Cold Payload Module of SPICA

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***Abstract*— The Space Infrared Telescope for Cosmology and Astrophysics (SPICA) is a large (3.2m physical diameter), cooled (below 6K) telescope mission which covers mid- and far-IR astronomy with unprecedented sensitivity. Here we present an overview of cold payload module (PLM) and its recent design updates. The PLM consists of the Scientific Instrument Assembly (SIA) cooled without cryogen, the mechanical coolers, and the radiation shields to block the heat from the sun and the bus module. The SIA consists of the telescope assembly and the instrument optical bench equipped with focal plane instruments(FPIs). The SIA is refrigerated to below 6 K by two sets of 4K-class Joule-Thomson (JT) cooler, and a long-wavelength detectors of FPIs are refrigerated to 1.7 K by two sets of 1K-class JT coolers.**

SPICA is transferred into the sun-earth L2 point, where radiation cooling is very efficient. However, since the cold telescope is mandatory for the success of the mission, extremely high reliability of the cooling system is required. We will present the redundancy policy, the thermal margin philosophy, and basic experimental activities to establish the high reliability.

The current FPI suite will be consolidated based on the international science and engineering review. The baseline FPIs are: a mid-IR coronagraph (SCI), a mid-IR camera and spectrometer (MCS), an imaging Fourier-transform spectrometer operating in the far-IR (SAFARI), and a focal plane camera (FPC) used for fine guidance. The FPC has two channels for redundancy, one of which is proposed for scientific use at the 0.7–5 micron waveband. The US community is proposing a far-IR/submillimetre spectrometer, which is more sensitive than SAFARI but has no imaging capability, and hence can be complementary with SAFARI.