

Thermal Analysis of large Cube Corner Reflectors

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There are several critical challenges associated with developing a large Cube Corner Reflector (CCR) for lunar laser ranging. These consist of the fabrication to the required accuracy, the method of deployment on the lunar surface, the thermal performance and the associated return signal. The first two challenges will be briefly addressed and the latter will be described. In particular, the thermal analysis programs that have been developed for the “Lunar Laser Ranging Retroreflector for the 21st Century” or LLRRA-21 will be described in detail. This set of linked programs are designed to handle the absorption of the solar influx, both within the CCR and on the external surfaces, the radiation from the CCR and the housing to space, the interaction with the regolith and the internal heat exchanges will be described. The latter include the conduction at the tabs, the radiation exchange with the pocket, the radiation to space and the internal conduction. As a particular example, we will describe the behavior of a “bare” CCR, that is, the case of a CCR, which is subjected to the solar input and the radiation to space. Finally, the requirements and procedures for developing an optimal enclosure will be addressed.