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Simulation studies for a drift chamber at the FCC-ee experiment

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Keywords:

Summary

The physics aims at the electron-positron option for the Future Circular Collider (FCC-ee) [**?**], impose high precision requirements on the vertex and tracking detectors. The detector has also to match the experimental conditions such as the collisions rate and the presence of beam-induced backgrounds. A light weight tracking detector is under investigation for the IDEA (International Detector for Electron-Positron Accelerator) detector concept and consists of a drift chamber. Simulation studies of the drift chamber using the FCCSW (FCC software) are presented. Full simulations are used to study the effect of beam-induced backgrounds on this detector.

Contents

1 Introduction

The FCC-ee high-luminosity circular electron-positron collider, with center-of-mass energies $\sqrt{s}$ from 91.2 GeV to 365 GeV, allows for high-precision measurements of the properties of the Z, the W, the top quark and the Higgs boson. As a predecessor of a new 100 TeV proton-proton collider, the FCC-ee collider is foreseen to be placed in a 100 km tunnel in Geneva area as shown in **??**.

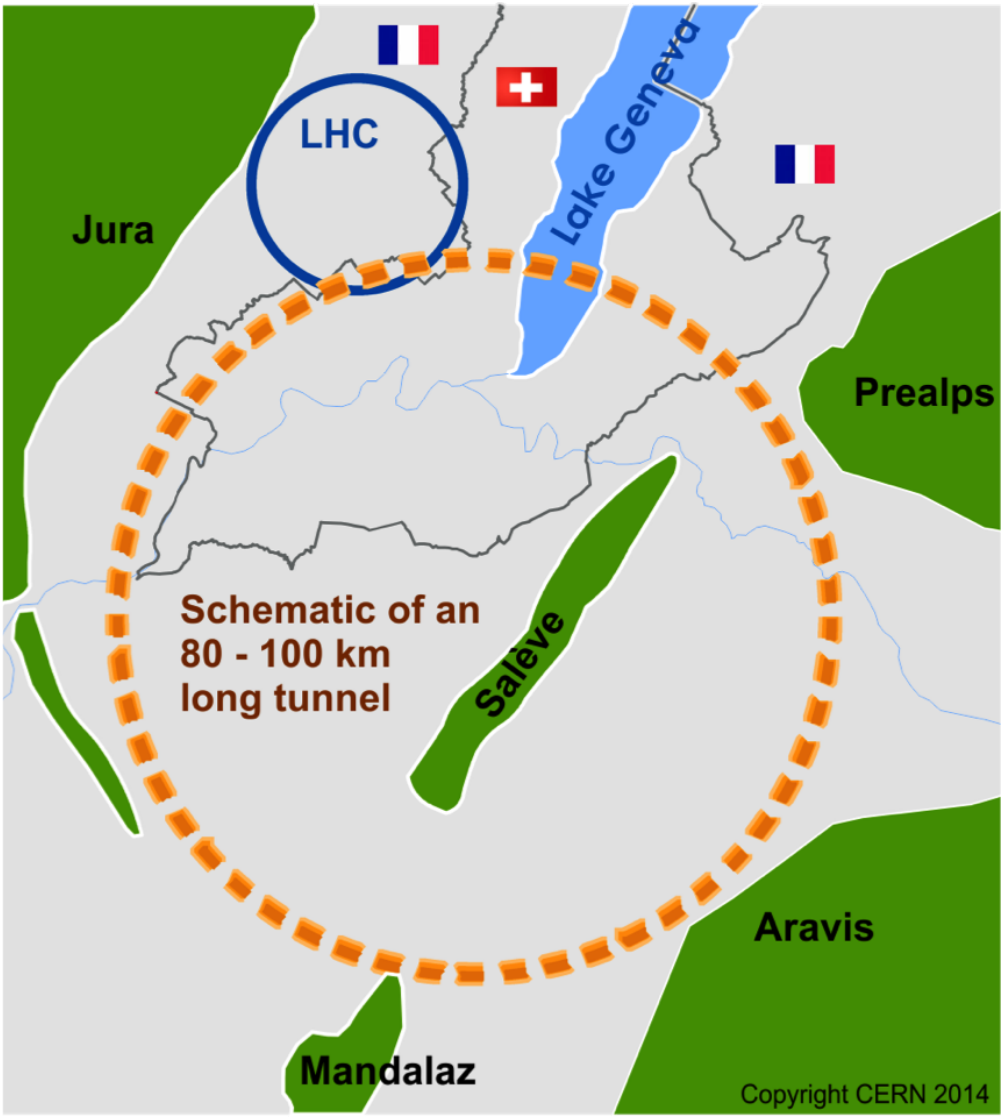

Figure 1: A possible realization of the FCC experiment near the Geneva region.

The IDEA detector, one of the two detector concepts under development for FCC-ee, has demanding requirements to match the experimental conditions. Its main components consist of: an ultra-light silicon-based vertex detector, an ultra-light drift chamber for track reconstruction and particle identification, a dual-readout calorimeter, a 2 T axial magnetic field and an instrumented return yoke as illustrated in **??**. The drift chamber is being investigated using GEANT4-based simulations. Its performance and the effect of beam-

induced backgrounds are presented here-below.

