

FCC-ee : beam Energy calibration and polarization

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The first stage of the FCC (Future Circular Collider) is a high-luminosity electron-positron collider (FCC-ee) with centre-of-mass energy ranging from 88 to 365 GeV, to study with high precision the Z, W, Higgs and top particles. A cornerstone of the physics program lays in ppm measurements of the W and Z masses and widths, as well as forward-backward asymmetries. To this effect the centre-of-mass energy distribution should be determined with high precision. This presentation describes the capacity offered by FCC-ee, starting with transverse polarization of the beams around the Z pole and the W pair threshold. A running scheme based on regular measurements, during physics data taking, of the beam energy is proposed, using resonant depolarization of pilot bunches. The design of polarization wigglers, polarimeter and depolarizer is outlined. The e^\pm beam energies will be monitored with a relative precision of one ppm. The derivation of centre-of-mass energy requires further corrections, related to the beam RF acceleration, synchrotron radiation and beamstrahlung; these effects are identified and evaluated. Dimuon events $e^+e^- \rightarrow \mu^+\mu^-$, recorded in the detectors, provide with great precision the beam crossing angle, the centre-of-mass energy spread, and the e^+ and e^- energy difference. Monitoring methods to minimize absolute error and relative uncertainties are discussed. The impact on the physics measurements is given. A programme of further simulations, design, monitoring and R&D is outlined.

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