Abstract Submitted
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Charge Management Numerical Modeling and Experimental Demonstrations for the LISA Gravitational Reference Sensor[1] SAMANTHA PARRY KENYON, JOHN SIU, ANTHONY DVILA LVAREZ, STEPHEN APPLE, TAIWO OLATUNDE, University of Florida, TIMOTHY SUMNER, Imperial College London, GUIDO MUELLER, PETER WASS, JOHN W. CONKLIN, University of Florida, LISA COLLABORATION — Capacitive inertial reference sensors in space are a necessary technology for earth geodesy and gravitational wave observations. They consist of a test mass (TM) in free fall surrounded by an electrode housing. In the space environment, the TM accrues electric charge that eventually pollutes the science measurement. To minimize electrostatic force noise contributions, it is necessary to maintain a near-neutral TM charge relative to the housing. The TM can be discharged in a contact-free manner, exploiting ultraviolet light via the photoelectric effect to preserve instrument sensitivity. Understanding the physics of UV light-based charge control is critical to the success of LISA, a gravitational wave detector in space to be launched in the early 2030s. Numerical and analytical modeling of charge movement within the LISA Gravitational Reference Sensor (GRS) is being done to validate if advanced charge control methods remain below the allotted charge-induced force noise budget. In addition, experiments on the University of Florida torsion pendulum are being done to validate the model. Results will include the charge control simulation work, experimental results that match the simulation, and drawing conclusions on the most robust schemes for LISA.

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