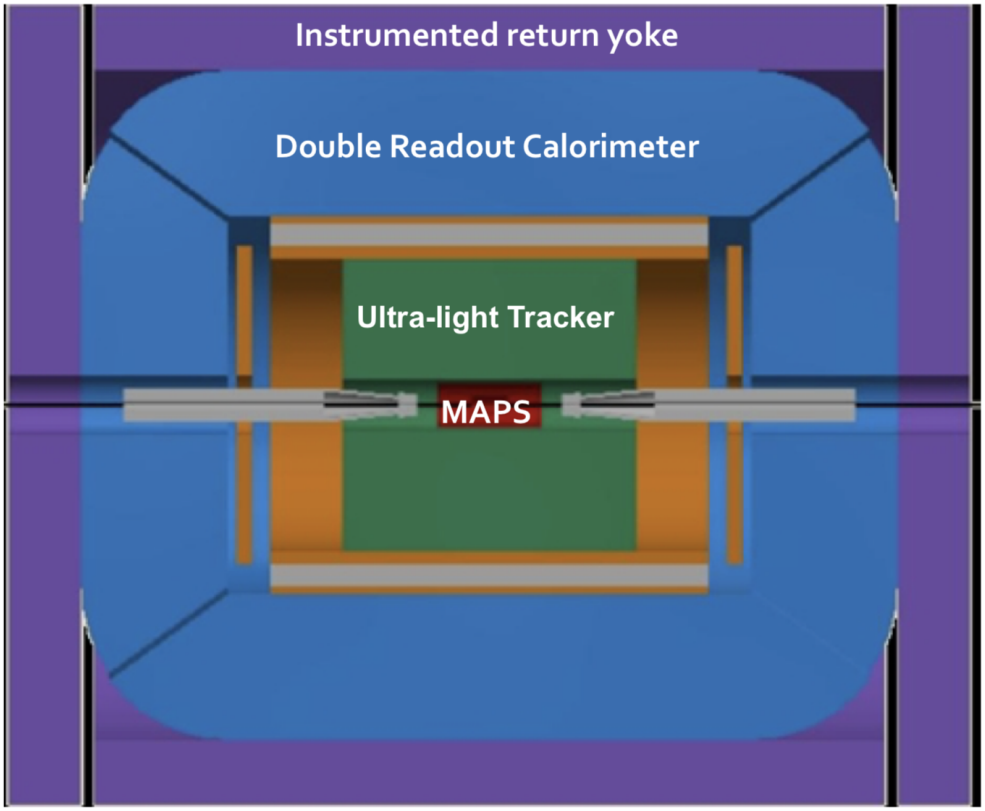

Figure 2: Schematic layout of the IDEA detector with the sub-detectors illustrated in different colors: vertex detector (red), drift chamber (green), pre-shower (orange), magnet (gray), calorimeter (blue), magnet yoke and muon system (violet).

2 Tracking

2.1 The Hough Transform

References

[1] M. Bicer et al. First Look at the Physics Case of TLEP. *JHEP*, 01:164, 2014.

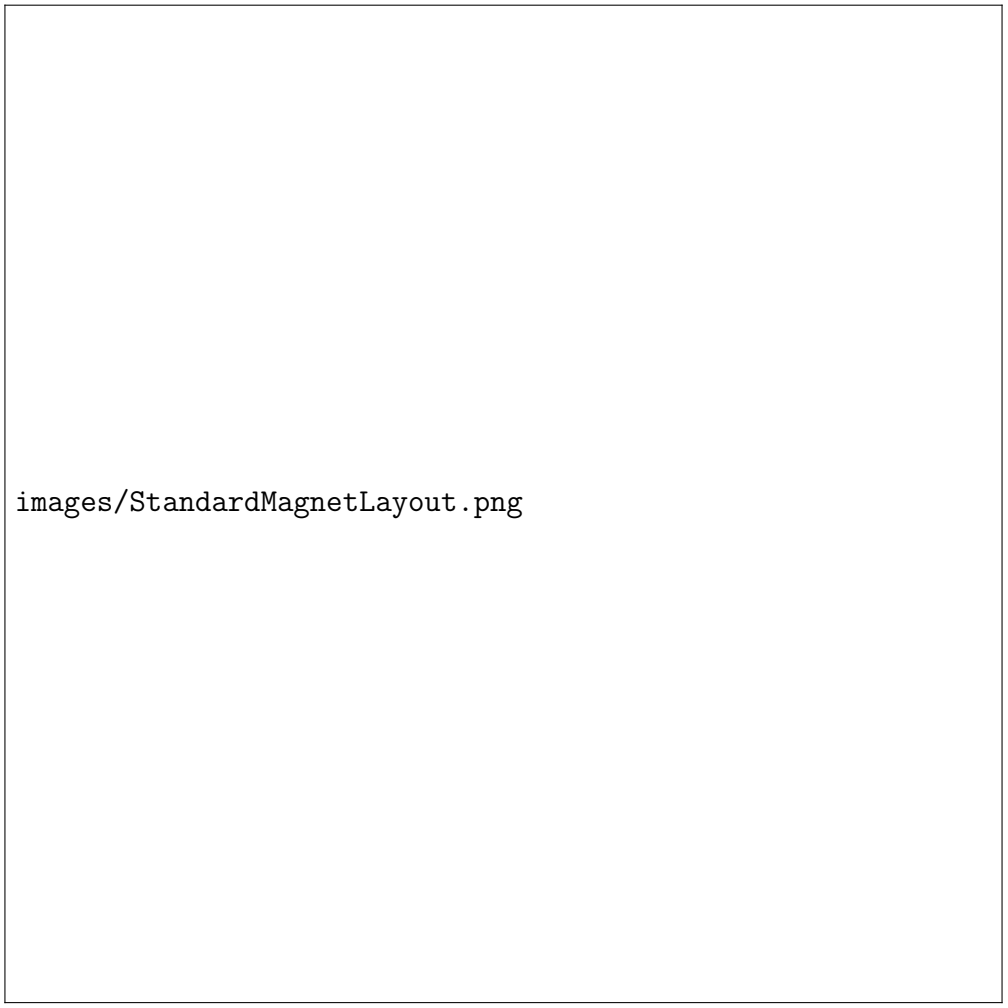

Figure 3: Standard magnet layout for a sector bending magnet