COMUNE DI VAL BREMBILLA
(Provincia di Bergamo)

COMPONENTE GEOLOGICA, IDROGEOLOGICA E SISMICA DEL PIANO DI GOVERNO DEL TERRITORIO

(ai sensi della L.R. n.12 del 11/03/2005 e della D.G.R. n.9/2616 del 30/11/2011)

RELAZIONE GEOLOGICA

Parte 3 - Appendice all'Analisi Sismica di 2° livello

Committente: Comune di Val Brembilla

Bergamo, Marzo 2017

Dott. Augusto Azzoni

Dott. Augusto Azzoni, n.527 dell'Ordine dei Geologi della Lombardia
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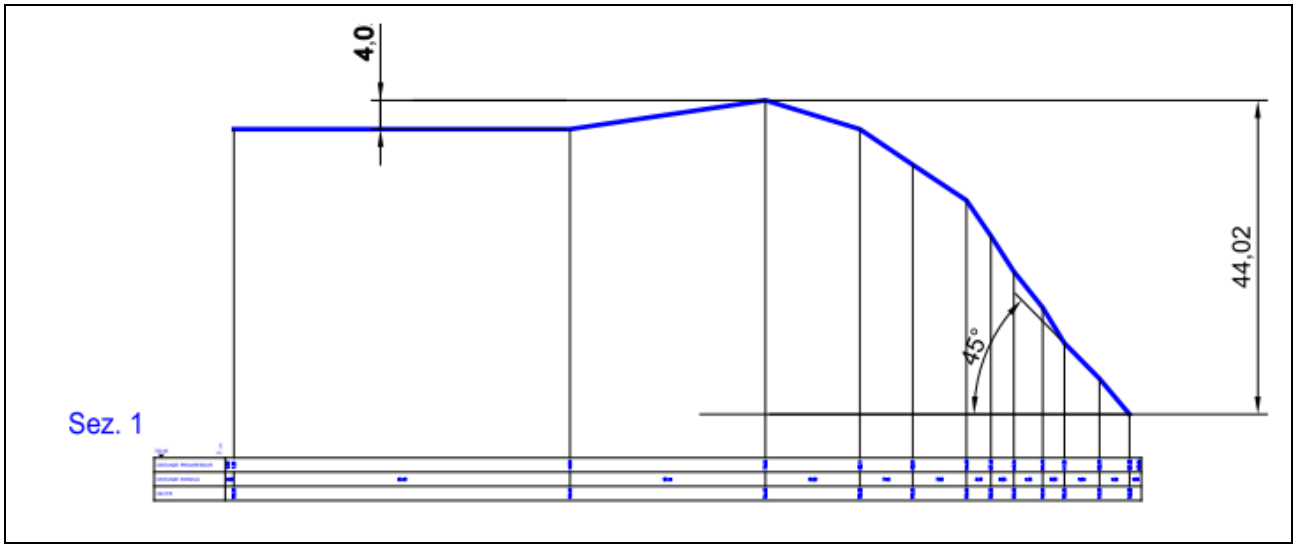
1. INTRODUZIONE

Si riportano di seguito i seguenti documenti, predisposti nel corso dell'Analisi simica di 2° livello:

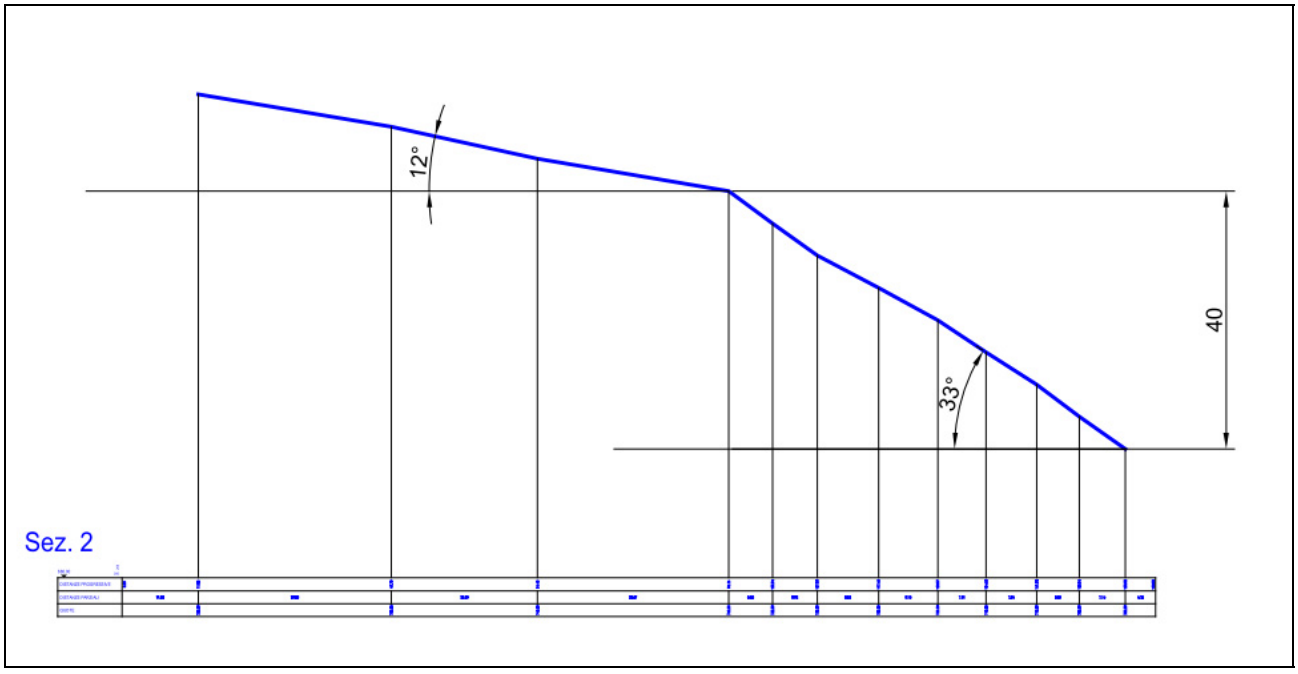
- Sezioni topografiche considerate per la valutazione degli effetti morfologici sul Fattore di amplificazione sismica.
- Misure di rumore sismico HVSR a stazione singola

Si allegano inoltre le Schede per la valutazione del Fattori di amplificazione sismica di tipo topografico e litologico, riportati sulla D.G.R. n.9/2616 del 30/11/2011.

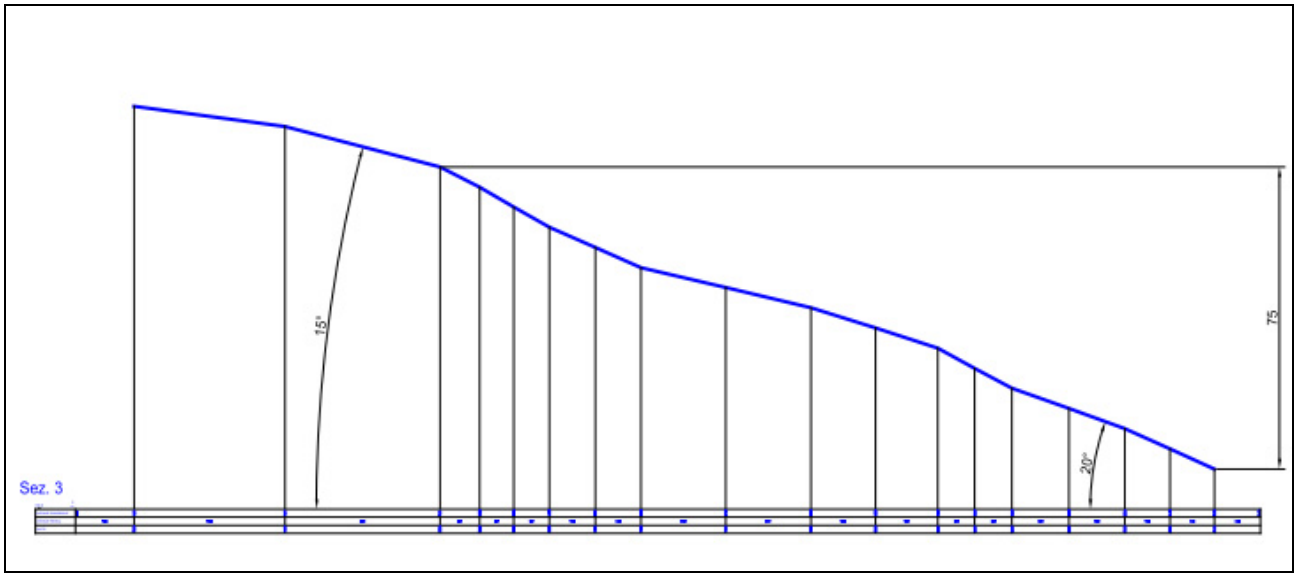
Sezioni topografiche considerate per la valutazione degli effetti morfologici sul Fattore di amplificazione topografico



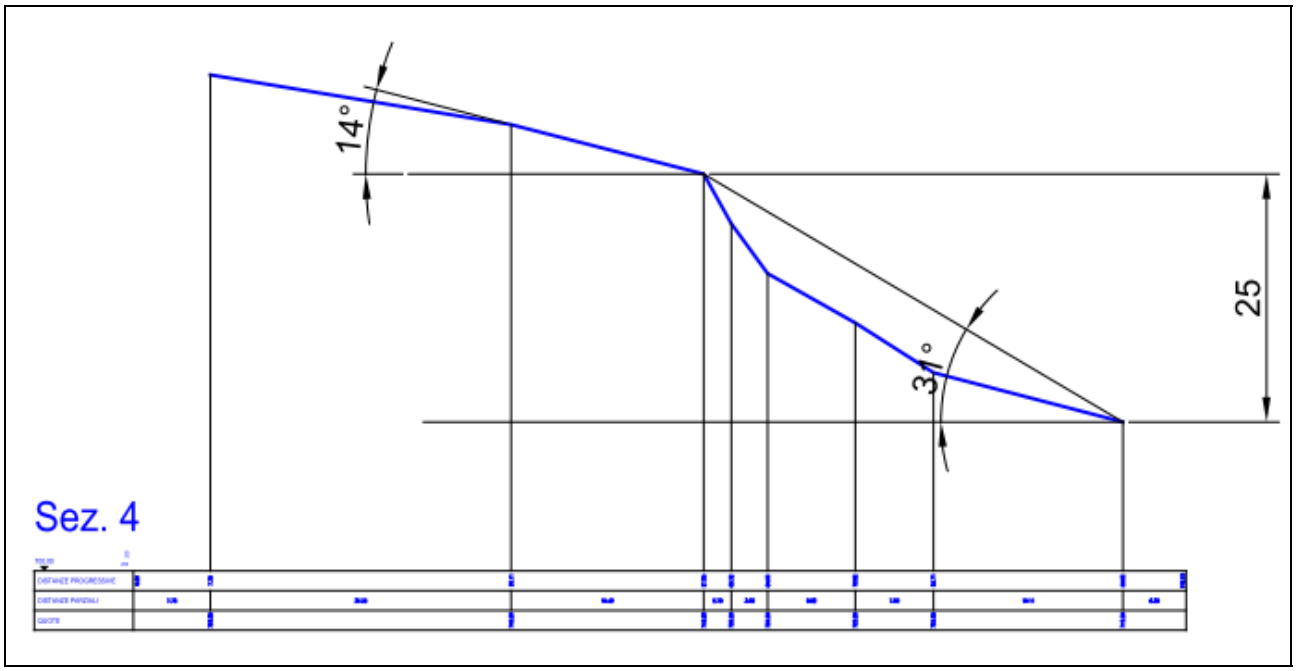
Sezione n.1 - Bura (scarpata in contropendenza).



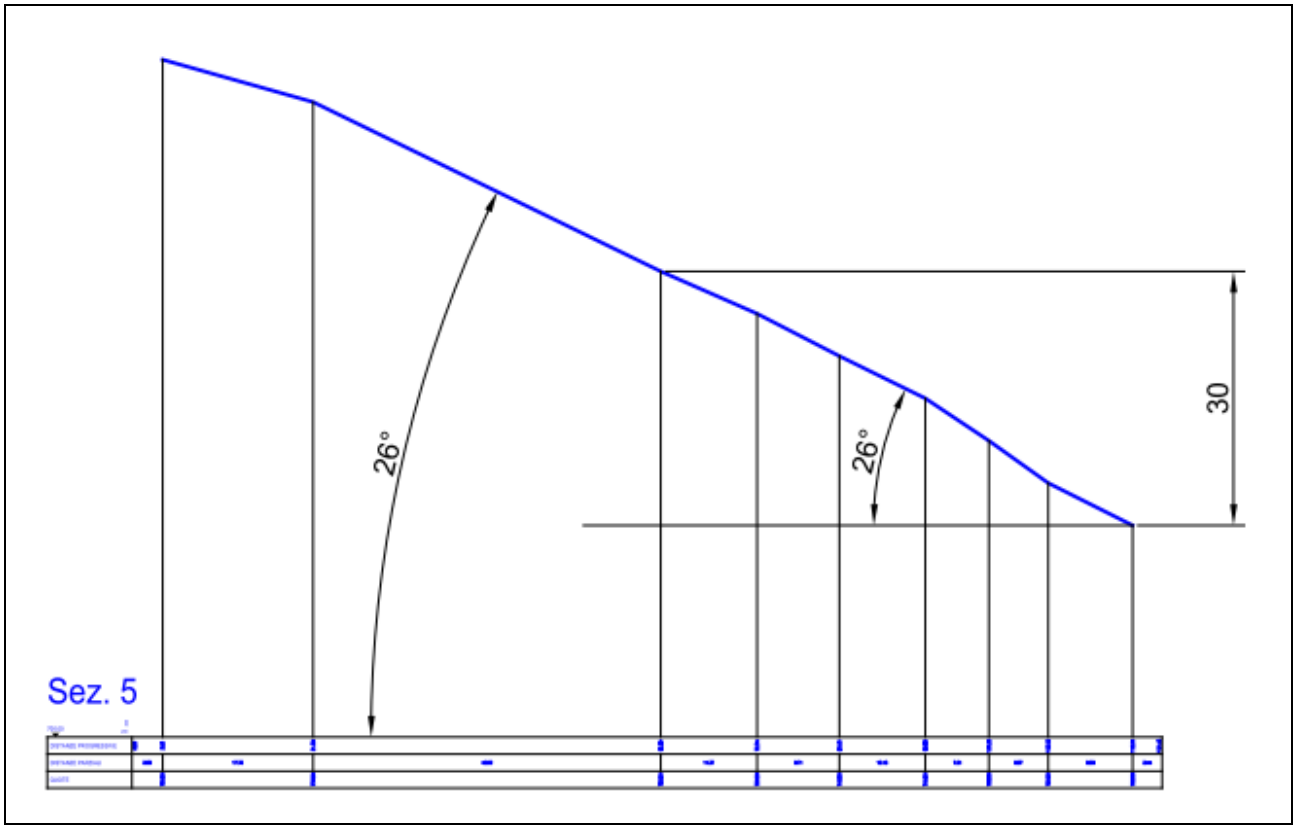
Sezione n.2 - Gerosa bassa (pendio).



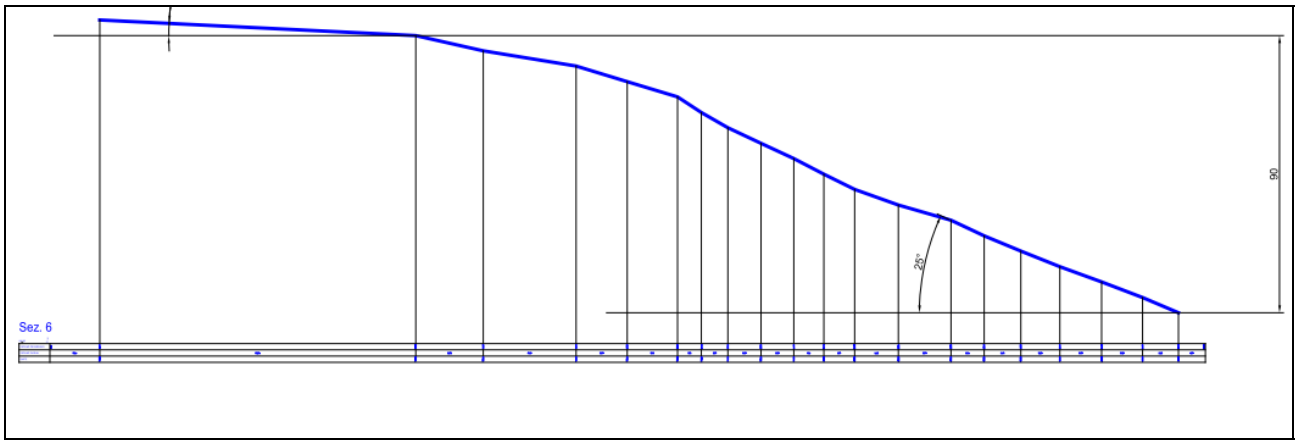
Sezione n. 3 - Gerosa (pendio).



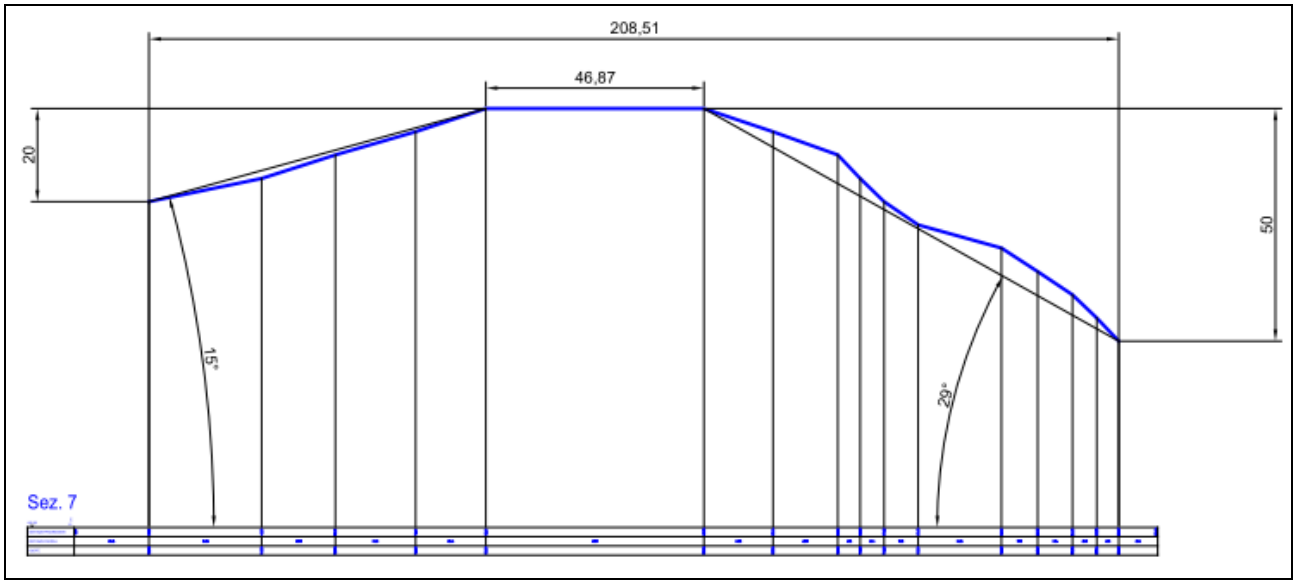
Sezione n. 4 - Gerosa (pendio).



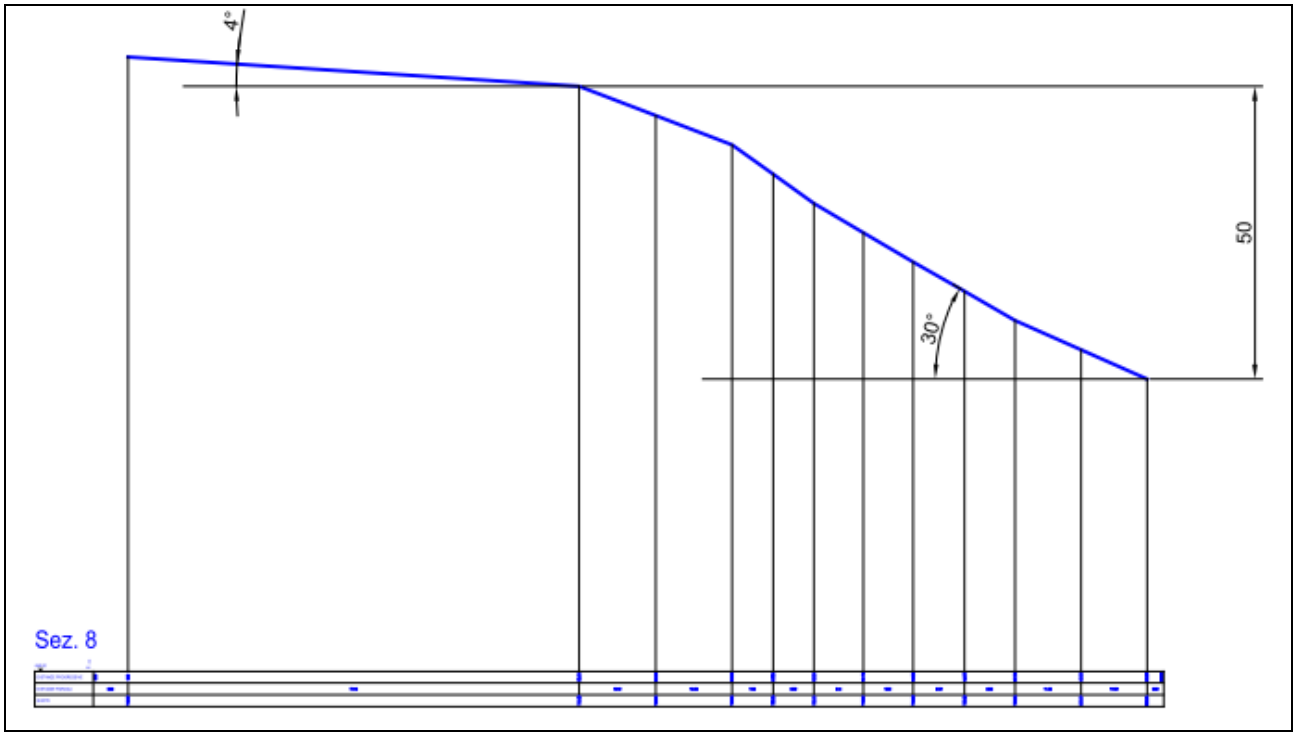
Sezione n. 5 - Gerosa (pendio).



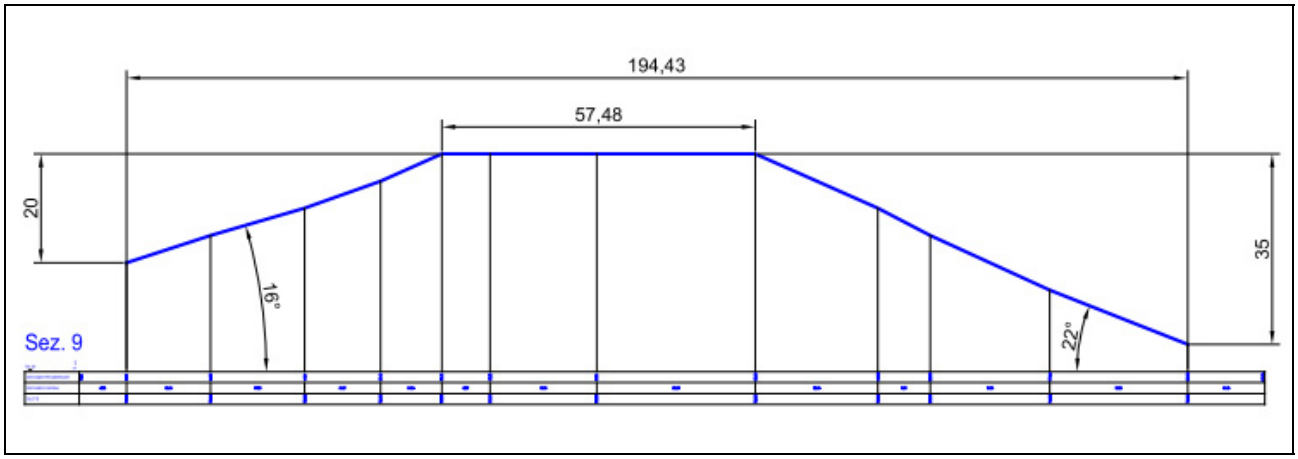
Sezione n. 6 - Gerosa (scarpata in pendenza).



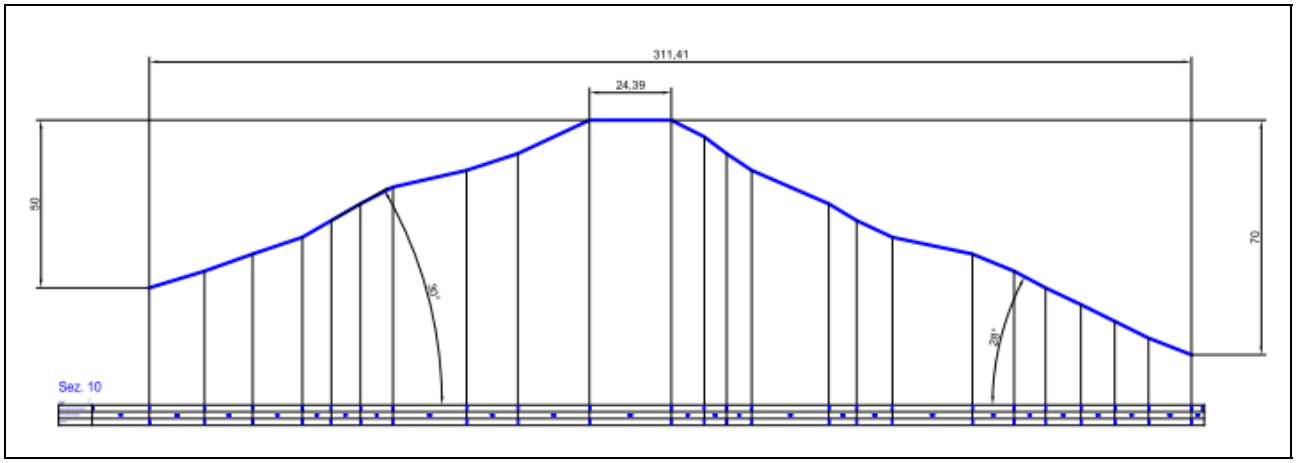
Sezione n. 7 - Gerosa (cresta appuntita).



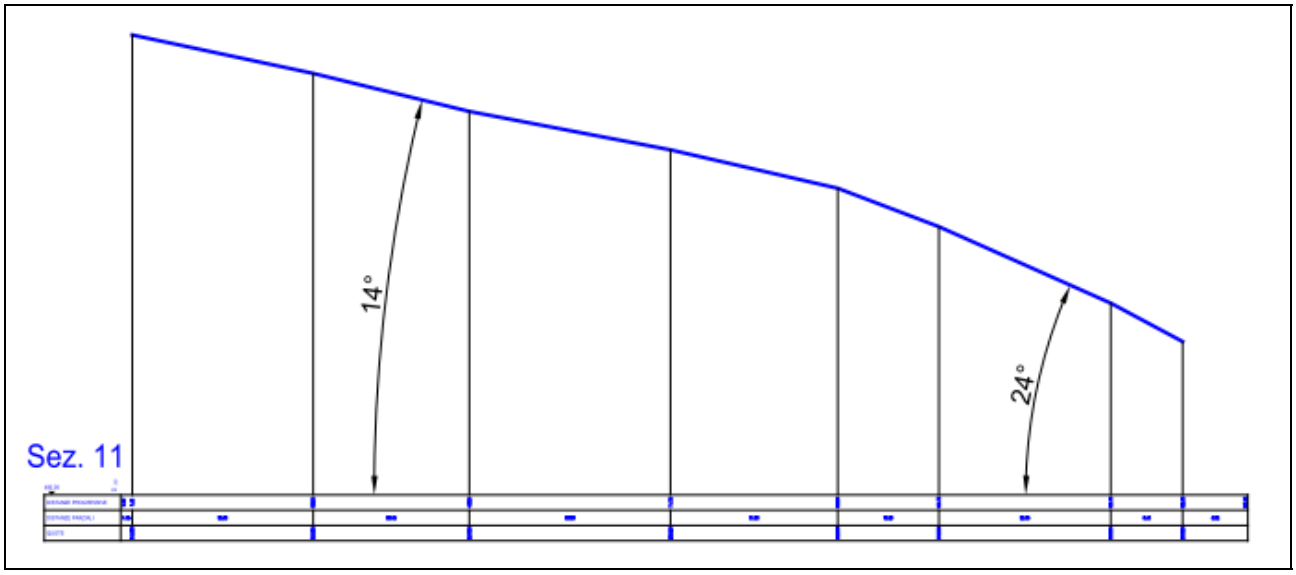
Sezione n. 8 - Gerosa (scarpata in pendenza).



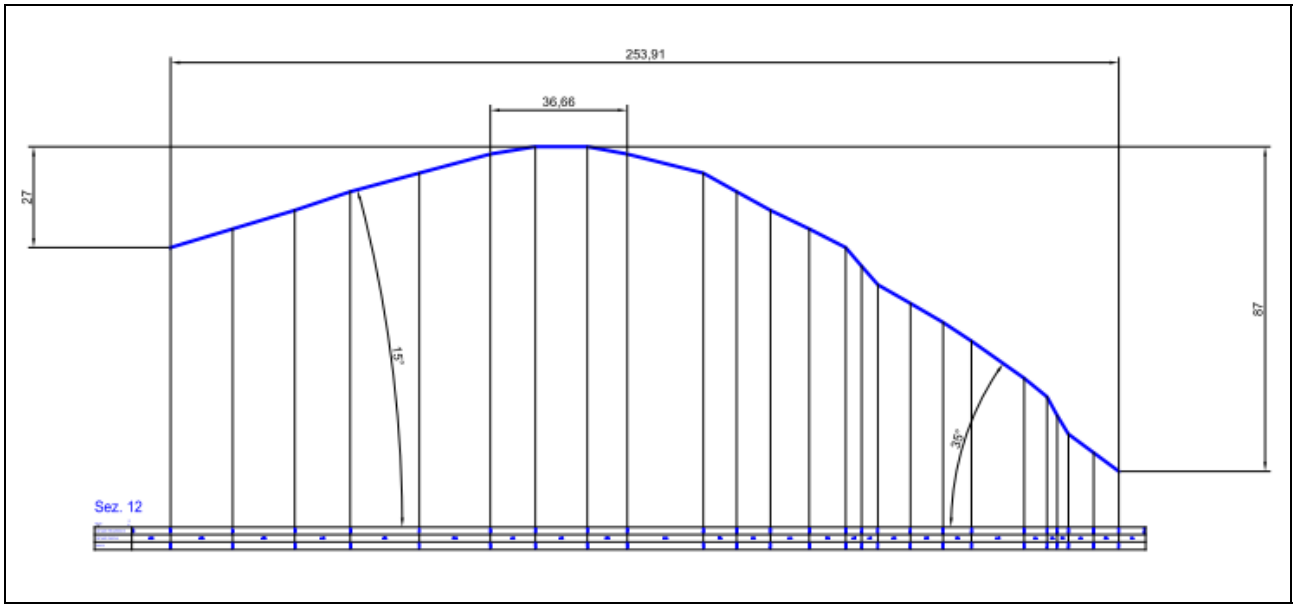
Sezione n. 9 - Gerosa (cresta arrotondata).



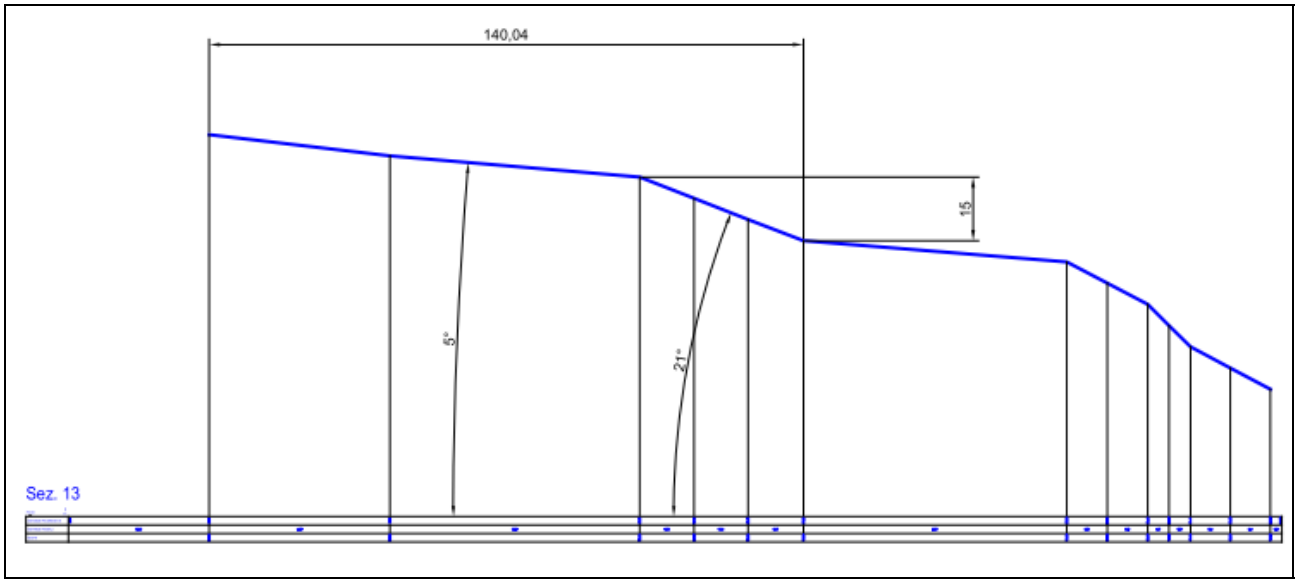
Sezione n. 10 - Gerosa (cresta appuntita).



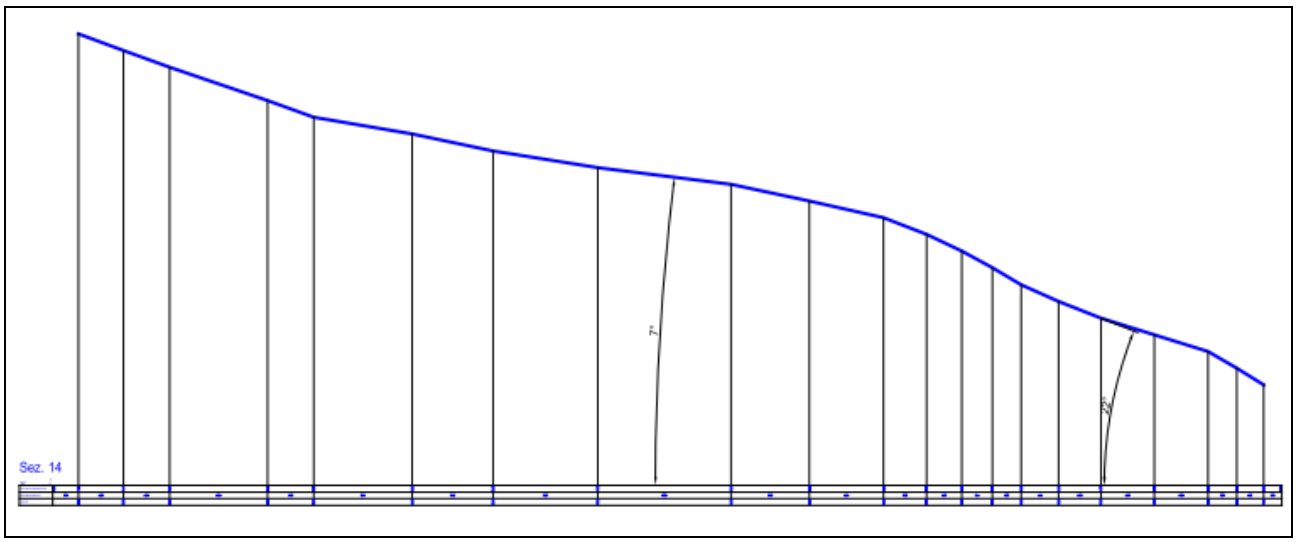
Sezione n. 11 - Gerosa loc. Foppacalda (pendio).



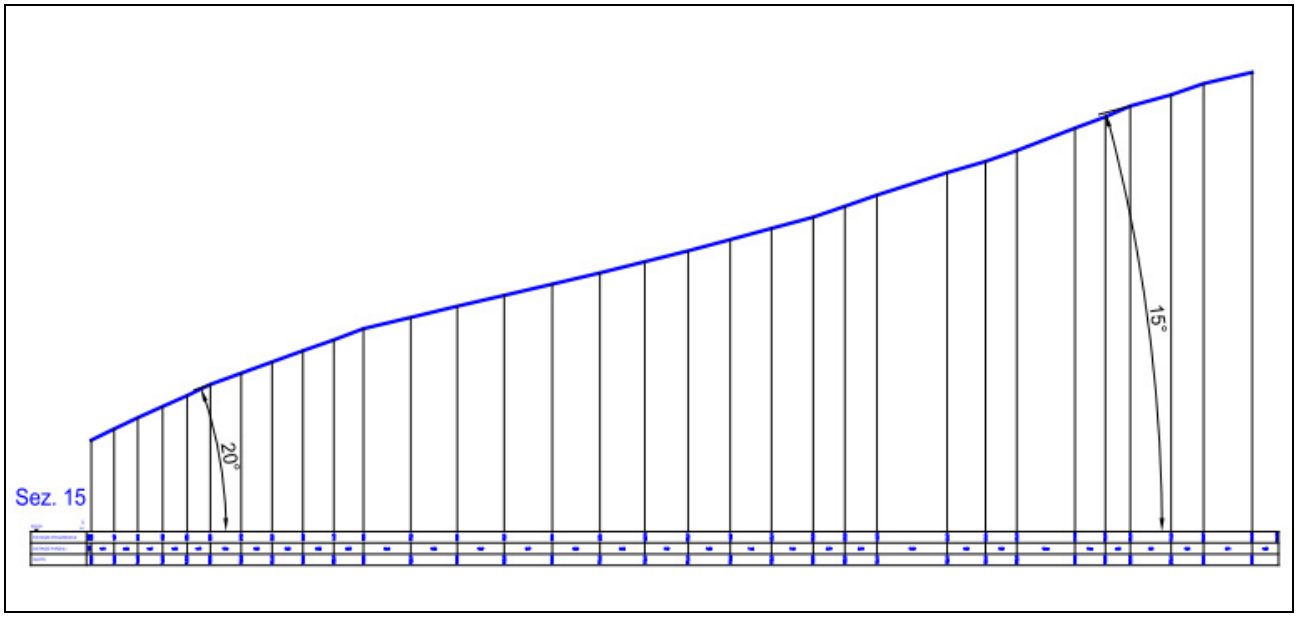
Sezione n. 12 – Canto del Ronco (cresta appuntita).



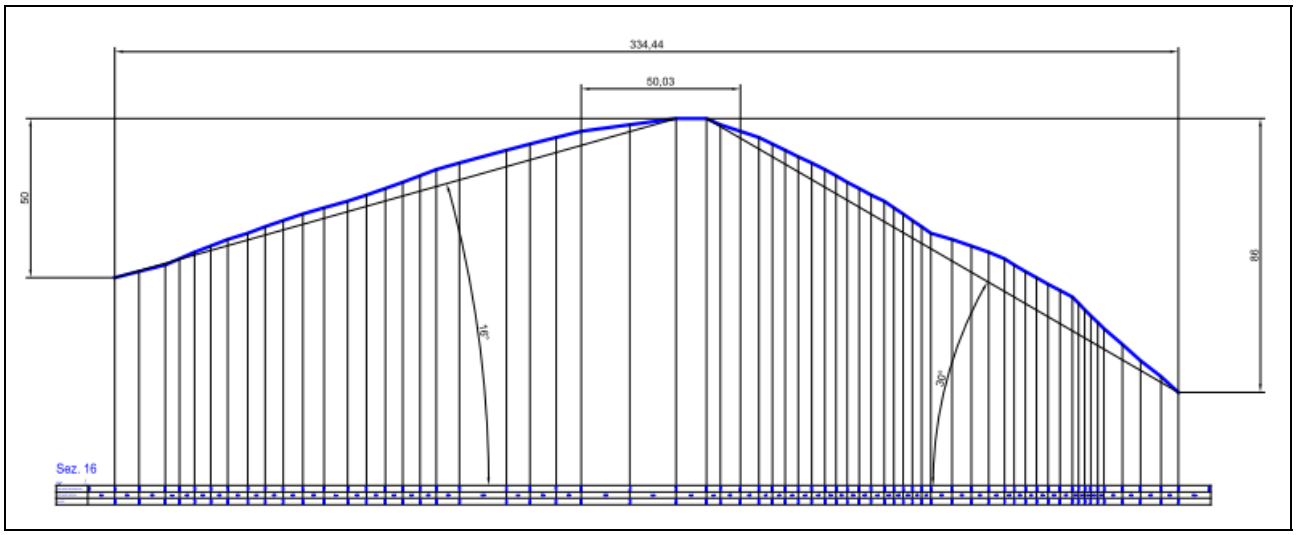
Sezione n. 13 - Blello (pendio).



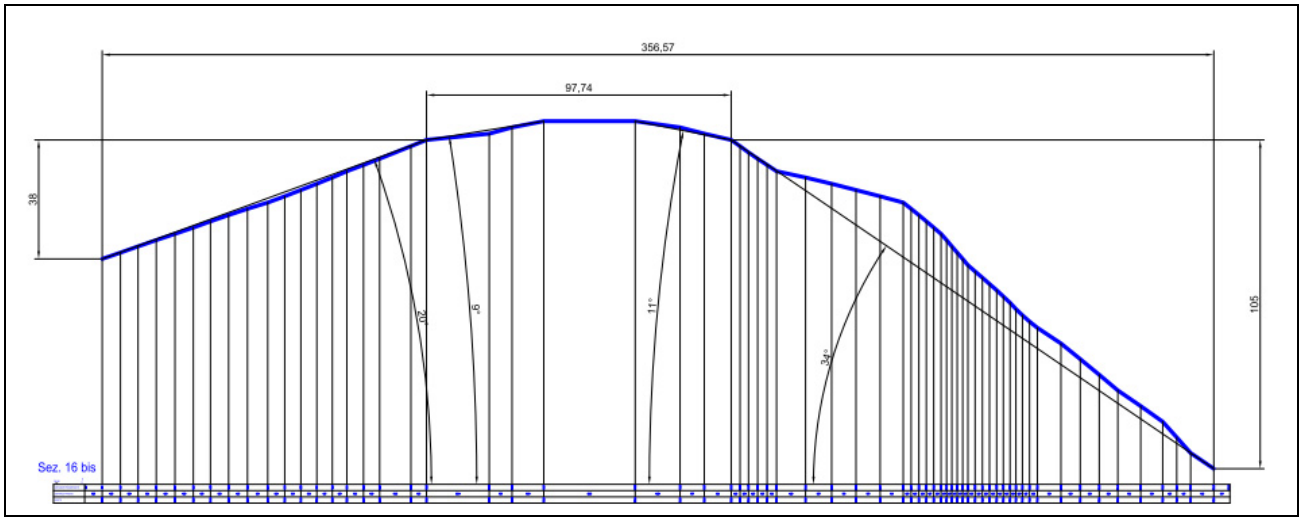
Sezione n. 14 – Gerosa loc. Prato Aroldi (pendio).



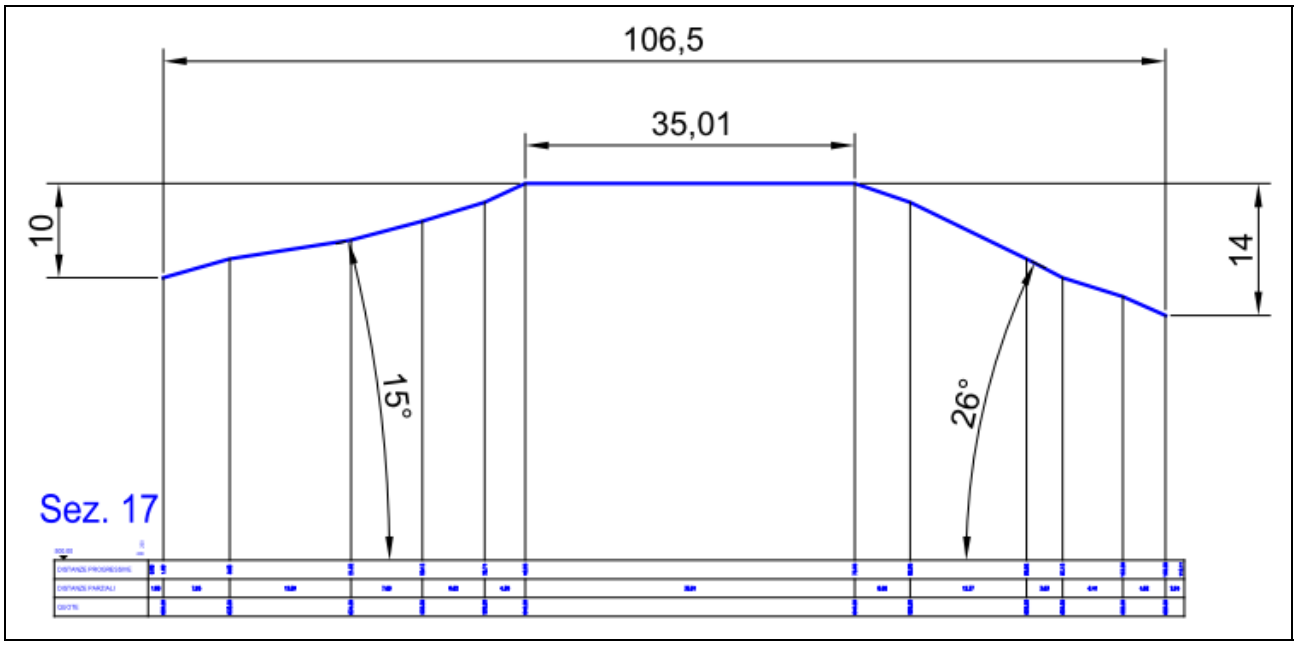
Sezione n. 15 - Brembilla loc. Gaiazzo (pendio).



