

Tolerance studies and coupling correction for FCC-ee

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The FCC-ee project is foreseen for precision studies and rare decay observations in the range of 90 to 350 GeV center of mass energy with luminosities in the order of $10^{35} \text{ cm}^{-2} \text{ s}^{-1}$. In order to reach such performances, an extreme focusing of the beam is required in the interaction regions with a low vertical beta function of 2mm at the IP. Moreover, the FCC-ee physics program requires also very low emittance never achieved in a collider with 2nm for ϵ_x and 2pm for ϵ_y , bringing down the coupling ratio to 1/1000. With such requirements, any field errors and source of coupling introduce spurious vertical dispersion which degrades the emittances, limiting the luminosity of the machine. This study aims to describe the tolerance of the emittances to the misalignments of the magnets and how beam position monitor reading errors will affect the vertical emittance. In order to preserve the FCC-ee performances, in particular ϵ_y , a challenging correction scheme is proposed to keep the coupling and the vertical emittance as low as possible.

Primary author: Dr AUMON, Sandra (CERN)

Co-authors: DOBLHAMMER, Andreas (Vienna University of Technology (AT)); HARER, Bastian (KIT - Karlsruhe Institute of Technology (DE)); HOLZER, Bernhard (CERN); WENNINGER, Jorg (CERN)

Presenter: Dr AUMON, Sandra (CERN)

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