

All-Silicon Tracker concept for the Electron-Ion Collider



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Tracking Requirements for the EIC

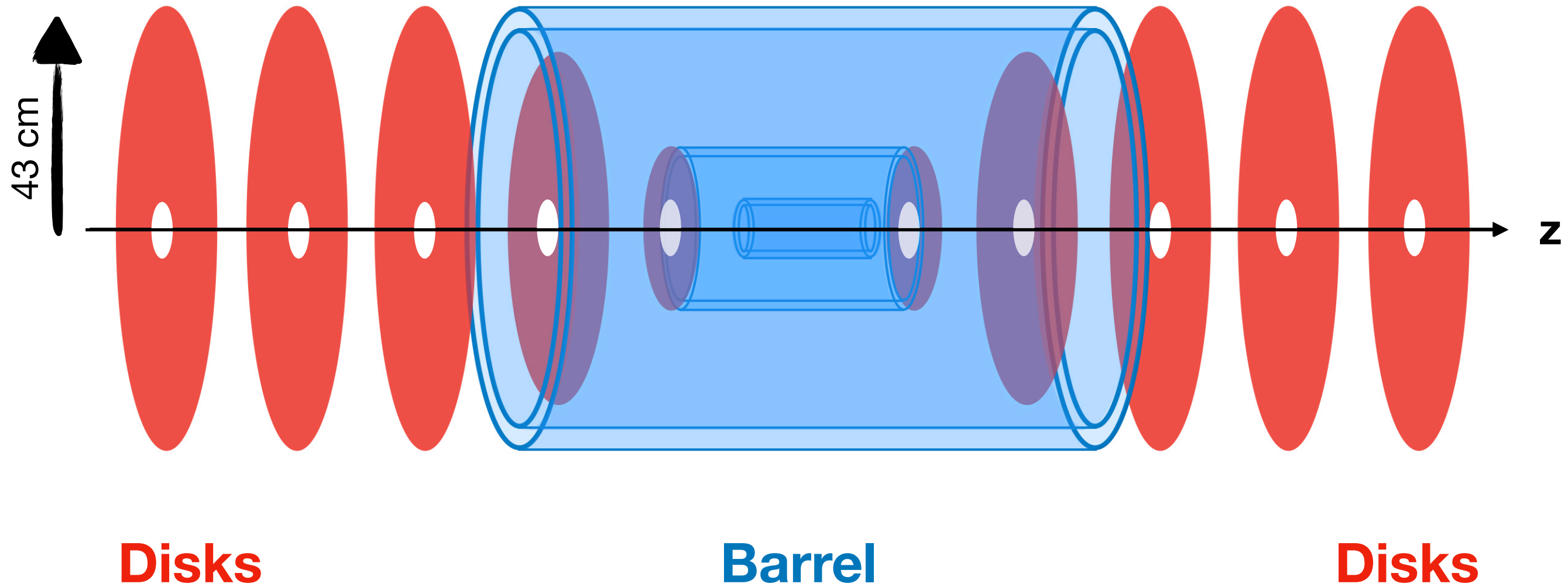
(Preliminary) requirements outlined in the [EIC detector handbook](#):

- Hermetic ($|\eta| < 4$, $0 \leq \phi < 2\pi$ coverage)
- Compact ($r \sim 88$ cm, $l \sim 300$ cm)
- Low-material-budget ($X/X_0 < 5\%$)
- Excellent angular (~ 1 mrad), and primary vertex resolutions ($< 20 \mu\text{m}$)
- Aid in particle identification (PID)
- Excellent momentum resolution

