



PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile



Regione Emilia-Romagna



Unione Rubicone e Mare



CONFERENZA DELLE REGIONI E
DELLE PROVINCE AUTONOME

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

MICROZONAZIONE SISMICA

di livello 2 e locali approfondimenti di livello 3

Regione Emilia-Romagna

Unione Rubicone e Mare

(Gatteo, San Mauro Pascoli e Savignano sul Rubicone)

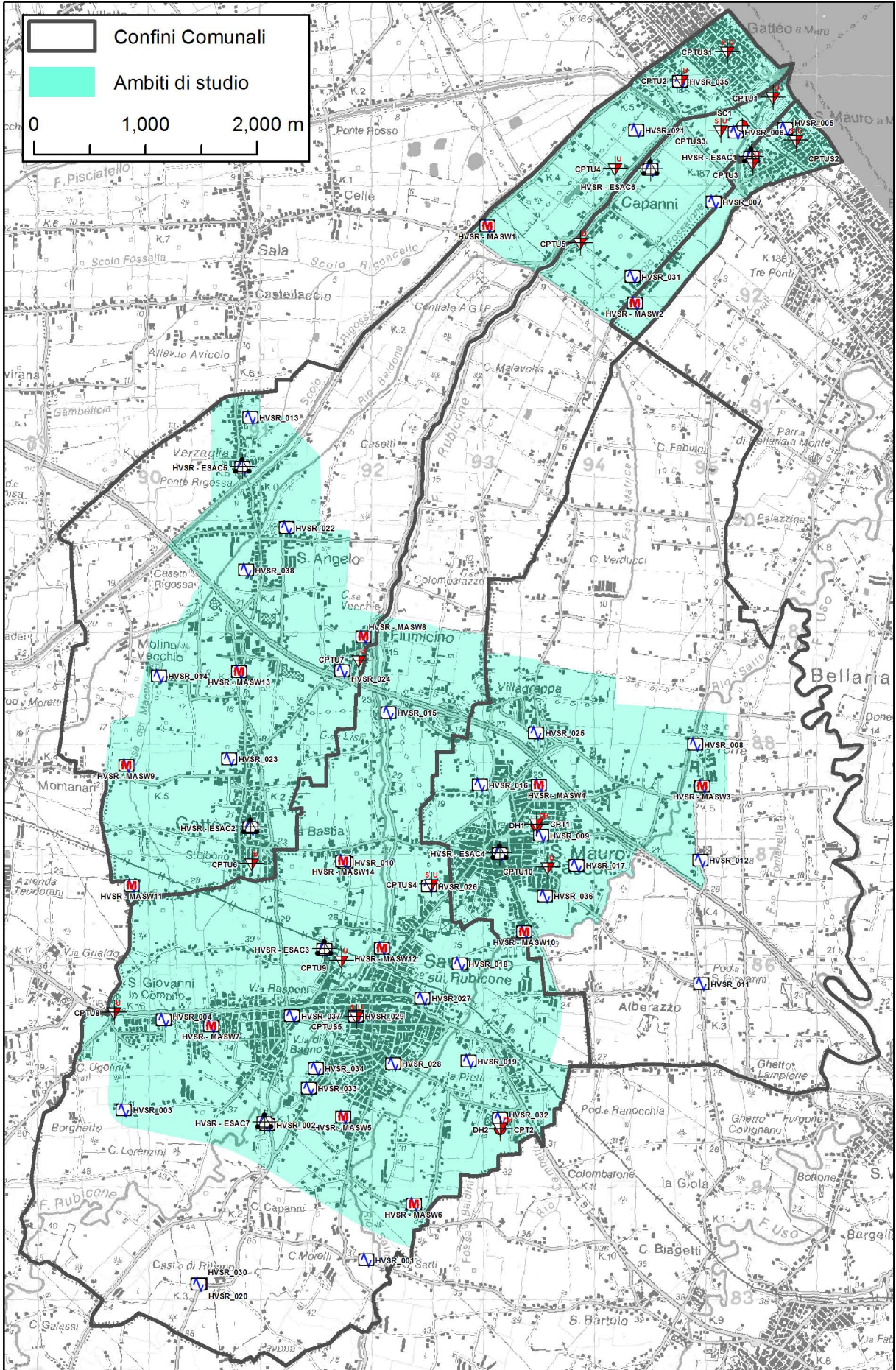


Allegato 2 – Rapporti delle indagini

Regione	Soggetto realizzatore	Data
Emilia-Romagna	Studio di geologia Gabriele Tarabusi	27/10/2014

Confini Comunali
Ambiti di studio

0 1,000 2,000 m





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S.R.L.
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Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-11	PROVA N°:	CPT-1
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
	DATA DI EMISSIONE:	21/08/2014	Latitudine:	N 44,107670°
			Longitudine:	E 12,418614°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	San Mauro Pascoli (FC)

Il presente certificato di prova si compone di n° pagine, esclusa la presente, ed ha per oggetto le seguenti prove:

<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input checked="" type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestmetro	<input type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: PAGANI TG73/200 Matricola n.: P00505- Cod. punta P004

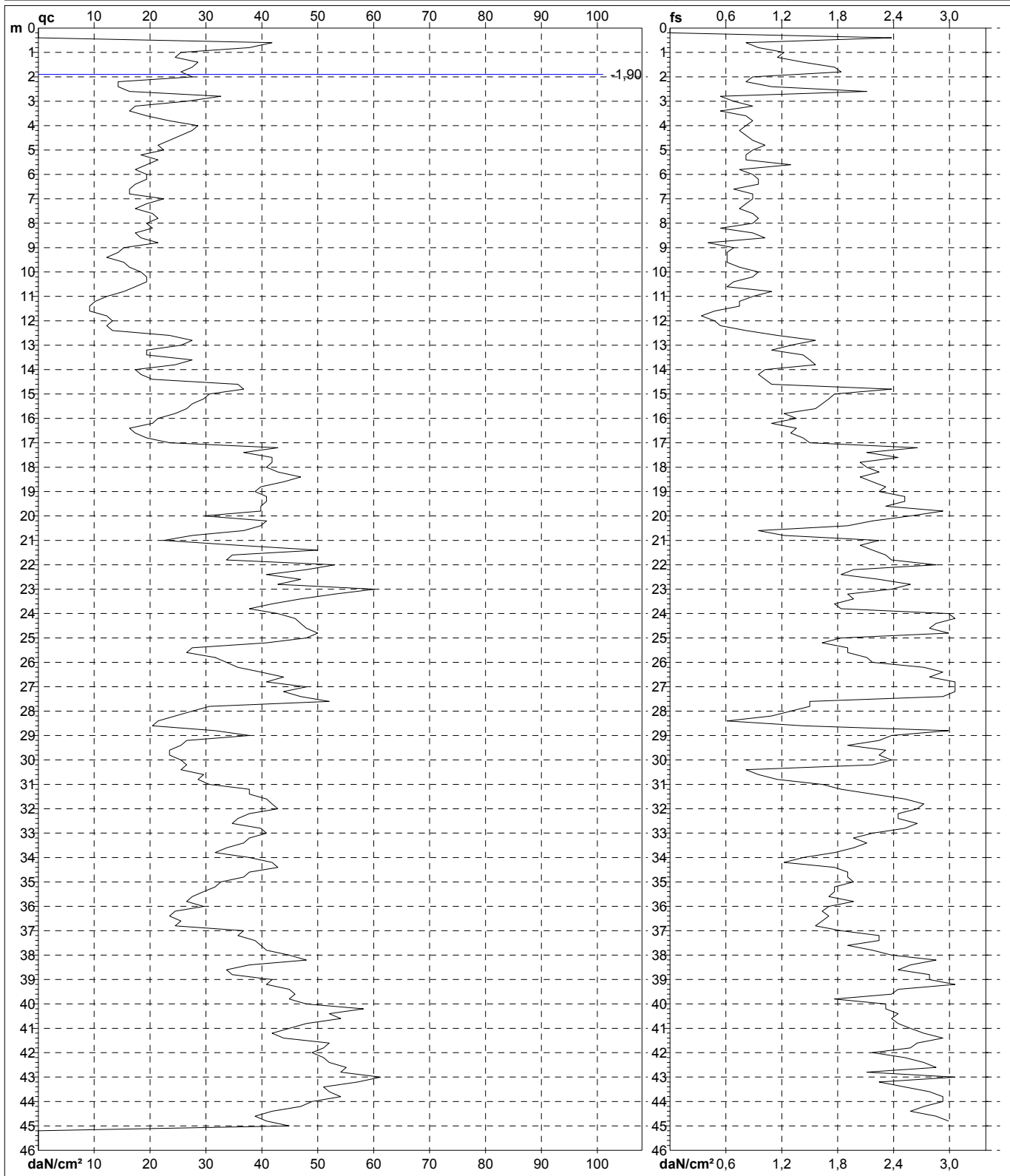
Allegati:

Timbro blu sull'originale	Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977

<h1>PROVA PENETROMETRICA STATICA MECCANICA</h1> <h2>DIAGRAMMI DI RESISTENZA</h2>	CPT	1
	riferimento	031-14
	certificato n°	C14-087-11

Committente: PROGEO	U.M.: daN/cm²	Data esec.: 16/07/2014
Cantiere: Studio microzonazione sismica	Scala: 1:230	Data certificato: 21/08/2014
Località: S. Mauro Pascoli	Pagina: 1	Quota inizio:
	Elaborato:	Falda: -1,90 m



Penetrometro: TG73-200	Corr.astine: kN/ml	Preforo: m
Responsabile:	Lo sperimentatore:	
Assistente:	Il direttore laboratorio:	



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Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-12	PROVA N°:	CPT-2
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
	DATA DI EMISSIONE:	21/08/2014	Latitudine:	N 44.082965°
			Longitudine:	E 12.415632°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Savignano sul Rubicone (FC)

Il presente certificato di prova si compone di n° pagine, esclusa la presente, ed ha per oggetto le seguenti prove:

<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input checked="" type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: PAGANI TG73/200 Matricola n.: P00505- Cod. punta P004

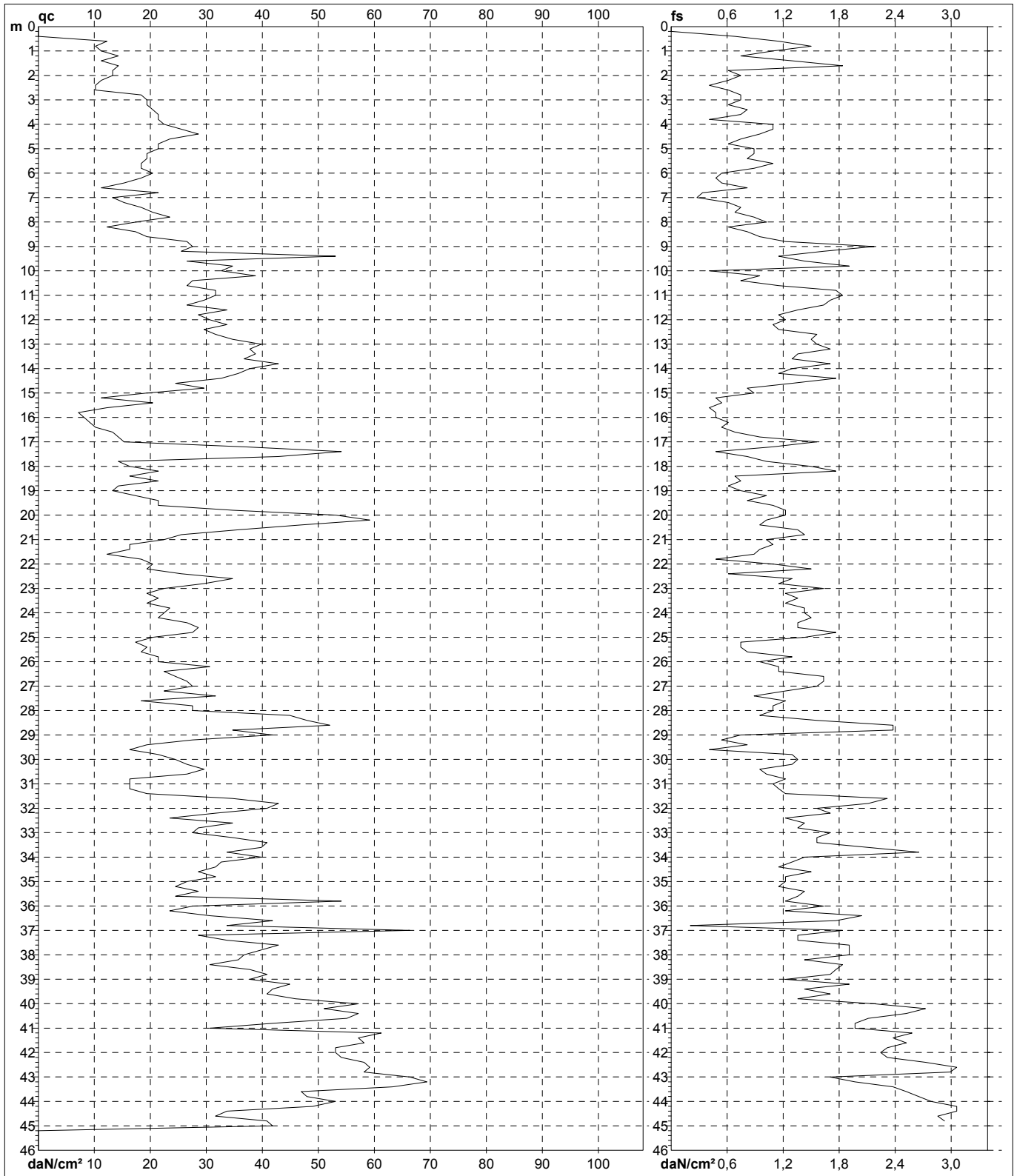
Allegati:

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977

PROVA PENETROMETRICA STATICA MECCANICA DIAGRAMMI DI RESISTENZA	CPT	2
	riferimento	031-14
	certificato n°	C14-087-12

Committente: PROGEO	U.M.: daN/cm²	Data eseg.: 16/07/2014
Cantiere: Studio microzonazione sismica	Scala: 1:230	Data certificato: 21/08/2014
Località: Scrigno - Comune di Savignano	Pagina: 1	Quota inizio:
	Elaborato:	Falda: -2,10 m



Penetrometro: TG73-200	Corr.astine: kN/ml	Preforo: m
Responsabile:	Lo sperimentatore:	
Assistente:	Il direttore laboratorio:	



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Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-13	PROVA N°:	CPTUS-1
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
	DATA DI EMISSIONE:	21/08/2014	Latitudine:	N 44,170629°
			Longitudine:	E 12,437314°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Gatteo Mare (FC)

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

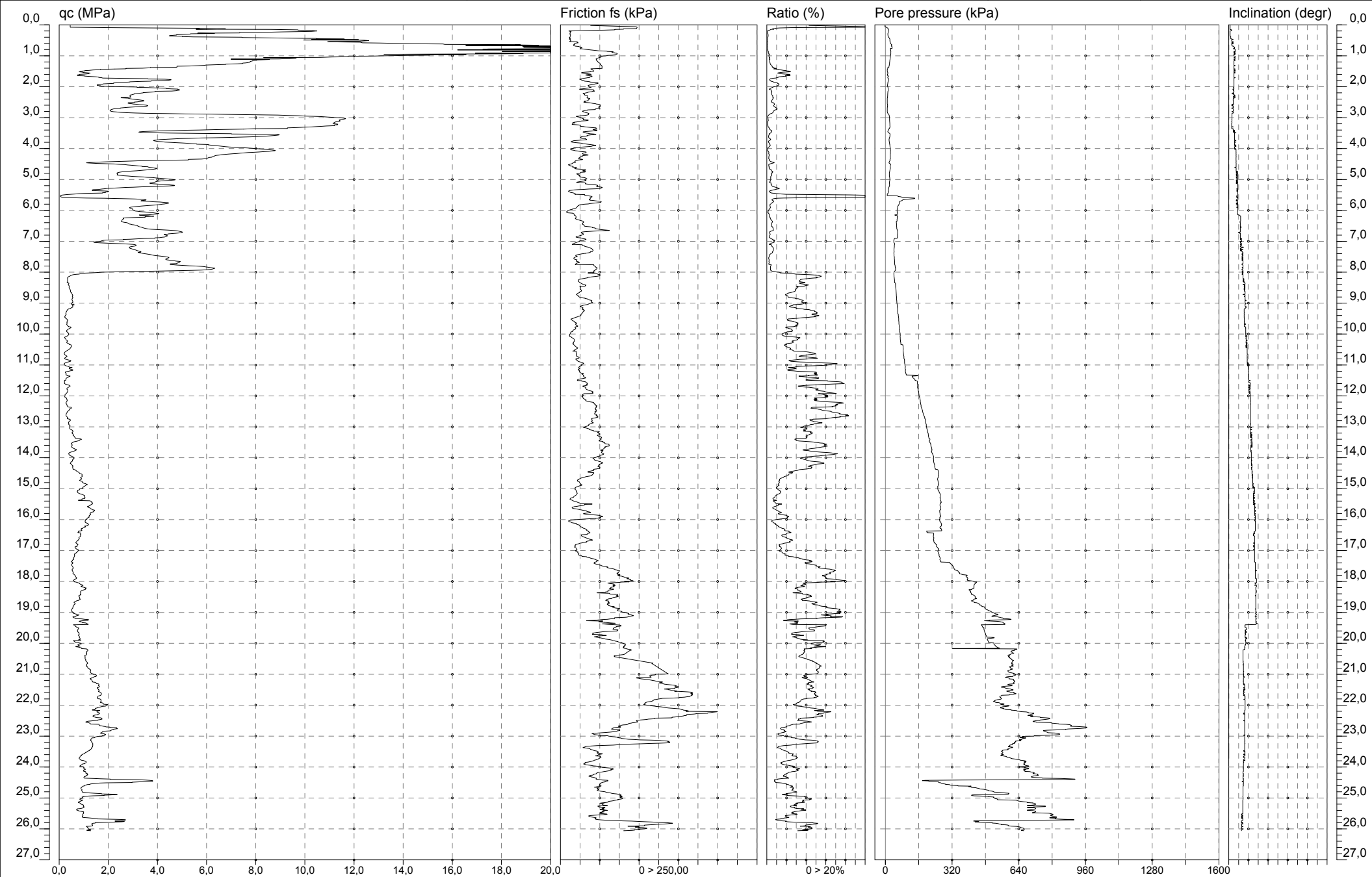
<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestmetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977



COMMITTENTE	UNIONE COMUNI DEL RUB.
CONO SISMICO	CPTUS1
Località	GATTEO MARE
Data acquisizione	12/08/2014

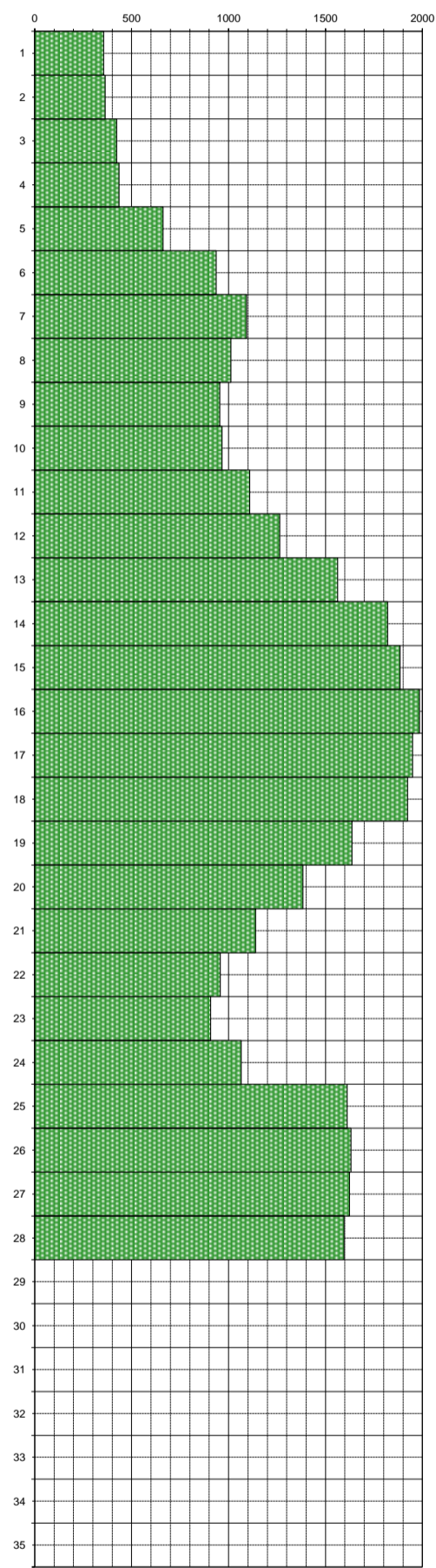
Codice lavoro **1422**



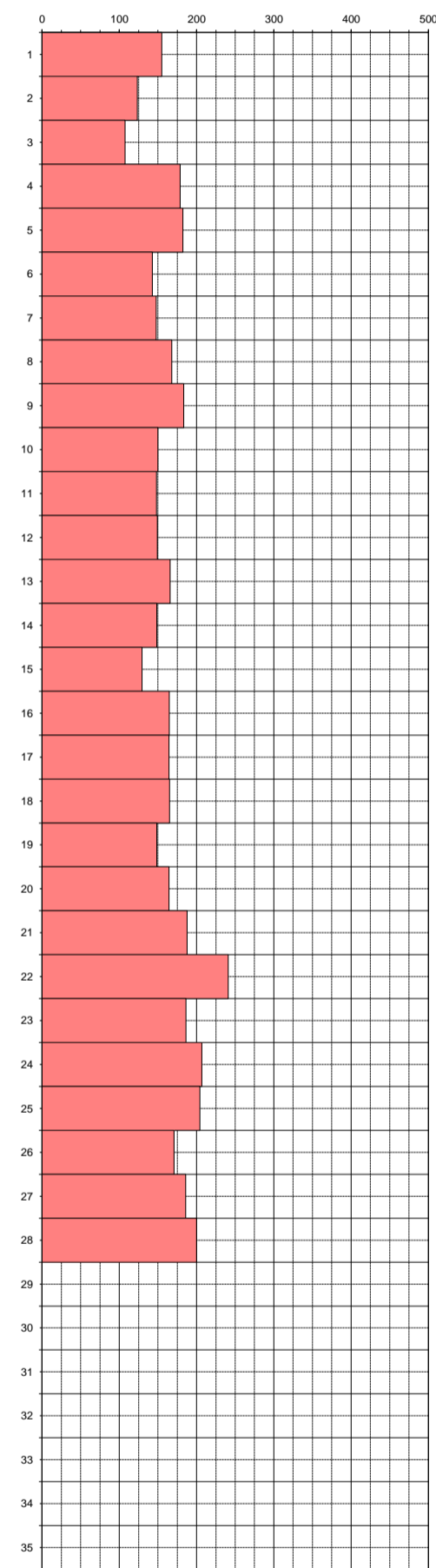
Profondità	Vp m/sec.	Vs m/sec.	v	γ T/m³	E _{din} Kg/cm²	G _{din} Kg/cm²	K _{din} Kg/cm²
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0							
1	356	155	0.38	1.56	1055	381	1503
2	364	123	0.44	1.56	697	243	1788
3	423	108	0.47	1.61	556	190	2682
4	436	179	0.40	1.62	1475	527	2428
5	662	182	0.46	1.75	1731	593	7042
6	936	143	0.49	1.87	1157	389	16211
7	1093	148	0.49	1.93	1280	429	22904
8	1013	168	0.49	1.90	1624	547	19134
9	955	183	0.48	1.88	1909	645	16594
10	967	150	0.49	1.88	1281	430	17362
11	1109	148	0.49	1.93	1291	433	23660
12	1264	149	0.49	1.98	1346	451	31672
13	1563	166	0.49	2.06	1726	578	50598
14	1821	148	0.50	2.12	1428	477	71118
15	1885	129	0.50	2.14	1090	364	76941
16	1986	165	0.50	2.16	1784	596	85951
17	1949	164	0.50	2.15	1770	591	82525
18	1924	165	0.50	2.15	1782	596	80129
19	1637	149	0.50	2.08	1402	469	56211
20	1384	164	0.49	2.02	1654	554	38611
21	1139	188	0.49	1.94	2071	697	24778
22	958	241	0.47	1.88	3259	1111	16097
23	908	186	0.48	1.86	1948	659	14754
24	1066	207	0.48	1.92	2472	835	21084
25	1612	204	0.49	2.07	2629	881	53800
26	1632	171	0.49	2.08	1845	617	55639
27	1624	186	0.49	2.08	2188	733	54881
28	1596	200	0.49	2.07	2521	845	52644
29							
30							
31							
32							
33							
34							
35							

VELOCITA' ONDE DI COMPRESIONE
m/sec



VELOCITA' ONDE DI TAGLIO
m/sec



Legenda parametri dinamici					
Tp	Tempi onde di compressione	millisecondi	γ	Peso di volume	T/m³
Ts	Tempi onde di taglio	millisecondi	E _{din}	Modulo di Elasticità dinamico	Kg/cm²
Vp	Velocità onde di compressione	m/sec	G _{din}	Modulo di Taglio dinamico	Kg/cm²
Vs	Velocità onde di taglio	m/sec	K _{din}	Modulo di Compressibilità dinamico	Kg/cm²
v	Coefficiente di Poisson	-			

CLASSIFICAZIONE SISMICA DEI SUOLI
(D.M. del 14/01/2008)

$$Vs_{30} = \frac{30}{\sum_{i=1,N} \frac{h_i}{V_i}} \quad Vs_{30} = \quad \text{m/sec}$$

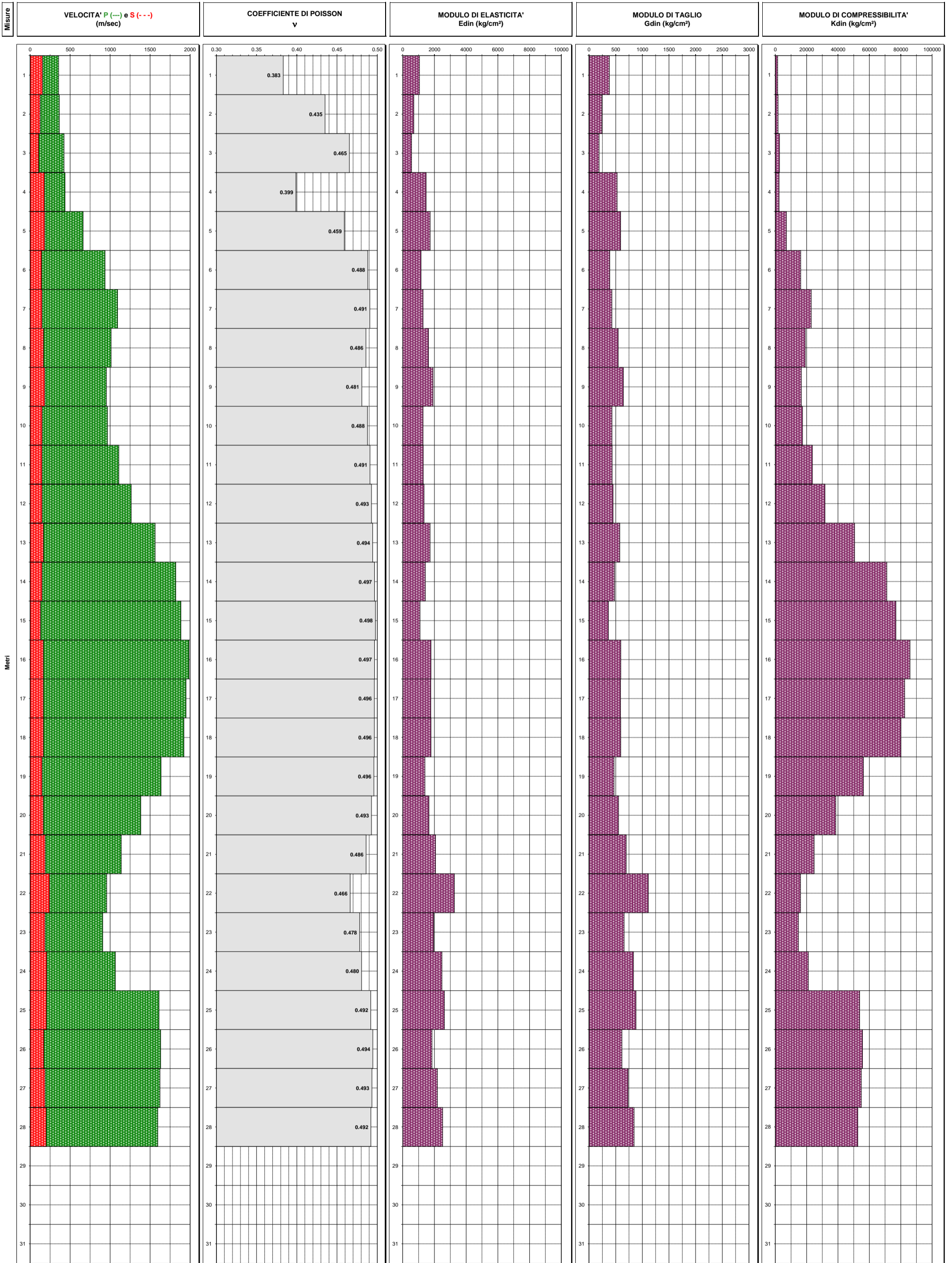
CATEGORIA SUOLO =

COMMITTENTE
CONO SISMICO
Località
Data acquisizione

UNIONE COMUNI DEL RUB.
CPTUS1
GATTEO MARE
12/08/2014



GRAFICI DEI PARAMETRI ELASTICI DINAMICI





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Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-14	PROVA N°:	CPTUS-2
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
	DATA DI EMISSIONE:	21/08/2014	Latitudine:	N 44,163665°
			Longitudine:	E 12,445361°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	San Mauro (FC) - Viale della Repubblica

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

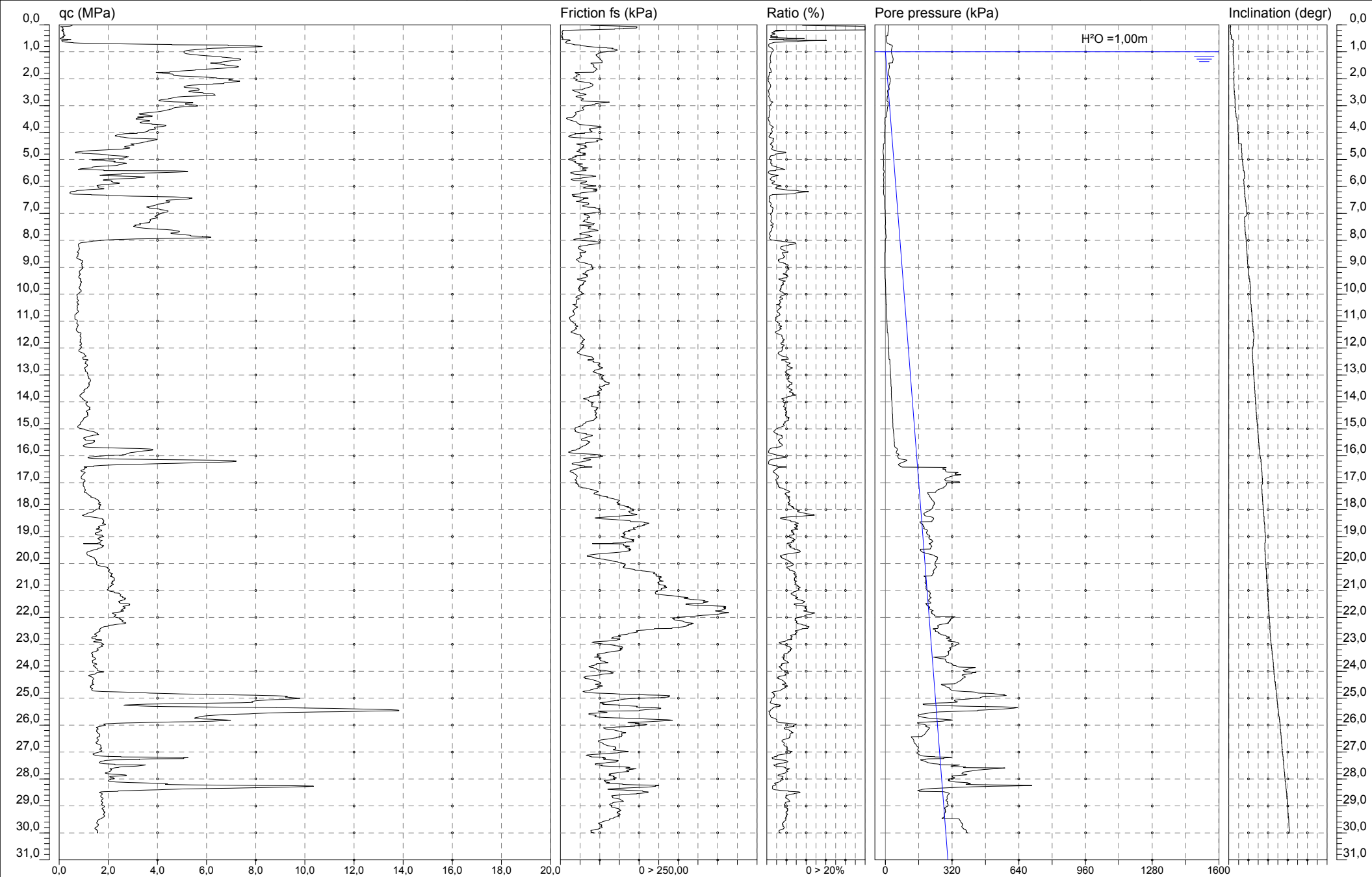
<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: **Matricola n.:**

Allegati:

Timbro blu sull'originale	Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977



COMMITTENTE	UNIONE COMUNI DEL RUB.
CONO SISMICO	CPTUS2
Località	SAN MAURO MARE
Data acquisizione	1/08/2014

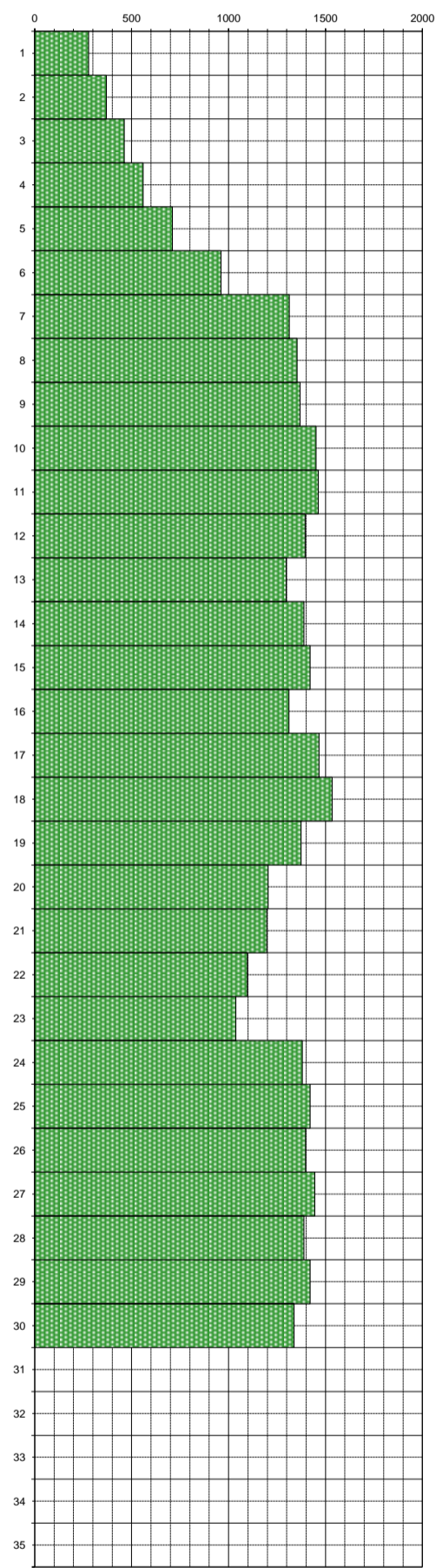
Codice lavoro **1422**



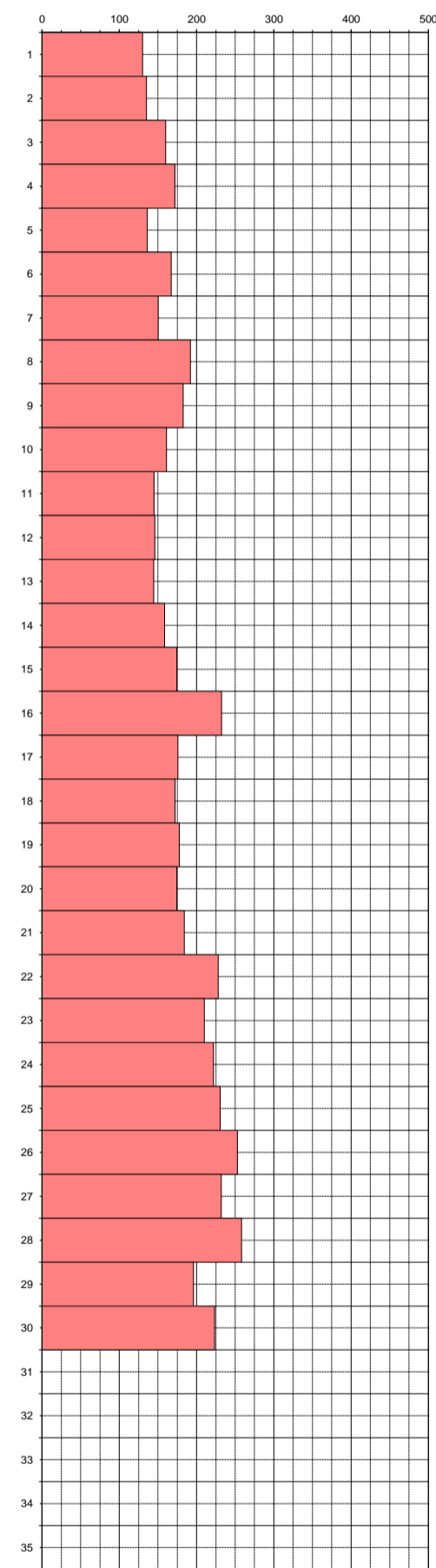
Profondità	Vp m/sec.	Vs m/sec.	v	γ T/m³	E _{din} Kg/cm²	G _{din} Kg/cm²	K _{din} Kg/cm²
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0							
1	278	130	0.36	1.49	699	257	831
2	370	135	0.42	1.57	830	291	1803
3	462	160	0.43	1.64	1224	427	2991
4	559	172	0.45	1.70	1477	510	4733
5	711	136	0.48	1.78	993	335	8699
6	961	167	0.48	1.88	1594	537	16988
7	1313	150	0.49	2.00	1373	460	34476
8	1354	192	0.49	2.01	2250	755	36503
9	1369	183	0.49	2.01	2042	685	37513
10	1452	161	0.49	2.03	1609	539	42994
11	1463	145	0.50	2.04	1306	437	43859
12	1395	146	0.49	2.02	1314	439	39456
13	1298	144	0.49	1.99	1264	423	33632
14	1389	158	0.49	2.02	1541	516	38978
15	1421	175	0.49	2.03	1878	629	40856
16	1312	232	0.48	2.00	3258	1098	33545
17	1467	176	0.49	2.04	1917	642	43852
18	1535	172	0.49	2.06	1856	621	48509
19	1375	178	0.49	2.01	1929	647	37908
20	1204	174	0.49	1.96	1813	609	28211
21	1198	184	0.49	1.96	2014	677	27787
22	1097	228	0.48	1.93	3024	1024	22292
23	1038	210	0.48	1.91	2542	860	19813
24	1381	222	0.49	2.01	3011	1013	37794
25	1421	231	0.49	2.03	3268	1099	40229
26	1398	253	0.48	2.02	3902	1315	38477
27	1445	232	0.49	2.03	3316	1115	41766
28	1389	258	0.48	2.02	4069	1373	37836
29	1421	196	0.49	2.03	2364	793	40637
30	1338	224	0.49	2.00	3030	1020	35197
31							
32							
33							
34							
35							

VELOCITA' ONDE DI COMPRESSIONE
m/sec



VELOCITA' ONDE DI TAGLIO
m/sec



Legenda parametri dinamici					
Tp	Tempi onde di compressione	millisecondi	γ	Peso di volume	T/m³
Ts	Tempi onde di taglio	millisecondi	E _{din}	Modulo di Elasticità dinamico	Kg/cm²
Vp	Velocità onde di compressione	m/sec	G _{din}	Modulo di Taglio dinamico	Kg/cm²
Vs	Velocità onde di taglio	m/sec	K _{din}	Modulo di Compressibilità dinamico	Kg/cm²
v	Coefficiente di Poisson	-			

CLASSIFICAZIONE SISMICA DEI SUOLI
(D.M. del 14/01/2008)

$$Vs_{30} = \frac{30}{\sum_{i=1, N} \frac{h_i}{V_i}}$$

Vs₃₀ = 178 m/sec

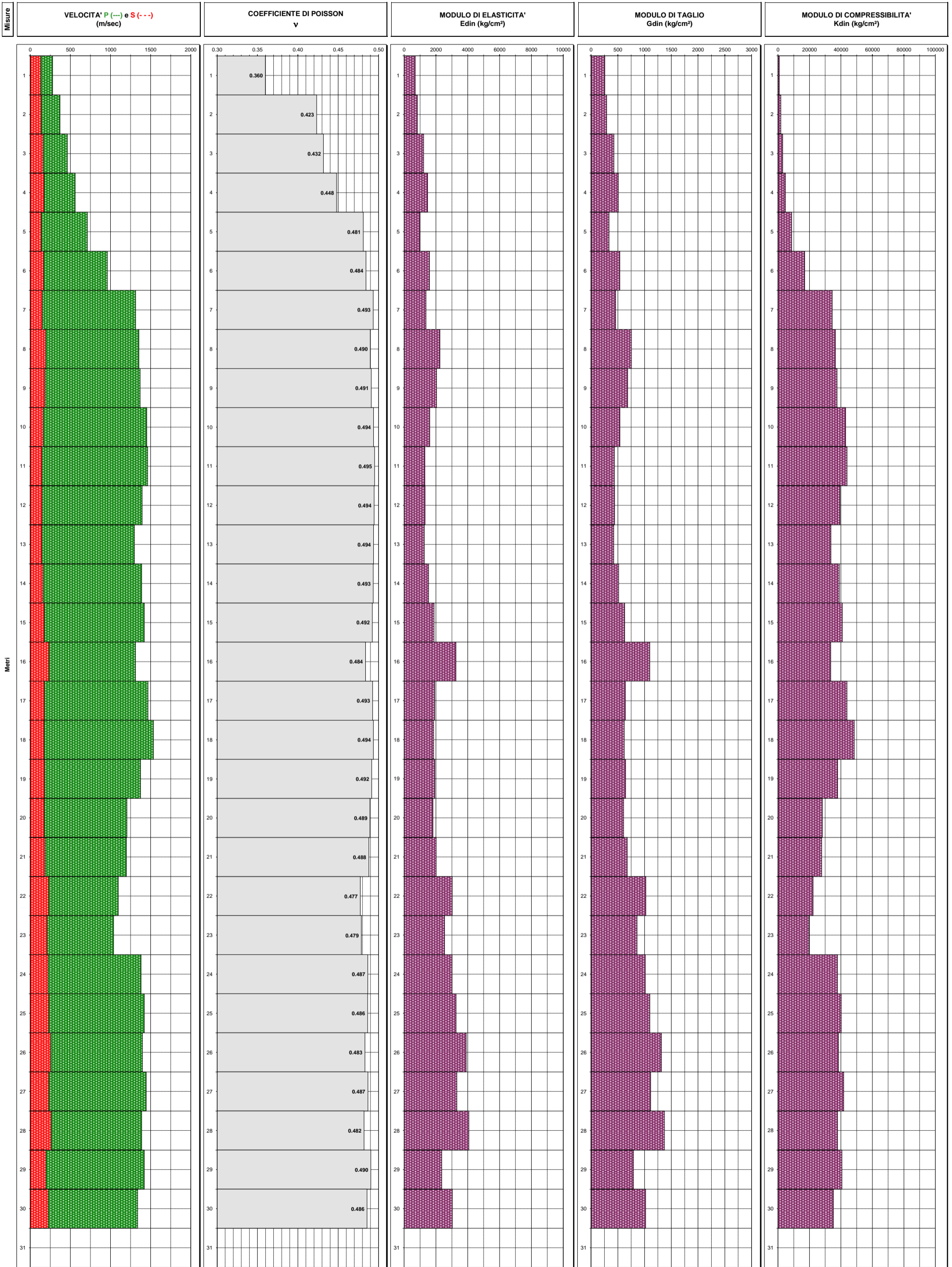
CATEGORIA SUOLO = D

COMMITTENTE
CONO SISMICO
Località
Data acquisizione

UNIONE COMUNI DEL RUB.
CPTUS2
SAN MAURO MARE
1/08/2014



GRAFICI DEI PARAMETRI ELASTICI DINAMICI





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Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	<input type="text" value="C14-087-15"/>	PROVA N°:	<input type="text" value="CPTUS-3"/>
<input type="checkbox"/>	RAPPORTO N°:	<input type="text"/>	UBICAZIONE PROVA: (gradi decimali)	
	DATA DI EMISSIONE:	<input type="text" value="21/08/2014"/>	Latitudine:	N 44,164272°
			Longitudine:	E 12,436843°

Riferimento Preventivo n°:	<input type="text" value="031-14"/>	Commessa n°:	<input type="text" value="14-080"/>
Verbale di accettazione n°:	<input type="text" value="VA14-087"/>	del:	<input type="text" value="21/08/2014"/>

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Savignano Mare (FC) - Camping Rubicone

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

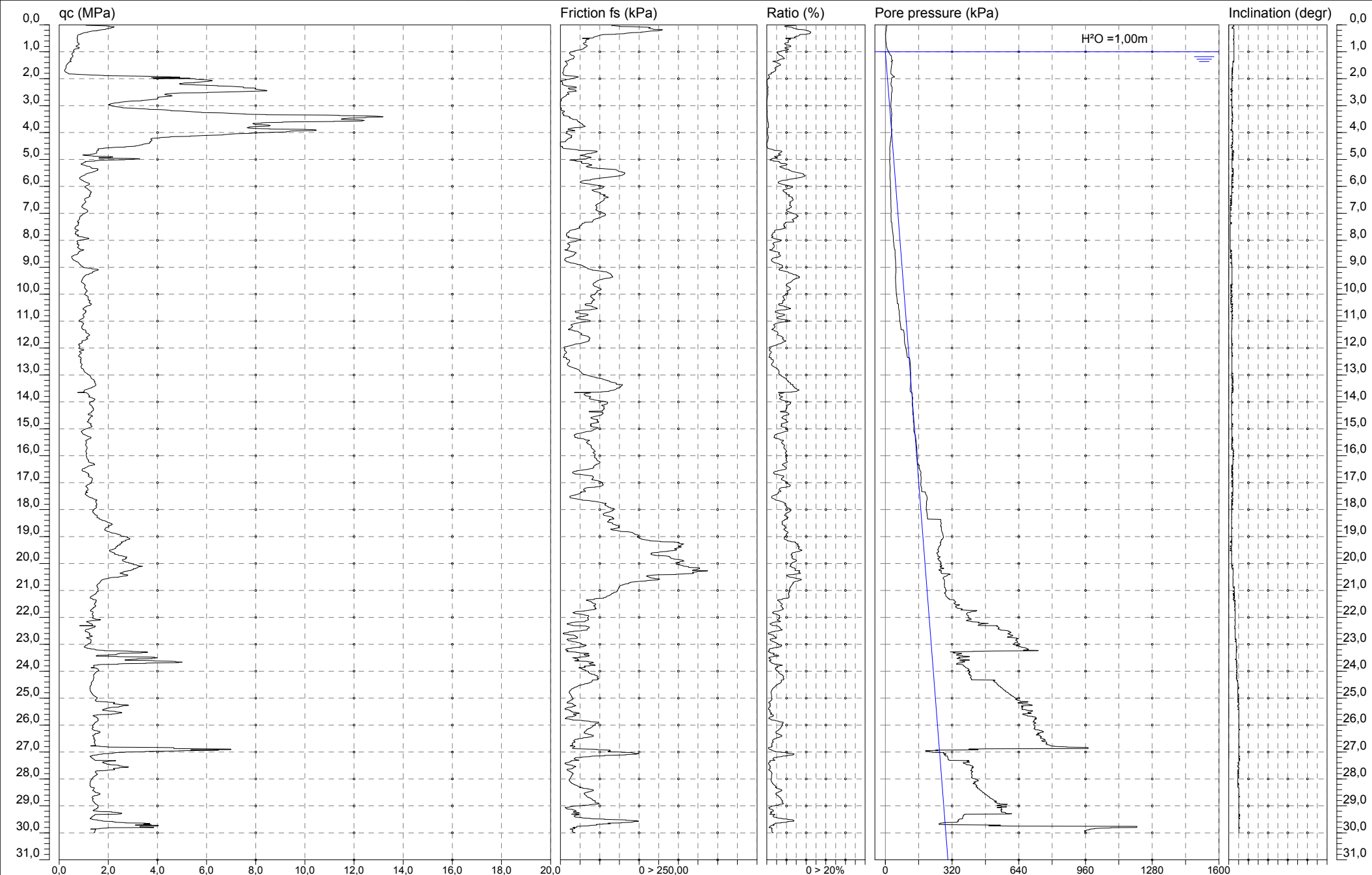
<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:

Normativa di Riferimento: **A.G.I 1977**



COMMITTENTE	UNIONE COMUNI DEL RUB.
CONO SISMICO	CPTUS3
Località	SAN MAURO MARE
Data acquisizione	8/08/2014

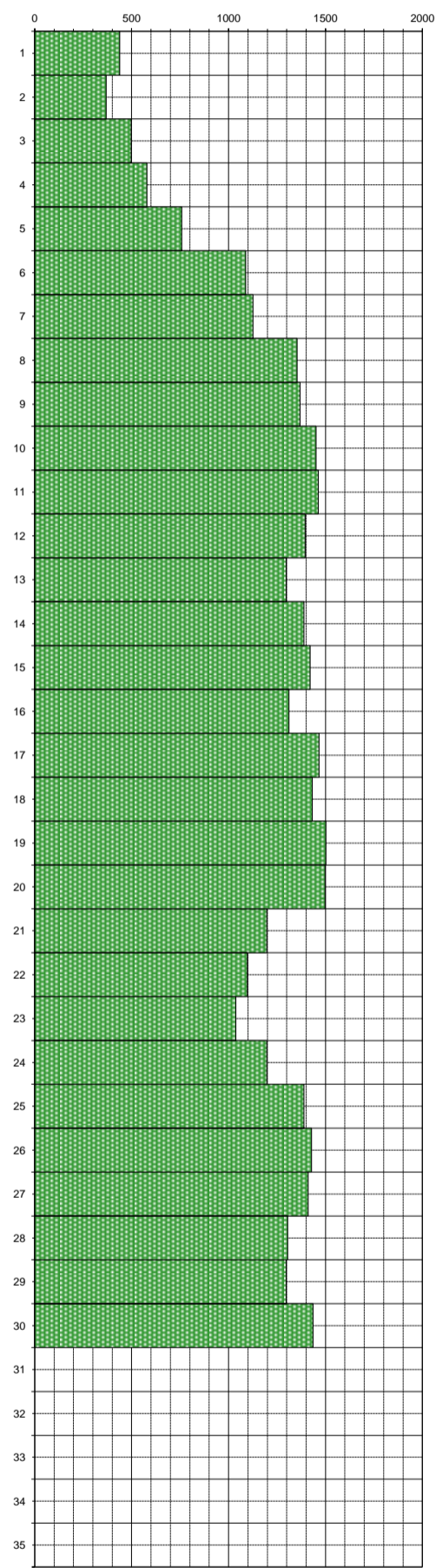
Codice lavoro **1422**



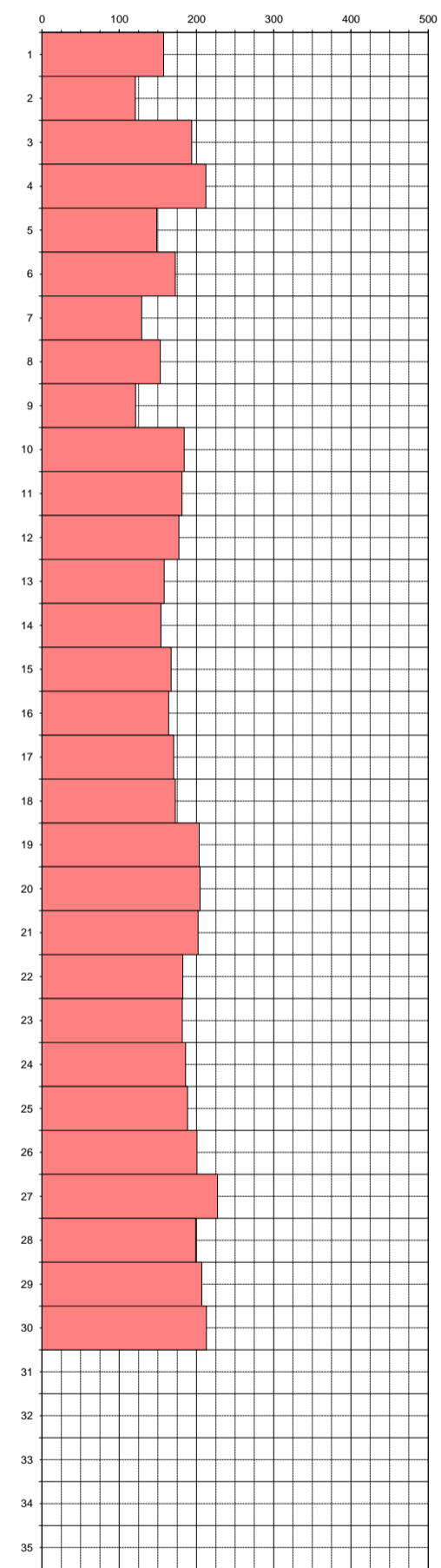
Profondità	Vp	Vs	v	γ	E _{din}	G _{din}	K _{din}
	m/sec.	m/sec.		T/m ³	Kg/cm ²	Kg/cm ²	Kg/cm ²

0							
1	439	158	0.43	1.62	1169	410	2637
2	369	121	0.44	1.57	673	234	1865
3	498	194	0.41	1.66	1793	636	3348
4	579	212	0.42	1.71	2233	785	4790
5	759	149	0.48	1.80	1198	405	10020
6	1089	173	0.49	1.93	1741	585	22500
7	1126	129	0.49	1.94	984	330	24608
8	1354	153	0.49	2.01	1431	479	36871
9	1369	121	0.50	2.01	898	300	38026
10	1452	184	0.49	2.03	2097	703	42776
11	1463	181	0.49	2.04	2039	683	43530
12	1395	177	0.49	2.02	1929	646	39180
13	1298	158	0.49	1.99	1515	508	33519
14	1389	154	0.49	2.02	1453	487	39017
15	1421	167	0.49	2.03	1722	577	40926
16	1312	164	0.49	2.00	1630	546	34280
17	1467	171	0.49	2.04	1804	604	43902
18	1432	173	0.49	2.03	1839	616	41584
19	1502	204	0.49	2.05	2582	866	45929
20	1498	205	0.49	2.05	2607	874	45637
21	1198	202	0.49	1.96	2429	818	27599
22	1097	182	0.49	1.93	1941	653	22786
23	1038	182	0.48	1.91	1906	642	20103
24	1198	186	0.49	1.96	2058	692	27767
25	1389	188	0.49	2.02	2178	730	38692
26	1428	201	0.49	2.03	2477	831	41038
27	1411	227	0.49	2.02	3173	1067	39632
28	1305	199	0.49	1.99	2390	803	33530
29	1298	207	0.49	1.99	2580	867	33039
30	1436	213	0.49	2.03	2789	937	41416
31							
32							
33							
34							
35							

VELOCITA' ONDE DI COMPRESSIONE
m/sec



VELOCITA' ONDE DI TAGLIO
m/sec



Legenda parametri dinamici					
Tp	Tempi onde di compressione	millisecondi	γ	Peso di volume	T/m ³
Ts	Tempi onde di taglio	millisecondi	E _{din}	Modulo di Elasticità dinamico	Kg/cm ²
Vp	Velocità onde di compressione	m/sec	G _{din}	Modulo di Taglio dinamico	Kg/cm ²
Vs	Velocità onde di taglio	m/sec	K _{din}	Modulo di Compressibilità dinamico	Kg/cm ²
v	Coefficiente di Poisson	-			

CLASSIFICAZIONE SISMICA DEI SUOLI
(D.M. del 14/01/2008)

$$Vs_{30} = \frac{30}{\sum_{i=1,N} \frac{h_i}{V_i}}$$

Vs₃₀ = 173 m/sec

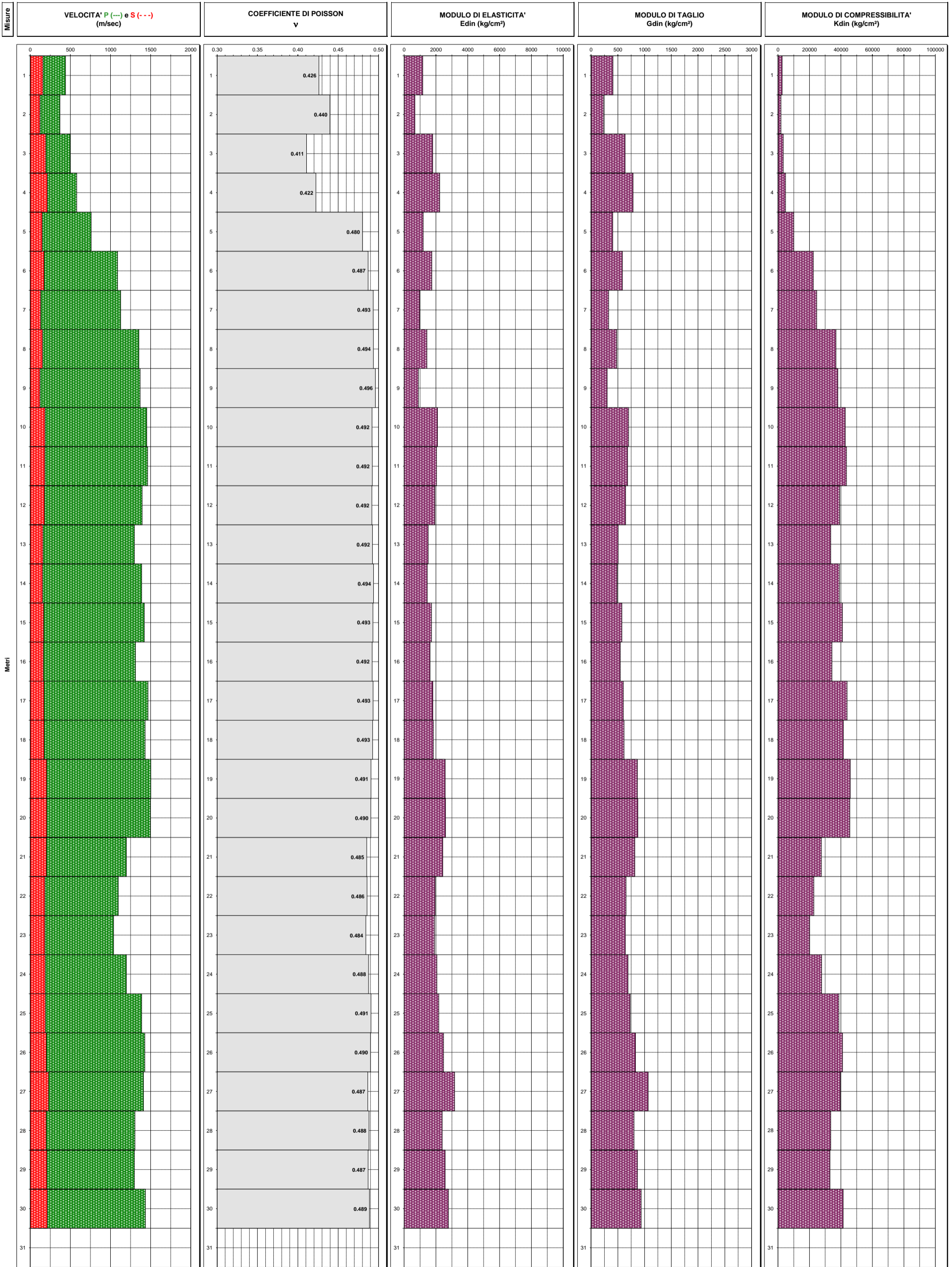
CATEGORIA SUOLO = D

COMMITTENTE
CONO SISMICO
Località
Data acquisizione

UNIONE COMUNI DEL RUB.
CPTUS3
SAN MAURO MARE
8/08/2014



GRAFICI DEI PARAMETRI ELASTICI DINAMICI





SOGEO[®]
S.R.L.
INDAGINI GEOGNOSTICHE ED AMBIENTALI

Via san Potito 43 - 48022 LUGO (RA)
Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-16	PROVA N°:	CPTUS-4
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
	DATA DI EMISSIONE:	21/08/2014	Latitudine:	N 44,102588°
			Longitudine:	E 12,407061°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	San Mauro (FC) - area cimitero

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

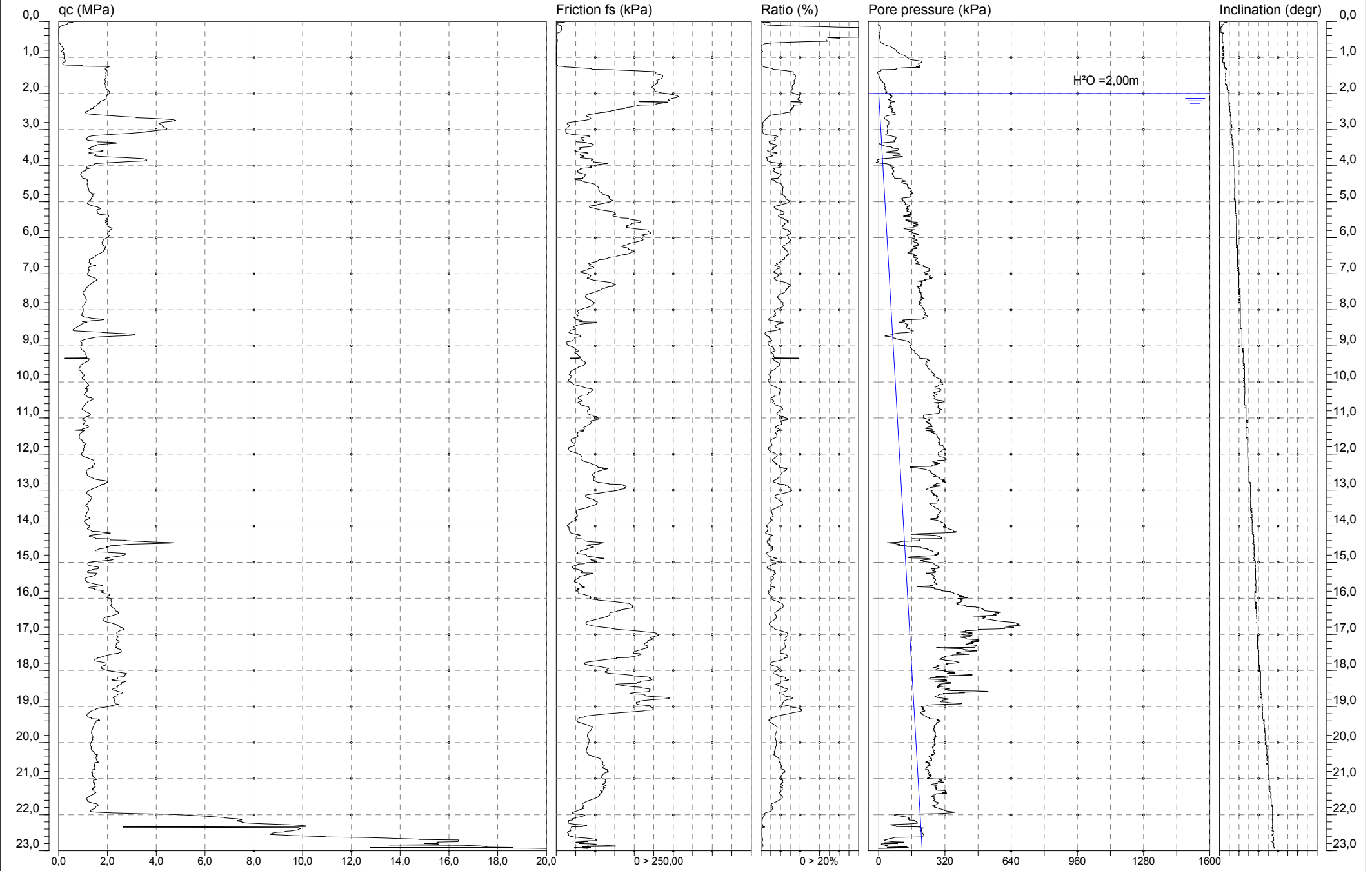
<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977



COMMITTENTE	UNIONE COMUNI DEL RUB.
CONO SISMICO	CPTUS4
Località	SAN MAURO PASCOLI
Data acquisizione	20/08/2014

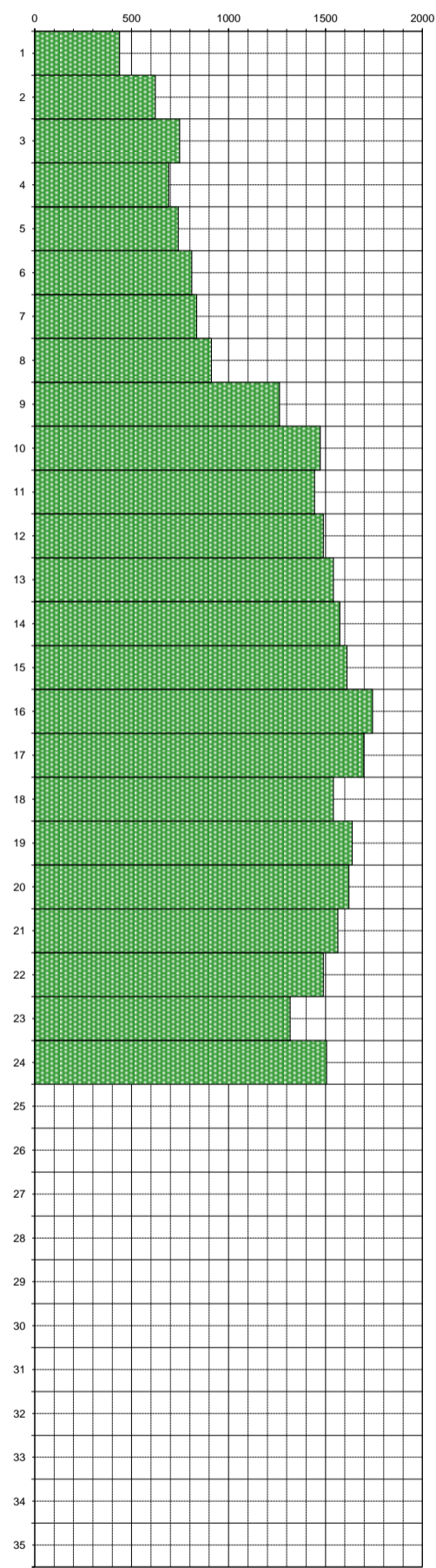
Codice lavoro **1422**



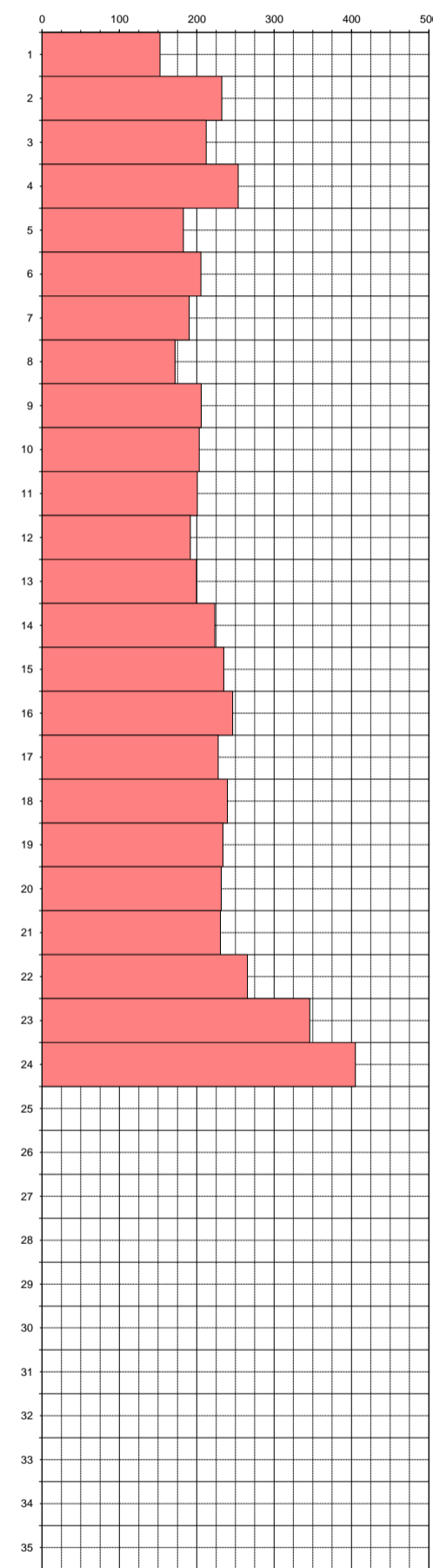
Profondità	Vp m/sec.	Vs m/sec.	v	γ T/m³	E _{din} Kg/cm²	G _{din} Kg/cm²	K _{din} Kg/cm²
------------	--------------	--------------	---	-----------	----------------------------	----------------------------	----------------------------

0							
1	438	153	0.43	1.62	1100	384	2655
2	623	232	0.42	1.73	2706	954	5581
3	748	212	0.46	1.79	2398	823	9129
4	692	253	0.42	1.77	3292	1157	7081
5	741	183	0.47	1.79	1785	608	9208
6	811	205	0.47	1.82	2294	782	11165
7	836	190	0.47	1.83	1990	676	12147
8	912	172	0.48	1.86	1661	561	15043
9	1263	206	0.49	1.98	2538	854	31077
10	1473	203	0.49	2.04	2562	860	43993
11	1444	201	0.49	2.03	2489	835	42074
12	1489	192	0.49	2.04	2283	765	45169
13	1541	199	0.49	2.06	2489	834	48683
14	1574	223	0.49	2.07	3133	1052	50758
15	1611	235	0.49	2.07	3477	1167	53327
16	1743	246	0.49	2.11	3880	1302	63478
17	1698	228	0.49	2.10	3302	1108	60107
18	1541	239	0.49	2.06	3575	1201	48193
19	1638	234	0.49	2.08	3452	1159	55373
20	1621	232	0.49	2.08	3383	1135	54118
21	1564	231	0.49	2.06	3329	1118	49947
22	1489	265	0.48	2.04	4353	1467	44233
23	1318	346	0.46	2.00	7137	2439	32114
24	1506	405	0.46	2.05	10009	3425	42769
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							

VELOCITA' ONDE DI COMPRESSIONE
m/sec



VELOCITA' ONDE DI TAGLIO
m/sec



Legenda parametri dinamici					
Tp	Tempi onde di compressione	millisecondi	γ	Peso di volume	T/m³
Ts	Tempi onde di taglio	millisecondi	E _{din}	Modulo di Elasticità dinamico	Kg/cm²
Vp	Velocità onde di compressione	m/sec	G _{din}	Modulo di Taglio dinamico	Kg/cm²
Vs	Velocità onde di taglio	m/sec	K _{din}	Modulo di Compressibilità dinamico	Kg/cm²
v	Coefficiente di Poisson	-			

CLASSIFICAZIONE SISMICA DEI SUOLI
(D.M. del 14/01/2008)

$$V_{S30} = \frac{30}{\sum_{i=1,N} \frac{h_i}{V_i}} \quad V_{S30} = \quad \text{m/sec}$$

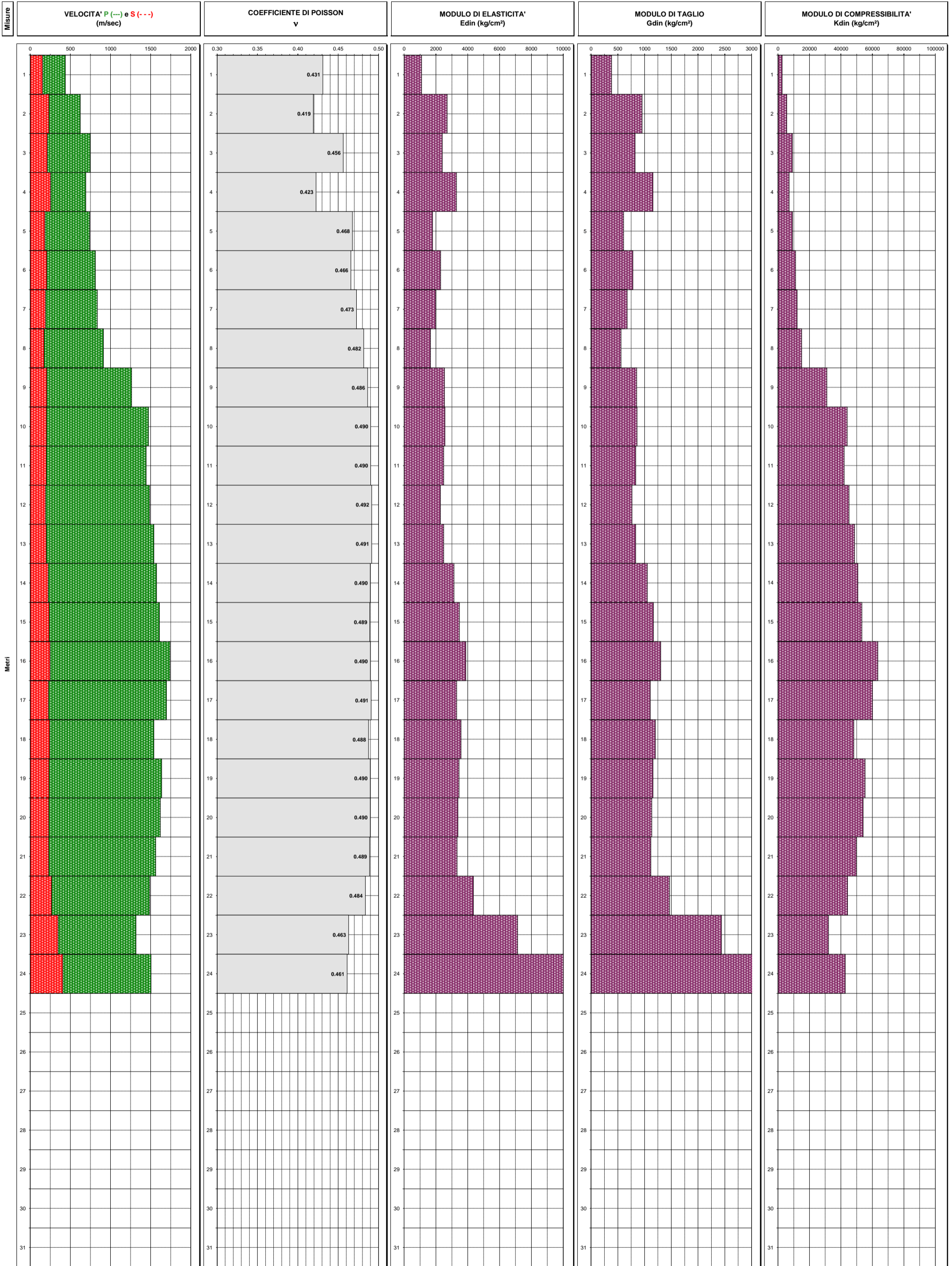
CATEGORIA SUOLO =

COMMITTENTE
CONO SISMICO
Località
Data acquisizione

UNIONE COMUNI DEL RUB.
CPTUS4
SAN MAURO PASCOLI
20/08/2014



GRAFICI DEI PARAMETRI ELASTICI DINAMICI





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INDAGINI GEOGNOSTICHE ED AMBIENTALI

Via san Potito 43 - 48022 LUGO (RA)
Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-17	PROVA N°:	CPTUS-5
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:		21/08/2014	Latitudine:	N 44,091679°
			Longitudine:	E 12,399113°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Savignano (FC) - area Municipio

Il presente certificato di prova si compone di n° pagine, esclusa la presente, ed ha per oggetto le seguenti prove:

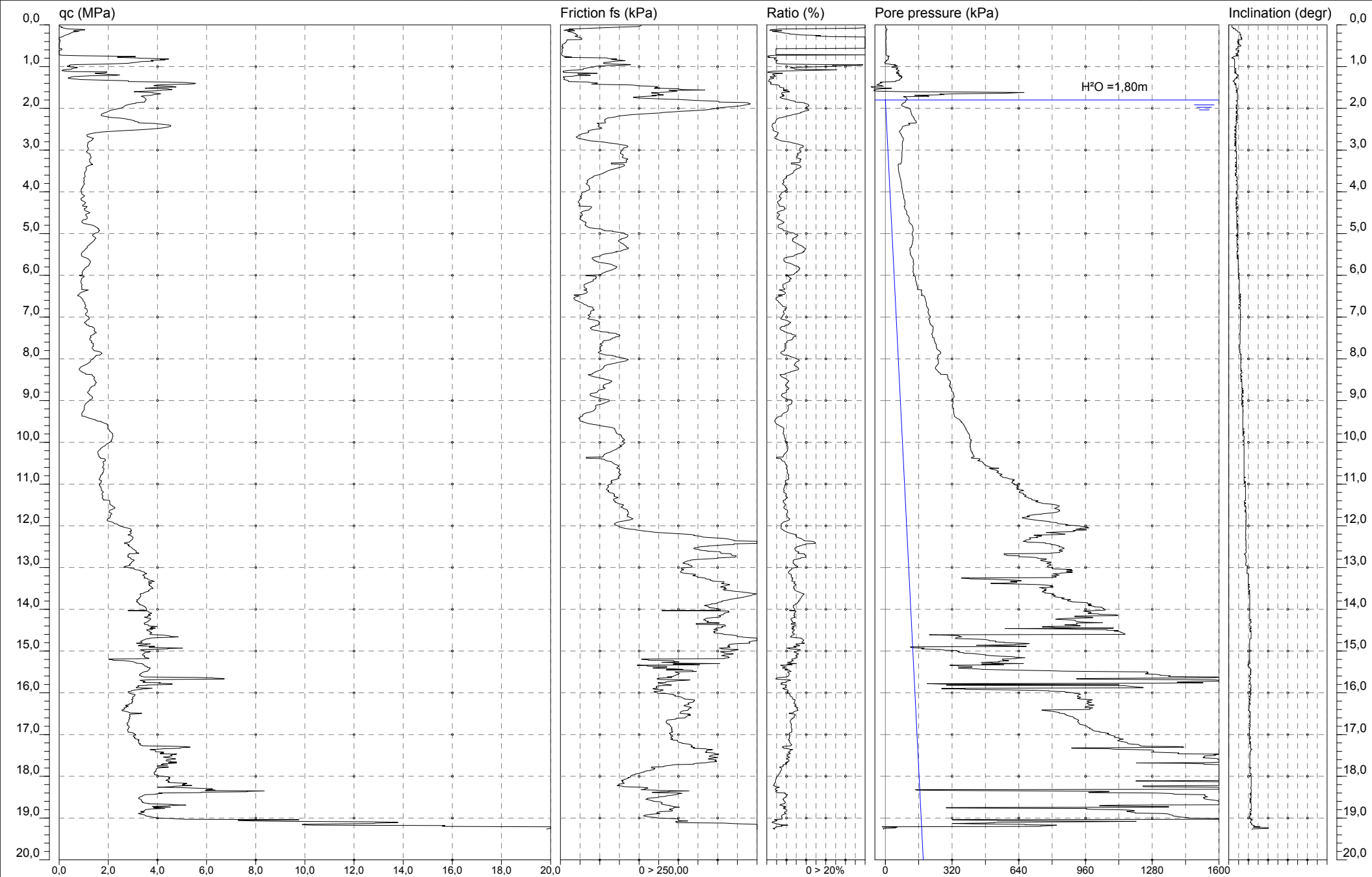
<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:
---------------------------	--	--------------------	-------------------------------

Normativa di Riferimento: A.G.I 1977



COMMITTENTE	UNIONE COMUNI DEL RUB.
CONO SISMICO	CPTUS5
Località	SAVIGNANO SUL RUBICONE
Data acquisizione	20/08/2014

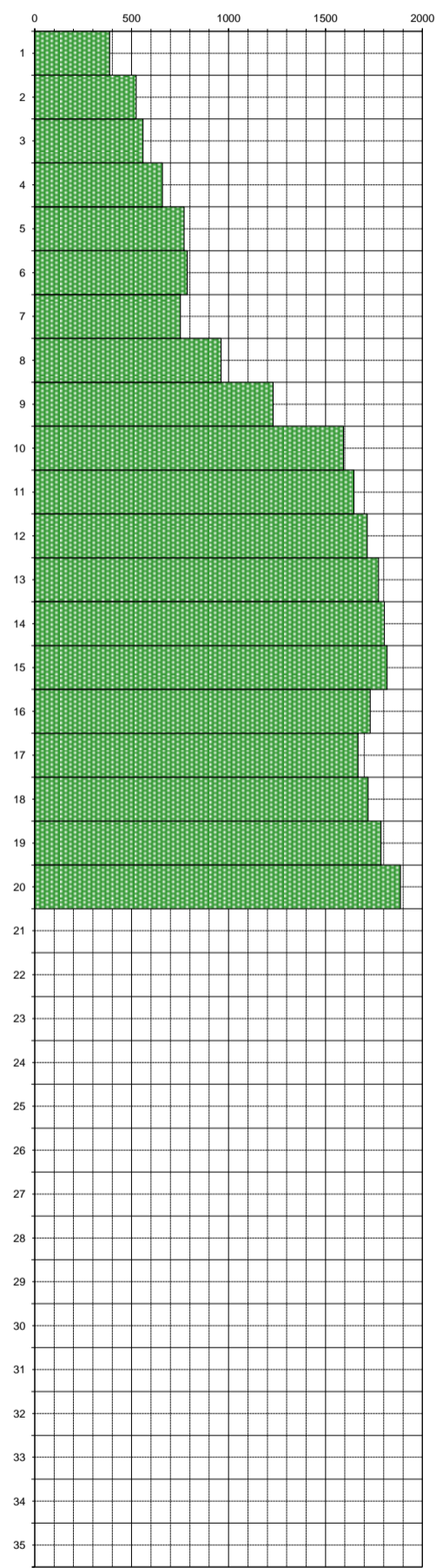
Codice lavoro **1422**



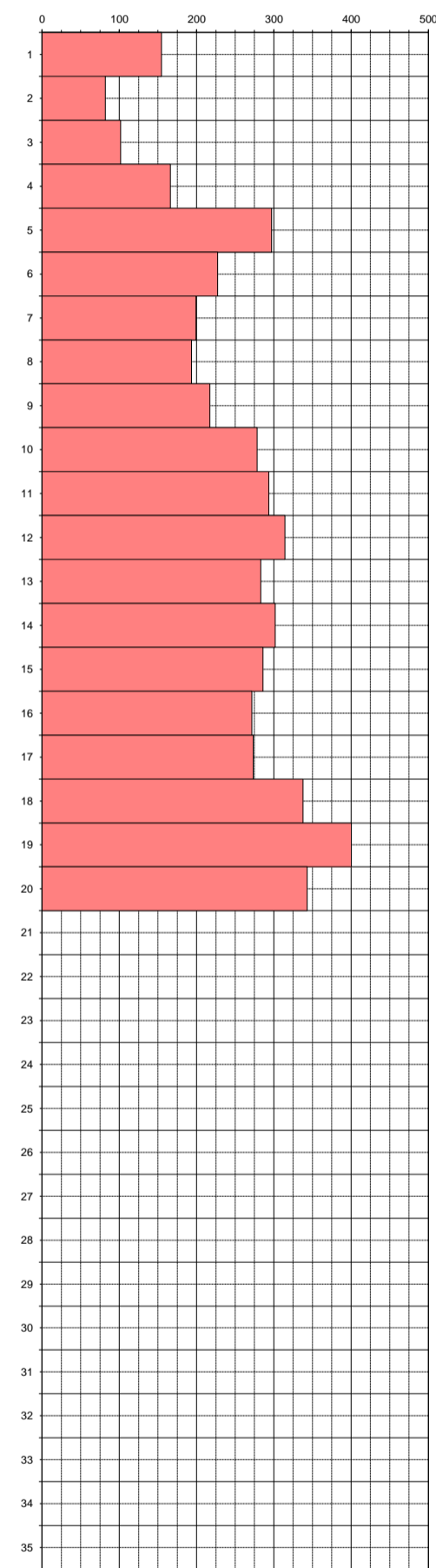
Profondità	Vp m/sec.	Vs m/sec.	v	γ T/m³	E _{din} Kg/cm²	G _{din} Kg/cm²	K _{din} Kg/cm²
------------	--------------	--------------	---	-----------	----------------------------	----------------------------	----------------------------

0							
1	387	155	0.40	1.58	1085	386	1901
2	524	82	0.49	1.68	341	114	4538
3	559	102	0.48	1.70	529	178	5166
4	659	166	0.47	1.75	1445	493	7092
5	771	297	0.41	1.80	4588	1624	8763
6	787	227	0.45	1.81	2774	953	10160
7	752	199	0.46	1.79	2127	727	9374
8	962	194	0.48	1.88	2123	718	16773
9	1230	217	0.48	1.97	2811	947	29155
10	1593	278	0.48	2.07	4856	1636	51393
11	1647	294	0.48	2.08	5433	1831	55164
12	1716	314	0.48	2.10	6269	2114	60203
13	1774	283	0.49	2.11	5133	1726	65480
14	1804	302	0.49	2.12	5848	1968	67692
15	1818	286	0.49	2.12	5262	1769	69188
16	1731	272	0.49	2.10	4705	1582	62126
17	1668	274	0.49	2.09	4734	1593	57128
18	1720	338	0.48	2.10	7233	2444	60086
19	1787	400	0.47	2.12	10191	3458	64263
20	1887	343	0.48	2.14	7615	2567	74173
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							

VELOCITA' ONDE DI COMPRESSIONE
m/sec



VELOCITA' ONDE DI TAGLIO
m/sec



Legenda parametri dinamici					
Tp	Tempi onde di compressione	millisecondi	γ	Peso di volume	T/m³
Ts	Tempi onde di taglio	millisecondi	E _{din}	Modulo di Elasticità dinamico	Kg/cm²
Vp	Velocità onde di compressione	m/sec	G _{din}	Modulo di Taglio dinamico	Kg/cm²
Vs	Velocità onde di taglio	m/sec	K _{din}	Modulo di Compressibilità dinamico	Kg/cm²
v	Coefficiente di Poisson	-			

CLASSIFICAZIONE SISMICA DEI SUOLI
(D.M. del 14/01/2008)

$$V_{S30} = \frac{30}{\sum_{i=1,N} \frac{h_i}{V_i}} \quad V_{S30} = \quad \text{m/sec}$$

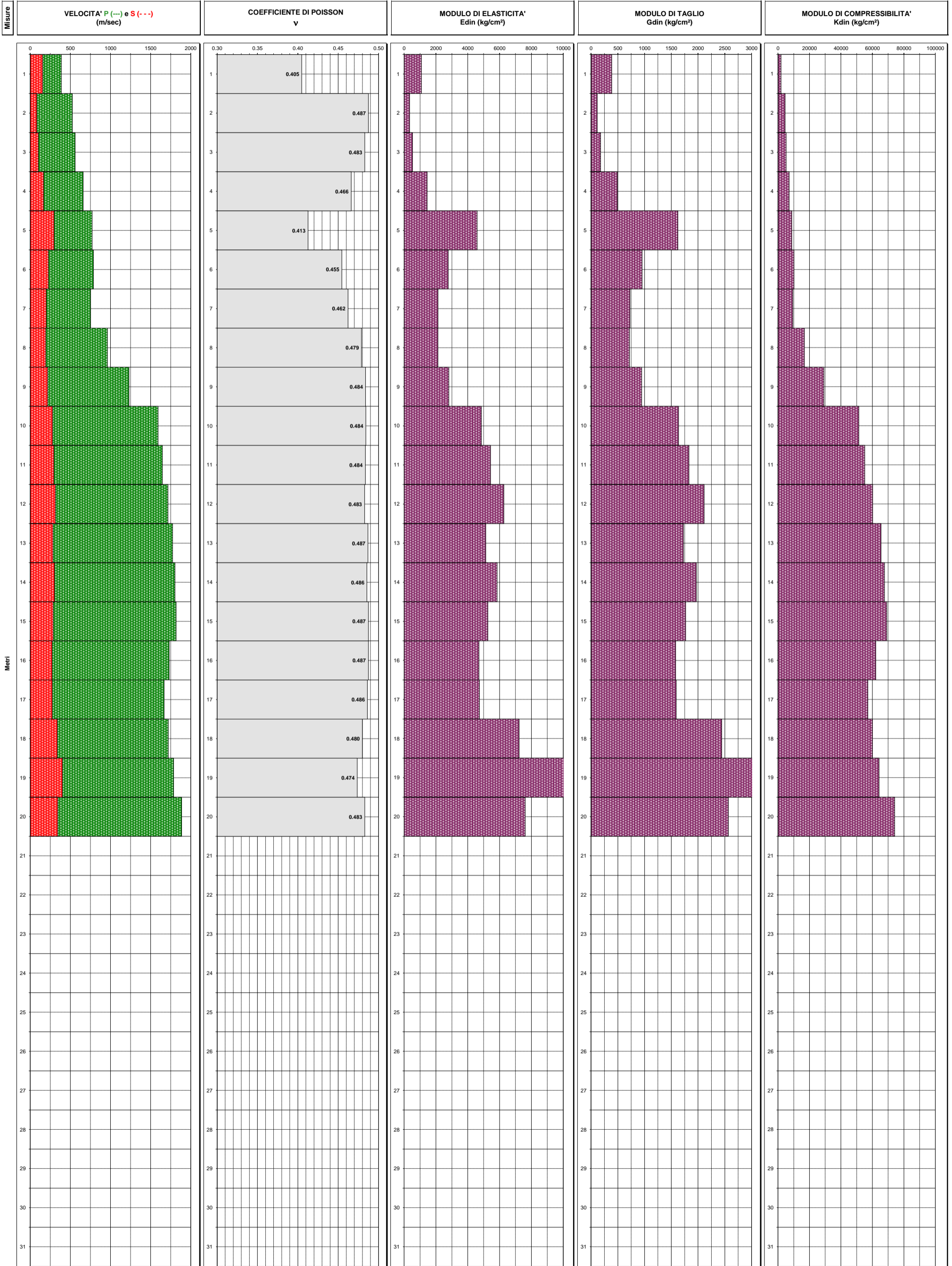
CATEGORIA SUOLO =

COMMITTENTE
CONO SISMICO
Località
Data acquisizione

UNIONE COMUNI DEL RUB.
CPTUS5
SAVIGNANO SUL RUBICONE
20/08/2014



GRAFICI DEI PARAMETRI ELASTICI DINAMICI





SOGEO[®]
S.R.L.
INDAGINI GEOGNOSTICHE ED AMBIENTALI

Via san Potito 43 - 48022 LUGO (RA)
Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	<input type="text" value="C14-087-1"/>	PROVA N°:	<input type="text" value="CPTU-1"/>
<input type="checkbox"/>	RAPPORTO N°:	<input type="text"/>	UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:		<input type="text" value="21/08/2014"/>	Latitudine:	N 44,167042°
			Longitudine:	E 12,442602°

Riferimento Preventivo n°:	<input type="text" value="031-14"/>	Commessa n°:	<input type="text" value="14-080"/>
Verbale di accettazione n°:	<input type="text" value="VA14-087"/>	del:	<input type="text" value="21/08/2014"/>

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Savignano Mare (FC)

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: **Matricola n.:**

Allegati:

Timbro blu sull'originale	Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977

SOGEO s.r.l.

Cone Penetration Test (CPTU) - Date: 01/07/2014

Site: Rif. 031-14 PROGEO srl - Test: CPTU 1 Certificato n. C14-087-1 Data emissione: 21/08/2014

Company information

Name: SOGEO s.r.l.

Address: Via San Potito 43

Zip code: 48022

City: Lugo (RA)

P.IVA: 01051620399

E-Mail: sogeo@sogeo-srl.com

Phone number: +39054522042

Fax number: +39054534443

Site information

Name: Rif. 031-14 PROGEO srl

Date: 01/07/2014

Commissioner: Progeo s.r.l.

Locality: Zonazione Sismica valle del Rubicone

Test information

Name: CPTU 1

Location: Savignano Mare

Date: 01/07/2014

Prehole mode: puntazza (valori da 400 a 600 kg/cmq)

Prehole depth [cm]: 220

Hydrostatic line [cm]: 100

Ground level [m]: 0

Latitude: 0

Longitude: 0

Operator:

Comments:

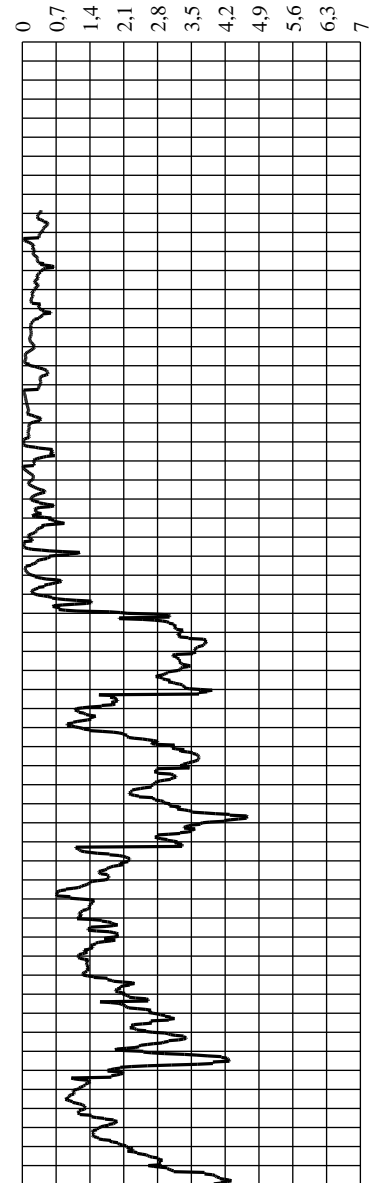
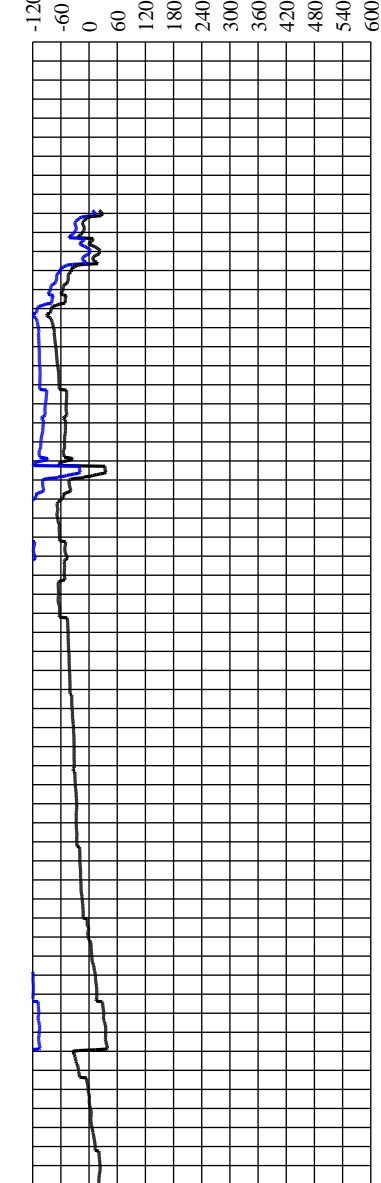
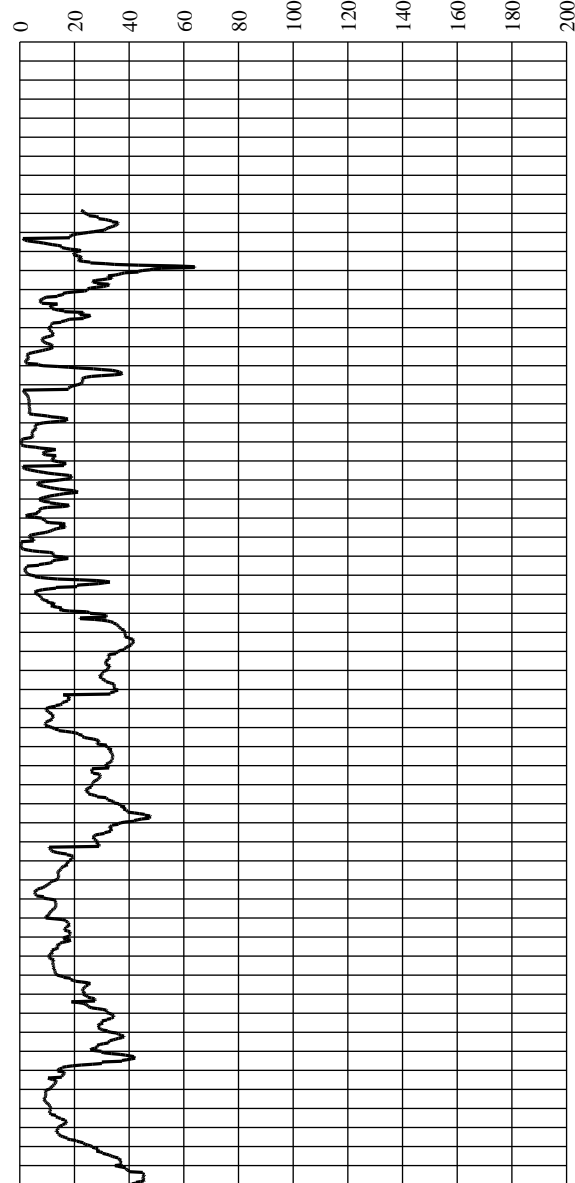
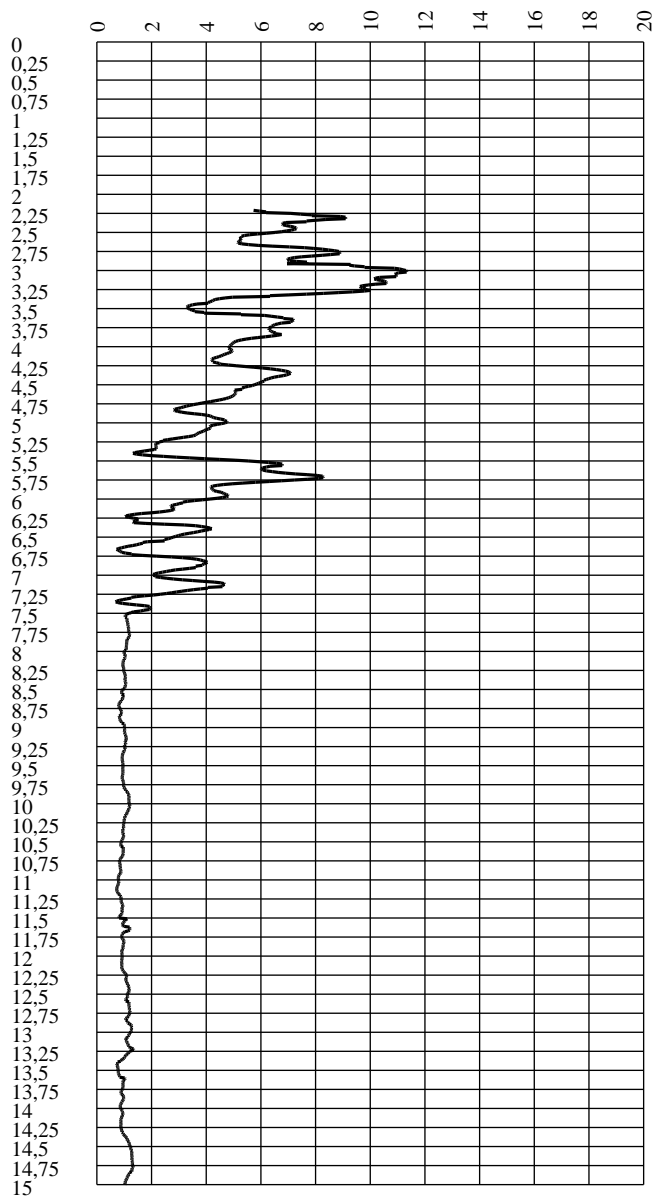
Probe code: MK160

Qc [MPa]

Fs [KPa]

U2 [KPa]

Rf [%]

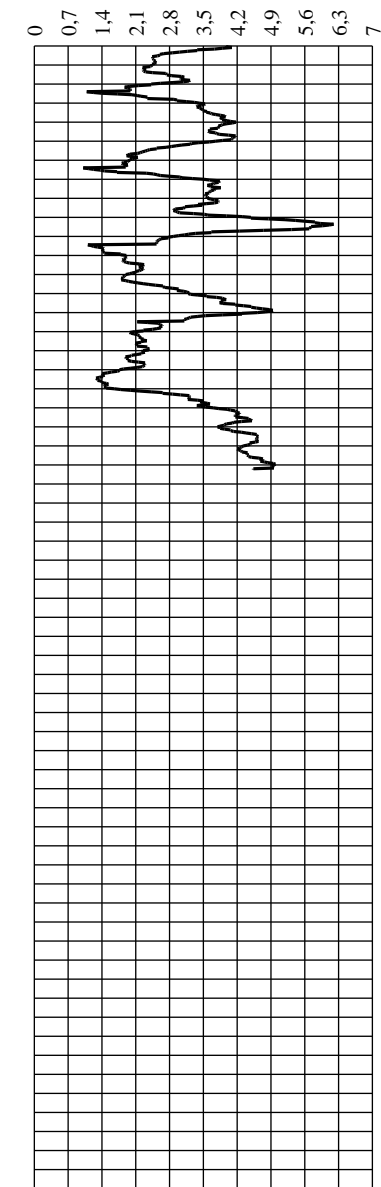
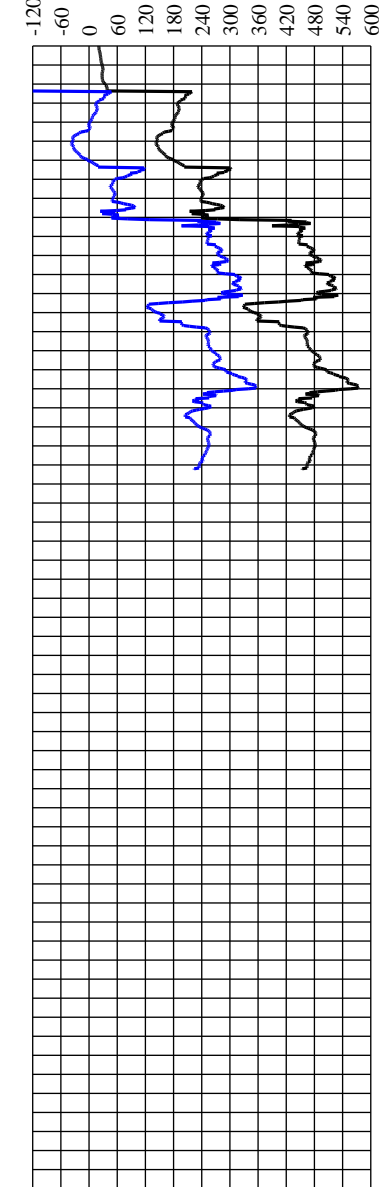
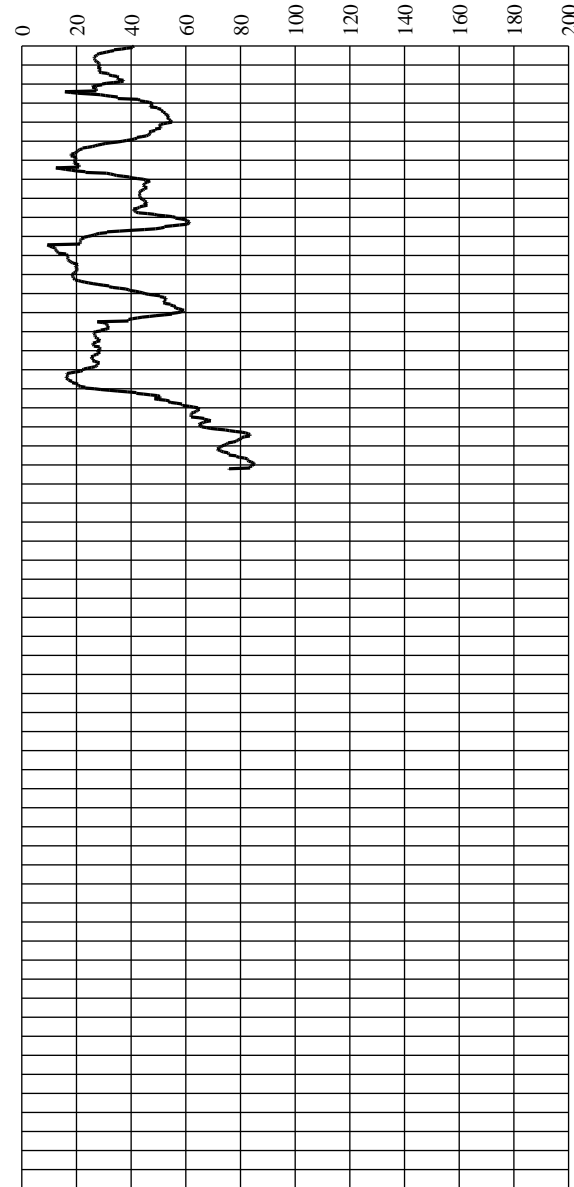
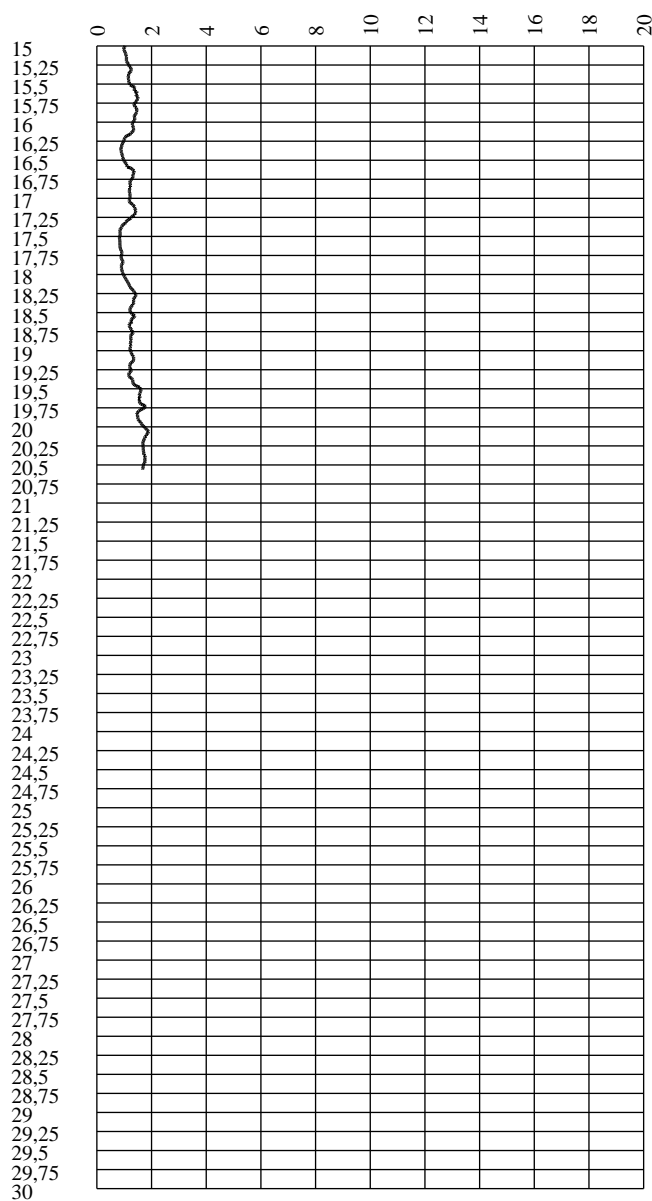


Qc [MPa]

Fs [KPa]

U2 [KPa]

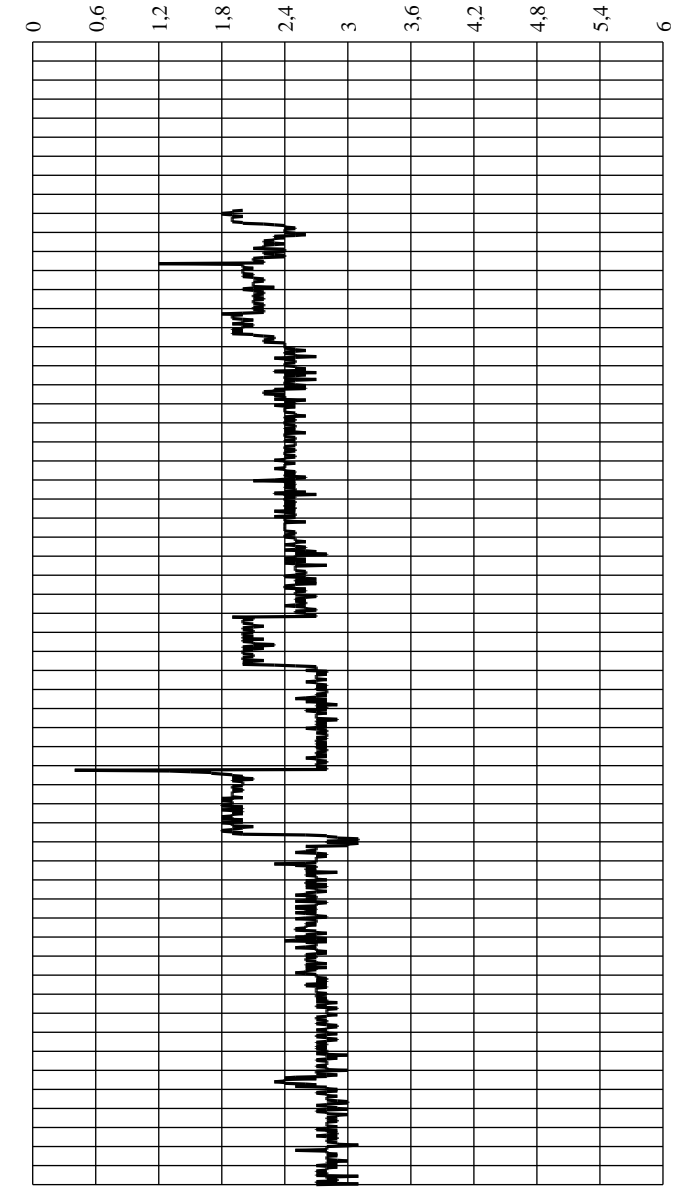
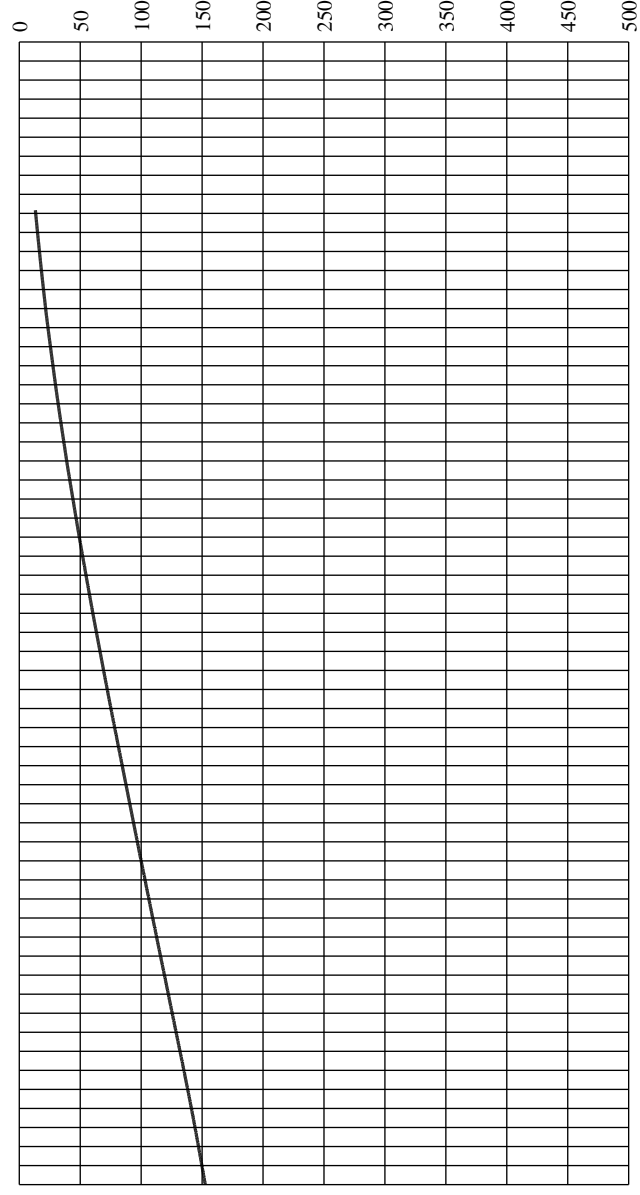
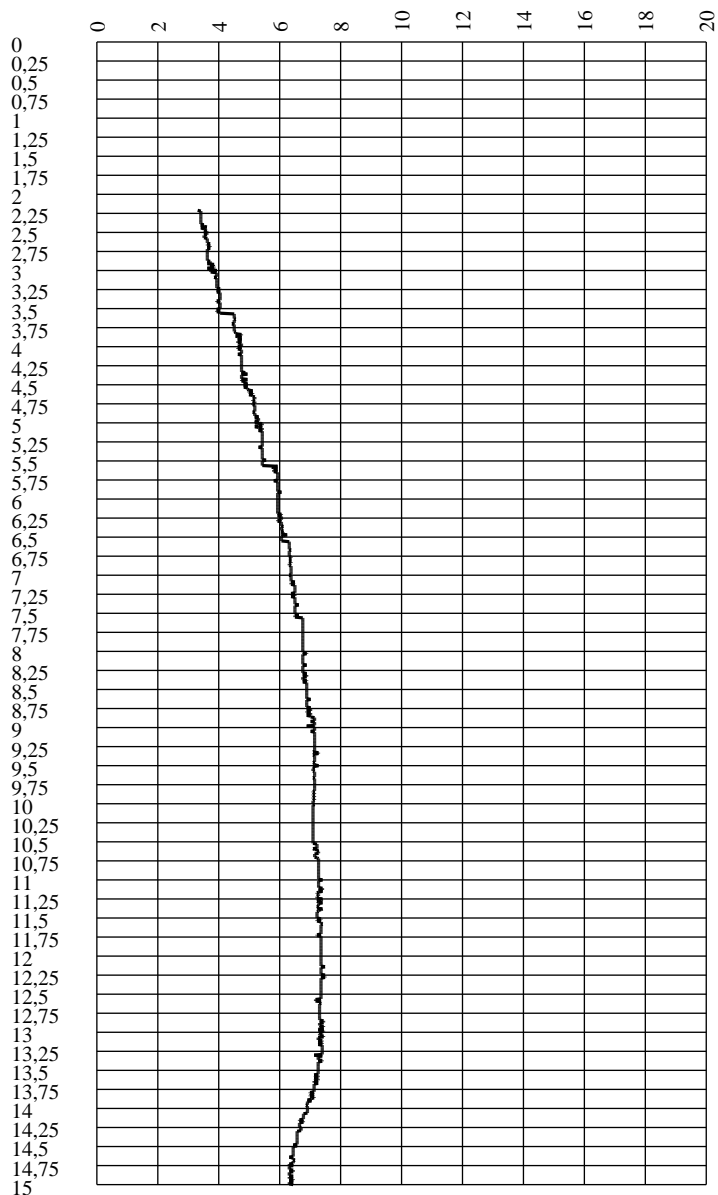
Rf [%]



Tilt [°]

Dist [cm]

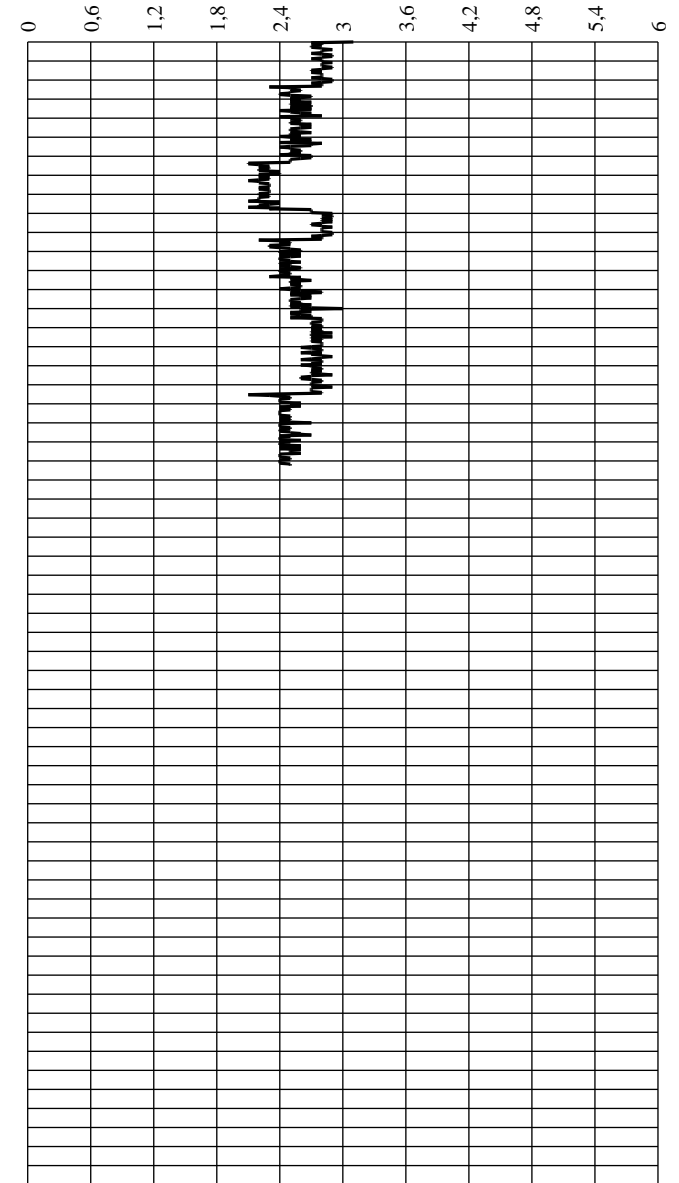
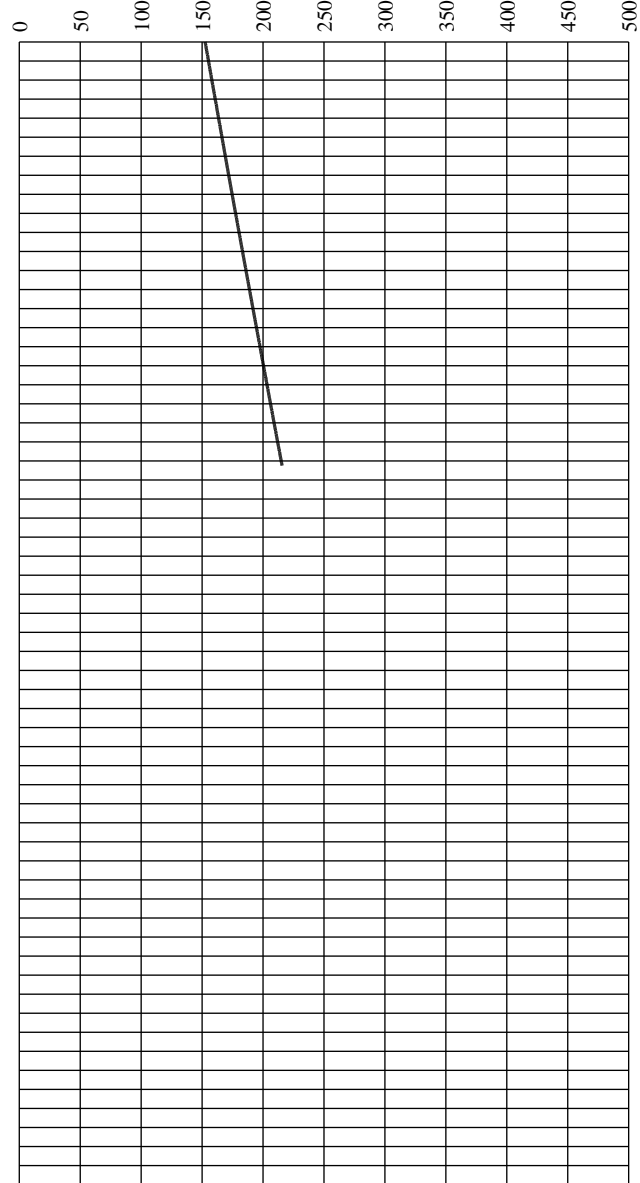
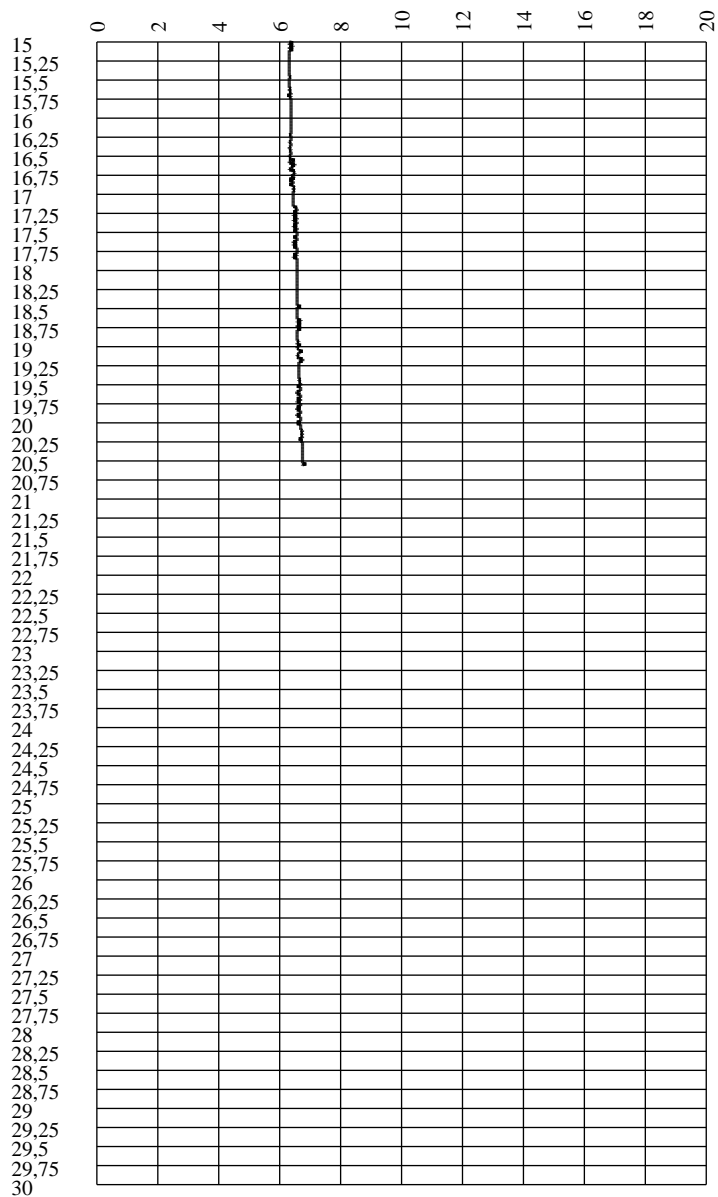
Speed [cm/sec]



Tilt [°]

Dist [cm]

Speed [cm/sec]





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Via san Potito 43 - 48022 LUGO (RA)
Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-2	PROVA N°:	CPTU-2
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:		21/08/2014	Latitudine:	N 44,168218°
			Longitudine:	E 12,432270°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Gatteo Mare (FC)

Il presente certificato di prova si compone di n° pagine, esclusa la presente, ed ha per oggetto le seguenti prove:

<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestmetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:
---------------------------	--	--------------------	-------------------------------

Normativa di Riferimento: A.G.I 1977

SOGEO s.r.l.

Cone Penetration Test (CPTU) - Date: 01/07/2014

Site: Rif. 031-14 PROGEO srl - Test: CPTU 2 Certificato n. C14-087-2 Data emissione: 21/08/2014

Company information

Name: SOGEO s.r.l.

Address: Via San Potito 43

Zip code: 48022

City: Lugo (RA)

P.IVA: 01051620399

E-Mail: sogeo@sogeo-srl.com

Phone number: +39054522042

Fax number: +39054534443

Site information

Name: Rif. 031-14 PROGEO srl

Date: 01/07/2014

Commissioner: Progeo s.r.l.

