

Comparison study between GEObit wide band sensor (GEOTinyMK2) and Guralp 3T/DM24EAM broad band sensor.



VS



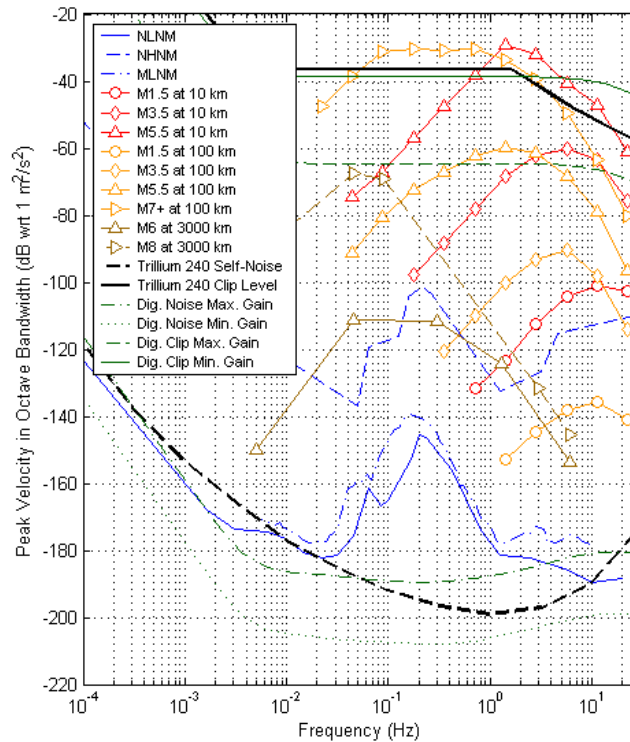
Abstract

Wide band seismic sensors are typically used in local and regional seismicity monitoring experiments. Local earthquakes do not produce very low frequency energy, therefore there is no reason to use expensive broad-band seismometers for local and regional seismicity monitoring. Low frequency geophones have been used also for this type of monitoring but since their response is not extended below 2Hz, so magnitude overestimation problem may occur.

GEObit PC

Address: 90 Solomou str, 26222 Patra, Greece
Tel: 0030.2610-876876, Fax: 0030.2610-876877
Email: info@geobit-instruments.com, skype: geobit.geobit





Picture 1: Local, Regional, and Teleseismic earthquakes frequency spectrum (picture taken from Nanometrics 120P clip level diagram)

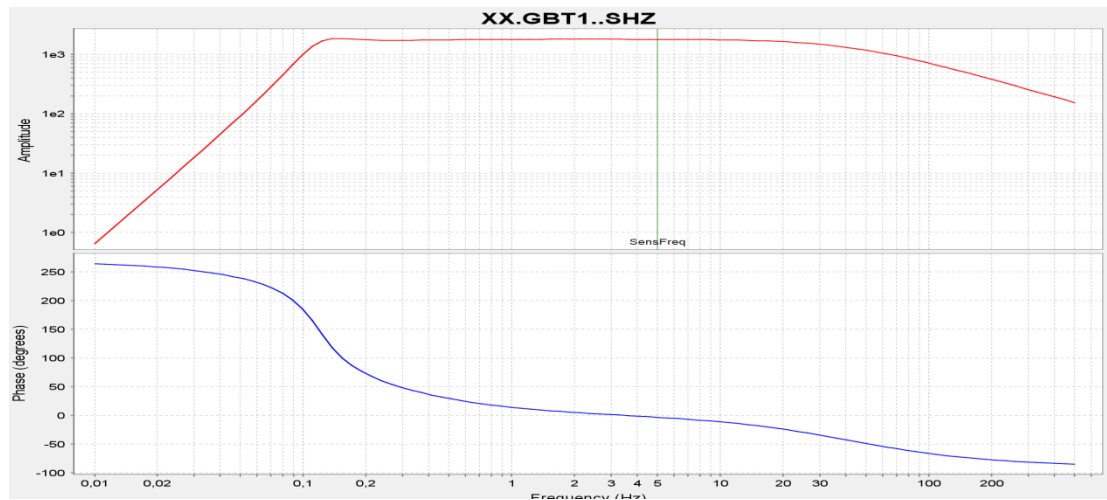
GEOtinyMK2 or C100/SRi32L wide band sensor

