



A D-battery scale Multiple-Degree-of-Freedom vibrational energy harvester (Multi-VIBE), which employs velocity amplification to enhance the power scavenged from ambient vibrations, is presented. The device comprises two masses relative oscillating one inside the other between four sets of springs. The resonant frequency of the device can be modified using a sliding cap that affects the height of the device. Electromagnetic transduction is used: seven coils are embedded in the external mass while the second mass is made of two NdFeB magnets.

TECHNICAL

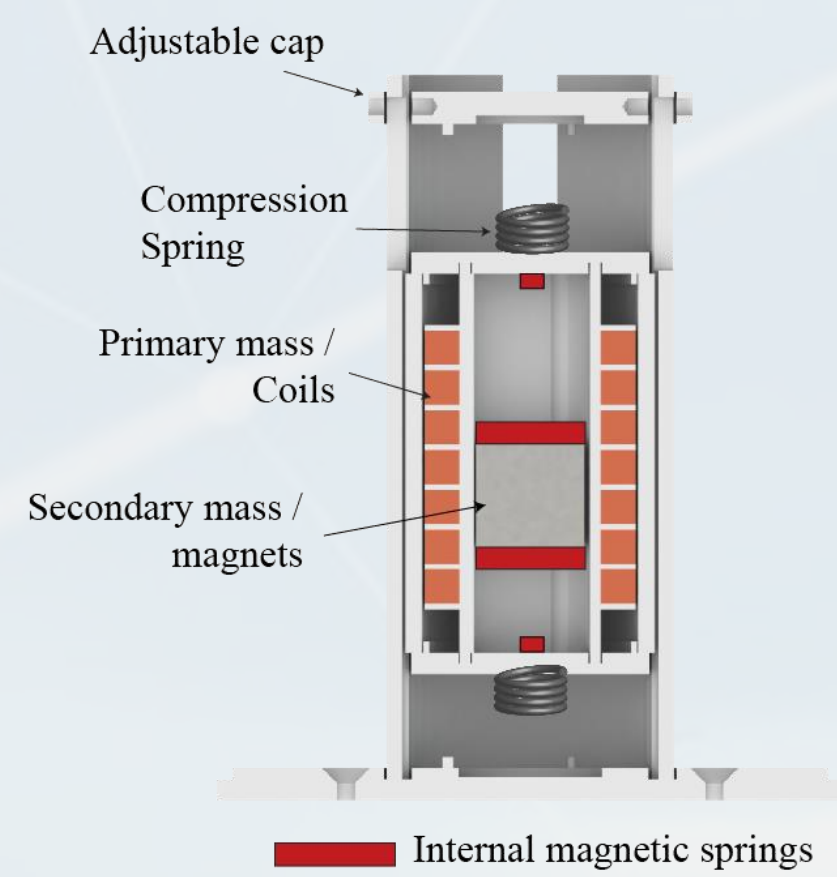


Fig.1 Schematics of the harvester.



Fig.2 Illustration of the scale of the harvester with reference to a D-battery.

OVERVIEW

Max output power (@ 0.4g, 14.5 Hz) [mW]	5
Min output power (@ 0.2g, 16 Hz) [mW]	1.3
Max output voltage [V]	8
Resonant frequency [Hz]	8 - 23
Acceleration rms [g]	0.2 - 0.6
-3dB bandwidth [Hz]	10
Recommended load [Ω]	12k

