

The MOLLER Experiment: An Ultra-Precise Measurement of the Weak Mixing Angle using Møller Scattering

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The future MOLLER experiment will measure the parity-violating asymmetry for Møller scattering improving on the previous measurement E158 at SLAC by a factor of five. This measurement will yield the most precise measurement of the weak mixing angle at energies well below the scale of electroweak symmetry breaking. This new result would be sensitive to the interference of the electromagnetic amplitude with new neutral current amplitudes as weak as $\sim 10^{-3} \cdot G_{\text{F}}$ from as yet undiscovered dynamics beyond the Standard Model. The resulting discovery reach is unmatched by any proposed experiment measuring a flavor- and CP-conserving process over the next decade, and yields a unique window to new physics at MeV and multi-TeV scales, complementary to direct searches at high energy colliders such as the Large Hadron Collider (LHC). The experiment takes advantage of the unique opportunity provided by the upgraded electron beam energy, luminosity, and stability at Jefferson Laboratory and the extensive experience accumulated in the community after a round of recent successfully completed parity-violating electron scattering experiments.

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