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A 170 mm hollow corner cube retro-reflector on Chang'e 4 lunar relay satellite

Lunar Laser Ranging (LLR) has made great contribution to the investigations of the Equivalence Principle, the time variation of Newton's gravitational constant, the lunar rotation, tide and interior structure. However, because of the lunar libration, the precision of ranging measurement is now limited by the corner cube retro-reflectors (CCR) with array structure on the moon, which are made up of several small aperture (38 mm) CCRs. As a result, next generation of the LLR CCR is proposed to be a single one with large aperture. Consequently, we are developing a single aperture and hollow CCR, which will be carried by the Chang'e 4 lunar relay satellite (June 2018) to make a performance verification. This satellite will operate round the second Lagrange point of earth-moon system with Halo orbit of radius 12000 km. The averaging distance is 450000 km from the earth. The CCR has 170mm aperture and is formed by three pieces of ULE glass using the Hydroxide Catalysis Bonding technique. Each dihedral angles aim for ≤ 0.6 arc second to ensure a concentrated far-field diffraction pattern, hence it has equivalent reflecting property as the Apollo 15 CCR array on the moon. To simulate the experience of space environment, CCR need to be tested by a series of experiments, such as acceleration, vibration, impact, thermal vacuum, ultraviolet radiation and charged particle radiation experiments.