Characterization of the optical performance of COTS laser retroreflectors for ASI-INFN Joint Projects

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SCF_Lab (Satellite/lunar/GNSS laser ranging/altimetry and Cube/microsat Characterization Facilities Laboratory) is a specialized infrastructure, dedicated to design, characterization and modeling of the space segment of Satellite Laser Ranging (SLR), Lunar Laser Ranging (LLR) and Planetary Laser Ranging & Altimetry (PLRA) for industrial/scientific applications.

We present activities that have been performed for the next ASI-INFN project for Gravitational Physics studies through laser ranging. We typically perform the SCF-Test, a full solar thermo-vacuum-optical characterization of the cube corner retroreflectors that will be the key for the optical measurements and (potentially) lasercom of reflectors once launched in space.

We chose COTS (Commercial Off-The-Shelf) because of their lower cost and faster availability.

We report some preliminary results of the SCF-Test of these retroreflectors. First we characterize their Optical Cross Section in air and isothermal conditions and compare it to optical simulations previously carried out with Code V. For the typical SCF-Test, retroreflectors are set in a thermo-vacuum environment with temperature controlled at 300 K; during the heating phase, it faces the incoming solar beam for ~3 hours, it is then moved towards the optical window for continuous laser interrogation (Far Field Diffraction Patterns are recorded) during the cooling phase for ~3 more hours. The retroreflectors are also subjected to continuous thermometry during the whole test to correlate their optical performance vs. velocity aberration during the changing environmental conditions of the whole test.

We will present preliminary results with special emphasis on test setup and facilities, data collection and analysis, and post-processing analysis.