



CEPC Gaseous Track Detector

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Chapter 06

- **Finalized Content**
 - Table styles: Done
 - Significant figures: Done
 - Figures style : Done
 - Glossary style : Done
 - Reference: Done
 - Comments of IDRC: Done

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Chapter 06

- Major revision after IDRC comments
 - Pixelated readout → **High granularity readout**
 - Discussion and confirmed in LCTPC collaboration
 - Barrel of TPC detector
 - Carbon fiber → **Carbon** fiber plus Honeycomb and FEA analysis update
 - Readout of TPC
 - Micromegas **readout** → **Double mesh** Micromegas readout
 - Graphene layer R&D in the future
 - Cost estimation
 - Based on Micromegas option in ILD and update total cost

List the main issues to be solved before IDRC review

- Since the IDRC 2024 review, significant progress has been made in the simulation of space charge distortions. For CEPC Higgs and low-luminosity Z runs, the maximum distortions after 3 meters of drift were found to be approximately 10 μm and 150 μm , respectively. Nevertheless, these figures require further verification, and careful evaluation of beam-related background effects must continue. In the longer term, dedicated simulation efforts are needed to develop and refine a "data driven" approach for extracting space-charge corrections, based on the alignment and correction models developed for the ALICE TPC
- Track-distortion corrections will be updated along different TPC radii and drift velocities under the condition $\text{IBF} \times \text{Gain} = 1$ at Higgs and the low luminosity Z run.

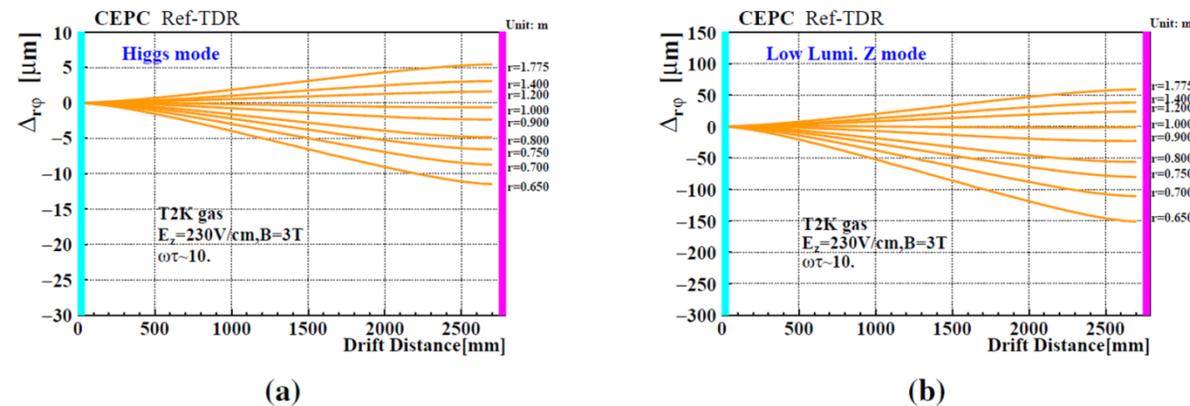
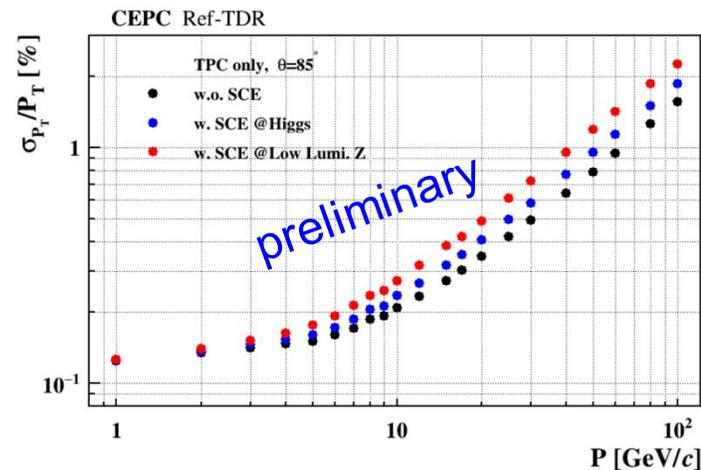


Figure 6.22: Azimuthal distortions as functions of drift distances at the CEPC H mode (a) and low luminosity Z mode (b) (without ≤ 10 MeV low energy photons). Each orange solid line represents distortions in azimuthal direction at different radii.

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Space-Charge Distortion

- The chapter still lacks a quantitative description of space-charge distortion and its impact on tracking;
- The space-charge distortion, which leads to a degradation of the spatial resolution, can be partially corrected by track-based calibration.
- However, even after calibration, the final spatial resolution cannot be fully restored to the ideal level.
- It is complicated to perform a precise simulation at this stage. To give a fast estimation of the impact from the distortion, the final spatial resolution for Higgs and Z mode are assumed to deteriorate by 20% and 50%, respectively, compared to the ideal case. The momentum resolution in different cases can be obtained.



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