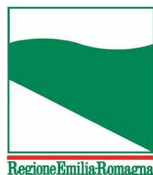




PROTEZIONE CIVILE  
Presidenza del Consiglio dei Ministri  
Dipartimento della Protezione Civile



Attuazione dell'articolo 11 dalla legge 24 giugno 2009, n.77

# MICROZONAZIONE SISMICA

## Livello 2

Regione Emilia-Romagna  
Comune di Anzola dell'Emilia



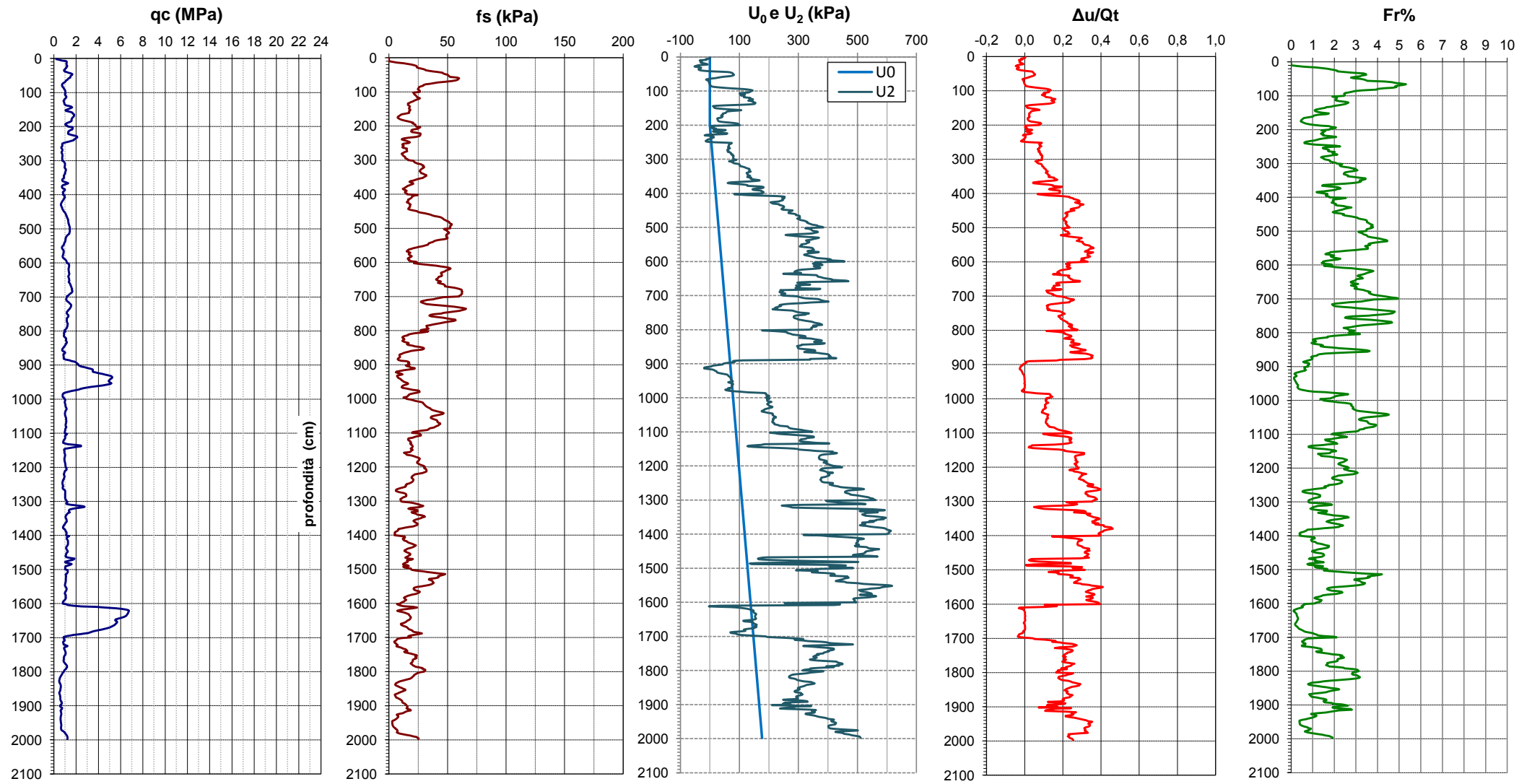
### Allegato 2 – Rapporti delle indagini

Regione	Soggetto realizzatore	Data
Emilia-Romagna	Studio di geologia Gabriele Tarabusi	15/12/2014

**Committ.:** Comune di Anzola Dell'Emilia  
**Località :** Anzola Dell'Emilia (BO)  
**Indirizzo :** Lavino di Mezzo

**Prova:** CPTU 1  
**Data:** 20/11/2014  
**Falda:** 2 metri da p.c.

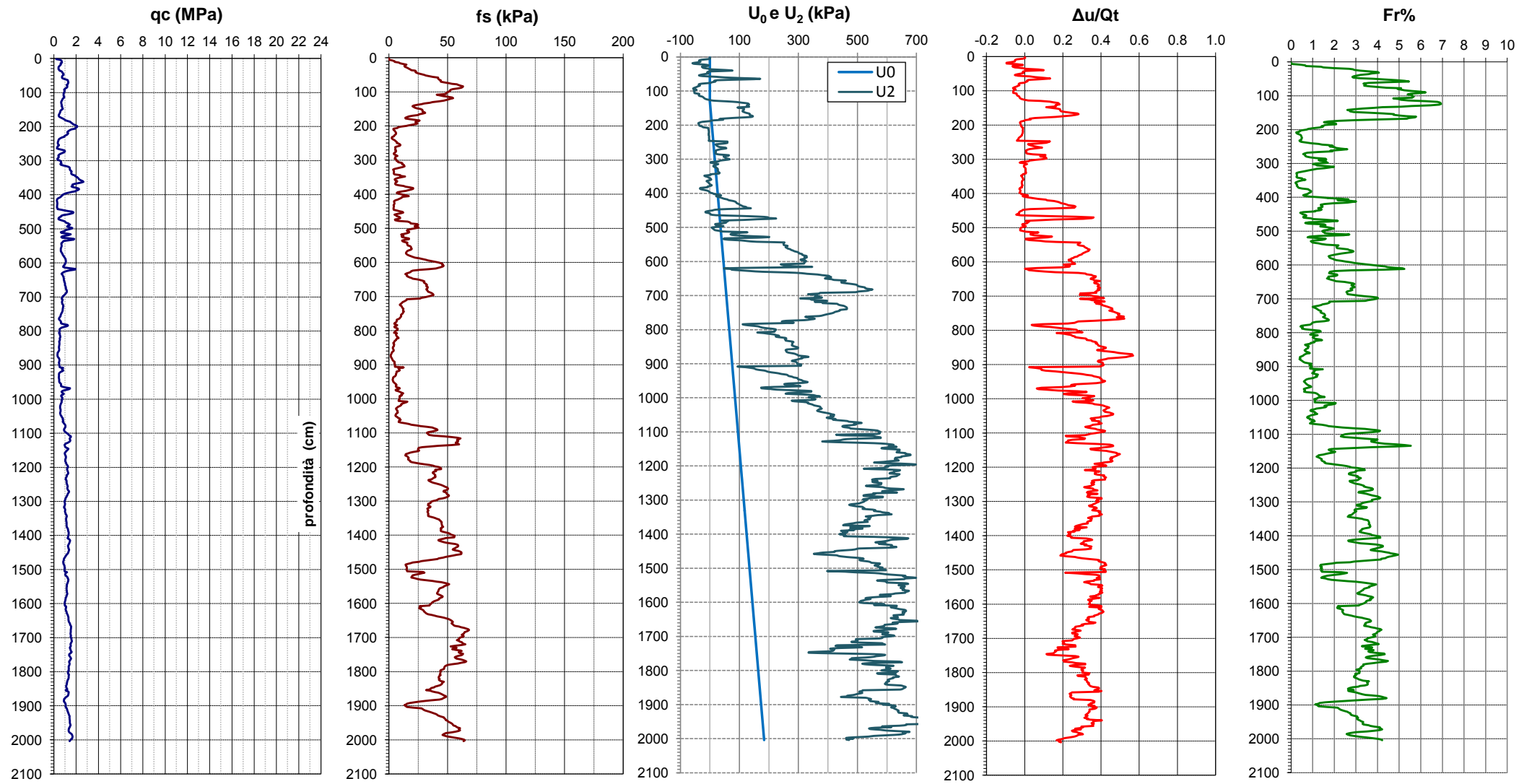
**Latitudine:** 44,5349  
**Longitudine:** 11,2355



**Committ.:** Comune di Anzola Dell'Emilia  
**Località :** Anzola Dell'Emilia (BO)  
**Indirizzo :** Via Dell'Olmo

**Prova:** CPTU 2  
**Data:** 20/11/2014  
**Falda:** 1.3 metri da p.c.

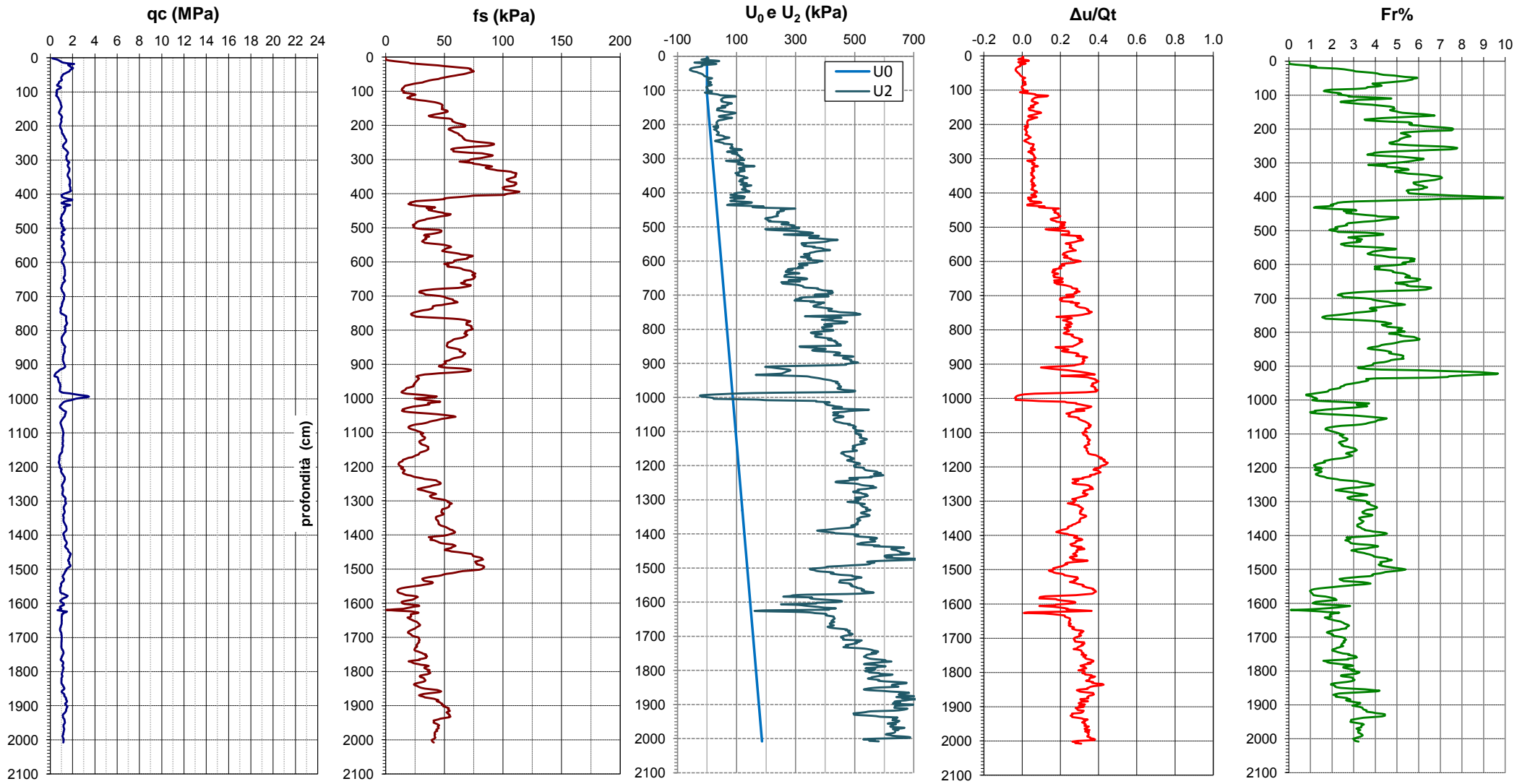
**Latitudine:** 44.54658  
**Longitudine:** 11.2033



**Committ.:** Comune di Anzola Dell'Emilia  
**Località :** Anzola Dell'Emilia (BO)  
**Indirizzo :** Via Rossini

**Prova:** CPTU 3  
**Data:** 20/11/2014  
**Falda:** 1.1 metri da p.c.

**Latitudine:** 44.5479  
**Longitudine:** 11.18291

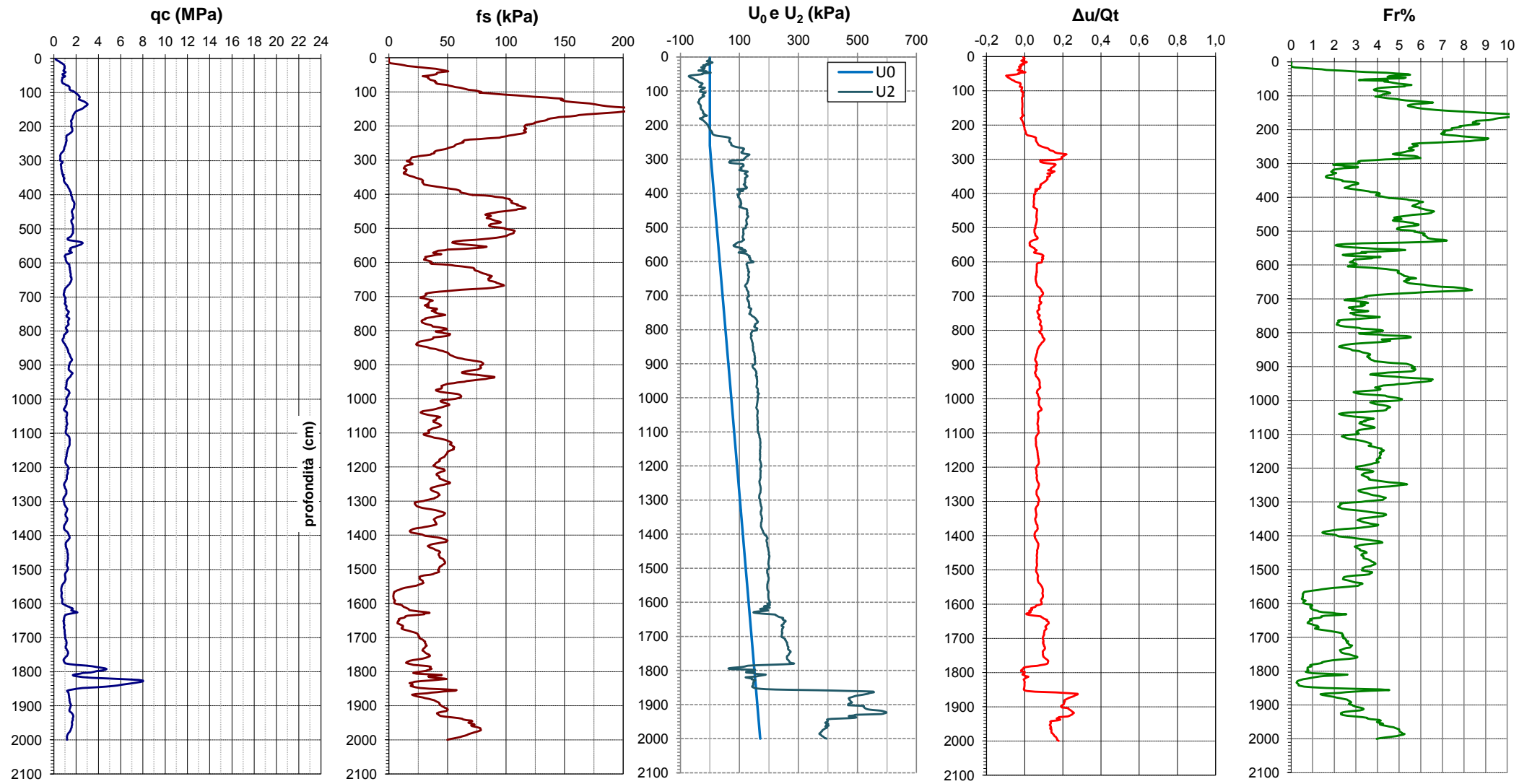




**Committ.:** Comune di Anzola Dell'Emilia  
**Località :** Anzola Dell'Emilia (BO)  
**Indirizzo :** Via Reggiani

**Prova:** CPTU 4  
**Data:** 20/11/2014  
**Falda:** 2.6 metri da p.c.

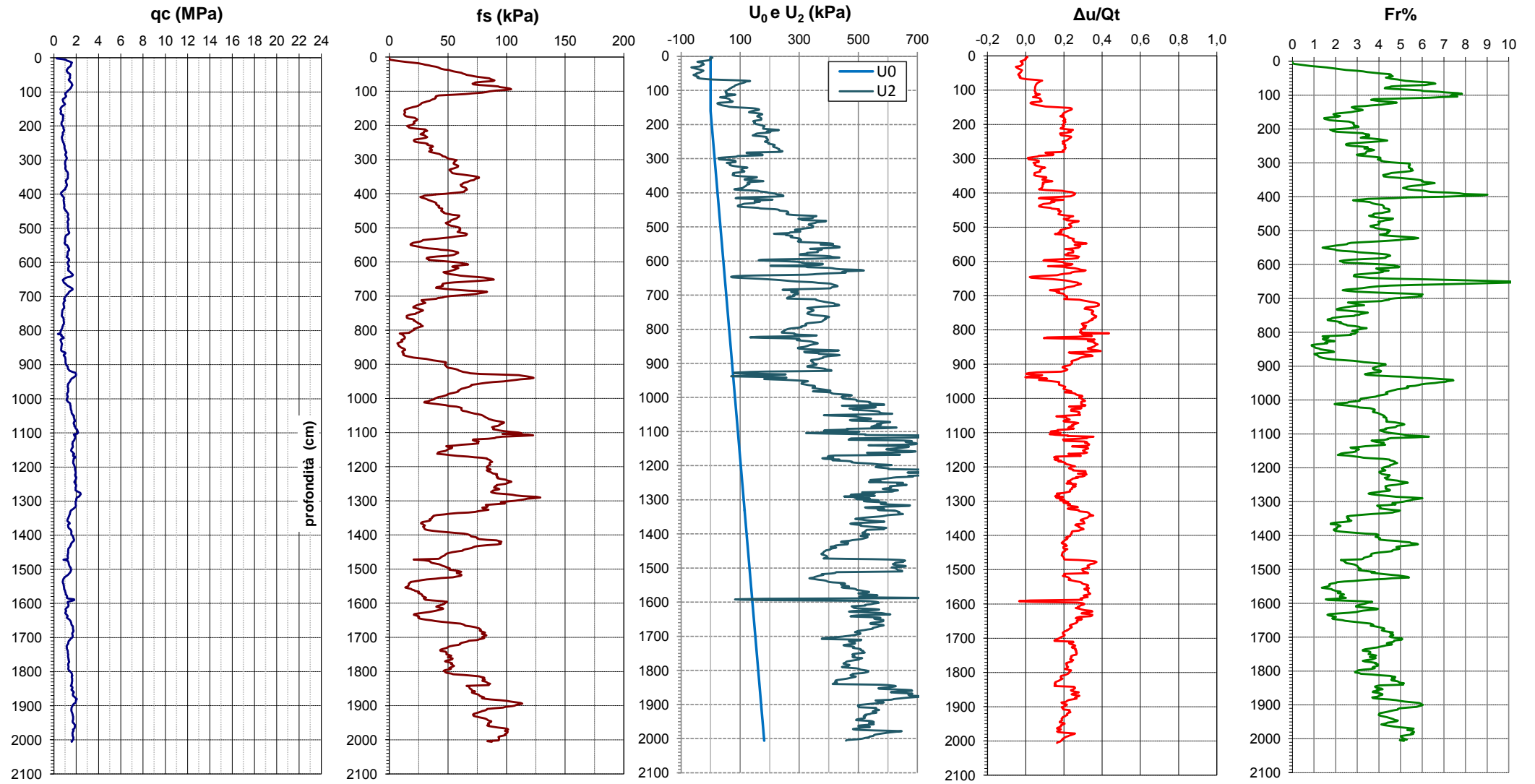
**Latitudine:** 44,54045  
**Longitudine:** 11,19385



**Committ.:** Comune di Anzola Dell'Emilia  
**Località :** Anzola Dell'Emilia (BO)  
**Indirizzo :** Castelletto

**Prova:** CPTU 5  
**Data:** 21/11/2014  
**Falda:** 1,6 metri da p.c.

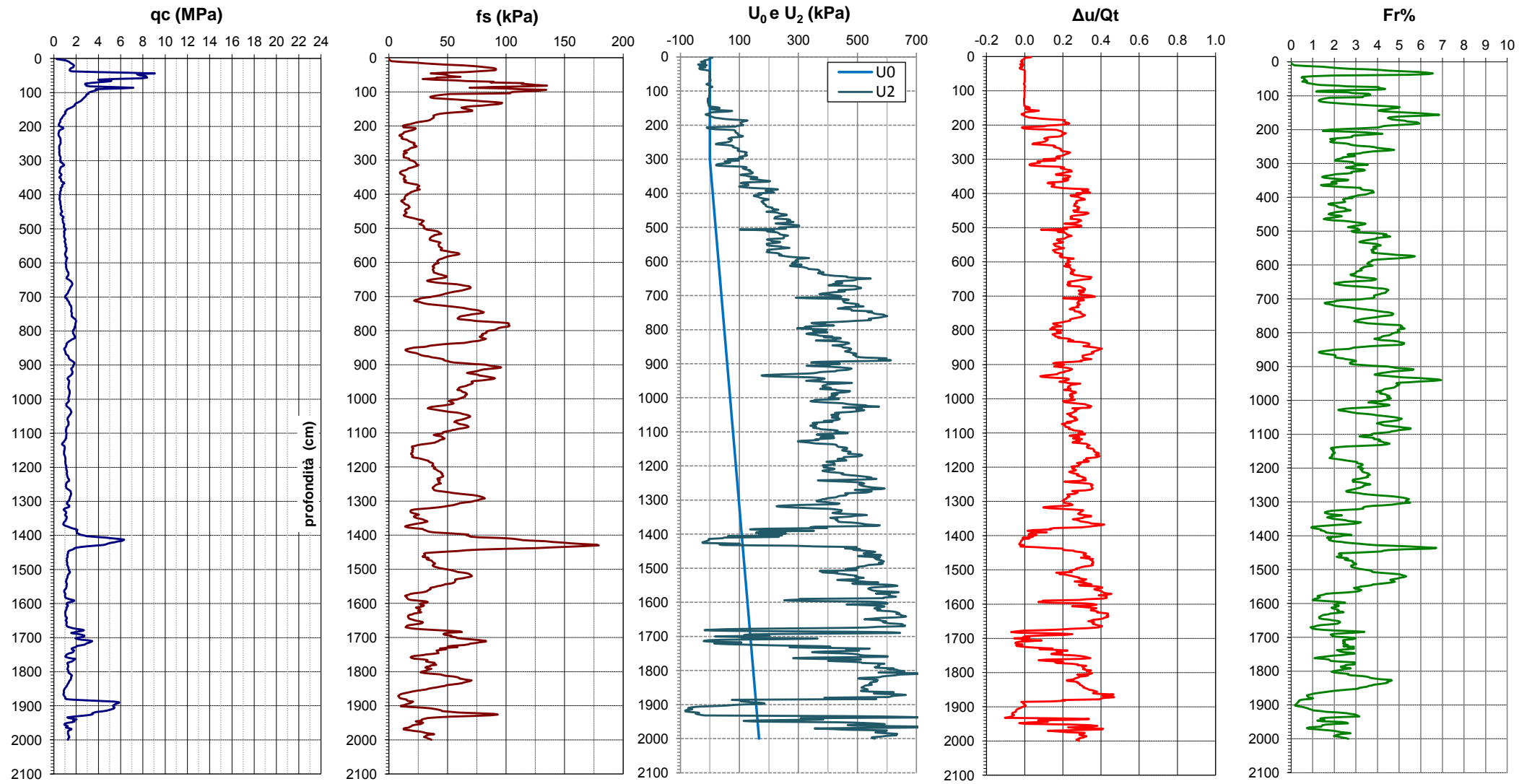
**Latitudine:** 44,56932  
**Longitudine:** 11,14665



**Committ.:** Comune di Anzola Dell'Emilia  
**Località :** Anzola Dell'Emilia (BO)  
**Indirizzo :** Santa Maria in Strada

**Prova:** CPTU 6  
**Data:** 21/11/2014  
**Falda:** 3 metri da p.c.

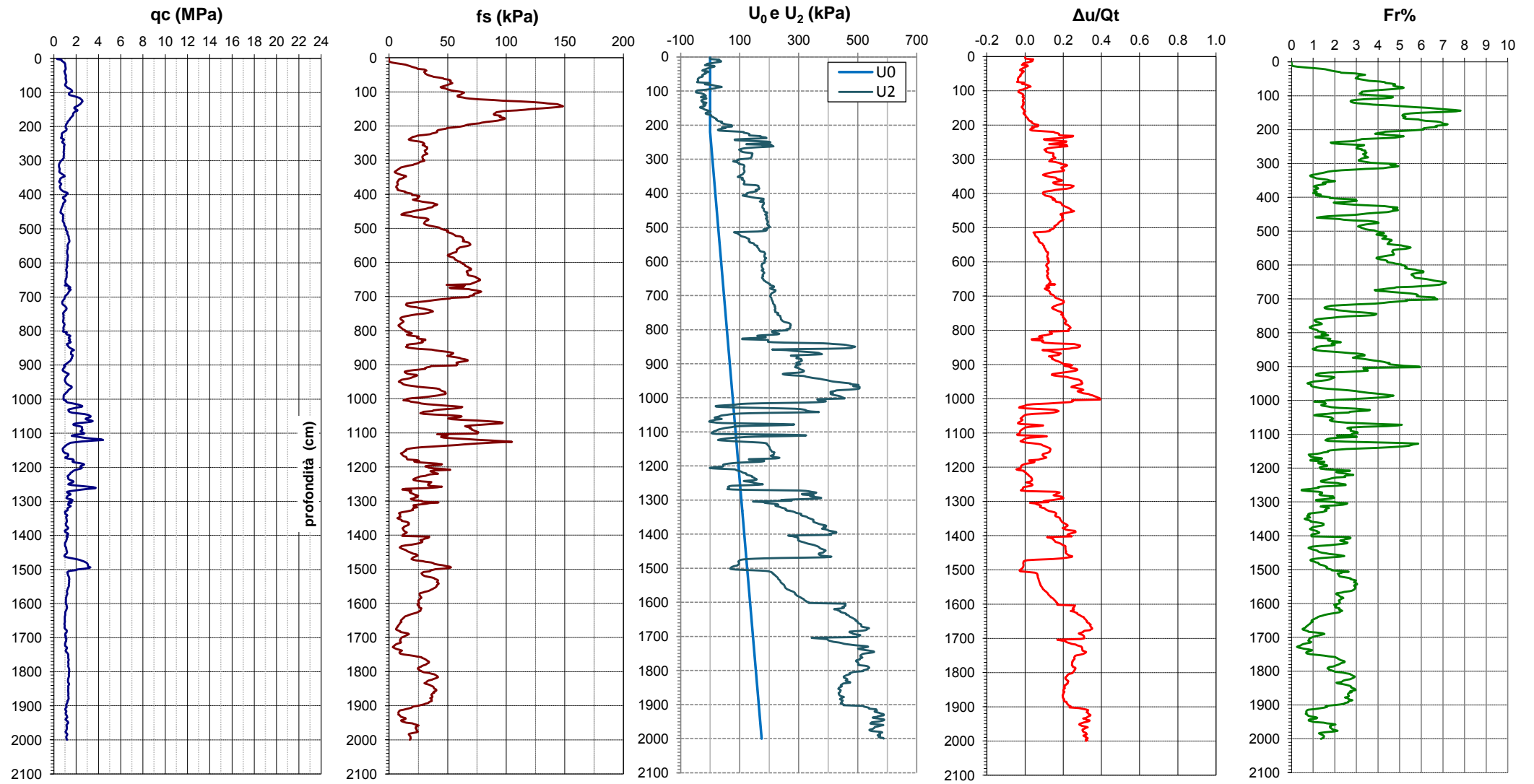
**Latitudine:** 44.57146  
**Longitudine:** 11.15855



**Committ.:** Comune di Anzola Dell'Emilia  
**Località :** Anzola Dell'Emilia (BO)  
**Indirizzo :** Martignone

**Prova:** CPTU 7  
**Data:** 21/11/2014  
**Falda:** 2.2 metri da p.c.

**Latitudine:** 44.59976  
**Longitudine:** 11.21648





# ANTENNA SISMICA (ESAC)

**CLIENTE:** COMUNE DI ANZOLA DELL'EMILIA

**CODICE LAVORO:** 1512

**CODICE PROVA:** Esac1

**LOCALITA':** Via XXV aprile- Anzola dell'Emilia

**DATA PROVA:** 21/10/2014

**Coordinata est:** 673923 m

**Coordinata nord:** 4935058 m

**QUOTA (m.s.l.m.):**

**TERRENO DI MISURA:** Naturale soffice

**SPACING:** 5 m.

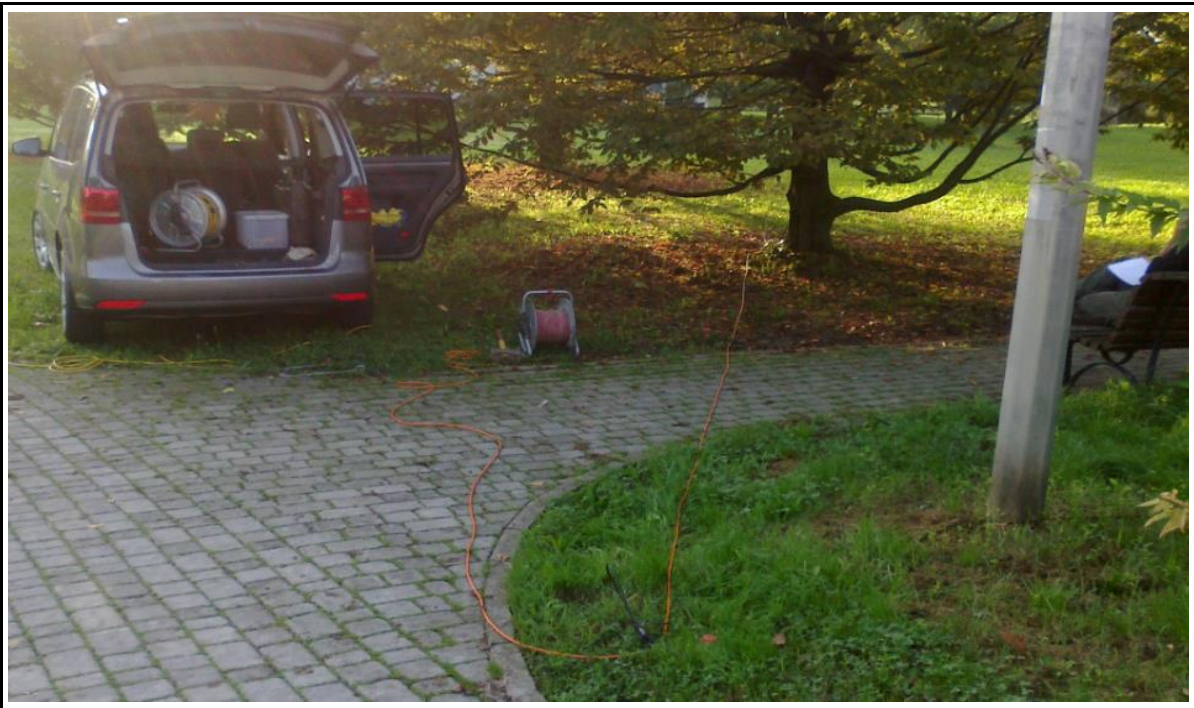
**RECORD TIME (min):** 18

**CONDIZIONI METEO:** Sole

## FOTO AEREA (Google Earth)



## FOTO AREA DI INDAGINE



# ANTENNA SISMICA (ESAC)

**CLIENTE** COMUNE DI ANZOLA DELL'EMILIA

**CODICE LAVORO** 1512

**CODICE PROVA** Esac1

**LOCALITA':** Via XXV aprile- Anzola dell'Emilia

**DATA PROVA:** 21/10/2014

**LONGITUDINE:** 673923 m

**LATITUDINE:** 4935058 m

**QUOTA (m.s.l.m.):**

**STRUMENTAZIONE** Geometrics GEODE

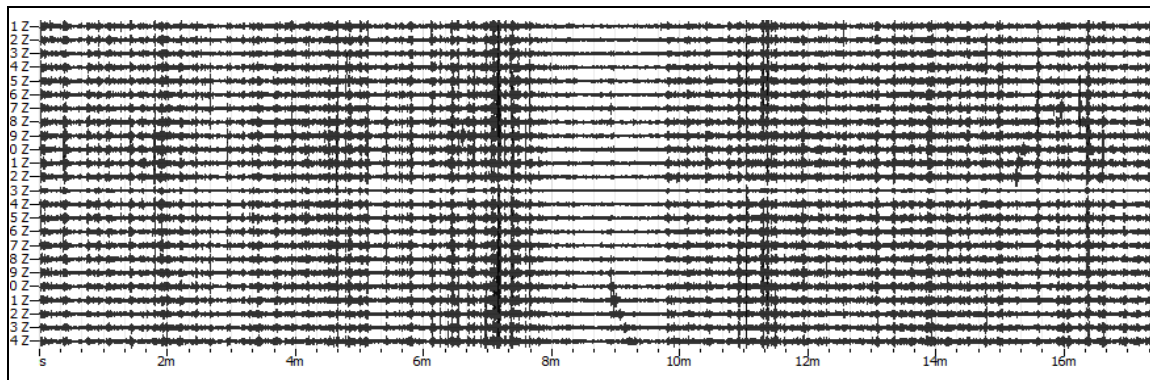
**N°CANALI** 24

**SPACING** 5 m.

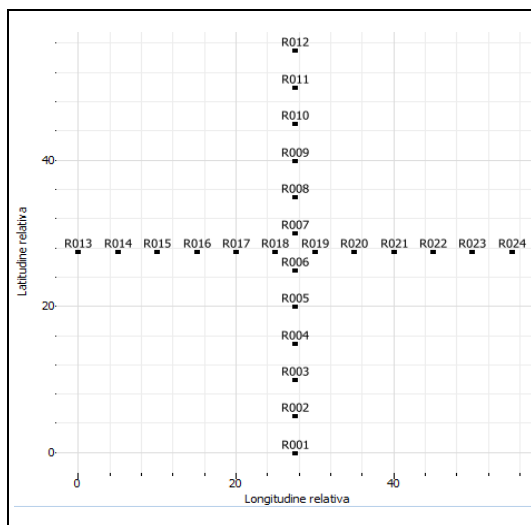
**RECORD TIME (min)** 18

**SAMPLING (Sec)** 0.0

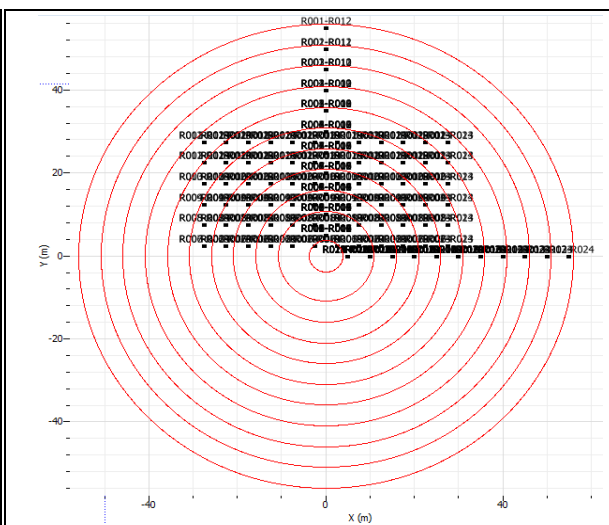
## REGISTRAZIONE



## PLANIMETRIA ARRAY



## CO-ARRAY E RINGS

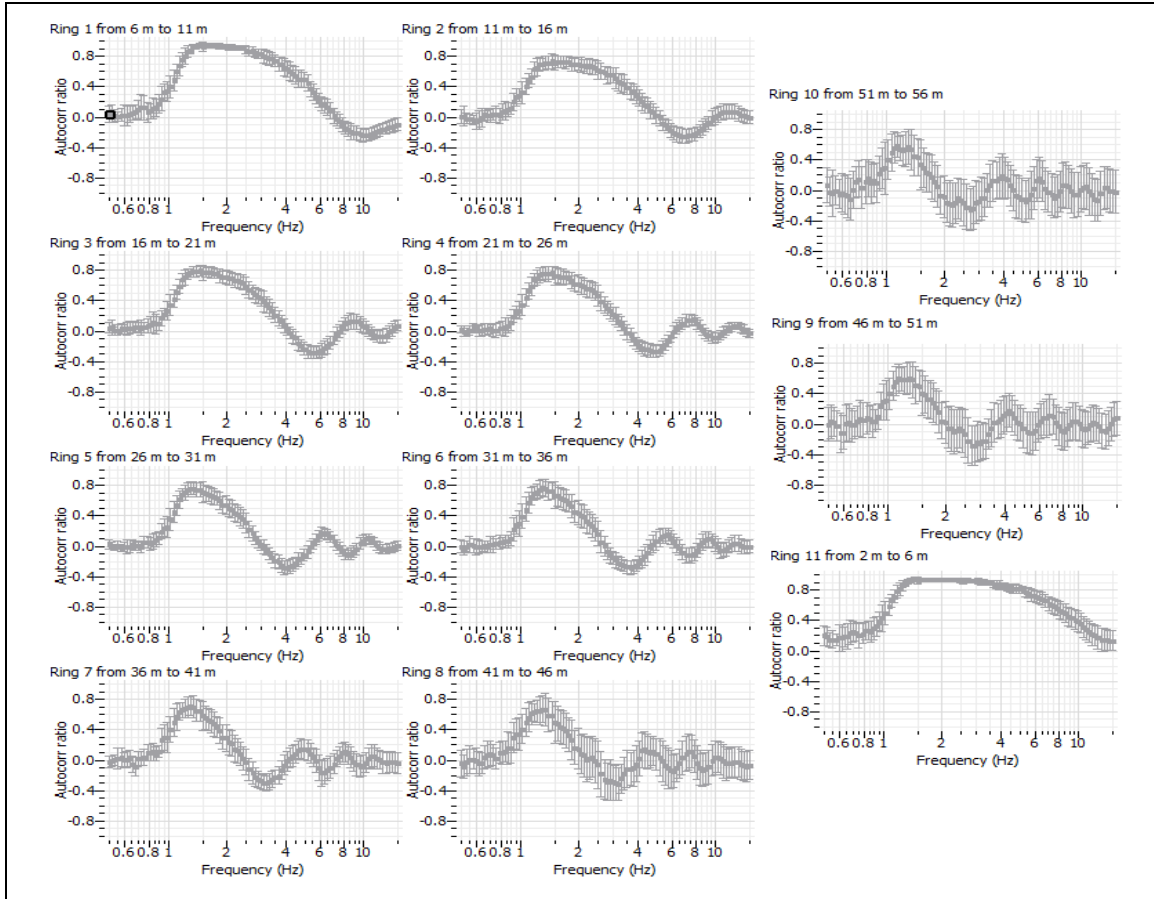




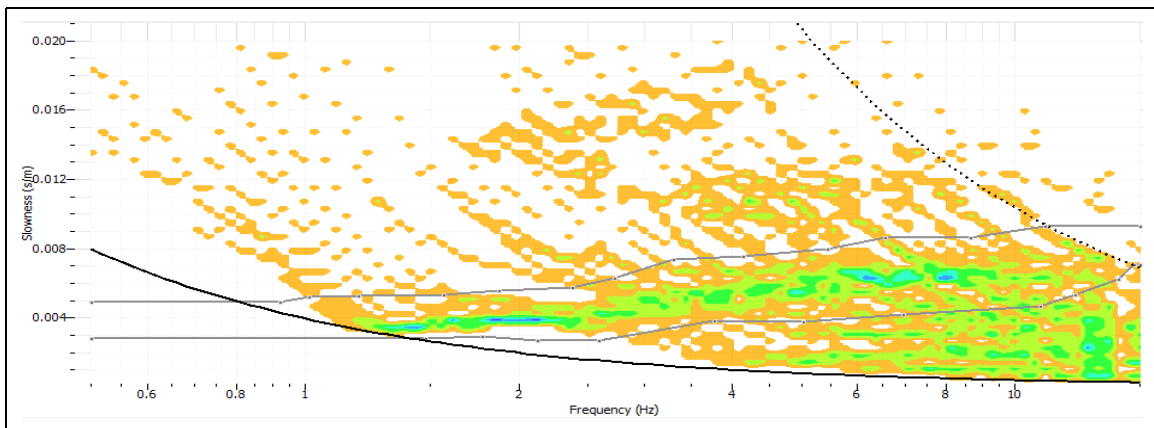
# ANTENNA SISMICA ESAC

**CLIENTE** COMUNE DI ANZOLA DELL'EMILIA  
**CODICE LAVORO** 1512  
**CODICE PROVA** Esac1

## CURVE DI DISPERSIONE CORRISPONDENTI AD OGNI RINGS



## CUMULATA DELLE CURVE DI DISPERSIONE DEI RINGS E RELATIVO PICKING PER INDIVIDUARNE LE FASI PIÙ SIGNIFICATIVE



# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: COMUNE DI ANZOLA DELL'EMILIA

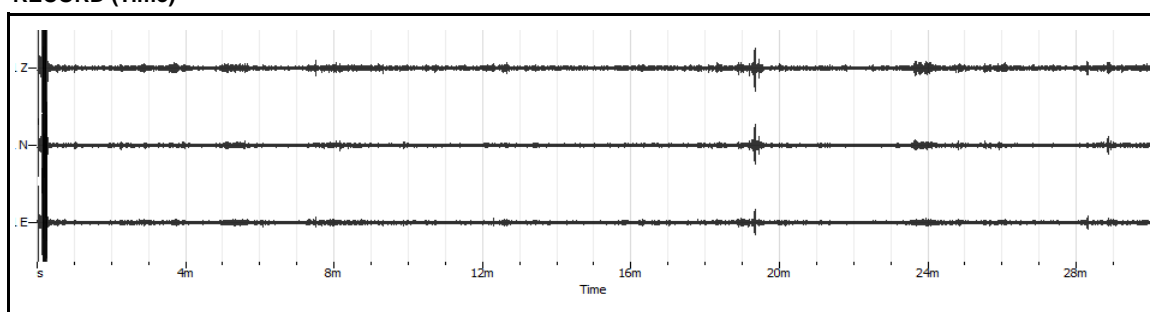
CODICE LAVORO: 1512

CODICE PROVA: Esac1

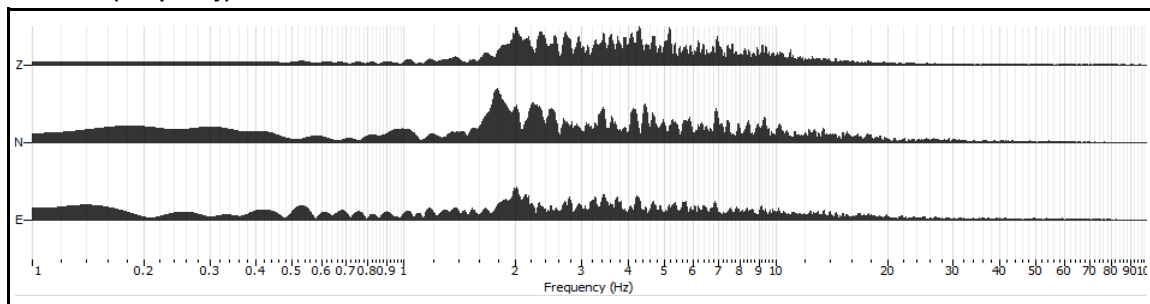
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	60

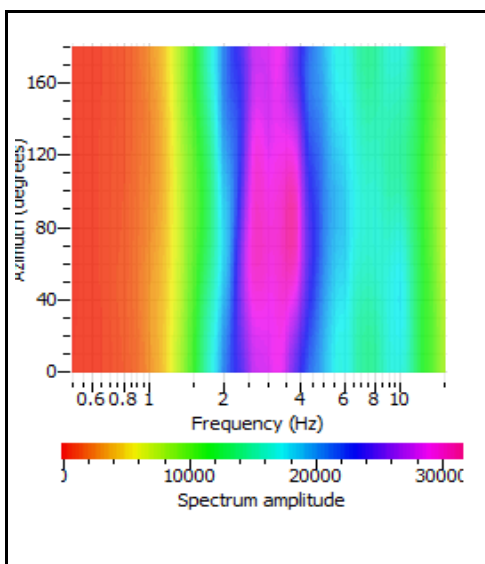
RECORD (Time)



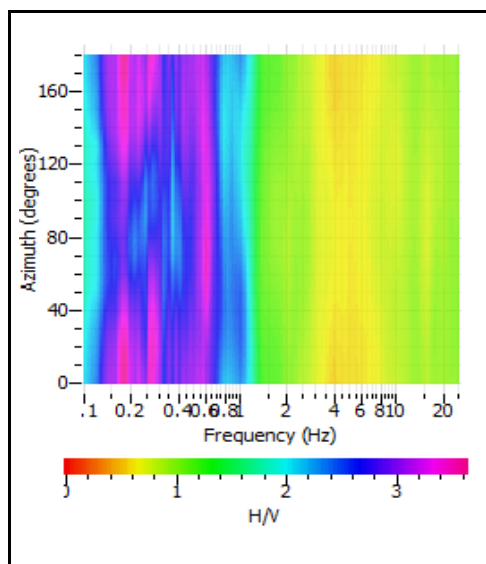
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

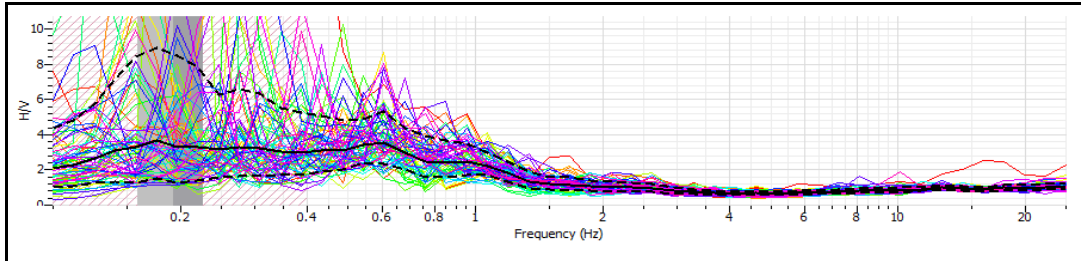


# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

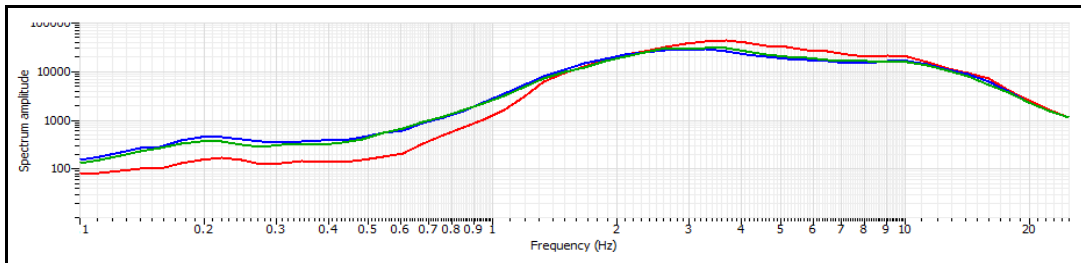
CLIENTE COMUNE DI ANZOLA DELL'EMILIA  
 CODICE LAVORO 1512  
 CODICE PROVA Esac1

## RAPPORTO SPETTRALE H/V

Max HVSR 0.19 ± 0.03 Hz. A0 = 3.66



## SPETTRO SINGOLE COMPONENTI



### Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.19		
Lw	20		
nw	71		
f0 > 10 / Lw	0.19 > 10/20		☒
nc (f0) > 200	269.8 > 200	☑	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	☑	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

### Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0]   AH/V(f) < A0/2	0 Hz		☒
Exists f+ in [4f0, f0]   AH/V(f+) < A0/2	0 Hz		☒
A0 > 2	3.66 > 2	☑	
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	24.81 < 0.05		☒
σ < ε(f0)	0.03442 < 0.0475	☑	
σA(f0) < θ(f0)	0.202658 < 3	☑	

Lw	Window length
nW	Number of windows used in the analysis
nc = Lw nW f0	Number of significant cycles
f	Current frequency
f0	H/V peak frequency
σ	Standard deviation of H/V peak frequency
ε(f0)	Threshold value for the stability condition of < ε(f0)
A0	H/V peak amplitude at frequency f0
AH/V(f)	H/V curve amplitude at frequency f
f -	Frequency between f0/4 and f0 for which AH/V(f-) < A0/2
f +	Frequency between f0 and 4f0 for which AH/V(f+) < A0/2
σA(f)	Standard deviation of AH/V(f), σA(f) is the factor by which the mean AH/V(f) curve should be multiplier or divided
σlogH/V(f)	Standard deviation of log AH/V(f) curve
θ(f0)	Threshold value for the stability condition σA(f) < θ(f0)

Freq. Range [Hz]	Threshold value for σi and σA(f0)				
	< 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0	> 2.0
ε(f0) (Hz)	0.25 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
θ(f0) for σA(f0)	3.00	2.50	2.00	1.78	1.58
Log θ(f0) for σlogH/V(f0)	0.48	0.40	0.30	0.25	0.20

# ANALISI CONGIUNTA PROVA ESAC - HVSR

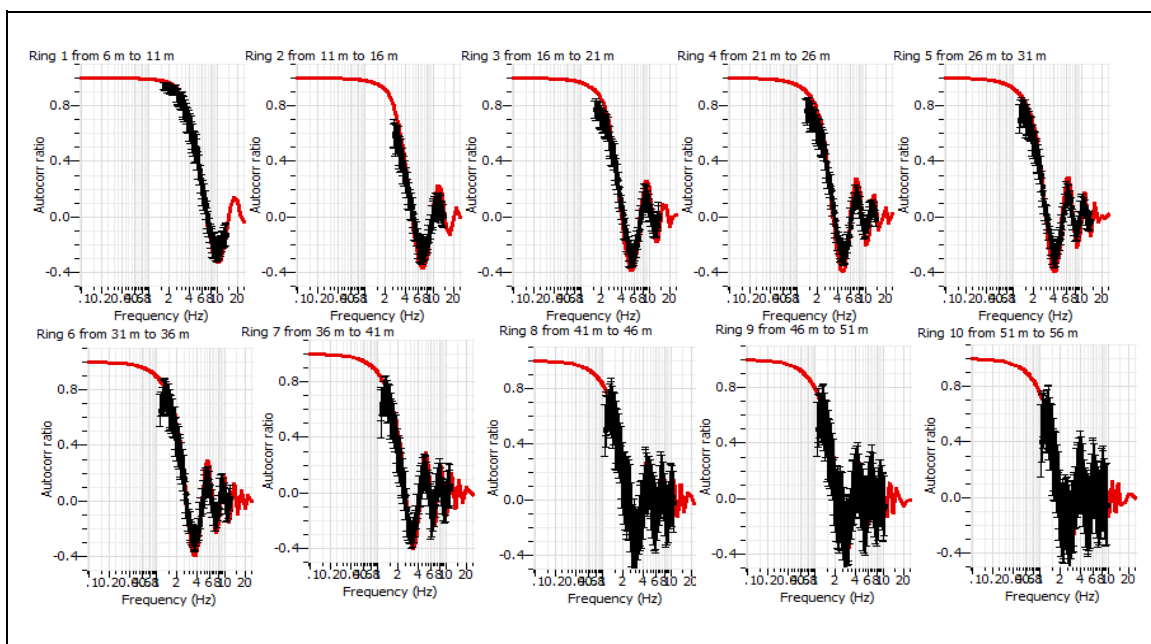
**CLIENTE**                    **COMUNE DI ANZOLA DELL'EMILIA**

**CODICE LAVORO**        **1512**  
**CODICE PROVA**        **Esac1**

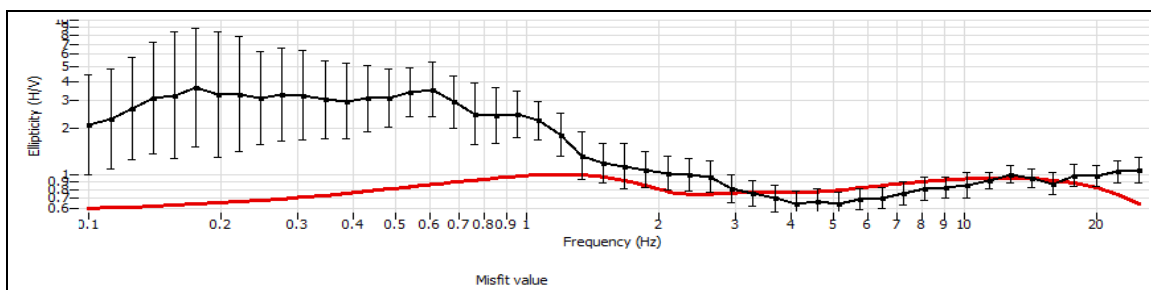
**LOCALITA':**                Via XXV aprile- Anzola dell'Emilia  
**DATA PROVA:**            21/10/2014  
**LONGITUDINE:**          673923 m  
**LATITUDINE:**            4935058 m  
**QUOTA (m.s.l.m.):**        45°  
**AZIMUT**                    45°

**APPARECCHIATURA ESAC:**    Geometrics GEODE  
**APPARECCHIATURA HVSR:**   SARA SL 07  
**N°CANALI**                    24  
**SPACING**                    5 m.  
**RECORD TIME (min)**        18

## VERTICAL RINGS AUTOCORRELATION



## ELLIPTICITY AUTOCORRELATION CURVES



# ANALISI CONGIUNTA PROVA ESAC - HVSR

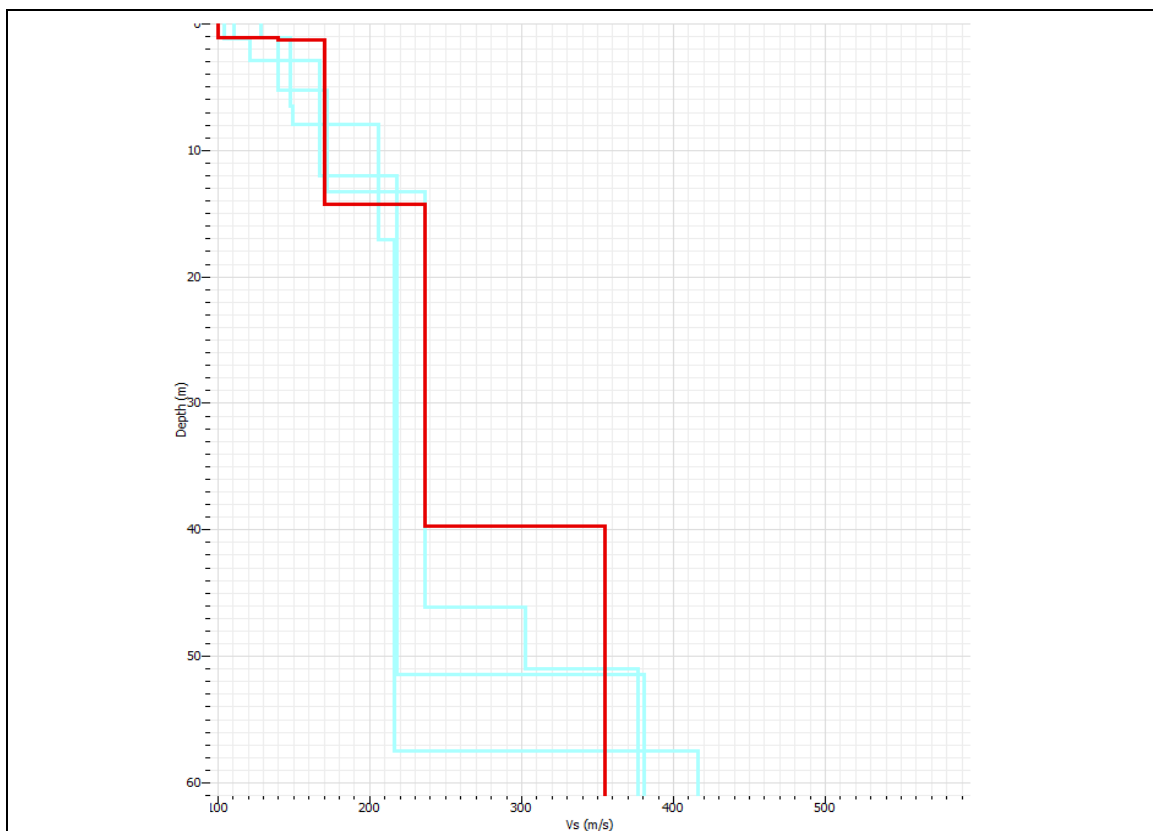
**CLIENTE**                    **COMUNE DI ANZOLA DELL'EMILIA**

**CODICE LAVORO**    **1512**  
**CODICE PROVA**     **Esac1**

**LOCALITA':**                Via XXV aprile- Anzola dell'Emilia  
**DATA PROVA:**            21/10/2014  
**LONGITUDINE:**         673923 m  
**LATITUDINE:**            4935058 m  
**QUOTA (m.s.l.m.):**         
**AZIMUT**                    45°

**APPARECCHIATURA ESAC:** Geometrics GEODE  
**APPARECCHIATURA HVSR:** SARA SL 07  
**N°CANALI**                    24  
**SPACING**                    5 m.  
**RECORD TIME (min)**        18

## PROFILO VELOCITÀ ONDE DI TAGLIO



## CALCOLO VS 30

SPESSORE	PROFONDITA'	Vs	SPESSORE/Vs
1.24	0	100	0.0124
0.13	1.24	141	0.000921986
12.9	1.37	170	0.075882353
15.73	14.27	236	0.066652542
	30		
			0.155856881

$V_{S30} = 192$

Seismic classification of soils  
 (It. D.M. 14/01/2008)     C



# ANTENNA SISMICA (ESAC)

**CLIENTE:** COMUNE DI ANZOLA DELL'EMILIA

**CODICE LAVORO:** 1512

**CODICE PROVA:** Esac2

**LOCALITA':** Via Torresotto- Anzola dell'Emilia

**DATA PROVA:** 21/10/2014

**Coordinata est:** 675898.75 m

**Coordinata nord:** 4940883.30 m

**QUOTA (m.s.l.m.):**

**TERRENO DI MISURA:** Naturale soffice

**SPACING:** 5 m.

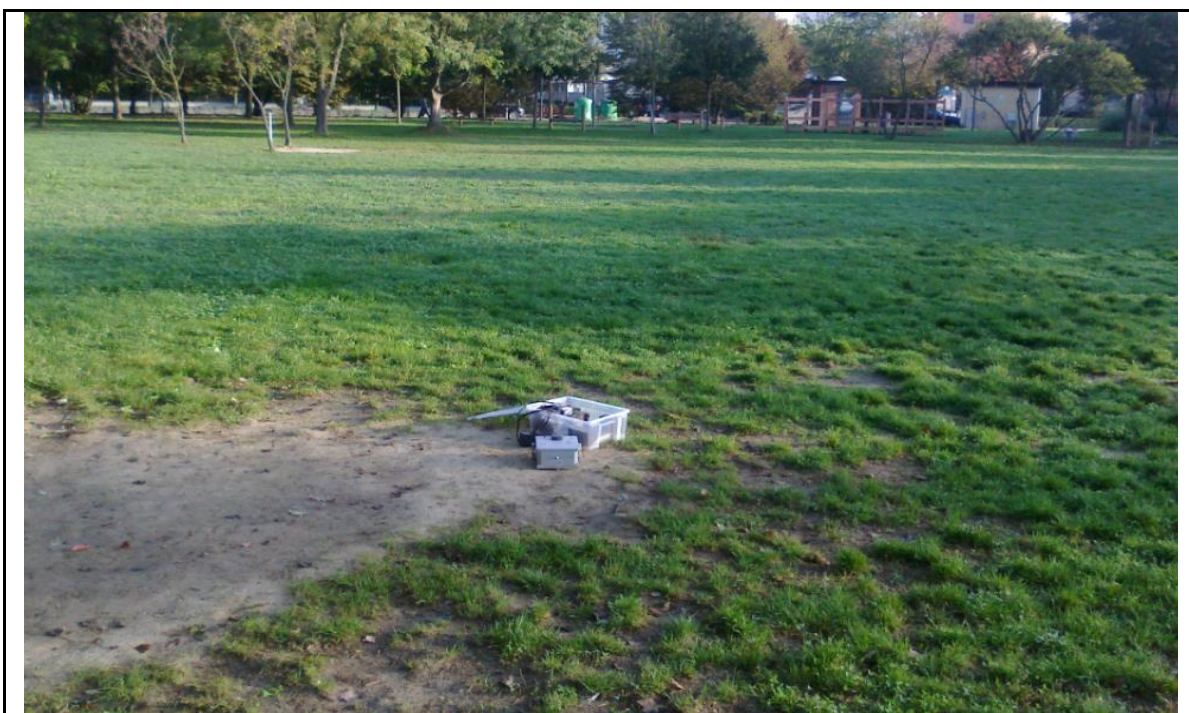
**RECORD TIME (min):** 18

**CONDIZIONI METEO:** Sole

## FOTO AEREA (Google Earth)



## FOTO AREA DI INDAGINE





# ANTENNA SISMICA (ESAC)

**CLIENTE** COMUNE DI ANZOLA DELL'EMILIA

**CODICE LAVORO** 1512

**CODICE PROVA** Esac2

**LOCALITA':** Via Torresotto- Anzola dell'Emilia

**DATA PROVA:** 21/10/2014

**LONGITUDINE:** 675898.75 m

**LATITUDINE:** 4940883.30 m

**QUOTA (m.s.l.m.):**

**STRUMENTAZIONE** Geometrics GEODE

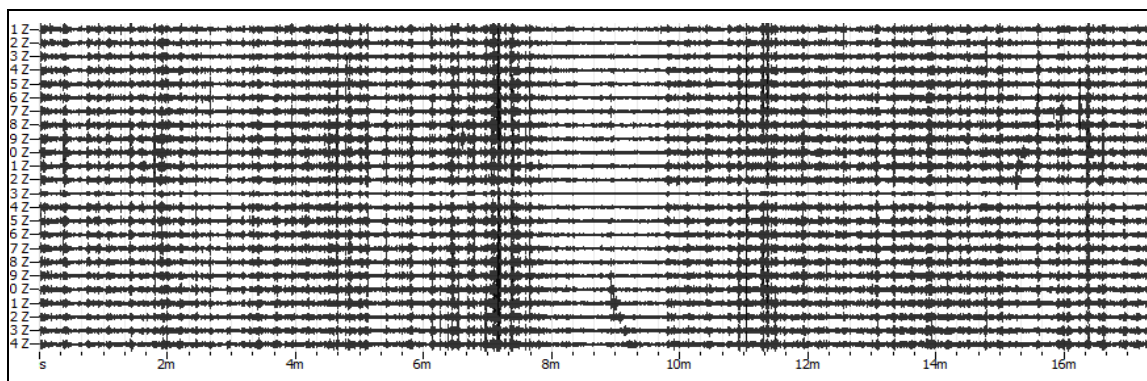
**N°CANALI** 24

**SPACING** 5 m.

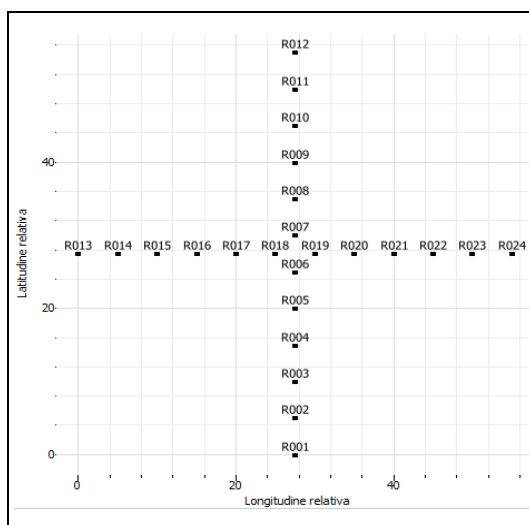
**RECORD TIME (min)** 18

**SAMPLING (Sec)** 0.0

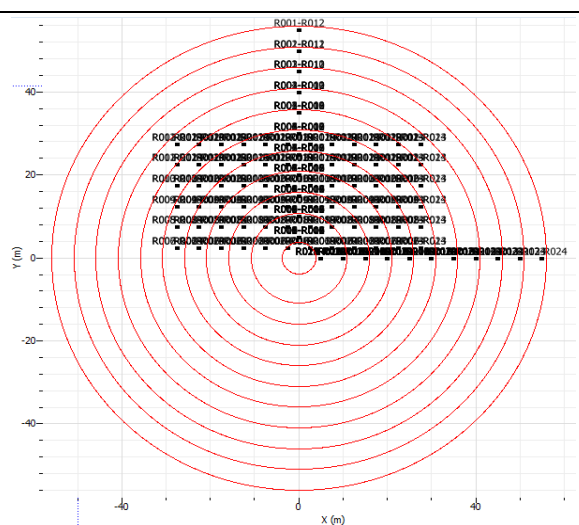
## REGISTRAZIONE



## PLANIMETRIA ARRAY



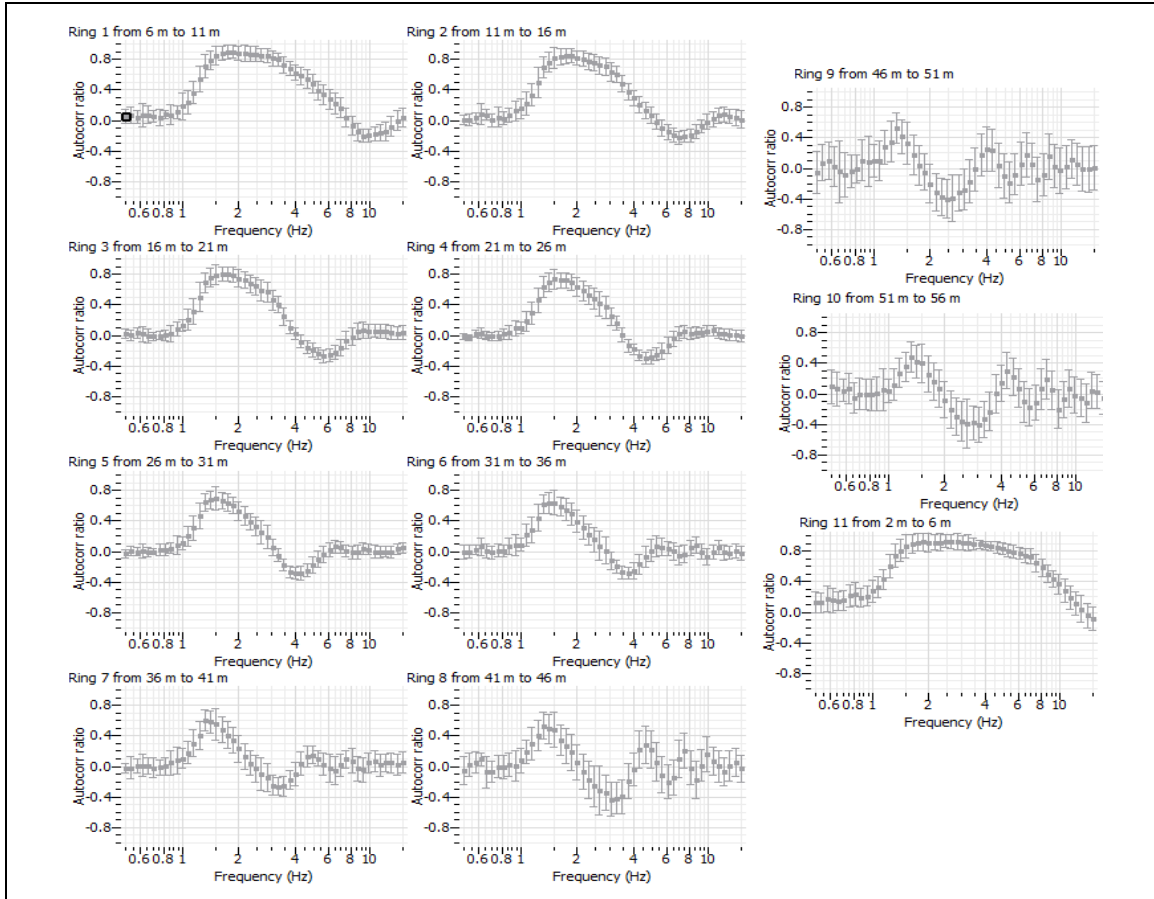
## CO-ARRAY E RINGS



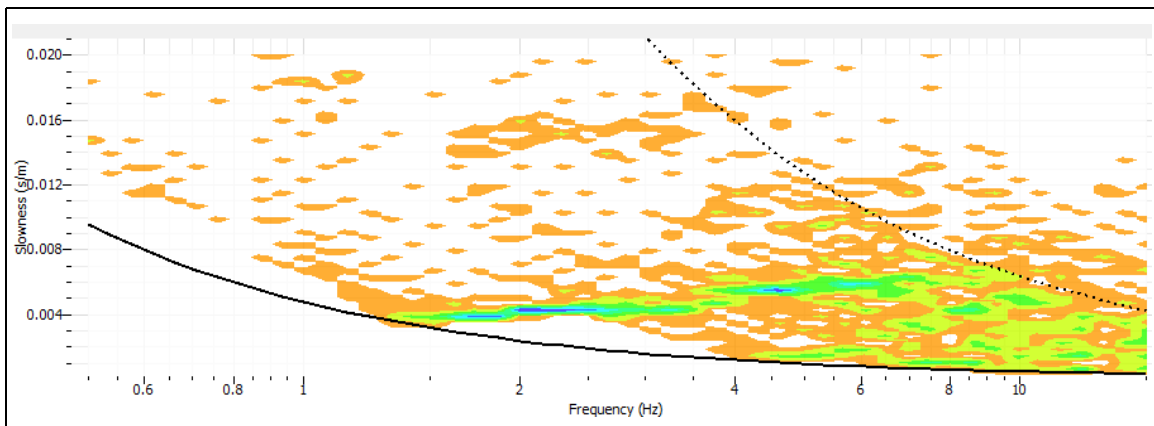
# ANTENNA SISMICA ESAC

**CLIENTE** COMUNE DI ANZOLA DELL'EMILIA  
**CODICE LAVORO** 1512  
**CODICE PROVA** Esac2

## CURVE DI DISPERSIONE CORRISPONDENTI AD OGNI RINGS



## CUMULATA DELLE CURVE DI DISPERSIONE DEI RINGS E RELATIVO PICKING PER INDIVIDUARNE LE FASI PIÙ SIGNIFICATIVE



# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: COMUNE DI ANZOLA DELL'EMILIA

