

ILD Tracking Performance Studies

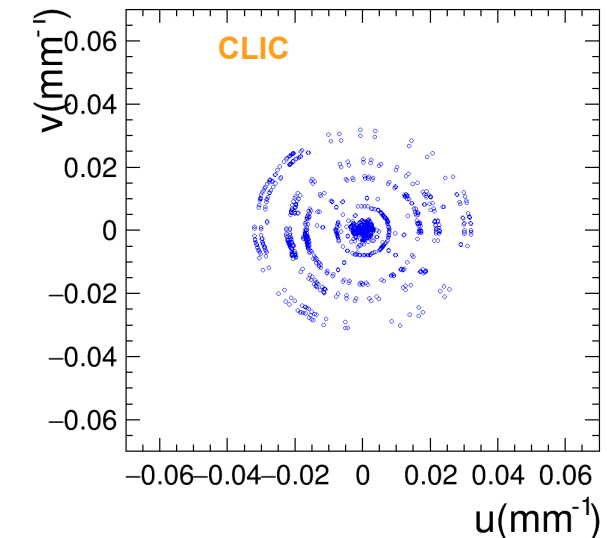
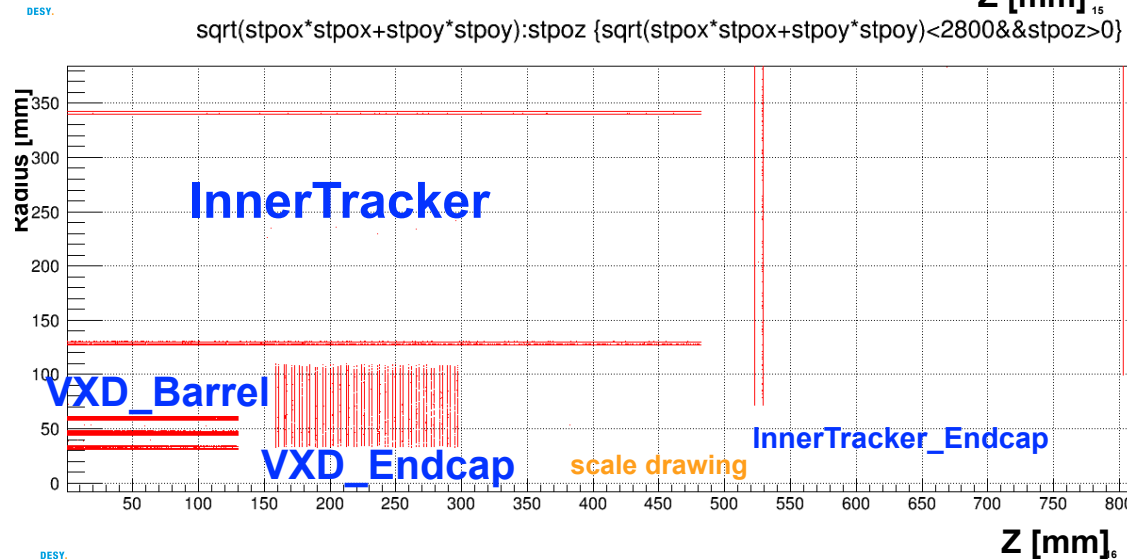
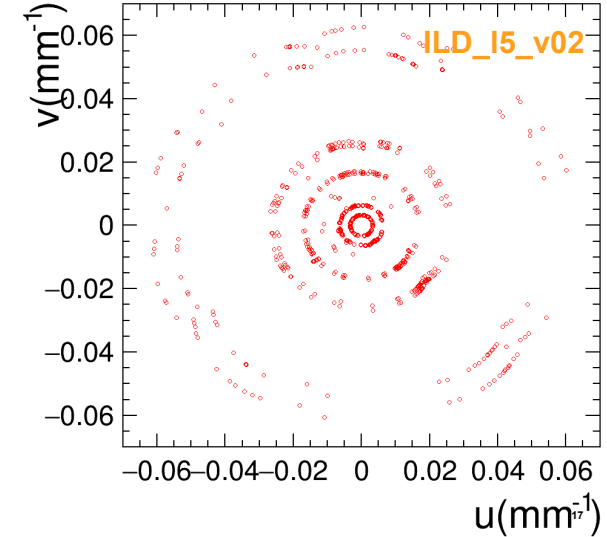
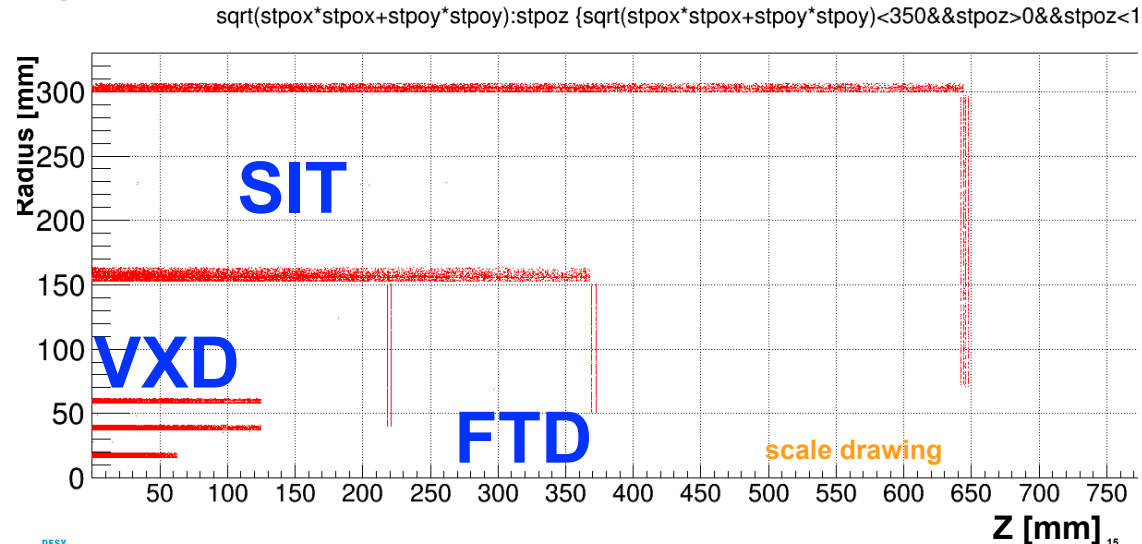
- Tracking Performance
 - ILD standard reconstruction
 - ILD w/ ConformalTracking
 - ILD w/ Pixel FTD
 - ILD w/ CLIC like VXD detector

