



Contribution ID: 90

Type: **not specified**

## Mitigating Parametric Instabilities with Mechanical Dampers in Current and Future Gravitational Wave Detectors

*Wednesday 23 October 2024 18:10 (20 minutes)*

To enhance the sensitivity of gravitational wave detectors, it is crucial to reduce noise within the 10 Hz to 10 kHz frequency range.

One effective method is to decrease shot noise by increasing the laser power.

This allows the achievement of noise specifications expected for the upcoming observation runs of Advanced Virgo and Advanced LIGO detectors, as well as for third generation detectors.

However, employing a high power laser may result in undesirable effects known as Parametric Instabilities (PI), impacting the instrument's efficiency.

These instabilities occur in an optical cavity due to the interaction between some optical and mechanical modes of the mirrors with very high quality factors and when the light power is very high (hundreds of kW).

To mitigate the effect, a system has been developed to prevent the triggering of instabilities.

Small oscillators resonating at the critical frequencies and with a low quality factor are attached to the lateral surface of the mirrors.

Due to coupling effect between the damper's mode and mirror's mode, the quality factor of the mirror's mode is reduced, and so allows for the reduction of the risk of triggering instabilities.

We present the latest results of various types of dampers tested on a suspended small fused silica substrate placed in a vacuum chamber at room temperature, as part of the effort to set up dampers for the Advanced Virgo interferometer.

**Authors:** COUINEAUX, Audrey; PUPPO, Paola; RAPAGNANI, Piero; MANGANO, Valentina (Università degli Studi di Sassari)

**Presenter:** MANGANO, Valentina (Università degli Studi di Sassari)

**Session Classification:** Parallel Session 6