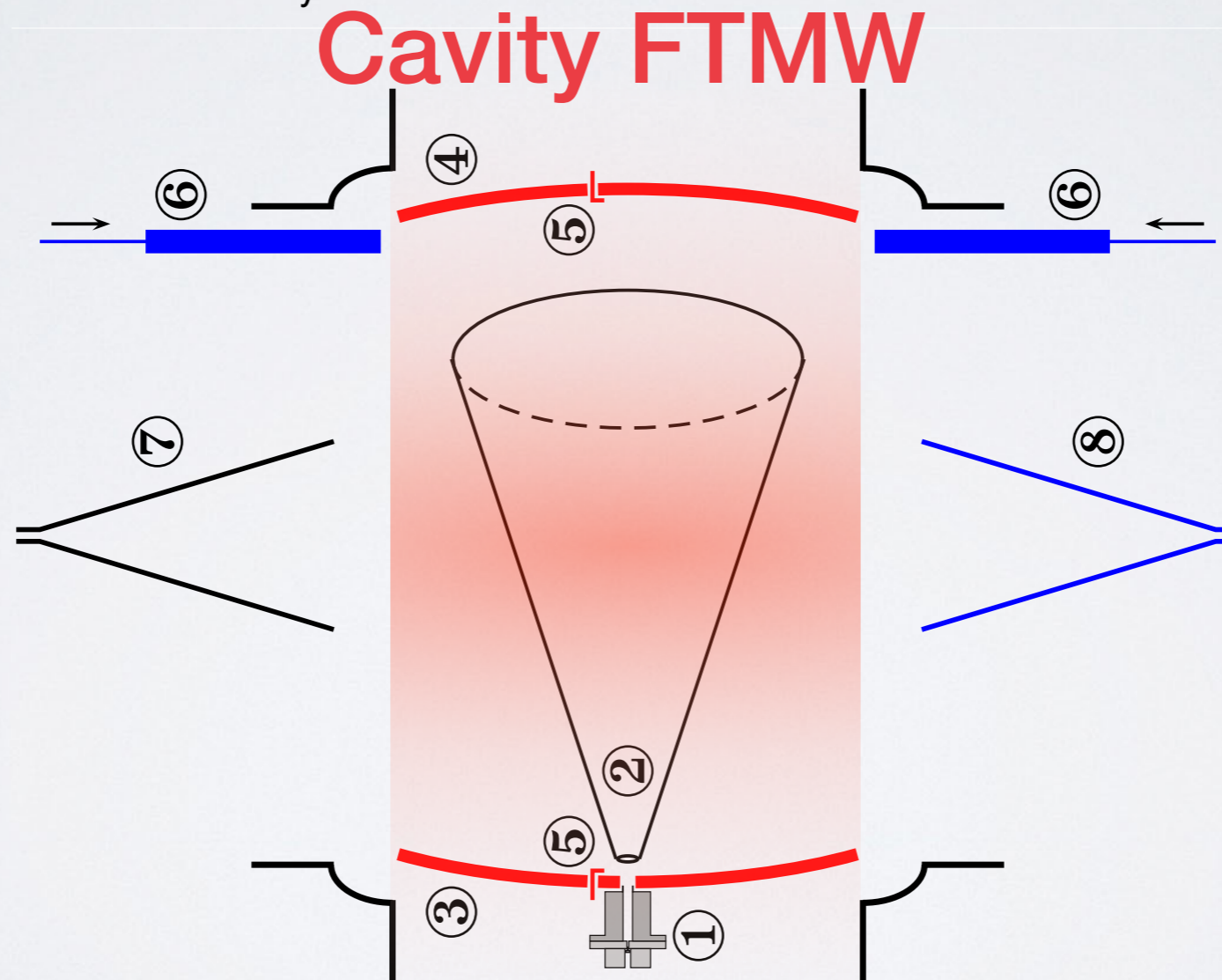
Microwave spectral taxonomy: A semi-automated combination of chirped-pulse and cavity Fourier-transform microwave spectroscopy

Kyle N. Crabtree,¹ Marie-Aline Martin-Drumel,² Gordon G. Brown,³ Sydney A. Gaster,³ Taylor M. Hall,³ and Michael C. McCarthy^{2,a)}

