



Planetary Origins and Evolution Multispectral Monochromator



The NASA Pioneers mission POEMM is a balloon-borne 1.8-m telescope, combined with state-of-the-art spectrometers and detectors developed by the POEMM team, to study planet formation and evolution with uniquely powerful far-infrared (FIR) diagnostics.

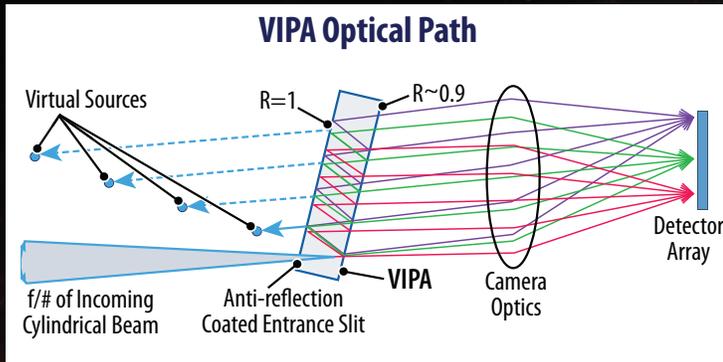
How do Gas Giants, Ice Giants, and Earth's Oceans Form?



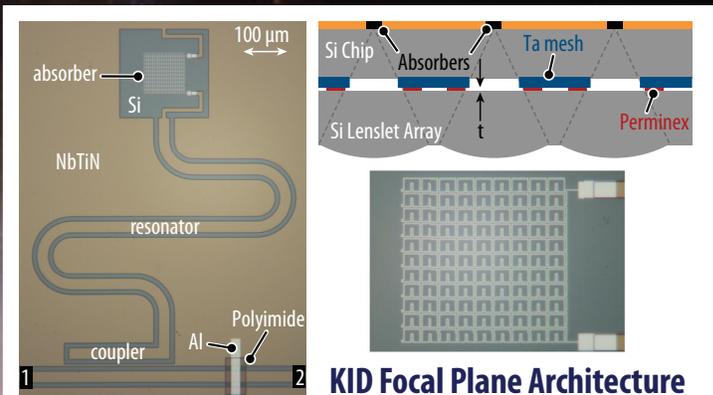
POEMM Planetary Origins and Evolution Multispectral Monochromator



POEMM leverages breakthrough FIR (Terahertz) spectrometer and detector technologies recently developed by the POEMM team to create a powerful new system dedicated to revealing the processes involved in planet formation and evolution.



Enabling Spectrometer Technology. Team members (Cornell/GSFC) recently demonstrated a Virtually Imaged Phase Array (VIPA) for the FIR. The FIR VIPA offers high sensitivity and high spectral resolving power (RP) in a compact device with no moving parts, resulting in factors of 8 times better sensitivity than other high RP THz technologies (Zou et al. 2025).



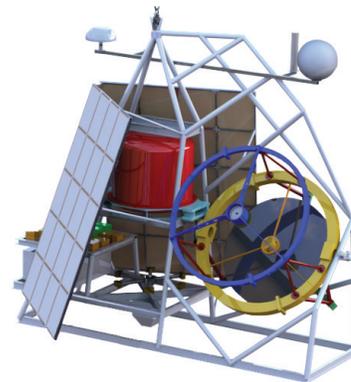
Enabling Detector Technology. Team members (SRON) recently perfected extremely low-noise Kinetic Inductance Detector (KID) technologies suitable for POEMM's three 8 x 64-pixel focal planes. New, highly efficient absorbers enable detection at fundamental limits (Dabironezare et al. 2025).

The POEMM Advantage:

- POEMM is 5x more sensitive with 100x the spectral resolving power of the Herschel PACS spectrometer.
- POEMM is 10x more sensitive than state-of-the-art heterodyne receivers at the POEMM wavelengths.
- POEMM accesses critical water ice features that are/were not observable with Spitzer, Herschel, JWST or ALMA.

POEMM's Spectrometers Include:

- Two VIPA-based modules (HR1 and HR2) will velocity resolve HD, water, and [OI] lines from exoplanetary disks, pinpointing the spatial distribution of the species tomographically.
- A broad-band (35 to 70 μm) low-resolution grating spectrometer LR to detect the critical water ice emission features at 43, 47 and 62 μm .



POEMM Mission
Observatory Gondola



Past Launch
Example

POEMM Mission utilizes a 1.8-m telescope with all aluminum mirrors (developed and fabricated at NASA MSFC) carried to 35 km float altitude by a NASA GSFC WFF zero-pressure balloon launched from McMurdo Station, Antarctica, for a planned 20-day (2 polar orbits) mission.

These recent VIPA and KID developments show that we will exceed our proposed system sensitivity requirements by factors 2 to 3!