PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

RegioneEmiliaRomagna

CONFERENZA DELLE REGIONI E DELLE PROVINCE AUTONOME

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

MICROZONAZIONE SISMICA

Livello 3

Allegato 2 – Report delle indagini

Regione Emilia-Romagna

Comune di Castel d'Aiano



Regione	Soggetto realizzatore	Data
EMILIA-ROMAGNA		
Studio realizzato con il contributo di cui all'OCPDC 532/2018 recepita con DGR 2047/2018	Dott. geologo Samuel Sangiorgi	Giugno 2023

Servizi Geotecnici Raffaele Scircoli
Via Nazionale Toscana, 16 - 40068 S Lazzaro (Bo)

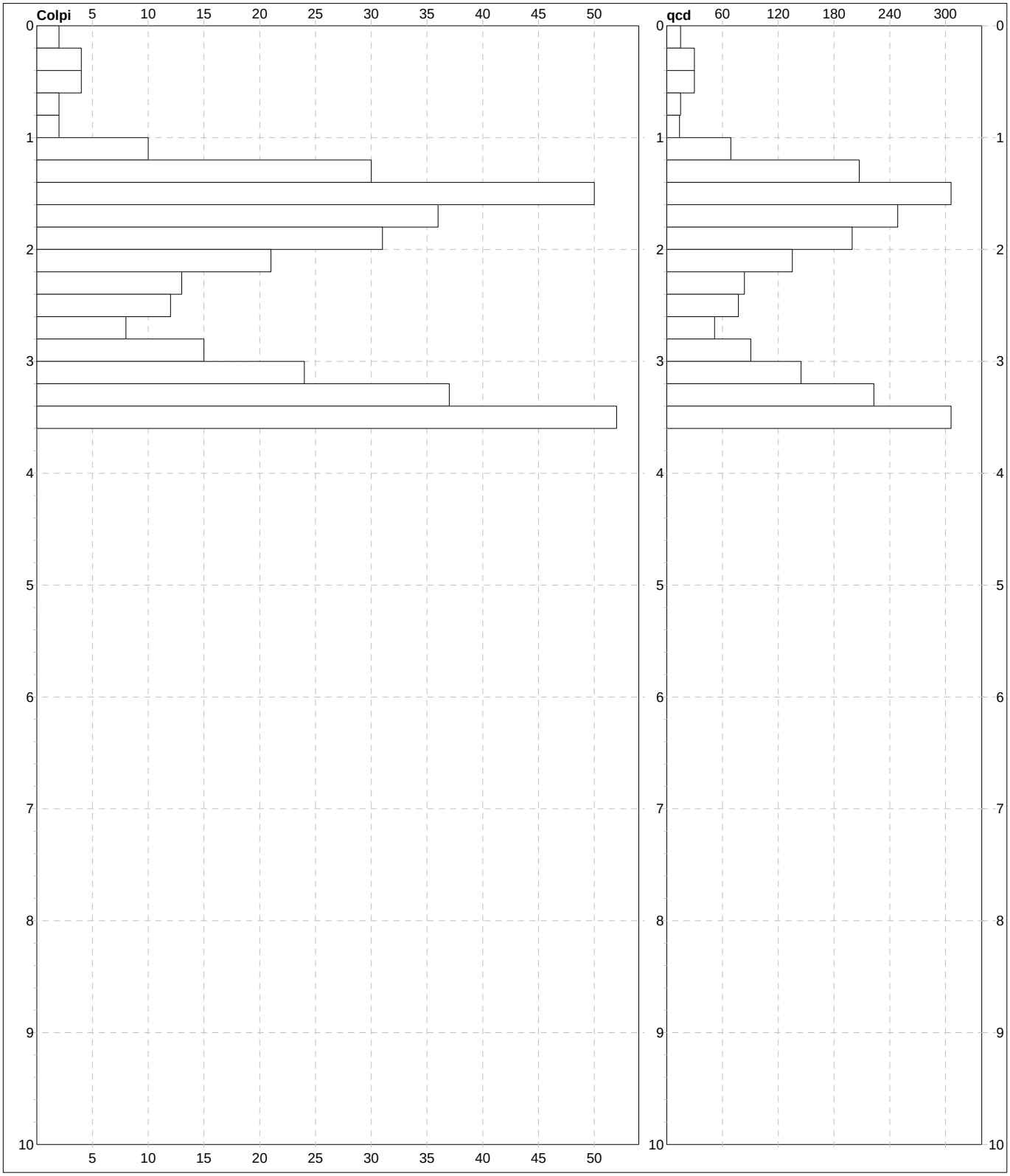
PROVA PENETROMETRICA DINAMICA
DIAGRAMMI COLPI / RESISTENZA

DIN	1
riferimento	43-2022

Committente: **dott geol Samuel Sangiorgi**
Cantiere: **44.291938, 11.219731**
Località: **Campeggio riva del Setta**

U.M.: **kg/cm²**
Scala: 1:50
Pagina: 1
Elaborato:

Data esec.: 25/06/2022
Quota ass.:
Falda: Assente



Penetrometro: DPSH (S. Heavy)
Massa battente: 63.50 m
Altezza caduta: 0.75 m
Avanzamento: 0.20 m

Servizi Geotecnici Raffaele Scircoli
Via Nazionale Toscana, 16 - 40068 S Lazzaro (Bo)

PROVA PENETROMETRICA DINAMICA
LETTURE DI CAMPAGNA PUNTA E/O TOTALE

DIN	1
riferimento	43-2022

Committente: **dott geol Samuel Sangiorgi**
Cantiere: **44.291938, 11.219731**
Località: **Campeggio riva del Setta**

U.M.: **kg/cm²**
Pagina: 1
Elaborato:

Data esec.: 25/06/2022
Falda: Assente

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm²
0.20	1	2		14.90
0.40	1	4		29.80
0.60	2	4		29.80
0.80	2	2		14.90
1.00	2	2		13.81
1.20	2	10		69.05
1.40	2	30		207.14
1.60	3	50		345.23
1.80	3	36		248.56
2.00	3	31		199.47
2.20	3	21		135.12
2.40	3	13		83.65
2.60	4	12		77.21
2.80	4	8		51.48
3.00	4	15		90.36
3.20	4	24		144.58
3.40	4	37		222.90
3.60	5	60		361.46

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm²

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)
qcd = resistenza dinamica punta
Asta = numero di asta impiegata

PROVA PENETROMETRICA DINAMICA
SUDDIVISIONE GEOTECNICA

DIN	1
riferimento	43-2022

Committente: **dott geol Samuel Sangiorgi**
Cantiere: **44.291938, 11.219731**
Località: **Campeggio riva del Setta**

U.M.: **kg/cm²**
Pagina: 1
Elaborato:

Data esec.: 25/06/2022
Falda: Assente

PARAMETRI GENERALI

n°	profondità m	statistica	VCA colpi	β -	Nspt colpi	rpd kg/cm²	qc kg/cm²	Vs m/sec	G kg/cm²	Q kg/cm²	natura	descrizione
1	0.00 : 1.20	Media	4	1.52	6	28.71	26.82	92	50	1.44	Coes./Gran.	
2	1.20 : 2.20	Media	34	1.52	51	227.10	208.79	178	279	11.36	Coes./Gran.	
3	2.20 : 3.40	Media	18	1.52	28	111.70	105.20	177	173	5.58	Coes./Gran.	
4	3.40 : 3.60	Media	60	1.52	91	361.46	361.46	226	443	18.07	Granulare	

NATURA COESIVA

NATURA GRANULARE

n°	profondità m	Nspt colpi	Cu kg/cm²	Ysat t/m³	W %	e -	Mo kg/cm²	Dr %	ø °	E' kg/cm²	Ysat t/m³	Yd t/m³	Mo kg/cm²	Liq. -
1	0.00 : 1.20	6	0.38	1.85	37.04	1.00	36	22	28	238	1.89	1.43	139	- - -
2	1.20 : 2.20	51	3.19	2.10	20.20	0.55	132	85	41	584	2.15	1.85	556	- - -
3	2.20 : 3.40	28	1.75	2.10	20.20	0.55	85	62	35	407	2.04	1.67	360	- - -
4	3.40 : 3.60	91	- - -	- - -	- - -	- - -	- - -	100	45	893	2.24	1.99	898	- - -

Servizi Geotecnici Raffaele Scircoli
Via Nazionale Toscana, 16 - 40068 S Lazzaro (Bo)

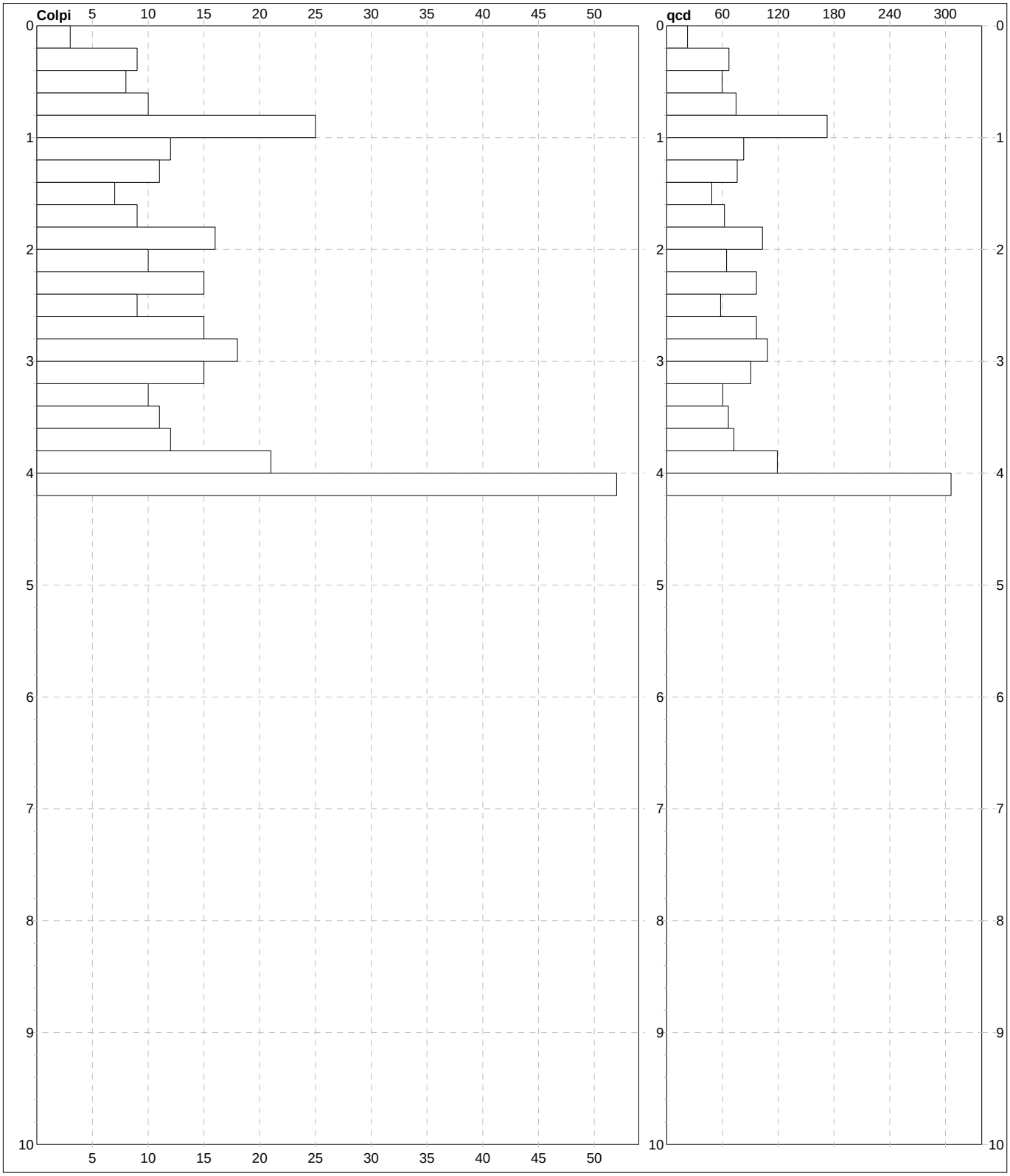
PROVA PENETROMETRICA DINAMICA
DIAGRAMMI COLPI / RESISTENZA

DIN	2
riferimento	43-2022

Committente: **dott geol Samuel Sangiorgi**
Cantiere: **44.248602, 11.225944**
Località: **Campeggio Le Querce**

U.M.: **kg/cm²**
Scala: 1:50
Pagina: 1
Elaborato:

Data esec.: 25/06/2022
Quota ass.:
Falda: Assente



Penetrometro: DPSH (S. Heavy)
Massa battente: 63.50 m
Altezza caduta: 0.75 m
Avanzamento: 0.20 m

Servizi Geotecnici Raffaele Scircoli
Via Nazionale Toscana, 16 - 40068 S Lazzaro (Bo)

PROVA PENETROMETRICA DINAMICA
LETTURE DI CAMPAGNA PUNTA E/O TOTALE

DIN	2
riferimento	43-2022

Committente: **dott geol Samuel Sangiorgi**
Cantiere: **44.248602, 11.225944**
Località: **Campeggio Le Querce**

U.M.: **kg/cm²**
Pagina: 1
Elaborato:

Data esec.: 25/06/2022
Falda: Assente

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm²
0.20	1	3		22.35
0.40	1	9		67.04
0.60	2	8		59.59
0.80	2	10		74.49
1.00	2	25		172.61
1.20	2	12		82.85
1.40	2	11		75.95
1.60	3	7		48.33
1.80	3	9		62.14
2.00	3	16		102.95
2.20	3	10		64.34
2.40	3	15		96.52
2.60	4	9		57.91
2.80	4	15		96.52
3.00	4	18		108.44
3.20	4	15		90.36
3.40	4	10		60.24
3.60	5	11		66.27
3.80	5	12		72.29
4.00	5	21		118.93
4.20	5	60		339.80

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm²

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)
qcd = resistenza dinamica punta
Asta = numero di asta impiegata

PROVA PENETROMETRICA DINAMICA
SUDDIVISIONE GEOTECNICA

DIN	2
riferimento	43-2022

Committente: **dott geol Samuel Sangiorgi**
Cantiere: **44.248602, 11.225944**
Località: **Campeggio Le Querce**

U.M.: **kg/cm²** | Data esec.: 25/06/2022
Pagina: 1 | Elaborato:
Falda: Assente

PARAMETRI GENERALI

n°	profondità m	statistica	VCA colpi	β -	Nspt colpi	rpd kg/cm²	qc kg/cm²	Vs m/sec	G kg/cm²	Q kg/cm²	natura	descrizione
1	0.00 : 0.20	Media	3	1.52	5	22.35	11.17	37	136	1.12	Torbosa	
2	0.20 : 4.00	Media	12	1.52	19	80.01	71.23	143	127	4.00	Coes./Gran.	
3	4.00 : 4.20	Media	60	1.52	91	339.80	339.80	233	443	16.99	Granulare	

NATURA COESIVA

n°	profondità m	Nspt colpi	Cu kg/cm²	Ysat t/m³	W %	e -	Mo kg/cm²
1	0.00 : 0.20	5	0.25	1.48	95.52	2.58	29
2	0.20 : 4.00	19	1.19	2.01	25.45	0.69	67
3	4.00 : 4.20	91	- - -	- - -	- - -	- - -	- - -

NATURA GRANULARE

n°	Dr %	ø °	E' kg/cm²	Ysat t/m³	Yd t/m³	Mo kg/cm²	Liq. -
1	- - -	- - -	- - -	- - -	- - -	- - -	- - -
2	49	33	338	1.98	1.58	284	- - -
3	100	45	893	2.24	1.99	898	- - -

Servizi Geotecnici Raffaele Scircoli
Via Nazionale Toscana, 16 - 40068 S Lazzaro (Bo)

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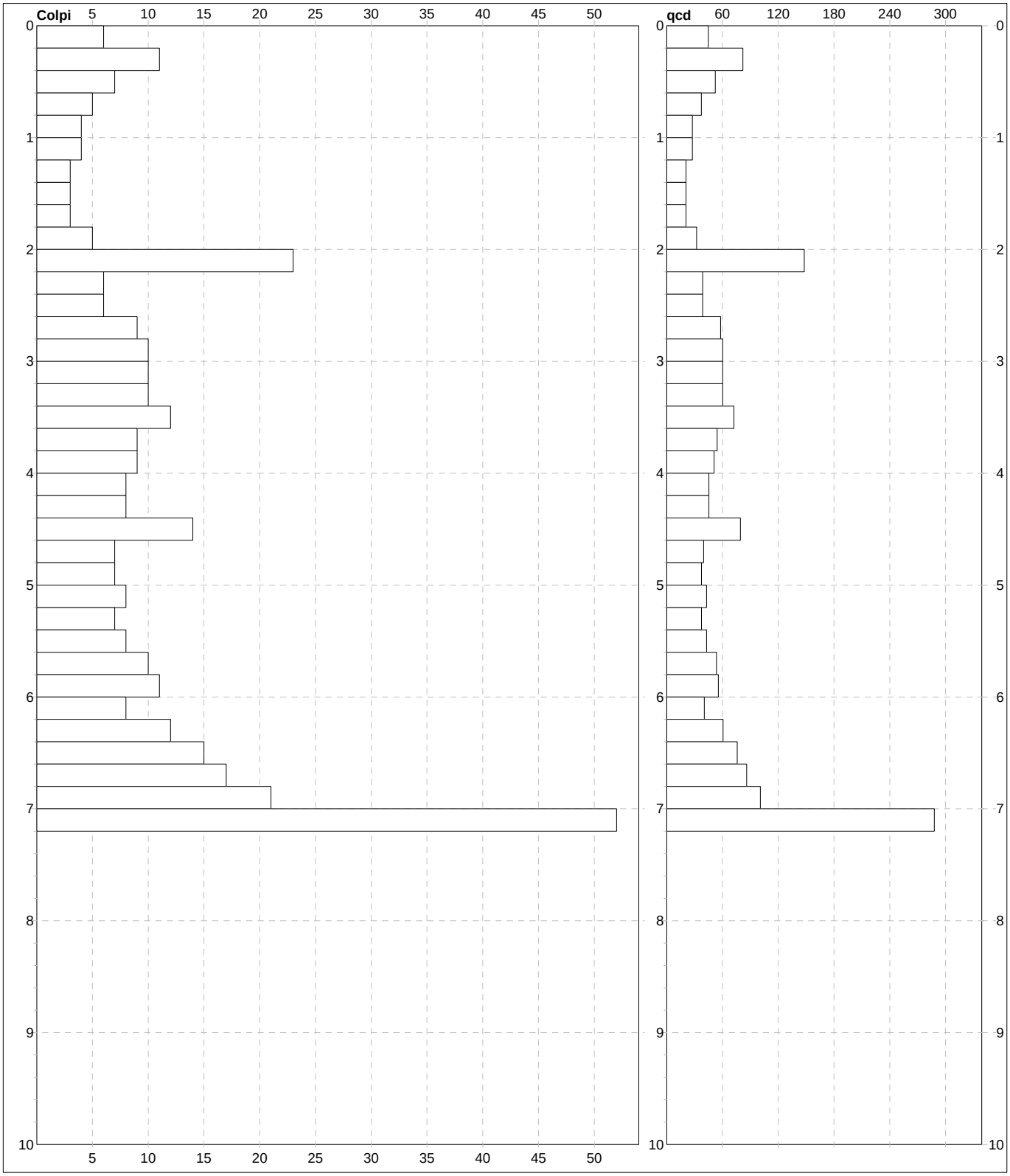
PROVA PENETROMETRICA DINAMICA
DIAGRAMMI COLPI / RESISTENZA

DIN	6
riferimento	43-2022

Committente: **dott geol Samuel Sangiorgi**
Cantiere: **44.318692, 11.263376**
Località: **Vado via Ginetta Chirici**

U.M.: **kg/cm²**
Scala: 1:50
Pagina: 1
Elaborato:

Data esec.: 25/06/2022
Quota ass.:
Falda: Assente



Penetrometro: DPSH (S. Heavy)
Massa battente: 63.50 m
Altezza caduta: 0.75 m
Avanzamento: 0.20 m

Servizi Geotecnici Raffaele Scircoli
Via Nazionale Toscana, 16 - 40068 S Lazzaro (Bo)

PROVA PENETROMETRICA DINAMICA
LETTURE DI CAMPAGNA PUNTA E/O TOTALE

DIN	6
riferimento	43-2022

Committente: **dott geol Samuel Sangiorgi**
Cantiere: **44.318692, 11.263376**
Località: **Vado via Ginetta Chirici**

