



Contribution ID: 46

Type: **Parallel Talk**

## Study status of the CEPC Machine-Detector Interface and Interaction Region

*Thursday, 7 July 2022 11:50 (15 minutes)*

The machine-detector interface (MDI) issues are one of the most complicated and challenging topics at the Circular Electron Positron Collider (CEPC). Comprehensive understandings of the MDI issues are decisive for achieving the optimal overall performance of the accelerator and detector. The CEPC machine will operate at different beam energies, from 45.5 GeV up to 120 GeV, with an instantaneous luminosity increasing from  $3 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$  for the highest energy to  $3.2 \times 10^{35} \text{ cm}^{-2} \text{ s}^{-1}$  or even higher for the lowest energy.

A flexible interaction region design will be plausible to allow for the large beam energy range. However, the design has to provide high luminosity that is desirable for physics studies, but keep the radiation backgrounds tolerable to the detectors. This requires a careful balance of the requirements from the accelerator and detector sides.

In this talk, the latest design of the CEPC MDI based on the current CEPC accelerator and detector design and parameters will be presented:

1. The design of the beam pipe will be presented, which would foresee several constraints: In the central region ( $z = \pm 10 \text{ cm}$ ), it should be placed as close as possible to the interaction point and with minimal material budget to allow the precise determination of the track impact parameters. But it should still stay far away enough not to interfere with the beam backgrounds. The material and coolants must be carefully chosen based on the heat load calculation. In the forward region, the beam pipe must be made by proper materials to conduct away the deposited heat in the interaction region and shield the detectors from the beam backgrounds.
2. The estimation and mitigation of beam-induced backgrounds has been simulated and will be presented. A detailed simulation covering the main contributions from synchrotron radiation, pair production, and off-momentum beam particles has been performed. The suppressing/mitigating schemes have also been studied.
3. The flexible layout of the CEPC IR and the engineering efforts for several key components like the position of LumiCal, the design of the Final Focusing system, and the Cryostat Chamber will be present.

We will also discuss our future plans towards the CEPC TDR.

### In-person participation

No

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**Session Classification:** Accelerators: Physics, Performance, and R&D for future facilities

**Track Classification:** Accelerators: Physics, Performance and R&D for future facilities