NASA SBIR/STTR Technologies – Phase I

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

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Identification and Significance of Innovation

Identification:

➢Ion thrusters are being planned for high-power and high-power-to-thruster operating conditions.

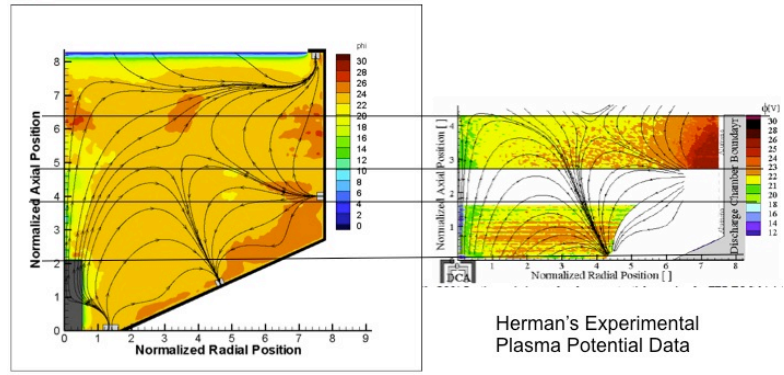
➢Self-consistent, fully kinetic ion thruster discharge chamber model which solves for plasma potentials is desired.

Significance:

➢Minimize the expenses for NASA in performing Long duration tests and wear tests for all operating conditions

➢Detailed understanding of the plasma processes with correct computation of plasma potentials

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



Herman's Experimental Plasma Potential Data

Our numerical plasma potential results are in closer agreement with experimental measurements.

Technical Objectives and Work Plan

Objectives:

- Include electric field effects into ion engine modeling in a physically precise manner.
- Demonstrate the ability of this computer tool to support ion thruster development for future space missions.

Tasks:

- Integrate and enhance particle tracking capabilities in kinetic discharge chamber model with OOPIC Pro
- Demonstrate the dynamic electric field model for the NASA's Evolutionary Xenon Thruster (NEXT) discharge chamber
- Measure the ion impingement effects on the discharge chamber components and performance parameters
- Demonstrate the kinetic model for studying the NEXT high power and high-thrust-to-power operating conditions

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 thruster 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