Shaojun Lu, Frank Gaede
shaojun.lu@desy.de

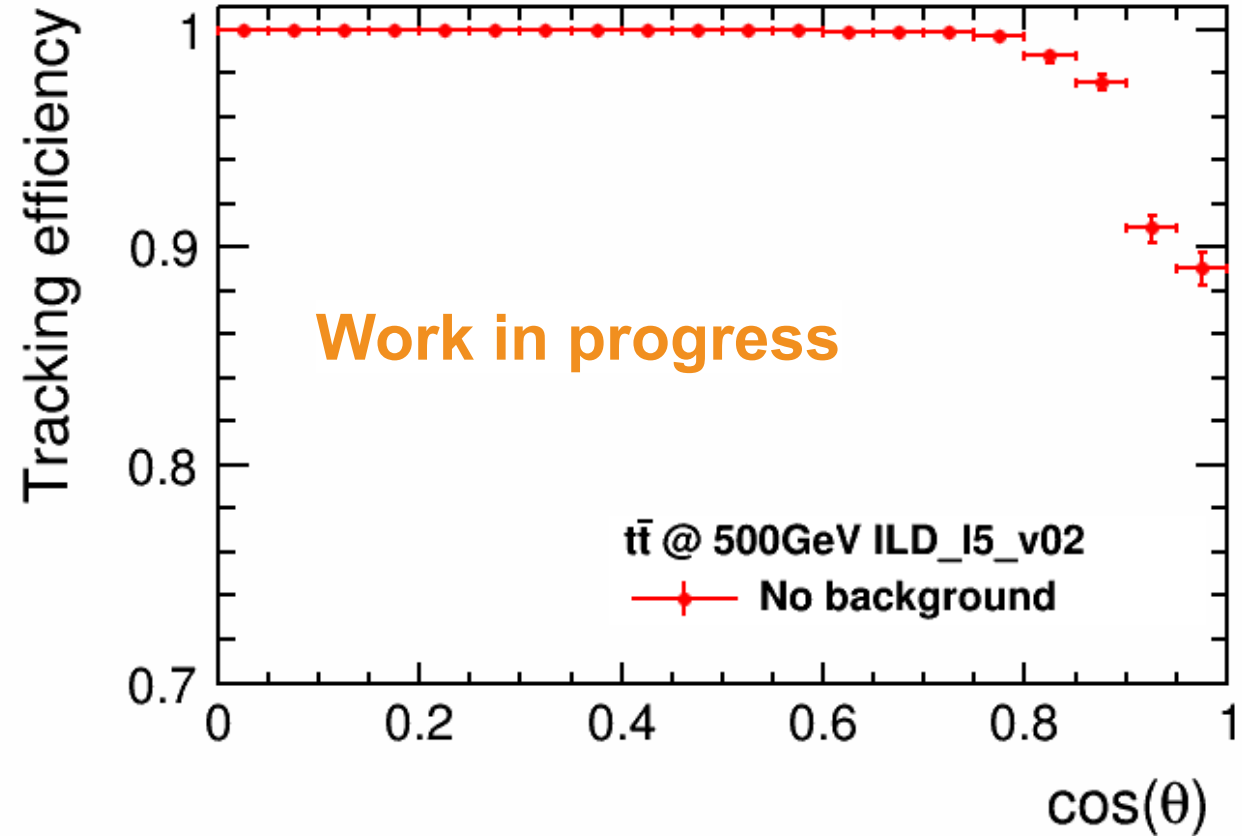
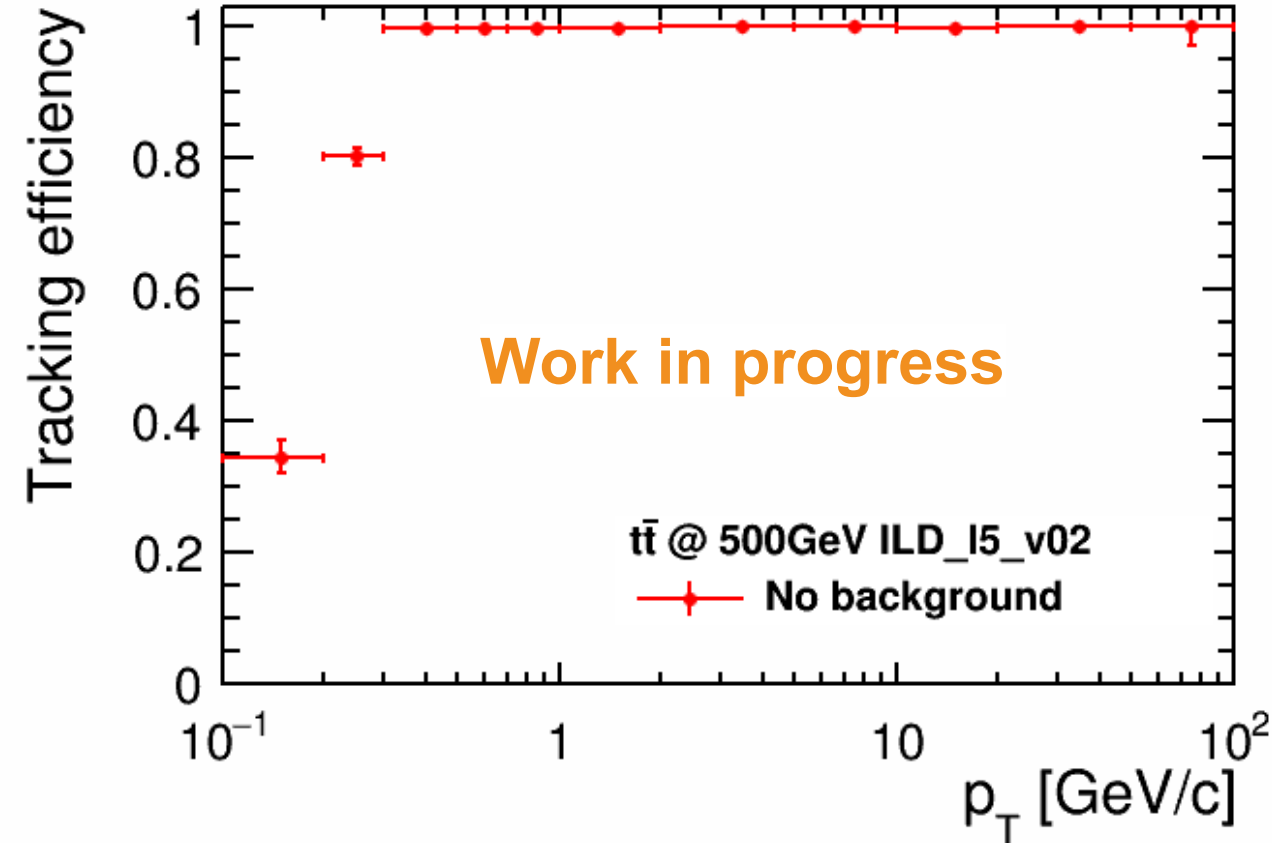
Motivation

Tracking efficiency and VXD layout

- At Ichinoseki ILD meeting showed first results of
- Applying ConformalTracking - originally developed for CLIC - to the ILD detector
 - Observed improvement in tracking efficiency
 - However not quite as good as seen by CLIC
- Investigate if this is due to the different detector layout