U.M.: **kg/cm²**
Pagina: 1
Elaborato:

Data esec.: 25/06/2022
Falda: Assente

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm²
0.20	1	6		44.69
0.40	1	11		81.94
0.60	2	7		52.14
0.80	2	5		37.24
1.00	2	4		27.62
1.20	2	4		27.62
1.40	2	3		20.71
1.60	3	3		20.71
1.80	3	3		20.71
2.00	3	5		32.17
2.20	3	23		147.99
2.40	3	6		38.61
2.60	4	6		38.61
2.80	4	9		57.91
3.00	4	10		60.24
3.20	4	10		60.24
3.40	4	10		60.24
3.60	5	12		72.29
3.80	5	9		54.22
4.00	5	9		50.97
4.20	5	8		45.31
4.40	5	8		45.31
4.60	6	14		79.29
4.80	6	7		39.64
5.00	6	7		37.40
5.20	6	8		42.74
5.40	6	7		37.40
5.60	7	8		42.74
5.80	7	10		53.43
6.00	7	11		55.63
6.20	7	8		40.46
6.40	7	12		60.69
6.60	8	15		75.86
6.80	8	17		85.97
7.00	8	21		100.81
7.20	8	60		288.02

H m	Asta n°	L1 n°	L2 n°	qcd kg/cm²

H = profondità
L1 = prima lettura (colpi punta)
L2 = seconda lettura (colpi rivestimento)
qcd = resistenza dinamica punta
Asta = numero di asta impiegata

PROVA PENETROMETRICA DINAMICA
SUDDIVISIONE GEOTECNICA

DIN	6
riferimento	43-2022

Committente: **dott geol Samuel Sangiorgi**
Cantiere: **44.318692, 11.263376**
Località: **Vado via Ginetta Chirici**

U.M.: **kg/cm²**
Pagina: 1
Elaborato:

Data esec.: 25/06/2022
Falda: Assente

PARAMETRI GENERALI

n°	profondità m	statistica	VCA colpi	β -	Nspt colpi	rpd kg/cm²	qc kg/cm²	Vs m/sec	G kg/cm²	Q kg/cm²	natura	descrizione
1	0.00 : 2.00	Media	5	1.52	8	36.56	31.69	107	63	1.83	Coes./Gran.	
2	2.00 : 2.20	Media	23	1.52	35	147.99	147.99	174	206	7.40	Granulare	
3	2.20 : 7.00	Media	10	1.52	15	55.67	51.39	160	105	2.78	Coes./Gran.	
4	7.00 : 7.20	Media	60	1.52	91	288.02	288.02	259	443	14.40	Granulare	

NATURA COESIVA

n°	profondità m	Nspt colpi	Cu kg/cm²	Ysat t/m³	W %	e -	Mo kg/cm²
1	0.00 : 2.00	8	0.50	1.87	34.98	0.94	41
2	2.00 : 2.20	35	- - -	- - -	- - -	- - -	- - -
3	2.20 : 7.00	15	0.94	1.96	28.61	0.77	59
4	7.00 : 7.20	91	- - -	- - -	- - -	- - -	- - -

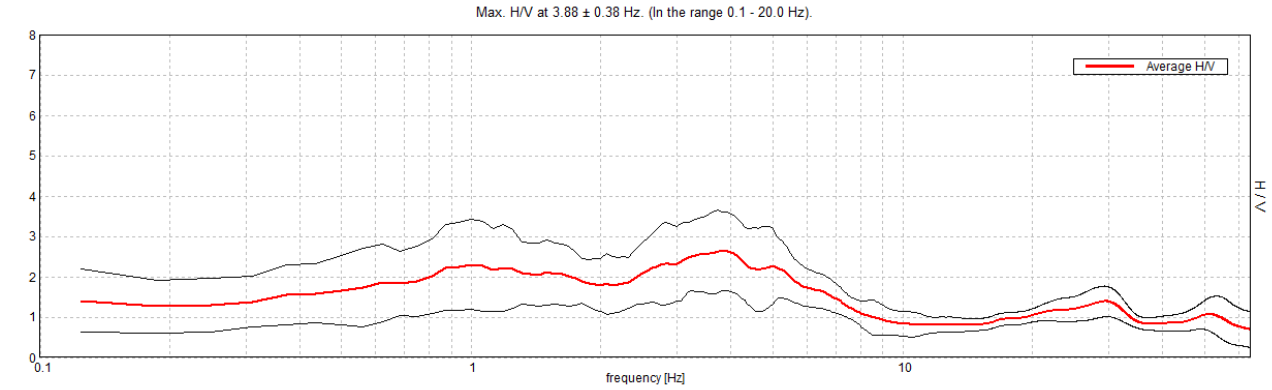
NATURA GRANULARE

n°	profondità m	Dr %	ø °	E' kg/cm²	Ysat t/m³	Yd t/m³	Mo kg/cm²	Liq. -
1	0.00 : 2.00	28	29	253	1.91	1.46	161	- - -
2	2.00 : 2.20	70	37	461	2.08	1.73	420	- - -
3	2.20 : 7.00	43	32	307	1.96	1.54	241	- - -
4	7.00 : 7.20	100	45	893	2.24	1.99	898	- - -

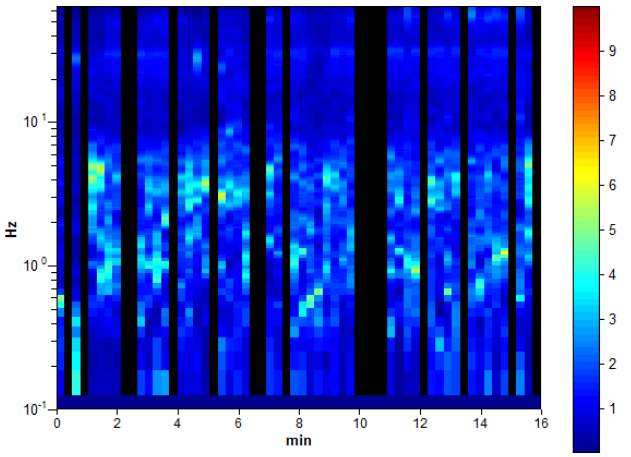
MS3 MONZUNO – HVSR1 037044P219HVSR220

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 10:22:19 End recording: 18/03/22 10:38:20
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 72% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

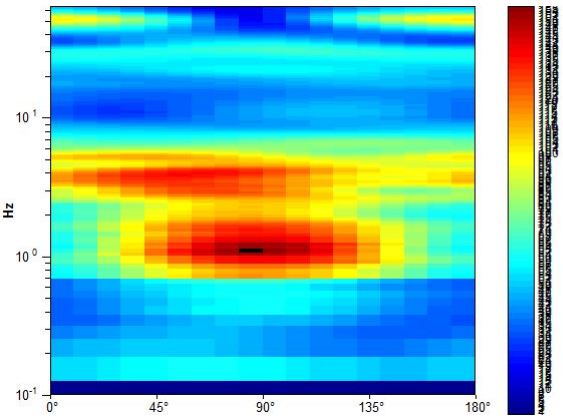
HORIZONTAL TO VERTICAL SPECTRAL RATIO



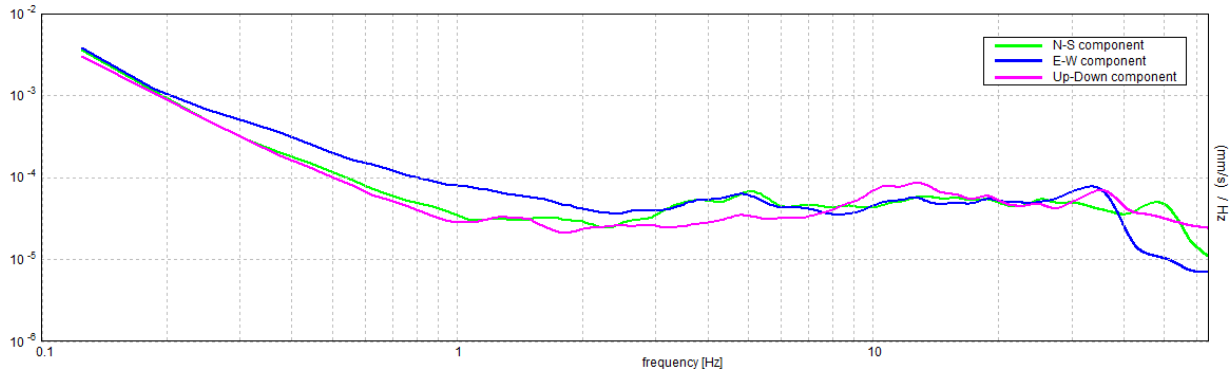
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 3.88 ± 0.38 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	3.88 > 0.63	OK	
$n_c(f_0) > 200$	2666.0 > 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 94 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	7.375 Hz	OK	
$A_0 > 2$	2.63 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.04791| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.18564 < 0.19375	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4781 < 1.58	OK	

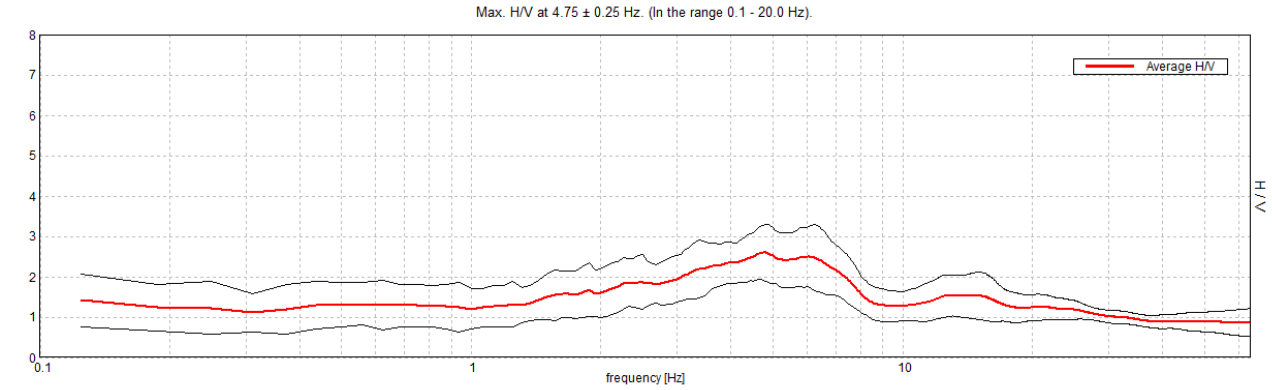
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

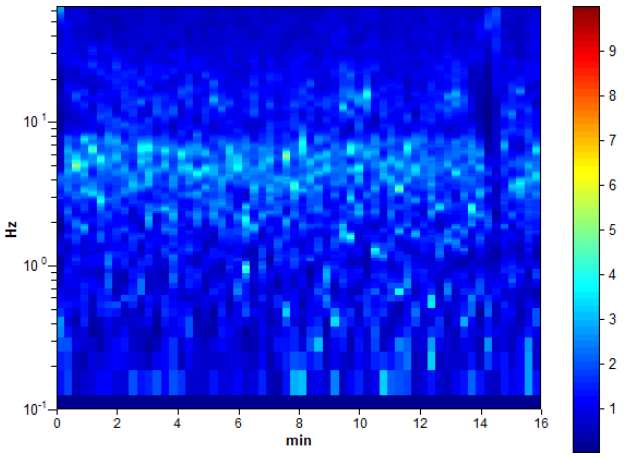
MS3 MONZUNO – HVSR2 037044P220HVSR221

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 10:47:31 End recording: 18/03/22 11:03:32
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analysis performed on the entire trace.
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

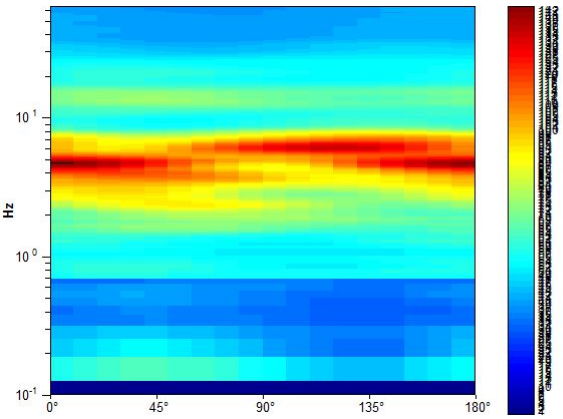
HORIZONTAL TO VERTICAL SPECTRAL RATIO



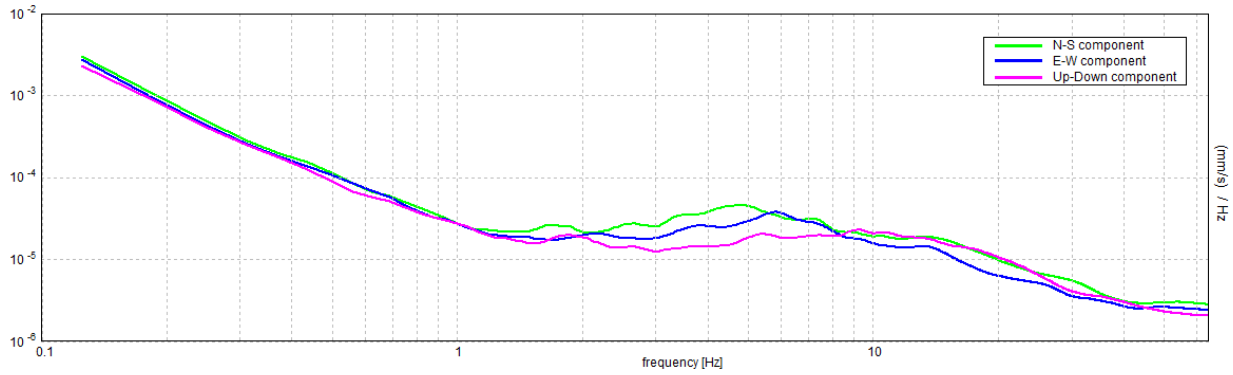
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 4.75 ± 0.25 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.75 > 0.63	OK	
$n_c(f_0) > 200$	4560.0 > 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 115 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	8.938 Hz	OK	
$A_0 > 2$	2.59 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02639| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.12536 < 0.2375	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3411 < 1.58	OK	

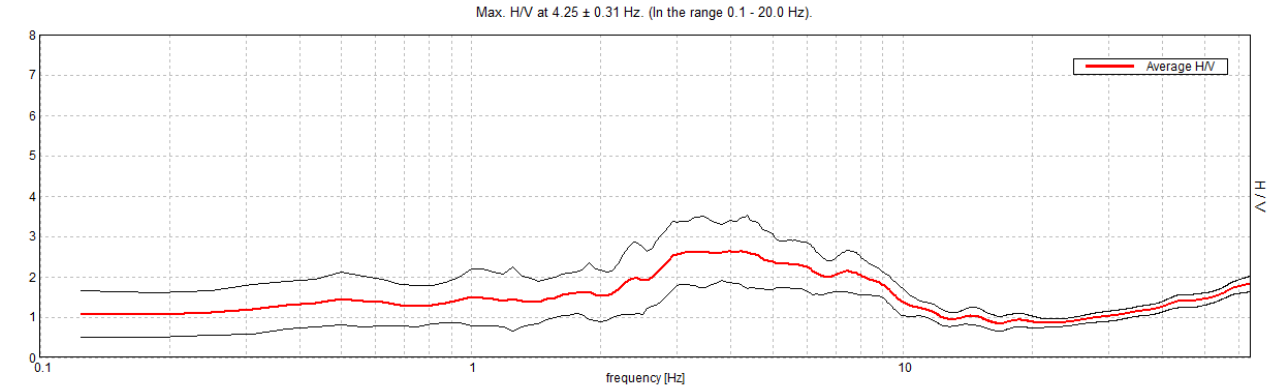
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

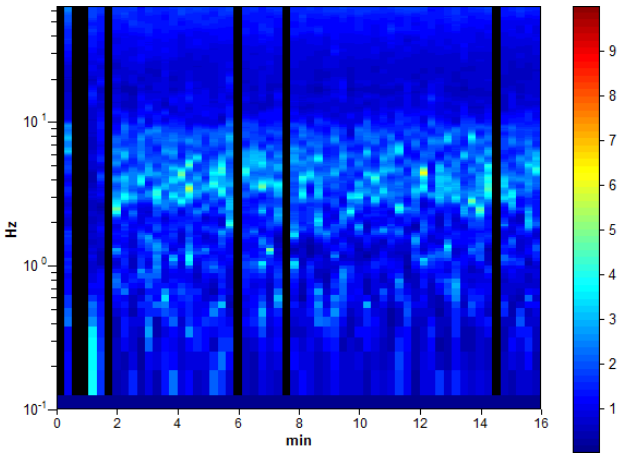
MS3 MONZUNO – HVSR3 037044P221HVSR222

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 11:09:16 End recording: 18/03/22 11:25:17
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 88% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

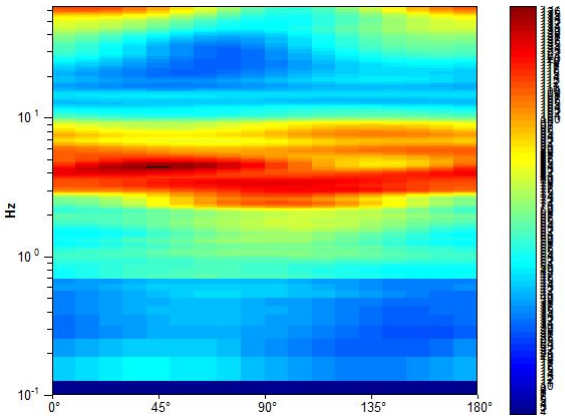
HORIZONTAL TO VERTICAL SPECTRAL RATIO



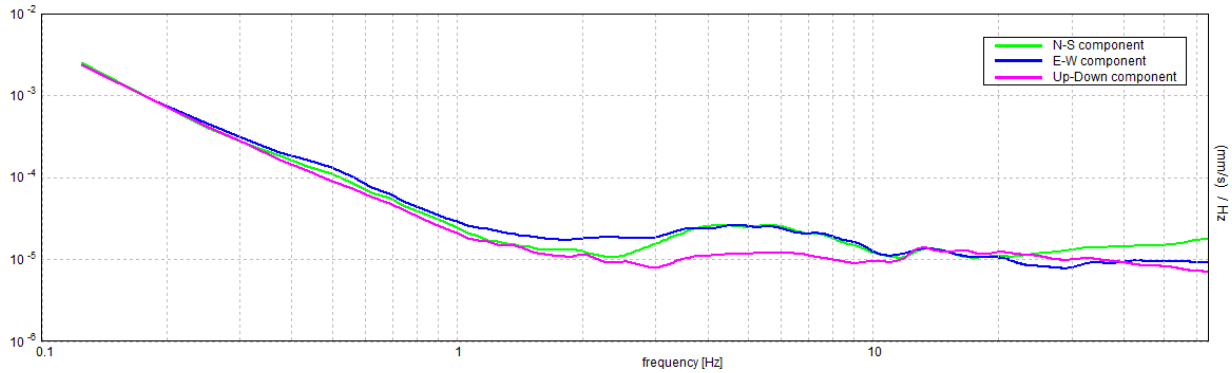
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 4.25 ± 0.31 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.25 > 0.63	OK	
$n_c(f_0) > 200$	3604.0 > 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 103 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	10.25 Hz	OK	
$A_0 > 2$	2.63 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03616| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.15367 < 0.2125	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4134 < 1.58	OK	

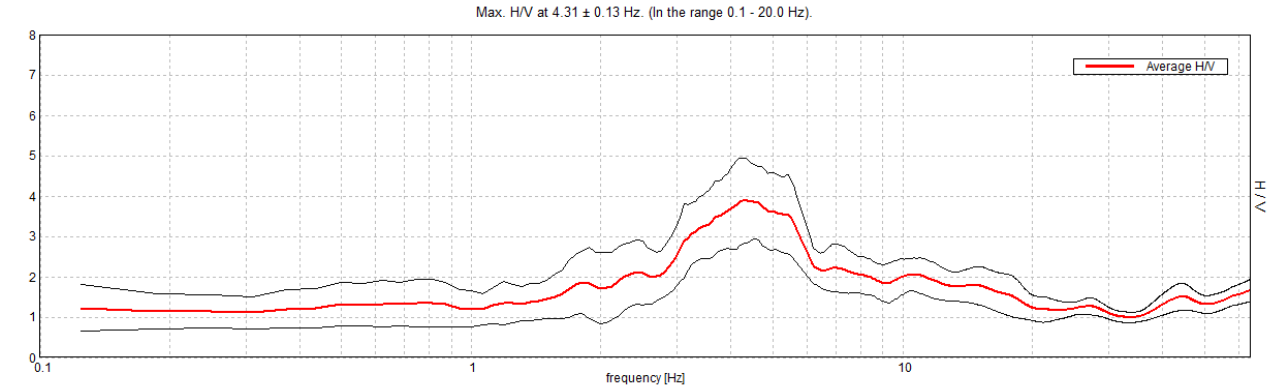
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