Locality: Zonazione Sismica valle del Rubicone

Test information

Name: CPTU 2

Location: Gatteo Mare

Date: 01/07/2014

Prehole mode:

Prehole depth [cm]: 0

Hydrostatic line [cm]: 150

Ground level [m]: 0

Latitude: 0

Longitude: 0

Operator:

Comments:

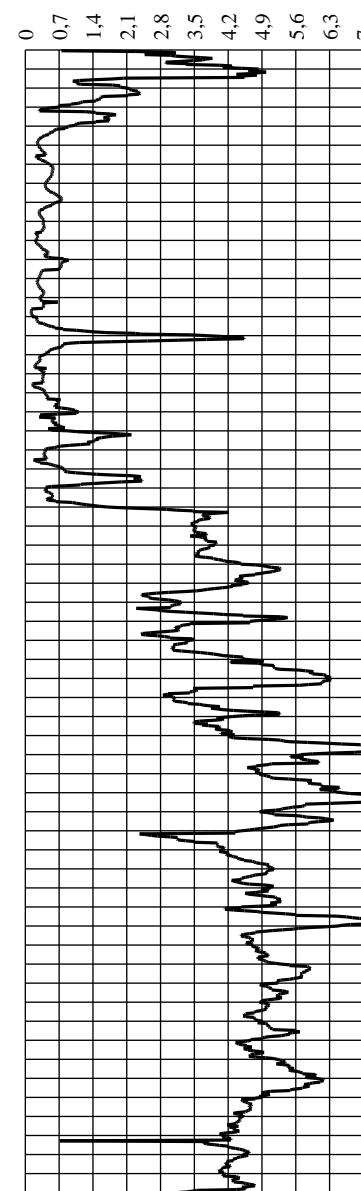
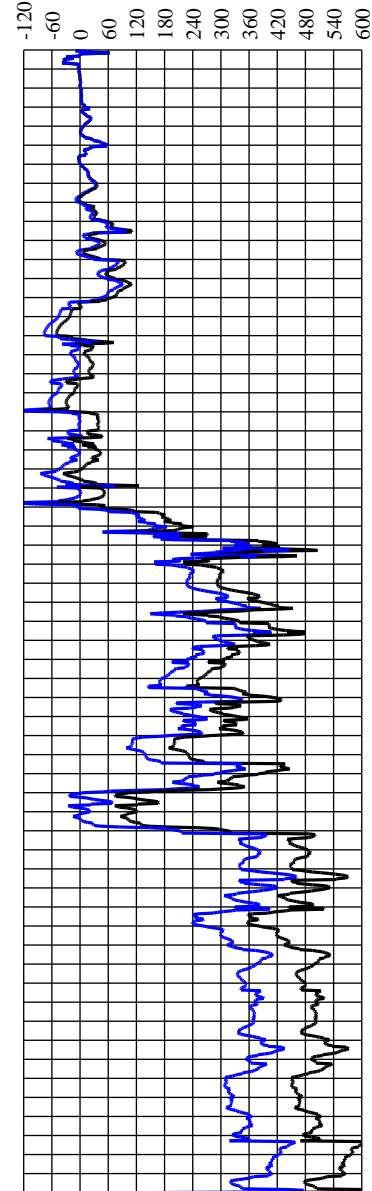
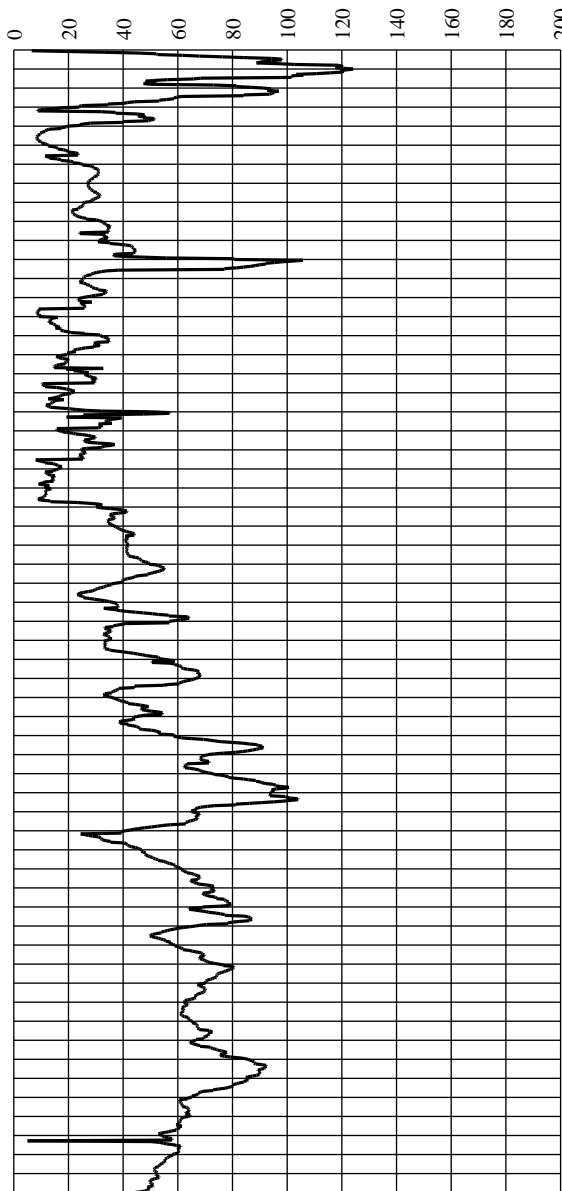
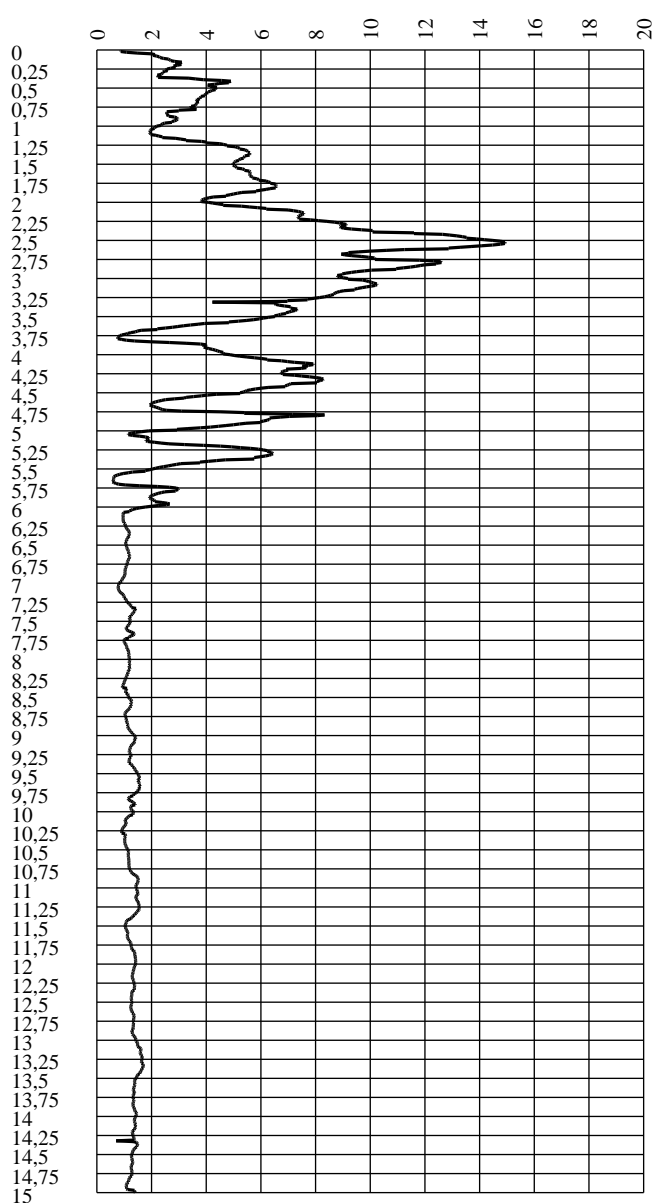
Probe code: MK160

Qc [MPa]

Fs [KPa]

U2 [KPa]

Rf [%]

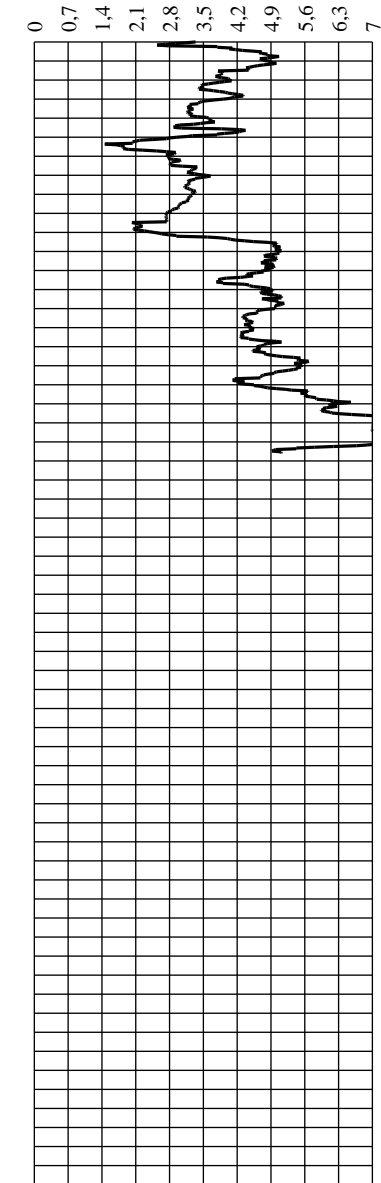
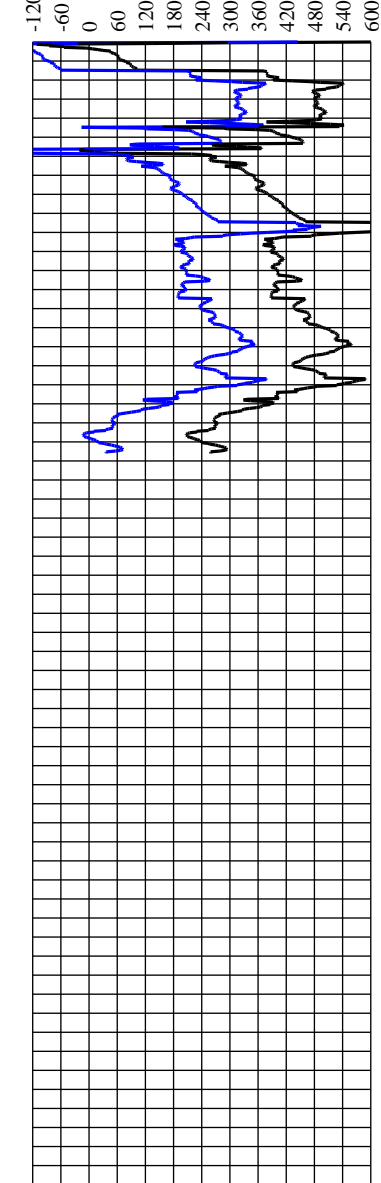
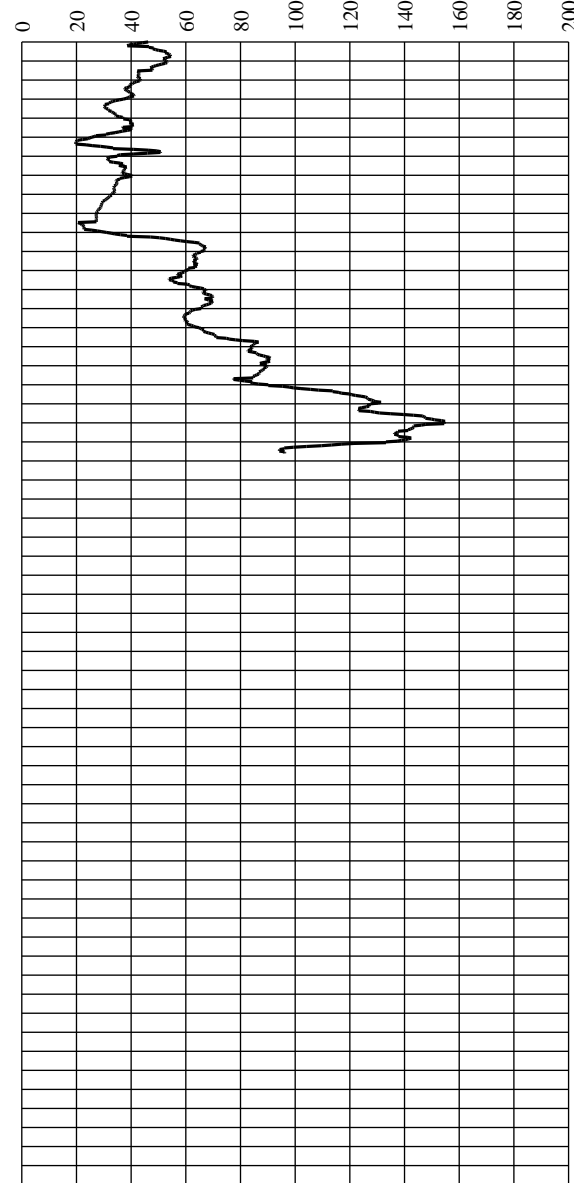
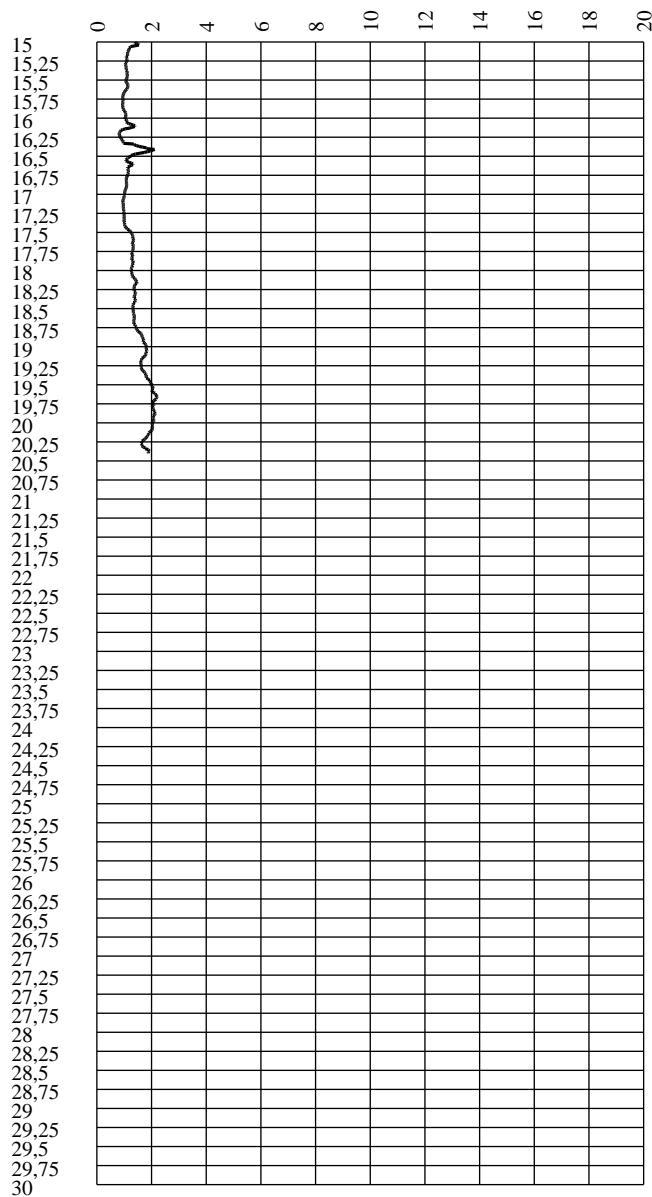


Qc [MPa]

Fs [KPa]

U2 [KPa]

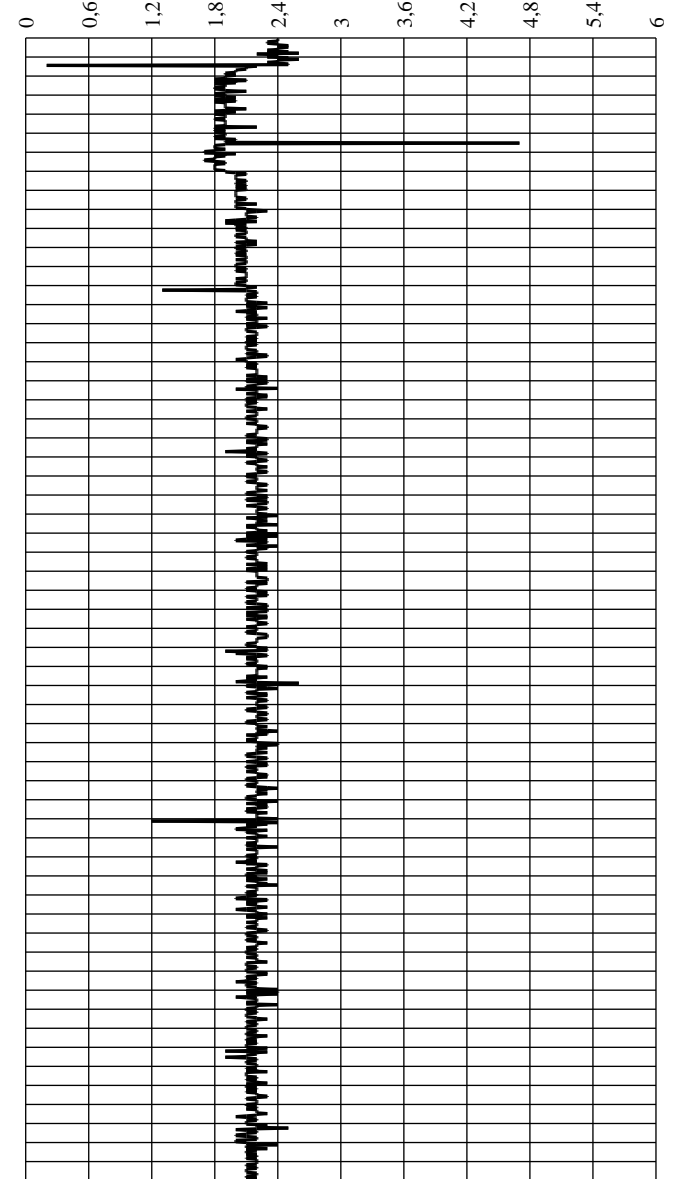
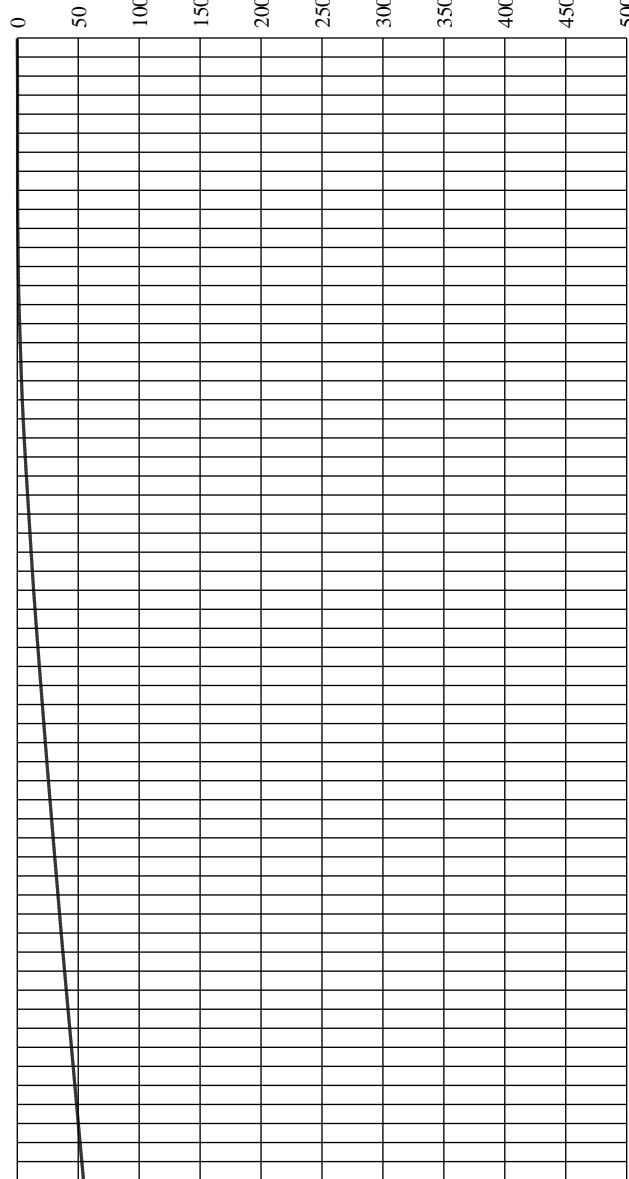
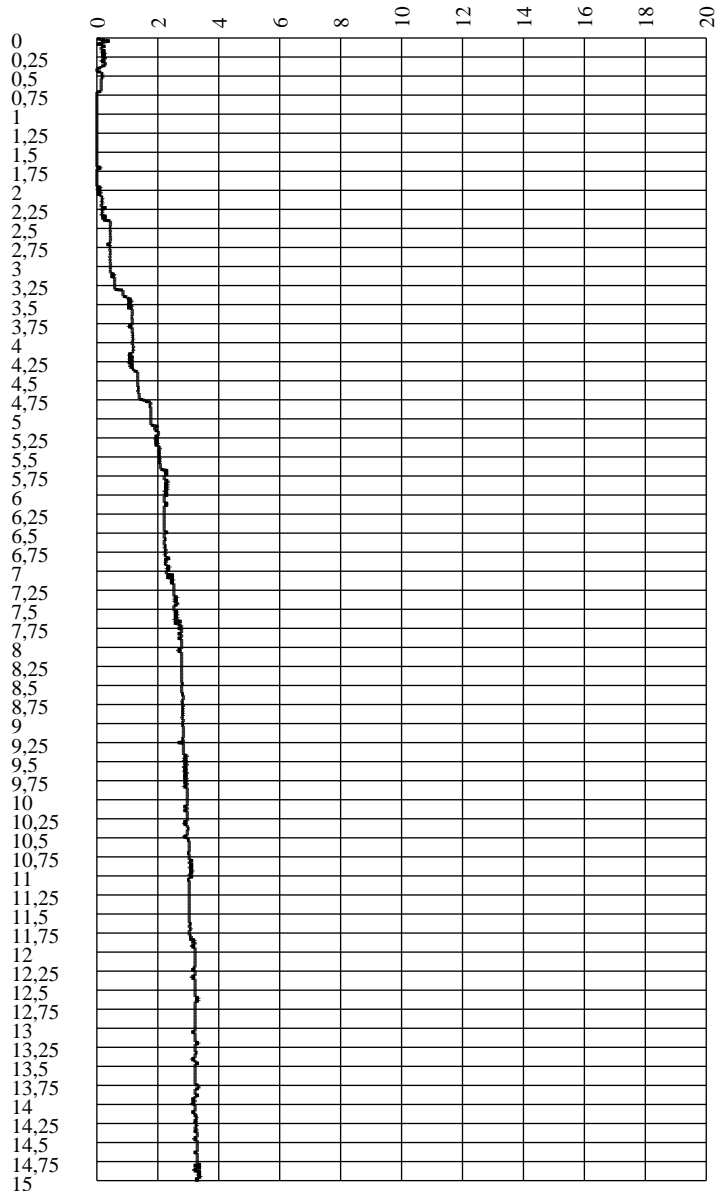
Rf [%]



Tilt [°]

Dist [cm]

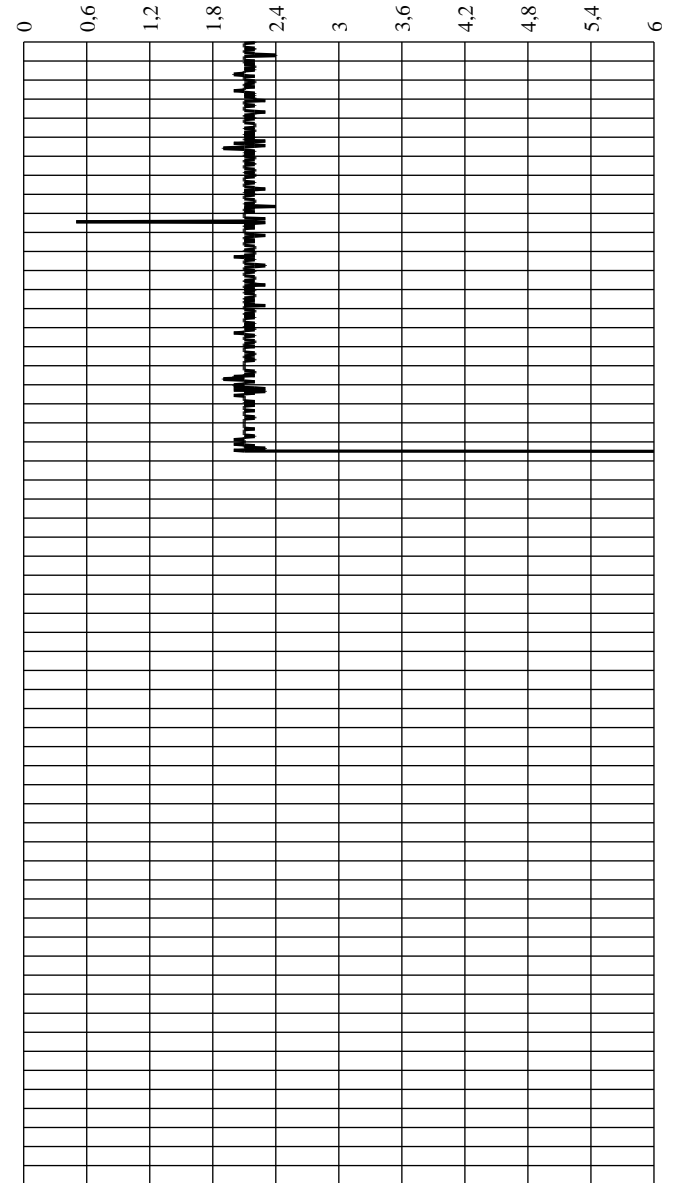
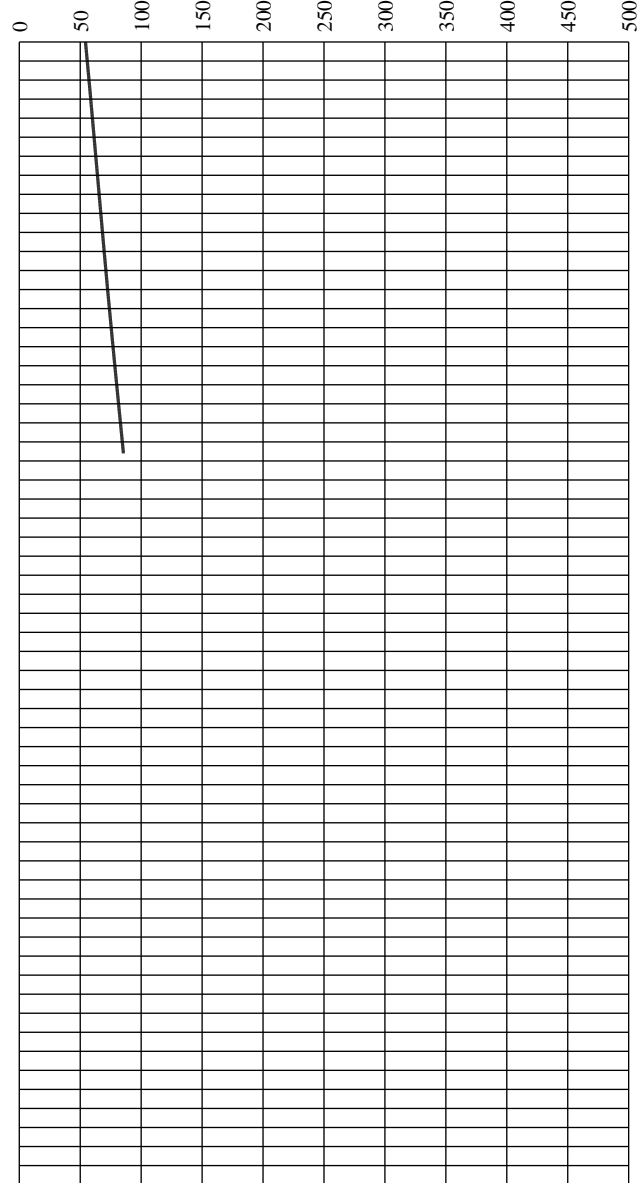
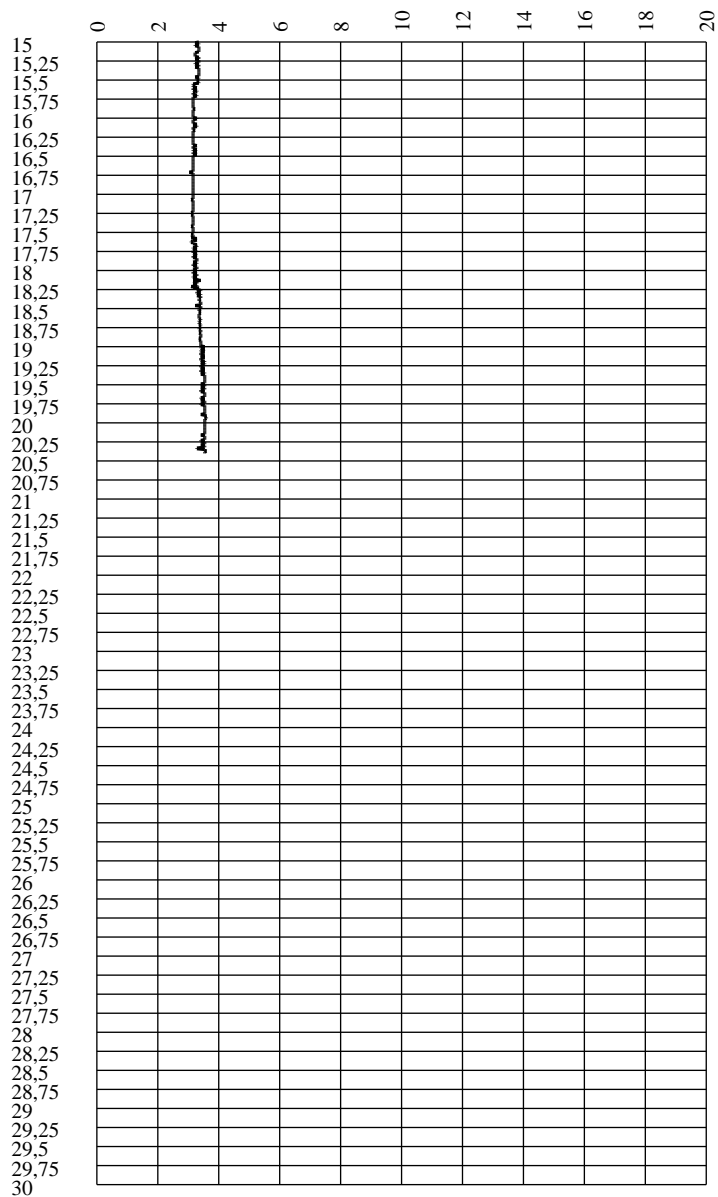
Speed [cm/sec]



Tilt [°]

Dist [cm]

Speed [cm/sec]





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INDAGINI GEOGNOSTICHE ED AMBIENTALI

Via san Potito 43 - 48022 LUGO (RA)
Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/> CERTIFICATO N°:	C14-087-3	PROVA N°:	CPTU-3
<input type="checkbox"/> RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:	21/08/2014	Latitudine:	N 44,161665°
		Longitudine:	E 12,440593°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	San Mauro Mare (FC)

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestmetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977

SOGEO s.r.l.

Cone Penetration Test (CPTU) - Date: 01/07/2014

Site: Rif. 031-14 PROGEO srl - Test: CPTU 3 Certificato n. C14-087-3 Data emissione: 21/08/2014

Company information

Name: SOGEO s.r.l.

Address: Via San Potito 43

Zip code: 48022

City: Lugo (RA)

P.IVA: 01051620399

E-Mail: sogeo@sogeo-srl.com

Phone number: +39054522042

Fax number: +39054534443

Site information

Name: Rif. 031-14 PROGEO srl

Date: 01/07/2014

Commissioner: Progeo s.r.l.

Locality: Zonazione Sismica valle del Rubicone

Test information

Name: CPTU 3

Location: San Mauro

Date: 01/07/2014

Prehole mode:

Prehole depth [cm]: 0

Hydrostatic line [cm]: 100

Ground level [m]: 0

Latitude: 0

Longitude: 0

Operator:

Comments:

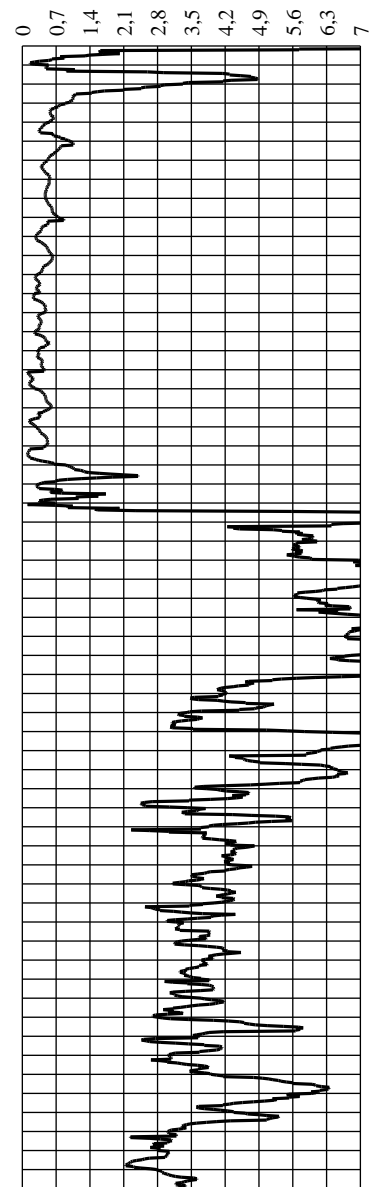
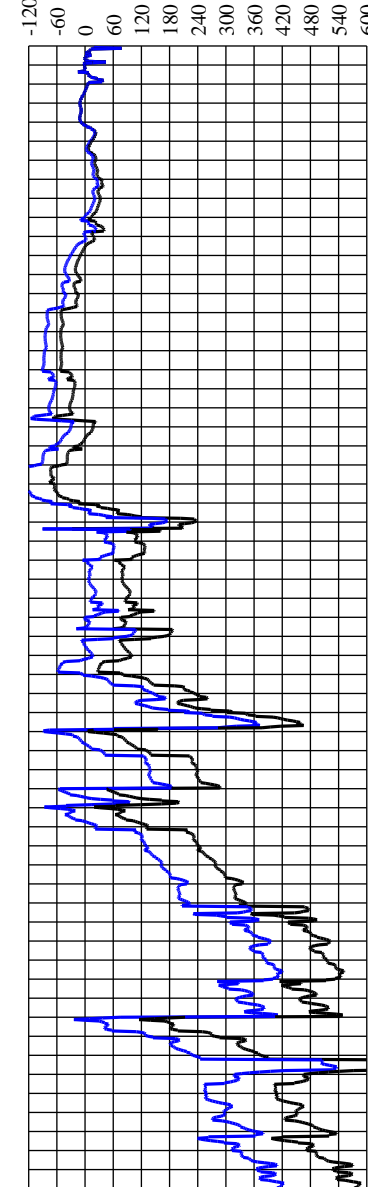
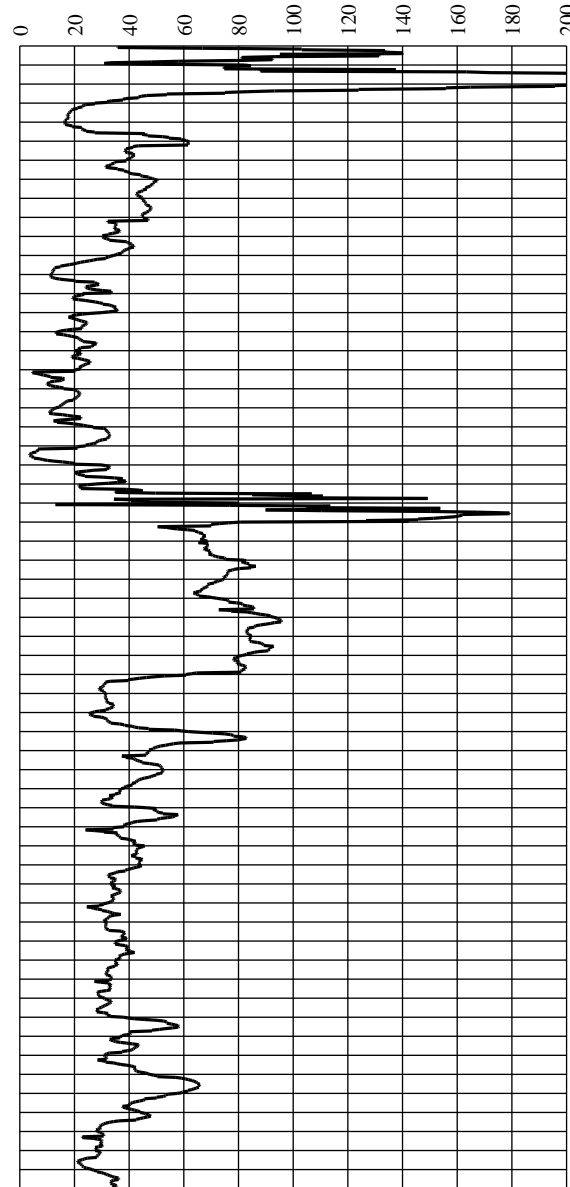
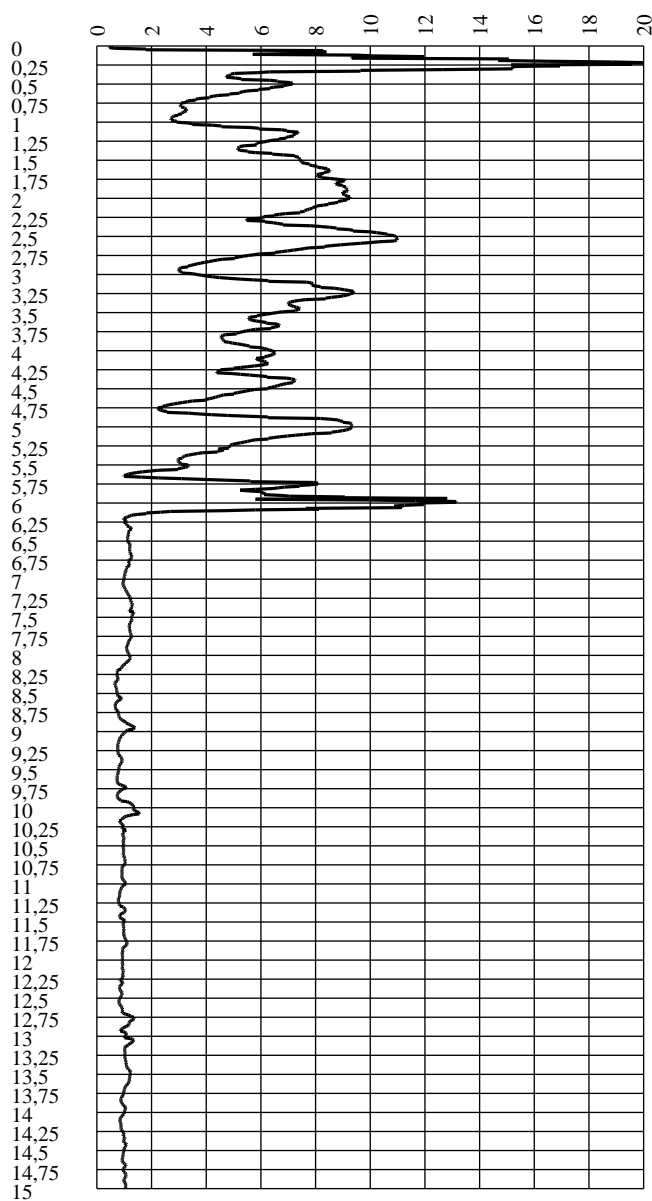
Probe code: MK160

Qc [MPa]

Fs [KPa]

U2 [KPa]

Rf [%]

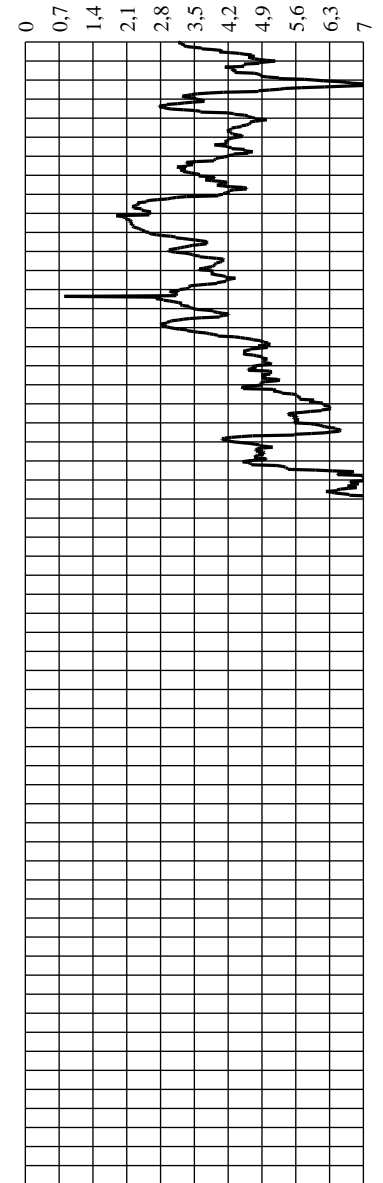
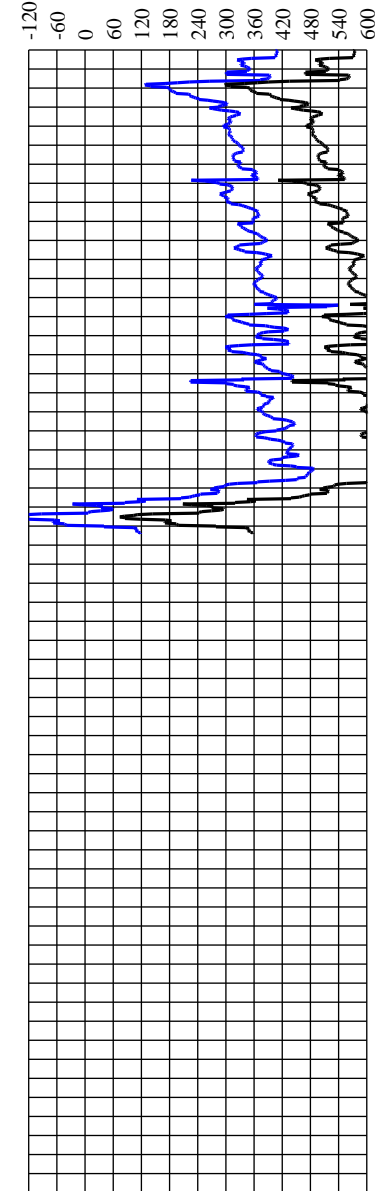
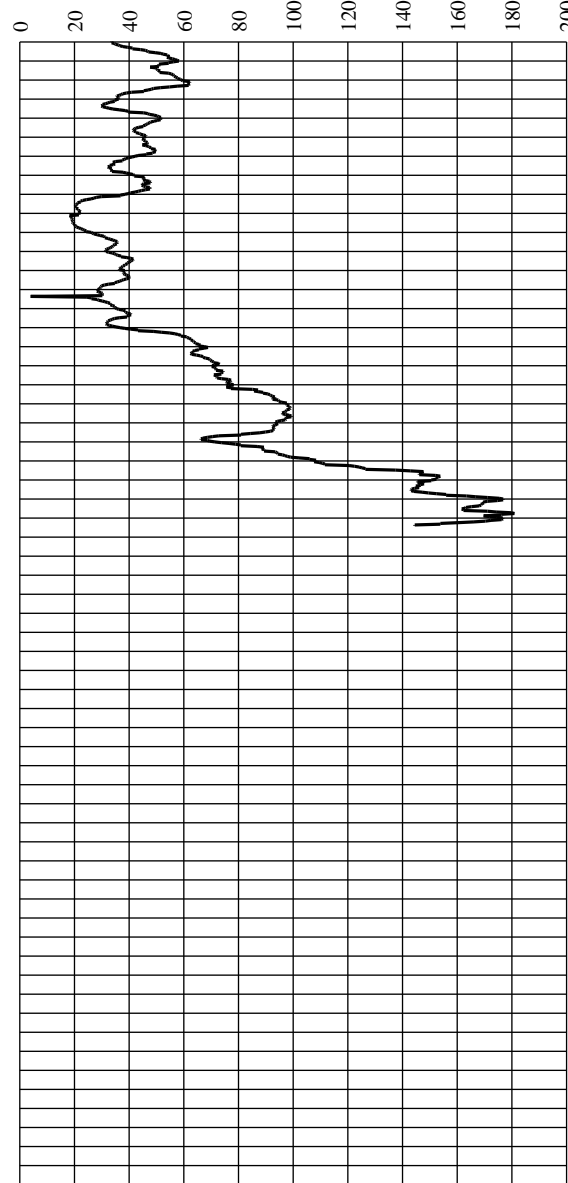
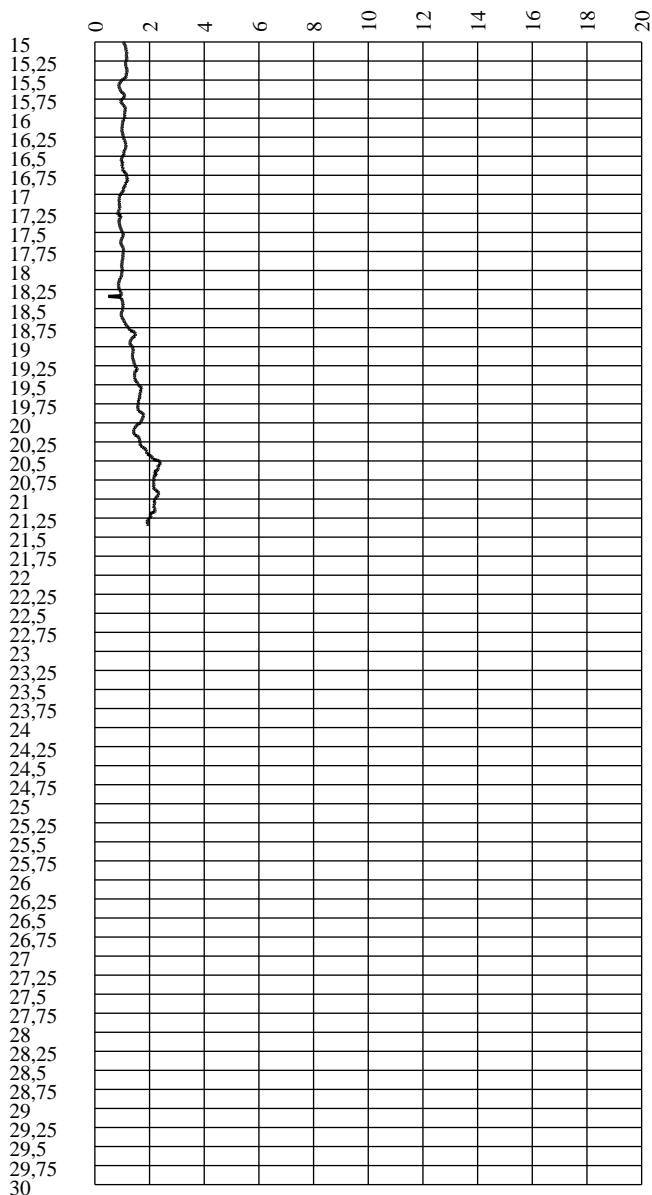


Qc [MPa]

Fs [KPa]

U2 [KPa]

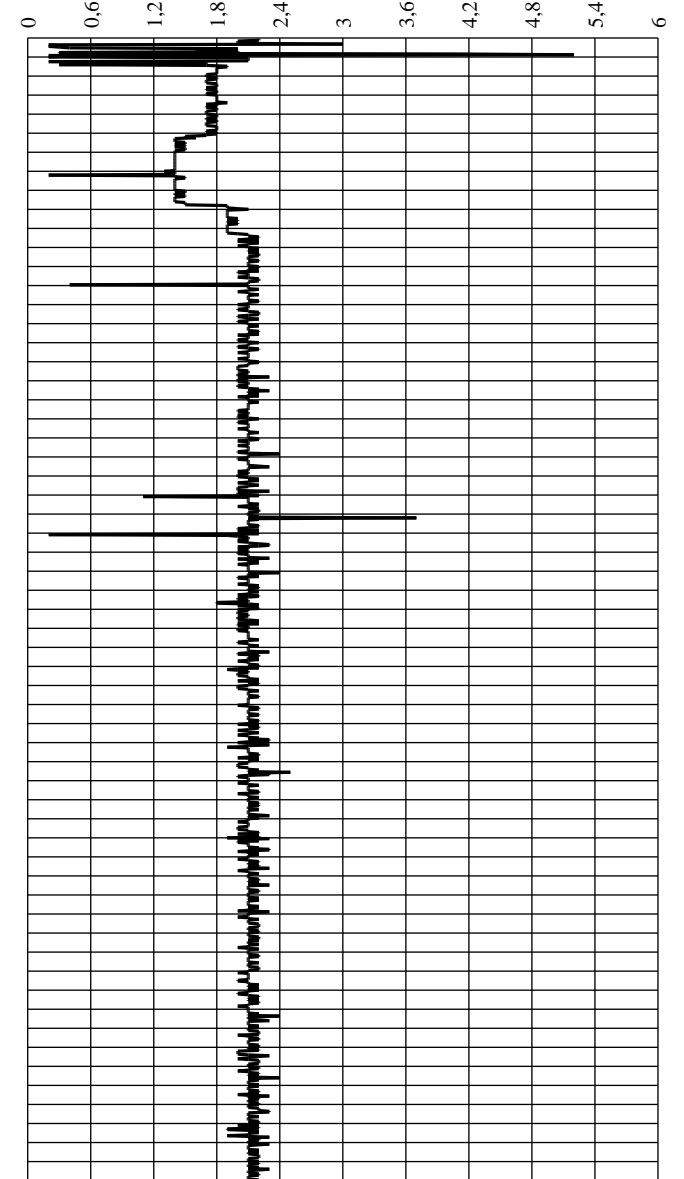
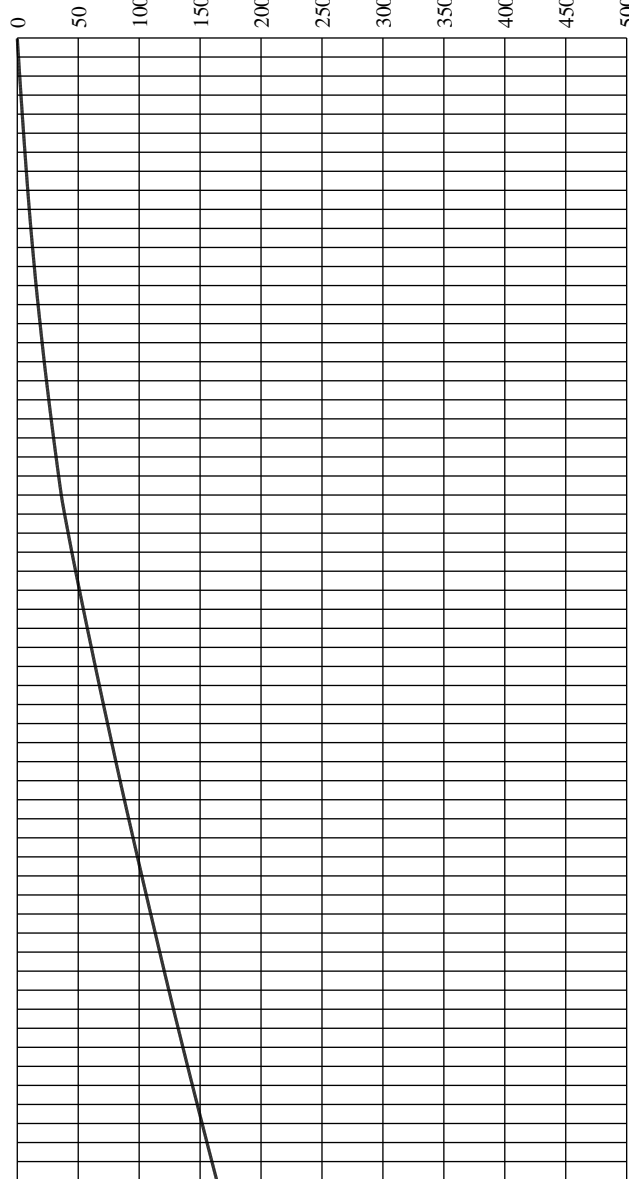
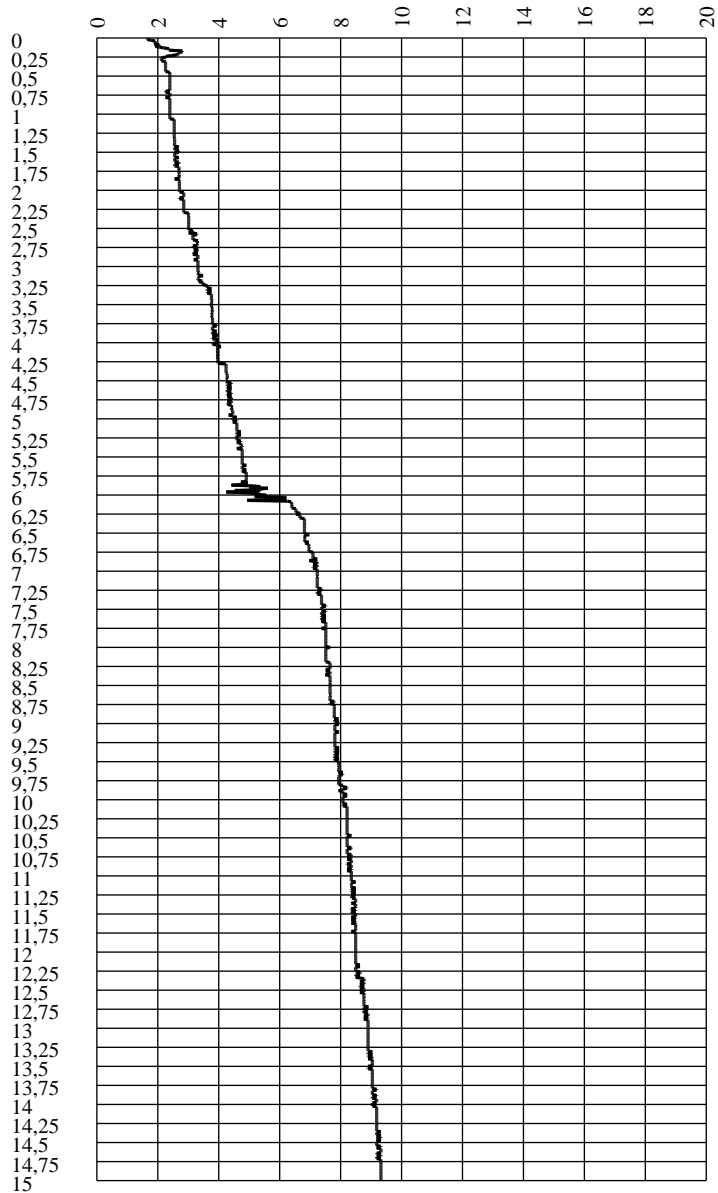
Rf [%]



Tilt [°]

Dist [cm]

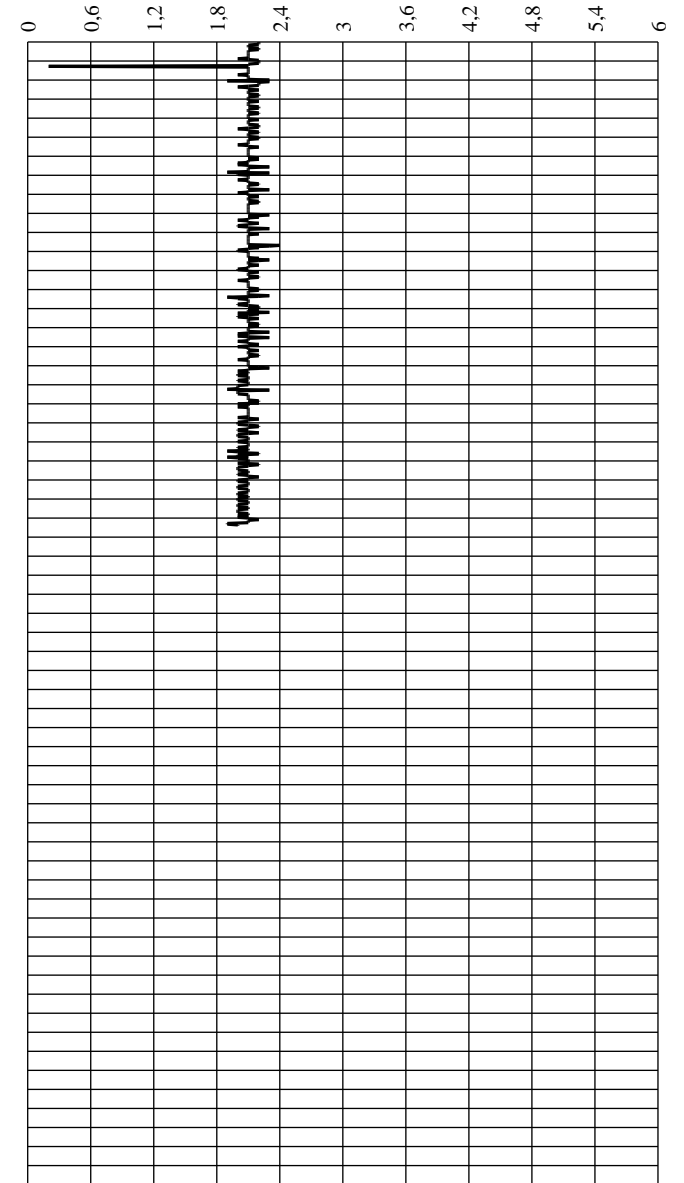
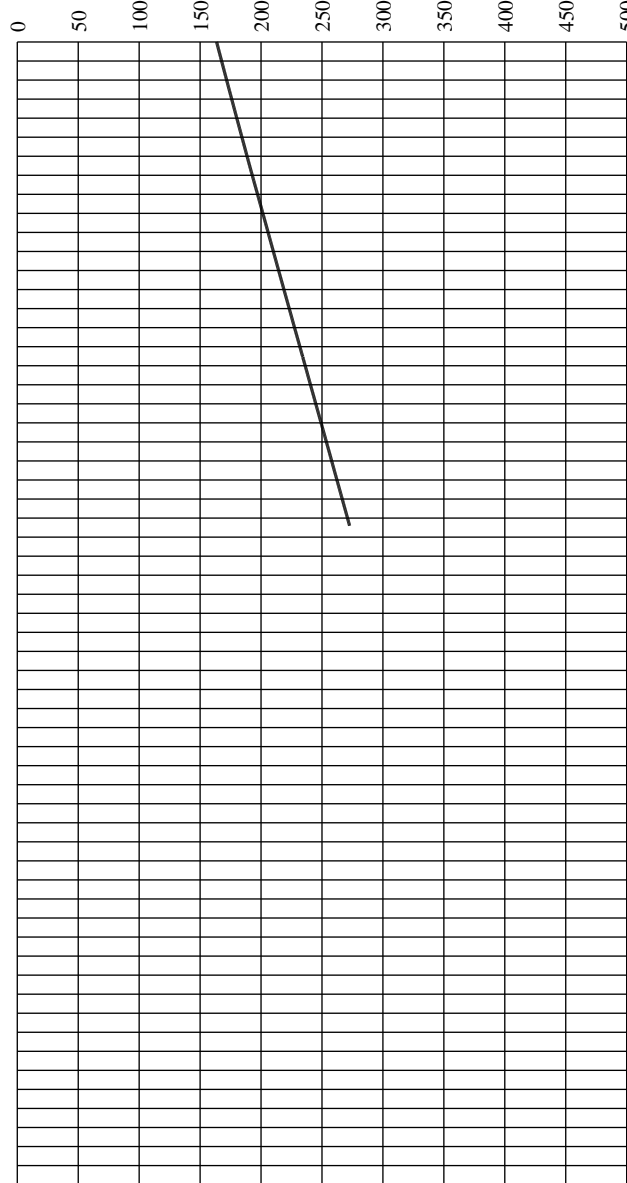
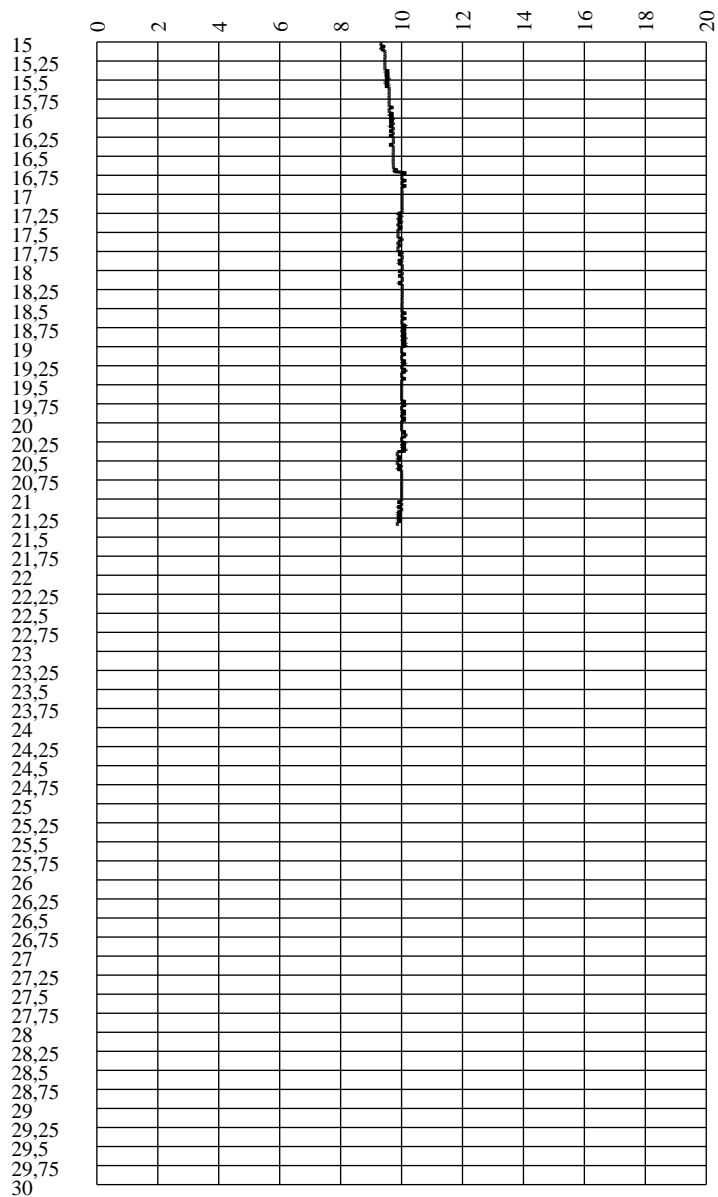
Speed [cm/sec]



Tilt [°]

Dist [cm]

Speed [cm/sec]





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INDAGINI GEOGNOSTICHE ED AMBIENTALI

Via san Potito 43 - 48022 LUGO (RA)
Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-4	PROVA N°:	CPTU-4
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:		21/08/2014	Latitudine:	N 44,160918°
			Longitudine:	E 12,425135°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	San Mauro Mare (FC)

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale	Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977

SOGEO s.r.l.

Cone Penetration Test (CPTU) - Date: 01/07/2014

Site: Rif. 031-14 PROGEO srl - Test: CPTU 4 Certificato n. C14-087-4 Data emissione: 21/08/2014

Company information

Name: SOGEO s.r.l.

Address: Via San Potito 43

Zip code: 48022

City: Lugo (RA)

P.IVA: 01051620399

E-Mail: sogeo@sogeo-srl.com

Phone number: +39054522042

Fax number: +39054534443

Site information

Name: Rif. 031-14 PROGEO srl

Date: 01/07/2014

Commissioner: Progeo s.r.l.

Locality: Zonazione Sismica valle del Rubicone

Test information

Name: CPTU 4

Location: San Mauro

Date: 01/07/2014

Prehole mode:

Prehole depth [cm]: 0

Hydrostatic line [cm]: 80

Ground level [m]: 0

Latitude: 0

Longitude: 0

Operator:

Comments:

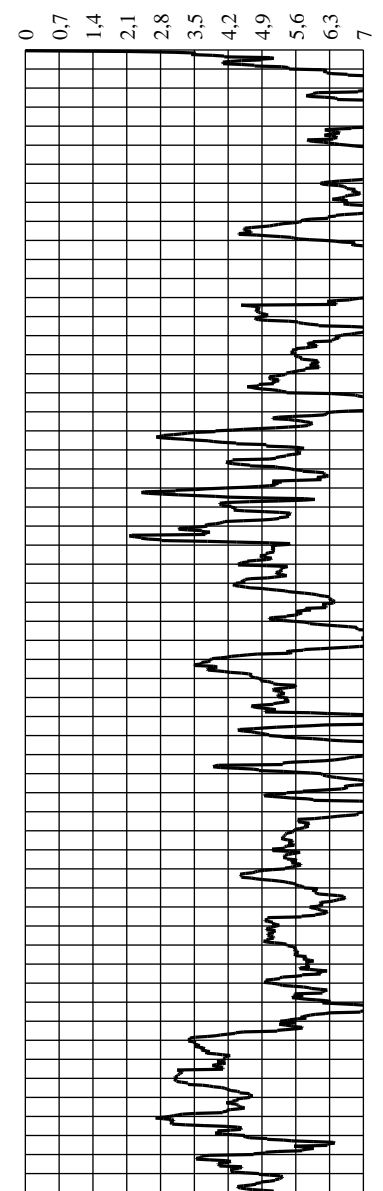
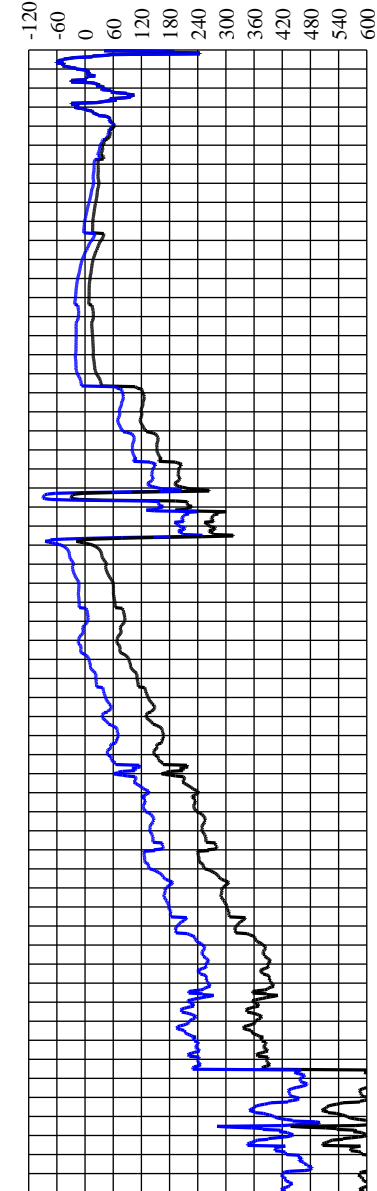
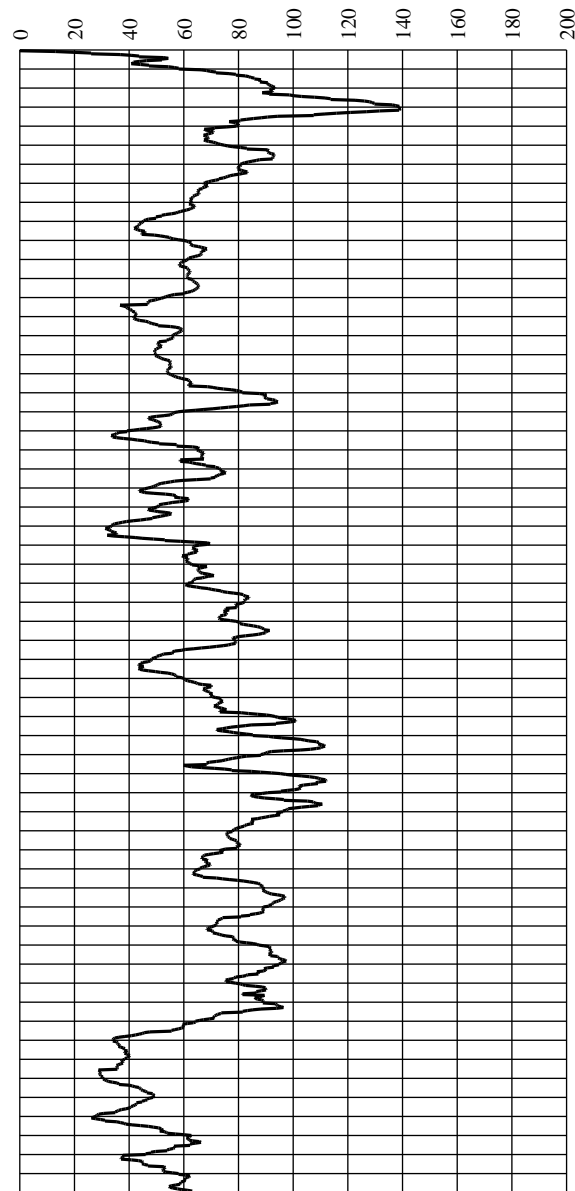
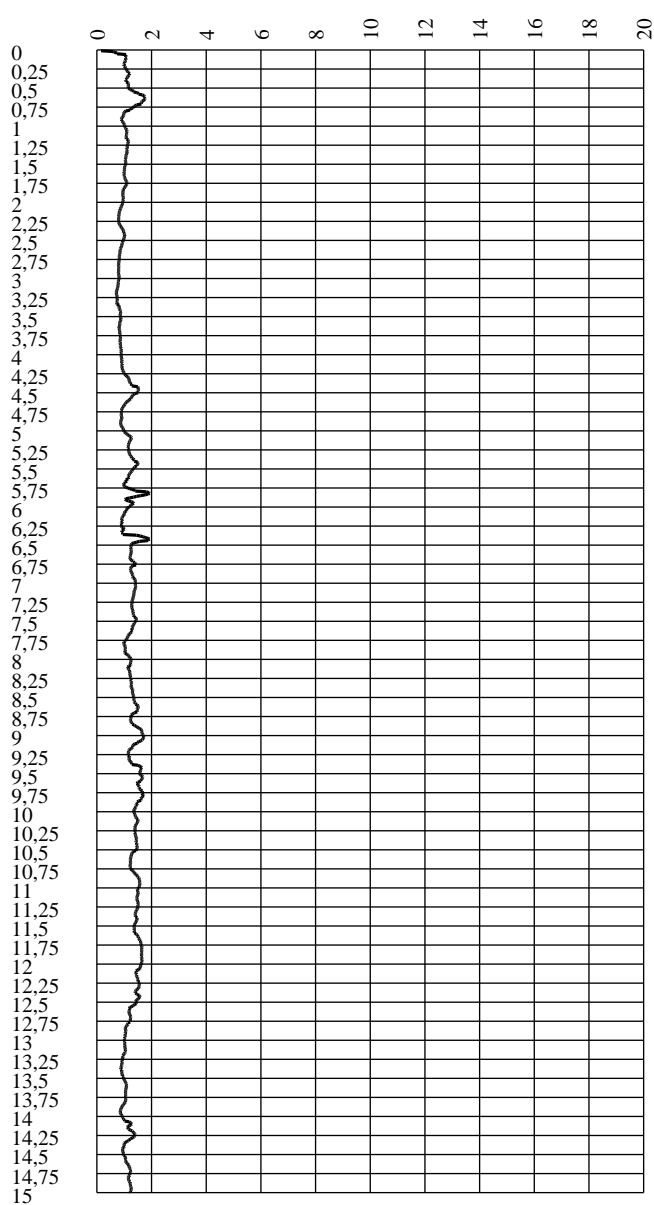
Probe code: MK160

Qc [MPa]

Fs [KPa]

U2 [KPa]

Rf [%]

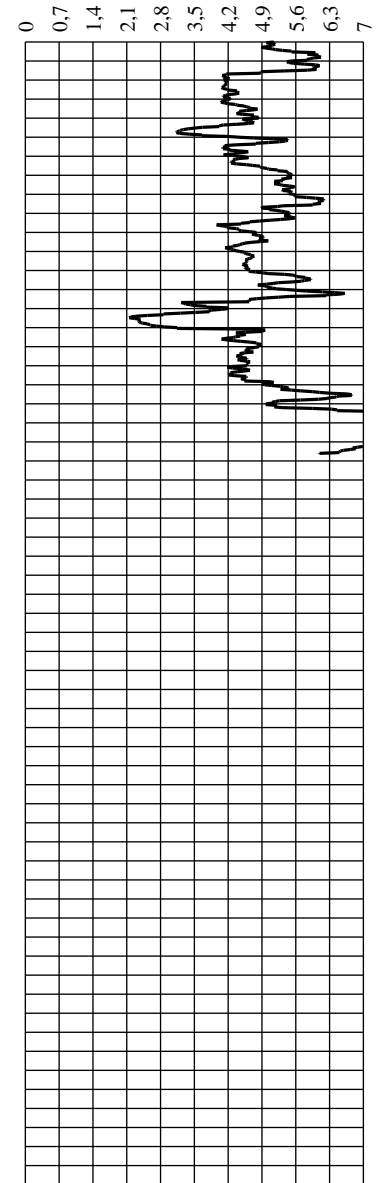
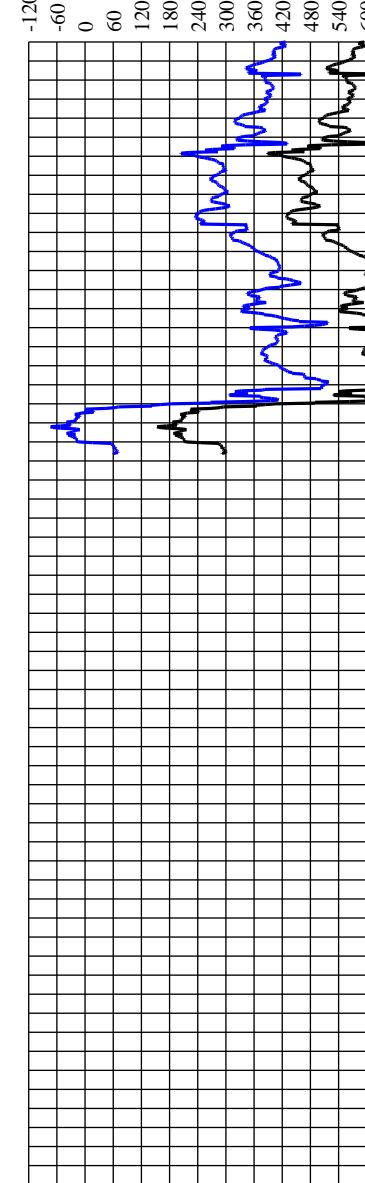
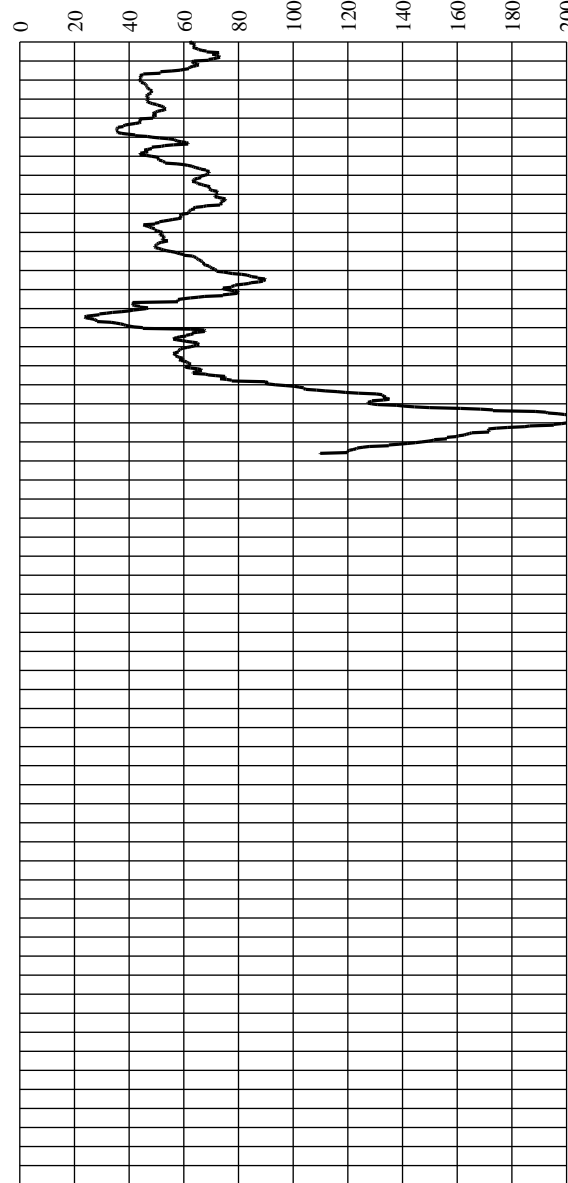
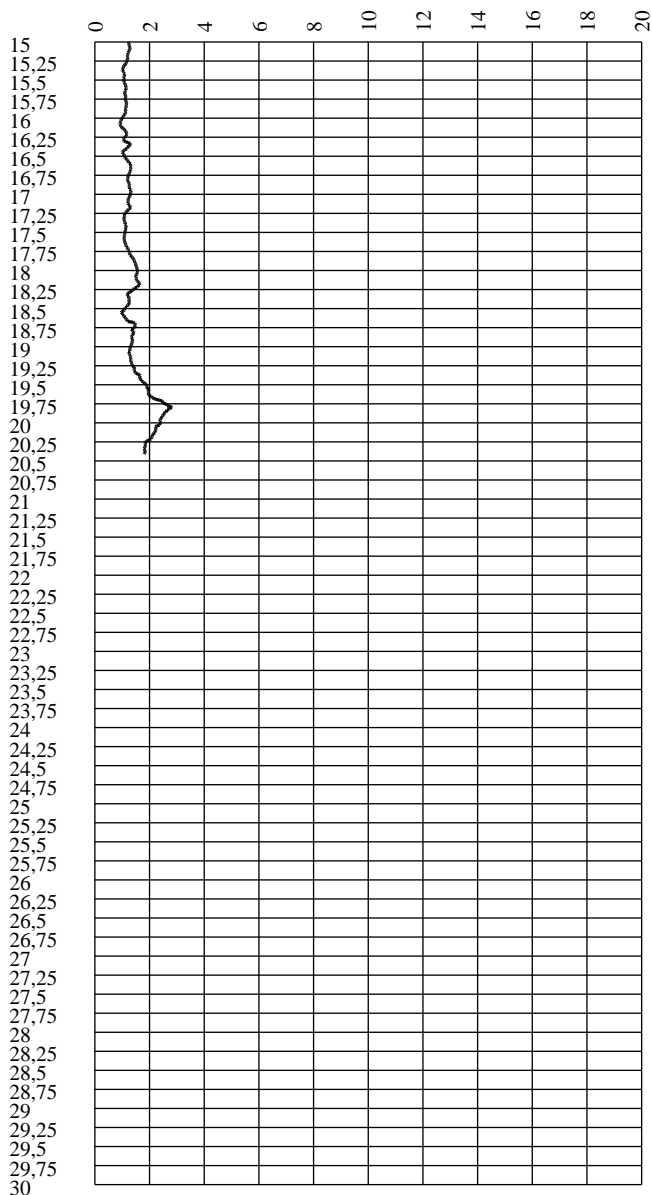


Qc [MPa]

Fs [KPa]

U2 [KPa]

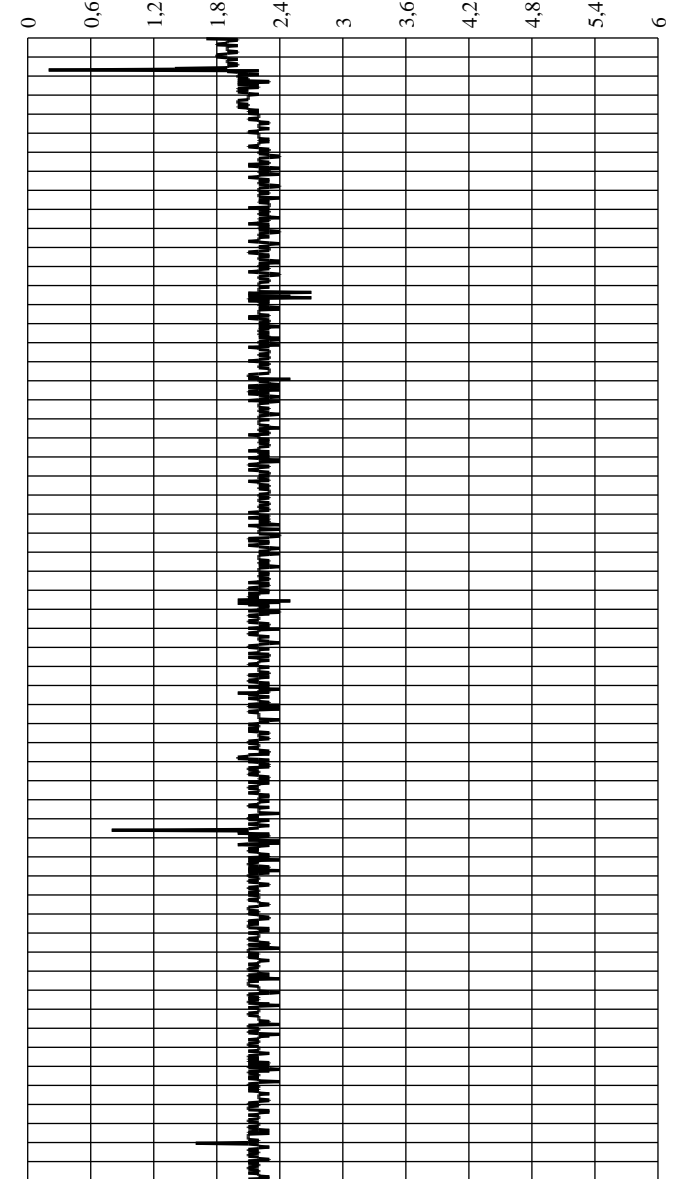
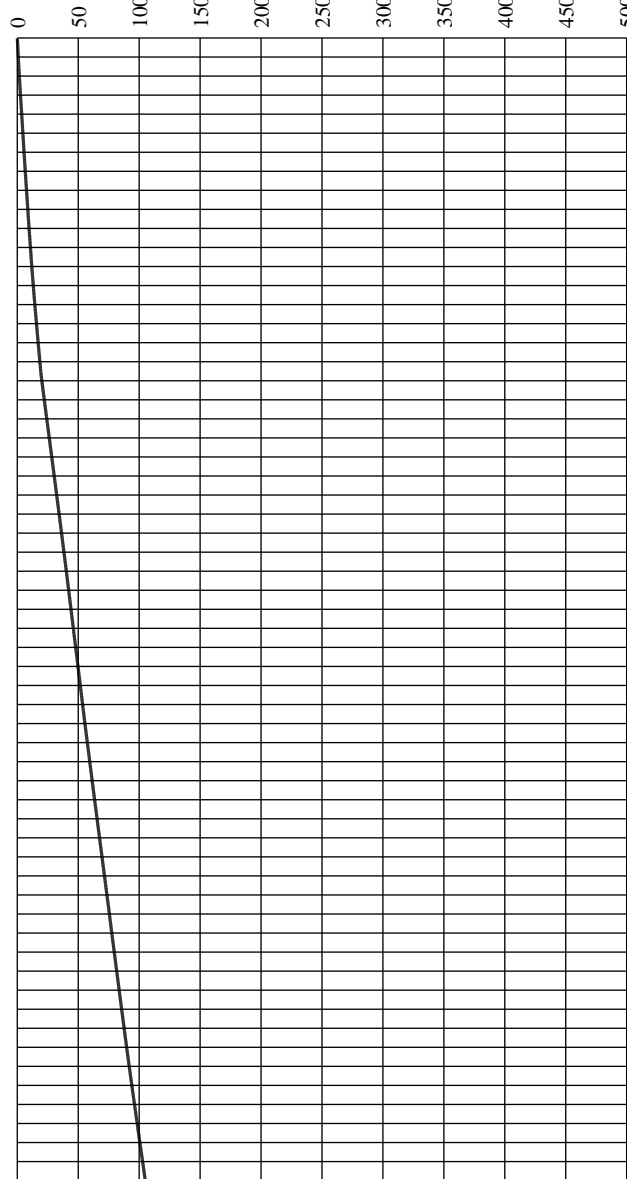
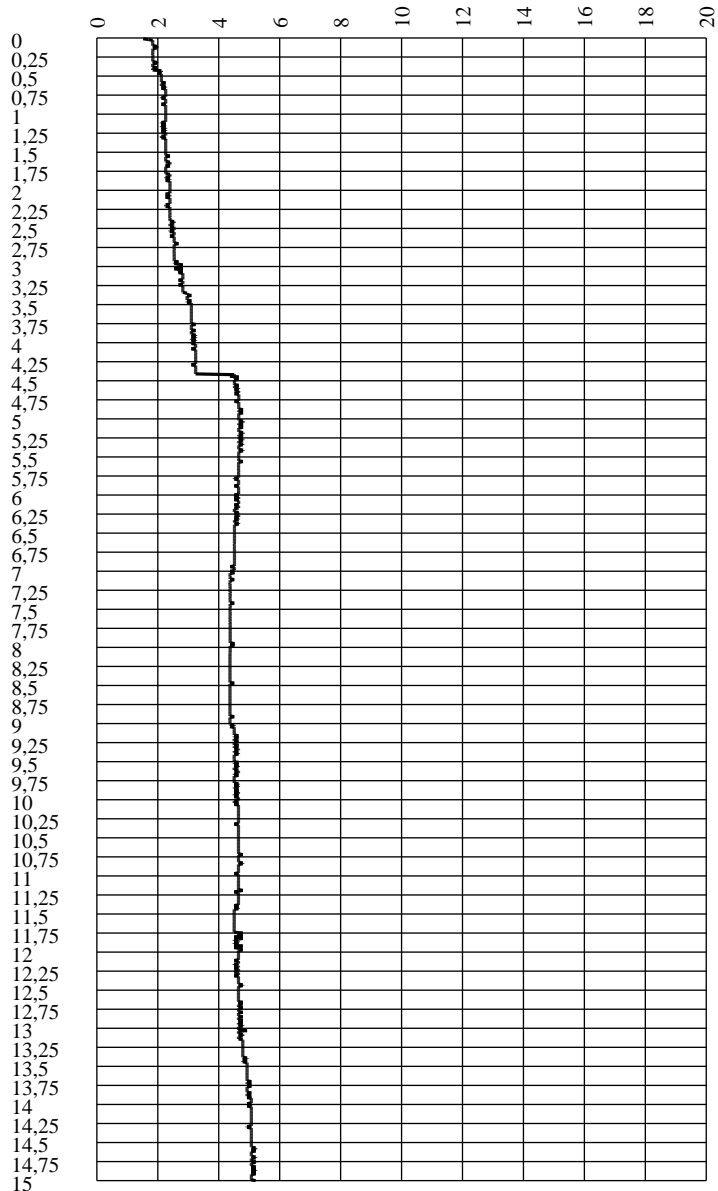
Rf [%]



Tilt [°]

Dist [cm]

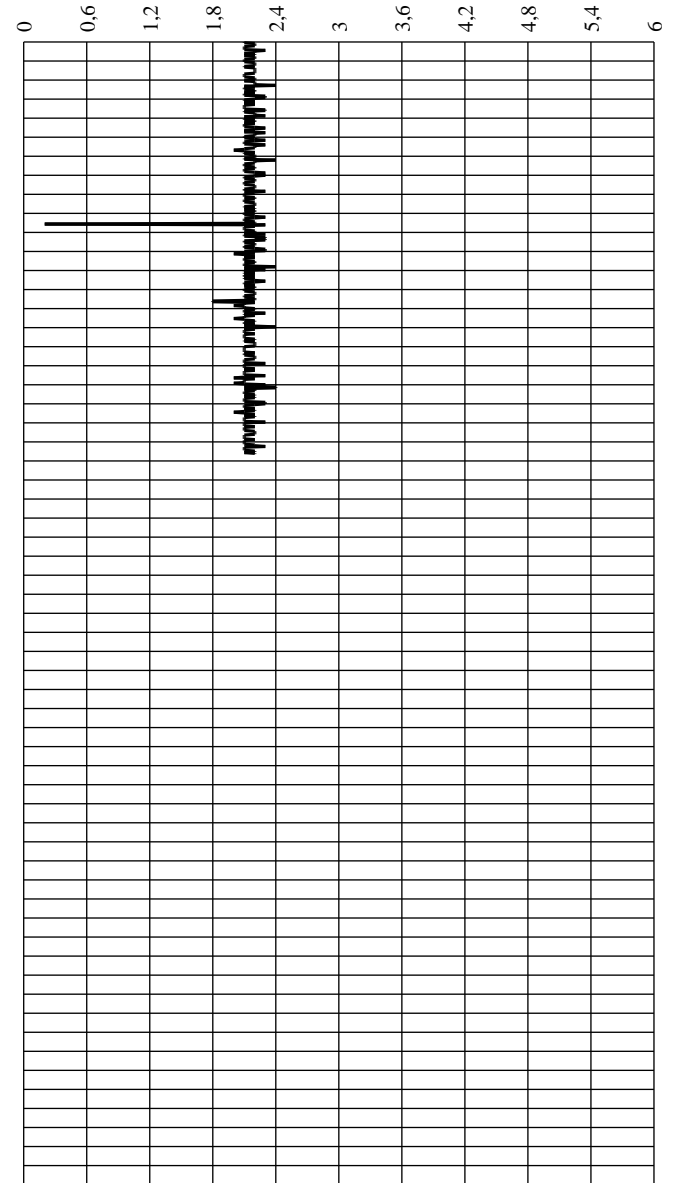
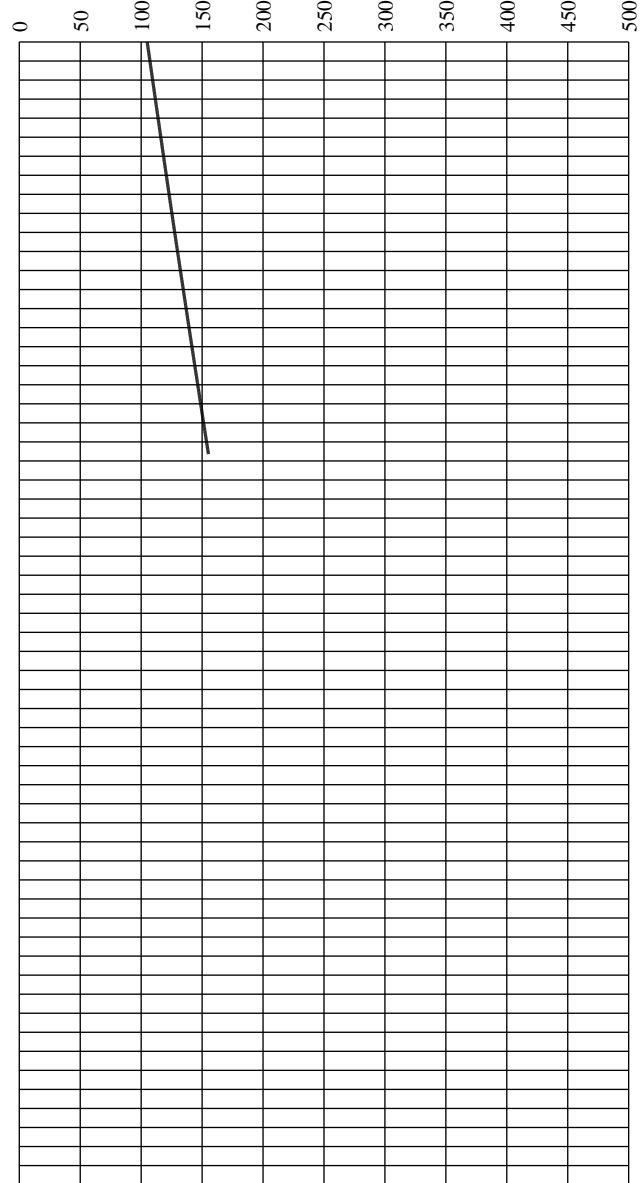
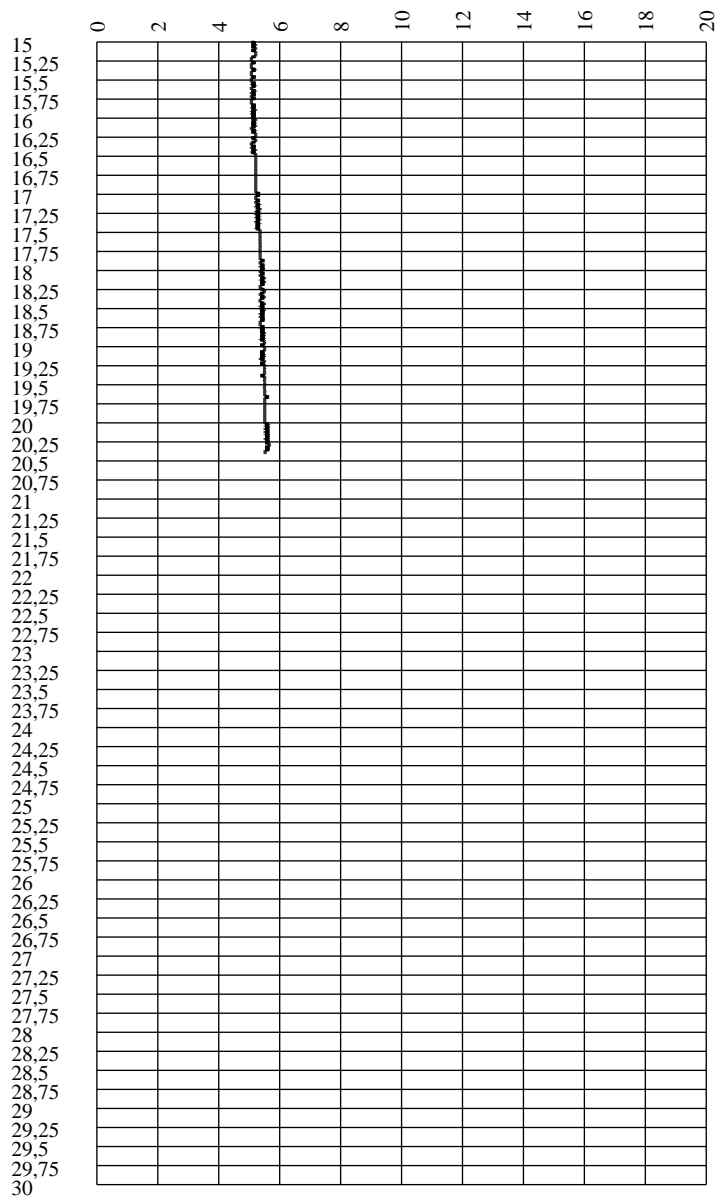
Speed [cm/sec]



Tilt [°]

Dist [cm]

Speed [cm/sec]





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INDAGINI GEOGNOSTICHE ED AMBIENTALI

Via san Potito 43 - 48022 LUGO (RA)
Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-5	PROVA N°:	CPTU-5
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:		21/08/2014	Latitudine:	N 44,15478°
			Longitudine:	E 12,421491°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	San Mauro Mare (FC)

Il presente certificato di prova si compone di n° pagine, esclusa la presente, ed ha per oggetto le seguenti prove:

<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestmetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977

SOGEO s.r.l.

Cone Penetration Test (CPTU) - Date: 01/07/2014

Site: Rif. 031-14 PROGEO srl - Test: CPTU 5 Certificato n. C14-087-5 Data emissione: 21/08/2014

Company information

Name: SOGEO s.r.l.

Address: Via San Potito 43

Zip code: 48022

City: Lugo (RA)

P.IVA: 01051620399

E-Mail: sogeo@sogeo-srl.com

Phone number: +39054522042

Fax number: +39054534443

Site information

Name: Rif. 031-14 PROGEO srl

Date: 01/07/2014

Commissioner: Progeo s.r.l.

Locality: Zonazione Sismica valle del Rubicone

Test information

Name: CPTU 5

Location: San Mauro

Date: 01/07/2014

Prehole mode:

Prehole depth [cm]: 0

Hydrostatic line [cm]: 90

Ground level [m]: 0

Latitude: 0

Longitude: 0

Operator:

Comments:

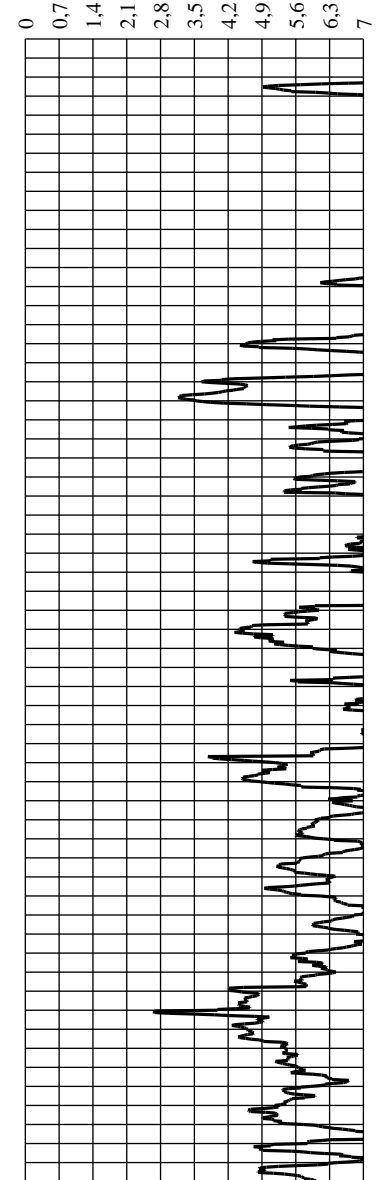
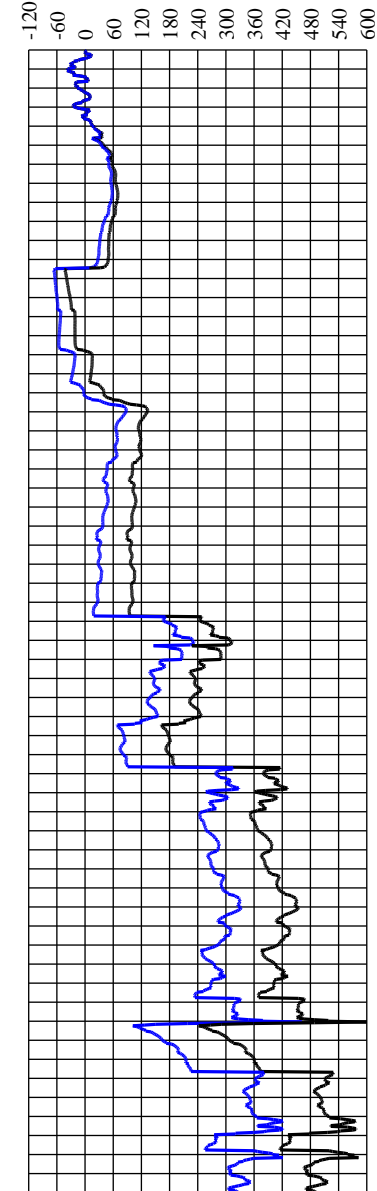
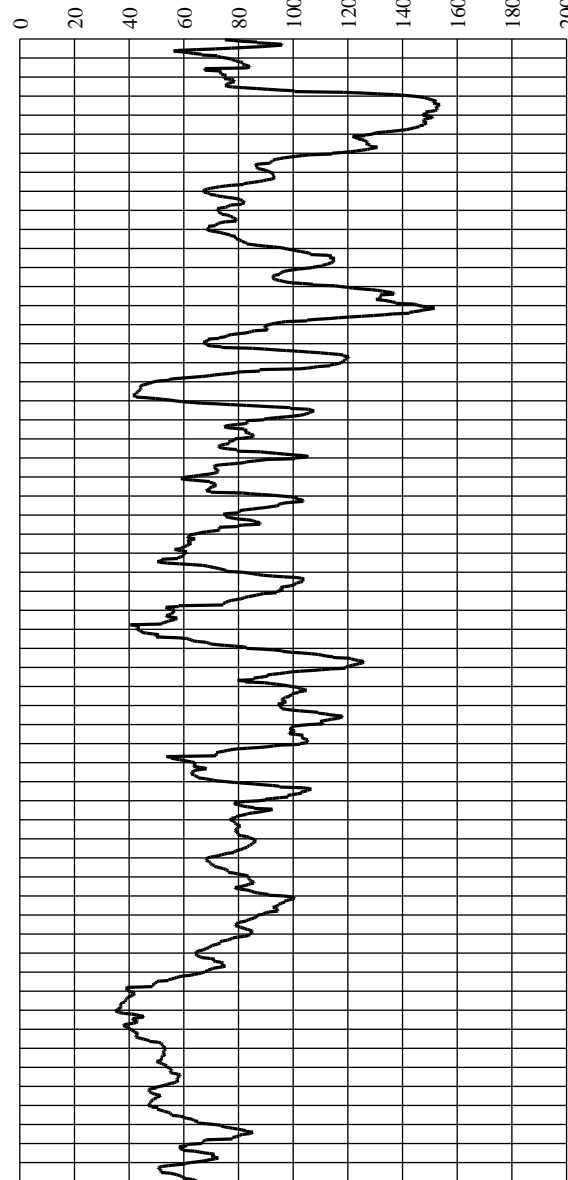
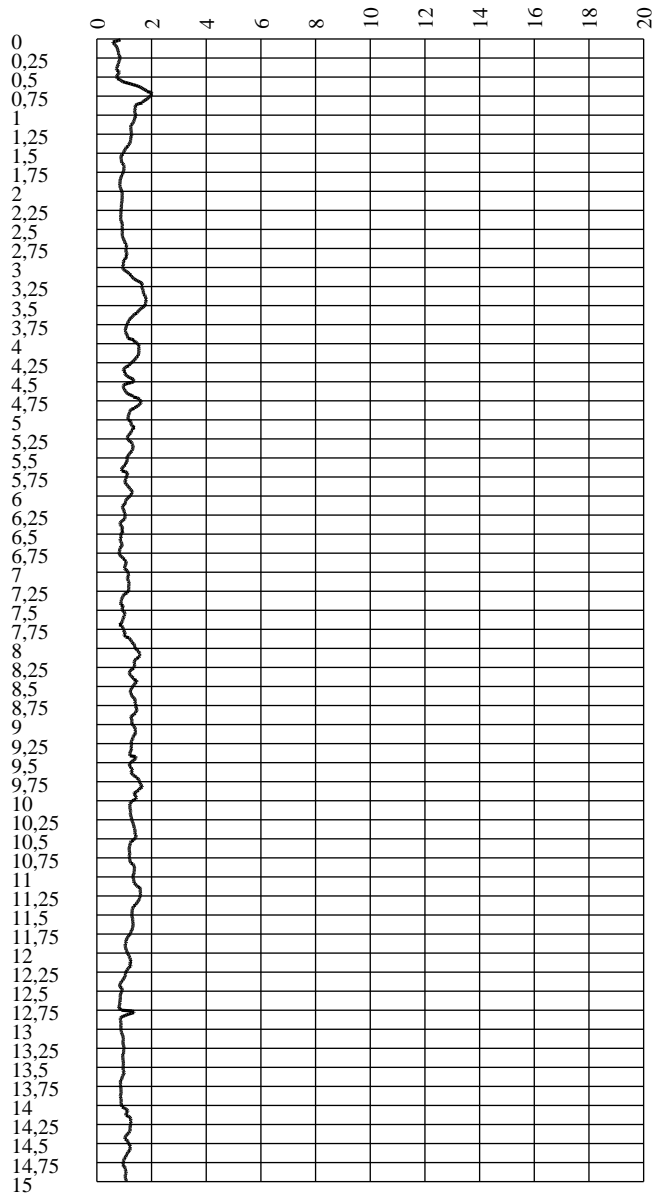
Probe code: MK160

Qc [MPa]

Fs [KPa]

U2 [KPa]

Rf [%]

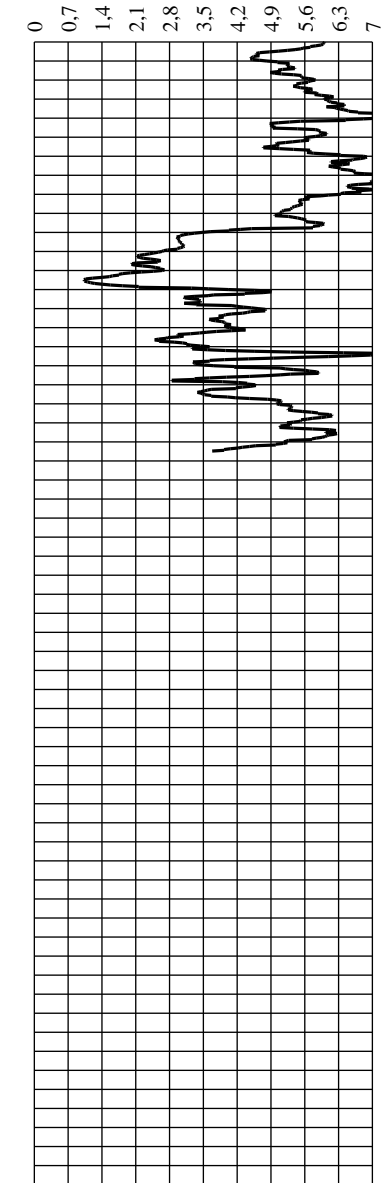
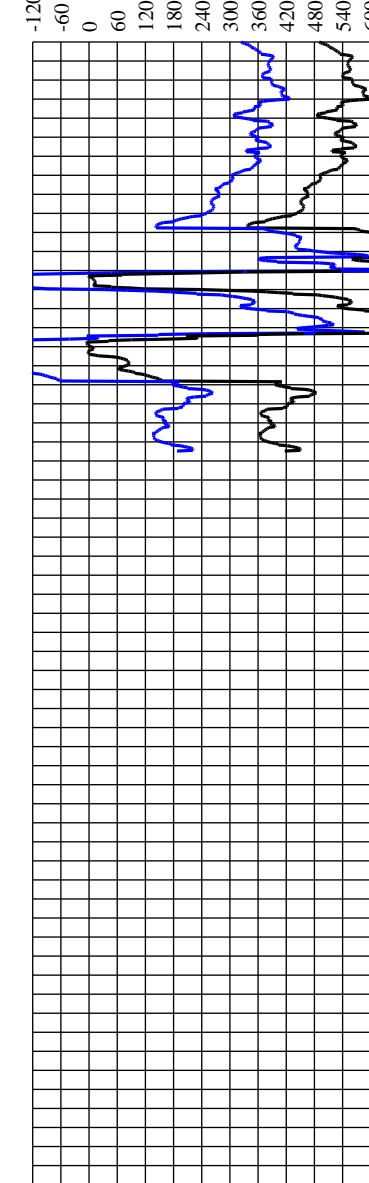
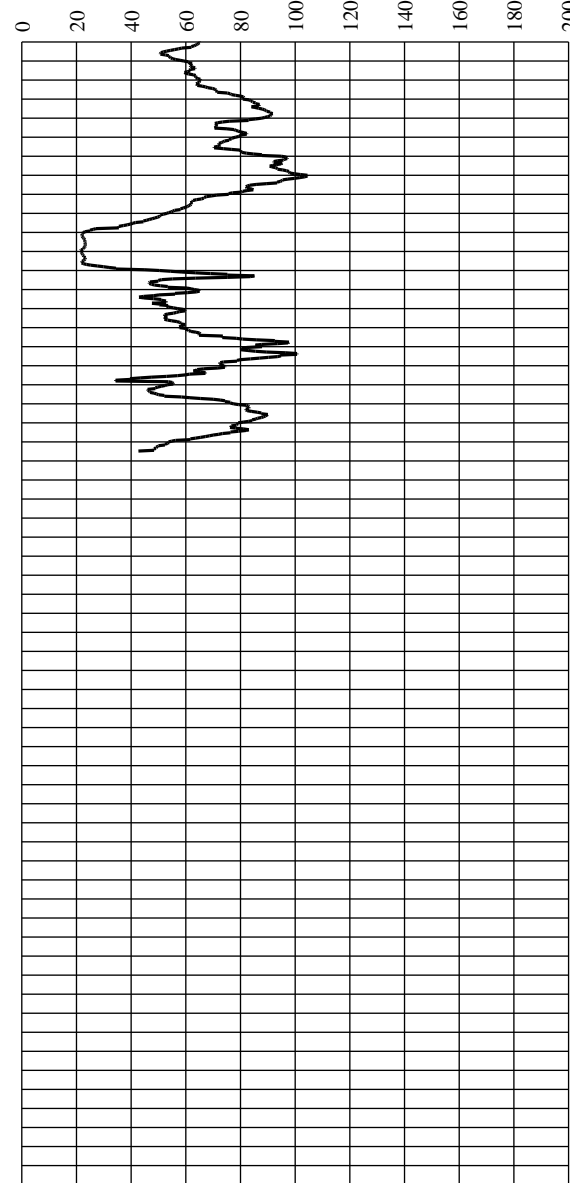
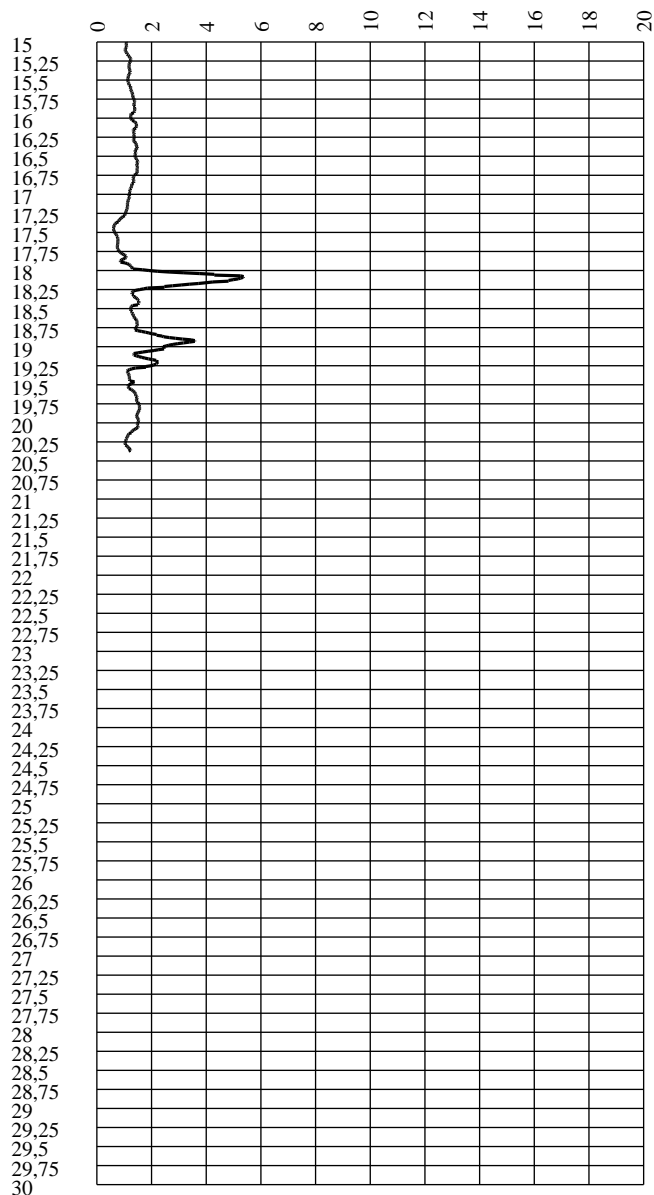


Qc [MPa]

Fs [KPa]

U2 [KPa]

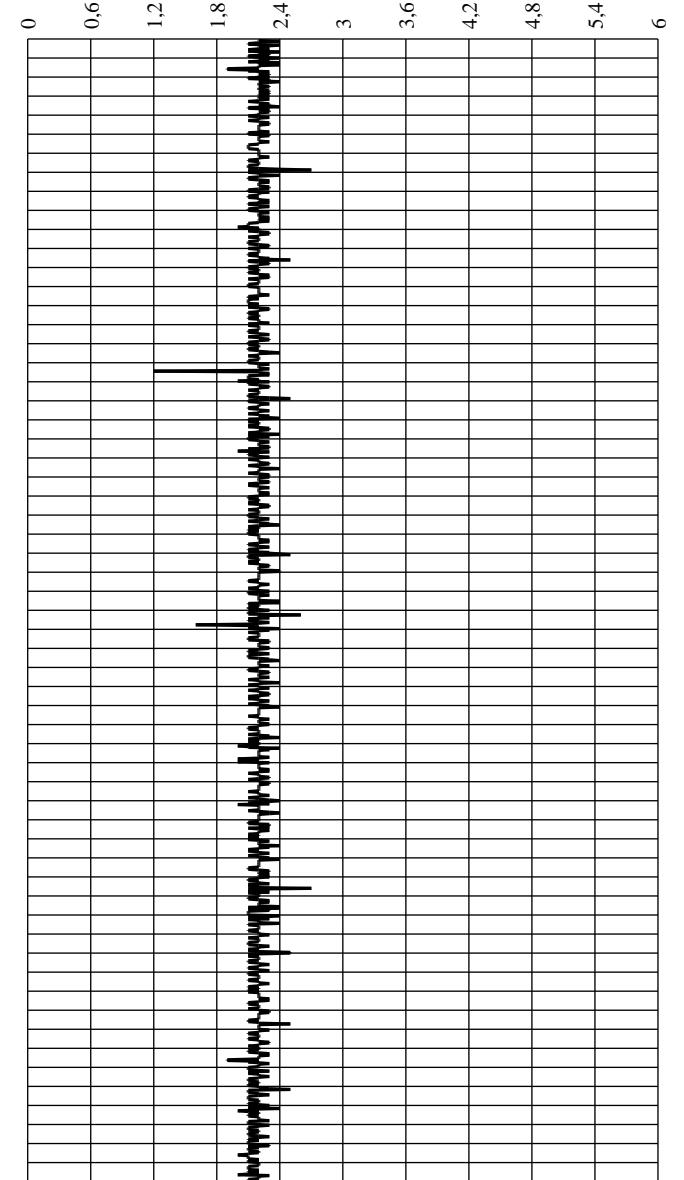
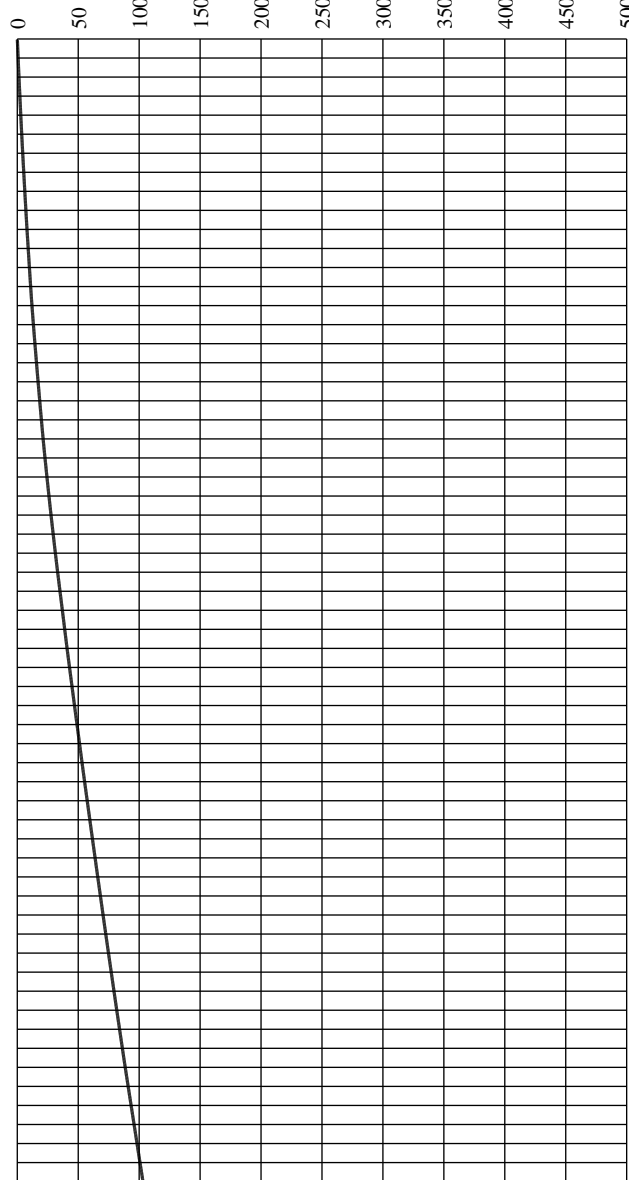
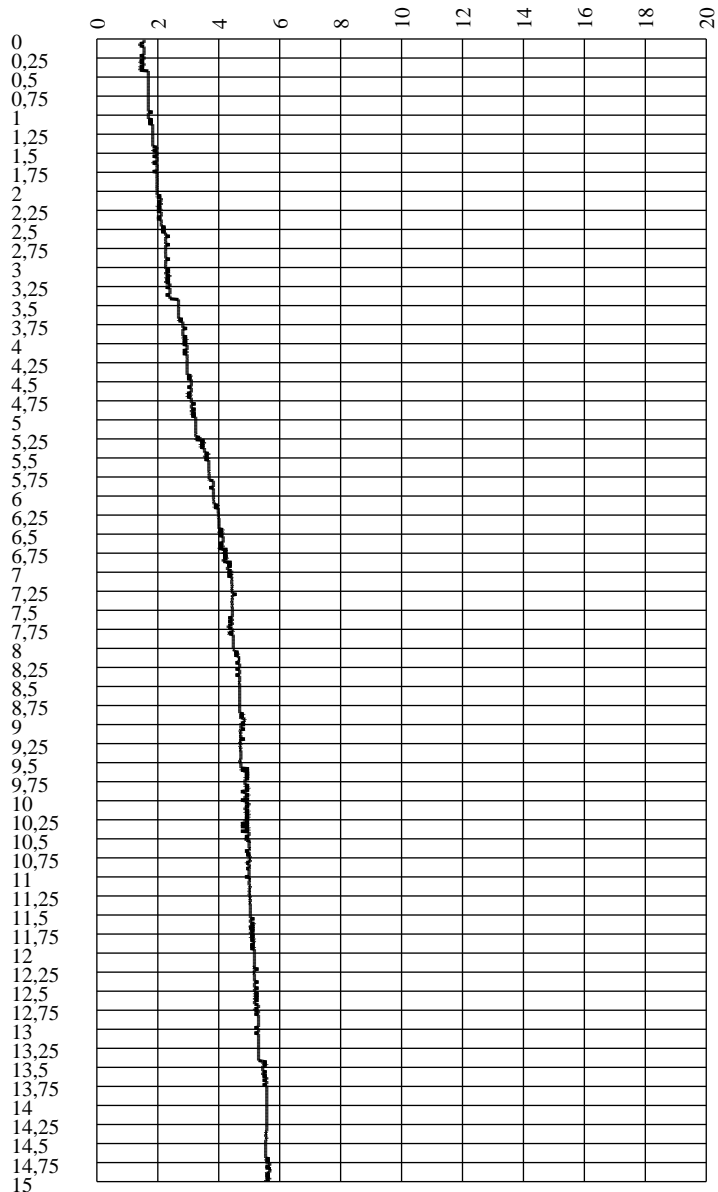
Rf [%]



Tilt [°]

Dist [cm]

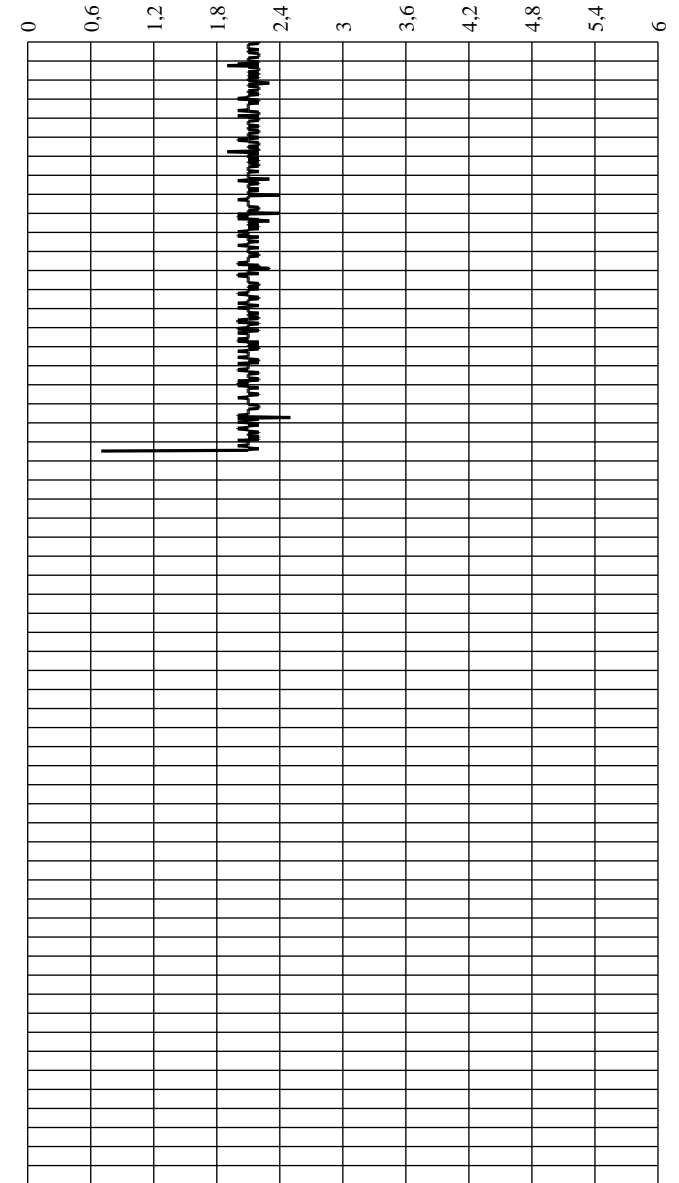
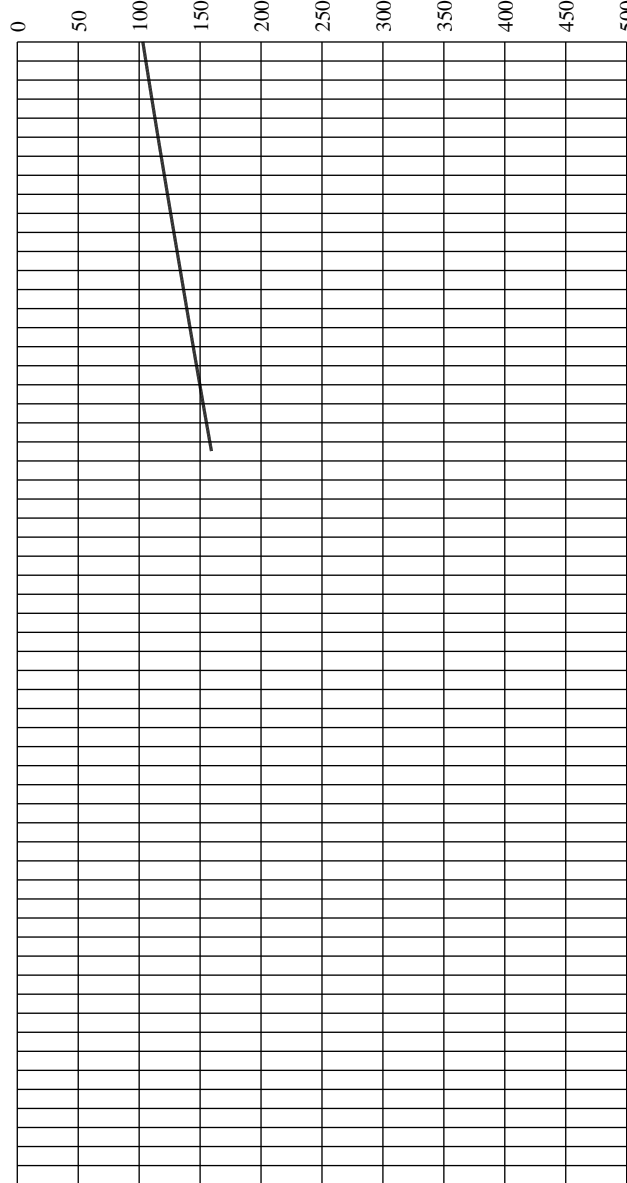
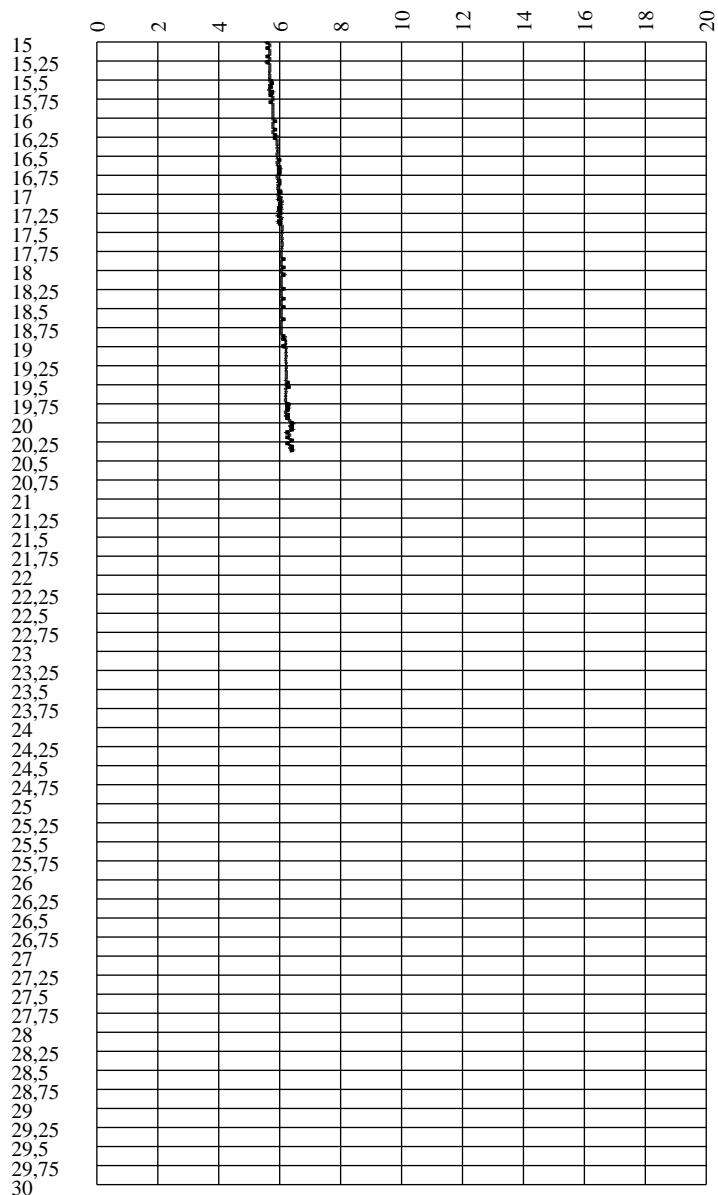
Speed [cm/sec]



Tilt [°]

Dist [cm]

Speed [cm/sec]





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Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	<input type="text" value="C14-087-6"/>	PROVA N°:	<input type="text" value="CPTU-6"/>
<input type="checkbox"/>	RAPPORTO N°:	<input type="text"/>	UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:		<input type="text" value="21/08/2014"/>	Latitudine:	N 44,103785°
			Longitudine:	E 12.386839°

Riferimento Preventivo n°:	<input type="text" value="031-14"/>	Commessa n°:	<input type="text" value="14-080"/>
Verbale di accettazione n°:	<input type="text" value="VA14-087"/>	del:	<input type="text" value="21/08/2014"/>

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Gatteo (FC) - Via Carducci

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

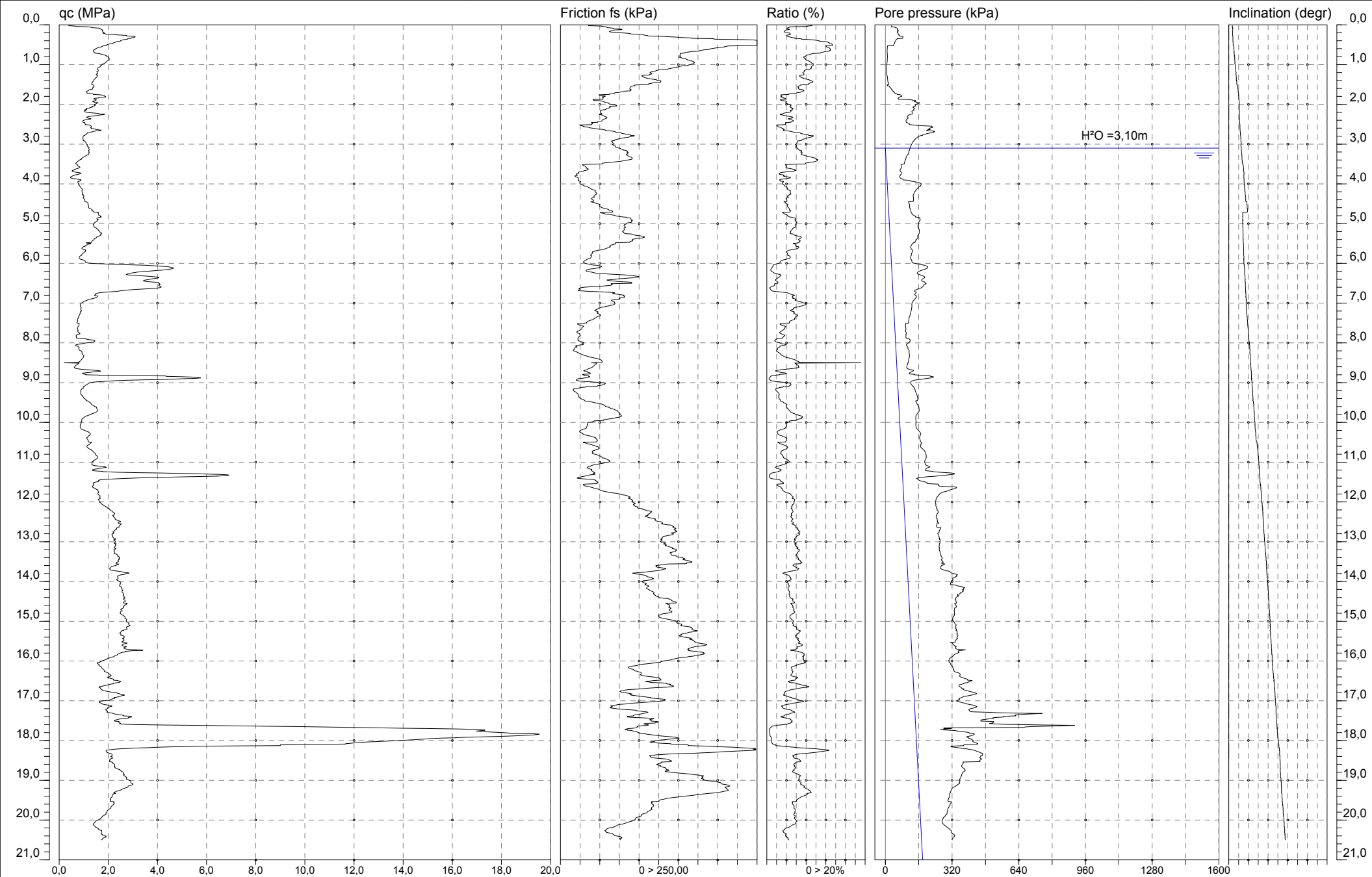
<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: **Matricola n.:**

Allegati:

Timbro blu sull'originale	Lo Sperimentatore:	Il Direttore del Laboratorio:
---------------------------	--------------------	-------------------------------

Normativa di Riferimento: A.G.I 1977





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Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-7	PROVA N°:	CPTU-7
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:		21/08/2014	Latitudine:	N 44,120486°
			Longitudine:	E 12,398092°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Fiumicino (FC) - Via Fiumicino

Il presente certificato di prova si compone di n° pagine, esclusa la presente, ed ha per oggetto le seguenti prove:

<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale	Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977

SOGEO s.r.l.

