Feedback and Work Plan —CEPC Gaseous Tracker

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Content

- **Feedback from IDRC review**
- **Work plan before TDR**

Feedback#1: Simulation

- **A full simulation is necessary to optimize** the pixel/pad size. Microscopic pixels present the advantage of low noise, allowing single electron efficiency for a digital readout. Larger pads (more than 500µm) allow a measurement of the ionization track element by track element, but require an electronics with an ADC for each pad, and this part is power consuming.

- Comments and work plan:
  - Full simulation using Geant4 and Garfield++
  - Balance the pad size, the physics requirements and detector construction

Feedback#2: IBF at Tera-Z

- The build-up of a space charge has to be very limited to avoid a transverse electric field which causes distortion of the trajectories of the ionization electrons, leading to track distortions. Beam backgrounds have to be kept to a minimum to avoid this space charge build-up, or mitigation and correction techniques have to be designed to limit these distortions. This problem makes a TPC improper at the Z peak at very high luminosity.

- Comments and work plan:
  - To optimize at low luminosity Z peak. (0.5× or 0.1×) ！ 10^{-35}
  - Double misaligned meshes (NIKHEF)
  - graphene filter(Shandong University)

Feedback#3: Beam background

- Beam backgrounds have to be estimated carefully, as they produce ionization in the TPC. Especially low-energy X-rays and muons from thermal neutron interaction (the beam halo) can lead to low-pT particles (curlers) which deposit a huge ionization in the gas. These effects are amplified by ion feedback : ions created in the amplification gap can escape and drift all the way to the cathode. This takes typically half a second. Thus ion feedback has to be very well.

- Comments and work plan:
  - Collaboration with MDI group

Feedback#4: Mechanical

- The mechanical alignment of the modules has to be excellent (a few tens of microns) to avoid systematics on the sagitta measurement. The electric and magnetic fields have to be precisely parallel to avoid ExB distortions. This calls for a very uniform magnetic field (see magnet section).

- Comments and work plan:
  - Collaboration with Mechanical and magnet group

Feedback#5: T0

- A precise T0 has to be determined for each interaction using the other tracking detectors.

- Comments and work plan:
  - T0 is possible from ITK and OTK.

Feedback#6: Protection Chip

- The readout chip itself has to be protected against damage from sparks. An adequate resistive coating has to be applied on each chip, with a surface resistivity tuned for maximal protection without excessive rate limitation.

- Comments and work plan:
  - Prototyping of chip + mesh + protection
  - Discussion with Tsinghua, the protection resistive layer will be coated with ASIC chips.