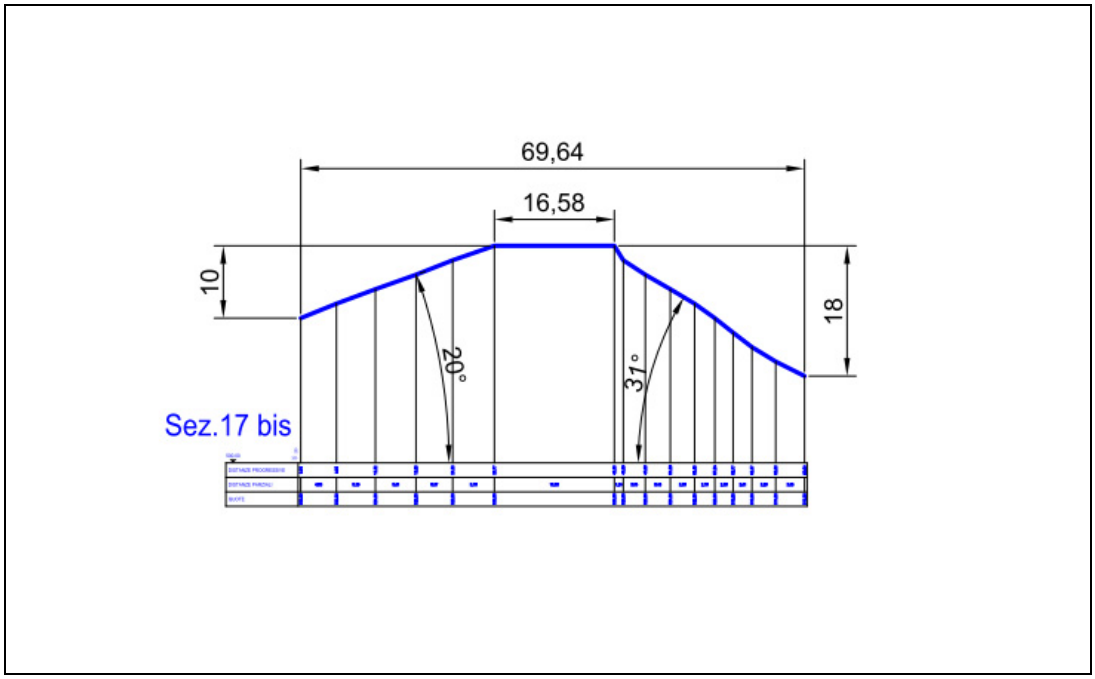
Sezione n. 16 - Cavaglia (cresta appuntita).



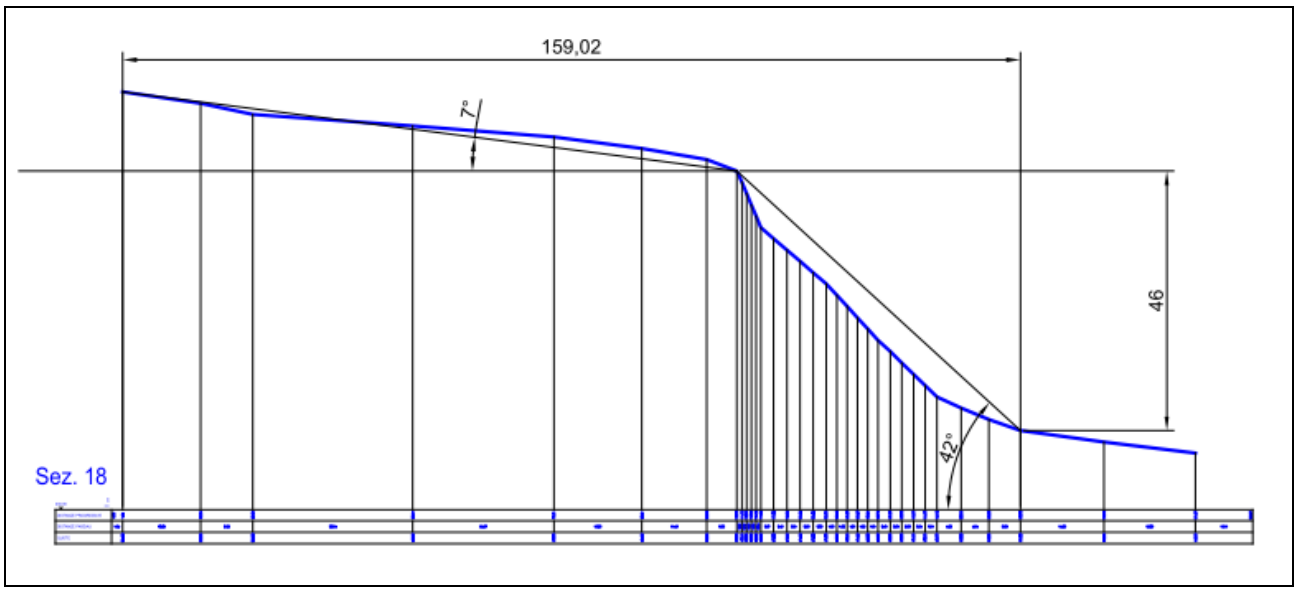
Sezione n. 16 bis - Cavaglia (cresta appuntita).



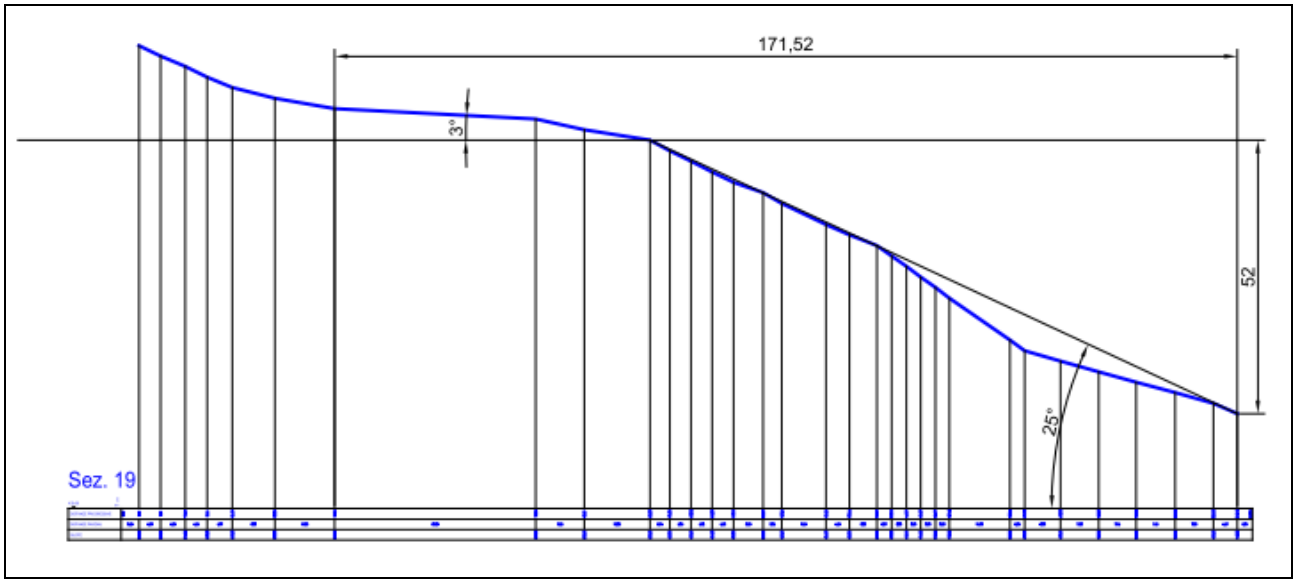
Sezione n. 17 - Brembilla loc. Tesotti (cresta arrotondata).



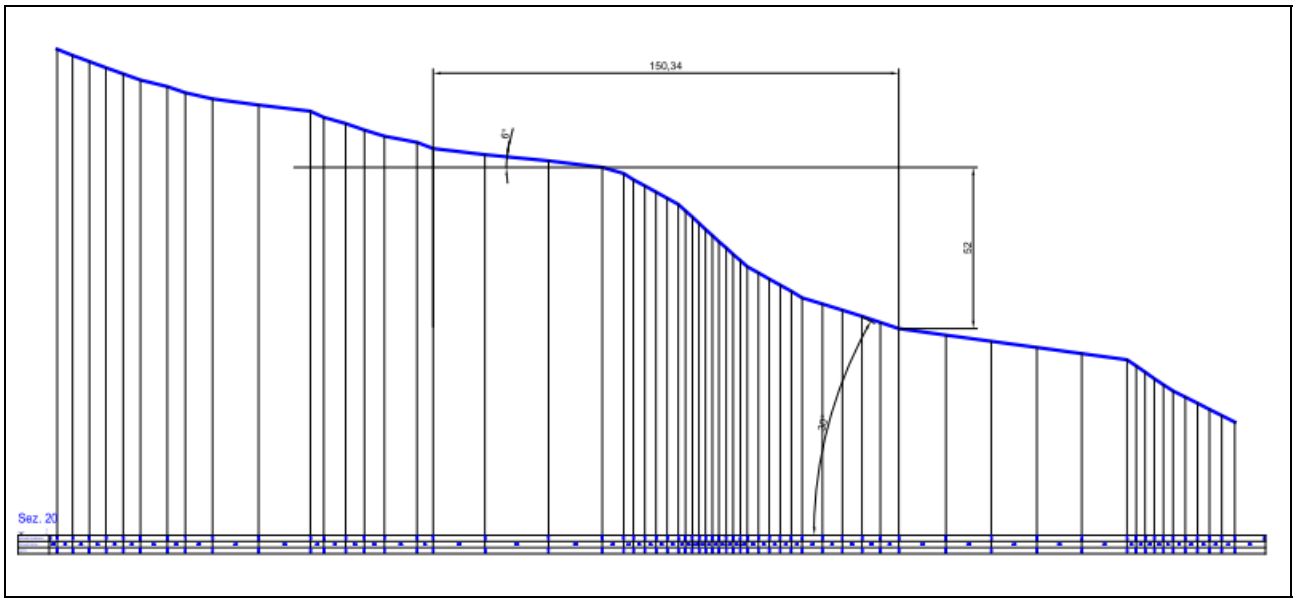
Sezione n. 17 bis - Brembilla loc. Tesotti (cresta arrotondata).



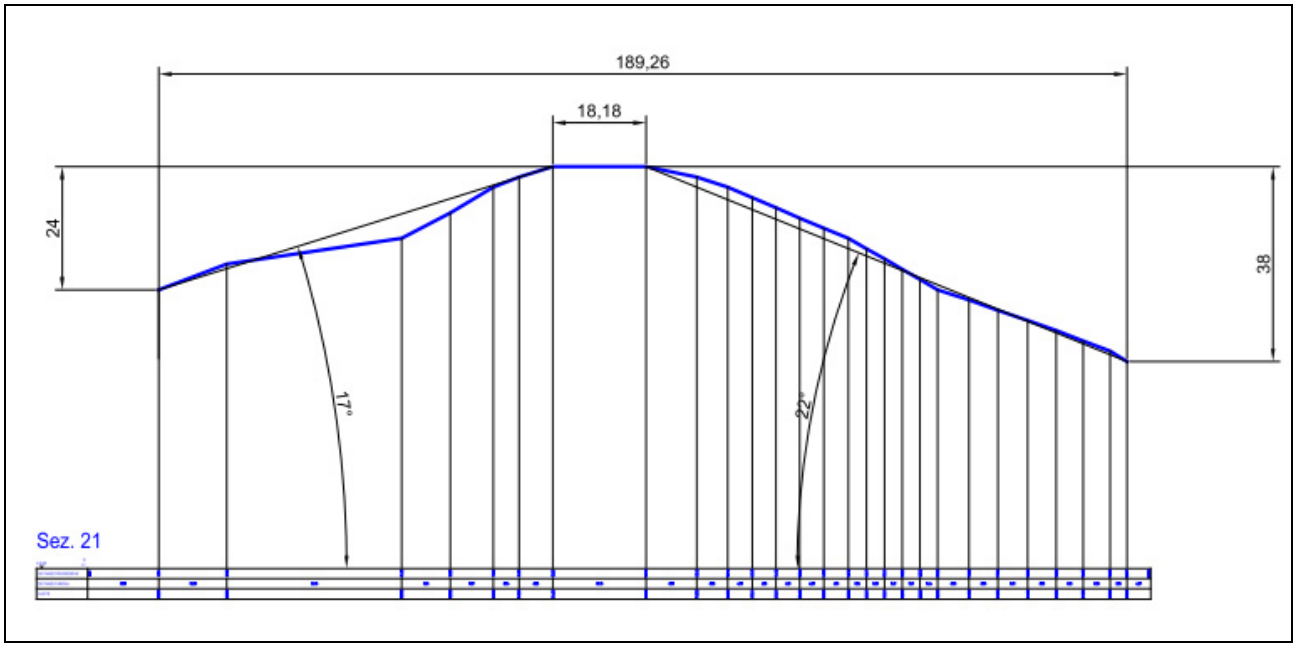
Sezione n. 18 - Brembilla loc. Garateno (scarpata in pendenza).



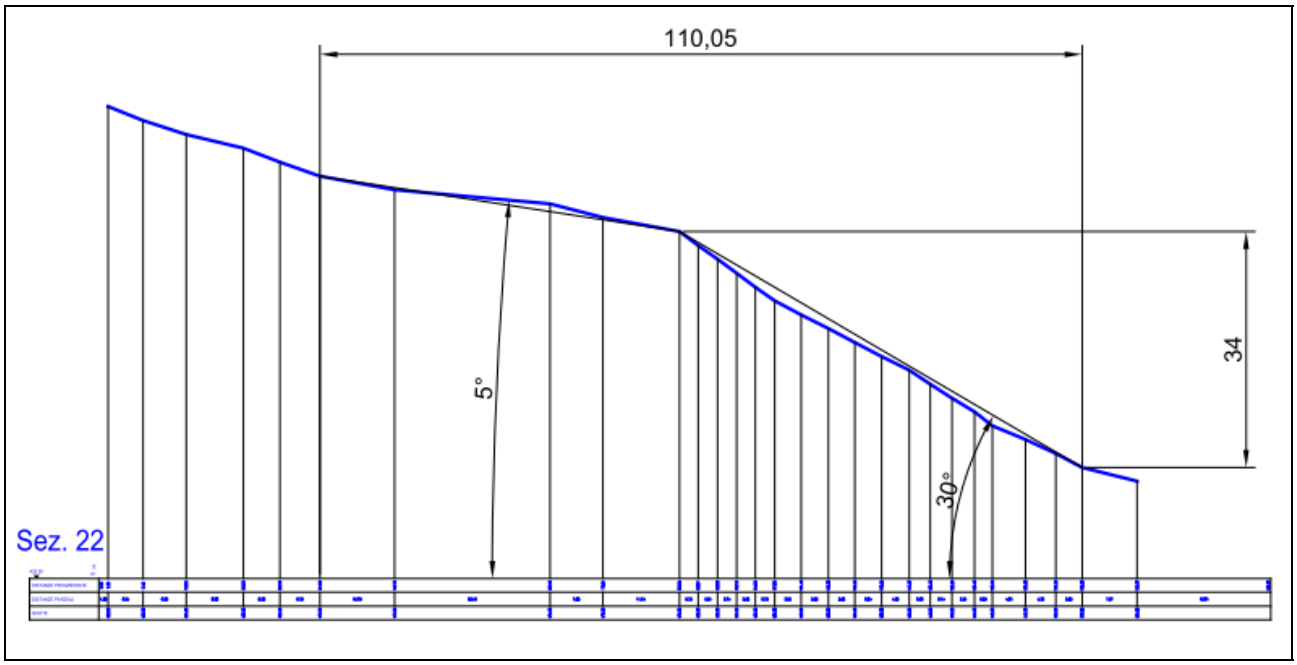
Sezione n. 19 - Brembilla loc. Garateno (scarpata in pendenza).



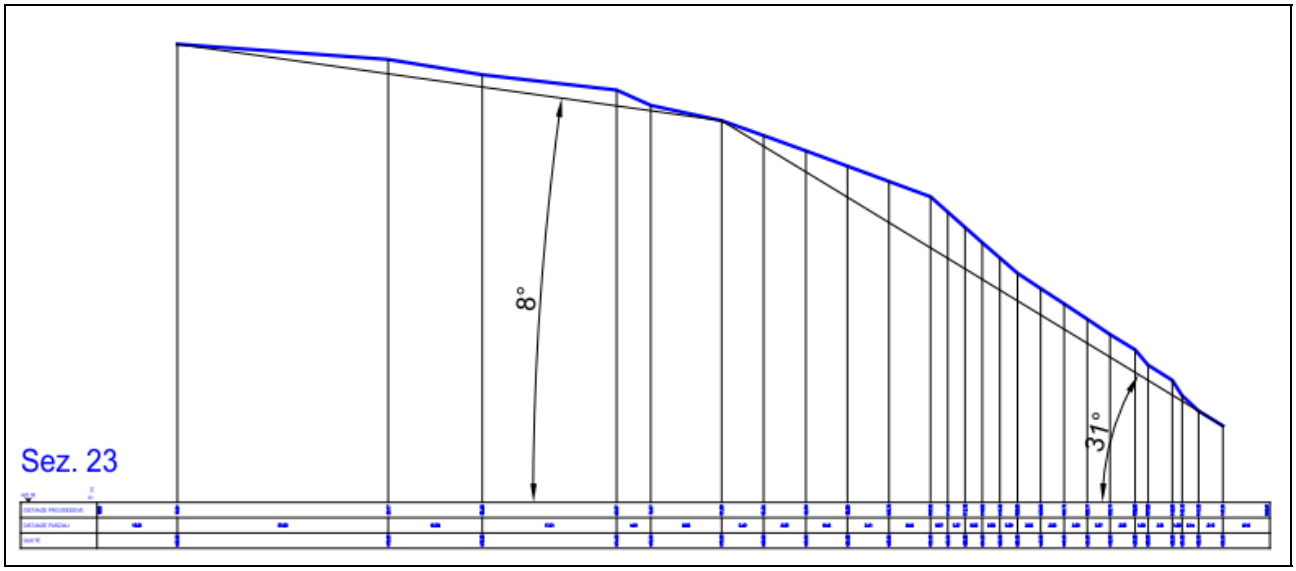
Sezione n. 20 - Brembilla loc. Roccolo (scarpata in pendenza).



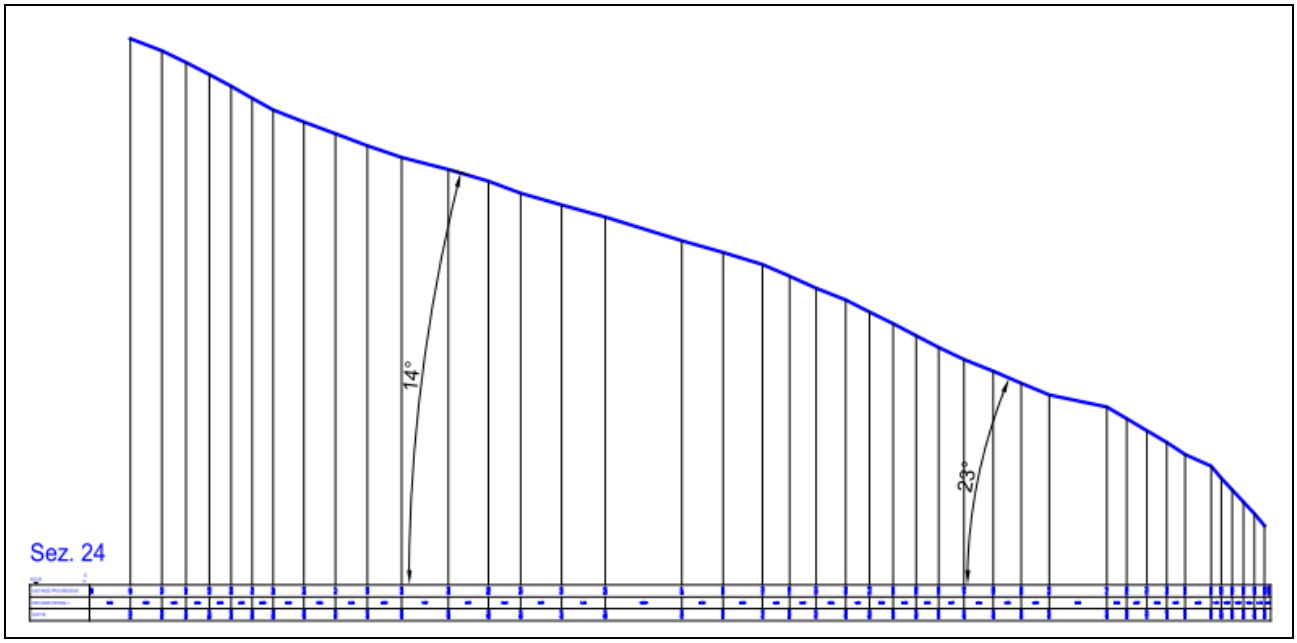
Sezione n. 21 - Brembilla loc. Roccolo (cresta appuntita).



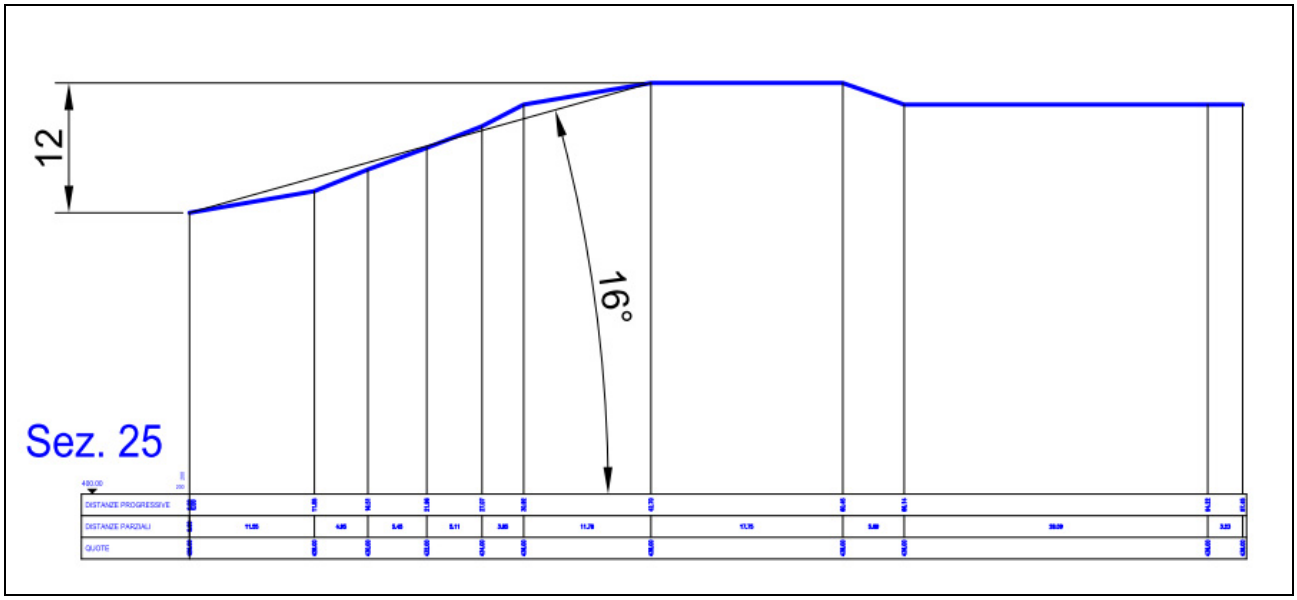
Sezione n. 22 - Brembilla via Libertà (scarpata in pendenza).



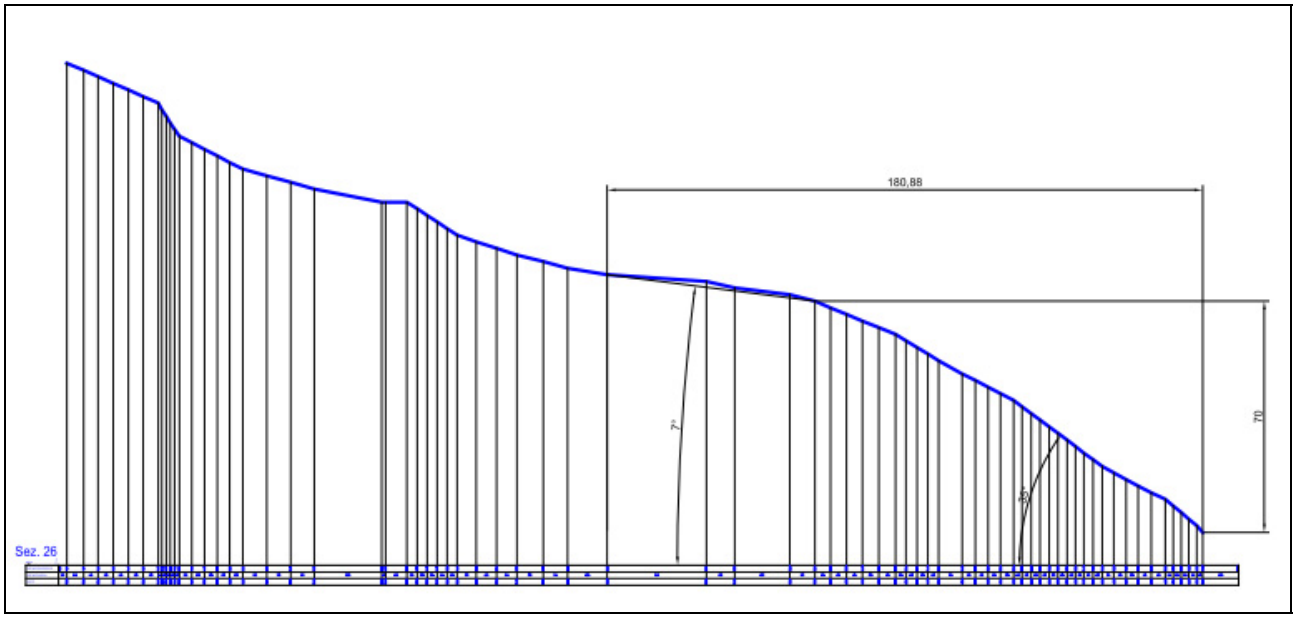
Sezione n. 23 - Brembilla via Libertà (pendio).



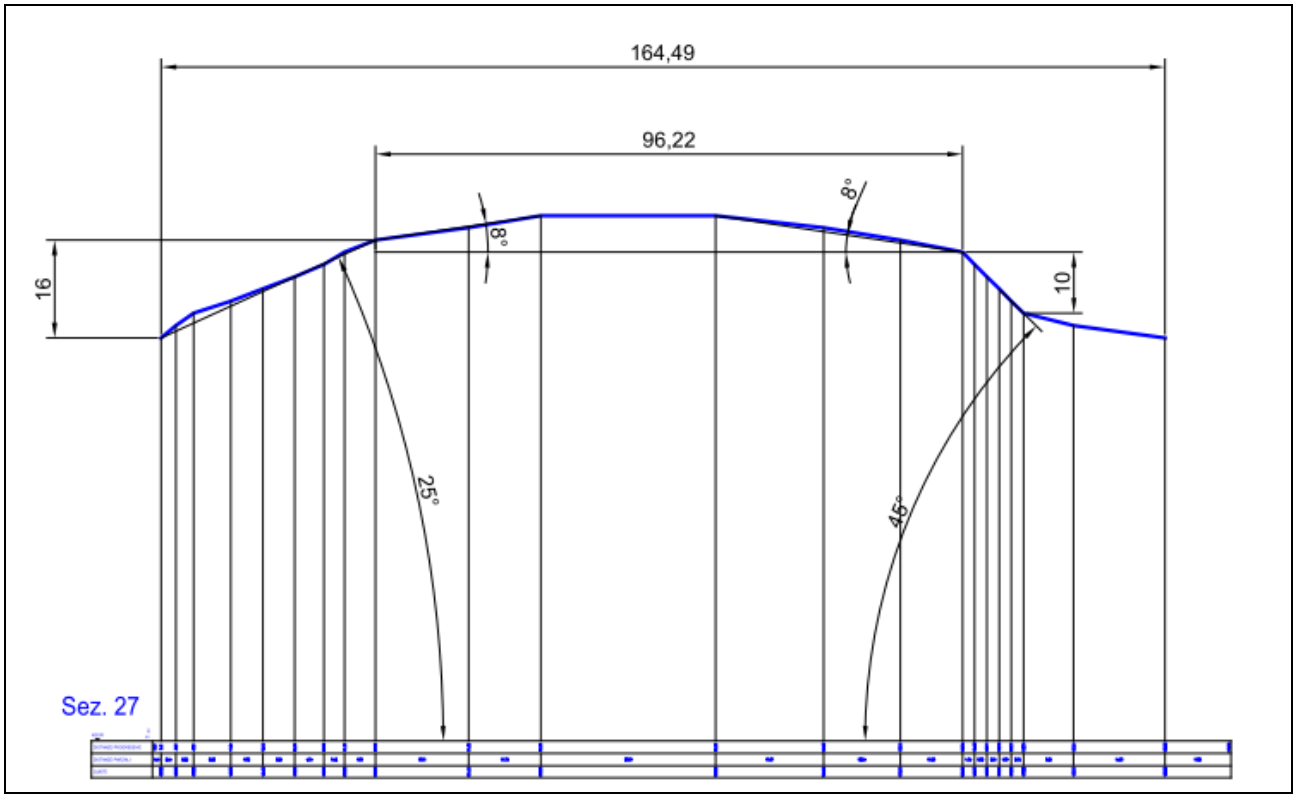
Sezione n. 24 - Brembilla loc. Capodato (pendio).



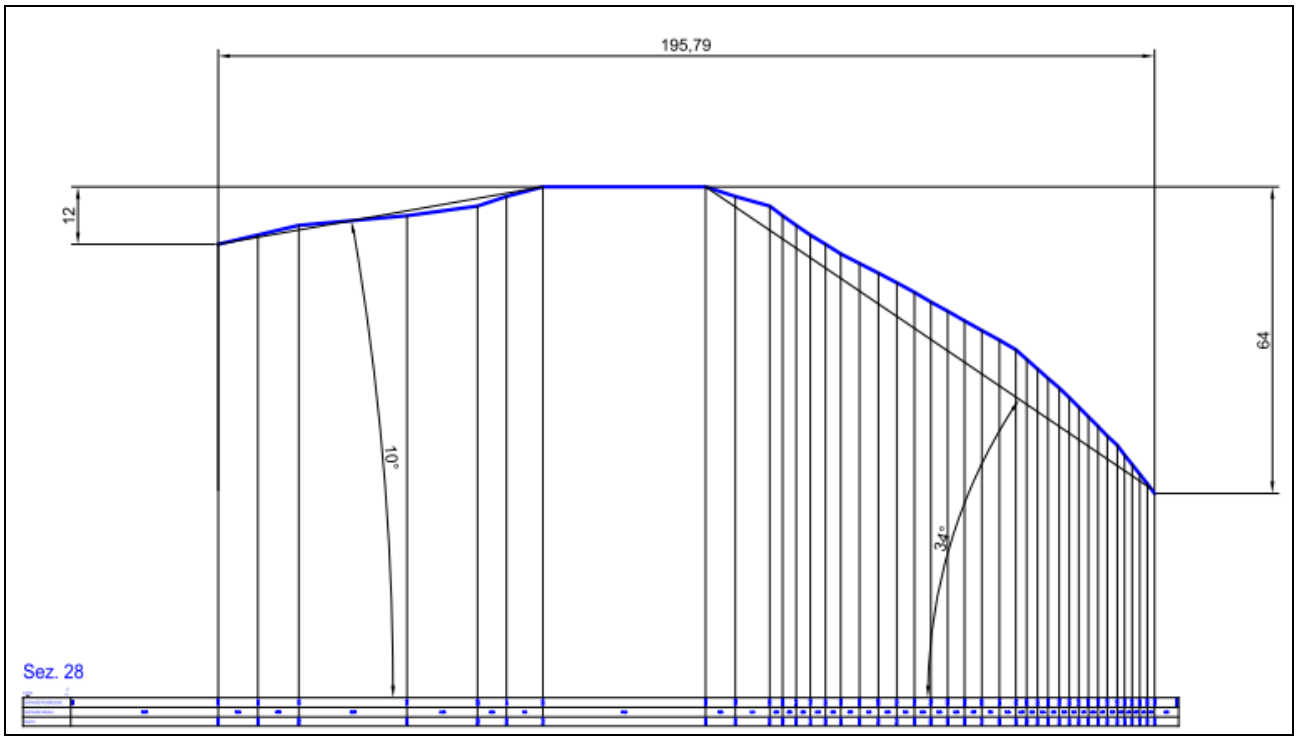
Sezione n. 25 - Brembilla Villaggio Europa.



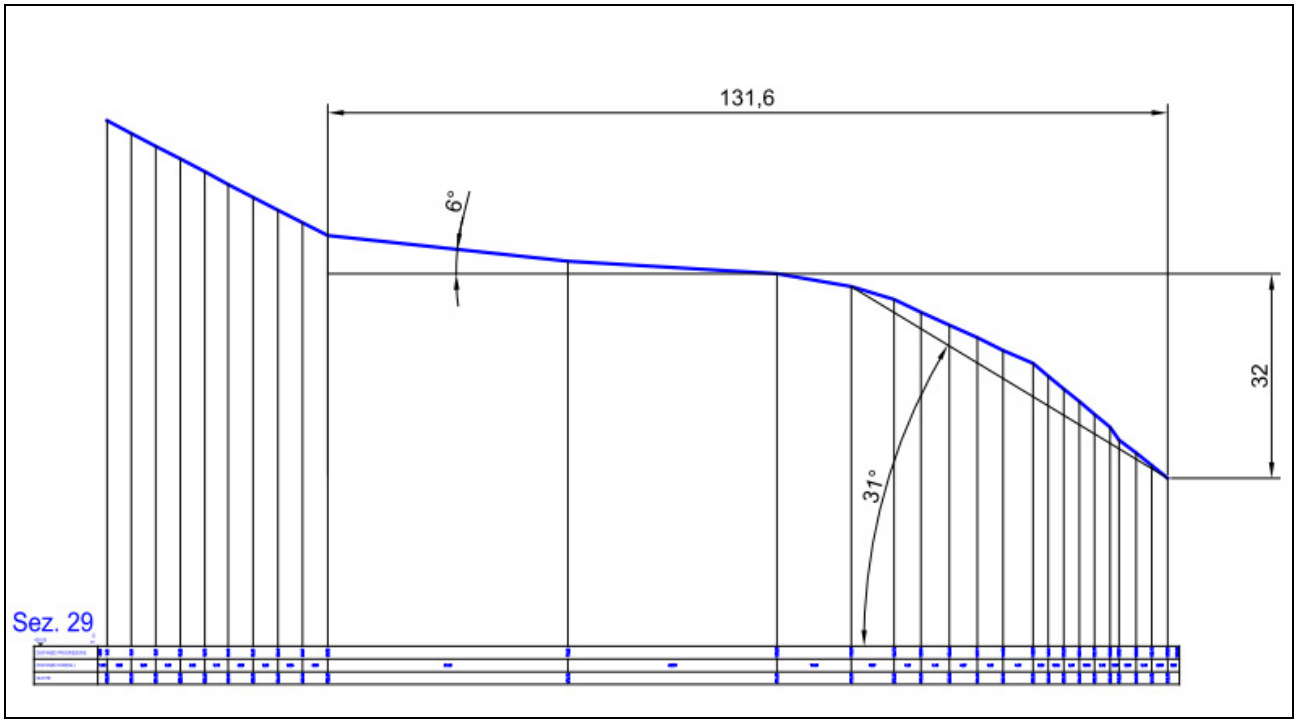
Sezione n. 26 - Brembilla loc. Chigavacche (scarpata in pendenza).



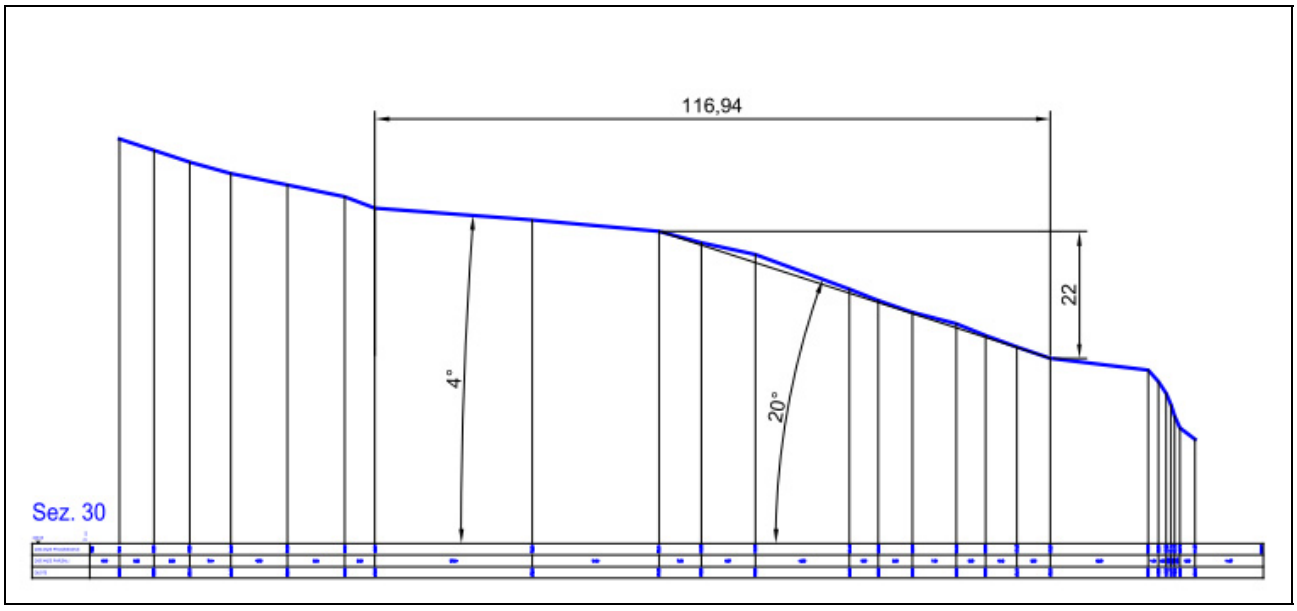
Sezione n. 27 - Brembilla loc. Chigavacche (cresta arrotondata).



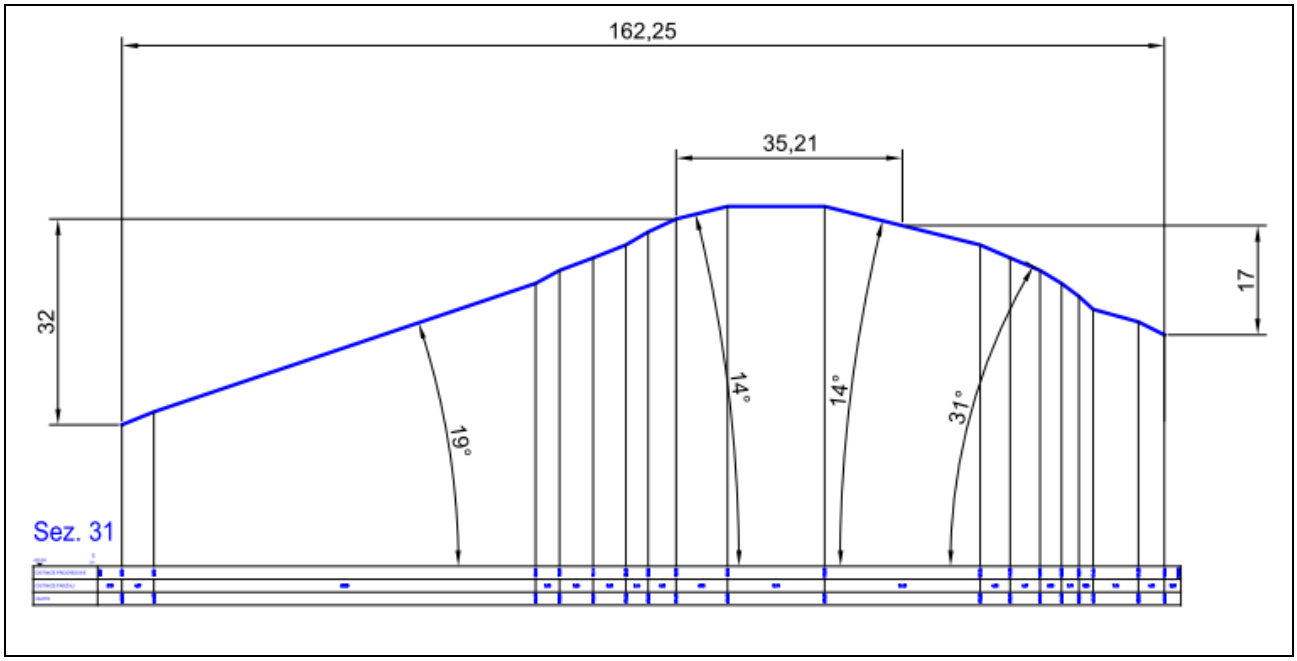
Sezione n. 28 - Brembilla loc. Foppa (cresta appuntita).



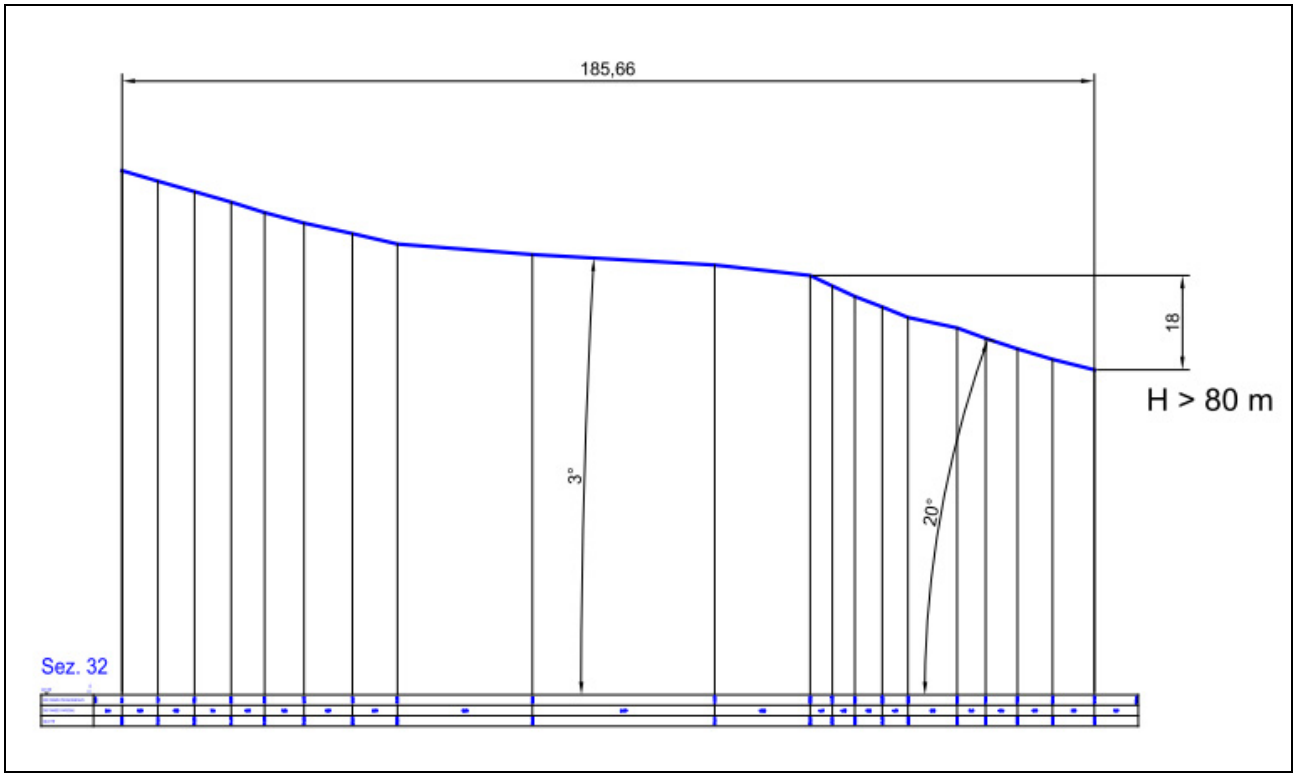
Sezione n. 29- Brembilla loc. Foppa (scarpata in pendenza).



