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Ultra-low-noise MEMS accelerometer for Seismology

Aurélien Fougerat and Laurent Guerineau
Sercel, R&D Digital Sensor, Carquefou 44470, France (aurelien.fougerat@sercel.com)

A MEMS (Micro Electro Mechanical System) accelerometer currently used for oil and gas seismic surveys is evaluated for seismological applications.
Noise below 15 ng/sqrt(Hz) has previously been demonstrated for seismic frequencies (10 Hz to 200 Hz) (Laine et Al., 2014).
This paper focuses on system performance at lower frequencies (0.02 Hz to 2 Hz) and on measurements with increased full-scale up to 12 m/s^2.
Noise measurements were taken on horizontal and vertical axis MEMS accelerometers in an acoustic vault using an anti-vibration platform.
Within the bandwidth of 0.02 Hz to 2 Hz, a dynamic range of 133 dB was achieved with full-scale at 5 m/s^2, and 131.7 dB at 12 m/s^2. Noise data will be compared with the NLNM (New Low Noise Model) and NHNM (New High Noise Model).
Teleseismic data will also be shown as the system was in acquisition during an earthquake in Iraq (12 Nov 2017).
The ultra-low noise performance in the bandwidth 0.02 Hz to 2 Hz demonstrates the systems suitability for use in seismology.
The above, in combination with small size, light weight and low power consumption (20 mW) makes this MEMS sensor a good low cost alternative to FBA (force balanced accelerometers).
It is also a promising candidate for other applications including Structural Health Monitoring and Space Exploration.

Citation: Lainé J. and Mougenot D. (Nov. 2014): A high-sensitivity MEMS-based accelerometer, The leading Edge, vol. 33, no. 11, pp. 1234-1242 http://dx.doi.org/10.1190/tle33111234.1