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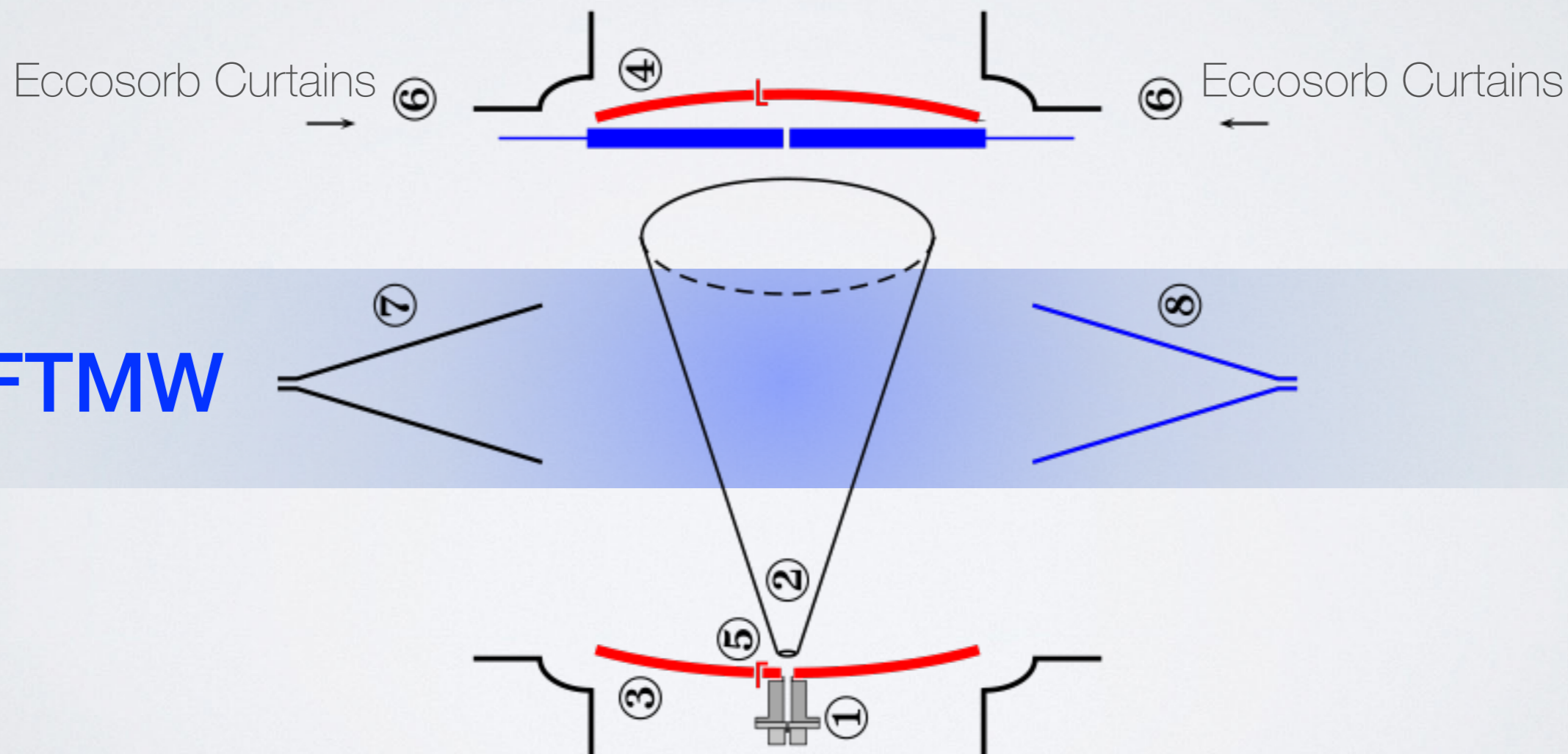
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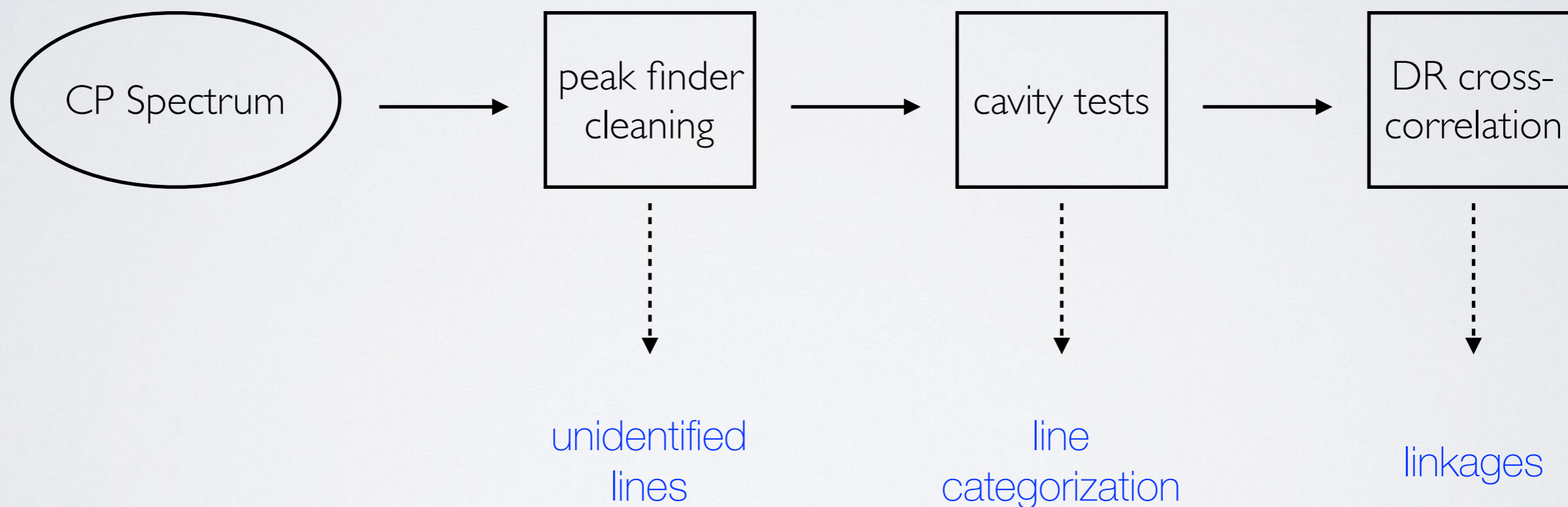