GEOMETRICAL DIMENSION

Diameter [mm]	26.5
Height [mm]	52.45
Mass [g]	100 g

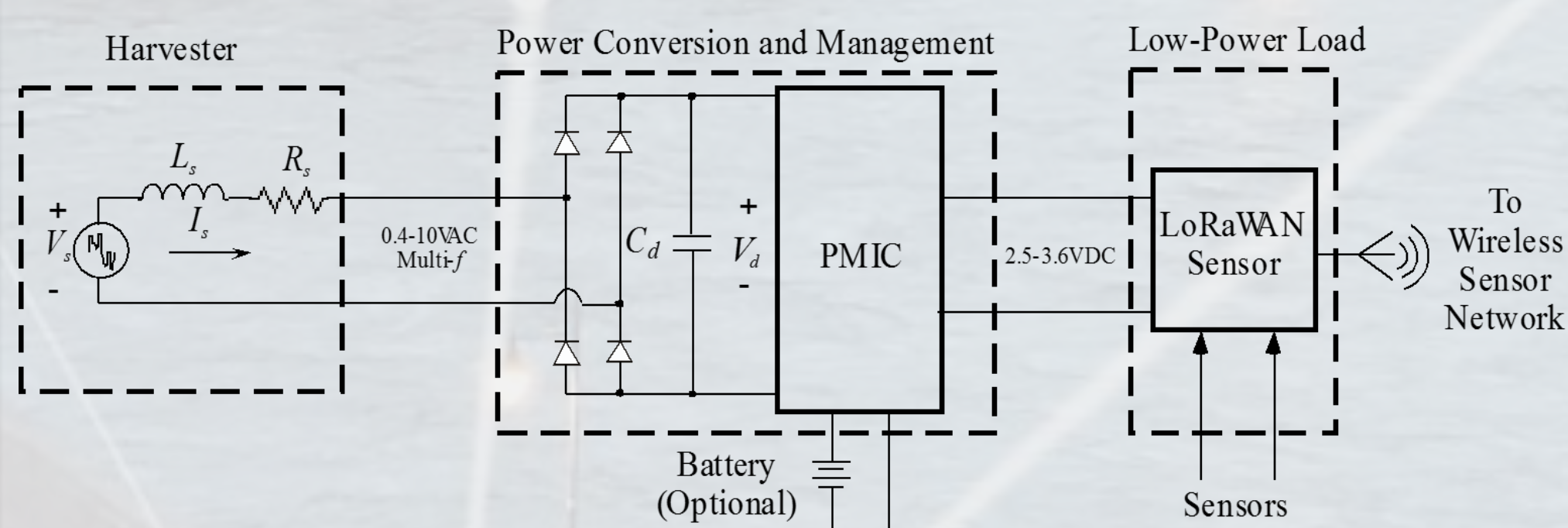


Fig.3 Schematic of the proposed self-powered wireless sensor node.



Fig.4 Implementation of the self-powered wireless sensor node.

COMPETITORS

Company	Technology	Mass	Volume
Kinergizer HiPER-DH	Electromagnetic	82 g	50.5 cm ³
ReViBe energy Model D	Electromagnetic	120 g	58.1 cm ³
Multi-VIBE	Electromagnetic	100 g	92.9 cm ³

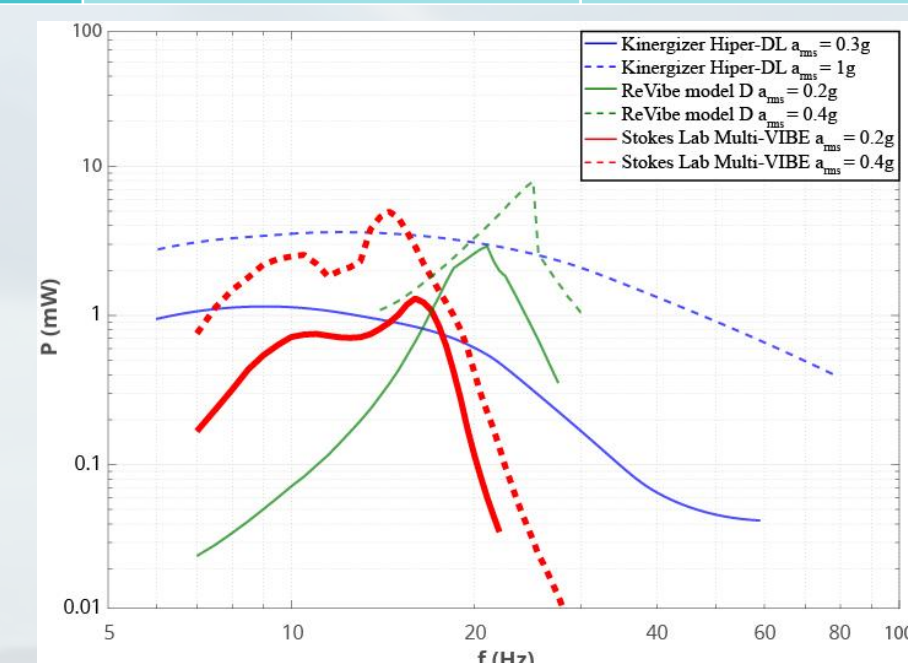


Fig.5 Comparison of Stokes Power technology with main competitors.