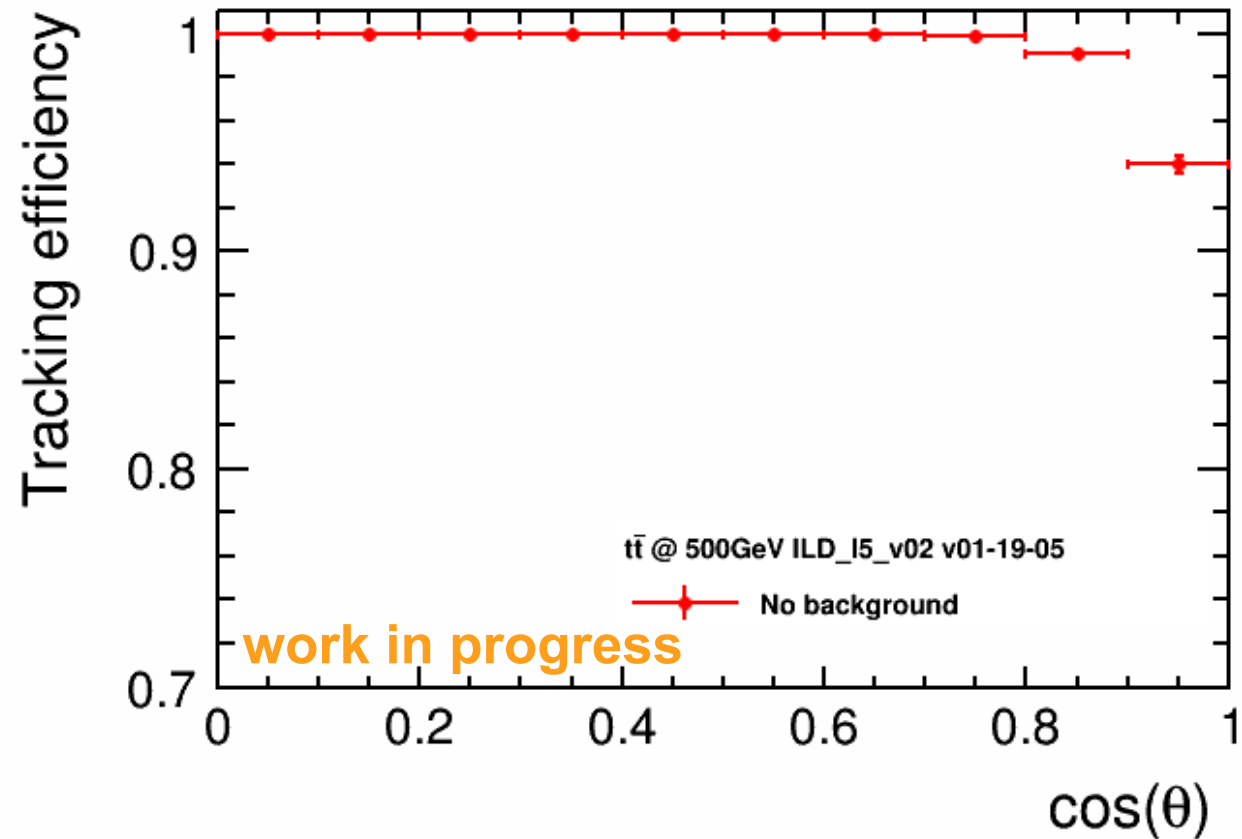
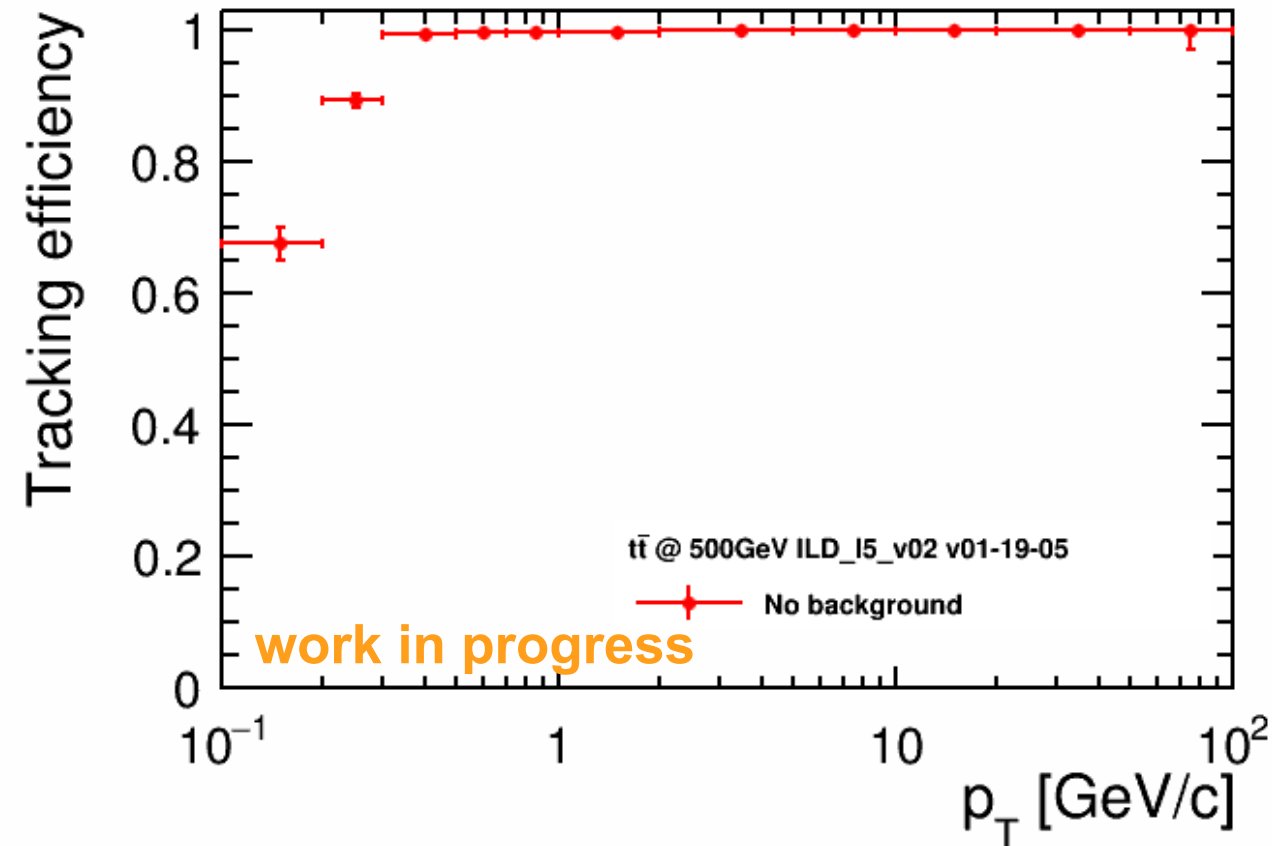
ILD reference (v02-00)



MCP nominator: stable charge particles with `GeneratorStatus == 1 && !IsDecayedInTracker && maximum distance from IP < 10 mm && cosTheta < 0.99`