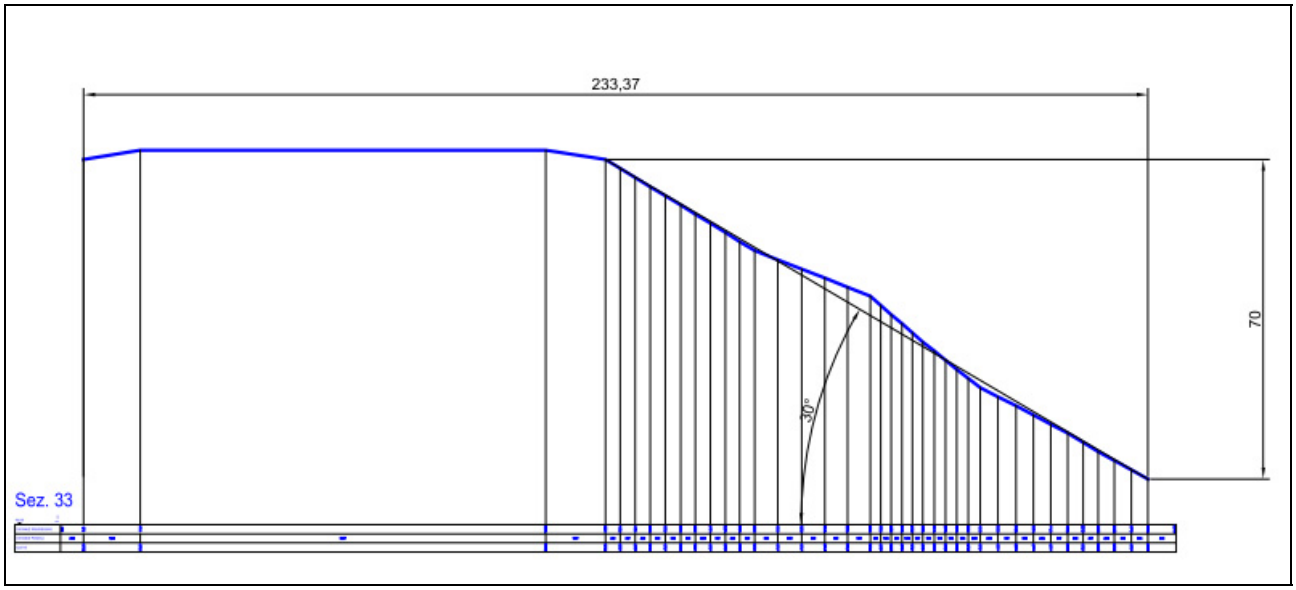
Sezione n. 30 - Brembilla loc. Cabonocchio (scarpata in pendenza).



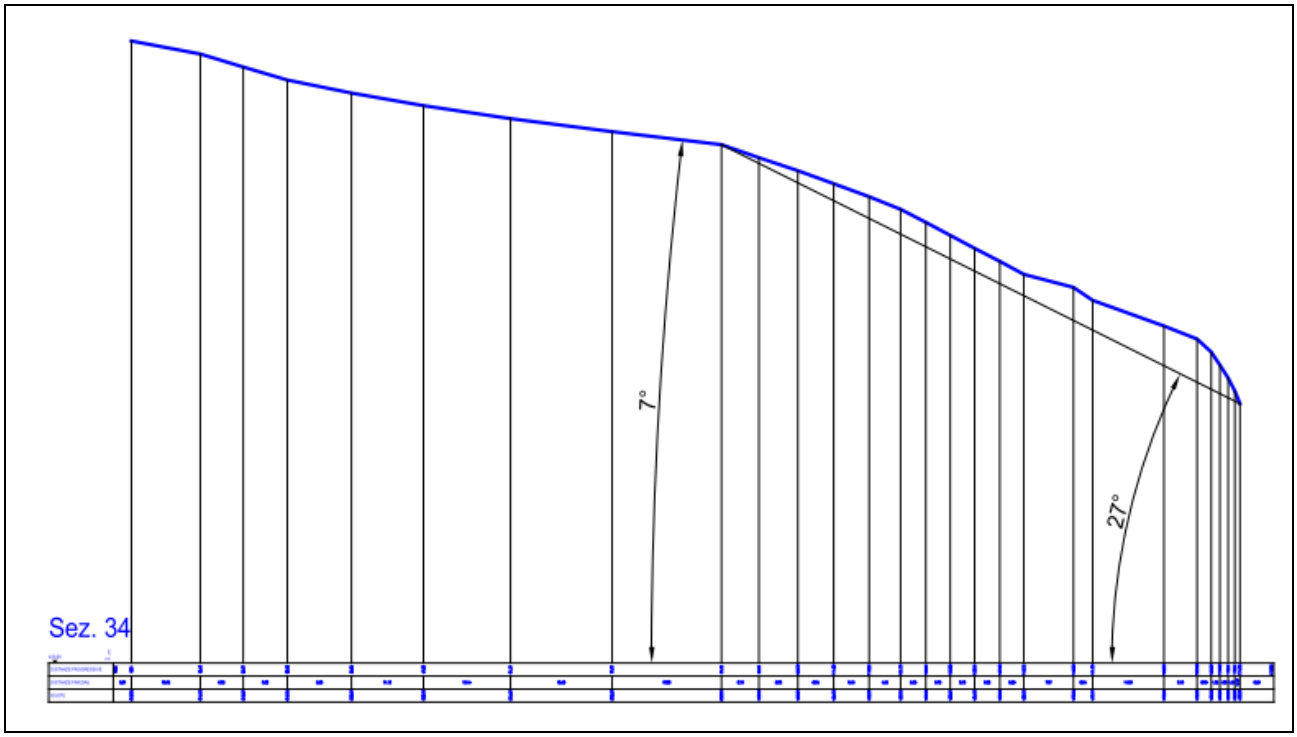
Sezione n. 31 - Brembilla loc. Cabonocchio (cresta appuntita).



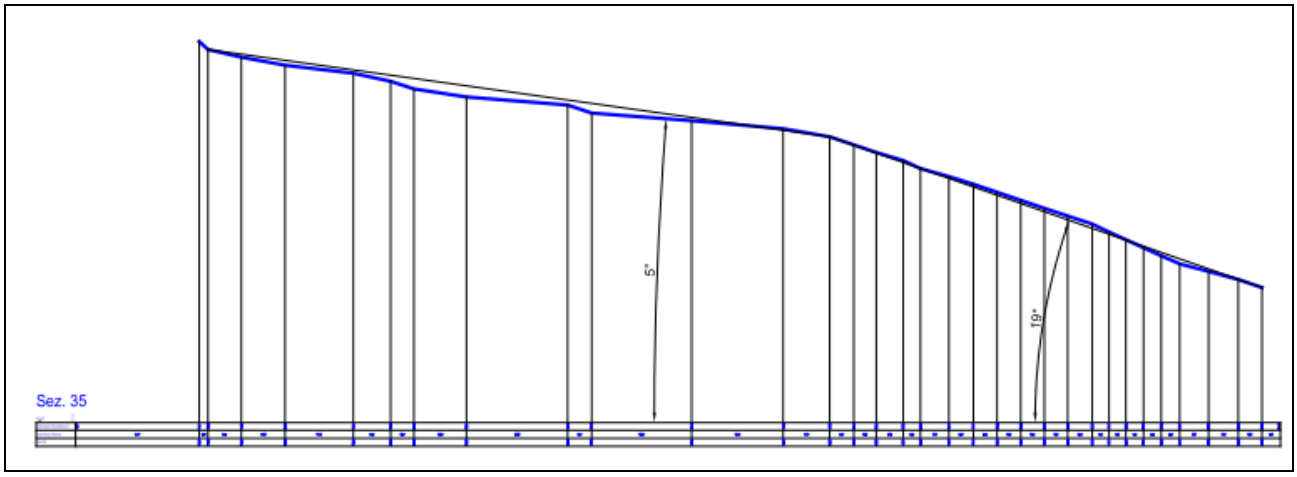
Sezione n. 32 - Brembilla loc. Cabonocchio (scarpata in pendenza).



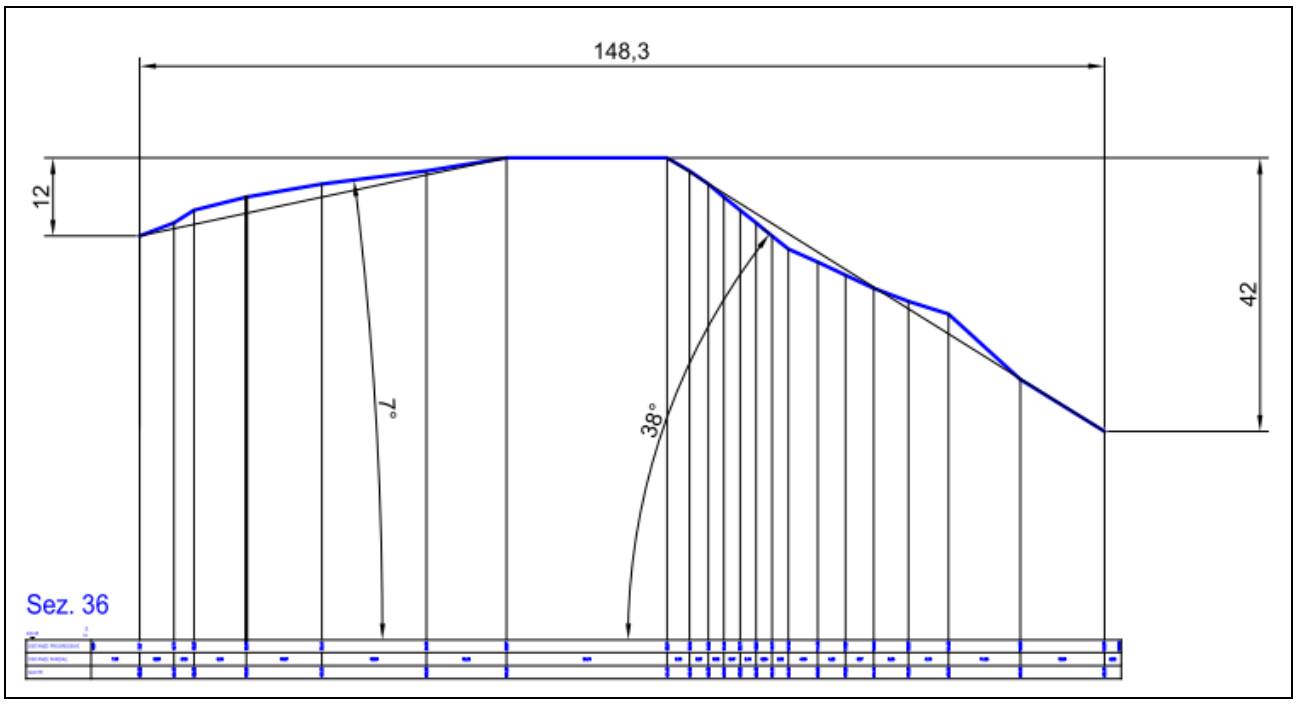
Sezione n. 33 - Brembilla loc. Cabonocchio (scarpata ideale).



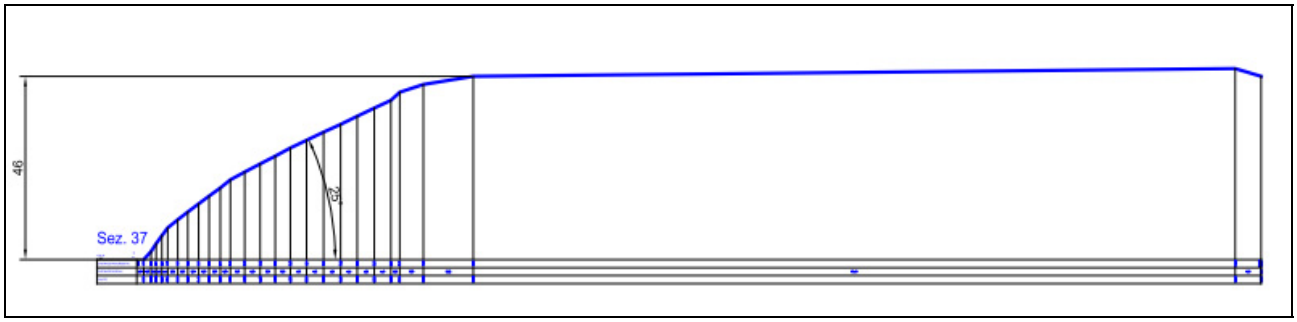
Sezione n. 34 - Brembilla loc. Cabonocchio (pendio).



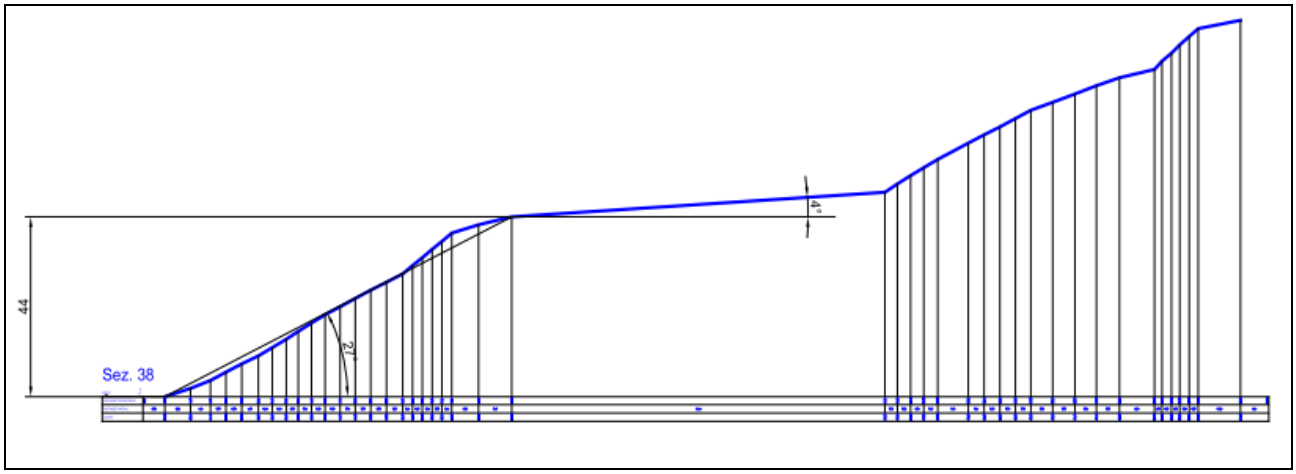
Sezione n. 35 - Brembilla via Caberardi (pendio).



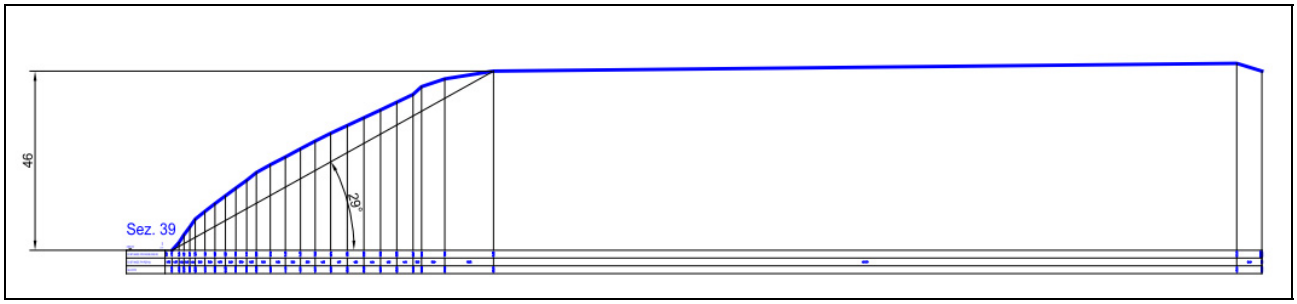
Sezione n.36 - Laxolo loc. Caberardi (scarpata in contropendenza).



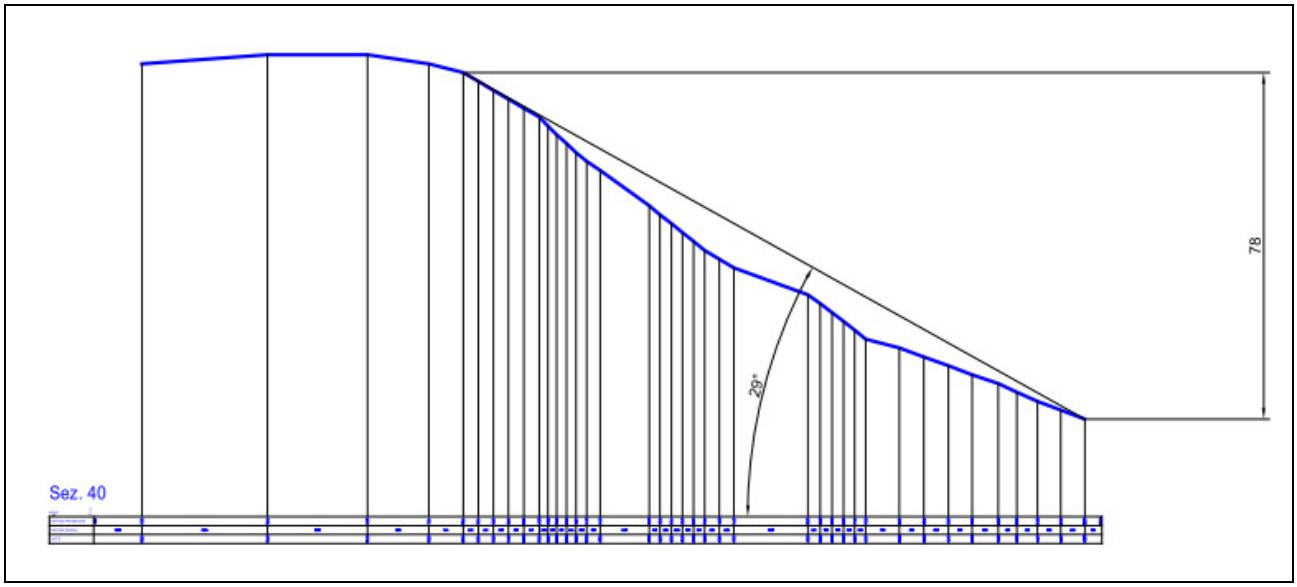
Sezione n.37 - Brembilla Campo Secomandi (scarpata ideale).



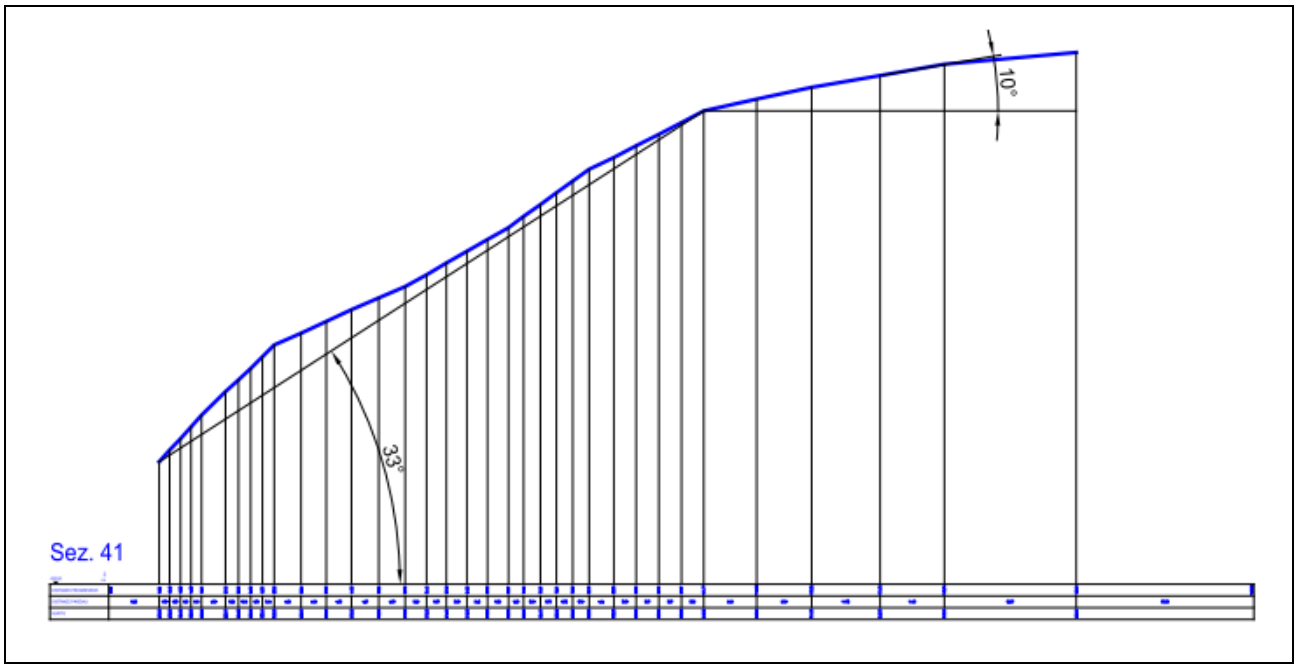
Sezione n. 38 - Brembilla Campo Secomandi (scarpata in pendenza).



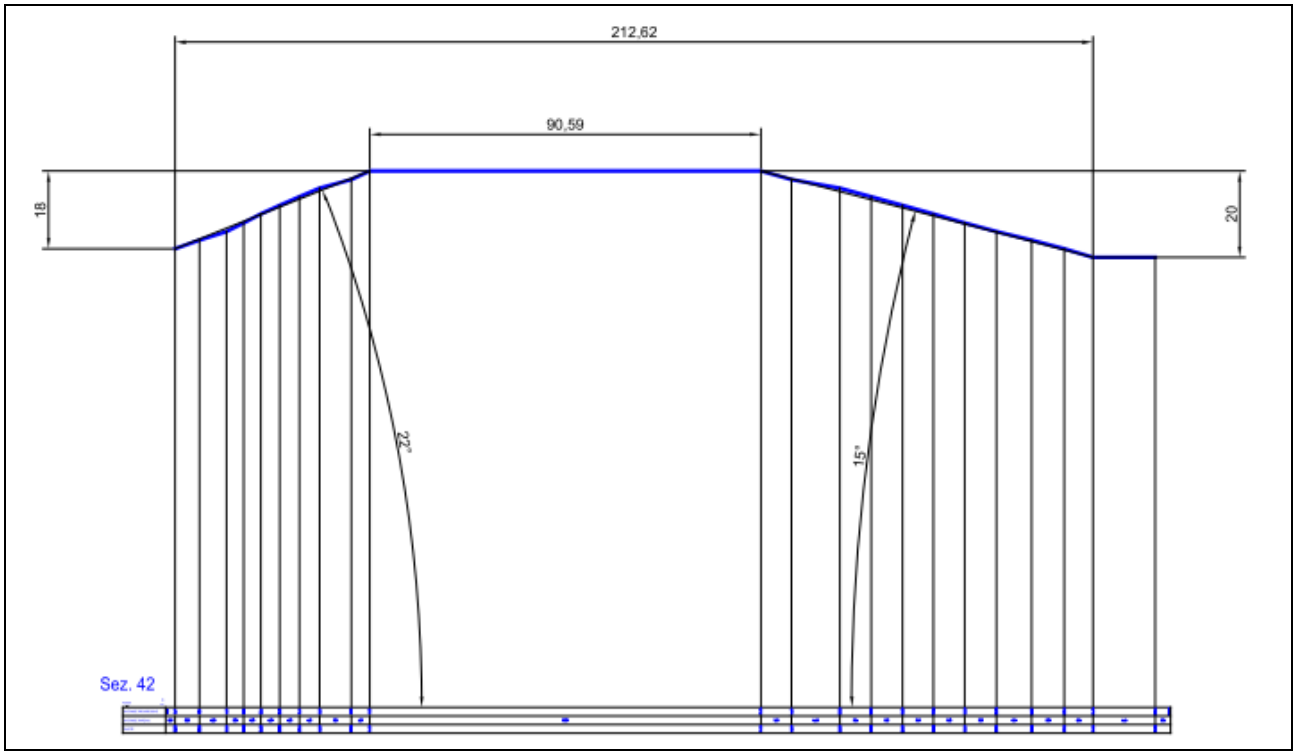
Sezione n. 39 - Brembilla Campo Secomandi (scarpata ideale).



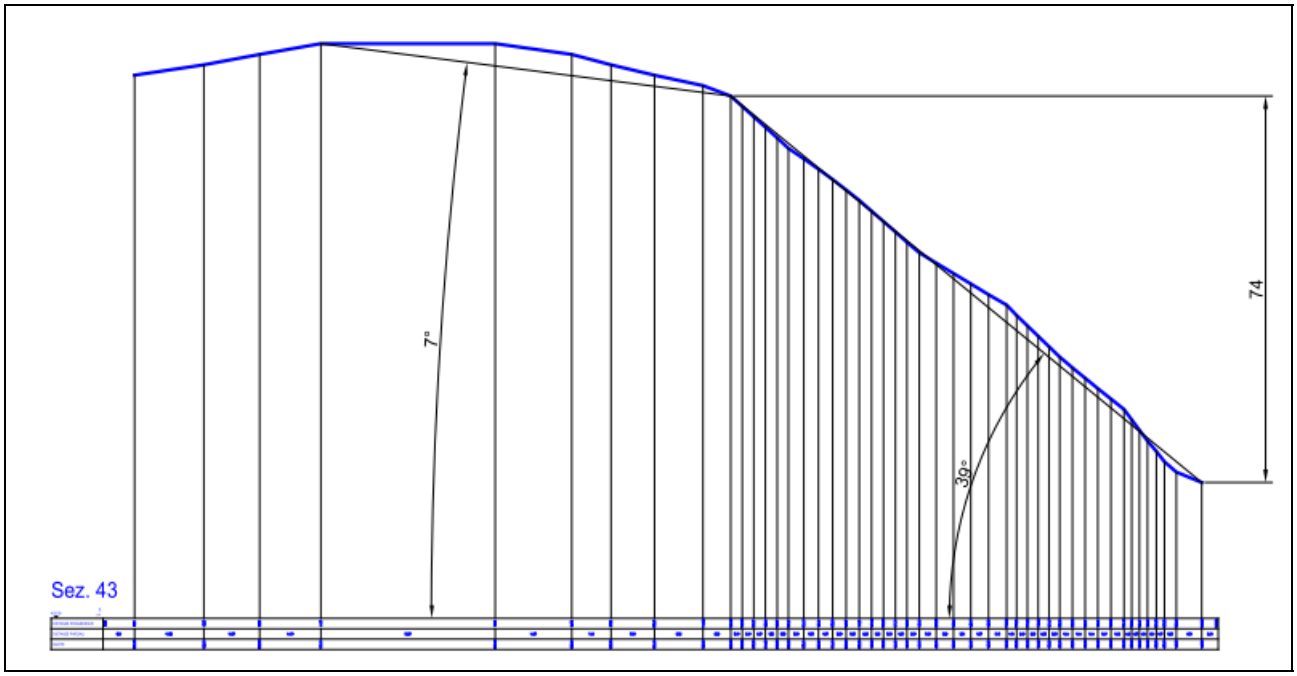
Sezione n. 40 - Brembilla loc. Caberardi (scarpata ideale).



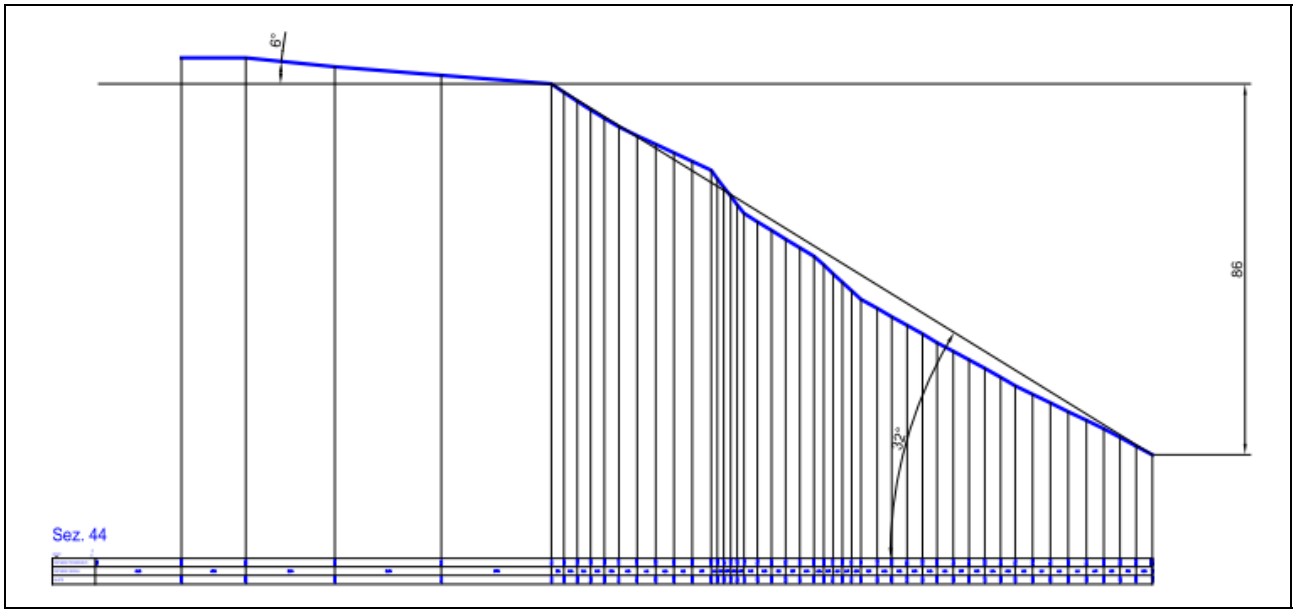
Sezione n. 41 - Brembilla loc. Malentrata (pendio).



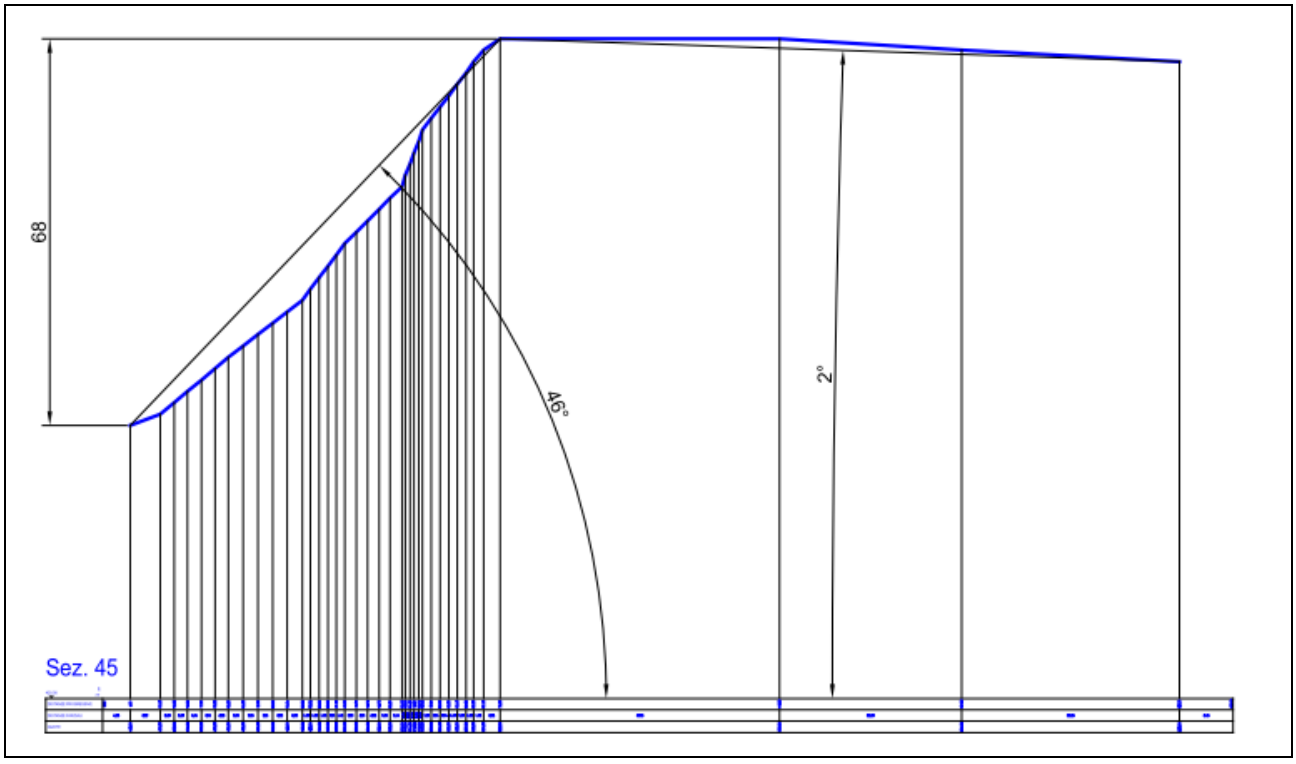
Sezione n. 42 - Laxolo loc. Torre (cresta arrotondata).



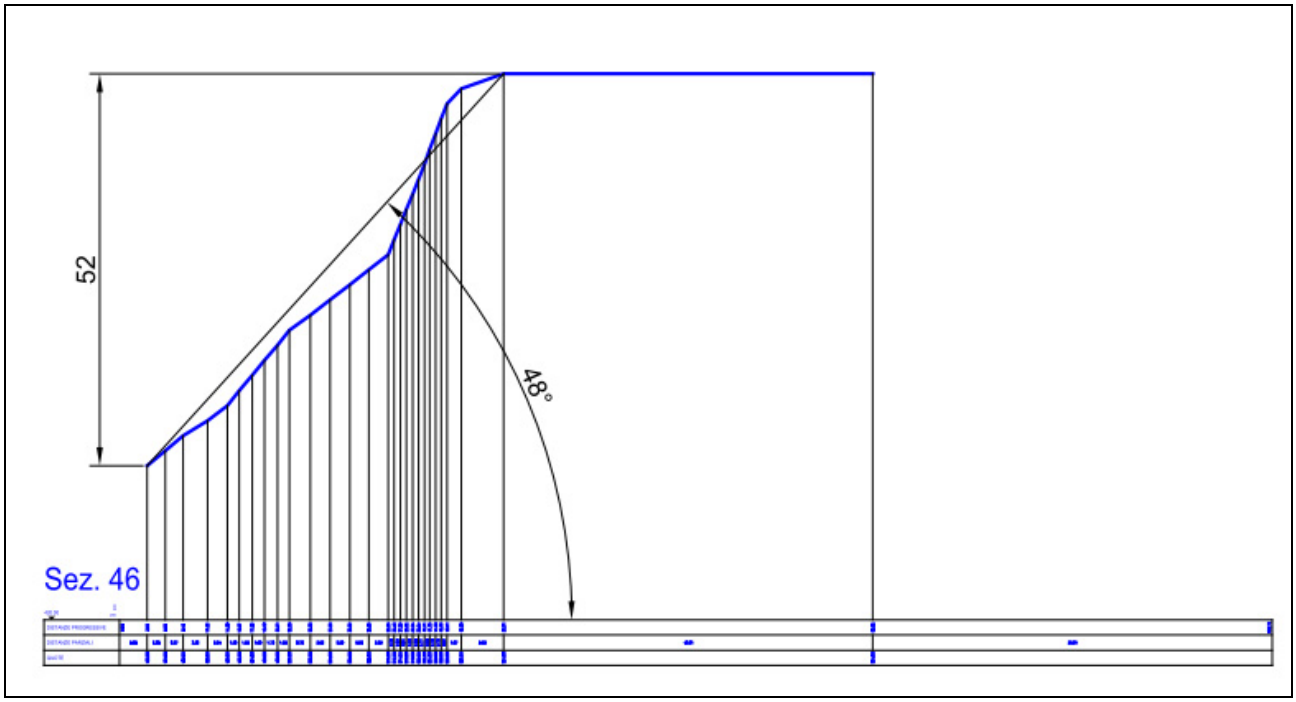
Sezione n. 43 - Laxolo loc. Caberardi (scarpata in pendenza).



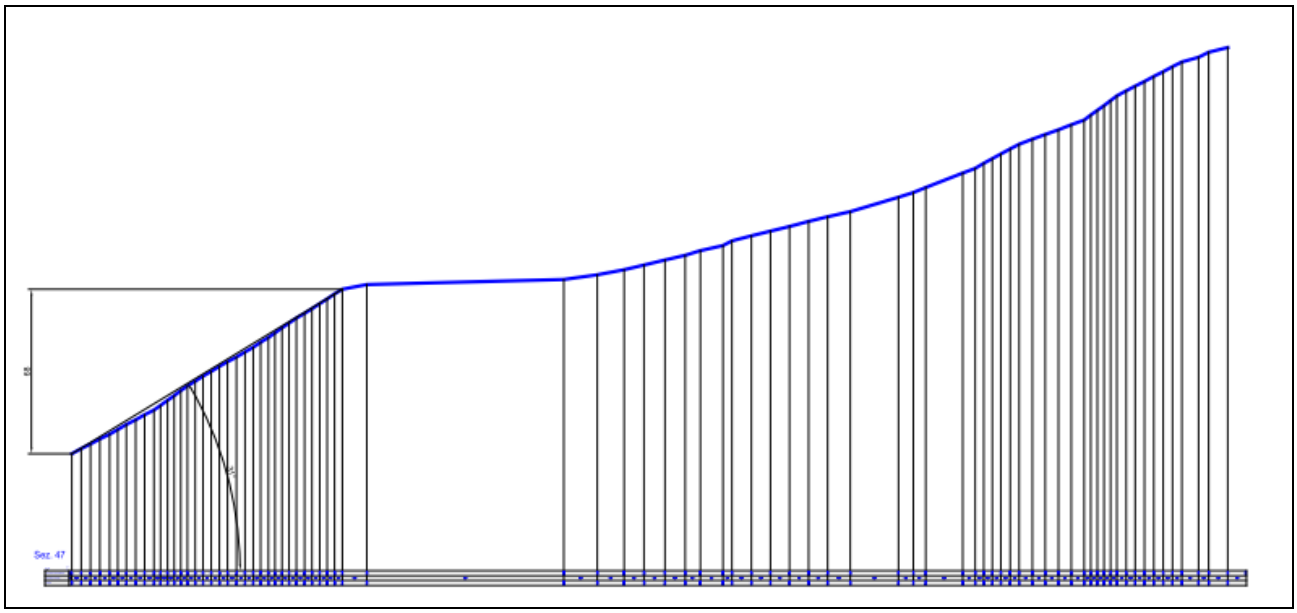
Sezione n. 44 - Laxolo loc. Caremondi (scarpata in pendenza).



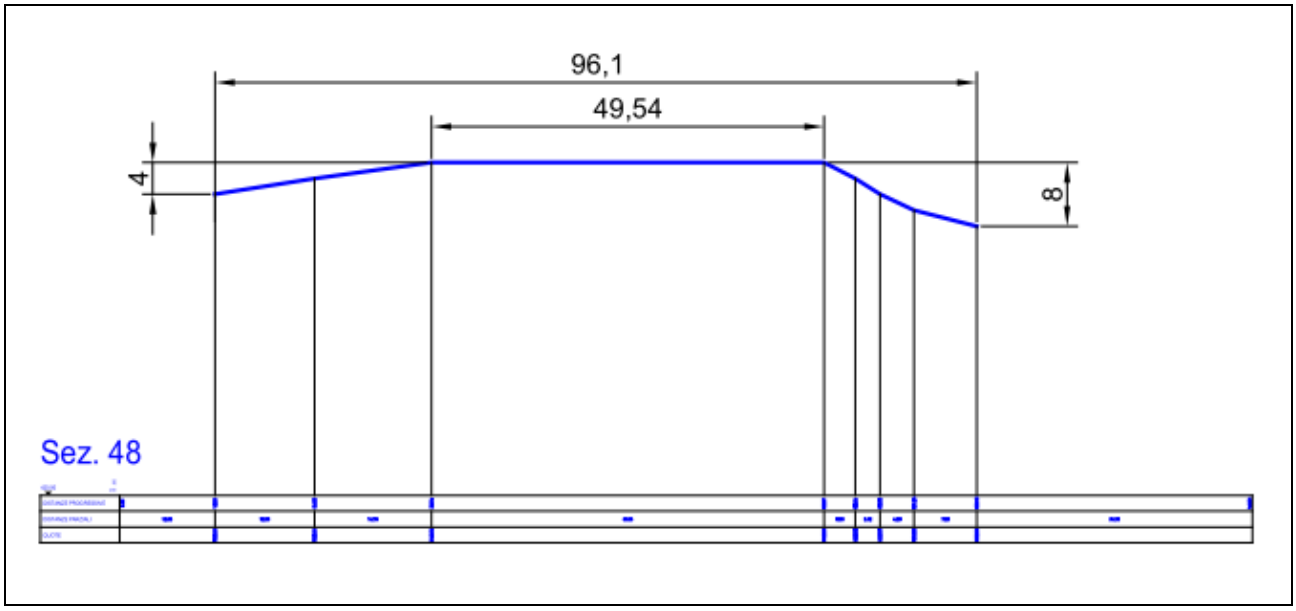
Sezione n. 45 - Laxolo loc. Caremondi (scarpata ideale).



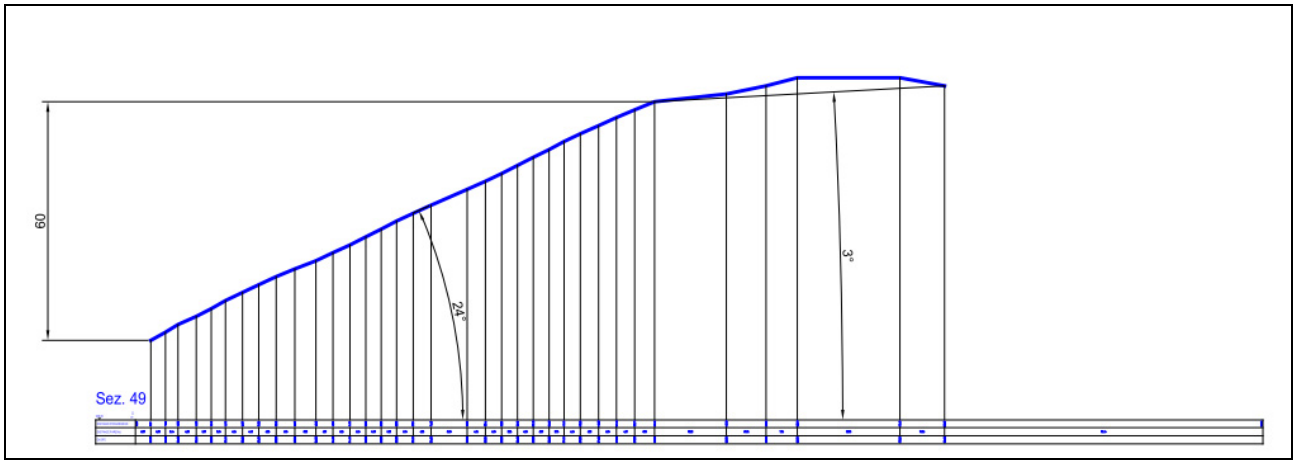
Sezione n. 46 - Laxolo loc. Caremondi (scarpata ideale).



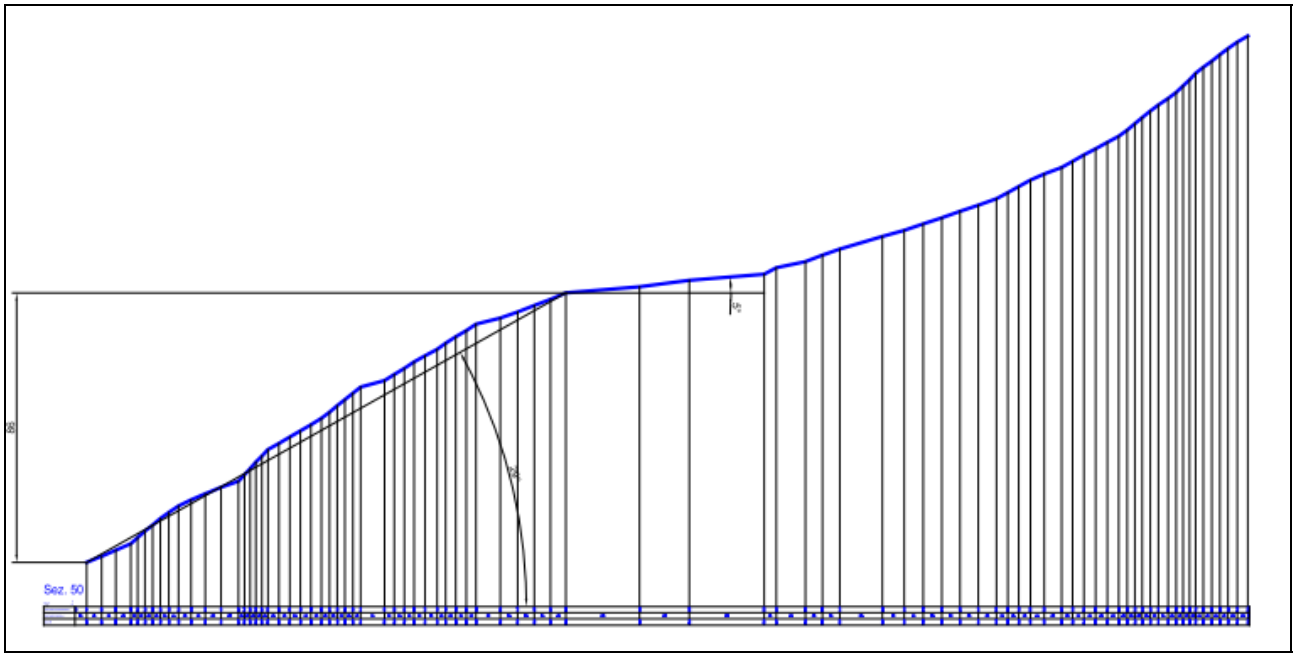
Sezione n. 47 - Brembilla loc. Castignola (scarpata ideale).