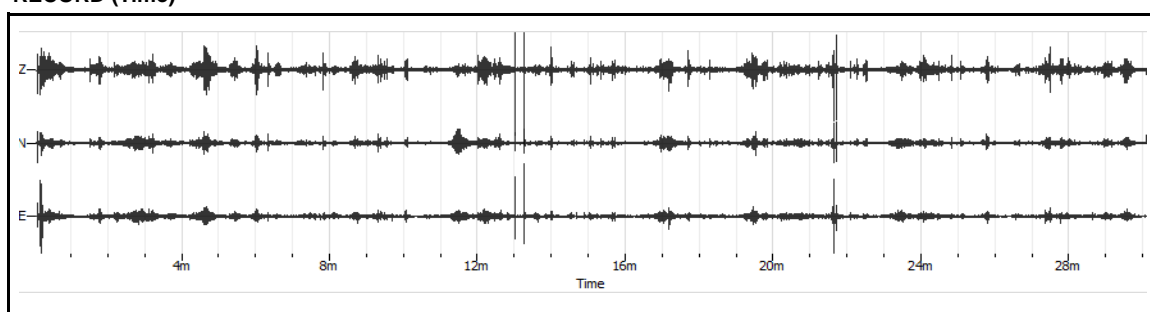
CODICE LAVORO: 1512

CODICE PROVA: Esac2

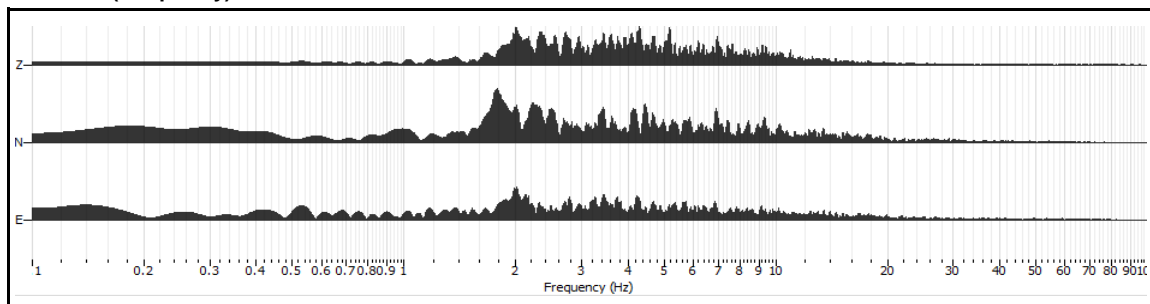
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	57

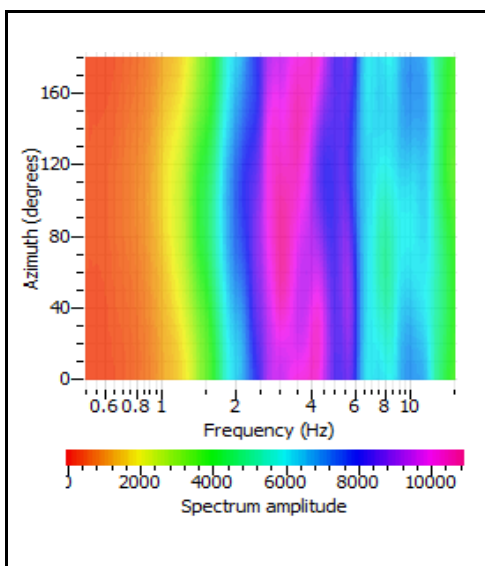
## RECORD (Time)



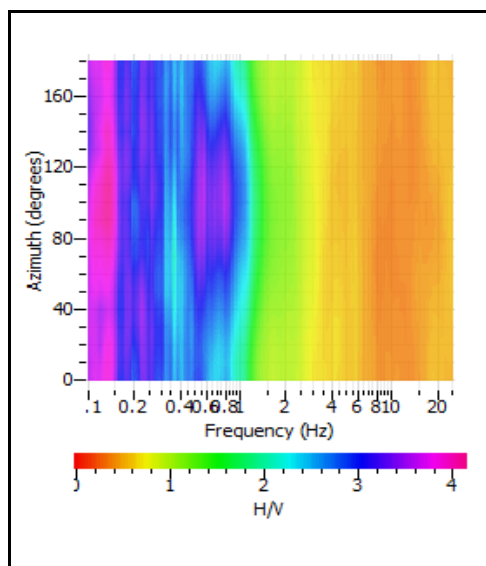
## RECORD (Frequency)



## HORIZONTAL SPECTRUM ROTATE



## HV ROTATE RESULTS

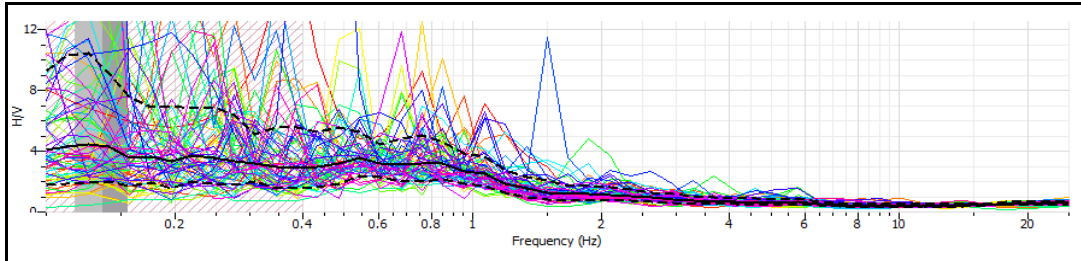


# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

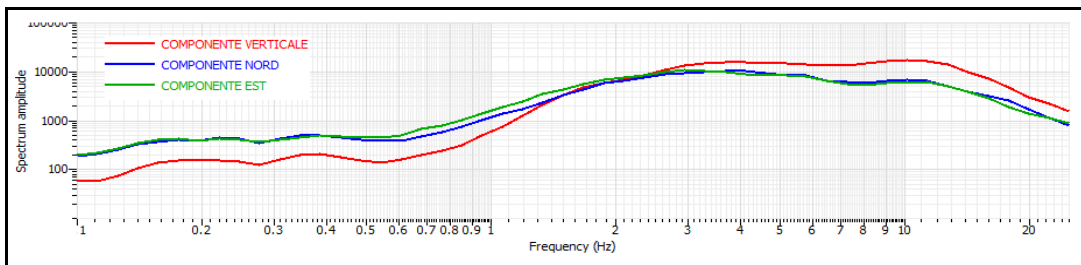
CLIENTE **COMUNE DI ANZOLA DELL'EMILIA**  
 CODICE LAVORO **1512**  
 CODICE PROVA **Esac2**

## RAPPORTO SPETTRALE H/V

**Max HVSR 0.13 ± 0.01 Hz. A0 = 4.45**



## SPETTRO SINGOLE COMPONENTI



### Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

<b>f0</b>	<b>0.13</b>		
<b>Lw</b>	<b>20</b>		
<b>nw</b>	<b>71</b>		
<b>f0 &gt; 10 / Lw</b>	<b>0.13 &gt; 10/20</b>		<input type="checkbox"/>
<b>nc (f0) &gt; 200</b>	<b>184.6 &gt; 200</b>		<input type="checkbox"/>
<b>σA(f) &lt; 2 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &gt; 0.5 Hz</b>	<b>Exceeded 0 out of 50 times</b>	<input checked="" type="checkbox"/>	
<b>σA(f) &lt; 3 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &lt; 0.5 Hz</b>			

### Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

<b>Exists f in [f0/4, f0]   AH/V(f) &lt; A0/2</b>	<b>0 Hz</b>		<input type="checkbox"/>
<b>Exists f+ in [4f0, f0]   AH/V(f+) &lt; A0/2</b>	<b>0 Hz</b>		<input type="checkbox"/>
<b>A0 &gt; 2</b>	<b>4.45 &gt; 2</b>	<input checked="" type="checkbox"/>	
<b>fpeak [AH/V(f) ± σA(f)] = f0 ± 5%</b>	<b>3.5513 &lt; 0.05</b>		<input type="checkbox"/>
<b>σf &lt; ε(f0)</b>	<b>0.019538 &lt; 0.0325</b>	<input checked="" type="checkbox"/>	
<b>σA(f0) &lt; θ(f0)</b>	<b>0.230654 &lt; 3</b>	<input checked="" type="checkbox"/>	

Lw	Window length
nW	Number of windows used in the analysis
nc = Lw nW f0	Number of significant cycles
f	Current frequency
f0	H/V peak frequency
σf	Standard deviation of H/V peak frequency
ε(f0)	Threshold value for the stability condition of < ε(f0)
A0	H/V peak amplitude at frequency f0
AH/V(f)	H/V curve amplitude at frequency f
f -	Frequency between f0/4 and f0 for which AH/V(f-) < A0/2
f +	Frequency between f0 and 4f0 for which AH/V(f+) < A0/2
σA(f)	Standard deviation of AH/V(f), σA(f) is the factor by which the mean AH/V(f) curve should be multiplier or divided
σlogH/V(f)	Standard deviation of log AH/V(f) curve
θ(f0)	Threshold value for the stability condition σA(f) < θ(f0)

Freq. Range [Hz]	Threshold value for σf and σA(f0)				
	< 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0	> 2.0
ε(f0) (Hz)	0.25 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
θ(f0) for σA(f0)	3.00	2.50	2.00	1.78	1.58
Log θ(f0) for σlogH/V(f0)	0.48	0.40	0.30	0.25	0.20

# ANALISI CONGIUNTA PROVA ESAC - HVSR

**CLIENTE** COMUNE DI ANZOLA DELL'EMILIA

**CODICE LAVORO** 1512

**CODICE PROVA** Esac2

**LOCALITA':** Via Torresotto- Anzola dell'Emilia

**DATA PROVA:** 21/10/2014

**LONGITUDINE:** 675898.75 m

**LATITUDINE:** 4940883.30 m

**QUOTA (m.s.l.m.):**

**AZIMUT** 45°

**APPARECCHIATURA ESAC:** Geometrics GEODE

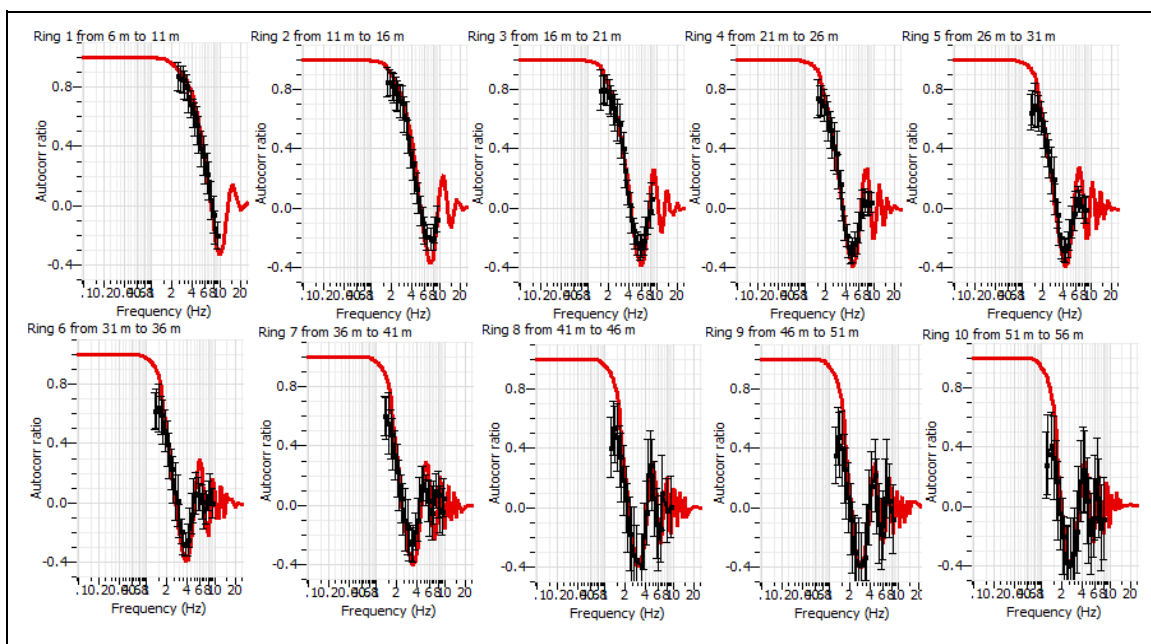
**APPARECCHIATURA HVSR:** SARA SL 07

**N°CANALI** 24

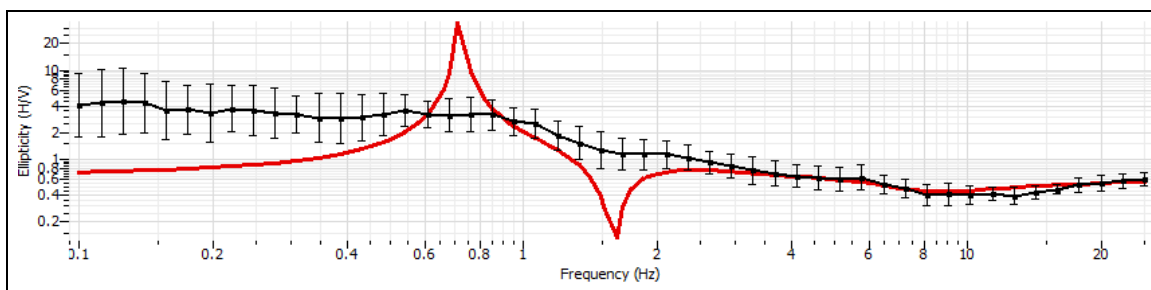
**SPACING** 5 m.

**RECORD TIME (min)** 18

## VERTICAL RINGS AUTOCORRELATION



## ELLIPTICITY AUTOCORRELATION CURVES



# ANALISI CONGIUNTA PROVA ESAC - HVSR

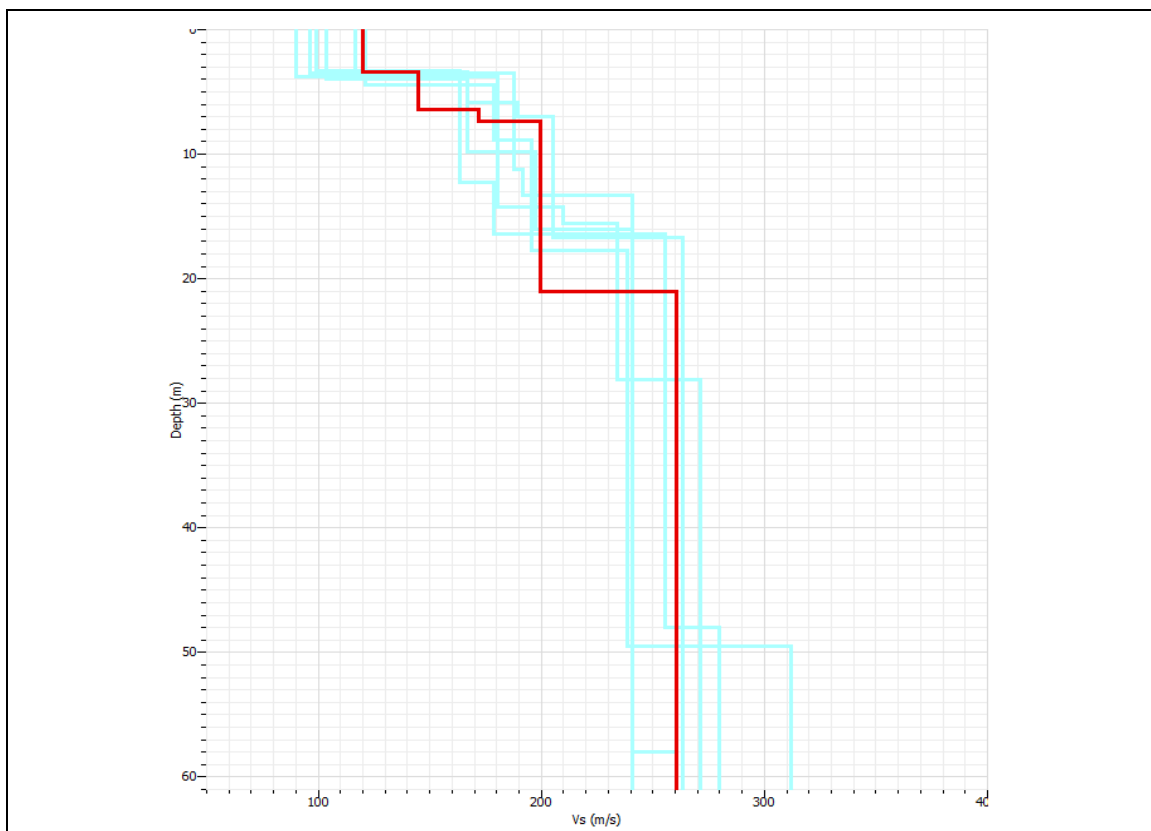
**CLIENTE**                    **COMUNE DI ANZOLA DELL'EMILIA**

**CODICE LAVORO**    1512  
**CODICE PROVA**     Esac2

**LOCALITA':**            Via Torresotto- Anzola dell'Emilia  
**DATA PROVA:**        21/10/2014  
**LONGITUDINE:**      675898.75 m  
**LATITUDINE:**        4940883.30 m  
**QUOTA (m.s.l.m.):**    45°  
**AZIMUT**                45°

**APPARECCHIATURA ESAC:** Geometrics GEODE  
**APPARECCHIATURA HVSR:** SARA SL 07  
**N°CANALI**              24  
**SPACING**                5 m.  
**RECORD TIME (min)**    18

## PROFILO VELOCITÀ ONDE DI TAGLIO



## CALCOLO VS 30

SPESSORE	PROFONDITA'	Vs	SPESSORE/Vs
3.6	0	120	0.03
3	3.6	144	0.020833333
1.2	6.6	174	0.006896552
13.8	7.8	199	0.069346734
8.4	21.6	260	0.032307692
	30		
			0.159384311

$V_{S30} = 188$

**C**

Seismic classification of soils  
 (It. D.M. 14/01/2008)



# MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

**CLIENT:** COMUNE DI ANZOLA EMILIA  
**JOB NUMBER:** 1512  
**SITE:** MASW 1  
**TEST NUMBER:** 1

## SITE DATA

Latitude	44.544722°
Longitude	11.206675°
Height m. s.l.m.	39 m s.l.m.
Azimuth	15°

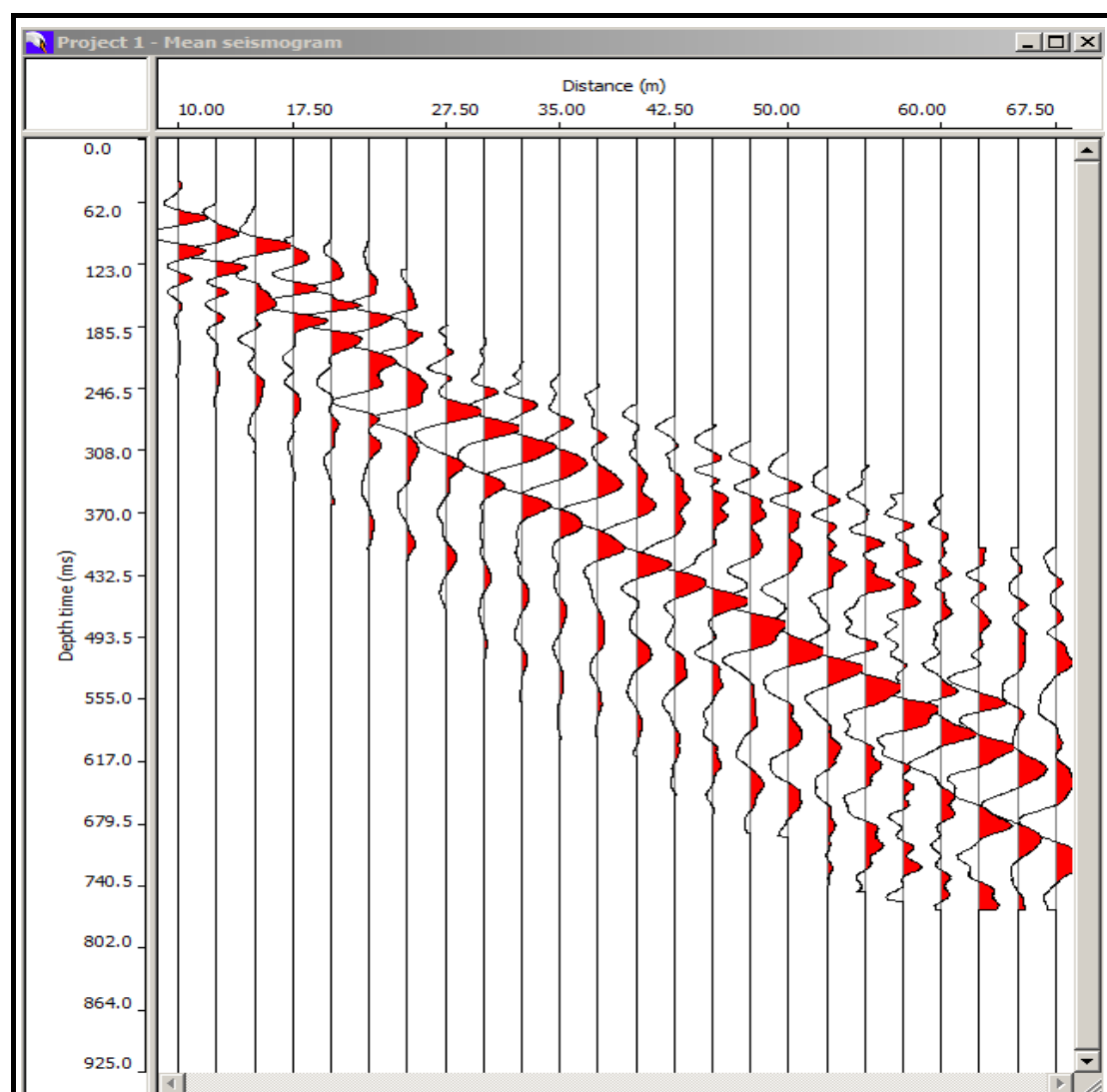
## ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	2.0
Sampling (millisec)	0.5

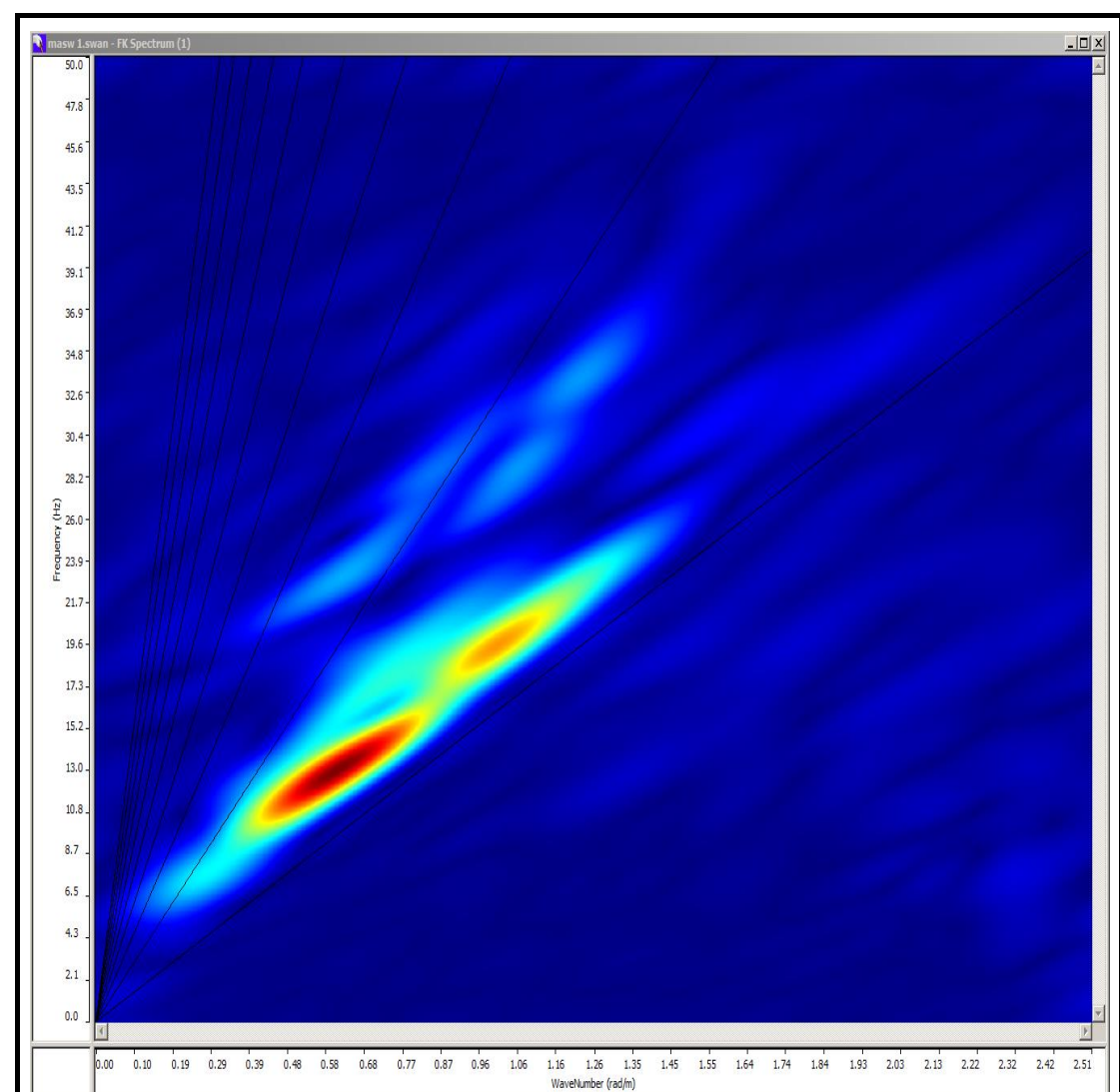
## SITE



## RECORD



## F-K SPECTRUM





# MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

**CLIENT:** COMUNE DI ANZOLA EMILIA  
**JOB NUMBER:** 1512  
**SITE:** MASW 1  
**TEST NUMBER:** 1

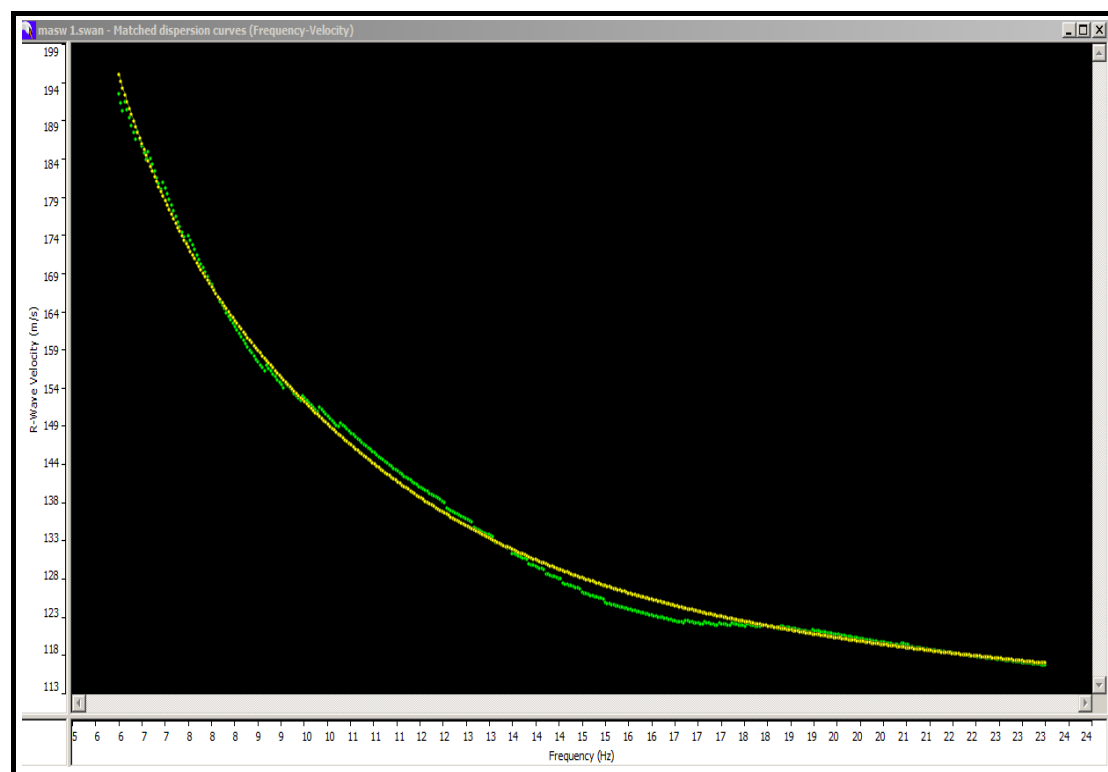
## SITE DATA

Latitude	44.544722°
Longitude	11.206675°
Height m. s.l.m.	39 m s.l.m.
Azimuth	15°

## ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	2.0
Sampling (millisec)	0.5

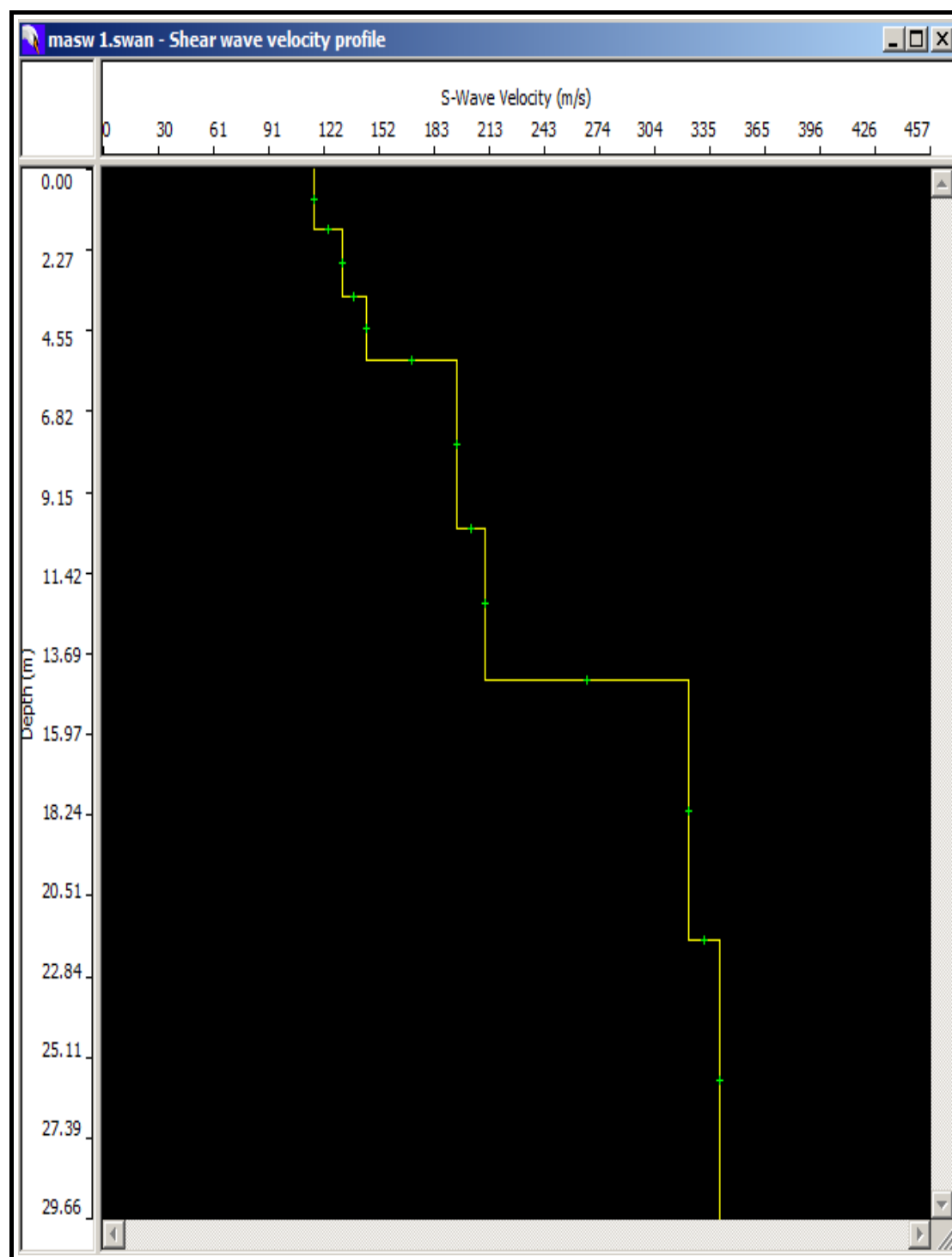
## MATCHED DISPERSION CURVES (f-v)



## SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.67	0.00	116
Layer 2	1.90	1.67	132
Layer 3	1.80	3.57	145
Layer 4	4.78	5.37	195
Layer 5	4.27	10.15	211
Layer 6	7.38	14.43	323
Layer 7	INF	21.81	340

## SHEAR WAVES VELOCITY PROFILE



## HISTORY

Thickness	Depth	Vs
1.673338	0.000000	116.0
1.900897	1.673338	132.0
1.798733	3.574235	145.0
4.780087	5.372968	195.0
4.272222	10.153055	211.0
7.382376	14.425277	323.0
	21.807653	340.0

Data Error: 0.82

## CALCULATION OF Vs<sub>30</sub>

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.67	0	116	0.01440
1.9	1.67	132	0.01439
1.8	3.57	145	0.01241
4.78	5.37	195	0.02451
4.27	10.15	211	0.02024
7.38	14.42	323	0.02285
8.2	21.8	340	0.02412
	30		
			0.13292

**$V_{s30} = 226$**

Seismic classification of soils (It. D.M. 14/01/2008) **C**



# MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

**CLIENT:** COMUNE DI ANZOLA EMILIA  
**JOB NUMBER:** 1512  
**SITE:** MASW 2  
**TEST NUMBER:** 1

## SITE DATA

Latitude	44.554431°
Longitude	11.172876°
Height m. slm	37 m s.l.m.
Azimuth	30°

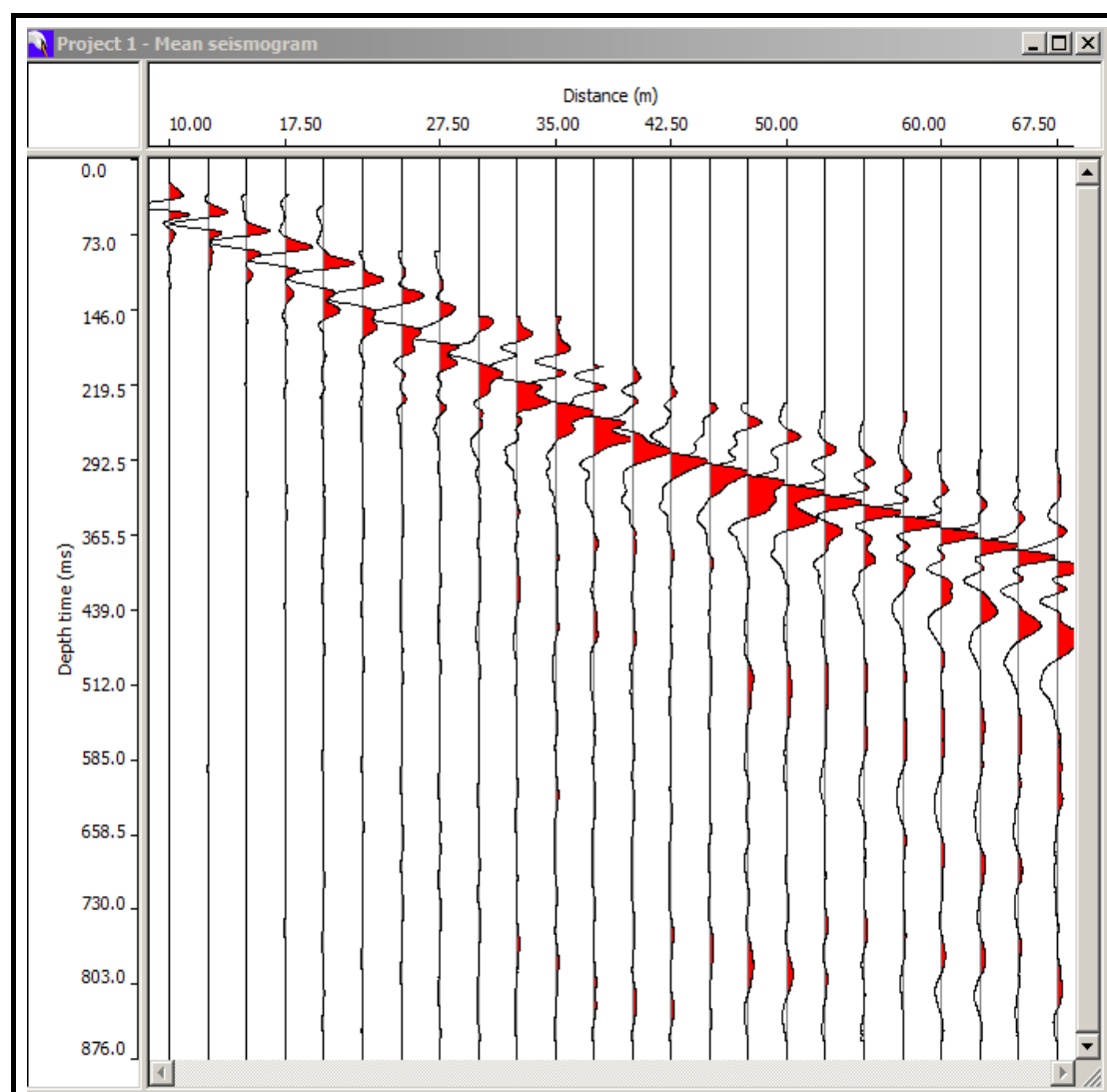
## ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	2.0
Sampling (millisec)	0.5

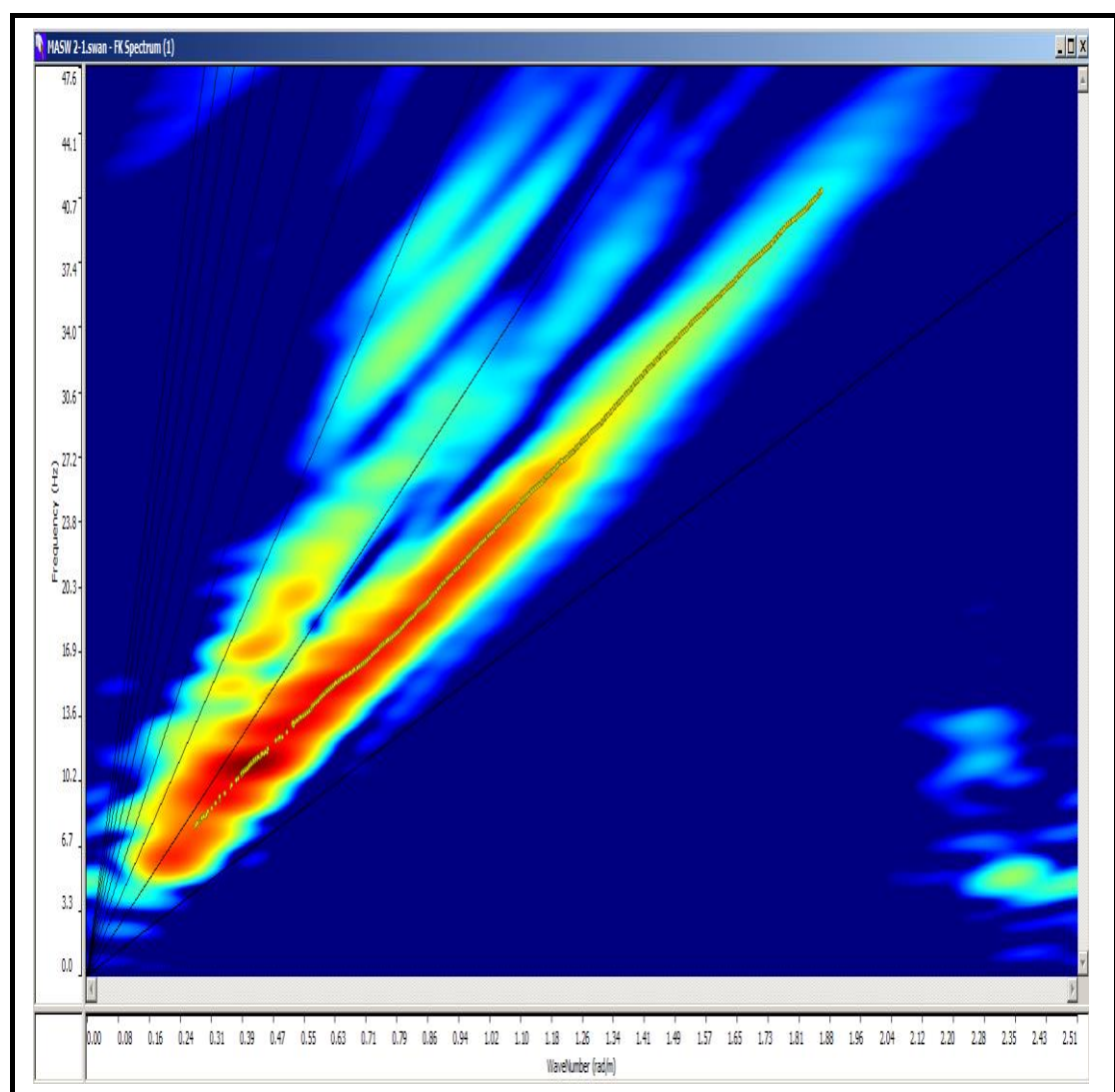
## SITE



## RECORD



## F-K SPECTRUM





# MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

**CLIENT:** COMUNE DI ANZOLA EMILIA  
**JOB NUMBER:** 1512  
**SITE:** MASW 2  
**TEST NUMBER:** 1

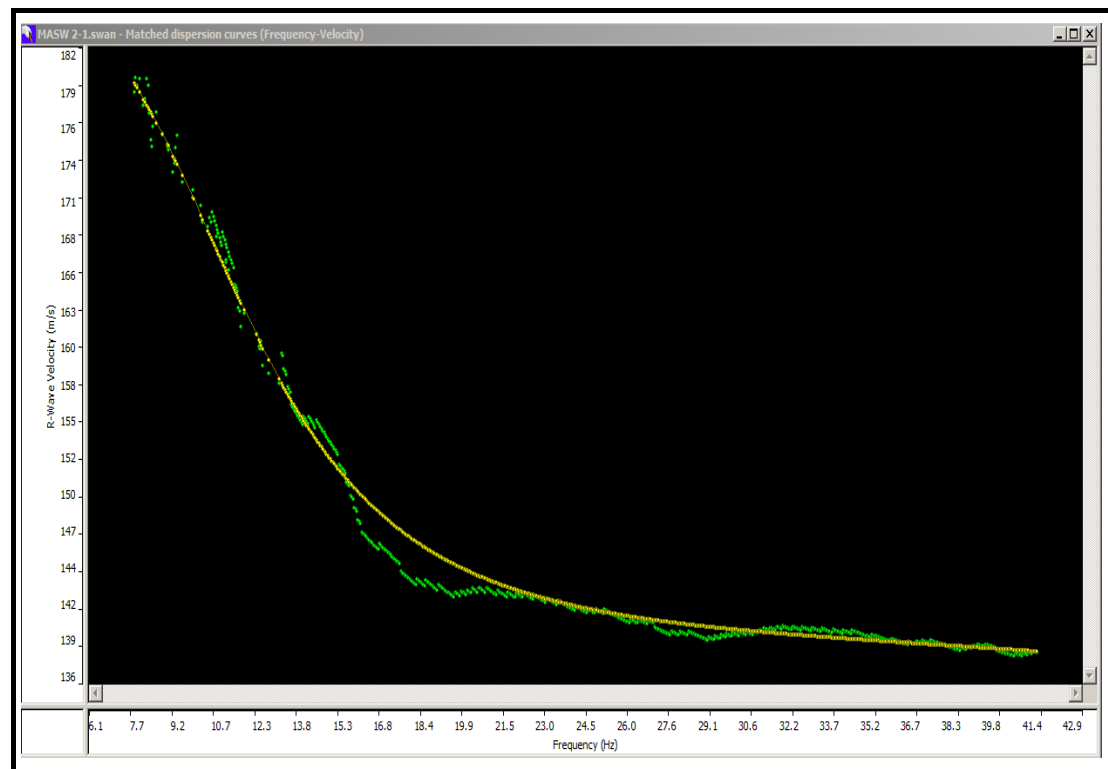
## SITE DATA

Latitude	44.554431°
Longitude	11.172876°
Height m. s.l.m.	37 m s.l.m.
Azimuth	30°

## ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	2.0
Sampling (millisec)	0.5

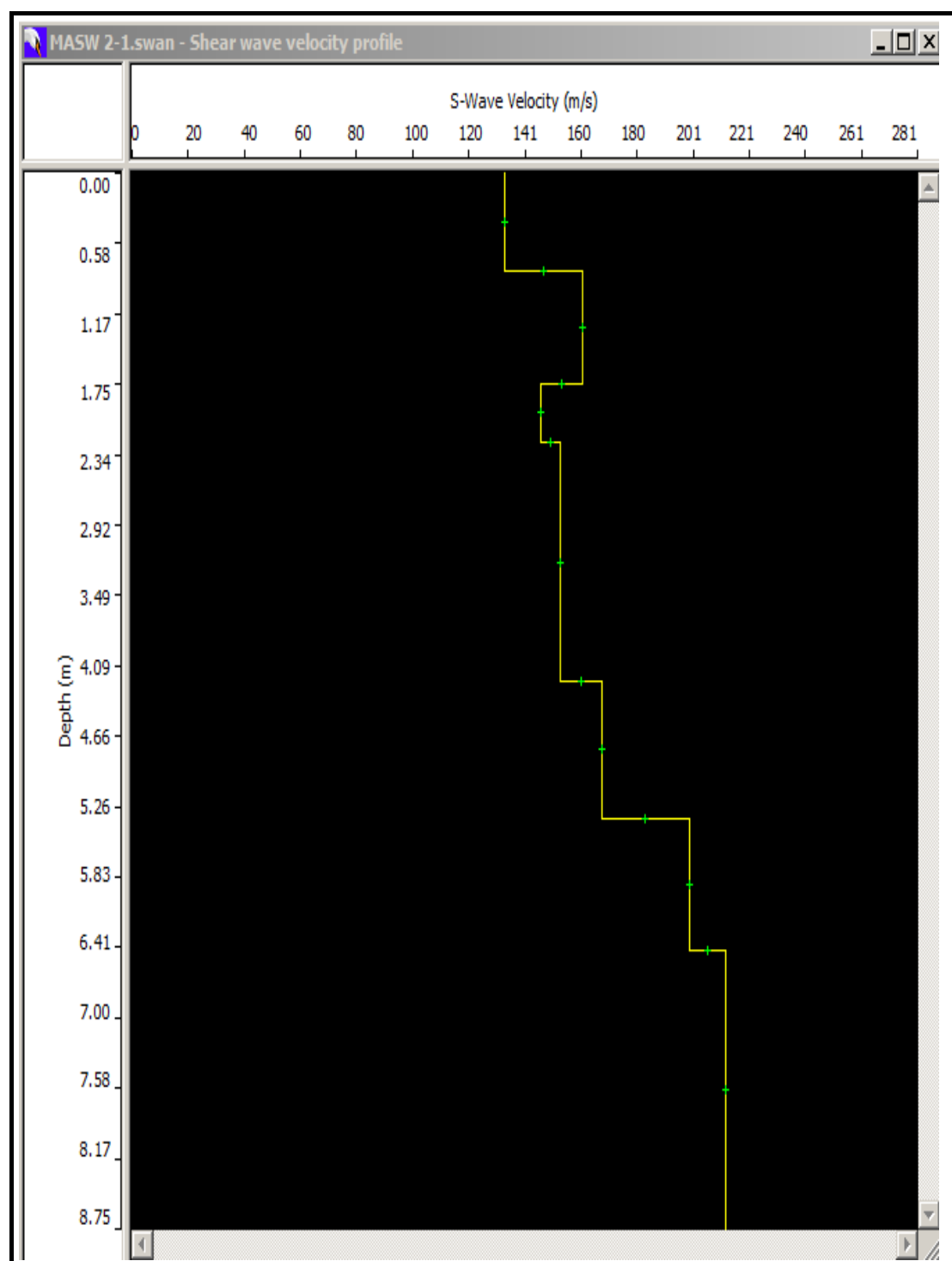
## MATCHED DISPERSION CURVES (f-v)



## SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	0.81	0.00	133
Layer 2	0.93	0.81	161
Layer 3	0.49	1.74	146
Layer 4	1.98	2.23	153
Layer 5	1.13	4.21	168
Layer 6	1.10	5.35	199
Layer 7	INF	6.45	212

## SHEAR WAVES VELOCITY PROFILE



## HISTORY

Model:

Thickness	Depth	Vs
0.810615	0.000000	133.000000
0.932640	0.810615	161.000000
0.485628	1.743256	146.000000
1.984584	2.228884	153.000000
1.131645	4.213467	168.000000
1.104170	5.345112	199.000000
	6.449282	212.000000

Data Error: 5.54

## CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
0.81	0	133	0.00609
0.93	0.81	161	0.00578
0.49	1.74	146	0.00336
1.98	2.23	153	0.01294
1.13	4.21	168	0.00673
1.1	5.34	199	0.00553
23.56	6.44	212	0.11113
	30		
			0.15155

**$V_{S_{30}} = 198$**

Seismic classification of soils  
(It. D.M. 14/01/2008) **C**



# MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

**CLIENT:** COMUNE DI ANZOLA EMILIA  
**JOB NUMBER:** 1512  
**SITE:** MASW 3  
**TEST NUMBER:** 1

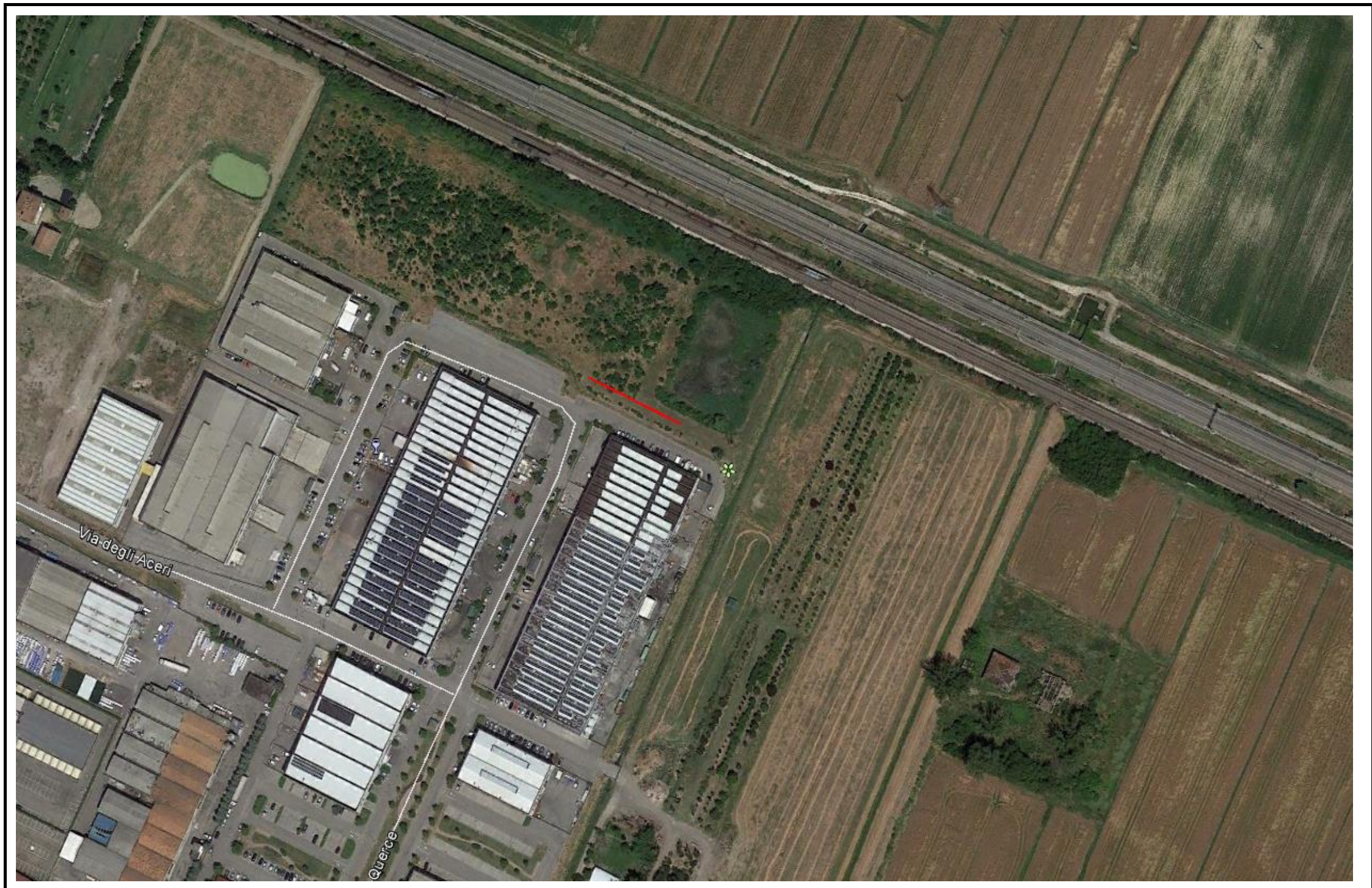
## SITE DATA

Latitude	44.562290°
Longitude	11.158781°
Height m. s.l.m.	36 m s.l.m.
Azimuth	110°

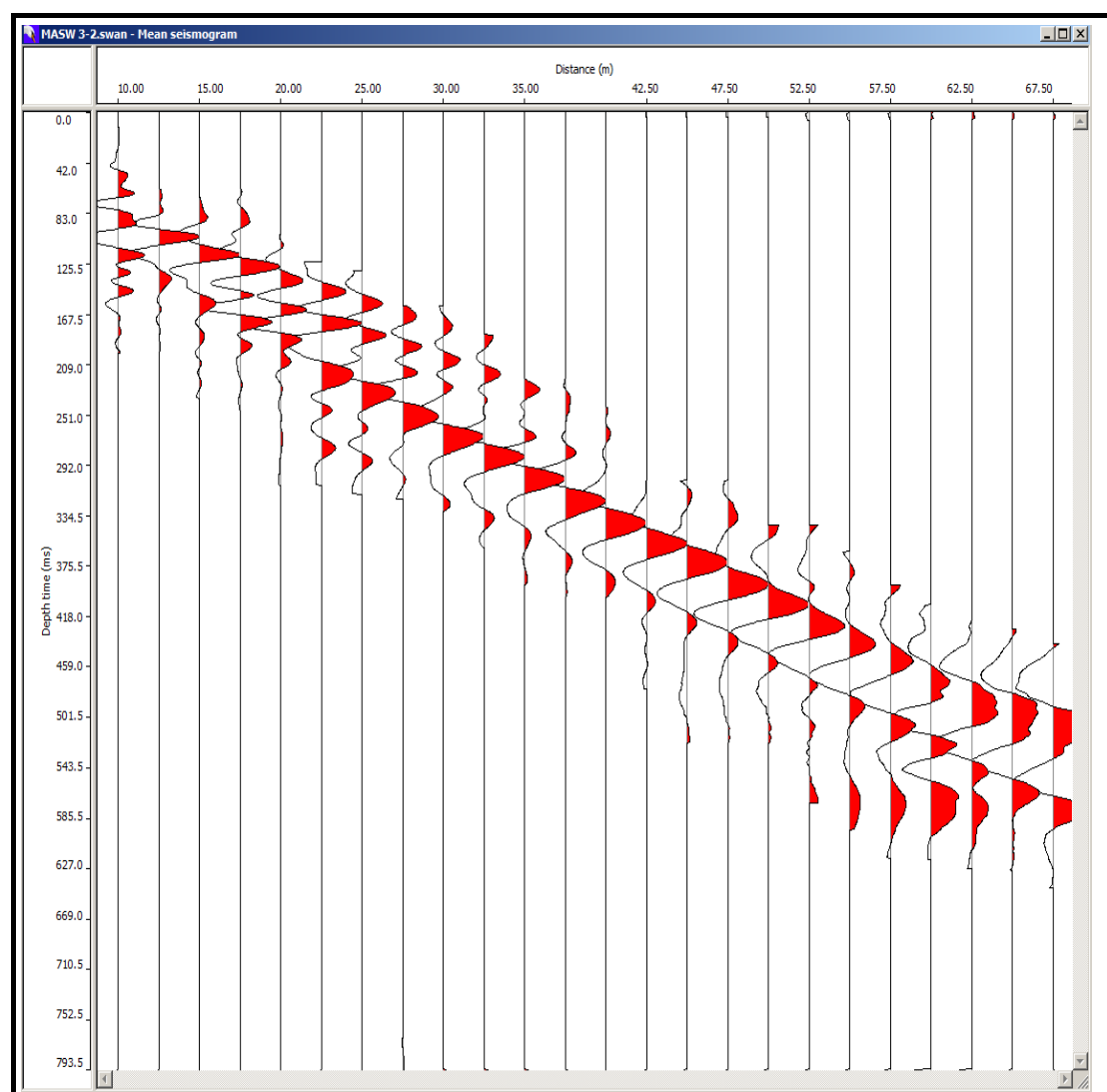
## ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	2.0
Sampling (millisec)	0.5

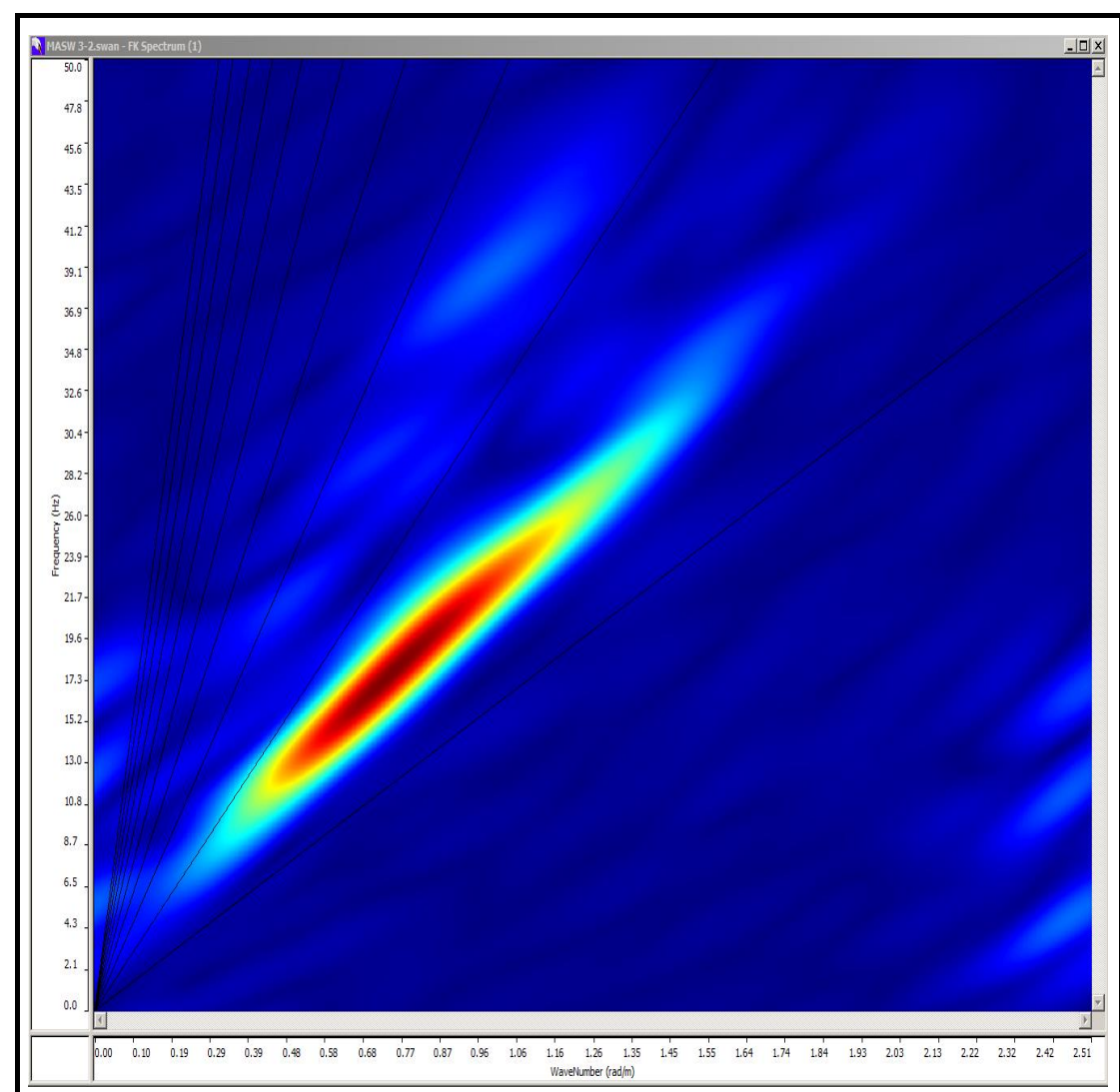
## SITE



## RECORD



## F-K SPECTRUM





# MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

**CLIENT:** COMUNE DI ANZOLA EMILIA  
**JOB NUMBER:** 1512  
**SITE:** MASW 3  
**TEST NUMBER:** 1

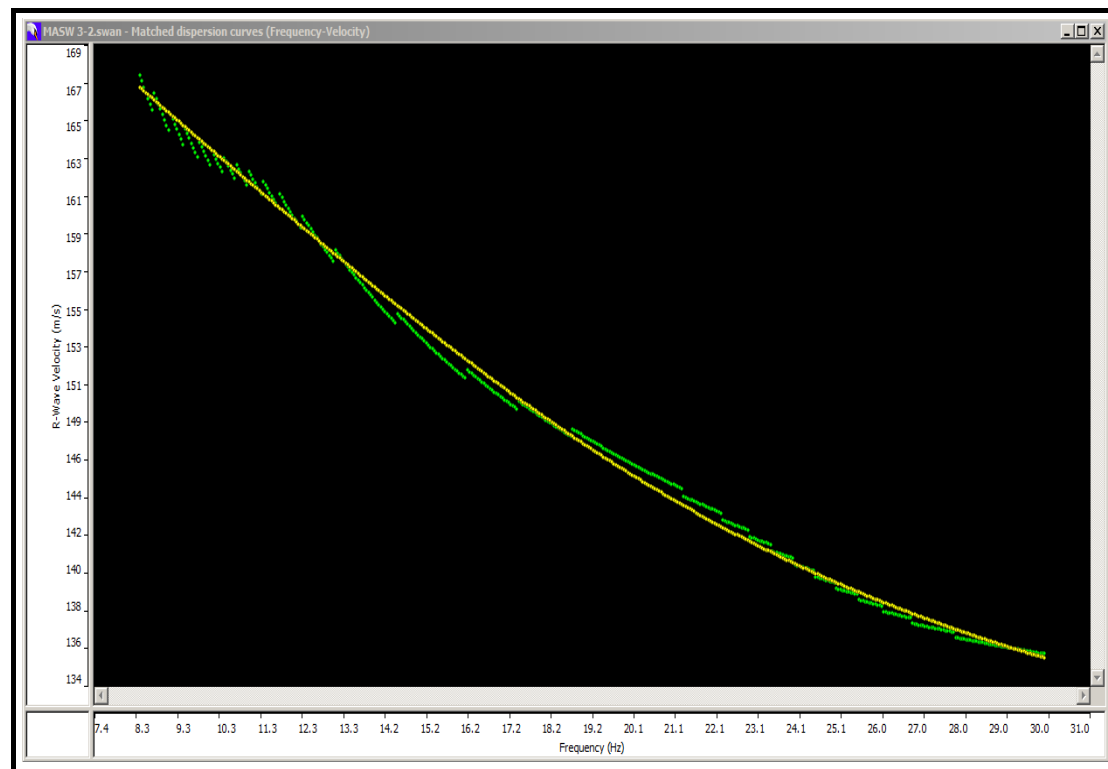
## SITE DATA

Latitude	44.562290°
Longitude	11.158781°
Height m. s.l.m.	36 m s.l.m.
Azimuth	110°

## ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	2.0
Sampling (millisec)	0.5

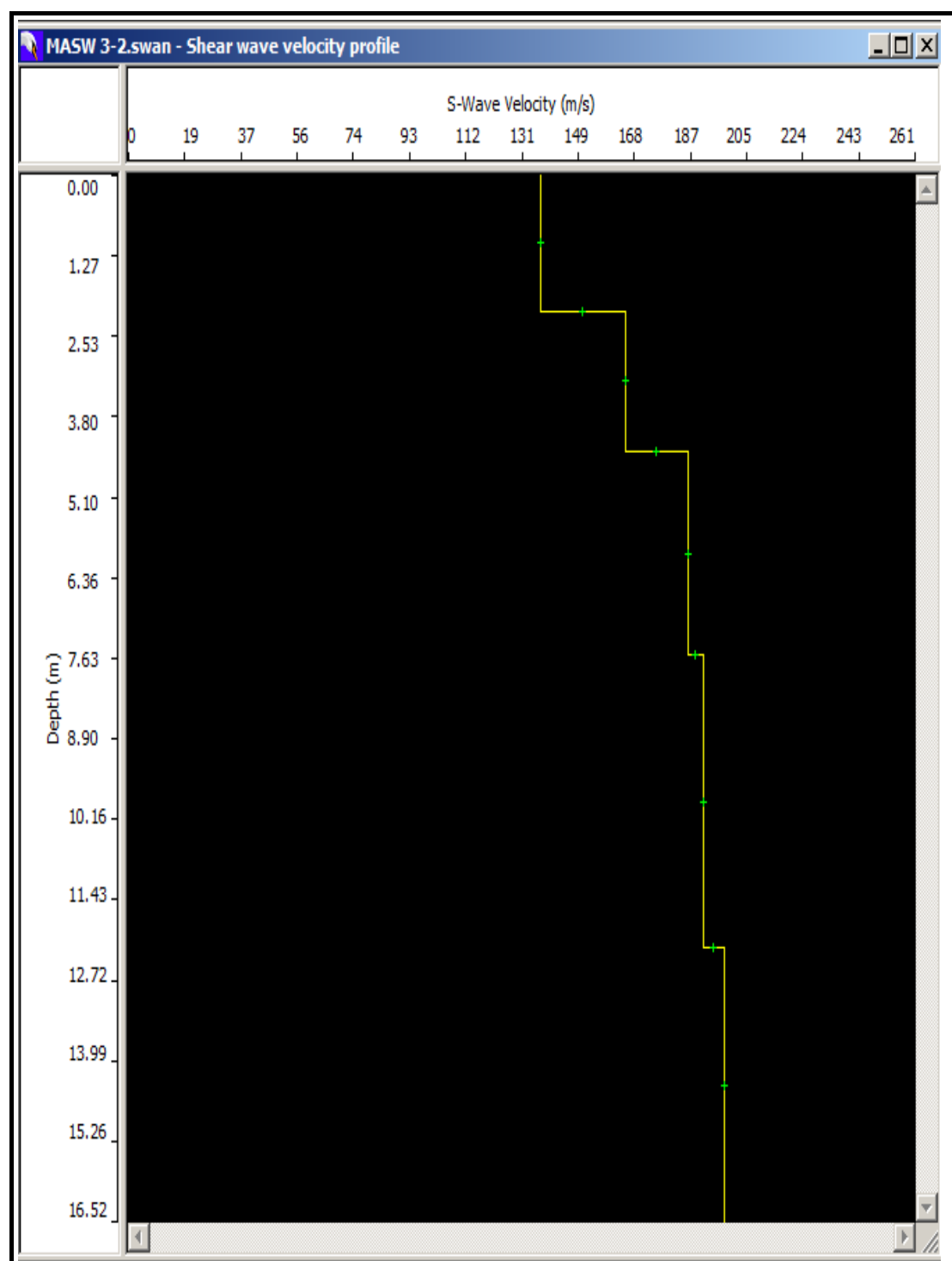
## MATCHED DISPERSION CURVES (f-v)



## SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	2.14	0.00	137
Layer 2	2.21	2.14	165
Layer 3	3.22	4.35	186
Layer 4	4.63	7.58	191
Layer 5	INF	12.21	198

## SHEAR WAVES VELOCITY PROFILE



## HISTORY

Model:	Thickness	Depth	Vs
	2.139507	0.000000	137.00
	2.214907	2.139507	165.00
	3.221683	4.354414	186.00
	4.631169	7.576097	191.00
		12.207266	198.00

Data Error: 0.33

## CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
2.14	0	137	0.01562
2.21	2.14	165	0.01339
3.22	4.35	186	0.01731
4.63	7.57	191	0.02424
17.8	12.2	198	0.08990
	30		
			0.16047

**$V_{S_{30}} = 187$**

Seismic classification of soils  
(It. D.M. 14/01/2008) **C**



# MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

**CLIENT:** COMUNE DI ANZOLA EMILIA  
**JOB NUMBER:** 1512  
**SITE:** MASW 4  
**TEST NUMBER:** 1

## SITE DATA

Latitude	44.541751°
Longitude	11.188032°
Height m. s.l.m.	40 m s.l.m.
Azimuth	110°

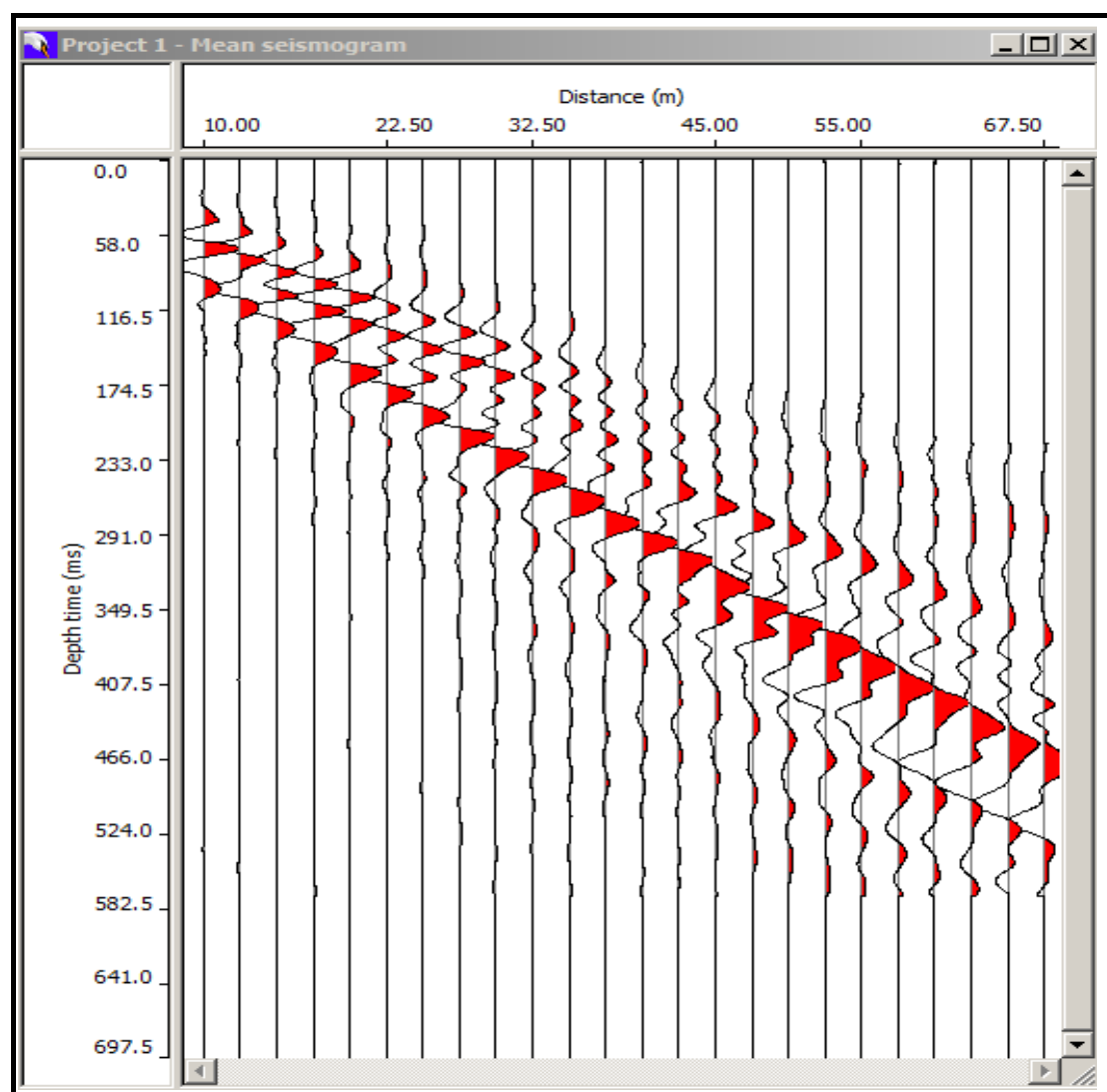
## ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	2.0
Sampling (millisec)	0.5

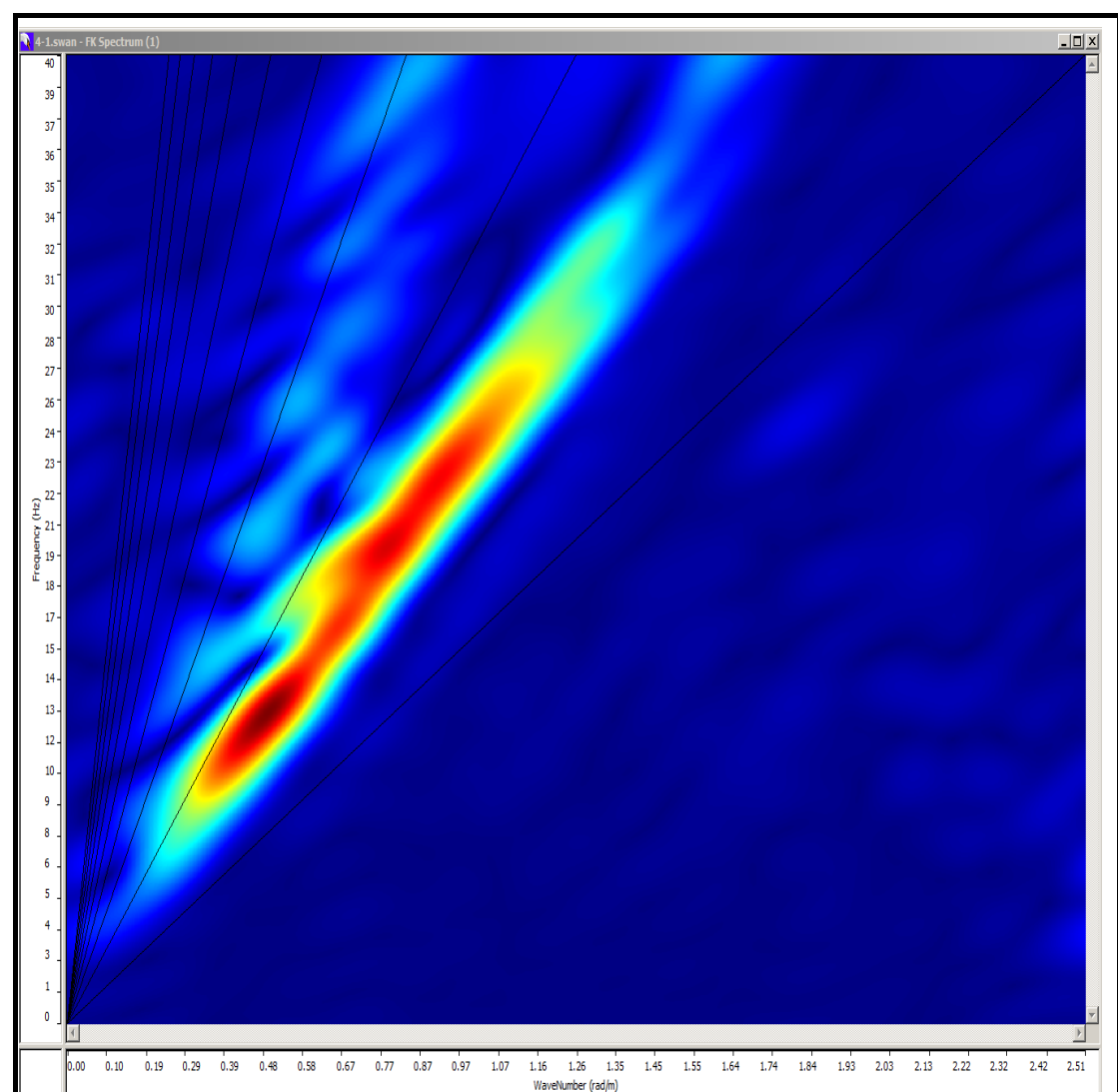
## SITE



## RECORD



## F-K SPECTRUM





# MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

**CLIENT:** COMUNE DI ANZOLA EMILIA  
**JOB NUMBER:** 1512  
**SITE:** MASW 4  
**TEST NUMBER:** 1

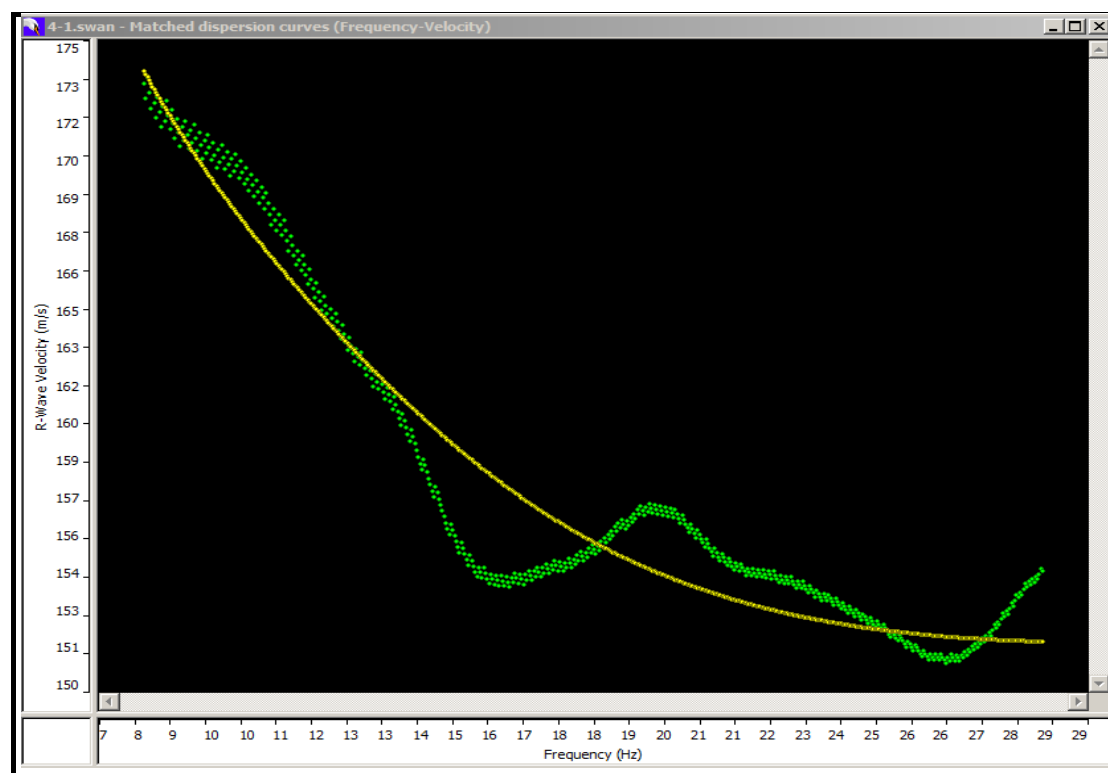
## SITE DATA

Latitude	44.541751°
Longitude	11.188032°
Height m. slm	40 m s.l.m.
Azimuth	110°

## ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	2.0
Sampling (millisec)	0.5

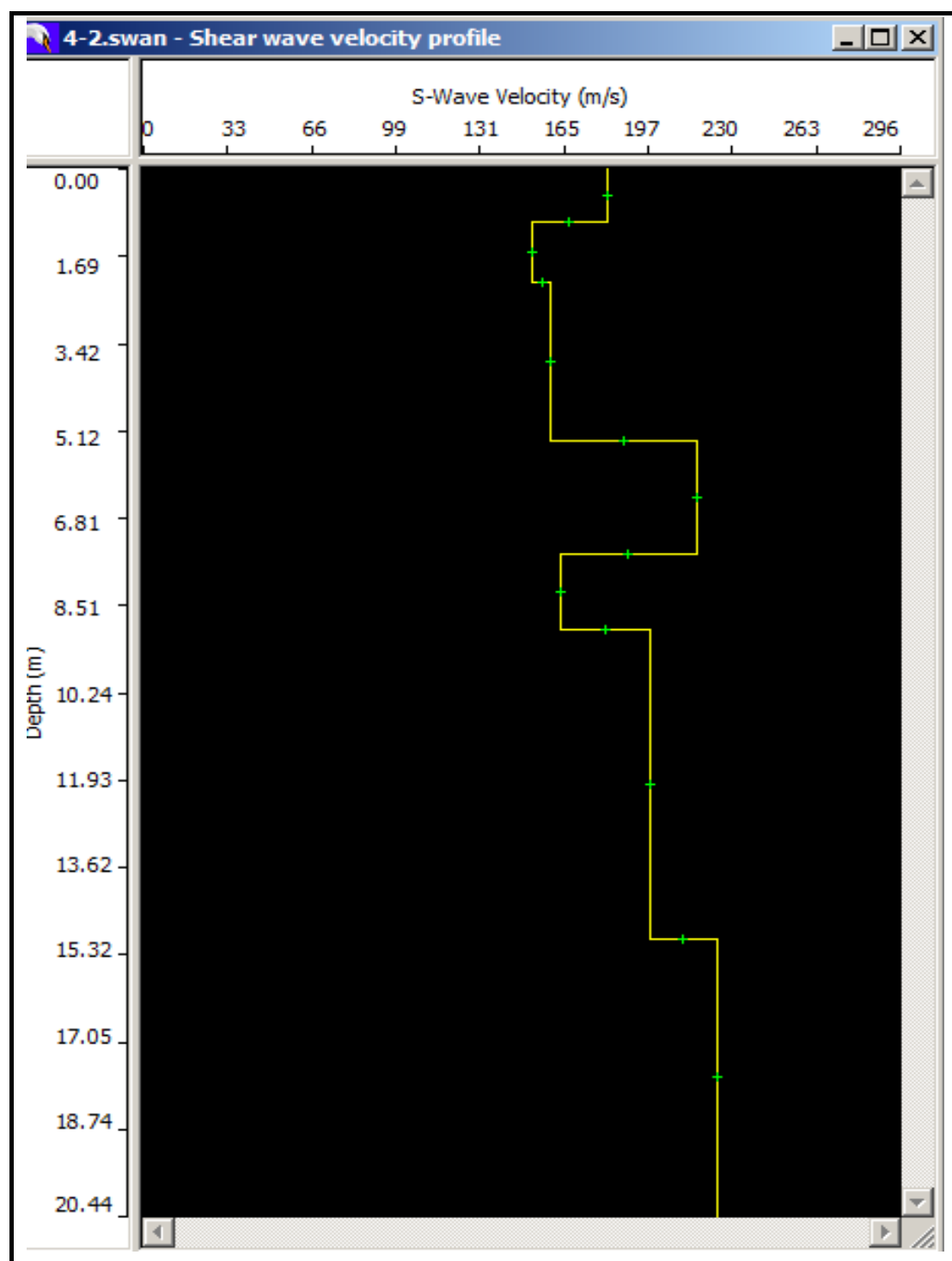
## MATCHED DISPERSION CURVES (f-v)



## SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.04	0.00	181
Layer 2	1.18	1.04	152
Layer 3	3.07	2.22	159
Layer 4	2.23	5.29	216
Layer 5	1.47	7.51	163
Layer 6	6.03	8.98	198
Layer 7	INF	15.01	224

## SHEAR WAVES VELOCITY PROFILE



## HISTORY

Thickness	Depth	Vs
1.044312	0.000000	181.0
1.175012	1.044312	152.0
3.067739	2.219323	159.0
2.225789	5.287062	216.0
1.477939	7.512851	163.0
6.029694	8.990790	198.0
	15.020484	224.0

Data Error: 1.10

## CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.04	0	181	0.00575
1.18	1.04	152	0.00776
3.07	2.22	159	0.01931
2.23	5.29	216	0.01032
1.48	7.52	163	0.00908
6.03	9	198	0.03045
14.97	15.03	224	0.06683
	30		
			0.14951

**$V_{s30} = 201$**

Seismic classification of soils  
(It. D.M. 14/01/2008) **C**



# MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

**CLIENT:** COMUNE DI ANZOLA EMILIA  
**JOB NUMBER:** 1512  
**SITE:** MASW 5  
**TEST NUMBER:** 1

## SITE DATA

Latitude	44.565505°
Longitude	11.144051°
Height m. slm	43 m s.l.m.
Azimuth	30°

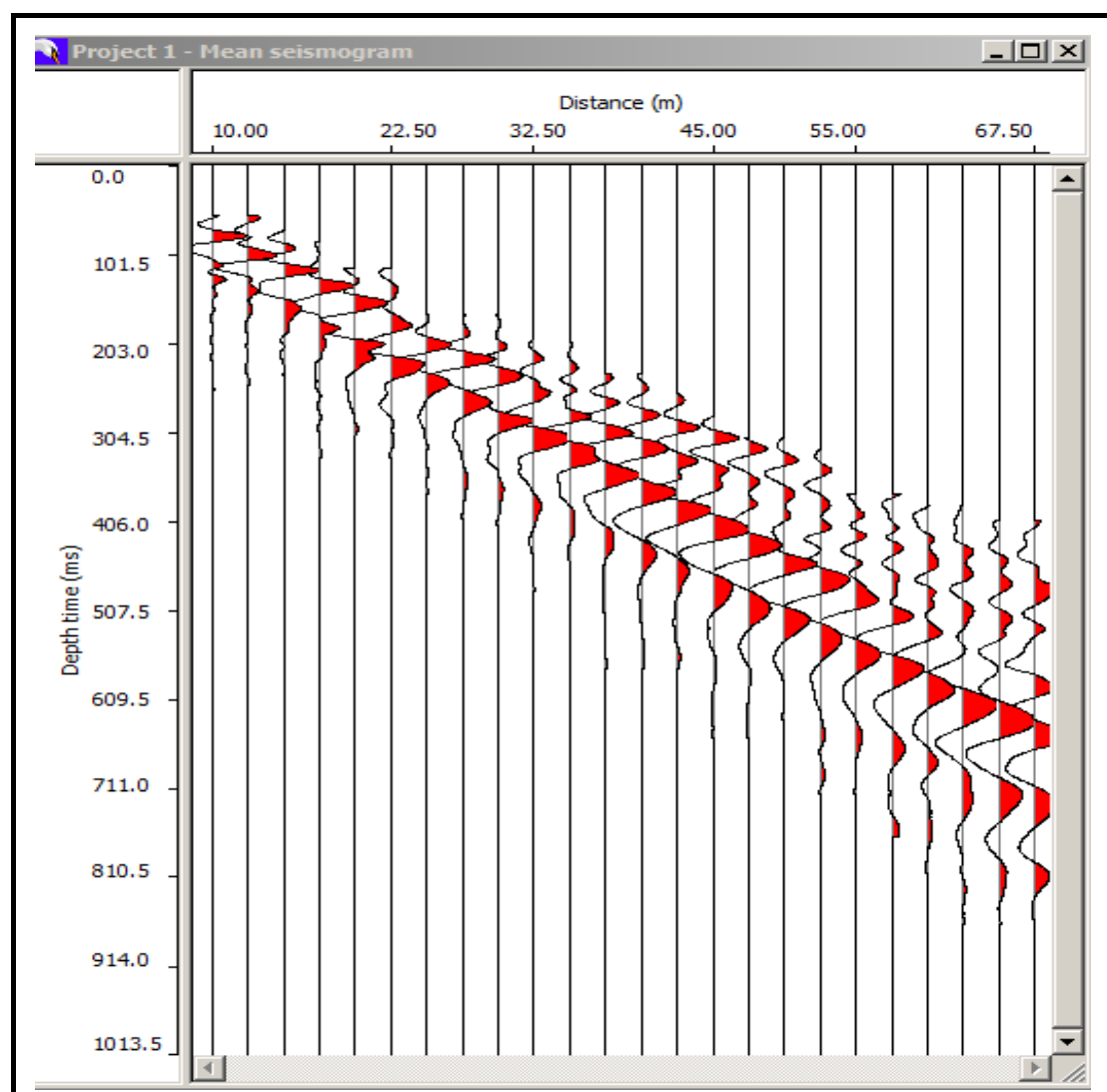
## ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	2.0
Sampling (millisec)	0.5

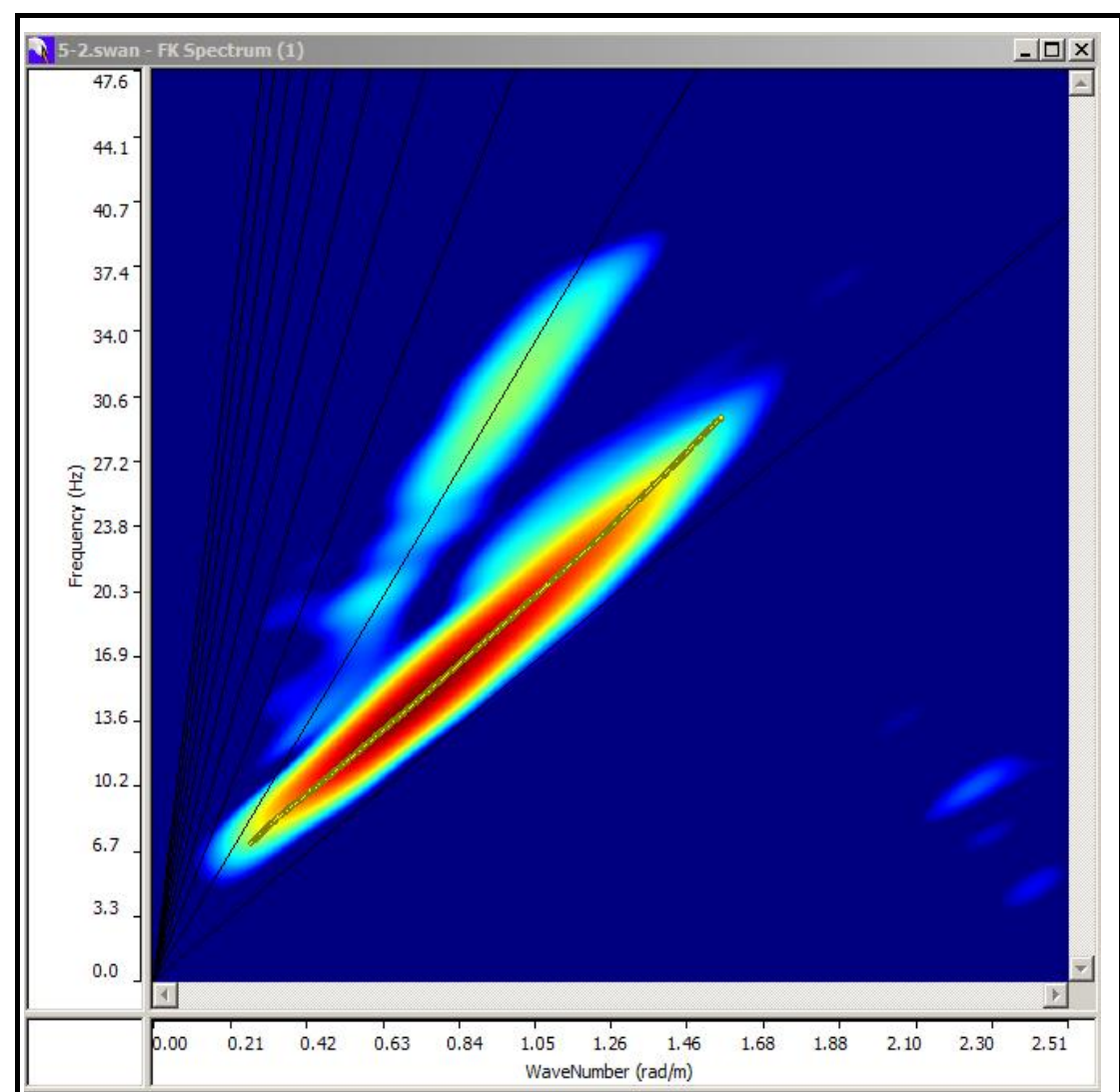
## SITE



## RECORD



## F-K SPECTRUM





# MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

**CLIENT:** COMUNE DI ANZOLA EMILIA  
**JOB NUMBER:** 1512  
**SITE:** MASW 5  
**TEST NUMBER:** 1

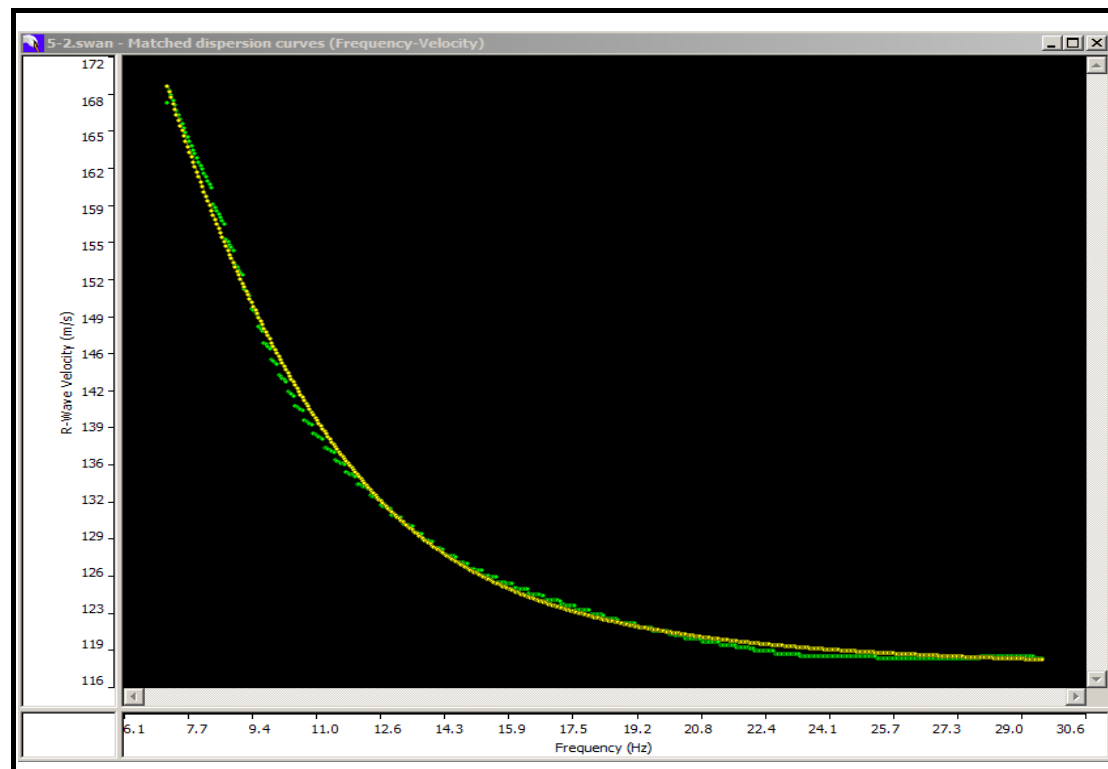
## SITE DATA

Latitude	44.565505°
Longitude	11.144051°
Height m. s.l.m.	43 m s.l.m.
Azimuth	30°

## ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	2.0
Sampling (millisec)	0.5

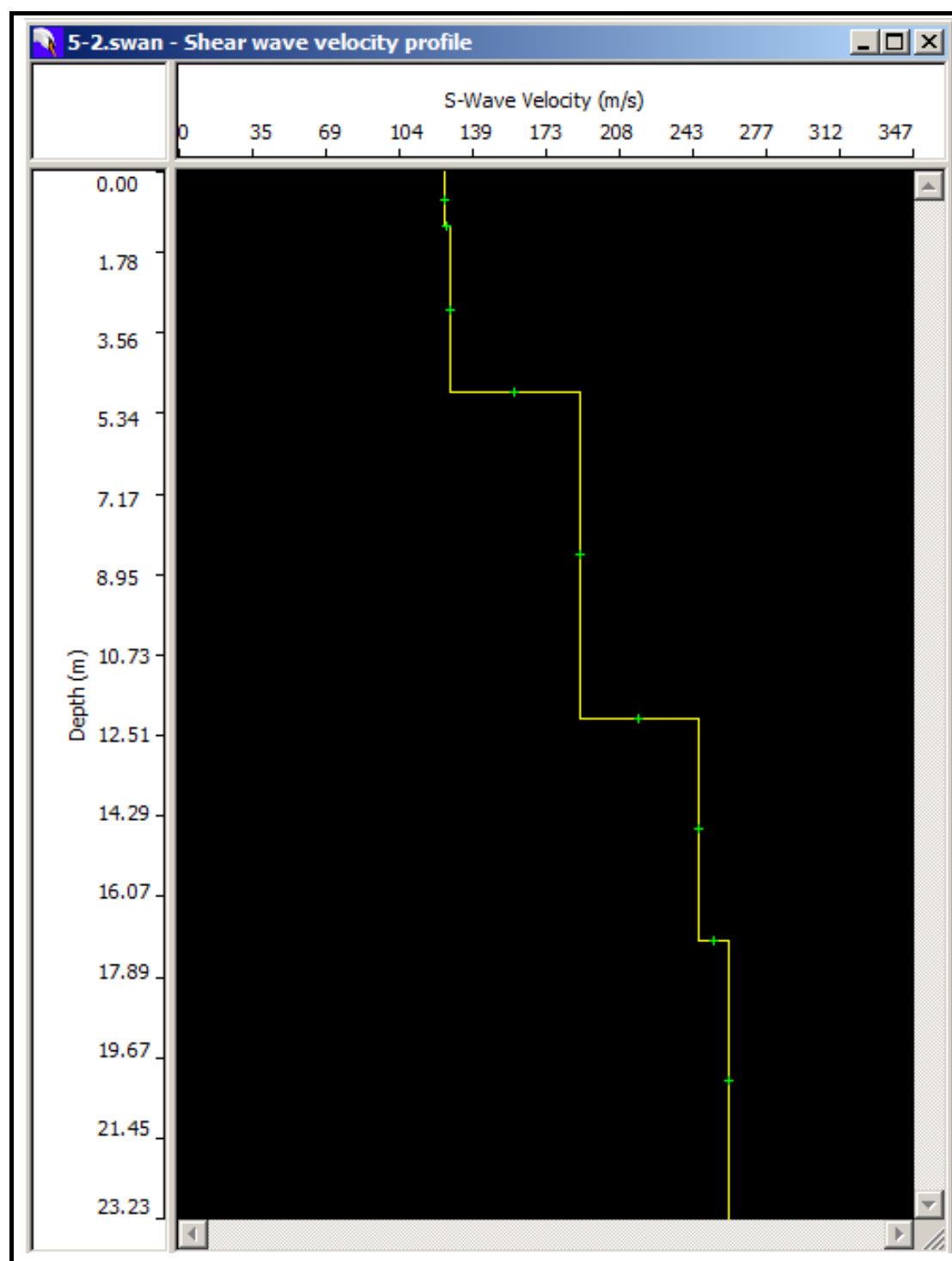
## MATCHED DISPERSION CURVES (f-v)



## SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.22	0.00	125
Layer 2	3.68	1.22	128
Layer 3	7.22	4.90	189
Layer 4	4.96	12.12	245
Layer 5	INF	17.08	260

## SHEAR WAVES VELOCITY PROFILE



## HISTORY

Model:

Thickness	Depth	Vs
1.216931	0.000000	125.0
3.684933	1.216931	128.0
7.215580	4.901864	189.0
4.962243	12.117444	245.0
	17.079688	260.0

Data Error: 0.44

## CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.22	0	125	0.00976
3.68	1.22	128	0.02875
7.22	4.9	189	0.03820
4.96	12.12	245	0.02024
12.92	17.08	260	0.04969
	30		
			0.14665

**$V_{s30} = 205$**

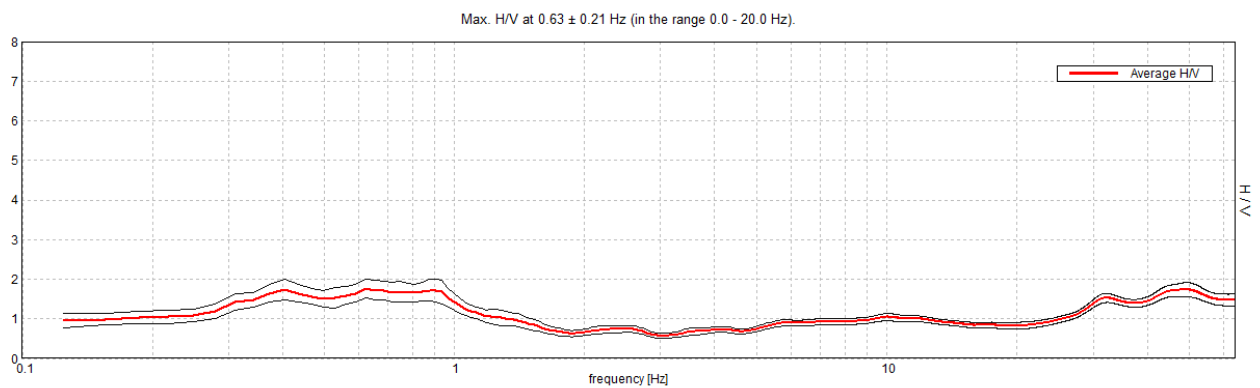
Seismic classification of soils  
(It. D.M. 14/01/2008) **C**

## ANZOLA DELL'EMILIA, AE\_0001

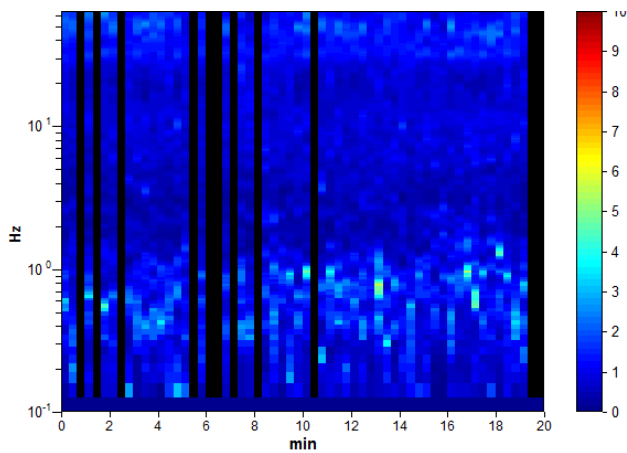
Instrument: TRS-0025/01-07  
Start recording: 20/06/14 13:27:05      End recording: 20/06/14 13:47:06  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00".      Analyzed 85% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

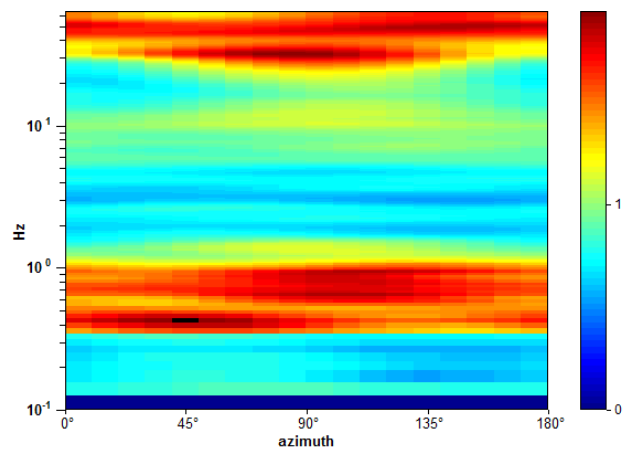
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



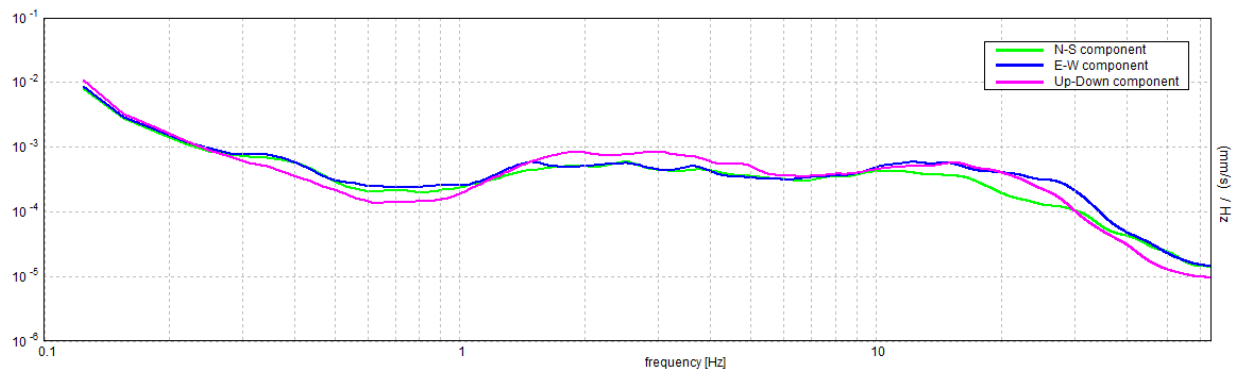
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.63 \pm 0.21$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.63 > 0.50$	OK	
$n_c(f_0) > 200$	$612.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 31 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.5 Hz	OK	
$A_0 > 2$	$1.76 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.33058  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.20661 < 0.09375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2355 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

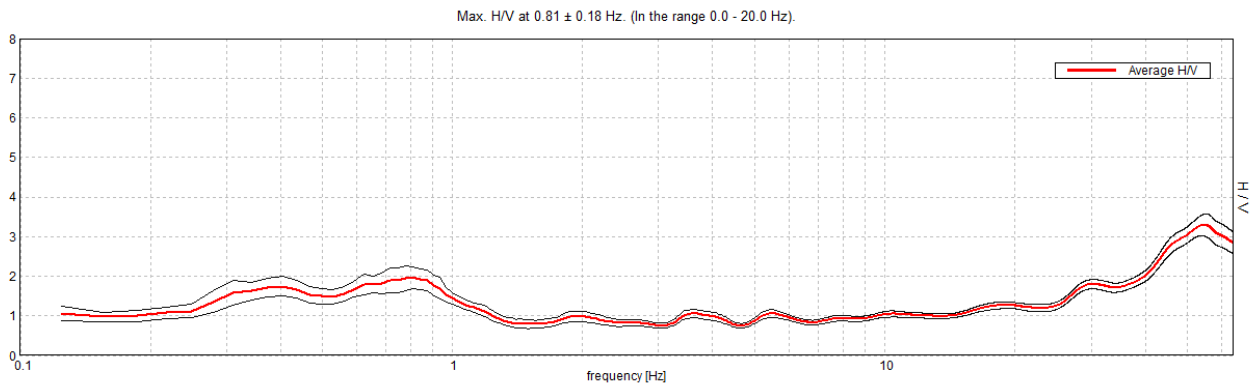


## ANZOLA DELL'EMILIA, AE\_0002

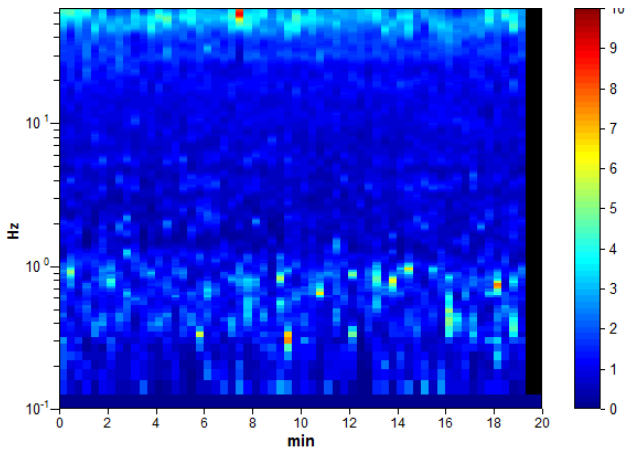
Instrument: TRS-0025/01-07  
Start recording: 20/06/14 13:59:15      End recording: 20/06/14 14:19:16  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00".      Analysis performed on the entire trace.  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

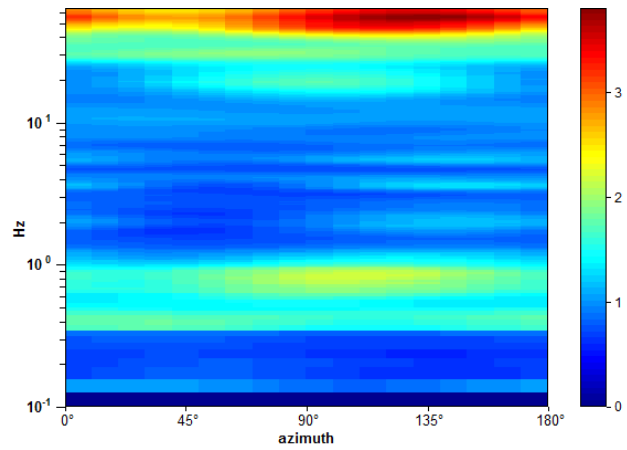
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



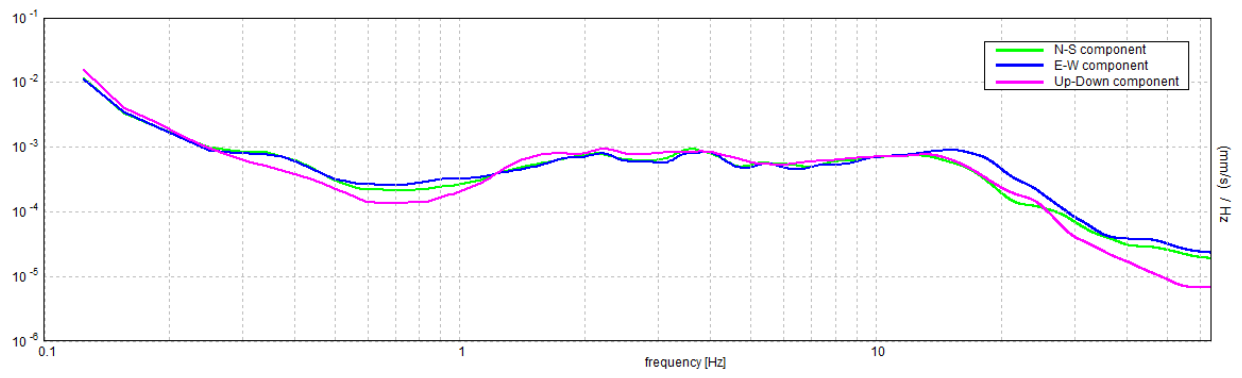
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.81 \pm 0.18$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.81 > 0.50$	OK	
$n_c(f_0) > 200$	$975.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 40 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.281 Hz	OK	
$A_0 > 2$	$1.96 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.22493  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.18275 < 0.12188$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2834 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

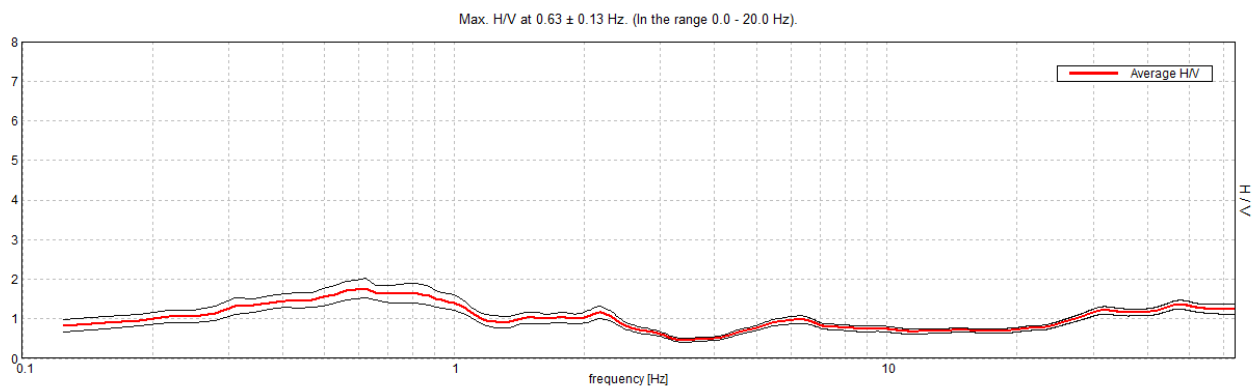
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0003

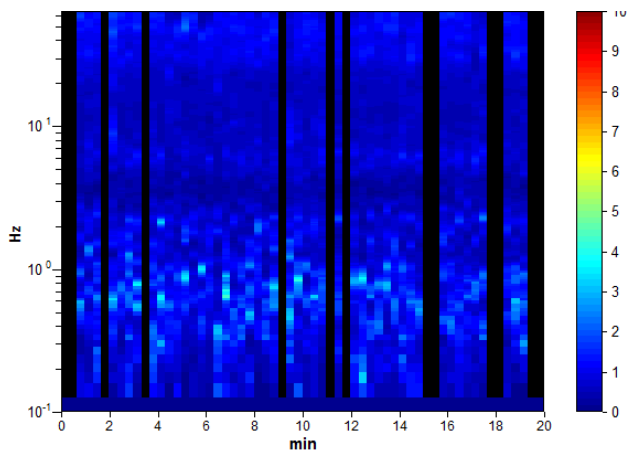
Instrument: TRS-0025/01-07  
Start recording: 20/06/14 15:33:00 End recording: 20/06/14 15:53:01  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 82% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

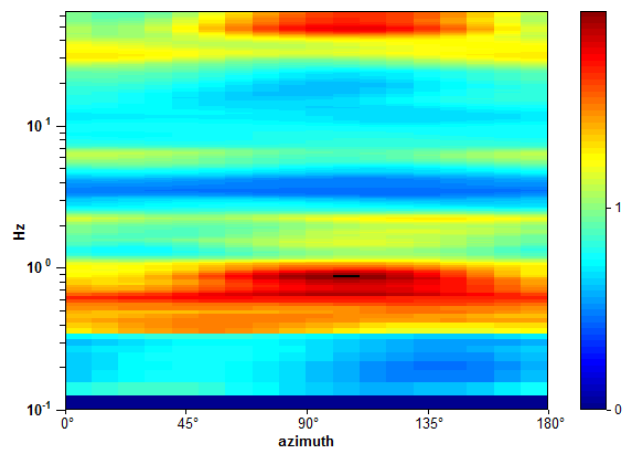
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



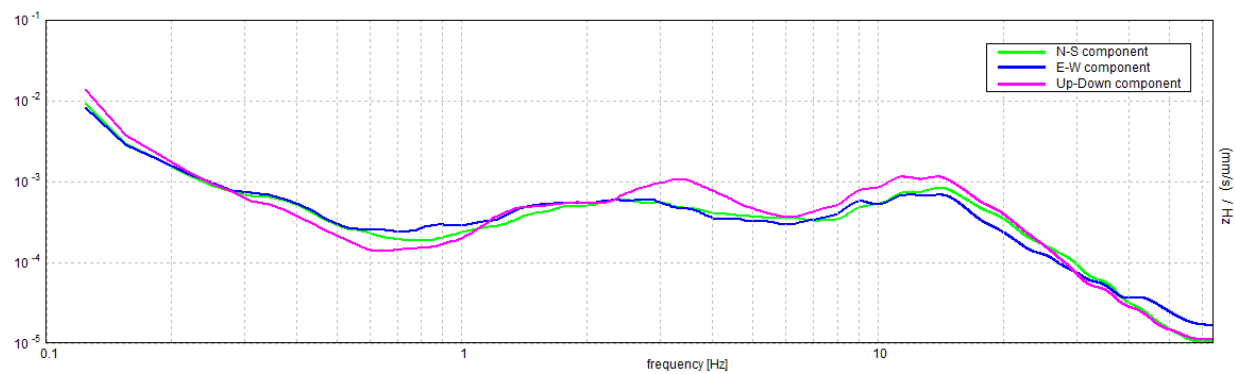
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.63 \pm 0.13$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.63 > 0.50$	OK	
$n_c(f_0) > 200$	$587.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 31 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	2.438 Hz	OK	
$A_0 > 2$	$1.77 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.21425  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.13391 < 0.09375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2454 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

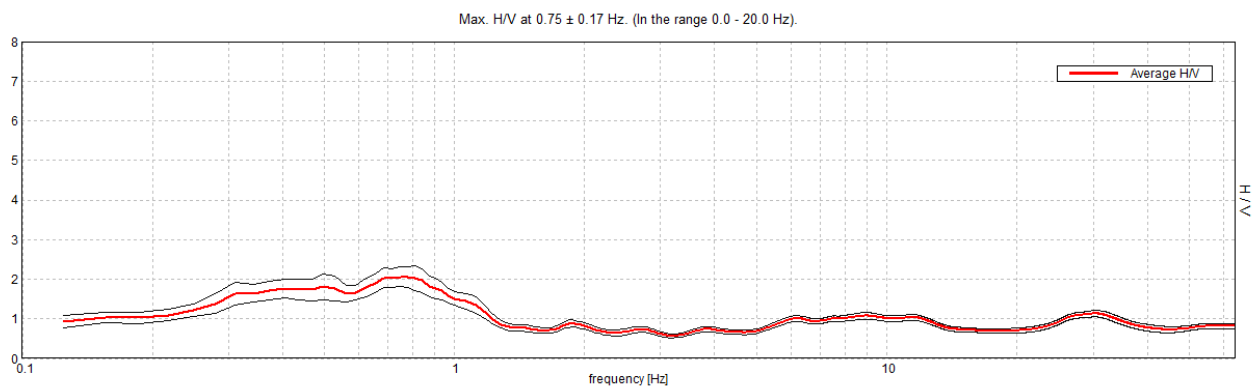


## ANZOLA DELL'EMILIA, AE\_0004

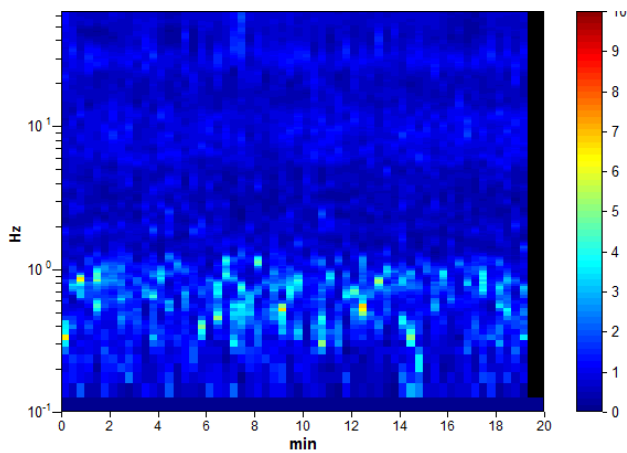
Instrument: TRS-0025/01-07  
Start recording: 20/06/14 16:08:40 End recording: 20/06/14 16:28:41  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analysis performed on the entire trace.  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

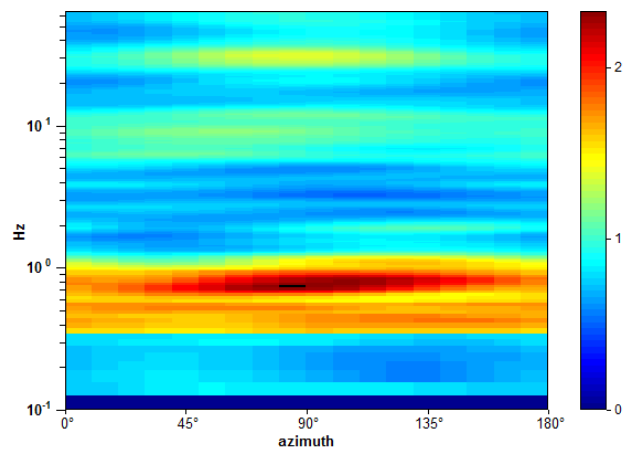
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



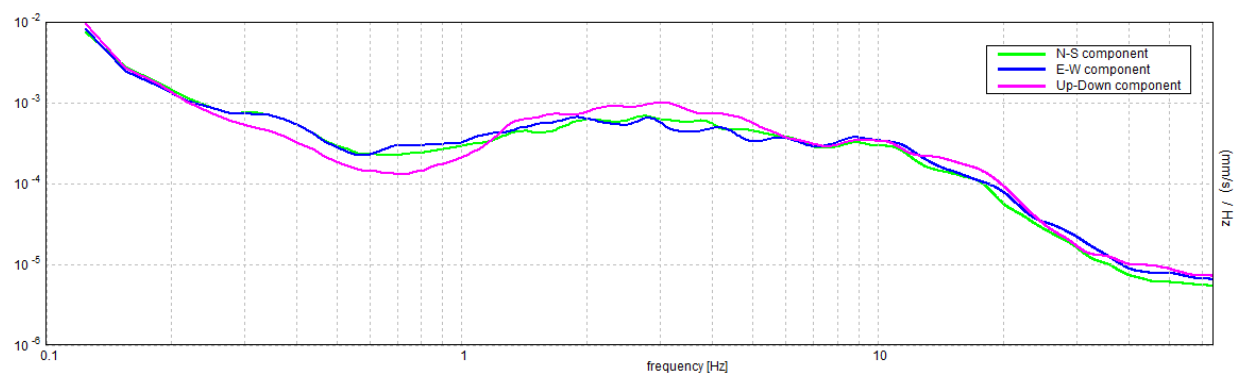
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.75 \pm 0.17$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.75 > 0.50$	OK	
$n_c(f_0) > 200$	$900.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 37 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$	0.188 Hz	OK	
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.219 Hz	OK	
$A_0 > 2$	$2.06 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.22419  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.16814 < 0.1125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2384 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

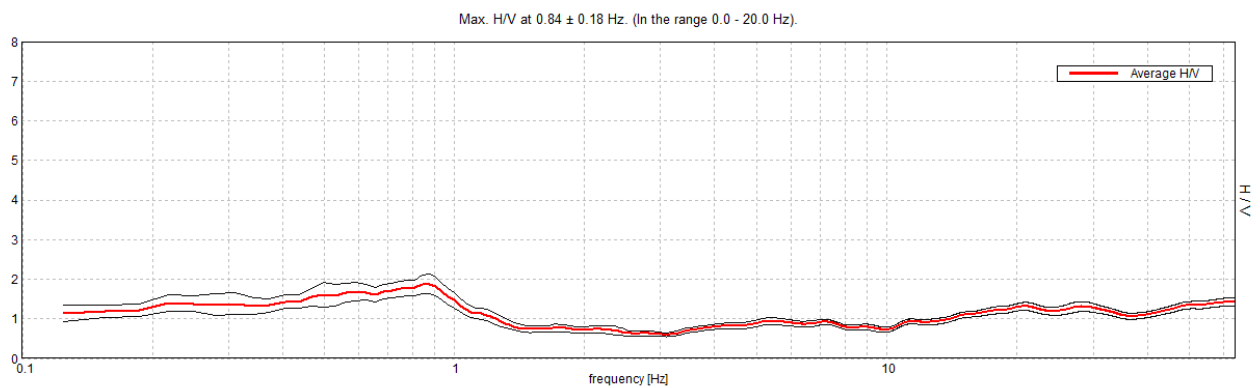
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0005

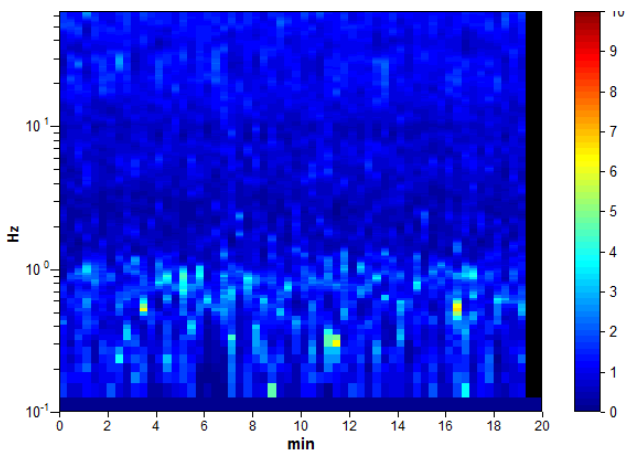
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 09:42:04 End recording: 22/07/14 10:02:05  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analysis performed on the entire trace.  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

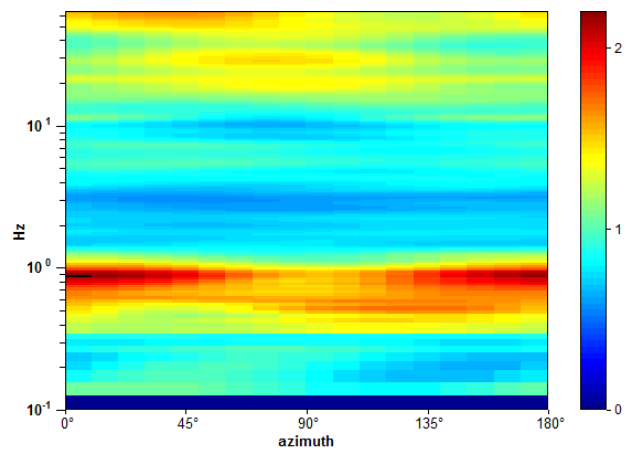
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



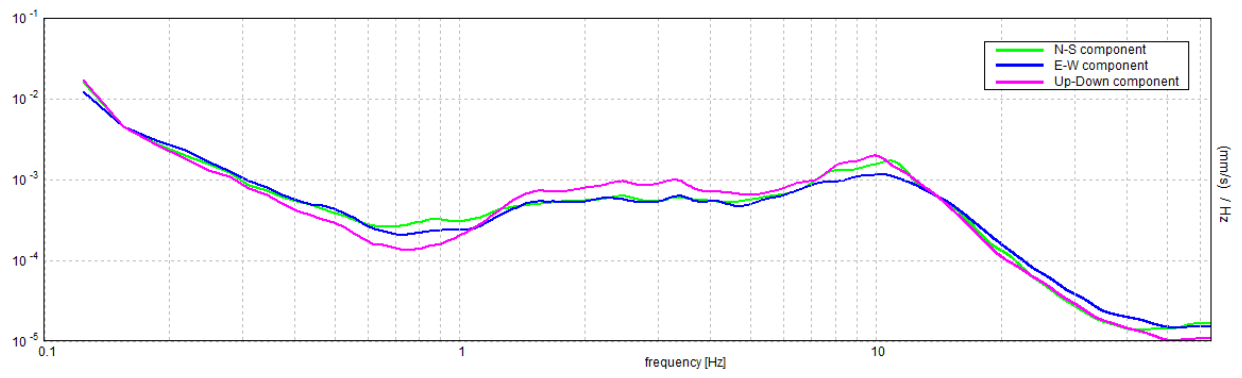
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.84 \pm 0.18$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.84 > 0.50$	OK	
$n_c(f_0) > 200$	$1012.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 42 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.281 Hz	OK	
$A_0 > 2$	$1.88 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.21838  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.18426 < 0.12656$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2348 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

**Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$**

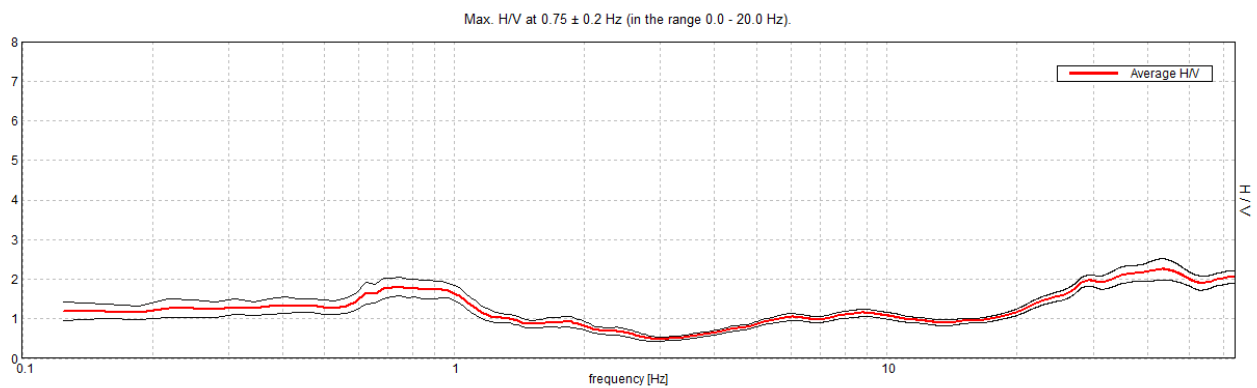
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0006

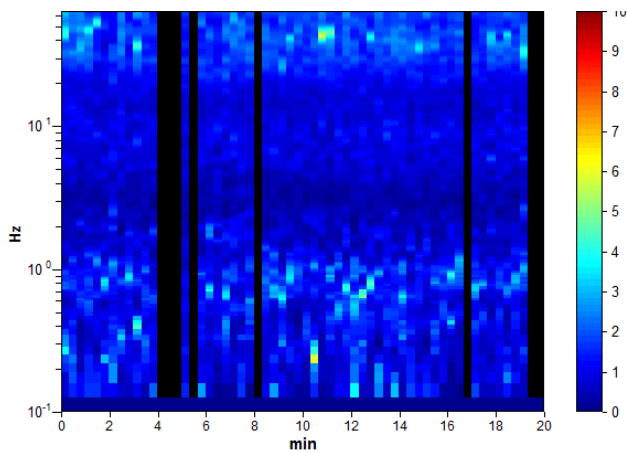
Instrument: TEN-0029/01-07  
 Start recording: 22/07/14 10:09:55 End recording: 22/07/14 10:29:56  
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
 GPS data not available

Trace length: 0h20'00". Analyzed 90% trace (manual window selection)  
 Sampling rate: 128 Hz  
 Window size: 20 s  
 Smoothing type: Triangular window  
 Smoothing: 10%

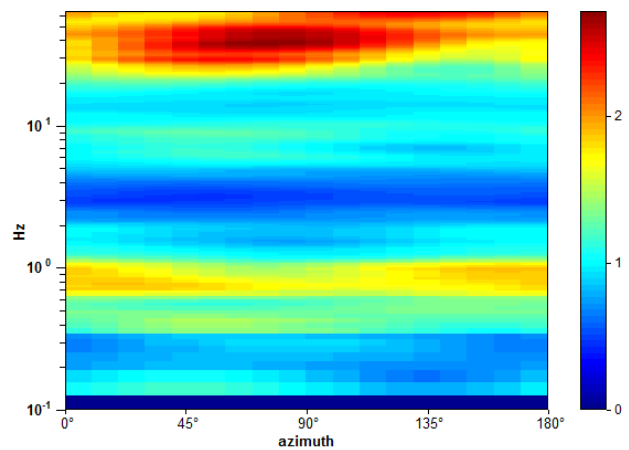
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



