A Green's function approach to PIV Pressure estimates[1] OLEG GOUSHCHA, PETER GANATOS, NIELL ELVIN, YIANNIS ANDREOPOULOS, The City College of New York — Spatial resolution of PIV data limits the ability to calculate the pressure along a solid boundary of a body immersed in a fluid and hence to accurately estimate the force exerted. Current methodologies solve numerically Navier-Stokes equations to calculate the pressure field from velocity data. An analytical approach has the potential of more accurate estimation of pressure in comparison to existing methods. A methodology has been developed to calculate the pressure distribution on the body in the flow by analytically solving the pressure Poisson Equation using a Green's function approach. The pressure is then extrapolated to the solid boundary resulting in an accurate pressure distribution and total net force on the boundary. This technique has been applied to the case of a flexible cantilever beam vibrating after interacting with a traveling vortex in an experimental setup to harvest energy from an air-flow. Time-resolved PIV has been used to acquire a two-dimensional velocity field which has been used to obtain a time-dependent pressure distribution acting on the surface of the beam and resultant forces. The analytical solution is compared to the force measured directly by a force sensor placed at the base of the beam as well as the power harvested.

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