Abstract Submitted for the DFD12 Meeting of The American Physical Society

Interaction of vortices with flexible piezoelectric beams<sup>1</sup> OLEG GOUSHCHA, HUSEYIN DOGUS AKAYDIN, NIELL ELVIN, YIANNIS AN-DREOPOULOS, The City College of The City University of New York — A cantilever piezoelectric beam immersed in a flow is used to harvest fluidic energy. Pressure distribution induced by naturally present vortices in a turbulent fluid flow can force the beam to oscillate producing electrical output. Maximizing the power output of such an electromechanical fluidic system is a challenge. In order to understand the behavior of the beam in a fluid flow where vortices of different scales are present, an experimental facility was set up to study the interaction of individual vortices with the beam. In our set up, vortex rings produced by an audio speaker travel at specific distances from the beam or impinge on it, with a frequency varied up to the natural frequency of the beam. Depending on this frequency both constructive and destructive interactions between the vortices and the beam are observed. Vortices traveling over the beam with a frequency multiple of the natural frequency of the beam cause the beam to resonate and larger deflection amplitudes are observed compared to excitation from a single vortex. PIV is used to compute the flow field and circulation of each vortex and estimate the effect of pressure distribution on the beam deflection.

<sup>1</sup>Sponsored by NSF Grant: CBET #1033117.

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Date submitted: 23 Jul 2012

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