# NASA SBIR 2016 Phase I Solicitation

## H8.03 Advanced Photovoltaic Systems

**Lead Center: GRC**

**Participating Center(s): JSC**

Advanced photovoltaic (PV) power generation and enabling power system technologies are sought with improvements in power system performance (conversion efficiency, mass, stowed volume, etc.), mission operation capability, and reliability for PV power systems supporting NASA human exploration missions. Power levels may cover ranges of 25-250 kWe to MegaWatt-class systems. Component technologies and array concept designs are sought that can address all or parts of the following: improved efficiency (>30% cell conversion efficiency at Air Mass zero), cost (50% reduction compared to state-of-the-art (SOA) through modularization, automated manufacturing, and reduced material costs), improved reliability, reduced mass (50% reduction compared to SOA designs), reduced stowed volume (designs capable of accommodating 100kW power levels within a single launch), high array bus voltages (> 250 V), and long-lived, reliable operation within the expected space environment (i.e., high radiation environments, both high and low temperature and light intensity extremes, planetary surface dust conditions, electric propulsion plume impingement erosion, and minimal arcing/degradation due to interactions with the space plasma). The technologies being sought should enable or enhance the ability to provide low-cost, low mass, and higher efficiency solar power systems that support high power Solar Electric Propulsion (SEP), high radiation/extreme environments, and Mars surface NASA missions. Areas of particular emphasis include:

- Advanced PV blanket and component technology with designs that support very high power and high voltage (> 250 V) applications.
- Array structures and blankets optimized for Mars surface gravity and maximum wind loading conditions while still preserving the low mass, low stowed volume, high reliability, and possible retraction/redeployment capabilities.
- Array/blanket designs capable of operating in high dust environments.
- PV blanket, component technology, and arrays optimized for extreme environment conditions (high radiation, low/high temperature extremes, exposure to SEP plume environments, etc.).
- PV module/component technologies that emphasize low mass and cost reduction (via materials, fabrication, and reduced testing).
- Improvements to solar cell efficiency consistent with low cost, high volume fabrication techniques that are applicable to HEOMD missions.
- Automated/modular fabrication methods for PV panels/modules on flexible blankets (includes cell laydown, interconnects, shielding and high voltage operation mitigation techniques).

Research should be conducted to demonstrate technical feasibility during Phase I and show a path toward a Phase I hardware demonstration, and when possible, deliver a demonstration unit for functional and environmental testing at the completion of the Phase II contract.