CITTÀ DI
FIGLINE E INCISA
VALDARNO

PIANO STRUTTURALE

APPROVAZIONE

DELIBERAZIONE CC N.

IS2.9 MS1 - Relazione sulle Indagini geofisiche

Figline Valdarno

Sindaca e Assessora alla Pianificazione Territoriale
Giulia Mugnai

Garante dell'Informazione e della Partecipazione
Samuele Venturi

Responsabile del Procedimento
Angela Rosati

GRUPPO DI PROGETTAZIONE

Progetto urbanistico e Coordinamento tecnico
Piazza Luciano - PIAZZASTUDIO

Collaboratore
Stefano Casali

Aspetti geologici e sismici
Luca Pagliazzi - GHEA S.r.l. Engineering & Consulting

Collaboratore
Serena Vannetti

Aspetti ecosistemici e agroforestali
Cristina Castelli, Alberto Chiti Batelli, Michele Giunti
NEMO Nature and Environment Management Operators S.r.l.

Aspetti idrologici e idraulici
Tiziano Staiano - HYDROGEO Ingegneria S.r.l.

Valutazione Ambientale Strategica e Studio di Incidenza
Alberto Chiti Batelli, Leonardo Lombardi
NEMO Nature and Environment Management Operators S.r.l.

Supporto tecnico - Servizio Pianificazione Urbanistica

Responsabile
Angela Rosati

Tecnici
Fabio Bianchi
Lucia Carli
Marco Catelani
Anna Di Maso
Francesco Poggesi

INDAGINI GEOFISICHE DI SISMICA PASSIVA HVSR, ESAC E SISMICA ATTIVA MASW, RIFRAZIONE PER LA MICROZONAZIONE SISMICA

Ubicazione: Comune di Figline - Incisa Valdarno (FI)

Loc. Burchio, Figline, Lagaccioni, Lo Stecco, Madonna del Cesto, Matassino, Poggio alla Croce, Poggiolino, Ponte agli Stolli, Porcellino, Restone.

Poggibonsi, Gennaio 2016

PREMESSA

Su incarico della società Ghea engineering & consulting s.r.l., è stata svolta una campagna di indagine sismica, estesa al territorio comunale di Figline Valdarno (FI), nell'ambito di un progetto di studio di microzonazione sismica di primo livello. La campagna, ha previsto la realizzazione di 66 misure di sismica passiva con tecnica a "stazione singola", 2 misure di sismica passiva acquisite con array bidimensionali elaborati in modalità ESAC, 1 misura di sismica attiva acquisita con array monodimensionale e tecnica MASW, 1 misura di sismica attiva e tecnica a Rifrazione.

Le misure sono state distribuite nei principali centri abitati del Comune di Figline, Burchio, Lagaccioni, Lo Stecco, Madonna del Cesto, Matassino, Poggio alla Croce, Poggiolino, Ponte agli Stolli, Porcellino, Restone ed ubicate secondo lo schema successivamente riportato.

Di seguito vengono esposte le basi teoriche della metodologia adottata, le specifiche tecniche dello strumento utilizzato ed infine i risultati ottenuti.

INTRODUZIONE

L'andamento delle velocità di propagazione delle onde di taglio nel primo sottosuolo (profilo delle Vs) rappresenta in generale un'informazione importante ai fini della caratterizzazione meccanica (in campo dinamico) dei terreni. In particolare essa risulta fondamentale negli studi della risposta sismica locale. A seguito di un terremoto, si ha spesso modo di osservare come la distribuzione dei danni sul territorio sia assai eterogenea a parità di vulnerabilità dell'edificato. Le condizioni geologico-tecniche degli strati più superficiali, nonché le caratteristiche geomorfologiche possono concorrere, infatti, ad accrescere localmente lo scuotimento indotto da un terremoto. Per un'efficace azione di prevenzione, in materia di rischio sismico, è necessario tener conto non solo, quindi, della zonazione sismica nazionale, ma anche di eventuali sfavorevoli condizioni locali, a scala intra-comunale.

Particolarmente rilevanti sono i cosiddetti effetti di amplificazione di sito, ossia l'insieme delle variazioni in ampiezza, durata e contenuto in frequenza che un moto sismico, rispetto ad una formazione rocciosa di base, subisce attraversando gli strati sovrastanti, fino alla superficie. Tali effetti sono causati, essenzialmente, da un processo di intrappolamento e risonanza dell'energia del terremoto all'interno di un volume di sottosuolo costituito da materiali sedimentari a bassa impedenza sismica (IS: prodotto della velocità di propagazione dell'onda per la densità del mezzo attraversato) e posto sopra ad un dominio con più alta IS, per esempio un substrato roccioso o un suolo particolarmente rigido. Durante la propagazione dalla sorgente al sito, il raggio sismico, per via del fenomeno della rifrazione, subisce un processo di verticalizzazione e tende ad emergere lungo una direzione sub-verticale. Le onde compressionali (P), dunque, sollecitano all'incirca

verticalmente l'edificato, tuttavia è la sollecitazione orizzontale, dovuta alle onde trasversali (S), la causa principale del danneggiamento per le costruzioni. Gli edifici e le opere architettoniche in genere sono collaudate per resistere a forti carichi statici ma quasi mai viene valutata la risposta della costruzione a carichi dinamici orizzontali. Da quanto detto si deduce che studiare le modalità di propagazione ed amplificazione delle onde trasversali o di taglio (S) nel sottosuolo vuol dire prevedere, a basso costo, le sollecitazioni che una struttura dovrà sopportare durante il verificarsi di un probabile evento sismico. Tra le metodologie che consentono di ricavare il profilo Vs del sottosuolo stanno suscitando particolare interesse quelle definite di tipo "passivo" ovvero basate sullo studio della continua vibrazione del suolo dovuta a cause sia antropiche che naturali (Vibrazioni Ambientali). Tali tecniche consentono di misurare le velocità di propagazione delle onde sismiche già presenti nel terreno per effetto di sorgenti naturali (p.es. il vento e le mareggiate) o antropiche (p.es. il traffico cittadino e l'attività industriale). A parità di caratteristiche degli stendimenti e dei sensori, le metodologie di tipo "passivo" raggiungono profondità di esplorazione di gran lunga superiori a qualsiasi altra tecnica sismica. Le più comuni tecniche "attive", infatti, (quali la rifrazione e la riflessione) non sono in grado di indagare spessori di terreno superiori a qualche decina di metri. Quanto detto dipende dal fatto che, questa tipologia di indagini, registra le velocità di propagazione dei segnali generati artificialmente da sorgenti controllate a bassa energia (colpo di martello per esempio) che non garantiscono una penetrazione delle onde nel sottosuolo tale da giustificare profondità d'esplorazione superiori a quelle precedentemente indicate.

Al contrario le metodologie "passive", sfruttando sorgenti energeticamente importanti (si pensi alle onde marine), oltre ad essere caratterizzate da profondità di espolorazione dell'ordine delle centinaia di metri, sono particolarmente adatte ad essere applicate in aree urbane, poiché sfruttando quella porzione di segnale che gli altri metodi geofisici scartano, difficilmente soffrono per un basso rapporto tra segnale e rumore. Se da un lato, quindi, le tecniche "passive" dimostrano numerosi vantaggi applicativi, d'altro canto il fatto che le sorgenti non siano note e controllate comporta una inferiore precisione delle misure che si traduce in notevoli ambiguità in fase di elaborazione dati. Le registrazioni di Vibrazioni Ambientali sono caratterizzate spesso da forti incertezze e si dimostrano efficaci nel momento in cui si parte almeno da una sommaria conoscenza delle litologie in esame che permetta di scartare i risultati più improbabili. In quest'ottica, tuttavia questi metodi sono applicazioni molto potenti poiché consentono di caratterizzare in tempi brevi e costi relativamente contenuti, non solo grandi spessori di sottosuolo ma anche estese aree in pianta. Di seguito vengono esposti i principi teorici delle due principali tecniche di acquisizione dati di Vibrazioni Ambientali (Antenna Sismica e HVSR).

PRINCIPI TEORICI DELLE TECNICHE ADOTTATE

Misure su "Antenna Sismica" (ESAC)

La metodologia consiste nel valutare i tempi di arrivo delle diverse onde sismiche a un insieme di sensori (geofoni) posti alla superficie del terreno. Questi sensori possono essere distribuiti secondo geometrie variabili fino a coprire distanze dell'ordine delle decine di metri (antenna sismica). Il segnale registrato, dovuto alle Vibrazioni Ambientali, risulta un insieme articolato di fasi sismiche dove tuttavia le onde superficiali (Sw) rappresentano la fase energeticamente prevalente e dunque più facilmente analizzabile. Oggetto di studio di tali metodi sono proprio le Sw, dunque, ed in particolare la loro caratteristica propagazione dispersiva in mezzi stratificati.

In termini qualitativi, la dispersione delle onde Sw può essere spiegata come segue. Onde superficiali di diversa frequenza (f) si propagano interessando volumi di terreno fino ad una profondità circa pari alla loro lunghezza d'onda (λ). La velocità di propagazione (v) sarà strettamente dipendente dalle proprietà fisiche degli strati coinvolti. Giacché f e λ sono correlate da una semplice relazione, si ha che onde Sw ad alta frequenza avranno tendenzialmente una minore lunghezza d'onda e si propagheranno nei livelli di terreno più superficiali, viceversa onde a bassa frequenza interesseranno strati più profondi. Ne deriva anche che differenti componenti armoniche delle onde superficiali avranno diverse velocità di propagazione. La funzione che associa la velocità di propagazione alla frequenza è detta curva di dispersione; essa è univocamente correlata alla struttura meccanico-stratigrafica del sito e può essere ricavata attraverso differenti metodologie di elaborazione dei dati acquisiti in campagna (ESAC, FK, HR) [**Ohori et al., 2002]** . La figura 1 mostra un esempio di antenna sismica mentre viene acquisita e una curva tipica di dispersione.

Dispersion curve

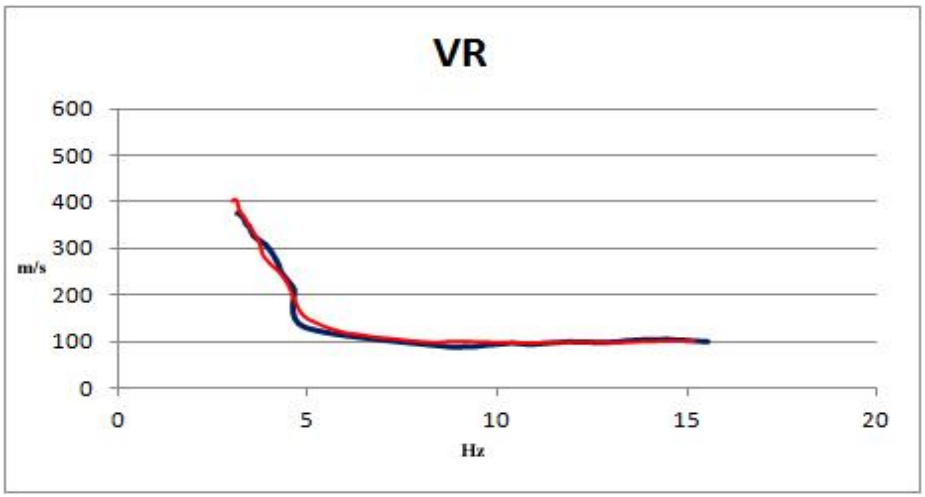


Figura 1: Esempio di misura realizzata con la tecnica dell'antenna sismica. Nella foto, si può osservare la disposizione dei sensori nella misura di Figline; nel grafico un match tra la curva sperimentale (blu) e la curva teorica (rossa) ricavata con il processo di inversione.

Considerando che le onde superficiali sono essenzialmente un prodotto delle onde di volume ed in particolar modo delle onde trasversali (S), attraverso opportune procedure numeriche, definite di inversione, è possibile infine risalire al profilo di velocità Vs nel sottosuolo partendo dalla curva di dispersione ricavata dai dati acquisiti in campagna. [**Pileggi et al., 2011]**

Metodologia a "Stazione Singola"(HVSR)

Accanto alle tecniche basate sull'impiego di una antenna sismica esistono altre tecniche basate sull'uso di una singola stazione di misura. In questo caso vengono misurate le vibrazioni ambientali nelle tre direzioni dello spazio attraverso un unico sensore tridirezionale posto sulla superfice del terreno. In particolare viene valutato il rapporto di ampiezza fra le componenti orizzontali e verticali del moto (metodo HVSR ovvero "Horizontal to Vertical Spectral Ratios") [**Bard., 1998]** . Analizzando misure di questo tipo è possibile identificare le modalità di vibrazione del terreno. In particolare è possibile individuare la frequenza f di questa vibrazione definita di "Risonanza". Sapendo che in generale esiste una relazione semplice fra f, lo spessore della parte più soffice del terreno e la velocità media delle onde sismiche nel sottosuolo (ricavata per esempio dai metodi con antenna), attraverso le misure HVSR è possibile risalire allo spessore di questo strato.

In figura 2 viene mostrato un esempio di misura a stazione singola e la curva HVSR corrispondente. Il massimo della curva HVSR indica la frequenza fondamentale di risonanza del sito.

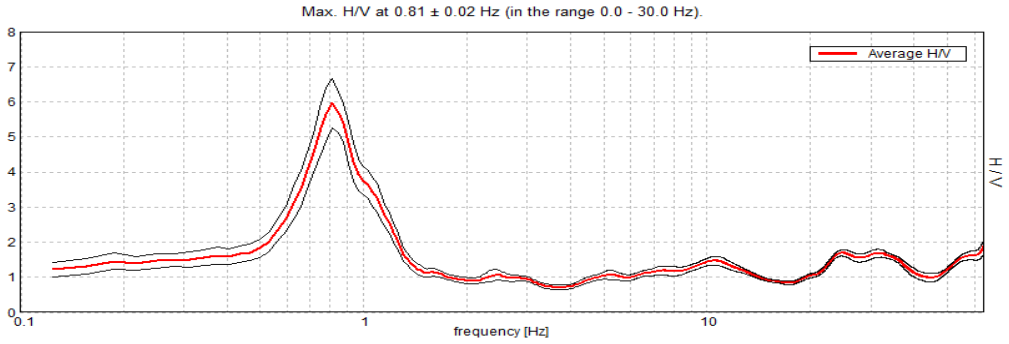


Figura 2: Esempio di misura realizzata con la tecnica a stazione singola. Nella foto, si può osservare il sensore tridirezionale e la curva dei rapporti spettrali.

Questa tipologia di misure può contribuire, inoltre, a ridurre la variabilità dovuta alla non unicità della soluzione del problema inverso realizzando una procedura d'inversione congiunta della curva di dispersione ricavata con le antenne sismiche e della curva HVSR [**Pileggi et al., 2011].**

Metodologia sismica tecnica "MASW"

La prova MASW, messa a punto nel 1999 da ricercatori del Kansas Geological Survey (Park et al., 1999) permette di determinare in modo dettagliato l'andamento della velocità delle onde sismiche di taglio (o onde S) in funzione della profondità attraverso lo studio della propagazione delle onde superficiali o di Rayleigh.

Il metodo di indagine MASW è un "metodo attivo", le onde superficiali sono prodotte da una sorgente impulsiva disposta a piano campagna e vengono registrate da uno stendimento lineare composto da numerosi ricevitori posti a breve distanza (distanza intergeofonica).

Il metodo consente di ottenere una curva di dispersione nel range di frequenza compreso tra 4.5 e 40 Hz e fornisce informazioni sulla parte più superficiale di sottosuolo (fino a circa 20-30 m di profondità in funzione della rigidezza del suolo).

Caratteristiche delle apparecchiature e principi generali dell'indagine

L'indagine Masw per l'analisi delle onde superficiali è stata eseguita utilizzando la strumentazione classica della prospezione sismica a rifrazione disponendo sul terreno 24 geofoni secondo un array lineare con spaziatura pari a 2.5 m. Per ottenere una buona risoluzione in termini di frequenza, sono stati utilizzati geofoni da 4.5 Hz.

Come sistema di energizzazione una mazza di 10Kg battente su piattello metallico. Per aumentare il rapporto segnale/rumore è stata eseguita la somma di più energizzazioni (processo di stacking).

Sono state fatte 4 acquisizioni, 2 per ogni lato della linea. Successivamente si è provveduto ad elaborare tutte e 4 le misurazioni valutando la coerenza dei risultati e la loro qualità.

Di seguito si riassumono le principali caratteristiche della strumentazione utilizzata ed i criteri di acquisizione della prova MASW attiva:

Strumentazione e caratteristiche dell'indagine

- 1 Unità di acquisizione sismografo Geode Geometrics
- 24 Geofoni verticali "con f = 4.5 Hz
- Cavi sismici L = 60 m
- 1 Sorgente Mazza battente su piattello metallico
- Spaziatura tra i geofoni 2.5 m
- Distanza sorgente 24° geofono 10 m
- Tempo di registrazione 1.0 s

Elaborazione dati

I dati sperimentali, acquisiti in formato SEG-2, sono stati trasferiti su PC per l'interpretazione attraverso l'utilizzo di uno specifico programma di elaborazione (Swan).

Tale programma permette di elaborare i dati acquisiti sia con il metodo attivo che con quello passivo.

L'analisi delle onde S con tecnica MASW viene eseguita mediante la trattazione spettrale del sismogramma, cioè a seguito di una trasformata di Fourier, che restituisce lo spettro del segnale.

In questo dominio, detto dominio trasformato, è semplice andare a separare il segnale relativo alle onde S da altri tipi di segnale, come onde P o propagazione in aria. L'osservazione dello spettro consente di notare che l'onda S si propaga a velocità variabile a seconda della frequenza dell'onda stessa, questo fenomeno è detto dispersione ed è caratteristico di questo tipo di onde.

La teoria sviluppata suggerisce di caratterizzare tale fenomeno mediante una funzione detta curva di dispersione, che associa ad ogni frequenza la velocità di propagazione dell'onda. Tale curva è facilmente estraibile dallo spettro del segnale poiché essa approssimativamente passa sui massimi del valore assoluto dello spettro.

A questo punto la curva di dispersione sperimentale deve essere confrontata con quella relativa ad un modello sintetico che verrà successivamente alterato in base alle differenze riscontrate tra le due curve, fino ad ottenere un modello sintetico a cui è associata una curva di dispersione teorica coincidente con la curva sperimentale.

Dall'inversione della curva di dispersione si ottiene il seguente modello medio di velocità delle onde sismiche di taglio con la profondità, rappresentativo dell'area investigata (stendimento complessivo di circa 57.5 m).

Metodologia sismica a "Rifrazione"

L' indagine sismica consiste nel produrre sulla superficie del terreno, in prossimità del sito da investigare, sollecitazioni dinamiche verticali per la generazione di onde di volume (P) e sollecitazioni dinamiche orizzontali per la generazione di onde di taglio (SH) e nel registrare le vibrazioni prodotte, sempre in corrispondenza della superficie, a distanze note e prefissate mediante sensori a componente verticale ed orizzontale.

L'interpretazione dei segnali rilevati e la conseguente stima del profilo di velocità delle onde sismiche, può scomporsi nelle seguenti fasi fondamentali:

individuazione del primo arrivo per ogni gtraccia, sui sismogrammi registrati;

ricostruzione delle relative dromocrone;

interpretazione delle dromocrone con conseguente ricostruzione delle geometrie del sottosuolo.

Apparecchiatura usata e schema della prova.

L'apparecchiatura utilizzata si compone delle seguenti parti:

- sistema sorgente;
- sistema di ricezione;
- sistema di acquisizione dati;
- trigger.

Sorgente onde P:

La sorgente deve essere in grado di generare onde elastiche ad alta frequenza ricche di energia, con forme d'onda ripetibili, con la possibilità di ottenere prevalentemente onde di compressione, es. grave in caduta libera (massa da 110 kg), in alternativa è possibile utilizzare un cannoncino a cartucce industriali o una mazza di 8 kg adoperata per colpire una piastra di alluminio appoggiata sul terreno.

Sorgente onde SH:

La sorgente deve essere in grado di generare onde elastiche ad alta frequenza ricche di energia, con forme d'onda ripetibili e direzionali, cioè con la possibilità di ottenere prevalentemente onde di taglio polarizzate sul piano orizzontale.

Tale sorgente è costituita da un parallelepipedo di forma tale da poter essere colpita lateralmente ad entrambe le estremità con una massa pesante. E' importante che il parallelepipedo venga gravato di un carico statico addizionale in modo che possa rimanere aderente al terreno sia nel momento in cui viene colpito sia successivamente, affinché l'energia prodotta non venga in parte dispersa. Con questo dispositivo è possibile generare essenzialmente delle onde elastiche di taglio polarizzate

orizzontalmente, con uniformità sia nella direzione di propagazione che nella polarizzazione e con una generazione di onde P trascurabile.

L'accoppiamento parallelepipedo-terreno è fatto per "contatto" e non per “infissione".

I profili sismici a rifrazione sono realizzati energizzando ad intervalli regolari lungo stendimenti di sensori detti geofoni: ciascuno stendimento multicanale viene denominato base sismica.

Sistema di ricezione:

Il sistema di ricezione è costituito da 24 geofoni a componente verticale per le onde P, con frequenza propria di circa 14 Hz e 24 goefoni a componente orizzontale per le onde SH, con frequenza propria di circa 10 Hz. Per l'acquisizione i geofoni sono accoppiati al terreno e posizionati verticalmente tramite il puntale di cui sono dotati.

Sistema di acquisizione dati:

Le registrazioni sono state acquisite mediante un sismografo digitale con 24 canali a 16 bit, si tratta di un sistema multicanale in grado di registrare su ciascun canale in modo digitale i segnali provenienti da ogni trasduttore di velocità (geofoni) a cui è collegato e conservarli su memoria di massa dinamica. Le forme d'onda acquisite sono visualizzabili come tracce a partire dall'impulso inviato dal trigger nel computer portatile ad esso collegato e salvabili in forma numerica in modo definitivo.

Trigger:

Il trigger consiste in un circuito elettrico che viene chiuso nell'istante in cui il grave o la mazza colpisce la base di battuta, consentendo la produzione di un impulso che viene inviato a un sensore collegato al sistema di acquisizione dati; in questo modo è possibile individuare e visualizzare l'esatto istante in cui la sorgente viene attivata e parte la sollecitazione dinamica.

Interpretazione dei profili sismici:

I tempi di arrivo delle onde letti in corrispondenza di ciascun geofono hanno permesso di ricostruire i diagrammi spazio-tempo, detti dromocrone. L'interpretazione delle dromocrone fatta attraverso il softwares Rayfract, ha permesso di definire un modello della stratigrafia del terreno basato sulle variazioni della velocità delle onde di volume e di taglio.

Risultati:

Dall’elaborazione dei dati acquisiti si sono ottenuti elaborati tomografici dell’andamento delle velocità delle onde di taglio vs e delle onde di volume vp, oltre alle relative sezioni sismostratigrafiche che schematizzano gli spessori individuati di seguito allegati.

CAMPAGNA DI RACCOLTA DATI

Durante la campagna di raccolta dati sono state realizzate 68 registrazioni di Vibrazioni Ambientali nel comune di Figline - Incisa Valdarno, in particolare: 4 nell'abitato di Burchio, 18 a Figline, 8 in loc. Lagaccioni, 9 in Loc. Lo Stecco, 3 in Loc. Madonna del Cesto, 7 a Matassino, 5 in Loc. Poggiolino, 4 in loc. Ponte agli Stolli, 2 in Loc. Porcellino, 6 in Loc. Restone.

Di queste 68 misure 66 sono state realizzate con tecnica a "stazione singola" (HVSR) mentre 2 registrazioni sono state realizzate per mezzo di antenne sismiche bidimensionali (ARRAY 2D).

Inoltre sono state realizzate anche 1 indagine attiva tipo Masw in Loc. Poggilino, ed 1 sismica a rifrazione in Loc. Ponte agli Stolli.

La Tabella 1 sintetizza il numero di registrazioni effettuate in ognuna delle località in studio, in allegato è mostrata l'ubicazione delle misure.

Località	H/V	ARRAY 2D	MASW	RIFRAZ.
Burchio	4			
Figline	18	2		
Lagaccioni	8			
Lo Stecco	9			
Madonna del Cesto	3			
Matassino	7			
Poggilino	5		1	
Ponte agli Stolli	4			1
Porcellino	2			
Restone	6			
Totale	**66**	**2**	**1**	**1**

Tabella 1 : Sintesi delle misure realizzate

Per le misure HVSR è stato impiegato un tromografo digitale modello **Tromino zero 3G** (Micromed). I dati di vibrazioni ambientali, acquisiti con questa tecnica d'indagine sono stati successivamente elaborati con il software "**Grilla**" in dotazione al tromografo e catalogati in base ai criteri proposti da Albarello e Mucciarelli pubblicati nel volume "Contributi per l'aggiornamento degli 'Indirizzi e criteri per la microzonazione sismica'" di supplemento alla rivista "Ingegneria Sismica", nel numero 2 del 2011.

Ogni misura è stata inserita in una delle seguenti 3 classi di appartenenza:

- Classe A: registrazione affidabile ed interpretabile che può essere utilizzata anche da sola
- Classe B: registrazione sospetta da utilizzare con cautela ed in presenza di altre misure ottenute nelle vicinanze
- Classe C: registrazione scadente e di difficile interpretazione

In base ai criteri di classificazione 66 misure su 66 totali sono state ritenute affidabili.

Le 2 registrazioni su antenna sono state realizzate con un sismografo a 24 canali e 24 bit (Geode-Geometrics). Per la ricostruzione delle curve di dispersione è stata utilizzata in fase di elaborazione la metodologia ESAC [**Ohori et al., 2002],** mentre per la stima dei profili Vs, sono state realizzate una serie di inversioni congiunte (Curva ESAC-HVSR) con misure di H/V realizzate nello stesso sito utilizzando la procedura agli "**algoritmi genetici**".

Ciascuna procedura di inversione ha permesso di identificare un profilo compatibile con le osservazioni di campagna e che meglio soddisfa il match con le curve di dispersione e H/V sperimentali.

TABELLA RIASSUNTIVA MISURE H/V

Località	Nome	Fq1_hz	A1	Fq2_hz	A2	Fq3_hz	A3	Fq0_hz	A0	Classe
Burchio	T56	flat	flat	4.38	9.43	flat	flat	4.38	9.43	A1
Burchio	T57	flat	flat	flat	flat	11.81	7.18	11.81	7.18	A1
Burchio	T58	4.68	5.4	5.94	5.41	flat	flat	5.94	5.41	A1
Burchio	T59	flat	flat	5.04	3.73	7.5	5.09	7.5	5.09	A1
Figline	T01	0.47	3.75	flat	flat	flat	flat	0.47	3.75	A1
Figline	T02	0.84	4.4	flat	flat	flat	flat	0.84	4.4	A1
Figline	T03	0.44	2.88	flat	flat	flat	flat	0.44	2.88	A1
Figline	T07	0.94	5.36	flat	flat	12.23	1.47	0.94	5.36	A1
Figline	T11	0.78	4.42	flat	flat	flat	flat	0.78	4.42	A1
Figline	T12	0.88	5.92	flat	flat	flat	flat	0.88	5.92	A1
Figline	T13	0.84	4.9	flat	flat	flat	flat	0.84	4.9	A1
Figline	T14	0.81	4.56	flat	flat	flat	flat	0.81	4.56	A1
Figline	T15	0.69	4.1	flat	flat	flat	flat	0.69	4.1	A1
Figline	T28	0.5	3.58	flat	flat	flat	flat	0.5	3.58	A1
Figline	T37	0.75	2.27	flat	flat	flat	flat	0.75	2.27	A1
Figline	T38	0.84	3.69	flat	flat	flat	flat	0.84	3.69	A1
Figline	T44	0.94	4.07	flat	flat	flat	flat	0.94	4.07	A1
Lagaccioni	T04	0.81	5.97	flat	flat	flat	flat	0.81	5.97	A1
Lagaccioni	T05	1.03	7.57	flat	flat	flat	flat	1.03	7.57	A1
Lagaccioni	T06	1	2.85	2.38	4.34	flat	flat	2.38	4.34	A1
Lagaccioni	T29	flat	flat	2.81	3.75	flat	flat	2.81	3.75	A1
Lagaccioni	T30	flat	flat	2.09	2.45	flat	flat	2.09	2.45	A1
Lagaccioni	T31	1.09	1.6	flat	flat	flat	flat	1.09	1.6	A1
Lagaccioni	T60	0.94	5.06	1.08	4.85	flat	flat	0.94	5.06	A1
Lagaccioni	T61	1.88	2.85	flat	flat	flat	flat	1.88	2.85	A1
Lo Stecco	T45	0.94	3.81	3.13	1.6	flat	flat	0.94	3.81	A1
Lo Stecco	T46	1.06	3.15	flat	flat	flat	flat	1.06	3.15	A1
Lo Stecco	T47	1.09	2.3	5.13	2.05	flat	flat	1.09	2.3	A1
Lo Stecco	T49	flat	flat	2.31	3.48	3.49	2.9	2.31	3.48	A1
Lo Stecco	T50	flat	flat	flat	flat	12.38	3.2	12.38	3.2	A1

Lo Stecco	T51	flat	flat	flat	flat	6	1.54	6	1.54	A1
Lo Stecco	T52	flat	flat	4.92	2.5	7.81	2.72	7.81	2.72	A1
Lo Stecco	T53	flat	flat	flat	flat	7.31	3.98	7.31	3.98	A1
Lo Stecco	T54	flat	flat	4.06	3.3	9.13	2.25	4.06	3.3	A1
Madonna del Cesto	T20	0.47	3.34	flat	flat	flat	flat	0.47	3.34	A1
Madonna del Cesto	T21	0.81	4.23	flat	flat	flat	flat	0.81	4.23	A1
Madonna del Cesto	T22	1.09	3.69	3.29	1.63	flat	flat	1.09	3.69	A1
Matassino	T23	0.44	3.02	0.81	2.61	flat	flat	0.44	3.02	A1
Matassino	T24	0.88	1.83	2.69	1.4	flat	flat	0.88	1.83	A1
Matassino	T25	0.31	8.42	0.87	2.93	flat	flat	0.31	8.42	A1
Matassino	T26	0.47	3.04	flat	flat	flat	flat	0.47	3.04	A1
Matassino	T27	0.5	2.46	flat	flat	flat	flat	0.5	2.46	A1
Matassino	T48	0.69	3.31	flat	flat	flat	flat	0.69	3.31	A1
Matassino	T55	0.56	3.45	flat	flat	flat	flat	0.56	3.45	A1
Poggio alla Croce	T62	flat	flat	flat	flat	flat	flat	flat	flat	A2
Poggio alla Croce	T63	1.16	4.21	4.48	2.15	flat	flat	1.16	4.21	A1
Poggio alla Croce	T64	flat	flat	flat	flat	flat	flat	flat	flat	A2
Poggio alla Croce	T65	flat	flat	flat	flat	flat	flat	flat	flat	A2
Poggio alla Croce	T66	flat	flat	flat	flat	8.44	2.99	8.44	2.99	A1
Poggiolino	T32	0.88	4.15	flat	flat	8.05	1.88	0.88	4.15	A1
Poggiolino	T33	0.91	3.46	flat	flat	flat	flat	0.91	3.46	A1
Poggiolino	T34	0.91	3.68	1.25	3.91	flat	flat	1.25	3.68	A1
Poggiolino	T35	1.13	3.43	-1	-1	16.8	2.64	1.13	3.43	A1
Poggiolino	T36	1.84	2.66	3.05	2.59	flat	flat	1.84	2.66	A1
Ponte agli Stolli	T40	flat	flat	flat	flat	flat	flat	flat	flat	A2
Ponte agli Stolli	T41	flat	flat	6.84	3.01	18.42	2.5	6.84	3.01	A1
Ponte agli Stolli	T42	flat	flat	flat	flat	flat	flat	flat	flat	A2
Ponte agli Stolli	T43	flat	flat	flat	flat	flat	flat	flat	flat	A2
Porcellino	T16	0.38	3.16	flat	flat	flat	flat	0.38	3.16	A1
Porcellino	T17	0.34	3.76	1	2.29	flat	flat	0.34	3.76	A1
Restone	T08	0.31	3.79	0.8	2	1.07	2.19	0.31	3.79	A1
Restone	T09	0.31	4.36	0.9	2.18	flat	flat	0.31	4.36	A1
Restone	T10	0.31	5.09	0.93	1.72	flat	flat	0.31	5.09	A1
Restone	T18	0.31	4.8	flat	flat	flat	flat	0.31	4.8	A1
Restone	T19	0.31	4.19	flat	flat	flat	flat	0.31	4.19	A1
Restone	T39	0.34	3.61	0.83	1.88	flat	flat	0.34	3.61	A1

I valori delle misure H/V precedenti, sono serviti per la realizzazione delle carte delle frequenze 1:10000 di seguito allegate. Per ogni località sono state realizzate due carte, una che rappresenta l'insieme delle frequenze rilevate F1, F2, F3 e l'altra che rappresenta la frequenza fondamentale F0.

CONCLUSIONI

Geologicamente l'area è rappresentata da un complesso di coperture alluvionali recenti oloceniche e pleistoceniche con facies sia pelitica che sabbiosa, poggianti più a Nord nella zona di Burchio, sull'Unità Tettonica Ligure rappresentata dalla Formazione di Monte Morello di età Eocenica, mentre a sud presso l'abitato di Figline, le coperture nascondono La Formazione del Macigno di età oligocenica, appartenente alle Unità Tettoniche della Serie Toscana. Le misure sismiche realizzate rispecchiano l'assetto geologico descritto, infatti tra le misure HVSR effettuate si individuano frequenze variabili in funzione degli spesori di copertura presenti. Le frequenze più basse con valori anche molto inferiori ad 1Hz, sono state riscontrate nella zona sud di Restone, dove sono presenti spessori di copertura maggiori, circa 165 m, le frequenze più elevate si riscontrano nella zona Nord ed Ovest, di Burchio, Poggioloino e Lo Stecco, dove le coperture sono più sottili e assumono spessori di pochi metri.

Il substrato roccioso è rappresentato dalla Formazione del Macigno, dove tramite la linea di sismica a rifrazione ST01 ne è stata determinata la velocità per le onde di compressione e di taglio che è risultata di circa 2500 m/sec per le prime e 1000 / 1100 m/sec per le seconde.

Le velocità così definite, sono servite ad interpretare meglio i profili di Vs ricavati delle elaborazioni congiunte delle indagini di sismica passiva Esac e H/V effettuate nella pianura alluvionale dell'Arno dalle quali è emerso un evidente contrasto di velocità ad una profondità di 165 metri per l'ESAC 1, che segna il passaggio al substrato con velocità di circa 800 m/sec., e un contrasto di velocità ad una profondità di 135metri per l' ESAC 2, che segna il passaggio al substrato con velocità di circa 900 m/sec., coerentemente con la situazione geologica locale.

Utilizzando allineamenti di più misure HVSR insieme alle velocità delle coperture apprese dalle indagini Esac, sono state realizzate due sezioni HVSR ortogonali tra loro che hanno ben rappresentato l'andamento del substrato roccioso nelle due direzioni principali della valle dell'Arno.

Nella prima sezione T44-T24 orientata S.O.-N.E. si osserva un livello rigido ad una profondità di un centinaio di metri che si approfondisce gradualmente in direzione N.E. fino alla progressiva dei 1700 metri dove sembra interrompersi probabilmente per una discontinuità tettonica.

Nella seconda sezione T29-T01 orientata N.O.-S.E. lo stesso livello rigido, si riscontra a profondità variabili, decisamente più elevate nella zona sud dove raggiunge circa i -200 m di profondità e gradualmente risale verso N.O. per arrivare a circa -40 m in corrispondenza della misura T29.

GeoEcho s.n.c.

Bibliografia

Albarello D. , Mucciarelli M "*Contributi per l'aggiornamento degli 'Indirizzi e criteri per la microzonazione sismica* "Ingegneria Sismica", nel numero 2 del 2011.

Bard P.Y. , " Microtremor Measurements: A Tool For Site Effect Estimation?", Manuscript for *Proc. of 2nd International Symposium on the Effect of Surface Geology on Seismic Motion*, Yokohama, Japan, 1-3 Dec, 1998.

Ohori M., Nobata A. and Wakamatsu K, "*A Comparison of ESAC and FK Methods of Estimating Phase Velocity Using Arbitrarily Shaped Microtremor Arrays*", Bulletin of the Seismological Society of America, Vol. 92, No. 6, pp. 2323–2332, August 2002.

Pileggi D., Rossi D., Lunedei E., Albarello D., "*Seismic characterization of rigid sites in the ITACA database by ambient vibration monitoring and geological surveys***",** Bulletin of Earthquake Engineering, Volume 9, Number 6, 1839-1854, DOI: 10.1007/s10518-011-9292-0, June 2011

ALLEGATI

Elaborati misure ESAC

Elaborati MASW

Elaborati sismica a rifrazione

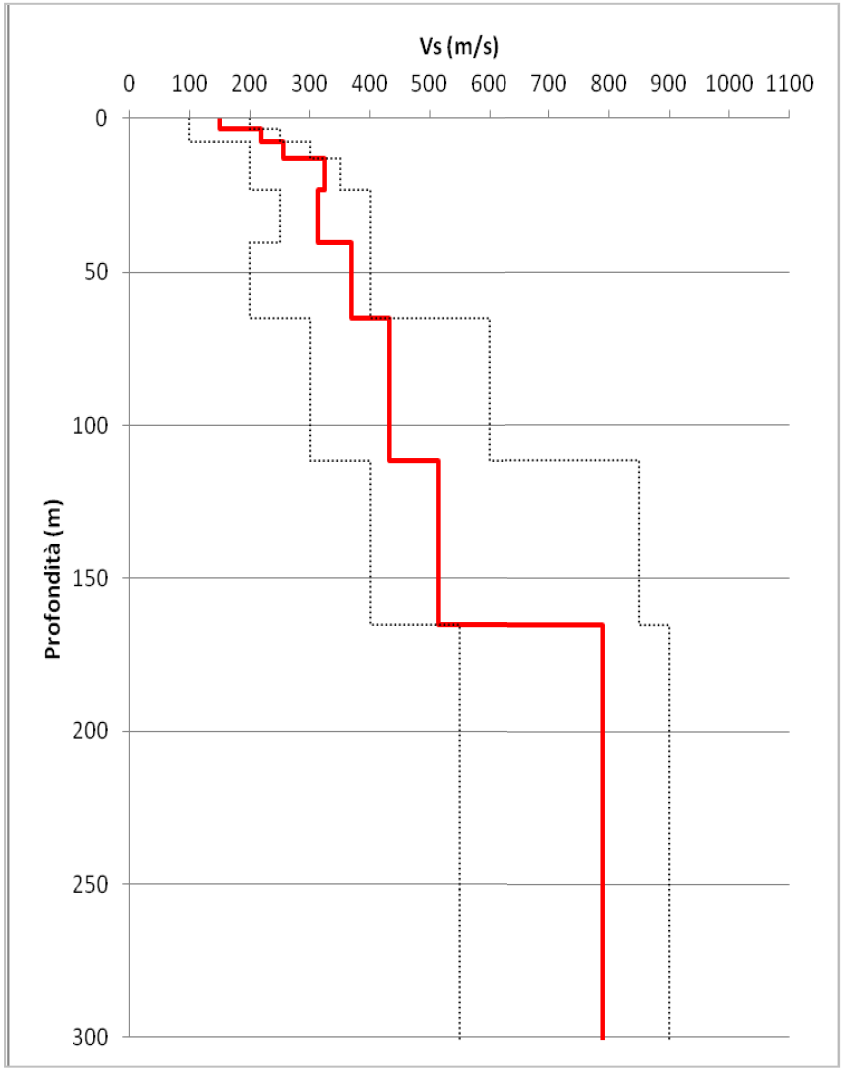
Sezioni HVSR

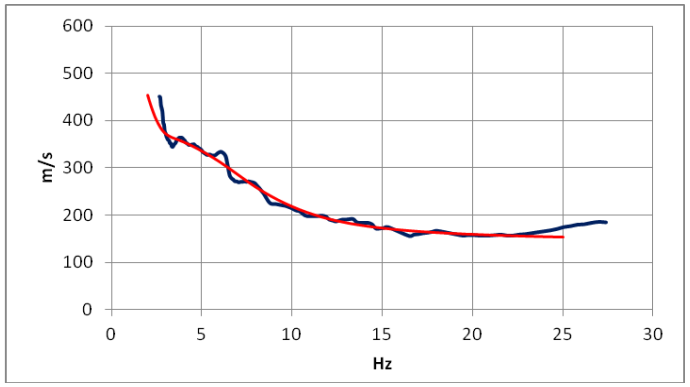
Carte delle Frequenze a scala 1:10000

- Burchio
- Burchio F0
- Figline, Lagaccioni, Poggiolino, Matassino
- Figline, Lagaccioni, Poggiolino, Matassino F0
- Figline, Lo Stecco, Madonna del Cesto
- Figline, Lo Stecco, Madonna del Cesto F0
- Poggio alla Croce
- Poggio alla Croce F0
- Ponte agli Stolli
- Ponte agli Stolli F0
- Porcellino, Restone
- Porcellino, Restone F0

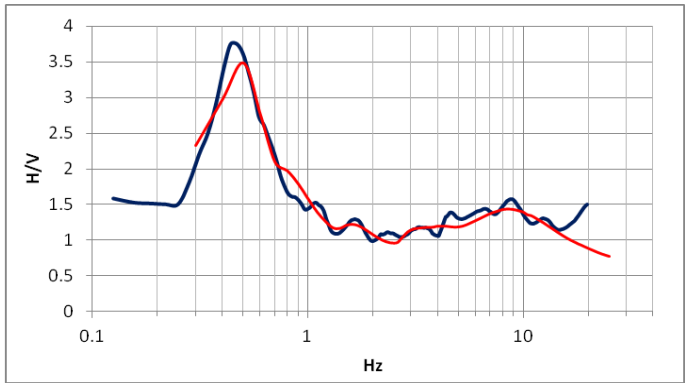
Elaborati misure HVSR

Profilo di Vs ESAC 1 Figline Valdarno





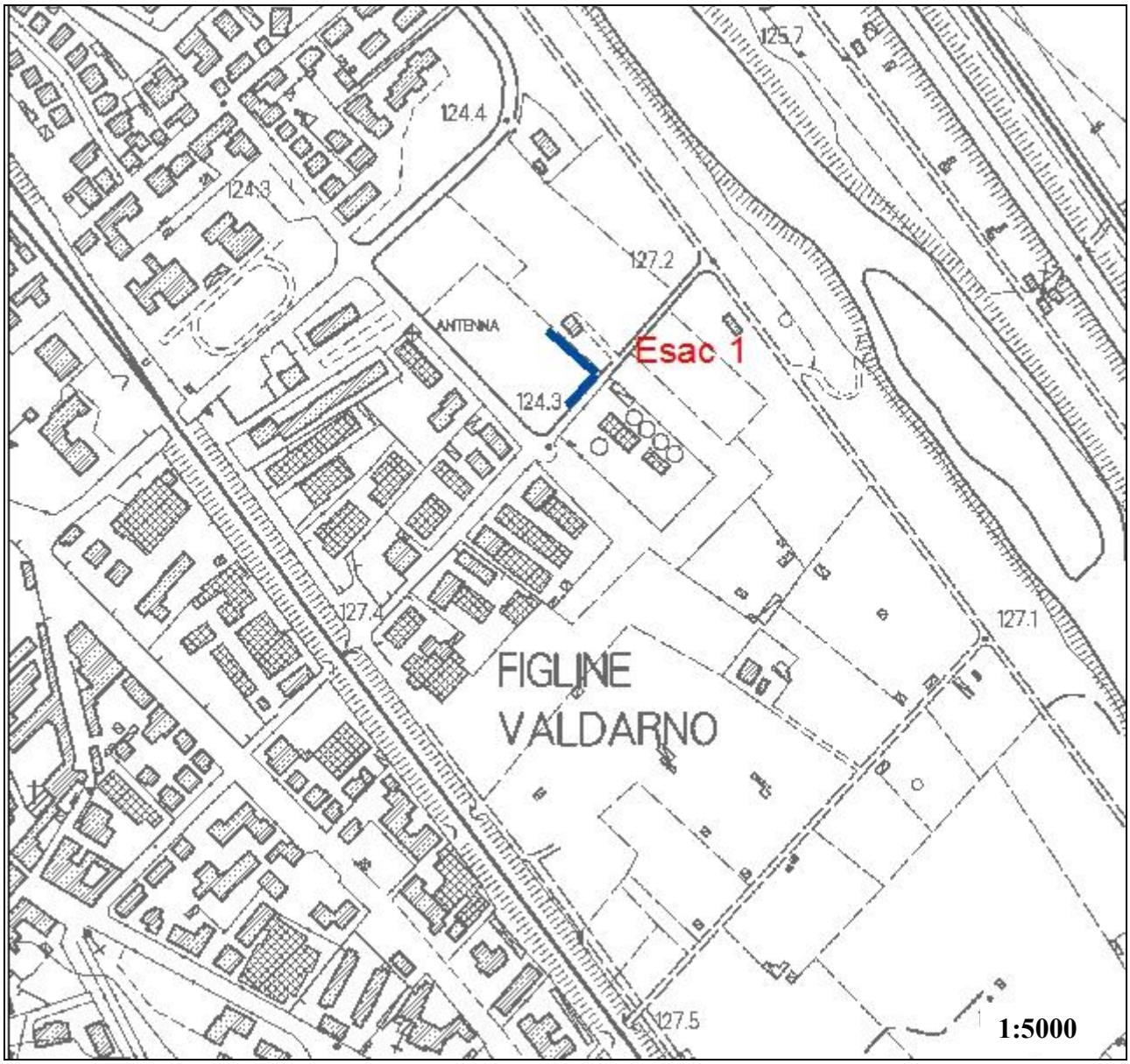
Match curva di dispersione teorica /sperimentale Array



Match curva di dispersione teorica /sperimentale HVSR

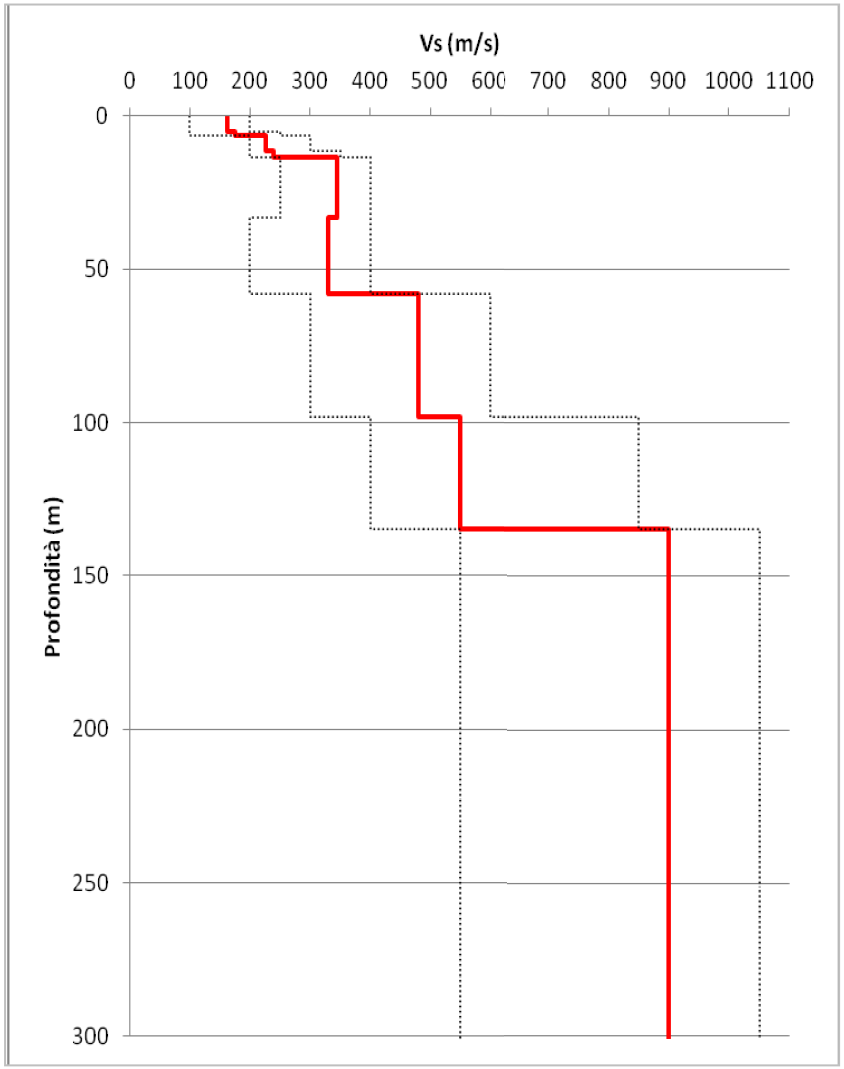
Modello monodimensionale Esac 1 Figline

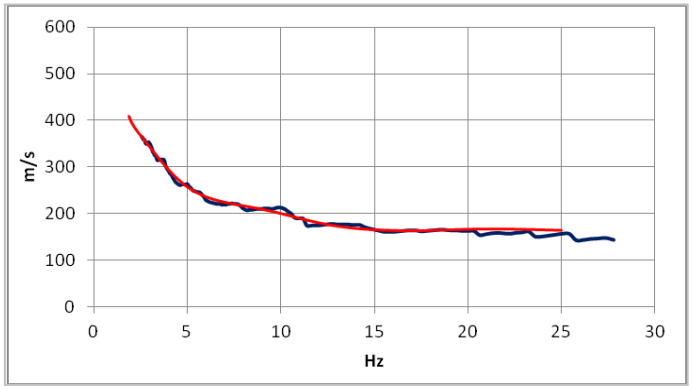
spessore (m)	Vp(m/s)	Vs(m/s)	ro(kg/m^3)	profondità	Vs medie
3.60	2497.85	149.95	2687.20	0.00	149.95
4.00	1612.76	219.06	1242.42	3.60	179.80
5.51	2413.98	256.31	1500.49	7.60	205.61
10.00	2455.03	324.19	1258.07	13.11	244.27
16.97	2441.35	312.90	1938.42	23.11	269.27
25.03	2482.41	369.06	1373.41	40.08	300.51
46.25	2490.23	432.03	1138.81	65.11	344.00
53.63	2470.28	515.07	2392.96	111.36	385.63
418.48	1296.55	789.49	2255.13	164.98	609.11
0.00	2897.36	1193.55	2219.94	583.46	609.11



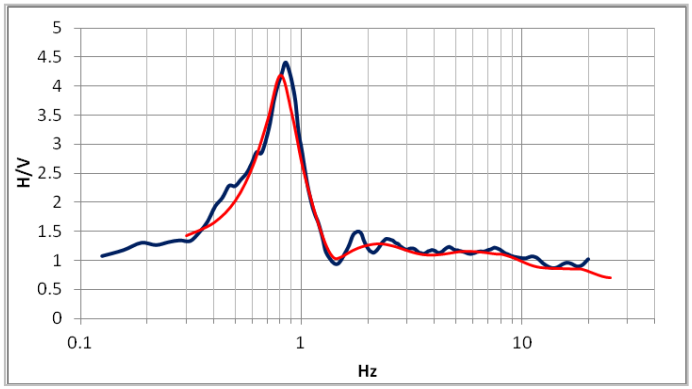
UBICAZIONE ESAC 1 FIGLINE VALDARNO

Profilo di Vs ESAC 2 Figline Valdarno





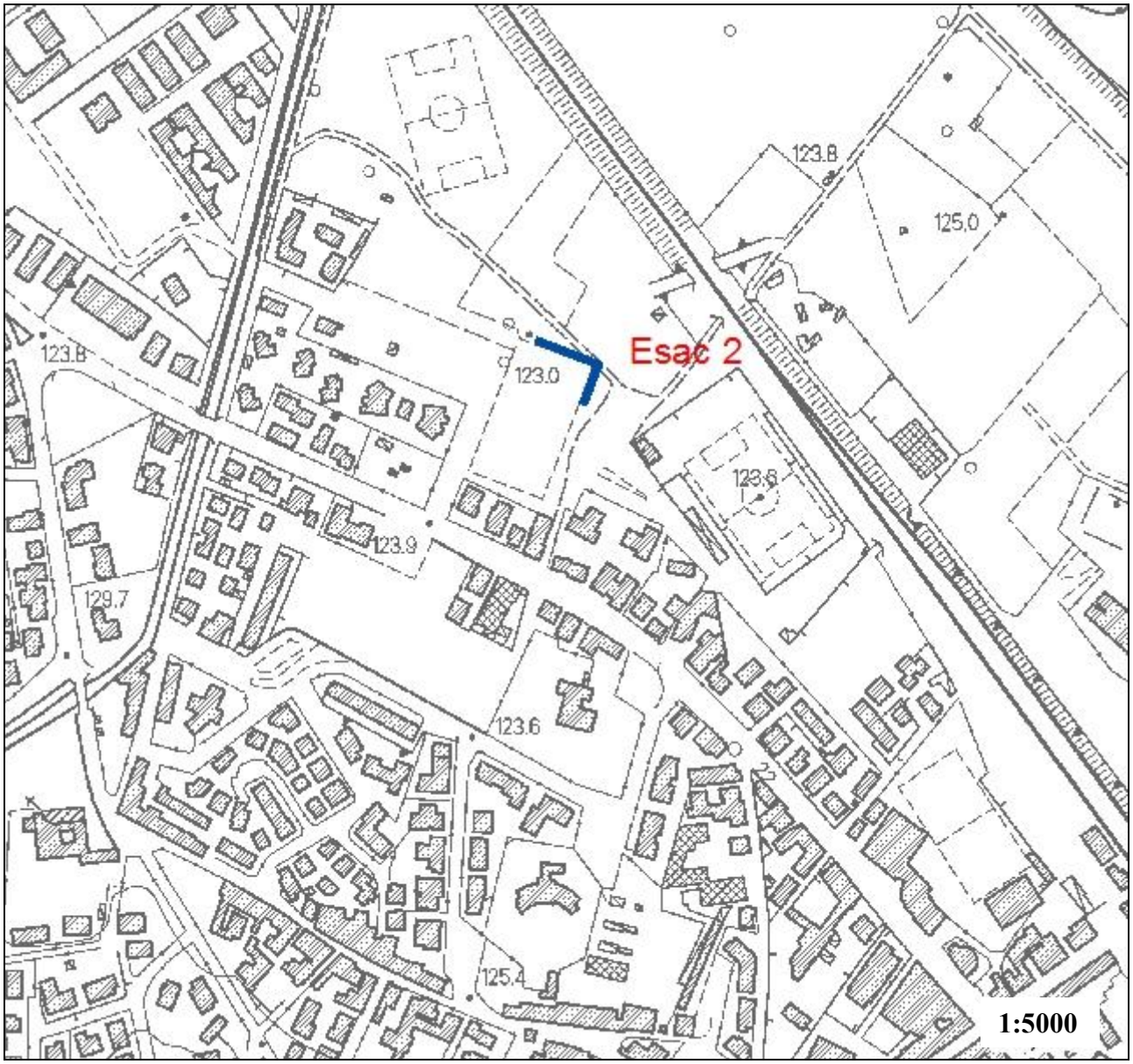
Match curva di dispersione teorica /sperimentale Array



Match curva di dispersione teorica /sperimentale HVSR

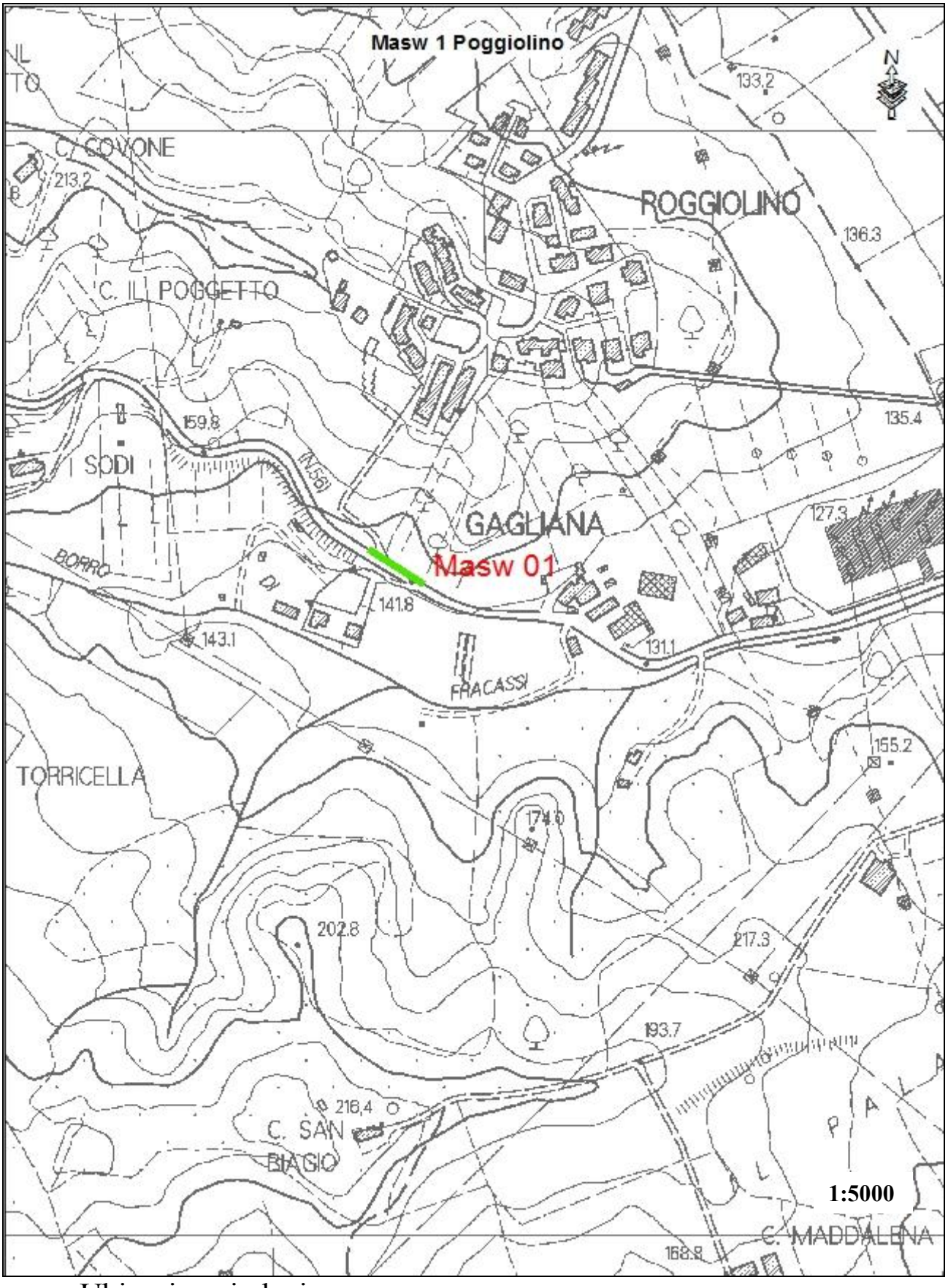
Modello monodimensionale Esac 2 Figline

spessore (m)	Vp(m/s)	Vs(m/s)	ro(kg/m^3)	profondità	Vs medie
4.95	1461.29	162.56	2917.89	0.00	162.56
1.52	437.63	174.93	1494.62	4.95	165.31
5.09	1708.21	225.22	2804.50	6.47	187.25
2.07	1590.91	238.12	1000.00	11.56	193.54
19.52	887.10	344.14	1250.24	13.63	260.70
24.76	963.34	330.21	2194.53	33.15	286.49
40.23	814.76	481.53	1142.72	57.91	343.52
36.50	847.02	550.44	1655.43	98.14	382.50
956.01	2265.86	899.66	2214.08	134.64	770.98
0.00	2944.58	1181.82	1646.63	1090.65	770.98



UBICAZIONE ESAC 2 FIGLINE VALDARNO

INDAGINE DI SISMICA MASW 01

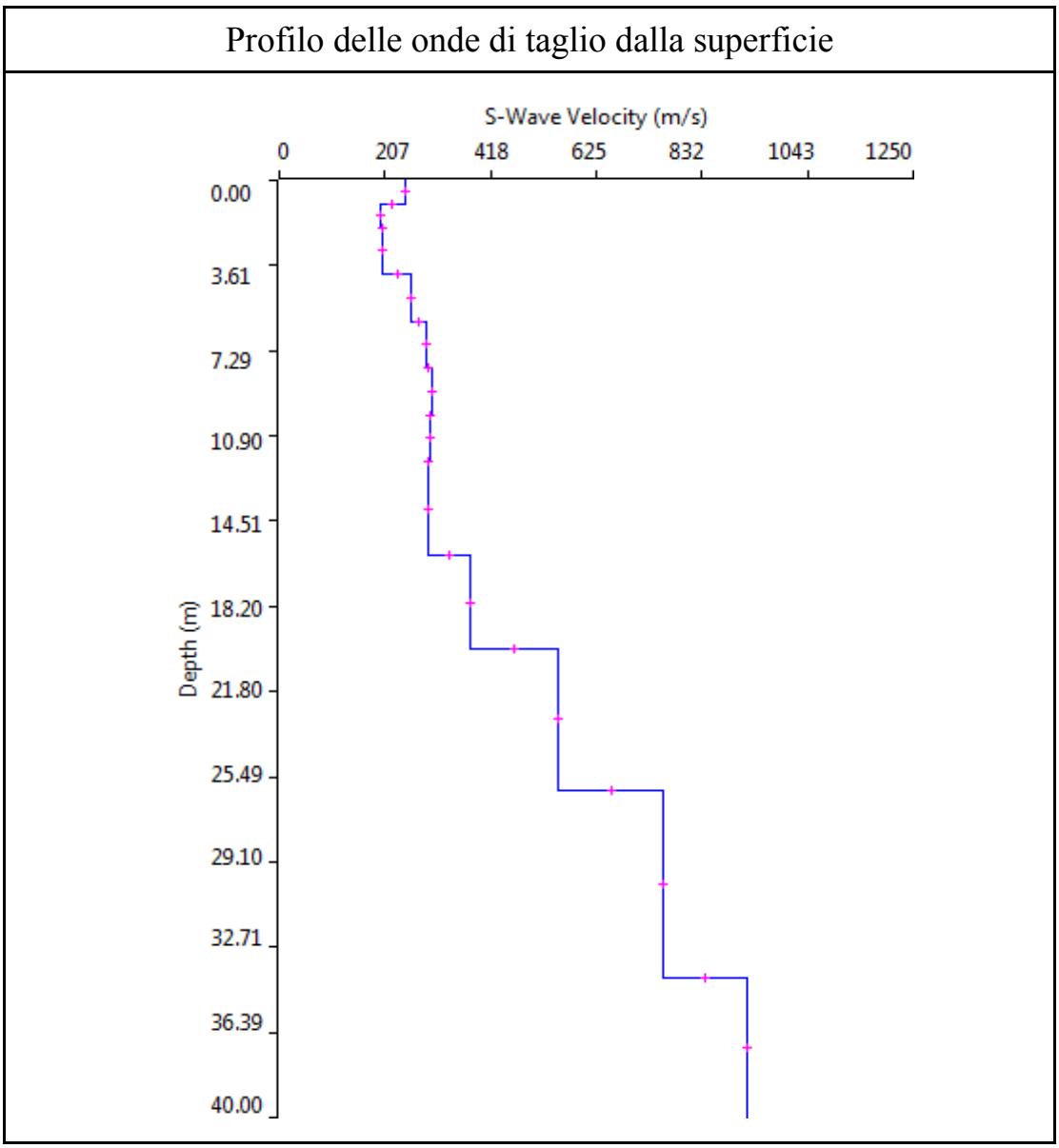


Ubicazione indagine

Thickness	Depth	Vs	Vp	Poisson	Density
1	0	247	494	0.333	1.8
1	1	200	400	0.333	1.8
2	2	205	410	0.333	1.8
2	4	261	522	0.333	1.8
2	6	291	582	0.333	1.8
2	8	300	600	0.333	1.8
2	10	296	592	0.333	1.8
4	12	294	588	0.333	1.8
4	16	376	751	0.333	1.8
6	20	551	1101	0.333	1.8
8	26	758	1515	0.333	1.8
	34	923	1845	0.333	1.8

Tabella 1: modello sismico monodimensionale.