GEObit produces cost effective, installation easy, low power and high sensitivity wide band sensors. The response is extended down to 10s (-12dB) and up to 98Hz (-3dB), thus providing a wide band seismic sensor. Sensitivity is 1500V/m/s which is excellent for local seismicity monitoring and for microseismicity seismicity monitoring. Our GEOtinyMK2 wide band sensors operate as standalone or telemetry units because the seismometer integrates sensor, digitizer and seedlink server.

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Picture 2: GEObit GEOTinyMK2 sensor response at JPlotResp

Performance

One GEOTiny type wide-band seismometer and one Guralp 3T/DM24 was placed side by side. Both instruments were left to operate for long time period into the same seismic vault. Here we analyze the performance of our GEOTinyMK2 sensor when regional earthquakes were recorded by both instruments. For data processing, routines from the software "isola" were used, developed by E.Sokos and J. Zahradnik [1]

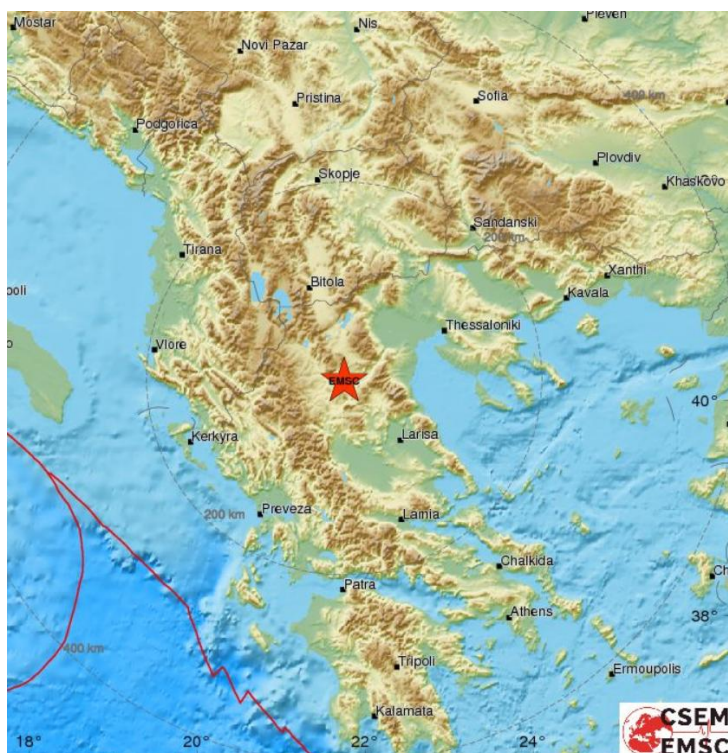
Example Earthquake 1:

The earthquake epicenter was about 200km far from the installation site and its magnitude was ML=4.9. The Z component of each sensor is used for the comparison. N,E components are producing similar results. The waveform plot and spectrum plot of each Z channel is illustrated in picture 4 and 5.