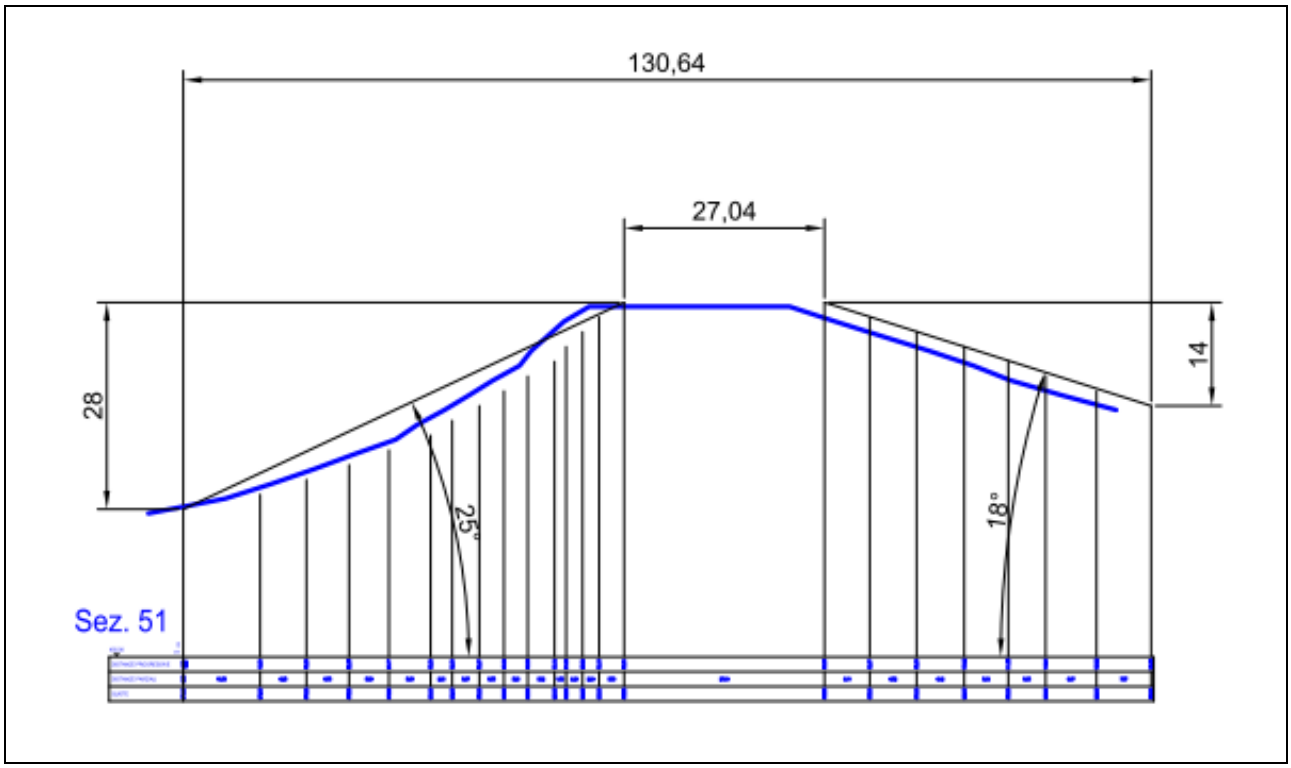
Sezione n.48 - Brembilla loc. Castignola (cresta arrotondata).



Sezione n.49 - Brembilla loc. Sant'Antonio Abbandonato (scarpata in pendenza).



Sezione n.50 - Brembilla loc. Catremerio (scarpata in pendenza).



Sezione n.51 - Brembilla loc. Lera (cresta arrotondata).

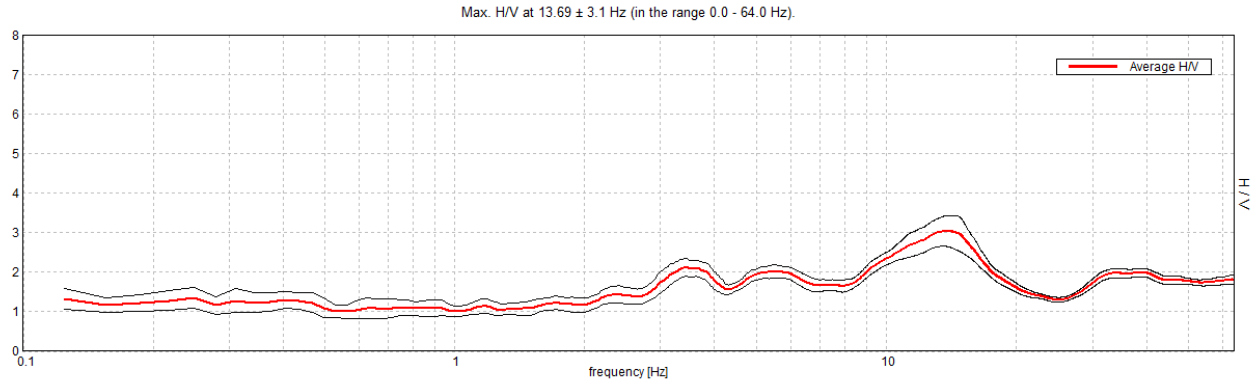
Misure di rumore sismico HVSR a stazione singola

T01 - BREMBILLA Chiesa Parrocchiale e Municipio Via Don Rizzi

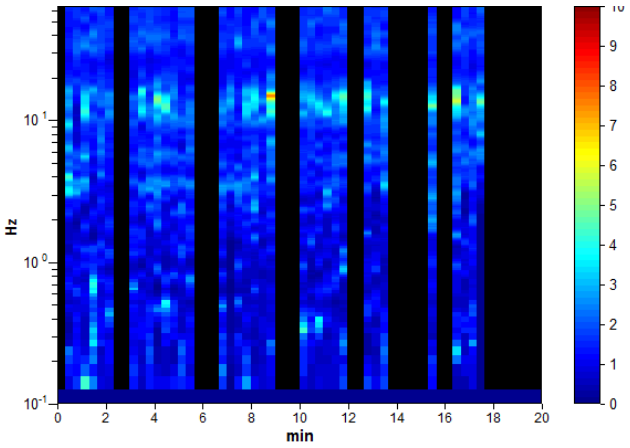
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 21/01/00 05:02:31 End recording: 21/01/00 05:22:32
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 58% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

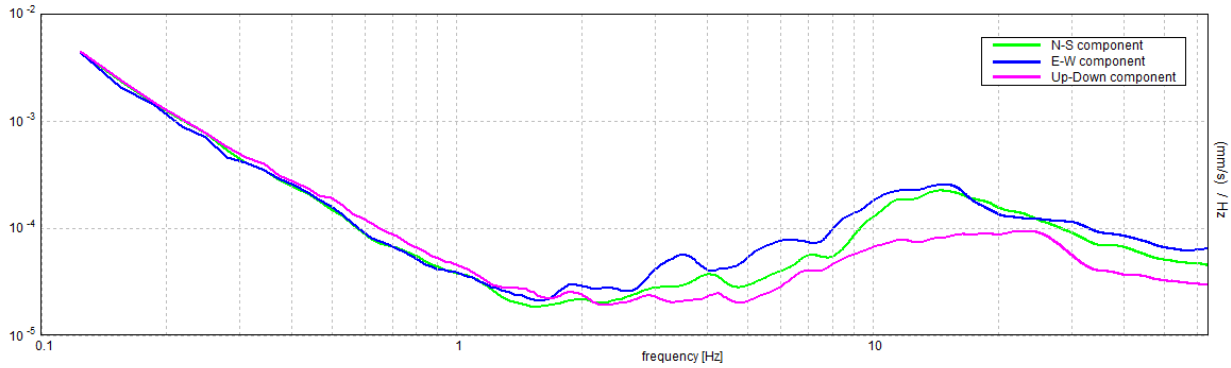
HORIZONTAL TO VERTICAL SPECTRAL RATIO



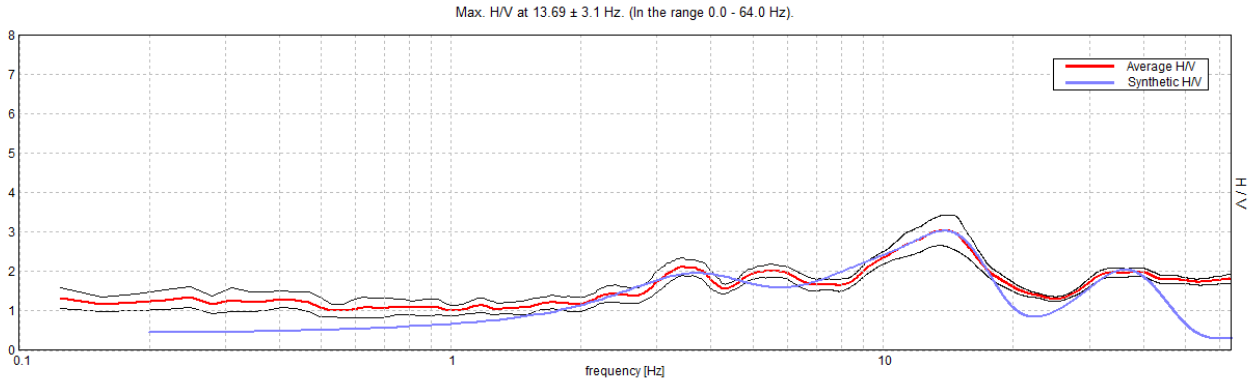
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

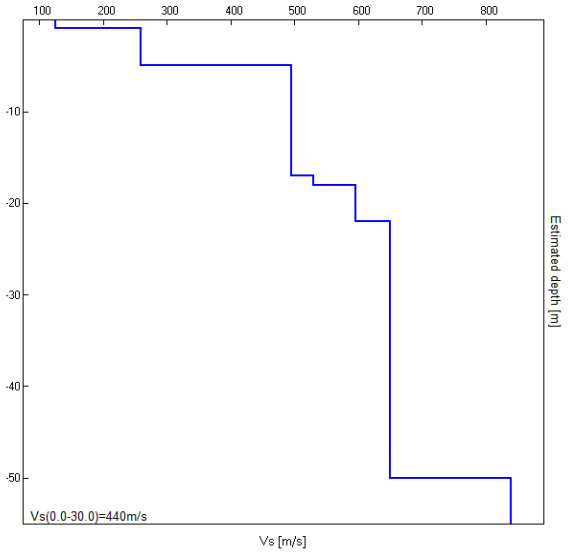


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.90	0.90	125	0.42
5.00	4.10	260	0.42
17.00	12.00	495	0.45
18.00	1.00	530	0.42
22.00	4.00	596	0.42
50.00	28.00	650	0.45
inf.	inf.	840	0.45

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 13.69 ± 3.1 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	13.69 > 0.50	OK	
$n_c(f_0) > 200$	9581.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 658 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	20.688 Hz	OK	
$A_0 > 2$	3.04 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.22675| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	3.10362 < 0.68438		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3826 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

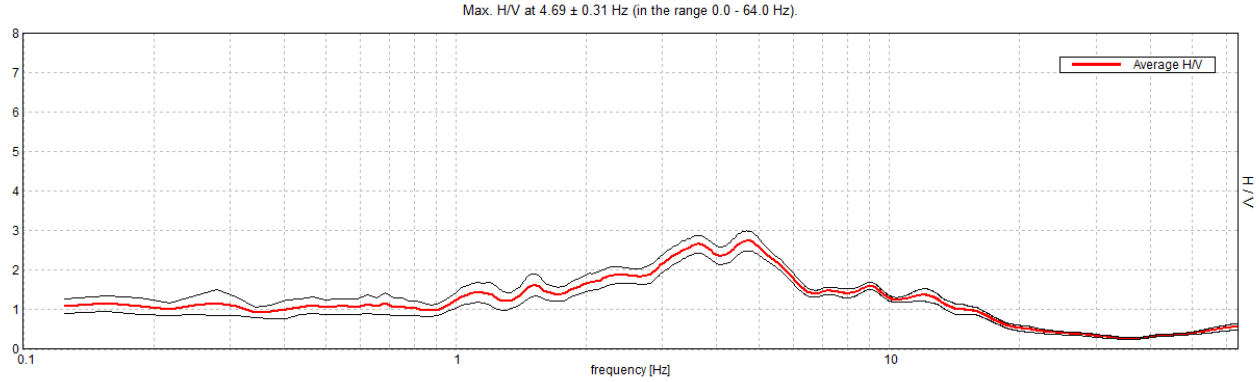
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T02 - BREMBILLA Scuole Medie Via Valletta

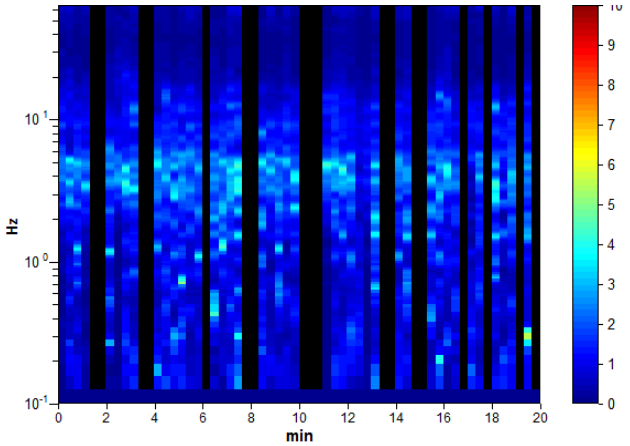
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 21/01/00 05:51:03 End recording: 21/01/00 06:11:04
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

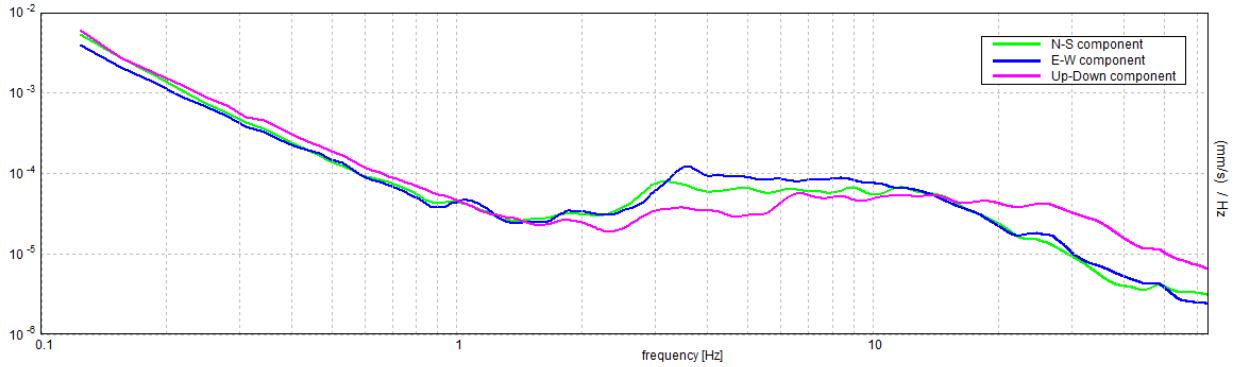
HORIZONTAL TO VERTICAL SPECTRAL RATIO



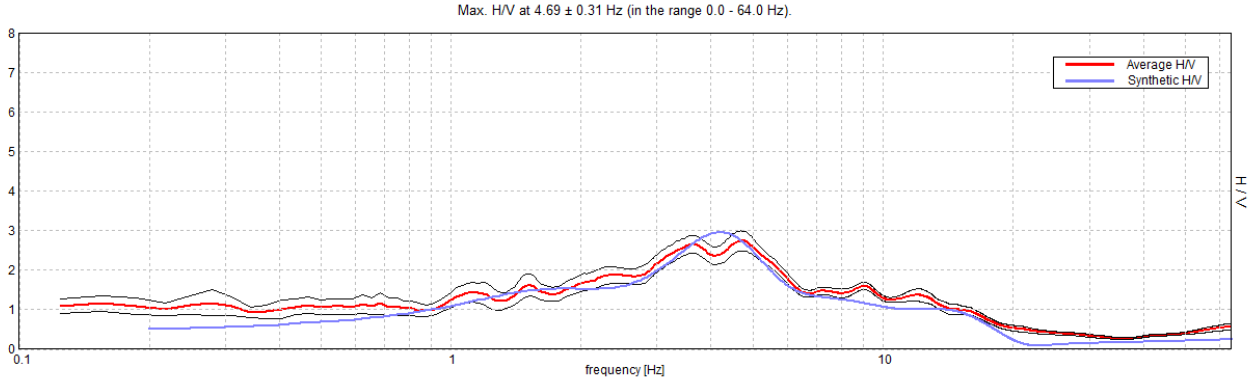
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

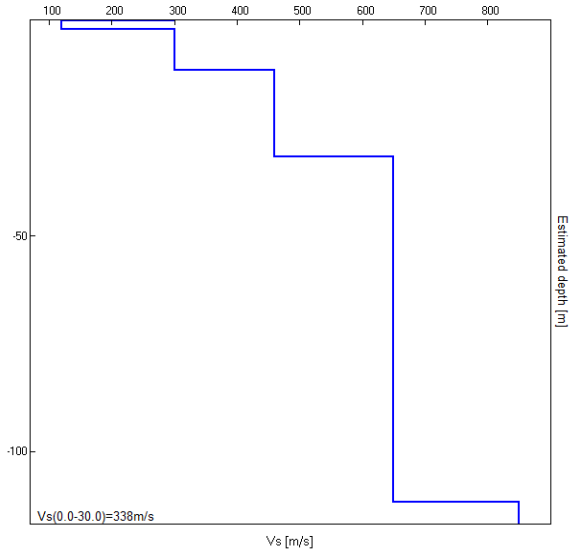


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.20	0.20	300	0.42
2.20	2.00	120	0.42
11.70	9.50	300	0.42
31.70	20.00	460	0.42
111.70	80.00	650	0.42
inf.	inf.	850	0.40

Vs(0.0-30.0)=338m/s



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

Max. H/V at 4.69 ± 0.31 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.69 > 0.50	OK	
$n_c(f_0) > 200$	3937.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 226 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.406 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	9.781 Hz	OK	
$A_0 > 2$	2.74 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.06637| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.31112 < 0.23438		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2548 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

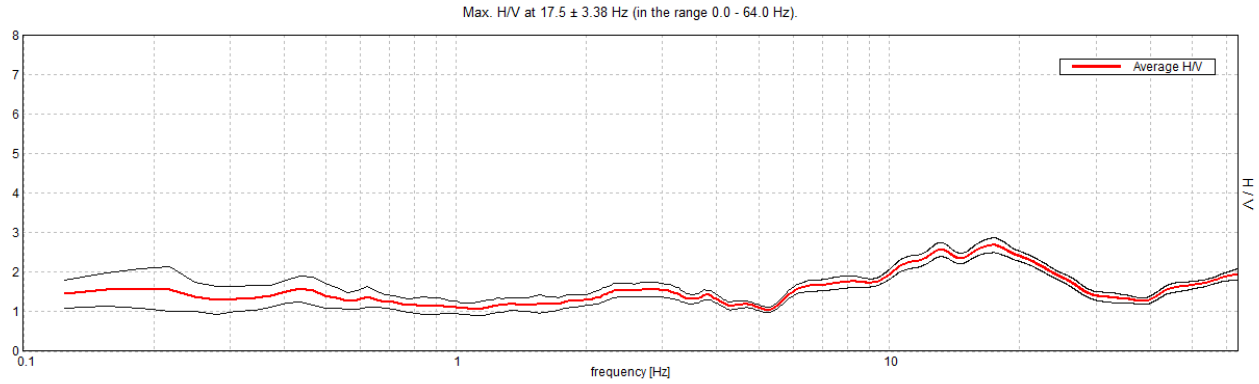
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T03 - LAXOLO Chiesa Parrocchiale Piazza S.Eurosia

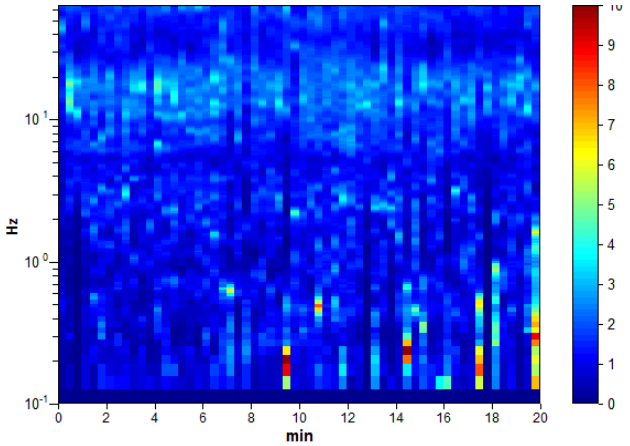
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 21/01/00 06:22:58 End recording: 21/01/00 06:42:59
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

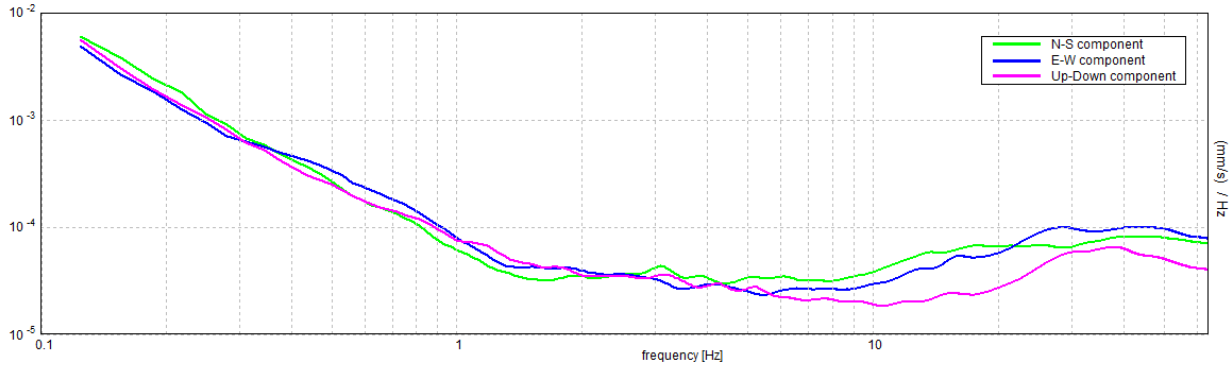
HORIZONTAL TO VERTICAL SPECTRAL RATIO



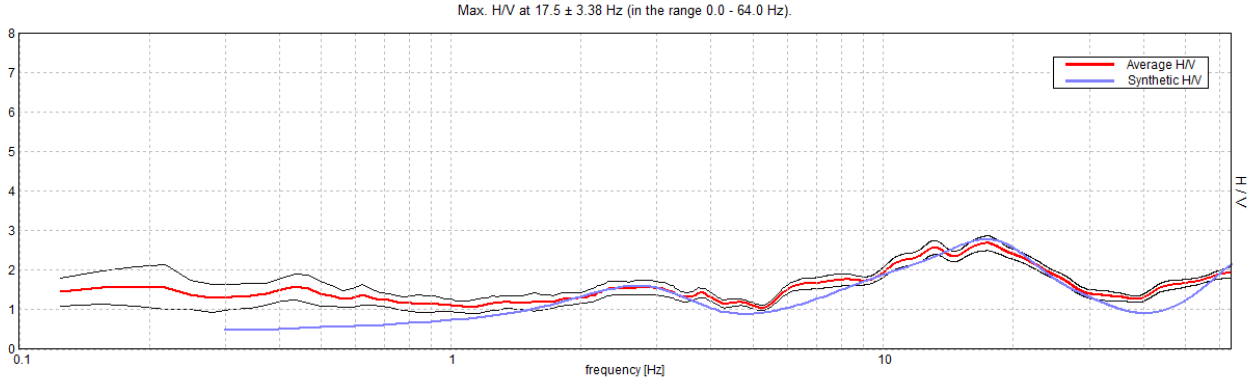
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

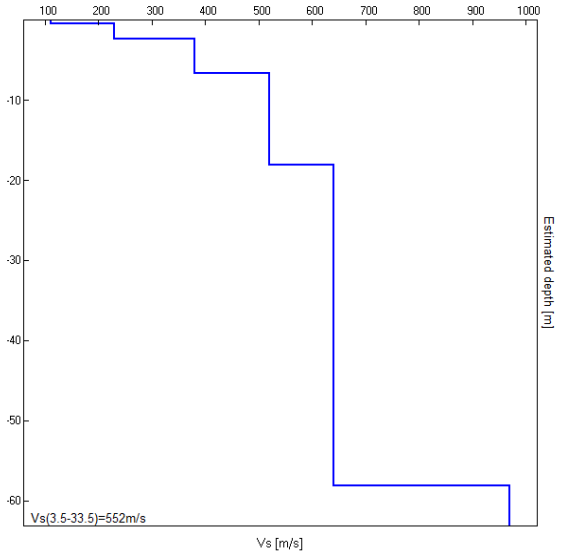


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.40	0.40	110	0.42
2.40	2.00	230	0.42
6.60	4.20	380	0.42
18.10	11.50	520	0.40
58.10	40.00	640	0.40
inf.	inf.	970	0.42

Vs(0.0-30.0)=468m/s



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

Max. H/V at 17.5 ± 3.38 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	17.50 > 0.50	OK	
$n_c(f_0) > 200$	21000.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 841 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	5.719 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	33.688 Hz	OK	
$A_0 > 2$	2.68 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.19317| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	3.38044 < 0.875		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1873 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

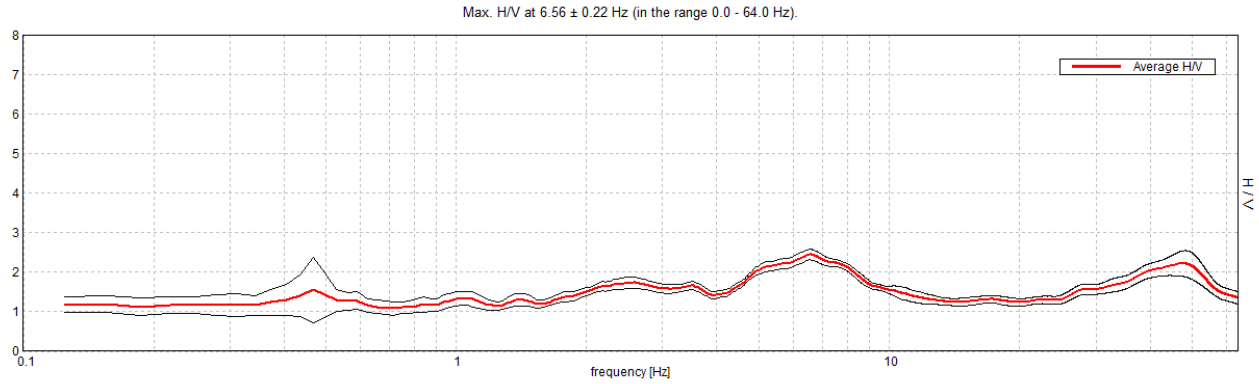
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T04 – LAXOLO Frazione Carbolone

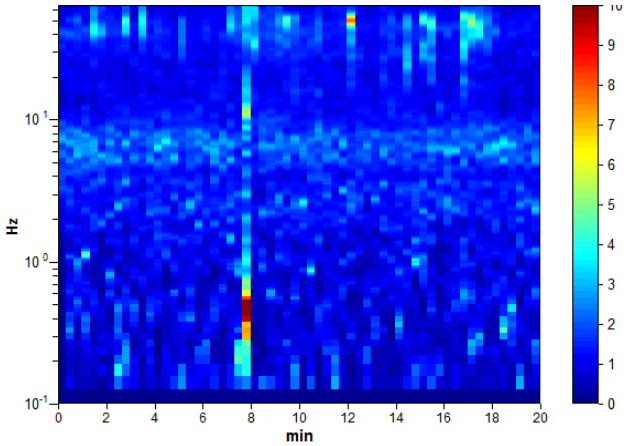
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 21/01/00 07:05:27 End recording: 21/01/00 07:25:28
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

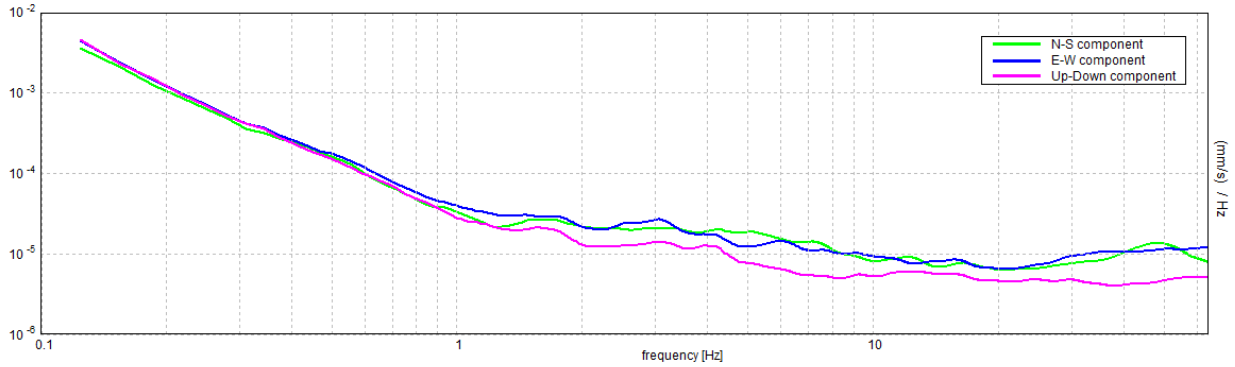
HORIZONTAL TO VERTICAL SPECTRAL RATIO



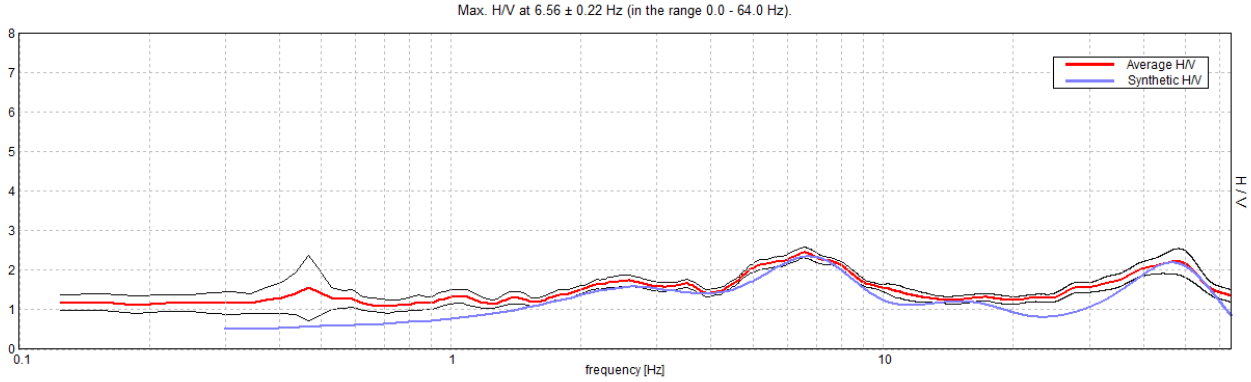
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

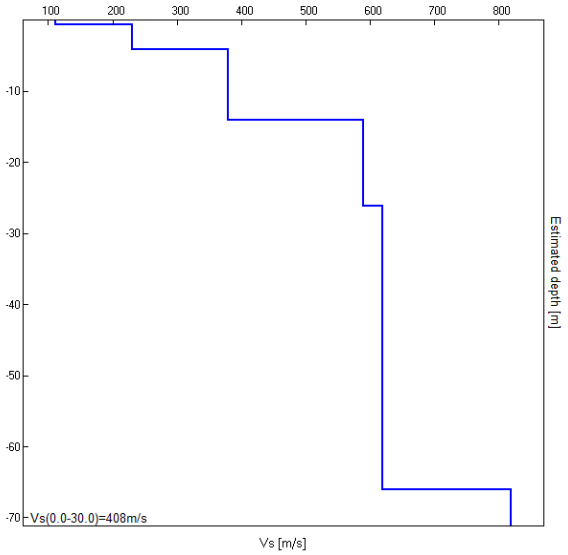


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.60	0.60	111	0.40
4.10	3.50	231	0.40
14.10	10.00	380	0.40
26.10	12.00	590	0.40
66.10	40.00	620	0.40
inf.	inf.	820	0.40

Vs(0.0-30.0)=408m/s



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

Max. H/V at 6.56 ± 0.22 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	6.56 > 0.50	OK	
$n_c(f_0) > 200$	7875.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 316 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
$A_0 > 2$	2.45 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.0342| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.22441 < 0.32813	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.1336 < 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 standard deviation of log $A_{H/V}(f)$ curve
$\sigma_{logH/V}(f)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$
$\theta(f_0)$	

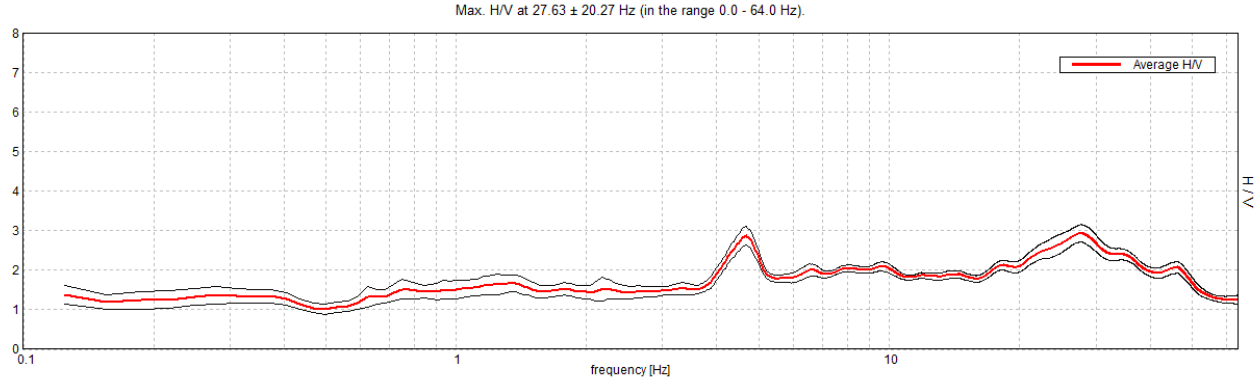
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T05 - CADELFOGLIA Chiesa Parrocchiale

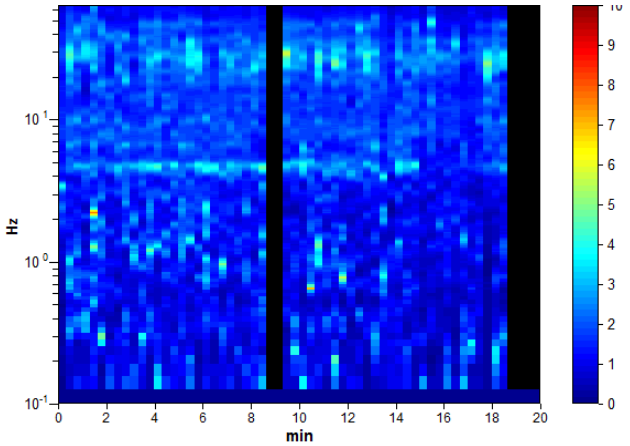
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 07/03/16 16:18:31 End recording: 07/03/16 16:38:32
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

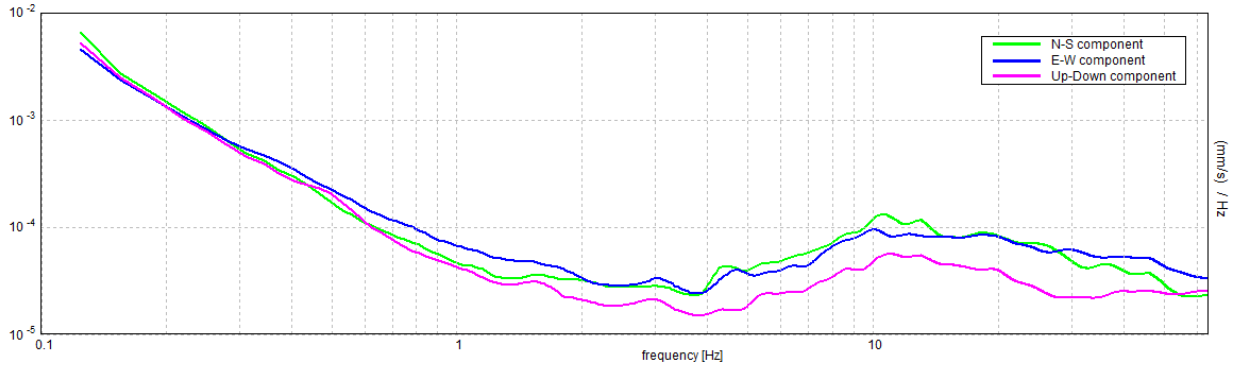
HORIZONTAL TO VERTICAL SPECTRAL RATIO



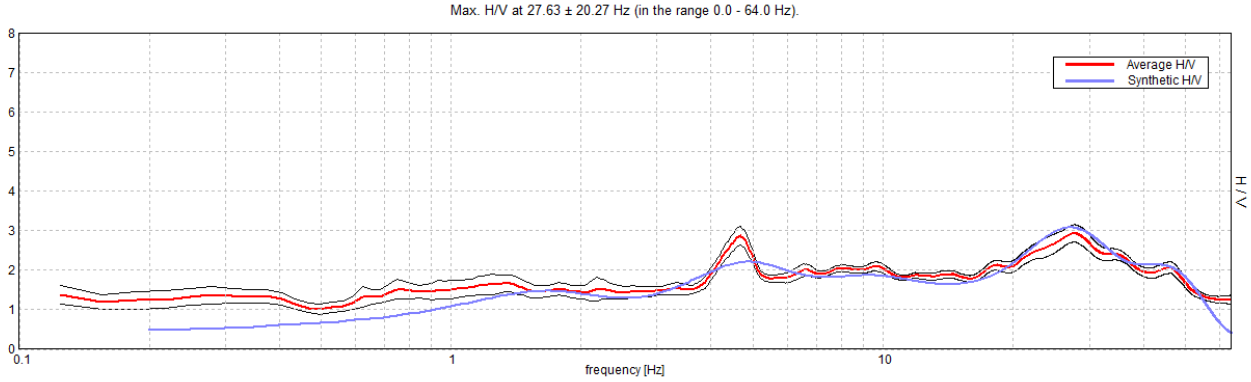
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

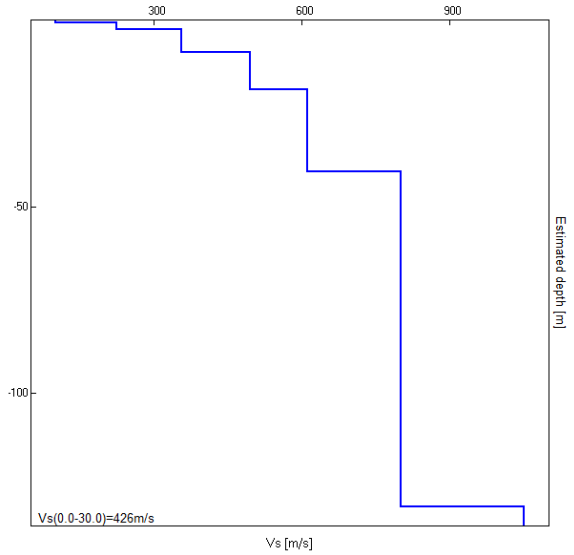


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.60	0.60	100	0.42
2.50	1.90	224	0.45
8.50	6.00	355	0.45
18.50	10.00	495	0.45
40.50	22.00	610	0.42
130.50	90.00	800	0.45
inf.	inf.	1050	0.45

Vs(0.0-30.0)=426m/s



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

Max. H/V at 27.63 ± 20.27 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	27.63 > 0.50	OK	
$n_c(f_0) > 200$	29835.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 1327 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	52.281 Hz	OK	
$A_0 > 2$	2.93 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.7336| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	20.26572 < 1.38125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2167 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

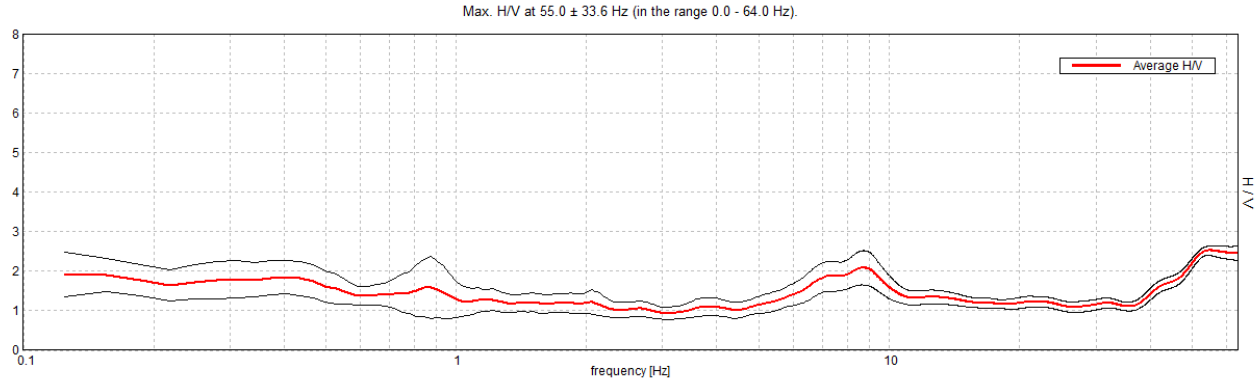
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T06 - GEROSA Scuola Elementare Via papa Giovanni XXIII

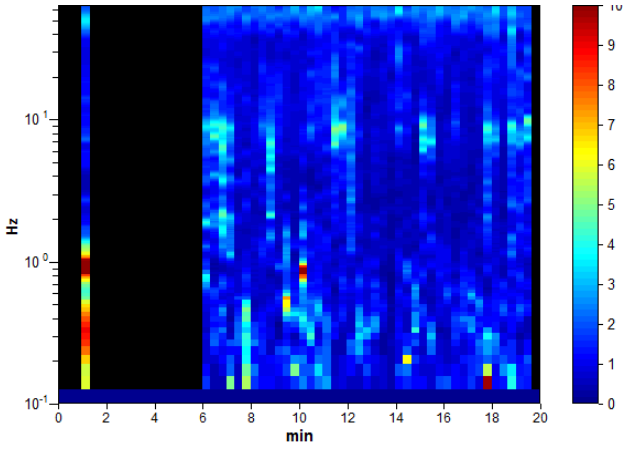
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 07/03/16 16:58:36 End recording: 07/03/16 17:18:37
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

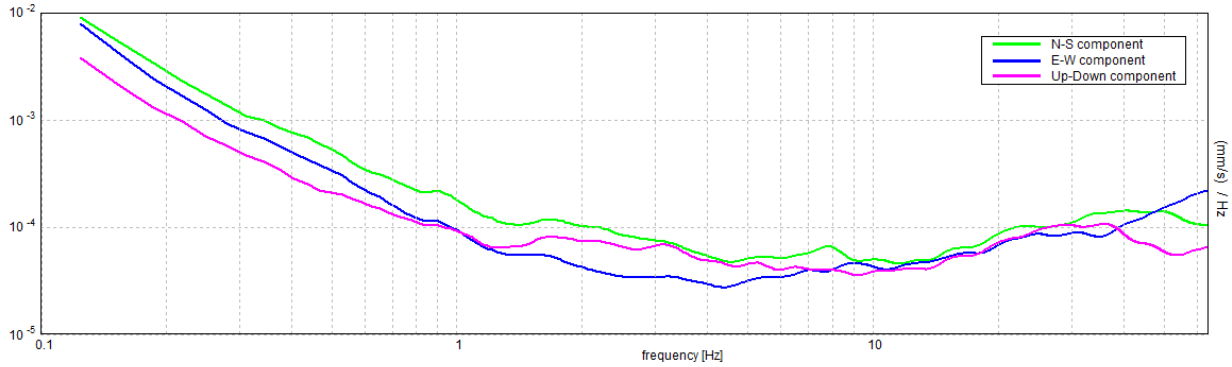
HORIZONTAL TO VERTICAL SPECTRAL RATIO



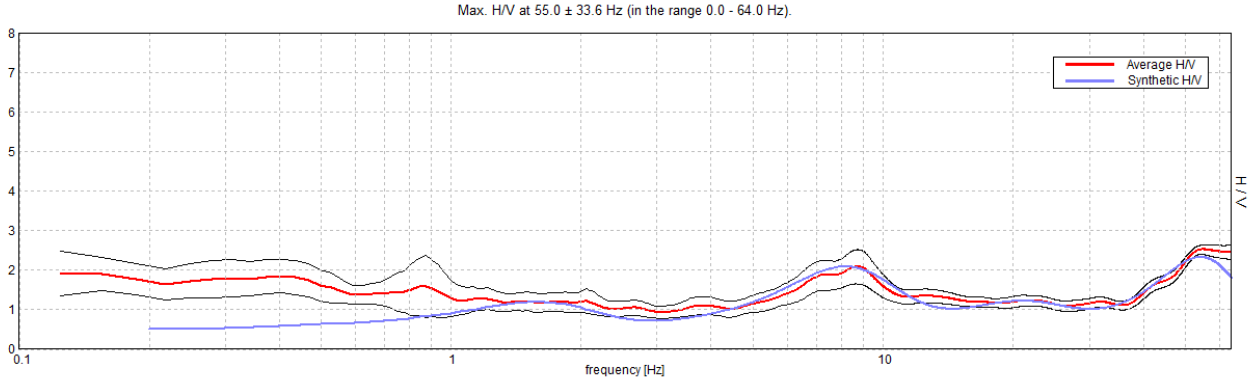
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

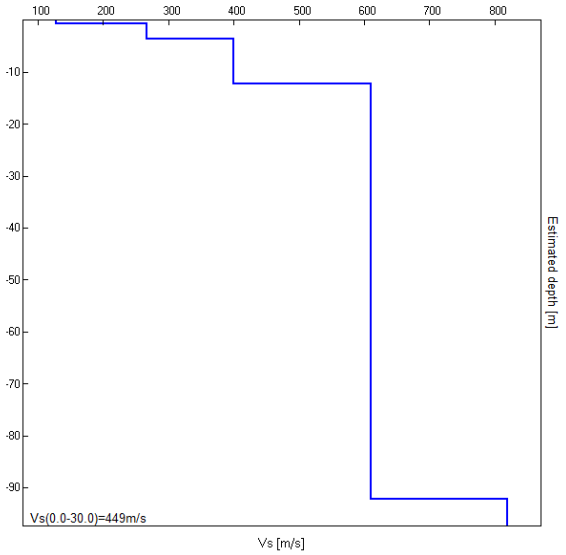


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.60	0.60	127	0.42
3.60	3.00	266	0.42
12.30	8.70	400	0.42
92.30	80.00	610	0.45
inf.	inf.	820	0.40

