



PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile



CONFERENZA DELLE REGIONI E
DELLE PROVINCE AUTONOME

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

MICROZONAZIONE SISMICA

Livello 2

Allegato 2 – Report delle indagini

Regione Emilia–Romagna

Comune di San Benedetto Val di Sambro



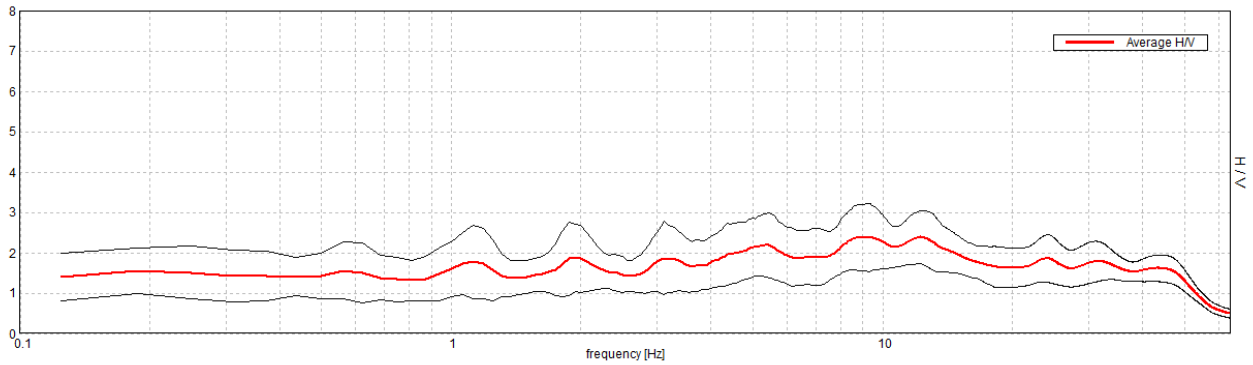
Regione	Soggetto realizzatore	Data
EMILIA–ROMAGNA	Raggruppamento temporaneo di professionisti Capogruppo: dott. geol. Samuel Sangiorgi Mandanti: dott. geol. Raffaele Brunaldi, dott. geol. Maurizio Zamboni, dott. geol. Antonio Milioto, ing. Marco Soglia	Luglio 2020

SAN BENEDETTO VAL DI SAMBRO_MS, TR66 MONTEACUTO VALLESE

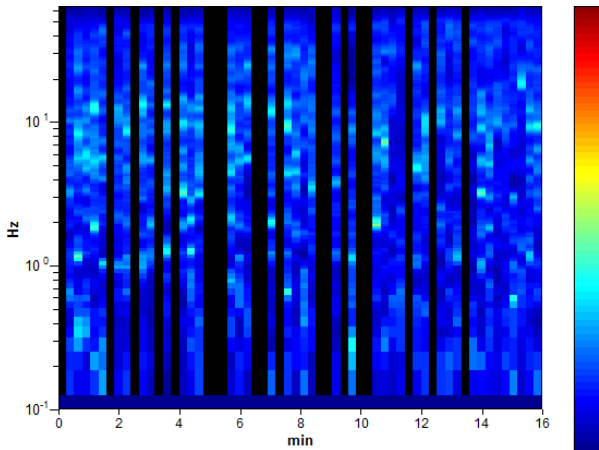
Instrument: TRZ-0108/01-10
Start recording: 25/10/18 15:18:39 End recording: 25/10/18 15:34:39
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 68% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

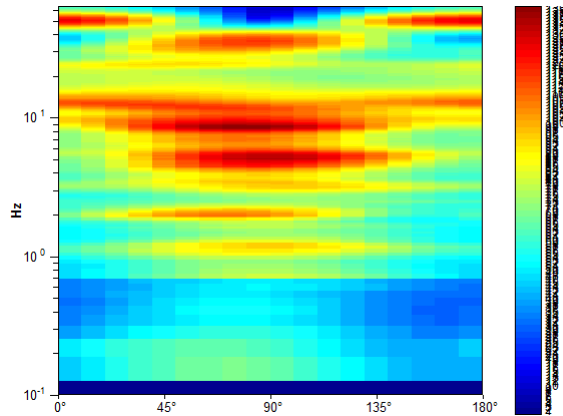
Max. H/V at 12.25 ± 1.2 Hz. (In the range 0.1 - 20.0 Hz).



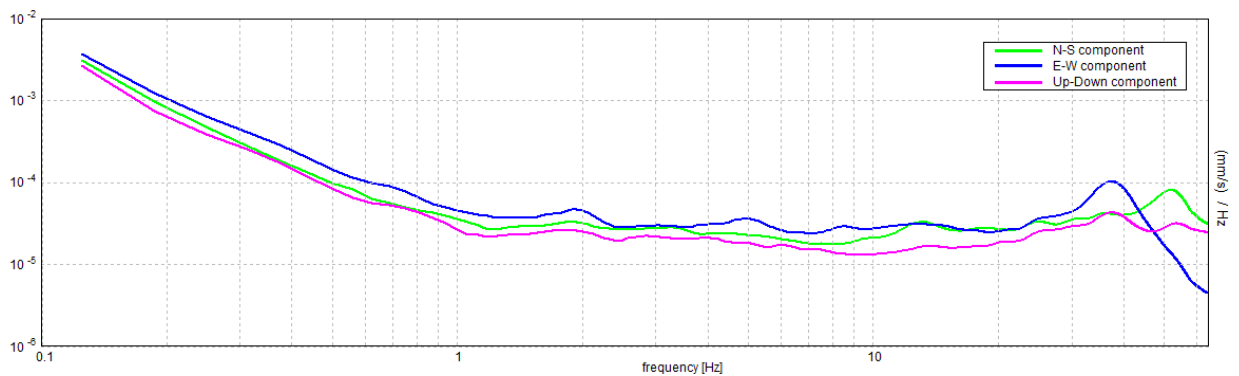
H/V TIME HISTORY



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 12.25 ± 1.2 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	12.25 > 0.63	OK	
$n_c(f_0) > 200$	8036.0 > 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 295 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
$A_0 > 2$	2.39 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.04775 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.58499 < 0.6125$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.318 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR62 MONTEACUTO VALLESE

Instrument: TRZ-0108/01-10

Start recording: 25/10/18 12:14:17 End recording: 25/10/18 12:30:18

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

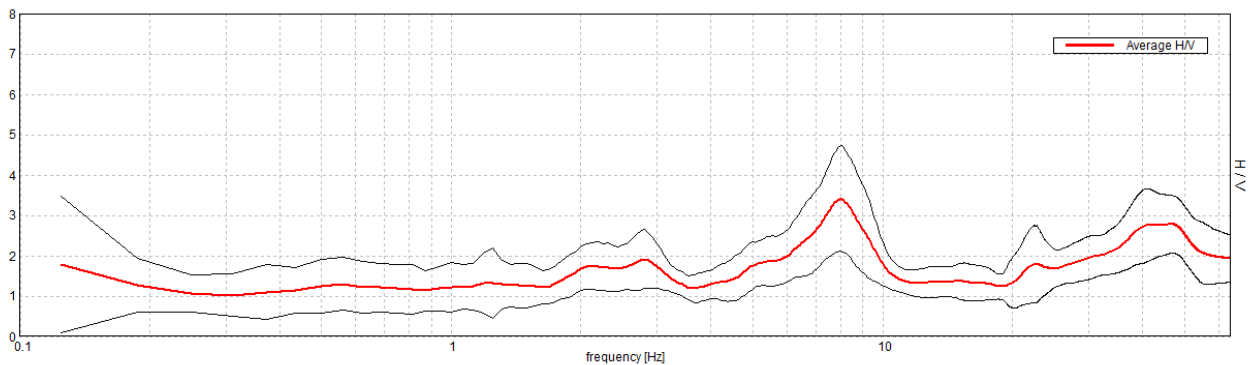
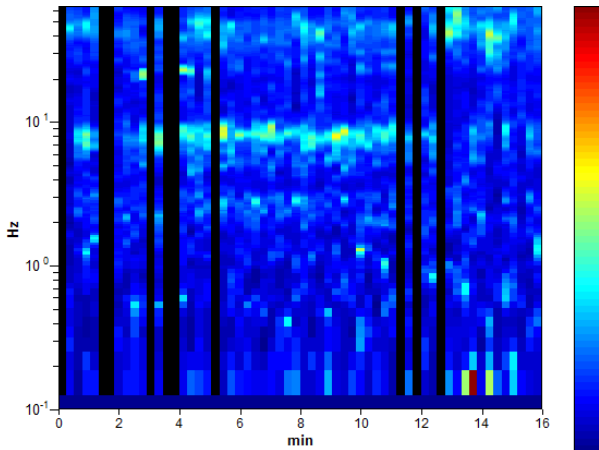
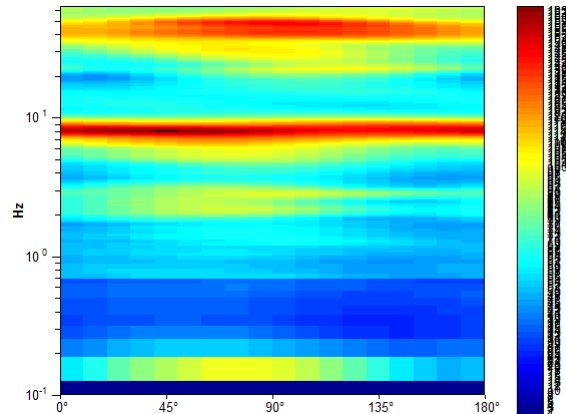
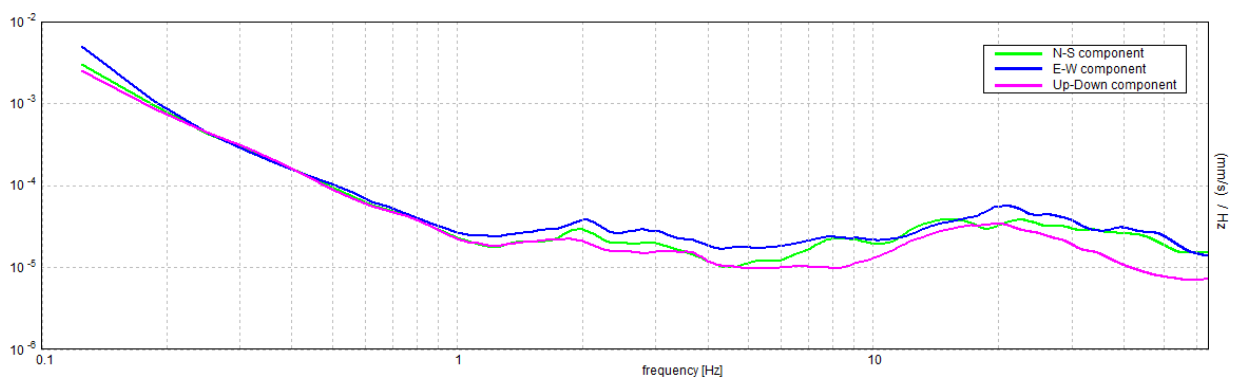
Trace length: 0h16'00". Analyzed 83% trace (manual window selection)

Sampling rate: 128 Hz

Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIOMax. H/V at 8.0 ± 0.32 Hz. (In the range 0.1 - 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 8.0 ± 0.32 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$8.00 > 0.63$	OK	
$n_c(f_0) > 200$	$6400.0 > 200$	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 193 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	4.875 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	10.188 Hz	OK	
$A_0 > 2$	$3.42 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.01939 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.15515 < 0.4$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.6468 < 1.58$	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
σ_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 σ_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



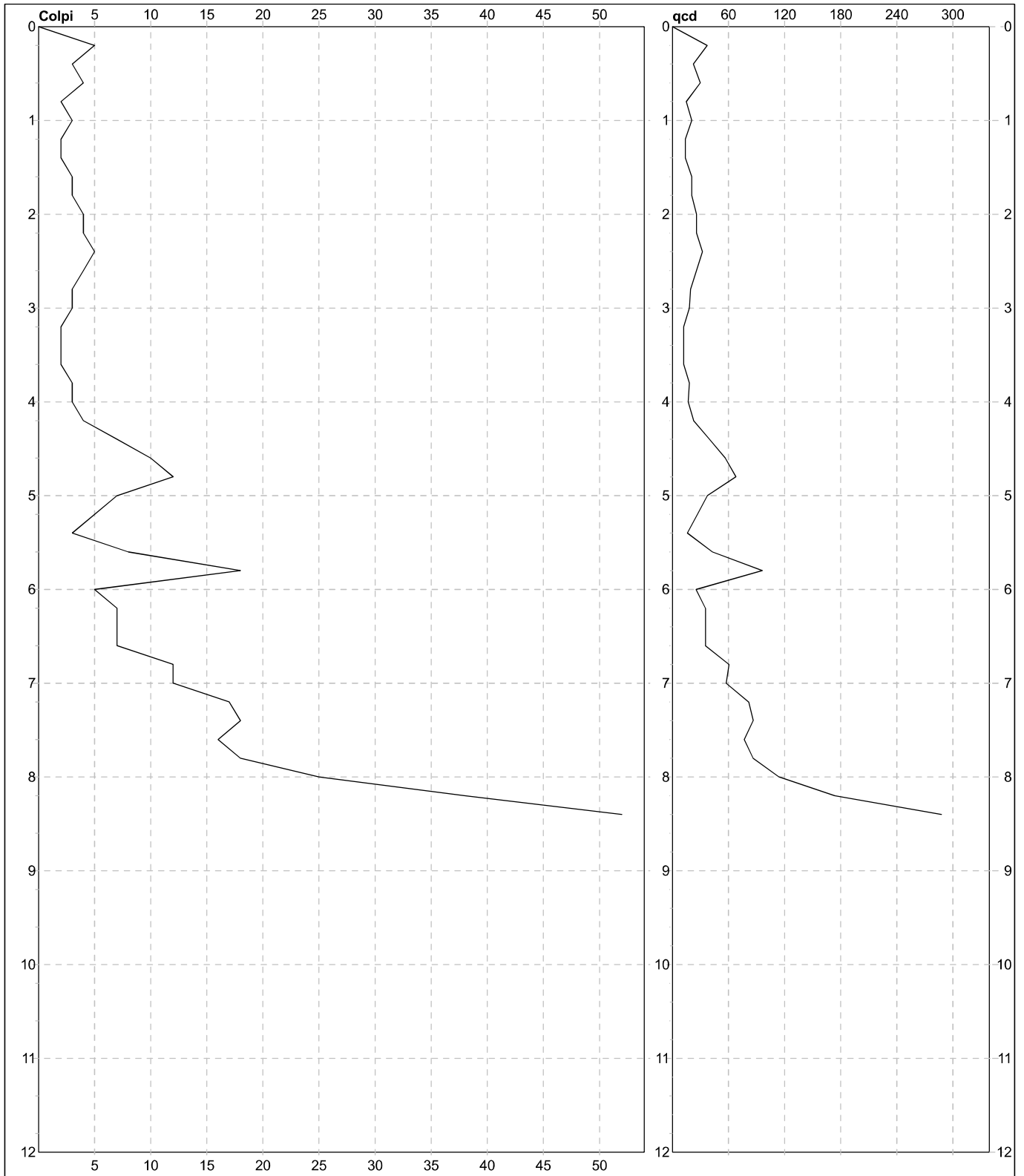
PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	15
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **Monteacuto Vallese**

U.M.: **kg/cm²**
 Scala: **1:60**
 Pagina: **1**
 Elaborato:

Data eseg.: **26/01/2019**
 Quota ass.:
 Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
 Massa battente: 63,50 m
 Altezza caduta: 0,75 m
 Avanzamento: 0,20 m

Responsabile:
 Assistente:

Preforo: m
 Corr.astine: kg/ml
 Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	15
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	Falda: Non rilevata
Località: Monteacuto Vallese	Elaborato:	

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	5		37,24					
0,40	1	3		22,35					
0,60	2	4		29,80					
0,80	2	2		14,90					
1,00	2	3		20,71					
1,20	2	2		13,81					
1,40	2	2		13,81					
1,60	3	3		20,71					
1,80	3	3		20,71					
2,00	3	4		25,74					
2,20	3	4		25,74					
2,40	3	5		32,17					
2,60	4	4		25,74					
2,80	4	3		19,30					
3,00	4	3		18,07					
3,20	4	2		12,05					
3,40	4	2		12,05					
3,60	5	2		12,05					
3,80	5	3		18,07					
4,00	5	3		16,99					
4,20	5	4		22,65					
4,40	5	7		39,64					
4,60	6	10		56,63					
4,80	6	12		67,96					
5,00	6	7		37,40					
5,20	6	5		26,72					
5,40	6	3		16,03					
5,60	7	8		42,74					
5,80	7	18		96,18					
6,00	7	5		25,29					
6,20	7	7		35,40					
6,40	7	7		35,40					
6,60	8	7		35,40					
6,80	8	12		60,69					
7,00	8	12		57,60					
7,20	8	17		81,61					
7,40	8	18		86,41					
7,60	9	16		76,80					
7,80	9	18		86,41					
8,00	9	25		114,21					
8,20	9	38		173,59					
8,40	9	63		287,80					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR65 MONTEACUTO VALLESE

Instrument: TRZ-0108/01-10

Start recording: 25/10/18 14:51:24 End recording: 25/10/18 15:07:25

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

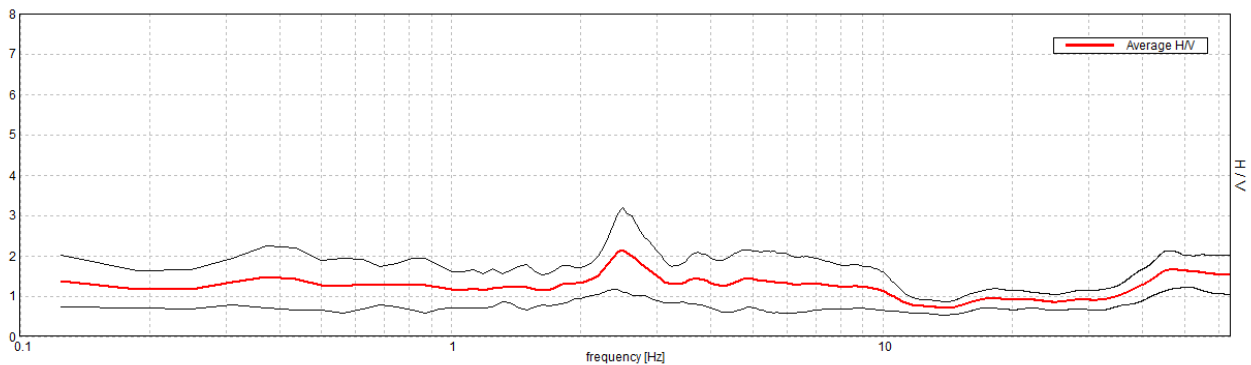
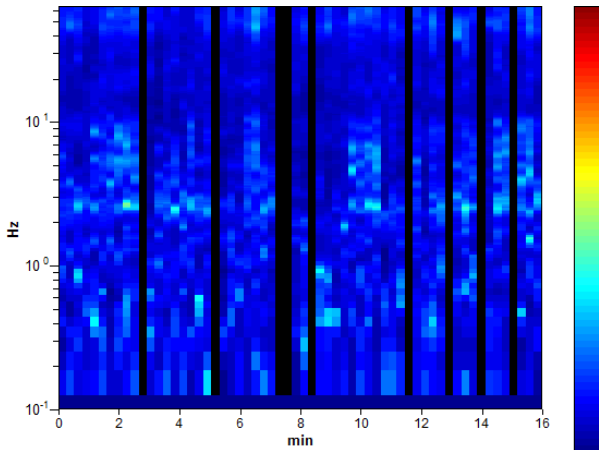
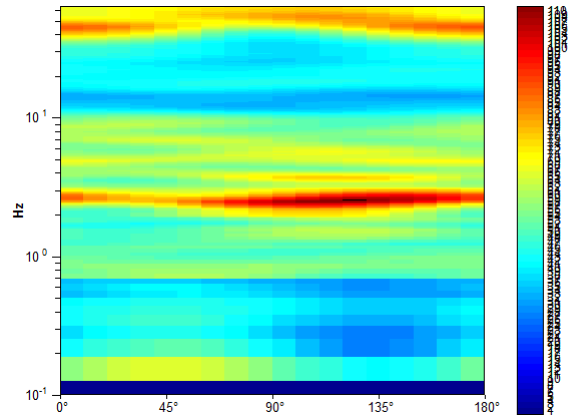
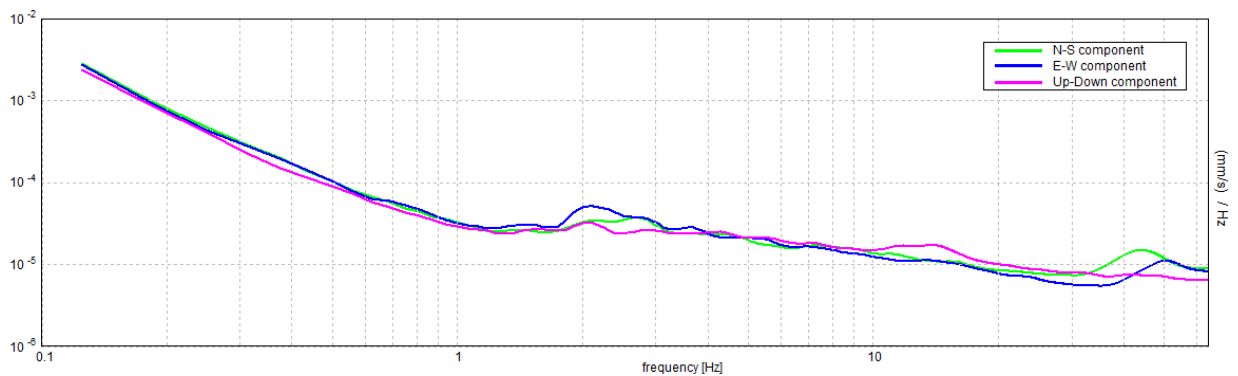
Trace length: 0h16'00". Analyzed 85% trace (manual window selection)

Sampling rate: 128 Hz

Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIOMax. H/V at 2.5 ± 0.08 Hz. (In the range 0.1 - 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 2.5 ± 0.08 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$2.50 > 0.63$	OK	
$n_c(f_0) > 200$	$2040.0 > 200$	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 61 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
$A_0 > 2$	$2.15 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.01548 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.0387 < 0.125$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.5202 < 1.58$	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
σ_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 $\sigma_A(f) < \theta(f_0)$

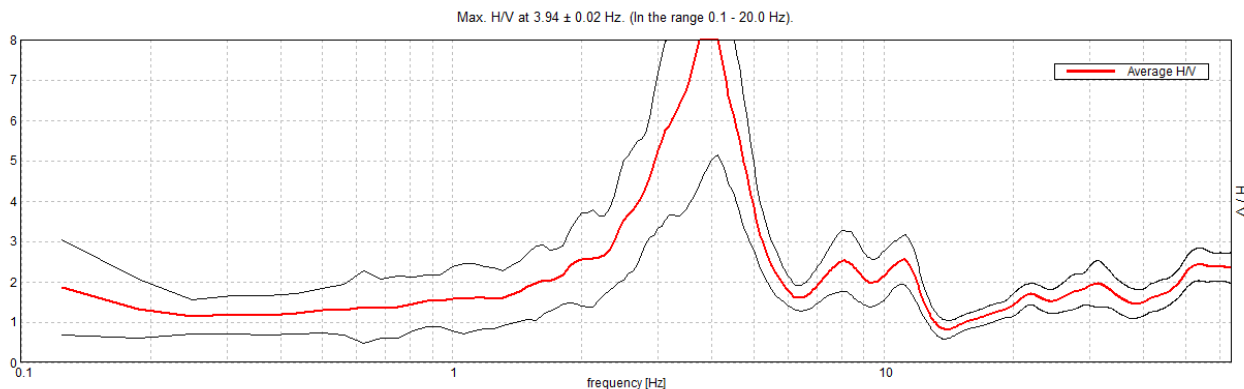
Threshold values for σ_f and $\sigma_A(f_0)$

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

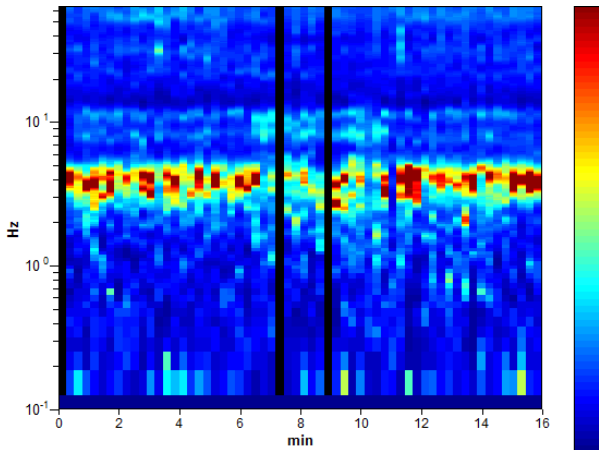
SAN BENEDETTO VAL DI SAMBRO_MS, TR46 BIVIO

Instrument: TRZ-0108/01-10
 Start recording: 18/10/18 13:40:20 End recording: 18/10/18 13:56:21
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 95% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

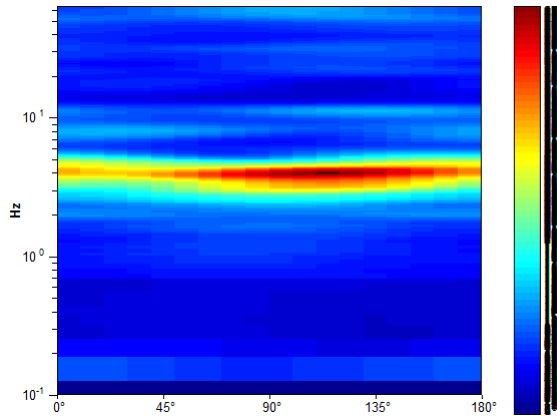
HORIZONTAL TO VERTICAL SPECTRAL RATIO



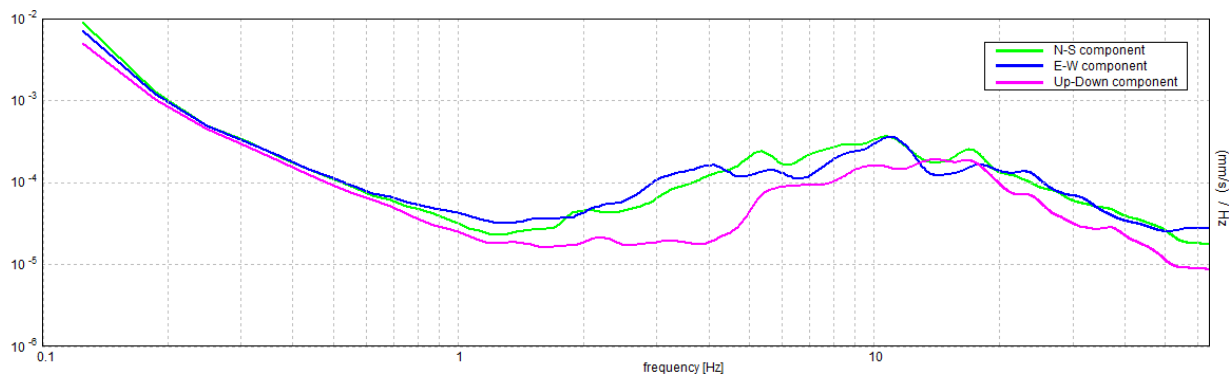
H/V TIME HISTORY



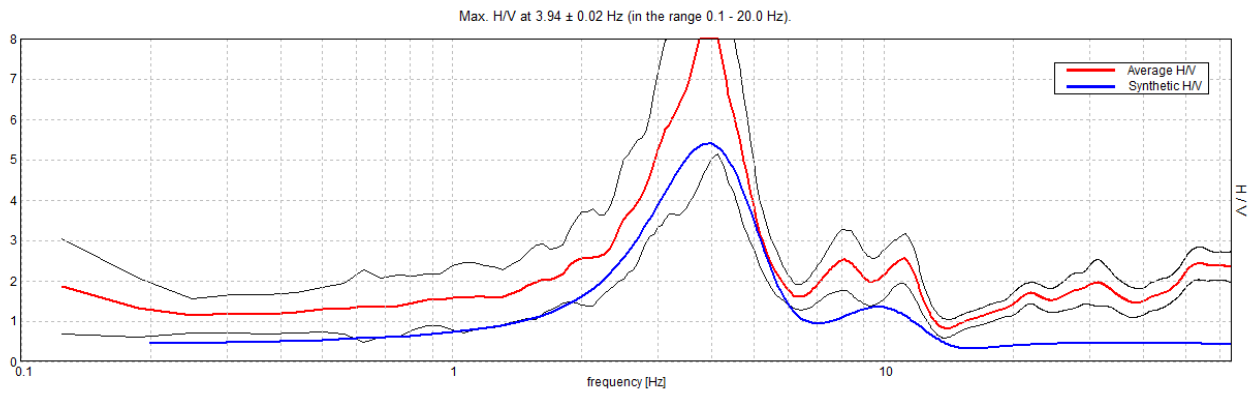
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

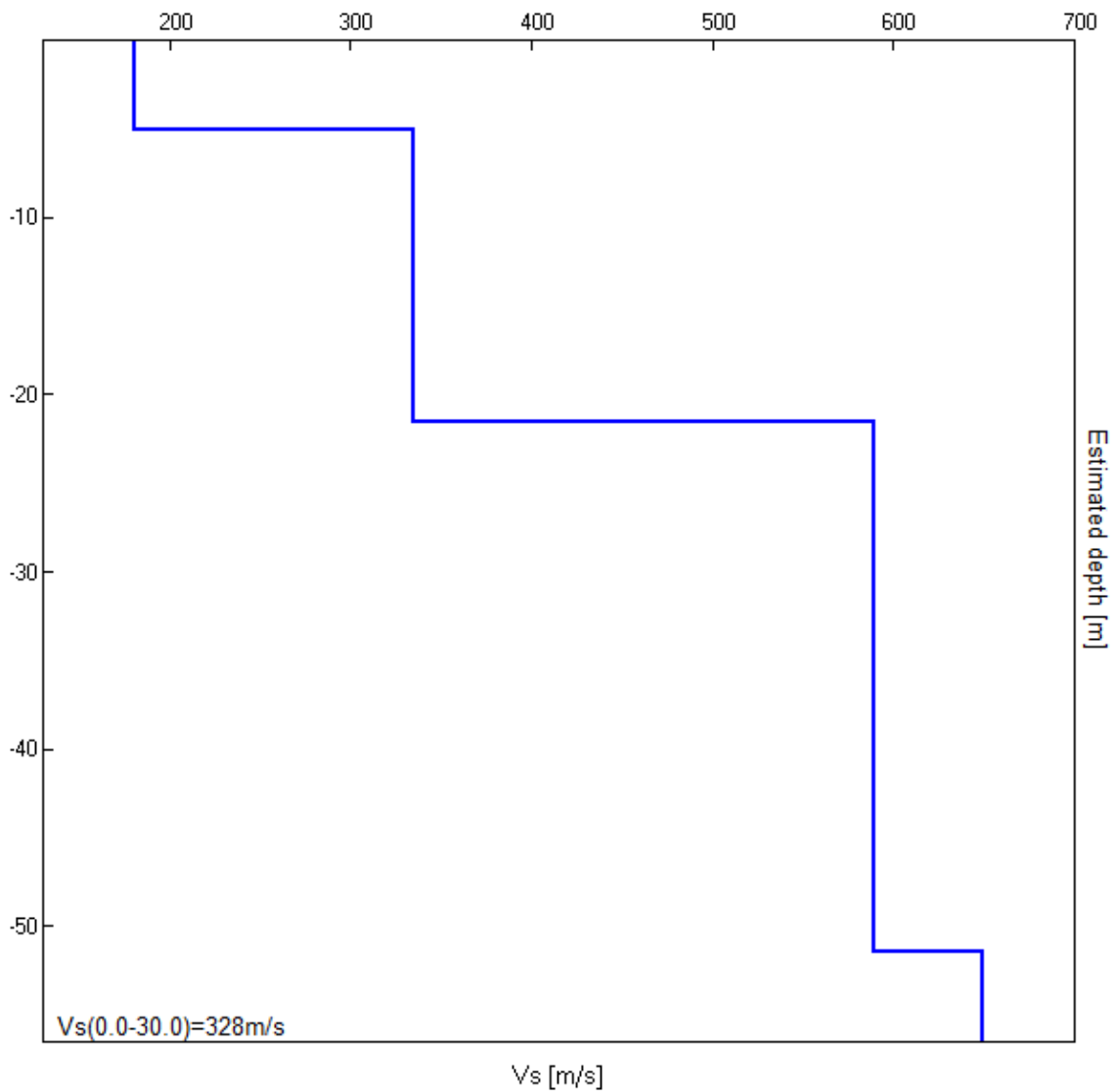


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
5.00	5.00	180
21.50	16.50	335
51.50	30.00	590
inf.	inf.	650

Vs(0.0-30.0)=328m/s



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

Max. H/V at 3.94 ± 0.02 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$3.94 > 0.63$	OK	
$n_c(f_0) > 200$	$3591.0 > 200$	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 22 out of 96 times		NO

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	2.75 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	4.938 Hz	OK	
$A_0 > 2$	$8.50 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00287 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.01129 < 0.19688$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$1.8046 < 1.58$		NO

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
σ_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 σ_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



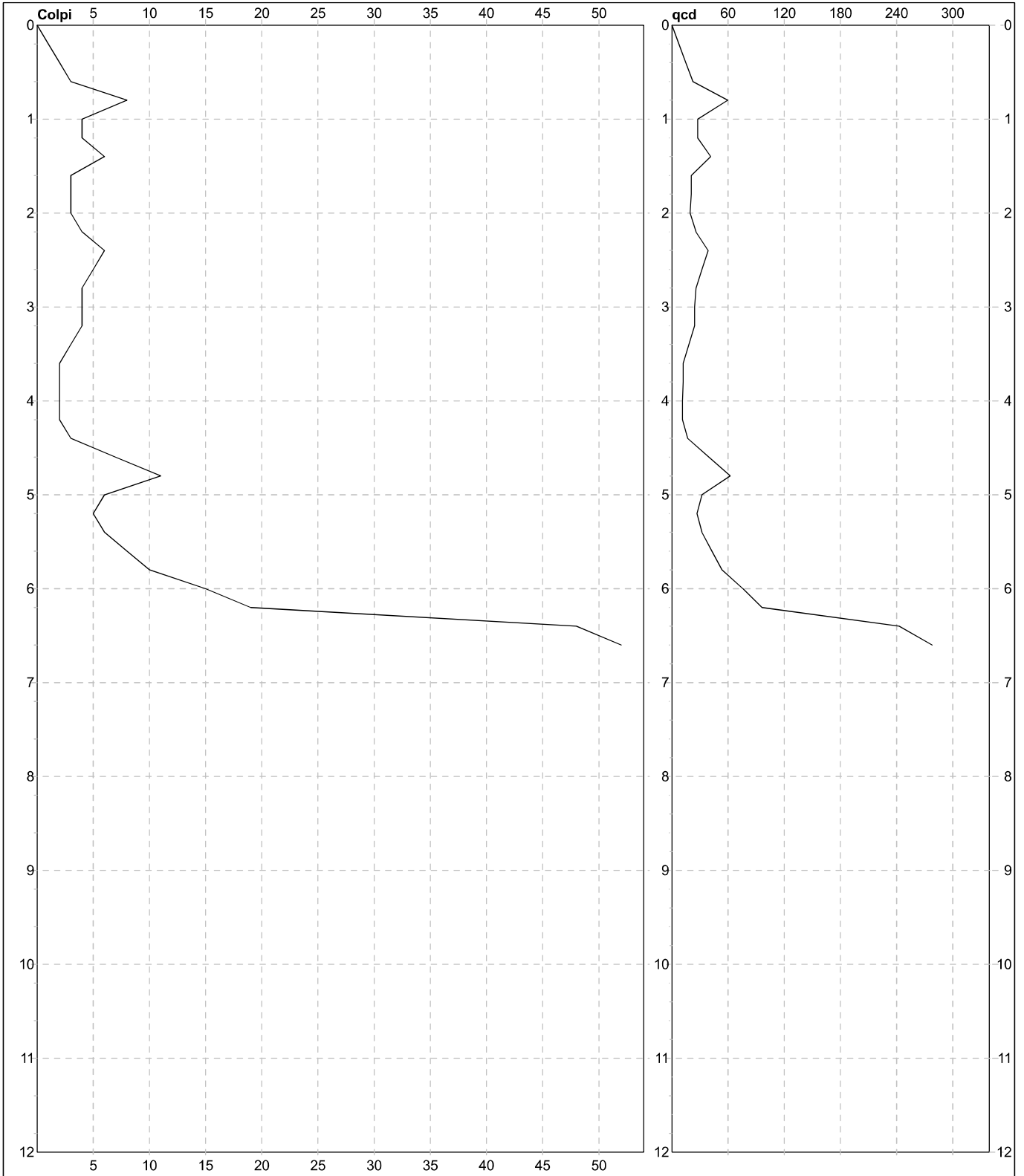
PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	14
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **loc. Il Bivio, ad.ze trattoria**

U.M.: **kg/cm²**
 Scala: **1:60**
 Pagina: **1**
 Elaborato:

Data esec.: **26/01/2019**
 Quota ass.:
 Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
 Massa battente: 63,50 m
 Altezza caduta: 0,75 m
 Avanzamento: 0,20 m

Responsabile:
 Assistente:

Preforo: m
 Corr.astine: kg/ml
 Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	14
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: loc.II Bivio, ad.ze trattoria	Elaborato:	Falda: Non rilevata

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45	15,20	1			
0,40	1	2		14,90	15,40	1			
0,60	2	3		22,35	15,60	2			
0,80	2	8		59,59	15,80	2			
1,00	2	4		27,62	16,00	2			
1,20	2	4		27,62	16,20	2			
1,40	2	6		41,43	16,40	2			
1,60	3	3		20,71	16,60	3			
1,80	3	3		20,71	16,80	3			
2,00	3	3		19,30	17,00	3			
2,20	3	4		25,74	17,20	3			
2,40	3	6		38,61	17,40	3			
2,60	4	5		32,17	17,60	4			
2,80	4	4		25,74	17,80	4			
3,00	4	4		24,10	18,00	4			
3,20	4	4		24,10	18,20	4			
3,40	4	3		18,07	18,40	4			
3,60	5	2		12,05	18,60	5			
3,80	5	2		12,05	18,80	5			
4,00	5	2		11,33	19,00	5			
4,20	5	2		11,33					
4,40	5	3		16,99					
4,60	6	7		39,64					
4,80	6	11		62,30					
5,00	6	6		32,06					
5,20	6	5		26,72					
5,40	6	6		32,06					
5,60	7	8		42,74					
5,80	7	10		53,43					
6,00	7	15		75,86					
6,20	7	19		96,09					
6,40	7	48		242,74					
6,60	8	55		278,14					
7,00	8								
7,20	8								
7,40	8								
7,60	9								
7,80	9								
8,00	9								
8,20	9								
8,40	9								
8,60	10								
8,80	10								
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13,80	15								
14,00	15								
14,20	15								
14,40	15								
14,60	16								
14,80	16								
15,00	16								

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR47 MOLINO NUOVO

Instrument: TRZ-0108/01-10

Start recording: 18/10/18 14:01:15 End recording: 18/10/18 14:17:16

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 82% trace (manual window selection)

Sampling rate: 128 Hz

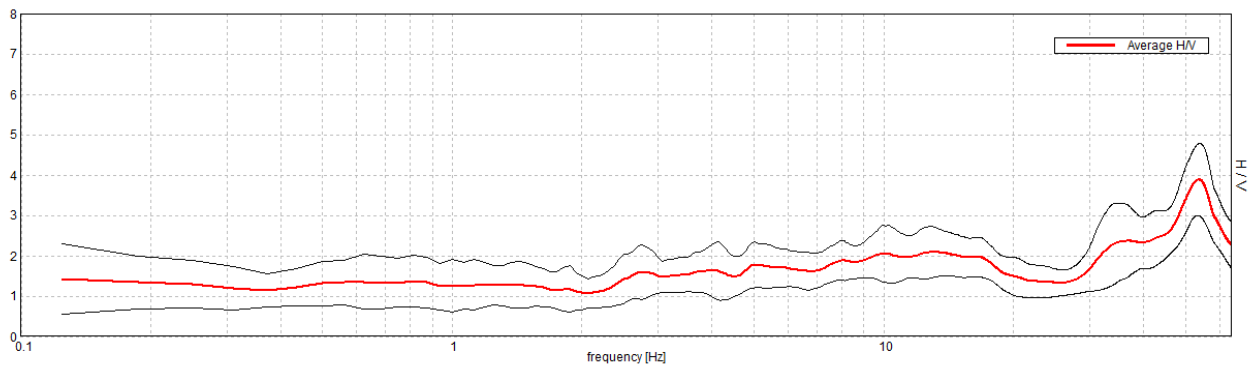
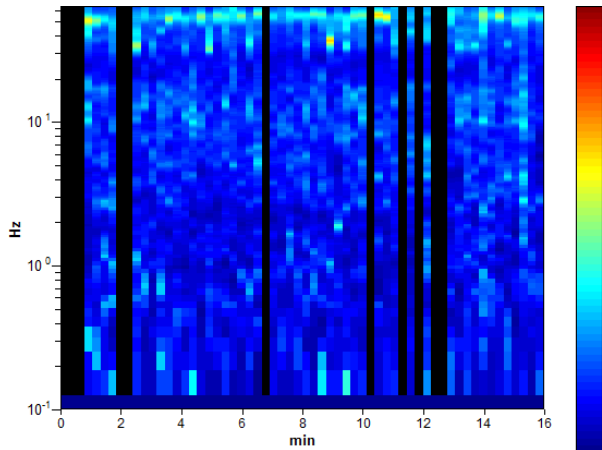
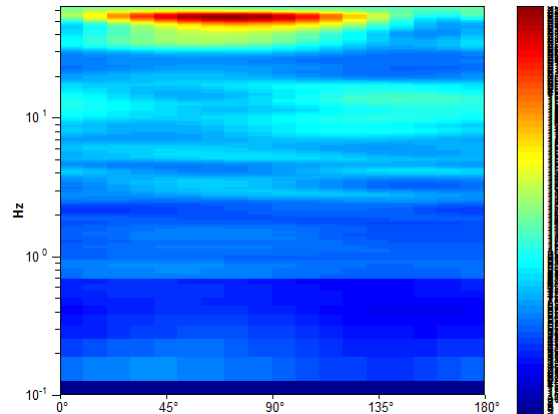
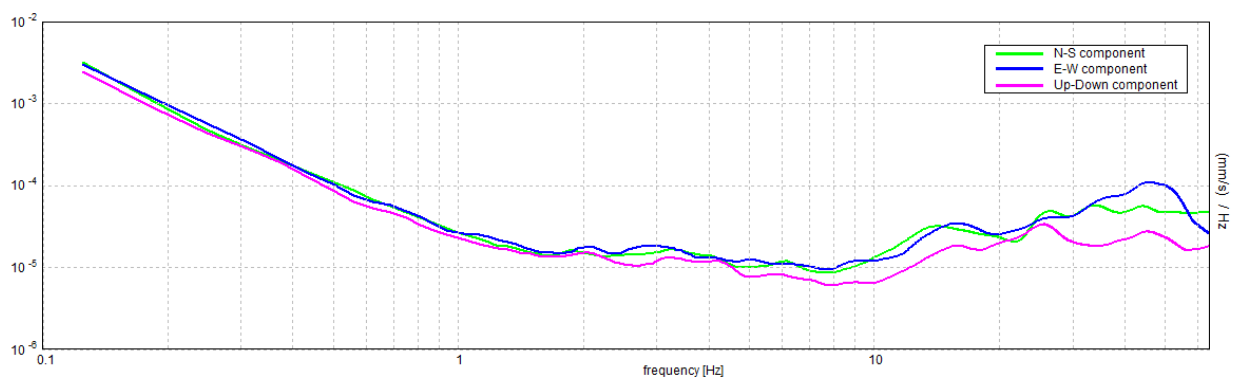
Window size: 16 s

Smoothing type: Triangular window

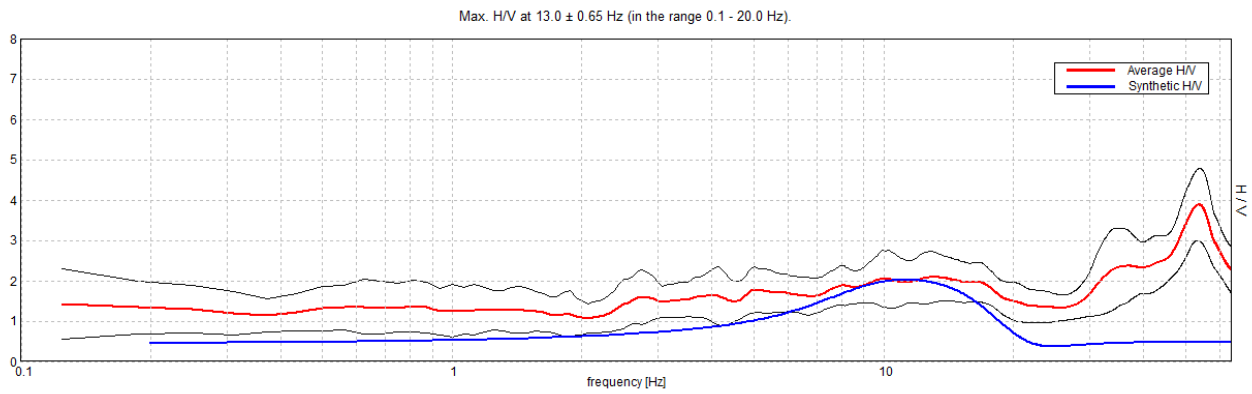
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 13.0 ± 0.65 Hz. (In the range 0.1 - 20.0 Hz).

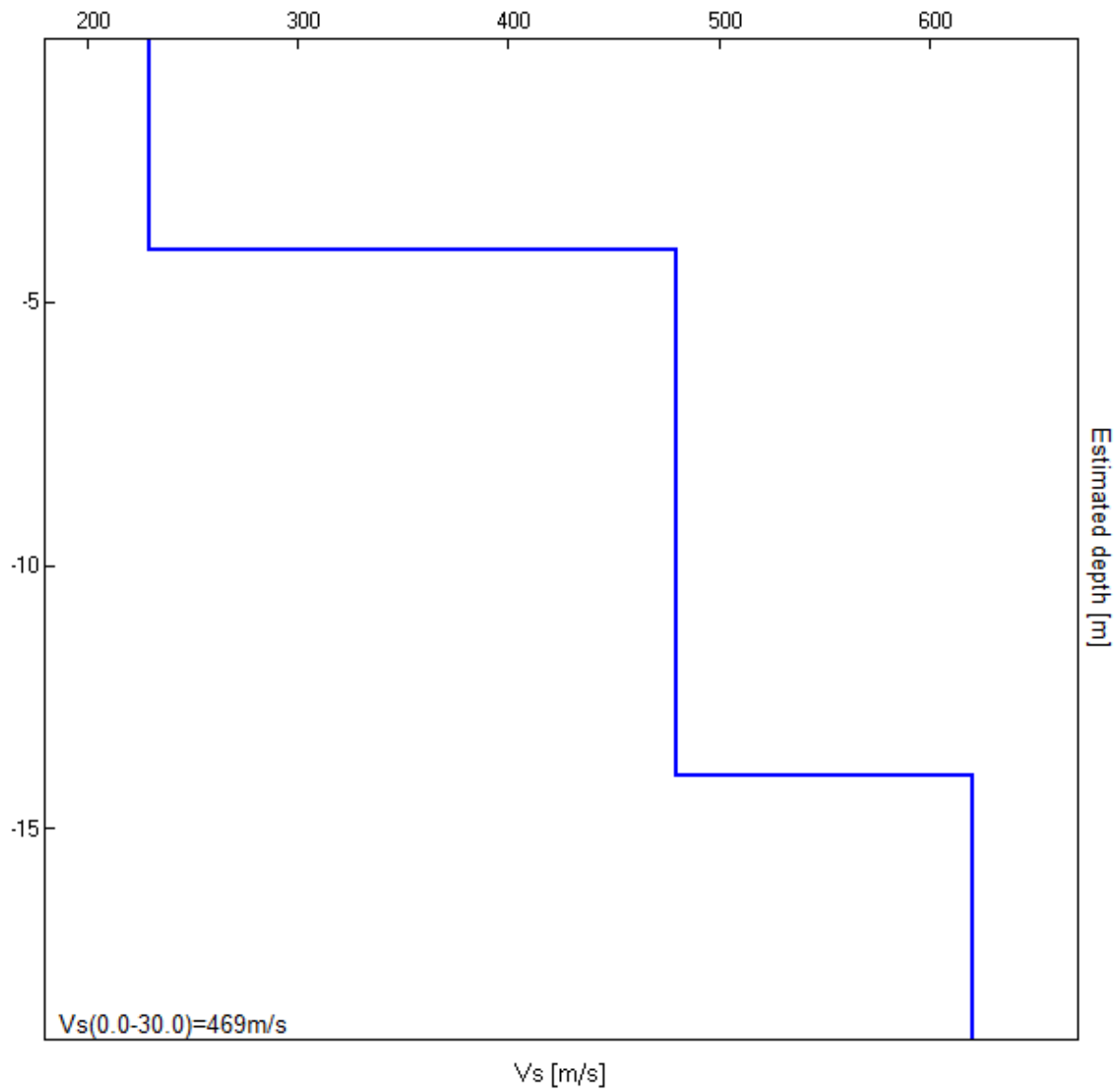
**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
4.00	4.00	230
14.00	10.00	480
inf.	inf.	620

Vs(0.0-30.0)=469m/s



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

Max. H/V at 13.0 ± 0.65 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$13.00 > 0.63$	OK	
$n_c(f_0) > 200$	$10192.0 > 200$	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 313 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
$A_0 > 2$	$2.09 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.0248 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.32235 < 0.65$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.3117 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

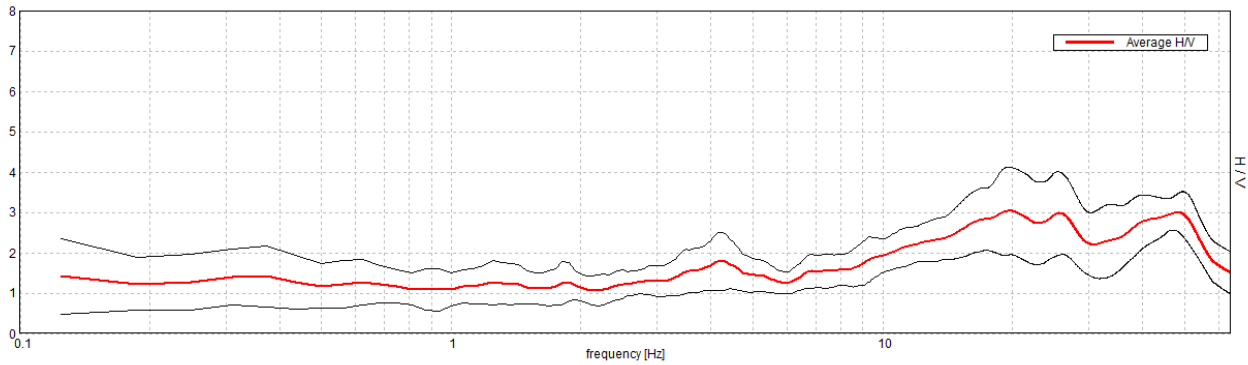
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR48 SAN MARTINO

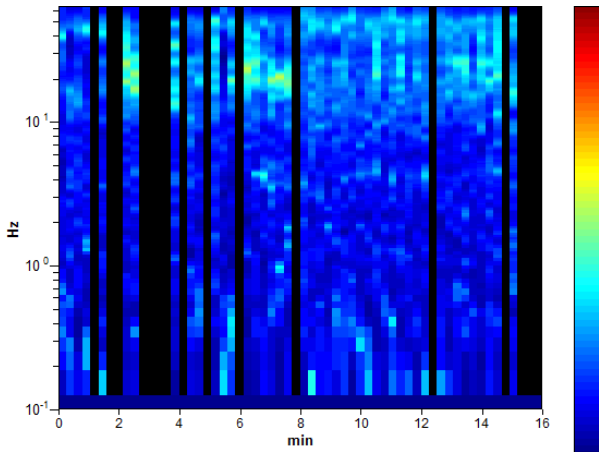
Instrument: TRZ-0108/01-10
Start recording: 18/10/18 14:25:51 End recording: 18/10/18 14:41:52
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 73% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

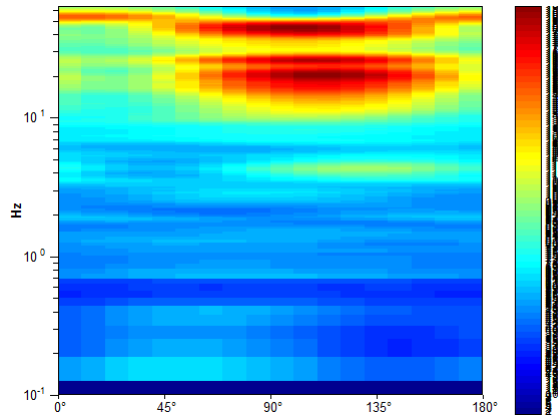
Max. H/V at 19.75 ± 1.03 Hz. (In the range 0.1 - 20.0 Hz).



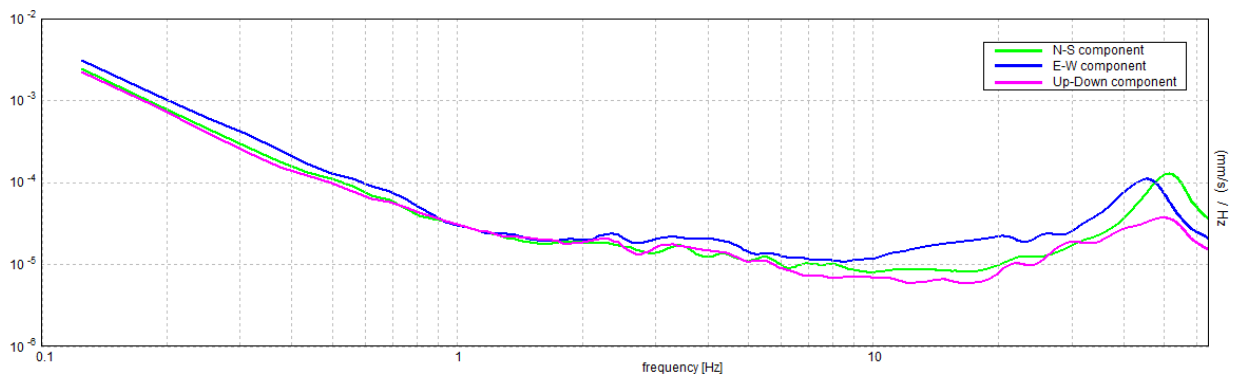
H/V TIME HISTORY



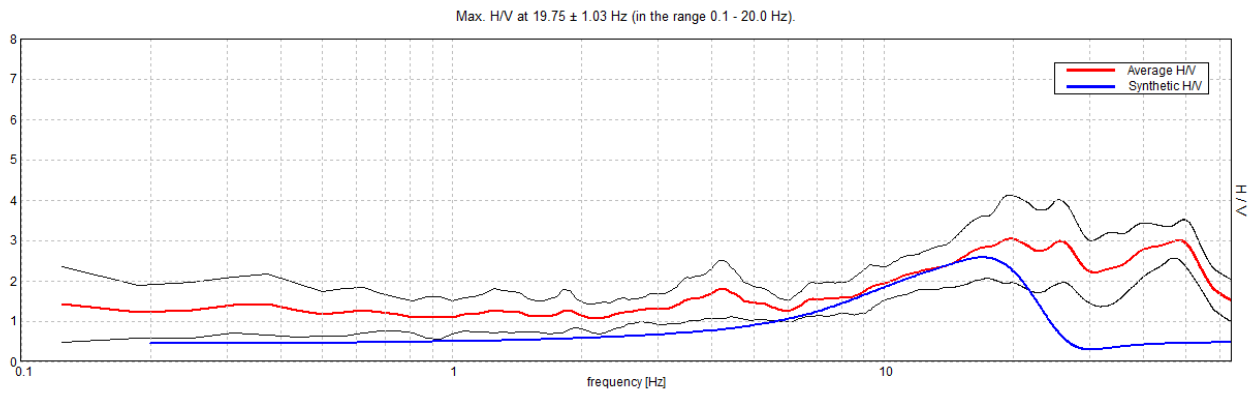
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

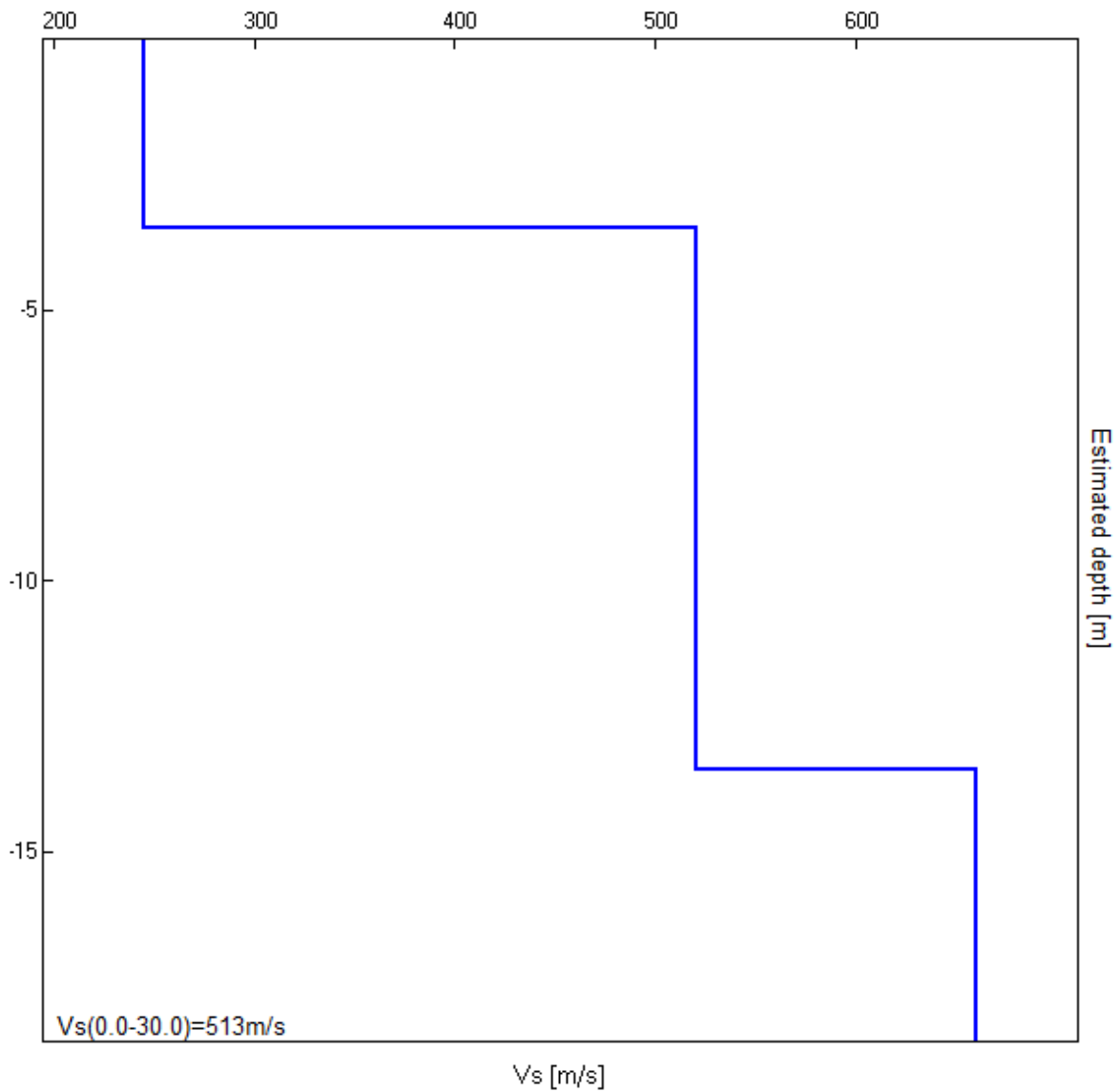


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
3.50	3.50	245
13.50	10.00	520
inf.	inf.	660

Vs(0.0-30.0)=513m/s



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

Max. H/V at 19.75 ± 1.03 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	19.75 > 0.63	OK	
$n_c(f_0) > 200$	13904.0 > 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 475 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	6.688 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	63.563 Hz	OK	
$A_0 > 2$	3.04 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.02545 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.50273 < 0.9875$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.5316 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

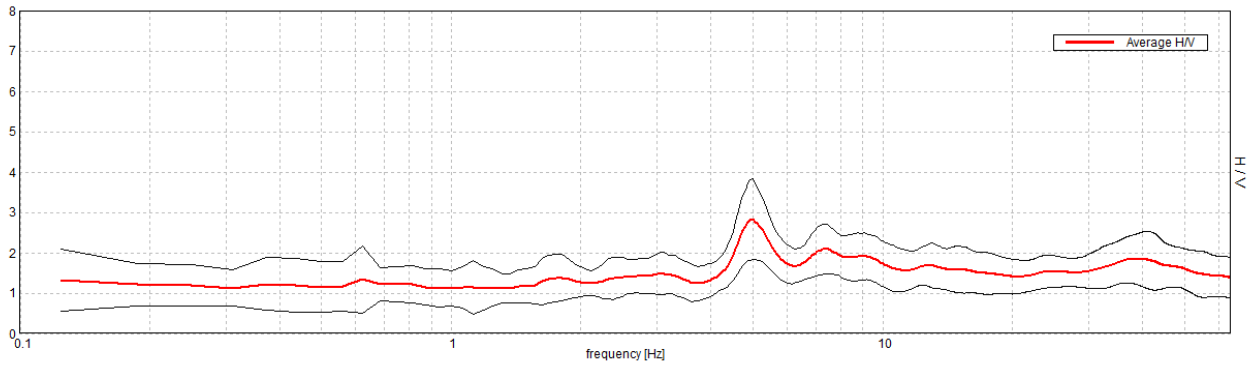
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR63 SANT'ANDREA

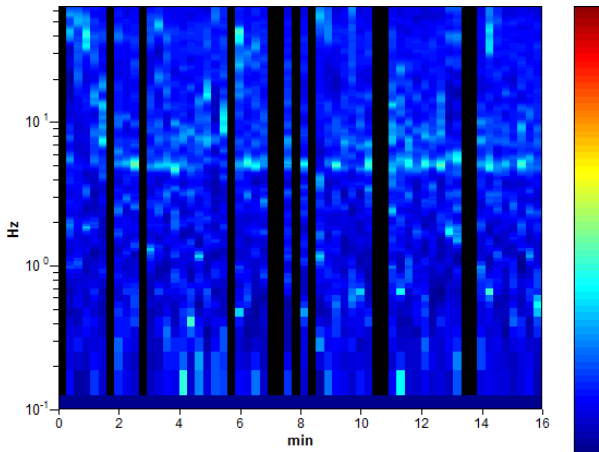
Instrument: TRZ-0108/01-10
Start recording: 25/10/18 13:59:15 End recording: 25/10/18 14:15:16
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

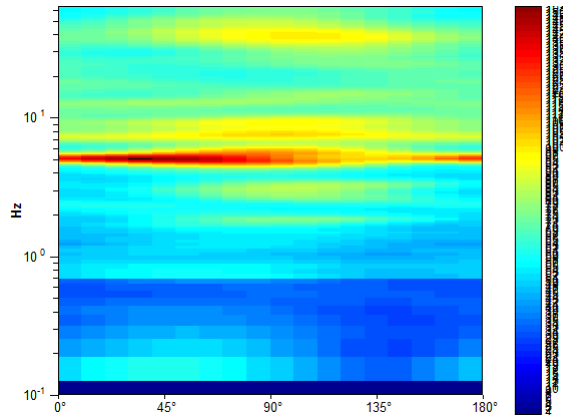
Max. H/V at 5.0 ± 0.22 Hz. (In the range 0.1 - 20.0 Hz).



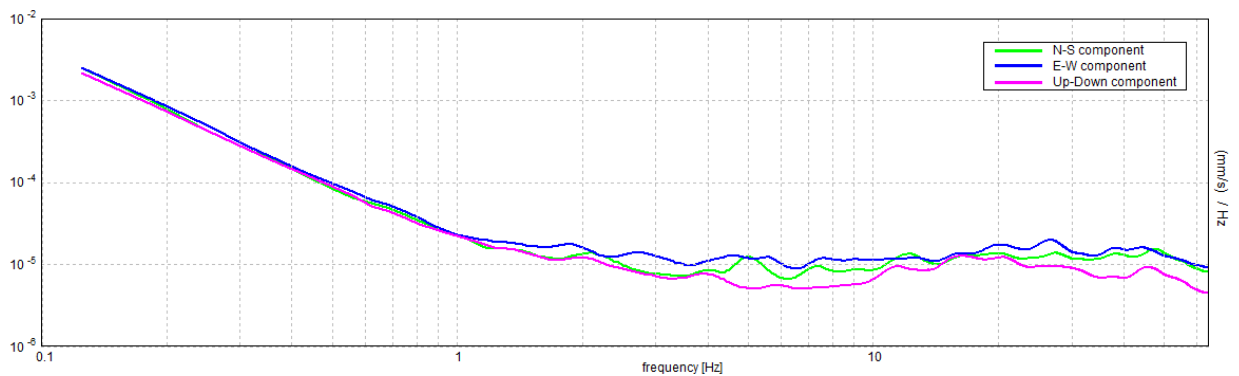
H/V TIME HISTORY



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 5.0 ± 0.22 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$5.00 > 0.63$	OK	
$n_c(f_0) > 200$	$3840.0 > 200$	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 121 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	4.125 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	19.75 Hz	OK	
$A_0 > 2$	$2.83 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.02165 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.10827 < 0.25$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.493 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

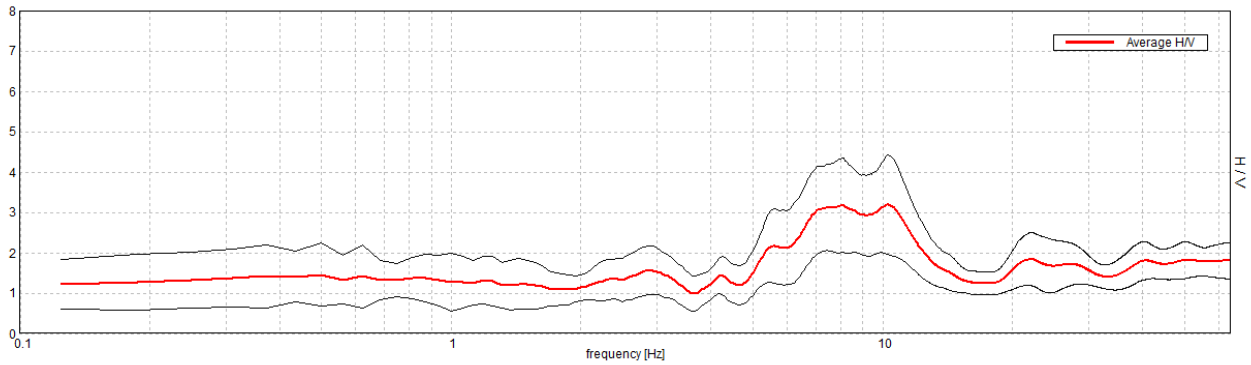
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR64 SANT'ANDREA

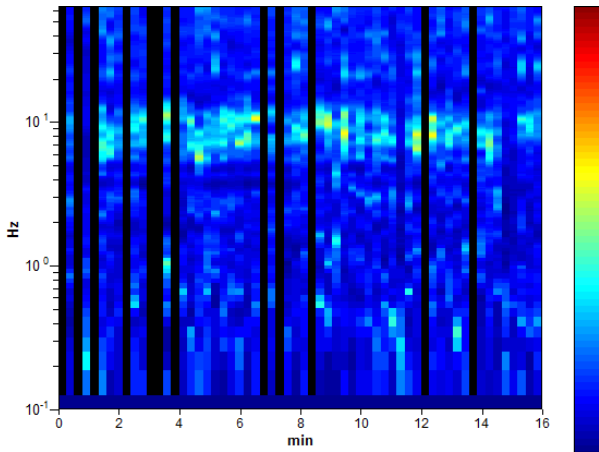
Instrument: TRZ-0108/01-10
 Start recording: 25/10/18 14:20:44 End recording: 25/10/18 14:36:45
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 80% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

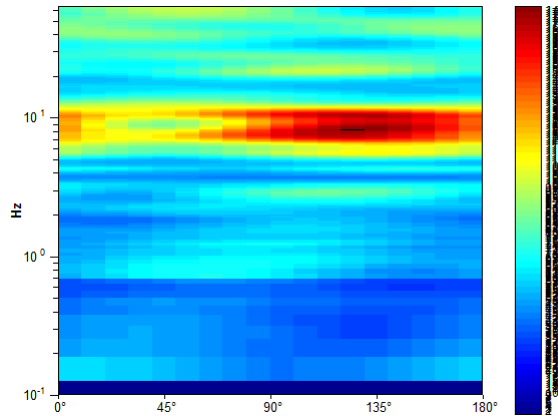
Max. H/V at 10.25 ± 0.62 Hz. (In the range 0.1 - 20.0 Hz).



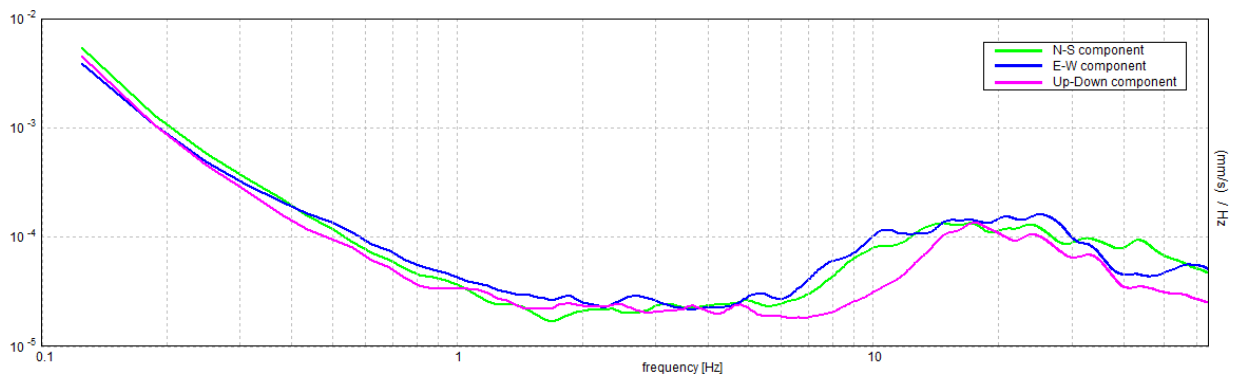
H/V TIME HISTORY



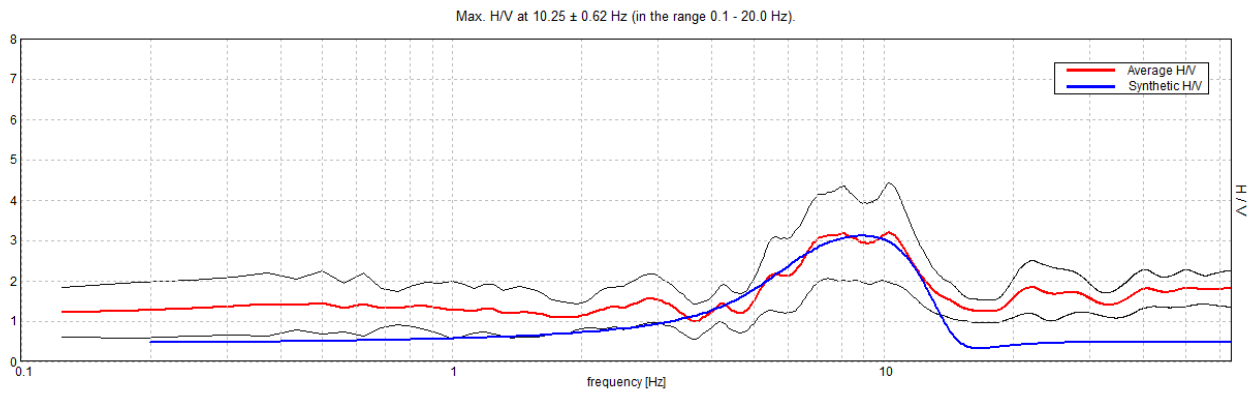
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

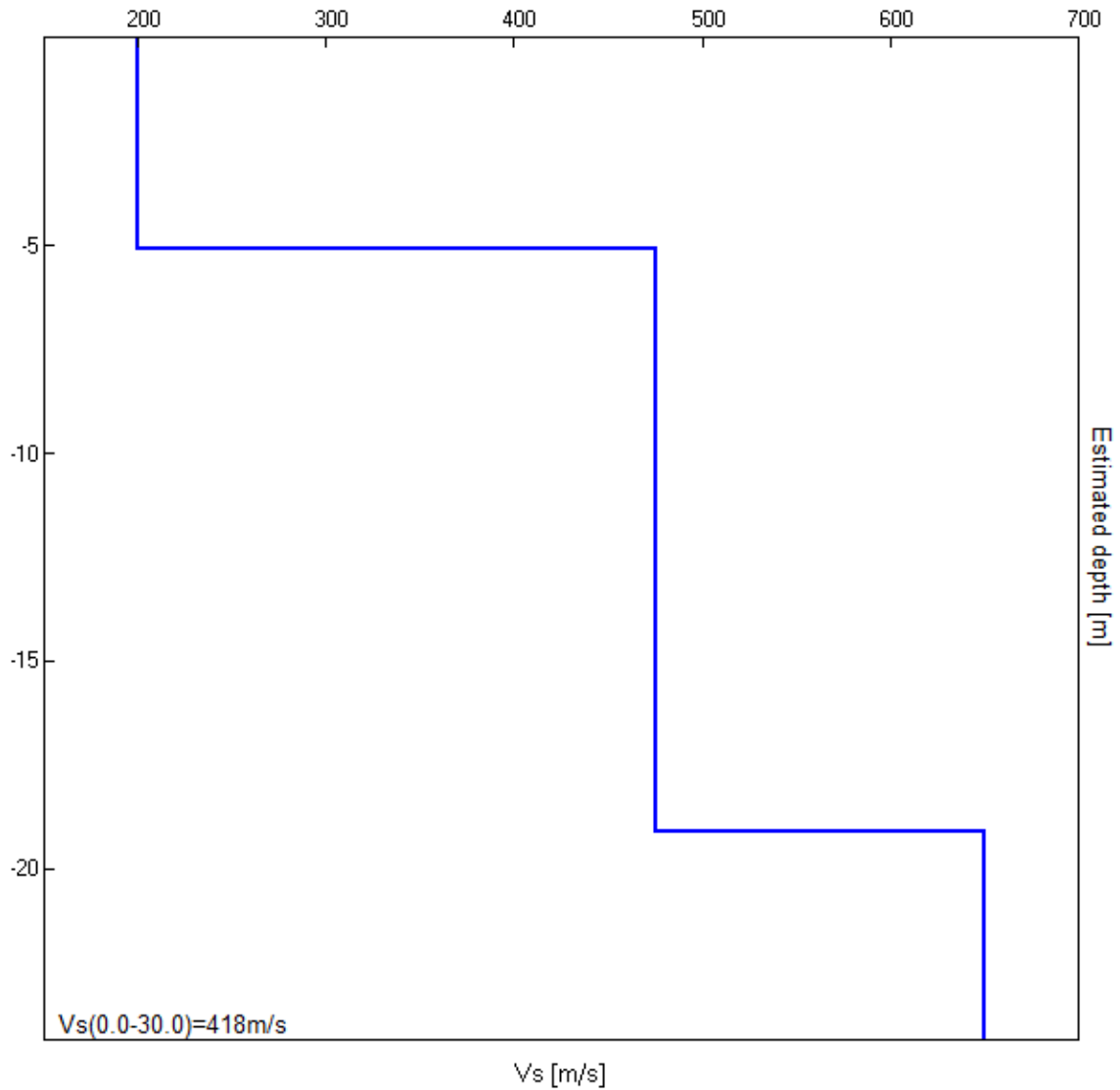


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
5.10	5.10	200
19.10	14.00	475
inf.	inf.	650

Vs(0.0-30.0)=418m/s



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

Max. H/V at 10.25 ± 0.62 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	10.25 > 0.63	OK	
$n_c(f_0) > 200$	7872.0 > 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 247 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	5.063 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	13.75 Hz	OK	
$A_0 > 2$	3.19 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.02969 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.30429 < 0.5125$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.6019 < 1.58$	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
σ_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 σ_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



PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

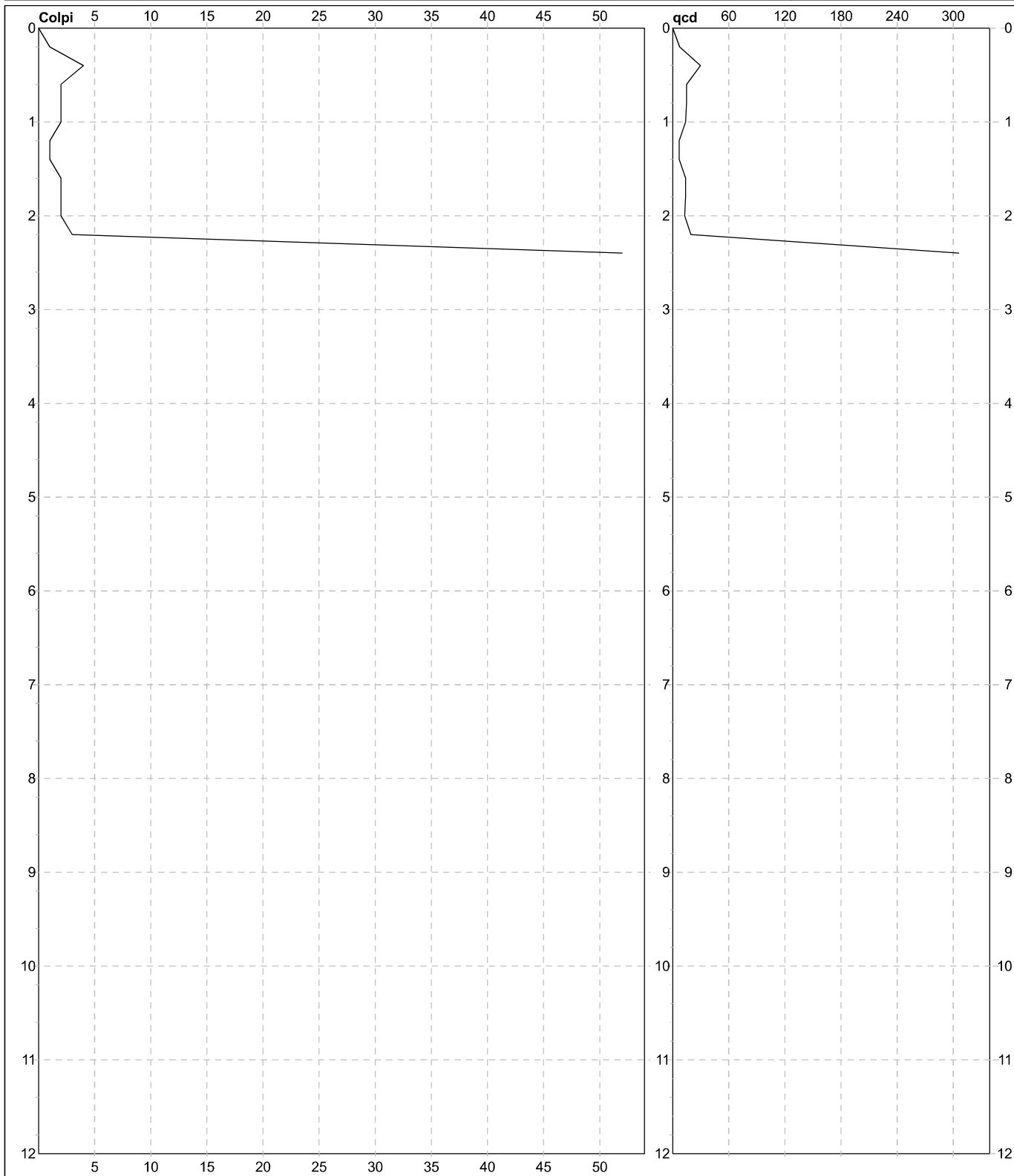
DIN	13
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
Cantiere: **Studio di MS comunale livello 2**
Località: **Sant'Andrea chiesa**

U.M.: **kg/cm²**
Scala: **1:60**
Pagina: **1**
Elaborato:

Data eseg.: **26/01/2019**
Quota ass.:

Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
Massa battente: 63,50 m
Altezza caduta: 0,75 m
Avanzamento: 0,20 m

Responsabile:
Assistente:

Preforo: m
Corr.astine: kg/ml
Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	13
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: Sant' Andrea chiesa	Elaborato:	Falda: Non rilevata

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45					
0,40	1	4		29,80					
0,60	2	2		14,90					
0,80	2	2		14,90					
1,00	2	2		13,81					
1,20	2	1		6,90					
1,40	2	1		6,90					
1,60	3	2		13,81					
1,80	3	2		13,81					
2,00	3	2		12,87					
2,20	3	3		19,30					
2,40	3	63		405,37					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

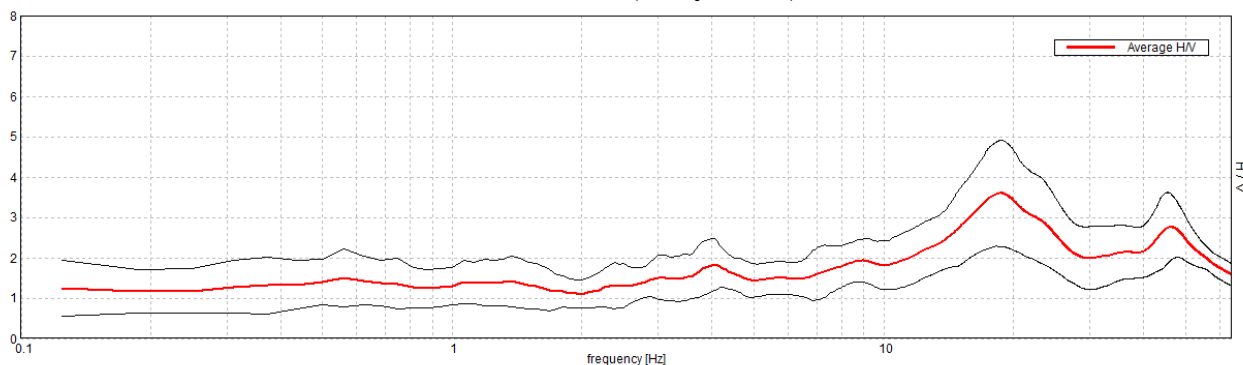
qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR49 SAN BENEDETTO VAL DI S

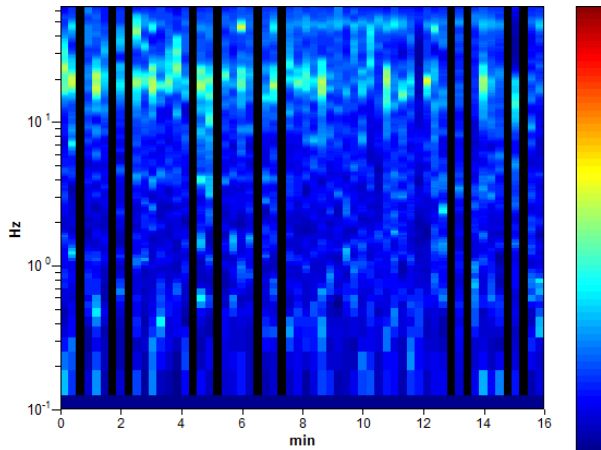
Instrument: TRZ-0108/01-10
Start recording: 18/10/18 14:51:24 End recording: 18/10/18 15:07:25
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 82% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

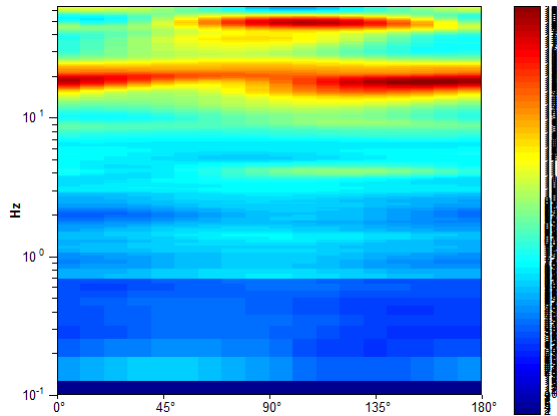
Max. H/V at 18.75 ± 0.15 Hz. (In the range 0.1 - 20.0 Hz).



