# NASA SBIR 2017 Phase I Solicitation

## Z1.01 High Power, High Voltage Electronics

**Lead Center: GSFC**

**Participating Center(s): GRC, JPL, LaRC**

**Technology Area: TA3 Space Power and Energy Storage**

NASA is seeking performance improvements to Power Management and Distribution (PMAD) systems through increases to the operating voltages of these electrical components. Specifically, NASA is developing Solar Electric Propulsion systems that use Power Processing Units (PPUs) to convert the 300V solar array output to the 700V-2000V input level of an electric thruster. Although many diodes and transistors exist in the commercial market place that would represent significant improvements over the state of the art space-qualified components, these parts have failed to pass critical tests related to space qualification most importantly in terms of their radiation tolerance. It is believed that the development and integration of high-voltage diodes and transistors that can be space-qualified will lead to increases in system-level performance as they will tend to increase efficiency and decrease mass at the system architecture level.

Proposals are solicited that address the gap for high-power, high-voltage electrical, electronic and electromechanical (EEE) parts suitable for the space environment through design and development of high-voltage, high-power diodes and/or transistors. Proposals must state the initial component state of the art and justify the expected final performance metrics. The proposals must also include plans for validating tolerance to both heavy-ion and total dose radiation. Target radiation performance levels include:

- 300 krad(Si) total ionizing dose tolerance.
- For vertical-field power devices: No heavy-ion induced permanent destructive effects upon irradiation while in blocking configuration (in powered reverse-bias/off state) with ions having a silicon-equivalent surface-incident linear energy transfer (LET) of 40 MeV-cm$^2$/mg and sufficient energy to fully penetrate the epitaxial layer(s) prior to the ions reaching their maximum LET (Bragg peak).
- For all other devices: No heavy-ion induced permanent destructive effects upon irradiation while in blocking configuration (in powered reverse-bias/off state) with ions having a silicon-equivalent surface-incident linear energy transfer (LET) of 75 MeV-cm$^2$/mg and sufficient energy to fully penetrate the active volume prior to the ions reaching their maximum LET (Bragg peak).