

NGSA – New Generation SuperAttenuator

Proponents:

Napoli

Pisa

Laboratori Nazionali del Sud/Sassari

External Participant: European Gravitational Observatory (EGO)

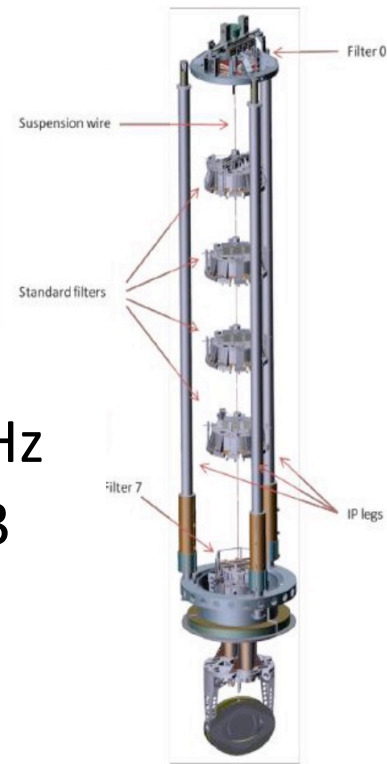
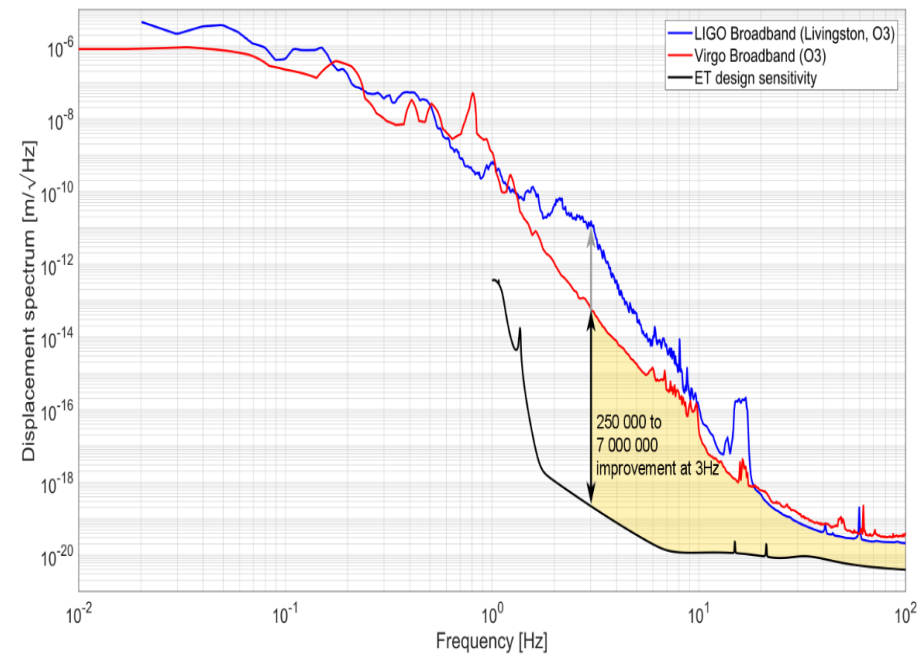
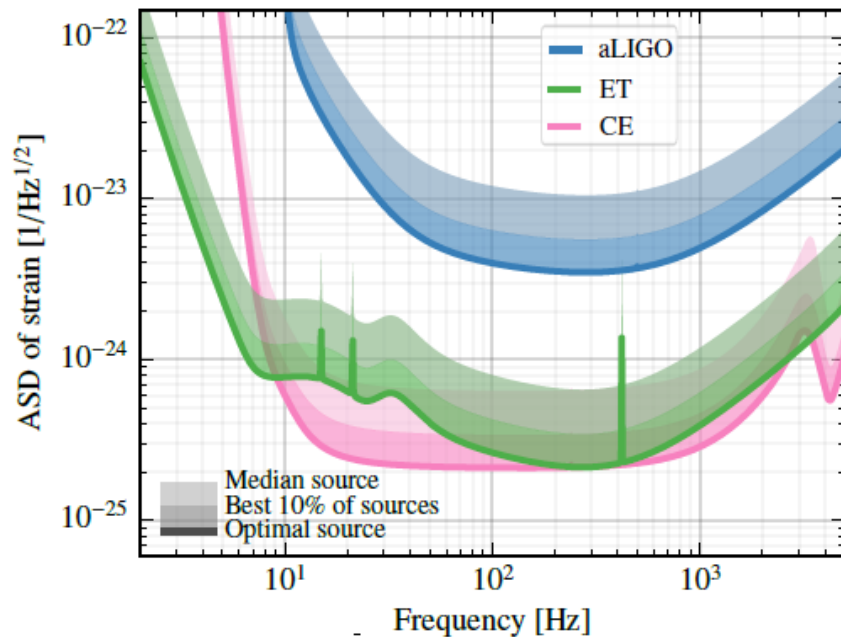
Resp. Nazionale: Luciano Di Fiore – Napoli

