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Predicting the Noise of High Power Fluid Targets Using Computational Fluid Dynamics MICHAEL MOORE, Jefferson Lab, Old Dominion University, SILVIU COVRIG DUSA, Jefferson Lab — The 2.5 kW liquid hydrogen (LH2) target used in the Q_{weak} parity violation experiment is the highest power LH2 target in the world and the first to be designed with Computational Fluid Dynamics (CFD) at Jefferson Lab. The Q_{weak} experiment determined the weak charge of the proton by measuring the parity-violating elastic scattering asymmetry of longitudinally polarized electrons from unpolarized liquid hydrogen at small momentum transfer ($Q^2 = 0.025$ GeV^2). This target satisfied the design goals of $< 1\%$ luminosity reduction and $< 5\%$ contribution to the total asymmetry width (the Q_{weak} target achieved 2% or 55ppm). State of the art time dependent CFD simulations are being developed to improve the predictions of target noise on the time scale of the electron beam helicity period. These predictions will be bench-marked with the Q_{weak} target data. This work is an essential component in future designs of very high power low noise targets like MOLLER (5 kW, target noise asymmetry contribution < 25 ppm) and MESA (4.5 kW).

Michael Moore
Jefferson Lab, Old Dominion University

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