Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Surface Pressure Fluctuations Produced by an Axisymmetric Impinging Jet: Generation Mechanisms[1] MALEK AL-AWENI, AHMED NAGUIB, Michigan State University — This study is motivated by understanding the mechanisms leading to unsteady surface pressure generation in impinging jet flows. Employing an extensive database of concurrent time-resolved flow visualization and time series from a surface-embedded microphone array, two dominant mechanisms are found to affect the space-time evolution of the pressure within the wall-jet zone: vortex-wall and vortex-vortex interaction. To gain deeper insight into these mechanisms, two closely-related model problems are studied computationally using Fluent. The problems involve the impingement of a single or two axisymmetric vortex rings on a flat wall. The resulting spatio-temporally resolved computations are used in conjunction with Possion's equation for pressure to investigate the nature of the pressure-generating sources, their relative importance, and their relation to the observed surface pressure signature. The findings provide significant information towards realization of efficient, structure-based models for computing the unsteady wall pressure in impinging jets.

[1]Partly funded by NSF grant OISE-0611984 and Libyan-North American Scholarship program

Ahmed Naguib
Michigan State University

Date submitted: 02 Aug 2013 Electronic form version 1.4