Vs(0.0-30.0)=449m/s



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

Max. H/V at 55.0 ± 33.6 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	55.00 > 0.50	OK	
$n_c(f_0) > 200$	46200.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 1169 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	38.625 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.52 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.61097| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	33.60309 < 2.75		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1195 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

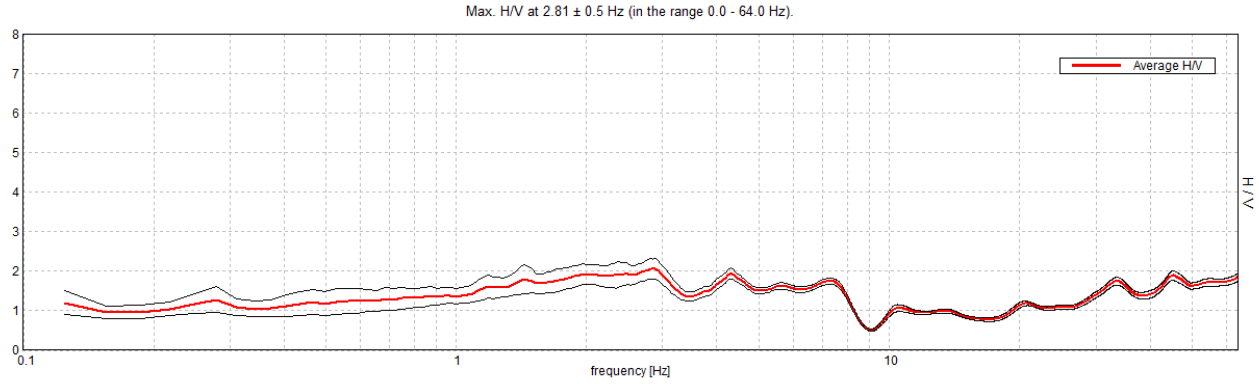
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T07 – BREMBILLA Piazzale Ex Zanardi

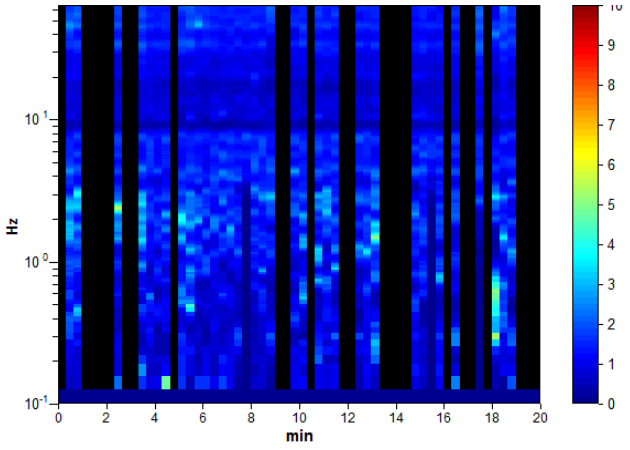
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 28/11/16 15:10:50 End recording: 28/11/16 15:30:51
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

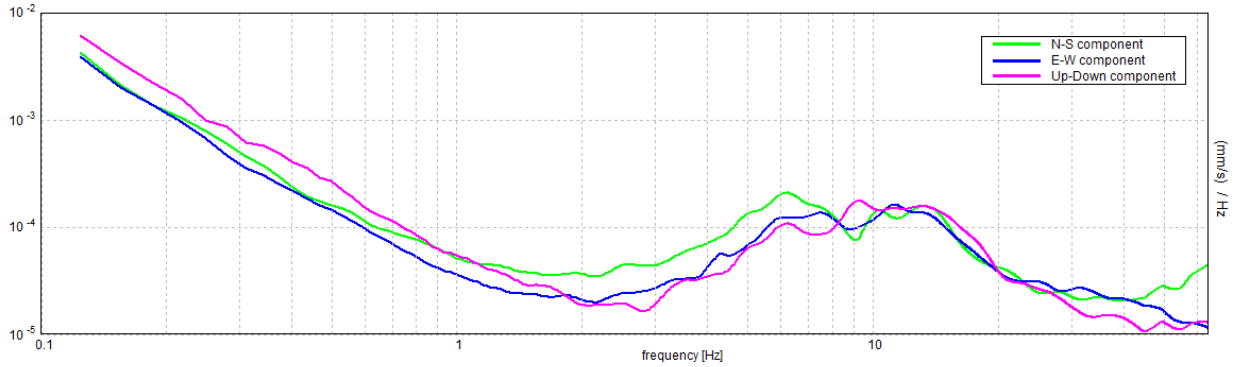
HORIZONTAL TO VERTICAL SPECTRAL RATIO



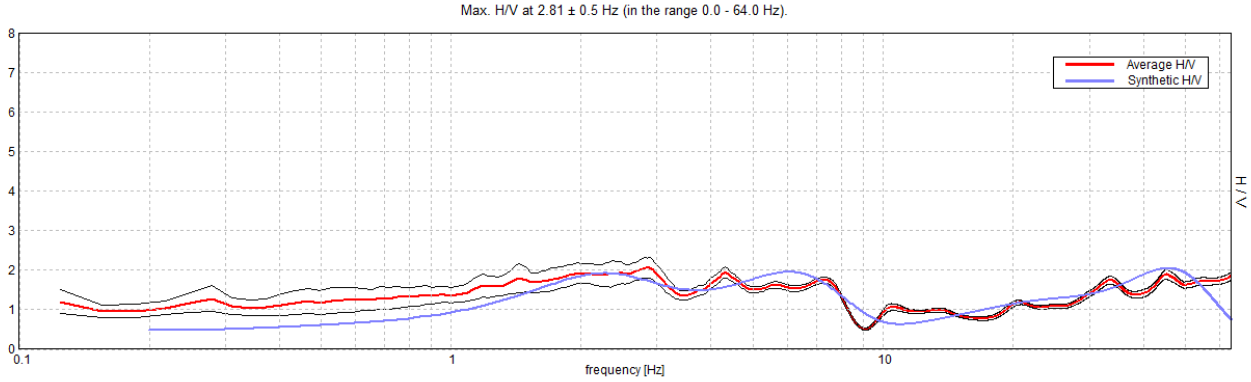
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

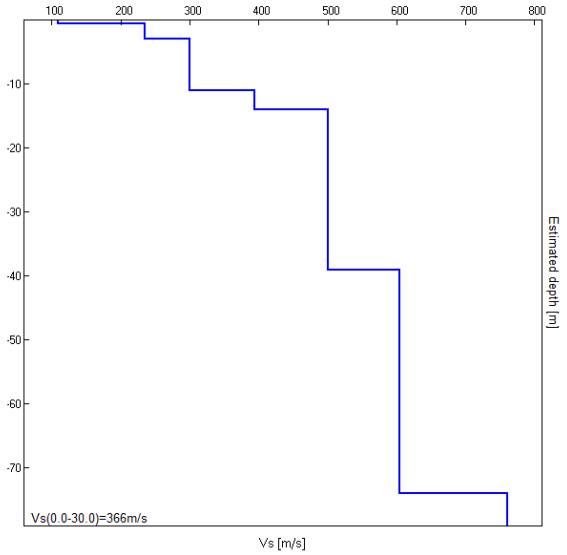


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.60	0.60	110	0.42
3.00	2.40	235	0.40
11.00	8.00	300	0.45
14.00	3.00	394	0.45
39.00	25.00	500	0.45
74.00	35.00	604	0.45
inf.	inf.	760	0.45

Vs(0.0-30.0)=366m/s



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

Max. H/V at 2.81 ± 0.5 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.81 > 0.50	OK	
$n_c(f_0) > 200$	2025.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	8.281 Hz	OK	
$A_0 > 2$	2.06 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.17666| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.49684 < 0.14063		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2601 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

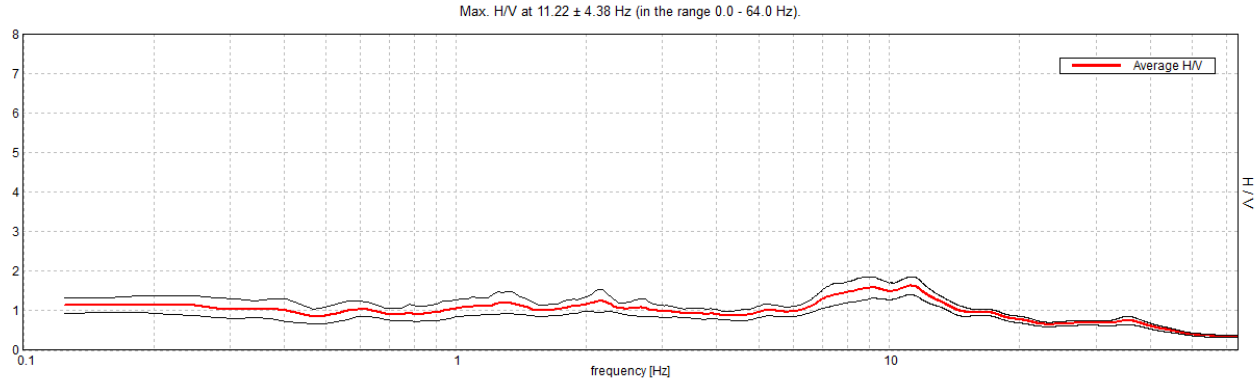
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T08 - GEROSA Località Valsalogna

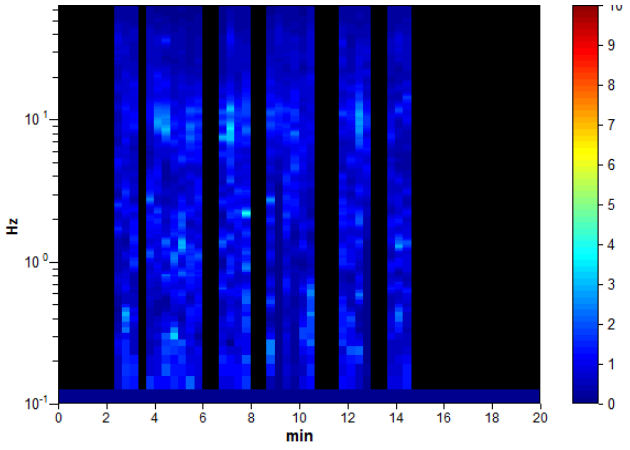
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 16/01/17 16:54:56 End recording: 16/01/17 17:14:56
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 45% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

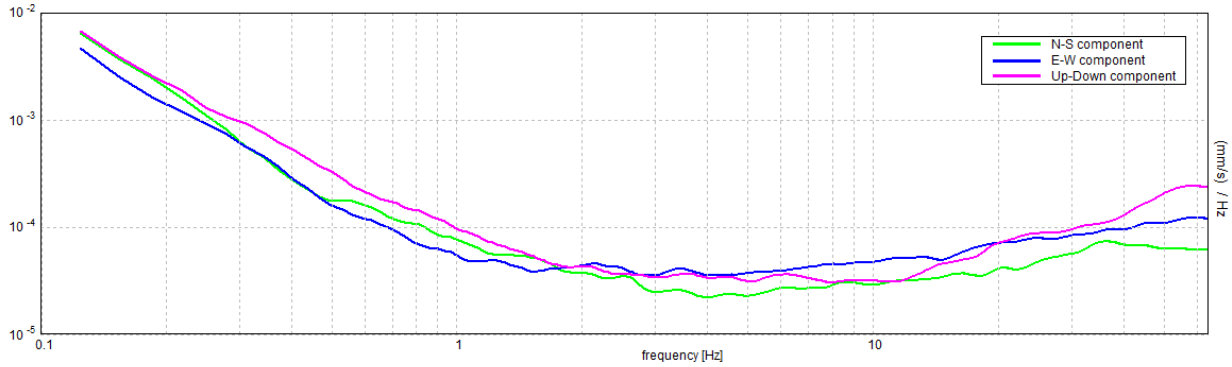
HORIZONTAL TO VERTICAL SPECTRAL RATIO



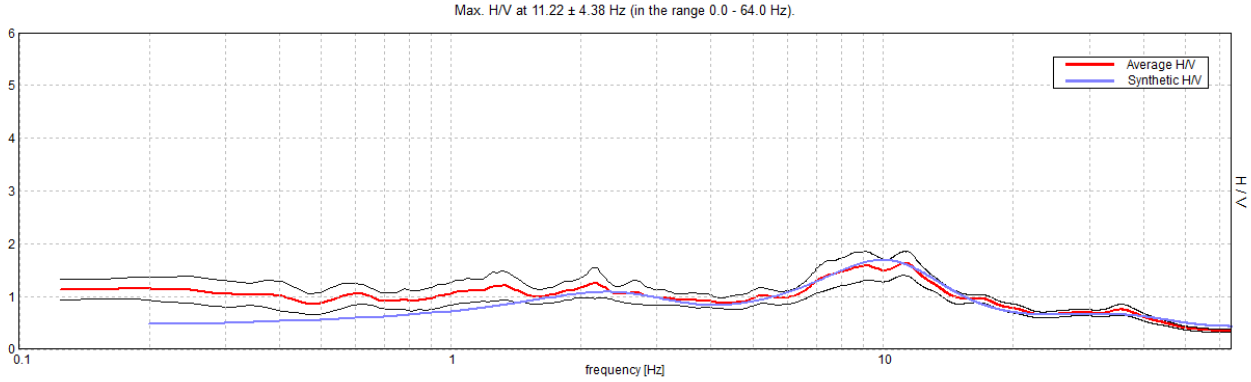
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

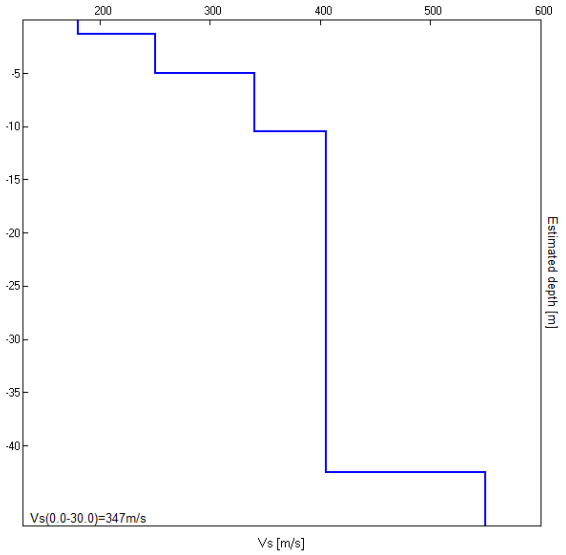


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
1.30	1.30	180	0.42
5.00	3.70	250	0.42
10.50	5.50	340	0.45
42.50	32.00	405	0.42
inf.	inf.	550	0.40

Vs(0.0-30.0)=347m/s



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

Max. H/V at 11.22 ± 4.38 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	11.22 > 0.50	OK	
$n_c(f_0) > 200$	6058.1 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 540 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	18.875 Hz	OK	
$A_0 > 2$	1.63 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.39016| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	4.37712 < 0.56094		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2267 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

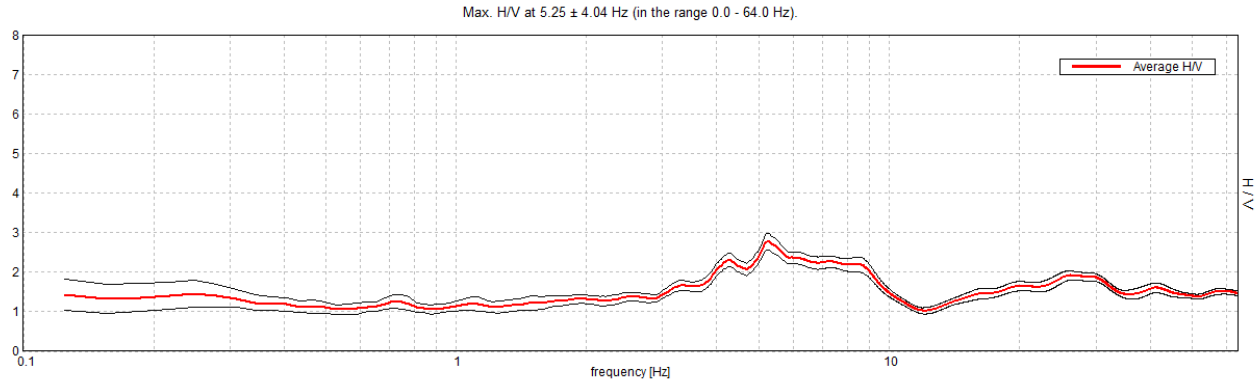
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T09 – LAXOLO Frazione Pagliaro

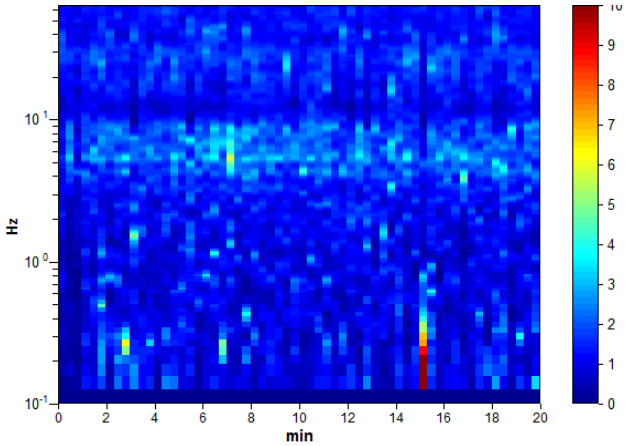
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 14/02/17 12:07:19 End recording: 14/02/17 12:27:20
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

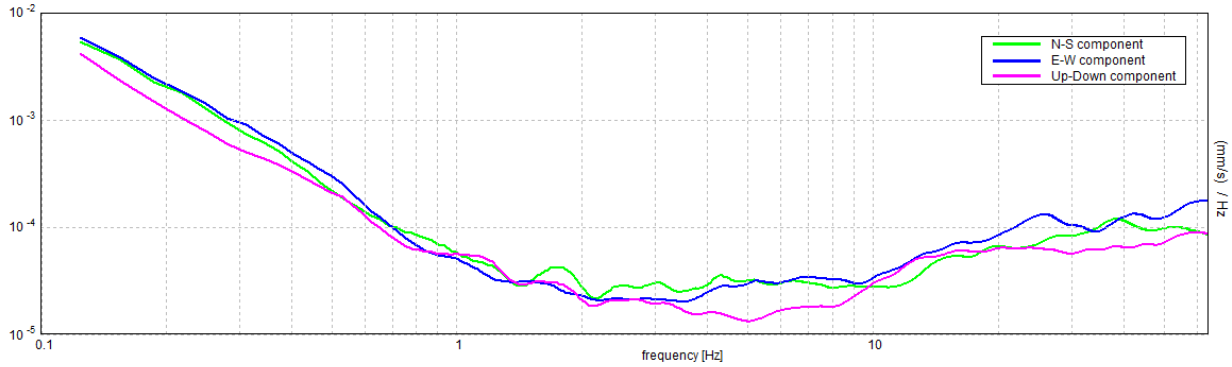
HORIZONTAL TO VERTICAL SPECTRAL RATIO



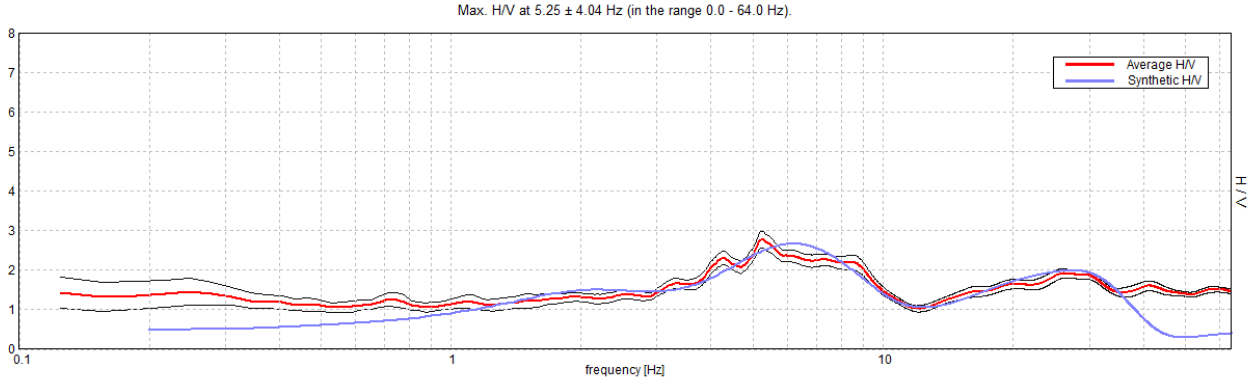
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

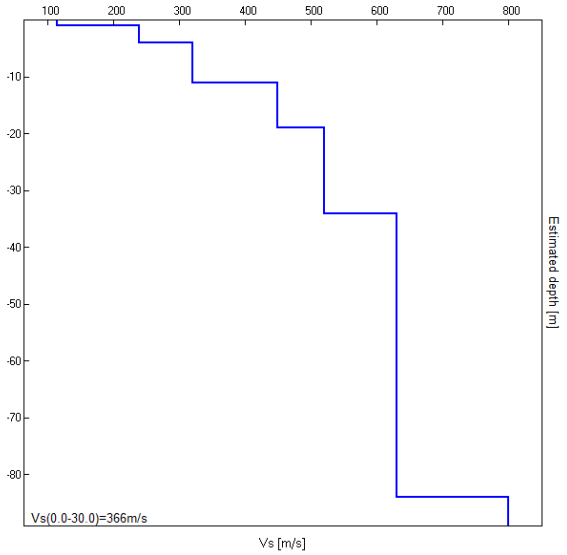


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
1.00	1.00	115	0.42
4.00	3.00	240	0.42
11.00	7.00	320	0.45
19.00	8.00	450	0.42
34.00	15.00	520	0.42
84.00	50.00	630	0.42
inf.	inf.	800	0.45

Vs(0.0-30.0)=366m/s



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

Max. H/V at 5.25 ± 4.04 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	5.25 > 0.50	OK	
$n_c(f_0) > 200$	6300.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 253 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.938 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	10.281 Hz	OK	
$A_0 > 2$	2.77 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.76922| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	4.03841 < 0.2625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2125 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

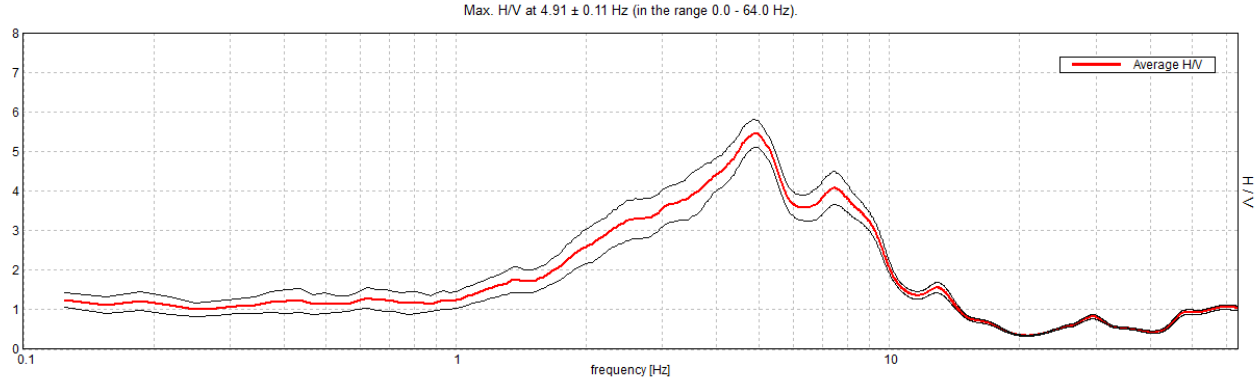
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T10 - LAXOLO Zona Artigianale Cà Noa

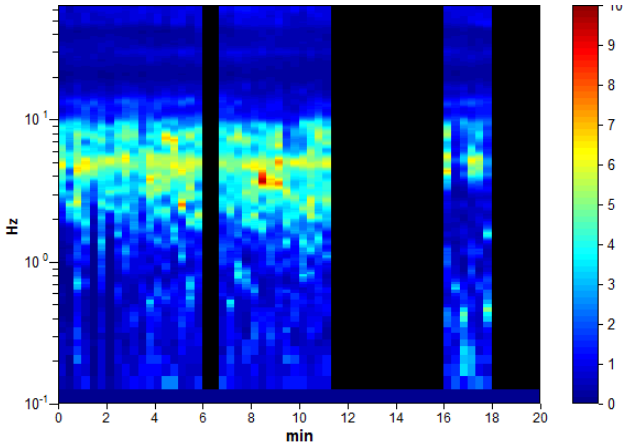
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 14/02/17 12:37:33 End recording: 14/02/17 12:57:34
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

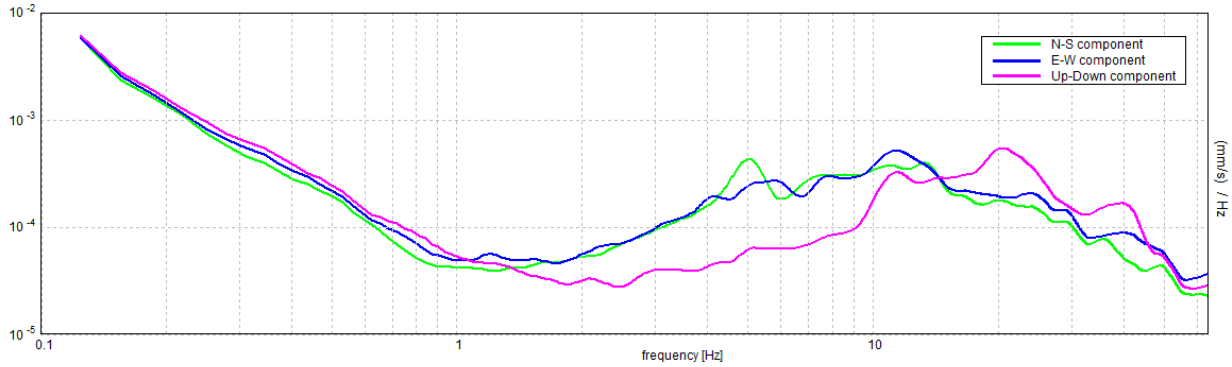
HORIZONTAL TO VERTICAL SPECTRAL RATIO



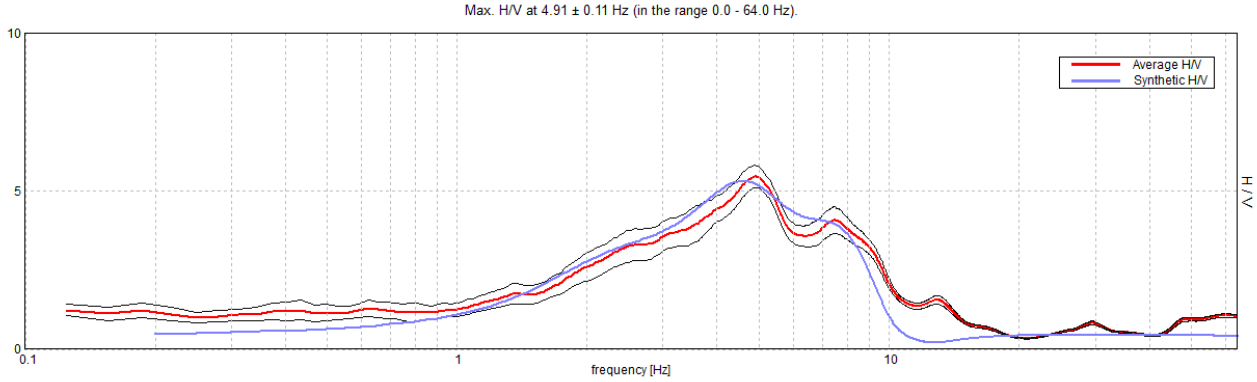
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

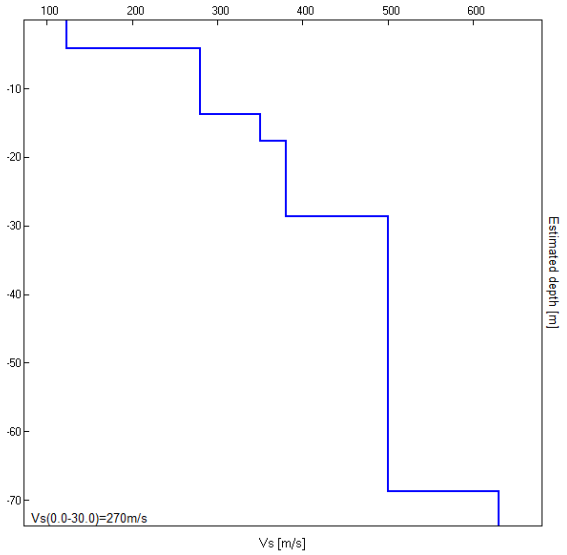


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
4.20	4.20	123	0.45
13.70	9.50	280	0.45
17.70	4.00	350	0.45
28.70	11.00	380	0.45
68.70	40.00	500	0.45
inf.	inf.	630	0.45

Vs(0.0-30.0)=270m/s



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

Max. H/V at 4.91 ± 0.11 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.91 > 0.50	OK	
$n_c(f_0) > 200$	3728.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 236 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	9.531 Hz	OK	
$A_0 > 2$	5.45 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02175| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.1067 < 0.24531	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3497 < 1.58	OK	

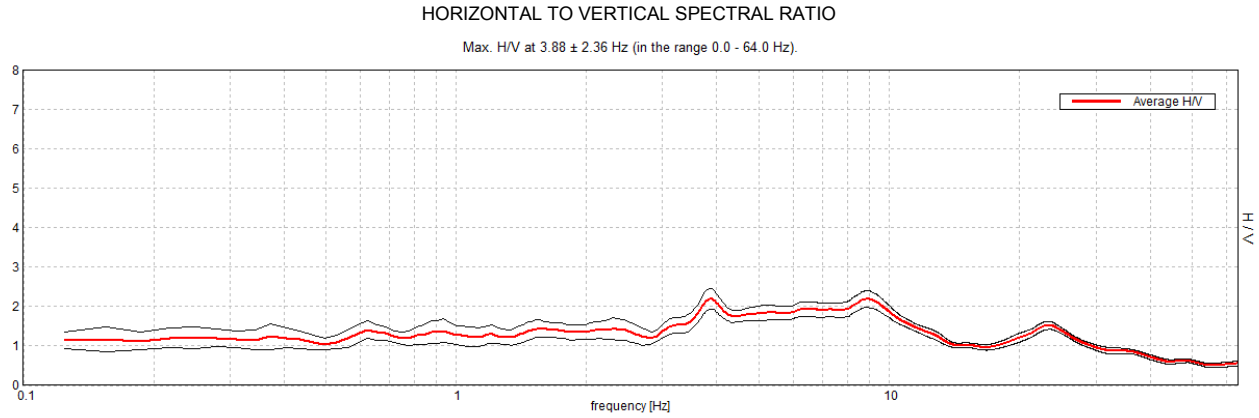
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

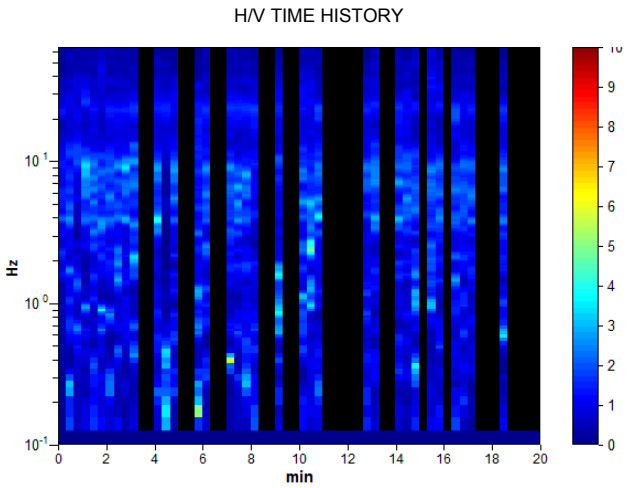
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T11 – LAXOLO Rsa Santa Maria Via Cà Noa

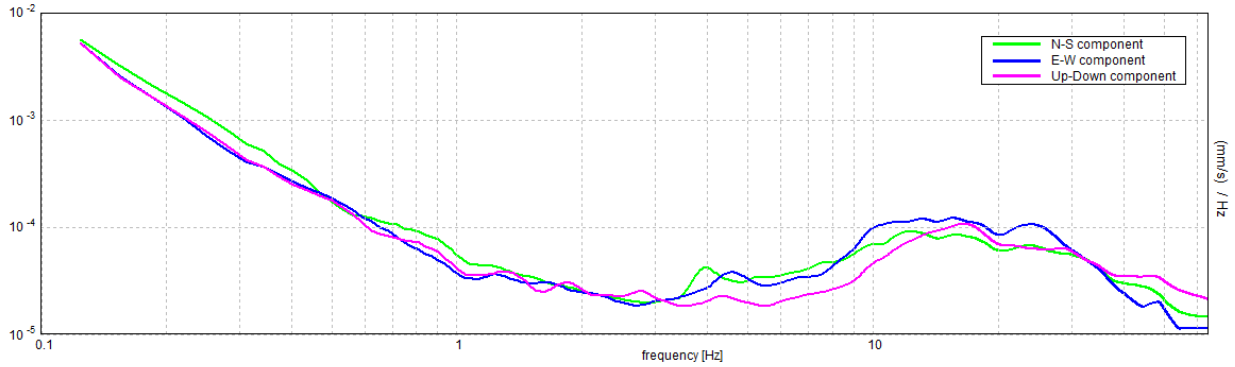
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 14/02/17 13:04:15 End recording: 14/02/17 13:24:16
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 57% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

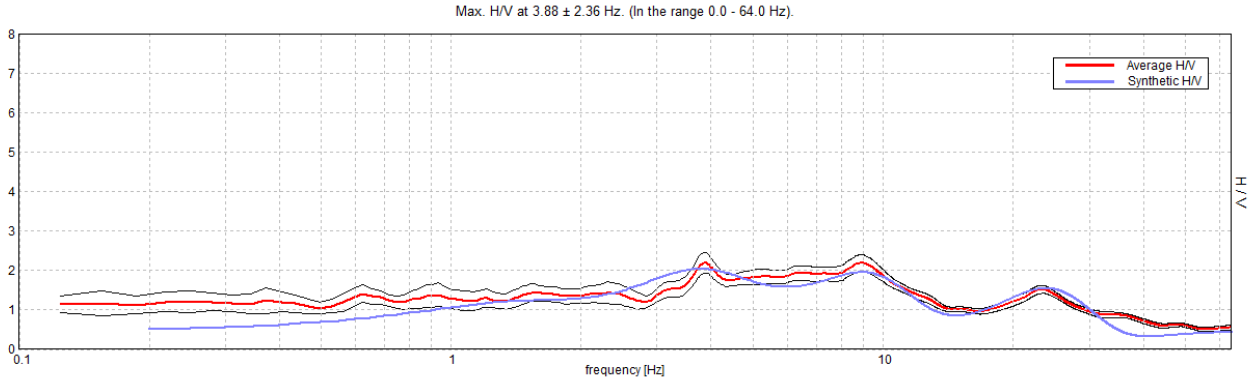




SINGLE COMPONENT SPECTRA

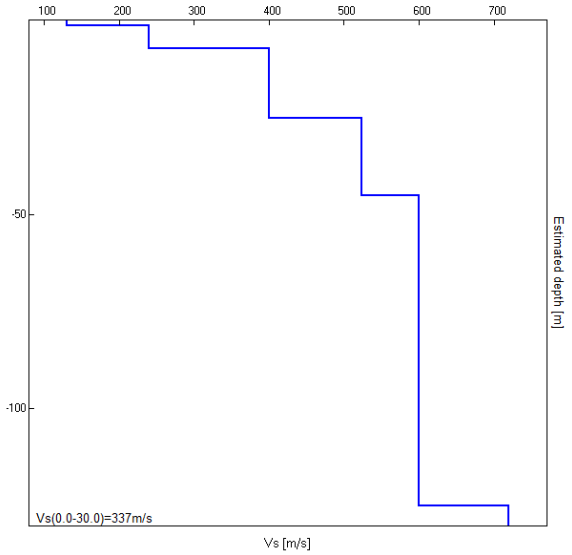


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
1.40	1.40	130	0.45
7.20	5.80	240	0.45
25.20	18.00	400	0.45
45.20	20.00	523	0.45
125.20	80.00	600	0.45
inf.	inf.	720	0.45

Vs(0.0-30.0)=337m/s



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

Max. H/V at 3.88 ± 2.36 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	3.88 > 0.50	OK	
$n_c(f_0) > 200$	2635.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 187 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	13.563 Hz	OK	
$A_0 > 2$	2.20 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.6089| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	2.35949 < 0.19375		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2637 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

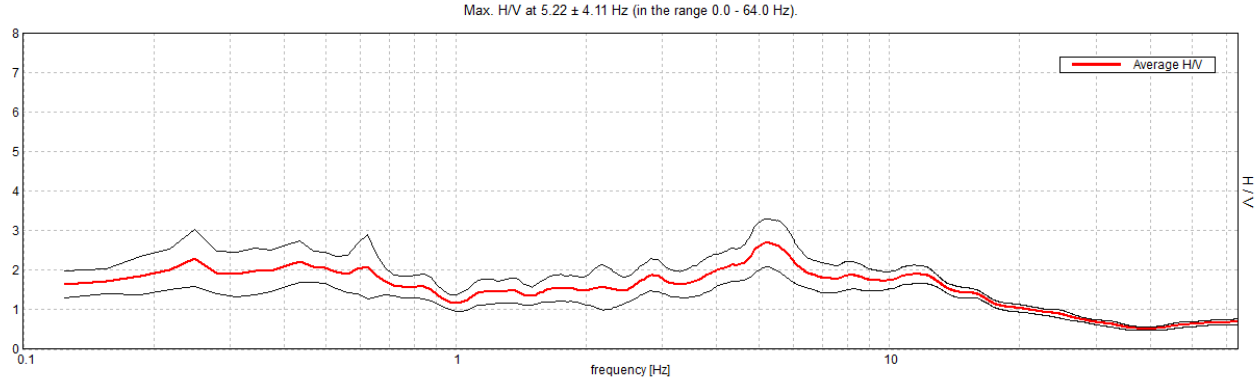
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T12 – LAXOLO Frazione Caberardi

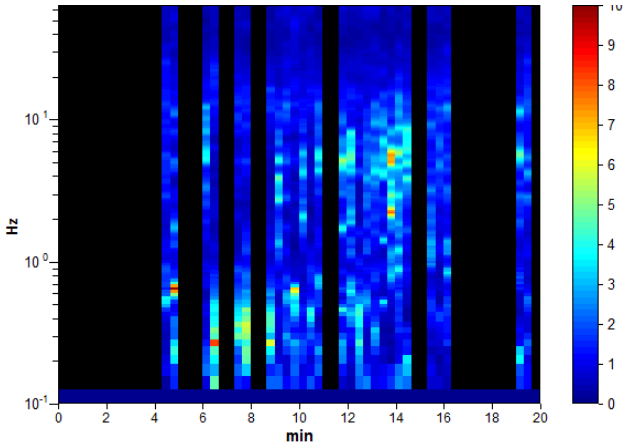
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 14/02/17 14:35:47 End recording: 14/02/17 14:55:47
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 45% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

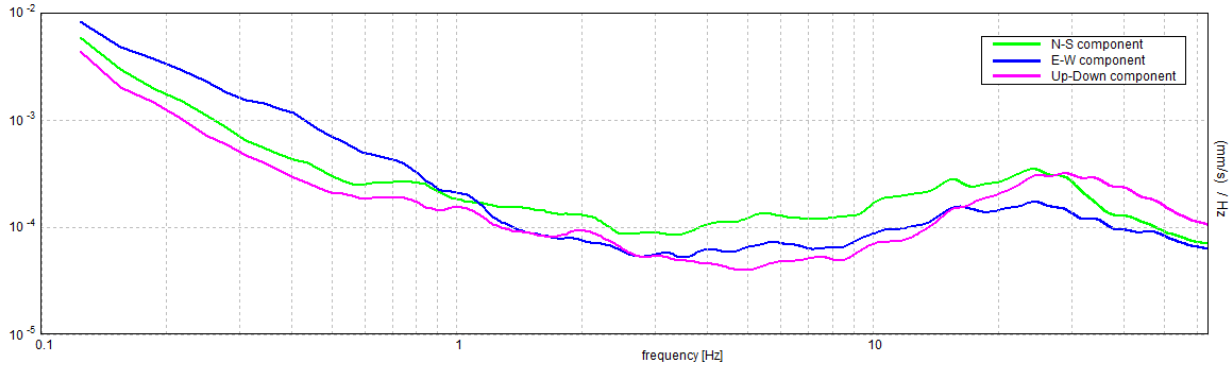
HORIZONTAL TO VERTICAL SPECTRAL RATIO



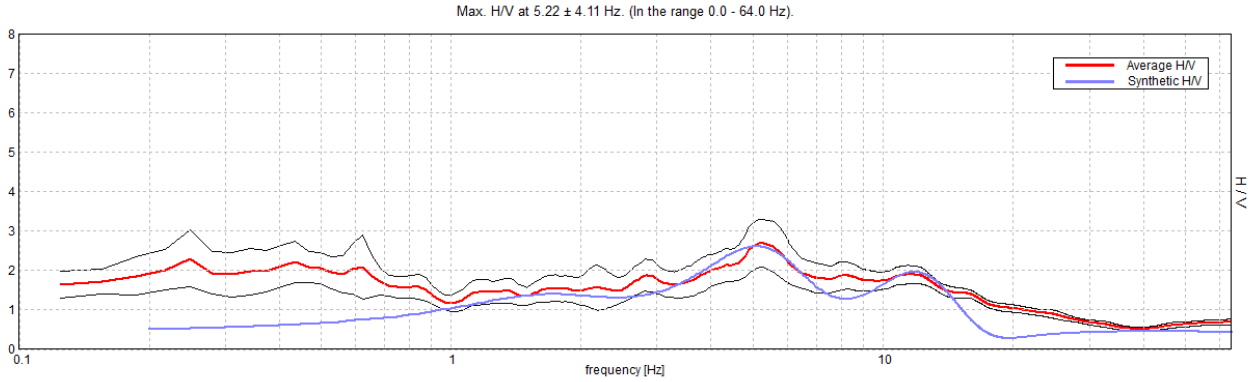
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

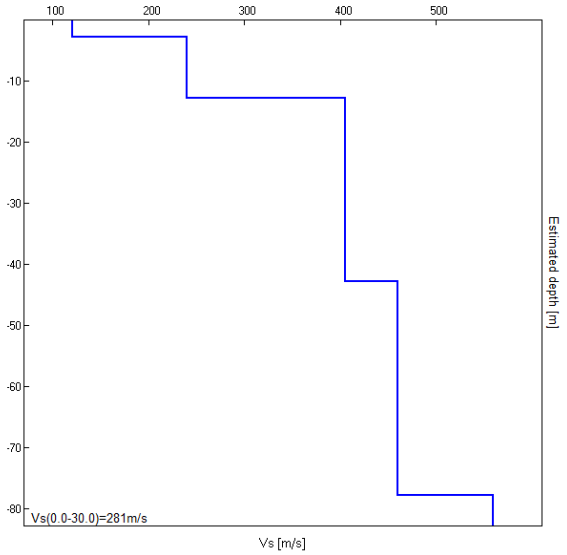


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
2.70	2.70	120	0.45
12.70	10.00	240	0.40
42.70	30.00	405	0.40
77.70	35.00	460	0.45
inf.	inf.	560	0.40

Vs(0.0-30.0)=281m/s



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

Max. H/V at 5.22 ± 4.11 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	5.22 > 0.50	OK	
$n_c(f_0) > 200$	2818.1 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 252 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	16.344 Hz	OK	
$A_0 > 2$	2.69 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.78714| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	4.1079 < 0.26094		NO
$\sigma_A(f_0) < \theta(f_0)$	0.6101 < 1.58	OK	

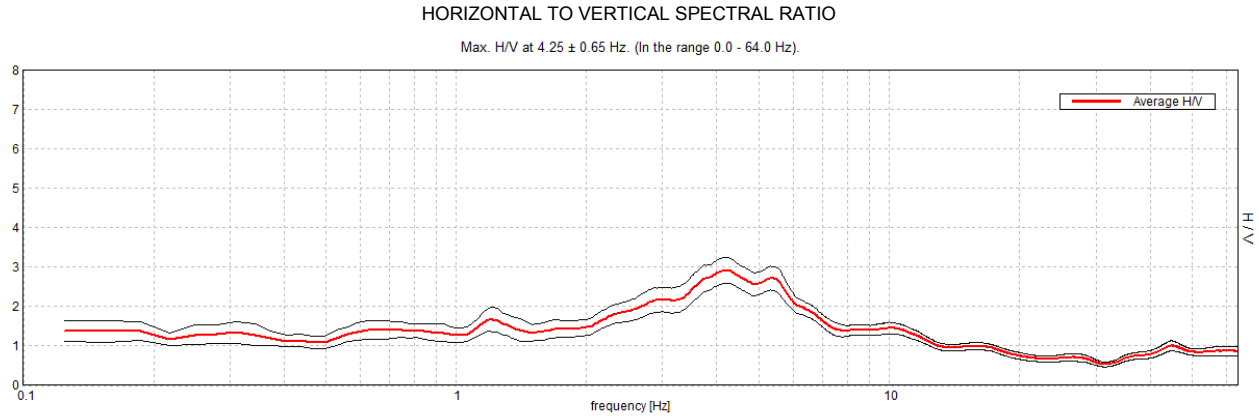
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

