Technion-Israel Institute of Technology
Faculty of Mechanical Engineering

הטכניון-מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות שתתקיים ביום ד' 15.05.2019 (י' באייר, תשע"ט), בניין דן קאהן, חדר 217, 13:30.

מרצה: אושרי איפרגן

מנחה: פרופ'/ח דוד גרינבלט

על הנושא:

Numerical and Experimental Investigation of Arc Plasma Wind Tunnels

The seminar will be given in Hebrew

תקציר ההרצאה :

Arc plasma wind tunnels, that are used to quantify thermal and aerodynamic loads on space vehicles, incorporate a constrictor tube with swirl-stabilized plasma that reaches temperatures of up to 30,000K. The Technion Arc Plasma Tunnel (TAPT), in operation since late 1984, has maximum power, enthalpy and pressure of 5MW, 20MJ/kg and 30bar respectively, and can attain supersonic and hypersonic Mach numbers. This research, which has both computational and experimental components, was motivated by the desire to understand the operation of the TAPT, improve its efficiency and redesign major components. The computational model was developed for the purpose of providing rapid and accurate solutions of the plasma core region for both laminar and turbulent flowfields, while accounting for radiation and convection heat losses. Despite its relative simplicity, the model attained excellent correspondence with far more sophisticated CFD-based models and captured the essential details of the electro-aerodynamic coupling. It also delivered excellent agreement with published data and in-house TAPT data. In the experiments, temporally and spatially simultaneous voltage and heat losses were measured along the length of the constrictor. High spatial voltage resolution measurements revealed a wave-like structure in the constrictor due to either an unstable arc, vortex precession, or a combination of the two. By varying either mass-flow or current, the separate effects of radiation and convection were quantified. A comparison of the model results with spatially resolved data revealed some model deficiencies; in particular, the near-cathode and near-anode electric fields were not correctly predicted and neither was the heat transfer distribution. Significant modifications must be made to the model to properly account for these effects.

בברכה,

פרופ"א מתי סאס
מרכז הסמינרים