Project S6 – Italian strong motion data base (1972-2004)

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TASK 1 - Deliverable 1

Data base structure

By

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1. INTRODUCTION

The Italian strong motion data base (Italian Strong Motion Data Base) is a joint product of the agreement between the *Dipartimento della Protezione Civile – Ufficio Valutazione Prevenzione e Mitigazione del Rischio Sismico ed Attività ed Opere Post-Emergenza* (Department of Civil Protection – Evaluation, Prevention and Mitigation of Seismic Risck and Post-Emergency Works) and the *Istituto Nazionale di Geofisica e Vulcanologia* (National Institute of Geophysics and Volcanology). The data base is handled through two different relational data base management system: Ms Access® 2003, of major use among research institutions and public administrations, for CD-ROM release, and MySQL for the web distribution. The selection of the former product is driven by the simplicity of the software, the worldwide diffusion and the possibility of being linked to software's for the management of spatial data, such as ESRI ArcGis® and Arcview®, and software for the scientific calculation such as Matlab ®. The data base will store the information regarding the seismic events, the recording stations, the installed instruments, the main features of the recordings and the engineering parameters. The structure is based on a previous version of the Italian strong-motion data base created by ENEA in collaboration with Department of Civil Protection, which stores the information regarding the accelerometric recordings in the time span 1972-1993.
This manuscript will explain the structure of the tables containing the information, the data base architecture, the relationships existing among tables and the technical features for data input.

2. TECHNICAL REQUIREMENTS FOR WAVEFORM STORAGE

2.1 RULES FOR FILES NAMING

The file name should make easier the data retrieval based on date, time, station name and component through simple OS commands. It should be therefore composed by:

YYYYYMMDD + _ + HHMMSS + NETWORK CODE + _ + STATION CODE + COMP ONENT+ PROCESSING FLAG . FORMAT

for a total length of 33 characters. The single segments are described in Table 1.

Example: the acceleration recorded by the *Department of Civil Protection network* (ITDPC) at *S. Giuliano di Puglia scuola* (SGIB), NS component, on 2002/11/12 at 09:27:00 GMT, unprocessed, ASCII format with header, will have the following name:

20021112_092700ITDPC_SGIB_NSX.DAT

Table 1: description of the segments forming the file name.

SEGMENT	DESCRIPTION	LENGTH	REQUIREMENTS
YYYYMMDD_HHMMSS	Origin time	15	The origin time of the selected localisation. When no events are listed in seismic catalogues, it is assumed the record start time
NETCODE	Network code	5	If the Network code has less than 5 characters, the rest is replaced by one or more underscores
STACODE	Station code	5	If the station code has less than 5 characters, the rest is replaced by one or more underscores
COMP	Component of the motion	2	*NS* = north-south *WE* = east-west *UP* = vertical *FC* = fixed trace
CORRECTION_FLAG	This flag specifies whether or not the record has been processed	1	*C* = processed *X* = unprocessed
FORMAT	Flag indicating the format type	4	*SAC* = acceleration (SAC format) *DAT* = acceleration (ASCII with header) *ASC* = acceleration (ASCII-XY) *VEL* = velocity (ASCII with header) *DIS* = displacement (ASCII with header) SPE = 5% damped acceleration response spectrum (ASCII-XY with header)

2.2 RECORD HEADER

The ASCII-with-header records (acceleration, velocity, displacement or acceleration response spectrum) will be characterised by a header of 43 rows, containing the following information, in order to make the record self-consistent:

1. Name of the seismic event
2. GMT event date (YYYYMMDD)
3. GMT event origin time (hhmmss)
4. Event Latitude (decimal degrees)
5. Event Longitude (decimal degrees)
6. Event depth (km)
7. Local magnitude Ml
8. Surface wave magnitude Ms
9. Moment magnitude Mw
10. Focal mechanism
11. Station code
12. Station name
13. Station Latitude (decimal degrees)
14. Station Longitude (decimal degrees)
15. Station elevation (m.a.s.l.)
16. Geotechnical classification (EC8)
17. Morphologic classification
18. Epicentral distance (km)
19. Earthquake backazimuth
20. Time (GMT) of the first sample (hhmmss.dec)
21. Sampling interval (s)
22. Number of points
23. Duration (s)
24. Component (NS, WE, UP, FC)
25. Units (cm/s^2, cm/s, cm, cm/s^2)
26. Instrument type
27. Instrument Frequency (Hz)
28. Instrument Damping
29. Sensitivity (cm/g, V/g)
30. Fullscale (g)
31. Number of bits of the Analog to Digital Converter
32. Pga, Pgv, Pgd (cm/s^2, cm/s, cm)
33. Time corresponding to the Pga, Pgv, Pgd
34. Owner of the record
35. Epicentral intensity
36. Baseline correction (REMOVED/NOT REMOVED)
37. Filter type (Butterworth, Cosine, ……)
38. Filter order
39. LP1 (low-cut frequency)

40. LP2 (roll-on frequency)
41. HP1 (roll-off frequency)
42. HP2 (high-cut frequency)
43. Data type (unprocessed acceleration, processed acceleration, velocity, displacement, acceleration response spectrum)

The SAC files are stored in binary format, with little-endian byte order, to be used with Linux OS.
The binary SAC format contains a fixed length header section followed by one or two data sections. The header contains floating point, integer, logical, and character fields. Details on the SAC header are defined at http://www.llnl.gov/sac/.
Some of the 43 row ASCII header metadata were stored in the unused spaces of the SAC header.

In particular the instrument characteristics were stored in the floating point part of the header (numbers refer to the position inside the header):

#22 instrument frequency
#23 instrument damping
#24 instrument sensitivity
#25 instrument full scale
#41 low pass frequency 1
#42 low pass frequency 2
#43 high pass frequency 1
#44 high pass frequency 2
#67 epicentral macroseismic intensity
#68 surface wave magnitude
#69 local magnitude
#70 moment magnitude

In the integer part of the header the following information has been stored (numbers refer to the position inside the header):

#26 number of bit of ADC
#27 1 = BASELINE REMOVED, 0 = BASELINE NOT REMOVED
#28 1 = BUTTERWORTH, 0 = COSINE filter
#29 1 = PROCESSED ACCELERATION, 0 = UN PROCESSED ACCELERATION

The instrument type information, contained in the character header KINST, is stored as DIGITAL or ANALOG, due to the limitation to 8 characters.

