SILICON CARBIDE POWER COMPONENTS FOR NASA LUNAR SURFACE APPLICATIONS

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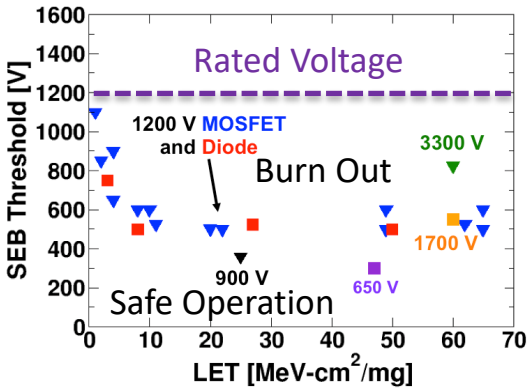
Research Objectives:

- Identify specific mechanisms in power device materials responsible for burn out with radiation.
- Develop new semiconductor processing techniques or designs that reduce or eliminate burnout.
- Fabricate hardened devices at GE
- Measure improvement in burnout reduction against baseline of first ion beam test



Problem: Silicon carbide power transistors work very well at high voltages on earth, but burn out due to radiation in space at voltages much lower than their rated voltage. Data points show the actual voltage at which devices burn out, versus the energy deposited by radiation.

Approach:

- Measure the burnout-voltages of existing GE Silicon Carbide (SiC) transistors in ion beams
- Develop models and computer simulation techniques necessary to understand burn-out mechanisms
- Harden the transistors to radiation through new fabrication techniques at GE and re-test in ion beams

Potential Impact:

- SiC power devices have the potential to significantly reduce size, weight, power loss, and volume of electronic power converters in spacecraft compared to silicon-based power converters.
- DC power lines can be operated at much higher voltages with SiC than with silicon, further increasing power efficiency
- SiC devices may be used in space-craft with novel power systems, for example nuclear fission.