Profilo delle onde di taglio dalla superficie



CALCOLO DELLE VS30

A partire dal modello sismico monodimensionale riportato, è possibile calcolare il valore delle Vs30, che rappresenta la velocità di propagazione entro 30 m di profondità delle onde di taglio.

Per il calcolo delle Vs30 si fa riferimento alla seguente espressione, riportata nel D.M. 14.09.2005 e nel D.M. 14.01.2008 ("Norme tecniche per le costruzioni"):

$$V_{s30} = \frac{30}{\sum_{i=1}^{n} H_i / V_i}$$

dove Hi e Vi indicano lo spessore (in m) e la velocità delle onde di taglio dello strato i-esimo, per un totale di N strati presenti nei 30 m superiori.

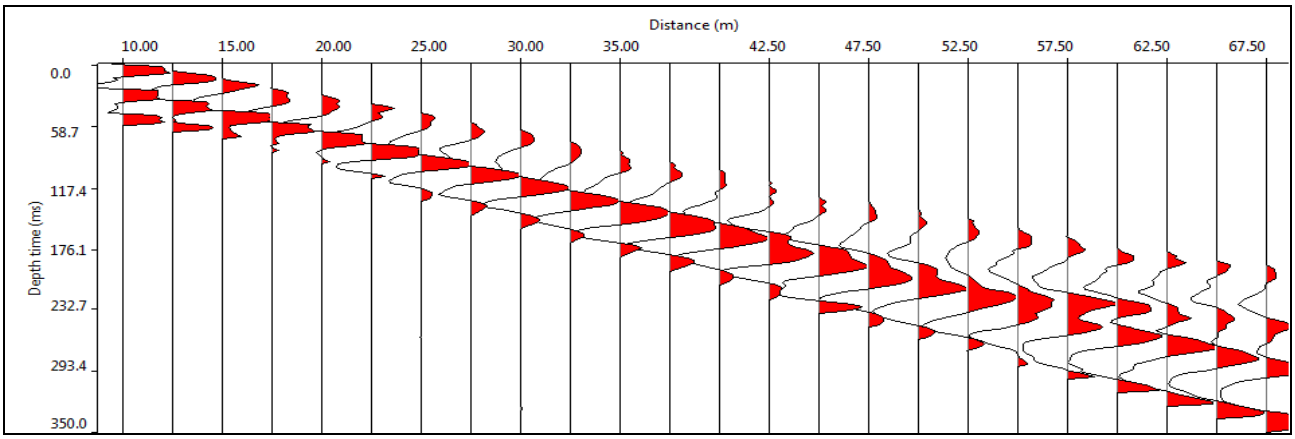
Utilizzando la formula sopra riportata, considerando la quota della fondazione a partire dal piano campagna attuale, si ottiene il seguente valore **Vs30 = 344 m/s** a cui corrisponde la categoria di suolo di fondazione di tipo **C** (si veda la tabella seguente).

Tabella : Categorie di suolo di fondazione(D.M. 14-09-2005; D.M. 14-01-2008)

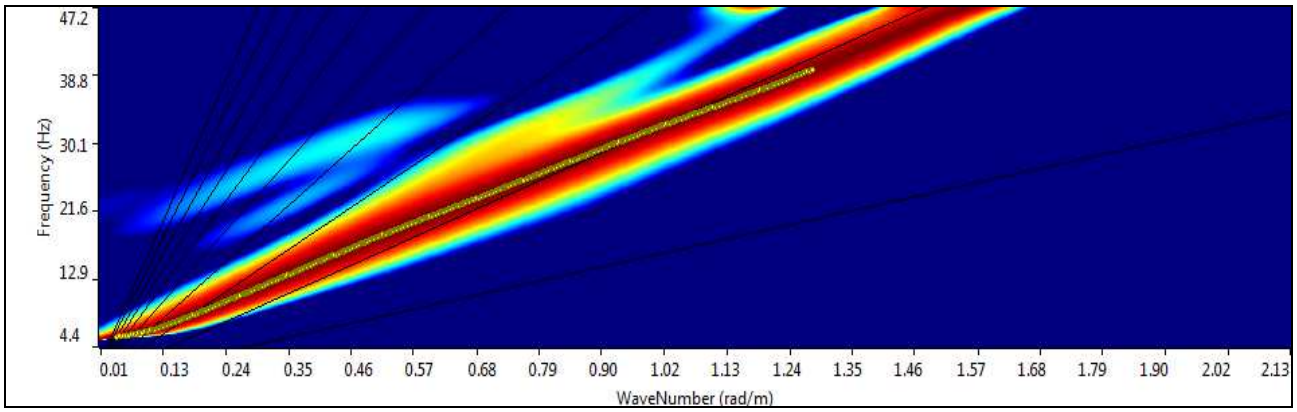
CAT.	DESCRIZIONE PROFILO STRATIGRAFICO	PARAMETRI		
		Vs 30 m/sec.	N spt	Cu (Kpa)
A	Ammassi rocciosi affioranti o terreni molto rigidi,caratterizzati da valori di VS30 superiori a 800 m/s, eventualmente comprendenti in superficie uno strato di alterazione, con spessore massimo di 3 m.	**> 800**	-	-
B	Rocce tenere e depositi di terreni a grana grossa molto addensati o terreni a grana fine molto consistenti, con spessori superiori a 30 m, caratterizzati da graduale miglioramento delle proprietà meccaniche con la profondità	**360-800**	**>50**	**>250**
C	Depositi di terreni a grana grossa mediamente addensati o terreni a grana fine mediamente consistenti, con spessori superiori a 30 m caratterizzati da graduale miglioramento delle proprietà meccaniche con la profondità	**180-360**	**<50**	**70-250**
D	Depositi di terreni a grana grossa scarsamente addensati o terreni a grana fine scarsamente consistenti, con spessori superiori a 30 m caratterizzati da graduale miglioramento delle proprietà meccaniche con la profondità	**<180**	**<15**	**<70**
E	E - Terreni dei sottosuoli dei tipi C o D per spessori non superiori a 20 m, posti sul substrato di riferimento (con VS > 800 m/s).			

Allegati

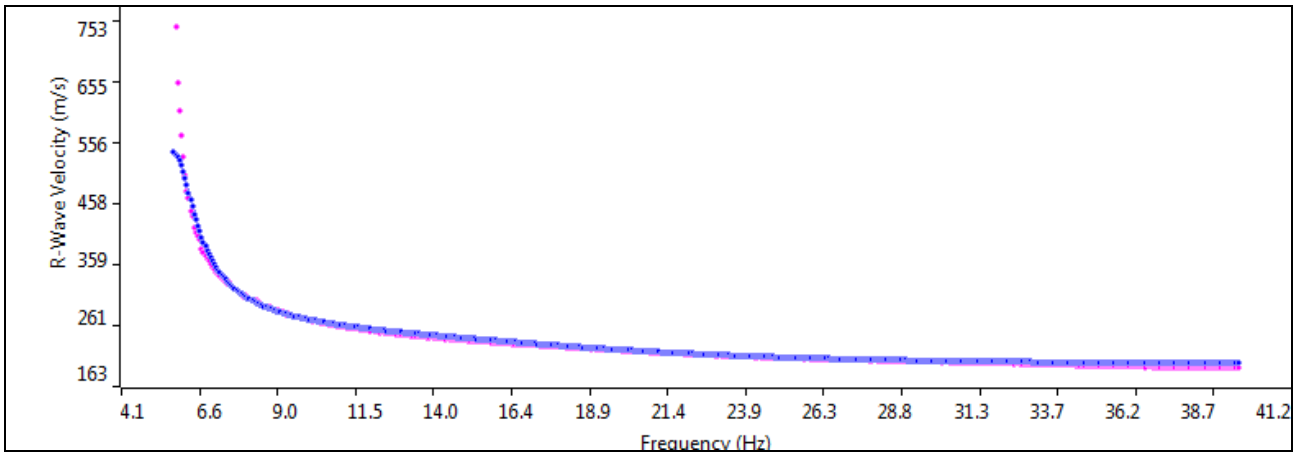
Sismogramma



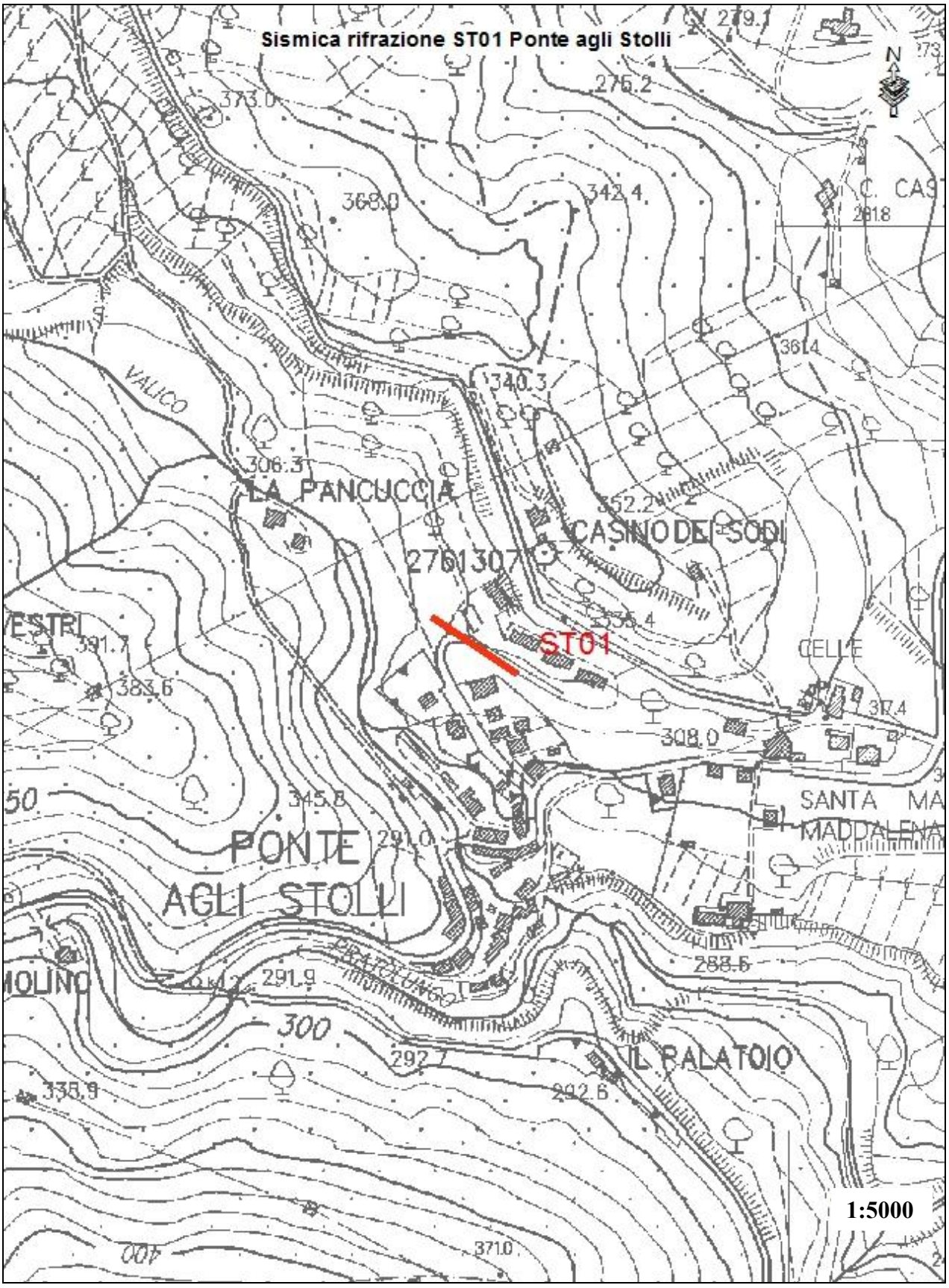
Spettro F –K



Match Curva di dispersione sperimentale – teorica



INDAGINE DI SISMICA A RIFRAZIONE ST 01



Ubicazione indagine

- LINEA ST01, INDAGINE DI SISMICA A RIFRAZIONE IN ONDE P e SH Ponte agli Stolli

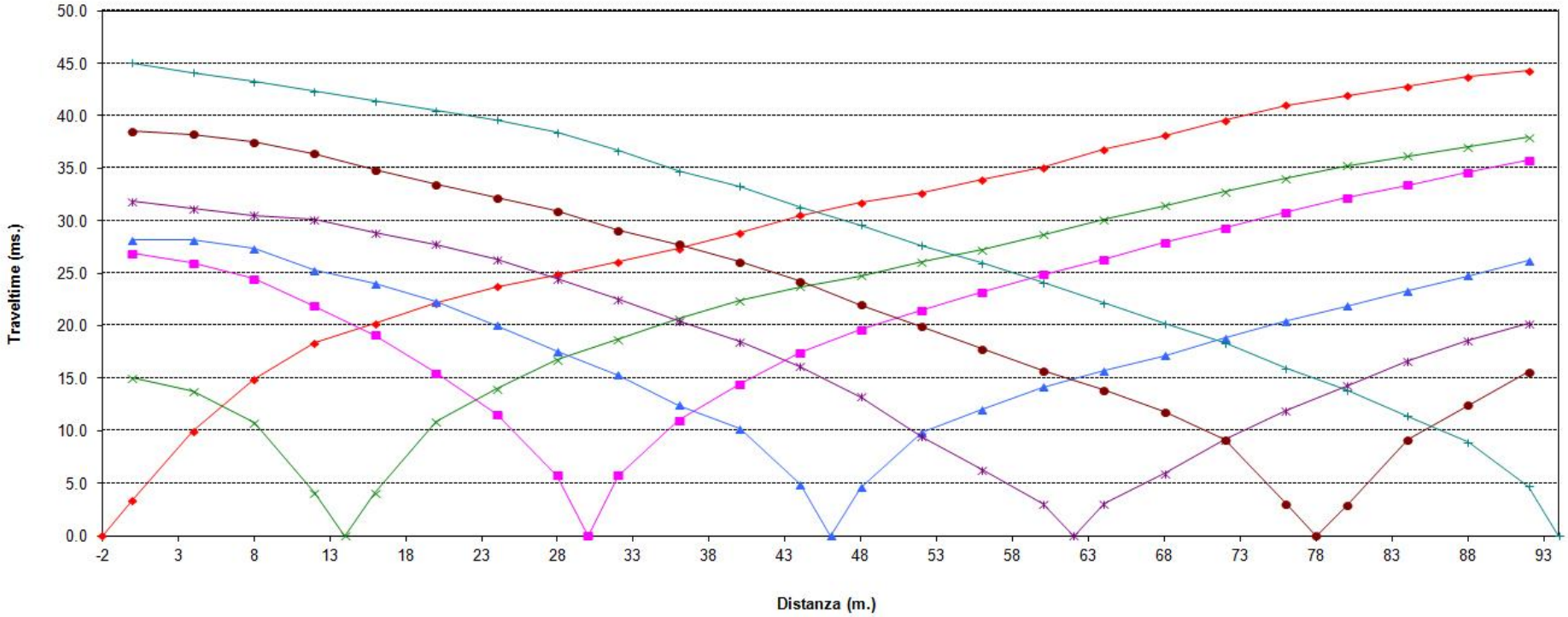
SCHEMA DETTAGLIATO DELLA LINEA DI ACQUISIZIONE

GEOFONI N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DISTANZA PROGRESSIVA (m)	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92
DISTANZA PARZIALE (m)	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
QUOTA (metri s.l.m.)	316.00	316.66	317.32	318.00	318.44	318.70	318.96	319.22	319.48	319.74	320.00	320.00	320.00	320.00	320.00	320.00	320.00	320.00	320.00	320.00	320.00	320.00	320.00	320.00

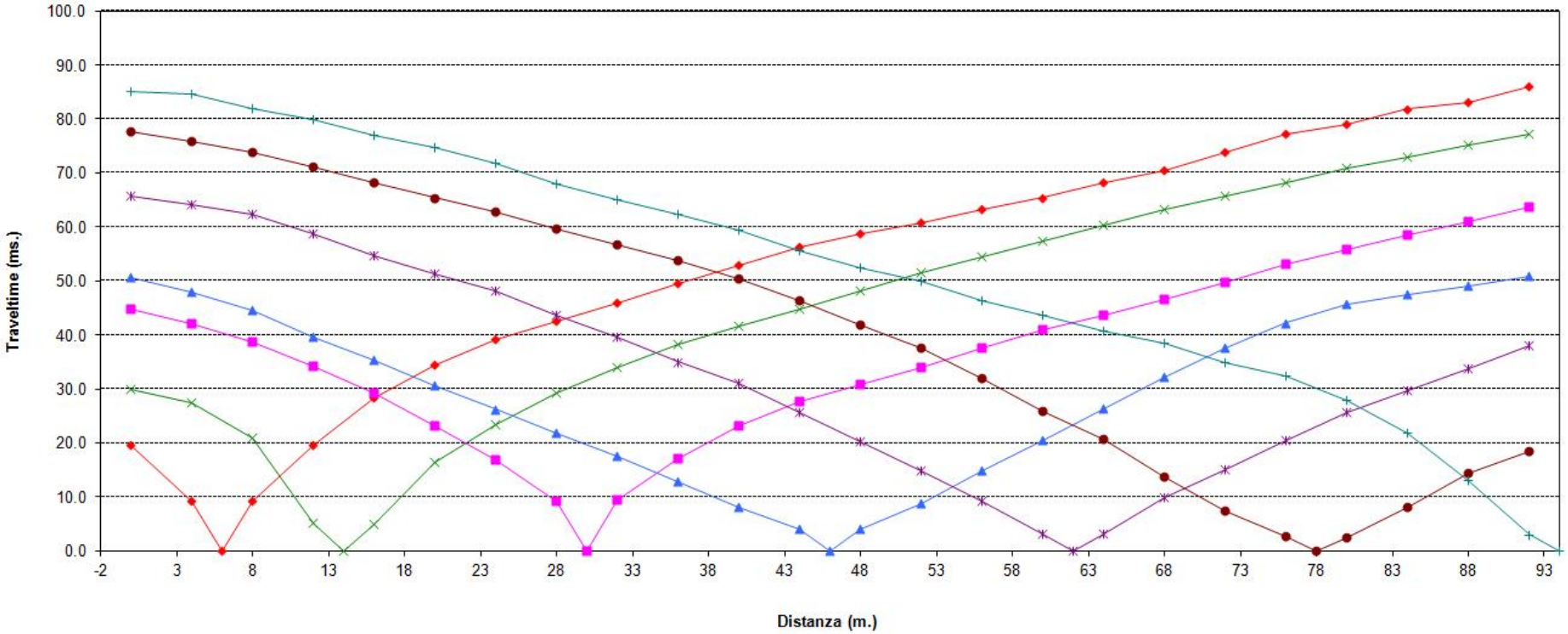
PUNTI DI ENERGIZZAZIONE ONDE P e SH

	SCOPPIO 1	SCOPPIO 2	SCOPPIO 3	SCOPPIO 4	SCOPPIO 5	SCOPPIO 6	SCOPPIO 7
POSIZ. DAL GEOF. N 1 (m)	-2.0	14.0	30.0	46.0	62.0	78.0	94.0
QUOTA (metri s.l.m.)	316.0	318.2	319.4	320.0	320.0	320.0	320.0

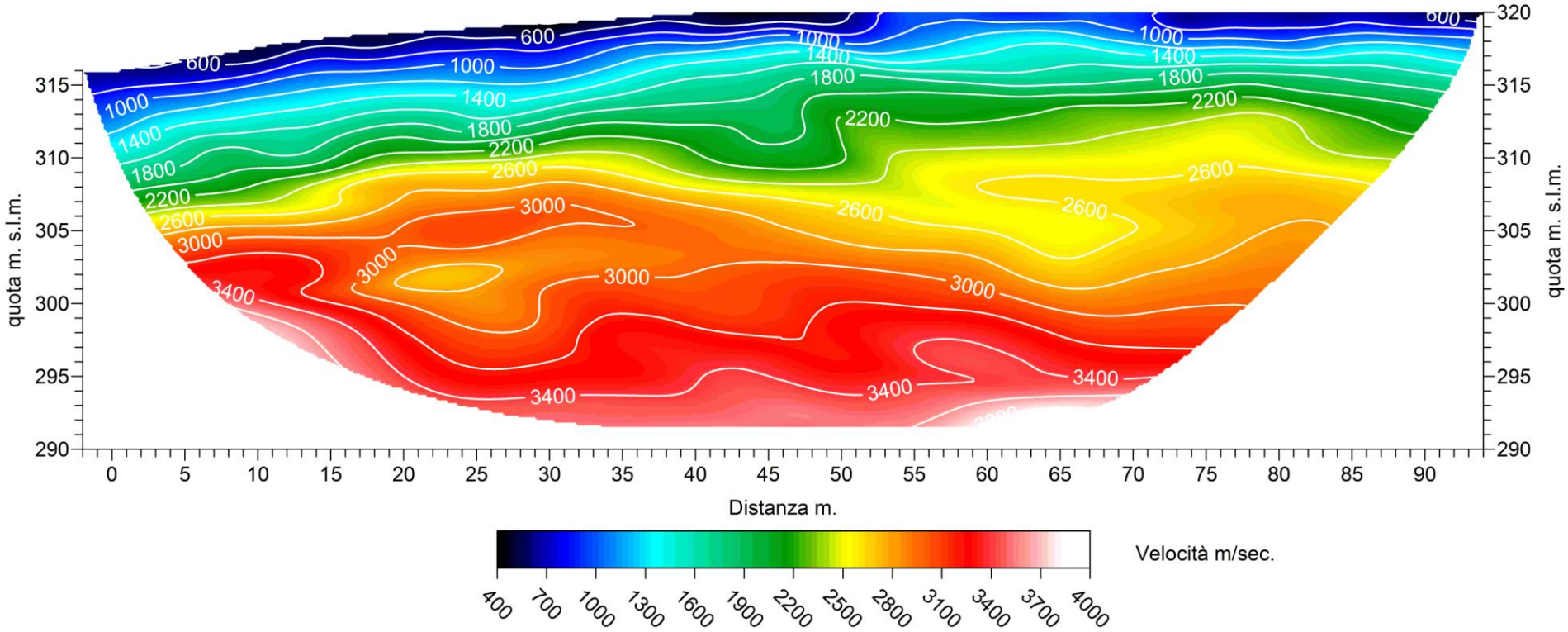
ST01 – DROMOCRONE - ONDE P



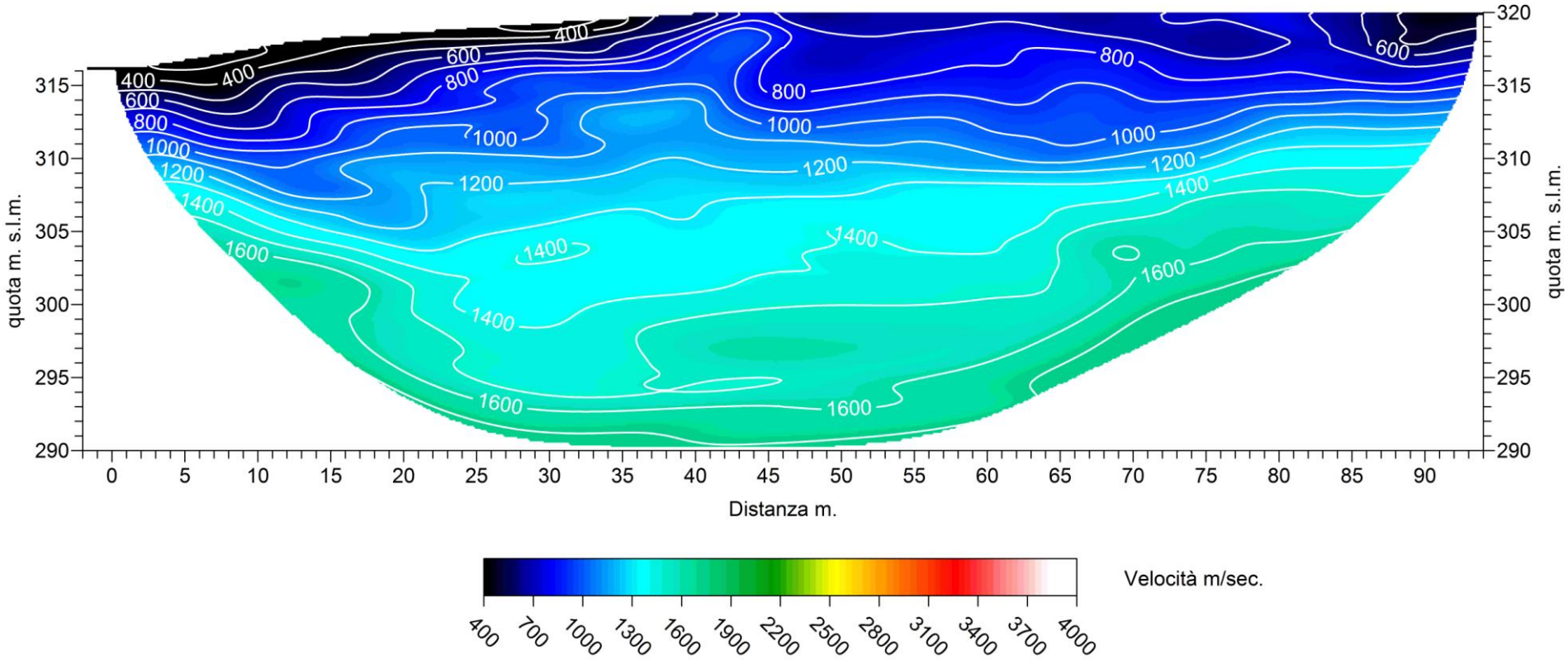
ST01 – DROMOCRONE - ONDE SH



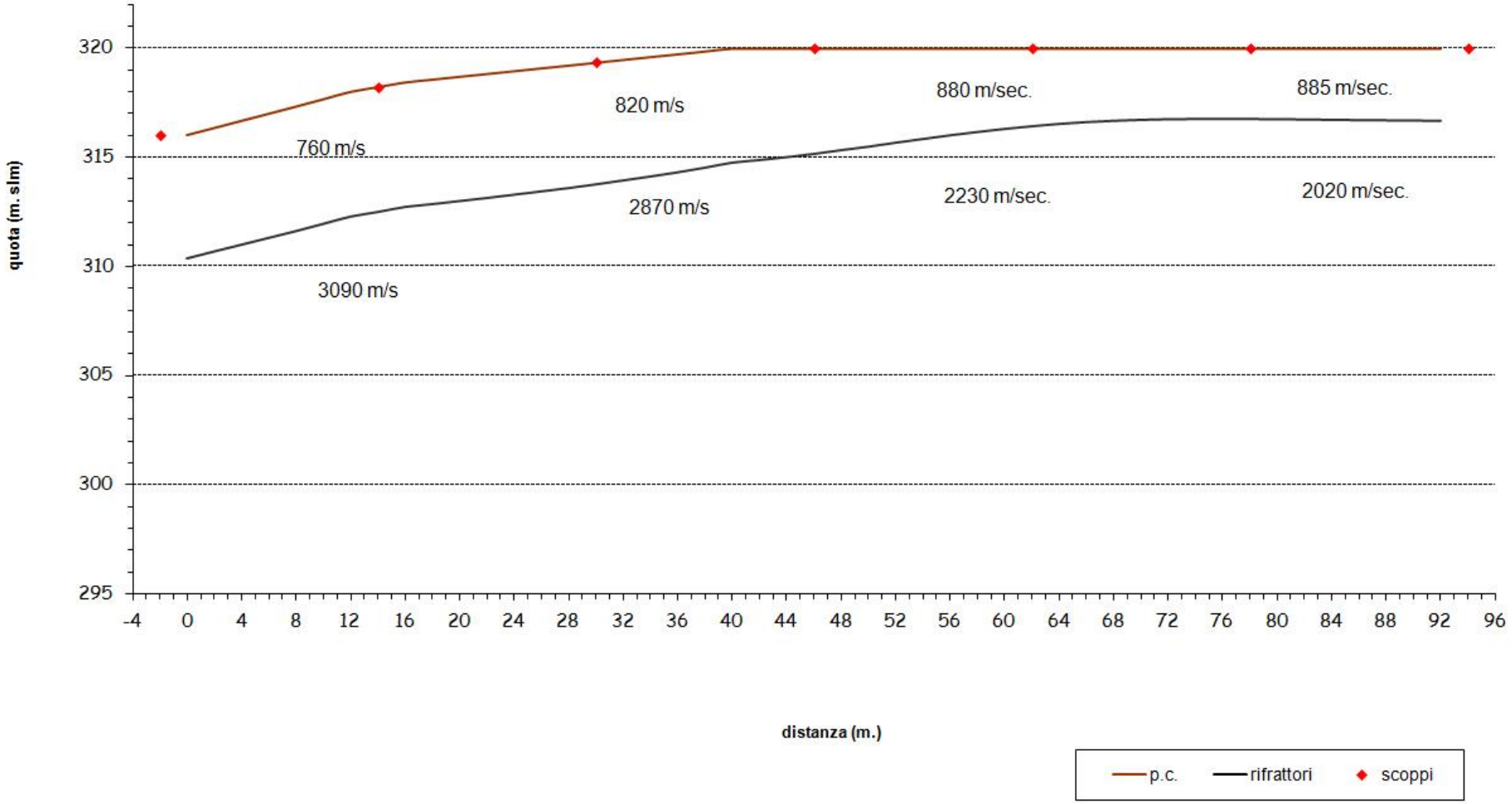
Tomografia sismica onde P



Tomografia sismica onde SH



ST01 – SEZIONE SISMOSTRATIGRAFICA - ONDE P



ST01 – SEZIONE SISMOSTRATIGRAFICA - ONDE SH

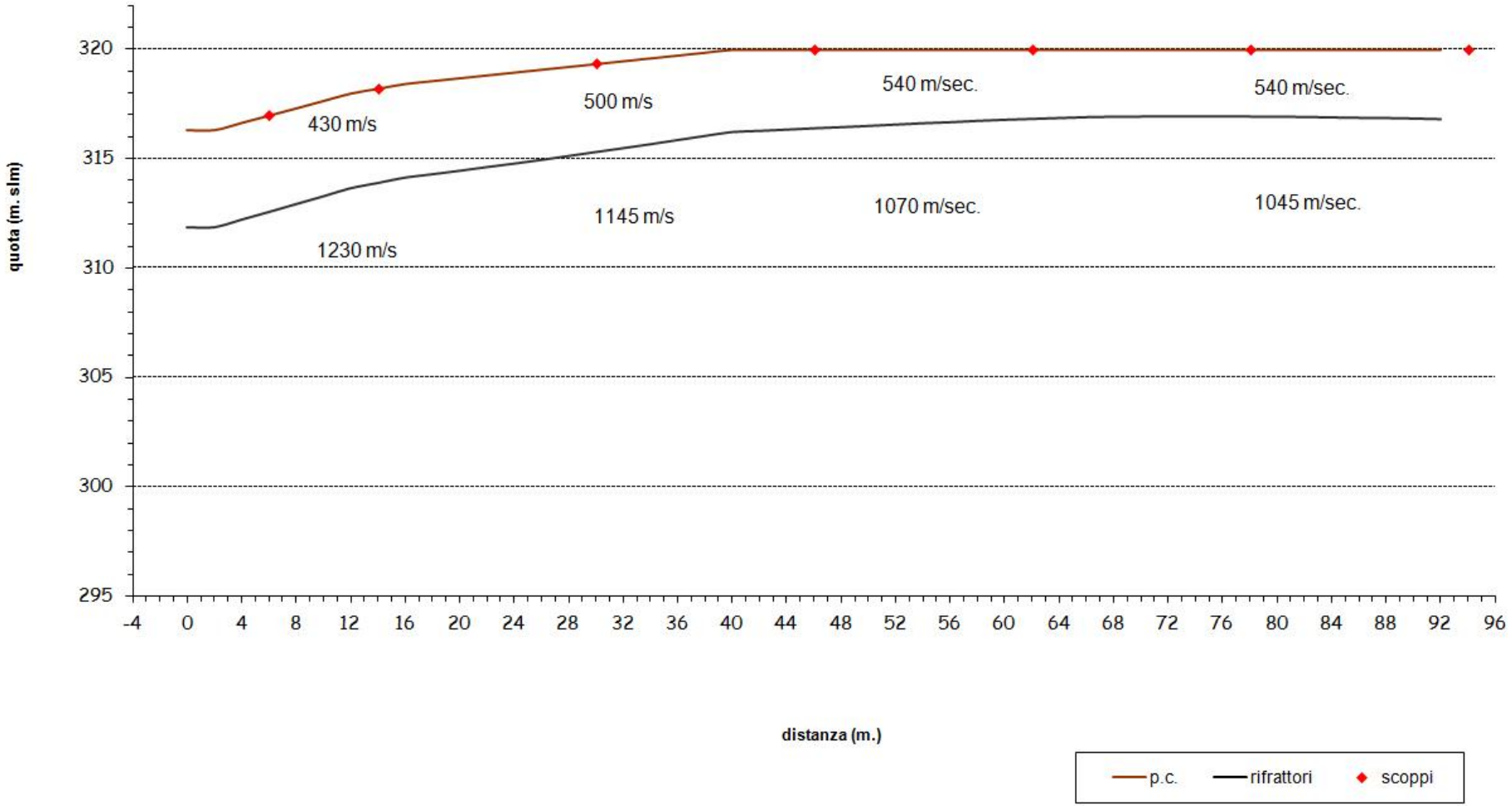


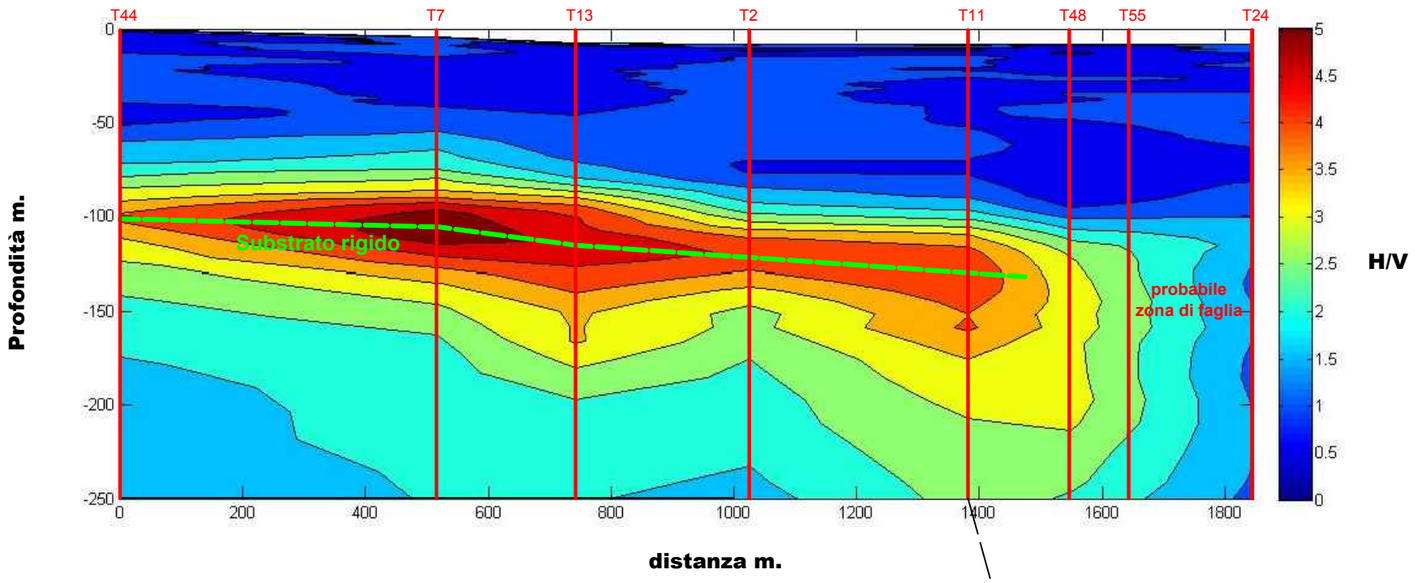
Tabella velocità e spessori Onde P					Linea	ST01
Distanza dal geof.1	Quota	V1 m/sec	Profondità 1 m.	V2 m/sec	Profondità 2 m.	V3 m/sec
0.00	316.00	752.43	5.63	3041.14		
2.00	316.33	753.94	5.64	3051.85		
4.00	316.66	755.45	5.66	3065.42		
6.00	316.99	756.34	5.68	3075.68		
8.00	317.32	757.23	5.70	3081.87		
10.00	317.66	757.01	5.71	3090.48		
12.00	318.00	756.78	5.72	3109.14		
14.00	318.22	757.16	5.73	3116.98		
16.00	318.44	757.53	5.72	3120.93		
18.00	318.57	760.23	5.72	3123.37		
20.00	318.70	762.94	5.71	3119.22		
22.00	318.83	763.70	5.70	3104.36		
24.00	318.96	764.46	5.68	3078.49		
26.00	319.09	772.52	5.66	3051.74		
28.00	319.22	780.58	5.64	3028.84		
30.00	319.35	792.86	5.60	2992.62		
32.00	319.48	805.15	5.55	2951.69		
34.00	319.61	817.27	5.50	2913.78		
36.00	319.74	829.40	5.44	2875.56		
38.00	319.87	838.85	5.36	2825.01		
40.00	320.00	848.31	5.26	2768.94		
42.00	320.00	859.47	5.14	2709.34		
44.00	320.00	870.63	5.01	2649.11		
46.00	320.00	876.05	4.86	2579.46		
48.00	320.00	881.48	4.69	2511.09		
50.00	320.00	882.50	4.53	2443.48		
52.00	320.00	883.52	4.35	2384.88		
54.00	320.00	883.52	4.18	2322.42		
56.00	320.00	883.52	4.01	2262.08		
58.00	320.00	883.52	3.86	2213.95		
60.00	320.00	883.52	3.72	2175.33		
62.00	320.00	883.52	3.60	2136.49		
64.00	320.00	883.52	3.49	2106.60		
66.00	320.00	883.52	3.41	2084.11		
68.00	320.00	883.52	3.35	2067.43		
70.00	320.00	883.52	3.31	2046.14		
72.00	320.00	883.52	3.28	2034.47		
74.00	320.00	883.52	3.27	2027.97		
76.00	320.00	883.52	3.26	2023.33		
78.00	320.00	883.52	3.27	2019.55		
80.00	320.00	883.52	3.28	2016.06		
82.00	320.00	883.52	3.29	2013.51		
84.00	320.00	883.52	3.31	2013.77		
86.00	320.00	883.52	3.32	2009.16		
88.00	320.00	883.52	3.33	2007.08		
90.00	320.00	883.52	3.34	2009.73		
92.00	320.00	883.52	3.35	2012.02		

Tabella velocità e spessori Onde SH Linea ST01						
Distanza dal geof.1	**Quota**	**V1 m/sec**	**Profondità 1 m.**	**V2 m/sec**	**Profondità 2 m.**	**V3 m/sec**
0.00	316.33	424.06	4.46	1256.11		
2.00	316.33	424.06	4.46	1256.11		
4.00	316.66	423.66	4.44	1251.69		
6.00	316.99	423.73	4.42	1246.24		
8.00	317.32	423.81	4.39	1239.50		
10.00	317.66	427.67	4.37	1233.53		
12.00	318.00	431.53	4.34	1228.78		
14.00	318.22	429.63	4.32	1225.18		
16.00	318.44	427.73	4.29	1217.86		
18.00	318.57	430.97	4.27	1208.28		
20.00	318.70	434.21	4.24	1199.69		
22.00	318.83	443.03	4.20	1191.68		
24.00	318.96	451.86	4.17	1183.19		
26.00	319.09	462.68	4.13	1174.95		
28.00	319.22	473.51	4.08	1166.41		
30.00	319.35	480.27	4.03	1158.60		
32.00	319.48	487.03	3.98	1152.07		
34.00	319.61	499.61	3.93	1146.99		
36.00	319.74	512.19	3.87	1142.42		
38.00	319.87	521.71	3.81	1135.20		
40.00	320.00	531.23	3.76	1128.40		
42.00	320.00	534.89	3.71	1122.45		
44.00	320.00	538.55	3.65	1115.23		
46.00	320.00	538.55	3.59	1109.51		
48.00	320.00	538.55	3.54	1104.32		
50.00	320.00	538.55	3.48	1100.44		
52.00	320.00	538.55	3.42	1094.35		
54.00	320.00	538.55	3.36	1089.78		
56.00	320.00	538.55	3.31	1080.40		
58.00	320.00	538.55	3.25	1073.55		
60.00	320.00	538.55	3.20	1068.47		
62.00	320.00	538.55	3.16	1062.60		
64.00	320.00	538.55	3.12	1056.91		
66.00	320.00	538.55	3.08	1051.57		
68.00	320.00	538.55	3.06	1045.69		
70.00	320.00	538.55	3.05	1040.50		
72.00	320.00	538.55	3.04	1039.66		
74.00	320.00	538.55	3.04	1039.64		
76.00	320.00	538.55	3.04	1039.54		
78.00	320.00	538.55	3.05	1039.77		
80.00	320.00	538.55	3.06	1039.84		
82.00	320.00	538.55	3.07	1040.30		
84.00	320.00	538.55	3.09	1042.23		
86.00	320.00	538.55	3.11	1047.18		
88.00	320.00	538.55	3.12	1052.07		
90.00	320.00	538.55	3.14	1056.93		
92.00	320.00	538.55	3.17	1061.58		

Sezioni HVSR

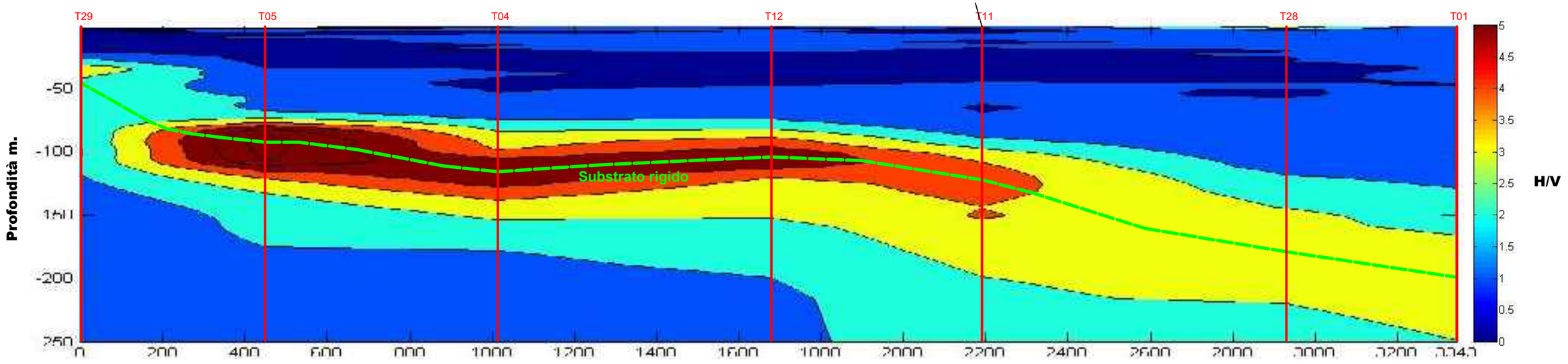
SEZIONI HVSR

S.O. **Sezione T44 - T24** **N.E.**



intersezione

N.O. **Sezione T29 - T01** **S.E.**



Scala orizzontale 1:10000
Scala Verticale amplificata

Carte delle Frequenze

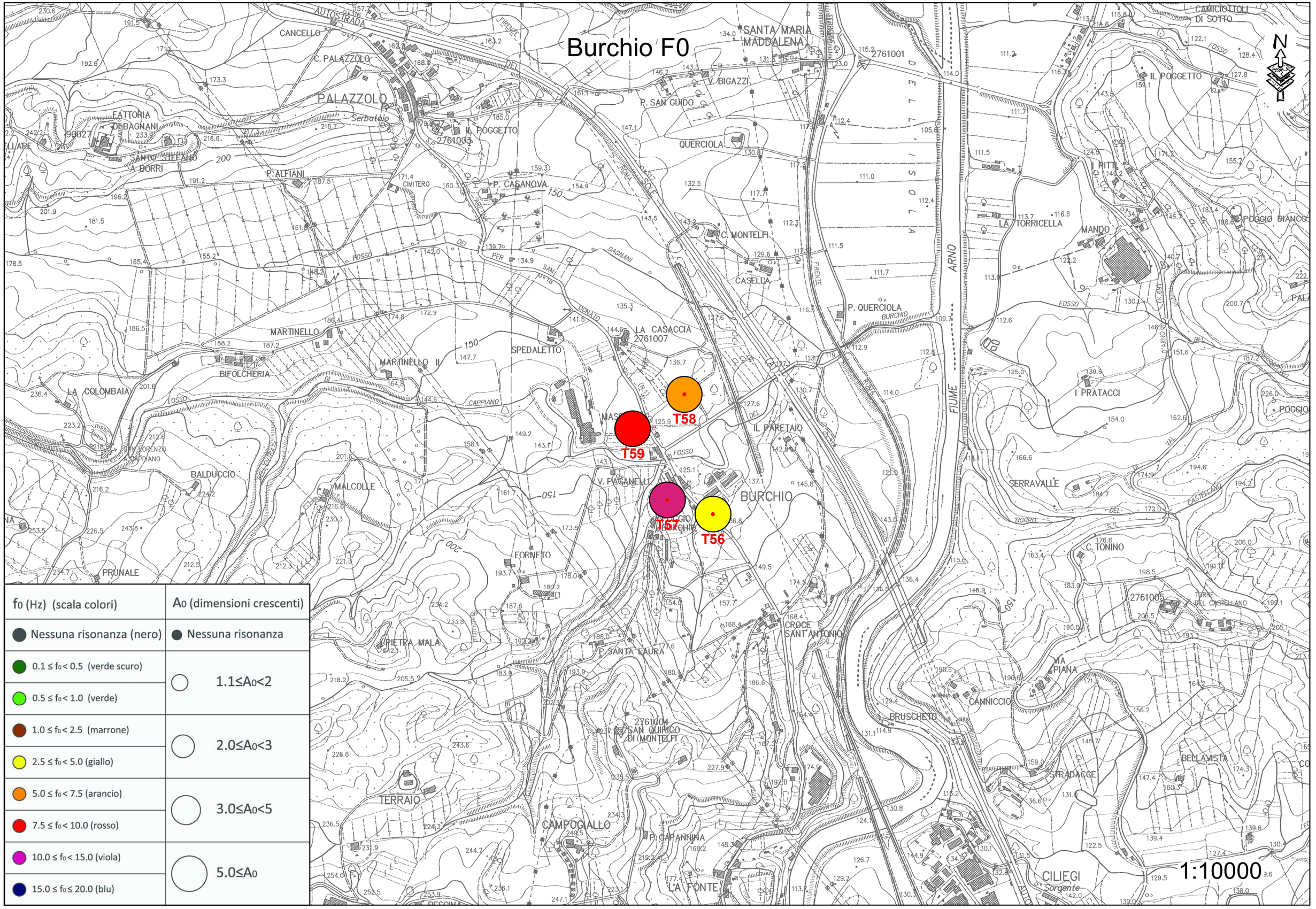
Burchio

f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

T58 T59 T57 T56

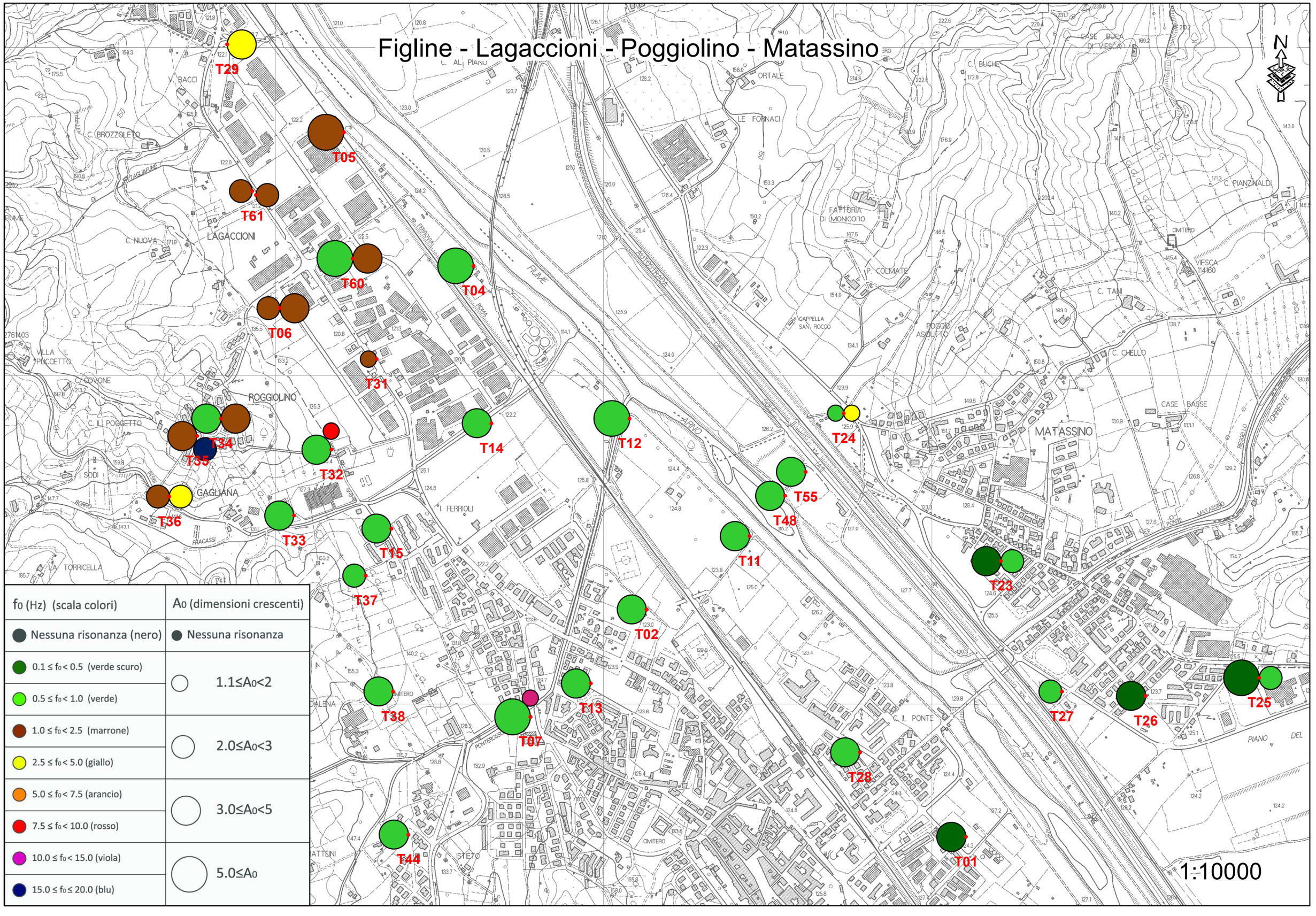
1:10000

Burchio F0



f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

Figline - Lagaccioni - Poggiolino - Matassino



Figline - Lagaccioni - Poggiolino - Matassino F0

f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

1:10000

Figline - Lo Stecco - Madonna del Cesto

f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

1:10000

Figline - Lo Stecco - Madonna del Cesto F0

f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

T01 T03 T20 T21 T22 T44 T45 T46 T47 T49 T50 T51 T52 T53 T54

1:10000

Poggio alla Croce

f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

T63
T62
T64
T65
T66

1:10000

Poggio alla Croce F0

f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

T63
T62
T64
T65
T66

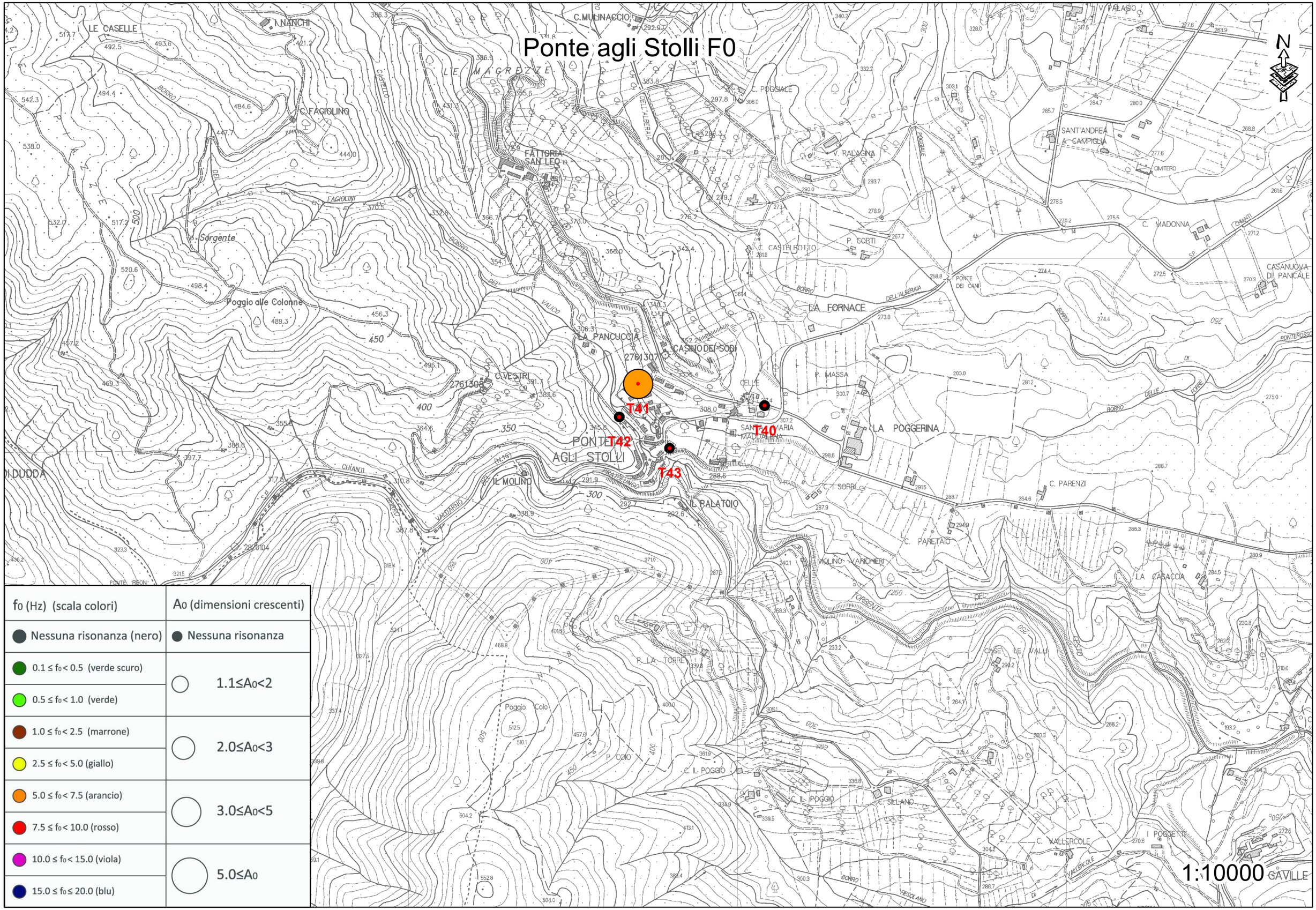
1:10000

Ponte agli Stolli

f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

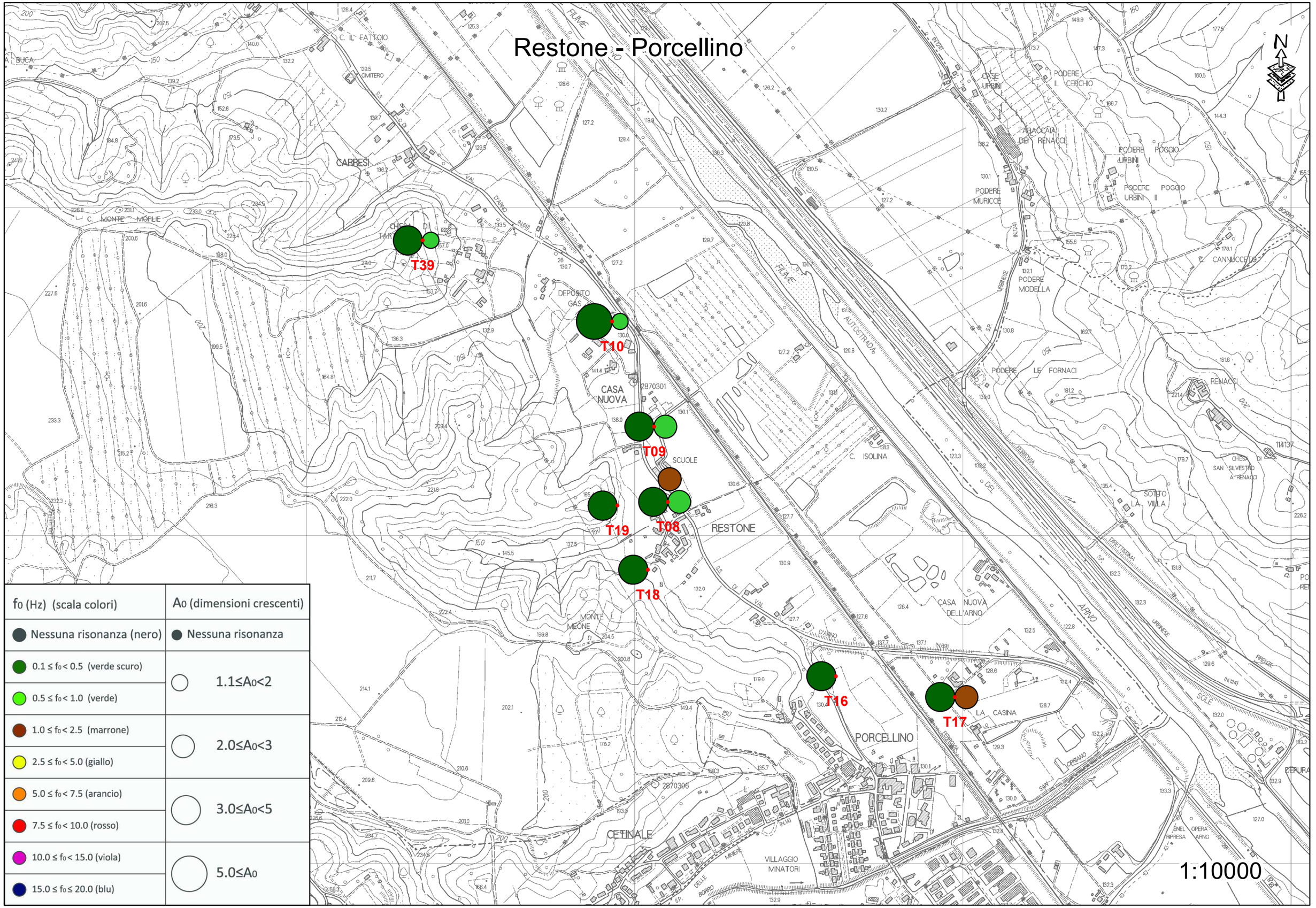
1:10000 GAVILLE

Ponte agli Stolli F0



f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

Restone - Porcellino



f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

Restone - Porcellino F0

f_0 (Hz) (scala colori)	A_0 (dimensioni crescenti)
Nessuna risonanza (nero)	Nessuna risonanza
$0.1 \le f_0 < 0.5$ (verde scuro)	$1.1 \le A_0 < 2$
$0.5 \le f_0 < 1.0$ (verde)	
$1.0 \le f_0 < 2.5$ (marrone)	$2.0 \le A_0 < 3$
$2.5 \le f_0 < 5.0$ (giallo)	
$5.0 \le f_0 < 7.5$ (arancio)	$3.0 \le A_0 < 5$
$7.5 \le f_0 < 10.0$ (rosso)	
$10.0 \le f_0 < 15.0$ (viola)	$5.0 \le A_0$
$15.0 \le f_0 \le 20.0$ (blu)	

T39 T10 T09 T19 T08 T18 T16 T17

RESTONE

PORCELLINO

CETINALE

CASA NUOVA

CASA NUOVA DELL'ARNO

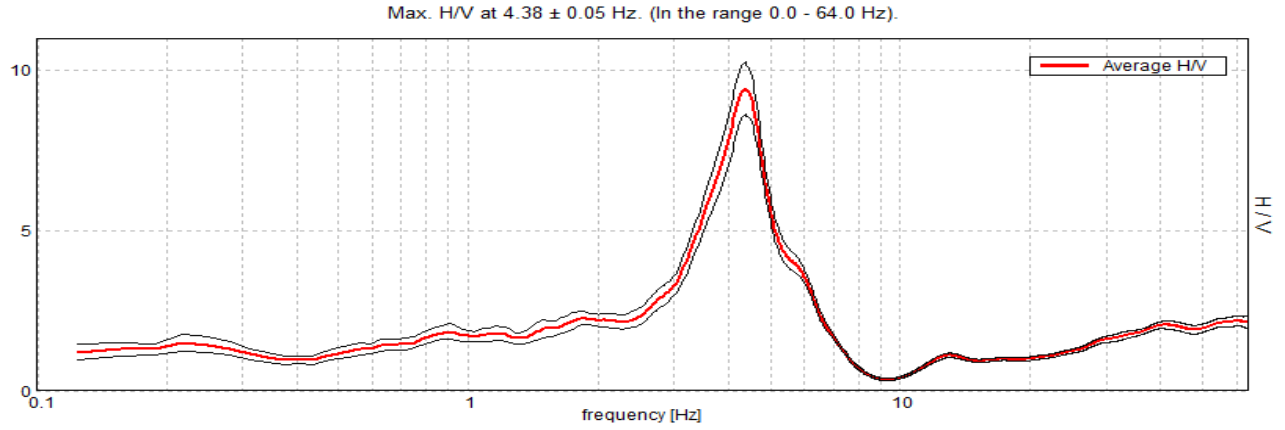
1:10000

Misure HVSR
Burchio

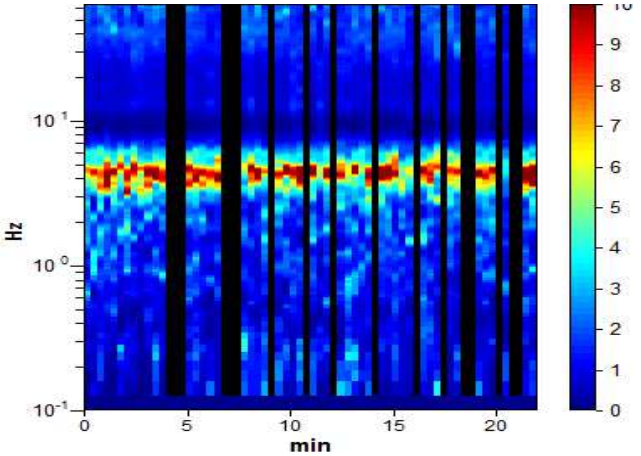
FIGLINE, T56

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 10/09/15 12:13:07 End recording: 10/09/15 12:35:07
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 74% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