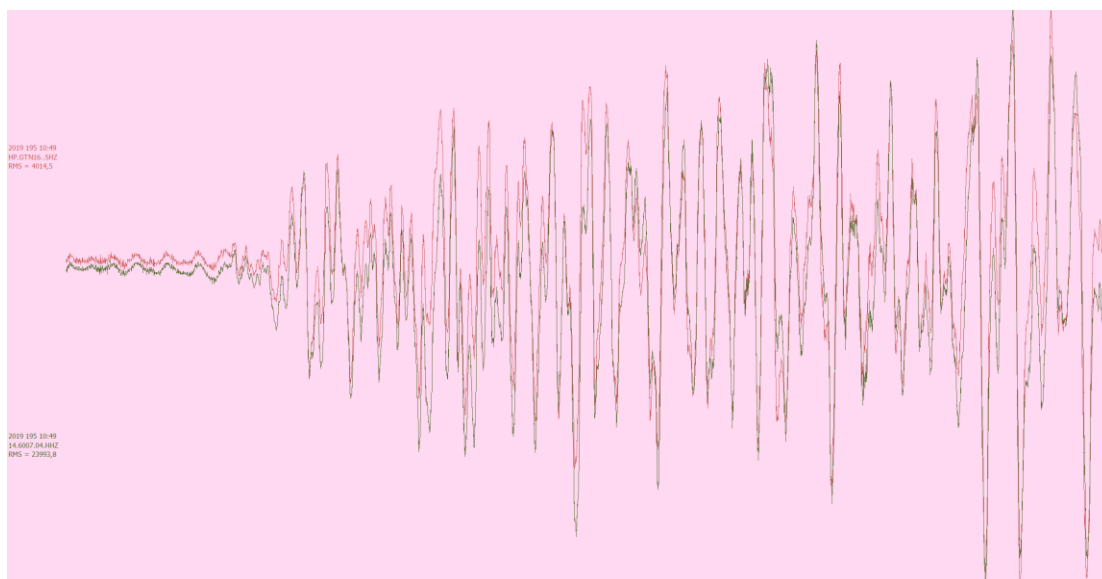
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Picture 3: GEObit GEOTinyMK2 compact digital seismometer.

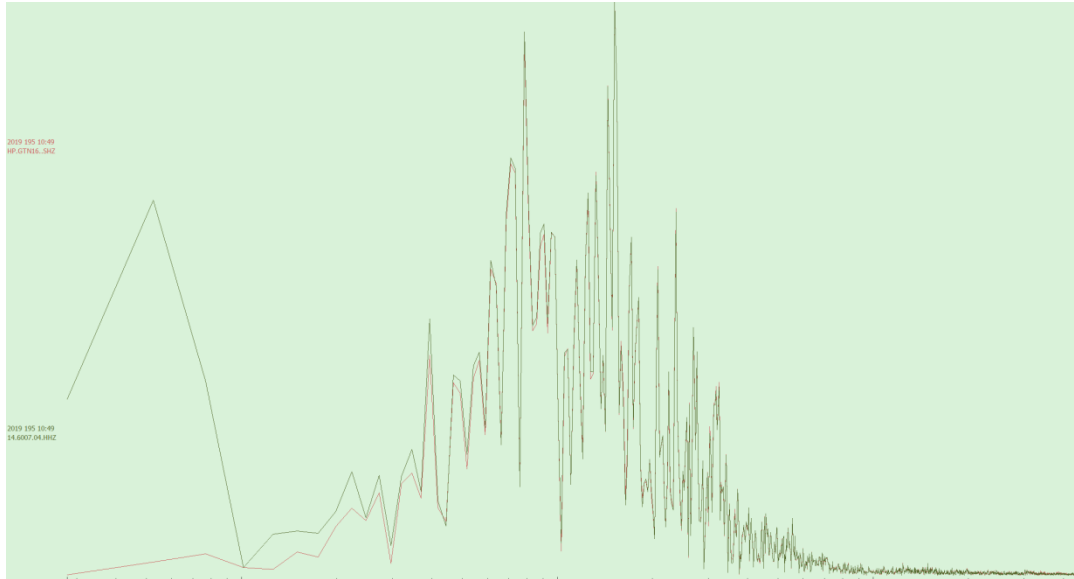


Picture 4: Guralp 3T/DM24EAM (upper) and GEObit GEOTinyMK2 (lower) signal plot

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Tel: 0030.2610-876876, Fax: 0030.2610-876877
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Picture 5: Guralp 3T/DM24EAM (upper) and GEObit GEOTinyMK2 (lower) spectrum plot

Green plot (ch name 6007) at figures 4 and 5 is referred to Guralp 3T/DM24EAM set while red plot (ch name GTN16) is referred to GEOtinyMK2 seismometer.