Cone Penetration Test (CPTU) - Date: 14/07/2014

Site: Rif. 031-14 PROGEO srl - Test: CPTU 7 Certificato n. C14-087-7 Data emissione: 21/08/2014

Company information

Name: SOGEO s.r.l.

Address: Via San Potito 43

Zip code: 48022

City: Lugo (RA)

P.IVA: 01051620399

E-Mail: sogeo@sogeo-srl.com

Phone number: +39054522042

Fax number: +39054534443

Site information

Name: Rif. 031-14 PROGEO srl

Date: 01/07/2014

Commissioner: Progeo s.r.l.

Locality: Zonazione Sismica valle del Rubicone

Test information

Name: CPTU 7

Location: via fiumicino

Date: 14/07/2014

Prehole mode:

Prehole depth [cm]: 0

Hydrostatic line [cm]: 0

Ground level [m]: 0

Latitude: 0

Longitude: 0

Operator:

Comments:

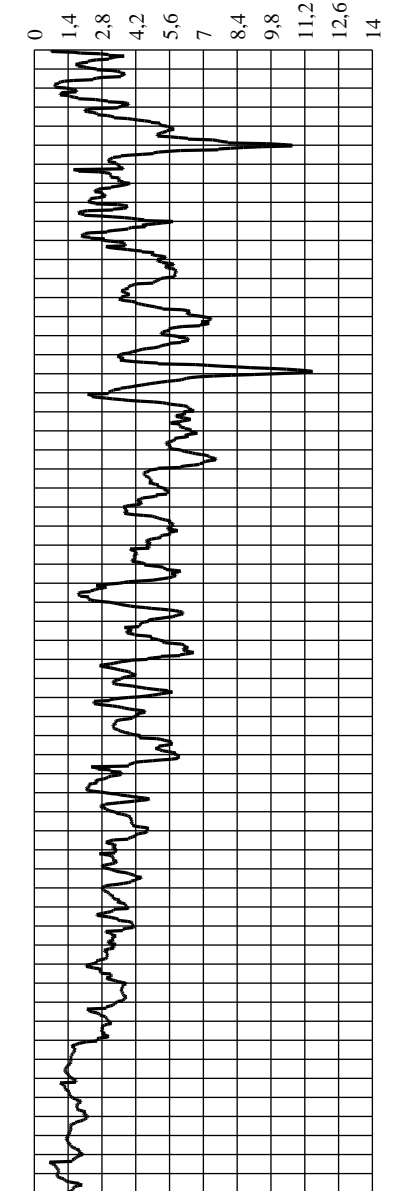
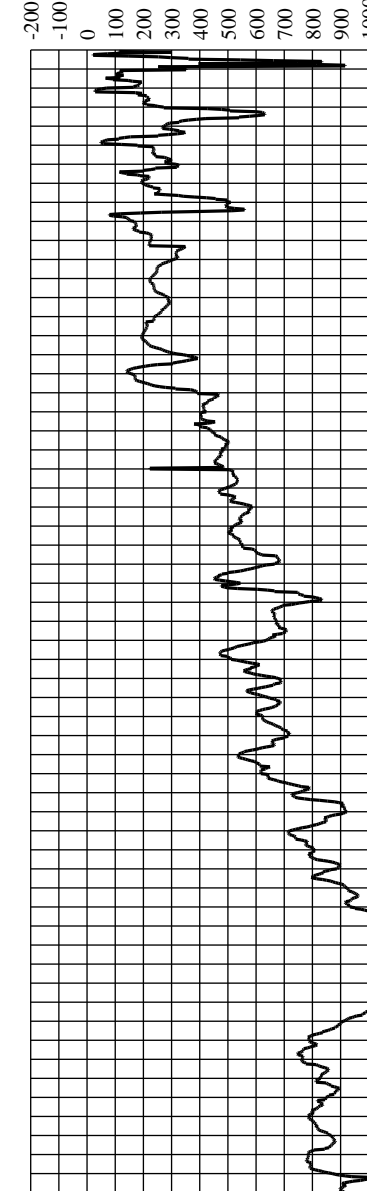
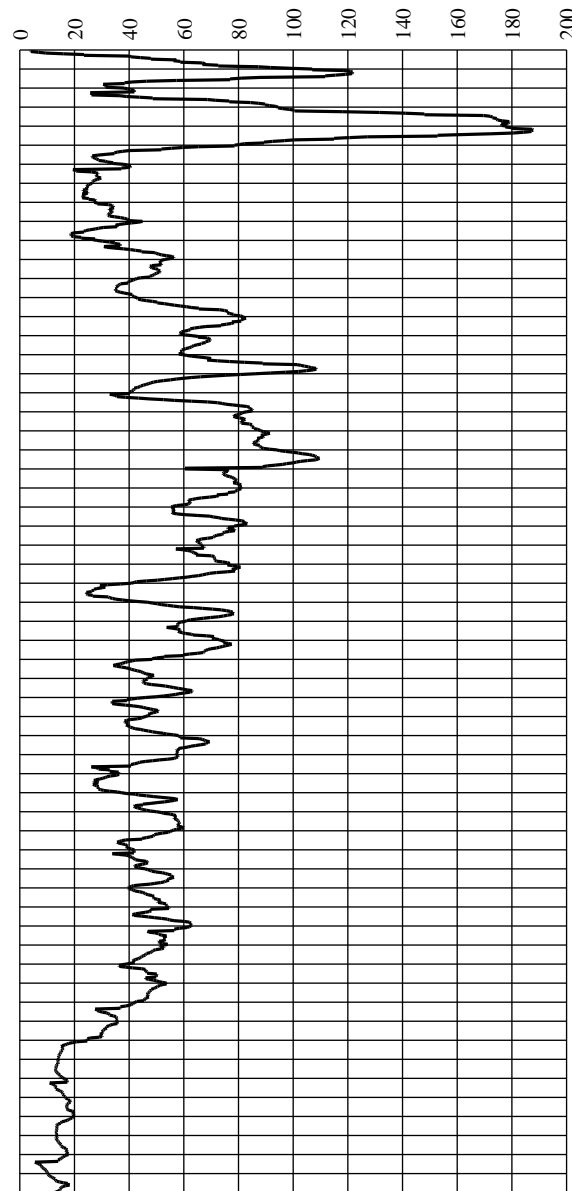
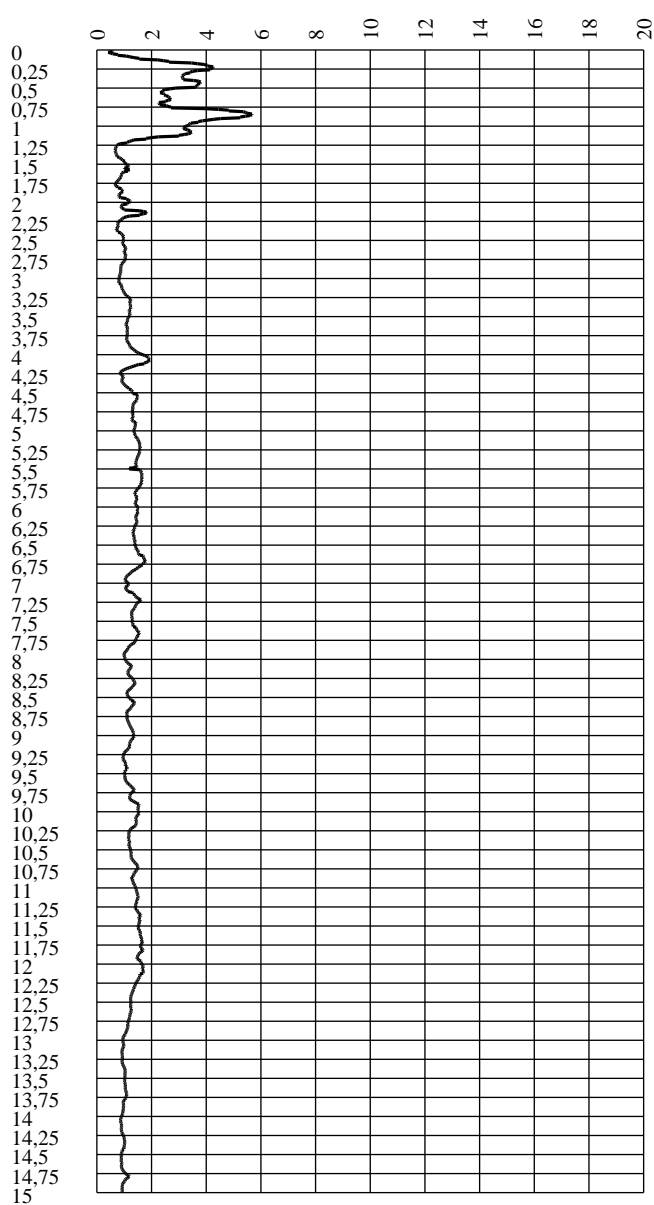
Probe code: MK160

Qc [MPa]

Fs [KPa]

U2 [KPa]

Rf [%]

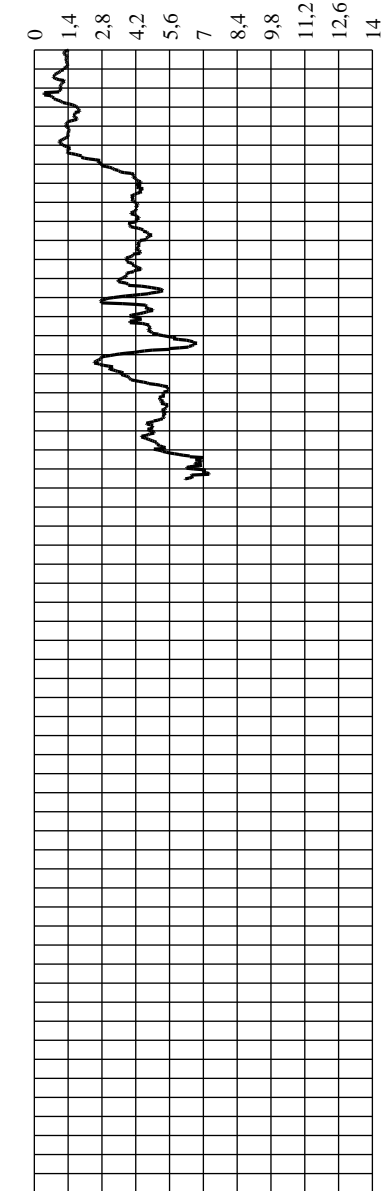
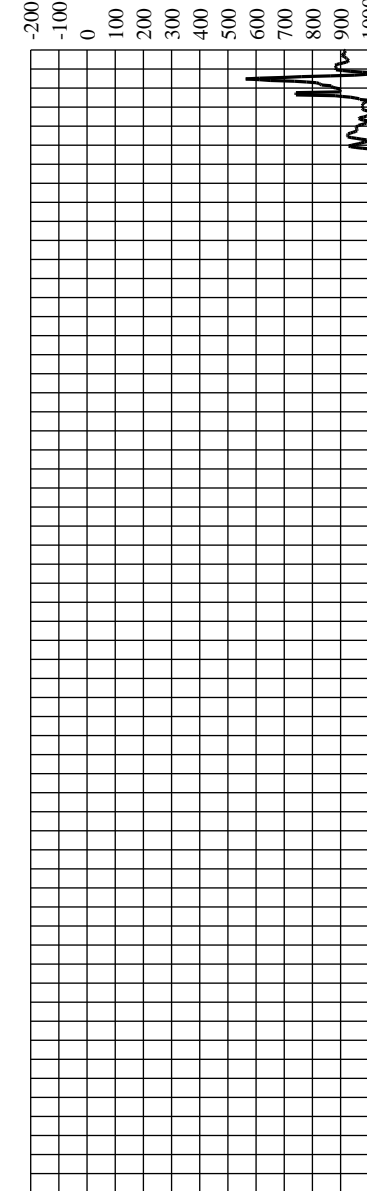
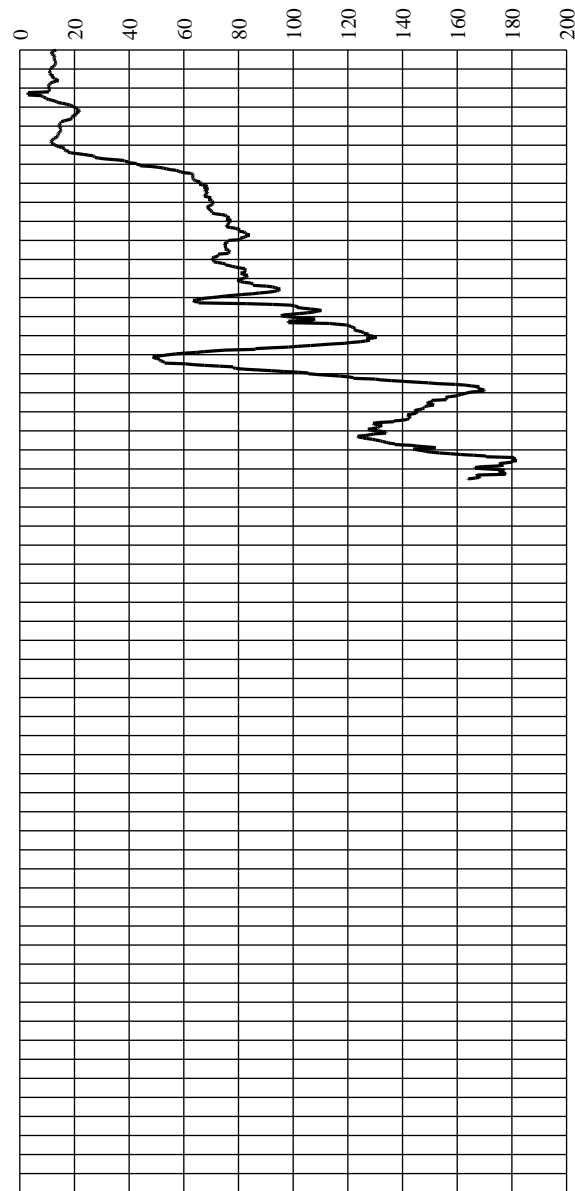
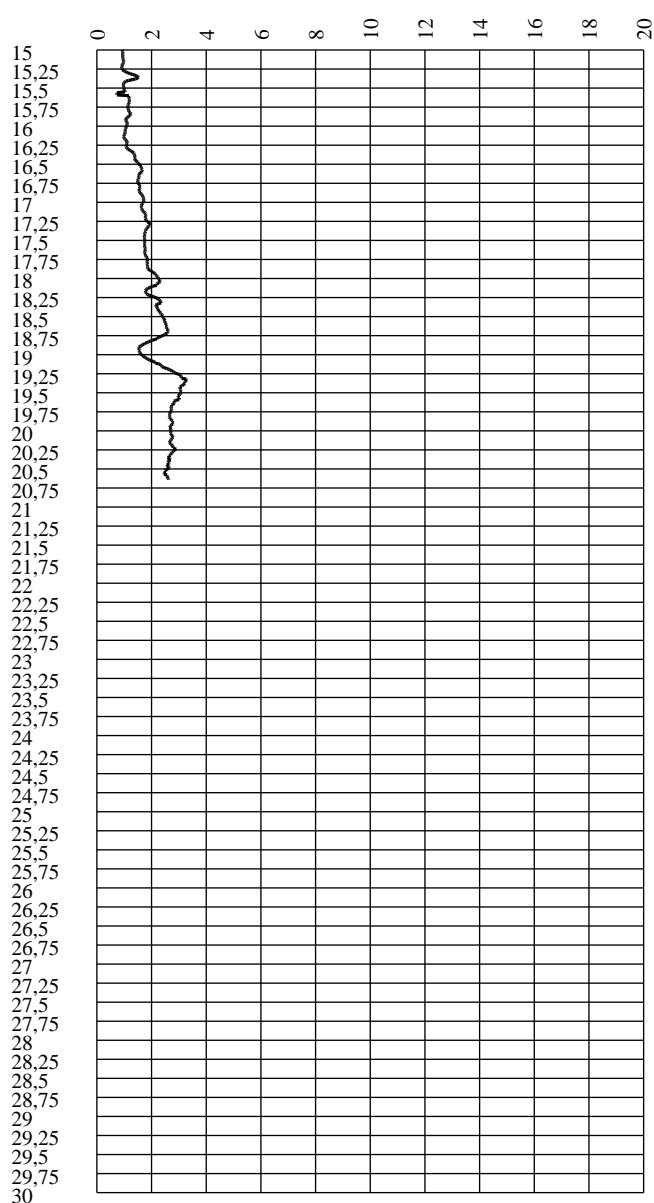


Qc [MPa]

Fs [KPa]

U2 [KPa]

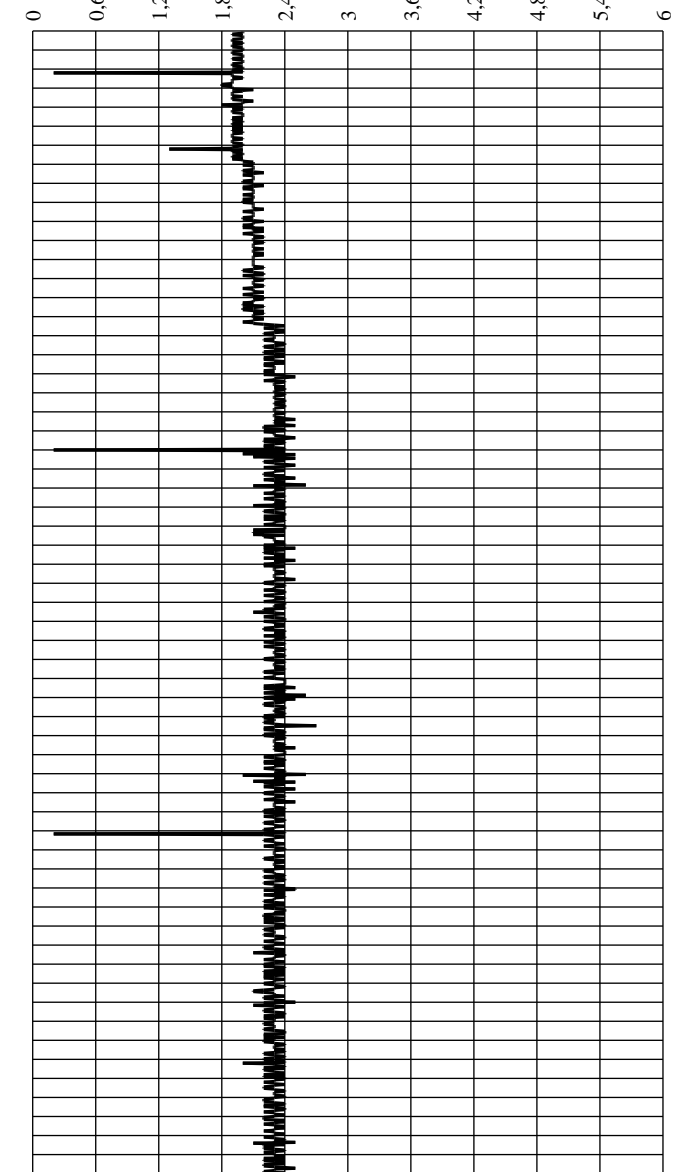
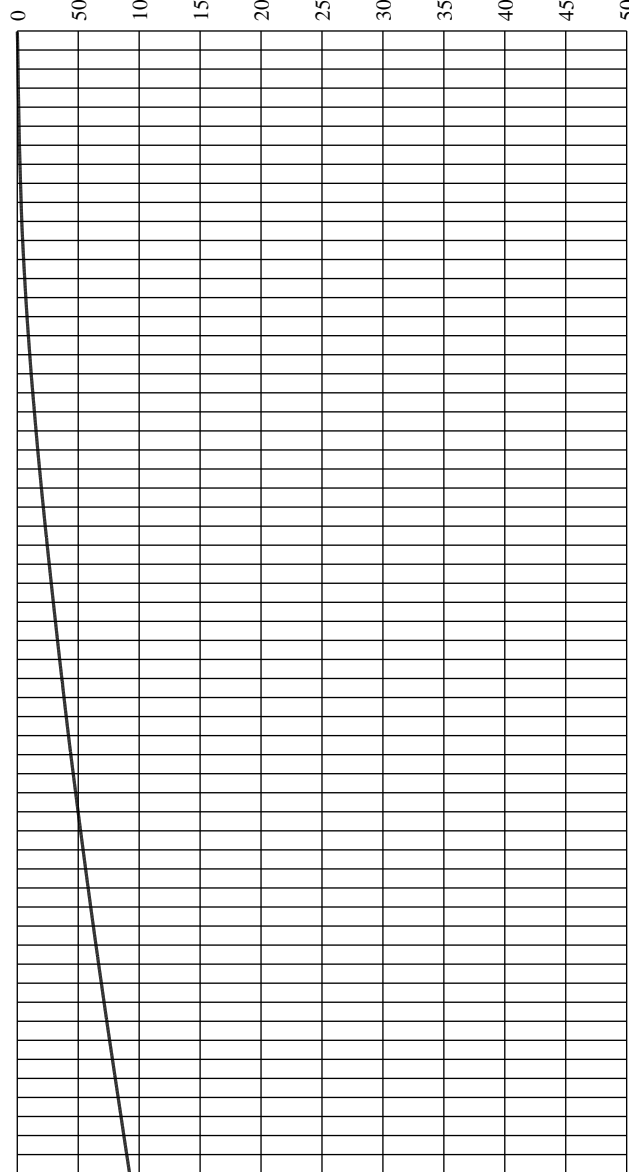
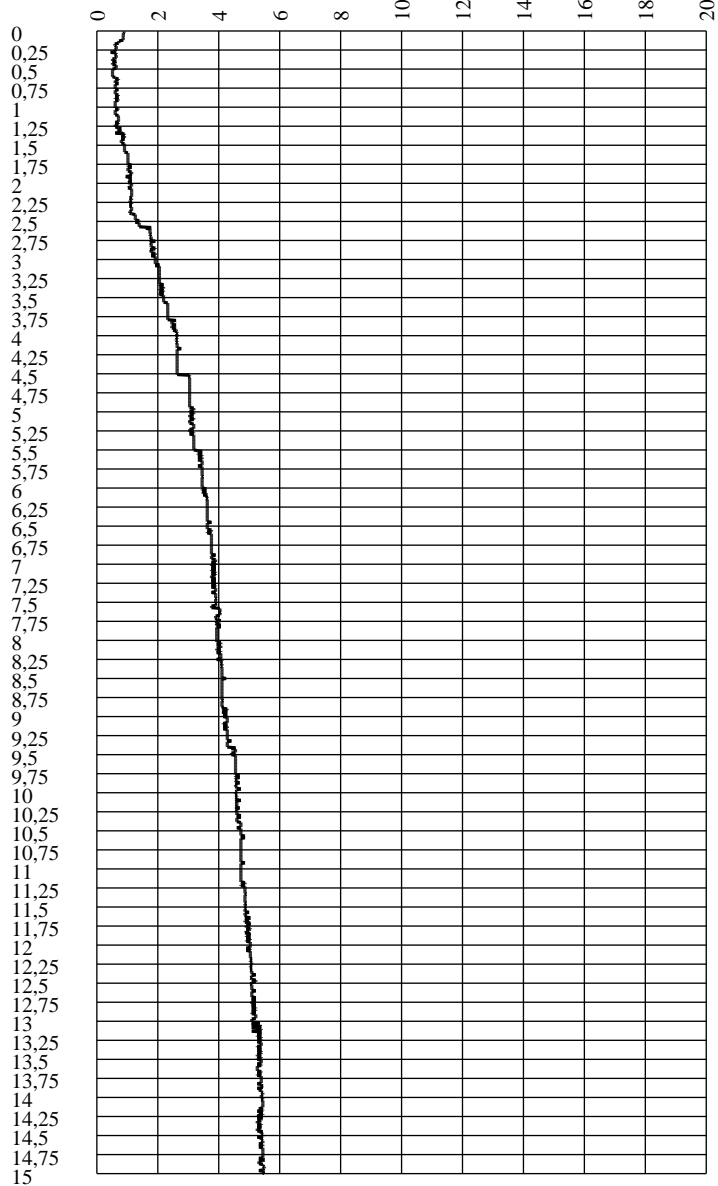
Rf [%]



Tilt [°]

Dist [cm]

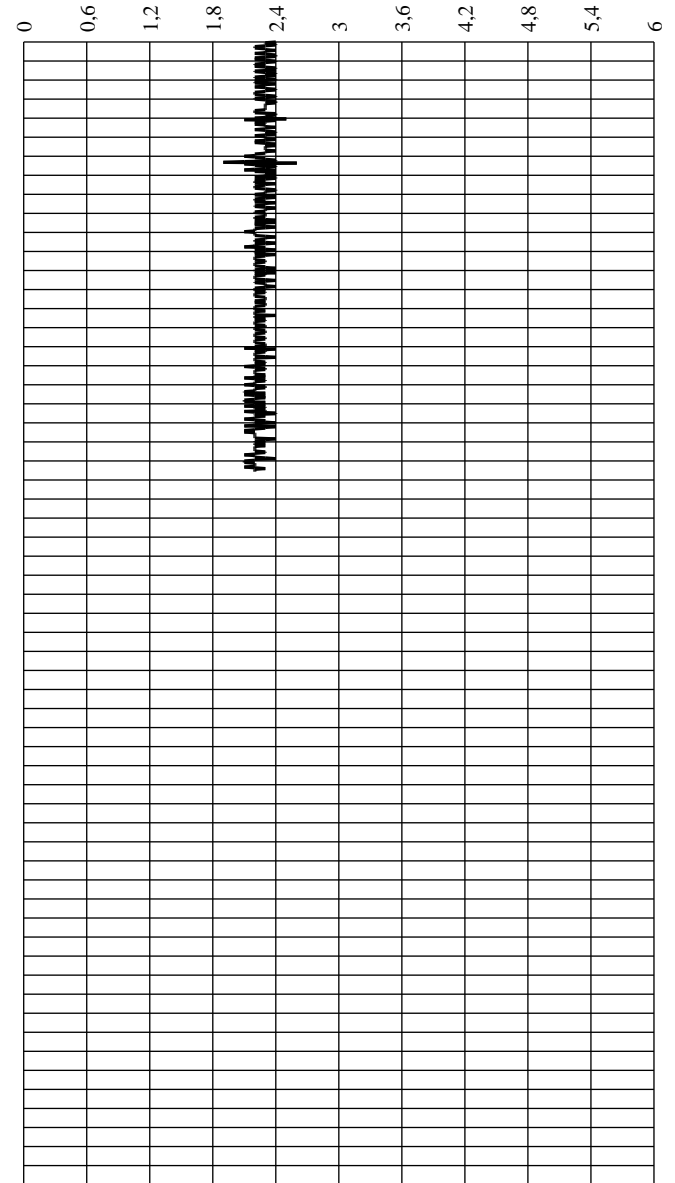
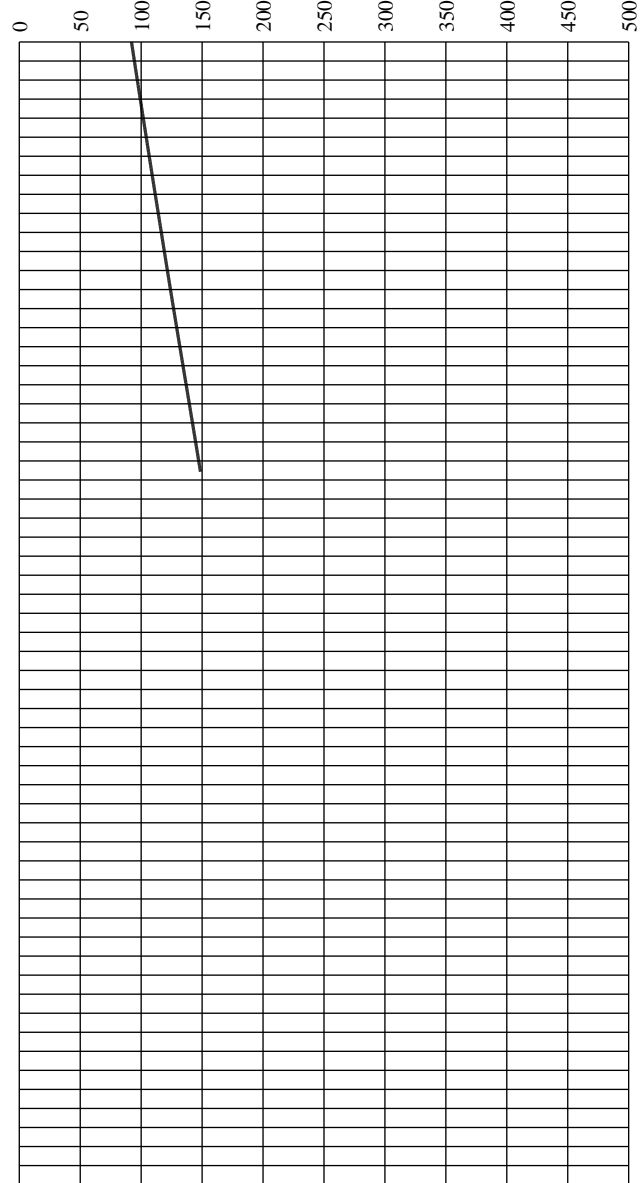
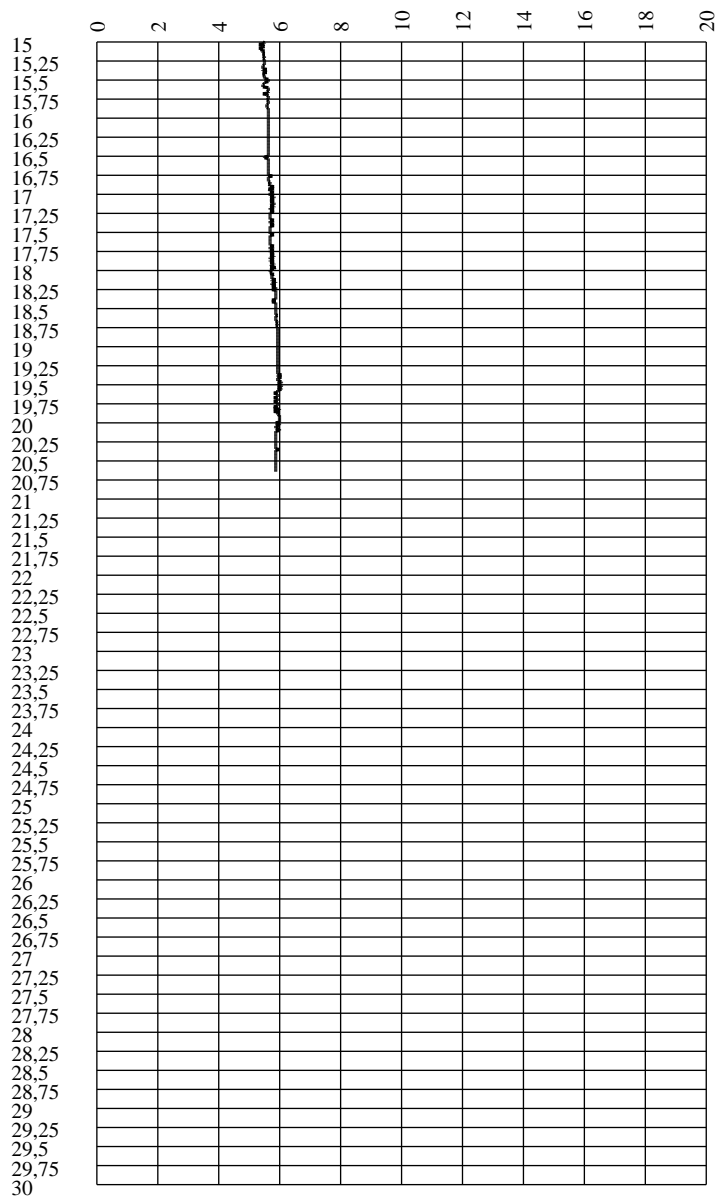
Speed [cm/sec]



Tilt [°]

Dist [cm]

Speed [cm/sec]





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Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-8	PROVA N°:	CPTU-8
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:		21/08/2014	Latitudine:	N 44,091413°
			Longitudine:	E 12,371931°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Savignano (FC) - Via Gatteo

Il presente certificato di prova si compone di n° pagine, esclusa la presente, ed ha per oggetto le seguenti prove:

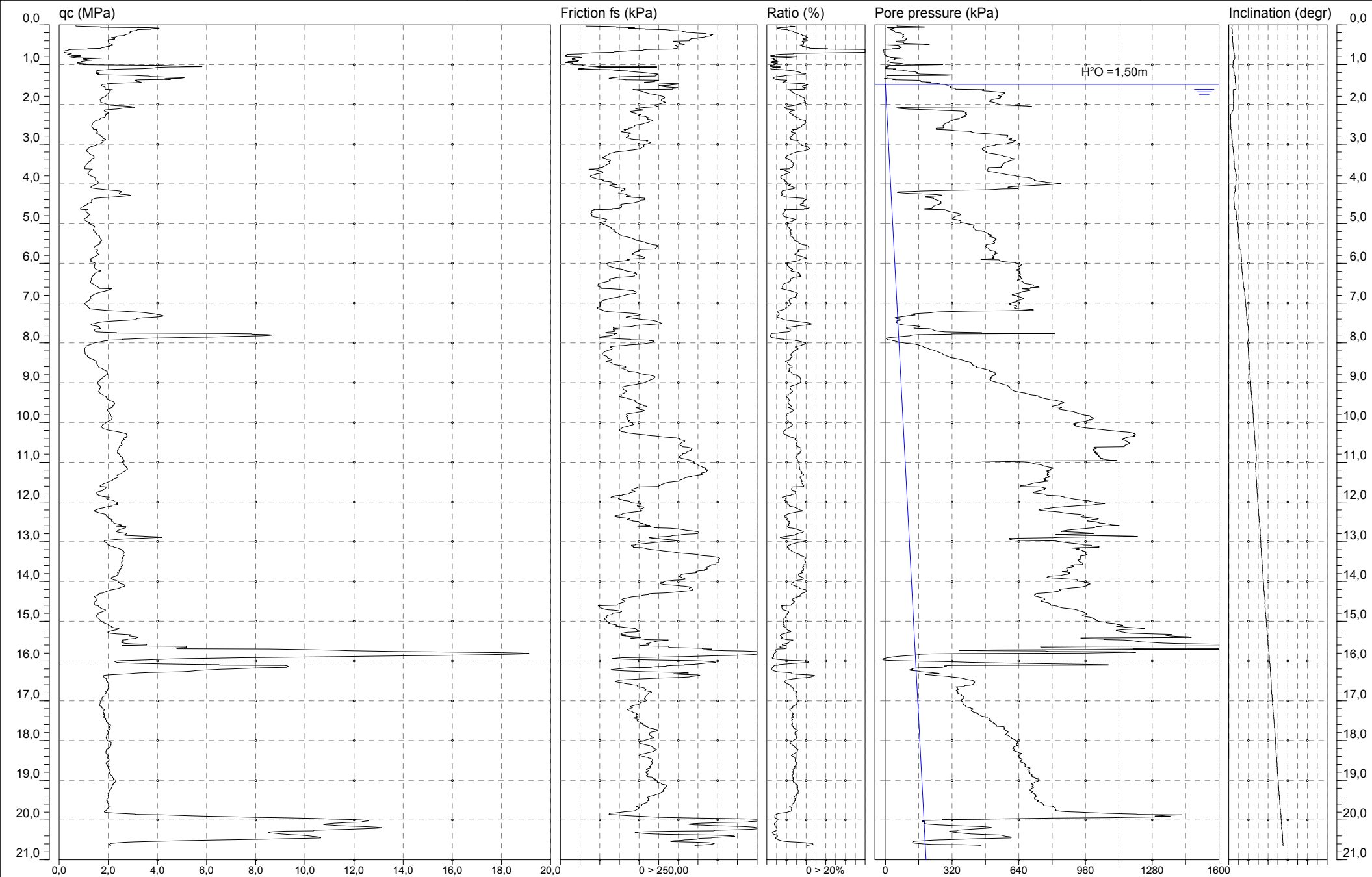
<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:
---------------------------	--	--------------------	-------------------------------

Normativa di Riferimento: A.G.I 1977





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Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/> CERTIFICATO N°:	C14-087-9	PROVA N°:	CPTU-9
<input type="checkbox"/> RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:	21/08/2014	Latitudine:	N 44,096173°
		Longitudine:	E 12,397192°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Savignano (FC) - Via Raffaello

Il presente certificato di prova si compone di n° pagine, esclusa la presente, ed ha per oggetto le seguenti prove:

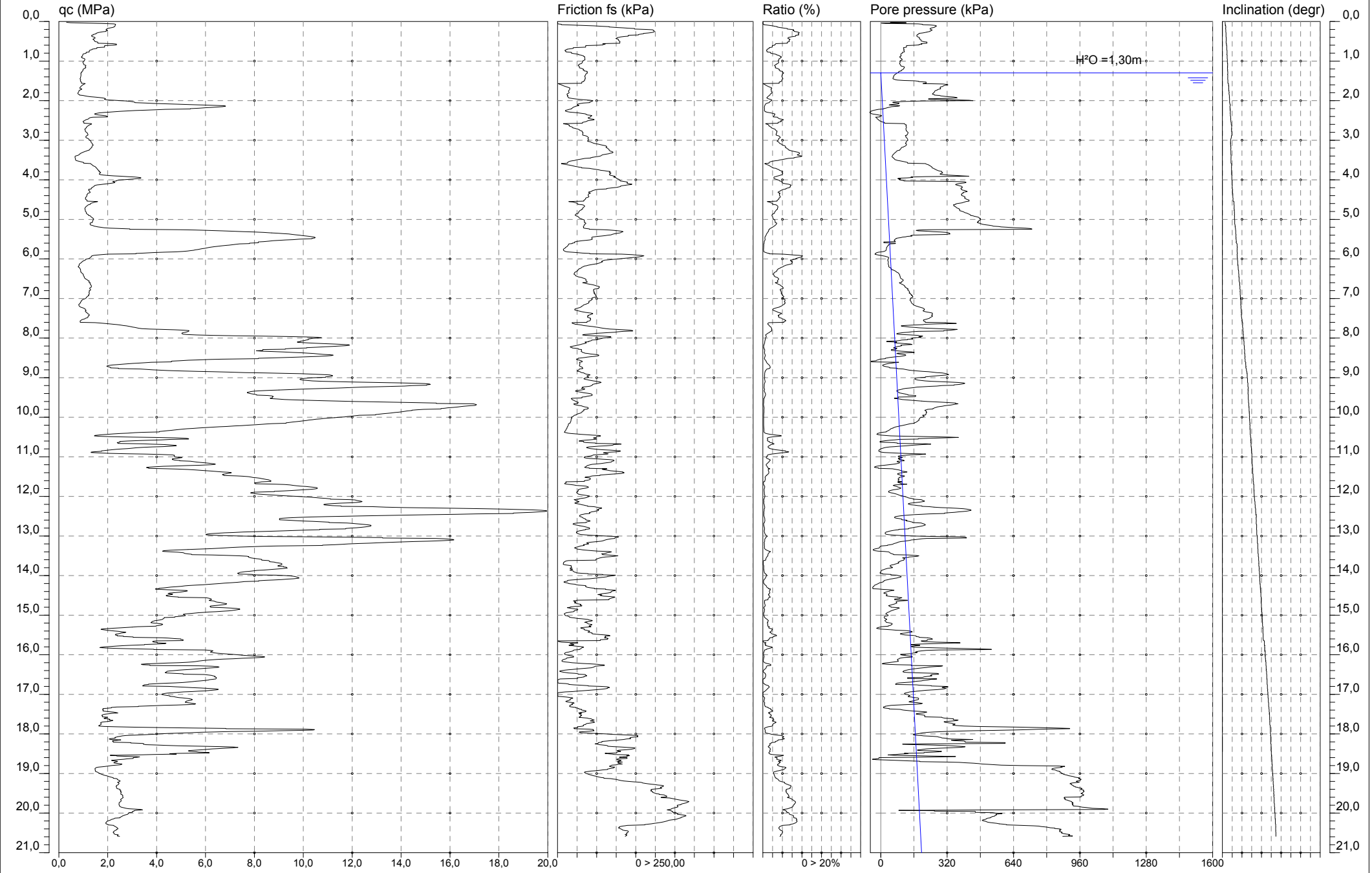
<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale	Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977





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Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/> CERTIFICATO N°:	C14-087-10	PROVA N°:	CPTU-10
<input type="checkbox"/> RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
DATA DI EMISSIONE:	21/08/2014	Latitudine:	N 44,104251°
		Longitudine:	E 12,4200298°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	San Mauro Pacoli - Via Togliatti

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

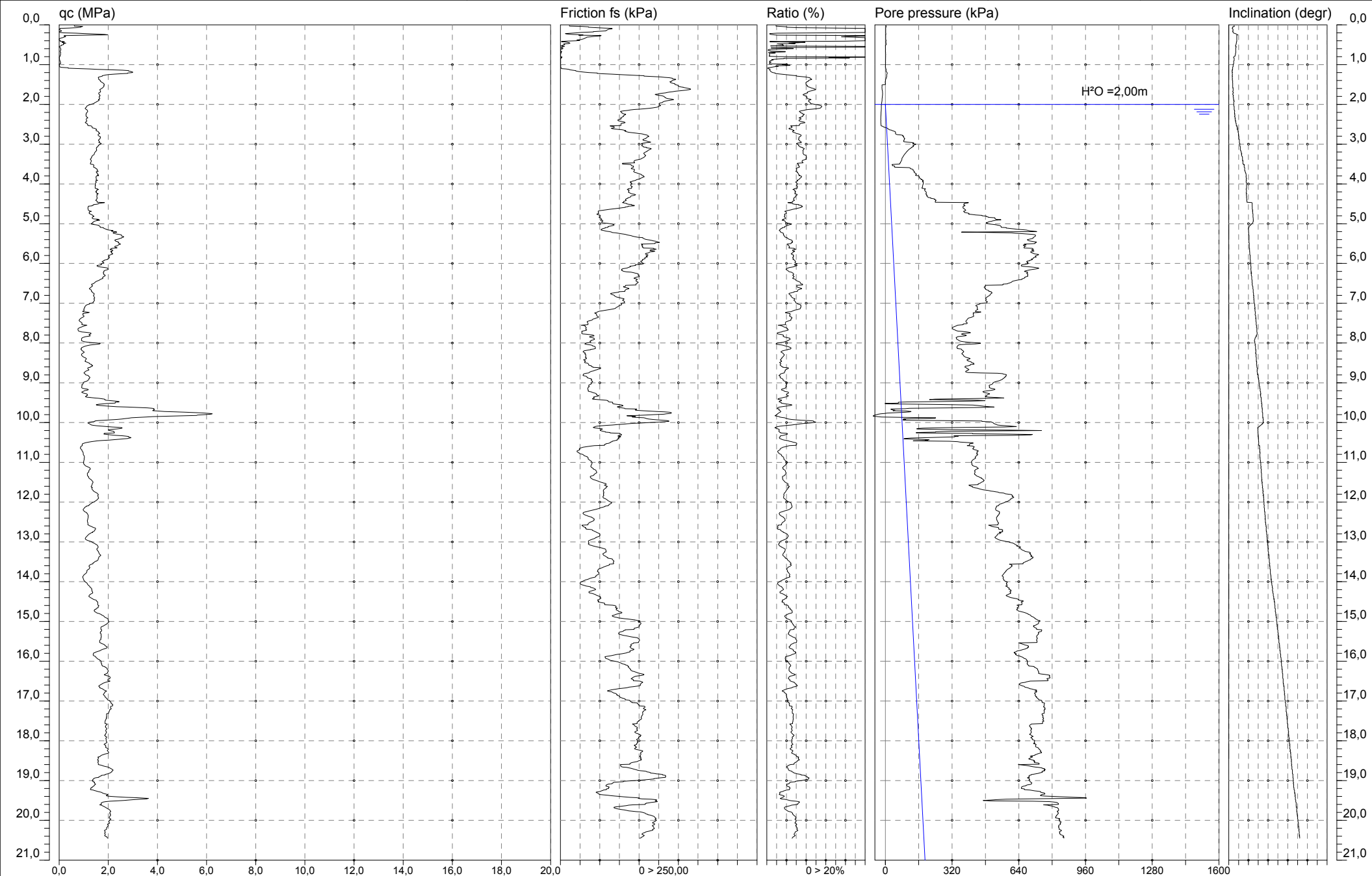
<input type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input checked="" type="checkbox"/>	Prova CPTU - Prova dissipazione
<input type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata: Matricola n.:

Allegati:

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977





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Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	C14-087-18	PROVA N°:	DH-1
<input type="checkbox"/>	RAPPORTO N°:		UBICAZIONE PROVA: (gradi decimali)	
	DATA DI EMISSIONE:	21/08/2014	Latitudine:	N 44,107670°
			Longitudine:	E 12,418614°

Riferimento Preventivo n°:	031-14	Commessa n°:	14-080
Verbale di accettazione n°:	VA14-087	del:	21/08/2014

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	San Mauro Pascoli (FC)

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

<input checked="" type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTe
<input type="checkbox"/>	Installazione assestimetro	<input type="checkbox"/>	Prova CPTU - Prova dissipazione
<input checked="" type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata:	CMV900D1	Matricola n.:	00422
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Allegati: Documentazione fotografica - Tabella PP e VT - Schema installazione strumentazione

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:
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Normativa di Riferimento: A.G.I 1977

		COMMITTENTE: PROGEO s.r.l.	SOND.N°: DH1	PROF.(m): 40.00
		CANTIERE: Zonazione sismica Valle del Rubicone - San Mauro Pascoli (FC)	QUOTA (m): p.d.c.	
		PERFORATRICE: CMV MK900 D1	LATITUDINE (°): N 44.107670°	
		METODO PERFORAZ.: Carotaggio continuo	LONGITUDINE (°): E 12.418614°	
RIVESTIMENTO: Ø 127 mm		ATTREZZO PERFORAZ.: Carotiere Ø 101 mm	DATA INIZ-FINE: 31/07/2014-01/08/2014	
PIEZOMETRO:			SCALA: 1:100	
RIF.PREV.N°: 031-14	CERTIFICATO N°: C14-087-18	RAPPORTO N°: -----	DATA DI EMISSIONE: 21/08/2014	PAGINA N°: 1 di 2

Scala 1:100	P.P. I [daN/cm²]	Vane Test [daN/cm²]	Profondita'	Stratigrafia	Descrizione	Campioni	Campioni Rim.	S.P.T. [n. colpi] P.A.	Falda	Pz.Norton	Inclinometro	Tubo Down Hole
1					Terreno di riporto costituito da limo sabbioso con macerie, ghiaia e radici							
2	2.0	0.90	1.50 1.75		Argilla limosa di colore marrone chiaro				1.90			
3			2.60 3.00		Limo sabbioso di colore marrone chiaro							
4	1.4	0.70			Sabbia limosa di colore marrone chiaro							
5	1.5	0.80			Argilla limosa di colore marrone chiaro - grigio con striature nere e giallastre							
6	1.7	0.80	5.10 5.60		Limo sabbioso di colore marrone chiaro							
7	1.7	0.80			Sabbia limosa di colore marrone chiaro							
8	2.0	1.00	6.60 7.00		Argilla limosa di colore marrone chiaro - grigio con striature nere e giallastre							
9	1.2	0.60			Limo argilloso di colore grigio con alcune striature nere e verdastre							
10	1.2	0.60										
11	1.0	0.50										
12	1.0	0.40	9.60		Limo sabbioso di colore grigio							
13	1.0	0.40										
14	1.2	0.60	11.20		Limo argilloso di colore grigio							
15	1.4	0.70	12.00		Campione indisturbato C.I.1	12.00						
16	1.4	0.70	12.60			C.I.1						
17	1.3	0.70			Limo argilloso di colore grigio							
18	1.2	0.60	14.30									
19	1.3	0.70										
20	1.8	0.90										
21	2.1	0.90										
22	1.7	1.00										
23	1.8	0.90										
24	1.9	0.90										
25	2.3	1.10										
26	2.2	1.10										
27	2.4	1.20										
28	2.5	1.20			Argilla limosa di colore grigio con alcune striature nere e giallastre e con rari bioclasti							
29	2.0	1.00										
30	2.3	1.10										
31	2.4	1.20										
32	2.2	1.00										
33	2.8	1.30										
34	2.5	1.20										
35	2.0	1.00										
36	2.1	1.00										
37	2.0	0.90	23.00		Sabbia limosa di colore grigio							
38	1.6	0.80	23.35									
39	1.6	0.80										
40	1.6	0.80										
41	1.2	0.60			Argilla limosa di colore grigio con piccoli calcinelli							
42	1.9	0.80										
43	1.4	0.70	26.40		Sabbia fine - media di colore grigio - giallastro							
44	1.2	0.70	27.10									
45	1.3	0.70			Argilla limosa di colore marrone chiaro - grigio							
46	1.6	0.80										
47	1.2	0.60	28.75		Sabbia limosa di colore marrone chiaro							
48			28.85		Limo sabbioso di colore marrone chiaro							
49			29.15		Argilla limosa di colore marrone chiaro - grigio							

		COMMITTENTE: PROGEO s.r.l.	SOND.N°: DH1	PROF.(m): 40.00
		CANTIERE: Zonazione sismica Valle de Rubicone - San Mauro Pascoli (FC)	QUOTA (m): p.d.c.	
		PERFORATRICE: CMV MK900 D1	LATITUDINE (°): N 44.107670°	
		METODO PERFORAZ.: Carotaggio continuo	LONGITUDINE (°): E 12.418614°	
RIVESTIMENTO: Ø 127 mm		ATTREZZO PERFORAZ.: Carotiere Ø 101 mm	DATA INIZ-FINE: 31/07/2014-01/08/2014	
PIEZOMETRO:			SCALA: 1:100	
RIF.PREV.N°: 031-14	CERTIFICATO N°: C14-087-18	RAPPORTO N°: -----	DATA DI EMISSIONE: 21/08/2014	PAGINA N°: 2 di 2

Scala 1:100	P.P. I [daN/cm²]	Vane Test [daN/cm²]	Profondita'	Stratigrafia	Descrizione	Campioni	Campioni Rim.	S.P.T. [n. colpi] P.A.	Falda	Pz.Norton	Inclinometro	Tubo Down Hole
31	1.3 1.2 2.4	0.70 0.60 1.20	31.00		Argilla limosa di colore marrone chiaro - grigio							
32	2.8 2.7	1.40 1.20	32.10		Argilla limosa di colore grigio con striature giallastre e nere e con calcinelli							
33	2.1 2.0	1.00 0.90	32.30		Sabbia limosa di colore grigio - giallastro							
34	2.2 1.9	1.00 1.00			Argilla limosa di colore grigio con striature giallastre e nere e con calcinelli							
35			34.50		Campione indisturbato C.I.2	34.50						
36	1.6 3.8	0.80 1.60	35.10			35.10						
37	2.0	1.10										
38	2.0 2.0 2.0	1.00 1.00 1.00			Argilla limosa di colore grigio con striature giallastre e nere e con calcinelli							
39	2.3 3.0	1.20 1.40										
40	1.6 3.0	0.80 1.40	40.00									40.00
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

Note:
Livello acqua rilevato a fine sondaggio a -1.90 m dal p.d.c.

Installato tubo in pvc Ø 3" per down-hole a -40.00 m dal p.d.c.

C.I. = campione indisturbato



TABELLA POCKET PENETROMETER E VANE TEST

COMMITTENTE: PROGEO s.r.l.	SONDAGGIO N° DH1
CANTIERE: Zonazione sismica Valle del Rubicone	RIF. PREV. N°: 031-14
LOCALITA' San Mauro Pascoli (FC)	DATA DI ESECUZIONE 31/07/2014
N° CERTIFICATO: C14-087-18 Pagina n. 1 di 2	DATA DI EMISSIONE: 21/08/2014

Quota	P.P.	T.V.
m	Kg/cmq	Kg/cmq
1,60	2,0	0,90
3,40	1,4	0,70
3,60	1,6	0,80
3,80	1,5	0,80
4,30	1,6	0,60
4,50	1,7	0,80
4,80	1,7	0,80
5,05	1,6	0,80
6,90	2,0	1,00
7,15	1,2	0,60
7,50	1,2	0,60
7,95	1,2	0,60
8,10	1,0	0,40
8,40	1,0	0,50
8,70	0,8	0,40
8,90	1,0	0,40
9,30	1,0	0,40
9,50	1,0	0,40
11,30	1,2	0,60
11,50	1,3	0,60
11,90	1,4	0,70
12,10	1,4	0,80
12,45	1,4	0,70
12,90	1,3	0,70
13,50	1,2	0,60
13,90	1,3	0,70
14,50	1,8	0,90
14,90	1,7	0,90
15,10	2,0	1,00
15,40	2,1	1,00
15,70	2,2	1,00
15,90	1,8	0,90
16,05	1,8	0,90
16,40	1,9	0,90
16,50	2,0	1,00

Quota	P.P.	T.V.
m	Kg/cmq	Kg/cmq
16,90	2,3	1,10
17,15	2,2	1,00
17,40	2,2	1,10
17,70	2,5	1,20
17,90	2,4	1,20
18,20	2,1	1,10
18,40	2,5	1,20
18,70	2,2	1,00
18,90	2,0	1,00
19,20	2,1	0,90
19,40	2,3	1,10
19,70	3,2	1,70
19,90	2,4	1,20
20,15	2,0	1,00
20,40	2,2	1,00
20,65	2,3	1,10
20,85	2,8	1,30
21,15	2,8	1,20
21,35	2,5	1,20
21,70	2,4	1,10
21,90	2,0	1,00
22,15	2,2	1,00
22,40	2,1	1,00
22,65	2,3	1,10
22,90	2,0	0,90
23,50	1,6	0,80
23,90	1,6	0,80
24,30	1,6	0,80
24,50	1,2	0,60
24,90	1,2	0,60
25,10	1,9	0,80
25,40	1,9	0,80
25,70	1,3	0,60
25,90	1,4	0,70
26,15	1,4	0,70

Quota	P.P.	T.V.
m	Kg/cmq	Kg/cmq
27,20	1,2	0,70
27,50	1,3	0,70
27,75	1,5	0,70
28,15	1,6	0,80
28,40	1,2	0,60
28,70	1,2	0,60
29,20	1,6	0,80
29,75	1,4	0,80
29,95	1,4	0,80
30,10	1,3	0,70
30,50	1,2	0,60
30,60	1,8	0,90
30,90	2,4	1,20
31,10	2,5	1,20
31,50	2,8	1,40
31,65	2,6	1,20
31,90	2,7	1,20
32,45	2,1	1,00
32,60	1,6	0,80
32,90	2,0	0,90
33,10	1,8	0,90
33,40	2,0	1,00
33,60	2,2	1,10
34,10	1,9	1,00
34,40	1,8	0,80
35,60	1,6	0,80
35,90	1,9	0,90
36,10	3,8	1,60
36,40	3,0	1,40
36,60	2,0	1,10
36,90	2,0	1,10
37,20	2,0	1,00
37,50	2,0	1,00
37,70	2,0	1,00
37,90	2,0	1,00



SOGEO s.r.l.

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Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 05/07/2010

SCHEMA INSTALLAZIONE STRUMENTI

Tubo per indagine geofisica "Down-Hole"

COMMITTENTE: PROGEO s.r.l.

SONDAGGIO N° DH1

CANTIERE: Zonazione Sismica Valle del Rubicone

RIF. PREV. N: 031-14

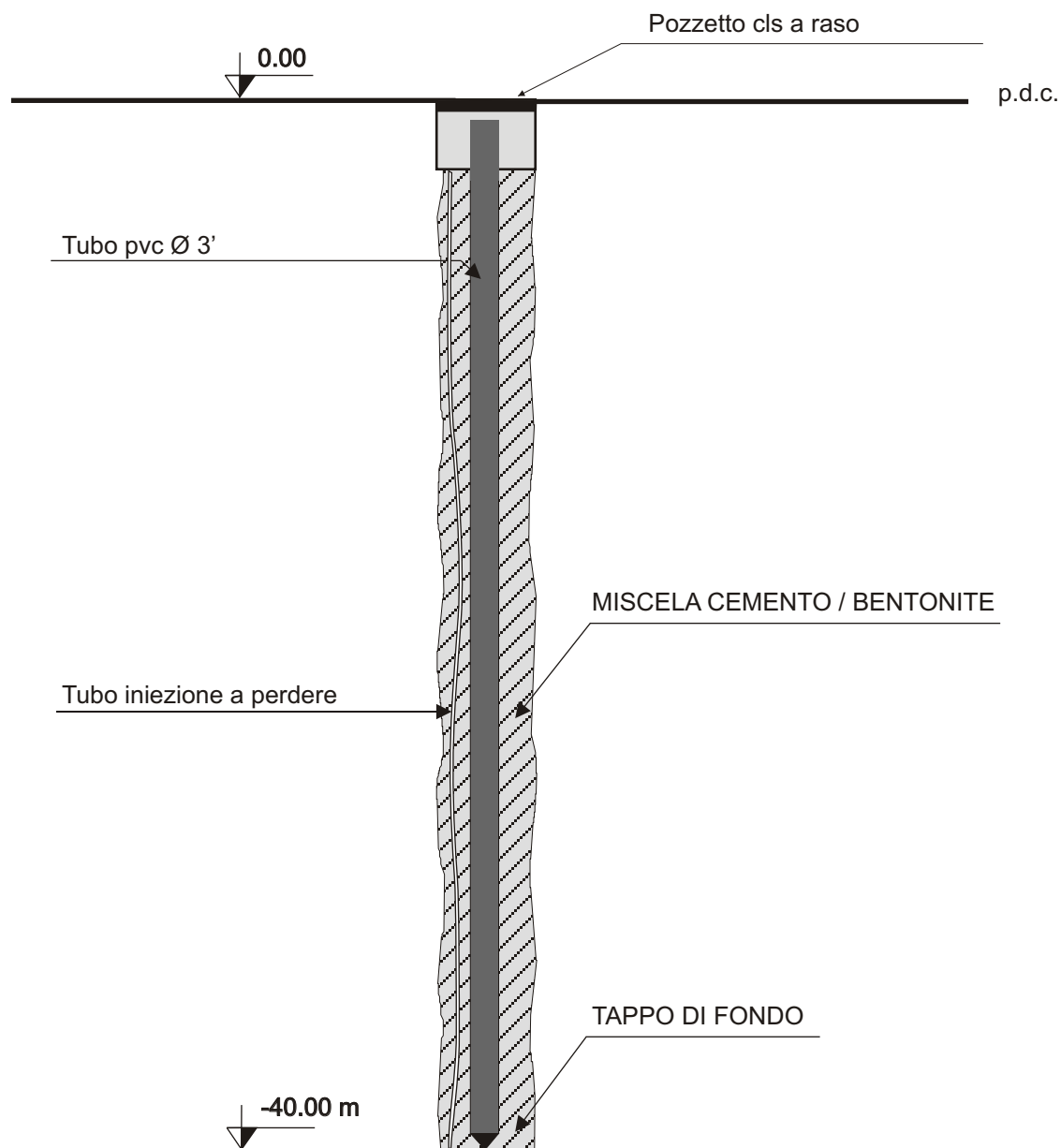
LOCALITA': San Mauro Pascoli (FC)

DATA DI ESECUZIONE: 01/08/2014

N° CERTIFICATO: C14-087-18b

N° RAPPORTO: -----

DATA DI EMISSIONE: 21/08/2014



N.B: SCHEMA NON IN SCALA

Lo Sperimentatore	Note ed osservazioni:	Il Direttore del Laboratorio



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INDAGINI GEOLOGICHE ED AMBIENTALI
Via S. Folto n. 43 - 48022 S. Folto di Lugo (RA)
Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com

COMMITTENTE: PROGEO s.r.l.
RIF. N°: 031-14

LOCALITA': San Mauro Pascoli (FC)

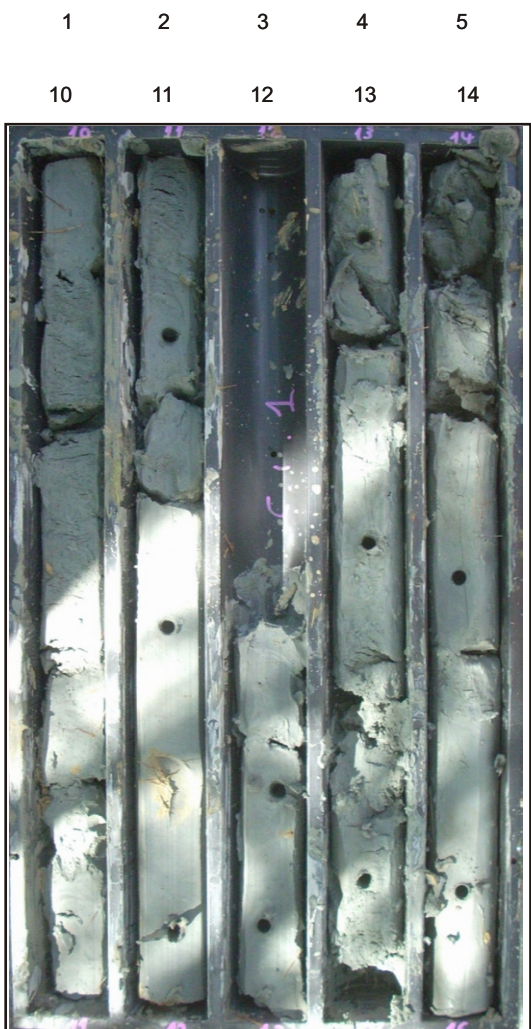
SONDAGGIO N: DH1
ALLEGATO A: C14-087-18
DATA: 31/07/2014



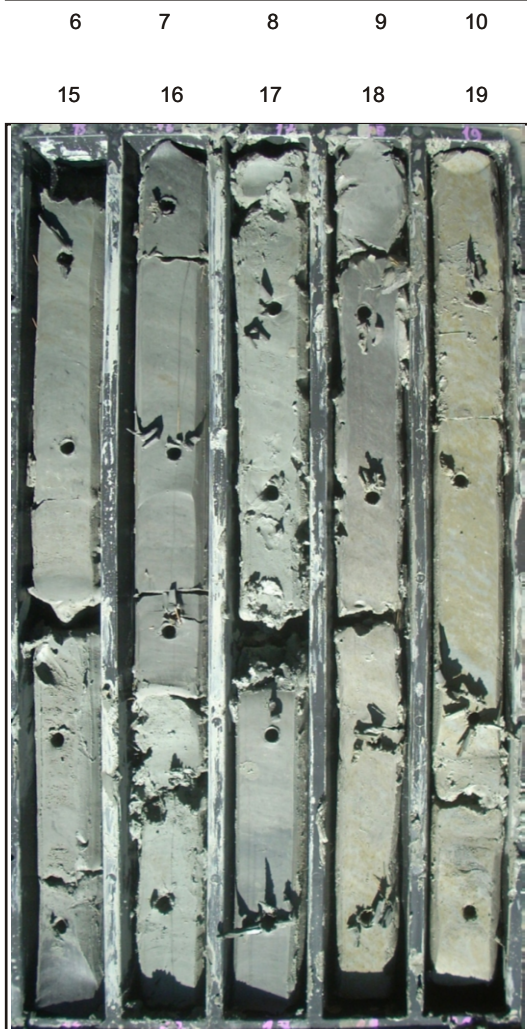
Cassa 1 da 0.0 a -5.0 m



Cassa 2 da -5.0 a -10.0 m



Cassa 3 da -10.0 a -15.0 m



Cassa 4 da -15.0 a -20.0 m



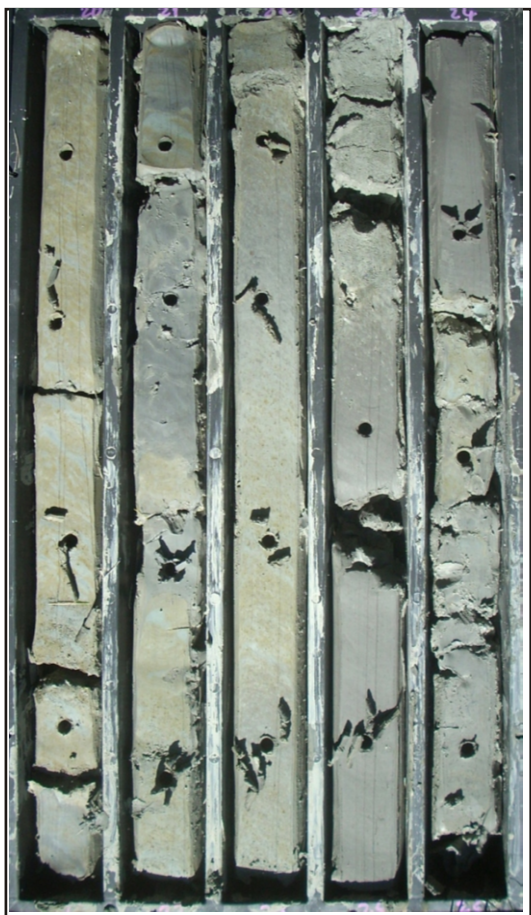
SOGGEO s.r.l.
INDAGINI GEOLOGICHE ED AMBIENTALI
Via S. Folto n. 43 - 48022 S. Folto di Lugo (RA)
Tel. 054522042 - Fax 054534443 - E-mail: soggeo@soggeo-srl.com

COMMITTENTE: PROGEO s.r.l.
RIF. N°: 031-14

LOCALITA': San Mauro Pascoli (FC)
ALLEGATO A: C14-087-18

SONDAGGIO N: DH1
DATA: 31/07/2014

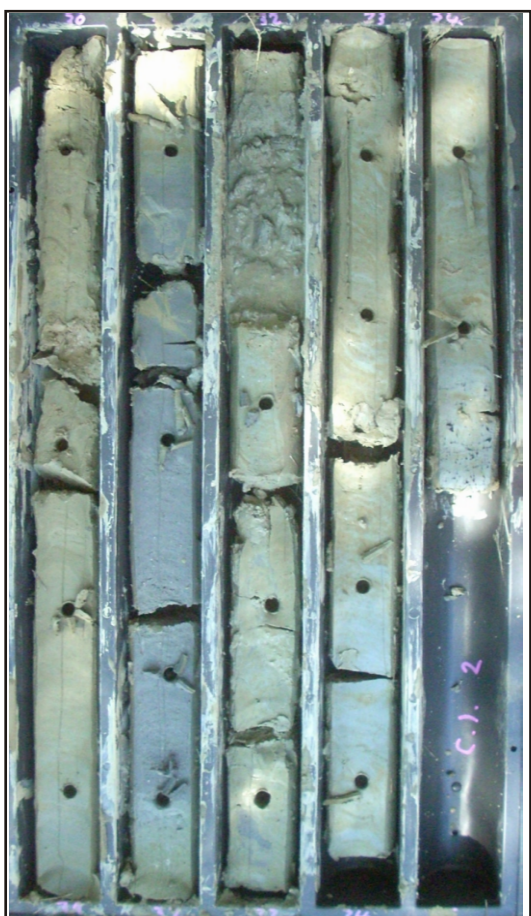
20 21 22 23 24



Cassa 5 da -20.0 a -25.0 m

21 22 23 24 25

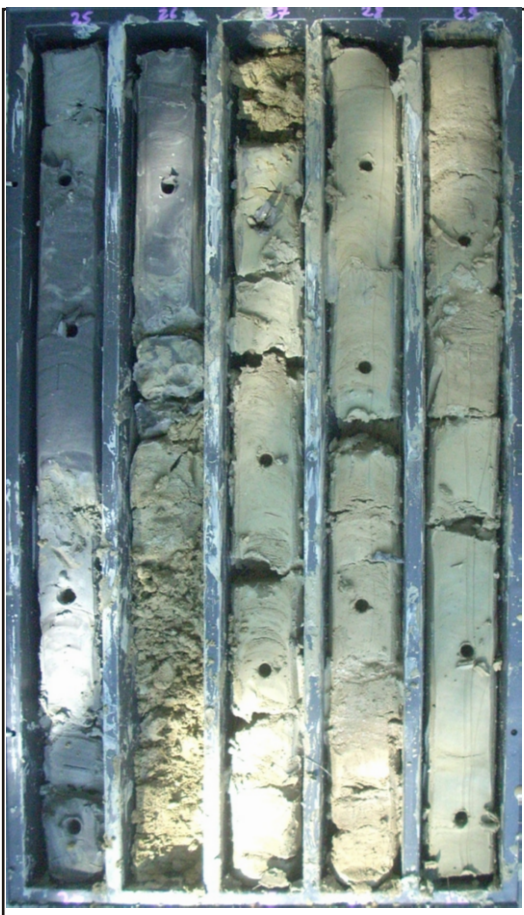
30 31 32 33 34



Cassa 7 da -30.0 a -35.0 m

31 32 33 34 35

25 26 27 28 29



Cassa 6 da -25.0 a -30.0 m

26 27 28 29 30

35 36 37 38 39



Cassa 8 da -35.0 a -40.0 m

36 37 38 39 40



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Via Edison 1/1 - 48022 LUIGO (RA)
Tel. 054522042 - Fax 054534443 - Email: soggeo@soggeo-srl.com

COMMITTENTE: PROGEO s.r.l.

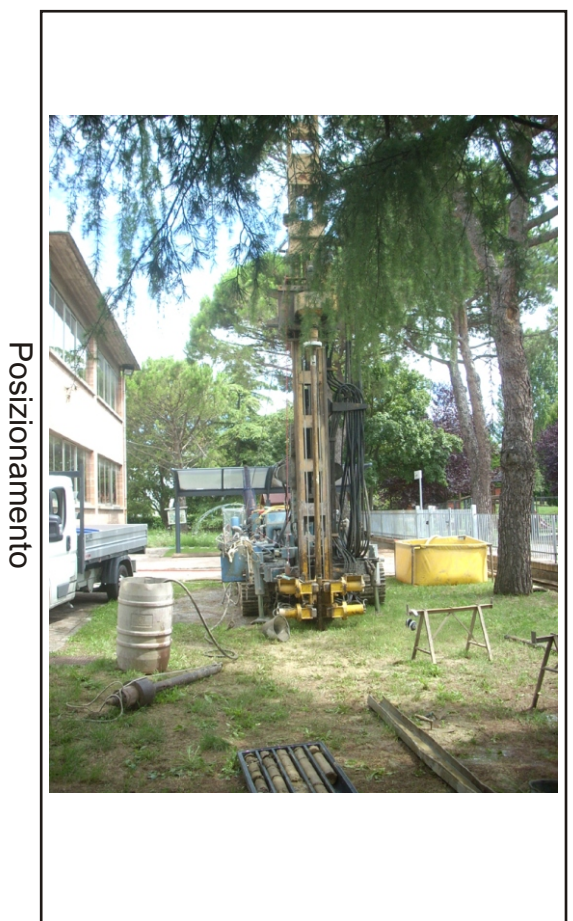
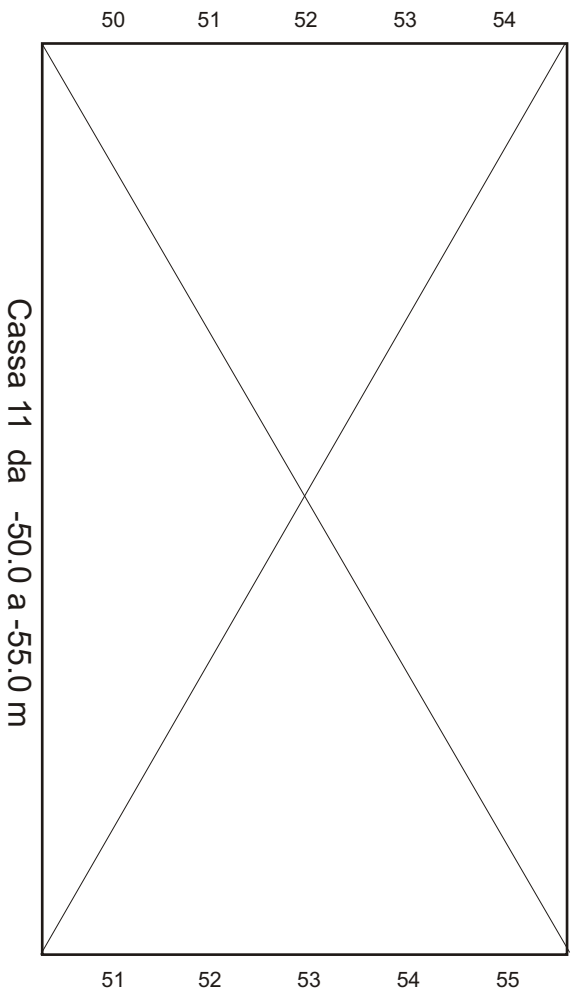
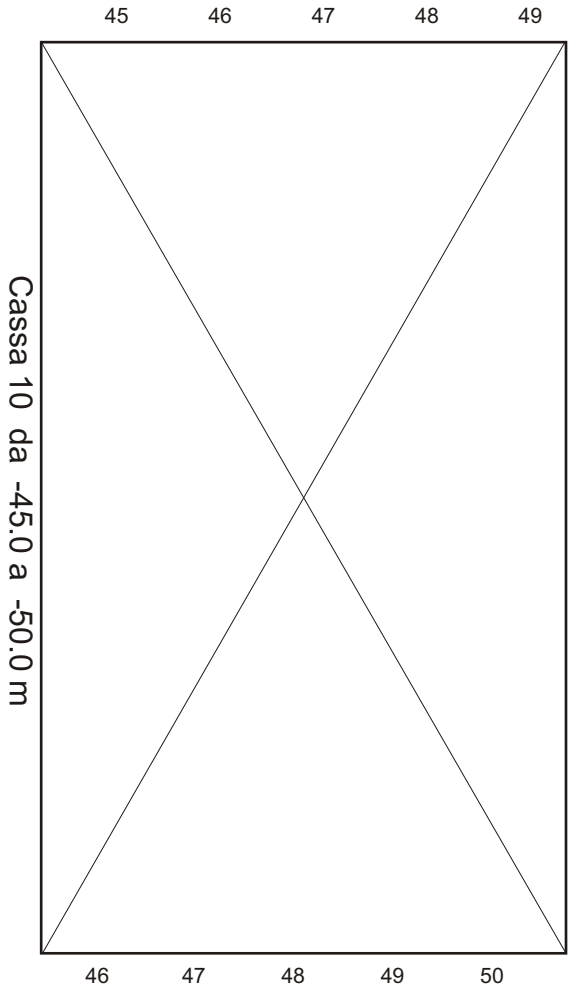
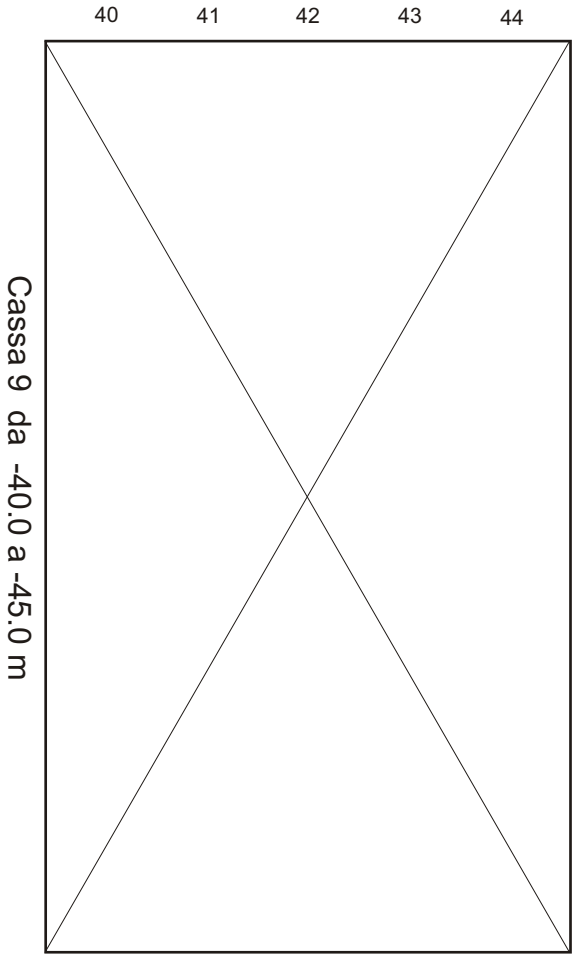
RIF. N° : 031-14

LOCALITA': San Mauro Pascoli (FC)

ALLEGATO A: C14-087-18

SONDAGGIO N: DH1

DATA: 31/07/2014



COMMITTENTE	UNIONE COMUNI DEL RUB.
DOWN HOLE	DH1
Località	SAN MAURO PASCOLI
Data acquisizione	20/08/2014

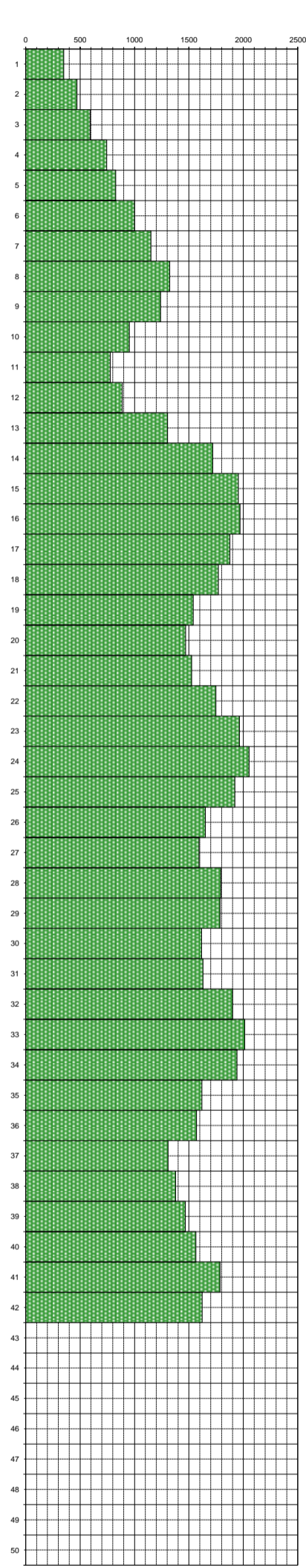
Codice lavoro 1422



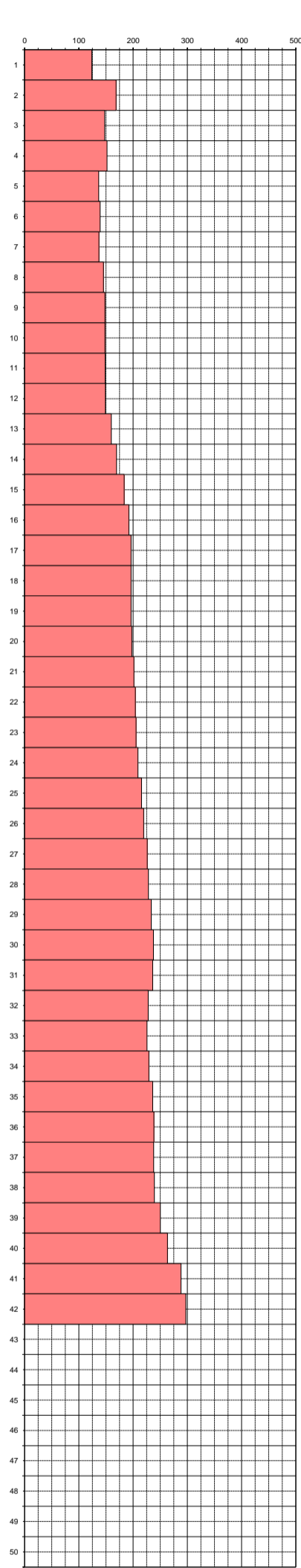
Profondità	Vp m/sec.	Vs m/sec.	v	γ T/m³	E _{din} Kg/cm²	G _{din} Kg/cm²	K _{din} Kg/cm²
------------	--------------	--------------	---	-----------	----------------------------	----------------------------	----------------------------

0							
1	350	124	0.43	1.55	695	243	1614
2	471	169	0.43	1.64	1358	476	3083
3	592	148	0.47	1.72	1119	381	5628
4	745	152	0.48	1.79	1251	423	9567
5	827	137	0.49	1.83	1034	348	12282
6	1000	139	0.49	1.89	1116	374	18817
7	1151	137	0.49	1.95	1112	372	25775
8	1324	145	0.49	2.00	1286	430	35129
9	1240	148	0.49	1.97	1320	442	30327
10	953	148	0.49	1.88	1249	420	16807
11	777	149	0.48	1.81	1203	406	10566
12	886	149	0.49	1.85	1247	420	14274
13	1304	160	0.49	1.99	1548	519	33846
14	1719	170	0.50	2.10	1841	616	62480
15	1954	183	0.50	2.15	2208	738	82779
16	1970	193	0.50	2.16	2436	815	84162
17	1876	197	0.49	2.14	2514	841	75520
18	1770	197	0.49	2.11	2485	832	66365
19	1540	197	0.49	2.06	2417	810	48633
20	1470	198	0.49	2.04	2426	814	43821
21	1525	202	0.49	2.05	2541	852	47523
22	1748	204	0.49	2.11	2678	897	64439
23	1964	206	0.49	2.15	2776	929	83453
24	2052	209	0.49	2.17	2898	969	91990
25	1922	216	0.49	2.15	3045	1019	79429
26	1651	220	0.49	2.08	3057	1025	56553
27	1593	226	0.49	2.07	3214	1079	52123
28	1792	228	0.49	2.12	3360	1126	67837
29	1786	234	0.49	2.12	3512	1177	67213
30	1616	238	0.49	2.08	3559	1195	53698
31	1629	236	0.49	2.08	3529	1185	54680
32	1901	228	0.49	2.14	3387	1134	77367
33	2013	226	0.49	2.16	3359	1125	87902
34	1942	229	0.49	2.15	3441	1152	81067
35	1619	236	0.49	2.08	3521	1182	53916
36	1570	238	0.49	2.06	3561	1196	50265
37	1308	238	0.48	1.99	3415	1151	33260
38	1377	239	0.48	2.01	3488	1175	37377
39	1467	250	0.49	2.04	3866	1302	42967
40	1564	263	0.49	2.06	4336	1459	49480
41	1785	288	0.49	2.12	5334	1794	66349
42	1622	297	0.48	2.08	5540	1868	53191
43							
44							
45							
46							
47							
48							
49							
50							

VELOCITA' ONDE DI COMPRESIONE
m/sec



VELOCITA' ONDE DI TAGLIO
m/sec



Legenda parametri dinamici				
Tp	Tempi onde di compressione	millisecondi	γ	Peso di volume T/m³
Ts	Tempi onde di taglio	millisecondi	E_{din}	Modulo di Elasticità dinamico Kg/cm²
Vp	Velocità onde di compressione	m/sec	G_{din}	Modulo di Taglio dinamico Kg/cm²
Vs	Velocità onde di taglio	m/sec	K_{din}	Modulo di Compressibilità dinamico Kg/cm²
v	Coefficiente di Poisson	-		

CLASSIFICAZIONE SISMICA DEI SUOLI
(D.M. del 14/01/2008)

$$Vs_{30} = \frac{30}{\sum_{i=1,N} \frac{h_i}{v_i}}$$

Vs₃₀ = > 174 m/sec

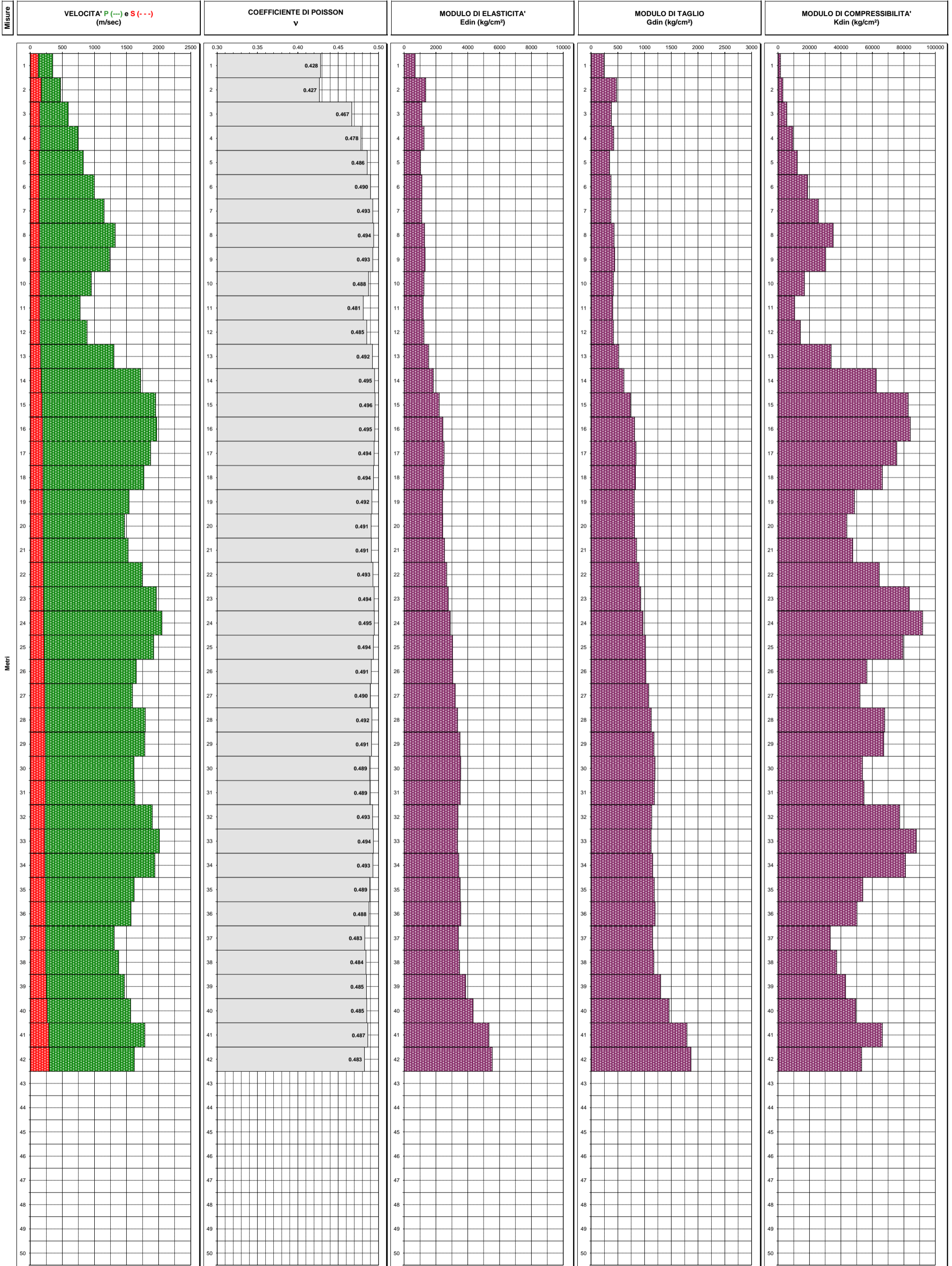
CATEGORIA SUOLO = D - C

COMMITTENTE
DOWN HOLE
Località
Data acquisizione

UNIONE COMUNI DEL RUB.
DH1
SAN MAURO PASCOLI
20/08/2014



GRAFICI DEI PARAMETRI ELASTICI DINAMICI





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S.R.L.
INDAGINI GEOGNOSTICHE ED AMBIENTALI

Via san Potito 43 - 48022 LUGO (RA)
Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 01/07/2010

<input checked="" type="checkbox"/>	CERTIFICATO N°:	<input type="text" value="C14-087-19"/>	PROVA N°:	<input type="text" value="DH-2"/>
<input type="checkbox"/>	RAPPORTO N°:	<input type="text"/>	UBICAZIONE PROVA: (gradi decimali)	
	DATA DI EMISSIONE:	<input type="text" value="21/08/2014"/>	Latitudine:	N 44,082965°
			Longitudine:	E 12,415632°

Riferimento Preventivo n°:	<input type="text" value="031-14"/>	Commessa n°:	<input type="text" value="14-080"/>
Verbale di accettazione n°:	<input type="text" value="VA14-087"/>	del:	<input type="text" value="21/08/2014"/>

Richiedente:	Dott. Gabriele Pulelli
Committente:	PROGEO s.r.l., Via Talete 10/8 - 47122 FORLI'
Cantiere:	Zonazione Sismica Valle del Rubicone
Località:	Savignano sul Rubicone (FC)

Il presente certificato di prova si compone di n° **pagine, esclusa la presente, ed ha per oggetto le seguenti prove:**

<input checked="" type="checkbox"/>	Scheda stratigrafica	<input type="checkbox"/>	Prova scissometrica a fondo foro
<input type="checkbox"/>	Installazione piezometro Casagrande	<input type="checkbox"/>	Prova SCPT
<input type="checkbox"/>	Installazione Piezometro Norton	<input type="checkbox"/>	Prova CPT
<input type="checkbox"/>	Installazione Inclinometro	<input type="checkbox"/>	Prova CPTE
<input type="checkbox"/>	Installazione assestimetro	<input type="checkbox"/>	Prova CPTU - Prova dissipazione
<input checked="" type="checkbox"/>	Installazione tubo per prospezione geofisica	<input type="checkbox"/>	Prova di carico su piastra
<input type="checkbox"/>	Prova di permeabilità LEFRANC - LUGEON	<input type="checkbox"/>	Prova di densità in situ

Attrezzatura utilizzata:	<input type="text" value="CMV900D1"/>	Matricola n.:	<input type="text" value="00422"/>
--------------------------	---------------------------------------	---------------	------------------------------------

Allegati: Documentazione fotografica - Tabella PP e VT - Schema installazione strumentazione

Timbro blu sull'originale		Lo Sperimentatore:	Il Direttore del Laboratorio:

Normativa di Riferimento: A.G.I 1977

		COMMITTENTE: PROGEO s.r.l.	SOND.N°: DH2	PROF.(m): 50.00
		CANTIERE: Zonazione sismica Valle del Rubicone - Savignano sul Rubicone (FC)	QUOTA (m): p.d.c.	
		PERFORATRICE: CMV MK900 D1	LATITUDINE (°): N 44.082965°	
		METODO PERFORAZ.: Carotaggio continuo	LONGITUDINE (°): E 12.415632°	
RIVESTIMENTO: Ø 127 mm		ATTREZZO PERFORAZ.: Carotiere Ø 101 mm	DATA INIZ-FINE: 30/07/2014-31/07/2014	
PIEZOMETRO:			SCALA: 1:100	
RIF.PREV.N°: 031-14	CERTIFICATO N°: C14-087-19	RAPPORTO N°: -----	DATA DI EMISSIONE: 21/08/2014	PAGINA N°: 2 di 2

Scala 1:100	P.P. I [daN/cm²]	Vane Test [daN/cm²]	Profondita'	Stratigrafia	Descrizione	Campioni	Campioni Rim.	S.P.T. [n. colpi] P.A.	Falda	Pz.Norton	Inclinometro	Tubo Down Hole
31	1.5	0.70										
	2.0	1.00										
32	2.4	1.10										
	1.6	0.90			Argilla limosa di colore grigio con striature nere e, da -31.0 m, anche giallastre e con calcinelli							
	1.5	0.70										
33	2.0	0.90										
	2.6	1.20										
34	2.8	1.40	34.00									
	1.2	0.60										
35	1.8	0.90			Limo argilloso di colore grigio - giallastro con calcinelli alternato, decimetricamente e centimetricamente, con limo sabbioso di colore grigio - giallastro							
	2.0	0.90										
	1.5	0.70										
36	1.7	0.80	36.50									
	2.1	1.00										
37	2.0	1.00										
	2.4	1.20			Argilla limosa di colore grigio - marrone - rossastro con striature giallastre e nere. Presenti calcinelli							
38	1.9	0.90										
	2.5	1.20										
39	3.8	1.90										
	2.5	1.10	39.90									
40	3.0	1.50	40.40		Limo sabbioso di colore marrone chiaro							
	3.6	1.80										
41	3.5	1.60										
	3.0	1.30										
42	3.8	1.60										
	2.8	1.20			Argilla limosa di colore grigio con striature giallastre, nere e con calcinelli							
43	2.8	1.30										
	3.0	1.40										
44	2.8	1.40										
	2.2	1.10	45.15									
45	1.7	0.90	45.30		Limo sabbioso di colore grigio - giallastro							
	1.6	0.80	45.50		Argilla limosa di colore grigio con striature giallastre, nere e con calcinelli							
46	1.8	0.90	45.75		Limo sabbioso di colore grigio - giallastro							
	3.0	1.50										
47	2.9	1.30										
	2.2	1.10										
48	2.5	1.20										
	2.4	1.20			Argilla limosa di colore grigio con striature giallastre, nere e con calcinelli							
49	2.2	1.10										
	2.1	1.00	50.00									50.00
50												
51												
52												
53												
54												
55												

Note:
Livello acqua rilevato a fine sondaggio a -2.10 m dal p.d.c.

Installato tubo in pvc Ø 3" per down-hole a -50.00 m dal p.d.c.

C.I. = campione indisturbato




TABELLA POCKET PENETROMETER E VANE TEST

COMMITTENTE: PROGEO s.r.l.	SONDAGGIO N° DH2
CANTIERE: Zonazione sismica Valle del Rubicone	RIF. PREV. N°: 031-14
LOCALITA' Savignano sul Rubicone (FC)	DATA DI ESECUZIONE 30/07/2014
N° CERTIFICATO: C14-087-19 Pagina n. 1 di 2	DATA DI EMISSIONE: 21/08/2014

Quota m	P.P. Kg/cmq	T.V. Kg/cmq
0,25	3,2	1,20
0,75	3,0	1,30
1,25	3,0	1,20
2,35	1,8	0,90
2,75	2,0	1,10
3,10	2,0	1,10
3,25	2,3	1,20
3,65	2,3	1,20
3,90	2,2	1,10
4,05	2,6	1,30
4,25	2,5	1,30
4,60	2,5	1,30
4,95	2,4	1,20
5,10	1,6	0,80
65,35	1,5	0,70
5,70	1,5	0,80
7,35	1,7	0,90
7,65	2,0	1,00
8,35	2,0	1,00
9,50	2,5	1,30
9,85	2,8	1,40
10,60	2,6	1,20
10,90	2,7	1,30
11,10	2,6	1,30
11,40	2,5	1,30
11,60	2,4	1,20
11,90	2,4	1,20
12,10	2,5	1,20
12,40	2,5	1,20
12,60	3,0	1,50
12,90	2,8	1,40
13,25	2,2	1,10
13,50	2,7	1,20
13,75	2,5	1,20
14,25	3,0	1,50

Quota m	P.P. Kg/cmq	T.V. Kg/cmq
14,50	3,0	1,50
14,75	3,5	1,60
16,10	3,0	1,50
16,40	2,8	1,30
16,60	2,0	1,00
16,90	1,2	0,70
17,90	2,0	1,00
18,30	2,7	1,20
18,60	1,2	0,60
18,90	1,5	0,70
19,10	1,5	0,80
19,40	1,6	0,80
19,60	2,0	1,00
19,90	2,0	1,00
20,10	2,7	1,30
20,40	2,5	1,20
20,60	2,8	1,40
20,90	2,8	1,40
21,10	2,0	1,00
21,40	1,6	0,80
21,60	1,8	0,70
21,90	1,2	0,70
23,10	1,5	0,70
23,40	1,8	0,90
23,60	1,7	0,90
23,90	1,5	0,70
24,10	1,8	0,90
24,90	2,0	1,00
26,40	1,9	0,80
26,60	1,6	0,80
26,90	1,8	0,80
27,35	1,6	0,70
29,95	2,0	1,00
30,10	1,6	0,80
30,40	1,5	0,70

Quota m	P.P. Kg/cmq	T.V. Kg/cmq
30,60	2,0	1,00
30,90	2,0	1,00
31,10	2,2	1,00
31,40	2,4	1,10
31,60	1,8	0,90
31,90	1,6	0,90
32,10	1,5	0,70
32,40	1,5	0,70
32,60	1,6	0,70
32,90	2,0	0,90
33,10	2,4	1,20
33,40	2,6	1,20
33,60	2,8	1,30
33,90	2,8	1,40
34,85	1,2	0,60
35,15	1,8	0,90
35,80	2,0	0,90
36,15	1,5	0,70
36,40	1,7	0,80
36,60	2,0	1,00
36,90	2,1	1,00
37,10	2,0	1,00
37,40	2,0	1,00
37,60	2,7	1,20
37,90	2,4	1,20
38,10	3,0	1,40
38,40	1,9	0,90
38,60	2,2	1,00
38,90	2,5	1,20
39,10	3,0	1,50
39,40	3,8	1,90
39,60	2,3	1,10
39,90	2,5	1,10
40,50	3,0	1,50
40,95	3,6	1,80

 SOGEO [®] S.R.L. <small>INDAGINI GEOGNOSTICHE ED AMBIENTALI Via Edison 1/1 - 48022 LUGO (RA) Tel. 054522042 - fax 054534443 - E-mail: sogeo@sogeo-srl.com</small>			TABELLA POCKET PENETROMETER E VANE TEST					
COMMITTENTE:	PROGEO s.r.l.	SONDAGGIO N°	DH2					
CANTIERE:	Zonazione sismica Valle del Rubicone	RIF. PREV. N°:	031-14					
LOCALITA':	Savignano sul Rubicone (FC)	DATA DI ESECUZIONE	30/07/2014					
N° CERTIFICATO:	C14-087-19	Pagina n. 2 di 2	DATA DI EMISSIONE:	21/08/2014				
Quota	P.P.	T.V.	Quota	P.P.	T.V.	Quota	P.P.	T.V.
m	Kg/cmq	Kg/cmq	m	Kg/cmq	Kg/cmq	m	Kg/cmq	Kg/cmq
41,10	3,6	1,80						
41,30	3,8	1,90						
41,50	3,5	1,60						
41,90	3,0	1,30						
42,10	3,5	1,60						
42,40	3,8	1,60						
42,70	3,1	1,50						
42,90	2,8	1,20						
43,10	2,5	1,20						
43,40	2,8	1,30						
43,70	3,2	1,60						
43,90	3,0	1,40						
44,10	2,5	1,10						
44,40	2,5	1,40						
44,65	2,5	1,20						
44,90	2,2	1,10						
45,05	2,2	1,00						
45,45	1,7	0,90						
45,90	1,6	0,80						
46,10	2,2	1,00						
46,45	1,8	0,90						
46,70	1,5	0,70						
46,90	3,0	1,50						
47,10	2,8	1,30						
47,45	2,9	1,30						
47,70	3,0	1,40						
47,85	2,2	1,10						
48,10	2,4	1,20						
48,45	2,5	1,20						
48,70	2,0	1,00						
48,90	2,4	1,10						
49,15	2,2	1,10						
49,40	2,2	1,10						
49,70	2,3	1,10						
49,90	2,1	1,00						



SOGEO s.r.l.

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Via S. Potito n. 43 - 48022 S. Potito di LUGO (RA)
Tel. 054522042 - Fax 054534443 - E-mail: sogeo@sogeo-srl.com
Concessione Ministero Infrastrutture e Trasporti - Settore C
Decr. n. 005754 del 05/07/2010

SCHEMA INSTALLAZIONE STRUMENTI

Tubo per indagine geofisica "Down-Hole"

COMMITTENTE: PROGEO s.r.l.

SONDAGGIO N° DH2

CANTIERE: Zonazione Sismica Valle del Rubicone

RIF. PREV. N: 031-14

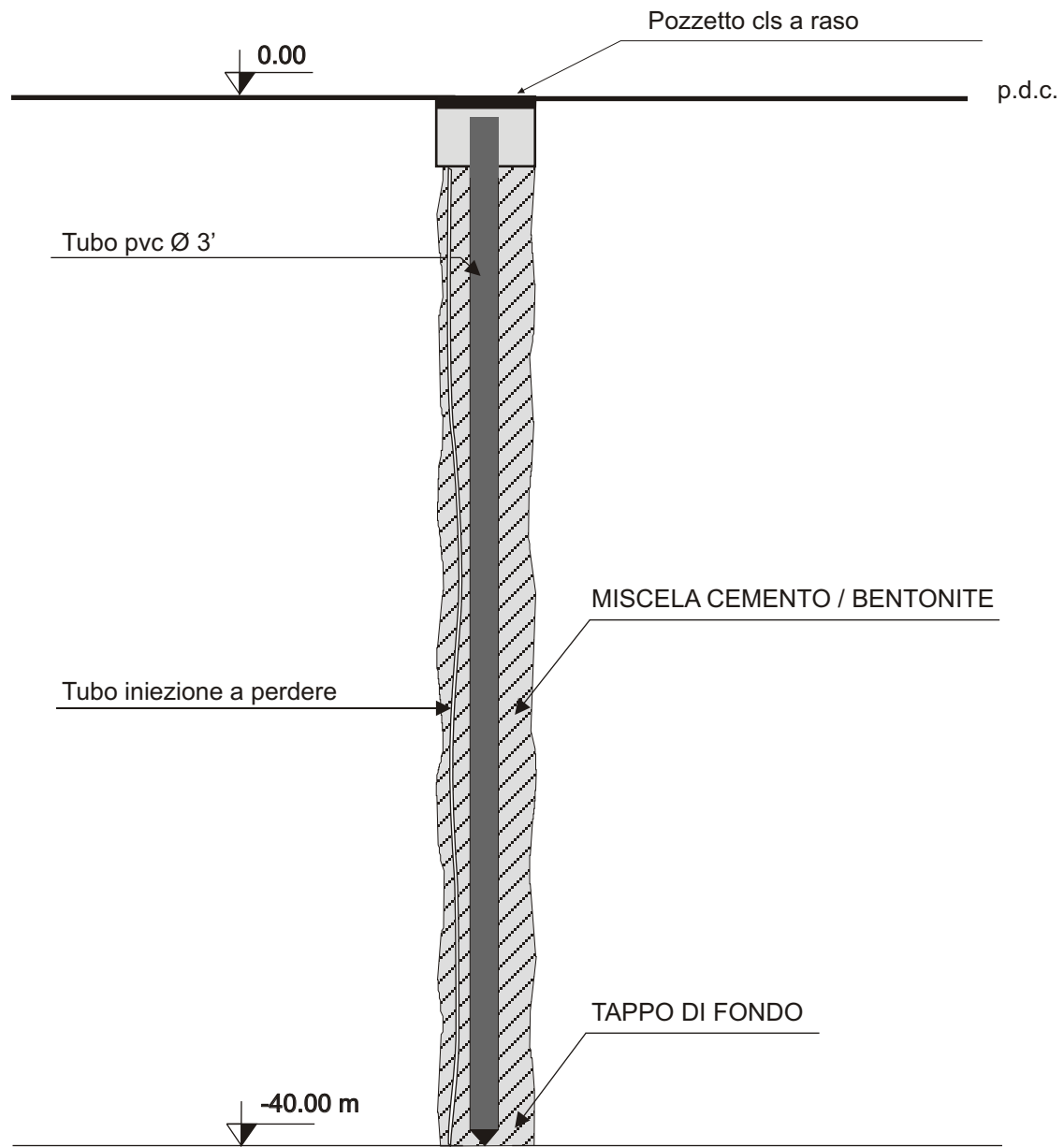
LOCALITA': Savignano sul Rubiconei (FC)

DATA DI ESECUZIONE: 31/07/2014

N° CERTIFICATO: C14-087-19b

N° RAPPORTO: -----

DATA DI EMISSIONE: 21/08/2014



N.B: SCHEMA NON IN SCALA

Lo Sperimentatore	Note ed osservazioni:	Il Direttore del Laboratorio



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: COMMITTENTE: PROGEO s.r.l.
RIF. N° : 031-14

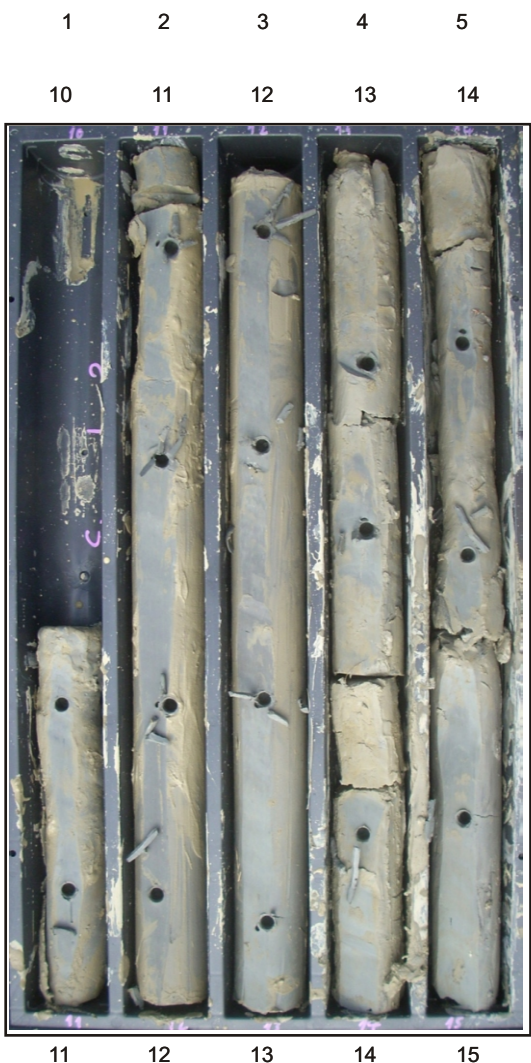
LOCALITA': Savignano sul Rubicone (FC) **SONDAGGIO N:** DH2
ALLEGATO A: C14-087-19 **DATA:** 30/07/2014



Cassa 1 da 0.0 a -5.0 m



Cassa 2 da -5.0 a -10.0 m



Cassa 3 da -10.0 a -15.0 m



Cassa 4 da -15.0 a -20.0 m



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COMMITTENTE: PROGEO s.r.l.
RIF. N°: 031-14

LOCALITA': Savignano sul Rubicone (FC) **SONDAGGIO N:** DH2
ALLEGATO A: C14-087-19 **DATA:** 30/07/2014

20 21 22 23 24



Cassa 5 da -20.0 a -25.0 m

21 22 23 24 25

25 26 27 28 29



Cassa 6 da -25.0 a -30.0 m

26 27 28 29 30

30 31 32 33 34



Cassa 7 da -30.0 a -35.0 m

31 32 33 34 35

35 36 37 38 39



Cassa 8 da -35.0 a -40.0 m

36 37 38 39 40

40 41 42 43 44



Cassa 9 da -40.0 a -45.0 m

41 42 43 44 45

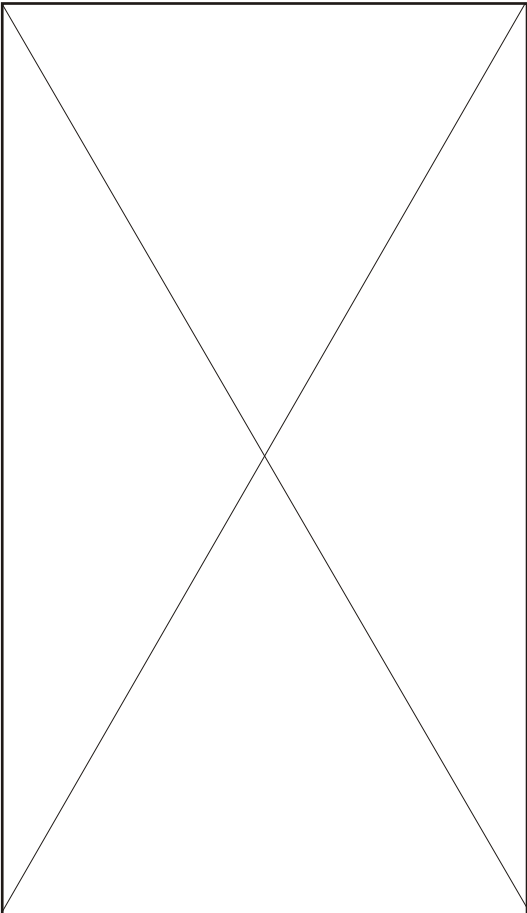
45 46 47 48 49



Cassa 10 da -45.0 a -50.0 m

46 47 48 49 50

50 51 52 53 54



Cassa 11 da -50.0 a -55.0 m

51 52 53 54 55



Posizionamento



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COMMITTENTE: PROGEO s.r.l.
RIF. N°: 031-14

LOCALITA': Savignano sul Rubicone (FC) **SONDAGGIO N:** DH2
ALLEGATO A: C14-087-19 **DATA:** 30/07/2014

COMMITTENTE	UNIONE COMUNI DEL RUB.
DOWN HOLE	DH2
Località	SAVIGNANO SUL RUBICONE
Data acquisizione	20/08/2014

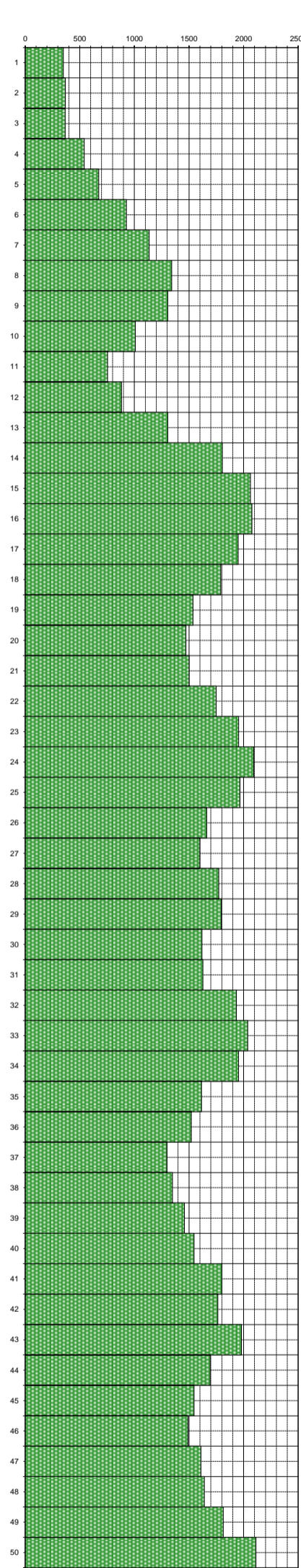
Codice lavoro **1422**



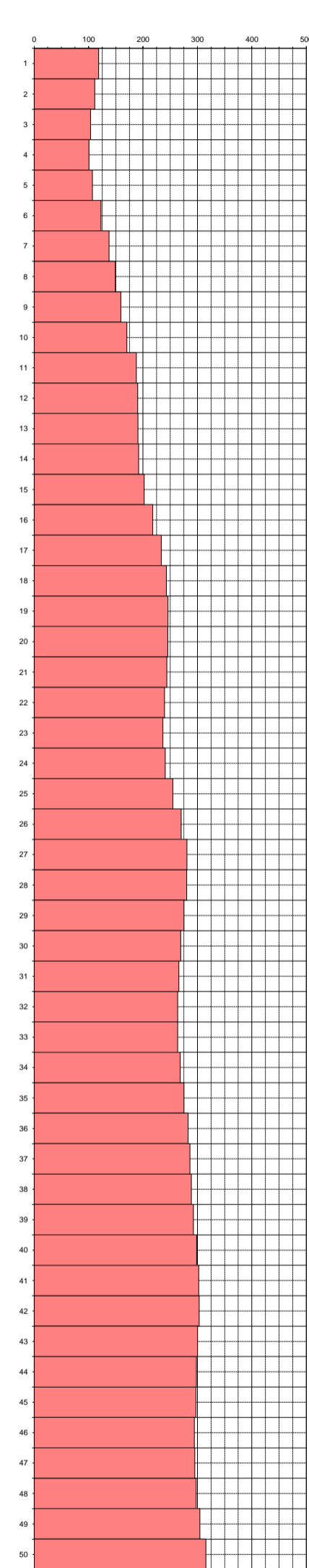
Profondità	Vp m/sec.	Vs m/sec.	v	γ T/m³	E _{din} Kg/cm²	G _{din} Kg/cm²	K _{din} Kg/cm²
------------	--------------	--------------	---	-----------	----------------------------	----------------------------	----------------------------

0							
1	350	119	0.44	1.55	638	222	1642
2	368	111	0.45	1.57	572	197	1900
3	366	104	0.46	1.57	500	172	1915
4	541	101	0.48	1.69	515	174	4806
5	674	107	0.49	1.76	609	205	7860
6	927	123	0.49	1.87	854	286	15986
7	1136	138	0.49	1.94	1121	375	25017
8	1342	149	0.49	2.00	1356	454	36160
9	1306	159	0.49	1.99	1537	515	33967
10	1008	170	0.49	1.90	1667	561	18924
11	755	188	0.47	1.80	1890	644	9570
12	882	190	0.48	1.85	2019	684	13750
13	1306	191	0.49	1.99	2203	740	33662
14	1805	192	0.49	2.12	2374	794	69363
15	2063	202	0.50	2.17	2705	905	93123
16	2076	218	0.49	2.18	3147	1053	94214
17	1950	234	0.49	2.15	3572	1197	81833
18	1791	243	0.49	2.12	3798	1274	67511
19	1536	246	0.49	2.06	3770	1268	47761
20	1472	246	0.49	2.04	3727	1254	43376
21	1501	244	0.49	2.05	3679	1238	45340
22	1748	239	0.49	2.11	3671	1231	64018
23	1955	237	0.49	2.15	3665	1228	82193
24	2093	241	0.49	2.18	3854	1290	95621
25	1967	255	0.49	2.15	4259	1428	83033
26	1662	270	0.49	2.09	4618	1553	56701
27	1599	281	0.48	2.07	4934	1662	51771
28	1772	280	0.49	2.11	5037	1694	65366
29	1796	275	0.49	2.12	4859	1633	67481
30	1619	269	0.49	2.08	4566	1537	53402
31	1627	266	0.49	2.08	4451	1497	54104
32	1934	264	0.49	2.15	4539	1523	79888
33	2038	264	0.49	2.17	4591	1539	89767
34	1954	268	0.49	2.15	4708	1580	81665
35	1615	275	0.49	2.08	4760	1603	53013
36	1521	283	0.48	2.05	4958	1673	46183
37	1297	286	0.47	1.99	4909	1665	31942
38	1348	289	0.48	2.01	5029	1704	34904
39	1458	293	0.48	2.04	5263	1779	41764
40	1546	299	0.48	2.06	5541	1871	47649
41	1801	302	0.49	2.12	5864	1974	67421
42	1764	303	0.48	2.11	5868	1976	64307
43	1980	300	0.49	2.16	5894	1980	83595
44	1694	298	0.48	2.09	5630	1897	58754
45	1546	297	0.48	2.06	5492	1855	47687
46	1491	294	0.48	2.04	5339	1804	43910
47	1609	295	0.48	2.07	5468	1844	52279
48	1641	298	0.48	2.08	5581	1882	54609
49	1814	305	0.49	2.12	5966	2008	68479
50	2113	315	0.49	2.18	6597	2216	96456

VELOCITA' ONDE DI COMPRESSIONE
m/sec



VELOCITA' ONDE DI TAGLIO
m/sec



Legenda parametri dinamici				
Tp	Tempi onde di compressione	millisecondi	γ	Peso di volume T/m³
Ts	Tempi onde di taglio	millisecondi	E_{din}	Modulo di Elasticità dinamico Kg/cm²
Vp	Velocità onde di compressione	m/sec	G_{din}	Modulo di Taglio dinamico Kg/cm²
Vs	Velocità onde di taglio	m/sec	K_{din}	Modulo di Compressibilità dinamico Kg/cm²
v	Coefficiente di Poisson	-		

CLASSIFICAZIONE SISMICA DEI SUOLI
(D.M. del 14/01/2008)

$$Vs_{30} = \frac{30}{\sum_{i=1,N} \frac{h_i}{V_i}}$$

Vs₃₀ = > 181 m/sec

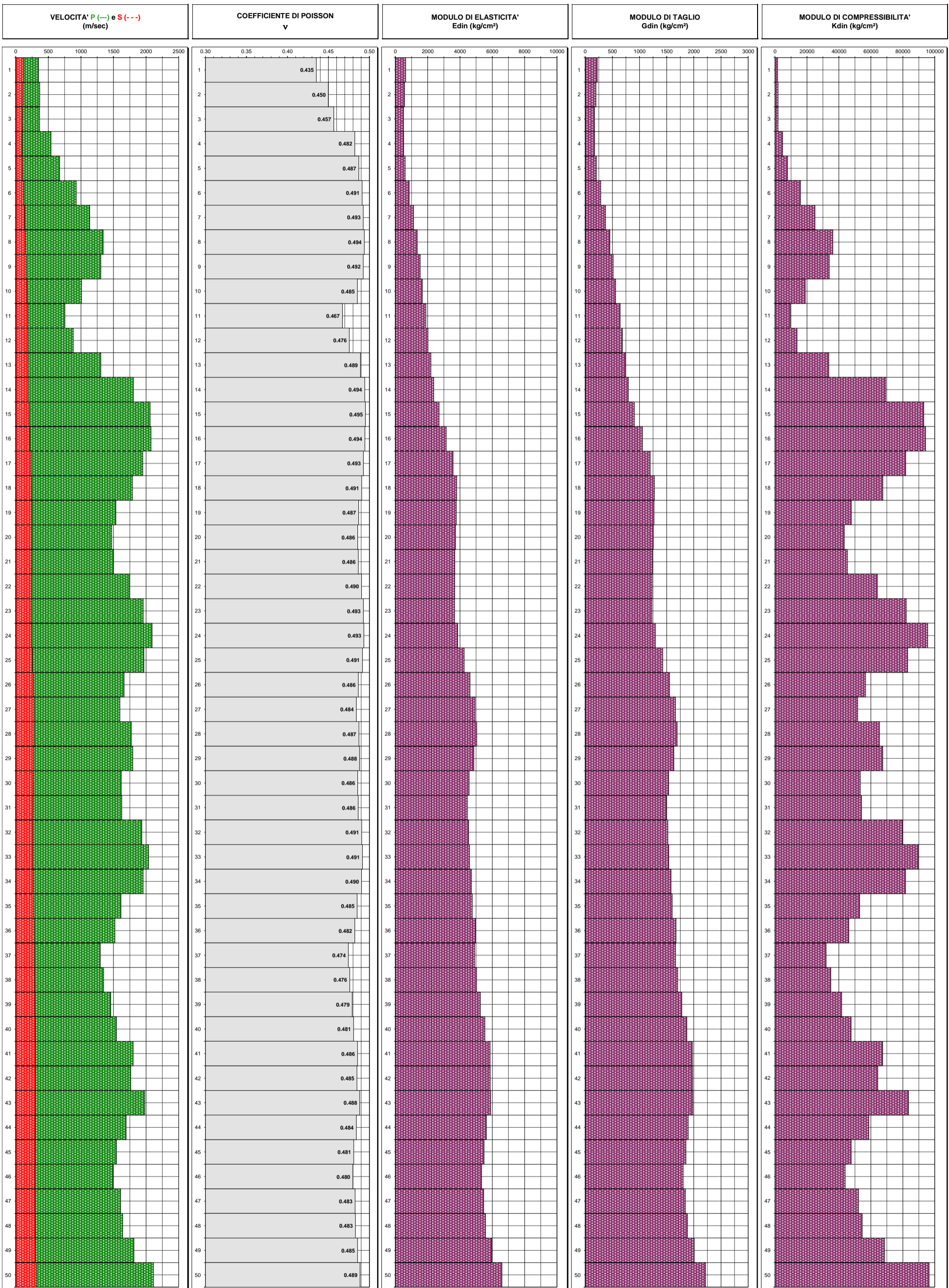
CATEGORIA SUOLO = C

COMMITTENTE
DOWN HOLE
Località
Data acquisizione

UNIONE COMUNI DEL RUB.
DH2
SAVIGNANO SUL RUBICONE
20/08/2014



GRAFICI DEI PARAMETRI ELASTICI DINAMICI



		COMMITTENTE: PROGEO s.r.l.	SOND.N°: S.1	PROF.(m): 8.00
		CANTIERE: Zonazione sismica Valle del Rubicone - Savignano Mare (FC)	QUOTA (m): p.d.c.	
		PERFORATRICE: Ellettari EK200/STR	LATITUDINE (°): N 44.16471°	
		METODO PERFORAZ.: Carotaggio continuo	LONGITUDINE (°): E 12.43927°	
RIVESTIMENTO: Ø 127 mm		ATTREZZO PERFORAZ.: Carotiere Ø 101 mm	DATA INIZ-FINE: 07/08/2014-07/08/2014	
PIEZOMETRO:			SCALA: 1:100	
RIF.PREV.N°: 031-14	CERTIFICATO N°: C14-087-20	RAPPORTO N°: -----	DATA DI EMISSIONE: 21/08/2014	PAGINA N°: 1 di 1

Scala 1:100	P.P. I [daN/cm ²]	Vane Test [daN/cm ²]	Profondita'	Stratigrafia	Descrizione	Campioni	Campioni Rim.	S.P.T. [n. colpi] P.A.	Falda	Pz.Norton	Inclinometro	Tubo Down Hole
1			0.50		Sabbia fine di colore marrone, con radici				0.90			
2			2.00		Sabbia fine di colore marrone - giallastro, con abbondanti bioclasti e biosomi.							
3			2.50		Campione indisturbato C.I.1	2.00 C.I.1						
4			2.50		Sabbia fine di colore marrone - giallastro, con abbondanti bioclasti e biosomi. A -3.50 m presente livello millimetrico di colore nerastro	2.50						
5					Sabbia fine e media di colore grigio, con qualche granulo di ghiaia e abbondanti biosomi							
6	0.5	1.50	5.30		Limo argilloso di colore grigio - nerastro	6.00 C.I.2						
7	3.0		5.50		Argilla limosa di colore grigio - marrone - giallastro, variegata, con calcinelli	6.50						
8	1.7	0.80	5.80		Campione indisturbato C.I.2							
9	1.9	0.40	7.30		Argilla limosa di colore grigio - marrone - giallastro, variegata, con calcinelli							
10	1.0	0.40	8.00		Fitta alternanza di livelli decimetrici di limo argilloso, limo e limo debolmente sabbioso. Colore grigio e marrone - giallastro. Presenza di calcinelli							
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												

Note:
Livello acqua rilevato a fine sondaggio a -0.90 m dal p.d.c.