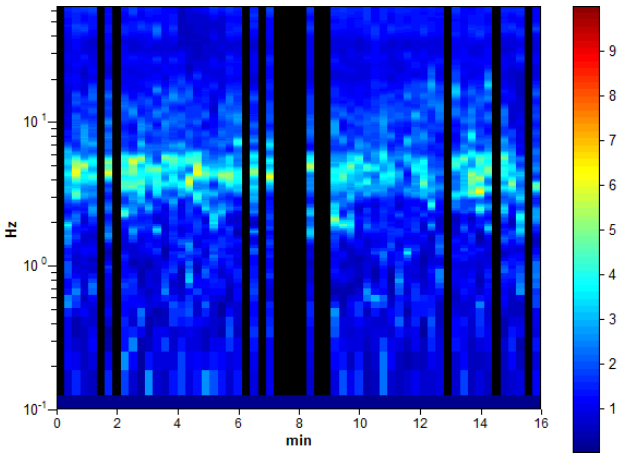
MS3 MONZUNO – HVSR4 037044P222HVSR223

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 11:32:10 End recording: 18/03/22 11:48:11
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

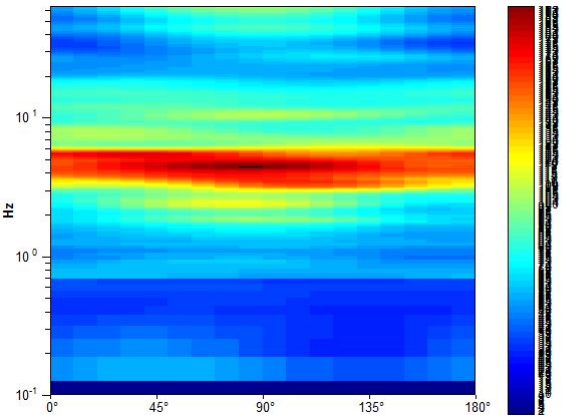
HORIZONTAL TO VERTICAL SPECTRAL RATIO



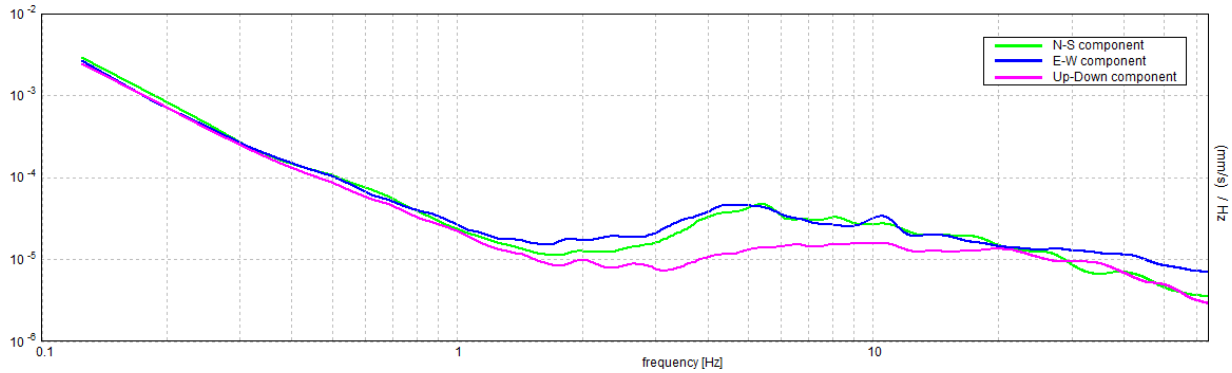
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 4.31 ± 0.13 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.31 > 0.63	OK	
$n_c(f_0) > 200$	3174.0 > 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 104 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	8.625 Hz	OK	
$A_0 > 2$	3.88 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01534| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.06616 < 0.21563	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5148 < 1.58	OK	

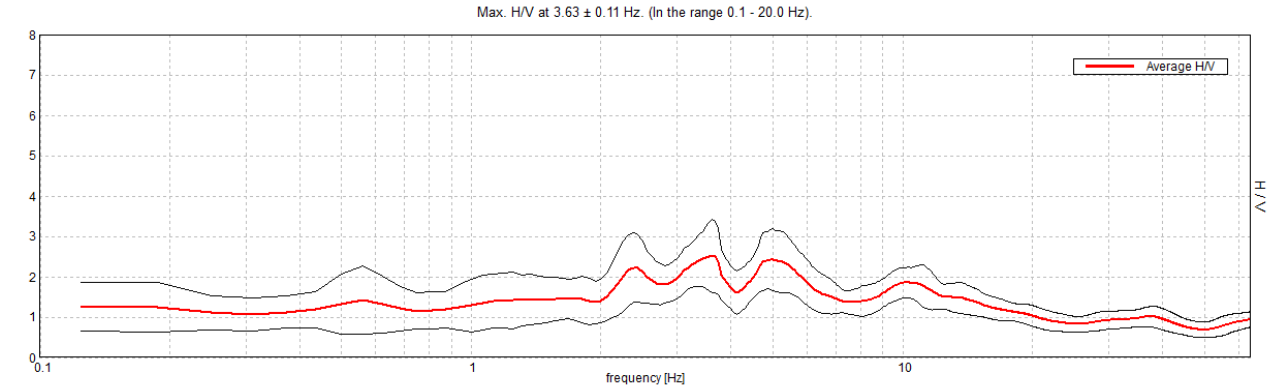
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

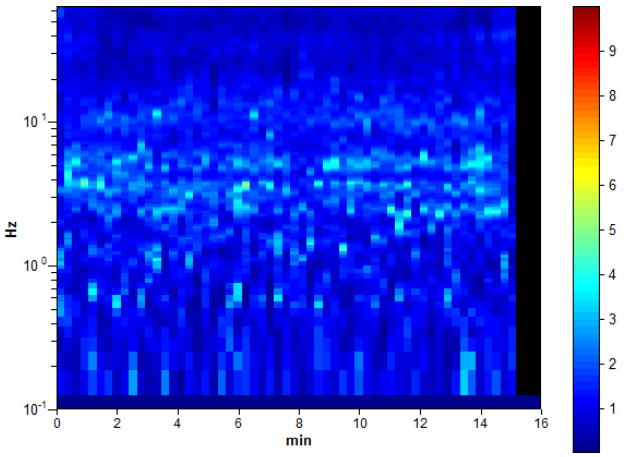
MS3 MONZUNO – HVSR5 037044P223HVSR224

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 11:51:02 End recording: 18/03/22 12:07:03
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 95% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

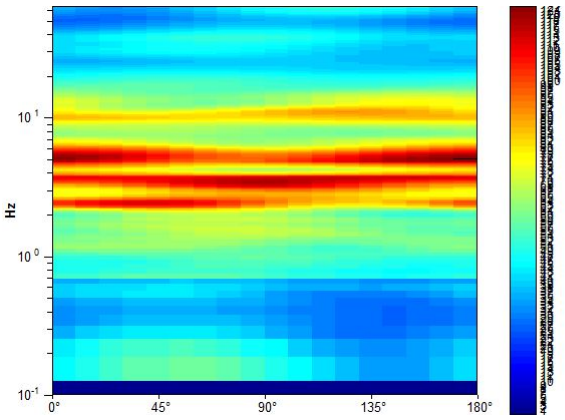
HORIZONTAL TO VERTICAL SPECTRAL RATIO



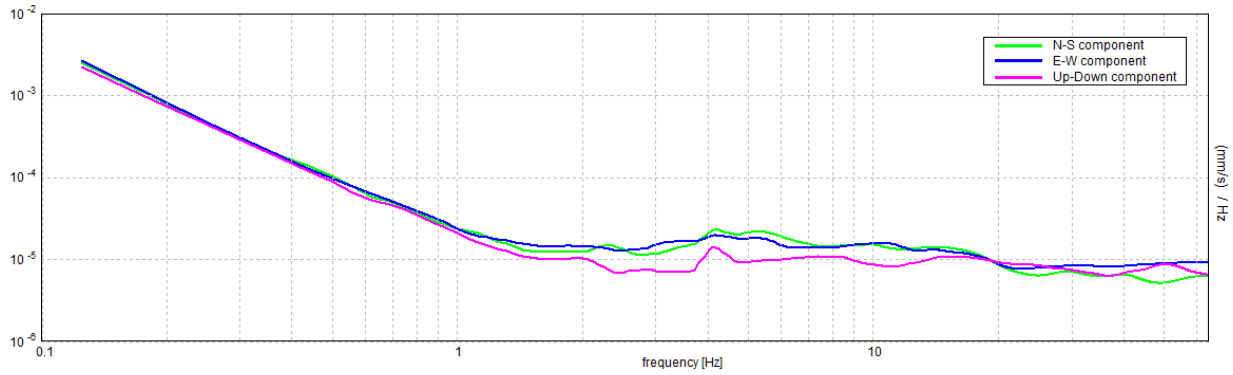
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 3.63 ± 0.11 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	3.63 > 0.63	OK	
$n_c(f_0) > 200$	3306.0 > 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 88 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.938 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.51 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01508| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.05465 < 0.18125	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4504 < 1.58	OK	

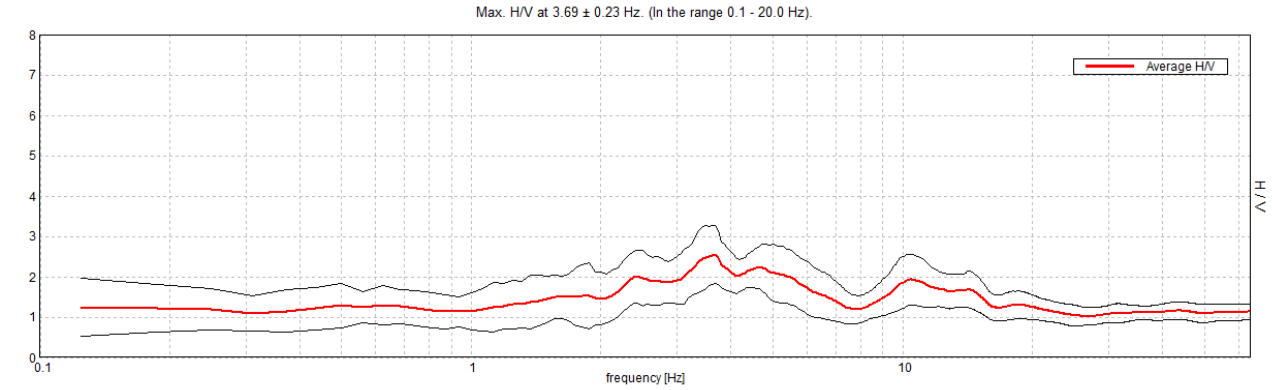
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

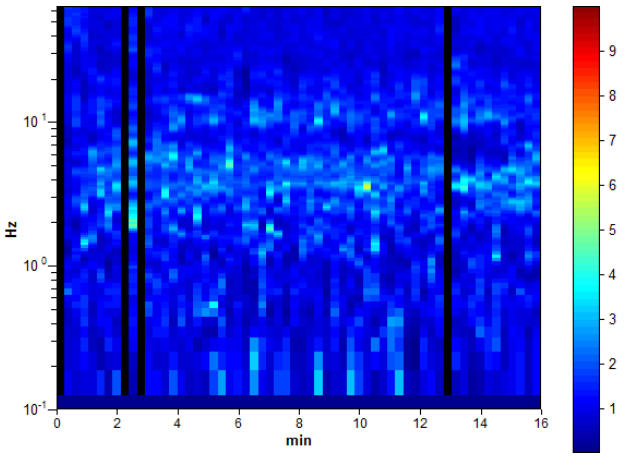
MS3 MONZUNO – HVSR6 037044P224HVSR225

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 12:10:23 End recording: 18/03/22 12:26:24
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 93% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

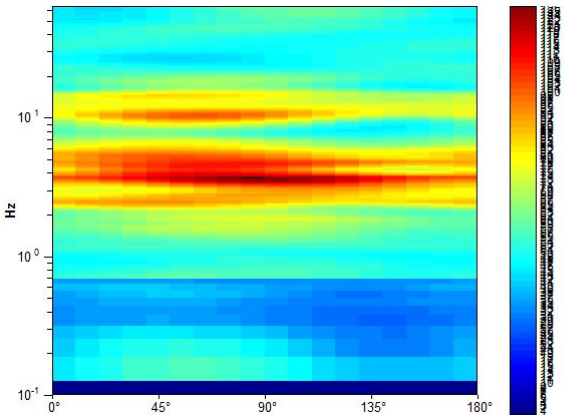
HORIZONTAL TO VERTICAL SPECTRAL RATIO



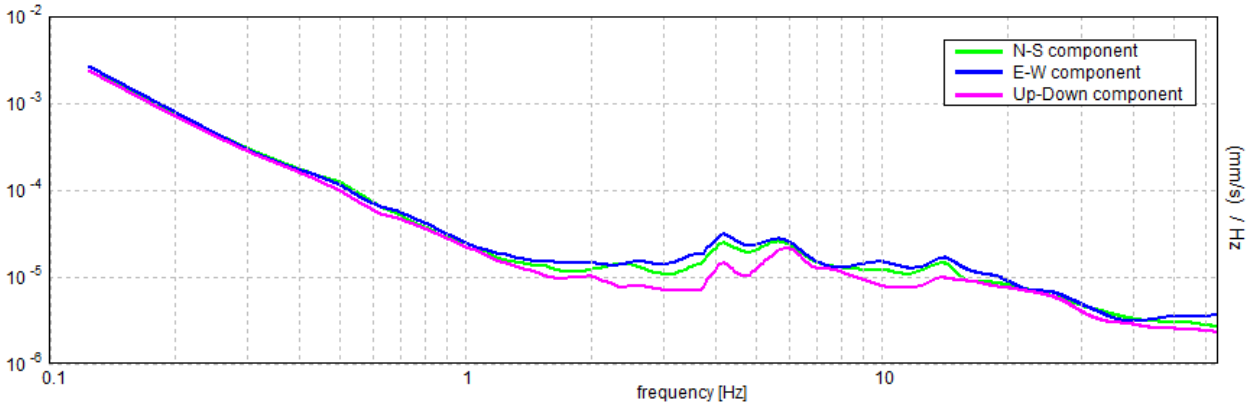
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 3.69 ± 0.23 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	3.69 > 0.63	OK	
$n_c(f_0) > 200$	3304.0 > 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 90 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	7.313 Hz	OK	
$A_0 > 2$	2.55 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03055| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.11265 < 0.18438	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3563 < 1.58	OK	

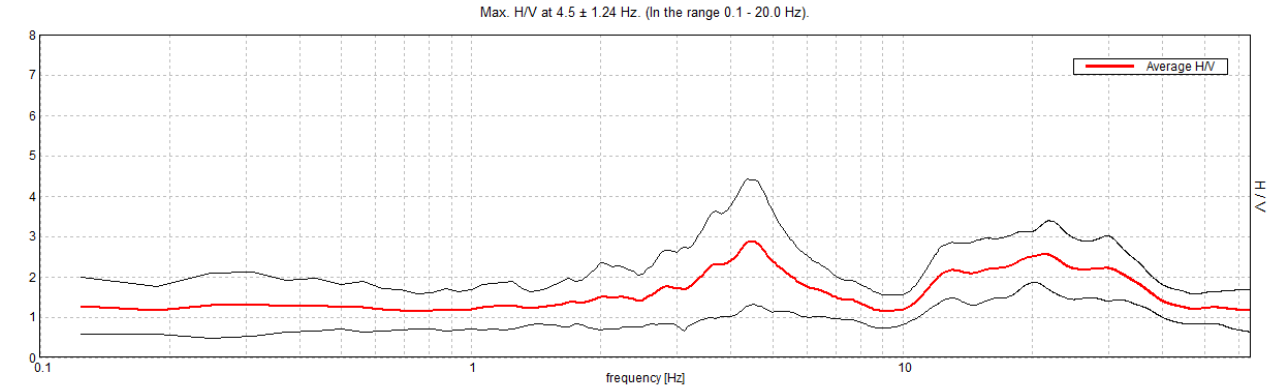
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

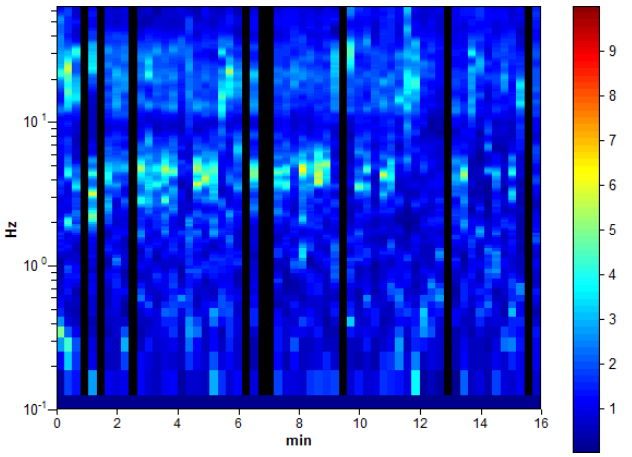
MS3 MONZUNO – HVSR7 037044P225HVSR226

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 12:46:33 End recording: 18/03/22 13:02:33
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

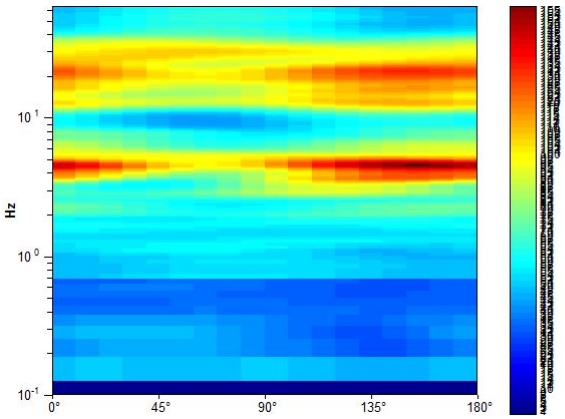
HORIZONTAL TO VERTICAL SPECTRAL RATIO



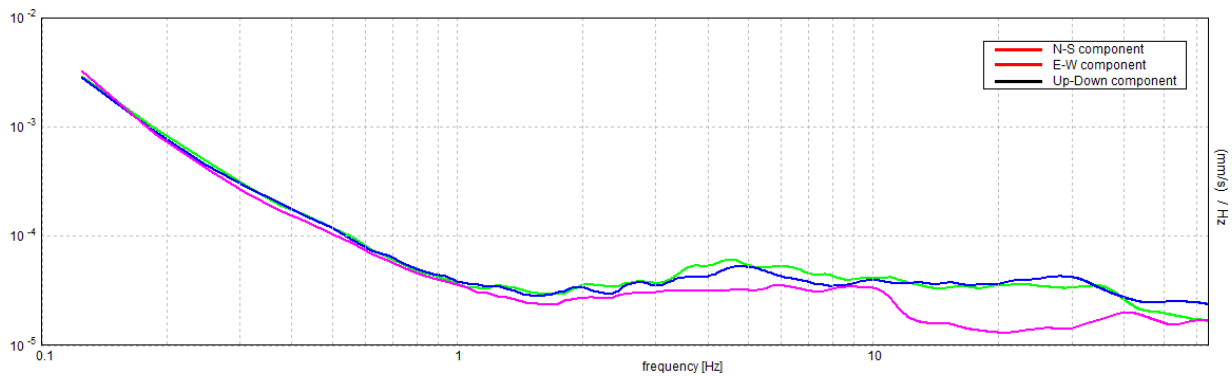
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 4.5 ± 1.24 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.50 > 0.63	OK	
$n_c(f_0) > 200$	3672.0 > 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 109 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.5 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	7.313 Hz	OK	
$A_0 > 2$	2.85 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.13632| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.61343 < 0.225		NO
$\sigma_A(f_0) < \theta(f_0)$	0.7608 < 1.58	OK	

