Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Internal Fluid Dynamics and Frequency Scaling of Sweeping Jet Fluidic Oscillators[1] JUNG HEE SEO, ERIK SALAZAR, RAJAT MITTAL, Johns Hopkins University — Sweeping jet fluidic oscillators (SJFOs) are devices that produce a spatially oscillating jet solely based on intrinsic flow instability mechanisms without any moving parts. Recently, SJFOs have emerged as effective actuators for flow control, but the internal fluid dynamics of the device that drives the oscillatory flow mechanism is not yet fully understood. In the current study, the internal fluid dynamics of the fluidic oscillator with feedback channels has been investigated by employing incompressible flow simulations. The study is focused on the oscillation mechanisms and scaling laws that underpin the jet oscillation. Based on the simulation results, simple phenomenological models that connect the jet deflection to the feedback flow are developed. Several geometric modifications are considered in order to explore the characteristic length scales and phase relationships associated with the jet oscillation and to assess the proposed phenomenological model. A scaling law for the jet oscillation frequency is proposed based on the detailed analysis.

[1]This research is supported by AFOSR Grant FA9550-14-1-0289 monitored by Dr. Douglas Smith

Rajat Mittal
Johns Hopkins University

Date submitted: 28 Jul 2017 Electronic form version 1.4