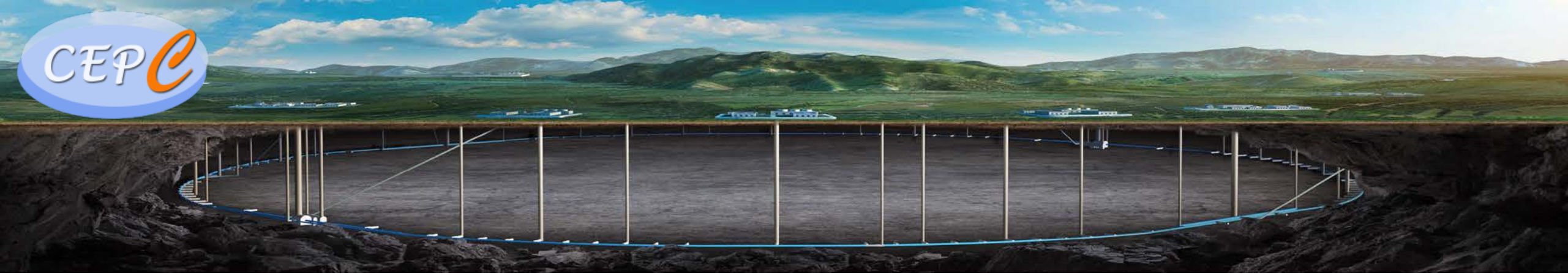

CEPC Gaseous Track Detector

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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

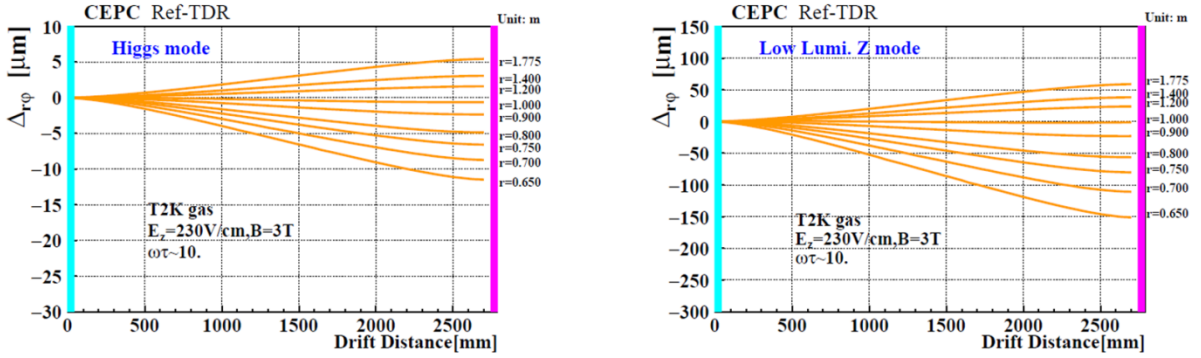
Chapter 06

- 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 IBF × Gain = 1 at Higgs and the low luminosity Z run.



(a) (b)

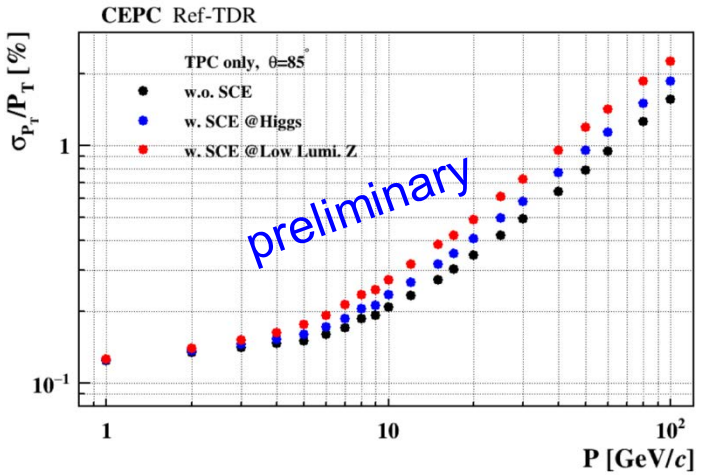
Figure 6.22: Azimuthal distortions as functions of drift distances at the CEPC *H* mode (a) and low luminosity *Z* mode (b) (without ≤ 10 MeV low energy photons). Each orange solid line represents distortions in azimuthal direction at different radii.

List the main issues to be solved before IDRC review

Space-Charge Distortion

- The chapter still lacks a quantitative description of space-charge distortion and its impact on tracking;
- he 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.



Linghui Wu and Xin She