C.I.1 = campione indisturbato Shelby
C.I.2 = campione indisturbato Osterberg



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Tel. 054522042 - Fax 054534443 - E-mail: soggeo@soggeo-srl.com

COMMITTENTE: PROGEO s.r.l.
RIF. N°: 031-14

LOCALITA': Savignano Mare (FC)
ALLEGATO A: C14-087-20

SONDAGGIO N: S.1
DATA: 07/08/2014



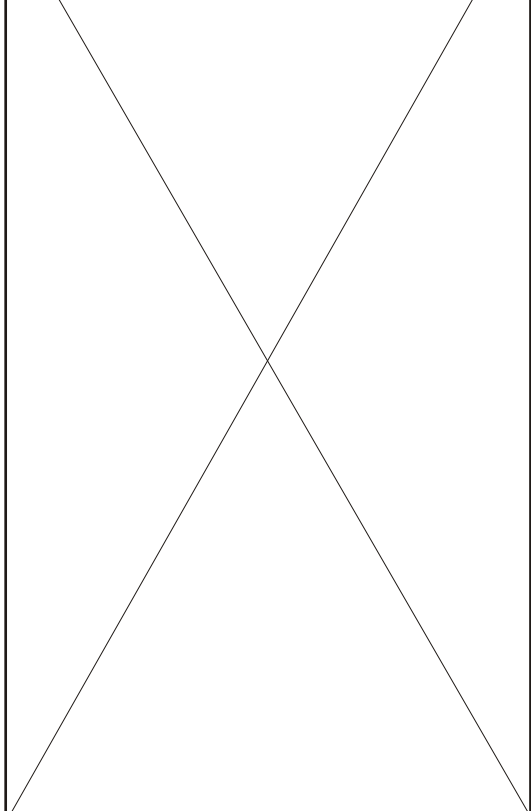
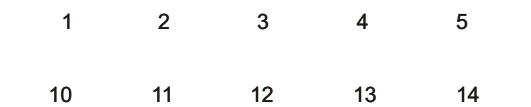
Cassa 2 da -5.0 a -10.0 m



Posizionamento



Cassa 1 da 0.0 a -5.0 m



Cassa 3 da -10.0 a -15.0 m

ANTENNA SISMICA (ESAC)

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac1

LOCALITA': Via Marco Polo - Savignano

DATA PROVA: 17/06/2014

LONGITUDINE: 295344 m

LATITUDINE: 4893058 m

QUOTA (m.s.l.m.): 3

STRUMENTAZIONE Geometrics GEODE

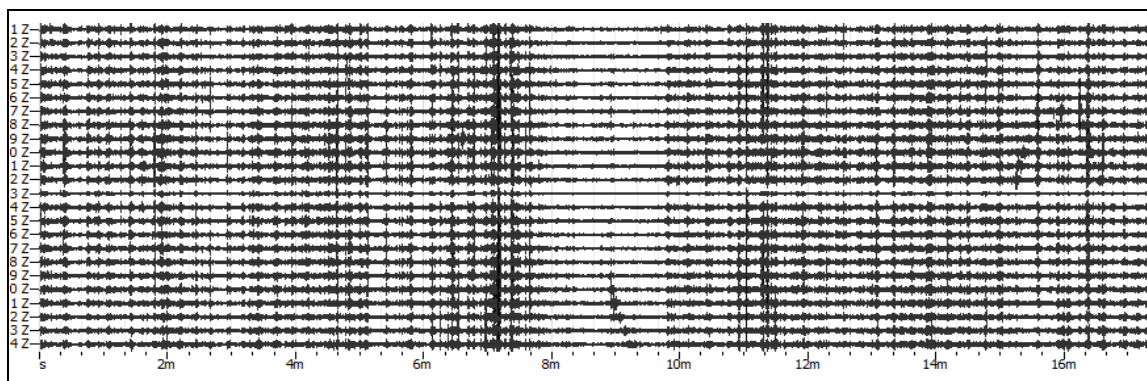
N°CANALI 24

SPACING 5 m.

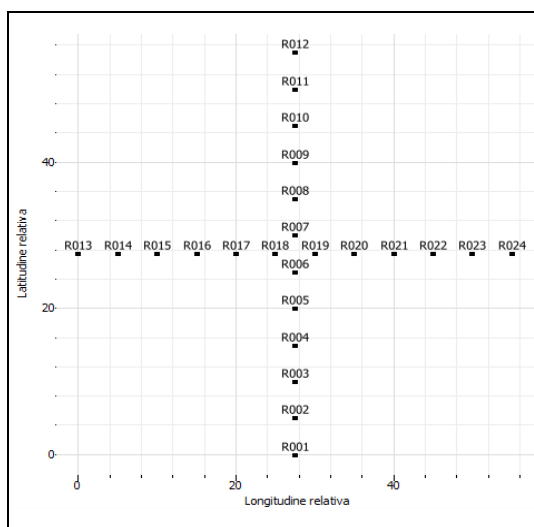
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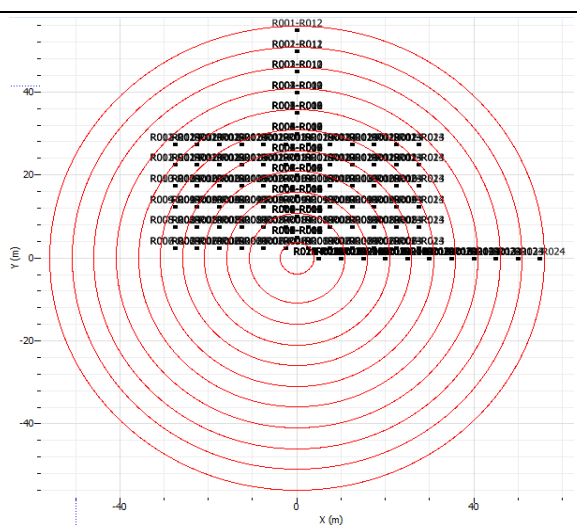
REGISTRAZIONE



PLANIMETRIA ARRAY



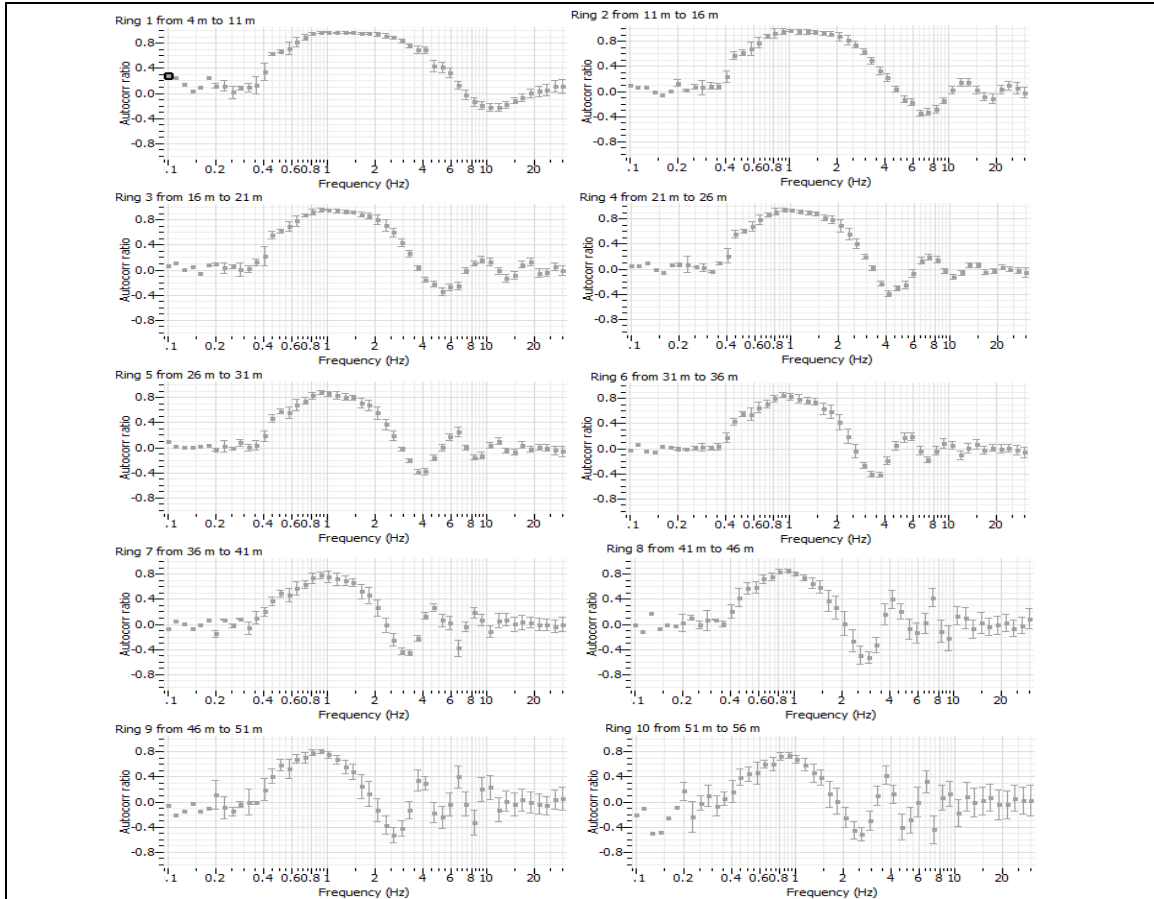
CO-ARRAY E RINGS



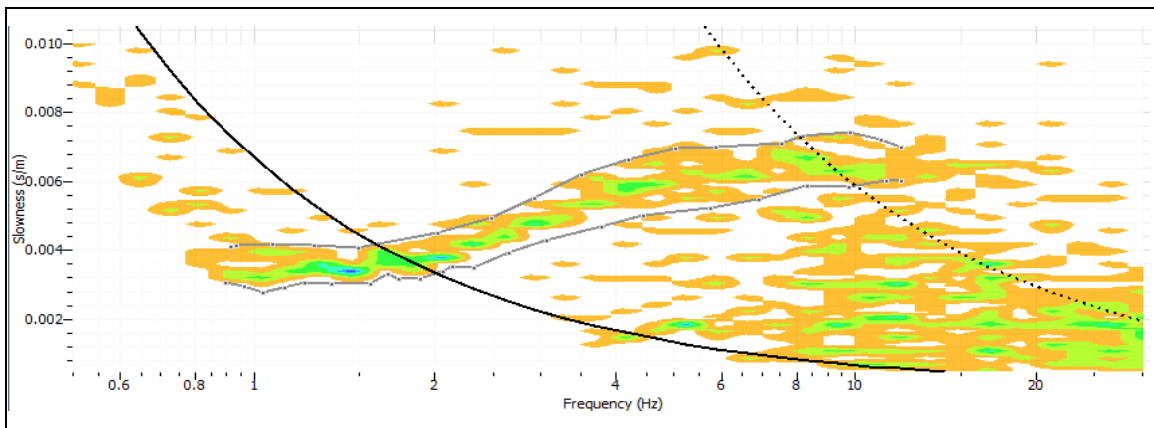
ANTENNA SISMICA ESAC

CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac1

CURVE DI DISPERSIONE CORRISPONDENTI AD OGNI RINGS



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



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

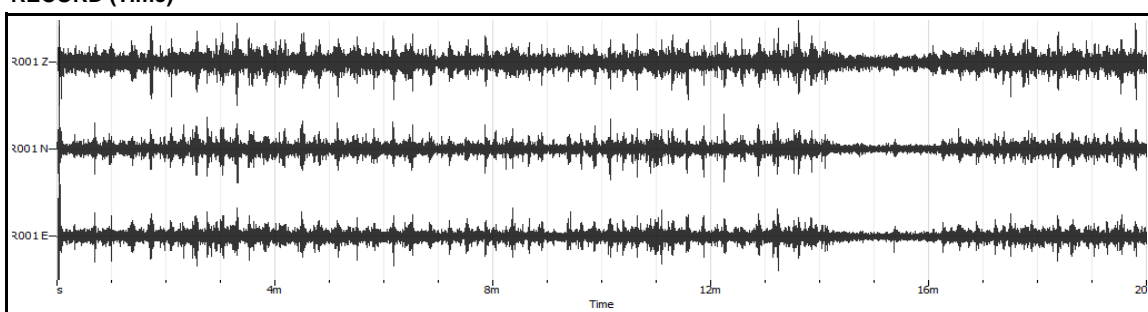
CODICE LAVORO: 1422

CODICE PROVA: Esac1

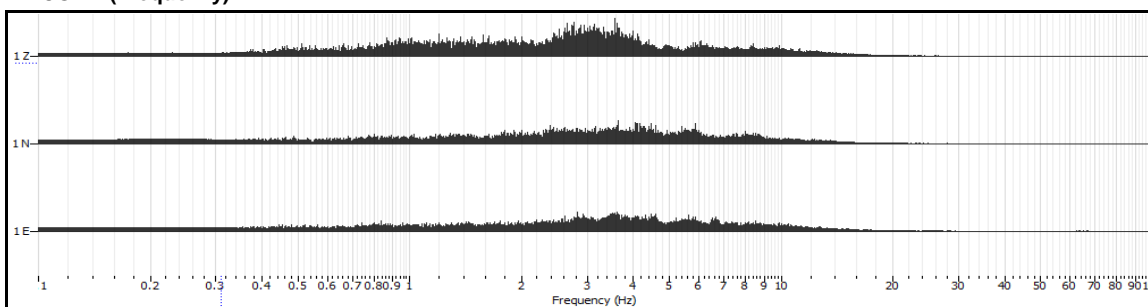
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	37

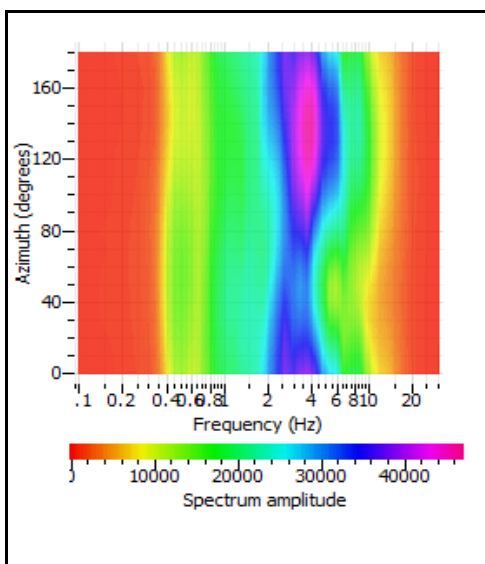
RECORD (Time)



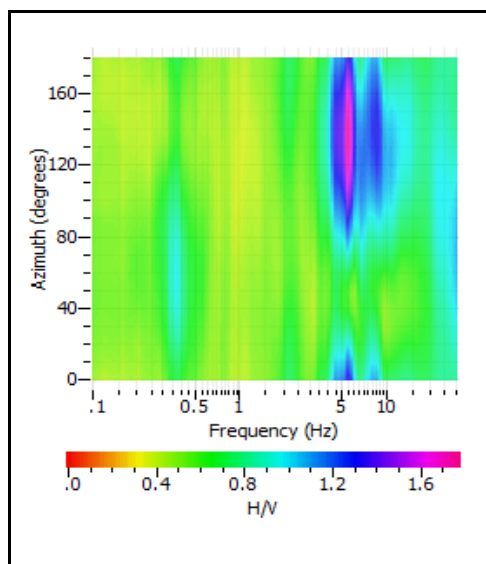
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

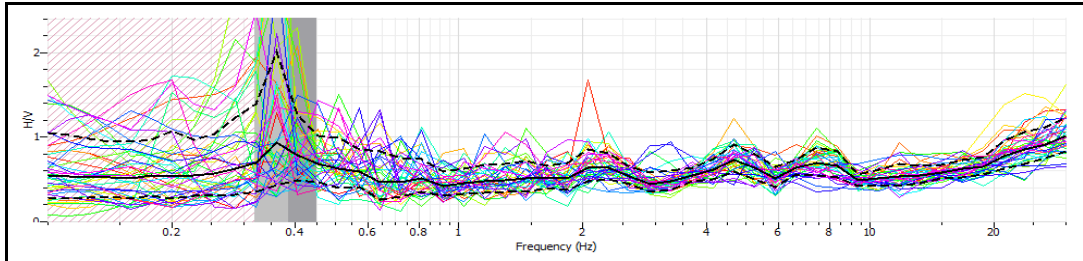


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

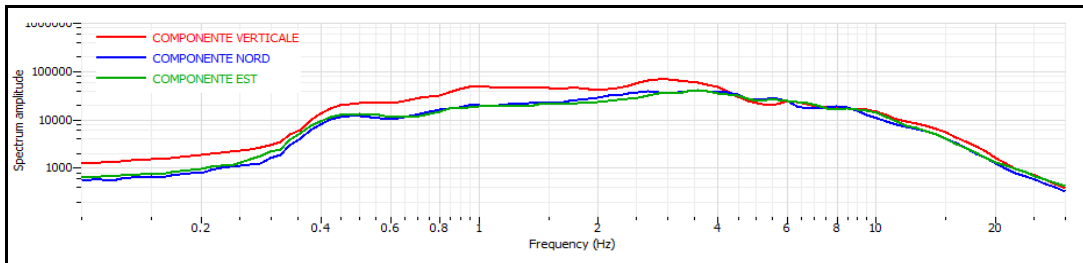
CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac1

RAPPORTO SPETTRALE H/V

Max HVSR 0.38 ± 0.06 Hz. A0 = 1.01



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.38		
Lw	20		
nw	71		
f0 > 10 / Lw	0.38 > 10/20		☒
nc (f0) > 200	539.6 > 200	☑	
σA(f) < 2 for 0.5 f0 < f < 2 f0 if f0 > 0.5 Hz	Exceeded 0 out of 50 times	☑	
σA(f) < 3 for 0.5 f0 < f < 2 f0 if f0 < 0.5 Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f⁻ in [f0/4, f0] AH/V(f⁻) < A0/2	0 Hz		☒
Exists f⁺ in [4f0, f0] AH/V(f⁺) < A0/2	0.64 Hz	☑	
A0 > 2	1.01 > 2		☒
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	29.62 < 0.05		☒
σf < ε(f0)	0.065947 < 0.076	☑	
σA(f0) < θ(f0)	0.1956155 < 2.5	☑	

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

Threshold value for σf and σA(f0)

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

ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac1

LOCALITA': Via Marco Polo - Savignano

DATA PROVA: 17/06/2014

LONGITUDINE: 295344 m

LATITUDINE: 4893058 m

QUOTA (m.s.l.m.): 3

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

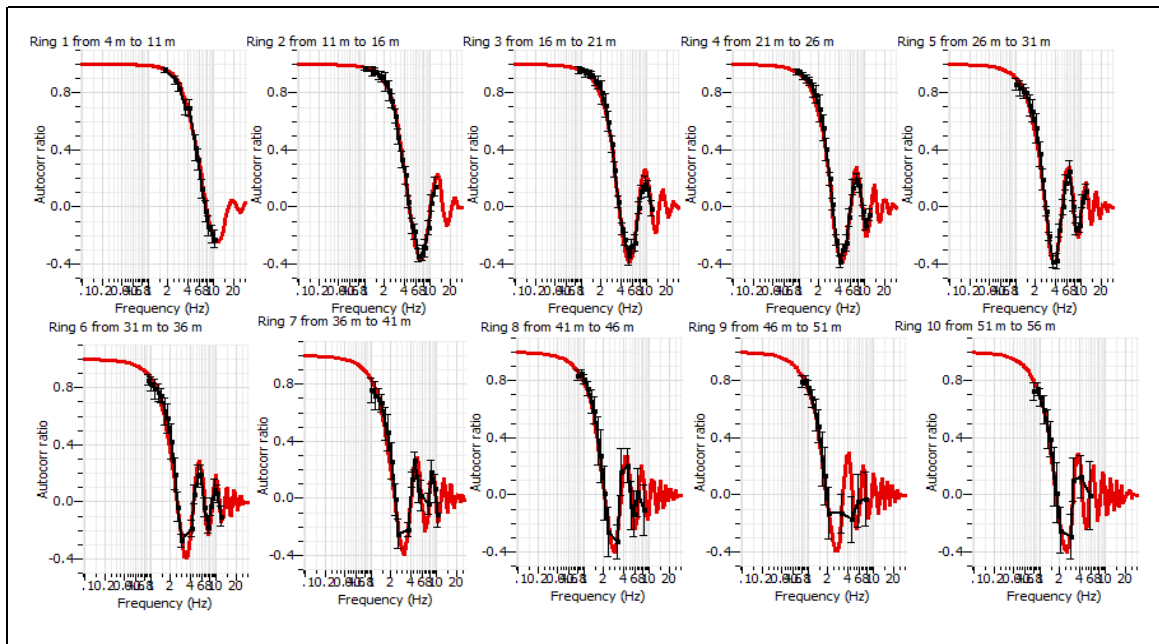
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

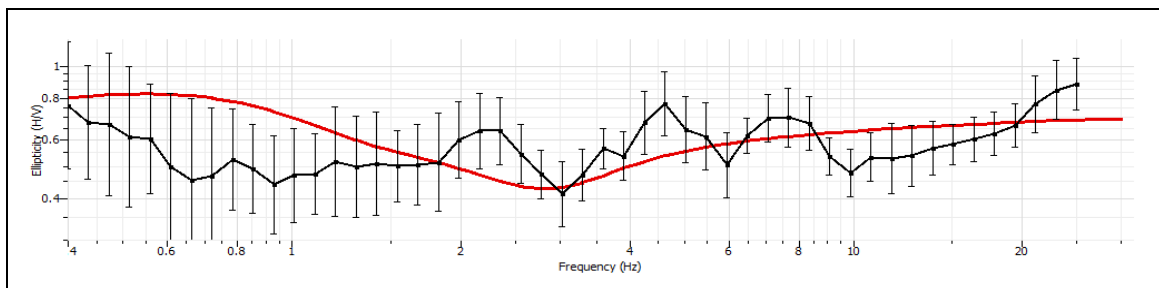
SPACING 5 m.

RECORD TIME (min) 18

VERTICAL RINGS AUTOCORRELATION



ELLIPTICITY AUTOCORRELATION CURVES



ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac1

LOCALITA': Via Marco Polo - Savignano

DATA PROVA: 17/06/2014

LONGITUDINE: 295344 m

LATITUDINE: 4893058 m

QUOTA (m.s.l.m.): 3

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

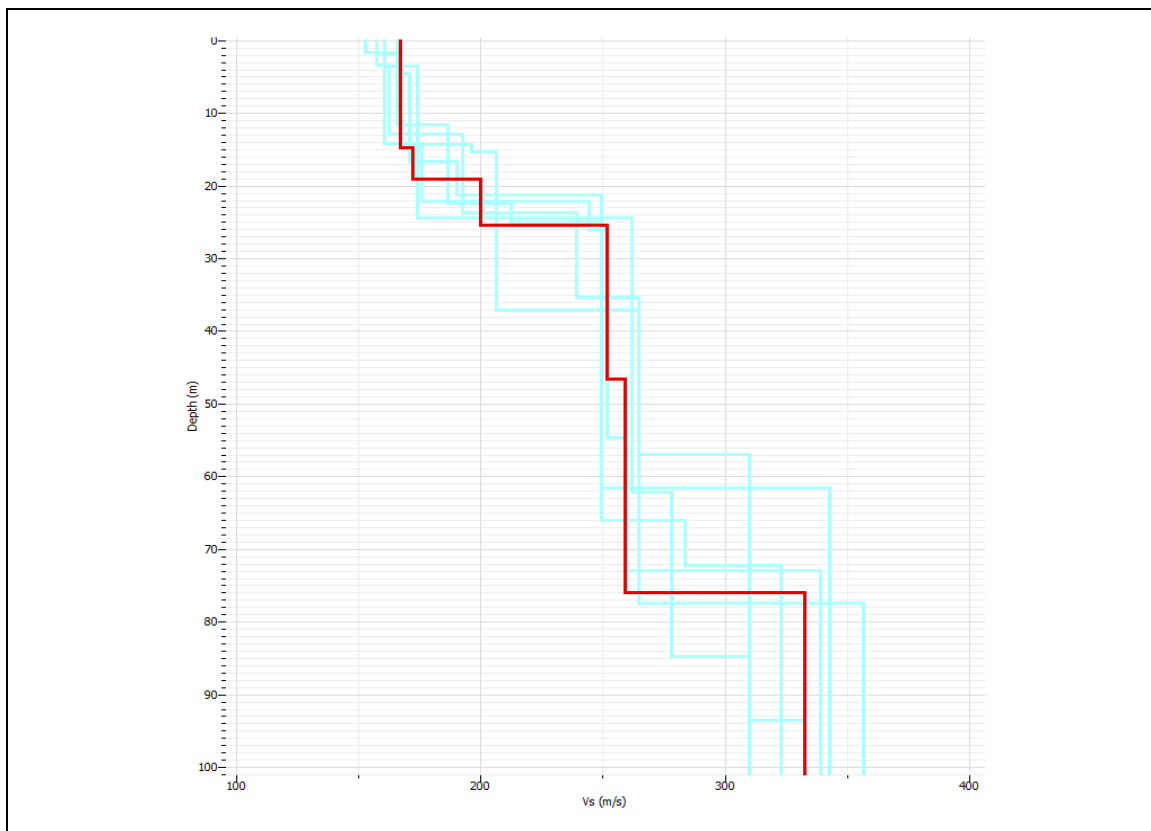
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

SPACING 5 m.

RECORD TIME (min) 18

PROFILO VELOCITÀ ONDE DI TAGLIO



CALCOLO VS 30

SPESSORE	PROFONDITA'	Vs	SPESSORE/Vs
15.14	0	167	0.090658683
3.99	15.14	172	0.023197674
6.39	19.13	200	0.03195
4.48	25.52	251	0.017848606
	30		
			0.163654963

$$Vs_{30} = 183$$

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

C

ANTENNA SISMICA (ESAC)

CLIENTE: Regione Emilia Romagna

CODICE LAVORO: 1422

CODICE PROVA: Esac2

LOCALITA': Via Varsavia - Gatteo

DATA PROVA: 17/06/2014

Coordinata est: 290852 m

Coordinata nord: 4887051 m

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

TERRENO DI MISURA: Naturale soffice

SPACING: 5 m.

RECORD TIME (min): 18

CONDIZIONI METEO: Sole

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



ANTENNA SISMICA (ESAC)

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac2

LOCALITA': Via Varsavia - Gatteo

DATA PROVA: 17/06/2014

LONGITUDINE: 290852 m

LATITUDINE: 4887051 m

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

STRUMENTAZIONE Geometrics GEODE

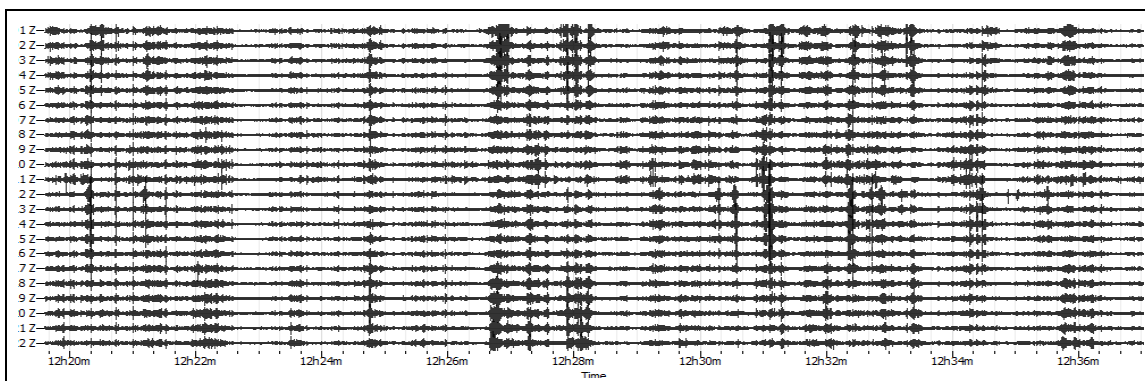
N°CANALI 24

SPACING 5 m.

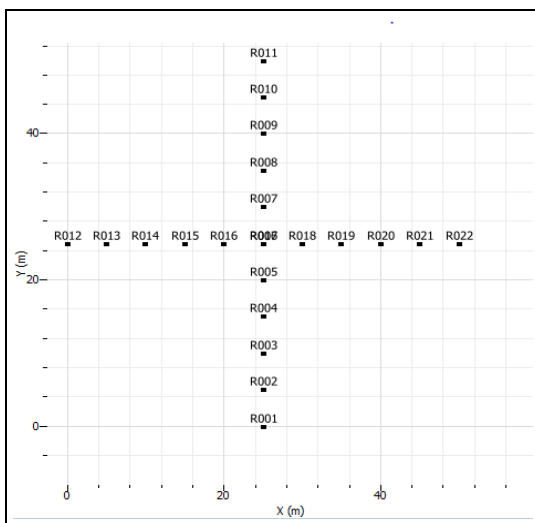
RECORD TIME (min) 18

SAMPLING (Sec) 0.0

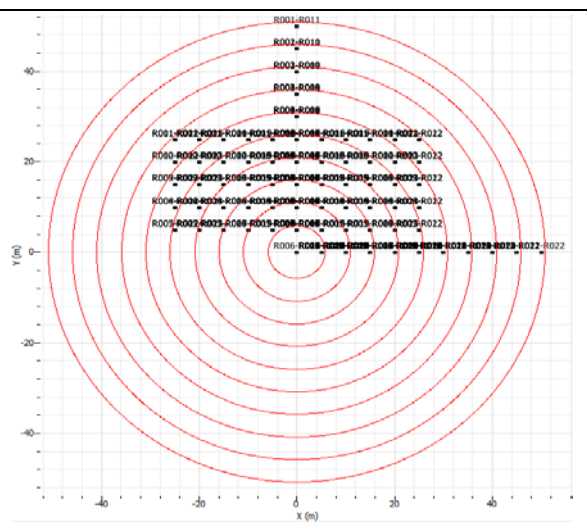
REGISTRAZIONE



PLANIMETRIA ARRAY



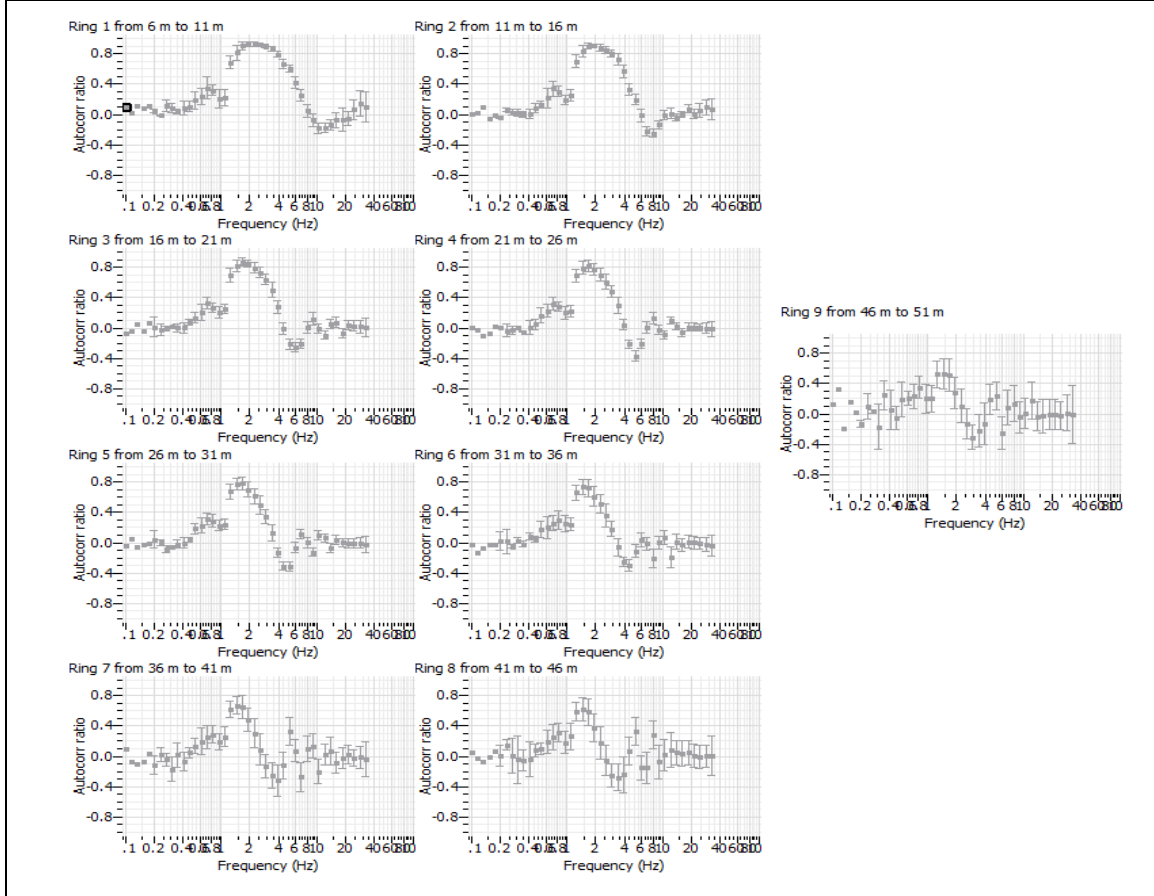
CO-ARRAY E RINGS



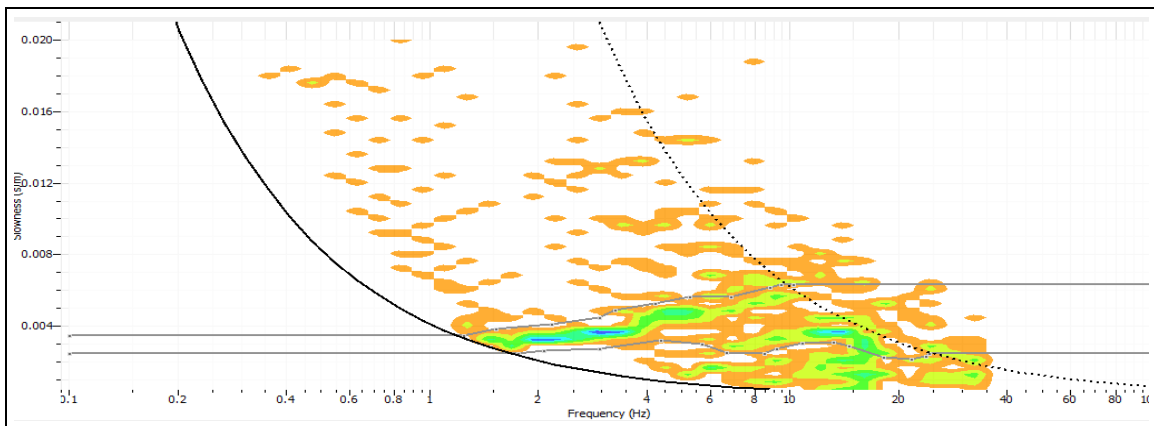
ANTENNA SISMICA ESAC

CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac2

CURVE DI DISPERSIONE CORRISPONDENTI AD OGNI RINGS



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



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

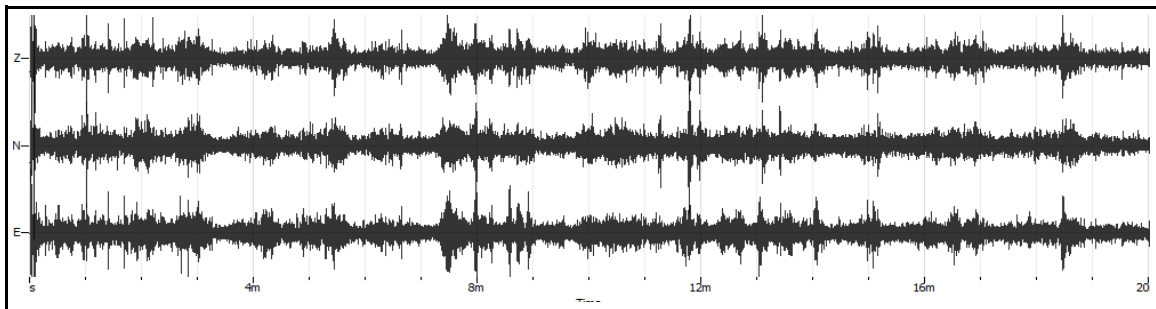
CODICE LAVORO: 1422

CODICE PROVA: Esac2

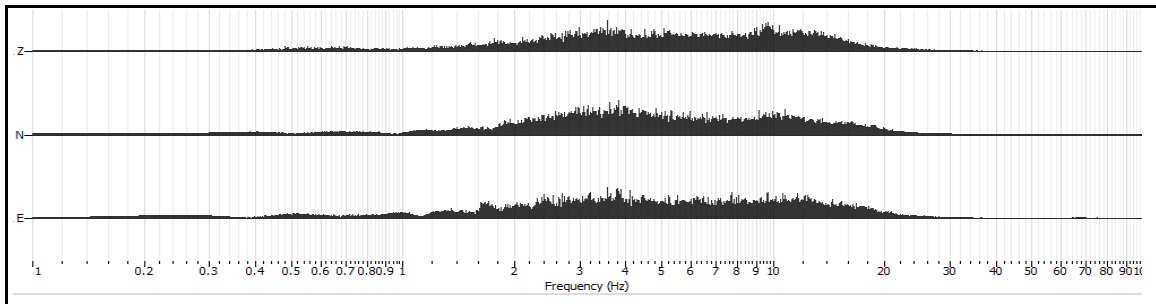
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

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

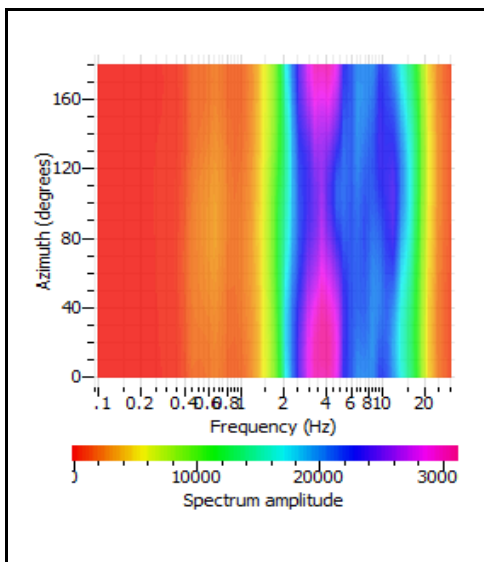
RECORD (Time)



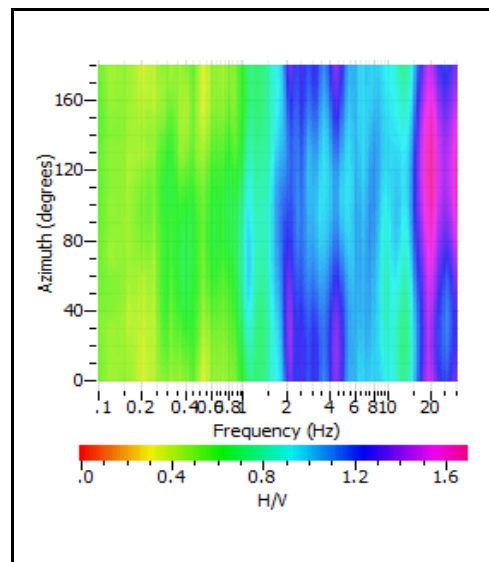
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

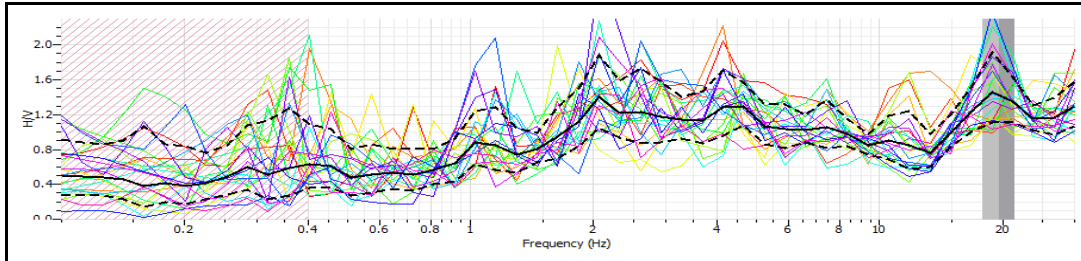


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

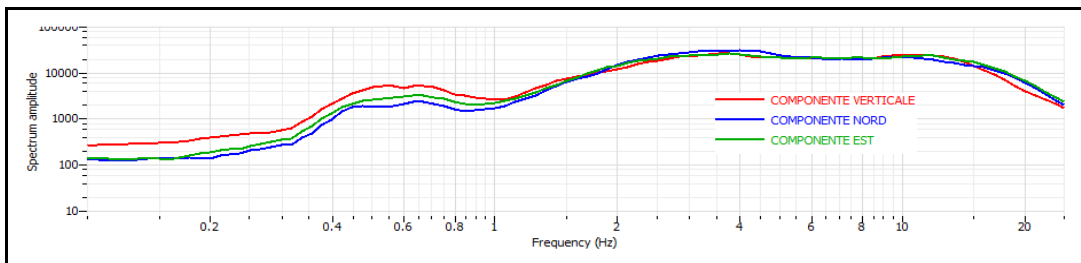
CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac2

RAPPORTO SPETTRALE H/V

Max HVSr 19.68 ± 1.77 Hz. A0 = 1.45



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	19.68		
Lw	20		
nw	71		
f0 > 10 / Lw	19.68 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	27945.6 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f ⁻ in [f0/4, f0] AH/V(f ⁻) < A0/2	0 Hz		<input checked="" type="checkbox"/>
Exists f ⁺ in [4f0, f0] AH/V(f ⁺) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	1.45 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	-0.8475 < 0.05	<input checked="" type="checkbox"/>	
σf < ε(f0)	1.7773 < 0.984		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.400505 < 1.58	<input checked="" type="checkbox"/>	

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

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

ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac2

LOCALITA': Via Varsavia - Gatteo

DATA PROVA: 17/06/2014

LONGITUDINE: 290852 m

LATITUDINE: 4887051 m

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

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

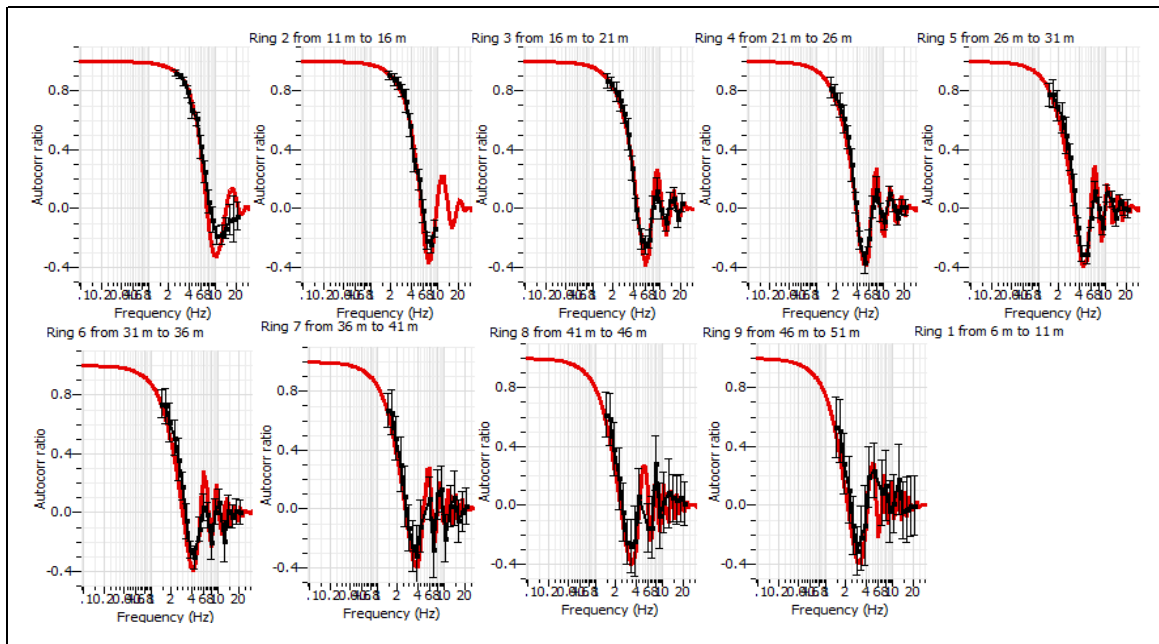
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

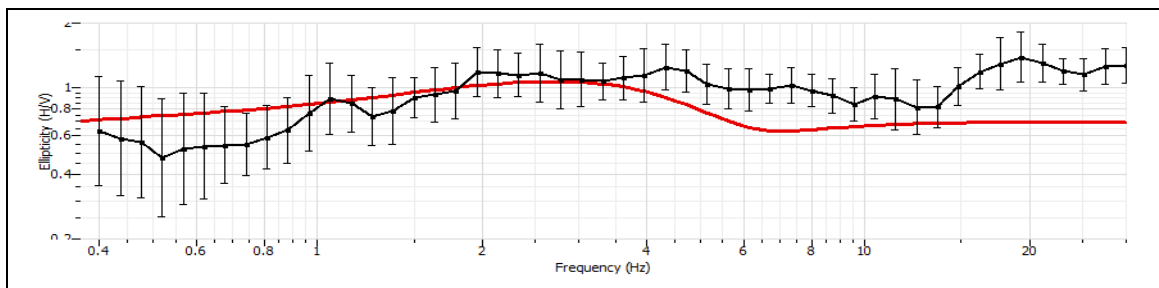
SPACING 5 m.

RECORD TIME (Min) 18

VERTICAL RINGS AUTOCORRELATION



ELIPTICITY AUTOCORRELATION CURVES



ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac2

LOCALITA': Via Varsavia - Gatteo

DATA PROVA: 17/06/2014

LONGITUDINE: 290852 m

LATITUDINE: 4887051 m

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

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

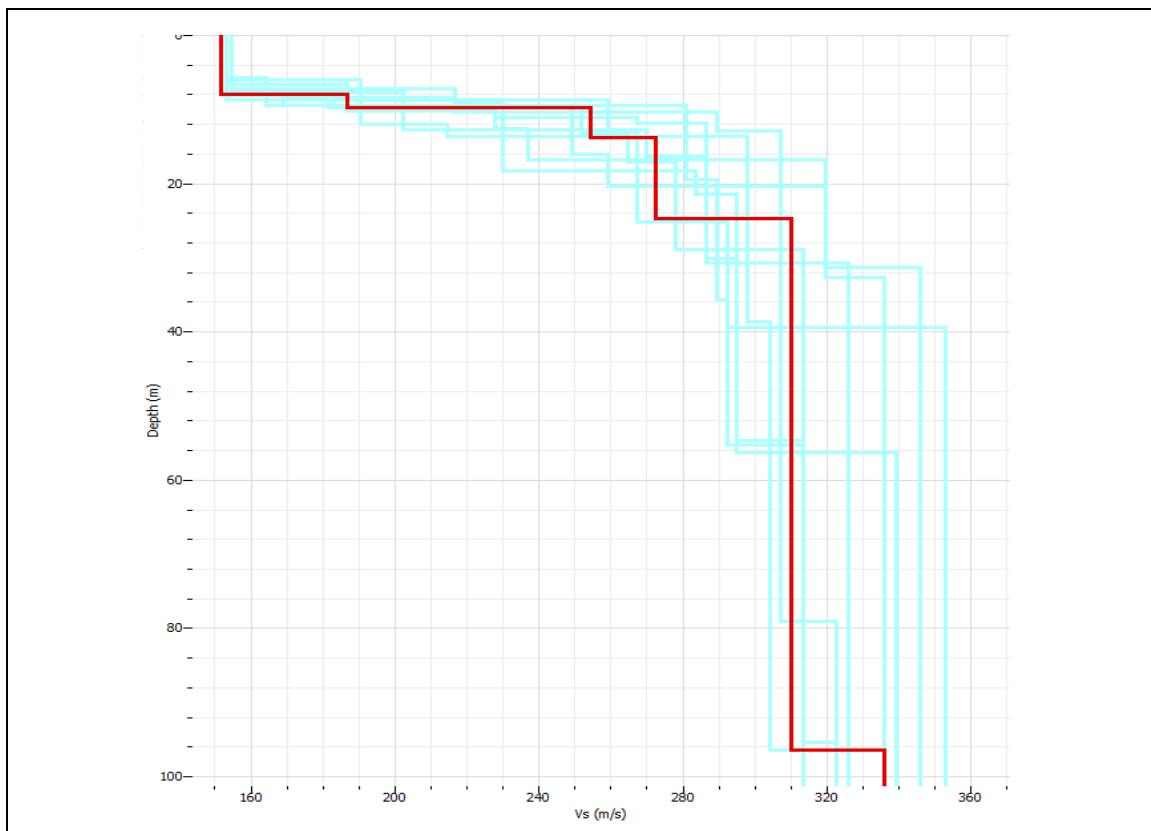
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

SPACING 5 m.

RECORD TIME (Min) 18

PROFILO VELOCITÀ ONDE DI TAGLIO



CALCOLO VS 30

SPESSORE	PROFONDITA'	Vs	SPESSORE/Vs
8.09	0	151	0.053576159
2.03	8.09	186	0.010913978
4.55	10.12	254	0.017913386
10.63	14.67	272	0.039080882
4.7	25.3	310	0.01516129
	30		
			0.136645696

$V_{S30} = 220$

C

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

ANTENNA SISMICA (ESAC)

CLIENTE: Regione Emilia Romagna

CODICE LAVORO: 1422

CODICE PROVA: Esac3

LOCALITA': Via Raffaello Sanzio - Savignano sul Rubicone

DATA PROVA: 17/06/2014

Coordinata est: 291513 m

Coordinata nord: 4885975 m

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

TERRENO DI MISURA: Naturale soffice

SPACING: 5 m.

RECORD TIME (min): 18

CONDIZIONI METEO: Sole

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



ANTENNA SISMICA (ESAC)

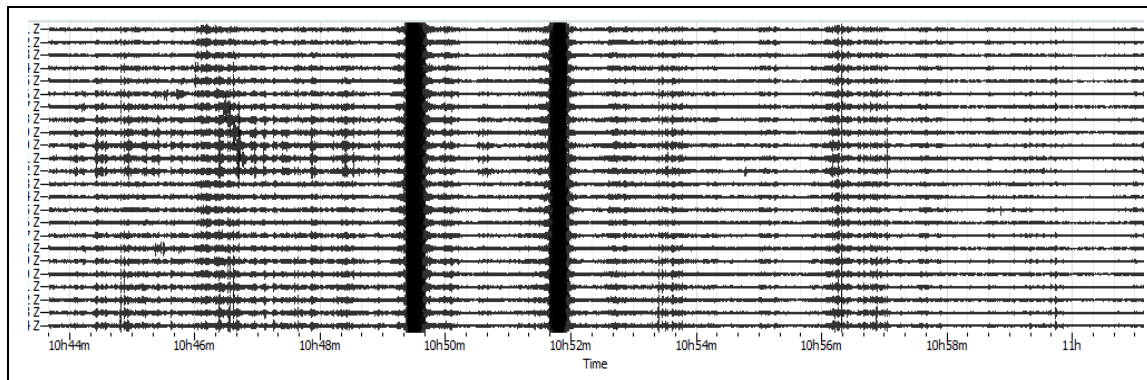
CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

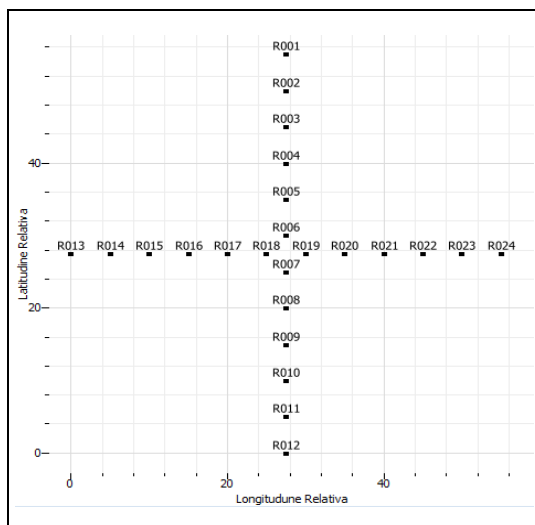
CODICE PROVA Esac3

LOCALITA':	Via Raffaello Sanzio - Savignano sul Rubiconi	STRUMENTAZIONE	Geometrics GEODE
DATA PROVA:	17/06/2014	N°CANALI	24
LONGITUDINE:	291513 m	SPACING	5 m.
LATITUDINE:	4885975 m	RECORD TIME (min)	18
QUOTA (m.s.l.m.):		SAMPLING (Sec)	0.0

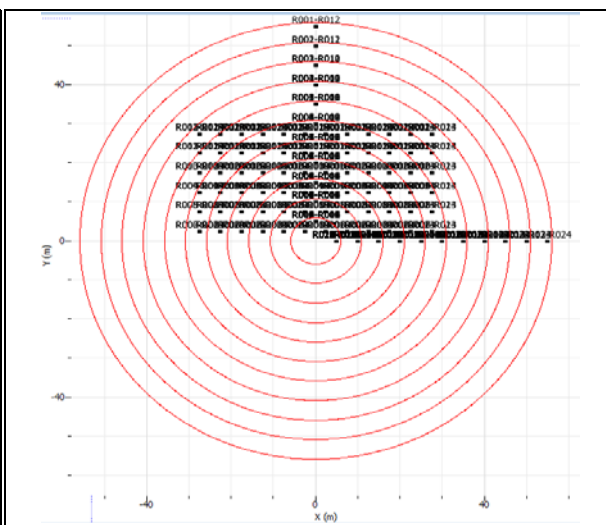
REGISTRAZIONE



PLANIMETRIA ARRAY



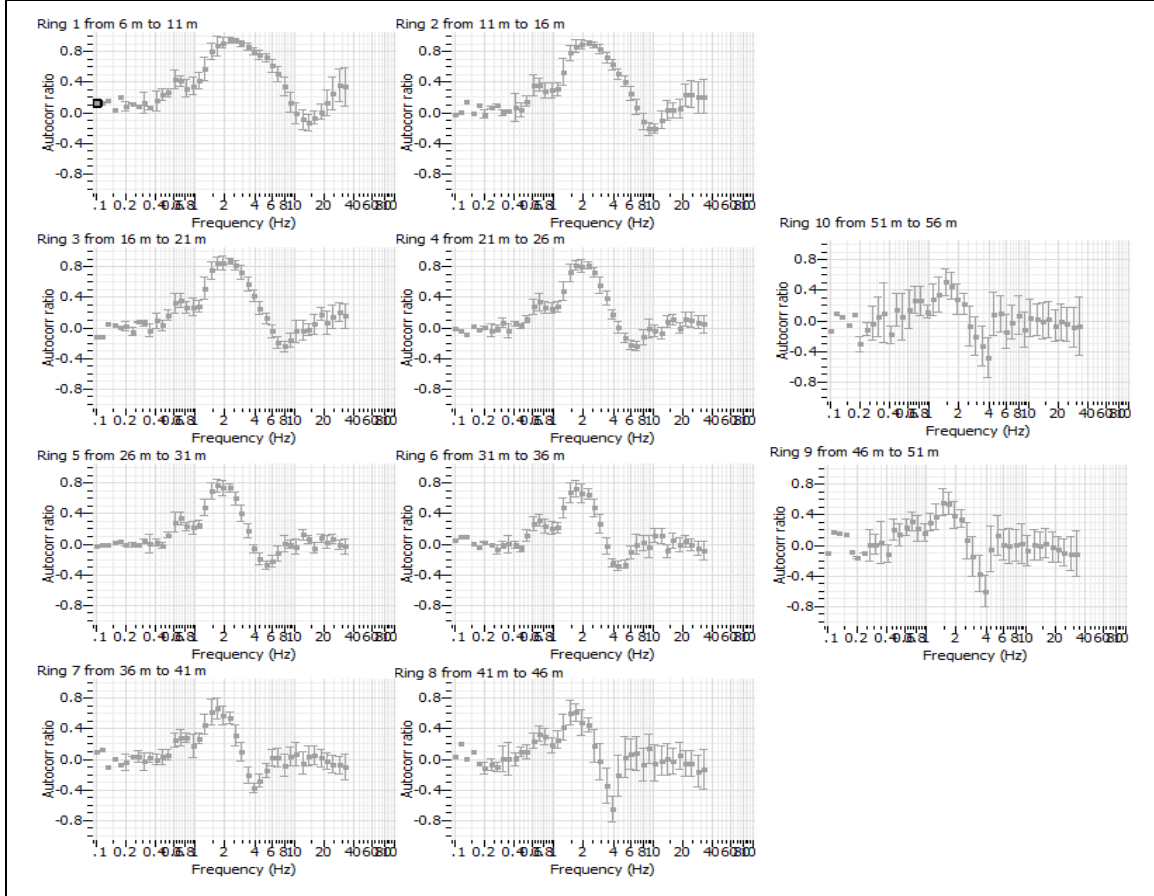
CO-ARRAY E RINGS



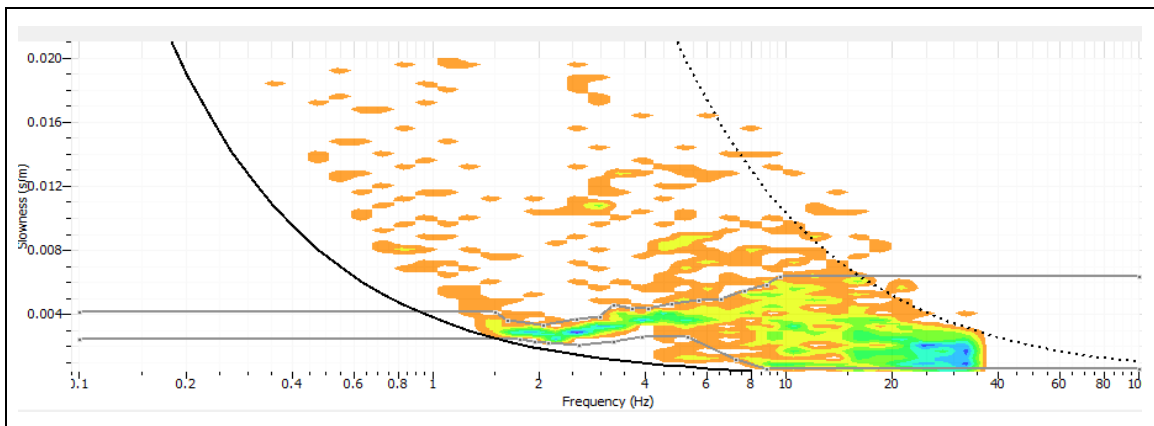
ANTENNA SISMICA ESAC

CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac3

CURVE DI DISPERSIONE CORRISPONDENTI AD OGNI RINGS



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



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

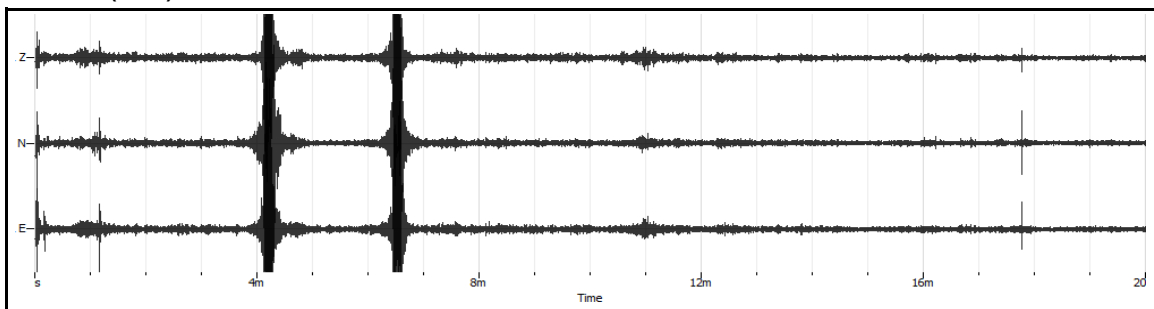
CODICE LAVORO: 1422

CODICE PROVA: Esac3

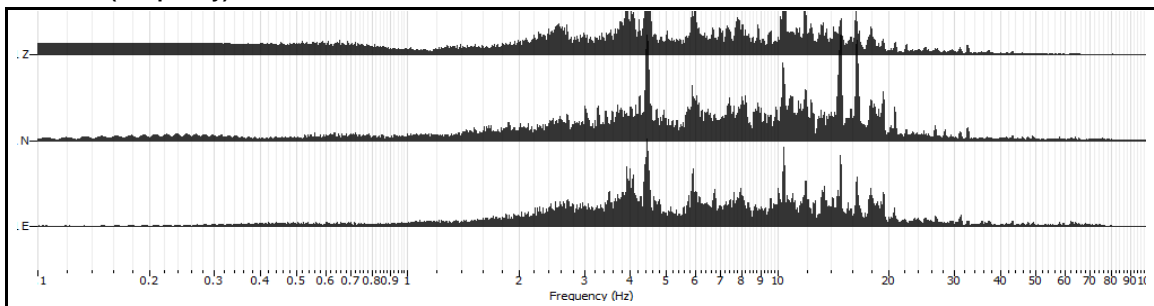
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	21

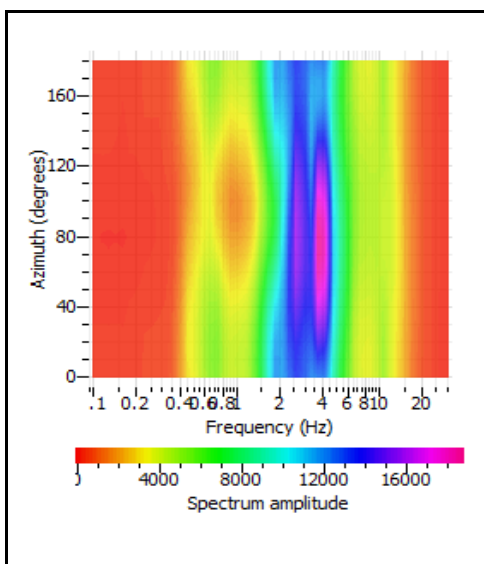
RECORD (Time)



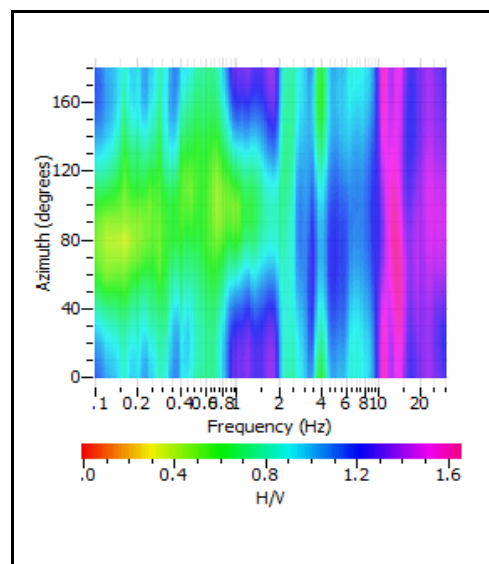
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

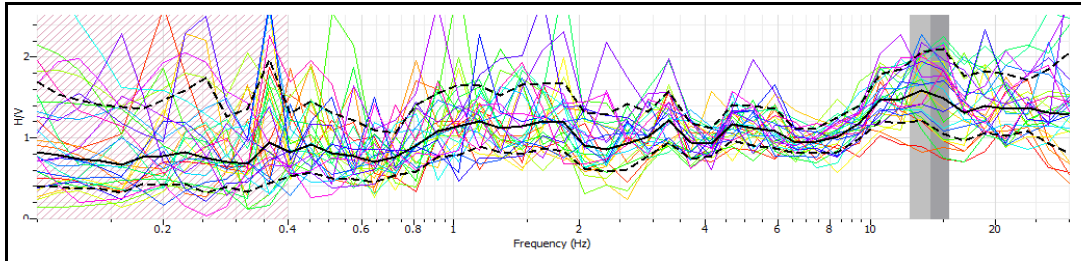


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

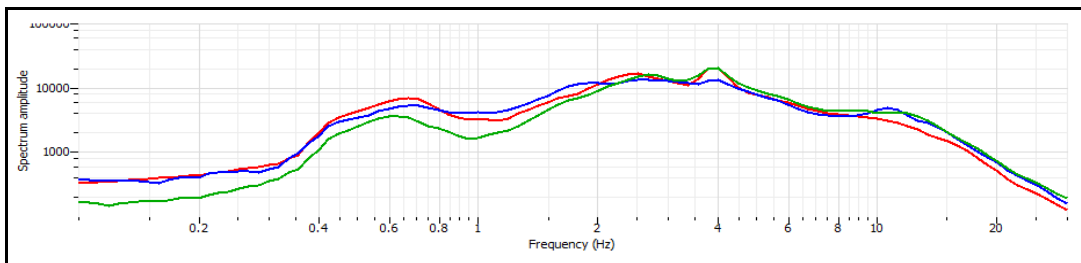
CLIENTE Regione Emilia Romagna
 CODICE LAVORO 1422
 CODICE PROVA Esac3

RAPPORTO SPETTRALE H/V

Max HVSR 13.95 ± 1.49 Hz. A0 = 1.58



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	13.95		
Lw	20		
nw	71		
f0 > 10 / Lw	13.95 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	19809 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		<input checked="" type="checkbox"/>
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	1.58 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	-0.6685 < 0.05	<input checked="" type="checkbox"/>	
σf < ε(f0)	1.4935 < 0.6975		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.425905 < 1.58	<input checked="" type="checkbox"/>	

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

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

ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac3

LOCALITA': Via Raffaello Sanzio - Savignano sul Rubicone

DATA PROVA: 17/06/2014

LONGITUDINE: 291513 m

LATITUDINE: 4885975 m

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

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

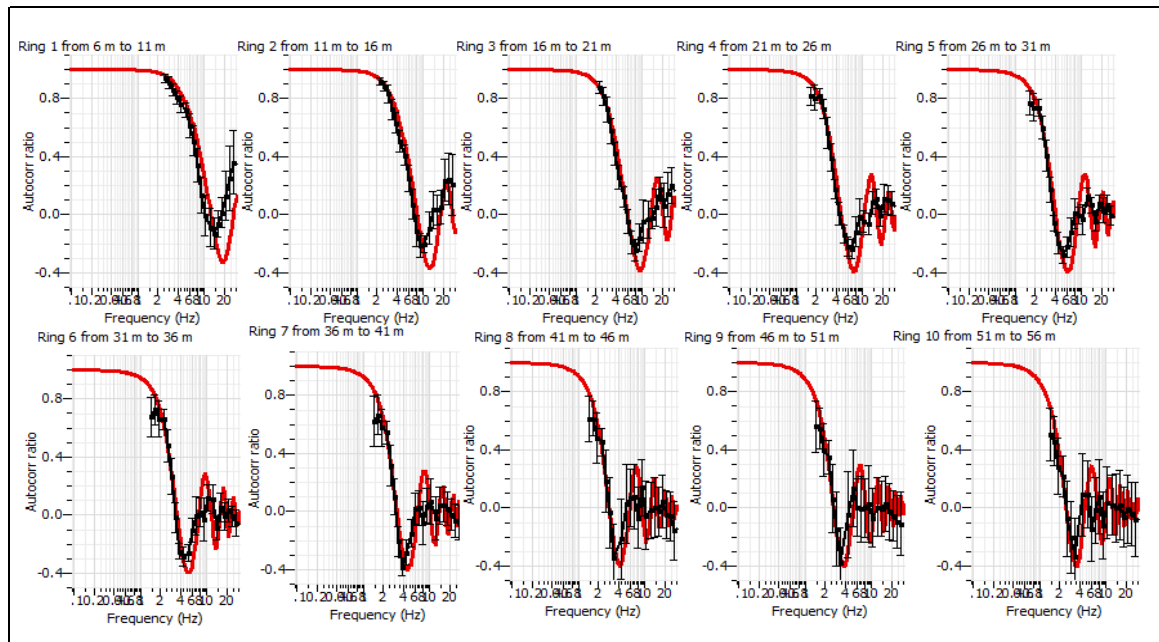
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

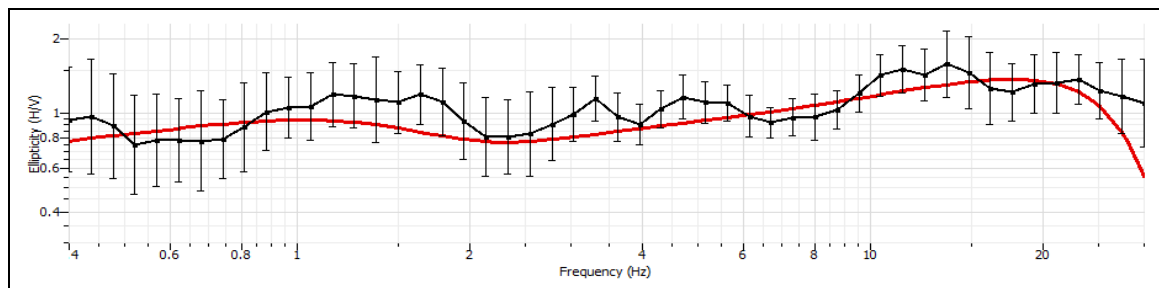
SPACING 5 m.

RECORD TIME (min) 18

VERTICAL RINGS AUTOCORRELATION



ELLIPTICITY AUTOCORRELATION CURVES



ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac3

LOCALITA': Via Raffaello Sanzio - Savignano sul Rubicone

DATA PROVA: 17/06/2014

LONGITUDINE: 291513 m

LATITUDINE: 4885975 m

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

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

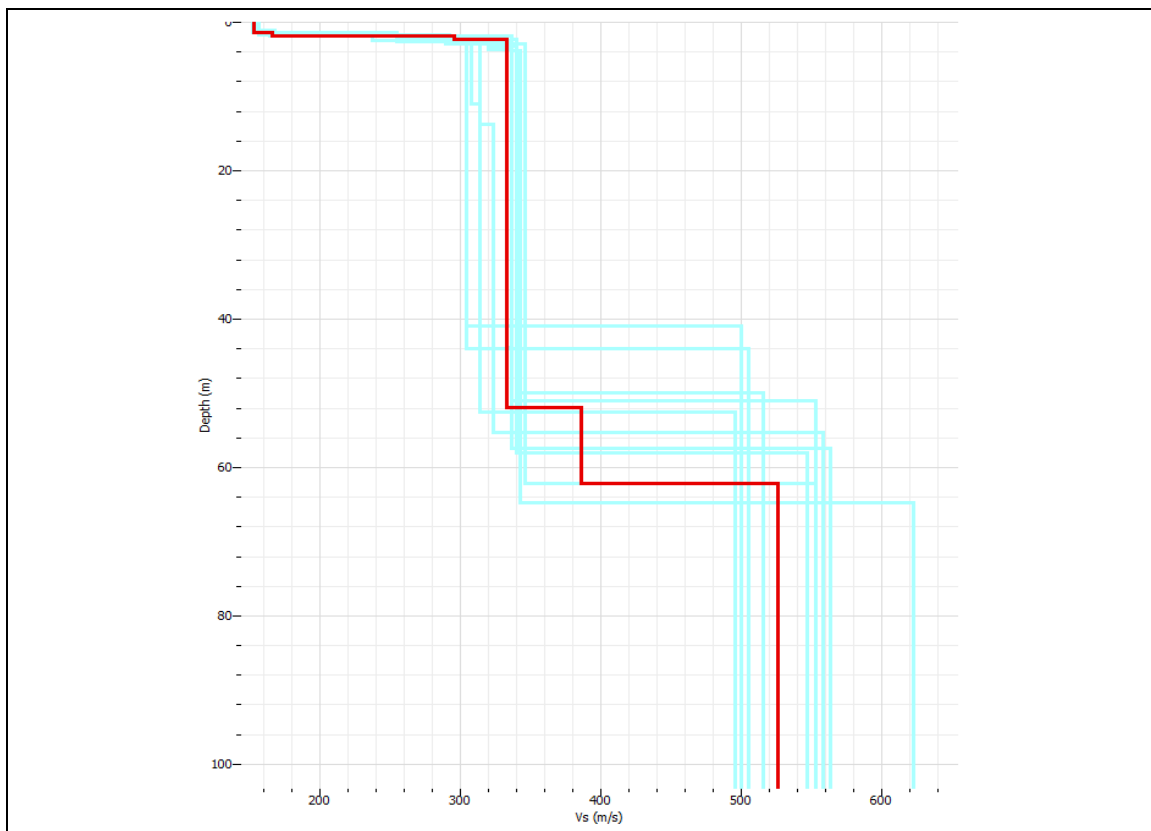
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

SPACING 5 m.

RECORD TIME (min) 18

PROFILO VELOCITÀ ONDE DI TAGLIO



CALCOLO VS 30

SPESSORE	PROFONDITA'	Vs	SPESSORE/Vs
2.02	0	151	0.013377483
1.01	2.02	186	0.005430108
26.97	3.03	254	0.106181102
	30	272	

0.124988693

$$V_{S30} = 240$$

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

C

ANTENNA SISMICA (ESAC)

CLIENTE: Regione Emilia Romagna

CODICE LAVORO: 1422

CODICE PROVA: Esac4

LOCALITA': Via Bastia - San Mauro Pascoli

DATA PROVA: 17/06/2014

Coordinata est: 293097 m

Coordinata nord: 4886796 m

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

TERRENO DI MISURA: Naturale soffice

SPACING: 5 m.

RECORD TIME (min): 18

CONDIZIONI METEO: Sole

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



ANTENNA SISMICA (ESAC)

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac4

LOCALITA': Via Bastia - San Mauro Pascoli

DATA PROVA: 17/06/2014

LONGITUDINE: 293097 m

LATITUDINE: 4886796 m

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

STRUMENTAZIONE Geometrics GEODE

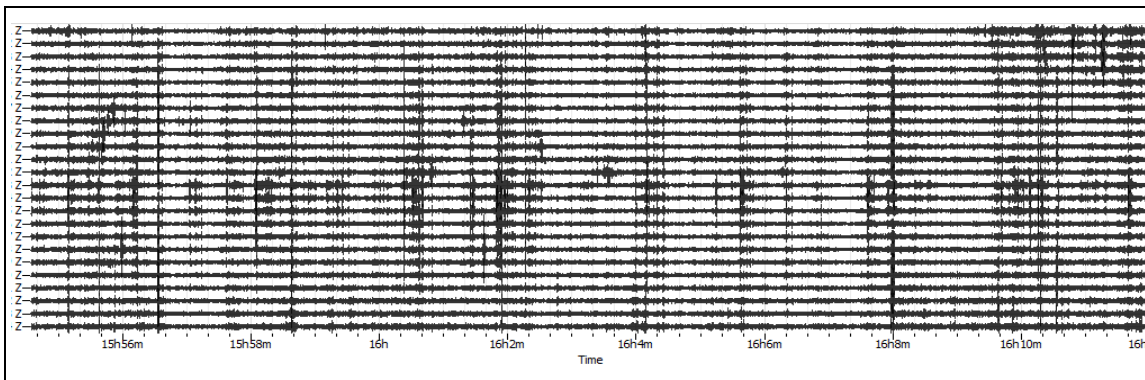
N°CANALI 24

SPACING 5 m.

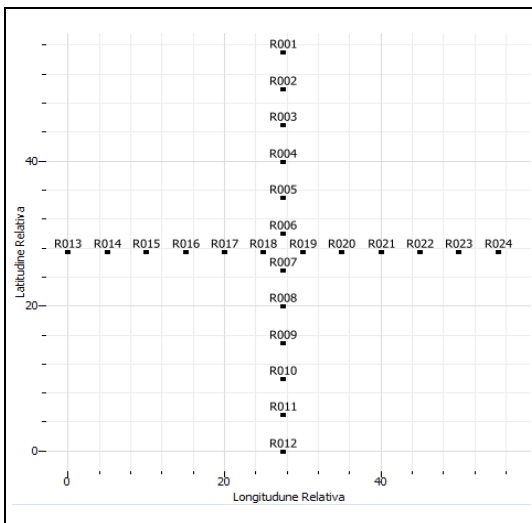
RECORD TIME (min) 18

SAMPLING (Sec) 0.0

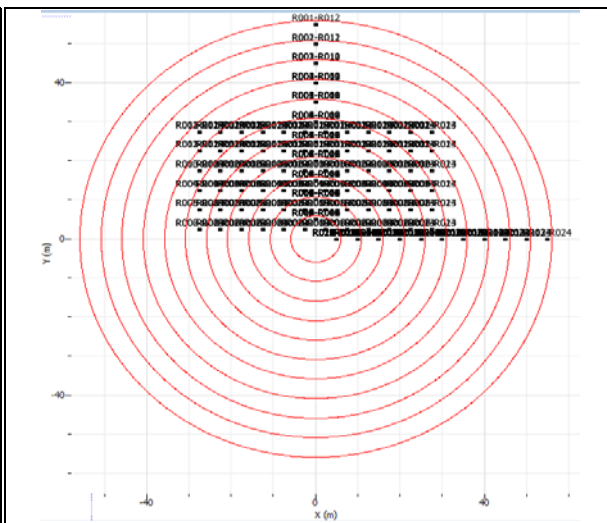
REGISTRAZIONE



PLANIMETRIA ARRAY



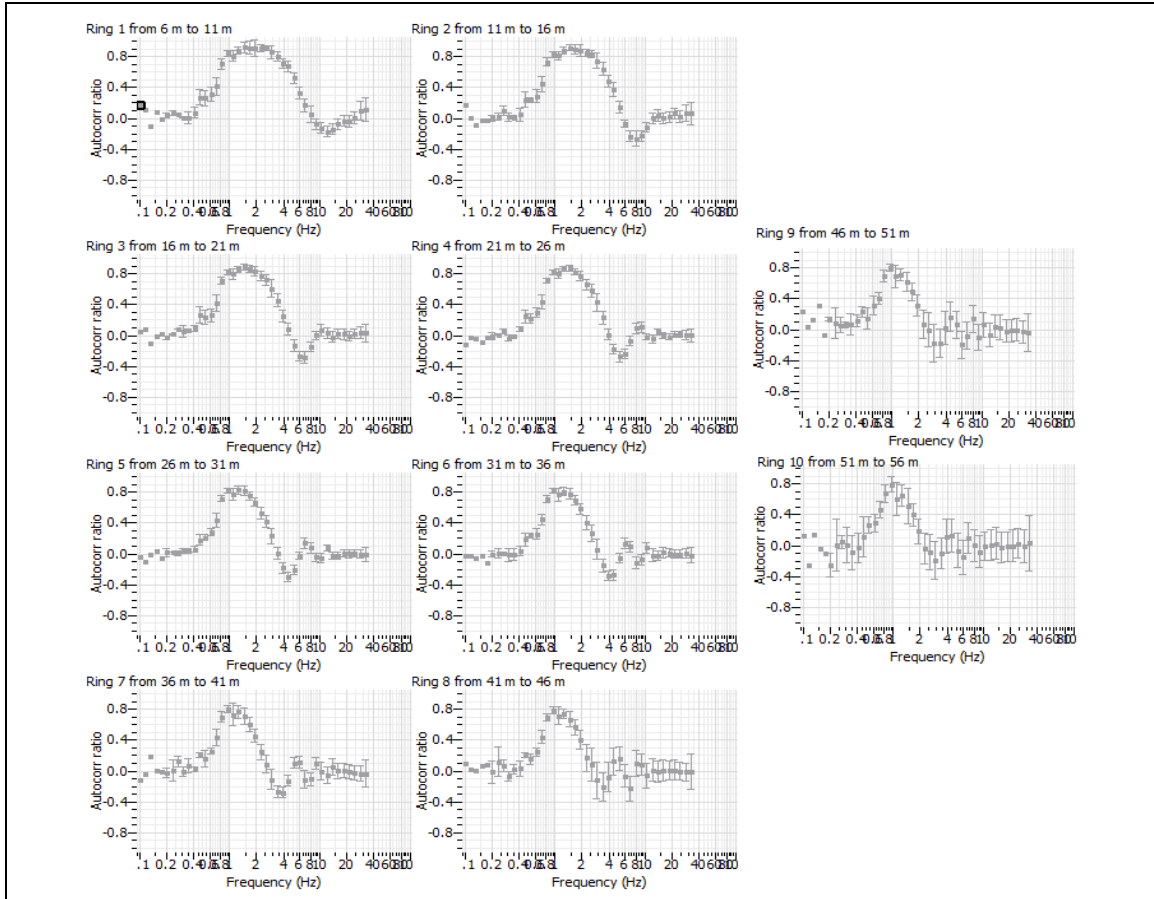
CO-ARRAY E RINGS



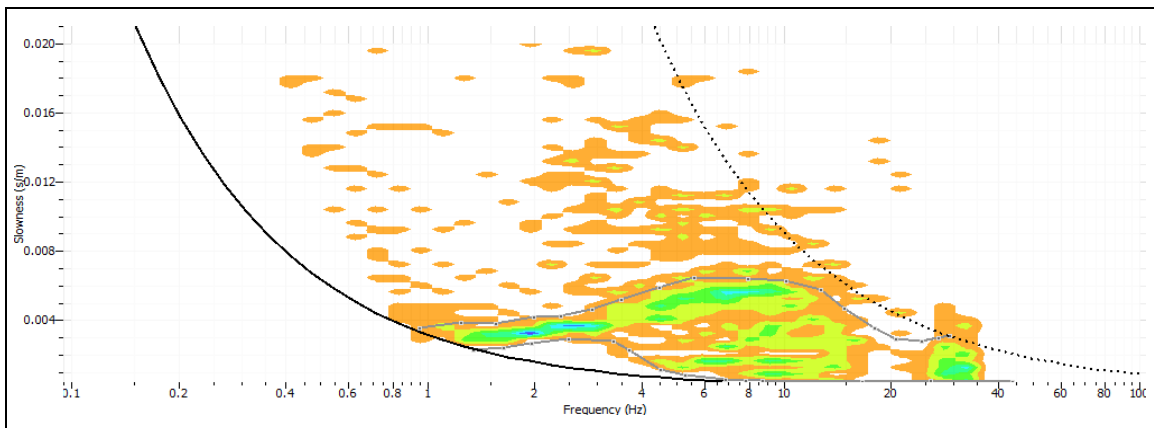
ANTENNA SISMICA ESAC

CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac4

CURVE DI DISPERSIONE CORRISPONDENTI AD OGNI RINGS



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



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

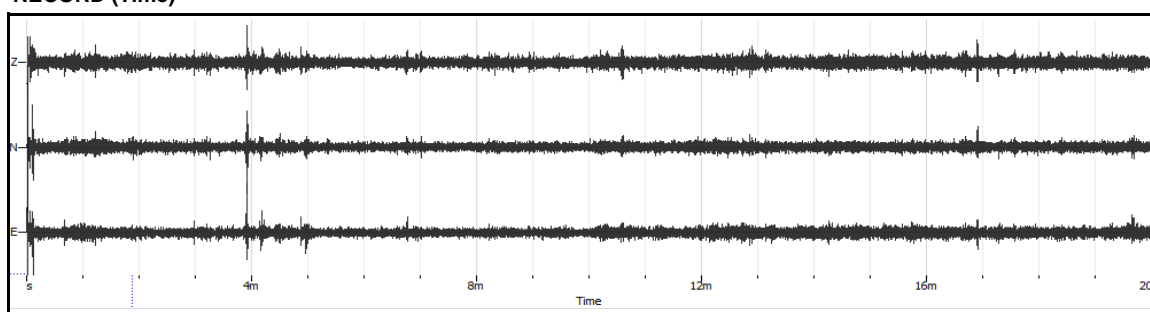
CODICE LAVORO: 1422

CODICE PROVA: Esac4

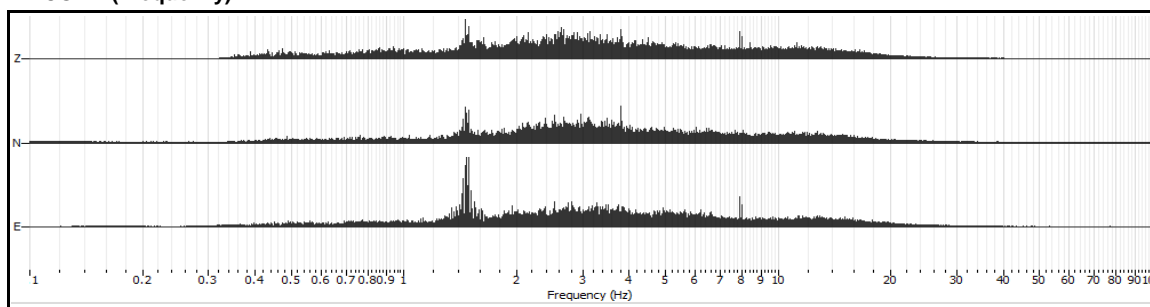
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	17

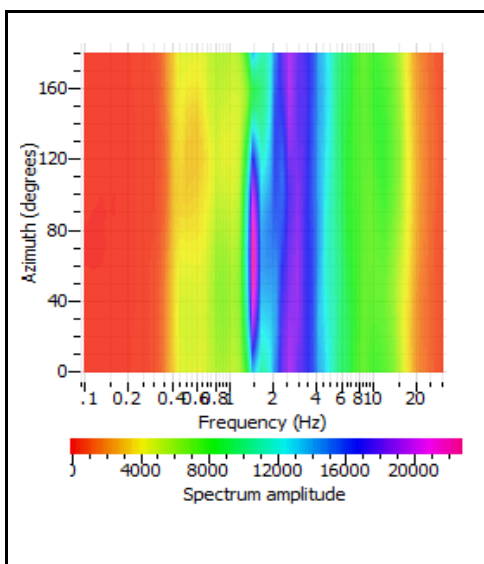
RECORD (Time)



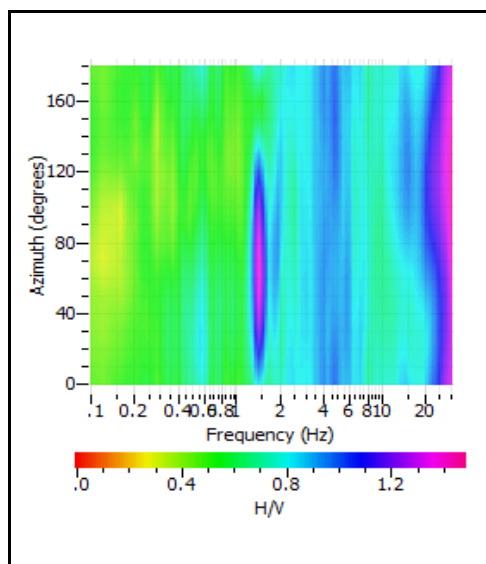
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

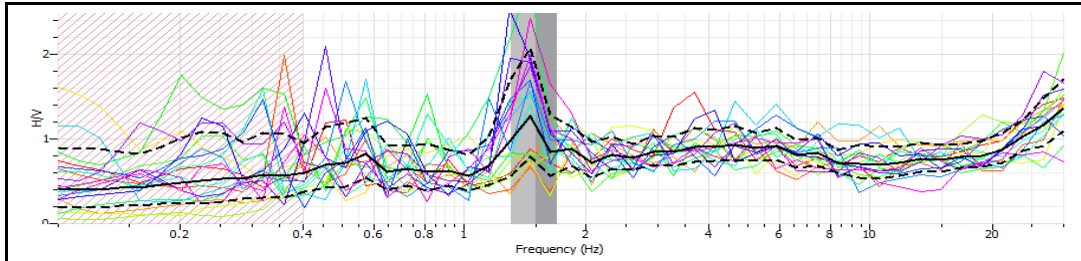


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

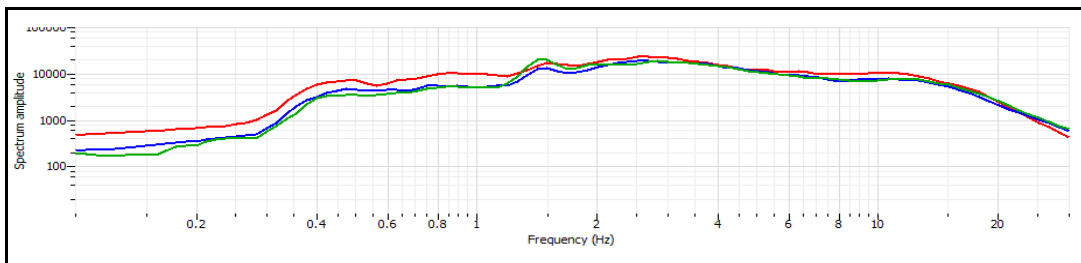
CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac4

RAPPORTO SPETTRALE H/V

Max HVSr 1.5 ± 0.19 Hz. A0 = 1.36



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	1.50		
Lw	20		
nw	71		
f0 > 10 / Lw	1.5 > 10/20	✓	
nc (f0) > 200	2130 > 200	✓	
σA(f) < 2 for 0.5 f0 < f < 2 f0 if f0 > 0.5 Hz	Exceeded 0 out of 50 times	✓	
σA(f) < 3 for 0.5 f0 < f < 2 f0 if f0 < 0.5 Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	1.02 Hz	✓	
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		✗
A0 > 2	1.36 > 2		✗
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	28.5 < 0.05		✗
σ < ε(f0)	0.19552 < 0.15		✗
σA(f0) < θ(f0)	0.3081 < 1.78	✓	

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

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

ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac4

LOCALITA': Via Bastia - San Mauro Pascoli

DATA PROVA: 17/06/2014

LONGITUDINE: 293097 m

LATITUDINE: 4886796 m

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

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

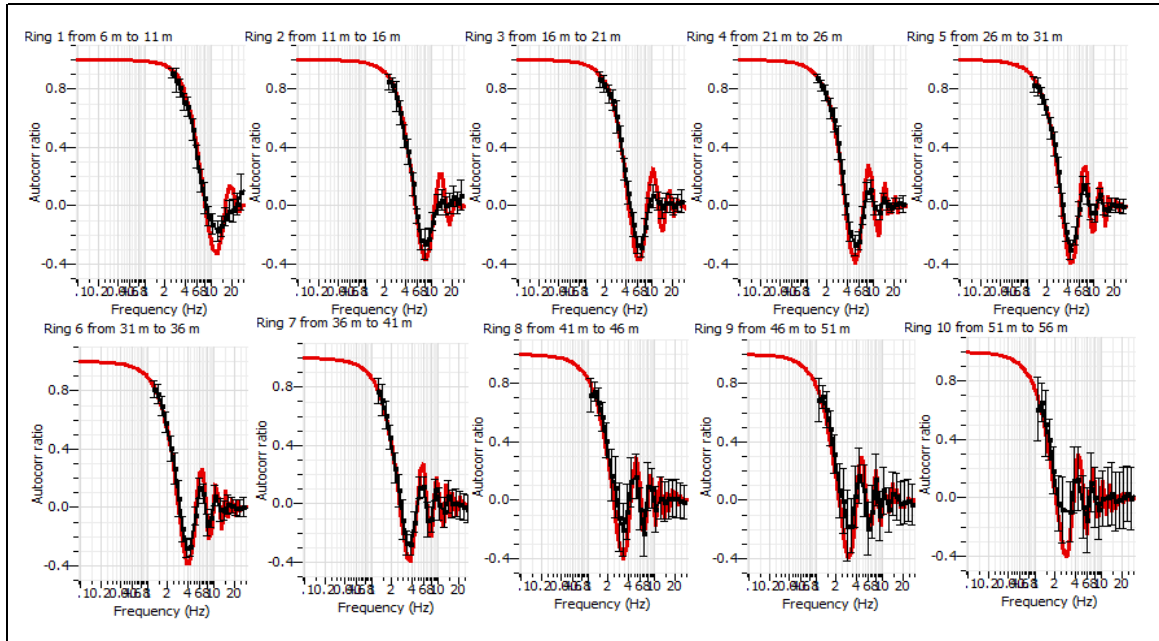
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

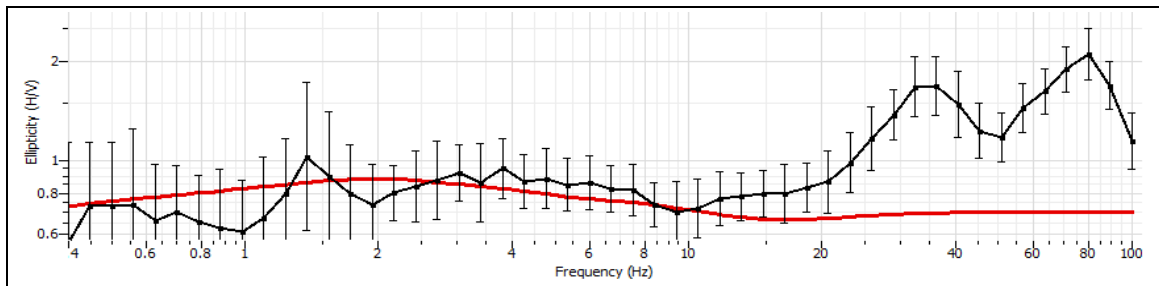
SPACING 5 m.

RECORD TIME (min) 18

VERTICAL RINGS AUTOCORRELATION



ELLIPTICITY AUTOCORRELATION CURVES



ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac4

LOCALITA': Via Bastia - San Mauro Pascoli

DATA PROVA: 17/06/2014

LONGITUDINE: 293097 m

LATITUDINE: 4886796 m

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

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

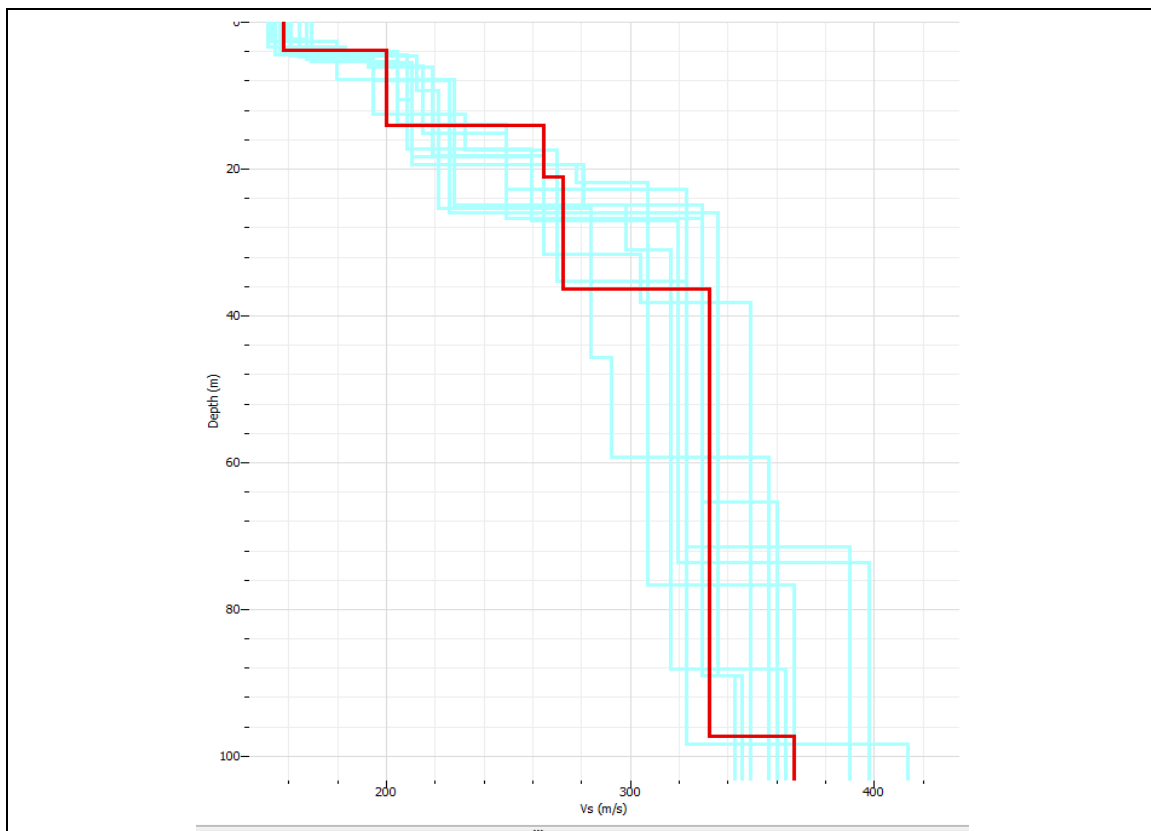
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

SPACING 5 m.

RECORD TIME (Min) 18

PROFILO VELOCITÀ ONDE DI TAGLIO



CALCOLO VS 30

SPESSORE	PROFONDITA'	Vs	SPESSORE/Vs
5	0	157	0.031847134
10	5	200	0.05
6.2	15	264	0.023484848
8.8	21.2	273	0.032234432

30

0.137566414

$$V_{S30} = 218$$

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

C

ANTENNA SISMICA (ESAC)

CLIENTE: Regione Emilia Romagna

CODICE LAVORO: 1422

CODICE PROVA: Esac5

LOCALITA': Via Evangelista Torricelli - Gatteo

DATA PROVA: 18/06/2014

Coordinata est: 290790 m

Coordinata nord: 4890276 m

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

TERRENO DI MISURA: Naturale soffice

SPACING: 5 m.

RECORD TIME (MIN): 18

CONDIZIONI METEO: Sole

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



ANTENNA SISMICA (ESAC)

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac5

LOCALITA': Via Evangelista Torricelli - Gatteo

DATA PROVA: 18/06/2014

LONGITUDINE: 290790 m

LATITUDINE: 4890276 m

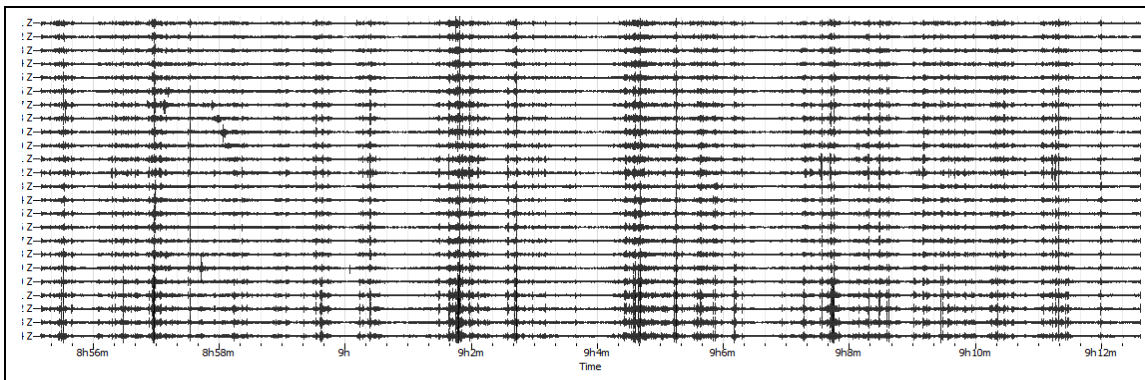
STRUMENTAZIONE Geometrics GEODE

N°CANALI 24

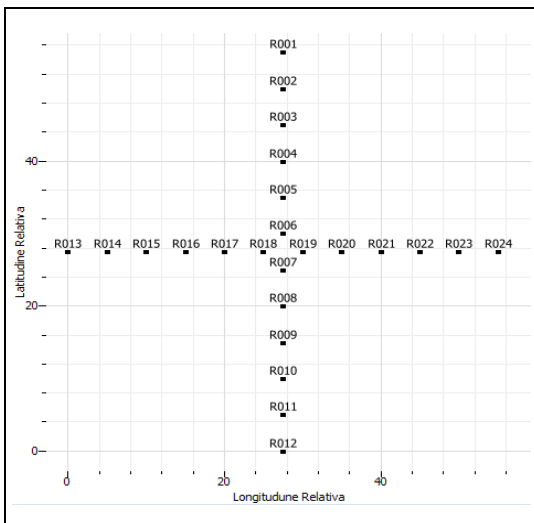
SPACING 5 m.

RECORD TIME (min) 18

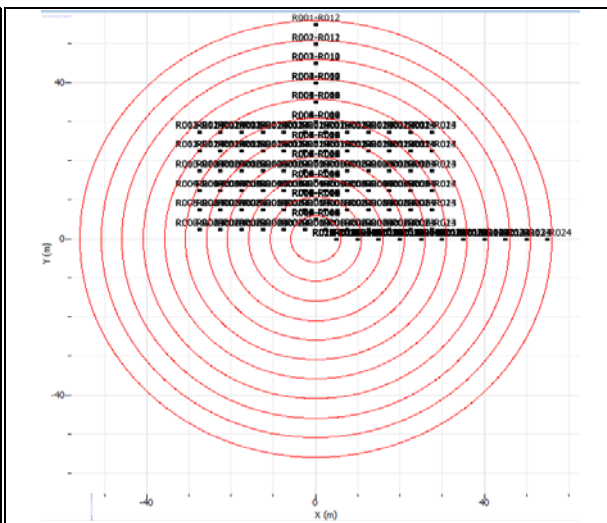
REGISTRAZIONE



PLANIMETRIA ARRAY



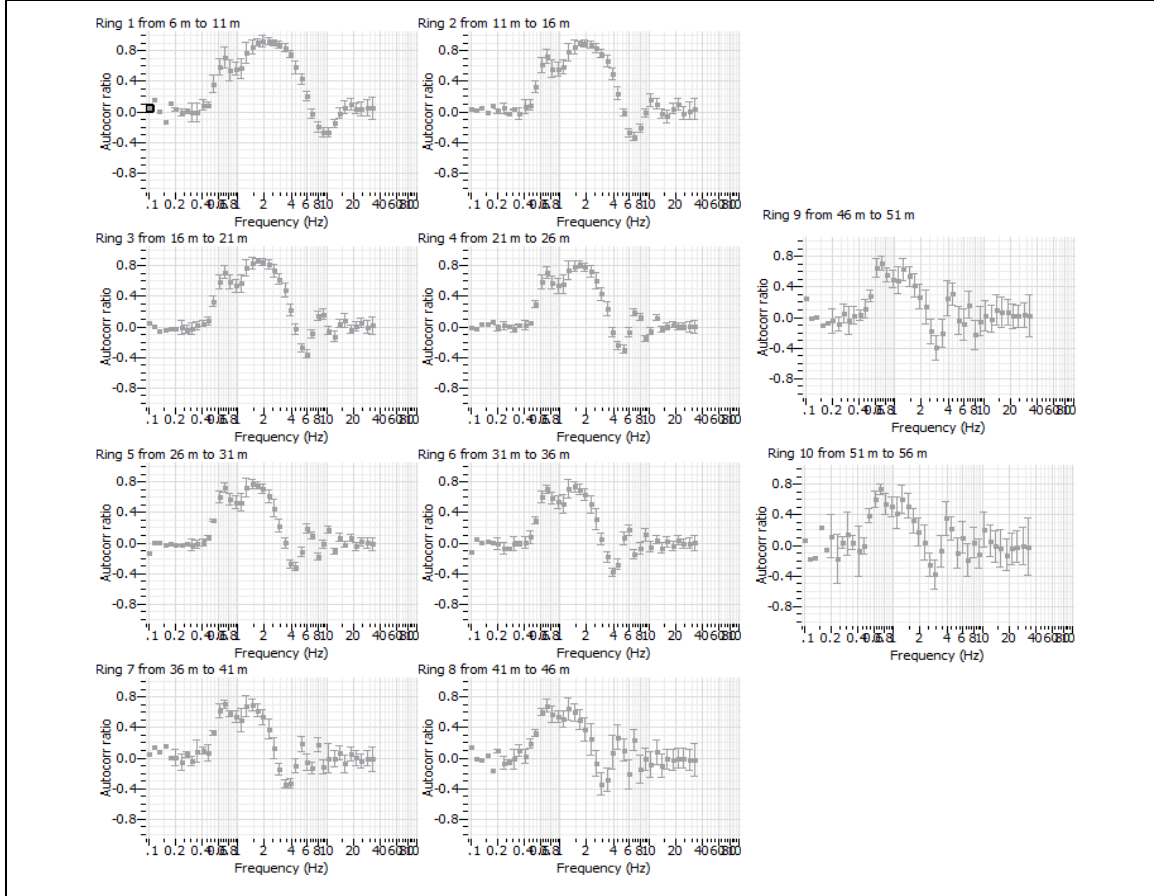
CO-ARRAY E RINGS



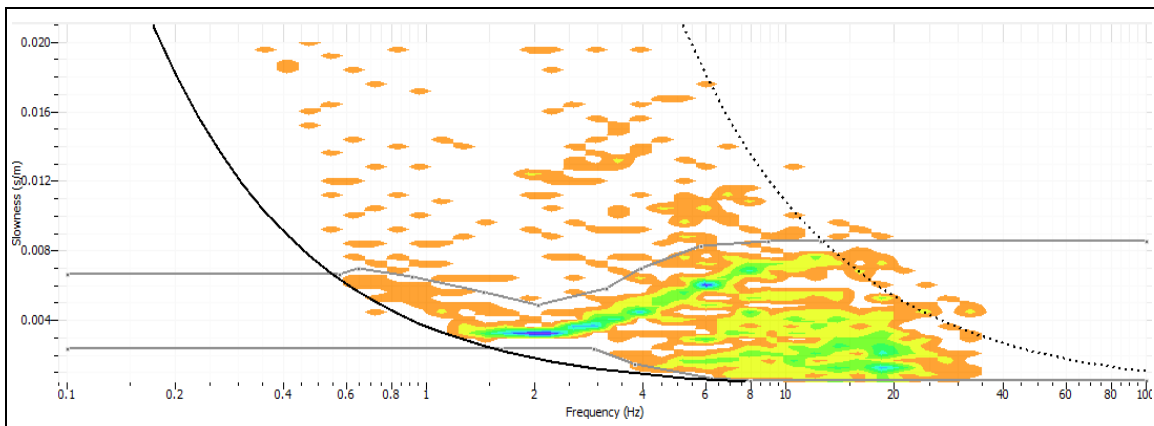
ANTENNA SISMICA ESAC

CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac5

CURVE DI DISPERSIONE CORRISPONDENTI AD OGNI RINGS



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



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

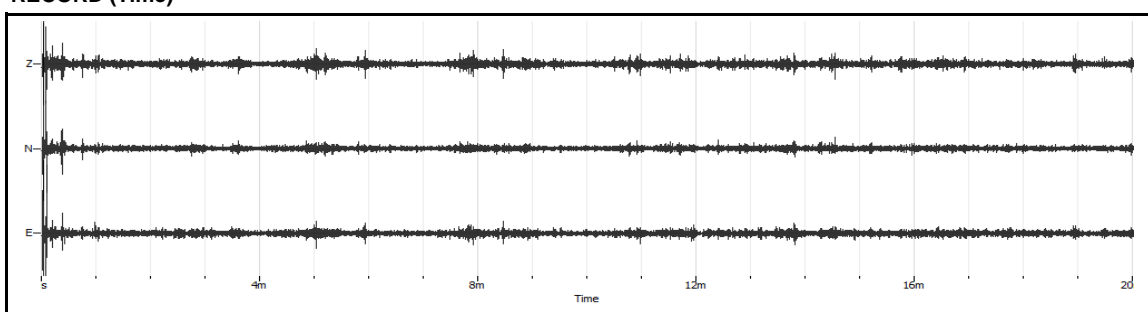
CODICE LAVORO: 1422

CODICE PROVA: Esac5

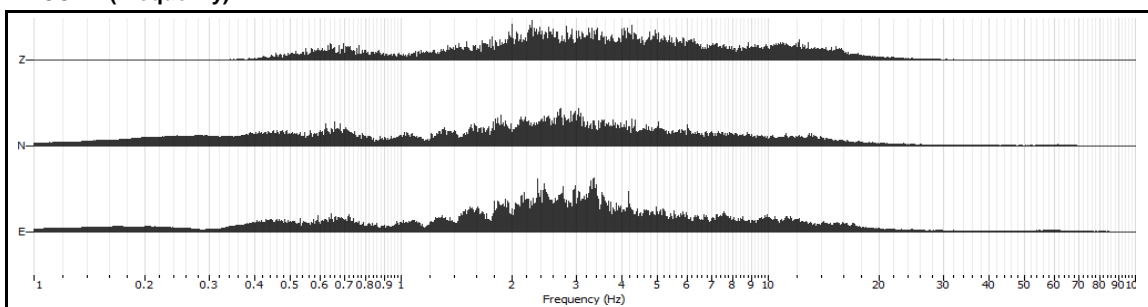
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	30

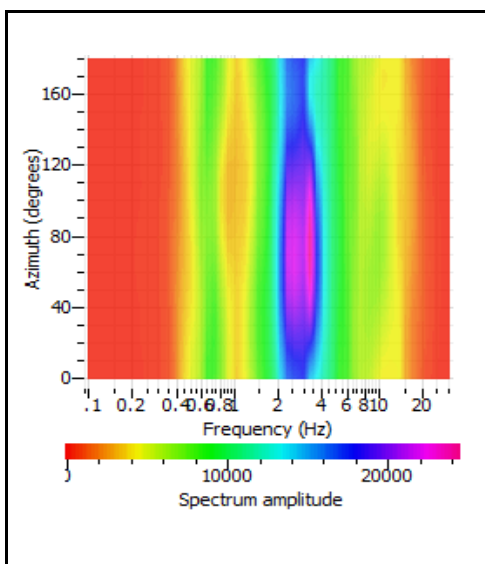
RECORD (Time)



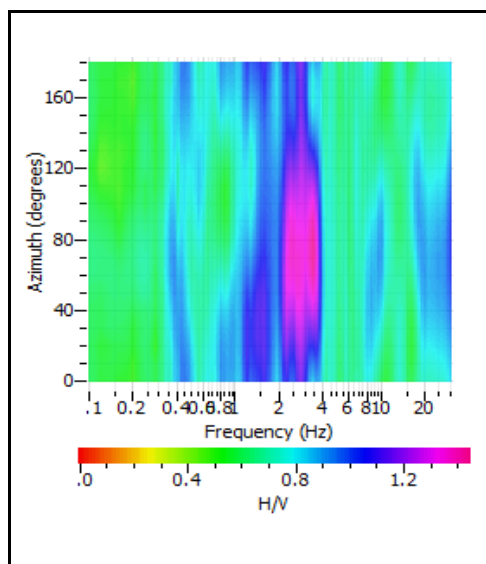
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

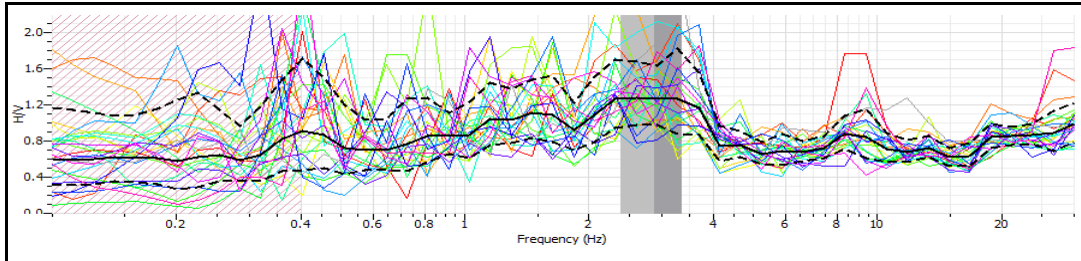


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

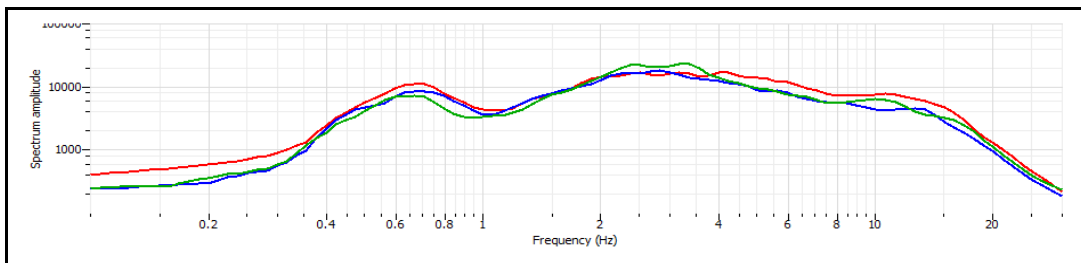
CLIENTE Regione Emilia Romagna
 CODICE LAVORO 1422
 CODICE PROVA Esac5

RAPPORTO SPETTRALE H/V

Max HVSR 2.9 ± 0.45 Hz. $A0 = 0.94$



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	2.90		
Lw	20		
nw	71		
f0 > 10 / Lw	2.9 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	4118 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		<input checked="" type="checkbox"/>
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	0.94 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	27.1 < 0.05		<input checked="" type="checkbox"/>
σf < ε(f0)	0.45093 < 0.145		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.182061 < 1.58	<input checked="" type="checkbox"/>	

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

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

ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac5

LOCALITA': Via Evangelista Torricelli - Gatteo

DATA PROVA: 18/06/2014

LONGITUDINE: 290790 m

LATITUDINE: 4890276 m

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

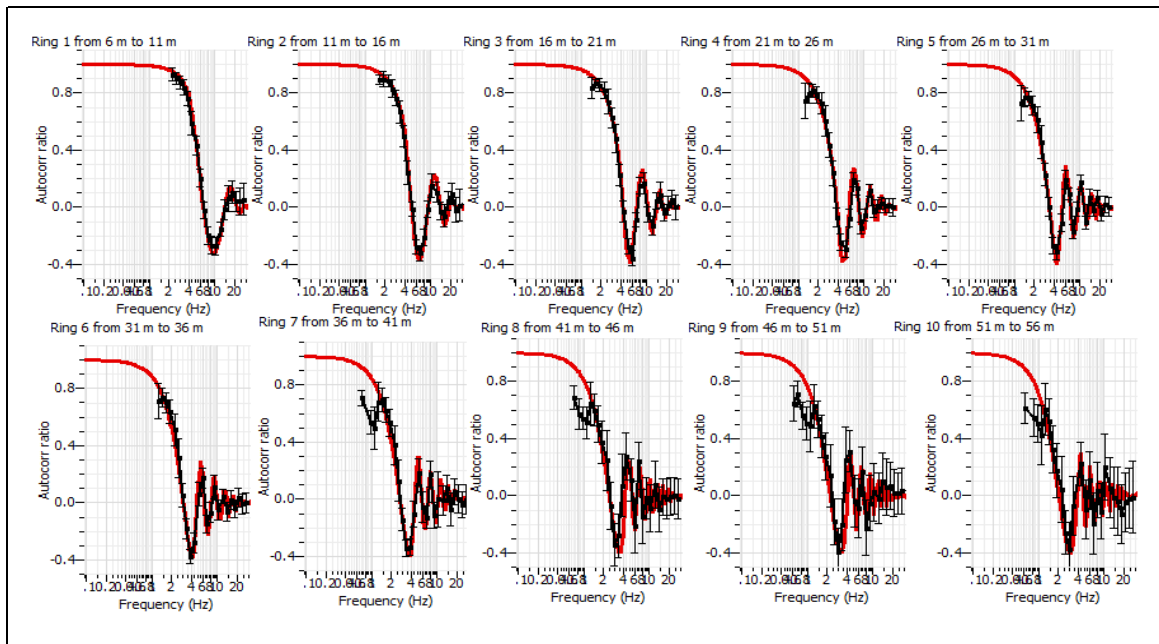
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

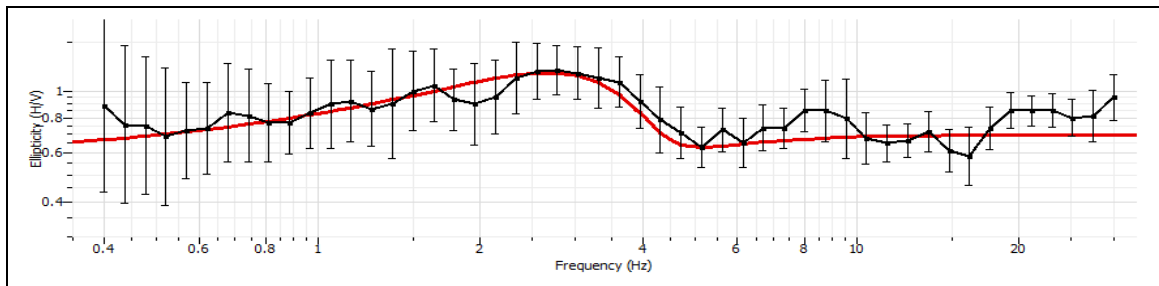
SPACING 5 m.

RECORD TIME (min) 18

VERTICAL RINGS AUTOCORRELATION



ELLIPTICITY AUTOCORRELATION CURVES



ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac5

LOCALITA': Via Evangelista Torricelli - Gatteo

DATA PROVA: 18/06/2014

LONGITUDINE: 290790 m

LATITUDINE: 4890276 m

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

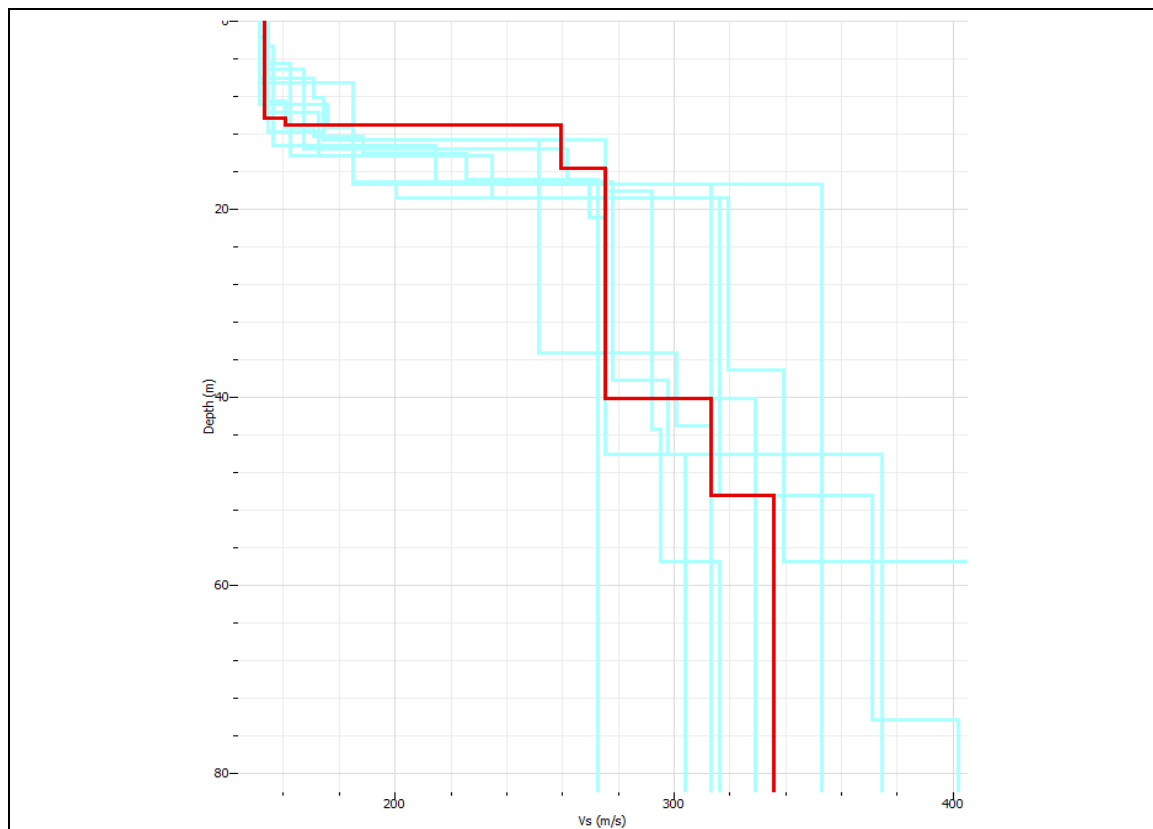
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

SPACING 5 m.

RECORD TIME (min) 18

PROFILO VELOCITÀ ONDE DI TAGLIO



CALCOLO VS 30

SPESSORE	PROFONDITA'	Vs	SPESSORE/Vs
10.66	0	153	0.069673203
0.82	10.66	160	0.005125
4.92	11.48	259	0.018996139
13.6	16.4	275	0.049454545

0.143248887

$$V_{S30} = 209$$

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

C

ANTENNA SISMICA (ESAC)

CLIENTE: Regione Emilia Romagna

CODICE LAVORO: 1422

CODICE PROVA: Esac6

LOCALITA': Via Varsavia - Savignano

DATA PROVA: 17/06/2014

Coordinata est: 294459 m

Coordinata nord: 4892960 m

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

TERRENO DI MISURA: Naturale soffice

SPACING: 5 m.

