

Abstract Submitted  
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**Role of Negative Ions and Crosstalk in DBD Flow Actuation<sup>1</sup>**

M.G. MUNGAL, H. DO, W. KIM, M.A. CAPPELLI, Stanford University — Phase-locked particle image velocimetry (PIV) is used to study the mechanism of induced-flow in the near field of a radio frequency (RF) dielectric barrier discharge (DBD) actuator mounted in the separated flow region of a bluff body. For a single pair of electrodes, flow actuation is found to be asymmetric, with suction towards the buried downstream electrode when it is biased positively relative to the upstream exposed electrode. Lesser flow is seen on the reverse voltage swing, where the buried electrode should attract positive ions. This phenomenon is enhanced when oxygen is added to the flow, suggesting that oxygen negative ions, possibly  $O_2^-$ , play a dominant role in plasma actuation. When using multiple pairs of electrodes, the PIV images further confirm the importance of negative ions in the actuation process. Furthermore, the flow actuation now becomes nearly symmetric owing to crosstalk interactions between adjacent upstream/downstream electrodes of neighboring actuator pairs.

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M. Godfrey Mungal  
Stanford University

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