

PRIMA

THE PROBE FAR-INFRARED MISSION FOR ASTROPHYSICS

A community-driven general-observer-accessible far-IR-optimized observatory for 2030.

- JPL implementation lead, GSFC key contributions.
- International partnerships in development.
- A cryogenic telescope with a target aperture of 2-3 meters.

Science and hardware formulation underway – inputs welcome.

Potential instrumentation capabilities:

Imaging / Polarimetry: ~10 to 300 μm

- Mapping speed: $\sim 10 \left(\frac{\text{deg}^2}{\text{hour}}\right) \left(\frac{F}{1 \text{ mJy}}\right)^2 \left(\frac{1}{\text{SNR}}\right)^2$ (Extragalactic confusion limited for $\lambda > 70 \mu\text{m}$).

Base low-resolution spectroscopy w/ wideband gratings: ~25 to 330 μm .

- Resolving power 60 to 250.
- Unprecedented line surface brightness sensitivity (bottom center figure).
- Spectral-line sensitivity when pointed: 5σ , 1 hour of 5×10^{-20} to $2 \times 10^{-19} \text{ W/m}^2$ (top right).
- Full instantaneous coverage of at least one \sim octave bandwidth spectrometer band at a time, multiple bands simultaneously on source is a goal.
- Mapping speed: 10^{-1} to 10^{-4} sq degrees per hour to $3 \times 10^{-19} \text{ W/m}^2$ (bottom right figure).

Medium-resolution capability using addition to low-resolution gratings: same 25-330 μm band.

- Available resolving power: up to 5000-8000.
- Sensitivity range: 5σ , 1 hour of 10^{-19} to $2 \times 10^{-18} \text{ W/m}^2$ per spectral resolution element (or unresolved line).
- Mapping speed in medium-res mode: modest, to be determined, depends on R desired.

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