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Arm locking experiments on UFLIS YINAN YU, GUIDO MUELLER, University of Florida — The Laser Interferometer Space Antenna (LISA) will detect gravitational waves in the frequency region of 3×10^{-5} Hz to 1 Hz by means of laser interferometry. At the University of Florida we developed the University of Florida LISA Interferometer Simulator (UFLIS) in order to study and verify laser frequency noise reduction and suppression techniques under realistic LISA-like conditions. These conditions include the Doppler shifts between the spacecraft, LISA-like signal travel times, and realistic laser frequency and timing noise. One of the proposed laser frequency stabilization techniques in LISA is arm locking, which synthesizes an adequately filtered linear combination of the LISA interferometry signals as a frequency reference. The arm locking experiments on UFLIS have already demonstrated the capability of single arm locking integrated with tunable cavity pre-stabilization as well as in the presence of a Doppler knowledge error. In this presentation we will report about experiments on advanced arm locking schemes such as dual arm locking and modified dual arm locking. We will demonstrate the noise suppression performance of dual arm locking and the capability of modified dual arm locking sensor to alleviate the frequency pulling effect due to the Doppler error. Furthermore, the limits of different noise sources such as digitization noise and clock noise in our experiments will also be discussed. This work is supported by NASA grant 07-ATFP07-0116.

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