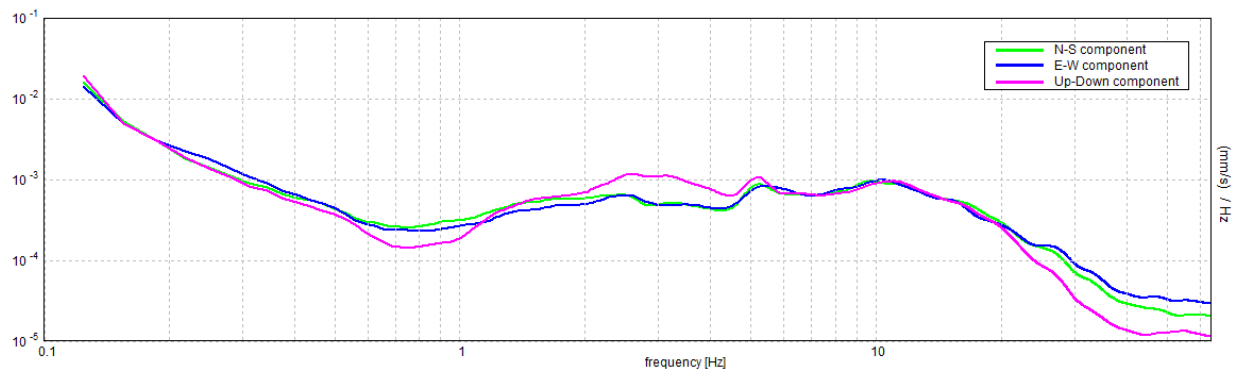
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.75 \pm 0.2$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.75 > 0.50$	OK	
$n_c(f_0) > 200$	$780.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 37 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.438 Hz	OK	
$A_0 > 2$	$1.82 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.26561  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.1992 < 0.1125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2404 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

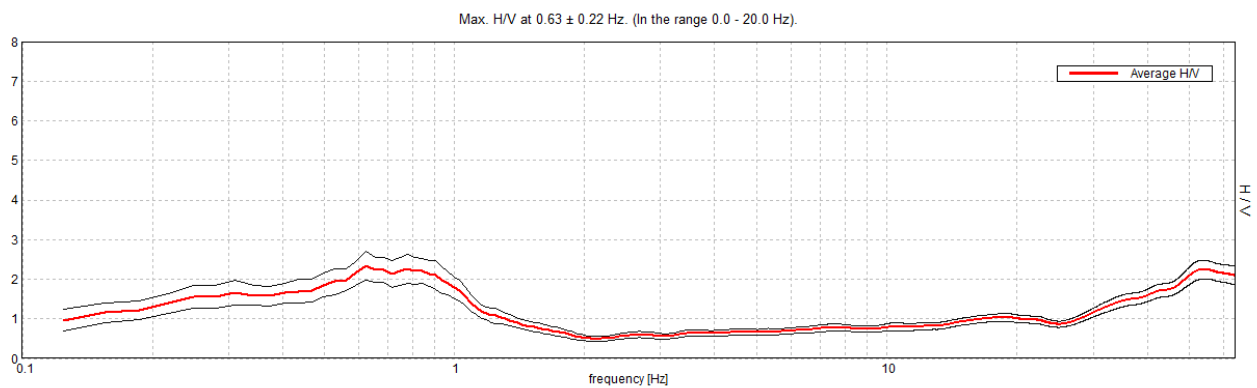
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0007

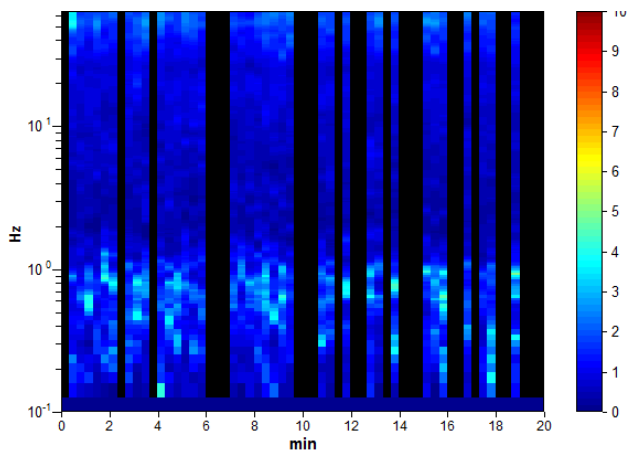
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 10:40:42 End recording: 22/07/14 11:00:43  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 63% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

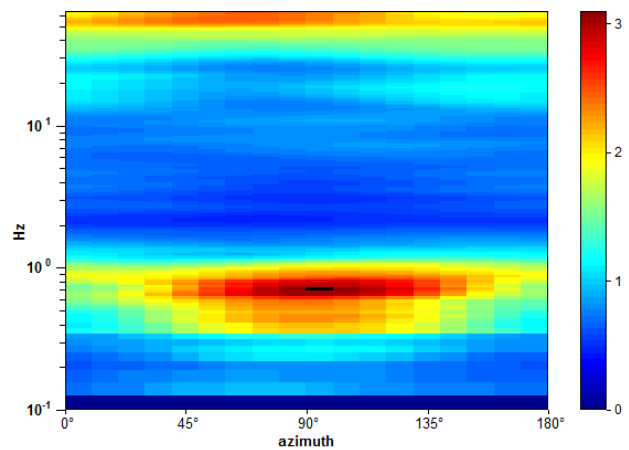
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



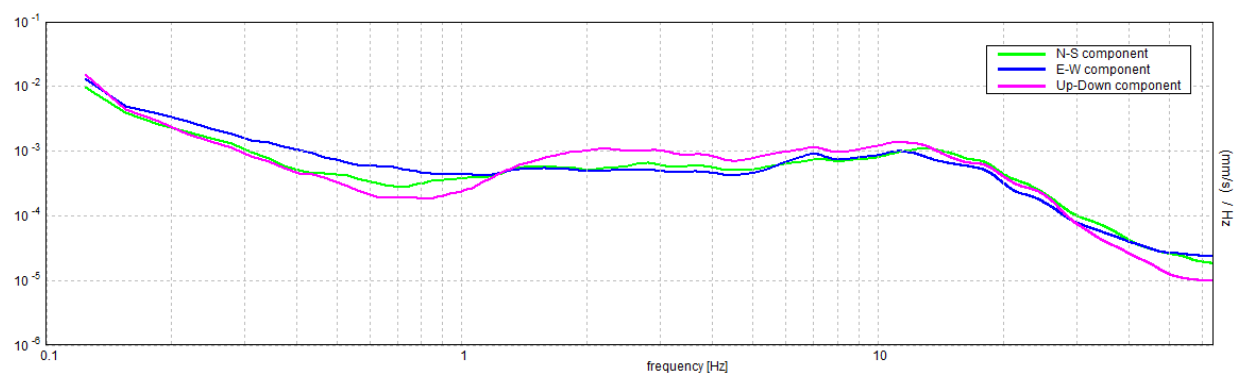
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.63 \pm 0.22$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.63 > 0.50$	OK	
$n_c(f_0) > 200$	$450.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 31 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$	0.156 Hz	OK	
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.188 Hz	OK	
$A_0 > 2$	$2.34 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.34591  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.21619 < 0.09375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3644 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

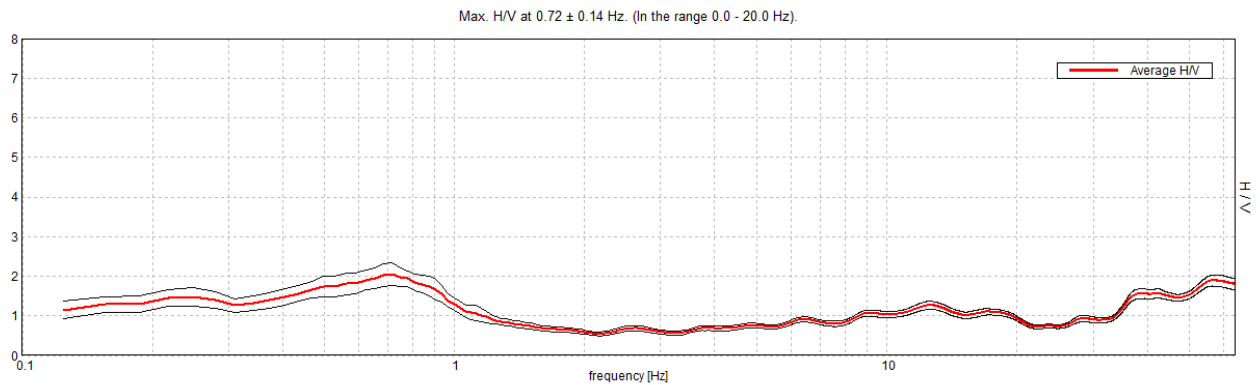


## ANZOLA DELL'EMILIA, AE\_0008

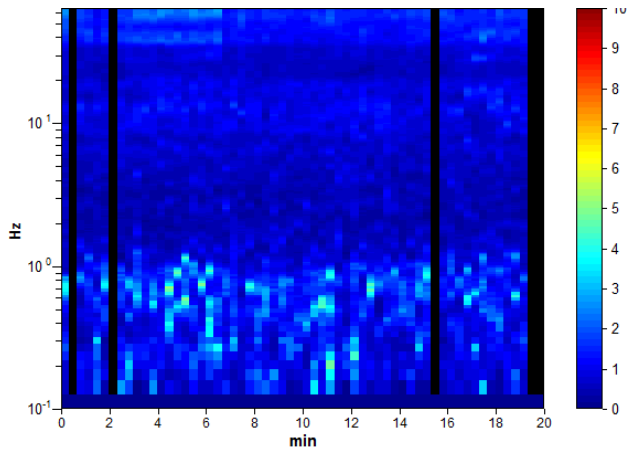
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 11:08:03 End recording: 22/07/14 11:28:04  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 95% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

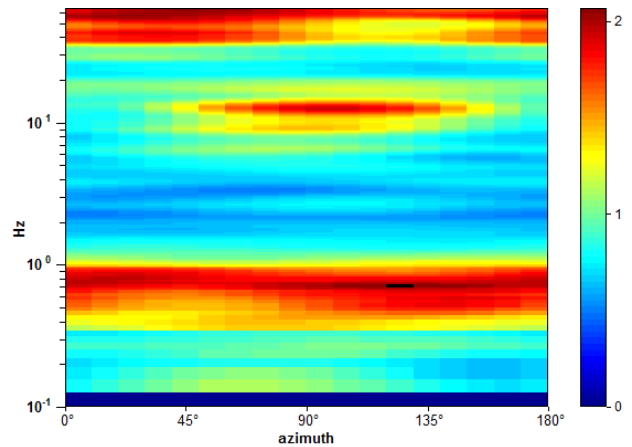
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



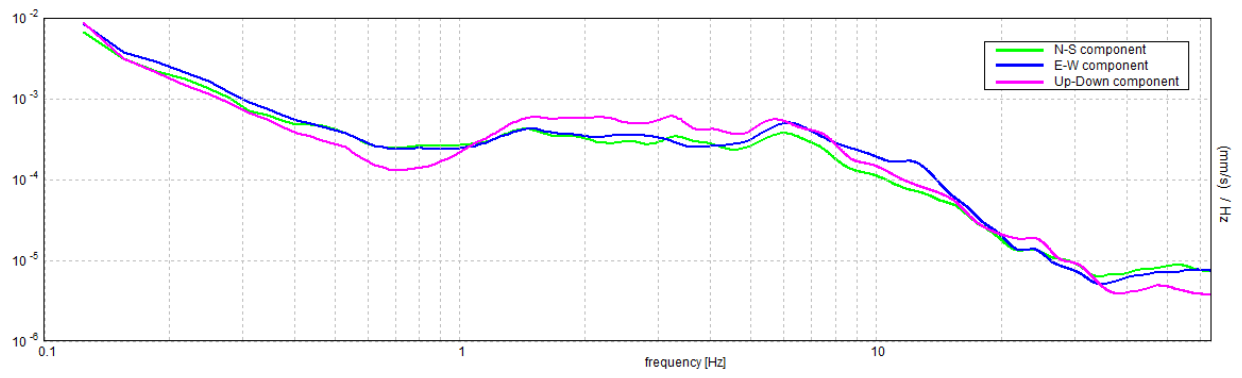
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.72 \pm 0.14$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.72 > 0.50$	OK	
$n_c(f_0) > 200$	$790.6 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 36 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.156 Hz	OK	
$A_0 > 2$	$2.05 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.19213  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.13809 < 0.10781$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2806 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

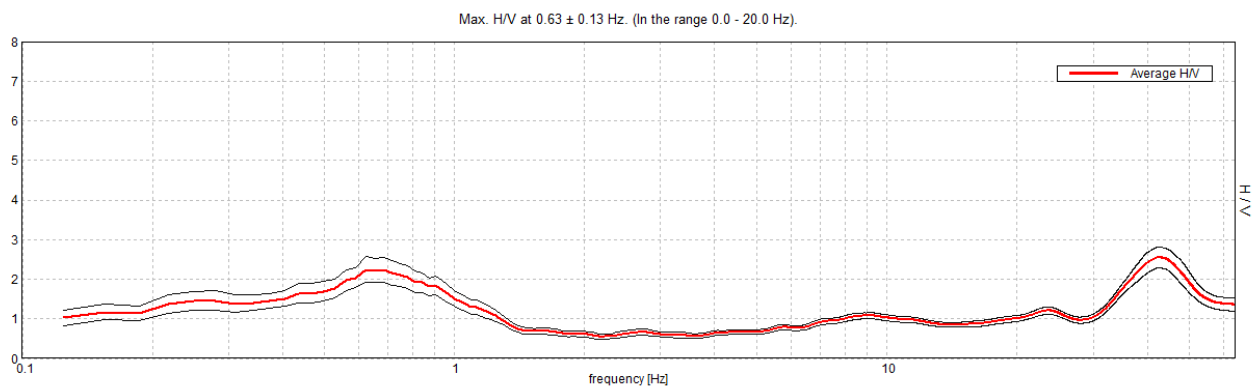
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0009

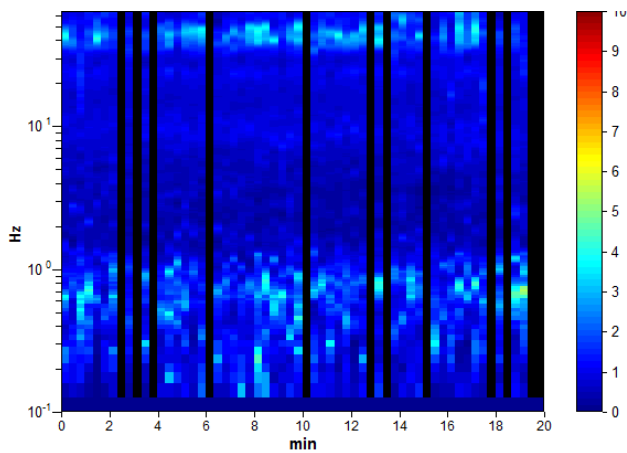
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 11:37:21 End recording: 22/07/14 11:57:22  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 83% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

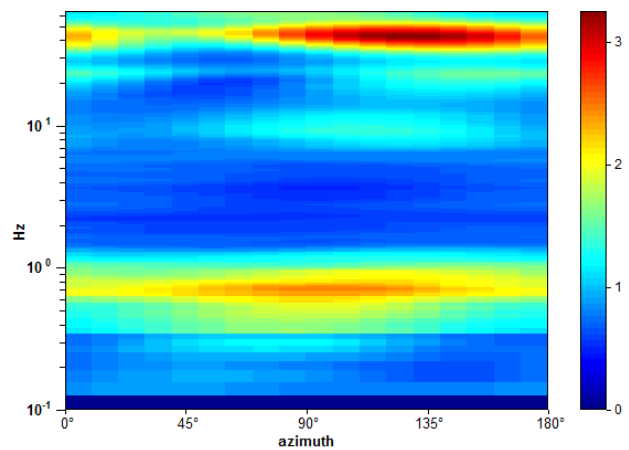
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



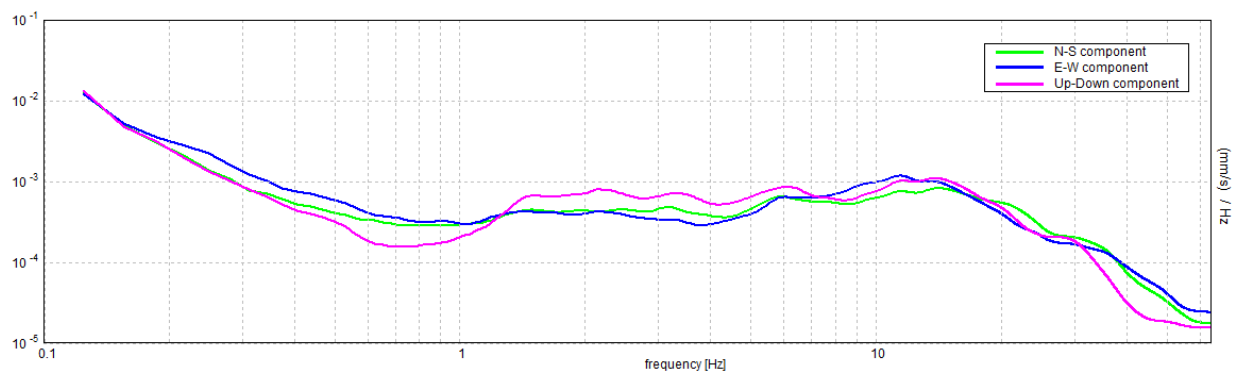
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.63 \pm 0.13$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.63 > 0.50$	OK	
$n_c(f_0) > 200$	$600.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 31 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$2.24 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.20463  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.1279 < 0.09375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3215 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

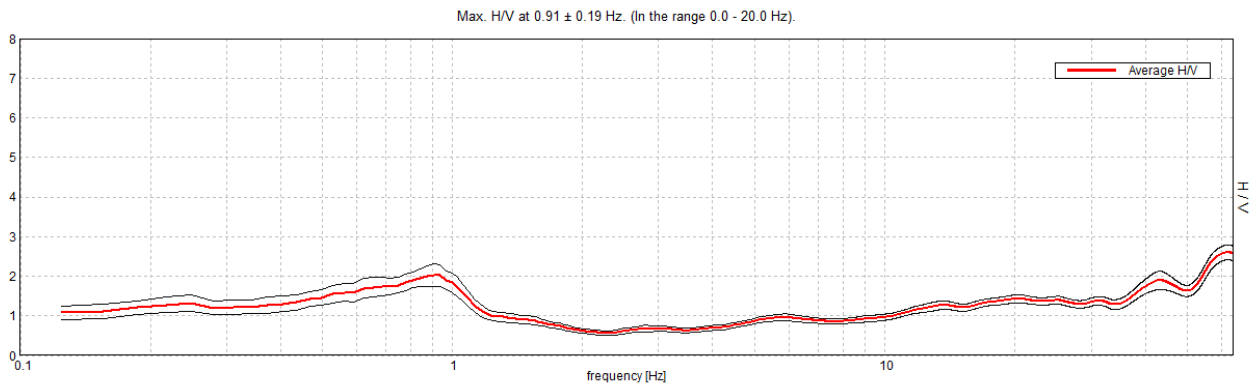
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0010

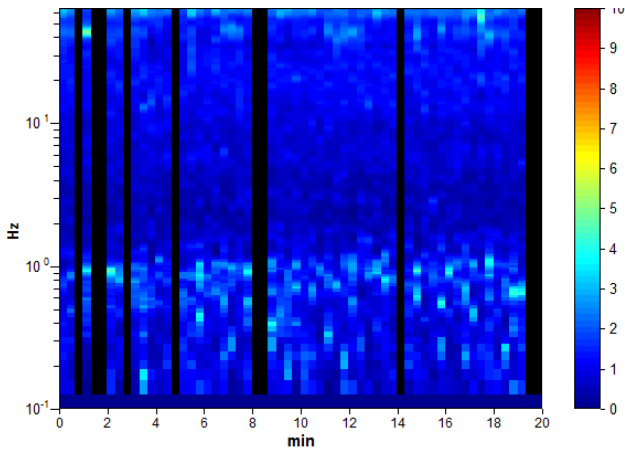
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 12:08:21      End recording: 22/07/14 12:28:22  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00".      Analyzed 87% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

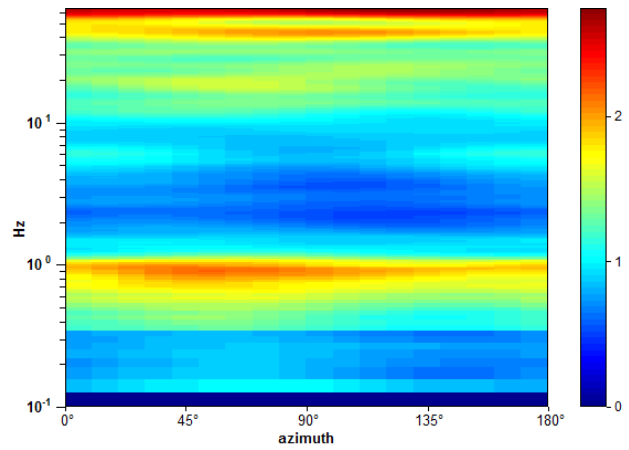
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



### H/V TIME HISTORY

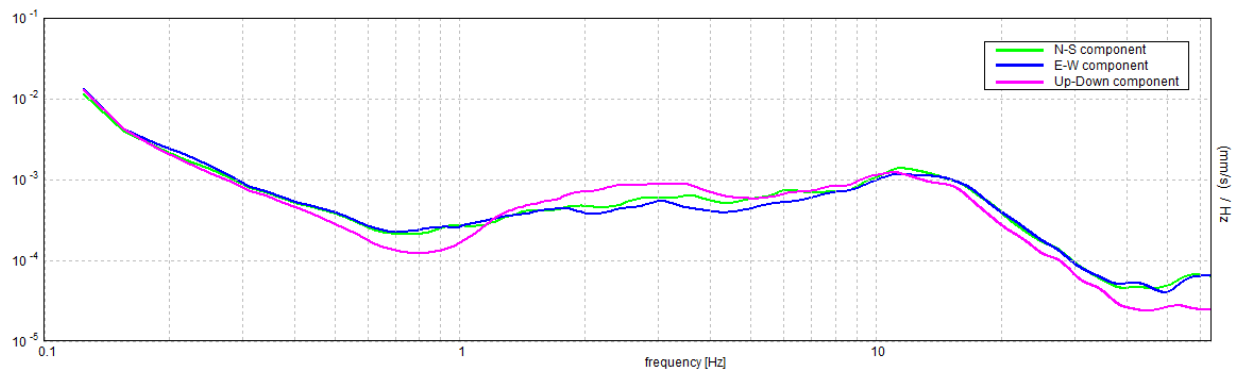


### DIRECTIONAL H/V





### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.91 \pm 0.19$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.91 > 0.50$	OK	
$n_c(f_0) > 200$	$906.3 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 44 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$2.02 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.20511  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.18588 < 0.13594$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.281 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

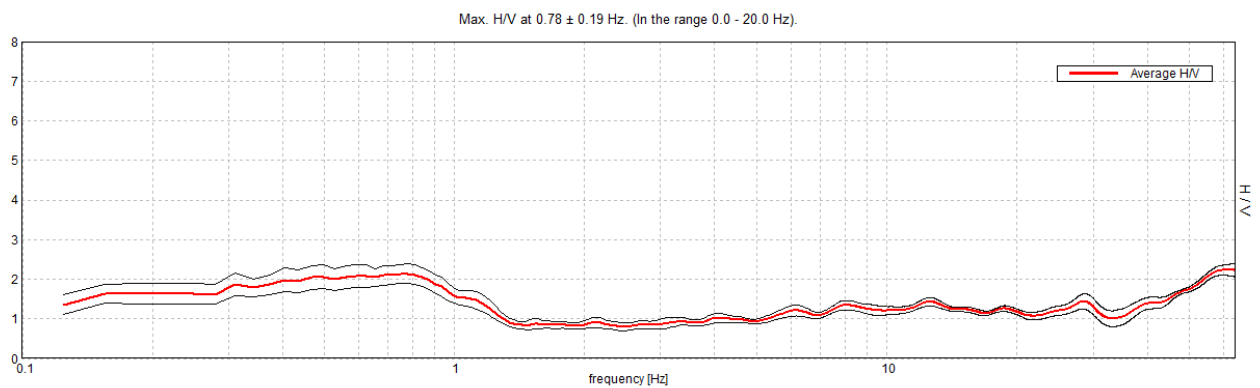
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0011

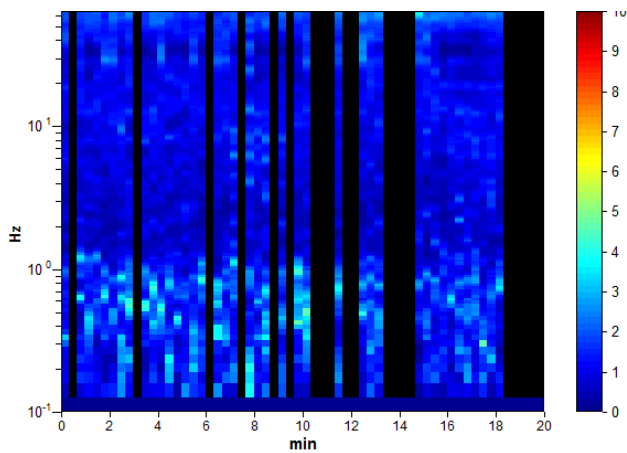
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 12:34:16 End recording: 22/07/14 12:54:17  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 67% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

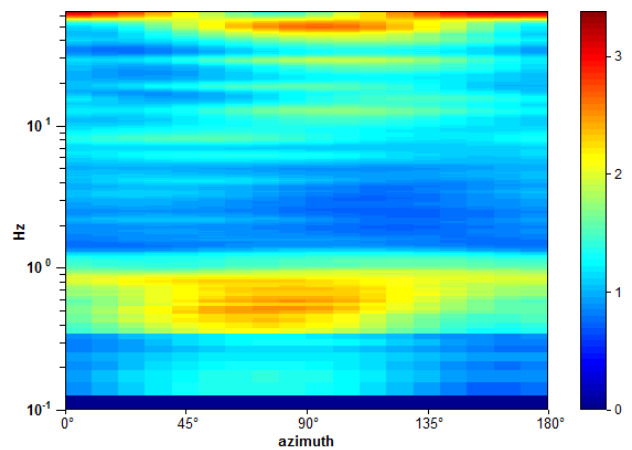
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



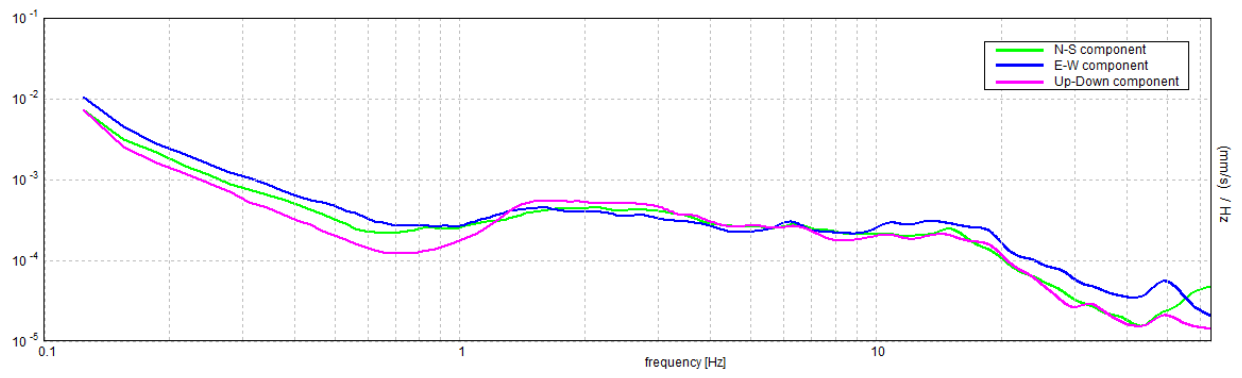
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.78 \pm 0.19$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.78 > 0.50$	OK	
$n_c(f_0) > 200$	$625.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 38 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.281 Hz	OK	
$A_0 > 2$	$2.14 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.23975  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.1873 < 0.11719$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2448 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

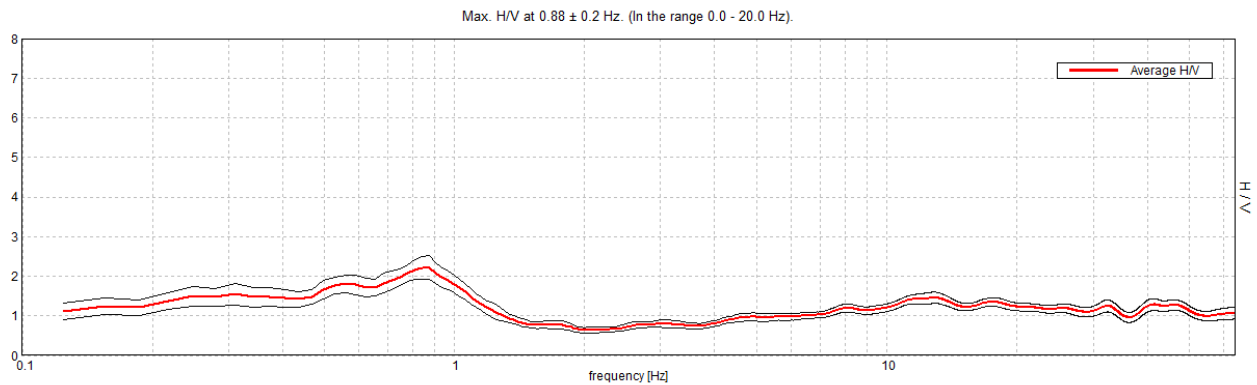
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0012

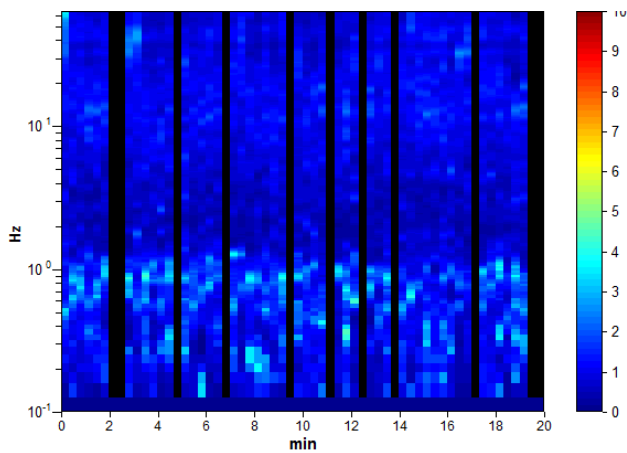
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 13:05:53 End recording: 22/07/14 13:25:54  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 85% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

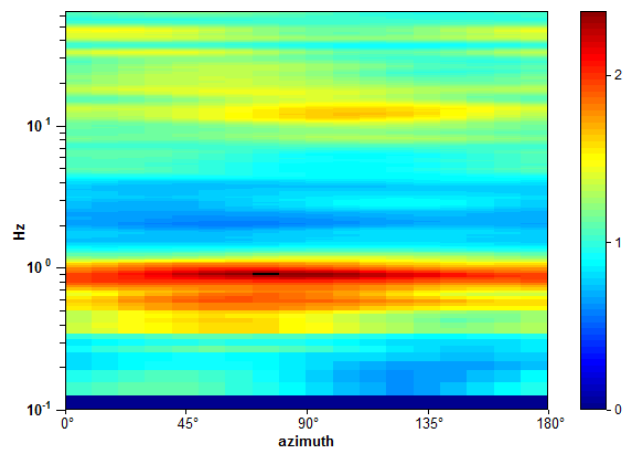
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



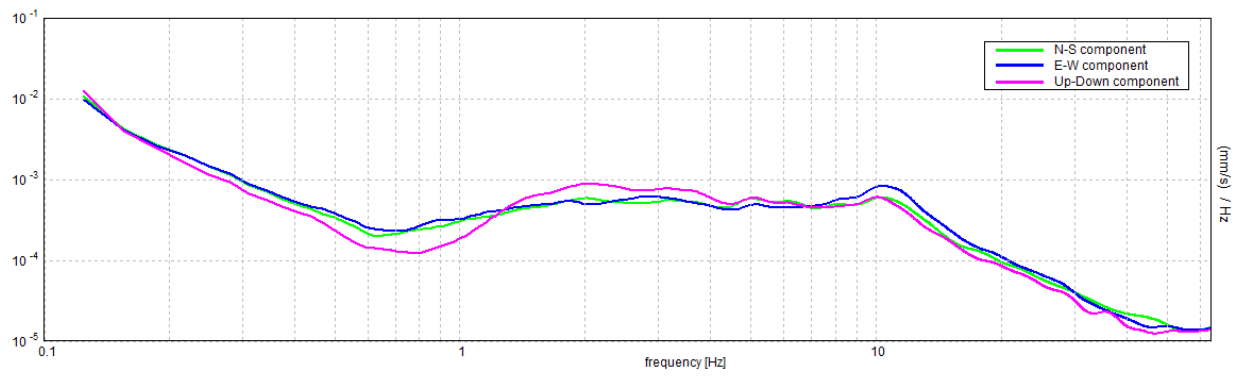
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.88 \pm 0.2$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.88 > 0.50$	OK	
$n_c(f_0) > 200$	$857.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 43 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$2.22 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.23369  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.20448 < 0.13125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2939 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

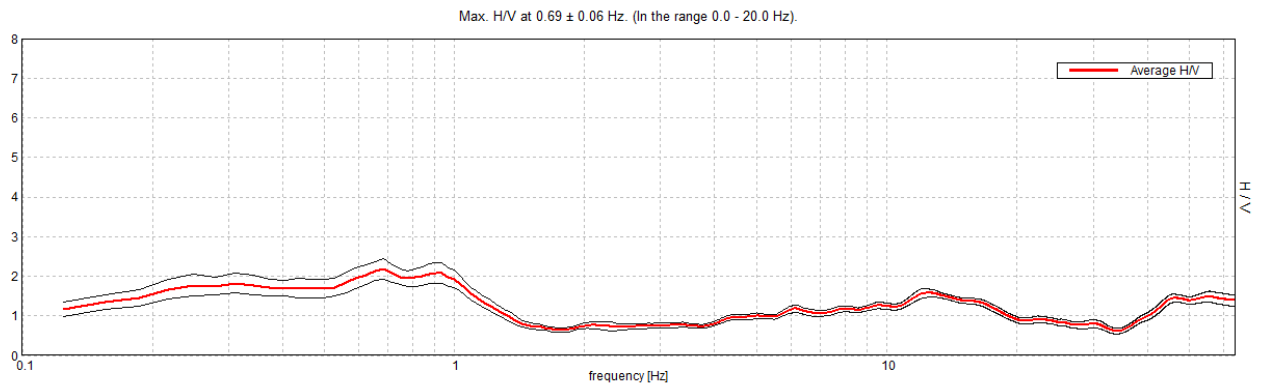


## ANZOLA DELL'EMILIA, AE\_0013

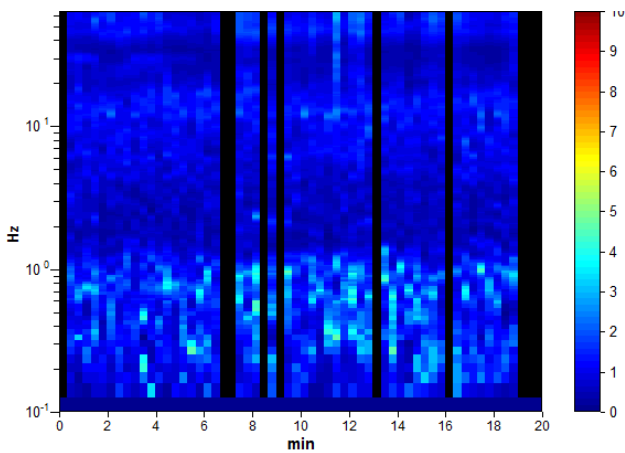
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 13:31:48 End recording: 22/07/14 13:51:49  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 83% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

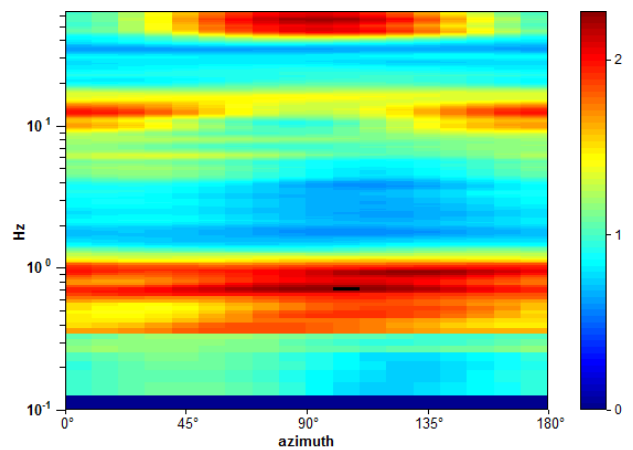
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



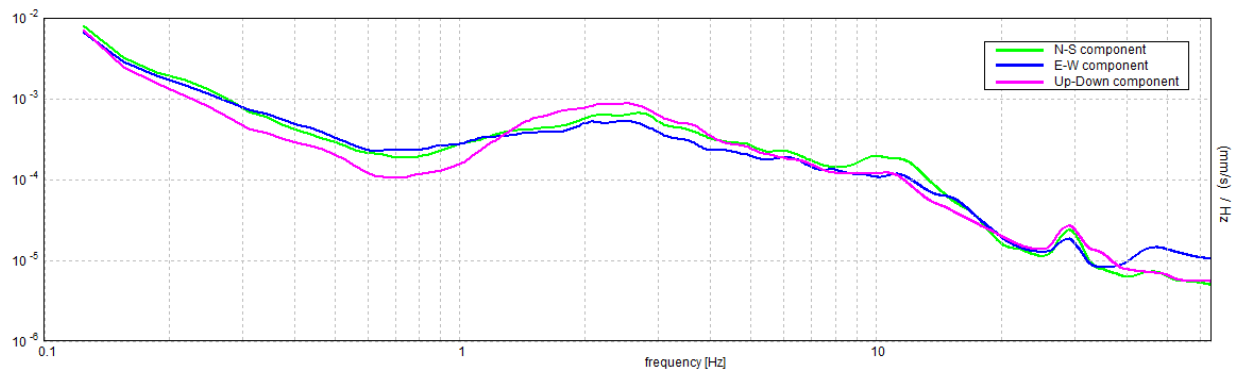
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.69 \pm 0.06$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.69 > 0.50$	OK	
$n_c(f_0) > 200$	$687.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 34 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.313 Hz	OK	
$A_0 > 2$	$2.18 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.09045  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.06219 < 0.10313$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.2586 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

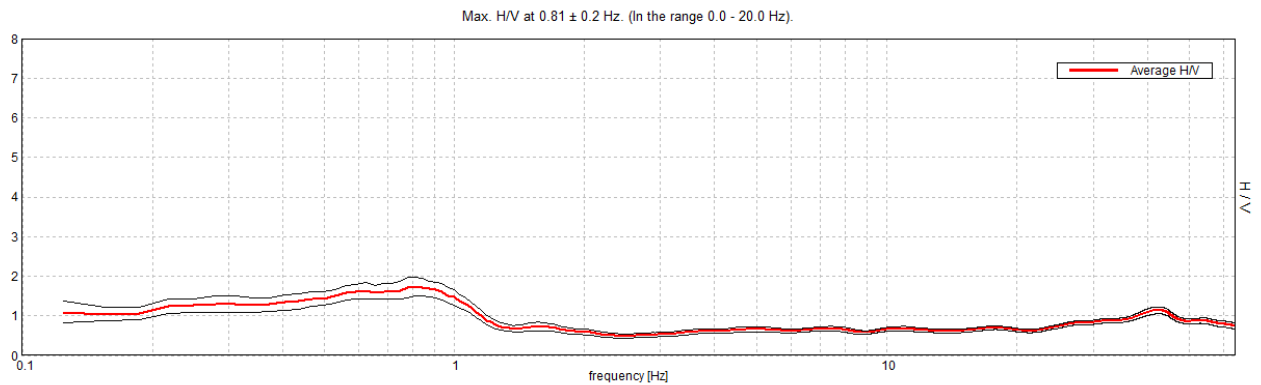
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0014

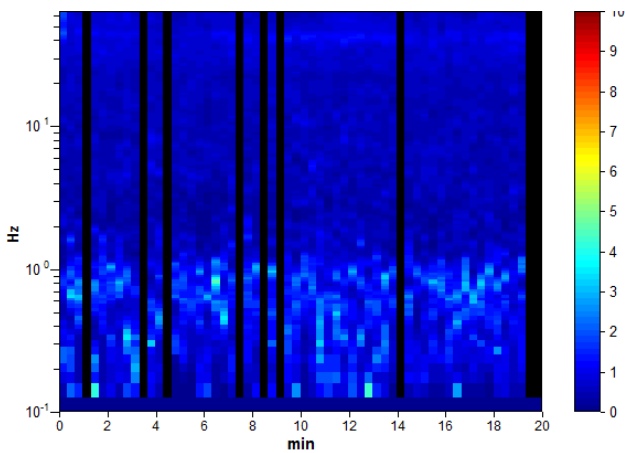
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 14:31:46 End recording: 22/07/14 14:51:47  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 88% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

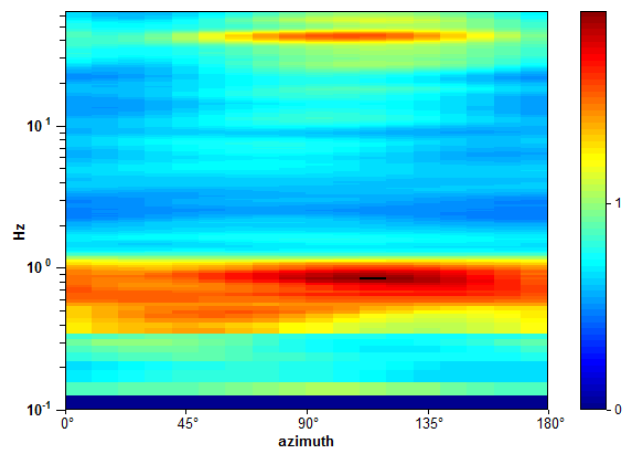
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



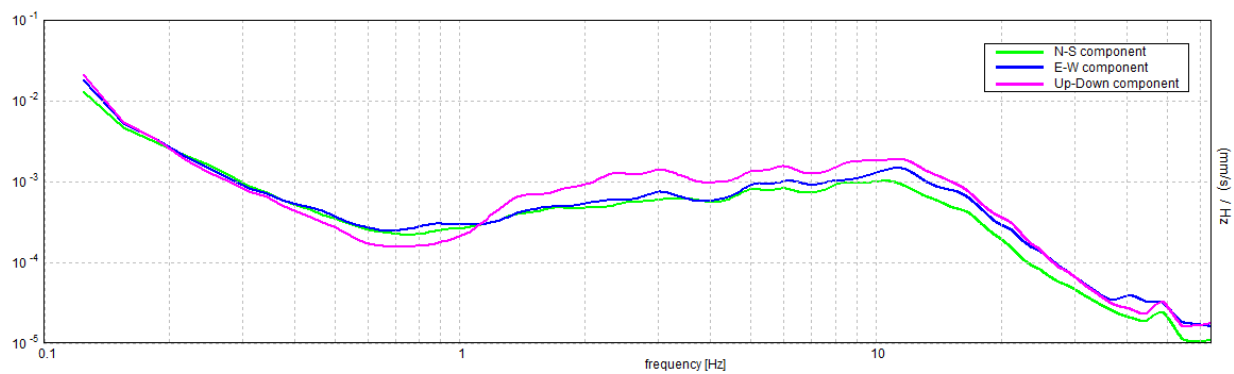
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.81 \pm 0.2$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.81 > 0.50$	OK	
$n_c(f_0) > 200$	$828.8 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 40 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.219 Hz	OK	
$A_0 > 2$	$1.74 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.24236  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.19691 < 0.12188$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2405 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

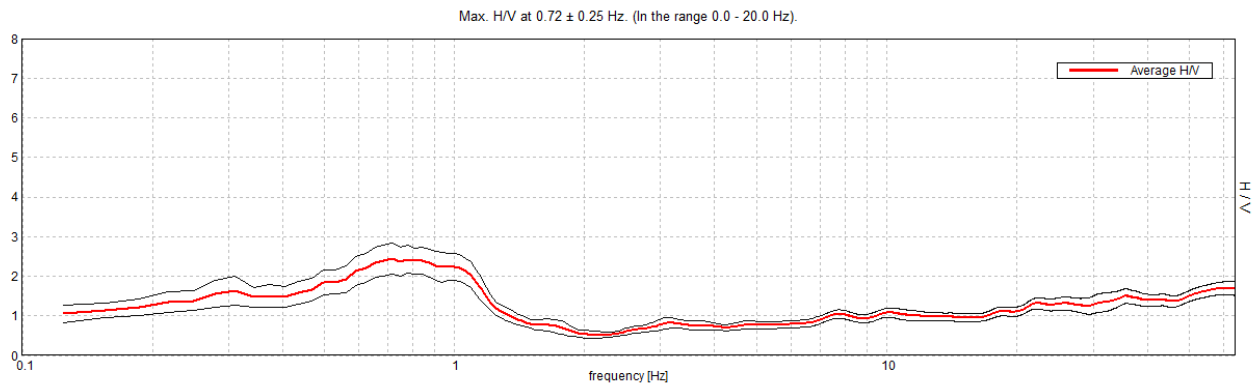
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0015

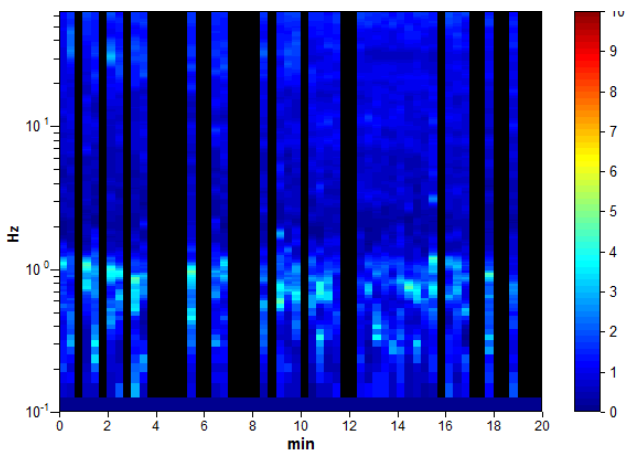
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 15:04:40 End recording: 22/07/14 15:24:41  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 60% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

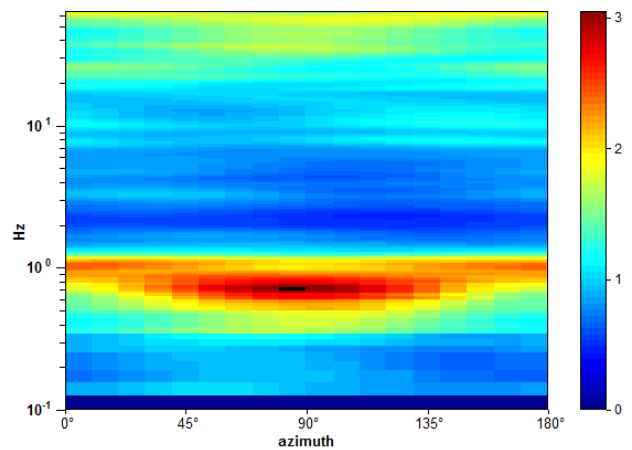
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



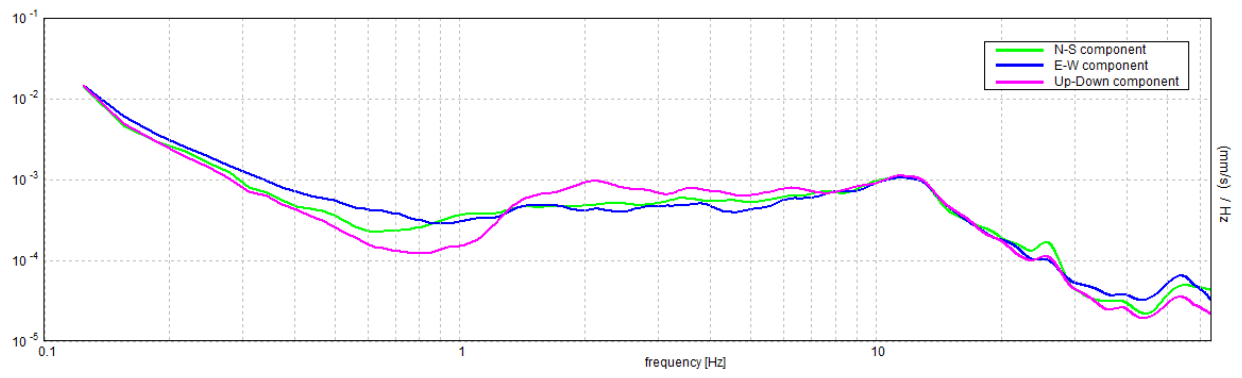
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.72 \pm 0.25$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.72 > 0.50$	OK	
$n_c(f_0) > 200$	$488.8 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 36 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$	0.188 Hz	OK	
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$2.44 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.34598  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.24868 < 0.10781$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3976 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

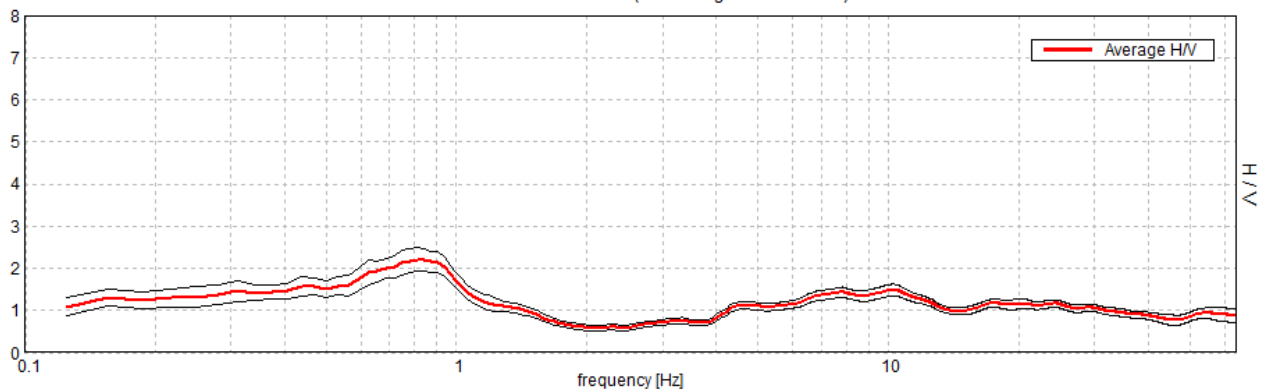
## ANZOLA DELL'EMILIA, AE\_0017

Instrument: TEN-0029/01-07  
Start recording: 22/07/14 16:11:40 End recording: 22/07/14 16:31:41  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

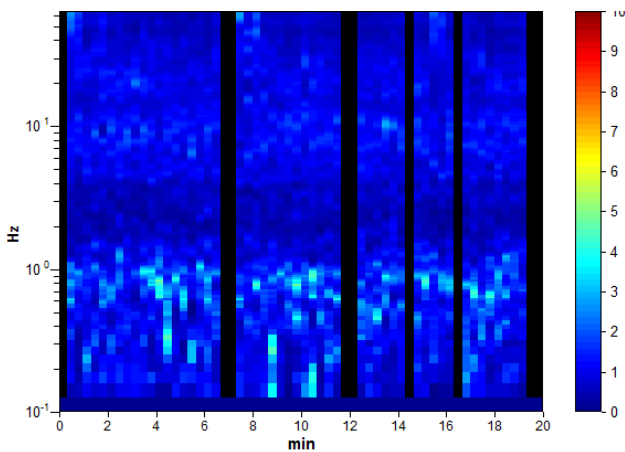
Trace length: 0h20'00". Analyzed 88% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

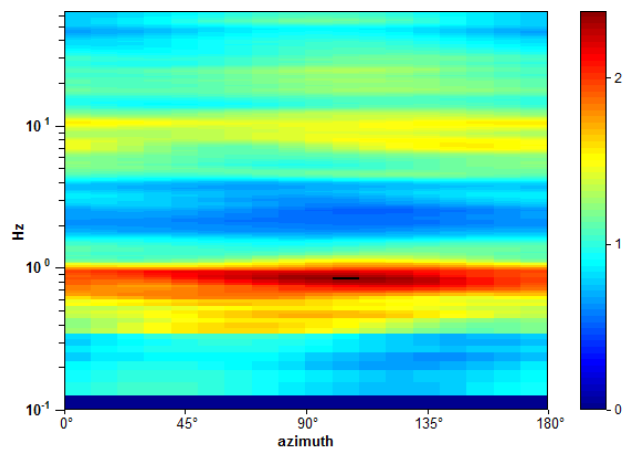
Max. H/V at  $0.81 \pm 0.17$  Hz (in the range 0.0 - 20.0 Hz).



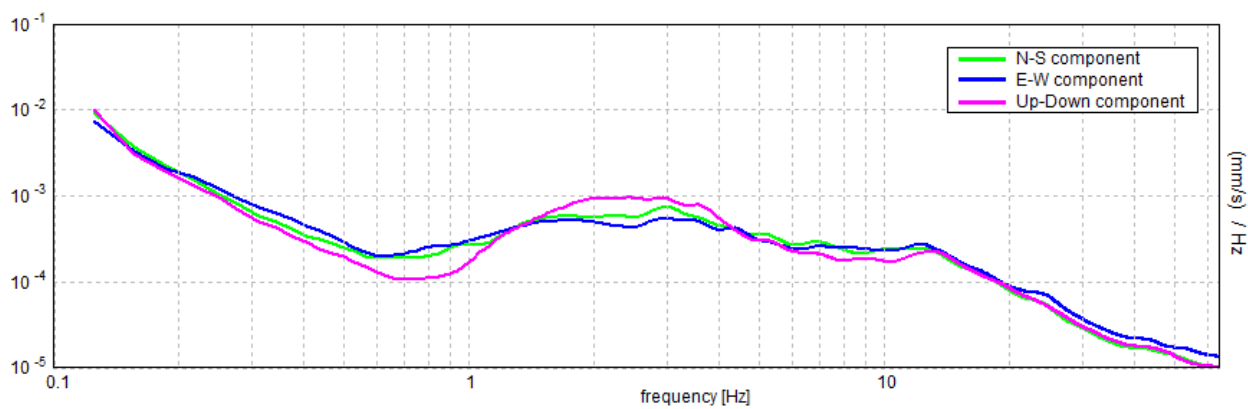
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.81 \pm 0.17$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.81 > 0.50$	OK	
$n_c(f_0) > 200$	$828.8 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 40 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.281 Hz	OK	
$A_0 > 2$	$2.21 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.21347  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.17344 < 0.12188$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2922 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

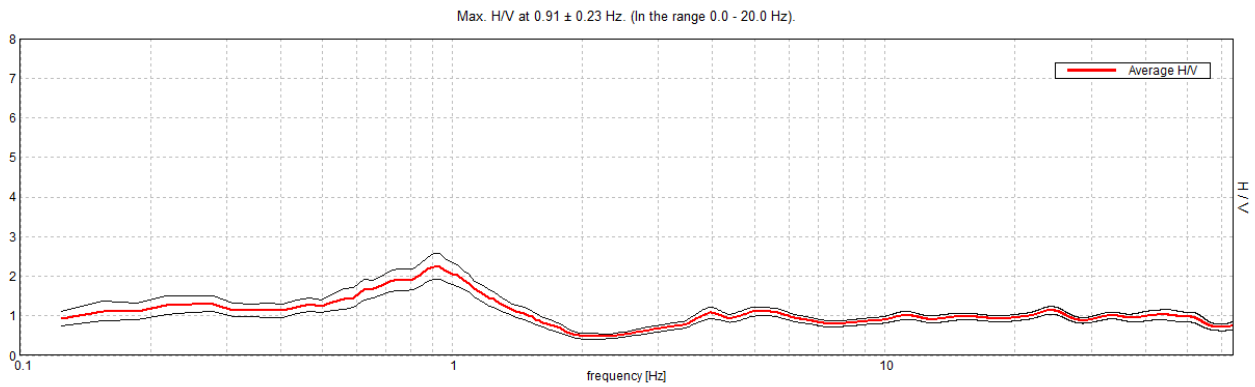
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0018

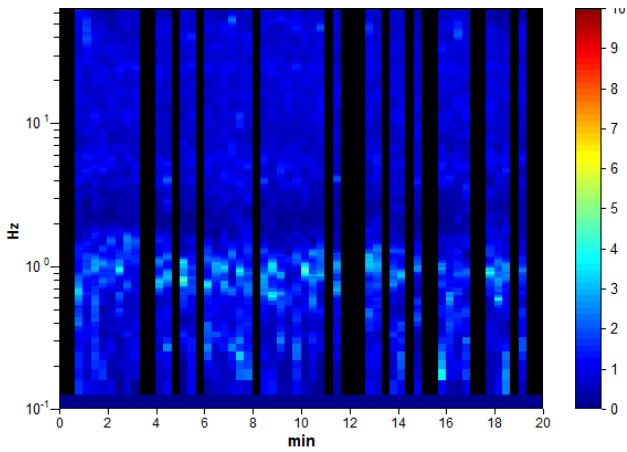
Instrument: TEN-0029/01-07  
Start recording: 22/07/14 16:42:58 End recording: 22/07/14 17:02:59  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 70% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

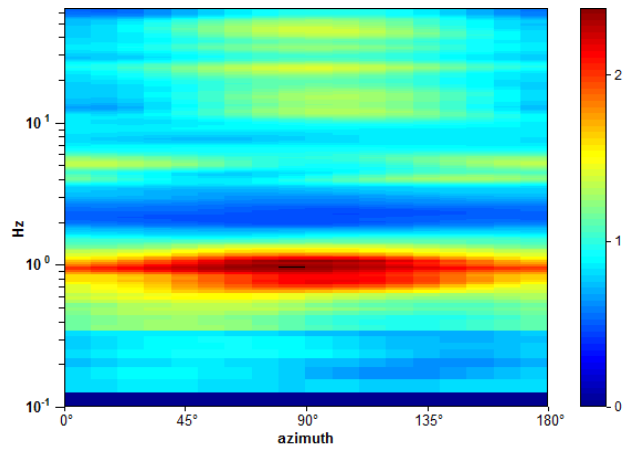
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



### H/V TIME HISTORY

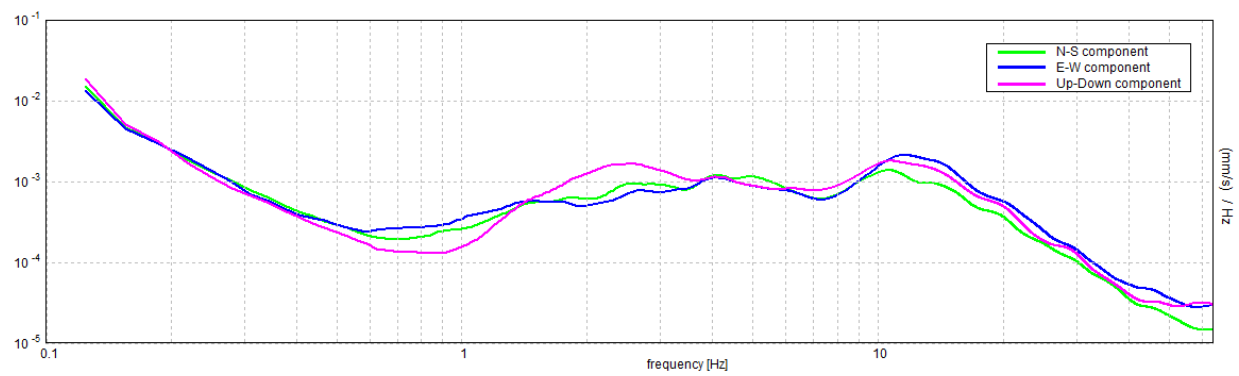


### DIRECTIONAL H/V





### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.91 \pm 0.23$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.91 > 0.50$	OK	
$n_c(f_0) > 200$	$725.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 44 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.406 Hz	OK	
$A_0 > 2$	$2.25 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.25316  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.22943 < 0.13594$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3224 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

**Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$**

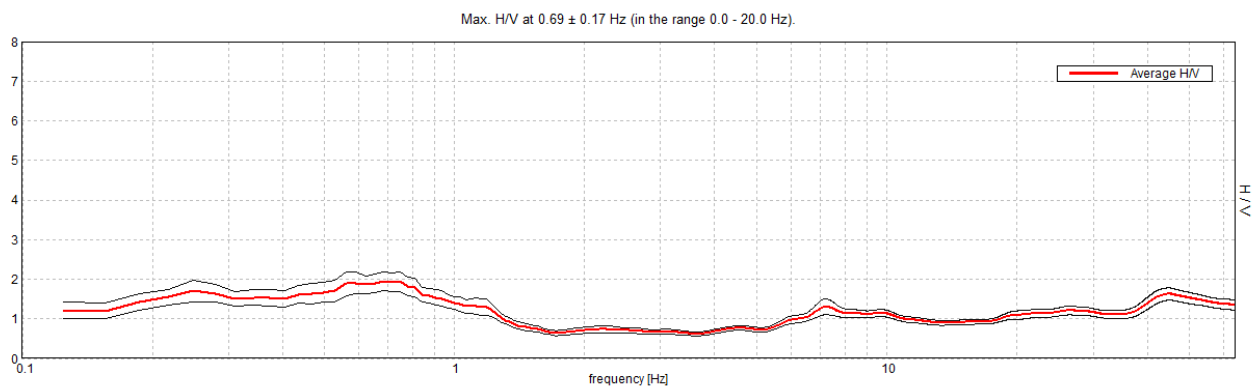
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0019

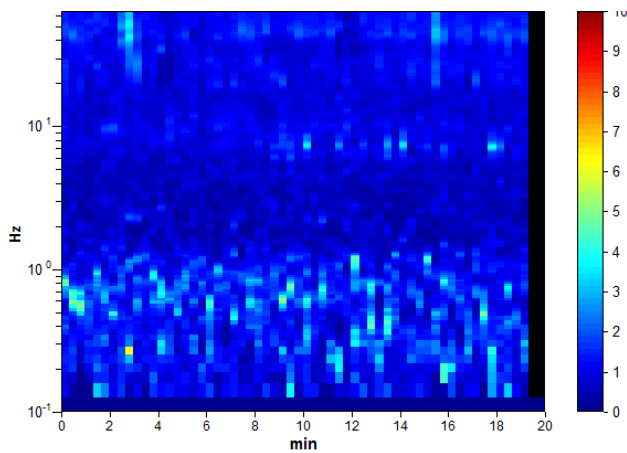
Instrument: TRS-0025/01-07  
Start recording: 22/07/14 09:47:18 End recording: 22/07/14 10:07:19  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analysis performed on the entire trace.  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

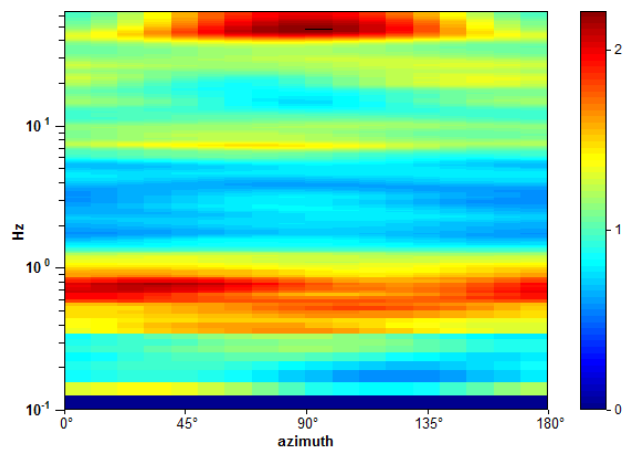
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



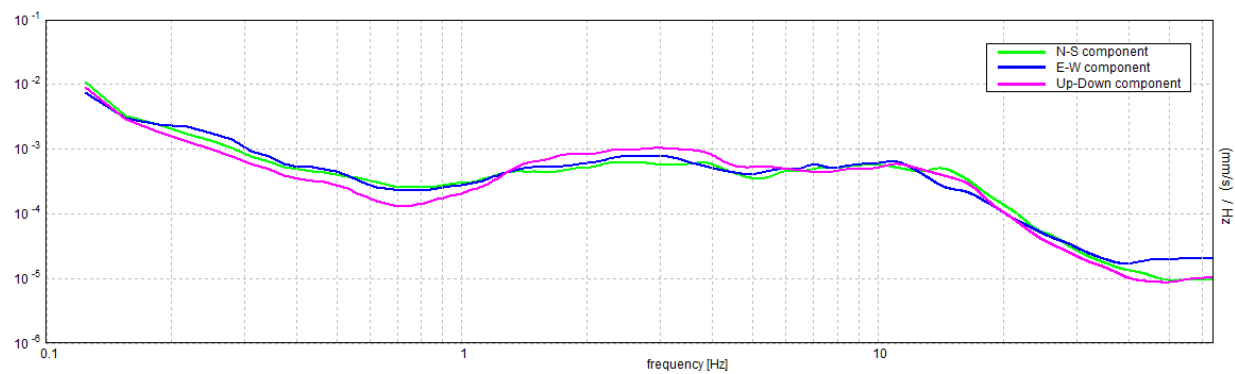
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.69 \pm 0.17$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.69 > 0.50$	OK	
$n_c(f_0) > 200$	$825.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 34 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.313 Hz	OK	
$A_0 > 2$	$1.94 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.24429  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.16795 < 0.10313$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2373 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

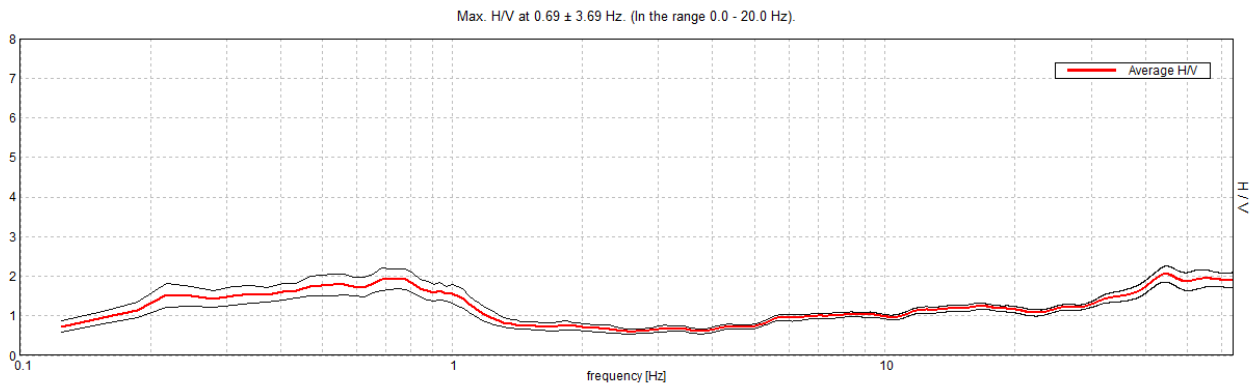


**ANZOLA DELL'EMILIA, AE\_0020**

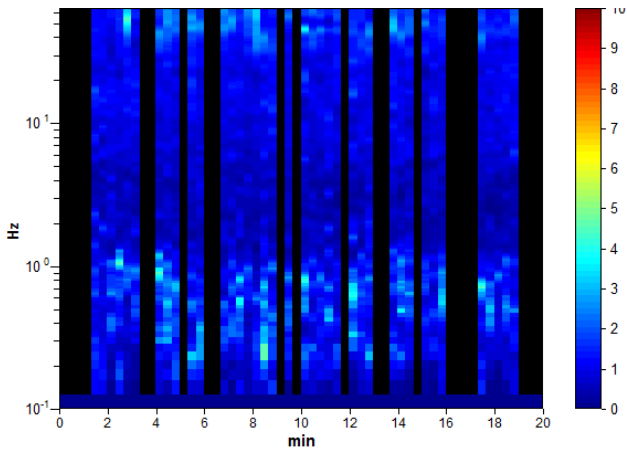
Instrument: TRS-0025/01-07  
 Start recording: 22/07/14 10:16:00 End recording: 22/07/14 10:36:01  
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
 GPS data not available