3. DATA BASE TABLES

In order to store the information and reduce the data redundancy, the following tables have been created:

1. *Channel* (recording channel)
2. *Dispersion_curve* (dispersion curve description for the recording site)
3. *Dispersion curve_values* (values of the dispersion curve)
4. *Events* (seismic events)
5. *Fdt* (transfer function description for the recording site)
6. *Fdt_values* (transfer function values)
7. *Generic_instr* (characteristic of the instrument)*Magnitude* (magnitude)
8. *Installation* (instrument installation description)
9. *Instrument* (instrument description)
10. *Log_Cu_layer* (log undrained cohesion)
11. *Log_geotec* (master table of the geotechnical-geophysical data)
12. *Log_nspt_layer* (log standard penetration test)
13. *Log_vs_layer* (log wave velocity)
14. *Magnitude* (magnitude values)
15. *Mag_type* (magnitude type description)
16. *Municipality* (list of the Italian municipality)
17. *Nation* (list of the countries)
18. *Networks* (networks description)
19. *Owners* (record owner description)
20. *Pole* (pole and zeros of the instrument)
21. *Province* (list of the Italian districts)
22. *Reference* (references)
23. *Region* (list of the Italian regions)
24. *Station* (recording sites)
25. *Stratigraphy* (master table of the stratigraphy of the recording site)
26. *Stratigraphy_layer* (stratigraphy of the recording site)
27. *Waveform* (unprocessed and processed record parameters)
28. *d_coordinate_ sources* (sources of coordinates)
29. *d_dispersion_curve_method* (description of the methods used to estimate the dispersion curve)
30. *d_EC8* (EC8 classification description)
31. *d_EC8_estimate* (type of estimation of EC8 code)
32. *d_FDT_type* (site transfer function typology)
33. *d_flag_digit* (digitalization type description)
34. *d_fm_method* (focal mechanism determination)
35. *d_fm_type* (type of focal mechanism)
36. *d_housing* (housing of the instrument)
37. *d_instrument_type* (instrument type description)
38. *d_lithography* (description of the lithotechnical units)
39. *d_located* (flag indicating located/not located)

40. *d_mag_method* (magnitude calculation description)
41. *d_morph_code* (morphology description)
42. *d_orientation* (sensor orientation description)
43. *d_permanent_flag* (station typology description)
44. *d_pole_type* (pole/zero description)
45. *d_projection* (cartographic projection description)
46. *d_proximity_flag* (proximity to building description)
47. *d_units_sensitivity* (units used for instrument sensitivity)
48. d_yes_no (logical fields)

3.1 DESCRIPTION OF THE SEISMIC EVENTS

General description

Table name: EVENTS

FIELD	LENG	TYPE	N.DEC	NOTE
EV_TIME	19	Varchar(19)		YYYY-MM-DD hh:mm:ss date and time of the event (GMT)
EVENT_NAME	100	Varchar(100)		Event name
NATION_CODE	3	Long		UN country code
REGION_CODE	2	Long		Link to table *REGION*
PROVINCE_CODE	3	Long		Link to table *PROVINCE*
COMUNE_CODE	6	Long		Link to table *MUNICIPALITY*
LATITUDE	9	Decimal(9,4)	4	Event latitude in decimal degrees (N of equator)
ERR_LAT	9	Decimal (9,4)	4	Latitude error (in km)
LONGITUDE	9	Decimal (9,4)	4	Event longitude in decimal degrees East of Greenwich meridian
ERR_LON	9	Decimal (9,4)	4	Longitude error (in km)
DEPTH_M	8	Decimal (8,3)	3	Hypocentral depth (km)
ERR_DEPTH	8	Decimal (8,3)	3	Depth error (in km)
HYP_REFERENCE	6	Long		link to table *REFERENCE*
OTHER_HYPOCENTER		MEMO		Other hypocentral estimation
I0	4	Decimal (4,1)	1	Epicentral intensity
I0_REFERENCE	6	Long		link to table *REFERENCE*
OTHER_I0		MEMO		Other intensity estimations
FM_METHOD_CODE	5	Varchar(5)		Method for focal mechanism assessment
FM_TYPE_CODE	2	Varchar(2)		Focal mechanism type

FM_REFERENCE	6	Long		link to table *REFERENCE*
FAULT_FLAG		Long		Flag indicating fault geometry availability *1* = available *0* = not available
STRIKE	6	Decimal(6,1)	1	Angle between the N direction and the projection of the fault surface, measured clockwise
DIP	6	Decimal(6,1)	1	Angle between the fault surface and the horizontal
RAKE	6	Decimal(6,1)	1	Angle of the hanging wall slip-vector measured in the fault plane (between -180 and 180 decimal degrees)
FAULT_REFERENCE	6	Long		Link to table *REFERENCE*
LOCATED		Varchar(5)		Flag indicating the location
SURFACE_FLAG	1	Long		Flag of surface faulting 1= true *0* = false
OTHER_FAULTS		MEMO		Other fault surface assessments

Magnitude

Table name: MAGNITUDE

FIELD	LENG	TYPE	N.DEC	NOTE
EVENT_CODE	6	Long		Event code
MAG_TYPE_CODE	20	Varchar(20)		Link to table *MAG_TYPE*
MAG_VALUE	4	Decimal(4,1)	1	Magnitude value
ERR_MAG	4	Decimal(4,1)	1	Error in the magnitude determination
METHOD_CODE	16	Varchar(16)		Link to a detailed description of the evaluation method
REFERENCE_CODE	6	Long		Link to table *REFERENCE*

Table name: MAG_TYPE

FIELD	LENG	TYPE	N.DEC	NOTE
MAG_TYPE_CODE	6	Varchar(6)		Magnitude type
DESCRIPTION	64	Varchar(64)		classical brief definition (e.g. Ml: local magnitude)

Table name: D_MAG_METHOD

FIELD	LENG	TYPE	N.DEC	NOTE
METHOD_CODE	16	Varchar(16)		Magnitude code
DESCRIPTION	64	Varchar(64)		Brief description
LONG_DESCRIPTION		MEMO		Detailed description of the method (if known, includes also the institution)

Focal mechanisms

Table name: *D_FM_TYPE*

FIELD	LENG	TYPE	N.DEC	NOTE
FM_TYPE_CODE	2	Varchar(2)		Focal mechanism code
DESCRIPTION	100	Varchar(100)		Description of the focal mechanism type

Table name: *D_FM_METHOD*

FIELD	LENG	TYPE	N.DEC	NOTE
FM_METHOD_CODE	5	Varchar(5)		Code of the method used for estimating the focal mechanism
DESCRIPTION	100	Varchar(100)		Description of the method used for estimating the focal mechanism

3.2 RECORDING SITE CHARACTERISTICS

General description

Table name: STATION

FIELD	LENG	TYPE	N.DEC	NOTE
STATION_CODE	5	Varchar(5)		Site code
NET_CODE	2	Varchar(2)		Link to table *NETWORK*
NATION_CODE	3	Varchar(3)		UN country code
COMUNE_CODE	6	Varchar(6)		ISTAT municipality code
PROVINCE_CODE	3	Varchar(3)		ISTAT district code
REGION CODE	3	Varchar(3)		ISTAT region code
INST_CODE	5	Varchar(5)		Link to table *D_INSTALLATION_TYPE*
EC8_CODE	2	Varchar(2)		Link to table *D_EC8*
EC8_ESTIMATE_CODE	10	Varchar(10)		Method of EC8 class estimate. Link to table *D_EC8_ESTIMATE*
f0	9	Decimal(9,5)		Fundamental frequency
DC_CODE	5	Long		Link to table *D_DISPERSION_CURVE*
MORPH_CODE	2	Varchar(2)		Link to table *MORPH_CODE*
STATION_NAME	100	Varchar(100)		Extended name of the station (generally it coincides with the locality in which the station is installed)
LATITUDE	9	Decimal (9,5)	5	Latitude N from the Equator (decimal degrees)
LONGITUDE	9	Decimal(9,5)	5	Longitude E from the zero meridian (decimal degrees)
COORDINATE_REFERENCE_CODE	10	Long		Reference to coordinates
PROJECTION_CODE	10	CHAR(10)		Cartographic projection code
ALLEGATO		Varchar(255)		Link to external documents
ALTITUDE	6	Long		Elevation (m.a.s.l.)