ILD w/ ConformalTracking and two FTD pixel disks

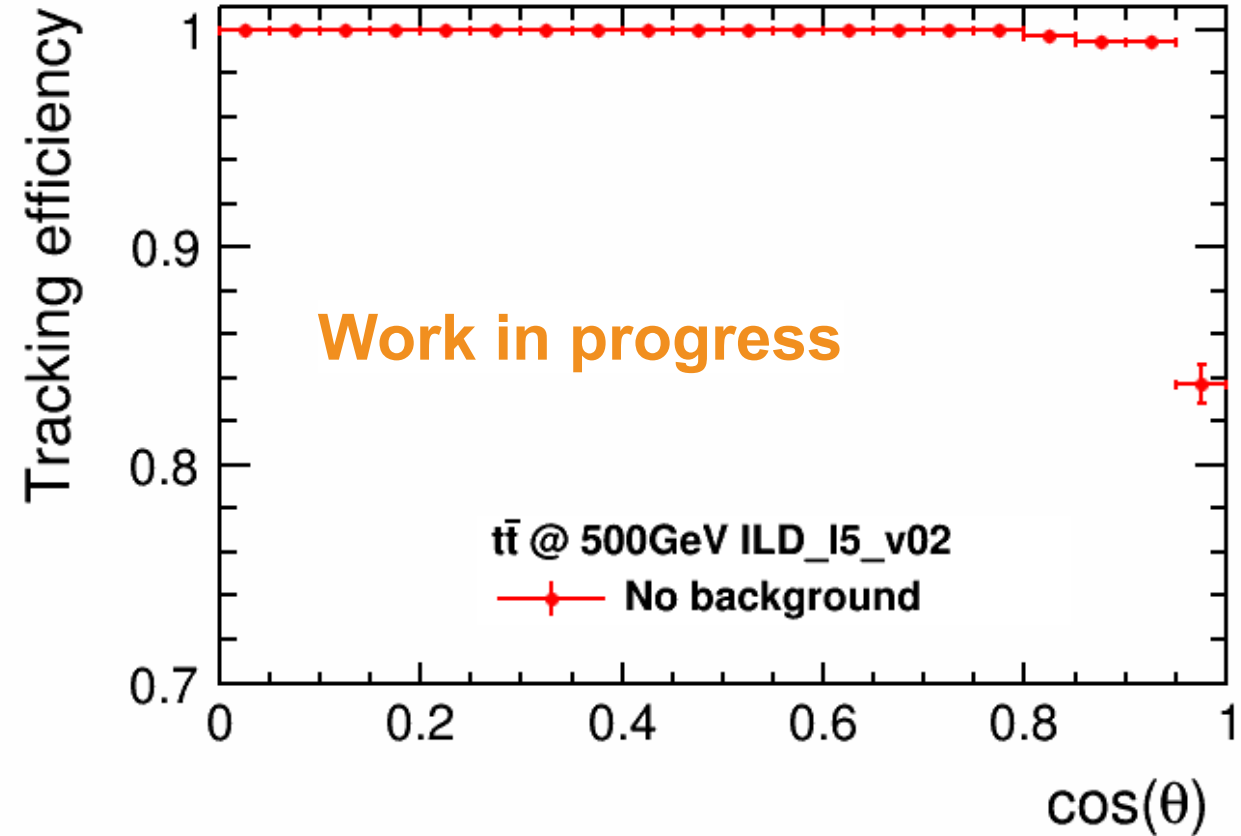
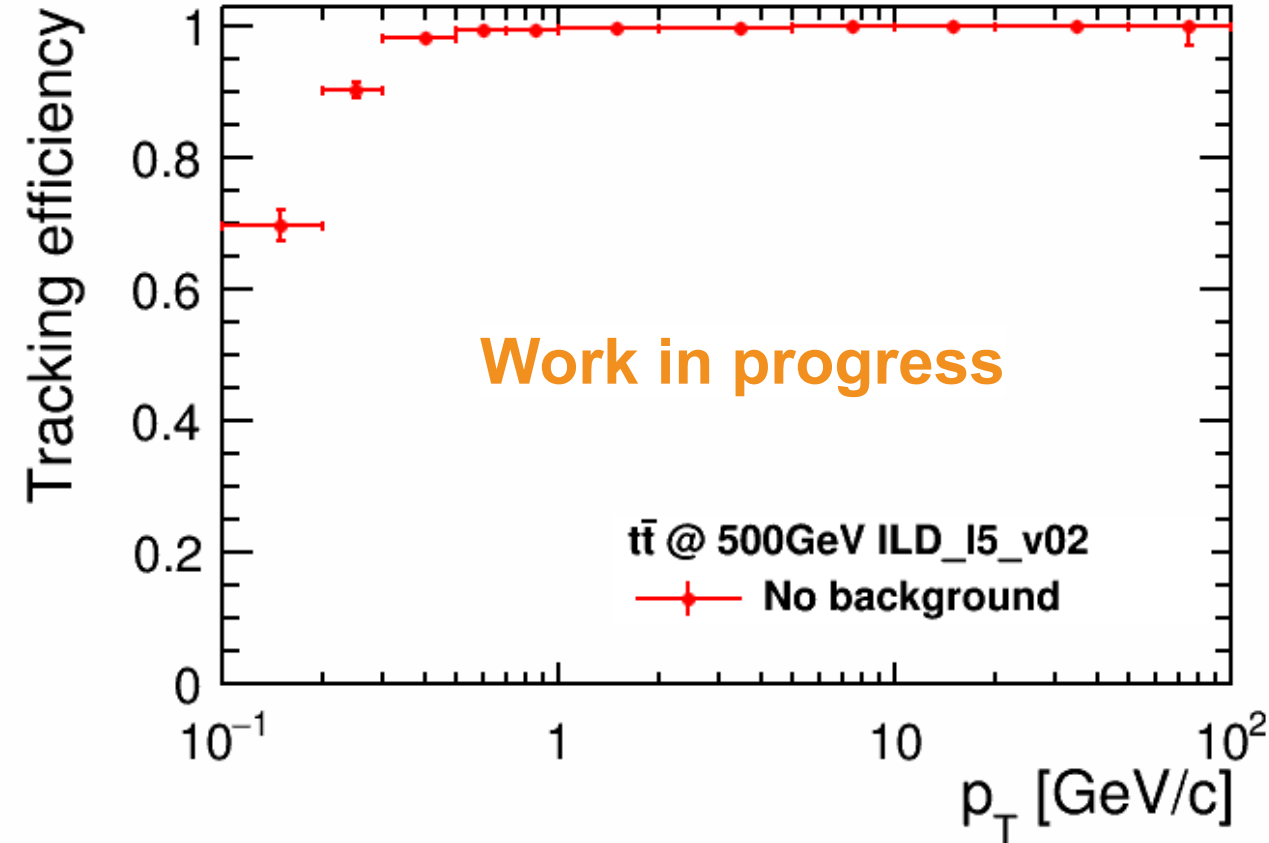
ILD VXD and two FTD pixel disks, ConformalTracking



MCP nominator: stable charge particles with `GeneratorStatus == 1 && !IsDecayedInTracker && maximum distance from IP < 10 mm && cosTheta < 0.99`