Trace length: 0h20'00". Analyzed 63% trace (manual window selection)  
 Sampling rate: 128 Hz  
 Window size: 20 s  
 Smoothing type: Triangular window  
 Smoothing: 10%

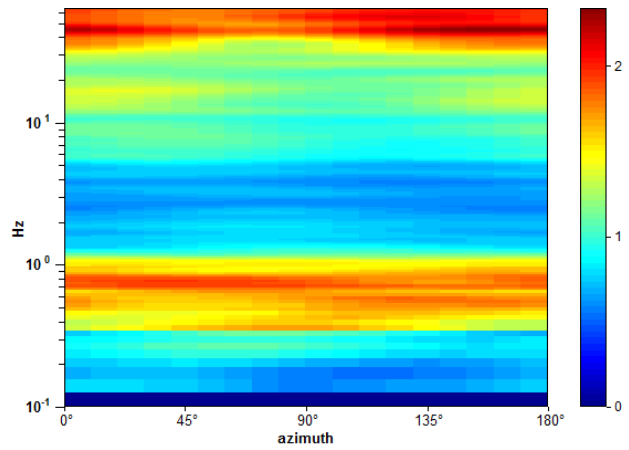
**HORIZONTAL TO VERTICAL SPECTRAL RATIO**



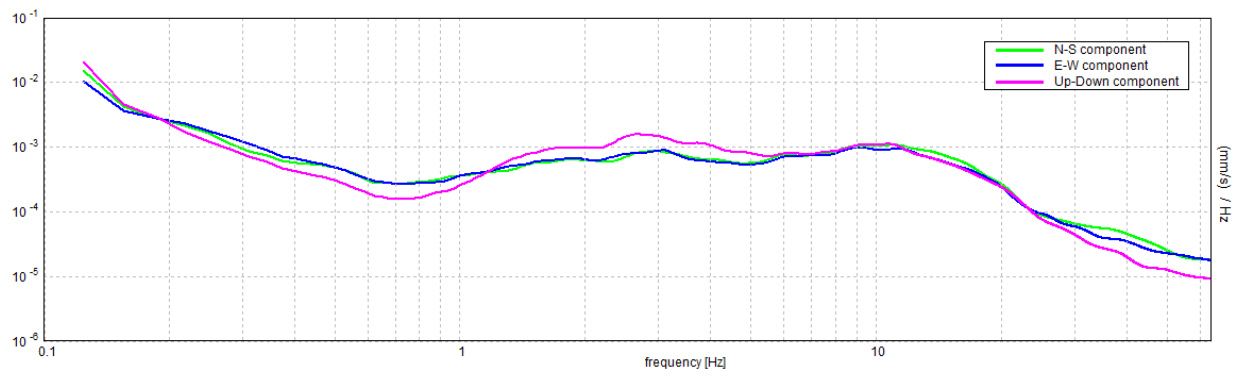
**H/V TIME HISTORY**



**DIRECTIONAL H/V**



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.69 \pm 3.69$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.69 > 0.50$	OK	
$n_c(f_0) > 200$	$522.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 34 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$1.93 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 5.36433  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$3.68797 < 0.10313$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2864 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

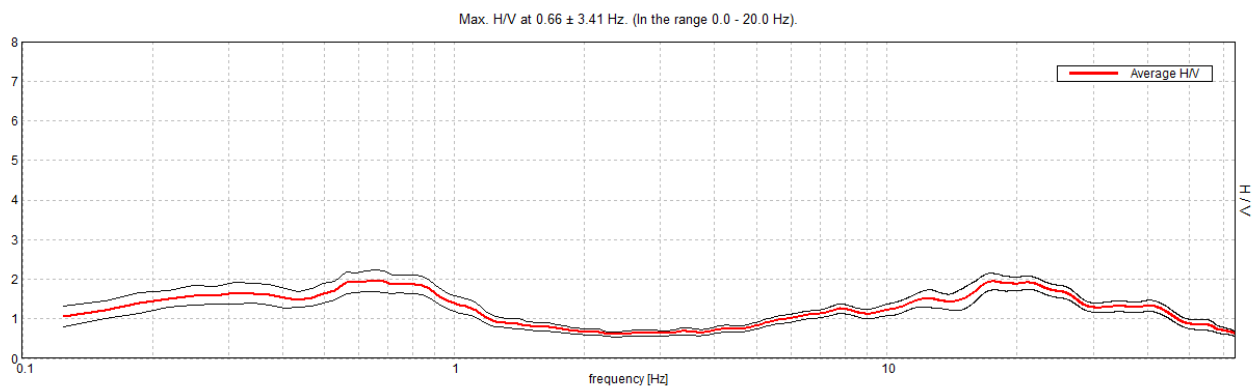
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0021

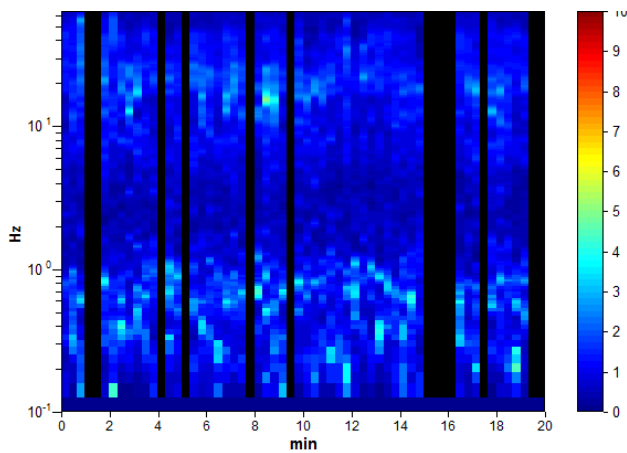
Instrument: TRS-0025/01-07  
Start recording: 22/07/14 10:44:32 End recording: 22/07/14 11:04:33  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 82% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

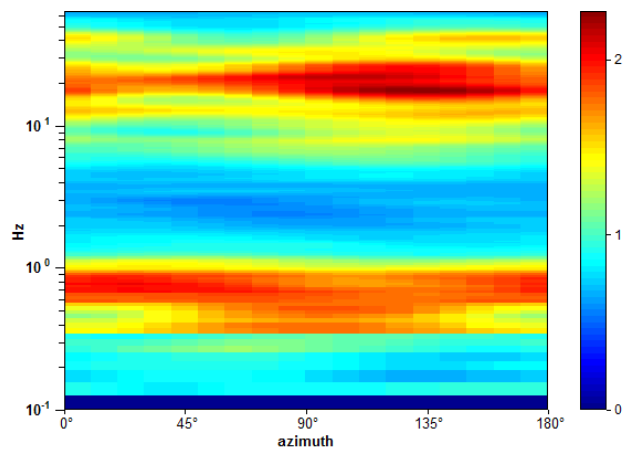
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



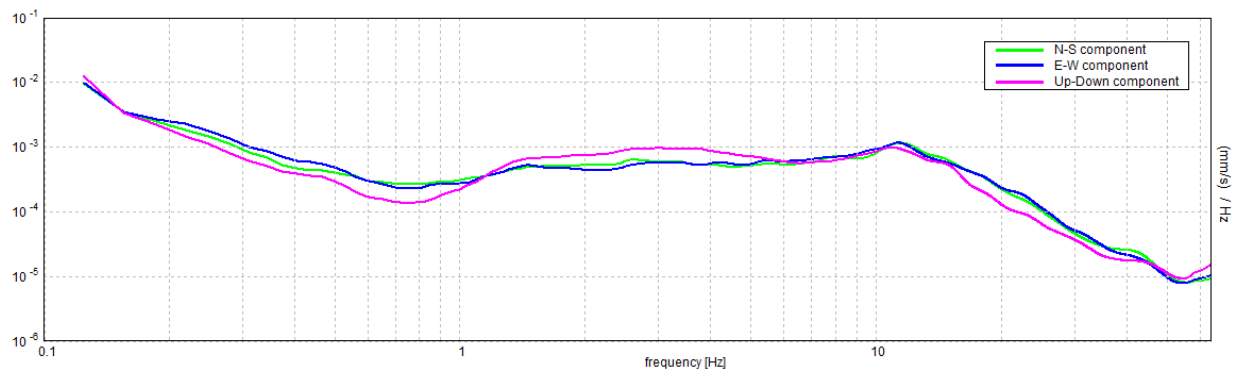
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.66 \pm 3.41$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.66 > 0.50$	OK	
$n_c(f_0) > 200$	$616.9 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 32 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.219 Hz	OK	
$A_0 > 2$	$1.96 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 5.19859  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$3.41157 < 0.09844$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2778 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

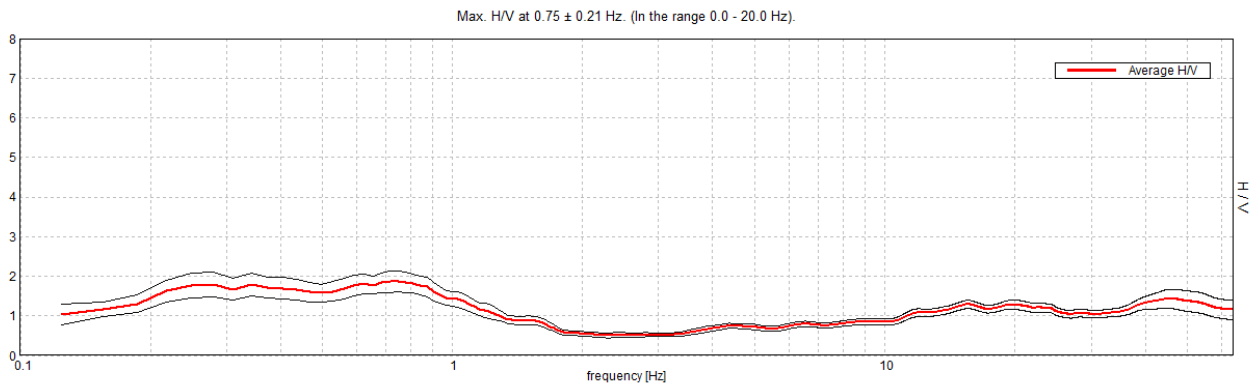
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

**ANZOLA DELL'EMILIA, AE\_0022**

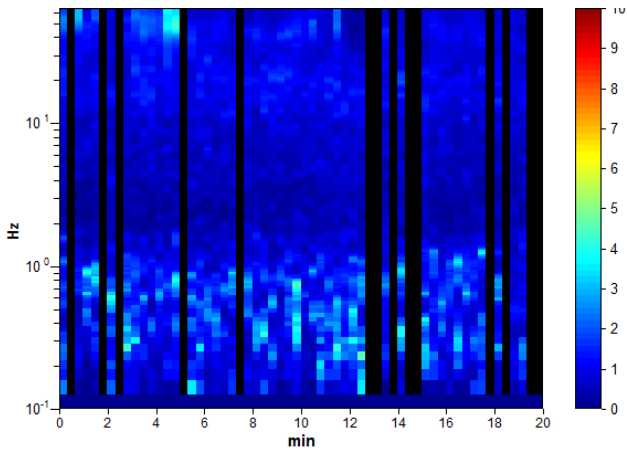
Instrument: TRS-0025/01-07  
 Start recording: 22/07/14 11:19:23 End recording: 22/07/14 11:39:24  
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
 GPS data not available

Trace length: 0h20'00". Analyzed 80% trace (manual window selection)  
 Sampling rate: 128 Hz  
 Window size: 20 s  
 Smoothing type: Triangular window  
 Smoothing: 10%

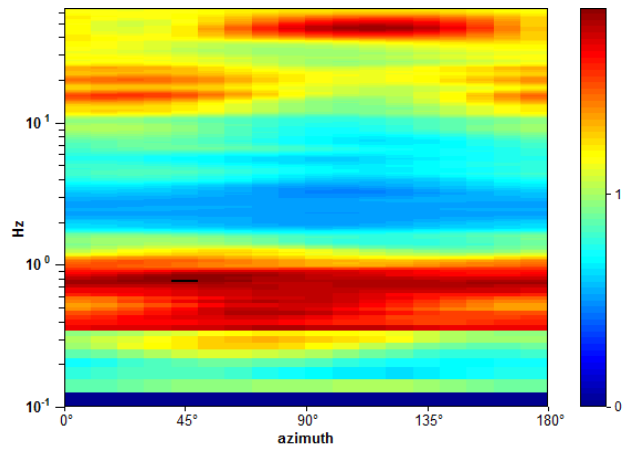
**HORIZONTAL TO VERTICAL SPECTRAL RATIO**



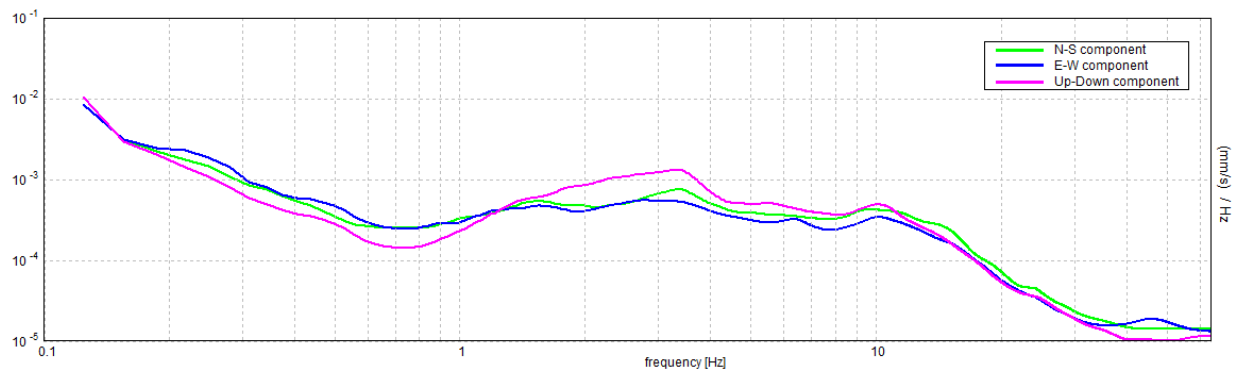
**H/V TIME HISTORY**



**DIRECTIONAL H/V**



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.75 \pm 0.21$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.75 > 0.50$	OK	
$n_c(f_0) > 200$	$690.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 37 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.344 Hz	OK	
$A_0 > 2$	$1.86 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.27556  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.20667 < 0.1125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2605 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

**Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$**

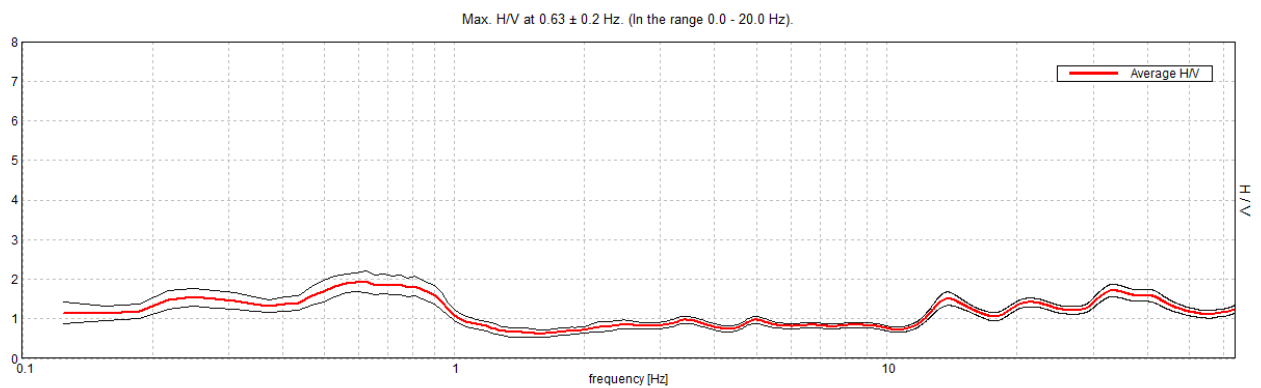
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0023

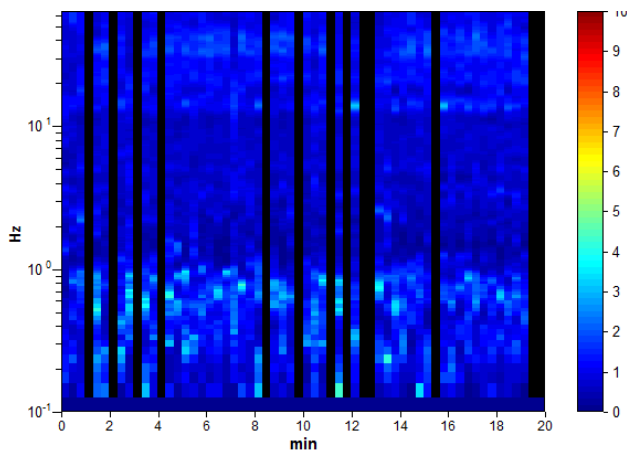
Instrument: TRS-0025/01-07  
Start recording: 22/07/14 11:55:33 End recording: 22/07/14 12:15:34  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 82% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

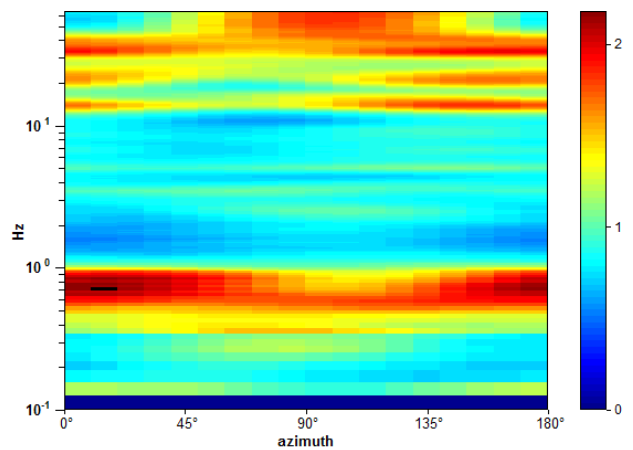
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



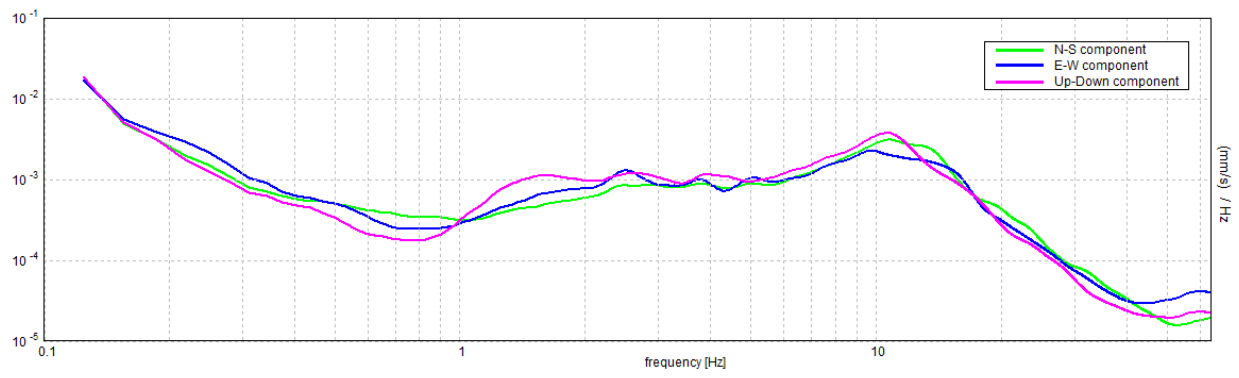
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.63 \pm 0.2$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.63 > 0.50$	OK	
$n_c(f_0) > 200$	$587.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 31 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.063 Hz	OK	
$A_0 > 2$	$1.94 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.32714  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.20446 < 0.09375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2694 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

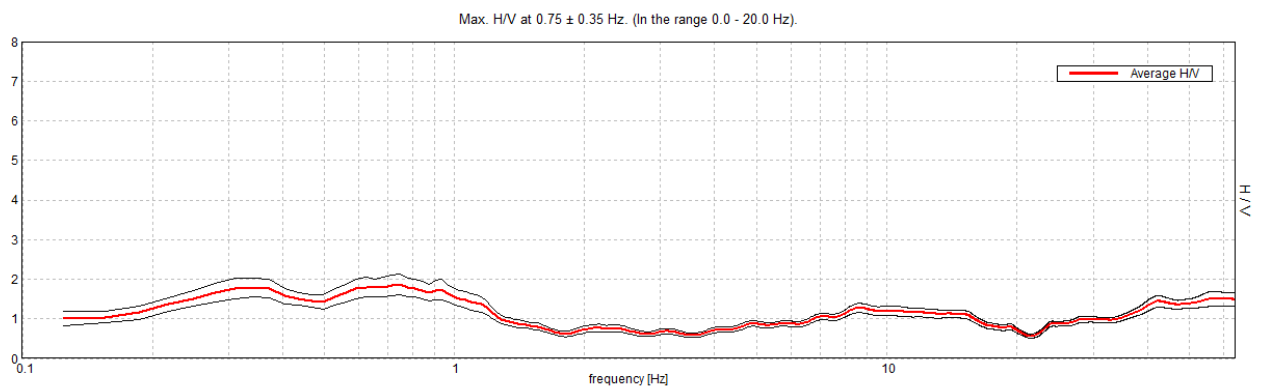
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0024

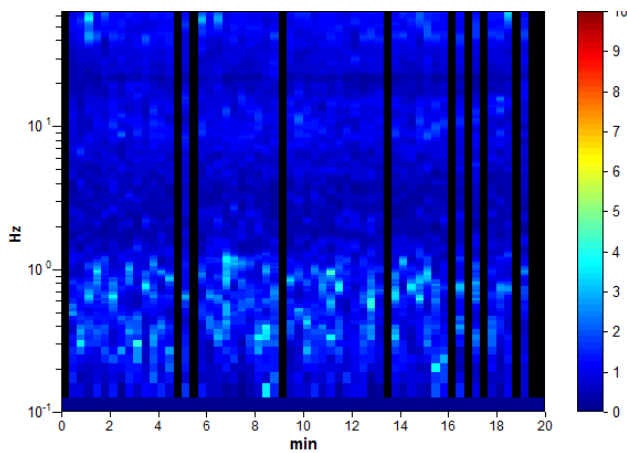
Instrument: TRS-0025/01-07  
Start recording: 22/07/14 12:29:38 End recording: 22/07/14 12:49:39  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 85% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

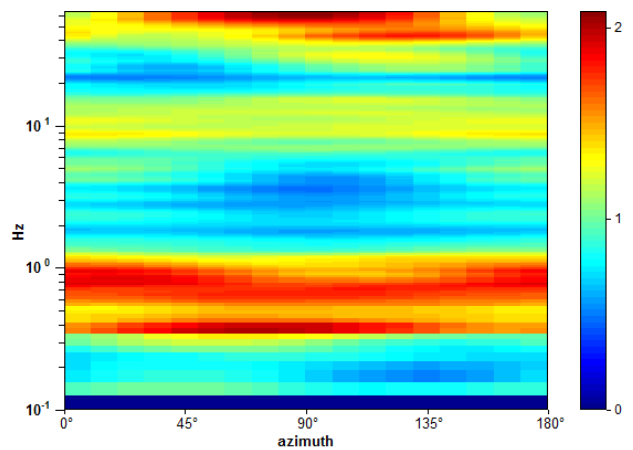
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



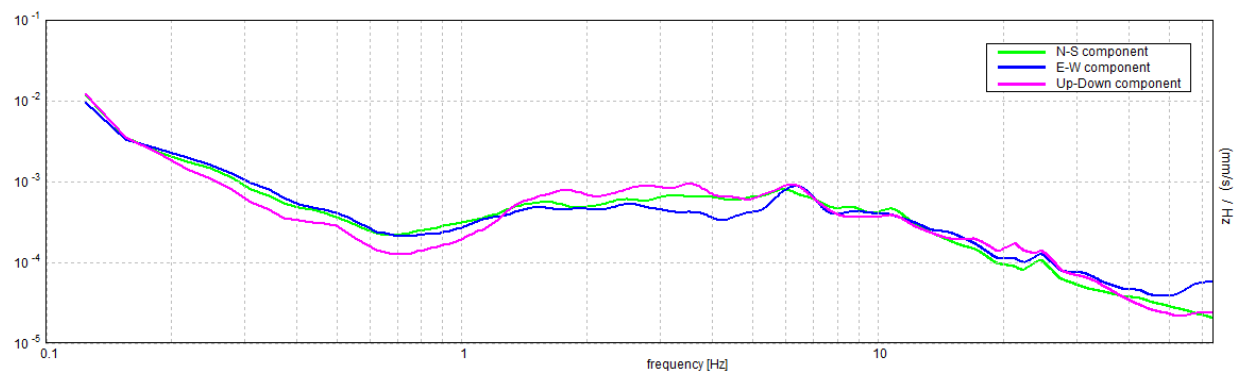
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.75 \pm 0.35$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.75 > 0.50$	OK	
$n_c(f_0) > 200$	$735.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 37 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.344 Hz	OK	
$A_0 > 2$	$1.86 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.46191  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.34644 < 0.1125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2596 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

**Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$**

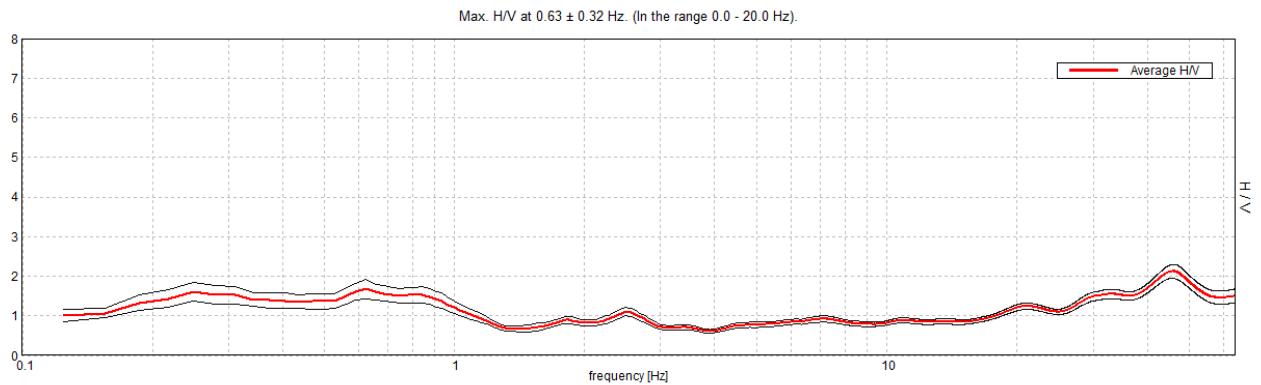
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0025

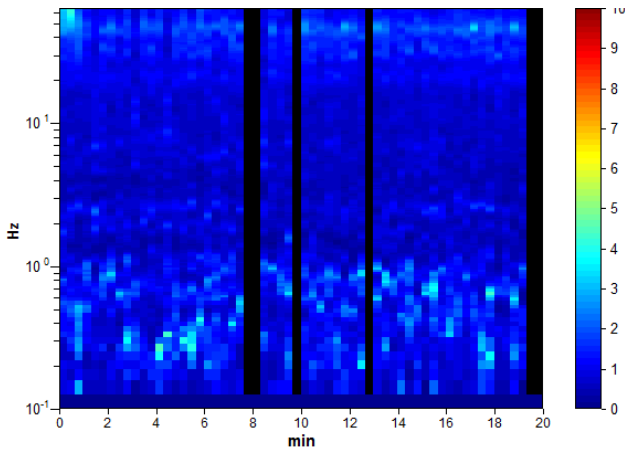
Instrument: TRS-0025/01-07  
Start recording: 22/07/14 13:00:39      End recording: 22/07/14 13:20:40  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00".      Analyzed 93% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

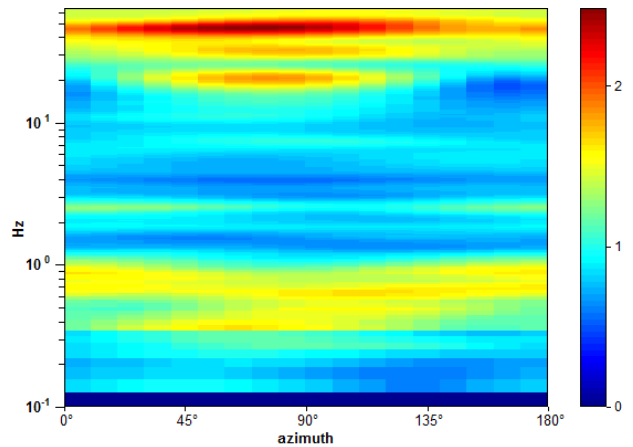
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



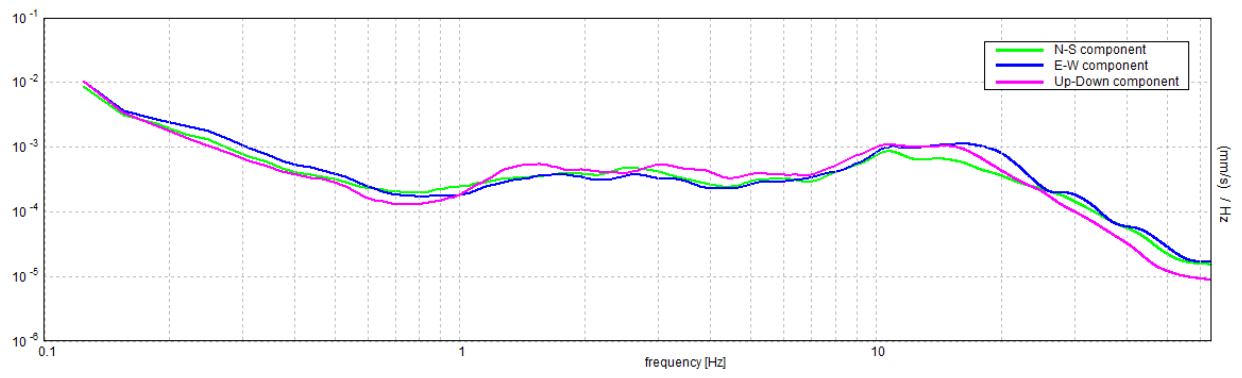
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.63 \pm 0.32$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.63 > 0.50$	OK	
$n_c(f_0) > 200$	$675.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 31 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.219 Hz	OK	
$A_0 > 2$	$1.68 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.50498  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.31561 < 0.09375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2377 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

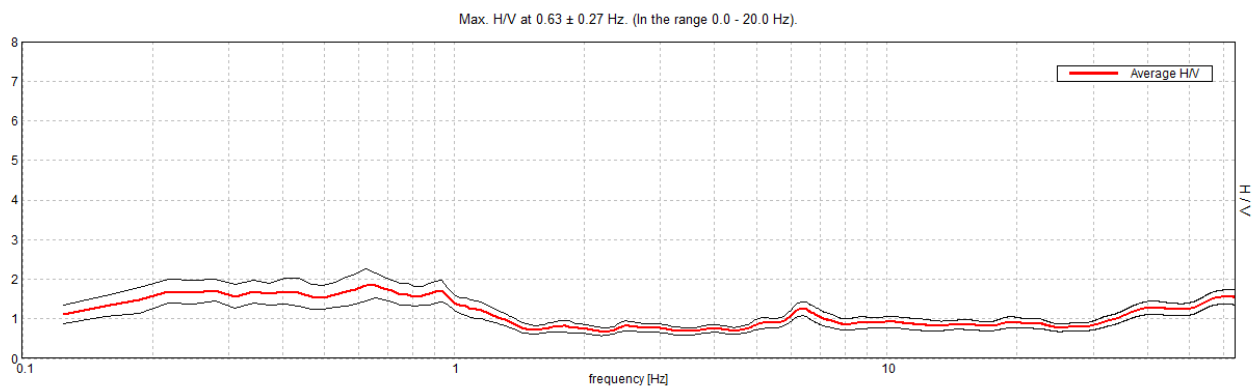
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0026

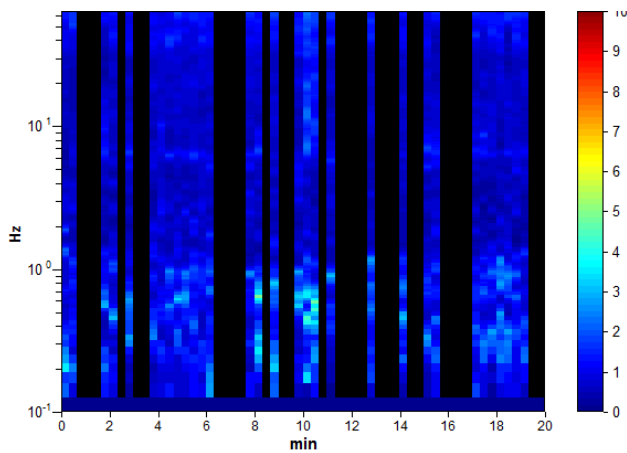
Instrument: TRS-0025/01-07  
Start recording: 22/07/14 13:35:36 End recording: 22/07/14 13:55:37  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 55% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

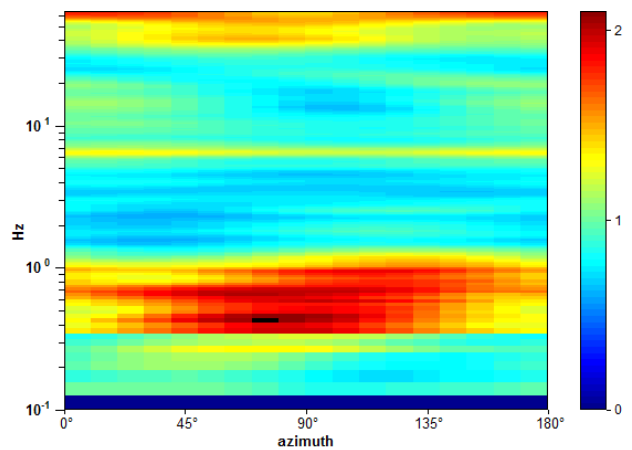
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



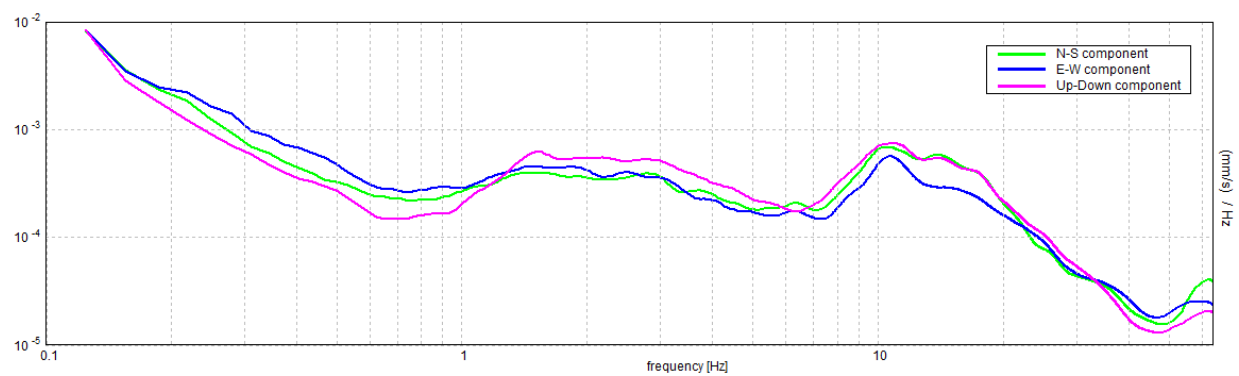
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.63 \pm 0.27$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.63 > 0.50$	OK	
$n_c(f_0) > 200$	$387.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 31 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.344 Hz	OK	
$A_0 > 2$	$1.85 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.43124  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.26952 < 0.09375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.4006 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

**Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$**

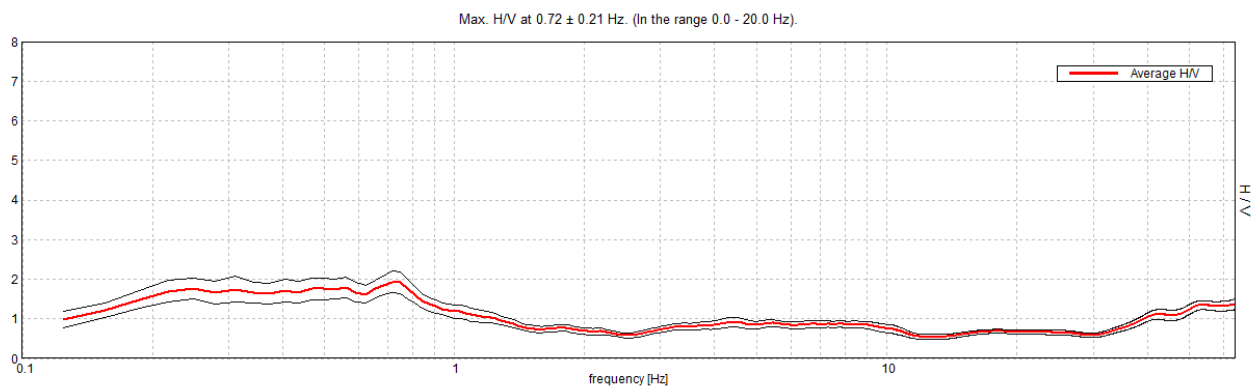
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0027

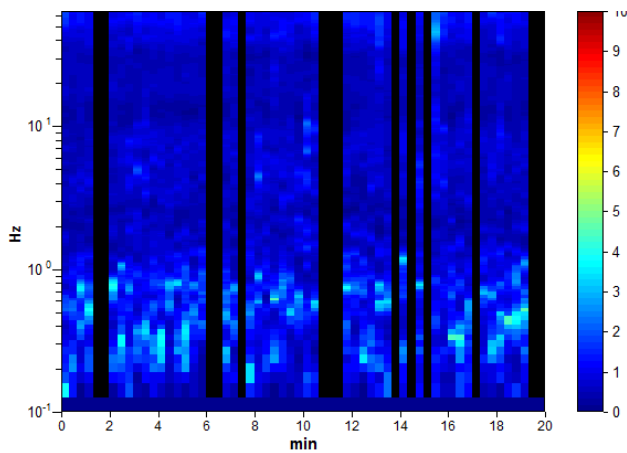
Instrument: TRS-0025/01-07  
Start recording: 22/07/14 14:14:04      End recording: 22/07/14 14:34:05  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00".      Analyzed 80% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

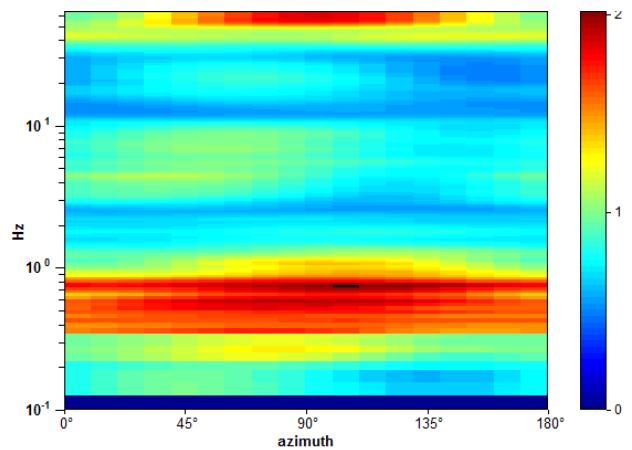
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



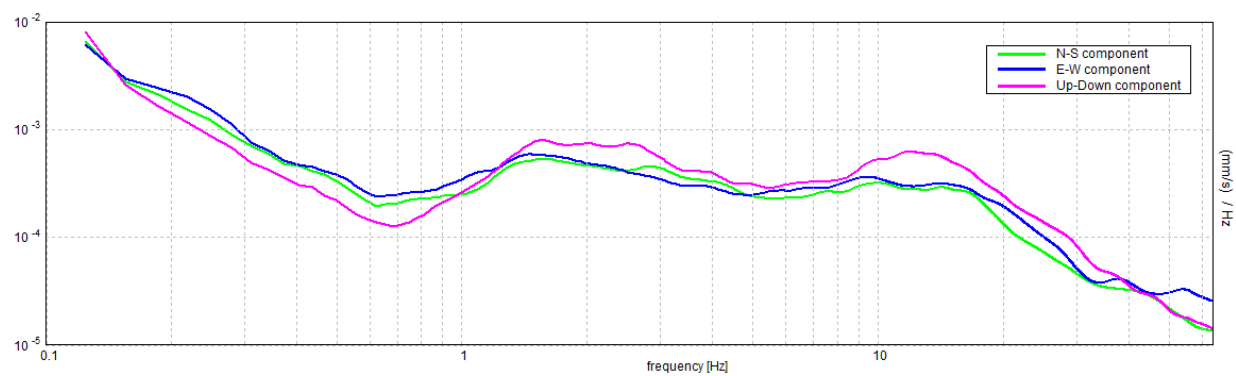
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.72 \pm 0.21$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.72 > 0.50$	OK	
$n_c(f_0) > 200$	$661.3 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 36 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.281 Hz	OK	
$A_0 > 2$	$1.93 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.29523  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.2122 < 0.10781$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2699 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

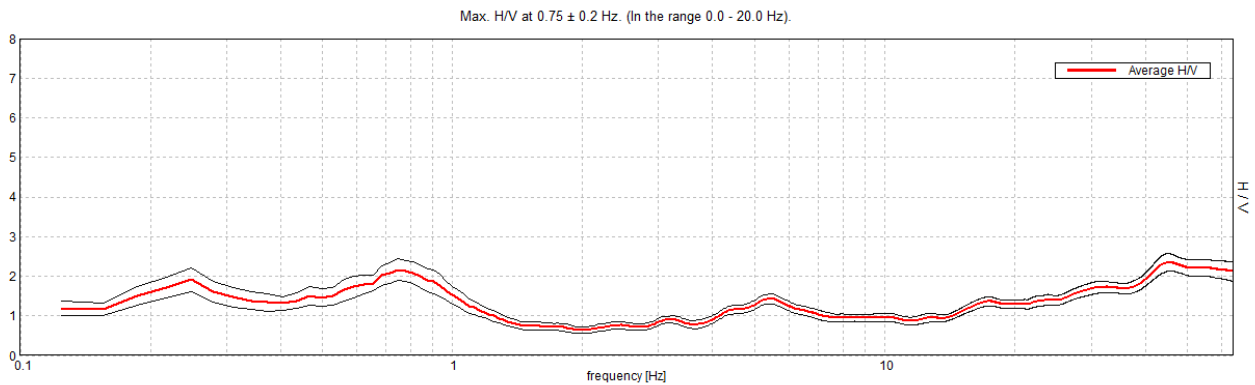
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0028

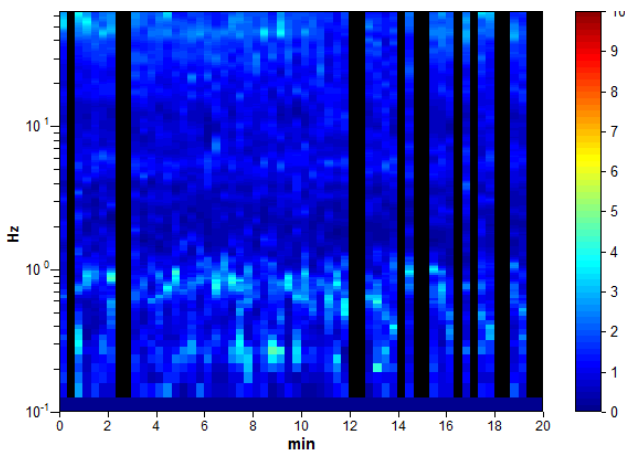
Instrument: TRS-0025/01-07  
Start recording: 22/07/14 14:46:34 End recording: 22/07/14 15:06:35  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 80% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

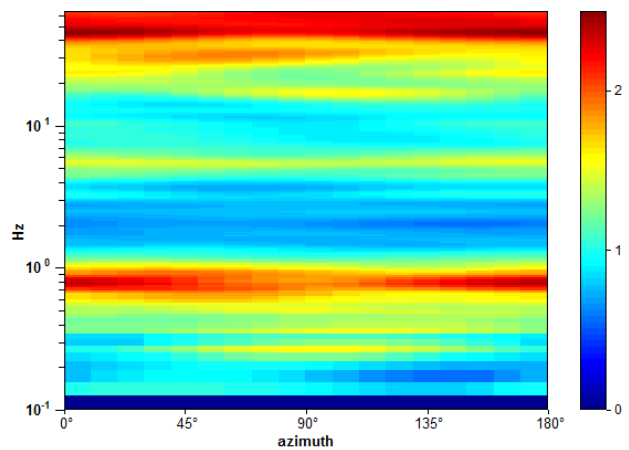
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



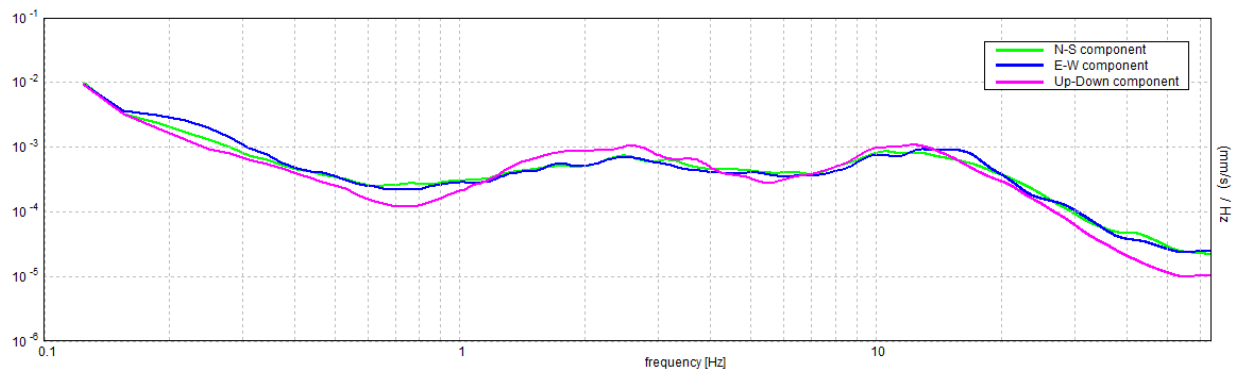
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.75 \pm 0.2$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.75 > 0.50$	OK	
$n_c(f_0) > 200$	$690.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 37 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.188 Hz	OK	
$A_0 > 2$	$2.17 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.26288  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.19716 < 0.1125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2712 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

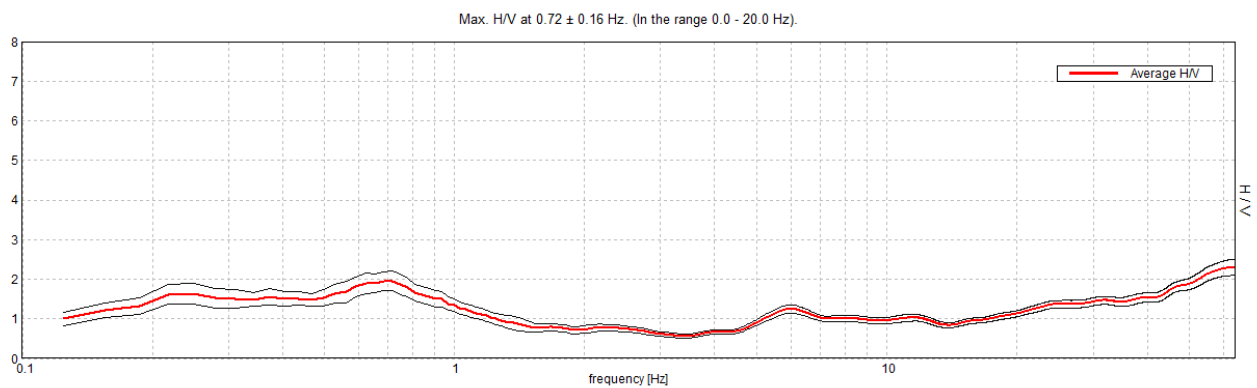
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0029

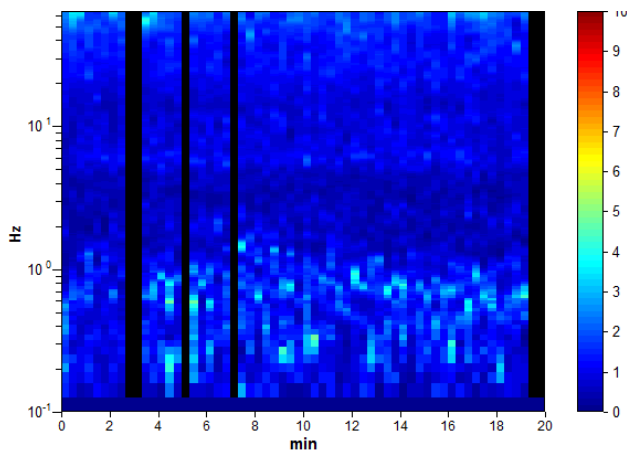
Instrument: TRS-0025/01-07  
 Start recording: 22/07/14 15:15:54 End recording: 22/07/14 15:35:55  
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
 GPS data not available

Trace length: 0h20'00". Analyzed 93% trace (manual window selection)  
 Sampling rate: 128 Hz  
 Window size: 20 s  
 Smoothing type: Triangular window  
 Smoothing: 10%

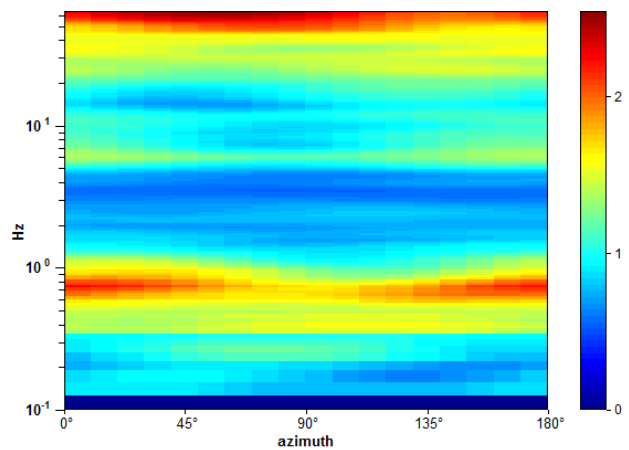
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



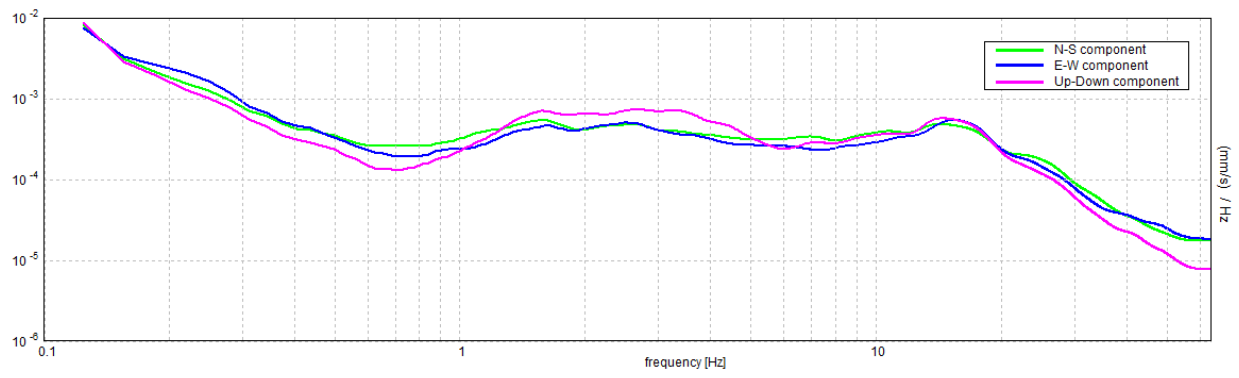
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.72 \pm 0.16$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.72 > 0.50$	OK	
$n_c(f_0) > 200$	$776.3 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 36 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.281 Hz	OK	
$A_0 > 2$	$1.96 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.22854  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.16426 < 0.10781$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.239 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

**Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$**

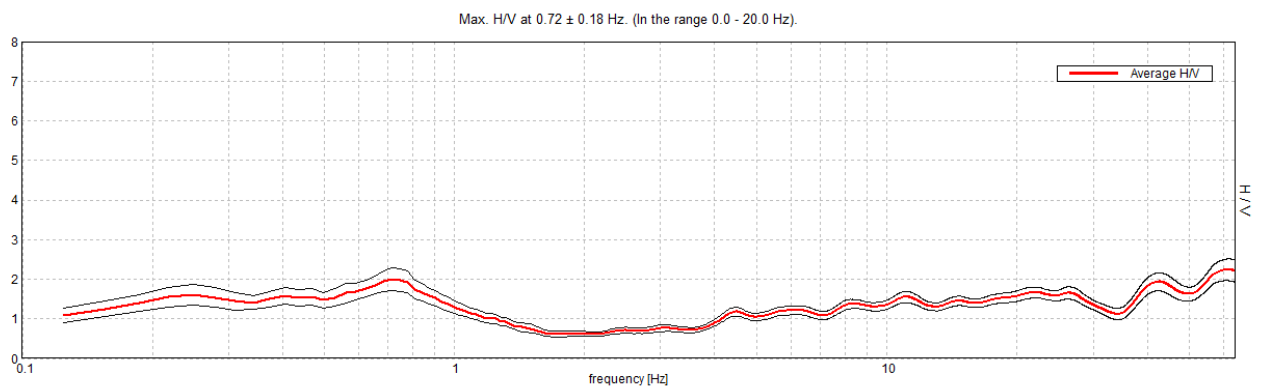
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0030

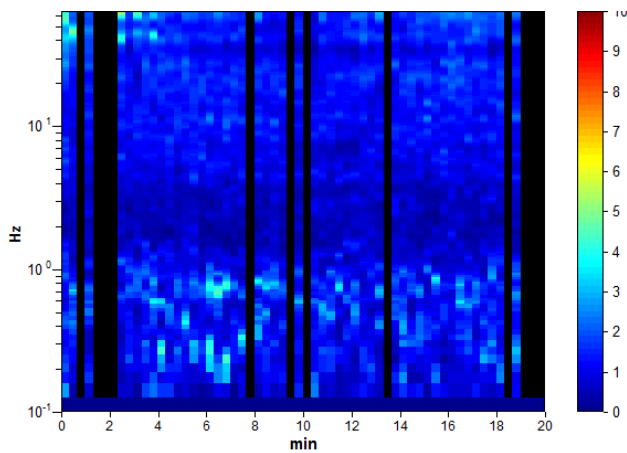
Instrument: TRS-0025/01-07  
Start recording: 22/07/14 15:42:34 End recording: 22/07/14 16:02:35  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 83% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

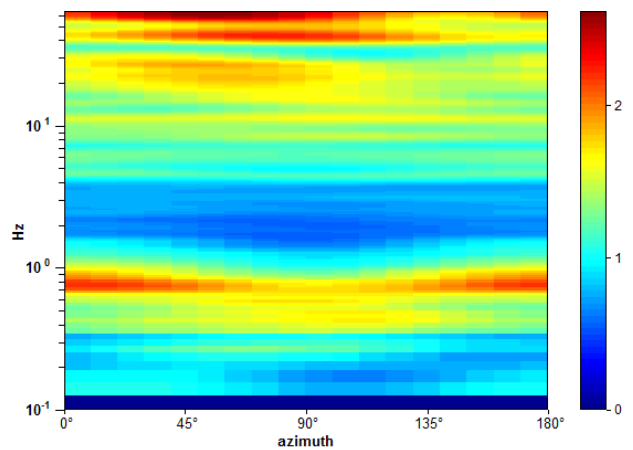
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



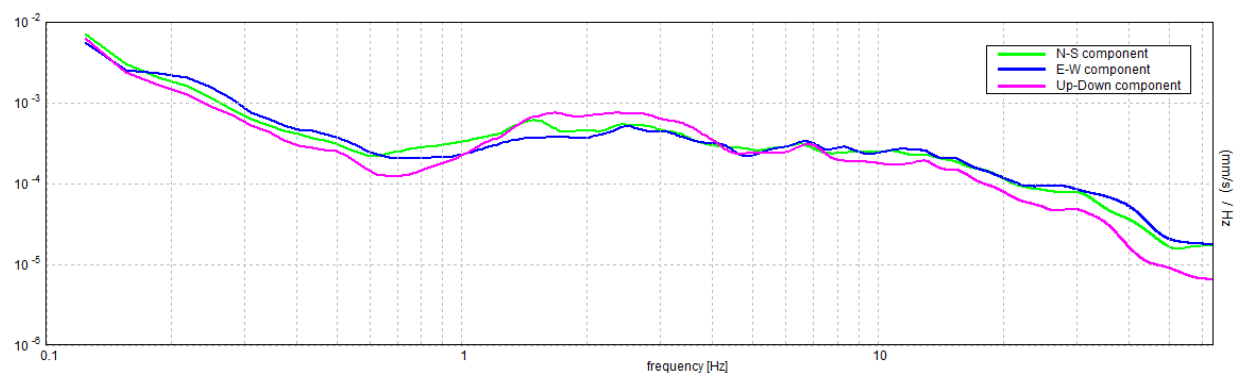
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.72 \pm 0.18$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.72 > 0.50$	OK	
$n_c(f_0) > 200$	$690.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 36 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$2.00 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.24984  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.17957 < 0.10781$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.28 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

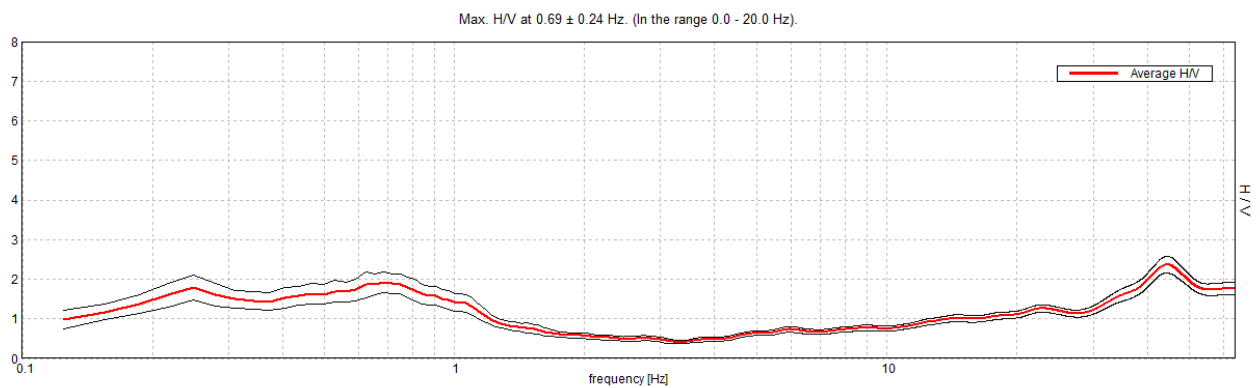
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0031

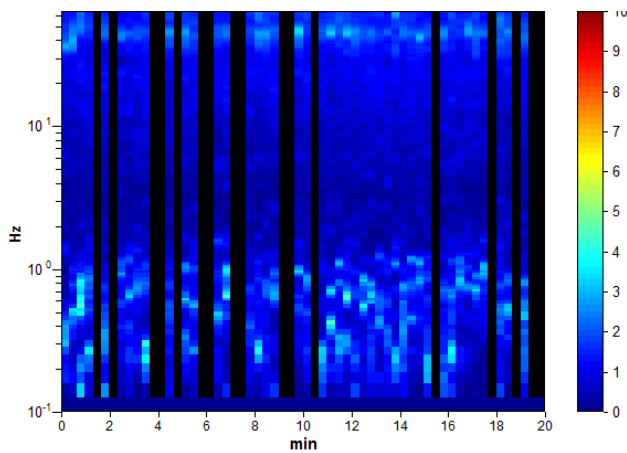
Instrument: TRS-0025/01-07  
Start recording: 22/07/14 16:24:43 End recording: 22/07/14 16:44:43  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 75% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

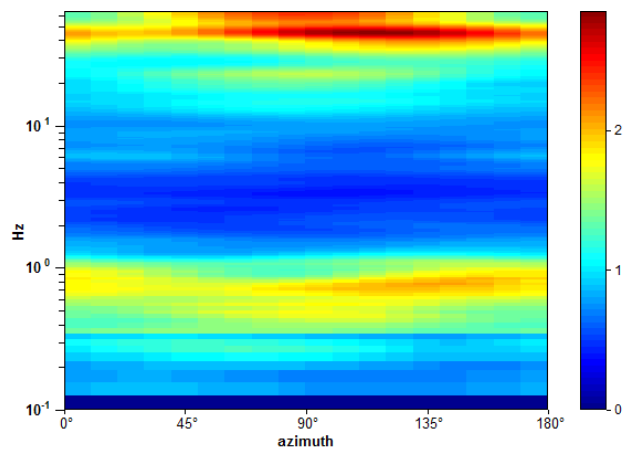
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



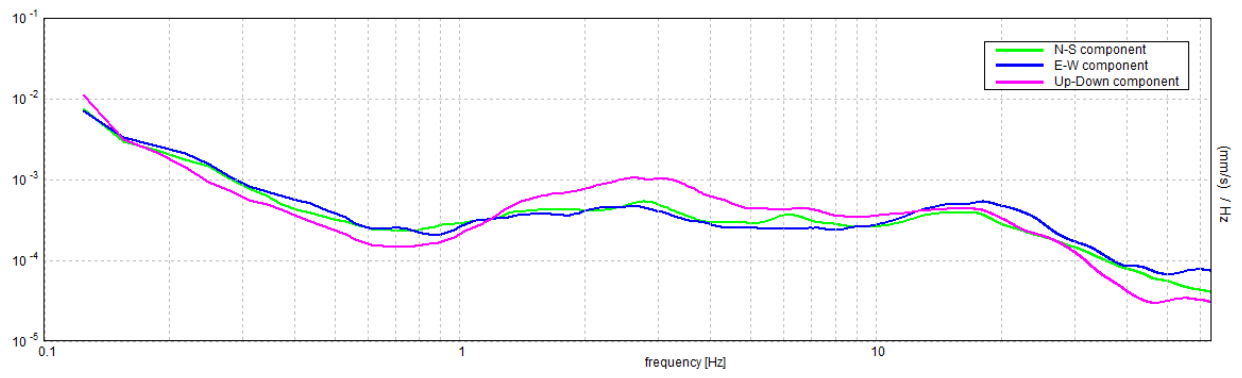
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.69 \pm 0.24$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.69 > 0.50$	OK	
$n_c(f_0) > 200$	$591.3 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 34 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$1.92 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.34714  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.23866 < 0.10313$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.265 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

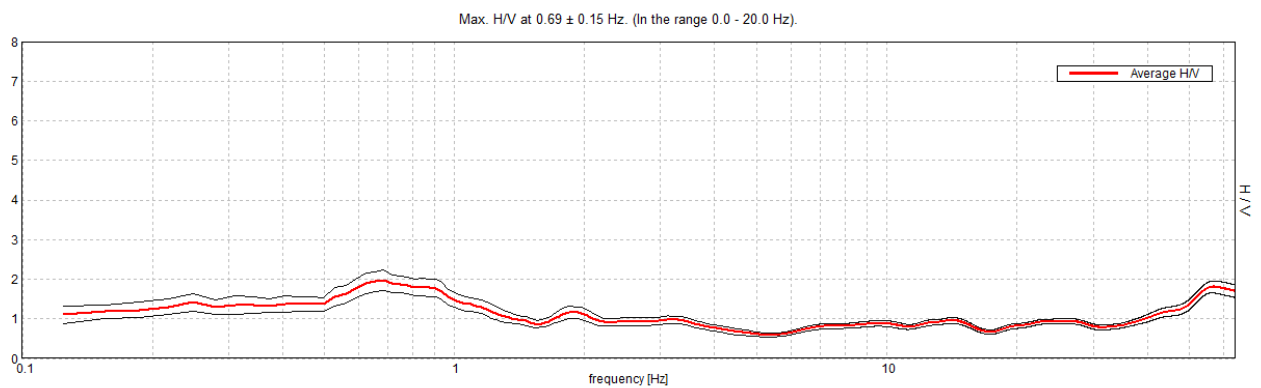
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0032

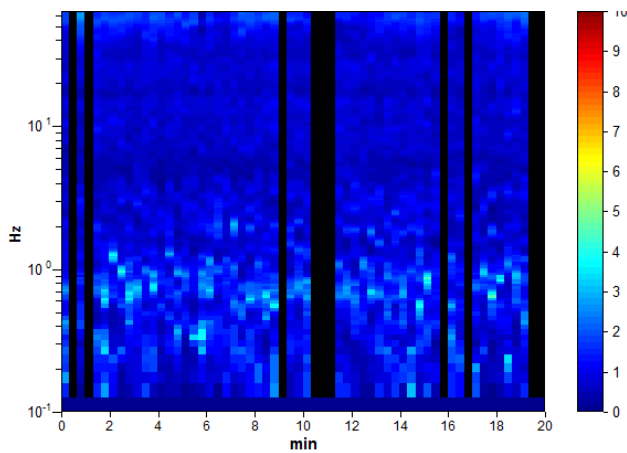
Instrument: TEN-0029/01-07  
Start recording: 23/07/14 15:28:46 End recording: 23/07/14 15:48:47  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 87% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

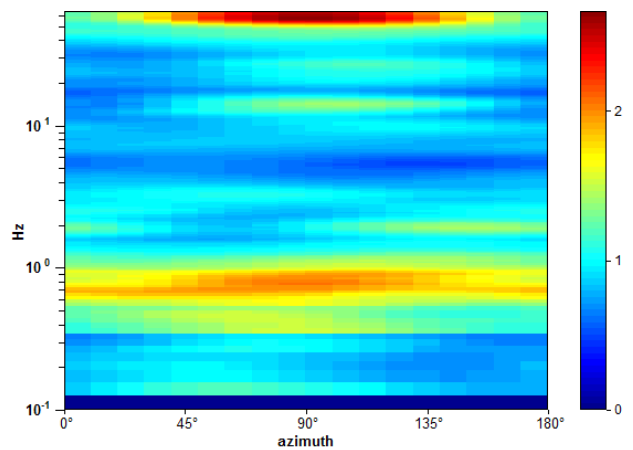
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