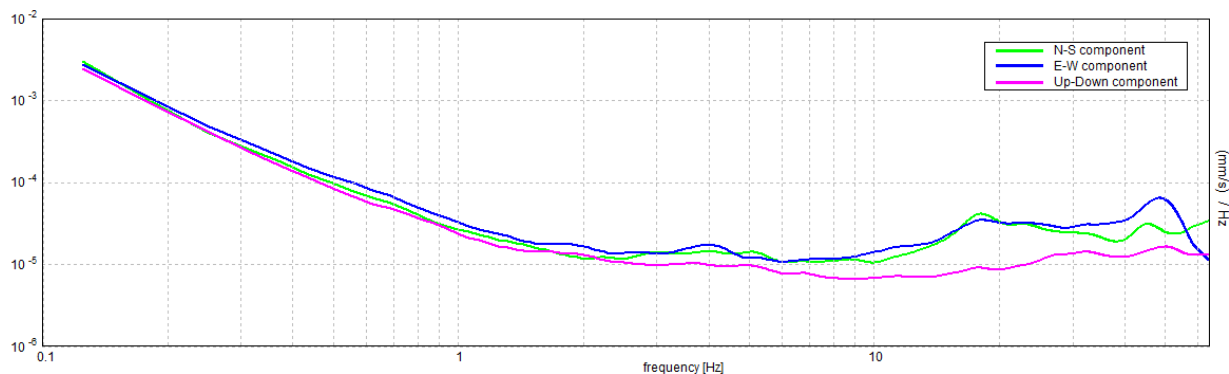
H/V TIME HISTORY



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 18.75 ± 0.15 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	18.75 > 0.63	OK	
$n_c(f_0) > 200$	14700.0 > 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 451 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	8.0 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	58.875 Hz	OK	
$A_0 > 2$	3.60 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00382 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.07155 < 0.9375$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.6518 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

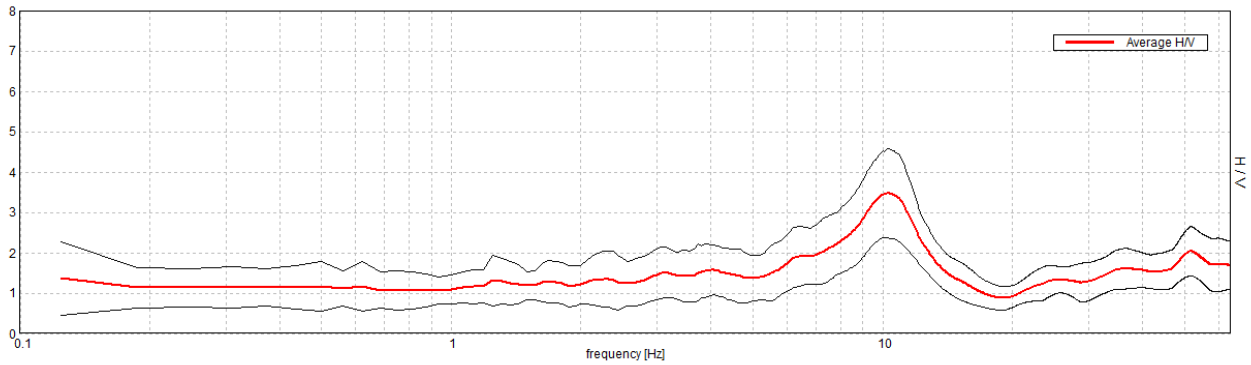
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR50 SAN BENEDETTO VAL DI S

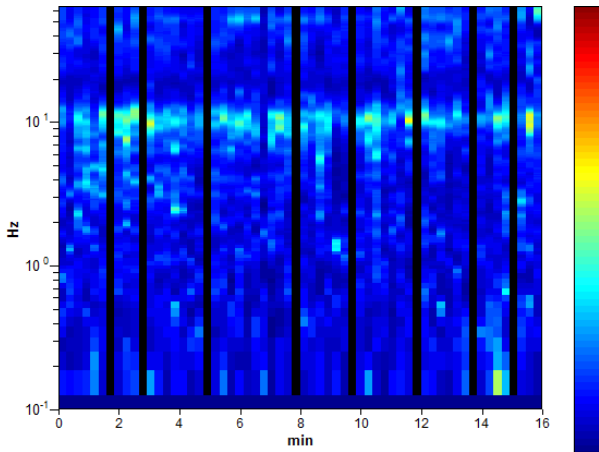
Instrument: TRZ-0108/01-10
 Start recording: 18/10/18 15:17:37 End recording: 18/10/18 15:33:38
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 87% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

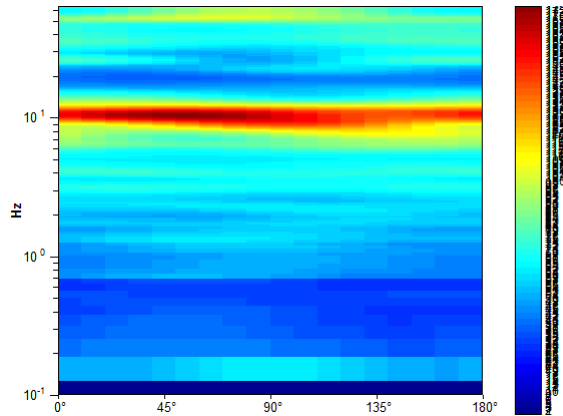
Max. H/V at 10.31 ± 0.11 Hz. (In the range 0.1 - 20.0 Hz).



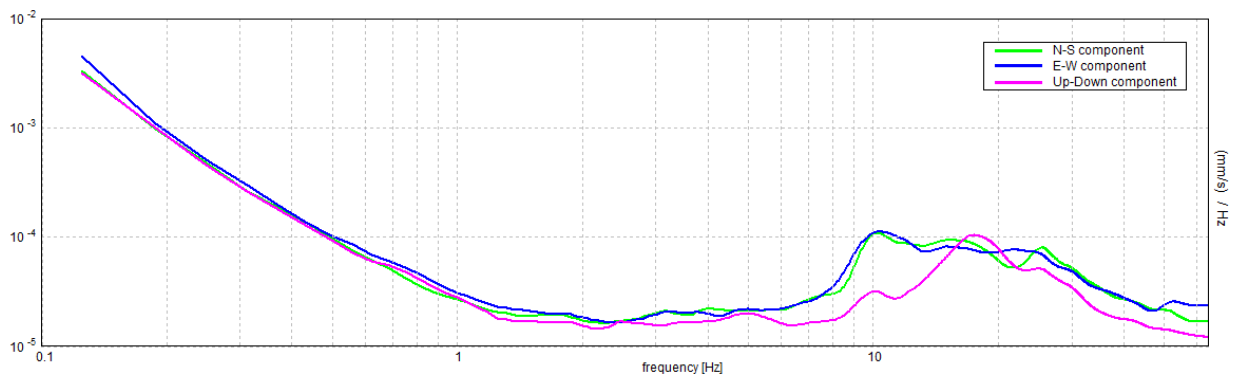
H/V TIME HISTORY



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 10.31 ± 0.11 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	10.31 > 0.63	OK	
$n_c(f_0) > 200$	8580.0 > 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 248 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	5.938 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	13.438 Hz	OK	
$A_0 > 2$	3.47 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00513 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.05293 < 0.51563$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.5478 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR54 SAN BENEDETTO VAL DI S

Instrument: TRZ-0108/01-10

Start recording: 18/10/18 16:53:15 End recording: 18/10/18 17:09:16

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 90% trace (manual window selection)

Sampling rate: 128 Hz

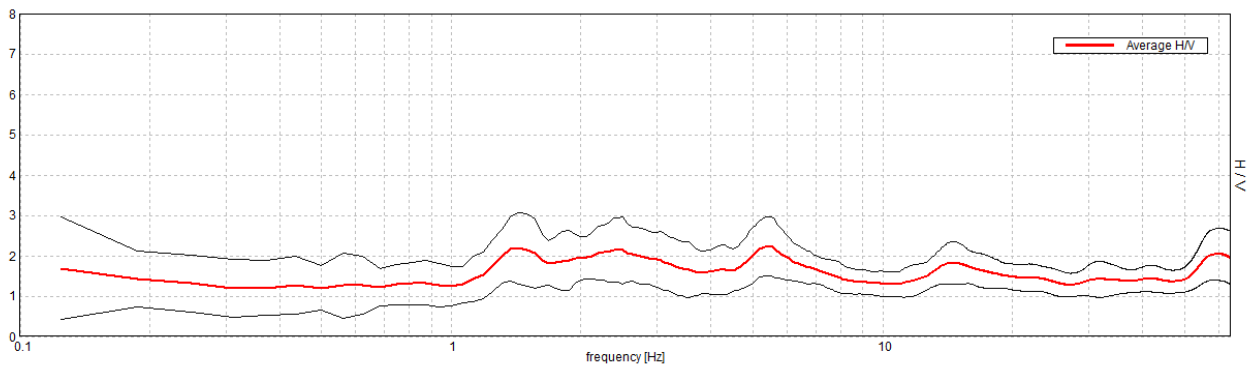
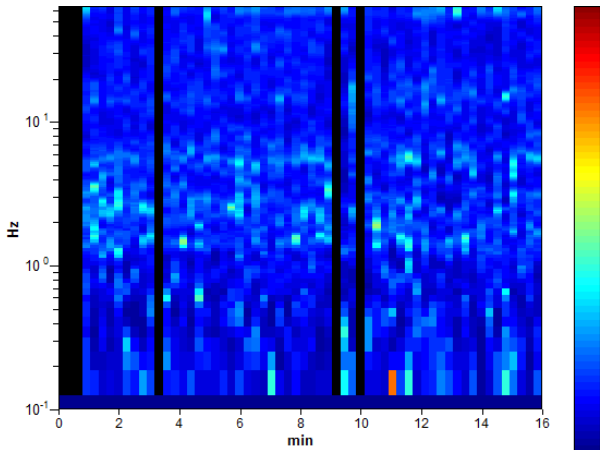
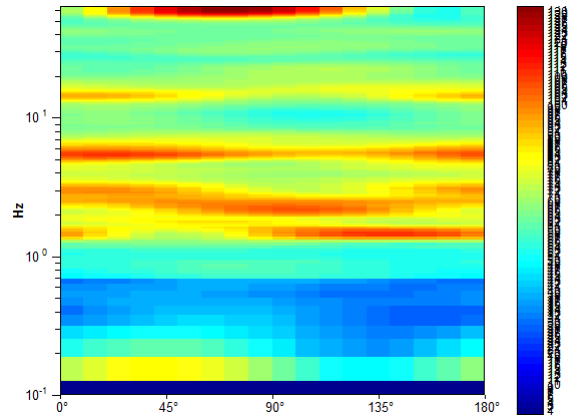
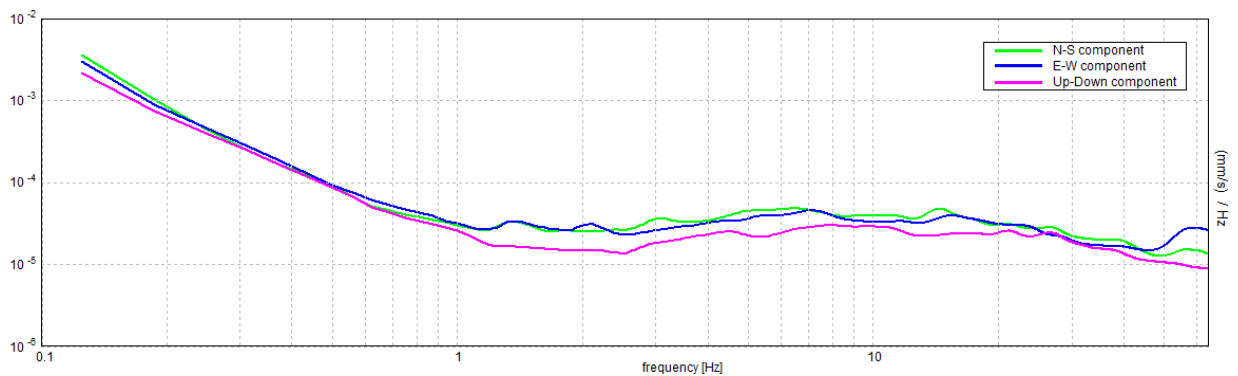
Window size: 16 s

Smoothing type: Triangular window

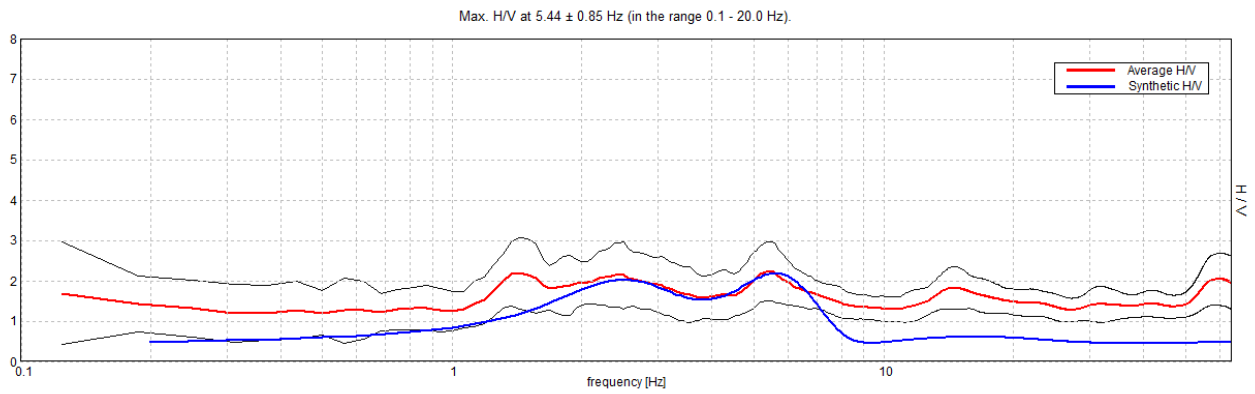
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 5.44 ± 0.85 Hz. (In the range 0.1 - 20.0 Hz).

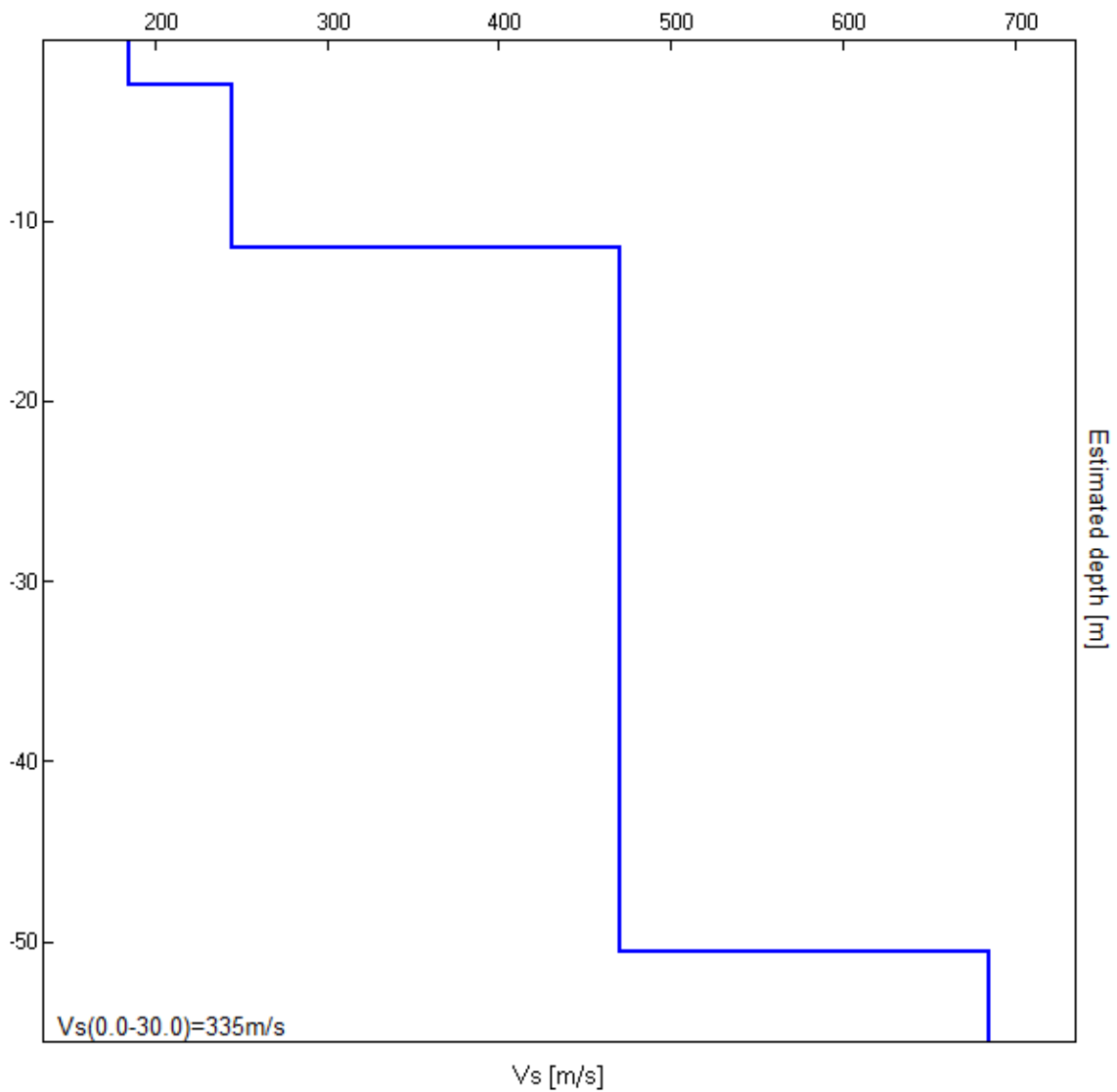
**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
2.50	2.50	185
11.50	9.00	245
50.50	39.00	470
inf.	inf.	685

Vs(0.0-30.0)=335m/s



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

Max. H/V at 5.44 ± 0.85 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	5.44 > 0.63	OK	
$n_c(f_0) > 200$	4698.0 > 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 132 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
$A_0 > 2$	2.23 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.07701 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	0.41874 < 0.27188		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3628 < 1.58	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR53 SAN BENEDETTO VAL DI S

Instrument: TRZ-0108/01-10

Start recording: 18/10/18 16:31:20 End recording: 18/10/18 16:47:21

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

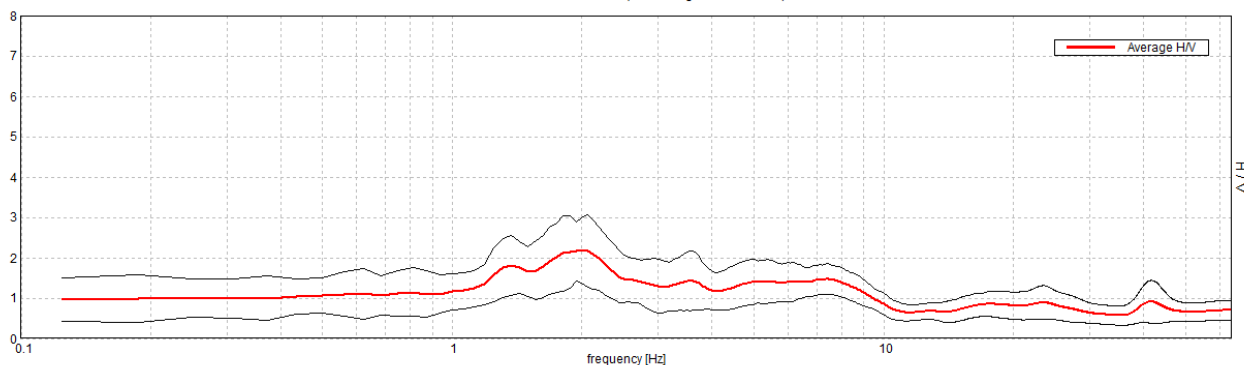
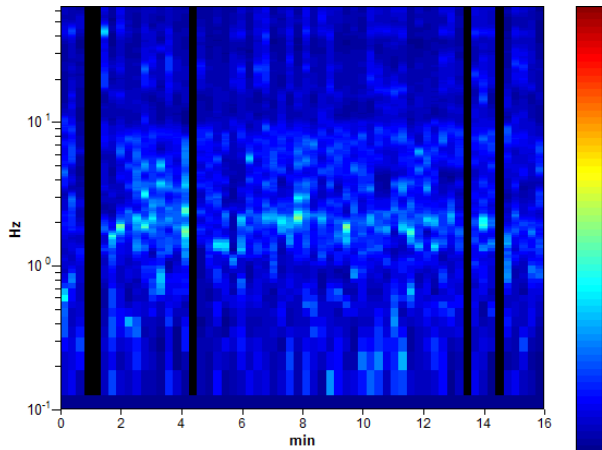
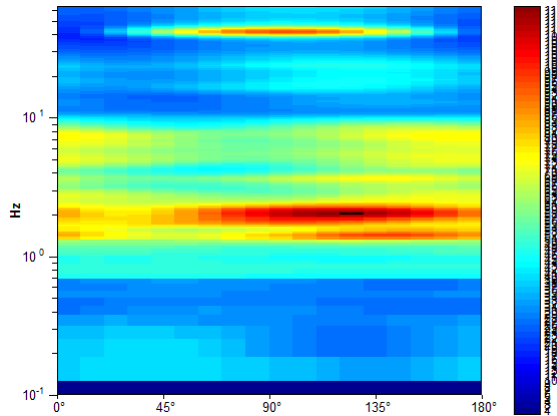
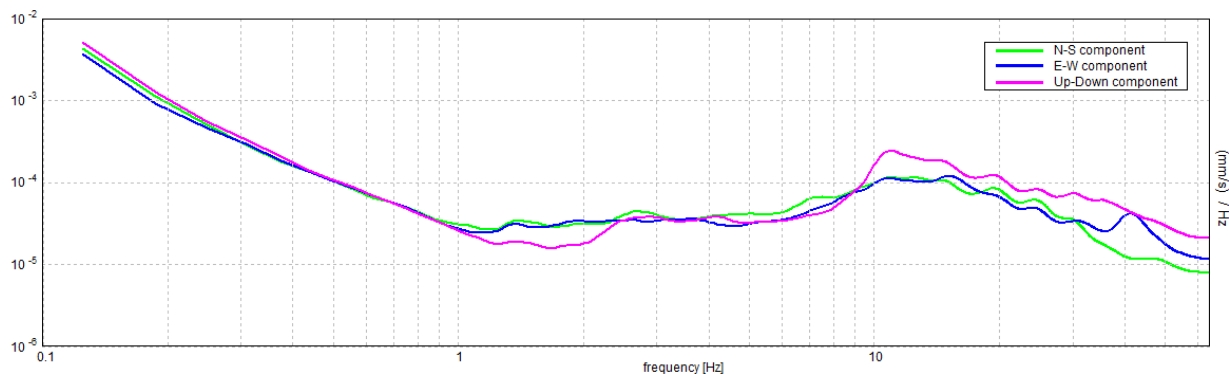
Trace length: 0h16'00". Analyzed 92% trace (manual window selection)

Sampling rate: 128 Hz

Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIOMax. H/V at 2.0 ± 0.11 Hz. (In the range 0.1 - 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 2.0 ± 0.11 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$2.00 > 0.63$	OK	
$n_c(f_0) > 200$	$1760.0 > 200$	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 49 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.688 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$2.18 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.0273 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.05459 < 0.1$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.4002 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

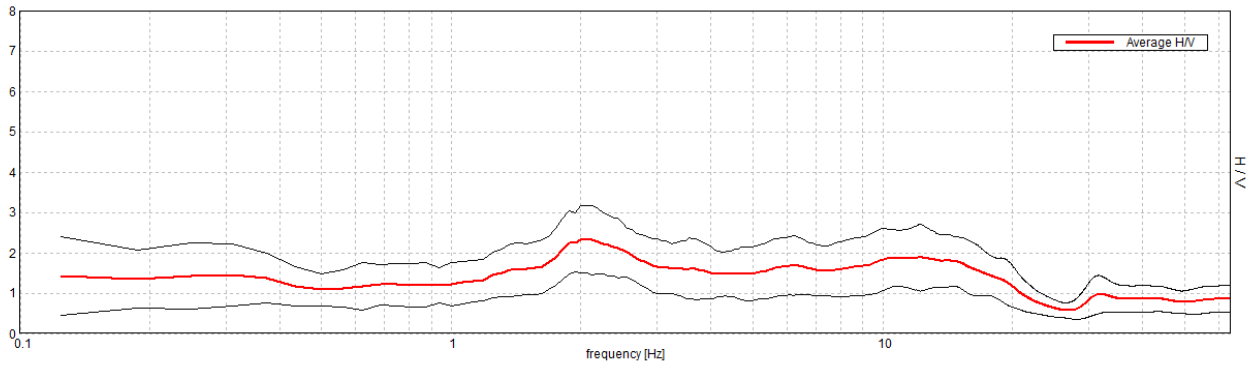
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR52 I MUSOLESI

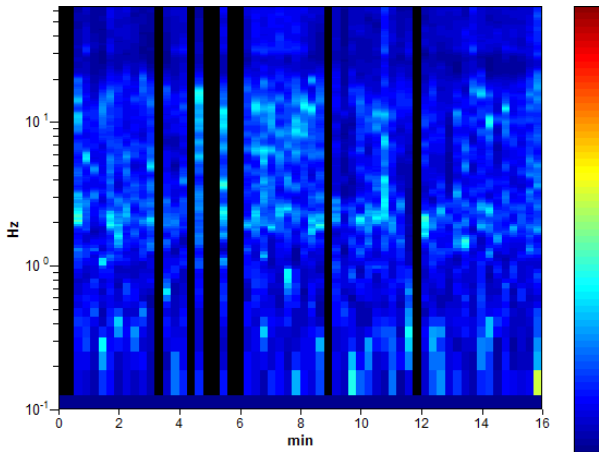
Instrument: TRZ-0108/01-10
Start recording: 18/10/18 16:08:13 End recording: 18/10/18 16:24:14
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 83% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

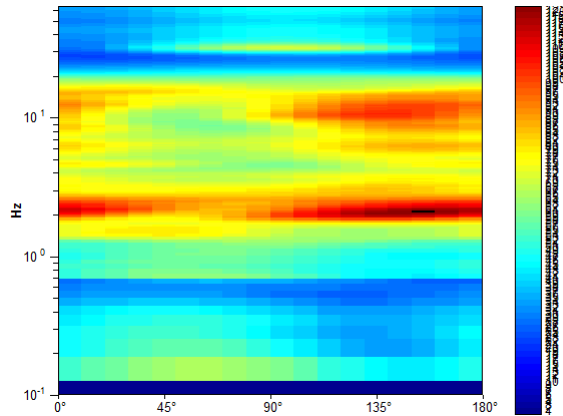
Max. H/V at 2.06 ± 0.02 Hz. (In the range 0.1 - 20.0 Hz).



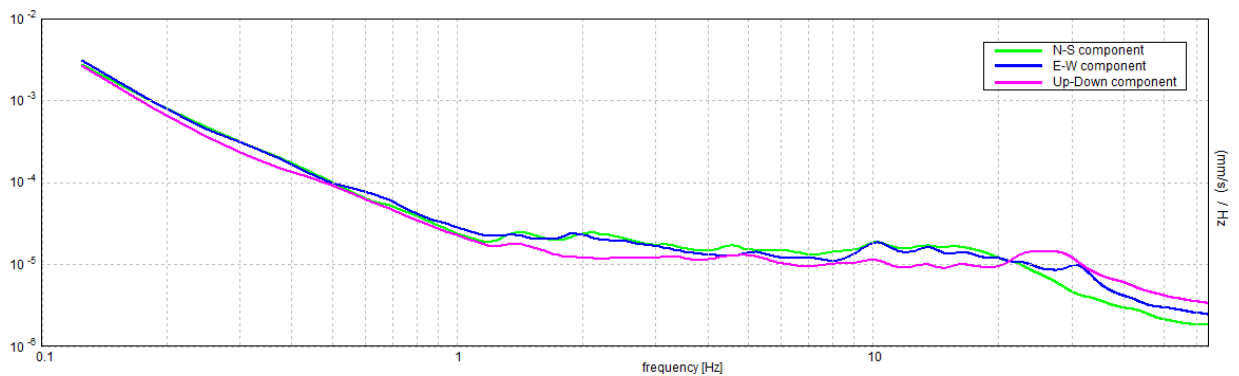
H/V TIME HISTORY



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 2.06 ± 0.02 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.06 > 0.63	OK	
$n_c(f_0) > 200$	1650.0 > 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 50 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.563 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.33 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00364 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	0.0075 < 0.10313	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4163 < 1.58	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
σ_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 σ_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

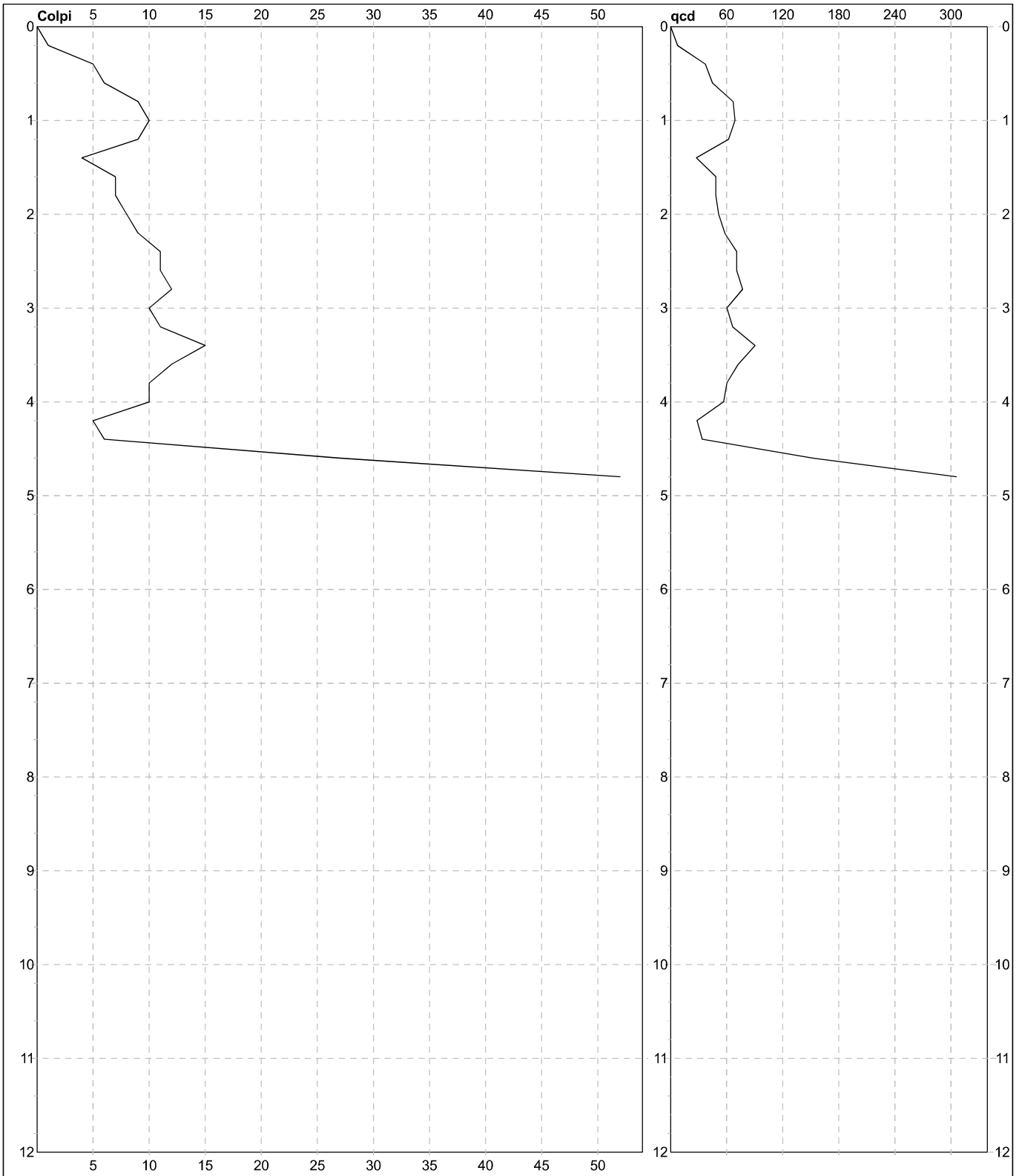


PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	10
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **San Benedetto Val di Sambro**

U.M.: **kg/cm²** Data eseg.: 26/01/2019
 Scala: 1:60 Quota ass.:
 Pagina: 1
 Elaborato: Falda:



Penetrometro: DPSH (S. Heavy)
 Massa battente: 63,50 m
 Altezza caduta: 0,75 m
 Avanzamento: 0,20 m

Responsabile:
Assistente:

Preforo: m
 Corr.astine: kg/ml
 Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	10
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: San Benedetto Val di Sambro	Elaborato:	Falda:

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45					
0,40	1	5		37,24					
0,60	2	6		44,69					
0,80	2	9		67,04					
1,00	2	10		69,05					
1,20	2	9		62,14					
1,40	2	4		27,62					
1,60	3	7		48,33					
1,80	3	7		48,33					
2,00	3	8		51,48					
2,20	3	9		57,91					
2,40	3	11		70,78					
2,60	4	11		70,78					
2,80	4	12		77,21					
3,00	4	10		60,24					
3,20	4	11		66,27					
3,40	4	15		90,36					
3,60	5	12		72,29					
3,80	5	10		60,24					
4,00	5	10		56,63					
4,20	5	5		28,32					
4,40	5	6		33,98					
4,60	6	27		152,91					
4,80	6	65		368,11					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta
Asta = numero di asta impiegata

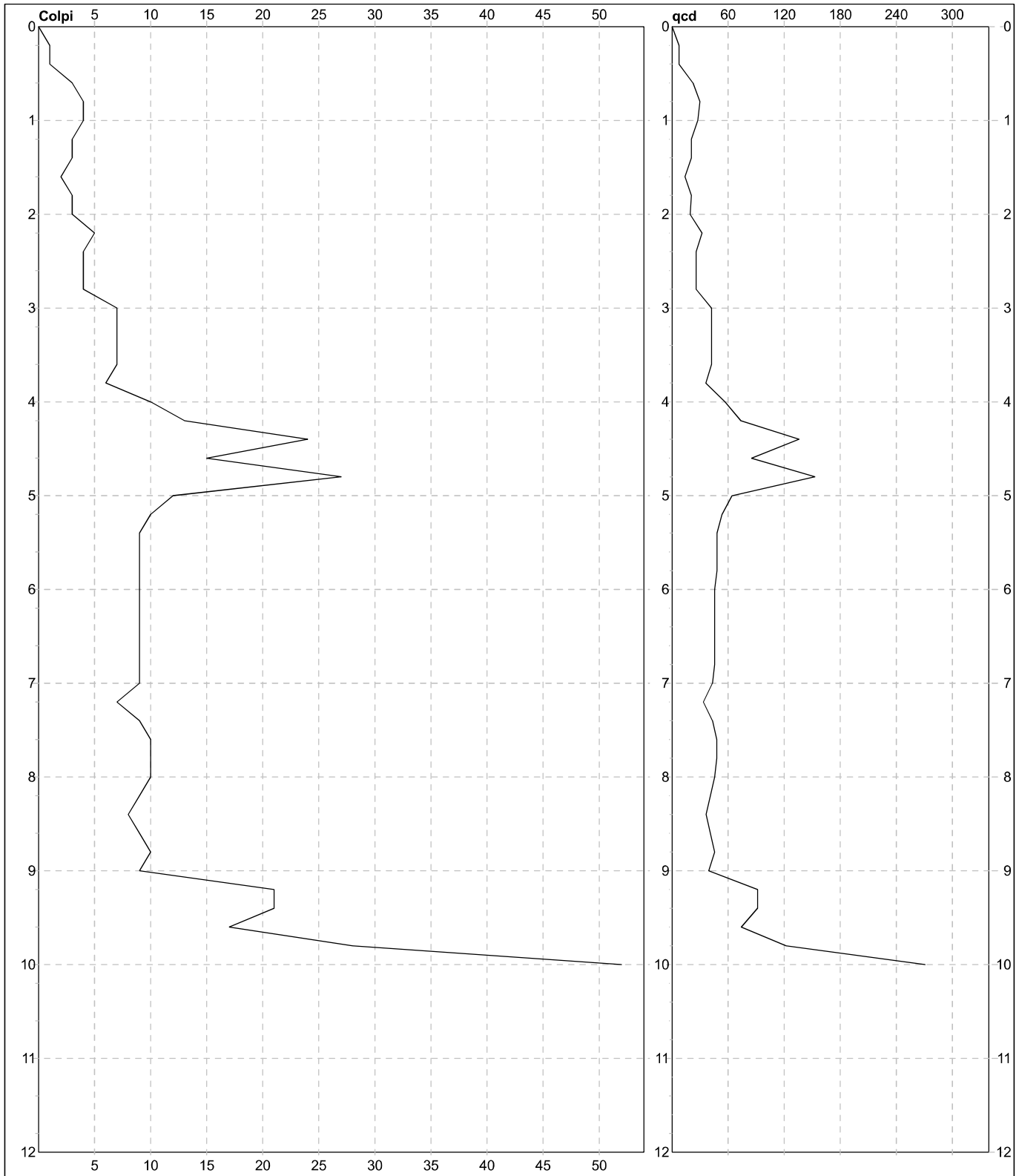


PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	11
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **San Benedetto Val di Sambro**

U.M.: **kg/cm²**
 Scala: **1:60**
 Pagina: **1**
 Elaborato:
 Data eseg.: **26/01/2019**
 Quota ass.:
 Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
 Massa battente: 63,50 m
 Altezza caduta: 0,75 m
 Avanzamento: 0,20 m

Responsabile:
 Assistente:

Preforo: m
 Corr.astine: kg/ml
 Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	11
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: San Benedetto Val di Sambro	Elaborato:	Falda: Non rilevata

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45					
0,40	1	1		7,45					
0,60	2	3		22,35					
0,80	2	4		29,80					
1,00	2	4		27,62					
1,20	2	3		20,71					
1,40	2	3		20,71					
1,60	3	2		13,81					
1,80	3	3		20,71					
2,00	3	3		19,30					
2,20	3	5		32,17					
2,40	3	4		25,74					
2,60	4	4		25,74					
2,80	4	4		25,74					
3,00	4	7		42,17					
3,20	4	7		42,17					
3,40	4	7		42,17					
3,60	5	7		42,17					
3,80	5	6		36,15					
4,00	5	10		56,63					
4,20	5	13		73,62					
4,40	5	24		135,92					
4,60	6	15		84,95					
4,80	6	27		152,91					
5,00	6	12		64,12					
5,20	6	10		53,43					
5,40	6	9		48,09					
5,60	7	9		48,09					
5,80	7	9		48,09					
6,00	7	9		45,51					
6,20	7	9		45,51					
6,40	7	9		45,51					
6,60	8	9		45,51					
6,80	8	9		45,51					
7,00	8	9		43,20					
7,20	8	7		33,60					
7,40	8	9		43,20					
7,60	9	10		48,00					
7,80	9	10		48,00					
8,00	9	10		45,68					
8,20	9	9		41,11					
8,40	9	8		36,55					
8,60	10	9		41,11					
8,80	10	10		45,68					
9,00	10	9		39,22					
9,20	10	21		91,51					
9,40	10	21		91,51					
9,60	11	17		74,08					
9,80	11	28		122,01					
10,00	11	65		270,76					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

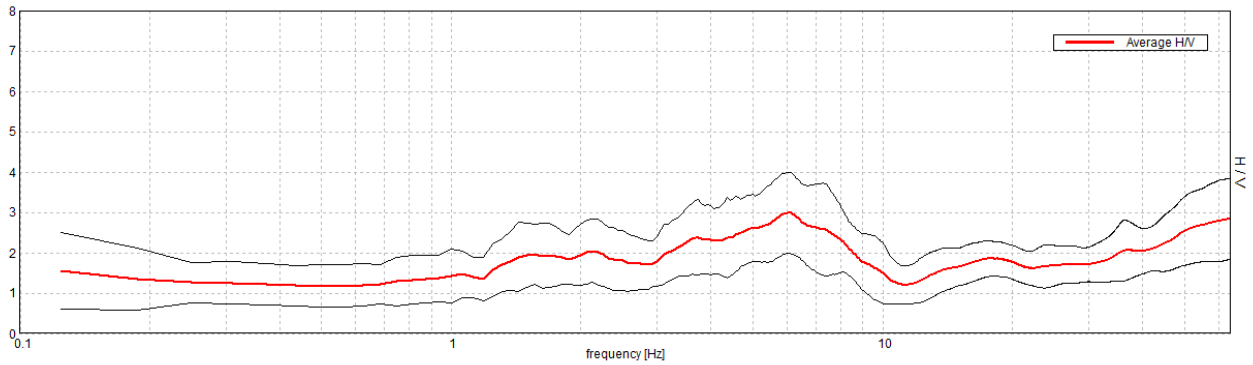
qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR45 SAN BENEDETTO VAL DI S

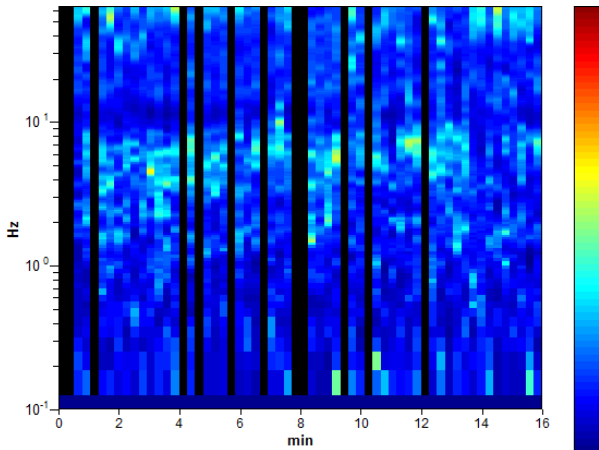
Instrument: TRZ-0108/01-10
Start recording: 18/10/18 12:22:13 End recording: 18/10/18 12:38:14
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

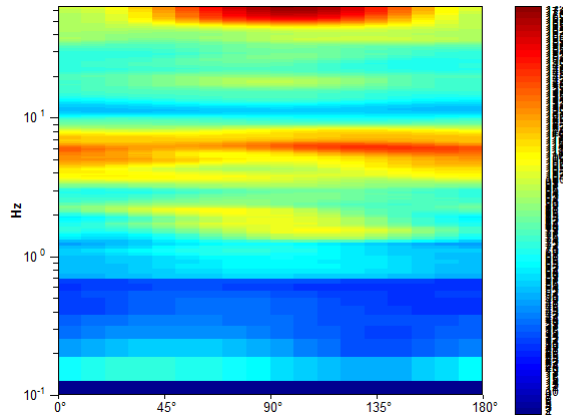
Max. H/V at 6.06 ± 0.29 Hz. (In the range 0.1 - 20.0 Hz).



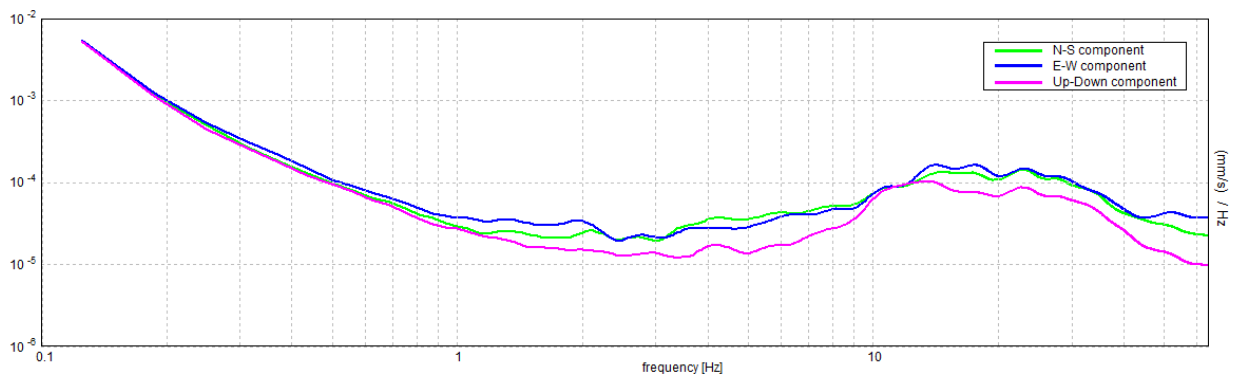
H/V TIME HISTORY



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 6.06 ± 0.29 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	6.06 > 0.63	OK	
$n_c(f_0) > 200$	4656.0 > 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 146 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	10.063 Hz	OK	
$A_0 > 2$	2.98 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.02385 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.14461 < 0.30313$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.49 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

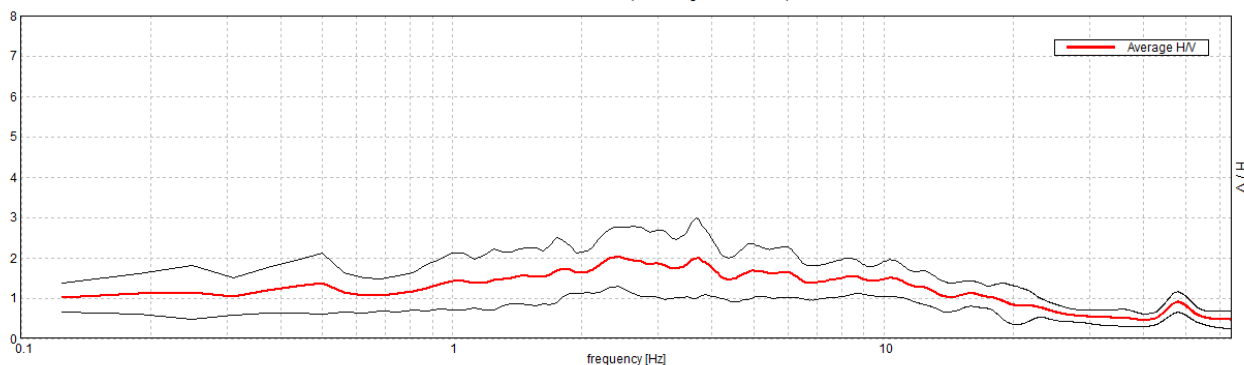
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR51 SAN BENEDETTO VAL DI S

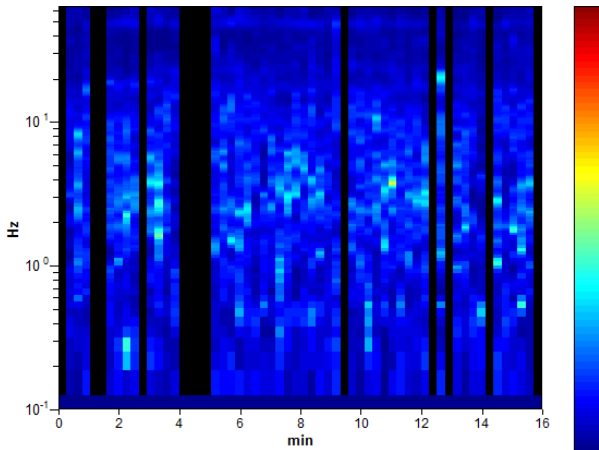
Instrument: TRZ-0108/01-10
 Start recording: 18/10/18 15:47:27 End recording: 18/10/18 16:03:28
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 78% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

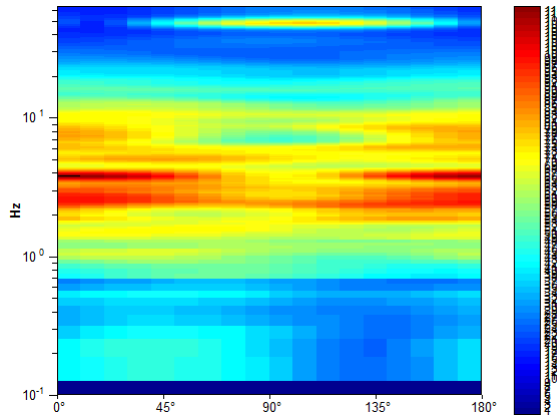
Max. H/V at 2.44 ± 0.44 Hz. (In the range 0.1 - 20.0 Hz).



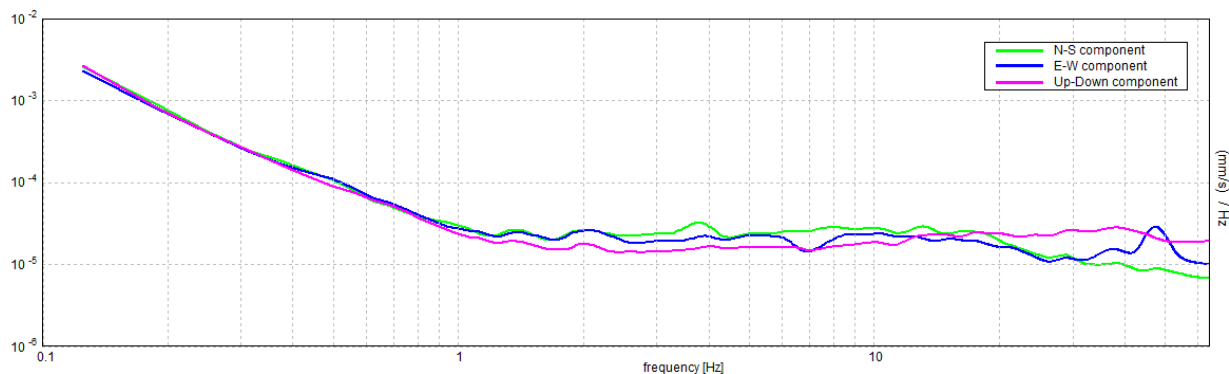
H/V TIME HISTORY



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 2.44 ± 0.44 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$2.44 > 0.63$	OK	
$n_c(f_0) > 200$	$1833.0 > 200$	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 60 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
$A_0 > 2$	$2.03 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.0884 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.21547 < 0.12188$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3592 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

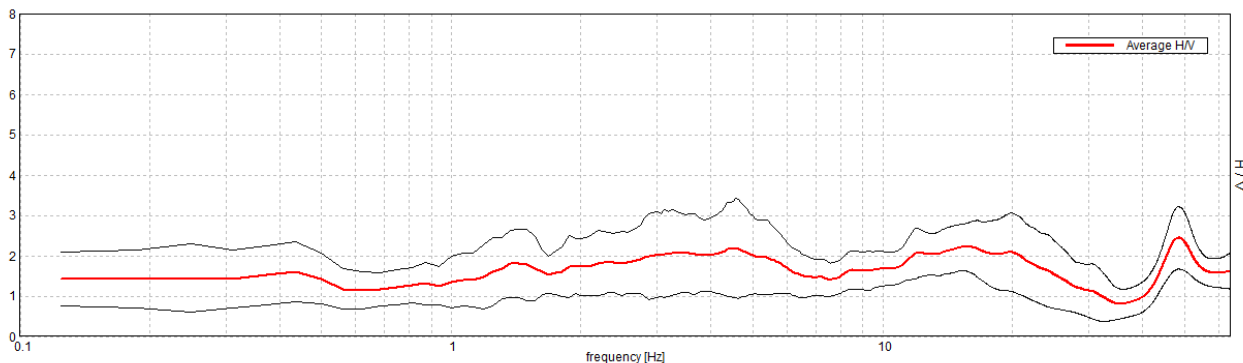
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR55 SAN BENEDETTO VAL DI S

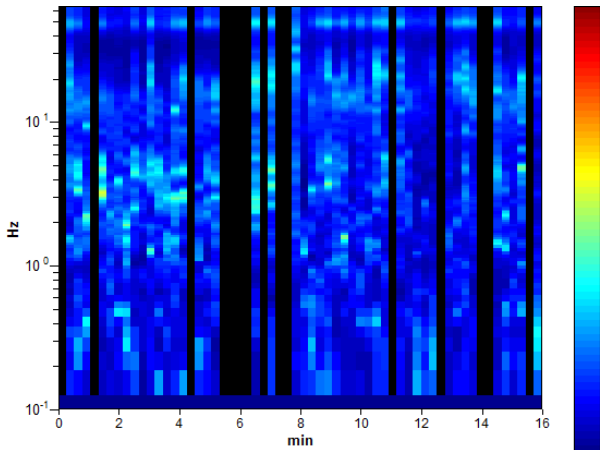
Instrument: TRZ-0108/01-10
Start recording: 18/10/18 17:17:00 End recording: 18/10/18 17:33:01
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 75% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

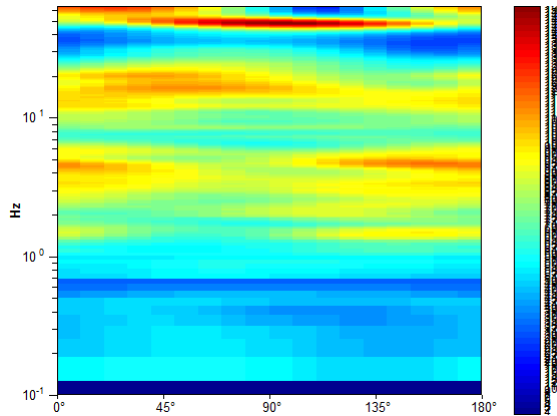
Max. H/V at 15.63 ± 3.24 Hz. (In the range 0.1 - 20.0 Hz).



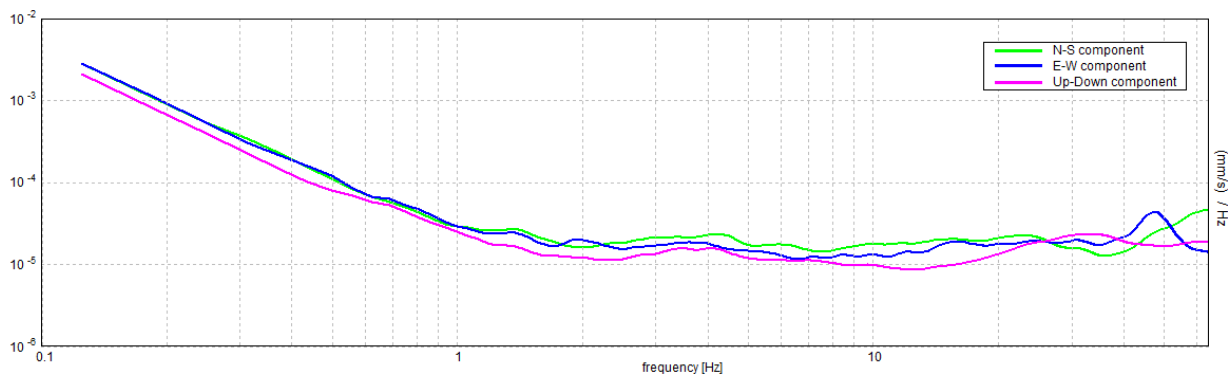
H/V TIME HISTORY



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 15.63 ± 3.24 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	15.63 > 0.63	OK	
$n_c(f_0) > 200$	11250.0 > 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 376 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 $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	30.875 Hz	OK	
$A_0 > 2$	2.21 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.10162 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	1.58783 < 0.78125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2908 < 1.58	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR43 CEDRECCHIA

Instrument: TRZ-0108/01-10

Start recording: 18/10/18 11:35:26 End recording: 18/10/18 11:51:27

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 80% trace (manual window selection)

Sampling rate: 128 Hz

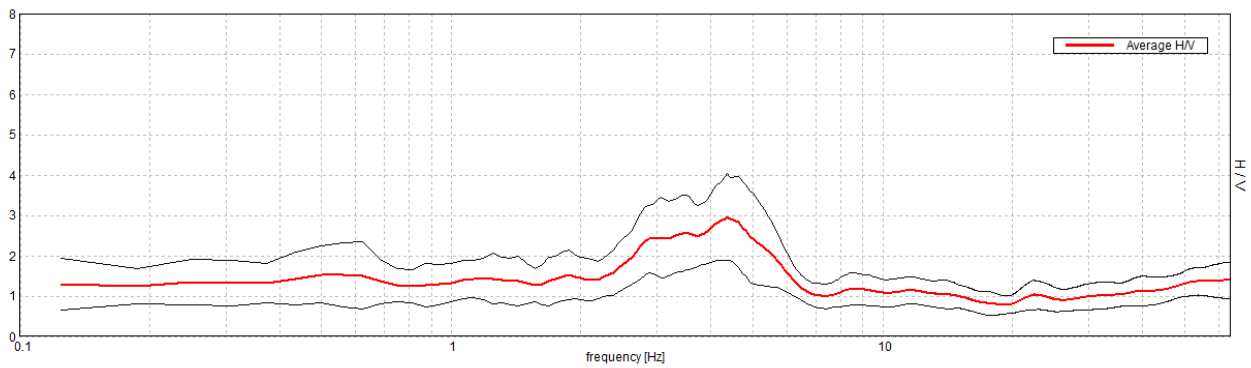
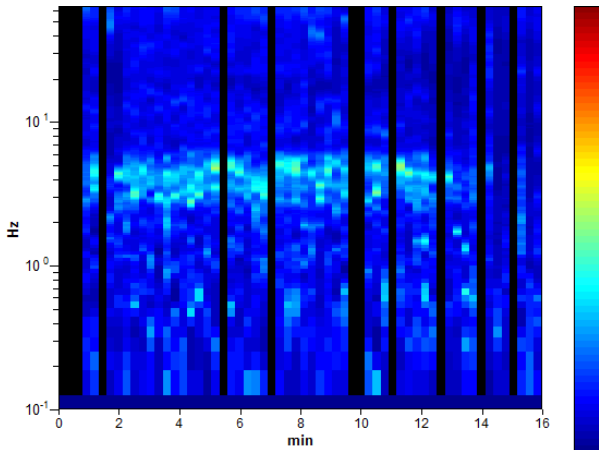
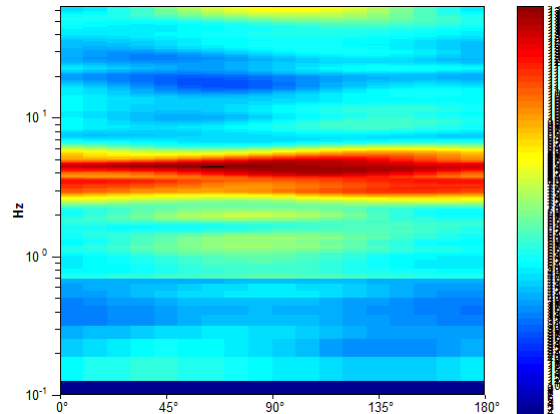
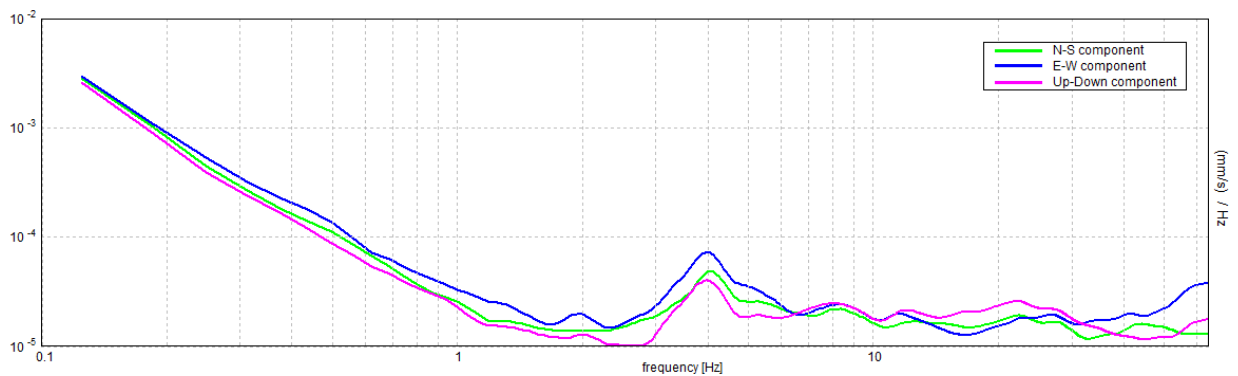
Window size: 16 s

Smoothing type: Triangular window

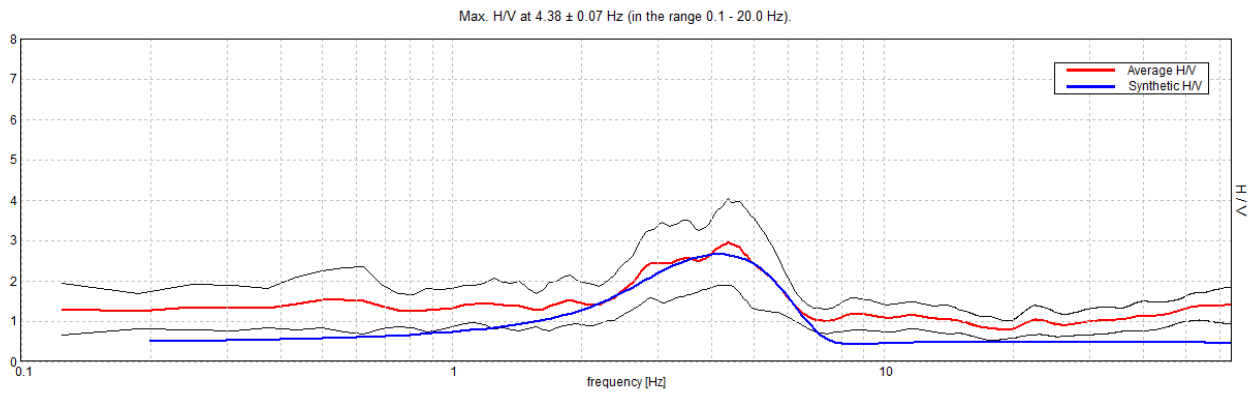
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 4.38 ± 0.07 Hz. (In the range 0.1 - 20.0 Hz).

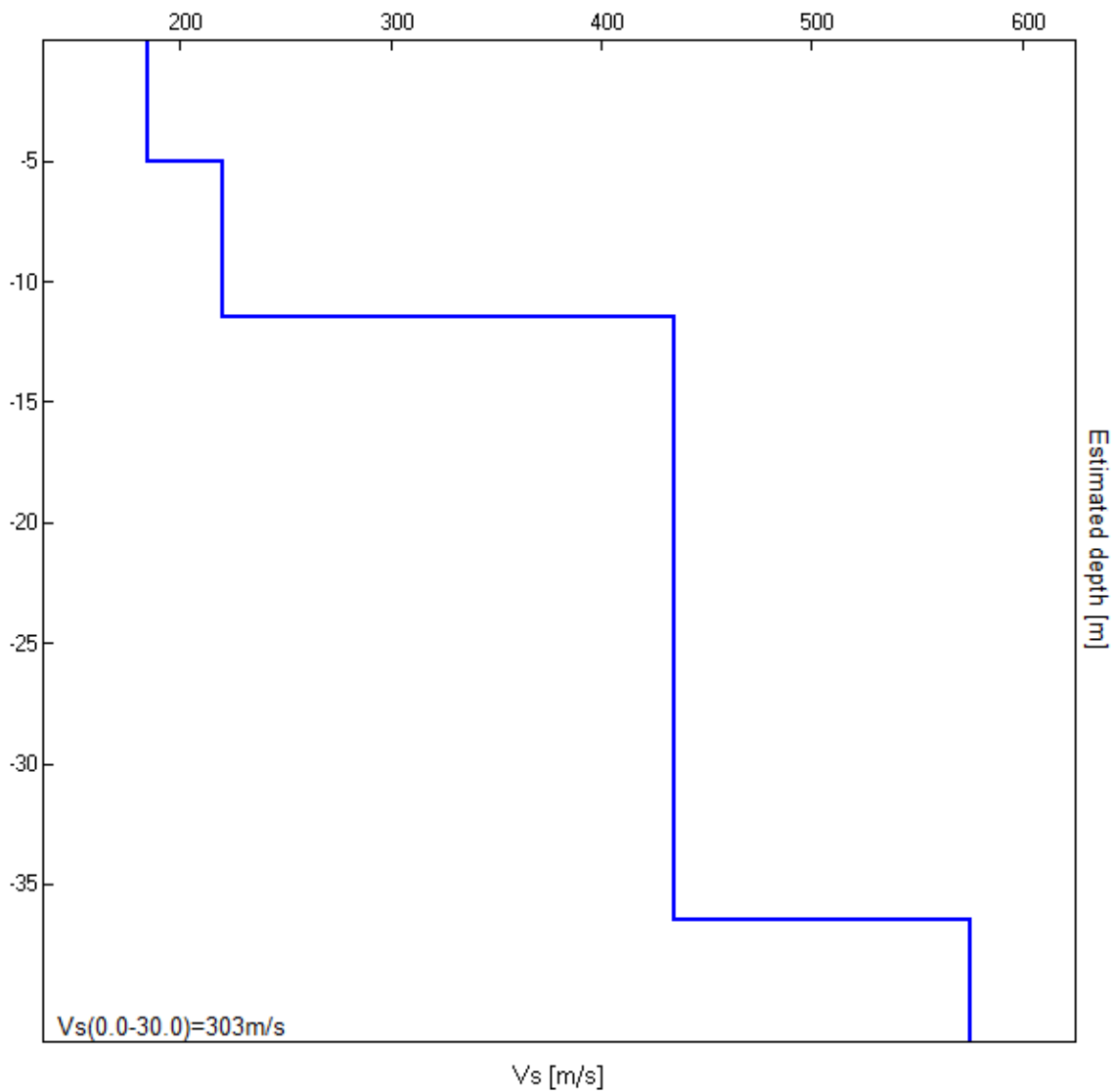
**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
5.00	5.00	185
11.50	6.50	220
36.50	25.00	435
inf.	inf.	575

Vs(0.0-30.0)=303m/s



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

Max. H/V at 4.38 ± 0.07 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$4.38 > 0.63$	OK	
$n_c(f_0) > 200$	$3360.0 > 200$	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 106 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	2.25 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	6.125 Hz	OK	
$A_0 > 2$	$2.95 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00752 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.03289 < 0.21875$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.5292 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR44 CEDRECCHIA

Instrument: TRZ-0108/01-10

Start recording: 18/10/18 11:56:13 End recording: 18/10/18 12:12:14

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 73% trace (manual window selection)

Sampling rate: 128 Hz

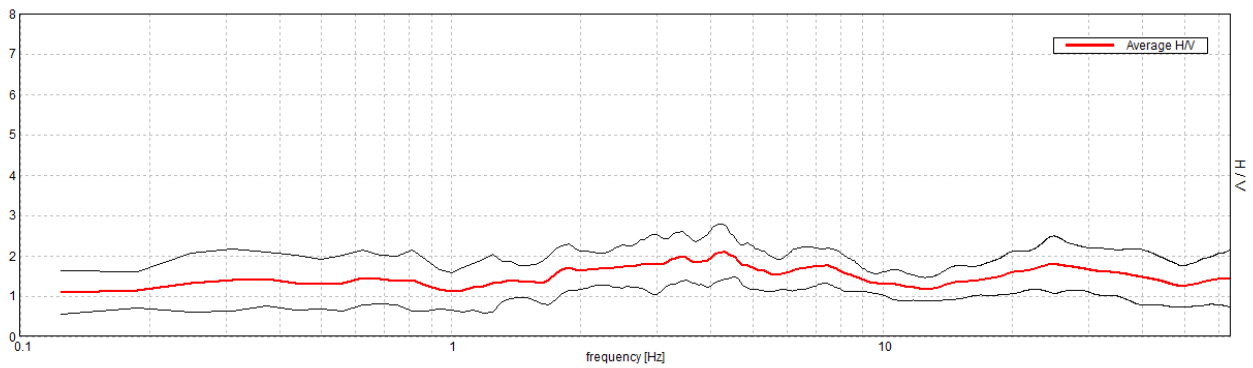
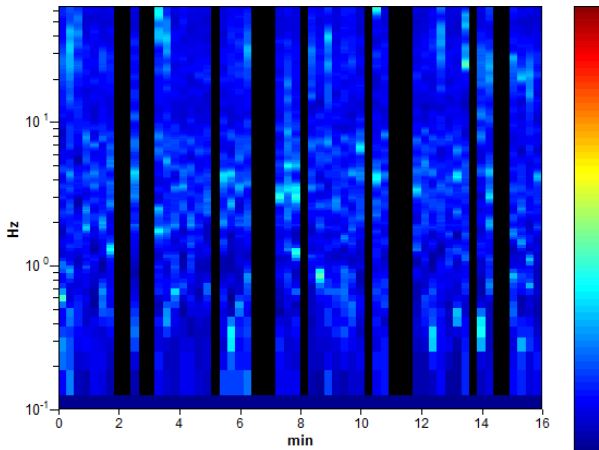
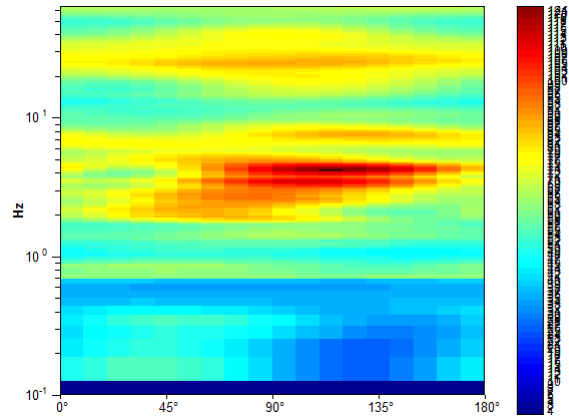
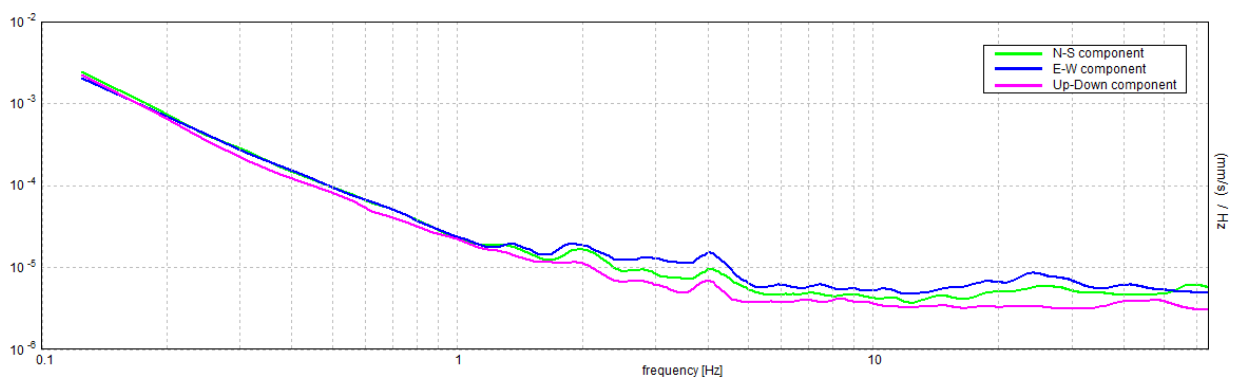
Window size: 16 s

Smoothing type: Triangular window

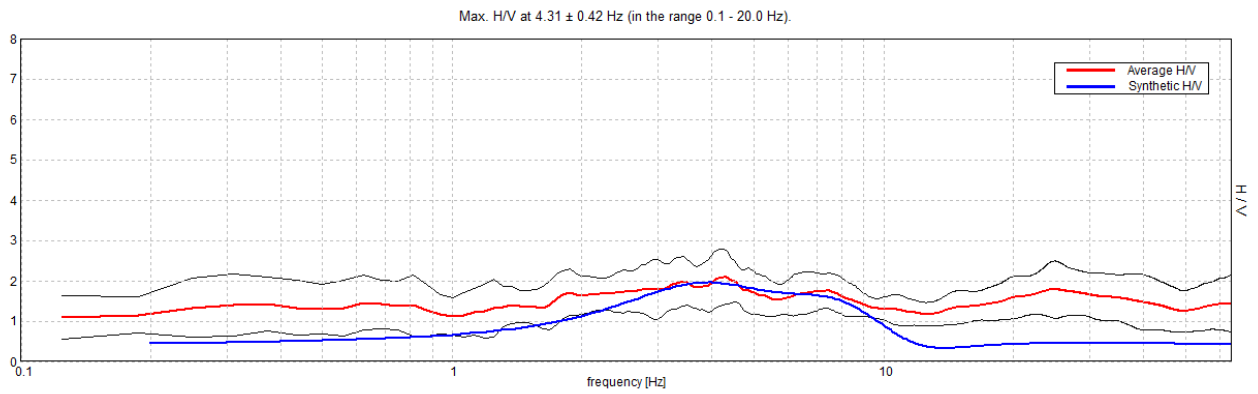
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 4.31 ± 0.42 Hz. (In the range 0.1 - 20.0 Hz).