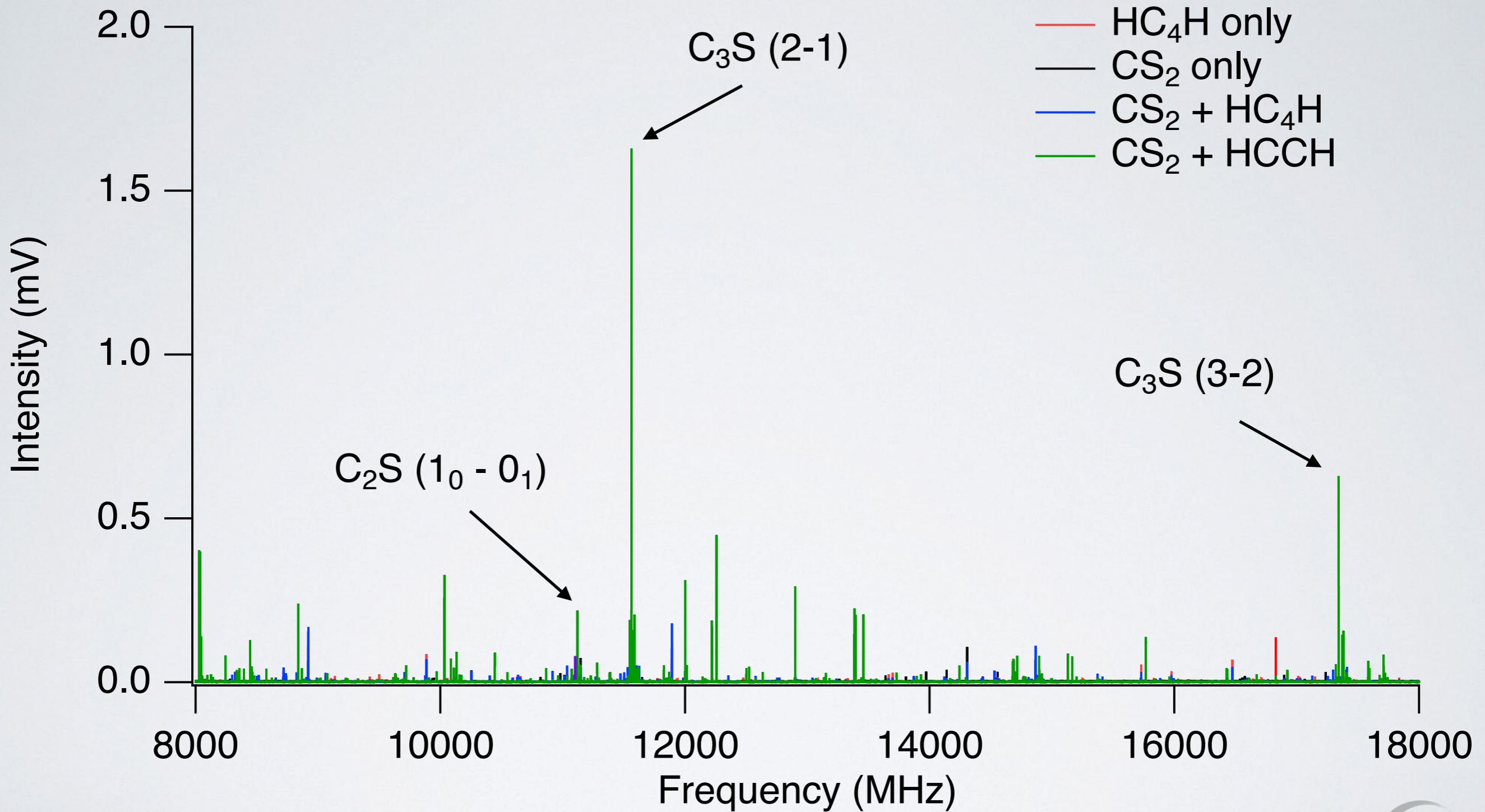
CP-FTMW

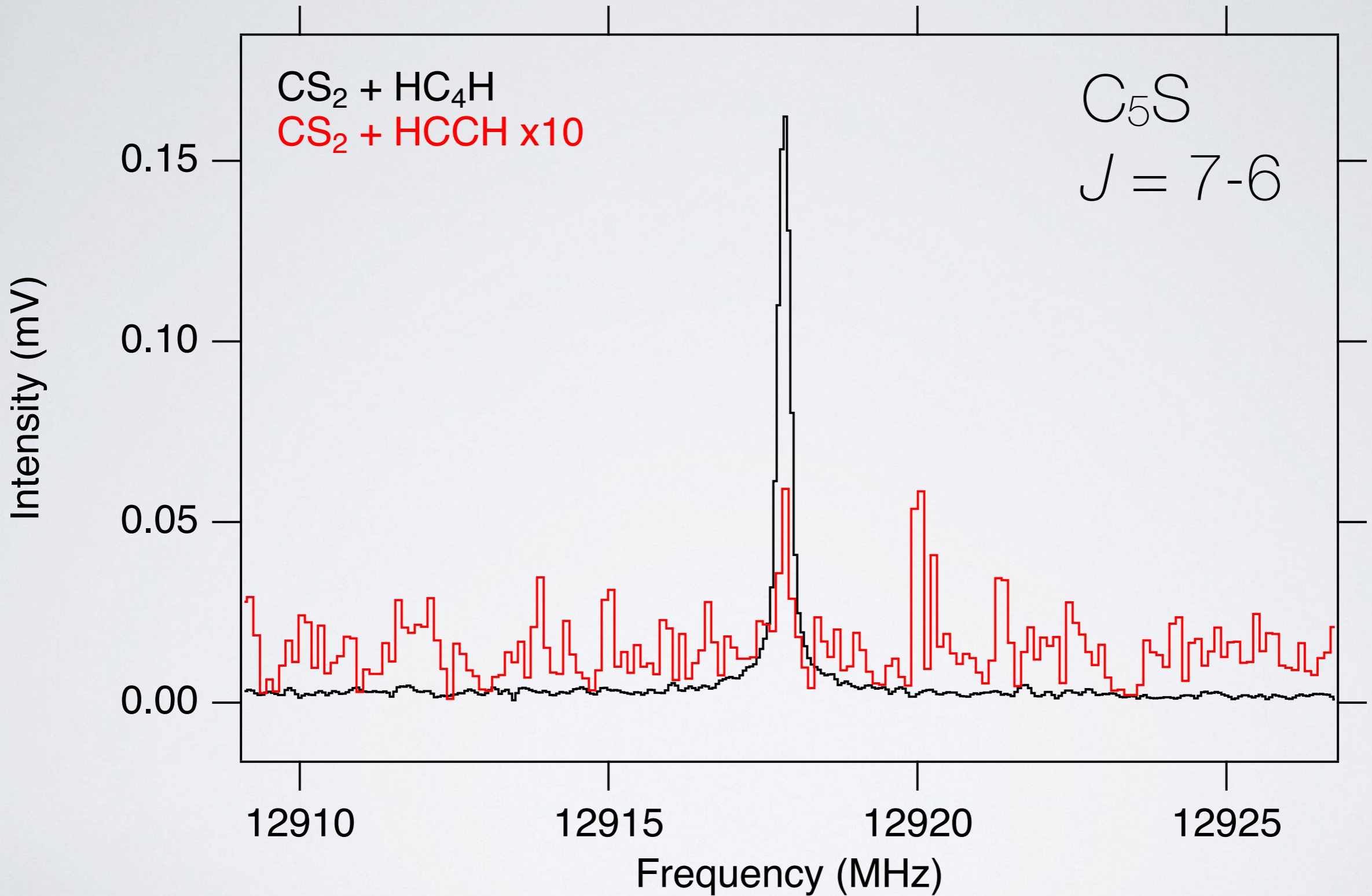
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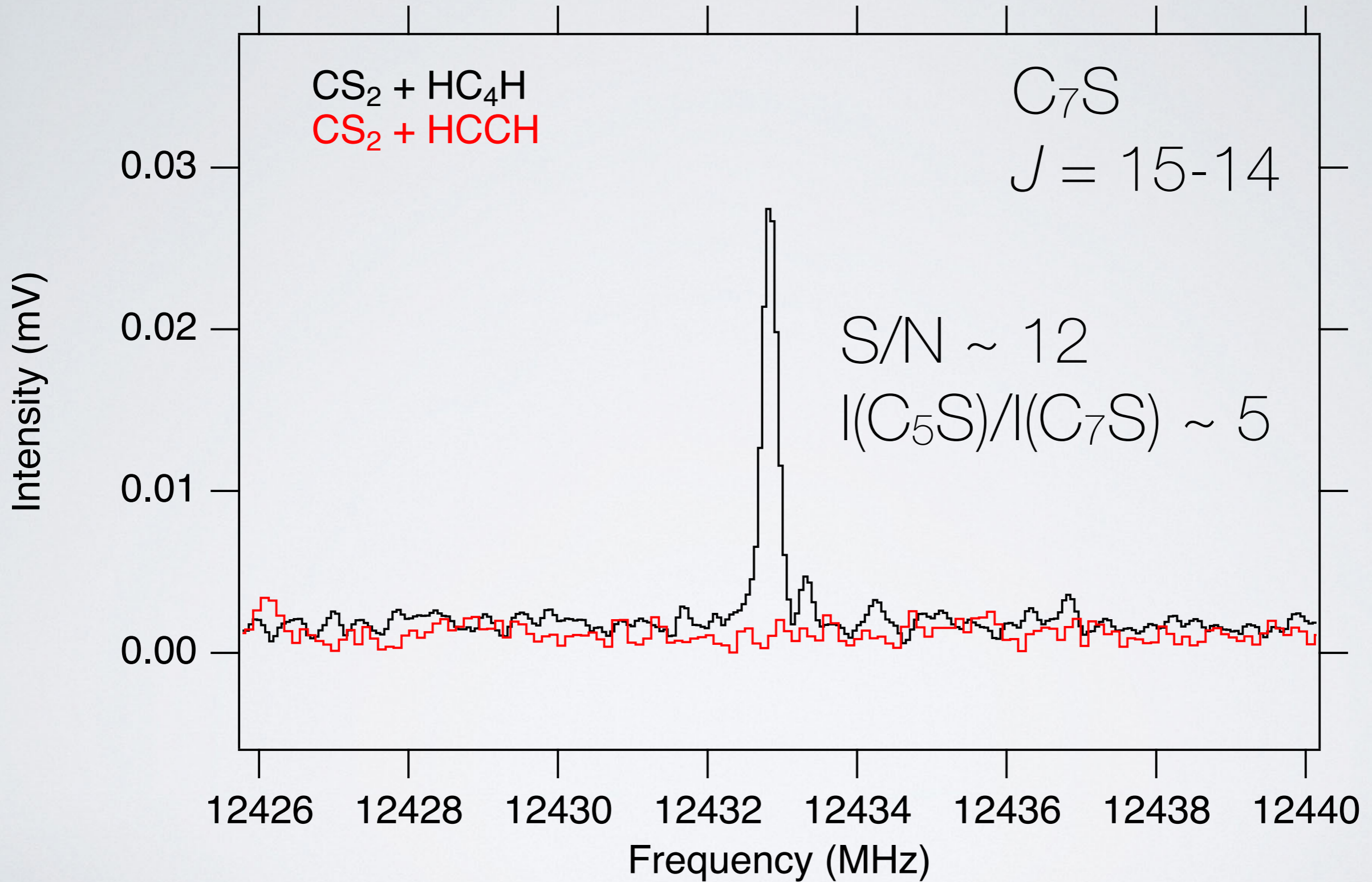