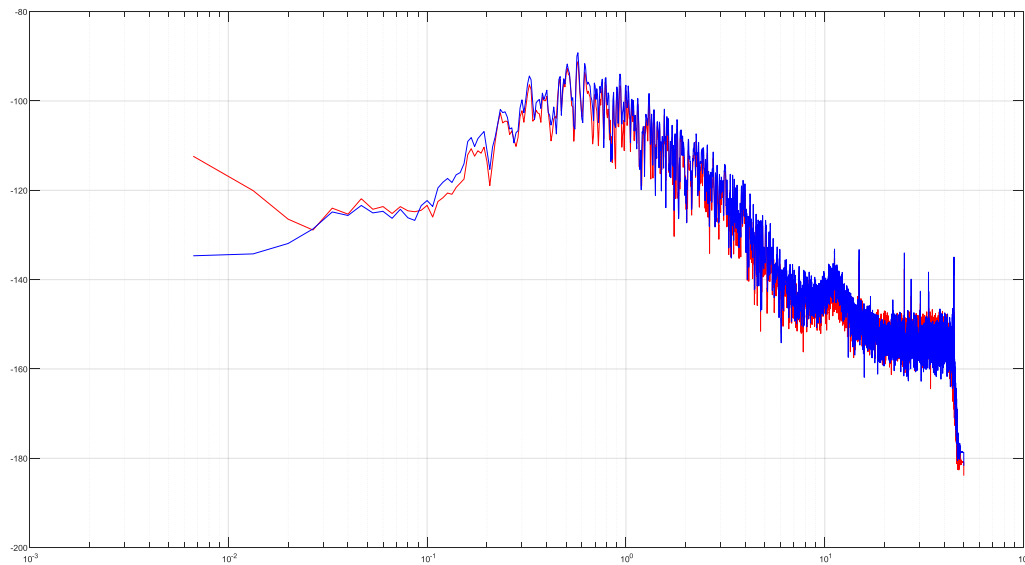
It is clearly seen that both signal and spectrum plots are equal for both instruments under comparison.

Further analysis has been performed extracting the earthquake PSD spectrum for both instruments. Both instrument responses have been corrected using the relevant response information (gain, poles, zeros). After the calculation both PSD plots are superimposed at picture 6.

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Address: 90 Solomou str, 26222 Patra, Greece
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Email: info@geobit-instruments.com, skype: geobit.geobit





Picture 6: Guralp 3T/DM24EAM (blue) and GEObit C100/SRi32S (red) PSD plot

The blue graph represents Guralp3T/DM24EAM PSD while red graph represents GEOTintMK2 PSD. Clearly both PSDs are similar down to 50 sec periods. The performance of GEOTintMK2 set is equal with the 3T/DM24EAM up to period 50 seconds