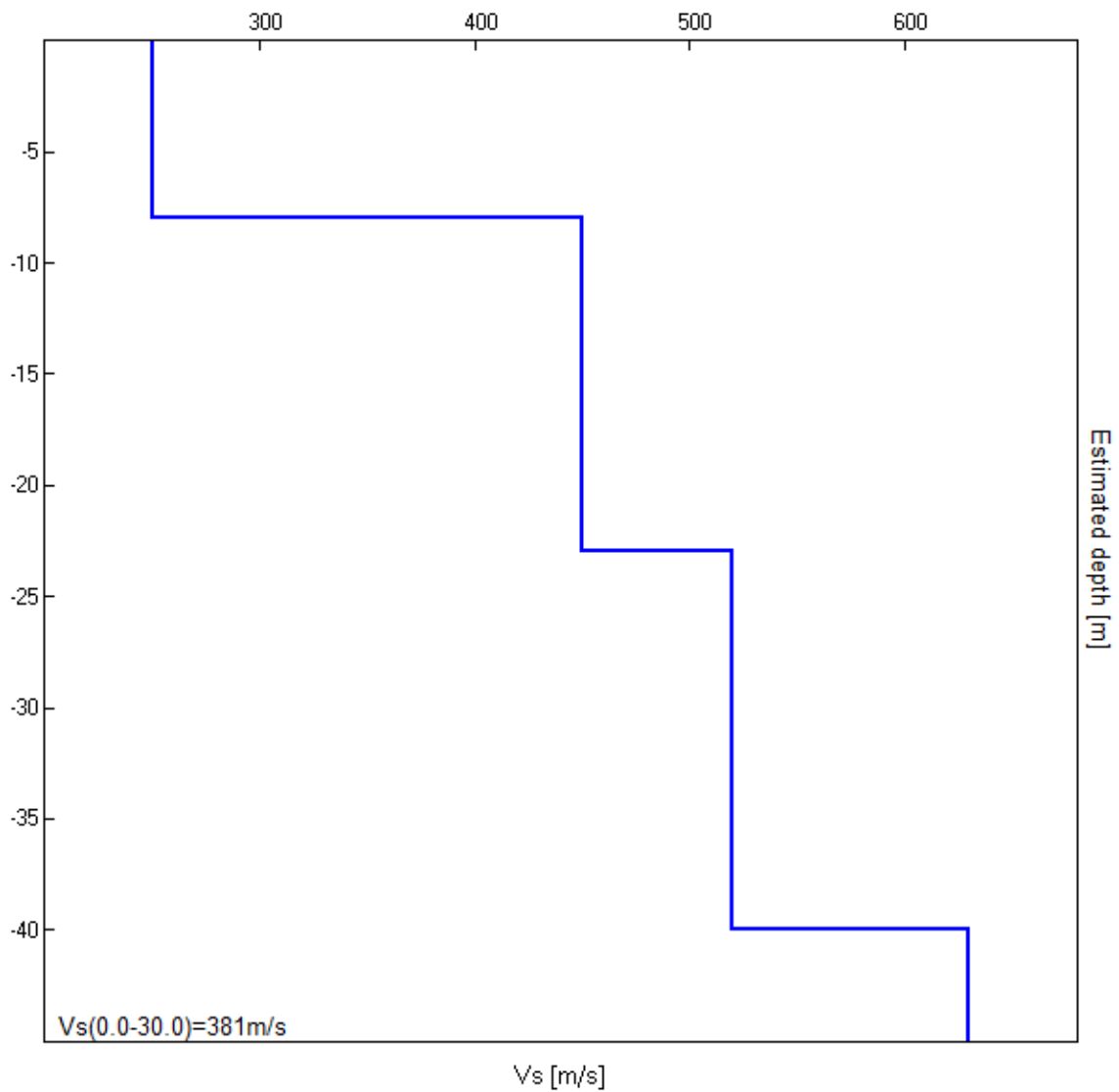
**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
8.00	8.00	250
23.00	15.00	450
40.00	17.00	520
inf.	inf.	630

Vs(0.0-30.0)=381m/s



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

Max. H/V at 4.31 ± 0.42 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$4.31 > 0.63$	OK	
$n_c(f_0) > 200$	$3036.0 > 200$	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 104 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
$A_0 > 2$	$2.09 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.04726 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.20383 < 0.21563$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.332 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR42 MADONNA DEI FORNELLI

Instrument: TRZ-0108/01-10

Start recording: 18/10/18 11:12:18 End recording: 18/10/18 11:28:18

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

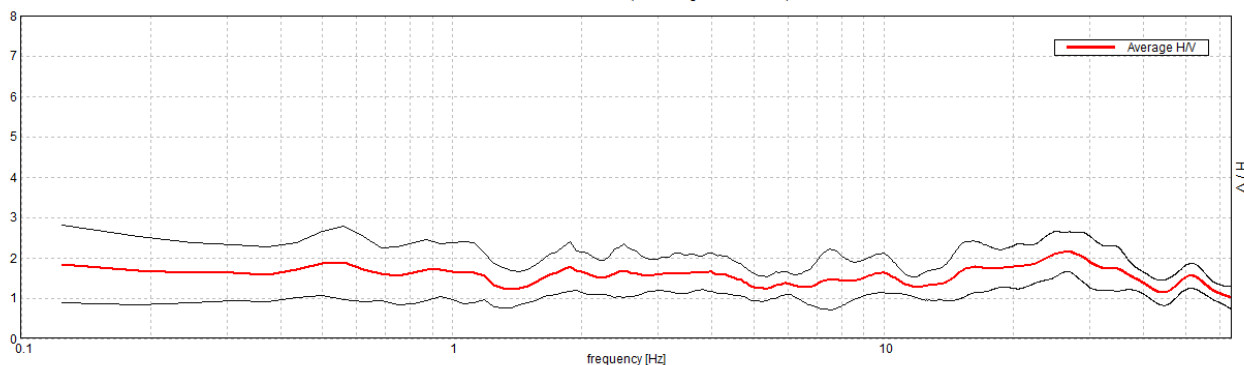
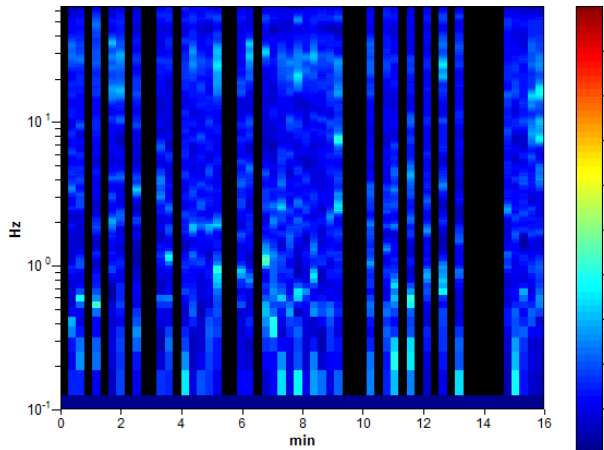
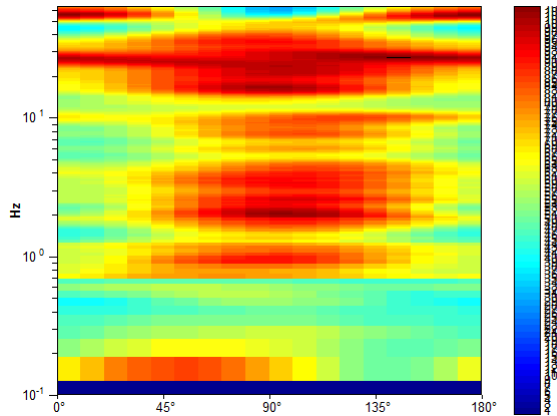
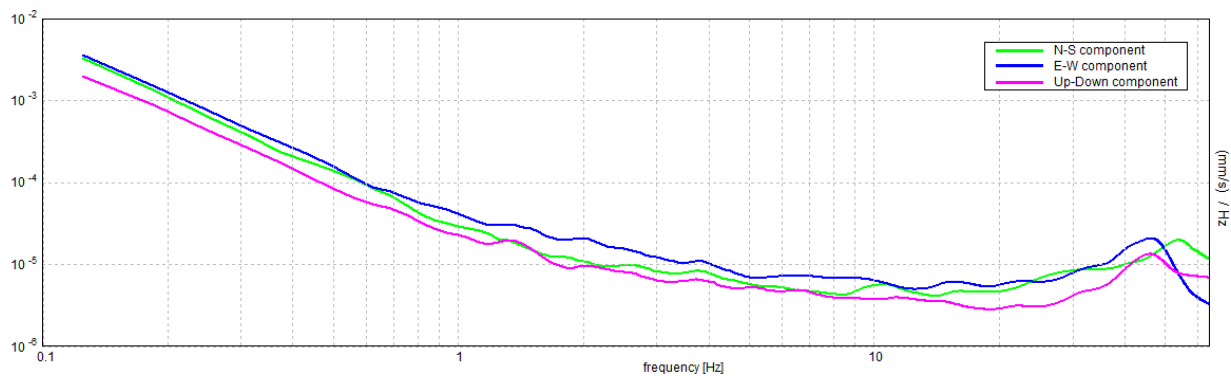
Trace length: 0h16'00". Analyzed 62% trace (manual window selection)

Sampling rate: 128 Hz

Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIOMax. H/V at 0.56 ± 1.52 Hz. (In the range 0.1 - 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 0.56 ± 1.52 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.56 > 0.63$		NO
$n_c(f_0) > 200$	$333.0 > 200$	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 14 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
$A_0 > 2$	$1.88 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 1.31609 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.7403 < 0.08438$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.4407 < 2.0$	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
σ_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 σ_f and $\sigma_A(f_0)$

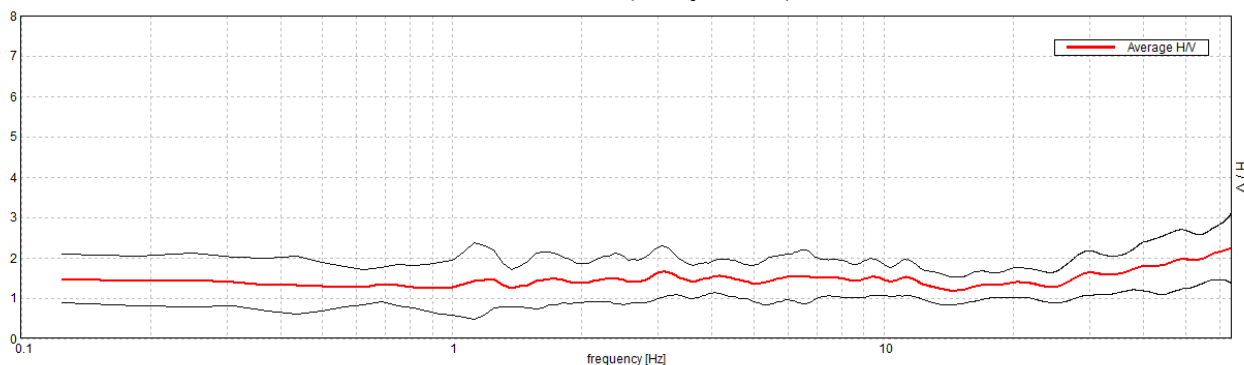
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR41 MADONNA DEI FORNELLI

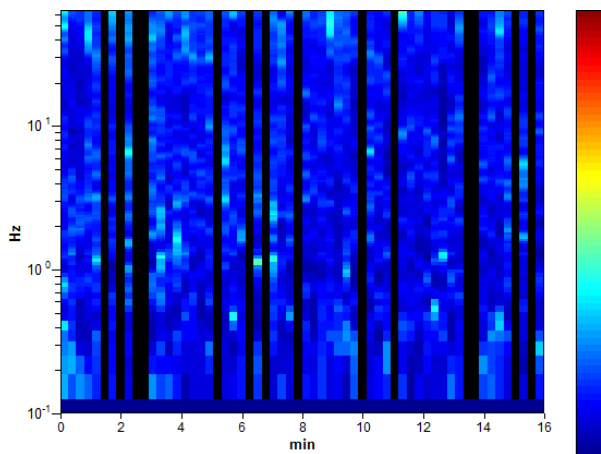
Instrument: TRZ-0108/01-10
Start recording: 18/10/18 10:50:36 End recording: 18/10/18 11:06:37
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

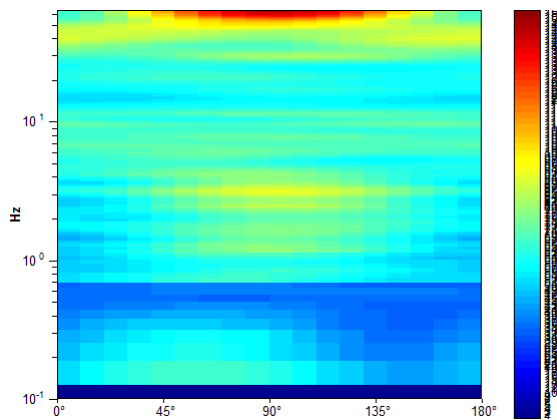
Max. H/V at 3.13 ± 0.37 Hz. (In the range 0.1 - 20.0 Hz).



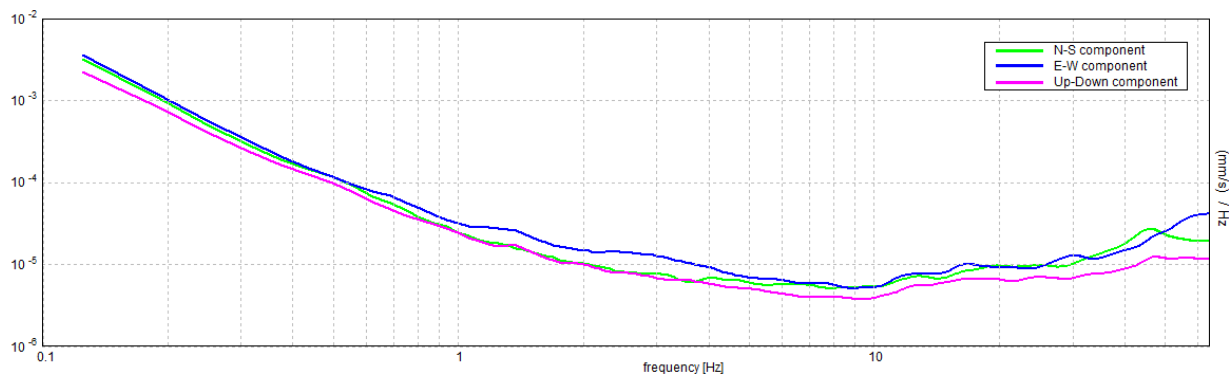
H/V TIME HISTORY



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 3.13 ± 0.37 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	3.13 > 0.63	OK	
$n_c(f_0) > 200$	2300.0 > 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 76 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
$A_0 > 2$	1.65 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.05816 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.18175 < 0.15625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3014 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

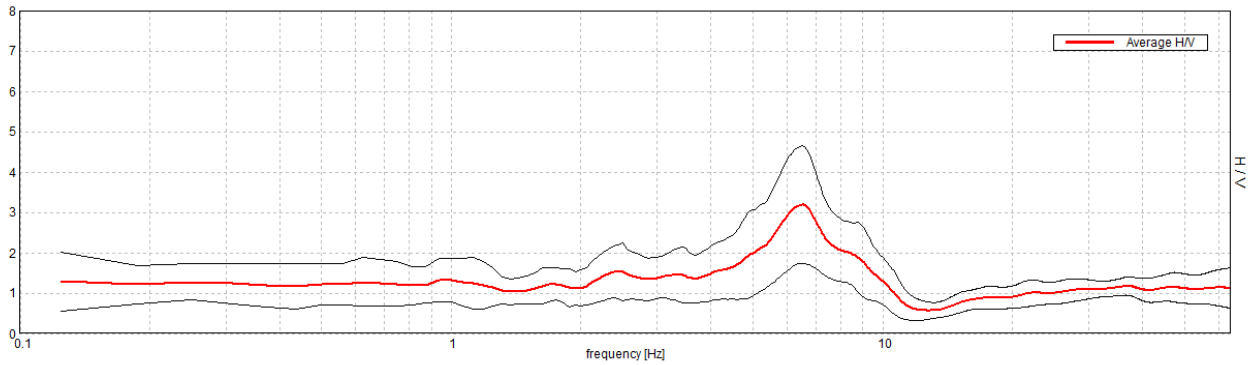
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR40 MADONNA DEI FORNELLI

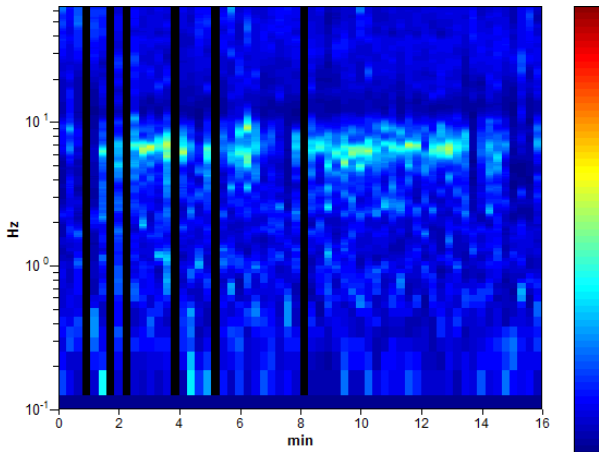
Instrument: TRZ-0108/01-10
 Start recording: 18/10/18 10:26:35 End recording: 18/10/18 10:42:36
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 90% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

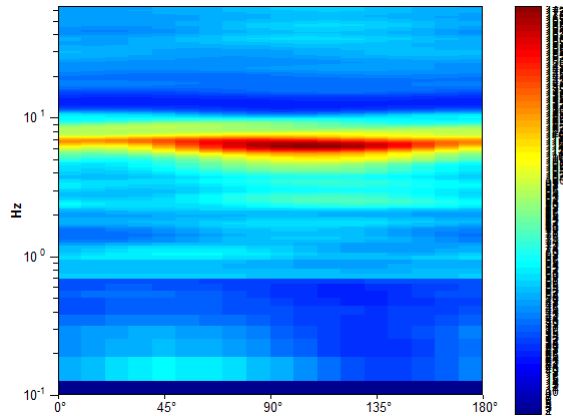
Max. H/V at 6.5 ± 0.36 Hz. (In the range 0.1 - 20.0 Hz).



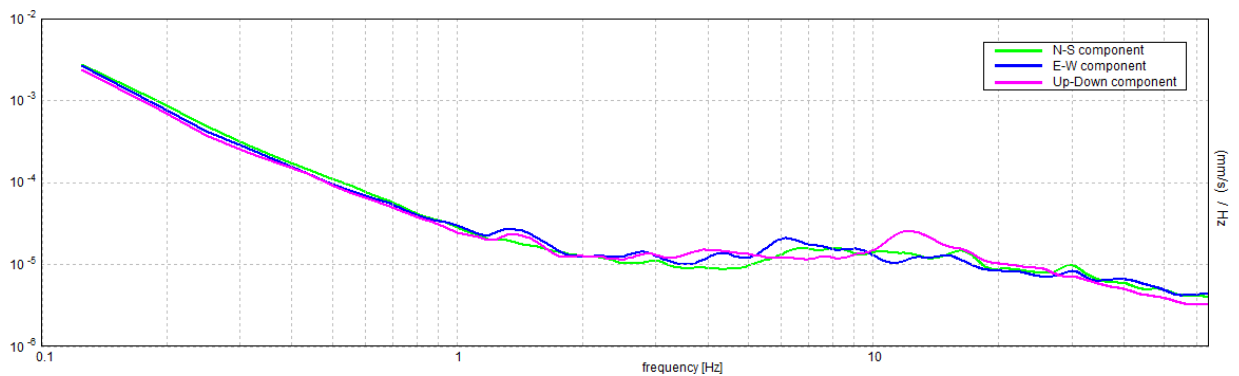
H/V TIME HISTORY



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 6.5 ± 0.36 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$6.50 > 0.63$	OK	
$n_c(f_0) > 200$	$5616.0 > 200$	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 157 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	4.313 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	9.313 Hz	OK	
$A_0 > 2$	$3.19 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.02701 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.17558 < 0.325$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.7163 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

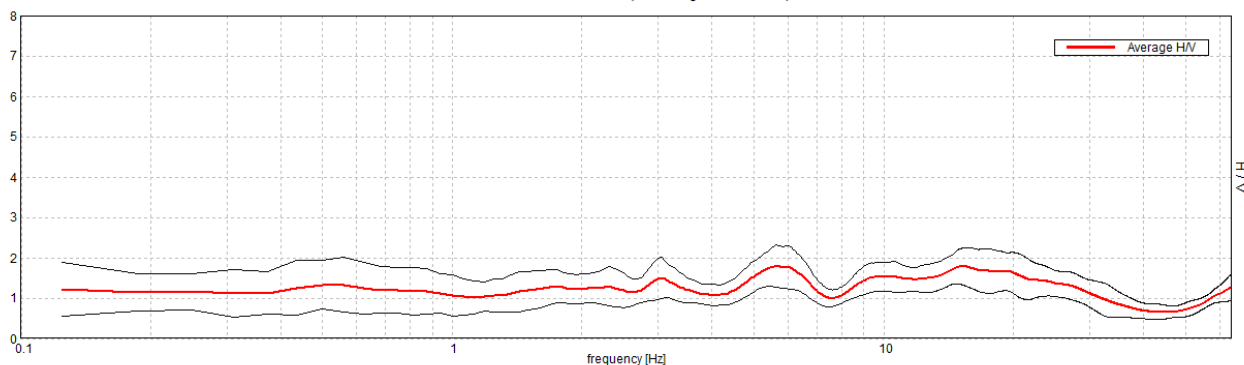
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR71 MADONNA DEI FORNELLI C

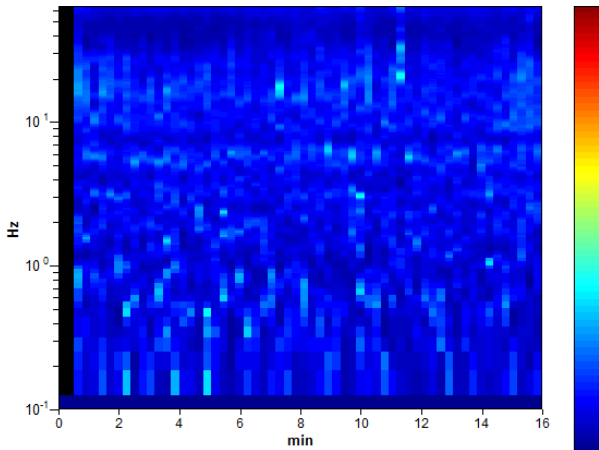
Instrument: TRZ-0108/01-10
Start recording: 11/12/18 16:05:29 End recording: 11/12/18 16:21:30
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 97% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

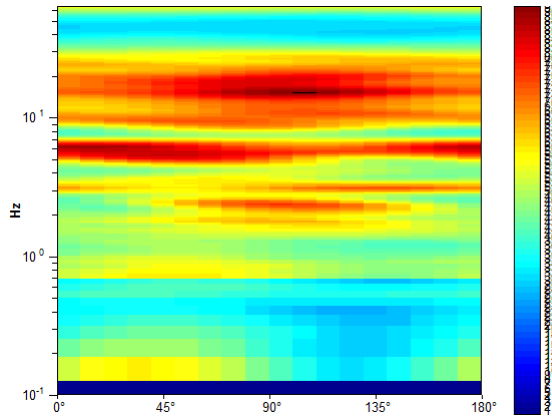
Max. H/V at 5.63 ± 2.34 Hz. (In the range 0.1 - 20.0 Hz).



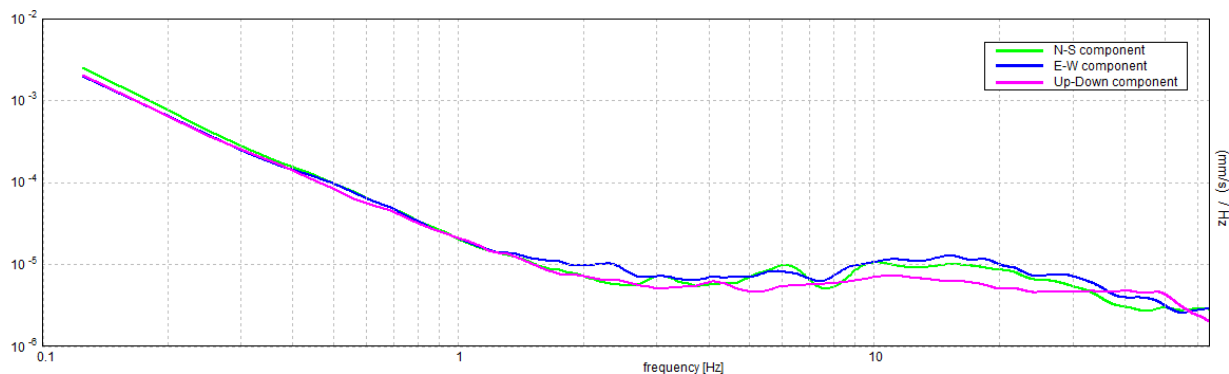
H/V TIME HISTORY



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 5.63 ± 2.34 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	5.63 > 0.63	OK	
$n_c(f_0) > 200$	5220.0 > 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 136 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
$A_0 > 2$	1.79 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.20572 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	1.15718 < 0.28125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2604 < 1.58	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
σ_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 σ_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



PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

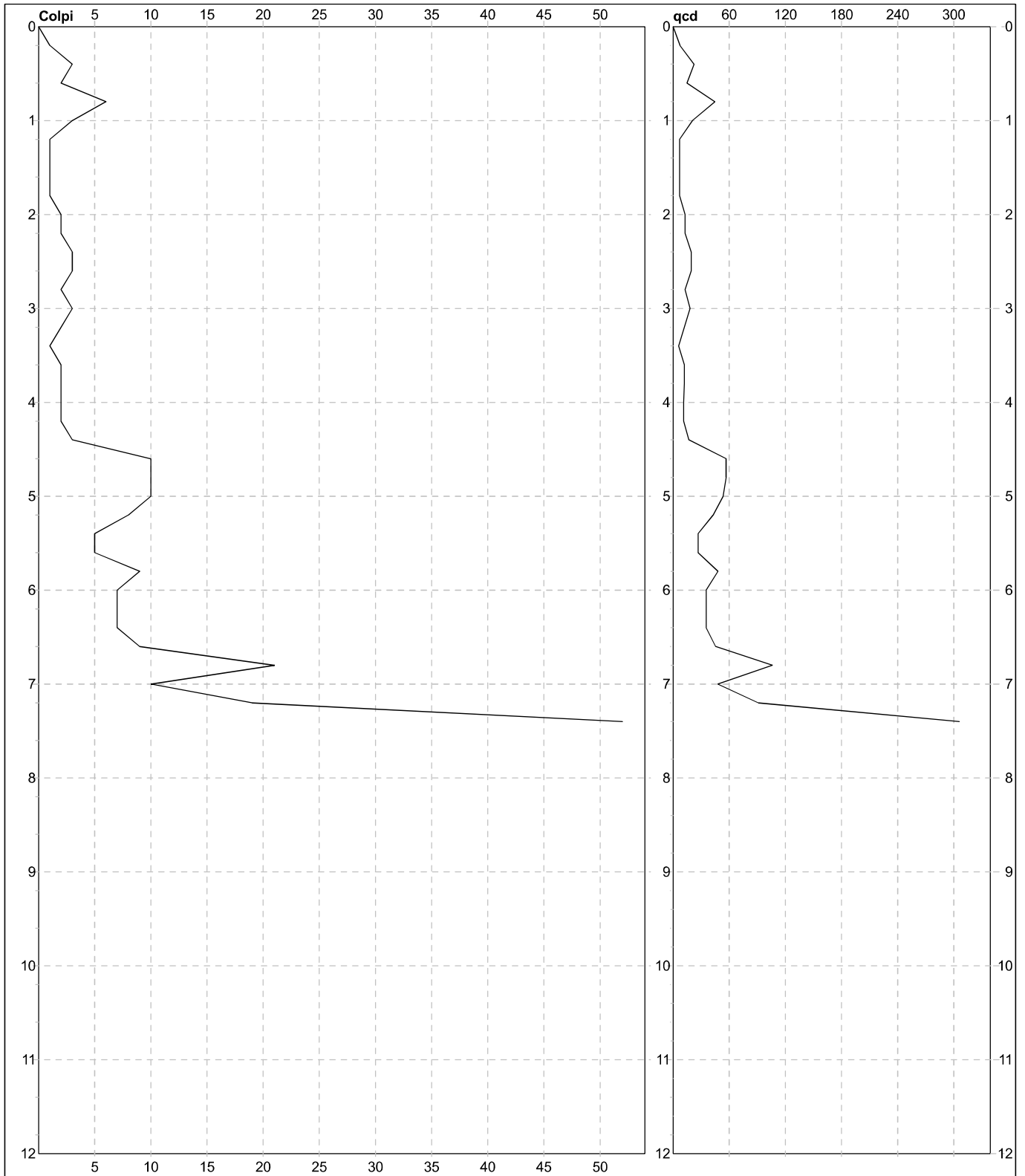
DIN	8
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
Cantiere: **Studio di MS comunale livello 2**
Località: **Madonna dei Fornelli**

U.M.: **kg/cm²**
Scala: **1:60**
Pagina: **1**
Elaborato:

Data eseg.: **26/01/2019**
Quota ass.:

Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
Massa battente: 63,50 m
Altezza caduta: 0,75 m
Avanzamento: 0,20 m

Responsabile:
Assistente:

Preforo: m
Corr.astine: kg/ml
Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	8
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: Madonna dei Fornelli	Elaborato:	Falda: Non rilevata

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45					
0,40	1	3		22,35					
0,60	2	2		14,90					
0,80	2	6		44,69					
1,00	2	3		20,71					
1,20	2	1		6,90					
1,40	2	1		6,90					
1,60	3	1		6,90					
1,80	3	1		6,90					
2,00	3	2		12,87					
2,20	3	2		12,87					
2,40	3	3		19,30					
2,60	4	3		19,30					
2,80	4	2		12,87					
3,00	4	3		18,07					
3,20	4	2		12,05					
3,40	4	1		6,02					
3,60	5	2		12,05					
3,80	5	2		12,05					
4,00	5	2		11,33					
4,20	5	2		11,33					
4,40	5	3		16,99					
4,60	6	10		56,63					
4,80	6	10		56,63					
5,00	6	10		53,43					
5,20	6	8		42,74					
5,40	6	5		26,72					
5,60	7	5		26,72					
5,80	7	9		48,09					
6,00	7	7		35,40					
6,20	7	7		35,40					
6,40	7	7		35,40					
6,60	8	9		45,51					
6,80	8	21		106,20					
7,00	8	10		48,00					
7,20	8	19		91,21					
7,40	8	63		302,42					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR37 MADONNA DEI FORNELLI

Instrument: TRZ-0108/01-10

Start recording: 15/10/18 18:36:10 End recording: 15/10/18 18:52:11

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 72% trace (manual window selection)

Sampling rate: 128 Hz

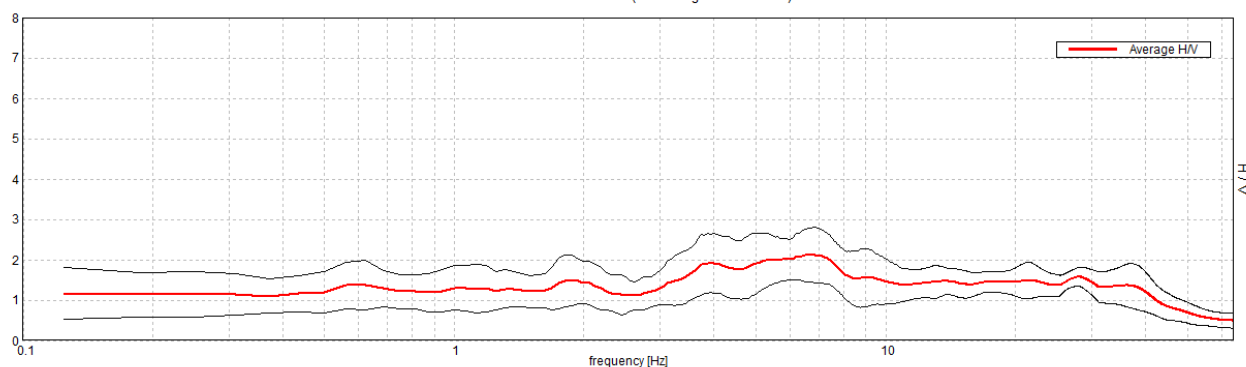
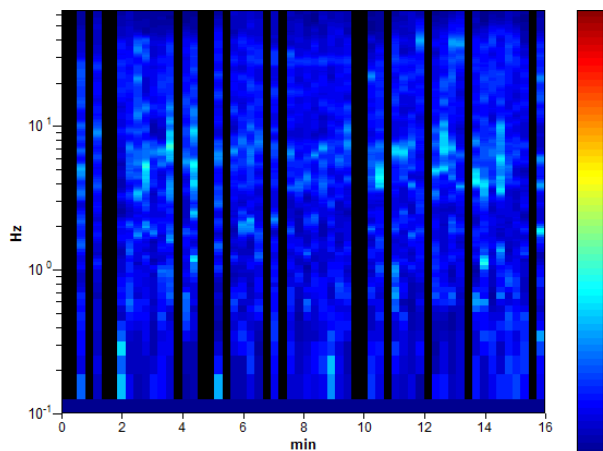
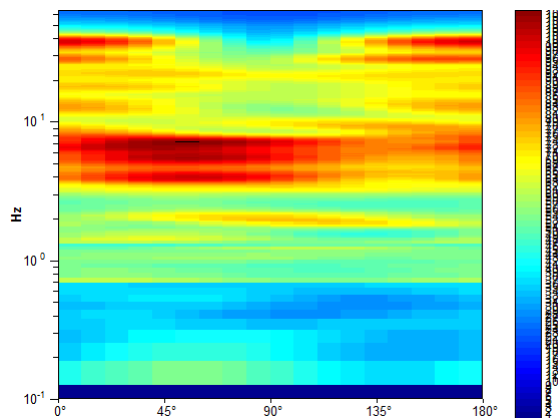
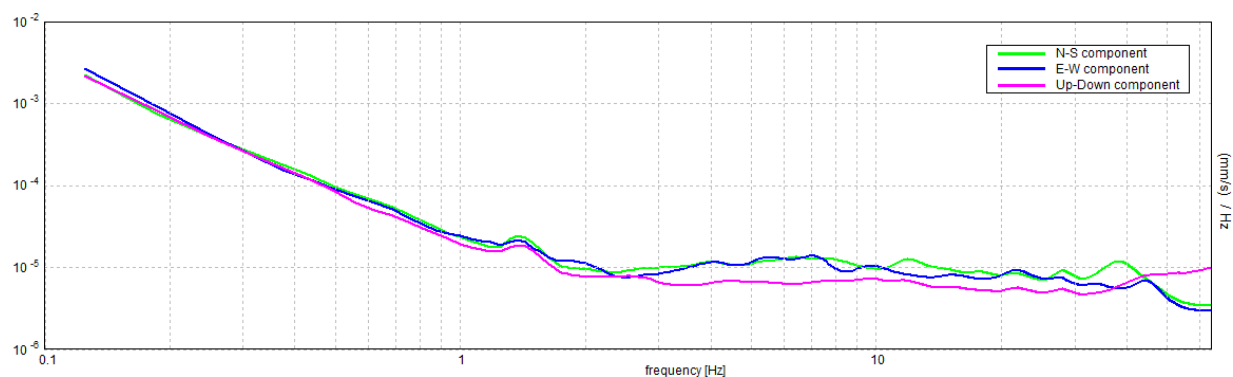
Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 6.81 ± 0.44 Hz. (In the range 0.1 - 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 6.81 ± 0.44 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	6.81 > 0.63	OK	
$n_c(f_0) > 200$	4687.0 > 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 164 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
$A_0 > 2$	2.12 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.03171 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	0.21602 < 0.34063	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3363 < 1.58	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
σ_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 σ_f and $\sigma_A(f_0)$

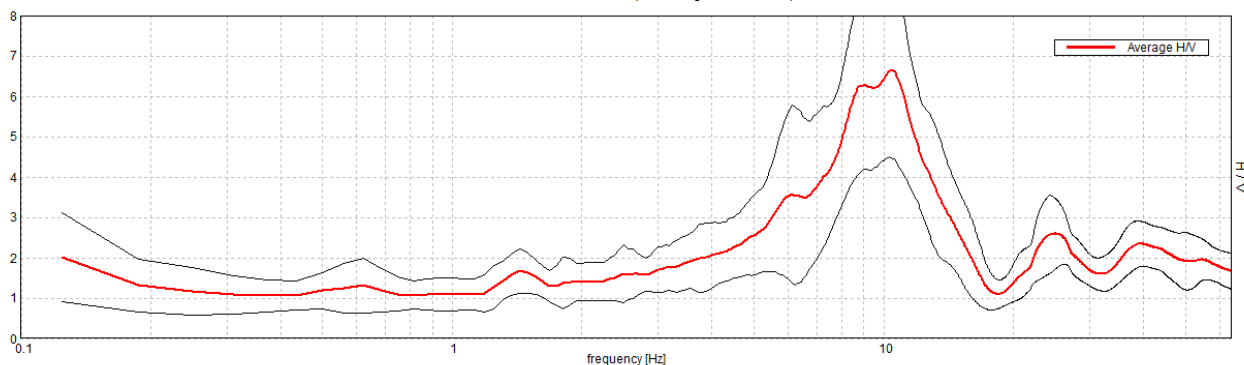
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR36 MADONNA DEI FORNELLI

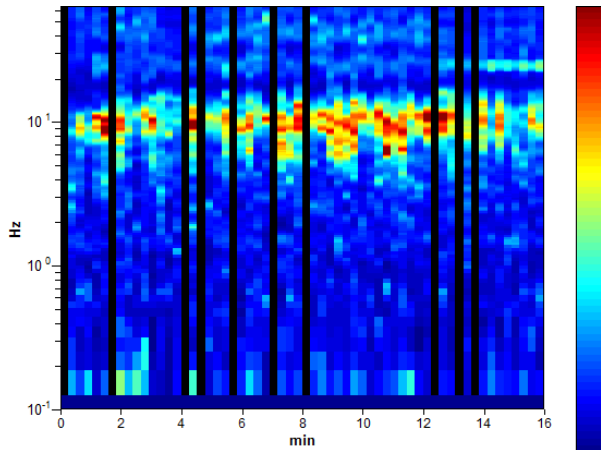
Instrument: TRZ-0108/01-10
Start recording: 15/10/18 18:12:03 End recording: 15/10/18 18:28:04
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 83% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

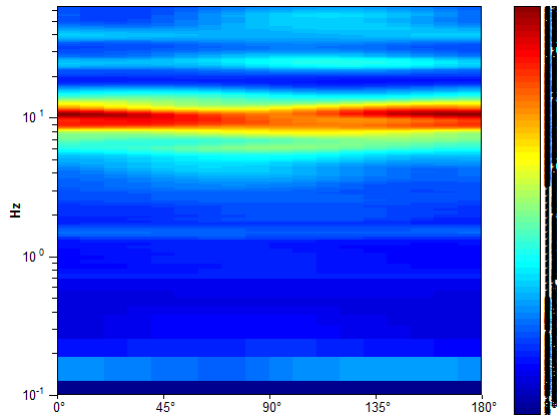
Max. H/V at 10.44 ± 0.28 Hz. (In the range 0.1 - 20.0 Hz).



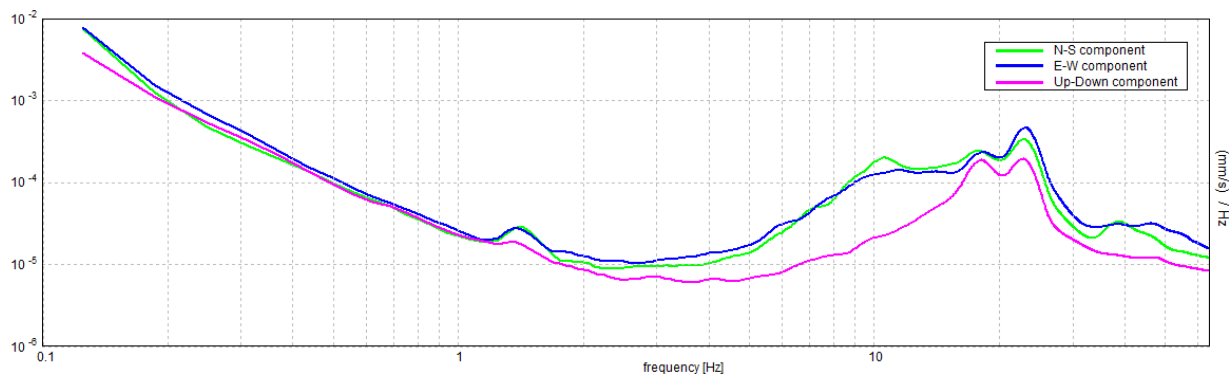
H/V TIME HISTORY



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 10.44 ± 0.28 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	10.44 > 0.63	OK	
$n_c(f_0) > 200$	8350.0 > 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 43 out of 252 times		NO

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	5.75 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	13.75 Hz	OK	
$A_0 > 2$	6.64 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.0134 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	0.13984 < 0.52188	OK	
$\sigma_A(f_0) < \theta(f_0)$	1.0683 < 1.58	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
σ_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 σ_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

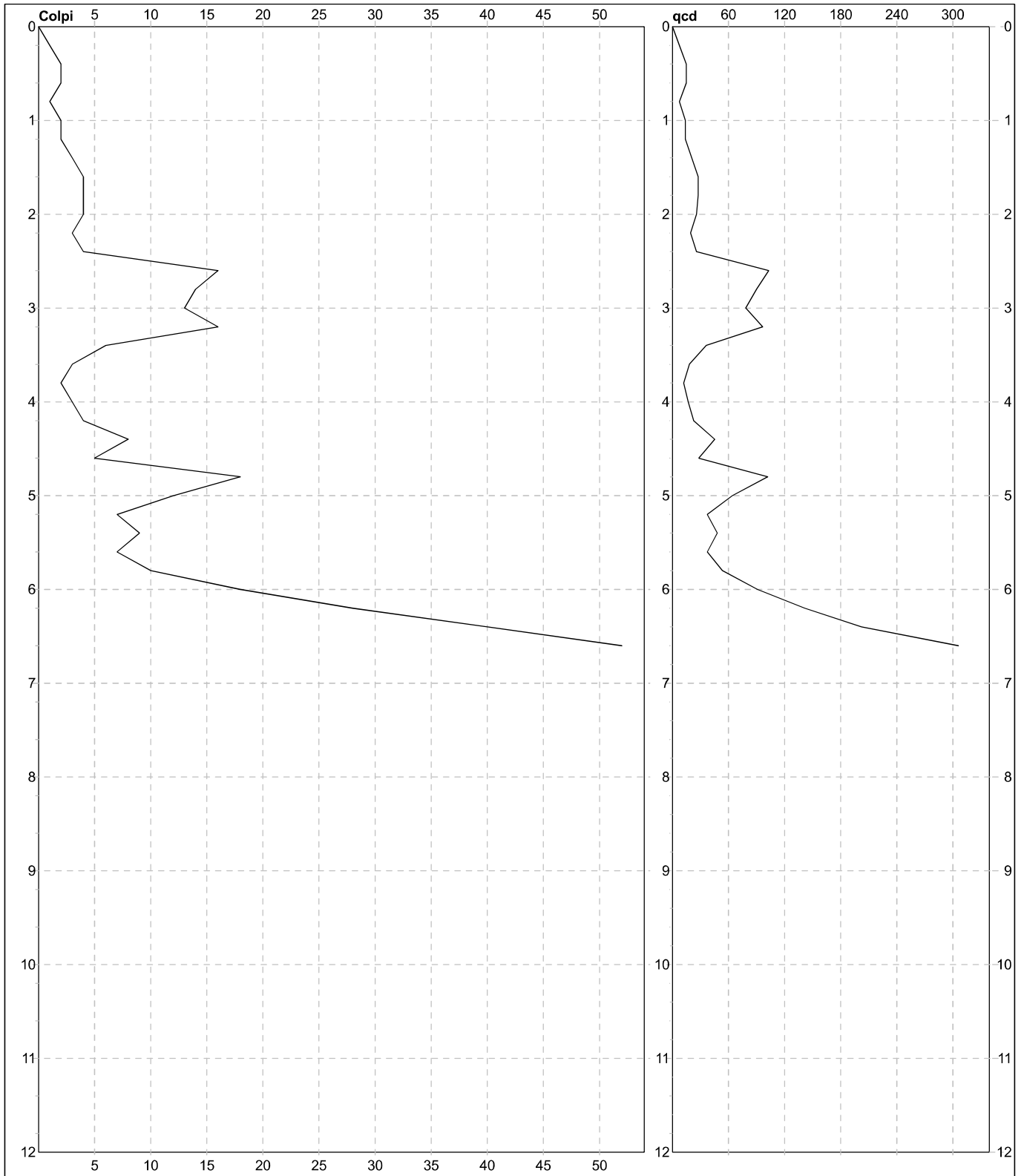


PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	7
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **Madonna dei Fornelli**

U.M.: **kg/cm²**
 Scala: **1:60**
 Pagina: **1**
 Elaborato:
 Data eseg.: **26/01/2019**
 Quota ass.:
 Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
 Massa battente: 63,50 m
 Altezza caduta: 0,75 m
 Avanzamento: 0,20 m

Responsabile:
 Assistente:

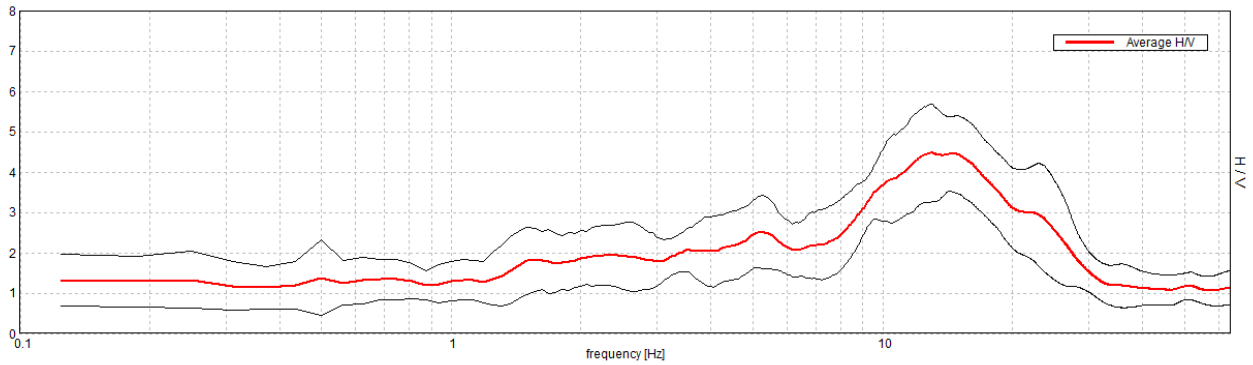
Preforo: m
 Corr.astine: kg/ml
 Cod.ISTAT: 0

SAN BENEDETTO VAL DI SAMBRO_MS, TR39 ZACCANESCA

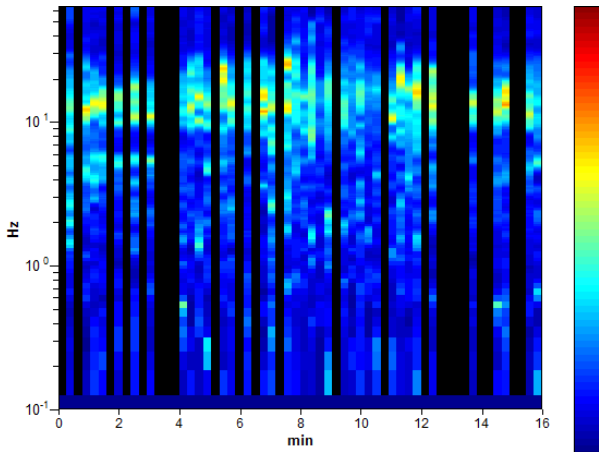
Instrument: TRZ-0108/01-10
Start recording: 18/10/18 10:04:24 End recording: 18/10/18 10:20:25
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 62% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

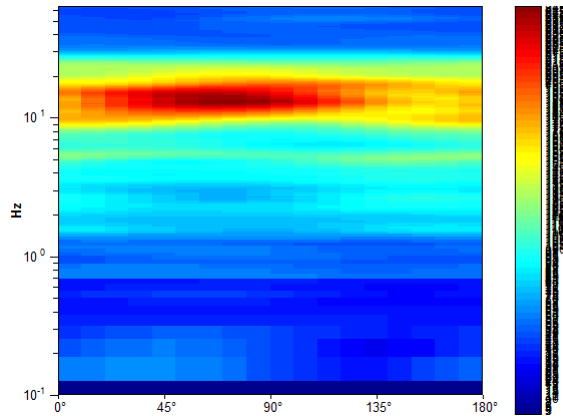
Max. H/V at 13.0 ± 0.24 Hz. (In the range 0.1 - 20.0 Hz).



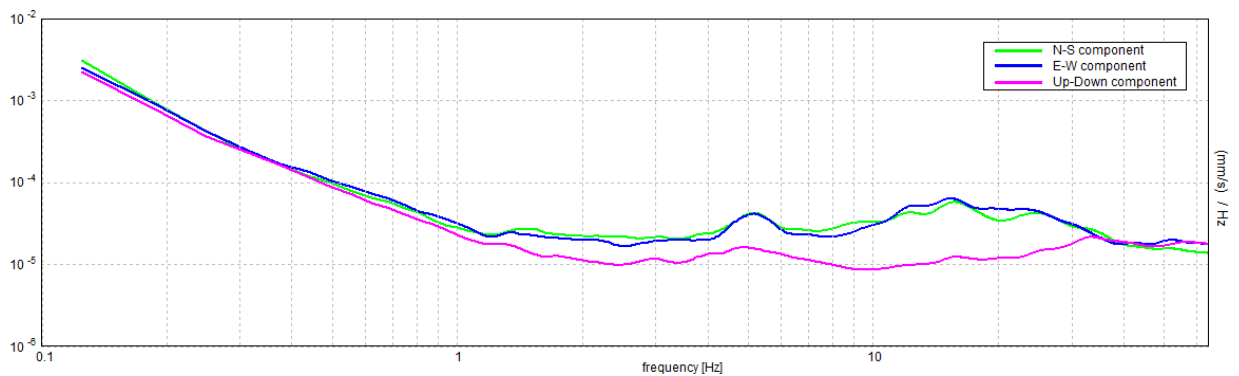
H/V TIME HISTORY



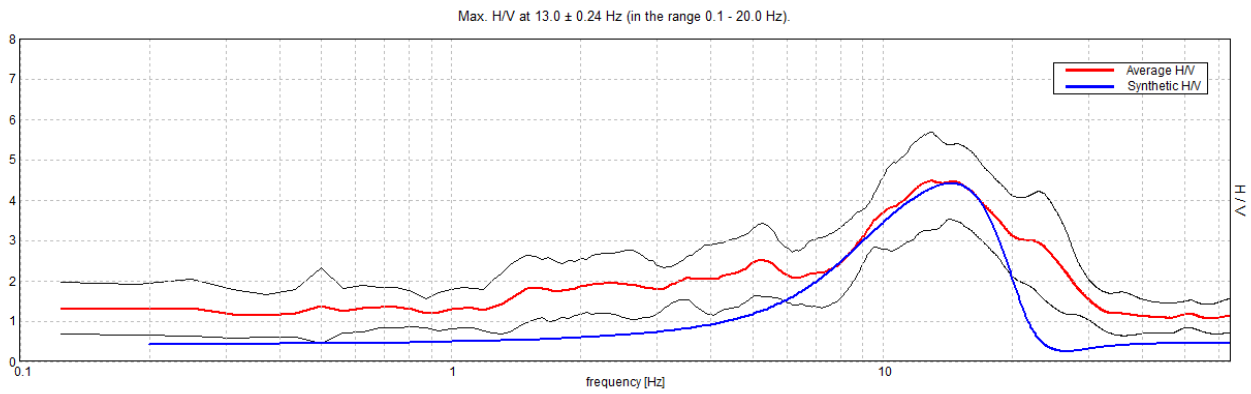
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

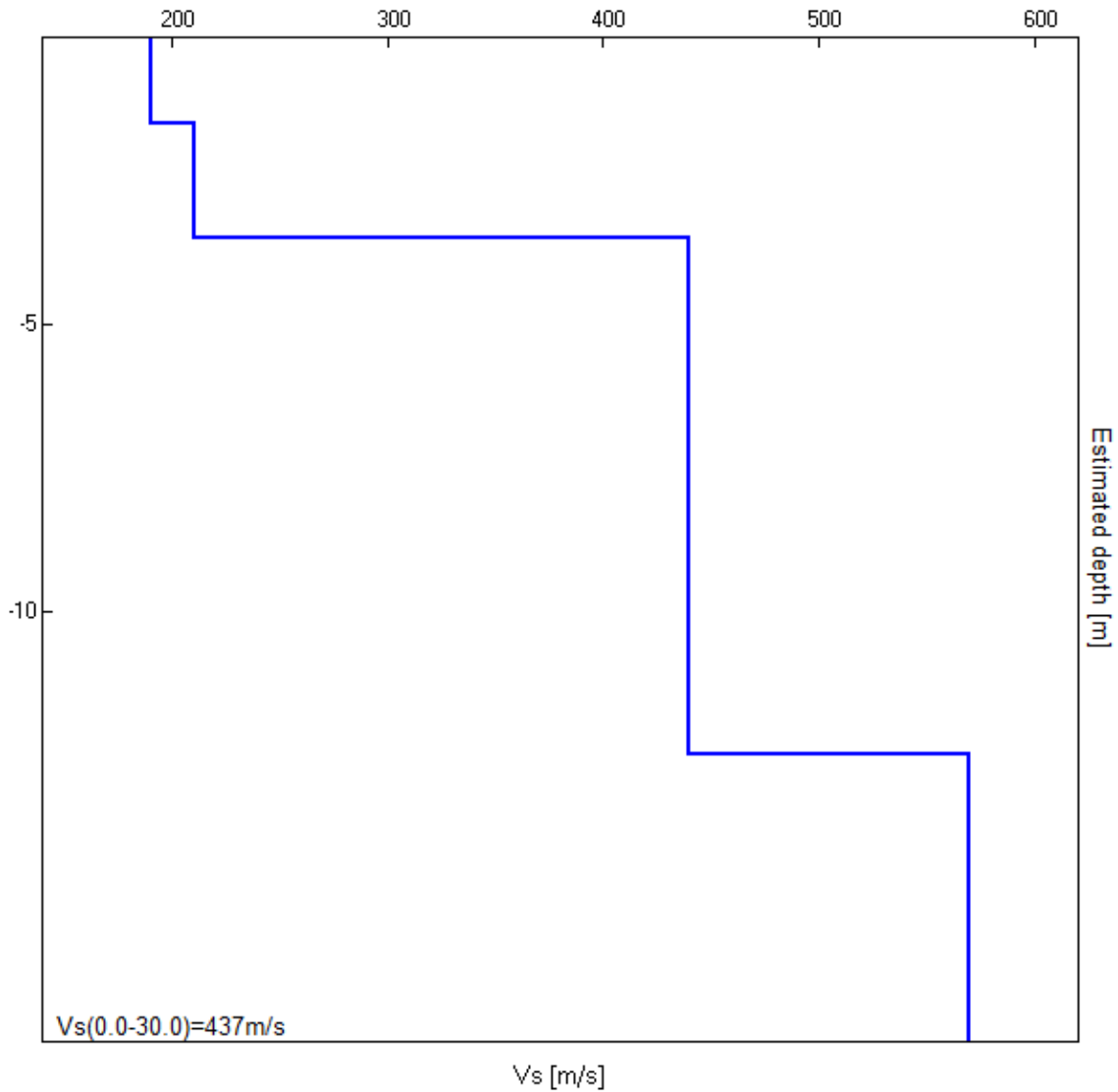


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
1.50	1.50	190
3.50	2.00	210
12.50	9.00	440
inf.	inf.	570

Vs(0.0-30.0)=437m/s



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

Max. H/V at 13.0 ± 0.24 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	13.00 > 0.63	OK	
$n_c(f_0) > 200$	7696.0 > 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 313 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	7.375 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	26.5 Hz	OK	
$A_0 > 2$	4.47 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00916 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	0.11904 < 0.65	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5902 < 1.58	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
σ_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 σ_f and $\sigma_A(f_0)$

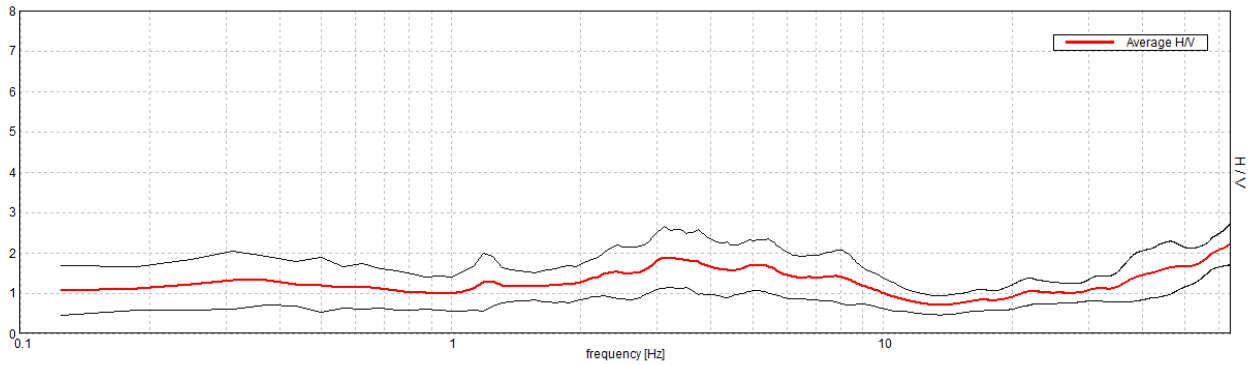
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR2 CÀ FALCHETTI

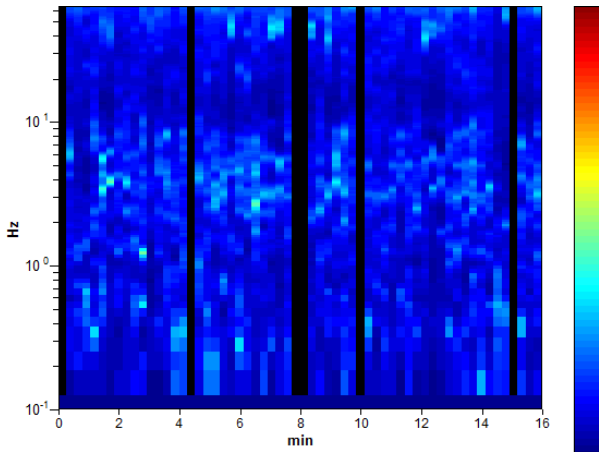
Instrument: TRZ-0108/01-10
 Start recording: 09/10/18 11:01:32 End recording: 09/10/18 11:17:32
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 90% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

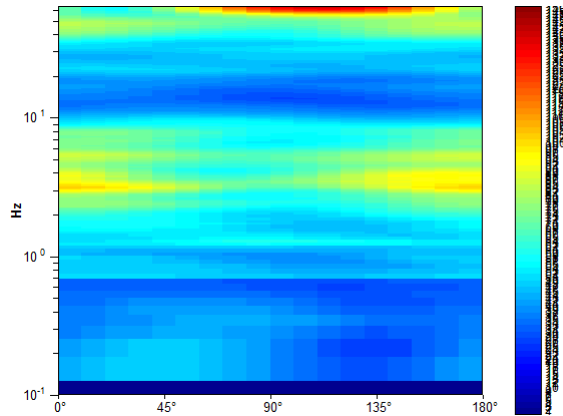
Max. H/V at 3.13 ± 0.28 Hz. (In the range 0.1 - 20.0 Hz).



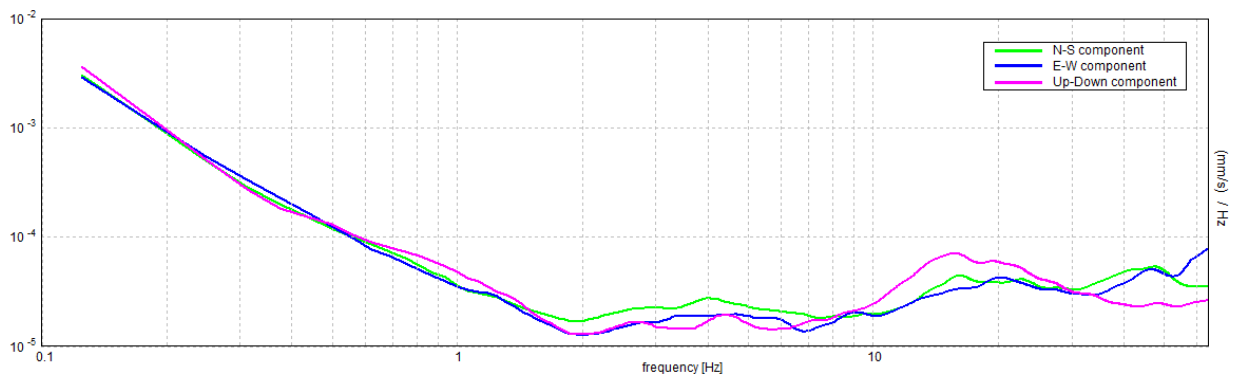
H/V TIME HISTORY



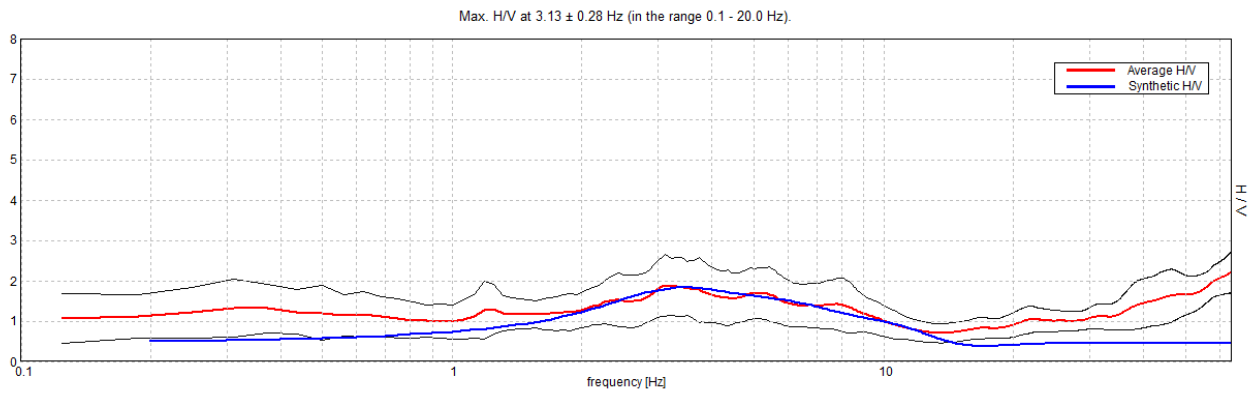
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

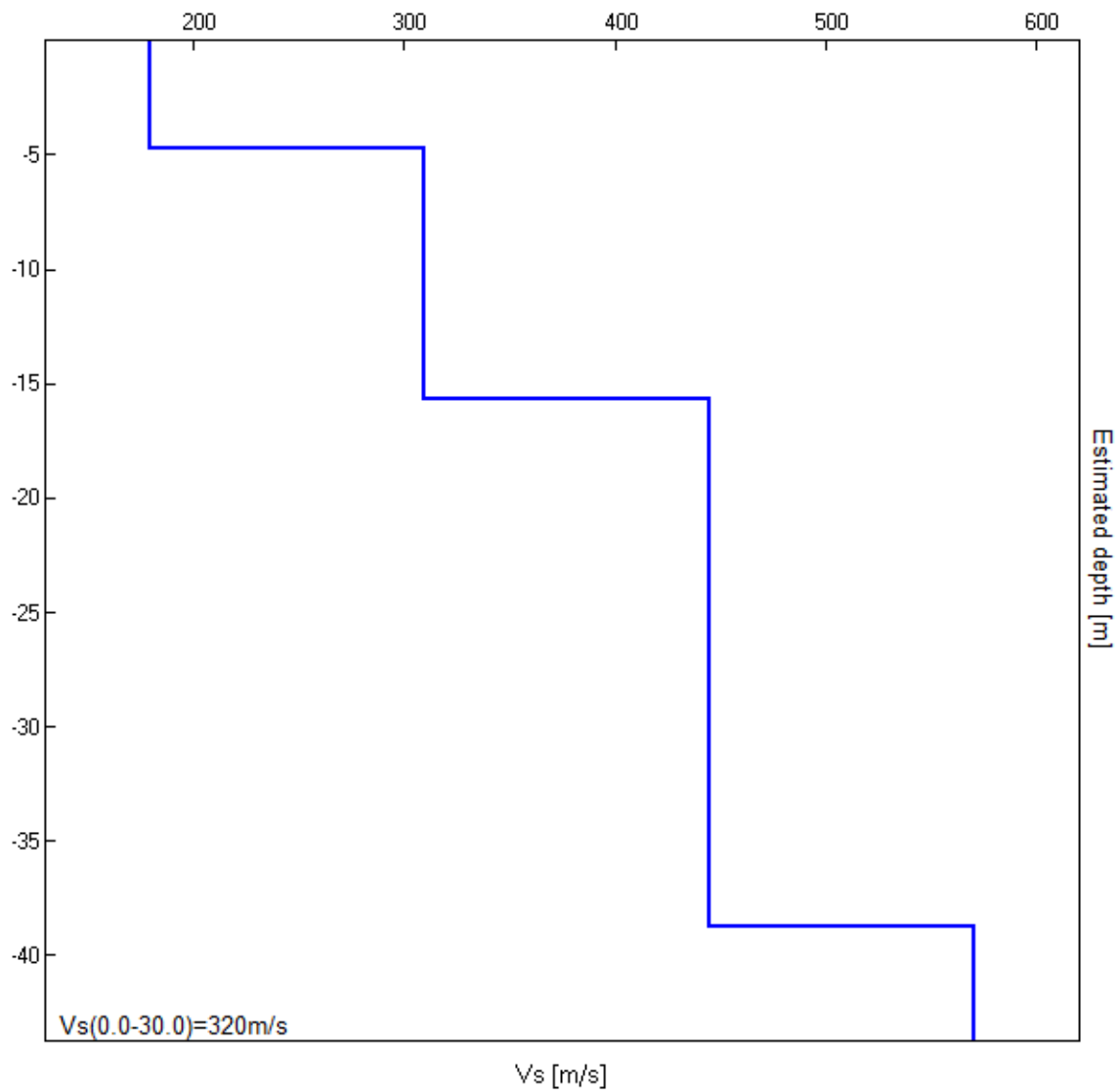


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
4.70	4.70	180
15.70	11.00	310
38.70	23.00	445
inf.	inf.	570

Vs(0.0-30.0)=320m/s



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

Max. H/V at 3.13 ± 0.28 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	3.13 > 0.63	OK	
$n_c(f_0) > 200$	2700.0 > 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 76 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	10.375 Hz	OK	
$A_0 > 2$	1.89 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.04405 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.13765 < 0.15625$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.3765 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

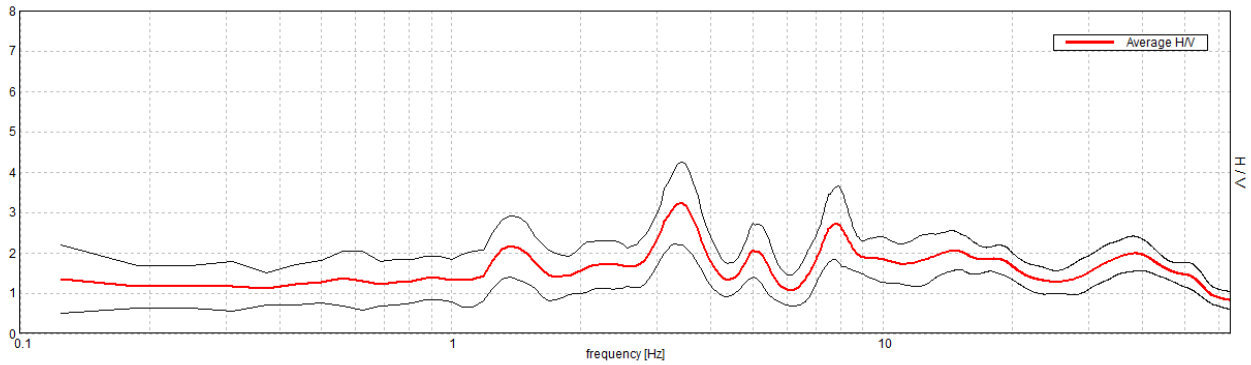
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR1 CÀ FALCHETTI

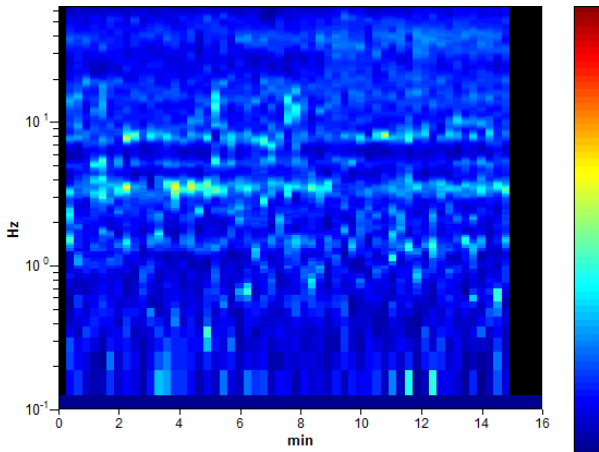
Instrument: TRZ-0108/01-10
Start recording: 09/10/18 09:57:46 End recording: 09/10/18 10:13:47
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 92% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

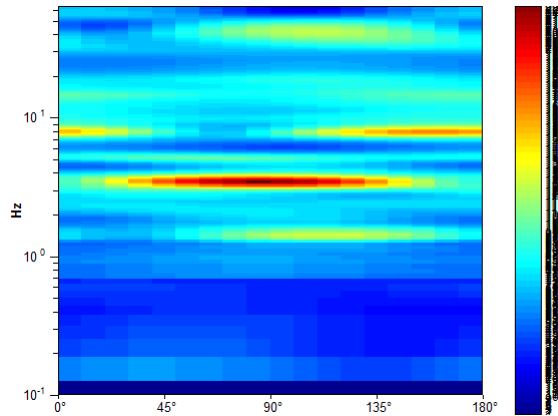
Max. H/V at 3.38 ± 0.07 Hz. (In the range 0.1 - 20.0 Hz).



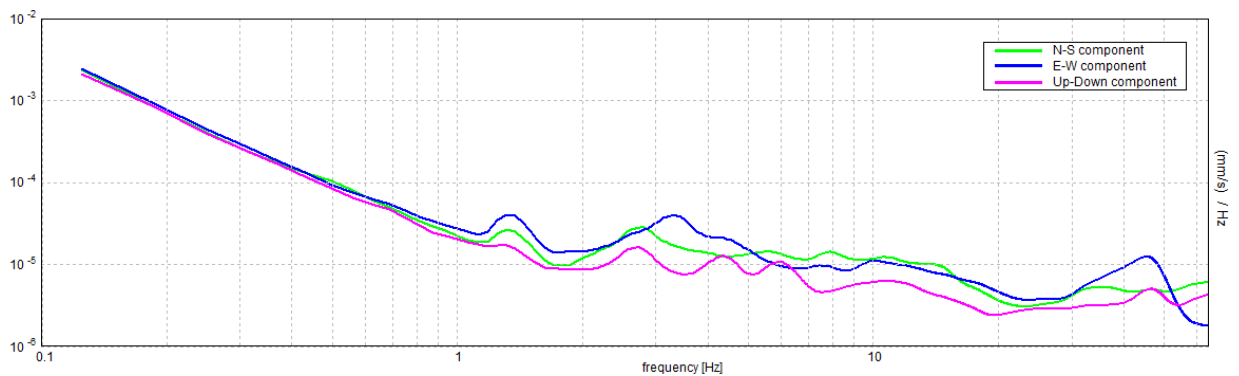
H/V TIME HISTORY



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 3.38 ± 0.07 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$3.38 > 0.63$	OK	
$n_c(f_0) > 200$	$2970.0 > 200$	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 82 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	2.0 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	4.125 Hz	OK	
$A_0 > 2$	$3.22 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.01082 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.03651 < 0.16875$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.5004 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR3 CASTEL DELL'ALPI

Instrument: TRZ-0108/01-10

Start recording: 09/10/18 11:24:36 End recording: 09/10/18 11:40:37

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 92% trace (manual window selection)

Sampling rate: 128 Hz

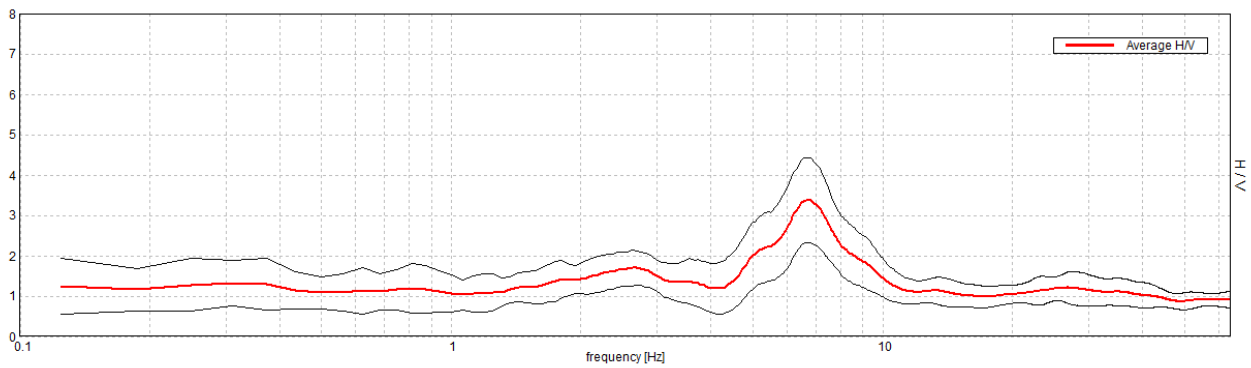
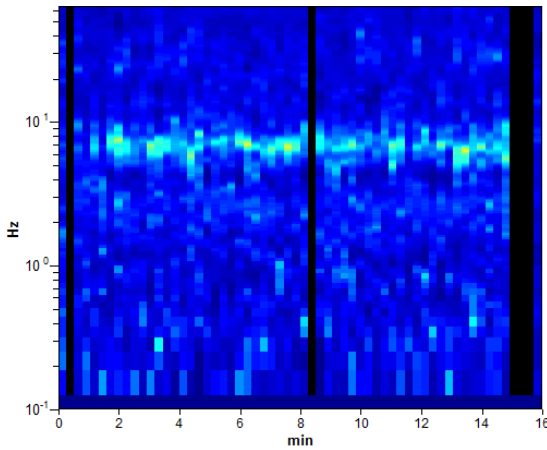
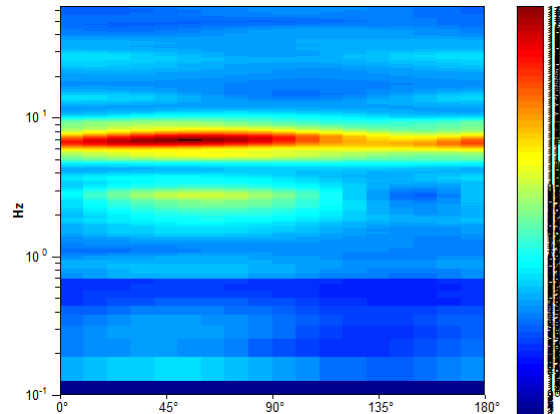
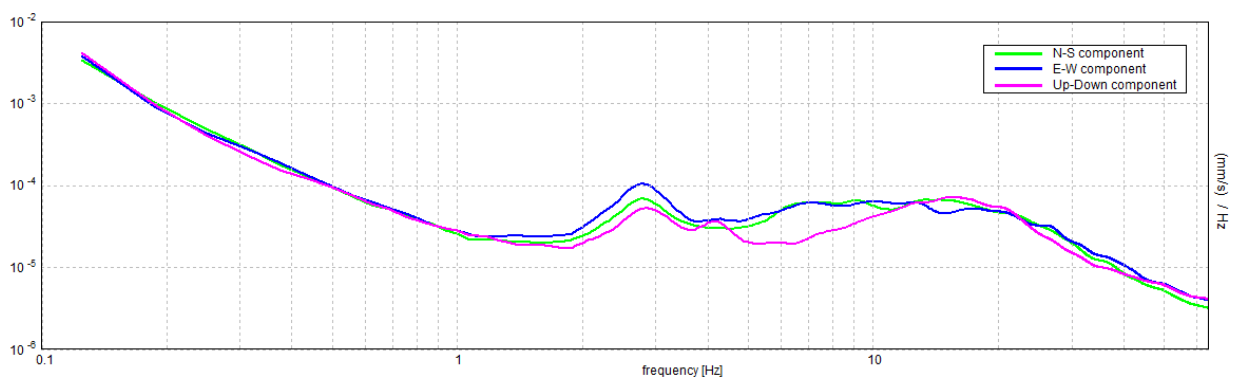
Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 6.75 ± 0.31 Hz. (In the range 0.1 - 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 6.75 ± 0.31 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$6.75 > 0.63$	OK	
$n_c(f_0) > 200$	$5940.0 > 200$	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 163 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	4.75 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	9.5 Hz	OK	
$A_0 > 2$	$3.38 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.02242 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.15133 < 0.3375$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.5217 < 1.58$	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
σ_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 σ_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



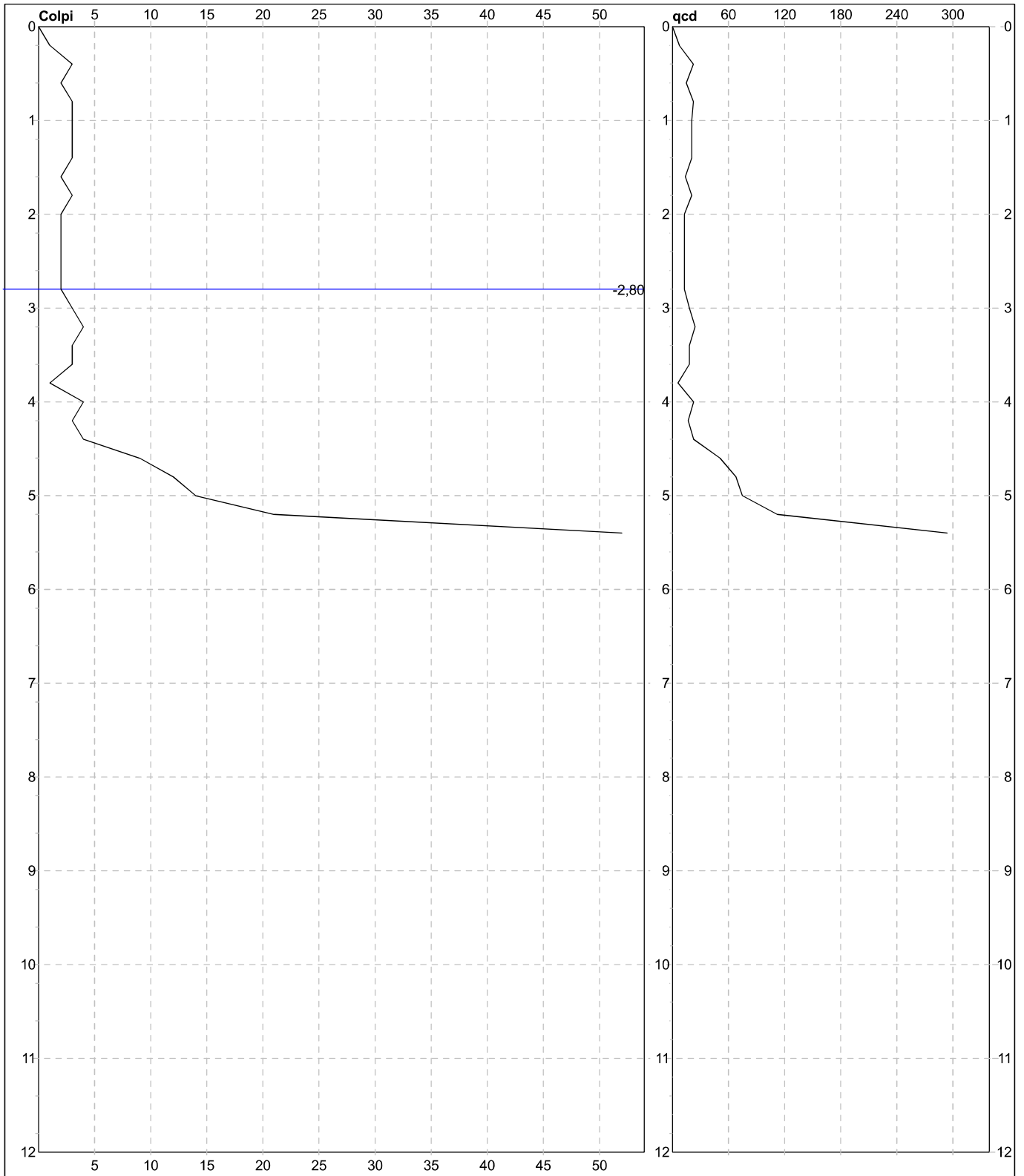
PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	9
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
Cantiere: **Studio di MS comunale livello 2**
Località: **Castel Dell'Alpi**

U.M.: **kg/cm²**
Scala: **1:60**
Pagina: **1**
Elaborato:

Data esec.: **26/01/2019**
Quota ass.:
Falda: **-2,80 m** da p.c.



Penetrometro: DPSH (S. Heavy)
Massa battente: 63,50 m
Altezza caduta: 0,75 m
Avanzamento: 0,20 m

Responsabile:
Assistente:

Preforo: m
Corr.astine: kg/ml
Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	9
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: Castel Dell'Alpi	Elaborato:	Falda: -2,80 m da p.c.

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45					
0,40	1	3		22,35					
0,60	2	2		14,90					
0,80	2	3		22,35					
1,00	2	3		20,71					
1,20	2	3		20,71					
1,40	2	3		20,71					
1,60	3	2		13,81					
1,80	3	3		20,71					
2,00	3	2		12,87					
2,20	3	2		12,87					
2,40	3	2		12,87					
2,60	4	2		12,87					
2,80	4	2		12,87					
3,00	4	3		18,07					
3,20	4	4		24,10					
3,40	4	3		18,07					
3,60	5	3		18,07					
3,80	5	1		6,02					
4,00	5	4		22,65					
4,20	5	3		16,99					
4,40	5	4		22,65					
4,60	6	9		50,97					
4,80	6	12		67,96					
5,00	6	14		74,80					
5,20	6	21		112,20					
5,40	6	55		293,87					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

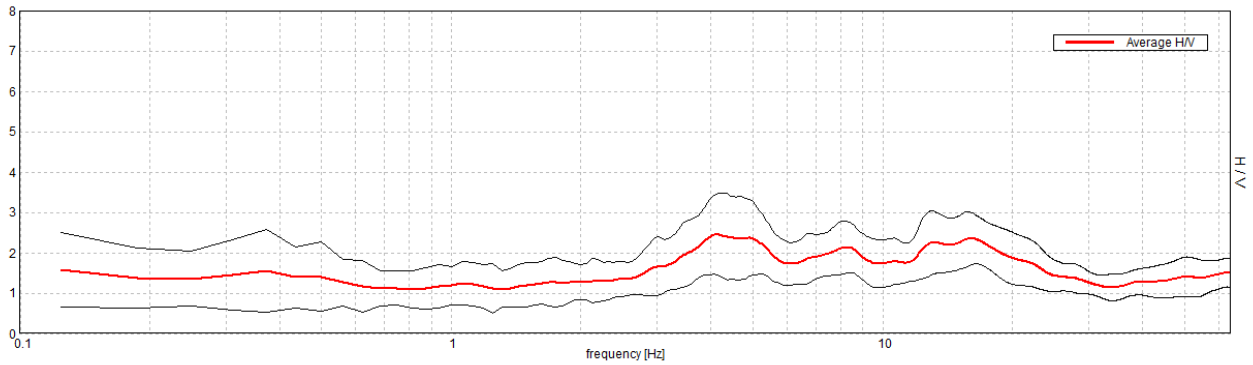
qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR4 CASTEL DELL'ALPI

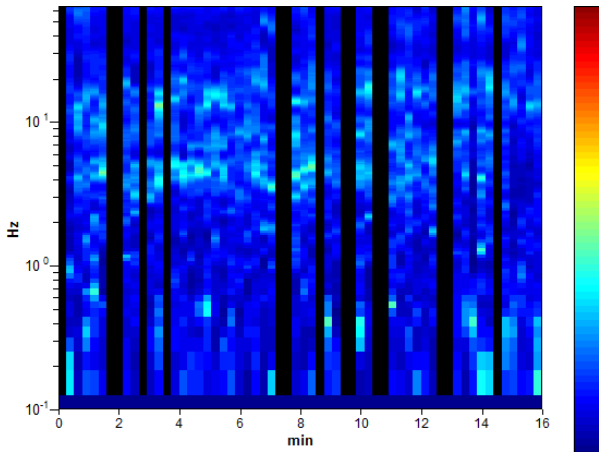
Instrument: TRZ-0108/01-10
 Start recording: 09/10/18 11:52:12 End recording: 09/10/18 12:08:13
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 75% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

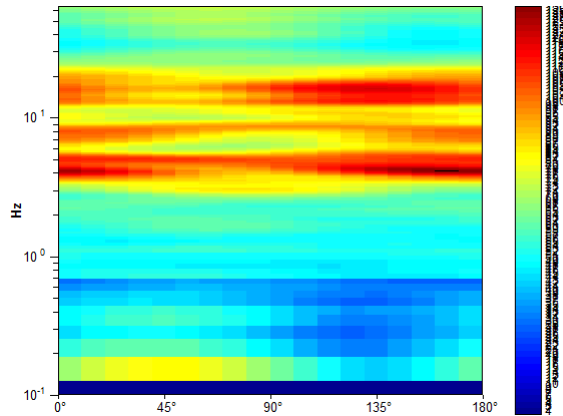
Max. H/V at 4.13 ± 0.57 Hz. (In the range 0.1 - 20.0 Hz).