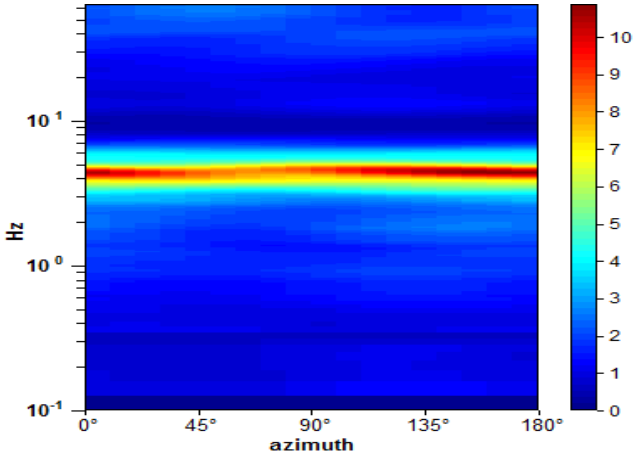
HORIZONTAL TO VERTICAL SPECTRAL RATIO



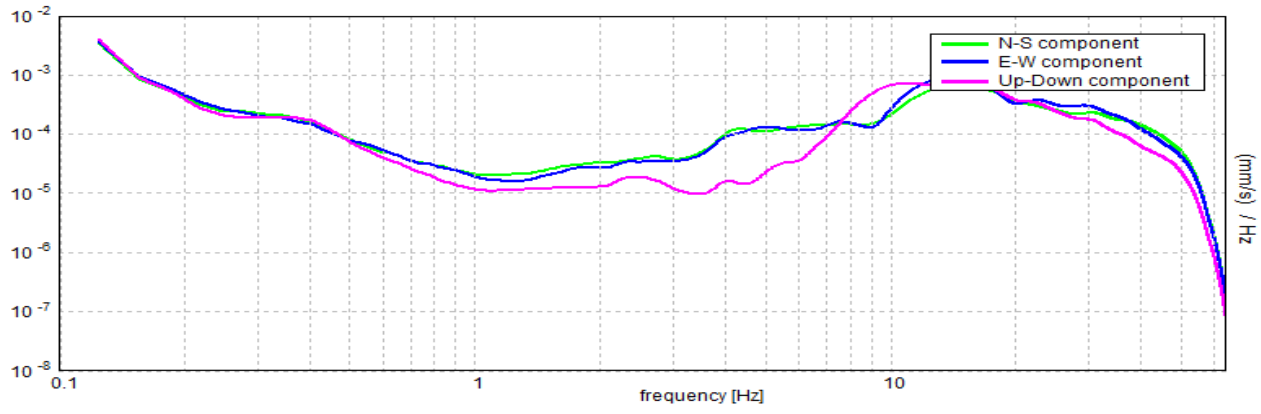
H/V TIME HISTORY



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 4.38 ± 0.05 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.38 > 0.50	OK	
$n_c(f_0) > 200$	4287.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 211 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	3.344 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	5.25 Hz	OK	
$A_0 > 2$	9.43 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.0106| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.04639 < 0.21875	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.8186 < 1.58	OK	

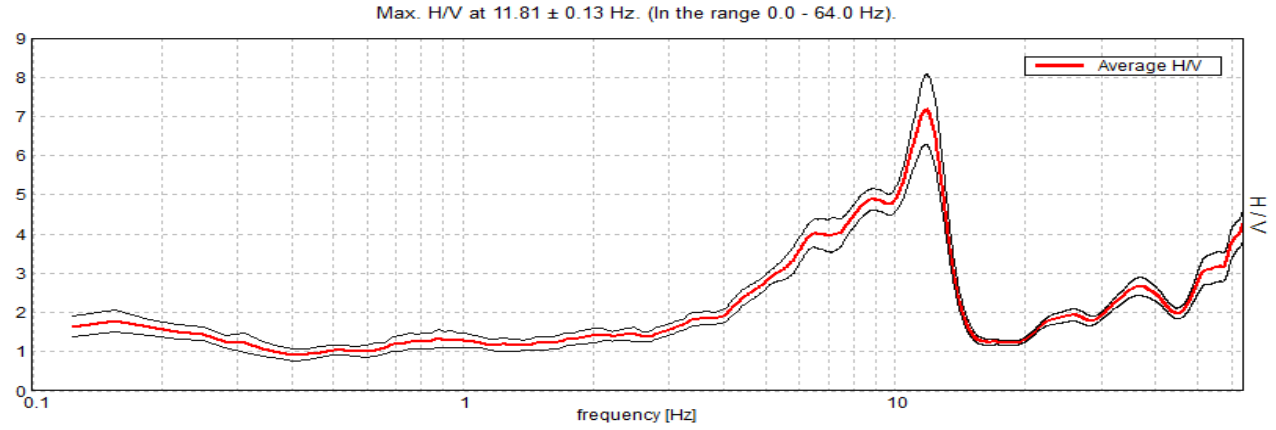
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

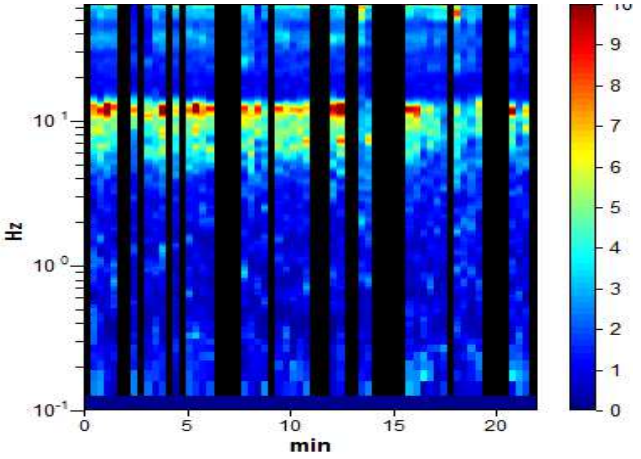
FIGLINE, T57

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 10/09/15 12:42:23 End recording: 10/09/15 13:04:23
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 59% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

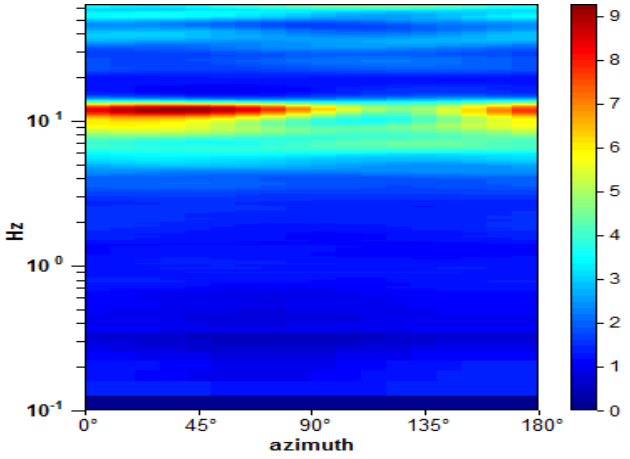
HORIZONTAL TO VERTICAL SPECTRAL RATIO



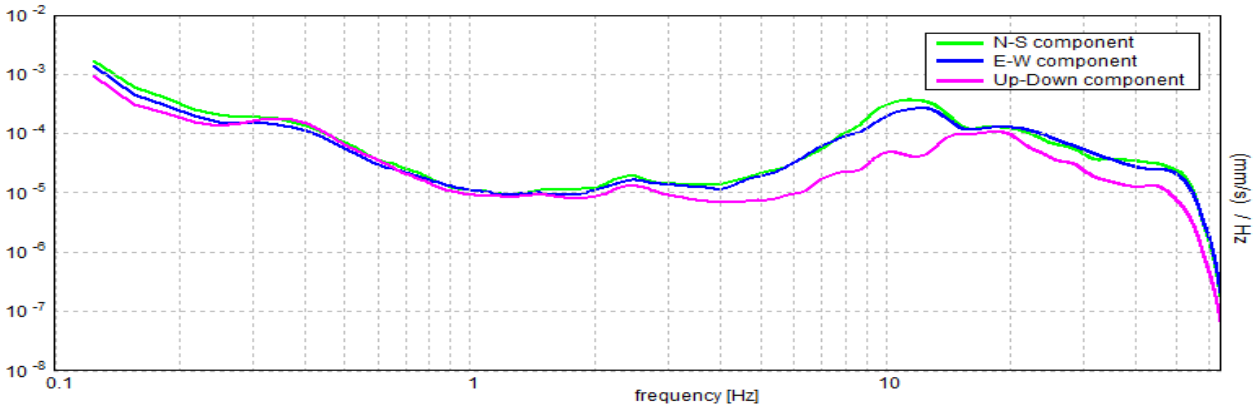
H/V TIME HISTORY



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 11.81 ± 0.13 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	11.81 > 0.50	OK	
$n_c(f_0) > 200$	9213.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 568 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	6.0 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	13.438 Hz	OK	
$A_0 > 2$	7.18 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01122| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.13258 < 0.59063	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.8987 < 1.58	OK	

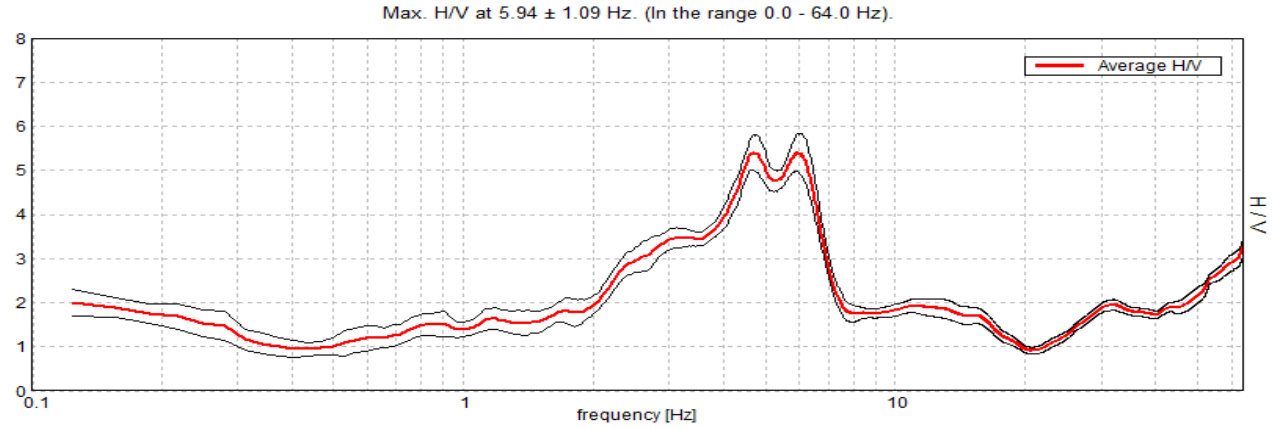
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

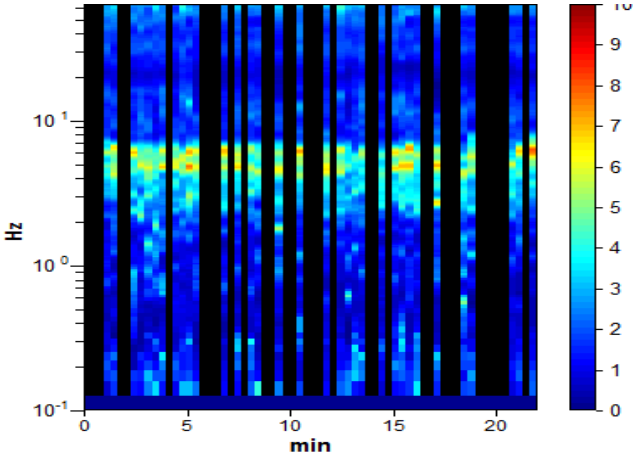
FIGLINE, T58

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 10/09/15 13:17:01 End recording: 10/09/15 13:39:01
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 50% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

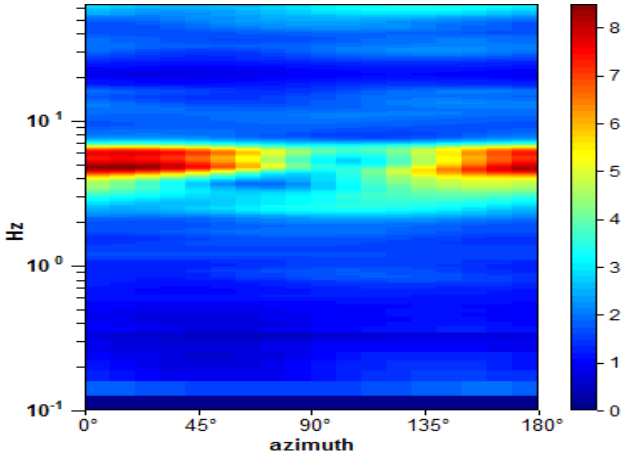
HORIZONTAL TO VERTICAL SPECTRAL RATIO



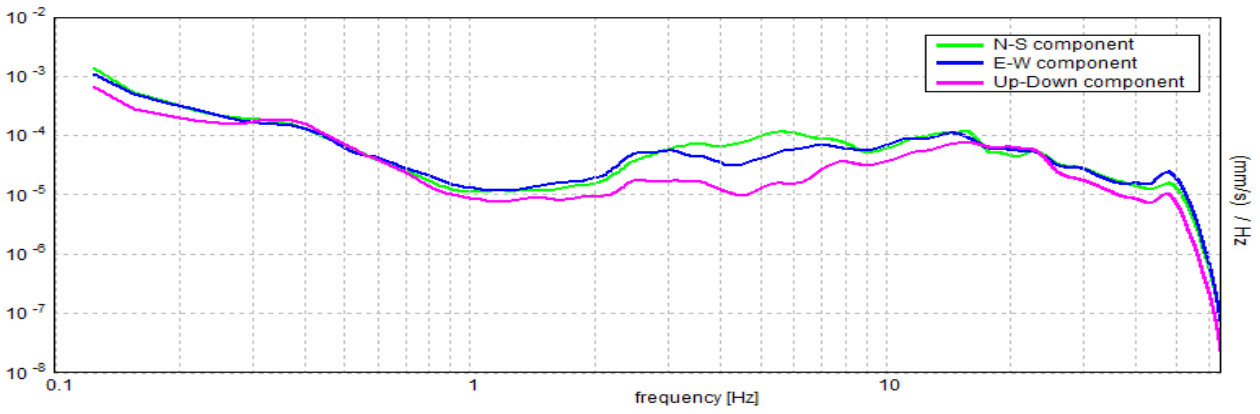
H/V TIME HISTORY



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 5.94 ± 1.09 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	5.94 > 0.50	OK	
$n_c(f_0) > 200$	3918.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 286 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.281 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	7.063 Hz	OK	
$A_0 > 2$	5.41 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.18391| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	1.09196 < 0.29688		NO
$\sigma_A(f_0) < \theta(f_0)$	0.4186 < 1.58	OK	

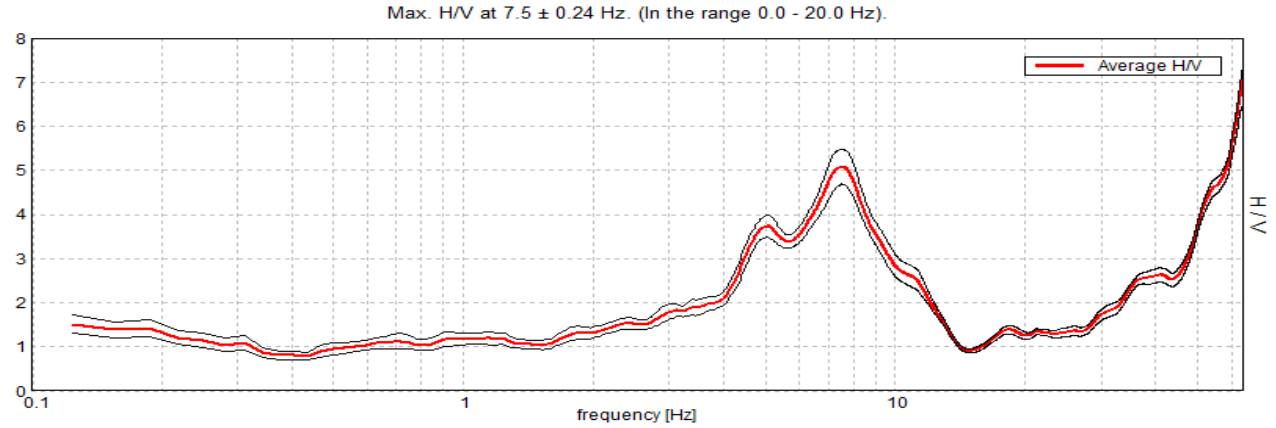
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

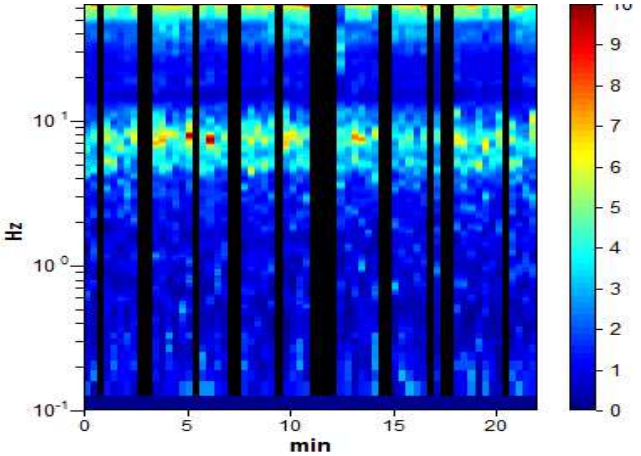
FIGLINE, T59

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 10/09/15 13:56:59 End recording: 10/09/15 14:18:59
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 74% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

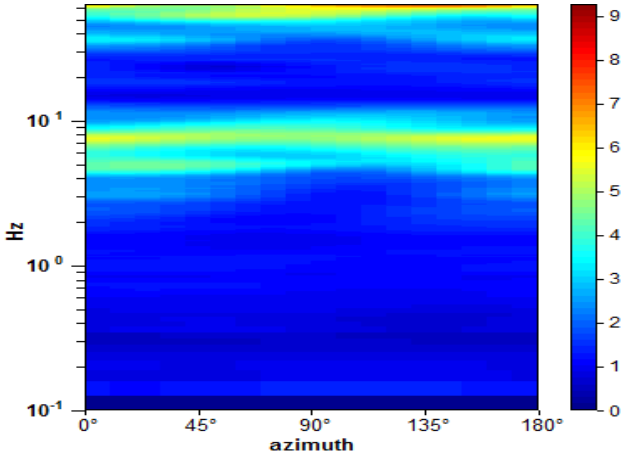
HORIZONTAL TO VERTICAL SPECTRAL RATIO



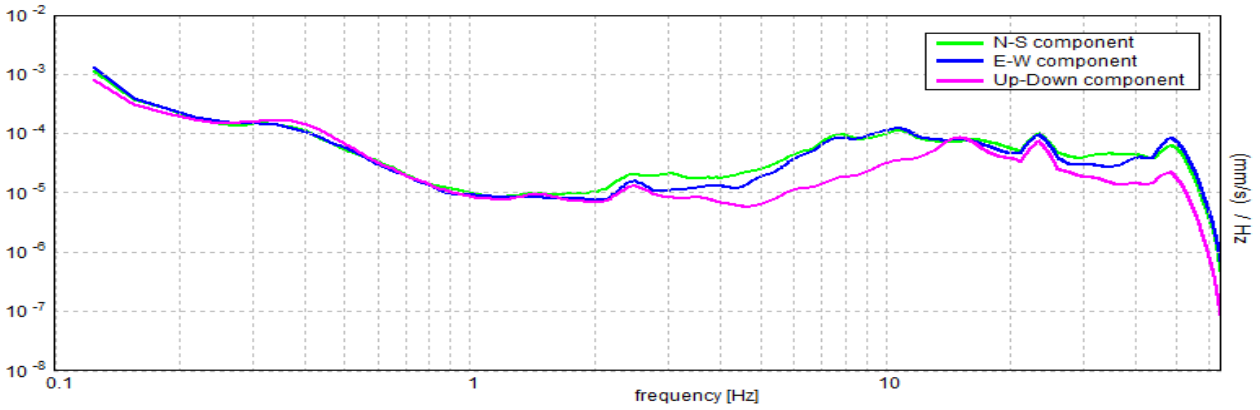
H/V TIME HISTORY



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 7.5 ± 0.24 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	7.50 > 0.50	OK	
$n_c(f_0) > 200$	7350.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 361 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	4.25 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	11.156 Hz	OK	
$A_0 > 2$	5.09 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03246| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.24346 < 0.375	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3939 < 1.58	OK	

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

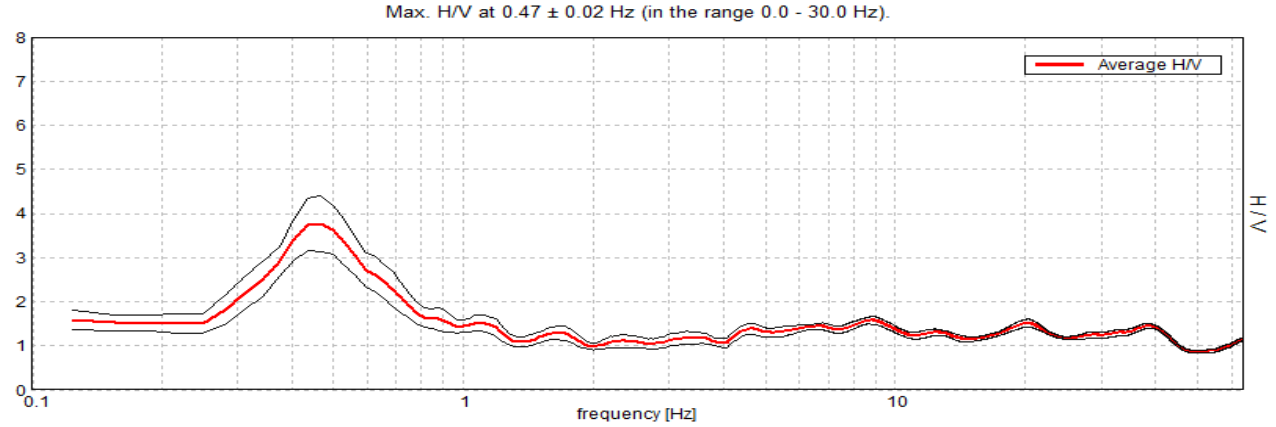
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

Misure HVSR
Figline

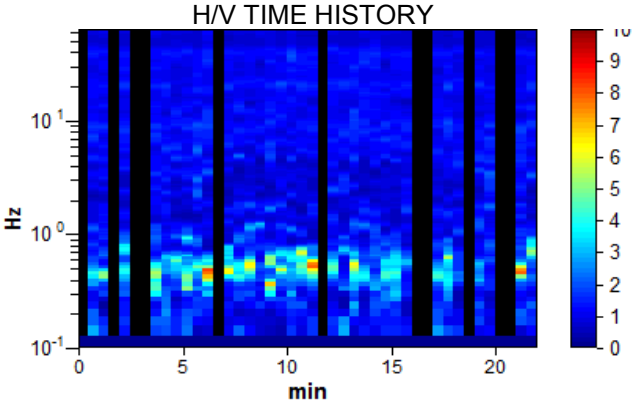
FIGLINE, T1

Instrument: TZ3-0001/01-13
Data format: 16 byte
Full scale [mV]: 51
Start recording: 29/10/13 16:56:58 End recording: 29/10/13 17:18:58
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 75% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

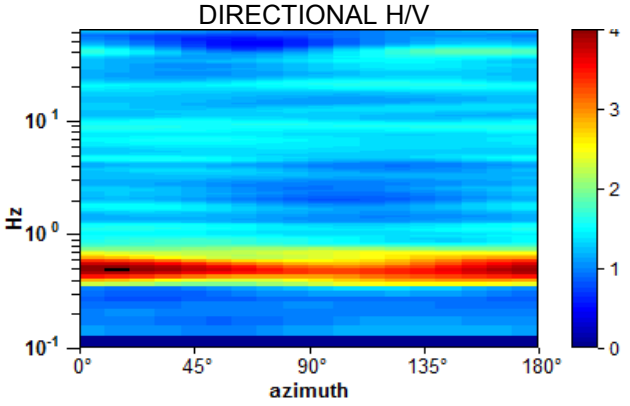
HORIZONTAL TO VERTICAL SPECTRAL RATIO



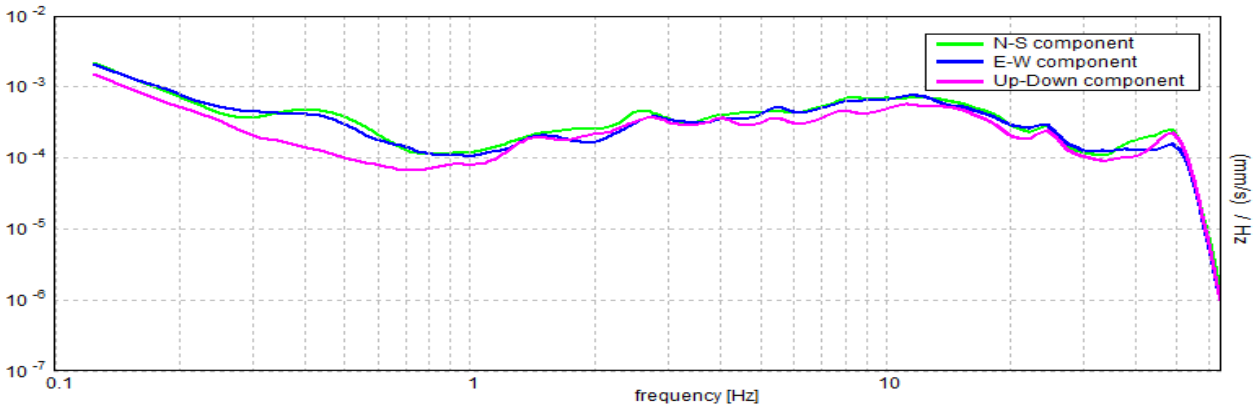
H/V TIME HISTORY



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 0.47 ± 0.02 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.47 > 0.33	OK	
$n_c(f_0) > 200$	464.1 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 24 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.281 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.781 Hz	OK	
$A_0 > 2$	3.76 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.04342| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.02035 < 0.09375	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.6335 < 2.5	OK	

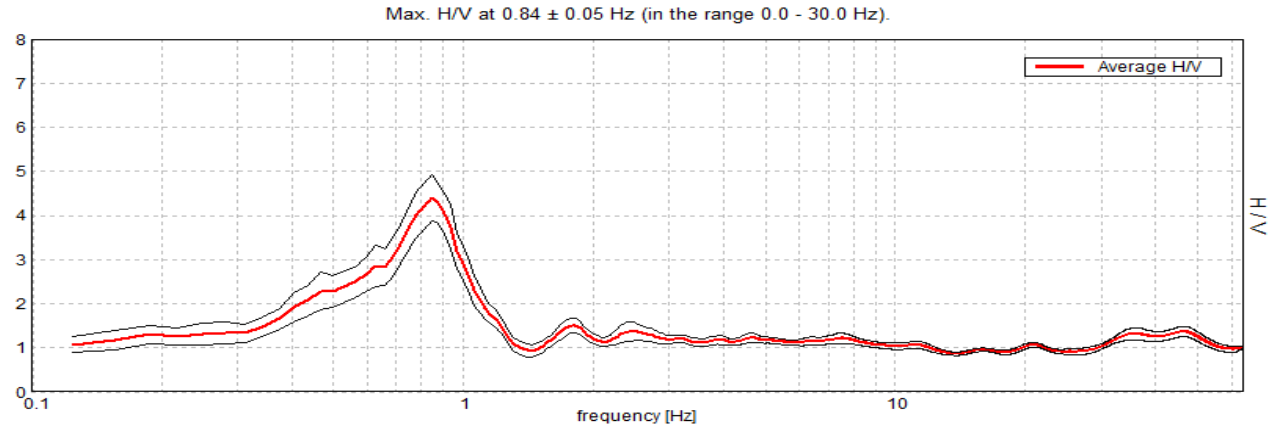
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

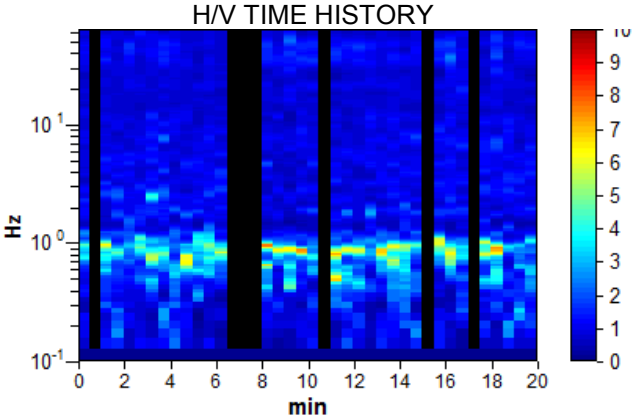
FIGLINE, T2

Instrument: TZ3-0001/01-13
Data format: 16 byte
Full scale [mV]: 51
Start recording: 29/10/13 18:11:54 End recording: 29/10/13 18:31:54
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h20'00". Analyzed 82% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

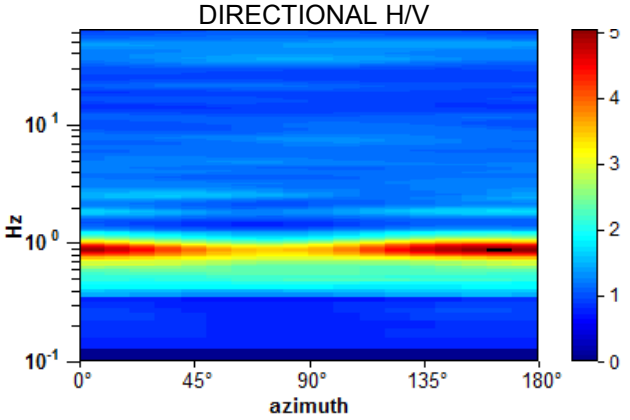
HORIZONTAL TO VERTICAL SPECTRAL RATIO



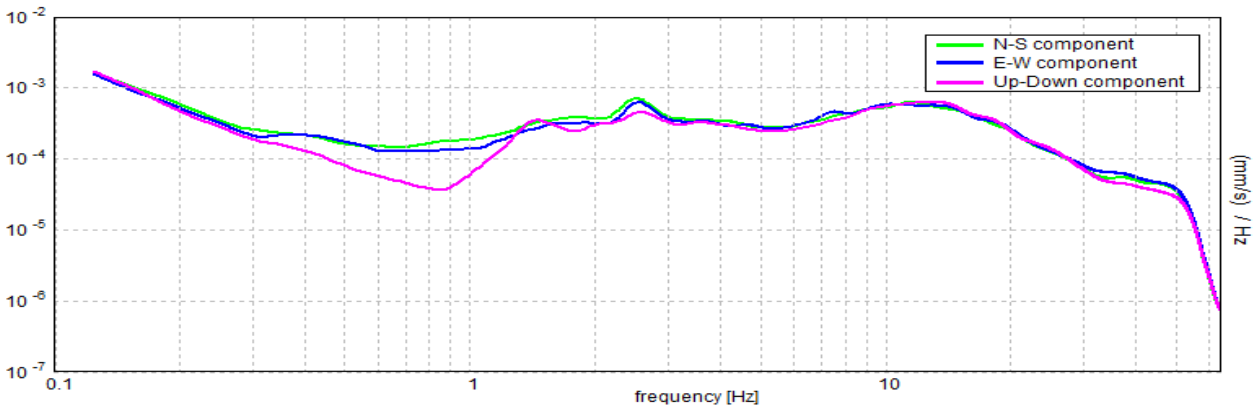
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.84 ± 0.05 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.84 > 0.33	OK	
$n_c(f_0) > 200$	835.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 42 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.438 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.094 Hz	OK	
$A_0 > 2$	4.40 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.06251| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.05274 < 0.12656	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5355 < 2.0	OK	

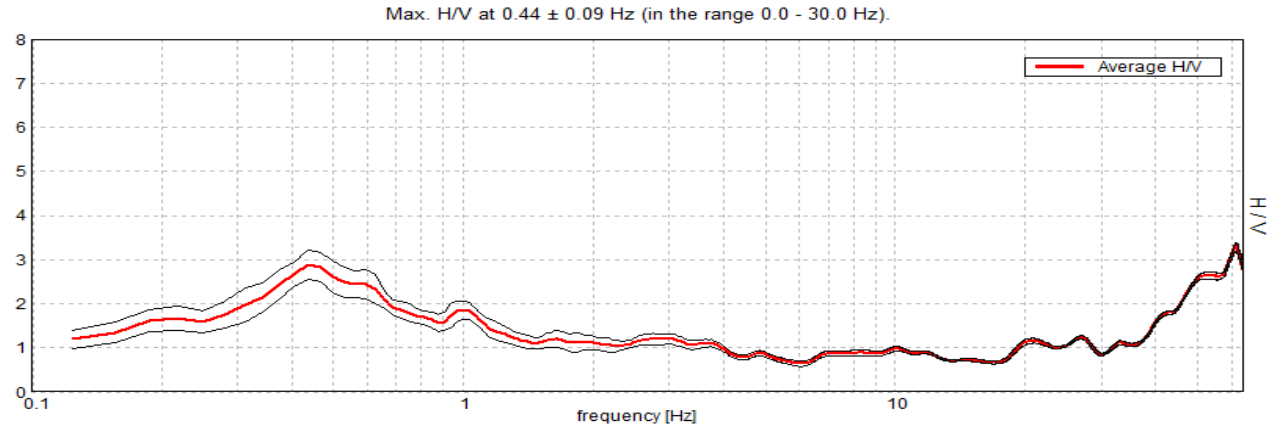
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

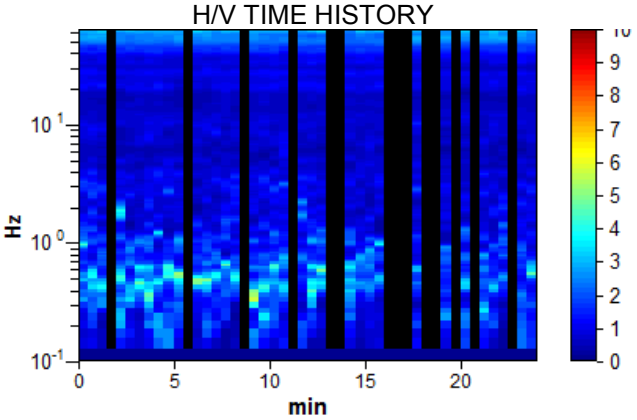
FIGLINE, T3

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 25/05/15 13:01:38 End recording: 25/05/15 13:25:38
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 71% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

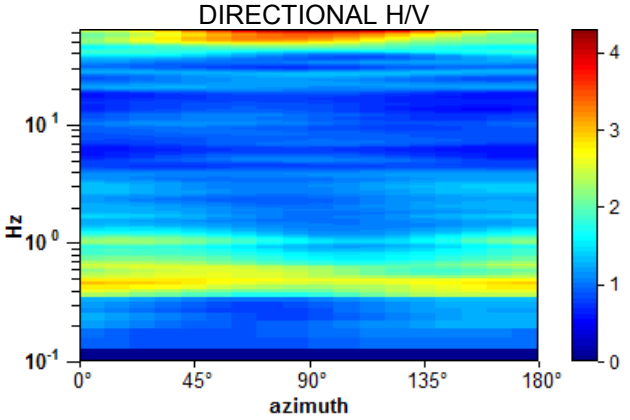
HORIZONTAL TO VERTICAL SPECTRAL RATIO



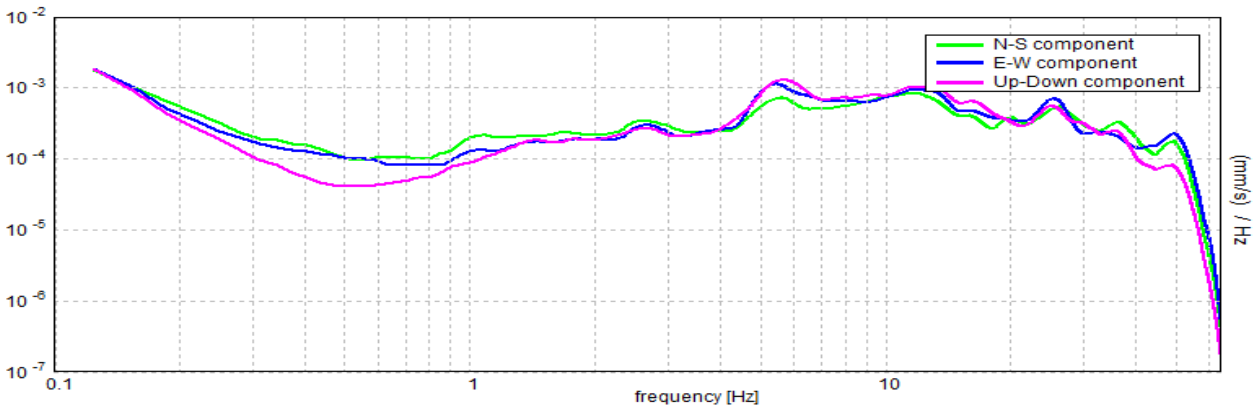
H/V TIME HISTORY



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 0.44 ± 0.09 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.44 > 0.33	OK	
$n_c(f_0) > 200$	446.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 22 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.156 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.156 Hz	OK	
$A_0 > 2$	2.88 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.20129| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.08806 < 0.0875		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3244 < 2.5	OK	

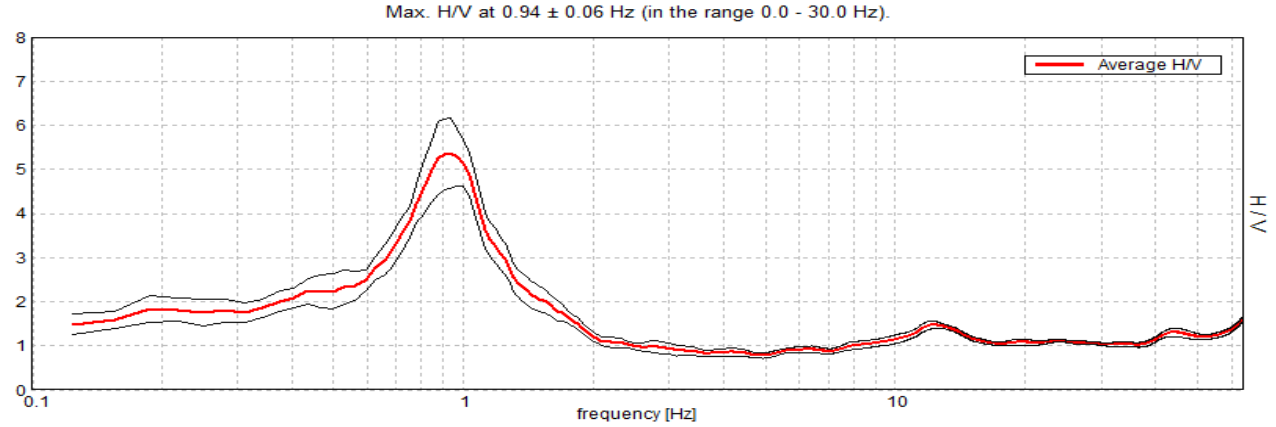
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

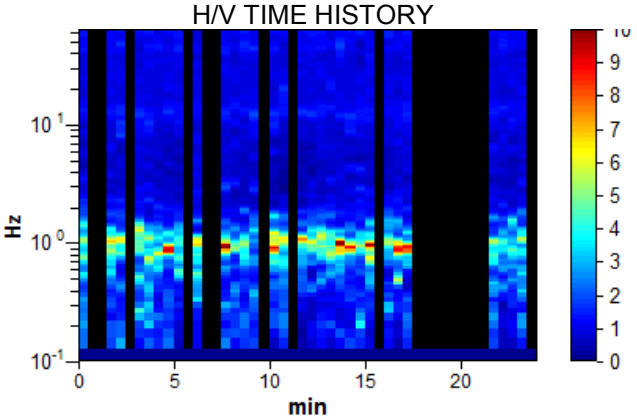
FIGLINE, T7

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 25/05/15 16:16:49 End recording: 25/05/15 16:40:49
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 62% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

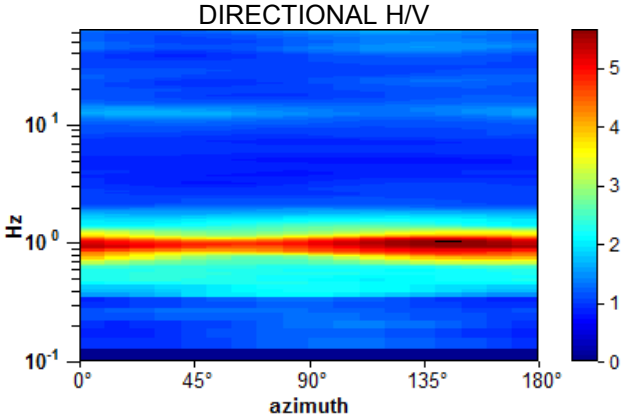
HORIZONTAL TO VERTICAL SPECTRAL RATIO



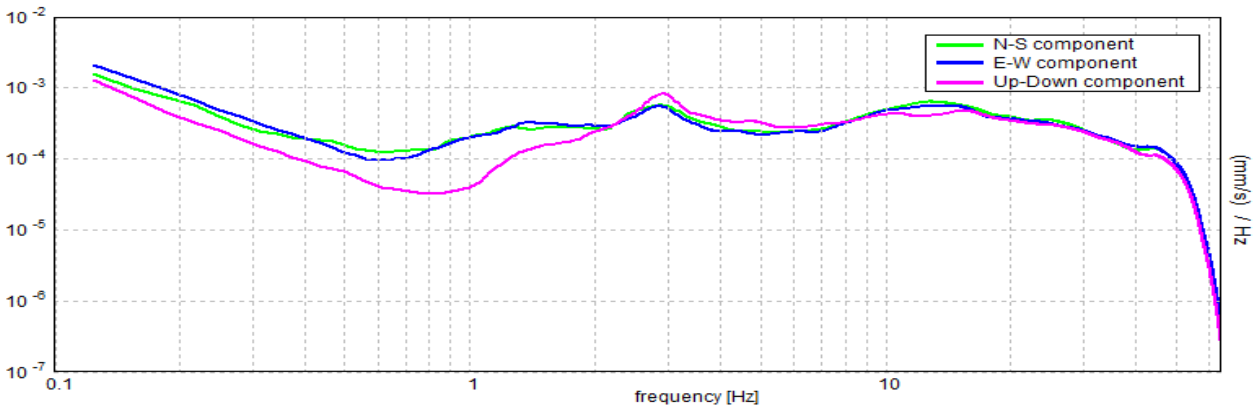
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.94 ± 0.06 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.94 > 0.33	OK	
$n_c(f_0) > 200$	843.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 46 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.594 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.313 Hz	OK	
$A_0 > 2$	5.36 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.06526| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.06118 < 0.14063	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.8089 < 2.0	OK	

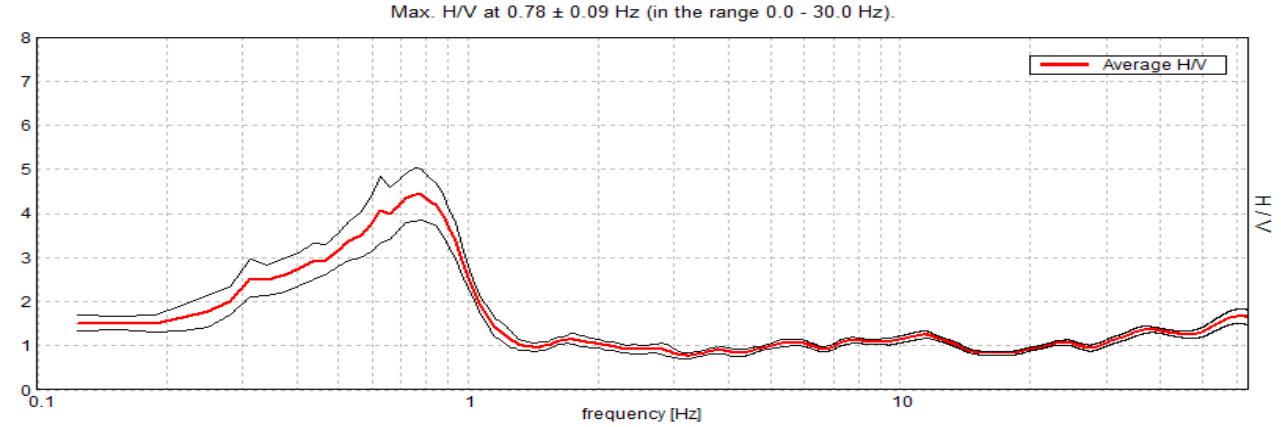
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

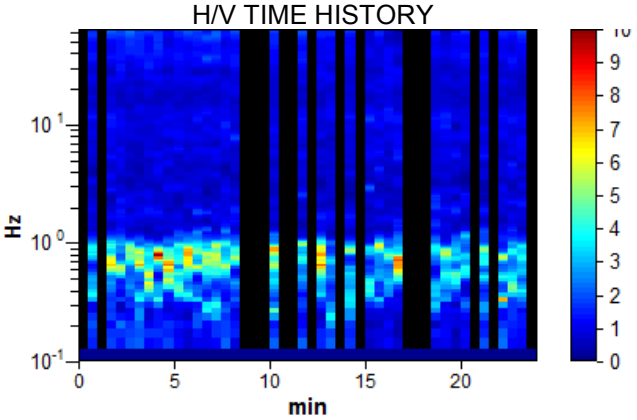
FIGLINE, T11

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 27/05/15 15:40:40 End recording: 27/05/15 16:04:40
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 67% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

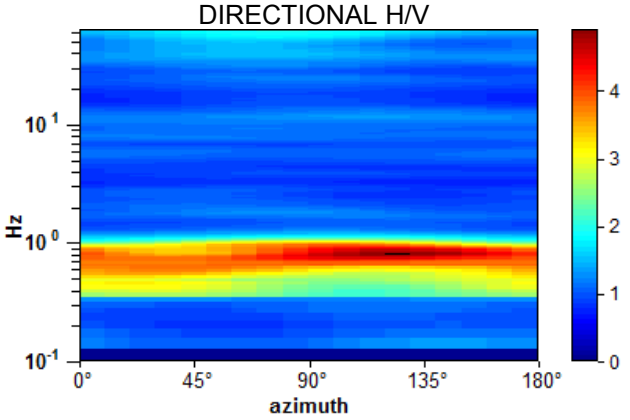
HORIZONTAL TO VERTICAL SPECTRAL RATIO



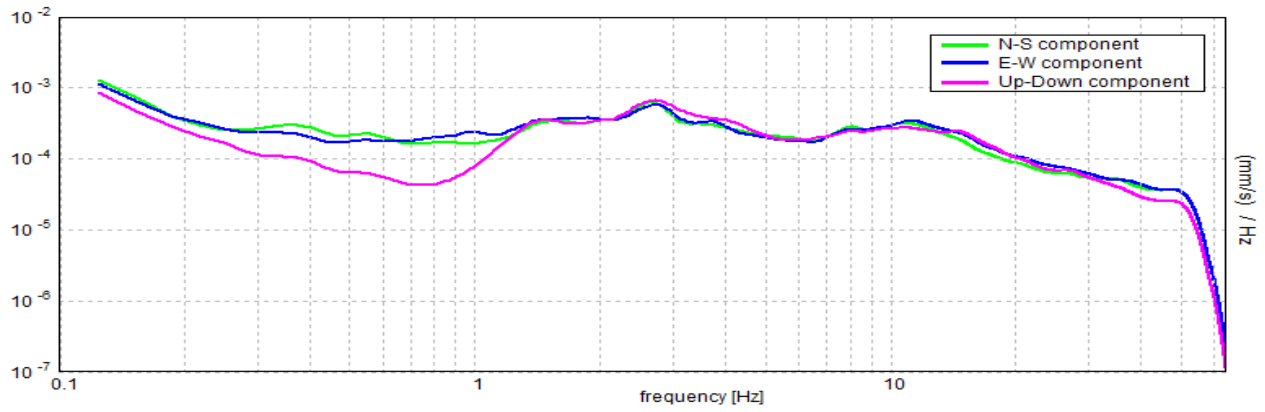
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.78 ± 0.09 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.78 > 0.33	OK	
$n_c(f_0) > 200$	750.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 38 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.281 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.063 Hz	OK	
$A_0 > 2$	4.42 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.11554| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.09027 < 0.11719	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5837 < 2.0	OK	

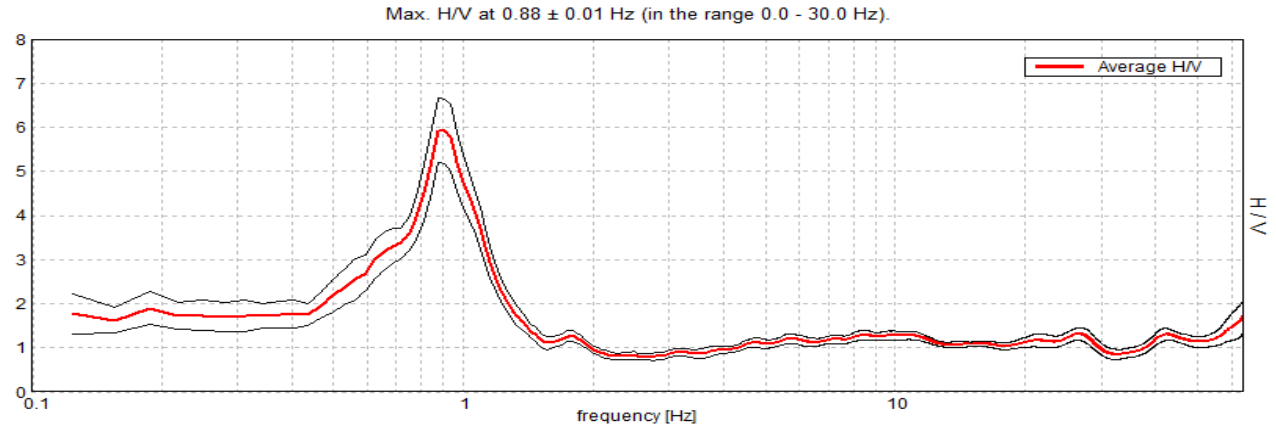
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

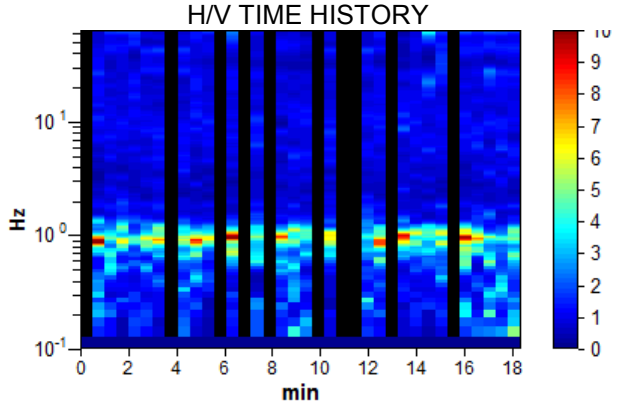
FIGLINE, T12

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 27/05/15 16:23:14 End recording: 27/05/15 16:41:38
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h18'24". Analyzed 72% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

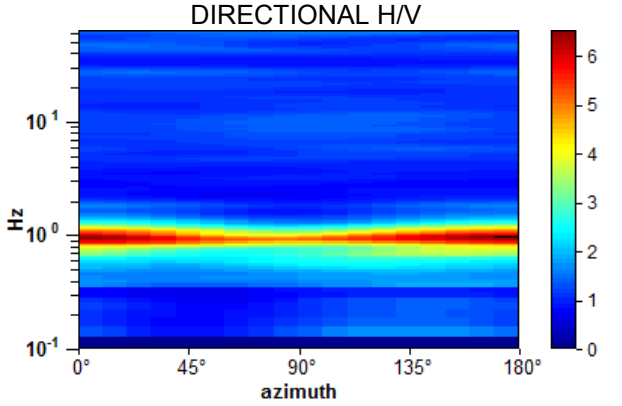
HORIZONTAL TO VERTICAL SPECTRAL RATIO



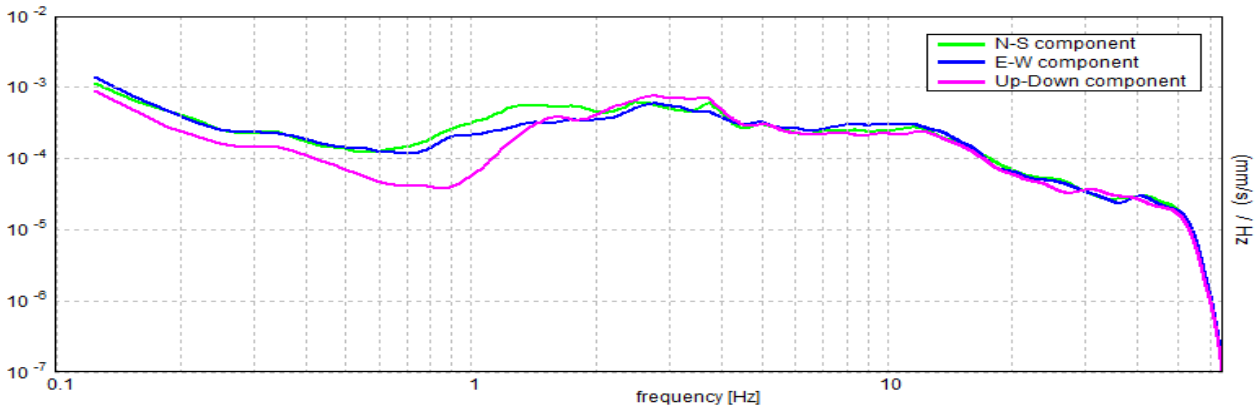
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.88 ± 0.01 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.88 > 0.33	OK	
$n_c(f_0) > 200$	682.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 43 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.594 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.156 Hz	OK	
$A_0 > 2$	5.92 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.007| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.00613 < 0.13125	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.7285 < 2.0	OK	

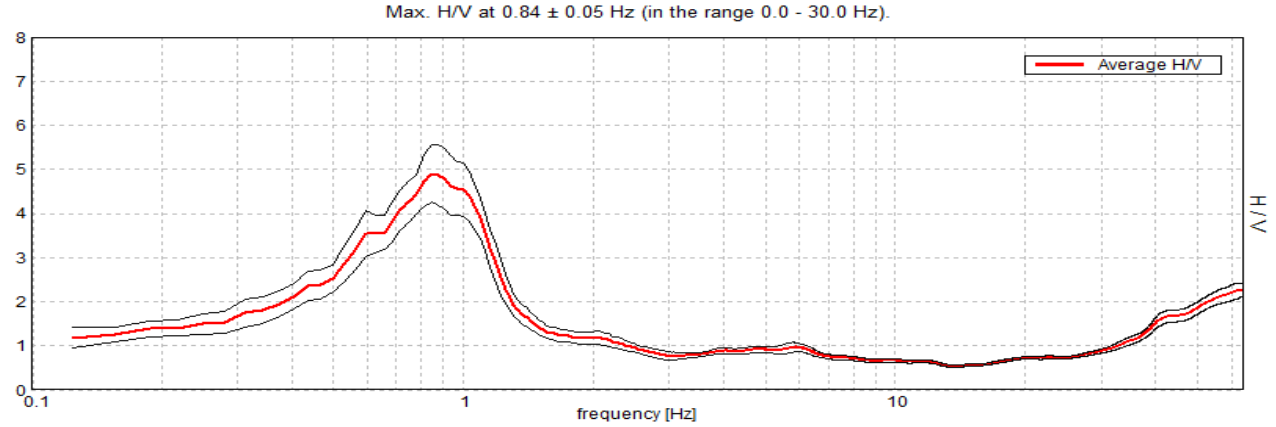
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

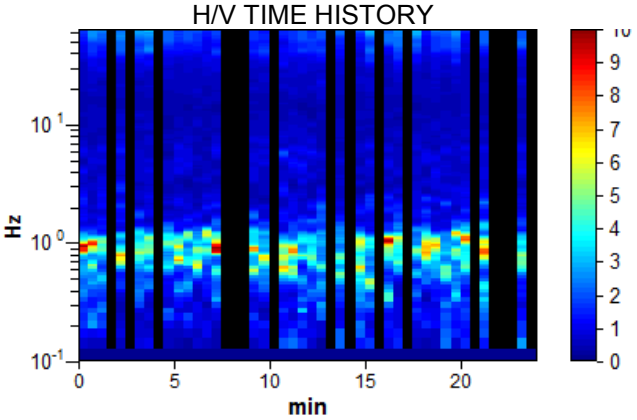
FIGLINE, T13

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 27/05/15 17:02:36 End recording: 27/05/15 17:26:37
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 67% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

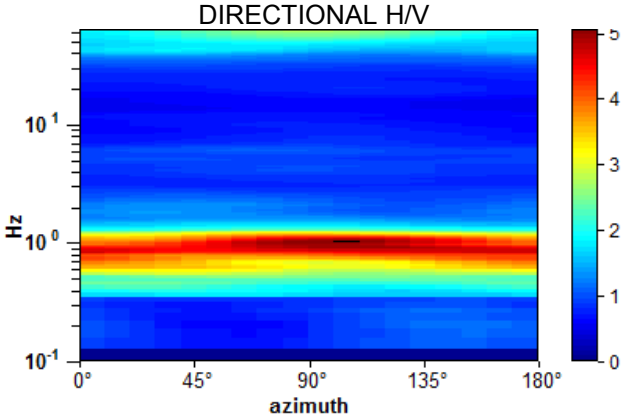
HORIZONTAL TO VERTICAL SPECTRAL RATIO



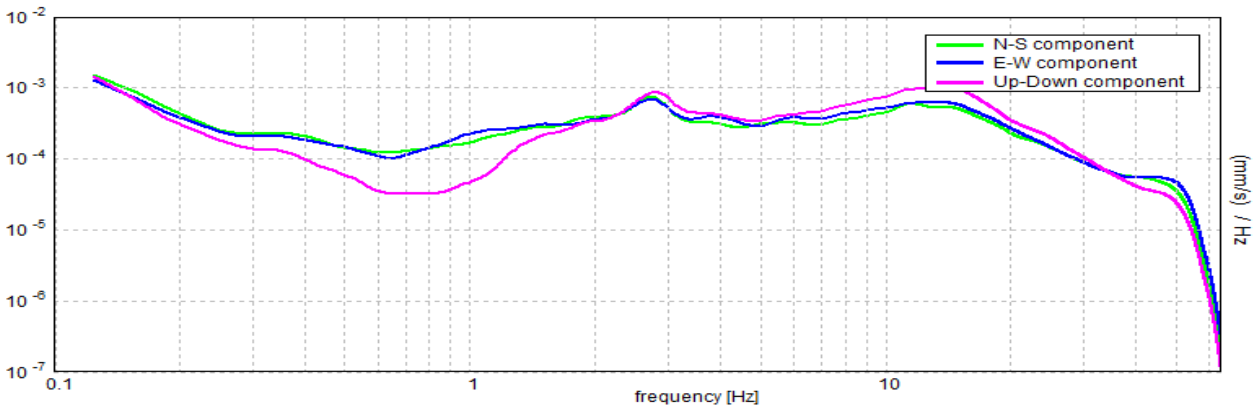
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.84 ± 0.05 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.84 > 0.33	OK	
$n_c(f_0) > 200$	810.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 42 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.469 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	4.90 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.05782| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.04879 < 0.12656	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.6468 < 2.0	OK	

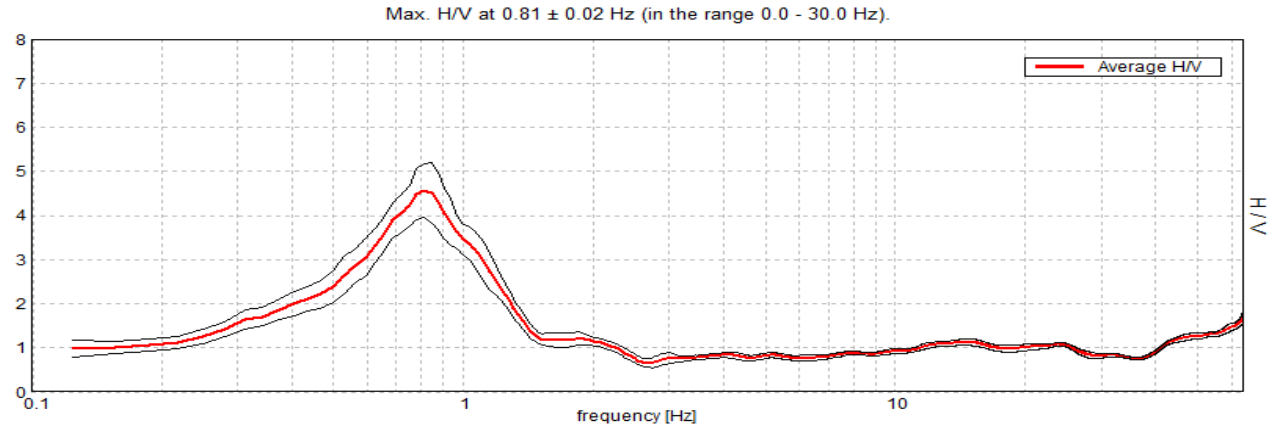
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

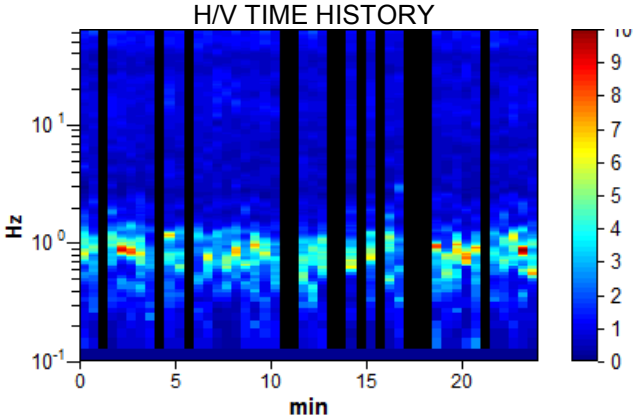
FIGLINE, T14

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 27/05/15 17:38:51 End recording: 27/05/15 18:02:51
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 73% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

