Abstract Submitted
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Estimating the pressure forcing on a flexible piezoelectric beams exerted by a passing vortex using time-resolved PIV data[1] OLEG GOUSHCHA, NIELL ELVIN, YIANNIS ANDREOPOULOS, The City College of The City University of New York — A cantilever flexible beam instrumented with a piezoelectric patch and immersed in a flow can be 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 current. Maximizing the power output of such an electromechanical fluidic system is a challenge. In order to understand the pressure force exerted on the beam in a fluid flow where vortices of different scales are present, an experimental facility was set up to observe the interaction of individual vortices with the beam and record the time-resolved PIV data around the beam. Using the time-resolved PIV data, the pressure Poisson equation is solved by using a Green function's approach to obtain the pressure distribution over the beam. The beam is instrumented at the base with a piezoelectric patch, a strain gage and a force sensor whose output data are compared to the results from the pressure Poisson equation solution. A large negative pressure peak is observed as the vortex core travels over the beam responsible for the net lift force deflecting the beam towards the center of the vortex core.

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