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Progress towards experimental verification of arm-locking for LISA JAMES THORPE, SHAWN MYTRIK, RACHEL CRUZ, GUIDO MUELLER, Dept. of Physics, University of Florida — The proposed space-based interferometric gravitational wave detector LISA will be used to study gravitational waves in the mHz regime. It consists of three spacecraft located at the vertices of a 5 Gm triangle, each containing two freely-falling proof masses. The distances between the proof masses will be monitored using laser interferometry in an effort to detect modulations due to gravitational waves. Orbital motion will cause arm-length mismatches in the constellation to a level of approximately 1%, which will cause laser frequency noise to couple into the interferometer output. In order to achieve the sensitivity required to detect gravitational waves, the laser frequency noise must be suppressed to an acceptable level. One proposed technique for reducing laser frequency noise in LISA is arm-locking, wherein some combination of the LISA arms is used as a frequency reference. We propose a method for evaluating arm-locking in an electro-optic laboratory model of LISA. This model includes lasers with LISA-like noise characteristics as well as realistic light travel delays achieved using an electronic phase delay method [Class. Quantum Grav. 22 (2005) S227-S234]. Current progress and results will be presented. This work is supported by NASA grant BEFS04-0019-0019.

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