HORIZ_ERR	6	Long		Expected error on the horizontal coordinates (m)
FOGLIO_100MILA_IGM	64	Varchar(64)		1:100.000 IGM sheet
IGM_TABLE	16	Varchar(16)		Frame
IGM_ORIENTATION	32	Varchar(32)		Orientation
START_TIME	19	Varchar(19)		Installation date (YYYY-MM-DD hh:mm:ss)
END_TIME	19	Varchar(19)		Removal date (YYYY-MM-DD hh:mm:ss)
ADDRESS	255	Varchar(255)		Site address
PERMANENT_FLAG	1	Long		Purpose of the installation *1* = permanent *0* = temporary *999* = no information
PROXIMITY_FLAG	1	Long		Flag of proximity to buildings 1 = close to buildings 0 = far from buildings 999 = no information
HOUSING_CODE	10	Varchar(10)		Link to table *D_HOUSING*
IMG1		IMMAGINE		Link to station report
OWNER_CODE	10	Long		Link to table *OWNER*
FDT_CODE	6	Long		Link to table *FDT*
LOCATION_ REFERENCE_CODE	6	Long		Link to table *REFERENCE*
NOTE		MEMO		Notable data from other sources

Networks

Table name: NETWORKS

FIELD	LENG	TYPE	N.DEC	NOTE
NET_CODE	2	Varchar(2)		Univocal Network code
NET_NAME	50	Varchar(50)		Network name
OWNER_CODE	10	Long		Link to table *OWNER*
START_TIME	19	Varchar(19)		Date of opening of the Network (YYYY-MM-DD hh:mm:ss)
END_TIME	19	Varchar(19)		Date of closing of the Network (YYYY-MM-DD hh:mm:ss)
MIN_LAT	9	Decimal(9,5)	5	Minimum latitude covered by the net

MAX_LAT	9	Decimal(9,5)	5	Maximum latitude covered by the net
MIN_LON	9	Decimal(9,5)	5	Minimum longitude covered by the net
MAX_LON	9	Decimal(9,5)	5	Maximum longitude covered by the net

Installation typology

Table name: INSTALLATION

FIELD	LENG	TYPE	N.DEC	NOTE
INST_CODE	5	Varchar(5)		Installation type code
DESCRIPTION	255	Varchar(255)		Description of the installation type

It contains the information on the installation type. Typical record will be:
P, pillar
PS, floor of the structure
T, directly on the ground

Table name: D_HOUSING

FIELD	LENG	TYPE	N.DEC	NOTE
HOUSING_CODE	10	Varchar(10)		Housing Code
DESCRIPTION	255	Varchar(255)		Housing description

Notes:

DAM = Dam
BUI = building
BRI = bridge
BOX = BOX
CAB = ENEL BOX
HIS = Historical building
CAV = Cave

Soil class description according to the European code (EC8)

Table name: D_EC8

FIELD	LENG	TYPE	N.DEC	NOTE
EC8_CODE	2	Varchar(2)		EC8 code
EC8_DESC	255	Varchar(255)		Soil description

EC8 soil classes:

A = Rock or other rock-like geological formation, including at most 5 m of weaker material at the surface (Vs_{30} > 800 m/s)
B = Deposits of very dense sand, gravel, or very stiff clay, at least several tens of m in thickness, characterised by a gradual increase of mechanical properties with depth (Vs_{30} = 360 – 800 m/s; NSPT > 50; cu > 250 kPa)
C = Deep deposits of dense or medium dense sand, gravel or stiff clay with thickness from several tens to many hundreds of m (Vs_{30} = 180 – 360 m/s; NSPT = 15 – 50; cu = 70 – 250 kPa)
D = Deposits of loose-to-medium cohesionless soil (with or without some soft cohesive layers), or of predominantly soft-to-firm cohesive soil (Vs_{30} < 180; NSPT < 15; cu < 70 kPa)
E = A soil profile consisting of a surface alluvium layer with Vs values of type C or D and thickness varying between about 5m and 20m, underlain by stiffer material with (Vs > 800 m/s)
S1 = Deposits consisting – or containing a layer at least 10m thick – of soft clays/silts with high plasticity index (PI > 40) and high water content (Vs_{30} < 100; cu = 10 – 20 kPa)
S2 = Deposits of liquefiable soils, of sensitive clays, or any other soil profile not included in types A – E or S1

Table name: D_EC8_ESTIMATE

FIELD	LENG	TYPE	N.DEC	NOTE
EC8_ESTIMATE_CODE	10	Varchar(10)		EC8 estimation code
EC8_ESTIMATE_DESC	255	Varchar(255)		Description of the method used to assign EC8 code

CH = from cross-hole measurement
DH = from Downhole measurement
SASW = from SASW measurement
REMI = from Refraction Microtremors test
EST = qualitative estimate
LITO = from stratigraphy
SPT = from Standard Penetration Test
Cu = from undrained cohesion test
REFR = from seismic refraction measurement
REFL = from seismic reflexion measurement

Morphology description

Table name: D_MORPH_CODE

FIELD	LENG	TYPE	N.DEC	NOTE
MORPH_CODE	2	Varchar(2)		Morphology Code
DESCRIPTION	255	Varchar(255)		Morphology description

Note:

C = crest
P = slope
V = valley
VE = peak
SE = saddle
PI = plain

Site stratigraphy

Table name: STRATIGRAPHY

FIELD	LENG	TYPE	N.DEC	NOTE
NET_CODE	2	Varchar(2)		Link to table NETWORKS
STATION_CODE	5	Varchar(5)		Link to table *STATION*
STRATIGRAPHY_CODE	6	Long		Stratigraphy code
LATITUDE	9	Decimal(9,5)	5	Latitude of the survey point
LONGITUDE	9	Decimal(9,5)	5	Longitude of the survey point
PROJECTION_CODE	10	Varchar(10)		Cartographic projection code
ELEVATION	6	Decimal(6,1)	1	Elevation of the reference point (m.a.s.l.)
REFERENCE_CODE	6	Long		Link to table *REFERENCE*

Table name: STRATIGRAPHY_LAYER

FIELD	LENG	TYPE	N.DEC	NOTE
STRATIGRAPHY_CODE	6	Long		Link to table *STRATIGRAPHY*
NET_CODE	2	Varchar(2)		Univocal Network code
STATION_CODE	5	Varchar(5)		Link to table *STATION*
LITHOGRAPHY_CODE	5	Varchar(5)		Link to table *LITOGRAPHY*
SEQUENCE NUMBER	3	Long		Progressive number of the layer
TOP	6	Decimal(6,1)	1	Top of the layer (meters from the ground level)
BOTTOM	6	Decimal(6,1)	1	Base of the layer (meters from the ground level)
DESCRIPTION	255	Varchar(255)		Layer description

