Abstract Submitted
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Charge Control for Space Inertial Sensors: Numerical Modeling and Experimental Demonstrations[1] SAMANTHA PARRY, STEPHEN APPLE, ANTHONY Y. DAVILA, TAIWO OLATUNDE, University of Florida, HENRI INCHAUSPE, Laboratoire APC, Universit de Paris, DEREK KLEIN, LUKAS HERRON, GUIDO MUELLER, PETER WASS, JOHN W. CONKLIN, University of Florida — Capacitive inertial reference sensors in space are a necessary technology for earth geodesy and gravitational wave observations past and future. 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. The University of Florida's torsion pendulum is a ground-based experimental testbed of the free fall space environment. It is equipped with a LISA-like inertial sensor with a novel UV illumination scheme more robust to variations in photoemissivity and offering either increased redundancy or decreased complexity compared to the sensor on LISA. To test various charge control schemes, experiments using UV LEDs have been performed and match an analytical model developed to describe photon and photoelectron movement.

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