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Investigations of the integrating readout system of the P2 experiment at MESA

The P2 experiment aims for a high precision measurement of the weak mixing angle, a fundamental parameter of the Standard Model. The weak mixing angle will be extracted from the parity-violating asymmetry in elastic electron-proton scattering at low momentum transfer, with an expected raw asymmetry of $A_{\text{raw}} = 0.2403 \times 10^{-7}$. The central component of the detector system is an integrating Cherenkov ring detector, which measures the rates of scattered electrons. These rates depend on the helicity of the electron beam and give rise to the production of Cherenkov light.

The detector modules are developed in collaboration with the University of Manitoba. They consist of a photomultiplier tube, the P2 voltage divider and pre-amplifier and the P2 sampling ADC. In this poster, the P2 experiment is introduced and a test setup for the readout system, emulating an asymmetric light signal down to $\mathcal{O}(10^{-7})$, is presented.

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