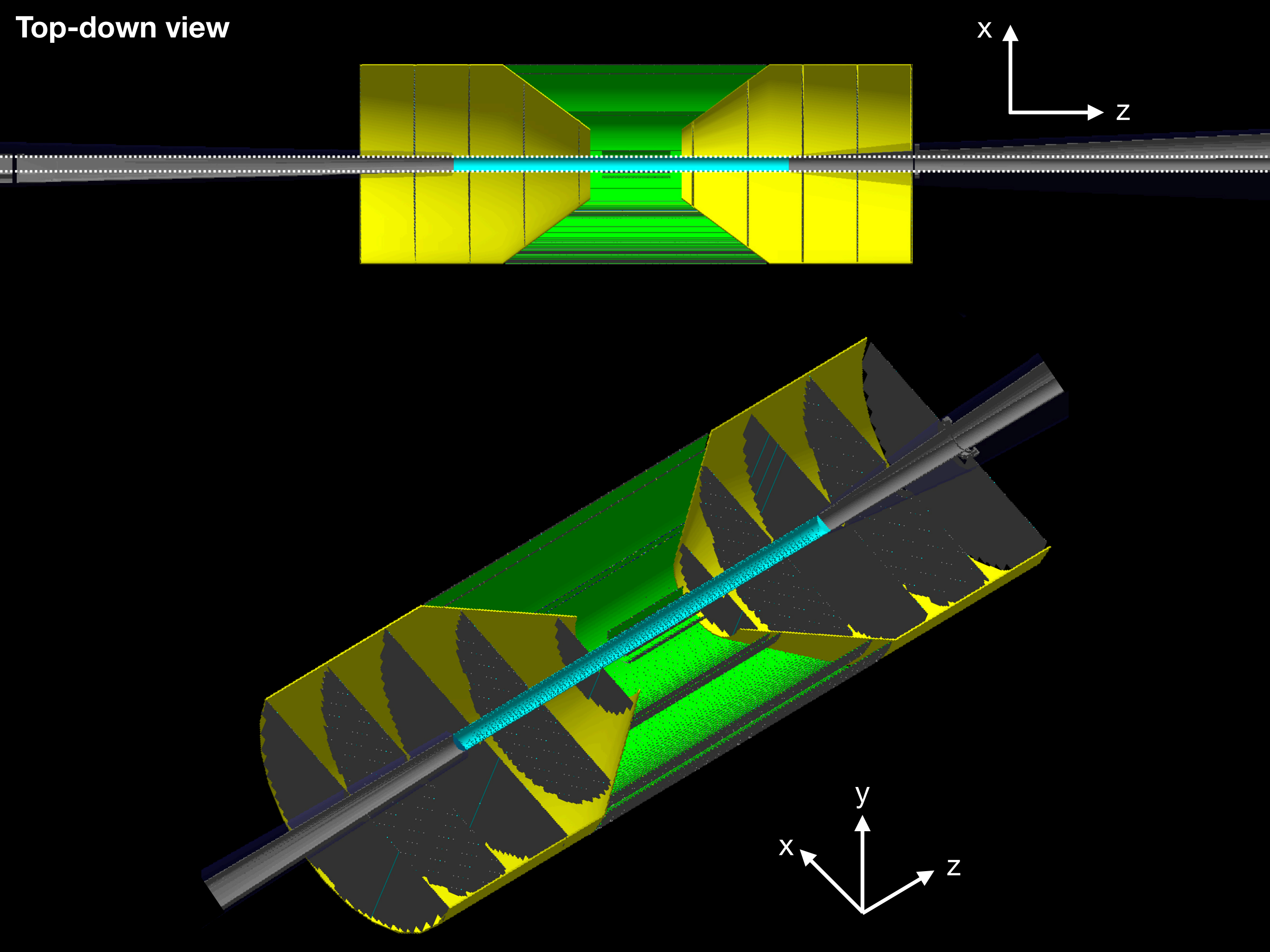
All-Silicon Tracker Prototype

pixel size: $10\mu\text{m} \times 10\mu\text{m}$
stave $\langle X/X_0 \rangle = 0.3\%$

