NASA SBIR 2016 Phase I Solicitation

H11 Radiation Protection

The SBIR Topic area of Radiation Protection focuses on the development of 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. All space radiation environments in which humans may travel in the foreseeable future are considered, including geosynchronous orbit (GEO), Moon, Mars, and the Asteroids. Advances are needed in mitigation schema for the next generation of exploration vehicles and structures technologies to protect humans from the hazards of space radiation during NASA missions. As NASA continues to form plans for long duration exploration, it has become clear that the ability to mitigate the risks posed to crews by the space radiation environment is of central importance. Advanced computer codes are needed to model and predict the transport of radiation through materials and subsystems, as well as to predict the effects of radiation on the physiological performance, health, and well-being of humans in space radiation environments.

A number of codes and computational packages currently exist that can be used to assess the transport of the diverse particle and energy spectra of the space environment through shielding materials. However, using these transport codes on geometry represented by complex CAD models requires considerable human intervention. Computational tools that automate vehicle ray tracing for use with the NASA-developed HZETRN space radiation transport code are needed to enable vehicle dose mapping and a larger vehicle optimization capability. Tools that enable the use of Monte-Carlo transport codes with native CAD geometry could also make it possible to perform radiation analyses for space architectures using multiple transport codes. Research under this topic should be conducted to demonstrate technical feasibility during Phase I and show a path forward to Phase II software demonstration. Phase I deliverables are alpha-tested computer codes. Phase II deliverables are beta-tested computer codes.

Subtopics

H11.01 Radiation Shielding Technologies - Transport Codes

Lead Center: LaRC

Participating Center(s): MSFC

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 2016 solicitation, the special interest is in advanced space radiation transport codes. Mid-TRL (3 to 5) 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. A number of codes and computational packages currently exist that can be used to assess the transport of the diverse particle and energy spectra of the space environment through shielding materials. However, using these transport codes on geometry represented by complex CAD models requires considerable human intervention. Computational tools that automate vehicle ray tracing for use with the NASA-developed HZETRN space radiation transport code are needed to enable vehicle dose mapping and a larger vehicle optimization capability.
- Tools that enable the use of Monte-Carlo transport codes with native CAD geometry could also make it possible to perform radiation analyses for space architectures using multiple transport codes.
- Phase I deliverables are alpha-tested computer codes.
- Phase II deliverables are beta-tested computer codes.

For additional information, please see the following link:
(http://www.nasa.gov/pdf/500436main_TA06-ID_rev6a_NRC_wTASR.pdf).