APPLICATIONS

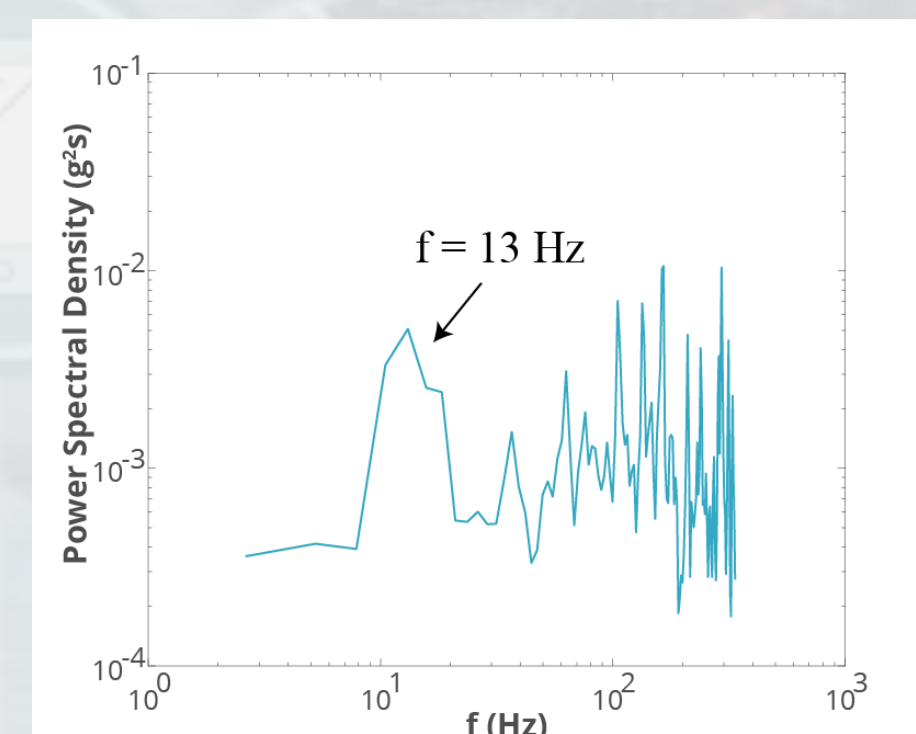


Fig.6 Power Spectral Density of an industrial air compressor.

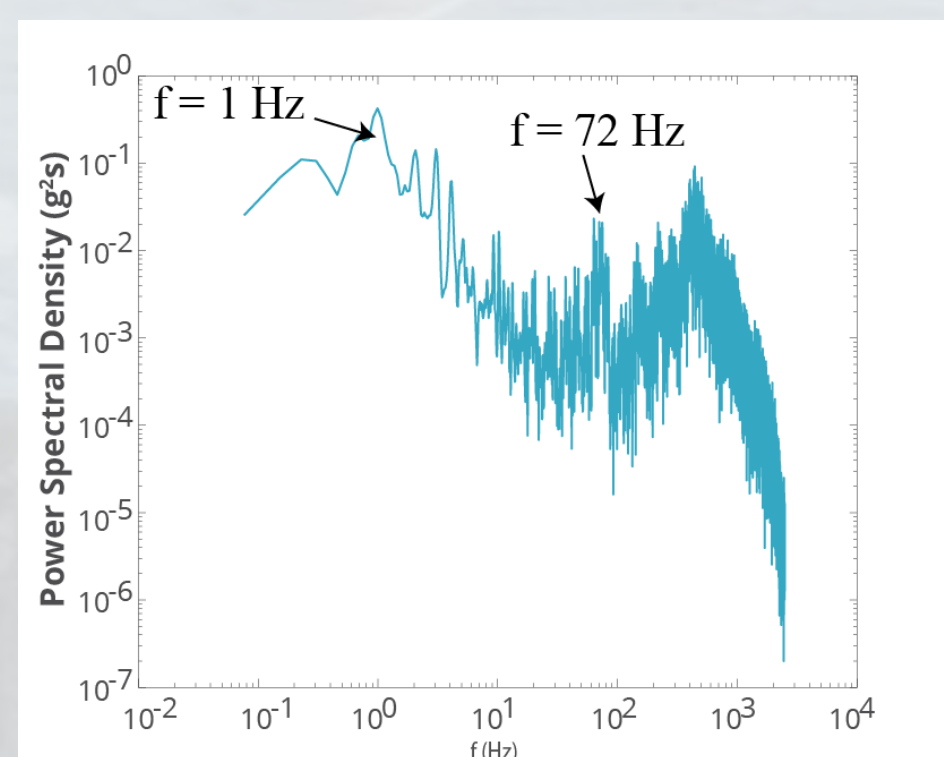


Fig.7 Power Spectral Density of a train measured on rails.

$$a_{\text{rms}} = 0.73\text{g}$$

$$a_{\text{rms}} = 3.55\text{g}$$



REFERENCE

Cottone, Francesco, Suresh Goyal, and Jeff Punch. "Energy harvester apparatus having improved efficiency." U.S. Patent No. 8,350,394. 8 Jan. 2013.