NASA SBIR 2019 Phase I Solicitation

S1.06 Particles and Fields Sensors & Instrument Enabling Technologies

Lead Center: GSFC

Participating Center(s): GSFC

Technology Area: TA8 Science Instruments, Observatories & Sensor Systems

While the size distribution of matter in space that ranges from large-scale (planets – moons – asteroids – dust) objects is quite well characterized down to micron-sized dust particles, below that there is a significant, largely unobserved gap down to single ions/electrons/ENAs. To cover the observational gap between 10-6m and 10-10m in particle size that includes nano-dust and molecules in space, new technology investment is needed. 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, LWS, 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, dust particle detectors, and associated support electronics and materials.

Low energy particle instruments often require significant high voltage power supplies up to 20KV. Linear control of high voltage with optical isolation is highly desirable in space plasma instrument. General specifications 3.3 to5V control, 10KV to 20KV high voltage, low leakage current, up to 25KV isolation voltage, Fast slew rate >200V/us; temperature insensitivity on the range -35° C to +55° C, radiation hardness >1~200Keads.

Subtopic is relevant to NASA Explorer missions, Decadal survey missions MIDEX, GDC, DYNAMICS, DRIVE Initiative, DISCOVERY, New Frontiers; CubeSat and SmallSat missions; and Sub-orbitals.

The desired deliverables of a Phase II are prototype and hardware. A prototype component that can be tested in engineering model plasma instrument. The expected Technology Readiness Level (TRL) range at completion of the project is 5-7.

NASA has plans to purchase services for delivery of payloads to the Moon through the Commercial Lunar Payload Services (CLPS) contract. Under this subtopic, proposals may include efforts to develop payloads for flight demonstration of relevant technologies in the lunar environment. The CLPS payload accommodations are yet to be precisely defined, however at least for early missions, proposed payloads should not exceed 15 kilograms in mass and not require more than 8 watts of continuous power. Smaller, simpler, and more self-sufficient payloads are more likely to be accommodated. Commercial payload delivery services may begin as early as 2020 and flight opportunities are expected to continue well into the future. In future years it is expected that payloads of higher mass and with higher power requirements might be accommodated. Selection for award under this solicitation will not guarantee selection for a lunar flight opportunity.