Table name: D_LITHOGRAPHY

FIELD	LENG	TYPE	N.DEC	NOTE
LITHOGRAPHY_CODE	5	Varchar(5)		Code of the lithography class
DESCRIPTION	255	Varchar(255)		Description of the lithography class

Velocity profile and geotechnical parameters

Table name: LOG_GEOTEC

FIELD	LENG	TYPE	N.DEC	NOTE
NET_CODE	2	Long		Network code
STATION_CODE	5	Varchar(5)		Link to table *STATION*
LOG_GEOTEC_CODE	6	Long		Geotechnical log code
LATITUDE	9	Decimal(9,5)	5	Latitude of the survey point
LONGITUDE	9	Decimal(9,5)	5	Longitude of the survey point
PROJECTION_CODE	10	Varchar(10)		Cartographic projection code
ELEVATION	9	Decimal(9,5)	5	Elevation of the reference point (m.a.s.l.)
REFERENCE_CODE	6	Long		Link to table *REFERENCE*

Table name: LOG_VS_LAYER

FIELD	LENG	TYPE	N.DEC	NOTE
LOG_VS_LAYER_CODE	6	Long		Log code
LOG_GEOTEC_CODE	6	Long		Link to table *LOG_GEOTEC*
STATION_CODE	5	Varchar(5)		Link to table *STATION*
NET_CODE	2	Varchar(2)		Network code
TOP	6	Decimal(6,1)	1	Upper bound (meters from the ground level)
BOTTOM	6	Decimal(6,1)	1	Lower bound (meters from the ground level)
VS	6	Decimal(6,2)	2	Shear-wave velocity value (m/s)
VP	6	Decimal(6,2)	2	Longitudinal-wave velocity value (m/s)

Table name: LOG_NSPT_LAYER

FIELD	LENG	TYPE	N.DEC	NOTE
LOG_NSPT_LAYER_CODE	6	Long		Log code
LOG_GEOTEC_CODE	6	Long		Link to table *LOG_GEOTEC*
NET_CODE	2	Varchar(2)		Network code
STATION_CODE	5	Varchar(5)		Link to table *STATION*
TOP	6	Decimal(6,1)	1	Upper bound (meters from the ground level)
BOTTOM	6	Decimal(6,1)	1	Lower bound (meters from the ground level)
NSPT	4	Long		NSPT value

Table name: LOG_Cu_LAYER

FIELD	LENG	TYPE	N.DEC	NOTE
LOG_CU_LAYER_CODE	6	Long		Univocal Log code
LOG_GEOTEC_CODE	6	Long		Link to table *LOG_GEOTEC*
NET_CODE	2	Varchar(2)		Network code
STATION_CODE	5	Varchar(5)		Link to table *STATION*
TOP	6	Decimal(6,1)	1	Upper bound (meters from the ground level)
BOTTOM	6	Decimal(6,1)	1	Lower bound (meters from the ground level)
Cu	6	Decimal(6,1)		Cohesion (undrained shear strength) value (kPa)

Site transfer function

Table name: FDT

FIELD	LENG	TYPE	N.DEC	NOTE
NET_CODE	2	Varchar(2)		Network code
STATION_CODE	5	Varchar(5)		Link to table *STATION*
FDT_TYPE_CODE	7	Varchar(7)		Link to table *FDT_TYPE*
REFERENCE_CODE	6	Long		Link to table *REFERENCE*

Table name: FDT_VALUES

FIELD	LENG	TYPE	N.DEC	NOTE
NET_CODE	2	Varchar(2)		Network code
STATION_CODE	5	Varchar(5)		Link to table *STATION*
FDT_TYPE_CODE	7	Varchar(7)		Link to table *FDT_TYPE*
FDT_SEQUENCE	5	I		
FREQ	6	Decimal (6,1)	1	Frequency
AMPLITUDE	6	Decimal (6,1)	1	Transfer function amplitude
STD	6	Decimal (6,1)	1	Standard deviation

Table name: D_FDT_TYPE

FIELD	LENG	TYPE	N.DEC	NOTE
FDT_TYPE_CODE	7	Varchar(7)		Type of FDT determination: *GIT* = generalized inversion *NHVSR* = H/V from microtremors *SMHVSR* = H/V from strong motions *WMHVSR* = H/V from weak motions WMSSR = standard spectral ratio from weak motion *SMSSR* = standard spectral ratio from strong motion *1DMOD* = 1D model *2DMOD* = 2D model
DESCRIPTION		MEMO		Description of the method

Dispersion curve

Table name: DISPERSION_CURVE

FIELD	LENG	TYPE	N.DEC	NOTE
DC_CODE	6	Long		Univocal dispersion curve code
NET_CODE	2	Varchar(2)		Network code
STATION_CODE	5	Varchar(5)		Link to table *STATION*
DC_METHOD_CODE	5	Varchar(5)		Link to table *DC_METHOD*
REFERENCE	6	Long		Link to table *REFERENCE*

Table name: DISPERSION_CURVE_VALUES

FIELD	LENG	TYPE	N.DEC	NOTE
DC_CODE	6	Long		Univocal dispersion curve code
NET_CODE	2	Varchar(2)		Network code
STATION_CODE	5	Varchar(5)		Link to table *STATION*
DISPERSION_CURVE_SEQUENCE				
FREQ	6	Decimal (6,1)	1	Frequency
PHASE_VEL	6	Decimal (6,1)	1	Phase velocity

Table name: D_DISPERSION_CURVE_METHOD

FIELD	LENG	TYPE	N.DEC	NOTE
DC_METHOD_CODE	5	Varchar(5)		Code of the method used for the determination of the dispersion curve
DESCRIPTION	255	Varchar(255)		Description

SPAC = Spatial autocorrelation
F_K = Frequency-wavenumber

Dictionary tables

Table name: D_PERMANENT_FLAG

FIELD	LENG	TYPE	N.DEC	NOTE
PERMANENT_FLAG	5	Long		Code of the installation type
DESCRIPTION	255	Varchar(255)		Description

Table name: D_PROXIMITY_FLAG

FIELD	LENG	TYPE	N.DEC	NOTE
PROXIMITY_FLAG	5	Long		Code of the type of proximity to buildings
DESCRIPTION	255	Varchar(255)		Description

3.3 INSTRUMENT DESCRIPTION

General description

Table name: GENERIC_INSTR

FIELD	LENG	TYPE	N.DEC	NOTE
GENERIC_INSTRUMENT_CODE	6	Long		Instrument code
SENSOR MANUFACTURER	64	Varchar(64)		Sensor manufacturer
SENSOR_MODEL	64	Varchar(64)		Sensor model
DIGITIZER_MANUFACTURER	64	Varchar(64)		Digitizer manufacturer
DIGITIZER_MODEL	64	Varchar(64)		Digitizer model
INSTRUMENT_TYPE_CODE	8	Varchar(8)		Analog/digital

