Abstract Submitted
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Schlieren observation of vortex flow structures in asymmetric dielectric barrier discharges DMITRY OPAITS, ALEXANDRE LIKHANSKII, GABRIELE NERETTI[1], SOHAIL ZAIDI, MIKHAIL SHNEIDER, Princeton University, SERGEY MACHERET, Skunk Works, Lockheed Martin, RICHARD MILES, Princeton University, PRINCETON UNIVERSITY TEAM, SKUNK WORKS, LOCKHEED MARTIN TEAM — Asymmetric DBD plasma actuator for flow control has been studied both numerically and experimentally. A comprehensive kinetic model for asymmetric DBD actuators in air has been developed. A new approach for non-intrusive diagnostic of plasma actuator induced flows in quiescent gas was proposed. The schlieren technique, burst mode of plasma actuator operation, and 2-D fluid numerical model coupled together allowed us to restore the entire two-dimensional unsteady plasma induced flow pattern as well as characteristics of the plasma induced force. A new voltage profile, consisted of nanosecond repetitive pulses added to low-frequency sinusoidal bias voltage, is proposed. Advantages of the new voltage profile have been demonstrated experimentally. Dependences of the DBD operation on bias voltage, pulse voltage and repetition rate have been investigated for both polarities of the pulses. Significance of the surface charge has been demonstrated.

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