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Track Reconstruction and Extrapolation In Qweak Experiment
JIE PAN, University of Manitoba, University of Winnipeg, QWEAK COLLABORATION — The Qweak experiment at Jefferson Laboratory is designed to precisely determine the proton's weak charge (Q_W^p) and thus the weak mixing angle ($\sin^2\theta_W$) by measuring the parity violating asymmetry in elastic electron-proton scattering at low momentum transfer $Q^2 = 0.03$ $(GeV/c)^2$. The Qweak experimental result will enable a precise test of the firm Standard Model prediction of Q_W^p, and hence will probe new physics. The experiment will be operated in a high-current (integration) mode for the parity measurement, and in a low-current (counting) mode for Q^2 determination. To reach the proposed experimental precision, the average Q^2 needs to be determined to 0.7% requiring individual tracks to be reconstructed with high efficiency. A set of high resolution tracking detectors were designed for this purpose. The hit information for each detector will then be fed into the tracking software for reconstructing the trajectories and extracting the Q^2. The tracking detectors however, are only operable in low-current mode. Therefore a tracking Čerenkov detector, the "focal-plane scanner," was designed for further extrapolating the Q^2 from low current to high current. A brief introduction on the Qweak tracking mechanism will be presented, along with some detailed track reconstruction strategies and the Q^2 extrapolation method.

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