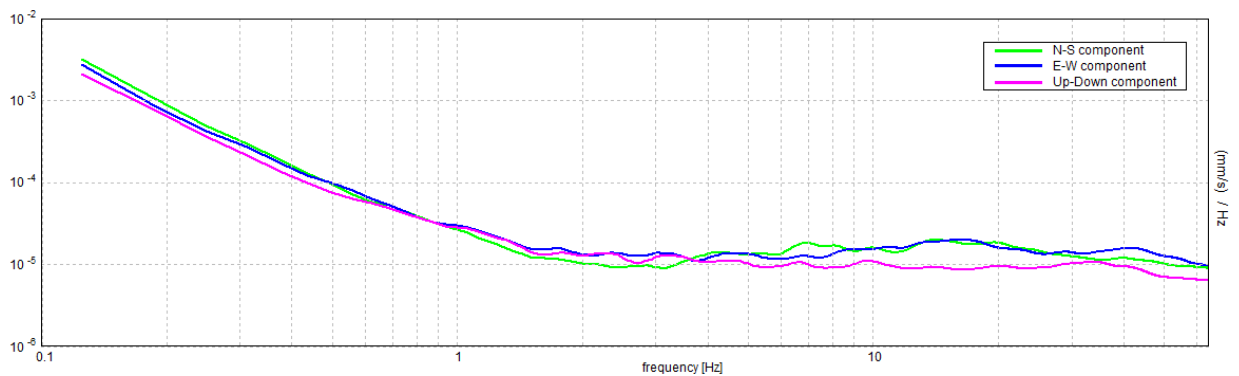
H/V TIME HISTORY



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 4.13 ± 0.57 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	4.13 > 0.63	OK	
$n_c(f_0) > 200$	2970.0 > 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 100 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	1.563 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.45 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.06835 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.28195 < 0.20625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.491 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

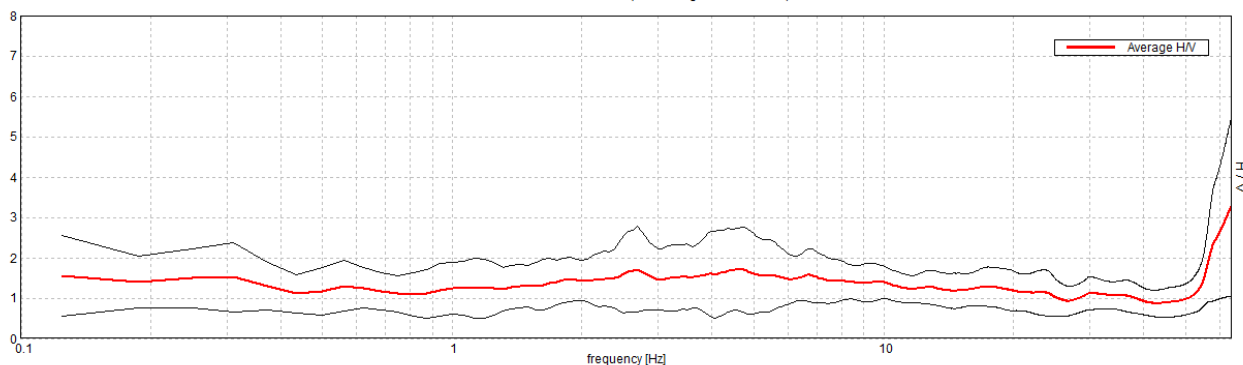
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR6 CASTEL DELL'ALPI

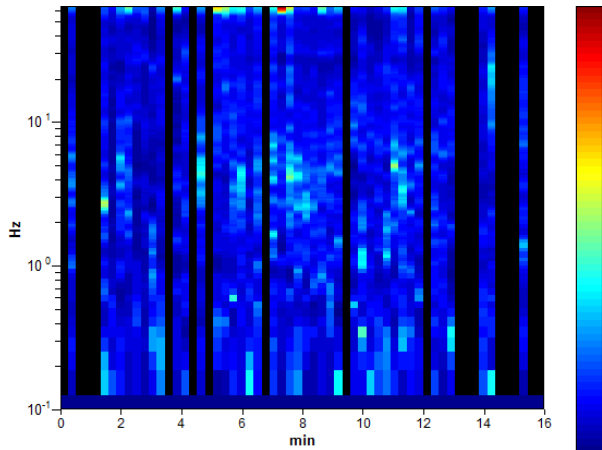
Instrument: TRZ-0108/01-10
Start recording: 09/10/18 12:42:31 End recording: 09/10/18 12:58:32
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 70% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

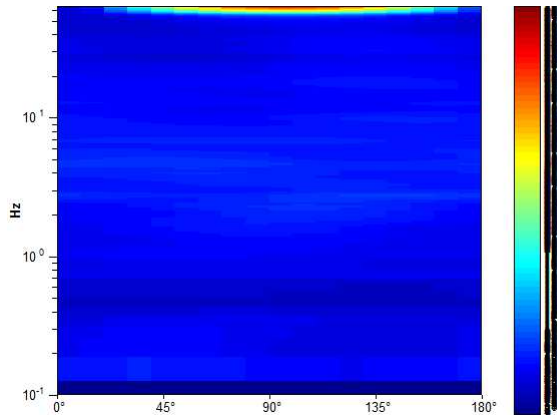
Max. H/V at 2.69 ± 0.17 Hz. (In the range 0.1 - 20.0 Hz).



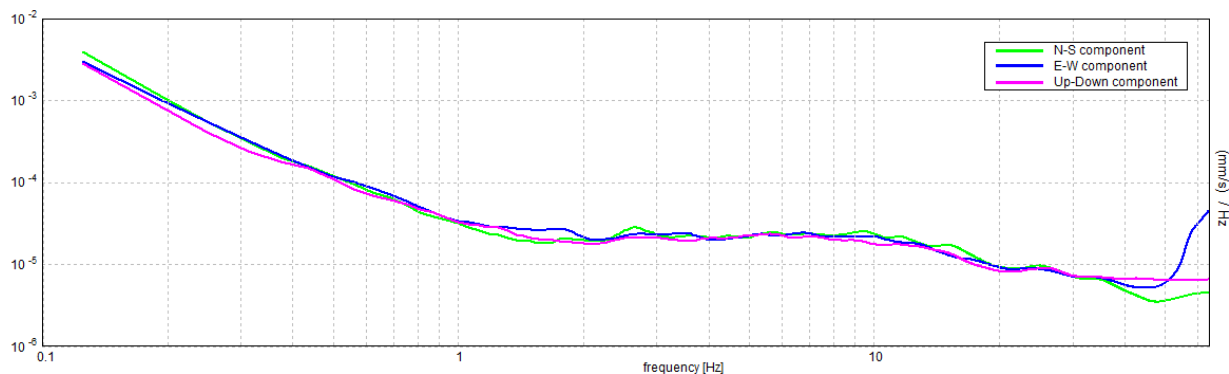
H/V TIME HISTORY



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 2.69 ± 0.17 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$2.69 > 0.63$	OK	
$n_c(f_0) > 200$	$1806.0 > 200$	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 66 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
$A_0 > 2$	$1.71 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.03086 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.08295 < 0.13438$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.52 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR5 CASTEL DELL'ALPI

Instrument: TRZ-0108/01-10

Start recording: 09/10/18 12:15:28 End recording: 09/10/18 12:31:29

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

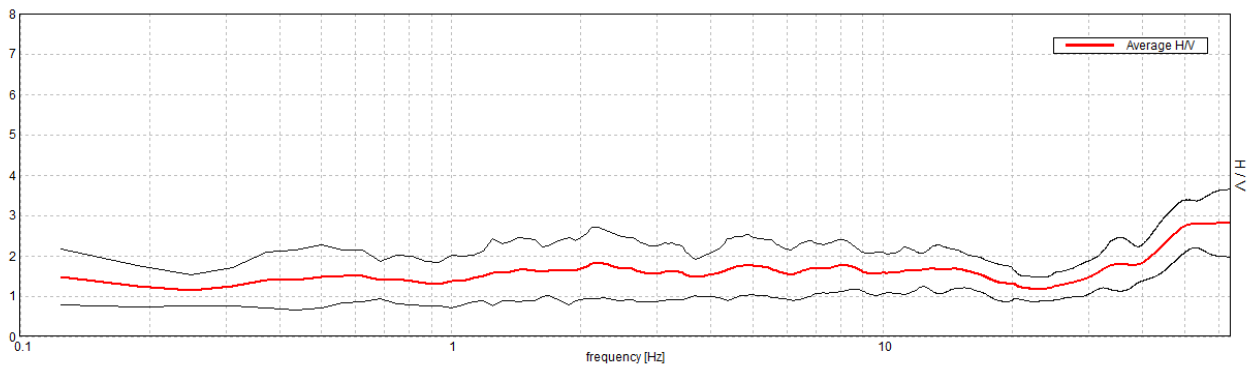
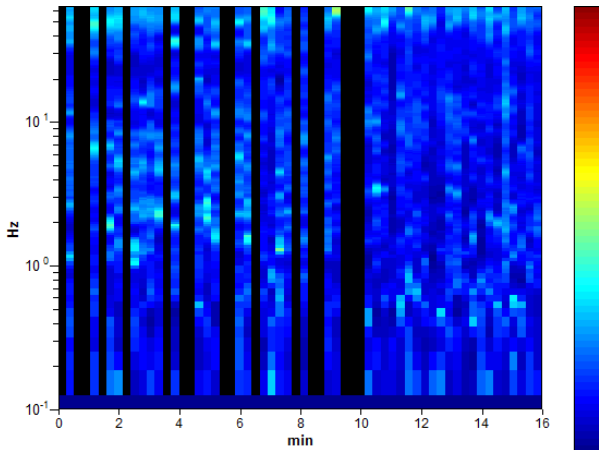
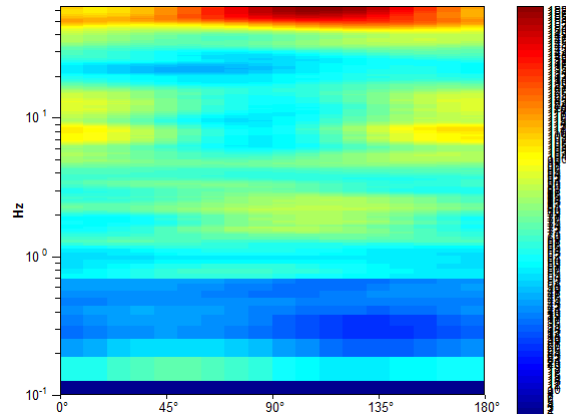
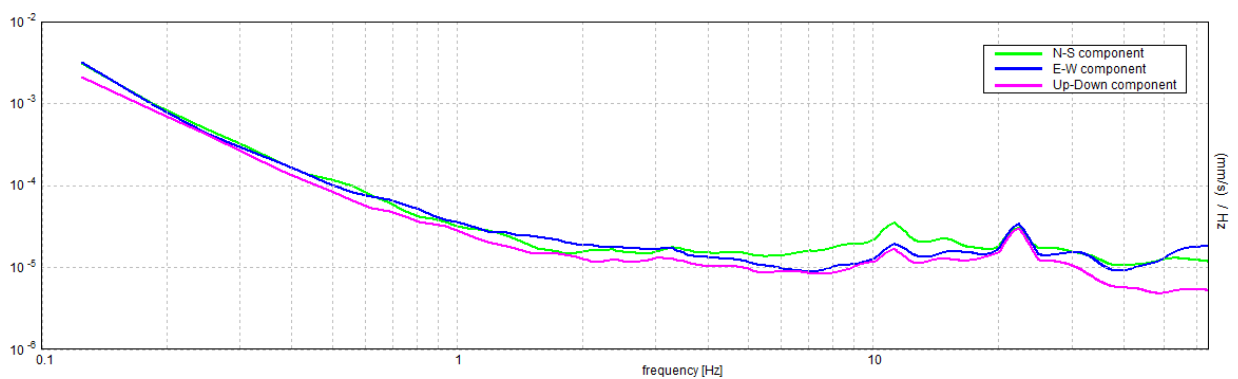
Trace length: 0h16'00". Analyzed 72% trace (manual window selection)

Sampling rate: 128 Hz

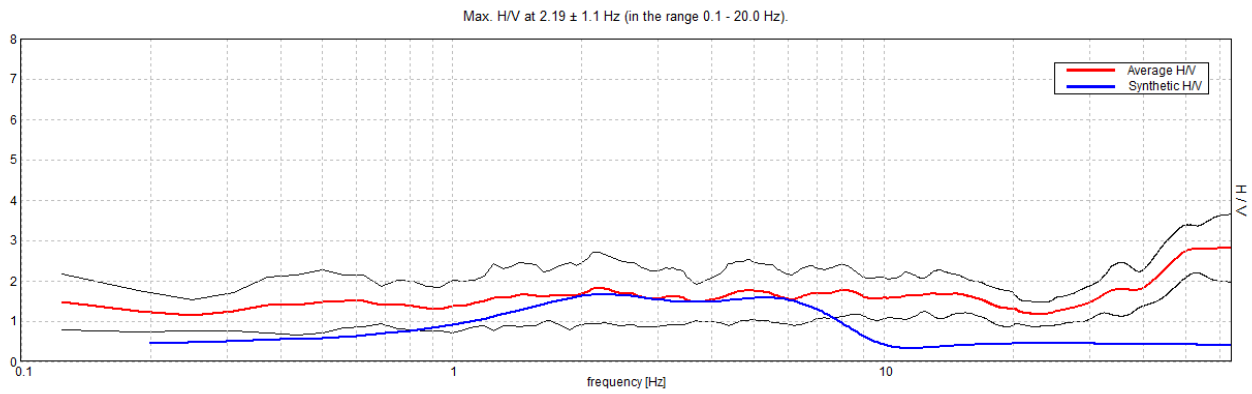
Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

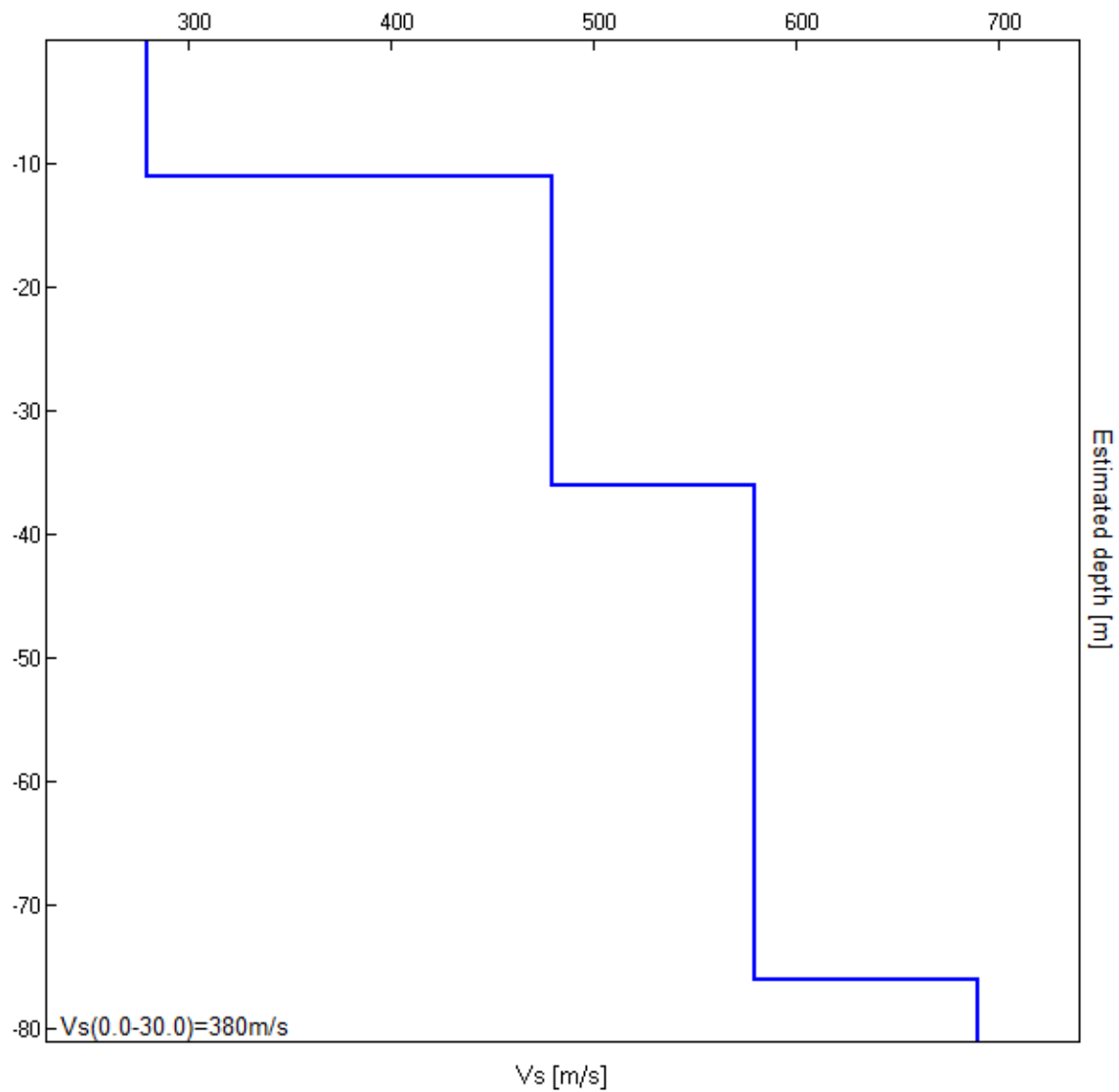
HORIZONTAL TO VERTICAL SPECTRAL RATIOMax. H/V at 2.19 ± 1.1 Hz. (In the range 0.1 - 20.0 Hz).**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
11.00	11.00	280
36.00	25.00	480
76.00	40.00	580
inf.	inf.	690

Vs(0.0-30.0)=380m/s



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

Max. H/V at 2.19 ± 1.1 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.19 > 0.63	OK	
$n_c(f_0) > 200$	1505.0 > 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 54 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
$A_0 > 2$	1.82 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.24704 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.54039 < 0.10938$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.4338 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

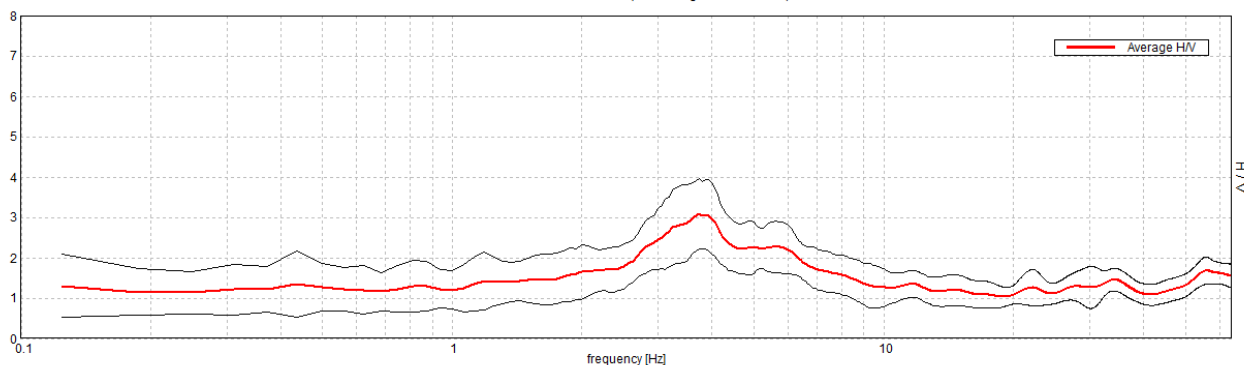
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR8 CÀ DEI BORELLI

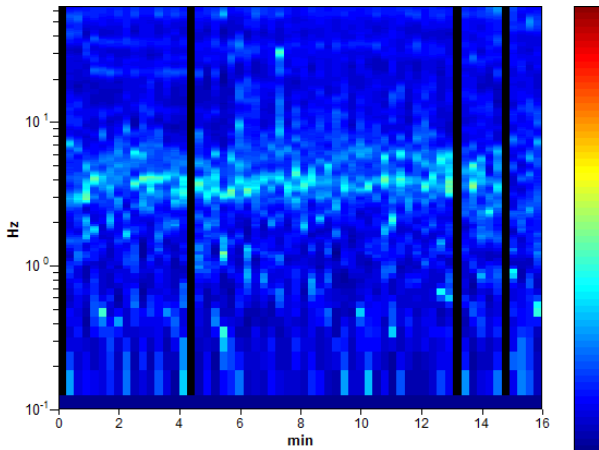
Instrument: TRZ-0108/01-10
Start recording: 09/10/18 14:27:01 End recording: 09/10/18 14:43:02
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 93% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

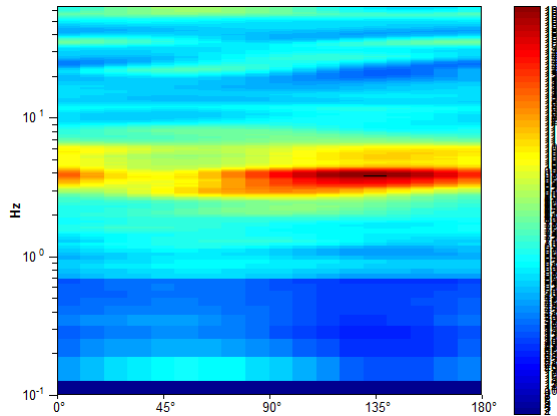
Max. H/V at 3.75 ± 0.14 Hz. (In the range 0.1 - 20.0 Hz).



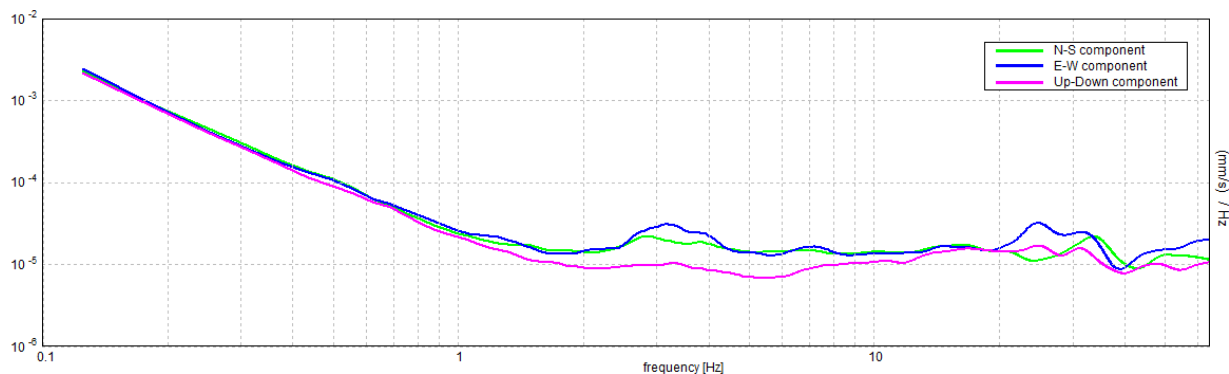
H/V TIME HISTORY



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 3.75 ± 0.14 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$3.75 > 0.63$	OK	
$n_c(f_0) > 200$	$3360.0 > 200$	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 91 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	1.813 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	8.188 Hz	OK	
$A_0 > 2$	$3.08 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.01785 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.06694 < 0.1875$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.4289 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

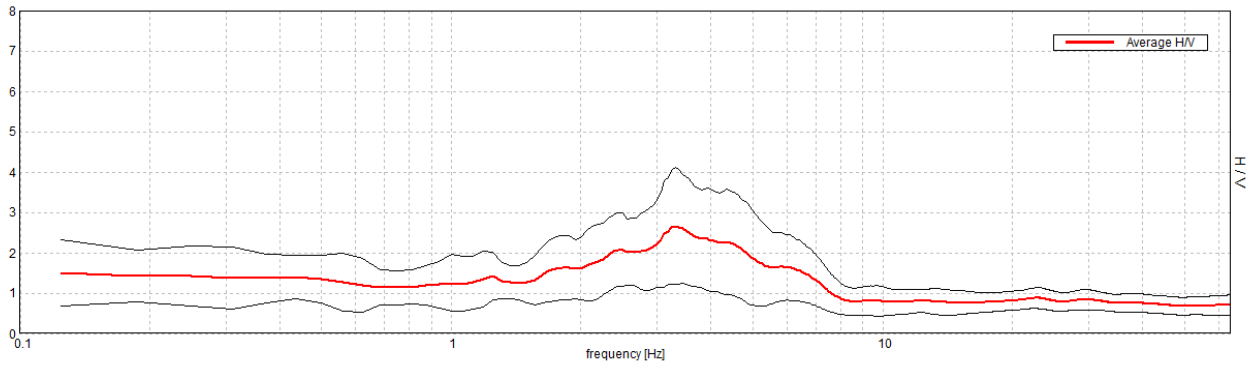
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR7 CÀ DEI BORELLI

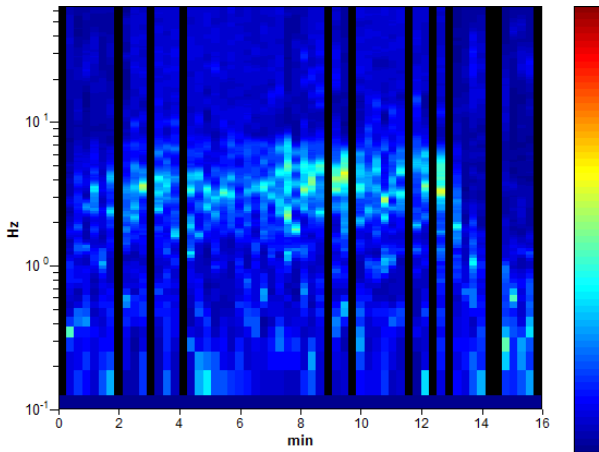
Instrument: TRZ-0108/01-10
Start recording: 09/10/18 14:03:52 End recording: 09/10/18 14:19:52
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

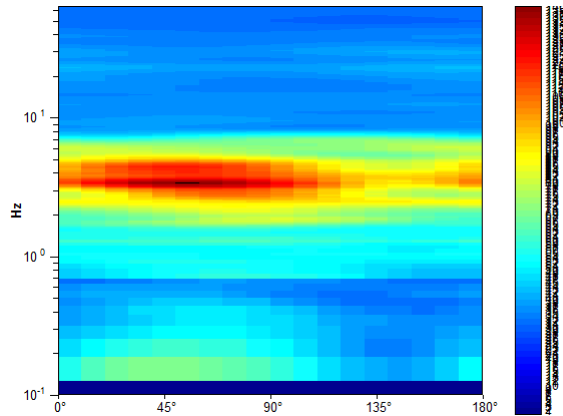
Max. H/V at 3.31 ± 0.29 Hz. (In the range 0.1 - 20.0 Hz).



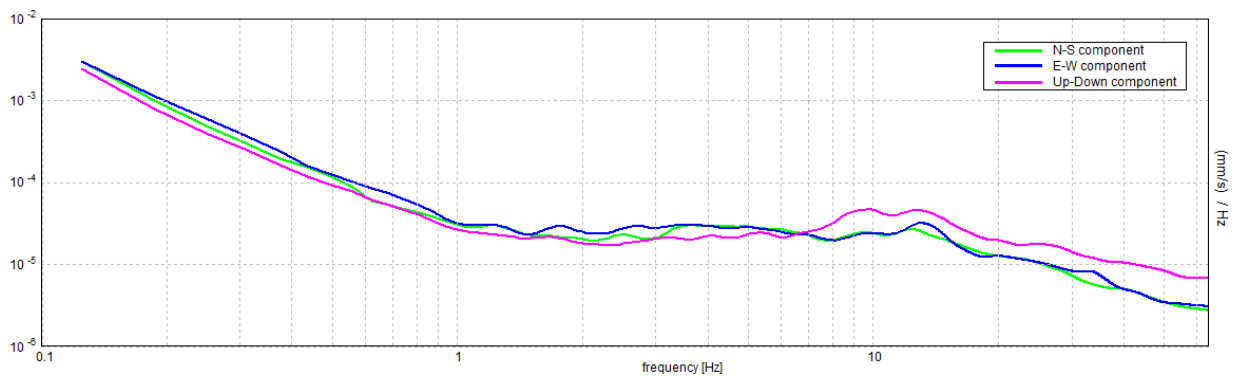
H/V TIME HISTORY



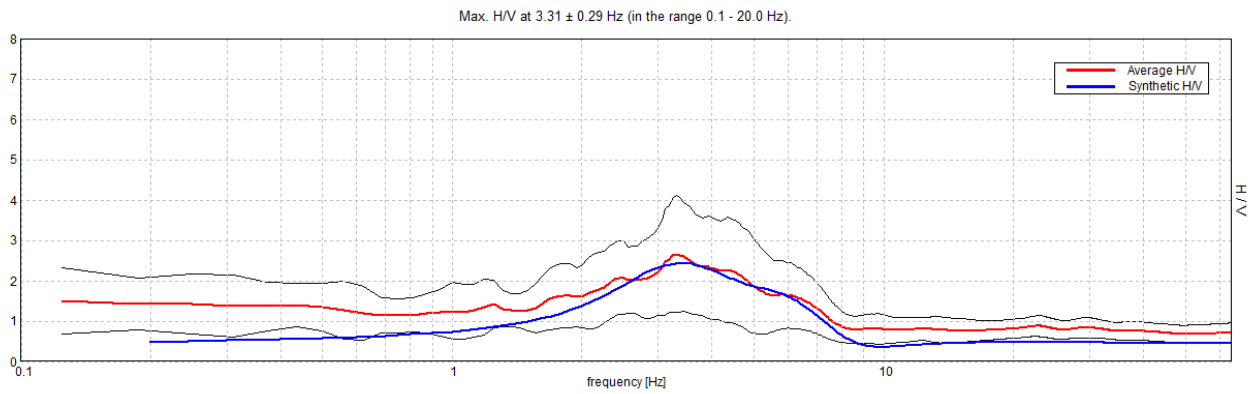
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

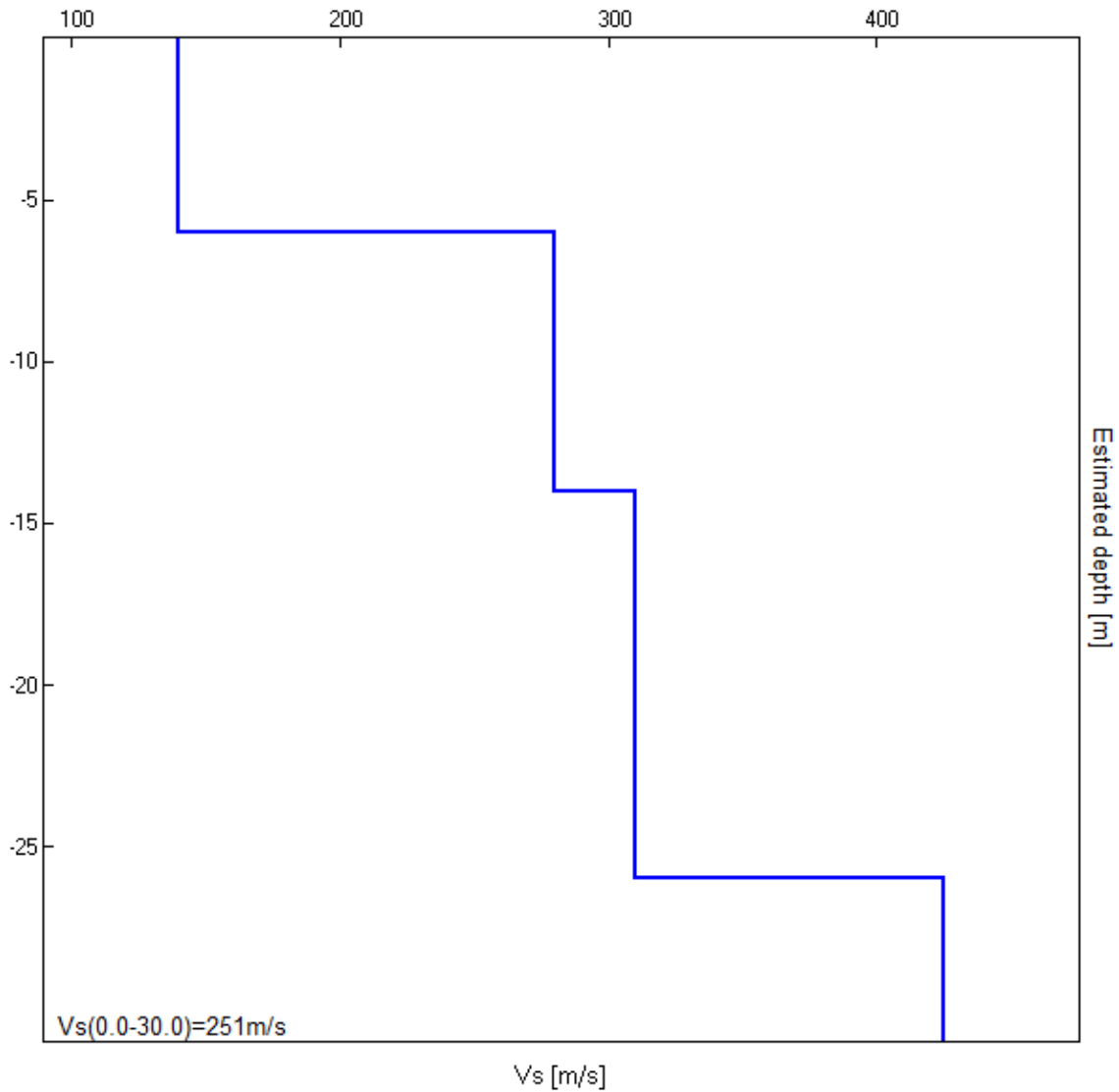


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
6.00	6.00	140
14.00	8.00	280
26.00	12.00	310
inf.	inf.	425

Vs(0.0-30.0)=251m/s



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

Max. H/V at 3.31 ± 0.29 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	3.31 > 0.63	OK	
$n_c(f_0) > 200$	2544.0 > 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 80 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	1.563 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	7.0 Hz	OK	
$A_0 > 2$	2.67 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.04343 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.14386 < 0.16563$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.7117 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR10 PIAN DI BALESTRA

Instrument: TRZ-0108/01-10

Start recording: 09/10/18 15:29:33 End recording: 09/10/18 15:45:34

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 93% trace (manual window selection)

Sampling rate: 128 Hz

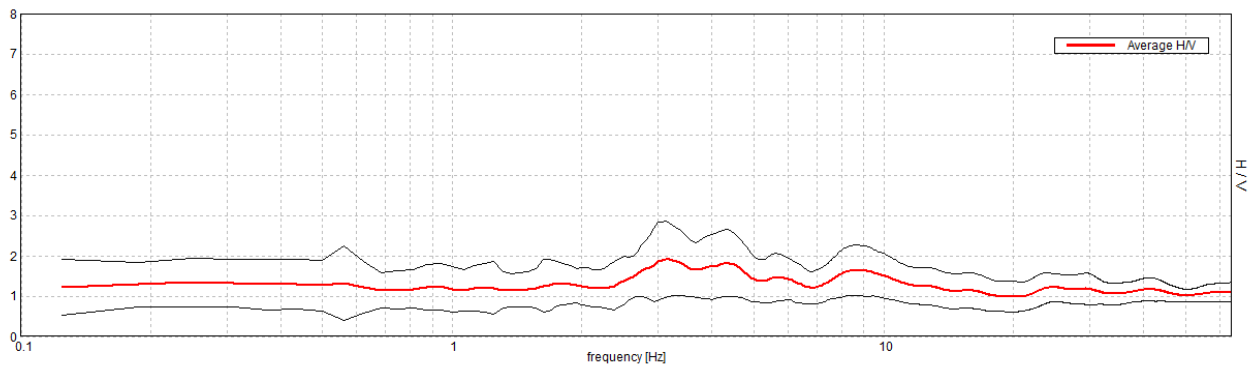
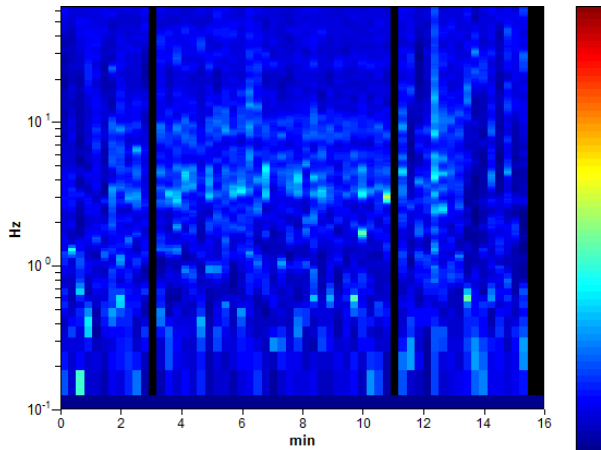
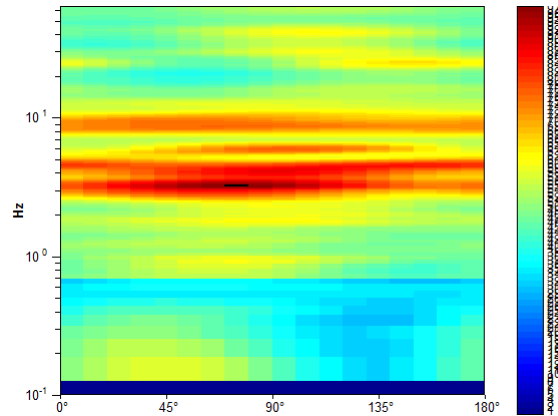
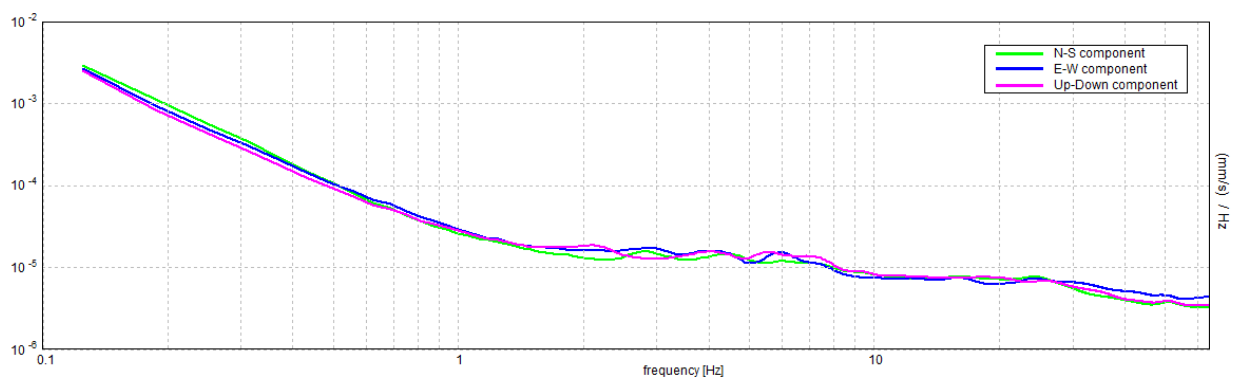
Window size: 16 s

Smoothing type: Triangular window

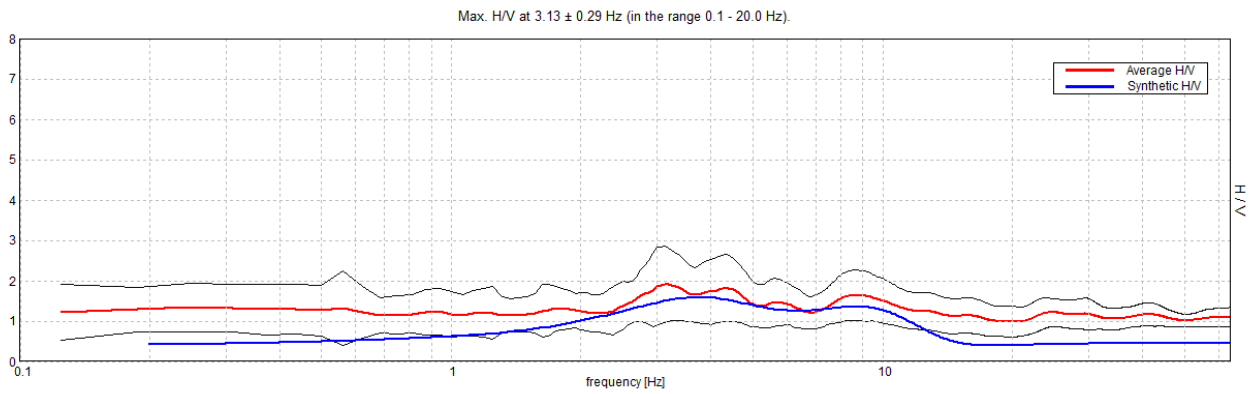
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 3.13 ± 0.29 Hz. (In the range 0.1 - 20.0 Hz).

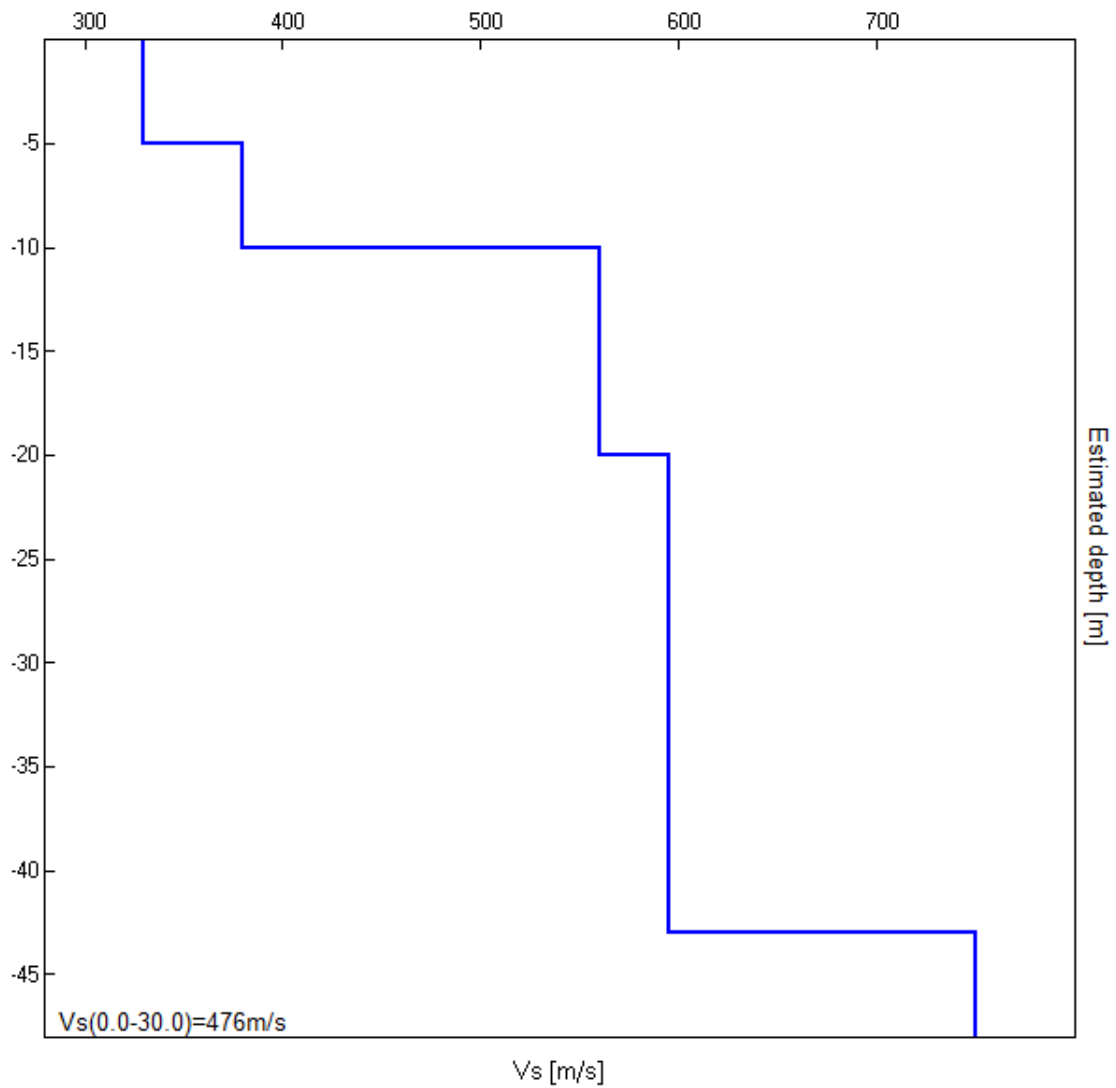
**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
5.00	5.00	330
10.00	5.00	380
20.00	10.00	560
43.00	23.00	595
inf.	inf.	750

Vs(0.0-30.0)=476m/s



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

Max. H/V at 3.13 ± 0.29 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	3.13 > 0.63	OK	
$n_c(f_0) > 200$	2800.0 > 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 76 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
$A_0 > 2$	1.91 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.04515 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.14111 < 0.15625$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.4681 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

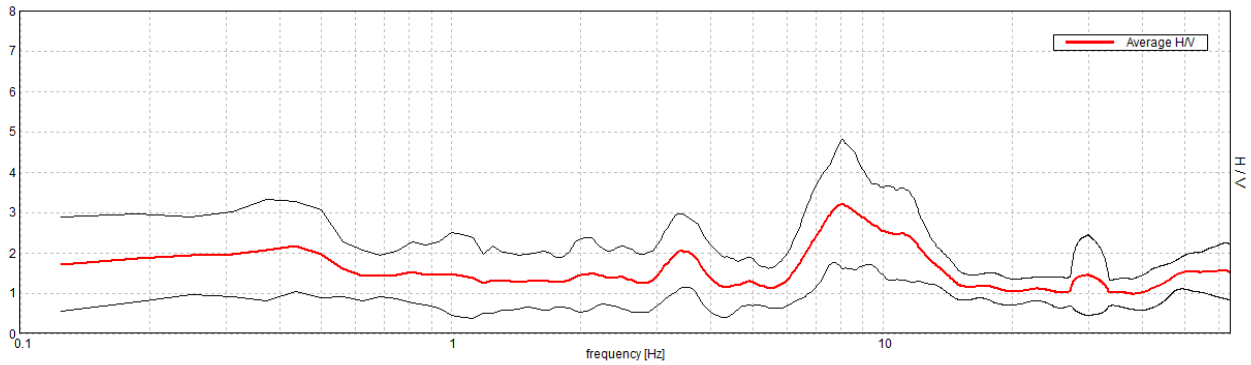
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR9 PIAN DI BALESTRA

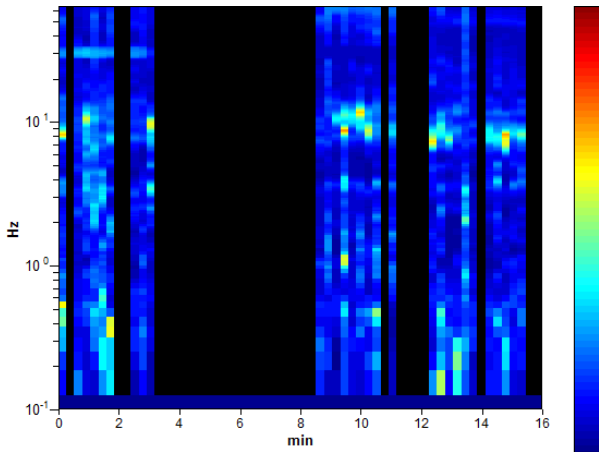
Instrument: TRZ-0108/01-10
 Start recording: 09/10/18 15:07:52 End recording: 09/10/18 15:23:53
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 48% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

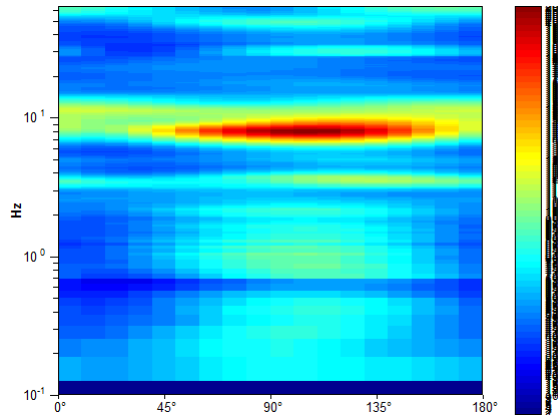
Max. H/V at 8.06 ± 0.73 Hz (in the range 0.1 - 20.0 Hz).



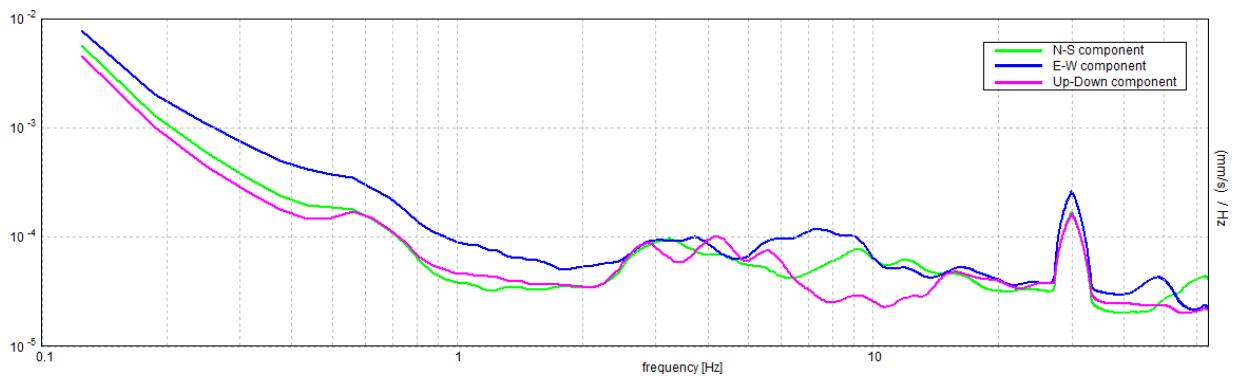
H/V TIME HISTORY



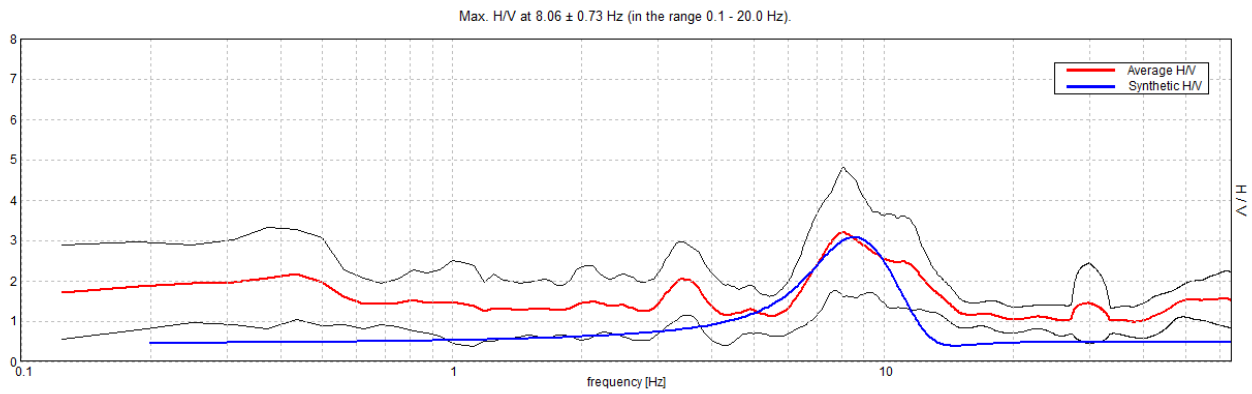
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

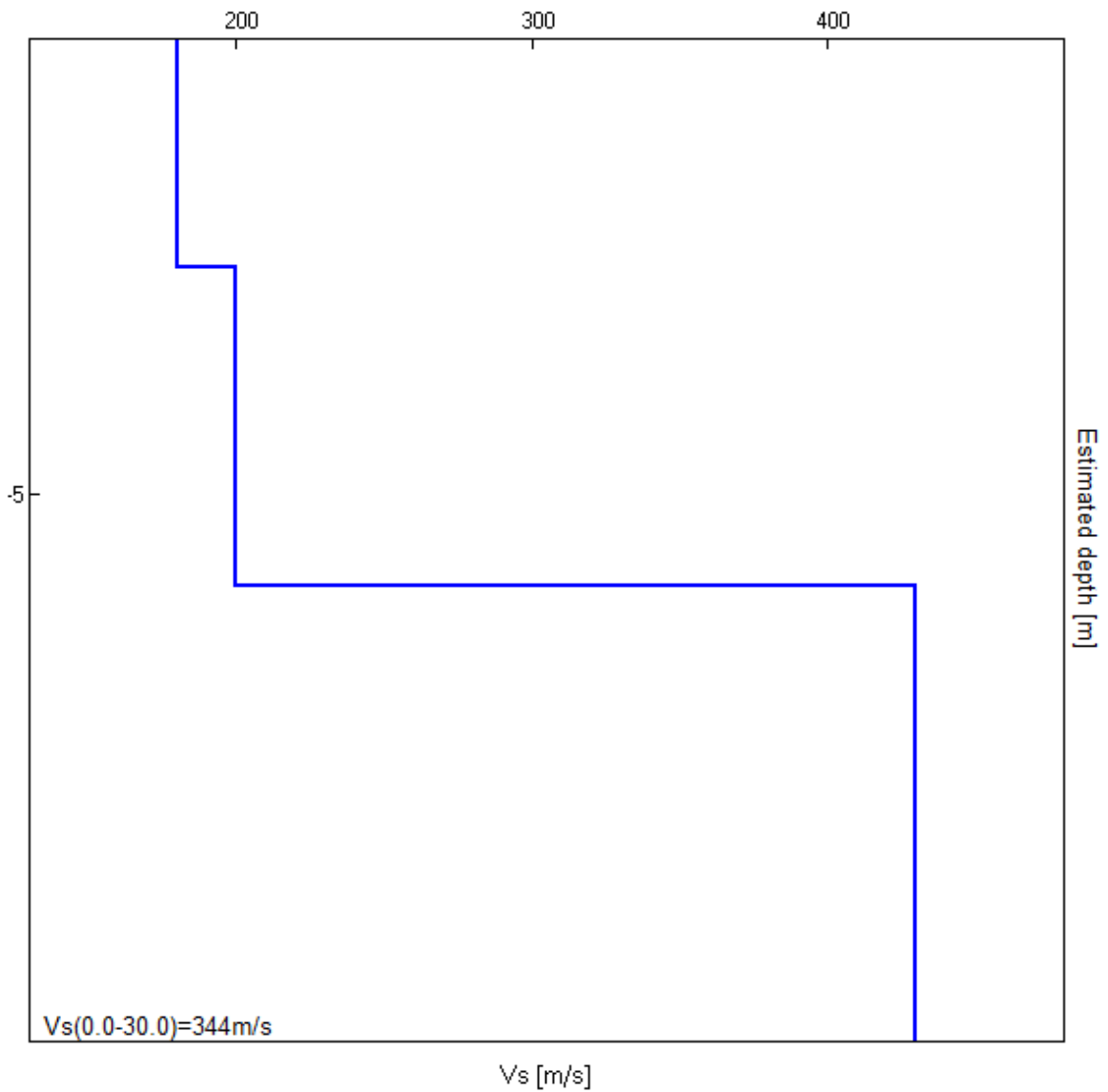


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
2.50	2.50	180
6.00	3.50	200
inf.	inf.	430

$V_s(0.0-30.0)=344\text{m/s}$



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

Max. H/V at 8.06 ± 0.73 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	8.06 > 0.63	OK	
$n_c(f_0) > 200$	3741.0 > 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 194 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	6.25 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	13.688 Hz	OK	
$A_0 > 2$	3.21 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.04335 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	0.34948 < 0.40313	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.7668 < 1.58	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
σ_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 σ_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



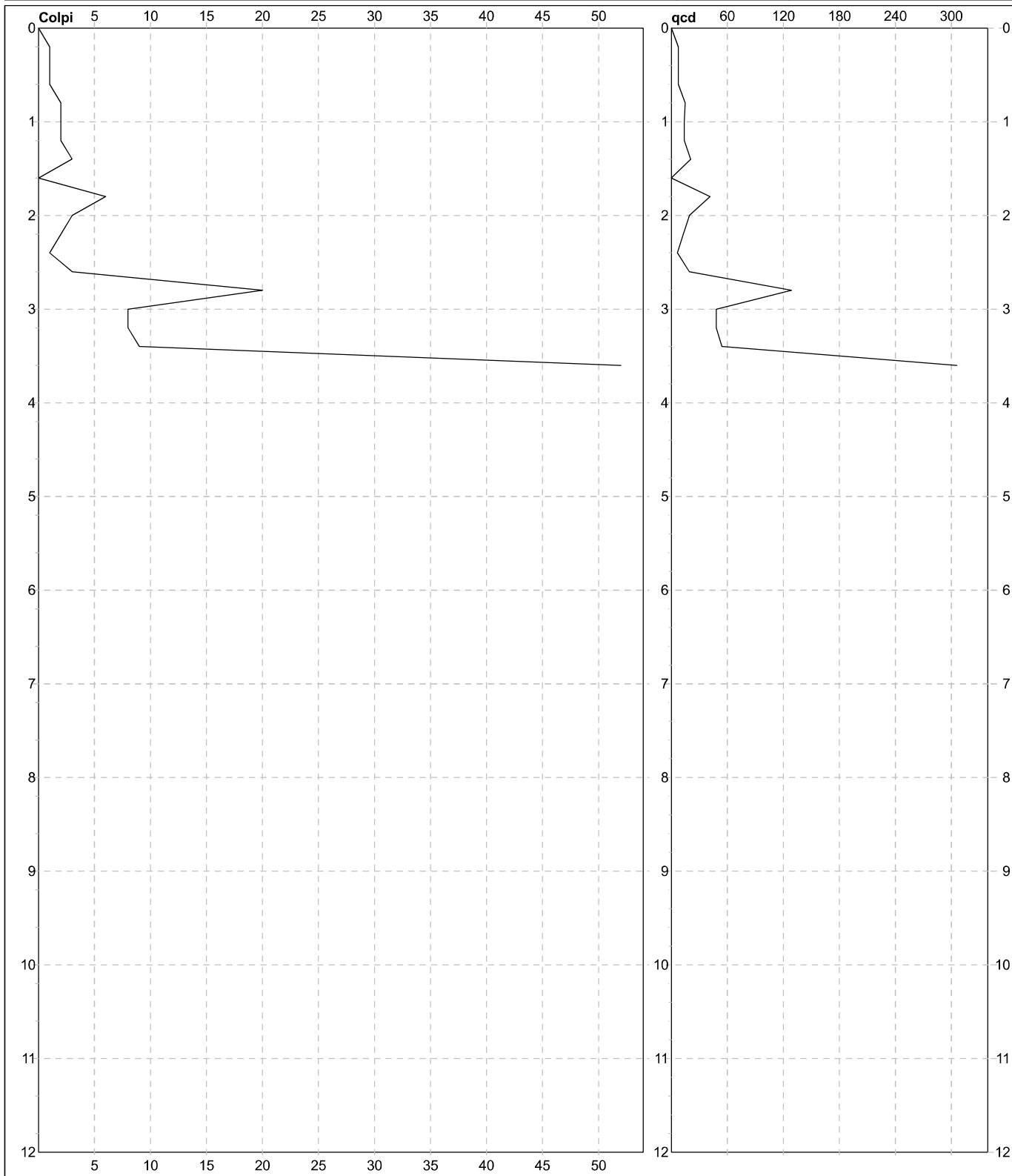
PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	18
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
Cantiere: **Studio di MS comunale livello 2**
Località: **loc. Val Serena Baita dei Cacciatori**

U.M.: **kg/cm²**
Scala: **1:60**
Pagina: **1**
Elaborato:

Data esec.: **26/01/2019**
Quota ass.:
Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
Massa battente: 63,50 m
Altezza caduta: 0,75 m
Avanzamento: 0,20 m

Responsabile:
Assistente:

Preforo: m
Corr.astine: kg/ml
Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	18
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: loc. Val Serena Baita dei Cacciatori	Elaborato:	Falda: Non rilevata

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45					
0,40	1	1		7,45					
0,60	2	1		7,45					
0,80	2	2		14,90					
1,00	2	2		13,81					
1,20	2	2		13,81					
1,40	2	3		20,71					
1,60	3	0		0,00					
1,80	3	6		41,43					
2,00	3	3		19,30					
2,20	3	2		12,87					
2,40	3	1		6,43					
2,60	4	3		19,30					
2,80	4	20		128,69					
3,00	4	8		48,19					
3,20	4	8		48,19					
3,40	4	9		54,22					
3,60	5	63		379,53					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR12 VALSERENA

Instrument: TRZ-0108/01-10

Start recording: 09/10/18 16:13:40 End recording: 09/10/18 16:29:41

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 80% trace (manual window selection)

Sampling rate: 128 Hz

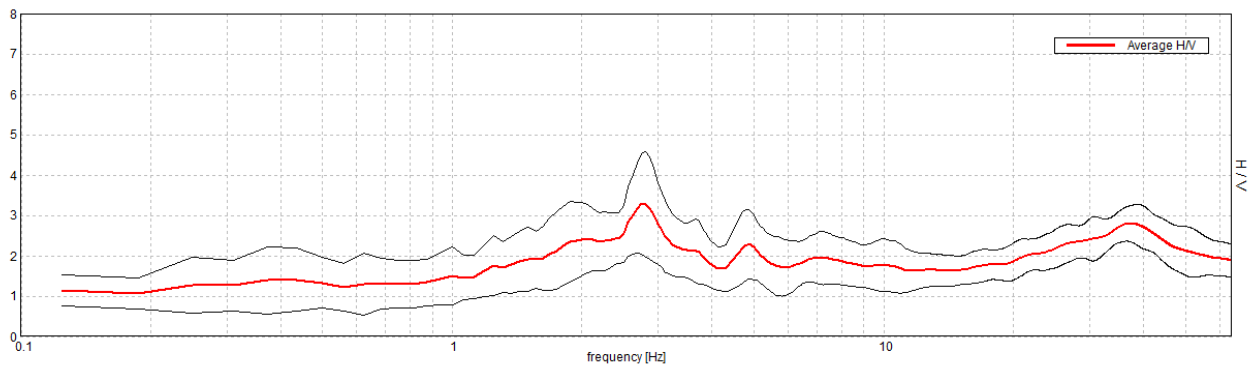
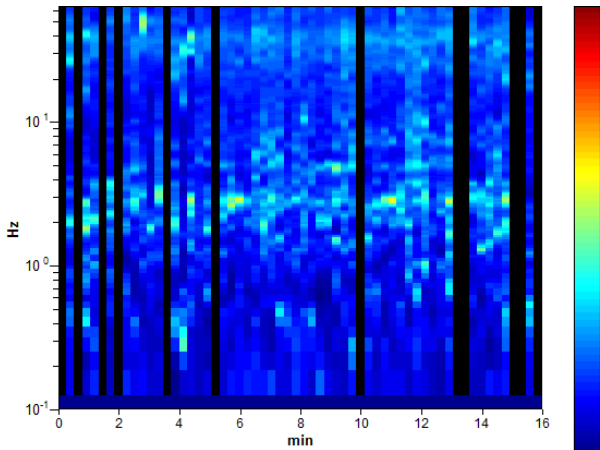
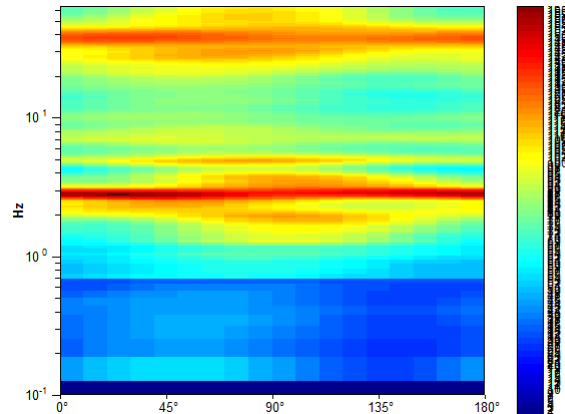
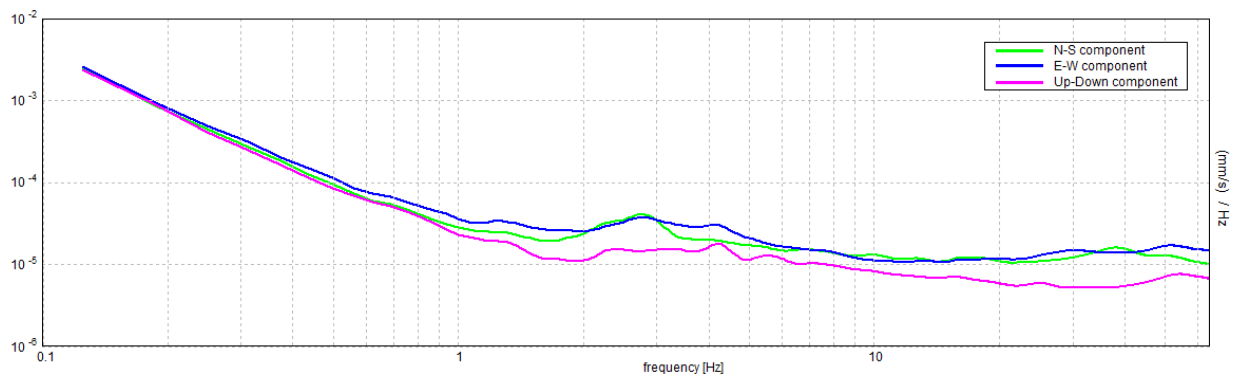
Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 2.75 ± 0.11 Hz. (In the range 0.1 - 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 2.75 ± 0.11 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.75 > 0.63	OK	
$n_c(f_0) > 200$	2112.0 > 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 67 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	1.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	3.28 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0.02 < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.05501 < 0.1375	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.6087 < 1.58	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
σ_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 σ_f and $\sigma_A(f_0)$

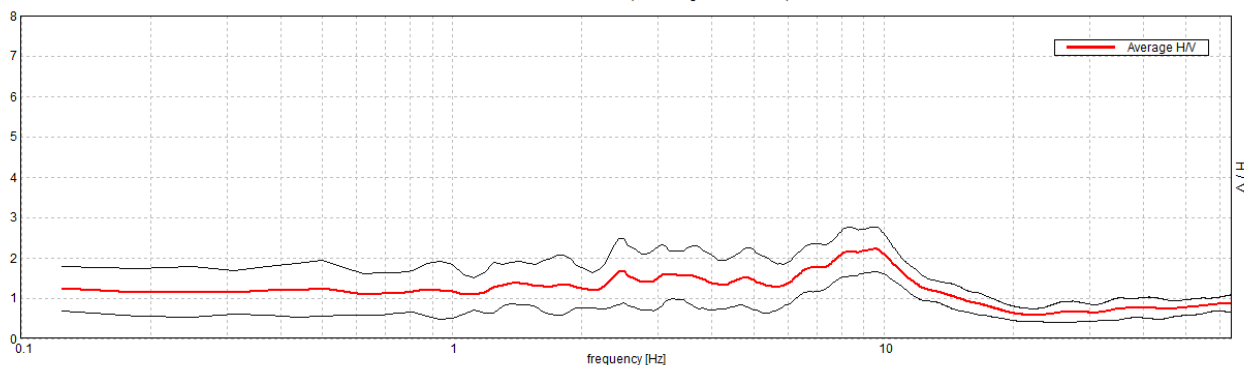
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR22 PIAN DEL VOGLIO

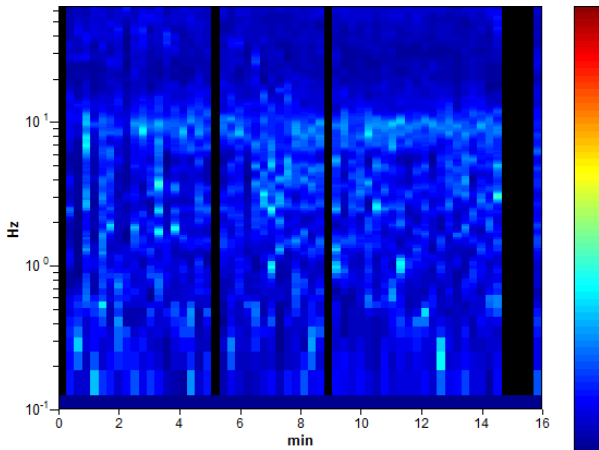
Instrument: TRZ-0108/01-10
Start recording: 15/10/18 11:17:10 End recording: 15/10/18 11:33:11
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 88% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

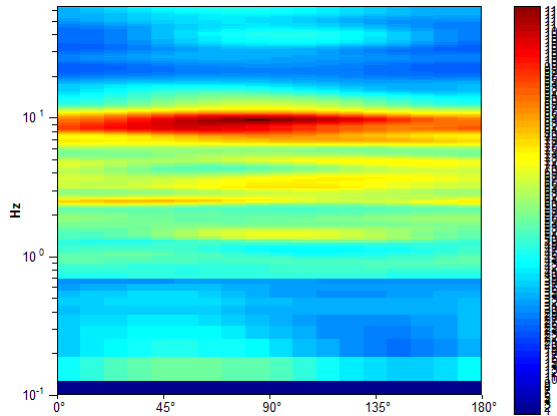
Max. H/V at 9.56 ± 0.84 Hz. (In the range 0.1 - 20.0 Hz).



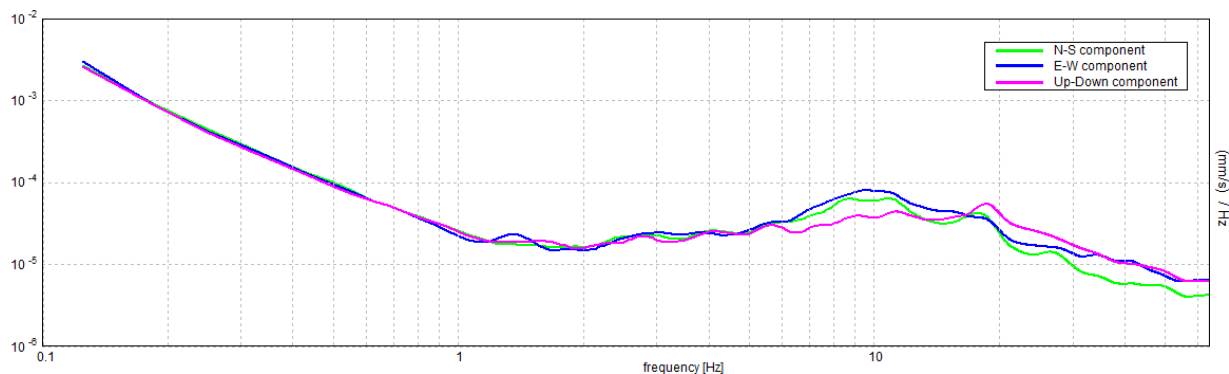
H/V TIME HISTORY



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 9.56 ± 0.84 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$9.56 > 0.63$	OK	
$n_c(f_0) > 200$	$8109.0 > 200$	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 230 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	13.875 Hz	OK	
$A_0 > 2$	$2.21 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.04338 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.41479 < 0.47813$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.2722 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

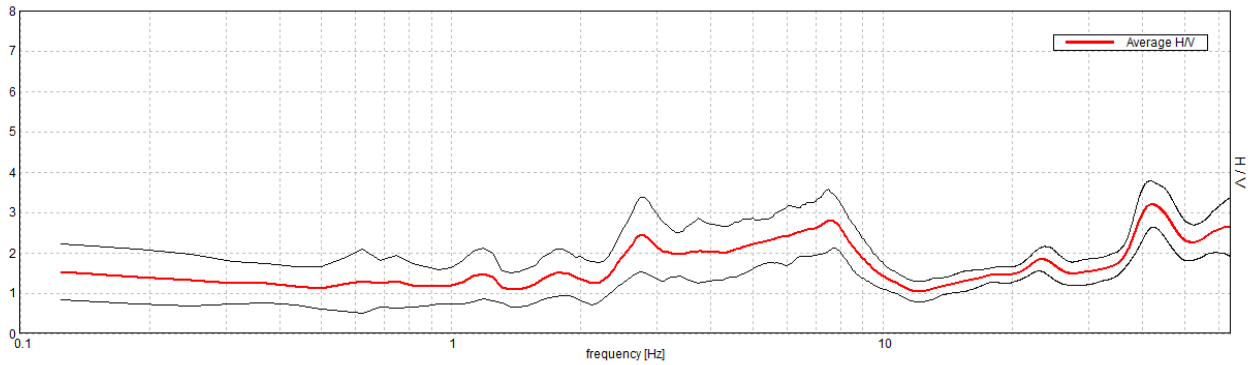
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR68 PIAN DEL VOGLIO SCUOLA

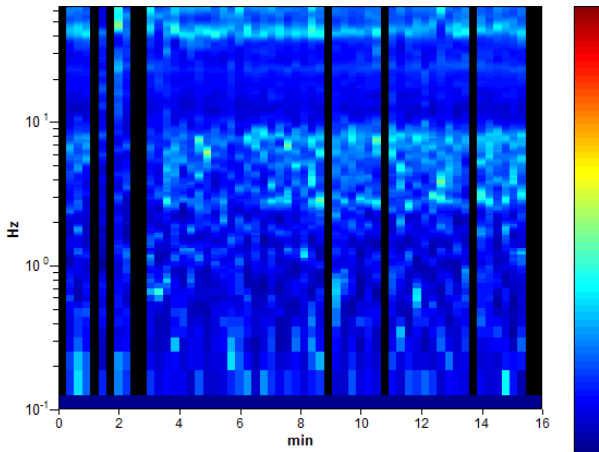
Instrument: TRZ-0108/01-10
 Start recording: 07/12/18 11:43:26 End recording: 07/12/18 11:59:27
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 83% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

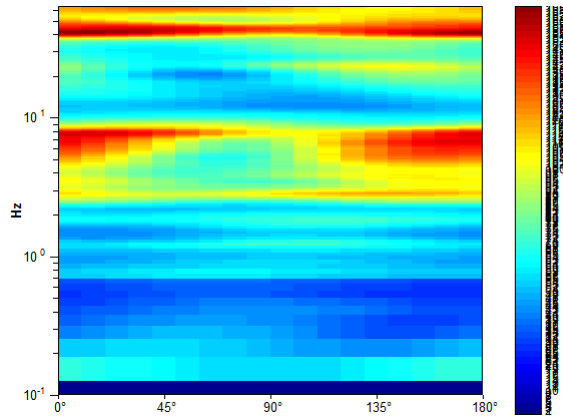
Max. H/V at 7.5 ± 0.46 Hz. (In the range 0.1 - 20.0 Hz).



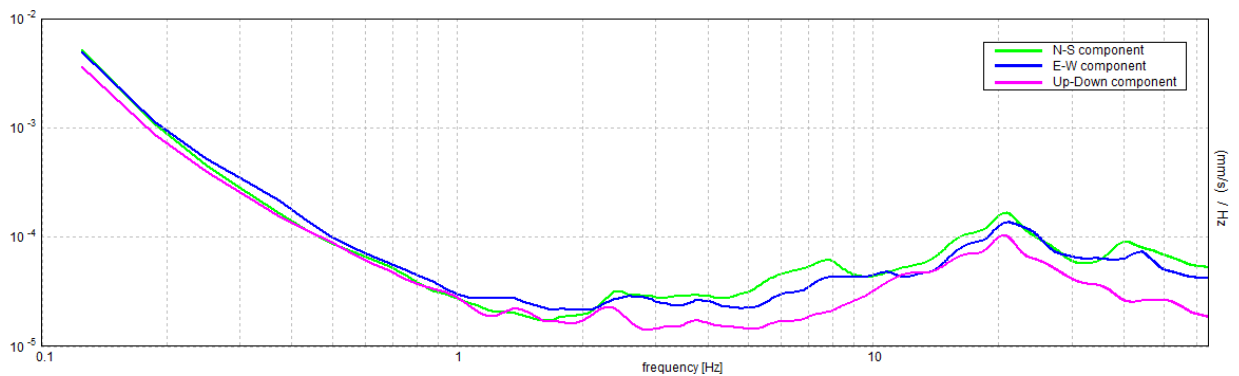
H/V TIME HISTORY



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 7.5 ± 0.46 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$7.50 > 0.63$	OK	
$n_c(f_0) > 200$	$6000.0 > 200$	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 181 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	2.25 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	10.063 Hz	OK	
$A_0 > 2$	$2.81 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.03001 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.22509 < 0.375$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.3745 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR23 PIAN DEL VOGLIO

Instrument: TRZ-0108/01-10

Start recording: 15/10/18 11:50:43 End recording: 15/10/18 12:06:44

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

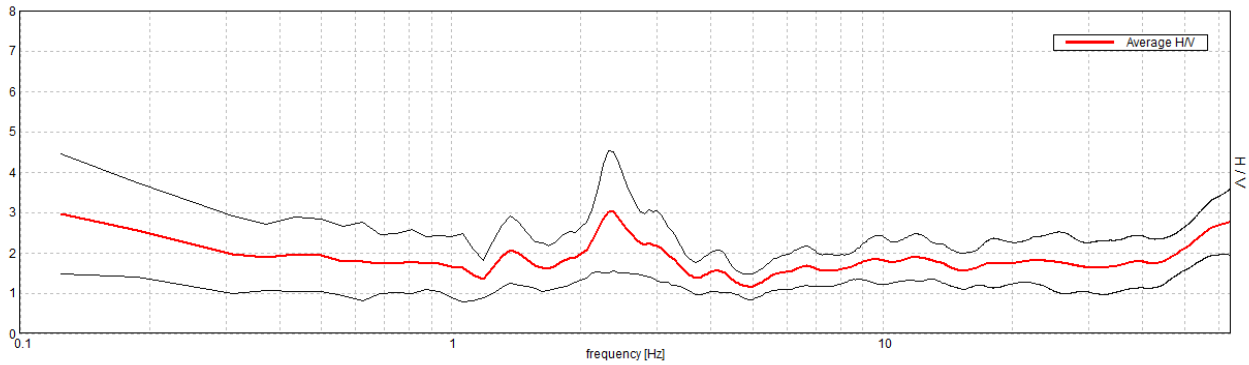
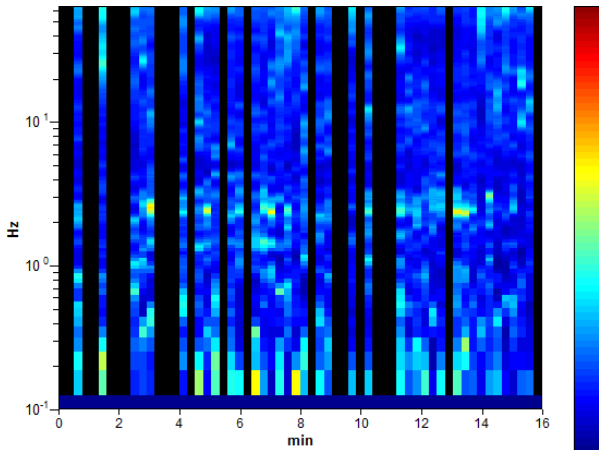
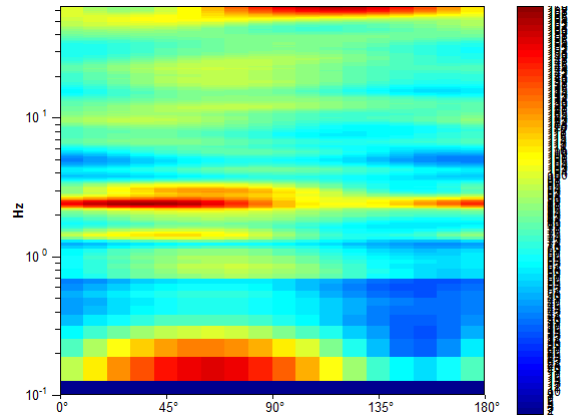
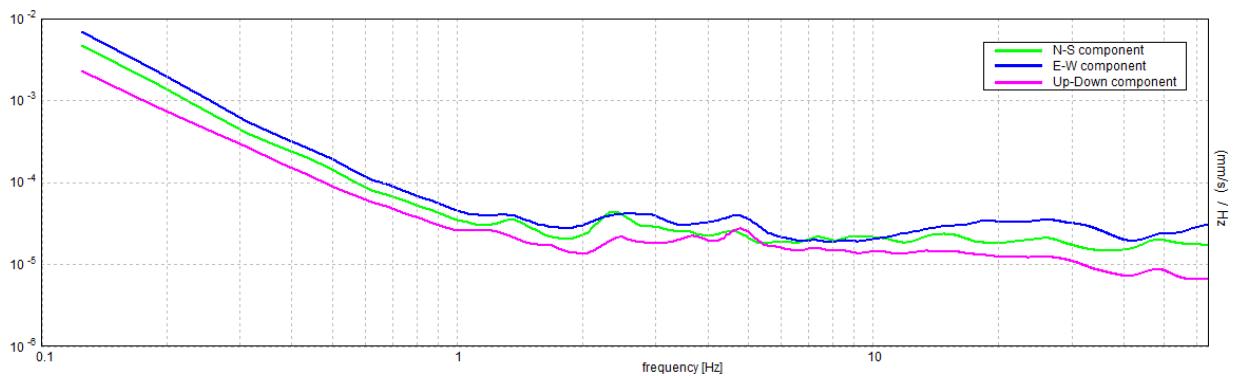
Trace length: 0h16'00". Analyzed 63% trace (manual window selection)

Sampling rate: 128 Hz

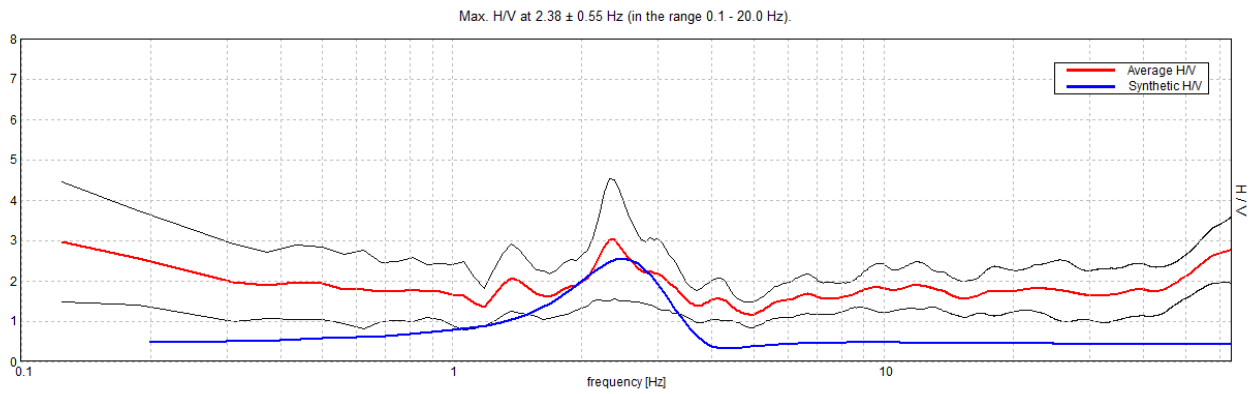
Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIOMax. H/V at 2.38 ± 0.55 Hz (in the range 0.1 - 20.0 Hz).**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]

25.00
inf.