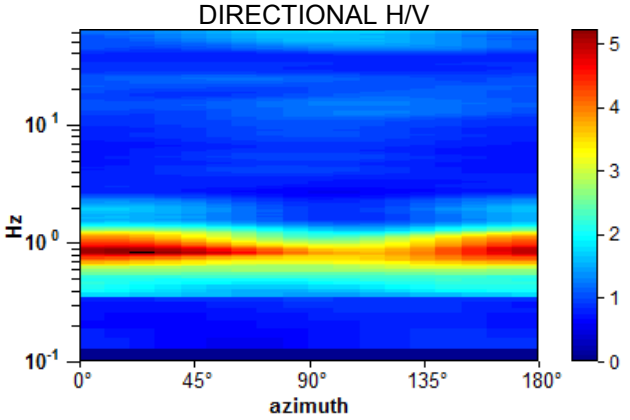
HORIZONTAL TO VERTICAL SPECTRAL RATIO



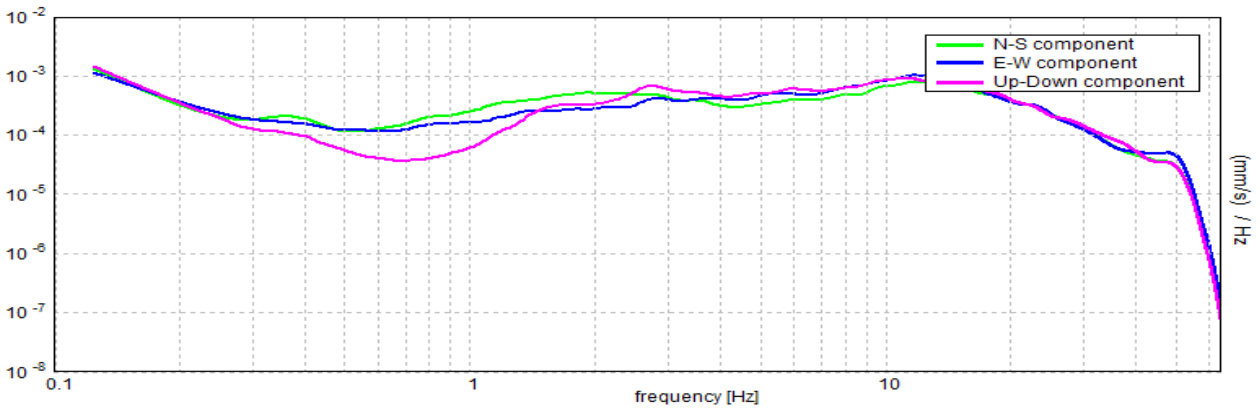
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.81 ± 0.02 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.81 > 0.33	OK	
$n_c(f_0) > 200$	853.1 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 40 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.469 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	4.56 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02907| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.02362 < 0.12188	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.6058 < 2.0	OK	

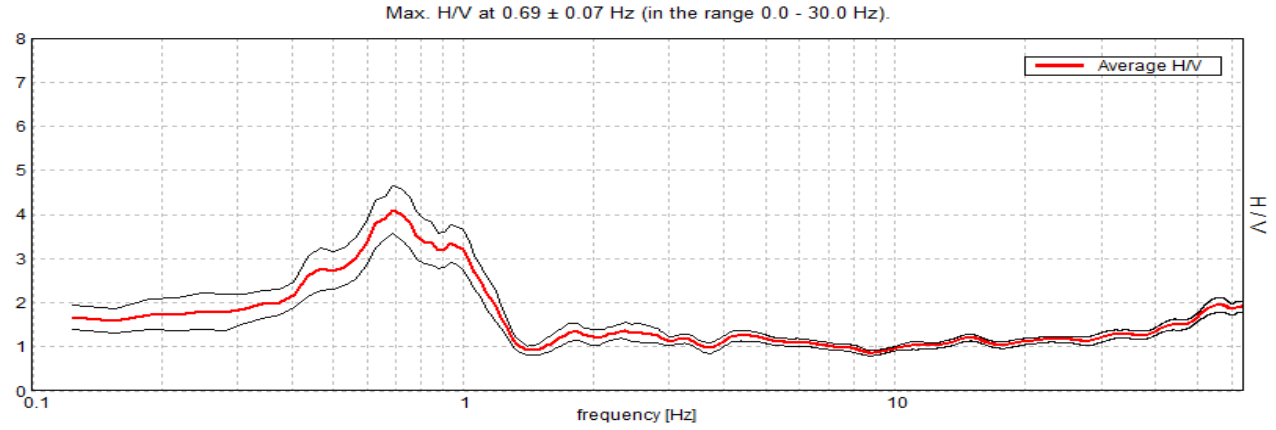
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

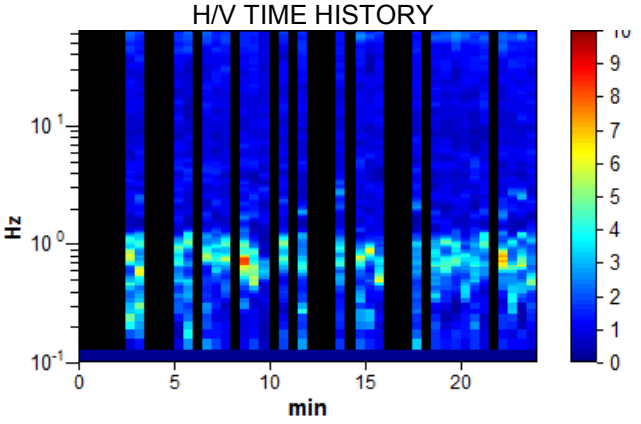
FIGLINE, T15

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 27/05/15 18:18:06 End recording: 27/05/15 18:42:06
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 56% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

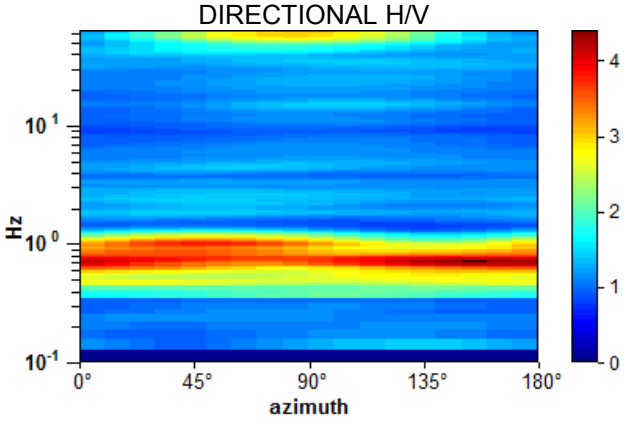
HORIZONTAL TO VERTICAL SPECTRAL RATIO



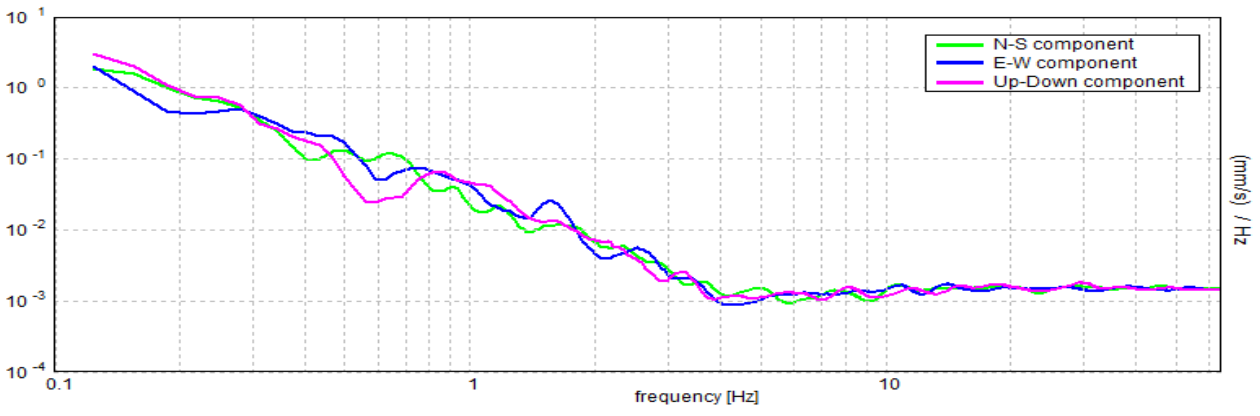
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.69 ± 0.07 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.69 > 0.33	OK	
$n_c(f_0) > 200$	556.9 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 34 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.375 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.188 Hz	OK	
$A_0 > 2$	4.10 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.10239| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.07039 < 0.10313	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5376 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

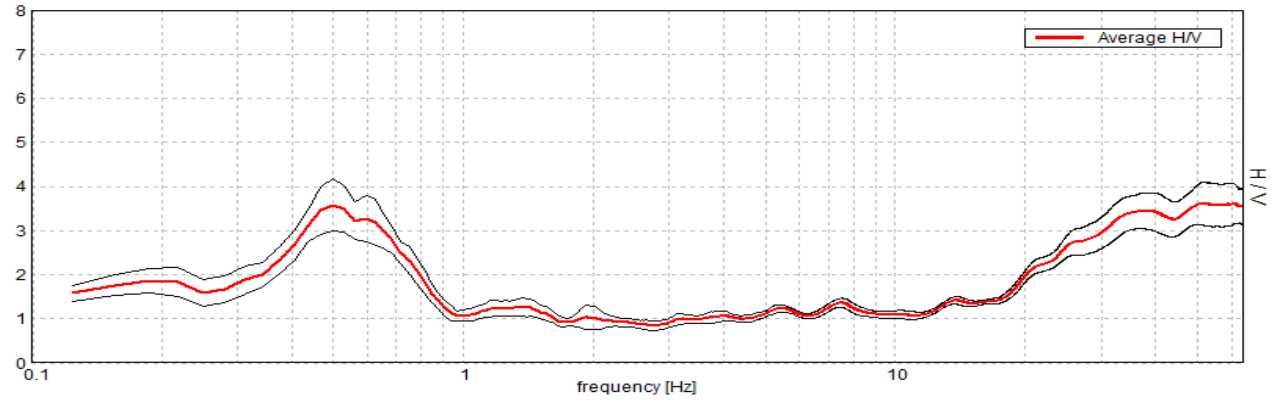
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T28

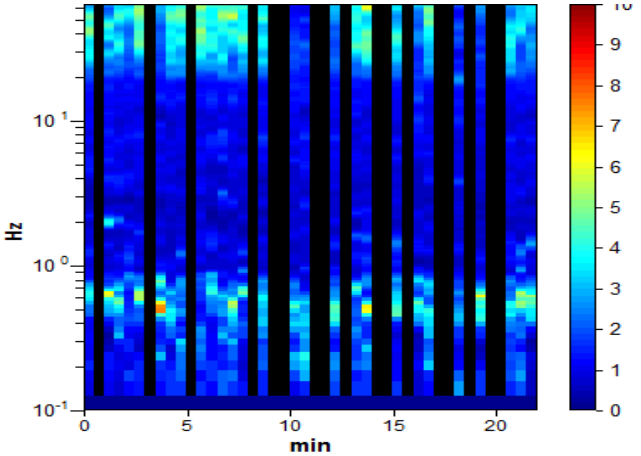
Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 21/08/15 20:38:26 End recording: 21/08/15 21:00:26
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 61% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

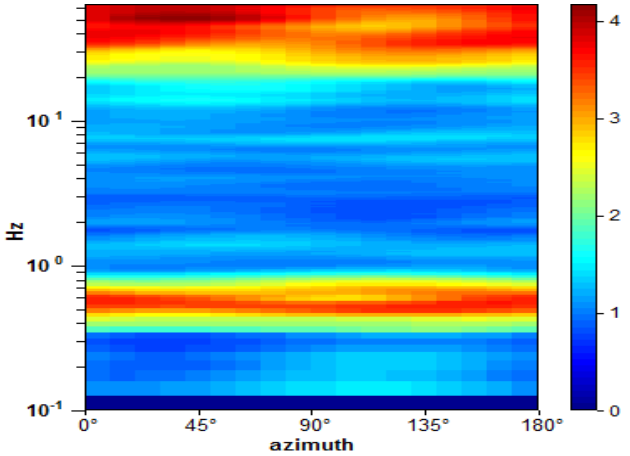
Max. H/V at 0.5 ± 0.08 Hz. (In the range 0.0 - 15.0 Hz).



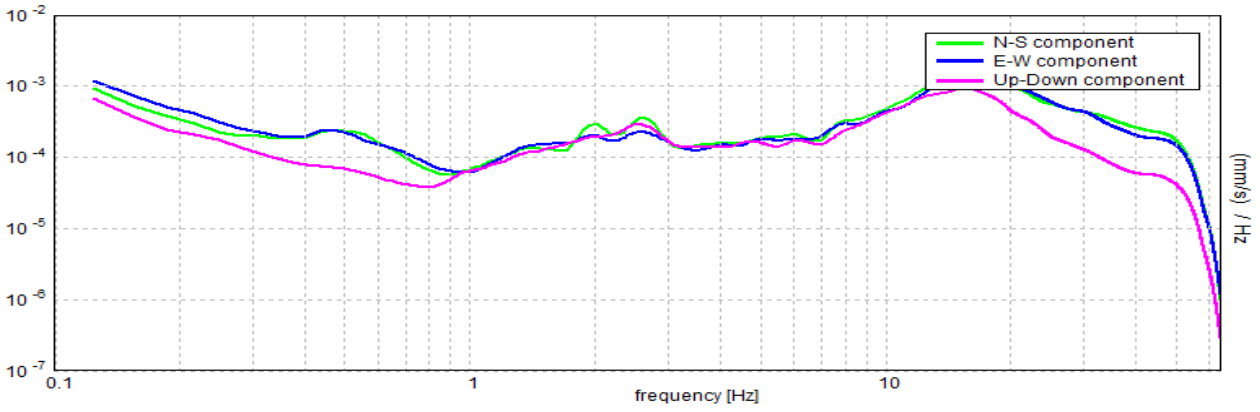
H/V TIME HISTORY



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 0.5 ± 0.08 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.50 > 0.33	OK	
$n_c(f_0) > 200$	405.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$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 $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.281 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.844 Hz	OK	
$A_0 > 2$	3.58 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.15215| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.07607 < 0.075		NO
$\sigma_A(f_0) < \theta(f_0)$	0.5968 < 2.0	OK	

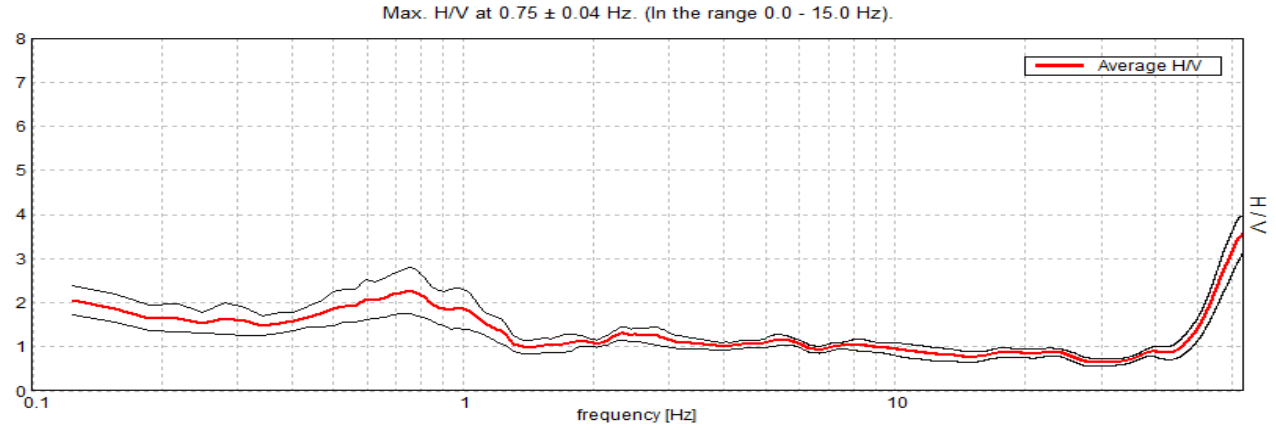
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

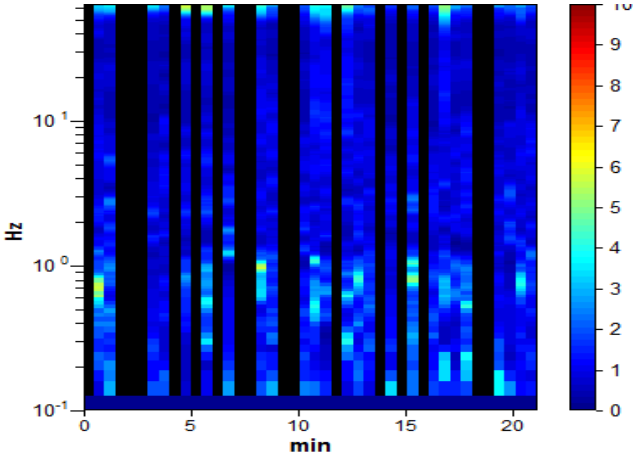
FIGLINE, T37

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 22/08/15 18:41:22 End recording: 22/08/15 19:02:38
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h21'12". Analyzed 60% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

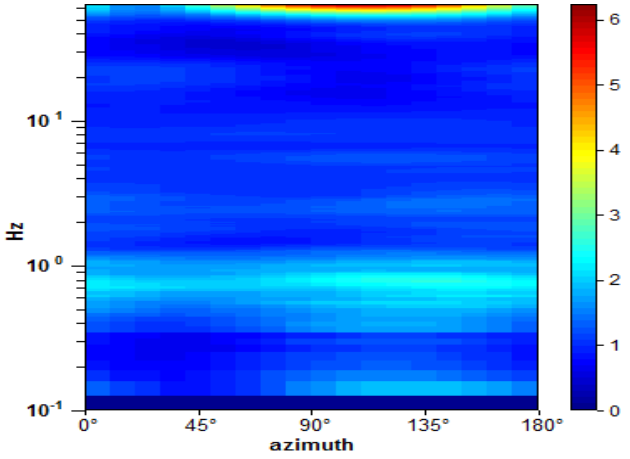
HORIZONTAL TO VERTICAL SPECTRAL RATIO



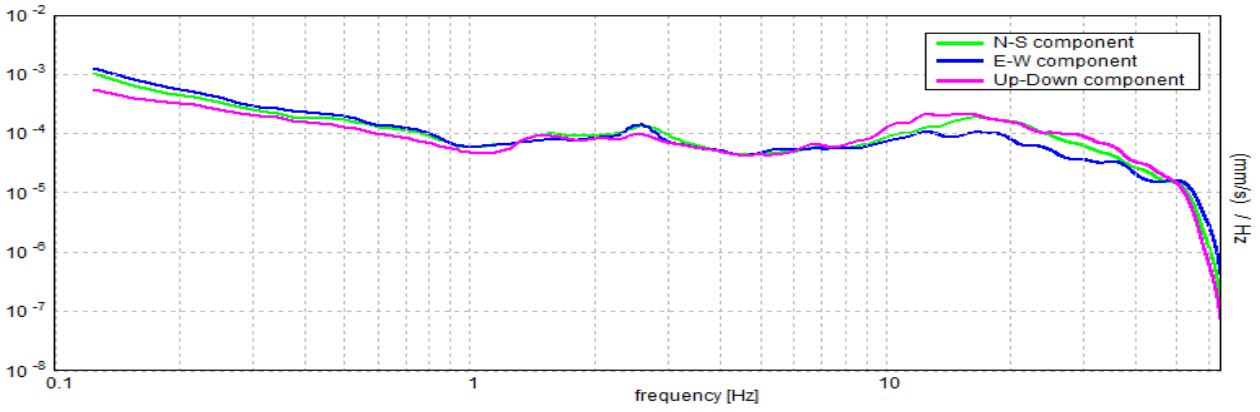
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.75 ± 0.04 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.75 > 0.33	OK	
$n_c(f_0) > 200$	562.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 37 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.313 Hz	OK	
$A_0 > 2$	2.27 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.04859| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.03644 < 0.1125	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5218 < 2.0	OK	

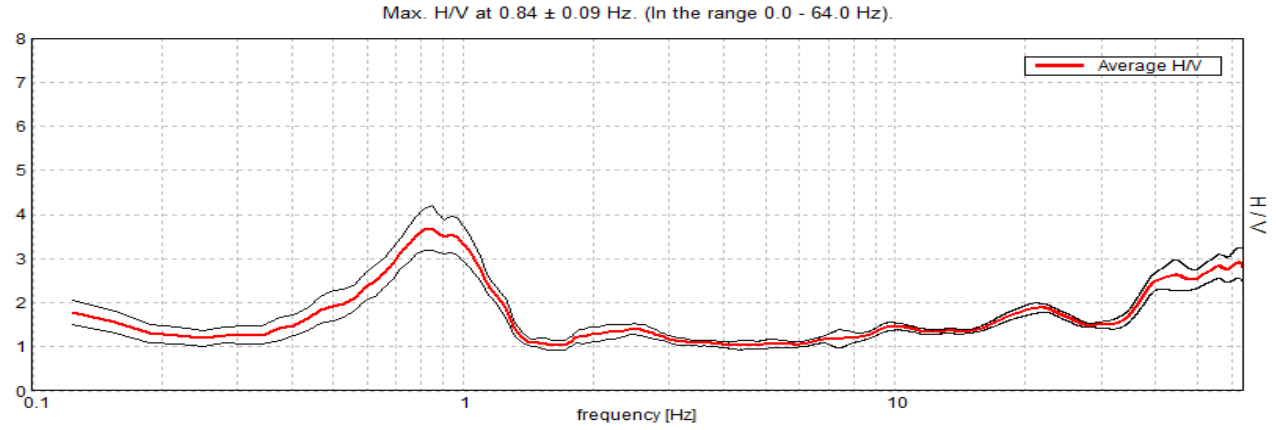
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

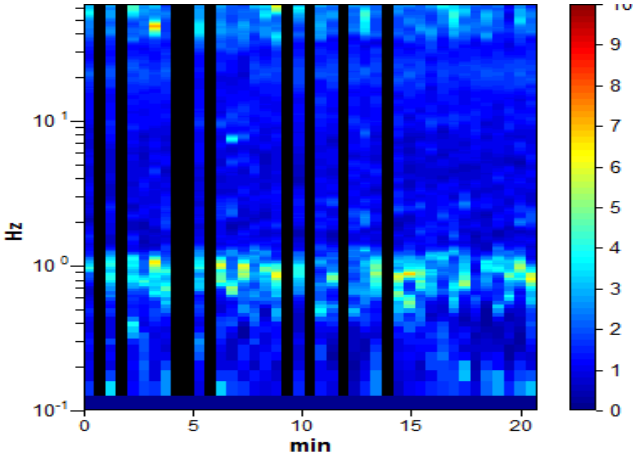
FIGLINE, T38

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 22/08/15 19:10:01 End recording: 22/08/15 19:30:52
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h20'48". Analyzed 78% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

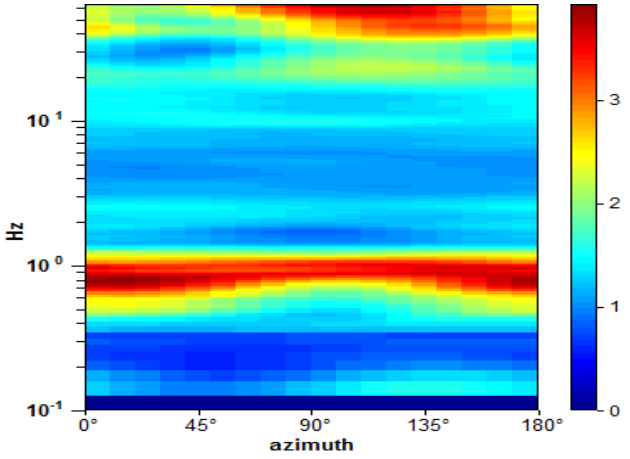
HORIZONTAL TO VERTICAL SPECTRAL RATIO



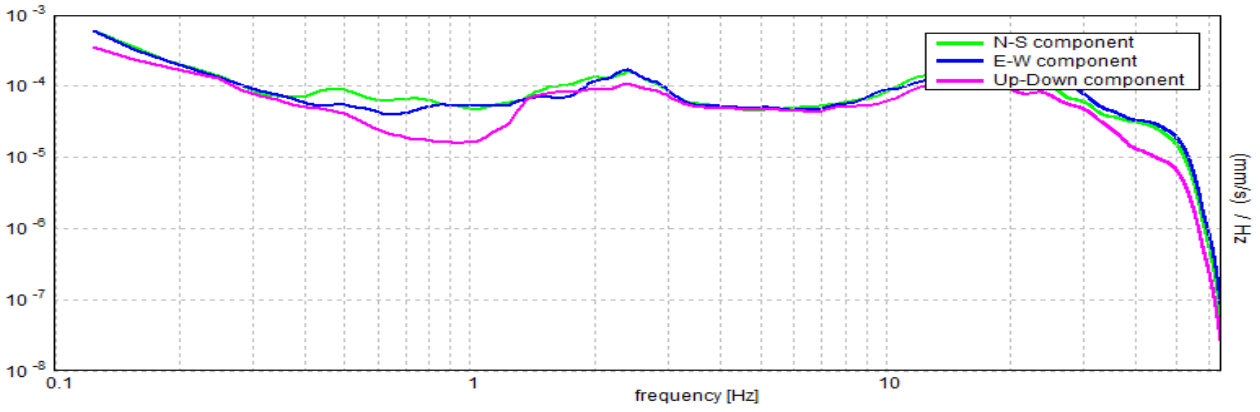
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.84 ± 0.09 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.84 > 0.33	OK	
$n_c(f_0) > 200$	810.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 42 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.469 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.281 Hz	OK	
$A_0 > 2$	3.69 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.11092| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.09359 < 0.12656	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5092 < 2.0	OK	

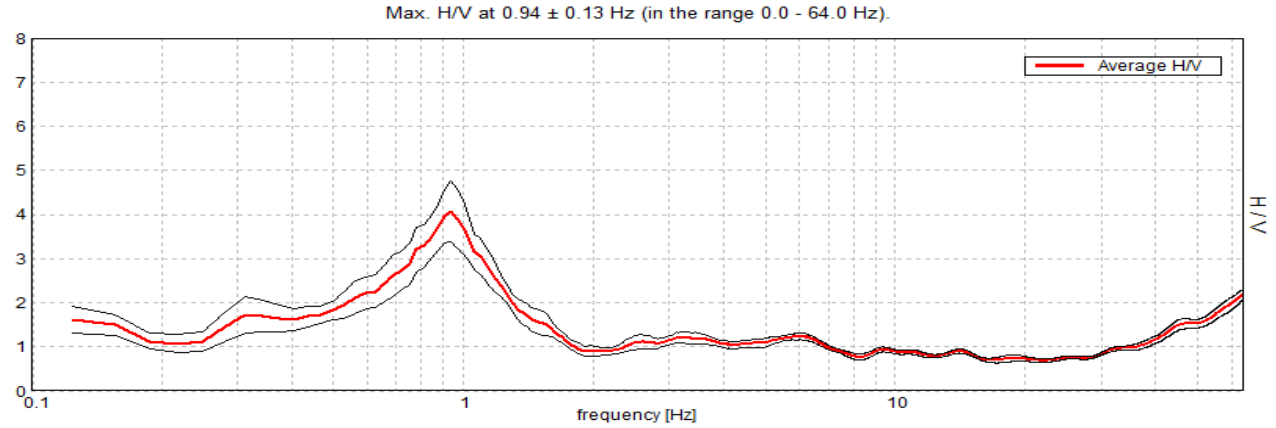
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

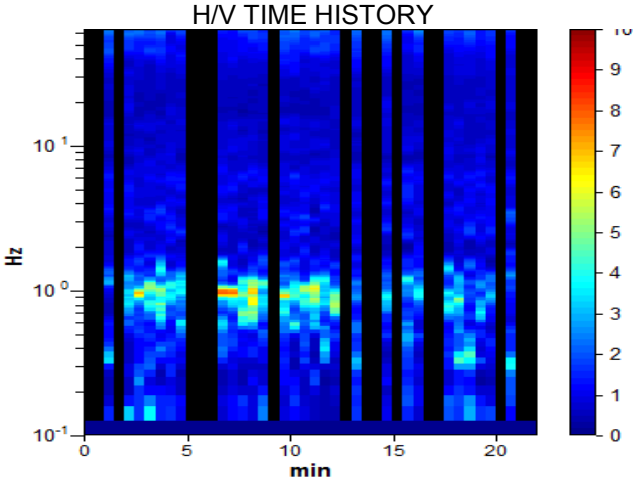
FIGLINE, T44

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 02/09/15 18:01:34 End recording: 02/09/15 18:23:34
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 64% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

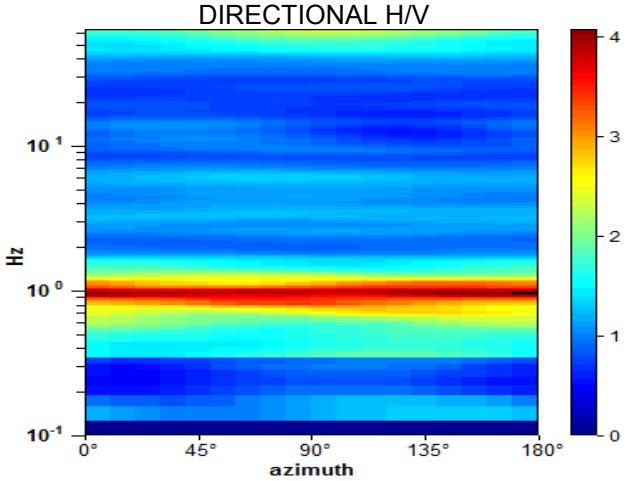
HORIZONTAL TO VERTICAL SPECTRAL RATIO



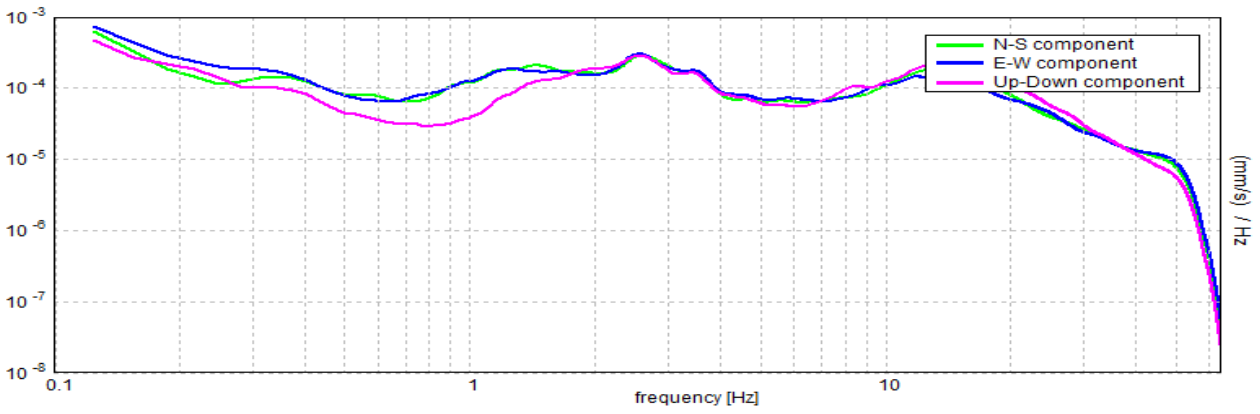
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.94 ± 0.13 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.94 > 0.33	OK	
$n_c(f_0) > 200$	787.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 46 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.531 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.313 Hz	OK	
$A_0 > 2$	4.07 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.13348| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.12514 < 0.14063	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.6973 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

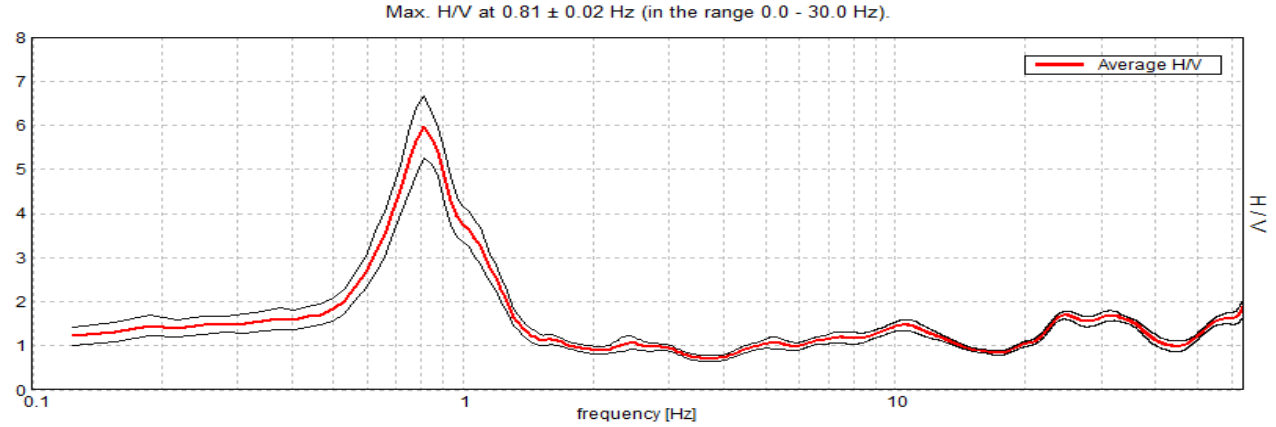
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

Misure HVSR
Lagaccioni

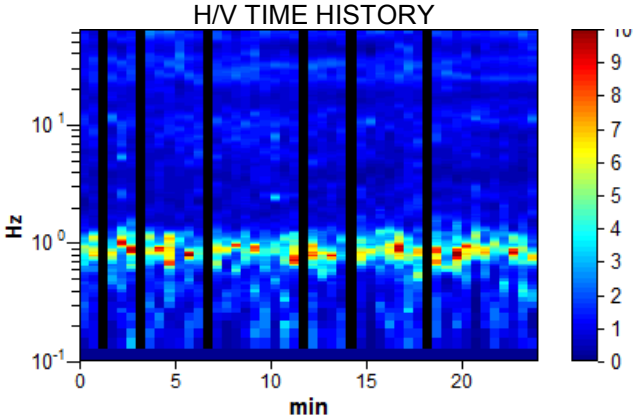
FIGLINE, T4

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 25/05/15 13:54:55 End recording: 25/05/15 14:18:55
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 88% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

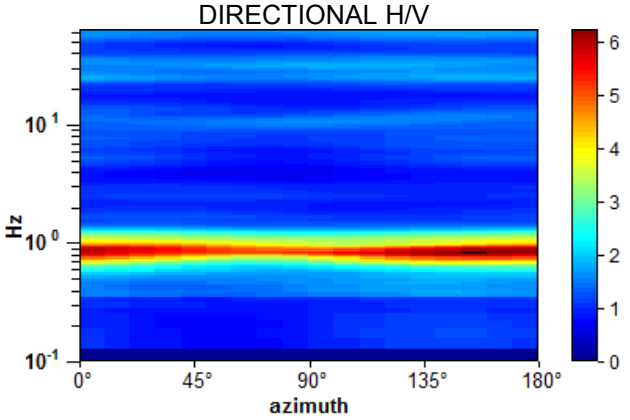
HORIZONTAL TO VERTICAL SPECTRAL RATIO



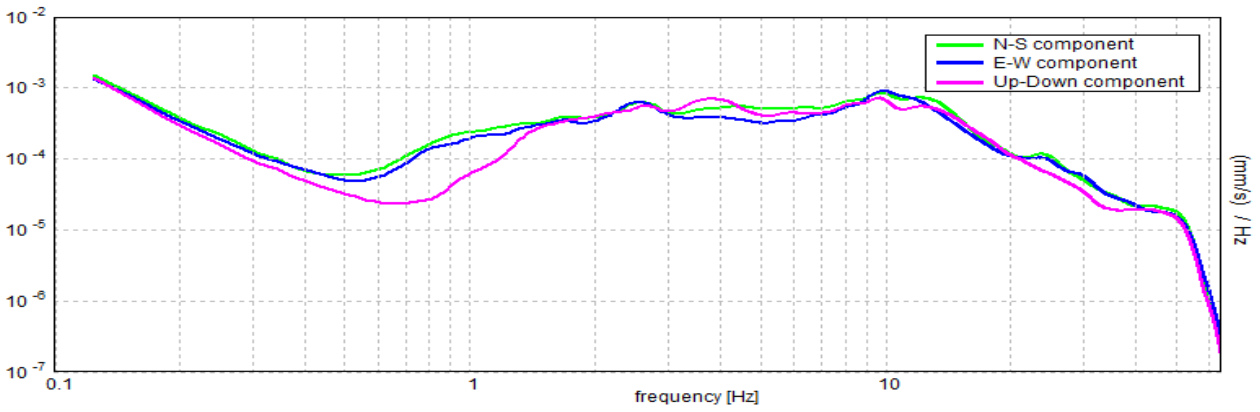
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.81 ± 0.02 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.81 > 0.33	OK	
$n_c(f_0) > 200$	1023.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 40 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.594 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.156 Hz	OK	
$A_0 > 2$	5.97 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02374| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.01929 < 0.12188	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.7059 < 2.0	OK	

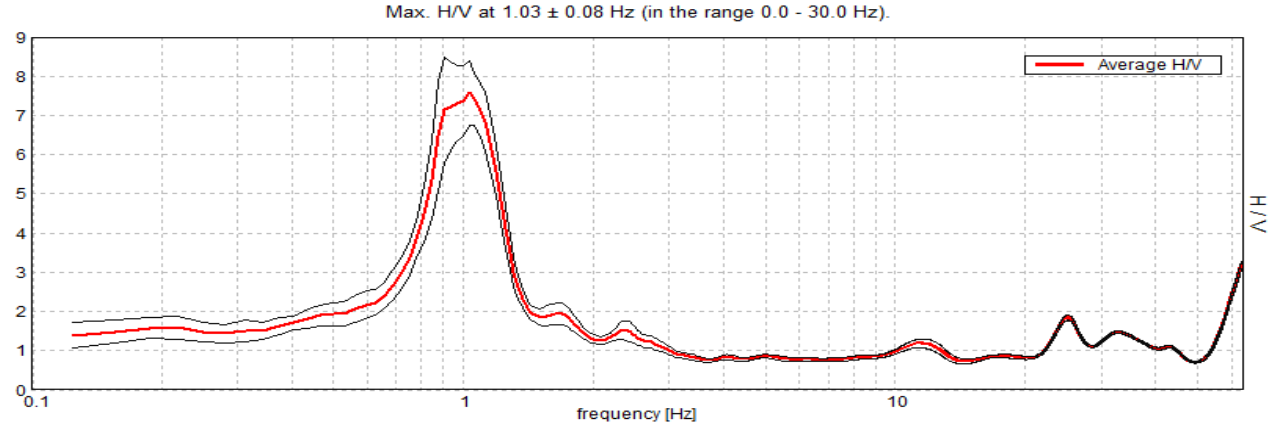
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

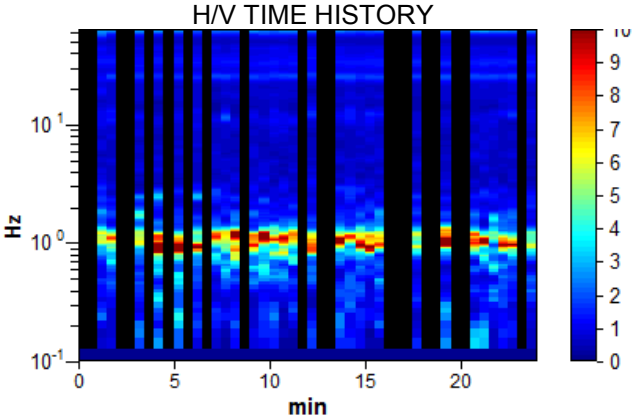
FIGLINE, T5

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 25/05/15 14:52:25 End recording: 25/05/15 15:16:25
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 58% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

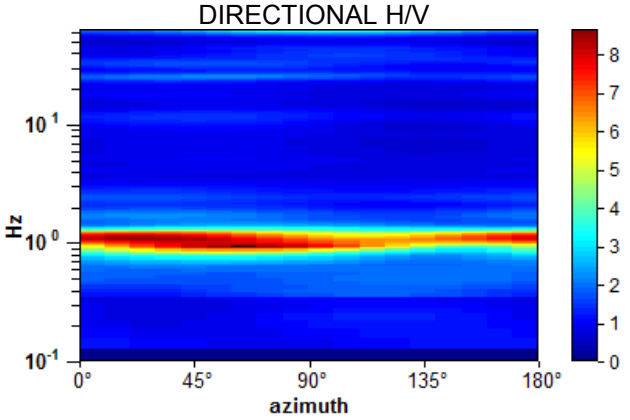
HORIZONTAL TO VERTICAL SPECTRAL RATIO



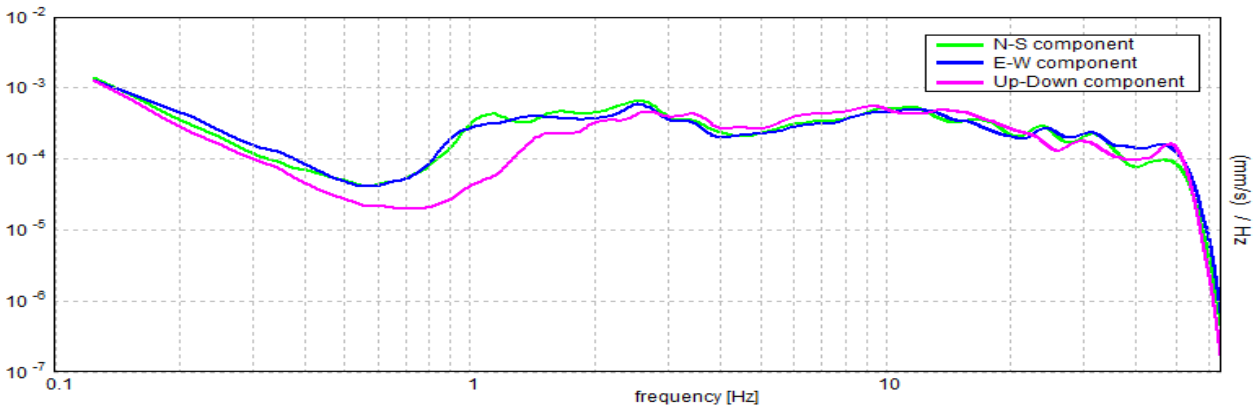
H/V TIME HISTORY



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 1.03 ± 0.08 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.03 > 0.33	OK	
$n_c(f_0) > 200$	866.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 50 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.75 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.281 Hz	OK	
$A_0 > 2$	7.57 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.07576| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.07813 < 0.10313	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.8264 < 1.78	OK	

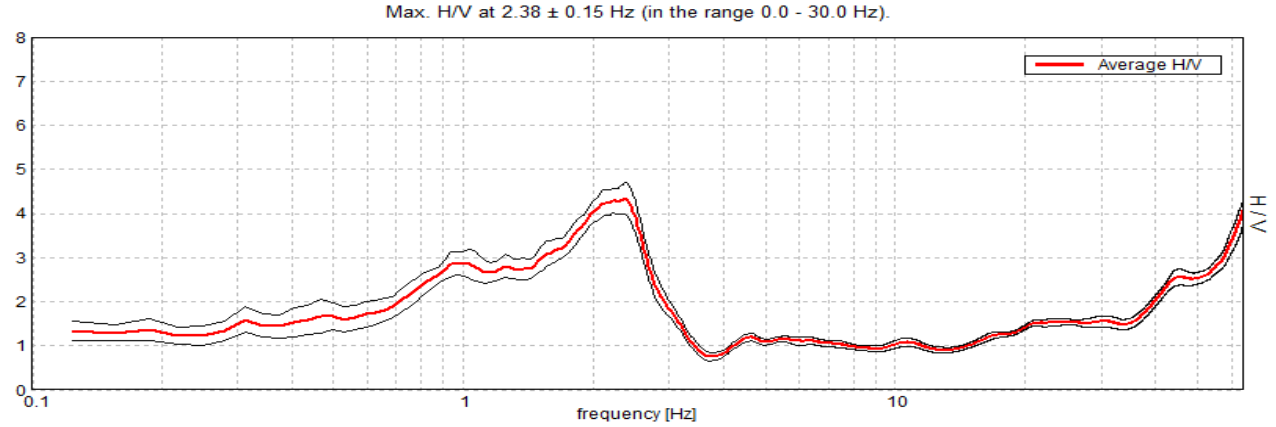
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

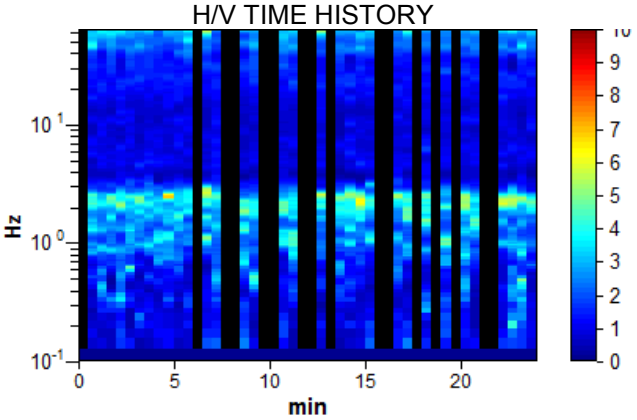
FIGLINE, T6

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 25/05/15 15:42:04 End recording: 25/05/15 16:06:04
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 67% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

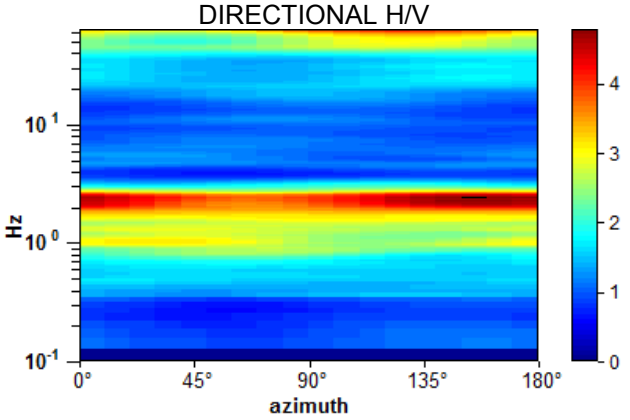
HORIZONTAL TO VERTICAL SPECTRAL RATIO



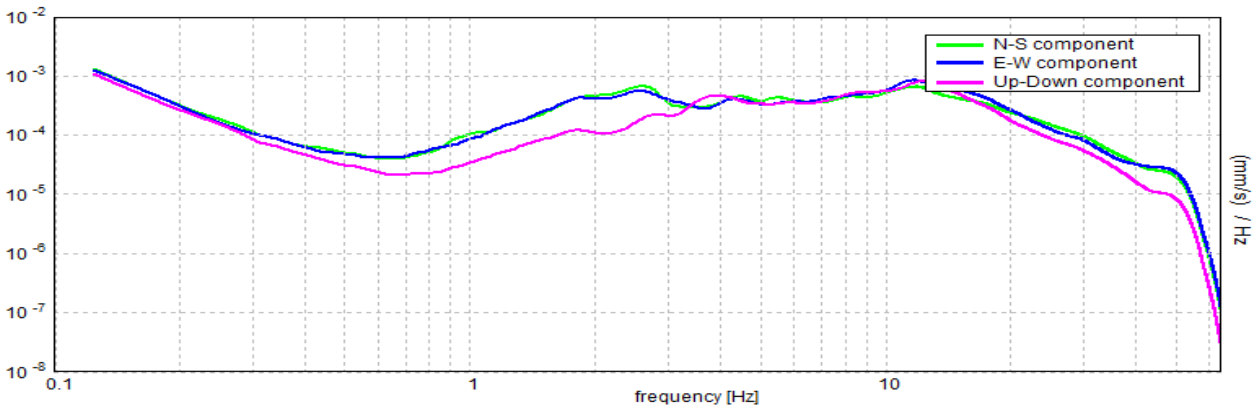
H/V TIME HISTORY



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 2.38 ± 0.15 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.38 > 0.33	OK	
$n_c(f_0) > 200$	2280.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 115 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.75 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.875 Hz	OK	
$A_0 > 2$	4.34 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.06167| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.14647 < 0.11875		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3637 < 1.58	OK	

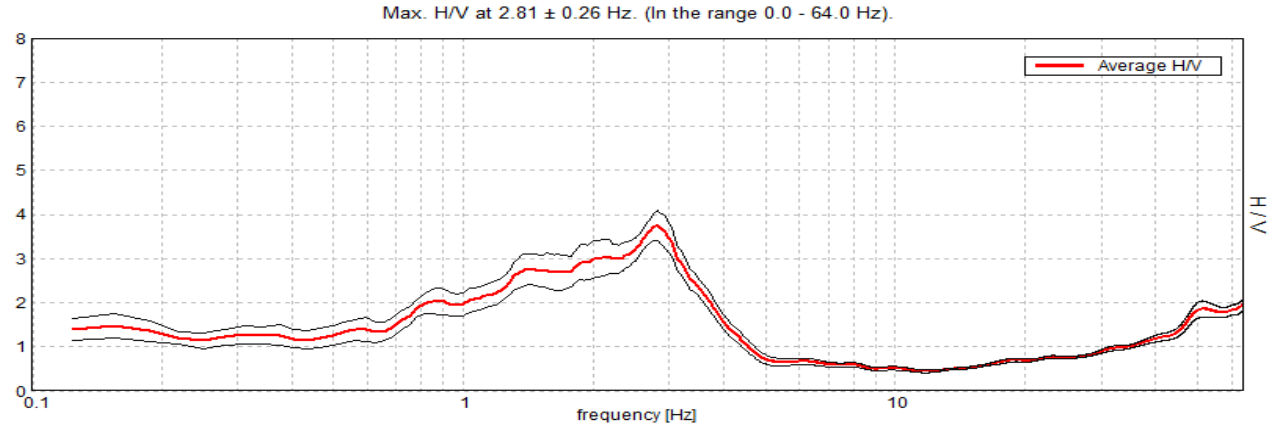
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

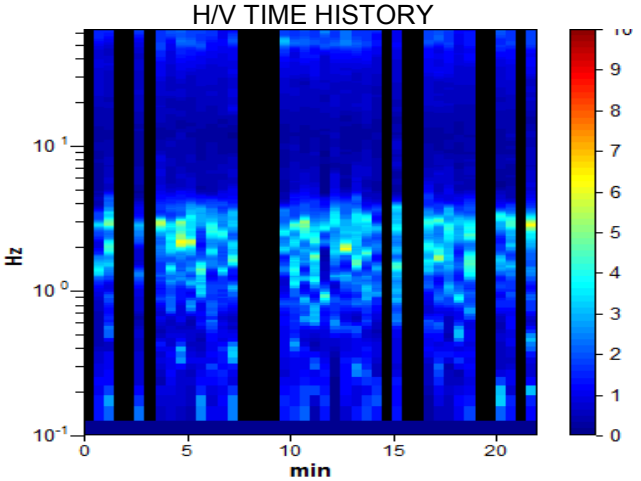
FIGLINE, T29

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 22/08/15 14:05:27 End recording: 22/08/15 14:27:27
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 68% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

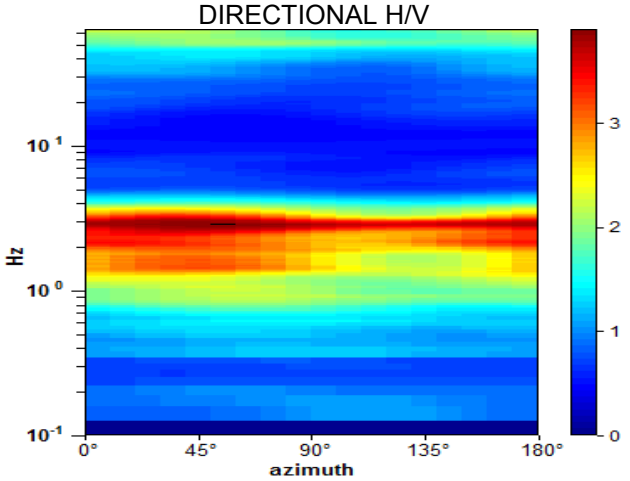
HORIZONTAL TO VERTICAL SPECTRAL RATIO



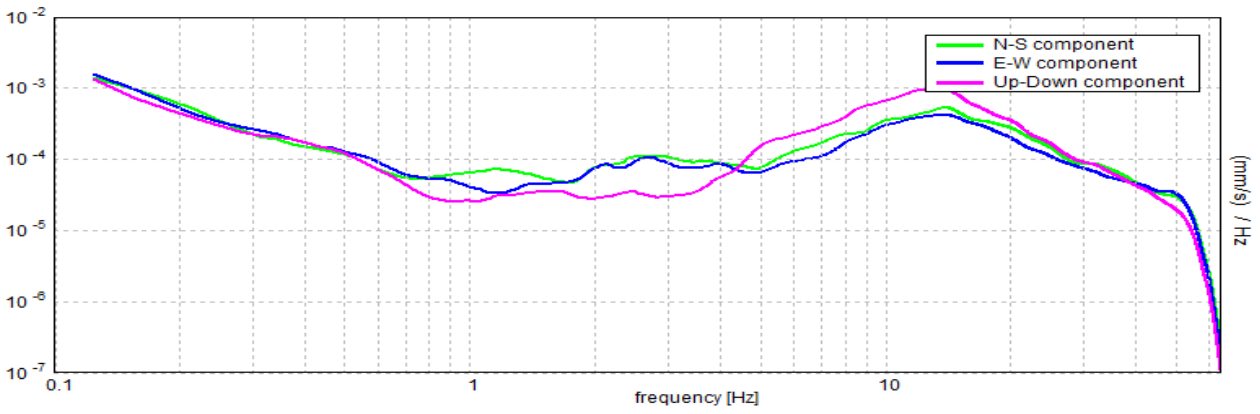
H/V TIME HISTORY



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 2.81 ± 0.26 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.81 > 0.33	OK	
$n_c(f_0) > 200$	2531.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 136 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.781 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	3.813 Hz	OK	
$A_0 > 2$	3.75 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.09332| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.26245 < 0.14063		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3362 < 1.58	OK	

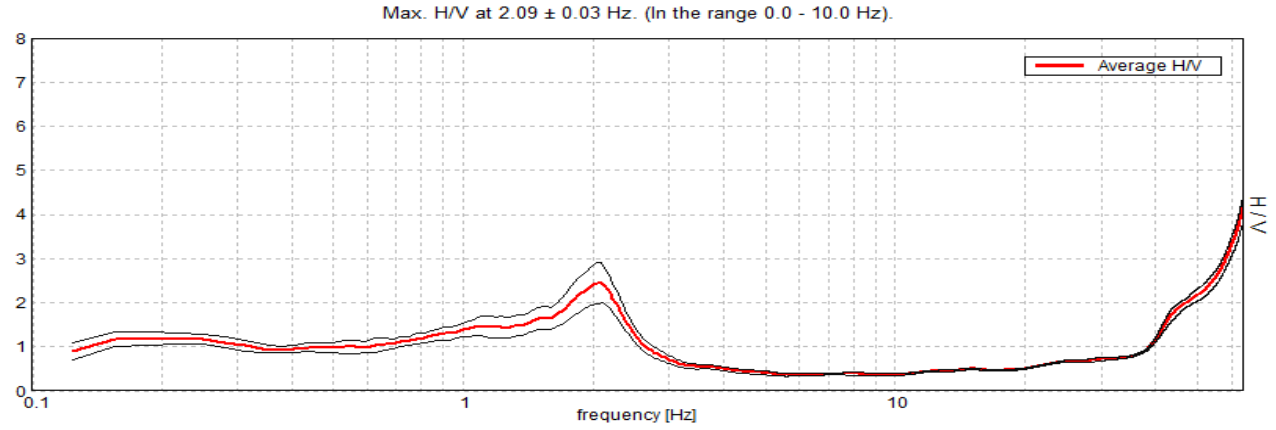
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

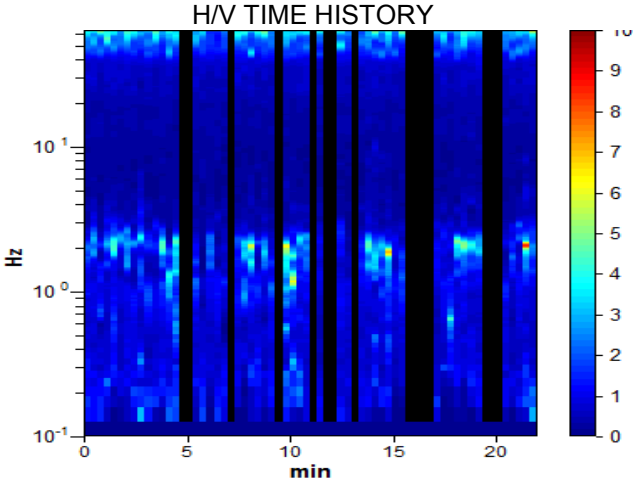
FIGLINE, T30

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 22/08/15 14:46:11 End recording: 22/08/15 15:08:11
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

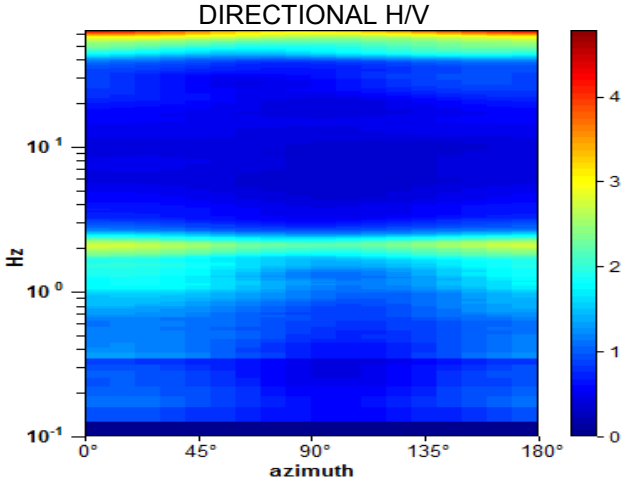
HORIZONTAL TO VERTICAL SPECTRAL RATIO



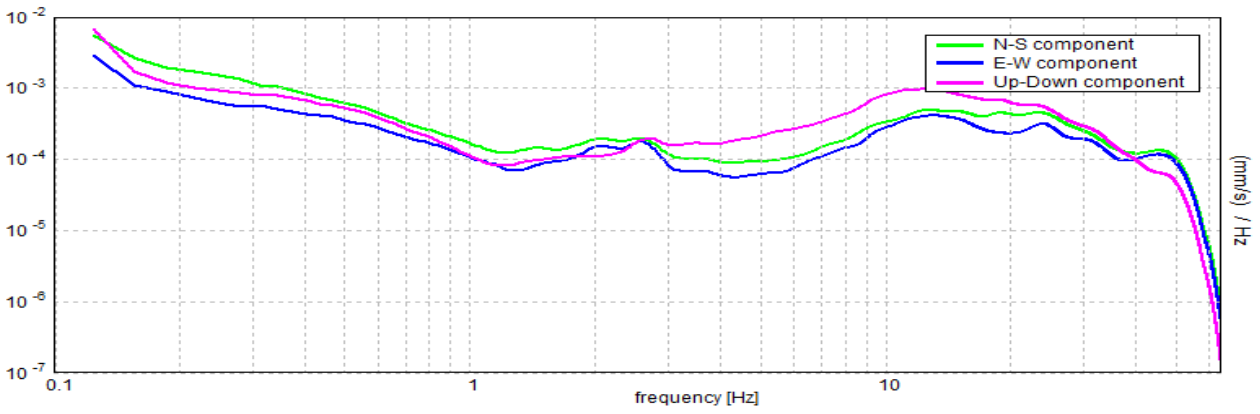
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 2.09 ± 0.03 Hz (in the range 0.0 - 10.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.09 > 0.50	OK	
$n_c(f_0) > 200$	2135.6 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 102 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.813 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.531 Hz	OK	
$A_0 > 2$	2.45 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01646| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.03446 < 0.10469	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4647 < 1.58	OK	

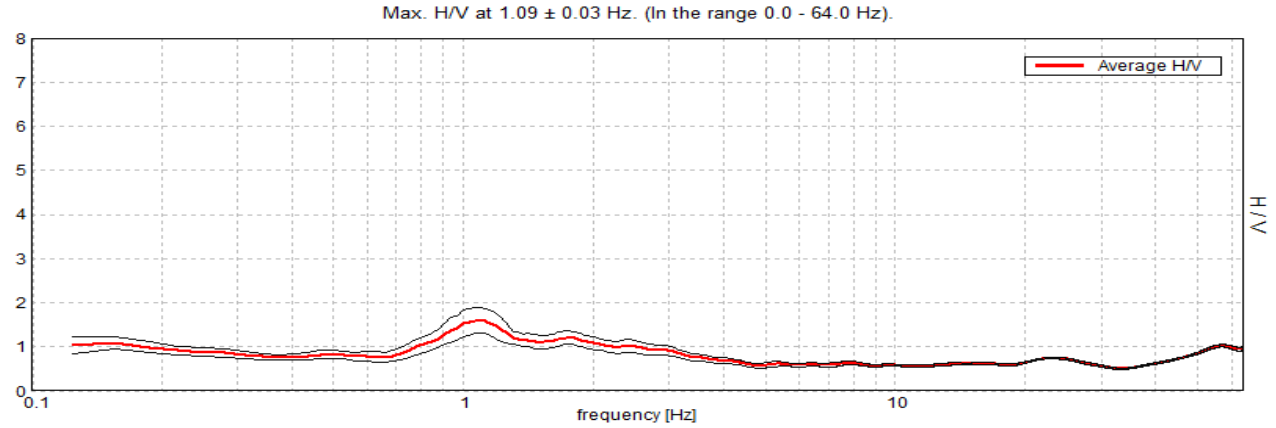
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

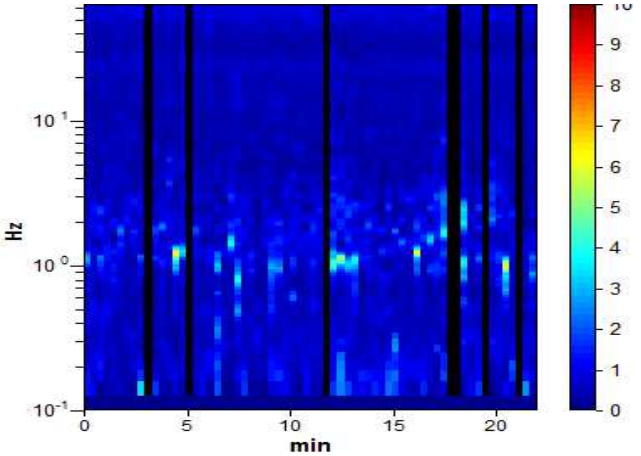
FIGLINE, T31

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 22/08/15 15:17:47 End recording: 22/08/15 15:39:47
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 89% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

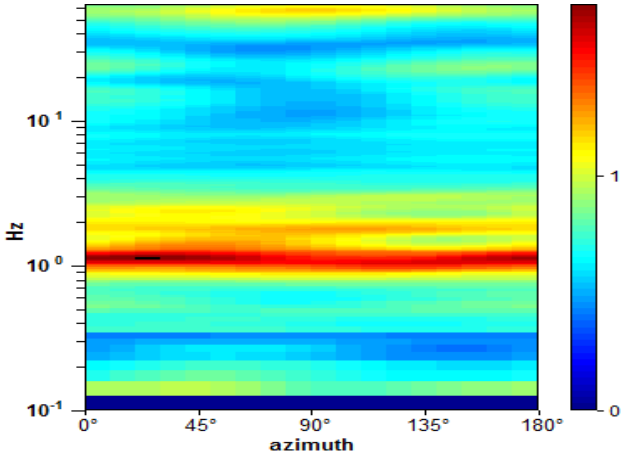
HORIZONTAL TO VERTICAL SPECTRAL RATIO



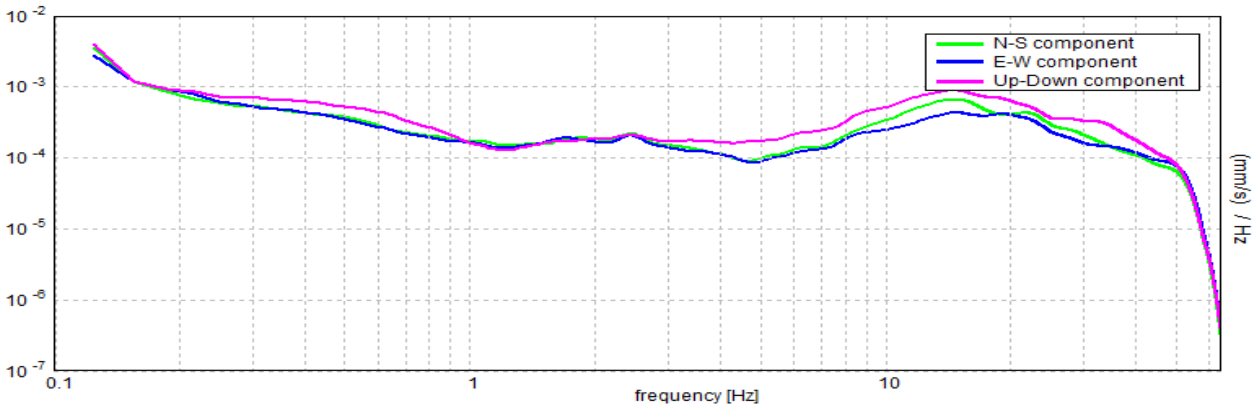
H/V TIME HISTORY



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 1.09 ± 0.03 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.09 > 0.50	OK	
$n_c(f_0) > 200$	1290.6 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 54 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.688 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	3.281 Hz	OK	
$A_0 > 2$	1.60 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02857| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.03125 < 0.10938	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.2847 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

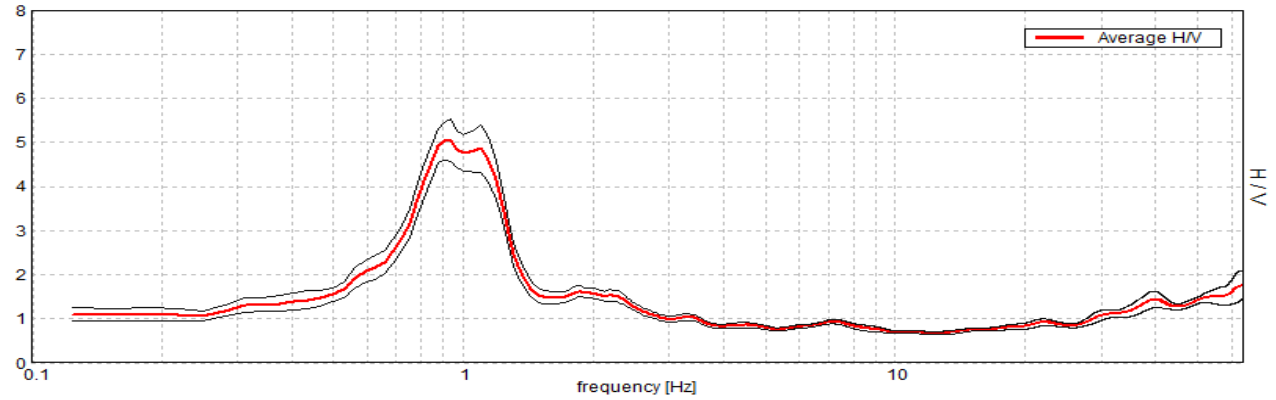
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T60

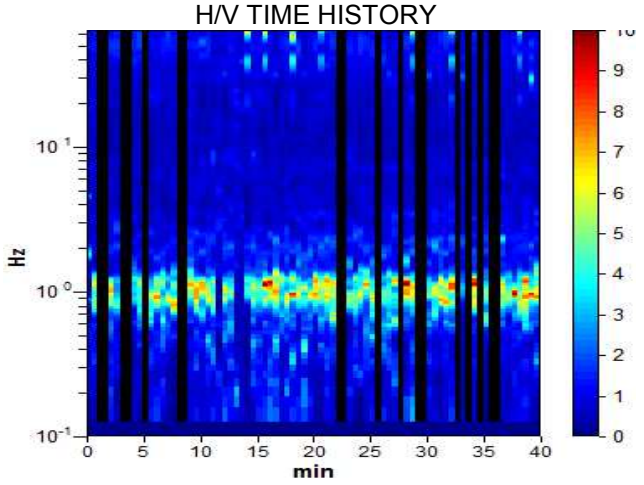
Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 04/12/15 12:24:07 End recording: 04/12/15 13:04:07
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h40'00". Analyzed 78% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

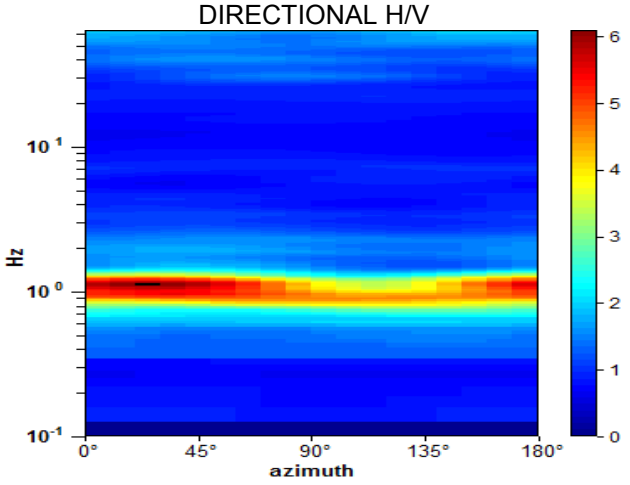
Max. H/V at 0.94 ± 0.13 Hz. (In the range 0.0 - 64.0 Hz).