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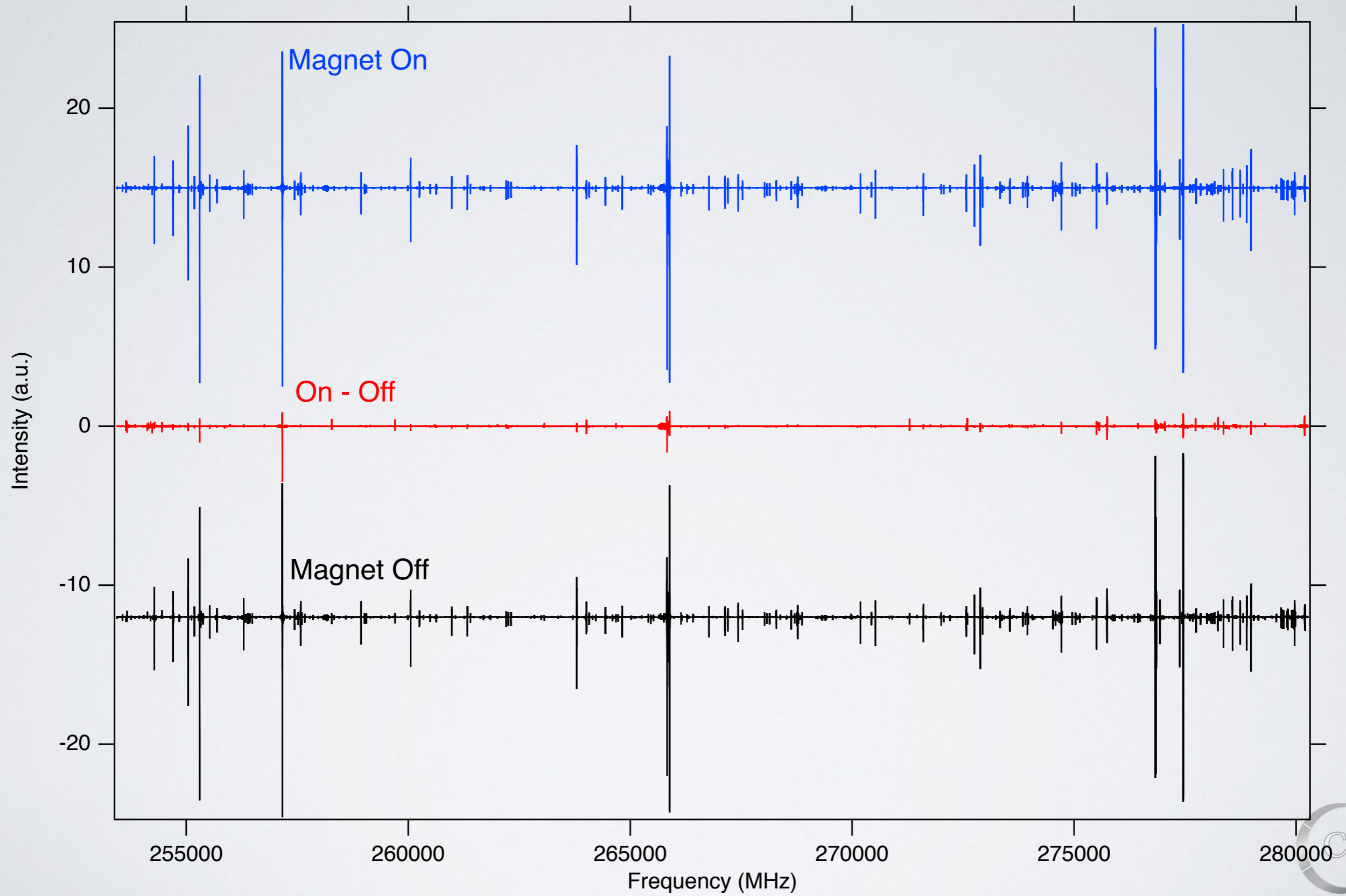
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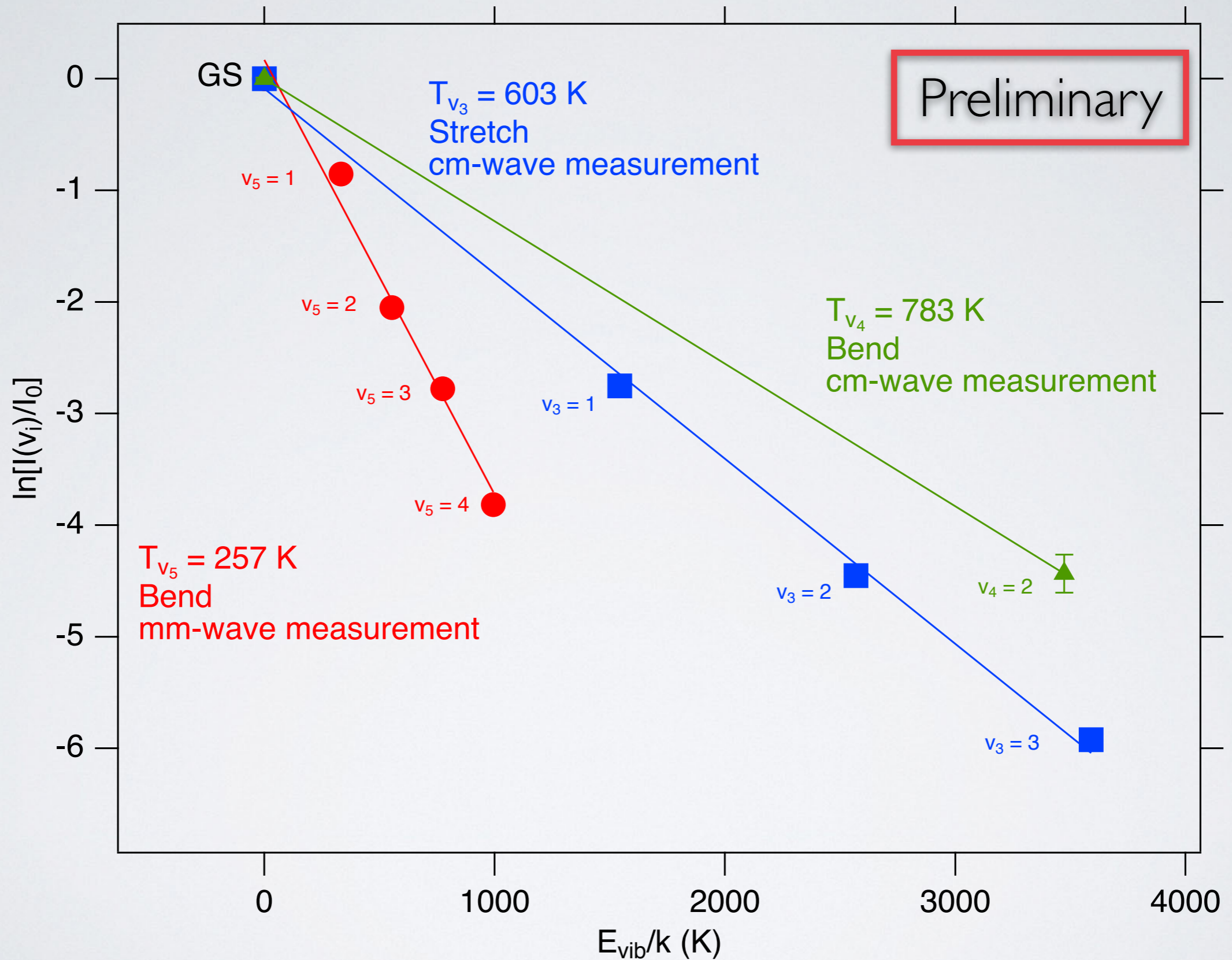