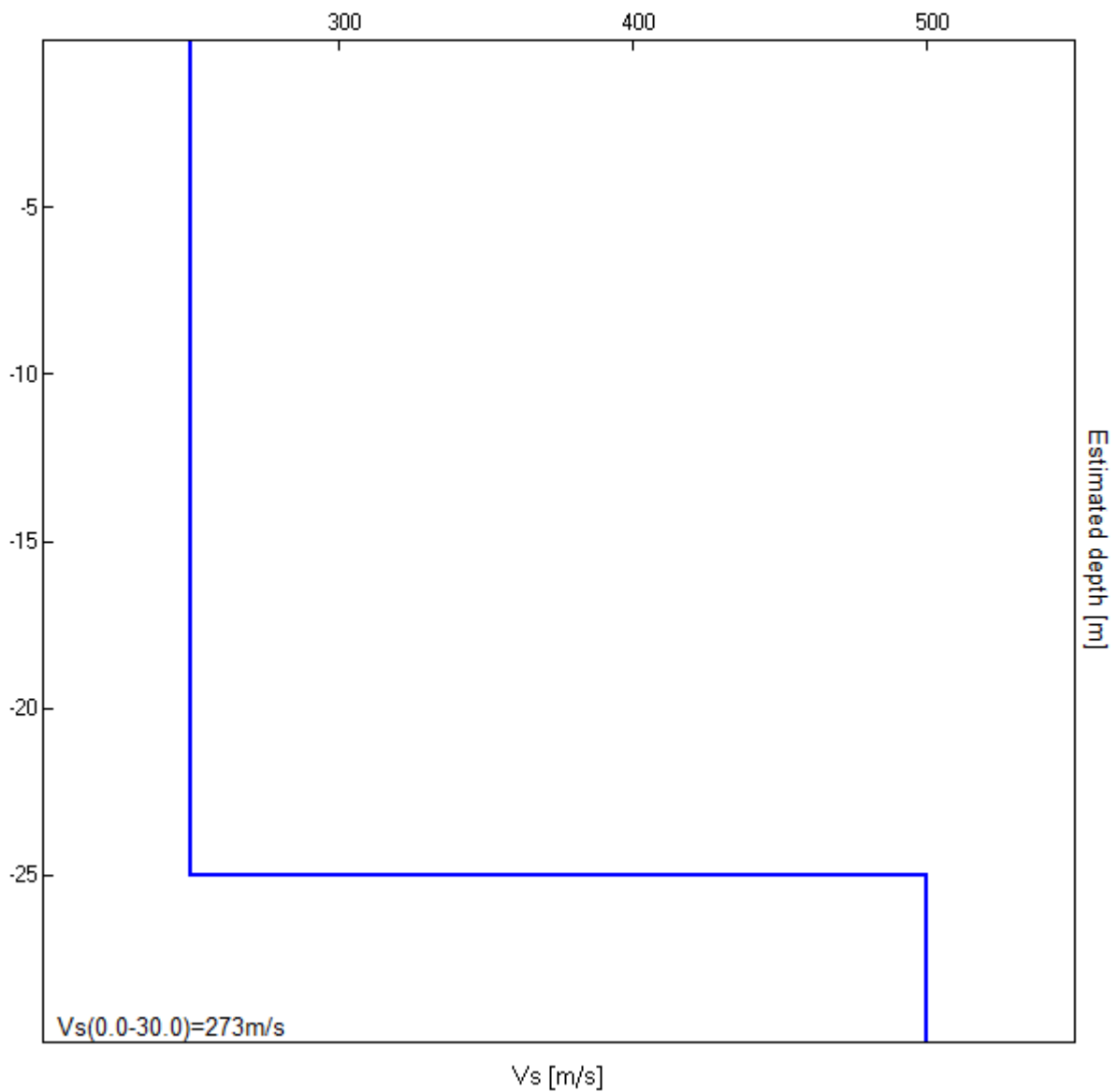
Thickness [m]

25.00
inf.

Vs [m/s]

250
500

$V_s(0.0-30.0)=273\text{m/s}$



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

Max. H/V at 2.38 ± 0.55 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$2.38 > 0.63$	OK	
$n_c(f_0) > 200$	$1444.0 > 200$	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 58 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	1.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	3.563 Hz	OK	
$A_0 > 2$	$3.02 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.11211 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.26625 < 0.11875$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.717 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR20 PIAN DEL VOGLIO

Instrument: TRZ-0108/01-10

Start recording: 15/10/18 10:32:06 End recording: 15/10/18 10:48:07

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 92% trace (manual window selection)

Sampling rate: 128 Hz

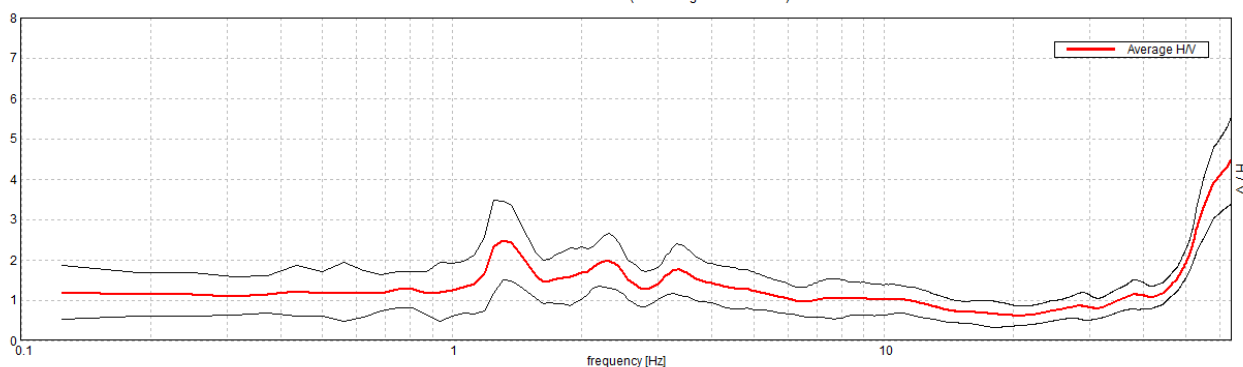
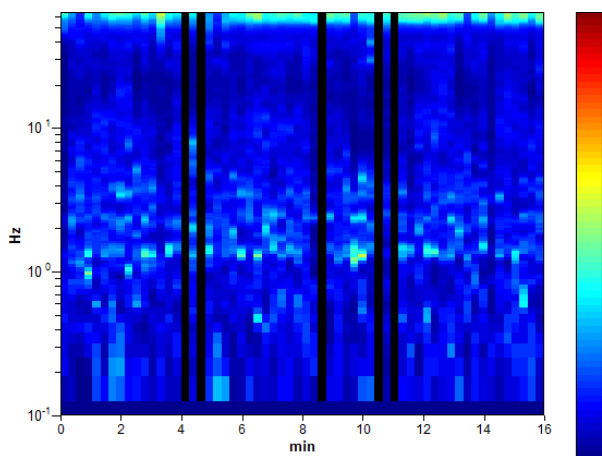
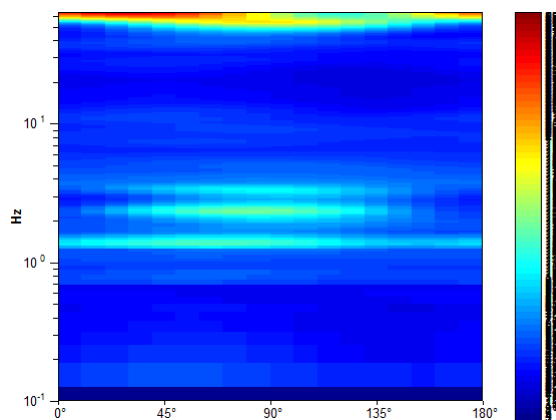
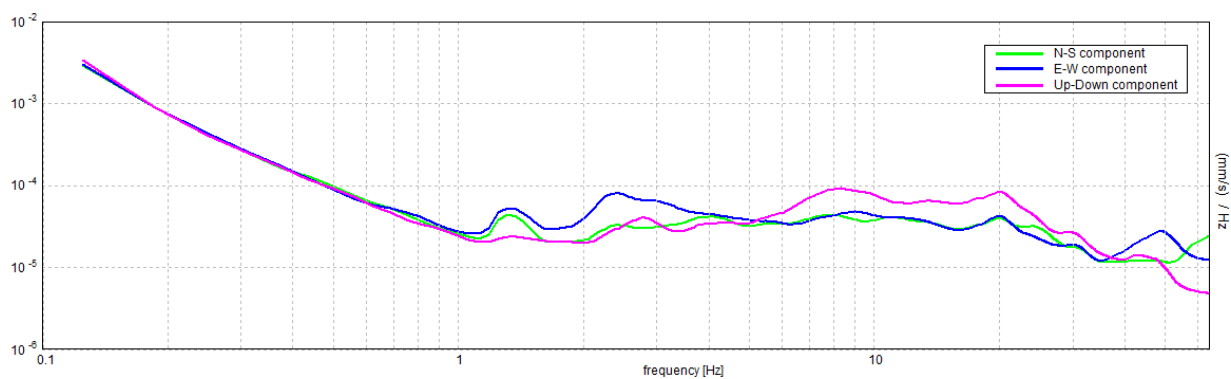
Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 1.31 ± 0.05 Hz. (In the range 0.1 - 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 1.31 ± 0.05 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$1.31 > 0.63$	OK	
$n_c(f_0) > 200$	$1155.0 > 200$	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 32 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.938 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	5.0 Hz	OK	
$A_0 > 2$	$2.46 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.01738 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.02281 < 0.13125$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.4807 < 1.78$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR19 PIAN DEL VOGLIO

Instrument: TRZ-0108/01-10

Start recording: 15/10/18 10:10:19 End recording: 15/10/18 10:26:20

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 88% trace (manual window selection)

Sampling rate: 128 Hz

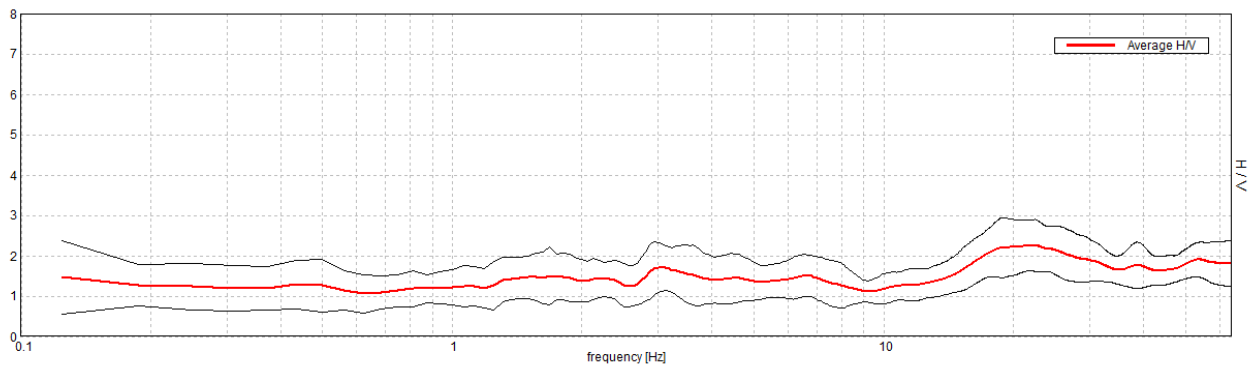
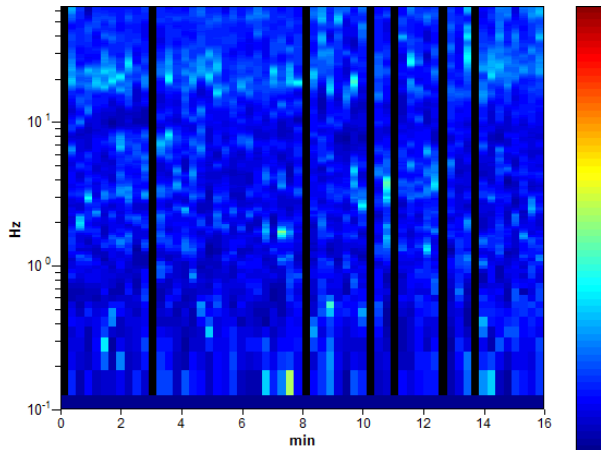
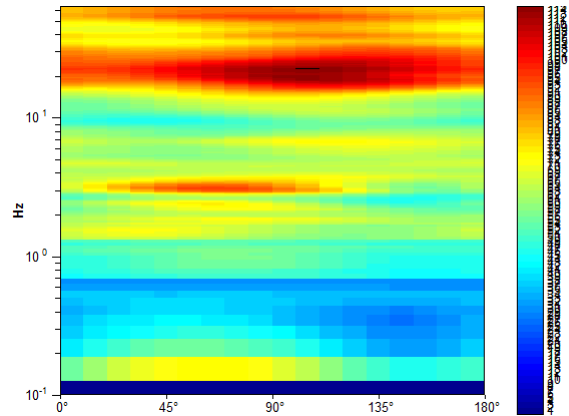
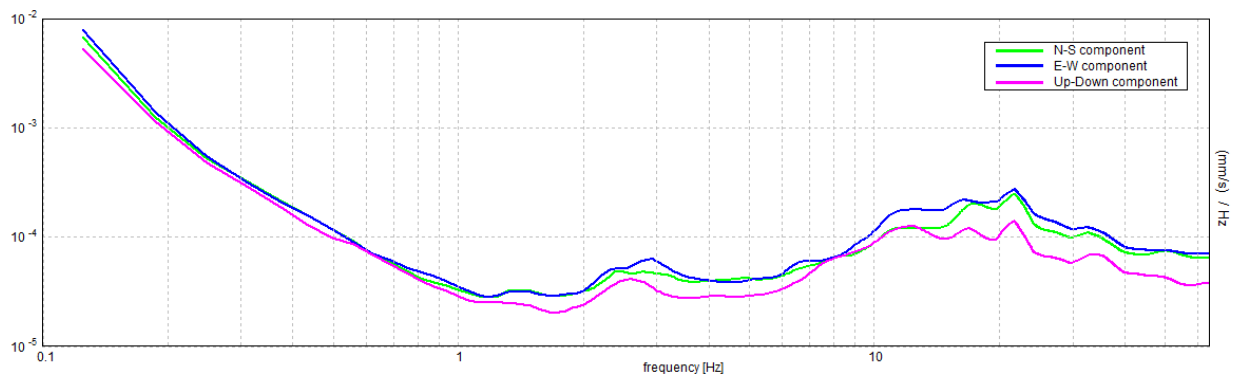
Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 19.75 ± 0.21 Hz. (In the range 0.1 - 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 19.75 ± 0.21 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	19.75 > 0.63	OK	
$n_c(f_0) > 200$	16748.0 > 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 475 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
$A_0 > 2$	2.21 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.0052 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	0.10265 < 0.9875	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3496 < 1.58	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
σ_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 σ_f and $\sigma_A(f_0)$

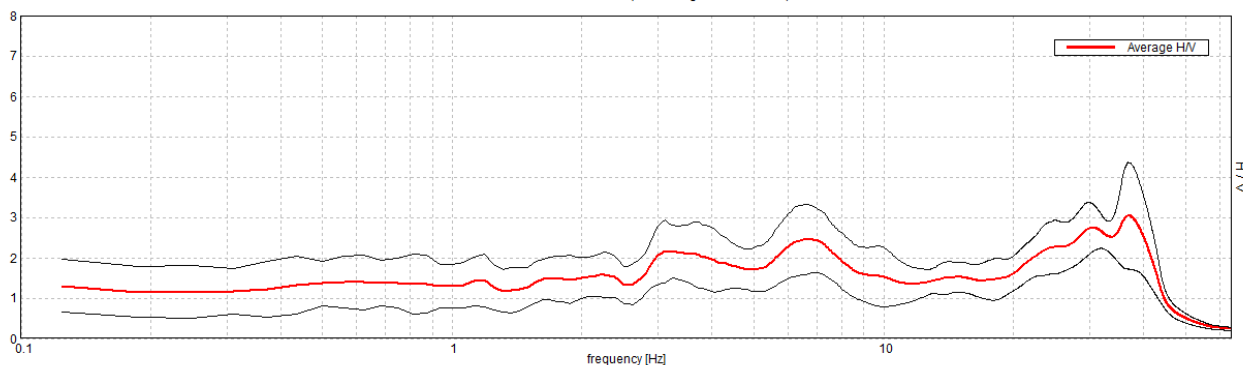
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR18 PIAN DEL VOGLIO

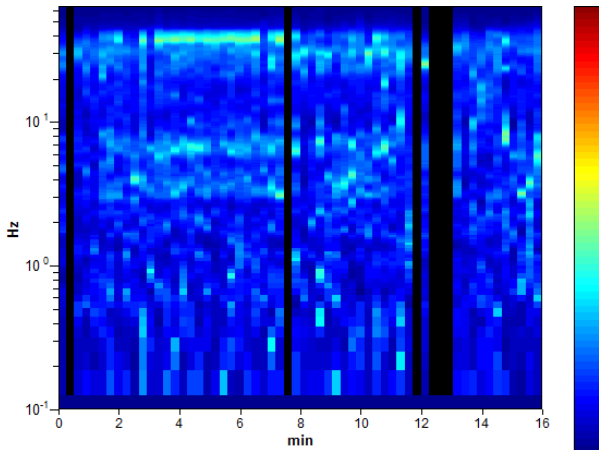
Instrument: TRZ-0108/01-10
 Start recording: 15/10/18 9:45:10 End recording: 15/10/18 10:01:11
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 90% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

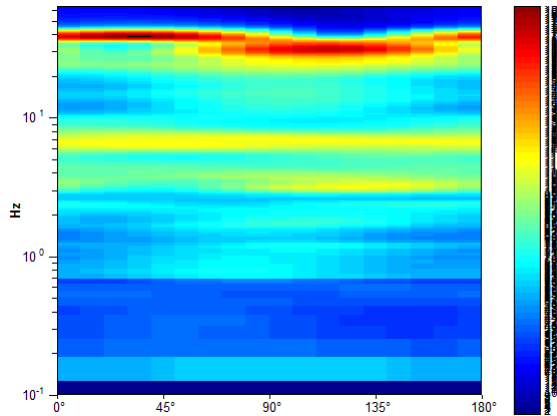
Max. H/V at 6.75 ± 0.25 Hz. (In the range 0.1 - 20.0 Hz).



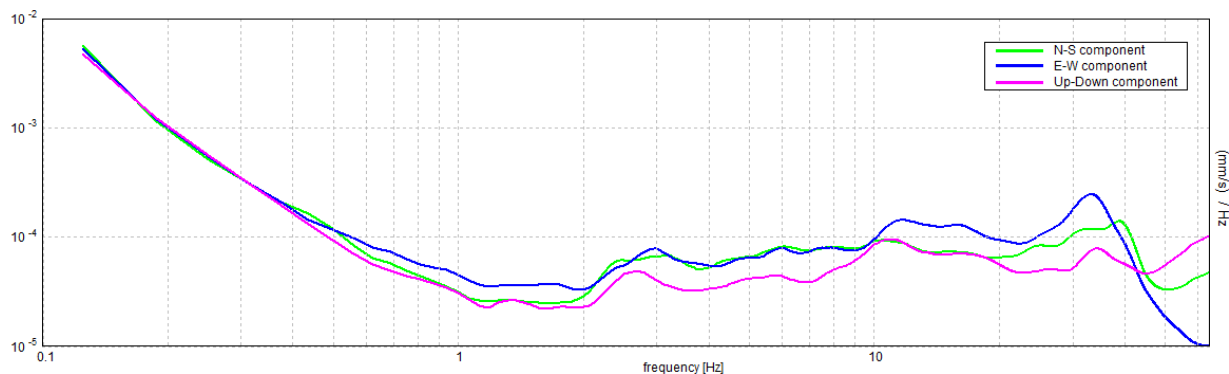
H/V TIME HISTORY



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 6.75 ± 0.25 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$6.75 > 0.63$	OK	
$n_c(f_0) > 200$	$5832.0 > 200$	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 163 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
$A_0 > 2$	$2.46 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.018 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.12148 < 0.3375$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.4187 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR21 PIAN DEL VOGLIO

Instrument: TRZ-0108/01-10

Start recording: 15/10/18 10:55:32 End recording: 15/10/18 11:11:33

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 92% trace (manual window selection)

Sampling rate: 128 Hz

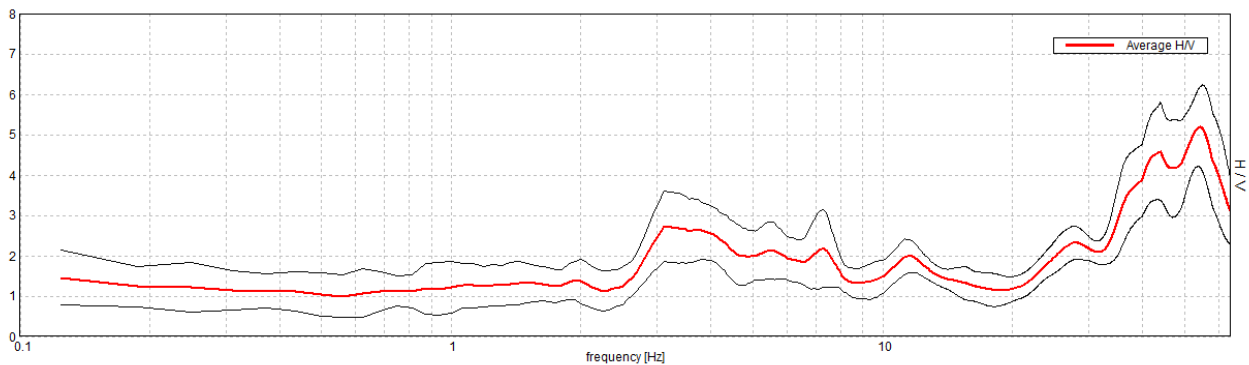
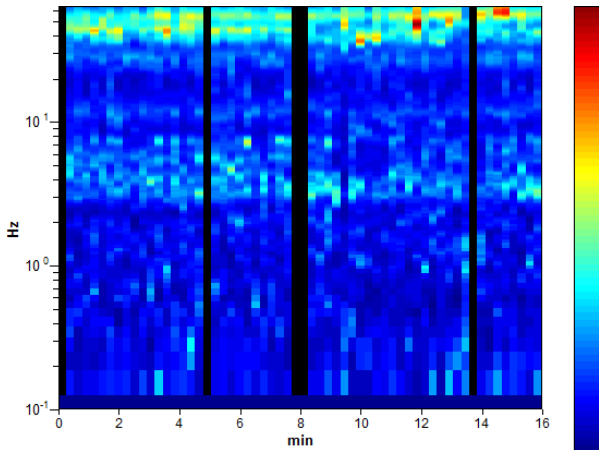
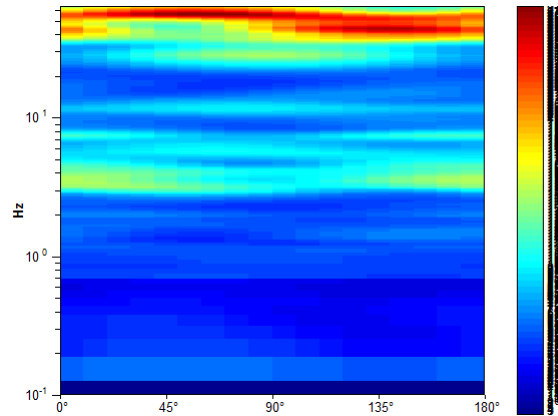
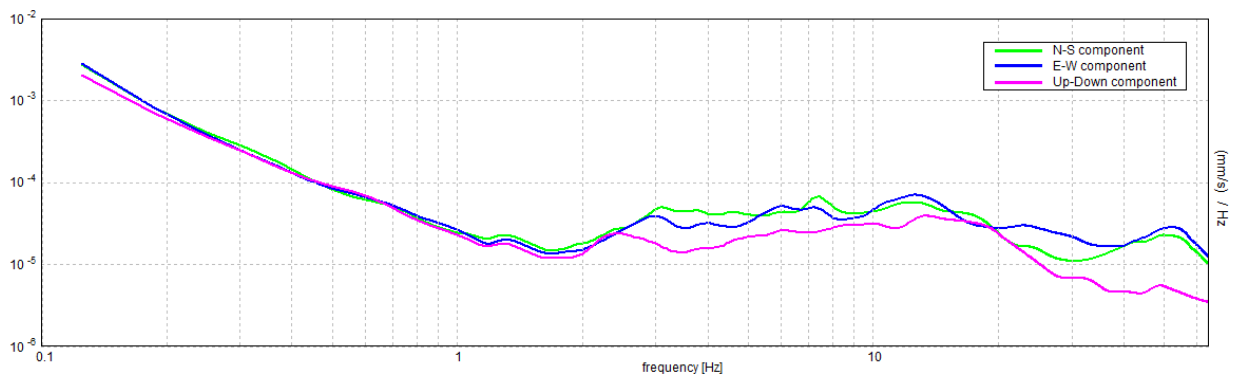
Window size: 16 s

Smoothing type: Triangular window

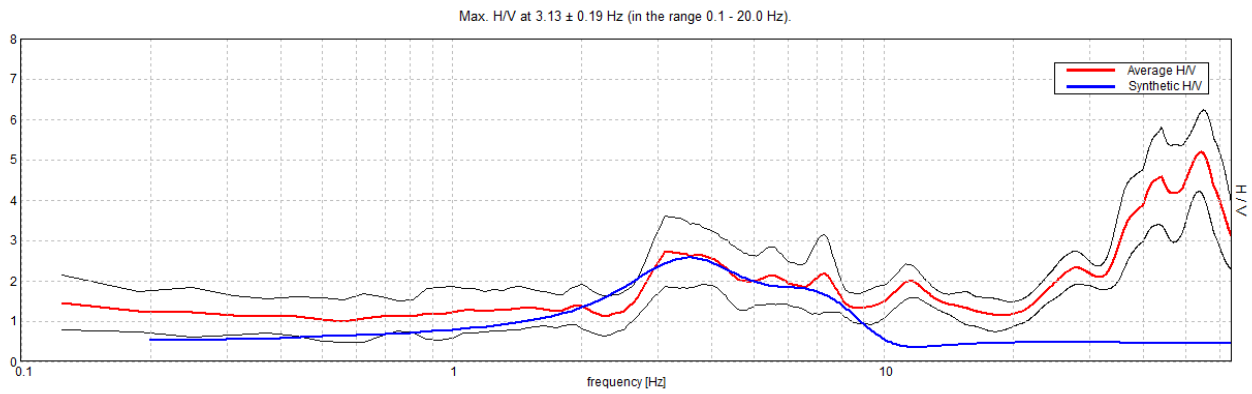
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 3.13 ± 0.19 Hz. (In the range 0.1 - 20.0 Hz).

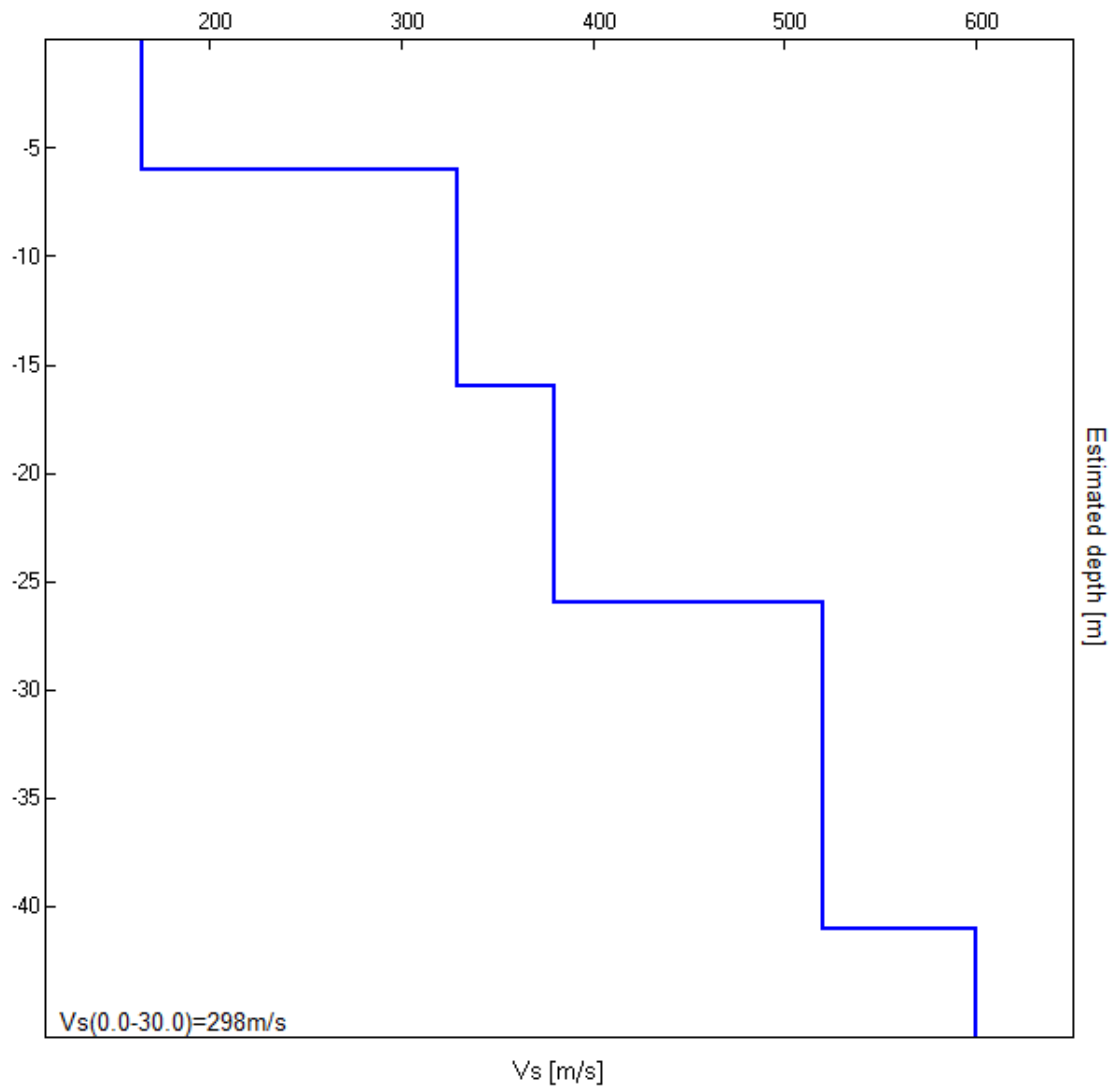
**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
6.00	6.00	165
16.00	10.00	330
26.00	10.00	380
41.00	15.00	520
inf.	inf.	600

Vs(0.0-30.0)=298m/s



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

Max. H/V at 3.13 ± 0.19 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	3.13 > 0.63	OK	
$n_c(f_0) > 200$	2750.0 > 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 76 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	2.563 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	8.375 Hz	OK	
$A_0 > 2$	2.73 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.03081 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.09628 < 0.15625$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.4327 < 1.58$	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
σ_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 σ_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

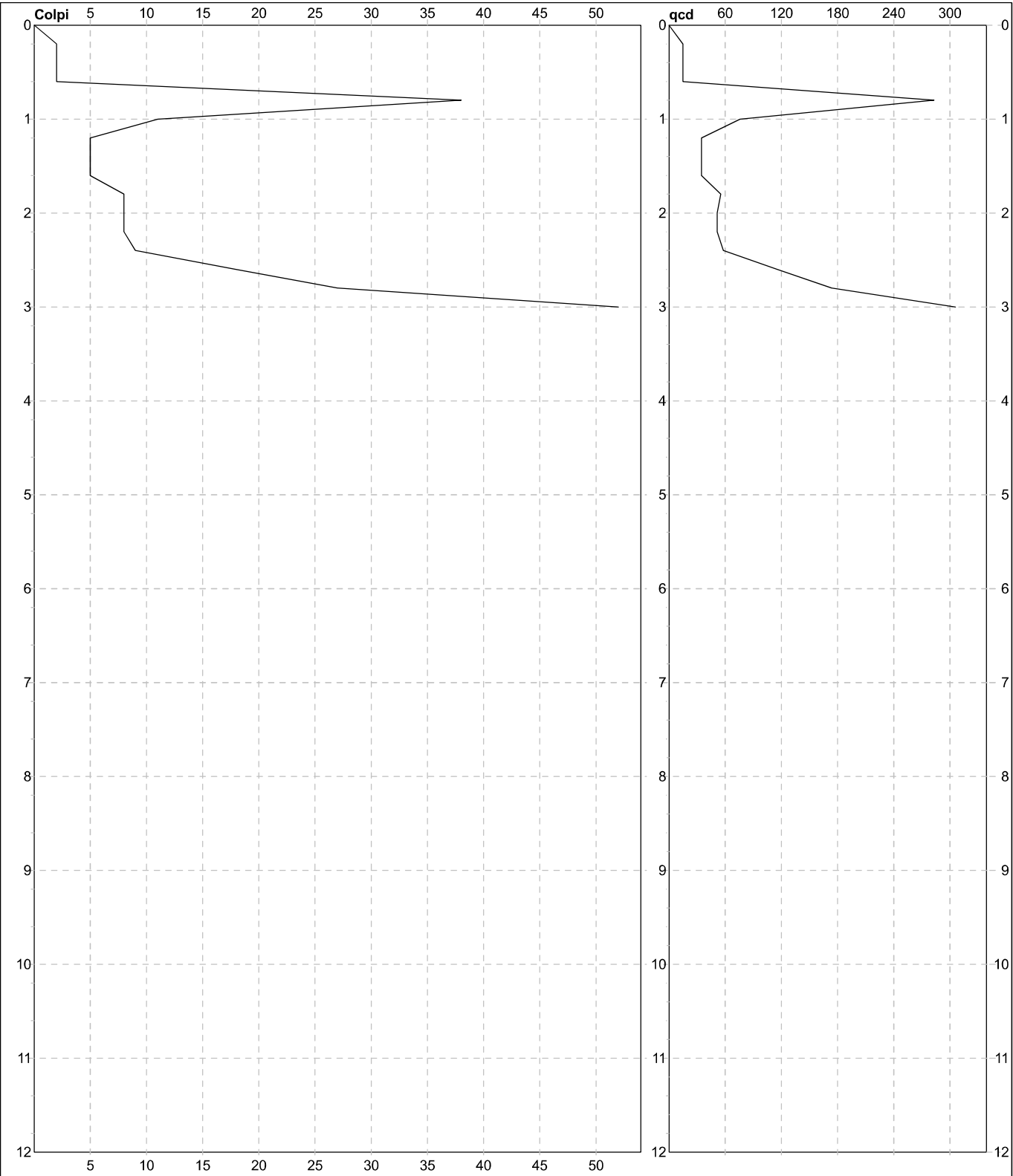


PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	3
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **Cimitero Pian Del Voglio**

U.M.: **kg/cm²**
 Scala: **1:60**
 Pagina: **1**
 Elaborato:
 Data eseg.: **26/01/2019**
 Quota ass.:
 Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy) Massa battente: 63,50 m Altezza caduta: 0,75 m Avanzamento: 0,20 m	Responsabile: Assistente:	Preforo: m Corr.astine: kg/ml Cod.ISTAT: 0
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PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	3
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: Cimitero Pian Del Voglio	Elaborato:	Falda: Non rilevata

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	2		14,90					
0,40	1	2		14,90					
0,60	2	2		14,90					
0,80	2	38		283,05					
1,00	2	11		75,95					
1,20	2	5		34,52					
1,40	2	5		34,52					
1,60	3	5		34,52					
1,80	3	8		55,24					
2,00	3	8		51,48					
2,20	3	8		51,48					
2,40	3	9		57,91					
2,60	4	18		115,82					
2,80	4	27		173,73					
3,00	4	68		409,65					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta
Asta = numero di asta impiegata



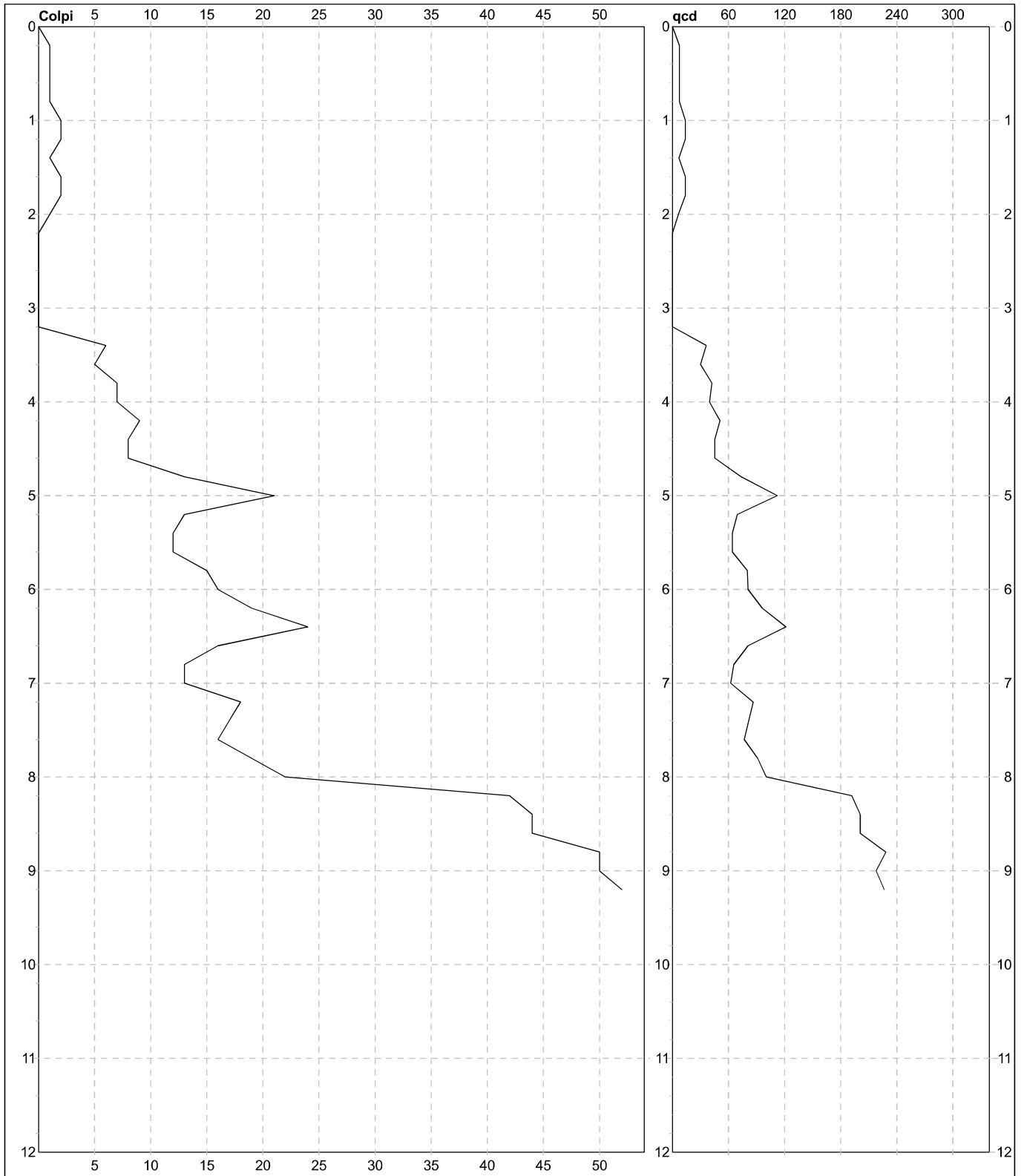
PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	4
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **Pian Del Voglio**

U.M.: **kg/cm²**
 Scala: **1:60**
 Pagina: **1**
 Elaborato:

Data eseg.: **26/01/2019**
 Quota ass.:
 Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
 Massa battente: 63,50 m
 Altezza caduta: 0,75 m
 Avanzamento: 0,20 m

Responsabile:
 Assistente:

Preforo: m
 Corr.astine: kg/ml
 Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	4
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: Pian Del Voglio	Elaborato:	Falda: Non rilevata

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45					
0,40	1	1		7,45					
0,60	2	1		7,45					
0,80	2	1		7,45					
1,00	2	2		13,81					
1,20	2	2		13,81					
1,40	2	1		6,90					
1,60	3	2		13,81					
1,80	3	2		13,81					
2,00	3	1		6,43					
2,20	3	0		0,00					
2,40	3	0		0,00					
2,60	4	0		0,00					
2,80	4	0		0,00					
3,00	4	0		0,00					
3,20	4	0		0,00					
3,40	4	6		36,15					
3,60	5	5		30,12					
3,80	5	7		42,17					
4,00	5	7		39,64					
4,20	5	9		50,97					
4,40	5	8		45,31					
4,60	6	8		45,31					
4,80	6	13		73,62					
5,00	6	21		112,20					
5,20	6	13		69,46					
5,40	6	12		64,12					
5,60	7	12		64,12					
5,80	7	15		80,15					
6,00	7	16		80,91					
6,20	7	19		96,09					
6,40	7	24		121,37					
6,60	8	16		80,91					
6,80	8	13		65,74					
7,00	8	13		62,40					
7,20	8	18		86,41					
7,40	8	17		81,61					
7,60	9	16		76,80					
7,80	9	19		91,21					
8,00	9	22		100,50					
8,20	9	42		191,87					
8,40	9	44		201,00					
8,60	10	44		201,00					
8,80	10	50		228,41					
9,00	10	50		217,88					
9,20	10	52		226,60					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR14 PIAN DI BOSSO

Instrument: TRZ-0108/01-10

Start recording: 09/10/18 17:12:29 End recording: 09/10/18 17:28:30

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 88% trace (manual window selection)

Sampling rate: 128 Hz

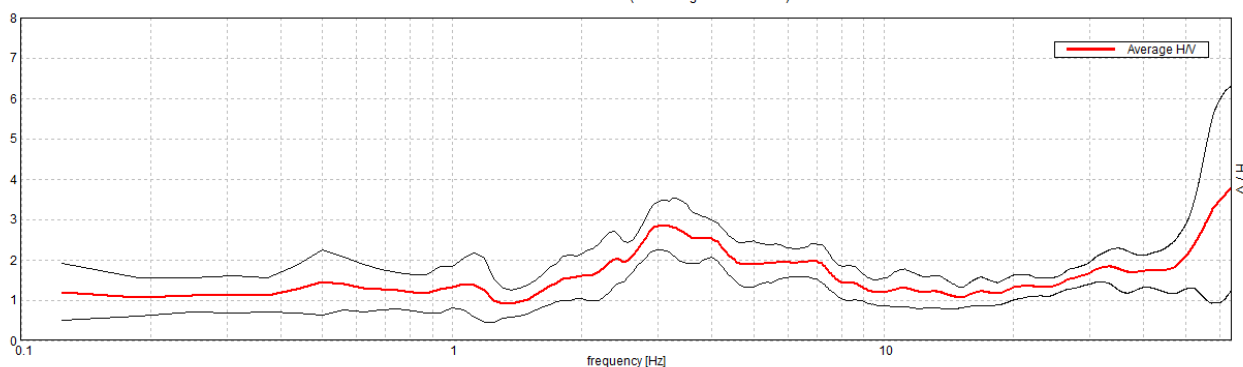
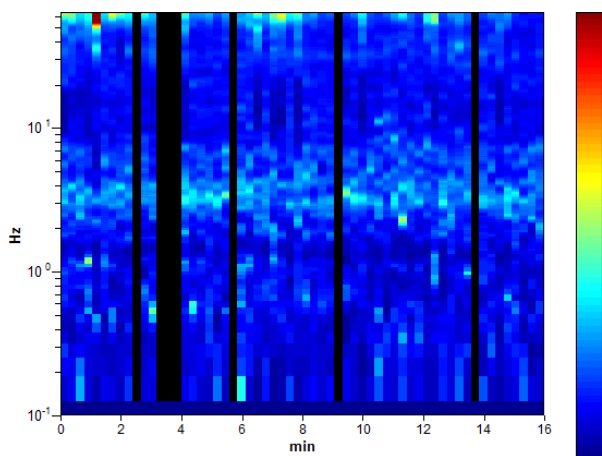
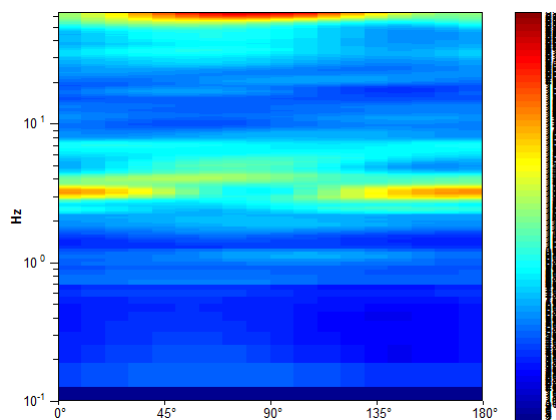
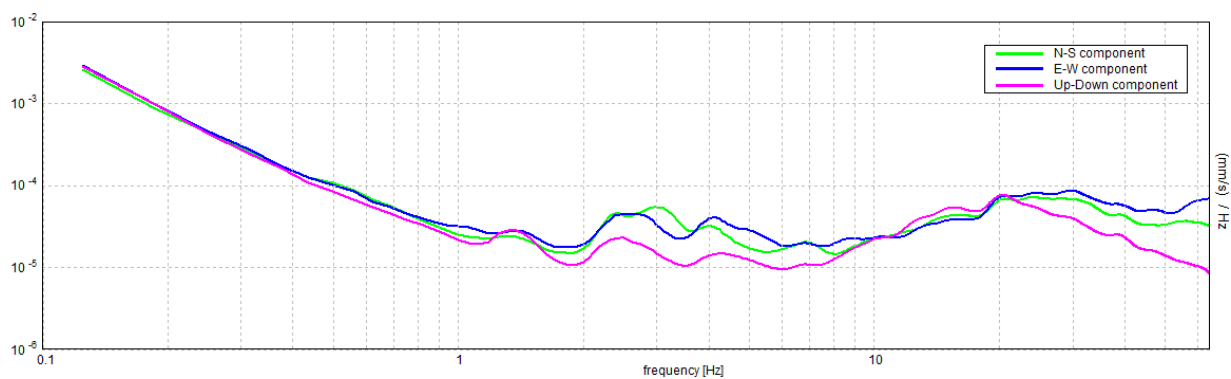
Window size: 16 s

Smoothing type: Triangular window

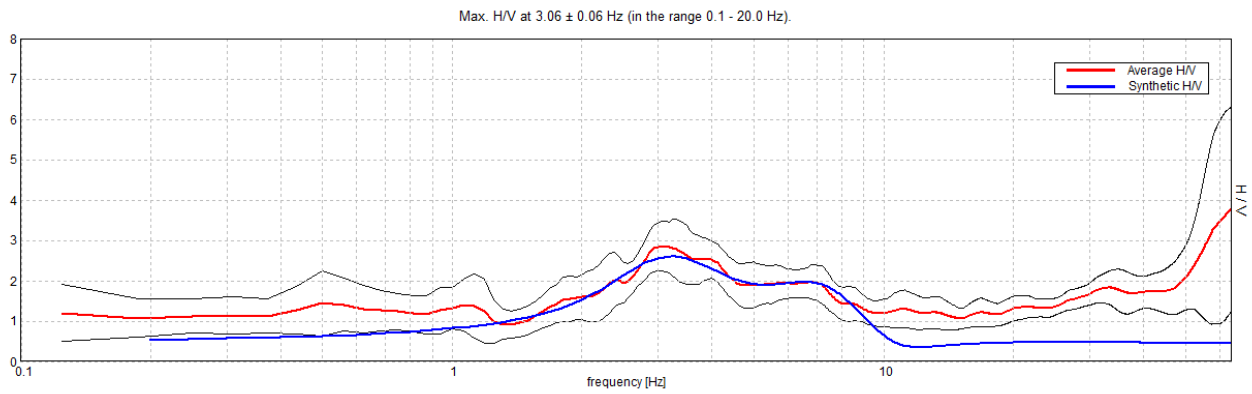
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 3.06 ± 0.06 Hz. (In the range 0.1 - 20.0 Hz).

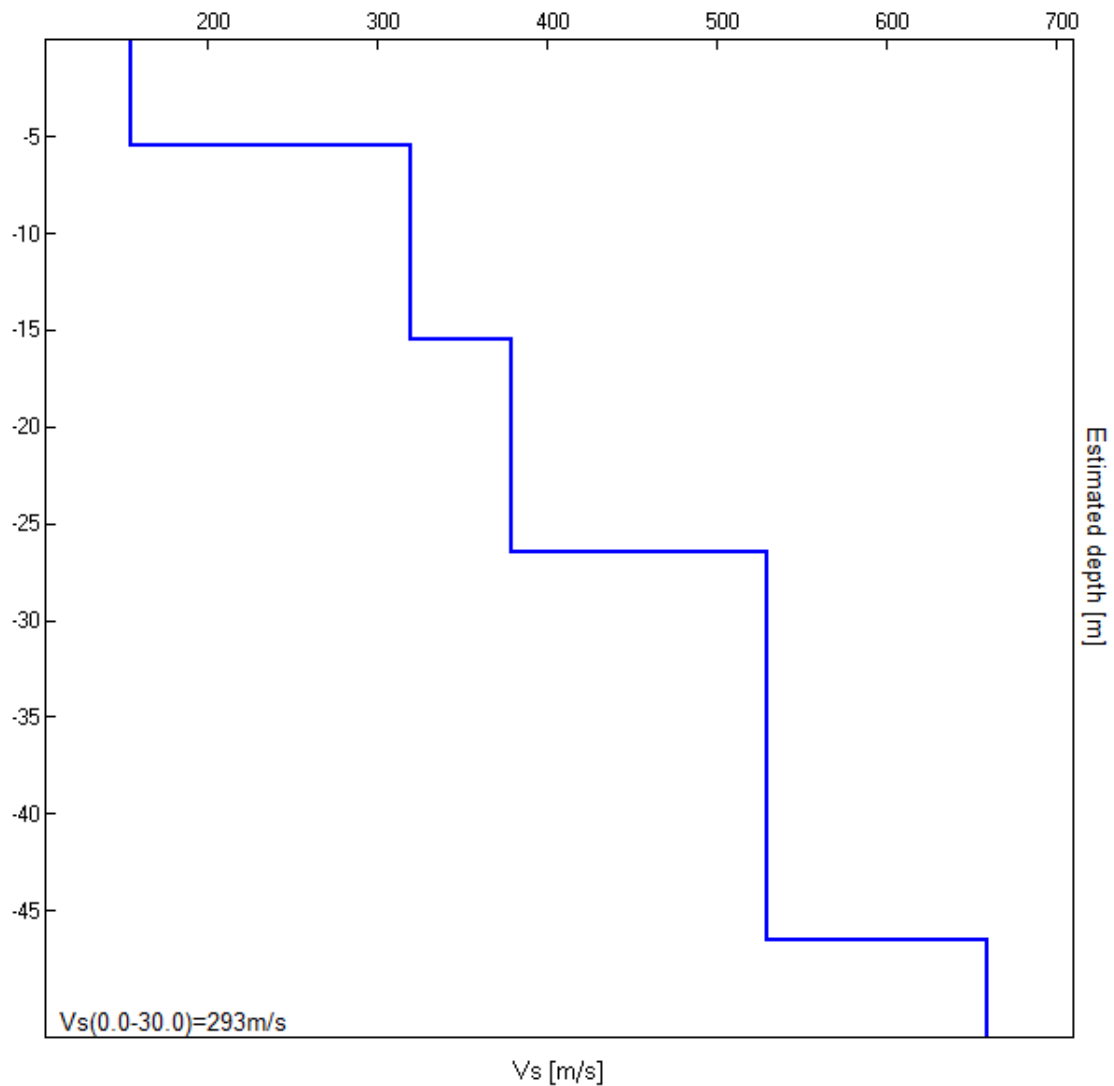
**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
5.50	5.50	155
15.50	10.00	320
26.50	11.00	380
46.50	20.00	530
inf.	inf.	660

Vs(0.0-30.0)=293m/s



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

Max. H/V at 3.06 ± 0.06 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	3.06 > 0.63	OK	
$n_c(f_0) > 200$	2597.0 > 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 74 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	1.688 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	8.063 Hz	OK	
$A_0 > 2$	2.86 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00927 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.02838 < 0.15313$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.2993 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

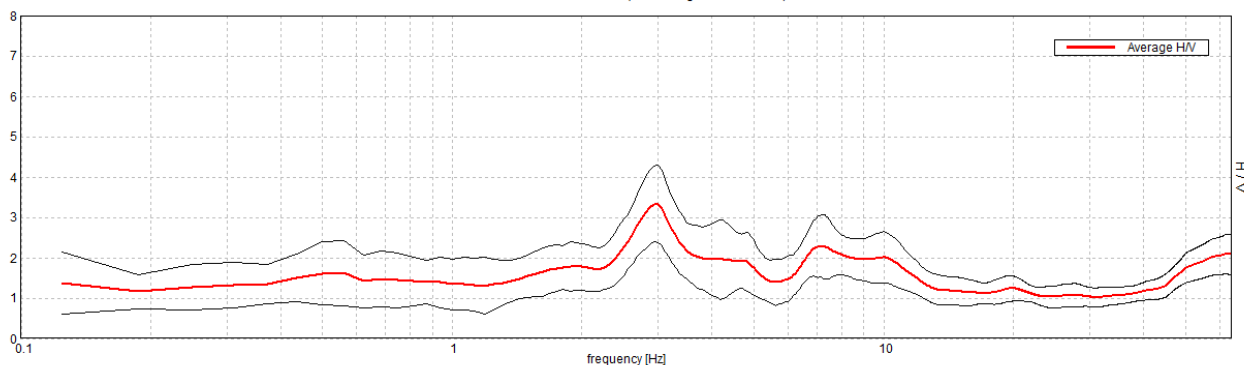
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR13 GINESTRELLA

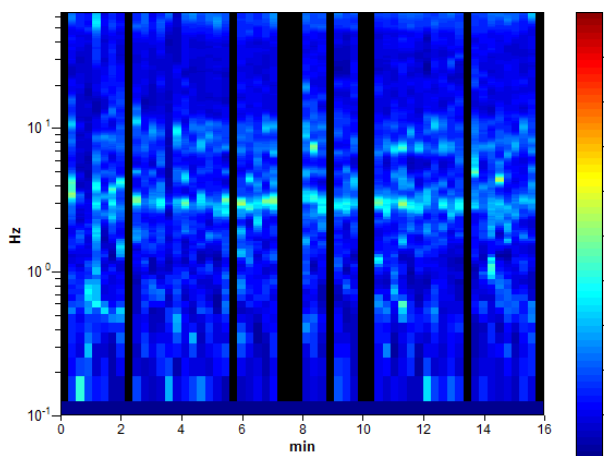
Instrument: TRZ-0108/01-10
Start recording: 09/10/18 16:48:42 End recording: 09/10/18 17:04:43
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 82% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

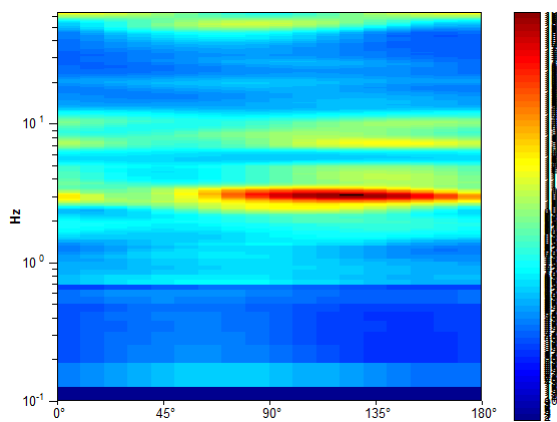
Max. H/V at 3.0 ± 0.04 Hz. (In the range 0.1 - 20.0 Hz).



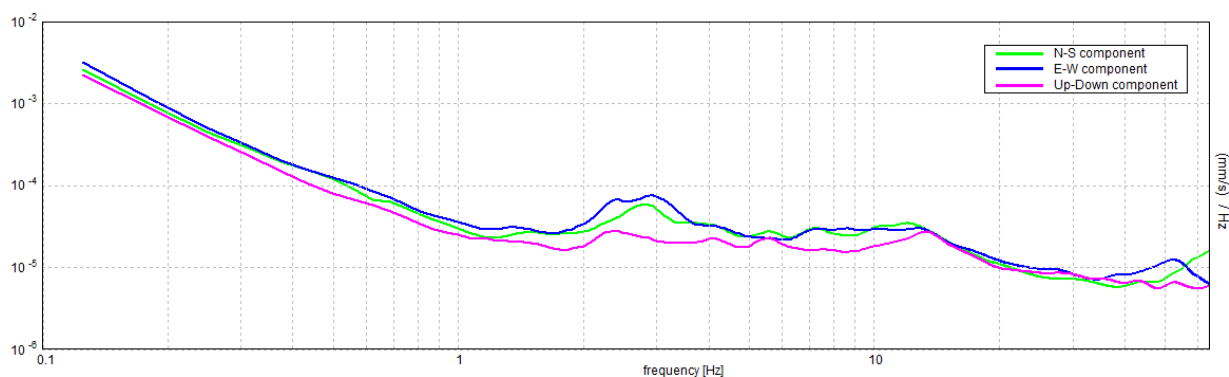
H/V TIME HISTORY



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 3.0 ± 0.04 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$3.00 > 0.63$	OK	
$n_c(f_0) > 200$	$2352.0 > 200$	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 73 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	1.625 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	5.125 Hz	OK	
$A_0 > 2$	$3.33 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00667 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.02001 < 0.15$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.4769 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

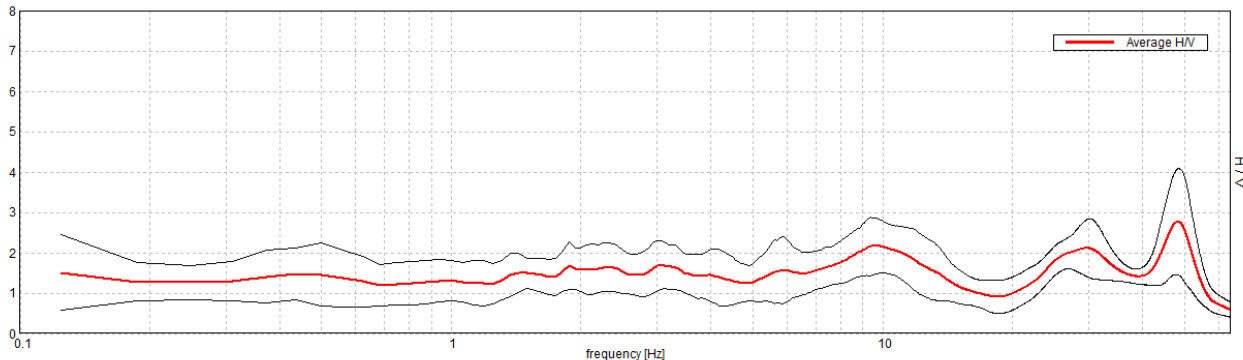
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR16 GINESTRELLA

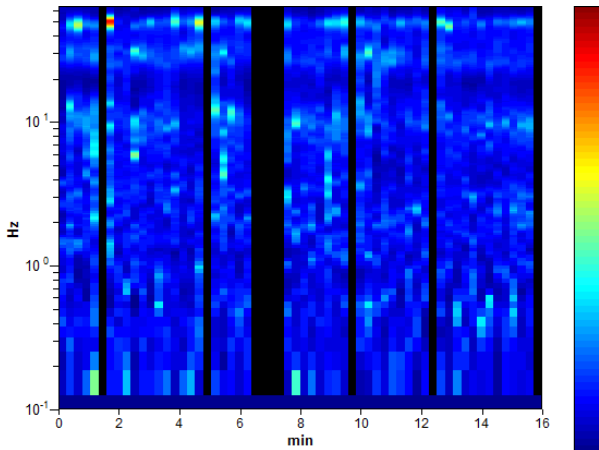
Instrument: TRZ-0108/01-10
 Start recording: 09/10/18 18:03:47 End recording: 09/10/18 18:19:48
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 85% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

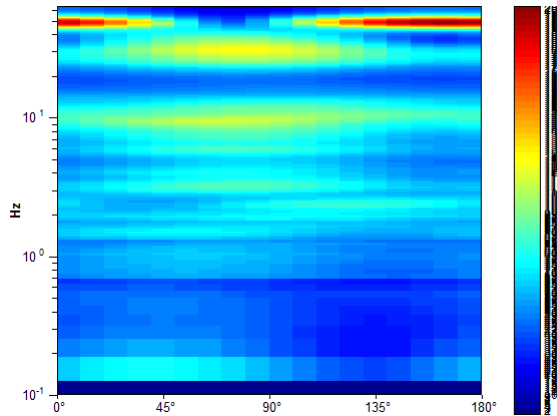
Max. H/V at 9.63 ± 0.49 Hz. (In the range 0.1 - 20.0 Hz).



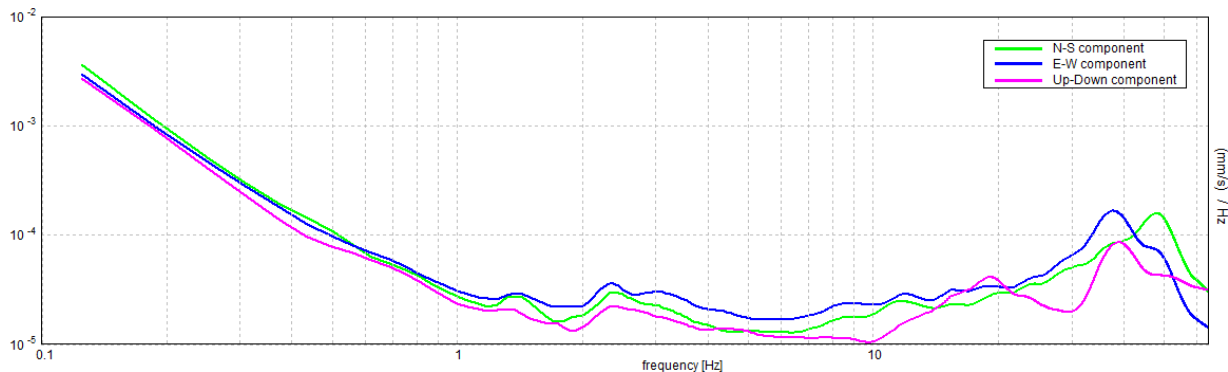
H/V TIME HISTORY



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 9.63 ± 0.49 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$9.63 > 0.63$	OK	
$n_c(f_0) > 200$	$7854.0 > 200$	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 232 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	15.625 Hz	OK	
$A_0 > 2$	$2.17 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.02503 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.2409 < 0.48125$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.3448 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

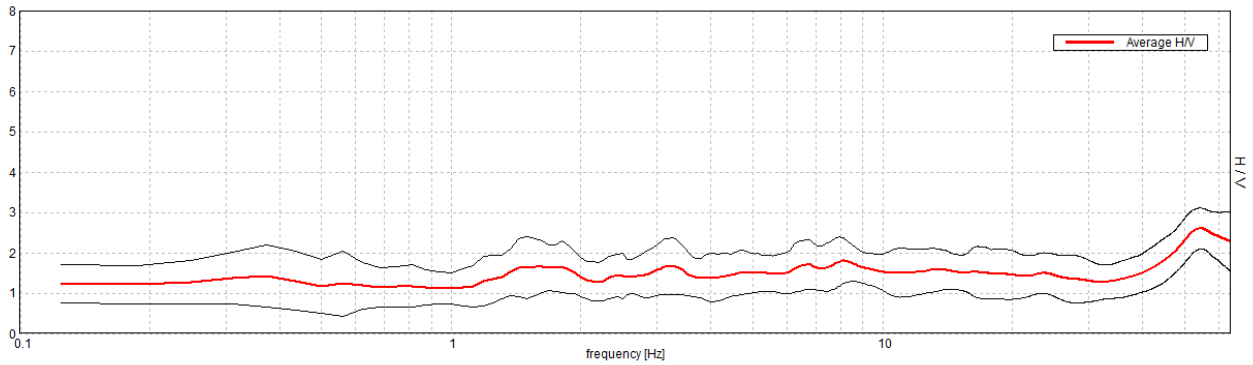
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR15 GINESTRELLA

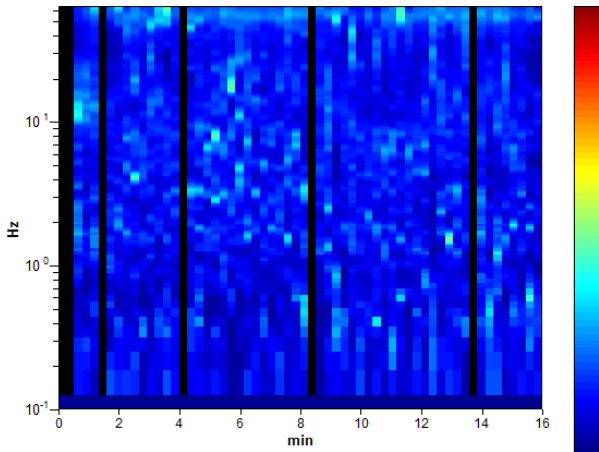
Instrument: TRZ-0108/01-10
Start recording: 09/10/18 17:34:00 End recording: 09/10/18 17:50:01
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 90% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

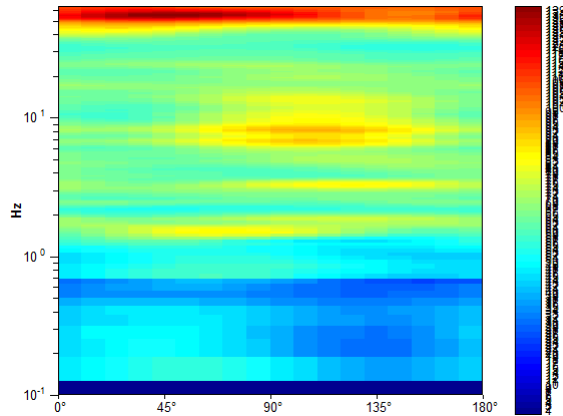
Max. H/V at 8.13 ± 0.86 Hz. (In the range 0.1 - 20.0 Hz).



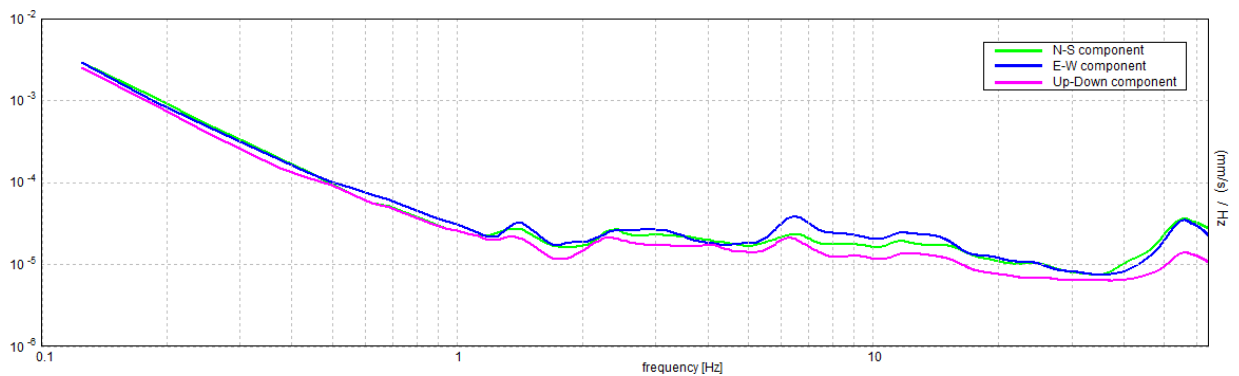
H/V TIME HISTORY



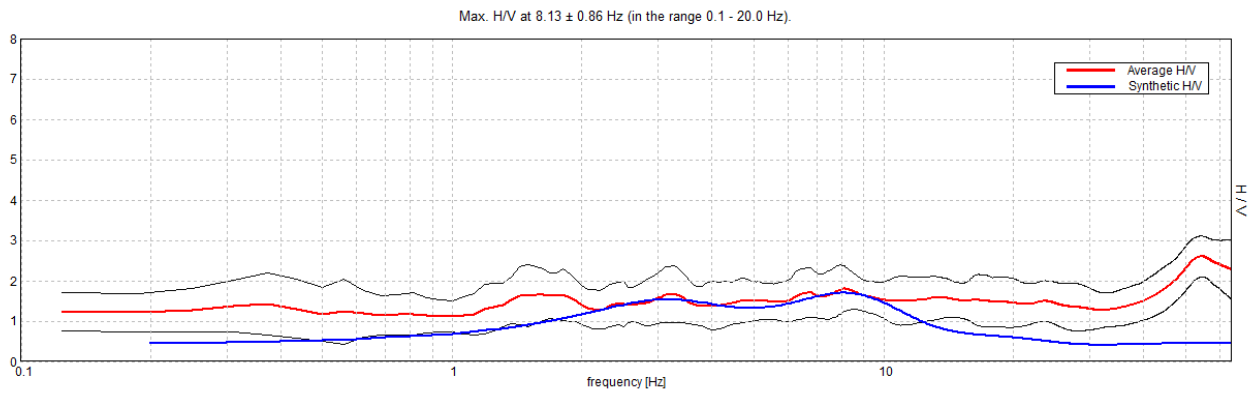
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

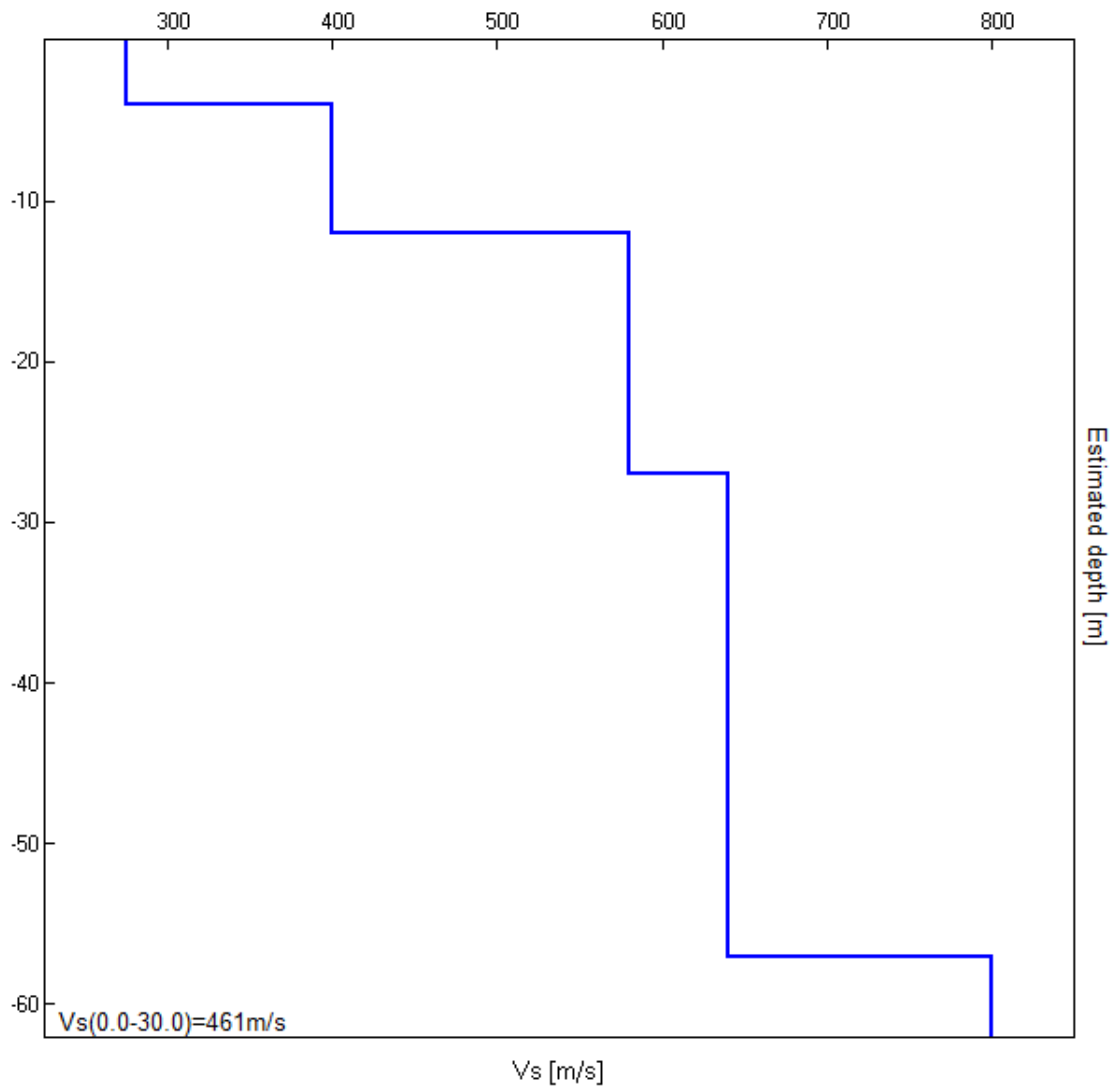


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
4.00	4.00	275
12.00	8.00	400
27.00	15.00	580
57.00	30.00	640
inf.	inf.	800

Vs(0.0-30.0)=461m/s



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

Max. H/V at 8.13 ± 0.86 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	8.13 > 0.63	OK	
$n_c(f_0) > 200$	7020.0 > 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 196 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
$A_0 > 2$	1.80 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.05202 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	0.42267 < 0.40625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2784 < 1.58	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
σ_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 σ_f and $\sigma_A(f_0)$

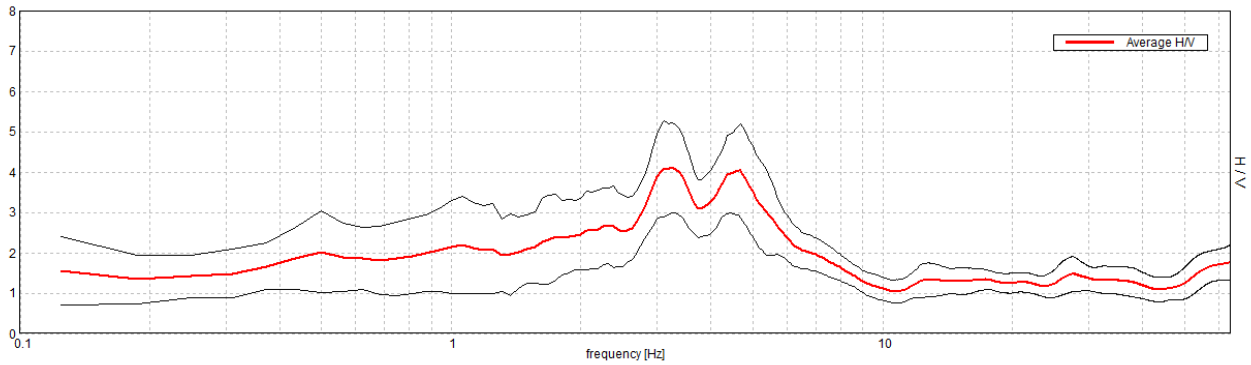
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR67 PIAN DEL VOGLIO CAMPO

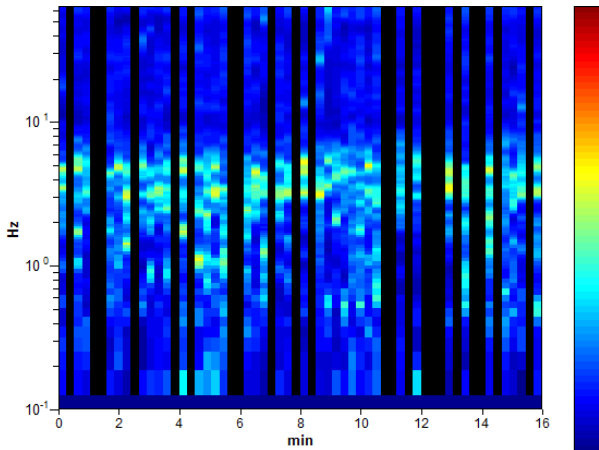
Instrument: TRZ-0108/01-10
 Start recording: 07/12/18 09:55:14 End recording: 07/12/18 10:11:15
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 63% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

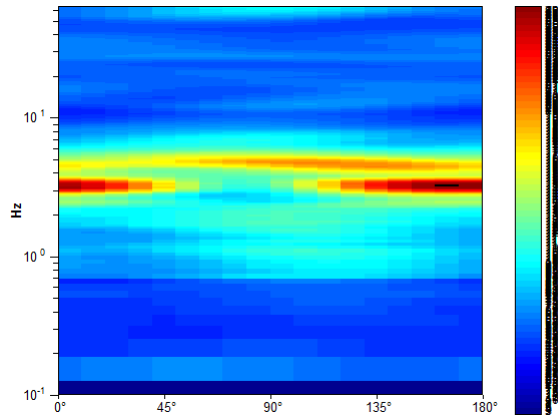
Max. H/V at 3.25 ± 0.33 Hz. (In the range 0.1 - 20.0 Hz).