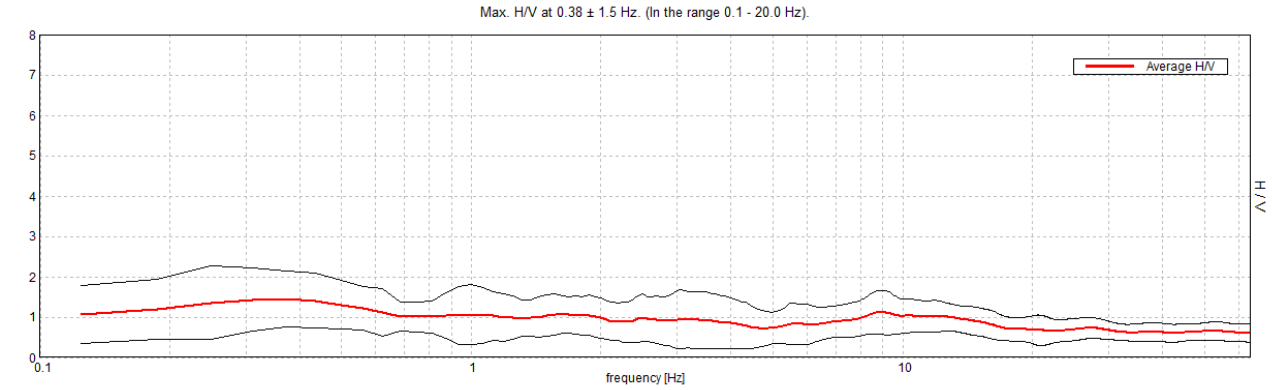
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

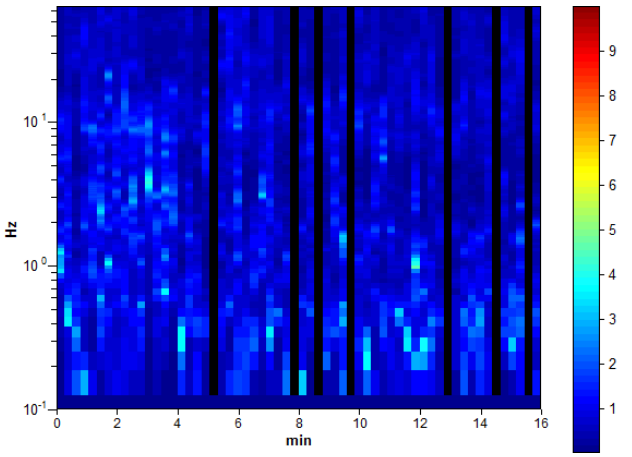
MS3 MONZUNO – HVSR8 037044P226HVSR227

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 13:22:24 End recording: 18/03/22 13:38:25
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 88% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

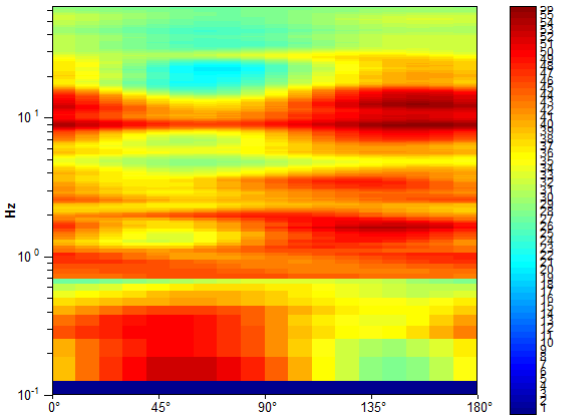
HORIZONTAL TO VERTICAL SPECTRAL RATIO



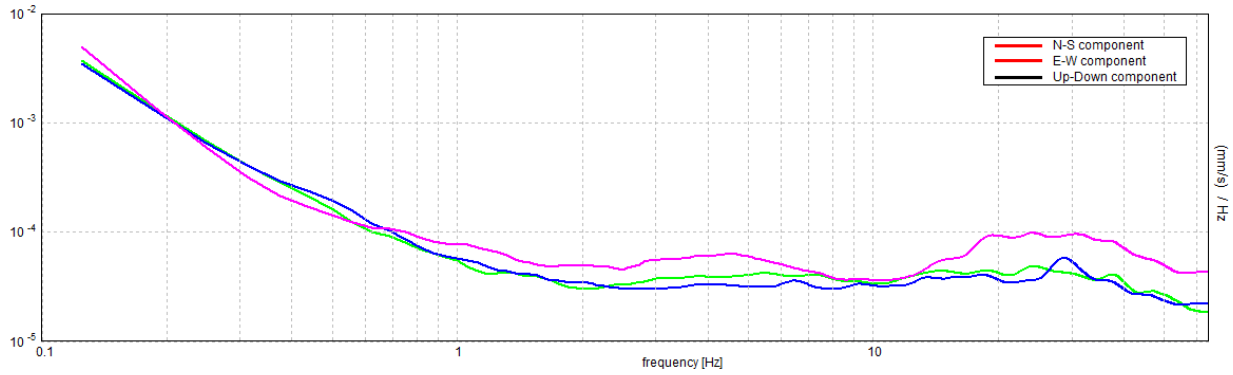
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.38 ± 1.5 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.38 > 0.63		NO
$n_c(f_0) > 200$	318.0 > 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 10 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.45 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|1.9783| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.74186 < 0.075		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3454 < 2.5	OK	

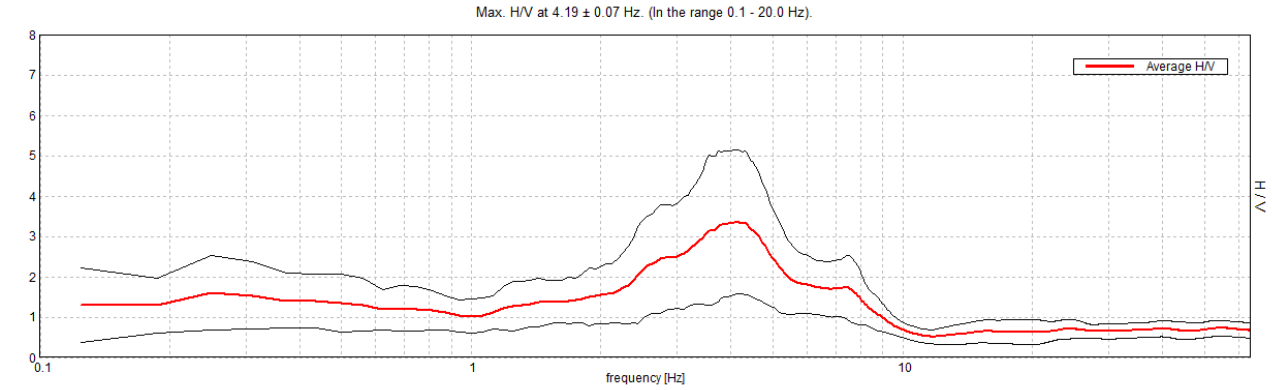
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

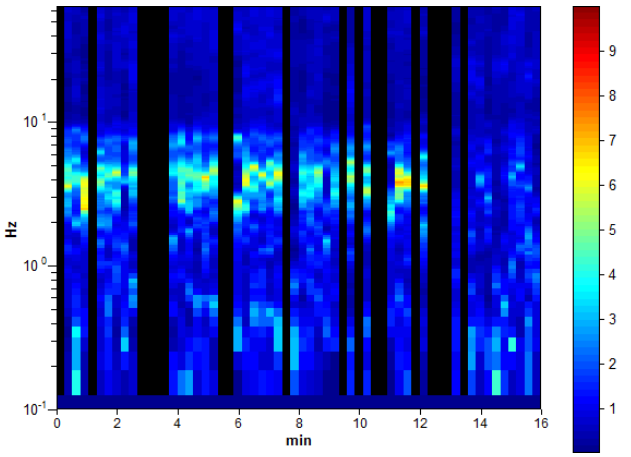
MS3 MONZUNO – HVSR9 037044P227HVSR228

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 13:47:19 End recording: 18/03/22 14:03:20
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 70% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

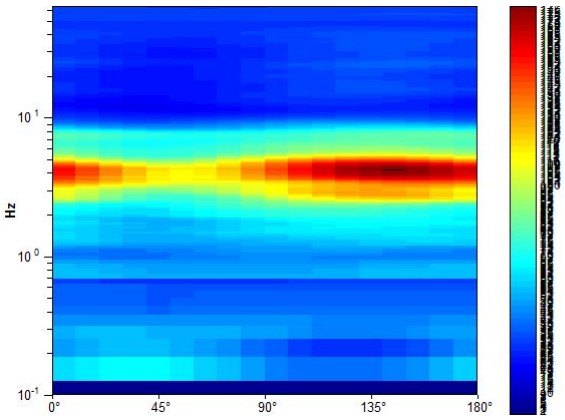
HORIZONTAL TO VERTICAL SPECTRAL RATIO



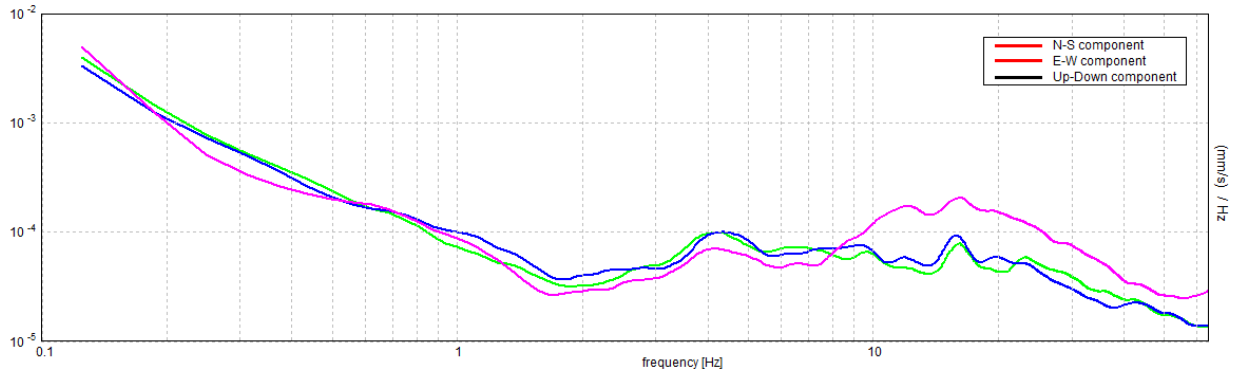
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 4.19 ± 0.07 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.19 > 0.63	OK	
$n_c(f_0) > 200$	2814.0 > 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 102 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	7.625 Hz	OK	
$A_0 > 2$	3.36 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00824| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.03452 < 0.20938	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.8679 < 1.58	OK	

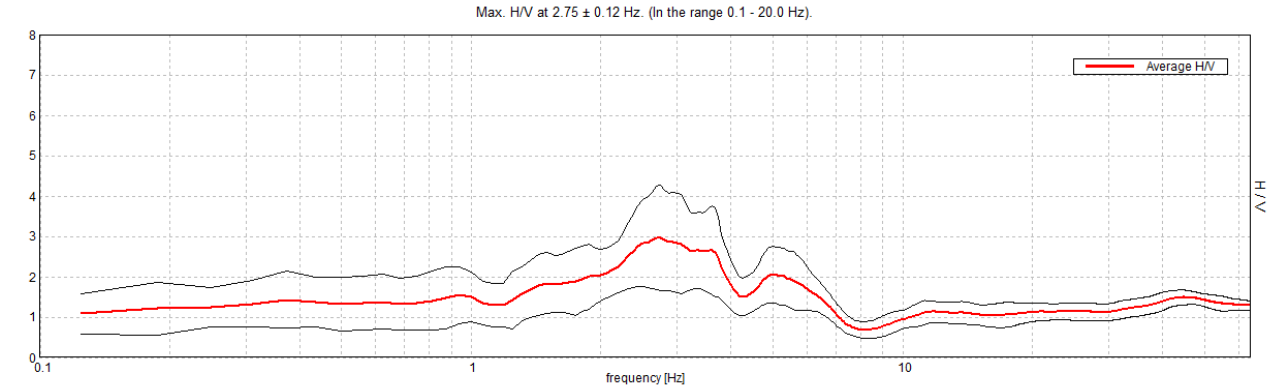
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

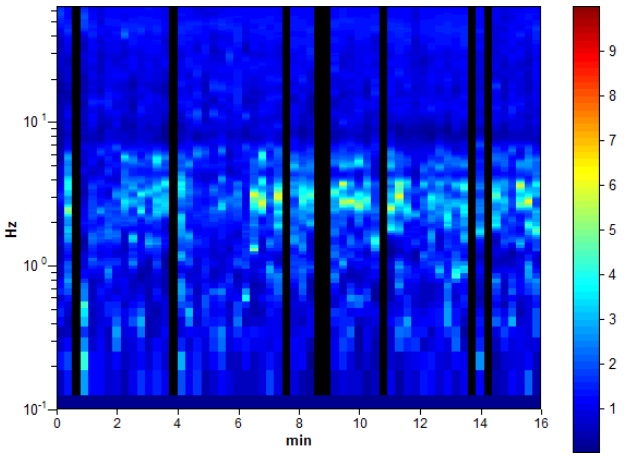
MS3 MONZUNO – HVSR10 037044P228HVSR229

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 14:41:55 End recording: 18/03/22 14:57:56
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 87% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

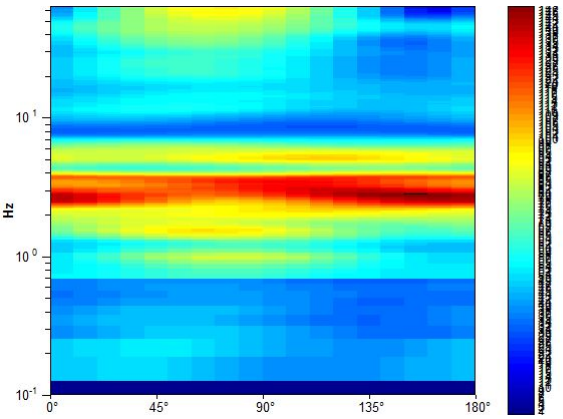
HORIZONTAL TO VERTICAL SPECTRAL RATIO



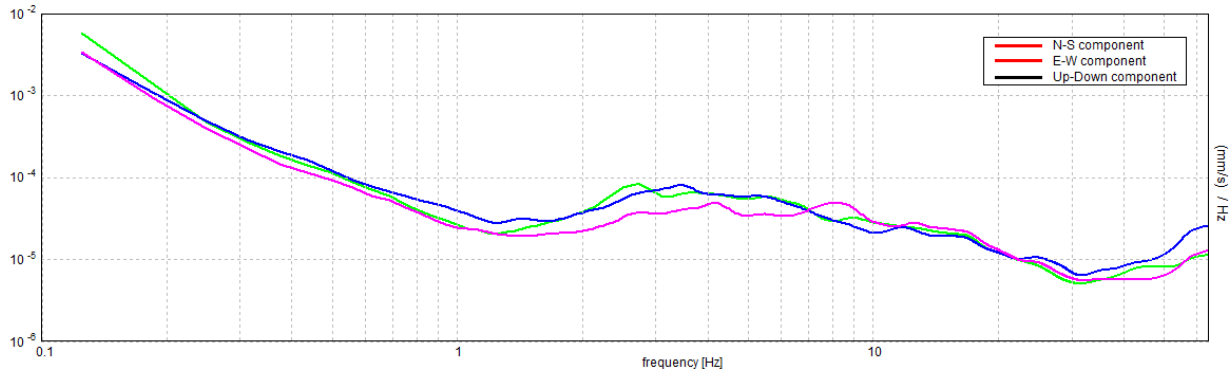
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 2.75 ± 0.12 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.75 > 0.63	OK	
$n_c(f_0) > 200$	2288.0 > 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 67 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.25 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	6.438 Hz	OK	
$A_0 > 2$	2.96 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02193| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.06031 < 0.1375	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.6404 < 1.58	OK	

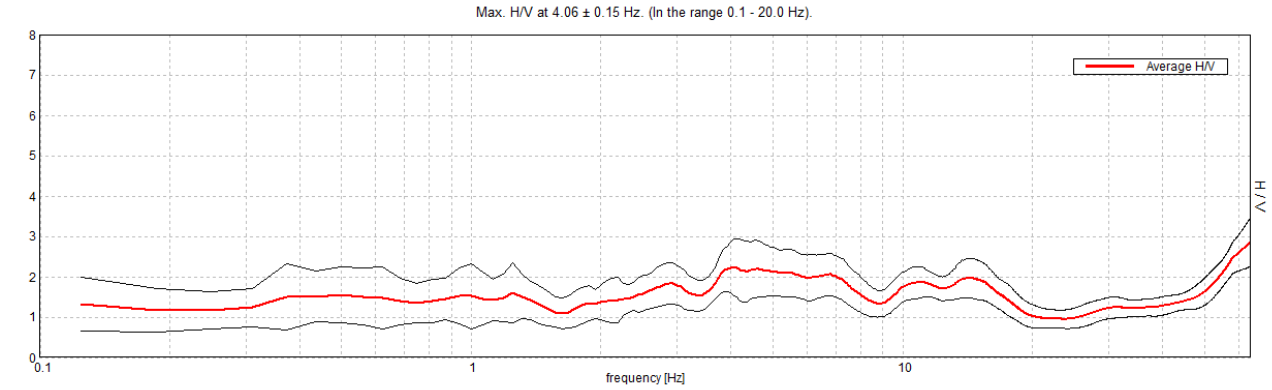
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

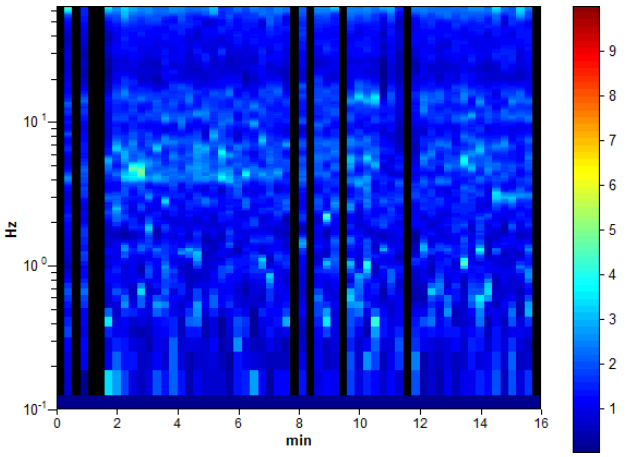
MS3 MONZUNO – HVSR11 037044P229HVSR230

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 15:14:32 End recording: 18/03/22 15:30:33
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

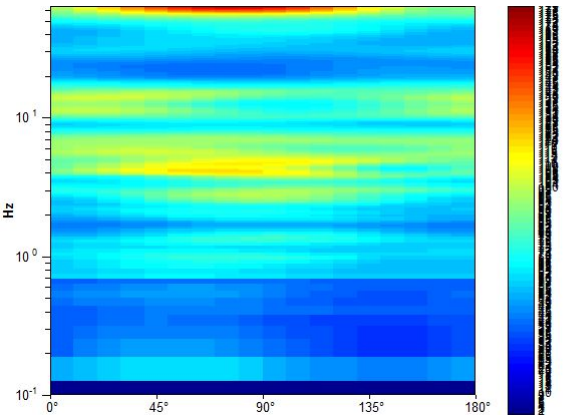
HORIZONTAL TO VERTICAL SPECTRAL RATIO



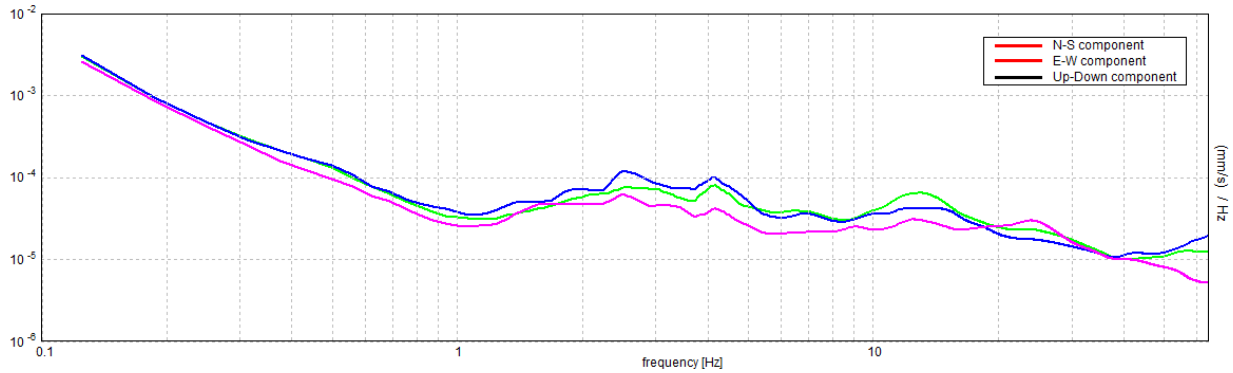
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 4.06 ± 0.15 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.06 > 0.63	OK	
$n_c(f_0) > 200$	3315.0 > 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 98 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.625 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.24 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01802| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.07321 < 0.20313	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3441 < 1.58	OK	