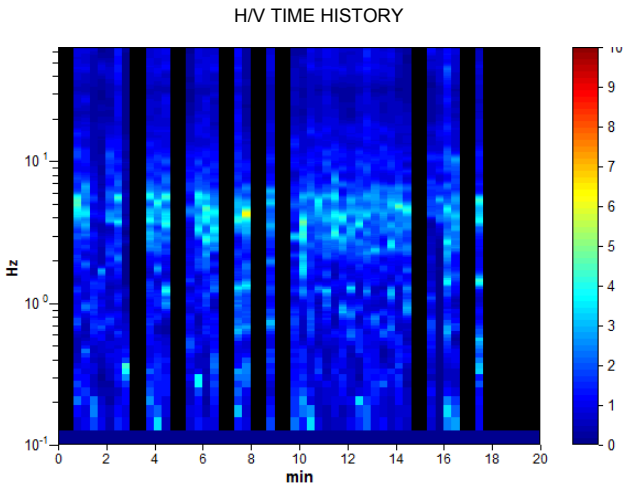
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T13 – BREMBILLA Frazione Garateno

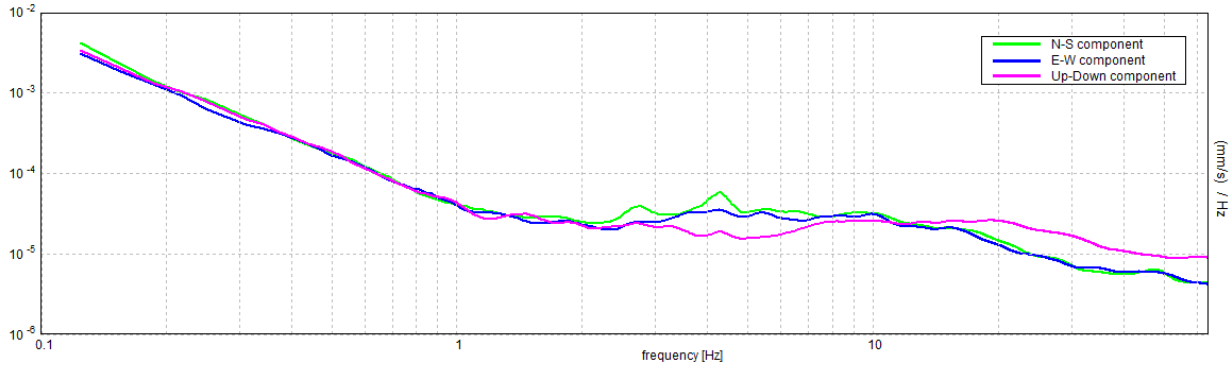
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 14/02/17 15:24:54 End recording: 14/02/17 15:44:55
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 62% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

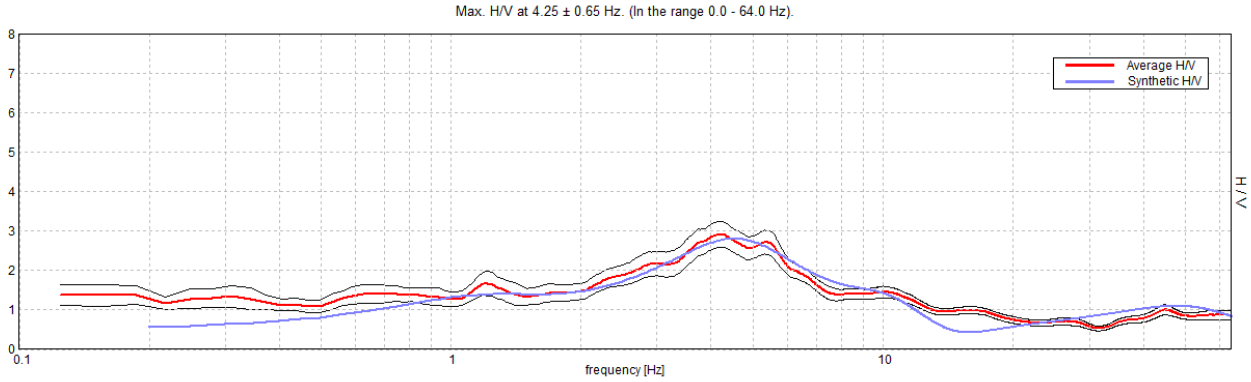




SINGLE COMPONENT SPECTRA

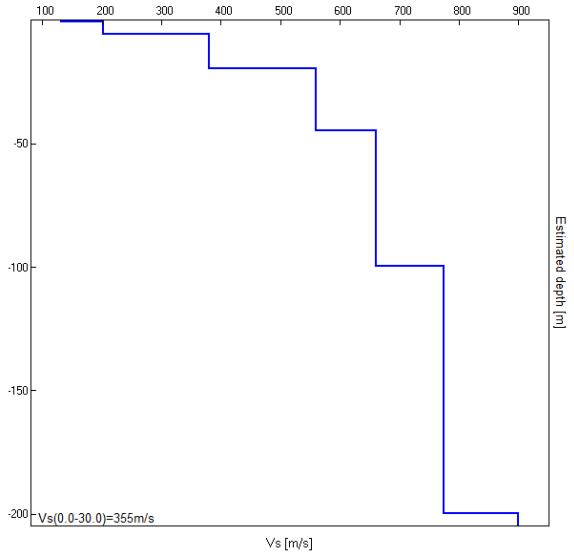


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.60	0.60	131	0.45
5.60	5.00	203	0.45
19.60	14.00	380	0.45
44.60	25.00	560	0.45
99.60	55.00	660	0.45
199.60	100.00	774	0.45
inf.	inf.	900	0.40

Vs(0.0-30.0)=355m/s



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

Max. H/V at 4.25 ± 0.65 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.25 > 0.50	OK	
$n_c(f_0) > 200$	3145.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 205 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.938 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	7.438 Hz	OK	
$A_0 > 2$	2.91 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.15179| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.6451 < 0.2125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3239 < 1.58	OK	

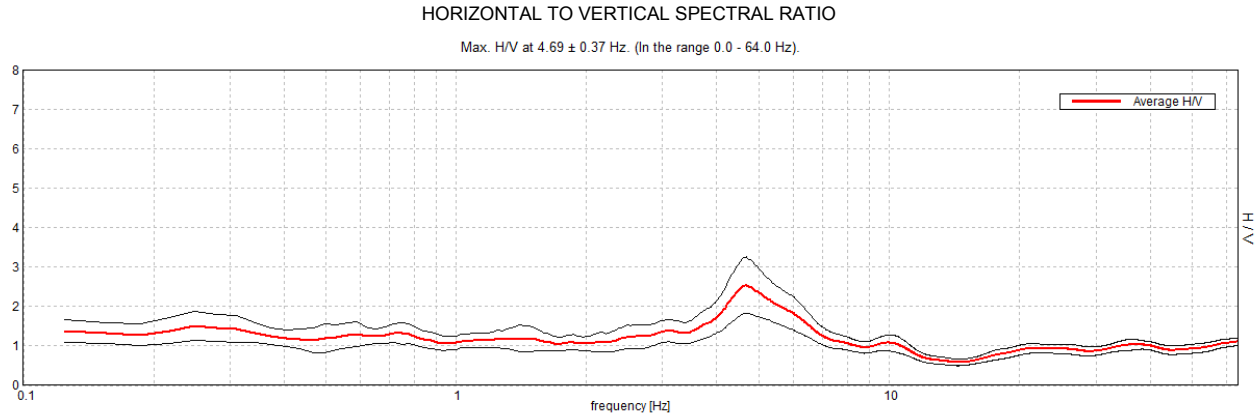
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

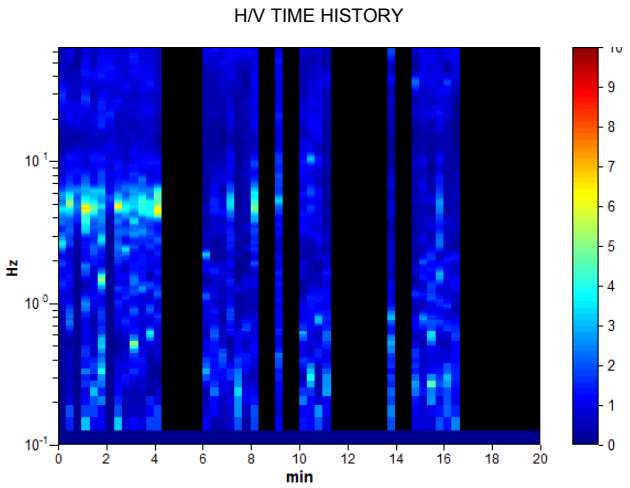
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T14- GEROSA Frazione Bura

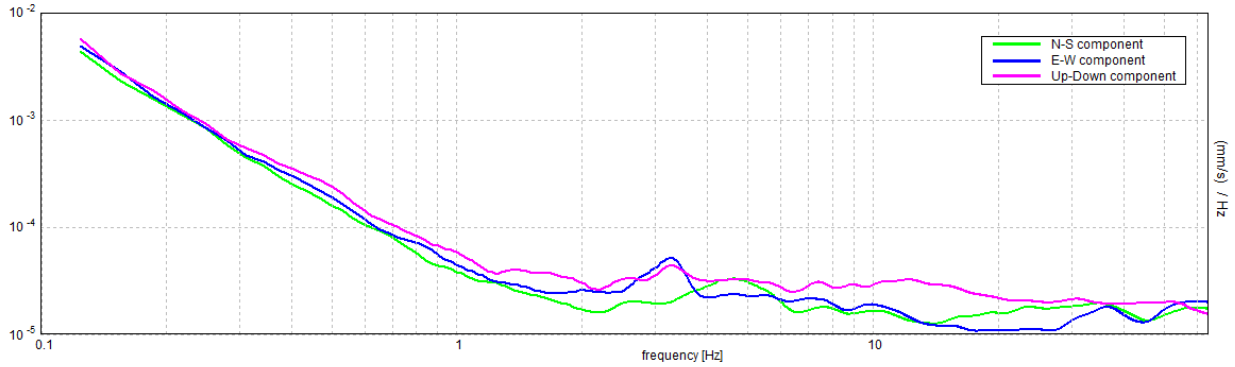
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 15/02/17 16:06:31 End recording: 15/02/17 16:26:32
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 53% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

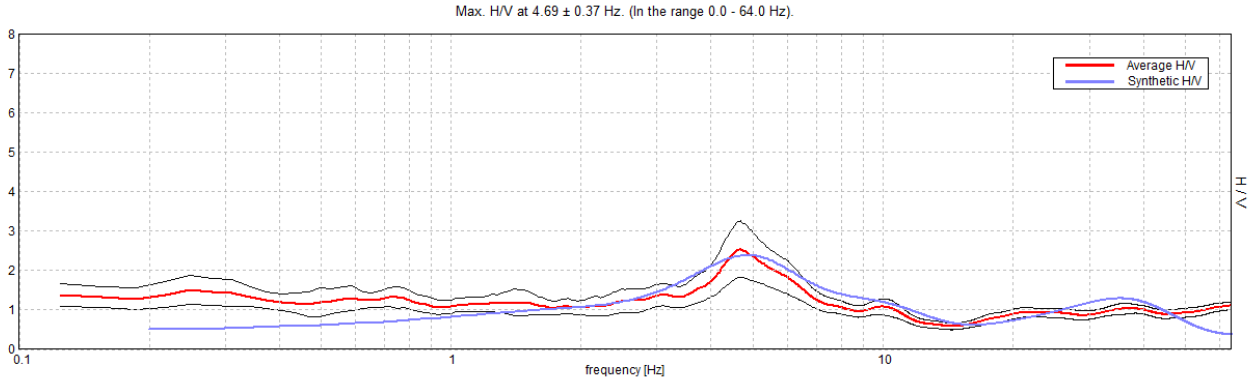




SINGLE COMPONENT SPECTRA

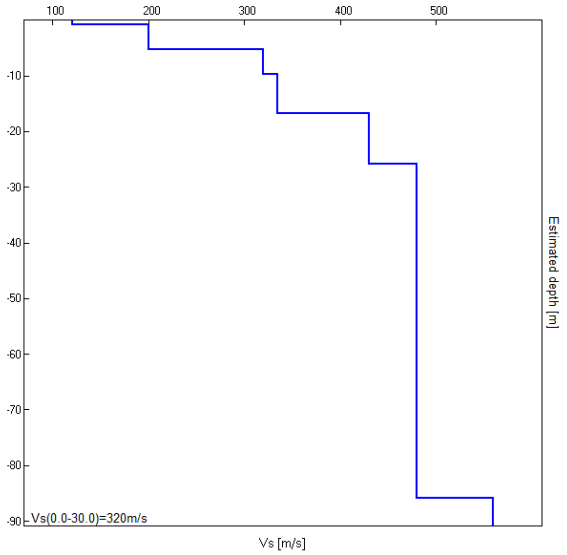


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.80	0.80	120	0.45
5.30	4.50	200	0.45
9.80	4.50	320	0.45
16.80	7.00	335	0.42
25.80	9.00	430	0.45
85.80	60.00	480	0.40
inf.	inf.	560	0.40

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 4.69 ± 0.37 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.69 > 0.50	OK	
$n_c(f_0) > 200$	3000.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 226 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.813 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	6.969 Hz	OK	
$A_0 > 2$	2.54 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.07926| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.37153 < 0.23438		NO
$\sigma_A(f_0) < \theta(f_0)$	0.7095 < 1.58	OK	

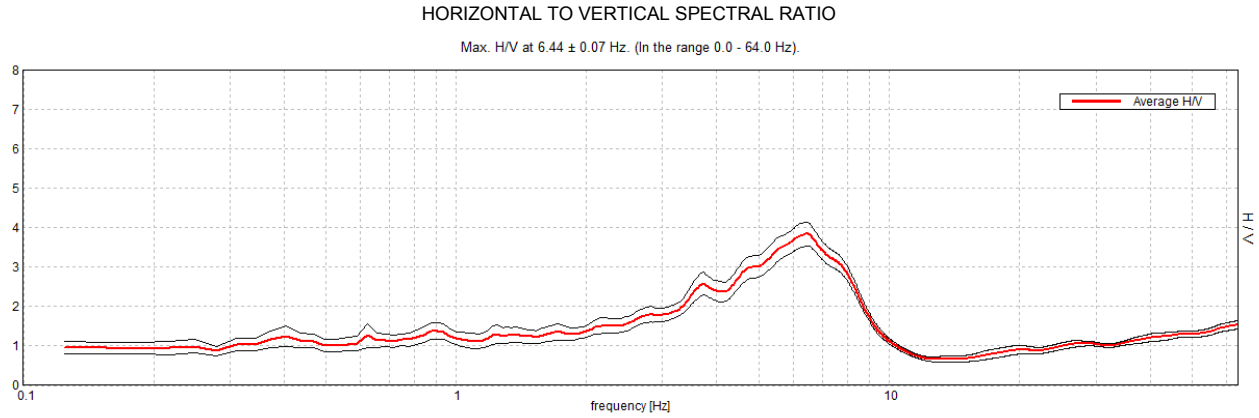
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

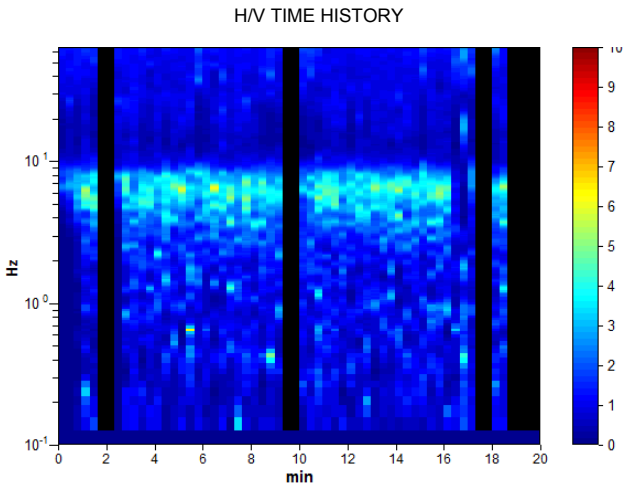
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T15 - GEROSA Via Papa Giovanni XXIII bassa

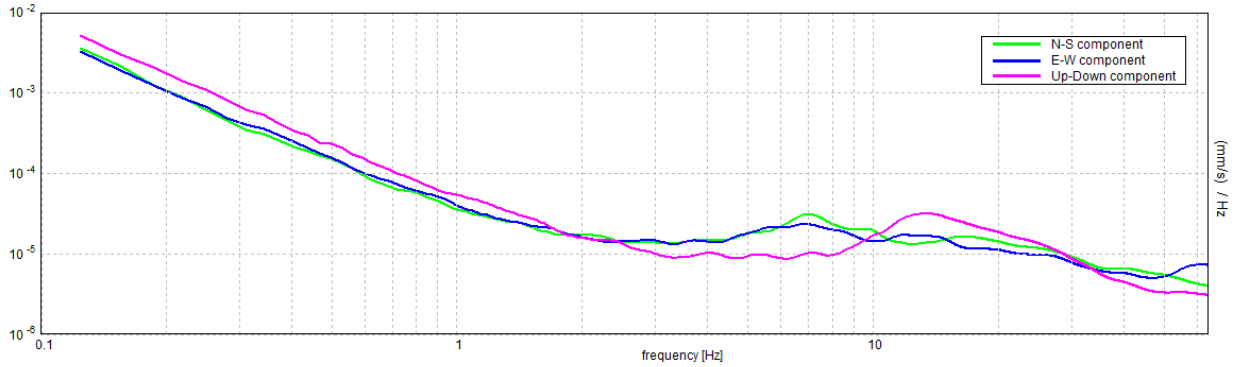
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 15/02/17 16:37:27 End recording: 15/02/17 16:57:27
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

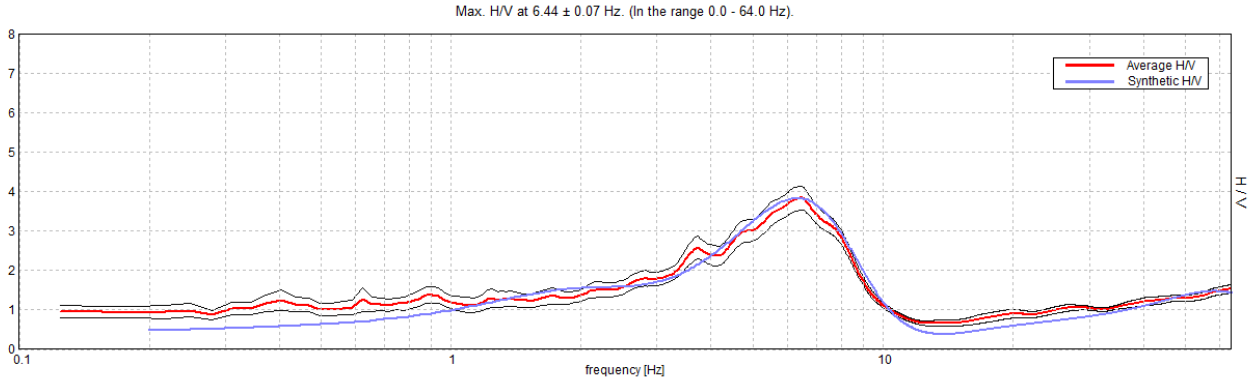




SINGLE COMPONENT SPECTRA

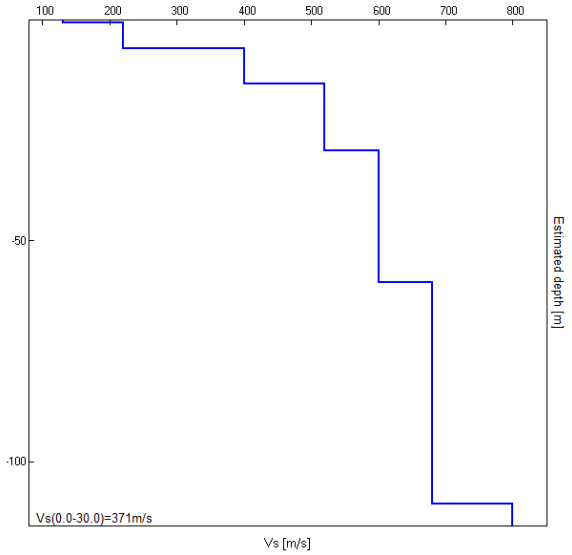


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.50	0.50	130	0.45
6.50	6.00	220	0.45
14.50	8.00	400	0.45
29.50	15.00	520	0.45
59.50	30.00	600	0.45
109.50	50.00	680	0.45
inf.	inf.	800	0.45

Vs(0.0-30.0)=371m/s



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

Max. H/V at 6.44 ± 0.07 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	6.44 > 0.50	OK	
$n_c(f_0) > 200$	6437.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 310 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	3.25 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	8.813 Hz	OK	
$A_0 > 2$	3.84 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01046| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.06731 < 0.32188	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3018 < 1.58	OK	

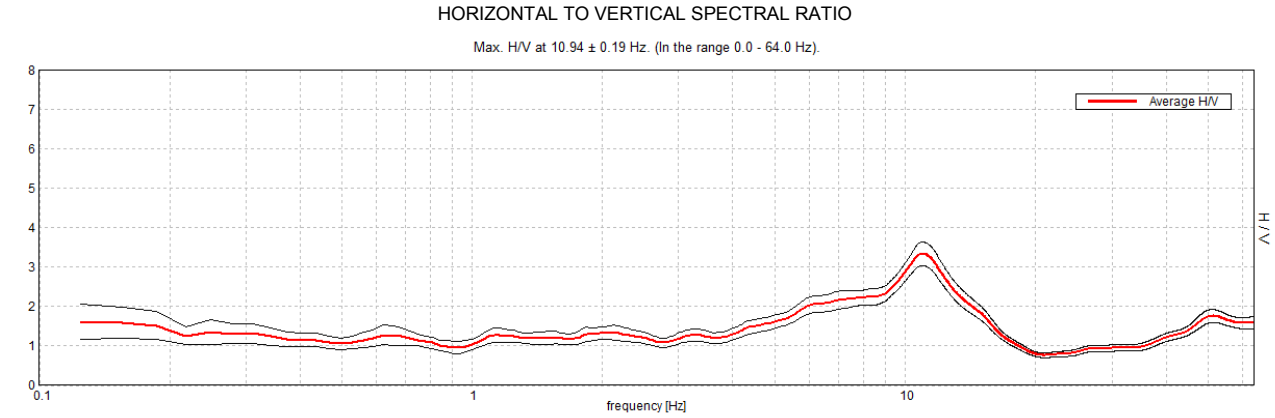
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

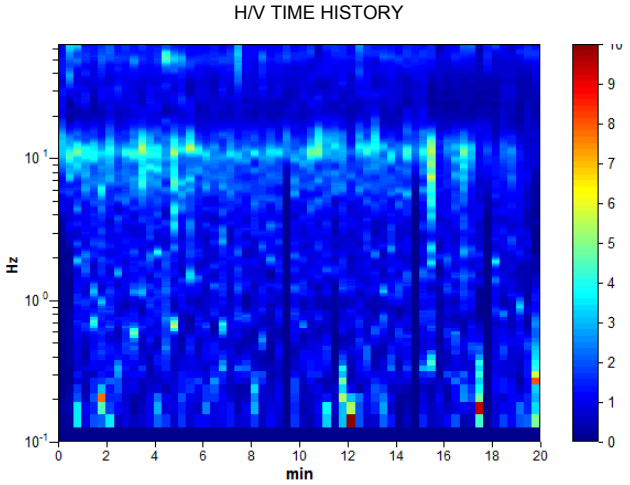
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T16 - GEROSA Frazione Blello

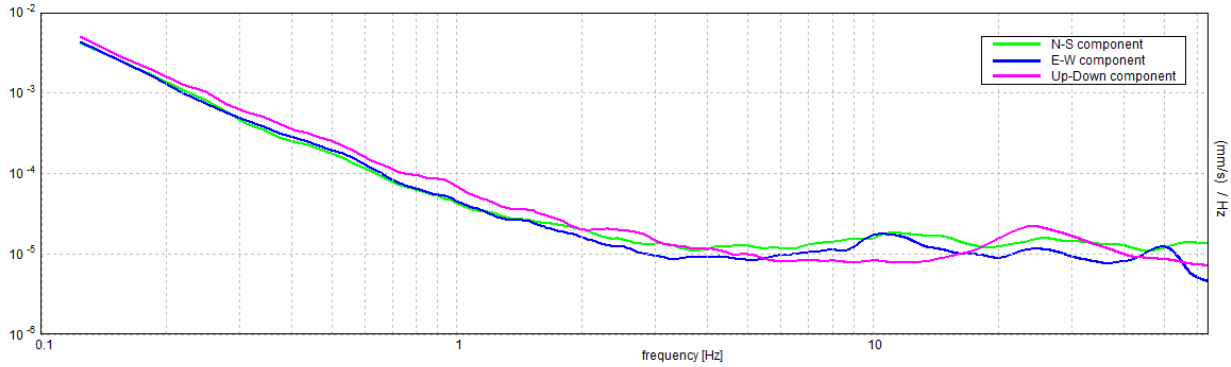
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 15/02/17 17:09:52 End recording: 15/02/17 17:29:52
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

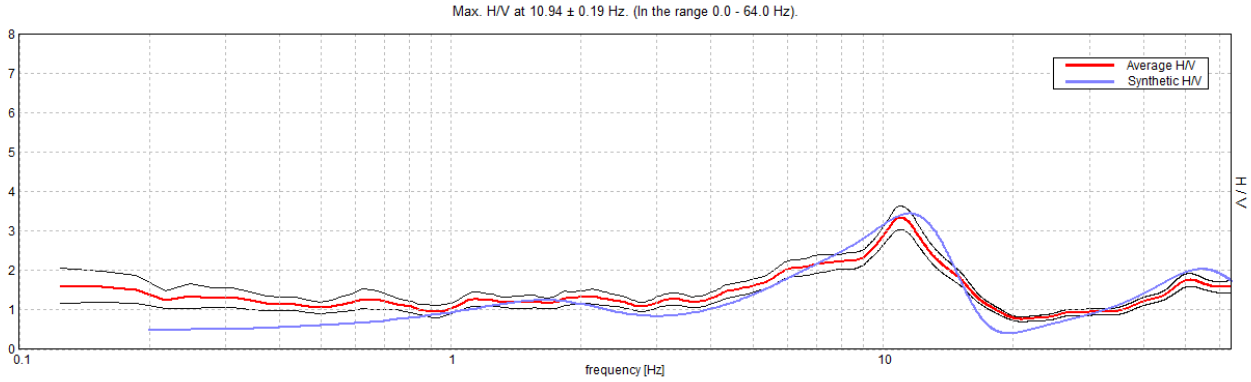




SINGLE COMPONENT SPECTRA

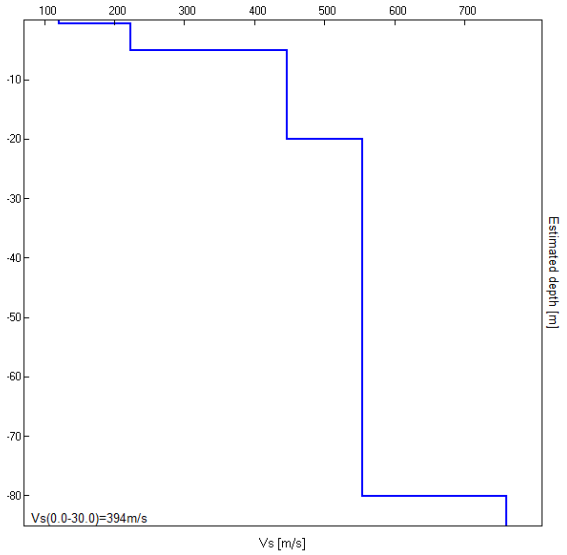


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.53	0.53	121	0.45
5.03	4.50	223	0.45
20.03	15.00	446	0.45
80.03	60.00	554	0.45
inf.	inf.	760	0.45

Vs(0.0-30.0)=394m/s



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

Max. H/V at 10.94 ± 0.19 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	10.94 > 0.50	OK	
$n_c(f_0) > 200$	13125.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 526 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	5.219 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	15.5 Hz	OK	
$A_0 > 2$	3.34 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01725| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.18867 < 0.54688	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.2972 < 1.58	OK	

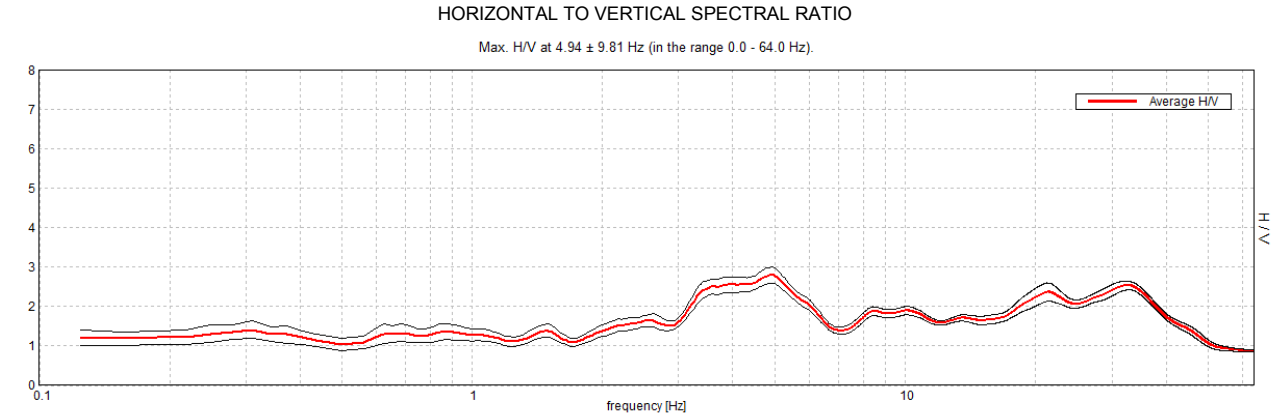
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

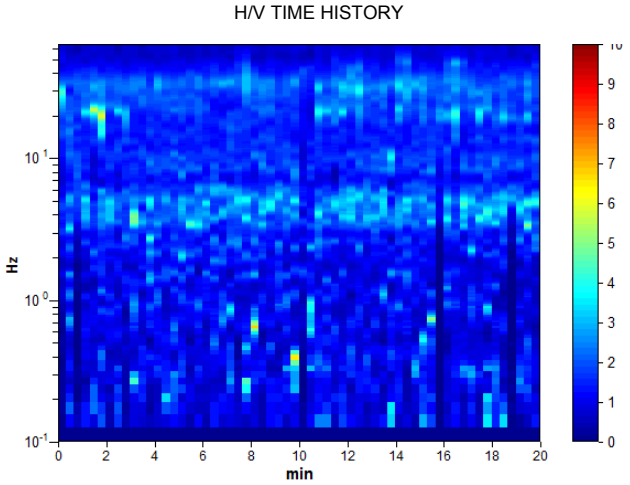
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T17 – GEROSA Frazione Musita

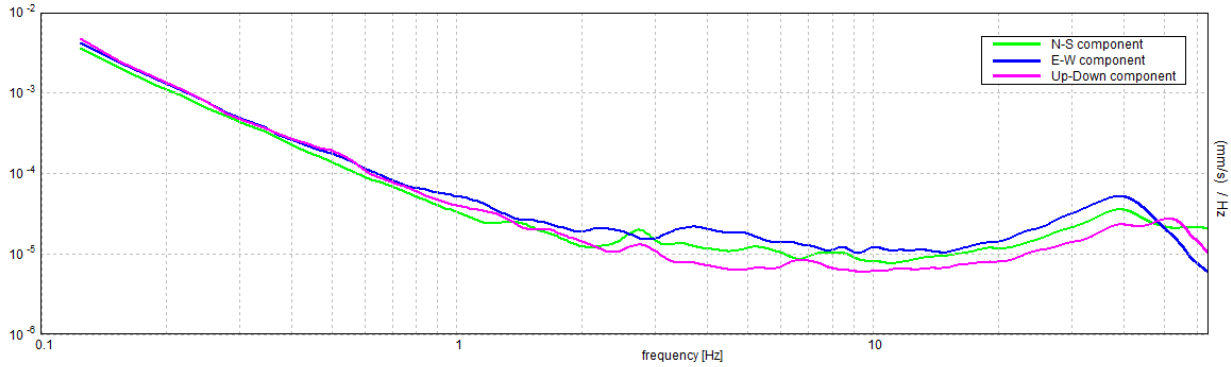
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 15/02/17 17:39:14 End recording: 15/02/17 17:59:15
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

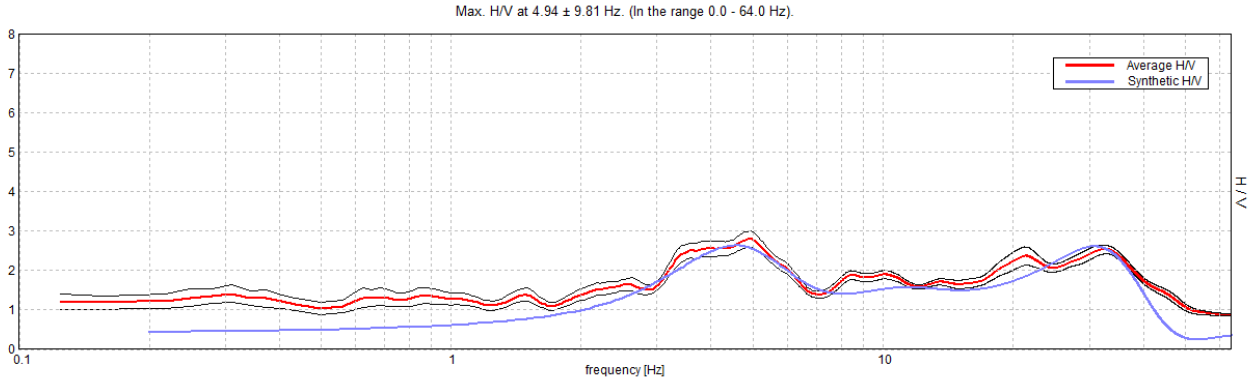




SINGLE COMPONENT SPECTRA

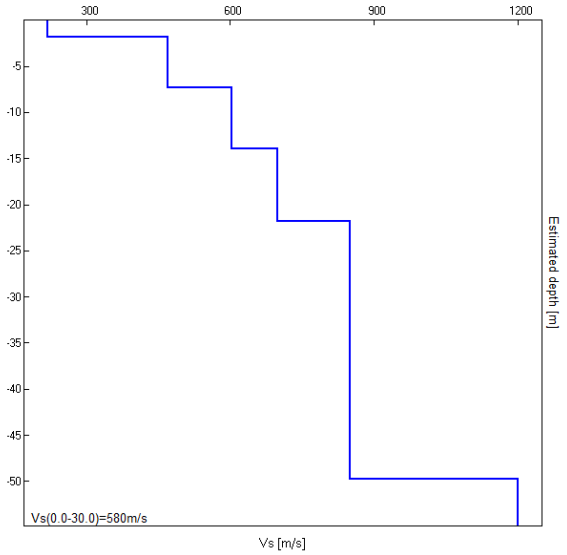


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
1.80	1.80	220	0.45
7.30	5.50	470	0.45
13.90	6.60	604	0.45
21.80	7.90	700	0.45
49.80	28.00	850	0.45
inf.	inf.	1200	0.45

Vs(0.0-30.0)=580m/s



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

Max. H/V at 4.94 ± 9.81 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.94 > 0.50	OK	
$n_c(f_0) > 200$	5925.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 238 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	6.969 Hz	OK	
$A_0 > 2$	2.79 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|1.98772| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	9.81434 < 0.24688		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1993 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

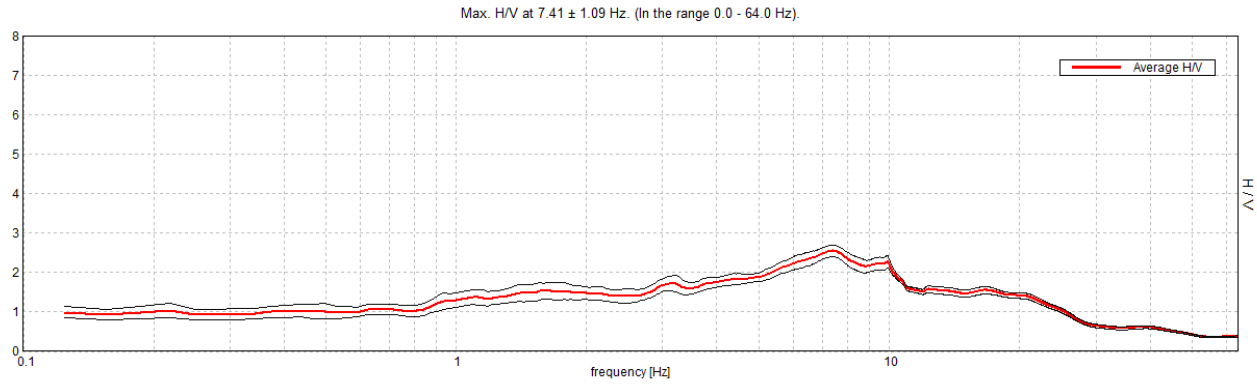
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T18 - BREMBILLA Via Marconi

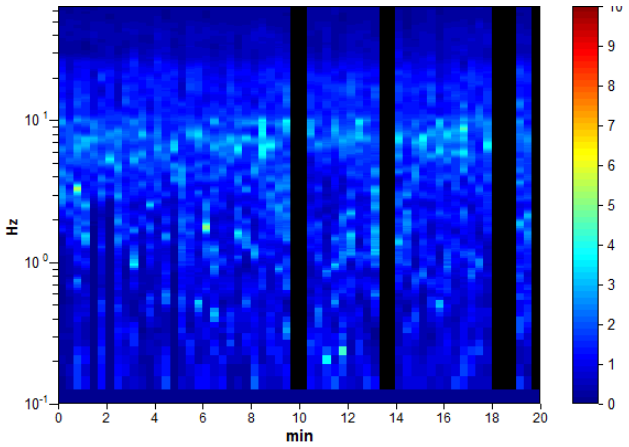
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 15/02/17 18:36:43 End recording: 15/02/17 18:56:44
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

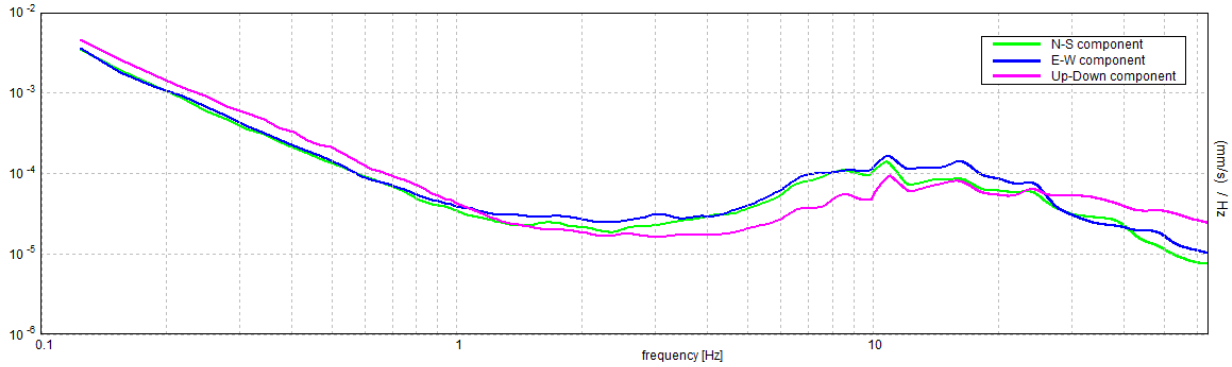
HORIZONTAL TO VERTICAL SPECTRAL RATIO



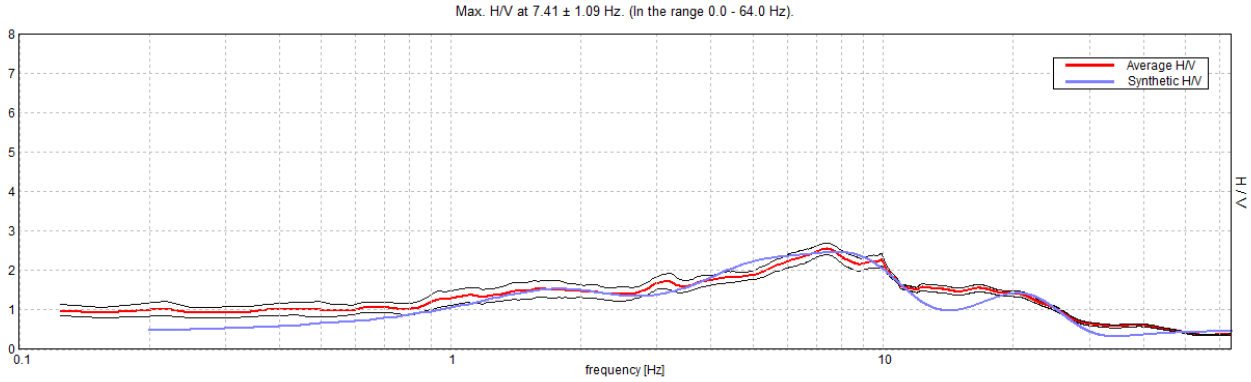
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

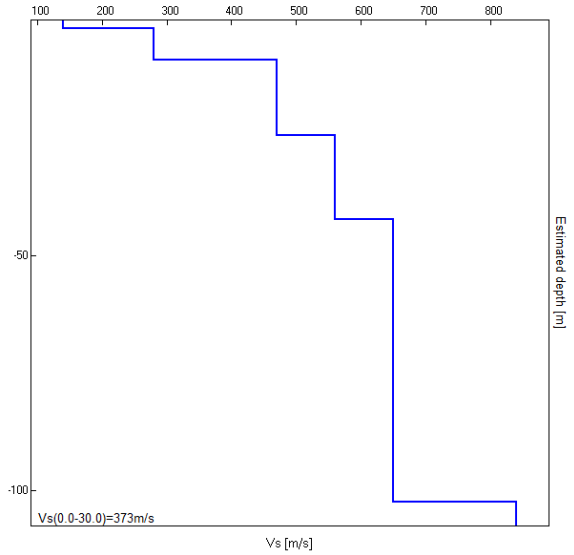


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
1.75	1.75	140	0.42
8.45	6.70	280	0.42
24.45	16.00	470	0.45
42.45	18.00	560	0.42
102.45	60.00	650	0.45
inf.	inf.	840	0.45

Vs(0.0-30.0)=373m/s



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

Max. H/V at 7.41 ± 1.09 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	7.41 > 0.50	OK	
$n_c(f_0) > 200$	7702.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 356 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	22.188 Hz	OK	
$A_0 > 2$	2.54 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.14691| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	1.08805 < 0.37031		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1513 < 1.58	OK	

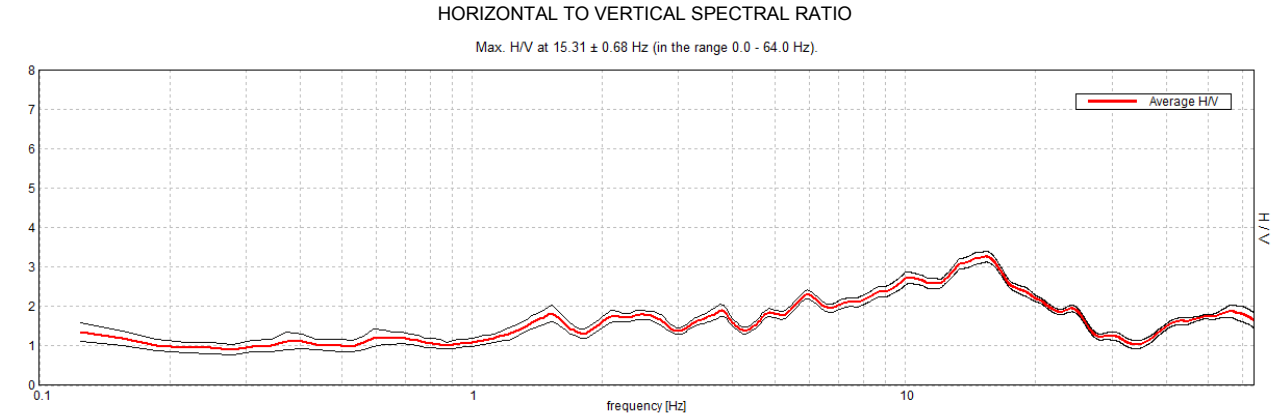
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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 standard deviation of log $A_{H/V}(f)$ curve
$\sigma_{logH/V}(f)$	
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

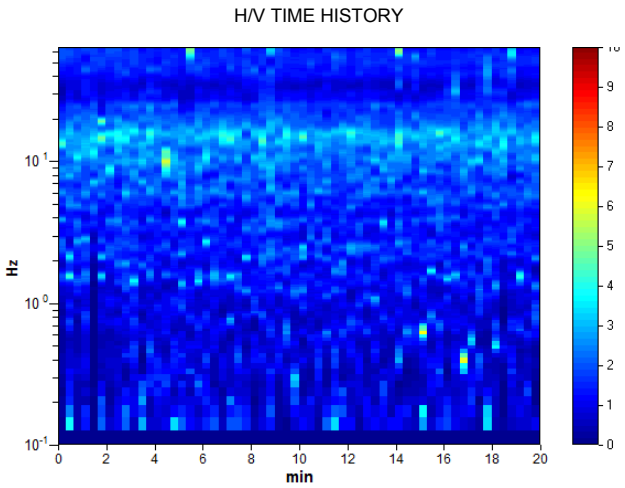
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T19 – LAXOLO Frazione Caremondi

