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Experimental observations and simulations of single and double barrier DBD plasma actuators[1] ALAN HOSKINSON, YOUNG-CHUL KIM, NOAH HERSHKOWITZ, University of Wisconsin - Madison — When operated in air, a surface-mounted dielectric barrier discharge (DBD) induces flow in the gas just above its surface. In recent years, interest has grown in using these discharges as aerodynamic actuators. We present the results of our experimental and computational studies of how variations in discharge geometry effect both the plasma and the induced electro-hydrodynamic (EHD) force. Our studies primarily focus on double barrier actuators (both electrodes insulated), but make comparisons to single barrier actuators (one electrode insulated). Pitot tube measurements of the induced air flow show the velocity reaches a plateau several kilovolts above the turn-on voltage, and shows only weak variations with the degree of asymmetry between the two electrodes. To explain this behavior, we present time-resolved optical emission measurements of the plasma volume while varying the diameter of one of the electrodes. We also report the results of fluid simulations of discharges with various electrode sizes.

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