



NASA SBIR 2008 Phase I Solicitation

X1.03 Radiation Hardened/Tolerant and Low Temperature Electronics and Processors

Lead Center: LaRC

Participating Center(s): GSFC, MSFC

The goal of leaving low Earth orbit for the purpose of human and robotic exploration will require avionic systems and components that are capable of operating in the extreme temperature and radiation environments of deep space, the lunar surface, and eventually the Martian surface. Spacecraft vehicle electronics will be required to operate across a wide temperature range and must be capable of enduring frequent (and often rapid) thermal-cycling. Packaging for these electronics must be able to accommodate the mechanical stress and fatigue associated with the thermal cycling. Spacecraft vehicle electronics must be radiation hardened for the target environment. They must be capable of operating through a total ionizing dose (TID) of 100 krad(Si) or more and providing single-event latchup immunity (SEL) of 100 MeV cm²/mg or more.

Considering the extreme environment performance parameters for thermal and radiation extremes, proposals are sought in the following specific areas:

- Low power, high efficiency, radiation-hardened processor technologies optimized for numerically intensive algorithms and applications, capable of a sustained processor throughput of 5 GMACS for 16-bit operations and a sustained processor efficiency of 5 GMACS/W.
- Field Programmable Gate Array technologies providing reliable reprogrammable capabilities that are radiation hardened by design and/or radiation hardened by process.
- Innovative radiation hardened volatile and nonvolatile memory technologies.
- Packaging capable of surviving numerous thermal cycles and tolerant of the extreme temperatures on the Moon and Mars. This includes the use of appropriate materials including substrates, die-attach, encapsulants, thermal compounds, etc.