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Status of crystalline monolithic suspension for ET-LF

The next generation of interferometric gravitational wave detectors faces limitations due to excessive thermal noise in key optical and suspension systems, particularly below 10 Hz. To address this issue, cryogenic solutions are being adopted. Dedicated studies are focusing on the creation of cryogenic payloads with quasi-monolithic suspensions, identifying suitable materials for substrates, suspensions, and suspension steering stages, ensuring optimal thermal, mechanical, and optical properties.

This talk aims to describe the main lines of research currently underway, the materials being studied (primarily silicon and sapphire, but also including new materials such as composites and germanium), the main challenges in creating a quasi-monolithic suspension, and what is currently being done to overcome these challenges. It is worth noting that this work is currently being addressed by a huge collaborative effort between universities, research institutions, and private companies, an effort that is leading to multiple solutions and promising results.

Authors: TRAVASSO, Flavio; DICORATO, Michele Arcangelo; BALDICCHI, Nicolo (Università degli studi di Perugia)

Presenters: DICORATO, Michele Arcangelo; BALDICCHI, Nicolo (Università degli studi di Perugia)

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