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Numerical, Experimental and Analytical Investigation of the Planar Electrohydrodynamic Wall Jet PATRICK FILLINGHAM, YIFEI GUAN, RAVI SANKAR VADI, IGOR NOVOSSELOV, University of Washington — Classical laminar wall jet theory is used for the examination of the flow induced by Electrohydrodynamic (EHD) actuators. The planar EHD wall jet, induced by both corona discharge and dielectric barrier discharge (DBD), is investigated experimentally and computationally. The thrust generated by the actuators is measured while the velocity profiles downstream of the cathode are measured using hot-wire anemometry. A multiphysics computational model couples the Navier-Stokes, electrical field, and ion transport equations. Experimental investigations of EHD actuators in the literature are used for model validation. The wall jet resulting from both DBD and Corona actuators was found to adhere to the analytical solution for a planar laminar wall jets; allowing for the calculation of the momentum generated by EHD actuators with only information about the downstream maximum velocity. The model allows for characterization of the thrust generated by any EHD actuator attached to a wall using only two velocity measurements.

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