ILD concept with FTD all pixel disks

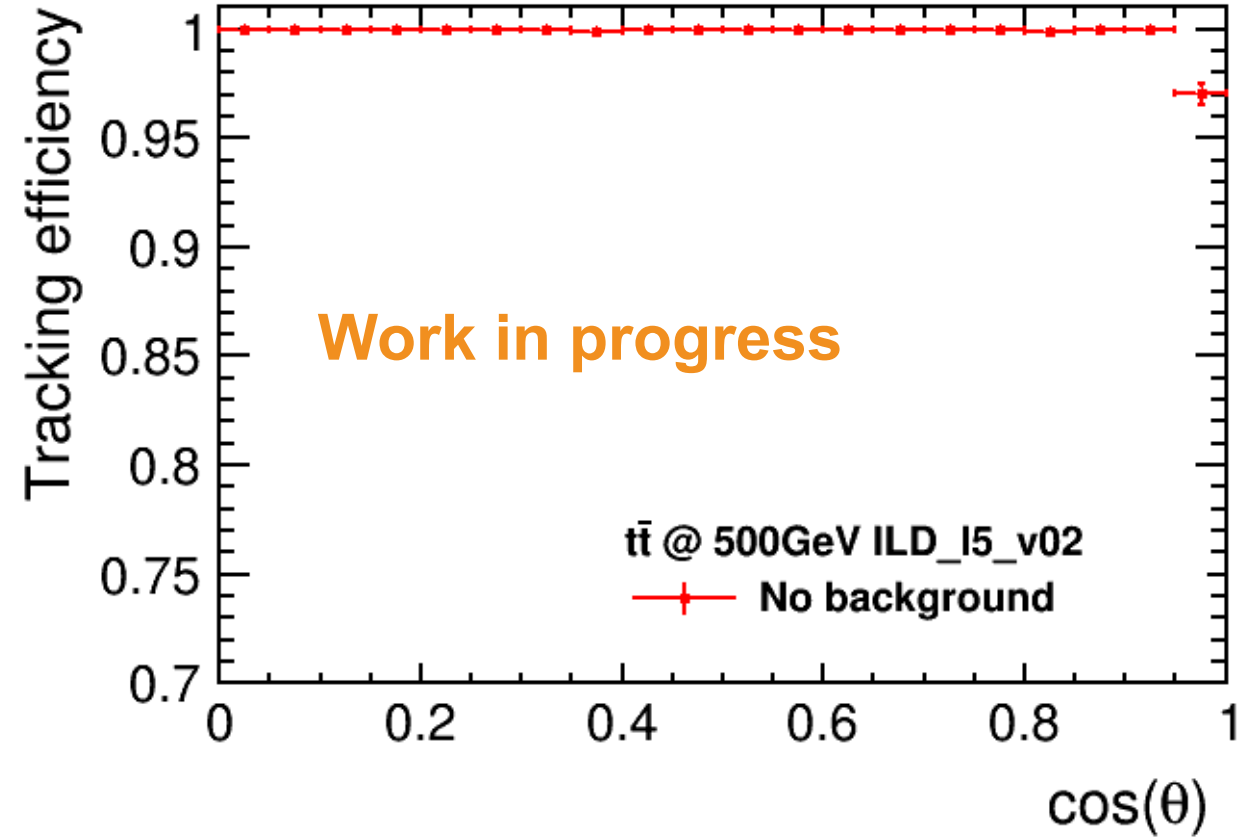
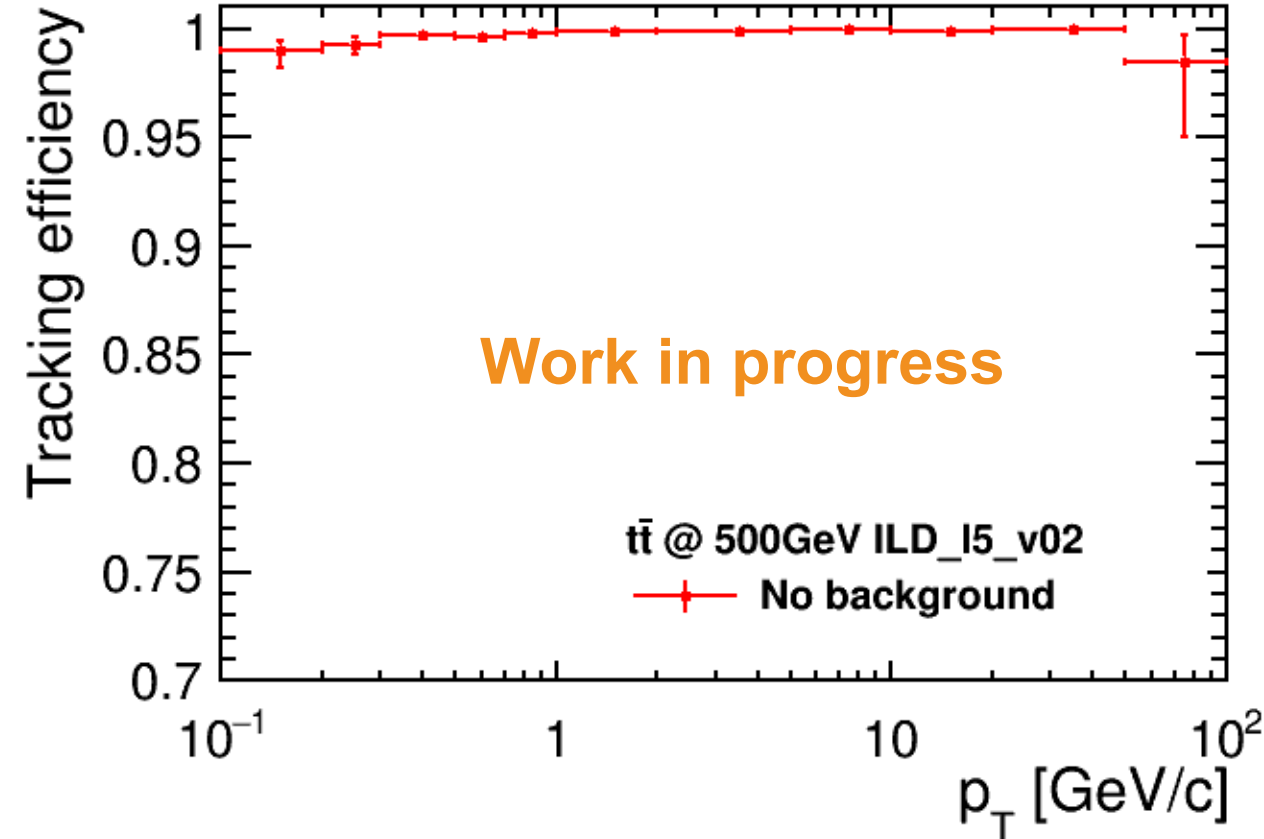
ILD VXD and FTD all pixel disks, ConformalTracking



MCP nominator: stable charge particles with `GeneratorStatus == 1 && !IsDecayedInTracker && maximum distance from IP < 10 mm && cosTheta < 0.99`

