Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

**Performance and Near-Wake Flow field of A Marine Hydrokinetic Turbine Operating in Free surface Proximity** ARINDAM BANERJEE, NITIN KOLEKAR, Lehigh University — The current experimental investigation aims at understanding the effect of free surface proximity and associated blockage on near-wake flow-field and performance of a three bladed horizontal axis marine hydrokinetic turbine. Experiments were conducted on a 0.14m radius, three bladed constant chord turbine in a 0.61m$\times$0.61m test section water channel. The turbine was subjected to various rotational speeds, flow speeds and depths of immersion. Experimental data was acquired through a submerged in-line thrust-torque sensor that was corrected to an unblocked dataset with a blockage correction using measured thrust data. A detailed comparison is presented between blocked and unblocked datasets to identify influence of Reynolds number and free surface proximity on blockage effects. The percent change in $C_{\mathrm{p}}$ was found to be dependent on flow velocity, rotational speed and free surface to blade tip clearance. Further, flow visualization using a stereoscopic particle image velocimetry was carried out in the near-wake region of turbine to understand the mechanism responsible for variation of $C_{\mathrm{p}}$ with rotational speed and free surface proximity. Results revealed presence of slower wake at higher rotational velocities and increased asymmetry in the wake at high free surface proximity.

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Date submitted: 24 Jul 2015 Electronic form version 1.4