Table name: INSTRUMENT

FIELD	LENG	TYPE	N.DEC	NOTE
NET_CODE	2	Varchar(2)		Network code
STATION_CODE	5	Varchar(5)		Link to table *STATION*
GENERIC_INSTRUMENT_CODE	6	Long		Instrument code
SENSOR_SERIAL_NUMBER	64	Varchar(64)		Sensor serial number of
DIGITIZER_SERIAL_NUMBER	64	Varchar(64)		Digitizer serial number
INSTALLATION_START_TIME	19	Varchar(19)		Installation date (YYYY-MM-DD hh:mm:ss)
INSTALLATION_END_TIME	19	Varchar(19)		Removal date (YYYY-MM-DD hh:mm:ss)
NUMBER_BITS_ADC	5	Long		Number of bits ADC
SAMPLES_PER_SECOND	6	Decimal(6,1)	1	Sampling rate

Single channel description

Table name: CHANNEL

FIELD	LENG	TYPE	N.DEC	NOTE
NET_CODE	2	Varchar(2)		Network code
ORIENTATION_CODE	2	Long		Link to table *D-ORIENTATION*
STATION_CODE	5	Varchar(5)		Link to table *STATION*
INSTALLATION_START_TIME	19	Varchar(19)		Date of the channel opening (YYYY-MM-DD hh:mm:ss)
AZIMUTH	9	Decimal(9,6)	6	Direction of the sensor from the North
INCLINATION	9	Decimal(9,6)	6	Inclination of the sensor from the vertical
SENSITIVITY	9	Decimal(9,6)	6	Sensitivity
SENSITIVITY_UNIT	10	Varchar(10)		Sensitivity units
GAIN	9	Decimal(9,6)	6	Multiplicative factor
FREQUENCY	5	Decimal(5,2)	2	Sensor natural frequency (Hz)
DAMPING	5	Decimal(5,2)	2	Damping
FULLSCALE	5	Decimal(5,2)	2	Full scale

Table name: POLE

FIELD	LENG	TYPE	N.DEC	NOTE
POLE_TYPE_CODE	8	Varchar(8)		Pole/Zero
NET_CODE	2	Varchar(2)		Network code
ORIENTATION_CODE	2	Long		Link to table *D-ORIENTATION*
STATION_CODE	5	Varchar(5)		Link to table *STATION*
INSTALLATION_START_TIME	19	Varchar(19)		Date of channel opening (YYYY-MM-DD hh:mm:ss)
REAL_PART	5	Decimal(5,2)	2	Real part
IMAGINARY_PART	5	Decimal(5,2)	2	Imaginary part

Dictionary tables

Table name: D_INSTRUMENT_TYPE

FIELD	LENG	TYPE	N.DEC	NOTE
INSTRUMENT_TYPE_CODE	8	Varchar(8)		Instrument type code
DESCRIPTION	255	Varchar(255)		Description of the instrument type

Table name: D_ORIENTATION

FIELD	LENG	TYPE	N.DEC	NOTE
ORIENTATION_CODE	2	Varchar(2)		Orientation code
DESCRIPTION	255	Varchar(255)		Orientation description

Table name: D_POLE_TYPE

FIELD	LENG	TYPE	N.DEC	NOTE
POLE_TYPE_CODE	2	Varchar(2)		Code
DESCRIPTION	255	Varchar(255)		Pole /Zero

3.4 INFORMATION ON THE INSTITUTIONS MANAGING NETWORKS, STATIONS OR DATA BASES

Table name: OWNERS

FIELD	LENG	TYPE	N.DEC	NOTE
OWNER_CODE	6	Long		Univocal code
SHORT_CODE	5	Varchar(5)		Code of max 5 characters, abbreviation of the complete name
DESCRIPTION	255	Varchar(255)		Long description
INFO	255	Varchar(255)		Information on the Agency
PHONE	50	Varchar(50)		Telephone number
CONTACT	255	Varchar(255)		Referring information

3.5 RECORDING CHARACTERISTICS

Characteristics of the unprocessed and processed recordings

Table Name: WAVEFORM

FIELD	LENG	TYPE	N.DEC	NOTE
INSTALLATION_START_TIME	19	Varchar(19)		Date of the channel opening (YYYY-MM-DD hh:mm:ss)
EVENT_TIME	19	Varchar(19)		Event time (YYYY-MM-DD hh:mm:ss)
NET_CODE	2	Varchar(2)		Network code
STATION_CODE	6	Varchar(5)		Link to table *STATION*
FLAG_DIGIT	3	Varchar(3)		Digitalization Flag *A* = automatic *M* = manual *A/M* = automatic/manual
UNPT_NS	10	Long		Number of samples of uncorrected record (NS component)
UNPT_WE	10	Long		Number of samples of uncorrected record (WE component)
UNPT_UP	10	Long		Number of samples of

				uncorrected record (UP component)
UDT	9	Decimal(9,4)	4	Sampling rate (s) of uncorrected record
FLAG_FC	1	Long		Fixed trace Flag (0 = absent, 1 = present)
UPGA_NS	9	Decimal(9,4)	4	Uncorrected peak ground acceleration NS
UPGA_WE	9	Decimal(9,4)	4	Uncorrected peak ground acceleration WE
UPGA_UP	9	Decimal(9,4)	4	Uncorrected peak ground acceleration UP
UPGA_NS_TIME	9	Decimal(9,4)	4	Time of UPGA_NS from the beginning of the recording, in seconds
UPGA_WE_TIME	9	Decimal(9,4)	4	Time of UPGA_WE from the beginning of the recording, in seconds
UPGA_UP_TIME	9	Decimal(9,4)	4	Time of UPGA_UP from the beginning of the recording, in seconds
NPT_NS	10	Long		Number of samples of the processed signal (NS component)
NPT_WE	10	Long		Number of samples of the processed signal (WE component)
NPT_UP	10	Long		Number of samples of the processed signal (UP component)
UNITS	10	Varchar(10)		Acceleration units of the processed signal
DT	9	Decimal(9,4)	4	Sampling rate (s) of the processed signal
FILTYPE	15	Varchar(15)		Filter type
HP1_NS	9	Decimal(9,4)	4	Low-cut frequency NS
HP1_WE	9	Decimal(9,4)	4	Low-cut frequency WE
HP1_UP	9	Decimal(9,4)	4	Low-cut frequency UP
HP2_NS	9	Decimal(9,4)	4	Roll-on frequency NS
HP2_WE	9	Decimal(9,4)	4	Roll-on frequency WE
HP2_UP	9	Decimal(9,4)	4	Roll-on frequency UP

