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Characterization of Flow Generated by Dielectric Barrier Discharges (DBD). ROGER KIMMEL, Air Force Research Laboratory, JORDI ESTEVADEORDAL, SIVARAM GOGINENI, Innovative Scientific Solutions, Inc. — The use of dielectric barrier discharges (DBD) for flow control has received increasing attention over the past several years. Despite numerous applications for DBD's, the fundamental mechanism of their operation is still unknown. For this reason, experiments were conducted to characterize the plasma flow actuation mechanisms. The DBD discharges were created in a quiescent environment and experiments were performed for various DBD driving signal characteristics such as frequency, amplitude, phase, and waveform. The effects of buoyancy and large-scale background air movement around the test device were explored. Particle image velocimetry (PIV) was used to characterize the flow field induced by the discharge for various conditions including the ones phase-locked to the DBD driving frequency. Effects of seeding material on the plasma discharge were evaluated. Flow field characteristics including wall jet formation and thickness, entrainment of ambient fluid, recirculation behind the discharge and flow unsteadiness were analyzed and the results are being used for validation and development of CFD models.

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