APPLICATION OF LOW TEMPERATURE PLASMAS FOR FLOW CONTROL

Moscow Institute of Physics and Technology (National Research University)

Degree or qualification is awarded: **PhD (Candidate of Science)**

Language of study: **English**
Mode of study: **full-time**
Duration: **4 years**
Availability of free education: **yes**
Price: **375 000 RUB**

Programme webpage at the university website:
https://eng.mipt.ru/programs/application-of-low-temperature-plasmas-for-flow-control/

Programme curator: **Denis Ustyuzhaninov**
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Entry requirements:

- Master's degree / equivalent in a related field
- B2 level of English
- Good track record of publications related to the topic of the intended research
- Strong research proposal 1,500 - 3,500 words

Research supervisor:
Ivan Moralev
PhD

Supervisor's research interests:
Research and development of the flow-control devices, based on low temperature plasma (plasma actuators). Development of plasma-based systems for boundary layer transition control, noise reduction in aeroacoustics problems, flow separation. Study of barrier discharge physics, including electrode processes, memory effects and ionic wind generation. Combustion and mixing control using gas discharges.
Research highlights:
Laboratory of plasma flow control and plasma assisted combustion is one of the leading research units in its area. The laboratory is equipped by two wind-tunnelsubsonic for low turbulent research and blowdown supersonic facility. Measurement techniques for flow quantities includes particle imaging velocimetry and high-speed shadow imaging. Study of the discharge physics is performed using short exposure (2ns) camera and high speed oscilloscopes. The lab is involved into the international cooperation with Ecole Polytechnique, and occasionally participates in the cooperative projects with leading aerospace centers in Europe (DLR, Onera, Nottingham University). The financial support can be provided, depending on applicant results and current situation in laboratory.
Supervisor's specific requirements:

- Mandatory:
  - Fluency in English or Russian .
  - High education in Physics/Physical Engineering.
  - Bold experience with MATLAB.
- Desirable:
  - Basic knowledge of gas dynamics or low temperature plasmas.
  - General experience in experimental work in physics.

Main publications:

- Moralev, I. et al. Localized micro-discharges group dielectric barrier discharge vortex generators: Disturbances source for active transition control. Proc IMechE Part G J Aerosp. Eng. 234, 42–57 (2020).
- Moralev, I. A., et.al. Damping of the longitudinal streak in the boundary layer by ‘plasma panel’ actuator. J. Phys. D. Appl. Phys. 52, 304003 (2019).
- Moralev, I., Selivonin, I. & Ustinov, M. On the stochastic forcing of the boundary layer by plasma actuators. Exp. Fluids 60, 177 (2019).
- Selivonin, I. V, et.al.Effect of electrode degradation on the electrical characteristics of surface dielectric barrier discharge. PSST. 27, 85003 (2018).
- Moralev, I., et.al. Effect of the discharge constriction in DBD plasma actuator on the laminar boundary layer. Int. J. Heat Mass Transf. 116, 1326–1340 (2018).

Specializations within this programme