

## Status and Challenges of CEPC Time Projection Chamber Detector

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We would like to present our latest progress and related study of the CEPC TPC (Time Projection Chamber) detector on the followings. Firstly, the status of GEM and Micromegas detector at Institute of High Energy Physics will be reported. Taking into account the advantages of the two detectors, one GEM foil was set as a preamplifier on the mesh of Micromegas in the structure and the GEM preamplification decreased the working voltage of Micromegas to reduce the effect of the discharge significantly. Compared with standard Micromegas detector, the influence of discharge decreases and the GEM-Micromegas detector could maintain stable operation. Over 8 keV, the detector could obtain a better than 20% of energy resolution [1]. The TPC prototype with the GEM readout developed in Tsinghua University, the performance of the detector using cosmic rays would be given in 1.0 Tesla of magnetic field [2]. To meet the same requirements as the main performance and design goals of ILD-TPC, the baseline design of the CEPC TPC detector takes exactly the same as that. Based on the preliminary simulation results of the track momentum resolution with different TPC geometries, the outer radius of the CEPC TPC will be close to 1800mm. However, the outer radius of the TPC detector needs to be further optimized to balance the overall detector performance and cost. The details of simulation with different TPC geometries will be presented. In the next years, a lot of issues and challenges needed to be addressed. There were the goals for performance and design parameters, the time structure of the beam, the ion back flow in the drift field and so on. Finally, the critical R&D of the CEPC-TPC detector prototype will be discussed.

### References:

- [1] Yu-Lian, Zhang, et al. "Investigation of GEM-Micromegas detector on X-ray beam of synchrotron radiation." Chinese Physics C 38.4 (2014): 046001.
- [2] Li, Yulan, et al. "Performance study of a GEM-TPC prototype using cosmic rays." Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment 596.3 (2008): 305-310.