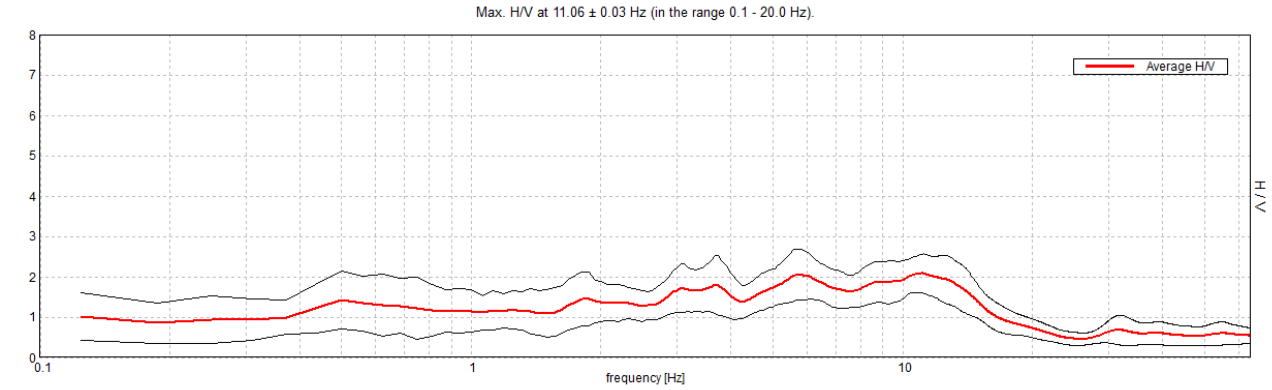
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

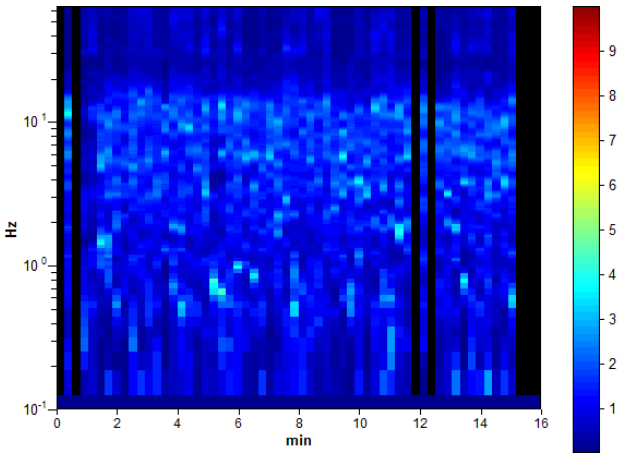
MS3 MONZUNO – HVSR12 037044P230HVSR231

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 15:49:22 End recording: 18/03/22 16:05:23
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 88% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

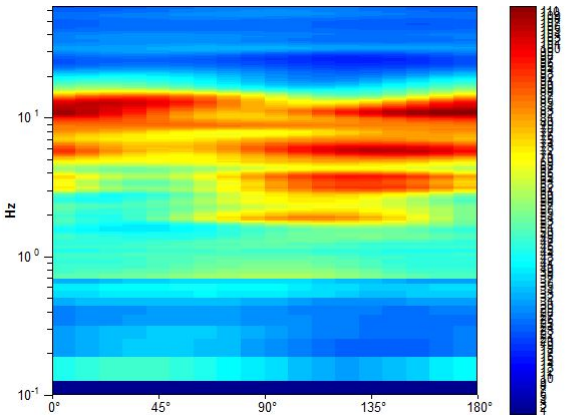
HORIZONTAL TO VERTICAL SPECTRAL RATIO



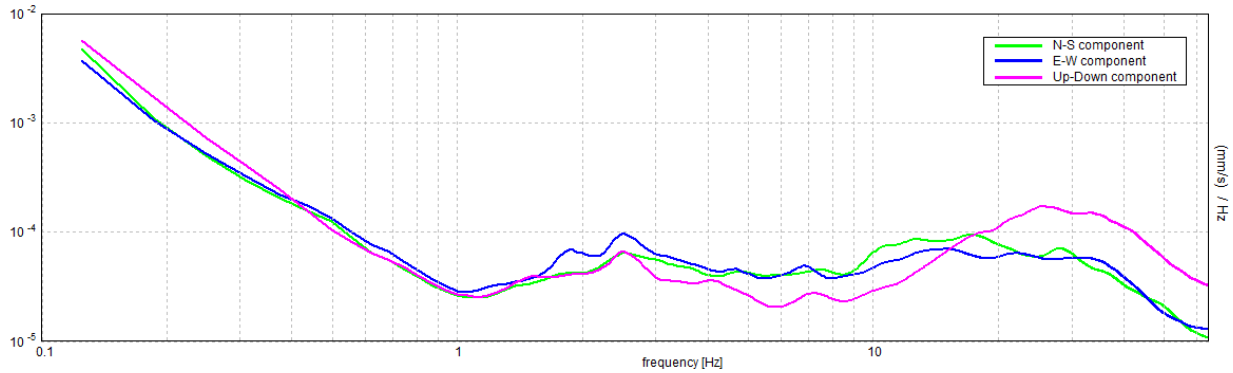
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 11.06 ± 0.03 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	11.06 > 0.63	OK	
$n_c(f_0) > 200$	9381.0 > 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 266 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	16.313 Hz	OK	
$A_0 > 2$	2.08 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00112| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.01242 < 0.55313	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.2366 < 1.58	OK	

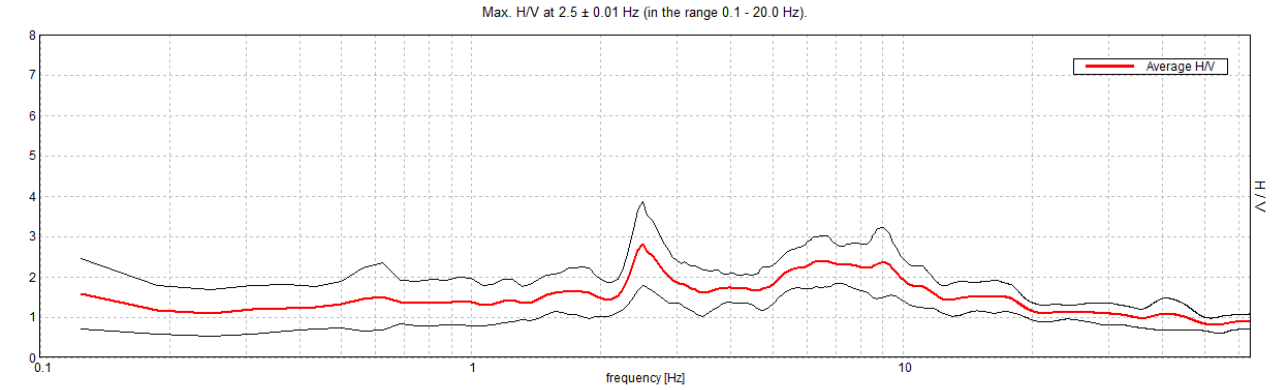
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

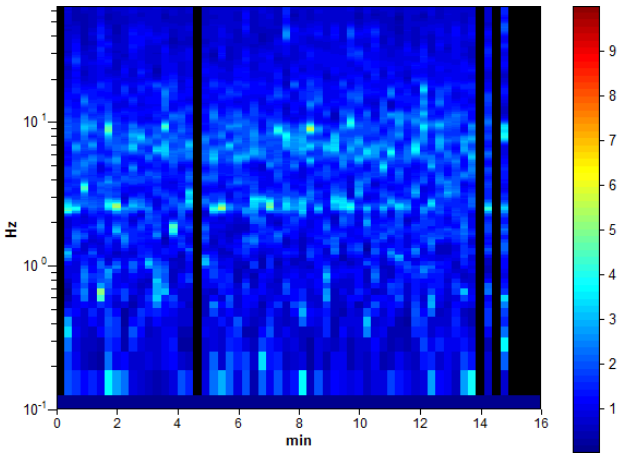
MS3 MONZUNO – HVSR13 037044P231HVSR232

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 16:10:29 End recording: 18/03/22 16:26:30
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 87% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

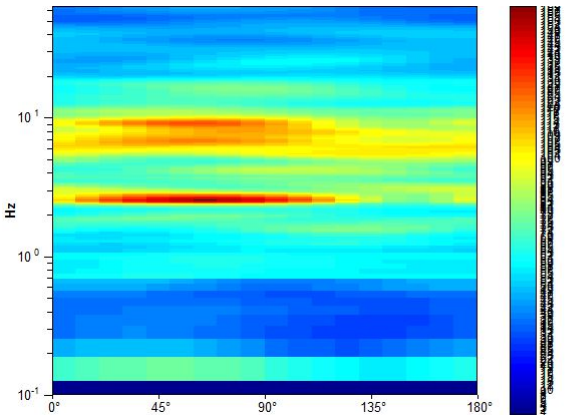
HORIZONTAL TO VERTICAL SPECTRAL RATIO



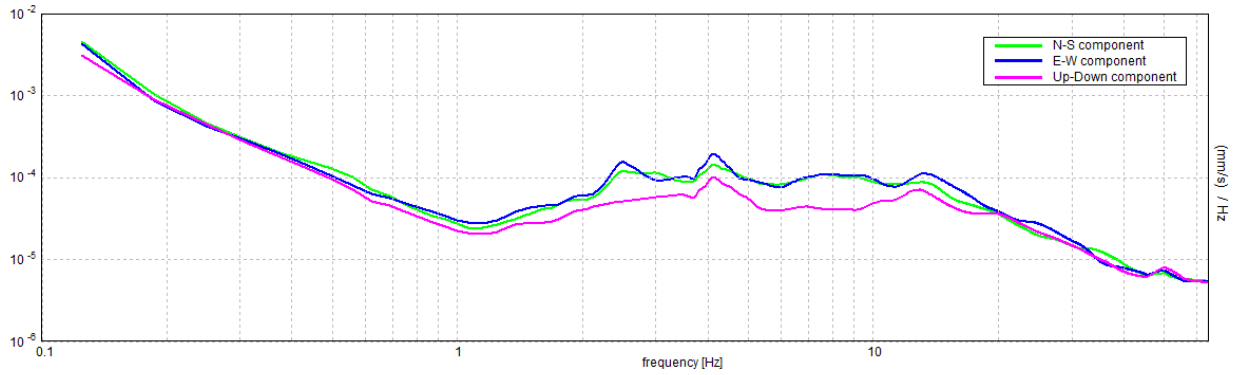
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 2.5 ± 0.01 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.50 > 0.63	OK	
$n_c(f_0) > 200$	2080.0 > 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 61 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.375 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.81 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00118| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.00294 < 0.125	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5131 < 1.58	OK	

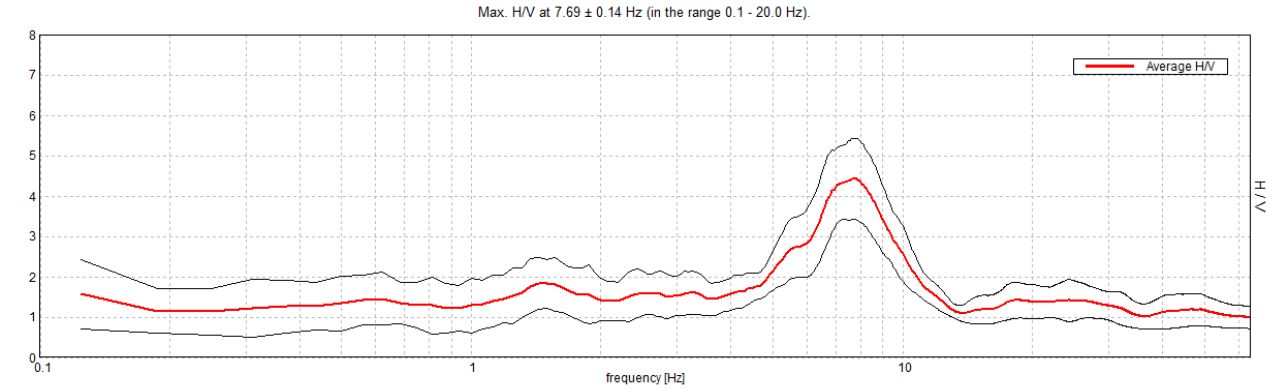
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

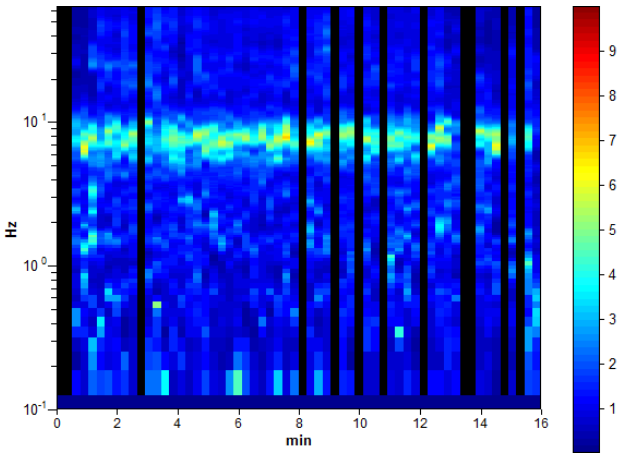
MS3 MONZUNO – HVSR14 037044P232HVSR233

Instrument: TRZ-0108/01-10
Start recording: 18/03/22 16:33:08 End recording: 18/03/22 16:49:08
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

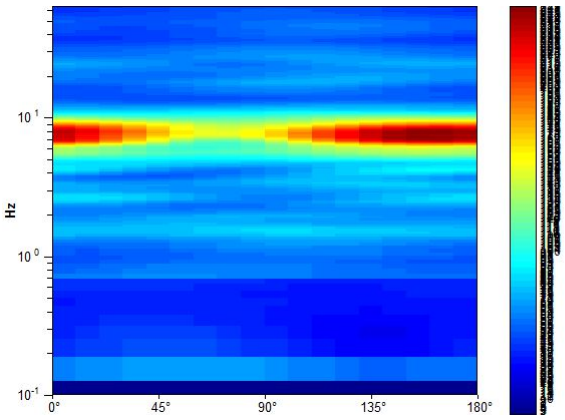
HORIZONTAL TO VERTICAL SPECTRAL RATIO



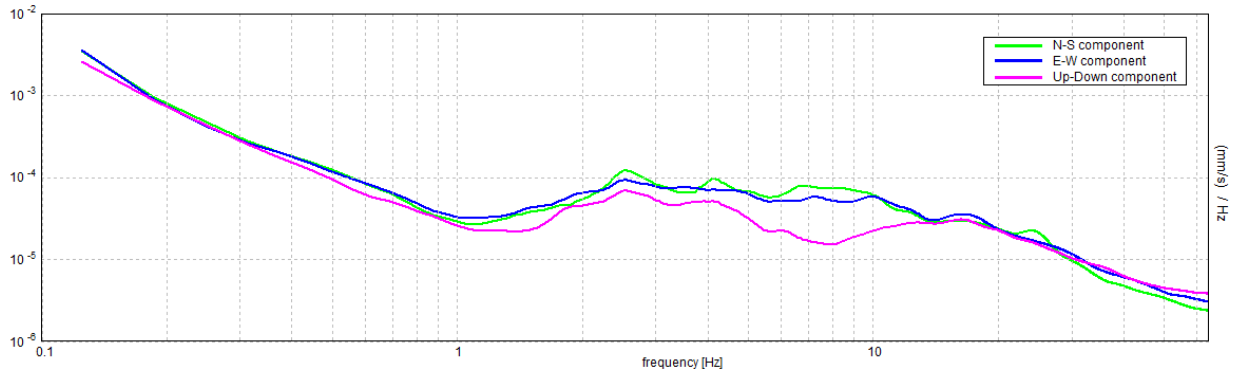
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 7.69 ± 0.14 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	7.69 > 0.63	OK	
$n_c(f_0) > 200$	5904.0 > 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 186 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	5.0 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	10.5 Hz	OK	
$A_0 > 2$	4.42 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00875| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.06727 < 0.38438	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4925 < 1.58	OK	

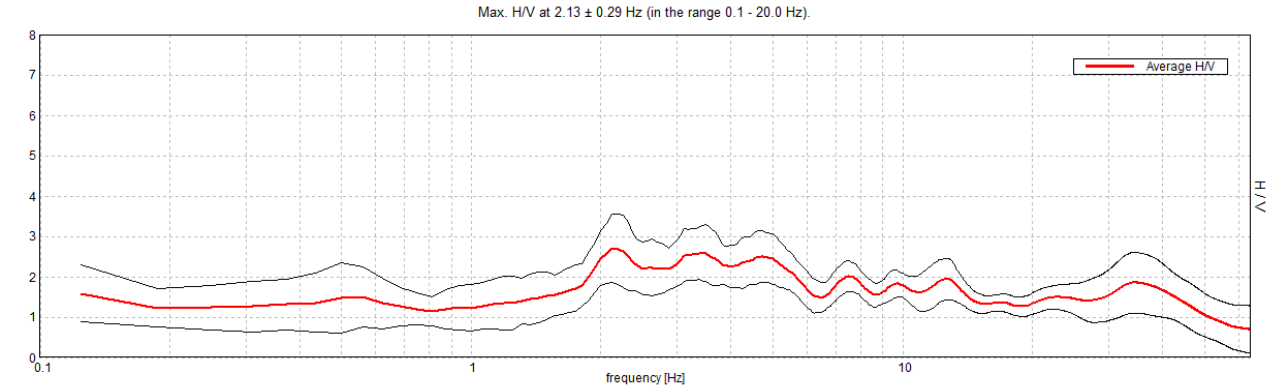
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

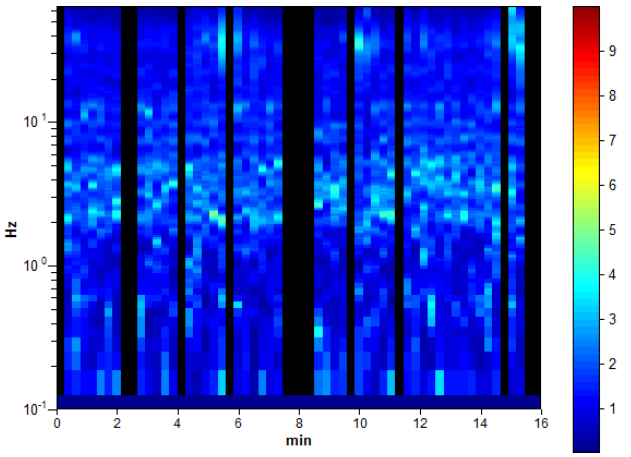
MS3 MONZUNO – HVSR15 037044P233HVSR234

Instrument: TRZ-0108/01-10
Start recording: 25/03/22 15:53:12 End recording: 25/03/22 16:09:12
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