LP1_NS	9	Decimal(9,4)	4	Roll-off frequency NS
LP1_WE	9	Decimal(9,4)	4	Roll-off frequency WE
LP1_UP	9	Decimal(9,4)	4	Roll-off frequency UP
LP2_NS	9	Decimal(9,4)	4	High-cut frequency NS
LP2_WE	9	Decimal(9,4)	4	High-cut frequency WE
LP2_UP	9	Decimal(9,4)	4	High-cut frequency UP
PGA_NS	9	Decimal(9,4)	4	Peak ground acceleration NS of the processed signal
PGA_WE	9	Decimal(9,4)	4	Peak ground acceleration WE of the processed signal
PGA_UP	9	Decimal(9,4)	4	Peak ground acceleration UP of the processed signal
PGA_NS_TIME	9	Decimal(9,4)	4	Time of the PGA_NS from the beginning of the recording, in seconds
PGA_WE_TIME	9	Decimal(9,4)	4	Time of the PGA_WE from the beginning of the recording, in seconds
PGA_UP_TIME	9	Decimal(9,4)	4	Time of the PGA_UP from the beginning of the recording, in seconds
PGV_NS	9	Decimal(9,4)	4	Peak ground velocity NS of the processed signal
PGV_WE	9	Decimal(9,4)	4	Peak ground velocity WE of the processed signal
PGV_UP	9	Decimal(9,4)	4	Peak ground velocity UP of the processed signal
PGD_NS	9	Decimal(9,4)	4	Peak ground displacement NS of the processed signal
PGD_WE	9	Decimal(9,4)	4	Peak ground displacement WE of the processed signal
PGD_UP	9	Decimal(9,4)	4	Peak ground displacement UP of the processed signal

DUR_NS	9	Decimal(9,4)	4	90% energy duration NS of the processed signal
DUR_WE	9	Decimal(9,4)	4	90% energy duration WE of the processed signal
DUR_UP	9	Decimal(9,4)	4	90% energy duration UP of the processed signal
EPA_NS	9	Decimal(9,4)	4	Effective Peak Acceleration NS of the processed signal
EPA_WE	9	Decimal(9,4)	4	Effective Peak Acceleration WE of the processed signal
EPA_UP	9	Decimal(9,4)	4	Effective Peak Acceleration UP of the processed signal
IA_NS	9	Decimal(9,4)	4	Arias intensity NS of the processed signal
IA_WE	9	Decimal(9,4)	4	Arias intensity WE of the processed signal
IA_UP	9	Decimal(9,4)	4	Arias intensity UP of the processed signal
EPI_DIST	9	Decimal(9,4)	4	Epicentre-station distance in km
EPI_AZ	9	Decimal(9,4)	4	Epicentre-station azimuth, clockwise from the N
FAULT_DIST	9	Decimal(9,4)	4	Joyner-Boore distance (distance from the station to the fault projection) in km

Data dictionary

Table Name: D_FLAG_DIGIT

FIELD	LENG	TYPE	N.DEC	NOTE
FLAG_DIGIT_CODE	3	Varchar(3)		Digitalization code
DESCRIPTION	100	Varchar(100)		Description

3.6 ADDITIONAL DATA DICTIONARIES

References

Table Name: REFERENCE

FIELD	LENG	TYPE	N.DEC	NOTE
REFERENCE_CODE	6	Long		Univocal self-incremental code
TITOLO		MEMO		Description of the reference
REF_ABBR	255	Varchar(255)		Brief reference description

Administrative data

Table Name: NATION

FIELD	LENG	TYPE	N.DEC	NOTE
NATION_CODE	3	Varchar(3)		UN country code
NATION_NAME	100	Varchar(100)		Country name

Table Name: MUNICIPALITY

FIELD	LENG	TYPE	N.DEC	NOTE
NATION_CODE	3	Varchar(3)		UN country code
REGION_CODE	2	Varchar(2)		ISTAT region code
PROVINCE_CODE	3	Varchar(3)		ISTAT district code
COMUNE_CODE	6	Varchar(6)		ISTAT municipality code
COMUNE_NAME	100	Varchar(100)		Municipality name
LATITUDE	9	Decimal(9,5)	5	Latitude of the municipality centroid
LONGITUDE	9	Decimal(9,5)	5	Longitude of the municipality centroid
PEOPLE	8	Long		Number of inhabitants

Table Name: PROVINCE

FIELD	LENG	TYPE	N.DEC	NOTE
NATION_CODE	3	Varchar(3)		UN country code
REGION_CODE	2	Varchar(2)		ISTAT region code
PROVINCE_CODE	3	Varchar(3)		ISTAT district code
PROVINCE_ABBR	2	Varchar(2)		District code

PROVINCE_NAME	50	Varchar(50)		District name

Table Name: REGION

FIELD	LENG	TYPE	N.DEC	NOTE
NATION_CODE	3	Varchar(3)		UN country code
REGION_CODE	2	Varchar(2)		ISTAT region code
REGION_NAME	50	Varchar(50)		Region name

Cartographic projections

Table Name: *D_PROJECTION*

FIELD	LENG	TYPE	N.DEC	NOTE
PROJECTION_CODE	10	Varchar(10)		Projection code
DESCRIPTION	100	Varchar(100)		Projection description

Networks

Table Name: *D_NET_TYPE*

FIELD	LENG	TYPE	N.DEC	NOTE
NET_TYPE_CODE	1	Varchar(1)		Net type code
DESCRIPTION	100	Varchar(100)		Description

Coordinates

Table Name: *D_COORDINATE_SOURCE*

FIELD	LENG	TYPE	N.DEC	NOTE
COORDINATE_SOURCE_CODE	1	Varchar(1)		Coordinate source code
DESCRIPTION	100	Varchar(100)		Description

Event location

Table Name: *D_LOCATED*

FIELD	LENG	TYPE	N.DEC	NOTE
LOCATED_CODE	1	Varchar(1)		Location code
DESCRIPTION	100	Varchar(100)		Description

Sensitivity units

Table Name: *D_UNITS_SENSITIVITY*

FIELD	LENG	TYPE	N.DEC	NOTE
UNITS_CODE	1	Varchar(1)		Unit ID
DESCRIPTION	100	Varchar(100)		Description

