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Measurement of the Forward–Backward Asymmetry in □⁺□⁻ → μ⁺μ⁻ at the CEPC □ Pole with the TDR Reference Detector

Sunday, 9 November 2025 11:00 (22 minutes)

The Circular Electron–Positron Collider (CEPC) enables high-precision electroweak studies at the □ pole. We present a simulation-based study of the forward–backward charge asymmetry (A_{FB}^{μ}) in $e^+e^- \to \mu^+\mu^-$ events using the TDR reference detector. After optimized event selection, the signal efficiency reaches about 90% with negligible background contamination. Signal and background samples are generated including γ^*/Z interference and QED radiation, and the simulated asymmetry agrees with the LEP result. Systematic effects from muon identification, background, detector resolution, beam energy spread and beam energy calibration are evaluated. Assuming one month of low-luminosity Z-pole running in the first CEPC ZH operation year, corresponding to 4×10^{10} Z bosons, the expected precision on A_{FB}^{μ} is $\pm 3.1 \times 10^{-5}$ (stat.) and $\pm 2.8 \times 10^{-5}$ (syst.), improving the LEP accuracy by two orders of magnitude.

Primary authors: HAN, Shuo (IHEP (高能所)); 万, 家威 (Nanjing University); 张 (ZHANG), 雷 (Lei) (南京大学 (Nanjing University))

Presenter: 万, 家威 (Nanjing University)

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