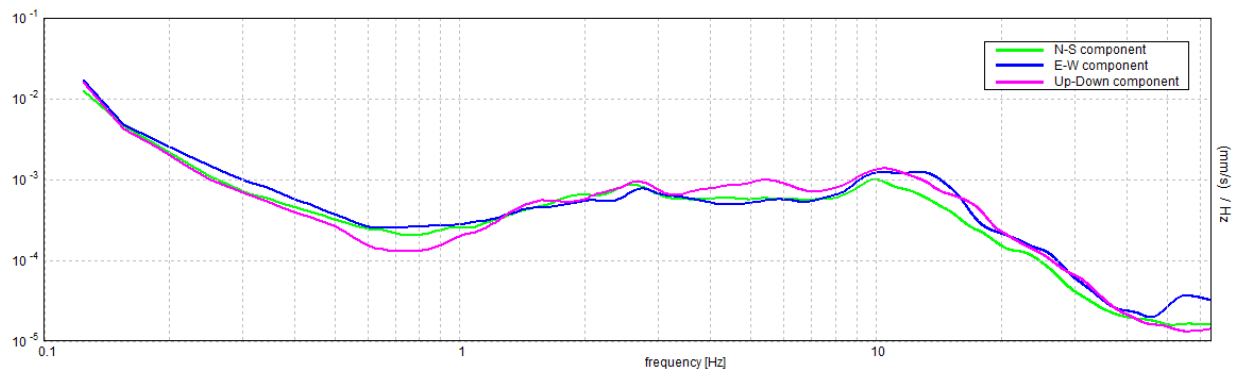
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.69 \pm 0.15$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.69 > 0.50$	OK	
$n_c(f_0) > 200$	$687.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 34 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.406 Hz	OK	
$A_0 > 2$	$1.98 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.21628  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.14869 < 0.10313$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2517 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

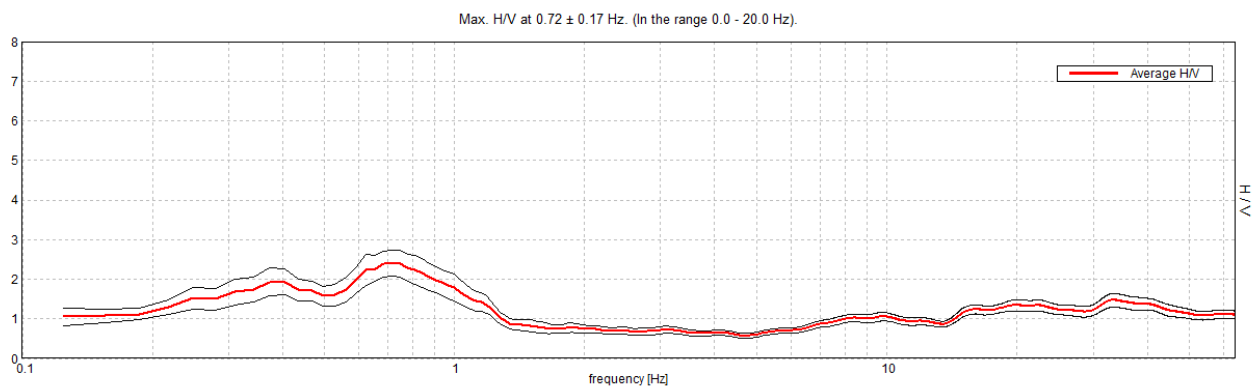
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0033

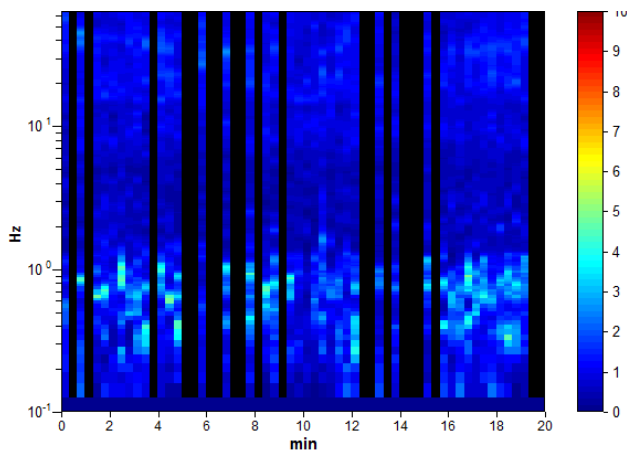
Instrument: TEN-0029/01-07  
Start recording: 23/07/14 15:54:56 End recording: 23/07/14 16:14:57  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 70% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

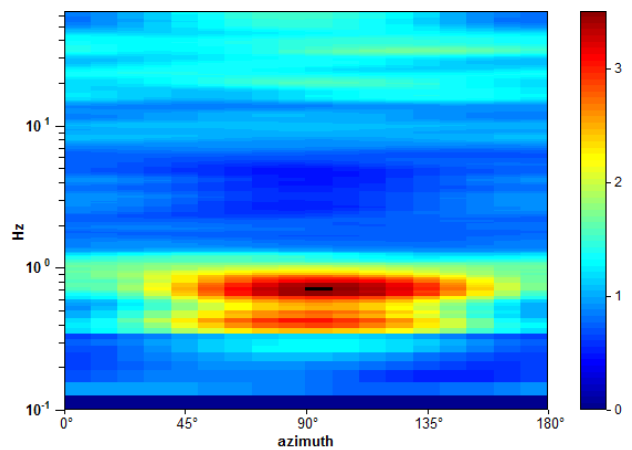
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



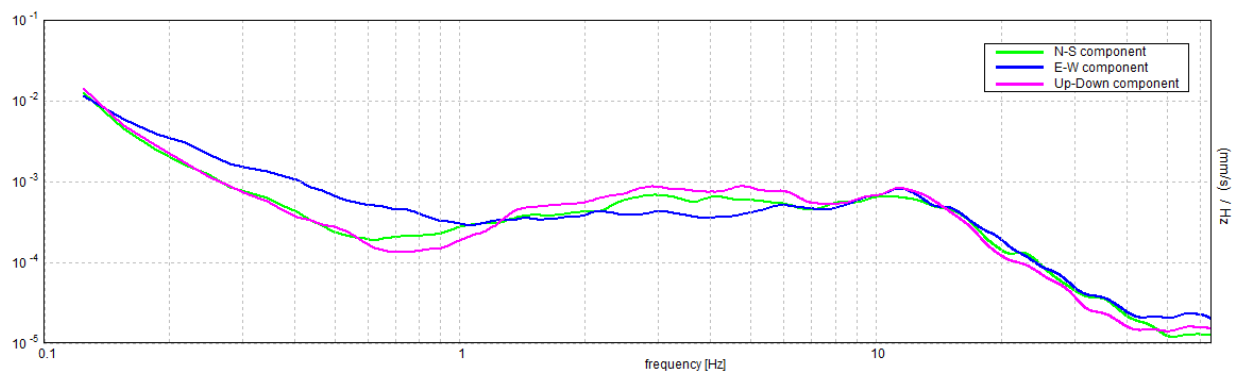
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.72 \pm 0.17$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.72 > 0.50$	OK	
$n_c(f_0) > 200$	$575.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 36 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.188 Hz	OK	
Exists $f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$2.40 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.23814  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.17116 < 0.10781$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3191 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

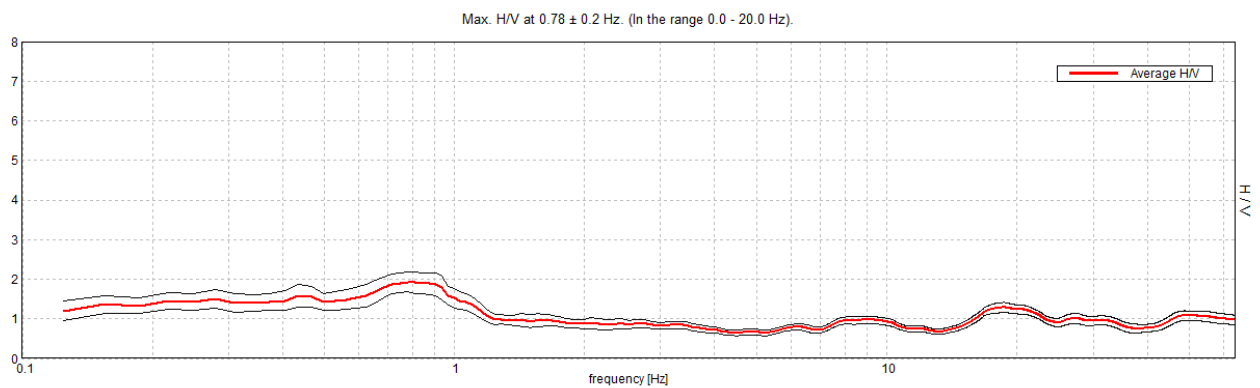


## ANZOLA DELL'EMILIA, AE\_0034

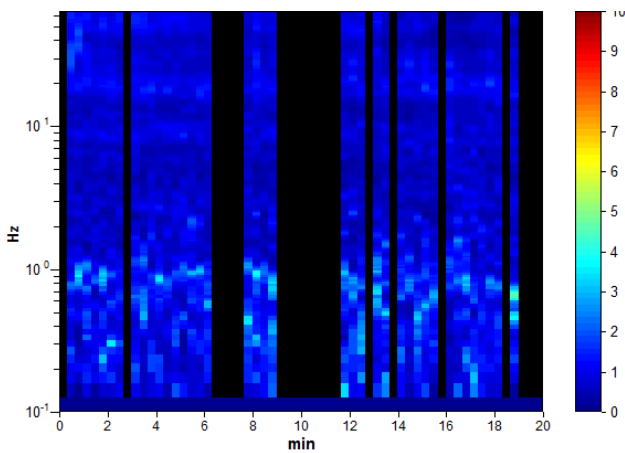
Instrument: TEN-0029/01-07  
Start recording: 23/07/14 16:25:38 End recording: 23/07/14 16:45:39  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 68% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

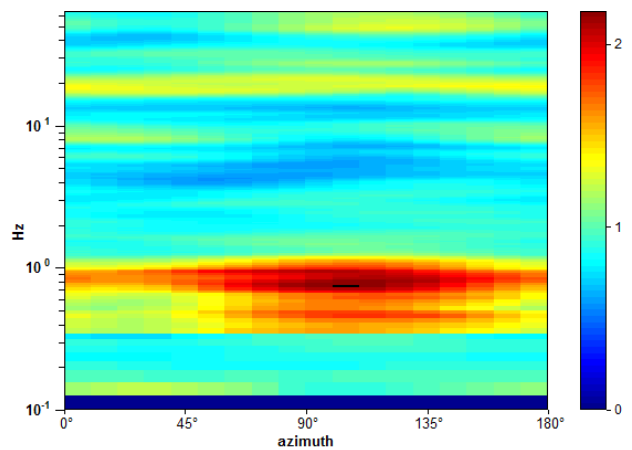
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



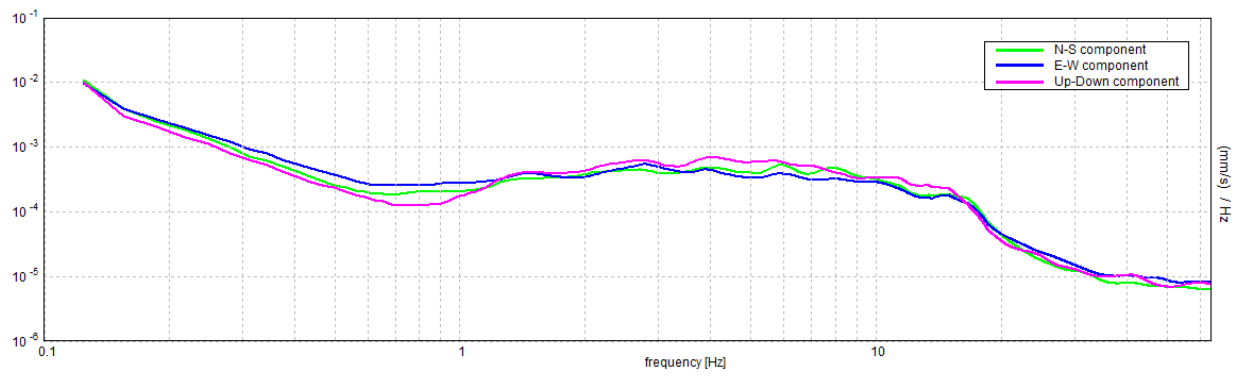
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.78 \pm 0.2$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.78 > 0.50$	OK	
$n_c(f_0) > 200$	$609.4 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 38 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.375 Hz	OK	
$A_0 > 2$	$1.93 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.26167  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.20443 < 0.11719$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2504 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

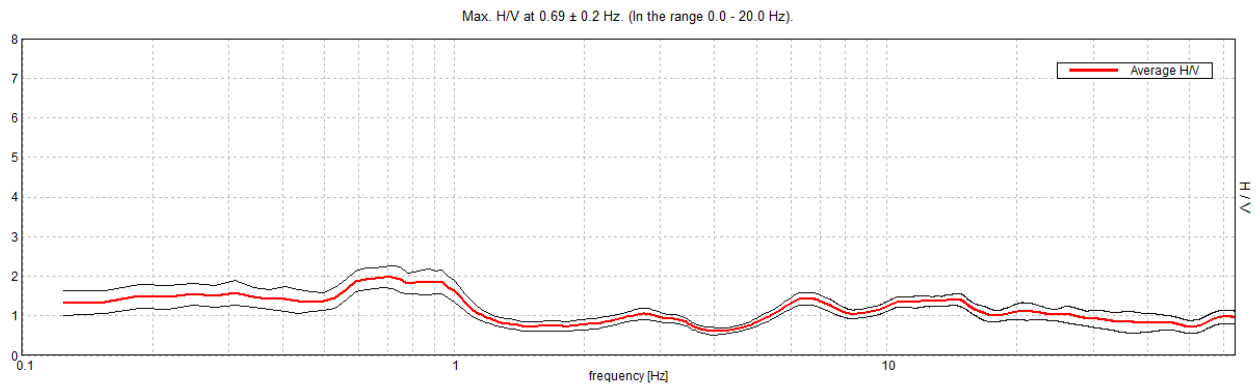
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0035

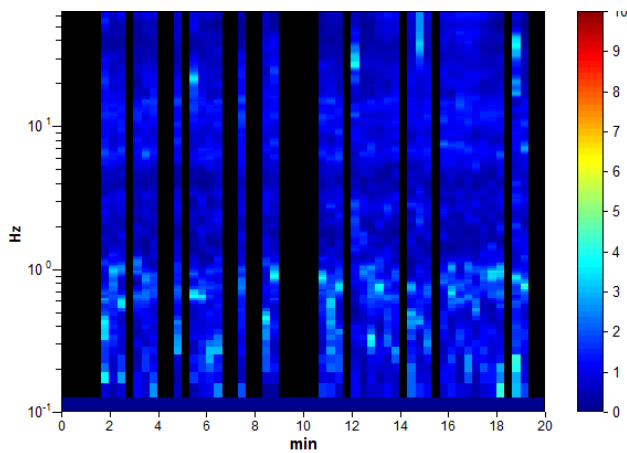
Instrument: TEN-0029/01-07  
Start recording: 23/07/14 16:49:14 End recording: 23/07/14 17:09:15  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 63% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

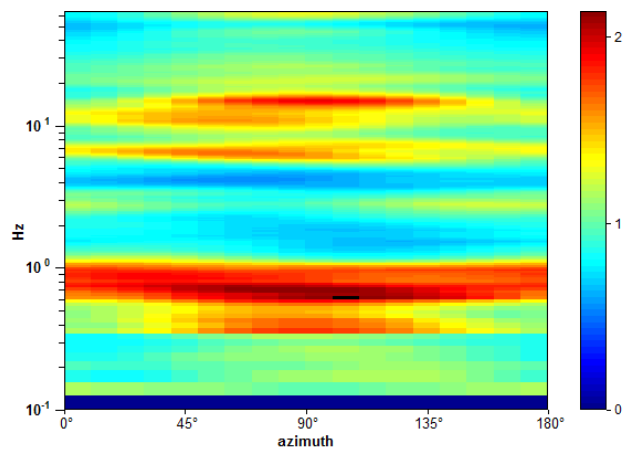
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



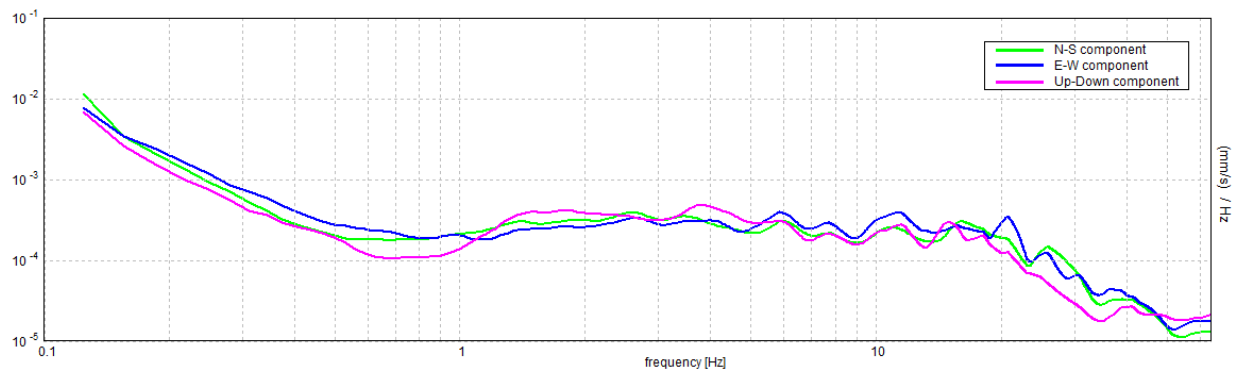
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.69 \pm 0.2$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.69 > 0.50$	OK	
$n_c(f_0) > 200$	$495.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 34 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.188 Hz	OK	
$A_0 > 2$	$1.98 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.29105  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.2001 < 0.10313$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2699 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

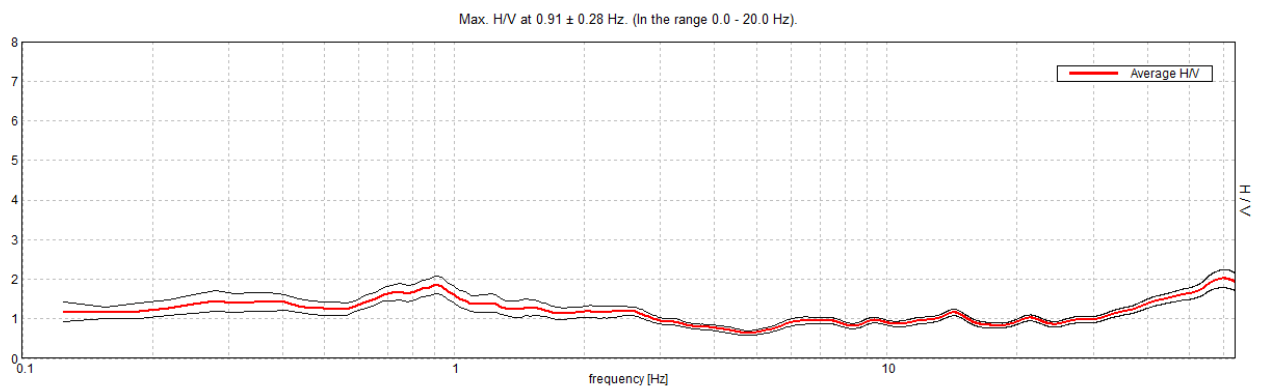
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0036

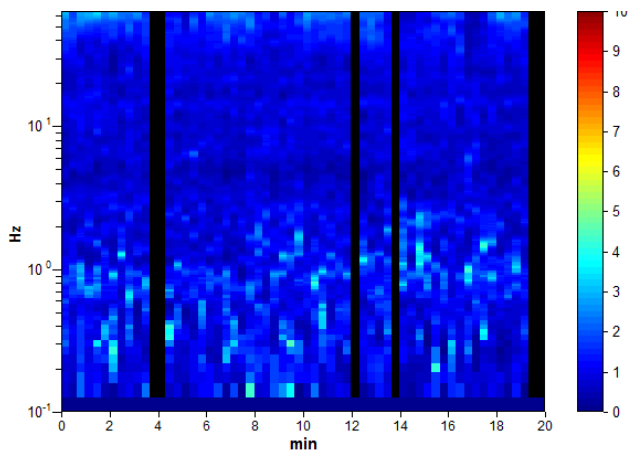
Instrument: TEN-0029/01-07  
Start recording: 23/07/14 17:16:12 End recording: 23/07/14 17:36:13  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 93% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

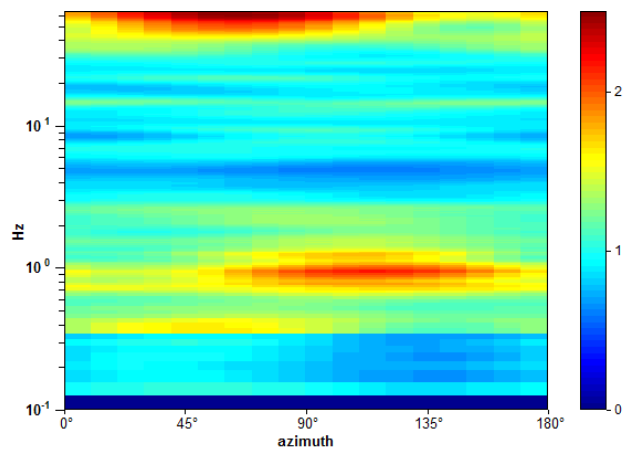
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



### H/V TIME HISTORY

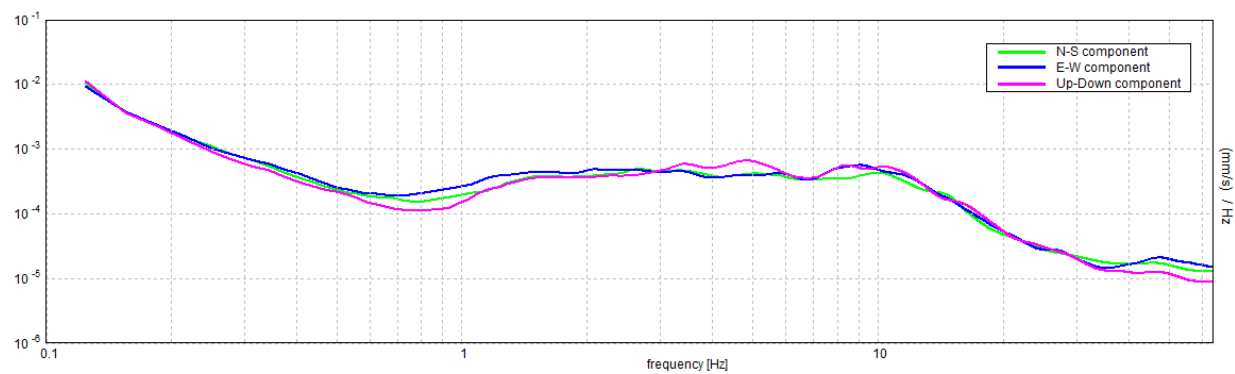


### DIRECTIONAL H/V





### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.91 \pm 0.28$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.91 > 0.50$	OK	
$n_c(f_0) > 200$	$978.8 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 44 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	3.156 Hz	OK	
$A_0 > 2$	$1.86 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.31306  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.28371 < 0.13594$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2167 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

**Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$**

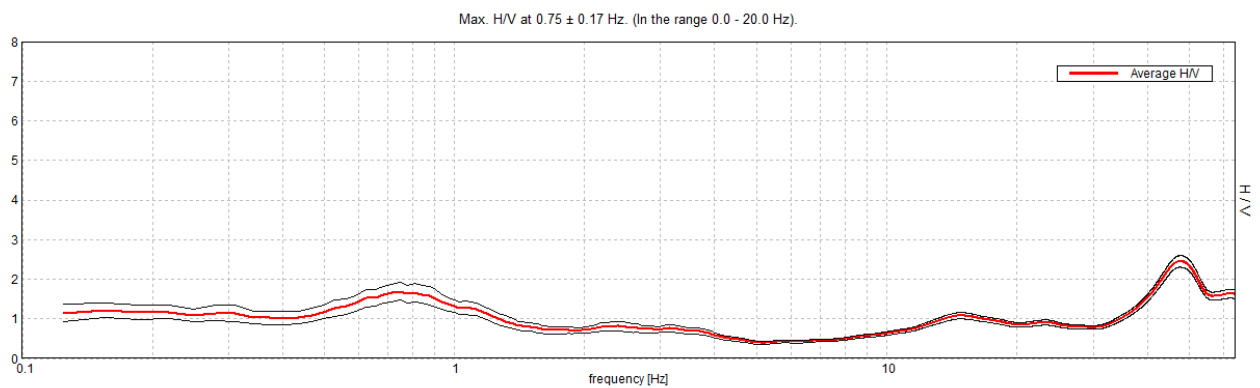
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0037

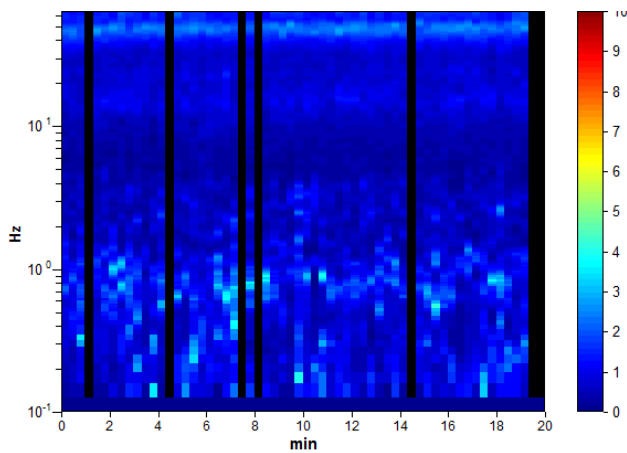
Instrument: TEN-0029/01-07  
Start recording: 23/07/14 17:43:44 End recording: 23/07/14 18:03:45  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 92% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

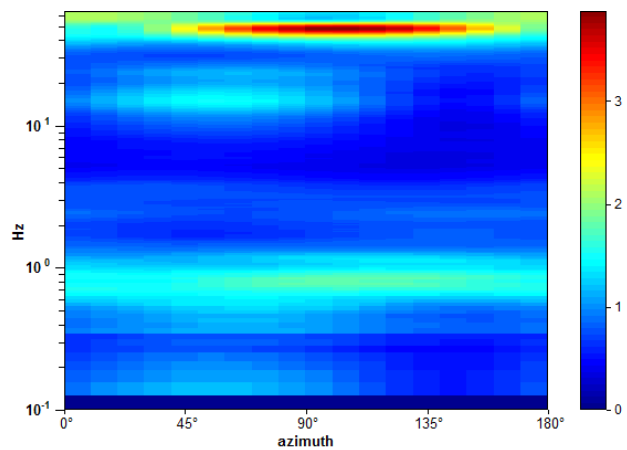
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



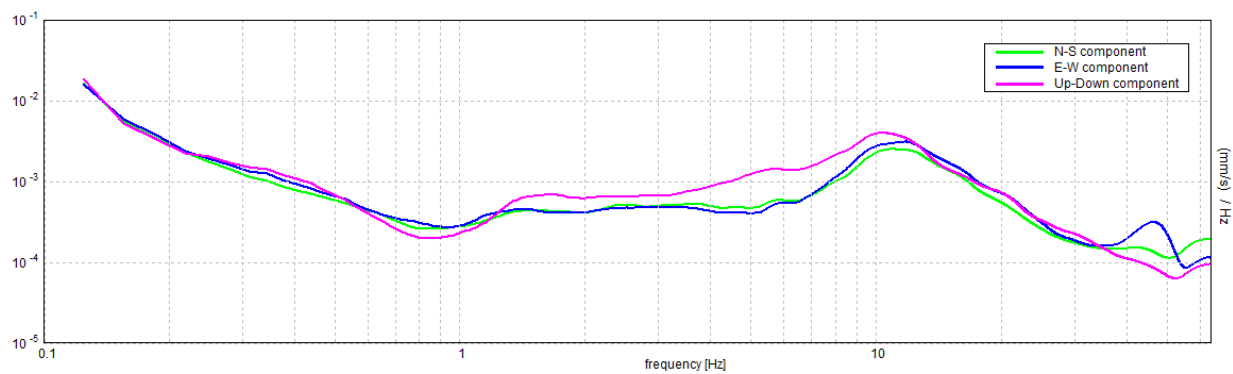
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.75 \pm 0.17$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.75 > 0.50$	OK	
$n_c(f_0) > 200$	$795.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 37 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.406 Hz	OK	
$A_0 > 2$	$1.69 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.23086  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.17314 < 0.1125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2191 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

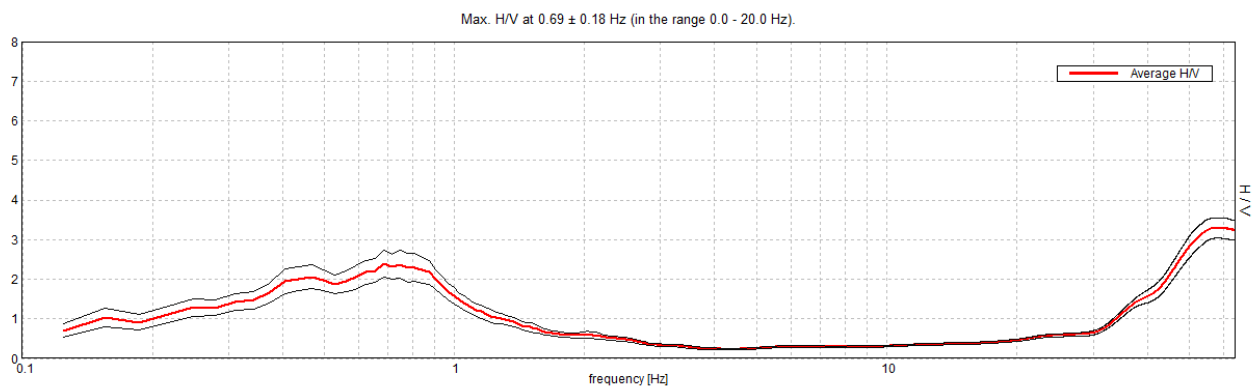
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0038

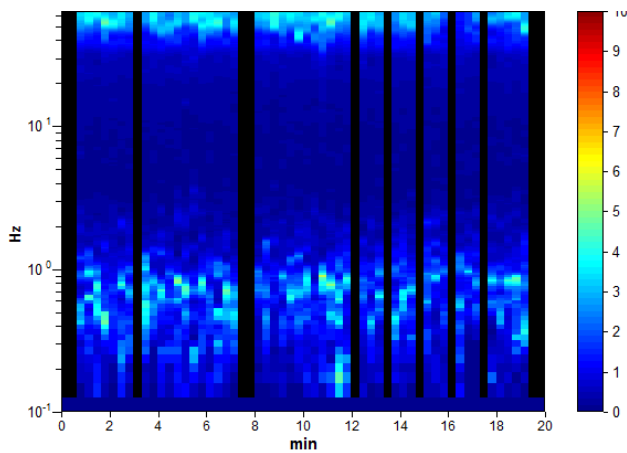
Instrument: TEN-0029/01-07  
Start recording: 24/07/14 09:42:45 End recording: 24/07/14 10:02:46  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 83% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

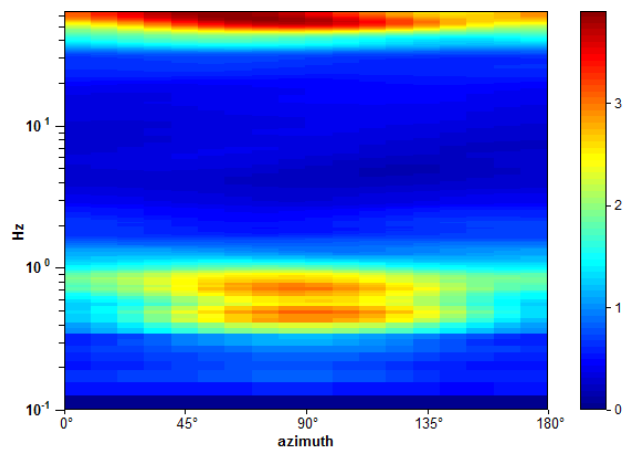
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



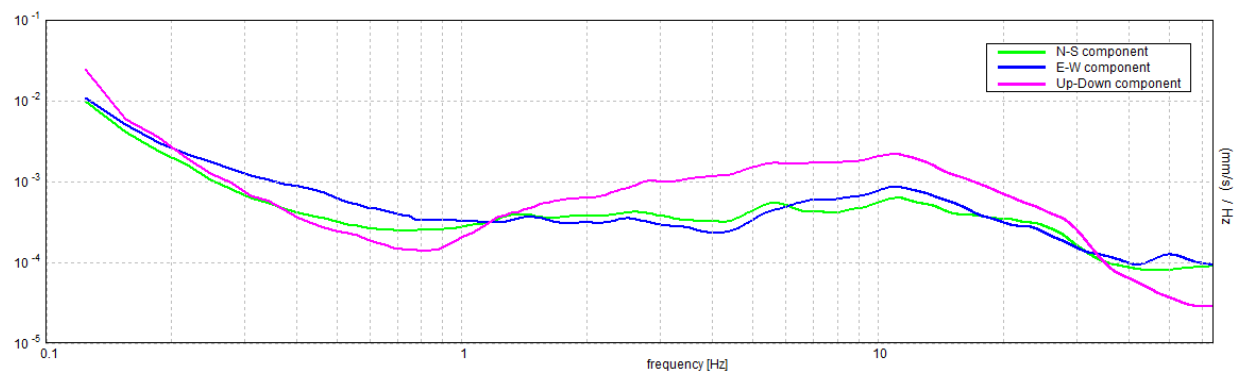
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.69 \pm 0.18$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.69 > 0.50$	OK	
$n_c(f_0) > 200$	$660.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 34 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$	0.219 Hz	OK	
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.156 Hz	OK	
$A_0 > 2$	$2.40 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.26235  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.18037 < 0.10313$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3392 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

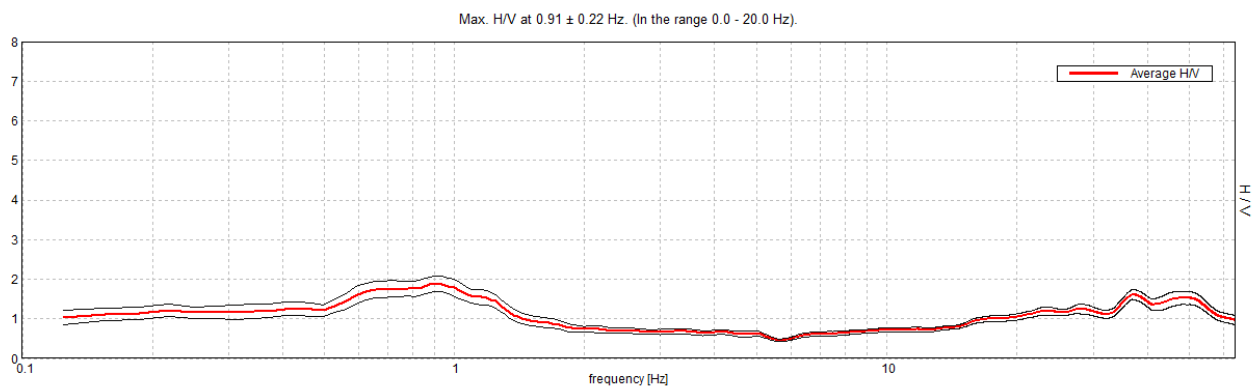
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0039

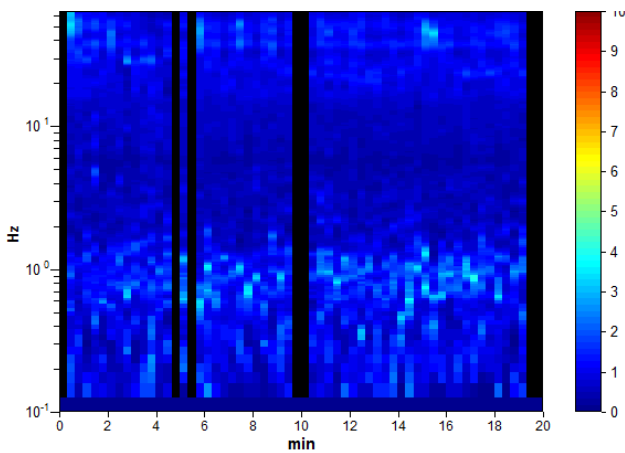
Instrument: TEN-0029/01-07  
Start recording: 24/07/14 10:12:08 End recording: 24/07/14 10:32:09  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 92% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

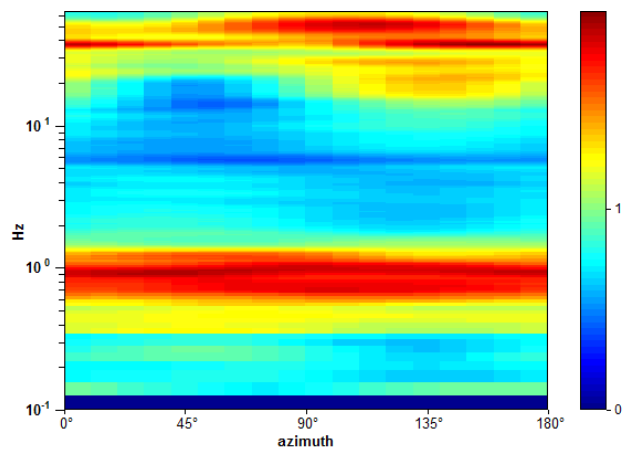
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



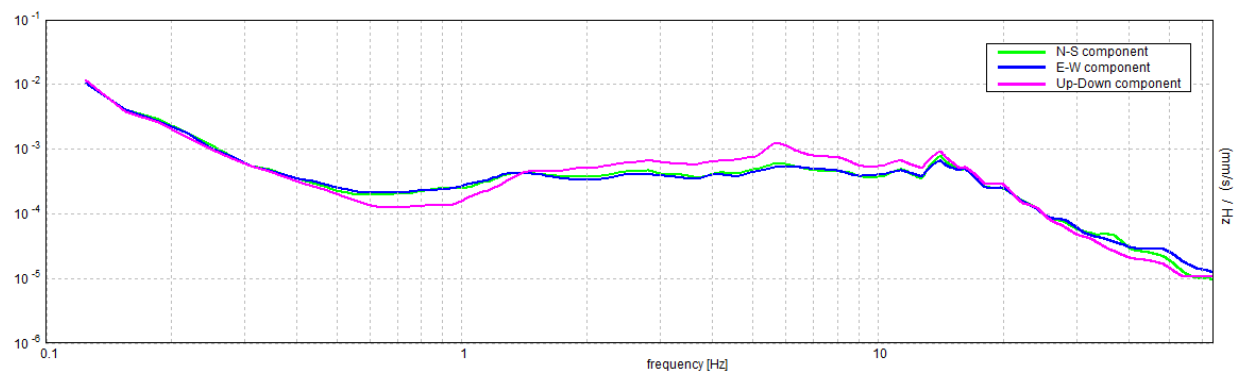
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.91 \pm 0.22$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.91 > 0.50$	OK	
$n_c(f_0) > 200$	$960.6 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 44 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.531 Hz	OK	
$A_0 > 2$	$1.89 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.24744  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.22424 < 0.13594$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.1945 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

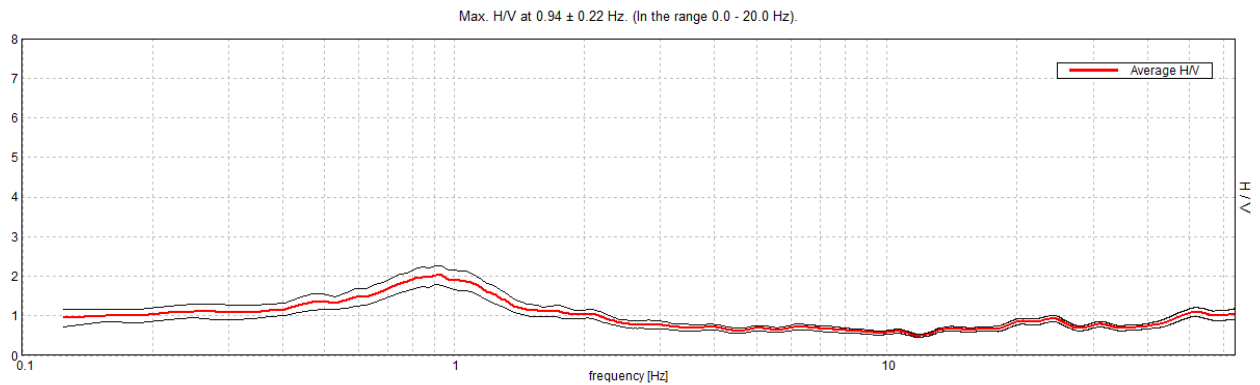
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE\_0040

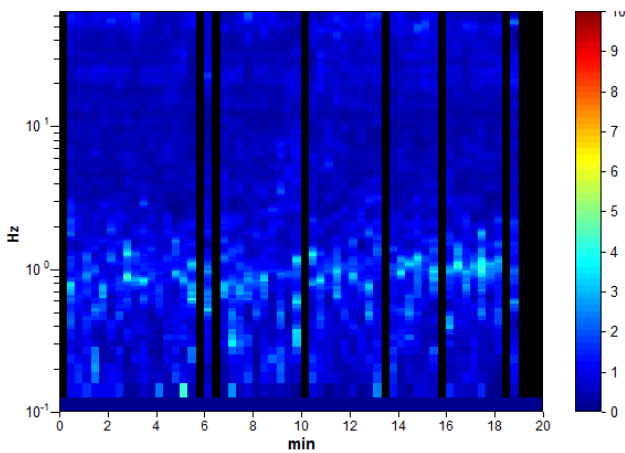
Instrument: TEN-0029/01-07  
Start recording: 24/07/14 10:37:10 End recording: 24/07/14 10:57:11  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analyzed 87% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

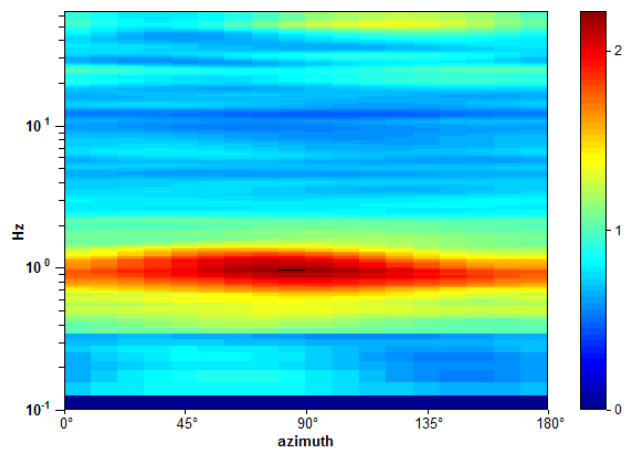
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



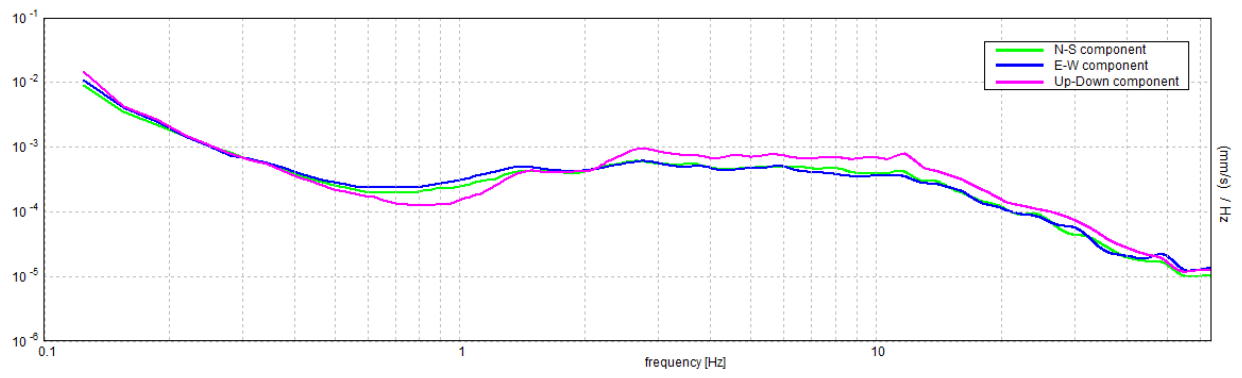
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.94 \pm 0.22$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.94 > 0.50$	OK	
$n_c(f_0) > 200$	$937.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 46 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	2.156 Hz	OK	
$A_0 > 2$	$2.02 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.23926  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.2243 < 0.14063$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.25 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

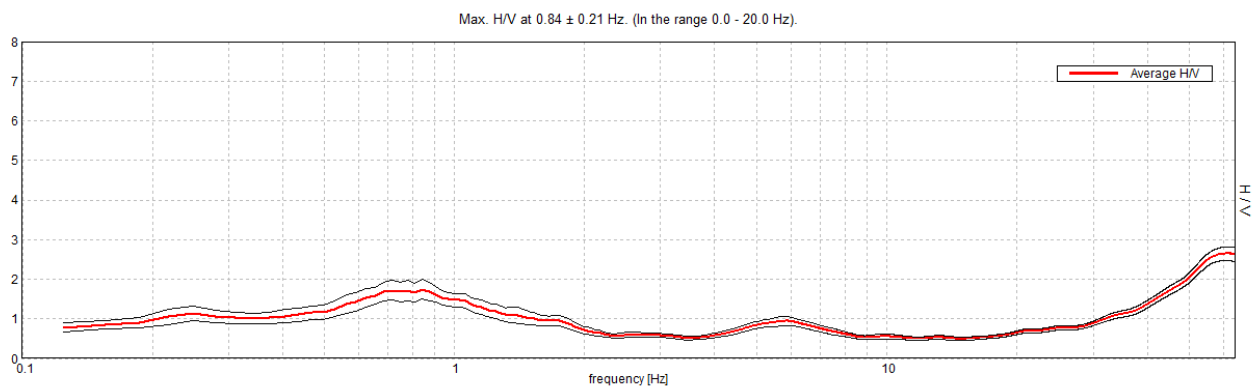


## ANZOLA DELL'EMILIA, AE\_0041

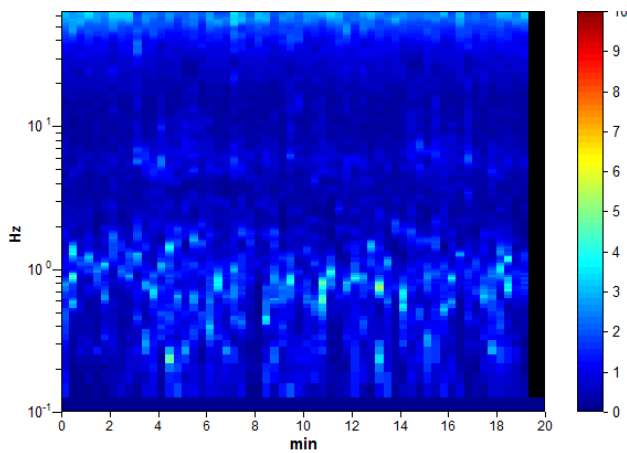
Instrument: TEN-0029/01-07  
Start recording: 24/07/14 11:13:50 End recording: 24/07/14 11:33:51  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00". Analysis performed on the entire trace.  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

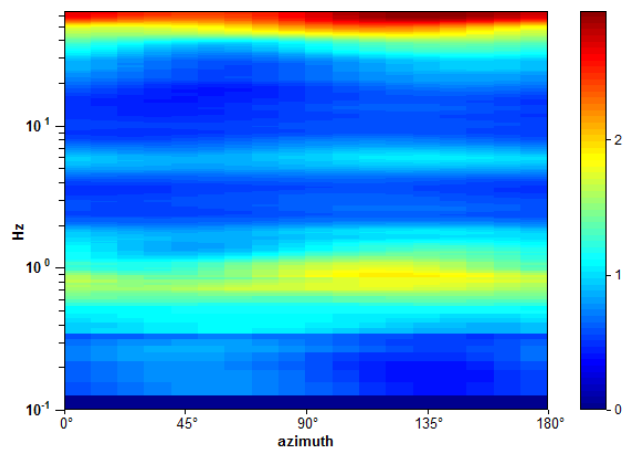
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



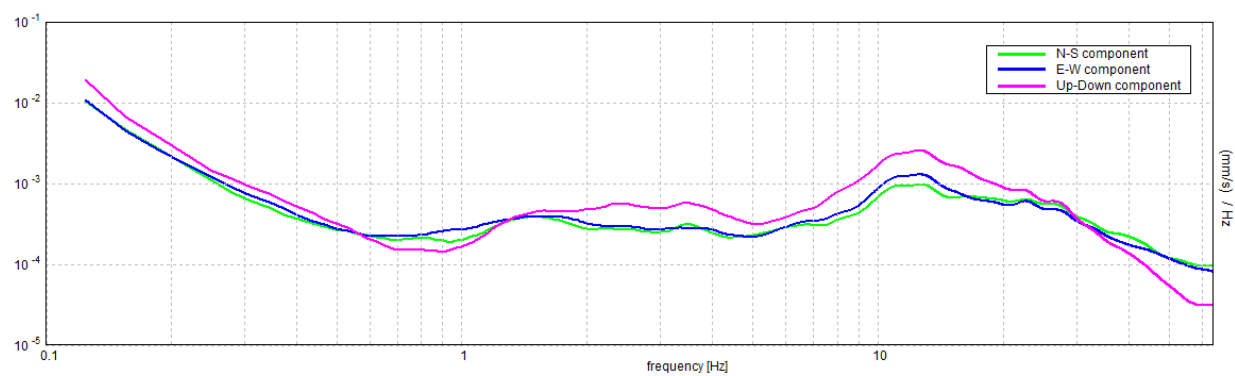
### H/V TIME HISTORY



### DIRECTIONAL H/V



### SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.84 \pm 0.21$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.84 > 0.50$	OK	
$n_c(f_0) > 200$	$1012.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 42 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.875 Hz	OK	
$A_0 > 2$	$1.75 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.24437  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.20619 < 0.12656$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2519 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

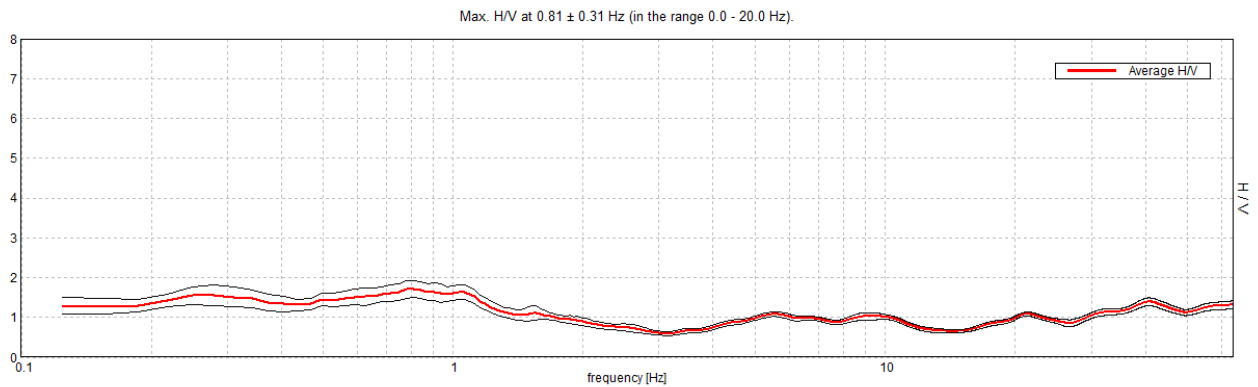
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

**ANZOLA DELL'EMILIA, AE 0042**

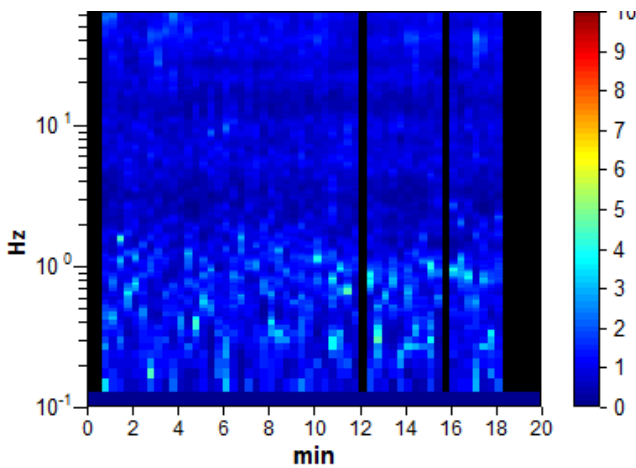
Instrument: TRS-0025/01-07  
 Data format: 16 byte  
 Full scale [mV]: n.a.  
 Start recording: 20/11/14 10:40:21 End recording: 20/11/14 11:00:22  
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
 GPS data not available

Trace length: 0h20'00". Analyzed 85% trace (manual window selection)  
 Sampling rate: 128 Hz  
 Window size: 20 s  
 Smoothing type: Triangular window  
 Smoothing: 10%

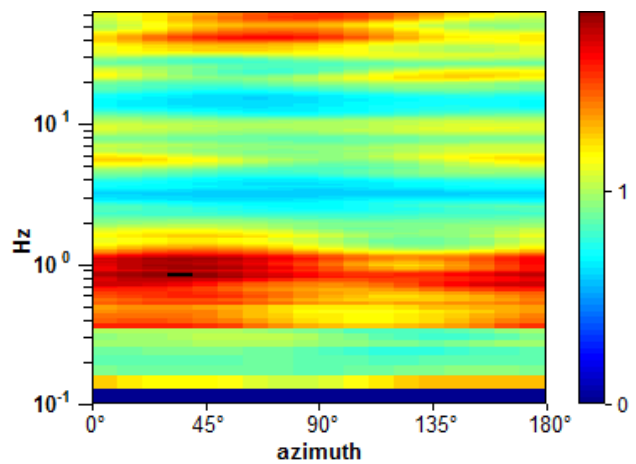
**HORIZONTAL TO VERTICAL SPECTRAL RATIO**



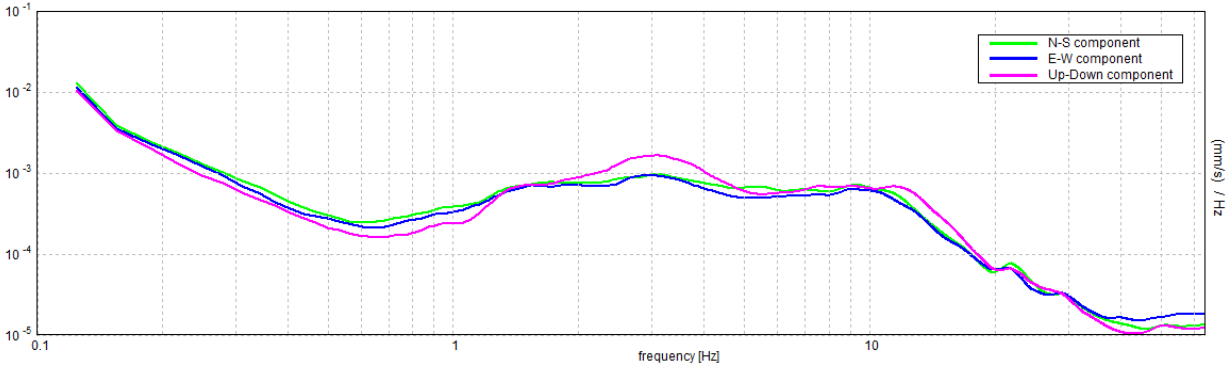
**H/V TIME HISTORY**



**DIRECTIONAL H/V**



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.81 \pm 0.31$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.81 > 0.50$	OK	
$n_c(f_0) > 200$	$828.8 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 40 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	2.063 Hz	OK	
$A_0 > 2$	$1.71 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.38522  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.31299 < 0.12188$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2154 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

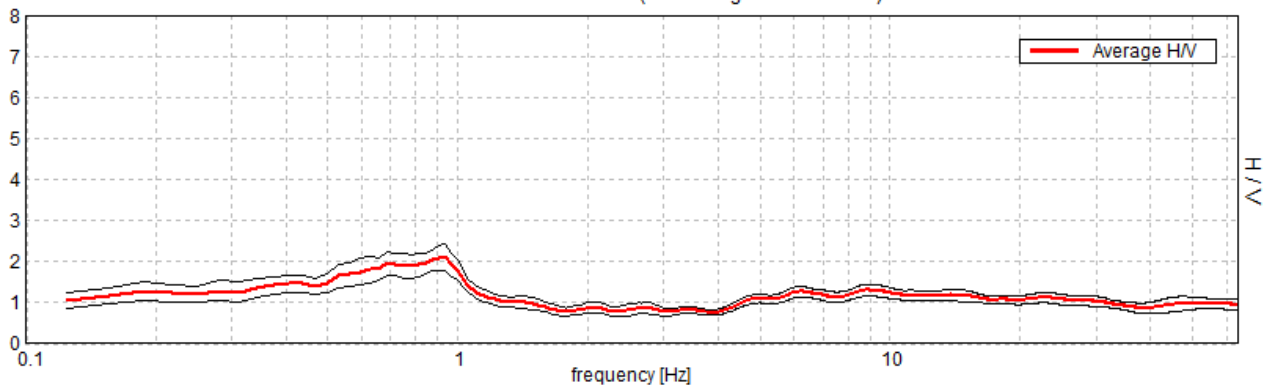
## ANZOLA DELL'EMILIA, AE 0043

Instrument: TRS-0025/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 20/11/14 11:52:12      End recording: 20/11/14 12:12:13  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

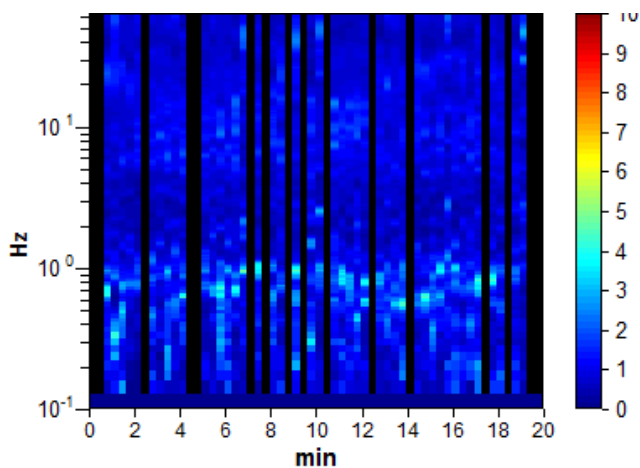
Trace length: 0h20'00".      Analyzed 77% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

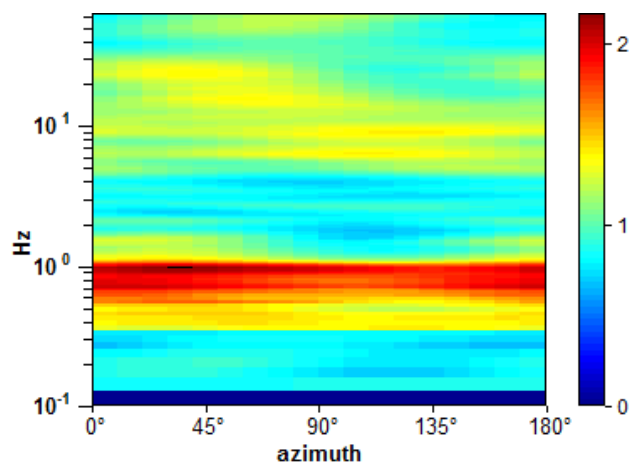
Max. H/V at  $0.94 \pm 0.27$  Hz. (In the range 0.0 - 20.0 Hz).



### H/V TIME HISTORY

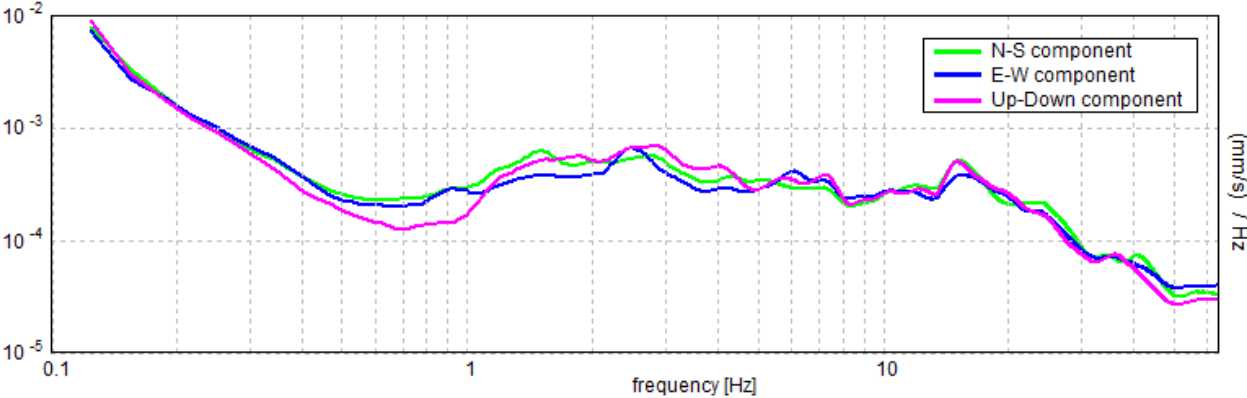


### DIRECTIONAL H/V





SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.94 \pm 0.27$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.94 > 0.50$	OK	
$n_c(f_0) > 200$	$825.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 46 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$2.12 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.29142  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.2732 < 0.14063$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3306 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

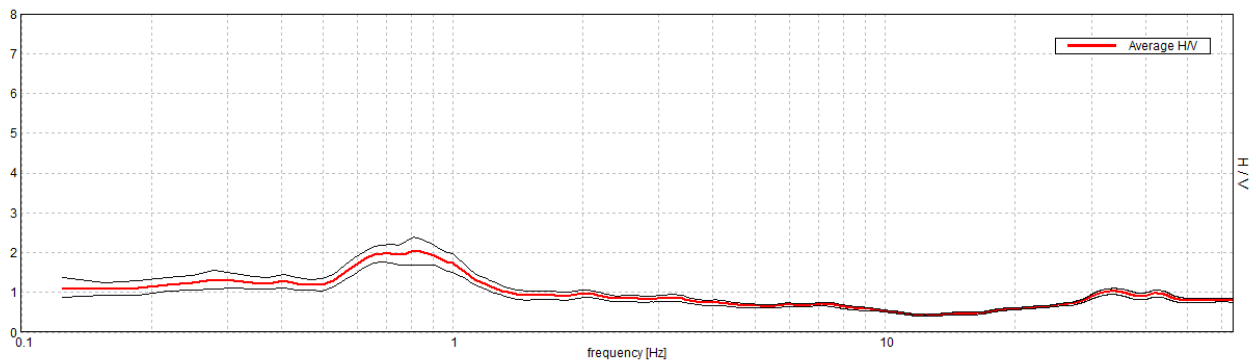
## ANZOLA DELL'EMILIA, AE 0044

Instrument: TRS-0025/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 20/11/14 12:59:08      End recording: 20/11/14 13:19:09  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

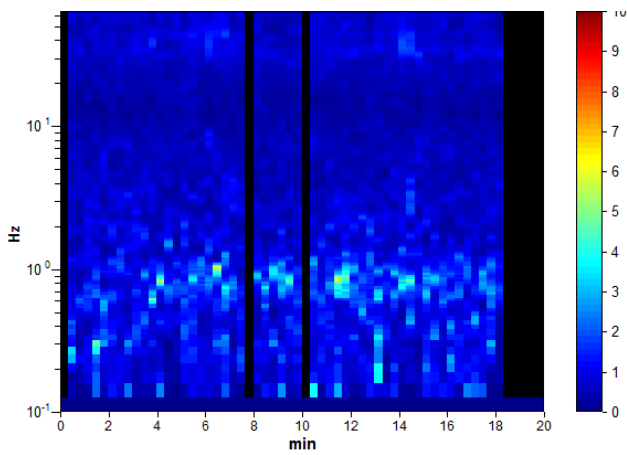
Trace length: 0h20'00".      Analyzed 87% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

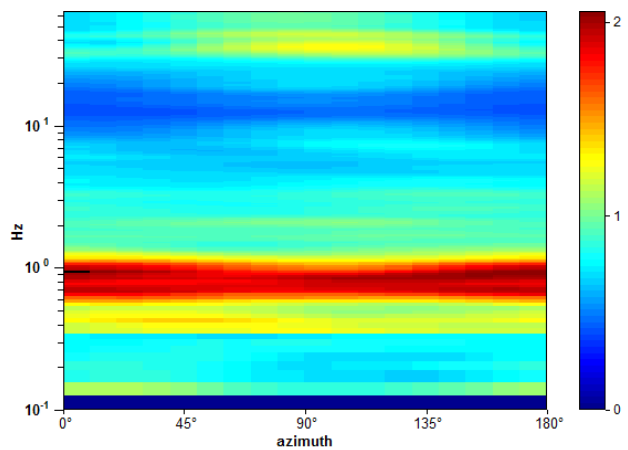
Max. H/V at  $0.81 \pm 0.26$  Hz. (In the range 0.0 - 20.0 Hz).