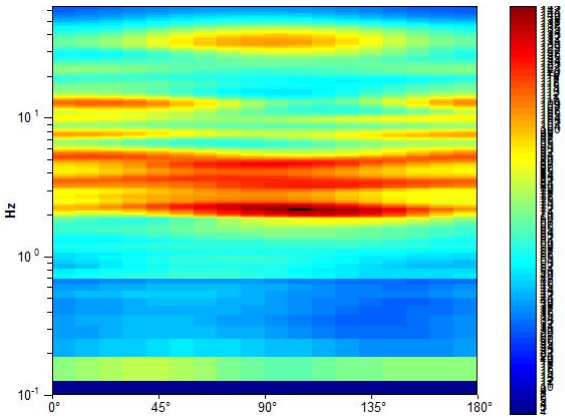
HORIZONTAL TO VERTICAL SPECTRAL RATIO



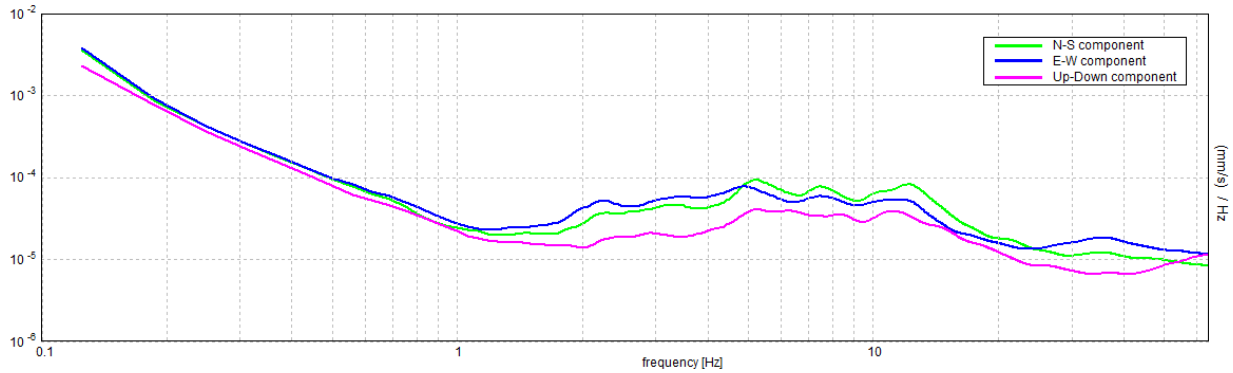
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 2.13 ± 0.29 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.13 > 0.63	OK	
$n_c(f_0) > 200$	1564.0 > 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 52 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.25 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.71 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.06605| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.14035 < 0.10625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.4095 < 1.58	OK	

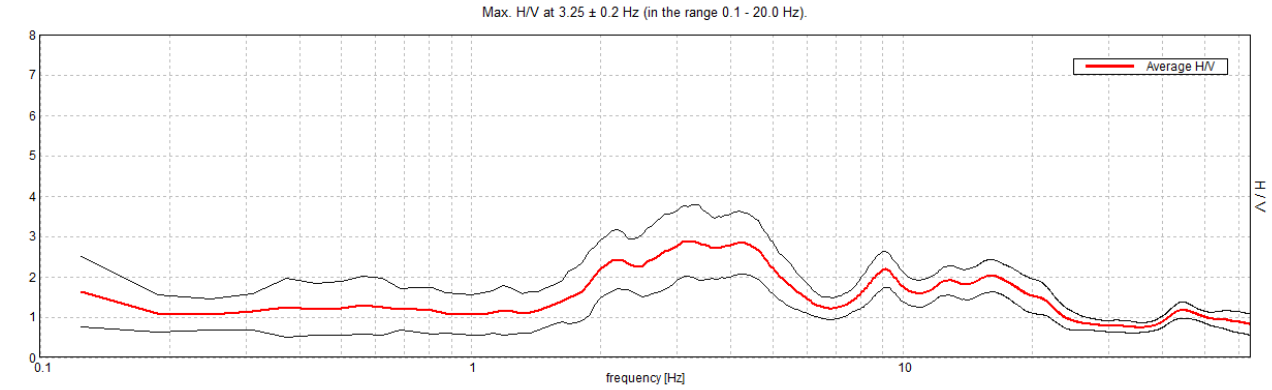
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

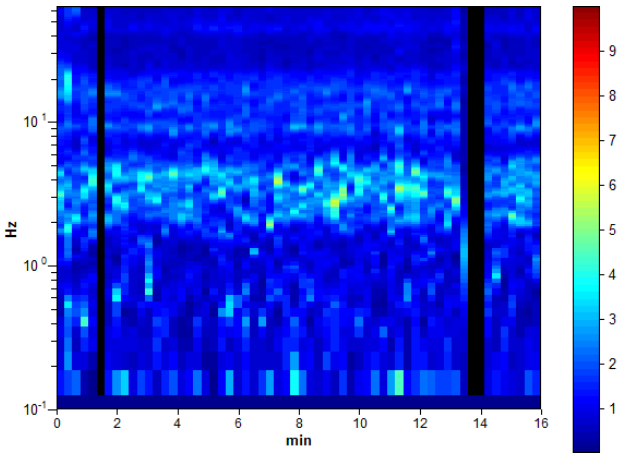
MS3 MONZUNO – HVSR16 037044P234HVSR235

Instrument: TRZ-0108/01-10
Start recording: 25/03/22 16:14:17 End recording: 25/03/22 16:30:18
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 95% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

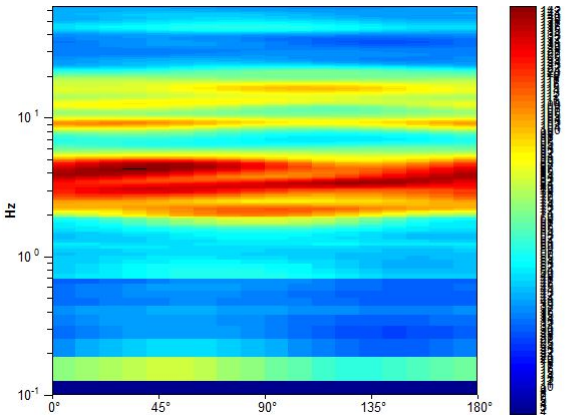
HORIZONTAL TO VERTICAL SPECTRAL RATIO



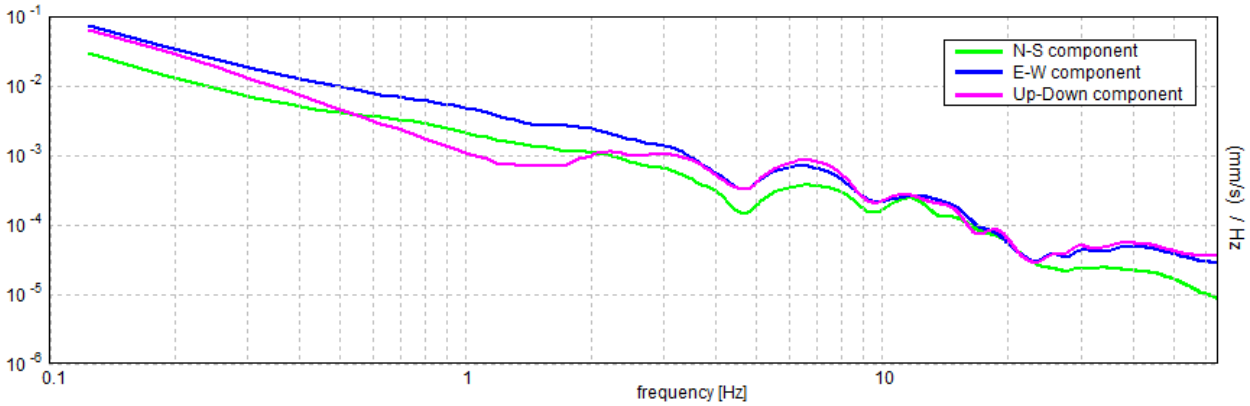
H/V TIME HISTORY



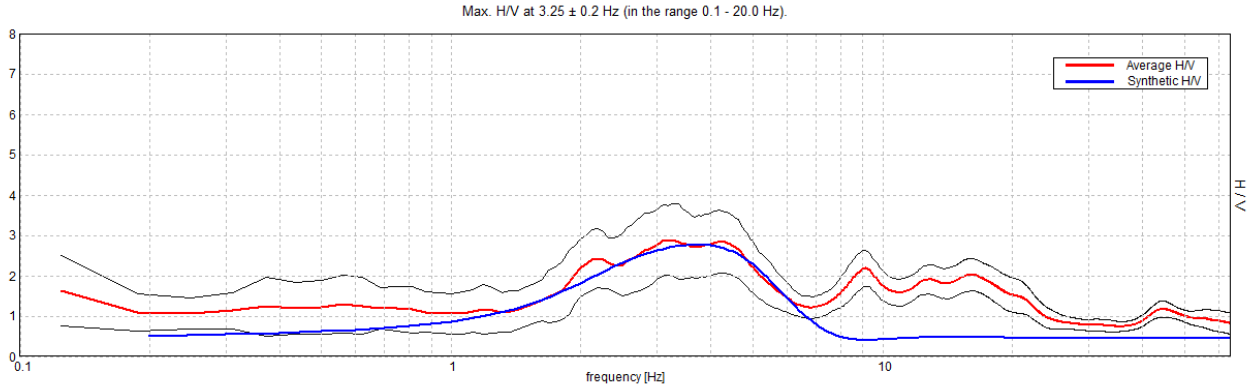
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

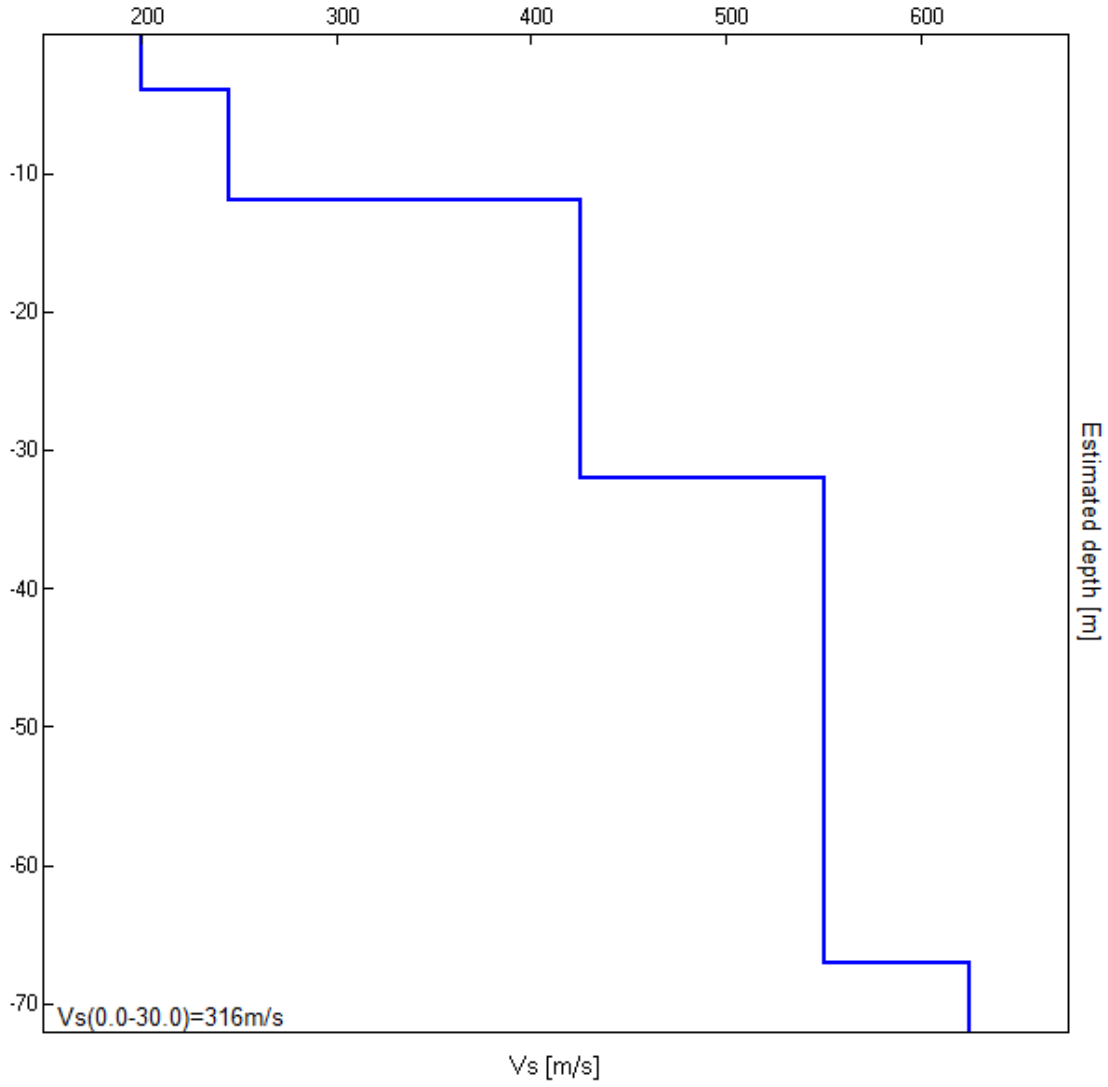


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
4.00	4.00	200
12.00	8.00	245
32.00	20.00	425
67.00	35.00	550
inf.	inf.	625

Vs(0.0-30.0)=316m/s



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

Max. H/V at 3.25 ± 0.2 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	3.25 > 0.63	OK	
$n_c(f_0) > 200$	2964.0 > 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 79 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.625 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	6.063 Hz	OK	
$A_0 > 2$	2.88 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03079| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.10008 < 0.1625	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4384 < 1.58	OK	

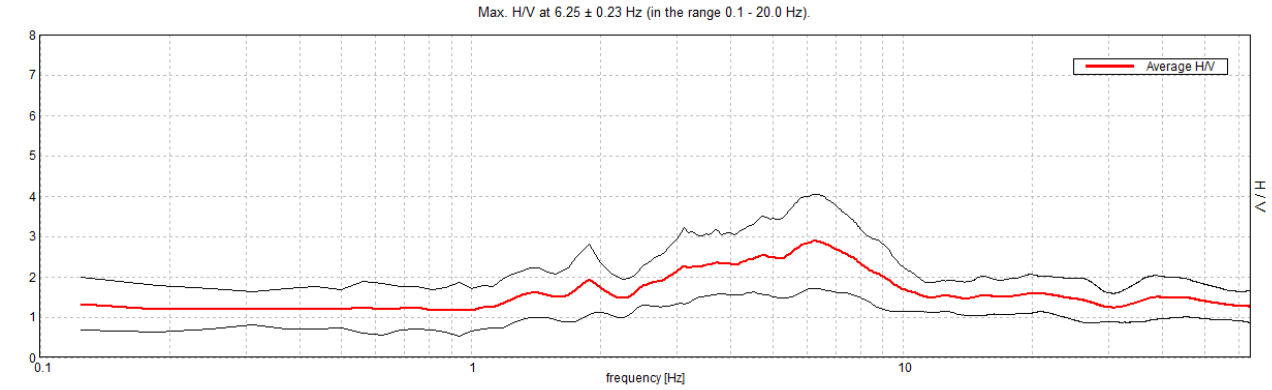
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

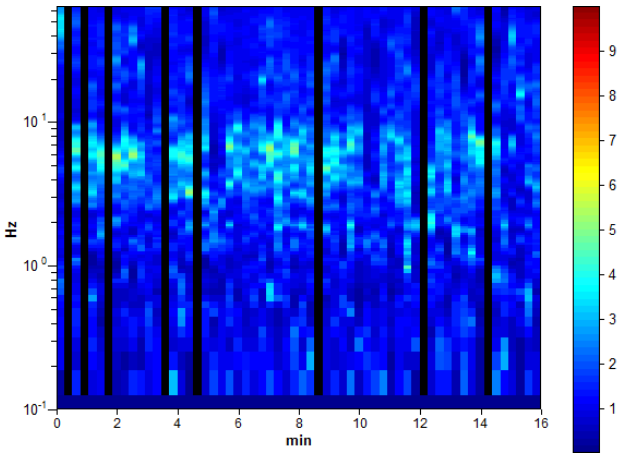
MS3 MONZUNO – HVSR17 037044P235HVSR236

Instrument: TRZ-0108/01-10
Start recording: 25/03/22 14:44:04 End recording: 25/03/22 15:00:05
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 87% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

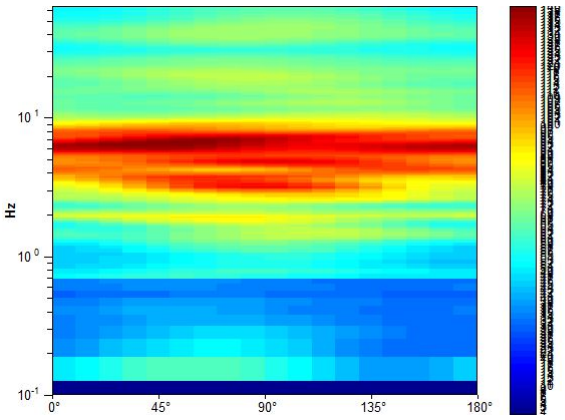
HORIZONTAL TO VERTICAL SPECTRAL RATIO



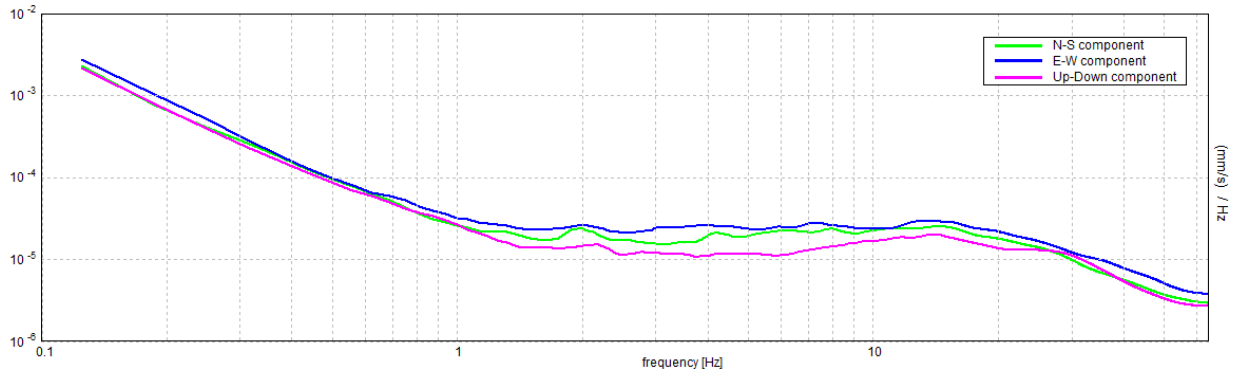
H/V TIME HISTORY



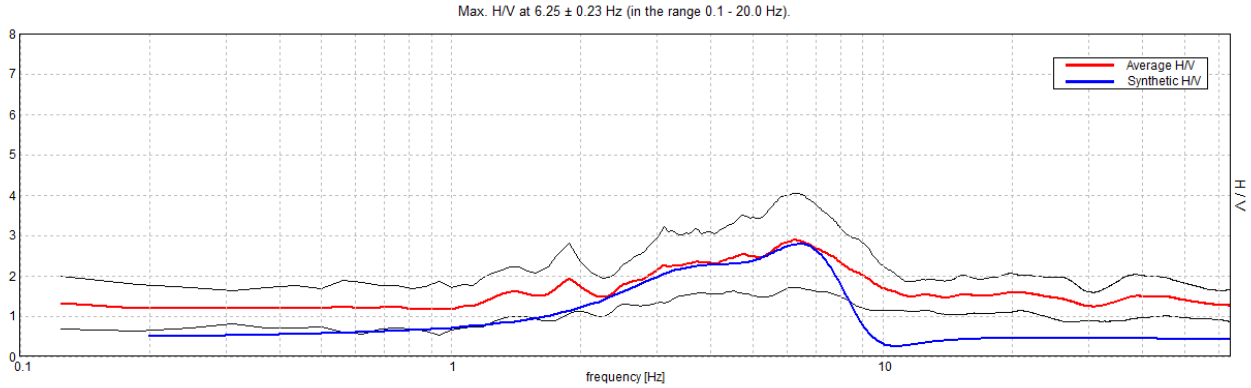
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