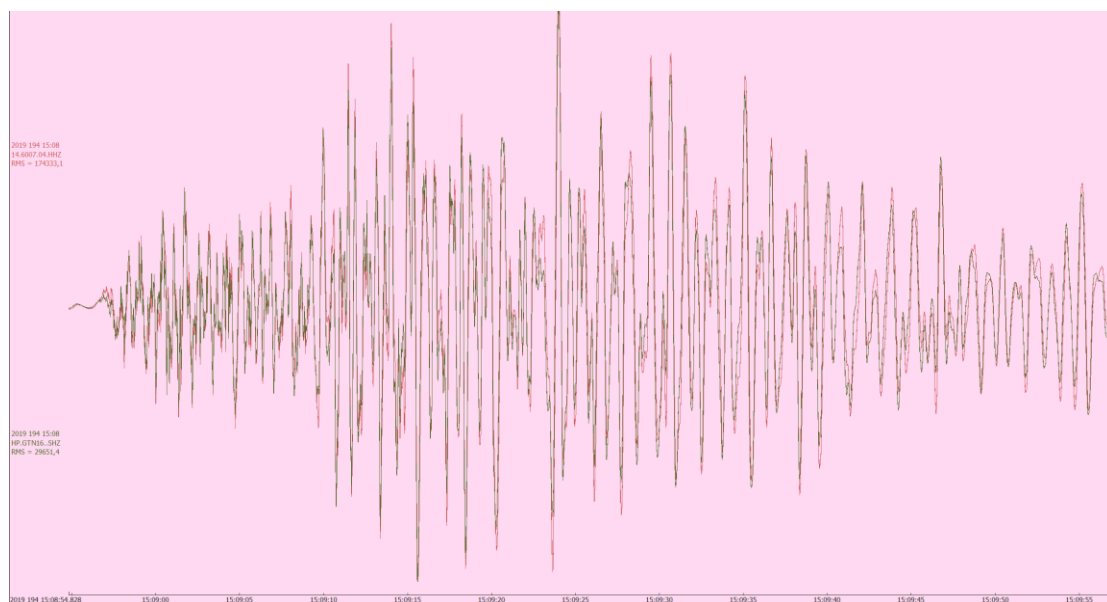
Example earthquake 2:

The earthquake epicenter was about 100km far from the installation site and its magnitude was ML=4.7. The Z component of each sensor is used for the comparison. N,E components are producing similar results. The waveform plot and spectrum plot of each Z channel is illustrated in picture 8 and 9 respectively.

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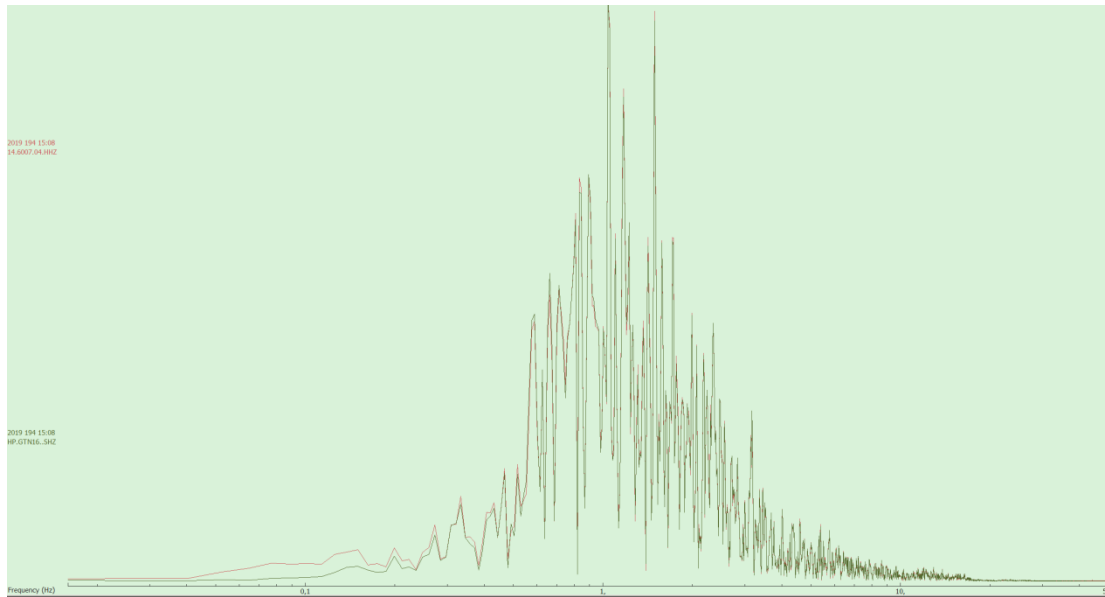