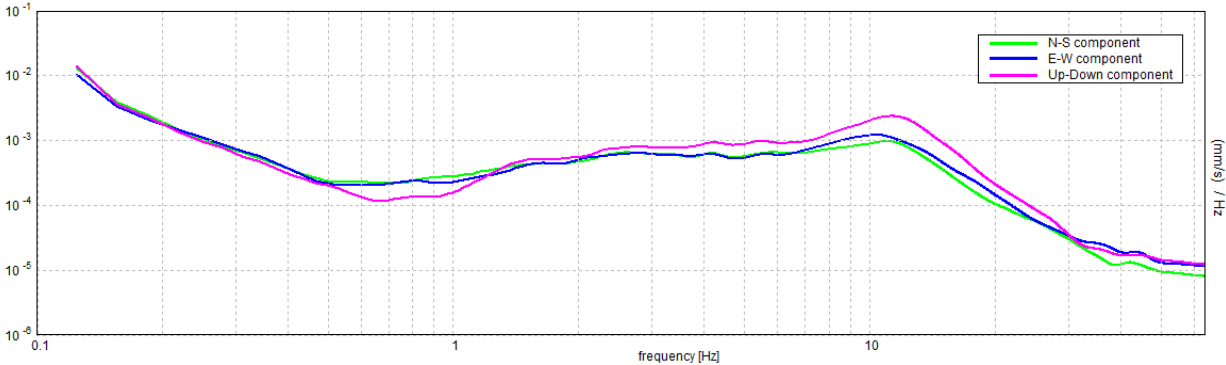
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.81 \pm 0.26$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.81 > 0.50$	OK	
$n_c(f_0) > 200$	$845.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 40 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.313 Hz	OK	
$A_0 > 2$	$2.04 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.32254  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.26207 < 0.12188$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3518 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

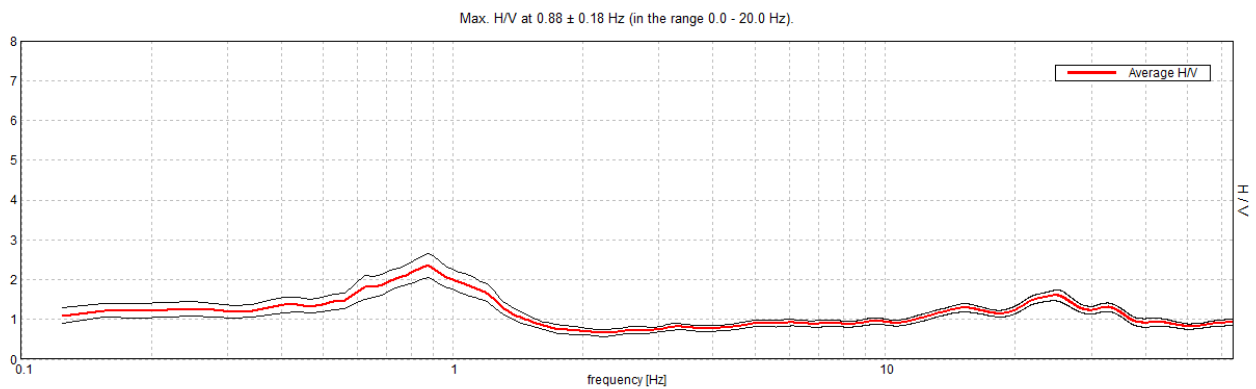
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE 0045

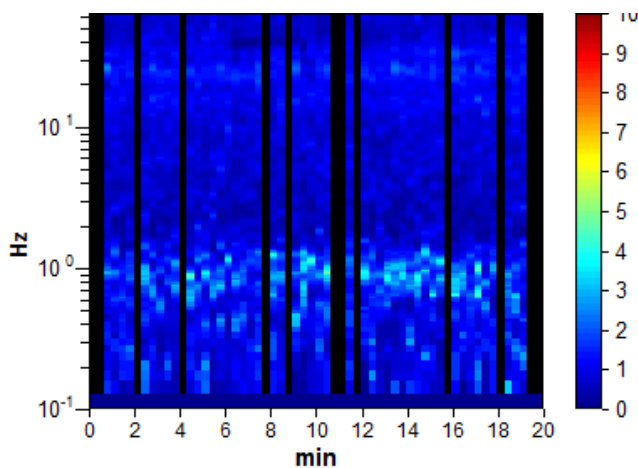
Instrument: TRS-0025/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 20/11/14 13:27:15      End recording: 20/11/14 13:47:16  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00".      Analyzed 82% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

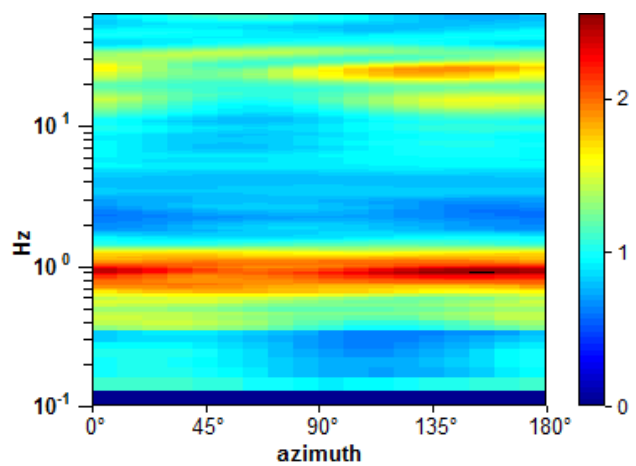
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



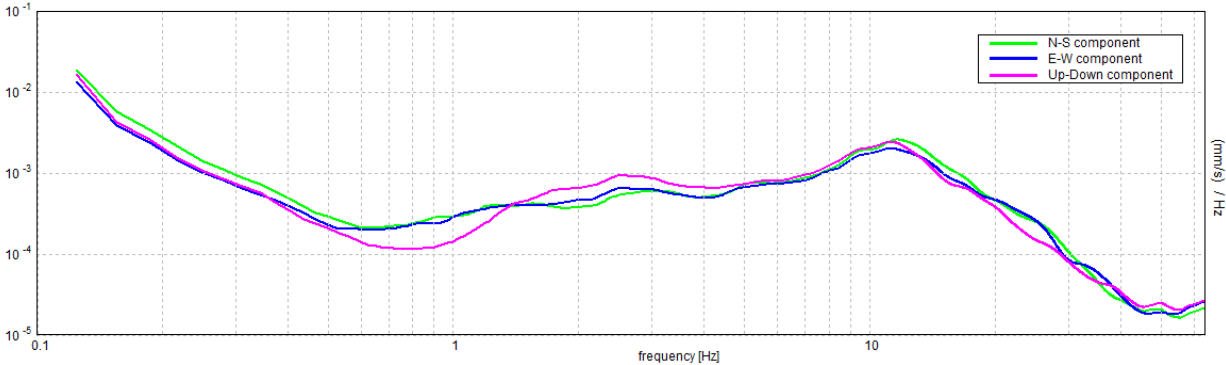
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.88 \pm 0.18$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.88 > 0.50$	OK	
$n_c(f_0) > 200$	$822.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 43 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.375 Hz	OK	
$A_0 > 2$	$2.35 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.20701  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.18113 < 0.13125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3007 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20



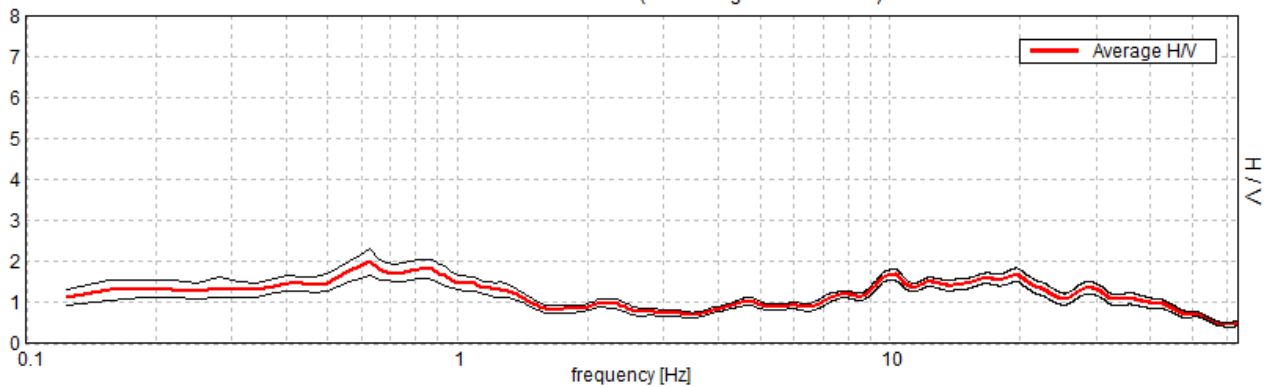
## ANZOLA DELL'EMILIA, AE 0046

Instrument: TRS-0025/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 20/11/14 14:48:51      End recording: 20/11/14 15:08:52  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

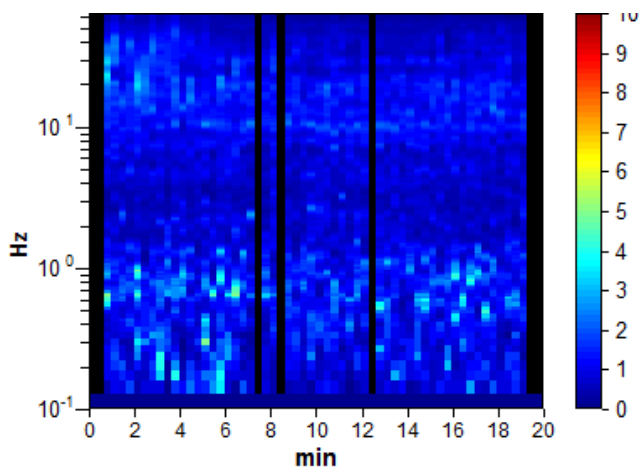
Trace length: 0h20'00".      Analyzed 92% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

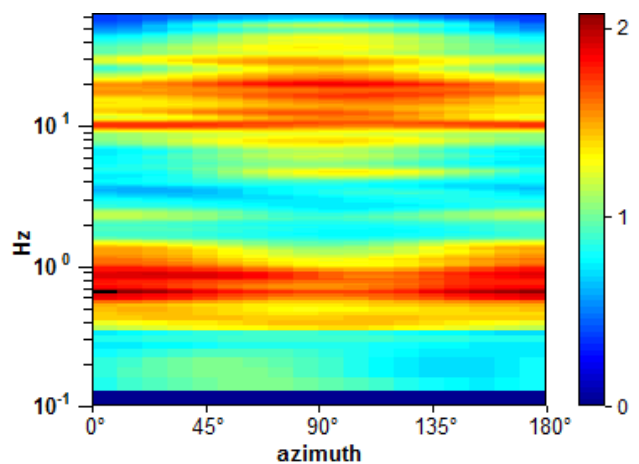
Max. H/V at  $0.63 \pm 0.12$  Hz. (In the range 0.0 - 20.0 Hz).



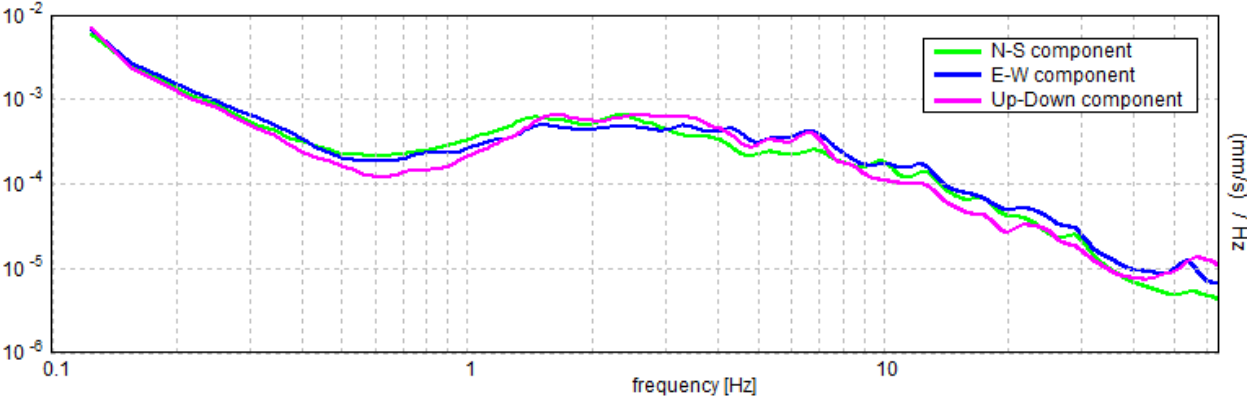
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.63 \pm 0.12$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.63 > 0.50$	OK	
$n_c(f_0) > 200$	$662.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 31 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.5 Hz	OK	
$A_0 > 2$	$1.99 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.19426  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.12141 < 0.09375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3232 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

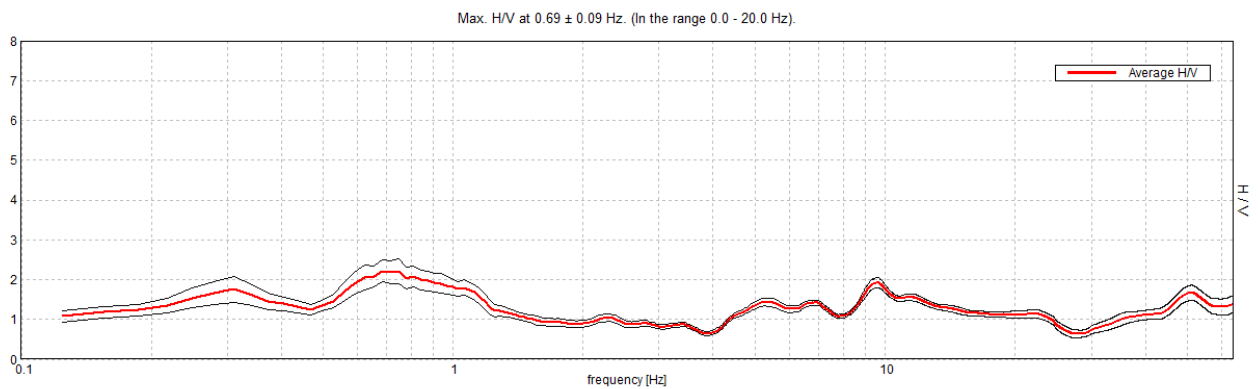
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE 0048

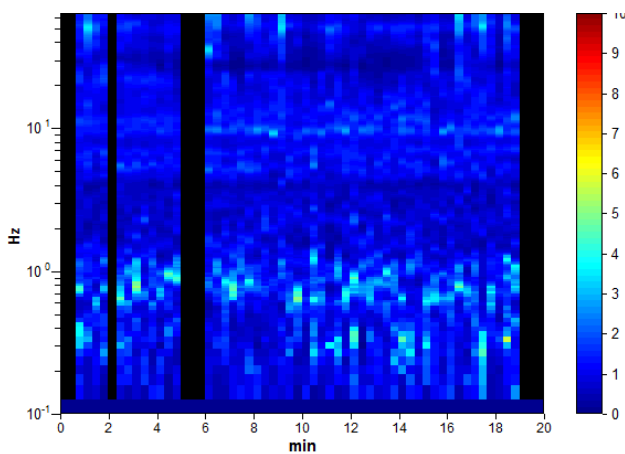
Instrument: TRS-0025/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 20/11/14 15:56:07      End recording: 20/11/14 16:16:08  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00".      Analyzed 85% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

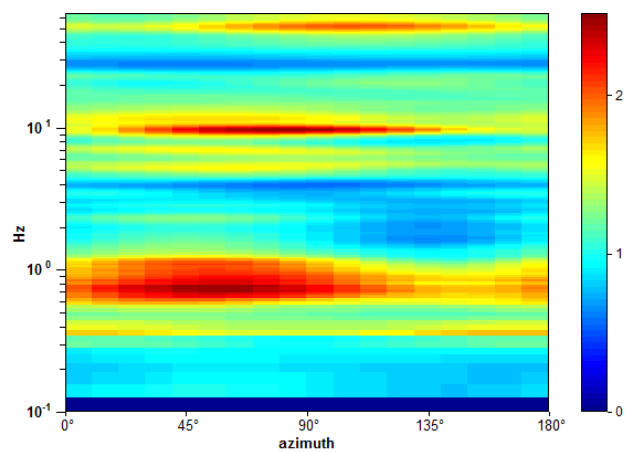
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



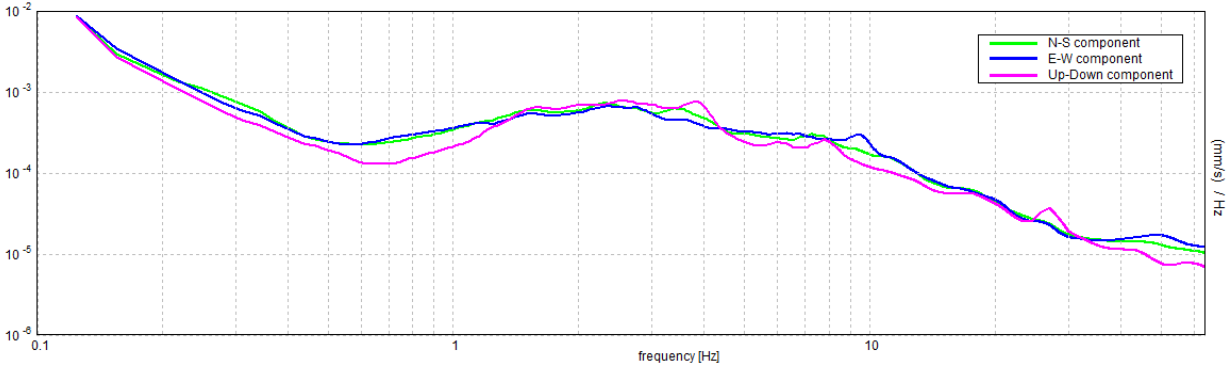
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.69 \pm 0.09$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.69 > 0.50$	OK	
$n_c(f_0) > 200$	$701.3 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 34 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.406 Hz	OK	
$A_0 > 2$	$2.21 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.12919  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.08882 < 0.10313$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.278 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

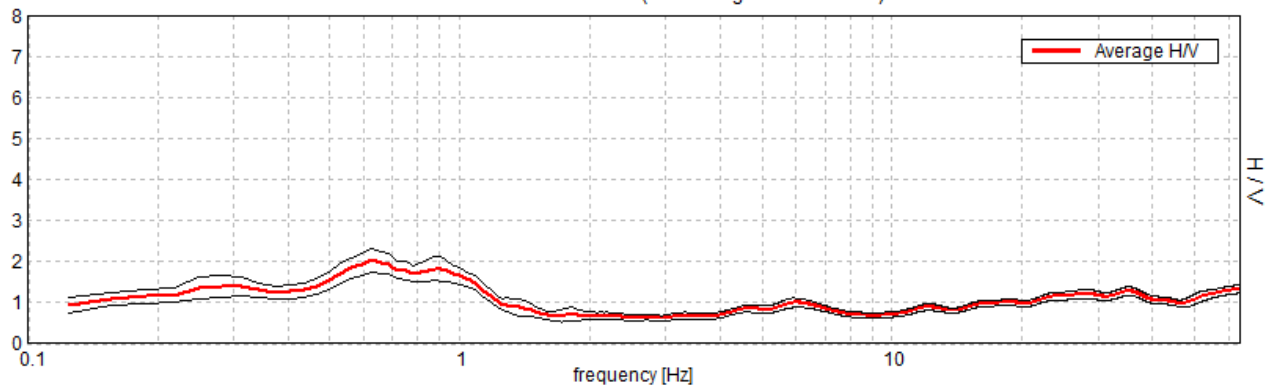
## ANZOLA DELL'EMILIA, AE 0049

Instrument: TRS-0025/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 21/11/14 08:31:46      End recording: 21/11/14 08:51:47  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

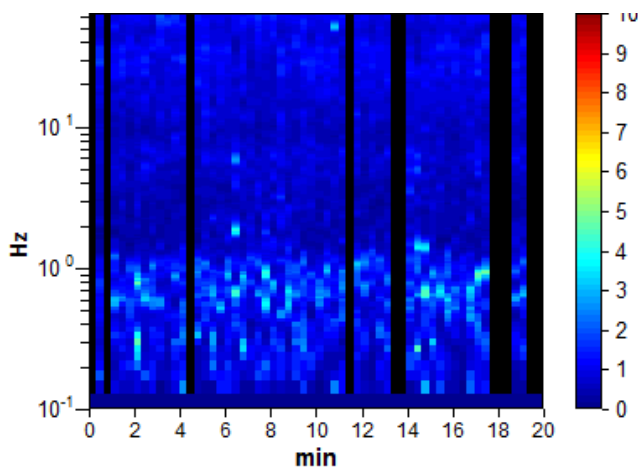
Trace length: 0h20'00".      Analyzed 85% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

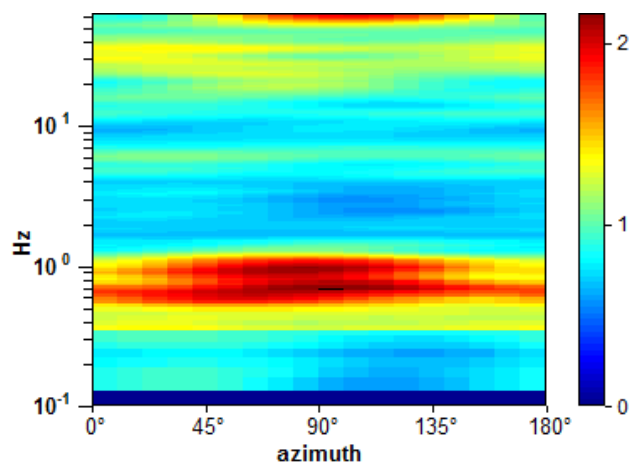
Max. H/V at  $0.63 \pm 0.15$  Hz. (In the range 0.0 - 20.0 Hz).



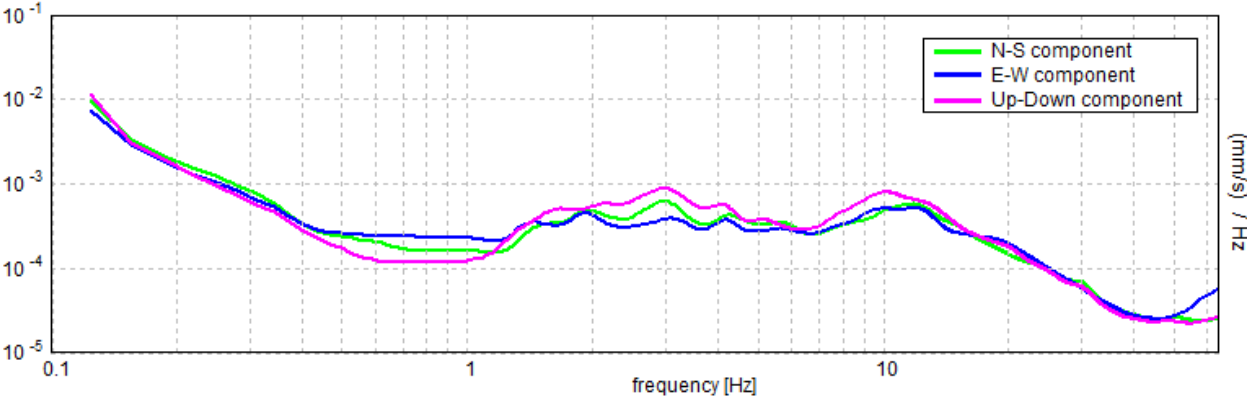
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.63 \pm 0.15$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.63 > 0.50$	OK	
$n_c(f_0) > 200$	$612.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 31 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$2.03 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.23528  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.14705 < 0.09375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2841 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

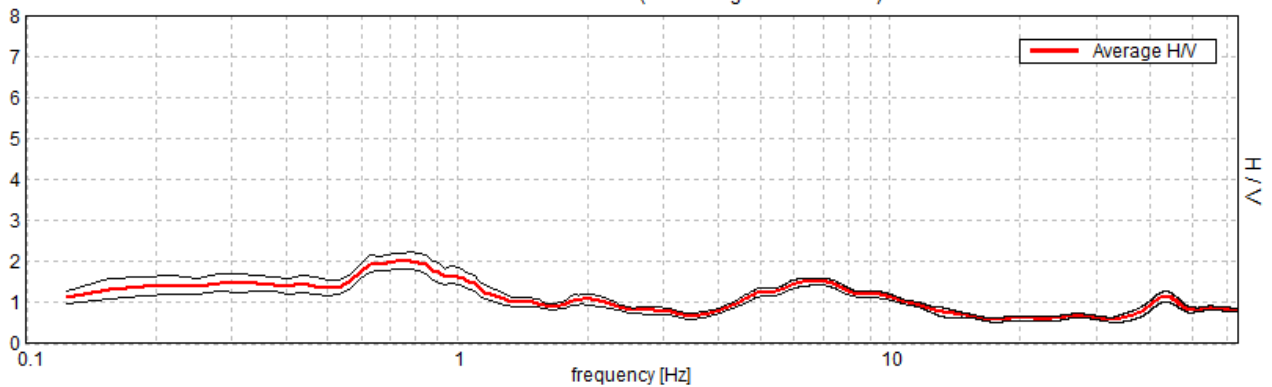
## ANZOLA DELL'EMILIA, AE 0050

Instrument: TRS-0025/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 21/11/14 09:14:47 End recording: 21/11/14 09:34:48  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

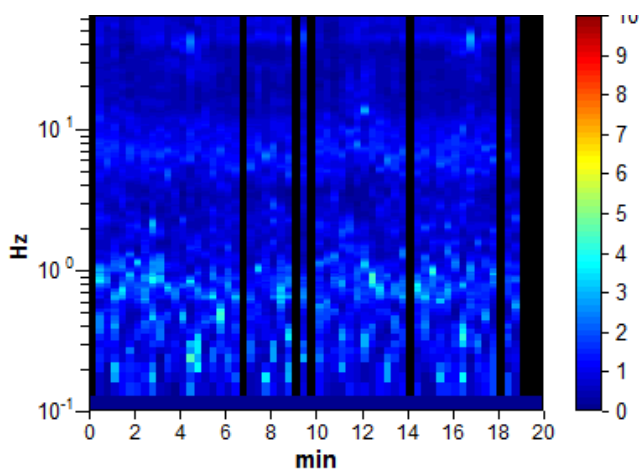
Trace length: 0h20'00". Analyzed 85% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

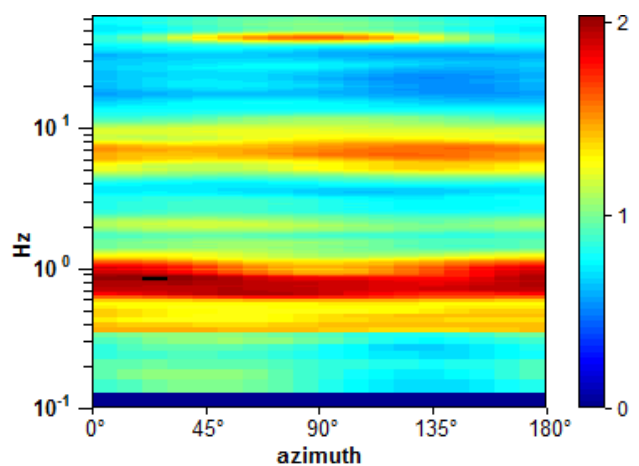
Max. H/V at  $0.78 \pm 0.06$  Hz. (In the range 0.0 - 20.0 Hz).



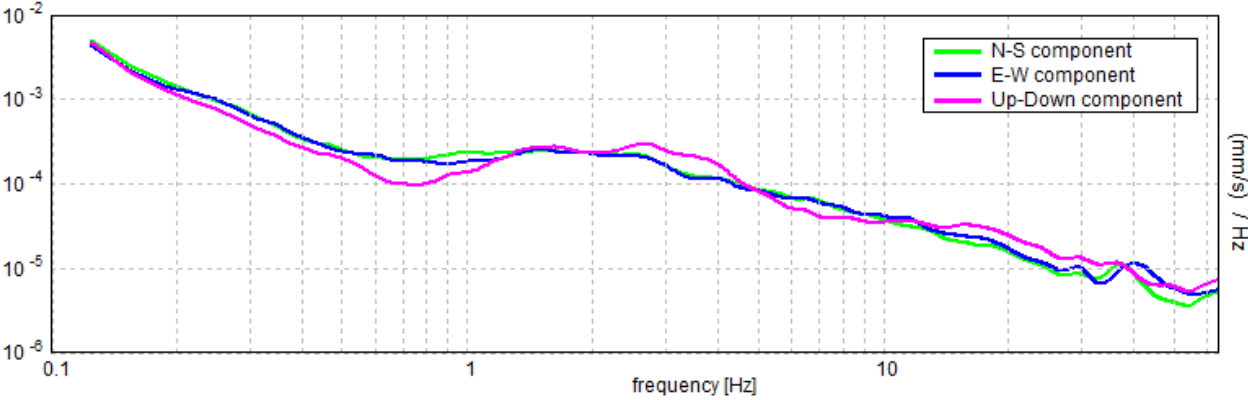
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.78 \pm 0.06$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.78 > 0.50$	OK	
$n_c(f_0) > 200$	$796.9 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 38 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.375 Hz	OK	
$A_0 > 2$	$2.02 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.07367  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.05756 < 0.11719$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.2047 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

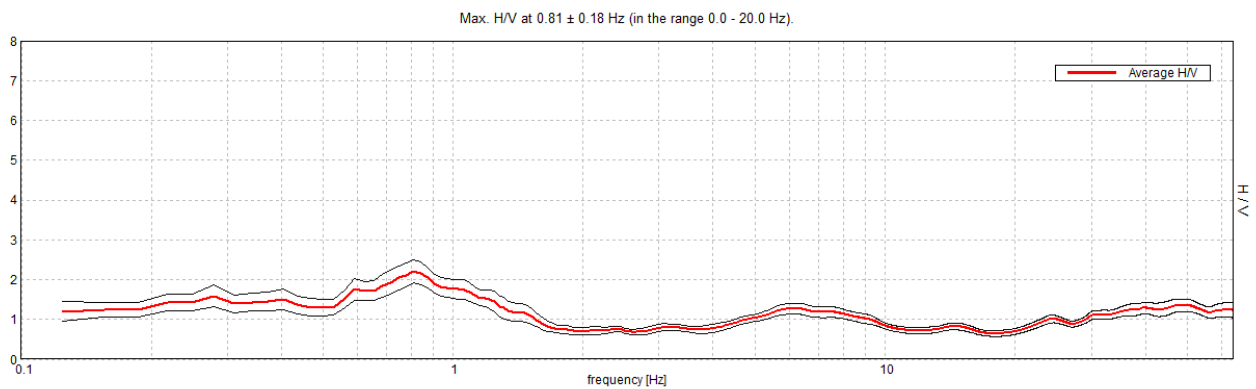
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE 0051

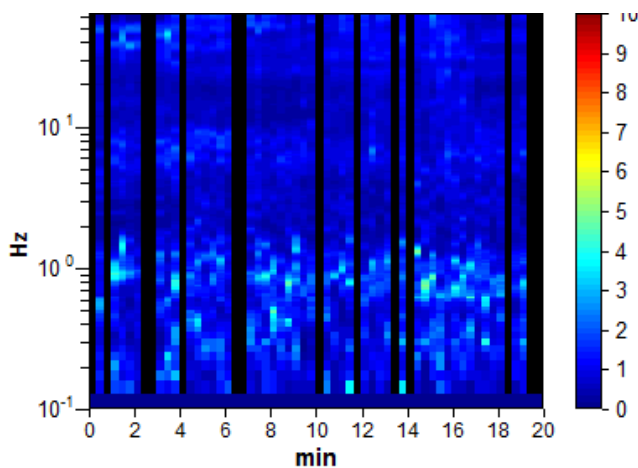
Instrument: TRS-0025/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 21/11/14 10:06:50      End recording: 21/11/14 10:26:51  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00".      Analyzed 80% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

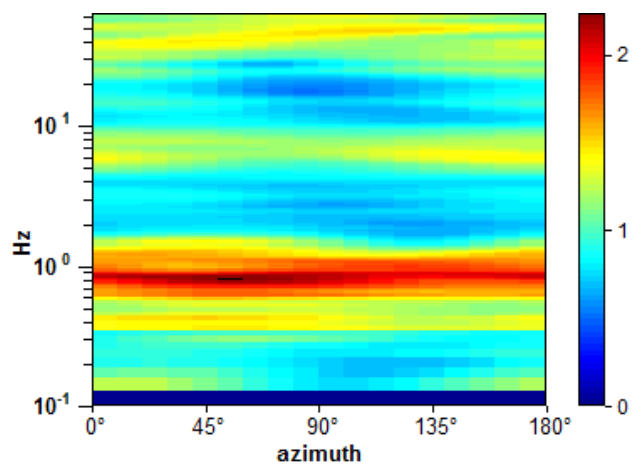
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



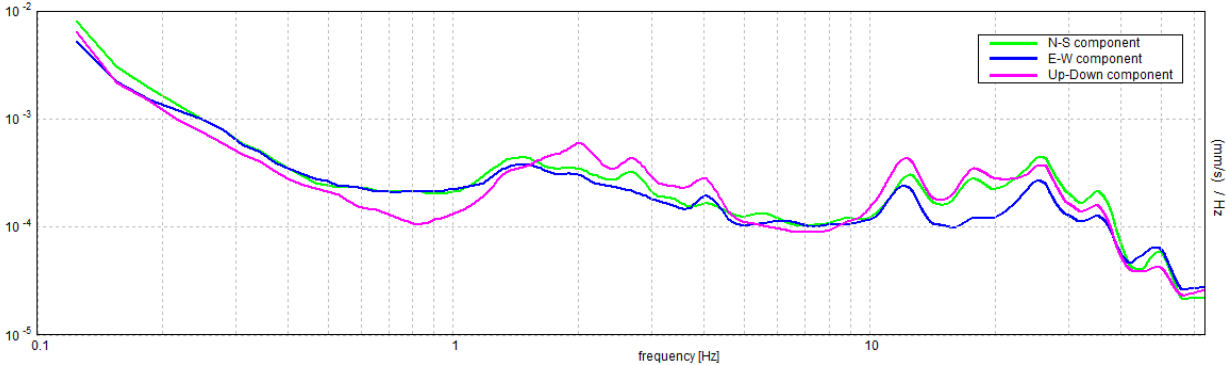
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.81 \pm 0.18$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.81 > 0.50$	OK	
$n_c(f_0) > 200$	$747.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 40 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.531 Hz	OK	
$A_0 > 2$	$2.20 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.21978  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.17857 < 0.12188$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.287 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

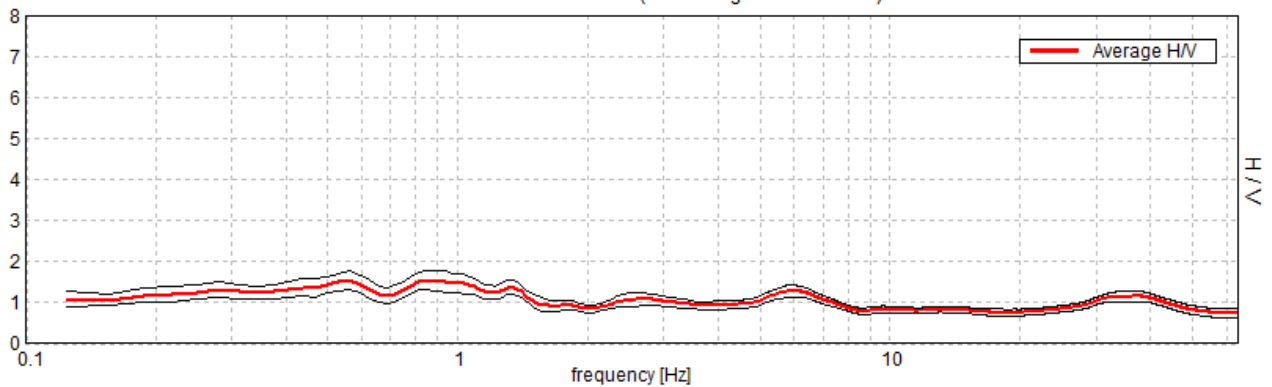
## ANZOLA DELL'EMILIA, AE 0052

Instrument: TRS-0025/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 21/11/14 10:59:32 End recording: 21/11/14 11:19:33  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

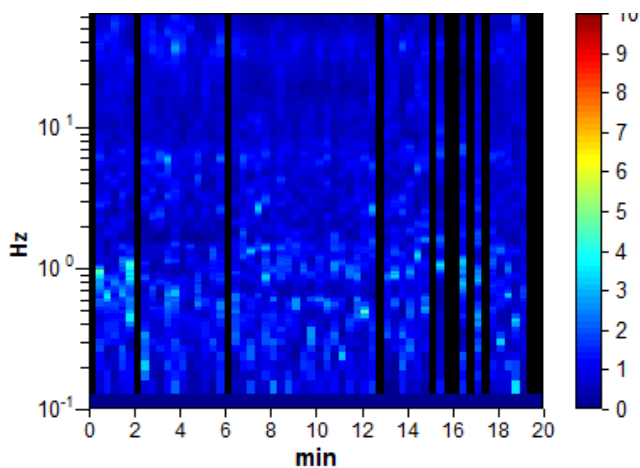
Trace length: 0h20'00". Analyzed 85% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

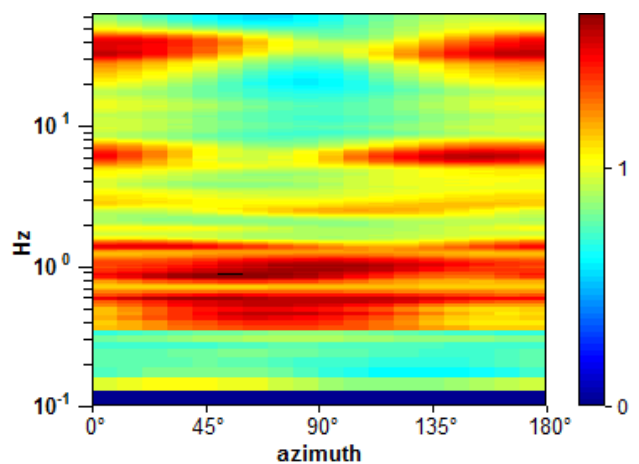
Max. H/V at  $0.84 \pm 0.29$  Hz. (In the range 0.0 - 20.0 Hz).



### H/V TIME HISTORY

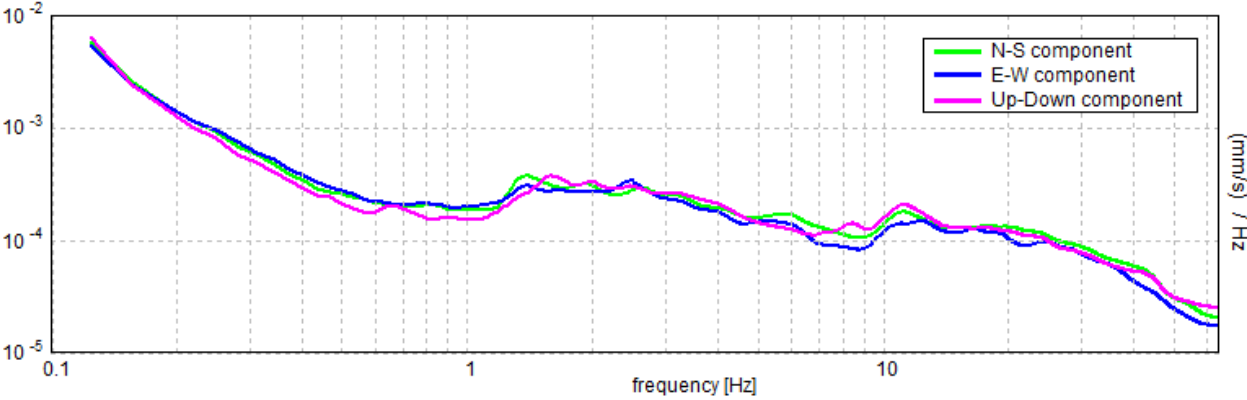


### DIRECTIONAL H/V





SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.84 \pm 0.29$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.84 > 0.50$	OK	
$n_c(f_0) > 200$	$826.9 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 42 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$1.55 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.34509  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.29117 < 0.12656$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2356 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

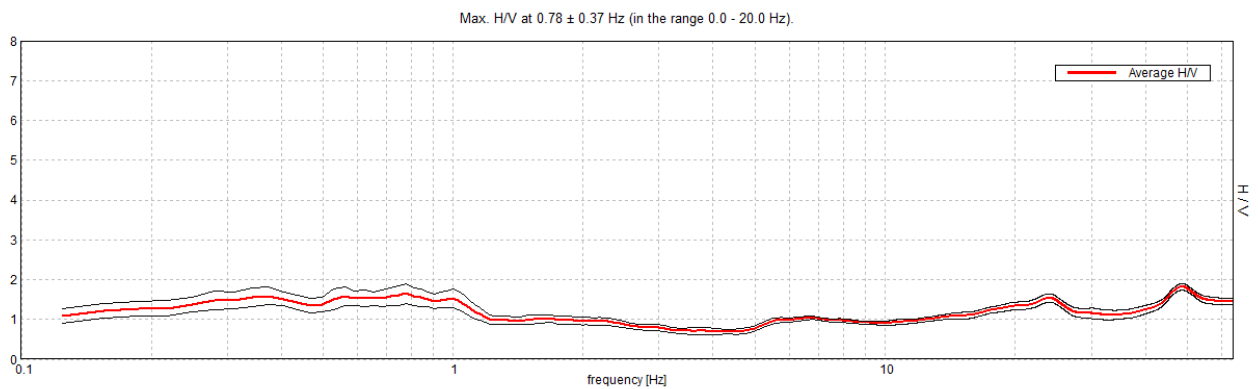
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE 0053

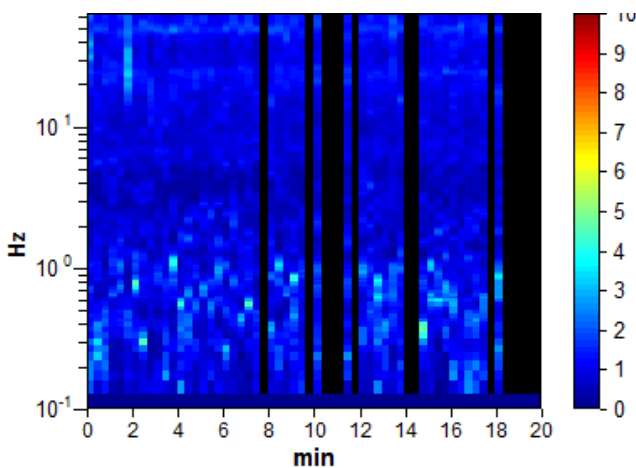
Instrument: TRS-0025/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 21/11/14 11:28:03      End recording: 21/11/14 11:48:04  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

Trace length: 0h20'00".      Analyzed 77% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

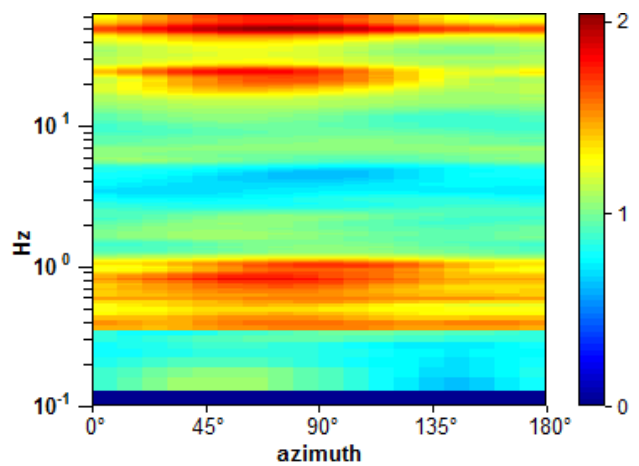
### HORIZONTAL TO VERTICAL SPECTRAL RATIO



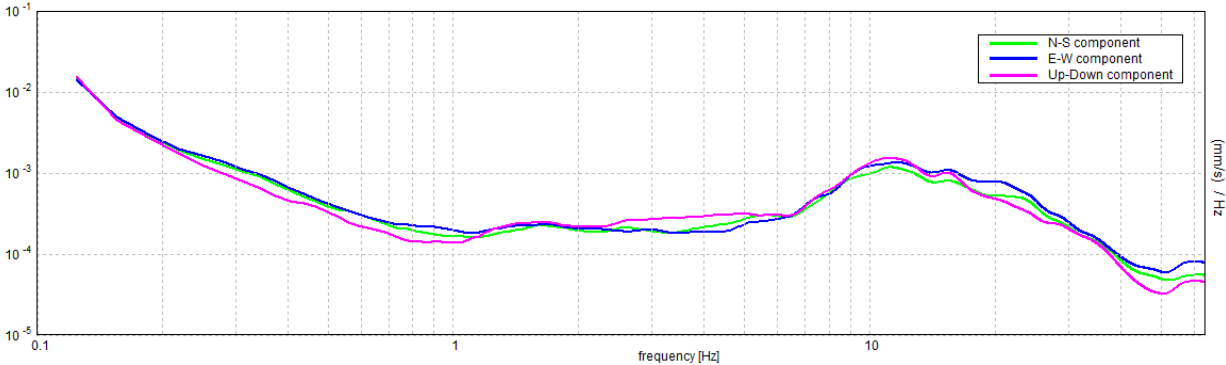
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.78 \pm 0.37$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.78 > 0.50$	OK	
$n_c(f_0) > 200$	$718.8 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 38 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	2.625 Hz	OK	
$A_0 > 2$	$1.66 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.47  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.36719 < 0.11719$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2513 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

## ANZOLA DELL'EMILIA, AE 0054

Instrument: TEN-0029/01-07

Data format: 16 byte

Full scale [mV]: n.a.

Start recording: 20/11/14 10:20:29 End recording: 20/11/14 10:40:30

Channel labels: NORTH SOUTH; EAST WEST; UP DOWN

GPS data not available

Trace length: 0h20'00". Analyzed 78% trace (manual window selection)

Sampling rate: 128 Hz

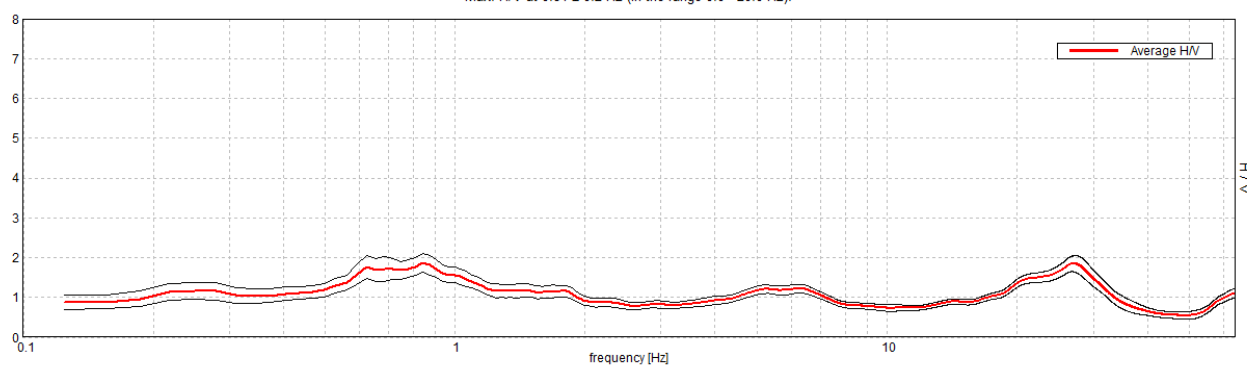
Window size: 20 s

Smoothing type: Triangular window

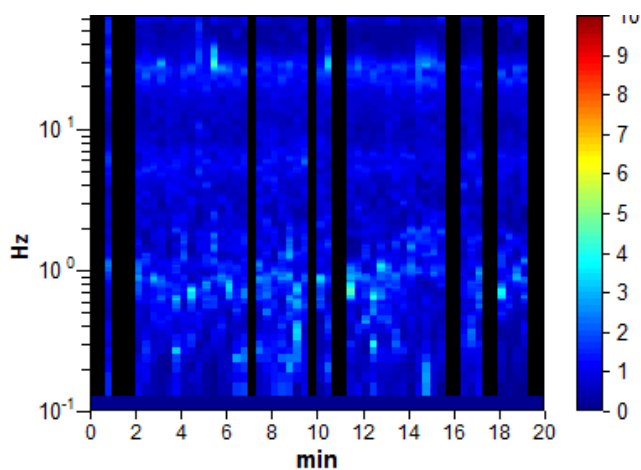
Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

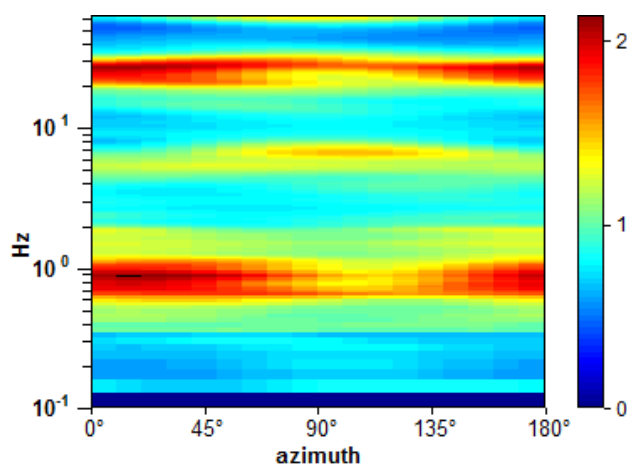
Max. H/V at  $0.84 \pm 0.2$  Hz (in the range 0.0 - 20.0 Hz).



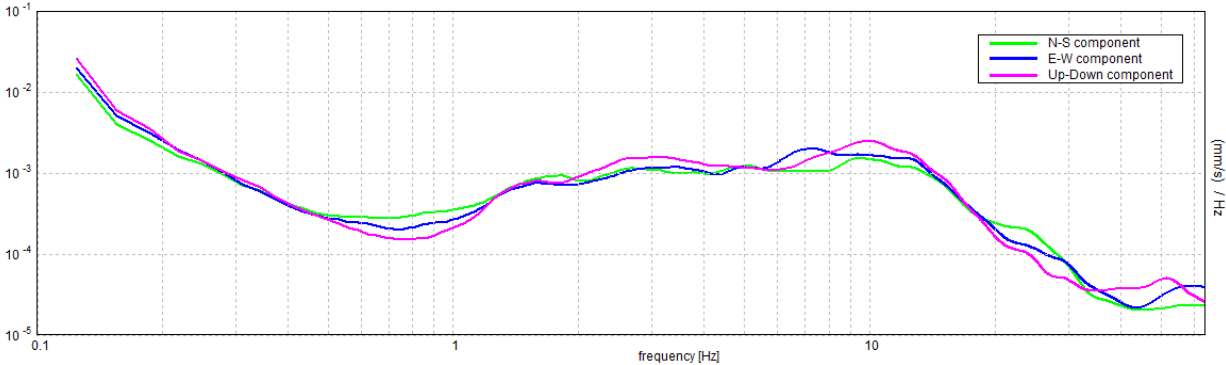
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.84 \pm 0.2$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.84 > 0.50$	OK	
$n_c(f_0) > 200$	$759.4 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 42 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	2.0 Hz	OK	
$A_0 > 2$	$1.87 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.2399  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.20242 < 0.12656$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2432 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20



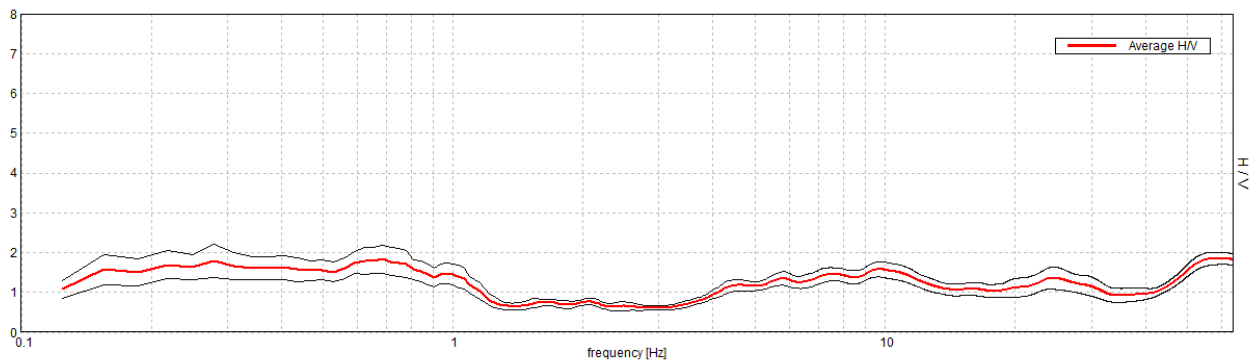
## ANZOLA DELL'EMILIA, AE 0055

Instrument: TEN-0029/01-07  
 Data format: 16 byte  
 Full scale [mV]: n.a.  
 Start recording: 20/11/14 15:07:39      End recording: 20/11/14 15:27:40  
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
 GPS data not available

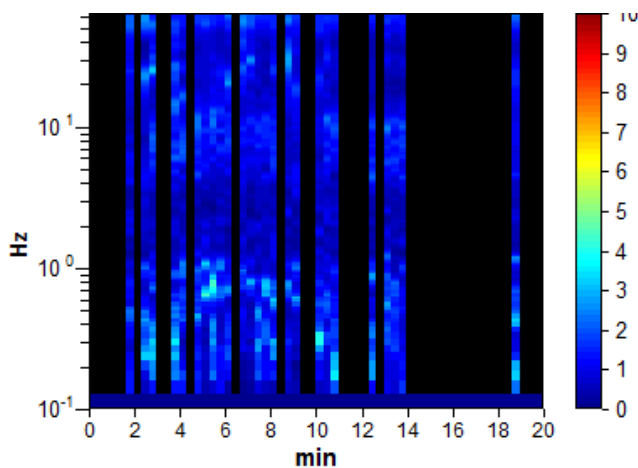
Trace length: 0h20'00".      Analyzed 42% trace (manual window selection)  
 Sampling rate: 128 Hz  
 Window size: 20 s  
 Smoothing type: Triangular window  
 Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

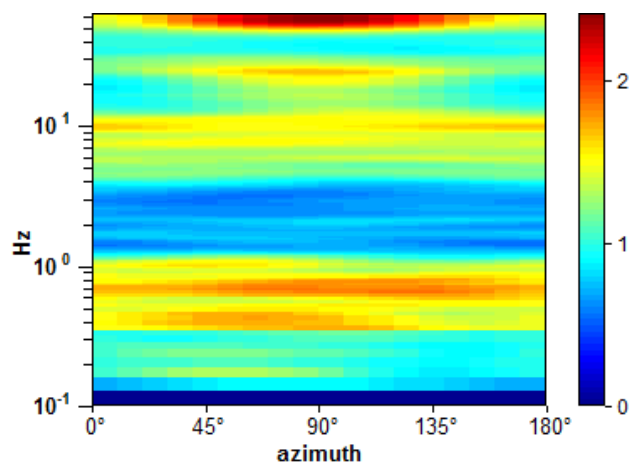
Max. H/V at  $0.69 \pm 0.21$  Hz (in the range 0.0 - 20.0 Hz).



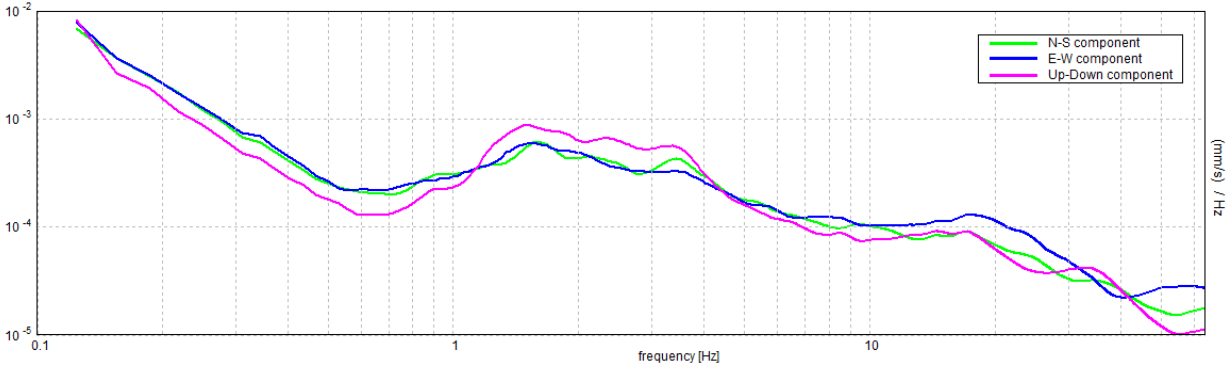
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.69 \pm 0.21$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.69 > 0.50$	OK	
$n_c(f_0) > 200$	$343.8 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 34 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.188 Hz	OK	
$A_0 > 2$	$1.84 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.31042  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.21342 < 0.10313$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3497 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

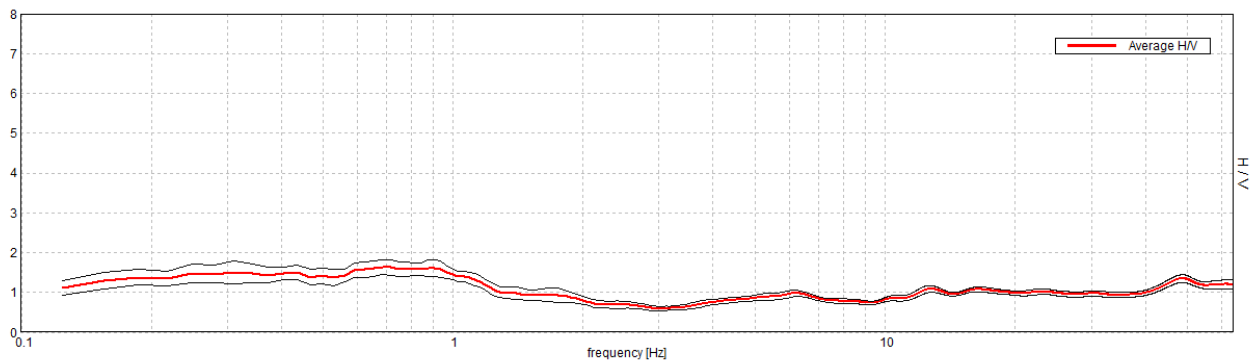
**ANZOLA DELL'EMILIA, AE 0056**

Instrument: TEN-0029/01-07  
 Data format: 16 byte  
 Full scale [mV]: n.a.  
 Start recording: 21/11/14 08:24:28 End recording: 21/11/14 08:44:29  
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
 GPS data not available

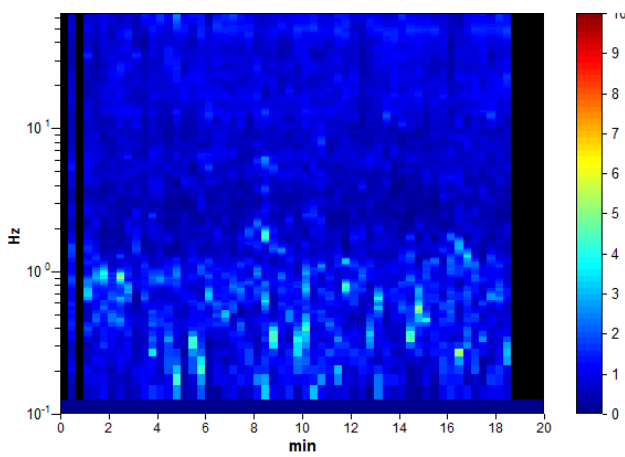
Trace length: 0h20'00". Analyzed 90% trace (manual window selection)  
 Sampling rate: 128 Hz  
 Window size: 20 s  
 Smoothing type: Triangular window  
 Smoothing: 10%

**HORIZONTAL TO VERTICAL SPECTRAL RATIO**

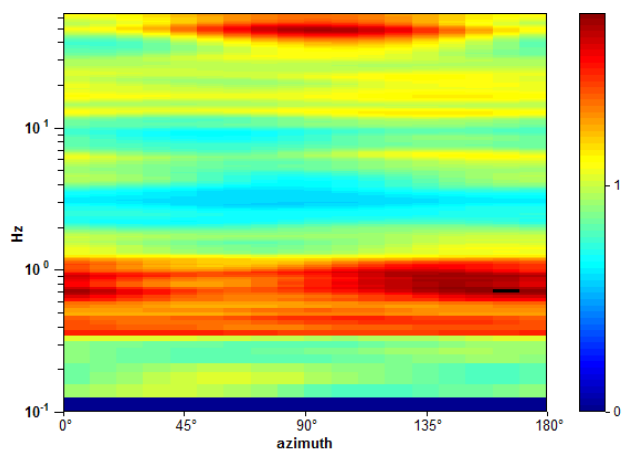
Max. H/V at 0.69 ± 0.18 Hz. (In the range 0.0 - 20.0 Hz).



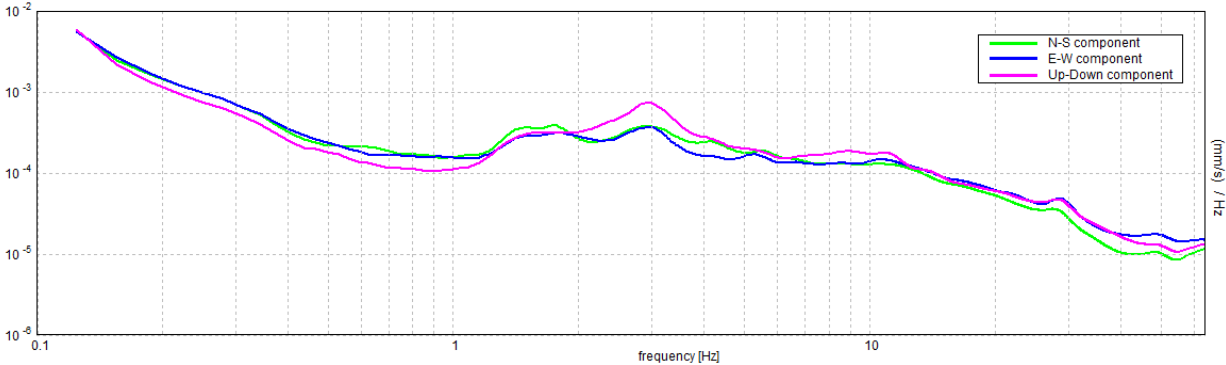
**H/V TIME HISTORY**



**DIRECTIONAL H/V**



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.69 \pm 0.18$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.69 > 0.50$	OK	
$n_c(f_0) > 200$	$742.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 34 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.969 Hz	OK	
$A_0 > 2$	$1.64 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.26265  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.18057 < 0.10313$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.1917 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

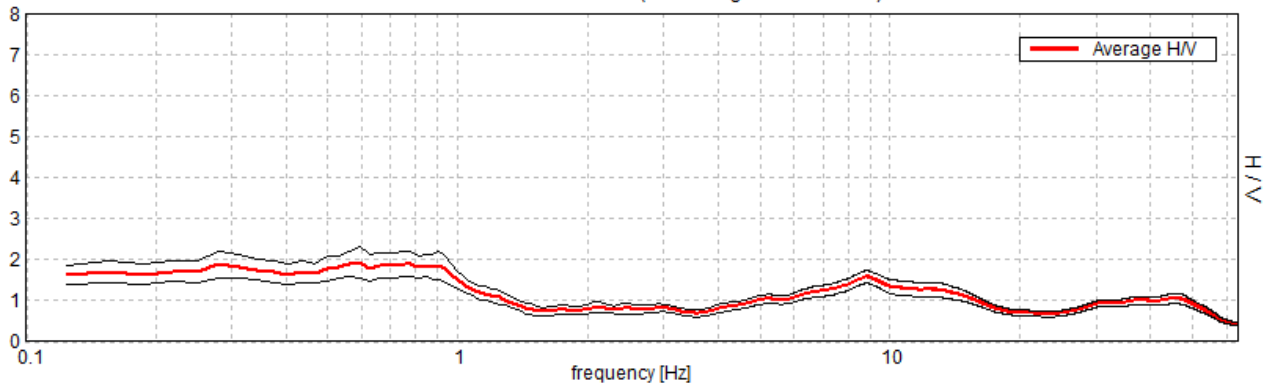
## ANZOLA DELL'EMILIA, AE 0057

Instrument: TEN-0029/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 21/11/14 09:02:01      End recording: 21/11/14 09:22:02  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

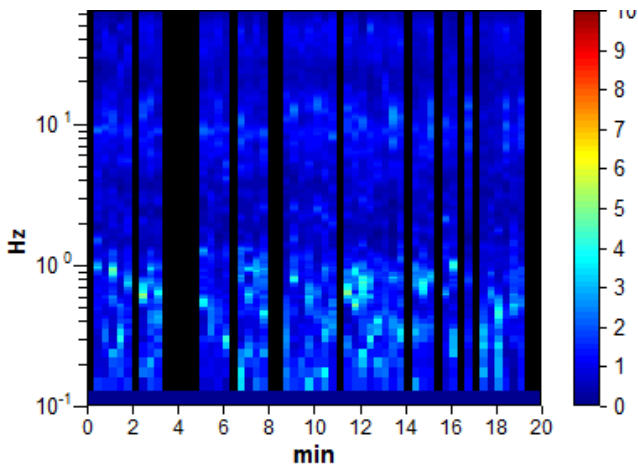
Trace length: 0h20'00".      Analyzed 75% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

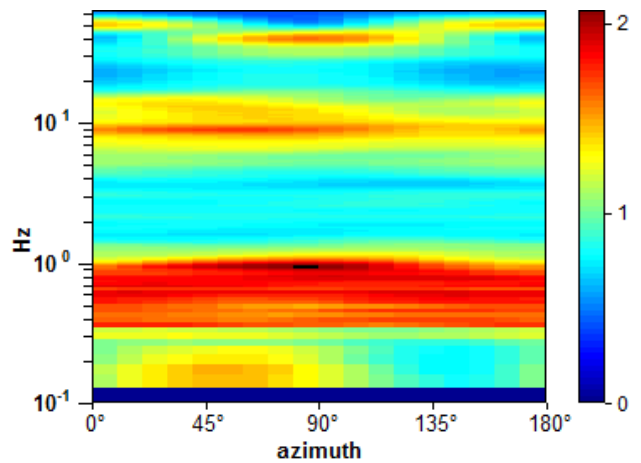
Max. H/V at  $0.59 \pm 0.24$  Hz. (In the range 0.0 - 20.0 Hz).



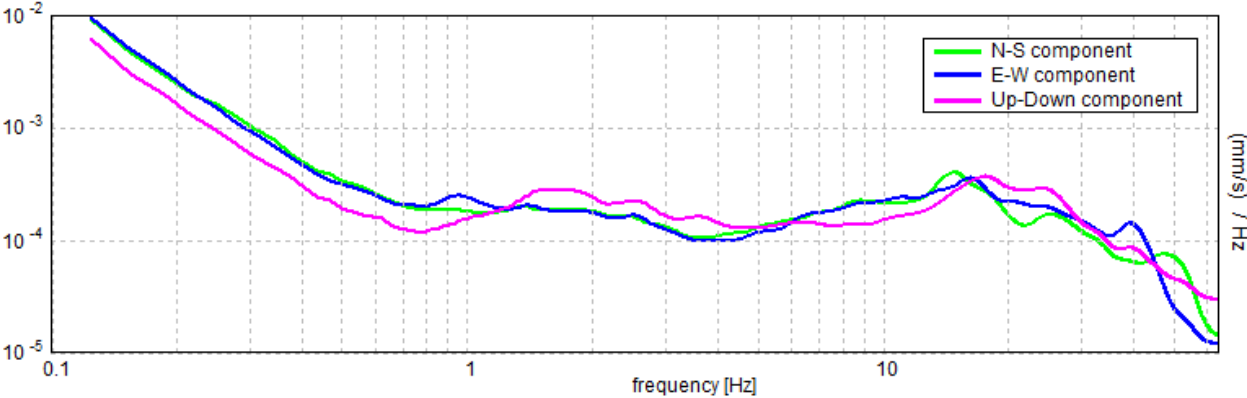
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA





[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.59 \pm 0.24$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.59 > 0.50$	OK	
$n_c(f_0) > 200$	$510.6 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 30 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.344 Hz	OK	
$A_0 > 2$	$1.93 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.40347  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.23956 < 0.08906$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3911 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

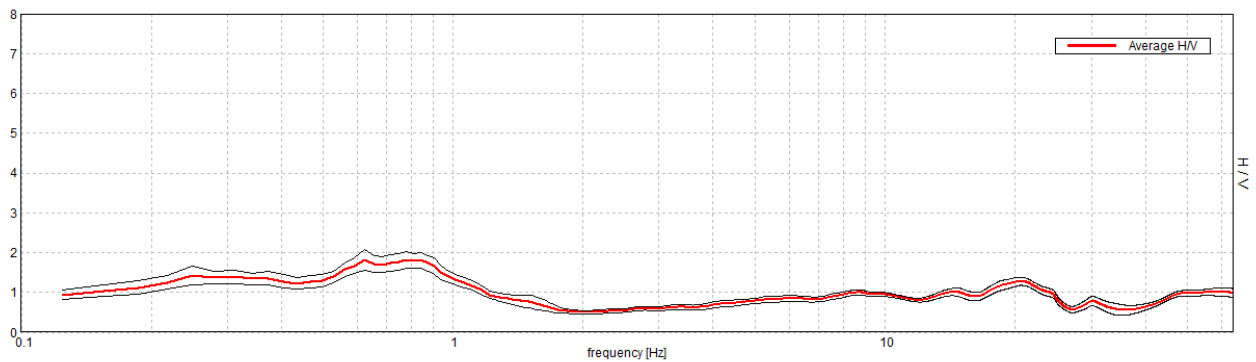
## ANZOLA DELL'EMILIA, AE 0058

Instrument: TEN-0029/01-07  
Data format: 16 byte  
Full scale [mV]: n.a.  
Start recording: 21/11/14 10:10:11      End recording: 21/11/14 10:30:12  
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN  
GPS data not available

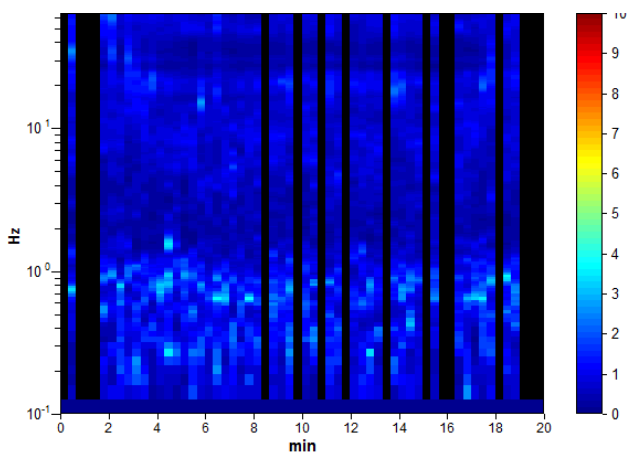
Trace length: 0h20'00".      Analyzed 73% trace (manual window selection)  
Sampling rate: 128 Hz  
Window size: 20 s  
Smoothing type: Triangular window  
Smoothing: 10%

### HORIZONTAL TO VERTICAL SPECTRAL RATIO

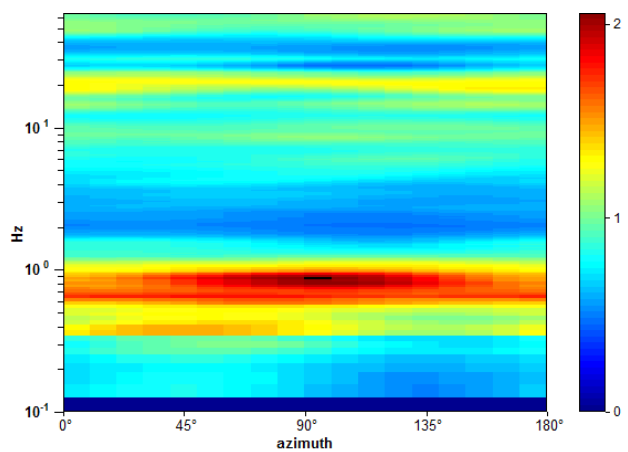
Max. H/V at  $0.78 \pm 0.06$  Hz. (In the range 0.0 - 20.0 Hz).



