Abstract Submitted
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Torsion Pendulum Laser Interferometer for Space Gravity Missions[1] ANTHONY DAVILA ALVAREZ, STEPHEN APPLE, DEREK KLEIN, LUKAS HERRON, DANIEL HILLSBERRY, ADA UMINSKA, University of Florida, ELEONORA POLINI, Sapienza Universit di Roma, PAUL FULDA, GUIDO MUELLER, PETER WASS, JOHN CONKLIN, University of Florida — Gravitational wave missions like the Laser Interferometer Space Antenna (LISA) and future Earth geodesy missions use reference isolated bodies called test masses (TM) in free-fall within each spacecraft. Their motion is measured by laser interferometer and capacitive sensing systems. These and related technologies are tested within the torsion pendulum, an experimental testbed comprised of four cubic TMs at the ends of two identical orthogonal rods suspended from a 1 meter long, 50-micron diameter tungsten fiber. Each TM represents an inertial sensor in a near free-fall condition in the torsional degree of freedom, close to the required performance for space-based gravitational missions. Capacitive sensors measure the position for two opposite TMs while the other two are end points for the Torsion Pendulum Interferometer (TPI). The TPI is a Mach-Zehnder and homodyne interferometer that measures the differential motion between the TMs with a target sensitivity below 100 pm/sqrt(Hz) in the mHz band. It uses focusing optics to maintain contrast for over a 1 mm range of motion, polarization multiplexing to maximize sensitivity, and two output beams to reject common noise. The performance of the University of Florida torsion pendulum and upgraded interferometer system is presented.

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