CEPC Tracking System Optimization

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Outline

- Physics requirements
- Tracking system of CEPC Reference Detector concept
- Tracking optimization with momentum
- Tracking optimization with PID
- Tracking optimization with material budget
- Summary and Outlook

Tracking performance

- Transverse momenta > 1GeV, reco eff > 99%.
- Momentum reso ~ 0.1%
- Lepton identification: Lepton ID of 99% with momenta > 5GeV Mis-ID < 2%, lepton inside jets for jet flavor and jet charge
- Charged kaon identification: efficiency and purity > 90%
- Photon ID and energy measurement : 20%/sqrt(E) cov.1% , pi0 eff and purity > 95%
- Jet and missing energy: BMR better than 4%
- Flavor tagging: b-jet > 80%, c-jet > 60%

Physics processes and key observables

Physics process	**Measurands**	**Detector subsystem**	**Performance requirement**
$ZH, Z \to e^+e^-, \mu^+\mu^-$ $H \to \mu^+\mu^-$	$m_H, \sigma(ZH)$ $\mathrm{BR}(H \to \mu^+\mu^-)$	Tracker	$\Delta(1/p_T) =$ $2 \times 10^{-5} \oplus \frac{0.001}{p(\mathrm{GeV})\sin^{3/2}\theta}$
$H \to b\bar{b}/c\bar{c}/gg$	$\mathrm{BR}(H \to b\bar{b}/c\bar{c}/gg)$	Vertex	$\sigma_{r\phi} =$ $5 \oplus \frac{10}{p(\mathrm{GeV})\times\sin^{3/2}\theta}(\mu\mathrm{m})$
$H \to q\bar{q}, WW^*, ZZ^*$	$\mathrm{BR}(H \to q\bar{q}, WW^*, ZZ^*)$	ECAL HCAL	$\sigma_E^{\mathrm{jet}}/E =$ $3 \sim 4\%$ at 100 GeV
$H \to \gamma\gamma$	$\mathrm{BR}(H \to \gamma\gamma)$	ECAL	$\frac{\Delta E}{E} =$ $\frac{0.20}{\sqrt{E(\mathrm{GeV})}} \oplus 0.01$

Tracking system of CEPC CRD

- Vertex
- Silicon Tracker
- Drift chamber

Tracking optimization with momentum

- CRD baseline tracking with only silicon

Tracking optimization with PID

Tracking optimization with material budget

Summary and Outlook