4. OUTLINE OF THE EXISTING RELATIONS INSIDE THE DATA BASE

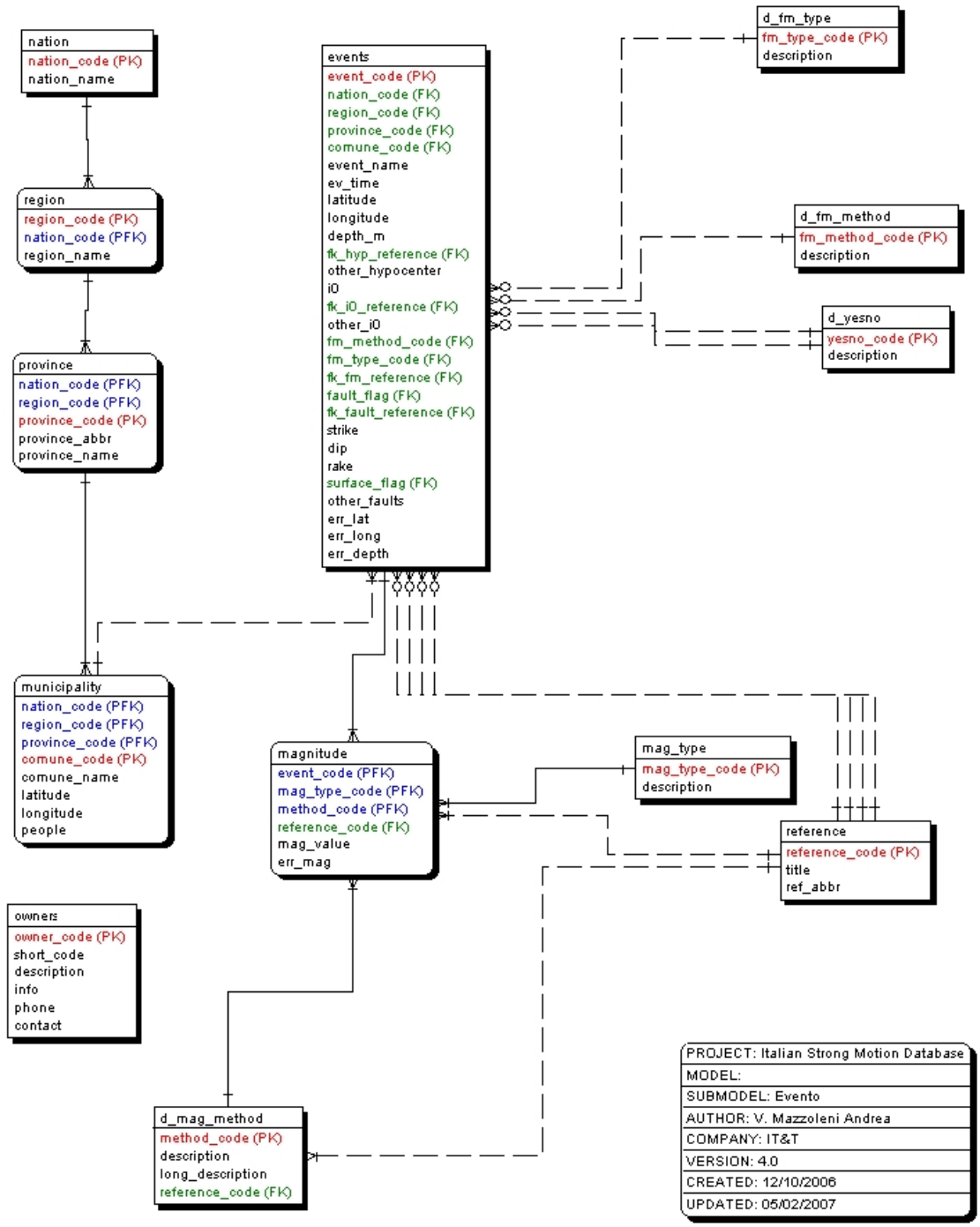

Figure 1: structure of the EVENT block

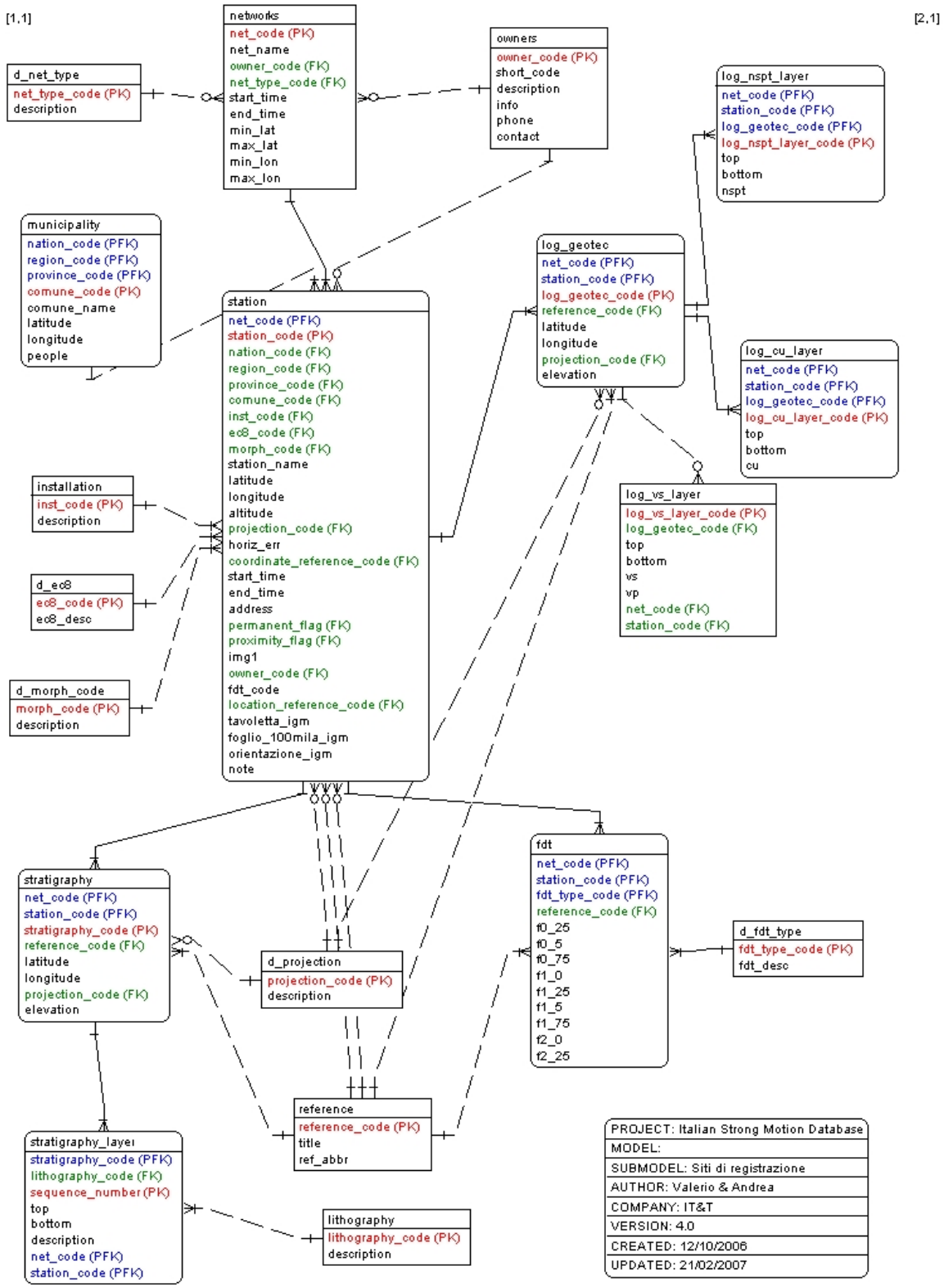

