Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Characteristics of a Plasma Synthetic Jet ARVIND SANTHANAKRISHNAN, KARTHIK RAMAKUMAR, JAMEY JACOB, University of Kentucky
— The term plasma (aka, 1 atm glow discharge or dielectric barrier discharge) actuator is used to describe an arrangement of two electrodes separated by dielectric material. Under input of a high voltage, high frequency AC, this leads to dielectric breakdown, and the plasma region produced at the interfacial air gap can be used for flow control applications. One such novel actuator design consisting of an annular electrode array embedded on a flat plate is examined here. This particular actuator produces a jet that can be applied continuously or pulsated to resemble a synthetic (zero-net mass flux) jet. The purpose of this work is to examine the evolution of the plasma synthetic jet, and compare the jet characteristics with a conventional synthetic jet. Flow visualization is employed for qualitative observation of the flowfield with and without actuation. Phase-locked PIV measurements are used to examine the development of regular vortical structures and jet profiles. Two sets of counter-rotating vortex rings are generated upon plasma actuation, one of which advects downstream ahead of the jet while the other is "trapped" peripherally to the annulus. The effects of changing the forcing frequency and actuator dimensions in relation to the resultant jet momentum are investigated.

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Date submitted: 22 Jul 2005 Electronic form version 1.4