The Next Generation Lunar Retroreflector and Lunar Laser Ranging

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Fifty years ago, during the Apollo 11 mission, Buzz Aldrin deployed our first retroreflector array. To this day, our Lunar Laser Ranging (LLR) program continues to operate the retroreflector arrays and produce new and unique science. However, the combination of a flat array of 100 Cube Corner Retroreflectors (CCRs) and the lunar librations result in the most significant uncertainty in our current range measurements. To address this, NASA, within the Lunar Surface Instrument and Technology Payloads (LSTIP) program is supporting the University of Maryland, College Park to create three Next Generation Lunar Retroreflectors (NGLRs). Our NGLRs will support an improvement in a given range measurement by up to a factor of 100, depending upon the hardware and procedures of the LLR Observatories. A discussion of the role of the NGLR in the Lunar Geophysical Network (LGN) that will be proposed for the New Frontiers 5 solicitation will also be considered. The current designs for LSITP and NGL will be reviewed, with a discussion of some of challenges and their resolution. Addressing the science advances that are expected, several areas of lunar and gravitational physics will be reviewed, including the Lunar Fluid Core, the Excessive Tidal Dissipation, the Lunar Moments of Inertia, the Love Numbers, the Retroreflector Coordinates, the Physical Libration, the Flattening of CMB and the Weak Equivalence Principle and GravitoMagnetic Effects.

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