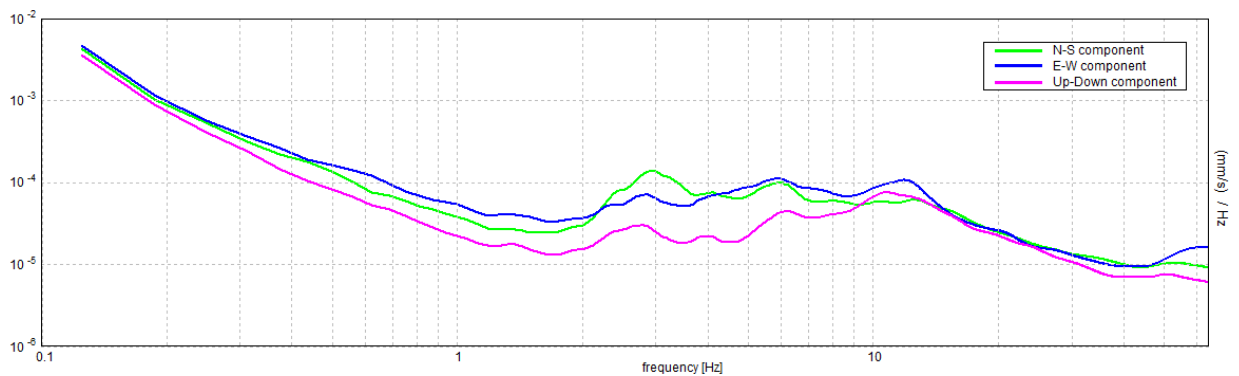
H/V TIME HISTORY



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 3.25 ± 0.33 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$3.25 > 0.63$	OK	
$n_c(f_0) > 200$	$1976.0 > 200$	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 79 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	1.438 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	6.563 Hz	OK	
$A_0 > 2$	$4.10 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.04926 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.16008 < 0.1625$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.548 < 1.58$	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
σ_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 σ_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

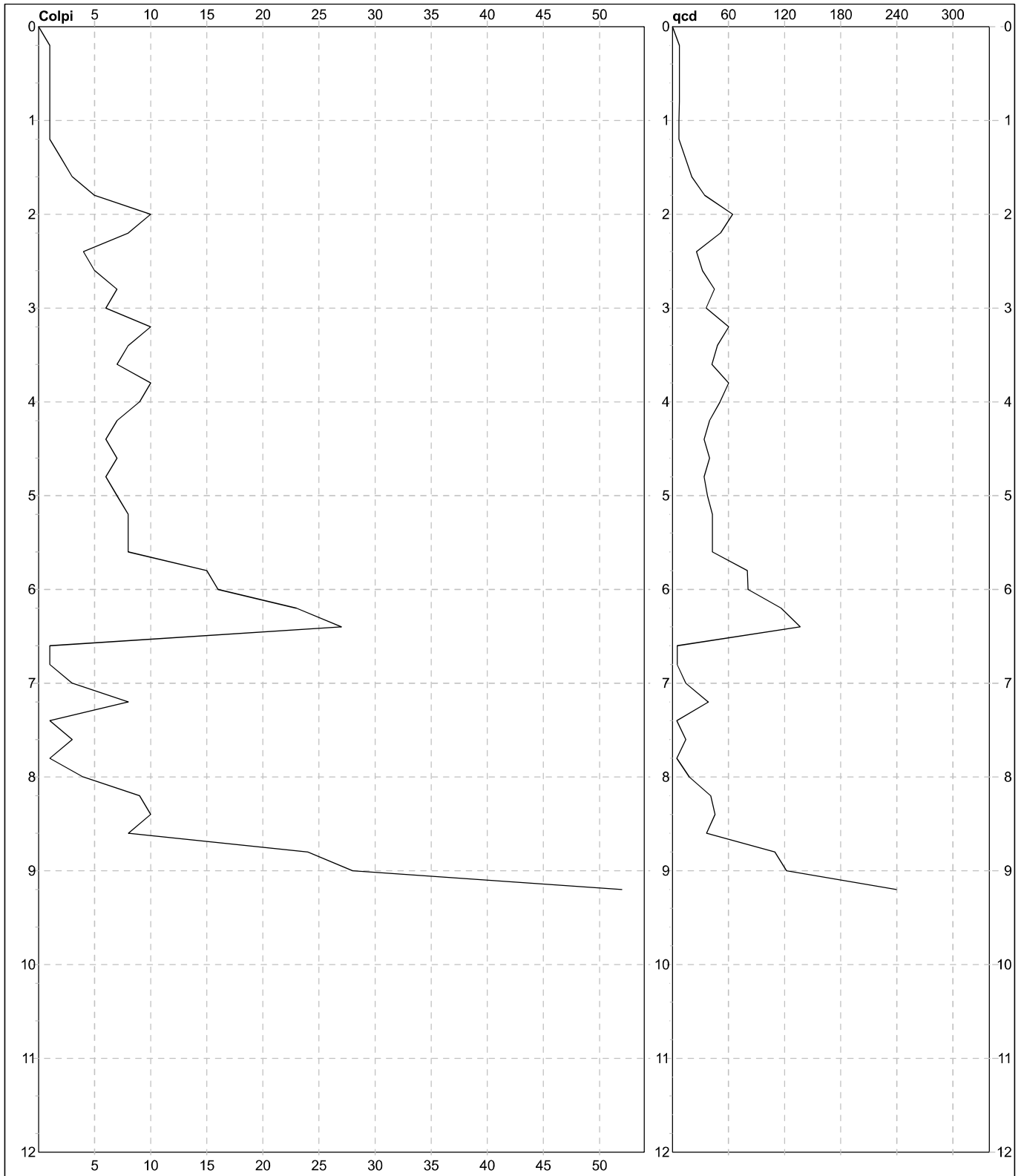


PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	2
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **Pian Del Voglio loc. Calcinata**

U.M.: **kg/cm²**
 Scala: **1:60**
 Pagina: **1**
 Elaborato:
 Data eseg.: **26/01/2019**
 Quota ass.:
 Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
 Massa battente: 63,50 m
 Altezza caduta: 0,75 m
 Avanzamento: 0,20 m

Responsabile:
 Assistente:

Preforo: m
 Corr.astine: kg/ml
 Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	2
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	Falda: Non rilevata
Località: Pian Del Voglio loc. Calcinata	Elaborato:	

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45					
0,40	1	1		7,45					
0,60	2	1		7,45					
0,80	2	1		7,45					
1,00	2	1		6,90					
1,20	2	1		6,90					
1,40	2	2		13,81					
1,60	3	3		20,71					
1,80	3	5		34,52					
2,00	3	10		64,34					
2,20	3	8		51,48					
2,40	3	4		25,74					
2,60	4	5		32,17					
2,80	4	7		45,04					
3,00	4	6		36,15					
3,20	4	10		60,24					
3,40	4	8		48,19					
3,60	5	7		42,17					
3,80	5	10		60,24					
4,00	5	9		50,97					
4,20	5	7		39,64					
4,40	5	6		33,98					
4,60	6	7		39,64					
4,80	6	6		33,98					
5,00	6	7		37,40					
5,20	6	8		42,74					
5,40	6	8		42,74					
5,60	7	8		42,74					
5,80	7	15		80,15					
6,00	7	16		80,91					
6,20	7	23		116,31					
6,40	7	27		136,54					
6,60	8	1		5,06					
6,80	8	1		5,06					
7,00	8	3		14,40					
7,20	8	8		38,40					
7,40	8	1		4,80					
7,60	9	3		14,40					
7,80	9	1		4,80					
8,00	9	4		18,27					
8,20	9	9		41,11					
8,40	9	10		45,68					
8,60	10	8		36,55					
8,80	10	24		109,64					
9,00	10	28		122,01					
9,20	10	55		239,67					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

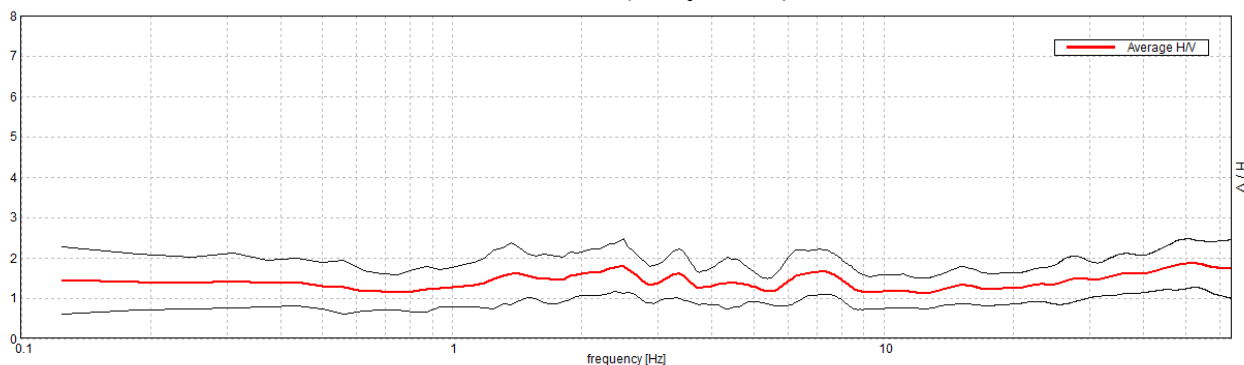
qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR17 CASELLO PIAN DEL VOGLI

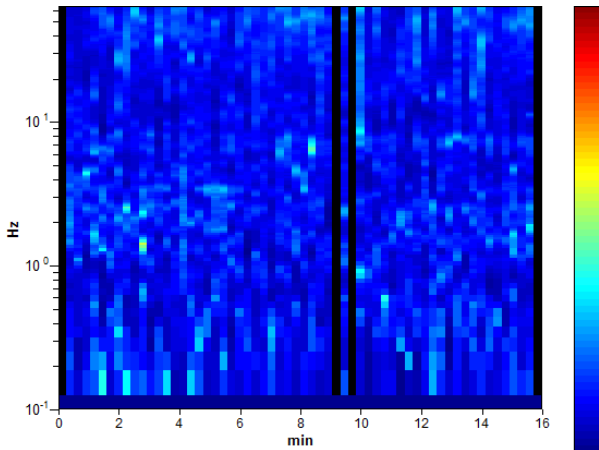
Instrument: TRZ-0108/01-10
 Start recording: 09/10/18 18:30:20 End recording: 09/10/18 18:46:21
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 93% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

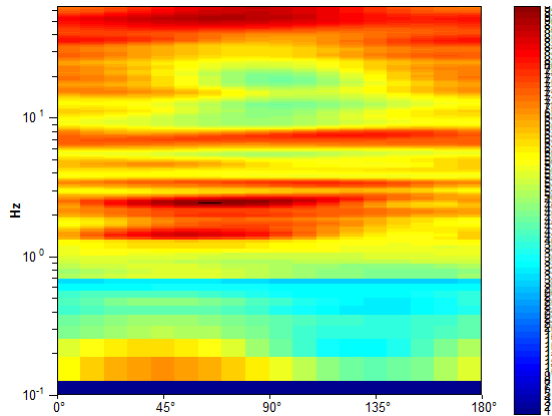
Max. H/V at 2.5 ± 0.19 Hz. (In the range 0.1 - 20.0 Hz).



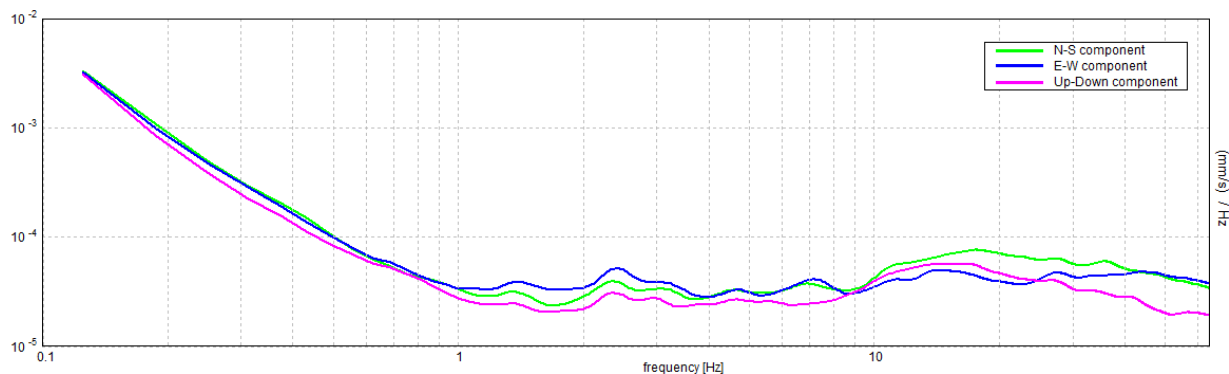
H/V TIME HISTORY



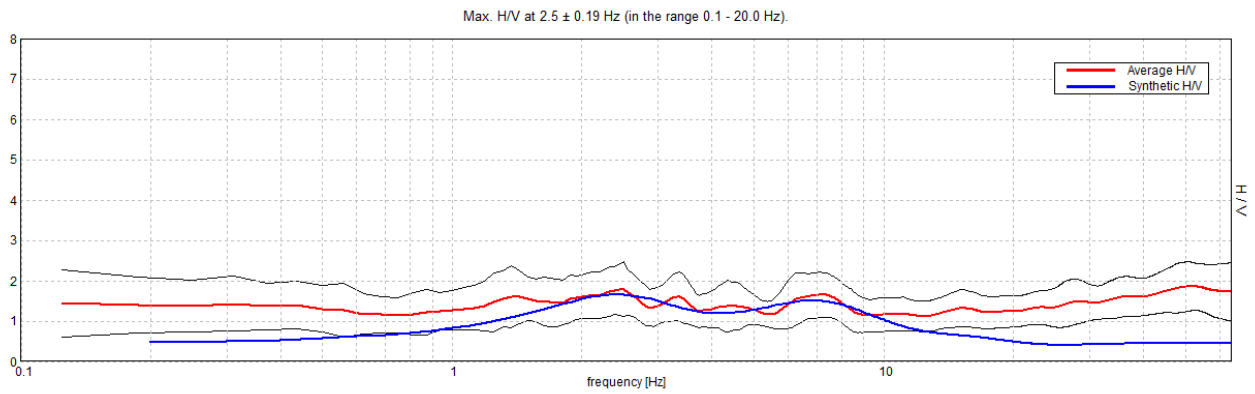
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

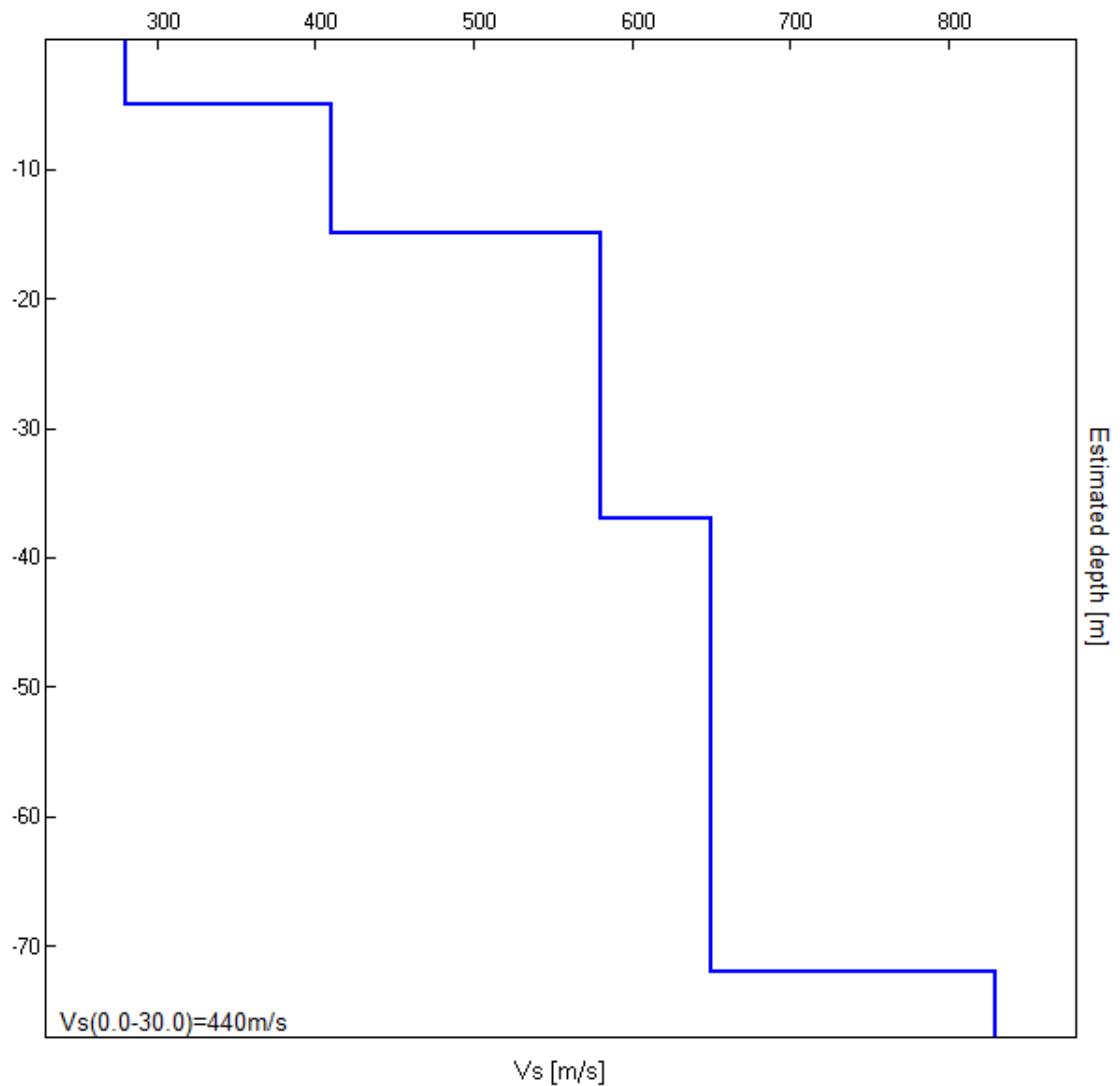


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
5.00	5.00	280
15.00	10.00	410
37.00	22.00	580
72.00	35.00	650
inf.	inf.	830

Vs(0.0-30.0)=440m/s



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

Max. H/V at 2.5 ± 0.19 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$2.50 > 0.63$	OK	
$n_c(f_0) > 200$	$2240.0 > 200$	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 61 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
$A_0 > 2$	$1.79 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.03815 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.09538 < 0.125$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.3344 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

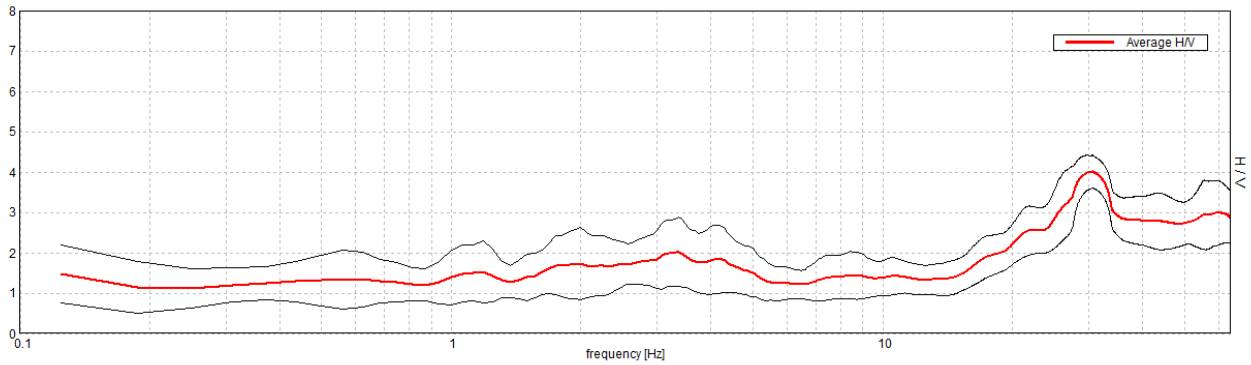
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR32 FALDO

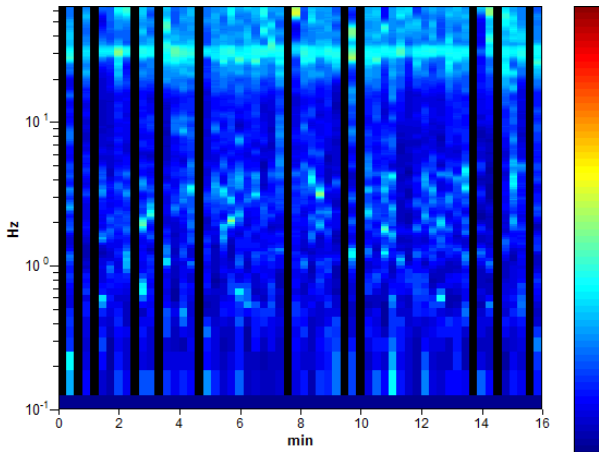
Instrument: TRZ-0108/01-10
Start recording: 15/10/18 16:30:27 End recording: 15/10/18 16:46:28
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

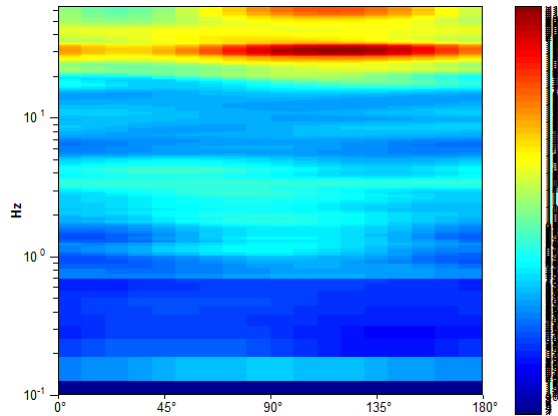
Max. H/V at 19.94 ± 2.97 Hz. (In the range 0.1 - 20.0 Hz).



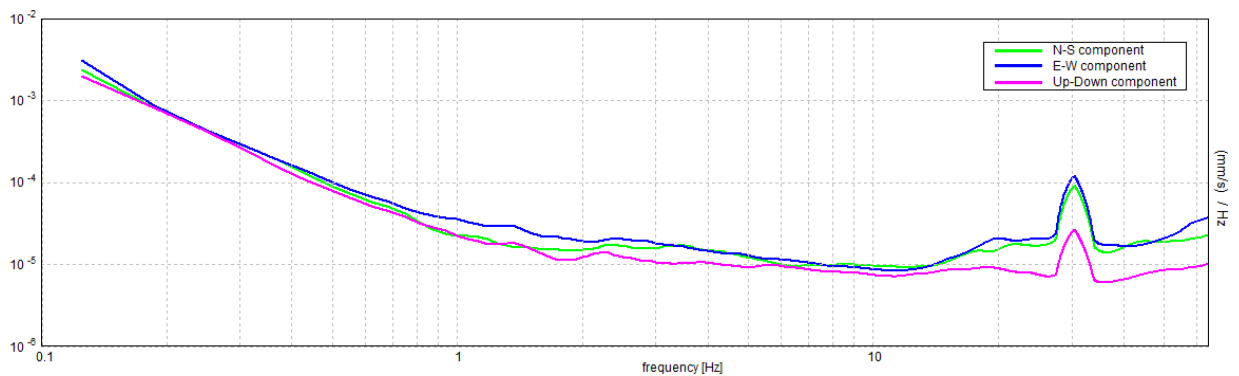
H/V TIME HISTORY



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 19.94 ± 2.97 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	19.94 > 0.63	OK	
$n_c(f_0) > 200$	15312.0 > 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 480 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
$A_0 > 2$	2.20 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.07334 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	1.46221 < 0.99688		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2454 < 1.58	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
σ_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 σ_f and $\sigma_A(f_0)$

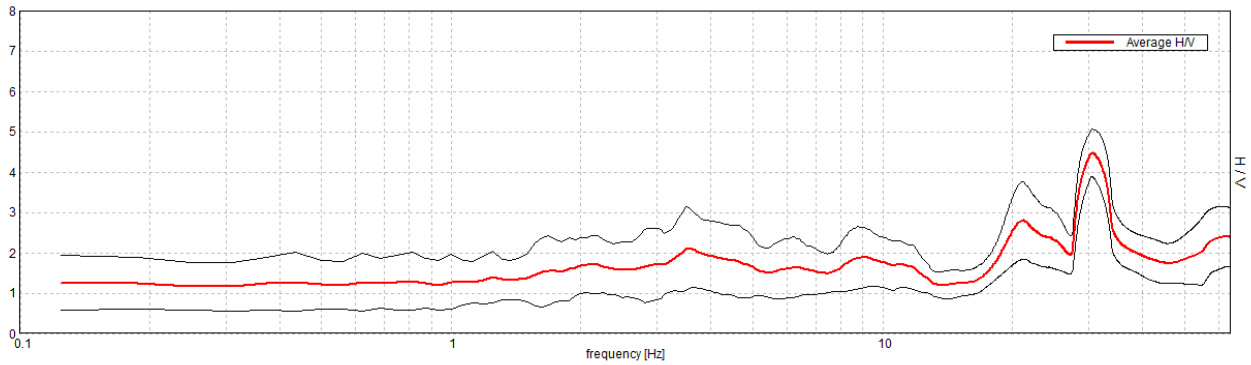
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR31 FALDO

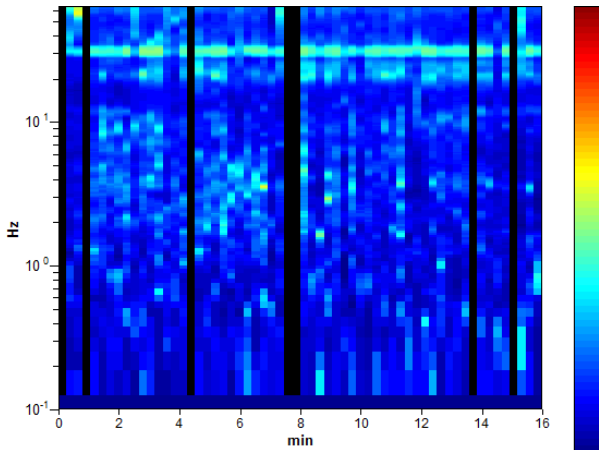
Instrument: TRZ-0108/01-10
 Start recording: 15/10/18 16:10:26 End recording: 15/10/18 16:26:27
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 88% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

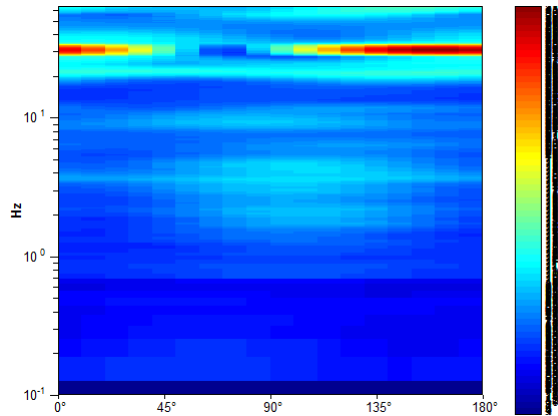
Max. H/V at 19.94 ± 2.62 Hz. (In the range 0.1 - 20.0 Hz).



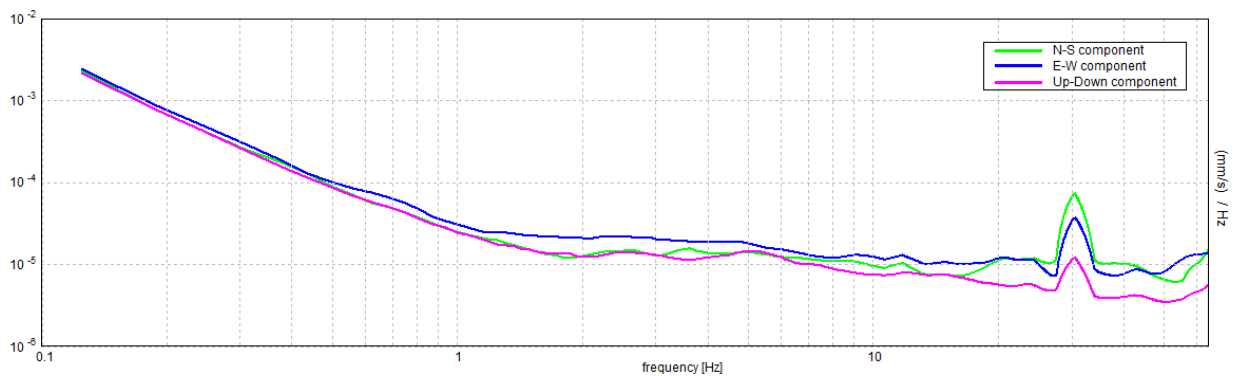
H/V TIME HISTORY



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 19.94 ± 2.62 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	19.94 > 0.63	OK	
$n_c(f_0) > 200$	16907.0 > 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 480 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	15.688 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.51 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.06493 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	1.2946 < 0.99688		NO
$\sigma_A(f_0) < \theta(f_0)$	0.408 < 1.58	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
σ_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 σ_f and $\sigma_A(f_0)$

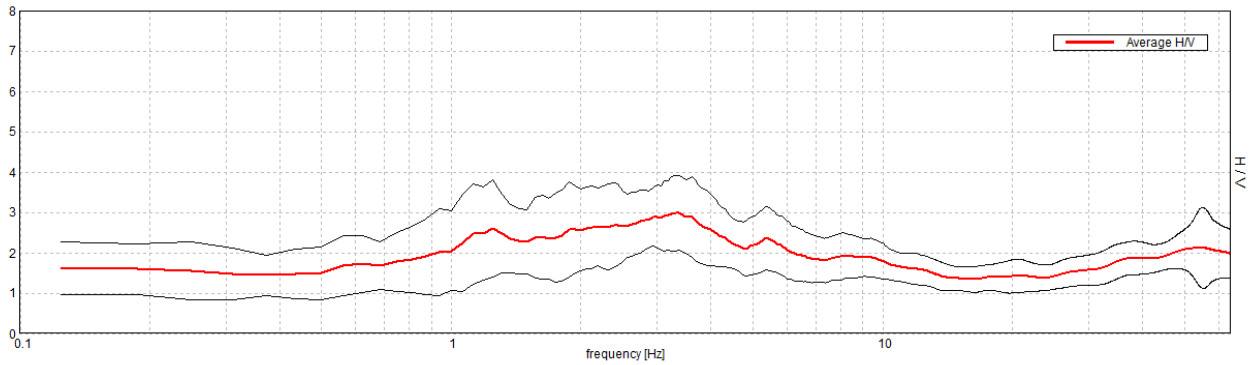
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR69 MONTEFREDENTE CAMPO SP

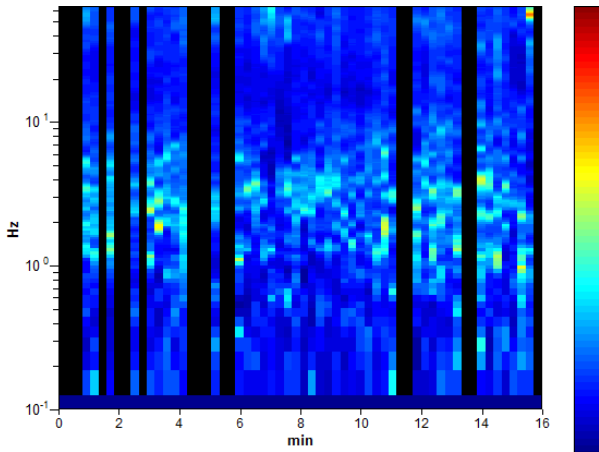
Instrument: TRZ-0108/01-10
Start recording: 07/12/18 13:05:36 End recording: 07/12/18 13:21:37
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 72% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

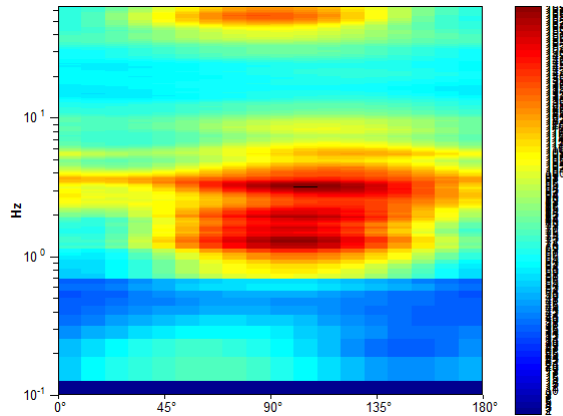
Max. H/V at 3.38 ± 0.23 Hz. (In the range 0.1 - 20.0 Hz).



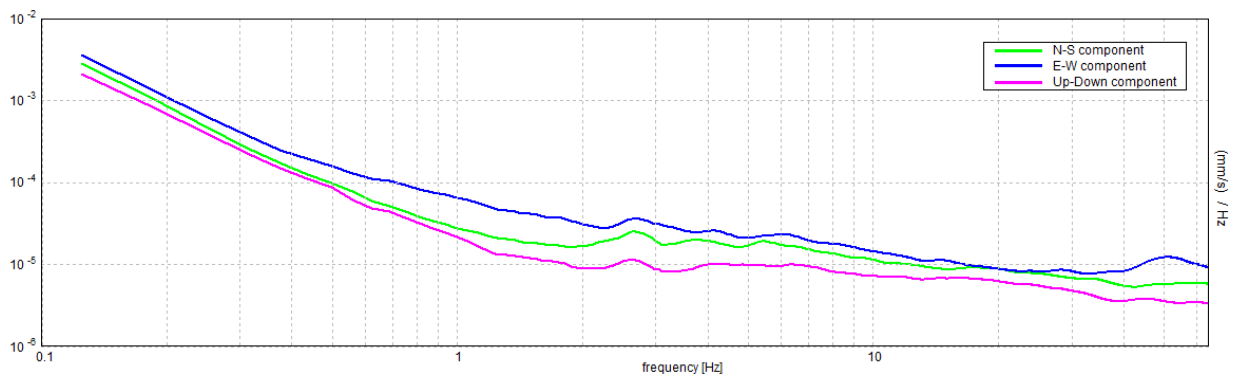
H/V TIME HISTORY



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 3.38 ± 0.23 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$3.38 > 0.63$	OK	
$n_c(f_0) > 200$	$2322.0 > 200$	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 82 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	13.063 Hz	OK	
$A_0 > 2$	$2.99 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.03373 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.11385 < 0.16875$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.4503 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

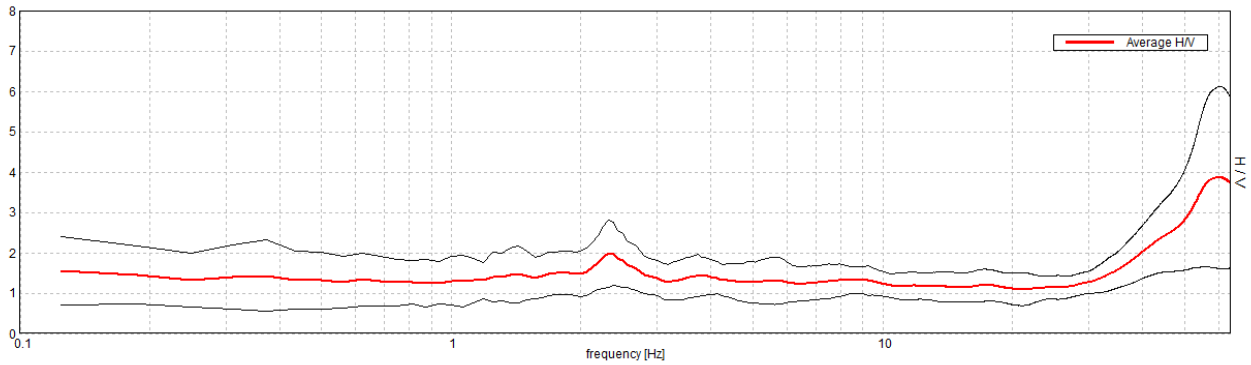
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR33 BORGO

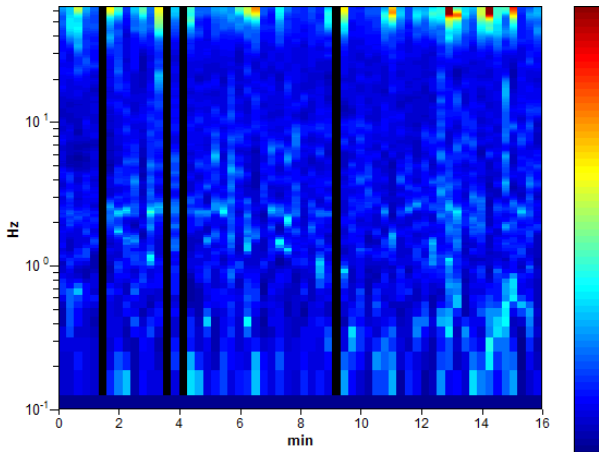
Instrument: TRZ-0108/01-10
Start recording: 15/10/18 16:53:55 End recording: 15/10/18 17:09:56
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 93% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

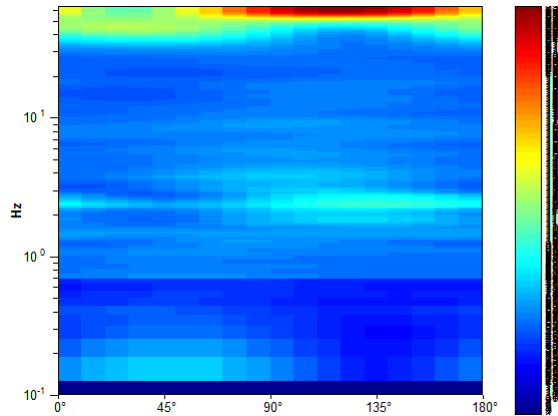
Max. H/V at 2.31 ± 0.15 Hz. (In the range 0.1 - 20.0 Hz).



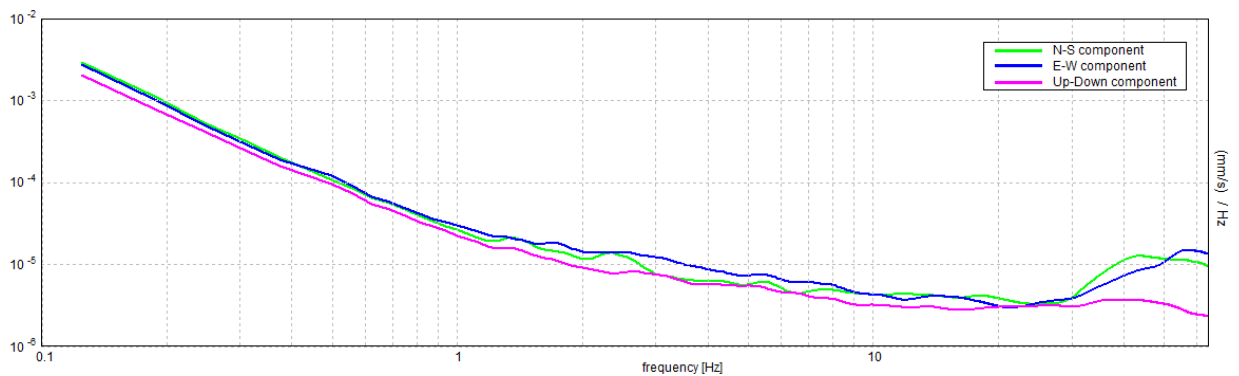
H/V TIME HISTORY



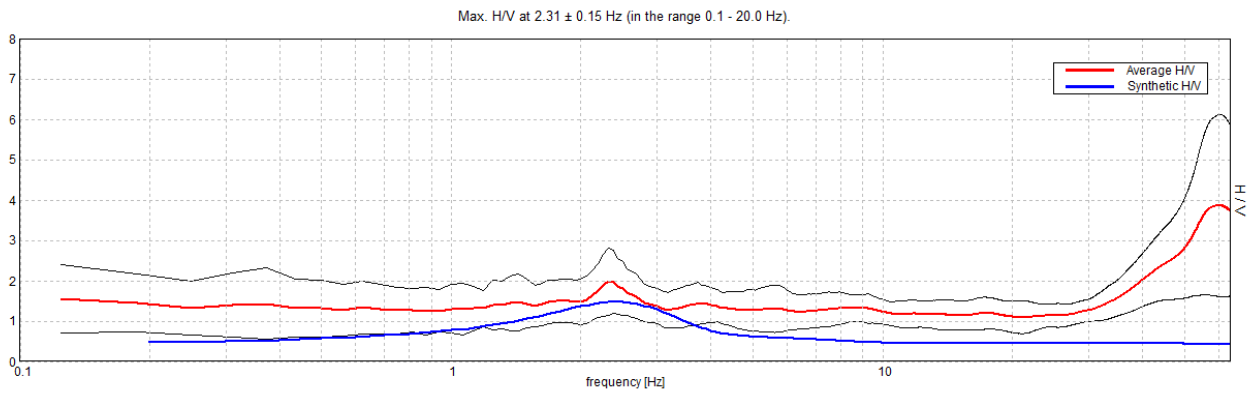
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

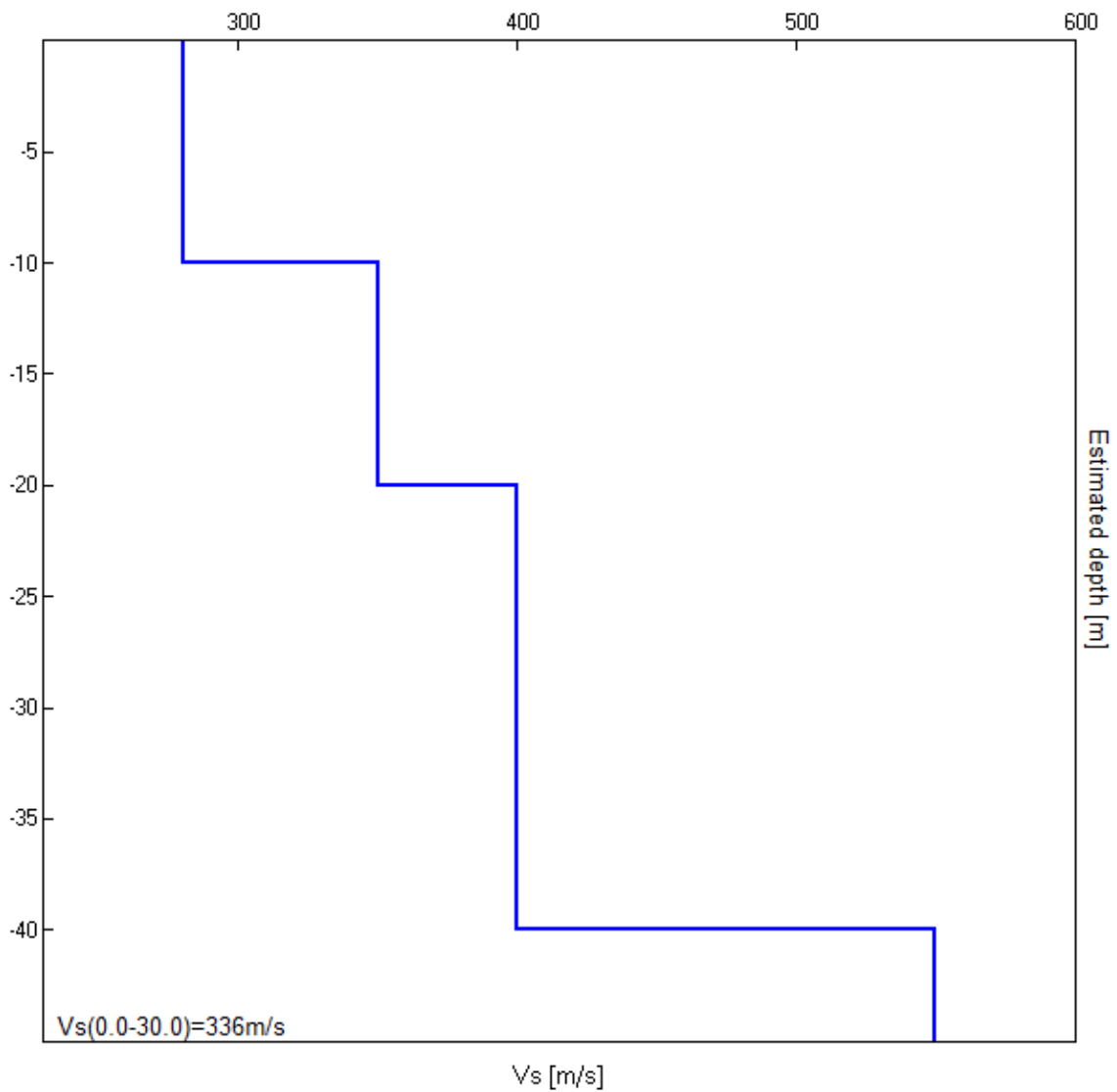


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
10.00	10.00	280
20.00	10.00	350
40.00	20.00	400
inf.	inf.	550

Vs(0.0-30.0)=336m/s



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

Max. H/V at 2.31 ± 0.15 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.31 > 0.63	OK	
$n_c(f_0) > 200$	2072.0 > 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 56 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
$A_0 > 2$	1.98 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.03173 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.07337 < 0.11563$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.4079 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

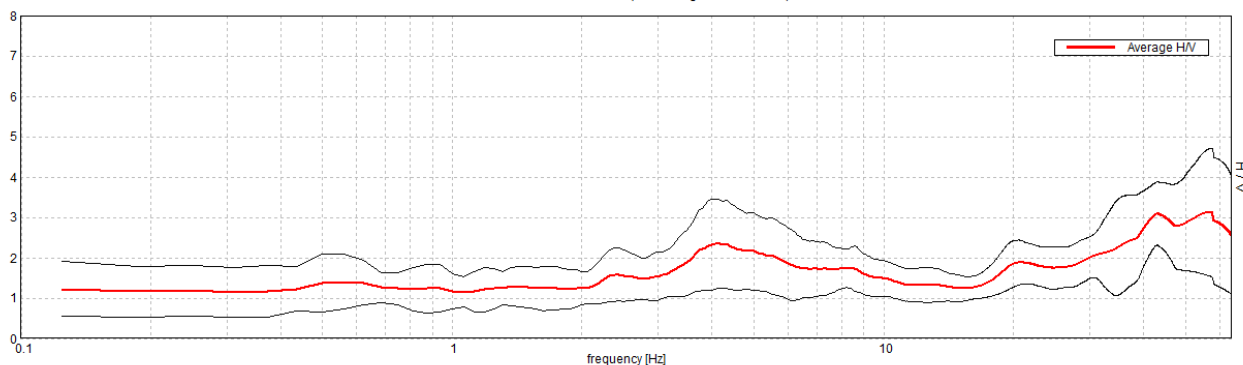
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR30 BORGIO

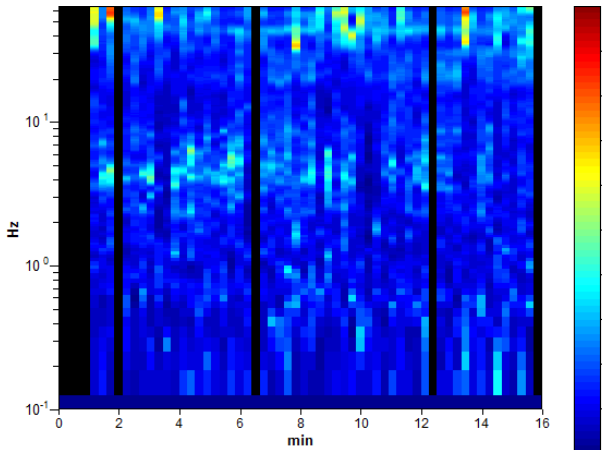
Instrument: TRZ-0108/01-10
Start recording: 15/10/18 15:48:35 End recording: 15/10/18 16:04:36
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 87% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

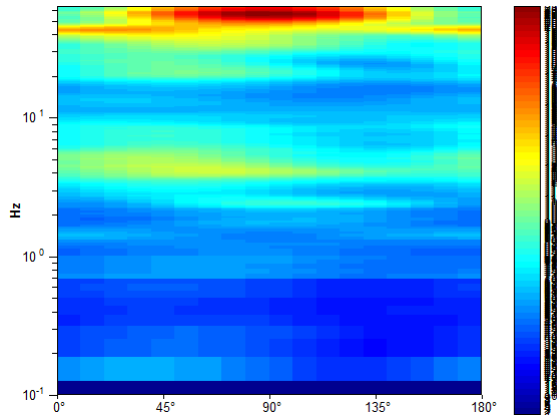
Max. H/V at 4.13 ± 0.03 Hz. (In the range 0.1 - 20.0 Hz).



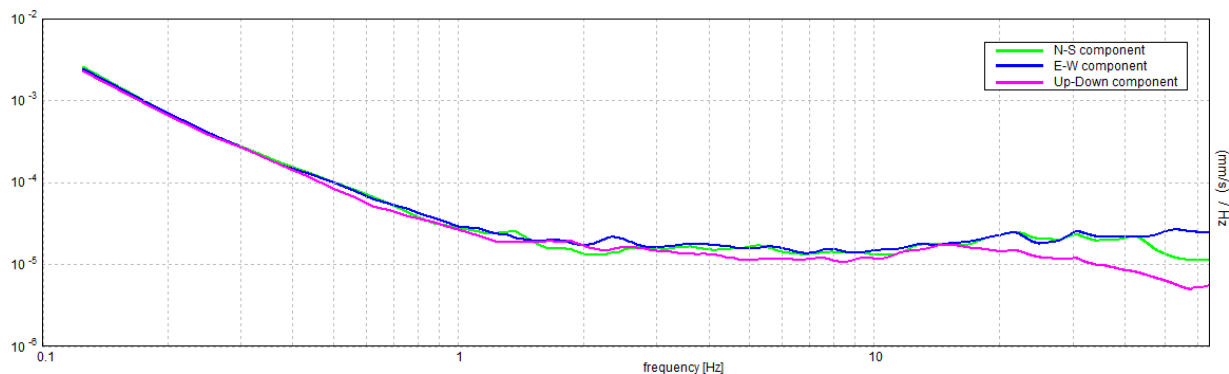
H/V TIME HISTORY



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 4.13 ± 0.03 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$4.13 > 0.63$	OK	
$n_c(f_0) > 200$	$3432.0 > 200$	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 100 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	1.125 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$2.35 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00401 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.01652 < 0.20625$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.5454 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR24 MONTEFREDENTE

Instrument: TRZ-0108/01-10

Start recording: 15/10/18 12:21:32 End recording: 15/10/18 12:37:33

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

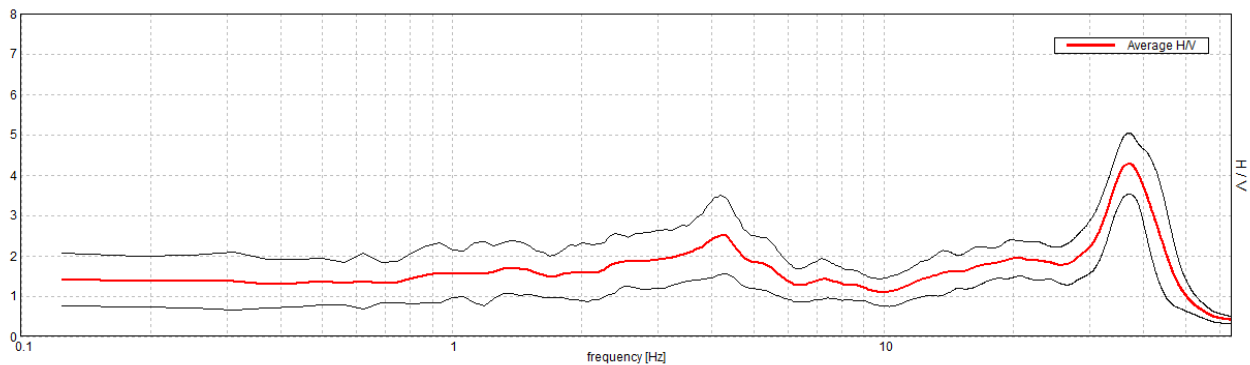
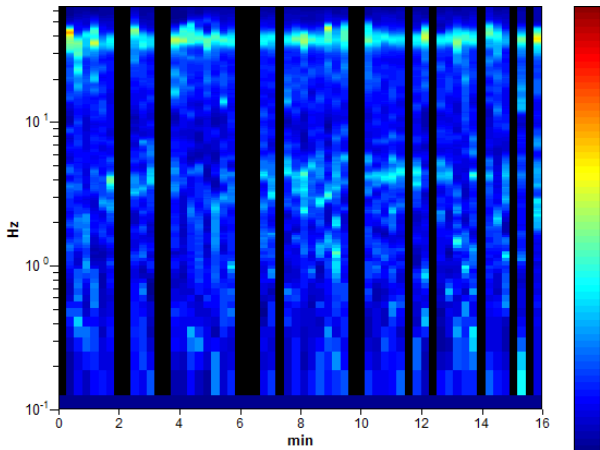
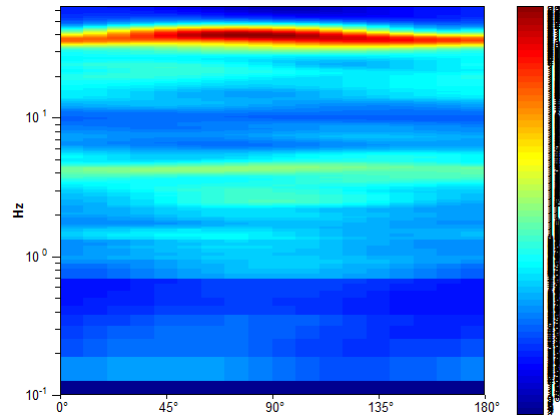
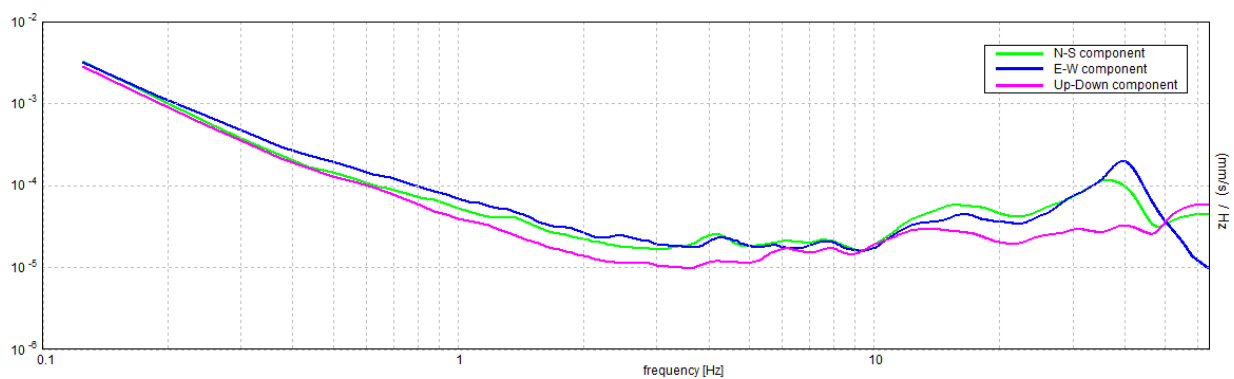
Trace length: 0h16'00". Analyzed 73% trace (manual window selection)

Sampling rate: 128 Hz

Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIOMax. H/V at 4.25 ± 1.47 Hz. (In the range 0.1 - 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 4.25 ± 1.47 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$4.25 > 0.63$	OK	
$n_c(f_0) > 200$	$2992.0 > 200$	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 103 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	8.75 Hz	OK	
$A_0 > 2$	$2.51 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.16895 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.71802 < 0.2125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.4738 < 1.58$	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR25 MONTEFREDEnte

Instrument: TRZ-0108/01-10

Start recording: 15/10/18 12:41:33 End recording: 15/10/18 12:57:34

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 97% trace (manual window selection)

Sampling rate: 128 Hz

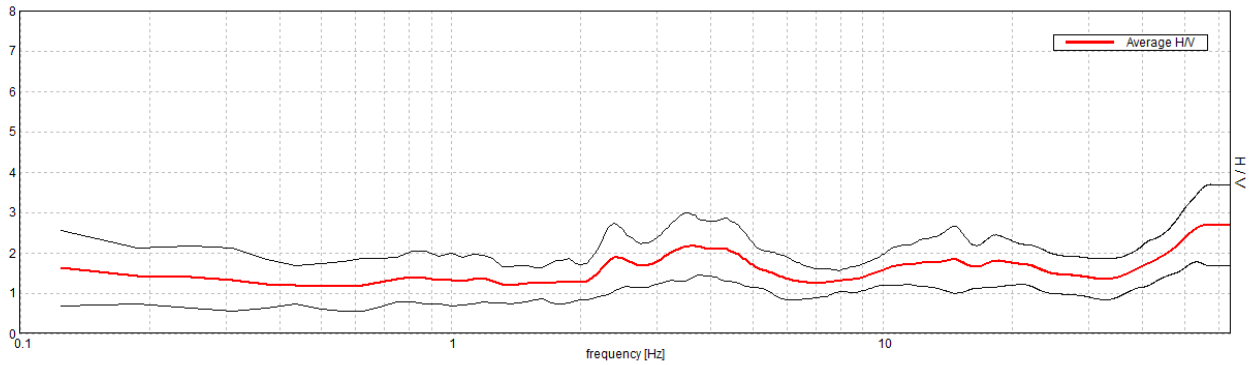
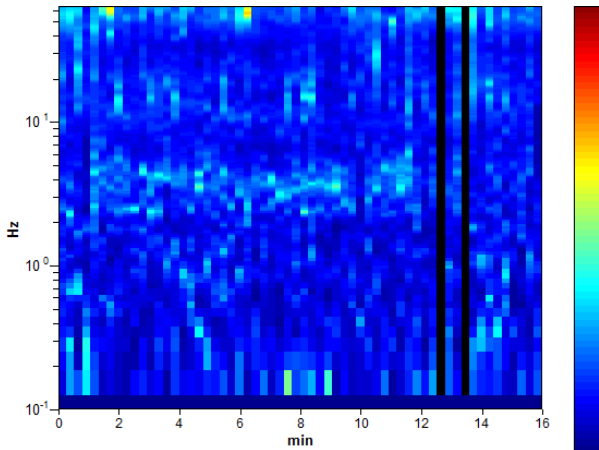
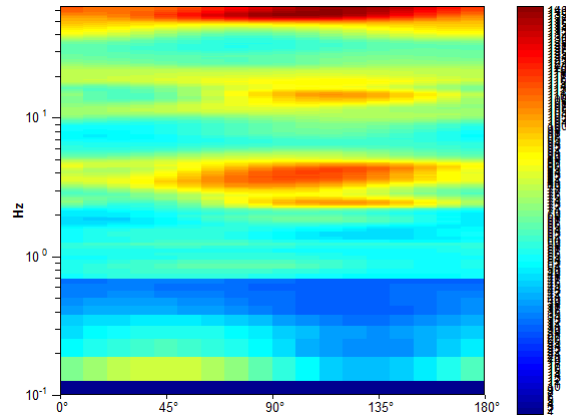
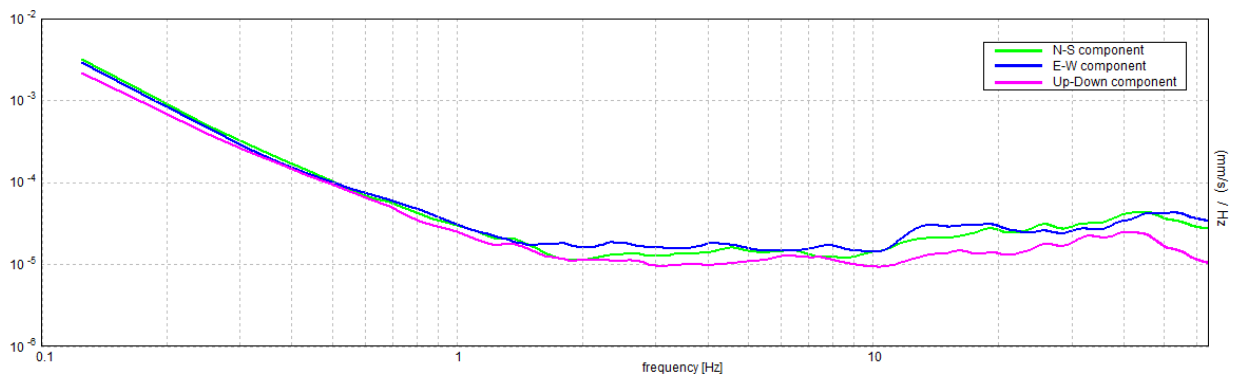
Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 3.69 ± 0.88 Hz. (In the range 0.1 - 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 3.69 ± 0.88 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$3.69 > 0.63$	OK	
$n_c(f_0) > 200$	$3422.0 > 200$	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 90 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
$A_0 > 2$	$2.17 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.11753 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.4334 < 0.18438$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3738 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

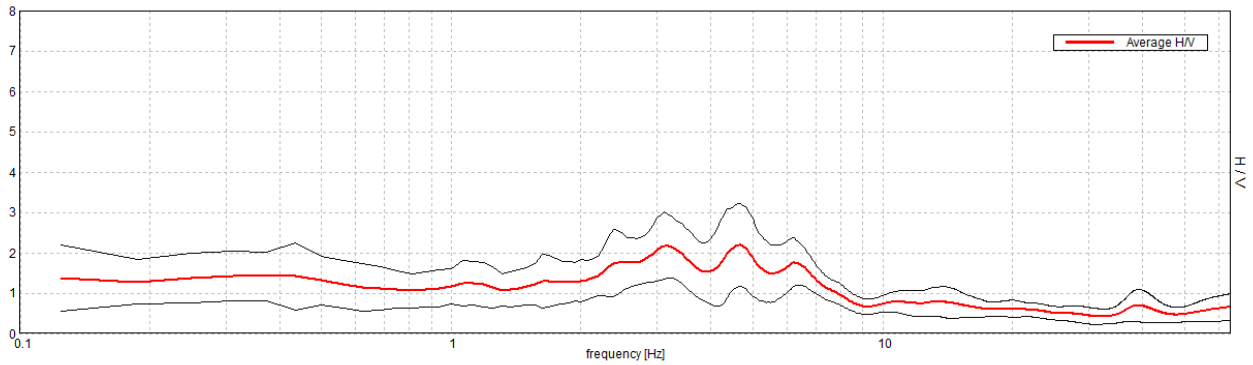
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR29 MONTEFREDEnte

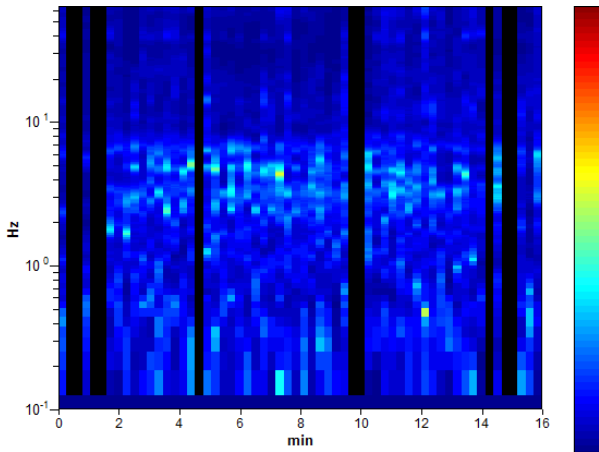
Instrument: TRZ-0108/01-10
Start recording: 15/10/18 15:20:51 End recording: 15/10/18 15:36:52
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 83% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

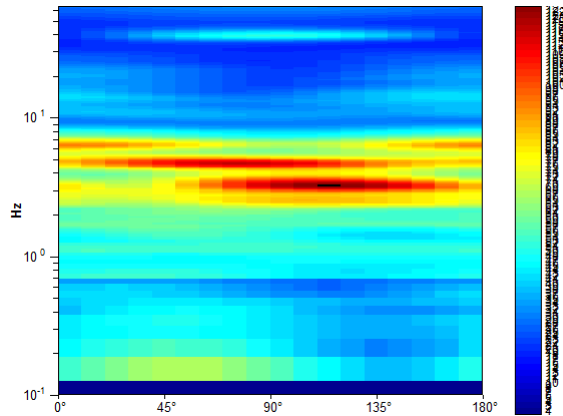
Max. H/V at 4.69 ± 0.47 Hz. (In the range 0.1 - 20.0 Hz).



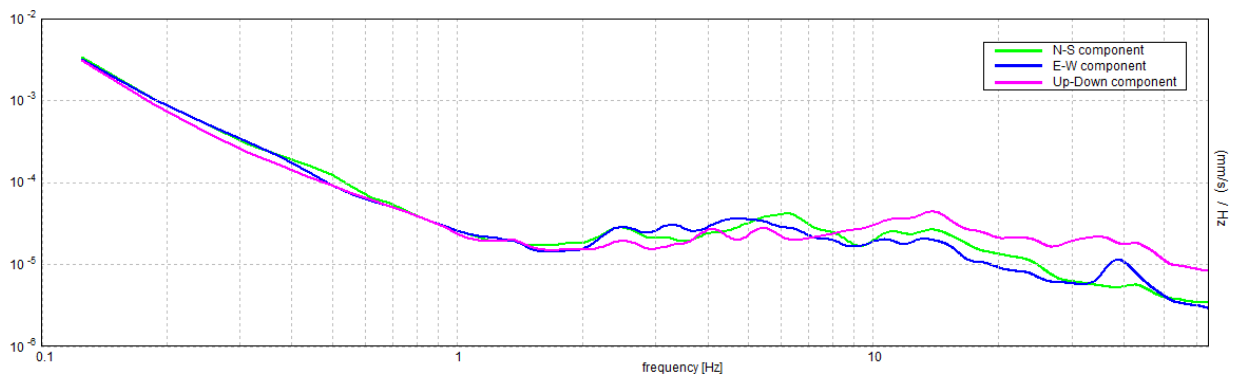
H/V TIME HISTORY



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 4.69 ± 0.47 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$4.69 > 0.63$	OK	
$n_c(f_0) > 200$	$3750.0 > 200$	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 114 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	1.375 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	7.5 Hz	OK	
$A_0 > 2$	$2.20 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.04902 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.22976 < 0.23438$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.5044 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

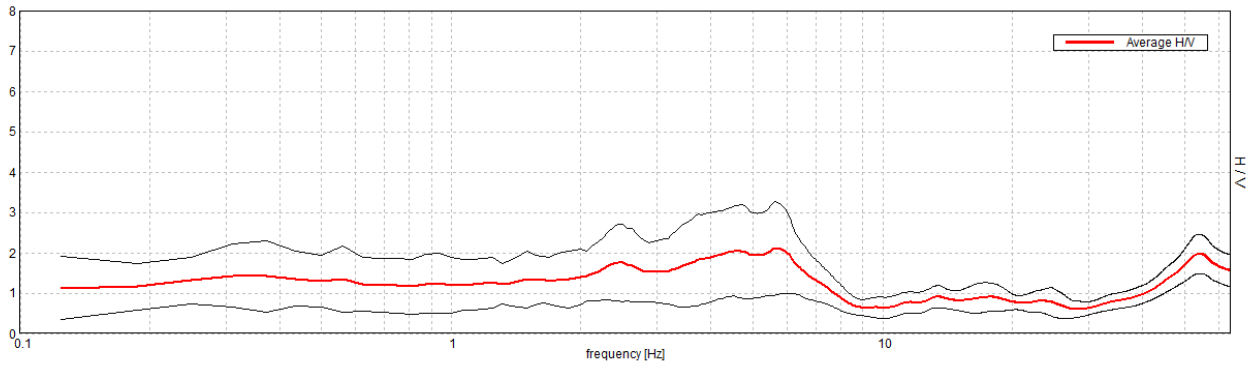
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR28 MONTEFREDENTE

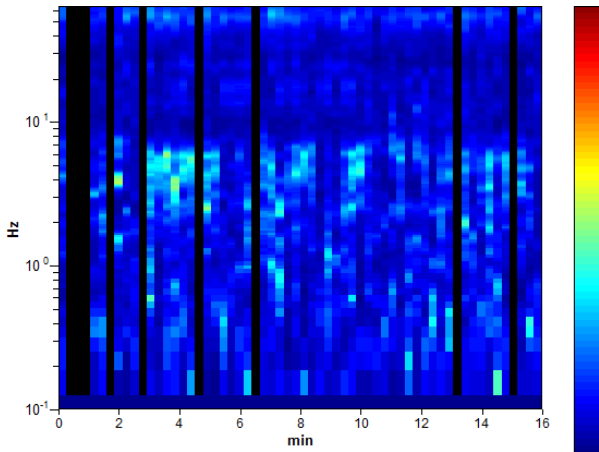
Instrument: TRZ-0108/01-10
Start recording: 15/10/18 14:58:36 End recording: 15/10/18 15:14:37
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

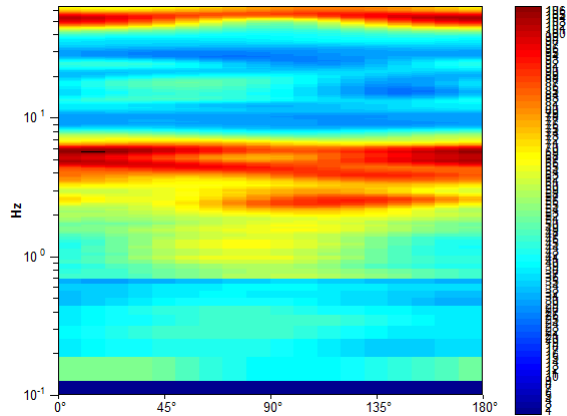
Max. H/V at 5.63 ± 0.34 Hz. (In the range 0.1 - 20.0 Hz).



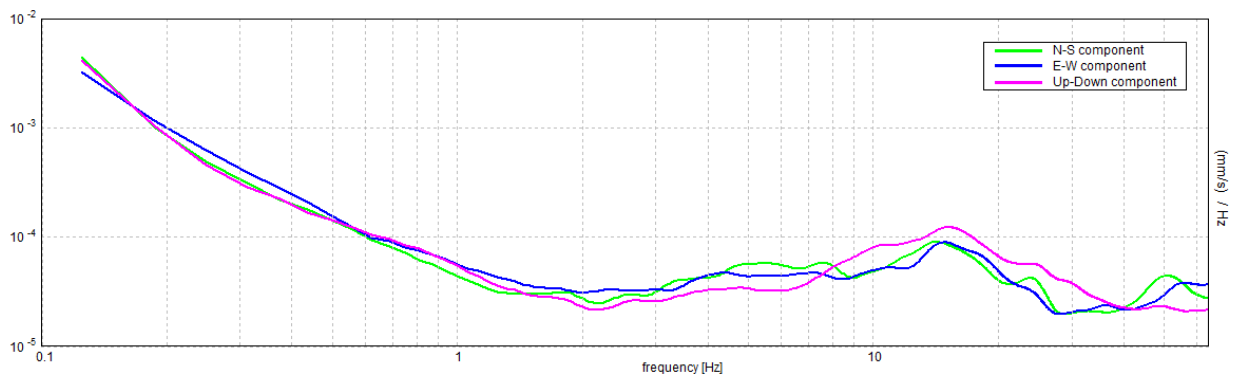
H/V TIME HISTORY



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 5.63 ± 0.34 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	5.63 > 0.63	OK	
$n_c(f_0) > 200$	4590.0 > 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 136 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	7.625 Hz	OK	
$A_0 > 2$	2.11 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.02938 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	0.16524 < 0.28125	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5756 < 1.58	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR70 MONTEFREDENTE CIMITERO

Instrument: TRZ-0108/01-10

Start recording: 07/12/18 15:26:04 End recording: 07/12/18 15:42:05

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 63% trace (manual window selection)

Sampling rate: 128 Hz

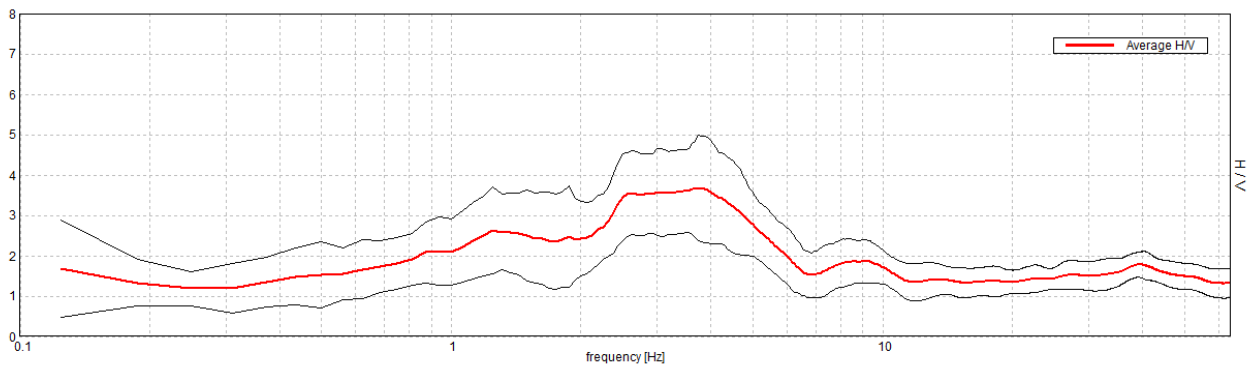
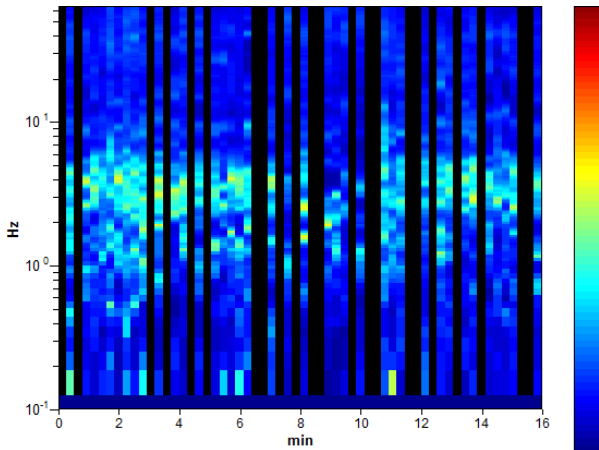
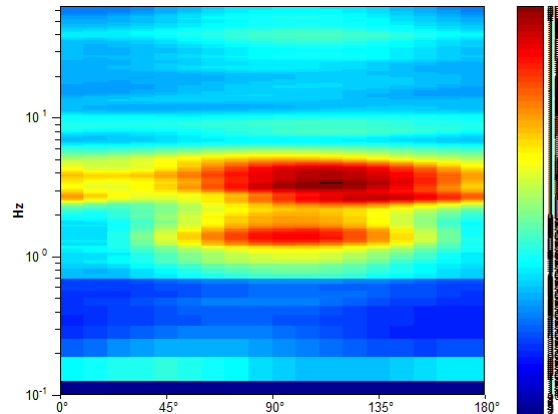
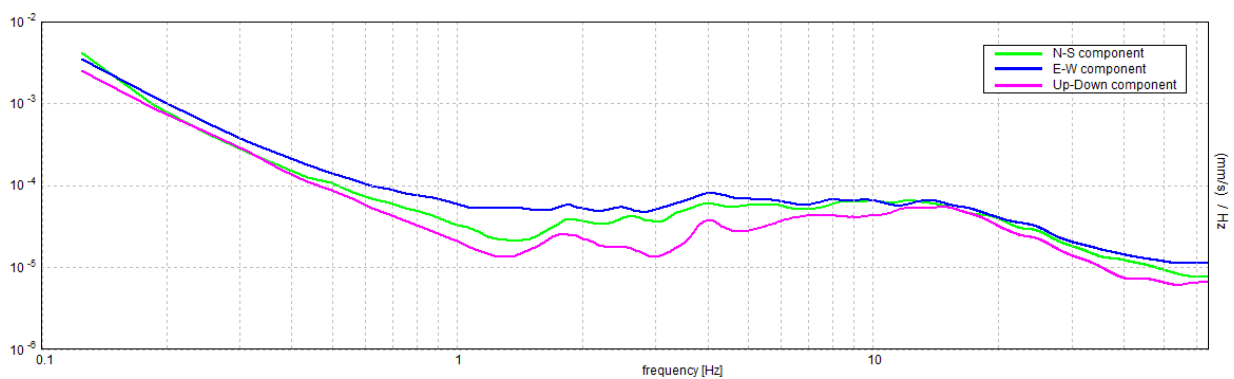
Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 3.75 ± 0.04 Hz. (In the range 0.1 - 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 3.75 ± 0.04 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$3.75 > 0.63$	OK	
$n_c(f_0) > 200$	$2280.0 > 200$	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 91 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 $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	6.25 Hz	OK	
$A_0 > 2$	$3.68 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00506 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.01897 < 0.1875$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.634 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

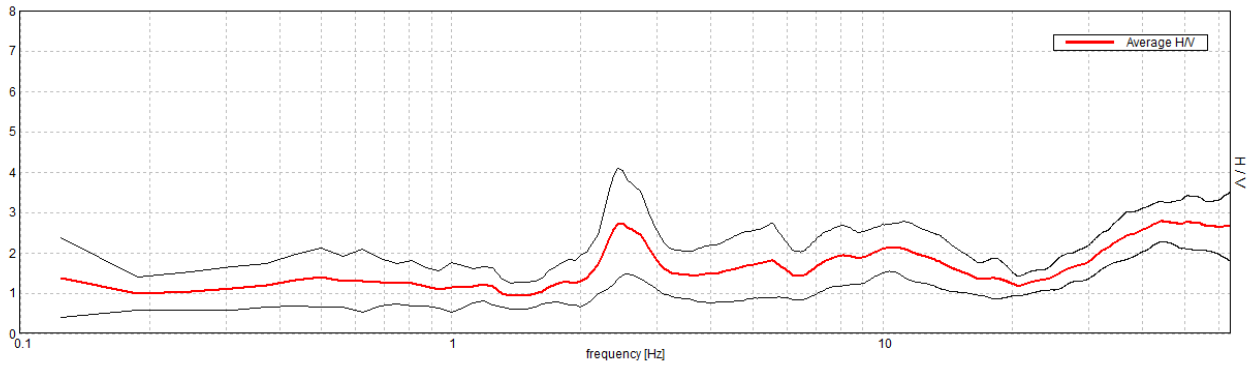
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR26 MONTEFREDENTE

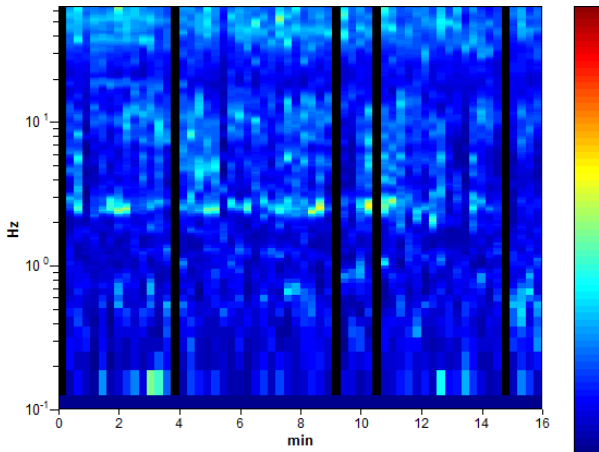
Instrument: TRZ-0108/01-10
Start recording: 15/10/18 13:03:05 End recording: 15/10/18 13:19:06
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 92% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

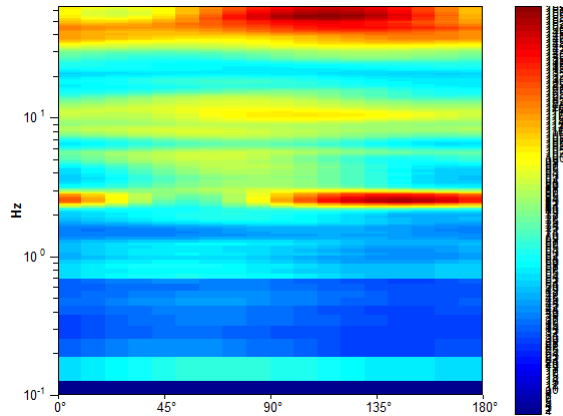
Max. H/V at 2.5 ± 0.02 Hz. (In the range 0.1 - 20.0 Hz).



