# NASA SBIR/STTR Technologies

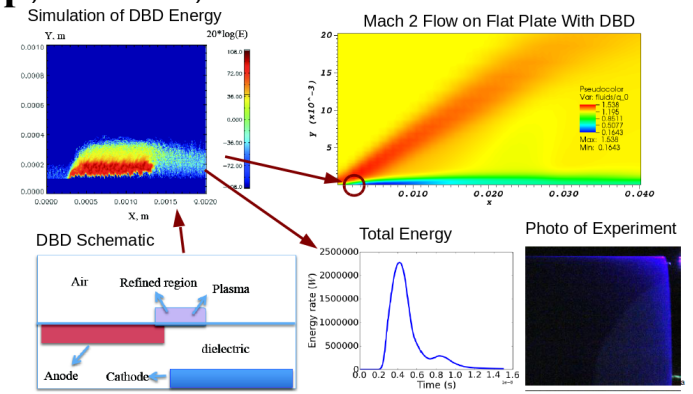
## NNX11CA46C - Simulation Tool for Dielectric Bar Discharge Plasma Actuators at Atmospheric and Sub-Atmospheric Pressures

PI: Peter Stoltz Tech-X Corp, Boulder, CO

### Identification and Significance of Innovation

An optimization of DBD plasmas used for actuators using efficient, comprehensive, physically-based DBD simulation tool for different operation conditions would allow NASA researchers to more quickly evaluate designs. We have developed a DBD plasma actuator simulation tool for a wide range of ambient gas pressures. This tool will treat DBD using either kinetic, fluid or hybrid model, depending on the DBD operational condition. The tool is validated by comparison with the experimental and numerical data on the DBD investigations.

Expected TRL Range at the end of Contract (1-9): 4




Simulation tool for DBD plasma actuator. The DBD is simulated at microscopic scale using particle code, the net energy trasfer to air is provided as input to the fluid simulation.

### Technical Objectives and Work Plan

Objectives:
The primary objective of this project is to provide NASA scientists with an efficient and faster simulation tool for the DBD modeling in a wide range of gas pressures and to demonstrate the DBD simulation tool through validation against experimental data at wide range of pressures.

Work Plan:
The objectives were achieved by the extension of air-chemistry and collision database for plasma actuator modeling, improved photoionization, enhancement of the hybrid simulations, integration of multilevel mesh, adaptive time steps, implementation of circuit model, experimental investigation of DBD operation followed by validation.

### NASA and Non-NASA Applications

The primary NASA applications of the proposed DBD simulation tool are active flow control concepts.

Active flow control using DBD plasma actuators is of interest to a number of government agencies, private industry and universities. Proposed tool will be beneficial for subsonic/hypersonic programs which involve active flow separation control.

### Firm Contacts

Dr. Peter Stoltz, pstoltz@txcorp.com, 720-563-0336