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Progress in the center-of-mass energy calibration at FCC-ee

The Future Circular Collider electron-positron (FCC-ee) is being designed to enable high energy physics experiments from the Z-pole up to above the top-pair-threshold, corresponding to center-of-mass energies from 91.2 to 365 GeV. This demands a precise knowledge of the center-of-mass energy and collision boosts at all interaction points. Center-of-mass energy measurements are envisaged being performed by resonant depolarization of transversely polarized pilot bunches in combination with a polarimeter. The center-of-mass energy itself depends on the beam energies, the crossing-angle, beamstrahlung, longitudinal impedance, the Earth tides, opposite sign dispersion and possible collision offsets. Thanks to the high collision rate, especially at the Z- and W-pair-energy, a statistical precision of 4 and 100 keV is predicted. Thus, it is aimed to reduce the systematic uncertainty to the same order of magnitude allowing performing particle physics experiments at an unprecedented precision. At the ZH- and top-pair-mode resonant depolarization is no longer possible and thus it is aimed at exploiting information obtained from various di-fermion events. Complementary, applying monochromatization schemes at a certain beam energy regime to reduce the collision energy spread are studied. These crucial challenges are being addressed within the FCC-ee energy calibration, polarization and monochromatization (EPOL) working group and its current status, research highlights and open questions are presented here.

Secondary track

T13 - Accelerators for HEP

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