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## EVALUATION OF THE INFRARED TEST METHOD FOR THE OLYMPUS THERMAL BALANCE TESTS

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### ABSTRACT

The present work reports on the performance of the infrared (IR) rig used for the thermal balance testing of the Olympus S/C thermal model. Included in this evaluation are the rig effects themselves, the IRFLUX computer code used to predict the radiation inputs, the Monitored Background Radiometers (MBR's) developed to measure the absorbed radiation flux intensity, the UTR (Uniform Temperature Reference) based temperature measurement system and the DPS data acquisition system.

The IR rig description and design has been reported in a previous paper (1). The logistics for the preparation and running of the rig and facilities are going to be detailed and compared to those for a Solar Simulation facility.

A preliminary set of verification tests were performed on a 1 m x 1 m zone to access the performance of the IR lamps, calrods, MBR's and aluminized baffles. The results were used, in part, to obtain some empirical data required for the IRFLUX code. This data included lamp and calrod characteristics, the absorptance function for various surface types, and the baffle reflectivities.

The MBR's were coated and calibrated with the same surface finishes as found in the S/C zones. Two different geometries were used; a round radiometer for all kapton surfaces (black paint, ITO) and a square MBR design for SSM's and white painted carbon fiber surfaces. Because eighty MBR's were used for the test, a mounting technique which did not interfere with the S/C surfaces was devised.

The temperature measurement system was based on UTR's located inside the chamber such that all feed-throughs were copper-copper. This system was devised to achieve a temperature measurement accuracy of  $\pm 0.2$  C for the over 900 thermocouples used in the tests. A primary and secondary real time data acquisition system were linked in order to provide continuous monitoring of all channels based on a two minute time scan.

The Olympus Thermal Model tests were divided in five phases: equinox, eclipse, sun off full power calibration, winter solstice and summer solstice. A detailed analysis for each S/C zone was performed to separate the effects of rig, shroud, the interaction of other S/C zones and the IR source radiation. For all tests phases the temperatures of the baffles, lamp and calrod supports, and major rig members were recorded. The radiation flux intensity on the S/C zones arising from the various rig elements was measured and compared with direct calculations and with pretest predictions.

(1) Design of an Orbital Heating Simulator Using IR Techniques by Donato et al, 13th Space Simulation Conference, 1984.