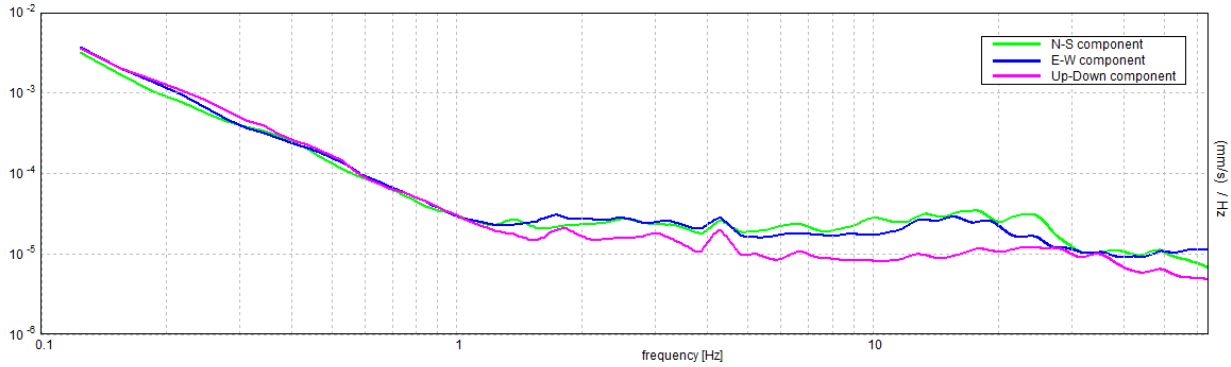
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 14/02/17 11:23:59 End recording: 14/02/17 11:44:00
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

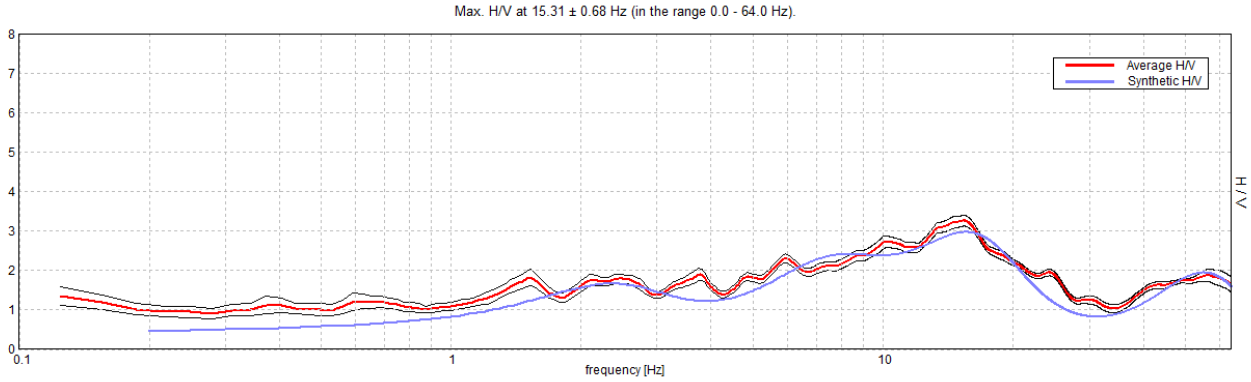




SINGLE COMPONENT SPECTRA

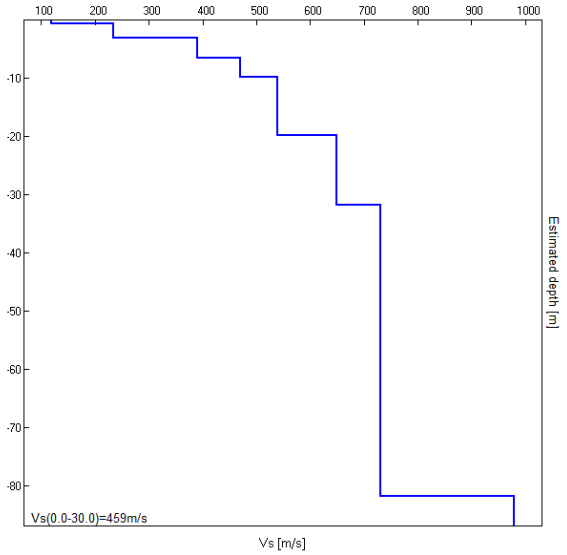


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.55	0.55	118	0.45
3.05	2.50	235	0.45
6.45	3.40	390	0.45
9.75	3.30	470	0.45
19.75	10.00	540	0.45
31.75	12.00	650	0.45
81.75	50.00	730	0.45
inf.	inf.	980	0.45

Vs(0.0-30.0)=459m/s



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

Max. H/V at 15.31 ± 0.68 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	15.31 > 0.50	OK	
$n_c(f_0) > 200$	18375.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 736 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	4.594 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	25.969 Hz	OK	
$A_0 > 2$	3.26 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.04424| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.6774 < 0.76563	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.1352 < 1.58	OK	

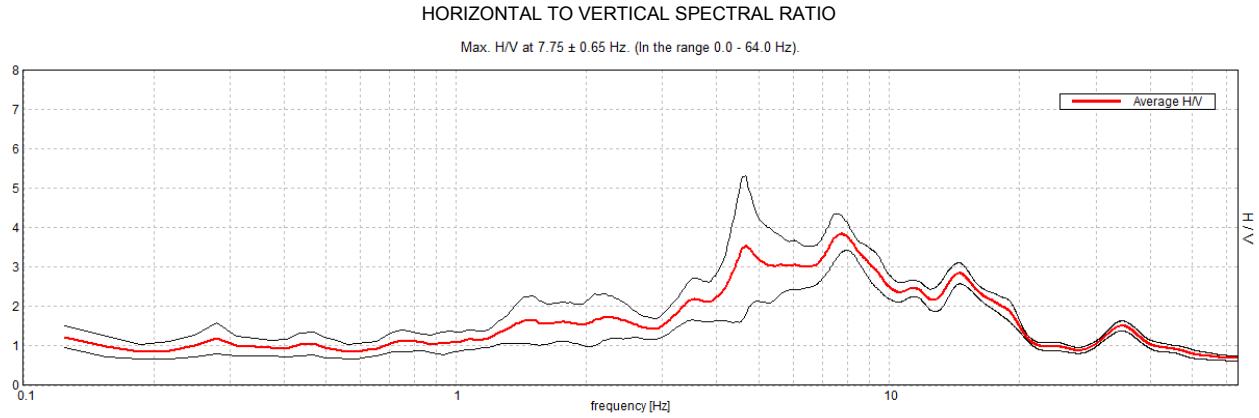
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

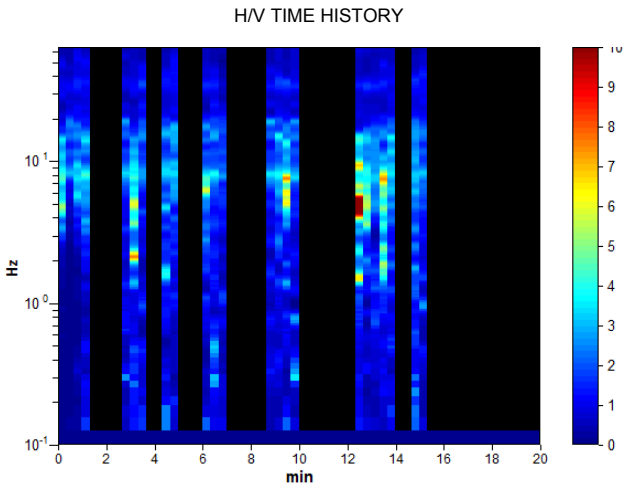
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T20 – BREMBILLA Frazione Sottocamorone

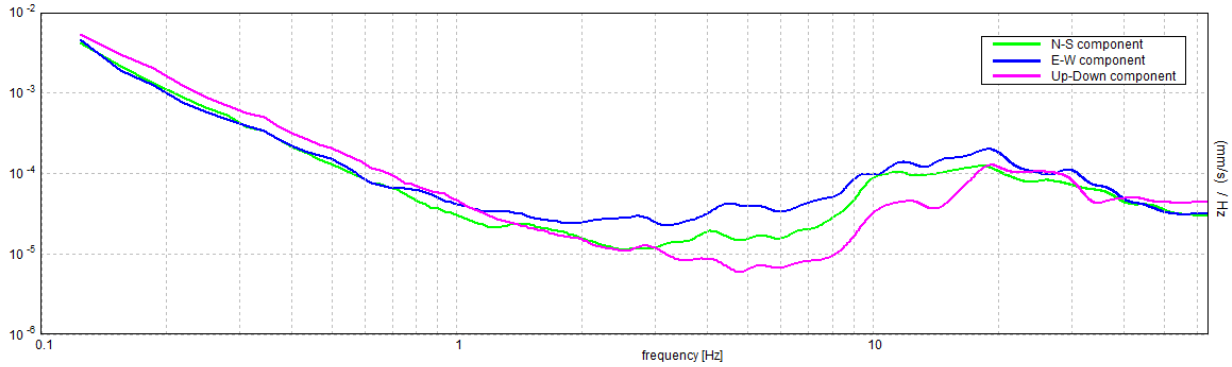
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 03/03/17 17:45:14 End recording: 03/03/17 18:05:15
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 38% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

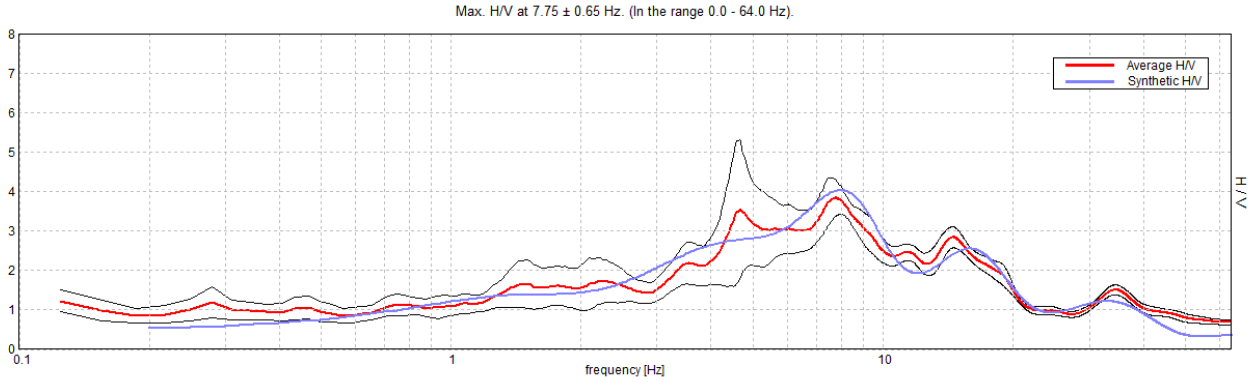




SINGLE COMPONENT SPECTRA

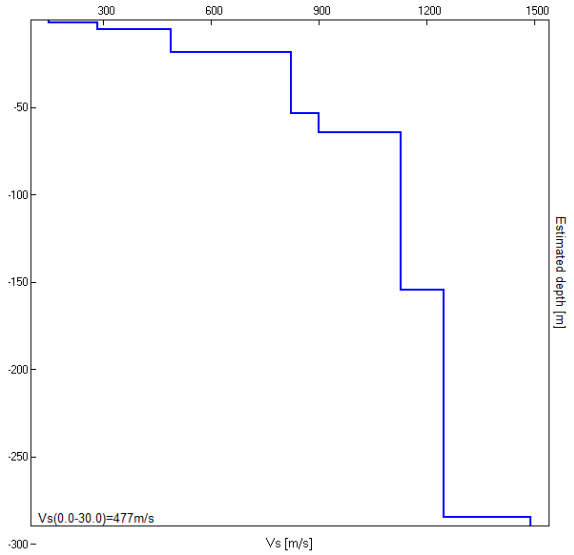


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
1.20	1.20	150	0.45
5.20	4.00	284	0.45
18.20	13.00	490	0.45
53.20	35.00	825	0.45
64.20	11.00	900	0.45
154.20	90.00	1130	0.45
284.20	130.00	1250	0.45
inf.	inf.	1490	0.42

Vs(0.0-30.0)=477m/s



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

Max. H/V at 7.75 ± 0.65 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	7.75 > 0.50	OK	
$n_c(f_0) > 200$	3565.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 373 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	3.281 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	18.813 Hz	OK	
$A_0 > 2$	3.84 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.08353| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.64733 < 0.3875		NO
$\sigma_A(f_0) < \theta(f_0)$	0.4731 < 1.58	OK	

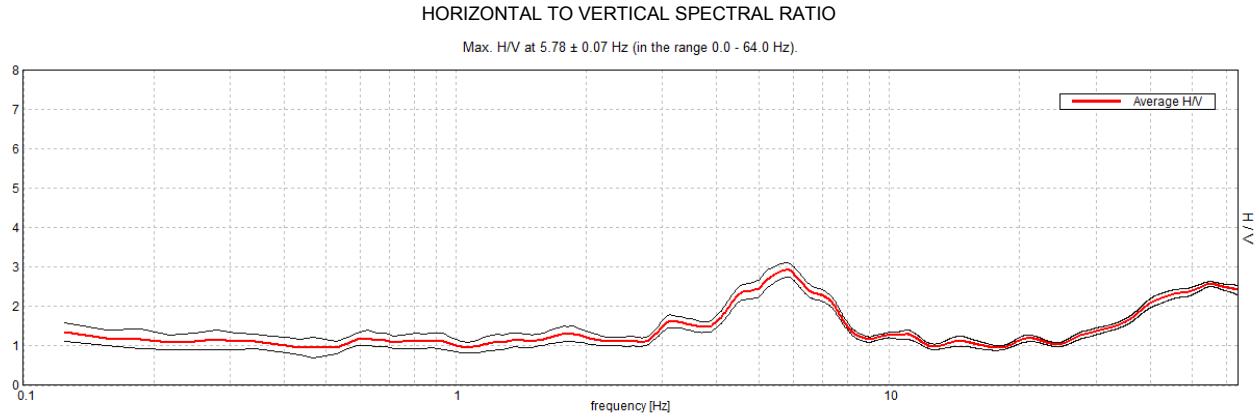
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

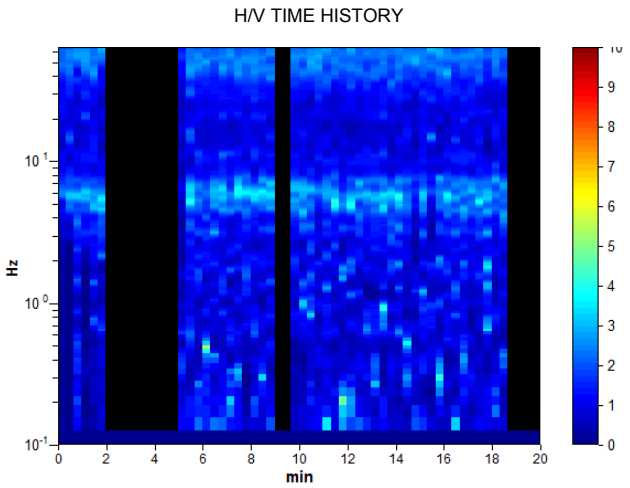
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T21 – BREMBILLA Frazione Cadamone

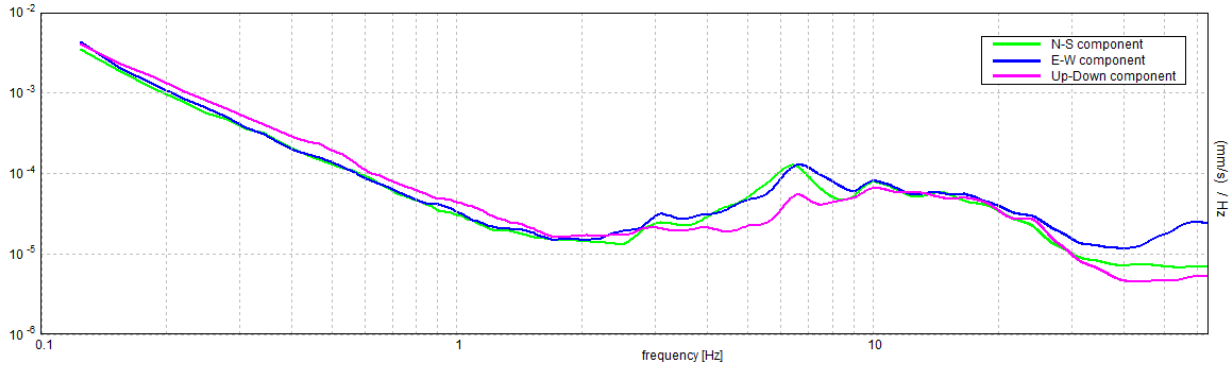
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 03/03/17 18:27:45 End recording: 03/03/17 18:47:46
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

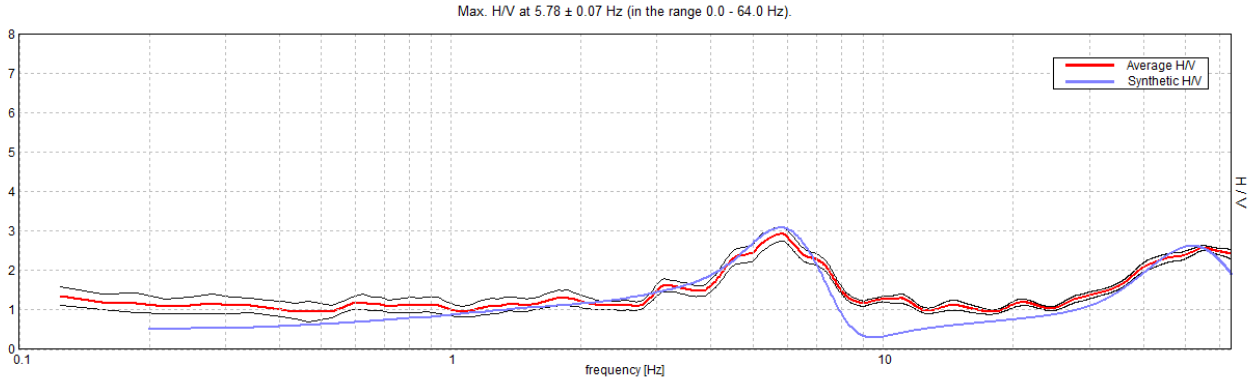




SINGLE COMPONENT SPECTRA

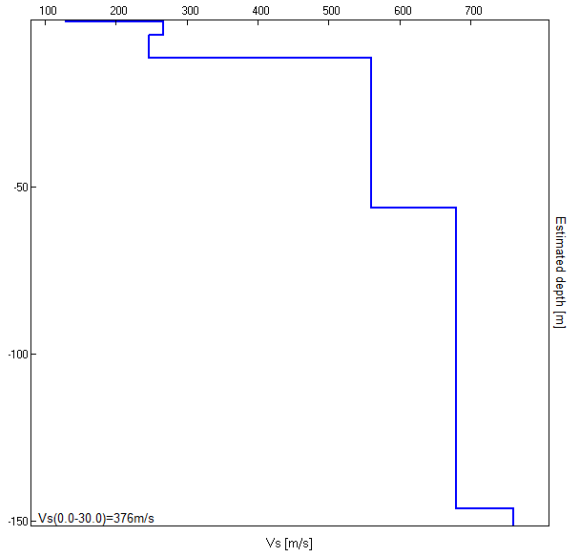


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.60	0.60	130	0.42
4.60	4.00	267	0.42
11.20	6.60	247	0.42
56.20	45.00	560	0.42
146.20	90.00	680	0.42
inf.	inf.	760	0.42

Vs(0.0-30.0)=376m/s



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

Max. H/V at 5.78 ± 0.07 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	5.78 > 0.50	OK	
$n_c(f_0) > 200$	5203.1 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 278 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.969 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	8.094 Hz	OK	
$A_0 > 2$	2.92 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01277| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.0738 < 0.28906	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.1836 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

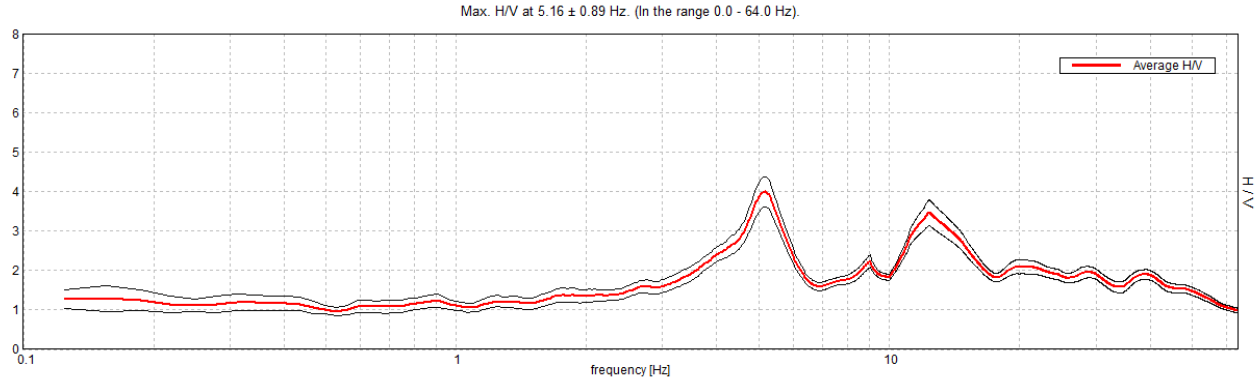
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T22 – BREMBILLA Frazione Ca Bonocchio

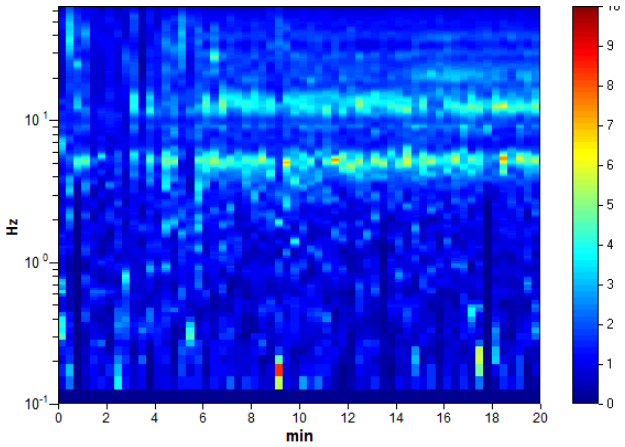
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 03/03/17 16:27:21 End recording: 03/03/17 16:47:22
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

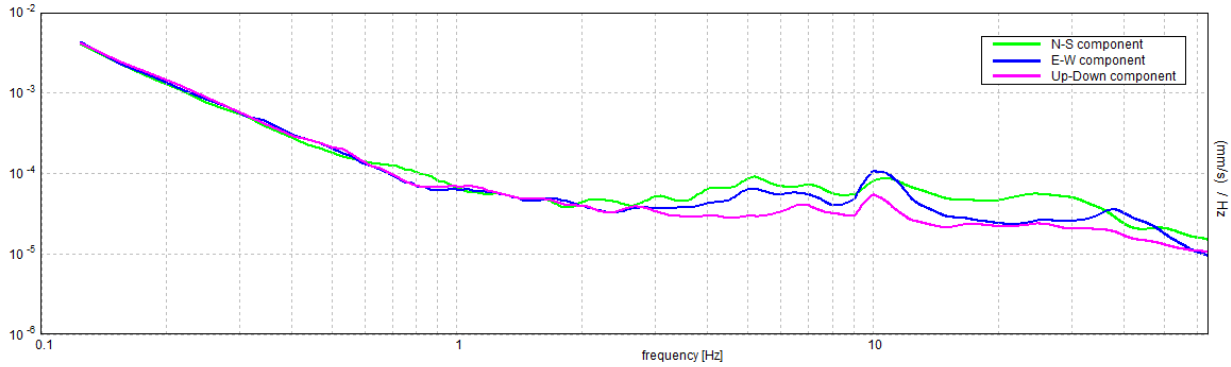
HORIZONTAL TO VERTICAL SPECTRAL RATIO



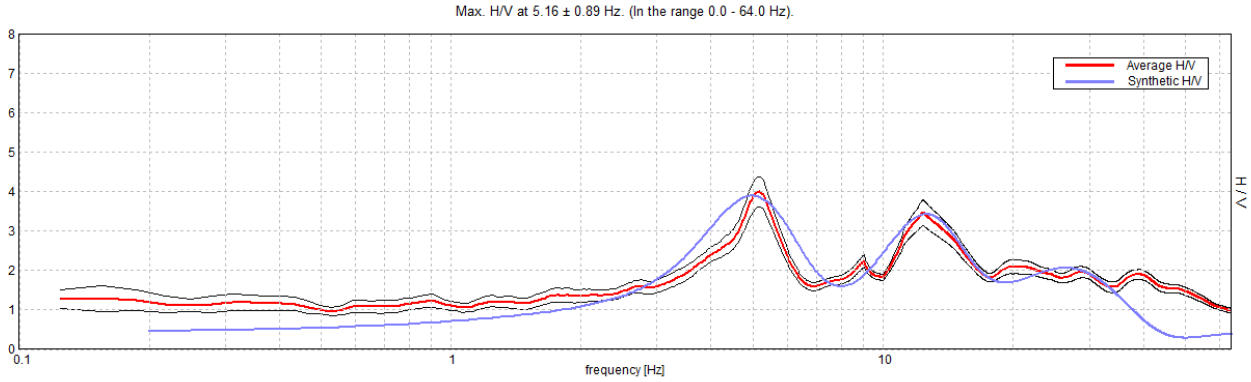
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

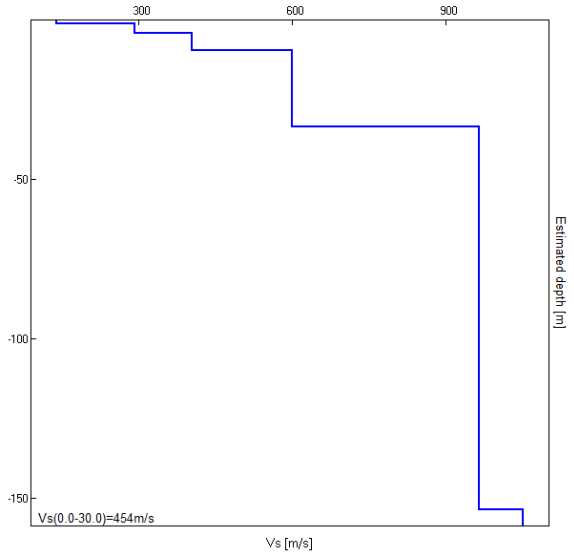


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
1.20	1.20	140	0.42
4.15	2.95	293	0.42
9.55	5.40	405	0.45
33.55	24.00	600	0.45
153.55	120.00	965	0.42
inf.	inf.	1050	0.45

Vs(0.0-30.0)=454m/s



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

Max. H/V at 5.16 ± 0.89 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	5.16 > 0.50	OK	
$n_c(f_0) > 200$	6187.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$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 $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	3.563 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	6.281 Hz	OK	
$A_0 > 2$	3.99 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.17188| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.88626 < 0.25781		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3819 < 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
$\sigma_{logH/V}(f)$	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 $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

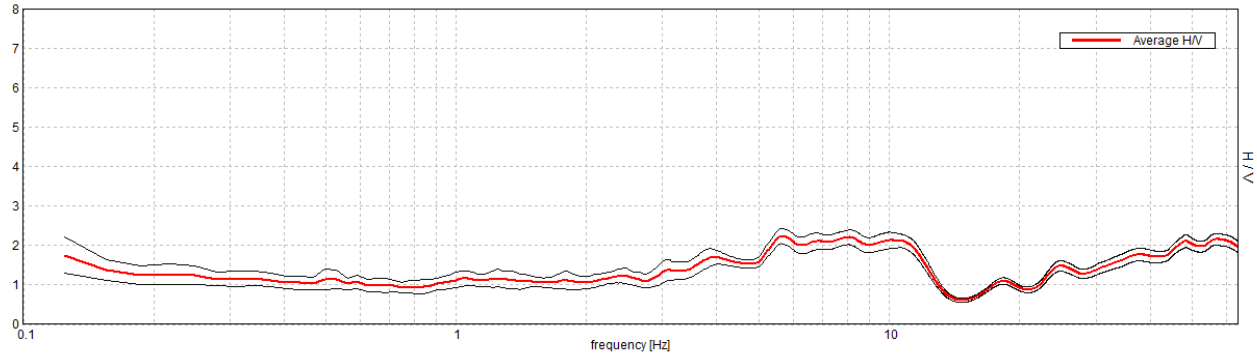
T23 - BREMBILLA Parco Via Donizetti

Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 03/03/17 17:06:20 End recording: 03/03/17 17:26:21
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

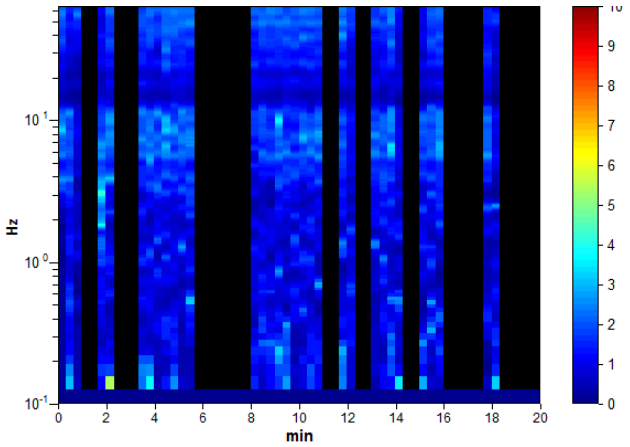
Trace length: 0h20'00". Analyzed 53% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

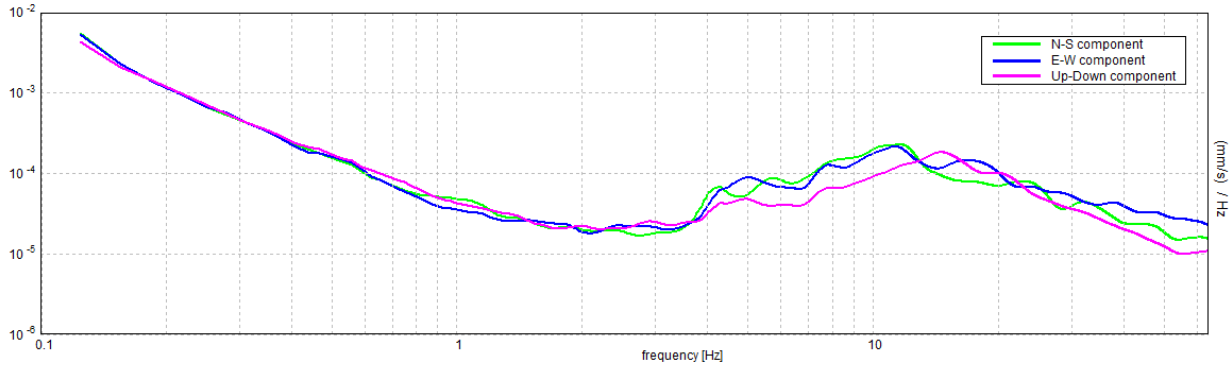
Max. H/V at 5.63 ± 9.48 Hz (in the range 0.0 - 64.0 Hz).



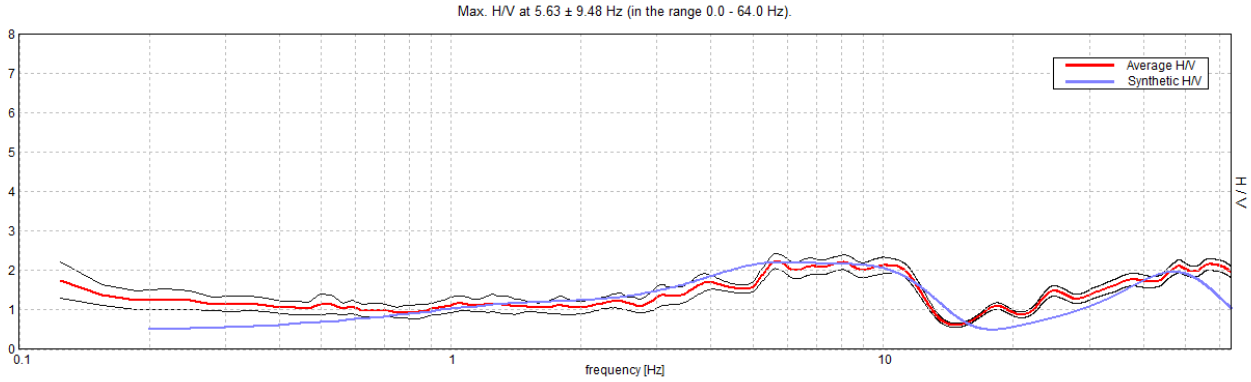
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

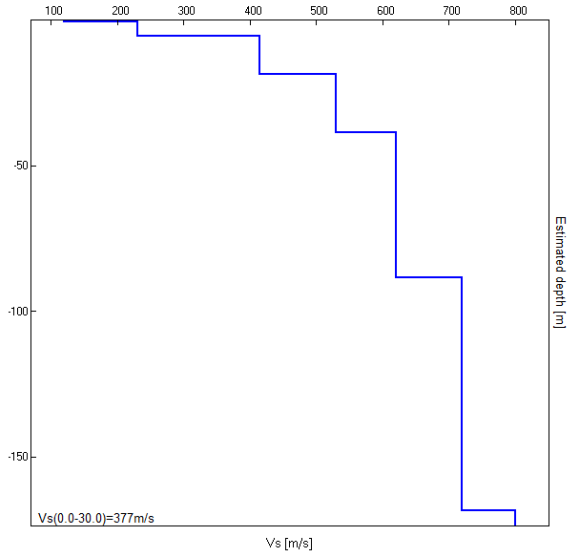


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.60	0.60	120	0.45
5.60	5.00	230	0.45
18.60	13.00	415	0.45
38.60	20.00	530	0.45
88.60	50.00	620	0.45
168.60	80.00	720	0.45
inf.	inf.	800	0.45

Vs(0.0-30.0)=377m/s



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

Max. H/V at 5.63 ± 9.48 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	5.63 > 0.50	OK	
$n_c(f_0) > 200$	3600.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 271 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.781 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	12.781 Hz	OK	
$A_0 > 2$	2.24 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|1.68557| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	9.48131 < 0.28125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1938 < 1.58	OK	

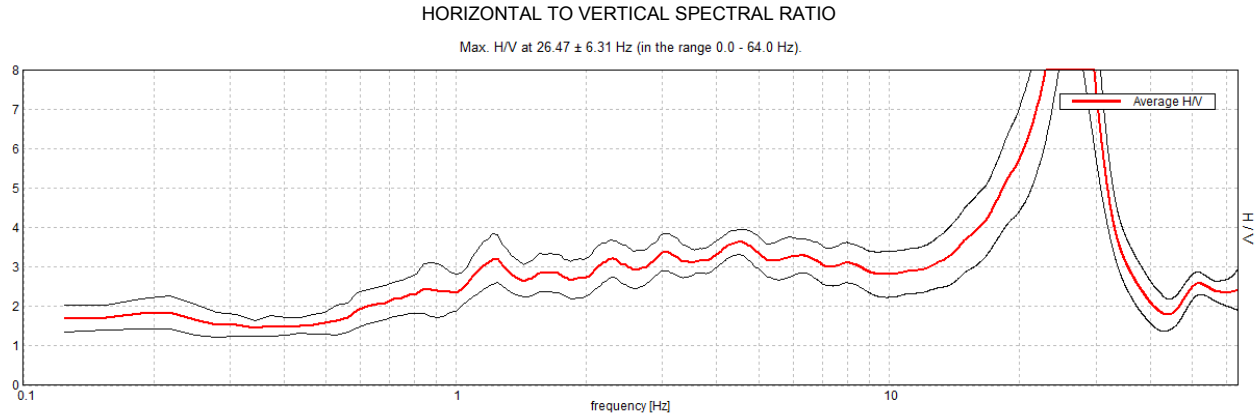
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

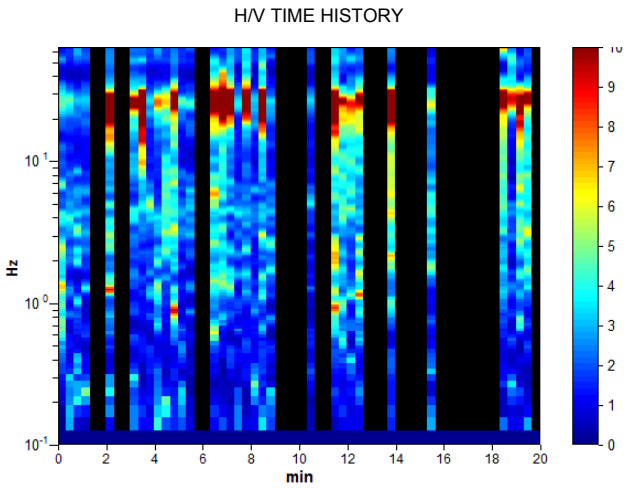
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T24 – BREMBILLA Frazione Castignola

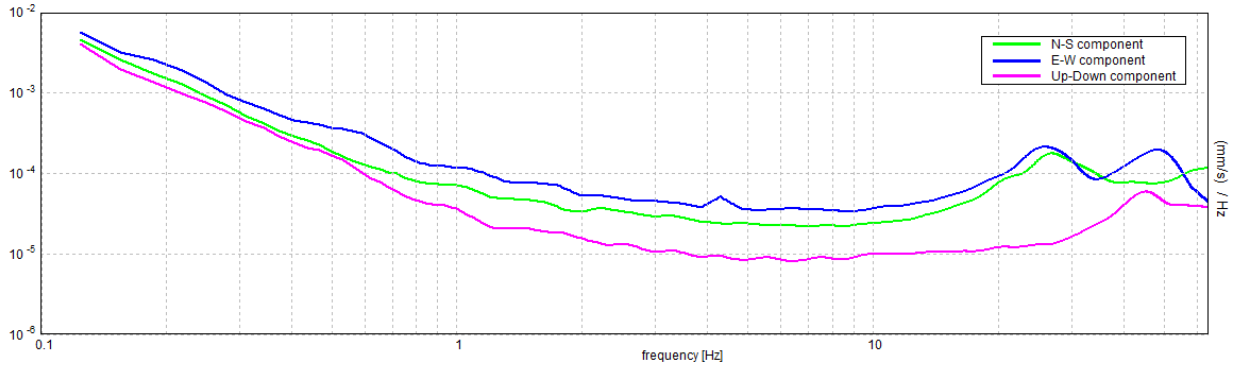
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 02/03/17 16:28:20 End recording: 02/03/17 16:48:21
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 53% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

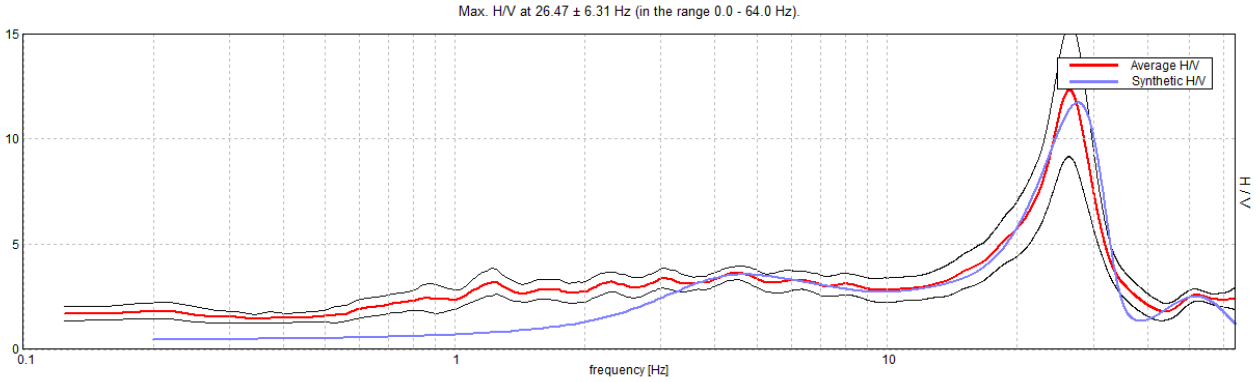




SINGLE COMPONENT SPECTRA

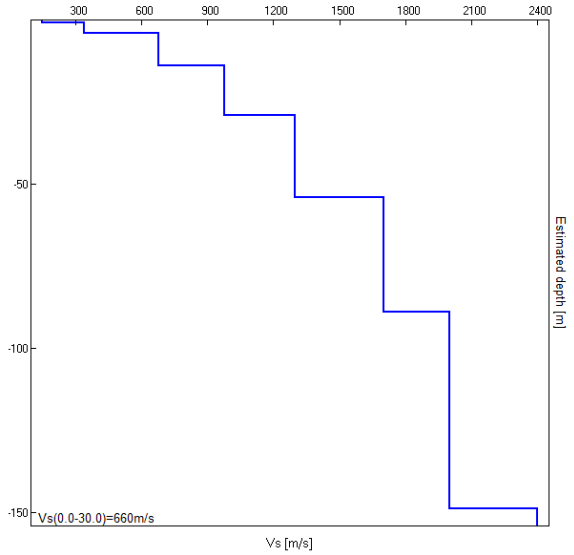


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.80	0.80	148	0.42
3.90	3.10	341	0.42
13.90	10.00	679	0.42
28.90	15.00	976	0.42
53.90	25.00	1300	0.42
88.90	35.00	1700	0.42
148.90	60.00	2000	0.42
inf.	inf.	2400	0.42

Vs(0.0-30.0)=660m/s



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

Max. H/V at 26.47 ± 6.31 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	26.47 > 0.50	OK	
$n_c(f_0) > 200$	16940.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 199 out of 1272 times		NO
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	20.75 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	31.0 Hz	OK	
$A_0 > 2$	12.33 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.23824| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	6.306 < 1.32344		NO
$\sigma_A(f_0) < \theta(f_0)$	3.1789 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

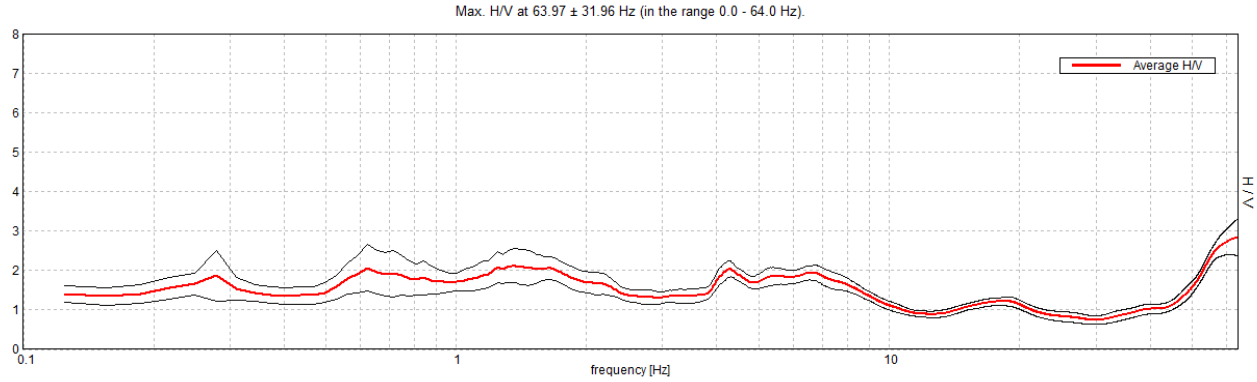
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T25 – BREMBILLA Frazione Catremerio

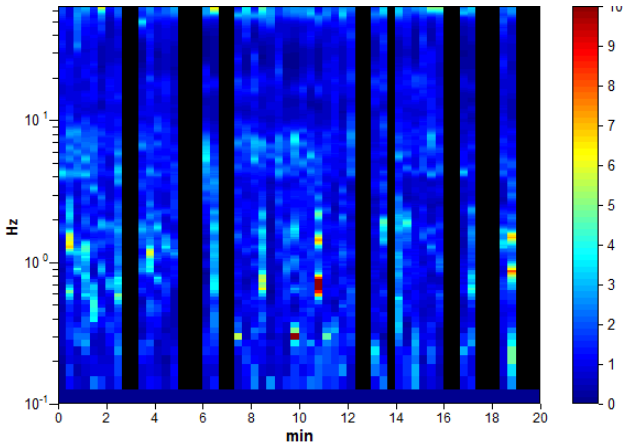
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 02/03/17 17:02:04 End recording: 02/03/17 17:22:05
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