Resp. Locale LNS: Davide Rozza

Aims

➤ Development of a new vibration isolation system (Super-Attenuator) for the mirrors of the ET antenna.

- ❑ Improve the current GW Detector sensitivity by more than one order of magnitude extending the detection band to the low frequency, down to 2-3 Hz
- ❑ The ET design sensitivity requires an improvement by a factor 10^5 around 2-3 Hz with respect to the present Virgo sensitivity



Methods

The Virgo Super-Attenuator is the best seismic isolator in the world. It is the result of years of R&D in INFN and was crucial to allow the extension of the antenna detection band down to 10 Hz.

The SA is made by a pre-isolator (inverted-pendulum), a passive filter chain and a Payload (mirror and control elements). The total length is about 9 m.

The ET-LF design sensitivity requires an improvement by a factor 10^5 around 2-3 Hz with respect to the present Virgo sensitivity

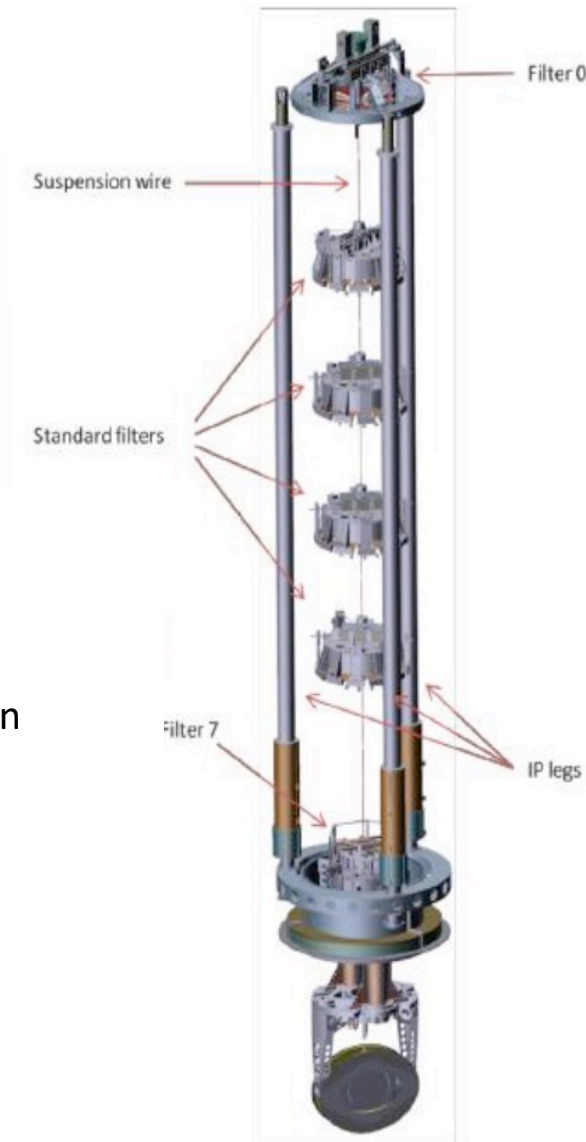
Two research lines:

1) Traditional solution (optimized SA)

- Starting from the Advanced Virgo SA architecture, optimization of the mass distribution along the isolation chain and improvement of the performance of the Magnetic Anti-Springs (MAS) of the single filters.
- Goal: total length around 12 m.
- If necessary, an active pre-isolator platforms, at the base of the IP, will be considered.

