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UV-LED-based charge control for LISA TAIWO OLATUNDE, RYAN SHELLEY, ANDREW CHILTON, GIACOMO CIANI, GUIDO MUELLER, JOHN CONKLIN, University of Florida — The test masses inside the LISA gravitational reference sensors (GRS) must maintain almost pure geodesic motion for gravitational waves to be successfully detected. The residual accelerations have to stay below $3fm/s^2/rtHz$ at all frequencies between 0.1 and 3 mHz. One of the well known noise sources is associated with the charges on the test masses which couple to stray electrical potentials and external electro-magnetic fields. The LISA pathfinder (LPF) will use Hg-discharge lamps emitting mostly around 253 nm to discharge the test masses via photoemission in its 2015/16 flight. A future LISA mission launched around 2030 will likely replace the lamps with newer UV-LEDs. UV-LEDs have a lower mass, a better power efficiency, and are smaller than their Hg counterparts. Furthermore, the latest generation produces light at 240 nm, with energy well above the work function of pure gold. I will describe a preliminary design for effective charge control through photoelectric effect by using these LEDs. The effectiveness of this method is verified by taking Quantum Efficiency (QE) measurements which relate the number of electrons emitted to the number of photons incident on the Au test mass surface. This presentation addresses our initial results and future plans which includes implementation and testing in the UF torsion pendulum and space-qualification in a small satellite mission which will launch in the summer of 2014, through a collaboration with Stanford, KACST, and NASA Ames Research Center.

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