RECORD TIME (min): 18

CONDIZIONI METEO: Sole

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



ANTENNA SISMICA (ESAC)

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac6

LOCALITA': Via Varsavia - Savignano

DATA PROVA: 17/06/2014

LONGITUDINE: 294459 m

LATITUDINE: 4892960 m

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

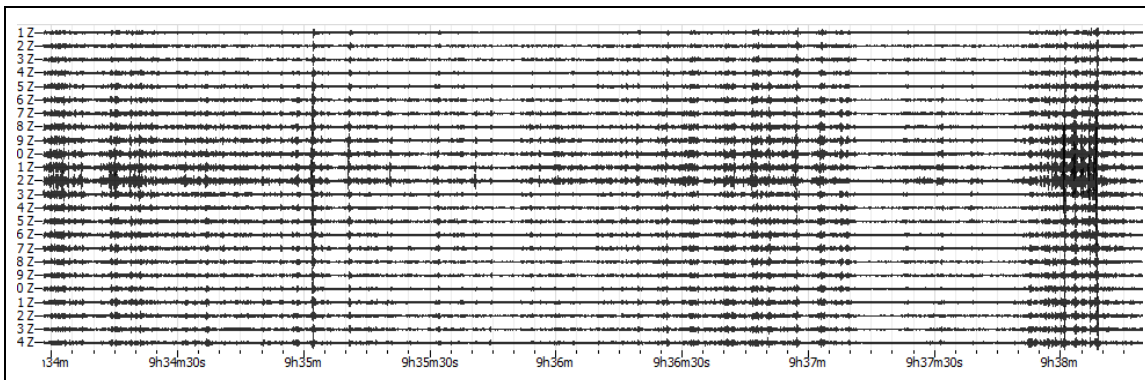
STRUMENTAZIONE Geometrics GEODE

N°CANALI 24

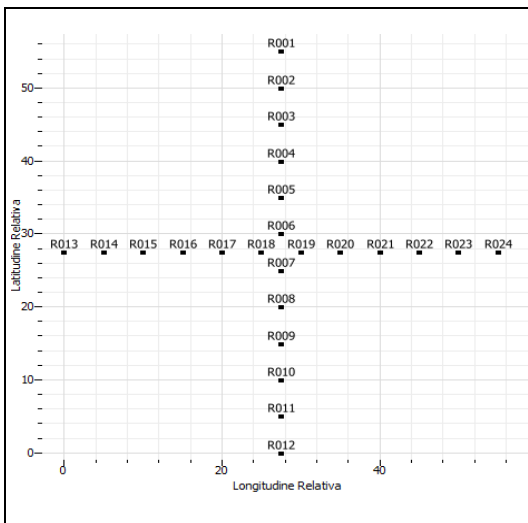
SPACING 5 m.

RECORD TIME (min) 18

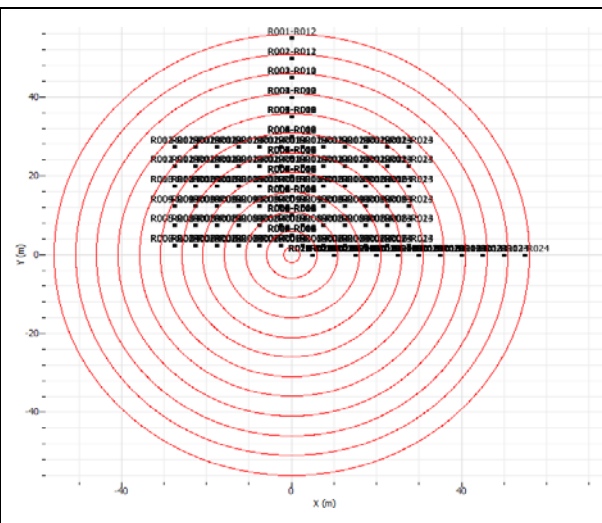
REGISTRAZIONE



PLANIMETRIA ARRAY



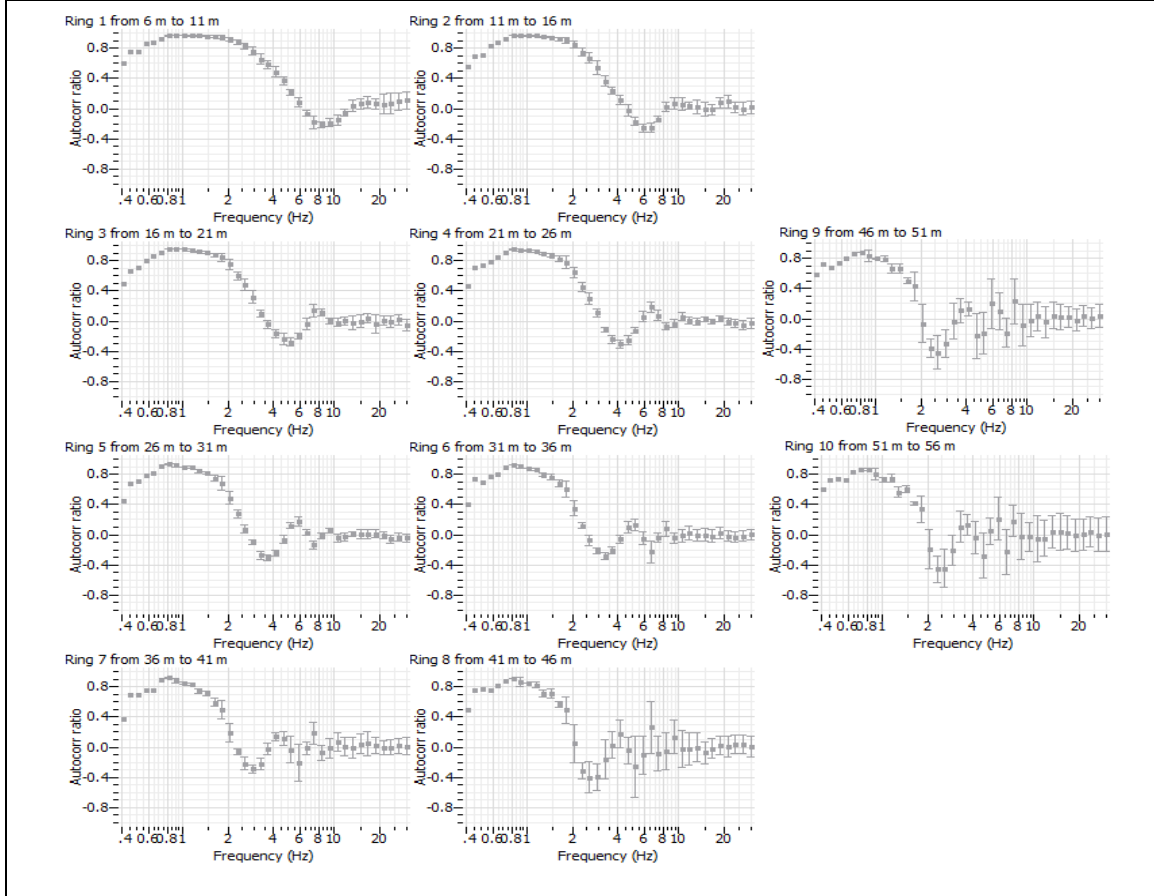
CO-ARRAY E RINGS



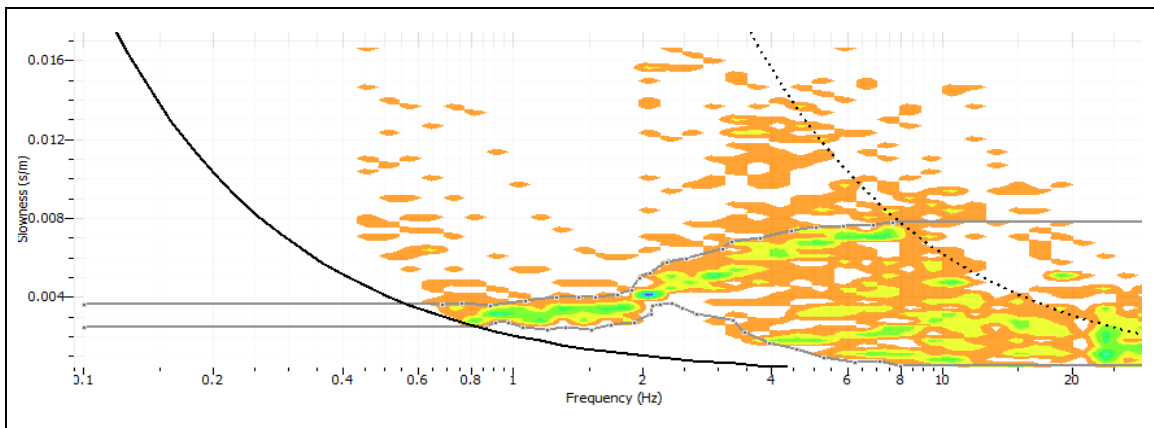
ANTENNA SISMICA ESAC

CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac6

CURVE DI DISPERSIONE CORRISPONDENTI AD OGNI RINGS



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



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

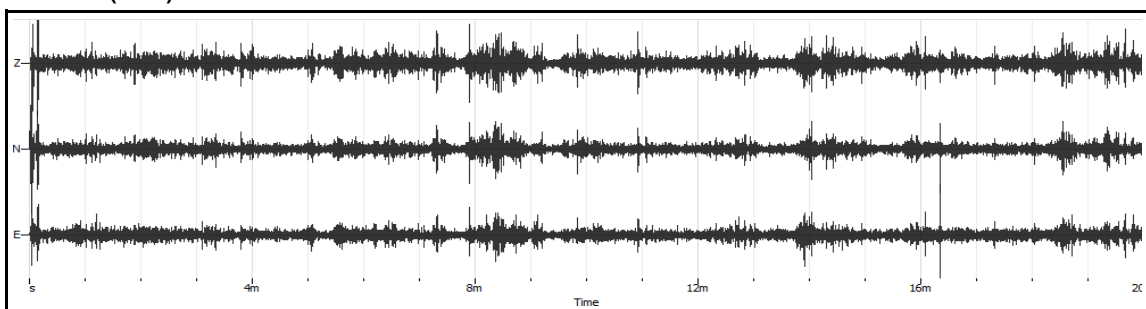
CODICE LAVORO: 1422

CODICE PROVA: Esac6

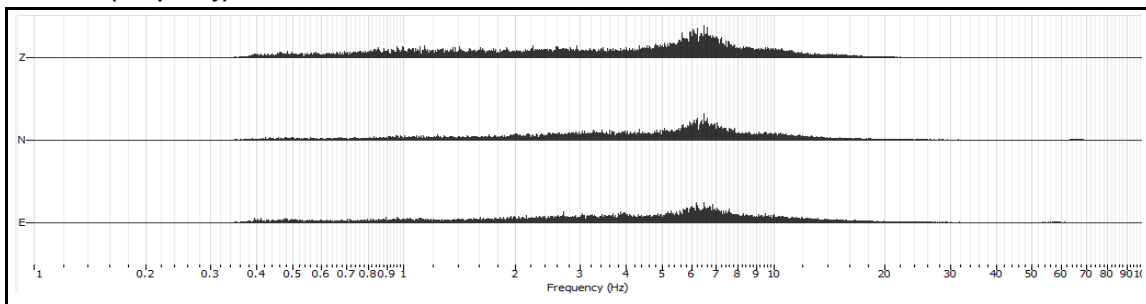
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	33

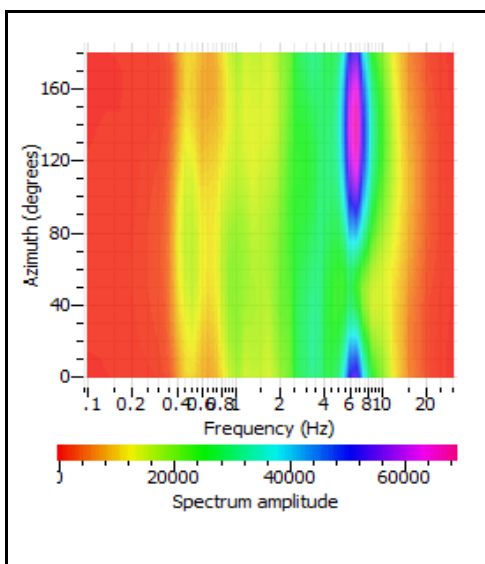
RECORD (Time)



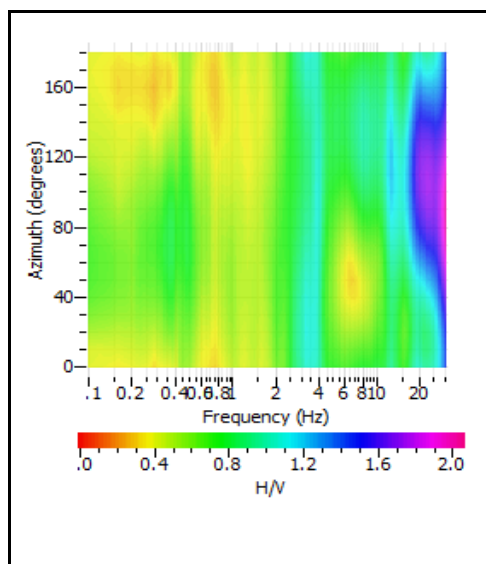
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

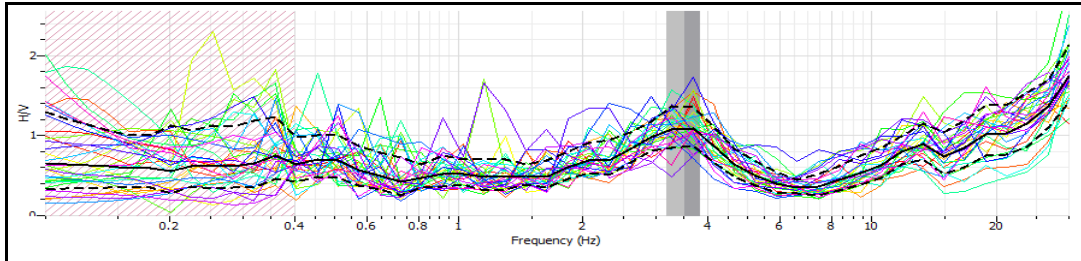


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

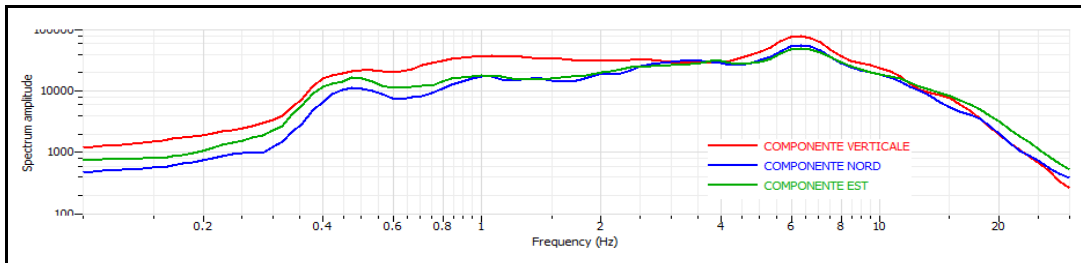
CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac6

RAPPORTO SPETTRALE H/V

Max HVSR 3.39 ± 0.41 Hz. A0 = 1.26



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	3.39		
Lw	20		
nw	71		
f0 > 10 / Lw	3.39 > 10/20	✓	
nc (f0) > 200	4813.8 > 200	✓	
σA(f) < 2 for 0.5 f0 < f < 2 f0 if f0 > 0.5 Hz	Exceeded 0 out of 50 times	✓	
σA(f) < 3 for 0.5 f0 < f < 2 f0 if f0 < 0.5 Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f⁻ in [f0/4, f0] AH/V(f⁻) < A0/2	1.82 Hz	✓	
Exists f⁺ in [4f0, f0] AH/V(f⁺) < A0/2	4.62 Hz	✓	
A0 > 2	1.26 > 2		✗
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	21.61 < 0.05		✗
σf < ε(f0)	0.41105 < 0.1695		✗
σA(f0) < θ(f0)	0.293285 < 1.58	✓	

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

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

ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac6

LOCALITA': Via Varsavia - Savignano

DATA PROVA: 17/06/2014

LONGITUDINE: 294459 m

LATITUDINE: 4892960 m

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

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

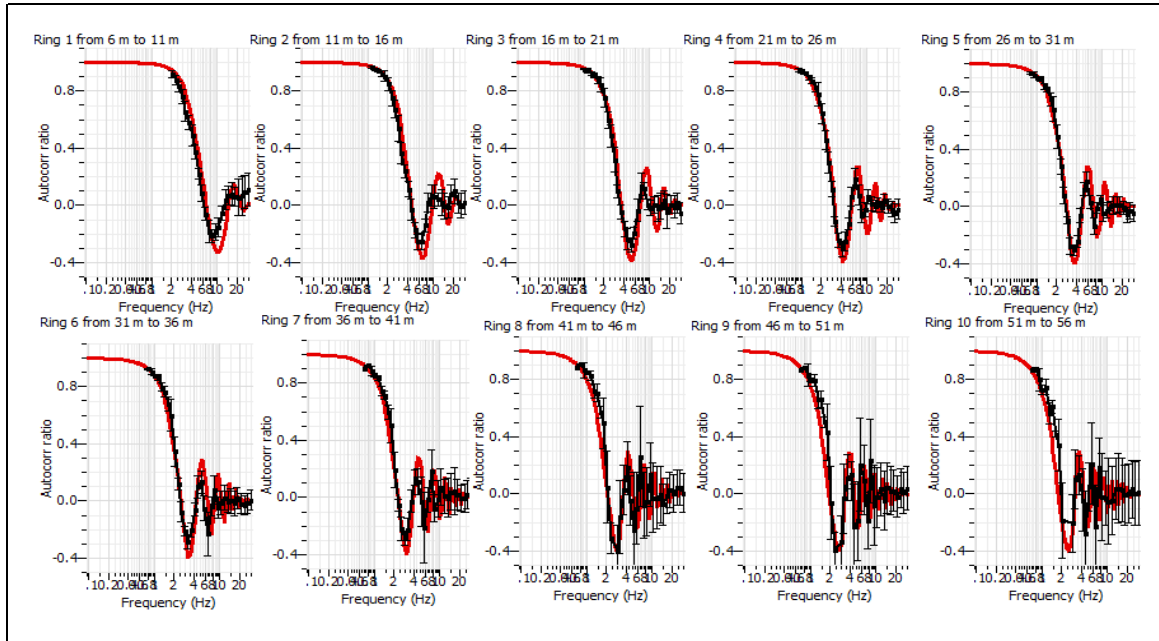
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

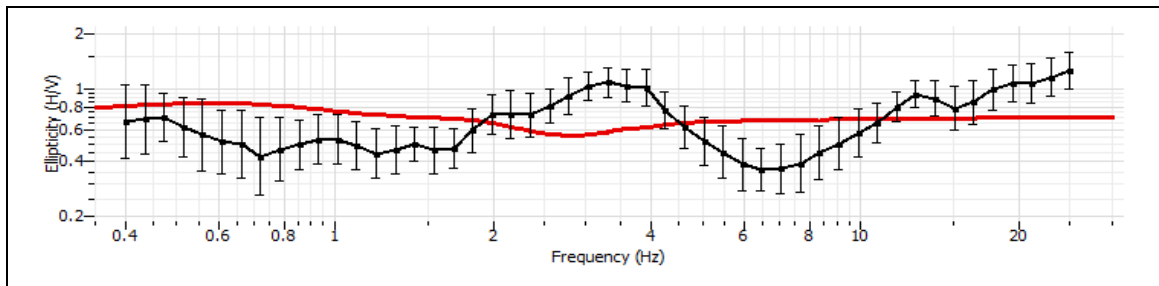
SPACING 5 m.

RECORD TIME (min) 18

VERTICAL RINGS AUTOCORRELATION



ELLIPTICITY AUTOCORRELATION CURVES



ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE Regione Emilia Romagna

CODICE LAVORO 1422

CODICE PROVA Esac6

LOCALITA': Via Varsavia - Savignano

DATA PROVA: 17/06/2014

LONGITUDINE: 294459 m

LATITUDINE: 4892960 m

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

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

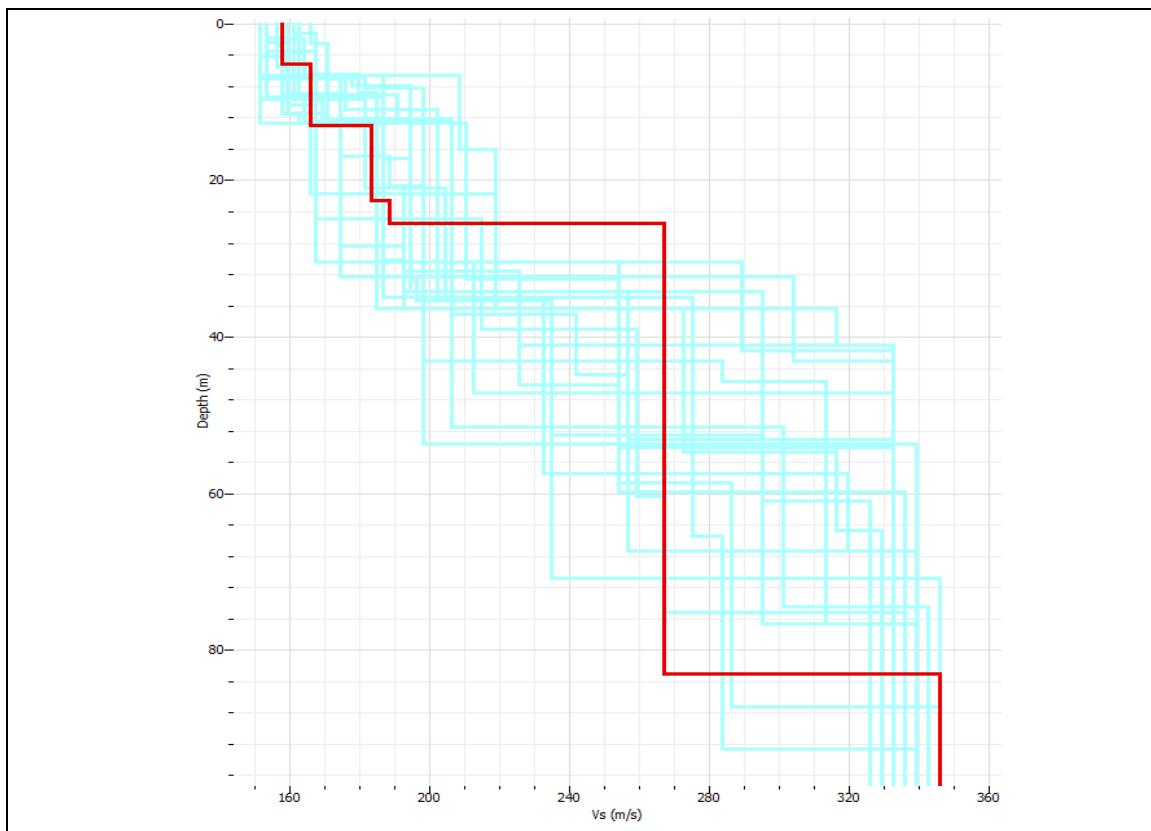
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

SPACING 5 m.

RECORD TIME (min) 18

PROFILO VELOCITÀ ONDE DI TAGLIO



CALCOLO VS 30

SPESSORE	PROFONDITA'	Vs	SPESSORE/Vs
5.22	0	156	0.033461538
7.85	5.22	165	0.047575758
10.46	13.07	183	0.05715847
2.61	23.53	188	0.013882979
3.86	26.14	267	0.014456929
	30		0.166535674

$$Vs_{30} = 180$$

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

C

ANTENNA SISMICA (ESAC)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Esac7

LOCALITA': Via Rubicone - Savignano

DATA PROVA: 25/08/2014

Coordinata est: 290982 m

Coordinata nord: 4884383 m

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

TERRENO DI MISURA: Naturale soffice

SPACING: 5 m.

RECORD TIME (min): 18

CONDIZIONI METEO: Sole

FOTO AEREA (Google Earth)

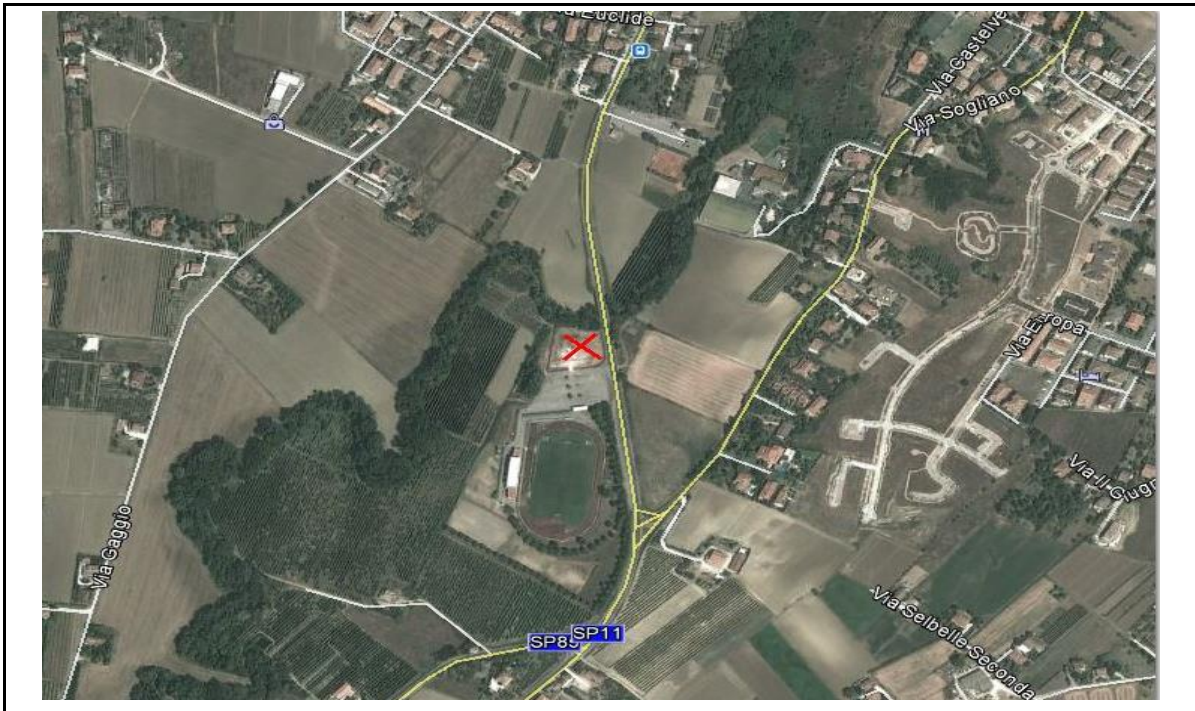


FOTO AREA DI INDAGINE



ANTENNA SISMICA (ESAC)

CLIENTE UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO 1422

CODICE PROVA Esac7

LOCALITA': Via Rubicone - Savignano

DATA PROVA: 25/08/2014

LONGITUDINE: 290982 m

LATITUDINE: 4884383 m

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

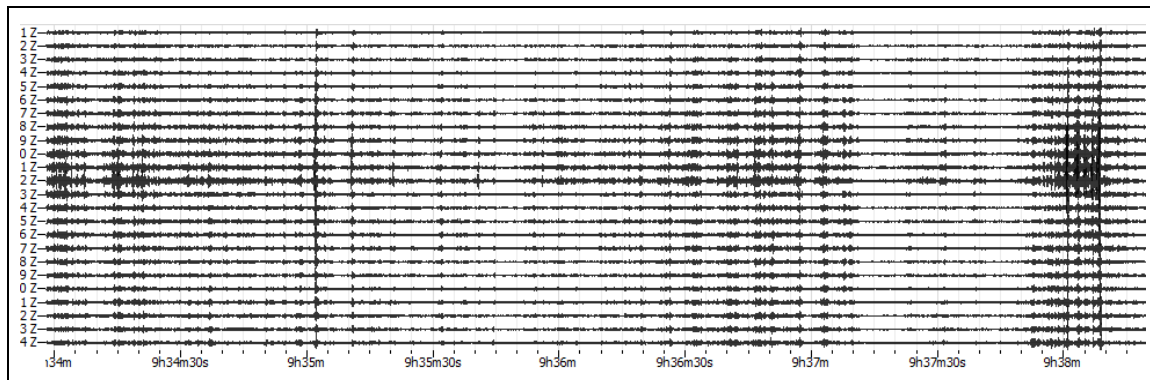
STRUMENTAZIONE Geometrics GEODE

N°CANALI 24

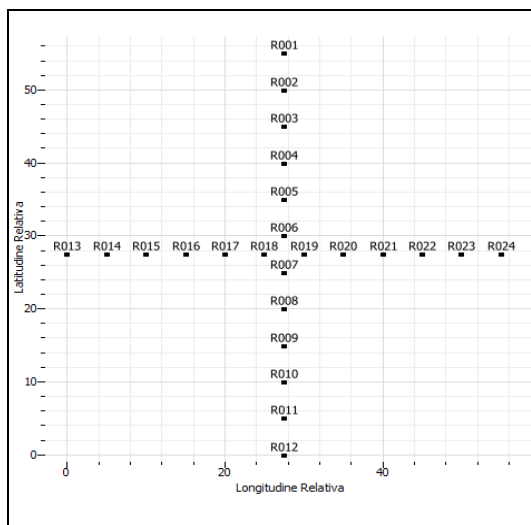
SPACING 5 m.

RECORD TIME (min) 18

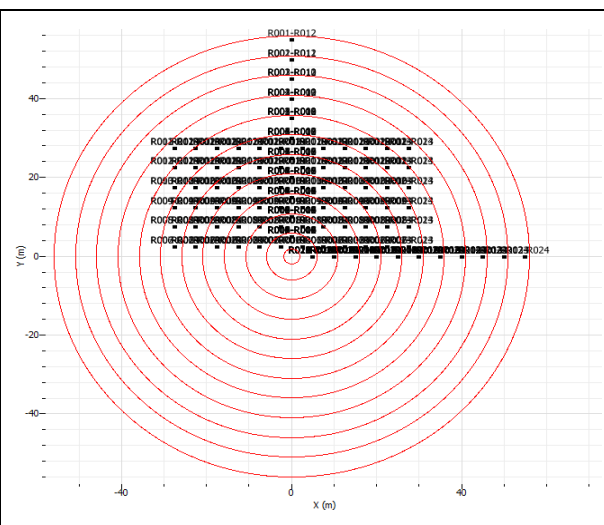
REGISTRAZIONE



PLANIMETRIA ARRAY



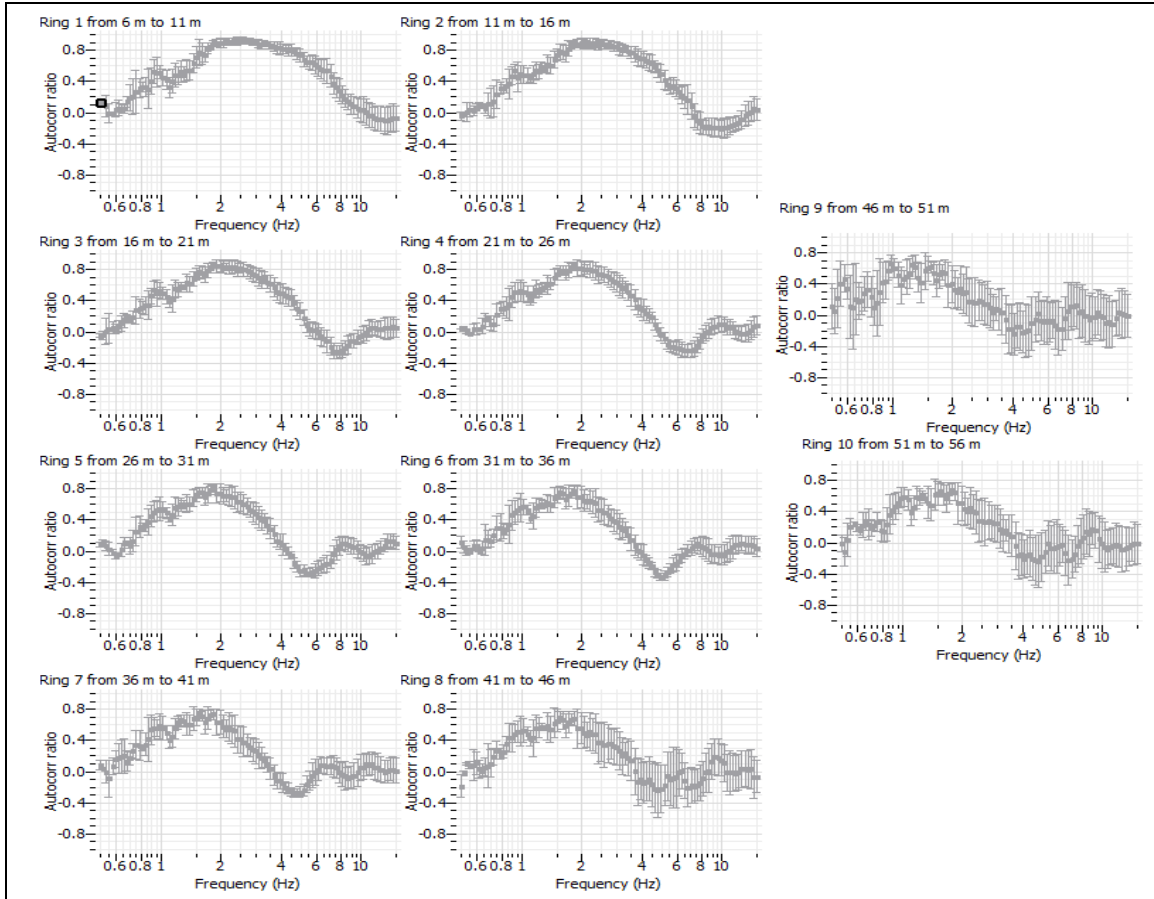
CO-ARRAY E RINGS



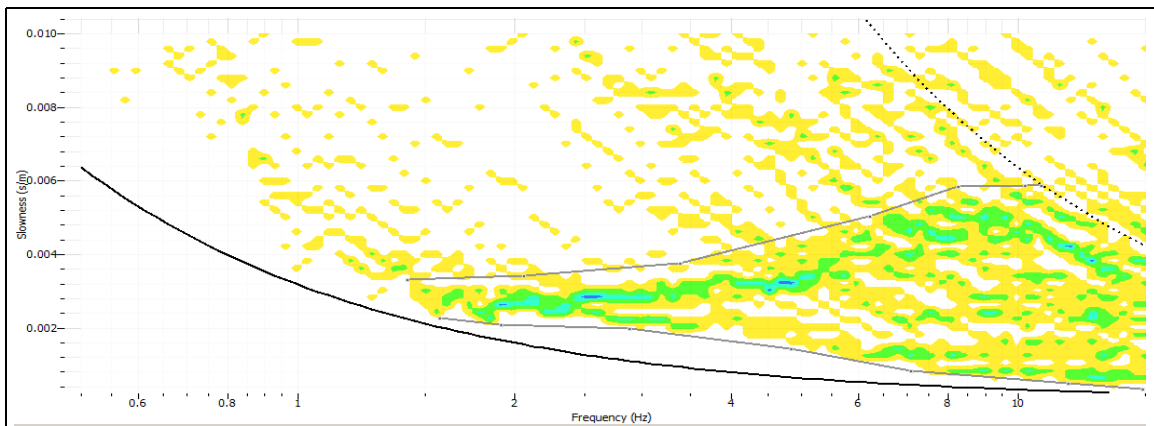
ANTENNA SISMICA (ESAC)

CLIENTE UNIONE DEI COMUNI DEL RUBICONE
CODICE LAVORO 1422
CODICE PROVA Esac7

CURVE DI DISPERSIONE CORRISPONDENTI AD OGNI RINGS



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



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

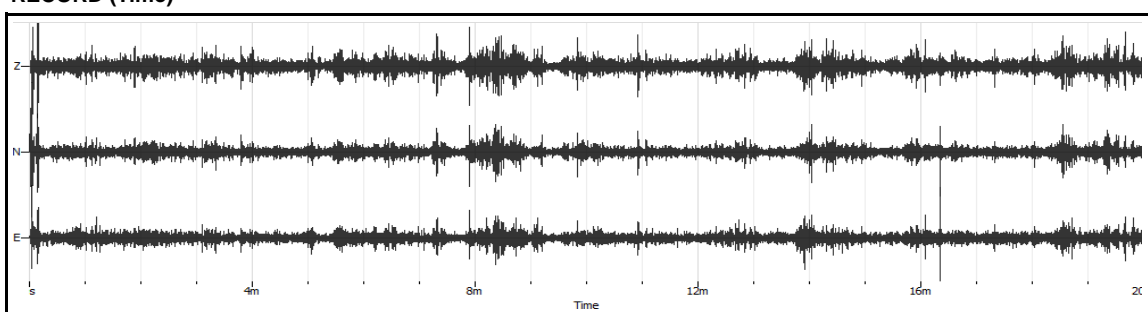
CODICE LAVORO: 1422

CODICE PROVA: Esac7

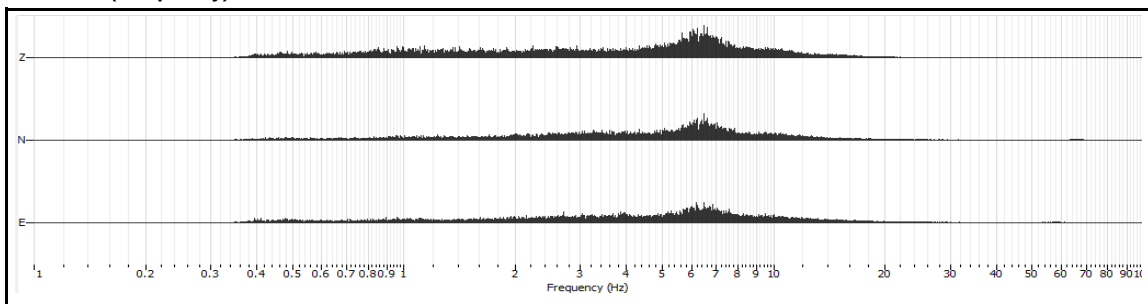
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

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

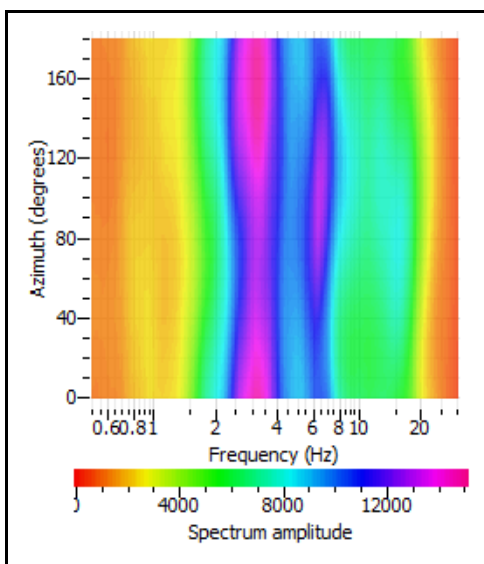
RECORD (Time)



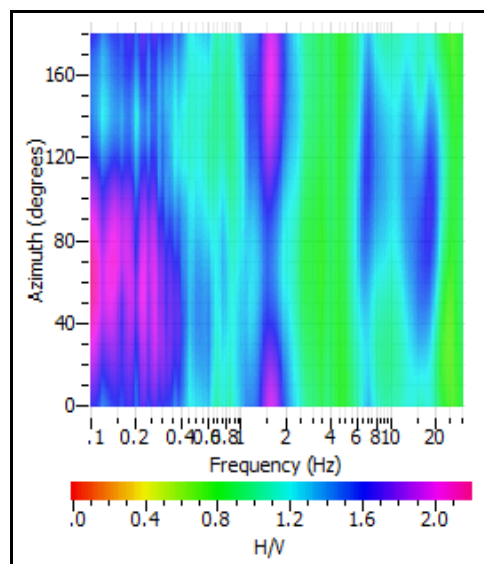
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

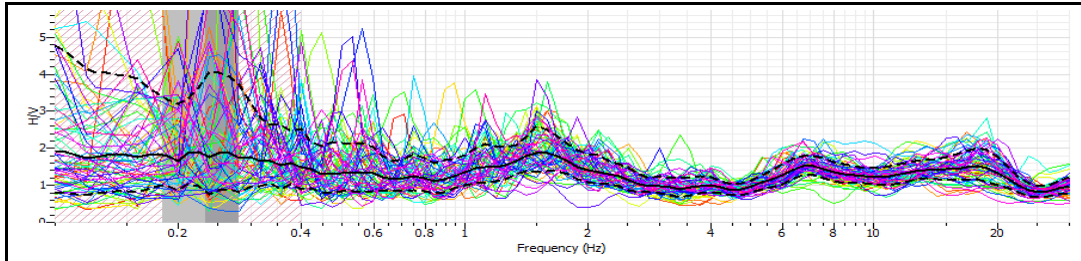


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

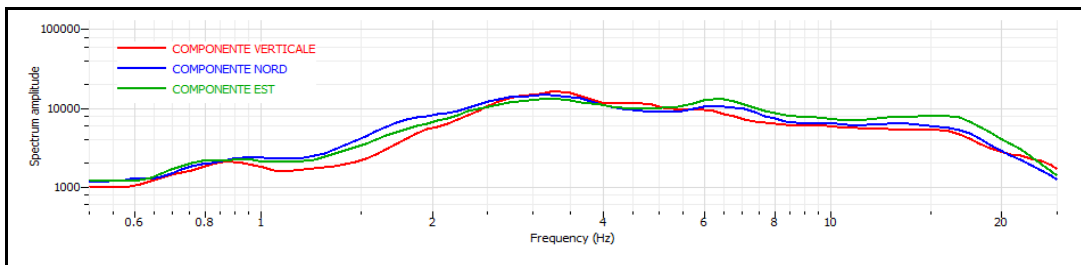
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Esac7

RAPPORTO SPETTRALE H/V

Max HVSR 0.26 ± 0.05 Hz. A0 = 1.48



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.26		
Lw	20		
nw	71		
f0 > 10 / Lw	0.26 > 10/20		☒
nc (f0) > 200	369.2 > 200	☑	
σA(f) < 2 for 0.5 f0 < f < 2 f0 if f0 > 0.5 Hz	Exceeded 0 out of 50 times	☑	
σA(f) < 3 for 0.5 f0 < f < 2 f0 if f0 < 0.5 Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		☒
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		☒
A0 > 2	1.48 > 2		☒
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	6.34581 < 0.05		☒
σf < ε(f0)	0.058056 < 0.052		☒
σA(f0) < θ(f0)	0.26284 < 2.5	☑	

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

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

ANALISI CONGIUNTA PROVA ESAC - HVSR

CLIENTE UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO 1422

CODICE PROVA Esac7

LOCALITA': Via Rubicone - Savignano

DATA PROVA: 25/08/2014

LONGITUDINE: 290982 m

LATITUDINE: 4884383 m

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

AZIMUT 45°

APPARECCHIATURA ESAC: Geometrics GEODE

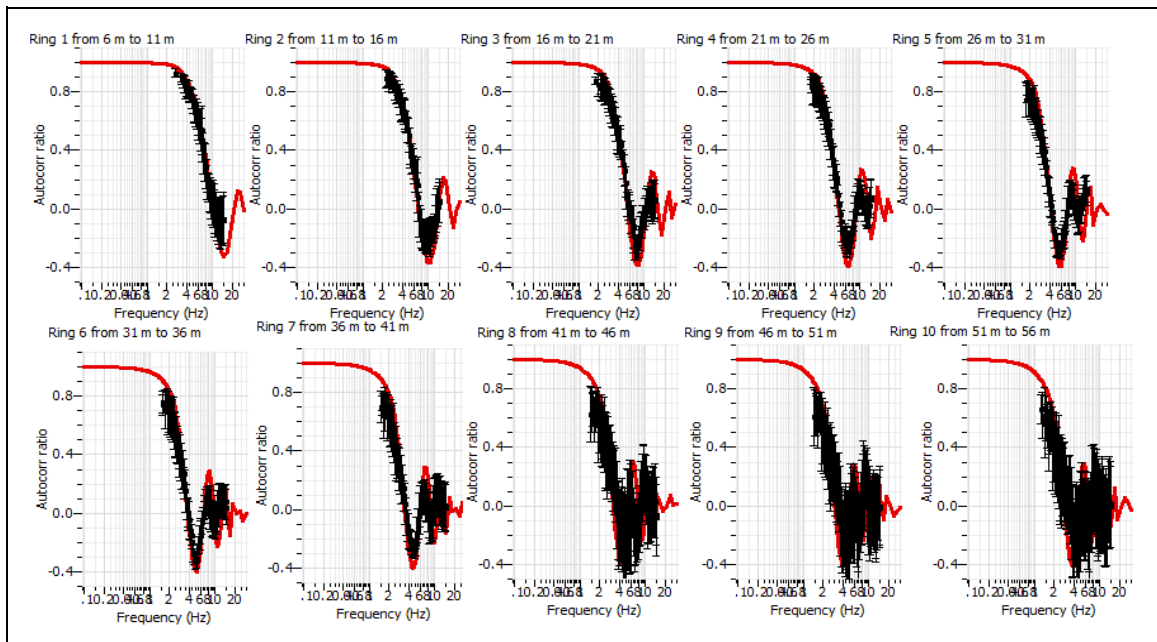
APPARECCHIATURA HVSR: SARA SL 07

N°CANALI 24

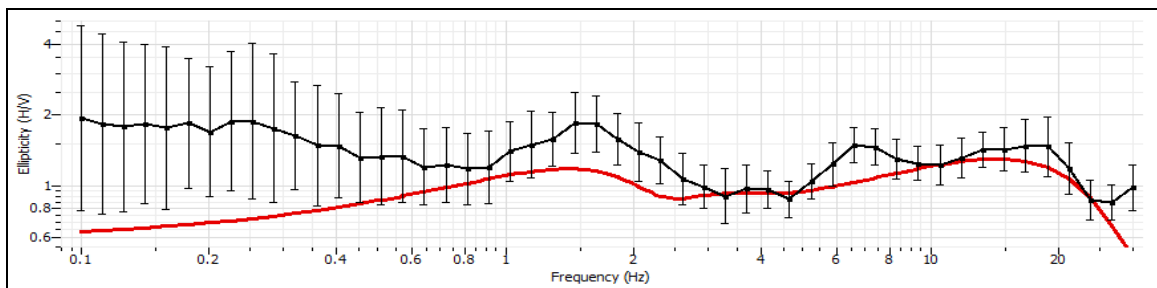
SPACING 5 m.

RECORD TIME (min) 18

VERTICAL RINGS AUTOCORRELATION



ELLIPTICITY AUTOCORRELATION CURVES



ANALISI CONGIUNTA PROVA ESAC - HVSR

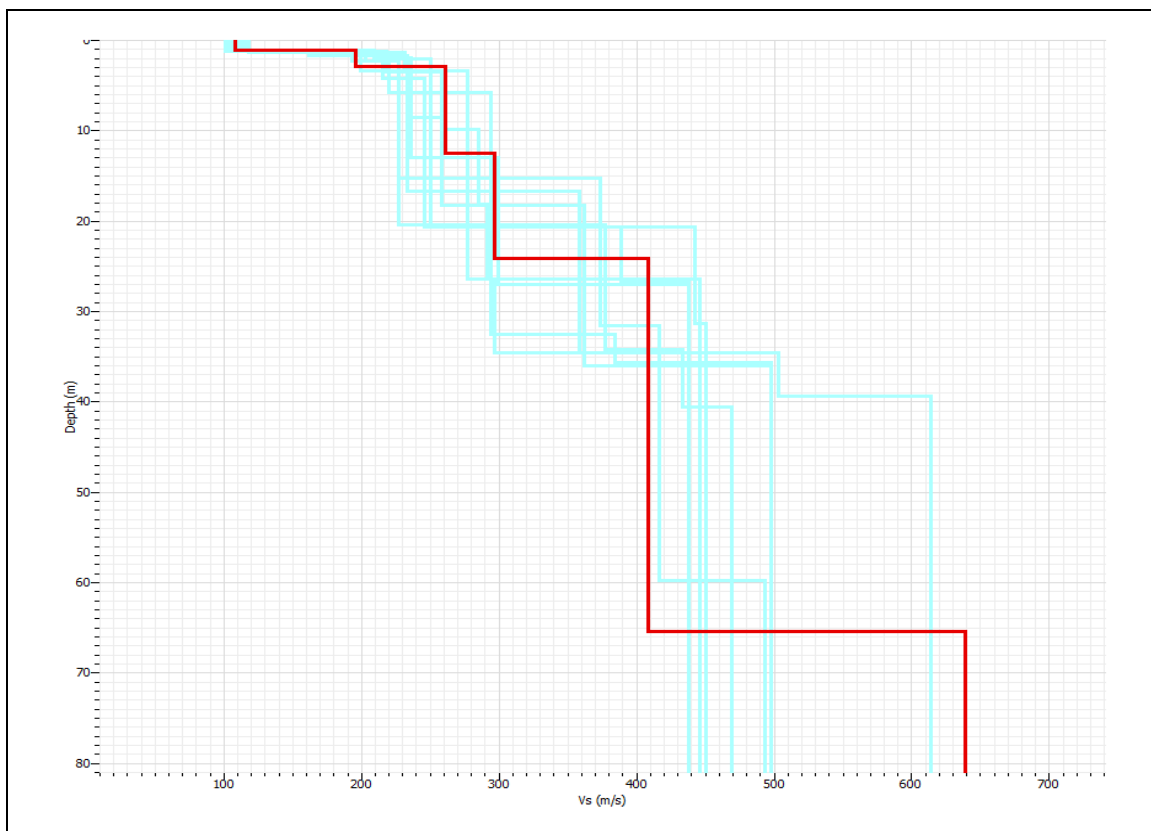
CLIENTE **UNIONE DEI COMUNI DEL RUBICONE**

CODICE LAVORO **1422**
CODICE PROVA **Esac7**

LOCALITA': Via Rubicone - Savignano
DATA PROVA: 25/08/2014
LONGITUDINE: 290982 m
LATITUDINE: 4884383 m
QUOTA (m.s.l.m.):
AZIMUT 45°

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

PROFILO VELOCITÀ ONDE DI TAGLIO



CALCOLO VS 30

SPESSORE	PROFONDITA'	Vs	SPESSORE/Vs
1.37	0	108	0.012685185
2.06	1.37	195	0.010564103
9.69	3.43	260	0.037269231
11.19	13.12	296	0.037804054
5.69	24.31	408	0.013946078
	30		
			0.112268651

$V_{S30} = 267$

C

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 1
TEST NUMBER: 1

SITE DATA

Latitude	44.155958°
Longitude	12.411060°
Height m. slm	3 m s.l.m.
Azimuth	120°

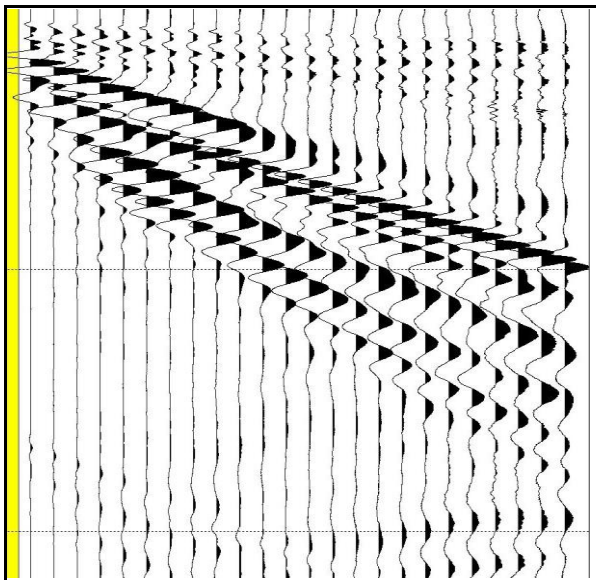
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

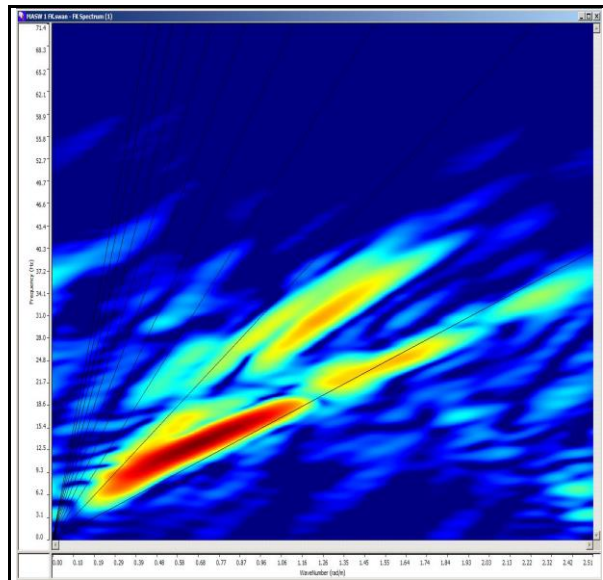
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 1
TEST NUMBER: 1

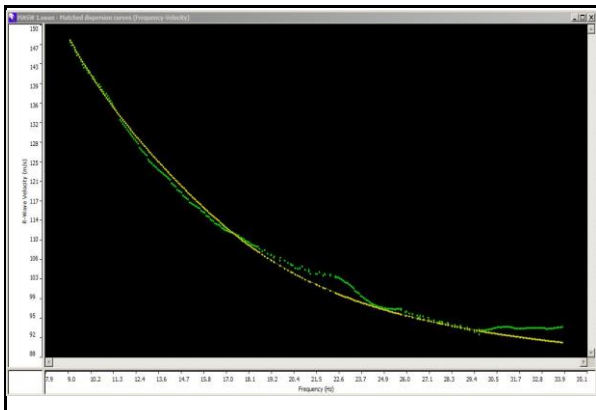
SITE DATA

Latitude	44.155958°
Longitude	12.411060°
Height m. slm	3 m s.l.m.
Azimuth	120°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

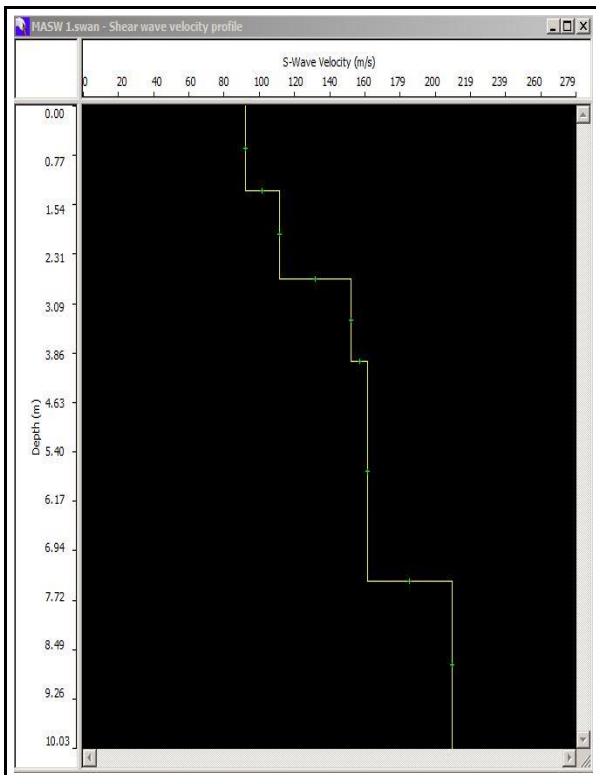
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

Layer	Thickness	Depth	Vs
Layer 1	1.32	0.00	92
Layer 2	1.38	1.32	111
Layer 3	1.28	2.70	152
Layer 4	3.43	3.98	161
Layer 5	INF	7.41	209

SHEAR WAVES VELOCITY PROFILE



HISTORY

Thickness	Depth	Vs
1.319881	0.000000	92.000000
1.382891	1.319881	111.000000
1.277492	2.702472	152.000000
3.430029	3.979964	161.000000
	7.409993	209.000000

Data Error: 20.13

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.32	0	92	0.01435
1.38	1.32	111	0.01243
1.28	2.7	152	0.00842
3.43	3.98	161	0.02130
22.59	7.41	209	0.10809
	30		0.16459

$V_{s_{30}} = 182$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 2
TEST NUMBER: 1

SITE DATA

Latitude	44.150074°
Longitude	12.427846°
Height m. slm	1 m s.l.m.
Azimuth	130°

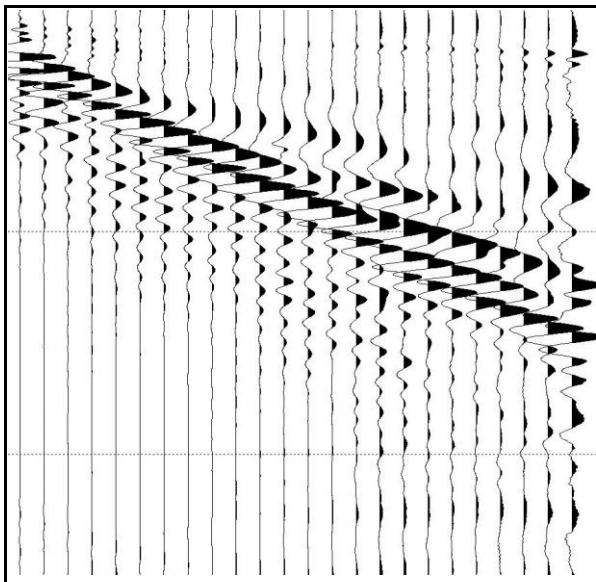
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

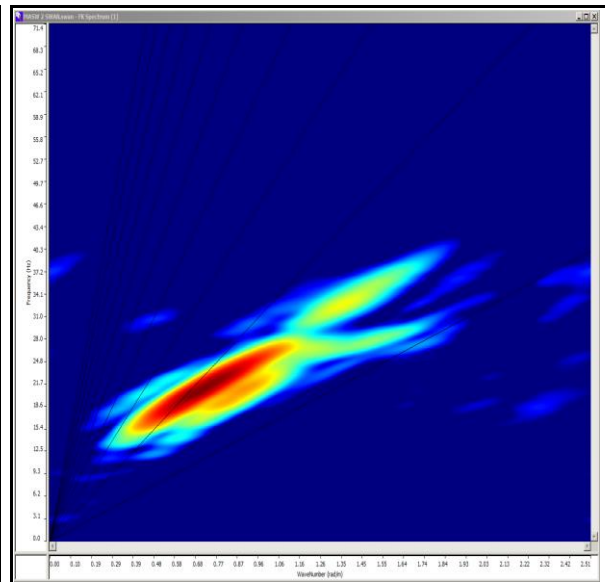
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 2
TEST NUMBER: 1

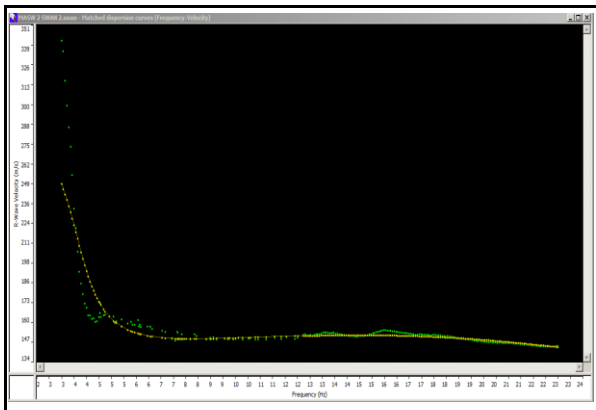
SITE DATA

Latitude	44.150074°
Longitude	12.427846°
Height m. slm	1 m s.l.m.
Azimuth	130°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

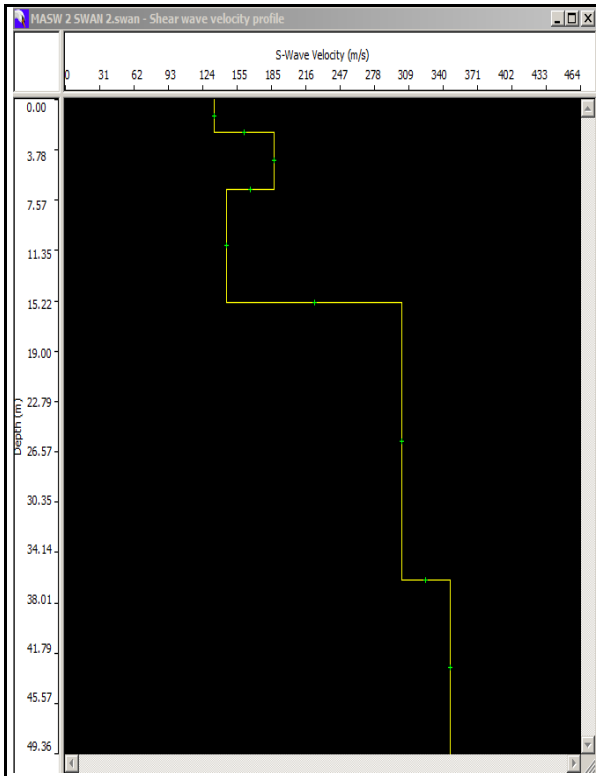
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	2.42	0.00	134
Layer 2	4.35	2.42	188
Layer 3	8.52	6.77	145
Layer 4	20.99	15.29	303
Layer 5	INF	36.27	346

SHEAR WAVES VELOCITY PROFILE



HISTORY

Model:	Thickness	Depth	Vs
1	2.421585	0.000000	134.000000
2	4.348815	2.421585	188.000000
3	8.516979	6.770401	145.000000
4	20.987072	15.287379	303.000000
5	36.274451	36.274451	346.000000

Data Error: 8.18

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
2.42	0	134	0.01806
4.35	2.42	188	0.02314
8.52	6.77	145	0.05876
14.71	15.29	303	0.04855
	30	346	0.00000
			0.14850

$V_{s_{30}} = 202$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 3
TEST NUMBER: 1

SITE DATA

Latitude	44.111185°
Longitude	12.437074°
Height m. slm	14 m s.l.m.
Azimuth	170°

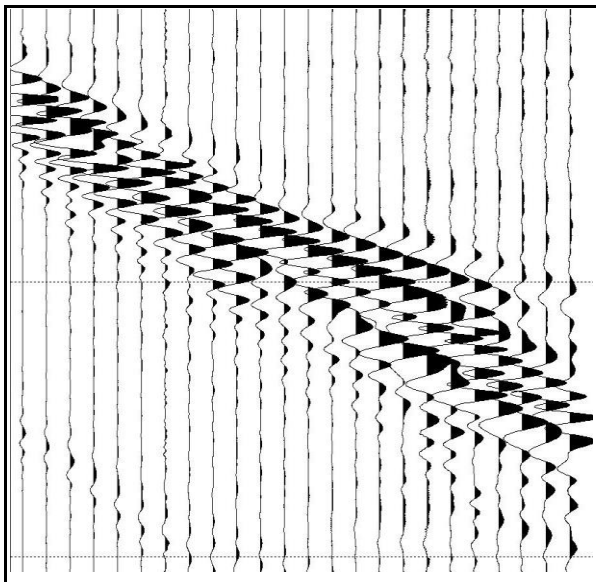
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

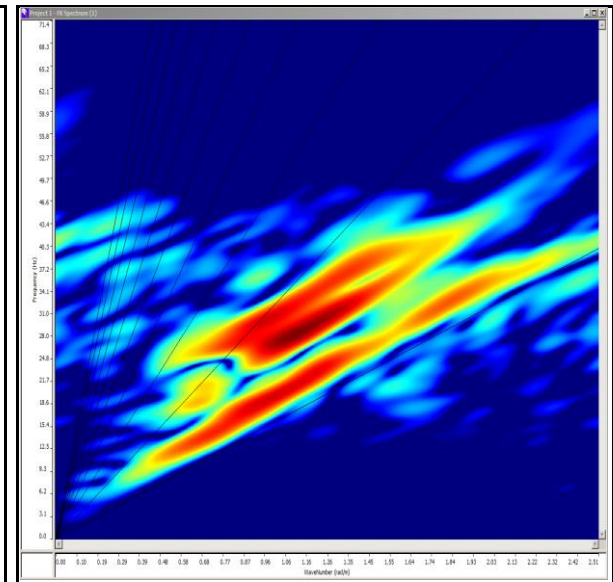
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 3
TEST NUMBER: 1

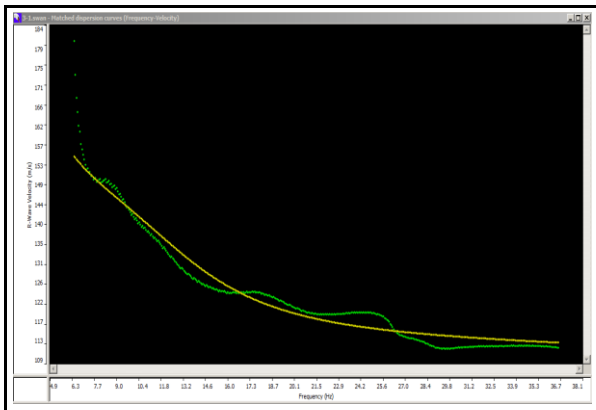
SITE DATA

Latitude	44.111185°
Longitude	12.437074°
Height m. s.l.m.	14 m s.l.m.
Azimuth	170°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

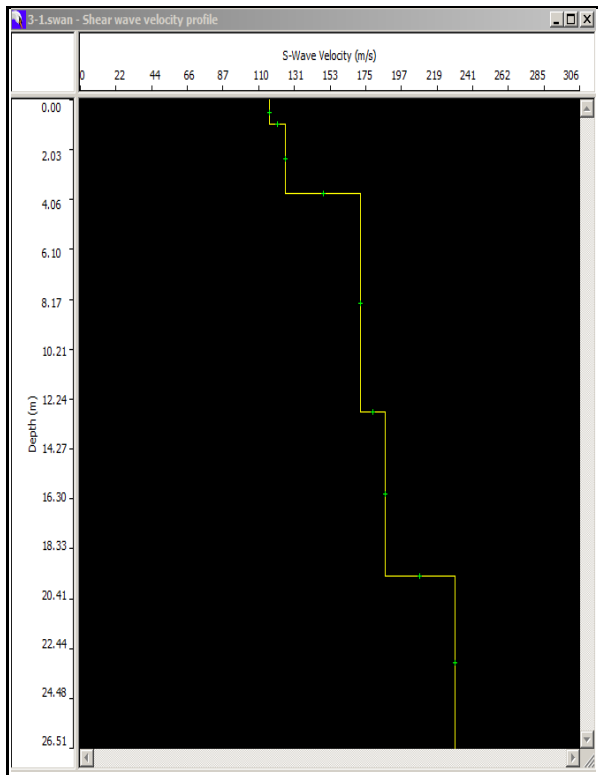
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.01	0.00	116
Layer 2	2.83	1.01	126
Layer 3	8.90	3.85	172
Layer 4	6.73	12.74	187
Layer 5	INF	19.47	230

SHEAR WAVES VELOCITY PROFILE



HISTORY

Model:	Thickness	Depth	Vs
1.010281	0.000000	116.000000	
2.834818	1.010281	126.000000	
8.897383	3.845000	172.000000	
6.725403	12.742482	187.000000	
	19.467945	230.000000	

Data Error: 1.94

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.01	0	116	0.00871
2.83	1.01	126	0.02246
8.9	3.84	172	0.05174
6.73	12.74	187	0.03599
10.67	19.47	230	0.04639

0.16529

$$V_{s_{30}} = 181$$

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

C

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 4
TEST NUMBER: 1

SITE DATA

Latitude	44.110881°
Longitude	12.418739°
Height m. slm	15 m s.l.m.
Azimuth	10°

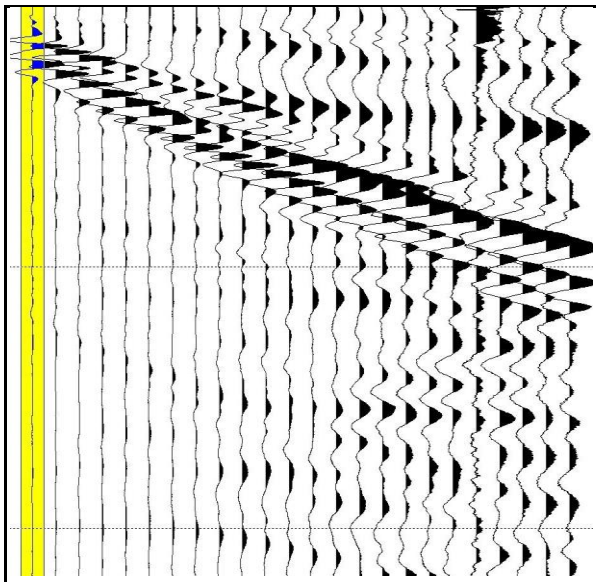
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

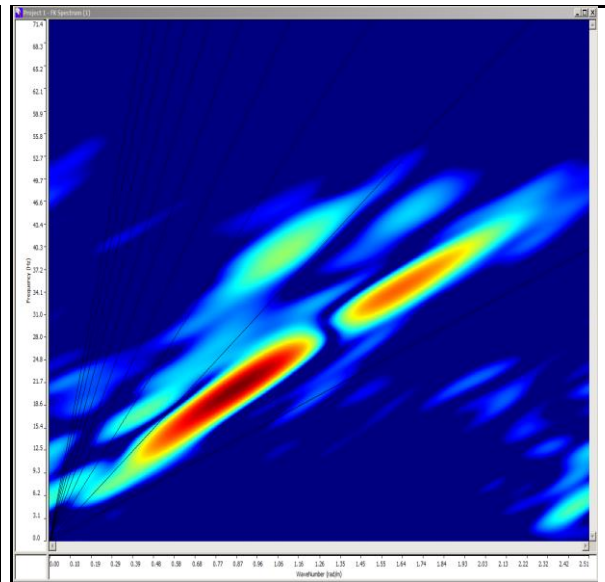
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 4
TEST NUMBER: 1

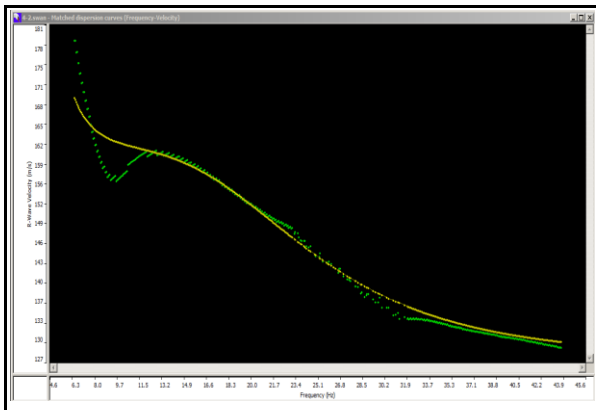
SITE DATA

Latitude	44.110881°
Longitude	12.418739°
Height m. slm	15 m s.l.m.
Azimuth	10°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

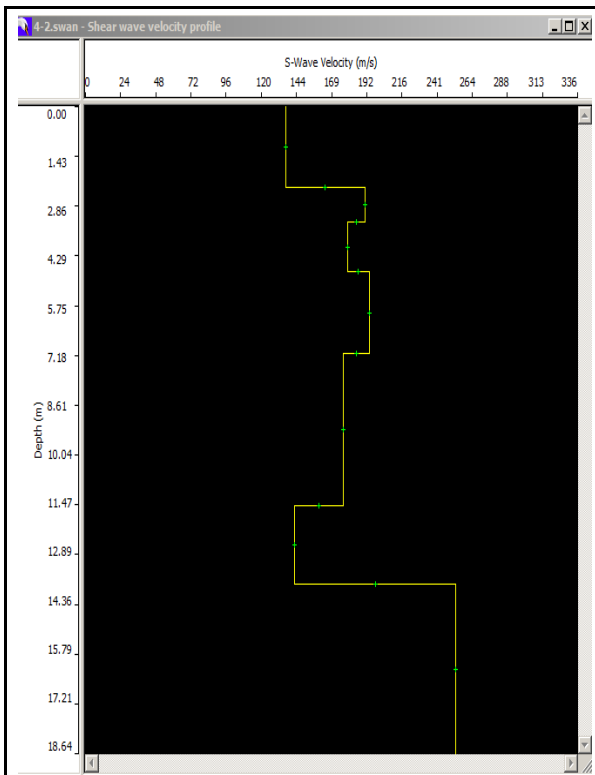
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	2.33	0.00	137
Layer 2	0.99	2.33	191
Layer 3	1.43	3.32	179
Layer 4	2.36	4.75	194
Layer 5	4.40	7.11	176
Layer 6	2.26	11.51	143
Layer 7	INF	13.77	253

SHEAR WAVES VELOCITY PROFILE



HISTORY

Model	Thickness	Depth	Vs
1	2.332840	0.000000	137.000000
2	0.990000	2.332840	191.000000
3	1.430000	3.322840	179.000000
4	2.360000	4.752840	194.000000
5	4.400000	7.112840	176.000000
6	2.260000	11.512840	143.000000
7	13.769472	13.769472	253.000000

Data Error: 1.24

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
2.33	0	137	0.01701
0.99	2.33	191	0.00518
1.43	3.32	179	0.00799
2.36	4.75	194	0.01216
4.4	7.11	176	0.02500
2.26	11.51	143	0.01580
16.23	13.77	253	0.06415
			0.14730

$$V_{s_{30}} = 204$$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 5
TEST NUMBER: 1

SITE DATA

Latitude	44.083564°
Longitude	12.397977°
Height m. slm	33 m s.l.m.
Azimuth	20°

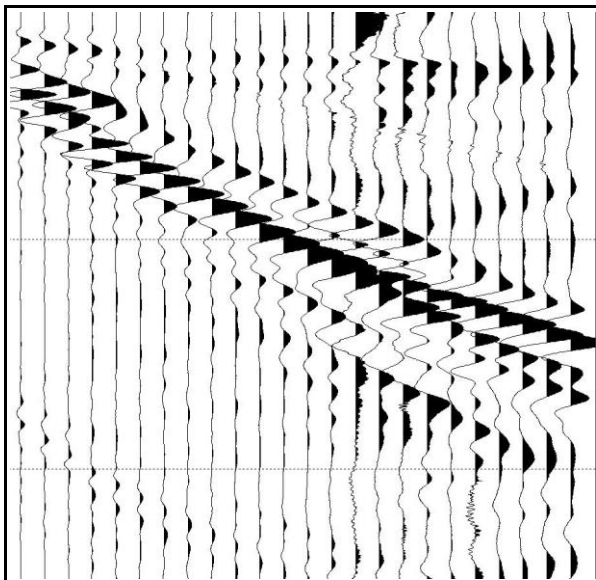
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

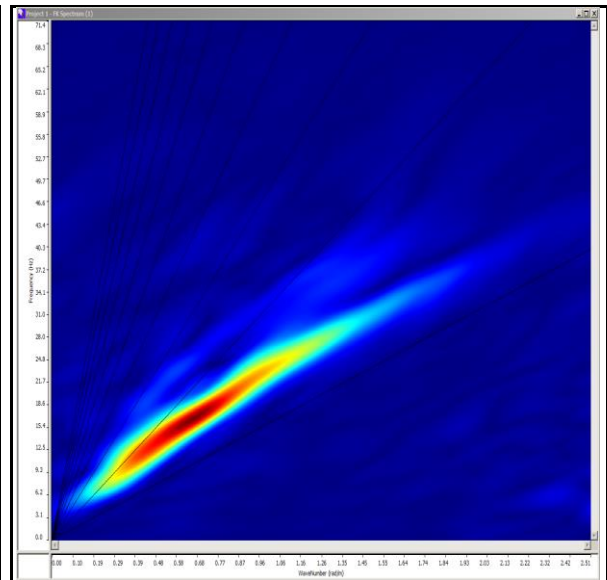
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 5
TEST NUMBER: 1

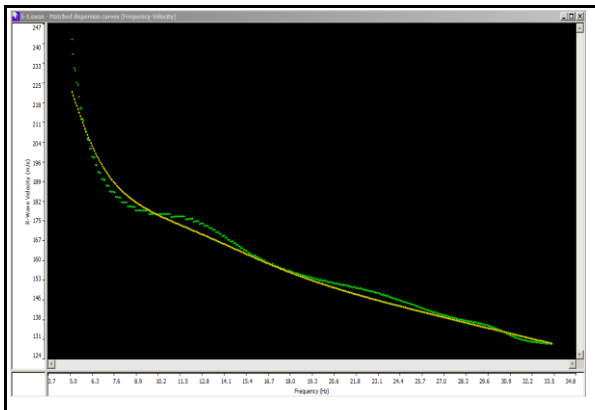
SITE DATA

Latitude	44.083564°
Longitude	12.397977°
Height m. slm	33 m s.l.m.
Azimuth	20°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

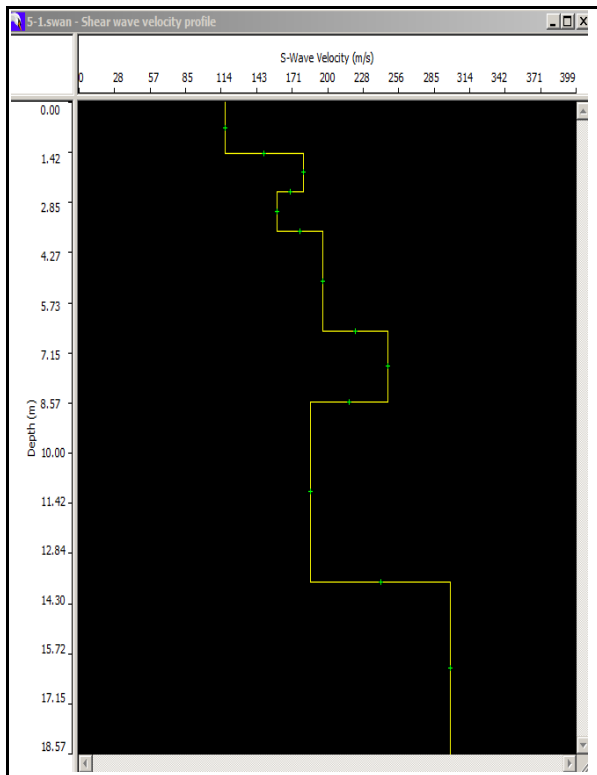
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.45	0.00	117
Layer 2	1.10	1.45	180
Layer 3	1.11	2.55	159
Layer 4	2.86	3.66	196
Layer 5	2.01	6.52	248
Layer 6	5.14	8.53	186
	INF	13.67	298

SHEAR WAVES VELOCITY PROFILE



HISTORY

Model	Thickness	Depth	Vs
1.449002	0.000000	117.000000	
1.098235	1.449002	180.000000	
1.112460	2.567332	159.000000	
2.862090	3.689423	196.000000	
2.008223	6.521784	248.000000	
5.143702	8.530506	186.000000	
	13.673808	298.000000	

Data Error: 1.42

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.45	0	117	0.01239
1.1	1.45	180	0.00611
1.11	2.55	159	0.00698
2.86	3.66	196	0.01459
2.01	6.52	248	0.00810
5.14	8.53	186	0.02763
16.33	13.67	298	0.05480
	30		0.13062

$$V_{s_{30}} = 230$$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 6
TEST NUMBER: 1

SITE DATA

Latitude	44.076680°
Longitude	12.406199°
Height m. slm	33 m s.l.m.
Azimuth	10°

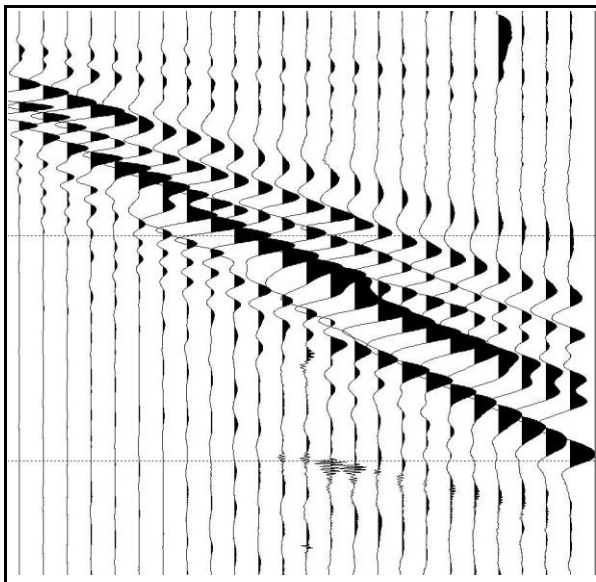
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

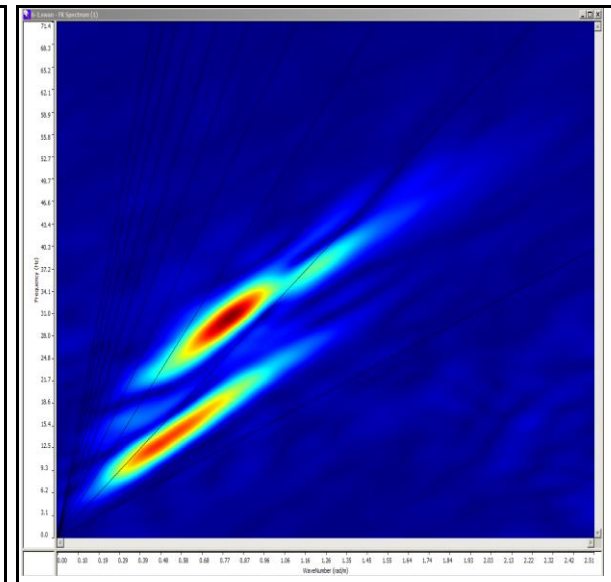
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 6
TEST NUMBER: 1

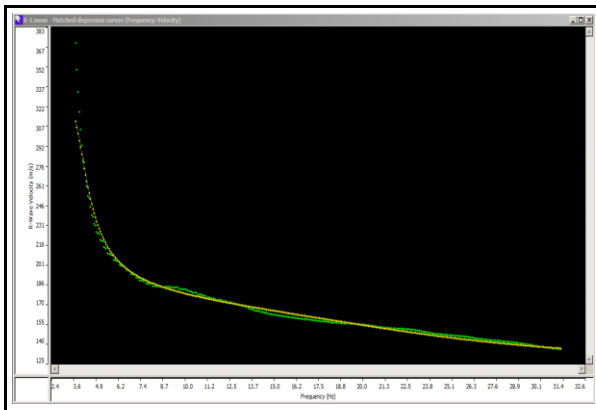
SITE DATA

Latitude	44.076680°
Longitude	12.406199°
Height m. slm	33 m s.l.m.
Azimuth	10°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

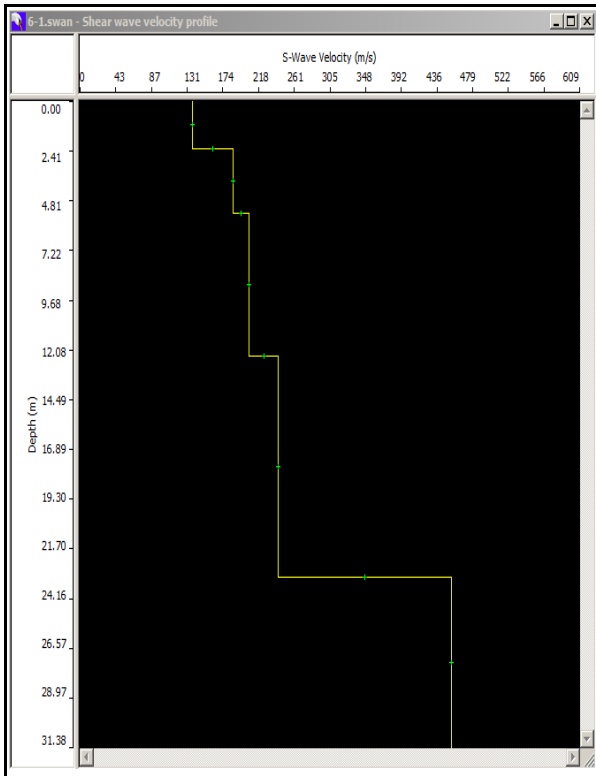
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	2.27	0.00	137
Layer 2	3.18	2.27	187
Layer 3	6.90	5.45	206
Layer 4	10.75	12.34	242
Layer 5	INF	23.10	453

SHEAR WAVES VELOCITY PROFILE



HISTORY

Model:	Thickness	Depth	Vs
1	2.268635	0.000000	137.000000
2	3.177543	2.268635	187.000000
3	6.806503	5.446178	206.000000
4	10.752796	12.342680	242.000000
5	23.095476	453.000000	

Data Error: 1.69

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
2.27	0	137	0.01657
3.18	2.27	187	0.01701
6.9	5.45	206	0.03350
10.75	12.35	242	0.04442
6.9	23.1	453	0.01523
	30		
			0.12672

$V_{s30} = 237$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 7
TEST NUMBER: 1

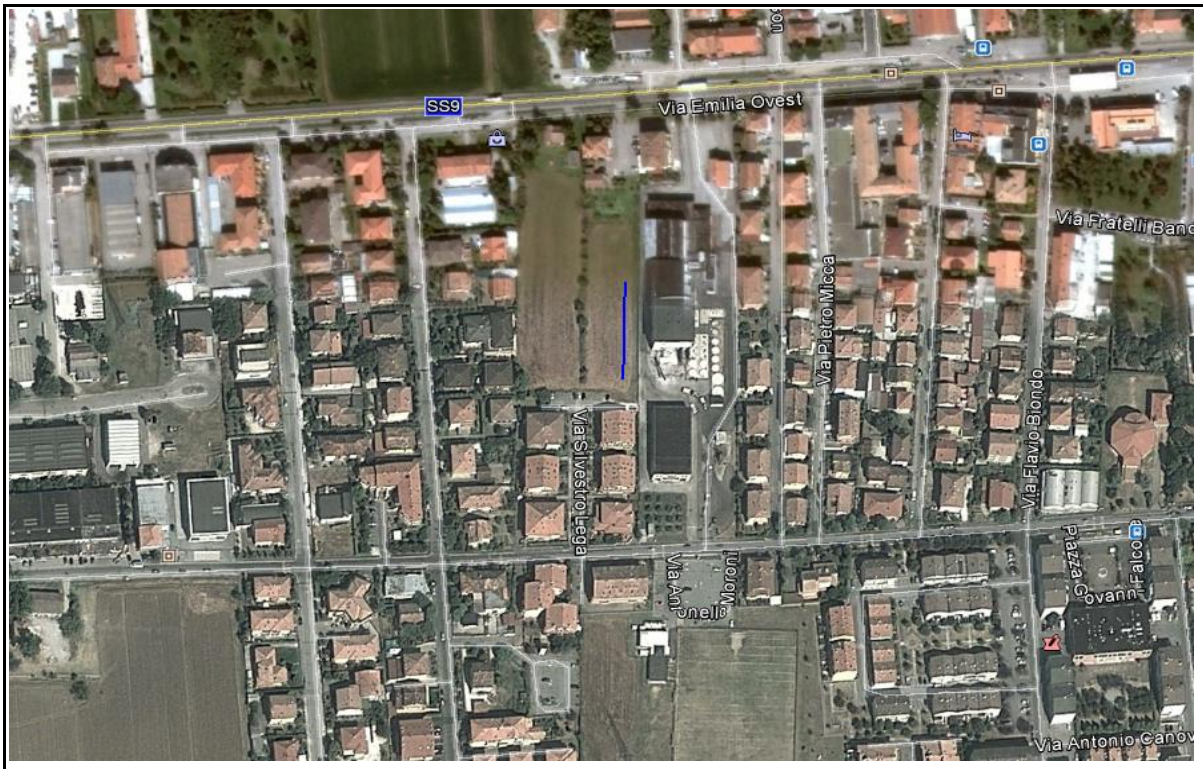
SITE DATA

Latitude	44.090548°
Longitude	12.382849°
Height m. s.l.m.	33 m s.l.m.
Azimuth	0°

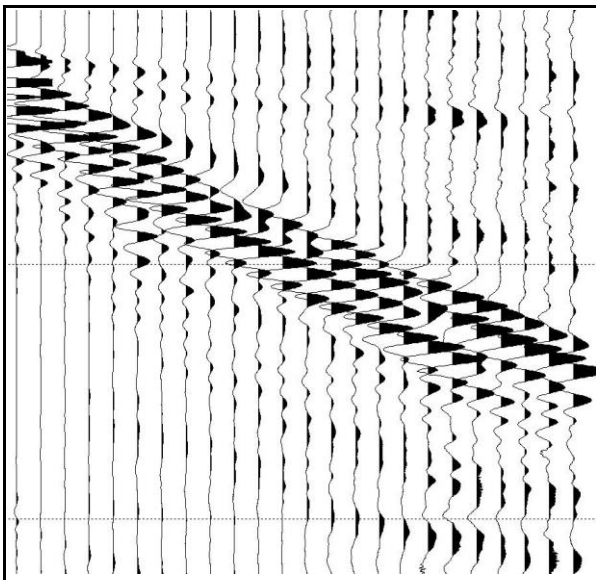
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

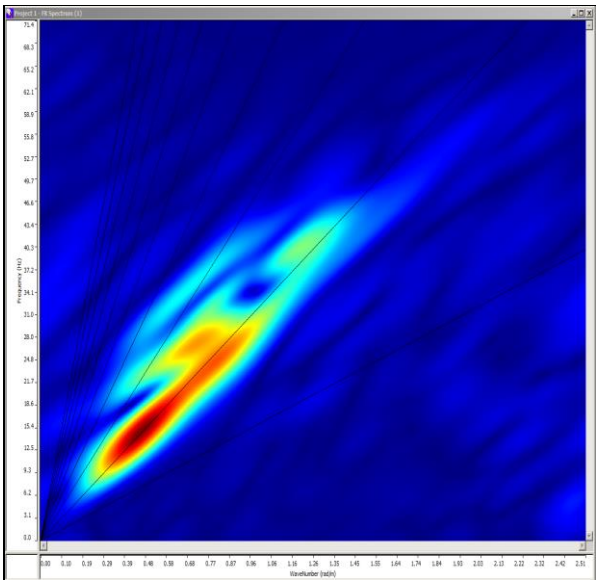
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
 JOB NUMBER: 1422
 SITE: MASW 7
 TEST NUMBER: 1

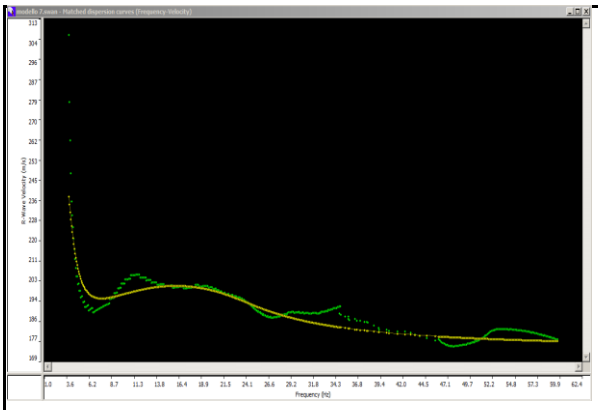
SITE DATA

Latitude	44.090548°
Longitude	12.382849°
Height m. sim	33 m s.l.m.
Azimuth	0°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

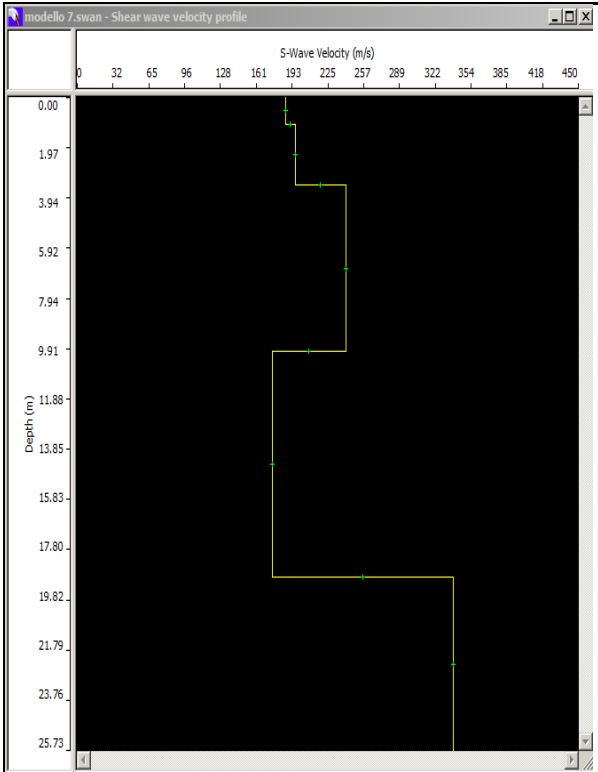
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.05	0.00	187
Layer 2	2.40	1.05	196
Layer 3	6.56	3.45	241
Layer 4	8.89	10.01	175
Layer 5	INF	18.90	338

SHEAR WAVES VELOCITY PROFILE



HISTORY

Thickness	Depth	Vs
1.045593	0.000000	187.000000
2.404803	1.045593	196.000000
6.558134	3.450486	241.000000
8.893714	10.005590	175.000000
	18.902304	338.000000

Data Error: 2.21

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.05	0	187	0.00561
2.4	1.05	196	0.01224
6.56	3.45	241	0.02722
8.89	10.01	175	0.05080
11.1	18.9	338	0.03284
	30		
			0.12872

$V_{S_{30}} = 233$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 8
TEST NUMBER: 1

SITE DATA

Latitude	44.122419°
Longitude	12.398570°
Height m. s.l.m.	14 m s.l.m.
Azimuth	160°

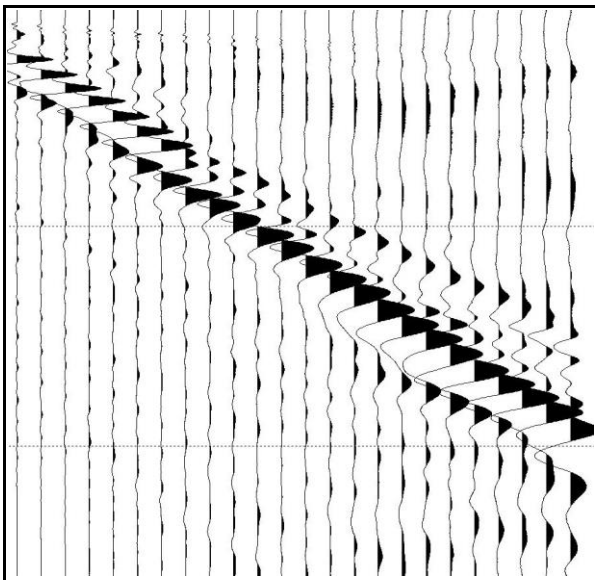
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

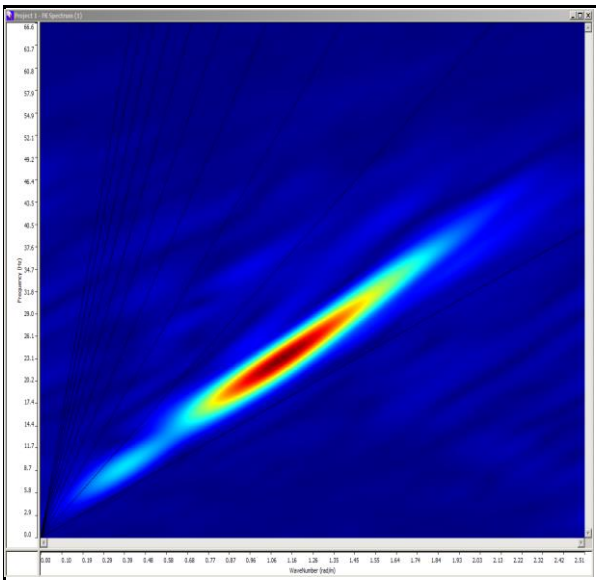
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
 JOB NUMBER: 1422
 SITE: MASW 8
 TEST NUMBER: 1

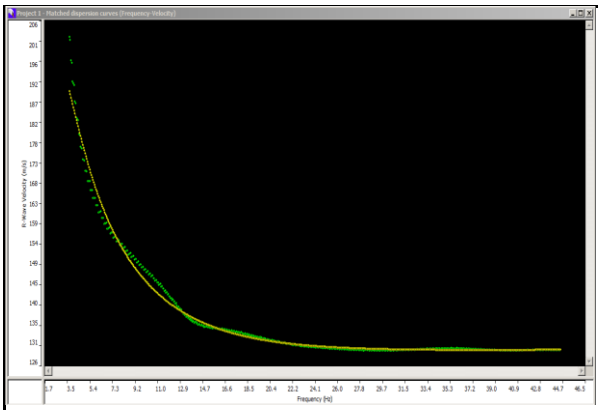
SITE DATA

Latitude	44.122419°
Longitude	12.398570°
Height m. sim	14 m s.l.m.
Azimuth	160°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

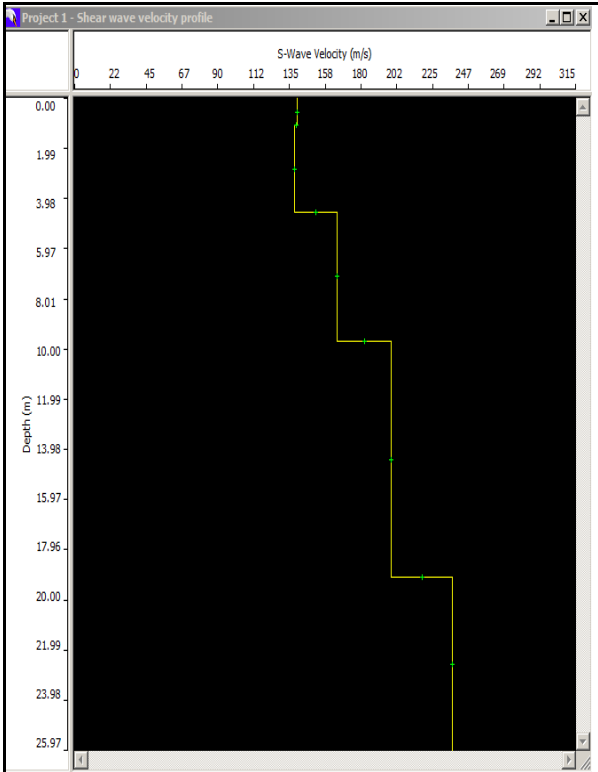
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.08	0.00	140
Layer 2	3.45	1.08	138
Layer 3	5.15	4.53	165
Layer 4	9.40	9.68	199
Layer 5	INF	19.08	237

SHEAR WAVES VELOCITY PROFILE



HISTORY

Model:	Thickness	Depth	Vs
1.080666	0.000000	140.000000	
3.449107	1.080666	138.000000	
5.148422	4.529773	165.000000	
9.401794	9.678196	199.000000	
	19.079900	237.000000	

Data Error: 0.84

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.08	0	140	0.00771
3.45	1.08	138	0.02500
5.15	4.53	165	0.03121
9.4	9.68	199	0.04724
10.92	19.08	237	0.04608
	30		0.15724

$V_{S30} = 191$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 9
TEST NUMBER: 1

SITE DATA

Latitude	44.111414°
Longitude	12.372428°
Height m. s.l.m.	19 m s.l.m.
Azimuth	110°

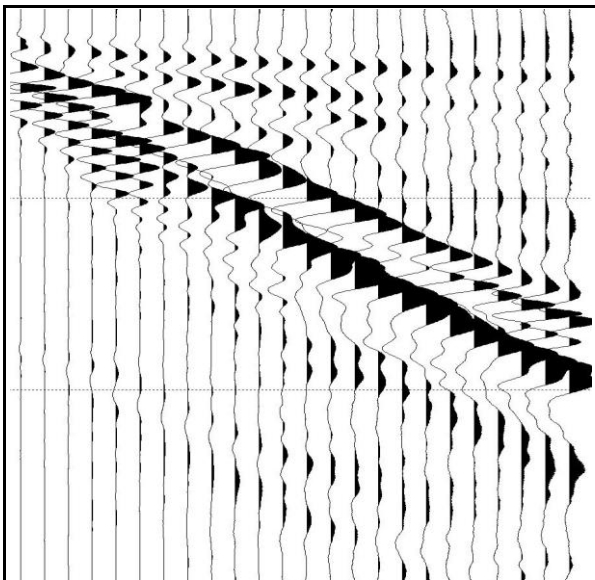
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

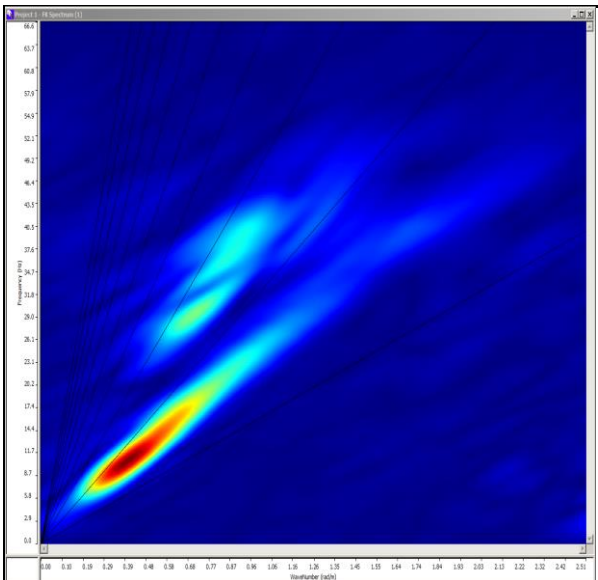
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 9
TEST NUMBER: 1

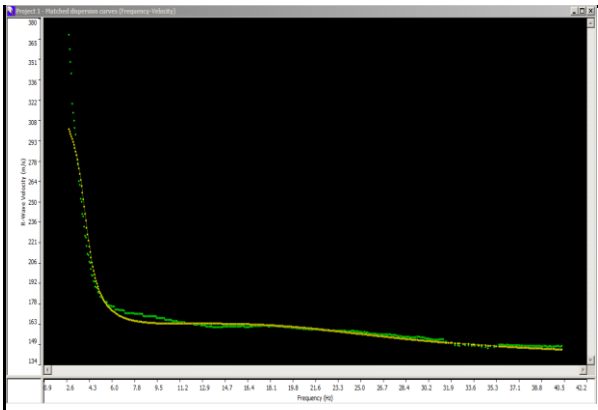
SITE DATA

Latitude	44.111414°
Longitude	12.372428°
Height m. sim	19 m s.l.m.
Azimuth	110°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

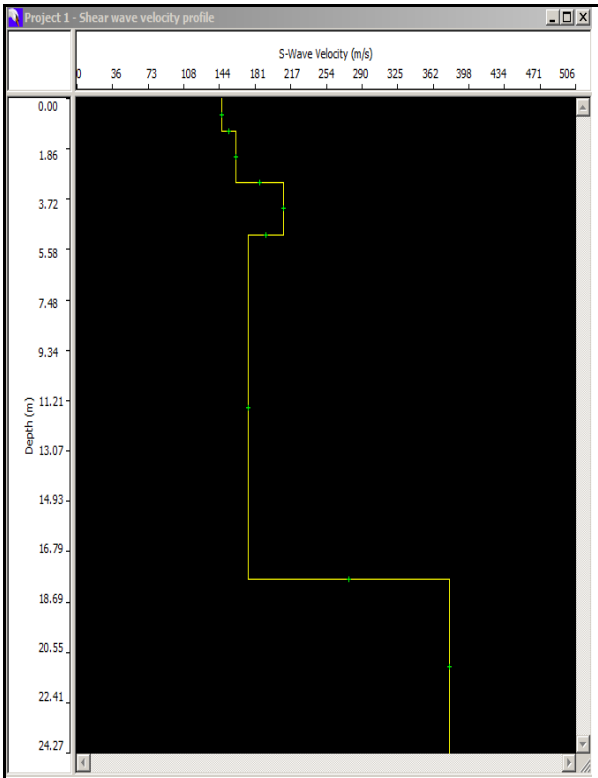
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.19	0.00	147
Layer 2	1.91	1.19	161
Layer 3	1.95	3.10	210
Layer 4	12.78	5.06	174
Layer 5	INF	17.84	378

SHEAR WAVES VELOCITY PROFILE



HISTORY

Thickness	Depth	Vs
1.192624	0.000000	147.000000
1.012040	1.192624	161.000000
1.053859	3.104663	210.000000
12.778874	5.058522	174.000000
	17.837396	378.000000

Data Error: 7.76

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.19	0	147	0.00810
1.91	1.19	161	0.01186
1.95	3.1	210	0.00929
12.78	5.05	174	0.07345
12.17	17.83	378	0.03220
	30		0.13489

$V_{s30} = 222$

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

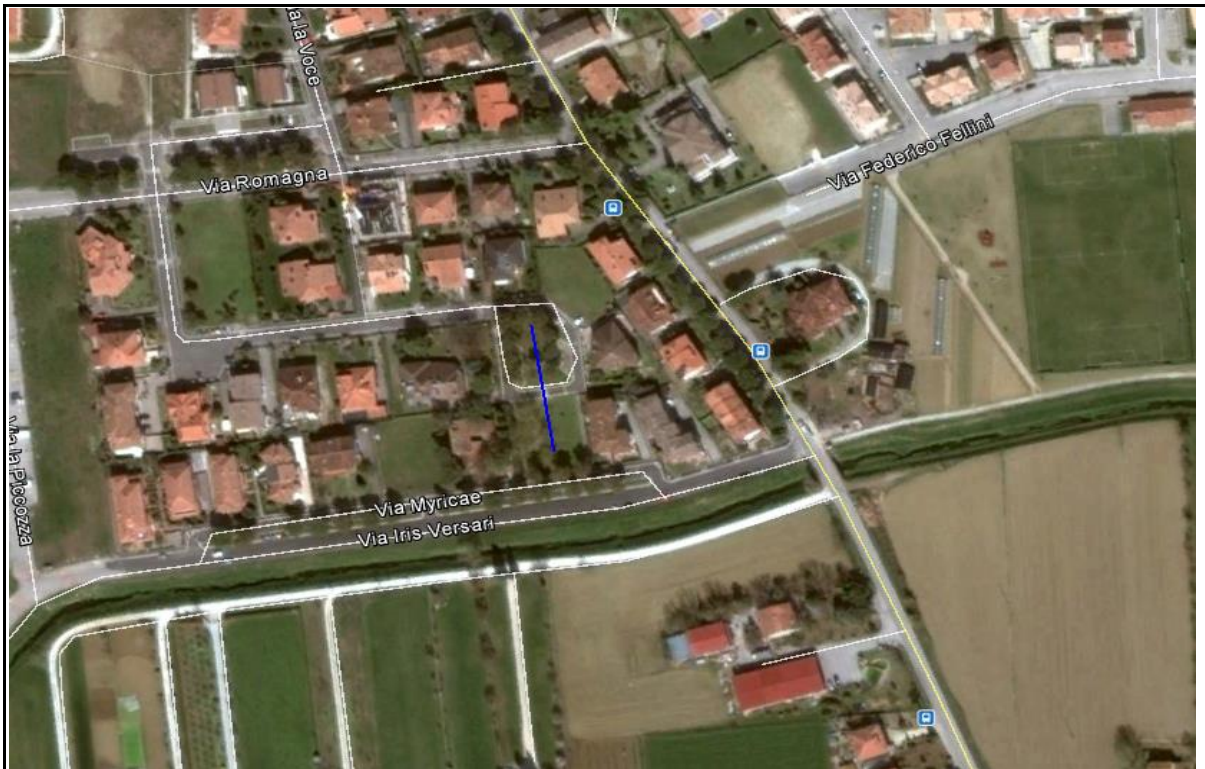
MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 10
TEST NUMBER: 1

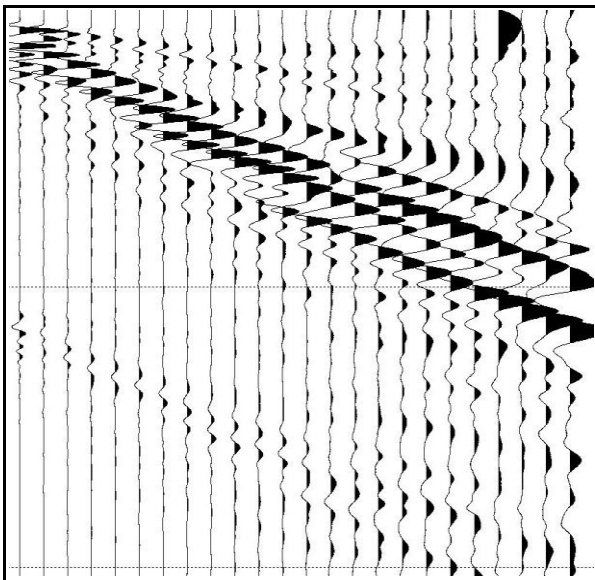
SITE DATA	
Latitude	44.098962°
Longitude	12.417622°
Height m. slm	24 m s.l.m.
Azimuth	170°

ACQUISITION DATA	
N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

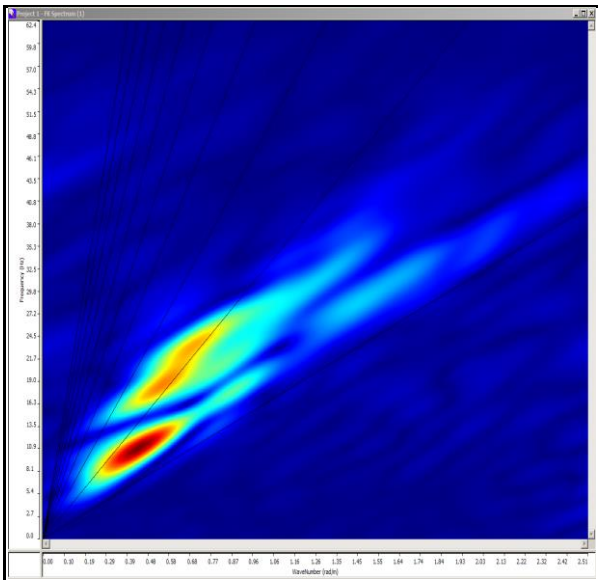
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 10
TEST NUMBER: 1

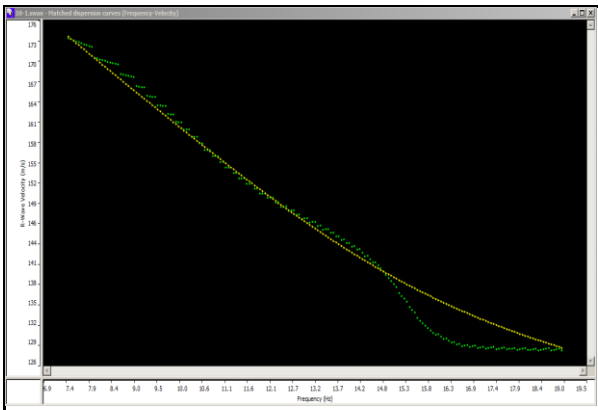
SITE DATA

Latitude	44.098962°
Longitude	12.417622°
Height m. sim	24 m s.l.m.
Azimuth	170°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

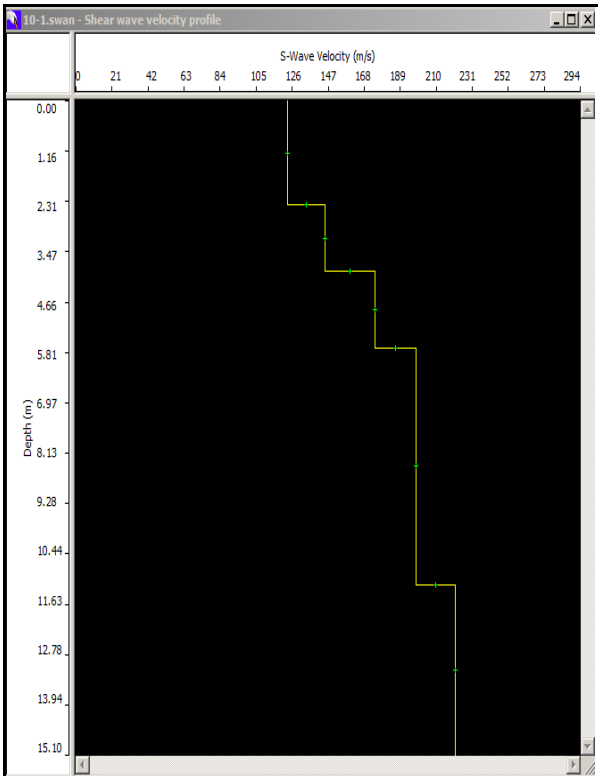
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	2.41	0.00	123
Layer 2	1.51	2.41	145
Layer 3	1.78	3.92	174
Layer 4	5.48	5.70	198
Layer 5	INF	11.18	221

SHEAR WAVES VELOCITY PROFILE



HISTORY

Model:	Thickness	Depth	Vs
1	2.407513	0.000000	123.000000
2	1.514237	2.407513	145.000000
3	1.775346	3.021750	174.000000
4	5.477919	5.097066	198.000000
5	11.175015	11.175015	221.000000

Data Error: 1.64

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
2.41	0	123	0.01959
1.51	2.41	145	0.01041
1.78	3.92	174	0.01023
5.48	5.7	198	0.02768
18.82	11.18	221	0.08516
	30		0.15307

$V_{S30} = 196$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 11
TEST NUMBER: 1

SITE DATA

Latitude	44.101727°
Longitude	12.373437°
Height m. s.l.m.	26 m s.l.m.
Azimuth	170°

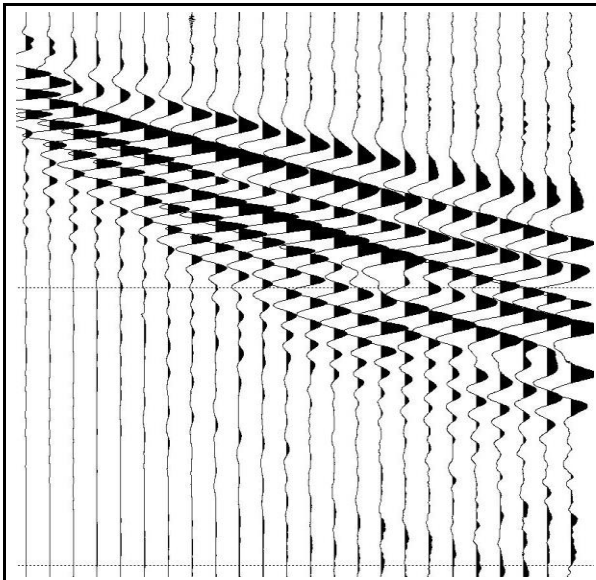
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

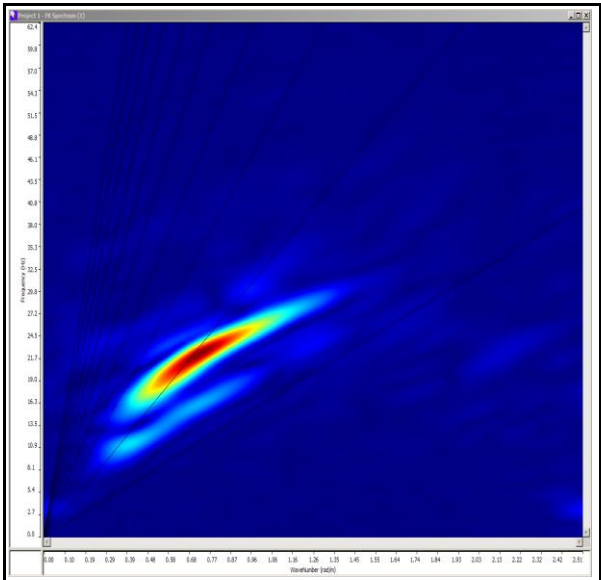
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 11
TEST NUMBER: 1

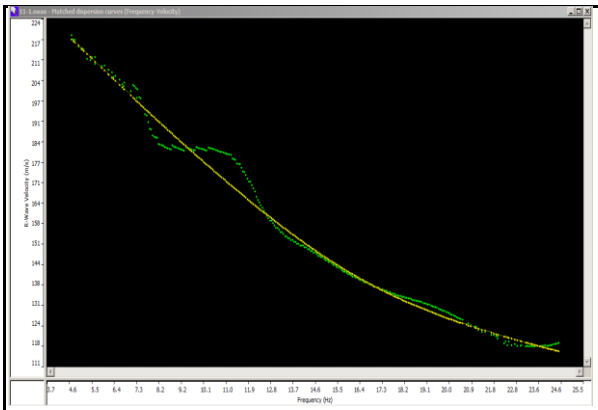
SITE DATA

Latitude	44.101727°
Longitude	12.373437°
Height m. sim	26 m s.l.m.
Azimuth	170°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

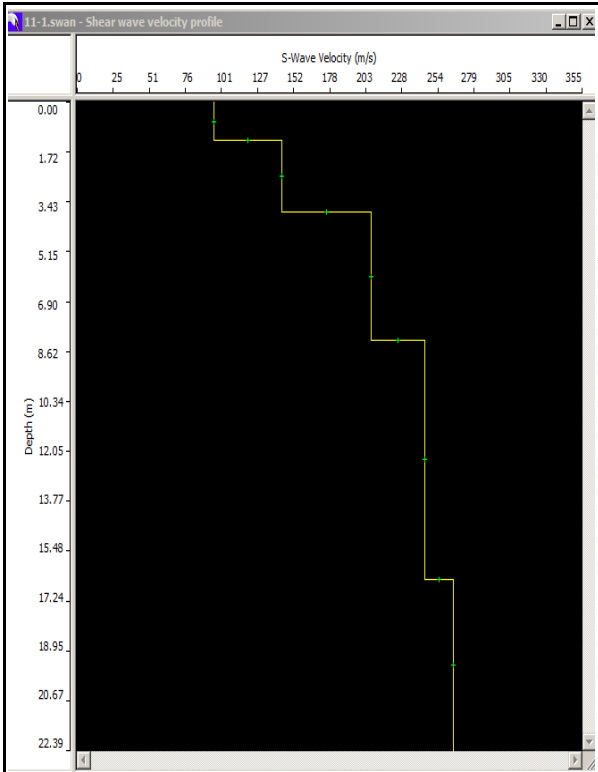
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.33	0.00	96
Layer 2	2.48	1.33	144
Layer 3	4.43	3.81	207
Layer 4	8.23	8.23	245
Layer 5	INF	16.46	265

SHEAR WAVES VELOCITY PROFILE



HISTORY

Model	Thickness	Depth	Vs
1	1.328769	0.000000	96.000000
2	2.478324	1.328769	144.000000
4	4.425579	3.807093	207.000000
8	8.230952	8.232673	245.000000
	16.463625	265.000000	

Data Error: 8.53

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.33	0	96	0.01385
2.48	1.33	144	0.01722
4.43	3.81	207	0.02140
8.23	8.24	245	0.03359
13.53	16.47	265	0.05106
	30		0.13713

$V_{S_{30}} = 219$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 12
TEST NUMBER: 1

SITE DATA

Latitude	44.097302°
Longitude	12.401724°
Height m. s.l.m.	22 m s.l.m.
Azimuth	50°

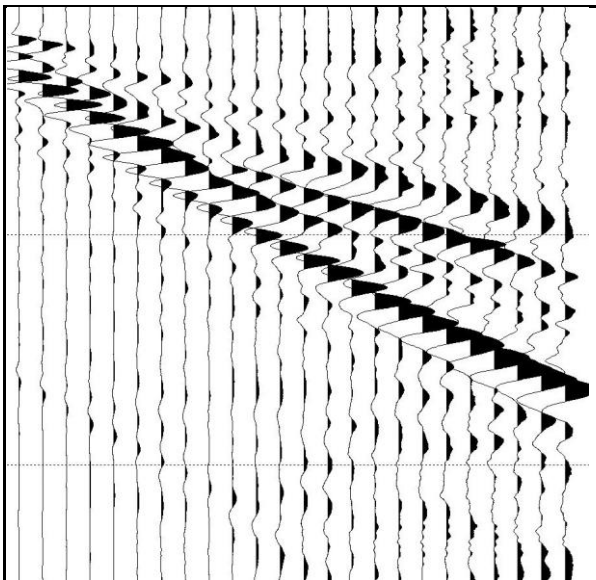
ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

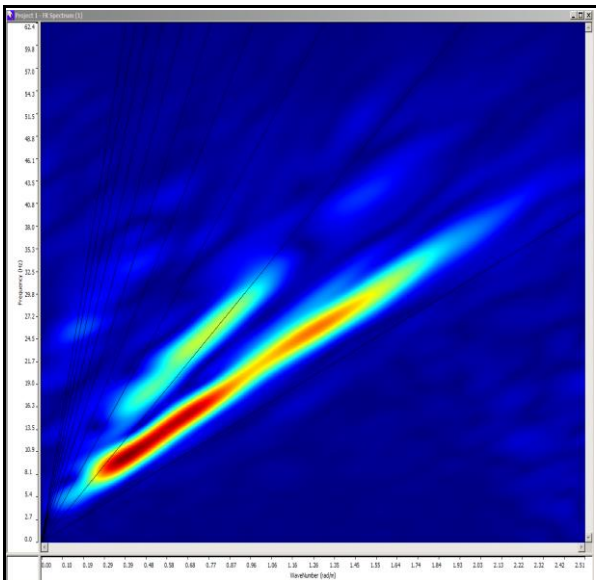
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 12
TEST NUMBER: 1

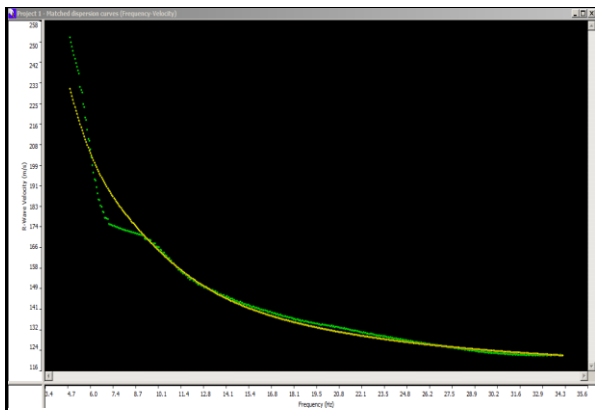
SITE DATA

Latitude	44.097302°
Longitude	12.401724°
Height m. sim	22 m s.l.m.
Azimuth	50°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

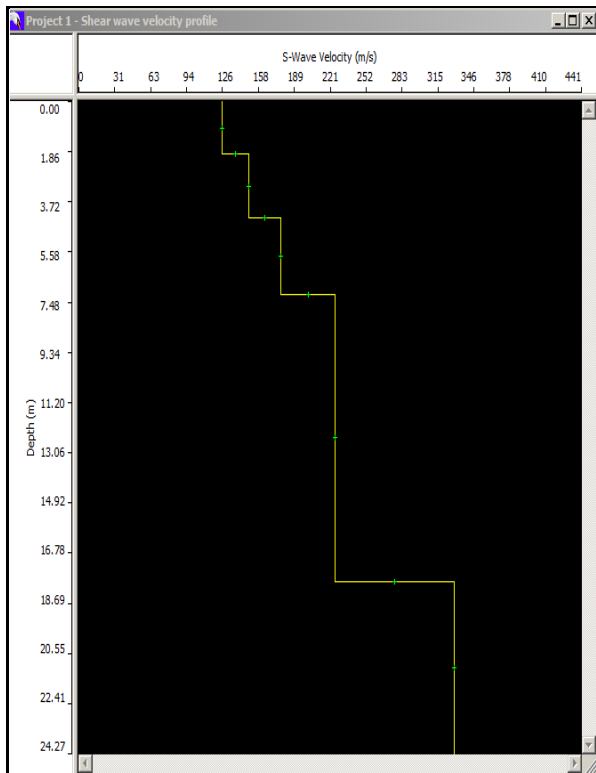
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.97	0.00	126
Layer 2	2.37	1.97	149
Layer 3	2.83	4.34	177
Layer 4	10.70	7.17	225
Layer 5	INF	17.87	329

SHEAR WAVES VELOCITY PROFILE



HISTORY

Thickness	Depth	Vs
1.967981	0.000000	126.000000
1.374813	1.067981	149.000000
2.826986	4.342493	177.000000
10.702695	7.169479	225.000000
	17.872175	329.000000

Data Error: 2.22

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.97	0	126	0.01563
2.37	1.97	149	0.01591
2.83	4.34	177	0.01599
10.7	7.17	225	0.04756
12.13	17.87	329	0.03687
	30		0.13195

$V_{s30} = 227$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 13
TEST NUMBER: 1

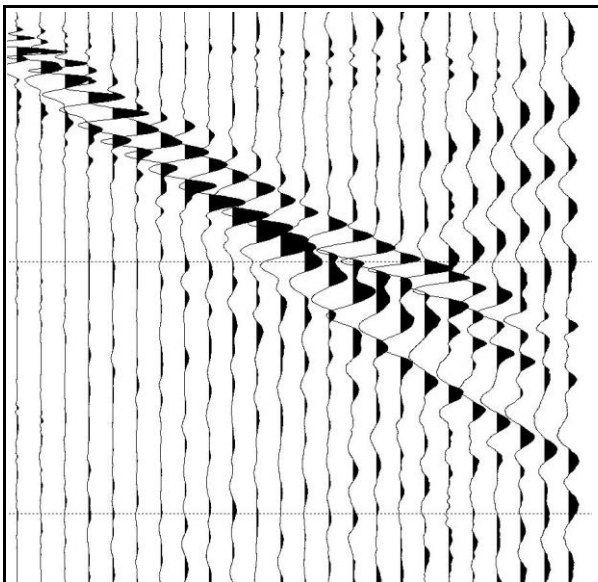
SITE DATA	
Latitude	44.119284°
Longitude	12.384704°
Height m. s.l.m.	12 m s.l.m.
Azimuth	50°

ACQUISITION DATA	
N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

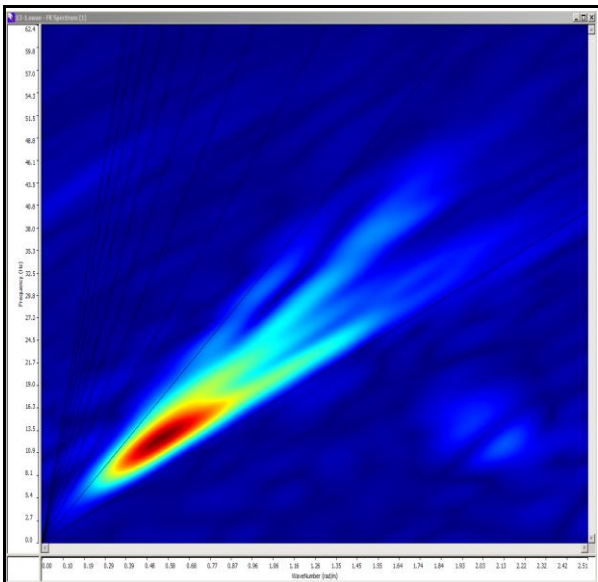
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
 JOB NUMBER: 1422
 SITE: MASW 13
 TEST NUMBER: 1

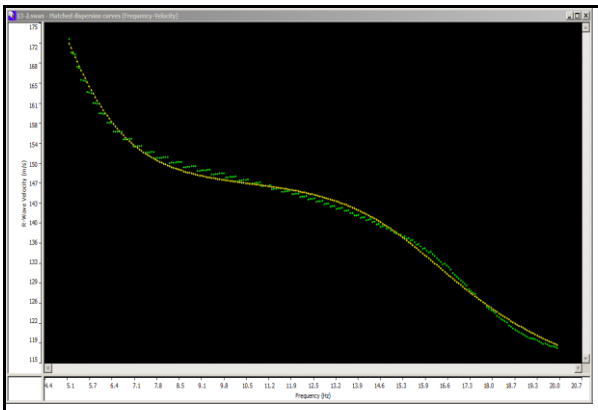
SITE DATA

Latitude	44.119284°
Longitude	12.384704°
Height m. slm	12 m s.l.m.
Azimuth	50°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

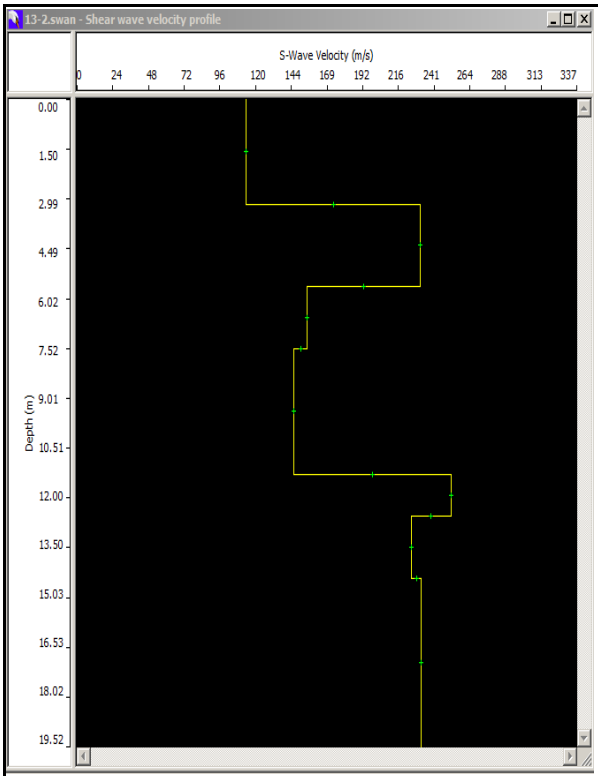
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	3.16	0.00	114
Layer 2	2.46	3.16	231
Layer 3	1.89	5.62	155
Layer 4	3.80	7.51	146
Layer 5	1.25	11.31	252
Layer 6	1.89	12.56	225
Layer 7	INF	14.45	232

SHEAR WAVES VELOCITY PROFILE



HISTORY

Thickness	Depth	Vs
3.164491	0.000000	114.000000
2.487694	3.164491	231.000000
1.828900	5.622148	155.000000
3.804394	7.807648	146.000000
1.281272	11.312040	252.000000
1.887706	12.869311	225.000000
	14.452627	232.000000

Data Error: 0.60

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
3.16	0	114	0.02772
2.46	3.16	231	0.01065
1.89	5.62	155	0.01219
3.8	7.51	146	0.02603
1.25	11.31	252	0.00496
1.89	12.56	225	0.00840
15.55	14.45	232	0.06703
	30		0.15698

$V_{S_{30}} = 191$

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

MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 14
TEST NUMBER: 1

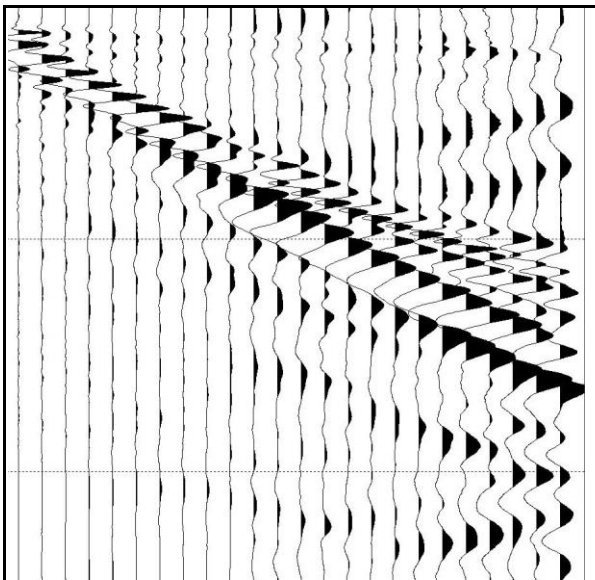
SITE DATA	
Latitude	44.104247°
Longitude	12.397067°
Height m. s.l.m.	21 m s.l.m.
Azimuth	30°

ACQUISITION DATA	
N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

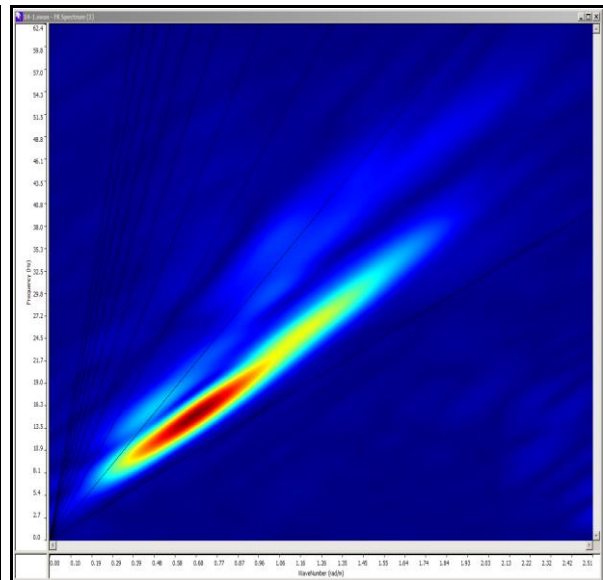
SITE



RECORD



F-K SPECTRUM



MULTICHANNEL ANALYSIS OF SURFACES WAVES (MASW)

CLIENT: UNIONE DEI COMUNI DEL RUBICONE
JOB NUMBER: 1422
SITE: MASW 14
TEST NUMBER: 1

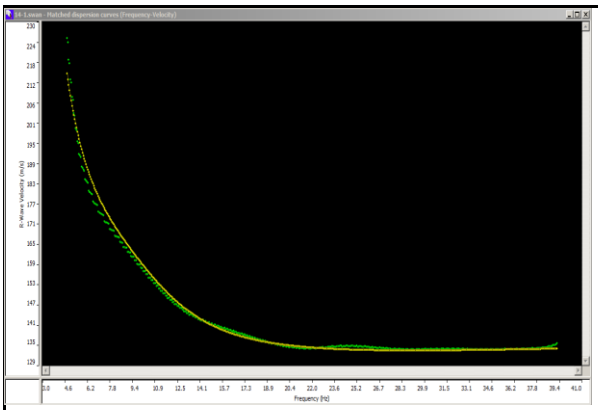
SITE DATA

Latitude	44.104247°
Longitude	12.397067°
Height m. slm	21 m s.l.m.
Azimuth	30°

ACQUISITION DATA

N° channels	24
Spacing (m)	2.5
Record time (sec)	5.0
Sampling (millisec)	0.5

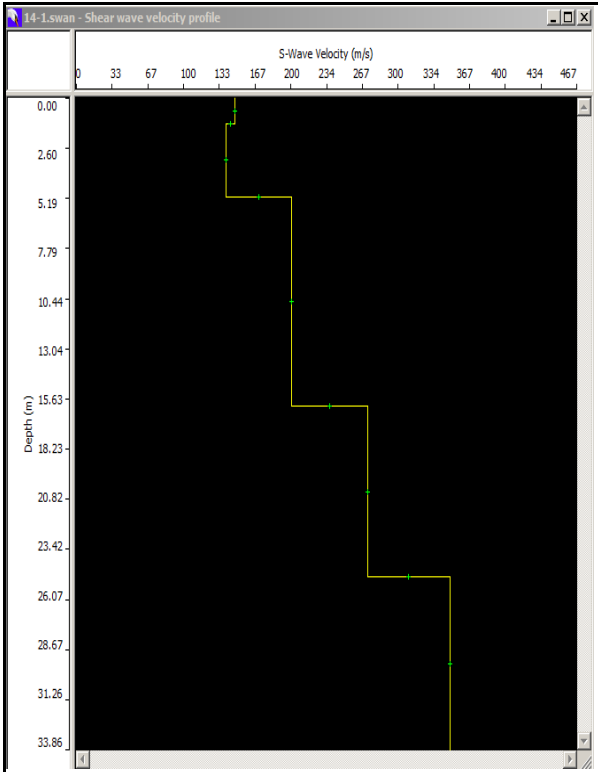
MATCHED DISPERSION CURVES (f-v)



SYNTHETIC MODEL TABLE

	Thickness	Depth	Vs
Layer 1	1.30	0.00	148
Layer 2	3.84	1.30	140
Layer 3	10.85	5.14	201
Layer 4	8.87	15.99	272
Layer 5	INF	24.87	349

SHEAR WAVES VELOCITY PROFILE



HISTORY

Thickness	Depth	Vs
1.308339	0.000000	148.000000
3.844231	1.298339	140.000000
10.851768	5.142570	201.000000
8.871986	15.994339	272.000000
	24.866324	349.000000

Data Error: 0.86

CALCULATION OF Vs 30

Thick. (m)	Depth (m)	Vs (m/sec)	Thick/Vs
1.3	0	148	0.00878
3.84	1.3	140	0.02743
10.85	5.14	201	0.05398
8.87	15.99	272	0.03261
5.14	24.86	349	0.01473
	30		
			0.13753

$V_{s30} = 218$

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

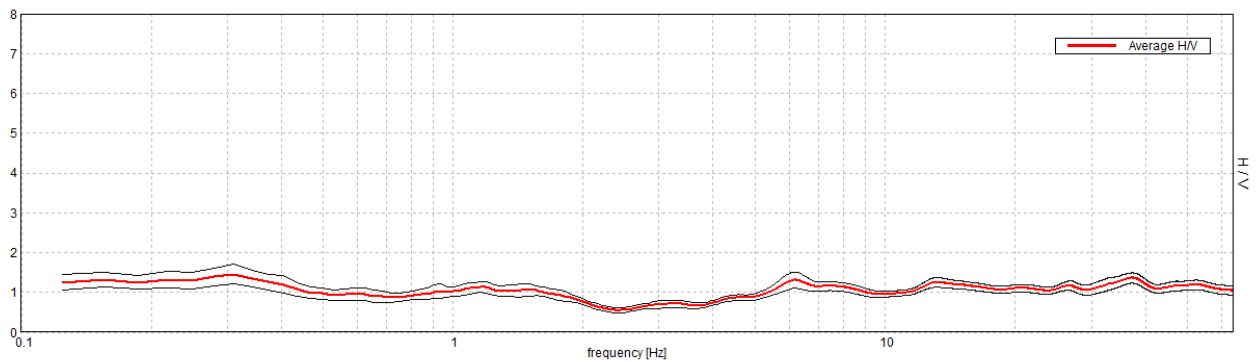
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_001

Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 27/05/14 09:39:45 End recording: 27/05/14 09:59:46
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

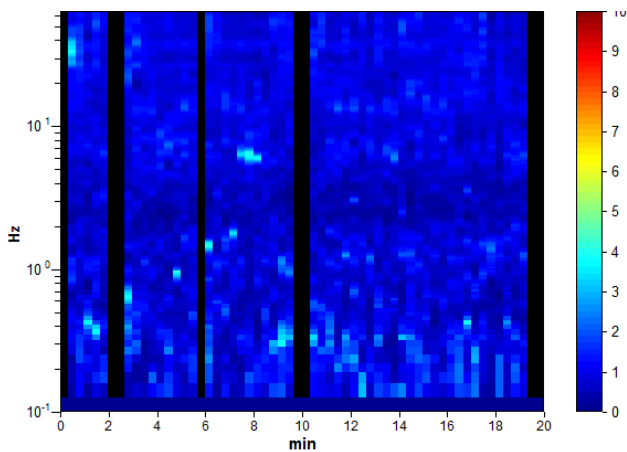
Trace length: 0h20'00". Analyzed 90% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

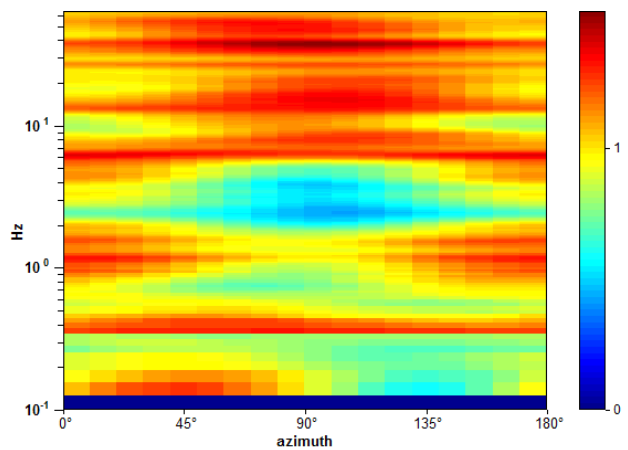
Max. H/V at 0.31 ± 1.84 Hz. (In the range 0.0 - 15.0 Hz).



