

Watt's linkage based large-band low-frequency sensors for scientific applications

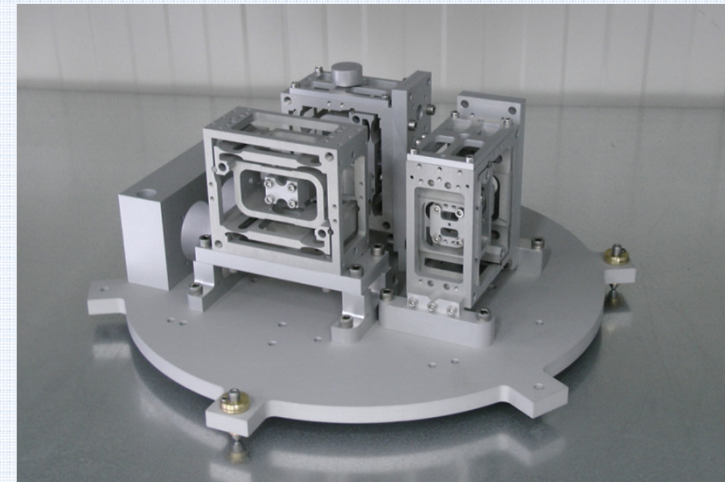
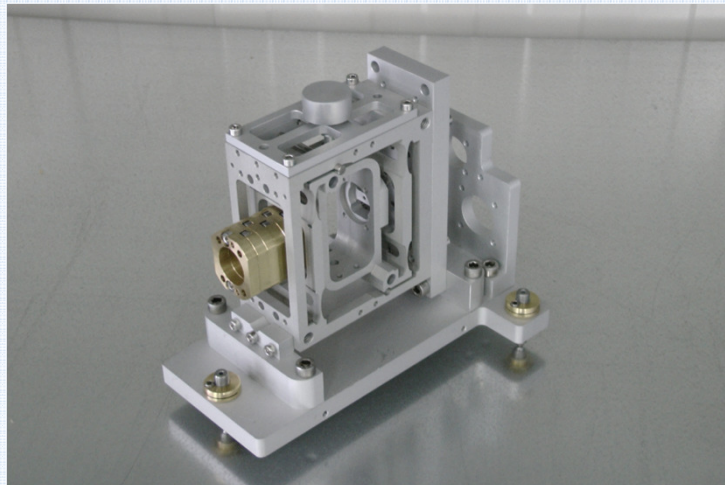
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Goal: implementation of triaxial seismometers and accelerometers for ground, space, and underwater applications, including ultra-high vacuum and cryogenics.

Solution: UNISA Folded Pendulum (Watt's linkage architecture).



Horizontal Monolithic Uniaxial and triaxial Seismometer/Accelerometer (2015)

UNISA FOLDED PENDULUMS PERFORMANCES RANGES:

Band: $0,0001 \text{ mHz} < B < 1 \text{ kHz}$ **Sensitivity:** $10^{-15} \text{ m/Hz}^{1/2} < S < 10^{-6} \text{ m/Hz}^{1/2}$
Directivity: $> 10^4$ **Quality Factor:** $Q > 16000 \text{ (UHV)} - Q > 2000 \text{ (air)}$
Res. Freq. $50 \text{ mHz} < f_0 < 1 \text{ kHz}$ **Scalability and Tunability**

Modular Readouts: shadow meter, optical lever (PSD, quadrant photodiode),
laser interferometer, optical fibre bundle, LVDT, capacitive sensor, etc.

ACTIVE APPLICATIONS AND COLLABORATIONS

Geophysics: Low –frequency seismic noise monitoring for characterization in the frequency band ($10^{-8} - 10^2$) of the Sos Enattos Mine (Lula) in Sardinia.

Historical Heritage: real-time low frequency monitoring of relevant italian monuments for structural characterization and conservation.

Bridges Safety: real-time low frequency monitoring of bridges for structural analysis and safety.

IN PROGRESS:

Very low Frequency seismometer: 20 mHz UNISA Folded Pendulum for geophysics.

Underwater low frequency microphone: Deep underwater (4 km) microphone .

Newtonian noise measurement: specialised version of the UNISA folded pendulum.

Control Accelerometer: open loop accelerometer for multi-stage suspensions .