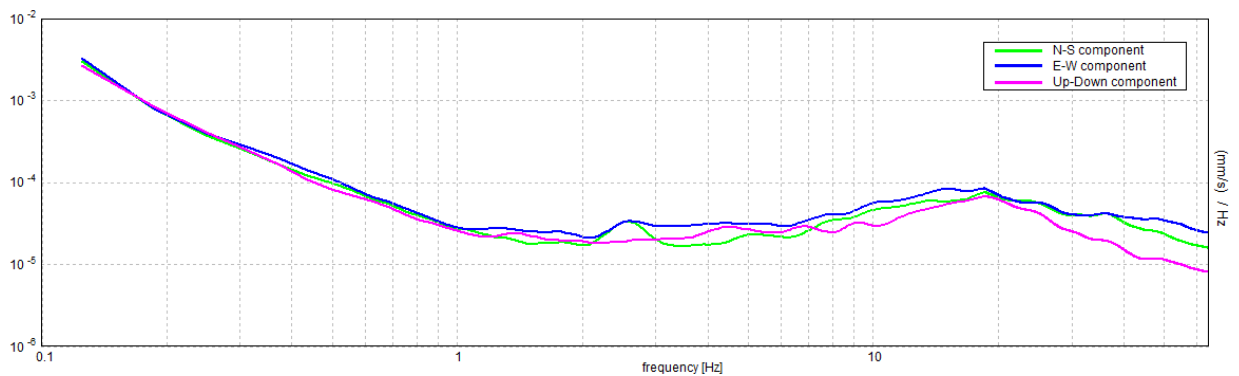
H/V TIME HISTORY



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 2.5 ± 0.02 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$2.50 > 0.63$	OK	
$n_c(f_0) > 200$	$2200.0 > 200$	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 61 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	2.0 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$2.74 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.00364 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.00909 < 0.125$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.6445 < 1.58$	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
σ_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 σ_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



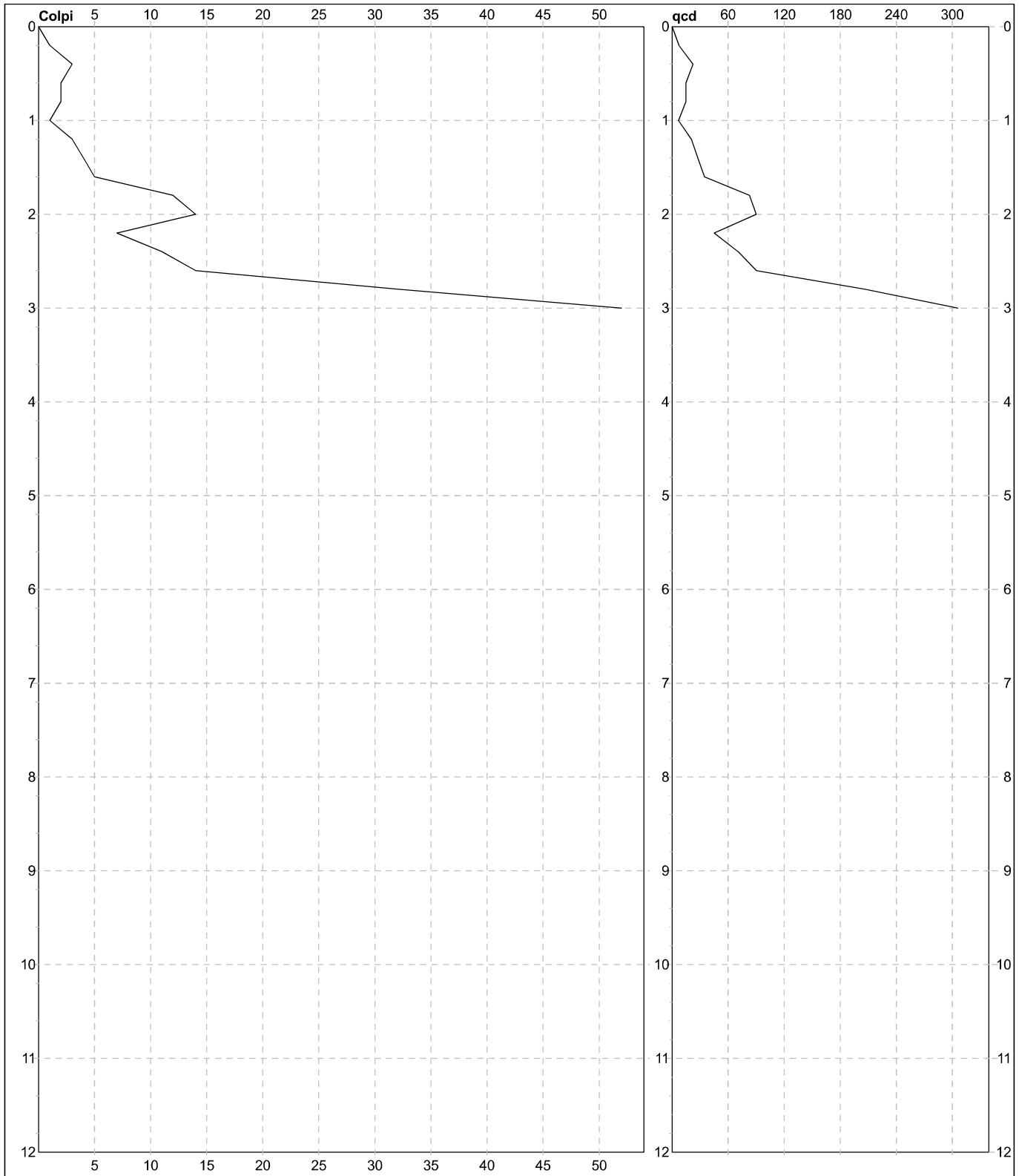
PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	5
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
Cantiere: **Studio di MS comunale livello 2**
Località: **Montefredente**

U.M.: **kg/cm²**
Scala: **1:60**
Pagina: **1**
Elaborato:

Data esec.: **26/01/2019**
Quota ass.:
Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
Massa battente: 63,50 m
Altezza caduta: 0,75 m
Avanzamento: 0,20 m

Responsabile:
Assistente:

Preforo: m
Corr.astine: kg/ml
Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE

DIN**5**

riferimento

006-2019Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**Cantiere: **Studio di MS comunale livello 2**Località: **Montefredente**U.M.: **kg/cm²**Data esec.: **26/01/2019**Pagina: **1**

Elaborato:

Falda: **Non rilevata**

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45					
0,40	1	3		22,35					
0,60	2	2		14,90					
0,80	2	2		14,90					
1,00	2	1		6,90					
1,20	2	3		20,71					
1,40	2	4		27,62					
1,60	3	5		34,52					
1,80	3	12		82,85					
2,00	3	14		90,08					
2,20	3	7		45,04					
2,40	3	11		70,78					
2,60	4	14		90,08					
2,80	4	32		205,90					
3,00	4	60		361,46					

H = profondità

L1 = prima lettura (colpi punta)

L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta

Asta = numero di asta impiegata



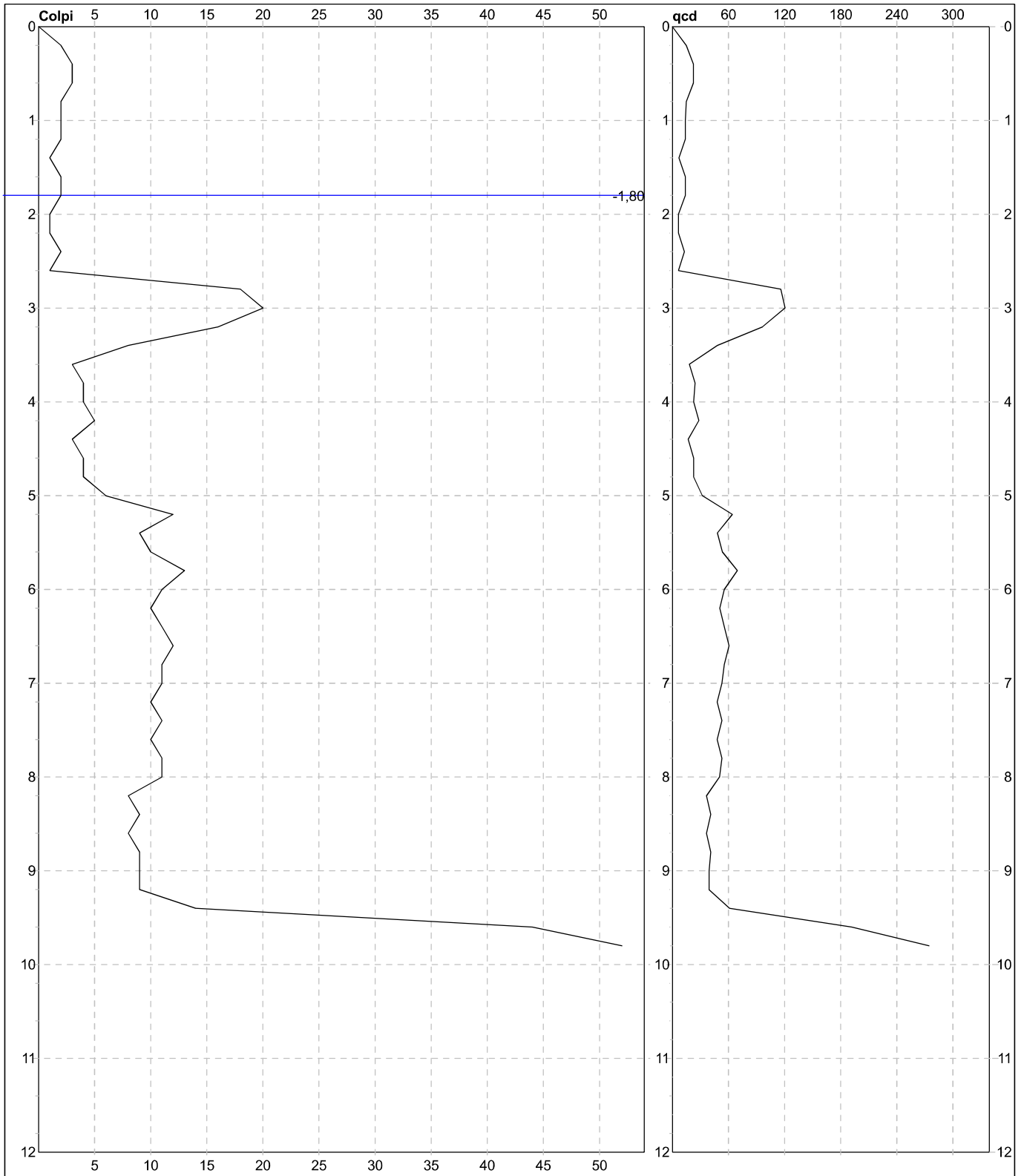
PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	6
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **Montefredente Cimitero**

U.M.: **kg/cm²**
 Scala: **1:60**
 Pagina: **1**
 Elaborato:

Data esec.: **26/01/2019**
 Quota ass.:
 Falda: **-1,80 m** da p.c.



Penetrometro: DPSH (S. Heavy)
 Massa battente: 63,50 m
 Altezza caduta: 0,75 m
 Avanzamento: 0,20 m

Responsabile:
 Assistente:

Preforo: m
 Corr.astine: kg/ml
 Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	6
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: Montefredente Cimitero	Elaborato:	Falda: -1,80 m da p.c.

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	2		14,90					
0,40	1	3		22,35					
0,60	2	3		22,35					
0,80	2	2		14,90					
1,00	2	2		13,81					
1,20	2	2		13,81					
1,40	2	1		6,90					
1,60	3	2		13,81					
1,80	3	2		13,81					
2,00	3	1		6,43					
2,20	3	1		6,43					
2,40	3	2		12,87					
2,60	4	1		6,43					
2,80	4	18		115,82					
3,00	4	20		120,49					
3,20	4	16		96,39					
3,40	4	8		48,19					
3,60	5	3		18,07					
3,80	5	4		24,10					
4,00	5	4		22,65					
4,20	5	5		28,32					
4,40	5	3		16,99					
4,60	6	4		22,65					
4,80	6	4		22,65					
5,00	6	6		32,06					
5,20	6	12		64,12					
5,40	6	9		48,09					
5,60	7	10		53,43					
5,80	7	13		69,46					
6,00	7	11		55,63					
6,20	7	10		50,57					
6,40	7	11		55,63					
6,60	8	12		60,69					
6,80	8	11		55,63					
7,00	8	11		52,80					
7,20	8	10		48,00					
7,40	8	11		52,80					
7,60	9	10		48,00					
7,80	9	11		52,80					
8,00	9	11		50,25					
8,20	9	8		36,55					
8,40	9	9		41,11					
8,60	10	8		36,55					
8,80	10	9		41,11					
9,00	10	9		39,22					
9,20	10	9		39,22					
9,40	10	14		61,01					
9,60	11	44		191,74					
9,80	11	63		274,53					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR27 MONTEFREDEnte

Instrument: TRZ-0108/01-10

Start recording: 15/10/18 13:25:35 End recording: 15/10/18 13:41:36

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 90% trace (manual window selection)

Sampling rate: 128 Hz

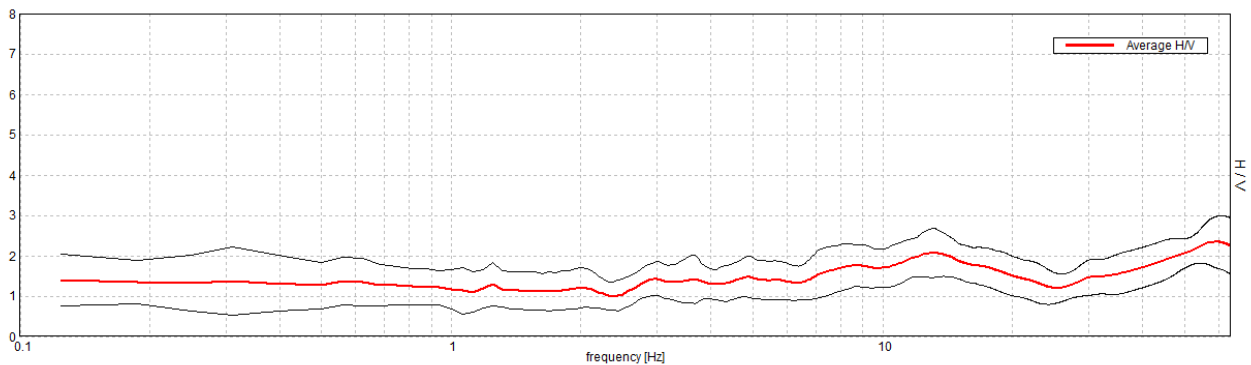
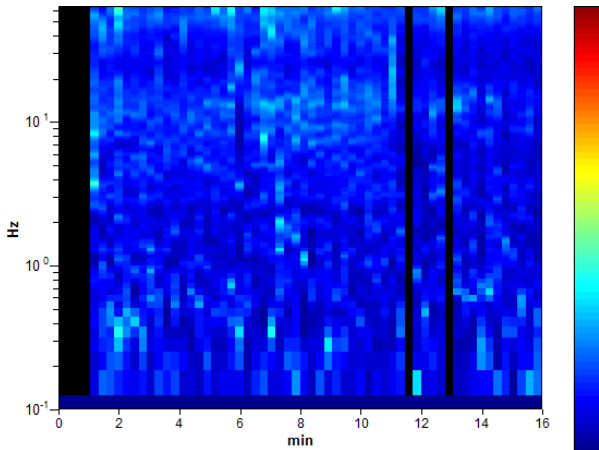
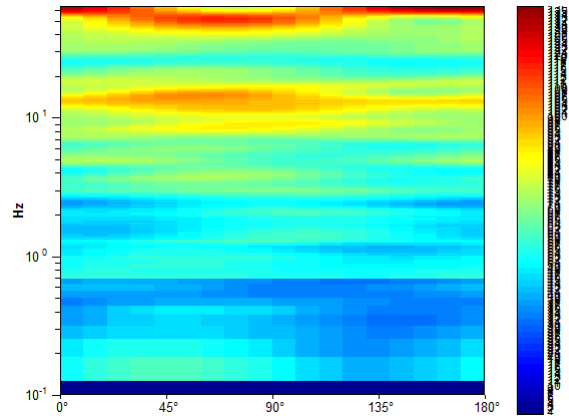
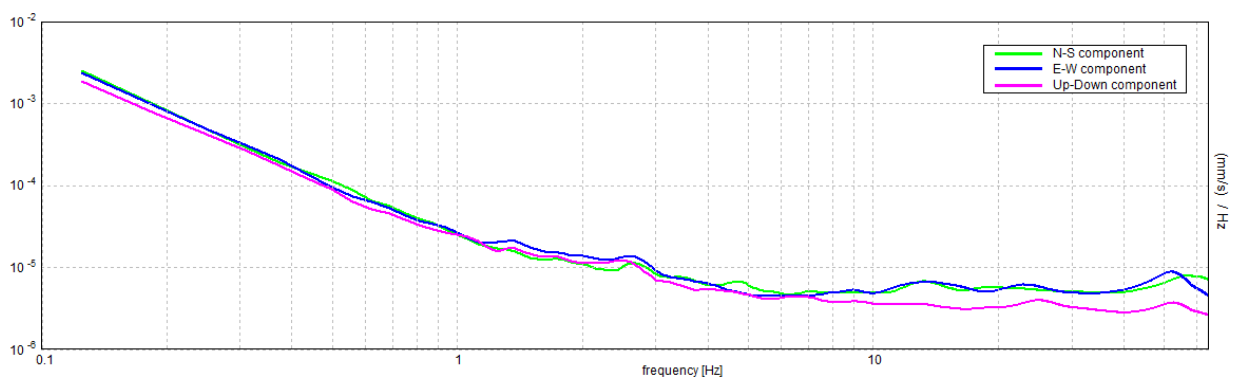
Window size: 16 s

Smoothing type: Triangular window

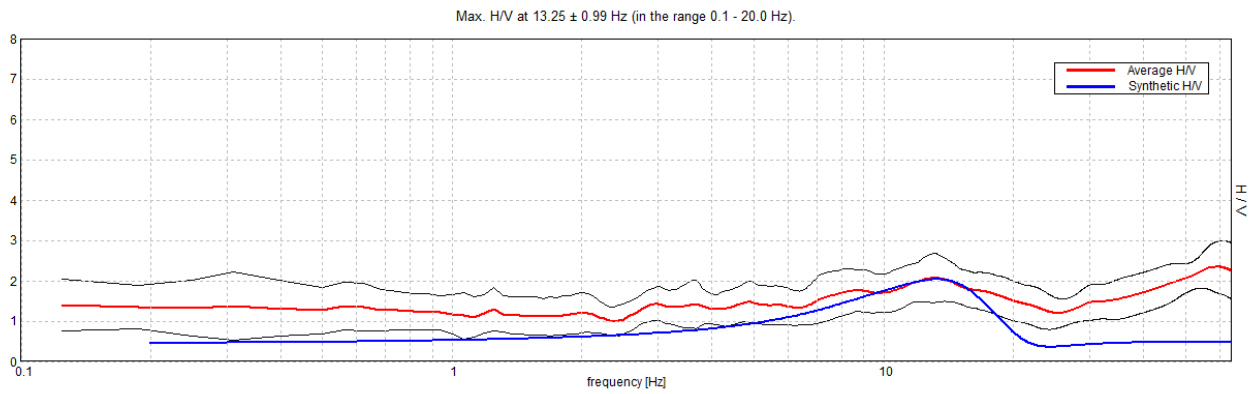
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 13.25 ± 0.99 Hz. (In the range 0.1 - 20.0 Hz).

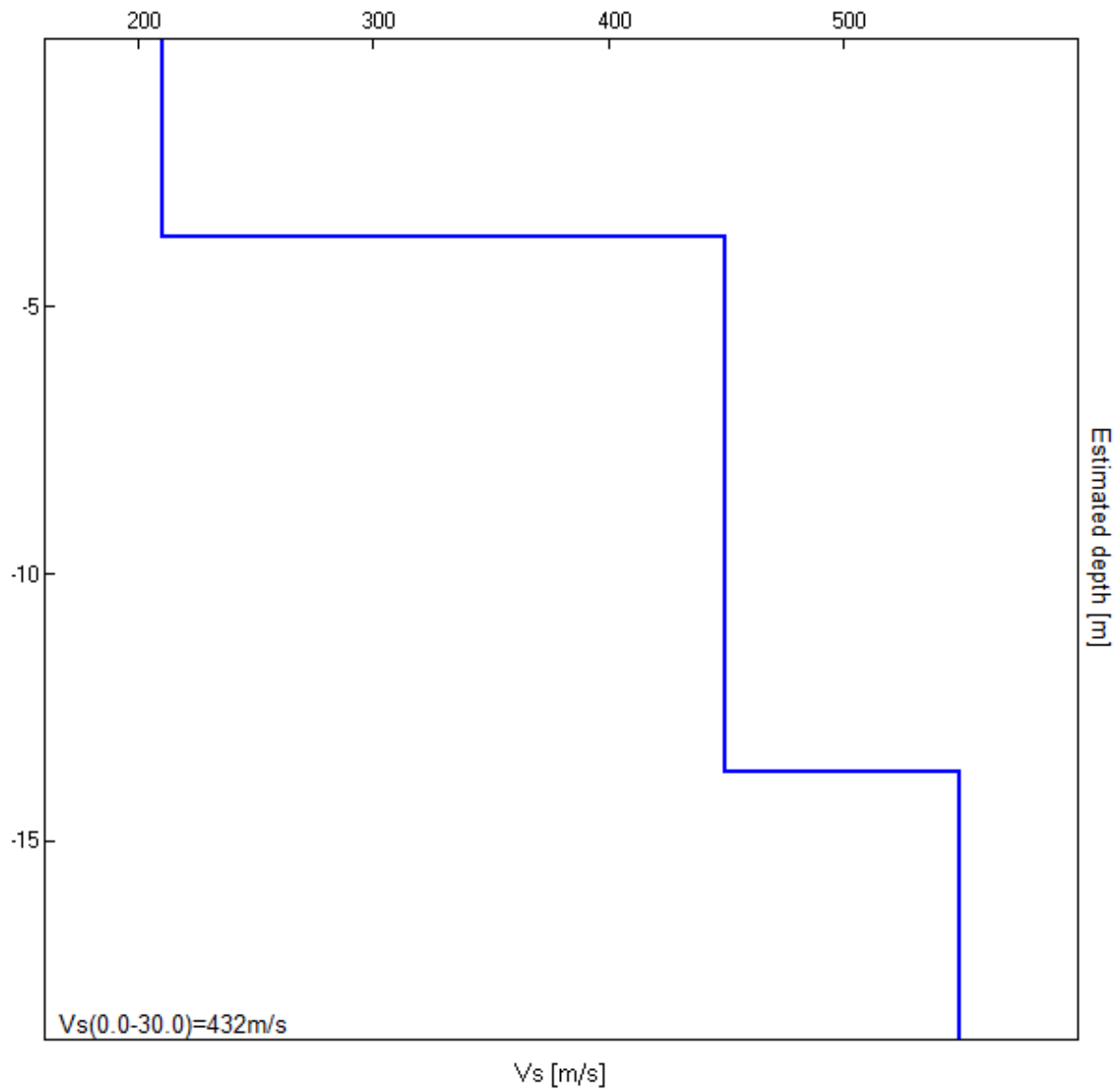
**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
3.70	3.70	210
13.70	10.00	450
inf.	inf.	550

Vs(0.0-30.0)=432m/s



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

Max. H/V at 13.25 ± 0.99 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	13.25 > 0.63	OK	
$n_c(f_0) > 200$	11448.0 > 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 319 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
$A_0 > 2$	2.07 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.03685 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	0.48821 < 0.6625	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.2981 < 1.58	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
σ_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 σ_f and $\sigma_A(f_0)$

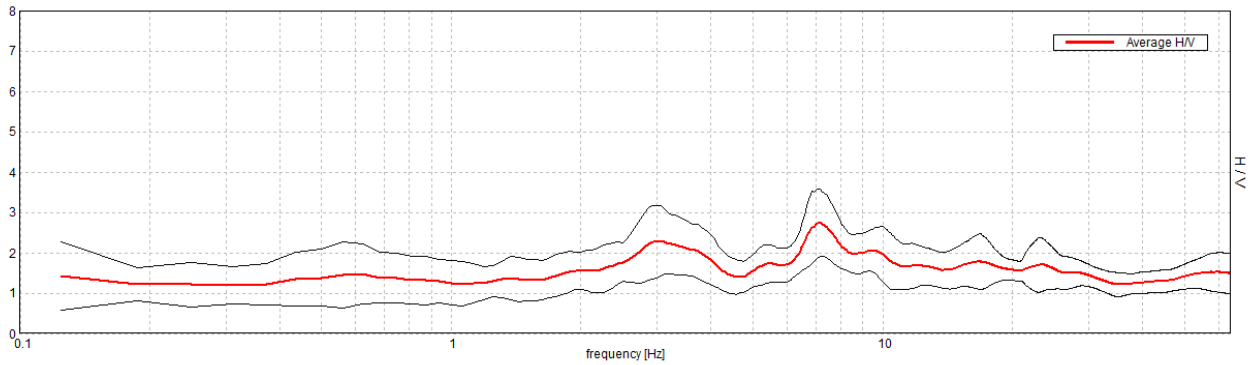
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR34 QUALTO

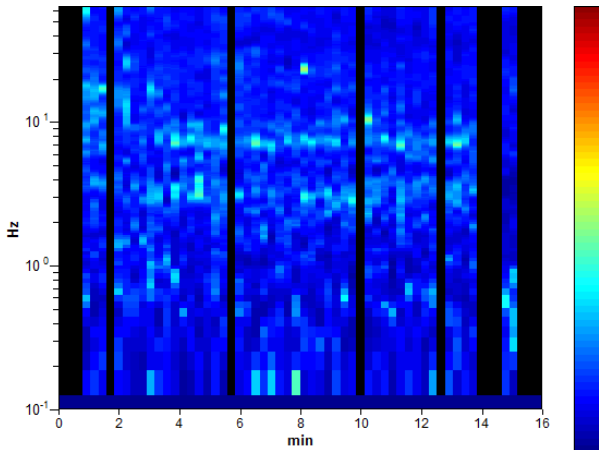
Instrument: TRZ-0108/01-10
 Start recording: 15/10/18 17:26:44 End recording: 15/10/18 17:42:45
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 78% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

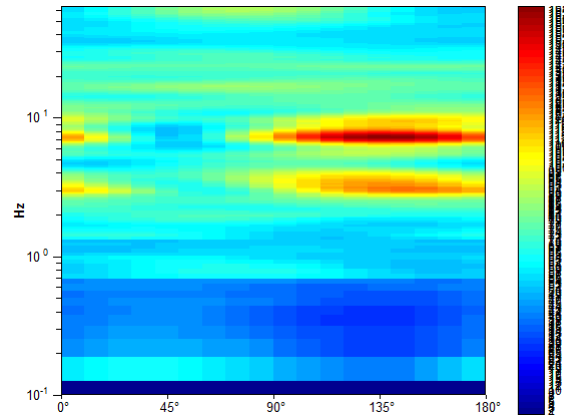
Max. H/V at 7.13 ± 1.46 Hz. (In the range 0.1 - 20.0 Hz).



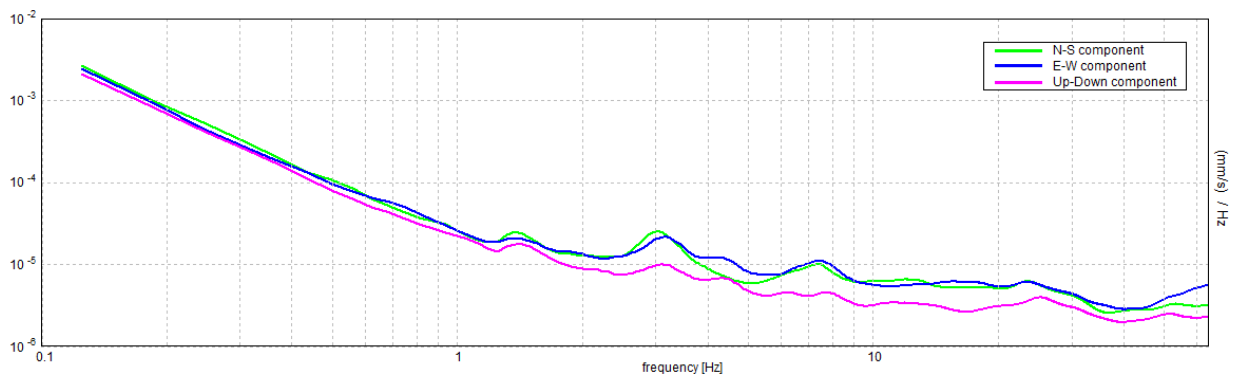
H/V TIME HISTORY



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 7.13 ± 1.46 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$7.13 > 0.63$	OK	
$n_c(f_0) > 200$	$5358.0 > 200$	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 172 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
$A_0 > 2$	$2.73 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.10103 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.71984 < 0.35625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.4146 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

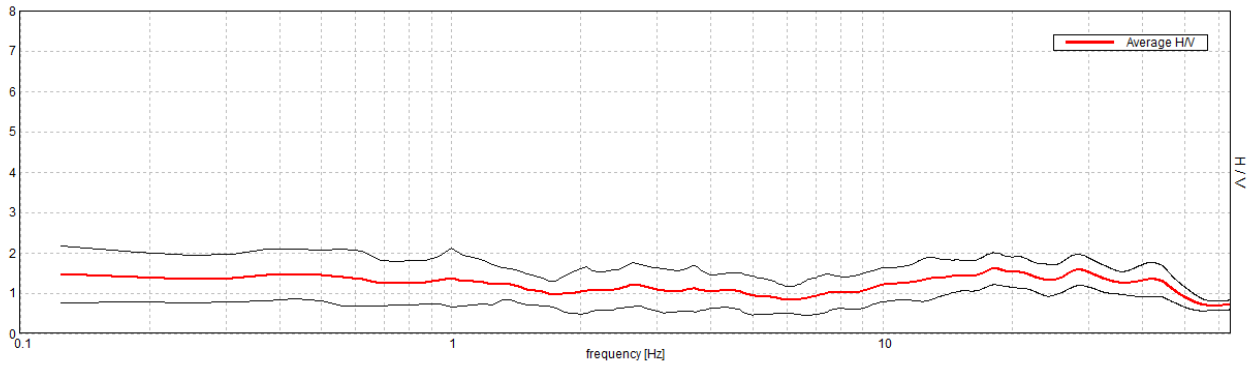
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR35 QUALTO

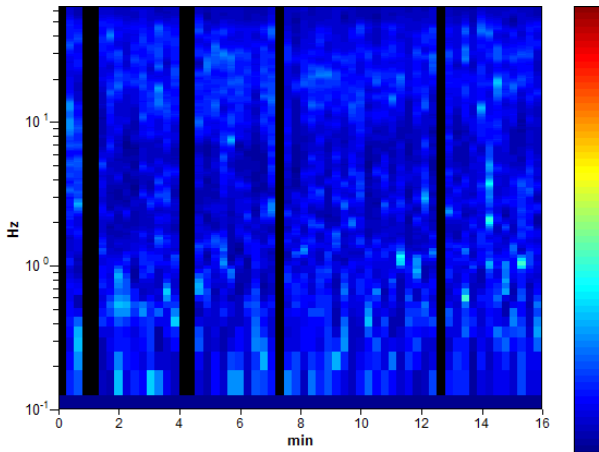
Instrument: TRZ-0108/01-10
 Start recording: 15/10/18 17:46:52 End recording: 15/10/18 18:02:53
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 88% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

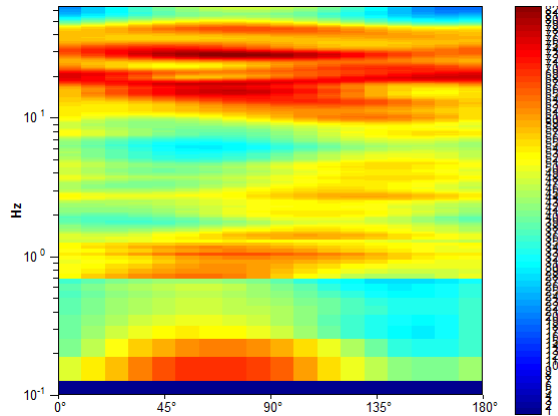
Max. H/V at 18.13 ± 3.77 Hz. (In the range 0.1 - 20.0 Hz).



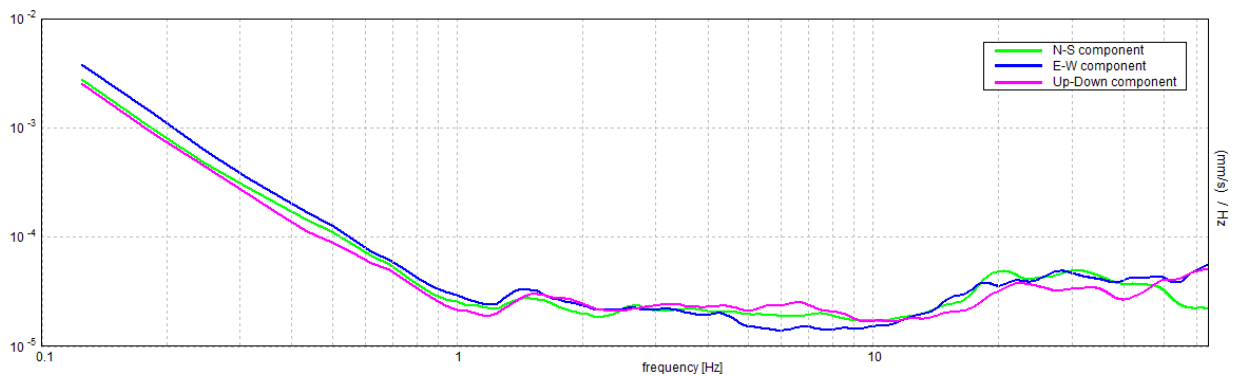
H/V TIME HISTORY



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 18.13 ± 3.77 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	18.13 > 0.63	OK	
$n_c(f_0) > 200$	15370.0 > 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 436 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 $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	52.188 Hz	OK	
$A_0 > 2$	1.61 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.10253 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	1.85835 < 0.90625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.196 < 1.58	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR57 STAZIONE FS

Instrument: TRZ-0108/01-10

Start recording: 25/10/18 10:01:29 End recording: 25/10/18 10:17:30

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 87% trace (manual window selection)

Sampling rate: 128 Hz

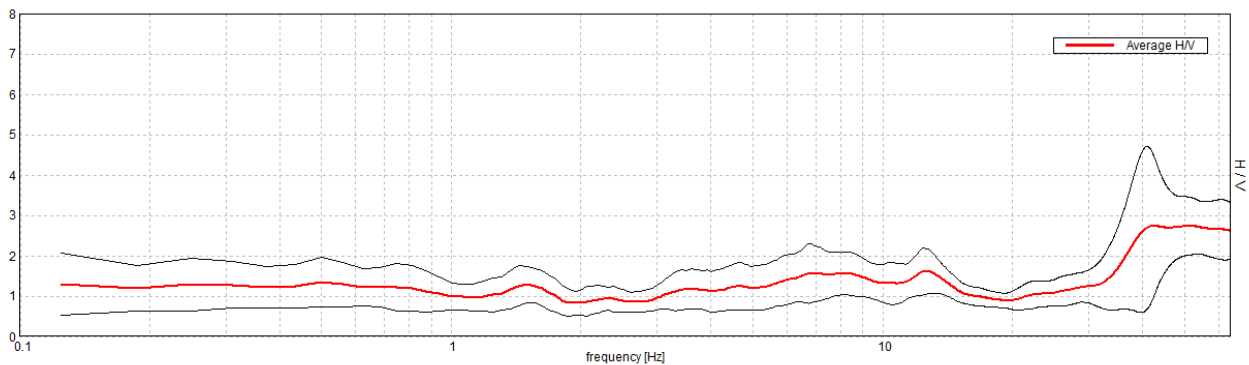
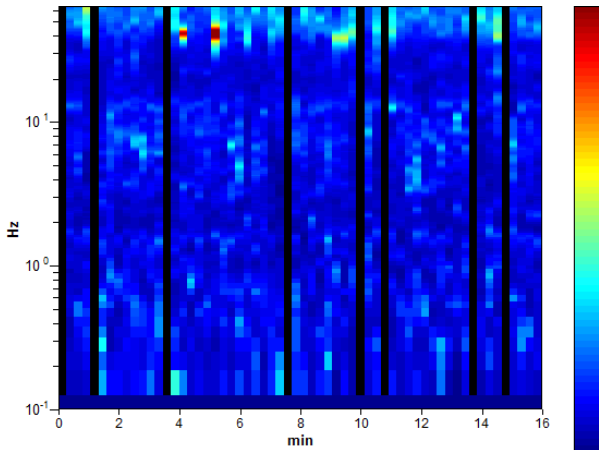
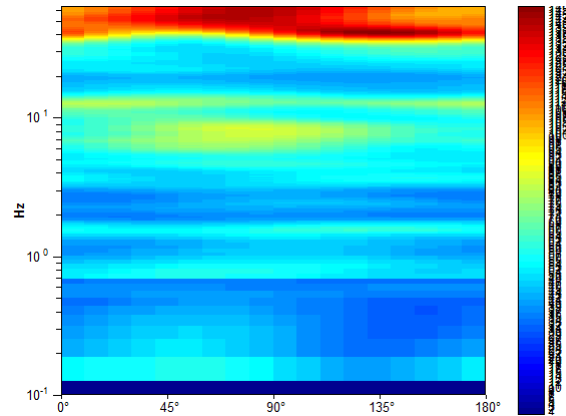
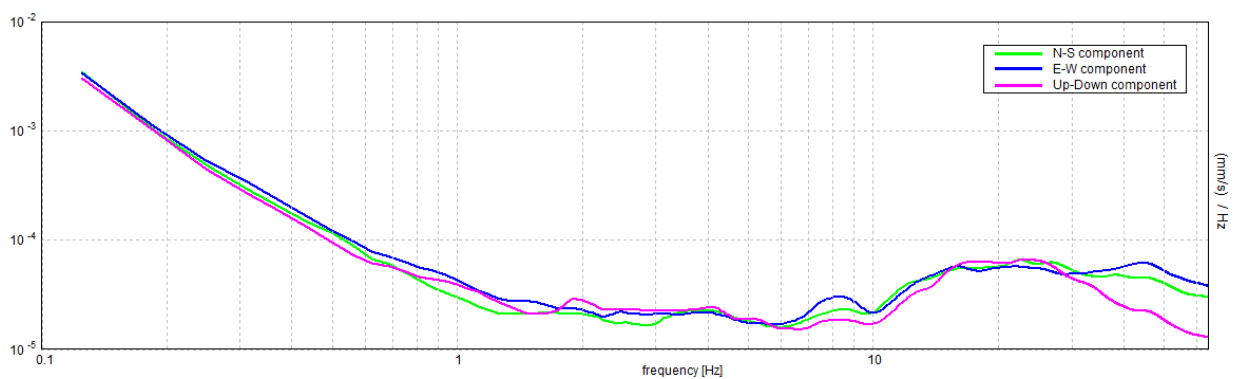
Window size: 16 s

Smoothing type: Triangular window

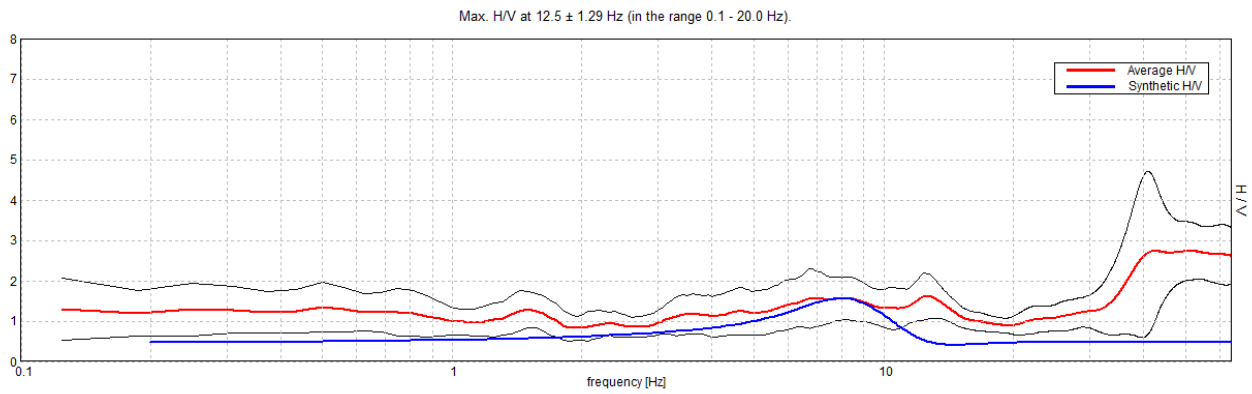
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 12.5 ± 1.29 Hz. (In the range 0.1 - 20.0 Hz).

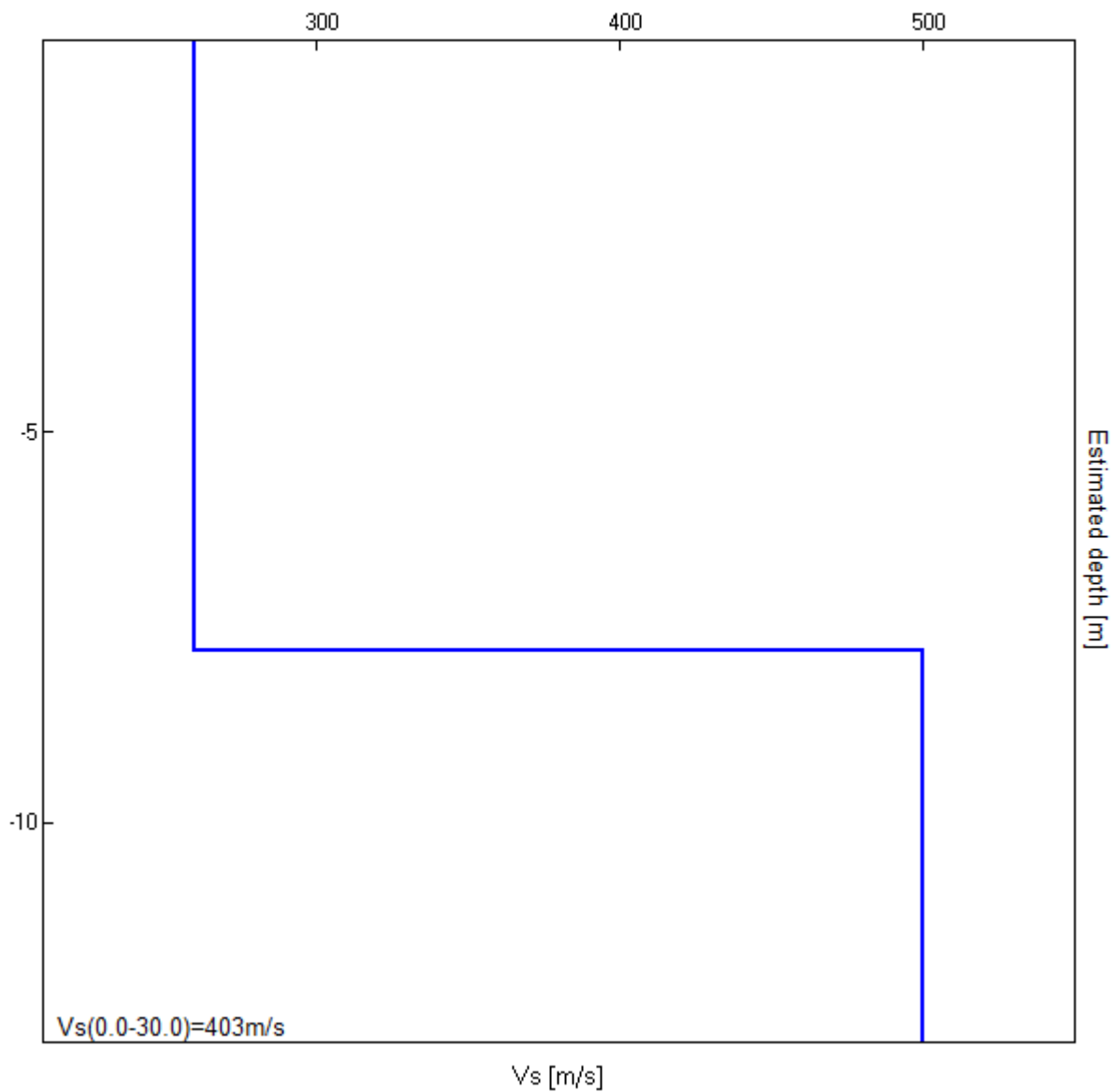
**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
7.80	7.80	260
inf.	inf.	500

Vs(0.0-30.0)=403m/s



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

Max. H/V at 12.5 ± 1.29 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$12.50 > 0.63$	OK	
$n_c(f_0) > 200$	$10400.0 > 200$	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 301 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
$A_0 > 2$	$1.62 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.05075 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.63444 < 0.625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2872 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

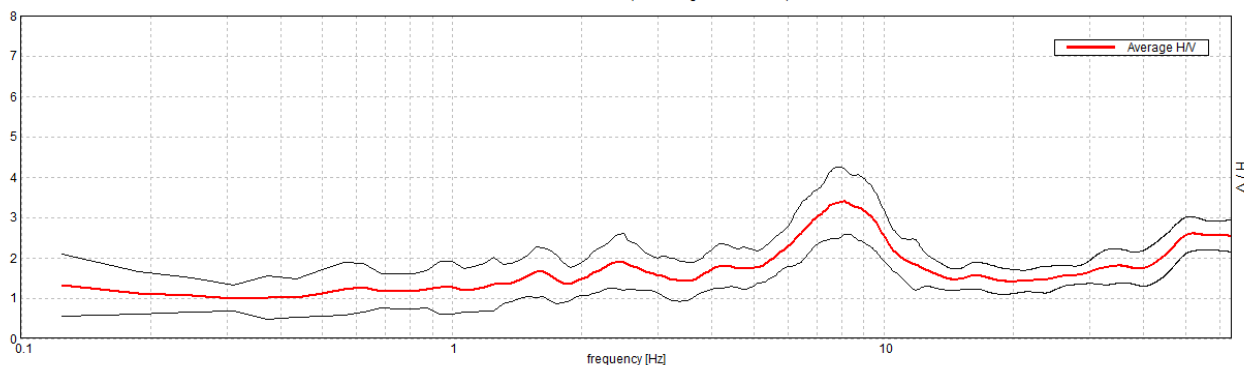
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR58 SANTA MARIA MADDALENA

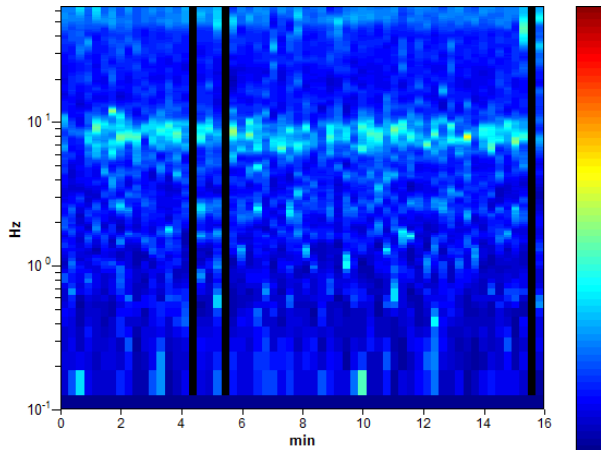
Instrument: TRZ-0108/01-10
Start recording: 25/10/18 10:39:14 End recording: 25/10/18 10:55:15
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 95% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

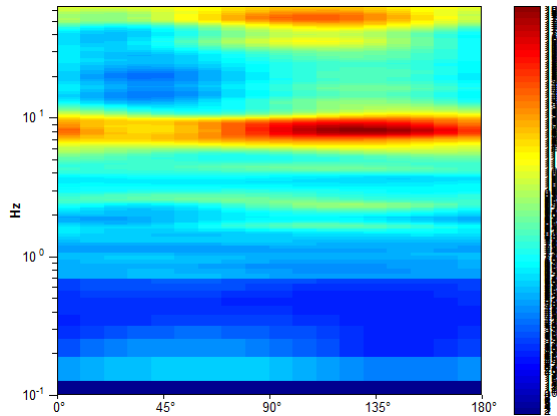
Max. H/V at 8.13 ± 0.11 Hz. (In the range 0.1 - 20.0 Hz).



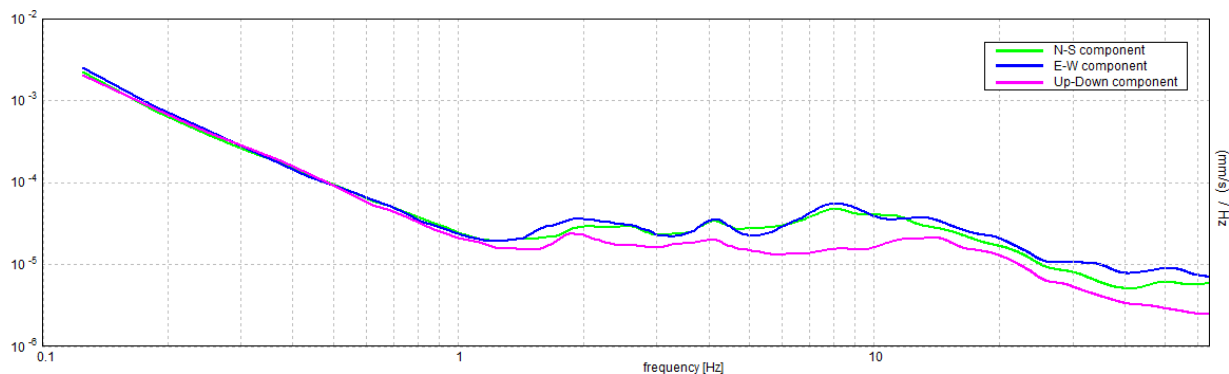
H/V TIME HISTORY



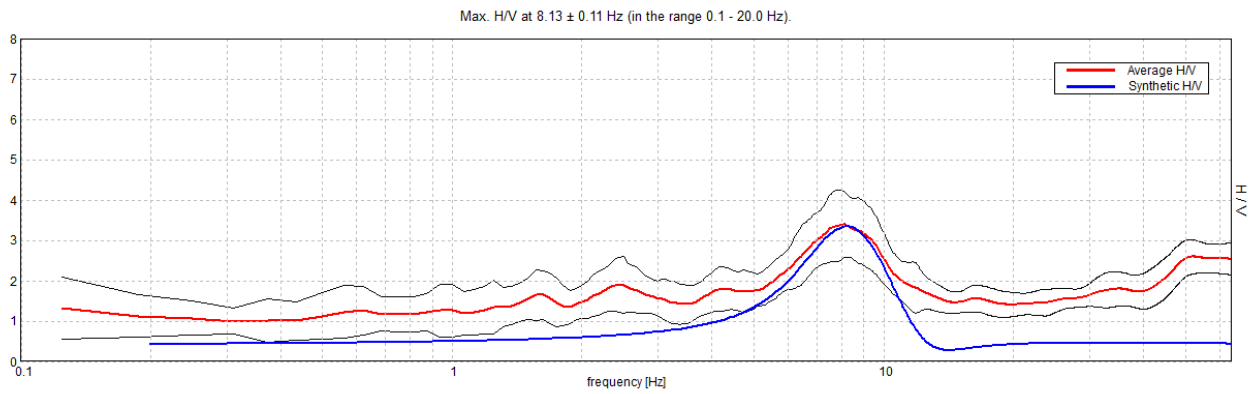
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

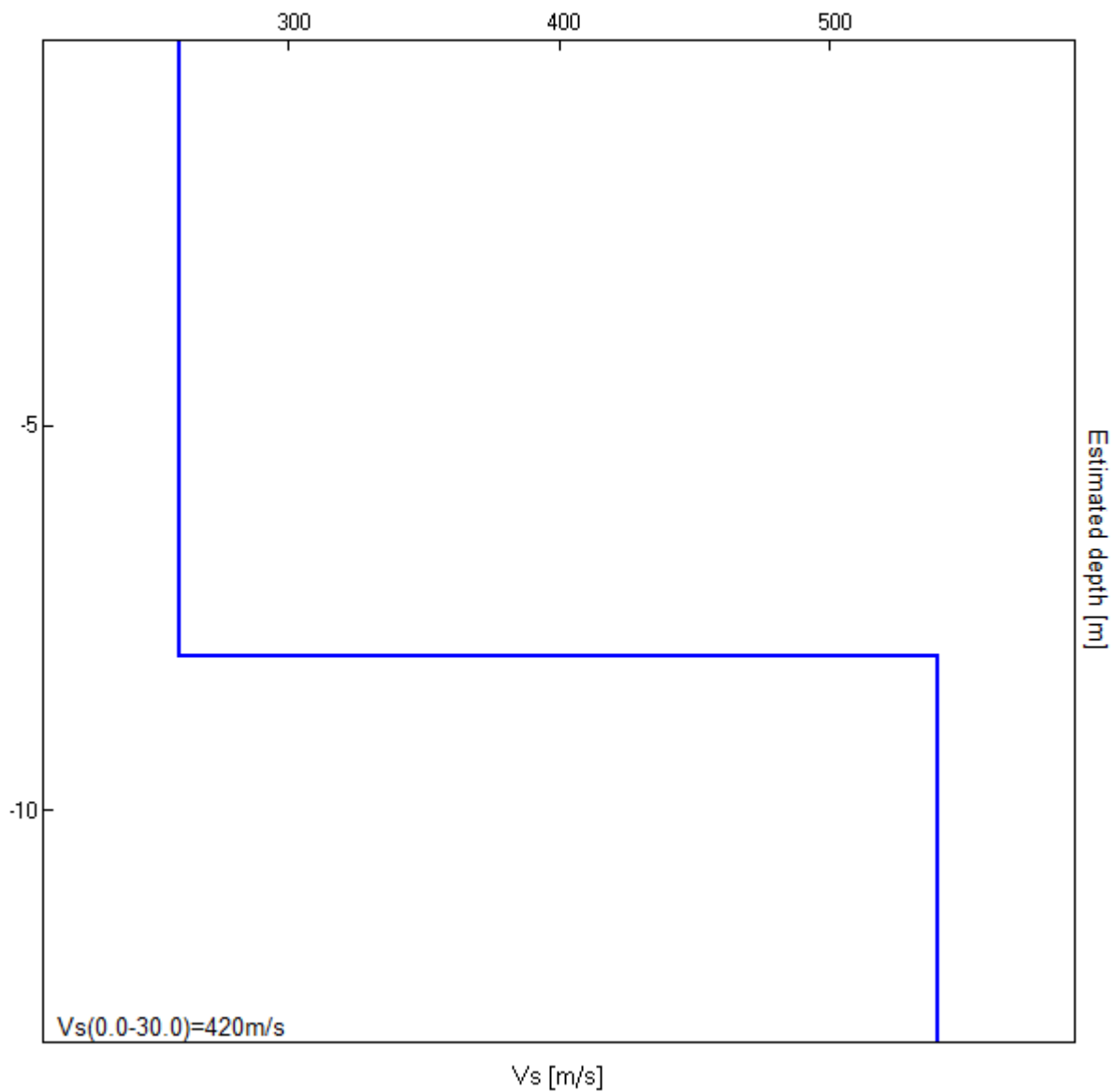


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
8.00	8.00	260
inf.	inf.	540

Vs(0.0-30.0)=420m/s



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

Max. H/V at 8.13 ± 0.11 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	8.13 > 0.63	OK	
$n_c(f_0) > 200$	7410.0 > 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 196 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	3.938 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	12.563 Hz	OK	
$A_0 > 2$	3.39 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.0067 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	0.05442 < 0.40625	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4012 < 1.58	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
σ_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 σ_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

SAN BENEDETTO VAL DI SAMBRO_MS, TR59 SANTA MARIA MADDALENA

Instrument: TRZ-0108/01-10

Start recording: 25/10/18 11:02:21 End recording: 25/10/18 11:18:22

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Trace length: 0h16'00". Analyzed 82% trace (manual window selection)

Sampling rate: 128 Hz

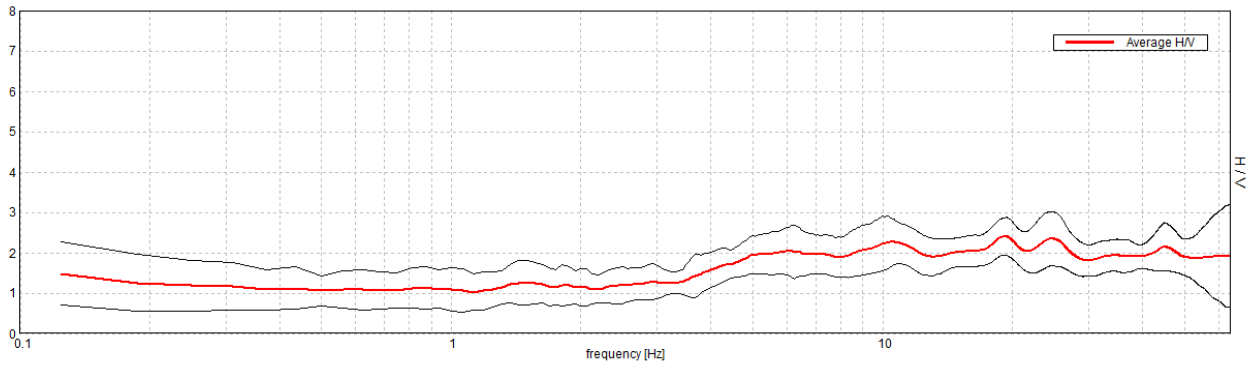
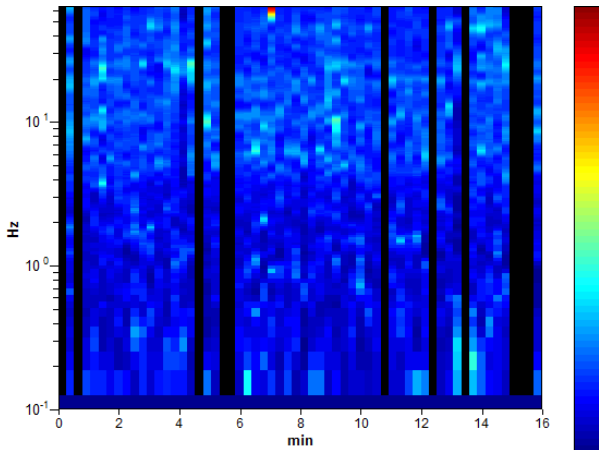
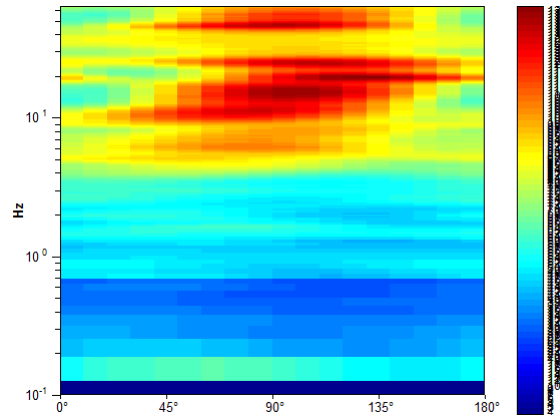
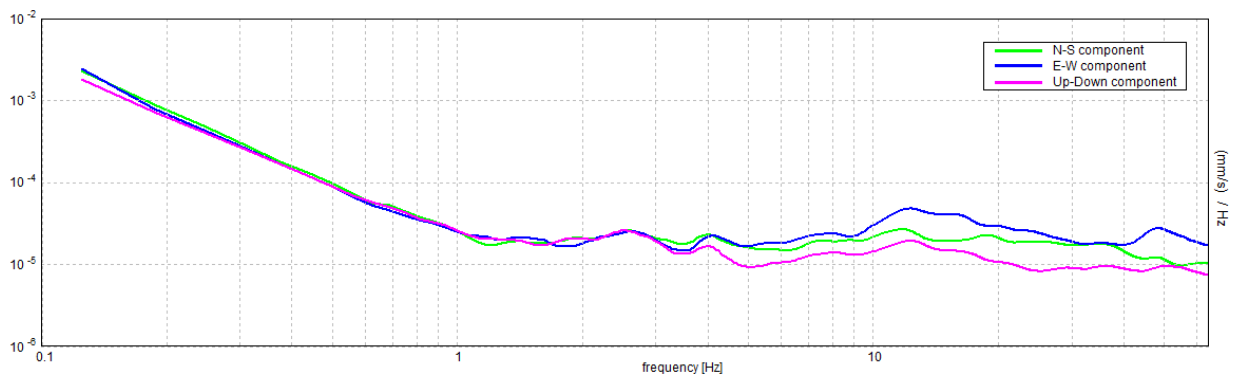
Window size: 16 s

Smoothing type: Triangular window

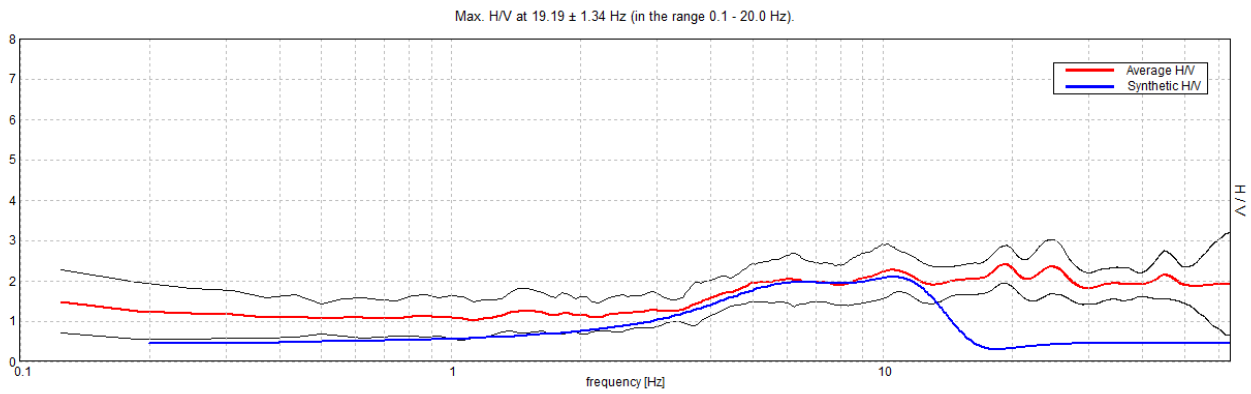
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 19.19 ± 1.34 Hz. (In the range 0.1 - 20.0 Hz).

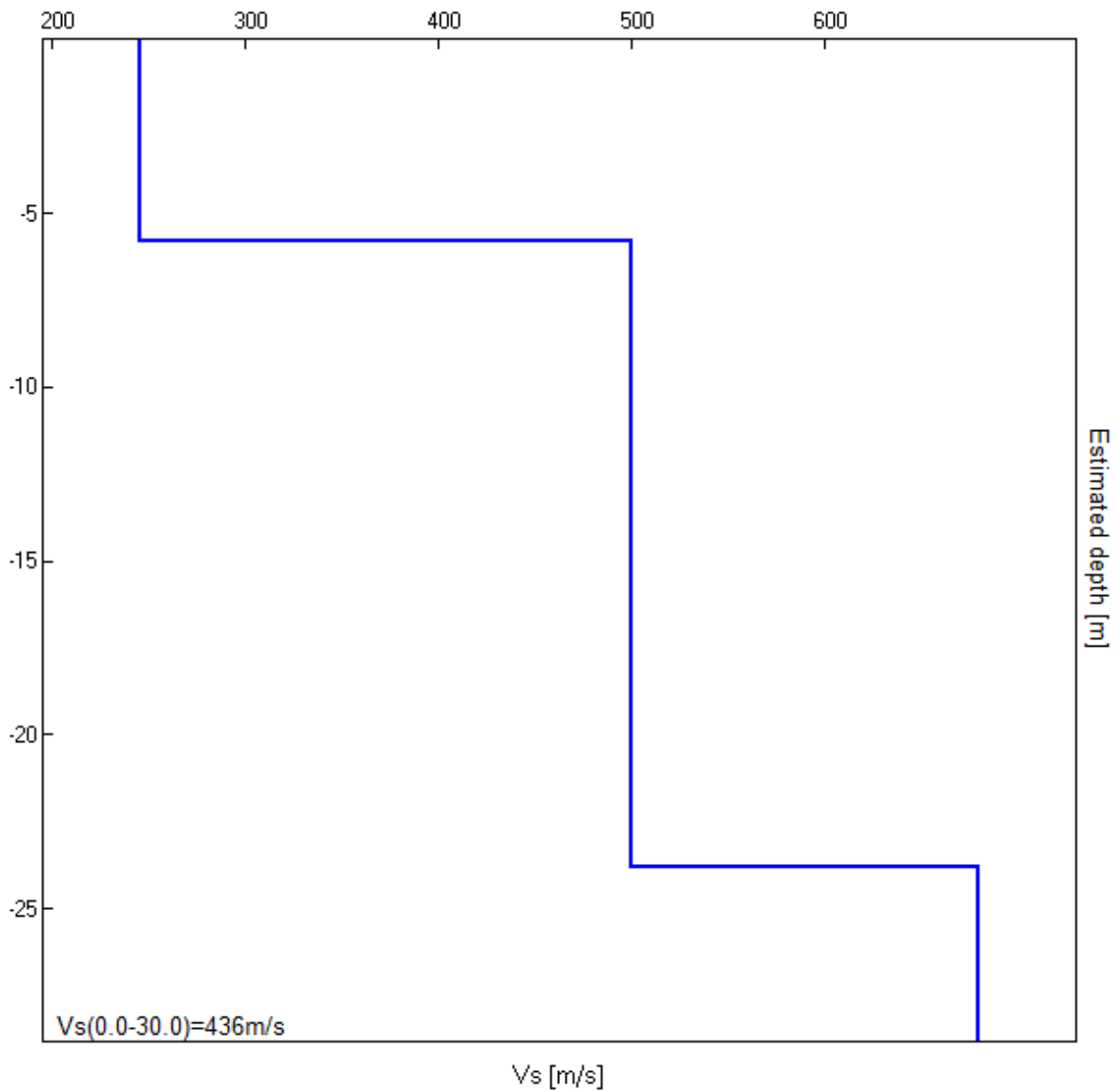
**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
5.80	5.80	245
23.80	18.00	500
inf.	inf.	680

Vs(0.0-30.0)=436m/s



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

Max. H/V at 19.19 ± 1.34 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	19.19 > 0.63	OK	
$n_c(f_0) > 200$	15043.0 > 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 462 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
$A_0 > 2$	2.41 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.03426 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.65746 < 0.95938$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.2277 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

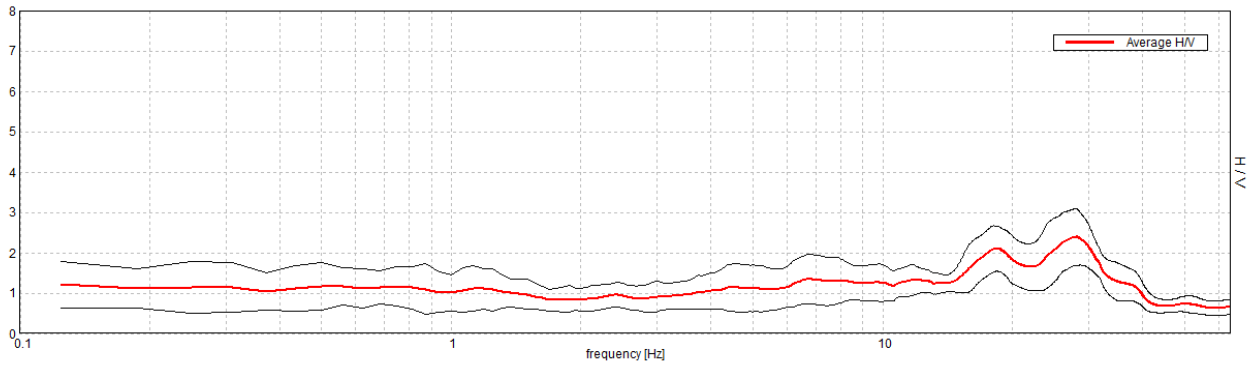
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR56 STAZIONE FS

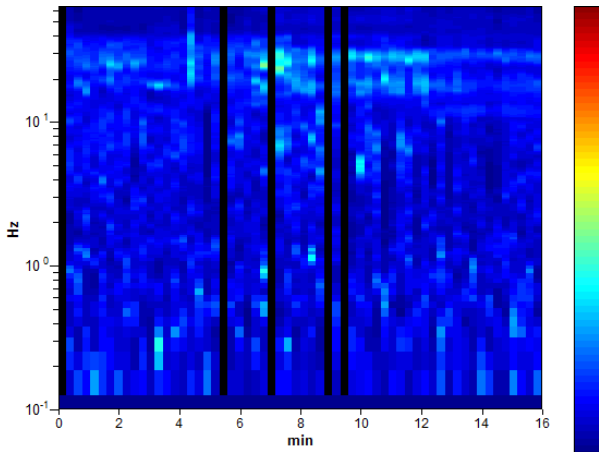
Instrument: TRZ-0108/01-10
 Start recording: 25/10/18 09:32:43 End recording: 25/10/18 09:48:44
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 92% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

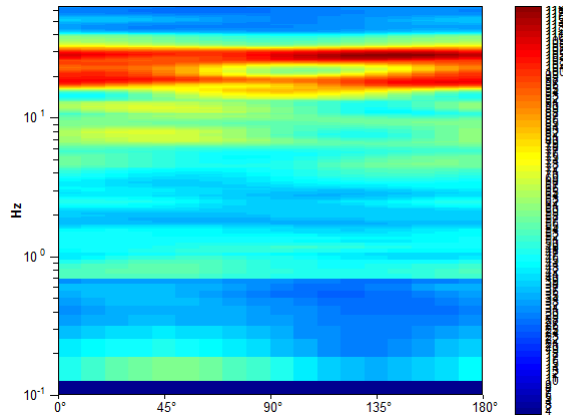
Max. H/V at 18.38 ± 0.91 Hz. (In the range 0.1 - 20.0 Hz).



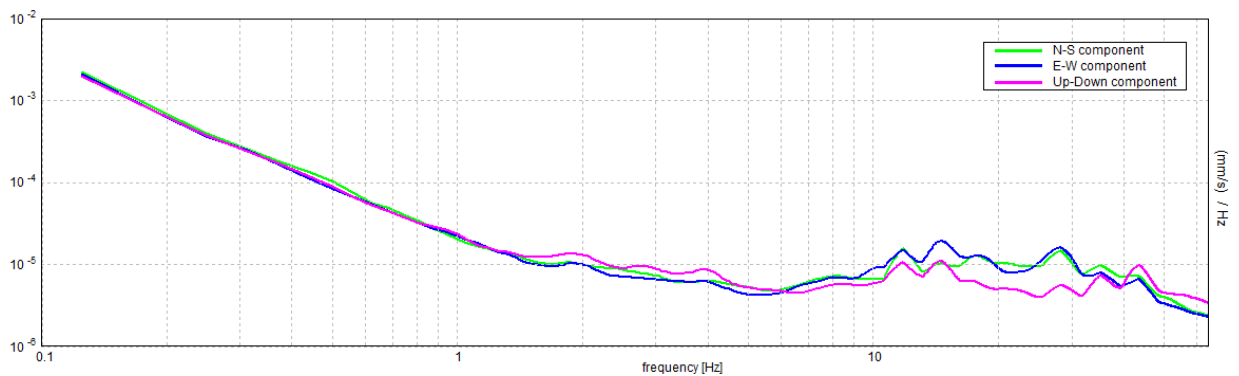
H/V TIME HISTORY



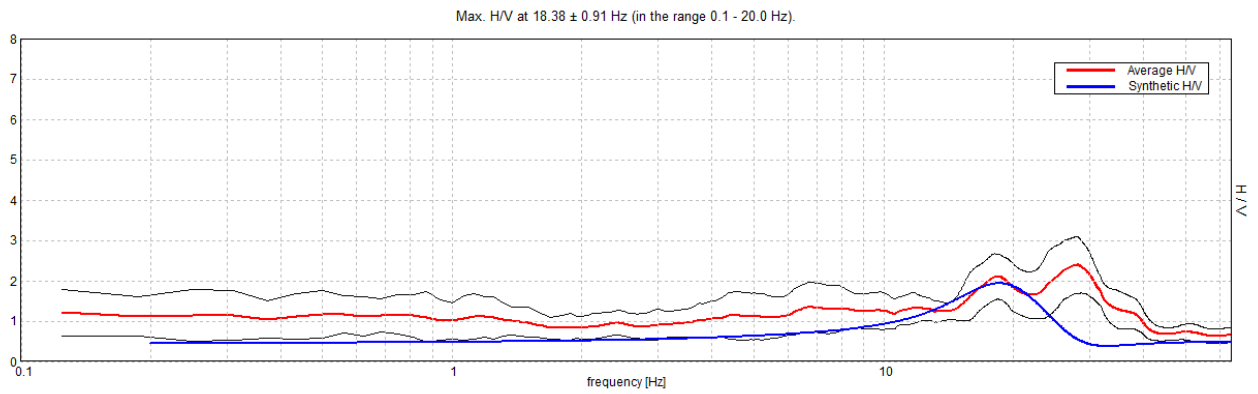
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]

3.30
inf.

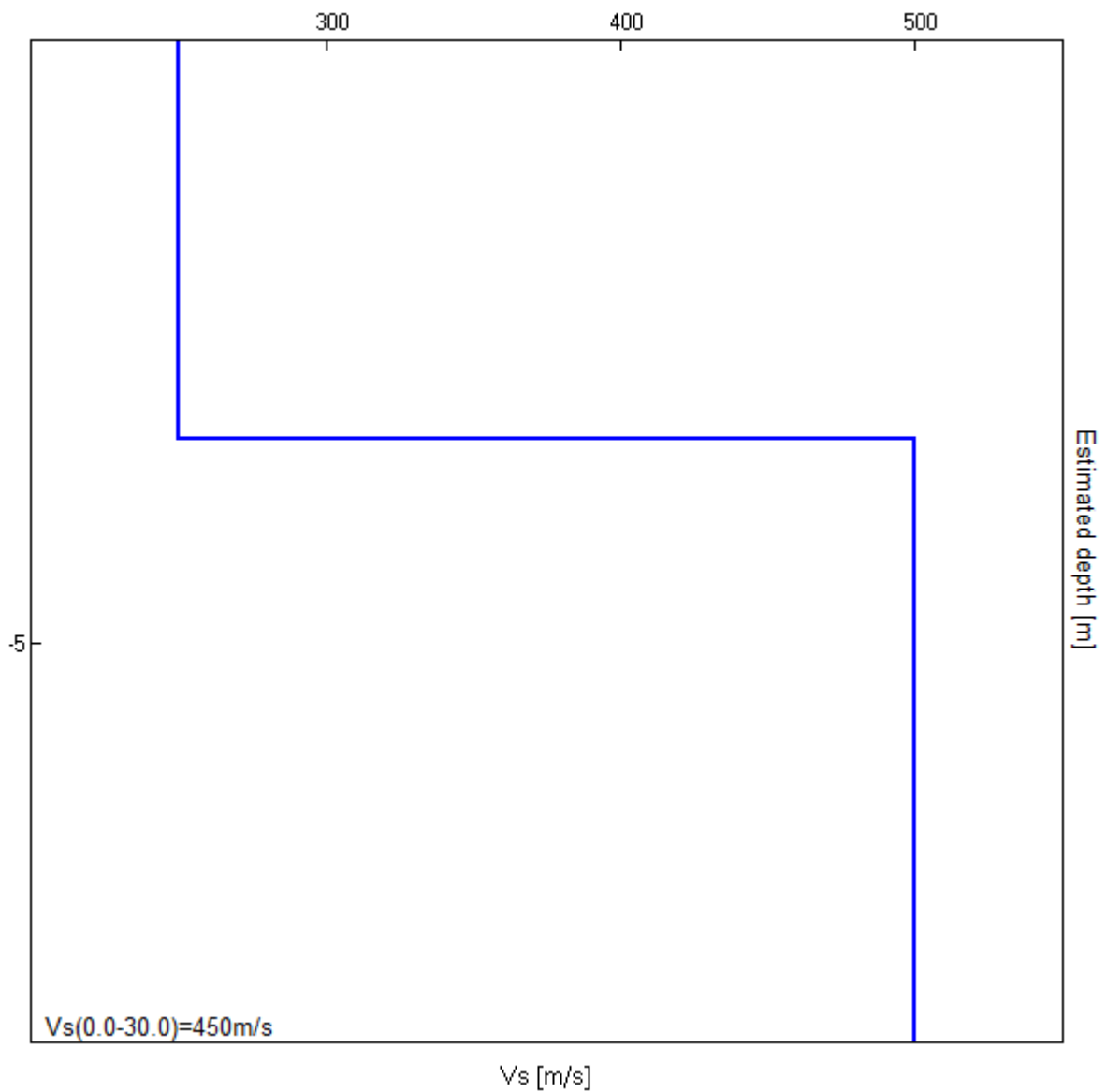
Thickness [m]

3.30
inf.

