



Photonic Integrated Circuit TUned for Reconnaissance and Exploration (PICTURE)

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Target: comets and planetary/moon atmospheres, including Mars and Titan.

Science:

- High resolution ($R \sim 15000$) spectroscopy :
- *Trace gas detection* (e.g. methanol in comets, CH_4 on Mars, aromatic molecules on Titan).
- *Isotopic measurements*: including important tracers of solar system formation such as D/H from HDO/H_2O in comets, Mars.
- Figure 1 shows need for high spectral resolution to separate gases: example CO , H_2O .

Objectives:

- To design, build and test a Photonic Integrated Circuit Spectrometer (PICS, Fig. 2) to enable high-resolution, solid state spectroscopy in the near and mid-infrared (1-5 μm).
- A PICS spectrometer with low mass and power requirements will be *mission-enabling* for high-resolution spectroscopy from small platforms.

Key Milestones:

- Year 1: PICS Breadboard at 1572 nm for sampling CO_2 ; Mid-IR Quantum Cascade Laser (QCL) design.
- Year 2: Manufacture & characterization of MIR AWG and QCL.
- Year 3: Integration and Test (I&T) of full PICS subsystem.

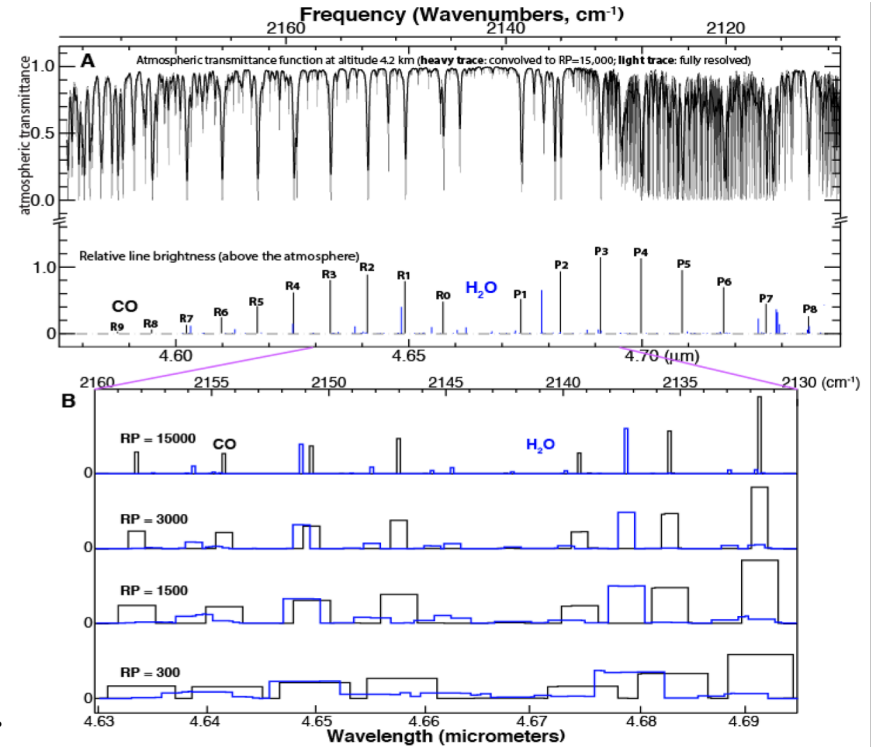


Fig. 1

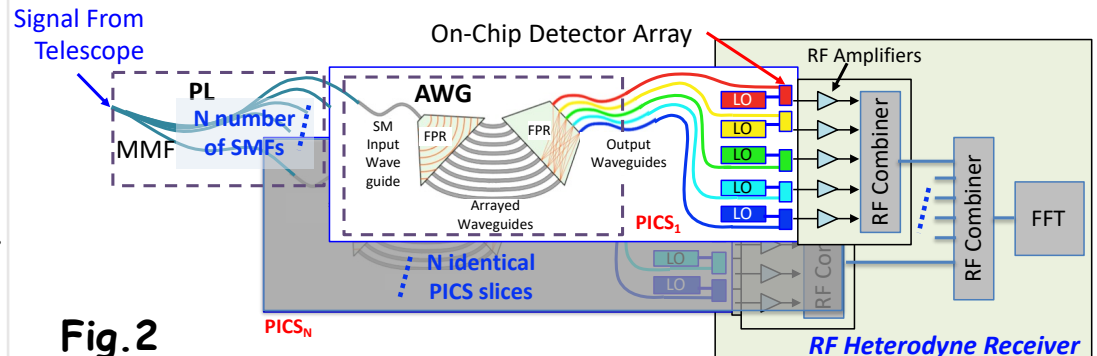


Fig. 2

TRL 2 (entry) to 4 (exit)