	cm-wave	mm-wave	new
CCS	✓	✓	
CCS v_1	✓	✓	✓
CCS v_2	✓	✓	✓
CCS v_3			

Evidence for : $2v_1$, $v_1 + v_2$, v_3 in cm-wave

	cm-wave	mm-wave	new
CCCS	✓	✓	
CCCS (1-4)v ₃	✓	✓	✓
CCCS v ₄		✓	
CCCS 2v ₄	✓	✓	✓
CCCS v ₅	✓	✓	
CCCS (2-4)v ₅		✓	

Evidence for : 5v₃, 6v₃, v₂, 2v₂ in cm-wave



Non-Detections

Quantitative Search

PRIMOS, Belloche IRAM 30m, HEXOS

Upper Limits (10^{13} cm^{-2})

T (K)	CCS v ₂	CCS v ₁	C ₃ S v ₃	C ₃ S 2v ₄	C ₃ S 1v ₅
100	15.5	15.7	4.2	4.1	8.1
150	21.1	21.5	5.2	5.1	10.1
200	26.2	27.1	6.3	6.2	12.3

CCS: 20 K, $8.3 \times 10^{13} \text{ cm}^{-2}$

C₃S: Present, but strange

Qualitative Search

TMC-1 (9 - 50 GHz)

Kaifu et al. (2004)

IRC+10216 (18 - 26 GHz)

Gong et al. (2015)

IRC+10216 (215 - 285 GHz)

Tenenbaum et al. (2010)

Orion KL (HEXOS)

Crockett et al. (2014)



Half a Decade of ALMA: Cosmic Dawns Transformed

20-23 September 2016, Indian Wells, CA (near Palm Springs)

To register and submit an abstract (now open!) visit: <http://go.nrao.edu/ALMA5years>

Invited Talks & Speakers

Galaxy Formation and Evolution I: Cosmic Evolution (Caitlin Casey)

Galaxy Formation and Evolution II: Gas & Star Formation Properties (Linda Tacconi)

Galactic Centers: Star Formation, AGN, Black Holes & ULIRGs (Masatoshi Imanishi)

Nearby Galaxies I: Normal Galaxies (Karin Sandstrom)

Nearby Galaxies II: Starburst & Super Star Clusters (Kazushi Sakamoto)

Massive Star Formation (Jill Rathborne)

Low Mass Star Formation (Adele Plunkett)

Chemical Evolution During Star and Planet Formation (Jeong-Eun Lee)

Protostellar Disks & Planet Formation (Laura Perez)

Debris Disks (Brenda Matthews)

Stars and Stellar Evolution (Leen Decin)

Solar System (Arielle Moullet)