Vs [m/s]

250
500

Vs(0.0-30.0)=450m/s



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

Max. H/V at 18.38 ± 0.91 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	18.38 > 0.63	OK	
$n_c(f_0) > 200$	16170.0 > 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 442 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 $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	39.5 Hz	OK	
$A_0 > 2$	2.10 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.02453 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.45077 < 0.91875$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.2761 < 1.58$	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
σ_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 σ_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

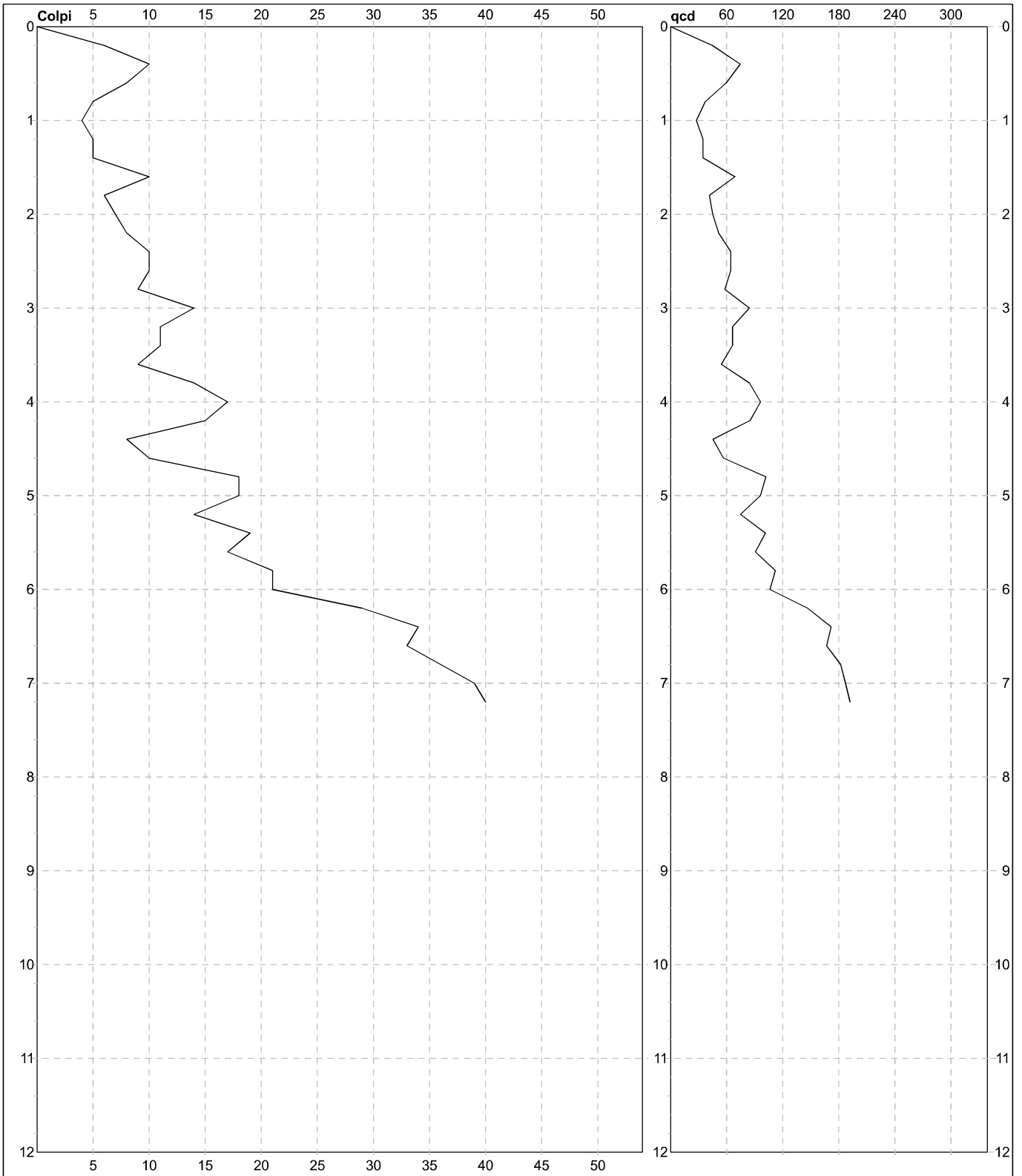


PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	17
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **loc.strada staz ferr verso Santa Maria Maddalena**

U.M.: **kg/cm²**
 Scala: **1:60**
 Pagina: **1**
 Elaborato:
 Data eseg.: **26/01/2019**
 Quota ass.:
 Falda: **Assente**



Penetrometro: DPSH (S. Heavy) Massa battente: 63,50 m Altezza caduta: 0,75 m Avanzamento: 0,20 m	Responsabile: Assistente:	Preforo: m Corr.astine: kg/ml Cod.ISTAT: 0
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PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	17
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	
Località: loc.strada staz ferr verso Santa Maria Maddalena	Elaborato:	Falda: Assente

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	6		44,69					
0,40	1	10		74,49					
0,60	2	8		59,59					
0,80	2	5		37,24					
1,00	2	4		27,62					
1,20	2	5		34,52					
1,40	2	5		34,52					
1,60	3	10		69,05					
1,80	3	6		41,43					
2,00	3	7		45,04					
2,20	3	8		51,48					
2,40	3	10		64,34					
2,60	4	10		64,34					
2,80	4	9		57,91					
3,00	4	14		84,34					
3,20	4	11		66,27					
3,40	4	11		66,27					
3,60	5	9		54,22					
3,80	5	14		84,34					
4,00	5	17		96,28					
4,20	5	15		84,95					
4,40	5	8		45,31					
4,60	6	10		56,63					
4,80	6	18		101,94					
5,00	6	18		96,18					
5,20	6	14		74,80					
5,40	6	19		101,52					
5,60	7	17		90,83					
5,80	7	21		112,20					
6,00	7	21		106,20					
6,20	7	29		146,66					
6,40	7	34		171,94					
6,60	8	33		166,89					
6,80	8	36		182,06					
7,00	8	39		187,21					
7,20	8	40		192,01					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta
Asta = numero di asta impiegata

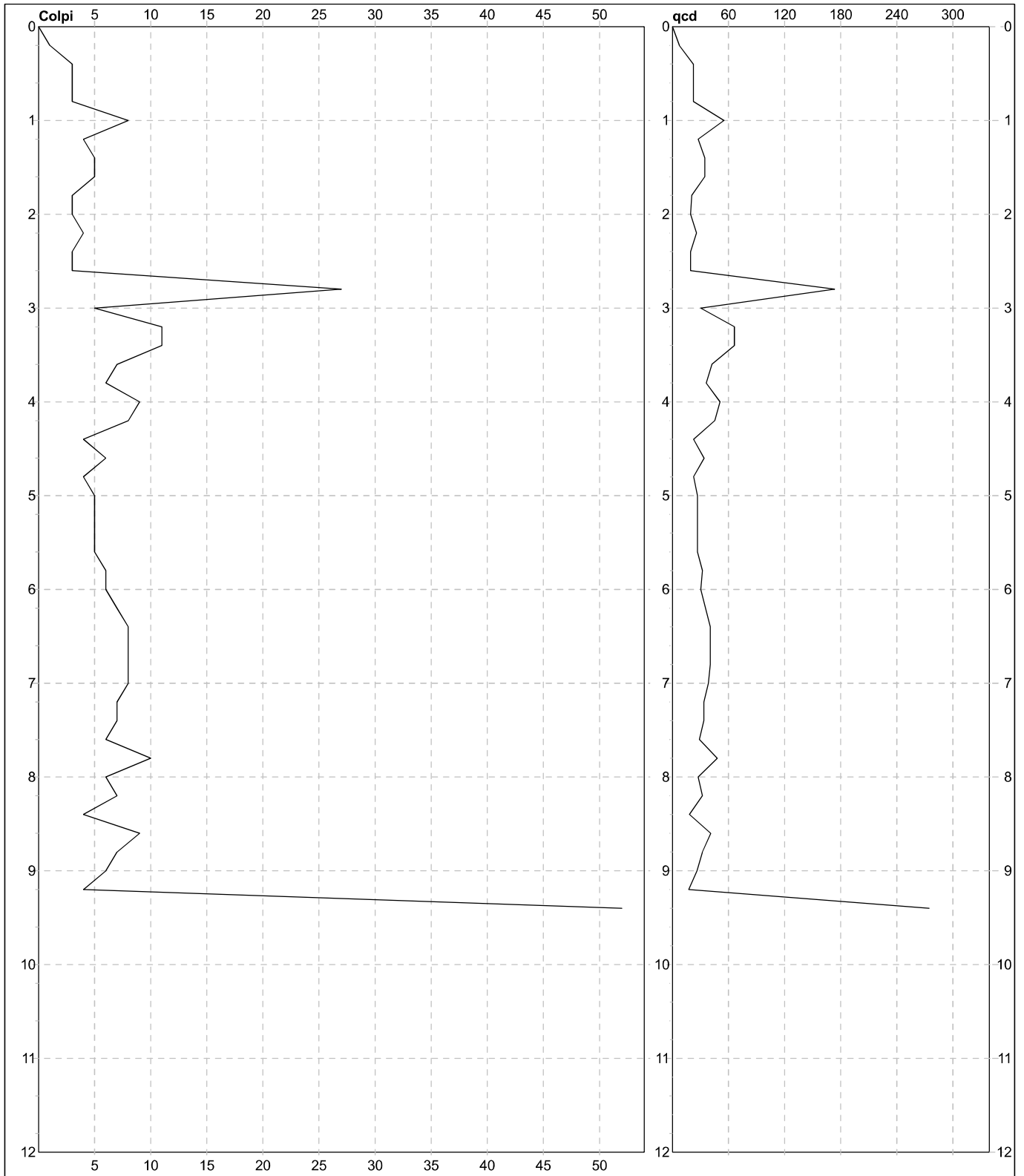


PROVA PENETROMETRICA DINAMICA DIAGRAMMI COLPI / RESISTENZA

DIN	16
riferimento	006-2019

Committente: **RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia**
 Cantiere: **Studio di MS comunale livello 2**
 Località: **loc. Santa Maria Maddalena**

U.M.: **kg/cm²**
 Scala: **1:60**
 Pagina: **1**
 Elaborato:
 Data eseg.: **26/01/2019**
 Quota ass.:
 Falda: **Non rilevata**



Penetrometro: DPSH (S. Heavy)
 Massa battente: 63,50 m
 Altezza caduta: 0,75 m
 Avanzamento: 0,20 m

Responsabile:
 Assistente:

Preforo: m
 Corr.astine: kg/ml
 Cod.ISTAT: 0



PROVA PENETROMETRICA DINAMICA LETTURE DI CAMPAGNA PUNTA E/O TOTALE	DIN	16
	riferimento	006-2019

Committente: RTP Sangiorgi, Zamboni, Brunaldi, Milioto, Soglia	U.M.: kg/cm²	Data esec.: 26/01/2019
Cantiere: Studio di MS comunale livello 2	Pagina: 1	Falda: Non rilevata
Località: loc. Santa Maria Maddalena	Elaborato:	

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²	H m	Asta n°	L1 n°	L2 n°	qcd kg/cm ²
0,20	1	1		7,45					
0,40	1	3		22,35					
0,60	2	3		22,35					
0,80	2	3		22,35					
1,00	2	8		55,24					
1,20	2	4		27,62					
1,40	2	5		34,52					
1,60	3	5		34,52					
1,80	3	3		20,71					
2,00	3	3		19,30					
2,20	3	4		25,74					
2,40	3	3		19,30					
2,60	4	3		19,30					
2,80	4	27		173,73					
3,00	4	5		30,12					
3,20	4	11		66,27					
3,40	4	11		66,27					
3,60	5	7		42,17					
3,80	5	6		36,15					
4,00	5	9		50,97					
4,20	5	8		45,31					
4,40	5	4		22,65					
4,60	6	6		33,98					
4,80	6	4		22,65					
5,00	6	5		26,72					
5,20	6	5		26,72					
5,40	6	5		26,72					
5,60	7	5		26,72					
5,80	7	6		32,06					
6,00	7	6		30,34					
6,20	7	7		35,40					
6,40	7	8		40,46					
6,60	8	8		40,46					
6,80	8	8		40,46					
7,00	8	8		38,40					
7,20	8	7		33,60					
7,40	8	7		33,60					
7,60	9	6		28,80					
7,80	9	10		48,00					
8,00	9	6		27,41					
8,20	9	7		31,98					
8,40	9	4		18,27					
8,60	10	9		41,11					
8,80	10	7		31,98					
9,00	10	6		26,15					
9,20	10	4		17,43					
9,40	10	63		274,53					

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)

qcd = resistenza dinamica punta
Asta = numero di asta impiegata

SAN BENEDETTO VAL DI SAMBRO_MS, TR60 RIPOLI

Instrument: TRZ-0108/01-10

Start recording: 25/10/18 11:28:52 End recording: 25/10/18 11:44:52

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

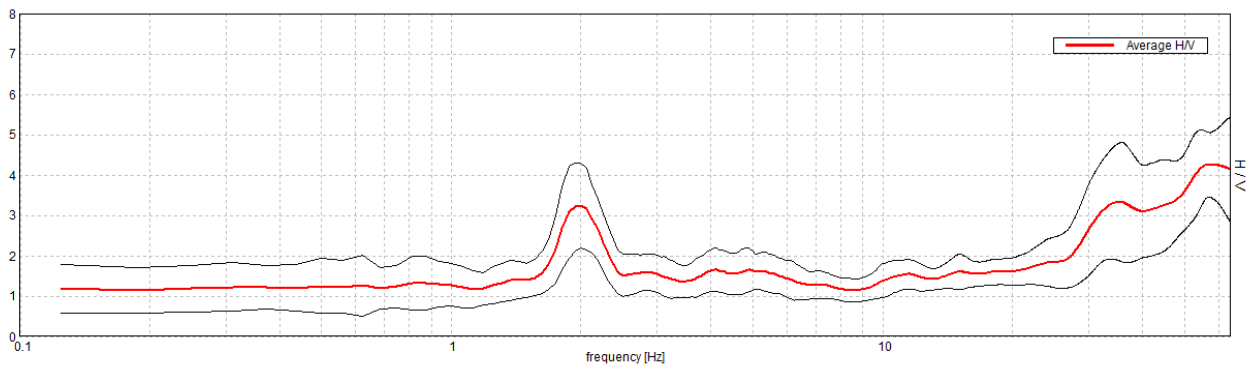
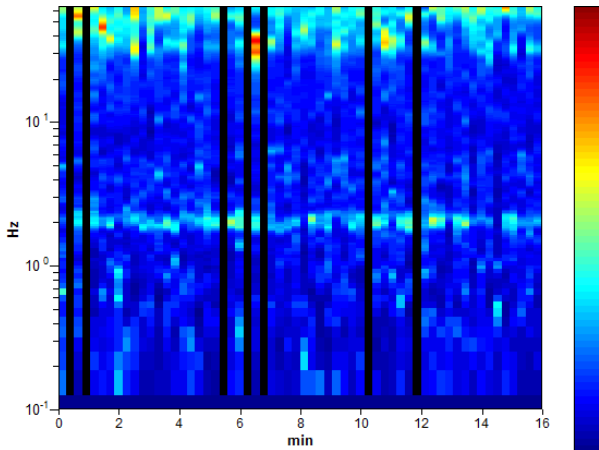
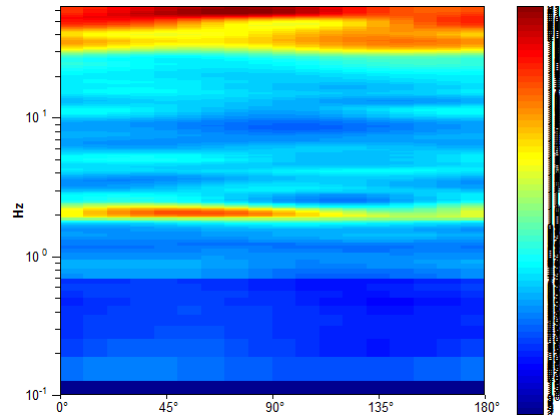
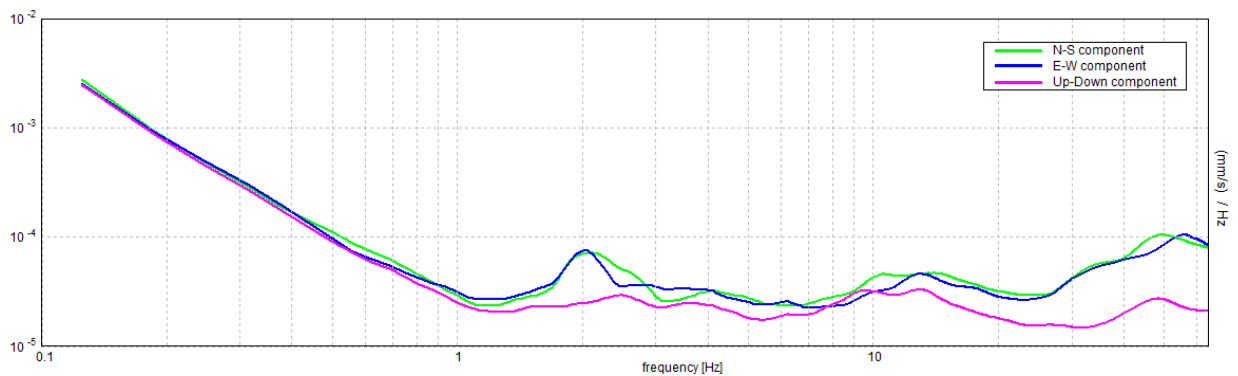
Trace length: 0h16'00". Analyzed 88% trace (manual window selection)

Sampling rate: 128 Hz

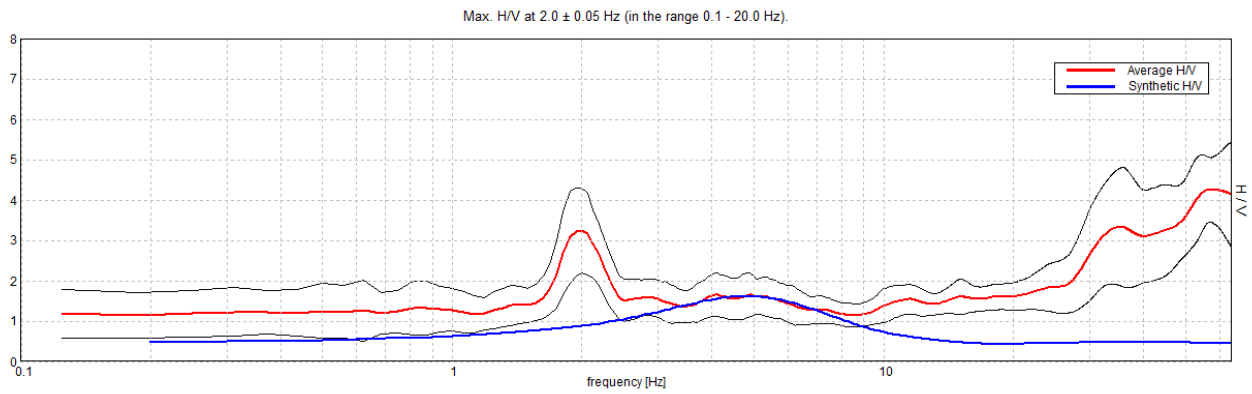
Window size: 16 s

Smoothing type: Triangular window

Smoothing: 10%

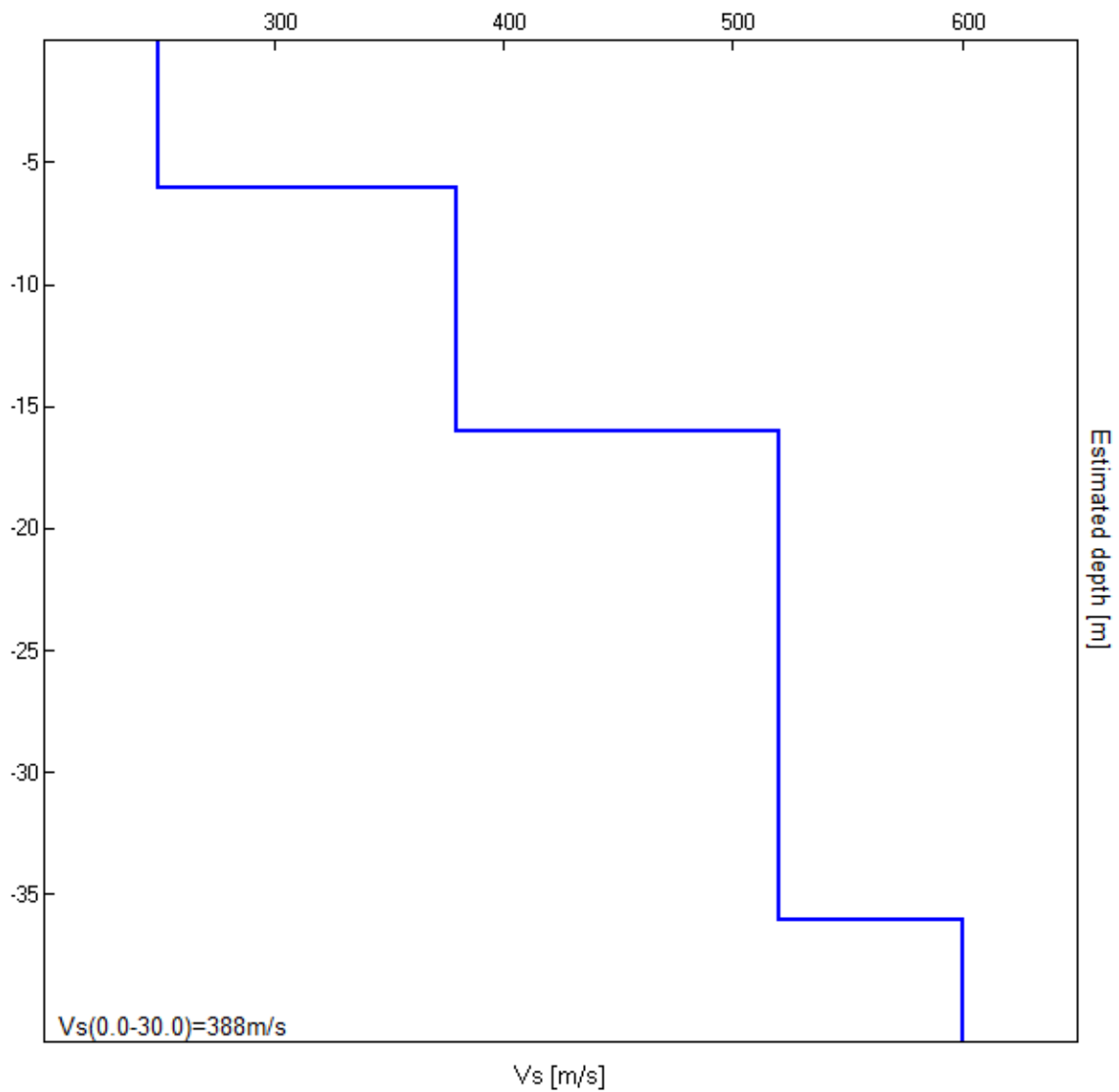
HORIZONTAL TO VERTICAL SPECTRAL RATIOMax. H/V at 2.0 ± 0.05 Hz. (In the range 0.1 - 20.0 Hz).**H/V TIME HISTORY****DIRECTIONAL H/V****SINGLE COMPONENT SPECTRA**

EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
6.00	6.00	250
16.00	10.00	380
36.00	20.00	520
inf.	inf.	600

Vs(0.0-30.0)=388m/s



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

Max. H/V at 2.0 ± 0.05 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$2.00 > 0.63$	OK	
$n_c(f_0) > 200$	$1696.0 > 200$	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 49 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	1.625 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	2.438 Hz	OK	
$A_0 > 2$	$3.25 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.01321 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.02642 < 0.1$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.5203 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

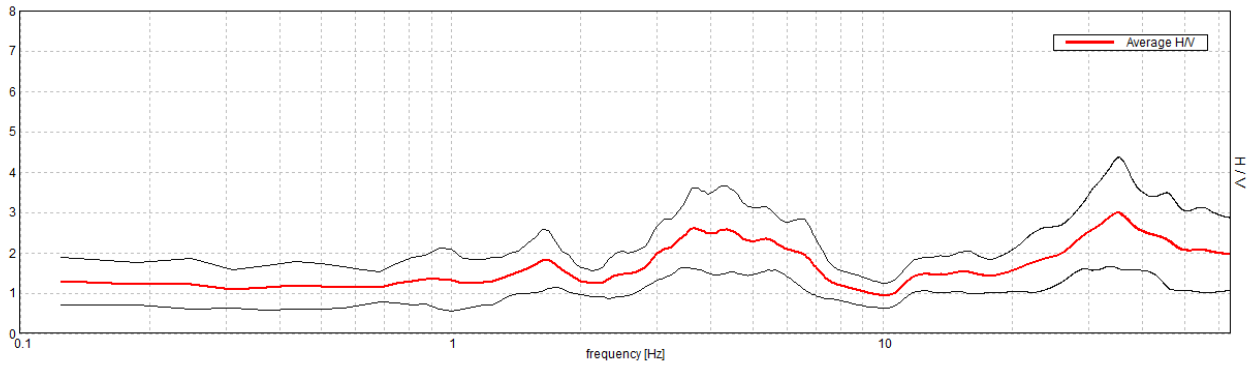
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR61 RIPOLI

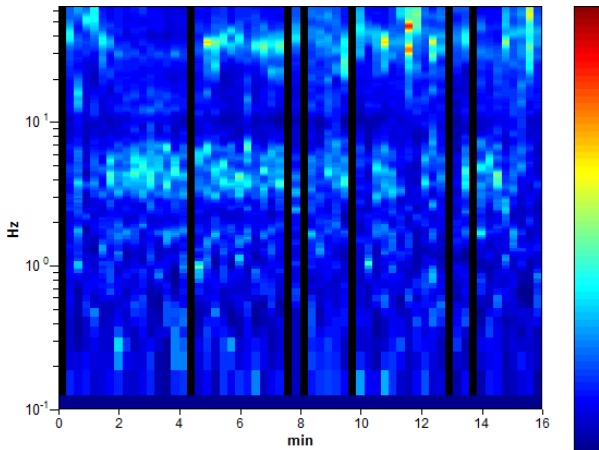
Instrument: TRZ-0108/01-10
 Start recording: 25/10/18 11:50:13 End recording: 25/10/18 12:06:14
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 88% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

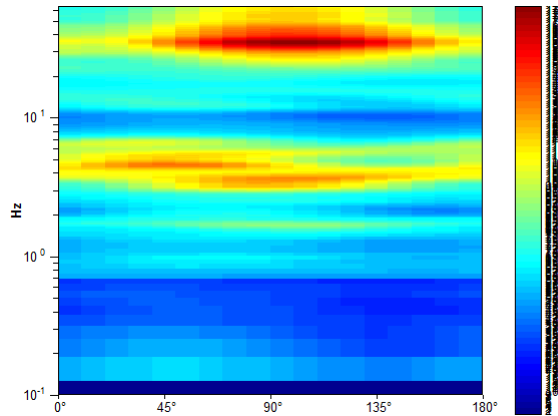
Max. H/V at 3.63 ± 0.15 Hz. (In the range 0.1 - 20.0 Hz).



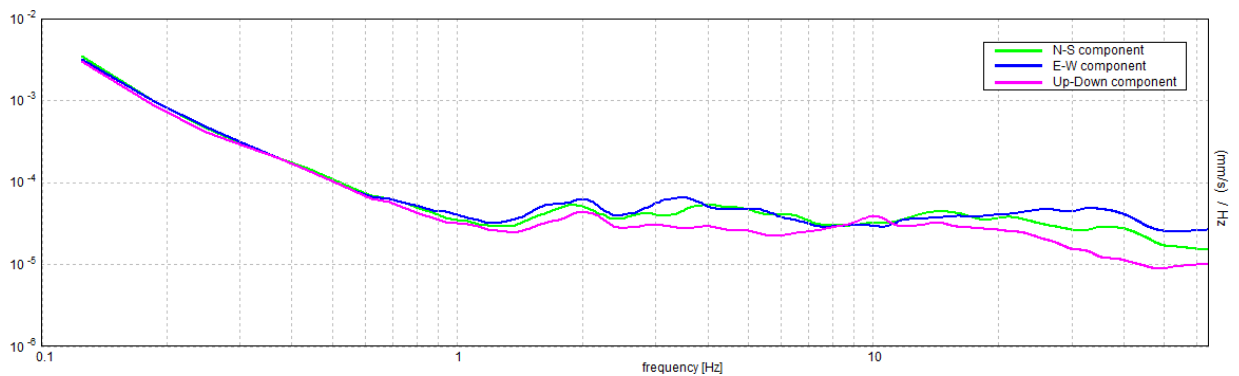
H/V TIME HISTORY



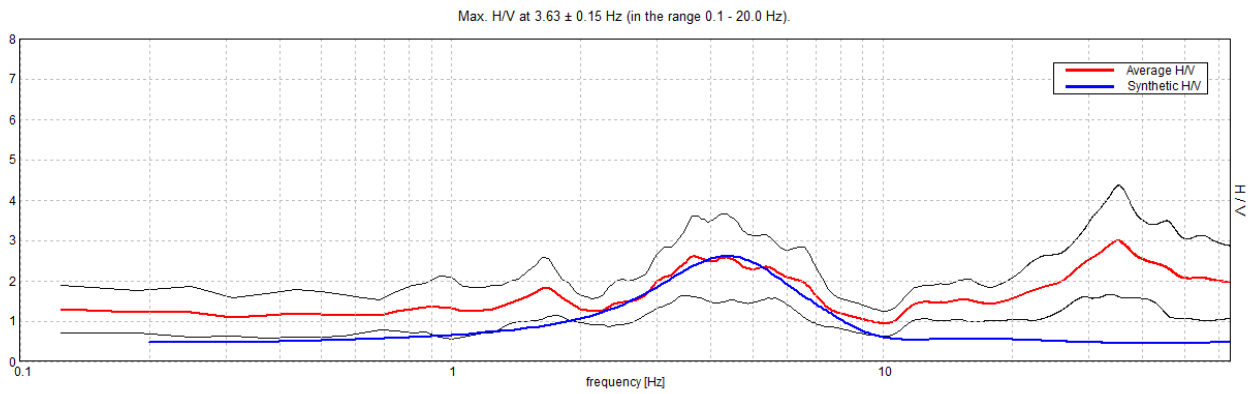
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

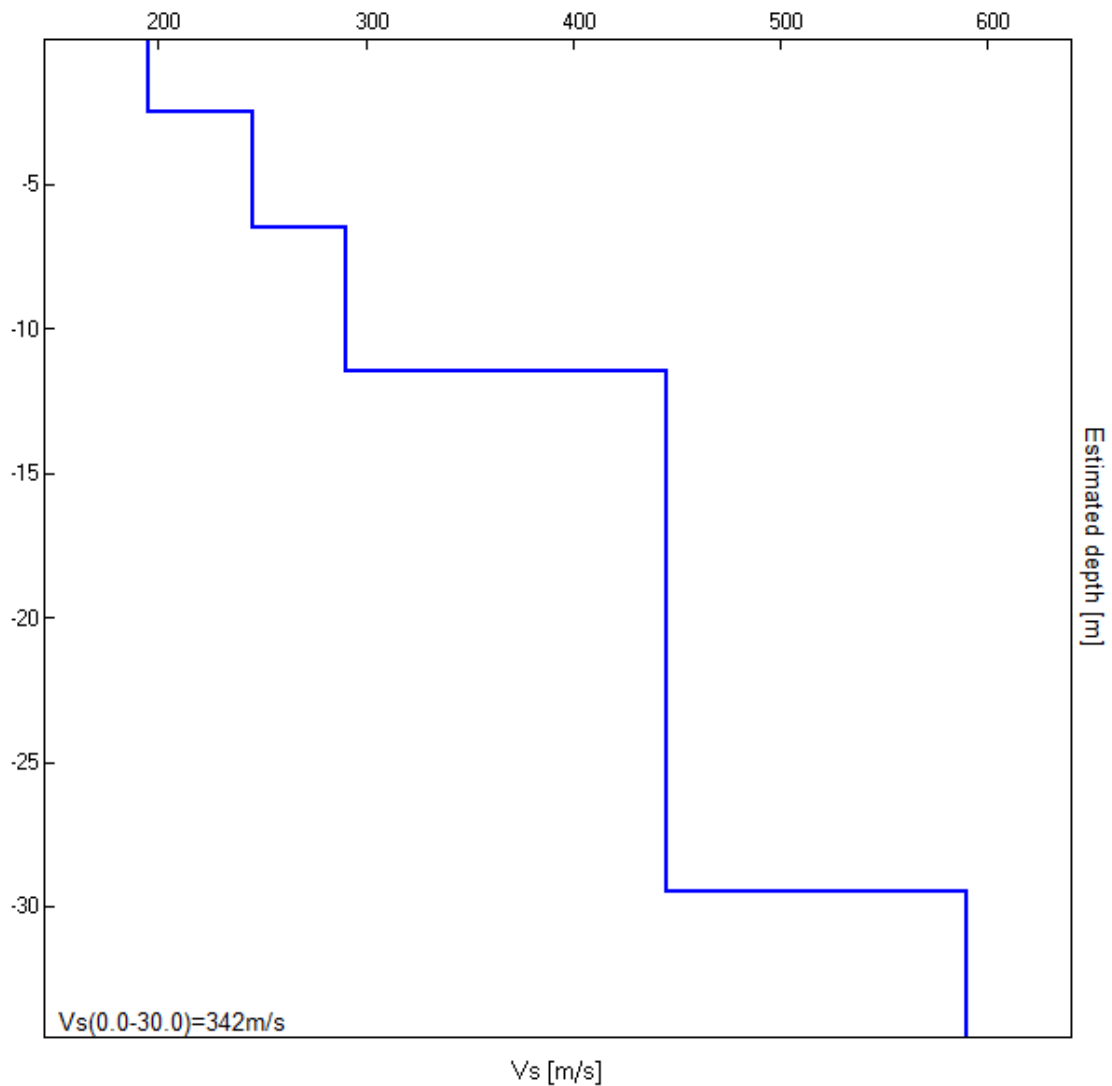


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
2.50	2.50	195
6.50	4.00	245
11.50	5.00	290
29.50	18.00	445
inf.	inf.	590

Vs(0.0-30.0)=342m/s



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

Max. H/V at 3.63 ± 0.15 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$3.63 > 0.63$	OK	
$n_c(f_0) > 200$	$3074.0 > 200$	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 88 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	2.25 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	7.563 Hz	OK	
$A_0 > 2$	$2.60 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.02048 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.07425 < 0.18125$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.4912 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

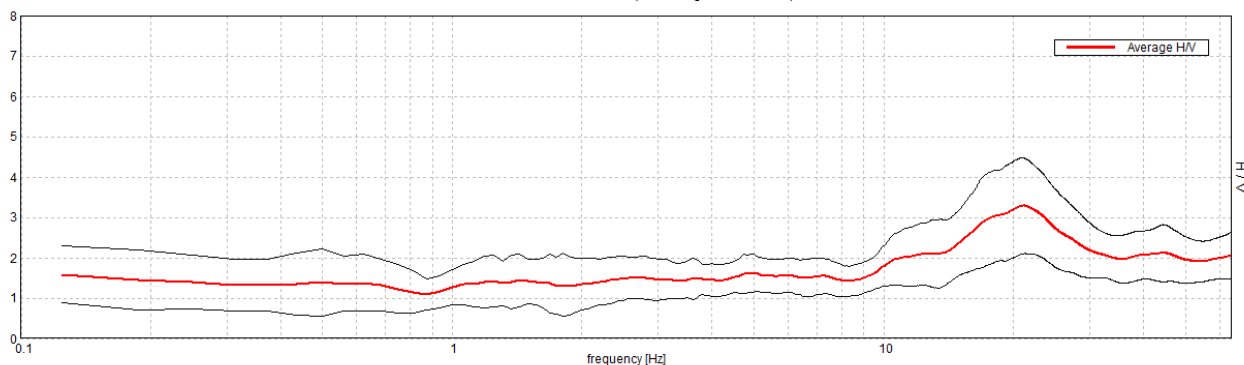
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SAN BENEDETTO VAL DI SAMBRO_MS, TR38 VILLA DI CEDRECCHIA

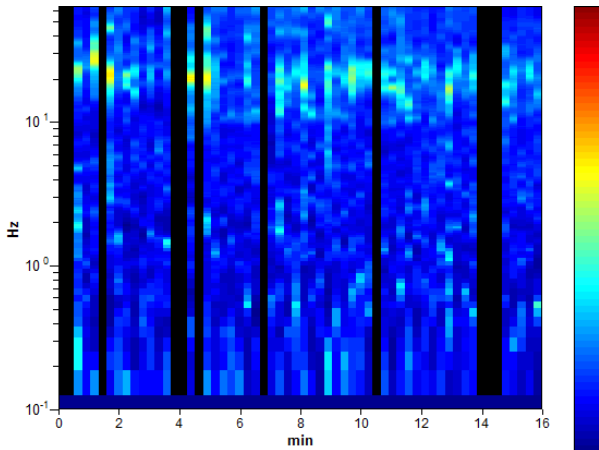
Instrument: TRZ-0108/01-10
 Start recording: 18/10/18 09:37:21 End recording: 18/10/18 09:53:22
 Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
 Trace length: 0h16'00". Analyzed 82% trace (manual window selection)
 Sampling rate: 128 Hz
 Window size: 16 s
 Smoothing type: Triangular window
 Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

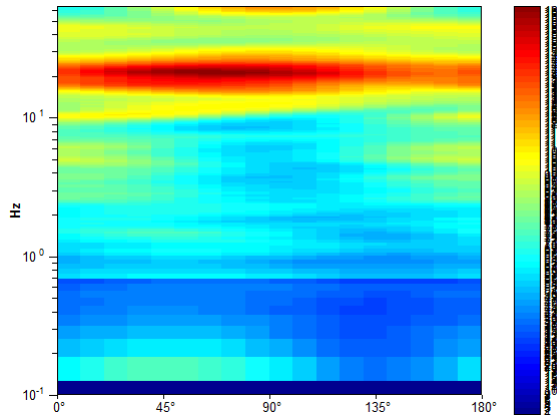
Max. H/V at 19.94 ± 0.75 Hz. (In the range 0.1 - 20.0 Hz).



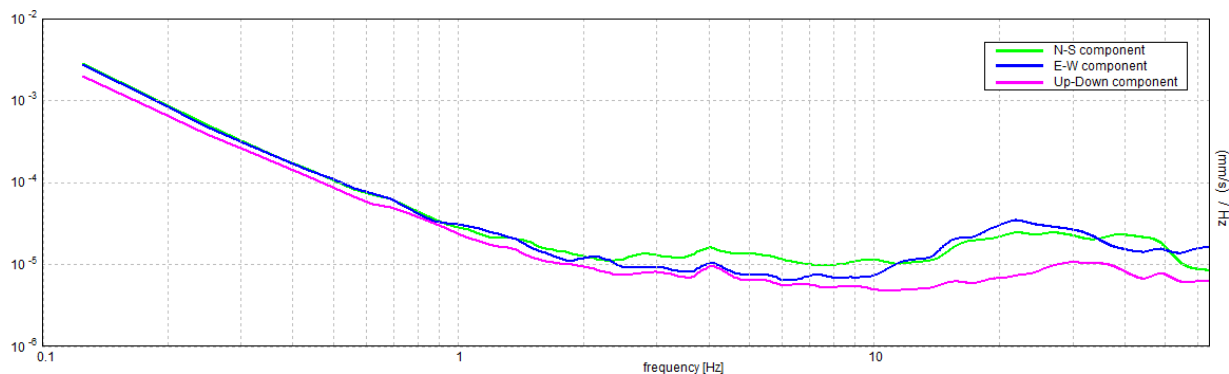
H/V TIME HISTORY



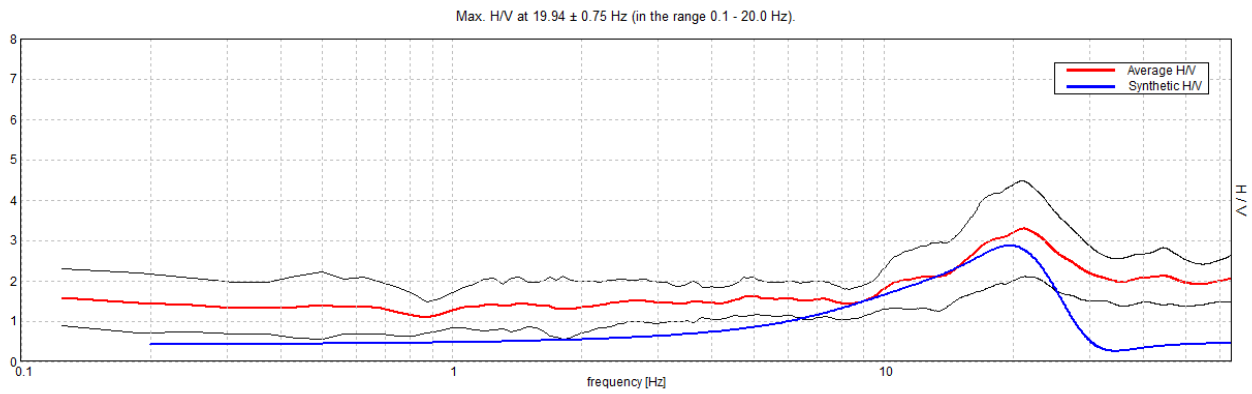
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

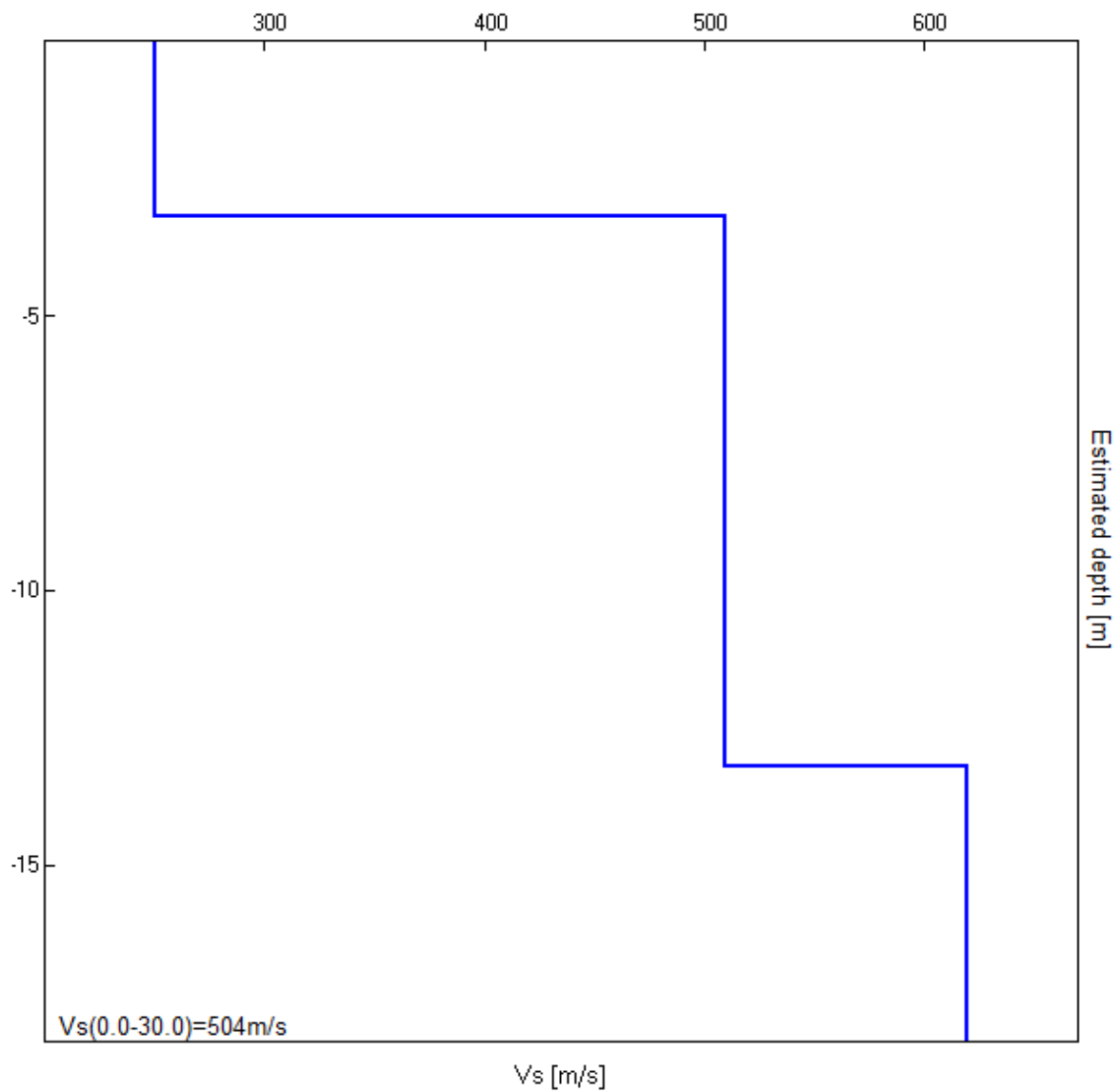


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
3.20	3.20	250
13.20	10.00	510
inf.	inf.	620

Vs(0.0-30.0)=504m/s



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

Max. H/V at 19.94 ± 0.75 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	19.94 > 0.63	OK	
$n_c(f_0) > 200$	15631.0 > 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 480 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	9.375 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	3.19 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.01849 < 0.05$	OK	
$\sigma_f < \varepsilon(f_0)$	$0.36873 < 0.99688$	OK	
$\sigma_A(f_0) < \theta(f_0)$	$0.5853 < 1.58$	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
σ_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 σ_f and $\sigma_A(f_0)$

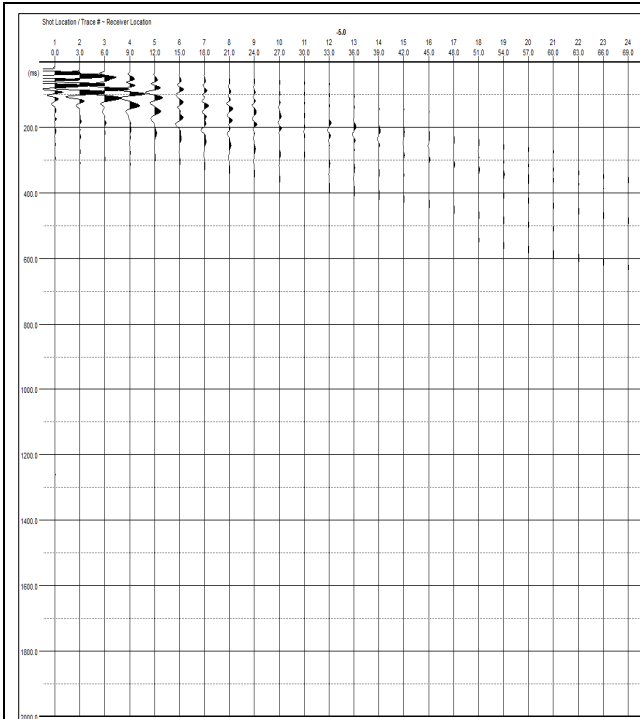
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

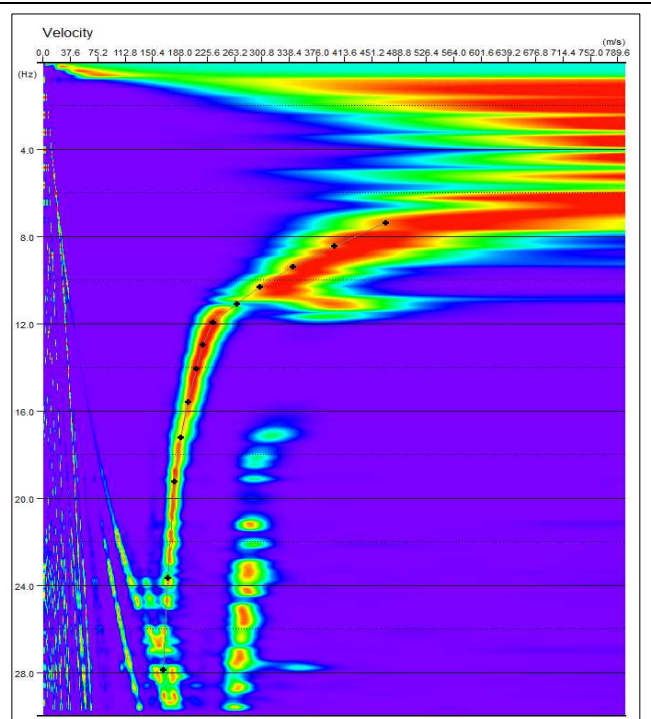
Campo sportivo Pian del Voglio, Comune di S. Benedetto Val di Sambro (BO) – 037051L11MASW11

n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	3,0	69,0	0,5/2,0	2,0/32,0

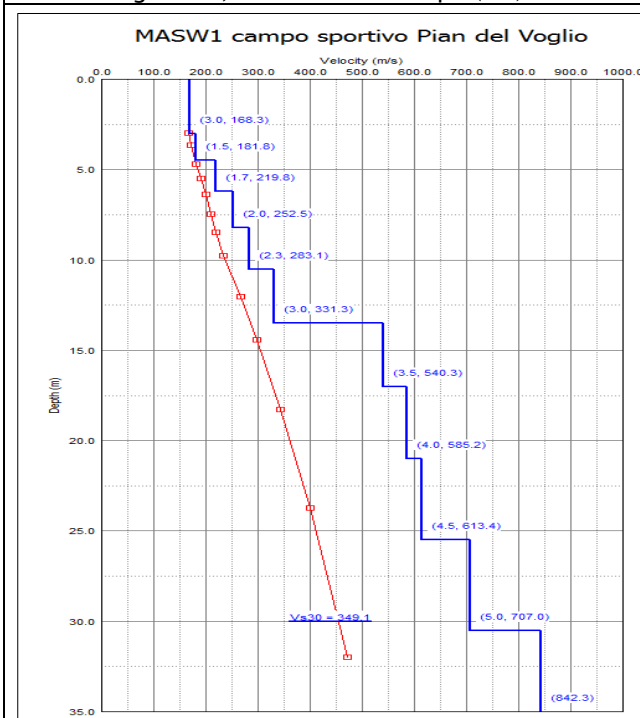
Δx : interdistanza geofonica; L tot: lunghezza profilo; Δt : passo di campionamento; T: durata registrazione.



Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).



Spettro di potenza nel dominio $f-v$ e Picking della curva sperimentale delle onde R (croci nere).



Modello di sottosuolo (1D) descritti in termini di V_s e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n.	Profondità letto (m dal p.c.)	Spessore (m)	V_s (m/s)
1	3.0	3.0	168.3
2	4.5	1.5	181.8
3	6.2	1.7	219.8
4	8.2	2.0	252.5
5	10.5	2.3	283.1
6	13.5	3.0	331.3
7	17.0	3.5	540.3
8	21.0	4.0	585.2
9	25.5	4.5	613.4
10	30.5	5.0	707.0
11	∞	∞	842.3

$V_{s30} = 349.1 \pm 10\% \text{ [m/s]}$

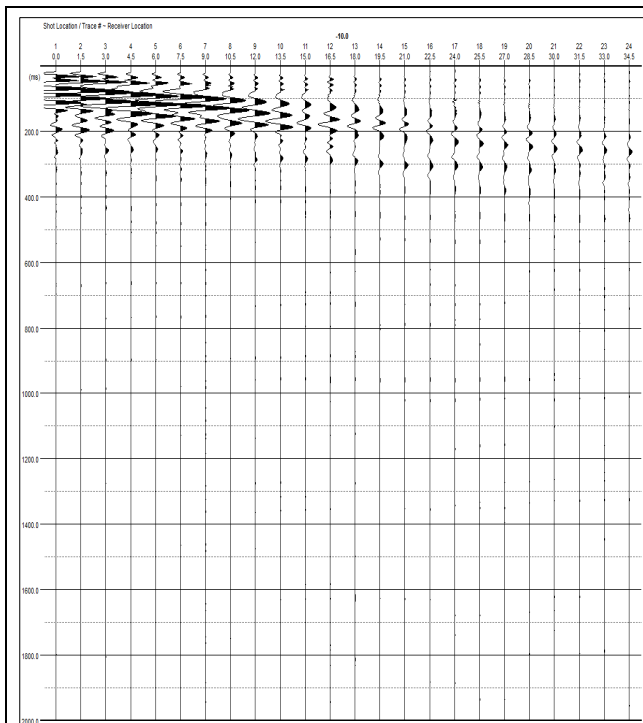
Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di V_{s30} calcolato.

PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

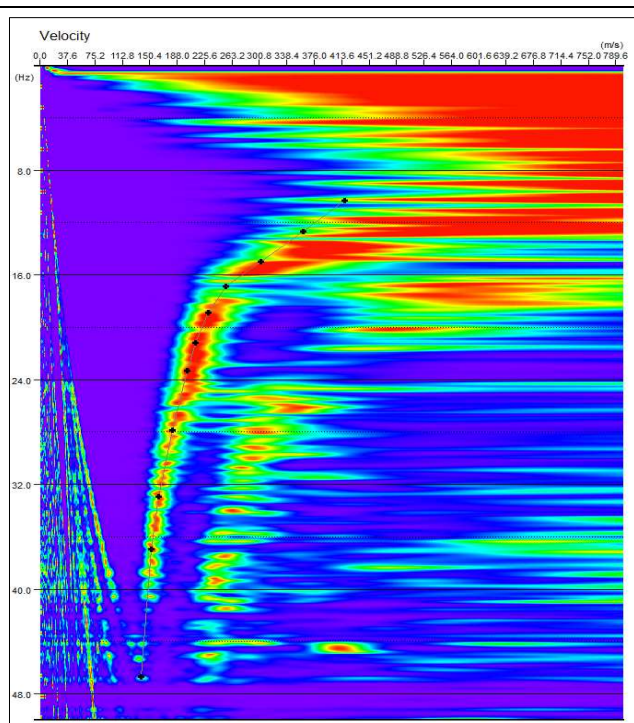
Scuola Pian del Voglio, Comune di San Benedetto Val di Sambro (BO) – 037051L12MASW12

n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	1,5	34,5	0,5/2,0	2,0/32,0

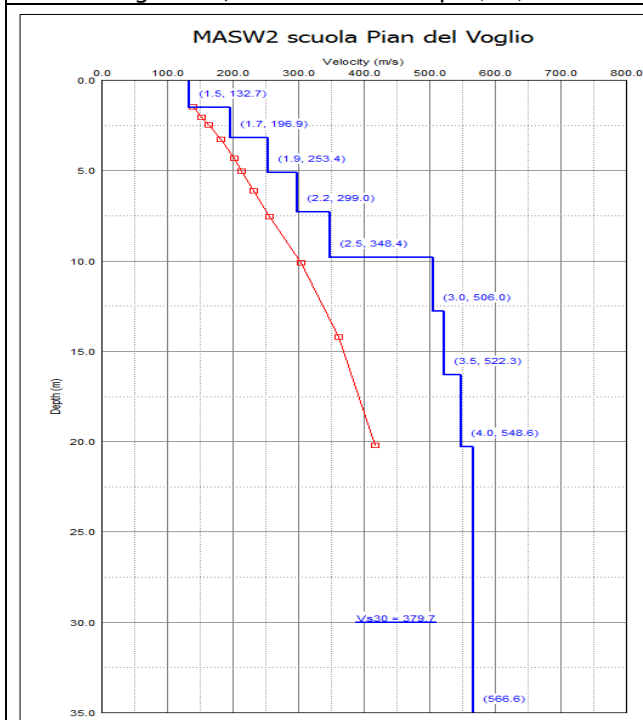
Δx : interdistanza geofonica; L tot: lunghezza profilo; Δt : passo di campionamento; T: durata registrazione.



Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).



Spettro di potenza nel dominio $f-v$ e Picking della curva sperimentale delle onde R (croci nere).



Modello di sottosuolo (1D) descritti in termini di V_s e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_s (m/s)
1	1.5	1.5	132.7
2	3.2	1.7	196.9
3	5.1	1.9	253.4
4	7.3	2.2	299.0
5	9.8	2.5	348.4
6	12.8	3.0	506.0
7	16.3	3.5	522.3
8	20.3	4.0	548.6
9	∞	∞	566.6

$V_{s30} = 379.7 \pm 10\%$ [m/s]

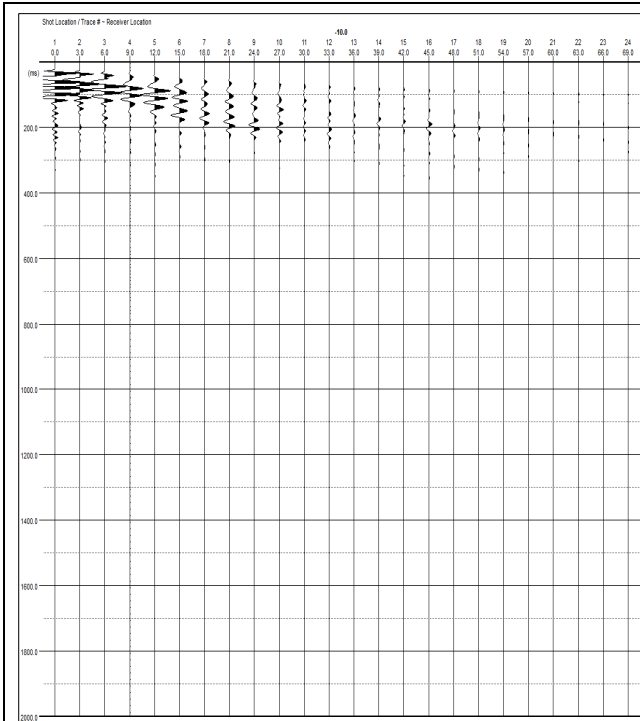
Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di V_{s30} calcolato.

PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

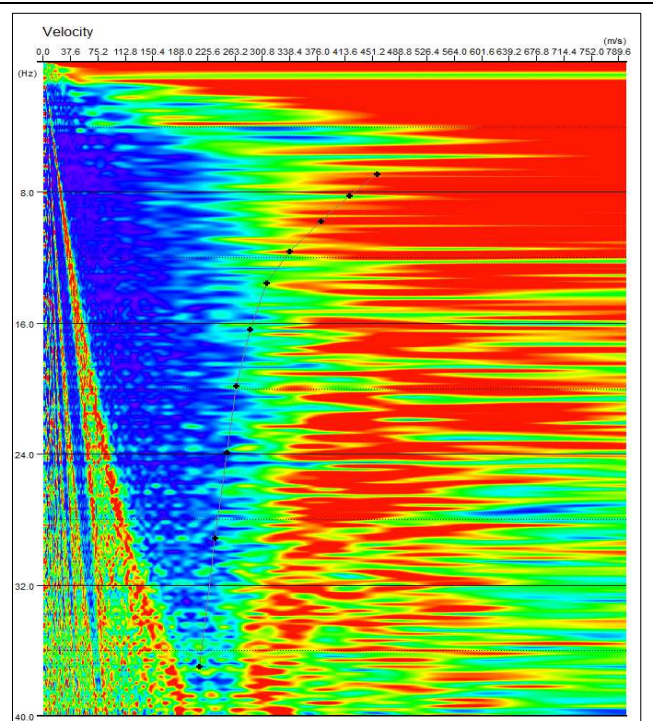
Campo sportivo Montefredente, Comune di S. Benedetto Val di Sambro (BO) – 037051L13MASW13

n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	3,0	69,0	0,5/2,0	2,0/32,0

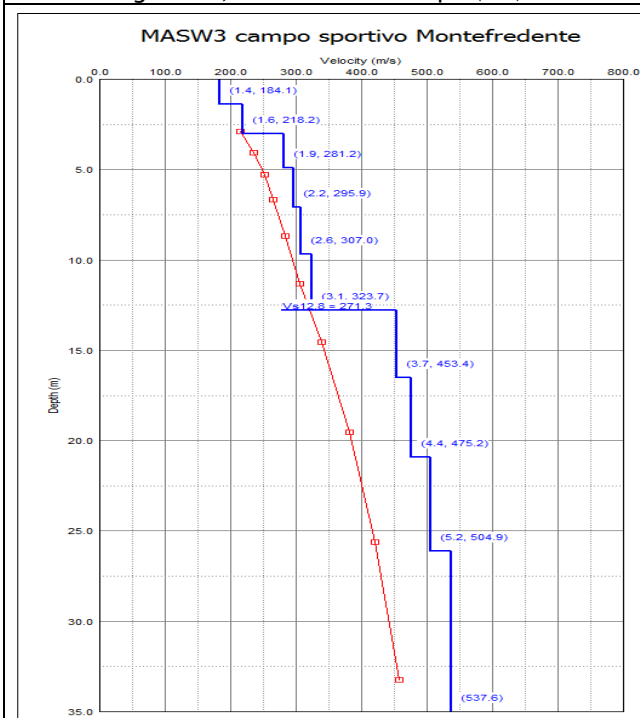
Δx : interdistanza geofonica; L tot: lunghezza profilo; Δt : passo di campionamento; T: durata registrazione.



Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).



Spettro di potenza nel dominio $f-v$ e Picking della curva sperimentale delle onde R (croci nere).



Modello di sottosuolo (1D) descritti in termini di V_s e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_s (m/s)
1	1.4	1.4	184.1
2	3.0	1.6	218.2
3	4.9	1.9	281.2
4	7.1	2.2	295.9
5	9.7	2.6	307.0
6	12.8	3.1	323.7
7	16.5	3.7	453.4
8	20.9	4.4	475.2
9	26.1	5.2	504.9
10	∞	∞	537.6

$$V_{s30} = 271.3 \pm 10\% \text{ [m/s]}$$

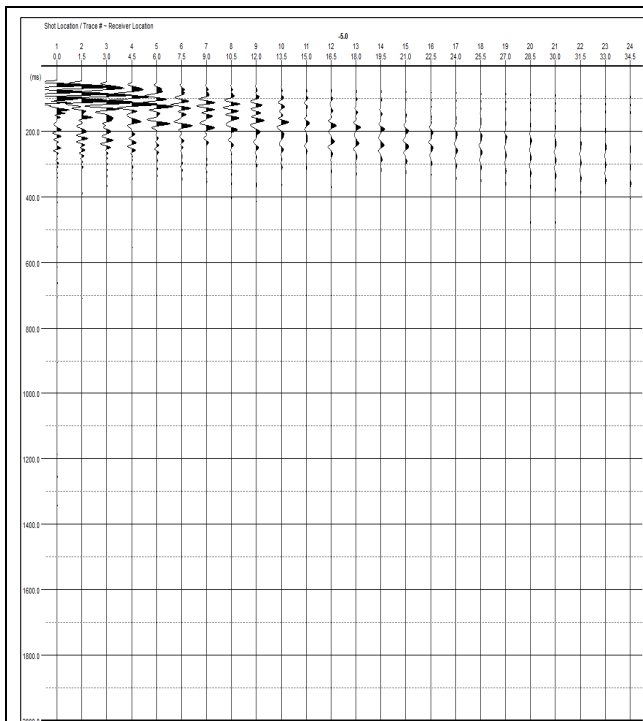
Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di V_{s30} calcolato.

PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

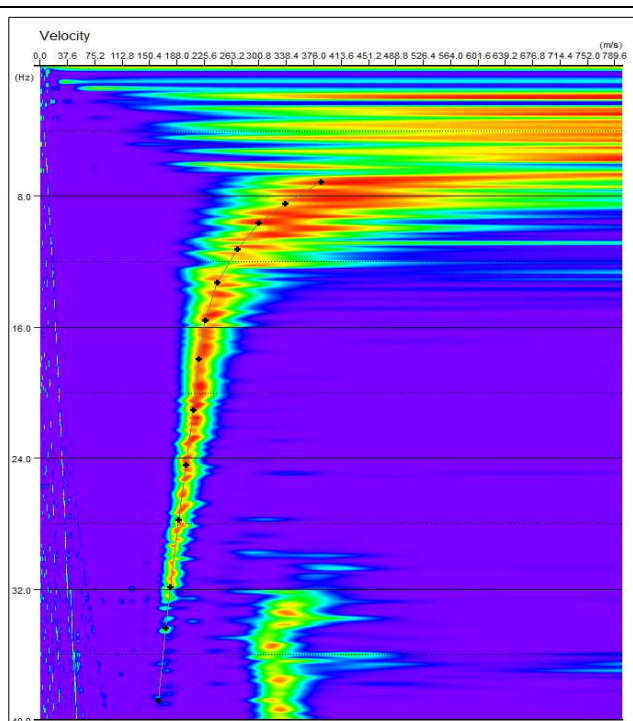
Cimitero Montefredente, Comune di San Benedetto Val di Sambro (BO) – 037051L14MASW14

n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	1,5	34,5	0,5/2,0	2,0/32,0

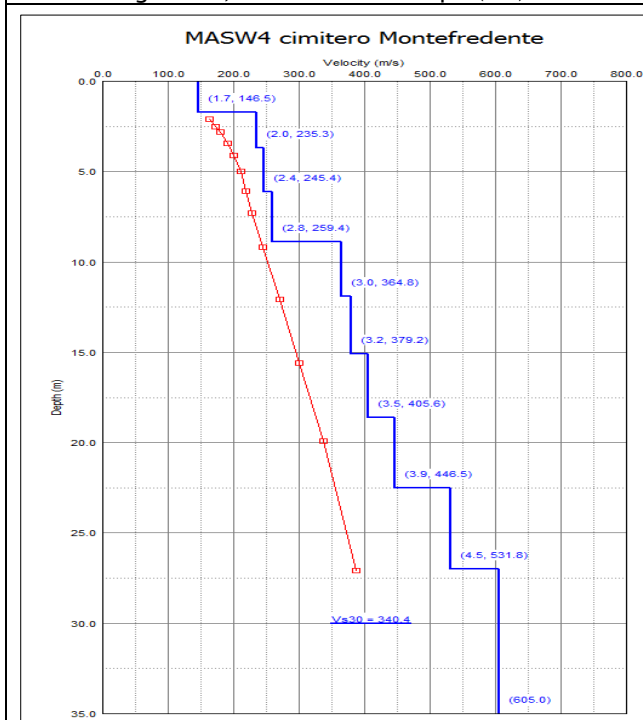
Δx : interdistanza geofonica; L tot: lunghezza profilo; Δt : passo di campionamento; T: durata registrazione.



Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).



Spettro di potenza nel dominio $f-v$ e Picking della curva sperimentale delle onde R (croci nere).



Modello di sottosuolo (1D) descritti in termini di V_s e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_s (m/s)
1	1.7	1.7	146.5
2	3.7	2.0	235.3
3	6.1	2.4	245.4
4	8.9	2.8	259.4
5	11.9	3.0	364.8
6	15.1	3.2	379.2
7	18.6	3.5	405.6
8	22.5	3.9	446.5
9	27.0	4.5	531.8
10	∞	∞	605.0

$V_{s30} = 340.4 \pm 10\% \text{ [m/s]}$

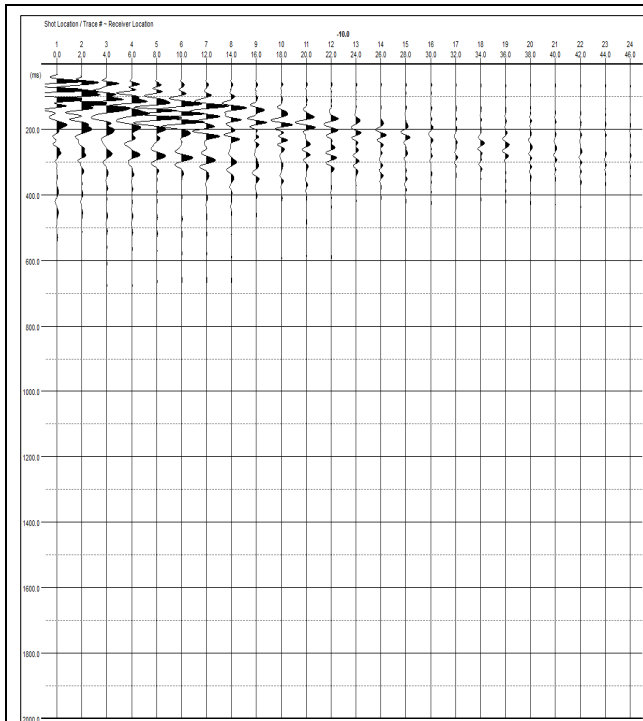
Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di V_{s30} calcolato.

PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

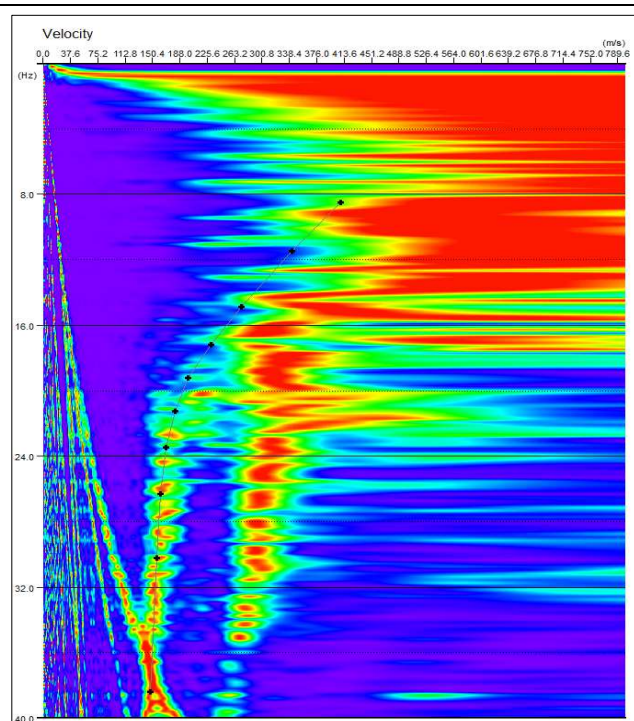
Madonna dei Fornelli, Comune di San Benedetto Val di Sambro (BO) – 037051L15MASW15

n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	2,0	46,0	0,5/2,0	2,0/32,0

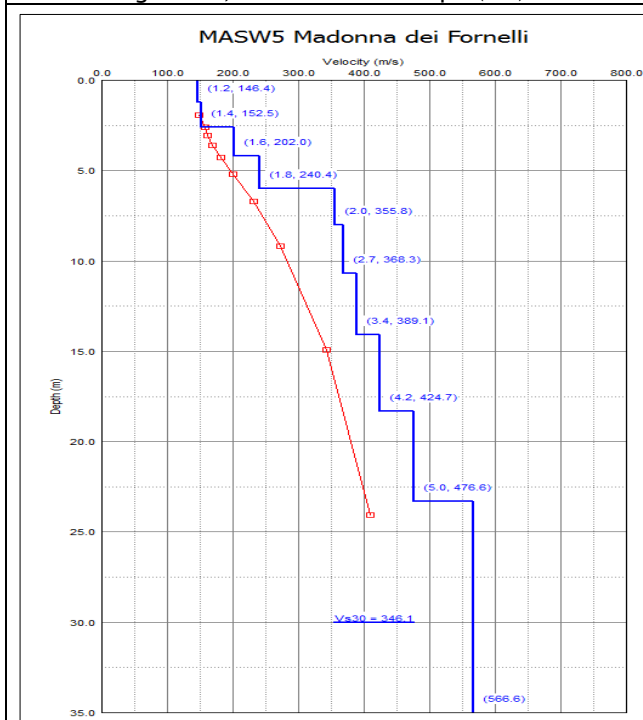
Δx : interdistanza geofonica; L tot: lunghezza profilo; Δt : passo di campionamento; T: durata registrazione.



Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).



Spettro di potenza nel dominio $f-v$ e Picking della curva sperimentale delle onde R (croci nere).



Modello di sottosuolo (1D) descritti in termini di V_s e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n.	Profondità letto (m dal p.c.)	Spessore (m)	V_s (m/s)
1	1.2	1.2	146.4
2	2.6	1.4	152.5
3	4.2	1.6	202.0
4	6.0	1.8	240.4
5	8.0	2.0	355.8
6	10.7	2.7	368.3
7	14.1	3.4	389.1
8	18.3	4.2	424.7
9	23.3	5.0	476.6
10	∞	∞	566.6

$$V_{s30} = 346.1 \pm 10\% \text{ [m/s]}$$

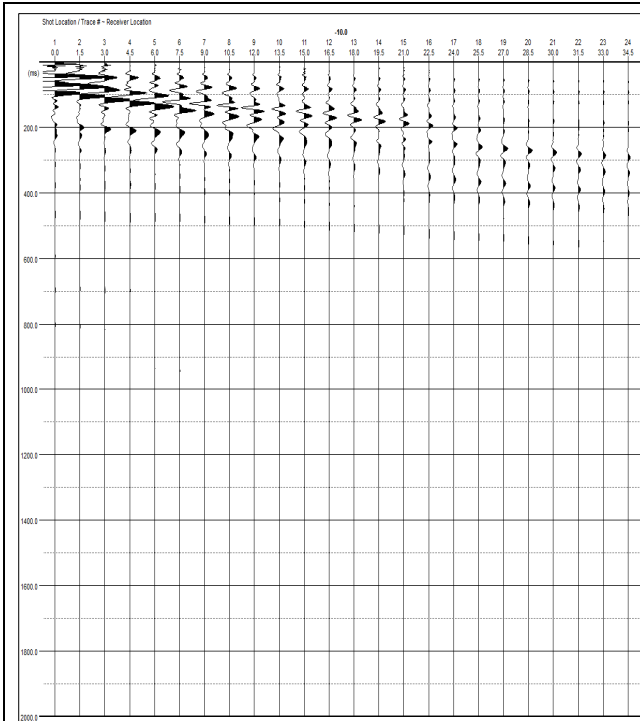
Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di V_{s30} calcolato.

PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

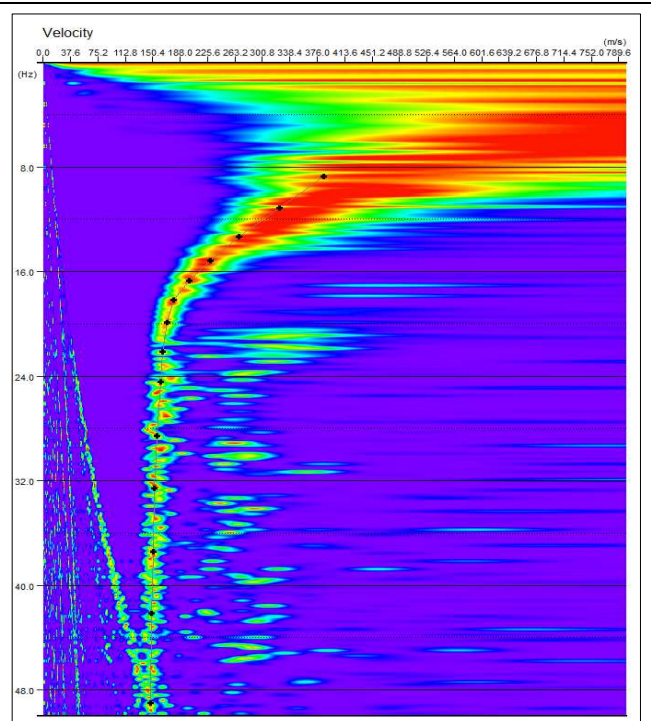
Castel dell'Alpi, Comune di San Benedetto Val di Sambro (BO) - 037051L16MASW16

n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	1,5	34,5	0,5/2,0	2,0/32,0

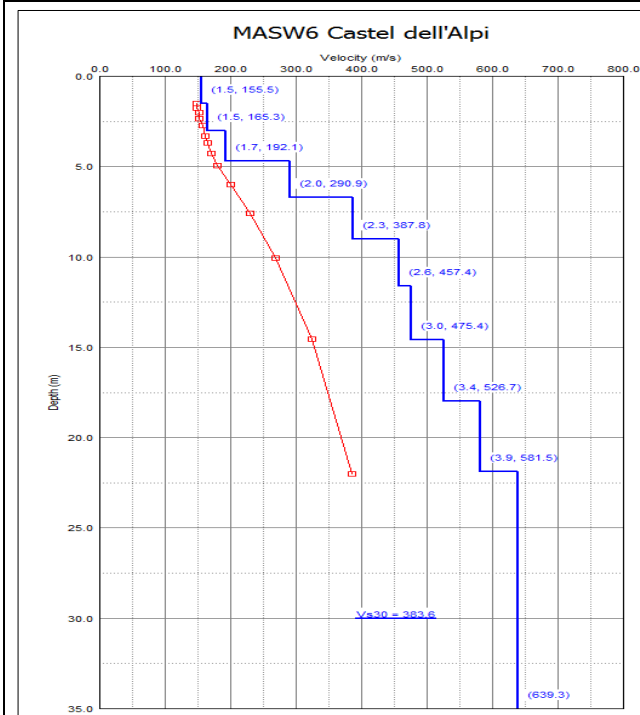
Δx : interdistanza geofonica; L tot: lunghezza profilo; Δt : passo di campionamento; T: durata registrazione.



Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).



Spettro di potenza nel dominio $f-v$ e Picking della curva sperimentale delle onde R (croci nere).



Modello di sottosuolo (1D) descritti in termini di V_s e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_s (m/s)
1	1.5	1.5	155.5
2	3.0	1.5	165.3
3	4.7	1.7	192.1
4	6.7	2.0	290.9
5	9.0	2.3	387.8
6	11.6	2.6	457.4
7	14.6	3.0	475.4
8	18.0	3.4	526.7
9	21.9	3.9	581.5
10	∞	∞	639.3

$V_{s30} = 383.6 \pm 10\% \text{ [m/s]}$

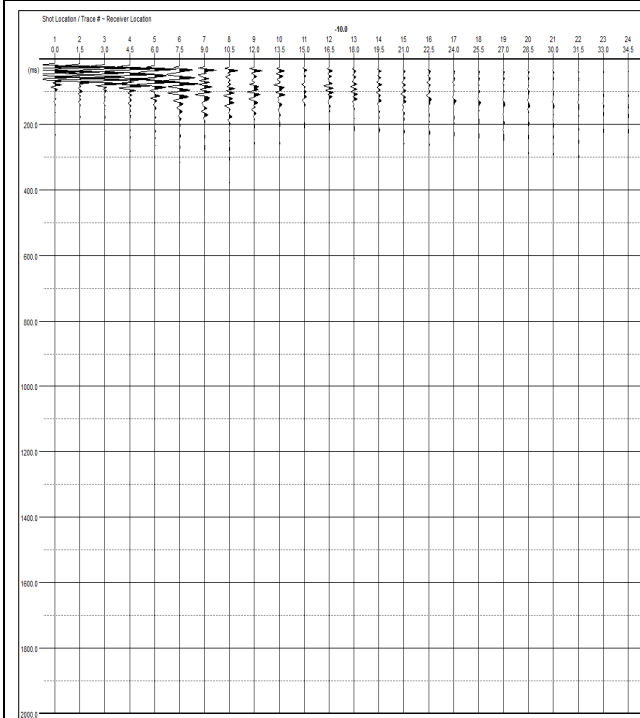
Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di V_{s30} calcolato.

PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

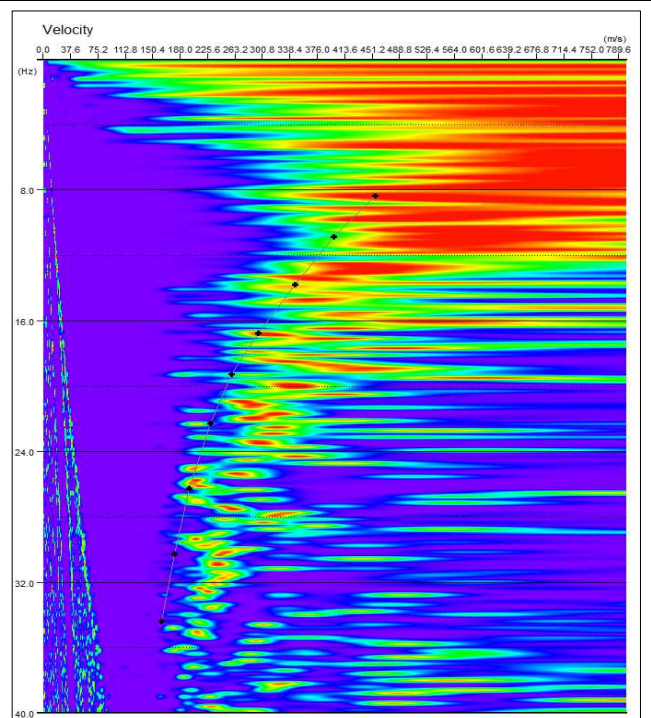
San Benedetto Val di Sambro (BO) – 037051L17MASW17

n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	1,5	34,5	0,5/2,0	2,0/32,0

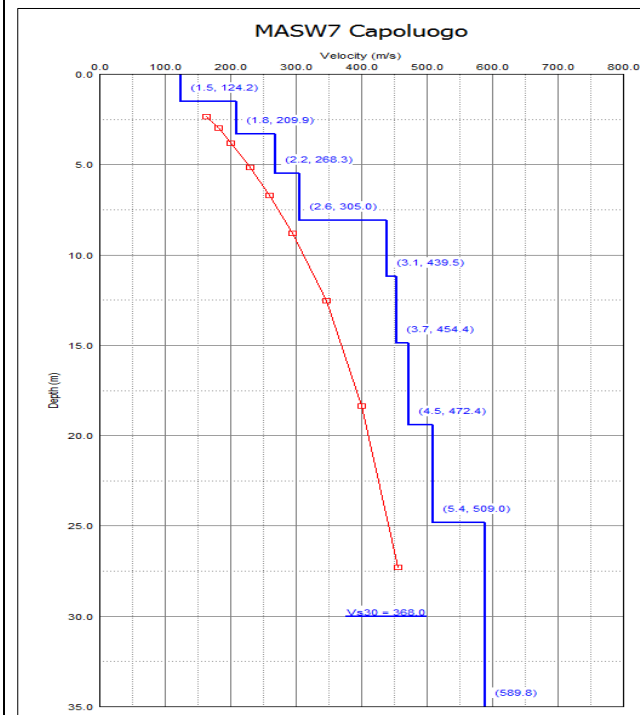
Δx : interdistanza geofonica; L tot: lunghezza profilo; Δt : passo di campionamento; T: durata registrazione.



Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).



Spettro di potenza nel dominio $f-v$ e Picking della curva sperimentale delle onde R (croci nere).



Modello di sottosuolo (1D) descritti in termini di V_s e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_s (m/s)
1	1.5	1.5	124.2
2	3.3	1.8	209.9
3	5.5	2.2	268.3
4	8.1	2.6	305.0
5	11.2	3.1	439.5
6	14.9	3.7	454.4
7	19.4	4.5	472.4
8	24.8	5.4	509.0
9	∞	∞	589.8

$V_{s30} = 368.0 \pm 10\% [m/s]$

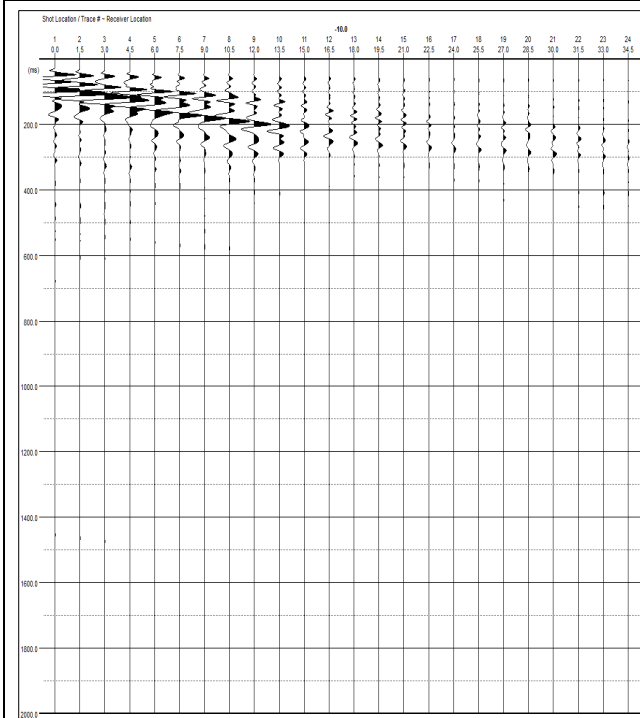
Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di V_{s30} calcolato.

PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

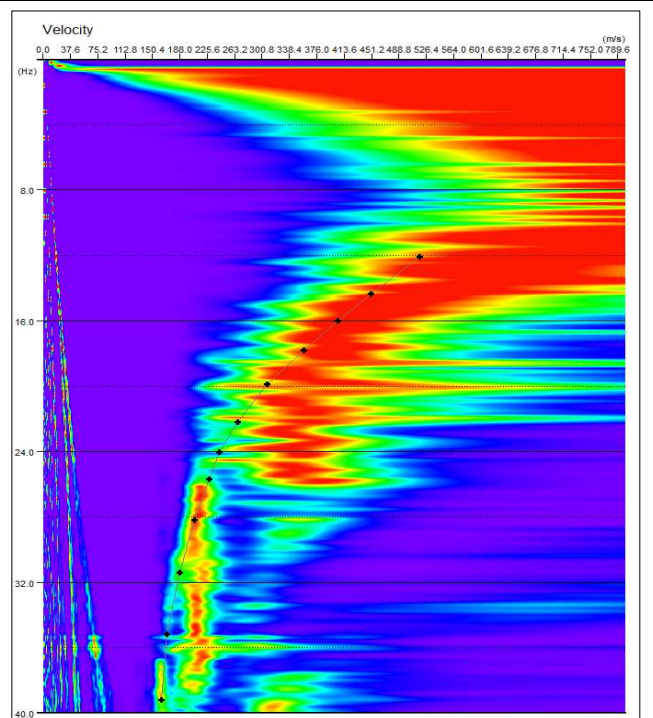
Monteacuto Vallese, Comune di San Benedetto Val di Sambro (BO) – 037051L18MASW18

n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	1,5	34,5	0,5/2,0	2,0/32,0

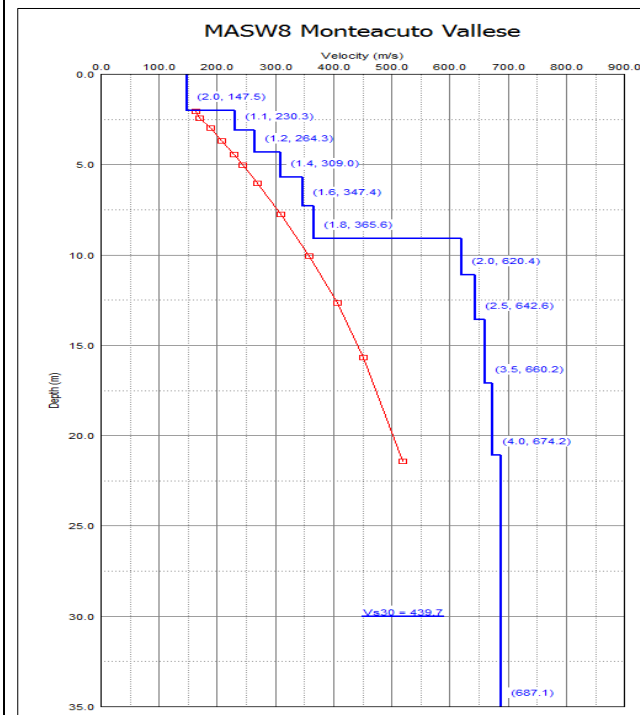
Δx : interdistanza geofonica; L tot: lunghezza profilo; Δt : passo di campionamento; T: durata registrazione.



Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).



Spettro di potenza nel dominio $f-v$ e Picking della curva sperimentale delle onde R (croci nere).



Modello di sottosuolo (1D) descritti in termini di Vs e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	Vs (m/s)
1	2.0	2.0	147.5
2	3.1	1.1	230.3
3	4.3	1.2	264.3
4	5.7	1.4	309.0
5	7.3	1.6	347.4
6	9.1	1.8	365.6
7	11.1	2.0	620.4
8	13.6	2.5	642.6
9	17.1	3.5	660.2
10	21.1	4.0	674.2
11	∞	∞	687.1

$V_{s30} = 439.7 \pm 10\% \text{ [m/s]}$

Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di Vs30 calcolato.