242 cm

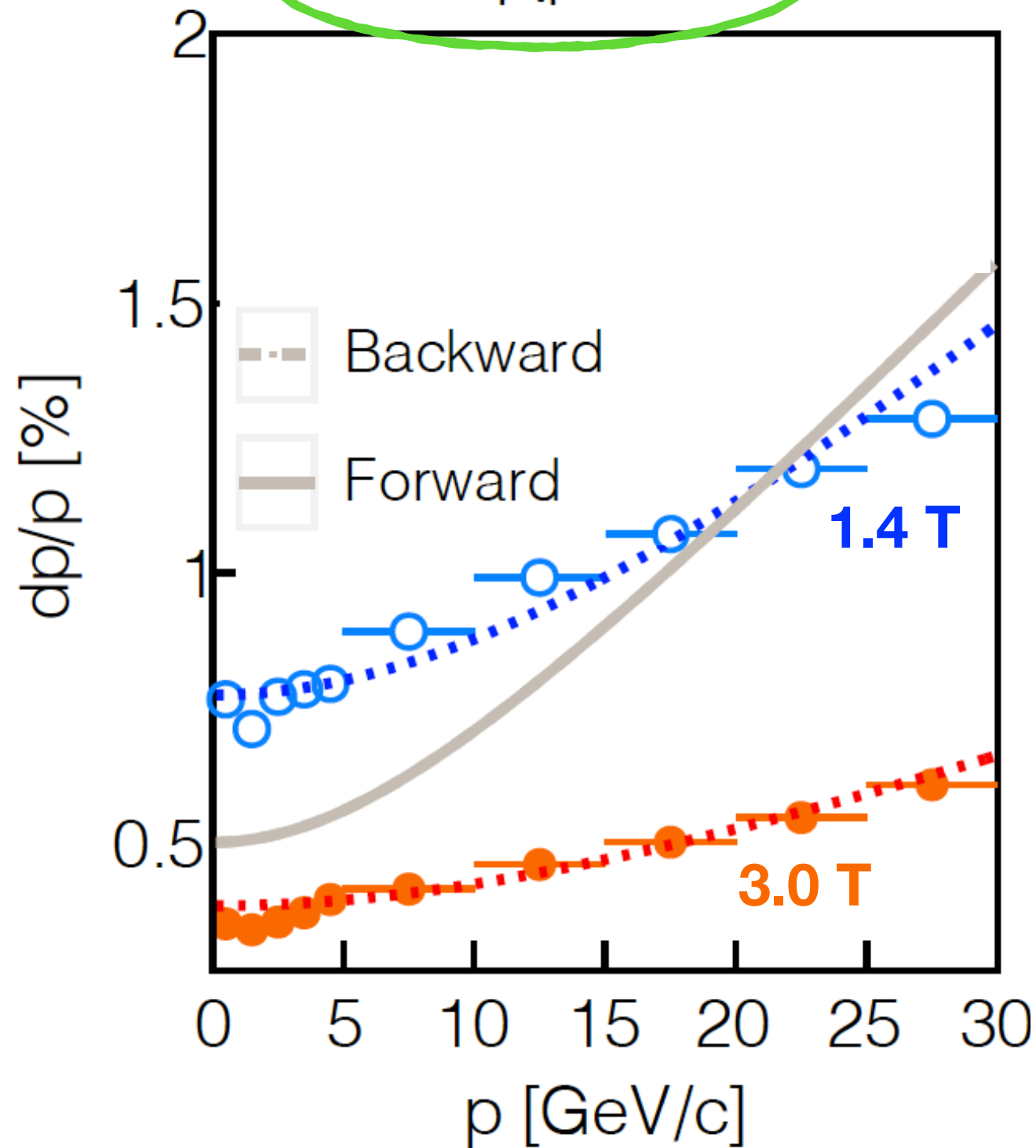


Top-down view

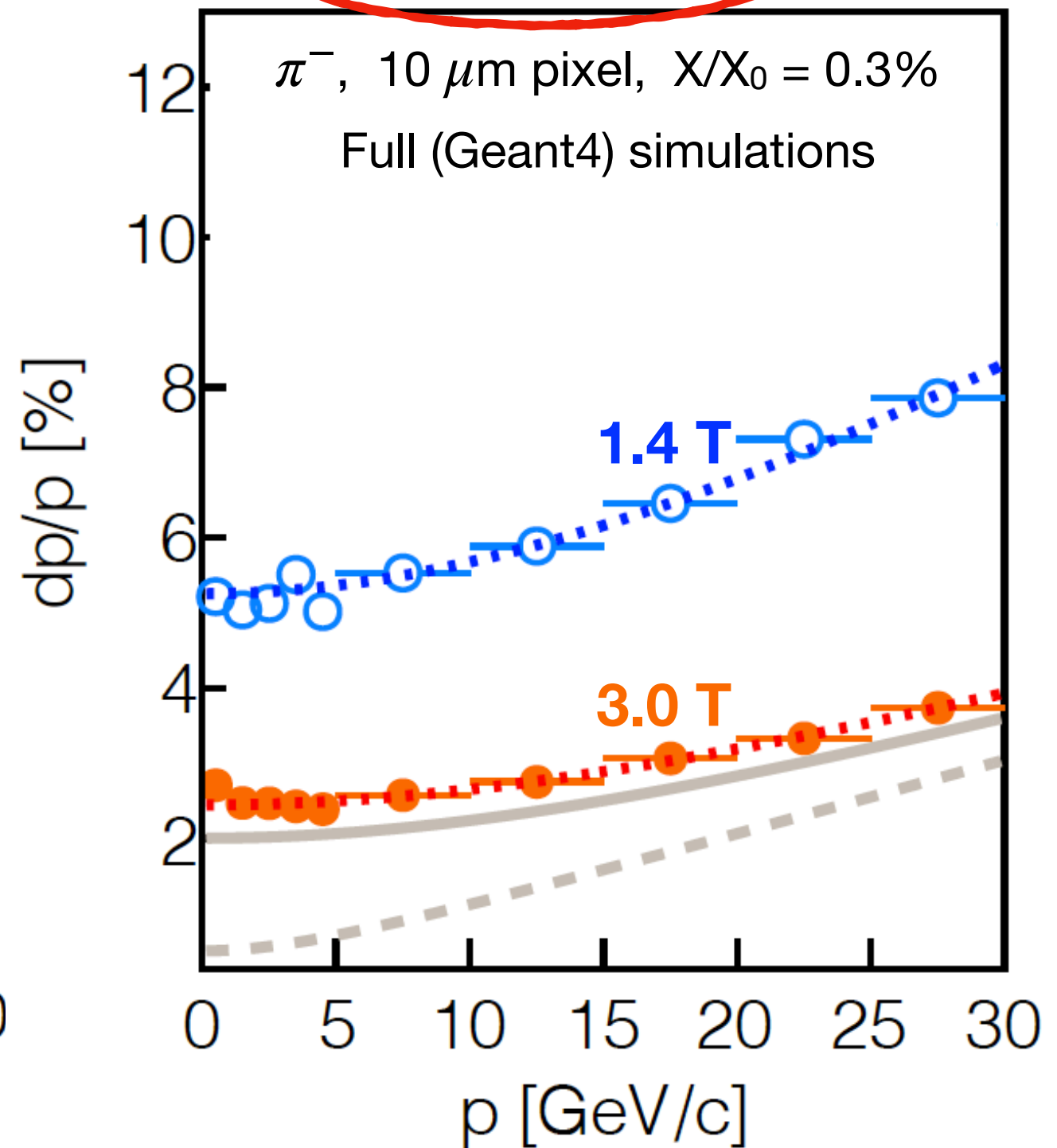


Resulting Momentum Resolutions

$$0.0 < |\eta| < 0.5$$

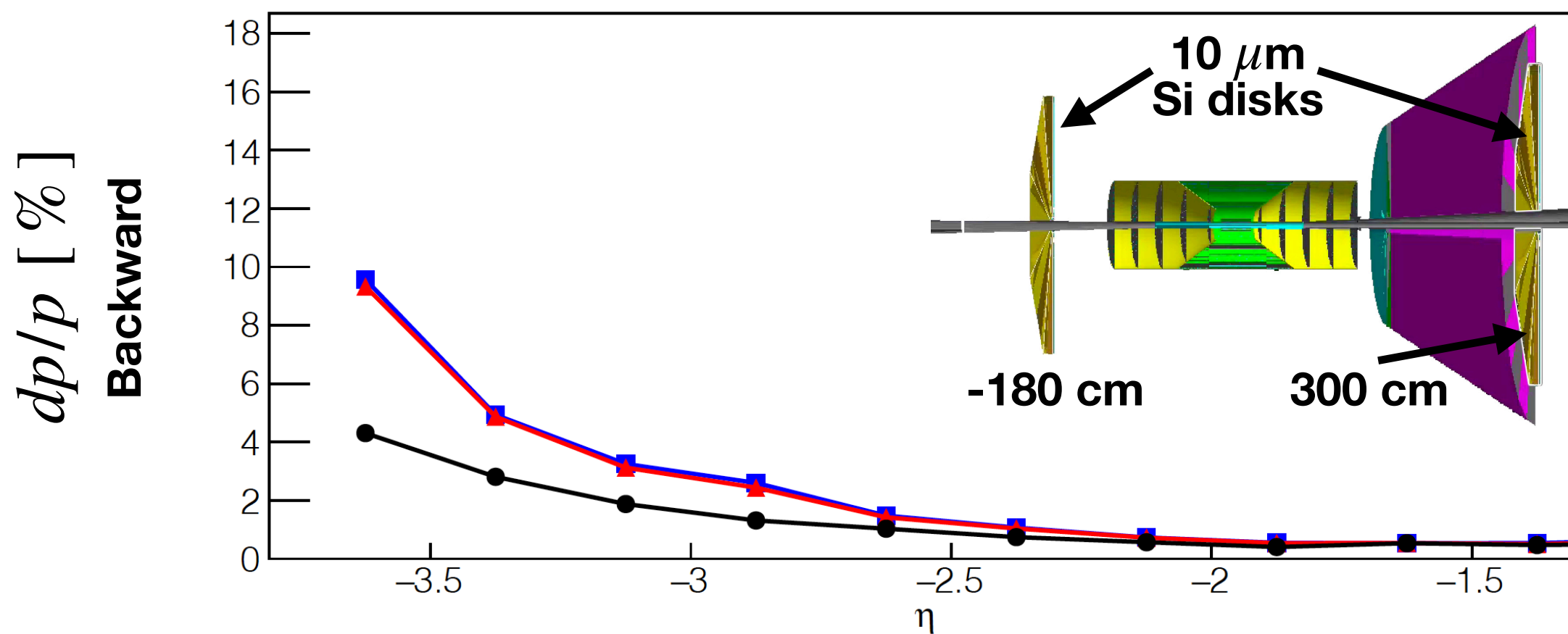
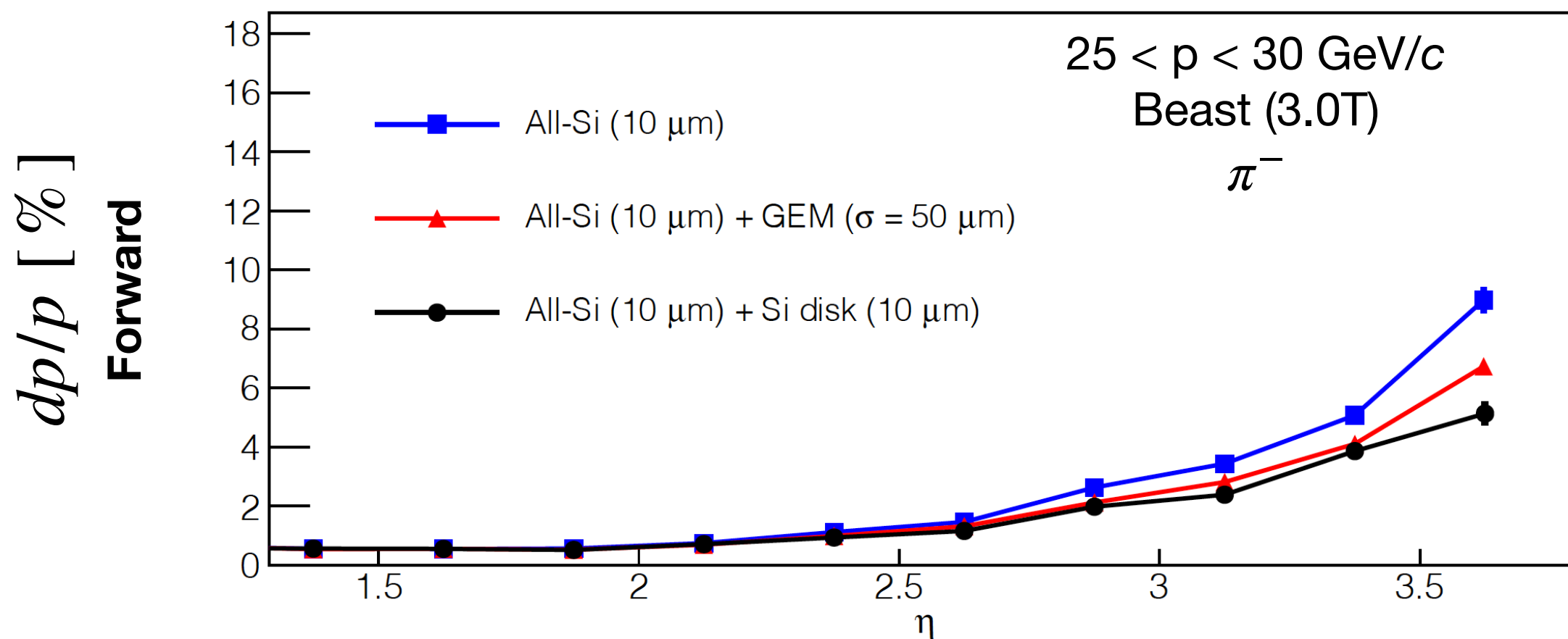


$$3.0 < |\eta| < 3.5$$



* Auxiliary tracking stations can be used to get a better resolution at high $|\eta|$

Complementing All-Si tracker with other detectors



Summary

- Studied All-Silicon tracker prototype for the EIC in full simulations
 - detector momentum resolution better than requirements (with 3 T field) in most of the acceptance and can be complemented with other tracking stations in the forward / backward pseudorapidities to enhance resolution.

Many other studies not presented here:

- Material scan
- Vertex resolutions
- Angular resolutions at vertex and PID-detector locations
- Azimuthal momentum-resolution asymmetry

*** Comparable or better performance as other candidate detectors**