Abstract Submitted
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Development of a towing tank PIV system and a wake survey of a marine current turbine under steady conditions[1] ETHAN LUST, LUKSA LUZNIK, KAREN FLACK, U.S. Naval Academy — A submersible particle image velocimetry (PIV) system was designed and built at the U.S. Naval Academy. The system was used to study the wake of a scale-independent horizontal axis marine current turbine. The turbine is a 1/25th scale model of the U.S. National Renewable Energy Laboratory's Reference Model 1 (RM1) tidal turbine. It is a two-bladed turbine measuring 0.8 m in diameter and featuring a NACA 63-618 airfoil cross-section. The wake survey was conducted over an area extending 0.25D forward of the turbine tip path to 2.0D aft to a depth of 1.0D beneath the turbine output shaft in the streamwise plane. Each field of view was approximately 30 cm by 30 cm, and each overlapped the adjacent fields of view by 5 cm. The entire flow field was then reconstructed by registering the resultant vector fields together into a single field of investigation. Results include the field of investigation from a representative case, for the mean velocity field averaged over approximately 1,000 realizations, and turbulent statistics including turbulence intensities, Reynolds shear stresses, and turbulent kinetic energy.

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