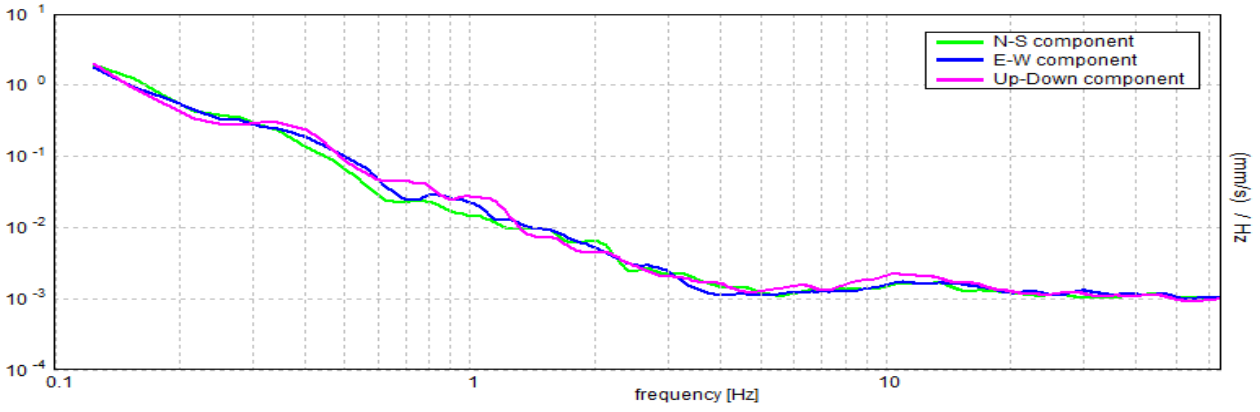
H/V TIME HISTORY



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 0.94 ± 0.13 Hz (in the range 0.0 - 64.0 Hz).

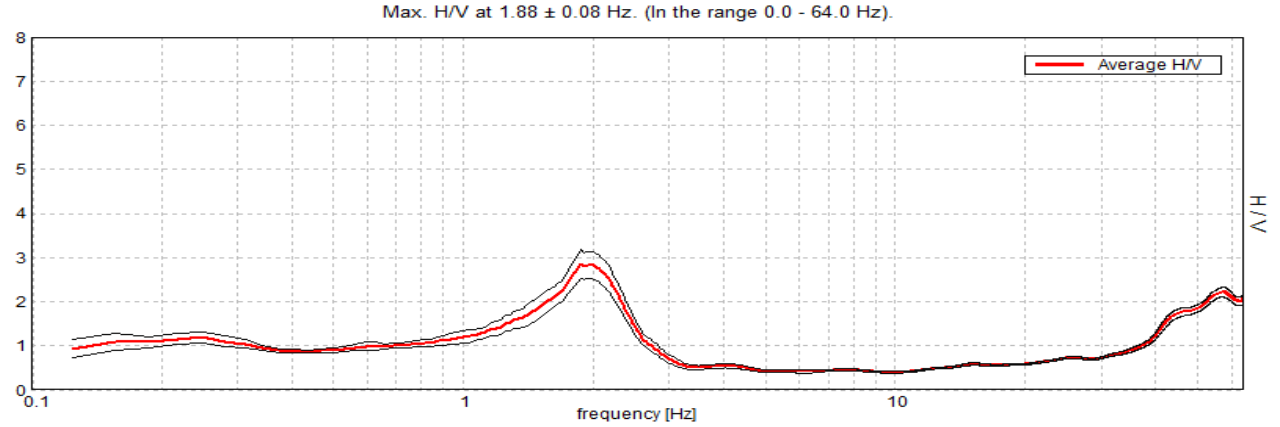
Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.94 > 0.33	OK	
$n_c(f_0) > 200$	1743.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 46 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.688 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.313 Hz	OK	
$A_0 > 2$	5.06 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.13815| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.12952 < 0.14063	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4767 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

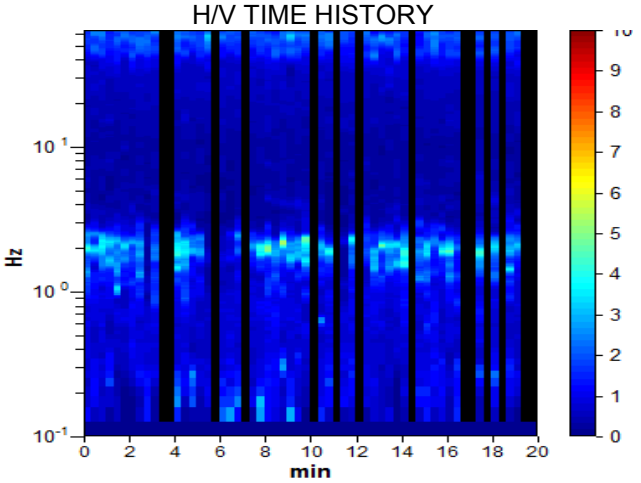
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T61
Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 04/12/15 14:27:44 End recording: 04/12/15 14:47:44
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h20'00". Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

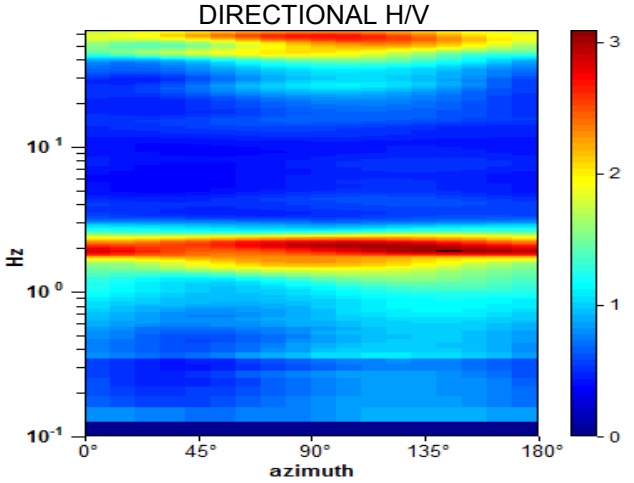
HORIZONTAL TO VERTICAL SPECTRAL RATIO



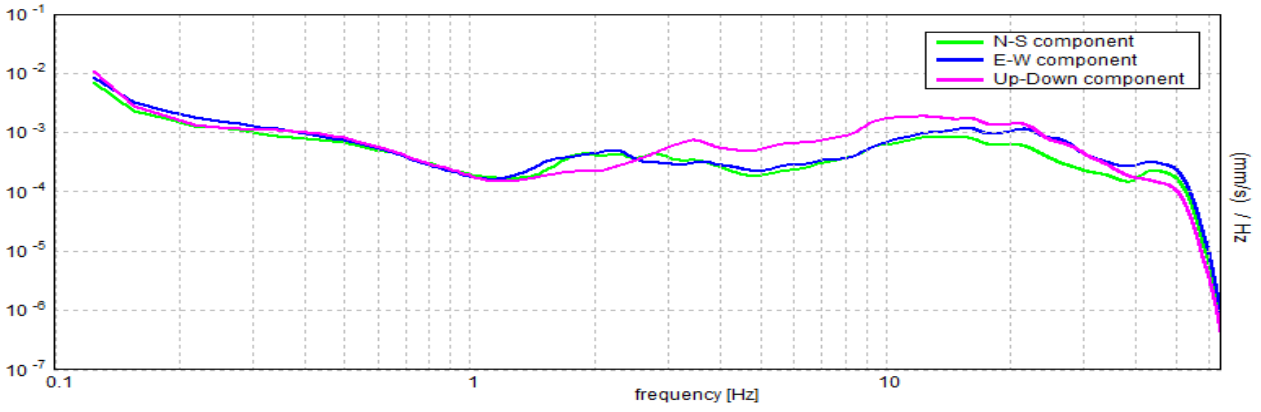
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 1.88 ± 0.08 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.88 > 0.50	OK	
$n_c(f_0) > 200$	1725.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 91 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.5 Hz	OK	
$A_0 > 2$	2.85 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.04464| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.0837 < 0.1875	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3315 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

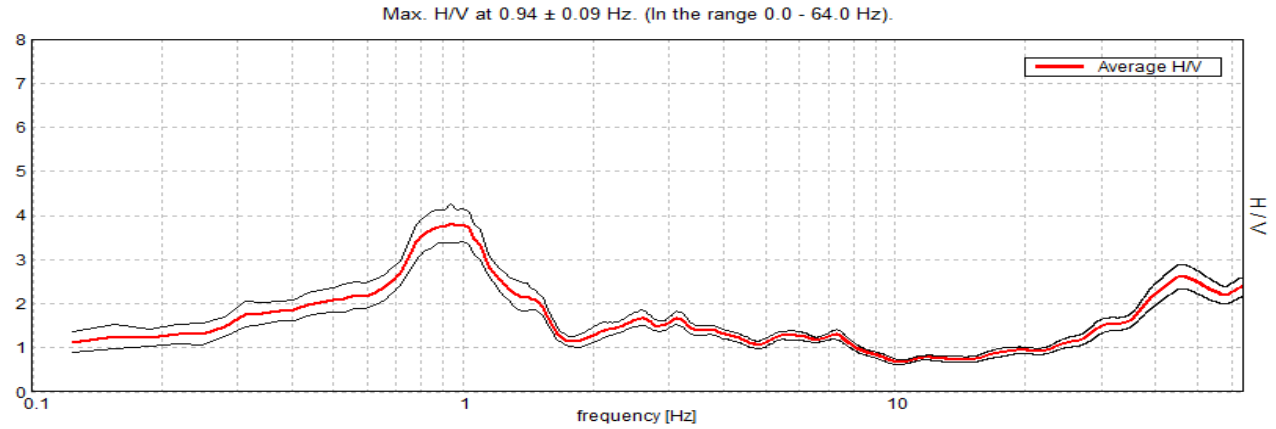
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

Misure HVSR
Lo Stecco

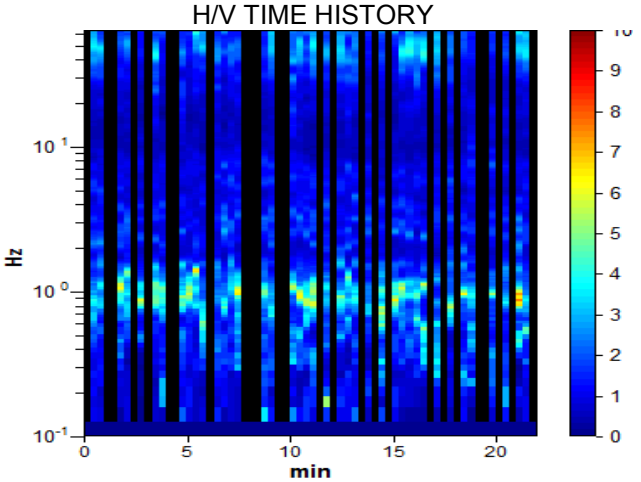
FIGLINE, T45

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 02/09/15 18:28:24 End recording: 02/09/15 18:50:24
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 61% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

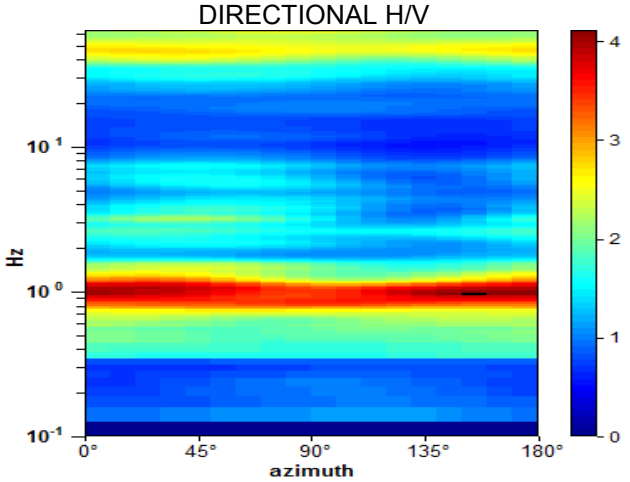
HORIZONTAL TO VERTICAL SPECTRAL RATIO



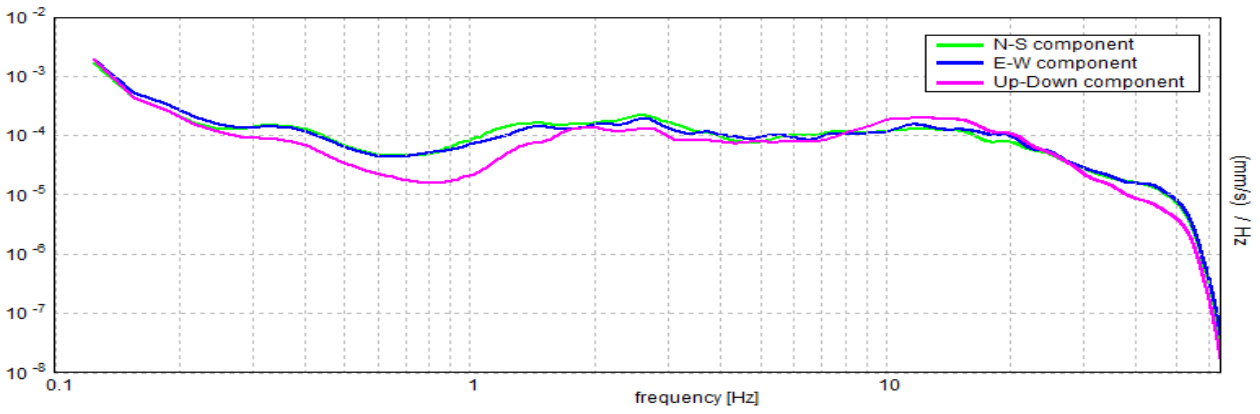
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.94 ± 0.09 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.94 > 0.50	OK	
$n_c(f_0) > 200$	750.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 46 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.406 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.563 Hz	OK	
$A_0 > 2$	3.81 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.09354| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.0877 < 0.14063	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.439 < 2.0	OK	

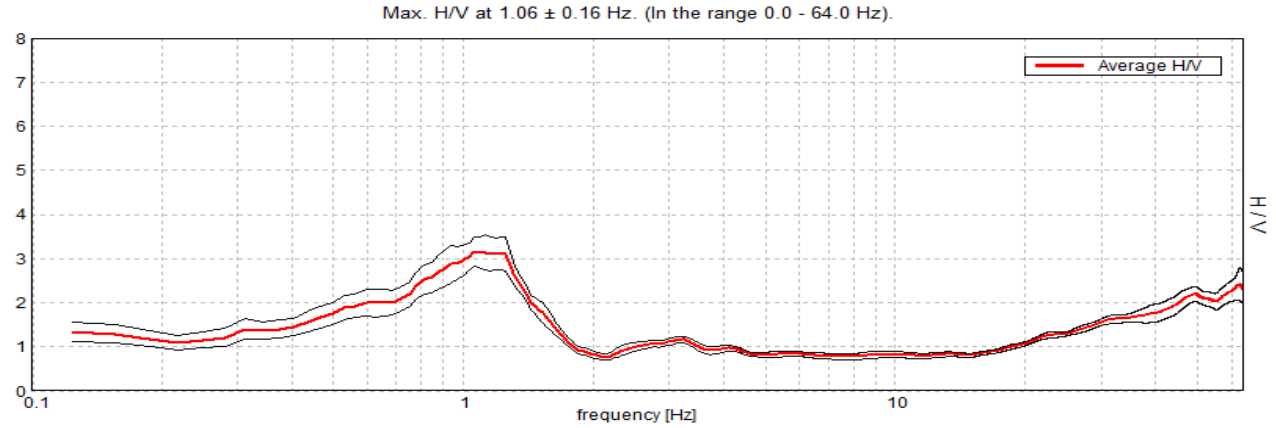
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

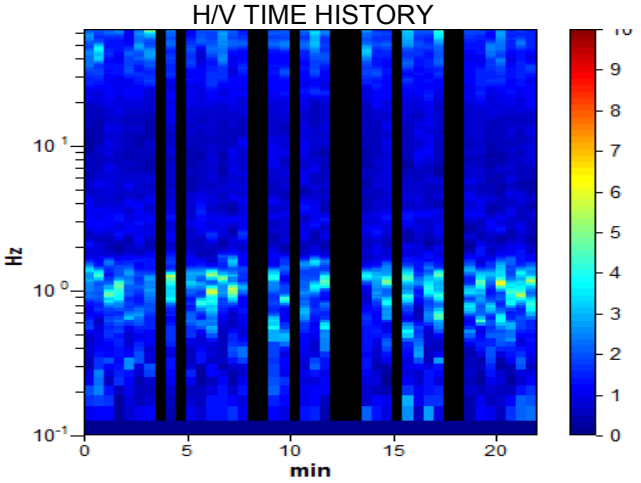
FIGLINE, T46

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 02/09/15 18:58:38 End recording: 02/09/15 19:20:38
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 75% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

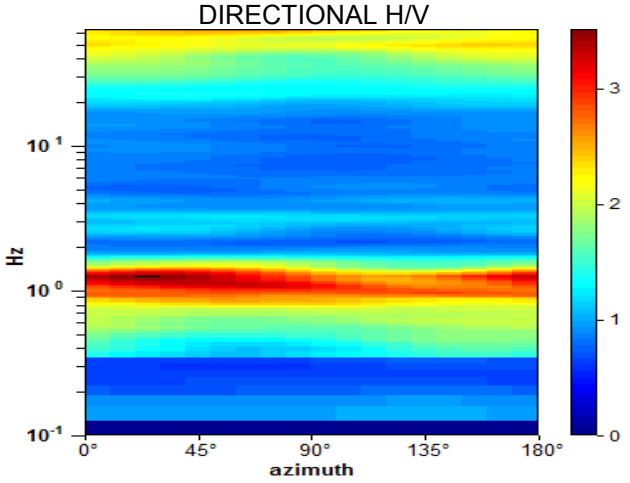
HORIZONTAL TO VERTICAL SPECTRAL RATIO



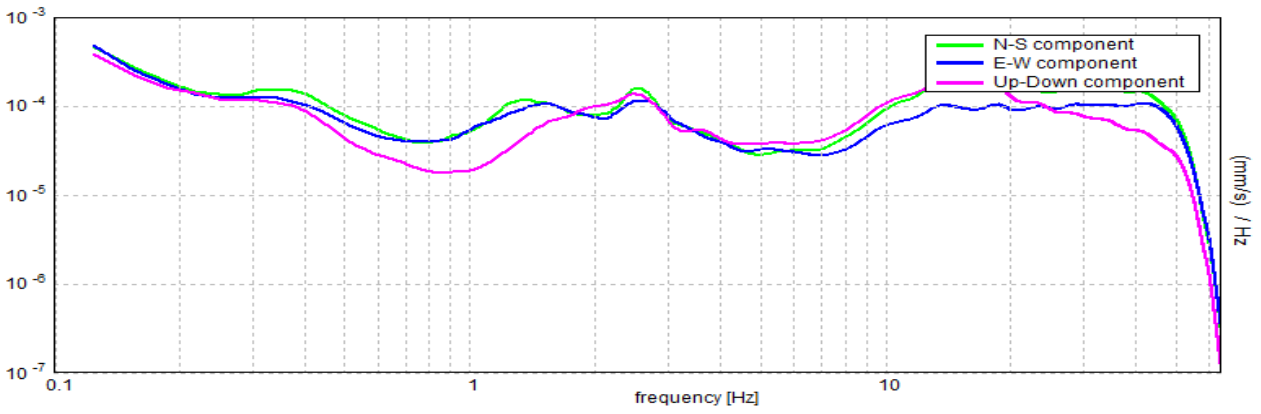
H/V TIME HISTORY



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 1.06 ± 0.16 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.06 > 0.33	OK	
$n_c(f_0) > 200$	1051.9 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 52 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.438 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.594 Hz	OK	
$A_0 > 2$	3.15 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.15197| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.16147 < 0.10625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3347 < 1.78	OK	

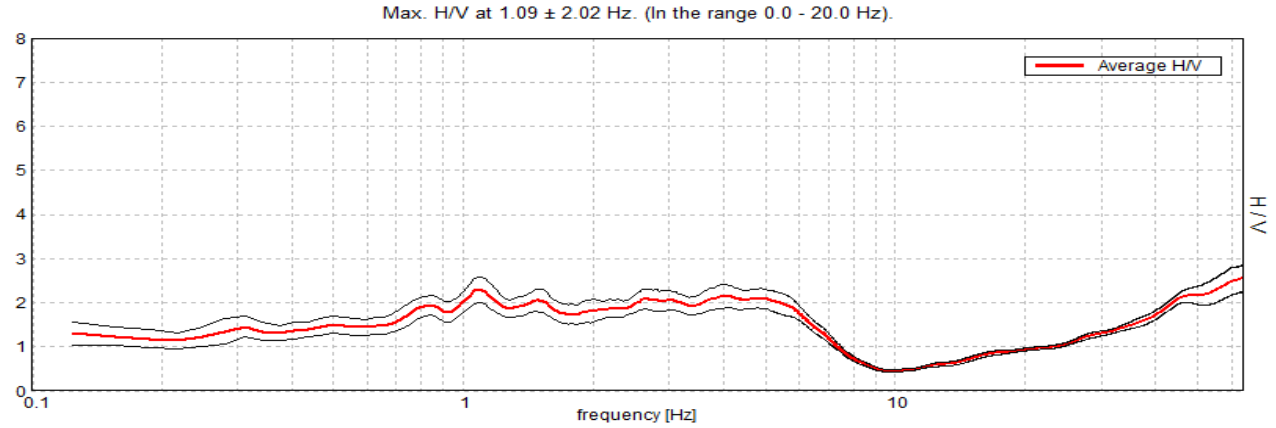
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

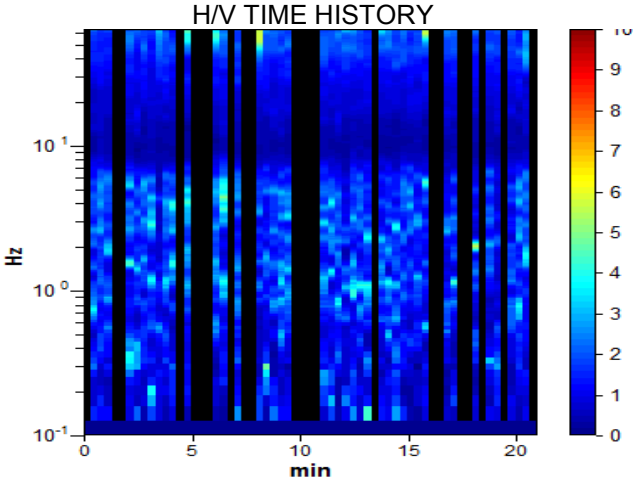
FIGLINE, T47

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 02/09/15 19:39:19 End recording: 02/09/15 20:00:30
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h21'00". Analyzed 65% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

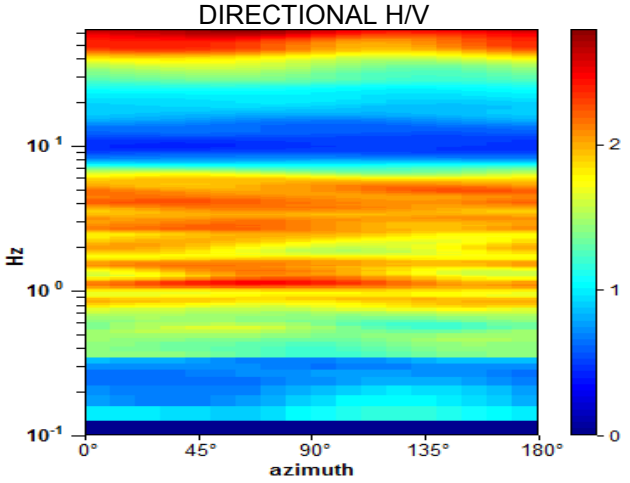
HORIZONTAL TO VERTICAL SPECTRAL RATIO



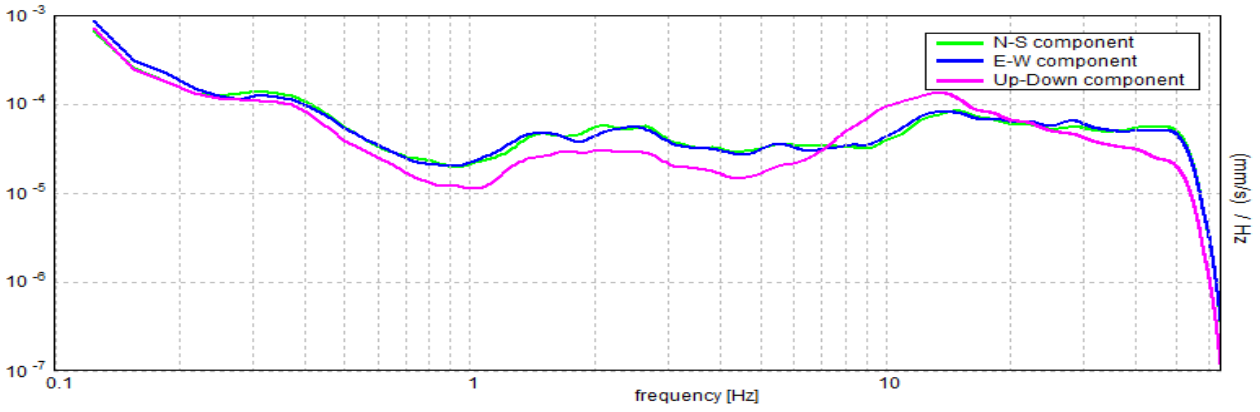
H/V TIME HISTORY



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 1.09 ± 2.02 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.09 > 0.50	OK	
$n_c(f_0) > 200$	896.9 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 54 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.30 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|1.84845| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	2.02174 < 0.10938		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2907 < 1.78	OK	

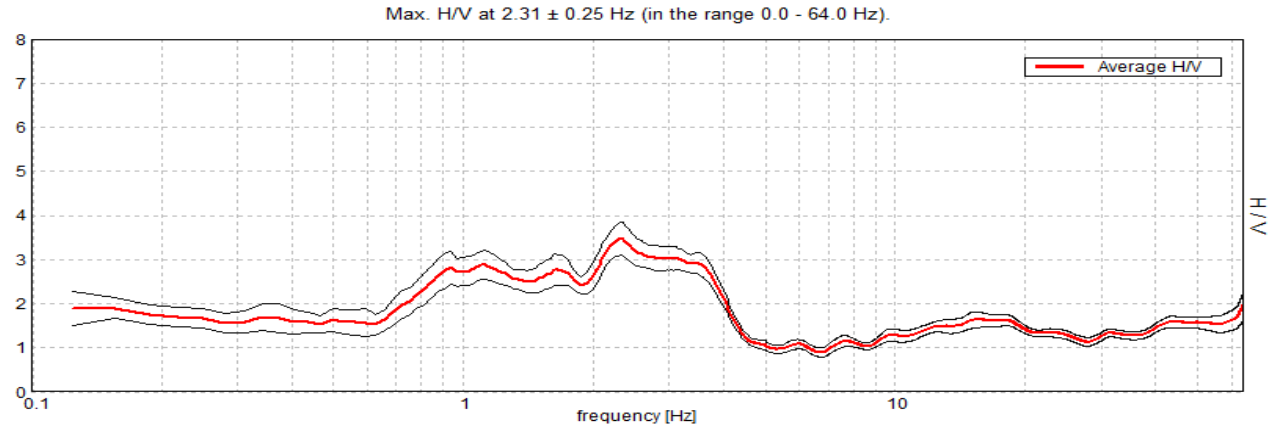
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

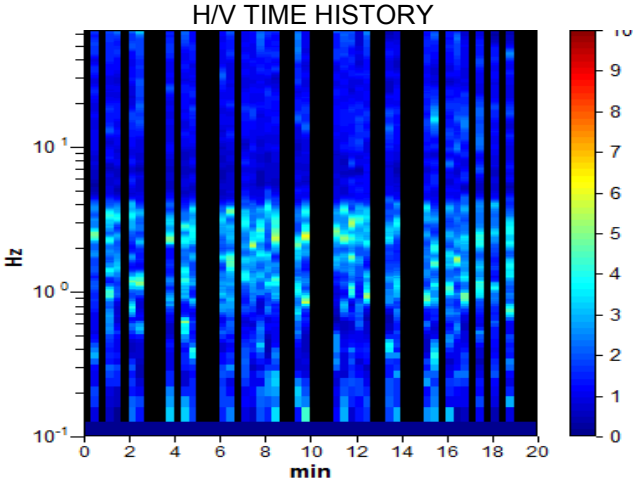
FIGLINE, T49

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 10/09/15 14:54:15 End recording: 10/09/15 15:14:15
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h20'00". Analyzed 53% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

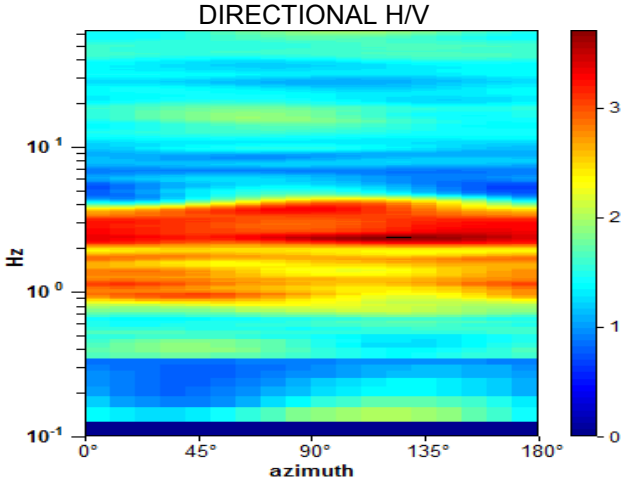
HORIZONTAL TO VERTICAL SPECTRAL RATIO



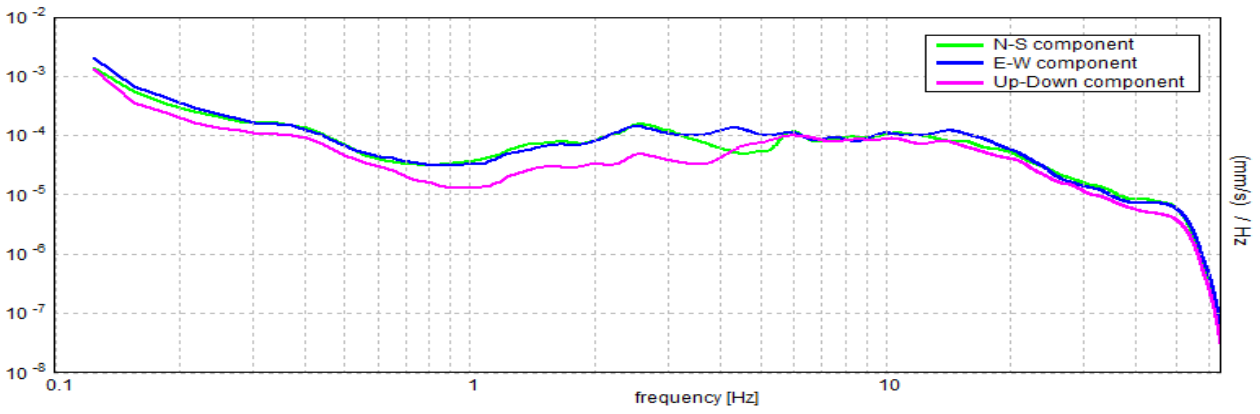
H/V TIME HISTORY



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 2.31 ± 0.25 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.31 > 0.50	OK	
$n_c(f_0) > 200$	1480.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 112 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.656 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	4.188 Hz	OK	
$A_0 > 2$	3.48 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.10845| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.25079 < 0.11563		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3794 < 1.58	OK	

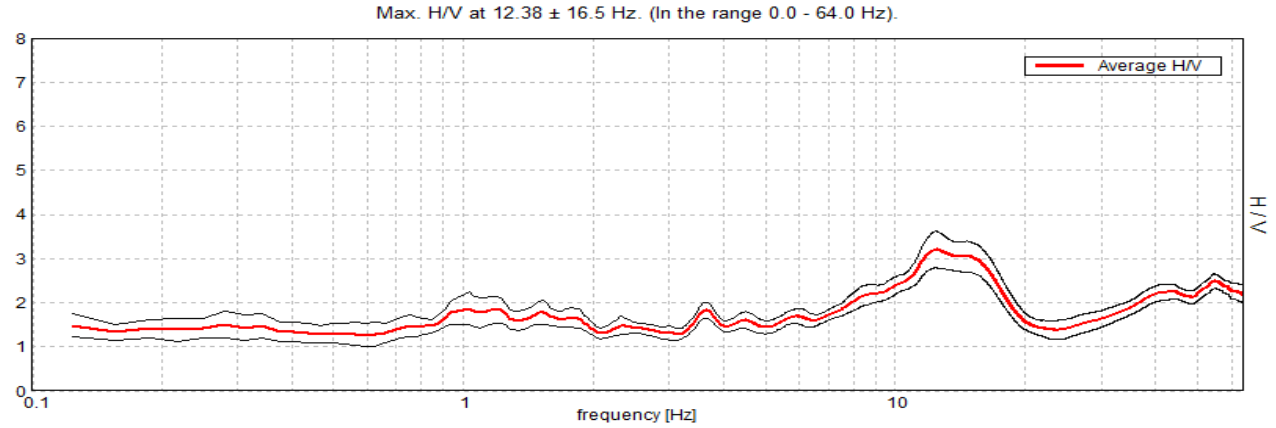
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

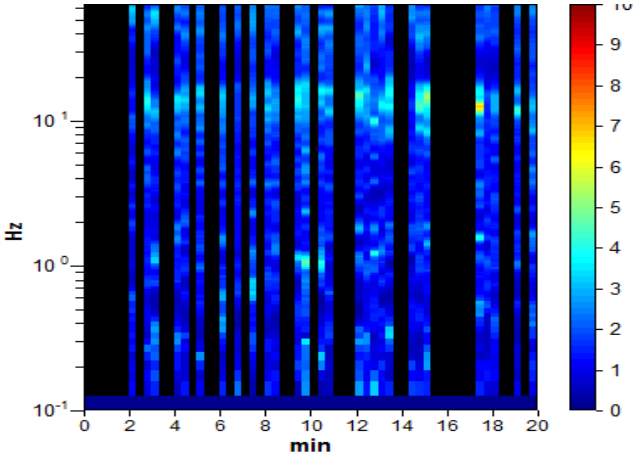
FIGLINE, T50

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 10/09/15 15:53:55 End recording: 10/09/15 16:13:55
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h20'00". Analyzed 47% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

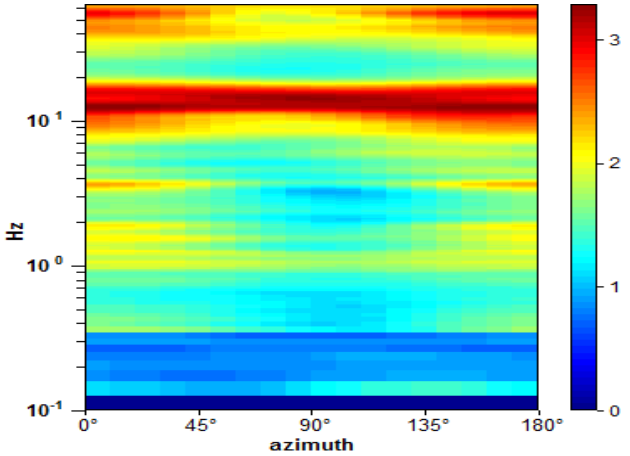
HORIZONTAL TO VERTICAL SPECTRAL RATIO



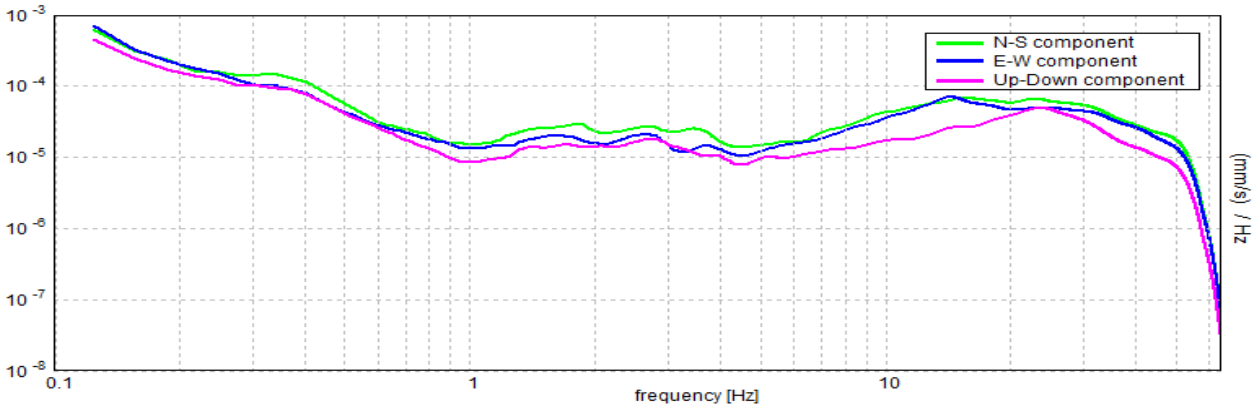
H/V TIME HISTORY



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 12.38 ± 16.5 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	12.38 > 0.50	OK	
$n_c(f_0) > 200$	6930.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 595 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	6.563 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	19.844 Hz	OK	
$A_0 > 2$	3.20 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|1.33348| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	16.50181 < 0.61875		NO
$\sigma_A(f_0) < \theta(f_0)$	0.4131 < 1.58	OK	

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

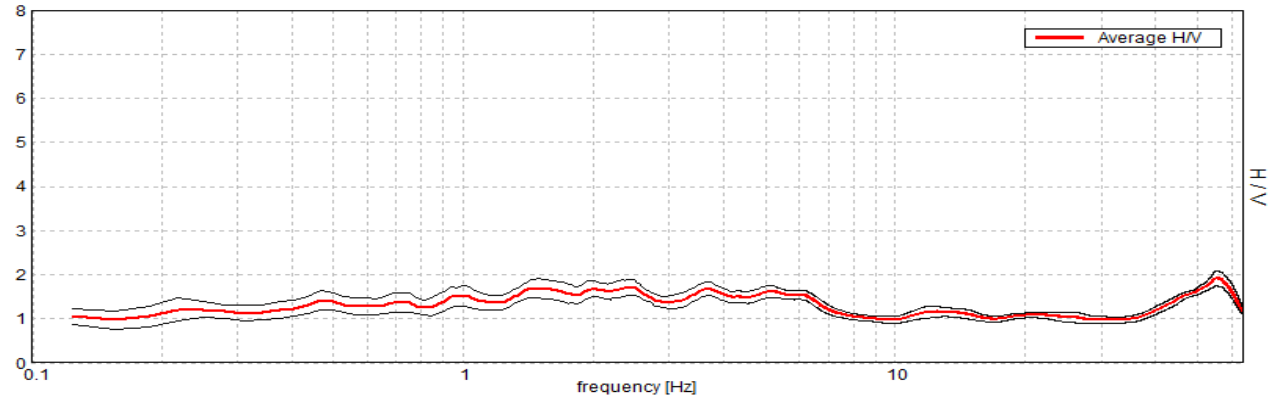
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T51

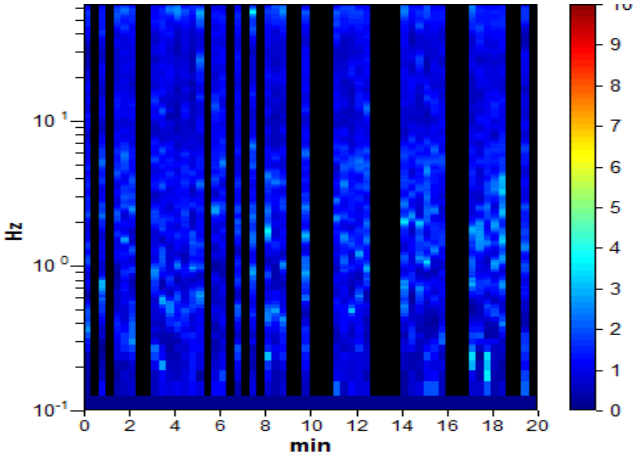
Instrument: TZ3-0001/01-13
Data format: 16 byte
Full scale [mV]: 51
Start recording: 10/09/15 16:18:27 End recording: 10/09/15 16:38:27
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h20'00". Analyzed 62% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

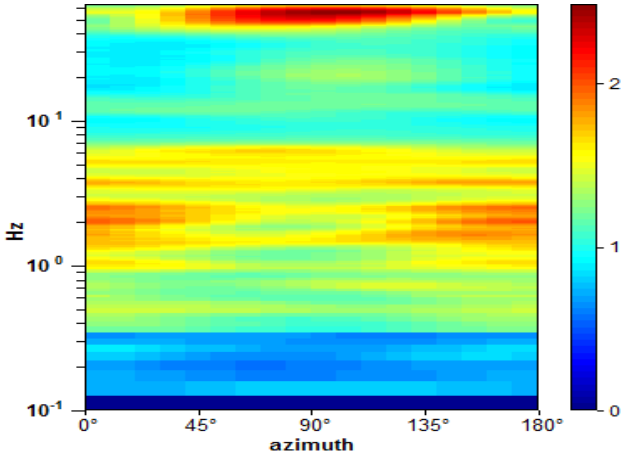
Max. H/V at 55.31 ± 17.73 Hz. (In the range 0.0 - 64.0 Hz).



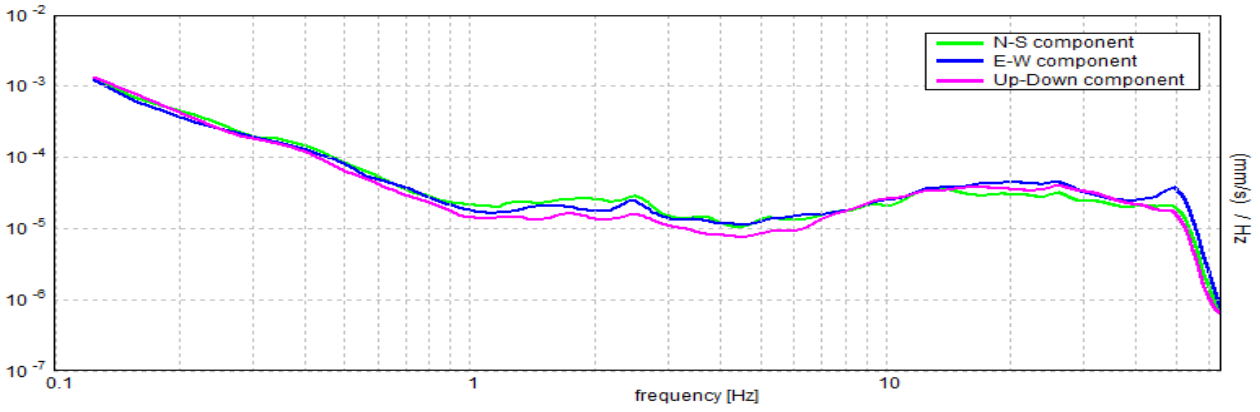
H/V TIME HISTORY



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 55.31 ± 17.73 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	55.31 > 0.50	OK	
$n_c(f_0) > 200$	40931.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 1164 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
$A_0 > 2$	1.92 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.32063| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	17.73499 < 2.76563		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1755 < 1.58	OK	

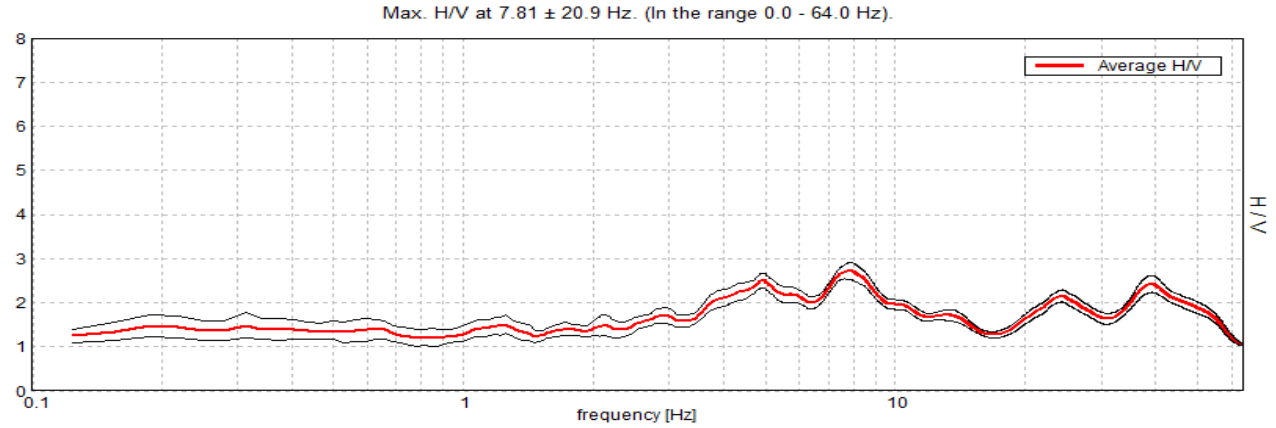
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

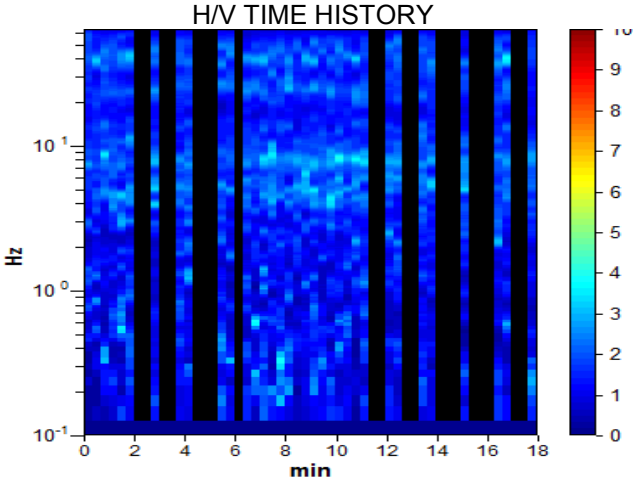
FIGLINE, T52

Instrument: TZ3-0001/01-13
Data format: 16 byte
Full scale [mV]: 51
Start recording: 10/09/15 16:44:35 End recording: 10/09/15 17:02:35
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h18'00". Analyzed 63% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

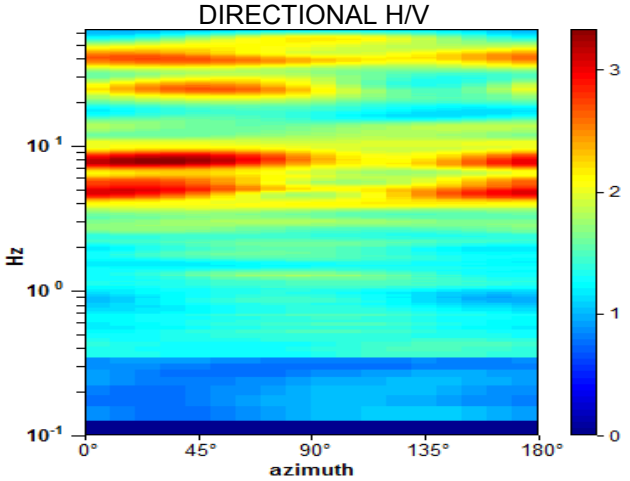
HORIZONTAL TO VERTICAL SPECTRAL RATIO



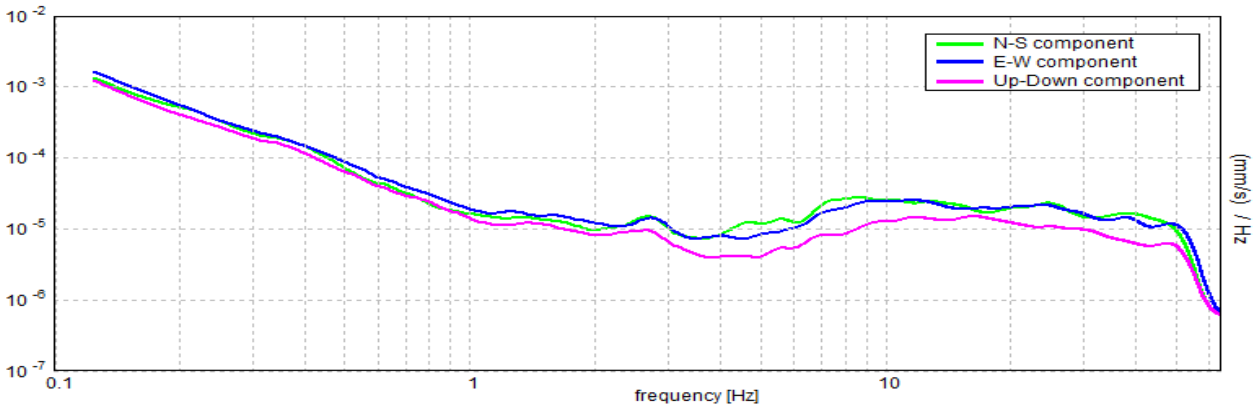
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 7.81 ± 20.9 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	7.81 > 0.50	OK	
$n_c(f_0) > 200$	5312.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 376 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.938 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	15.625 Hz	OK	
$A_0 > 2$	2.72 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|2.6749| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	20.89766 < 0.39063		NO
$\sigma_A(f_0) < \theta(f_0)$	0.188 < 1.58	OK	

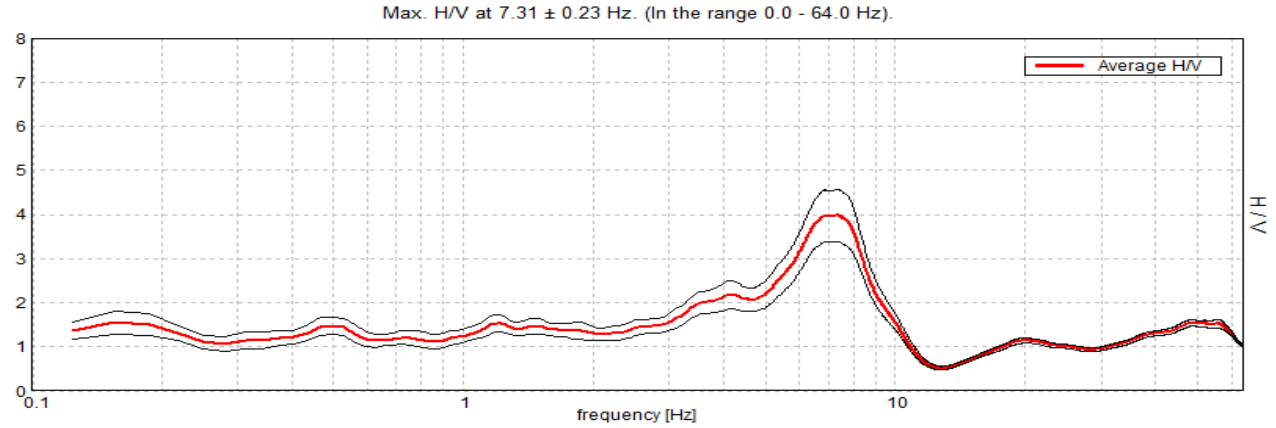
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

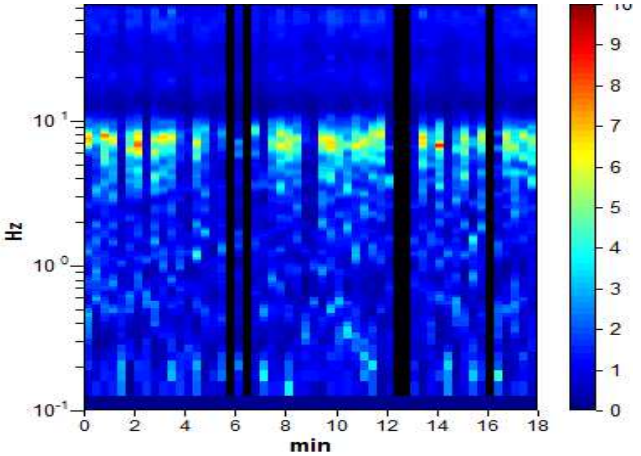
FIGLINE, T53

Instrument: TZ3-0001/01-13
Data format: 16 byte
Full scale [mV]: 51
Start recording: 10/09/15 17:16:17 End recording: 10/09/15 17:34:17
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h18'00". Analyzed 91% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

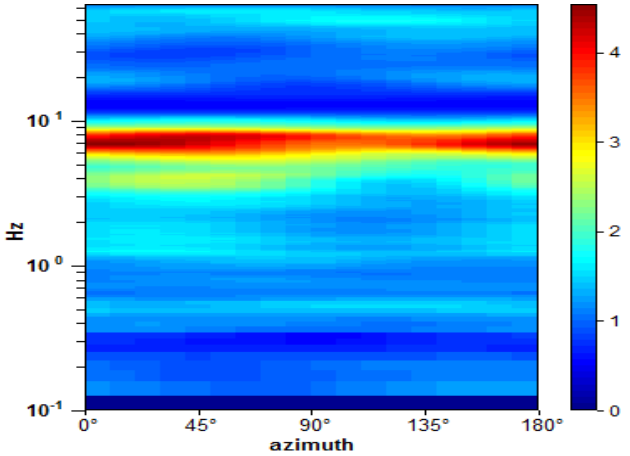
HORIZONTAL TO VERTICAL SPECTRAL RATIO



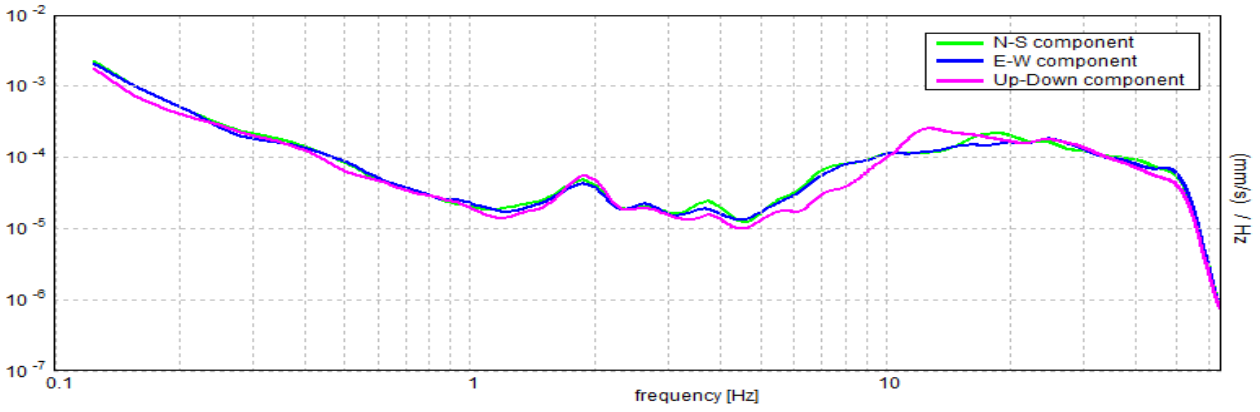
H/V TIME HISTORY



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 7.31 ± 0.23 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	7.31 > 0.50	OK	
$n_c(f_0) > 200$	7166.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 352 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	3.5 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	9.313 Hz	OK	
$A_0 > 2$	3.98 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03145| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.22994 < 0.36563	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5861 < 1.58	OK	

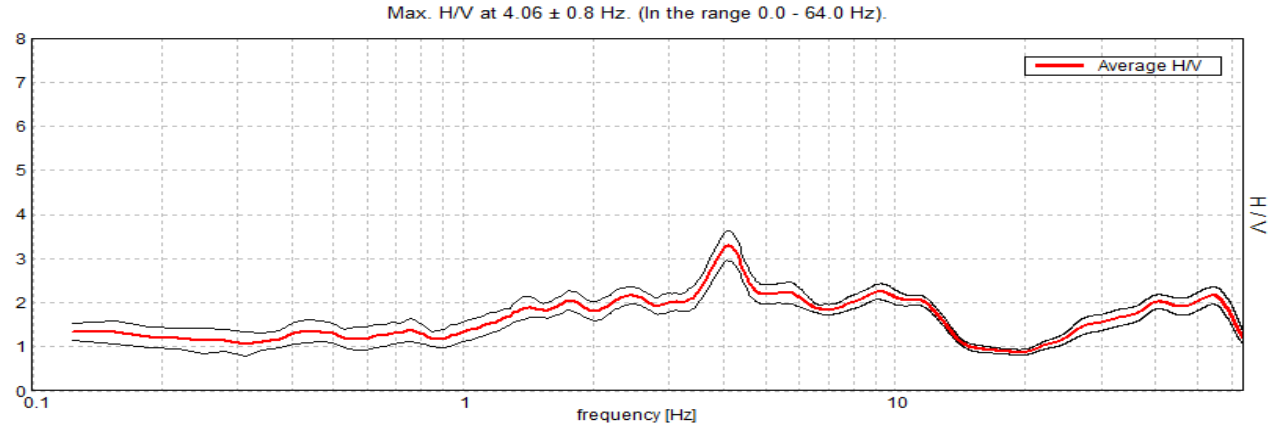
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

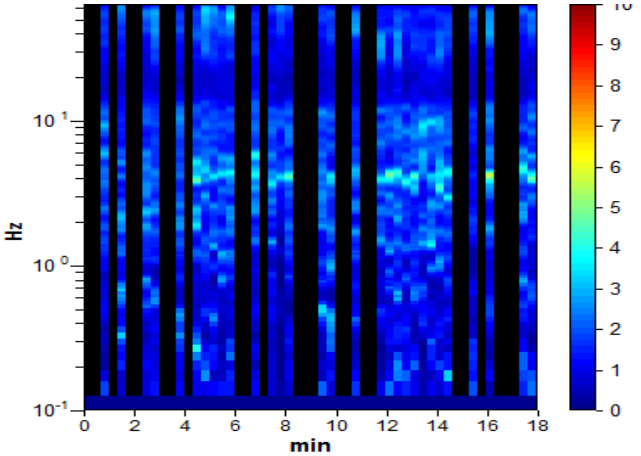
FIGLINE, T54

Instrument: TZ3-0001/01-13
Data format: 16 byte
Full scale [mV]: 51
Start recording: 10/09/15 17:45:30 End recording: 10/09/15 18:03:30
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h18'00". Analyzed 56% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