Figure 2: structure of the RECORDING SITE block

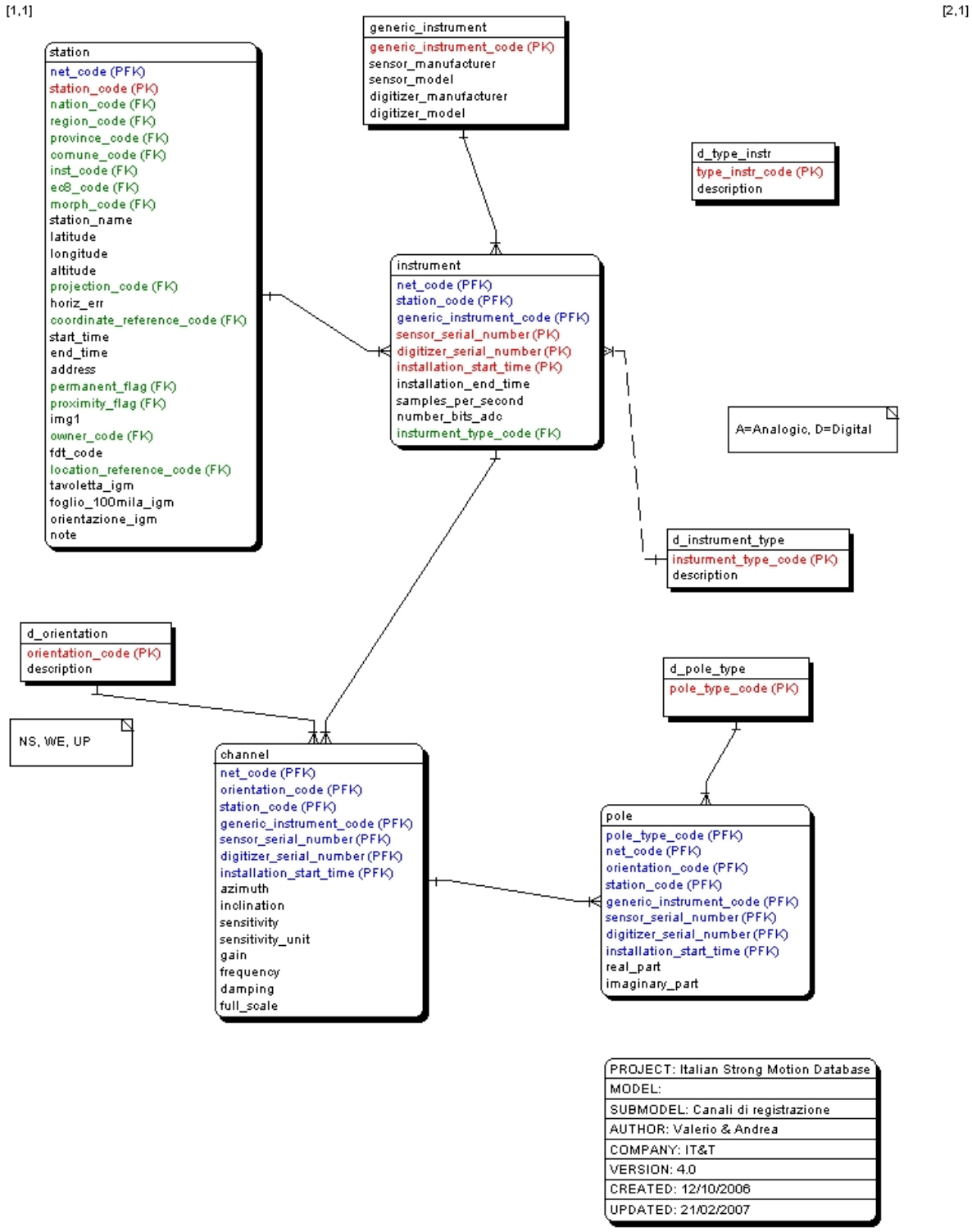

Figure 3: structure of the INSTRUMENT block

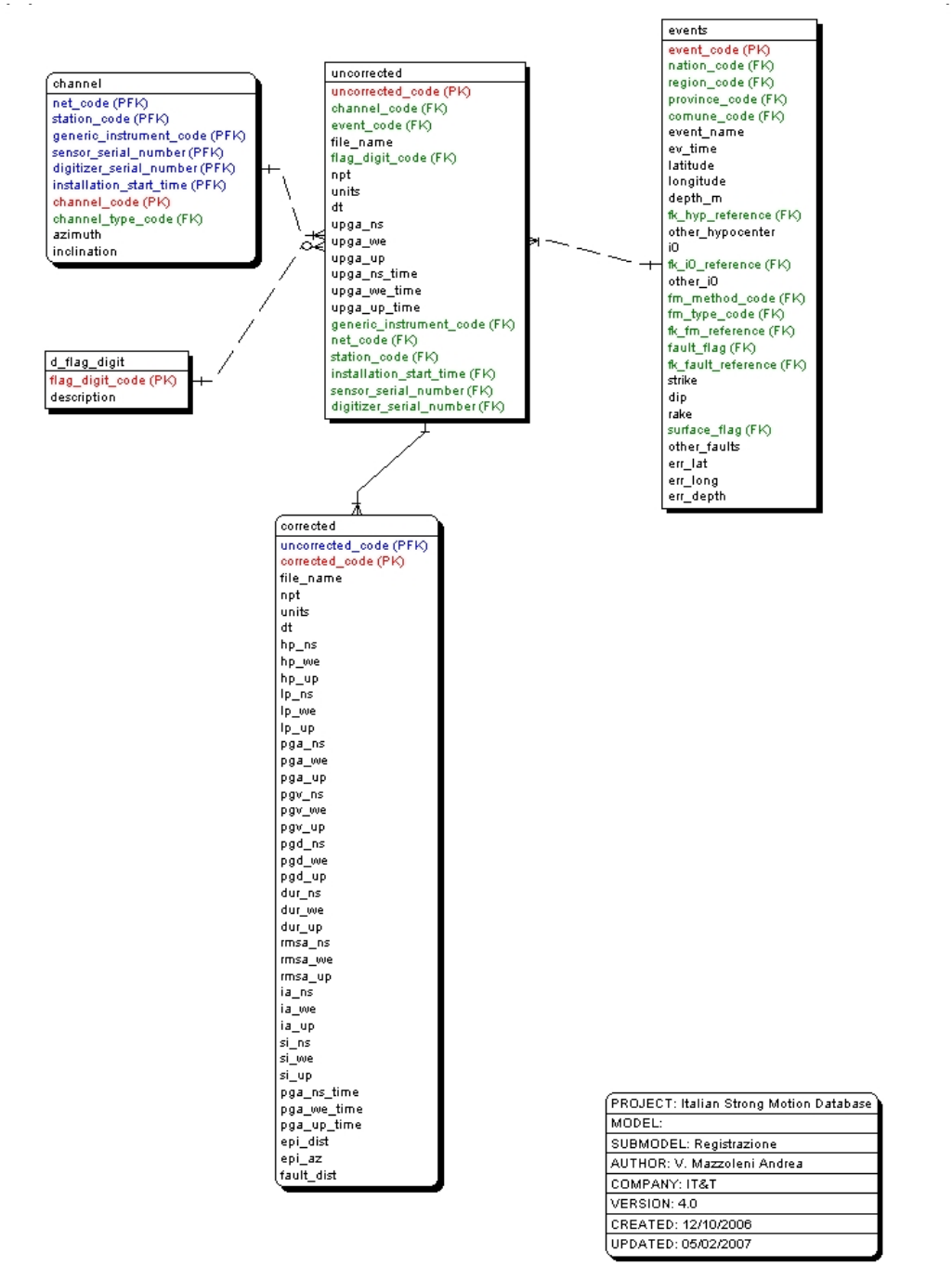

Figure 4: structure of the RECORD block