A 2U SWIR-MIR Point Spectrometer for SmallSat and Landed Missions: Enabling Characterization of Solar System Volatiles

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**Instrument Objectives**

- To develop a small, scientifically capable, readily-replicable IR point spectrometer, miniaturizing by several factors a crucial (and proven) technique to enable assay of volatiles, minerals, organics, and ices from small satellites
- A key element of the Intrepid (NEO-100) mission concept science payload, as well as a versatile instrument for many other CubeSat & SmallSat concepts (2U form factor)
- Of size and capability suitable for mass-constrained landers and commercial opportunities
- Surface volatile assessment (quantity, nature of the host materials) and mineralogy enabled by wavelength ranges SWIR (2 – 4 µm) and Thermal IR (5.5 – 12 µm) in a single instrument

**Scientific Drivers and Capabilities**

Mineral types of silicates, salts, organics, and ices give insight into geological processes and chemical evolution

**Volatiles, Organics, and Hydrous Minerals**
- Ice presence/absence (3.0-3.2 µm)
- Hydrated/hydroxylated minerals and ices (2.72-2.95 µm)
- Organics (3.25-3.45 µm)
- Carbonates (3.45-3.55 µm)
- Hydrated/hydroxylated minerals (9.0-9.29 µm)
- Organics (~9 µm)
- Minerals (~10 µm)

**Silicate and Amorphous Phases**
- The Christensen feature and Rachwalhal feature change in wavelength with silicate polymerization and amorphous vs. crystalline materials (8.0-11.0 µm)
- Organics (~9 µm)
- Carbonates (~7.0 µm)

**Performance Model**

Our instrument is optimized to detect volatiles and silicates on bodies (even very dark bodies) from 1 AU to the edge of the Main Belt.

**Plans for the Remaining 6 Months of FY’19**

- Measure BIRD in dark.
- Previous noise was 2x higher due to unstable temperature and stray light.
- Integrate optics into instrument.
- All the optics have been delivered and are ready for installation.
- Measure BIRD with optics.
- Integrate thermopile into instrument for simultaneous performance test
- Demonstrate w/ asteroid analogs at room temperature.
- Ready for SmallSat (e.g., SIMPLEx) and Lander (e.g., Commercial Lunar) opportunities as well as Discovery, New Frontiers – contact us.

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