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Picture 8: Guralp 3T/DM24EAM (RED) and GEObit GEOTinyMK2 (GREEN) signal plot



Picture 9: Guralp 3T/DM24EAM (RED) and GEObit GEOTinyMK2 (GREEN) spectrum plot

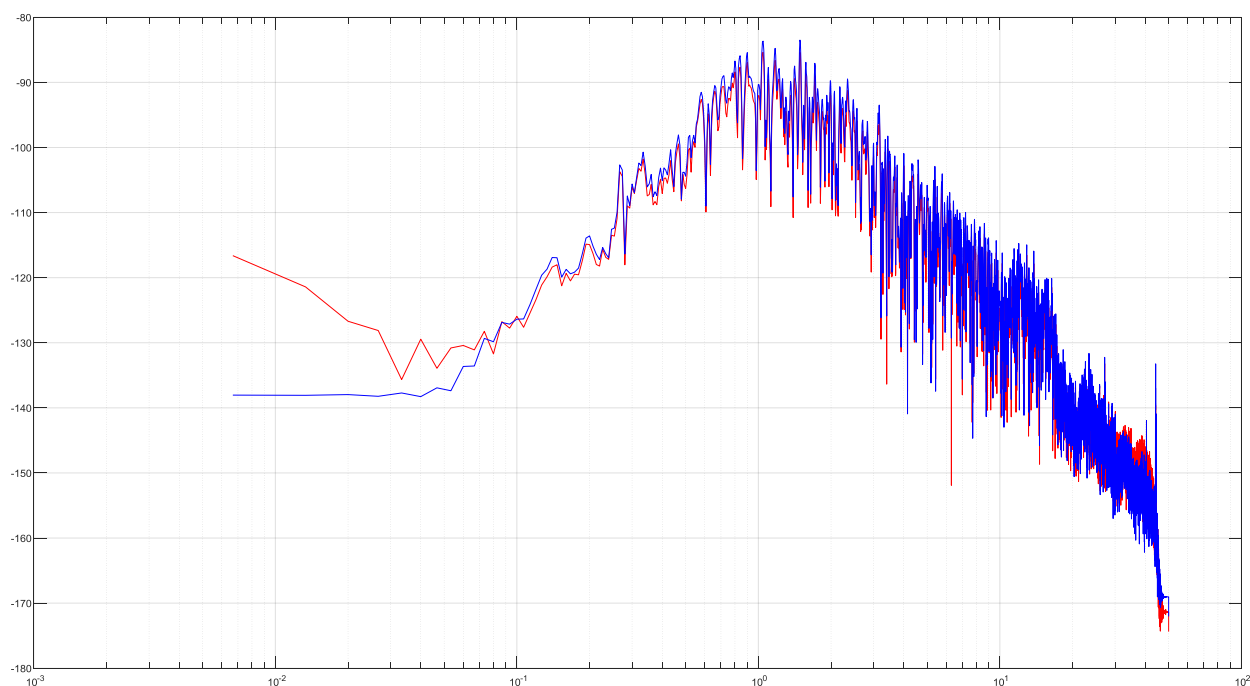
Red plot (ch name 6007) at figures 8 and 9 is referred to Guralp 3T/DM24EAM set while the Green plot (ch name GTN16) is referred to GEOTinyMK2 seismometer.

The earthquake PSD plots of both instruments (Guralp = Blue, GEObit = Red) are illustrated at picture 10

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Picture 10: Guralp 3T/DM24EAM (blue) and GEObit C100/SRi32S (red) PSD plot

Conclusion

Above analysis proves that the **GEObit GEOTinyMK2 seismometer** (as above described) provide superior performance in the range of their recording spectrum. The performance is equal to a **Guralp 3T/DM24EAM** sensor down to 10 sec periods.

Our wide band sensor can be used for local and regional seismicity monitoring, as well as micro-seismicity monitoring with no loss of any low period information.

References

[1]: <http://seismo.geology.upatras.gr/isola/>

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