NASA SBIR 2015 Phase I Solicitation

S3.09 Command, Data Handling, and Electronics

Lead Center: GSFC

Participating Center(s): JPL, LaRC

NASA's space based observatories, fly-by spacecraft, orbiters, landers, and robotic and sample return missions, require robust command and control capabilities. Advances in technologies relevant to command and data handling and instrument electronics are sought to support NASA's goals and several missions and projects under development.Â

The 2015 subtopic goals are to develop platforms for the implementation of miniaturized highly integrated avionics and instrument electronics that:Â

- Are consistent with the performance requirements for NASA science missions.
- Minimize required mass/volume/power as well as development cost/schedule resources.
- Can operate reliably in the expected thermal and radiation environments.

Additionally, the development of radiation hardened, high speed memory devices and advanced point-of-load power converters for high performance onboard processing systems is included as a goal.Â

Successful proposal concepts should significantly advance the state-of-the-art. Proposals should clearly:Â

- State what the product is.
- Identify the needs it addresses.
- Identify the improvements over the current state of the art.
- Outline the feasibility of the technical and programmatic approach.
- Present how it could be infused into a NASA program.

Furthermore, proposals should indicate an understanding of the intended operating environment, including temperature and radiation. It should be noted that environmental requirements can vary significantly from mission to mission. For example, some low earth orbit missions have a total ionizing dose (TID) radiation requirement of less than 10 krad(Si), while some planetary missions can have requirements well in excess of 1 Mrad(Si). For descriptions of radiation effects in electronics, the proposer may visit (http://radhome.gsfc.nasa.gov/radhome/overview.htm).Â

If a Phase II proposal is awarded, the combined Phase I and Phase II developments should produce a prototype that can be characterized by NASA.Â

The technology priorities sought are listed below: Â

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- Technologies enabling the use of COTS micropower/ultra-low power computing devices in highly reliable spacecraft avionics systems.
- Technologies enabling 3-D die stacking using die from different processes and foundries, enabling implementation of miniaturized, highly-reliable fault tolerant systems.
- Radiation hardened, high speed SDRAM memory devices for high performance onboard processing systems (focusing on DDR3 or newer technologies).
- Novel approaches for miniaturized, highly reliable point-of-load converters capable of providing core and I/O power for existing and emerging spaceflight processors and Field Programmable Gate Arrays (FPGAs). These should be capable of:
    - Accepting a nominal 5V input.
    - Sourcing voltages as low as 1V at up to 5A.
    - Providing peak efficiency exceeding 90%.
    - Maintaining stability across a wide range of output loads while requiring a minimal number of external discrete components.
- Innovative approaches for single event effects mitigation utilizing non-RHBD (Radiation Hardened By Design) FPGA devices for performance (speed, power, mass) that is capable of meeting or exceeding traditional RHBD devices and leveraging commercially available devices.Â