

Preliminary Thermal Design Analysis of Large-Sized Infrared Telescope for SPICA

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An ambitious spacecraft mission named SPICA is intended to make high-resolution infrared astronomical observations. The spacecraft, which is launched by the H-IIA launch vehicle, is finally swung into a halo orbit around the Sun-Earth Lagrangian liberation point 2 (S-E L2). The telescope of 3.5 m diameter is required to keep at 4.5 K in the inside and 1.5 K for a far-infrared observation instrument on the focal plane over a long period of mission operations. This telescope system is radiatively cooled down and then mechanically refrigerated without cryogenes. It is, therefore, crucial to achieve practical and efficient thermal design for mission success. In this paper, we carry out axial and radial temperature predictions in some cases where different types of the H-IIA payload fairing are used, considering the aperture ration, the radiation area, the shield thickness and materials as design parameters. Finally we propose an optimum structure of this infrared telescope.