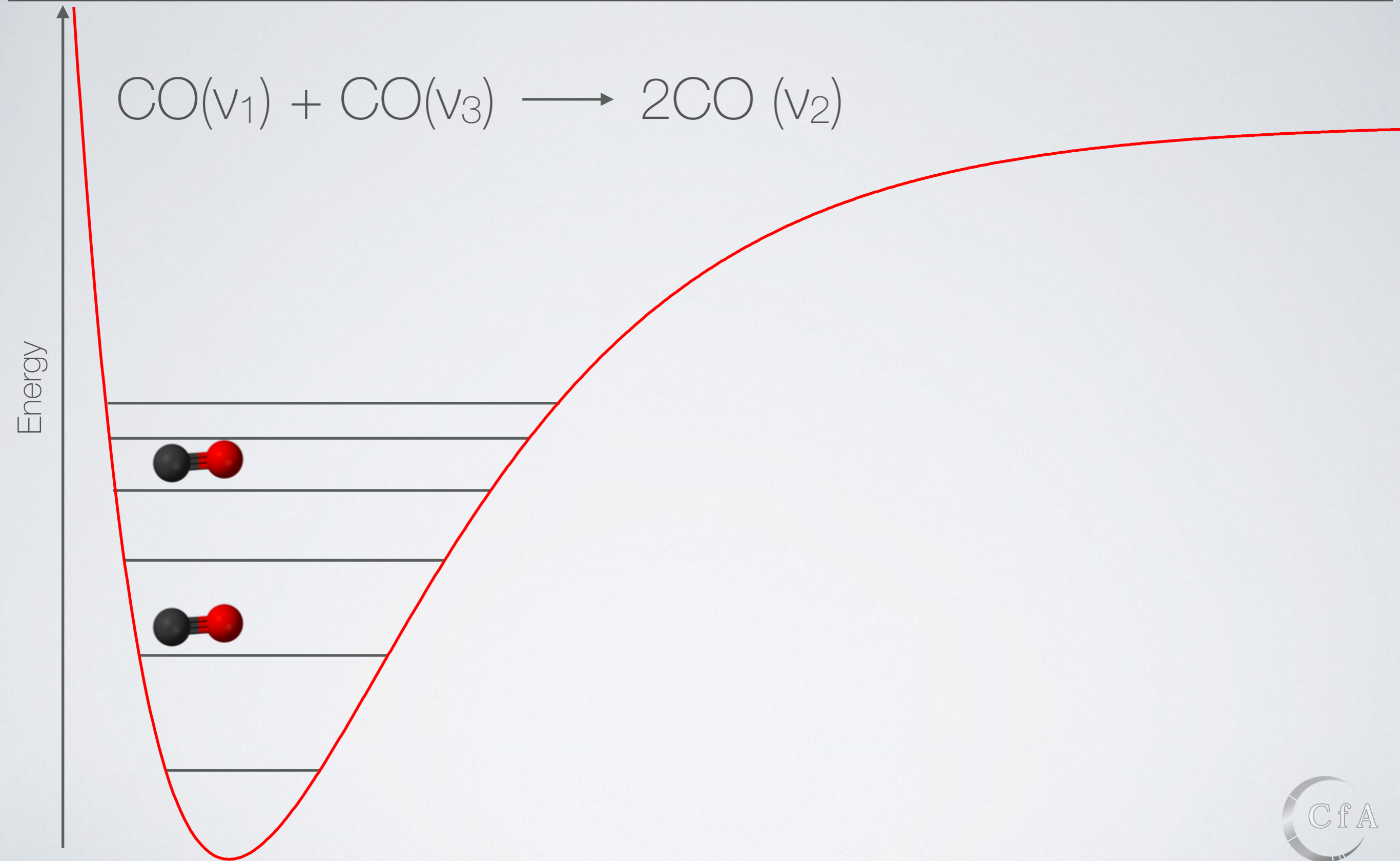
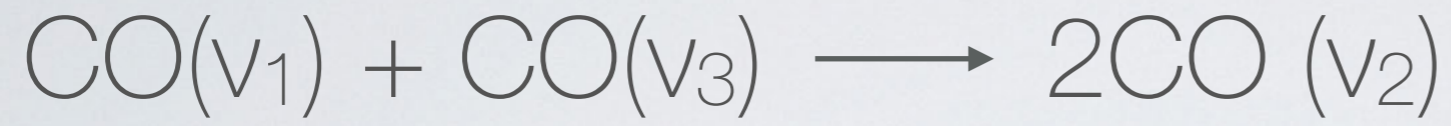
Synergy between ALMA and JWST (Klaus Pontoppidan)

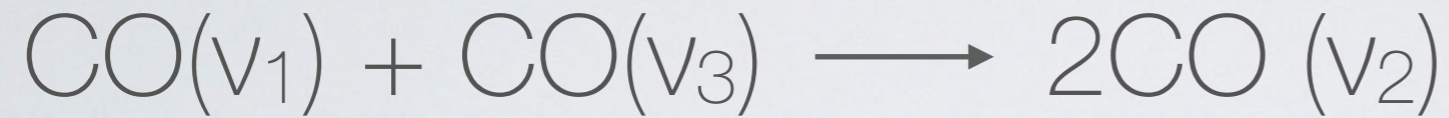
ALMA after 5 Years (Pierre Cox)

Future ALMA (John Carpenter, Al Wootten, Neal Evans)

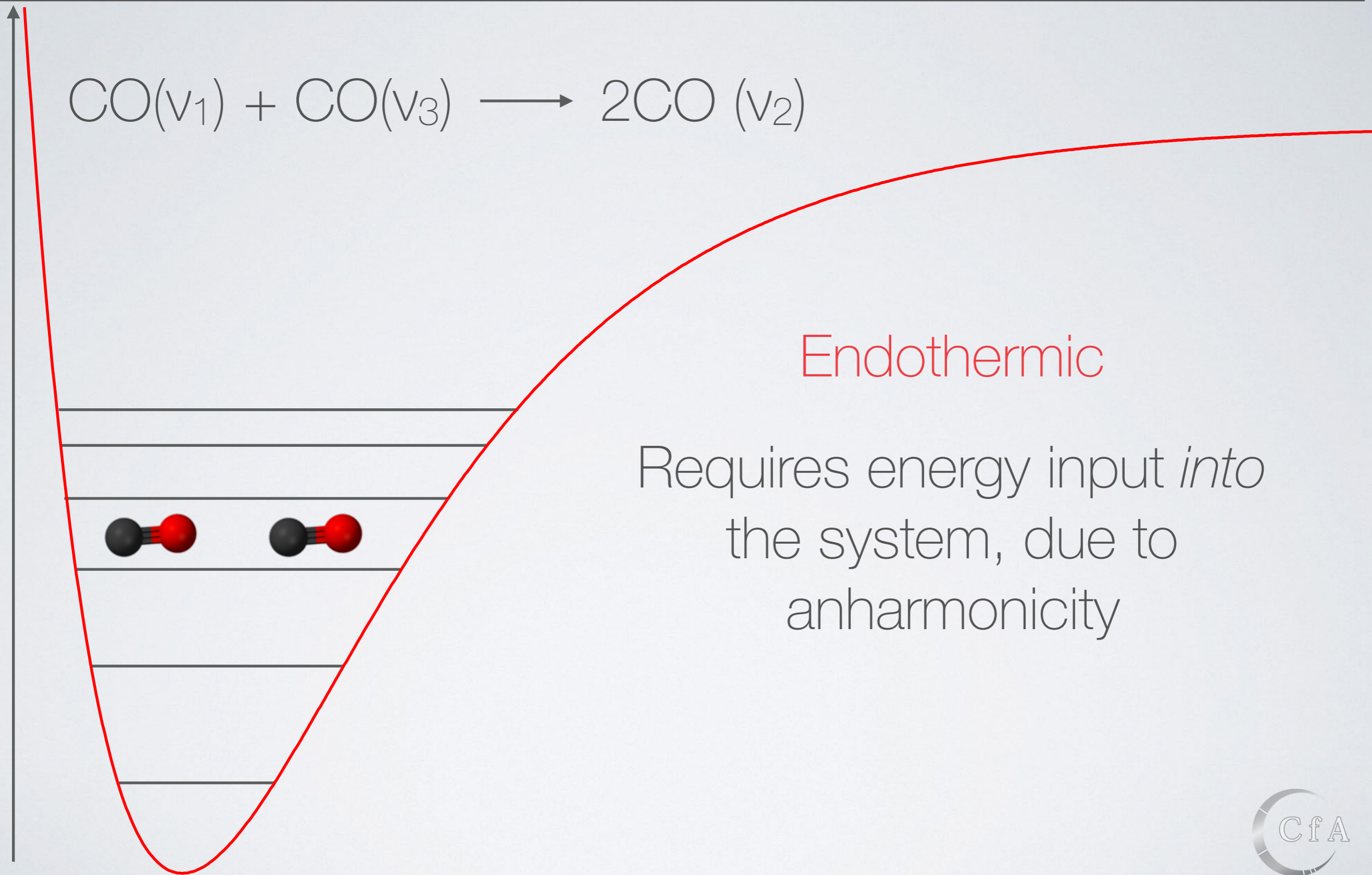
Conference Summary (Anneila Sargent)





