



NASA SBIR 2014 Phase I Solicitation

Z1.04 Modeling and Measurements for Propulsion and Power

Lead Center: GRC

Participating Center(s): ARC, MSFC

To reduce the development time of advanced future systems needed for space exploration, physics-based modeling tools are sought for:

- Electrochemical systems such as battery chemistries with “beyond Lithium ion” expected specific energies, proton exchange membrane and solid oxide fuel cells and electrolyzers, and chemical sensors for safety and operational monitoring.
- Electric propulsion systems such as Hall thrusters, nested Hall thrusters, ion engines, electrospray propulsion, and micro-propulsion.
- Nuclear power and propulsion systems such as 1kW-class, 10kW-class, and 100kW-class fission reactors, and nuclear thermal propulsion systems.

In each case, the emphasis is on determining performance-limiting features and determining potential means to overcome limitations. Either Dcomponents or full systems can be targeted.

Model validation is also required; improved measurement techniques needed for validation are also of interest provided they are coupled with a modeling activity outlined above.

Finally, tools that exclusively model proprietary systems will not be considered for award.

Below are listed examples of the types of models of interest for each area, and subtopics that contain additional information about systems of interest:

- Modeling the kinetics and thermodynamics of batteries, fuel cells and electrolyzers; and modeling the dielectrophoresis in the alignment of nanostructures within chemical and physical sensors for aerospace propulsion systems.
 - Z1.02 Advanced Space Battery Technology.
 - H8.01 Solid Oxide Fuel Cells and Electrolyzers.
 - T12.02 High Temperature Materials and Sensors for Propulsion Systems.
- Modeling electric propulsion (EP) life and failure mechanisms to predict the performance, plasma properties and lifetime of EP devices of interest and to help assess the interaction between the EP device plume and spacecraft surfaces.
 - H2.02 In-Space Propulsion Systems.
- Creating interfaces between reactor models and engine system models, including radiation effects; modeling NTP ground test engine exhaust filtering and containment.
 - H8.02 Space Nuclear Power Systems.

◦ H2.04 Nuclear Thermal Propulsion (NTP) Ground Test Technologies.