ILD concept with CLICdp style vertex detectors

Replace ILD VXD and FTD pixel with CLICdp vertex detector, ConformalTracking



MCP nominator: stable charge particles with `GeneratorStatus == 1 && !IsDecayedInTracker && maximum distance from IP < 10 mm && cosTheta < 0.99`

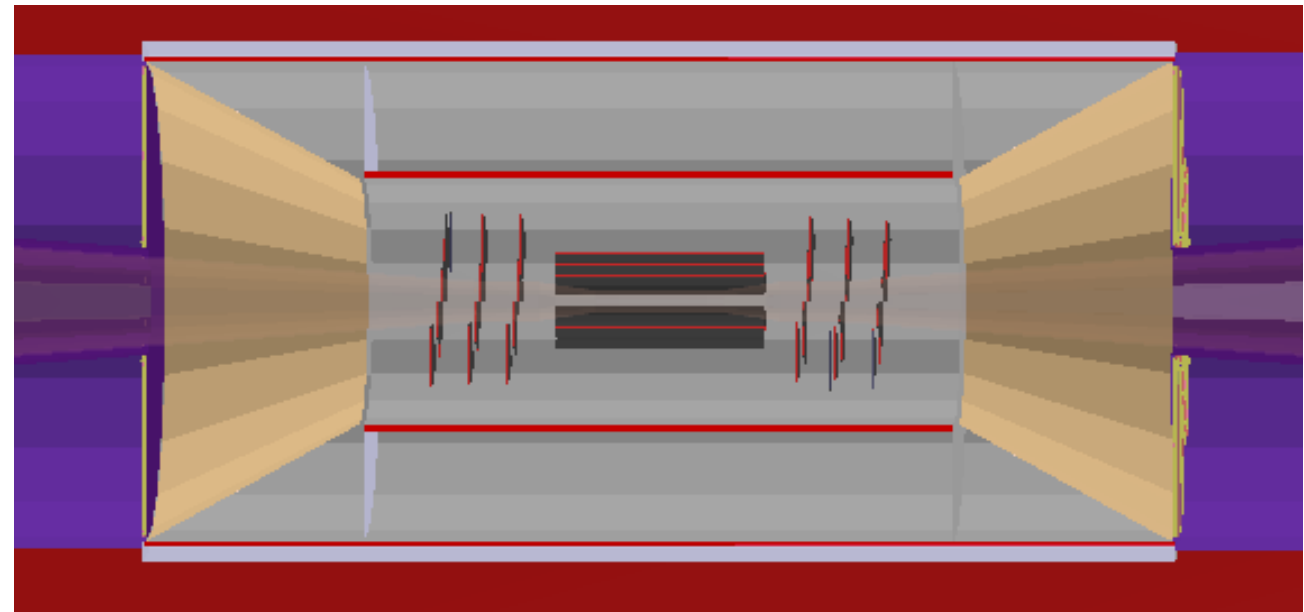
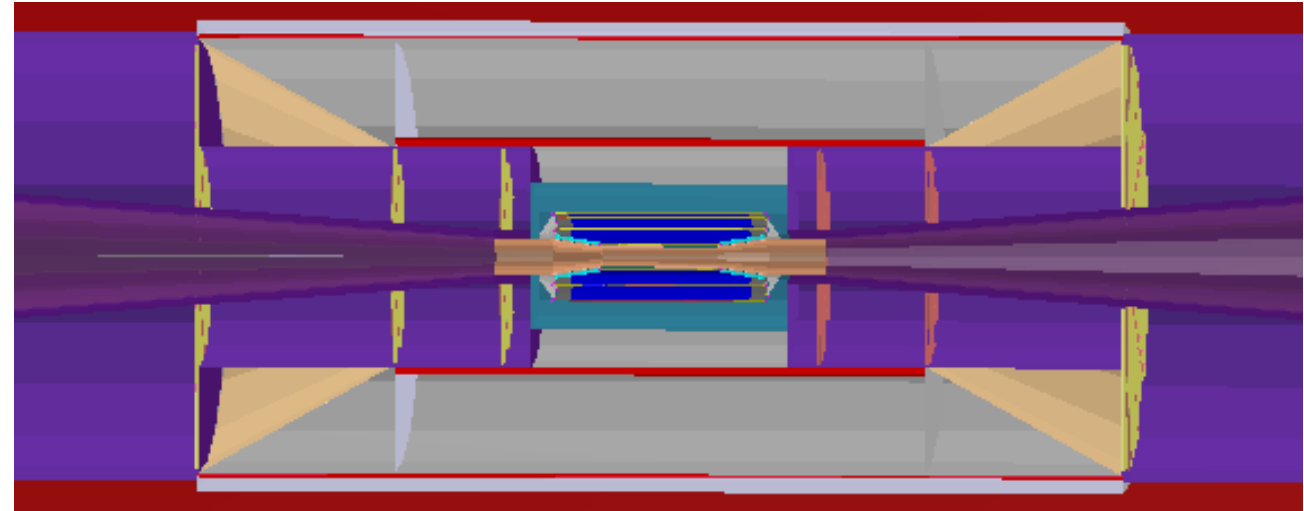
ILD concept with CLICdp style vertex detectors

The difference of ILD VXD and CLICdp vertex barrel

- In total 6 layers for both
- Point resolution 3um
- Outer layer r2 is same
- Inner layer r1 is smaller in ILD VXD

