

## **II. Workshop on ET-LF TM Tower Integration**

# **Report of Contributions**

Contribution ID: 1

Type: **not specified**

## **The payloads for the Test Masses of the ET-LF and ET-HF interferometers: status and perspectives**

*Wednesday 26 March 2025 09:00 (45 minutes)*

The payloads are the last stage suspensions for the test masses. They are designed to fulfill the requirements coming from the control system and the sensitivity of the detector. The status of the designs for the payloads, both in the LF and HF interferometers, will be presented.

**Primary author:** PUPPO, Paola

**Co-author:** TEAM, pay

**Presenter:** PUPPO, Paola

**Session Classification:** Payload and super-attenuator design

Contribution ID: 2

Type: **not specified**

## ET Activities at LNF: Status and Future Directions

*Tuesday 25 March 2025 17:15 (45 minutes)*

The primary objective of the activities conducted at LNF is to investigate and validate innovative strategies for the active mitigation of ice formation and electrostatic charging on mirrors, as well as to collaborate with EGO/Virgo on the passive mitigation of charge emission from ion pumps. These efforts are currently in progress, with preliminary results from prototype systems demonstrating the potential efficacy of the proposed approaches. In principle, these strategies could be successfully implemented in real-world applications.

However, to ensure the seamless integration of these mitigation strategies into the design of the ET towers and vacuum systems, further advancements in engineering and technological solutions are imperative. To align with the overall infrastructure timeline, it is crucial to initiate this R&D work at the earliest opportunity.

The goal of this presentation is to address these critical aspects and foster a constructive discussion on concrete R&D proposals, paving the way for the successful implementation of these strategies in future projects.

**Primary authors:** SPALLINO, Luisa; Dr ANGELUCCI, Marco (INFN - LNF); CIMINO, Roberto

**Presenter:** SPALLINO, Luisa

**Session Classification:** Status and project constraints

Contribution ID: 3

Type: **not specified**

## Super-Attenuator Design Concept Integrating an Active Platform and an Inverted Pendulum

*Wednesday 26 March 2025 11:00 (45 minutes)*

This work originates from the aim of reducing the height of the 17 m suspension chain considered in the ET 2011 Conceptual Design Report and its 2020 Update. The presentation focuses on the current state of design and modelling of a candidate solution integrating both an inverted pendulum and an active platform. This key feature allows reducing the height of the seismic attenuation chain, while satisfying the requirements in terms of residual longitudinal motion of the test-mass below the ET-LF design sensitivity reaching  $7.45e-24 \text{ Hz}^{-1/2}$  at 3 Hz.

**Primary author:** GIORDANO, Thomas (ULiège)

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**Session Classification:** Payload and super-attenuator design

Contribution ID: 4

Type: **not specified**

## The reference solution: a Superattenuator for Einstein Telescope

*Wednesday 26 March 2025 09:45 (45 minutes)*

The Superattenuator - a cornerstone in seismic isolation systems for ground-based interferometers - is recognized as the seismic isolation reference solution for the Einstein Telescope in both the 2011 and 2020 Technical Reference Documents.

As seismic isolation system design progresses, evaluating the impact of targeted interventions on the performance of existing solutions is essential for effective risk mitigation.

The need for an update of the Superattenuator arises not only from the increased sensitivity, but also from the requirement to suspend a heavier, cryogenic payload, which makes the mechanics more demanding and imposes constraints on the materials, that must be compatible with both vacuum and cryogenic conditions.

In the conservative approach of the reference solution, the design is preserved: the simple yet effective upgrade detailed here does not alter the concept, but focuses on adjusting construction parameters, allowing the Superattenuator to meet the more demanding requirements of a third-generation interferometer while preserving its well-established reliability and performance.

**Primary authors:** SPADA, Francesca; Dr LUCCHESI, Leonardo (INFN Pisa); TROZZO, Lucia (INFN, sez. Napoli); PINTO, Manuel; RUGGI, Paolo

**Presenter:** SPADA, Francesca

**Session Classification:** Payload and super-attenuator design

Contribution ID: 5

Type: **not specified**

## An Active platform for the Inverted Pendulum of the Superattenuator

*Wednesday 26 March 2025 11:45 (45 minutes)*

The Seismic Isolation System of the Advanced VIRGO, based on the working principle of a multi-stage pendulum hung to a three legs mechanical structure of the Inverted Pendulum, is equipped with 3 Piezoelectric actuators encapsulated with a foot structure. So far, these tools were never used to compensate seismic motion at very low frequencies regime due to missing high sensitivity sensor and some difficulties to distinguish this component of noise from the others. Recently the INFN Pisa group started a deep revision of this transducer with the intent to improve its performance within a more complex control strategy together with the possibility to implement a similar device for the horizontal degrees of freedom in view of ET.

**Primary author:** FRASCONI, Franco (INFN Pisa)

**Presenter:** FRASCONI, Franco (INFN Pisa)

**Session Classification:** Payload and super-attenuator design

Contribution ID: 6

Type: **not specified**

## **Introduction, scope and status of ET-LF TM tower integration**

*Tuesday 25 March 2025 14:00 (45 minutes)*

**Presenter:** GROHMANN, Steffen (KIT)

**Session Classification:** Status and project constraints

Contribution ID: 7

Type: **not specified**

## **Status of infrastructure planning**

*Tuesday 25 March 2025 14:45 (45 minutes)*

**Presenter:** WERNEKE, Patrick

**Session Classification:** Status and project constraints



Contribution ID: 8

Type: **not specified**

## **ET's Tower nodes: classification and subsystem integration**

*Tuesday 25 March 2025 15:30 (45 minutes)*

Methodology of efforts ongoing to classify ET's towers, following from the noise budget and high-level interferometer architecture. Discussion on the set of boundary conditions that are to be established for a solution-agnostic framework, from which we can do comparative design analysis.

**Presenter:** MEIJER, Romano (Nikhef)

**Session Classification:** Status and project constraints

Contribution ID: 9

Type: **not specified**

## **Stability analyses of IP base ring integration options**

*Tuesday 25 March 2025 16:30 (45 minutes)*

**Presenter:** IAQUANIELLO, Gregory

**Session Classification:** Status and project constraints