

## NASA SBIR/STTR Technologies Phase II



### Next-Generation Ion Thruster Design Tool to Support Future Space Missions

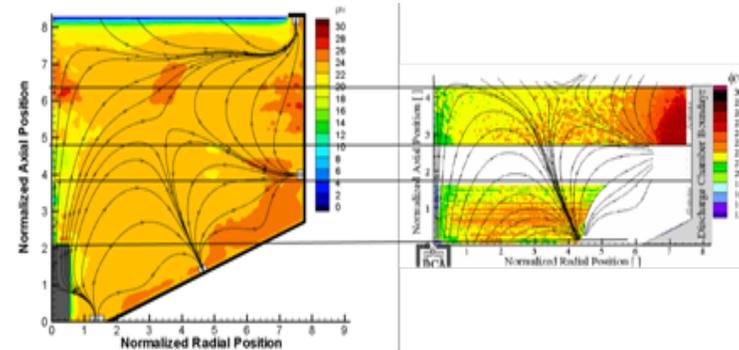
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Proposal No.: T3.01-9893

#### Identification and Significance of Innovation

The most detailed and accurate computer model of the plasma in the discharge chamber of an ion engine has been developed in Phase I of this NASA funded project. This is significant because this provides NASA and other governmental and commercial organizations a tool which can be used to reduce development time and expense for bringing new and different sized ion engines to a space ready level. In Phase I of this project it was proved that such a detailed and accurate model can be made. In Phase II of this project, the computational time required by this computer program will be reduced and the program will be made user friendly so that it will be commercially acceptable.

**Expected TRL Range at the end of Contract (1-9):** TRL 6



This picture shows the comparisons between computer model electrical potential results (in volts) and experimental results. These results are for the TL35 operating condition of the NASA NEXT ion engine.

#### Technical Objectives and Work Plan

##### **Objectives:**

- Reduce computational time of new modeling tool
- Make new modeling tool user friendly
- Make new modeling tool commercially attractive

##### **Tasks:**

- Implement implicit difference schemes
- Implement 2D domain decomposition
- Implement faster convergence routines
- Implement particle merging and fragmentation process
- Simulate NEXT and NSTAR engines for code verification
- Implement user friendly GUI
- Reduce complexity of input data processes
- Reduce complexity of output data processes

#### NASA and Non-NASA Applications

**NASA Application:** Off-the-shelf computational tools minimize the modeling development effort required by NASA for thruster simulations. These tools support both ion and Hall electric propulsion systems.

**Non NASA Application:** Accurate plasma modeling and sputter erosion tools have applications in other government organizations as well as the aerospace, satellite, ion source and plasma processing industries.

#### Firm Contacts

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**NON-PROPRIETARY DATA**