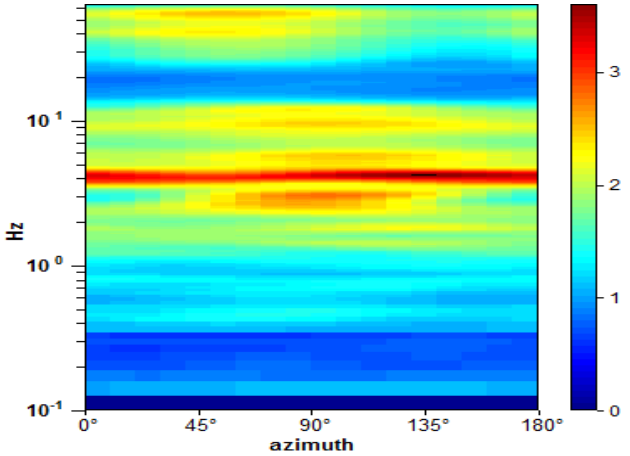
HORIZONTAL TO VERTICAL SPECTRAL RATIO



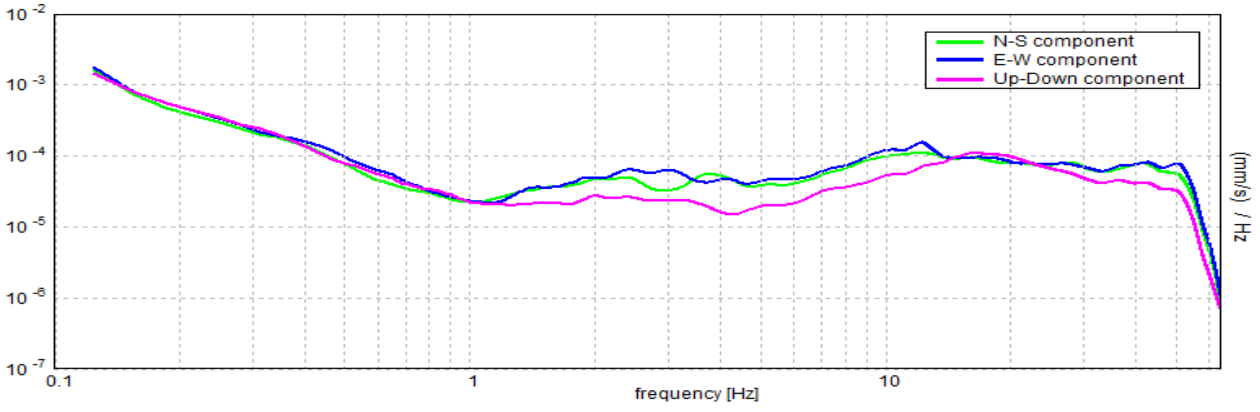
H/V TIME HISTORY



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 4.06 ± 0.8 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	4.06 > 0.50	OK	
$n_c(f_0) > 200$	2437.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 196 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.219 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	12.75 Hz	OK	
$A_0 > 2$	3.30 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.19701| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.80037 < 0.20313		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3433 < 1.58	OK	

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

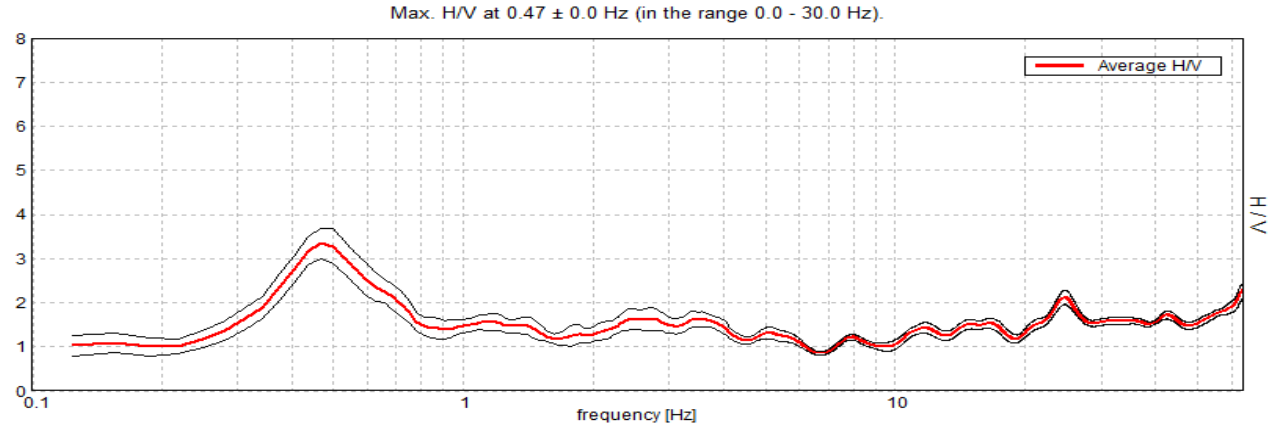
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

Misure HVSR
Madonna del Cesto

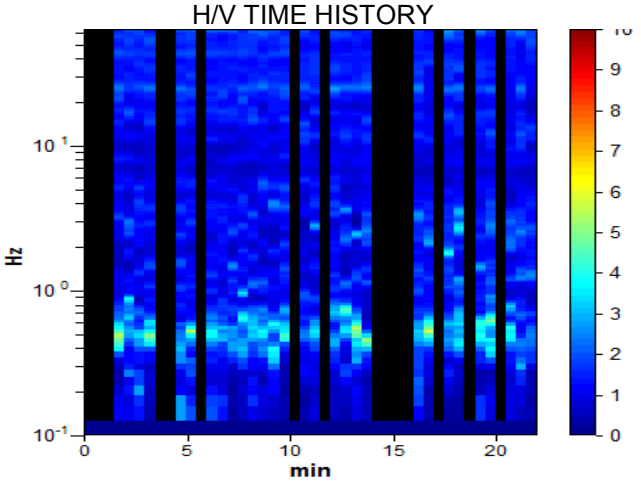
FIGLINE, T20

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 29/05/15 18:00:17 End recording: 29/05/15 18:22:17
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 66% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

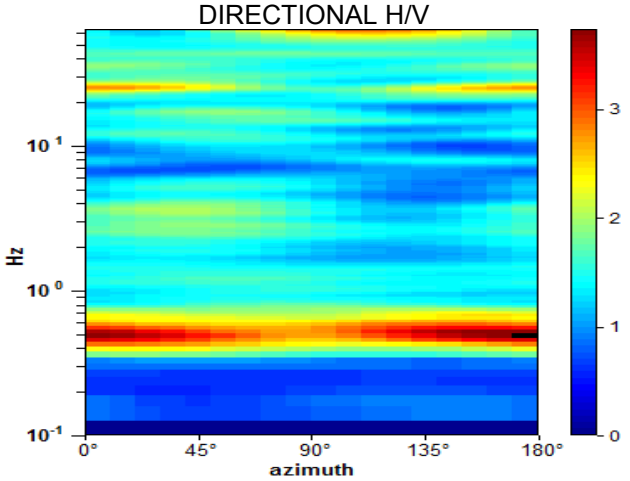
HORIZONTAL TO VERTICAL SPECTRAL RATIO



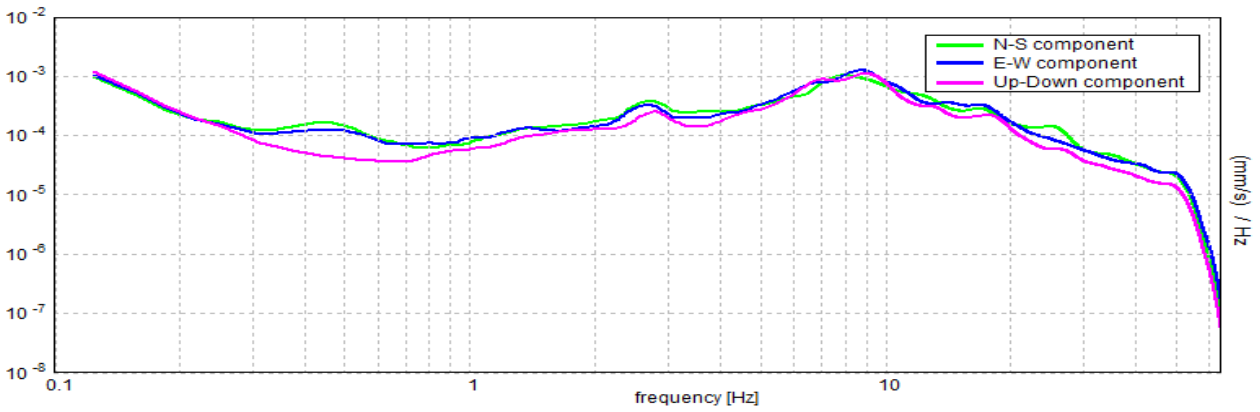
H/V TIME HISTORY



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 0.47 ± 0.0 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.47 > 0.33	OK	
$n_c(f_0) > 200$	407.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 24 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.313 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.781 Hz	OK	
$A_0 > 2$	3.34 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.0| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.0 < 0.09375	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3536 < 2.5	OK	

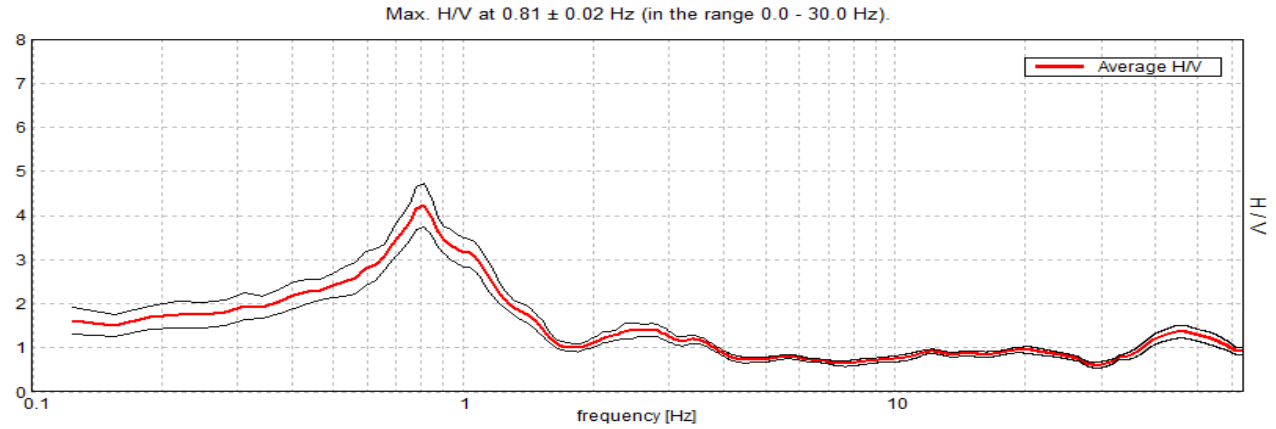
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

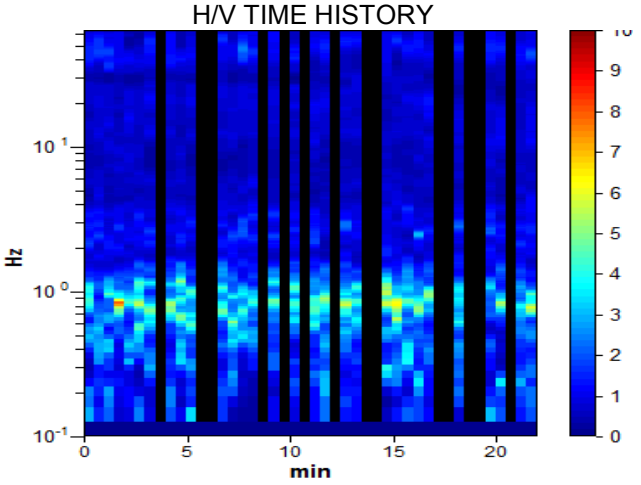
FIGLINE, T21

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 29/05/15 18:40:15 End recording: 29/05/15 19:02:15
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 68% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

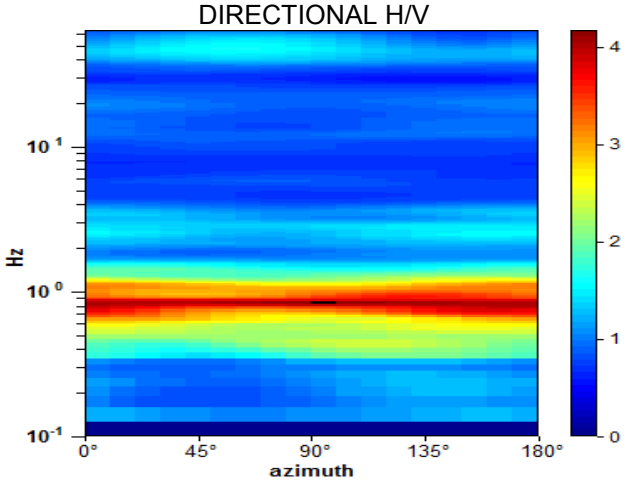
HORIZONTAL TO VERTICAL SPECTRAL RATIO



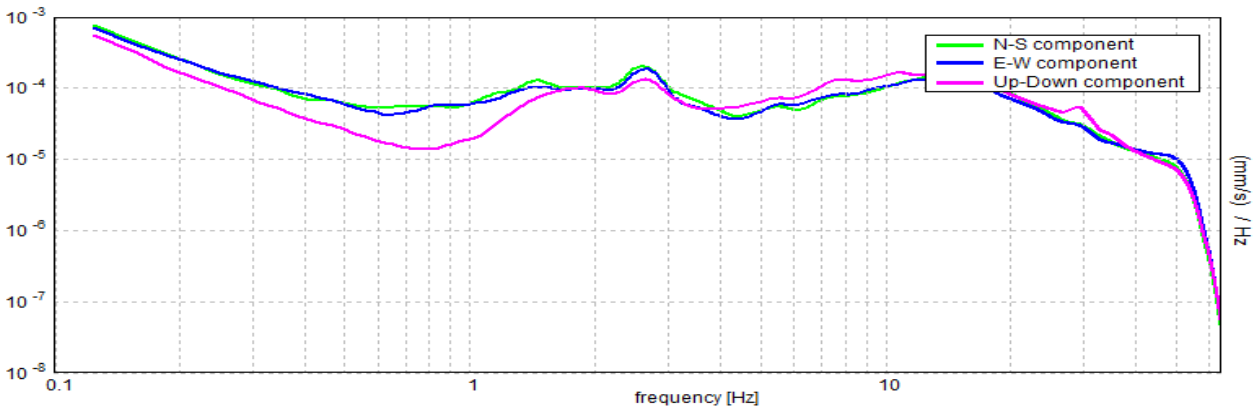
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.81 ± 0.02 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.81 > 0.33	OK	
$n_c(f_0) > 200$	731.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 40 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.375 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.25 Hz	OK	
$A_0 > 2$	4.23 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02895| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.02352 < 0.12188	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5033 < 2.0	OK	

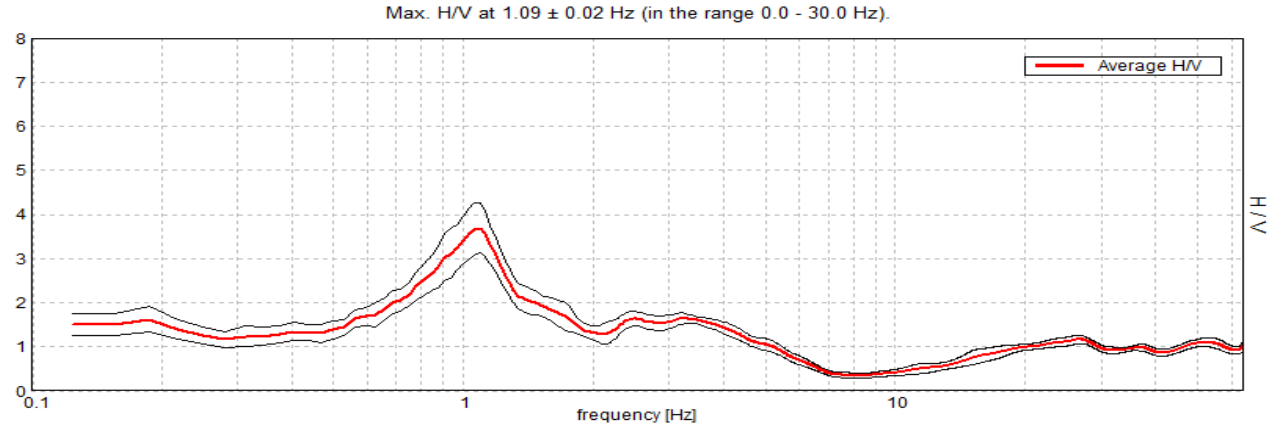
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

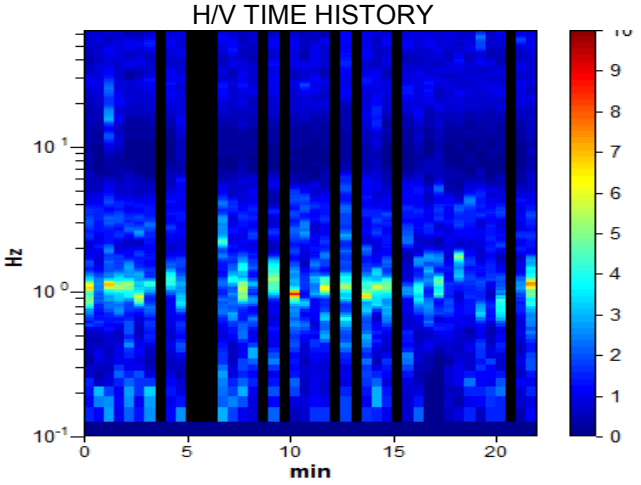
FIGLINE, T22

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 29/05/15 19:10:34 End recording: 29/05/15 19:32:34
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

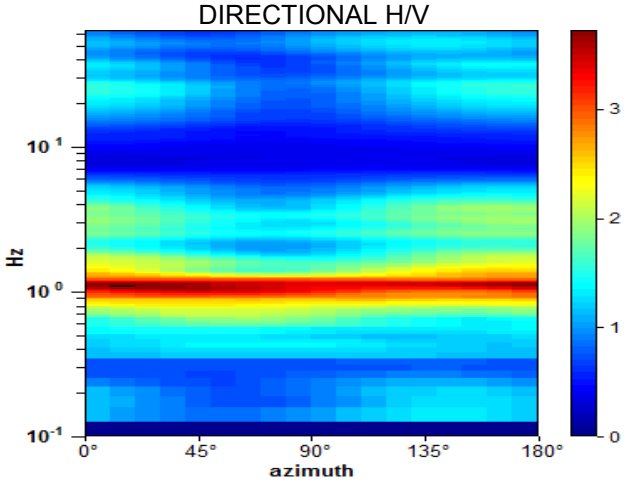
HORIZONTAL TO VERTICAL SPECTRAL RATIO



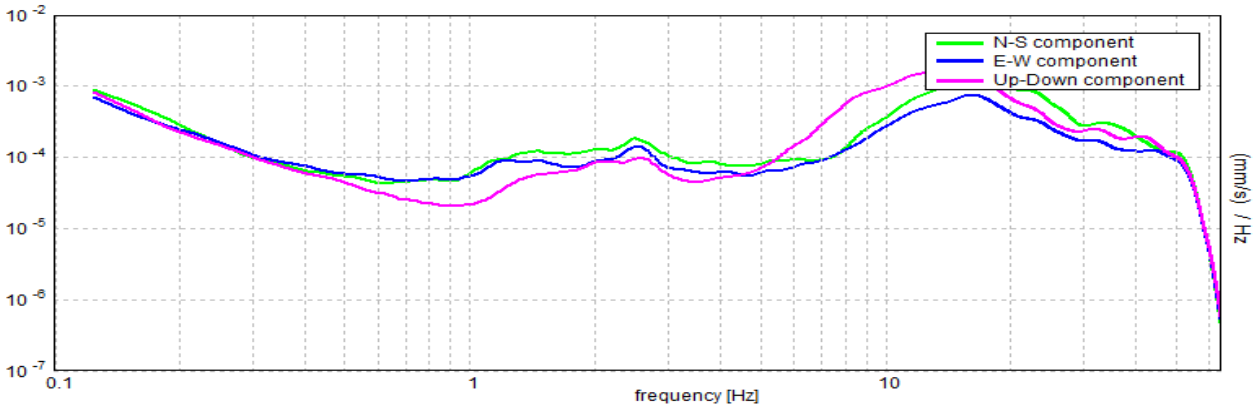
H/V TIME HISTORY



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 1.09 ± 0.02 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.09 > 0.33	OK	
$n_c(f_0) > 200$	1115.6 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 54 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.625 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.594 Hz	OK	
$A_0 > 2$	3.69 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02136| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.02336 < 0.10938	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5663 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

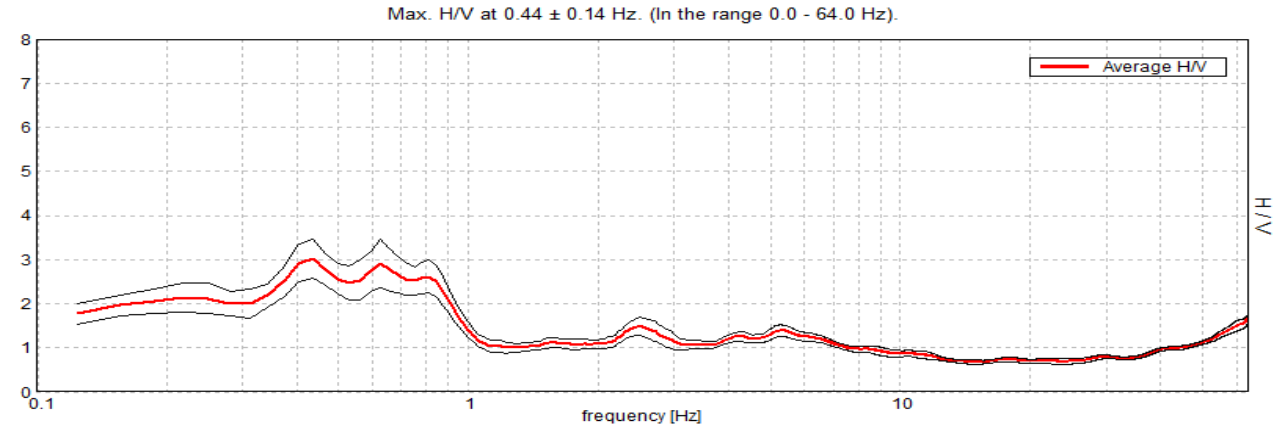
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

Misure HVSR
Matassino

FIGLINE, T23

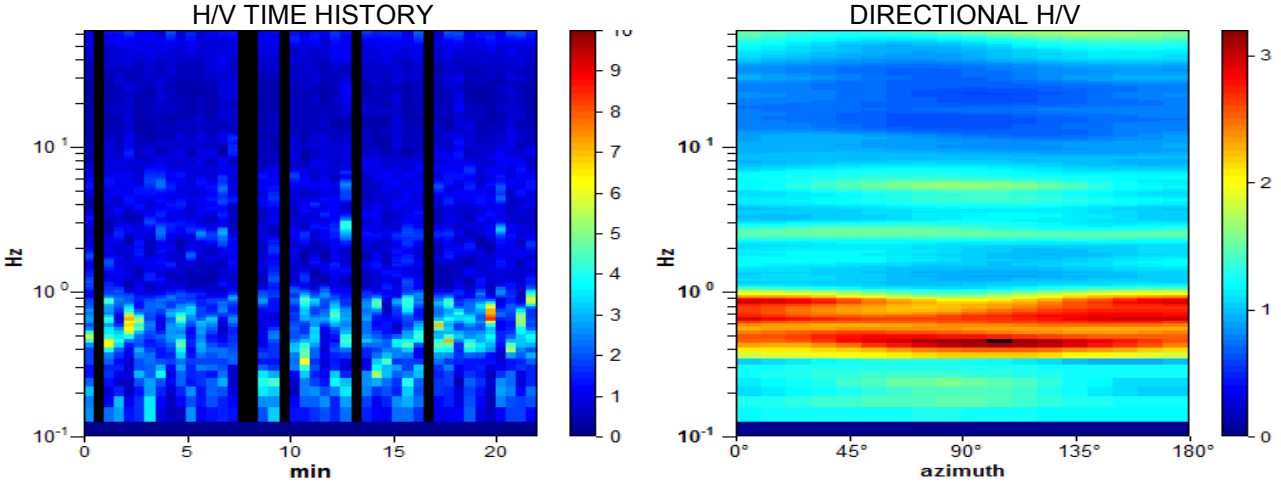
Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 21/08/15 17:37:26 End recording: 21/08/15 17:59:27
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 86% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

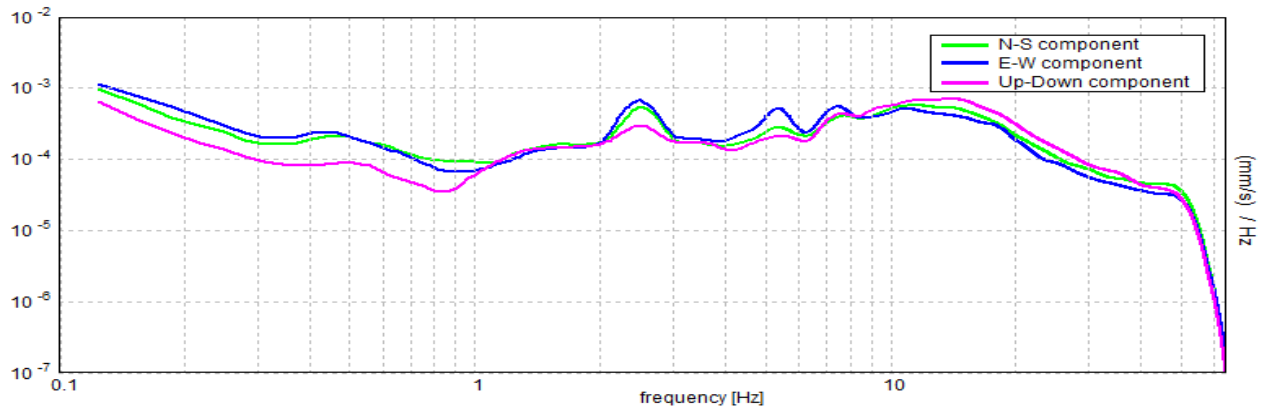


H/V TIME HISTORY

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 0.44 ± 0.14 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.44 > 0.33	OK	
$n_c(f_0) > 200$	498.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 22 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.0 Hz	OK	
$A_0 > 2$	3.02 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.31178| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.1364 < 0.0875		NO
$\sigma_A(f_0) < \theta(f_0)$	0.4425 < 2.5	OK	

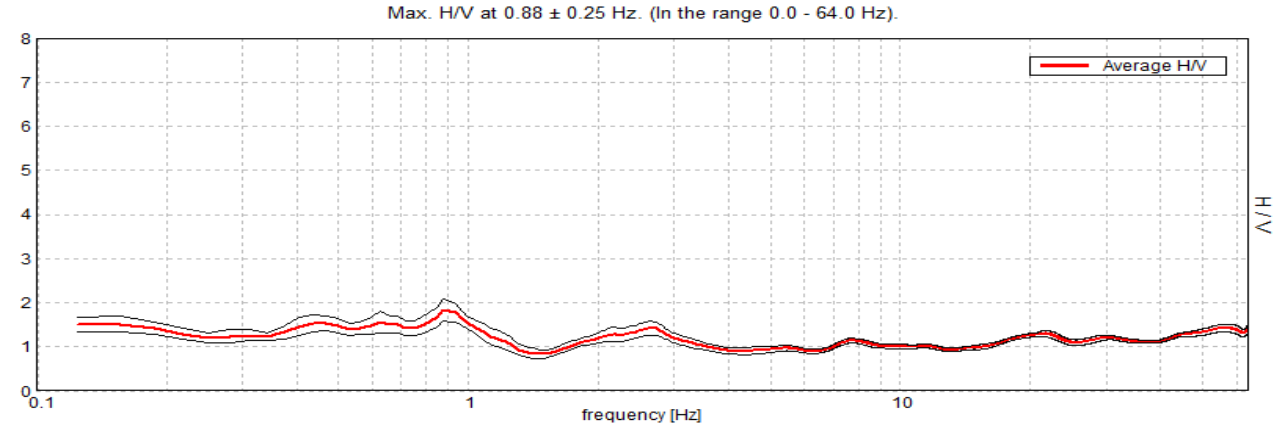
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

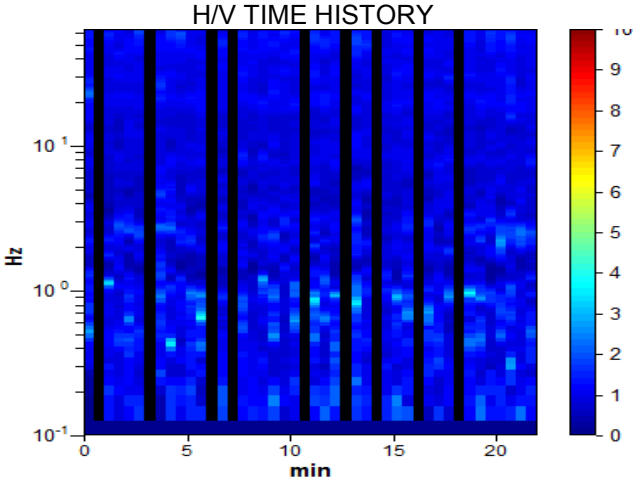
FIGLINE, T24

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 21/08/15 18:11:44 End recording: 21/08/15 18:33:44
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

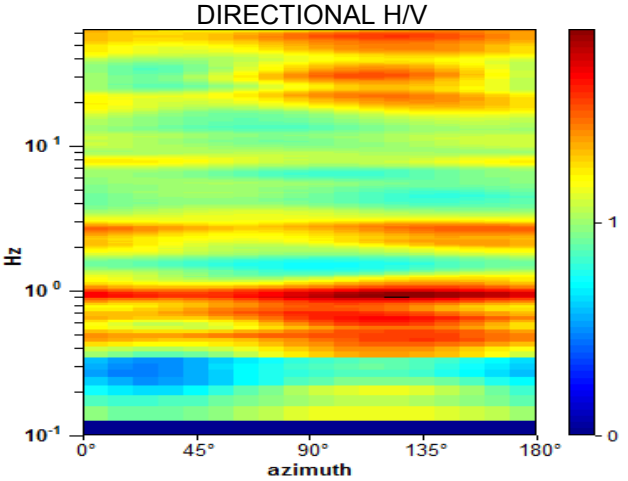
HORIZONTAL TO VERTICAL SPECTRAL RATIO



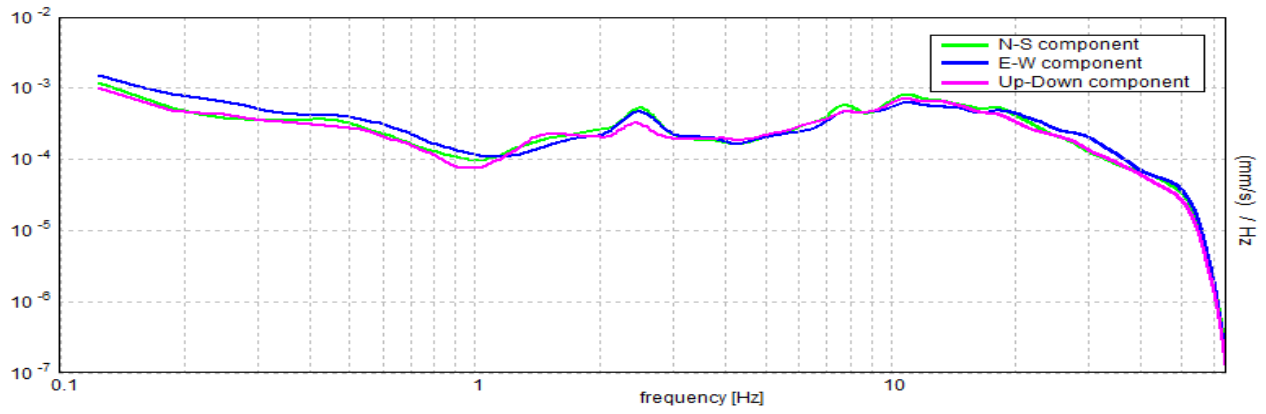
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.88 ± 0.25 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.88 > 0.33	OK	
$n_c(f_0) > 200$	918.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 43 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.344 Hz	OK	
$A_0 > 2$	1.83 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.28737| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.25145 < 0.13125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2465 < 2.0	OK	

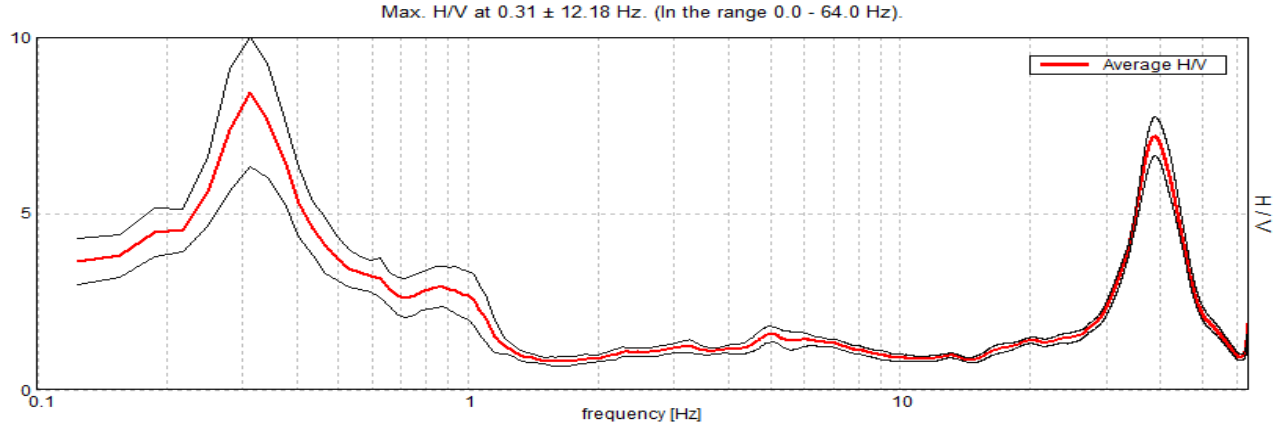
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

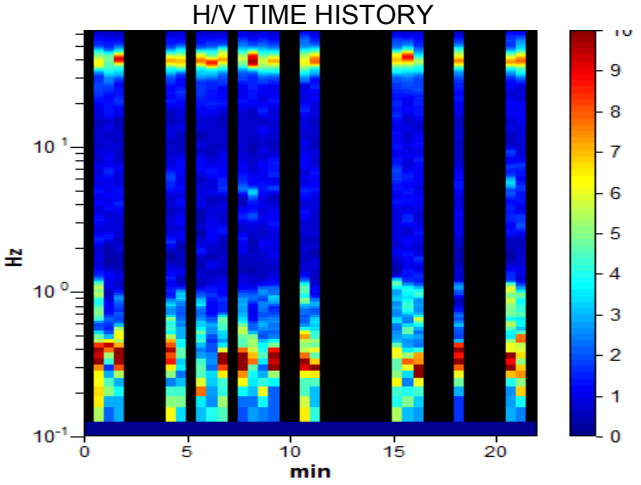
FIGLINE, T25

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 21/08/15 18:59:16 End recording: 21/08/15 19:21:16
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 45% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

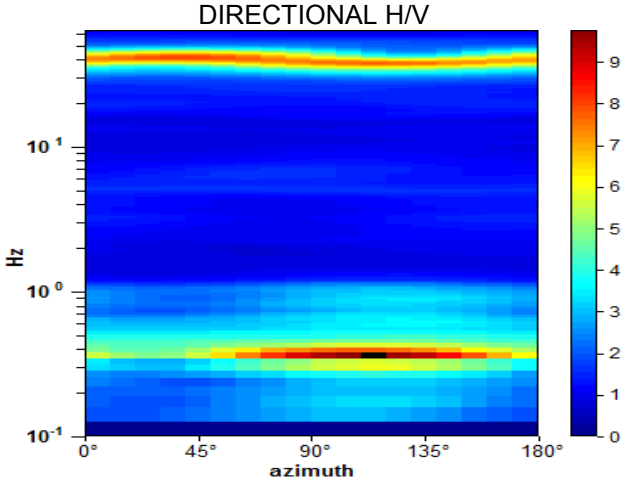
HORIZONTAL TO VERTICAL SPECTRAL RATIO



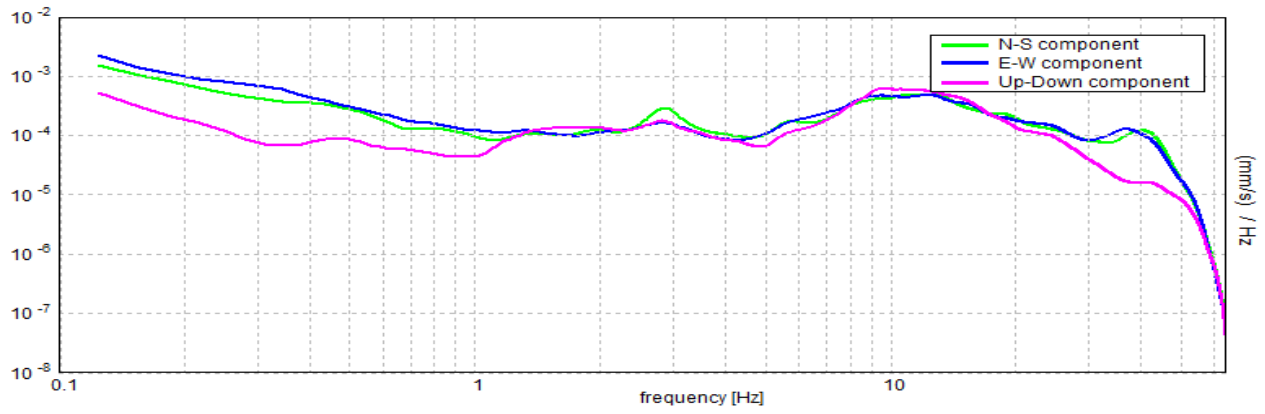
H/V TIME HISTORY



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 ± 12.18 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.31 > 0.33		**NO**
$n_c(f_0) > 200$	187.5 > 200		**NO**
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 16 times	**OK**	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.156 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.469 Hz	**OK**	
$A_0 > 2$	8.42 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|38.99116| < 0.05		**NO**
$\sigma_f < \varepsilon(f_0)$	12.18474 < 0.0625		**NO**
$\sigma_A(f_0) < \theta(f_0)$	2.0829 < 2.5	**OK**	

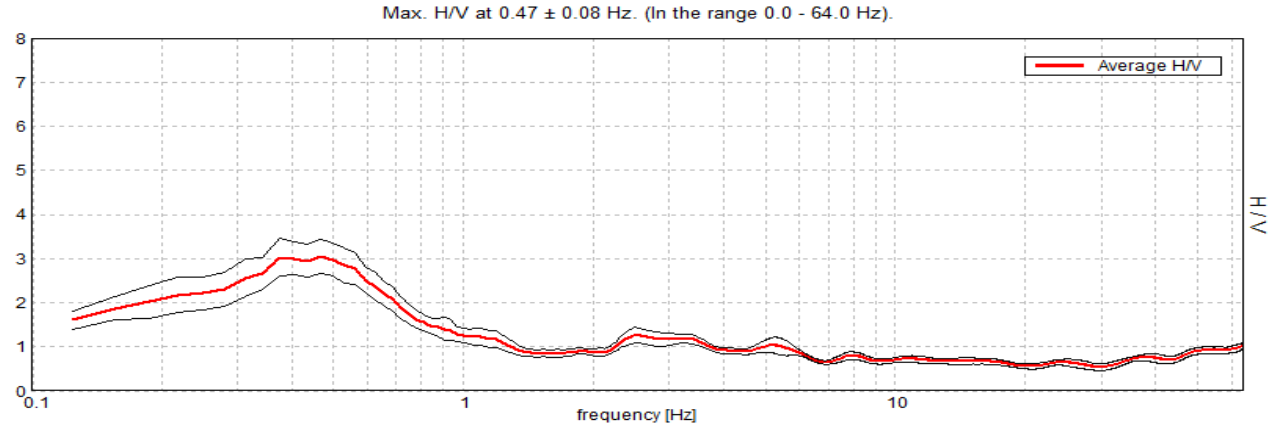
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

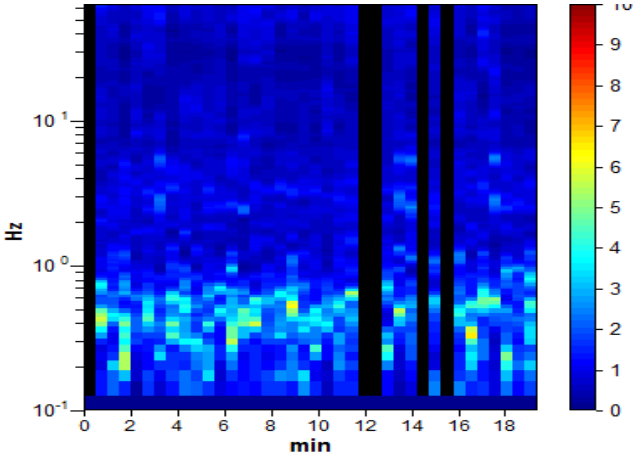
FIGLINE, T26

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 21/08/15 19:36:07 End recording: 21/08/15 19:55:32
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h19'24". Analyzed 87% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

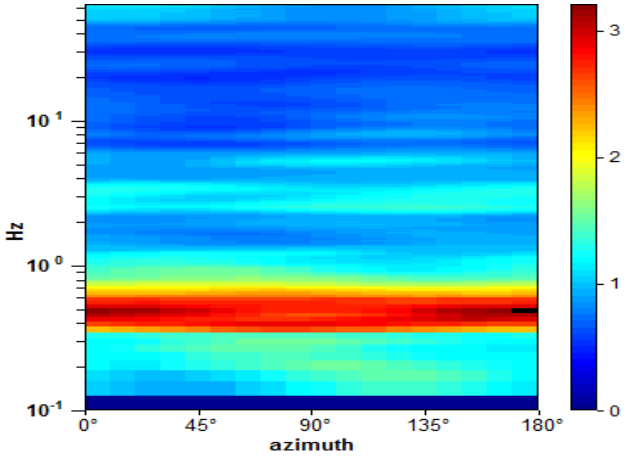
HORIZONTAL TO VERTICAL SPECTRAL RATIO



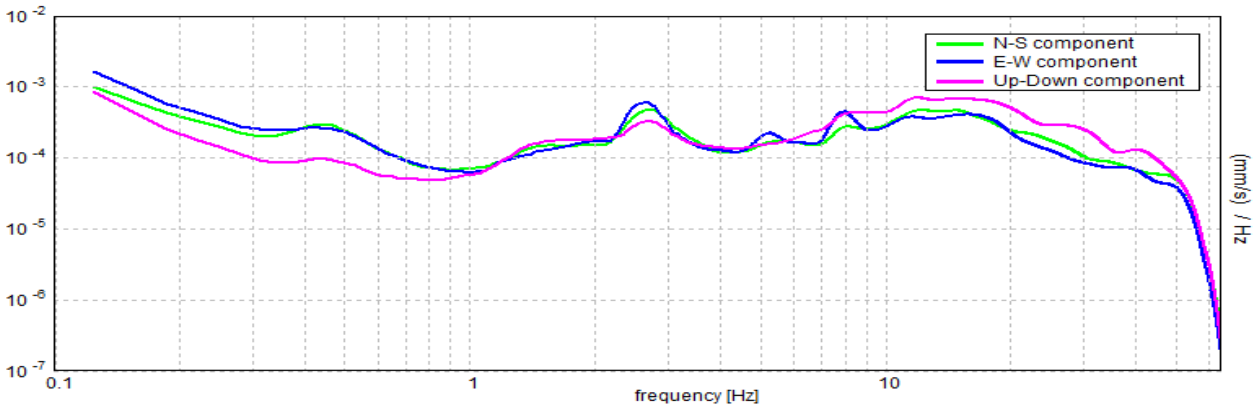
H/V TIME HISTORY



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 0.47 ± 0.08 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.47 > 0.33	OK	
$n_c(f_0) > 200$	464.1 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 24 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.844 Hz	OK	
$A_0 > 2$	3.04 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.17753| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.08321 < 0.09375	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3899 < 2.5	OK	

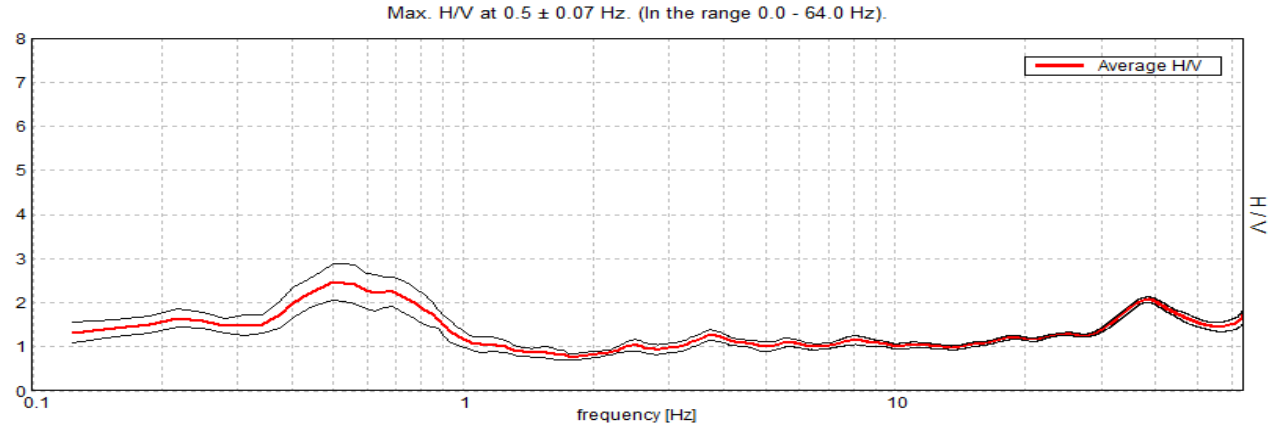
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

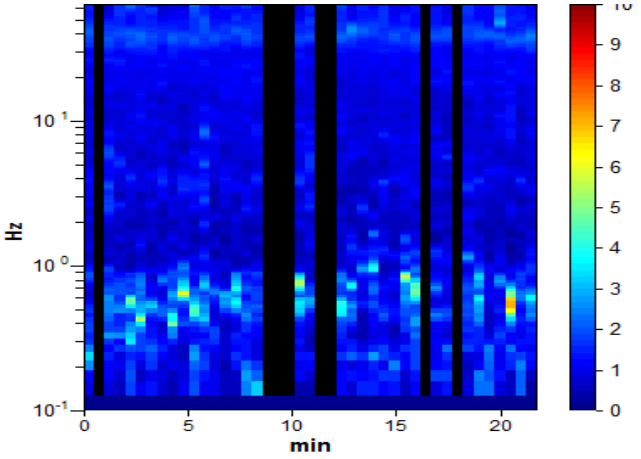
FIGLINE, T27

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 21/08/15 20:02:54 End recording: 21/08/15 20:24:48
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h21'48". Analyzed 81% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

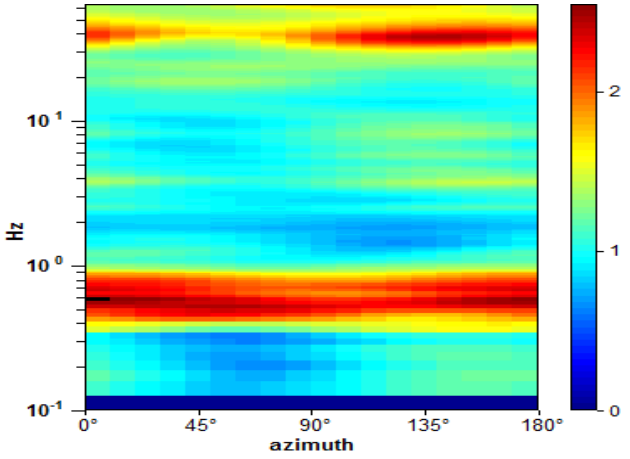
HORIZONTAL TO VERTICAL SPECTRAL RATIO



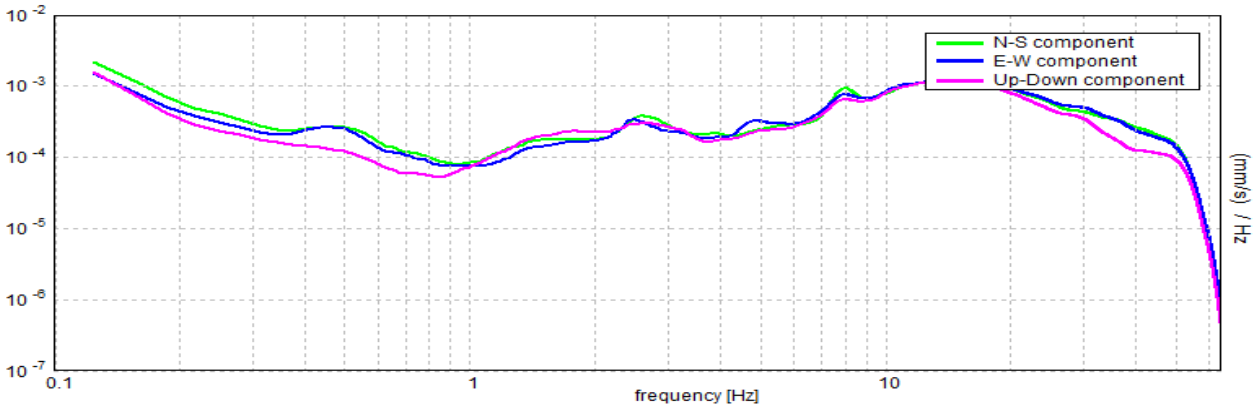
H/V TIME HISTORY



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 ± 0.07 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.50 > 0.33	OK	
$n_c(f_0) > 200$	525.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.0 Hz	OK	
$A_0 > 2$	2.46 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.14903| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.07451 < 0.075	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4094 < 2.0	OK	

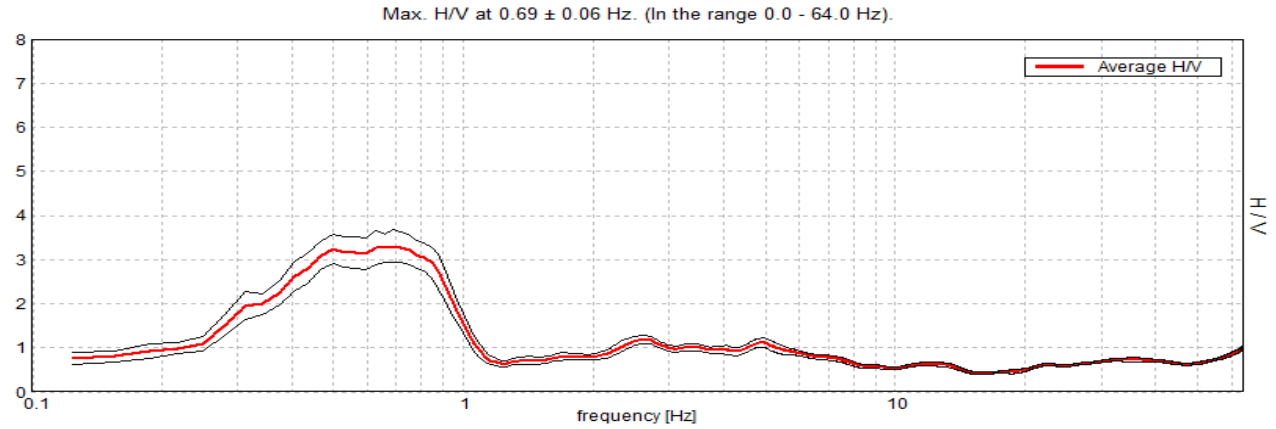
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

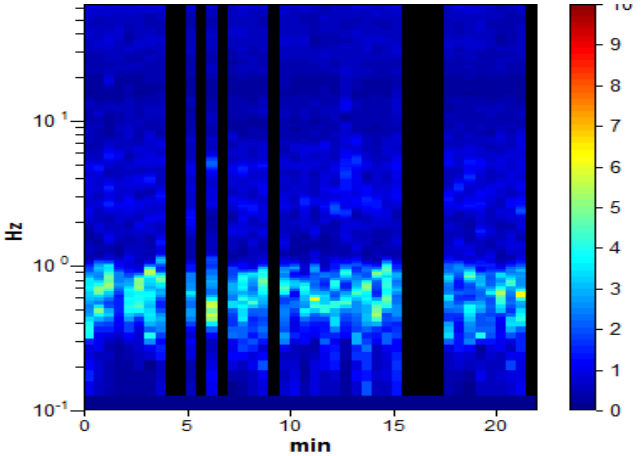
FIGLINE, T48

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 02/09/15 20:24:40 End recording: 02/09/15 20:46:40
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

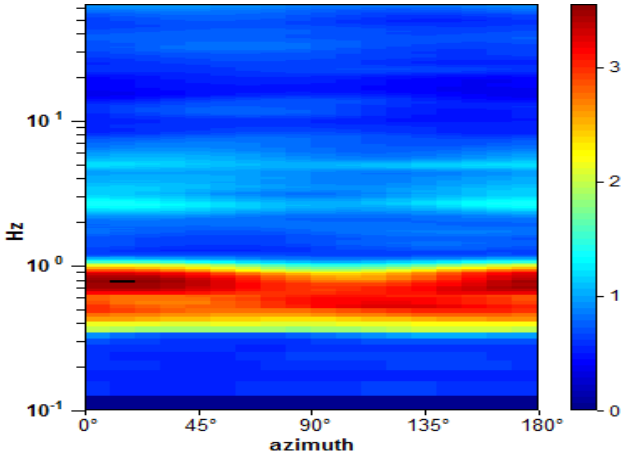
HORIZONTAL TO VERTICAL SPECTRAL RATIO



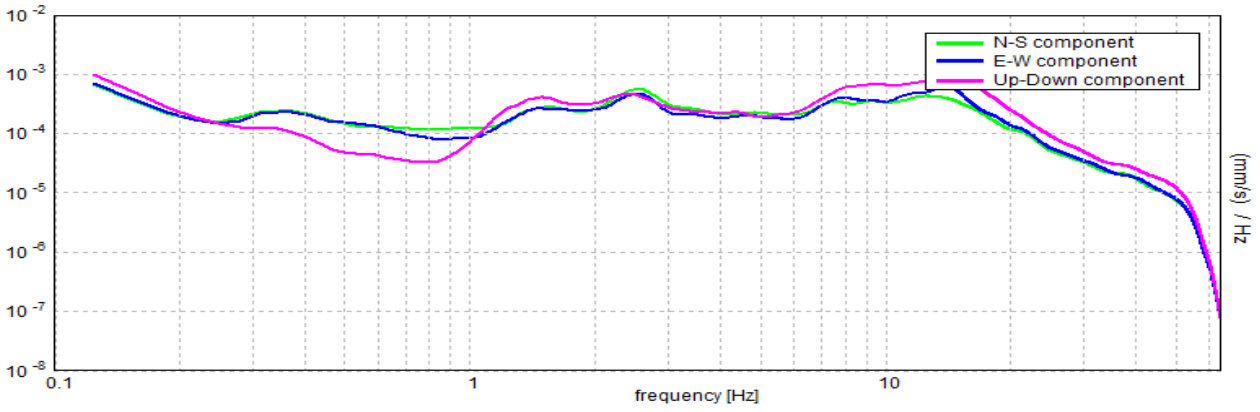
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.69 ± 0.06 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.69 > 0.33	OK	
$n_c(f_0) > 200$	701.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 34 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.281 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.0 Hz	OK	
$A_0 > 2$	3.31 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.0861| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.0592 < 0.10313	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3735 < 2.0	OK	

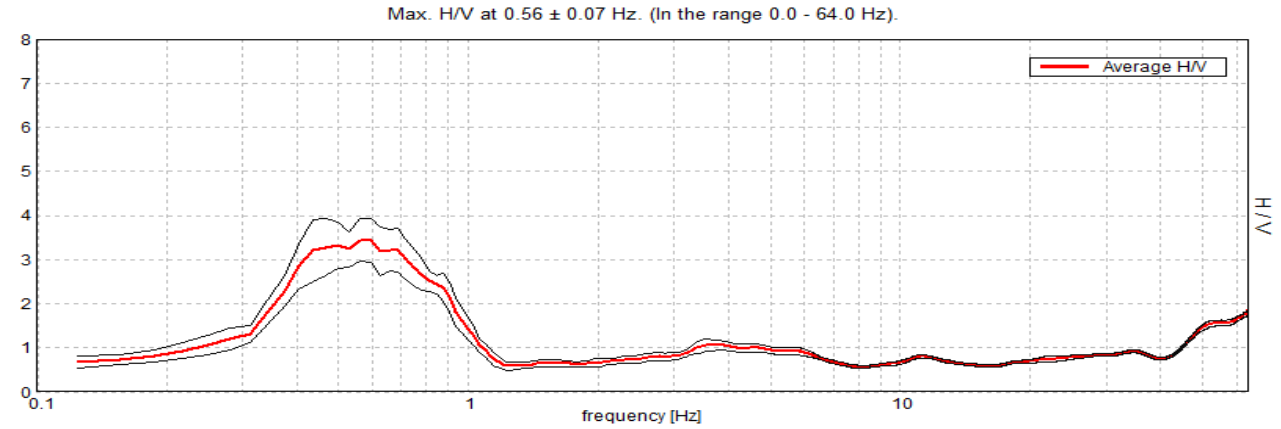
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

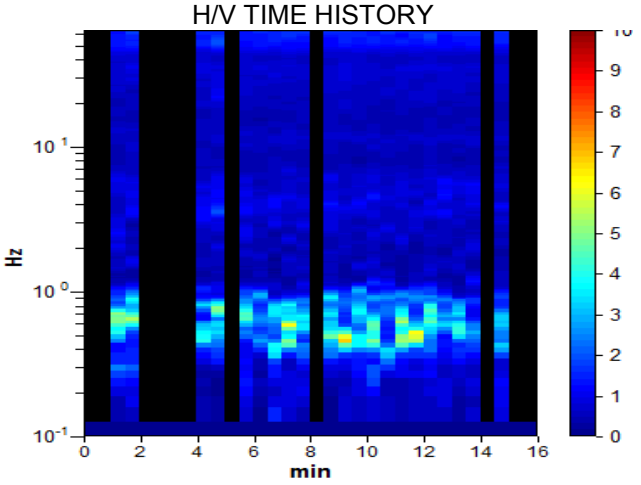
FIGLINE, T55

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 10/09/15 19:57:02 End recording: 10/09/15 20:13:02
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h16'00". Analyzed 66% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

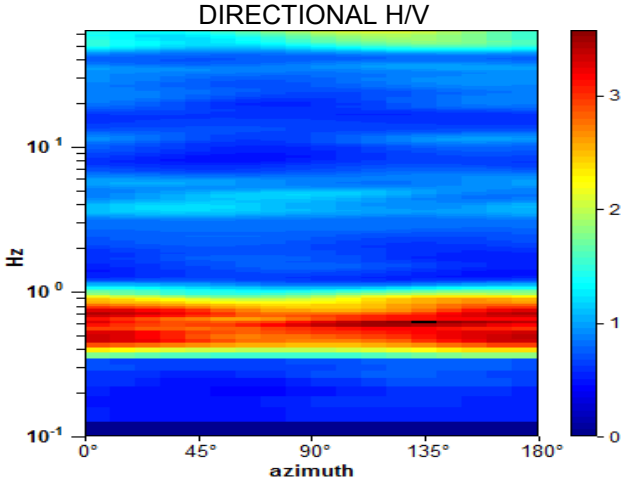
HORIZONTAL TO VERTICAL SPECTRAL RATIO



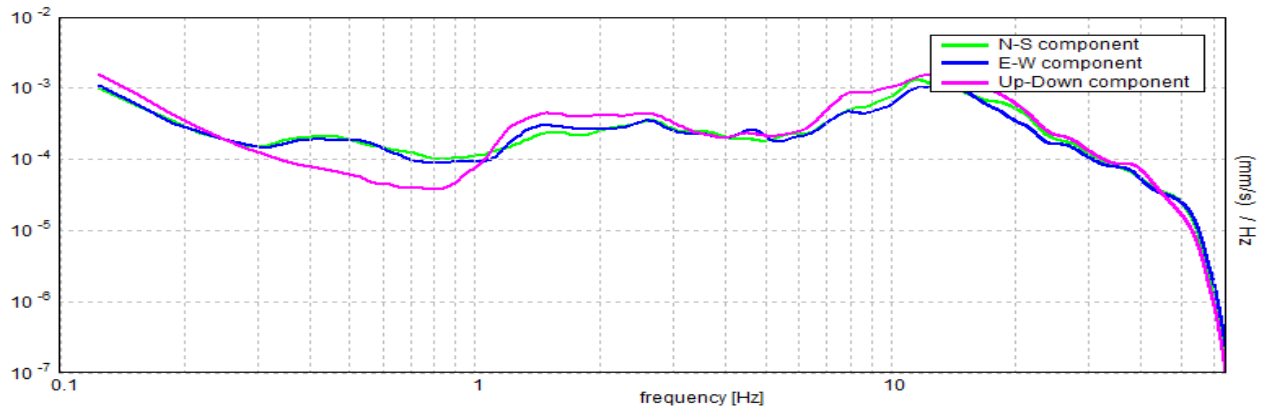
H/V TIME HISTORY



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 0.56 ± 0.07 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.56 > 0.33	OK	
$n_c(f_0) > 200$	354.4 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 28 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.313 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.969 Hz	OK	
$A_0 > 2$	3.45 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.1328| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.0747 < 0.08438	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4862 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

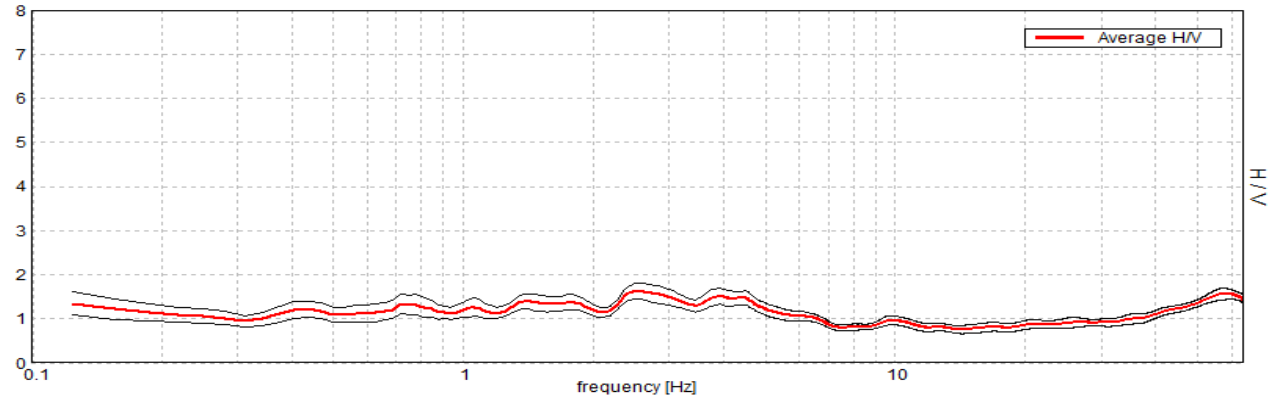
Misure HVSR
Poggio alla Croce

FIGLINE, T62

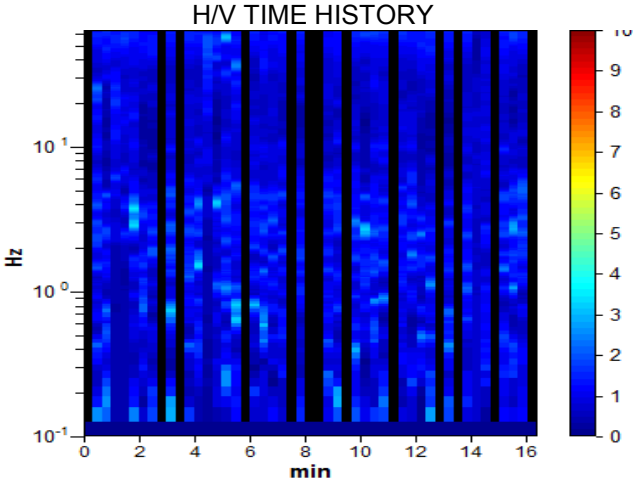
Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 04/12/15 15:14:57 End recording: 04/12/15 15:31:25
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h16'24". Analyzed 73% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

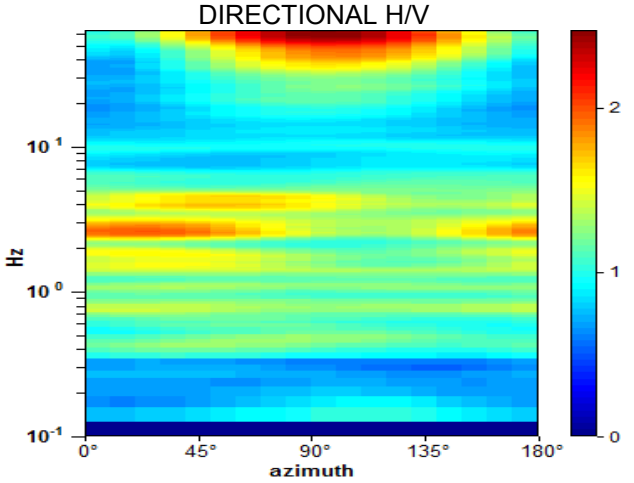
Max. H/V at 2.5 ± 9.54 Hz. (In the range 0.0 - 64.0 Hz).



