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SOLAR ORBITER HEAT SHIELD THERMAL PERFORMANCE DEMONSTRATED ON STM

Abstract

Solar Orbiter is the next solar-heliospheric mission in the ESA Science Directorate. The mission will provide the next major step forward in the exploration of the Sun and the heliosphere investigating many of the fundamental problems in solar and heliospheric science. One of the main design drivers for Solar Orbiter is the thermal environment, determined by a total irradiance of 13 solar constant (17500 W/m2) due to the proximity with the Sun. The spacecraft is normally in sun-pointing attitude and the main barrier to protect the satellite from severe solar energy is the Heat Shield. The Heat Shield is mainly composed by a panel aimed to provide a support and the interfaces with feed-throughs and doors for the Remote Sensing Payload. The insulation from the extreme external environment is guaranteed by high and medium temperature MLI blankets. A thermal verification campaign of the Heat Shield STM (Structural Thermal Model) has been performed in the second quarter of 2014 to verify the design and to correlate its thermal mathematical model. A first Thermal Balance test in vacuum was performed in May in the ESTEC Large Space Simulator where the heat Shield was subjected to a solar flux of 6 and 10 solar constants.. A second Thermal balance Test was performed in IABG in June where solar fluxes of 1.35 and 0.44 solar constant were used. This paper will describe the Heat Shield thermal design, how the Thermal Balance Tests were performed and the relevant TMM correlations.