



Contribution ID: 55

Type: **Poster**

Technological demonstrators towards the OGSE for the LISA mission

Tuesday, 23 May 2023 18:52 (1 minute)

The LISA space interferometer aims at GW detection with $\sim 3 \times 10^{-20} / \sqrt{\text{Hz}}$ strain sensitivity, resulting in a displacement sensitivity of $11 \text{ pm} / \sqrt{\text{Hz}}$ over a path length of $2.5 \times 10^9 \text{ m}$ in the frequency range from 3×10^{-5} to 1 Hz .

The LISA France Collaboration is in charge of the ground optical tests of the MOSA (Moving Optical Sub-Assembly), including the Optical Bench, Telescope and Gravitational Reference Sensor. Special check-out equipment is required, such as the Far-Field Optical Ground Support Equipment aiming at measuring the Tilt-To-Length coupling coefficient between angular residual beam jitter and longitudinal path length. The FF-OGSE simulates the incoming jittering beam and measures the associated longitudinal path length change. We present two prototypes –the Zerodur InterFerOmeter and the TTL-OB - that will demonstrate the optical performance, the functional tests, the limits on sensitivity and the precision of the path length measurements achievable on-ground. These two benches are the first part of the design and specification for the FF-OGSE.

The Stray Light OGSE aims at stray light characterization in the integrated MOSA. It measures and identifies, separately, the different sources of stray light through the measurement of the corresponding fringe patterns while scanning the laser's optical frequency.

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Session Classification: Tuesday Poster session

Track Classification: Infrastructures: Moon and Space