Abstract Submitted
for the APR21 Meeting of
The American Physical Society

Torsion Pendulum for Testing of Space Gravity Mission Technology[1] ANTHONY DVILA LVAREZ, JOHN SIU, DEREK KLEIN, STEPHEN APPLE, SAMANTHA PARRY KENYON, JOS SANJUN, TIMOTHY SUMNER, GUIDO MUELLER, PETER WASS, JOHN CONKLIN, University of Florida — Space based gravity science instruments measure the motion of isolated reference bodies, called test masses (TM), to detect gravitational field changes. A Gravitational Reference Sensor (GRS) uses two methods to capture this movement, a laser interferometer, and a capacitive sensor system. The University of Florida torsion pendulum is used to test and improve the performance of this technology. It is comprised of four cubic TMs at the ends of identical orthogonal rods, connected to a central piece suspended from a 1 m long, 50 um 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. Their charge is measured and controlled by an UV LED system that is connected to light injection ports in the GRS housing. Capacitive sensors measure the position for two opposite TMs while the other two are end points for a Mach-Zehnder and homodyne interferometer (IFO) that measures their differential motion. The IFO uses polarization multiplexing to maximize its range of sensitivity, and two output beams to reject common noise. The torsion pendulum, GRS and IFO are described along with their components and performance.

[1]NASA RTF NNX15AF26G

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Date submitted: 08 Jan 2021 Electronic form version 1.4