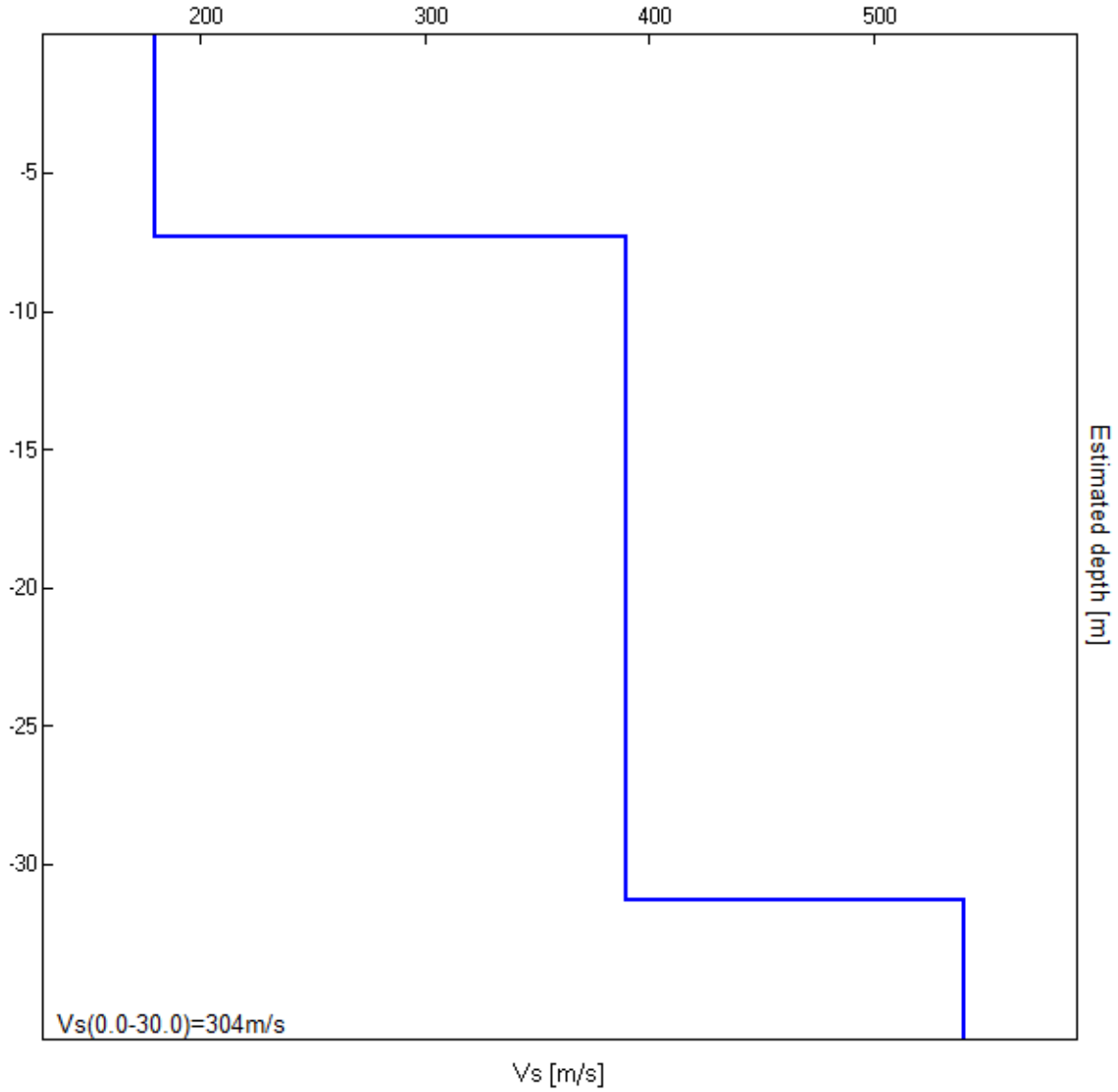


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
7.30	7.30	180
31.30	24.00	390
inf.	inf.	540

Vs(0.0-30.0)=304m/s



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

Max. H/V at 6.25 ± 0.23 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	6.25 > 0.63	OK	
$n_c(f_0) > 200$	5200.0 > 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 151 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
$A_0 > 2$	2.88 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01786| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.1116 < 0.3125	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5743 < 1.58	OK	

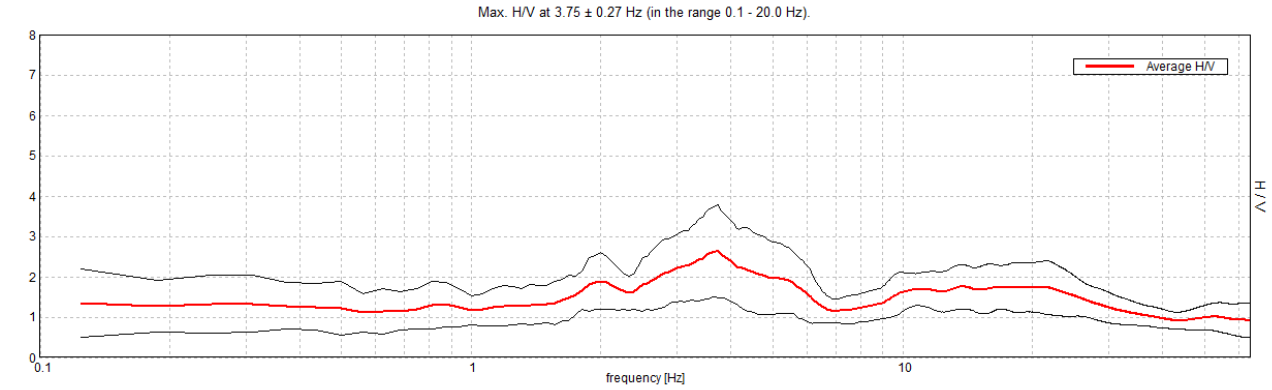
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

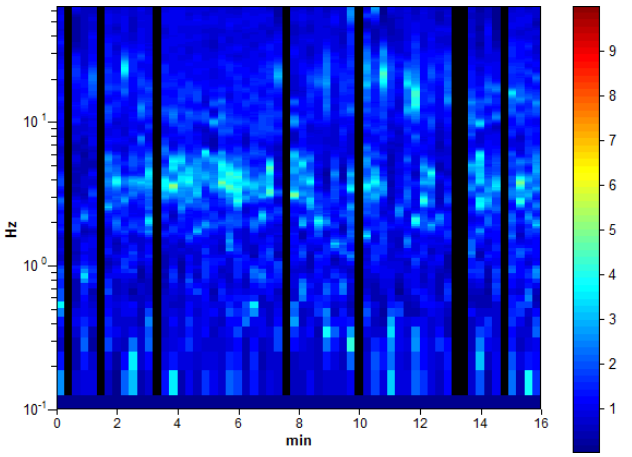
MS3 MONZUNO – HVSR18 037044P236HVSR237

Instrument: TRZ-0108/01-10
Start recording: 25/03/22 15:13:16 End recording: 25/03/22 15:29:17
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
Trace length: 0h16'00". Analyzed 87% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

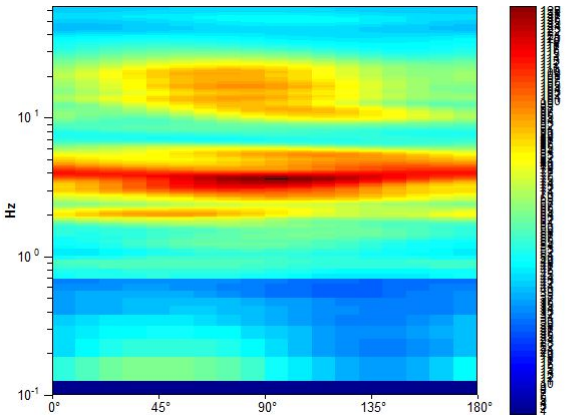
HORIZONTAL TO VERTICAL SPECTRAL RATIO



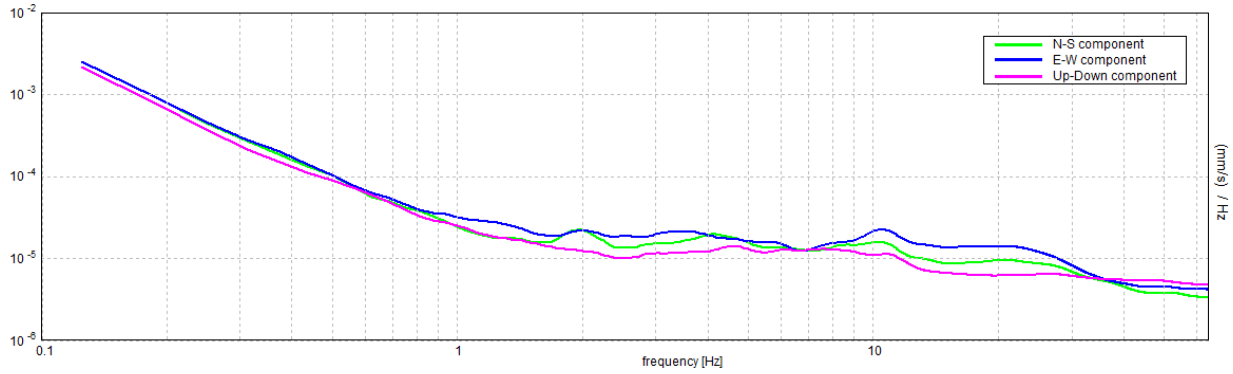
H/V TIME HISTORY



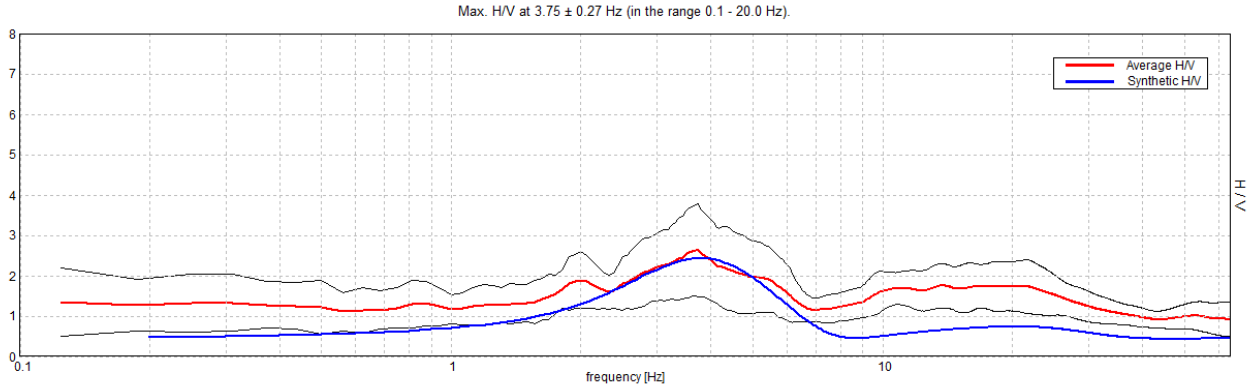
DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA

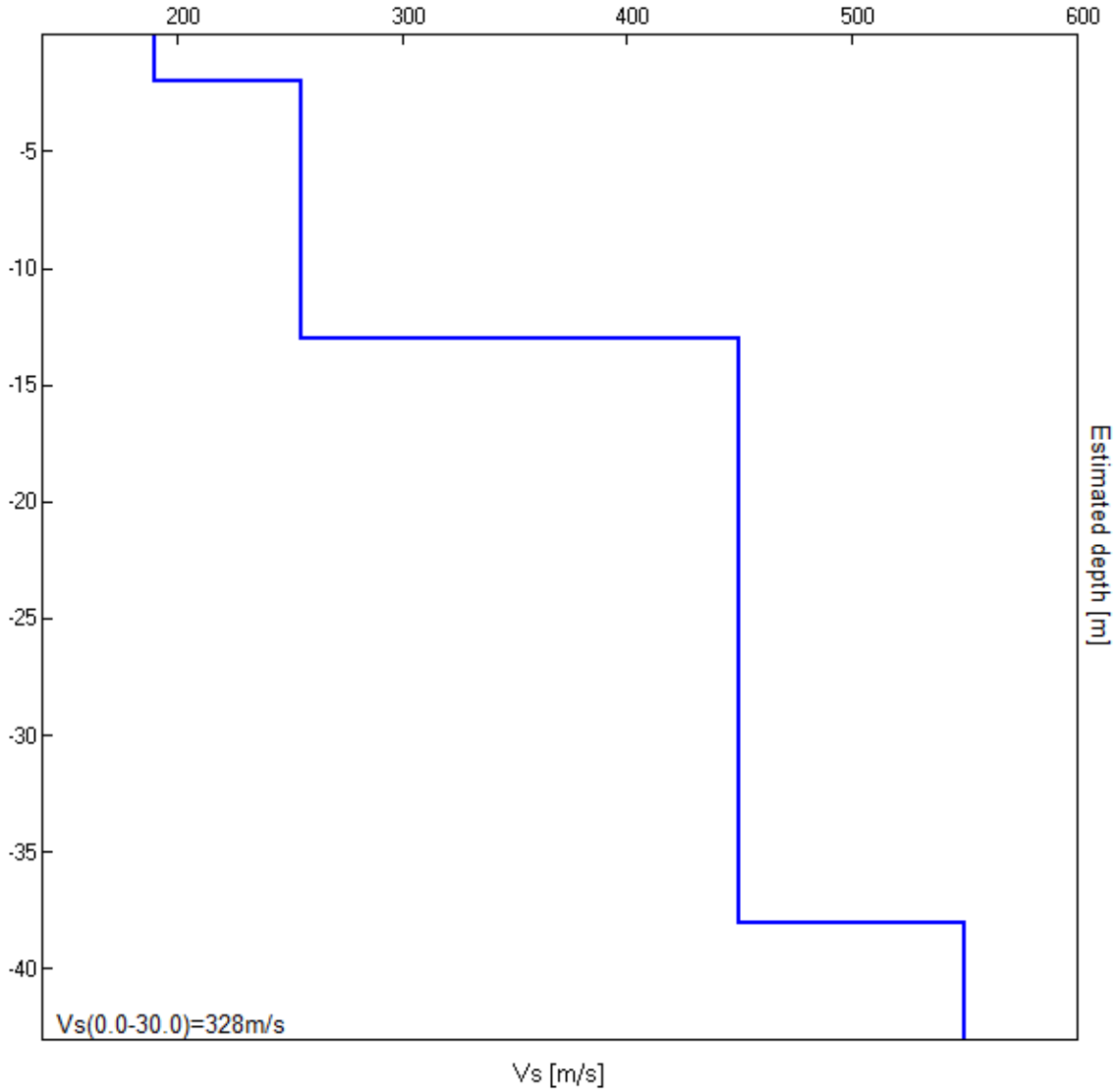


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
2.00	2.00	190
13.00	11.00	255
38.00	25.00	450
inf.	inf.	550

Vs(0.0-30.0)=328m/s



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

Max. H/V at 3.75 ± 0.27 Hz (in the range 0.1 - 20.0 Hz).

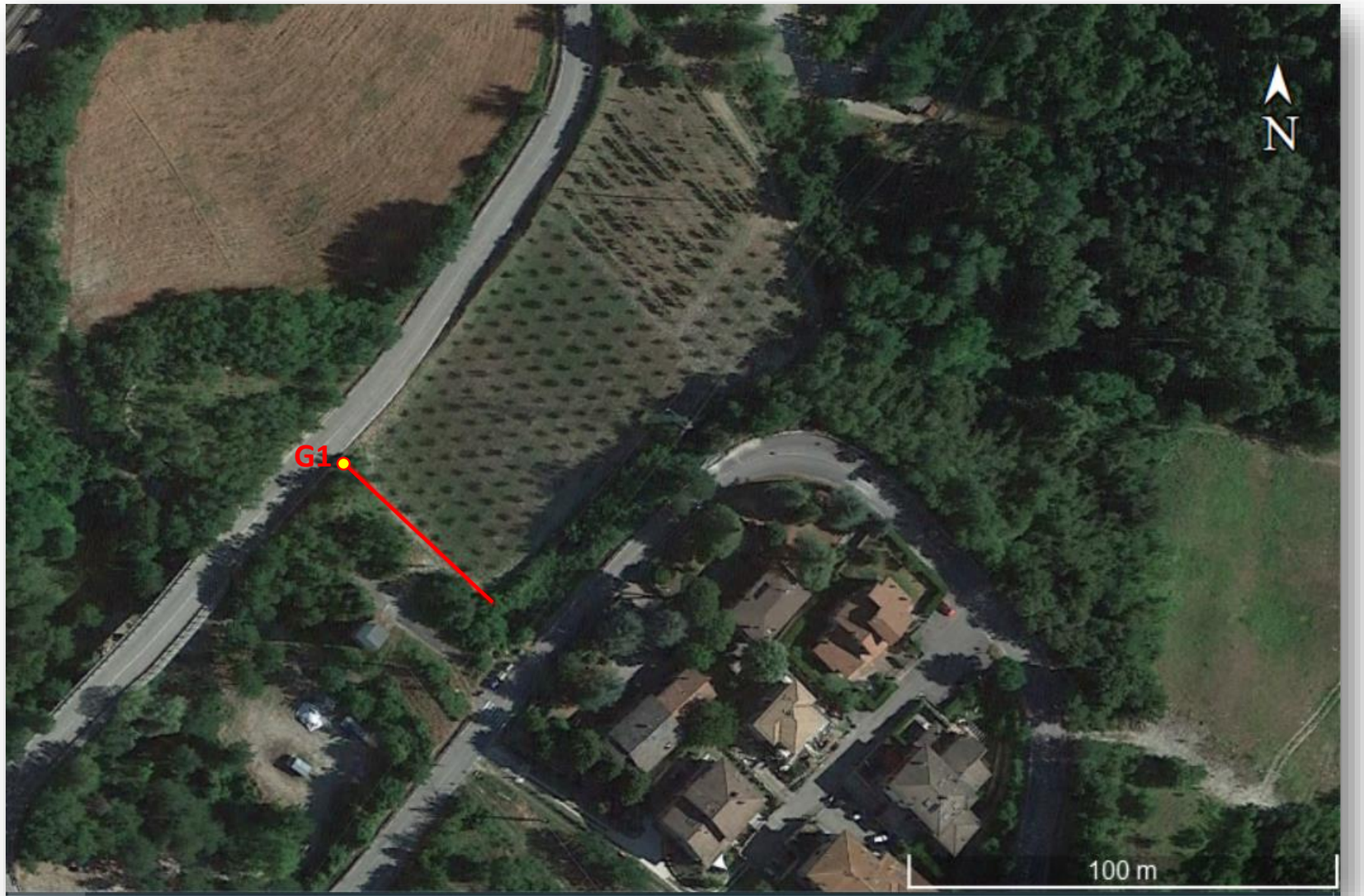
Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	3.75 > 0.63	OK	
$n_c(f_0) > 200$	3120.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 91 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.438 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	6.438 Hz	OK	
$A_0 > 2$	2.63 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03504| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.13142 < 0.1875	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.566 < 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

TAVOLA N°2

Ubicazione indagine SRT 1 onde P e Sh – Vado Nord (BO)







Lavoro: Indagini geofisiche per gli studi di MS comunale di livello 2 – Vado (BO)	**Committente:** Geol. Samuel Sangiorgi	**Indagini:** SRT **Data di esecuzione:** Giugno 2022	**Elaborato:** A. Battiato **Verificato:** D. Fiore **Approvato:** M. De Iasi

SOCOTEC

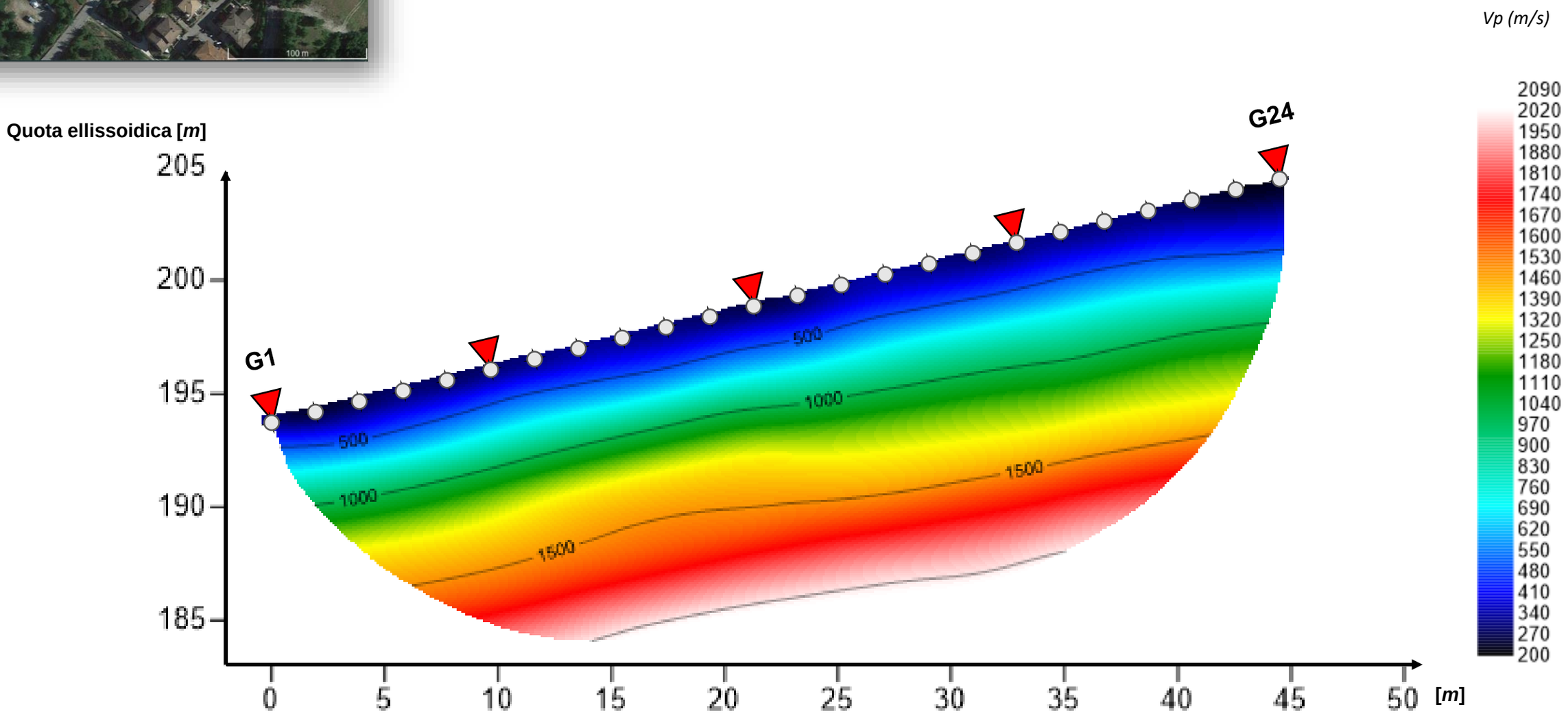
TAVOLA N°3

Ubicazione indagine SRT 1 onde P – Vado Nord (BO)

