NASA SBIR 2017 Phase I Solicitation

H11.01 Radiation Shielding Technologies for Human Protection

Lead Center: LaRC

Participating Center(s): JSC, MSFC

Technology Area: TA6 Human Health, Life Support and Habitation Systems

Advanced radiation shielding technologies are needed to protect humans from the hazards of space radiation during future NASA missions. All space radiation environments in which humans may travel in the foreseeable future are considered, including the Moon, Mars, asteroids, geosynchronous orbit (GEO), and low Earth orbit (LEO). All particulate radiations are considered, particularly galactic cosmic radiation (GCR), solar energetic particles (SEP), and secondary neutrons.

For this 2017 solicitation, technologies of specific interest include, but are not limited to, the following:

- Computational tools that enable the evaluation of the transport of space radiation through highly complex vehicle architectures as represented in detailed computer-aided design (CAD) models are needed. The needed tools are the following:
    - An easy way to manipulate metadata for CAD or CAD-derived geometries, such as materials and densities for input into radiation transport codes;
    - A general method of scoring/tallying that can be equated across multiple radiation transport codes and validating these equivalencies;
    - A general method/interface of radiation transport problem setup that can be used for many different radiation transport codes. This would include (1) and (2) above, as well as allow for radiation source selection for various spectral and special distributions common to space radiation problems, provide this setup data to create input files for many different radiation transport codes (HZETRN, PHITS, FLUKA, GEANT4, etc.), and provide error checking for incompatible user inputs;
    - Provide a tool for visualizing vast numbers of complex radiation transport data sets allowing the user to evaluate quickly scored/tallied parameters in the context of the three-dimensional geometry used in the problem setup. The tool should also be able to move quickly through any or all parameters that were scored/tallied in the problem setup. Phase I deliverables are alpha-tested computer codes. Phase II deliverables are beta-tested computer codes.

- Processing/manufacturing/construction technologies for habitation that utilize in-situ resources (atmosphere, water, regolith, etc.) for radiation shielding on Mars are also of interest. Phase I deliverables are detailed conceptual designs. Phase II deliverables are initial prototypes.
- Credible “out-of-the-box” solutions for space radiation shielding. This could include passive or active radiation shielding solutions. Phase I deliverables are detailed conceptual designs. Phase II deliverables are initial prototypes.