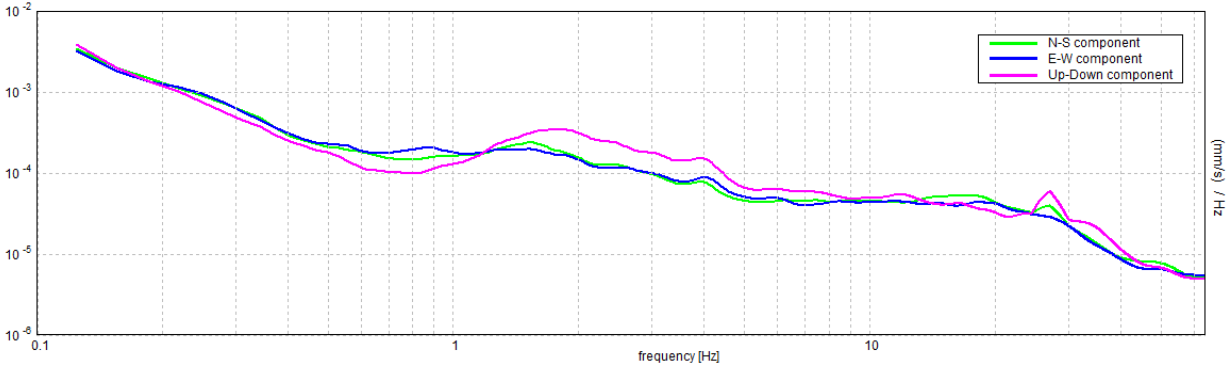
### H/V TIME HISTORY



### DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



[According to the SESAME, 2005 guidelines. Please read carefully the *Grilla* manual before interpreting the following tables.]

**Max. H/V at  $0.78 \pm 0.06$  Hz (in the range 0.0 - 20.0 Hz).**

**Criteria for a reliable H/V curve**

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.78 > 0.50$	OK	
$n_c(f_0) > 200$	$687.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 38 times	OK	

**Criteria for a clear H/V peak**

[At least 5 out of 6 should be fulfilled]

Exists $f^-$ in $[f_0/4, f_0]$   $A_{H/V}(f^-) < A_0 / 2$			NO
Exists $f^+$ in $[f_0, 4f_0]$   $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	$1.82 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.07508  < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.05865 < 0.11719$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.2137 < 2.0$	OK	

$L_w$	window length
$n_w$	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
$f$	current frequency
$f_0$	H/V peak frequency
$\sigma_f$	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
$A_0$	H/V peak amplitude at frequency $f_0$
$A_{H/V}(f)$	H/V curve amplitude at frequency $f$
$f^-$	frequency between $f_0/4$ and $f_0$ for which $A_{H/V}(f^-) < A_0/2$
$f^+$	frequency between $f_0$ and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$ , $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for  $\sigma_f$  and  $\sigma_A(f_0)$

Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

**CLIENTE:** COMUNE DI ANZOLA DELL'EMILIA

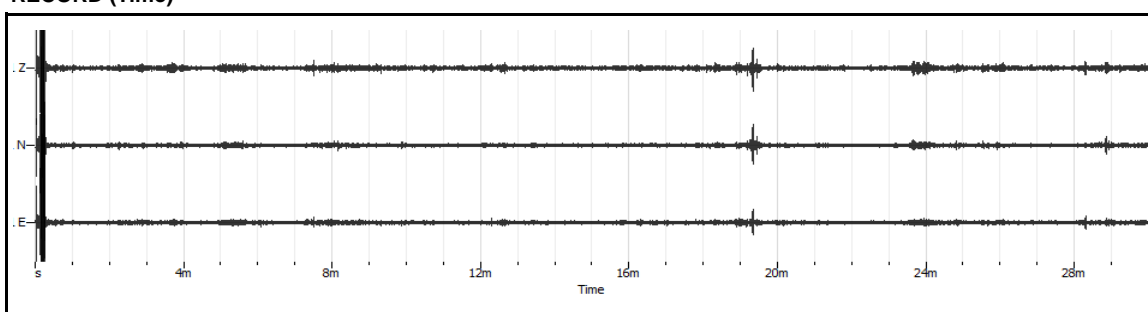
**CODICE LAVORO:** 1512

**CODICE PROVA:** Esac1

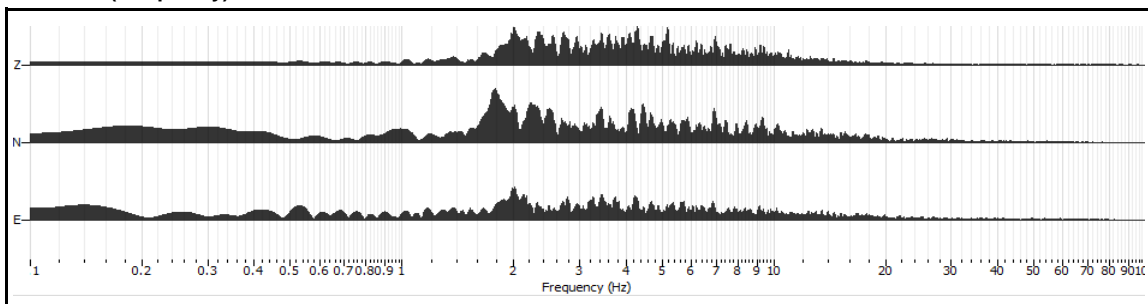
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	60

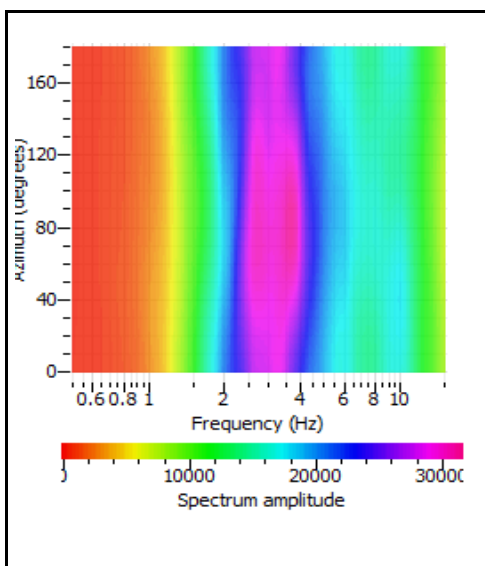
**RECORD (Time)**



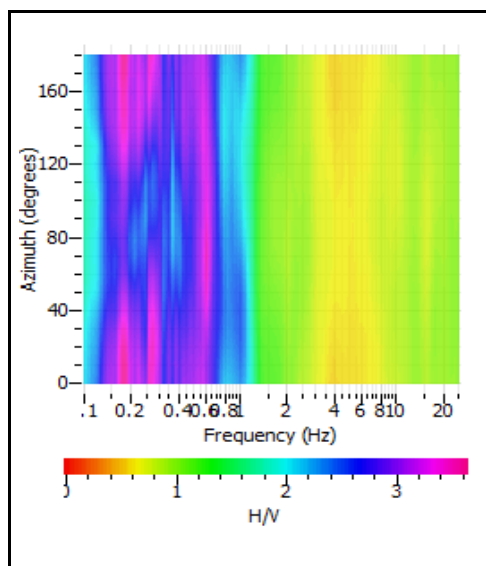
**RECORD (Frequency)**



**HORIZONTAL SPECTRUM ROTATE**



**HV ROTATE RESULTS**

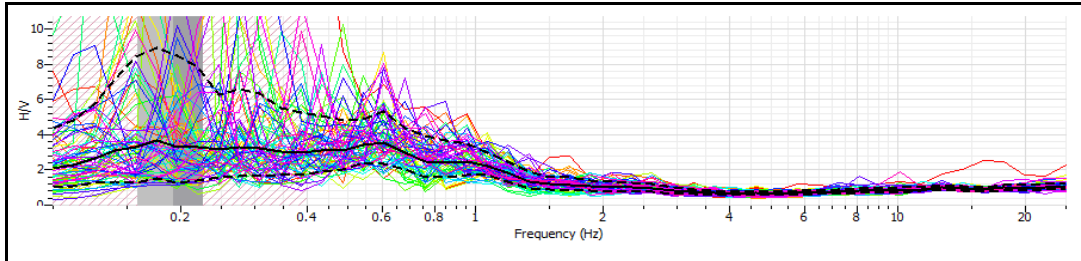


# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

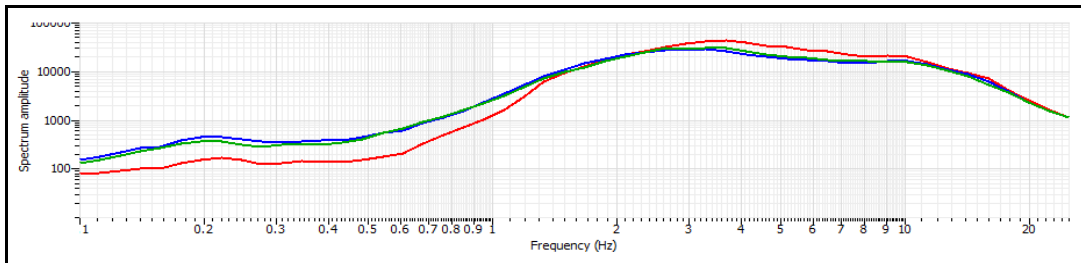
CLIENTE COMUNE DI ANZOLA DELL'EMILIA  
 CODICE LAVORO 1512  
 CODICE PROVA Esac1

## RAPPORTO SPETTRALE H/V

Max HVSR 0.19 ± 0.03 Hz. A0 = 3.66



## SPETTRO SINGOLE COMPONENTI



### Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.19		
Lw	20		
nw	71		
f0 > 10 / Lw	0.19 > 10/20		☒
nc (f0) > 200	269.8 > 200	☑	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	☑	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

### Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0]   AH/V(f) < A0/2	0 Hz		☒
Exists f+ in [4f0, f0]   AH/V(f+) < A0/2	0 Hz		☒
A0 > 2	3.66 > 2	☑	
fpeak [AH/V(f) ± $\sigma_A(f)$ ] = f0 ± 5%	24.81 < 0.05		☒
$\sigma < \varepsilon(f_0)$	0.03442 < 0.0475	☑	
$\sigma_A(f_0) < \theta(f_0)$	0.202658 < 3	☑	

Lw	Window length
nW	Number of windows used in the analysis
nc = Lw nW f0	Number of significant cycles
f	Current frequency
f0	H/V peak frequency
$\sigma$	Standard deviation of H/V peak frequency
$\varepsilon(f_0)$	Threshold value for the stability condition $\sigma < \varepsilon(f_0)$
A0	H/V peak amplitude at frequency f0
AH/V(f)	H/V curve amplitude at frequency f
f-	Frequency between f0/4 and f0 for which AH/V(f-) < A0/2
f+	Frequency between f0 and 4f0 for which AH/V(f+) < A0/2
$\sigma_A(f)$	Standard deviation of AH/V(f), $\sigma_A(f)$ is the factor by which the mean AH/V(f) curve should be multiplier or divided
$\sigma_{\log H/V}(f)$	Standard deviation of log AH/V(f) curve
$\theta(f_0)$	Threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Freq. Range [Hz]	Threshold value for $\sigma$ and $\sigma_A(f_0)$				
	< 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0	> 2.0
$\varepsilon(f_0)$ (Hz)	0.25 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.00	2.50	2.00	1.78	1.58
Log $\theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

**CLIENTE:** COMUNE DI ANZOLA DELL'EMILIA

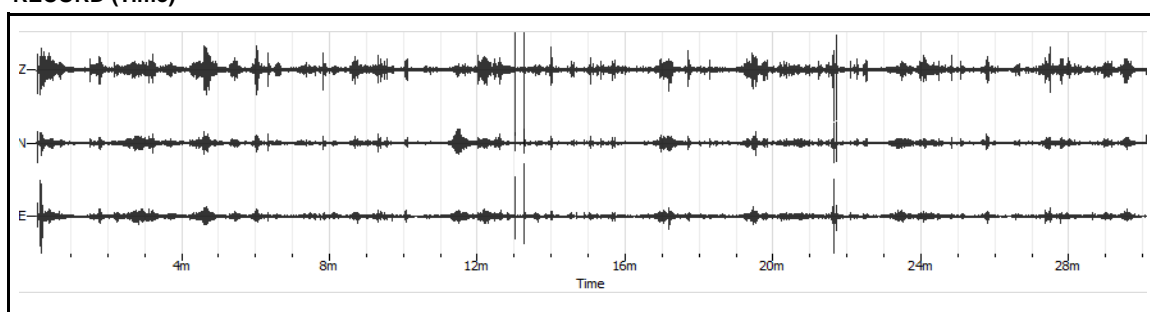
**CODICE LAVORO:** 1512

**CODICE PROVA:** Esac2

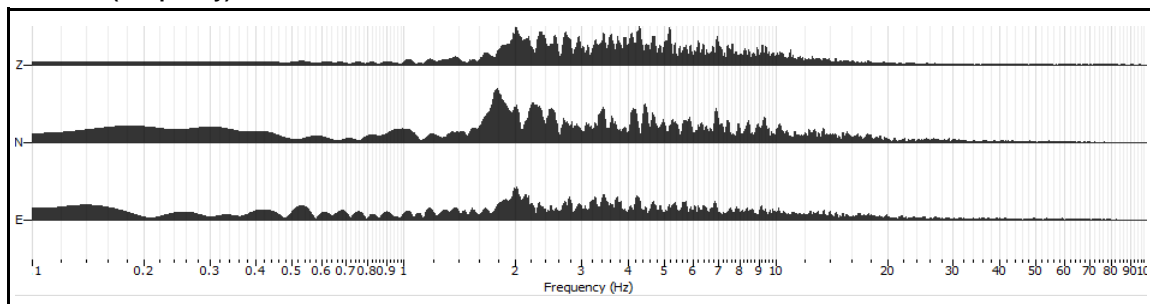
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	57

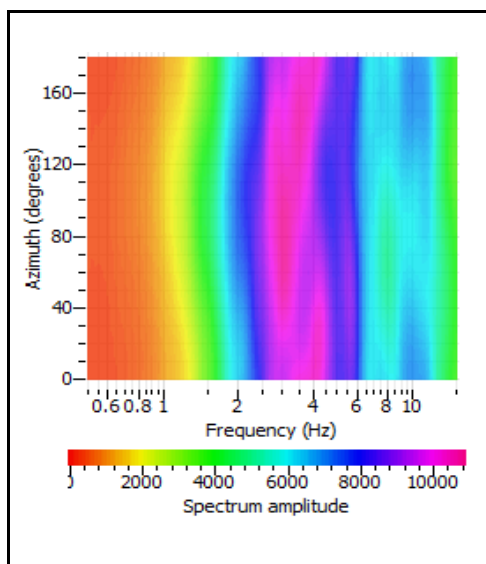
## RECORD (Time)



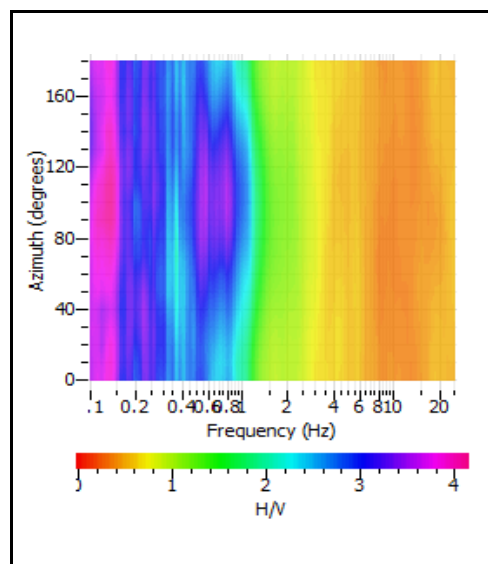
## RECORD (Frequency)



## HORIZONTAL SPECTRUM ROTATE



## HV ROTATE RESULTS

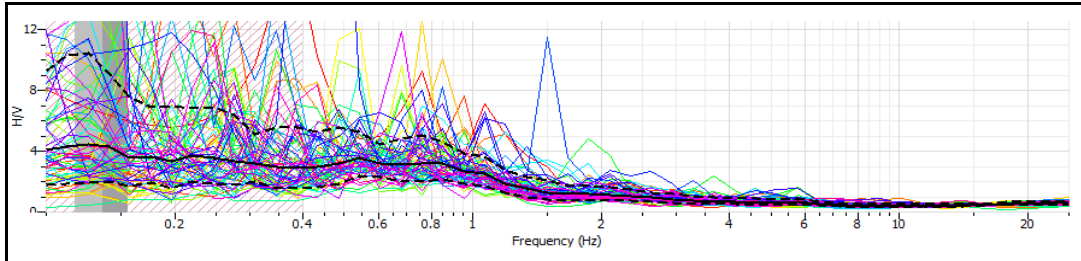


# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

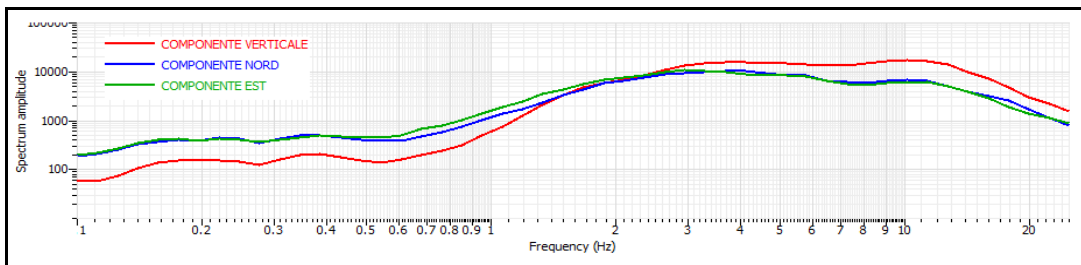
CLIENTE **COMUNE DI ANZOLA DELL'EMILIA**  
 CODICE LAVORO **1512**  
 CODICE PROVA **Esac2**

## RAPPORTO SPETTRALE H/V

**Max HVSr 0.13 ± 0.01 Hz. A0 = 4.45**



## SPETTRO SINGOLE COMPONENTI



### Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

<b>f0</b>	<b>0.13</b>		
<b>Lw</b>	<b>20</b>		
<b>nw</b>	<b>71</b>		
<b>f0 &gt; 10 / Lw</b>	<b>0.13 &gt; 10/20</b>		<input type="checkbox"/>
<b>nc (f0) &gt; 200</b>	<b>184.6 &gt; 200</b>		<input type="checkbox"/>
<b>σA(f) &lt; 2 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &gt; 0.5 Hz</b>	<b>Exceeded 0 out of 50 times</b>	<input checked="" type="checkbox"/>	
<b>σA(f) &lt; 3 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &lt; 0.5 Hz</b>			

### Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

<b>Exists f in [f0/4, f0]   AH/V(f) &lt; A0/2</b>	<b>0 Hz</b>		<input type="checkbox"/>
<b>Exists f+ in [4f0, f0]   AH/V(f+) &lt; A0/2</b>	<b>0 Hz</b>		<input type="checkbox"/>
<b>A0 &gt; 2</b>	<b>4.45 &gt; 2</b>	<input checked="" type="checkbox"/>	
<b>fpeak [AH/V(f) ± σA(f)] = f0 ± 5%</b>	<b>3.5513 &lt; 0.05</b>		<input type="checkbox"/>
<b>σf &lt; ε(f0)</b>	<b>0.019538 &lt; 0.0325</b>	<input checked="" type="checkbox"/>	
<b>σA(f0) &lt; θ(f0)</b>	<b>0.230654 &lt; 3</b>	<input checked="" type="checkbox"/>	

Lw	Window length
nW	Number of windows used in the analysis
nc = Lw nW f0	Number of significant cycles
f	Current frequency
f0	H/V peak frequency
σf	Standard deviation of H/V peak frequency
ε(f0)	Threshold value for the stability condition of < ε(f0)
A0	H/V peak amplitude at frequency f0
AH/V(f)	H/V curve amplitude at frequency f
f -	Frequency between f0/4 and f0 for which AH/V(f-) < A0/2
f +	Frequency between f0 and 4f0 for which AH/V(f+) < A0/2
σA(f)	Standard deviation of AH/V(f), σA(f) is the factor by which the mean AH/V(f) curve should be multiplier or divided
σlogH/V(f)	Standard deviation of log AH/V(f) curve
θ(f0)	Threshold value for the stability condition σA(f) < θ(f0)

Freq. Range [Hz]	Threshold value for σf and σA(f0)				
	< 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0	> 2.0
ε(f0) (Hz)	0.25 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
θ(f0) for σA(f0)	3.00	2.50	2.00	1.78	1.58
Log θ(f0) for σlogH/V(f0)	0.48	0.40	0.30	0.25	0.20



# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

**CLIENTE:** Comune di Anzola dell'Emilia

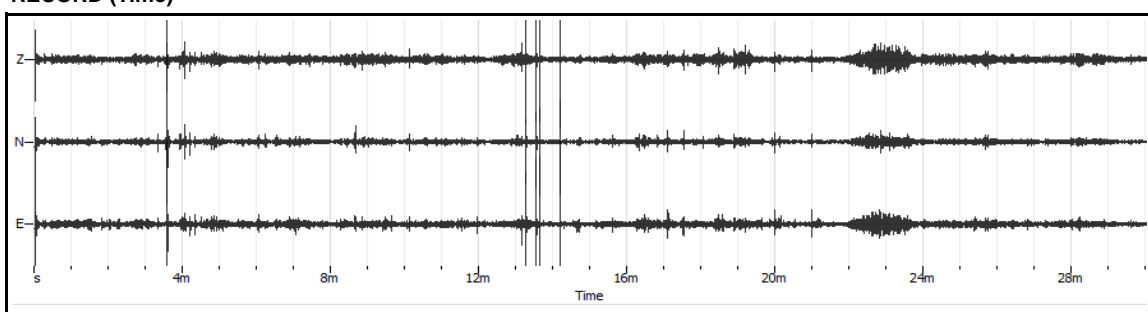
**CODICE LAVORO:** 1512

**CODICE PROVA:** HVSR - Masw 1

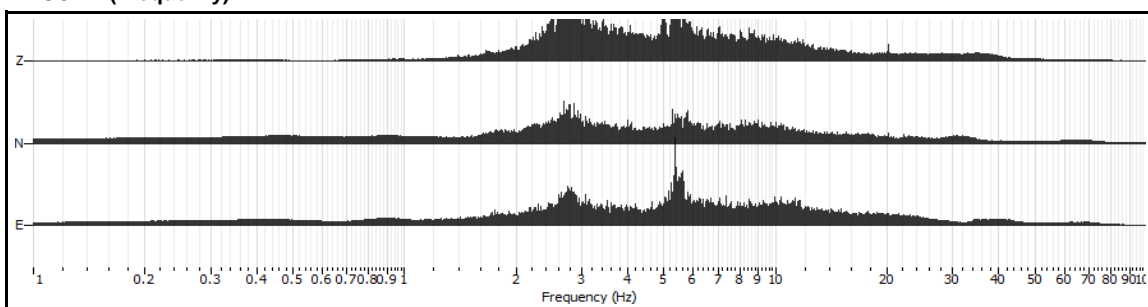
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	30 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	58

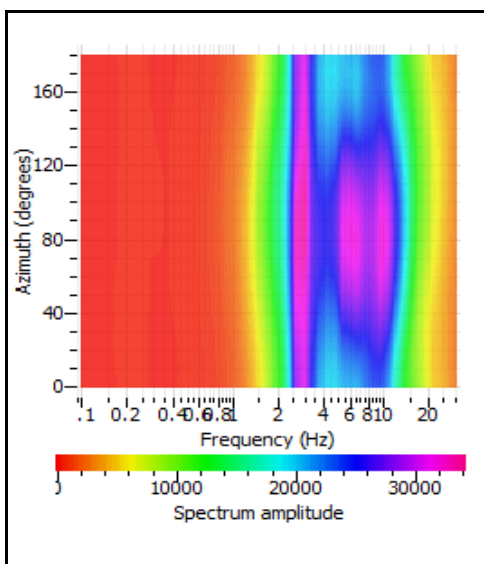
**RECORD (Time)**



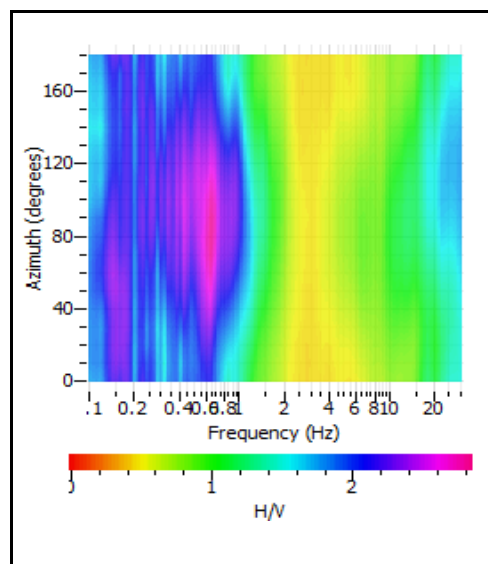
**RECORD (Frequency)**



**HORIZONTAL SPECTRUM ROTATE**



**HV ROTATE RESULTS**

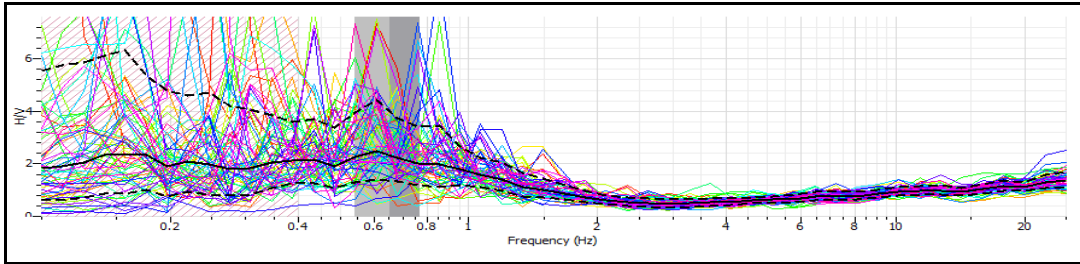


# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

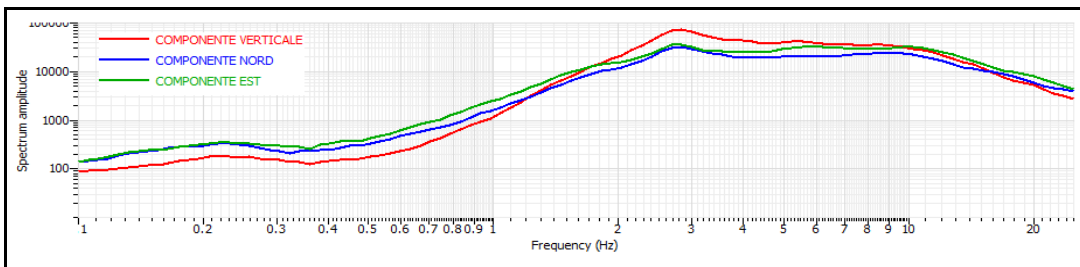
CLIENTE **Comune di Anzola dell'Emilia**  
 CODICE LAVORO **1512**  
 CODICE PROVA **HVSR - Masw 1**

## RAPPORTO SPETTRALE H/V

**F0 0.65 ± 0.11 Hz. A0 = 2.49** **FMax 0.65 ± 0.11 Hz. A0 = 2.49**



## SPETTRO SINGOLE COMPONENTI



### Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.65		
Lw	20		
nw	71		
f0 > 10 / Lw	0.65 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	923 > 200	<input checked="" type="checkbox"/>	
$\sigma A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 100 times	<input checked="" type="checkbox"/>	
$\sigma A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

### Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0]   AH/V(f) < A0/2	0 Hz		<input checked="" type="checkbox"/>
Exists f+ in [4f0, f0]   AH/V(f+) < A0/2	1.67 Hz	<input checked="" type="checkbox"/>	
A0 > 2	2.49 > 2	<input checked="" type="checkbox"/>	
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	-0.65 < 0.05	<input checked="" type="checkbox"/>	
σf < ε(f0)	0.112082 < 0.0975		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0 < 2	<input checked="" type="checkbox"/>	

Lw	Window length
nW	Number of windows used in the analysis
nc = Lw nW f0	Number of significant cycles
f	Current frequency
f0	H/V peak frequency
σf	Standard deviation of H/V peak frequency
ε(f0)	Threshold value for the stability condition of < ε(f0)
A0	H/V peak amplitude at frequency f0
AH/V(f)	H/V curve amplitude at frequency f
f-	Frequency between f0/4 and f0 for which AH/V(f-) < A0/2
f+	Frequency between f0 and 4f0 for which AH/V(f+) < A0/2
σA(f)	Standard deviation of AH/V(f), σA(f) is the factor by which the mean AH/V(f) curve should be multiplier or divided
σlogH/V(f)	Standard deviation of log AH/V(f) curve
θ(f0)	Threshold value for the stability condition σA(f) < θ(f0)

Freq. Range [Hz]	Threshold value for σf and σA(f0)				
	< 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0	> 2.0
ε(f0) (Hz)	0.25 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
θ(f0) for σA(f0)	3.00	2.50	2.00	1.78	1.58
Log θ(f0) for σlogH/V(f0)	0.48	0.40	0.30	0.25	0.20

In accordo con SESAME Guidelines 2005

# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

**CLIENTE:** Comune di Anzola dell'Emilia

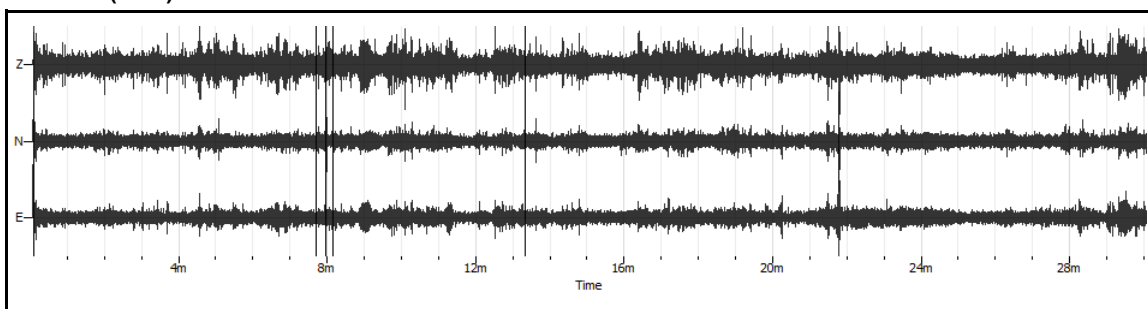
**CODICE LAVORO:** 1512

**CODICE PROVA:** HVSr - Masw 2

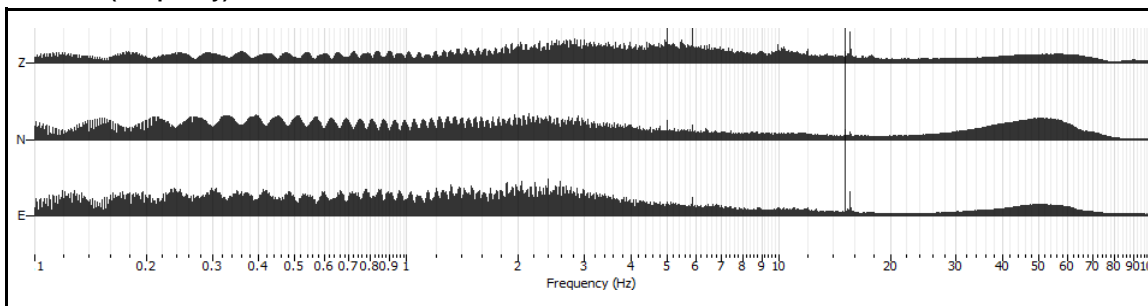
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	30 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	55

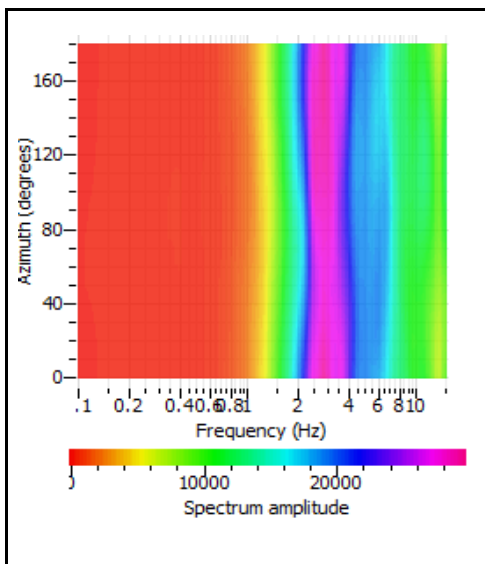
**RECORD (Time)**



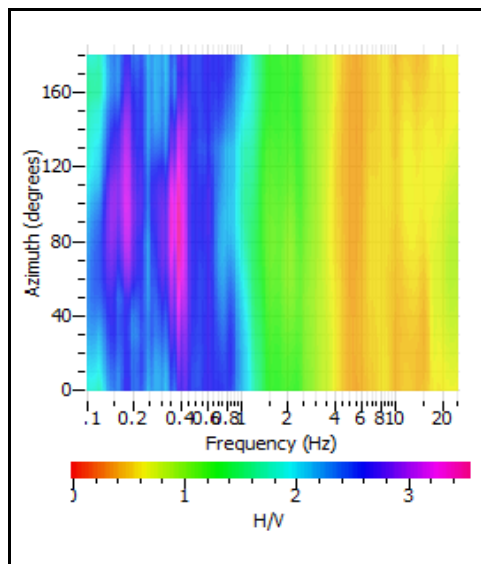
**RECORD (Frequency)**



**HORIZONTAL SPECTRUM ROTATE**



**HV ROTATE RESULTS**



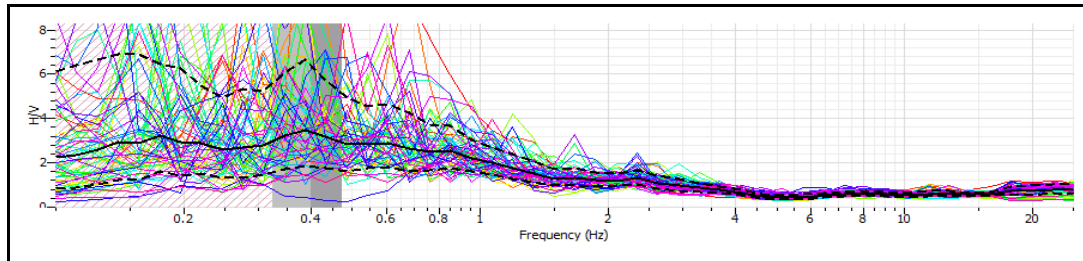
# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

**CLIENTE** Comune di Anzola dell'Emilia  
**CODICE LAVORO** 1512  
**CODICE PROVA** HVSR - Masw 2

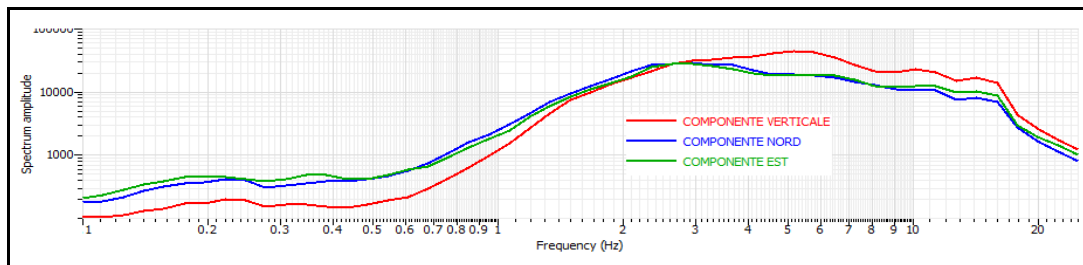
## RAPPORTO SPETTRALE H/V

**F0 0.39 ± 0.07 Hz. A0 = 3.5**

**FMax 0.39 ± 0.07 Hz. A0 = 3.5**



## SPETTRO SINGOLE COMPONENTI



### Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

<b>f0</b>	<b>0.39</b>		
<b>Lw</b>	<b>20</b>		
<b>nw</b>	<b>71</b>		
<b>f0 &gt; 10 / Lw</b>	<b>0.39 &gt; 10/20</b>		<input checked="" type="checkbox"/>
<b>nc (f0) &gt; 200</b>	<b>553.8 &gt; 200</b>	<input checked="" type="checkbox"/>	
<b>σA(f) &lt; 2 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &gt; 0.5 Hz</b>	<b>Exceeded 0 out of 50 times</b>	<input checked="" type="checkbox"/>	
<b>σA(f) &lt; 3 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &lt; 0.5 Hz</b>		<input checked="" type="checkbox"/>	

### Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

<b>Exists f in [f0/4, f0]   AH/V(f) &lt; A0/2</b>	<b>0 Hz</b>		<input checked="" type="checkbox"/>
<b>Exists f+ in [4f0, f0]   AH/V(f+) &lt; A0/2</b>	<b>0 Hz</b>		<input checked="" type="checkbox"/>
<b>A0 &gt; 2</b>	<b>3.5 &gt; 2</b>	<input checked="" type="checkbox"/>	
<b>fpeak [AH/V(f) ± σA(f)] = f0 ± 5%</b>	<b>21.9458 &lt; 0.05</b>		<input checked="" type="checkbox"/>
<b>σf &lt; ε(f0)</b>	<b>0.074894 &lt; 0.078</b>	<input checked="" type="checkbox"/>	
<b>σA(f0) &lt; θ(f0)</b>	<b>0.215438 &lt; 2.5</b>	<input checked="" type="checkbox"/>	

Lw	Window length
nW	Number of windows used in the analysis
nc = Lw nW f0	Number of significant cycles
f	Current frequency
f0	H/V peak frequency
σf	Standard deviation of H/V peak frequency
ε(f0)	Threshold value for the stability condition σf < ε(f0)
A0	H/V peak amplitude at frequency f0
AH/V(f)	H/V curve amplitude at frequency f
f-	Frequency between f0/4 and f0 for which AH/V(f-) < A0/2
f+	Frequency between f0 and 4f0 for which AH/V(f+) < A0/2
σA(f)	Standard deviation of AH/V(f), σA(f) is the factor by which the mean AH/V(f) curve should be multiplier or divided
σlogH/V(f)	Standard deviation of log AH/V(f) curve
θ(f0)	Threshold value for the stability condition σA(f) < θ(f0)

Freq. Range [Hz]	Threshold value for σf and σA(f0)				
	< 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0	> 2.0
ε(f0) (Hz)	0.25 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
θ(f0) for σA(f0)	3.00	2.50	2.00	1.78	1.58
Log θ(f0) for σlogH/V(f0)	0.48	0.40	0.30	0.25	0.20

In accordo con SESAME Guidelines 2005

# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

**CLIENTE:** Comune di Anzola dell'Emilia

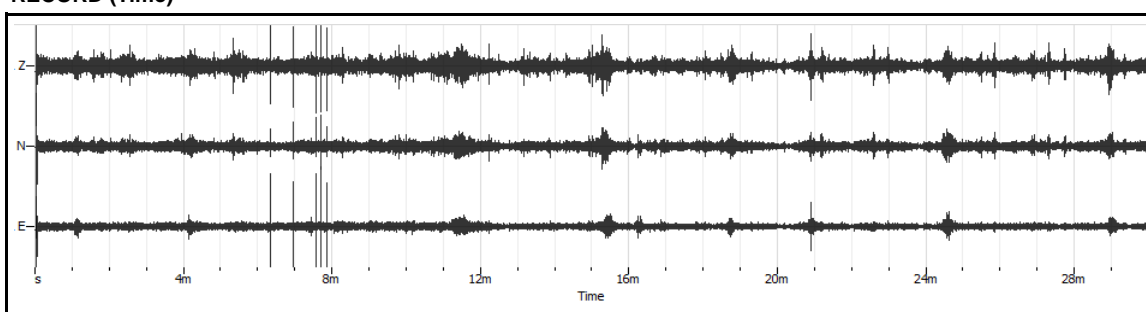
**CODICE LAVORO:** 1512

**CODICE PROVA:** HVSR - Masw 3

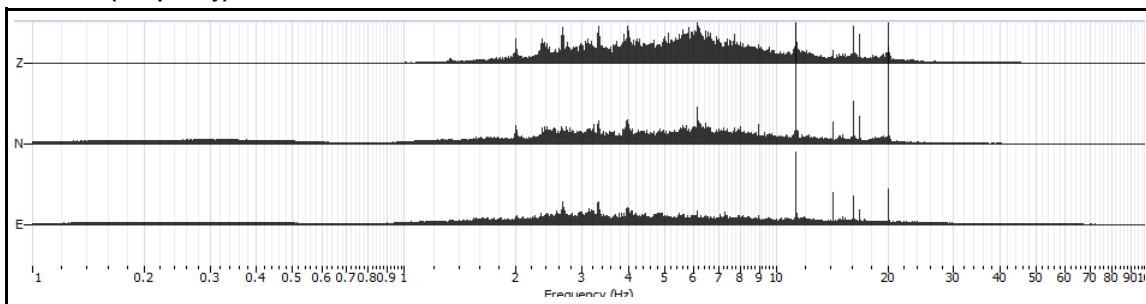
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	30 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	55

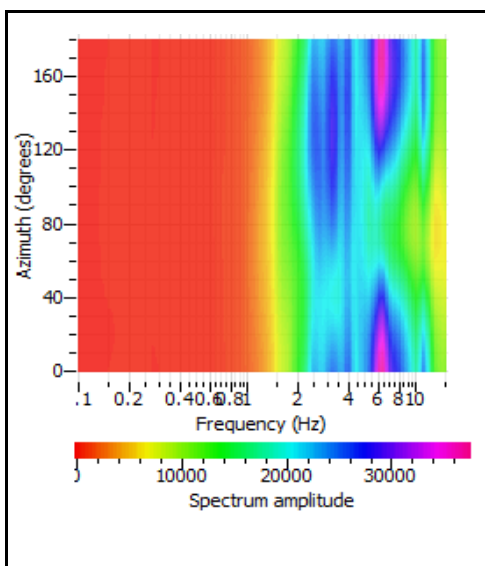
**RECORD (Time)**



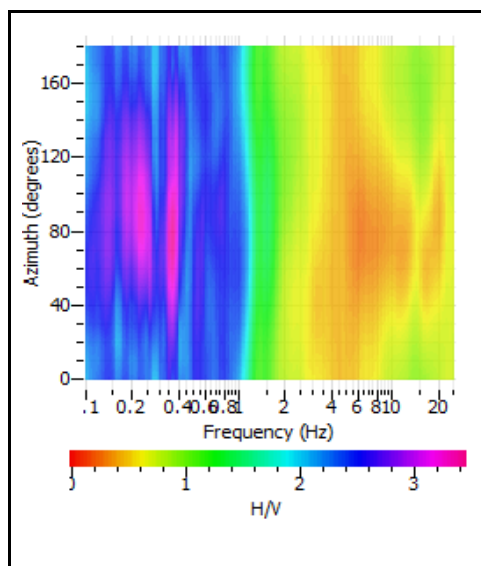
**RECORD (Frequency)**



**HORIZONTAL SPECTRUM ROTATE**



**HV ROTATE RESULTS**

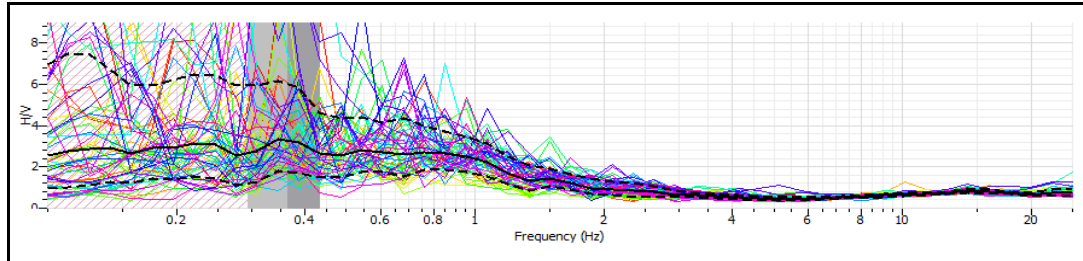


# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

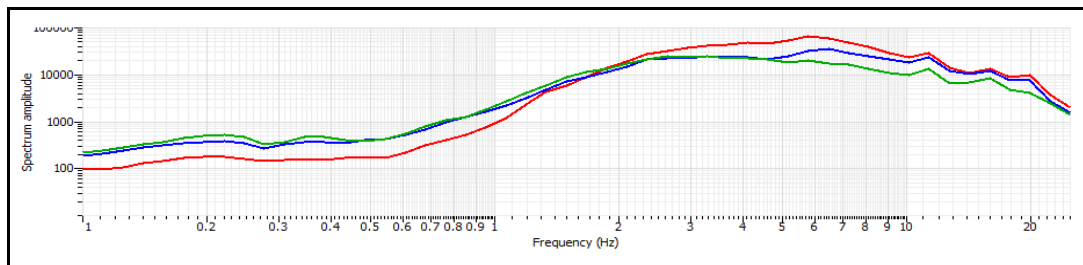
**CLIENTE** Comune di Anzola dell'Emilia  
**CODICE LAVORO** 1512  
**CODICE PROVA** HVSR - Masw 3

## RAPPORTO SPETTRALE H/V

**F0 0.36 ± 0.07 Hz. A0 = 3.34**
**FMax 0.36 ± 0.07 Hz. A0 = 3.34**



## SPETTRO SINGOLE COMPONENTI



### Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

<b>f0</b>	0.36		
<b>Lw</b>	20		
<b>nw</b>	71		
<b>f0 &gt; 10 / Lw</b>	0.36 > 10/20		☒
<b>nc (f0) &gt; 200</b>	511.2 > 200	☑	
<b>σA(f) &lt; 2 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &gt; 0.5 Hz</b>	Exceeded 0 out of 50 times	☑	
<b>σA(f) &lt; 3 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &lt; 0.5 Hz</b>			

### Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

<b>Exists f' in [f0/4, f0]   AH/V(f') &lt; A0/2</b>	0 Hz		☒
<b>Exists f+ in [4f0, f0]   AH/V(f+) &lt; A0/2</b>	0 Hz		☒
<b>A0 &gt; 2</b>	3.34 > 2	☑	
<b>fpeak [AH/V(f) ± σA(f)] = f0 ± 5%</b>	13.8716 < 0.05		☒
<b>σf &lt; ε(f0)</b>	0.070074 < 0.072	☑	
<b>σA(f0) &lt; θ(f0)</b>	0.0894525 < 2.5	☑	

Lw	Window length
nW	Number of windows used in the analysis
nc = Lw nW f0	Number of significant cycles
f	Current frequency
f0	H/V peak frequency
σf	Standard deviation of H/V peak frequency
ε(f0)	Threshold value for the stability condition σf < ε(f0)
A0	H/V peak amplitude at frequency f0
AH/V(f)	H/V curve amplitude at frequency f
f -	Frequency between f0/4 and f0 for which AH/V(f-) < A0/2
f +	Frequency between f0 and 4f0 for which AH/V(f+) < A0/2
σA(f)	Standard deviation of AH/V(f), σA(f) is the factor by which the mean AH/V(f) curve should be multiplier or divided
σlogH/V(f)	Standard deviation of log AH/V(f) curve
θ(f0)	Threshold value for the stability condition σA(f) < θ(f0)

Freq. Range [Hz]	Threshold value for σf and σA(f0)				
	< 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0	> 2.0
ε(f0) (Hz)	0.25 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
θ(f0) for σA(f0)	3.00	2.50	2.00	1.78	1.58
Log θ(f0) for σlogH/V(f0)	0.48	0.40	0.30	0.25	0.20

In accordo con SESAME Guidelines 2005

# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

**CLIENTE:** Comune di Anzola dell'Emilia

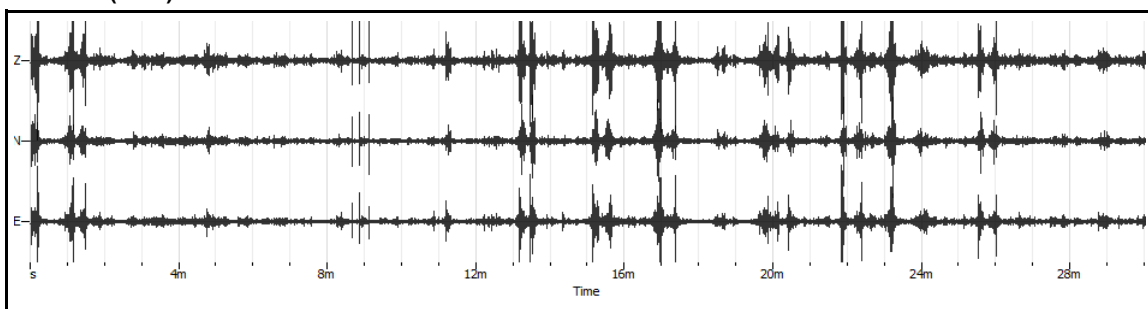
**CODICE LAVORO:** 1512

**CODICE PROVA:** HVSr - Masw 4

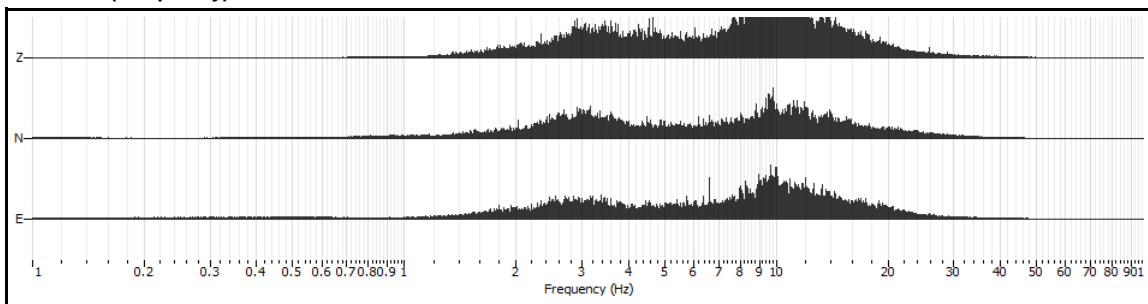
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	30 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	59

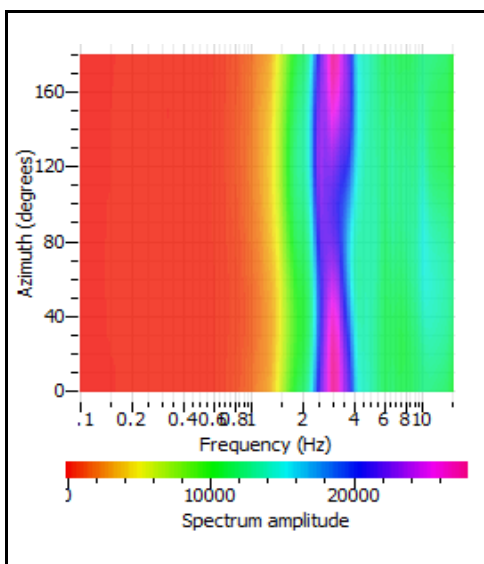
**RECORD (Time)**



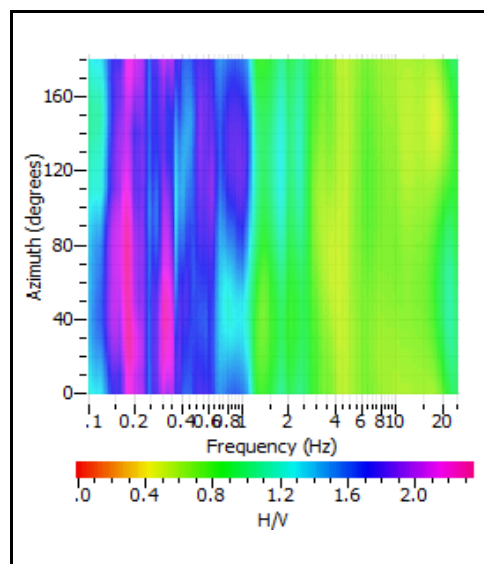
**RECORD (Frequency)**



**HORIZONTAL SPECTRUM ROTATE**



**HV ROTATE RESULTS**

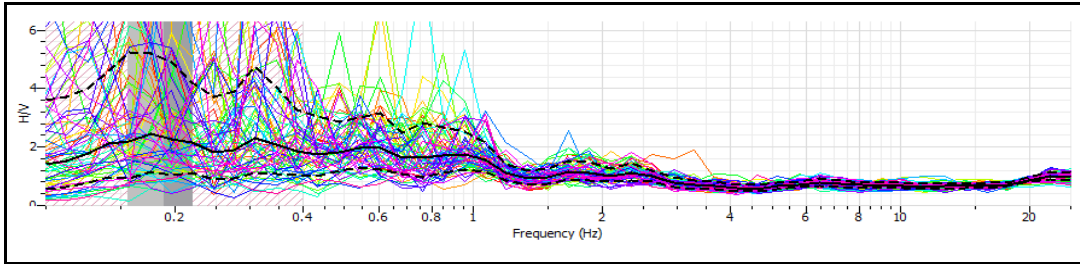


# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

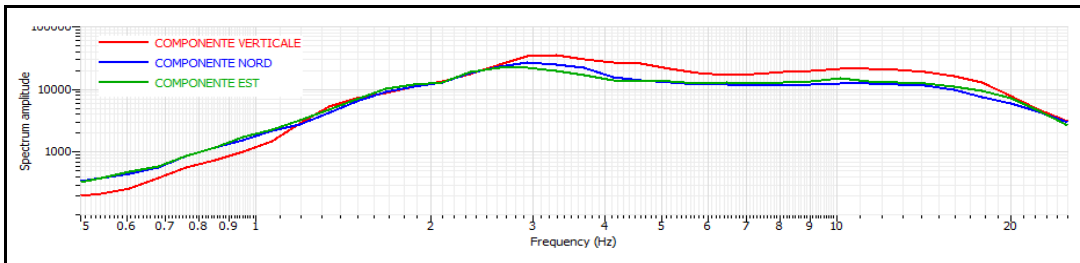
**CLIENTE** Comune di Anzola dell'Emilia  
**CODICE LAVORO** 1512  
**CODICE PROVA** HVSR - Masw 4

## RAPPORTO SPETTRALE H/V

**F0 0.35 ± 0.05 Hz. A0 = 2.27**
**FMax 0.18 ± 0.03 Hz. A0 = 2.45**



## SPETTRO SINGOLE COMPONENTI



### Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

<b>f0</b>	0.35		
<b>Lw</b>	20		
<b>nw</b>	71		
<b>f0 &gt; 10 / Lw</b>	0.35 > 10/20		☒
<b>nc (f0) &gt; 200</b>	497 > 200	☑	
<b>σA(f) &lt; 2 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &gt; 0.5 Hz</b>	Exceeded 0 out of 50 times	☑	
<b>σA(f) &lt; 3 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &lt; 0.5 Hz</b>			

### Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

<b>Exists f in [f0/4, f0]   AH/V(f) &lt; A0/2</b>	0 Hz		☒
<b>Exists f+ in [4f0, f0]   AH/V(f+) &lt; A0/2</b>	0 Hz		☒
<b>A0 &gt; 2</b>	2.27 > 2	☑	
<b>fpeak [AH/V(f) ± σA(f)] = f0 ± 5%</b>	22.4075 < 0.05		☒
<b>σf &lt; ε(f0)</b>	0.053922 < 0.07	☑	
<b>σA(f0) &lt; θ(f0)</b>	0.137148 < 2.5	☑	

Lw	Window length
nW	Number of windows used in the analysis
nc = Lw nW f0	Number of significant cycles
f	Current frequency
f0	H/V peak frequency
σf	Standard deviation of H/V peak frequency
ε(f0)	Threshold value for the stability condition σf < ε(f0)
A0	H/V peak amplitude at frequency f0
AH/V(f)	H/V curve amplitude at frequency f
f -	Frequency between f0/4 and f0 for which AH/V(f-) < A0/2
f +	Frequency between f0 and 4f0 for which AH/V(f+) < A0/2
σA(f)	Standard deviation of AH/V(f), σA(f) is the factor by which the mean AH/V(f) curve should be multiplier or divided
σlogH/V(f)	Standard deviation of log AH/V(f) curve
θ(f0)	Threshold value for the stability condition σA(f) < θ(f0)

Freq. Range [Hz]	Threshold value for σf and σA(f0)				
	< 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0	> 2.0
ε(f0) (Hz)	0.25 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
θ(f0) for σA(f0)	3.00	2.50	2.00	1.78	1.58
Log θ(f0) for σlogH/V(f0)	0.48	0.40	0.30	0.25	0.20

In accordo con SESAME Guidelines 2005



# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

**CLIENTE:** Comune di Anzola dell'Emilia

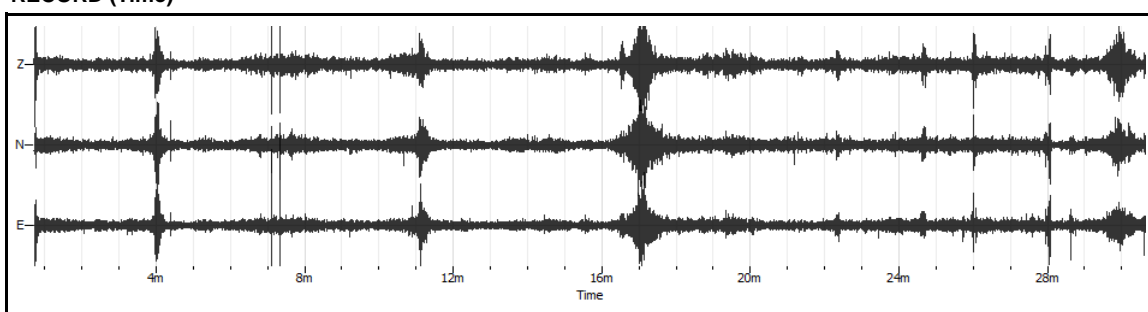
**CODICE LAVORO:** 1512

**CODICE PROVA:** HVSR - Masw 5

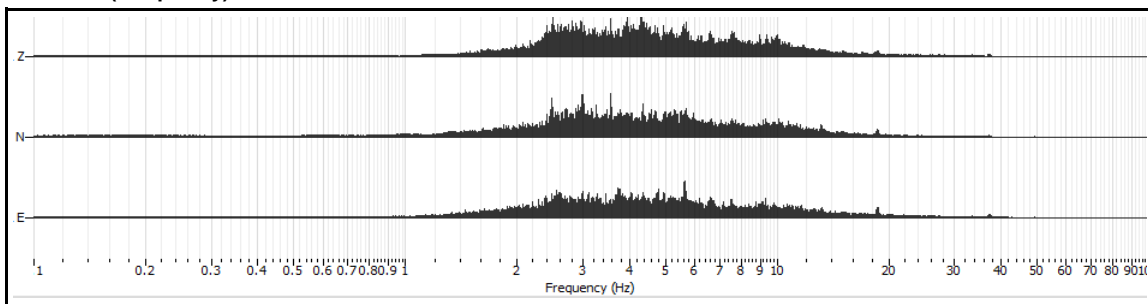
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	30 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	64

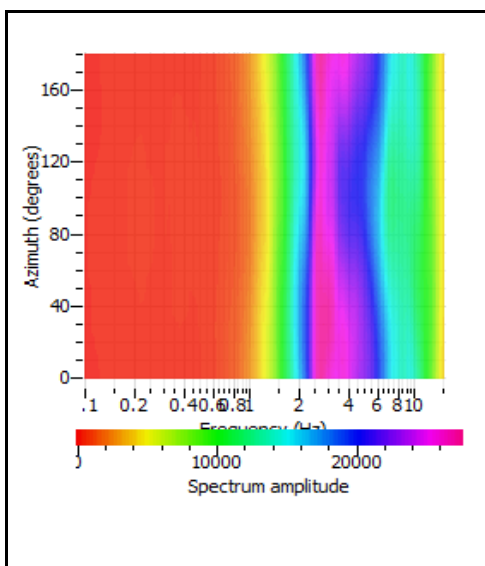
**RECORD (Time)**



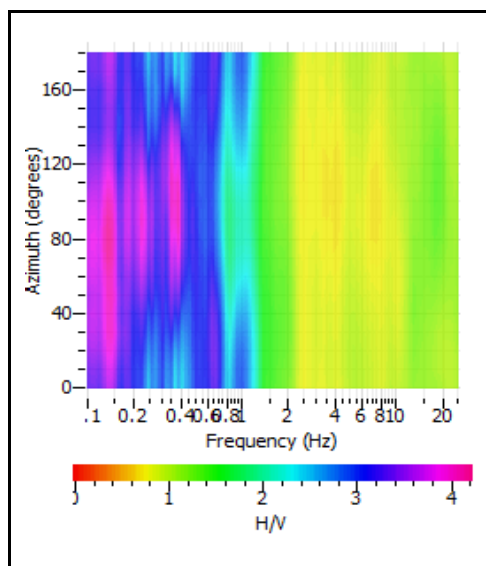
**RECORD (Frequency)**



**HORIZONTAL SPECTRUM ROTATE**



**HV ROTATE RESULTS**

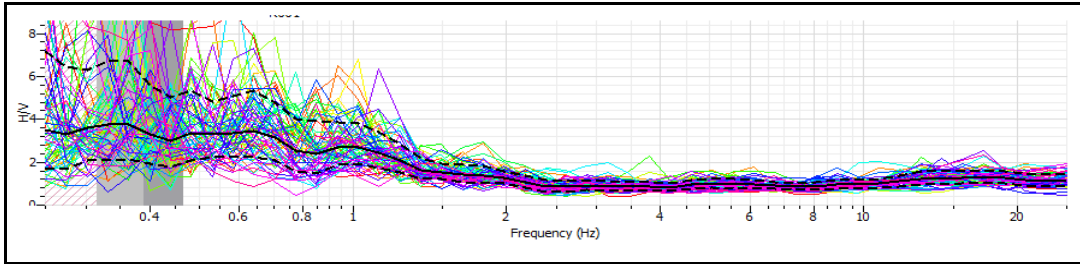


# RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

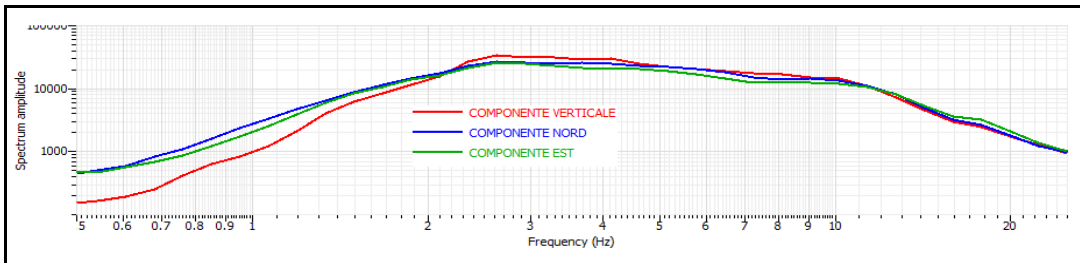
**CLIENTE** Comune di Anzola dell'Emilia  
**CODICE LAVORO** 1512  
**CODICE PROVA** HVSR - Masw 5

## RAPPORTO SPETTRALE H/V

**F0 0.39 ± 0.07 Hz. A0 = 3.77** **FMax 0.39 ± 0.07 Hz. A0 = 3.77**



## SPETTRO SINGOLE COMPONENTI



### Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

<b>f0</b>	0.39		
<b>Lw</b>	20		
<b>nw</b>	71		
<b>f0 &gt; 10 / Lw</b>	0.39 > 10/20		☒
<b>nc (f0) &gt; 200</b>	553.8 > 200	☑	
<b>σA(f) &lt; 2 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &gt; 0.5 Hz</b>	Exceeded 0 out of 50 times	☑	
<b>σA(f) &lt; 3 for 0.5 f0 &lt; f &lt; 2 f0 if f0 &lt; 0.5 Hz</b>			

### Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

<b>Exists f in [f0/4, f0]   AH/V(f) &lt; A0/2</b>	0 Hz		☒
<b>Exists f+ in [4f0, f0]   AH/V(f+) &lt; A0/2</b>	0 Hz		☒
<b>A0 &gt; 2</b>	3.77 > 2	☑	
<b>fpeak [AH/V(f) ± σA(f)] = f0 ± 5%</b>	18.4678 < 0.05		☒
<b>σ &lt; ε(f0)</b>	0.075603 < 0.078	☑	
<b>σA(f0) &lt; θ(f0)</b>	0.28023 < 2.5	☑	

Lw	Window length
nW	Number of windows used in the analysis
nc = Lw nW f0	Number of significant cycles
f	Current frequency
f0	H/V peak frequency
σ	Standard deviation of H/V peak frequency
ε(f0)	Threshold value for the stability condition σ < ε(f0)
A0	H/V peak amplitude at frequency f0
AH/V(f)	H/V curve amplitude at frequency f
f -	Frequency between f0/4 and f0 for which AH/V(f-) < A0/2
f +	Frequency between f0 and 4f0 for which AH/V(f+) < A0/2
σA(f)	Standard deviation of AH/V(f), σA(f) is the factor by which the mean AH/V(f) curve should be multiplier or divided
σlogH/V(f)	Standard deviation of log AH/V(f) curve
θ(f0)	Threshold value for the stability condition σA(f) < θ(f0)

Threshold value for σ and σA(f0)					
Freq. Range [Hz]	< 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0	> 2.0
ε(f0) (Hz)	0.25 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
θ(f0) for σA(f0)	3.00	2.50	2.00	1.78	1.58
Log θ(f0) for σlogH/V(f0)	0.48	0.40	0.30	0.25	0.20

In accordo con SESAME Guidelines 2005