



T0257

INTREPID Particle Detector

Technology Need

Exploration beyond Earth requires the understanding and composition of the space and surrounding environments. Existing technologies are physically large, fragile, power hungry and/or require post-processing.

INTREPID is a low-cost highly integrated COTS-based instrument that can detect, and discriminate between, neutrons and gamma rays. Such an instrument will allow us to characterize the radiation environment on small-satellite or rover-based platforms and assist in identifying potentially habitable environments and resource exploration.

Technology Concept

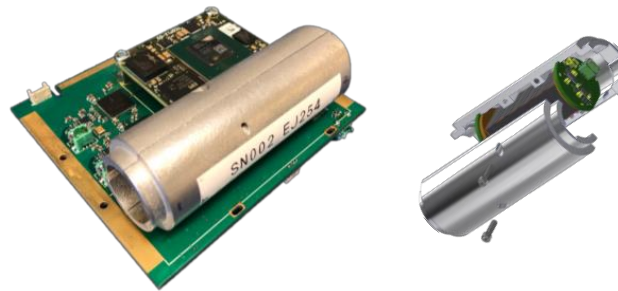
INTREPID is a highly integrated gamma / neutron particle detector. It utilizes specialized scintillators coupled with an array of silicon photomultipliers to detect the particle environment. Particle events are conditioned, digitized and processed in real-time to reduce data overhead. This combination of technology and data processing enables unprecedented miniaturization.

Technology Development Team

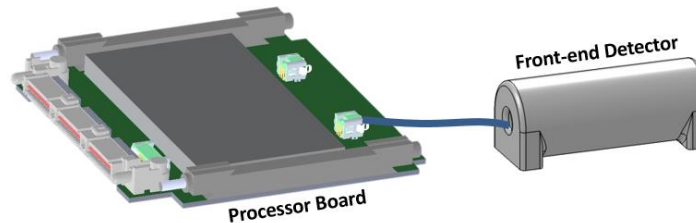
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Test Apparatus

- Size/Weight:** <1U, ~500 g
- Custom Interfaces Req.:** This instrument is intended to be integrated with the ADP Avionics and flown together
- Hazards/safety:** No concerns, standard electronics parts. No radiation source involved (detector only)
- Payload Details:**
 - Front-end particle detector (2.5 cm Ø x 8 cm)
 - Processor-board (9 cm x 9 cm x 1.5 cm).



Drill-based Intrepid v1.0



Space-based Intrepid v2.0

Flight Requirements/Objectives

- Flight Vehicle:** High altitude balloon
- No. of Flights Req.:** 1
- Flight-readiness:** Sep 15, 2020 (PL handover)
- No. of Personnel Req.:** 3
- Flight Test Plan:** Remove RBF - subsystems power up, take measurements during ascent, float (2hrs @ 30.5 km/100,000 ft), and descent

Technology Advancement

Success Criteria: Functional and performance test of the Intrepid particle detector in a space-like environment.

Start TRL: 4 End TRL: 6

Advancement of state-of-the-art: The balloon flight will enable the first data sampling using intrepid in a high altitude radiation environment, validating the sensor.

Technology End Users

Users: NASA CubeSat programs, CubeSat based astrophysics science mission, planetary exploration with micro drills on compact rovers
Applications: Geochemical analysis (prospecting), radiation analysis, astrophysics