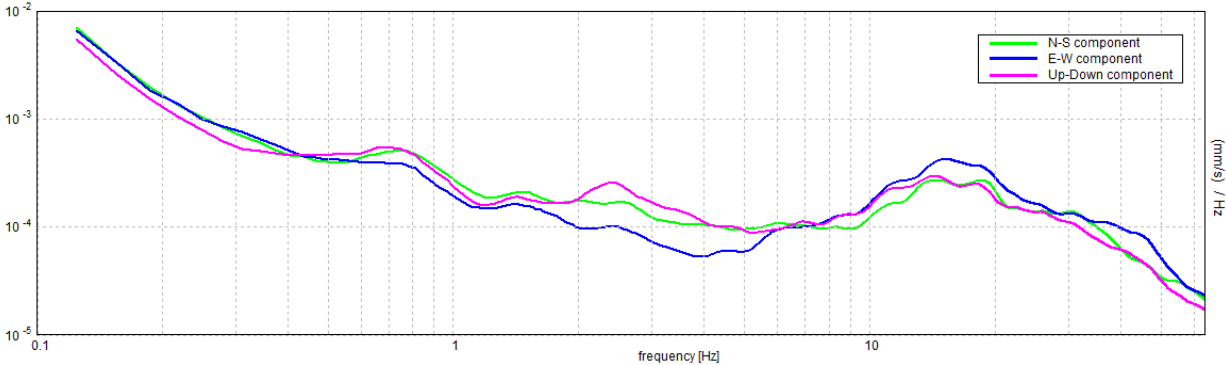
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.31 ± 1.84 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.31 > 0.50$		NO
$n_c(f_0) > 200$	$325.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 16 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$1.46 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 5.87549 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$1.83609 < 0.0625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.243 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

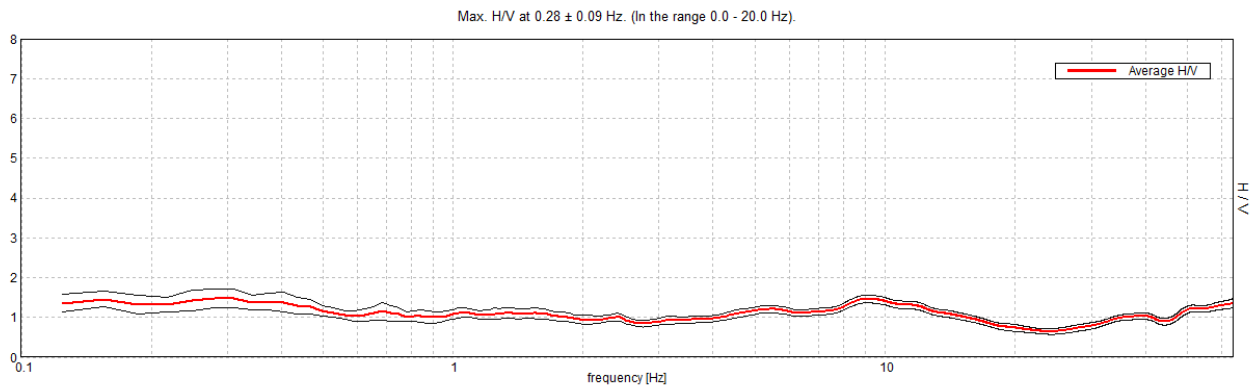
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_002

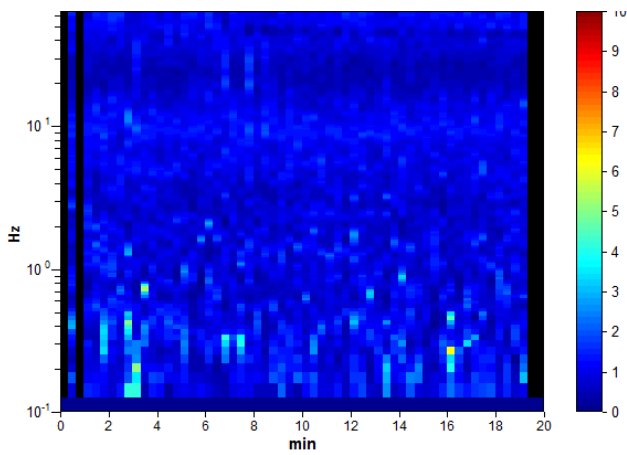
Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 27/05/14 10:30:50 End recording: 27/05/14 10:50:51
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 97% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

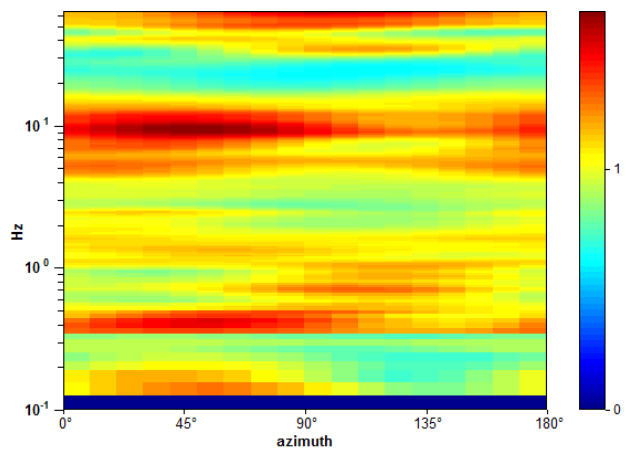
HORIZONTAL TO VERTICAL SPECTRAL RATIO



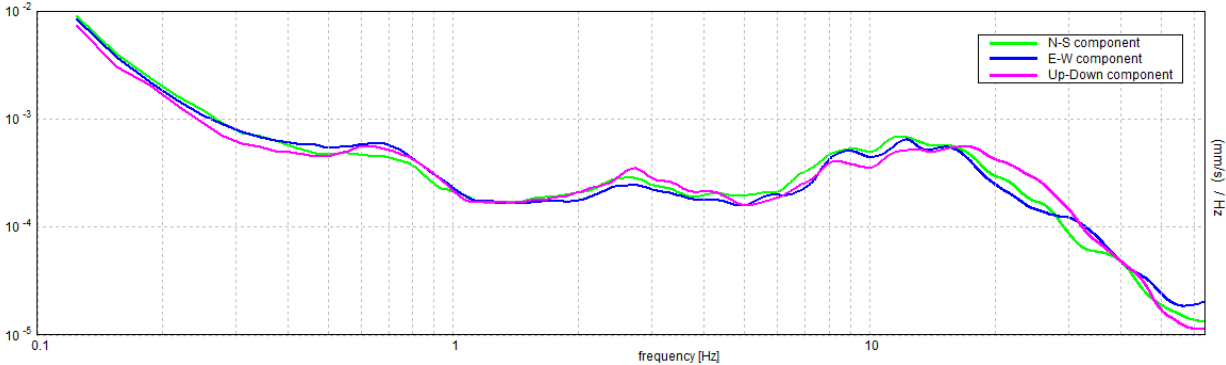
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.28 ± 0.09 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.28 > 0.50$		NO
$n_c(f_0) > 200$	$315.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 14 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$1.48 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.32052 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.09015 < 0.05625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2326 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

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

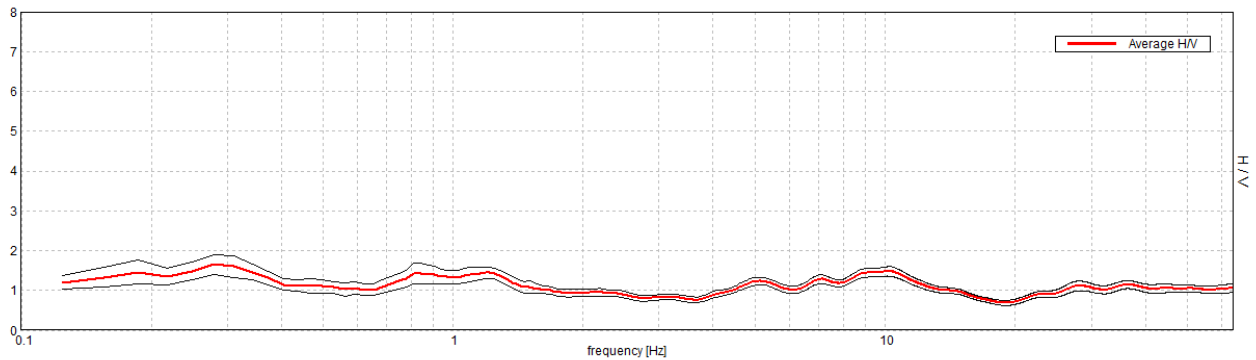
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_003

Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 27/05/14 11:06:05 End recording: 27/05/14 11:26:06
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

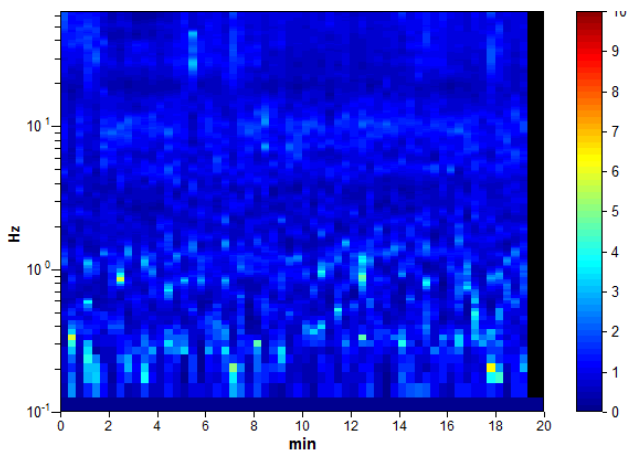
Trace length: 0h20'00". Analysis performed on the entire trace.
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

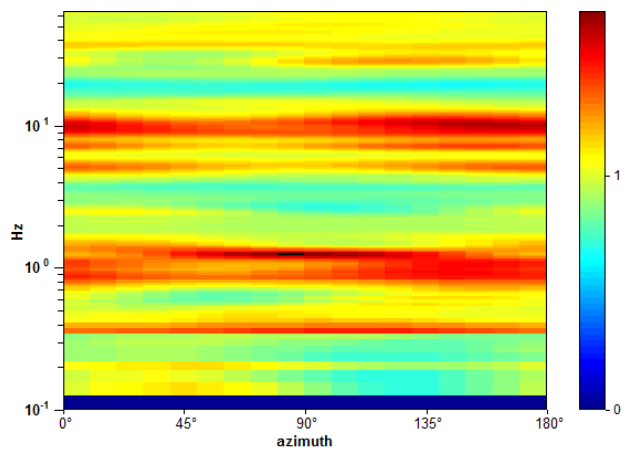
Max. H/V at 0.28 ± 0.12 Hz. (In the range 0.0 - 20.0 Hz).



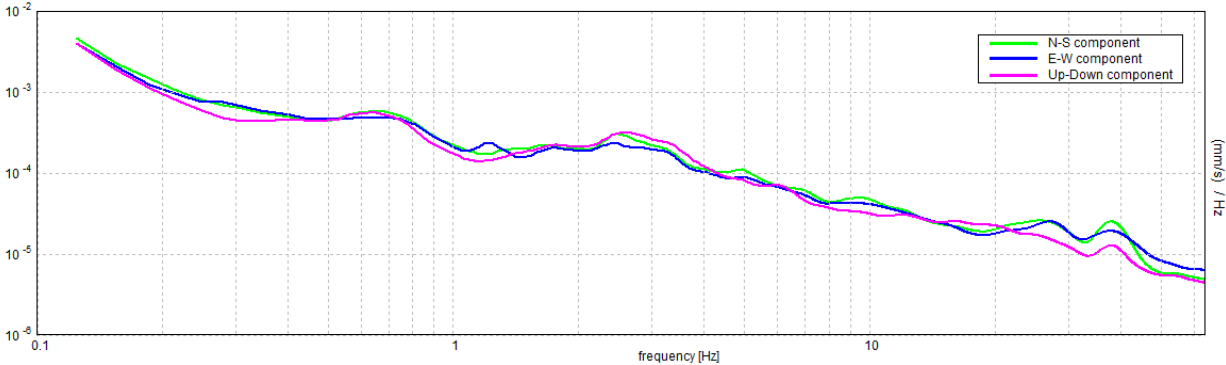
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.28 ± 0.12 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.28 > 0.50$		NO
$n_c(f_0) > 200$	$337.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 14 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$1.65 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.43627 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.1227 < 0.05625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2558 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

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

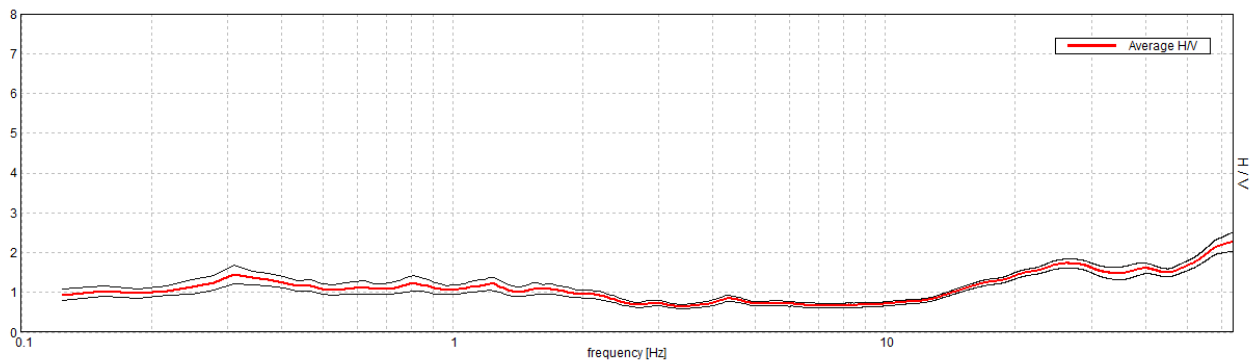
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_004

Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 27/05/14 11:45:13 End recording: 27/05/14 12:05:14
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

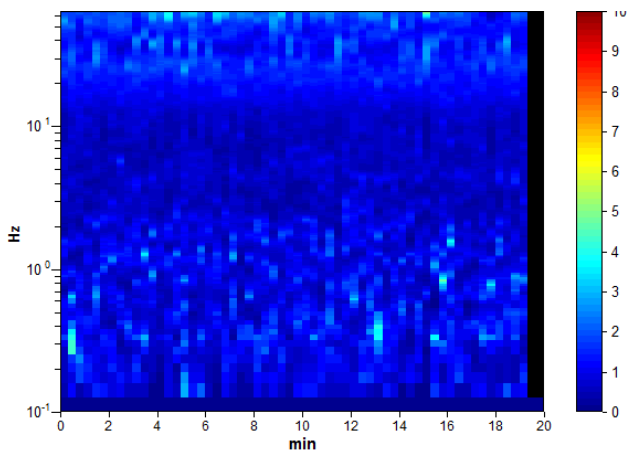
Trace length: 0h20'00". Analysis performed on the entire trace.
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

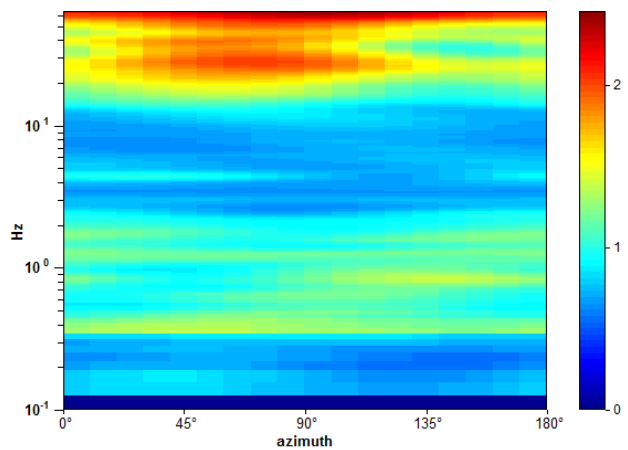
Max. H/V at 0.31 ± 5.68 Hz. (In the range 0.0 - 20.0 Hz).



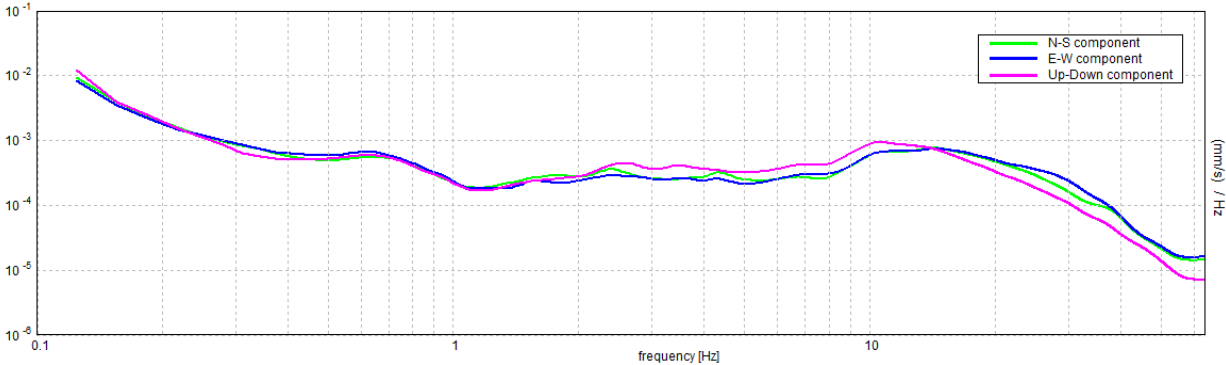
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.31 ± 5.68 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	0.31 > 0.50		NO
$n_c(f_0) > 200$	375.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 16 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.46 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 18.19178 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	5.68493 < 0.0625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2302 < 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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

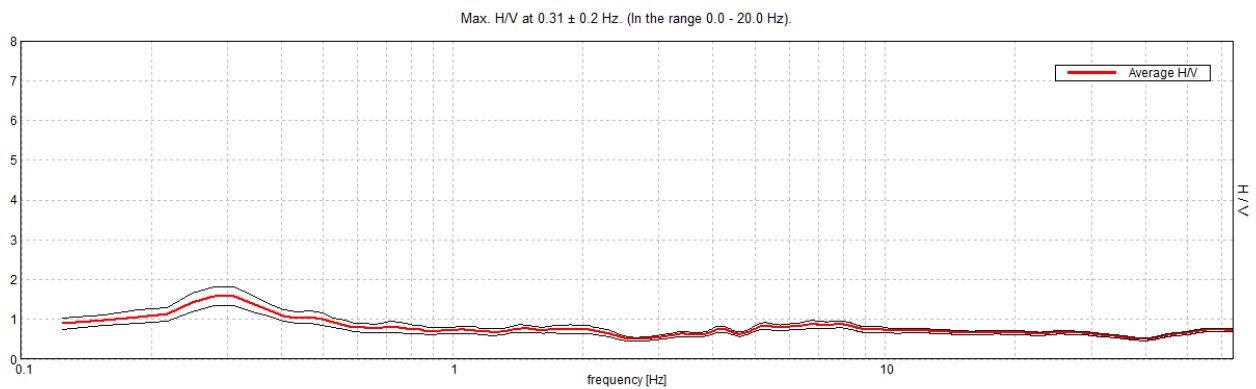
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAN MAURO PASCOLI, HVSR_005

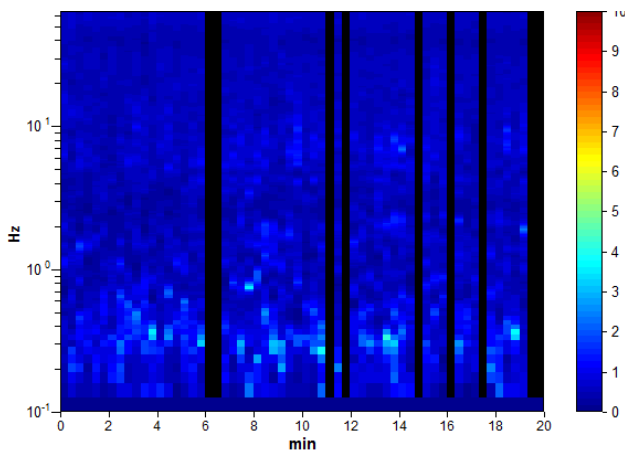
Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 27/05/14 12:37:47 End recording: 27/05/14 12:57:48
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

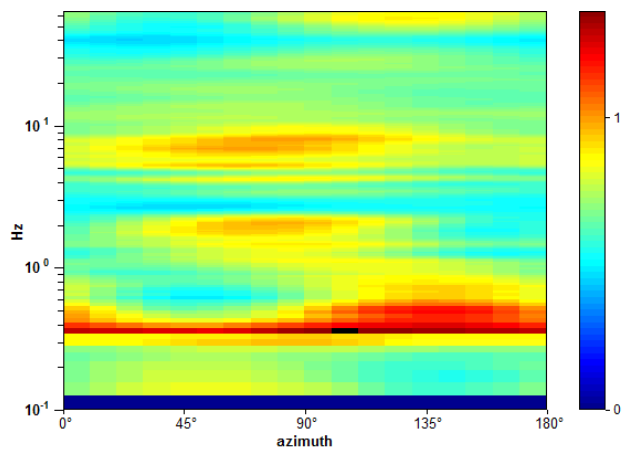
HORIZONTAL TO VERTICAL SPECTRAL RATIO



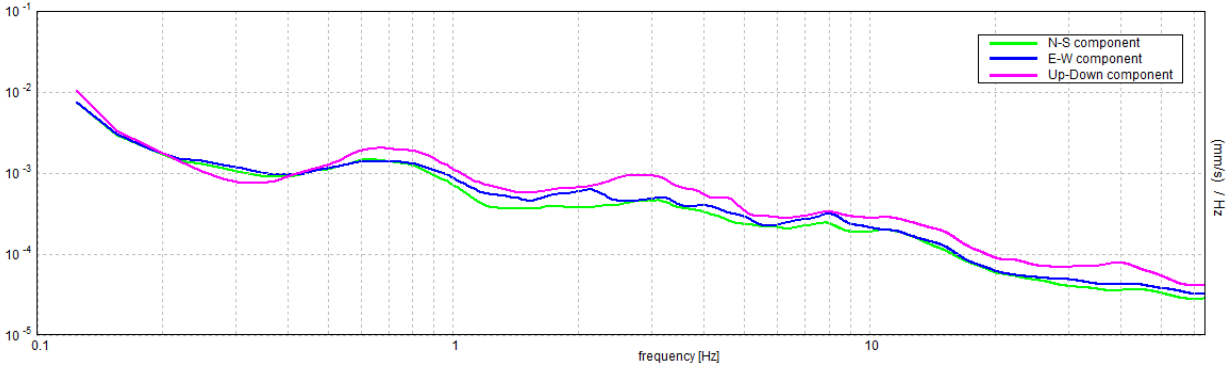
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.31 ± 0.2 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.31 > 0.50$		NO
$n_c(f_0) > 200$	$318.8 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 16 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	0.656 Hz	OK	
$A_0 > 2$	$1.58 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.65515 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.20473 < 0.0625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2385 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

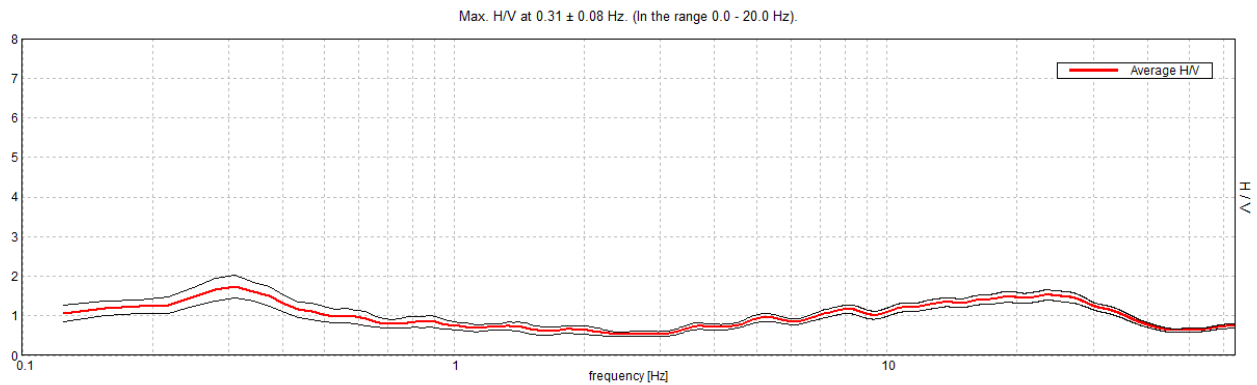
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_006

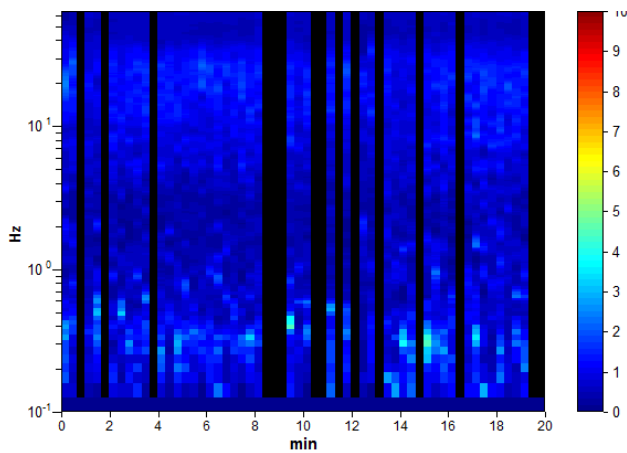
Instrument: TEN-0029/01-07
Start recording: 27/05/14 14:05:12 End recording: 27/05/14 14:25:13
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 78% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

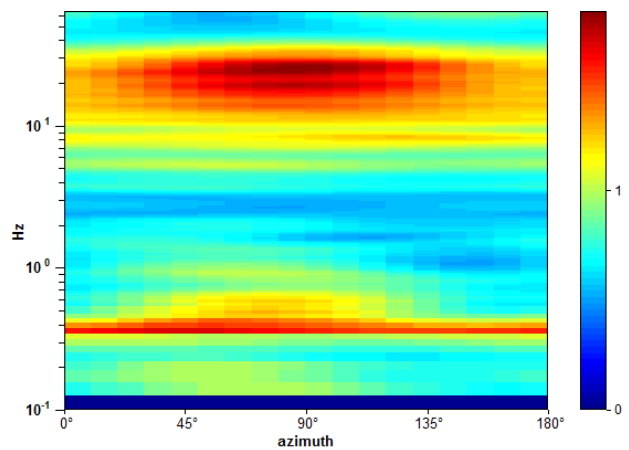
HORIZONTAL TO VERTICAL SPECTRAL RATIO



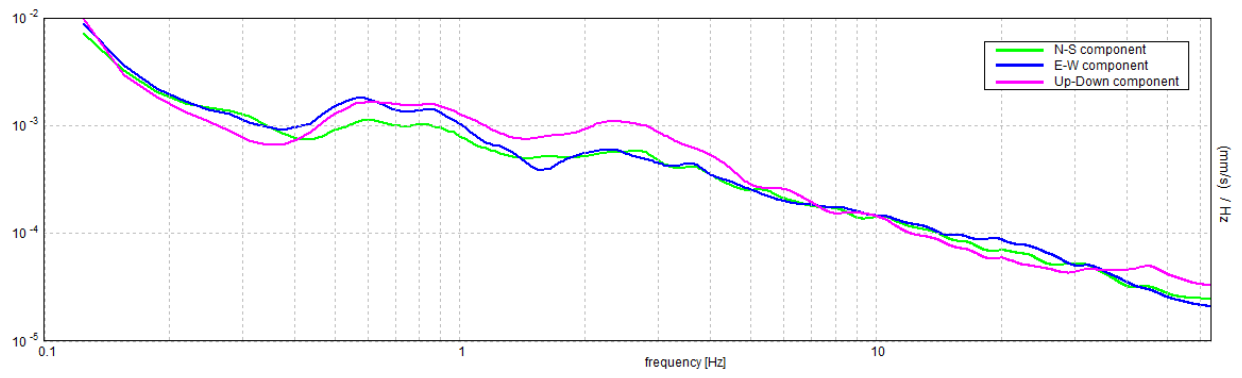
H/V TIME HISTORY



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 0.31 ± 0.08 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.31 > 0.50$		NO
$n_c(f_0) > 200$	$281.3 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 16 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	0.656 Hz	OK	
$A_0 > 2$	$1.74 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.24267 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.07583 < 0.0625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.278 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

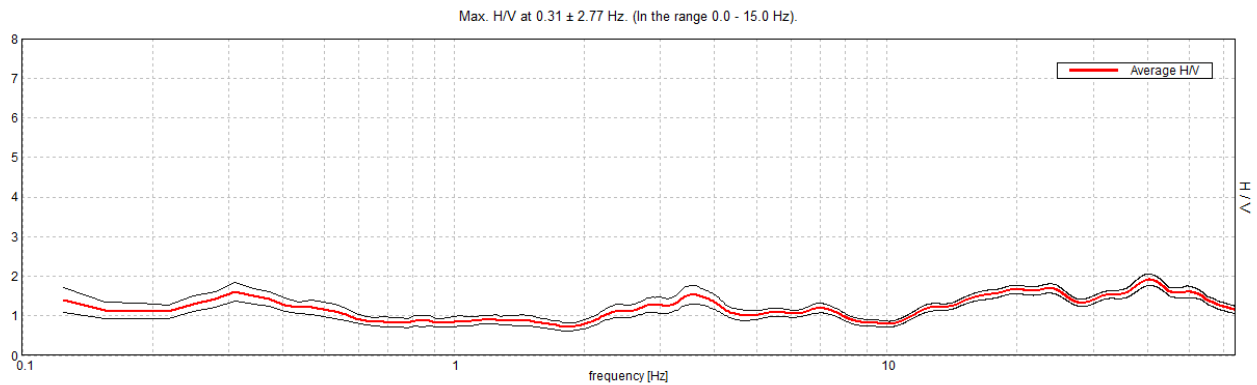
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_007

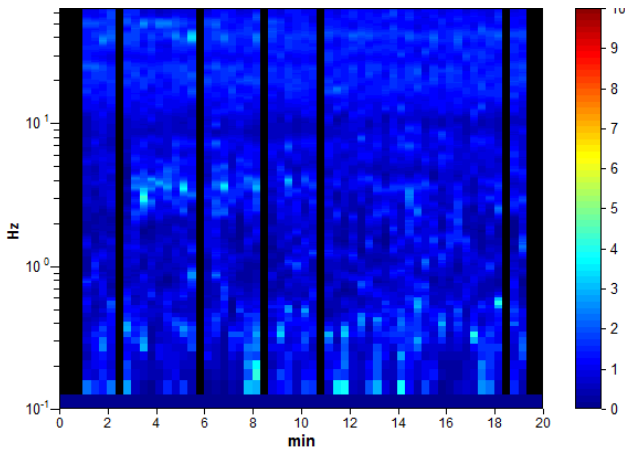
Instrument: TEN-0029/01-07
Start recording: 27/05/14 14:46:02 End recording: 27/05/14 15:06:03
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

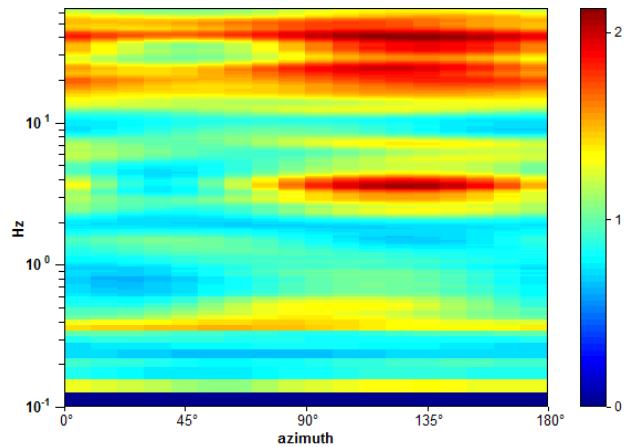
HORIZONTAL TO VERTICAL SPECTRAL RATIO



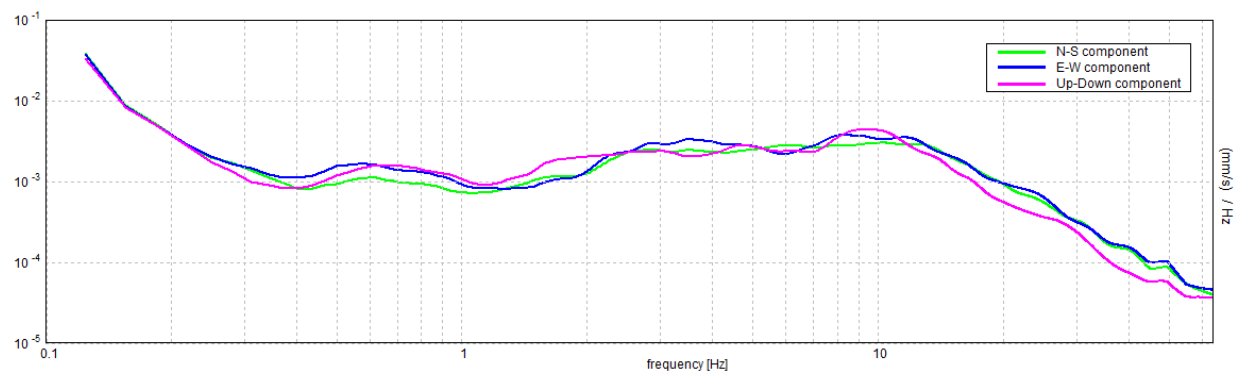
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.31 ± 2.77 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	0.31 > 0.50		NO
$n_c(f_0) > 200$	312.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 16 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.61 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 8.85488 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	2.76715 < 0.0625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2359 < 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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

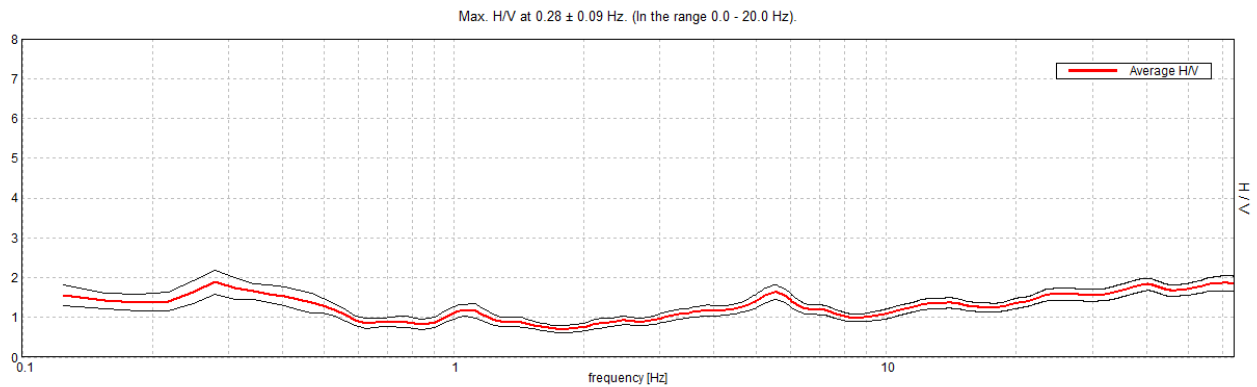
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAN MAURO PASCOLI, HVSR_008

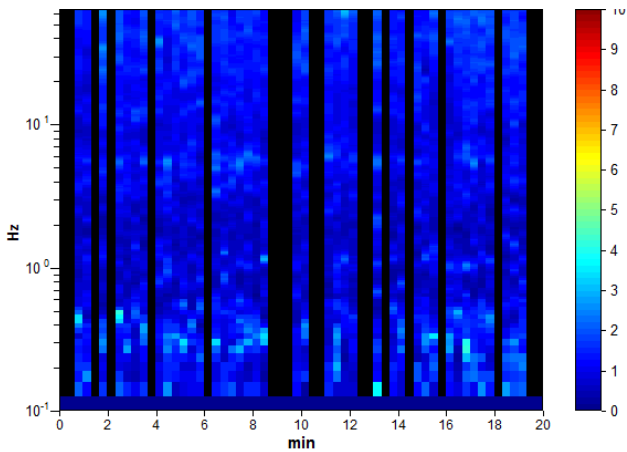
Instrument: TEN-0029/01-07
Start recording: 27/05/14 15:29:36 End recording: 27/05/14 15:49:37
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 72% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

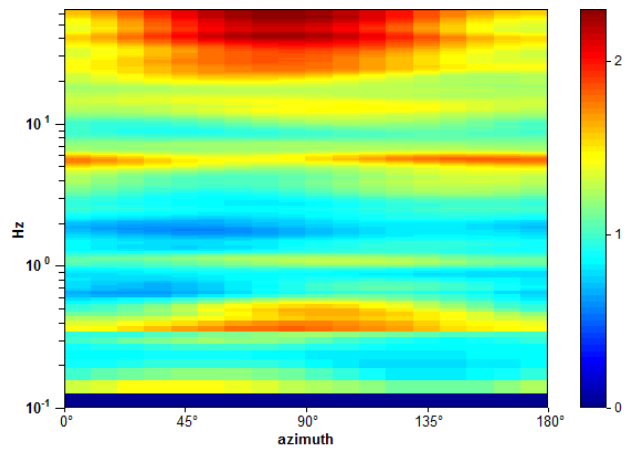
HORIZONTAL TO VERTICAL SPECTRAL RATIO



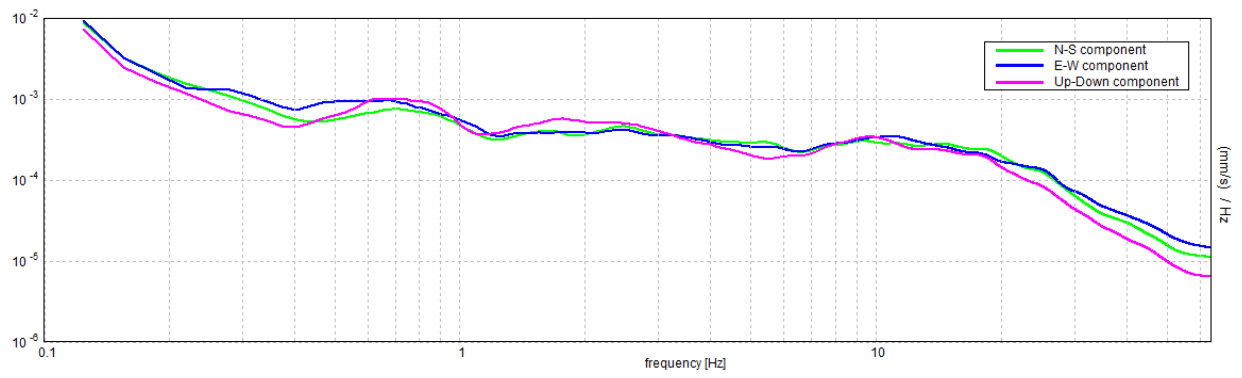
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.28 ± 0.09 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.28 > 0.50$		NO
$n_c(f_0) > 200$	$230.6 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 14 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	0.594 Hz	OK	
$A_0 > 2$	$1.89 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.30798 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.08662 < 0.05625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.3022 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

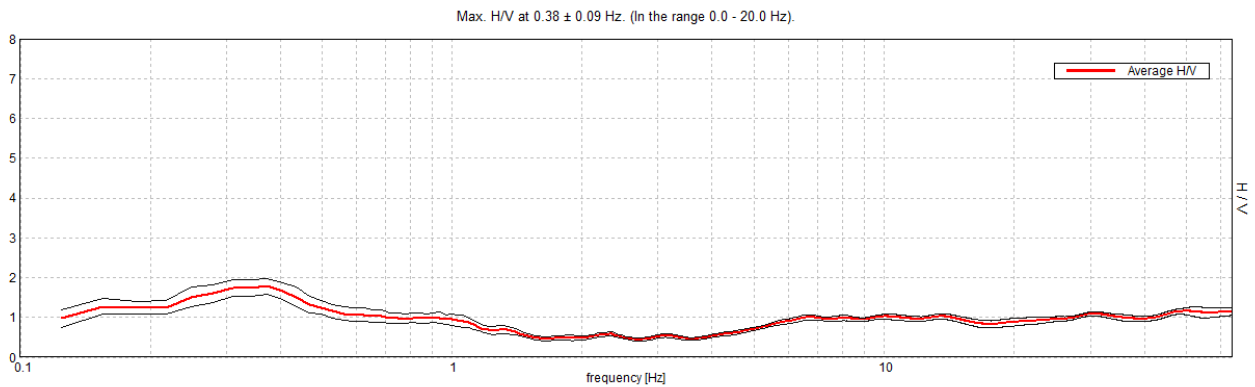
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAN MAURO PASCOLI, HVSR_009

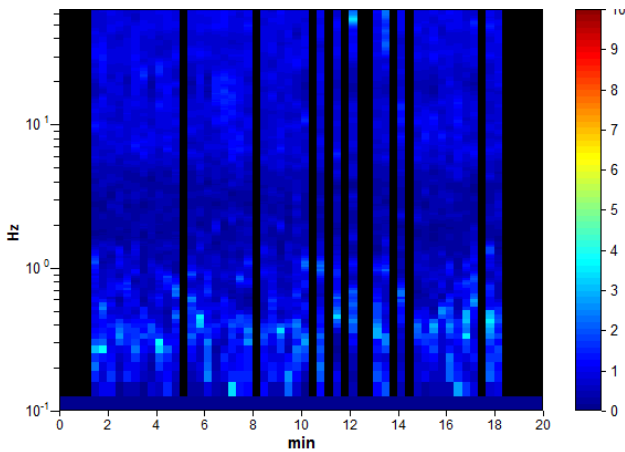
Instrument: TEN-0029/01-07
Start recording: 27/05/14 16:37:12 End recording: 27/05/14 16:57:13
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

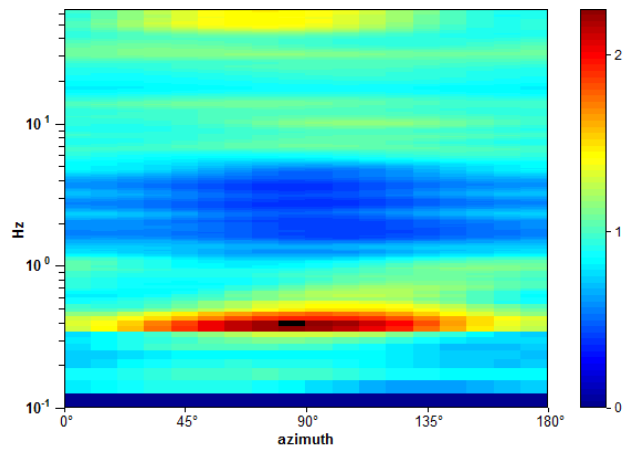
HORIZONTAL TO VERTICAL SPECTRAL RATIO



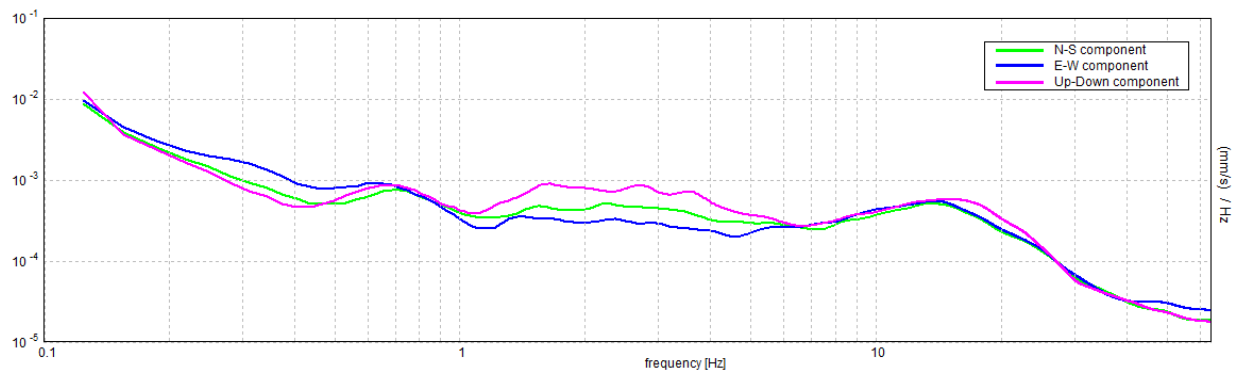
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.38 ± 0.09 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.38 > 0.50$		NO
$n_c(f_0) > 200$	$307.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 19 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	1.094 Hz	OK	
$A_0 > 2$	$1.78 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.23317 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.08744 < 0.075$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2039 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

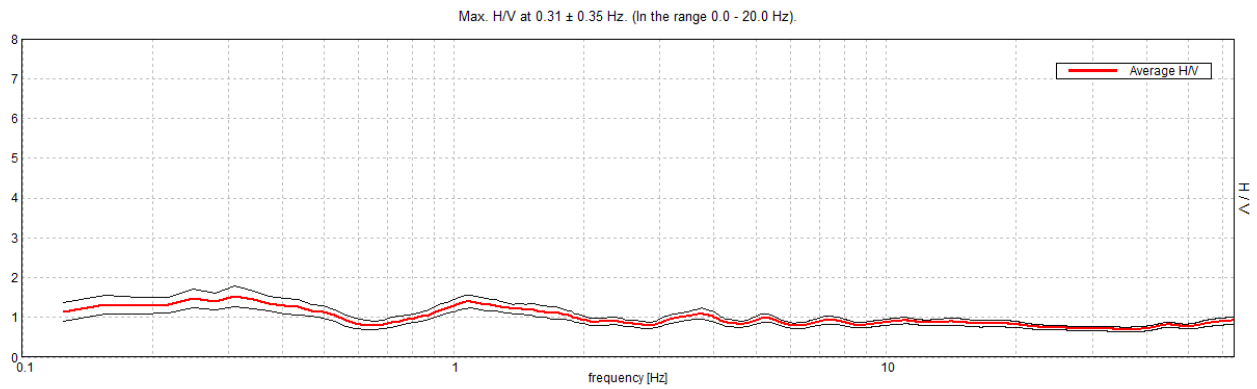
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_010

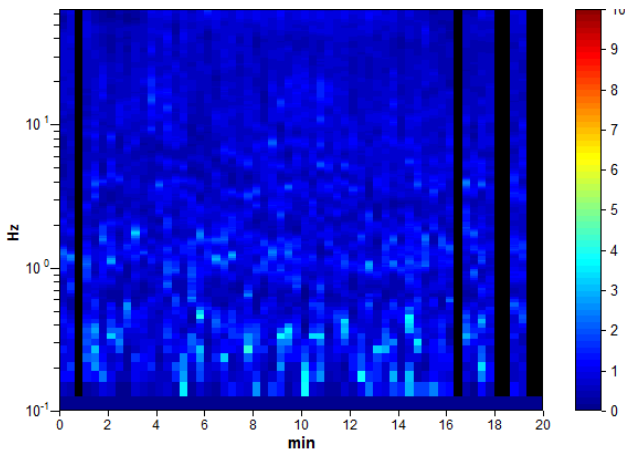
Instrument: TEN-0029/01-07
Start recording: 27/05/14 17:08:44 End recording: 27/05/14 17:28:45
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

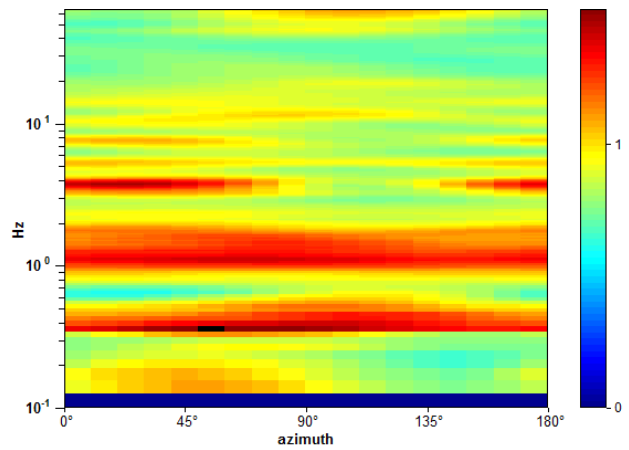
HORIZONTAL TO VERTICAL SPECTRAL RATIO



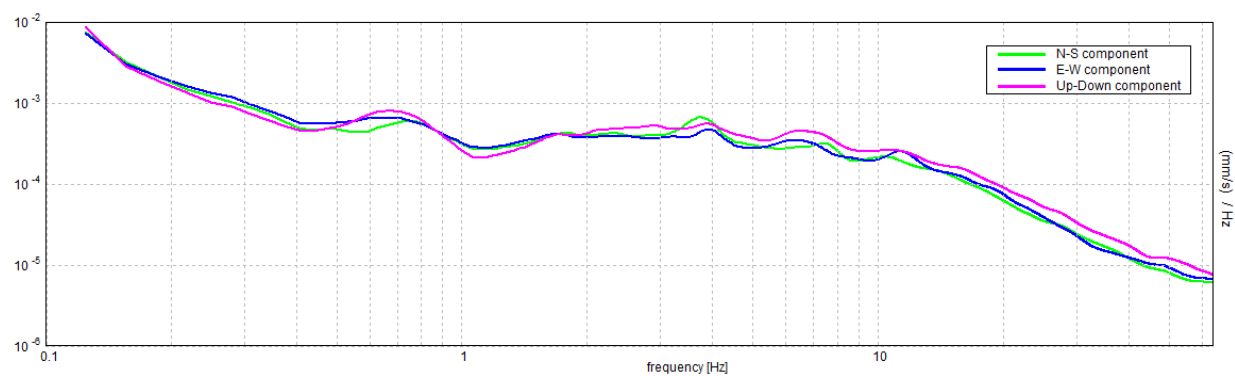
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.31 ± 0.35 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	0.31 > 0.50		NO
$n_c(f_0) > 200$	337.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 16 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.53 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 1.11961 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	0.34988 < 0.0625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2625 < 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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

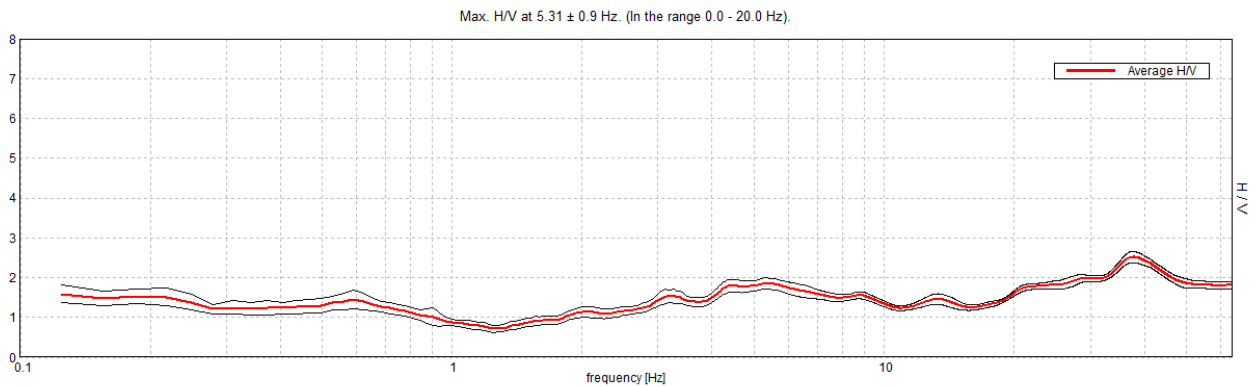
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAN MAURO PASCOLI, HVSR_011

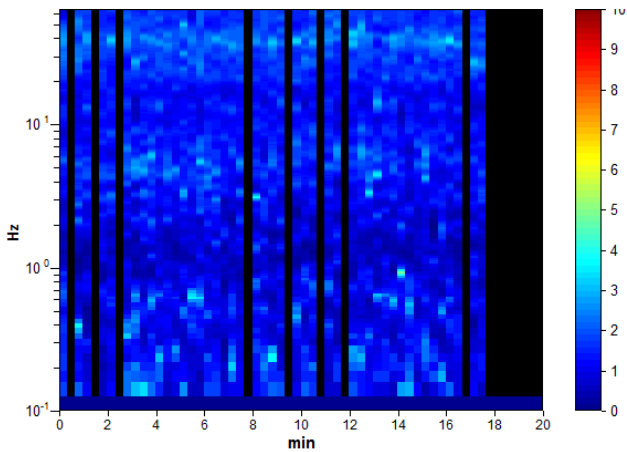
Instrument: TEN-0029/01-07
Start recording: 10/06/14 15:24:45 End recording: 10/06/14 15:44:46
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

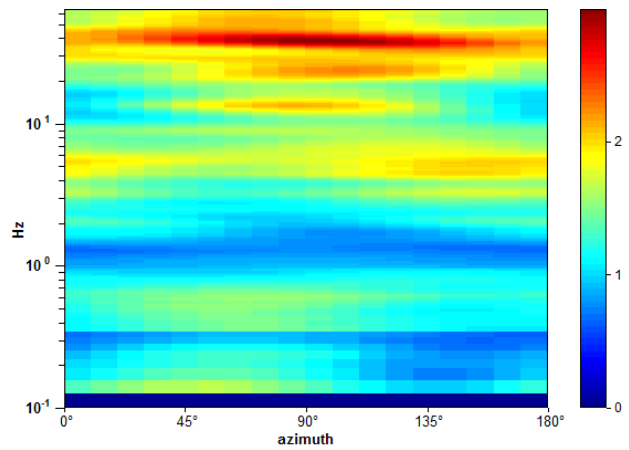
HORIZONTAL TO VERTICAL SPECTRAL RATIO



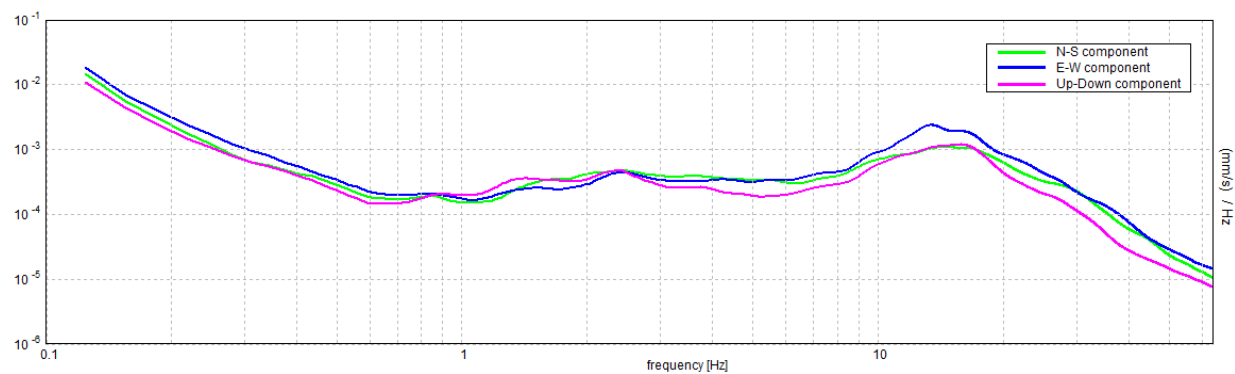
H/V TIME HISTORY



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 5.31 ± 0.9 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	5.31 > 0.50	OK	
$n_c(f_0) > 200$	4781.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 256 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	1.656 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.86 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.16915 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	0.89863 < 0.26563		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1418 < 1.58	OK	

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

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

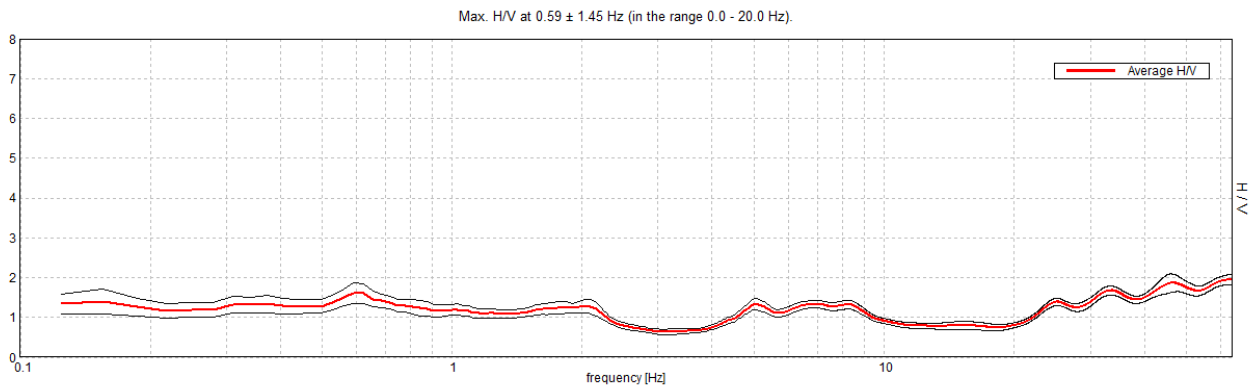
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAN MAURO PASCOLI, HVSR_012

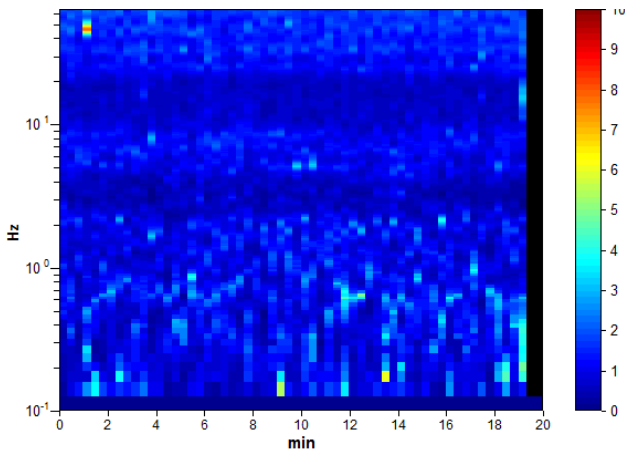
Instrument: TEN-0029/01-07
Start recording: 10/06/14 16:00:49 End recording: 10/06/14 16:20:50
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

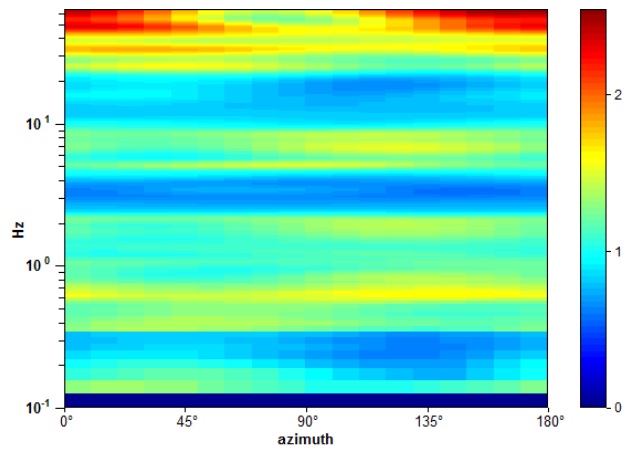
HORIZONTAL TO VERTICAL SPECTRAL RATIO



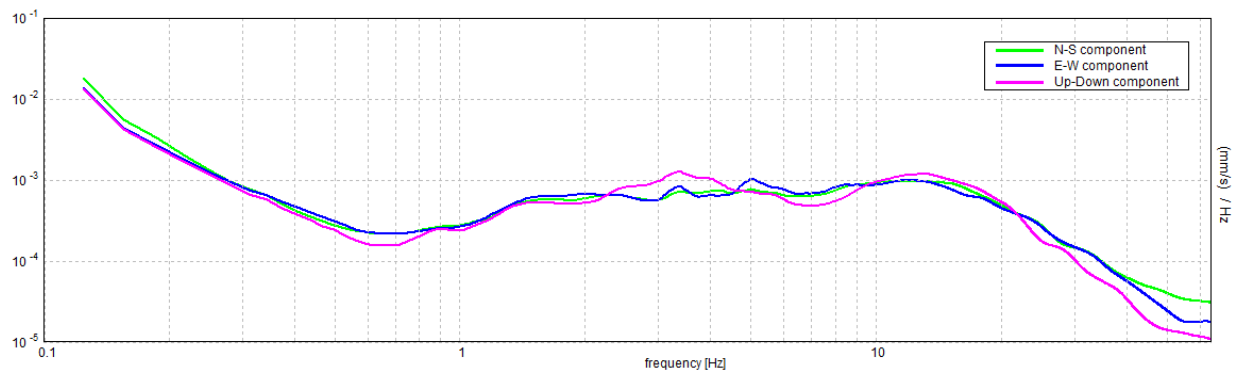
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.59 ± 1.45 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.59 > 0.50$	OK	
$n_c(f_0) > 200$	$712.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 30 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$1.60 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 2.43663 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$1.44675 < 0.08906$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2569 < 2.0$	OK	

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

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

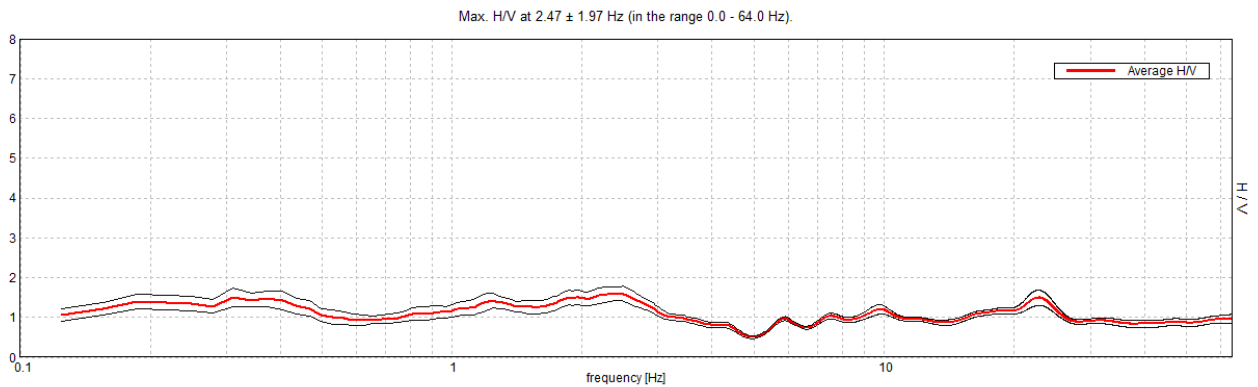
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI GATTEO, HVSR_013

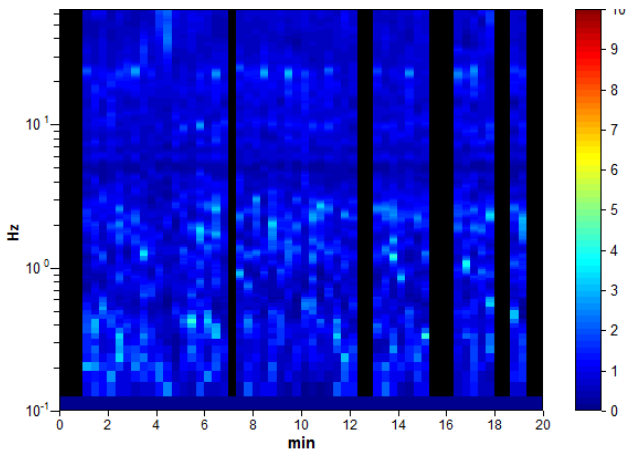
Instrument: TRS-0025/01-07
Start recording: 11/07/14 09:18:57 End recording: 11/07/14 09:38:58
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 78% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

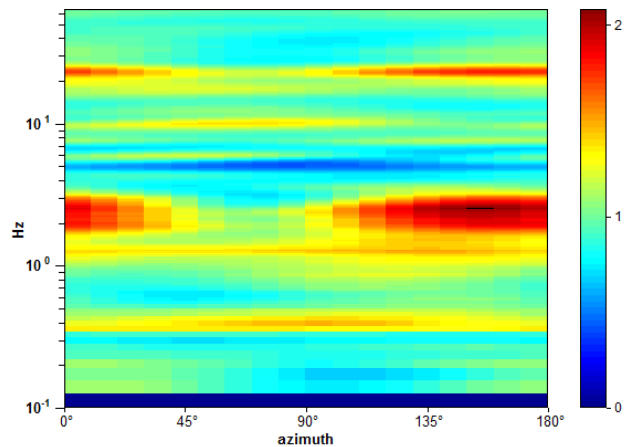
HORIZONTAL TO VERTICAL SPECTRAL RATIO



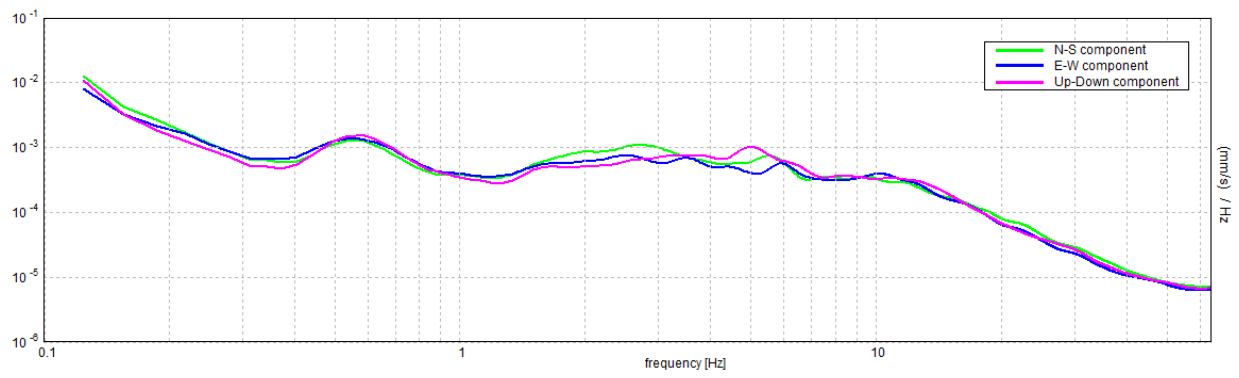
H/V TIME HISTORY



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 2.47 ± 1.97 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$2.47 > 0.50$	OK	
$n_c(f_0) > 200$	$2320.6 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 120 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 $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	4.375 Hz	OK	
$A_0 > 2$	$1.59 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.79961 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$1.97404 < 0.12344$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.1788 < 1.58$	OK	

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

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

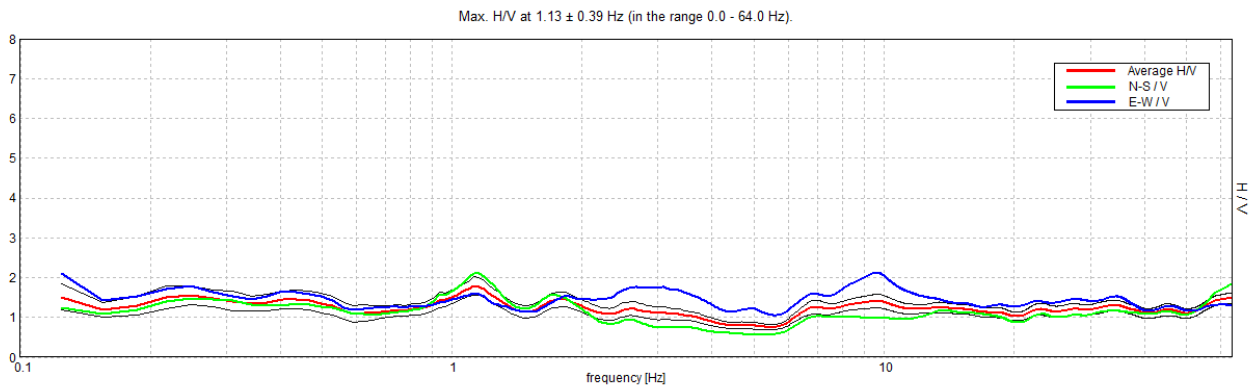
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI GATTEO, HVSR_014

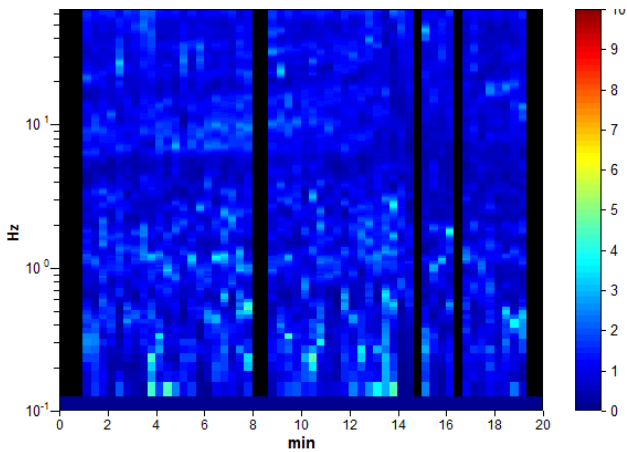
Instrument: TRS-0025/01-07
Start recording: 11/07/14 10:00:34 End recording: 11/07/14 10:20:35
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

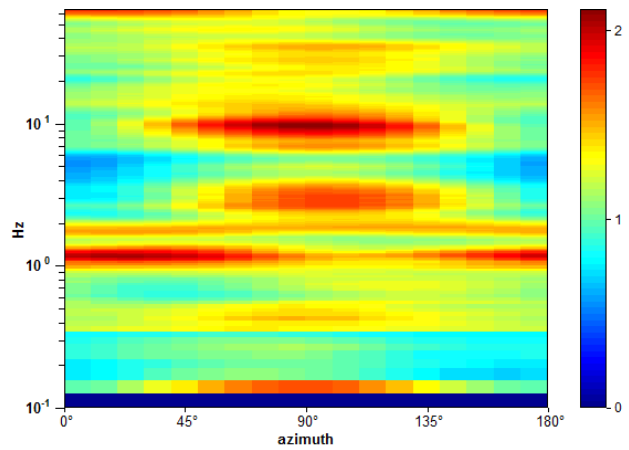
HORIZONTAL TO VERTICAL SPECTRAL RATIO



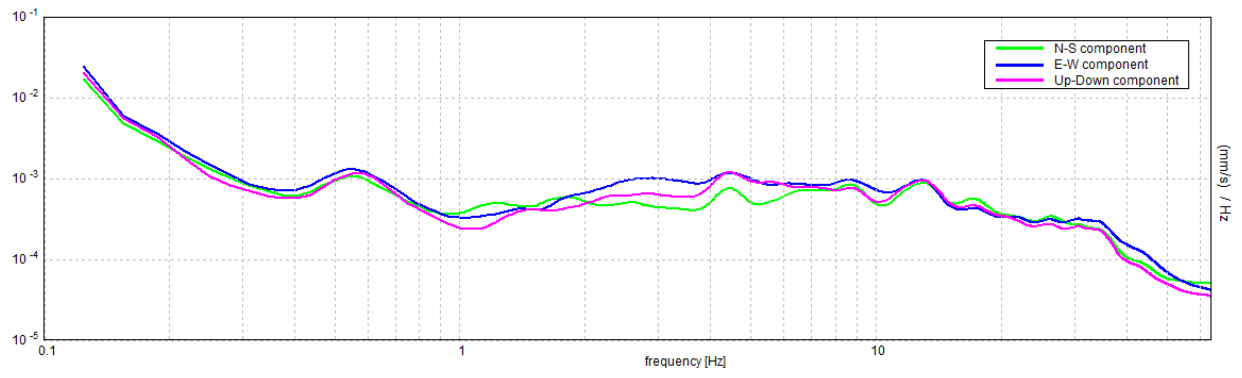
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 1.13 ± 0.39 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.13 > 0.50	OK	
$n_c(f_0) > 200$	1147.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 55 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	4.0 Hz	OK	
$A_0 > 2$	1.79 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.34309 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.38597 < 0.1125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2245 < 1.78$	OK	

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

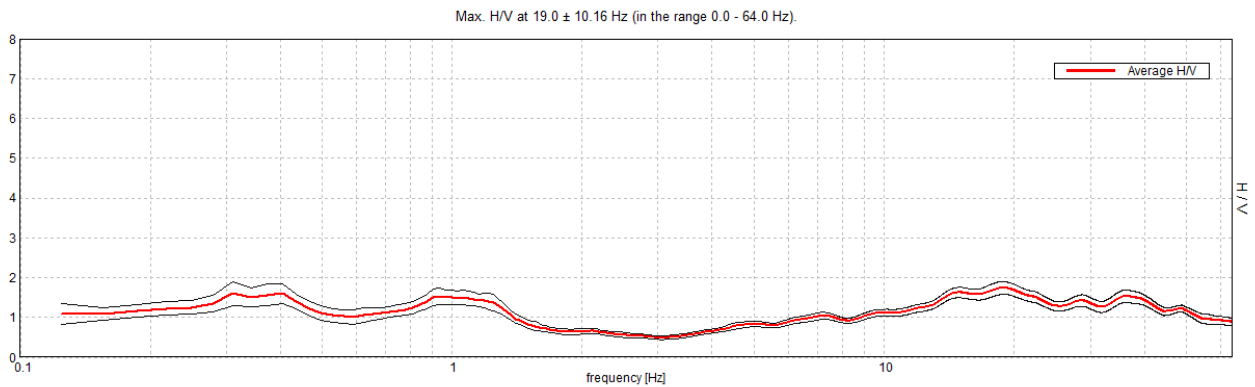
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40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

UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_015

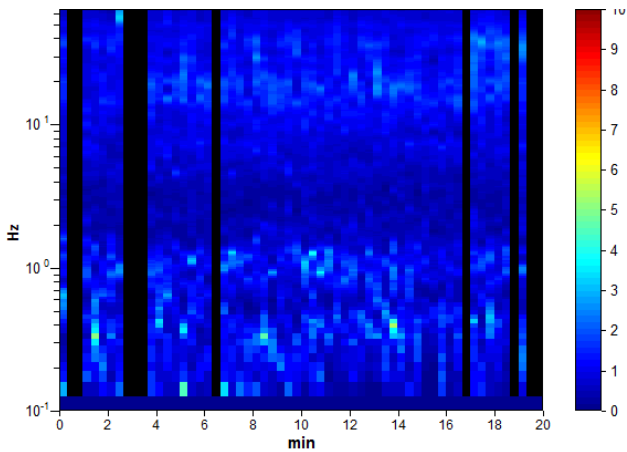
Instrument: TRS-0025/01-07
Start recording: 11/07/14 10:43:31 End recording: 11/07/14 11:03:32
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

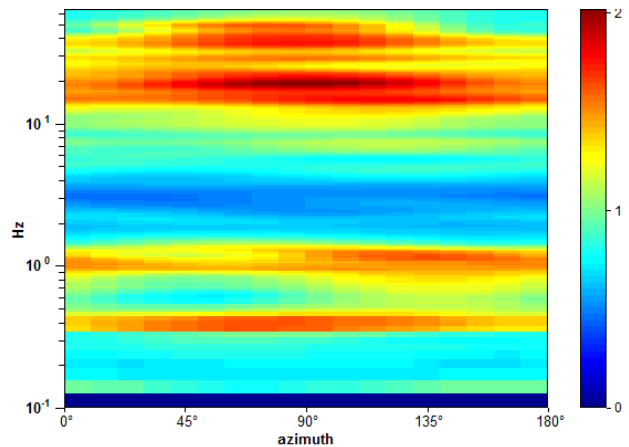
HORIZONTAL TO VERTICAL SPECTRAL RATIO



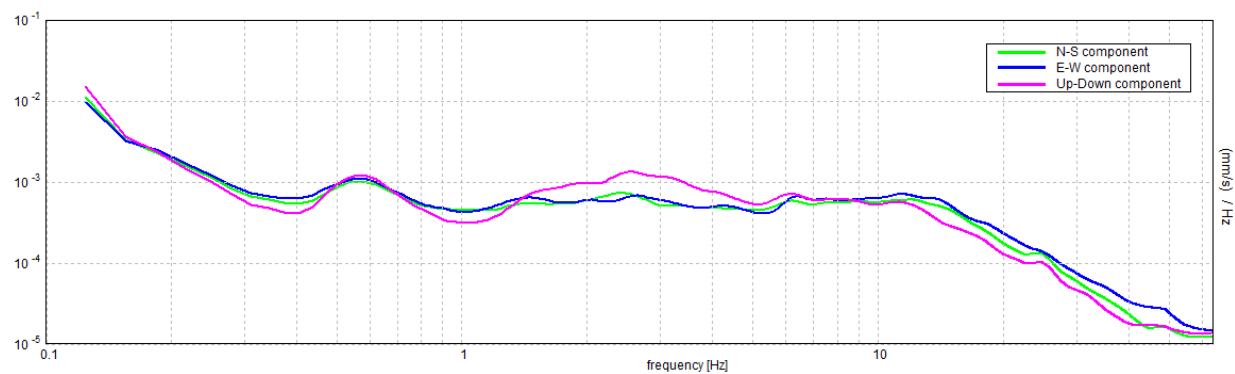
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 19.0 ± 10.16 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	19.00 > 0.50	OK	
$n_c(f_0) > 200$	19000.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 913 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	5.938 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.74 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.53477 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	10.16063 < 0.95		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1572 < 1.58	OK	

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

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

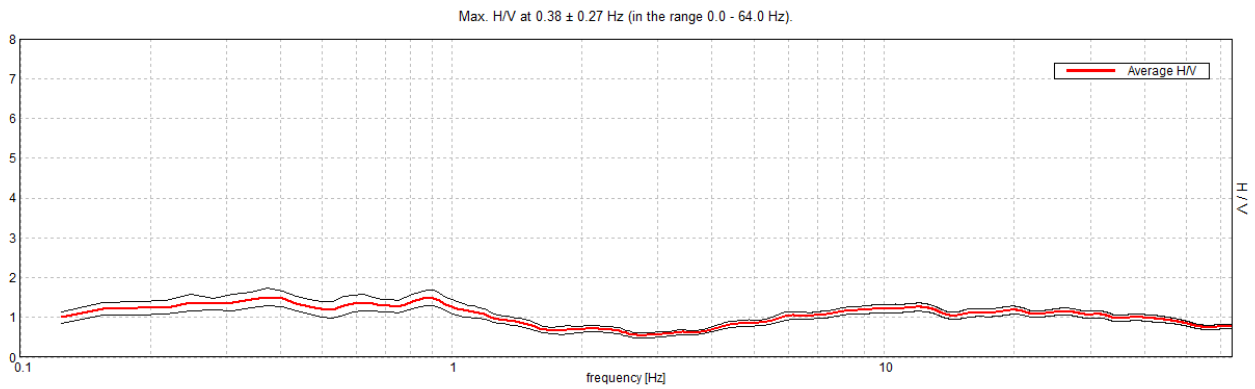
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAN MAURO PASCOLI, HVSR_016

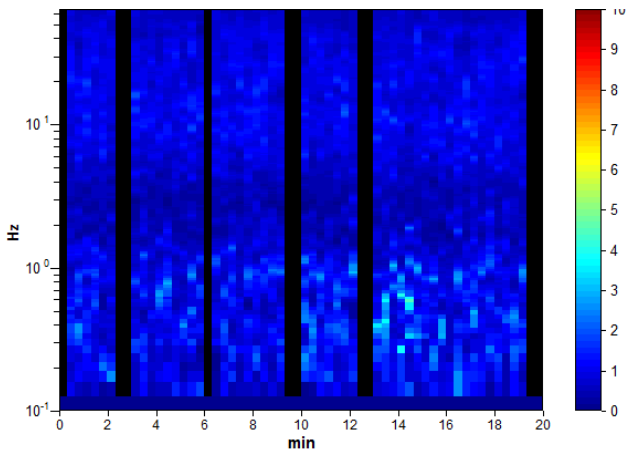
Instrument: TRS-0025/01-07
Start recording: 11/07/14 11:29:40 End recording: 11/07/14 11:49:41
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

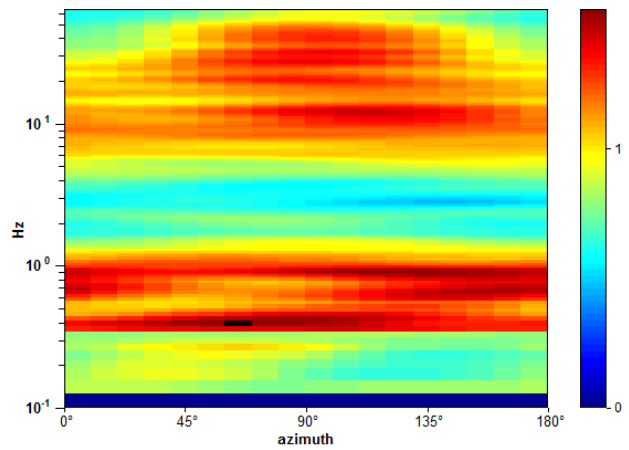
HORIZONTAL TO VERTICAL SPECTRAL RATIO



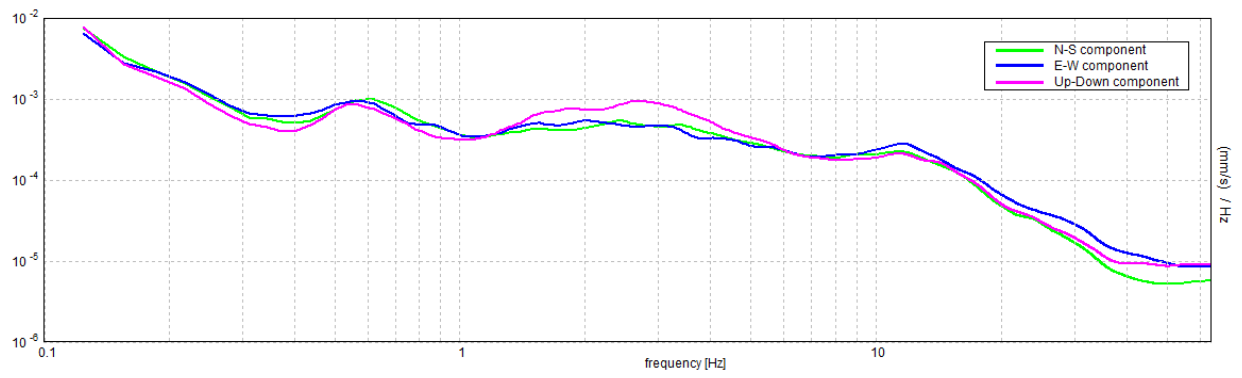
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.38 ± 0.27 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.38 > 0.50$		NO
$n_c(f_0) > 200$	$375.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 19 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$1.51 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.72782 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.27293 < 0.075$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.217 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

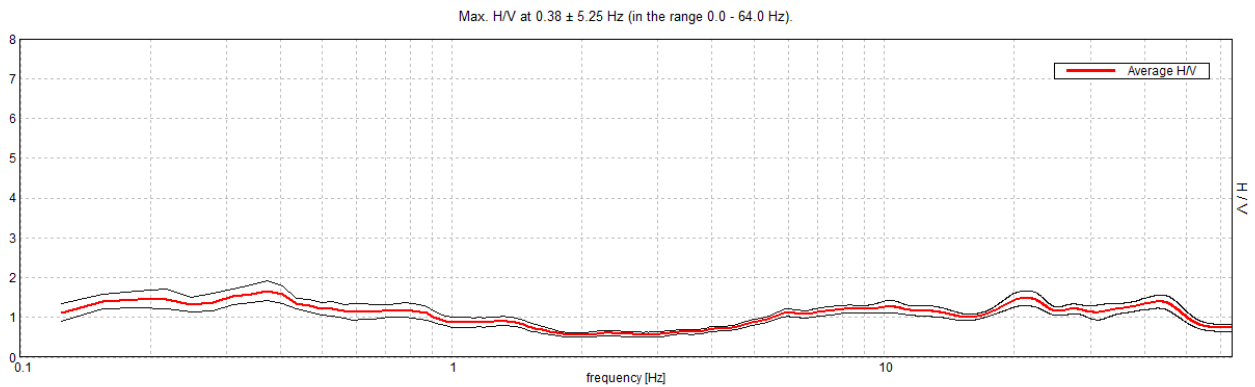
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAN MAURO PASCOLI, HVSR_017

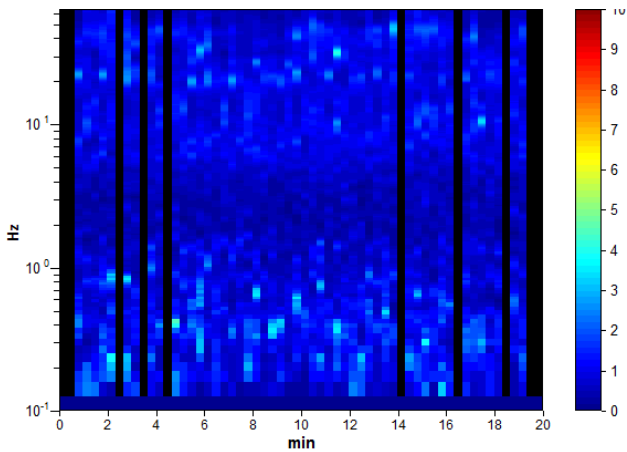
Instrument: TRS-0025/01-07
Start recording: 11/07/14 12:05:35 End recording: 11/07/14 12:25:36
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

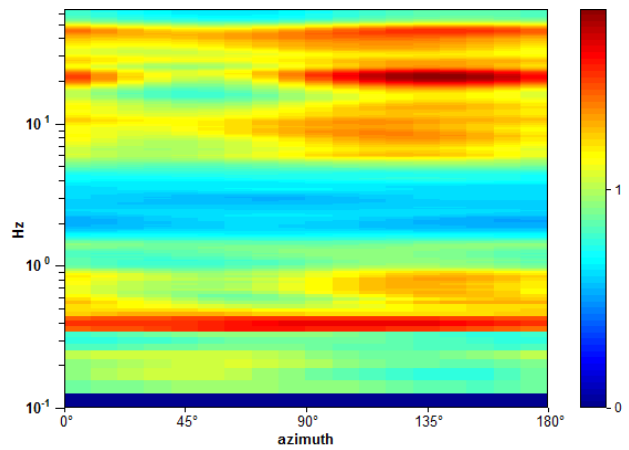
HORIZONTAL TO VERTICAL SPECTRAL RATIO



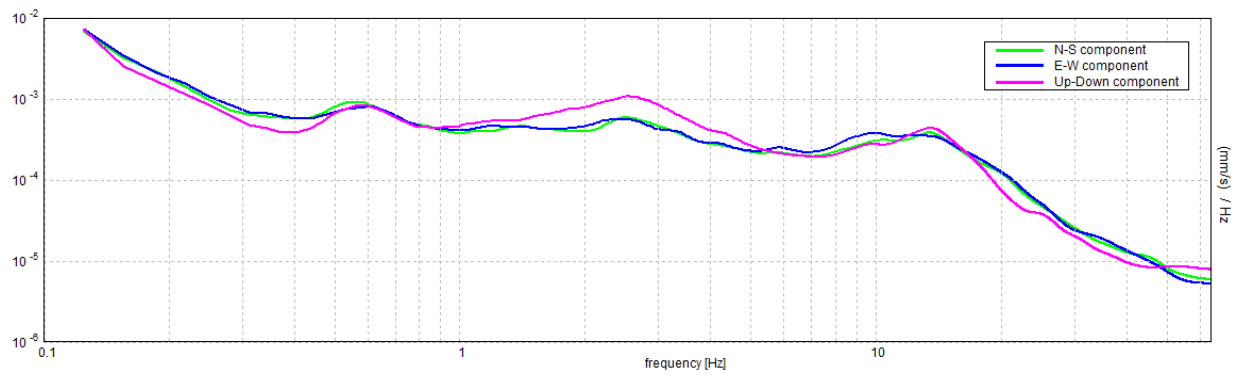
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.38 ± 5.25 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.38 > 0.50$		NO
$n_c(f_0) > 200$	$375.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 19 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	1.469 Hz	OK	
$A_0 > 2$	$1.67 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 14.01169 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$5.25439 < 0.075$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.236 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

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

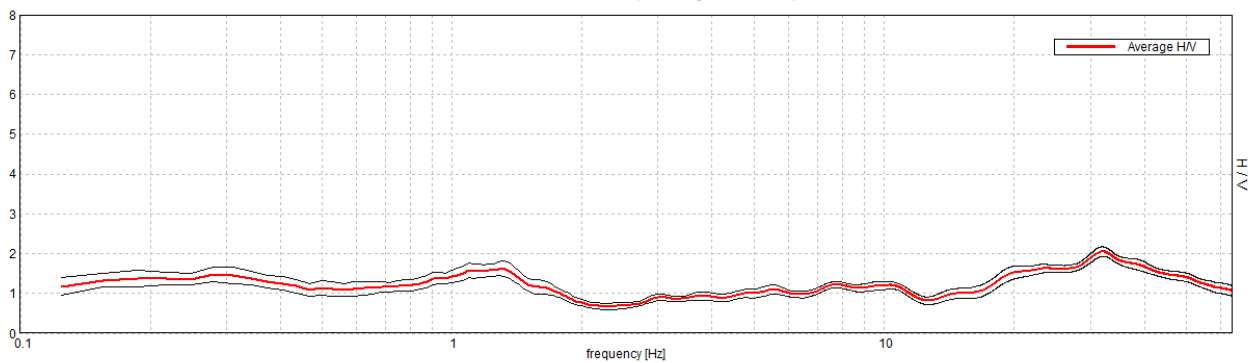
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_018

Instrument: TRS-0025/01-07
Start recording: 11/07/14 12:46:43 End recording: 11/07/14 13:06:43
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

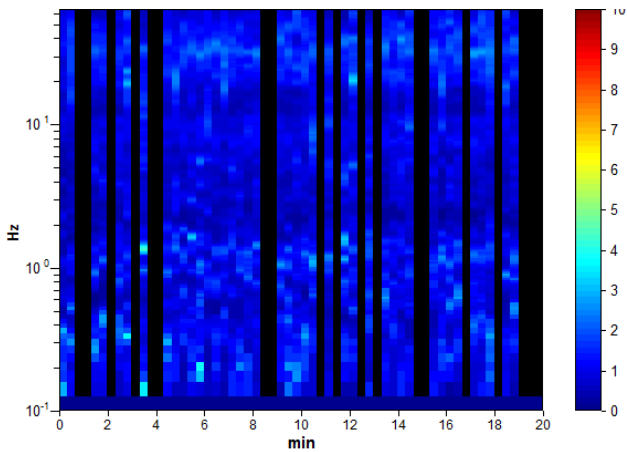
Trace length: 0h20'00". Analyzed 68% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

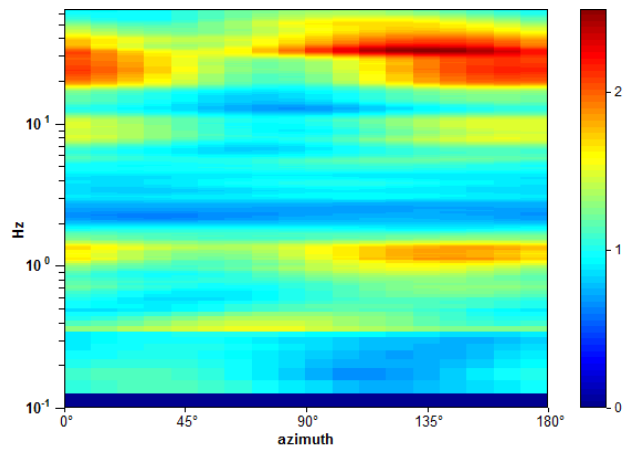
Max. H/V at 31.88 ± 16.35 Hz (in the range 0.0 - 64.0 Hz).



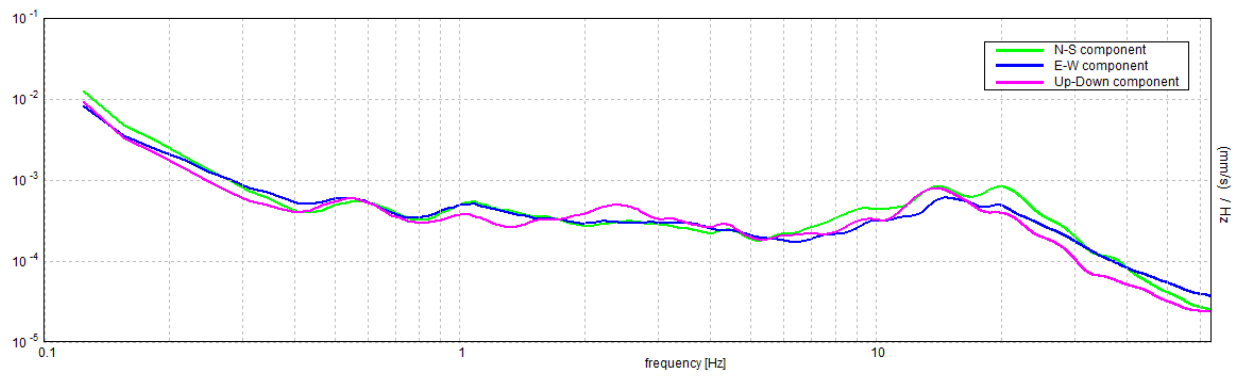
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 31.88 ± 16.35 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	31.88 > 0.50	OK	
$n_c(f_0) > 200$	26137.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 1531 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	16.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.05 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.51308 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$16.35437 < 1.59375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.1241 < 1.58$	OK	

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

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

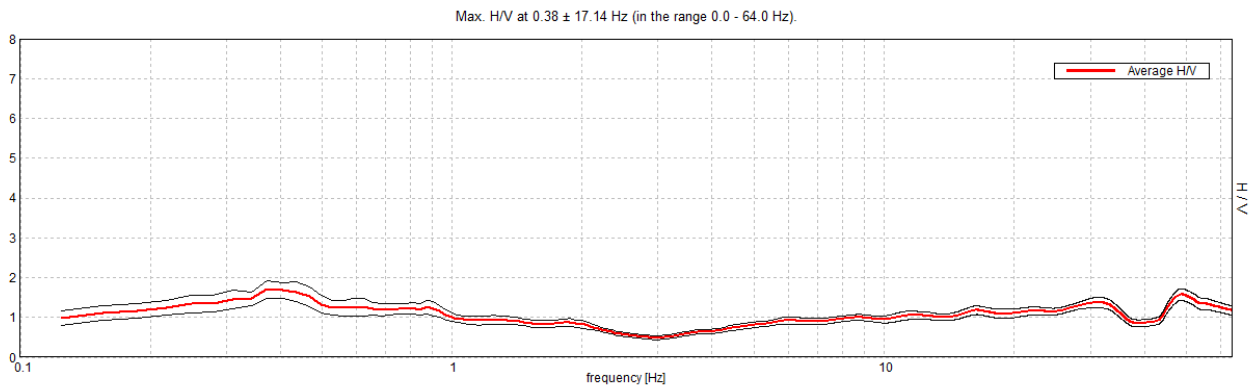
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_019

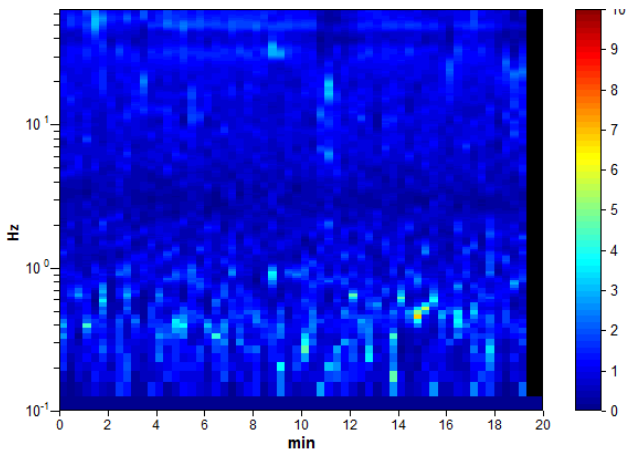
Instrument: TRS-0025/01-07
Start recording: 11/07/14 13:27:03 End recording: 11/07/14 13:47:04
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

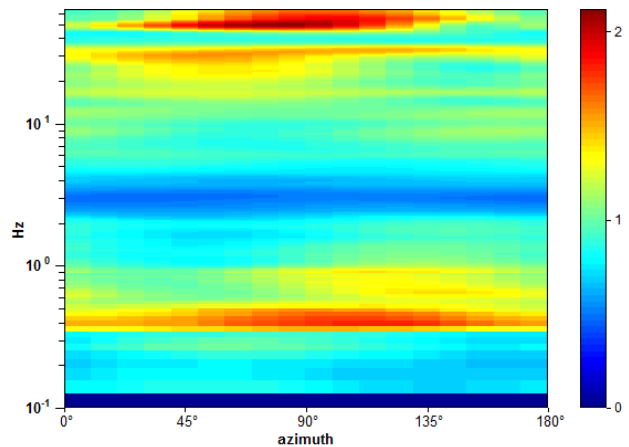
HORIZONTAL TO VERTICAL SPECTRAL RATIO



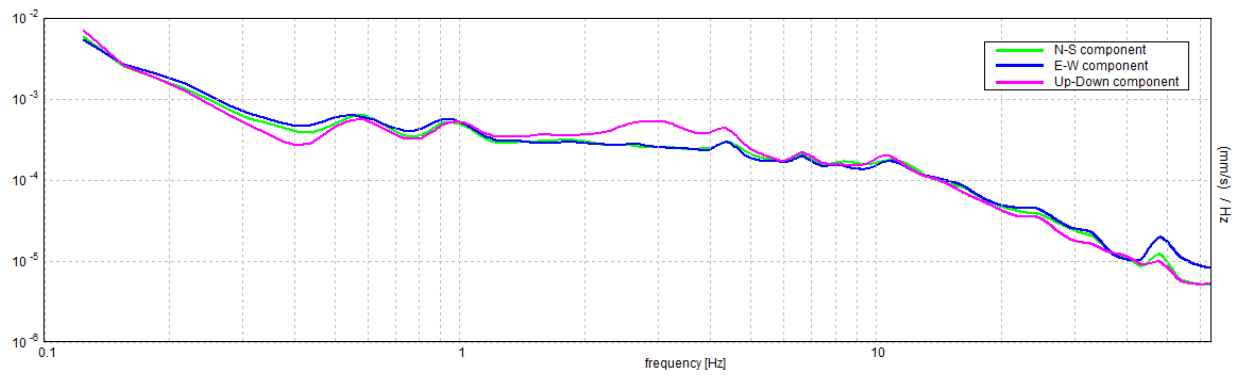
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.38 ± 17.14 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	0.38 > 0.50		NO
$n_c(f_0) > 200$	450.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 19 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.70 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 45.69992 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	17.13747 < 0.075		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2239 < 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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

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

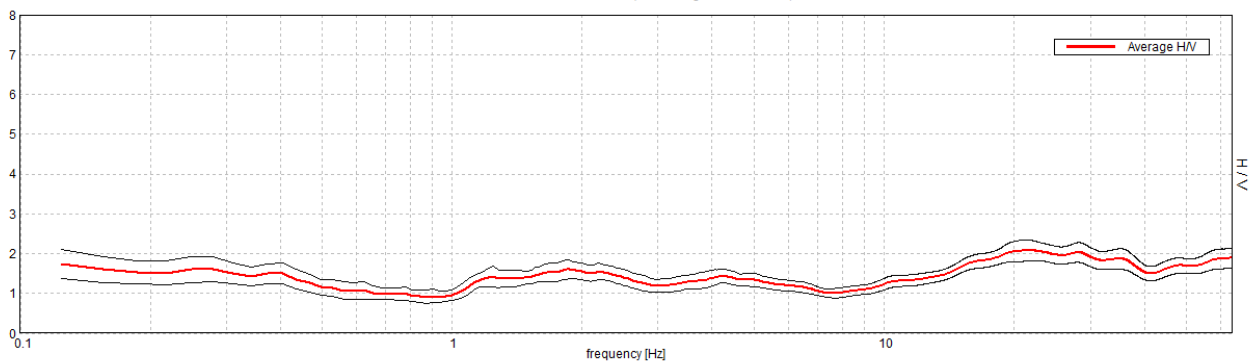
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_020

Instrument: TRS-0025/01-07
Start recording: 11/07/14 14:43:33 End recording: 11/07/14 15:03:34
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

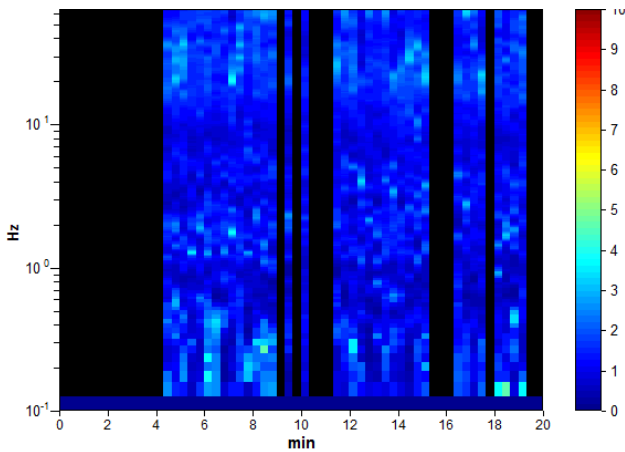
Trace length: 0h20'00". Analyzed 63% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

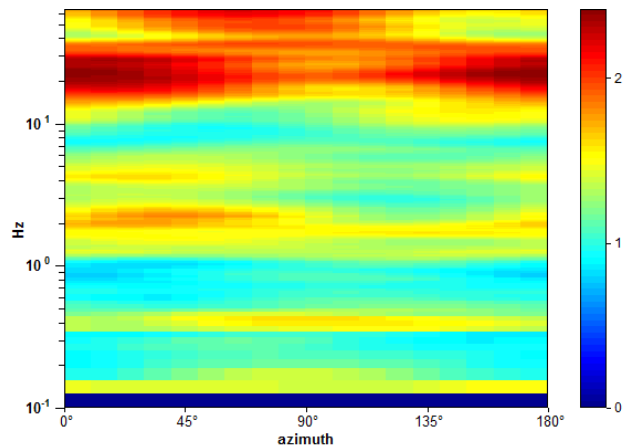
Max. H/V at 21.88 ± 9.18 Hz (in the range 0.0 - 64.0 Hz).



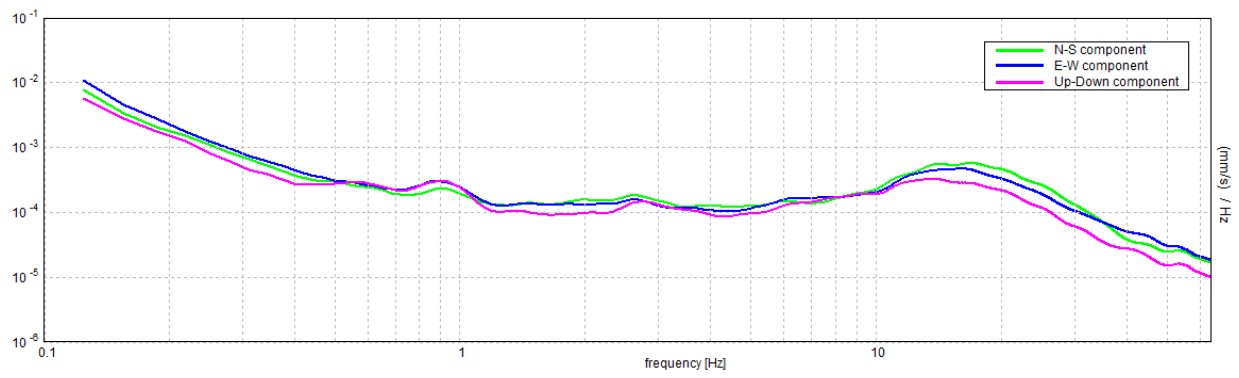
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 21.88 ± 9.18 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	21.88 > 0.50	OK	
$n_c(f_0) > 200$	15750.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 1051 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	8.156 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.08 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.41966 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	9.18005 < 1.09375		NO
$\sigma_A(f_0) < \theta(f_0)$	0.255 < 1.58	OK	

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

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

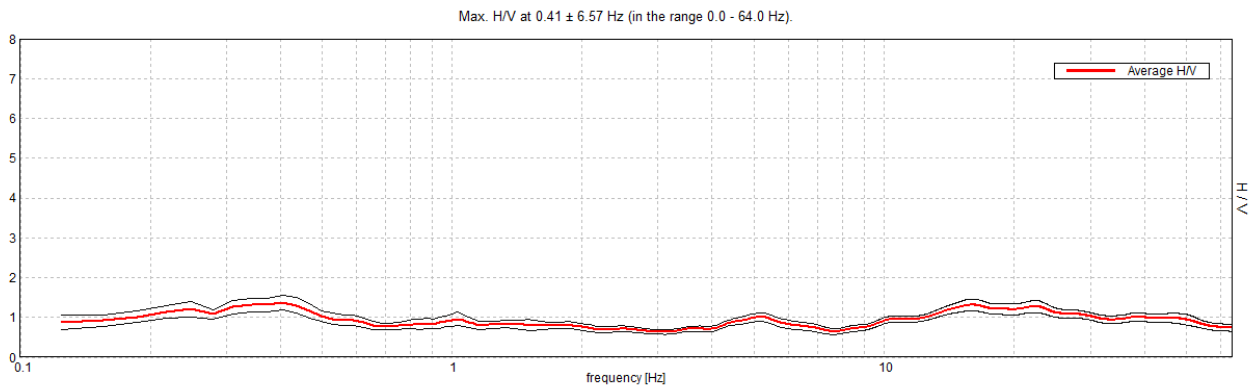
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI GATTEO, HVSR_021

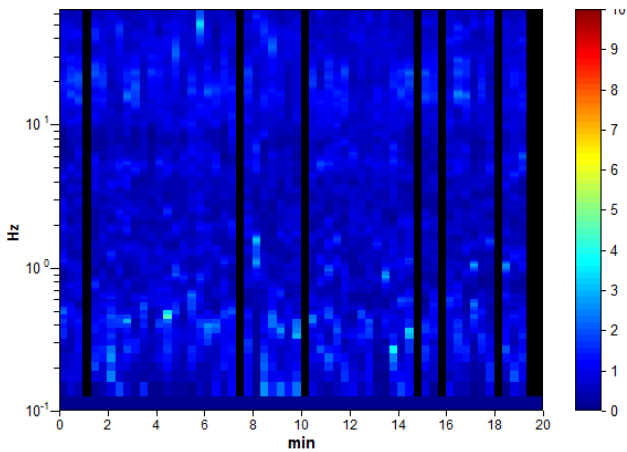
Instrument: TRS-0025/01-07
Start recording: 11/07/14 15:58:10 End recording: 11/07/14 16:18:11
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

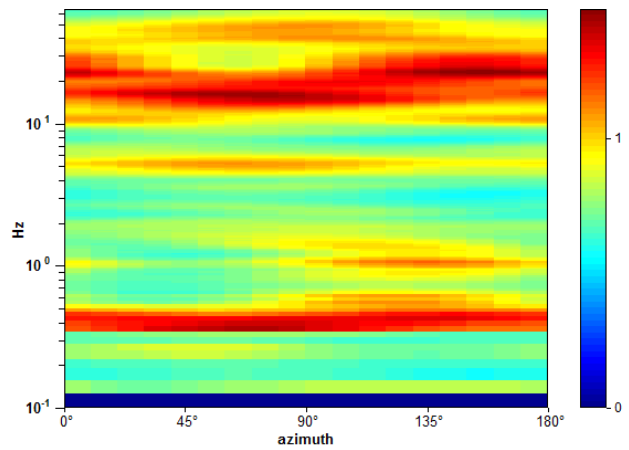
HORIZONTAL TO VERTICAL SPECTRAL RATIO



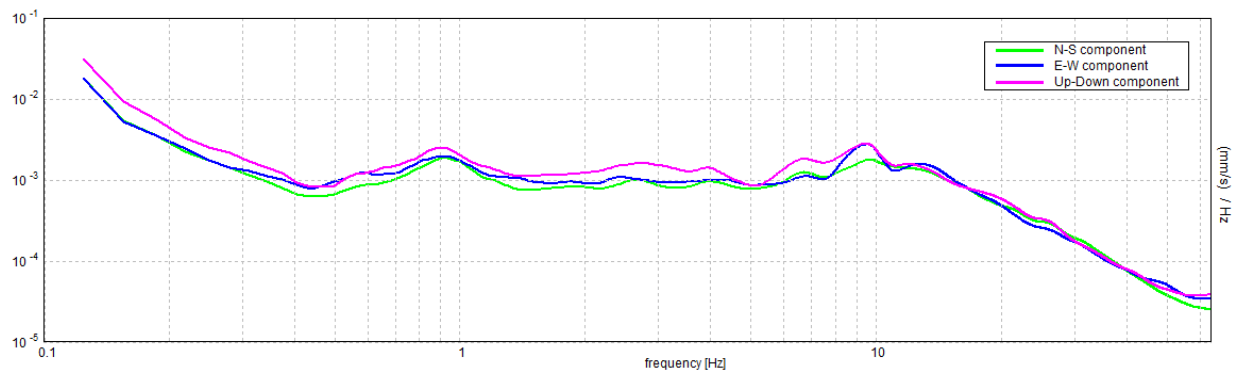
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.41 ± 6.57 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.41 > 0.50$		NO
$n_c(f_0) > 200$	$422.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 20 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$1.36 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 16.17174 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$6.56977 < 0.08125$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.1811 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

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

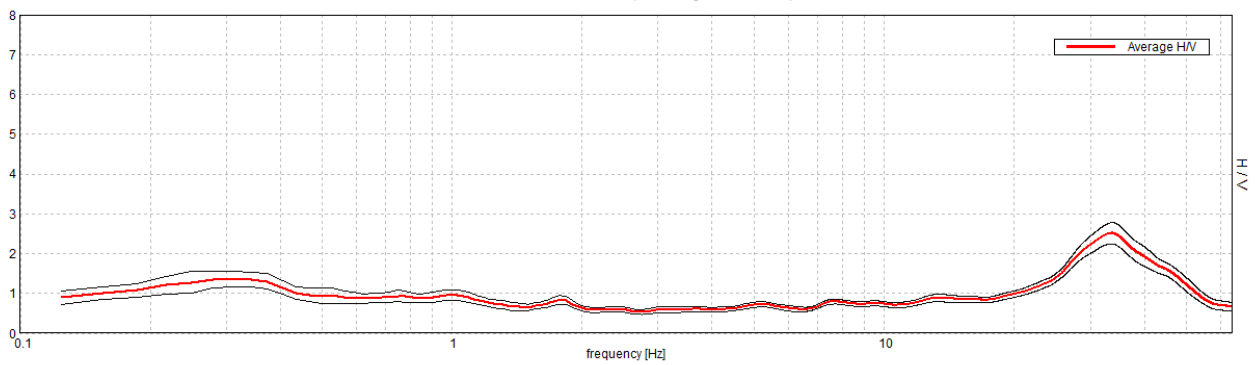
UNIONE RUBICONE E MARE, COMUNE DI GATTEO, HVSR_022

Instrument: TEN-0029/01-07
Start recording: 11/07/14 09:10:42 End recording: 11/07/14 09:30:43
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

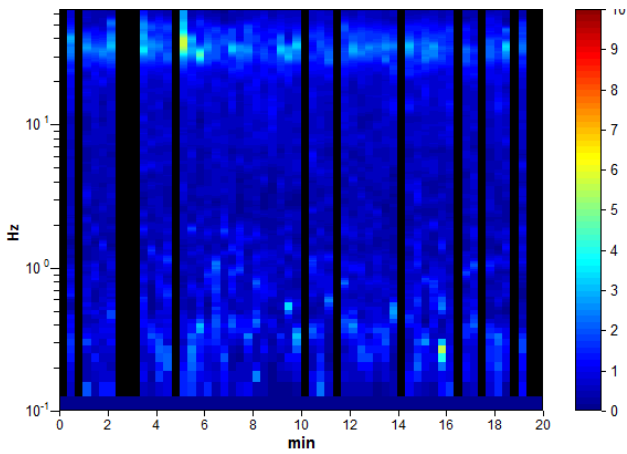
Trace length: 0h20'00". Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

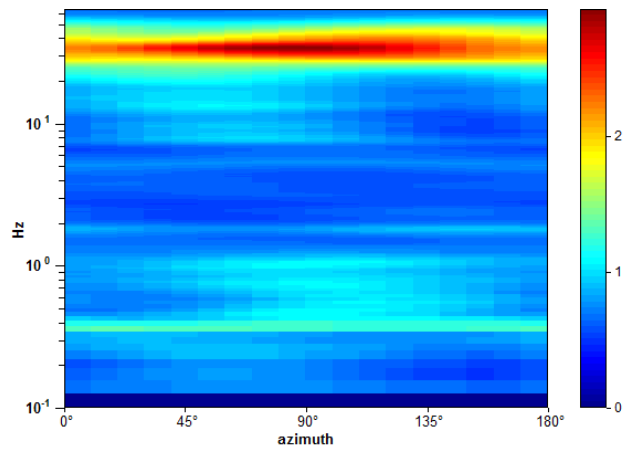
Max. H/V at 33.69 ± 7.08 Hz (in the range 0.0 - 64.0 Hz).



