Contribution ID: **60** Contribution code: **P#18** Type: **Poster**

Simulation Study of the Sloshing Speedmeter

Tuesday 7 May 2024 17:47 (1 minute)

The low-frequency component of the Einstein telescope is expected to be limited by contributions of seismic, Newtonian and radiation pressure noise. In order to further increase the astrophysical range at these low frequencies, it is essential that all three of these noise sources are reduced simultaneously. This means that, if seismic and Newtonian noise levels see sufficient improvement, one will need to tackle radiation pressure noise. One well-known way of doing this is (frequency-dependent) squeezing. Here, we present a numerical analysis of an alternative, or perhaps complementary solution: The Sloshing speedmeter.

The Sloshing speedmeter extends on the standard Michelson interferometer with an additional filter cavity at the dark port. In particular, we are interested in the capabilities to control this extra cavity, as the response of the speedmeter drops quickly at lower frequencies. Furthermore, we can put limits on the requirements for the cavity suspensions.

A speedmeter is a powerful option to explore in combination with squeezing, as it allows to probe below the standard quantum limit for frequencies below the first cavity pole and it eliminates the need for frequency dependent squeezing. On top of that, the noise-mitigation effect increases linearly with decreasing frequency, which can lead to a factor 100 improvement in quantum-noise limited sensitivity in the frequency range of interest for ET-LF.

Primary author: VAN RANST, Zeb (Maastricht University)

Co-author: HILD, Stefan

Session Classification: Posters

Track Classification: Instrument Science Board (ISB)