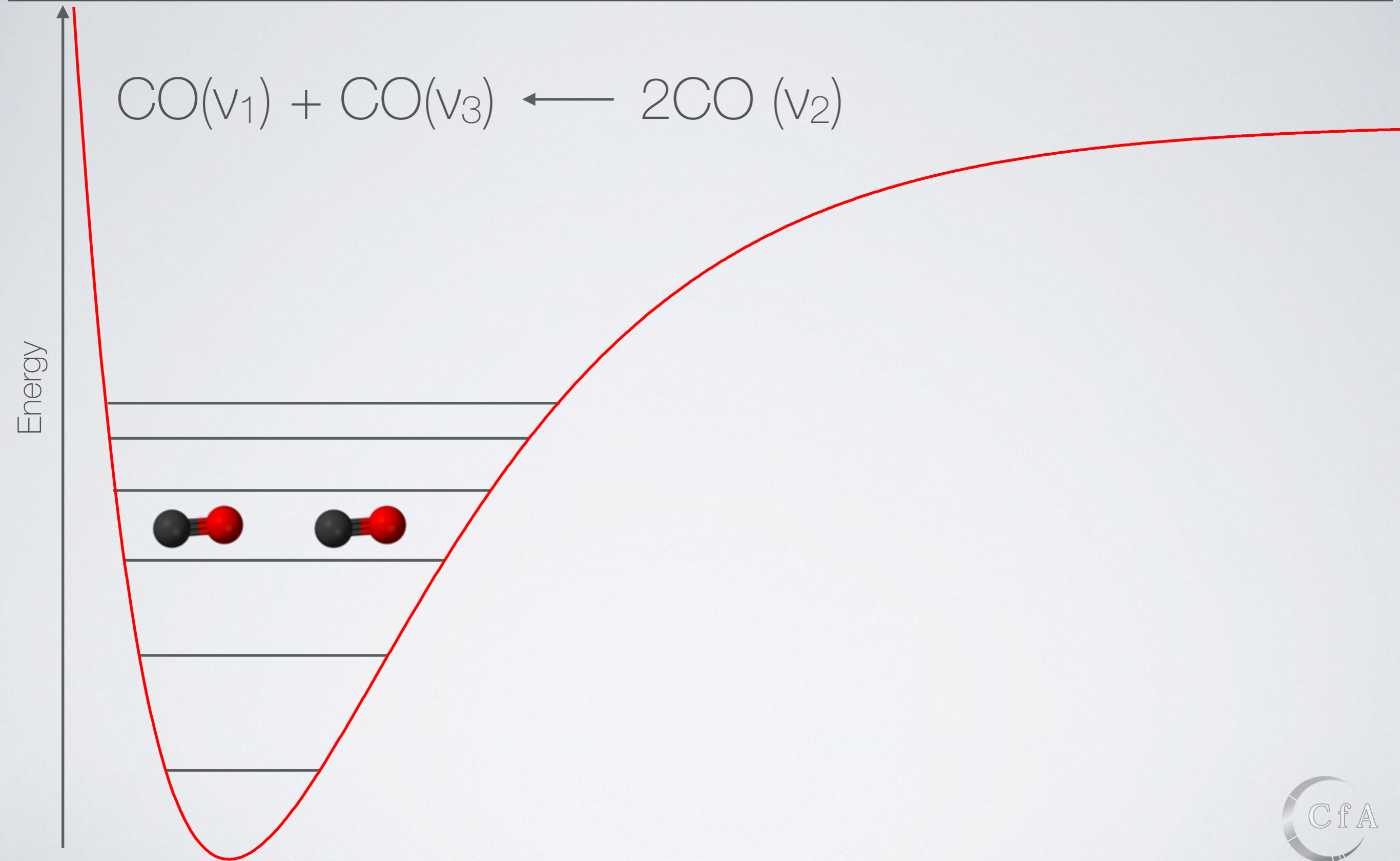
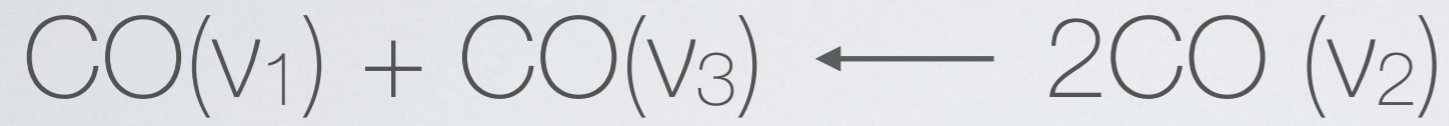