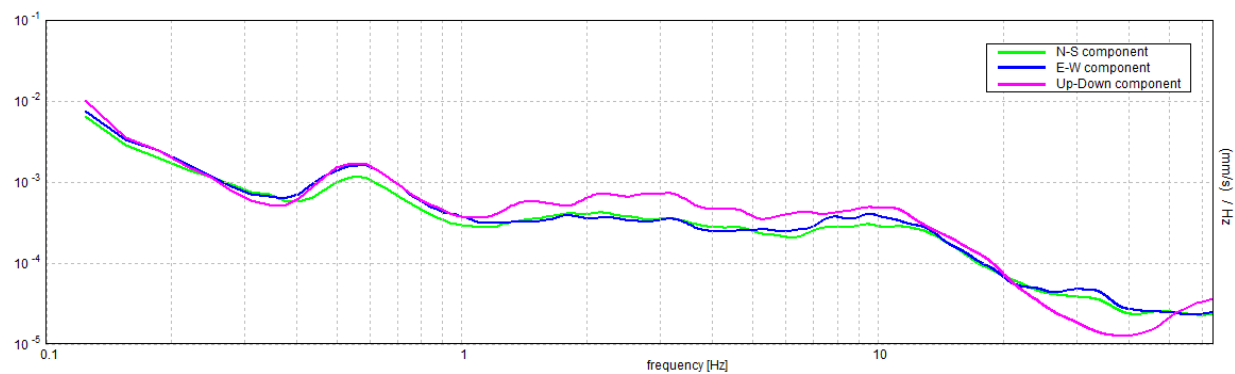
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 33.69 ± 7.08 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	33.69 > 0.50	OK	
$n_c(f_0) > 200$	30992.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 1510 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	23.656 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$	49.625 Hz	OK	
$A_0 > 2$	2.51 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.21012 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	7.07829 < 1.68438		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2666 < 1.58	OK	

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

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

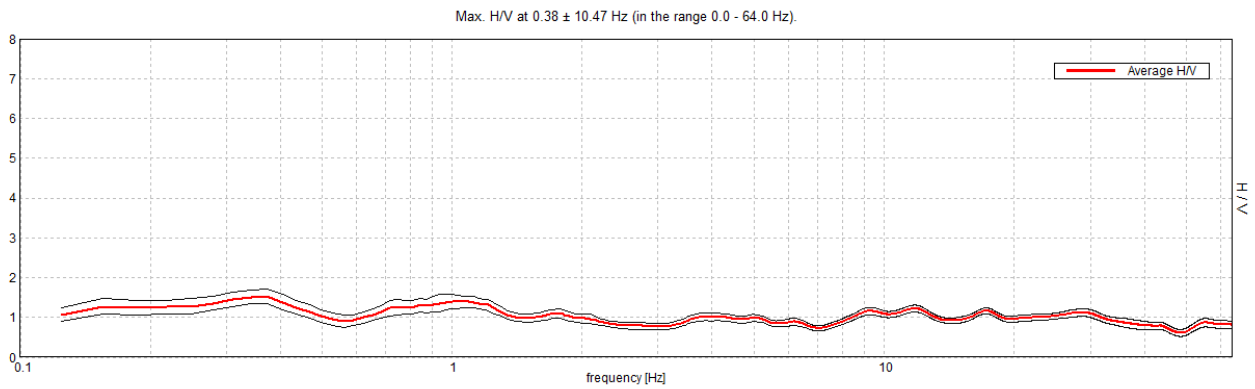
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI GATTEO, HVSR_023

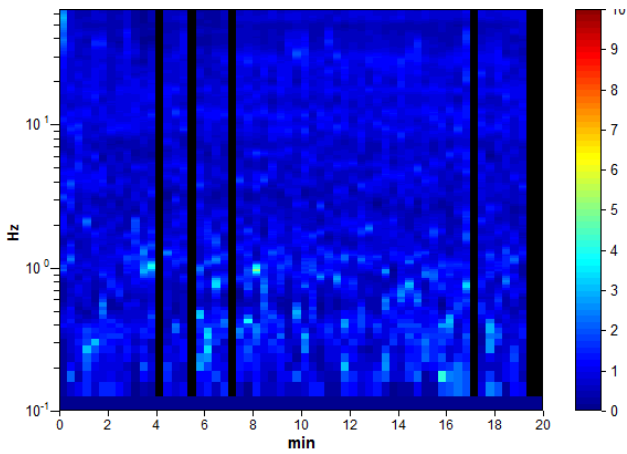
Instrument: TEN-0029/01-07
Start recording: 11/07/14 09:55:13 End recording: 11/07/14 10:15:14
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

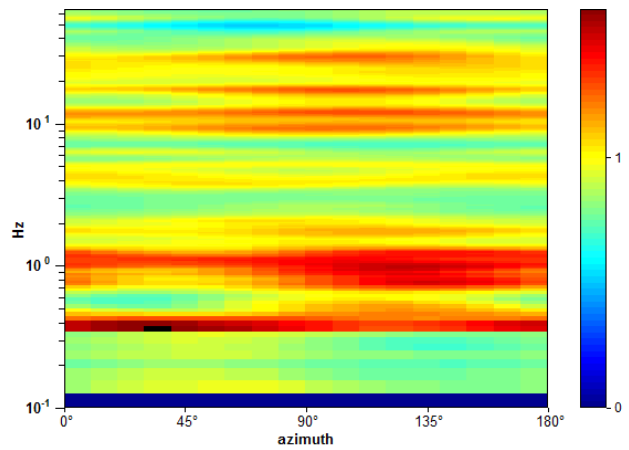
HORIZONTAL TO VERTICAL SPECTRAL RATIO



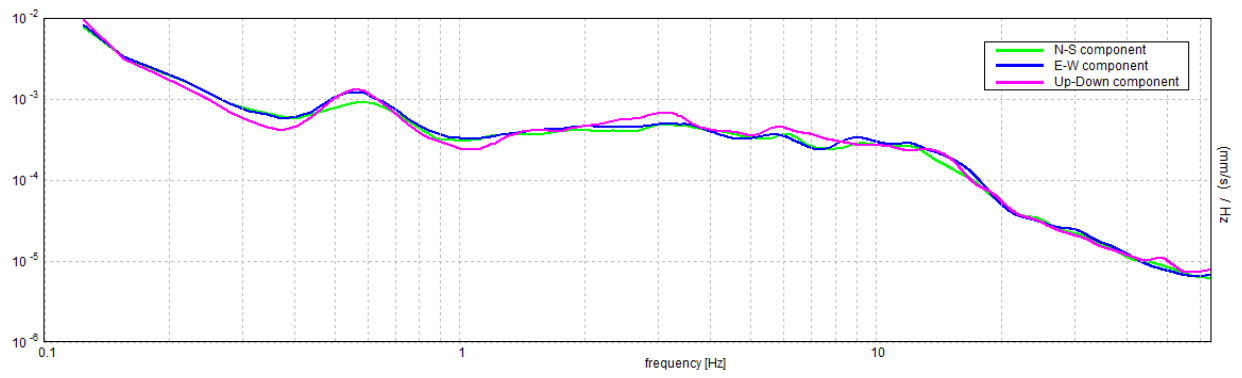
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.38 ± 10.47 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	0.38 > 0.50		NO
$n_c(f_0) > 200$	405.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 19 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.54 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 27.93264 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	10.47474 < 0.075		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1797 < 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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

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

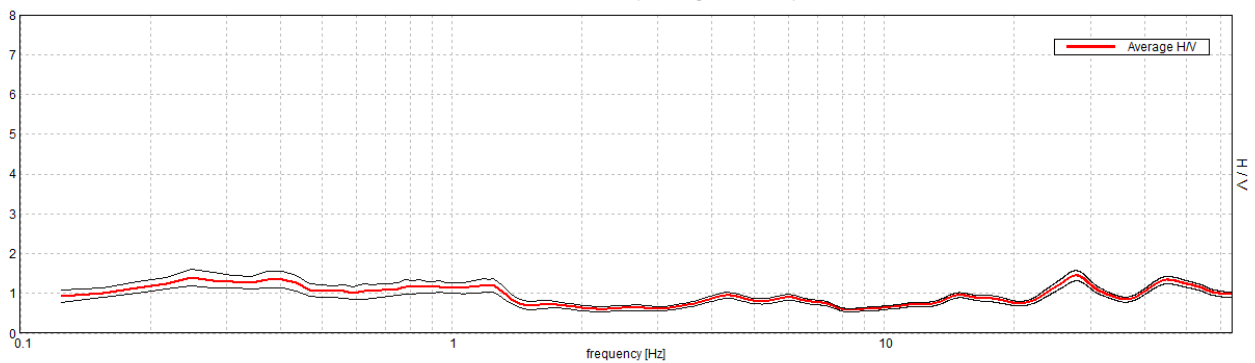
UNIONE RUBICONE E MARE, COMUNE DI GATTEO, HVSR_024

Instrument: TEN-0029/01-07
Start recording: 11/07/14 10:35:41 End recording: 11/07/14 10:55:42
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

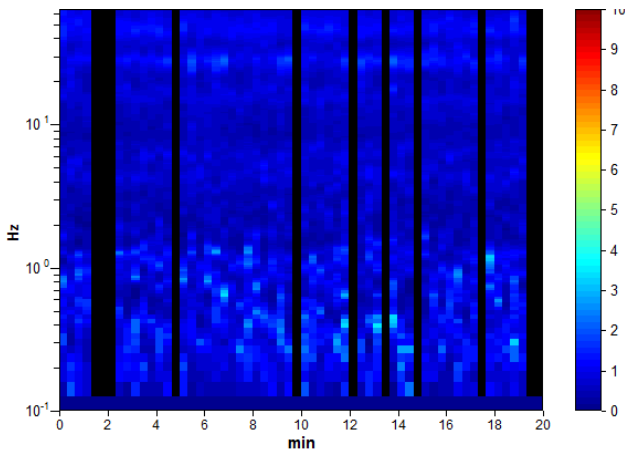
Trace length: 0h20'00". Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

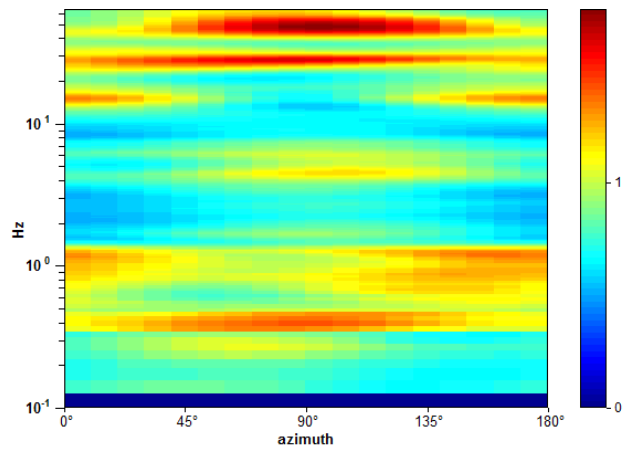
Max. H/V at 27.81 ± 15.17 Hz (in the range 0.0 - 64.0 Hz).



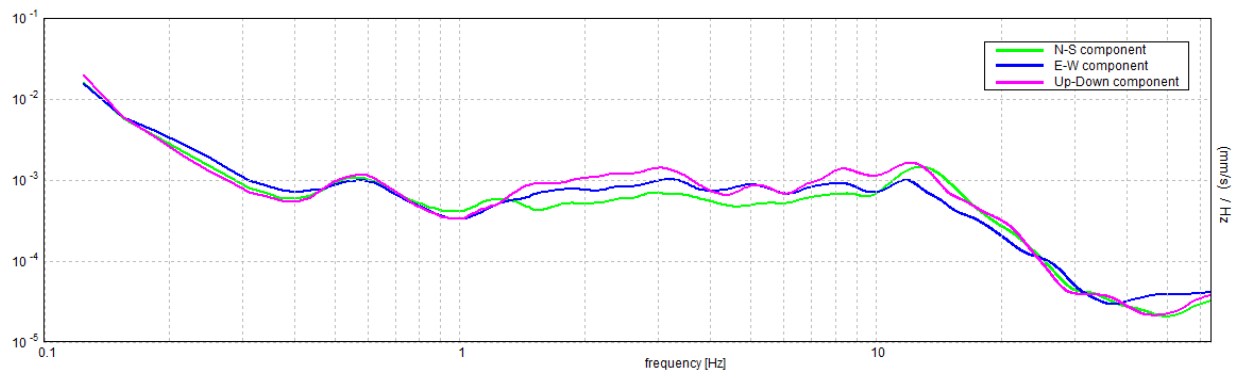
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 27.81 ± 15.17 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	27.81 > 0.50	OK	
$n_c(f_0) > 200$	27256.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 1336 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	11.781 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.44 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.54534 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	15.16723 < 1.39063		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1288 < 1.58	OK	

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

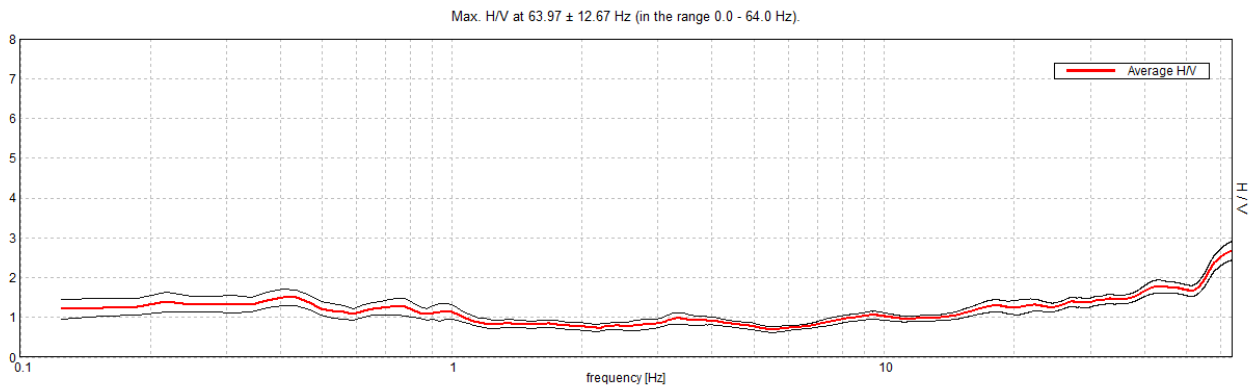
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25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

UNIONE RUBICONE E MARE, COMUNE DI SAN MAURO PASCOLI, HVSR_025

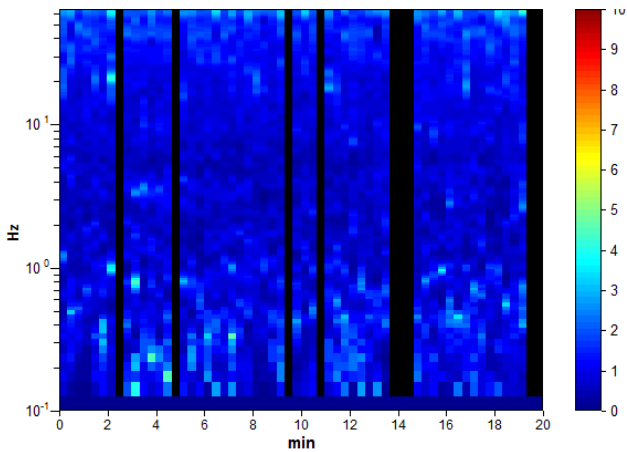
Instrument: TEN-0029/01-07
Start recording: 11/07/14 11:24:20 End recording: 11/07/14 11:44:21
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

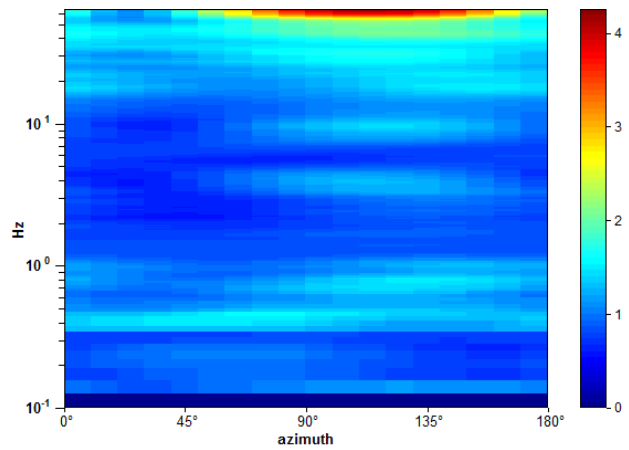
HORIZONTAL TO VERTICAL SPECTRAL RATIO



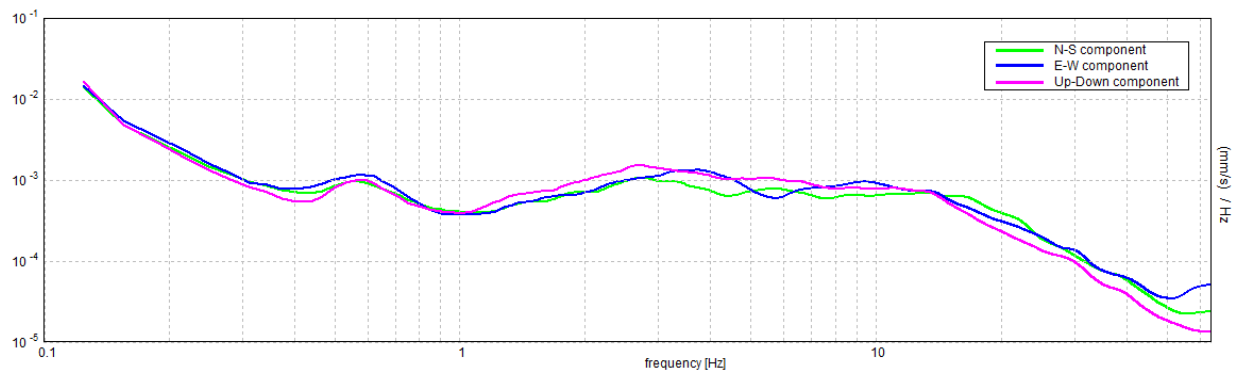
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 63.97 ± 12.67 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	
$n_c(f_0) > 200$	65248.1 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 1026 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	26.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.68 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0.19803 < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	12.6677 < 3.19844		NO
$\sigma_A(f_0) < \theta(f_0)$	0.237 < 1.58	OK	

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

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

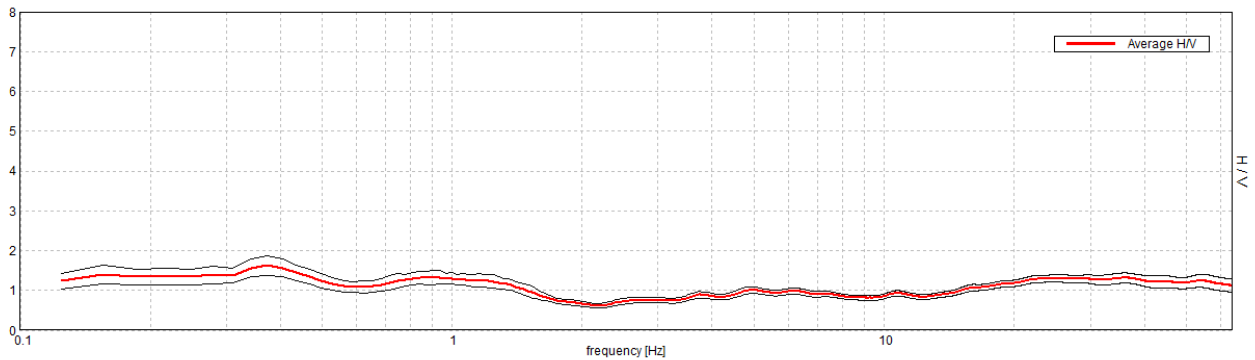
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_026

Instrument: TEN-0029/01-07
Start recording: 11/07/14 11:59:43 End recording: 11/07/14 12:19:44
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

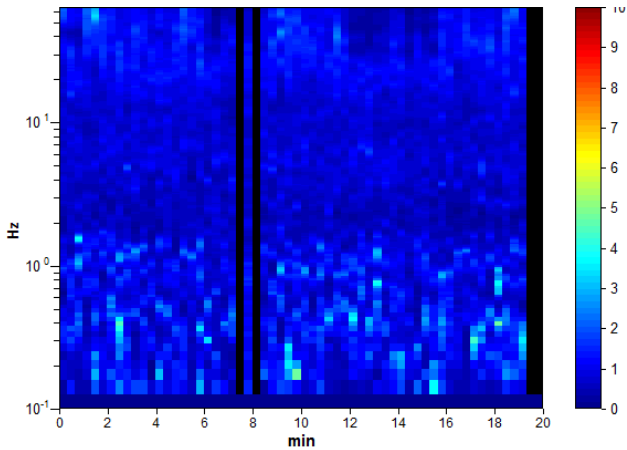
Trace length: 0h20'00". Analyzed 97% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

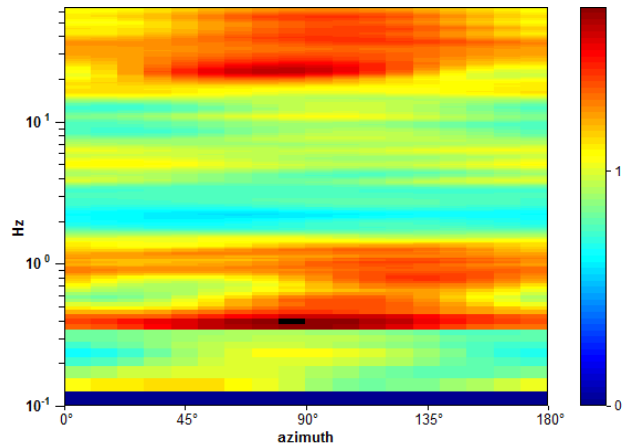
Max. H/V at 0.38 ± 27.59 Hz (in the range 0.0 - 64.0 Hz).



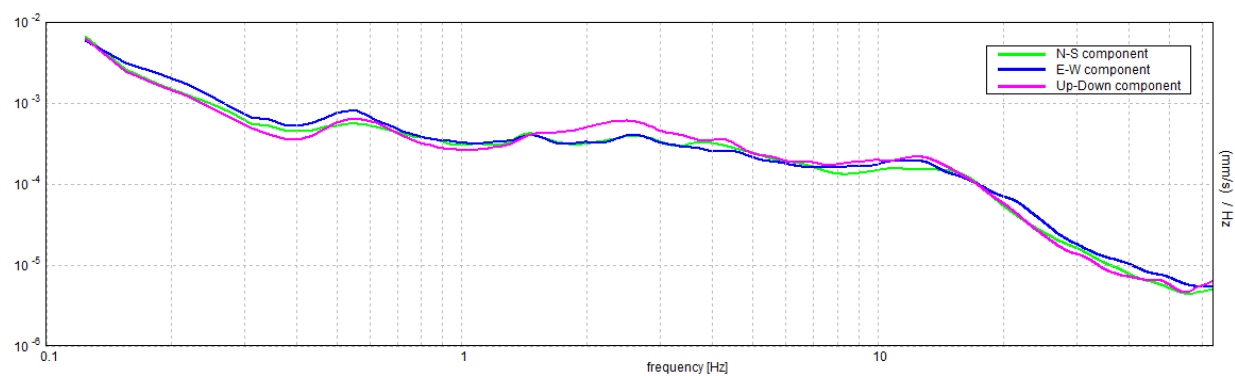
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.38 ± 27.59 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	0.38 > 0.50		NO
$n_c(f_0) > 200$	420.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 19 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.62 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 73.56342 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	27.58628 < 0.075		NO
$\sigma_A(f_0) < \theta(f_0)$	0.257 < 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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

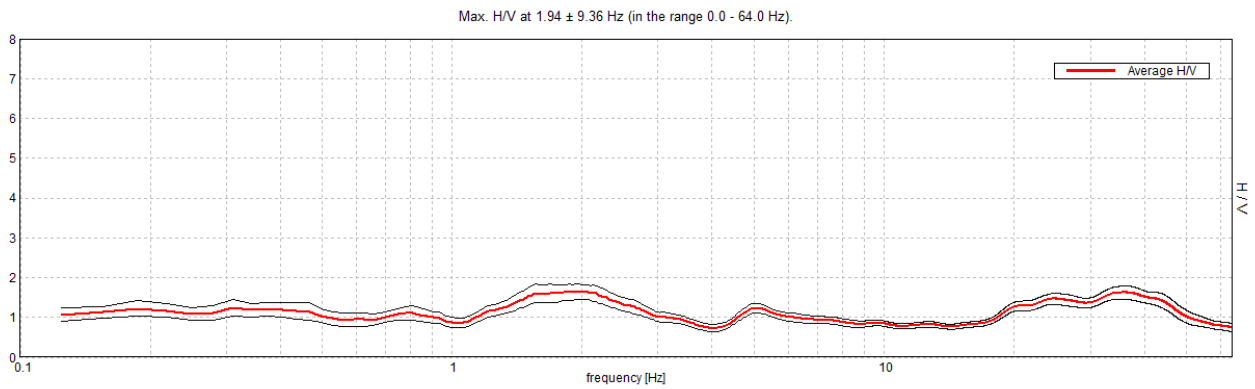
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_027

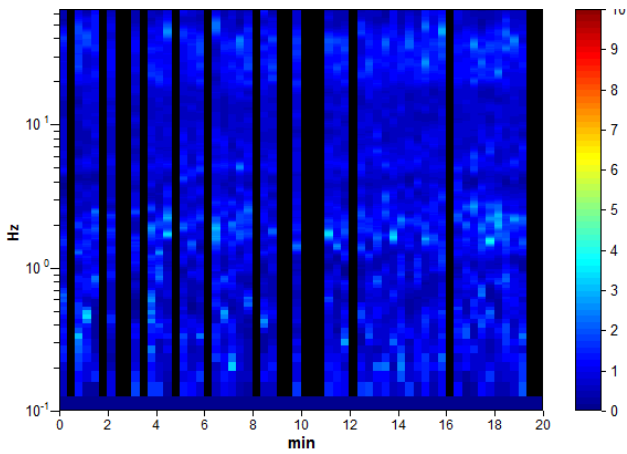
Instrument: TEN-0029/01-07
Start recording: 11/07/14 12:55:10 End recording: 11/07/14 13:15:11
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

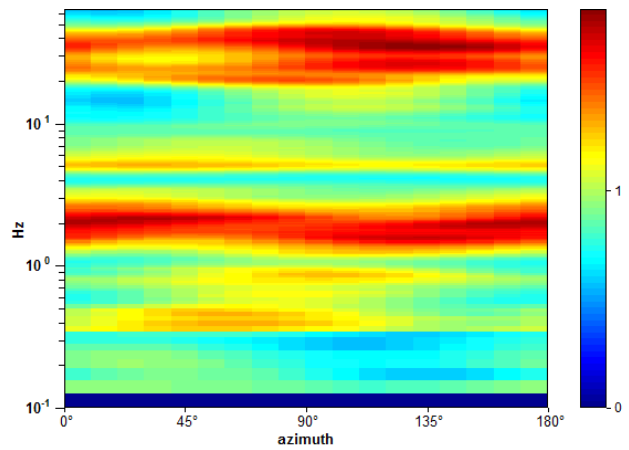
HORIZONTAL TO VERTICAL SPECTRAL RATIO



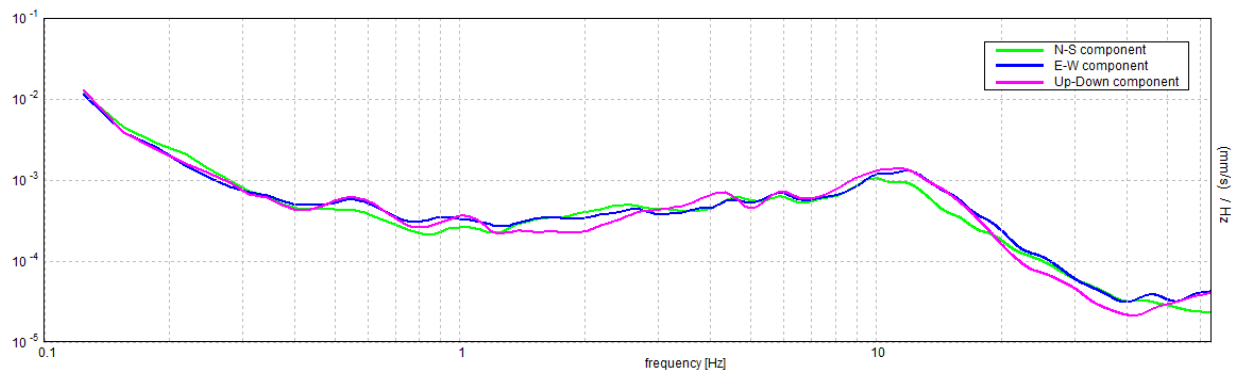
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 1.94 ± 9.36 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$1.94 > 0.50$	OK	
$n_c(f_0) > 200$	$1666.3 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 94 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	3.656 Hz	OK	
$A_0 > 2$	$1.65 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 4.82986 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$9.35785 < 0.19375$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.1955 < 1.78$	OK	

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

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

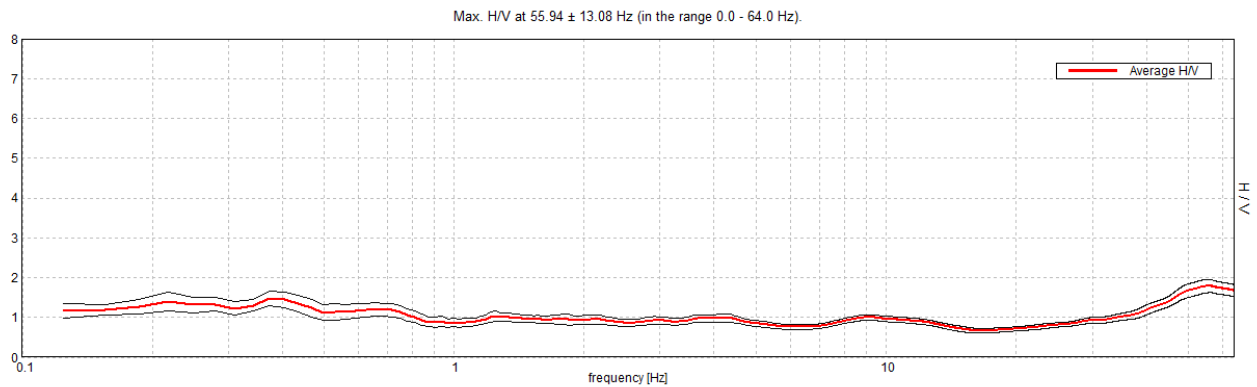
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_028

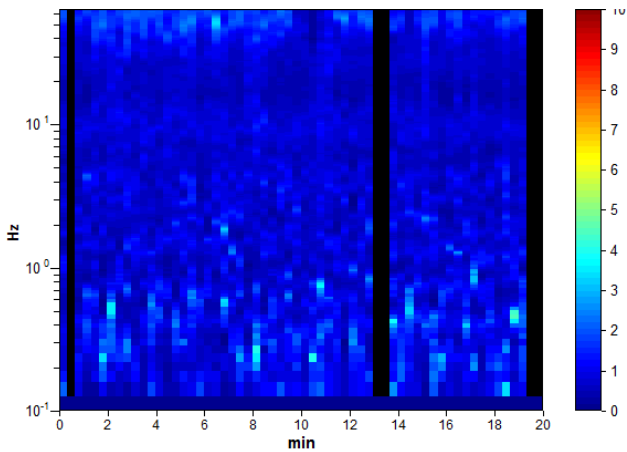
Instrument: TEN-0029/01-07
Start recording: 11/07/14 13:28:17 End recording: 11/07/14 13:48:18
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

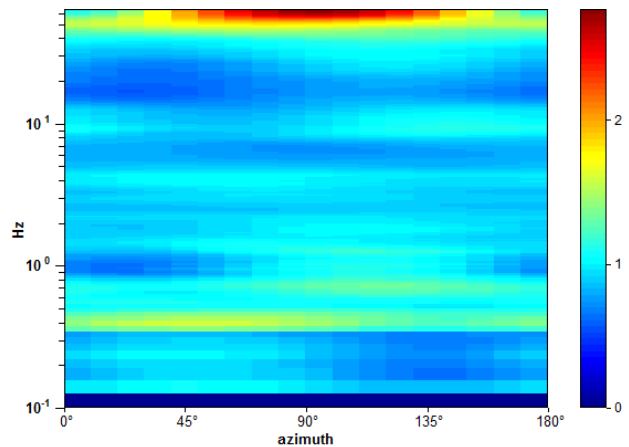
HORIZONTAL TO VERTICAL SPECTRAL RATIO



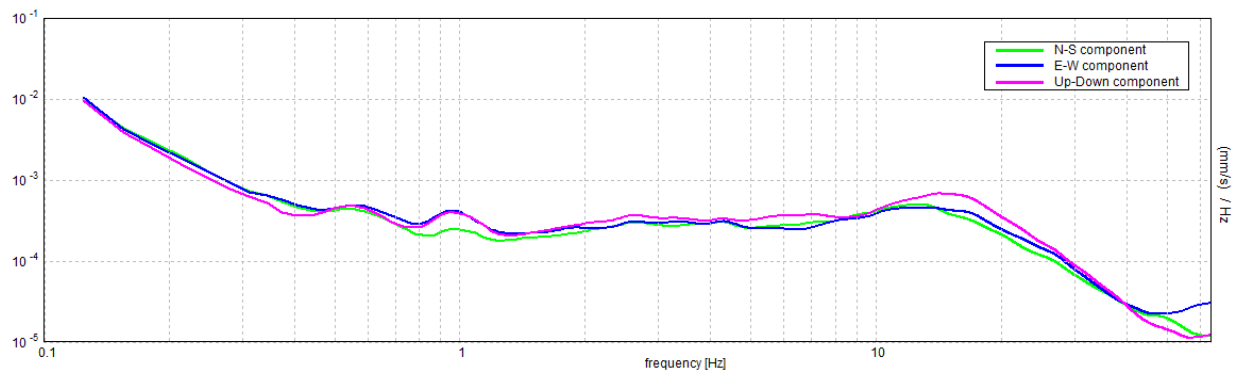
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 55.94 ± 13.08 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	55.94 > 0.50	OK	
$n_c(f_0) > 200$	61531.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 1154 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	28.5 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.79 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.2338 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	13.07813 < 2.79688		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1635 < 1.58	OK	

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

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

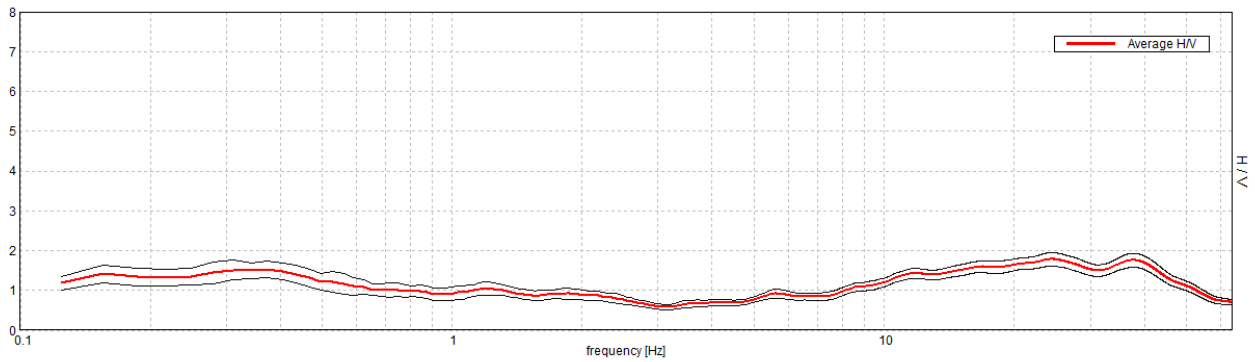
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_029

Instrument: TEN-0029/01-07
Start recording: 11/07/14 13:59:55 End recording: 11/07/14 14:19:56
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

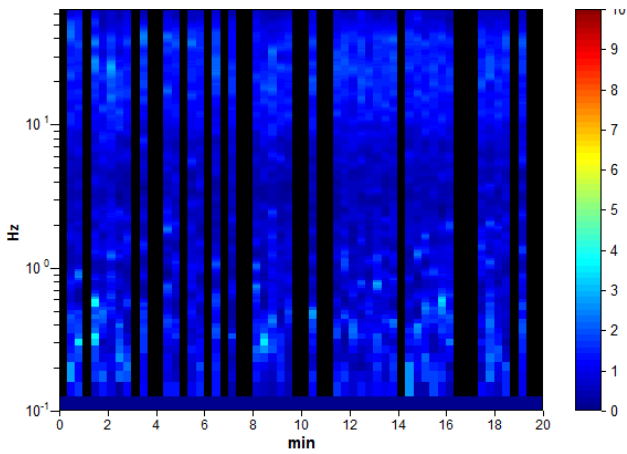
Trace length: 0h20'00". Analyzed 68% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

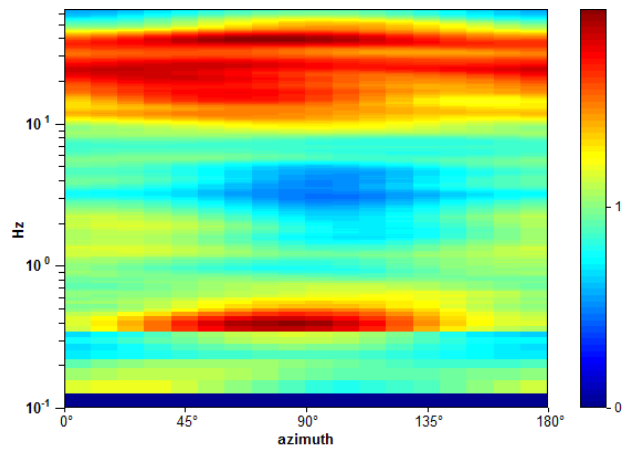
Max. H/V at 24.31 ± 12.27 Hz (in the range 0.0 - 64.0 Hz).



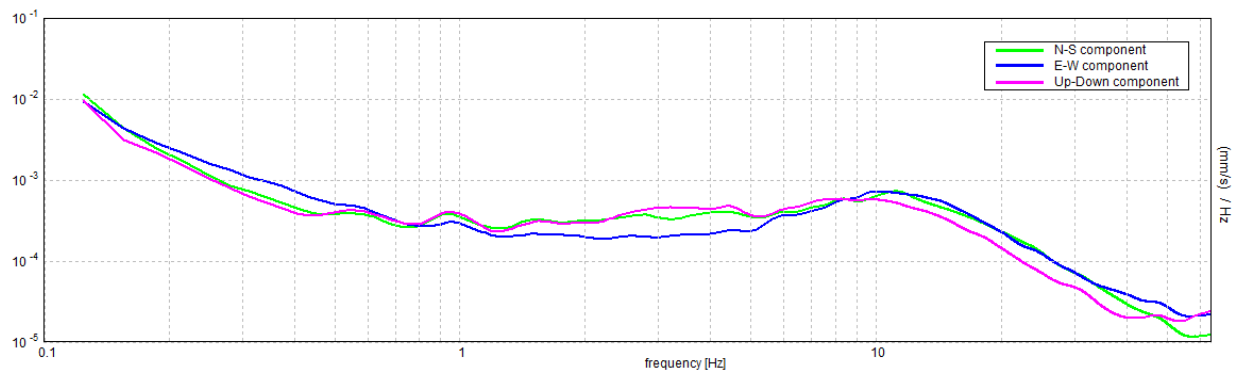
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 24.31 ± 12.27 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	24.31 > 0.50	OK	
$n_c(f_0) > 200$	18963.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 1168 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	7.656 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	54.906 Hz	OK	
$A_0 > 2$	1.78 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.50478 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	12.27245 < 1.21563		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1704 < 1.58	OK	

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

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

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

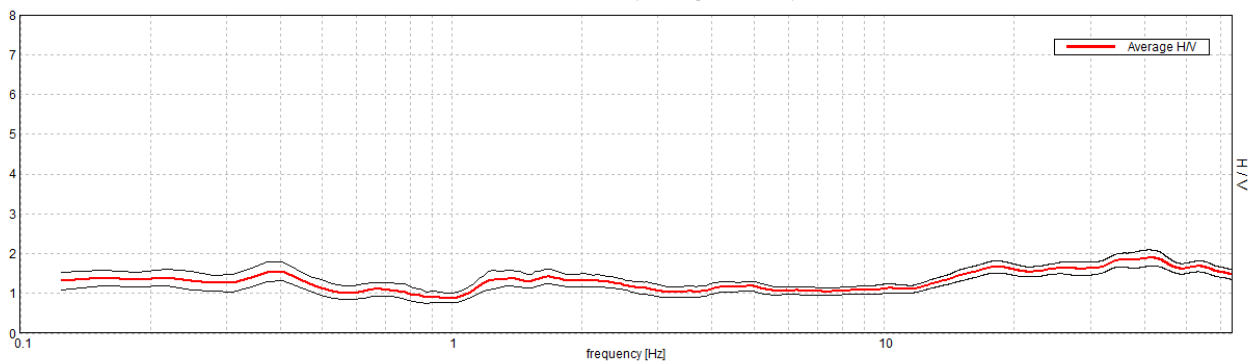
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_030

Instrument: TEN-0029/01-07
Start recording: 11/07/14 14:42:55 End recording: 11/07/14 15:02:56
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

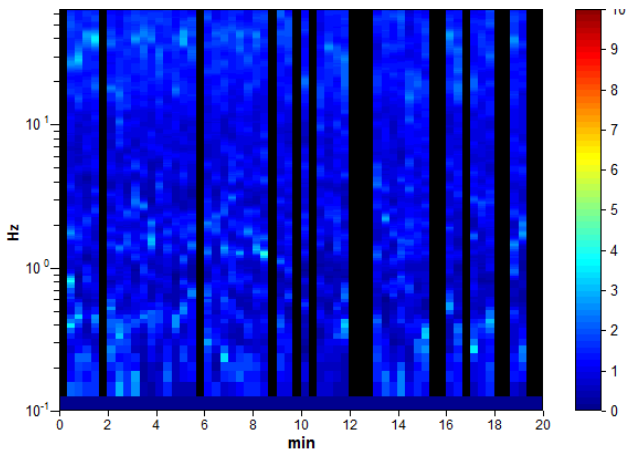
Trace length: 0h20'00". Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

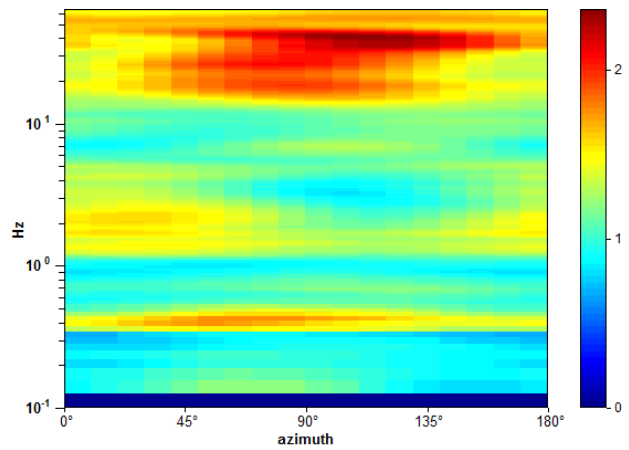
Max. H/V at 41.22 ± 11.14 Hz (in the range 0.0 - 64.0 Hz).



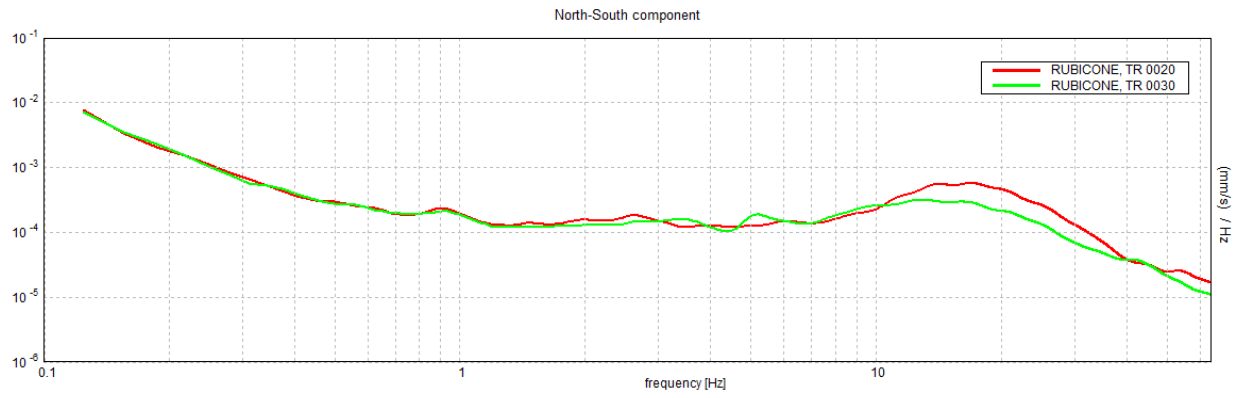
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 41.22 ± 11.14 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	41.22 > 0.50	OK	
$n_c(f_0) > 200$	36272.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 1390 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
$A_0 > 2$	1.89 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.27038 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	11.14468 < 2.06094		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2041 < 1.58	OK	

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

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

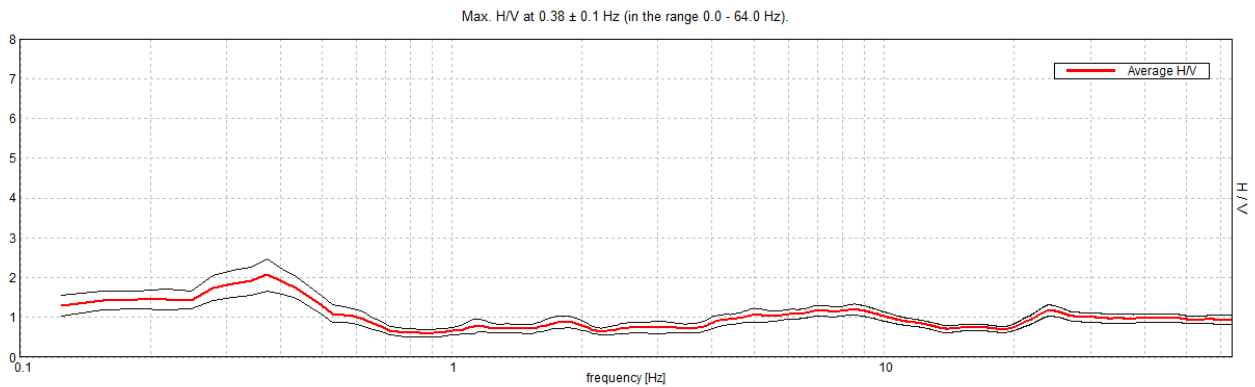
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_031

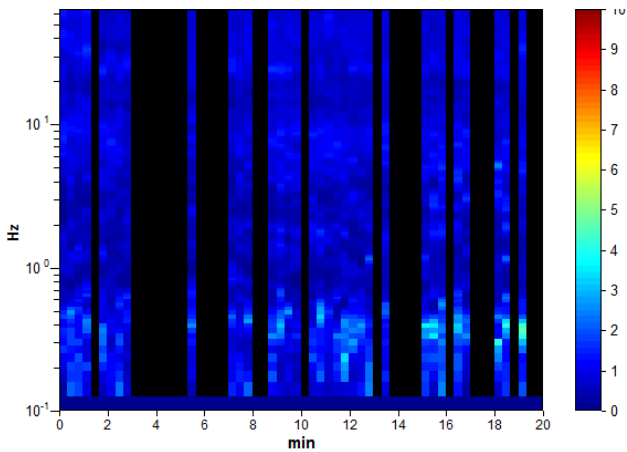
Instrument: TEN-0029/01-07
Start recording: 11/07/14 16:04:16 End recording: 11/07/14 16:24:17
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

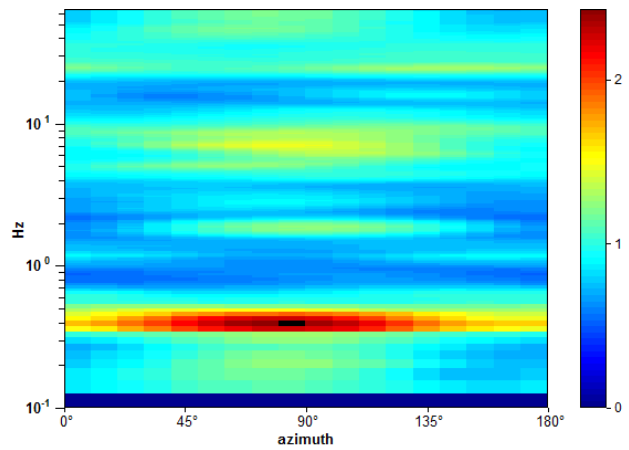
HORIZONTAL TO VERTICAL SPECTRAL RATIO



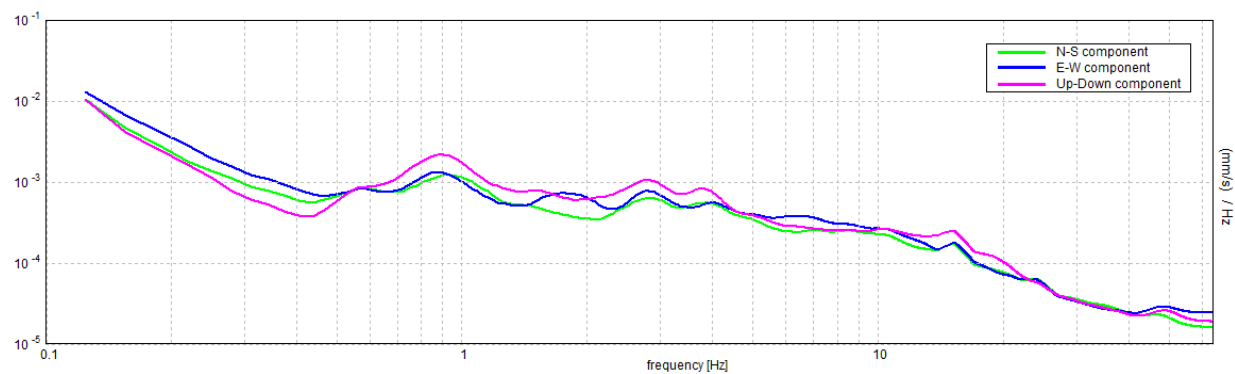
H/V TIME HISTORY



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 ± 0.1 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.38 > 0.50$		NO
$n_c(f_0) > 200$	$247.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 19 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	0.594 Hz	OK	
$A_0 > 2$	$2.08 > 2$	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.26352 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.09882 < 0.075$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.404 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

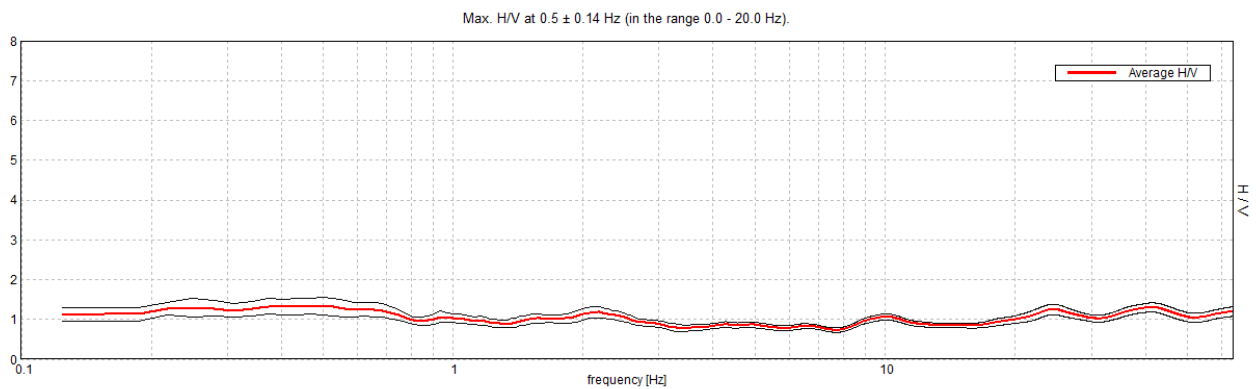
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
$\log \theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_032

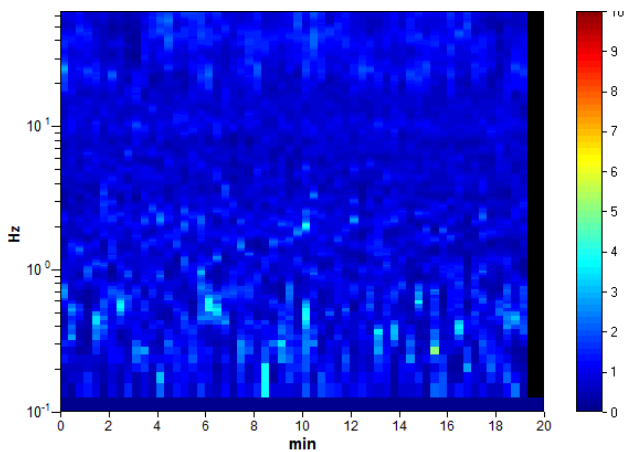
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 06/09/14 17:24:23 End recording: 06/09/14 17:44:24
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

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

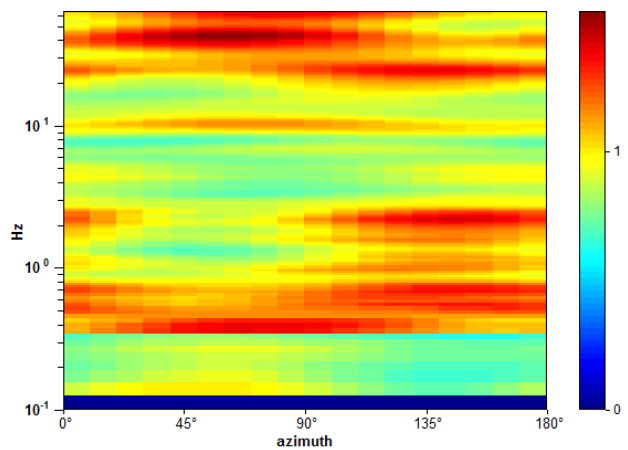
HORIZONTAL TO VERTICAL SPECTRAL RATIO



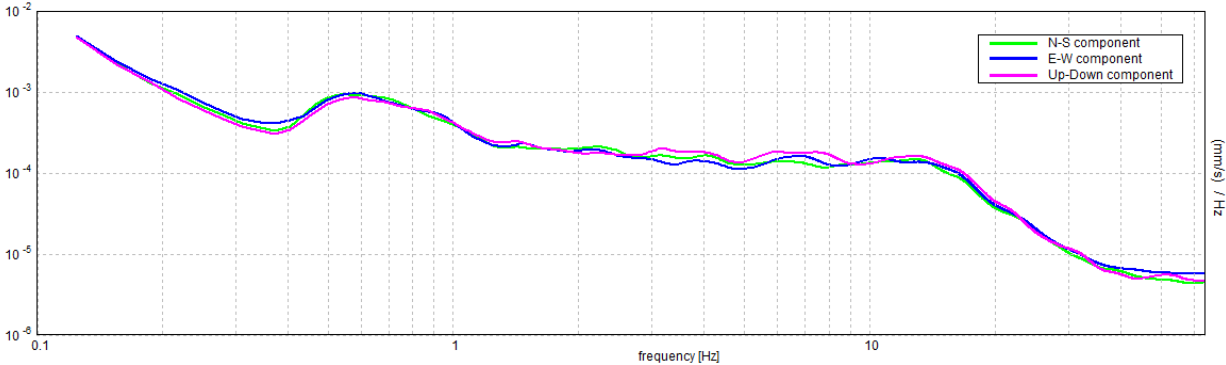
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.5 ± 0.14 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	0.50 > 0.50		NO
$n_c(f_0) > 200$	600.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 25 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
$A_0 > 2$	1.33 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.28459 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	0.14229 < 0.075		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2237 < 2.0	OK	

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

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

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

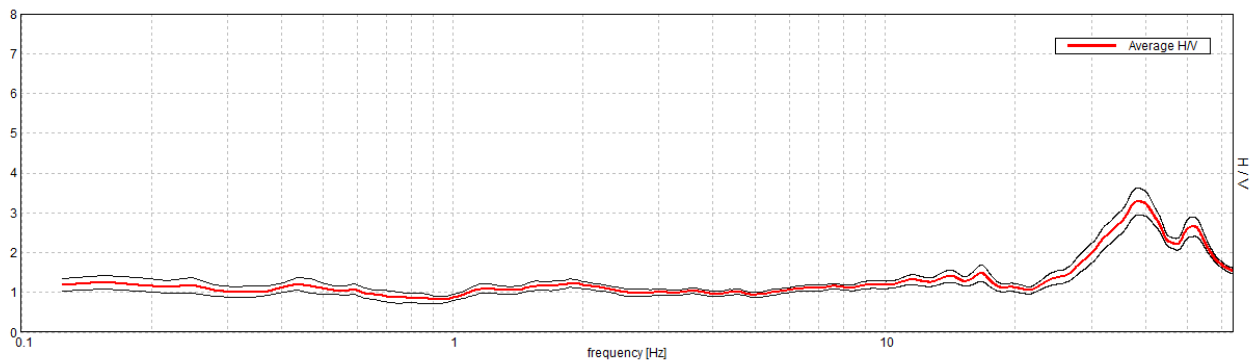
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_033

Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 06/09/14 17:56:16 End recording: 06/09/14 18:16:17
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

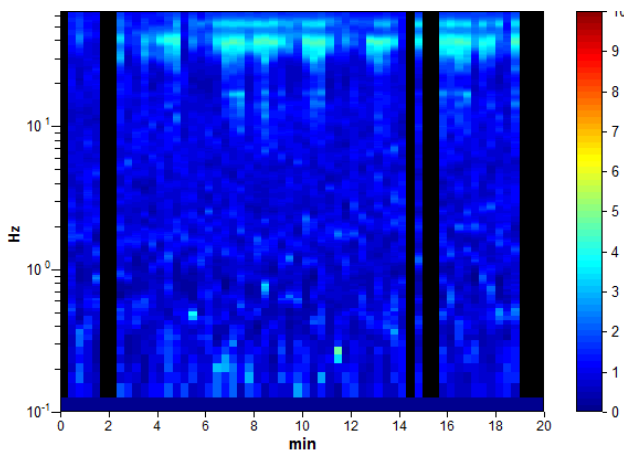
Trace length: 0h20'00". Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

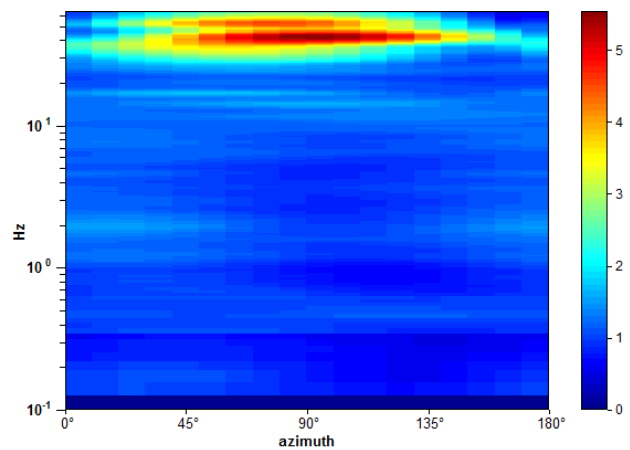
Max. H/V at 16.72 ± 9.9 Hz (in the range 0.0 - 20.0 Hz).



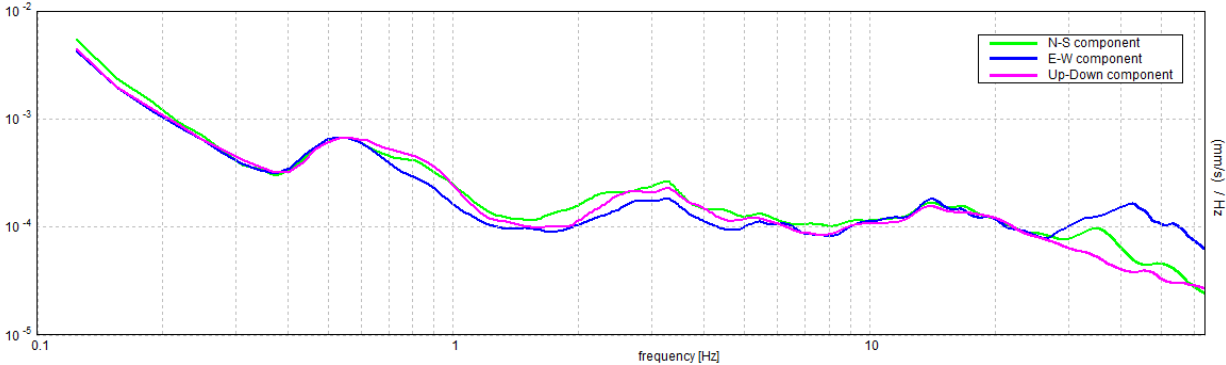
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 16.72 ± 9.9 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	16.72 > 0.50	OK	
$n_c(f_0) > 200$	17053.1 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 804 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
$A_0 > 2$	1.48 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.59225 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$9.90162 < 0.83594$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.204 < 1.58$	OK	

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

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

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

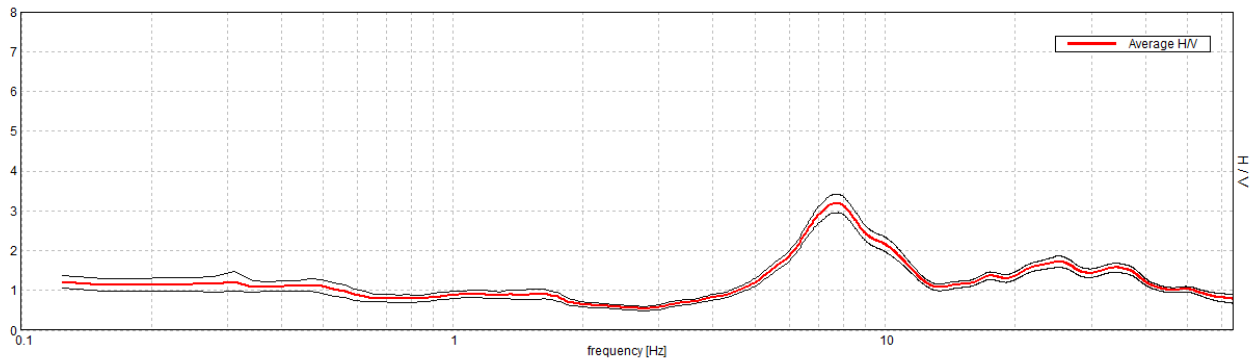
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_034

Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 07/09/14 08:19:15 End recording: 07/09/14 08:39:16
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

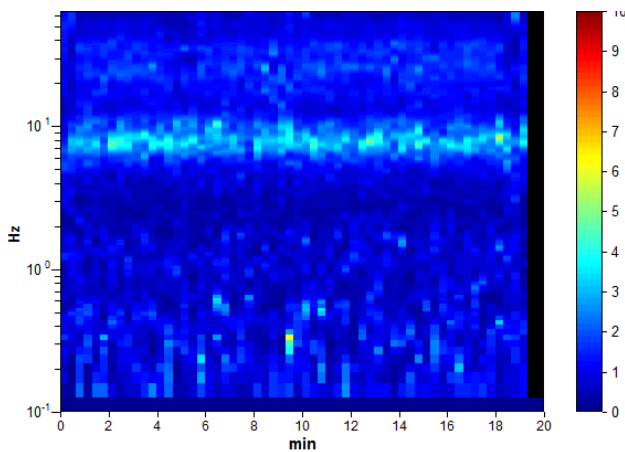
Trace length: 0h20'00". Analysis performed on the entire trace.
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

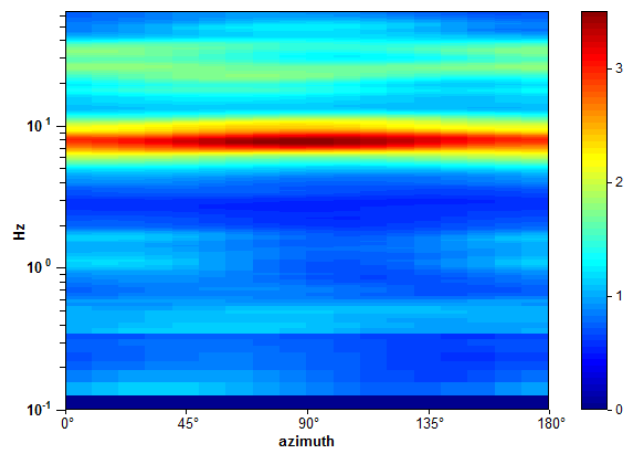
Max. H/V at 7.81 ± 1.46 Hz. (In the range 0.0 - 20.0 Hz).



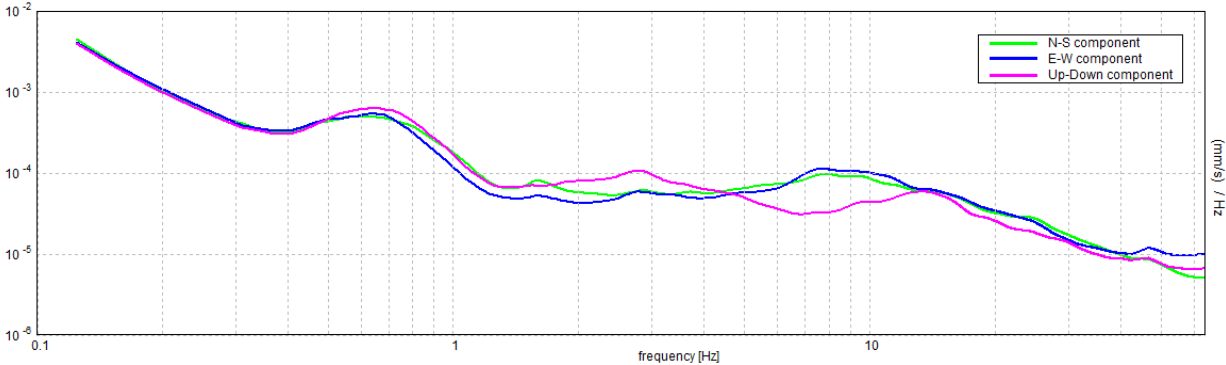
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 7.81 ± 1.46 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	7.81 > 0.50	OK	
$n_c(f_0) > 200$	9375.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 376 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	5.563 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	11.406 Hz	OK	
$A_0 > 2$	3.19 > 2	OK	
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.18708 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$1.46155 < 0.39063$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2328 < 1.58$	OK	

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

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

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

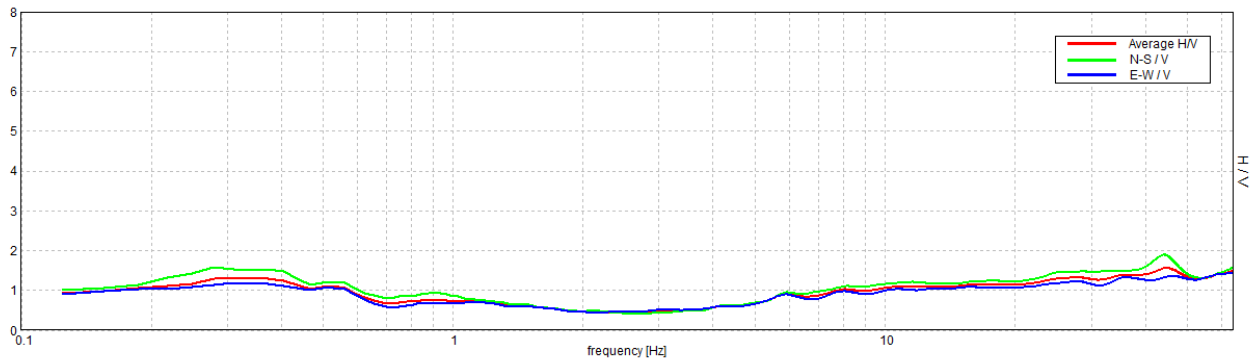
UNIONE RUBICONE E MARE, COMUNE DI GATTEO, HVSR_035

Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 07/09/14 18:10:22 End recording: 07/09/14 18:30:22
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

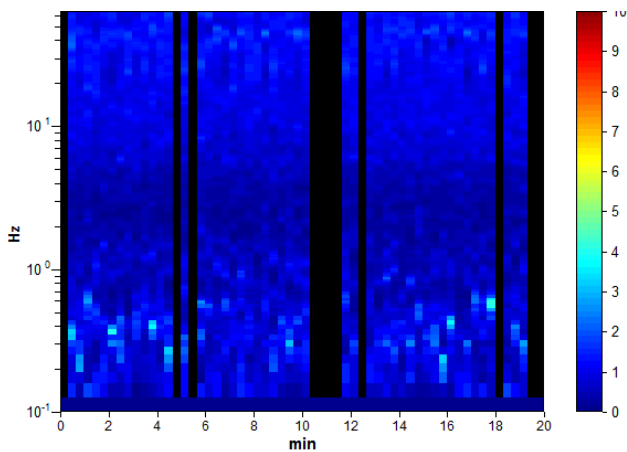
Trace length: 0h20'00". Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

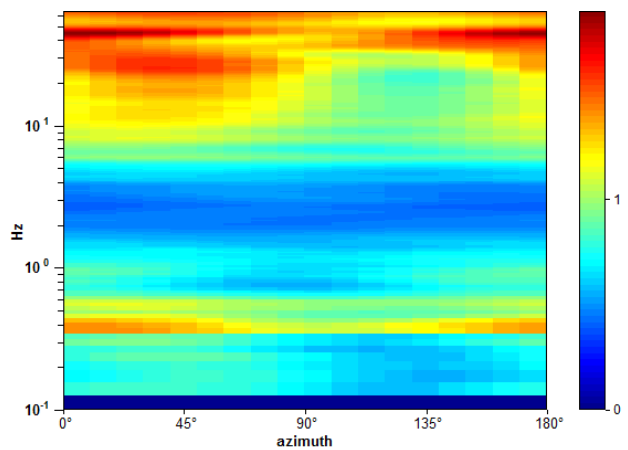
Max. H/V at 0.31 ± 0.08 Hz. Max.(N-S)/V: 0.28 ± 0.54 Hz. Max.(E-W)/V: 0.31 ± 0.41 Hz. (In the range 0.0 - 20.0 Hz).



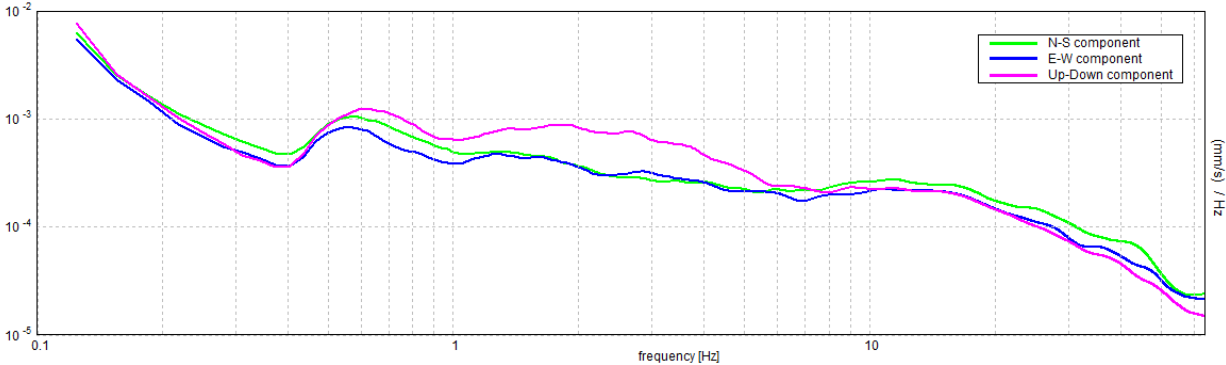
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.31 ± 0.08 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	0.31 > 0.50		NO
$n_c(f_0) > 200$	306.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 16 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.29 > 2		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.24075 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	0.07523 < 0.0625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1804 < 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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

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

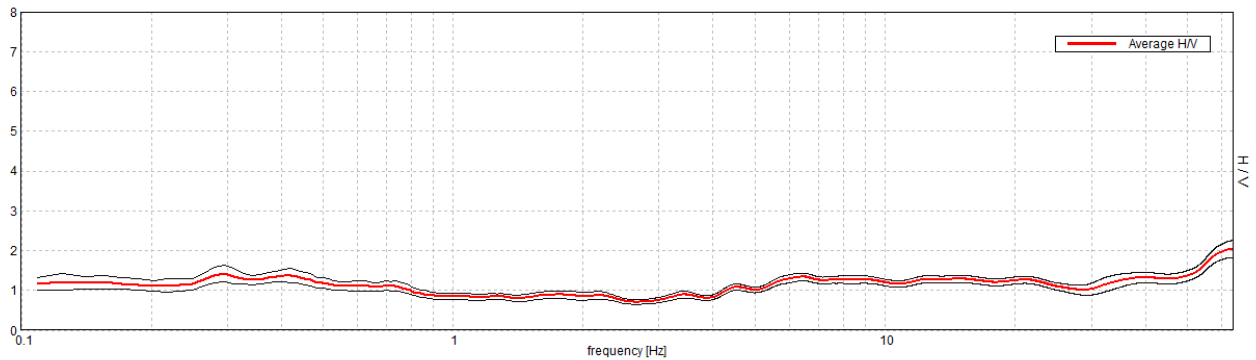
UNIONE RUBICONE E MARE, COMUNE DI SAN MAURO PASCOLI, HVSR_036

Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 06/09/14 16:11:14 End recording: 06/09/14 17:11:15
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

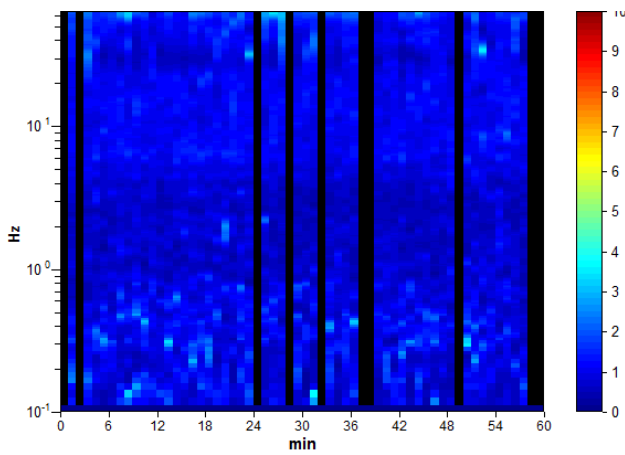
Trace length: 1h00'00". Analyzed 87% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 60 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

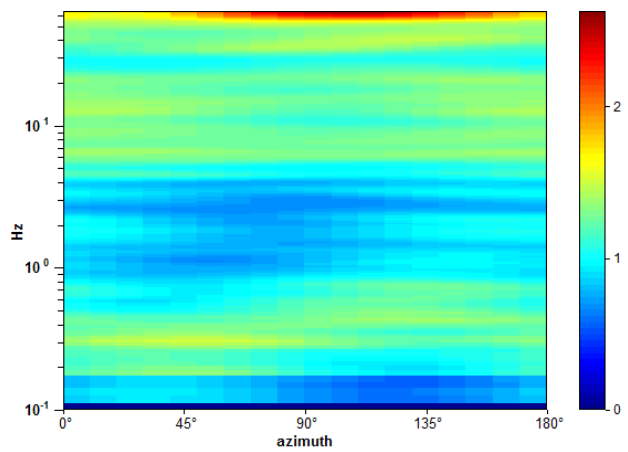
Max. H/V at 0.3 ± 0.08 Hz. (In the range 0.0 - 20.0 Hz).



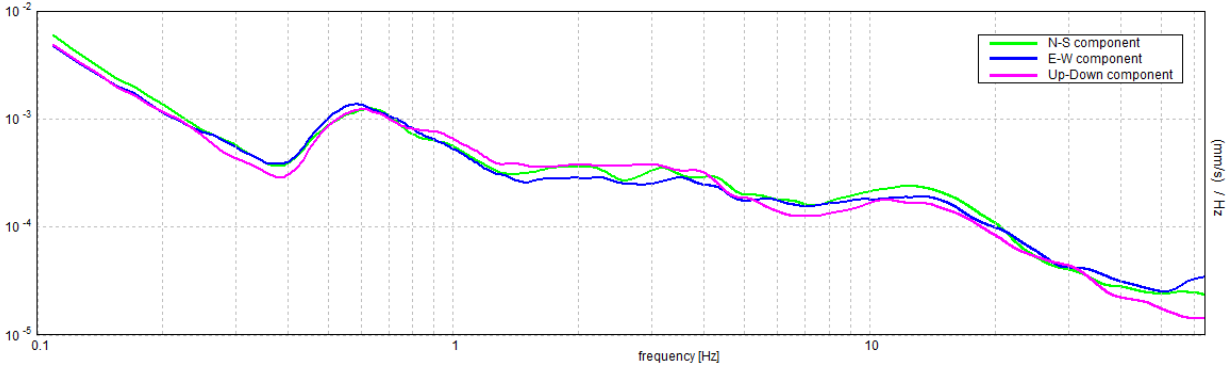
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.3 ± 0.08 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.30 > 0.17$	OK	
$n_c(f_0) > 200$	$890.6 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 30 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$1.43 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.26702 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.07927 < 0.05938$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.2089 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

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

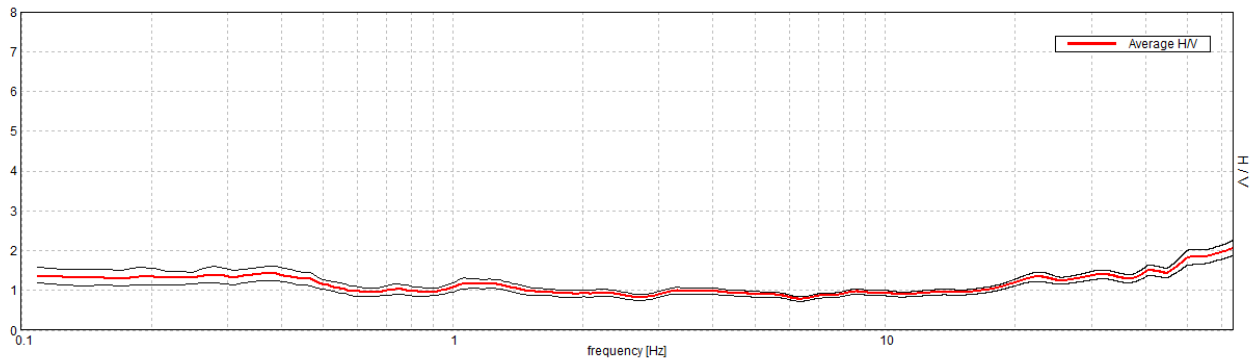
UNIONE RUBICONE E MARE, COMUNE DI SAVIGNANO SUL RUBICONE, HVSR_037

Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 07/09/14 08:54:34 End recording: 07/09/14 09:54:34
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

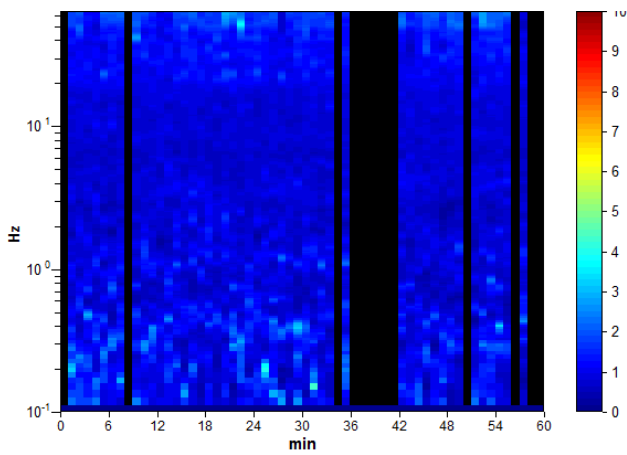
Trace length: 1h00'00". Analyzed 82% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 60 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

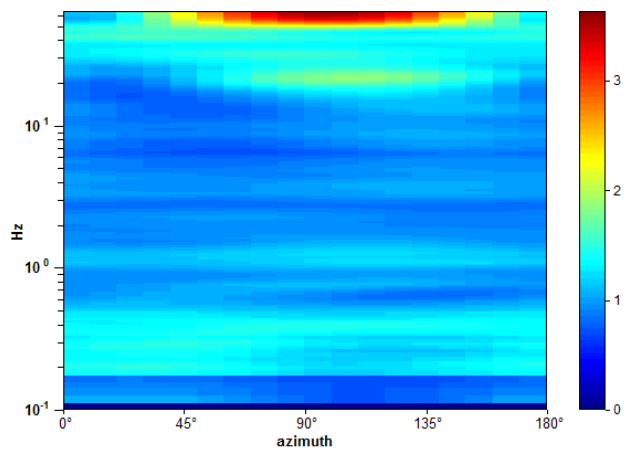
Max. H/V at 0.38 ± 0.15 Hz. (In the range 0.0 - 20.0 Hz).



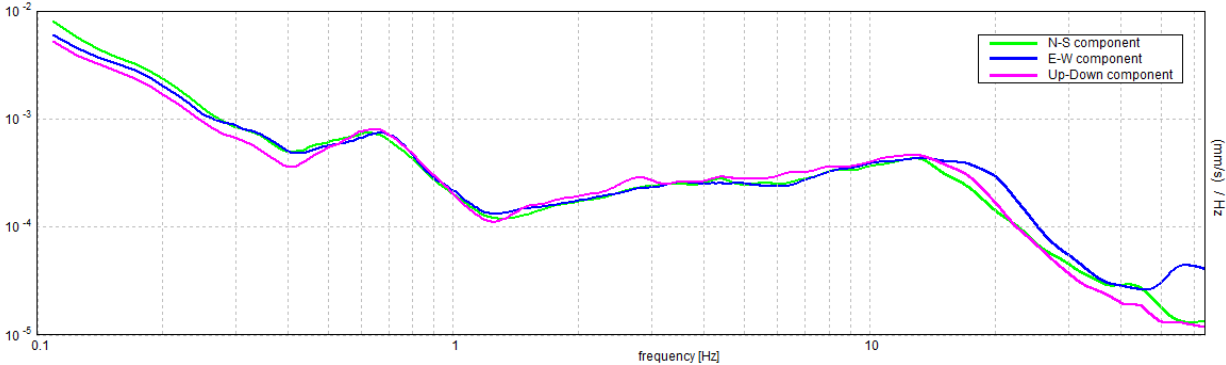
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.38 ± 0.15 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.38 > 0.17$	OK	
$n_c(f_0) > 200$	$1057.5 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 37 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ $A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$1.43 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 0.40352 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$0.15132 < 0.075$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.1912 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

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

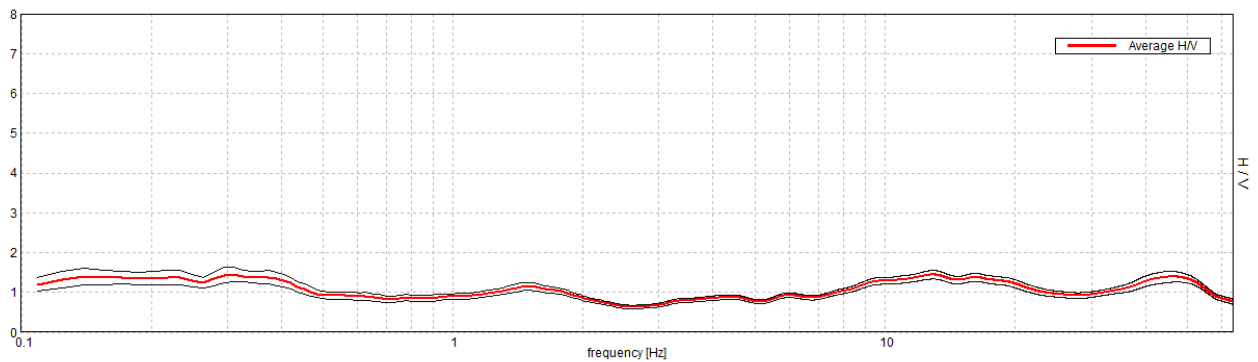
UNIONE RUBICONE E MARE, COMUNE DI GATTEO, HVSR_038

Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 07/09/14 10:12:17 End recording: 07/09/14 11:12:18
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

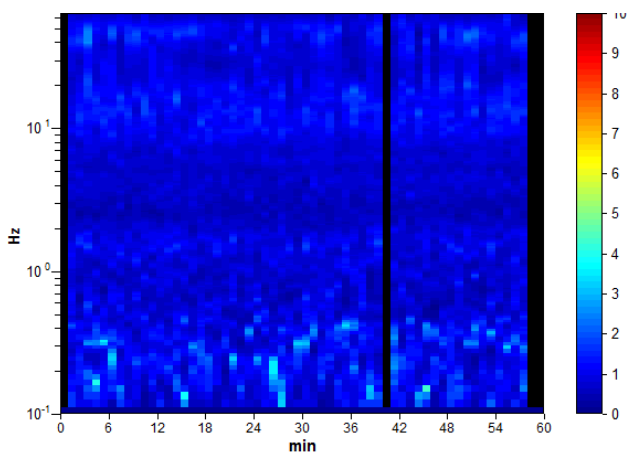
Trace length: 1h00'00". Analyzed 97% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 60 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

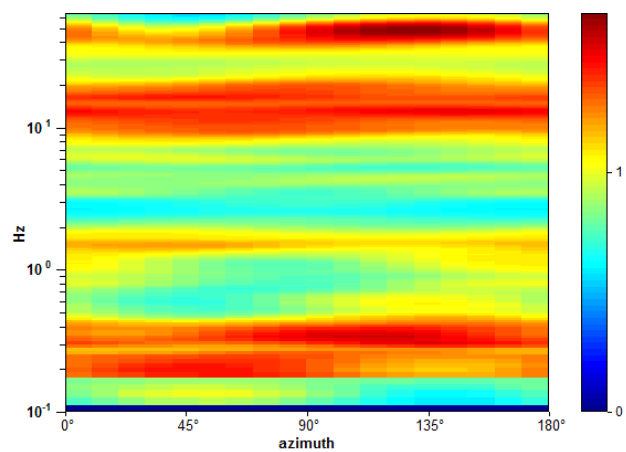
Max. H/V at 0.31 ± 1.69 Hz. (In the range 0.0 - 20.0 Hz).



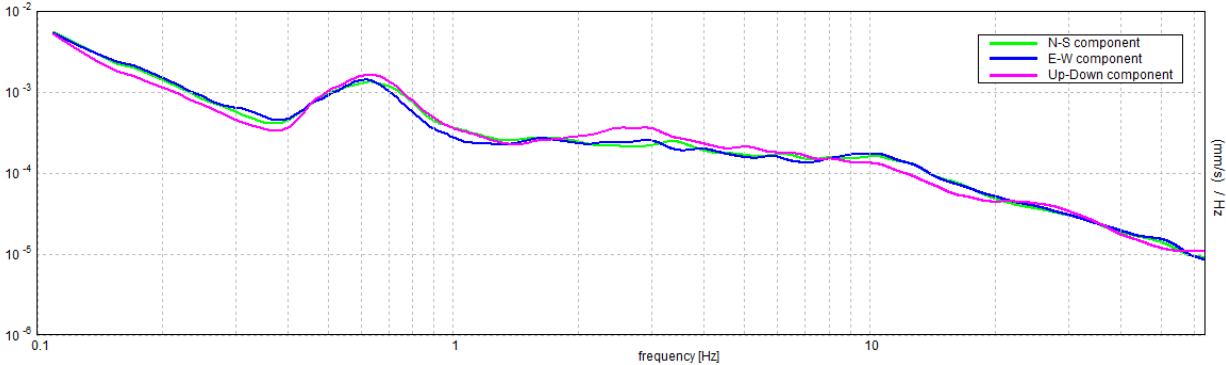
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.31 ± 1.69 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve

[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$0.31 > 0.17$	OK	
$n_c(f_0) > 200$	$1050.0 > 200$	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5\text{Hz}$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5\text{Hz}$	Exceeded 0 out of 31 times	OK	

Criteria for a clear H/V peak

[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.094 Hz	OK	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	$1.45 > 2$		NO
$f_{\text{peak}}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$ 5.41927 < 0.05$		NO
$\sigma_f < \varepsilon(f_0)$	$1.69352 < 0.0625$		NO
$\sigma_A(f_0) < \theta(f_0)$	$0.1887 < 2.5$	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
$\sigma_{\log H/V}(f)$	standard deviation of $\log A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

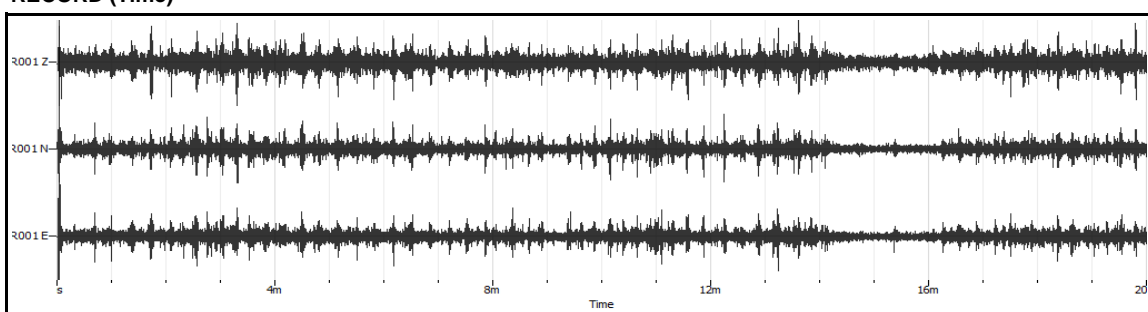
CODICE LAVORO: 1422

CODICE PROVA: Esac1

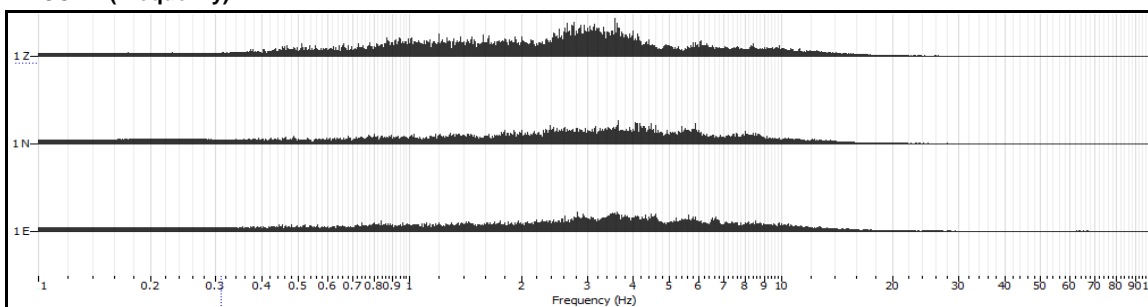
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	37

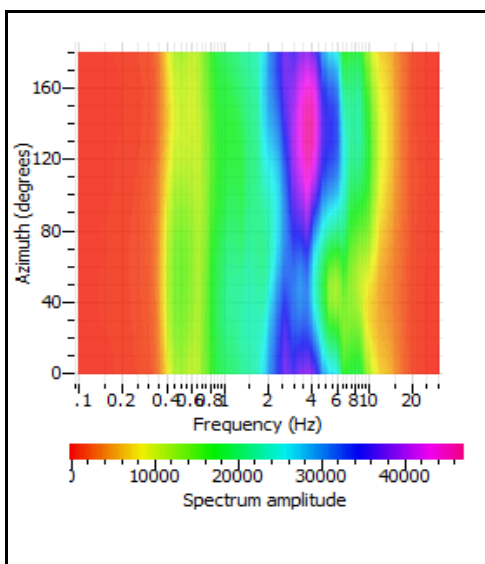
RECORD (Time)



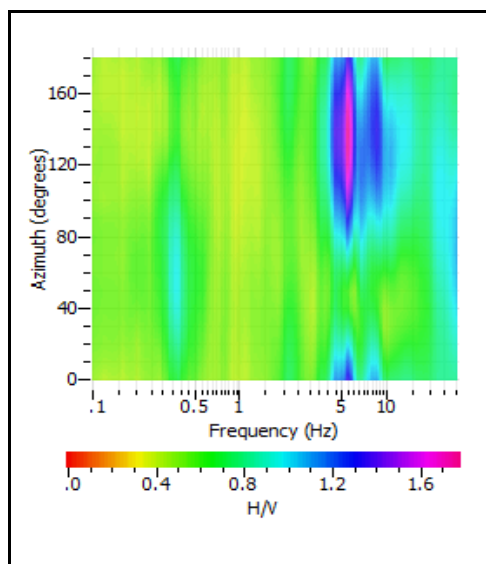
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

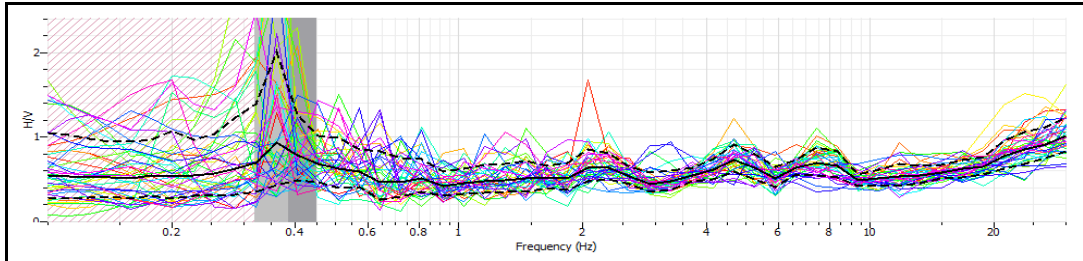


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

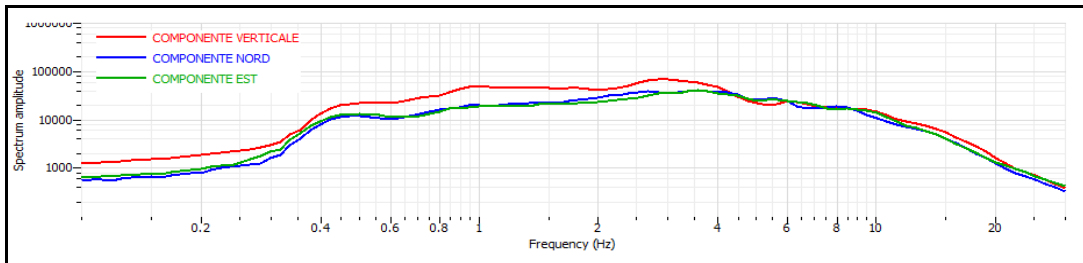
CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac1

RAPPORTO SPETTRALE H/V

Max HVSR 0.38 ± 0.06 Hz. A0 = 1.01



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.38		
Lw	20		
nw	71		
f0 > 10 / Lw	0.38 > 10/20		☒
nc (f0) > 200	539.6 > 200	☑	
σA(f) < 2 for 0.5 f0 < f < 2 f0 if f0 > 0.5 Hz	Exceeded 0 out of 50 times	☑	
σA(f) < 3 for 0.5 f0 < f < 2 f0 if f0 < 0.5 Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		☒
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0.64 Hz	☑	
A0 > 2	1.01 > 2		☒
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	29.62 < 0.05		☒
σf < ε(f0)	0.065947 < 0.076	☑	
σA(f0) < θ(f0)	0.1956155 < 2.5	☑	

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

Threshold value for σf and σA(f0)

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

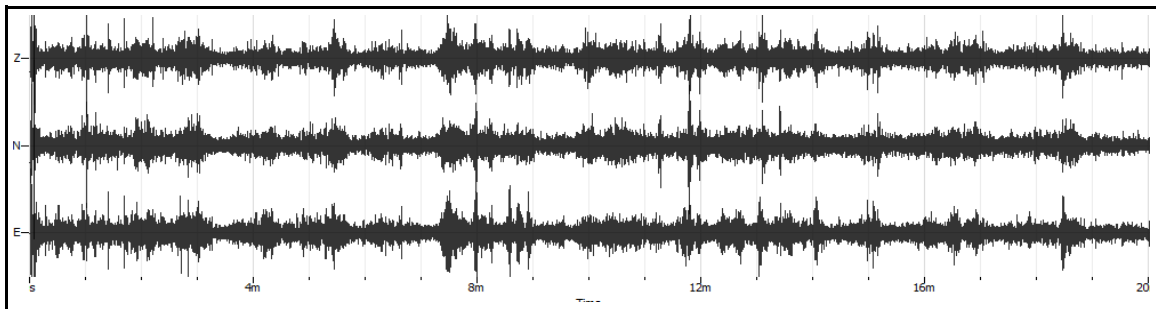
CODICE LAVORO: 1422

CODICE PROVA: Esac2

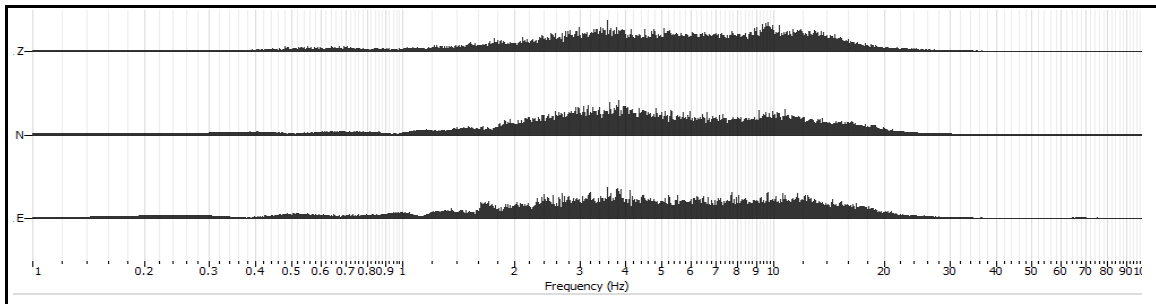
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

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

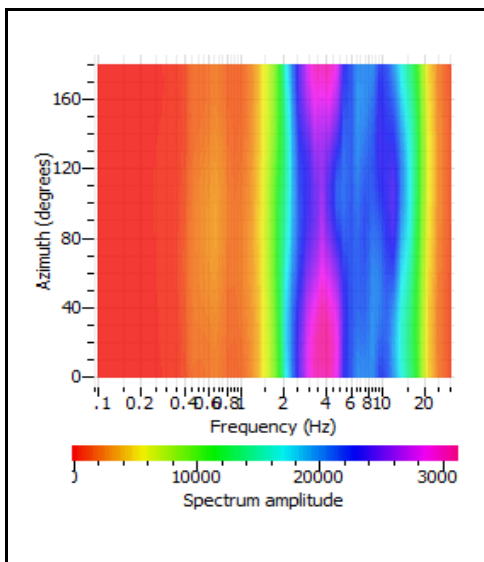
RECORD (Time)



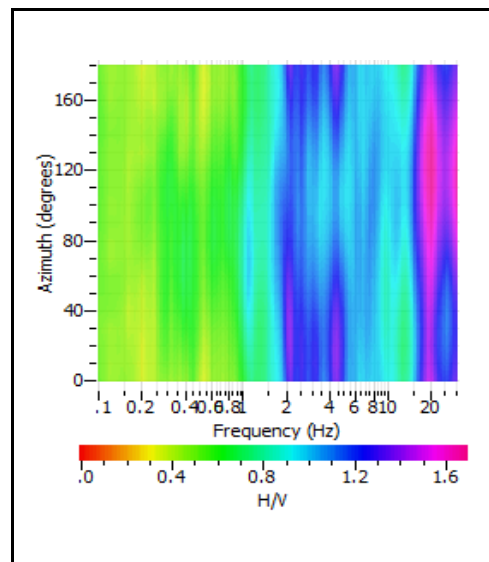
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

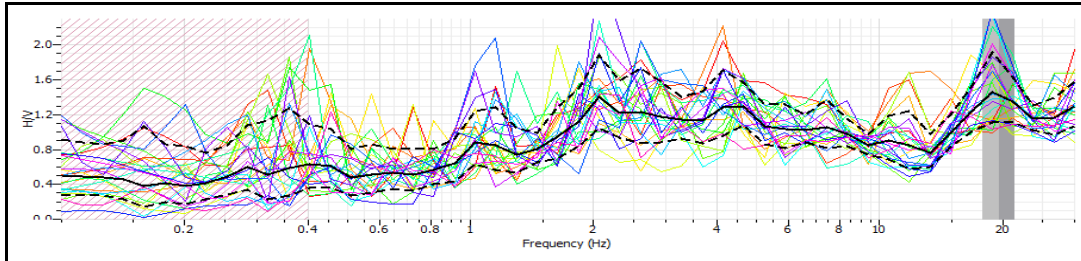


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

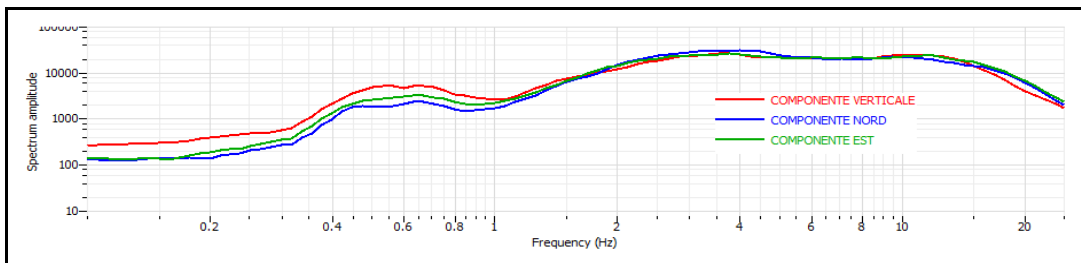
CLIENTE Regione Emilia Romagna
 CODICE LAVORO 1422
 CODICE PROVA Esac2

RAPPORTO SPETTRALE H/V

Max HVSR 19.68 ± 1.77 Hz. A0 = 1.45



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	19.68		
Lw	20		
nw	71		
f0 > 10 / Lw	19.68 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	27945.6 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		<input checked="" type="checkbox"/>
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	1.45 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	-0.8475 < 0.05	<input checked="" type="checkbox"/>	
σf < ε(f0)	1.7773 < 0.984		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.400505 < 1.58	<input checked="" type="checkbox"/>	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

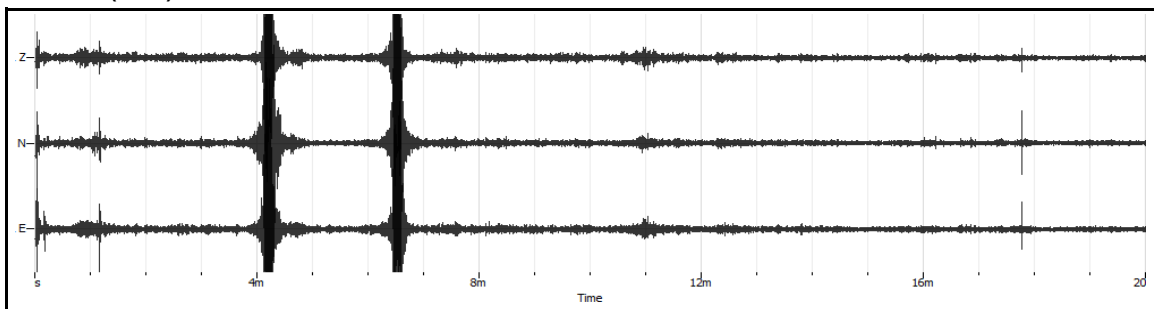
CODICE LAVORO: 1422

CODICE PROVA: Esac3

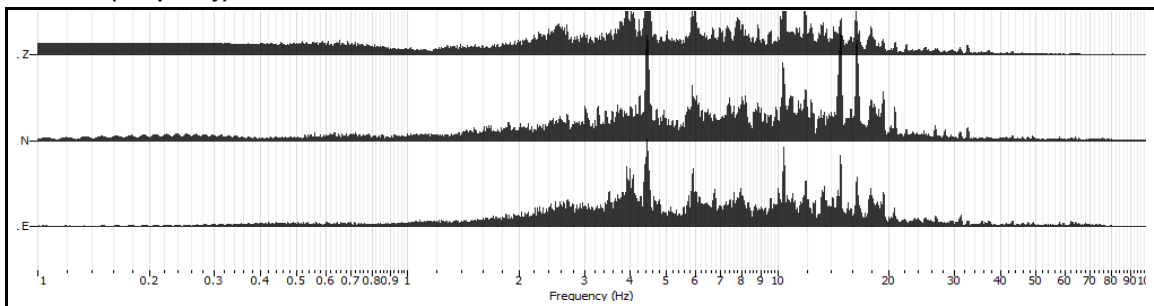
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	21

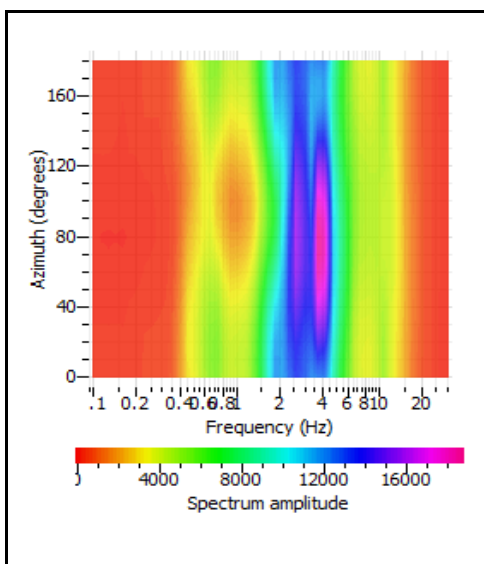
RECORD (Time)



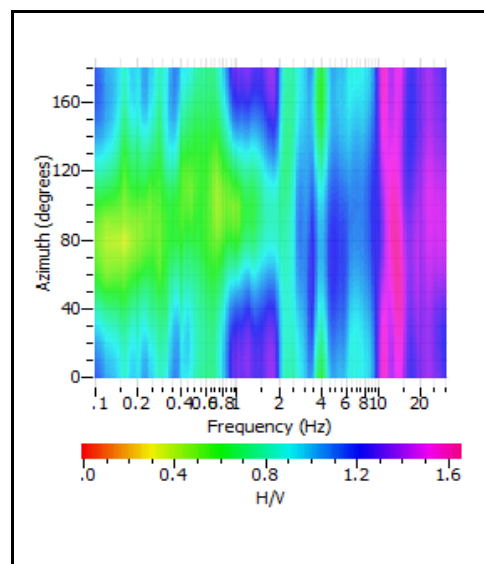
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

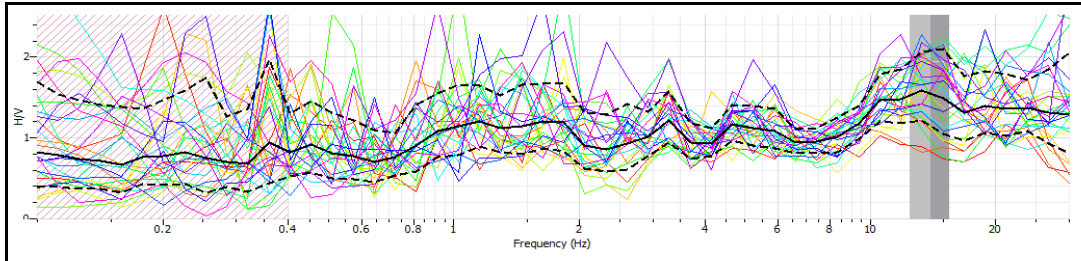


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

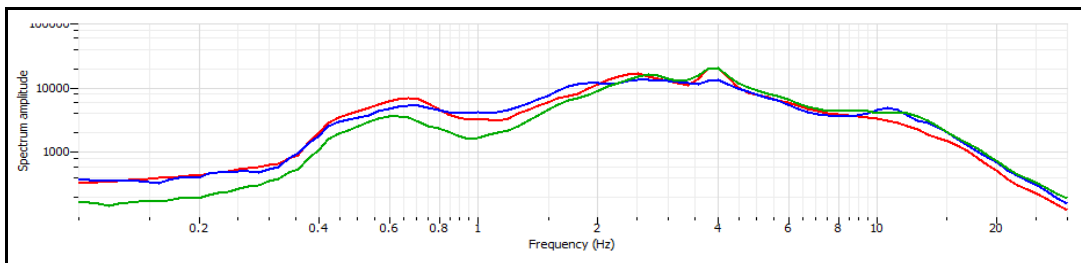
CLIENTE Regione Emilia Romagna
 CODICE LAVORO 1422
 CODICE PROVA Esac3

RAPPORTO SPETTRALE H/V

Max HVSR 13.95 ± 1.49 Hz. A0 = 1.58



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	13.95		
Lw	20		
nw	71		
f0 > 10 / Lw	13.95 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	19809 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		<input checked="" type="checkbox"/>
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	1.58 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	-0.6685 < 0.05	<input checked="" type="checkbox"/>	
σf < ε(f0)	1.4935 < 0.6975		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.425905 < 1.58	<input checked="" type="checkbox"/>	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

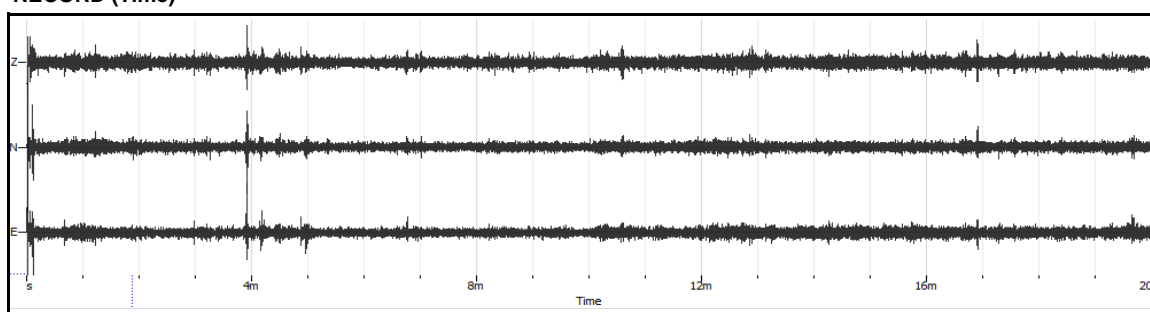
CODICE LAVORO: 1422

CODICE PROVA: Esac4

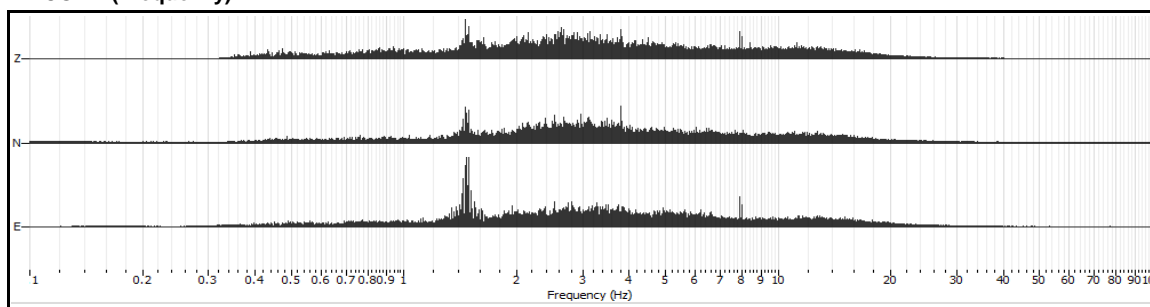
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	17

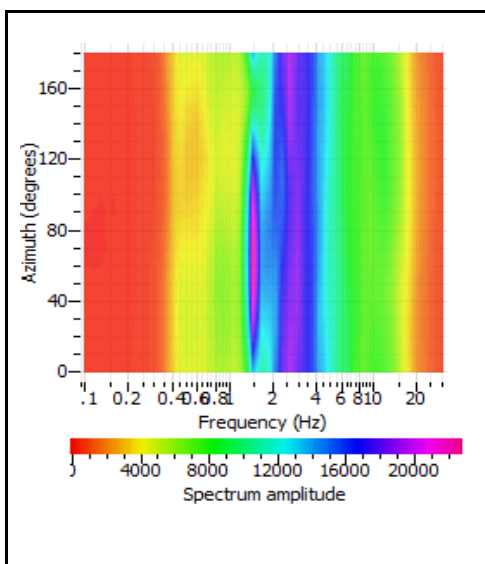
RECORD (Time)



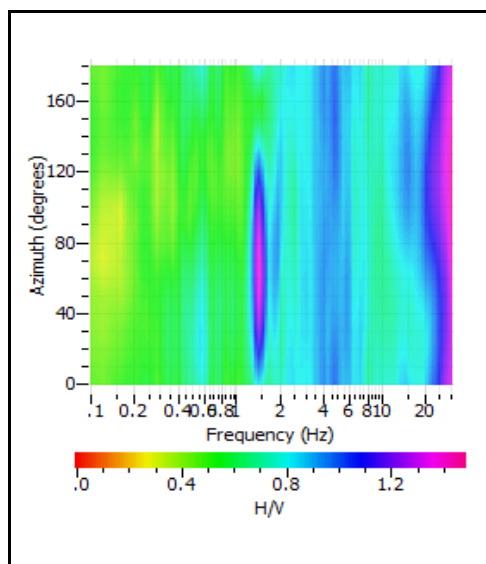
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

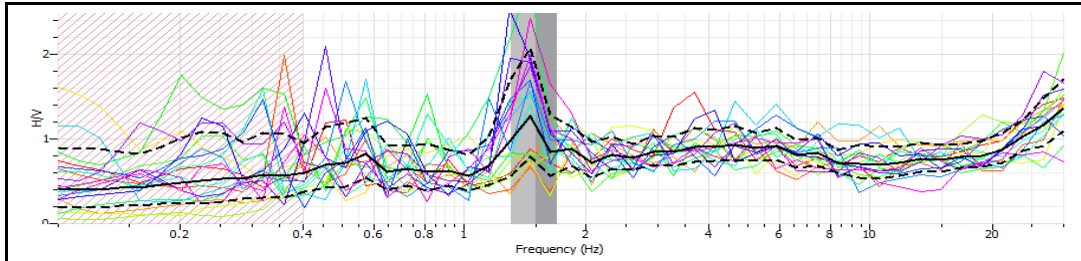


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

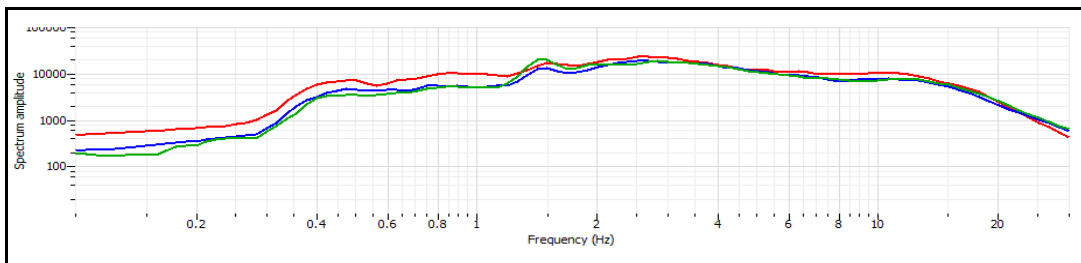
CLIENTE Regione Emilia Romagna
 CODICE LAVORO 1422
 CODICE PROVA Esac4

RAPPORTO SPETTRALE H/V

Max HVSR 1.5 ± 0.19 Hz. $A0 = 1.36$



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	1.50		
Lw	20		
nw	71		
f0 > 10 / Lw	1.5 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	2130 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	1.02 Hz	<input checked="" type="checkbox"/>	
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	1.36 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	28.5 < 0.05		<input checked="" type="checkbox"/>
σ < ε(f0)	0.19552 < 0.15		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.3081 < 1.78	<input checked="" type="checkbox"/>	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

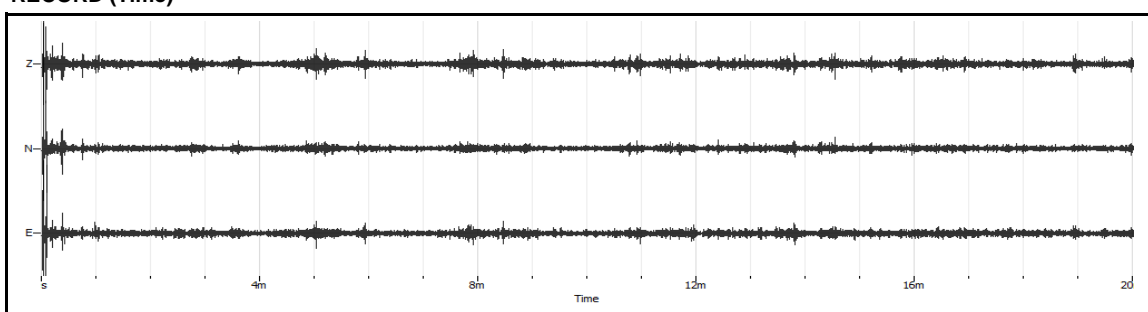
CODICE LAVORO: 1422

CODICE PROVA: Esac5

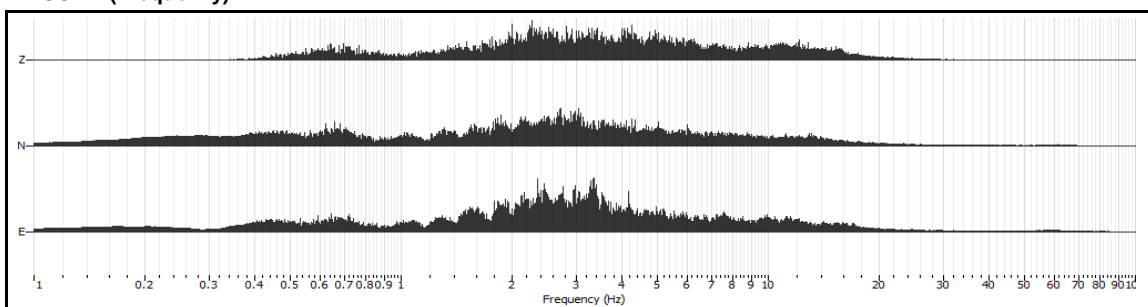
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	30

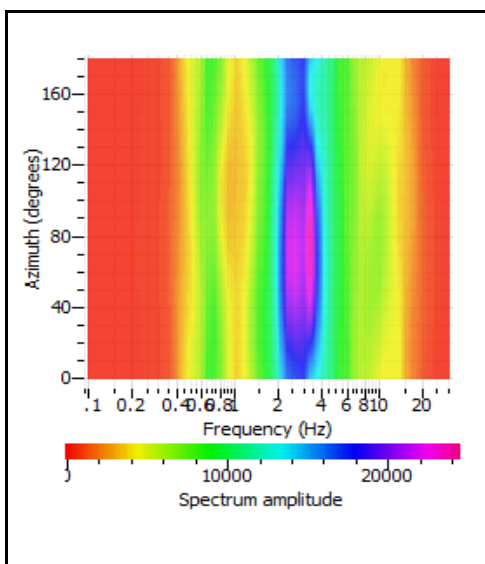
RECORD (Time)



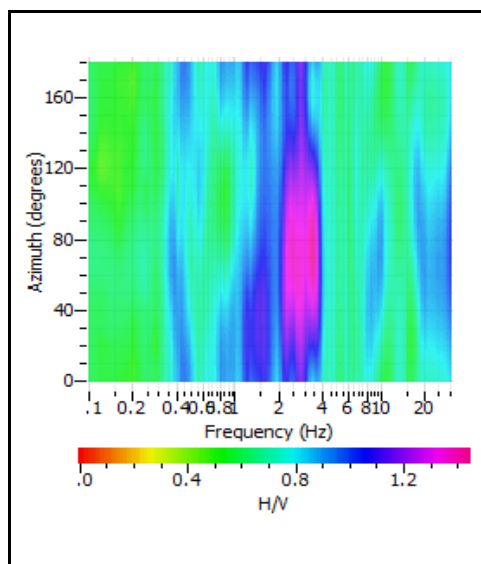
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

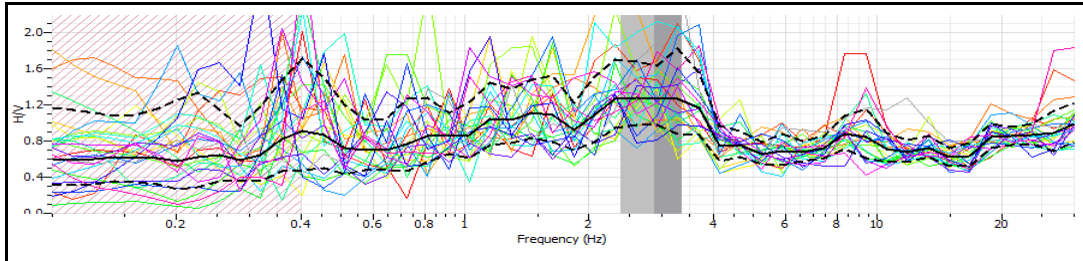


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

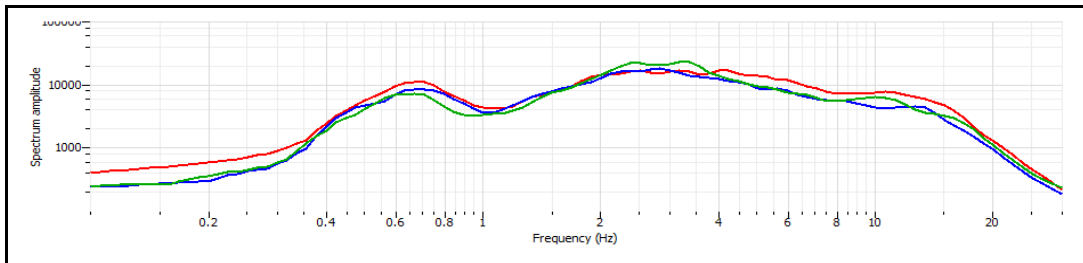
CLIENTE Regione Emilia Romagna
 CODICE LAVORO 1422
 CODICE PROVA Esac5

RAPPORTO SPETTRALE H/V

Max HVSR 2.9 ± 0.45 Hz. $A0 = 0.94$



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	2.90		
Lw	20		
nw	71		
f0 > 10 / Lw	2.9 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	4118 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		<input checked="" type="checkbox"/>
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	0.94 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	27.1 < 0.05		<input checked="" type="checkbox"/>
σ < ε(f0)	0.45093 < 0.145		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.182061 < 1.58	<input checked="" type="checkbox"/>	

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

Threshold value for σ and σA(f0)

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: Regione Emilia Romagna

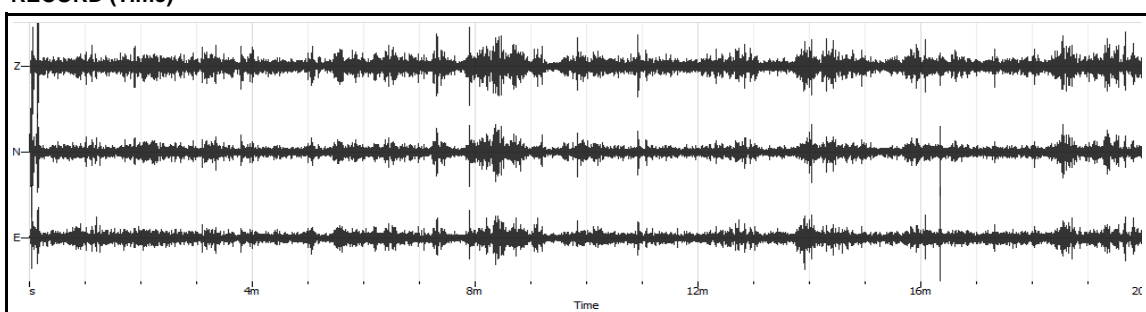
CODICE LAVORO: 1422

CODICE PROVA: Esac6

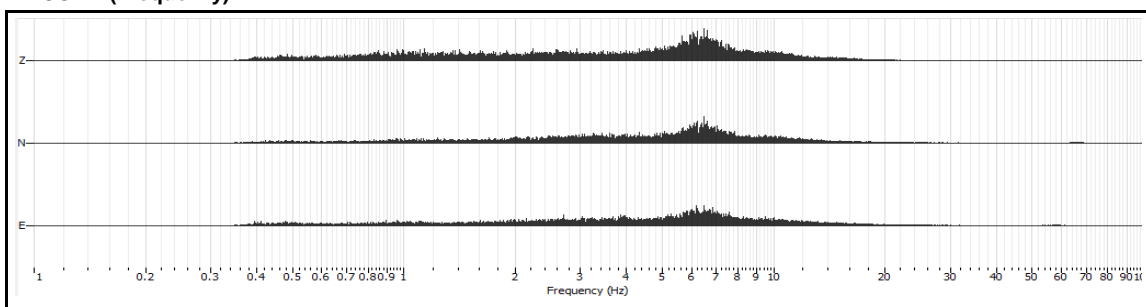
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	33