Passo intergeofonico: 2 m



Coordinate UTM-WGS84		
ID	**Latitudine**	**Longitudine**
G1	44°19'29.31"N	11°15'55.68"E
G24	44°19'28.29"N	11°15'57.16"E



Scala 1 : 226

Lavoro: Indagini geofisiche per gli studi di MS comunale di livello 2 – Vado (BO)	**Committente:** Geol. Samuel Sangiorgi	**Indagini:** SRT **Data di esecuzione:** Giugno 2022	**Elaborato:** A. Battiato **Verificato:** D. Fiore **Approvato:** M. De Iasi

SOCOTEC

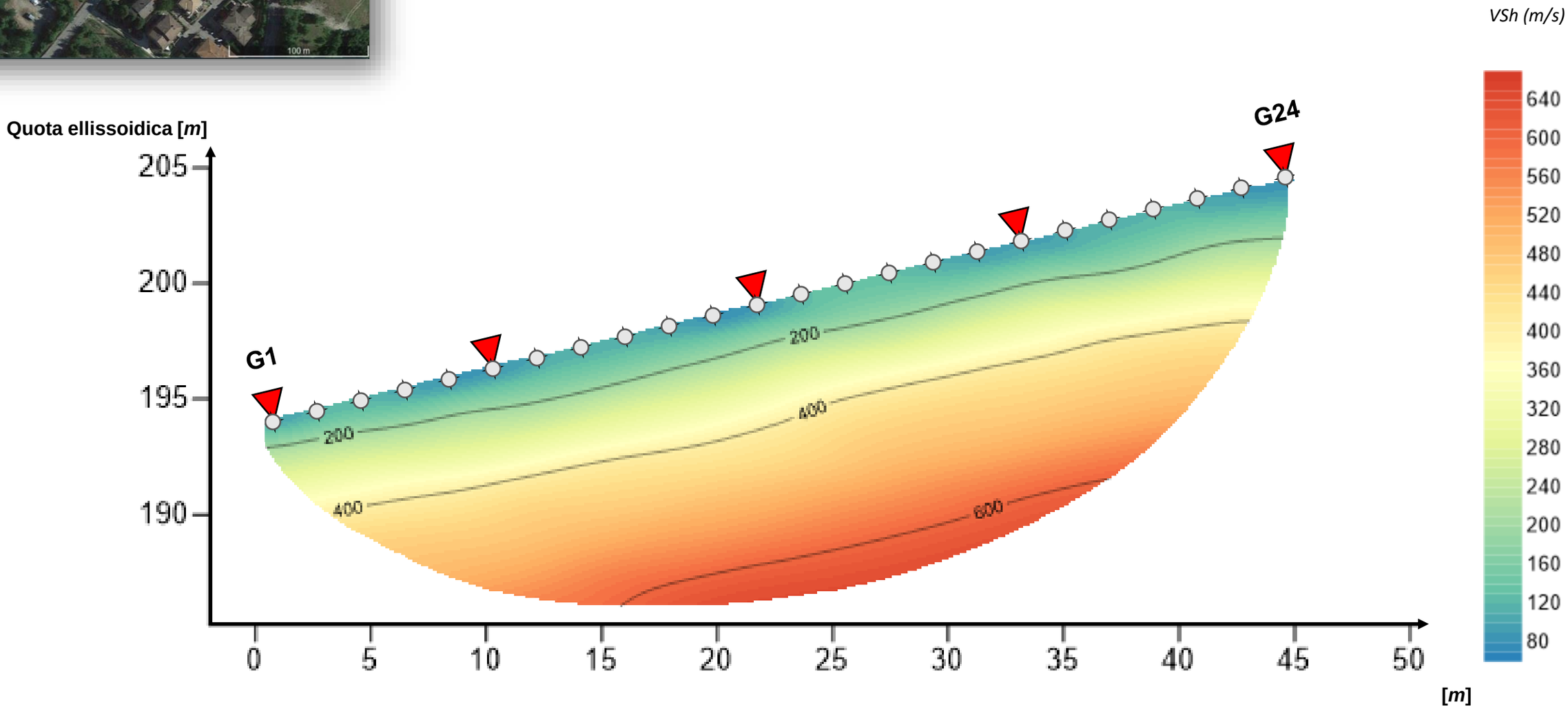
TAVOLA N°4

Ubicazione indagine SRT 1 onde P – Vado Nord (BO)

Passo intergeofonico: 2 m



Coordinate UTM-WGS84		
ID	**Latitudine**	**Longitudine**
G1	44°19'29.31"N	11°15'55.68"E
G24	44°19'28.29"N	11°15'57.16"E



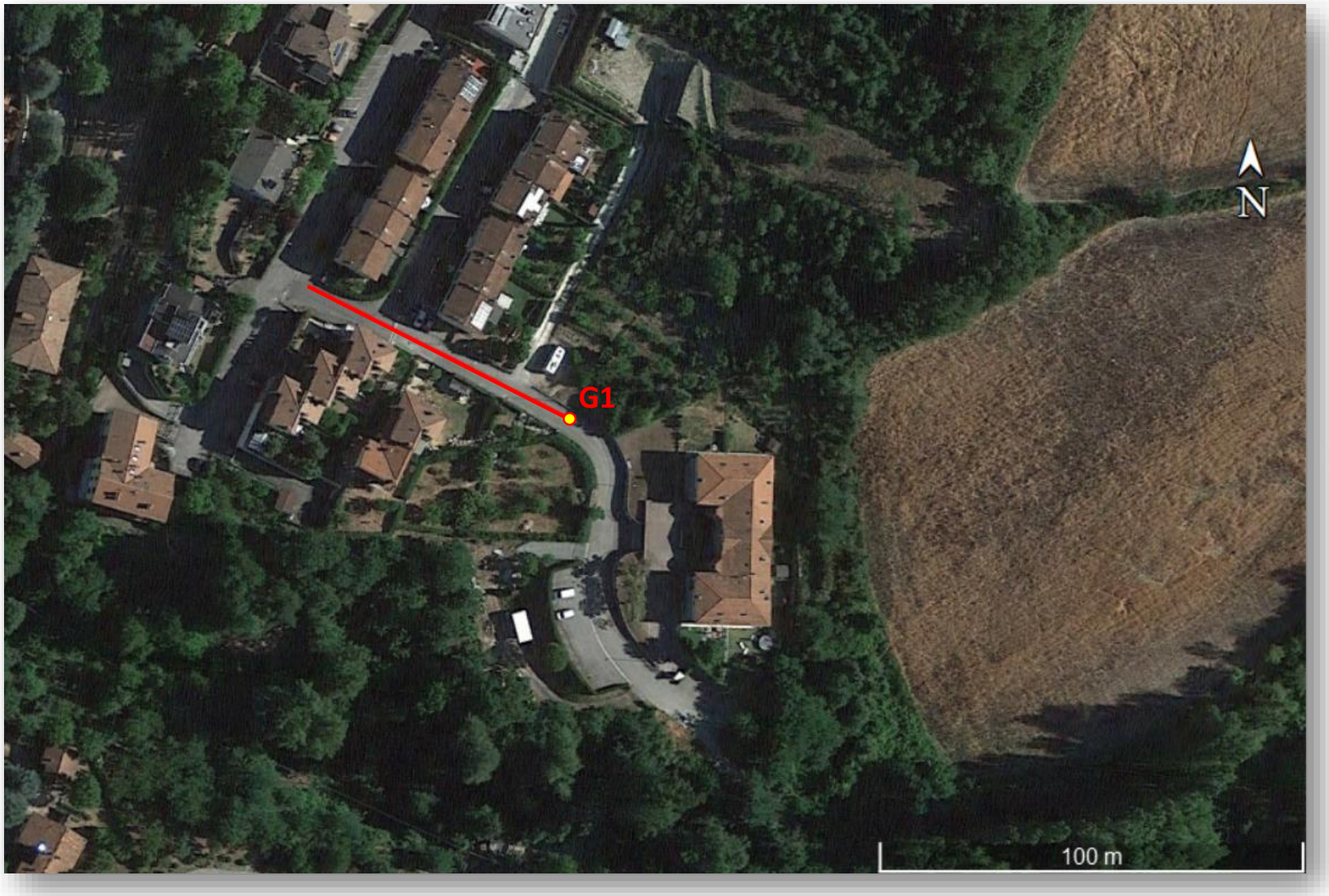
Scala 1 : 226

Lavoro: Indagini geofisiche per gli studi di MS comunale di livello 2 – Vado (BO)	**Committente:** Geol. Samuel Sangiorgi	**Indagini:** SRT **Data di esecuzione:** Giugno 2022	**Elaborato:** A. Battiato **Verificato:** D. Fiore **Approvato:** M. De Iasi

SOCOTEC

TAVOLA N°5

Ubicazione indagine SRT 2 onde P e Sh – Vado Sud (BO)







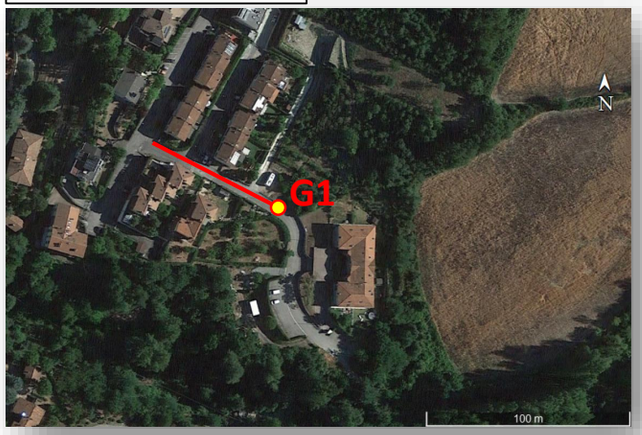
Lavoro: Indagini geofisiche per gli studi di MS comunale di livello 2 – Vado (BO)	**Committente:** Geol. Samuel Sangiorgi	**Indagini:** SRT **Data di esecuzione:** Giugno 2022	**Elaborato:** A. Battiato **Verificato:** D. Fiore **Approvato:** M. De Iasi

SOCOTEC

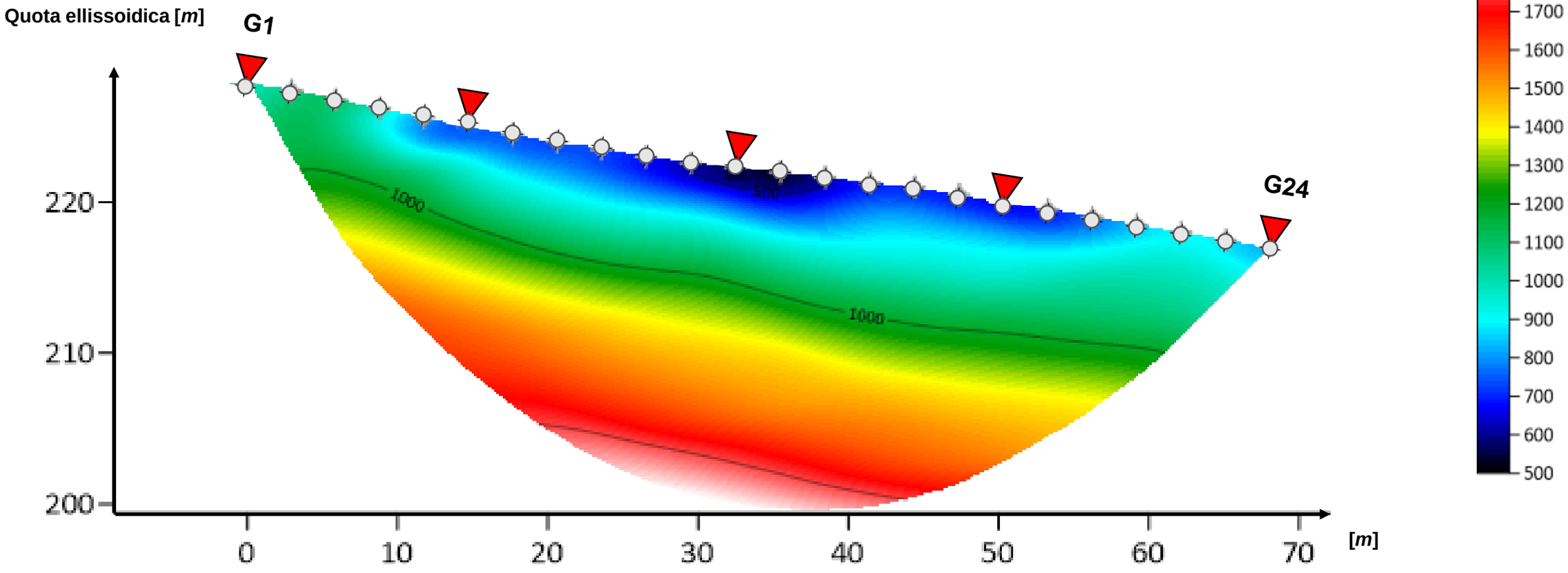
TAVOLA N°6

Ubicazione indagine SRT 2 onde P – Vado Sud (BO)

Passo intergeofonico: 3 m



Coordinate UTM-WGS84		
ID	**Latitudine**	**Longitudine**
G1	44°19'5.91"N	11°15'48.02"E
G24	44°19'6.90"N	11°15'45.24"E



Scala 1 : 330

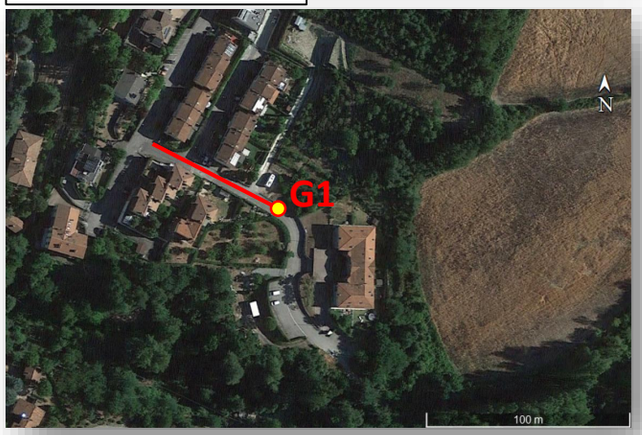
Lavoro: Indagini geofisiche per gli studi di MS comunale di livello 2 – Vado (BO)	**Committente:** Geol. Samuel Sangiorgi	**Indagini:** SRT **Data di esecuzione:** Giugno 2022	**Elaborato:** A. Battiato **Verificato:** D. Fiore **Approvato:** M. De Iasi

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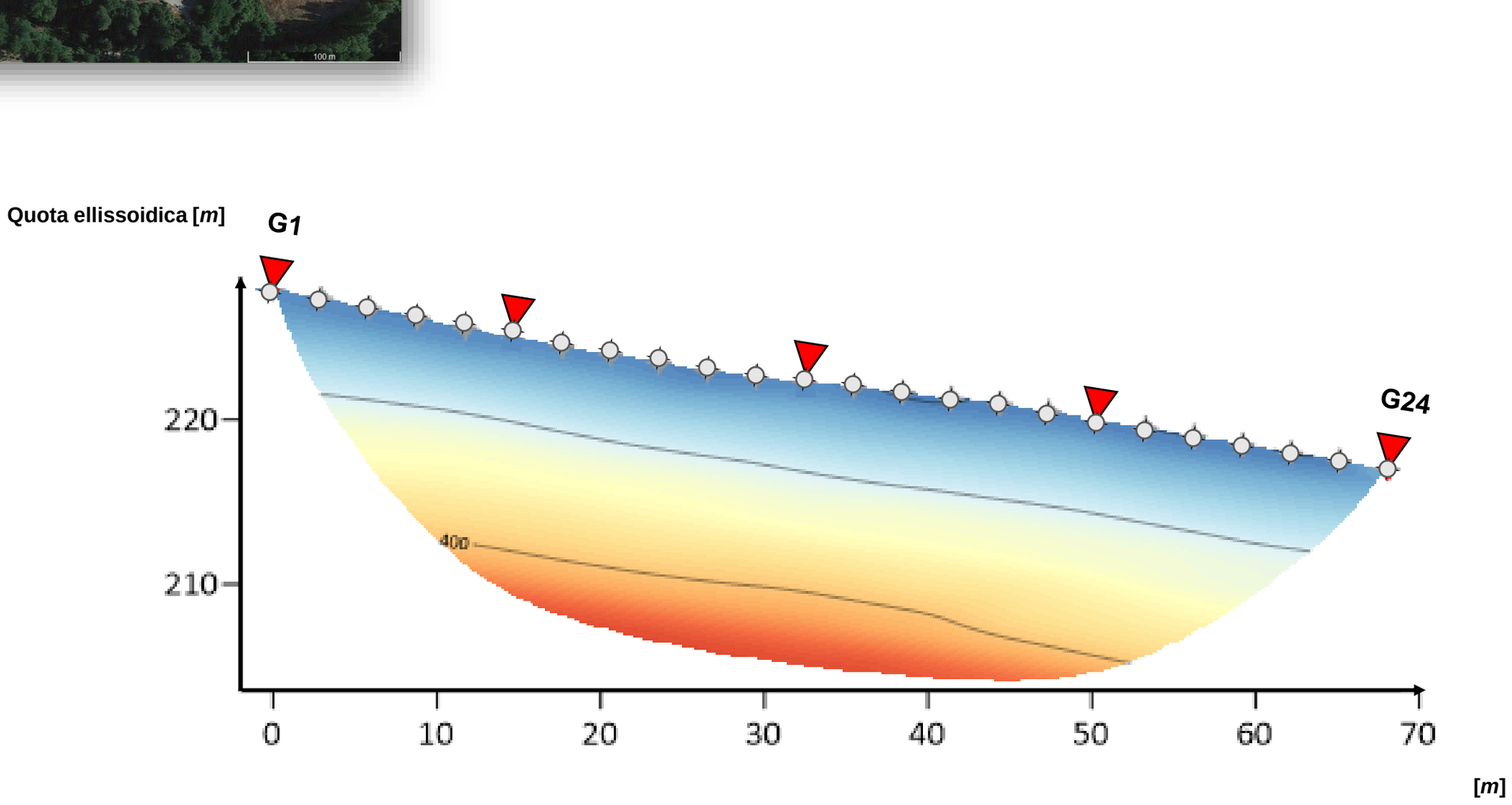
TAVOLA N°7

Ubicazione indagine SRT 2 onde Sh – Vado Sud (BO)

Passo intergeofonico: 3 m



Coordinate UTM-WGS84		
ID	**Latitudine**	**Longitudine**
G1	44°19'5.91"N	11°15'48.02"E
G24	44°19'6.90"N	11°15'45.24"E



Scala 1 : 330

Lavoro: Indagini geofisiche per gli studi di MS comunale di livello 2 – Vado (BO)	**Committente:** Geol. Samuel Sangiorgi	**Indagini:** SRT **Data di esecuzione:** Giugno 2022	**Elaborato:** A. Battiato **Verificato:** D. Fiore **Approvato:** M. De Iasi

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