Contribution ID: **19** Type: **Oral**

High precision measurement of the weak mixing angle at low energy,

Thursday, 25 September 2025 10:00 (30 minutes)

The theory of elementary particle physics, the Standard Model (SM), provides a successful description of the basic constituents of matter and the forces acting between them. However, it explains only about 15 % of the total mass in the universe, not accounting for the dark matter postulated in the face of astrophysical and cosmological data. The study of the universe at large shows that our theory of the smallest entities of Nature must be extended.

In the absence of a direct observation of new particles it becomes increasingly important to determine the parameters of the SM with the highest possible precision, as new particles and forces would modify their values through quantum effects. The existence of the W and Z bosons, and later the top quark, the tau neutrino, and the Higgs boson - the ultimate discovery of the SM - were all inferred from precision measurements before their direct observations.

A cornerstone parameter of the SM is the so-called weak mixing angle, which relates different sectors of the theory and is particularly sensitive to new physics. We plan on a new measurement of the weak mixing angle by employing parity violating electron scattering at the upcoming MESA accelerator in Mainz. We will report on the experimental setup and the sources of systematic effects.

In combination with the measurements at the Z-pole this comprises a test of the running of the effective weak mixing angle and allows for a sensitive test of the standard model up to a mass schale of 50 TeV.

Primary author: MAAS, Frank (HI Mainz, GSI Darmstadt / JGU Mainz)

Presenter: MAAS, Frank (HI Mainz, GSI Darmstadt / JGU Mainz)

Session Classification: Scientific Program