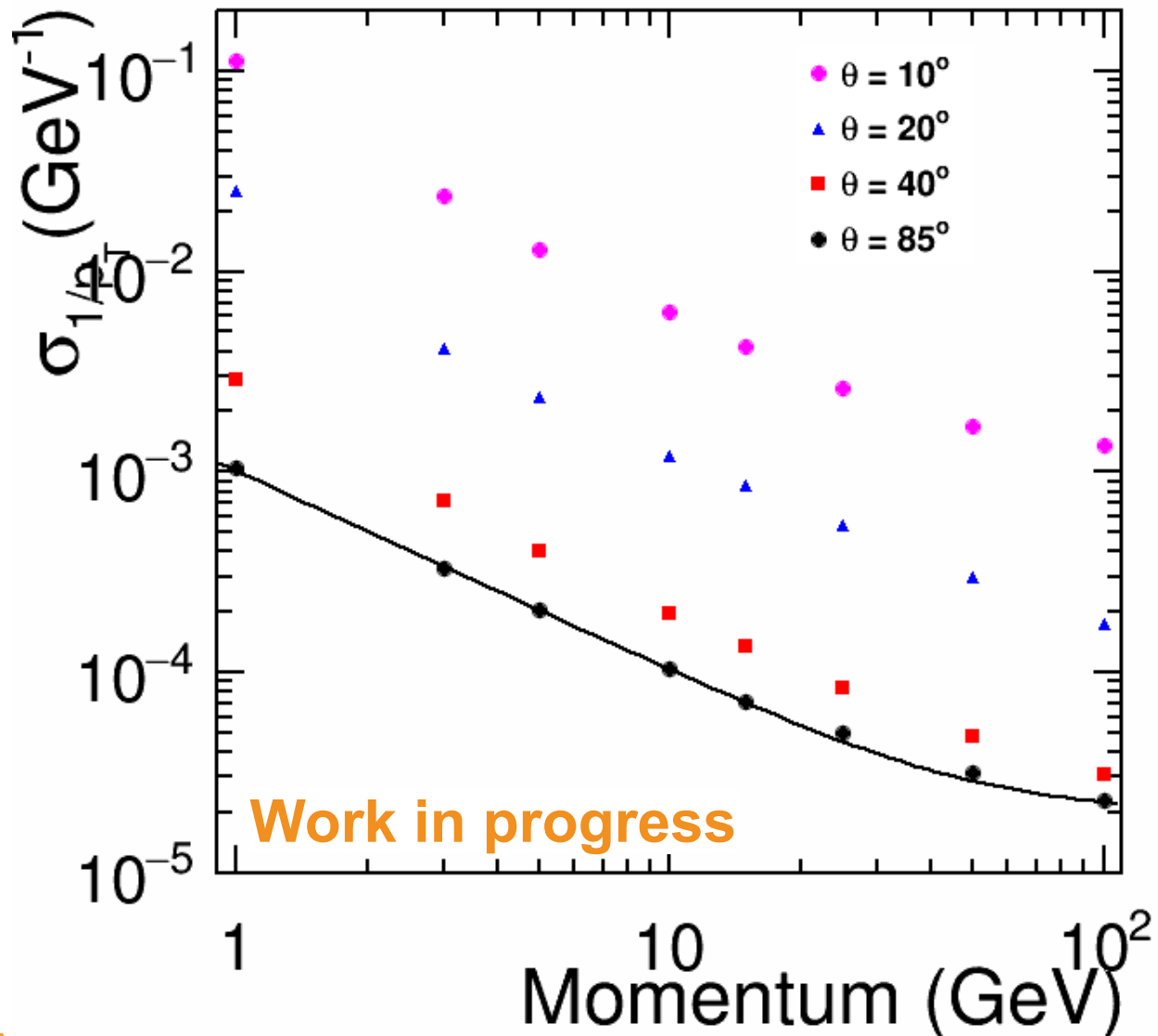
$$\sigma^2 = \left(\frac{\sigma_1 r_2}{r_2 - r_1} \right)^2 + \left(\frac{\sigma_2 r_1}{r_2 - r_1} \right)^2$$

- ILD VXD should have better resolution just simplify take account the inner and outer radius.

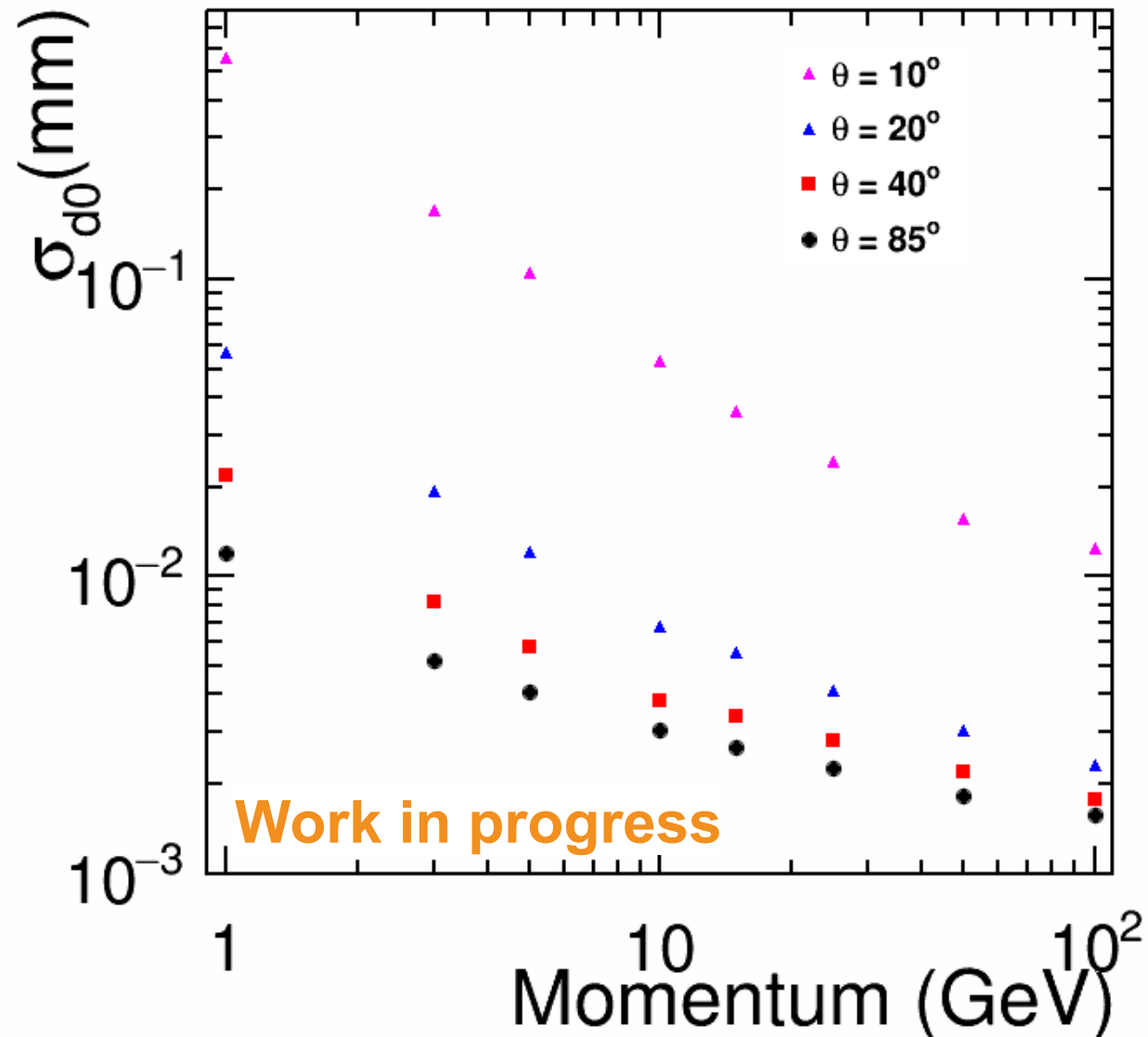


ILD reference (v02-00)

