

The P2 Experiment

Wednesday, November 9, 2022 3:00 PM (15 minutes)

P2 is a precision experiment planned for the Mainz Energy recovering Superconducting Accelerator (MESA) currently under construction. The goal of P2 is to determine the electroweak mixing angle at a four-momentum transfer of $Q^2 = 4.5 \times 10^{-3} \text{ GeV}^2$ with a precision of 0.14 %, comparable to existing measurements at the Z pole. The mixing angle is extracted by measuring the protons weak charge exploiting the parity-violating asymmetry in elastic electron-proton scattering. A high precision measurement of the electroweak mixing angle at low energies is sensitive for deviations from the SM's prediction of the running of the angle and, therefore, for new physics beyond the SM. Reaching the precision goal with the 155 MeV, 150 μA polarized electron beam provided by the MESA facility requires 11000 hours of measurement time using a 60 cm liquid hydrogen target. The detection of several GHz of scattered electrons poses interesting challenges for the experiment and its electronics.

This talk provides an overview of key features of the P2 spectrometer and the physics motivation behind it.

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