Karlsruhe Institute of Technology

Institute of Fluid Mechanics
Building 10.23, 6th floor, Kaiserstraße 10, D-76131 Karlsruhe, Germany
http://www.istm.kit.edu

10th July 2019

Master thesis – experimental

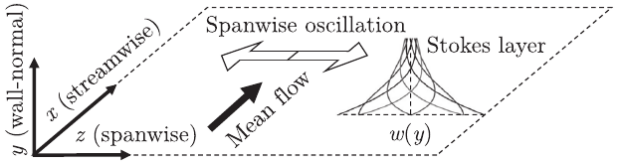
# Stokes-layer-like flow formation using AC-DBD plasma actuators

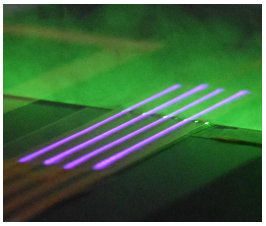
**Background**

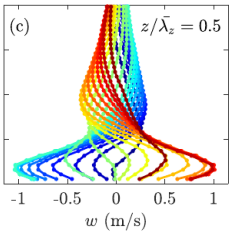
The ability of reducing friction drag with aerodynamic vehicles, e.g. airplanes or trucks, is beneficial to lessen both fuel consumption and gas emissions, as a consequence positively contributing to the environmental conditions. An active flow control strategy is spanwise oscillation of a turbulent flow. The resulting flow field driven by the periodic oscillation is a so-called Stokes-layer flow. For both a local, i.e. temporal oscillation and a convective (streamwise) oscillation, mechanically complex devices have been implemented into the flow scenario (Choi *et al.*, 1998, AIAA, Auteri *et al.*, 2010, PoF). A recent investigation revealed a novel concept for a plasma actautor to be used to generate a Stokes-layer-like flow without mechanically moving parts or any limitation of the oscillation freqeucny by resonance effects (Hehner *et al.*, 2019, PoF). Notwithstanding the advantages of the developed concept compared with former works, there is ample room to improve the durability of the plasma actuators and the performance of the control mechanism.

**Content of the Thesis**

The current project is thus going to investigate another approach of powering the plasma actuator. This method is brandnew and has only been worked out theoretically, however it remains to be experimentally implemented and testified. After a thorough literature study of the field, the first and most important milestone is, therefore, to build up the concept and verfiy a stable operation of the actuator. Afterwards, as a second step, the flow characteristics induced by the plasma actuator have to be experimentally captured by planar high-speed particle image velocimetry (PIV) in quiescent-air conditions. In the last stage of the schedule, the outcomes are going to be assessed with respect to the results of Hehner *et al.*, 2019, finalising this project with a thoroughly worked out report.






**Requirements**

basic knowledge in fluid mechanics,
Matlab

**Beneficial Skills**

basic knowledge about turbulent flows,
plasma actuators and flow control,
PIV expreience

**Start:** immediately

**Contact:**
M.Sc. Marc Hehner

Institute of Fluid Mechanics
Kaiserstraße 10,
Building 10.23, 6th floor,
Room 603

☎ +49 721 608 42765
✉ marc.hehner@kit.edu