Measurements of 3D slip velocities and plasma column lengths of a gliding arc discharge - DTU Orbit (24/09/2019)

Measurements of 3D slip velocities and plasma column lengths of a gliding arc discharge

A non-thermal gliding arc discharge was generated at atmospheric pressure in an air flow. The dynamics of the plasma column and tracer particles were recorded using two synchronized high-speed cameras. Whereas the data analysis for such systems has previously been performed in 2D (analyzing the single camera image), we provide here a 3D data analysis that includes 3D reconstructions of the plasma column and 3D particle tracking velocimetry based on discrete tomography methods. The 3D analysis, in particular, the determination of the 3D slip velocity between the plasma column and the gas flow, gives more realistic insight into the convection cooling process. Additionally, with the determination of the 3D slip velocity and the 3D length of the plasma column, we give more accurate estimates for the drag force, the electric field strength, the power per unit length, and the radius of the conducting zone of the plasma column. © 2015 AIP Publishing LLC.