SPICA Mid-Infrared Instrument (SMI)


SPICA Mid-infrared Instrument (SMI) is one of the two focal-plane scientific instruments planned for SPICA. SPICA covers a wavelength range of 12–36 μm with the three spectroscopic channels: low-resolution spectroscopy (LRS; 17–36 μm, plus broad-band camera at 34 μm), mid-resolution spectroscopy (MRS; 18–36 μm), and high-resolution spectroscopy (HRS; 12–18 μm).

SMI specifications

- **LRS**: prism (4 slits, 10' long, R~100), combined with a 10'x12' slit viewer. High-speed dust-band mapping.
- **MRS**: Echelle grating with a cross-disperser (1' long, R~2000), combined with a beam-steering mirror. High-sensitivity multi-purpose spectral mapping.
- **HRS**: CdZnTe immersion grating (R~30000), realizing compact optics. High-resolution molecular-gas spectroscopy.

Optical design

Mechanical design

SMI key sciences

- **LRS** surveys will detect organic matters (PAHs) from many high-z galaxies and minerals from many planet-forming disks, while **MRS** will characterize them. **HRS** will characterize molecular gases and resolve their velocities in planet-forming disks.

PAH galaxy survey in the Universe

- Wide area spectroscopic survey with **LRS** (10 deg²; 600 hrs)
  - Detection of ~50000 PAH galaxies at z up to 5
  - Diagnosis of PAH galaxies, & provision of targets for **MRS** and **SAFARI**
  - Characterization of PAH galaxies in the Universe

Protoplanetary/debris disks to our Solar system

- High-resolution spectroscopy with **HRS**
  - Planet formation and evolution by probing gas dispersal, determining snow-line location
  - Wide area survey and targeted observations with **LRS**
  - Debris disks down to levels close to our Solar system

Demonstration of SMI mapping capability