

SPICA and future infrared observations of cosmic matters

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SPICA (Space Infrared Telescope for Cosmology and Astrophysics) is an ESA-JAXA joint mission for infrared astrophysics. The main goal of the mission is to make significant contribution to answer the essential questions; how the universe has evolved to the current state of being rich in metals and cosmic dust, and how our solar system involving life has formed and developed.

SPICA is equipped with a 2.5 m telescope operated at cryogenic temperature (8 K). Three scientific instruments on board are SPICA Mid-infrared Instrument (SMI), SPICA Far-infrared Instrument (SAFARI) and Magnetic field explorer with Bolometric Polarimeter (B-BOP). SMI covers 18-36 μm with spectral resolutions $R \sim 100$ or 2000, and 12-18 μm with $R \sim 28000$ and it is also capable of imaging at 34 μm . SAFARI observes 34-230 μm in four wavelength bands at spectral resolution of $R \sim 300$ or 2000-11000. B-BOP carries out imaging polarimetry at 100, 200, and 350 μm .

Thanks to the cryogenic telescope and the cutting-edge sensor technique, SPICA will realize sensitivity two orders of magnitude better than that in the previous missions such as Herschel. Significant fraction of the observing time will be open to the committee as proposal-based observations. Various celestial objects can be targets for observation with SPICA. For instance, high-quality spectroscopic data of trans-Neptunian objects and planet-forming circumstellar disks may clarify detailed formation process of our solar system. Observation of circumstellar dust of mass-losing stars at various environments will inform us how the cosmic dust are provided into our universe.

SPICA was selected as one of three candidates for ESA Cosmic Vision M5 mission from 25 proposals in May 2018, and it is currently under conceptual design. JAXA is a major partner, and will provide cryogenic payload module (PLM) and SMI. SAFARI and B-BOP are provided by the European consortia. The final selection of M5 will be in mid 2021, and the launch is expected to be late 2020's.

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