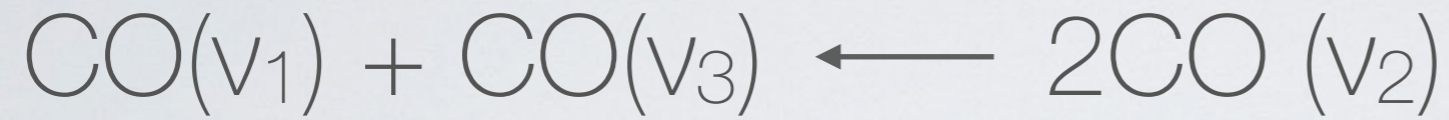
Energy



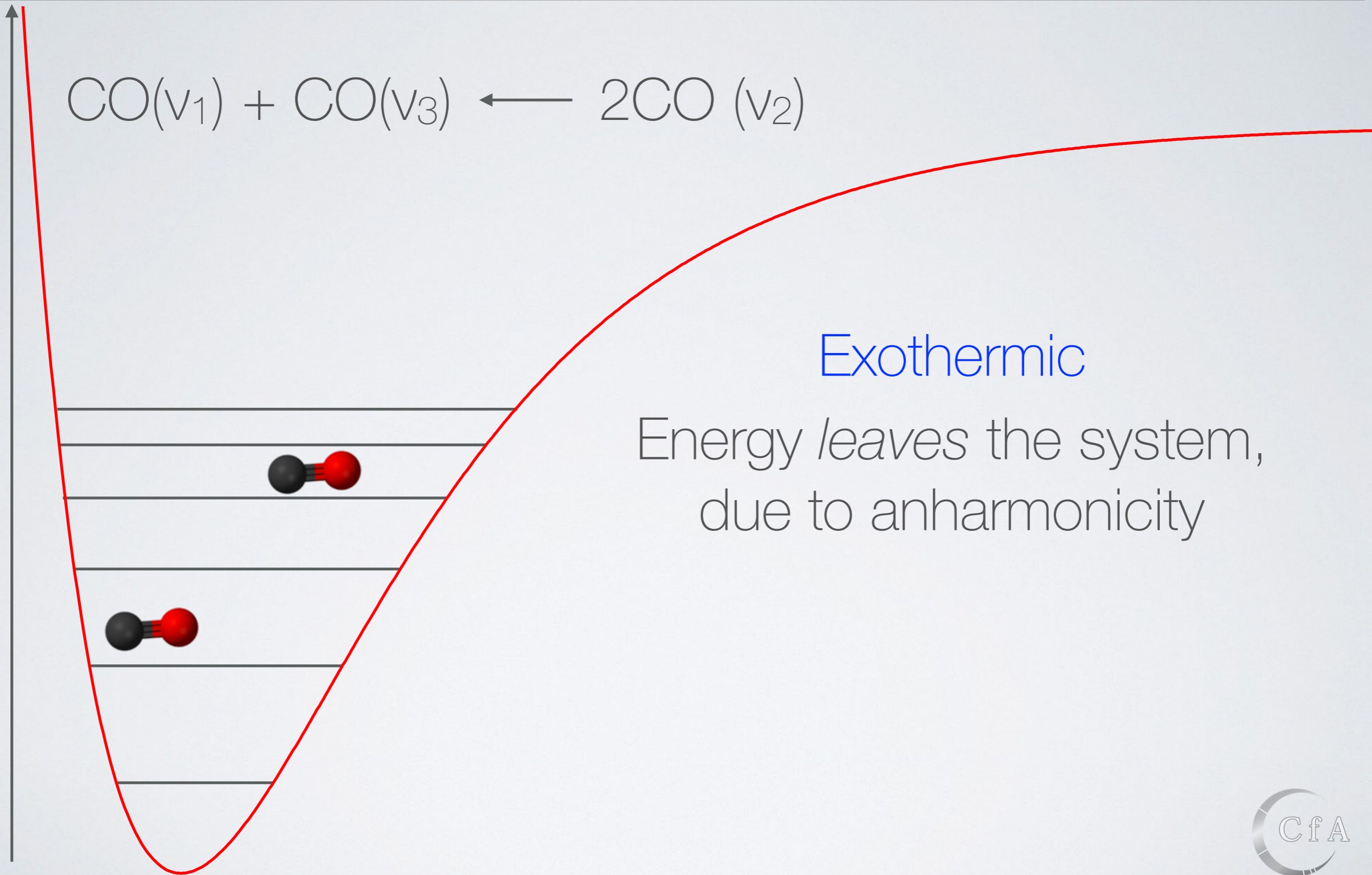
Endothermic

Requires energy input *into* the system, due to anharmonicity



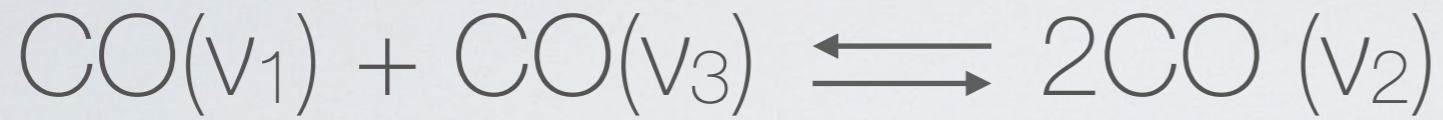


Energy

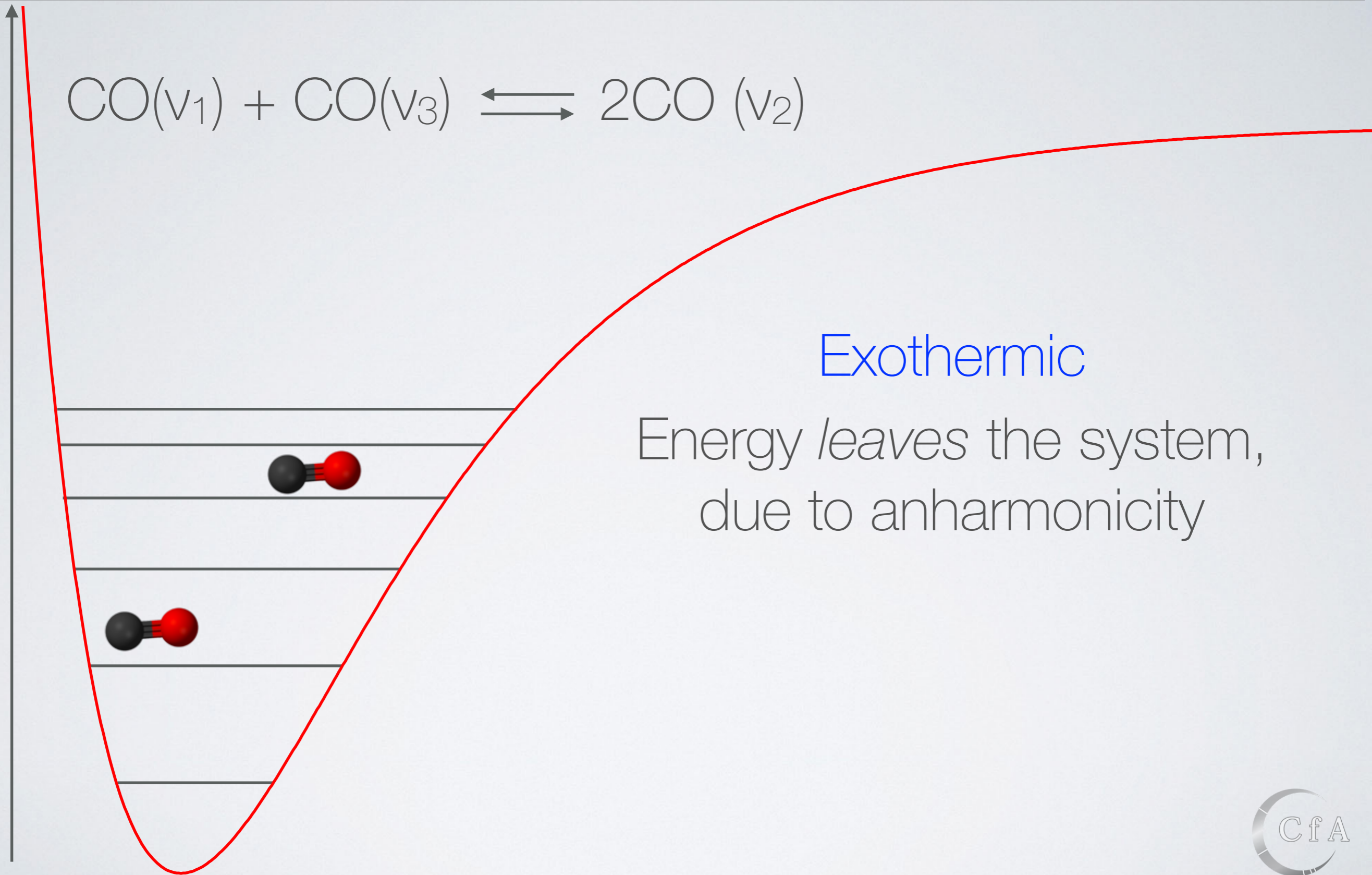


Exothermic

Energy *leaves* the system,
due to anharmonicity



Energy



Exothermic

Energy *leaves* the system,
due to anharmonicity