Contribution ID: **6** Type: **Poster**

Update on the feasibility analysis of a cryogenic test-mass suspension with flexures operating in compression

This presentation provides an update on the feasibility analysis of a novel suspension for the cryogenic test-mass mirrors of the low-frequency detector of the Einstein Telescope. To overcome the severe limitation imposed on traditional suspensions by the tensile stress for simultaneously achieving low thermal noise, safer mechanical margins and high thermal conductance, this configuration takes advantage of the many times higher compressive strength of silicon with respect to its tensile strength. We propose the use of vertical rigid beams with large cross sections working in tension, combined with short flexures working in compression. The flexures are mechanically robust and at the same time soft in the working direction, thus producing low suspension thermal noise and, by being short, they provide high thermal conductance for cryogenic cooling. The beams have negligible vertical elastic compliance, but they are still subject to unavoidable machining tolerances, so vertical blade springs must be used to provide elastic compliance.
After briefly reviewing some basic results about the mechanical and thermal behaviour, the presentation will focus first on the feasibility of using optical anti-springs to reduce the pendulum resonant frequency to further improve the vibration isolation of the test mass. Then, the suspension thermal noise calculated with a rigid-body model will be presented. Finally, an introduction will be given on the possibility of using active anti-springs to reduce the resonant frequency of the blade springs to achieve useful vertical vibration isolation.

Primary author: PEÑA ARELLANO, Fabián

Co-authors: IANNONE, Gerardo (INFN - Salerno); AVALLONE, Guerino (University of Salerno); THEMANN, Harry; GONZÁLEZ, Leonardo (University of Guadalajara); BARTON, Mark (University of Glasgow); LEON, Nelson (California State University at Los Angeles); DESALVO, Riccardo (California State University at Los Angeles)

Presenter: PEÑA ARELLANO, Fabián

Session Classification: Poster Session