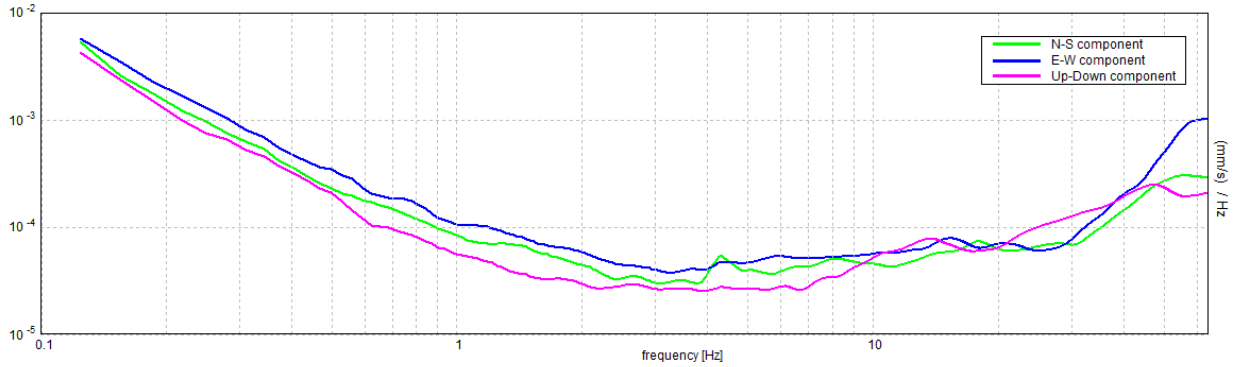
HORIZONTAL TO VERTICAL SPECTRAL RATIO



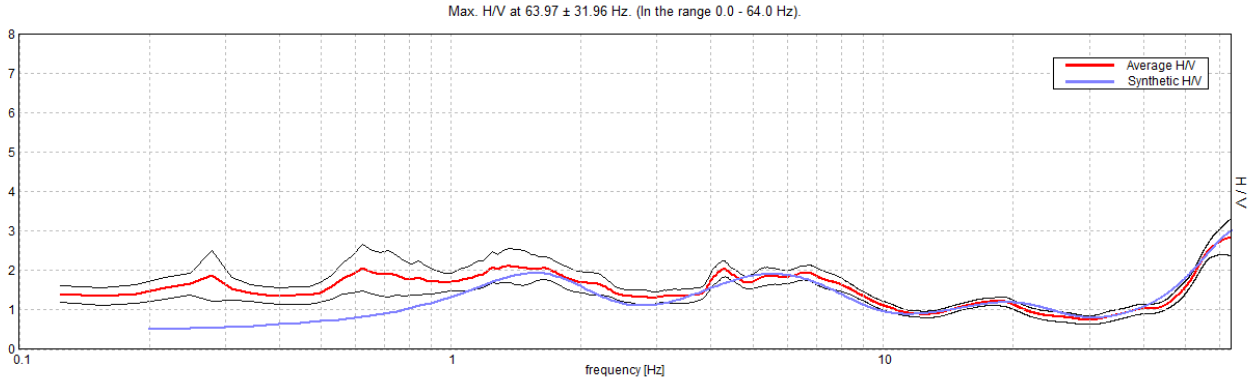
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

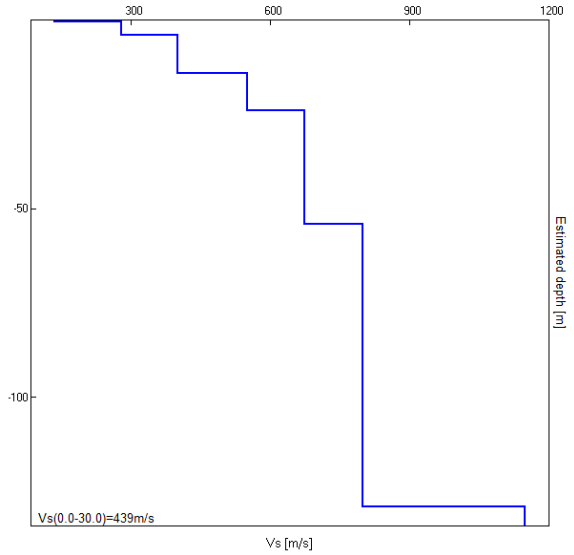


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.50	0.50	135	0.45
4.00	3.50	280	0.45
14.00	10.00	400	0.45
24.00	10.00	550	0.45
54.00	30.00	675	0.45
129.00	75.00	800	0.45
inf.	inf.	1150	0.45

Vs(0.0-30.0)=439m/s



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

Max. H/V at 63.97 ± 31.96 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	63.97 > 0.50	OK	
$n_c(f_0) > 200$	53733.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 1026 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	48.531 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.83 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.49963| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	31.96082 < 3.19844		NO
$\sigma_A(f_0) < \theta(f_0)$	0.4799 < 1.58	OK	

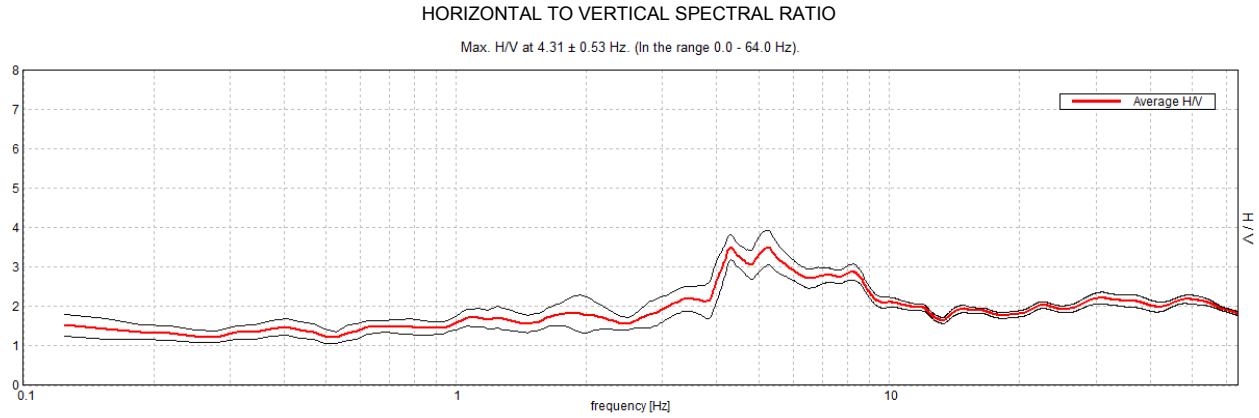
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

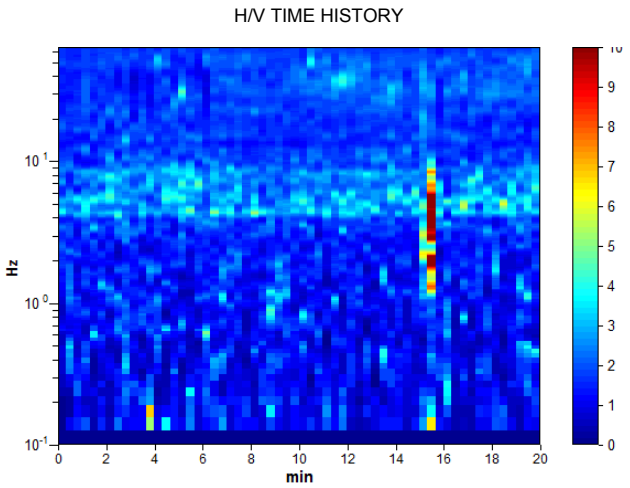
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

T26 – BREMBILLA Frazione Camorone

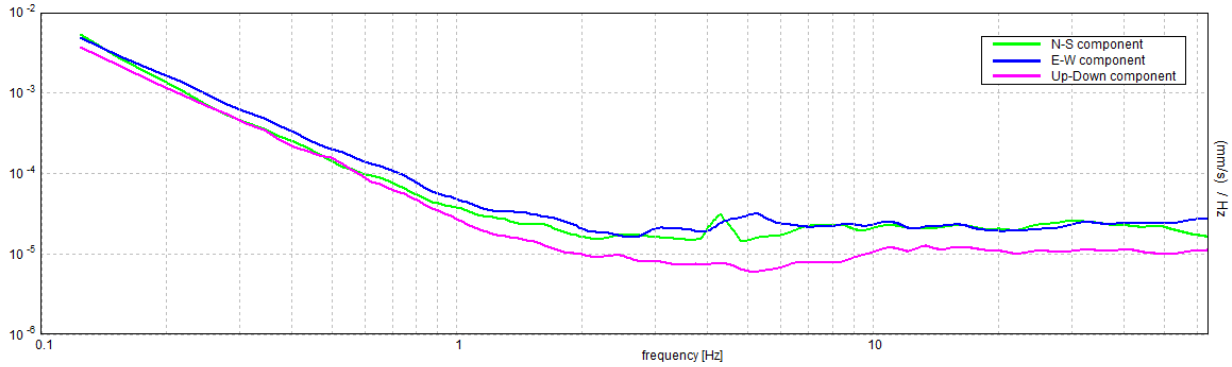
Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 02/03/17 17:49:28 End recording: 02/03/17 18:09:28
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

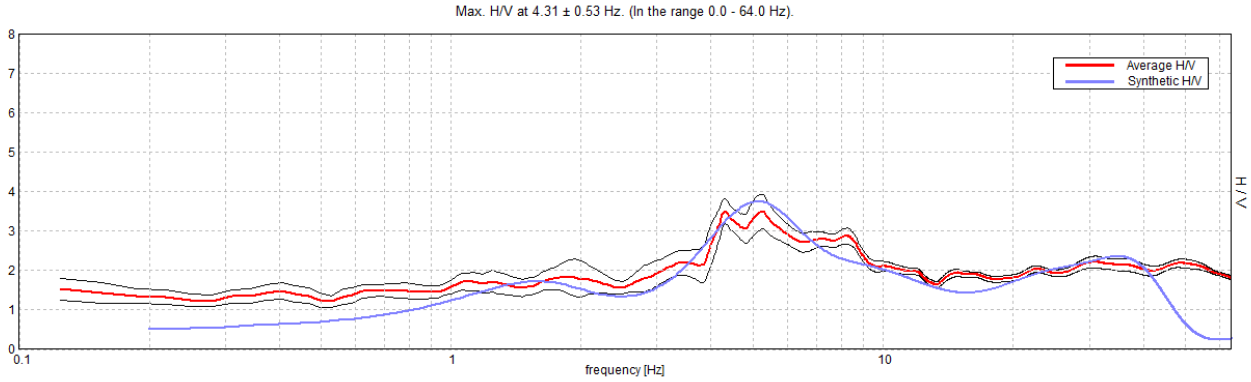




SINGLE COMPONENT SPECTRA

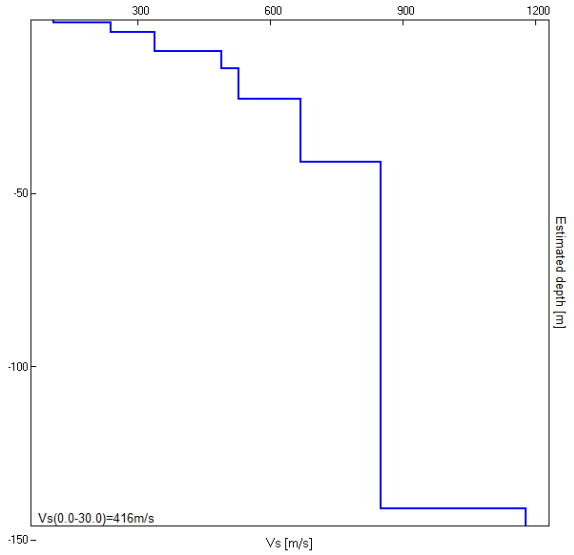


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.80	0.80	110	0.45
3.40	2.60	240	0.45
8.90	5.50	340	0.45
13.90	5.00	490	0.45
22.90	9.00	530	0.45
40.90	18.00	670	0.45
140.90	100.00	850	0.45
inf.	inf.	1180	0.40

Vs(0.0-30.0)=416m/s



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

Max. H/V at 4.31 ± 0.53 Hz (in the range 0.0 - 64.0 Hz).

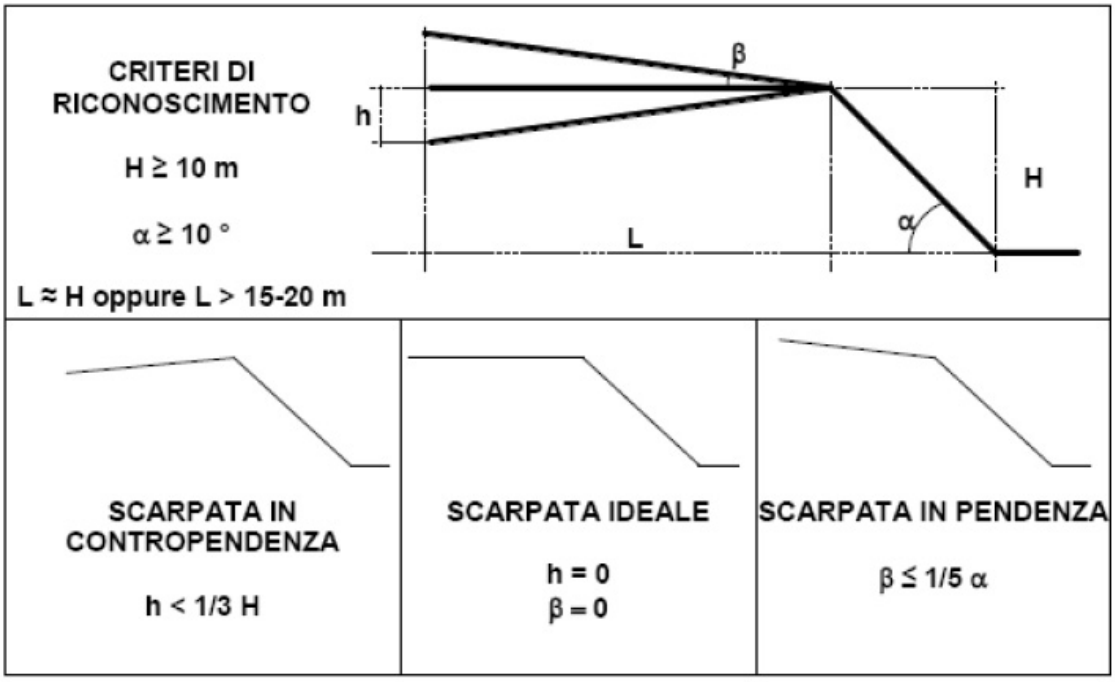
Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.31 > 0.50	OK	
$n_c(f_0) > 200$	5175.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 208 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.719 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	12.656 Hz	OK	
$A_0 > 2$	3.50 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.12211| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.5266 < 0.21563		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3252 < 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
$\sigma_{logH/V}(f)$	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
og $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

Schede per la valutazione del Fattori di amplificazione sismica di tipo topografico e litologico (da D.G.R. n.9/2616 del 30/11/2011)

EFFETTI MORFOLOGICI – SCARPATA - SCENARIO Z3a



Classe altimetrica	Classe di inclinazione	Valore di $Fa_{0.1-0.5}$	Area di influenza
10 m ≤ H ≤ 20 m	10° ≤ α ≤ 90°	1.1	$A_i = H$
20 m < H ≤ 40 m	10° ≤ α ≤ 90°	1.2	$A_i = \frac{3}{4} H$
H > 40 m	10° ≤ α ≤ 20°	1.1	$A_i = \frac{2}{3} H$
	20° < α ≤ 40°	1.2	
	40° < α ≤ 60°	1.3	
	60° < α ≤ 70°	1.2	
	α > 70°	1.1	

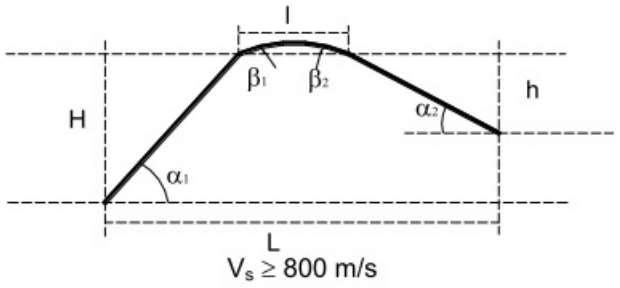
EFFETTI MORFOLOGICI – CRESTE - SCENARIO Z3b

CRITERI DI RICONOSCIMENTO

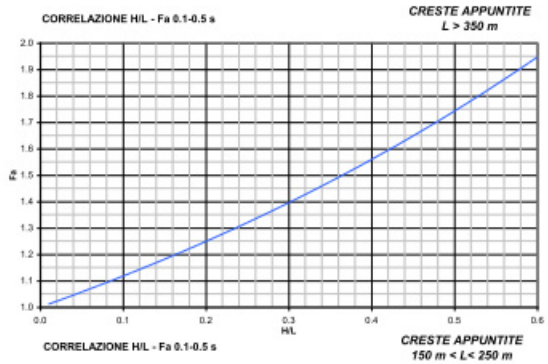
CRESTA
$\alpha_1 \geq 10°$ e $\alpha_2 \geq 10°$
$h \geq 1/3\ H$

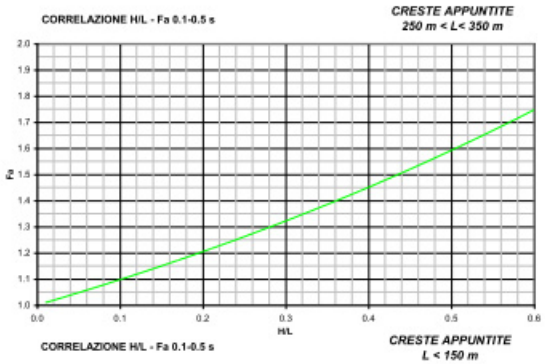
CRESTA ARROTONDATA
$\beta_1 < 10°$ e $\beta_2 < 10°$
$l \geq 1/3\ L$

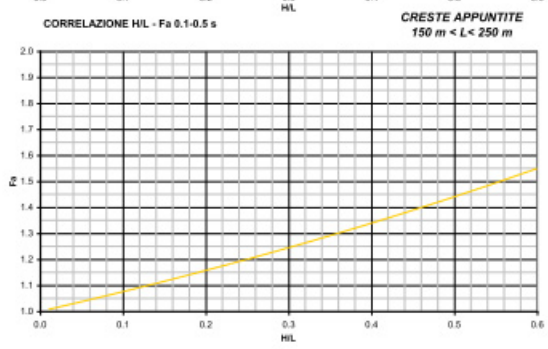
CRESTA APPUNTITA
$l < 1/3\ L$

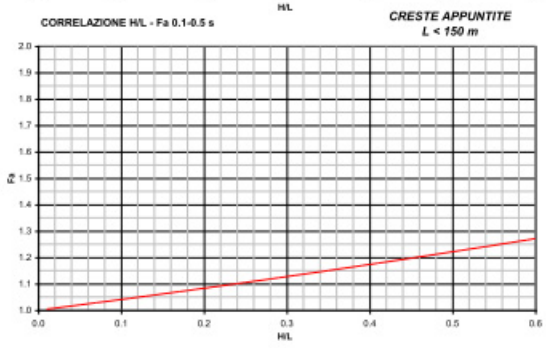


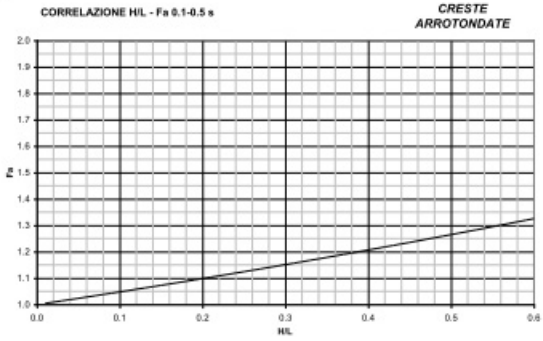
	L > 350	250 < L <350	150 < L < 250	L < 150
Creste Appuntite	$Fa_{0.1-0.5} = e^{1.11H/L}$	$Fa_{0.1-0.5} = e^{0.93H/L}$	$Fa_{0.1-0.5} = e^{0.73H/L}$	$Fa_{0.1-0.5} = e^{0.40H/L}$
Creste Arrotondate	$Fa_{0.1-0.5} = e^{0.47H/L}$			









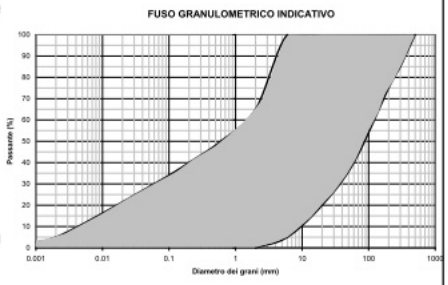


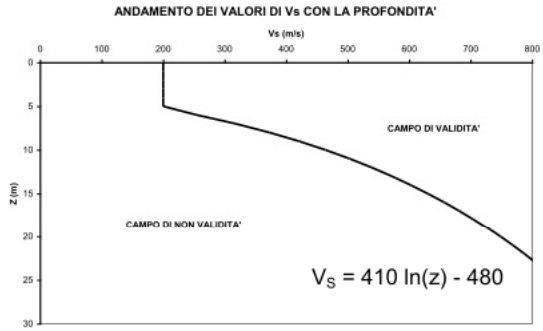
EFFETTI LITOLOGICI – SCHEDA LITOLOGIA GHIAIOSA

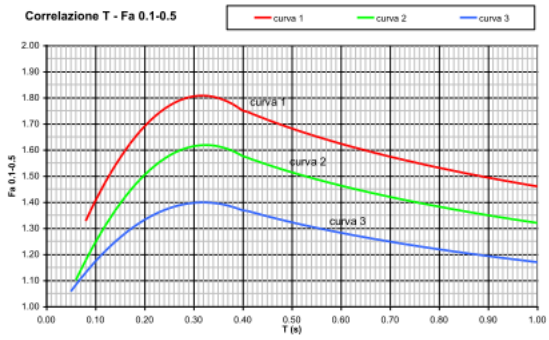
PARAMETRI INDICATIVI

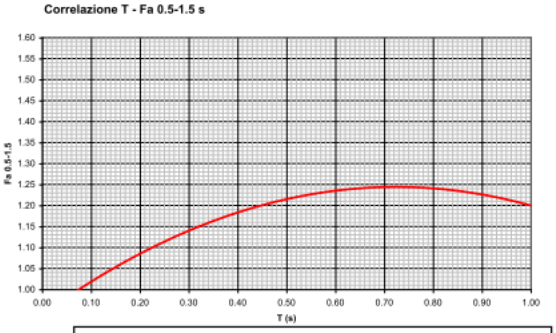
GRANULOMETRIA:
Da ghiaie e ciottoli con blocchi a ghiaie e sabbie limose debolmente argillose passando per ghiaie con sabbie limose, ghiaie sabbiose, ghiaie con limo debolmente sabbiose e sabbie con ghiaie

NOTE:
Comportamento granulare
Struttura granulo-sostenuta
Frazione ghiaiosa superiore al 35%
Frequenti clasti con D_{max} > 20 cm
Frazione sabbiosa fino ad un massimo del 65%
Matrice limoso - argillosa fino ad un massimo del 30% con frazione argillosa subordinata (fino al 5%)
Presenza di eventuali trovanti con D > 50 cm
Presenza di eventuali orizzonti localmente cementati









$$Fa_{0.5-1.5} = -0.58T^2 + 0.84T + 0.94$$

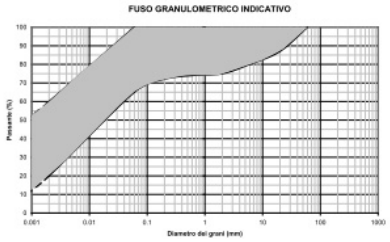
Curva	Tratto polinomiale	Tratto logaritmico
1	$0.08 < T \leq 0.40$	$0.40 < T \leq 1.00$
	$Fa_{0.1-0.5} = -8.5T^2 + 5.4T + 0.95$	$Fa_{0.1-0.5} = 1.46 - 0.32LnT$
2	$0.06 < T \leq 0.40$	$0.40 < T \leq 1.00$
	$Fa_{0.1-0.5} = -7.4T^2 + 4.8T + 0.84$	$Fa_{0.1-0.5} = 1.32 - 0.28LnT$
3	$0.05 < T \leq 0.40$	$0.40 < T \leq 1.00$
	$Fa_{0.1-0.5} = -4.7T^2 + 3.0T + 0.92$	$Fa_{0.1-0.5} = 1.17 - 0.22LnT$

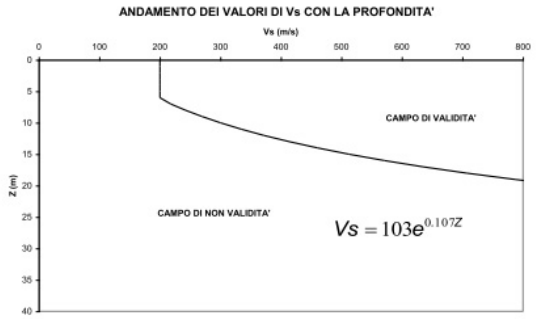
EFFETTI LITOLOGICI – SCHEDA LITOLOGIA LIMOSO – ARGILLOSA TIPO 1

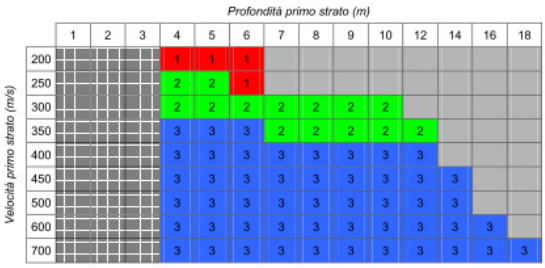
PARAMETRI INDICATIVI

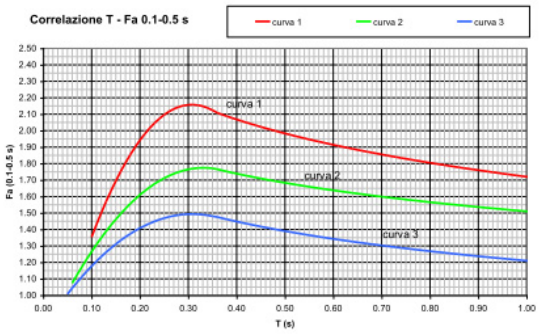
GRANULOMETRIA:
Da limi ghiaioso – argillosi debolmente sabbiosi ad argille con limi passando per limi argillosi, limi con sabbie argillose, limi e sabbie con argille, argille ghiaiose, argille ghiaiose debolmente limose ed argille con sabbie debolmente limose

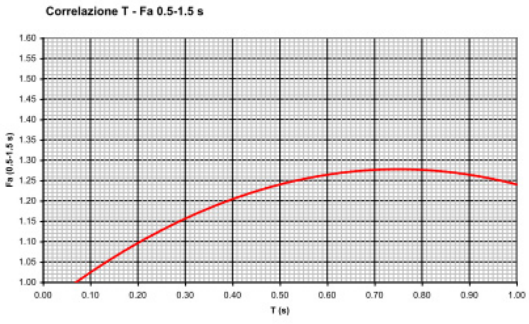
NOTE:
Comportamento coesivo
Struttura matrice-sostenuta
Frazione limosa superiore al 40%
Presenza di clasti immersi con D_{max} < 2-3 cm
Frazione ghiaiosa fino ad un massimo del 25%
Frazione sabbiosa fino ad un massimo del 35%
Frazione argillosa compresa tra 20% e 60%
Presenza di eventuali sottili orizzonti ghiaioso fini e sabbioso medio-grossolani











$$Fa_{0.5-1.5} = -0.6T^2 + 0.9T + 0.94$$

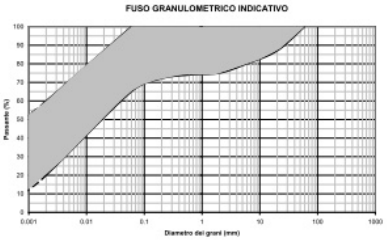
Curva	Tratto polinomiale	Tratto logaritmico
1	$0.08 < T \leq 0.35$	$0.35 < T \leq 1.00$
	$Fa_{0.1-0.5} = -18.7T^2 + 11.5T + 0.39$	$Fa_{0.1-0.5} = 1.72 - 0.38LnT$
2	$0.06 < T \leq 0.35$	$0.35 < T \leq 1.00$
	$Fa_{0.1-0.5} = -9.5T^2 + 6.3T + 0.73$	$Fa_{0.1-0.5} = 1.51 - 0.25LnT$
3	$0.05 < T \leq 0.35$	$0.35 < T \leq 1.00$
	$Fa_{0.1-0.5} = -7.3T^2 + 4.5T + 0.80$	$Fa_{0.1-0.5} = 1.21 - 0.26LnT$

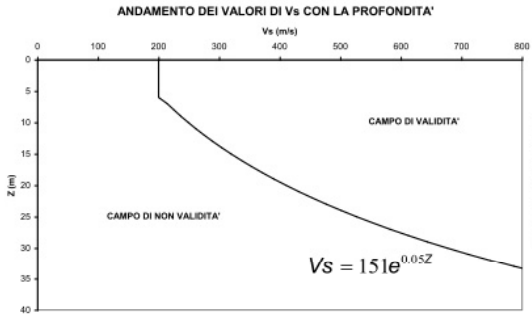
EFFETTI LITOLOGICI – SCHEDA LITOLOGIA LIMOSO – ARGILLOSA TIPO 2

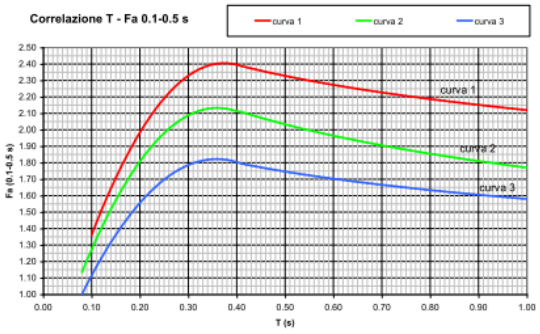
PARAMETRI INDICATIVI

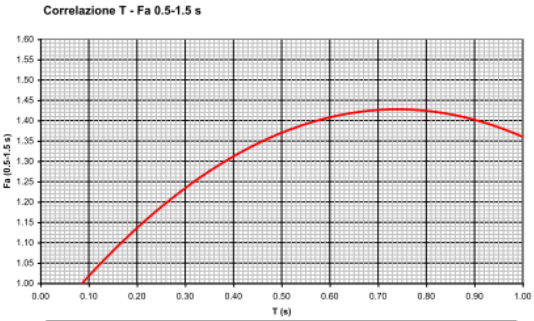
GRANULOMETRIA e NOTE: come per la litologia limoso - argillosa TIPO 1, a cui in aggiunta è possibile associare i seguenti range di valori per alcuni parametri geotecnici significativi validi per argille con limi ghiaiosi debolmente sabbiosi:

PARAMETRO		INTERVALLO
Peso di volume naturale	γ[kN/m^3]	19.5-20.0
Peso specifico particelle solide	γ_s [kN/m^3]	25.7-26.7
Contenuto d'acqua naturale	w [%]	20-25
Limite di liquidità	w_L [%]	30-50
Limite di plasticità	w_P [%]	15-20
Indice di plasticità	I_P [%]	15-30
Indice dei vuoti	e	0.5-0.7
Grado di saturazione	S_r [%]	90-100
Coefficiente di spinta a riposo	K_0	0.5-0.6
Indice di compressione	C_c	0.15-0.30
Indice di rigonfiamento	C_s	0.02-0.06
Coefficiente di consolidazione secondaria	C_a	0.001-0.005
Grado di consolidazione	OCR	1-3
Numero colpi prova SPT (nei primi 10 m)	Nspt	15-30









$$Fa_{0.5-1.5} = -T^2 + 1.48T + 0.88$$

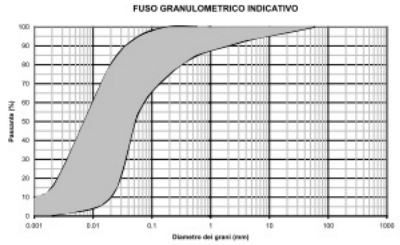
Curva	Tratto polinomiale	Tratto logaritmico
1	$0.10 < T \leq 0.40$	$0.40 < T \leq 1.00$
	$Fa_{0.1-0.5} = -13.9T^2 + 10.4T + 0.46$	$Fa_{0.1-0.5} = 2.12 - 0.30LnT$
2	$0.08 < T \leq 0.40$	$0.40 < T \leq 1.00$
	$Fa_{0.1-0.5} = -12.8T^2 + 9.2T + 0.48$	$Fa_{0.1-0.5} = 1.77 - 0.38LnT$
3	$0.05 < T \leq 0.40$	$0.40 < T \leq 1.00$
	$Fa_{0.1-0.5} = -10.6T^2 + 7.6T + 0.46$	$Fa_{0.1-0.5} = 1.58 - 0.24LnT$

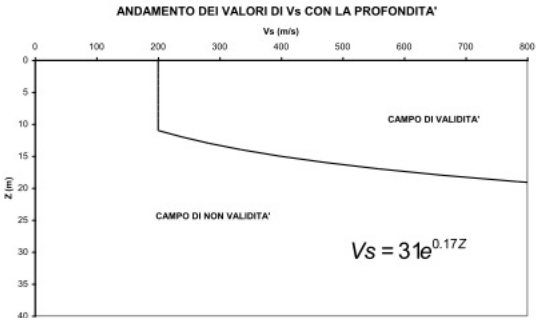
EFFETTI LITOLOGICI – SCHEDA LITOLOGIA LIMOSO – SABBIOSA TIPO 1

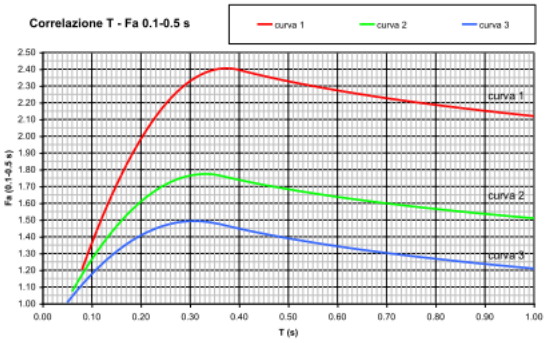
PARAMETRI INDICATIVI

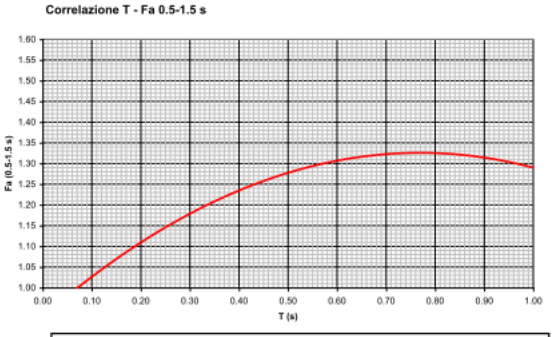
GRANULOMETRIA:
Da limi con sabbie debolmente ghiaiose a limi debolmente sabbioso-argillosi passando per limi con sabbie, limi debolmente argillosi, limi debolmente sabbiosi, limi debolmente ghiaiosi e sabbie con limi debolmente argillosi

NOTE:
Comportamento coesivo
Frazione limosa ad un massimo del 95%
Presenza di clasti immersi con D_{max} < 2-3 cm
Frazione ghiaiosa fino ad un massimo del 10%
Frazione sabbiosa fino ad un massimo del 45%
Frazione argillosa fino ad un massimo del 15%
A FIANCO: range di valori per alcuni parametri geotecnici significativi validi per limi sabbiosi debolmente argillosi









$$Fa_{0.5\text{-}1.5} = -0.67T^2 + 1.03T + 0.93$$

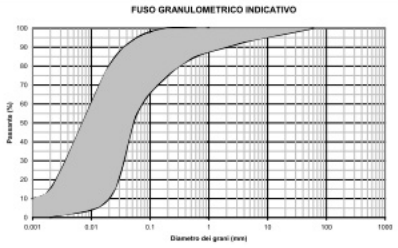
Curva	Tratto polinomiale	Tratto logaritmico
1	$0.08 < T \leq 0.40$	$0.40 < T \leq 1.00$
	$Fa_{0.1-0.5} = -13.9T^2 + 10.4T + 0.46$	$Fa_{0.1-0.5} = 2.12 - 0.30LnT$
2	$0.06 < T \leq 0.35$	$0.35 < T \leq 1.00$
	$Fa_{0.1-0.5} = -9.5T^2 + 6.3T + 0.73$	$Fa_{0.1-0.5} = 1.51 - 0.25LnT$
3	$0.05 < T \leq 0.35$	$0.35 < T \leq 1.00$
	$Fa_{0.1-0.5} = -7.3T^2 + 4.5T + 0.80$	$Fa_{0.1-0.5} = 1.21 - 0.26LnT$

EFFETTI LITOLOGICI – SCHEDA LITOLOGIA LIMOSO – SABBIOSA TIPO 2

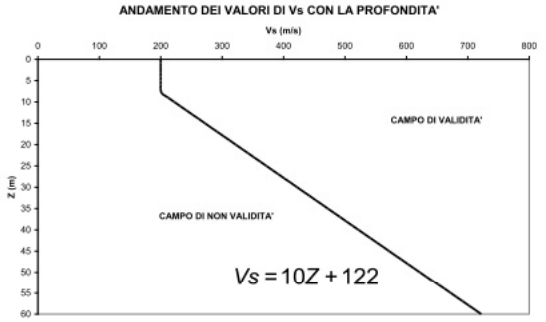
PARAMETRI INDICATIVI

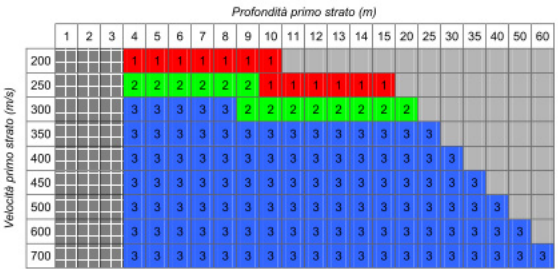
GRANULOMETRIA:
Da limi con sabbie debolmente ghiaiose a limi debolmente sabbioso-argillosi passando per limi con sabbie, limi debolmente argillosi, limi debolmente sabbiosi, limi debolmente ghiaiosi e sabbie con limi debolmente argillosi

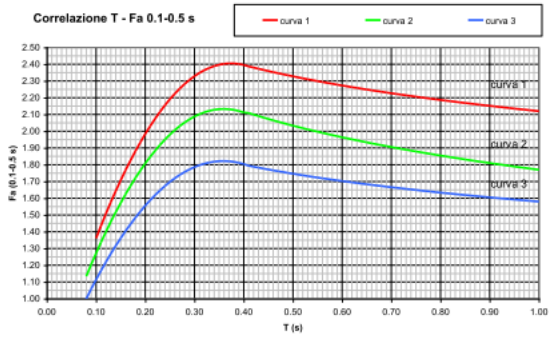
NOTE:
Comportamento coesivo
Frazione limosa ad un massimo del 95%
Presenza di clasti immersi con D_{max} < 2-3 cm
Frazione ghiaiosa fino ad un massimo del 10%
Frazione sabbiosa fino ad un massimo del 45%
Frazione argillosa fino ad un massimo del 15%
A FIANCO: range di valori per alcuni parametri geotecnici significativi validi per limi sabbiosi debolmente argillosi

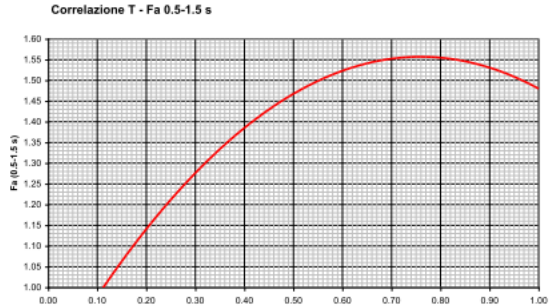


PARAMETRO		INTERVALLO
Peso di volume naturale	γ[kN/m^3]	18.5-19.5
Peso specifico particelle solide	γ_s [kN/m^3]	26.0-27.9
Contenuto d'acqua naturale	w [%]	25-30
Limite di liquidità	w_L [%]	25-35
Limite di plasticità	w_P [%]	15-20
Indice di plasticità	I_P [%]	5-15
Indice dei vuoti	e	0.6-0.9
Grado di saturazione	S_r [%]	90-100
Coefficiente di spinta a riposo	K_0	0.4-0.5
Indice di compressione	C_c	0.10-0.30
Indice di rigonfiamento	C_s	0.03-0.05
Coefficiente di consolidazione secondaria	C_α	0.002-0.006
Numero colpi prova SPT (nei primi 10 m)	Nspt	0-20









$$Fa_{0.5\ 1.5} = -1.33T^2 + 2.02T + 0.79$$

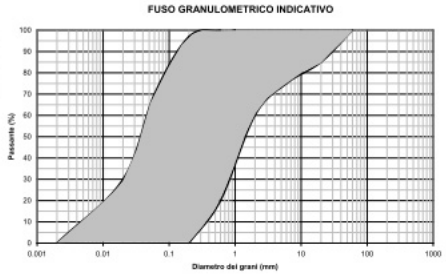
Curva	Tratto polinomiale	Tratto logaritmico
1	$0.10 < T \leq 0.40$	$0.40 < T \leq 1.00$
	$Fa_{0.1-0.5} = -13.9T^2 + 10.4T + 0.46$	$Fa_{0.1-0.5} = 2.12 - 0.30LnT$
2	$0.08 < T \leq 0.40$	$0.40 < T \leq 1.00$
	$Fa_{0.1-0.5} = -12.8T^2 + 9.2T + 0.48$	$Fa_{0.1-0.5} = 1.77 - 0.38LnT$
3	$0.05 < T \leq 0.40$	$0.40 < T \leq 1.00$
	$Fa_{0.1-0.5} = -10.6T^2 + 7.6T + 0.46$	$Fa_{0.1-0.5} = 1.58 - 0.24LnT$

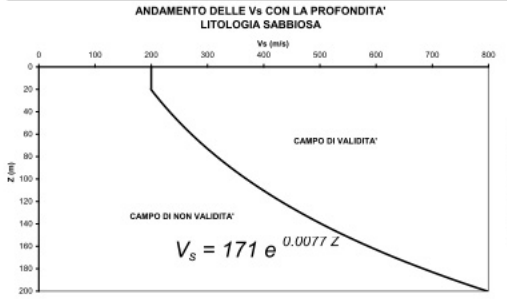
EFFETTI LITOLOGICI – SCHEDA LITOLOGIA SABBIOSA

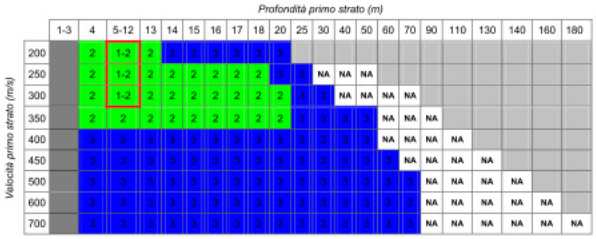
PARAMETRI INDICATIVI

GRANULOMETRIA:
Da sabbia con ghiaia e ciottoli a limo e sabbia passando per sabbie ghiaiose, sabbie limose, sabbie con limo e ghiaia, sabbie limose debolmente ghiaiose, sabbie ghiaiose debolmente limose e sabbie

NOTE:
Comportamento granulare
Struttura granulo-sostenuta
Clasti con D_{max} > 20 cm inferiori al 15%
Frazione ghiaiosa inferiore al 25%
Frazione limosa fino ad un massimo del 70%



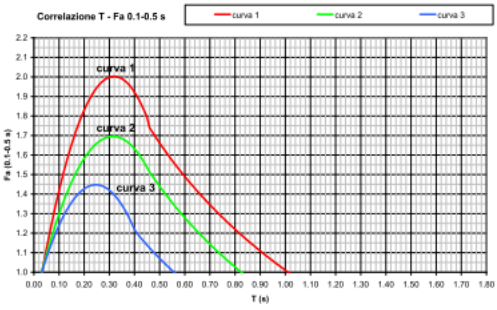


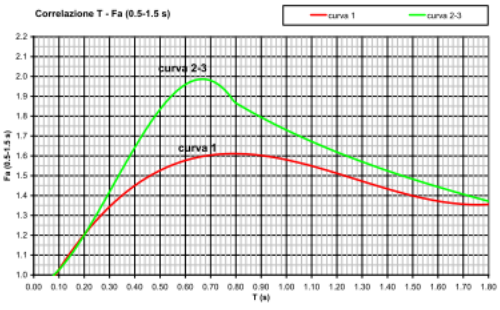


ove
la sigla NA indica *Fa* = 1

il riquadro rosso indica la condizione stratigrafica per cui è necessario utilizzare le curve 1
CONDIZIONE: strato con spessore compreso tra 5 e 12 m e velocità media Vs minore o uguale a 300 m/s poggiante su strato con velocità maggiore di 500 m/s

Vs < 300 m/s	0
Vs > 500 m/s	5 - 12 m





Curva	Tratto polinomiale	Tratto logaritmico	Tratto rettilineo
1	0.03 ≤ T ≤ 0.50	0.50 < T ≤ 1.00	T > 1.00
	$Fa_{0.1-0.5} = -12.21\ T^2 + 7.79\ T + 0.76$	$Fa_{0.1-0.5} = 1.01 - 0.94\ \ln T$	$Fa_{0.1-0.5} = 1.00$
2	0.03 ≤ T ≤ 0.45	0.45 < T ≤ 0.80	T > 0.80
	$Fa_{0.1-0.5} = -8.65\ T^2 + 5.44\ T + 0.84$	$Fa_{0.1-0.5} = 0.83 - 0.88\ \ln T$	$Fa_{0.1-0.5} = 1.00$
3	0.03 ≤ T ≤ 0.40	0.50 < T ≤ 0.55	T > 0.55
	$Fa_{0.1-0.5} = -9.68\ T^2 + 4.77\ T + 0.86$	$Fa_{0.1-0.5} = 0.62 - 0.65\ \ln T$	$Fa_{0.1-0.5} = 1.00$

Curva		
1	0.08 ≤ T ≤ 1.80	
	$Fa_{0.5-1.5} = 0.57\ T^3 - 2.18\ T^2 + 2.38\ T + 0.81$	
2 3	0.08 ≤ T < 0.80	0.80 ≤ T ≤ 1.80
	$Fa_{0.5-1.5} = -6.11\ T^3 + 5.79\ T^2 + 0.44\ T + 0.93$	$Fa_{0.5-1.5} = 1.73 - 0.61\ \ln T$