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Heterodyne Stabilization for the Laser Interferometer Space Antenna (LISA) JOHANNES EICHHOLZ, University of Florida, STEVEN HOCHMAN, ALIX PRESTON, GUIDO MUELLER — LISA is a joint NASA/ESA space mission to detect gravitational waves from 0.1 mHz to 1 Hz generated e.g. by super-massive black hole mergers. Three spacecraft move in a triangular constellation on a heliocentric orbit. Their distances are monitored interferometrically with laser links. LISA detects fluctuations of the 5 million km arm lengths on a picometer scale. The requirement for the frequency stability of the lasers is 141 Hz/$\sqrt{\text{Hz}}$. I will present a new stabilization scheme based on heterodyne interferometry. It requires less components than the currently envisioned Pound Drever Hall technique and can easily be integrated into LISA's interferometry measurement system. The two lasers of each spacecraft are injected into the same optical cavity. Near resonance, the phase of the reflected light is sensitive to frequency fluctuations. The second, off-resonant beam can be used to lock the primary laser to the cavity resonance. I will discuss this technique and present experimental results. This work is supported by NASA Contract #00078244 and NASA Grant NNX08AG75G.

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