

# First measurements for test and characterization of the Pendulum Inverted Pendulum for ET suspensions

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One of the goals of the Einstein Telescope is to improve the sensitivity at low frequencies. This target enables us to look gravitational waves carrying information from the early Universe, extend the time observation of binary system of compact objects, and enhancing the signal-to-noise ratio for spinning neutron stars and stochastic background.

The Einstein Telescope aims at reaching a sensitivity of approximately  $10^{-22} \text{ Hz}^{-1/2}$  at 2 Hz, more than ten times better the sensitivity of Virgo and LIGO interferometers. This can be obtained with a Super-Attenuator (SA) that is 17 meters long or, alternatively, with a new design that reduces the height of the SA. Moreover the narrow restricted mine tunnels at SOS Enattos require a more compact solution for the super attenuator. Inside the project "Black Holes for ET in Sardinia" (BHETSA) a new concept of filter has been developed: the Pendulum Inverted Pendulum (PIP). With the term PIP we mean a single stadium of a multi-stage pendulum capable of attenuating both vertical and horizontal vibrations.

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At the ET laboratory in Pisa we have begun assembling and studying the first prototype of PIP. Initial measurements have been collected, and we are currently working on studying the horizontal vibrations. At the ET Symposium we will present the first measurements of the PIP filter: in this first step we characterized the PIP and studied the behavior of the filter in various configurations.

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