# NASA SBIR 2008 Phase I Solicitation

## S1.06 Particles and Field Sensors and Instrument Enabling Technologies

**Lead Center: GSFC**

**Participating Center(s): ARC, JPL, MSFC**

Advanced sensors and instrument enabling technologies for the measurement of the physical properties of space plasmas and energetic charged particles, mesospheric-thermospheric neutral species, energetic neutral atoms created by charge exchange, and electric and magnetic fields in space are needed to achieve NASA's transformational science advancements in Heliophysics. The Heliophysics discipline has as its primary strategic goal the understanding of the physical coupling between the sun's outer corona, the solar wind, the trapped radiation in Earth's and other planetary magnetic fields, and to the upper atmospheres of the planets and their moons. This understanding is of national importance not only because of its intrinsic scientific worth, but also because it is the necessary first step toward developing the ability to measure and forecast the "space weather" that affects all human crewed and robotic space assets. Improvements in particles and fields sensors and associated instrument technologies will enable further scientific advancement for upcoming NASA missions such as Solar Probe (http://solarprobe.gsfc.nasa.gov/), Solar Orbiter (http://www.rssd.esa.int/index.php?project=SOLARORBITER), Solar Sentinels (http://www.lws.nasa.gov/missions/sentinels/solar_sentinels_orbiter.htm), GEC, Magnetospheric Constellation (http://stp.gsfc.nasa.gov/missions/mc/mc.htm), IT-SP (http://www.lws.nasa.gov/missions/geospace/geospace.htm) and some planetary exploration missions. Technology developments that result in expanded measurement capabilities and a reduction in size, mass, power, and cost are necessary in order for some of these missions to proceed. Of special interest are magnetometers, fast high voltage stepping power supplies for charged particle analyzers, electric field booms and other supporting sensor electronics. Specific areas of interest include:

- Low cost, low power, low current, high voltage power supplies which allow ultra-fast stepping (t < 100- Î¼s) over the full voltage range (0 < V < 5-15 kV).
- Self-calibrating scalar-vector magnetometer for future Earth and space science missions. Performance goals: dynamic range: +/-100,000 nT, accuracy with self-calibration: 1 nT, sensitivity: 5 pT / sqrtHz, max sensor unit size: 6 x 6 x 12 cm, max sensor mass: 0.6 kg, max electronics unit size: 8 x 13 x 5 cm, max electronics mass: 1 kg, and max power: 5 W operation, 0.5 W standby, including, but not limited to "sensors on a chip".
- Strong, lightweight, thin, compactly-stowed electric field booms possibly using composite materials that deploy sensors to distances of 10 m or more and/or long wire boom (> 50 m) deployment systems for the deployment of very lightweight tethers or antennae on spinning spacecraft.
- Low power charge sensitive preamplifiers on a chip.
- Radiation hardened ASIC spectrum analyzer module that determines mass spectra using fast algorithm deconvolution to produce ion counts for specific ion species.

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