S1.09 In Situ Sensors and Sensor Systems for Planetary Science

Lead Center: JPL

Participating Center(s): ARC, GSFC, JSC, LaRC, MSFC

This subtopic solicits development of advanced instruments and instrument components that are tailored to the
demands of planetary instrument deployment on a variety of space platforms (orbiters, flyby spacecraft, landers,
rovers, balloon or other aerial vehicles, subsurface penetrators or impactors, etc.) accessing the wide variety of
bodies in our solar system (inner and outer planets and their moons, comets, asteroids, etc.). For example
missions see: http://science.hq.nasa.gov/missions/solar_system.html.

Specifically, this subtopic solicits instrument development that provides significant advances in the following areas:

- Reduced mass, power, volume, data rates for instruments or instrument components that could be
  achieved in optomechanical components (e.g., room temperature lasers, detectors, mixers, microvalves,
  optical components and structures, gas and liquid pumps, ion sources, light sources from UV to microwave,
  seismometers, etc.) or electronics (e.g., FPGA, ASIC implementations, advanced array readouts);
- Improved g-force survivability for rough landings on Mars, Moon, or comet/asteroid bodies;
- Mitigation strategies for tolerance to high-radiation environments like that around Europa;
- High temperature and/or high pressure lifetime improvement for instruments landed on Venus;
- Low temperature survivability or lifetime improvement for instruments landed on cryogenic outer planet
  bodies or deployed to the subsurface;
- Advanced sample handling and manipulation technologies for challenging environments and planetary
  protection.

Proposers are strongly encouraged to relate their proposed development to (a) future planetary exploration goals of
NASA; and (b) existing flight instrument capability to provide a comparison metric for assessing proposed
improvements.

Instruments for both remote sensing and in situ investigations are required for NASA's planned and potential solar
system exploration missions. Instruments are required for the characterization of the atmosphere, surface, and
subsurface regions of planets, satellites, and small bodies. These instruments may be deployed for remote
sensing, on orbital or flyby spacecraft, or for in situ measurements, on surface landers and rovers, subsurface
penetrators, and airborne platforms. In situ instruments cover spatial scales from surface reconnaissance to
microscopic investigations. These instruments must be capable of withstanding operation in space and planetary
environmental extremes, which include temperature, pressure, radiation, and impact stresses.

Proposals should show an understanding of one or more relevant space science needs, and present a feasible
plan to fully develop a technology and infuse it into a NASA program.