Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Jet Interactions in a Feedback-Free Fluidic Oscillator in the Transition Region MEHMET TOMAC, Abdullah Gul University, JAMES GREGORY, The Ohio State University — The details of the jet interactions and oscillation mechanism of a feedback-free type fluidic oscillator are studied in this work. Flow rate-frequency measurements indicate the existence of three distinct operating regimes: low flow rate, transition, and high flow rate regions. This study presents results from the transition regime, extracted by using refractive index-matched particle image velocimetry (PIV). A newly-developed sensor configuration for frequency measurements in the refractive index-matched fluid and a phase-averaging method that minimizes jitter will be discussed. Experimental results indicate that the interactions of the two jets create three main vortices in the mixing chamber. One vortex vanishes and forms depending on the oscillation phase and plays a key role in the oscillation mechanism. The other two vortices sustain their existence throughout the oscillation cycle; however, both continuously change their size and strength. The resulting complex flow field with self-sustained oscillations is a result of the combination of many interesting phenomena such as jet interactions and bifurcations, viscous effects, vortex-shear layer interactions, vortex-wall interactions, instabilities, and saddle point creations.

Mehmet Tomac
Abdullah Gul University

Date submitted: 01 Aug 2013 Electronic form version 1.4