

Measurement of PEP-II Beam Polarization with Tau Polarimetry

We present a new technique for measuring beam polarization in an electron-positron collider through the kinematics of tau decay products. The intention is to apply the technique to measure the electron beam polarization in SuperKEKB once a proposed beam polarization upgrade is realized. Having a polarized beam with high luminosity at Belle II opens a new precision electroweak physics program that will yield a weak mixing angle measurement at 10 GeV with higher precision than that obtained at the Z-pole, as well as unprecedented precision in the studies of neutral current universality involving b-quarks, c-quarks, electrons, muons and taus. It also provides unique sensitivity to parity-violating dark sector processes and will improve lepton flavour violating searches. The limiting factor on the precision of some of these future measurements is expected to be the systematic uncertainty in the average beam polarization achieved at the interaction point. We describe how the BaBar dataset has been used to develop the technique and measure the PEP-II electron beam polarization to better than 0.5% systematic uncertainty. As BaBar and Belle II are similar in design, it is expected the technique will yield measurements at least as precise using the Belle II detector.

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