## GWADW2023 - Gravitational-Wave Advanced Detector Workshop



Contribution ID: 3

Type: Poster

## Stabilized laser system at 1550 nm wavelength for the ET-LF interferometers

Tuesday, 23 May 2023 18:11 (1 minute)

Proposed future gravitational wave detectors place high demands on their stabilized laser system. Especially the proposed interferometers operating with cryogenically cooled silicon mirrors demand another laser wavelength than current detectors. In addition, some of these detectors are expected to be sensitive to gravitational waves down to a few hertz.

We present a prototype for a pre-stabilized laser system at 1550 nm wavelength with frequency and power stabilizations optimized for the needs of gravitational wave detectors. A power stabilization with shot noise limited performance below a relative power noise of  $1 \times 10^{-8}$  Hz<sup>-1/2</sup> between 100 Hz to 100 kHz and an active frequency stabilization with a unity-gain frequency above 2 MHz were operated simultaneously. Out-of-loop measurements are performed to characterize the achieved stability and to analyze sensor noise limits.

Further research and development are needed to extend this demonstrated high stability towards the lowfrequency band of the Einstein Telescope low-frequency interferometers. We present a specific experiment designed to analyze the fundamental sensing and control limitations at these low frequencies in our laser system.

**Primary author:** MEYLAHN, Fabian (Max Planck Institute for Gravitational Physics (Albert Einstein Institute))

Co-authors: KNUST, Nicole (Leibniz University Hannover); WILLKE, Benno (Leibniz University Hannover)

Presenter: MEYLAHN, Fabian (Max Planck Institute for Gravitational Physics (Albert Einstein Institute))

Session Classification: Tuesday Poster session

Track Classification: Low Frequency Noise: Low Frequency Sensing and Control