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LISA technology development using the UF precision torsion pendulum STEPHEN APPLE, ANDREW CHILTON, TAIWO OLATUNDE, GIACOMO CIANI, GUIDO MUELLER, JOHN CONKLIN, University of Florida — LISA will directly observe low-frequency gravitational waves emitted by sources ranging from super-massive black hole mergers to compact galactic binaries. A laser interferometer will measure picometer changes in the distances between free falling test masses separated by millions of kilometers. A test mass and its associated sensing, actuation, charge control and caging subsystems are referred to as a gravitational reference sensor (GRS). The demanding acceleration noise requirement for the LISA GRS has motivated a rigorous testing campaign in Europe and a dedicated technology mission, LISA Pathfinder, scheduled for launch in the fall of 2015. At the University of Florida we are developing a nearly thermally noise limited torsion pendulum for testing GRS technology enhancements that may improve the performance and/or reduce the cost of the LISA GRS. This experimental facility is based on the design of a similar facility at the University of Trento, and consists of a vacuum enclosed torsion pendulum that suspends mock-ups of the LISA test masses, surrounded by electrode housings. Some of the technologies that will be demonstrated by this facility include a novel TM charge control scheme based on ultraviolet LEDs, an all-optical TM position and attitude sensor, and drift mode operation. This presentation will describe the design of the torsion pendulum facility, its current acceleration noise performance, and the status of the GRS technologies under development.

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