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Back-reflection from a Spiral Pattern Secondary Mirror for LISA

ZACHARY BUSH, AARON SPECTOR, GUIDO MUELLER, Univ of Florida - Gainesville — The Laser Interferometer Space Antenna (LISA) represents a class of proposed space-based gravitational wave observatories that will operate in the frequency band between 0.03 mHz and 1 Hz. These missions are characterized by a triangular constellation of three spacecraft (SC), separated by gigameters, in a heliocentric orbit. A reflecting telescope transfers the laser signals between the SC, and laser interferometry is used to measure length changes between proof masses housed on adjacent SC with pm/rtHz sensitivity. One of the proposed telescope designs is an on-axis 'quadpod' in which the secondary mirror is axially aligned to the primary mirror. Back-reflected (BR) light from the secondary can introduce phase noise to the measurement signal due to length changes between the telescope structure and the optical bench. Simulations have demonstrated that the BR power can be sufficiently attenuated by imprinting an anti-reflective spiral pattern in the reflective gold coating at the center of the secondary. Prototype secondaries were manufactured by depositing a layer of gold onto a germanium substrate and using photolithography to etch the spiral pattern. An experimental testbed was built to evaluate the secondary prototype's BR distribution and the results will be discussed.

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