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Frequency stabilization of a Planar Waveguide External Cavity Laser OLIVER PUNCKEN, GREGORIO TELLEZ, STEVEN SHOEN, VOLKER QUETSCHKE, University of Texas at Brownsville, CGWA TEAM — Narrow linewidths and high stability in frequency and intensity are important laser properties in fields as optical communication, laser cooling, and atomic frequency standards. In the context of space based gravitational wave astronomy, it is assumed that the lasers must have a frequency stability of 30 $Hz/\sqrt{Hz}$ over a frequency-band from 3 mHz to 30 mHz. Planar-Waveguide External-Cavity lasers might provide an alternative to nonplanar ring oscillators or fiber lasers. To achieve this requirement, frequency stabilization to an external reference is necessary. We present our initial experimental results of the intensity and frequency stabilization setup for a Planar Waveguide External Cavity Laser at 1550 nm to a high finesse ultra low expansion (ULE) cavity. The stabilization to the sub-Hertz level can be accomplished by using a Pound-Drever-Hall stabilization scheme. The injection current is used as a fast actuator and the laser temperature as a compensator for slow drifts. The setup is isolated from the environment by using a radiative shield inside a vacuum tank in order to decouple it from thermal and acoustical disturbances. We build two identical setups, which allows for measuring the sum frequency noise of the systems by investigating the beat note.

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