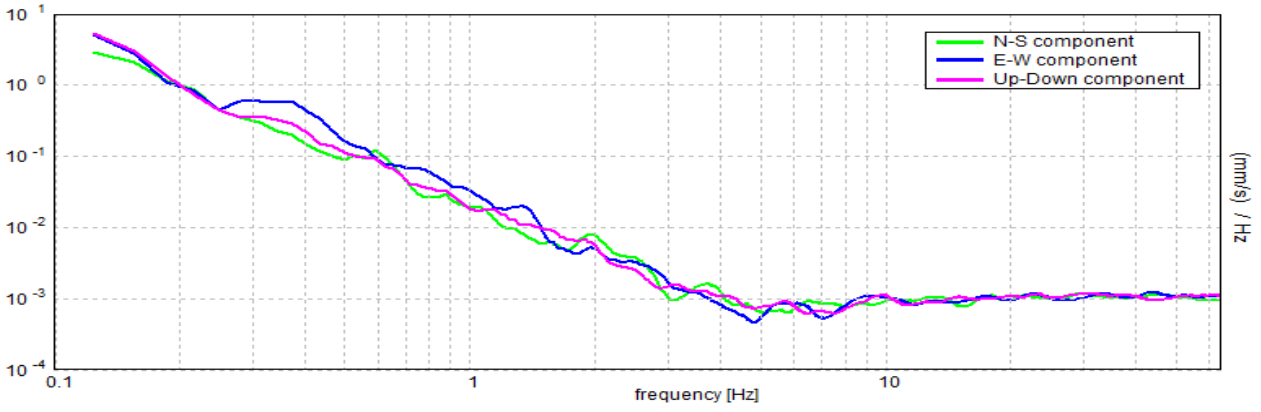
H/V TIME HISTORY



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 2.5 ± 9.54 Hz (in the range 0.0 - 64.0 Hz).

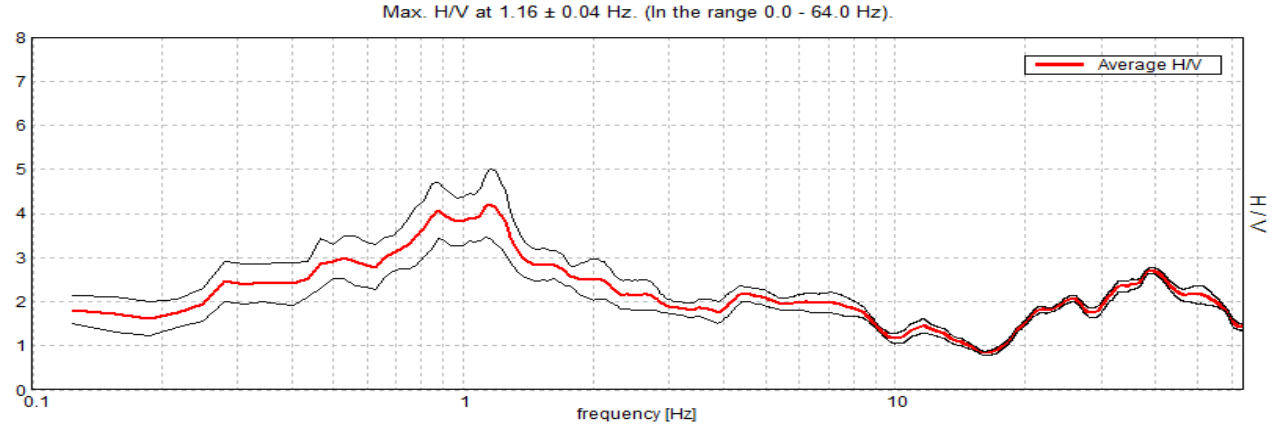
Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.50 > 0.50	OK	
$n_c(f_0) > 200$	1800.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 121 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	7.281 Hz	OK	
$A_0 > 2$	1.63 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|3.81514| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	9.53785 < 0.125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.172 < 1.58	OK	

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

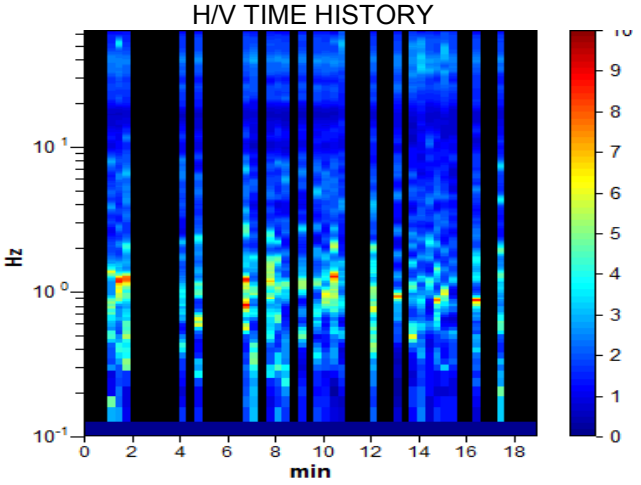
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T63
Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 04/12/15 15:38:02 End recording: 04/12/15 15:57:03
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h19'00". Analyzed 44% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

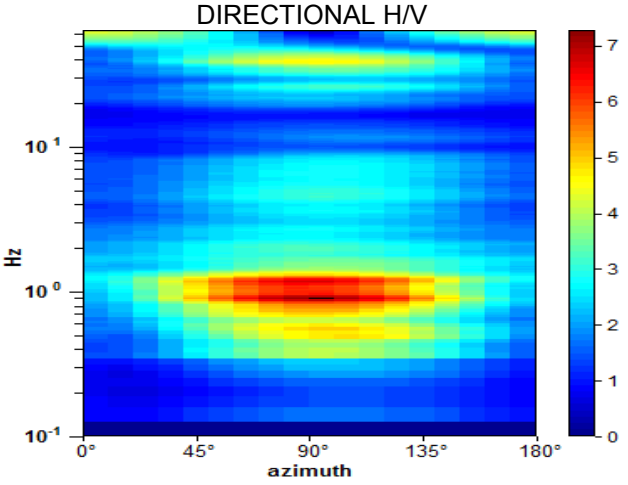
HORIZONTAL TO VERTICAL SPECTRAL RATIO



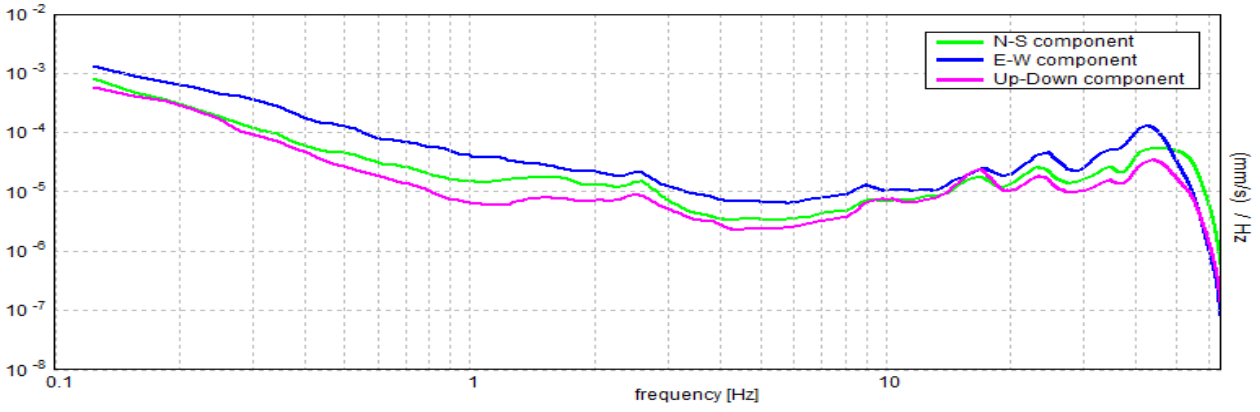
H/V TIME HISTORY



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 1.16 ± 0.04 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.16 > 0.50	OK	
$n_c(f_0) > 200$	578.1 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 56 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.781 Hz	OK	
$A_0 > 2$	4.21 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03376| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.03903 < 0.11563	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.7879 < 1.78	OK	

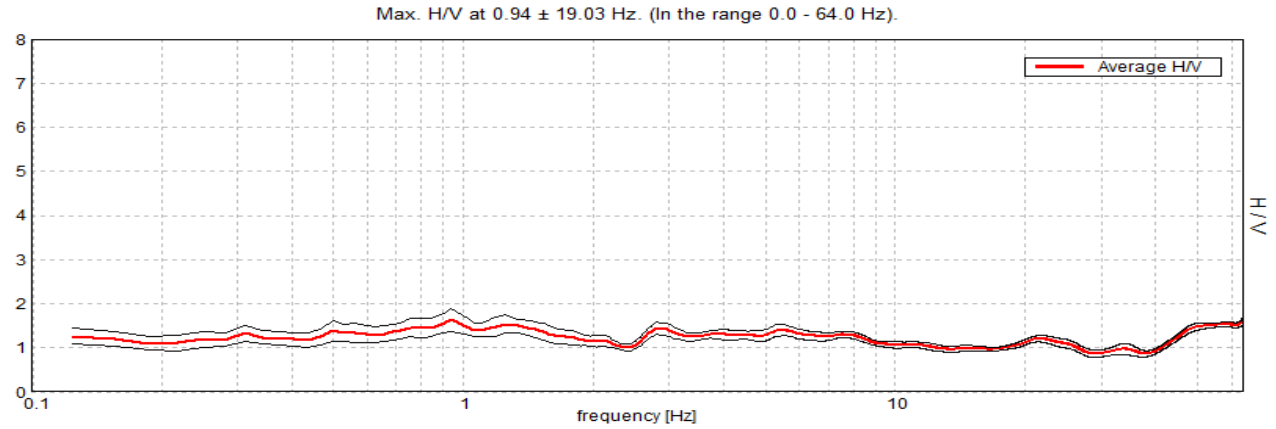
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

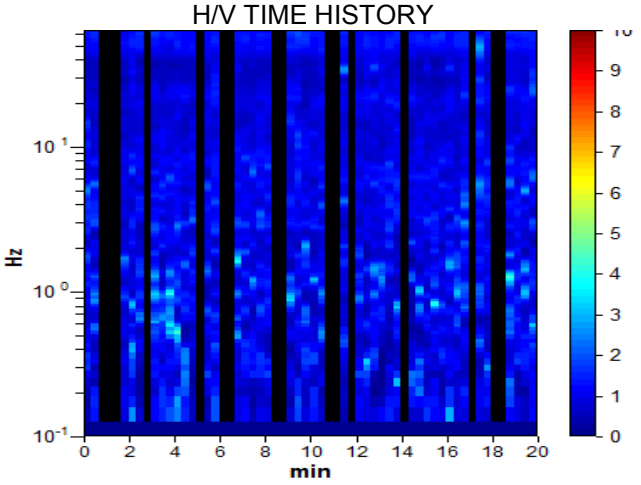
FIGLINE, T64

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 04/12/15 16:05:20 End recording: 04/12/15 16:25:20
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h20'00". Analyzed 73% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

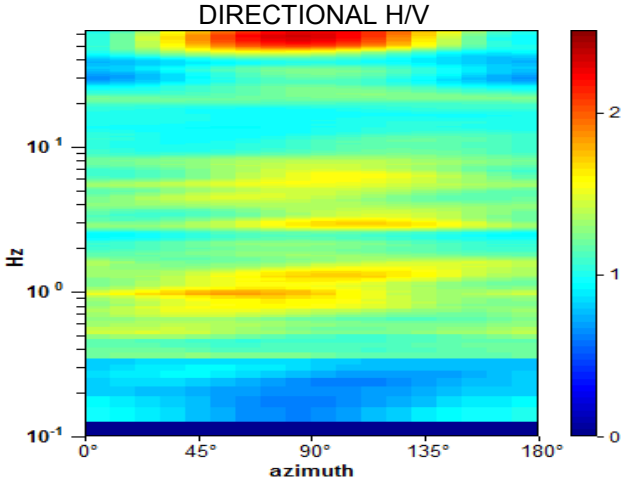
HORIZONTAL TO VERTICAL SPECTRAL RATIO



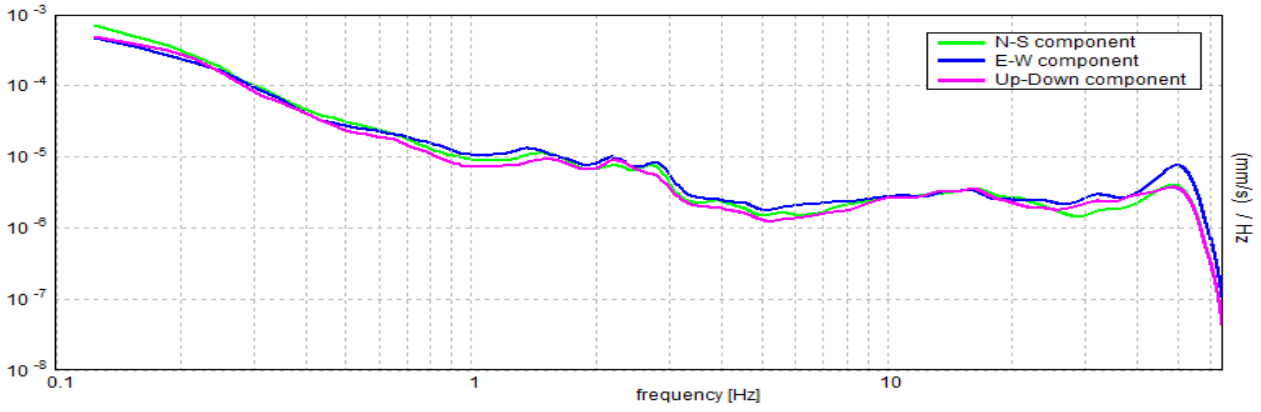
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.94 ± 19.03 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.94 > 0.50	OK	
$n_c(f_0) > 200$	825.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 46 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.63 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|20.29389| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	19.02552 < 0.14063		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2659 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

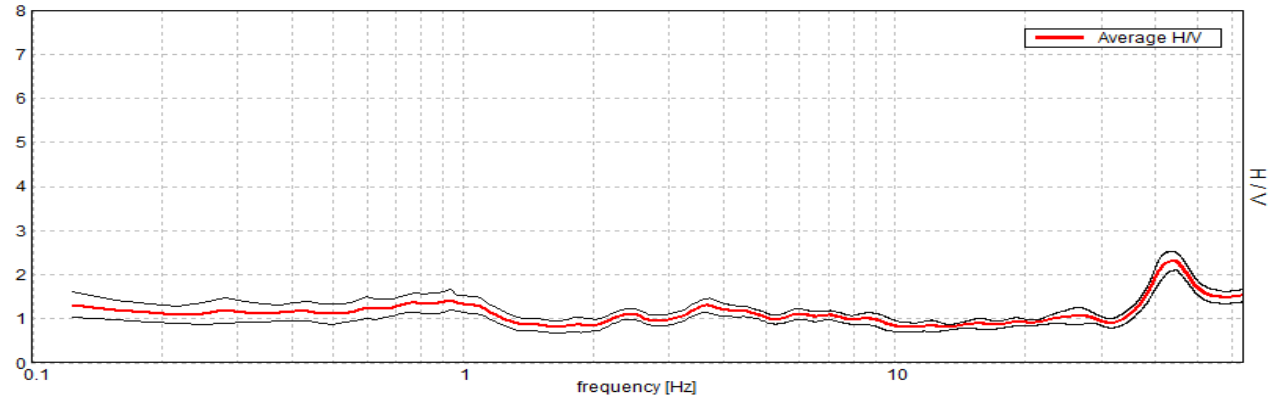
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T65

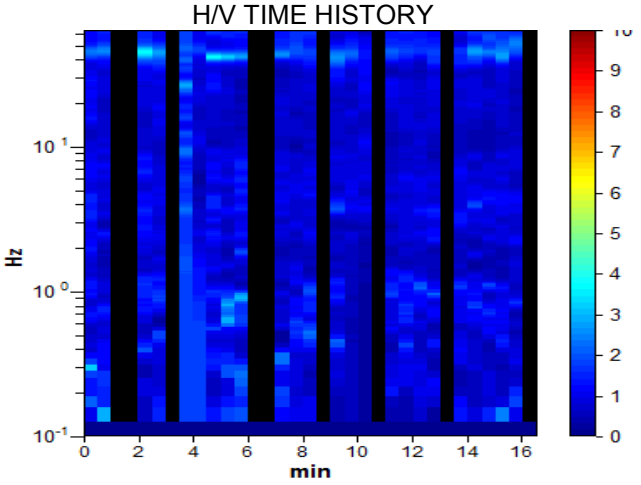
Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 04/12/15 16:37:42 End recording: 04/12/15 16:54:26
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h16'36". Analyzed 73% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

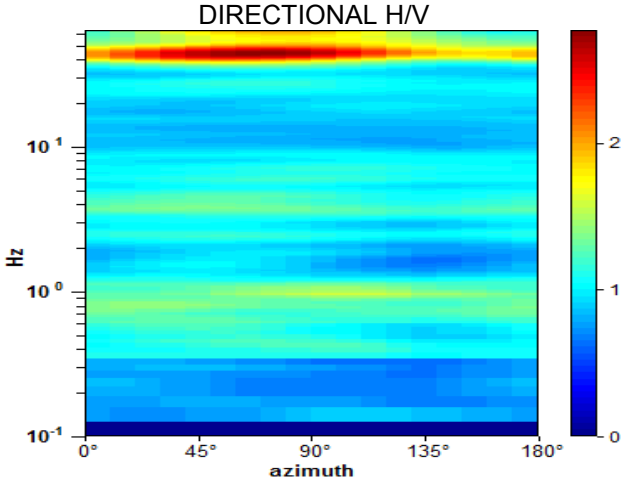
Max. H/V at 44.38 ± 9.09 Hz. (In the range 0.0 - 64.0 Hz).



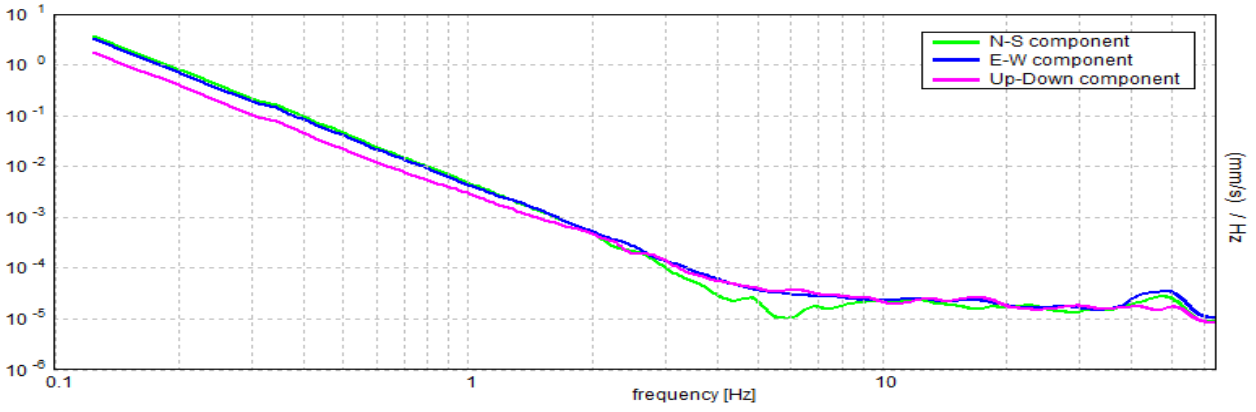
H/V TIME HISTORY



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 44.38 ± 9.09 Hz (in the range 0.0 - 64.0 Hz).

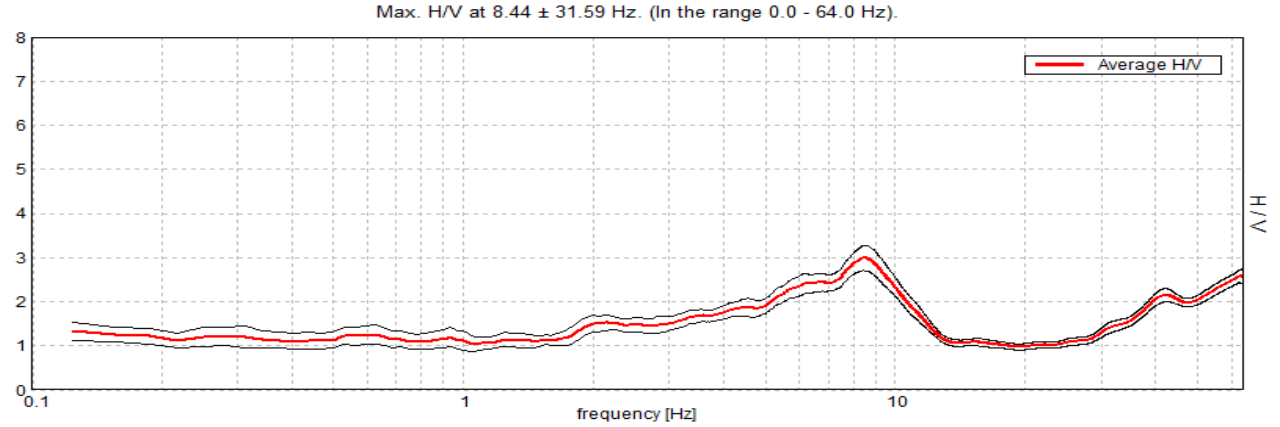
Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	44.38 > 0.33	OK	
$n_c(f_0) > 200$	31950.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 1339 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	35.406 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.31 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.20493| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	9.09387 < 2.21875		NO
$\sigma_A(f_0) < \theta(f_0)$	0.206 < 1.58	OK	

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

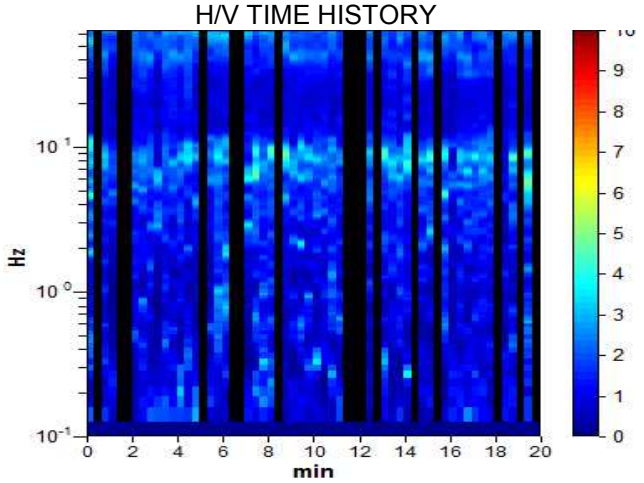
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T66
Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 04/12/15 17:11:40 End recording: 04/12/15 17:31:40
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h20'00". Analyzed 73% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

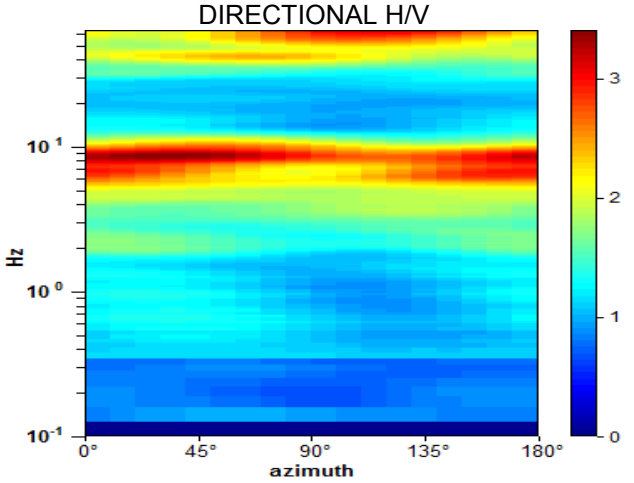
HORIZONTAL TO VERTICAL SPECTRAL RATIO



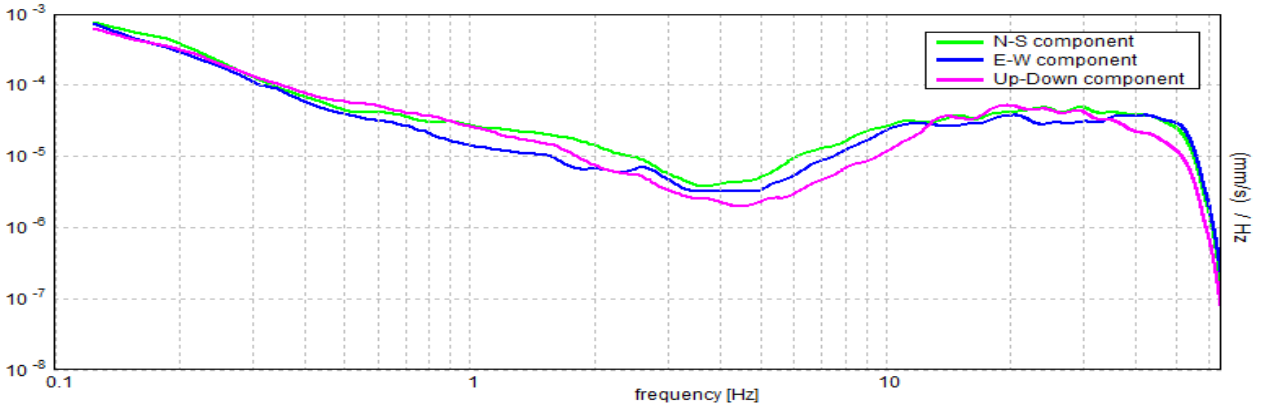
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 8.44 ± 31.59 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	8.44 > 0.50	OK	
$n_c(f_0) > 200$	7425.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 406 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.938 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	11.875 Hz	OK	
$A_0 > 2$	2.99 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|3.74347| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	31.58549 < 0.42188		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2869 < 1.58	OK	

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

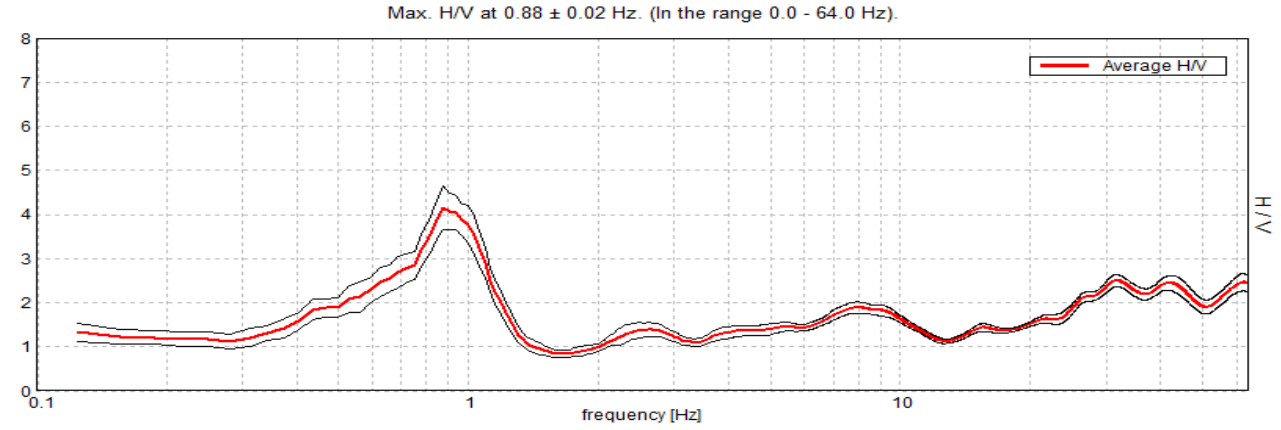
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

Misure HVSR
Poggiolino

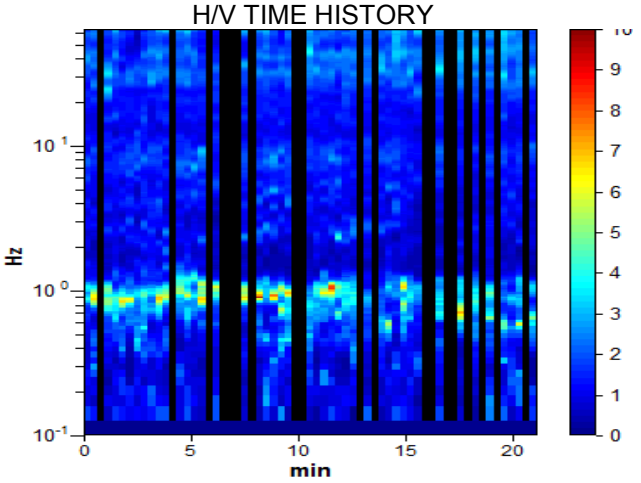
FIGLINE, T32

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 22/08/15 15:56:57 End recording: 22/08/15 16:18:20
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h21'12". Analyzed 70% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

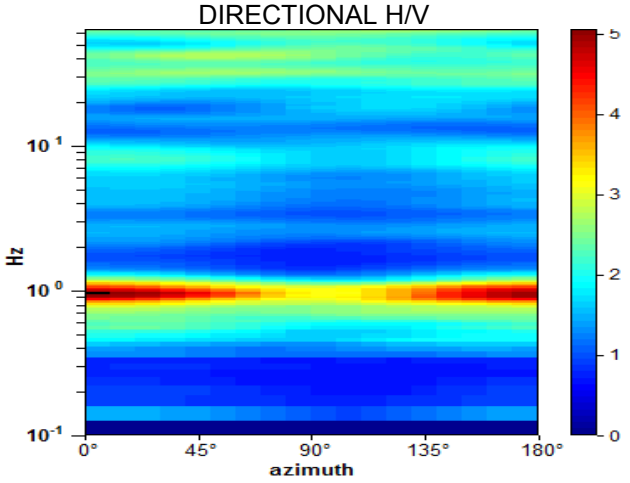
HORIZONTAL TO VERTICAL SPECTRAL RATIO



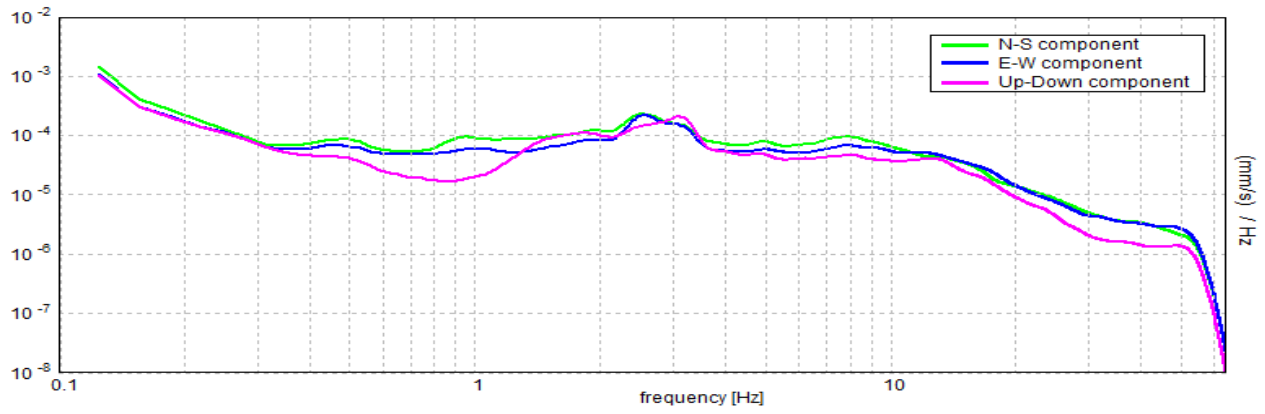
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.88 ± 0.02 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.88 > 0.50	OK	
$n_c(f_0) > 200$	770.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 43 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.5 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.188 Hz	OK	
$A_0 > 2$	4.15 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01865| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.01632 < 0.13125	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4858 < 2.0	OK	

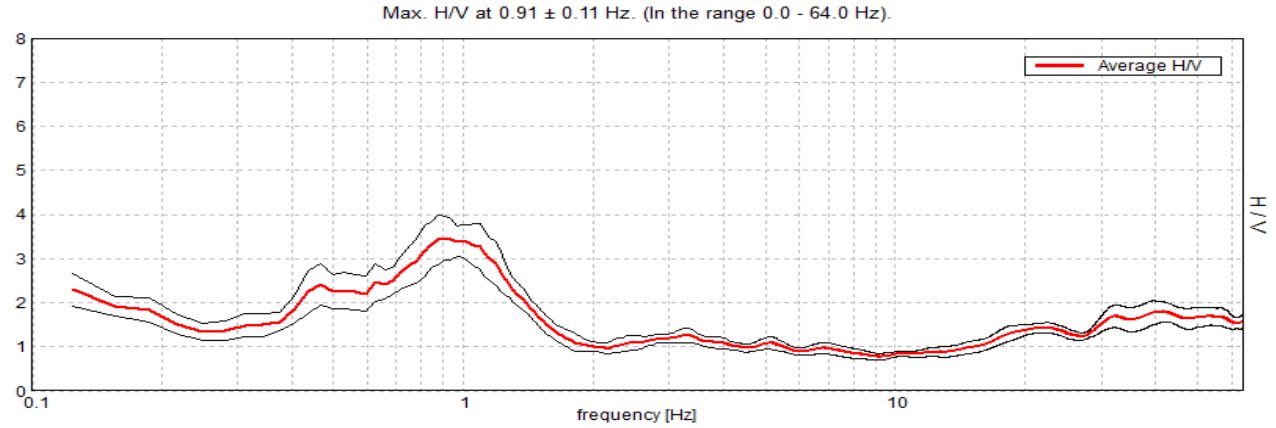
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

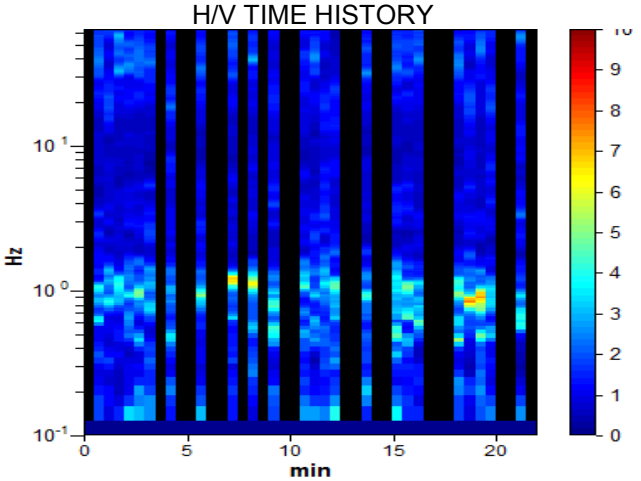
FIGLINE, T33

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 22/08/15 16:24:22 End recording: 22/08/15 16:46:22
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 55% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

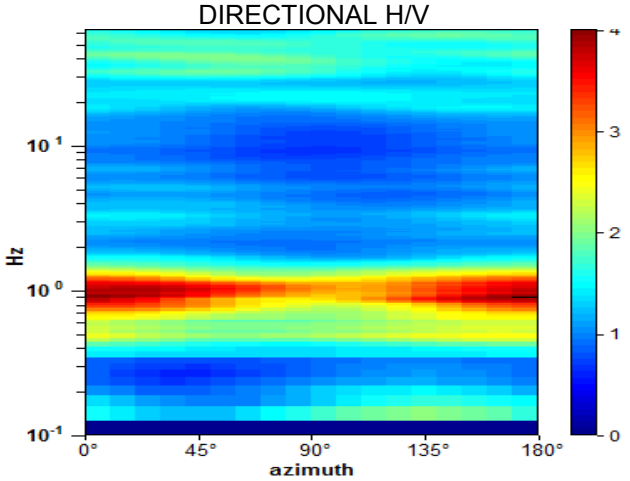
HORIZONTAL TO VERTICAL SPECTRAL RATIO



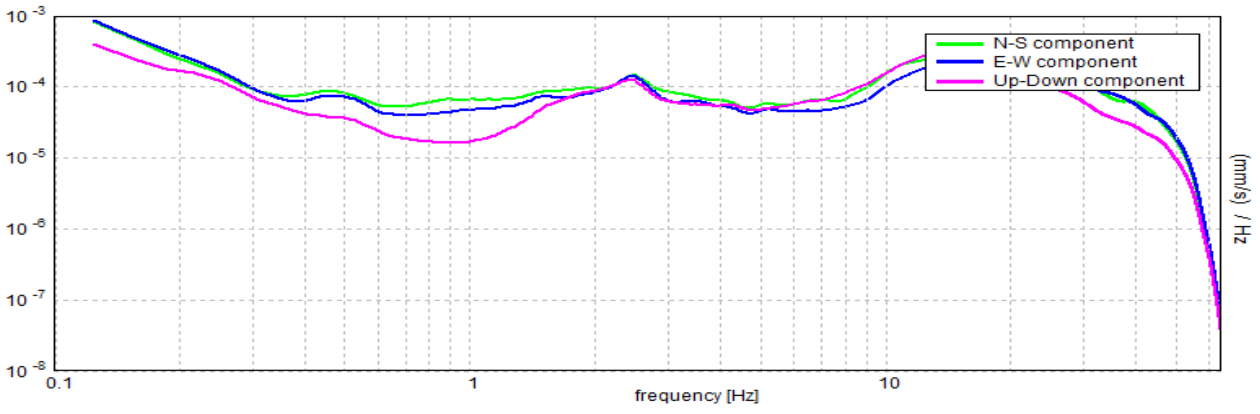
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 0.91 ± 0.11 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.91 > 0.33	OK	
$n_c(f_0) > 200$	652.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 44 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.375 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.5 Hz	OK	
$A_0 > 2$	3.46 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.12393| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.11231 < 0.13594	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5065 < 2.0	OK	

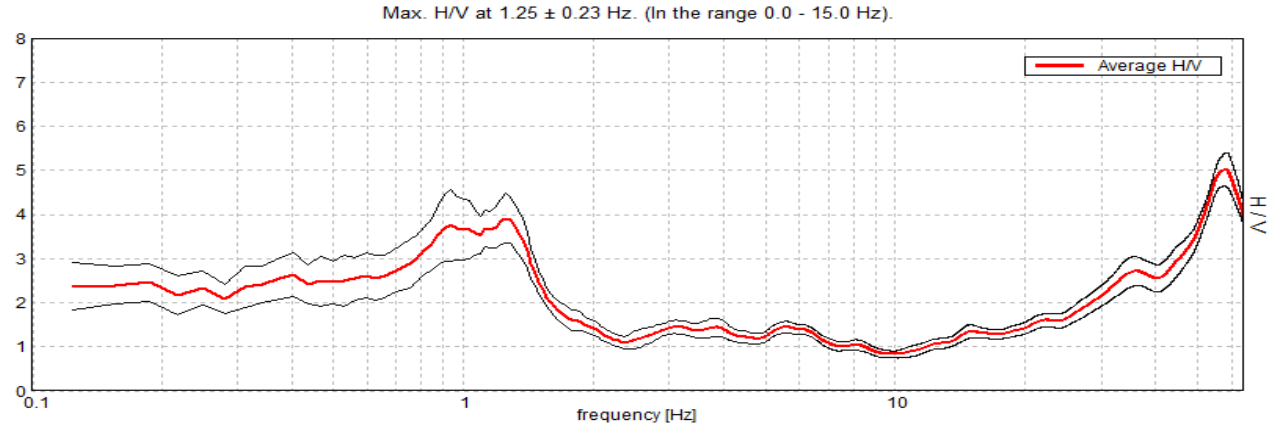
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

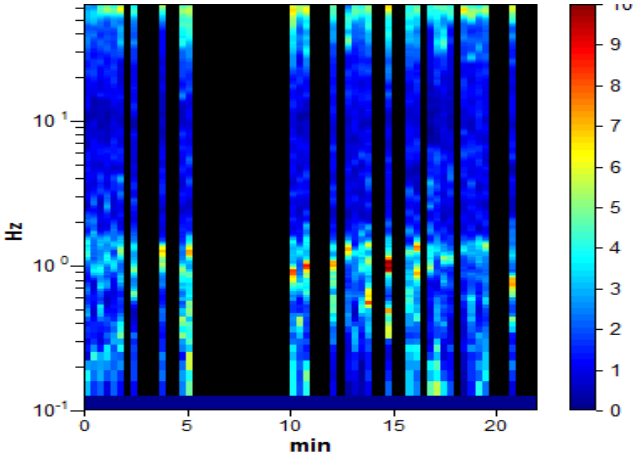
FIGLINE, T34

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 22/08/15 17:09:20 End recording: 22/08/15 17:31:20
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 45% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

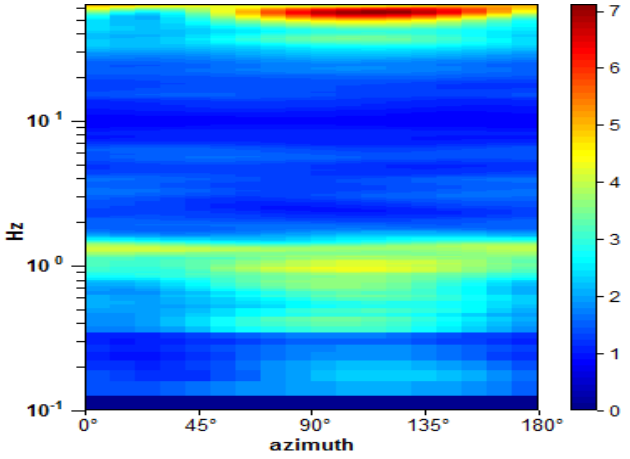
HORIZONTAL TO VERTICAL SPECTRAL RATIO



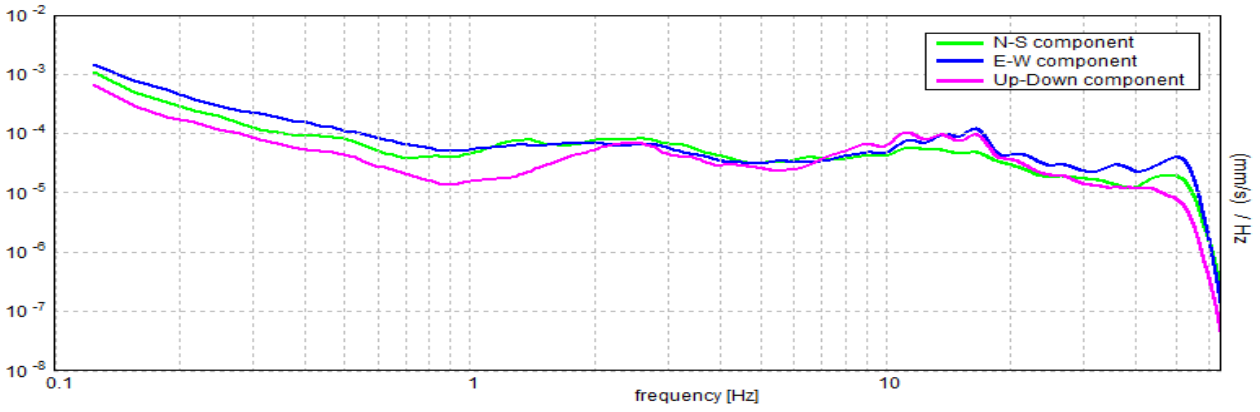
H/V TIME HISTORY



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 1.25 ± 0.23 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.25 > 0.50	OK	
$n_c(f_0) > 200$	750.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 61 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.625 Hz	OK	
$A_0 > 2$	3.91 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.18016| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.2252 < 0.125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.561 < 1.78	OK	

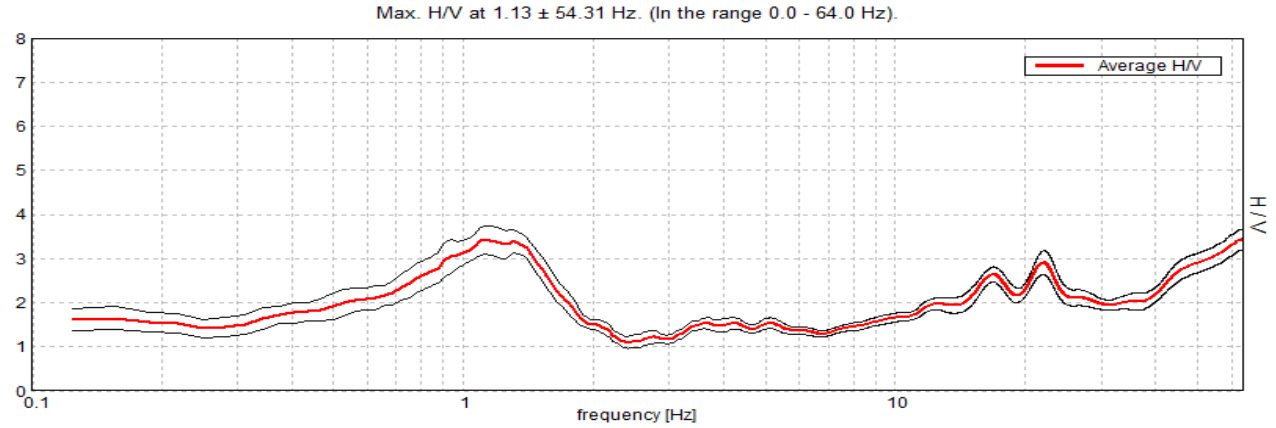
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

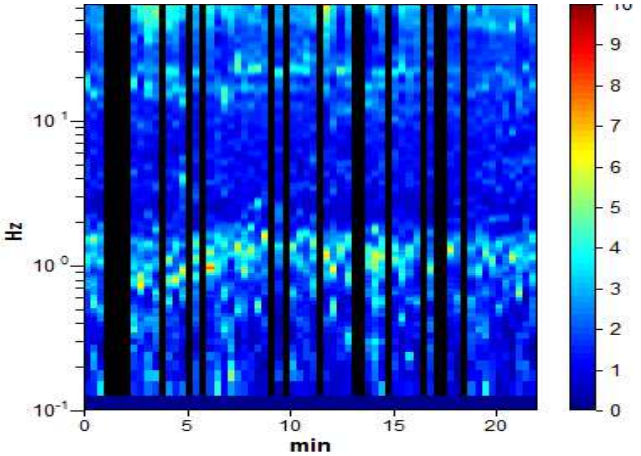
FIGLINE, T35

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 22/08/15 17:39:01 End recording: 22/08/15 18:01:01
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 74% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

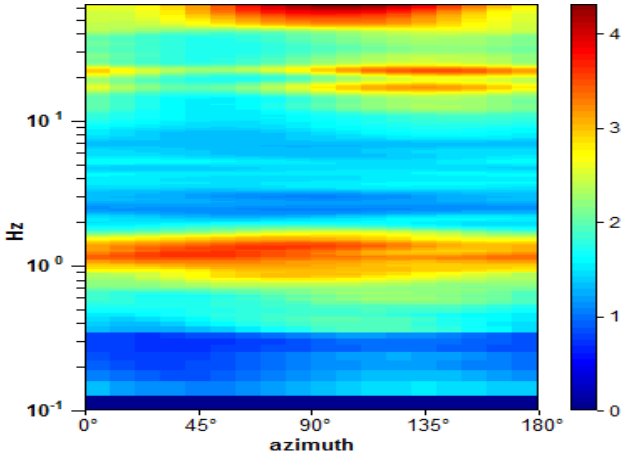
HORIZONTAL TO VERTICAL SPECTRAL RATIO



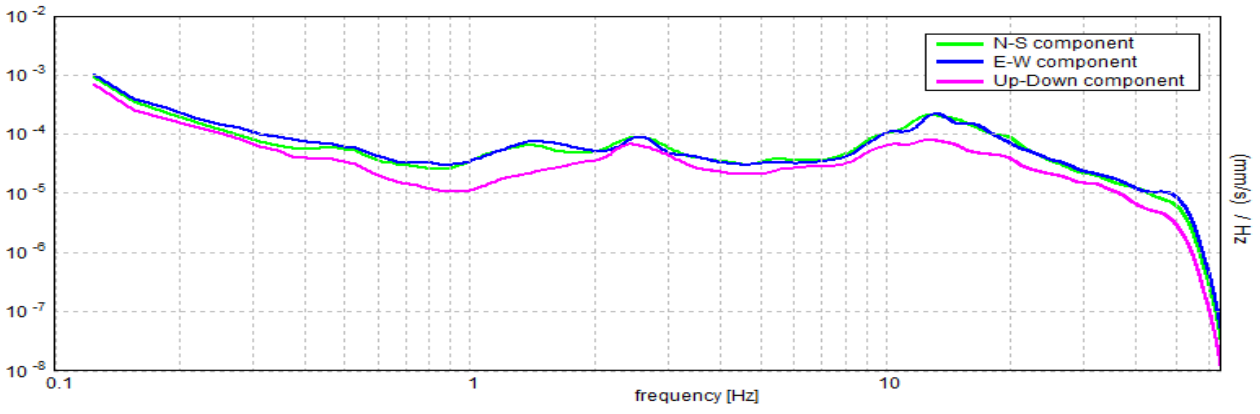
H/V TIME HISTORY



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 ± 54.31 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.13 > 0.50	OK	
$n_c(f_0) > 200$	1102.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 55 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.344 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.875 Hz	OK	
$A_0 > 2$	3.43 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|48.27575| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	54.31022 < 0.1125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3203 < 1.78	OK	

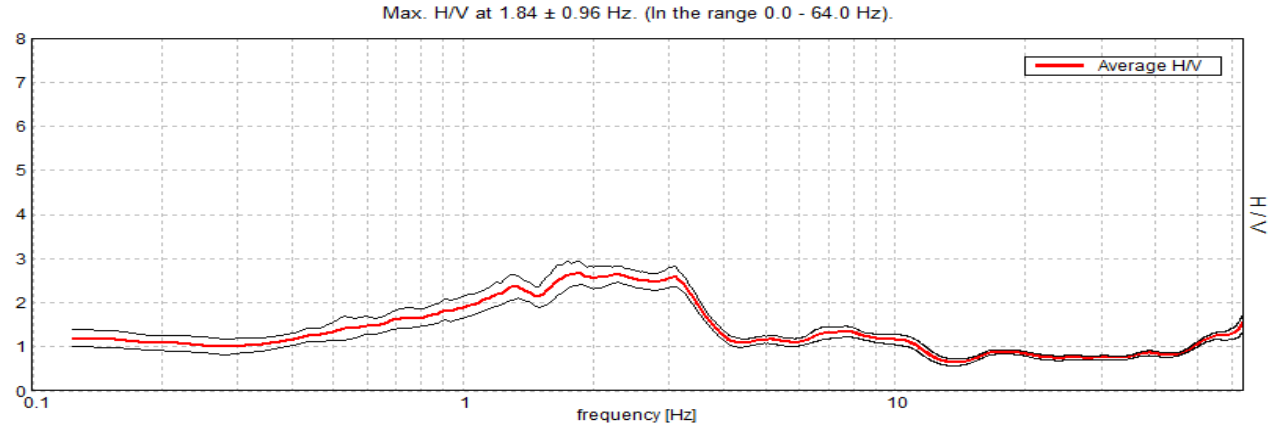
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

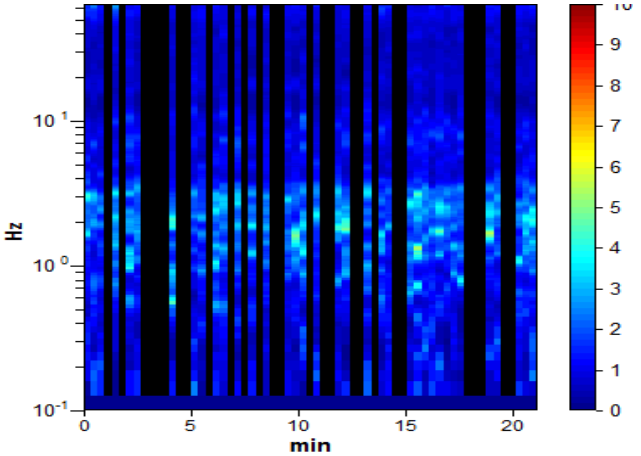
FIGLINE, T36

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 22/08/15 18:10:01 End recording: 22/08/15 18:31:22
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h21'12". Analyzed 57% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

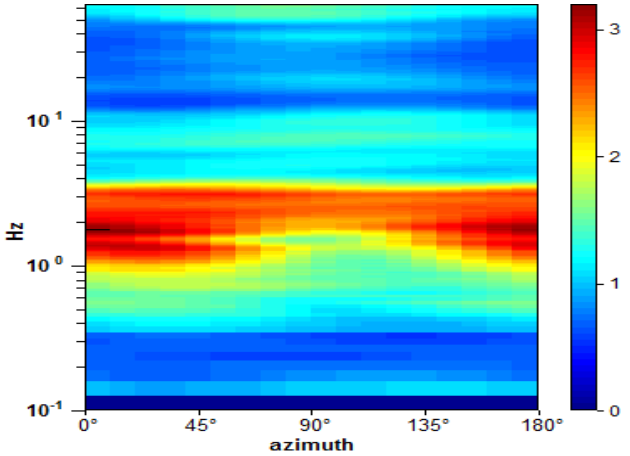
HORIZONTAL TO VERTICAL SPECTRAL RATIO



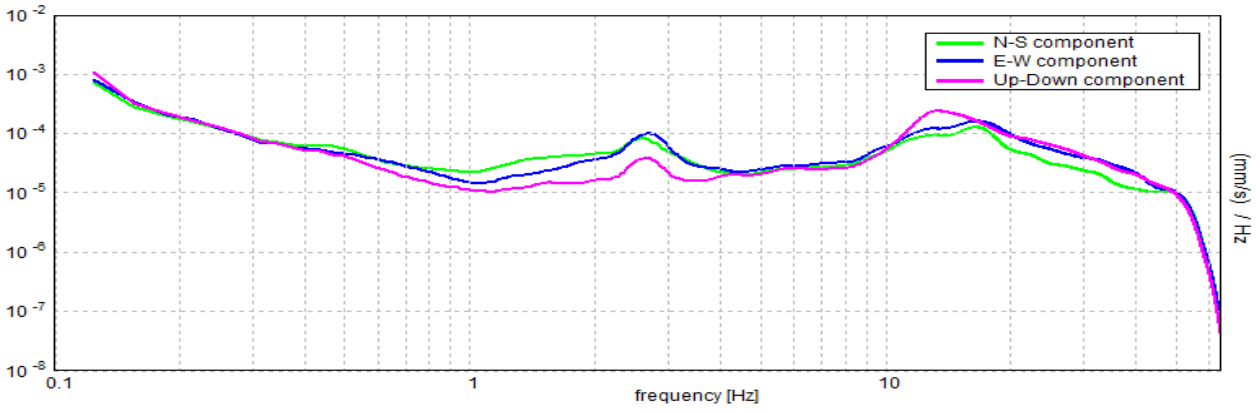
H/V TIME HISTORY



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 1.84 ± 0.96 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.84 > 0.50	OK	
$n_c(f_0) > 200$	1327.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 90 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.469 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	3.938 Hz	OK	
$A_0 > 2$	2.66 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.52223| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.96287 < 0.18438		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2637 < 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
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

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

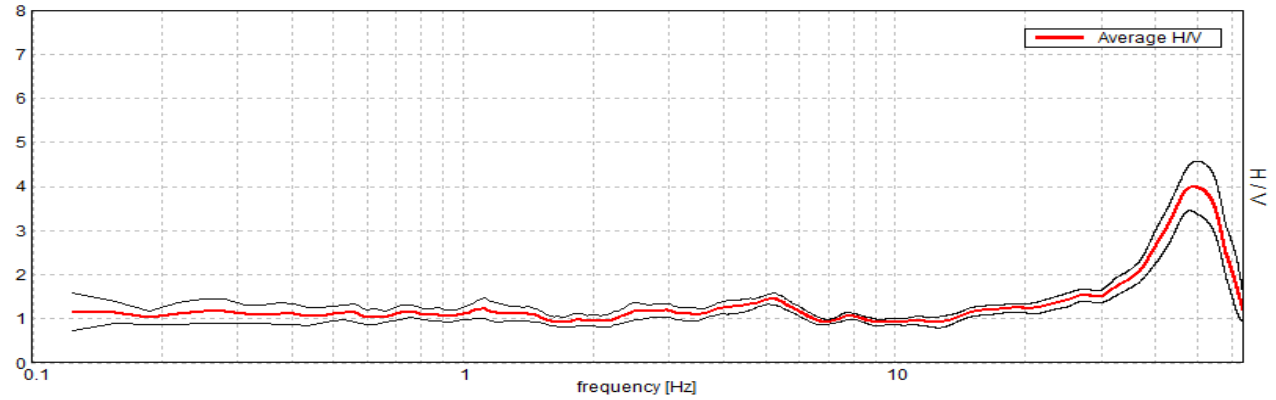
Misure HVSR
Ponte agli Stolli

FIGLINE, T40

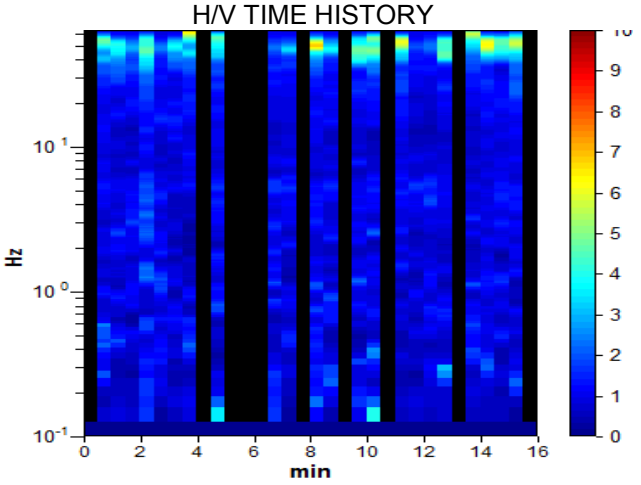
Instrument: TZ3-0001/01-13
Data format: 16 byte
Full scale [mV]: 51
Start recording: 10/09/15 18:46:47 End recording: 10/09/15 19:02:47
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h16'00". Analyzed 69% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

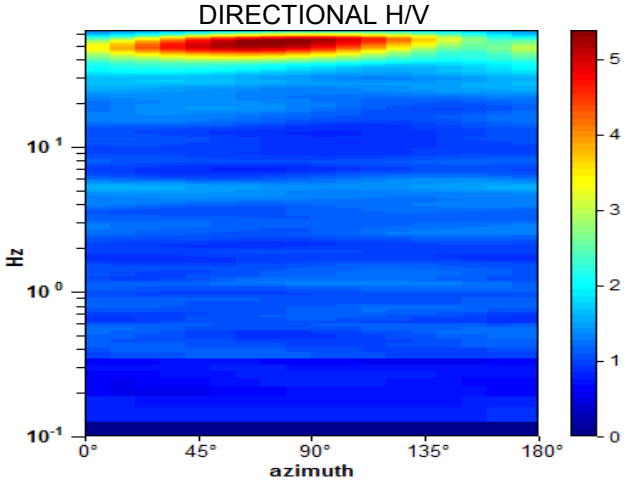
Max. H/V at 5.22 ± 2.27 Hz (in the range 0.0 - 10.0 Hz).