2) *Alternative solution* (Nested inverted pendulum pre-isolator)

- Study of an innovative solution, based on a two-stage Nested Inverted Pendulum (NIP)
- This solution allows a better horizontal attenuation of the pre-isolator but has never been experimentally demonstrated.
- Open questions to be addressed: reliability, stability, control systems, cross talks and vertical and angular noise suppression.



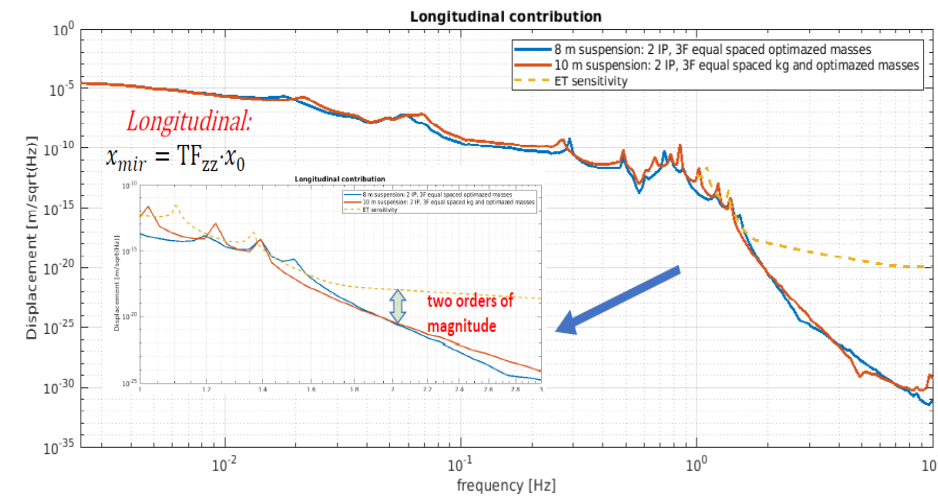
Methods

The project is organized in 4 WP:

WP1 – Simulation and optimization of the Superattenuator

Responsabile: L. Trozzo (INFN-NA)

Extend the frequency domain of mathematical model used to simulate the Superattenuator



WP2 – Mechanical filter with improved Magnetic Anti-Spring (MAS)

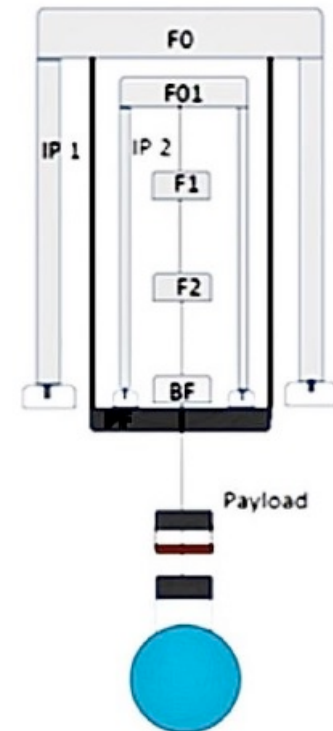
Responsabile: F. Frasconi (INFN-PI)

Development of a single stage mechanical filter based on magnetic anti-spring

WP3 – Development and test of a Nested Inverted Pendulum (NIP)

Responsabile: R. De Rosa (INFN-NA)

Design, construction and testing of a prototype of a Nested Inverted Pendulum



WP4 – Sensing and Control (S&C)

Responsabile: A. Gennai (INFN PI)

Implementation of a control system for NIP commissioning and test

Requests

Consumo	Materiale di meccanica per la realizzazione del prototipo	5
	Componenti di elettronica per le schede di controllo	10
Inventario		
Missioni	Missioni per la costruzione e commissioning: 1 persone x 5 gg x 6	8
Totale		23

Nome	FTE
D. D'Urso	0.2
L. Pesenti	0.3
D. Rozza	0.1
V. Sipala	0.1
I. Tosta e Melo	0.3
totale	1.0