NASA SBIR 2017 Phase I Solicitation

S1.06 Particles and Field Sensors and Instrument Enabling Technologies

Lead Center: GSFC

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

Technology Area: TA8 Science Instruments, Observatories & Sensor Systems

Advanced sensors for the detection of elementary particles (atoms, molecules and their ions) and electric and magnetic fields in space and associated instrument technologies are often critical for enabling transformational science from the study of the sun's outer corona, to the solar wind, to the trapped radiation in Earth's and other planetary magnetic fields, and to the atmospheric composition of the planets and their moons. Improvements in particles and fields sensors and associated instrument technologies enable further scientific advancement for upcoming NASA missions such as CubeSats, Explorers, STP, and planetary exploration missions. Technology developments that result in a reduction in size, mass, power, and cost will enable these missions to proceed. Of interest are advanced magnetometers, electric field booms, ion/atom/molecule detectors, and associated support electronics and materials. Specific areas of interest include:

- High efficiency reliable cold ionizers to ionize neutral gas as an alternative to thermionic emitters.
    - Science Traceability: Decadal survey missions: DRIVE Initiative, EXPLORERs DISCOVERY, CubeSats / Smallsats, Sounding Rockets.
    - Need Horizon: 1 to 3 years, 3 to 5 years.
    - Reliable and efficient cold ionizers are desires as an alternative to commonly used thermionic emitters. Possible use of nanotechnology. Efficiency >1%.
    - Importance: Very High – Critical need for next generation low energy neutral particle spectrometers.
- Strong, compactly stowed magnetically clean magnetic field booms possibly using composite materials that deploy mag sensors (including internal harness) to distances up to 10 meters, for Cubesats;
    - Science Traceability: Explorer missions, DRIVE Initiative, CubeSat/Smallsat missions.
    - Need Horizon: 1 to 3 years.
    - State of the Art: Such a boom up to 10 meters long will high quality electric filed measurements from small platforms.
    - Importance: Very High for future Cubesat and SmallSat stand alone and constellation missions.
- Control Element for High Voltage Power Supplies.
    - Science Traceability: Decadal survey missions: IMAP, MEDICI, DRIVE Initiative, EXPLORERs DISCOVERY, CubeSats / Smallsats, Sounding Rockets.
    - Need Horizon: 1 to 3 years, 3 to 5 years.
    - State of art high voltage controller device with the following basic characteristic. Control from standard voltage of 3.3V to 5V, HV switch of up to 20KV, HV isolation up to 25KV, low leakage currents, slew rates of 100V/us on 10pf loads, mil spec temperature range, radiation tolerance up to 300 krads.