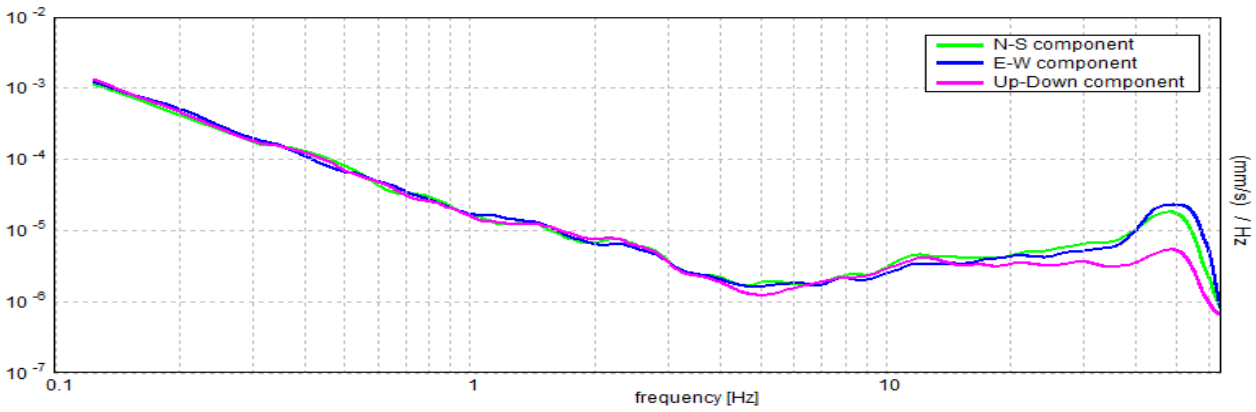
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 5.22 ± 2.27 Hz (in the range 0.0 - 10.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	5.22 > 0.33	OK	
$n_c(f_0) > 200$	3444.4 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 252 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.45 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.43533| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	2.27187 < 0.26094		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1279 < 1.58	OK	

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

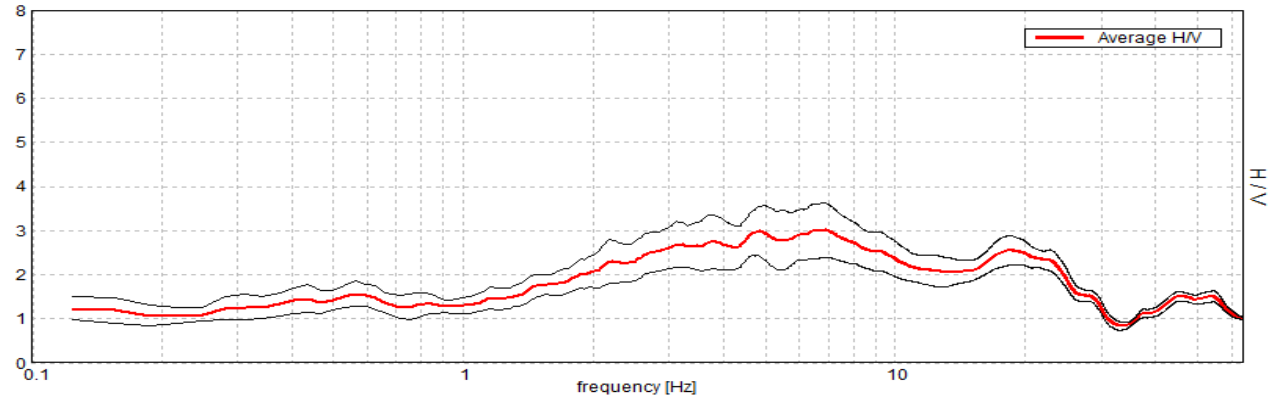
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T41

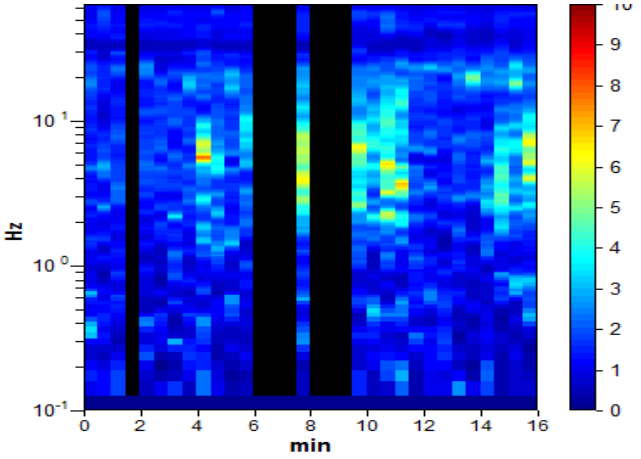
Instrument: TZ3-0001/01-13
Data format: 16 byte
Full scale [mV]: 51
Start recording: 10/09/15 18:18:39 End recording: 10/09/15 18:34:39
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h16'00". Analyzed 78% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

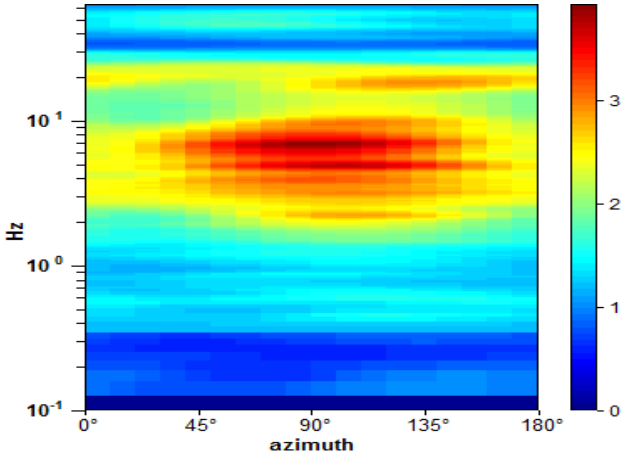
Max. H/V at 6.84 ± 2.28 Hz. (In the range 0.0 - 64.0 Hz).



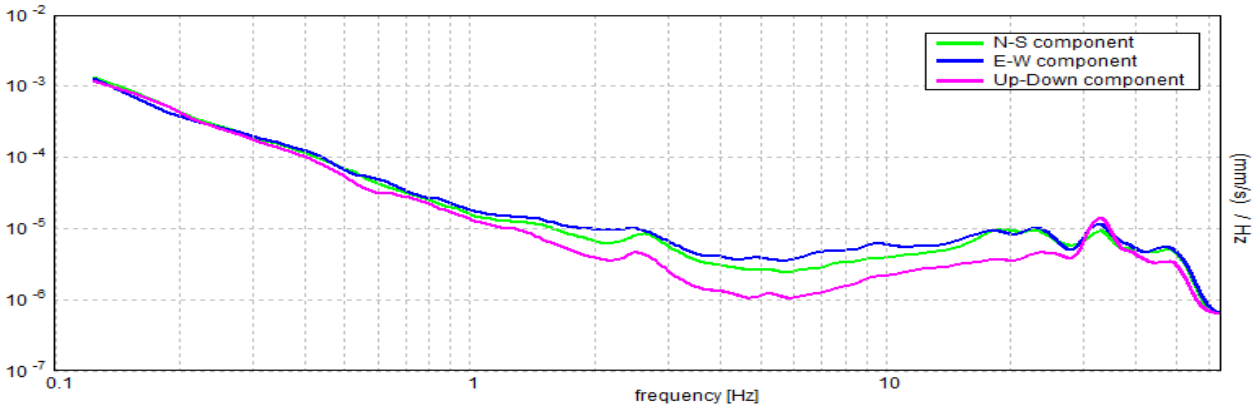
H/V TIME HISTORY



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 6.84 ± 2.28 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	6.84 > 0.33	OK	
$n_c(f_0) > 200$	5132.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 330 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
$A_0 > 2$	3.01 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.33271| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	2.27701 < 0.34219		NO
$\sigma_A(f_0) < \theta(f_0)$	0.62 < 1.58	OK	

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

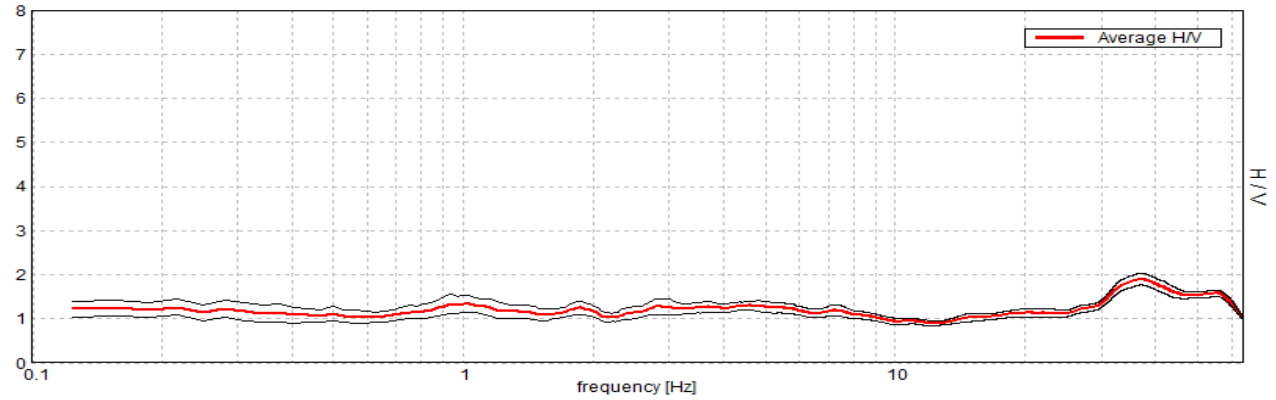
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T42

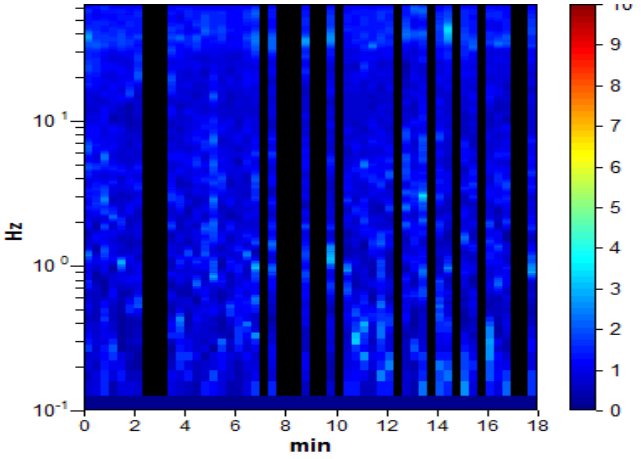
Instrument: TZ3-0001/01-13
Data format: 16 byte
Full scale [mV]: 51
Start recording: 02/09/15 17:18:38 End recording: 02/09/15 17:36:38
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h18'00". Analyzed 70% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

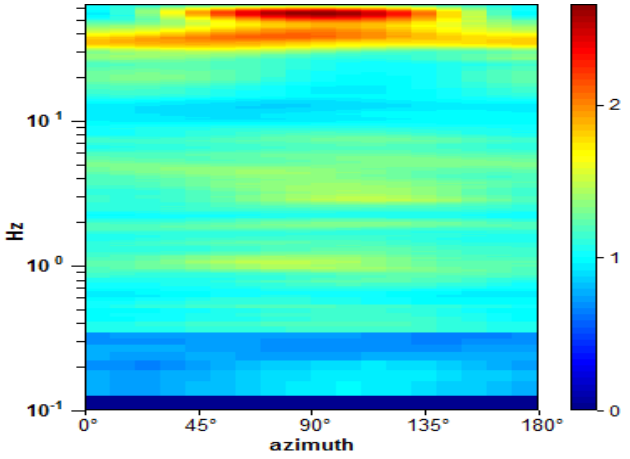
Max. H/V at 37.09 ± 0.19 Hz. (In the range 0.0 - 64.0 Hz).



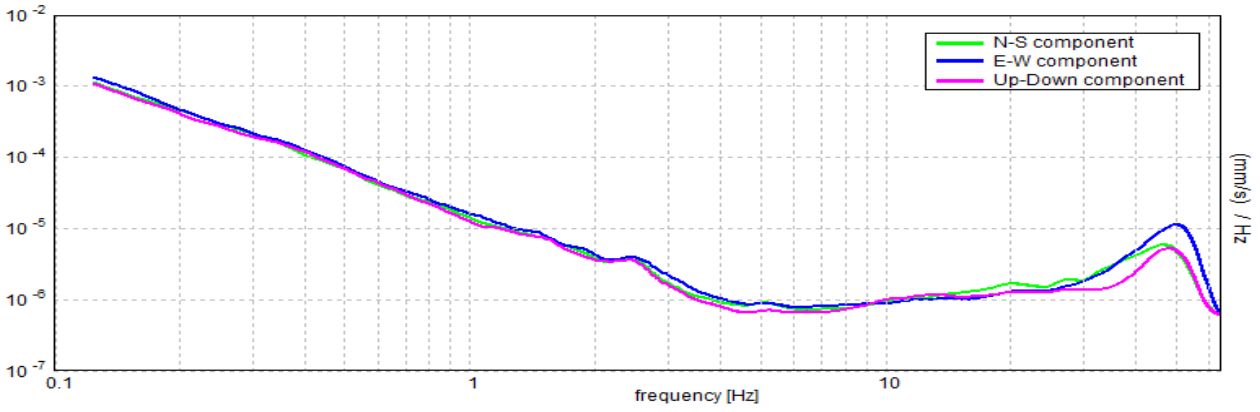
H/V TIME HISTORY



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 37.09 ± 0.19 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	37.09 > 0.50	OK	
$n_c(f_0) > 200$	28191.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 1456 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	13.594 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	1.90 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00516| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.1913 < 1.85469	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.1347 < 1.58	OK	

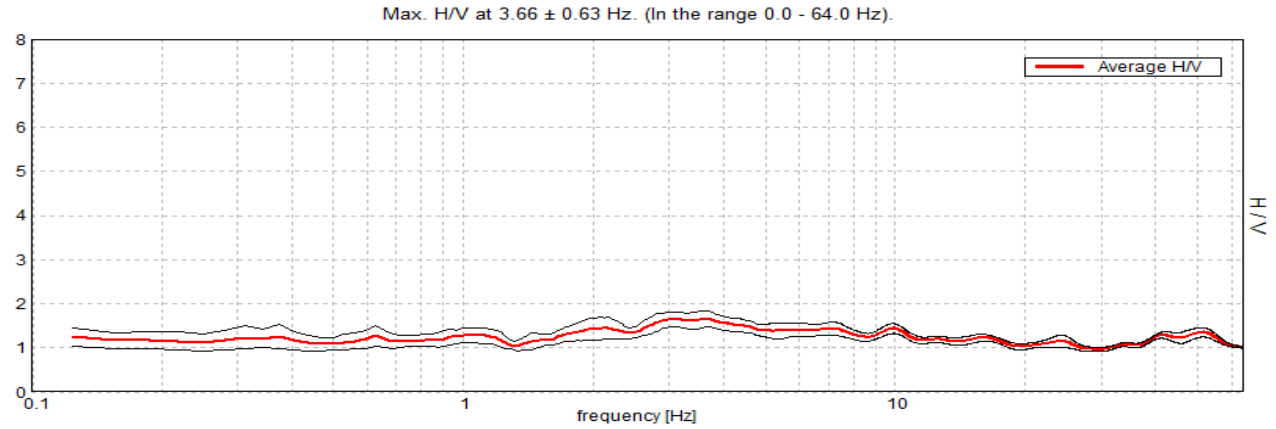
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

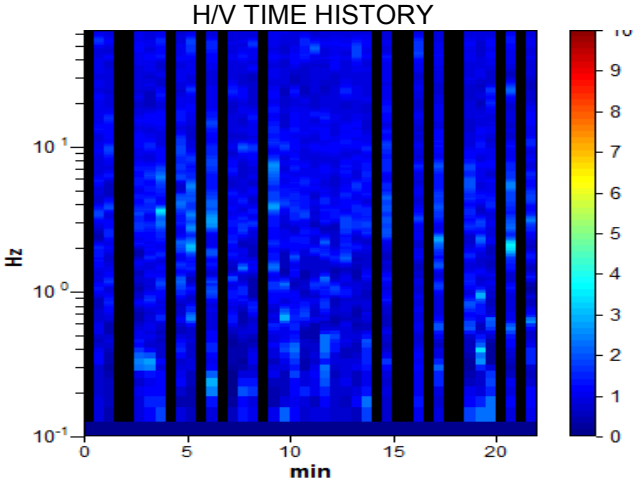
FIGLINE, T43

Instrument: TZ3-0001/01-13
Data format: 16 byte
Full scale [mV]: 51
Start recording: 02/09/15 16:48:45 End recording: 02/09/15 17:10:45
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 66% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

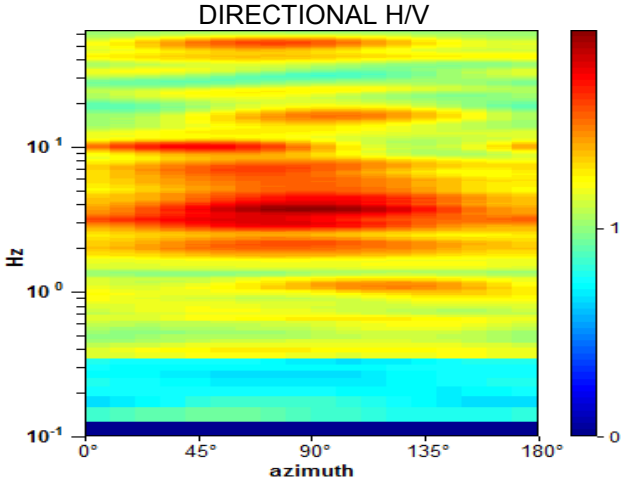
HORIZONTAL TO VERTICAL SPECTRAL RATIO



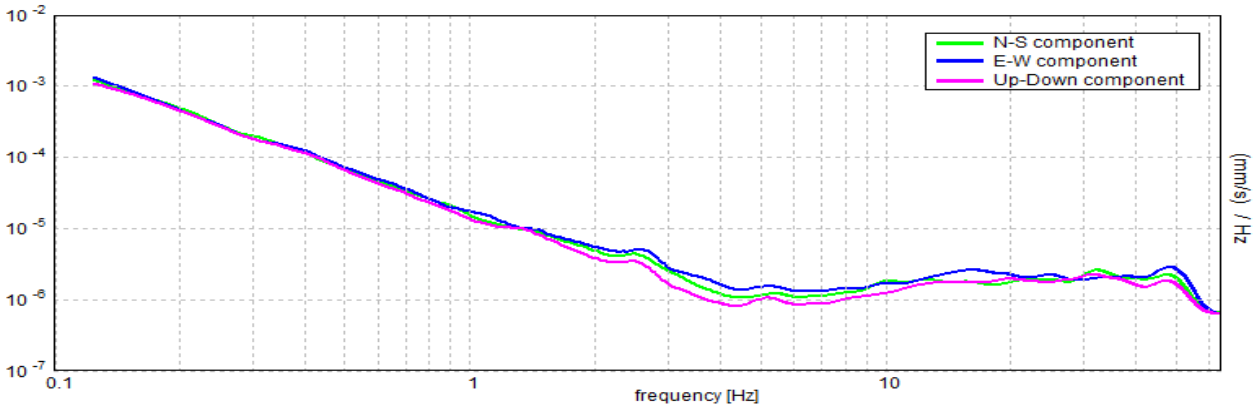
H/V TIME HISTORY



DIRECTIONAL H/V



SINGLE COMPONENT SPECTRA



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

Max. H/V at 3.66 ± 0.63 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	3.66 > 0.33	OK	
$n_c(f_0) > 200$	3180.9 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 176 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
$A_0 > 2$	1.66 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.17125| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.62613 < 0.18281		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1838 < 1.58	OK	

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

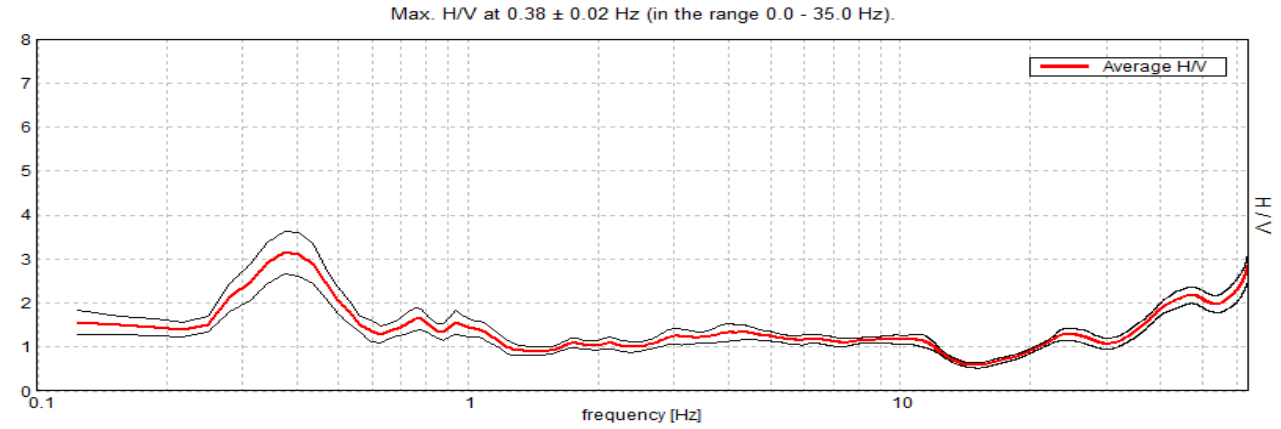
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

Misure HVSR
Porcellino

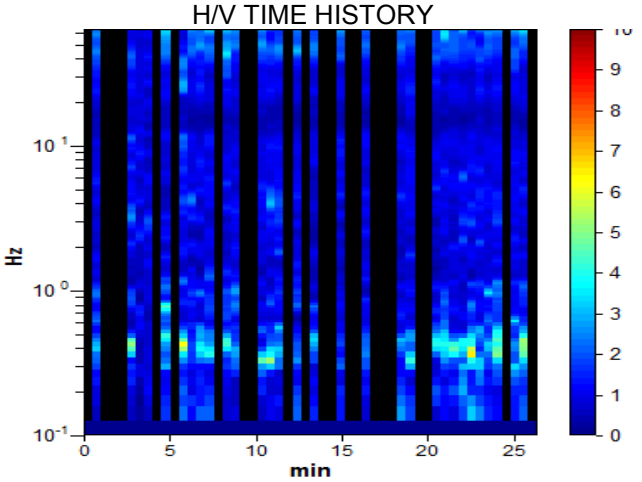
FIGLINE, T16

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 29/05/15 13:12:12 End recording: 29/05/15 13:38:43
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h26'24". Analyzed 58% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

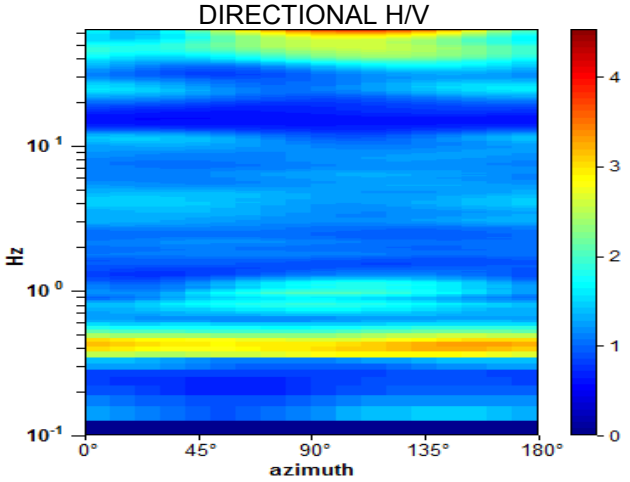
HORIZONTAL TO VERTICAL SPECTRAL RATIO



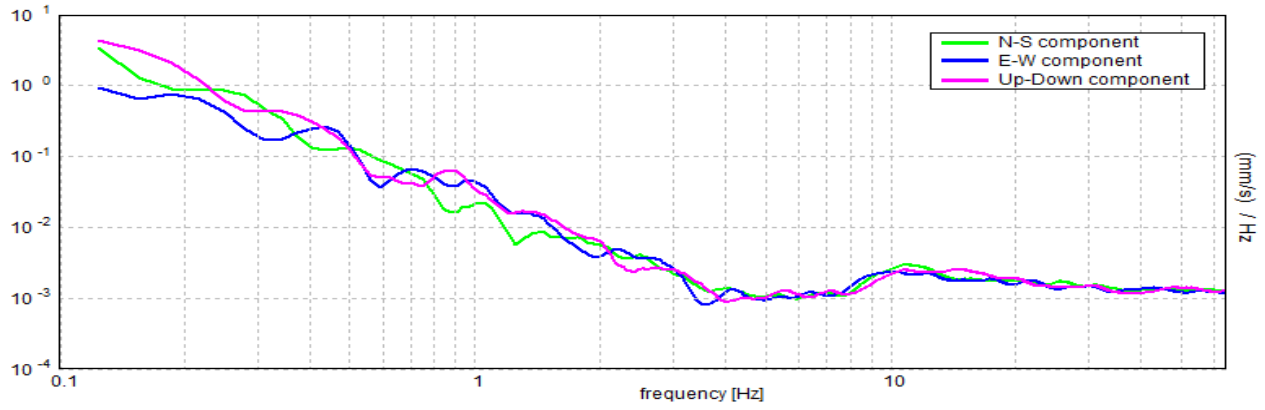
H/V TIME HISTORY



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 ± 0.02 Hz (in the range 0.0 - 35.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.38 > 0.33	OK	
$n_c(f_0) > 200$	337.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$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 $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.25 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.563 Hz	OK	
$A_0 > 2$	3.16 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.04811| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.01804 < 0.075	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4814 < 2.5	OK	

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

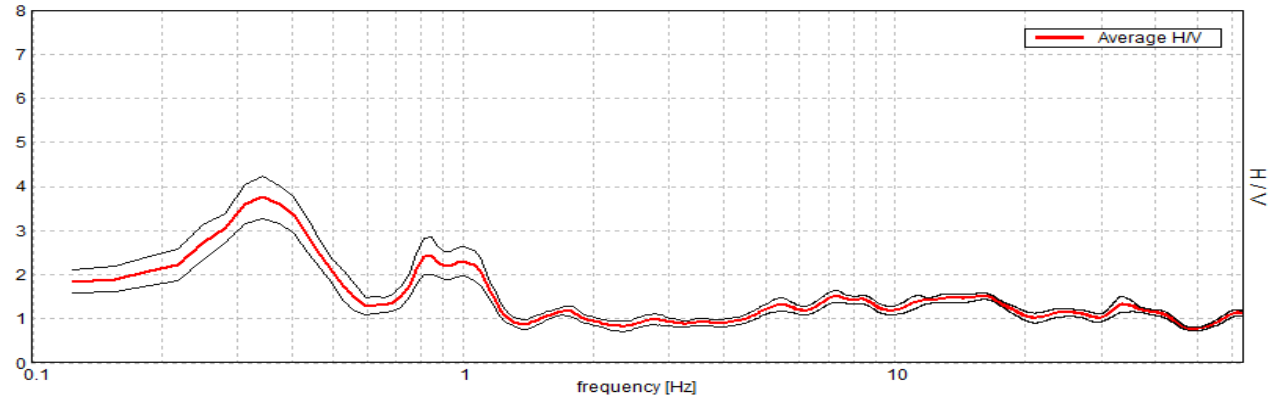
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T17

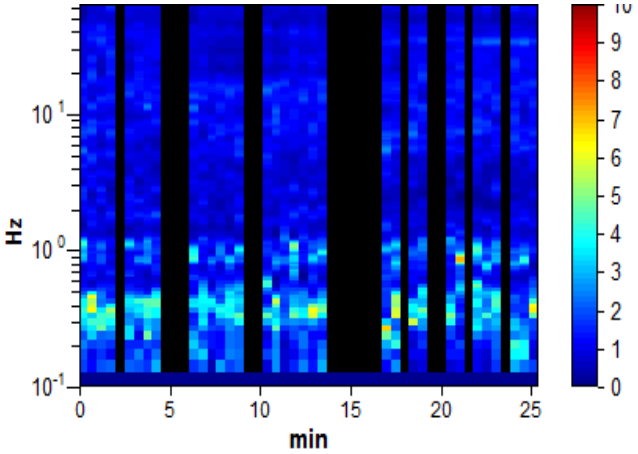
Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 29/05/15 13:51:27 End recording: 29/05/15 14:16:59
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h25'24". Analyzed 66% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

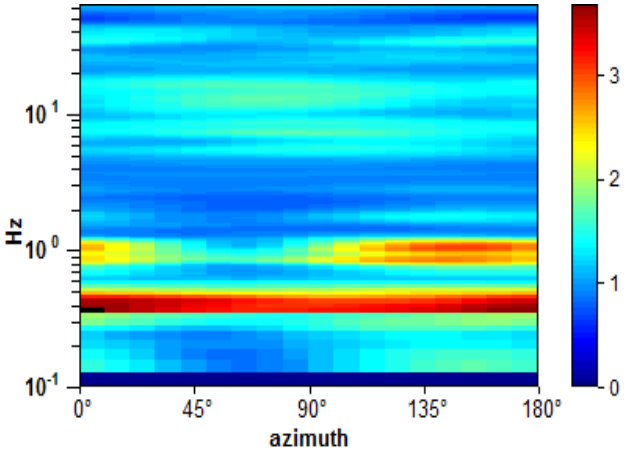
Max. H/V at 0.34 ± 0.13 Hz (in the range 0.0 - 30.0 Hz).



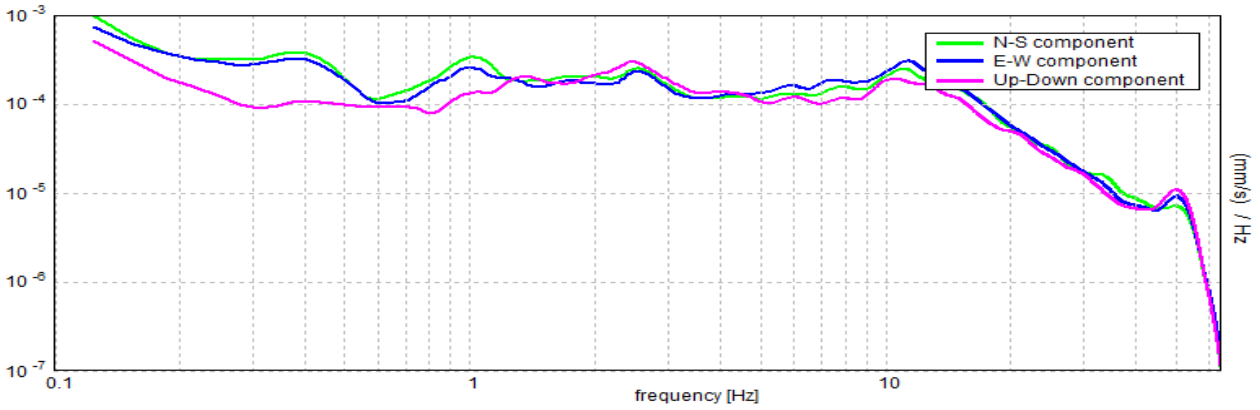
H/V TIME HISTORY



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 0.34 ± 0.13 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.34 > 0.33	OK	
$n_c(f_0) > 200$	340.3 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 18 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.125 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.531 Hz	OK	
$A_0 > 2$	3.76 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.37981| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.13056 < 0.06875		NO
$\sigma_A(f_0) < \theta(f_0)$	0.4825 < 2.5	OK	

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

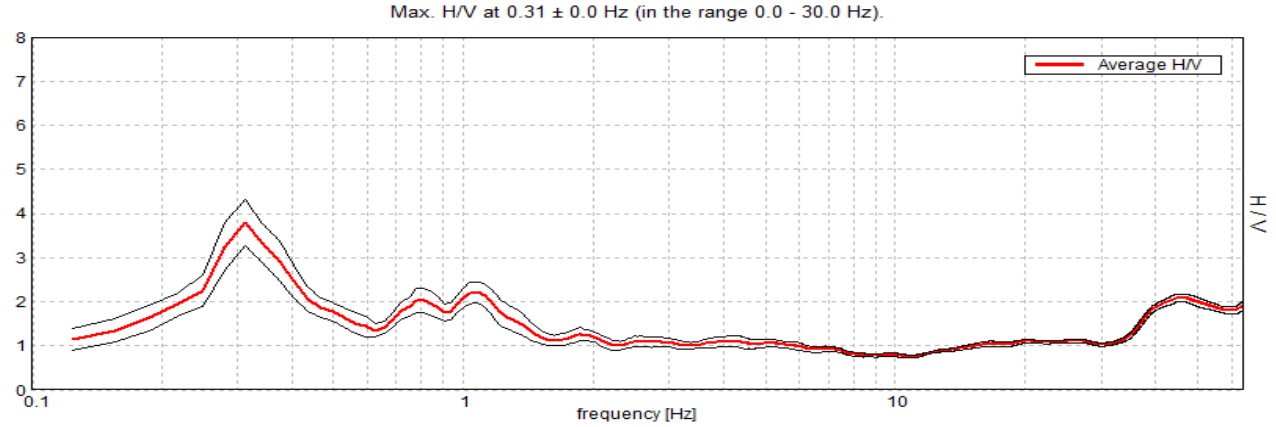
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

Misure HVSR
Restone

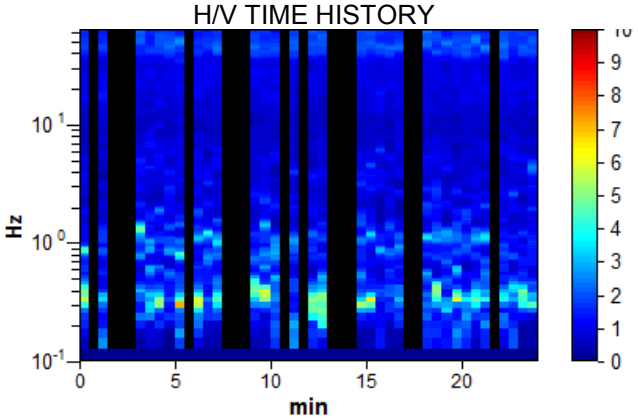
FIGLINE, T8

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 27/05/15 13:08:41 End recording: 27/05/15 13:32:41
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 67% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

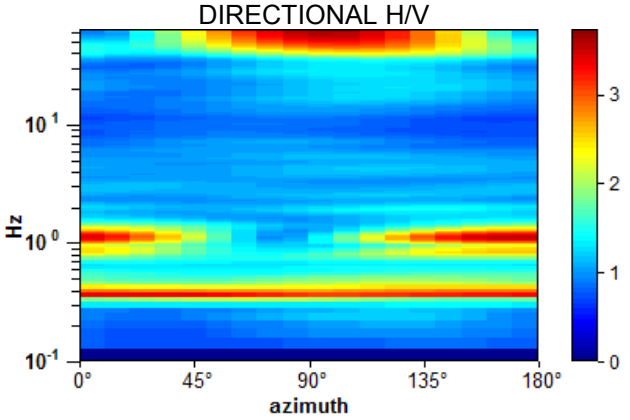
HORIZONTAL TO VERTICAL SPECTRAL RATIO



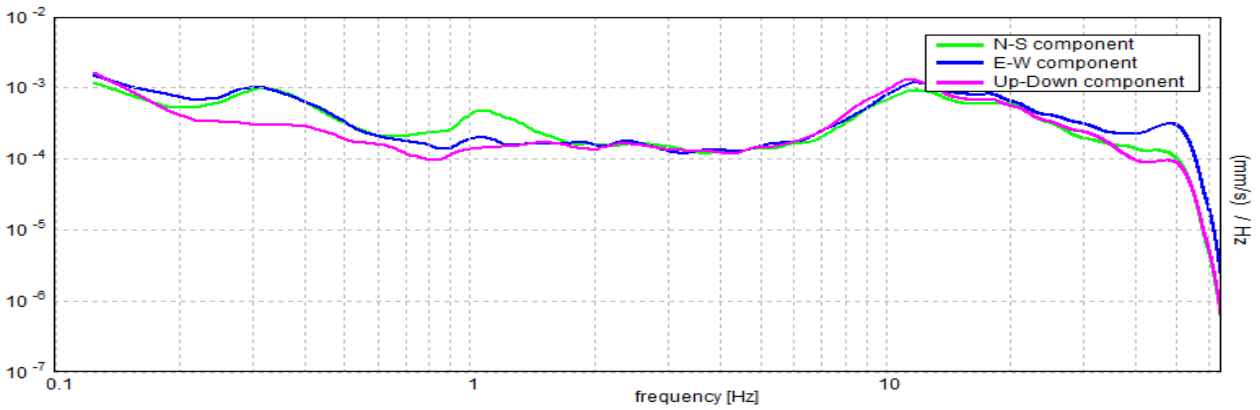
H/V TIME HISTORY



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 ± 0.0 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.31 > 0.33		NO
$n_c(f_0) > 200$	300.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 16 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.469 Hz	OK	
$A_0 > 2$	3.79 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.0| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.0 < 0.0625	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5202 < 2.5	OK	

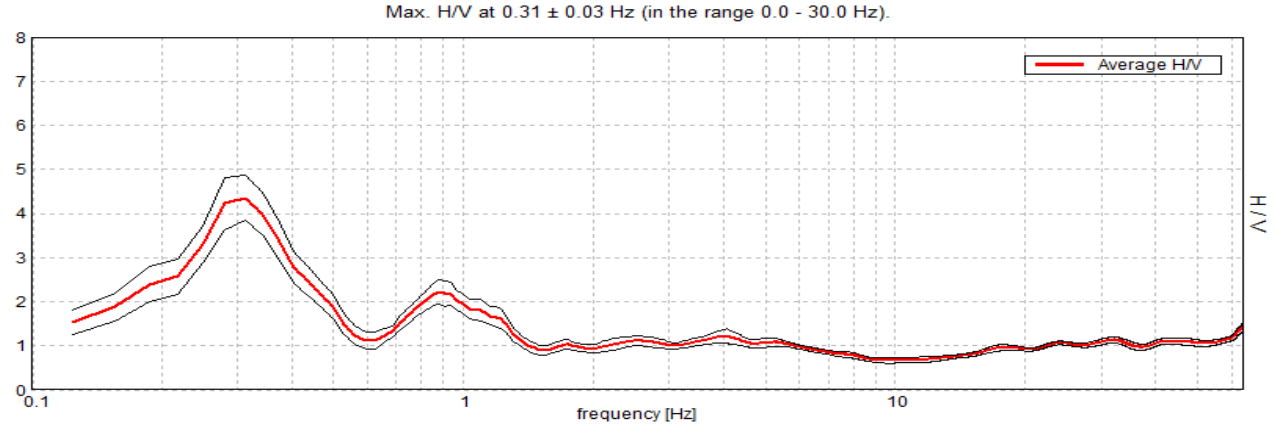
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

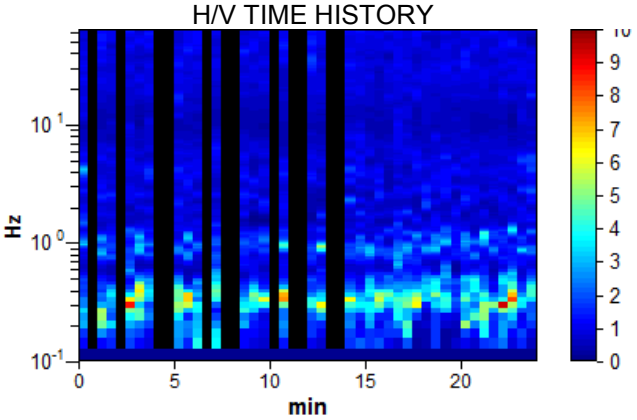
FIGLINE, T9

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 27/05/15 13:49:00 End recording: 27/05/15 14:13:00
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 75% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

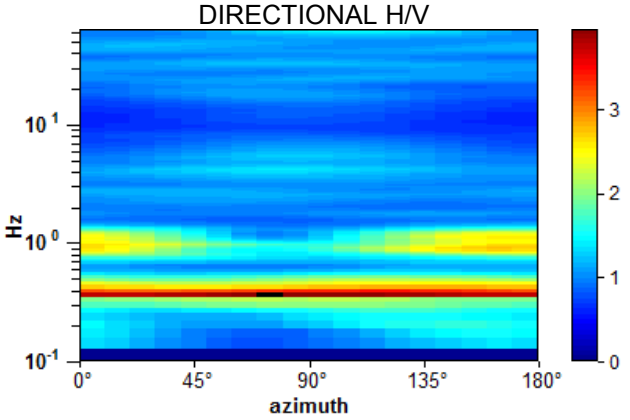
HORIZONTAL TO VERTICAL SPECTRAL RATIO



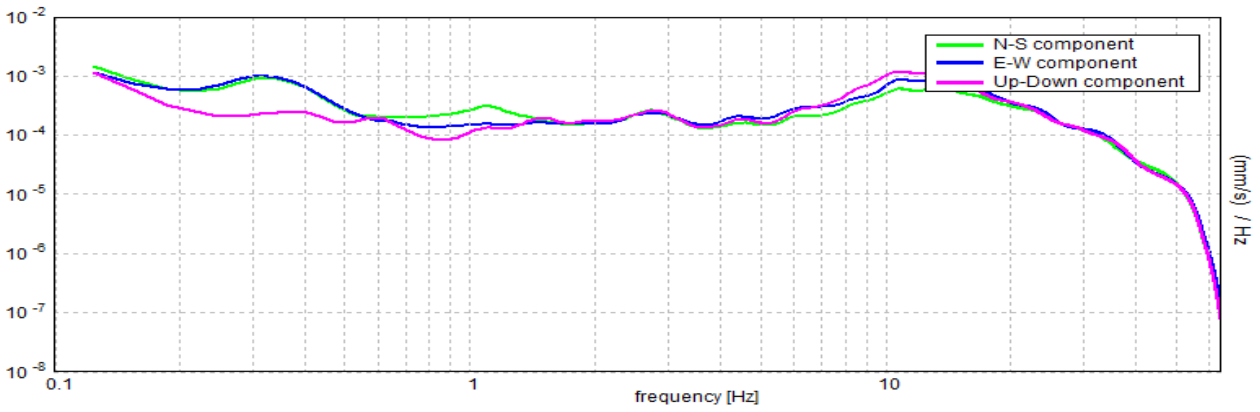
H/V TIME HISTORY



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 ± 0.03 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.31 > 0.33		NO
$n_c(f_0) > 200$	337.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$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 $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.156 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.469 Hz	OK	
$A_0 > 2$	4.36 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.10274| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.03211 < 0.0625	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.5154 < 2.5	OK	

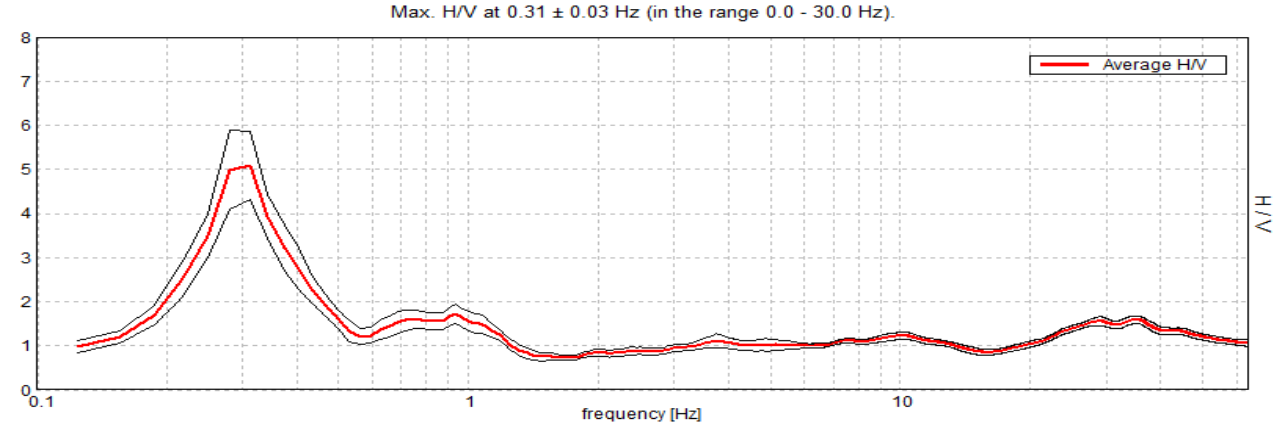
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

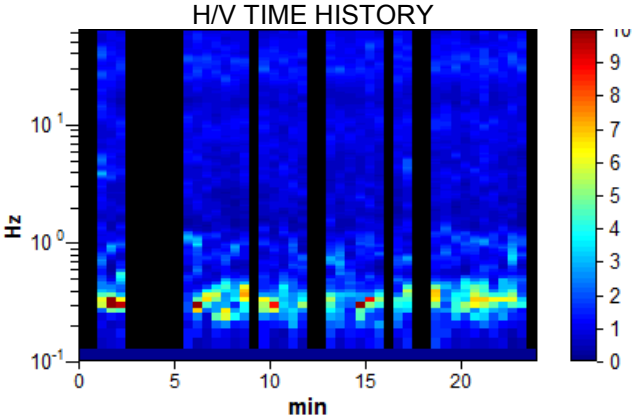
FIGLINE, T10

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 27/05/15 14:30:44 End recording: 27/05/15 14:54:44
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h24'00". Analyzed 69% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

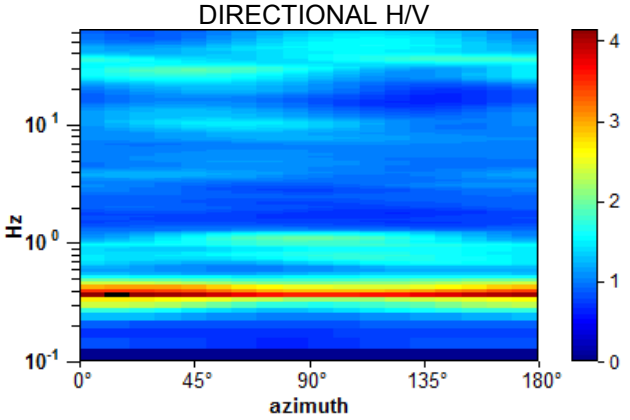
HORIZONTAL TO VERTICAL SPECTRAL RATIO



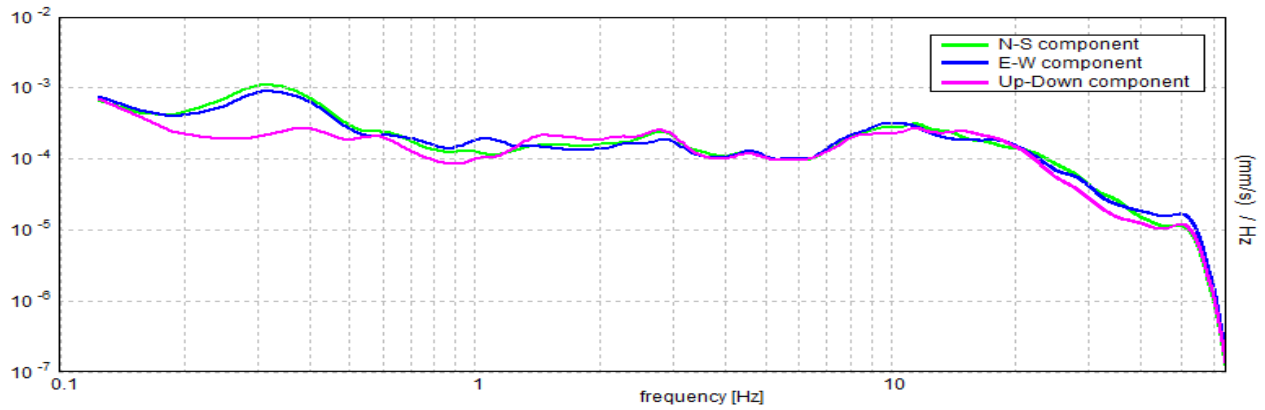
H/V TIME HISTORY



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 ± 0.03 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.31 > 0.33		NO
$n_c(f_0) > 200$	309.4 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 16 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.219 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.438 Hz	OK	
$A_0 > 2$	5.09 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.08876| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.02774 < 0.0625	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.7641 < 2.5	OK	

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

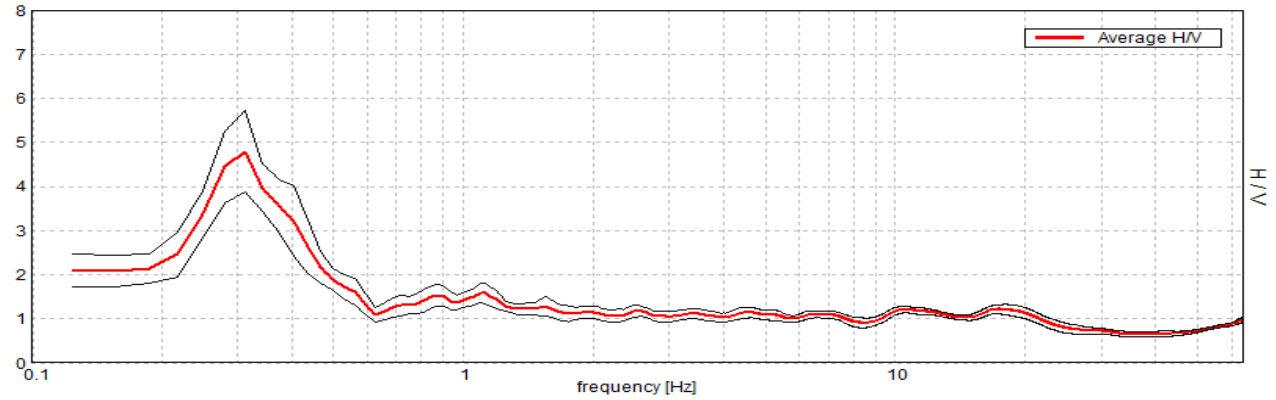
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

FIGLINE, T18

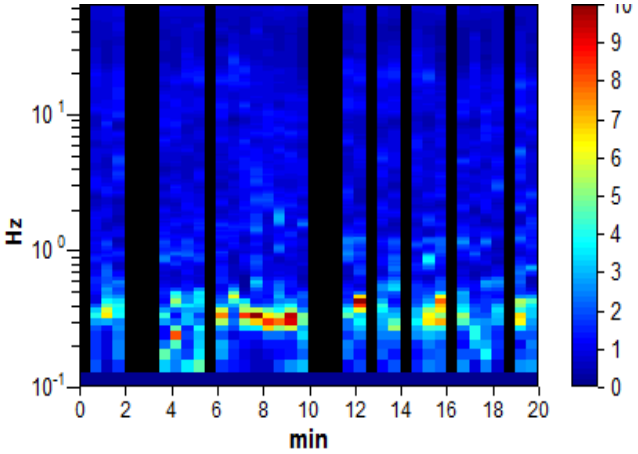
Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 29/05/15 16:04:32 End recording: 29/05/15 16:24:32
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h20'00". Analyzed 70% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

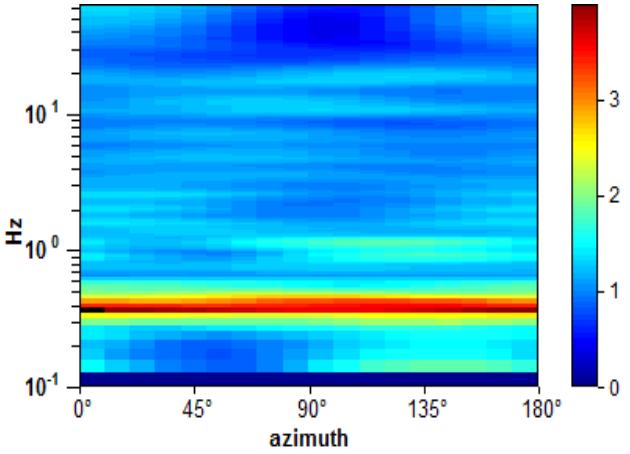
Max. H/V at 0.31 ± 0.0 Hz (in the range 0.0 - 30.0 Hz).



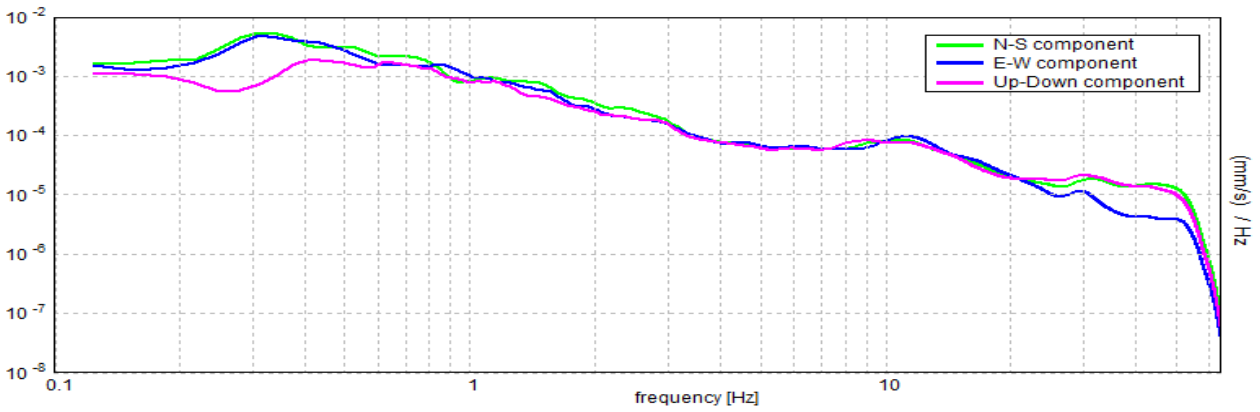
H/V TIME HISTORY



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 ± 0.0 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.31 > 0.33		NO
$n_c(f_0) > 200$	262.5 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 16 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.469 Hz	OK	
$A_0 > 2$	4.80 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.0| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.0 < 0.0625	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.9313 < 2.5	OK	

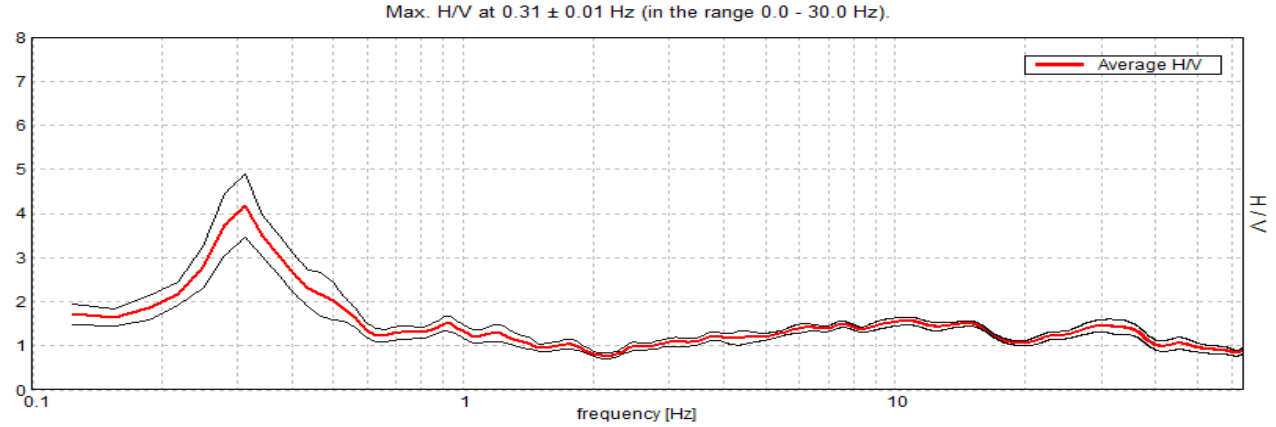
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

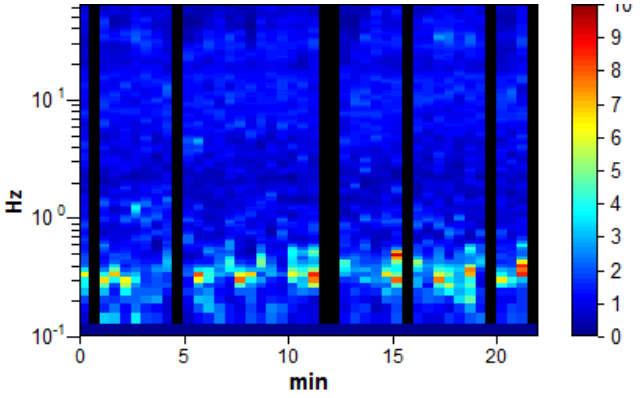
FIGLINE, T19

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 29/05/15 17:12:11 End recording: 29/05/15 17:34:11
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 84% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

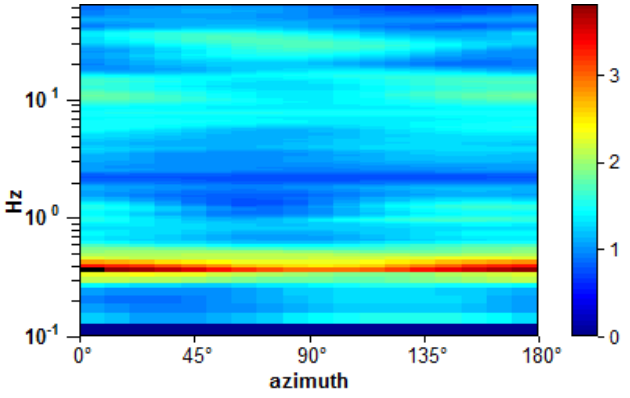
HORIZONTAL TO VERTICAL SPECTRAL RATIO



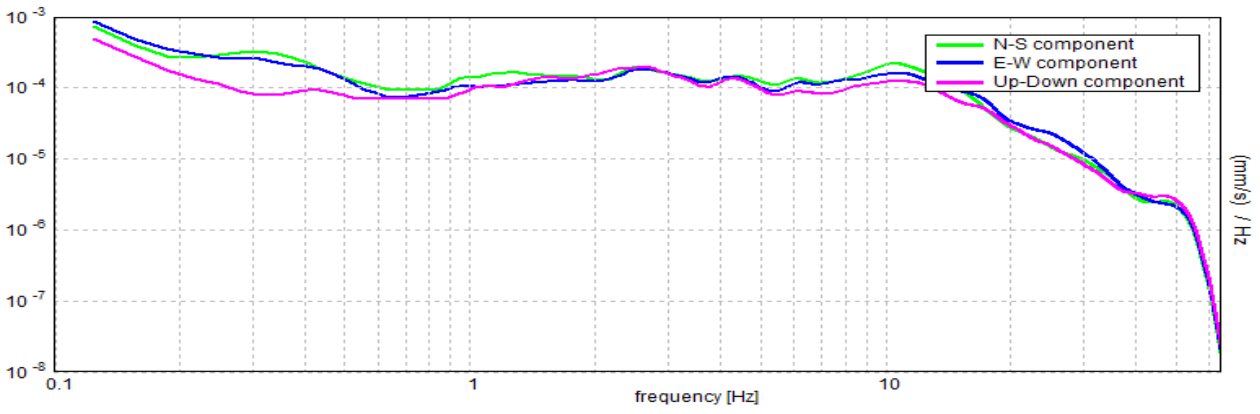
H/V TIME HISTORY



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 ± 0.01 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.31 > 0.33		NO
$n_c(f_0) > 200$	346.9 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 16 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.188 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.5 Hz	OK	
$A_0 > 2$	4.19 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.0435| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.01359 < 0.0625	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.7203 < 2.5	OK	

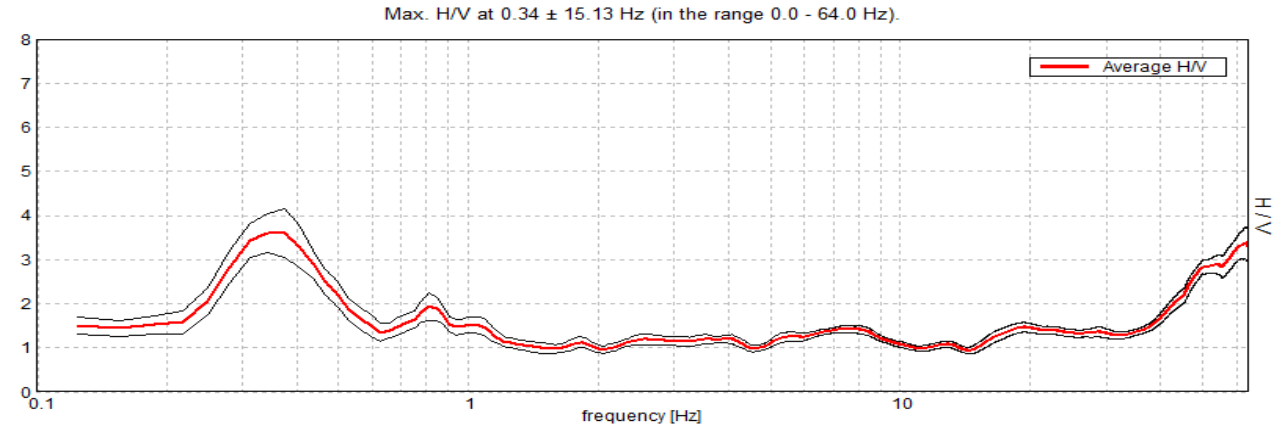
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak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

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

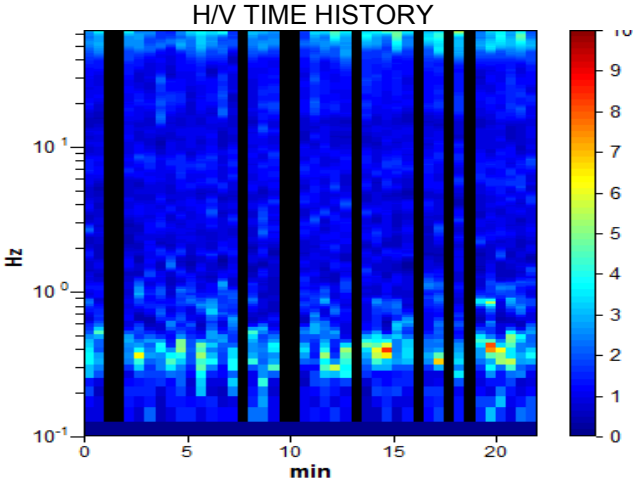
FIGLINE, T39

Instrument: TZ3-0001/01-13
Data format: 32 byte
Full scale [mV]: 51
Start recording: 02/09/15 12:45:27 End recording: 02/09/15 13:07:28
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available
Trace length: 0h22'00". Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 30 s
Smoothing type: Triangular window
Smoothing: 10%

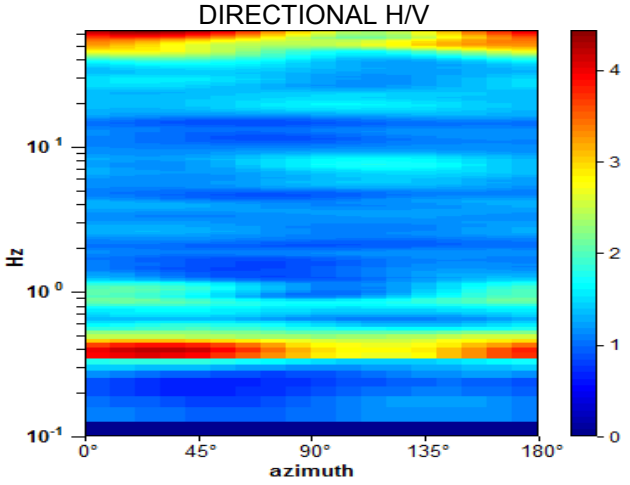
HORIZONTAL TO VERTICAL SPECTRAL RATIO



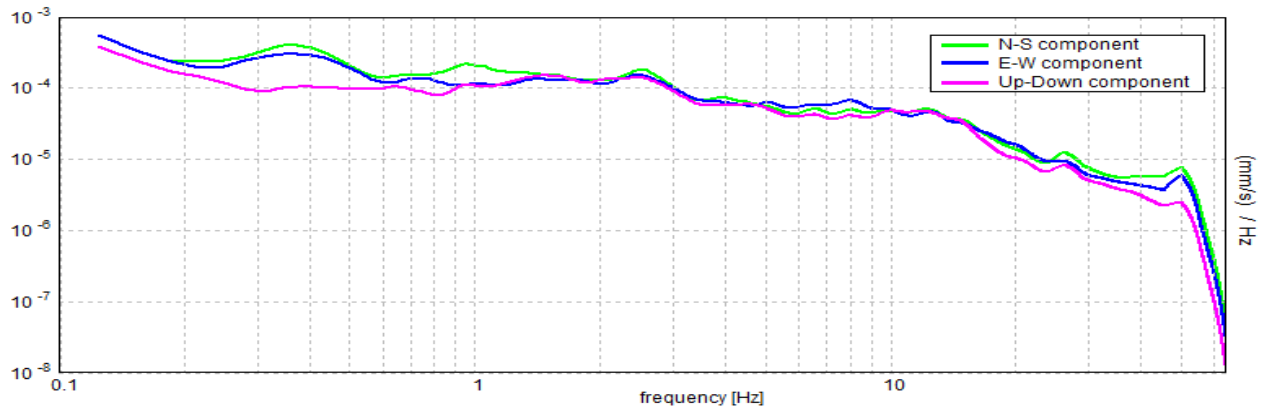
H/V TIME HISTORY



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 0.34 ± 15.13 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.34 > 0.33	OK	
$n_c(f_0) > 200$	360.9 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 18 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.219 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	0.563 Hz	OK	
$A_0 > 2$	3.61 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|44.01703| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	15.13085 < 0.06875		NO
$\sigma_A(f_0) < \theta(f_0)$	0.4426 < 2.5	OK	

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

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