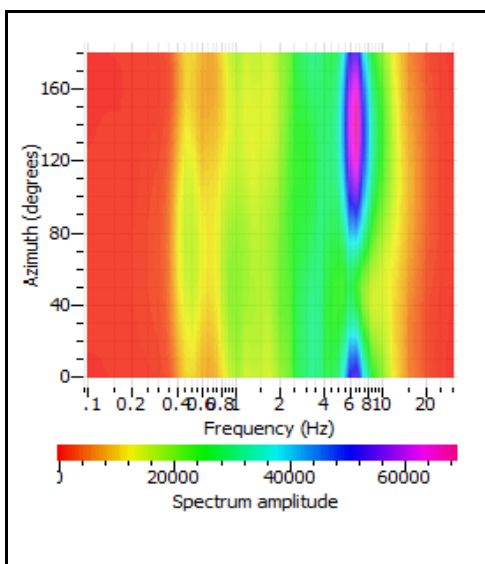
RECORD (Time)



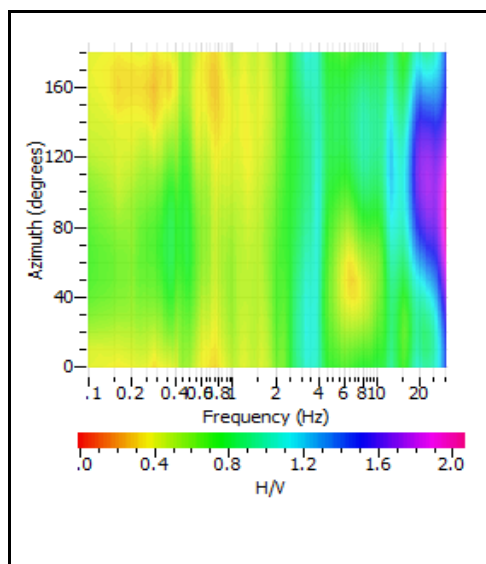
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

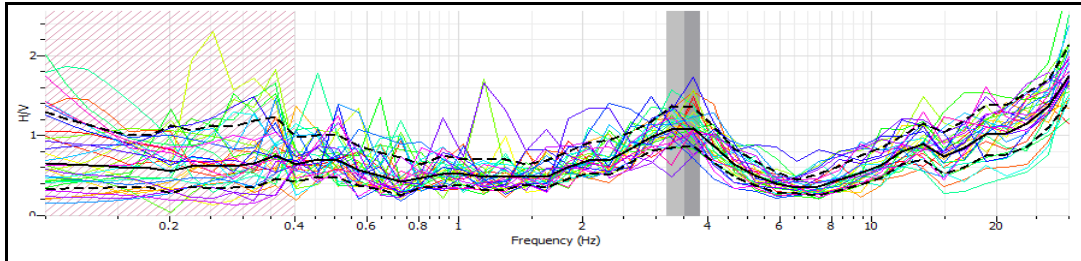


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

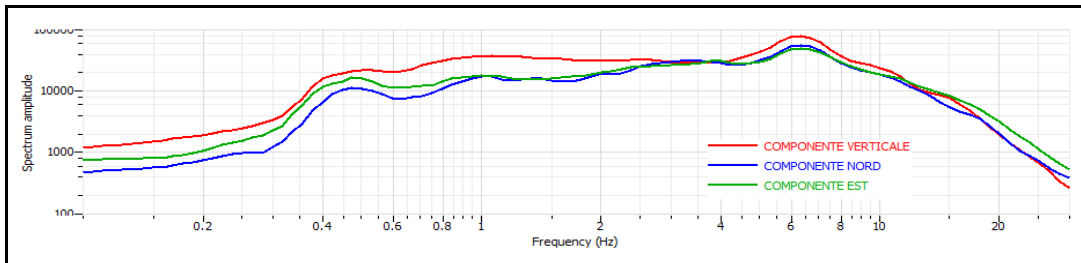
CLIENTE Regione Emilia Romagna
CODICE LAVORO 1422
CODICE PROVA Esac6

RAPPORTO SPETTRALE H/V

Max HVSR 3.39 ± 0.41 Hz. A0 = 1.26



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	3.39		
Lw	20		
nw	71		
f0 > 10 / Lw	3.39 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	4813.8 > 200	<input checked="" type="checkbox"/>	
σA(f) < 2 for 0.5 f0 < f < 2 f0 if f0 > 0.5 Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
σA(f) < 3 for 0.5 f0 < f < 2 f0 if f0 < 0.5 Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f⁻ in [f0/4, f0] AH/V(f⁻) < A0/2	1.82 Hz	<input checked="" type="checkbox"/>	
Exists f⁺ in [4f0, f0] AH/V(f⁺) < A0/2	4.62 Hz	<input checked="" type="checkbox"/>	
A0 > 2	1.26 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	21.61 < 0.05		<input checked="" type="checkbox"/>
σf < ε(f0)	0.41105 < 0.1695		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.293285 < 1.58	<input checked="" type="checkbox"/>	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

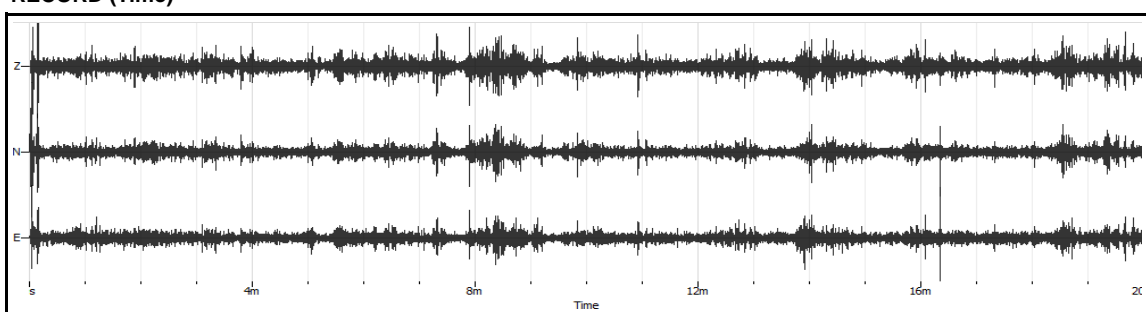
CODICE LAVORO: 1422

CODICE PROVA: Esac7

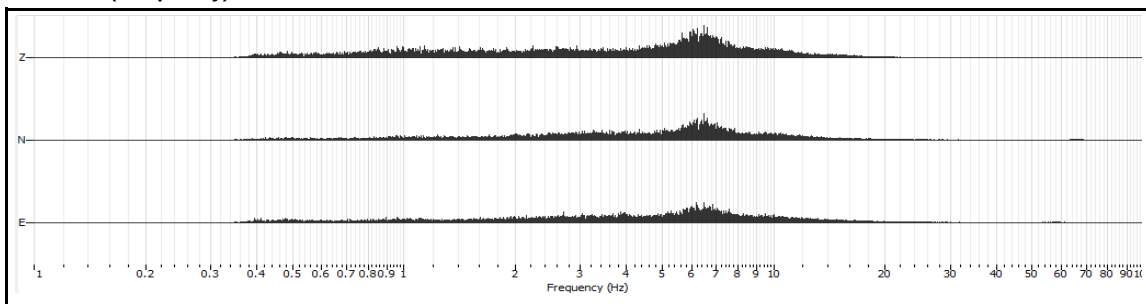
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	00:00:00
Frequenza di campionamento	200 Hz

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

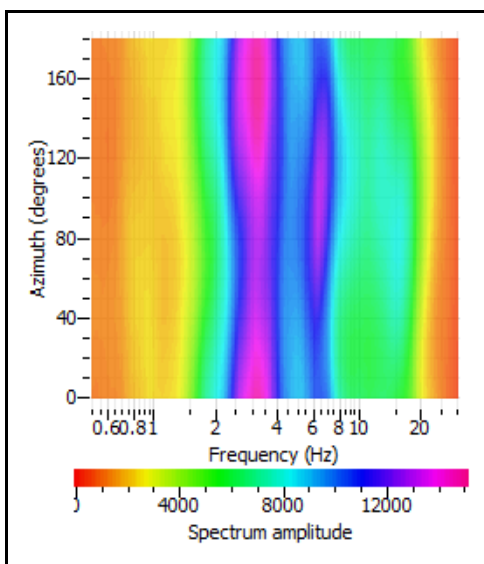
RECORD (Time)



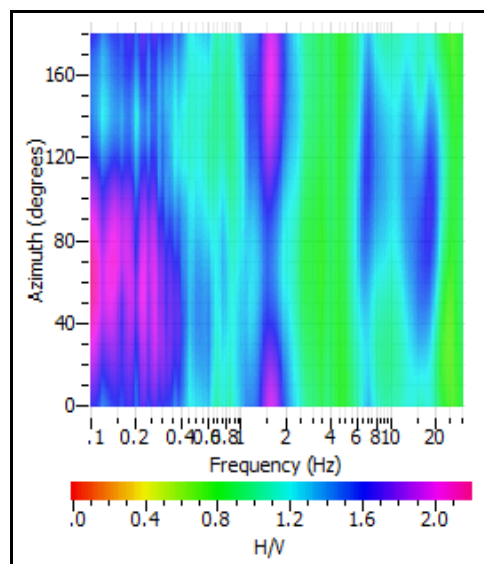
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

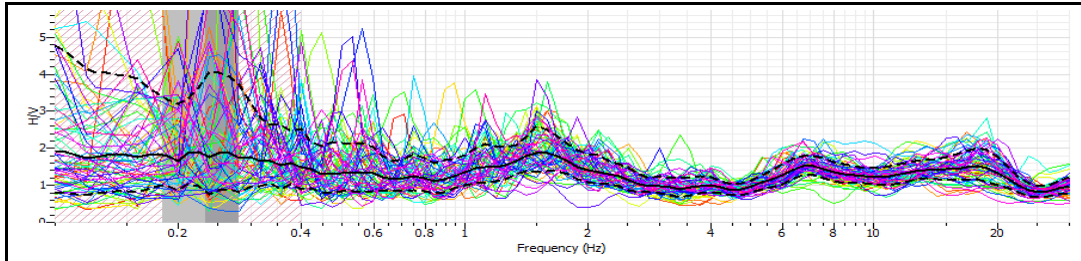


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

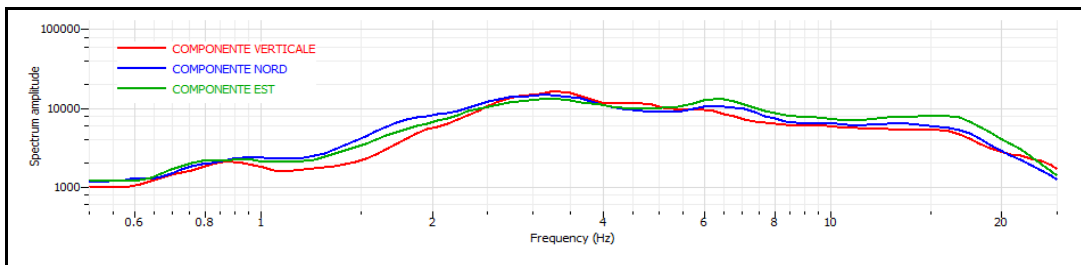
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Esac7

RAPPORTO SPETTRALE H/V

Max HVSr 0.26 ± 0.05 Hz. A0 = 1.48



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.26		
Lw	20		
nw	71		
f0 > 10 / Lw	0.26 > 10/20		☒
nc (f0) > 200	369.2 > 200	☑	
σA(f) < 2 for 0.5 f0 < f < 2 f0 if f0 > 0.5 Hz	Exceeded 0 out of 50 times	☑	
σA(f) < 3 for 0.5 f0 < f < 2 f0 if f0 < 0.5 Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		☒
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		☒
A0 > 2	1.48 > 2		☒
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	6.34581 < 0.05		☒
σ < ε(f0)	0.058056 < 0.052		☒
σA(f0) < θ(f0)	0.26284 < 2.5	☑	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 1

LOCALITA': S.p. 108 Gatteo

DATA PROVA: 20/12/2012

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

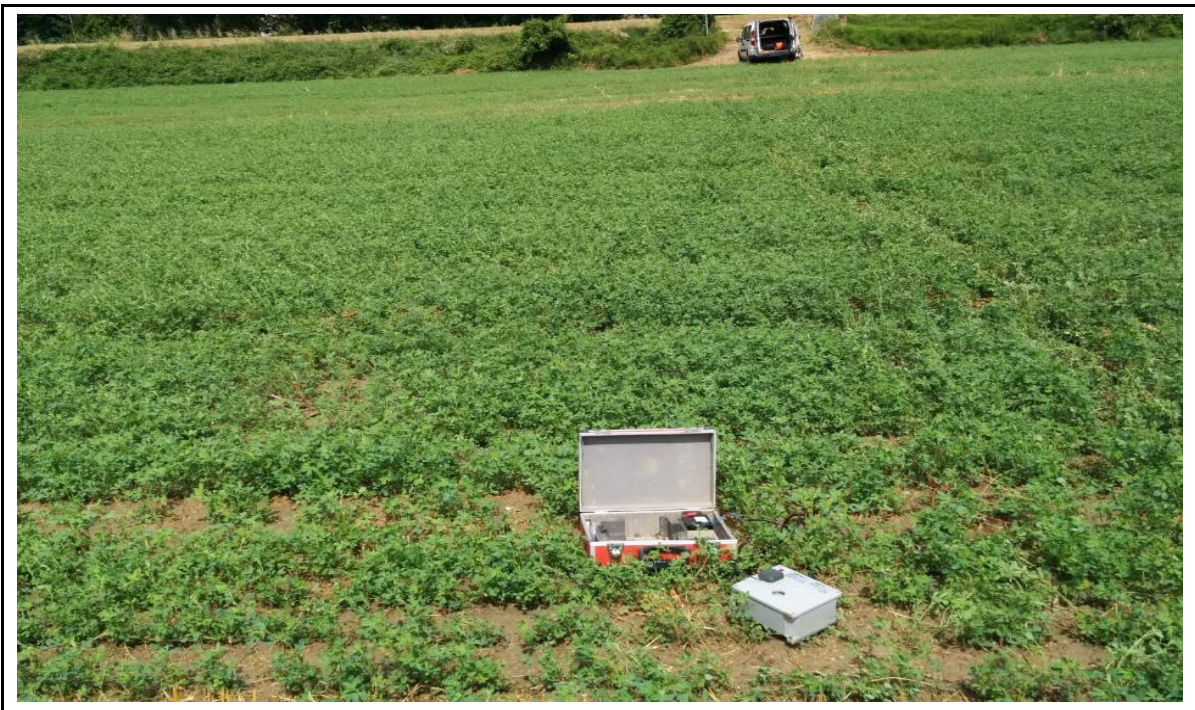
ORIENTAMENTO: Nord

CONDIZIONI METEO: Sole

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

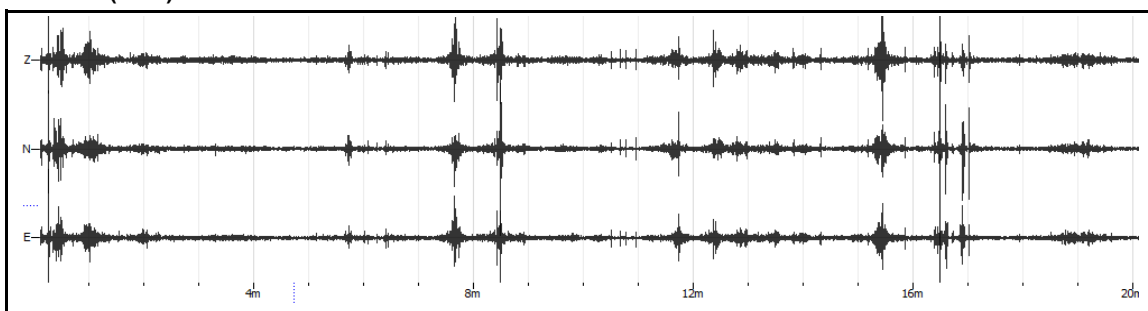
CODICE LAVORO: 1422

CODICE PROVA: Masw 1

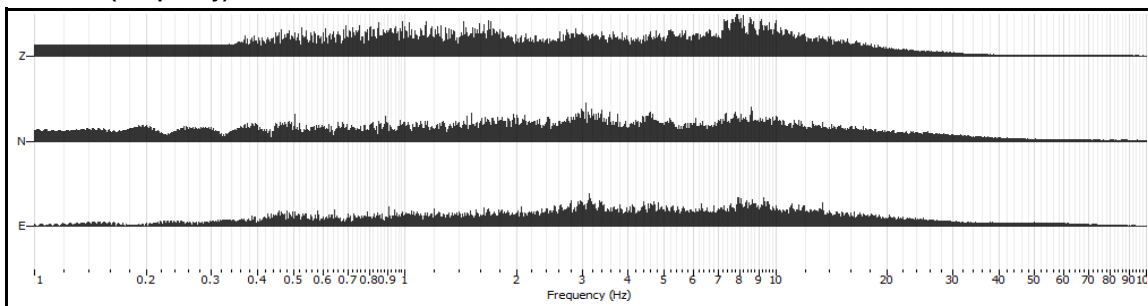
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	31

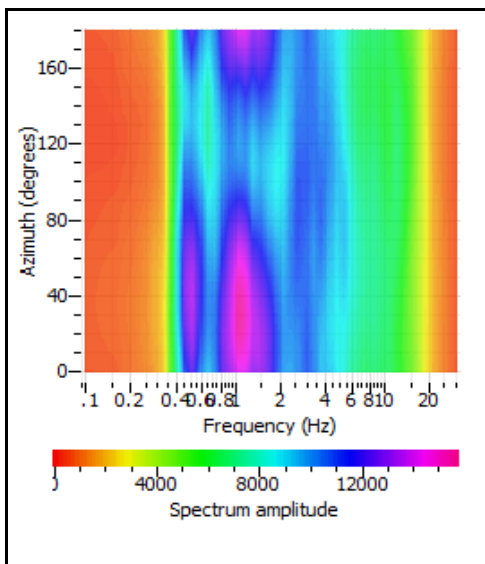
RECORD (Time)



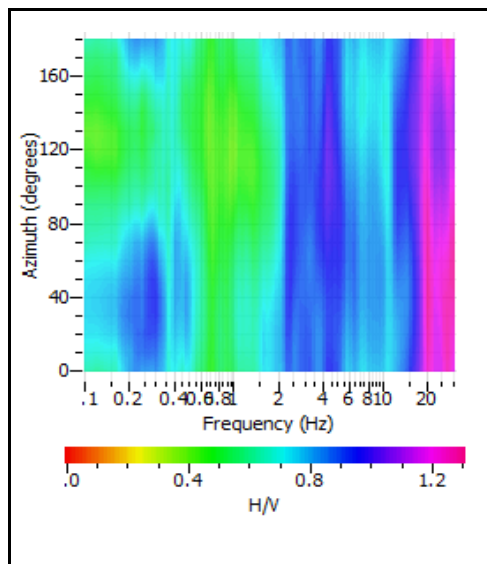
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

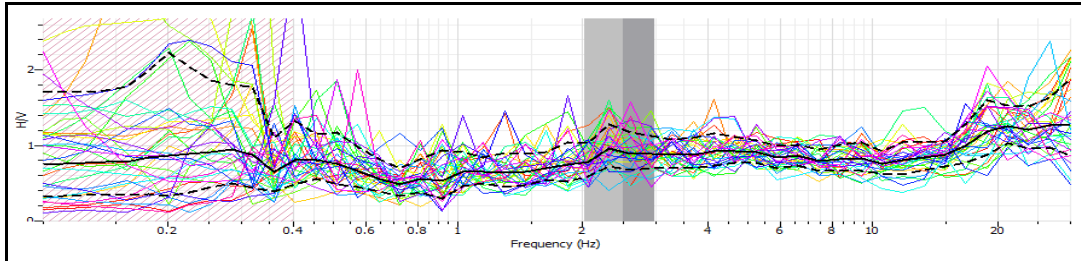


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

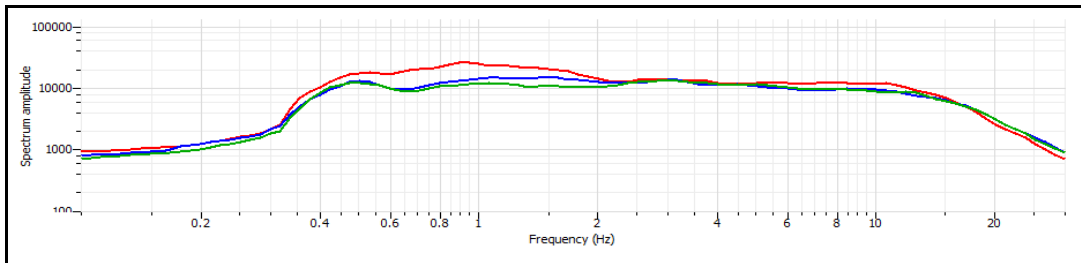
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
CODICE LAVORO 1422
CODICE PROVA Masw 1

RAPPORTO SPETTRALE H/V

Max HVSr 2.5 ± 0.48 Hz. $A0 = 1.27$



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	2.50		
Lw	20		
nw	71		
f0 > 10 / Lw	2.5 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	3550 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	1.29 Hz	<input checked="" type="checkbox"/>	
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	1.27 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	27.5 < 0.05		<input checked="" type="checkbox"/>
σf < ε(f0)	0.48503 < 0.125		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.512839 < 1.58	<input checked="" type="checkbox"/>	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 2

LOCALITA': S.p. 10 S. Mauro Pascoli

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

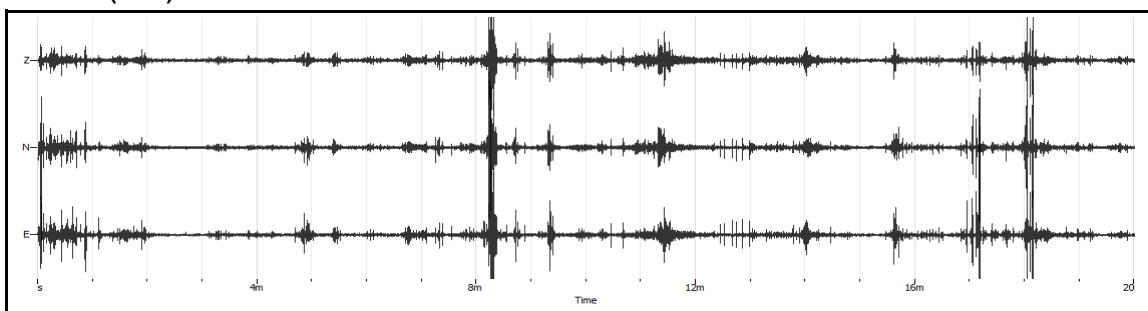
CODICE LAVORO: 1422

CODICE PROVA: Masw 2

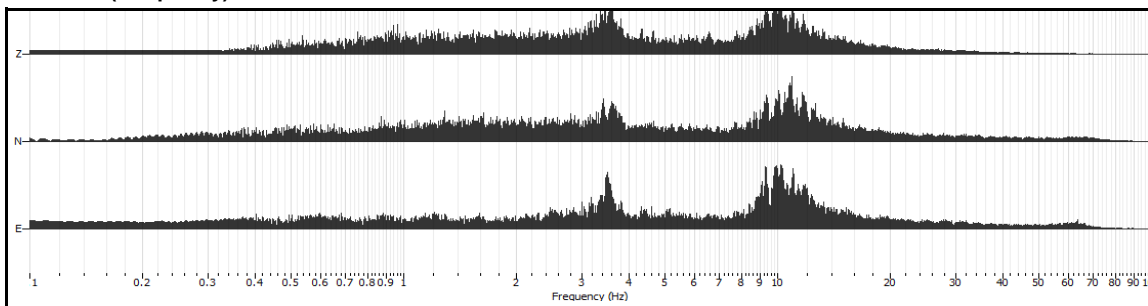
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	25

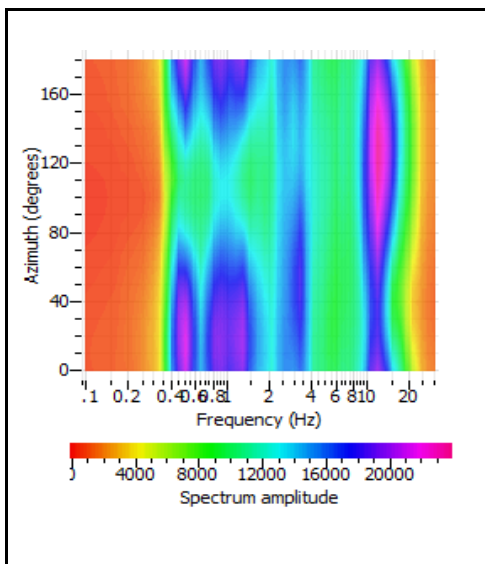
RECORD (Time)



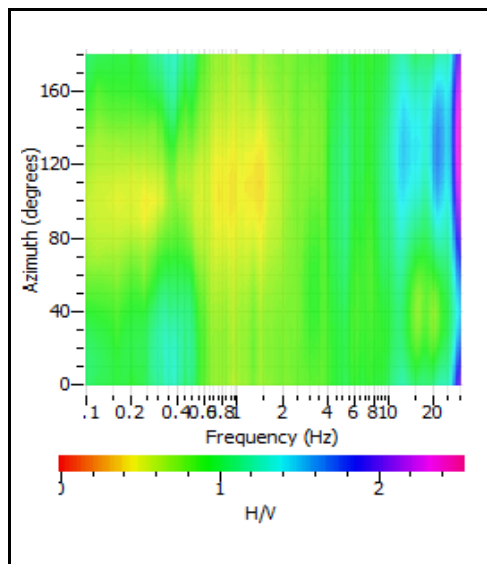
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

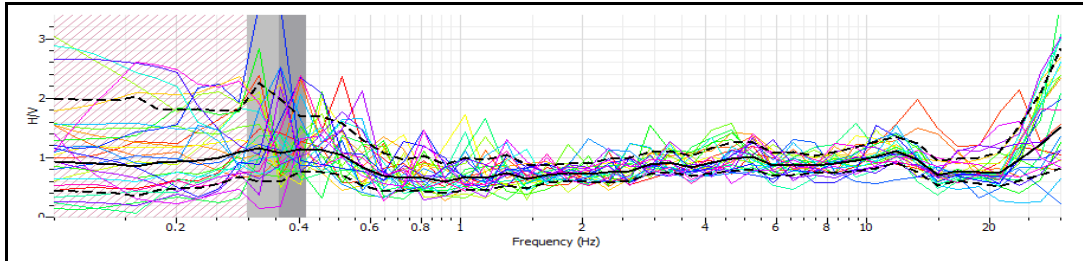


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

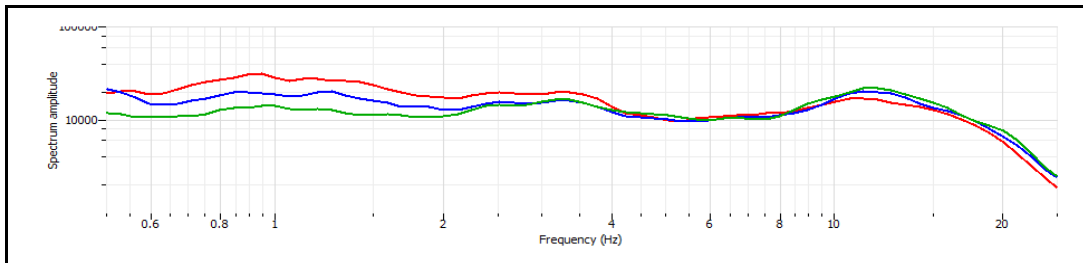
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Masw 2

RAPPORTO SPETTRALE H/V

Max HVSR 0.35 ± 0.05 Hz. A0 = 1.52



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.35		
Lw	20		
nw	71		
f0 > 10 / Lw	0.35 > 10/20		☒
nc (f0) > 200	497 > 200	☑	
σA(f) < 2 for 0.5 f0 < f < 2 f0 if f0 > 0.5 Hz	Exceeded 0 out of 50 times	☑	
σA(f) < 3 for 0.5 f0 < f < 2 f0 if f0 < 0.5 Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		☒
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0.64 Hz	☑	
A0 > 2	1.52 > 2		☒
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	29.65 < 0.05		☒
σ < ε(f0)	0.058565 < 0.07	☑	
σA(f0) < θ(f0)	1.0060655 < 2.5	☑	

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

Threshold value for σi and σA(f0)

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 3

LOCALITA': Via Ticino - San Mauro Pascoli

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

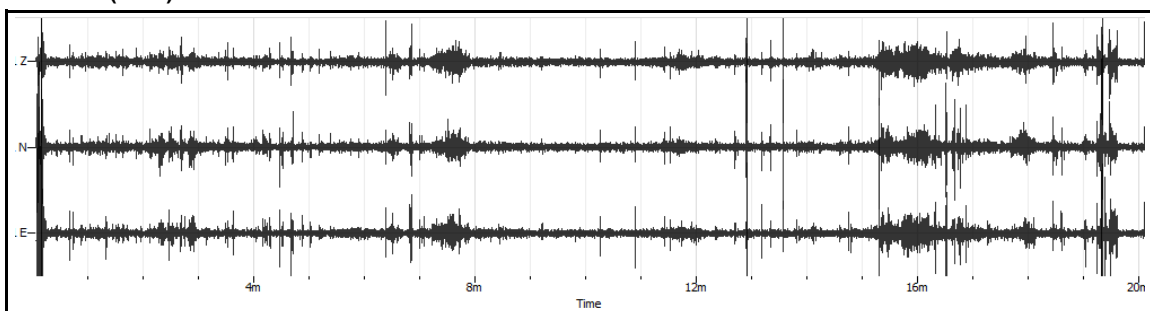
CODICE LAVORO: 1422

CODICE PROVA: Masw 3

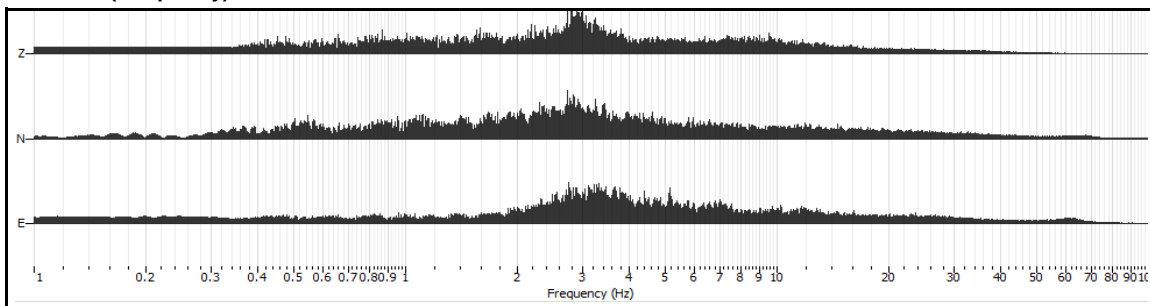
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	30

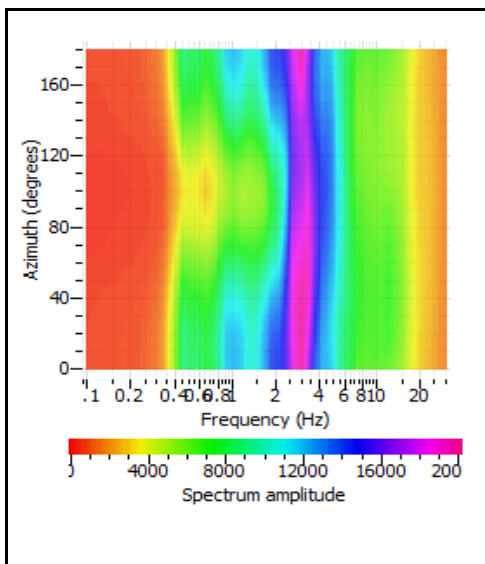
RECORD (Time)



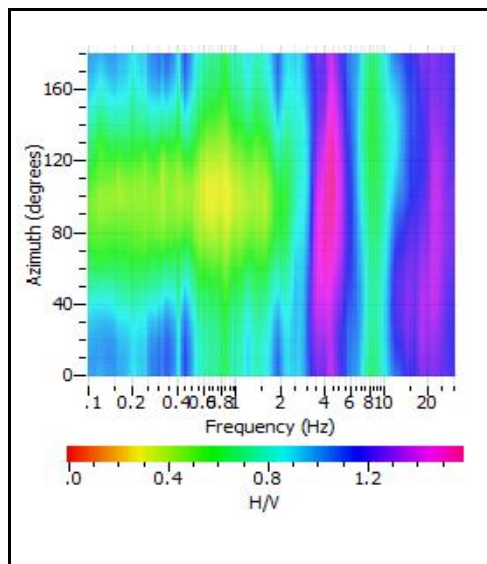
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

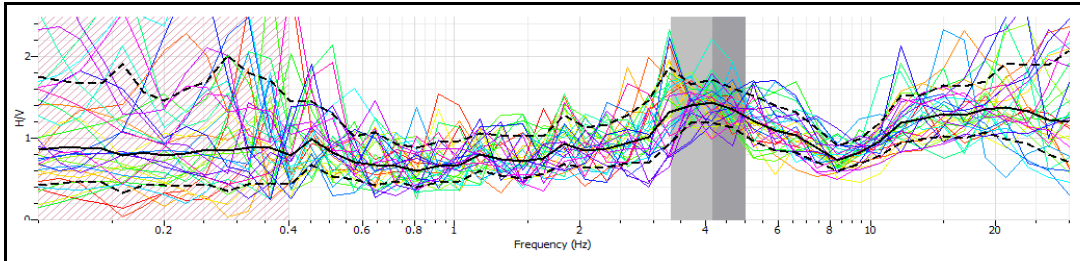


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

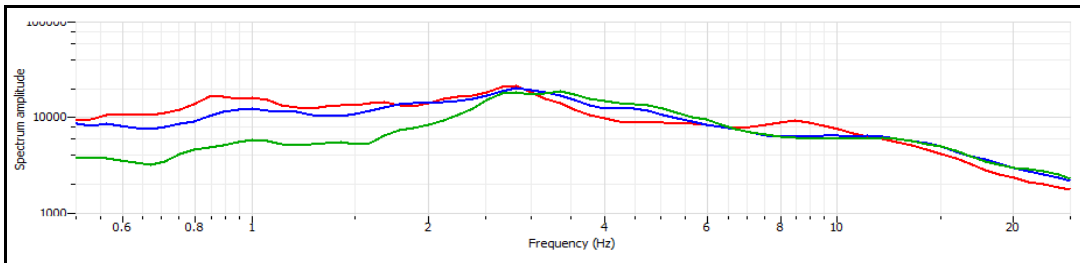
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Masw 3

RAPPORTO SPETTRALE H/V

Max HVSR 4.17 ± 0.85 Hz. A0 = 1.43



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	4.17		
Lw	20		
nw	71		
f0 > 10 / Lw	4.17 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	5921.4 > 200	<input checked="" type="checkbox"/>	
$\sigma A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		<input checked="" type="checkbox"/>
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	1.43 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	-0.0232099999999997 <	<input checked="" type="checkbox"/>	
σf < ε(f0)	0.85276 < 0.2085		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.263985 < 1.58	<input checked="" type="checkbox"/>	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 4

LOCALITA': Via XX Settembre - San Mauro Pascoli

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

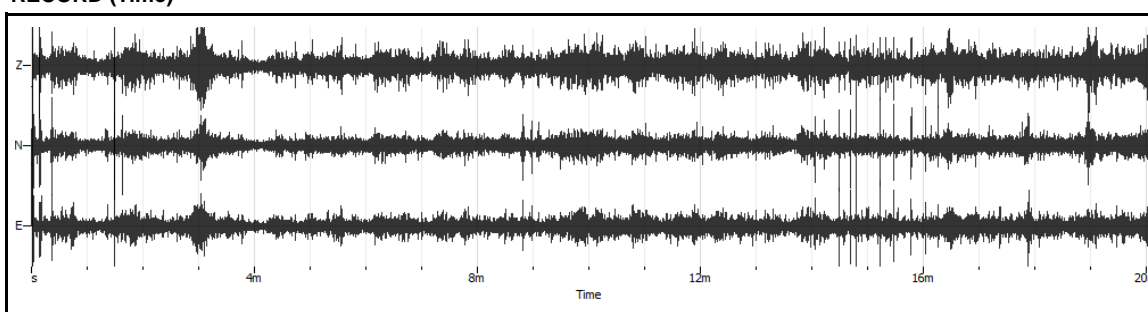
CODICE LAVORO: 1422

CODICE PROVA: Masw 4

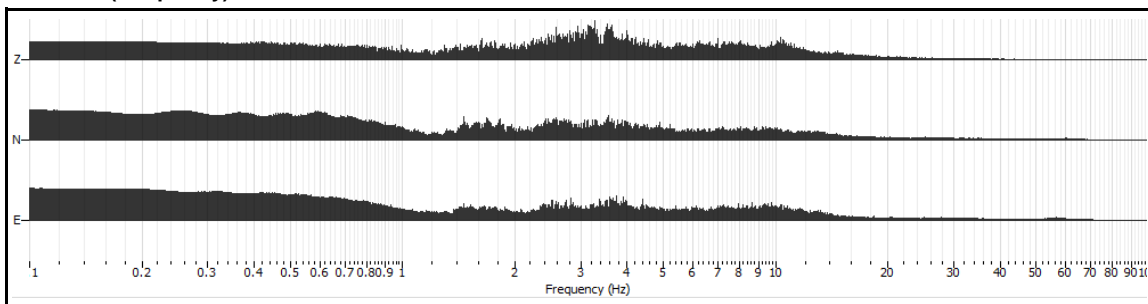
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	22

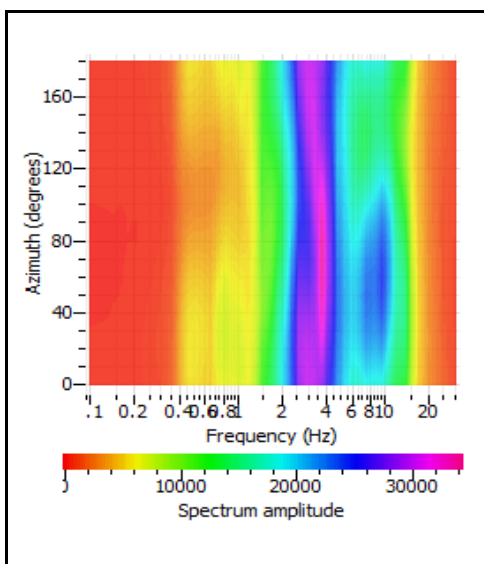
RECORD (Time)



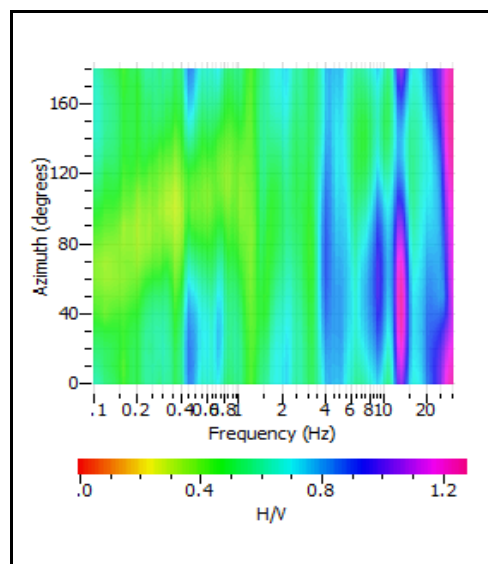
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

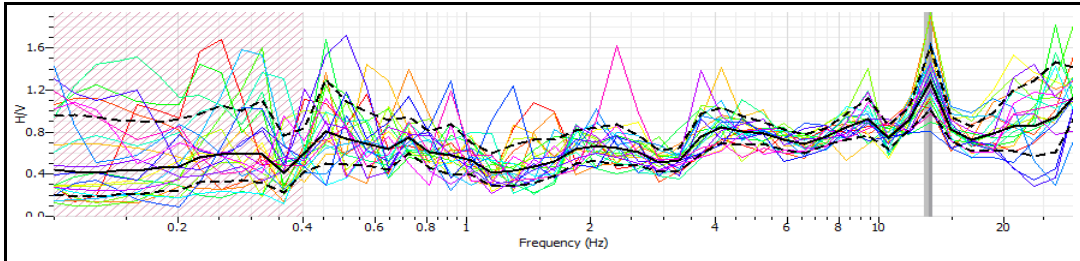


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

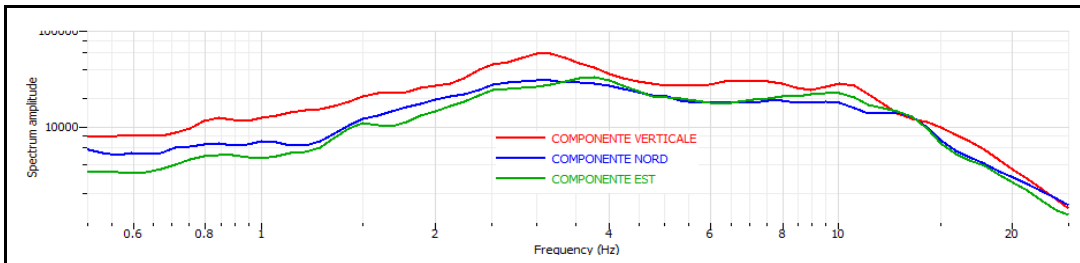
CLIENTE **UNIONE DEI COMUNI DEL RUBICONE**
 CODICE LAVORO **1422**
 CODICE PROVA **Masw 4**

RAPPORTO SPETTRALE H/V

Max HVSR 13.21 ± 0.31 Hz. A0 = 1.27



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	13.21		
Lw	20		
nw	71		
f0 > 10 / Lw	13.21 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	18758.2 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		<input checked="" type="checkbox"/>
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	1.27 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	0.07149999999999986 <		<input checked="" type="checkbox"/>
σf < ε(f0)	0.3111999999999999 < 0.	<input checked="" type="checkbox"/>	
σA(f0) < θ(f0)	0.29991 < 1.58	<input checked="" type="checkbox"/>	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 5

LOCALITA': Viale Luigi Bernardini - Savignano sul Rubicone

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

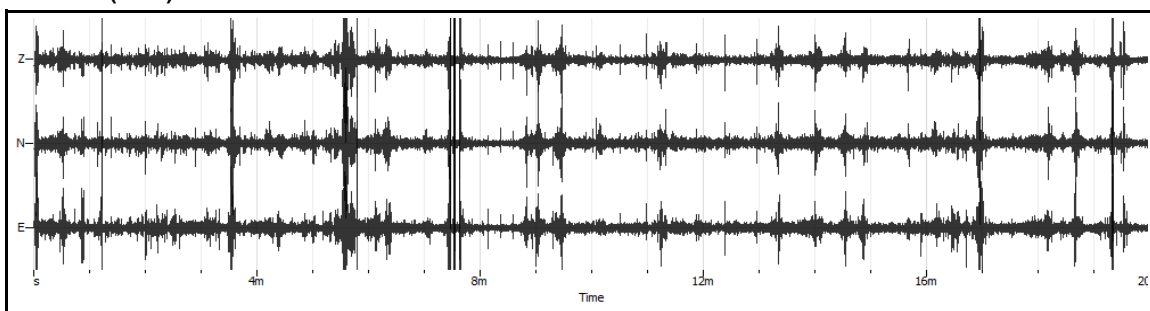
CODICE LAVORO: 1422

CODICE PROVA: Masw 5

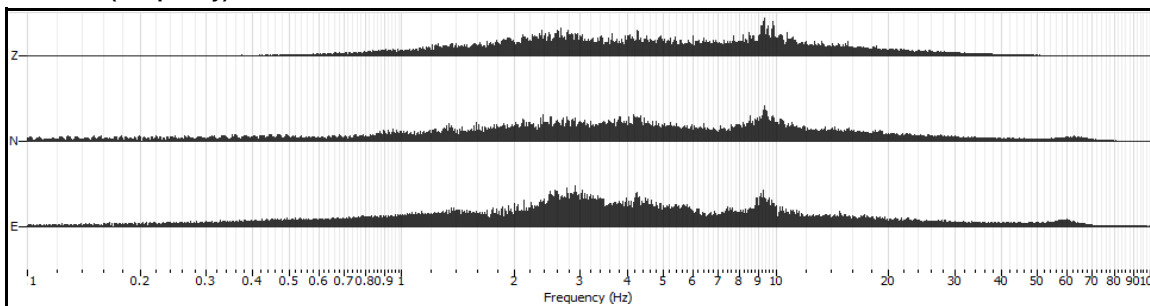
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	32

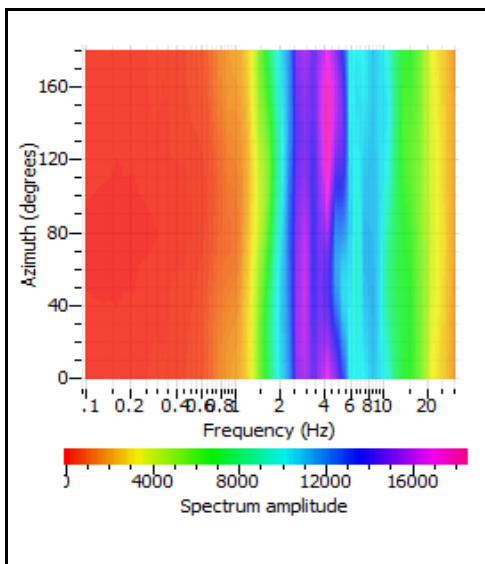
RECORD (Time)



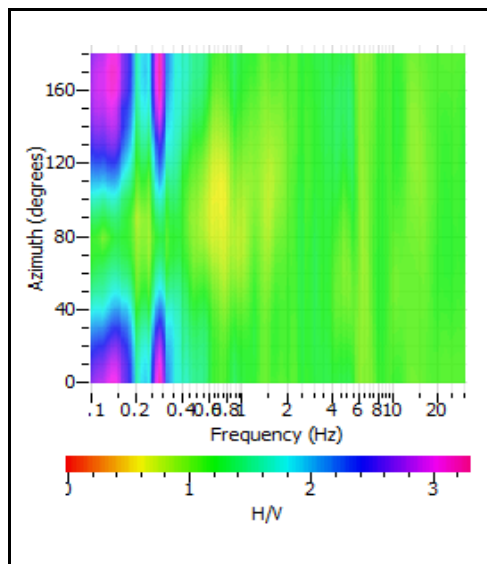
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

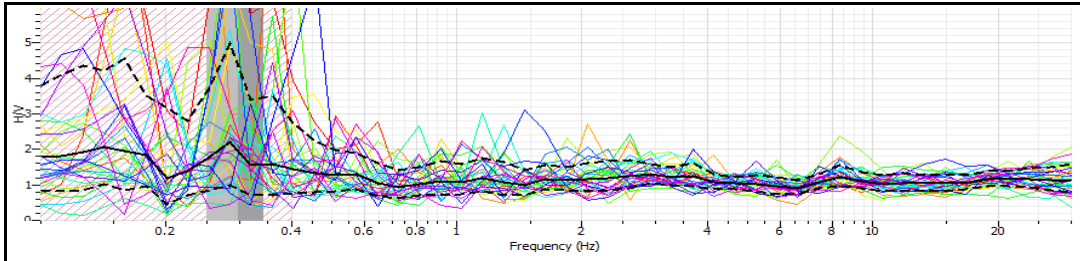


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

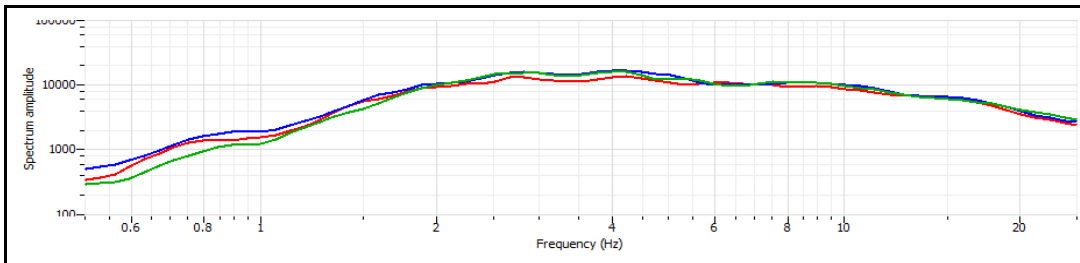
CLIENTE **UNIONE DEI COMUNI DEL RUBICONE**
 CODICE LAVORO **1422**
 CODICE PROVA **Masw 5**

RAPPORTO SPETTRALE H/V

Max HVSR 0.28 ± 0.04 Hz. A0 = 2.2



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.28		
Lw	20		
nw	71		
f0 > 10 / Lw	0.28 > 10/20		☒
nc (f0) > 200	397.6 > 200	☑	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 100 times	☑	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		☒
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		☒
A0 > 2	2.2 > 2	☑	
fpeak [AH/V(f) ± $\sigma_A(f)$] = f0 ± 5%	2.71409 < 0.05		☒
$\sigma < \varepsilon(f_0)$	0.049817 < 0.056	☑	
$\sigma_A(f_0) < \theta(f_0)$	0.287505 < 2.5	☑	

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

Threshold value for σ 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 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.00	2.50	2.00	1.78	1.58
Log $\theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 6

LOCALITA': Via San Bartolo- Savignano sul Rubicone

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)

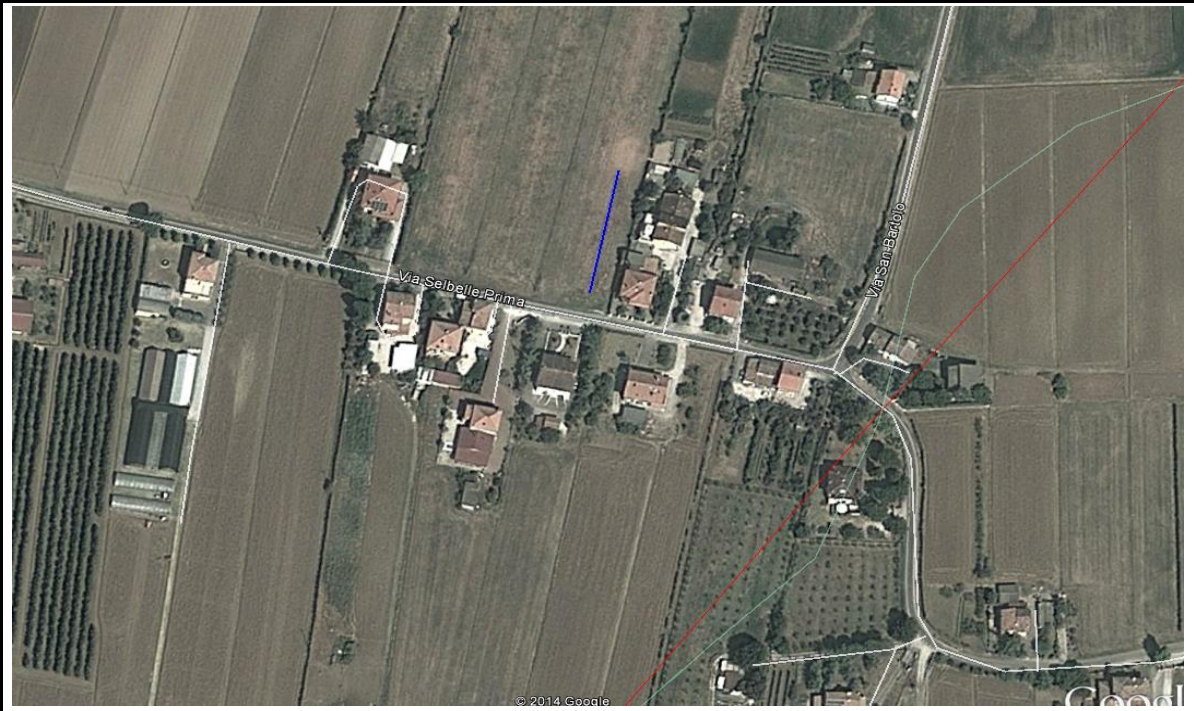


FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

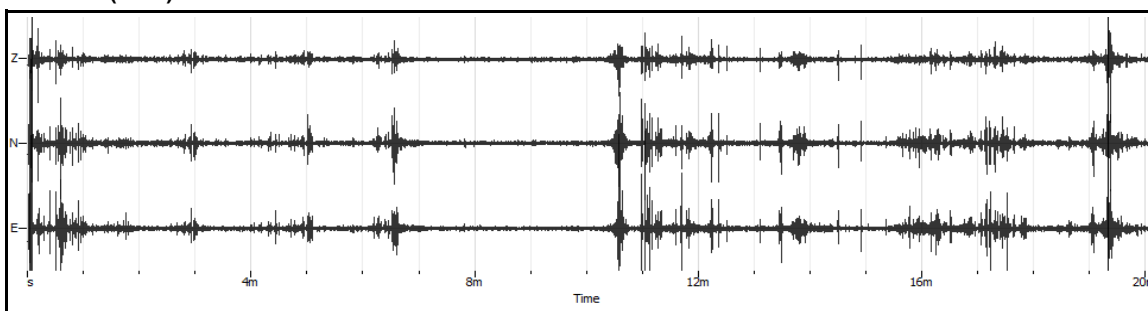
CODICE LAVORO: 1422

CODICE PROVA: Masw 6

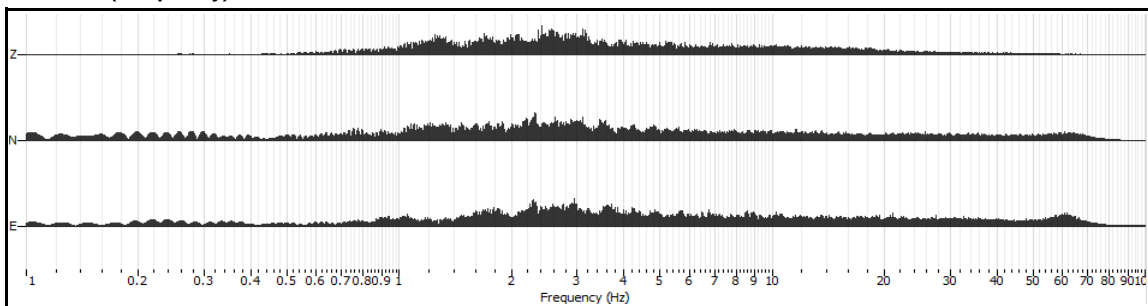
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	22

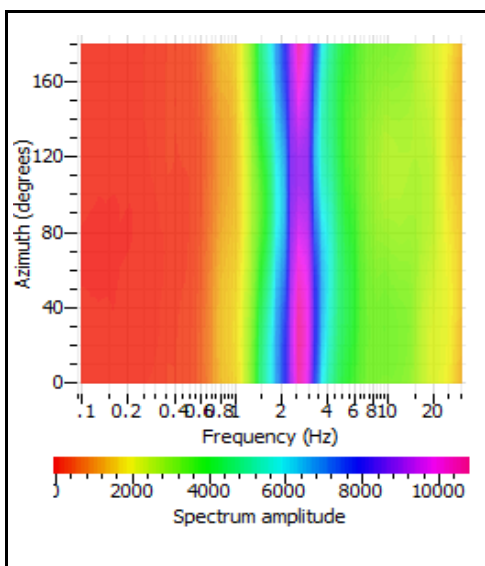
RECORD (Time)



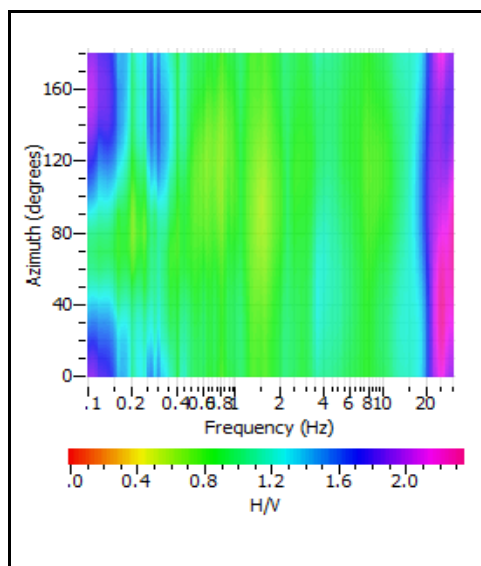
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

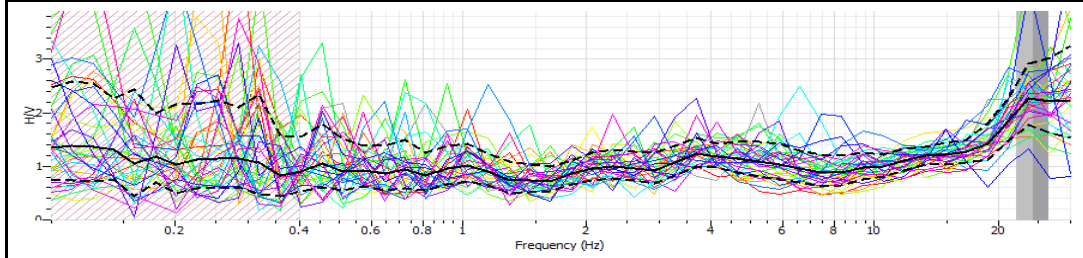


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

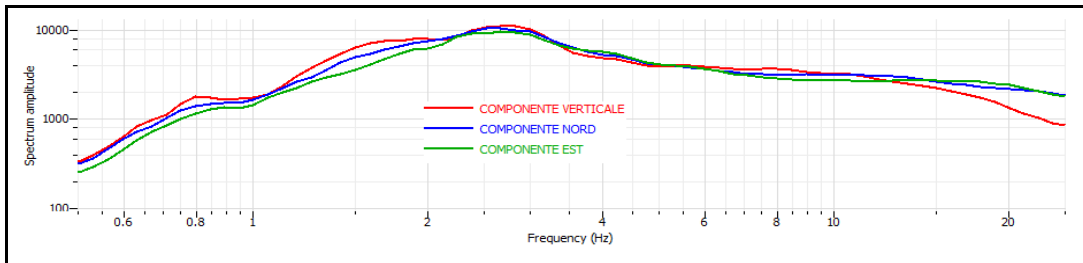
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Masw 6

RAPPORTO SPETTRALE H/V

Max HVSR 24.37 ± 2.22 Hz. A0 = 2.27



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	24.37		
Lw	20		
nw	71		
f0 > 10 / Lw	24.37 > 10/20	✓	
nc (f0) > 200	34605.4 > 200	✓	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	✓	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	11.82 Hz	✓	
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		✗
A0 > 2	2.27 > 2	✓	
fpeak [AH/V(f) ± $\sigma_A(f)$] = f0 ± 5%	-0.6008 < 0.05	✓	
$\sigma_f < \varepsilon(f_0)$	2.2201 < 1.2185		✗
$\sigma_A(f_0) < \theta(f_0)$	0.56974 < 1.58	✓	

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

Threshold value 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 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.00	2.50	2.00	1.78	1.58
Log $\theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 7

LOCALITA': Via Silvestro Lega - Savignano sul Rubicone

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

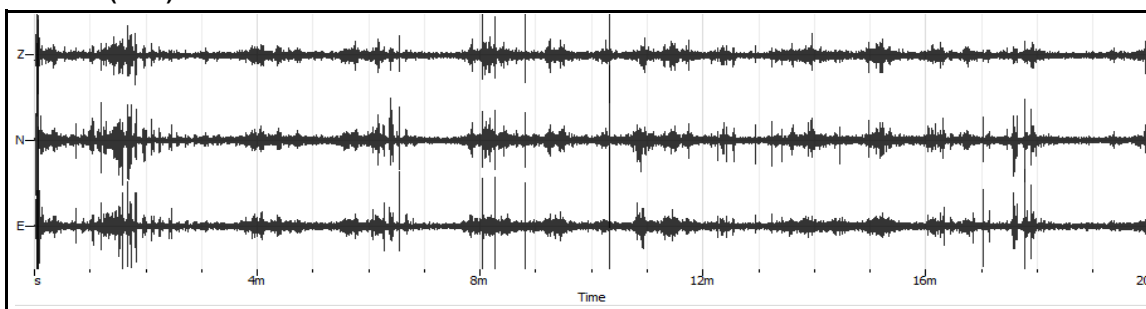
CODICE LAVORO: 1422

CODICE PROVA: Masw 7

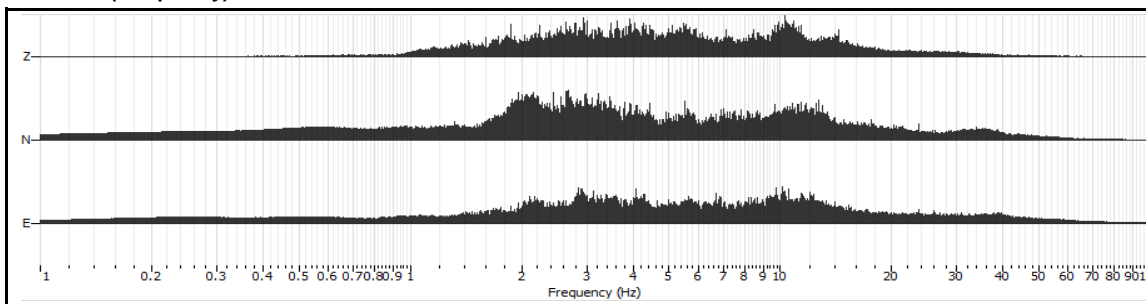
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	25

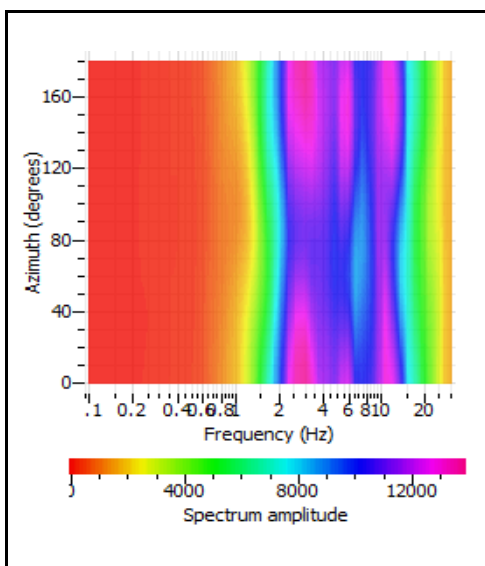
RECORD (Time)



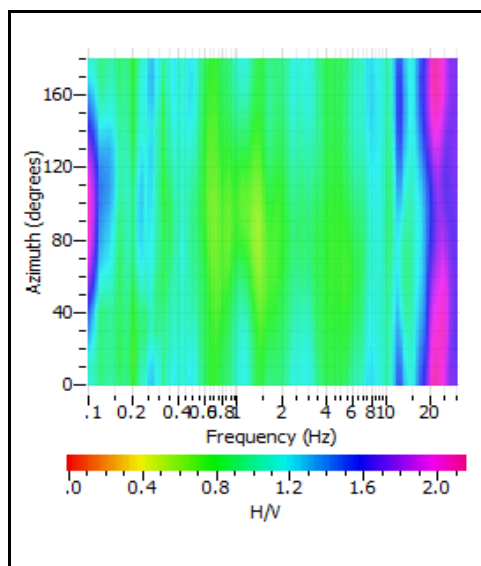
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

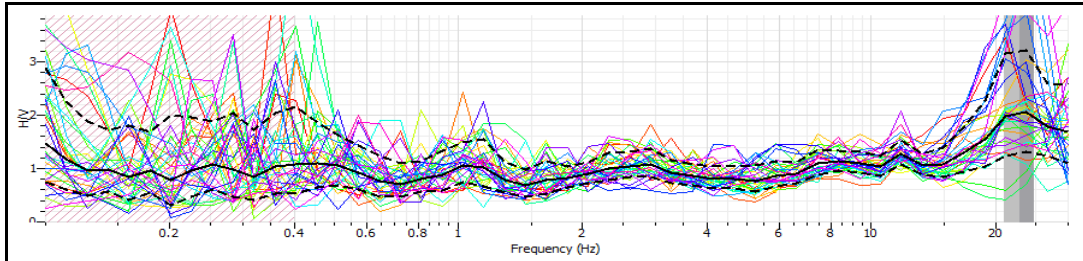


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

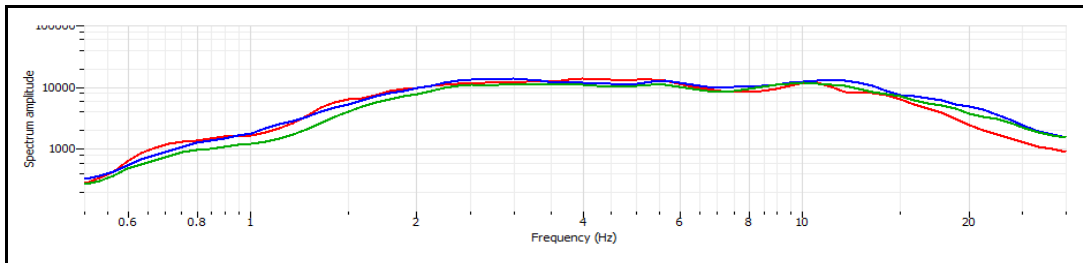
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Masw 7

RAPPORTO SPETTRALE H/V

Max HVSR 22.97 ± 1.88 Hz. A0 = 2.06



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	22.97		
Lw	20		
nw	71		
f0 > 10 / Lw	22.97 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	32617.4 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for 0.5 f0 < f < 2 f0 if f0 > 0.5 Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for 0.5 f0 < f < 2 f0 if f0 < 0.5 Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	10.52 Hz	<input checked="" type="checkbox"/>	
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	2.06 > 2	<input checked="" type="checkbox"/>	
fpeak [AH/V(f) ± $\sigma_A(f)$] = f0 ± 5%	0.799200000000003 < 0		<input checked="" type="checkbox"/>
$\sigma_f < \varepsilon(f_0)$	1.8818 < 1.1485		<input checked="" type="checkbox"/>
$\sigma_A(f_0) < \theta(f_0)$	0.95071 < 1.58	<input checked="" type="checkbox"/>	

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

Threshold value 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 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.00	2.50	2.00	1.78	1.58
Log $\theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 8

LOCALITA': Via Alfredo Binda - Gatteo

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

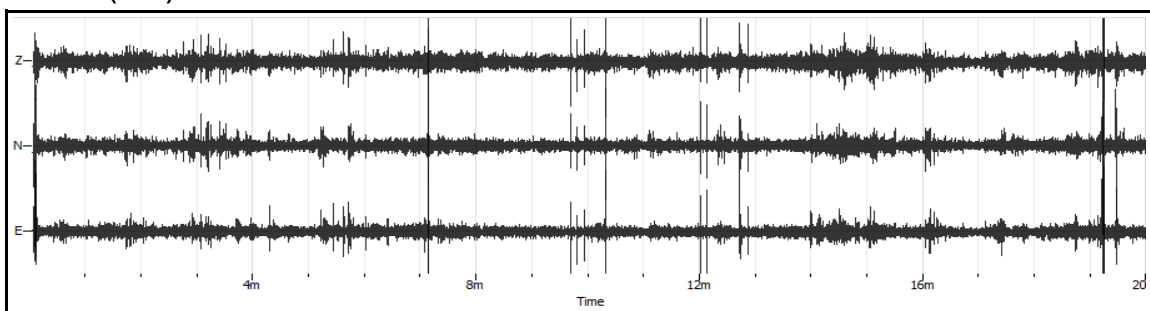
CODICE LAVORO: 1422

CODICE PROVA: Masw 8

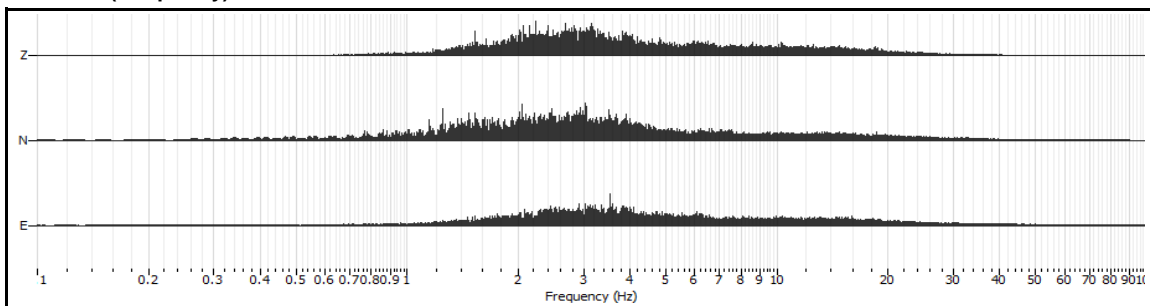
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	22

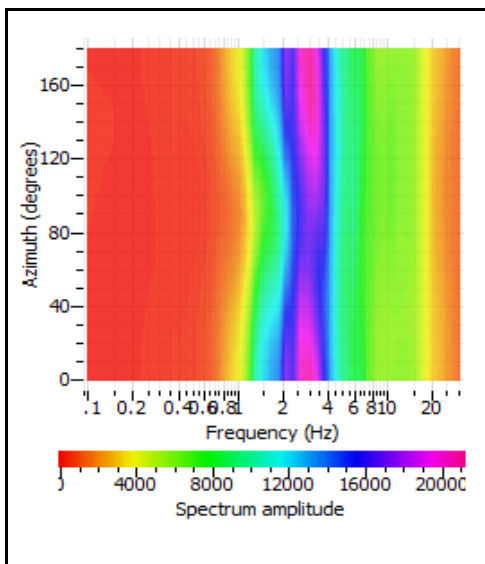
RECORD (Time)



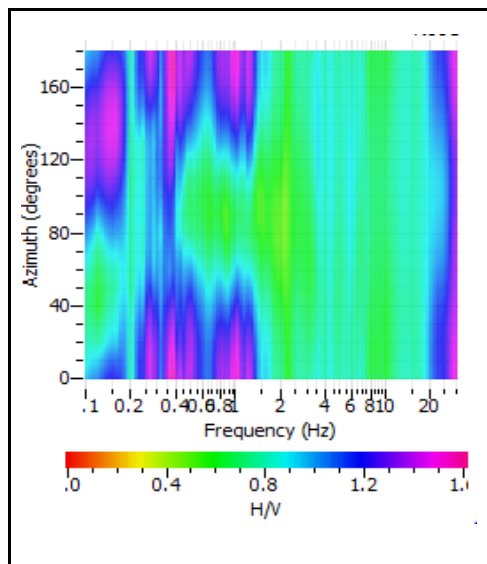
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

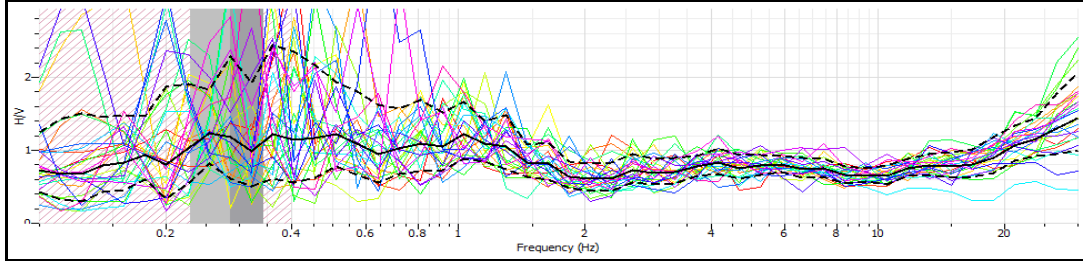


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

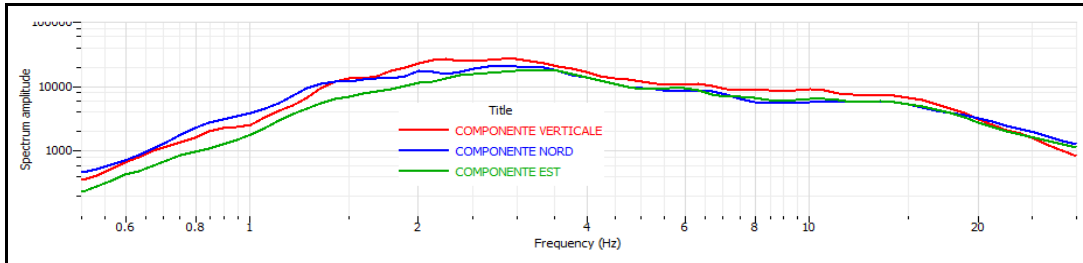
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Masw 8

RAPPORTO SPETTRALE H/V

Max HVSR 0.28 ± 0.05 Hz. A0 = 1.22



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.28		
Lw	20		
nw	71		
f0 > 10 / Lw	0.28 > 10/20		☒
nc (f0) > 200	397.6 > 200	☑	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	☑	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f' in [f0/4, f0] AH/V(f') < A0/2	0.12 Hz	☑	
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		☒
A0 > 2	1.22 > 2		☒
fpeak [AH/V(f) ± $\sigma_A(f)$] = f0 ± 5%	29.72 < 0.05		☒
$\sigma_f < \varepsilon(f_0)$	0.056282 < 0.056		☒
$\sigma_A(f_0) < \theta(f_0)$	0.529775 < 2.5	☑	

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

Threshold value 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 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.00	2.50	2.00	1.78	1.58
Log $\theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 9

LOCALITA': S.p 62 - Gatteo

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

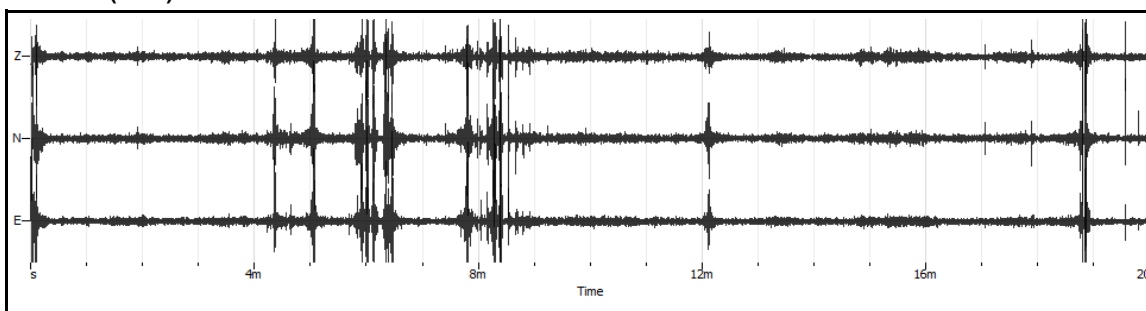
CODICE LAVORO: 1422

CODICE PROVA: Masw 9

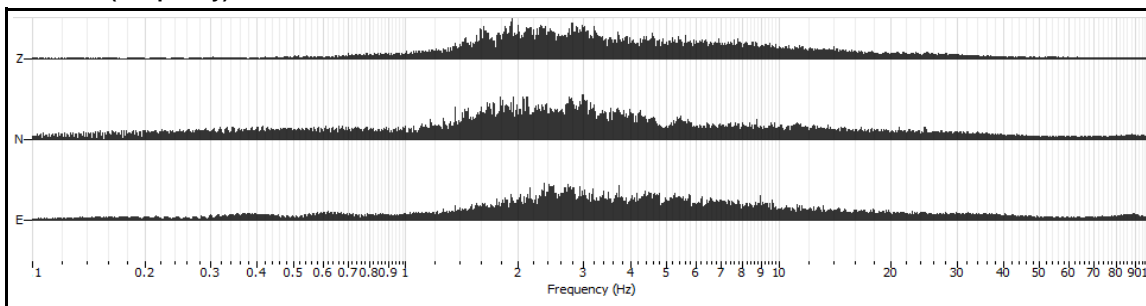
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	29

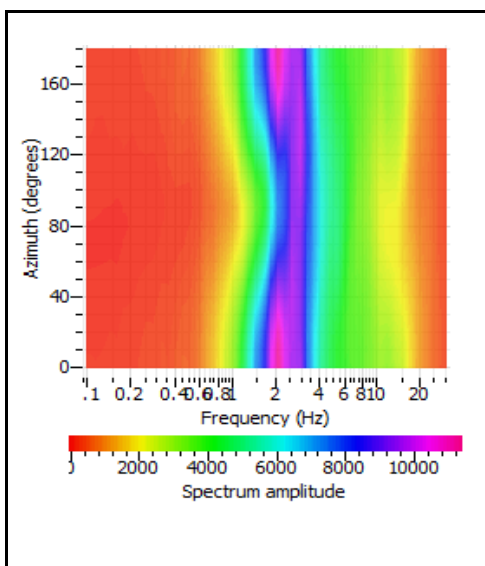
RECORD (Time)



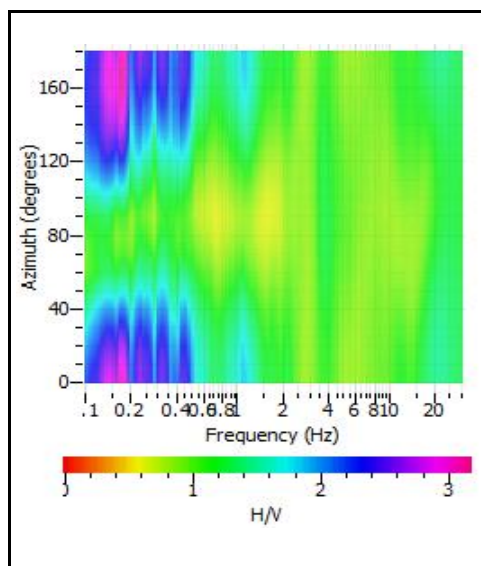
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

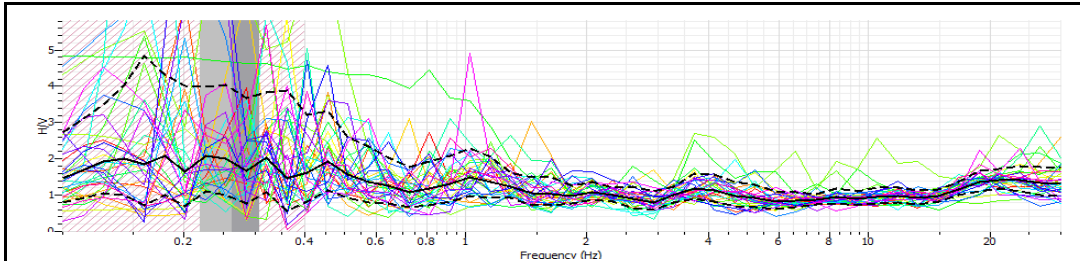


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

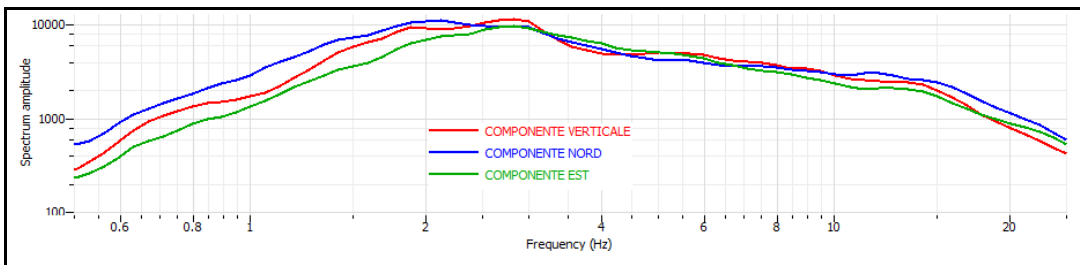
CLIENTE **UNIONE DEI COMUNI DEL RUBICONE**
 CODICE LAVORO **1422**
 CODICE PROVA **Masw 9**

RAPPORTO SPETTRALE H/V

Max HVSR 0.26 ± 0.04 Hz. A0 = 2.09



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.26		
Lw	20		
nw	71		
f0 > 10 / Lw	0.26 > 10/20		☒
nc (f0) > 200	369.2 > 200	☑	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	☑	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		☒
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		☒
A0 > 2	2.09 > 2	☑	
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	20.8973 < 0.05		☒
σf < ε(f0)	0.044615 < 0.052	☑	
σA(f0) < θ(f0)	0.276165 < 2.5	☑	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 10

LOCALITA': Via la Picozza- San Mauro Pascoli

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)

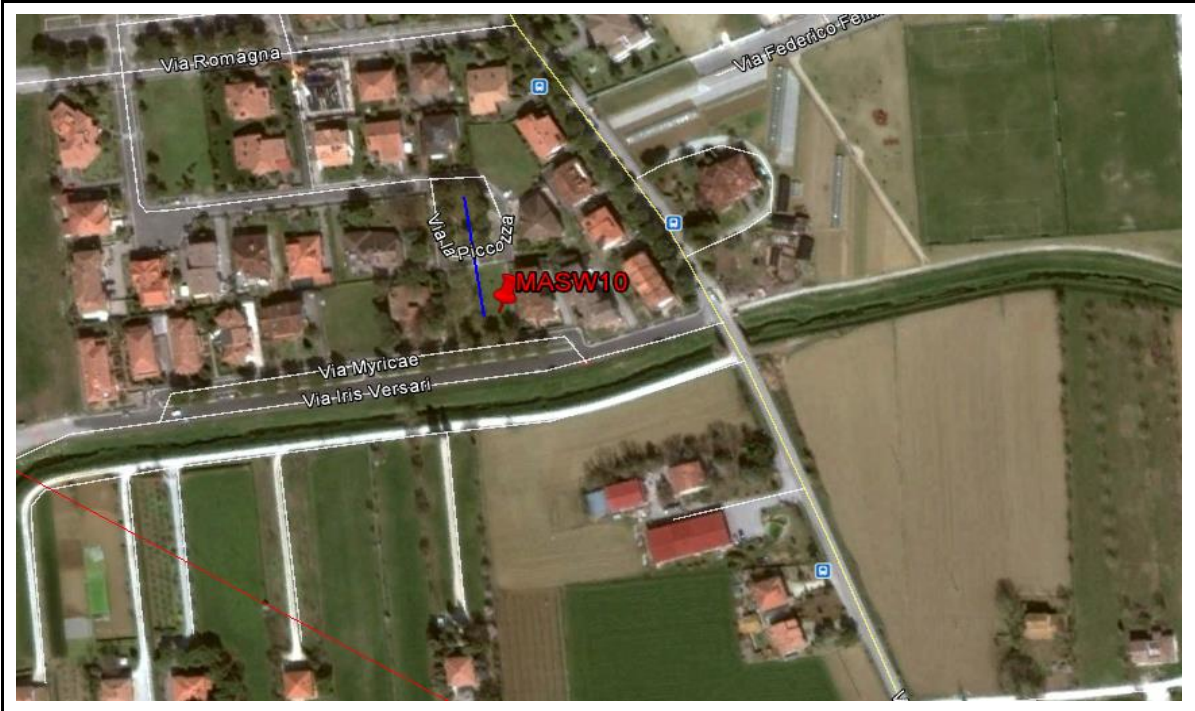


FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

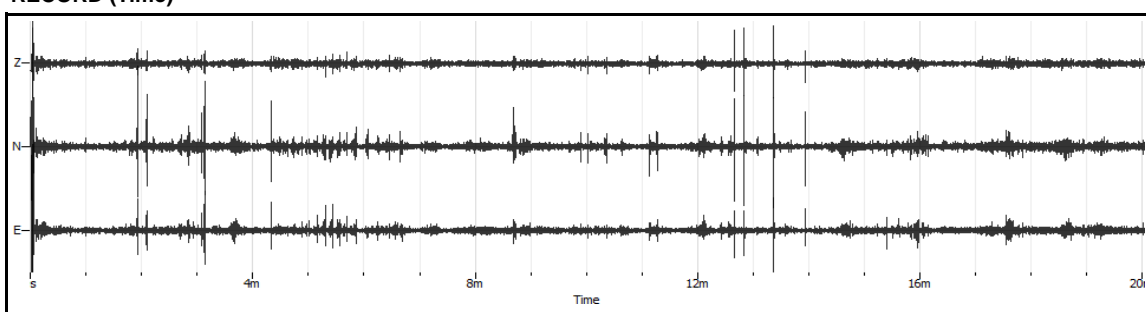
CODICE LAVORO: 1422

CODICE PROVA: Masw 10

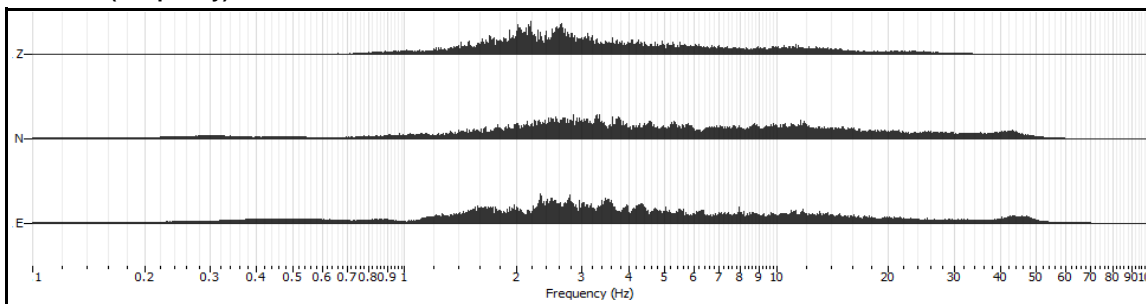
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	37

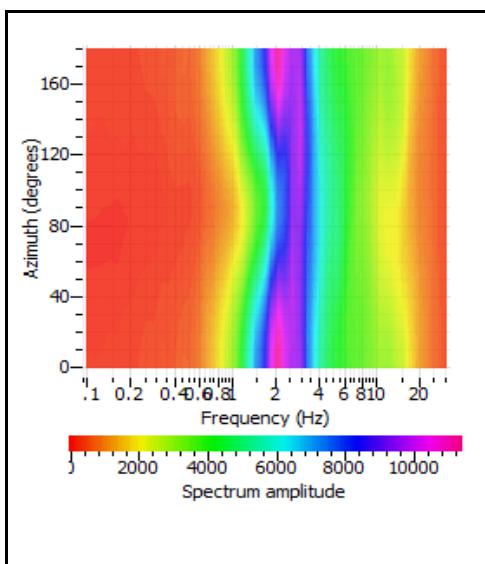
RECORD (Time)



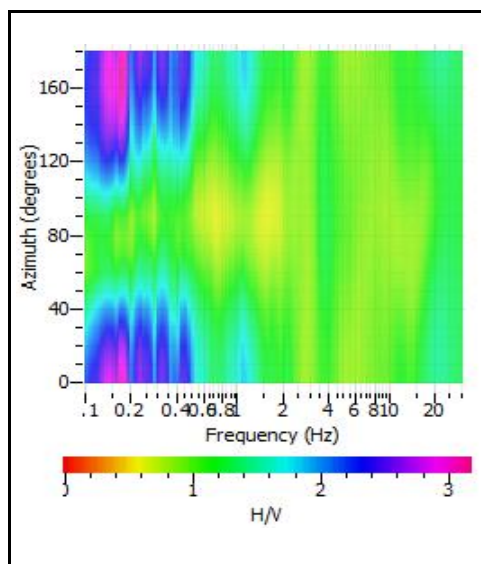
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

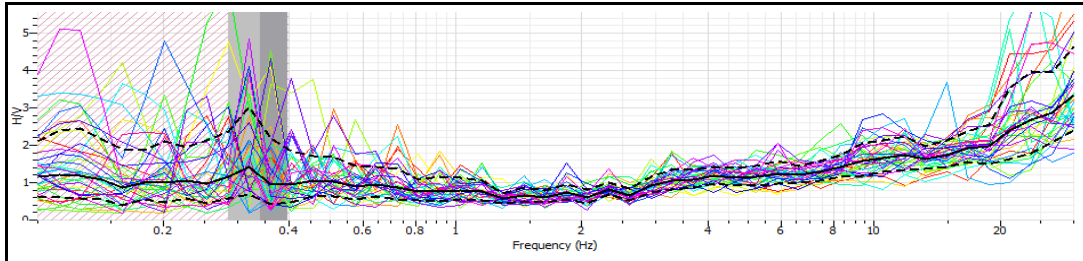


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

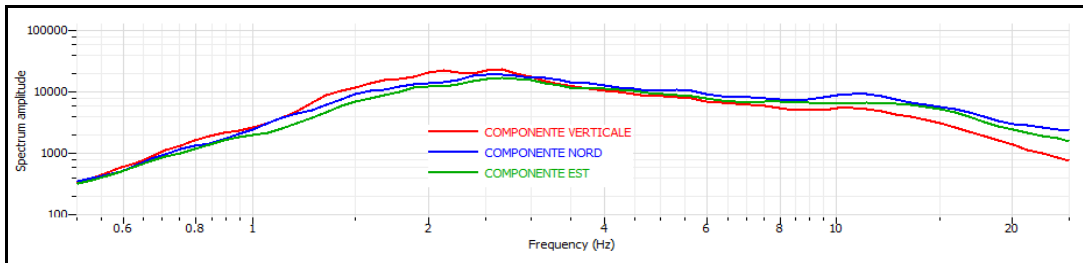
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Masw 10

RAPPORTO SPETTRALE H/V

Max HVSR 0.34 ± 0.05 Hz. A0 = 1.42



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.34		
Lw	20		
nw	71		
f0 > 10 / Lw	0.34 > 10/20		☒
nc (f0) > 200	482.8 > 200	☑	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	☑	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0.32 Hz	☑	
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0.35 Hz	☑	
A0 > 2	1.42 > 2		☒
fpeak [AH/V(f) ± $\sigma_A(f)$] = f0 ± 5%	29.66 < 0.05		☒
$\sigma < \varepsilon(f_0)$	0.055697 < 0.068	☑	
$\sigma_A(f_0) < \theta(f_0)$	1.11063 < 2.5	☑	

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

Threshold value for σ 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 f0	0.20 f0	0.15 f0	0.10 f0	0.05 f0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.00	2.50	2.00	1.78	1.58
Log $\theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSr)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 11

LOCALITA': Via Ranto 1 - Gatteo

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)

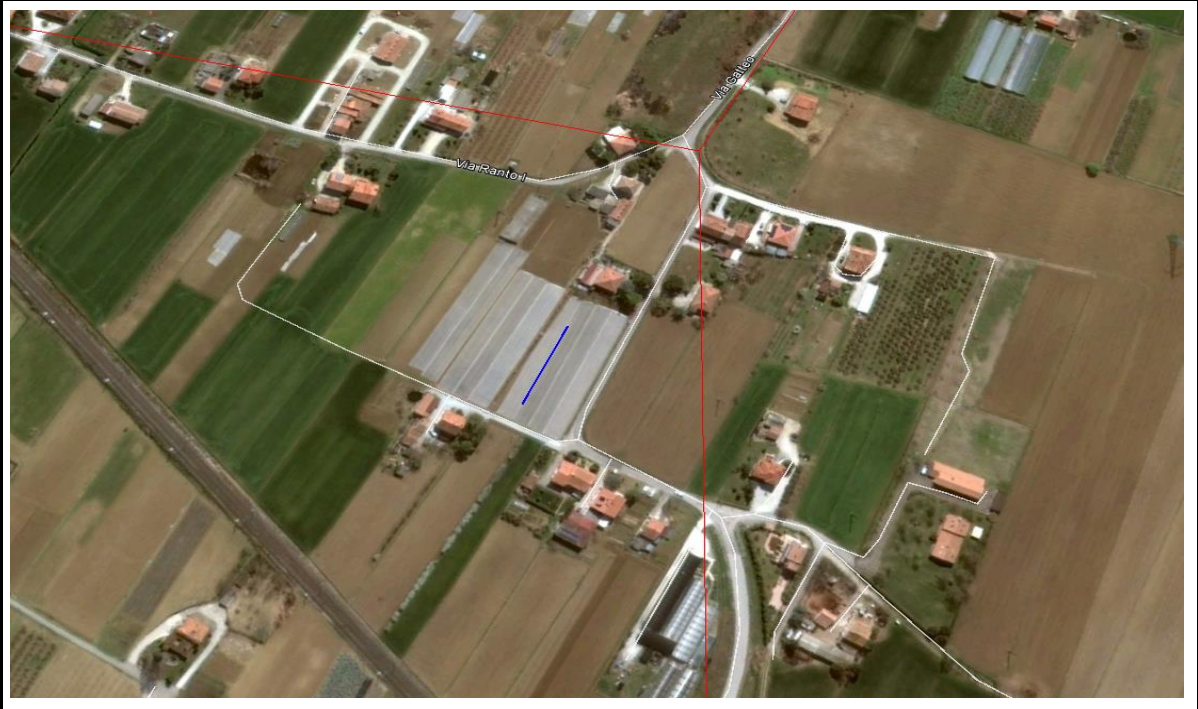


FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

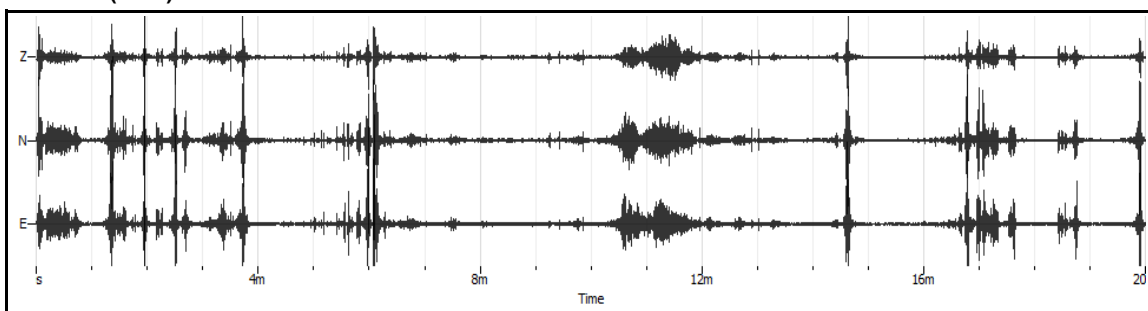
CODICE LAVORO: 1422

CODICE PROVA: Masw 11

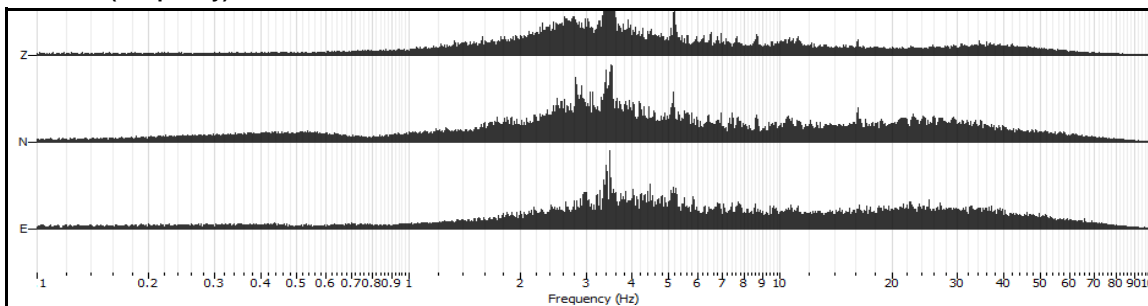
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	16

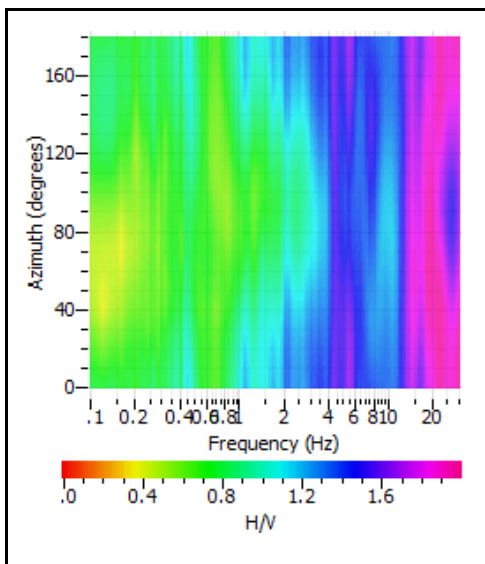
RECORD (Time)



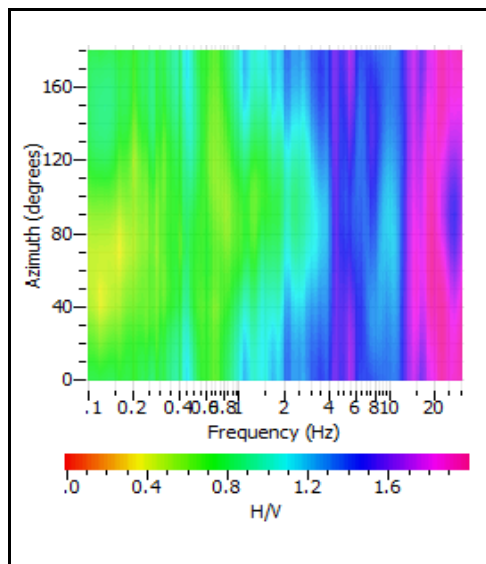
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

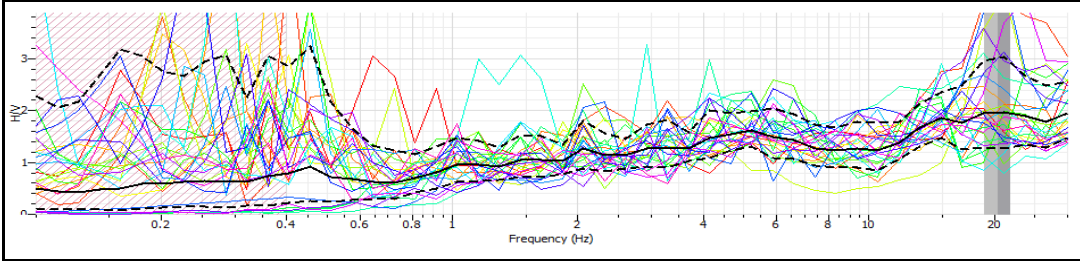


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

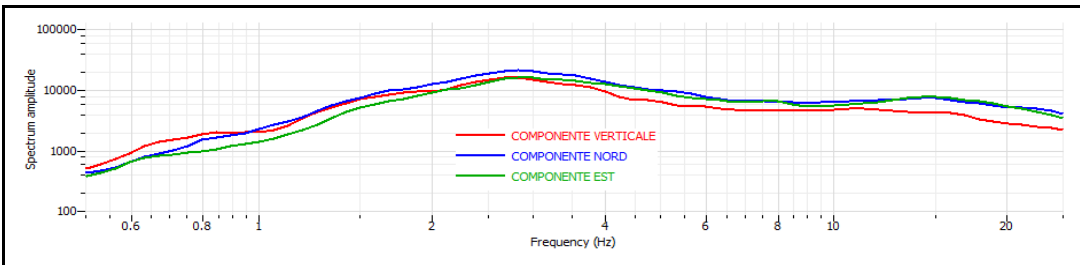
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Masw 11

RAPPORTO SPETTRALE H/V

Max HVSR 20.44 ± 1.44 Hz. A0 = 1.96



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	20.44		
Lw	20		
nw	71		
f0 > 10 / Lw	20.44 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	29024.8 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		<input checked="" type="checkbox"/>
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	1.96 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	0.717299999999998 < 0		<input checked="" type="checkbox"/>
σf < ε(f0)	1.4426 < 1.022		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.884425 < 1.58	<input checked="" type="checkbox"/>	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 12

LOCALITA': Via Ravenna - Savignano sul Rubicone

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

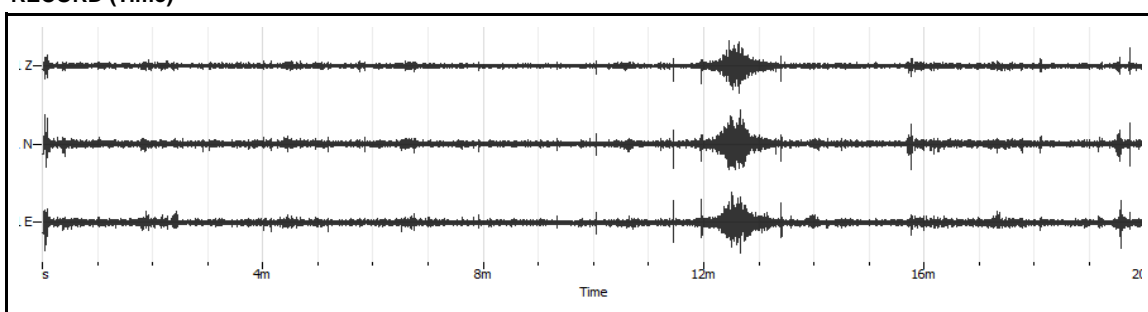
CODICE LAVORO: 1422

CODICE PROVA: Masw 12

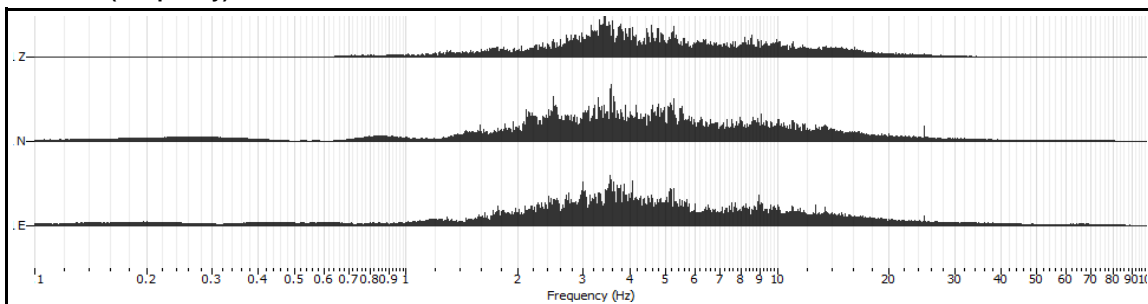
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	29

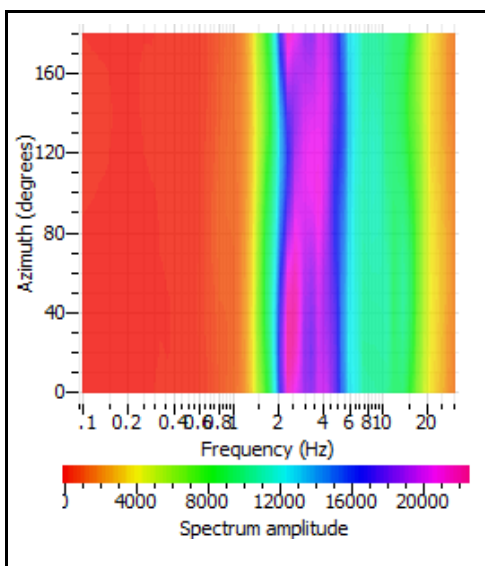
RECORD (Time)



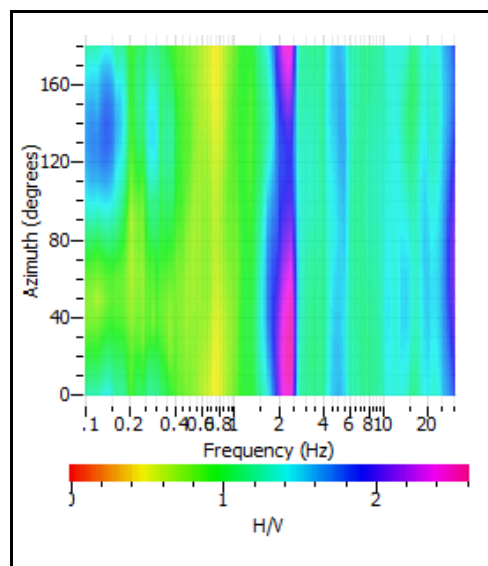
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

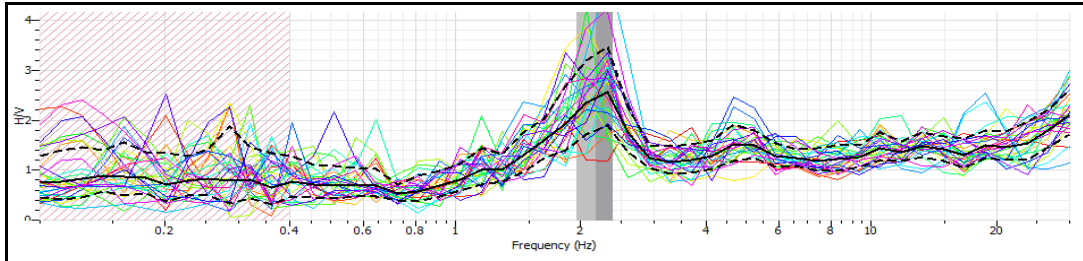


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

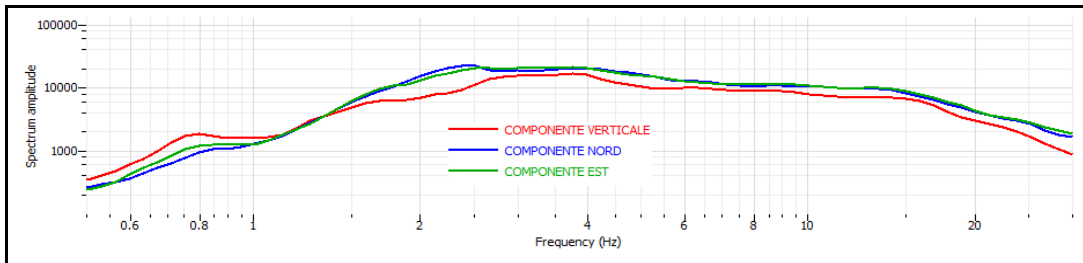
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Masw 12

RAPPORTO SPETTRALE H/V

Max HVSR 2.17 ± 0.21 Hz. $A0 = 2.1$



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	2.17		
Lw	20		
nw	71		
f0 > 10 / Lw	2.17 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	3081.4 > 200	<input checked="" type="checkbox"/>	
$\sigma A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	1.29 Hz	<input checked="" type="checkbox"/>	
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	2.1 > 2	<input checked="" type="checkbox"/>	
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	27.83 < 0.05		<input checked="" type="checkbox"/>
σf < ε(f0)	0.21317 < 0.1085		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.443845 < 1.58	<input checked="" type="checkbox"/>	

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

Threshold value for σf and σA(f0)

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 13

LOCALITA': S.p 33 - Gatteo

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)

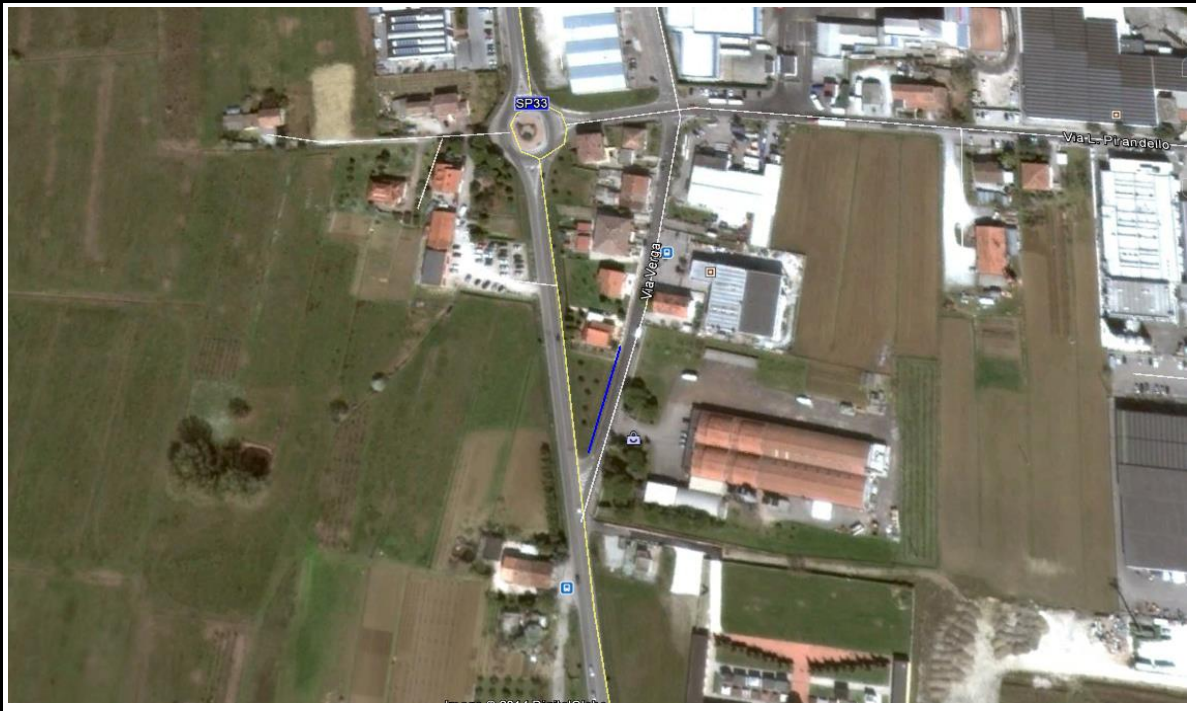


FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

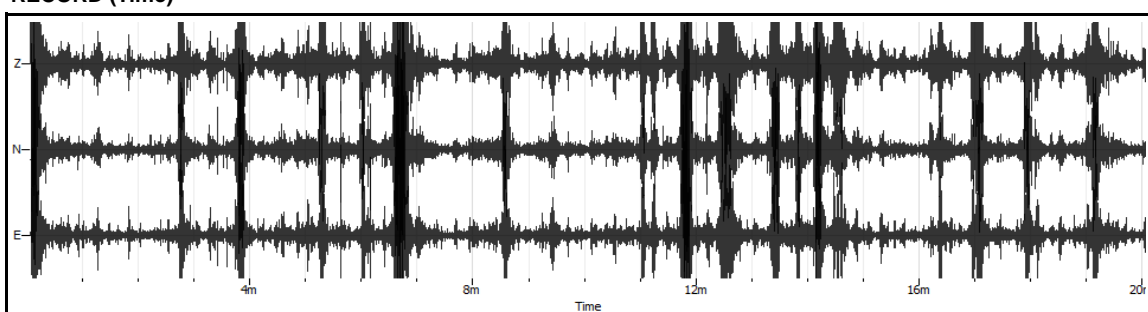
CODICE LAVORO: 1422

CODICE PROVA: Masw 13

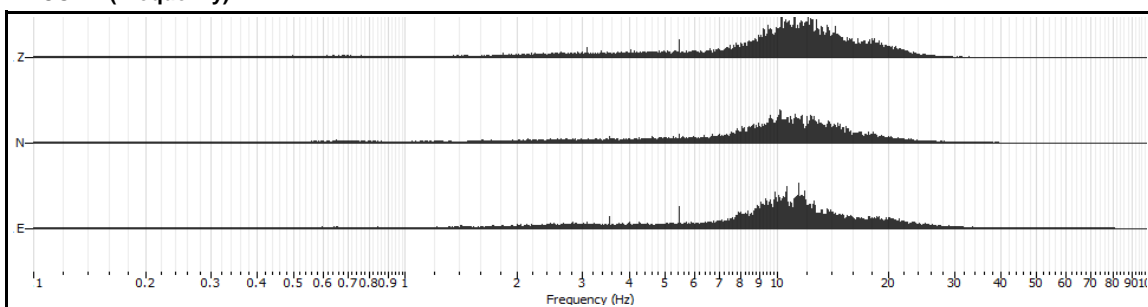
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	37

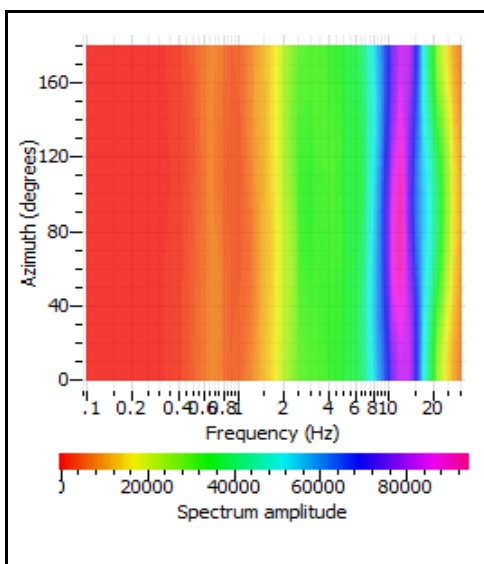
RECORD (Time)



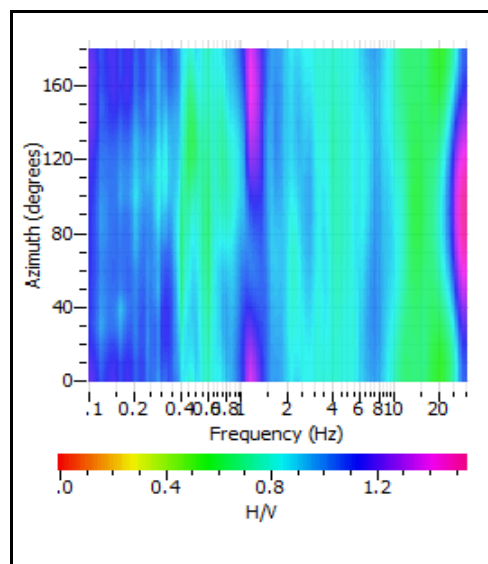
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

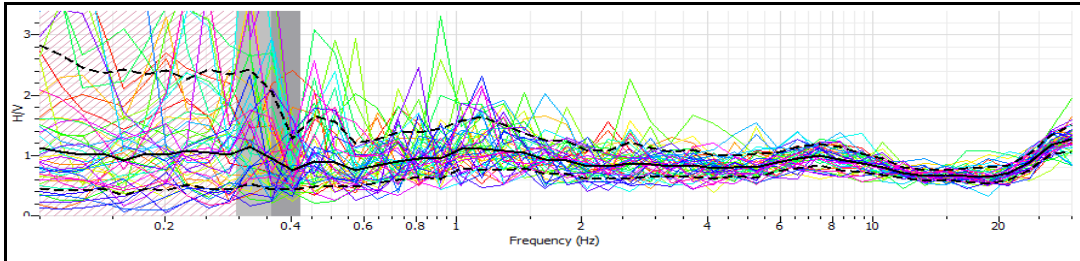


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

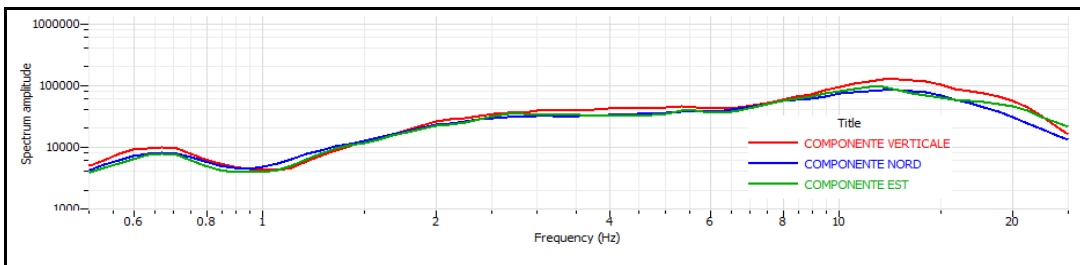
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Masw 13

RAPPORTO SPETTRALE H/V

Max HVSR 0.35 ± 0.06 Hz. A0 = 1.26



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	0.35		
Lw	20		
nw	71		
f0 > 10 / Lw	0.35 > 10/20		☒
nc (f0) > 200	497 > 200	☑	
$\sigma A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	☑	
$\sigma A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	0 Hz		☒
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		☒
A0 > 2	1.26 > 2		☒
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	29.65 < 0.05		☒
σf < ε(f0)	0.064099 < 0.07	☑	
σA(f0) < θ(f0)	0.220715 < 2.5	☑	

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

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

RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

CODICE LAVORO: 1422

CODICE PROVA: Masw 14

LOCALITA': Via Lombardia - Savignano sul Rubicone

DATA PROVA: 20/6/2014

LONGITUDINE: 12.317734°

LATITUDINE: 44.061852°

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

TERRENO DI MISURA: Naturale soffice

ACCOPIAMENTO: Con piedini metallici

ORIENTAMENTO: Nord

CONDIZIONI METEO: Variabile

FOTO AEREA (Google Earth)



FOTO AREA DI INDAGINE



RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

CLIENTE: UNIONE DEI COMUNI DEL RUBICONE

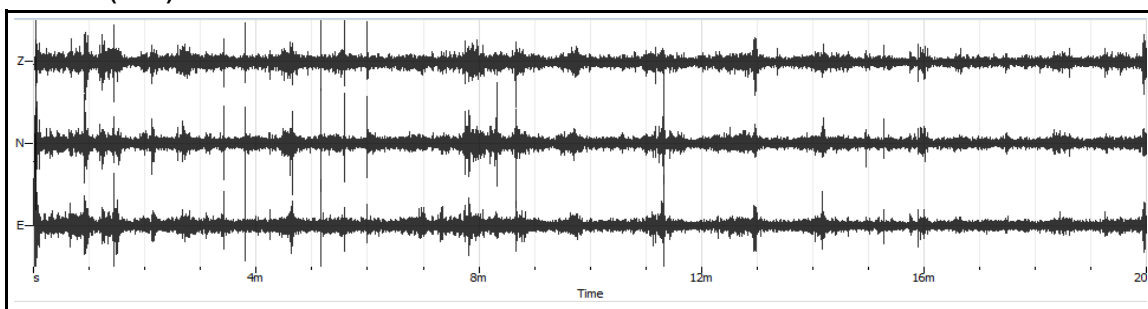
CODICE LAVORO: 1422

CODICE PROVA: Masw 14

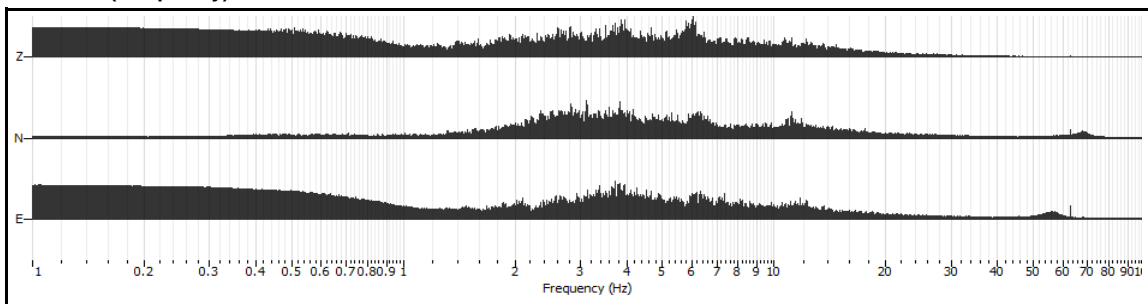
PARAMETRI DI ACQUISIZIONE	
Apparecchiatura di misura	Sara SL 07
Lunghezza registrazione	20 min
Fine registrazione	11:20:00
Frequenza di campionamento	200 Hz

PARAMETRI DI ELABORAZIONE	
Windows lenght (sec)	20
Overlap	5%
Smoothing windows	Konno & Ohmachi
Costant	40
Taper	0.5%
Low Pass	15 Hz
N° of windows	44

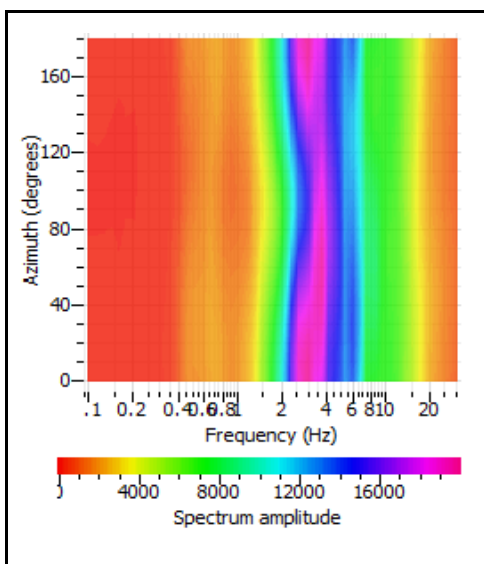
RECORD (Time)



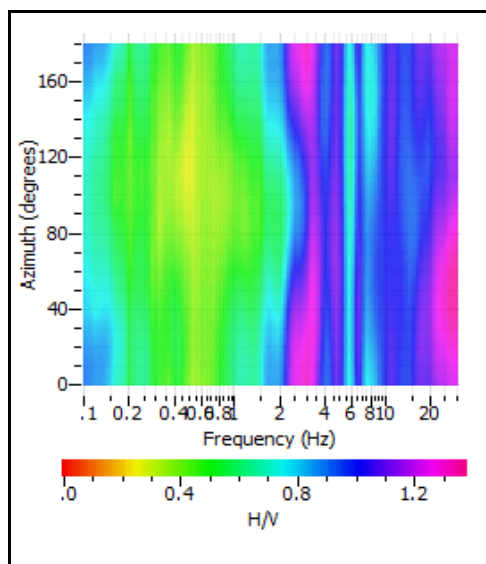
RECORD (Frequency)



HORIZONTAL SPECTRUM ROTATE



HV ROTATE RESULTS

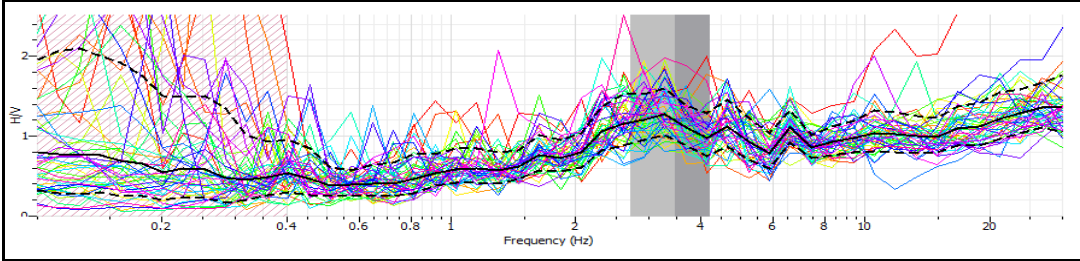


RAPPORTO SPETTRALE A STAZIONE SINGOLA (HVSR)

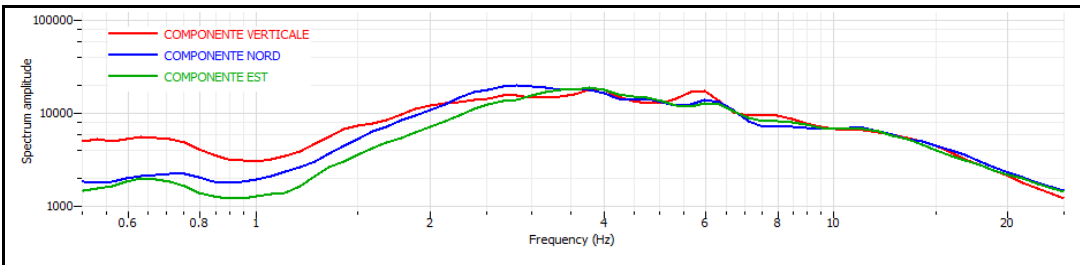
CLIENTE UNIONE DEI COMUNI DEL RUBICONE
 CODICE LAVORO 1422
 CODICE PROVA Masw 14

RAPPORTO SPETTRALE H/V

Max HVSR 3.47 ± 0.75 Hz. A0 = 1.35



SPETTRO SINGOLE COMPONENTI



Criteri per una curva H/V affidabile

[tutti 3 dovrebbero risultare soddisfatti]

f0	3.47		
Lw	20		
nw	71		
f0 > 10 / Lw	3.47 > 10/20	<input checked="" type="checkbox"/>	
nc (f0) > 200	4927.4 > 200	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 2$ for $0.5 f_0 < f < 2 f_0$ if $f_0 > 0.5$ Hz	Exceeded 0 out of 50 times	<input checked="" type="checkbox"/>	
$\sigma_A(f) < 3$ for $0.5 f_0 < f < 2 f_0$ if $f_0 < 0.5$ Hz			

Criteri per un picco H/V chiaro

[almeno 5 su 6 dovrebbero essere soddisfatti]

Exists f in [f0/4, f0] AH/V(f) < A0/2	1.45 Hz	<input checked="" type="checkbox"/>	
Exists f+ in [4f0, f0] AH/V(f+) < A0/2	0 Hz		<input checked="" type="checkbox"/>
A0 > 2	1.35 > 2		<input checked="" type="checkbox"/>
fpeak [AH/V(f) ± σA(f)] = f0 ± 5%	26.53 < 0.05		<input checked="" type="checkbox"/>
σf < ε(f0)	0.75474 < 0.1735		<input checked="" type="checkbox"/>
σA(f0) < θ(f0)	0.360605 < 1.58	<input checked="" type="checkbox"/>	

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

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