NASA STTR 2015 Phase I Solicitation

T8 Science Instruments, Observatories and Sensor Systems

Lead Center: HQ

Science Instruments, Observatories, and Sensor Systems addresses technologies that are primarily of interest for missions sponsored by NASA's Science Mission Directorate and are primarily relevant to space research in Earth science, heliophysics, planetary science, and astrophysics. This topic consists of three Level 2 technology subareas:

- Remote sensing instruments/sensors.
- Observatories.
- In situ instruments/sensors.

Subtopics

T8.01 Technologies for Planetary Compositional Analysis and Mapping

Lead Center: JPL

Participating Center(s): GSFC, LaRC

This subtopic is focused on developing and demonstrating technologies for both orbital and in situ compositional analysis and mapping that can be proposed to future planetary missions. Technologies that can increase instrument resolution, precision and sensitivity or achieve new and innovative scientific measurements are solicited. For example missions, see (http://science.hq.nasa.gov/missions). For details of the specific requirements see the National Research Council's, Vision and Voyages for Planetary Science in the Decade 2013-2022 (http://solarsystem.nasa.gov/2013decadal/).

Possible areas of interest include:

- Improved sources such as lasers, LEDs, X-ray tubes, etc. for imaging and spectroscopy instruments (including Laser Induced Breakdown Spectroscopy, Raman Spectroscopy, Deep UV Raman and Fluorescence spectroscopy, Hyperspectral Imaging Spectroscopy, and X-ray Fluorescence Spectroscopy).
- Improved detectors for imaging and spectroscopy instruments (e.g., flight-compatible iCCDS and other time-gated detectors that provide gain, robot arm compatible PMT arrays and other detectors requiring high voltage operation, detectors with improved UV and near-to-mid IR performance, near-to-mid IR detectors with reduced cooling requirements). Technologies for 1-D and 2-D raster scanning from a robot arm. Novel approaches that could help enable in situ organic compound analysis from a robot arm (e.g., ultra-miniaturized Matrix Assisted Laser Desorption-Ionization Mass Spectrometry). "Smart software" for

evaluating imaging spectroscopy data sets in real-time on a planetary surface to guide rover targeting, sample selection (for missions involving sample return), and science optimization of data returned to earth. Other technologies and approaches (e.g., improved cooling methods) that could lead to lower mass, lower power, and/or improved science return from instruments used to study the elemental, chemical, and mineralogical composition of planetary materials. Improved technologies for the handling and fine manipulation of solid or powdered surface samples that could be coupled to robotic arm- or body-mounted analytical instruments.

Projects selected under this subtopic should address at least one of the above areas of interest. Multiple-area proposals are encouraged. Proposers should specifically address:

- The suitability of the technology for flight applications, e.g., mass, power, compatibility with expected shock and vibration loads, radiation environment, interplanetary vacuum, etc. Advantages of the proposed technology compared to the competition. Relevance of the technology to NASA's planetary exploration science goals.

Phase I contracts will be expected to demonstrate feasibility, and Phase II contracts will be expected to fabricate and complete laboratory testing on an actual instrument/test article.

T8.02 Visible to Far-Infared Absolute Radiance Developments

Lead Center: LaRC

Participating Center(s): GSFC

This solicitation seeks to advance the state of the art in absolute radiance measurements in the visible through the far-infrared (0.3 - 50 µm wavelength). Technologies to increase accuracy, precision, and sensitivity of absolute radiance measurements are desired. These wavelengths are of specific interest to remote sensing applications for both Earth science and planetary exploration missions.

Areas of interest include:

- Develop detector technologies to improve absolute radiance measurements in the infrared (1 - 50 µm wavelength) by increasing sensitivity, decreasing noise levels, and reducing or removing cooling requirements.
- Study and thoroughly characterize the non-linearities present in infrared detectors, specifically pyroelectric and mercury cadmium telluride (MCT), in the 5 - 50 µm wavelength region.
- Develop detector technologies to improve absolute radiance measurements in the visible to near infrared (0.3 - 8 µm wavelength).
- Develop novel compact lightweight high performance blackbody calibration source that may be enabled by recent developments in high emissivity surface treatments.
- Develop revolutionary compact, lightweight, and high performing infrared spectrometer (5 - 50 µm wavelength).

Proposals should specifically address one or more of the previously listed areas and include:

- Advantages and improvements of the proposed technology relative to current standards.
- Relevance of the technology to NASA’s science goals.

Phase I deliverables - Feasibility study and documentation of clear path to working prototype in Phase II for hardware topics or complete report characterizing infrared detector non-linearities.

Phase II deliverables - Working prototype hardware with thorough documentation of development and complete testing and characterization results.