Momentum Resolution

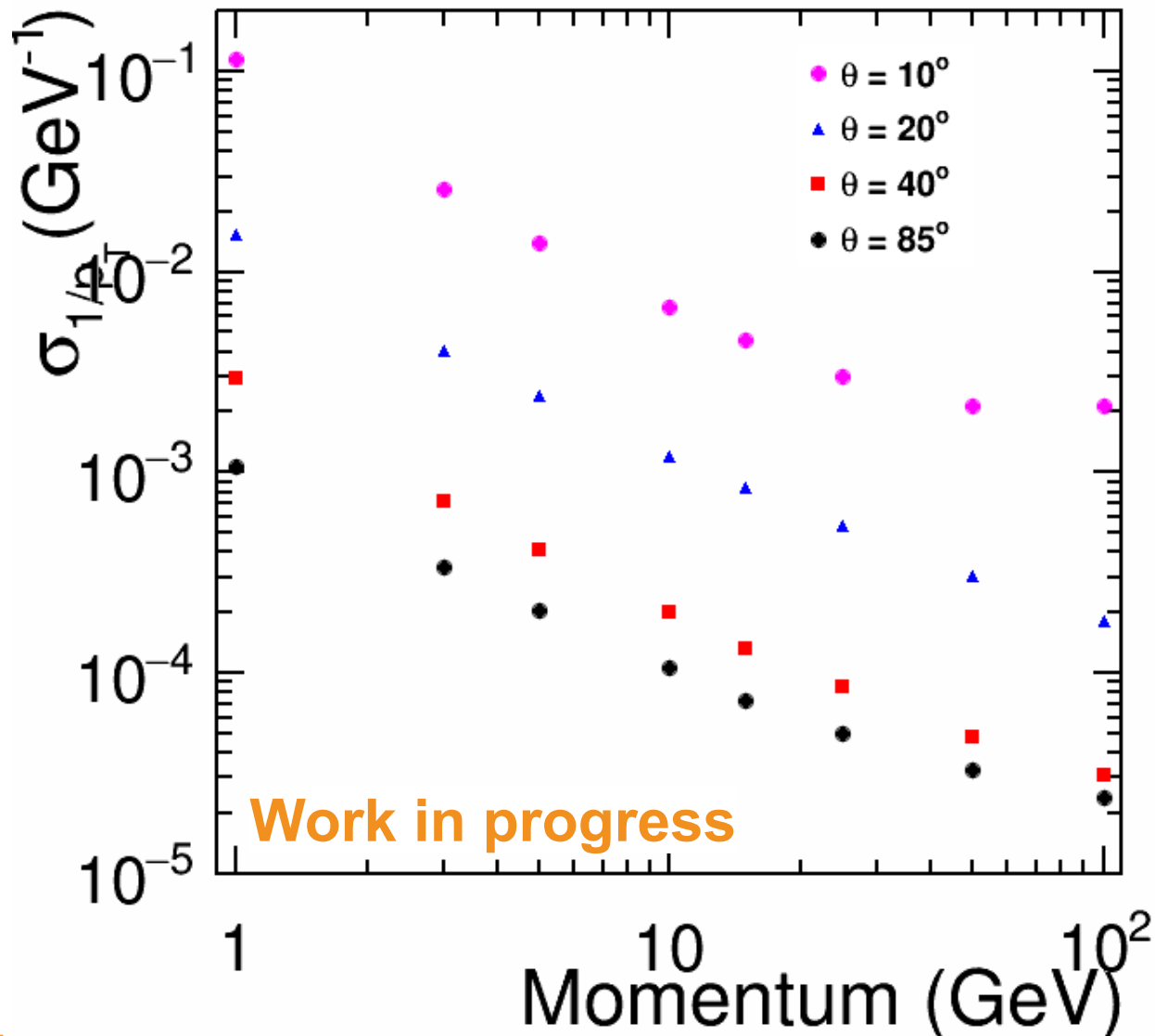


Impact Parameter Resolution

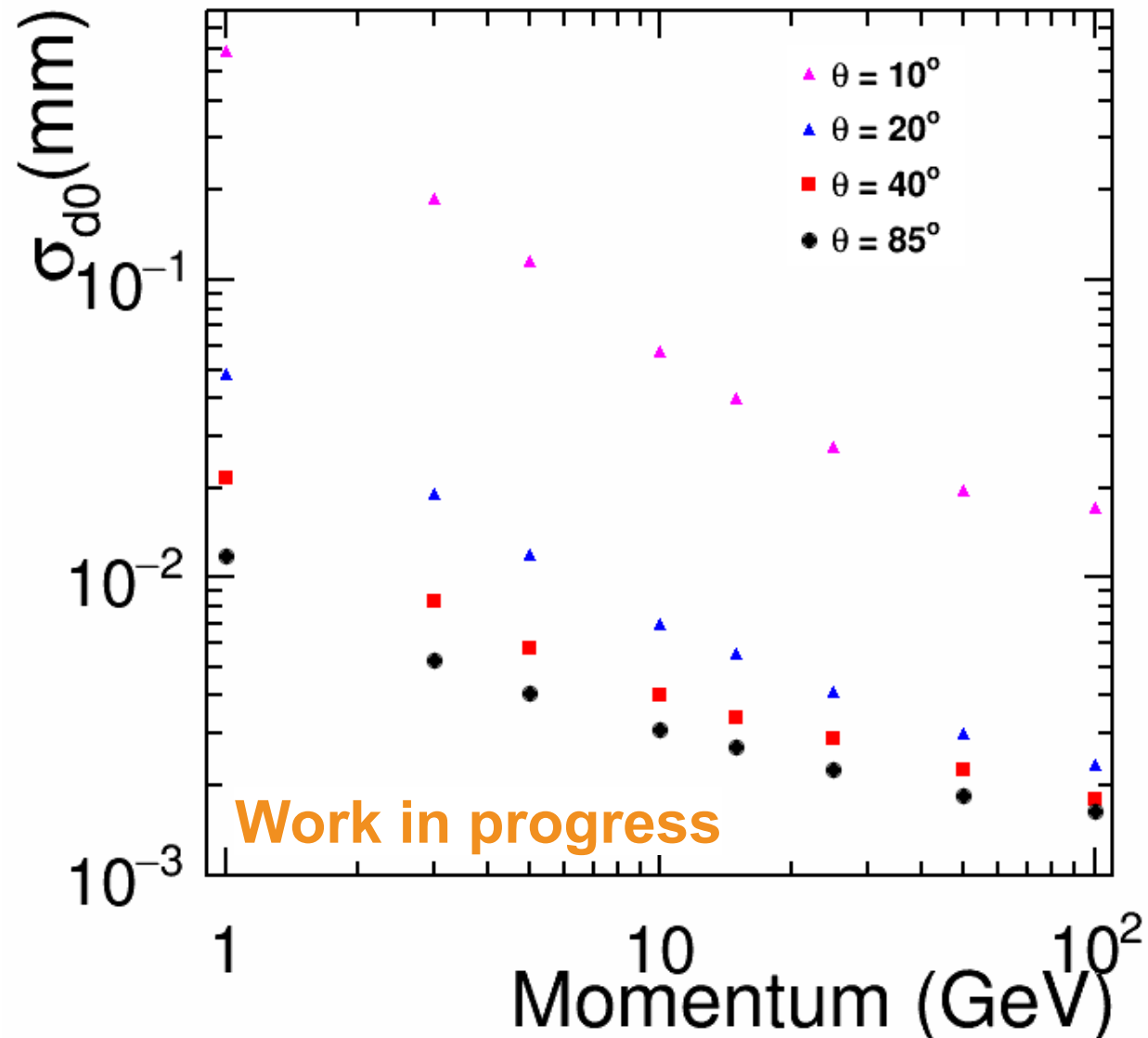


ILD w/ ConformalTracking and two FTD pixel disks

Momentum Resolution

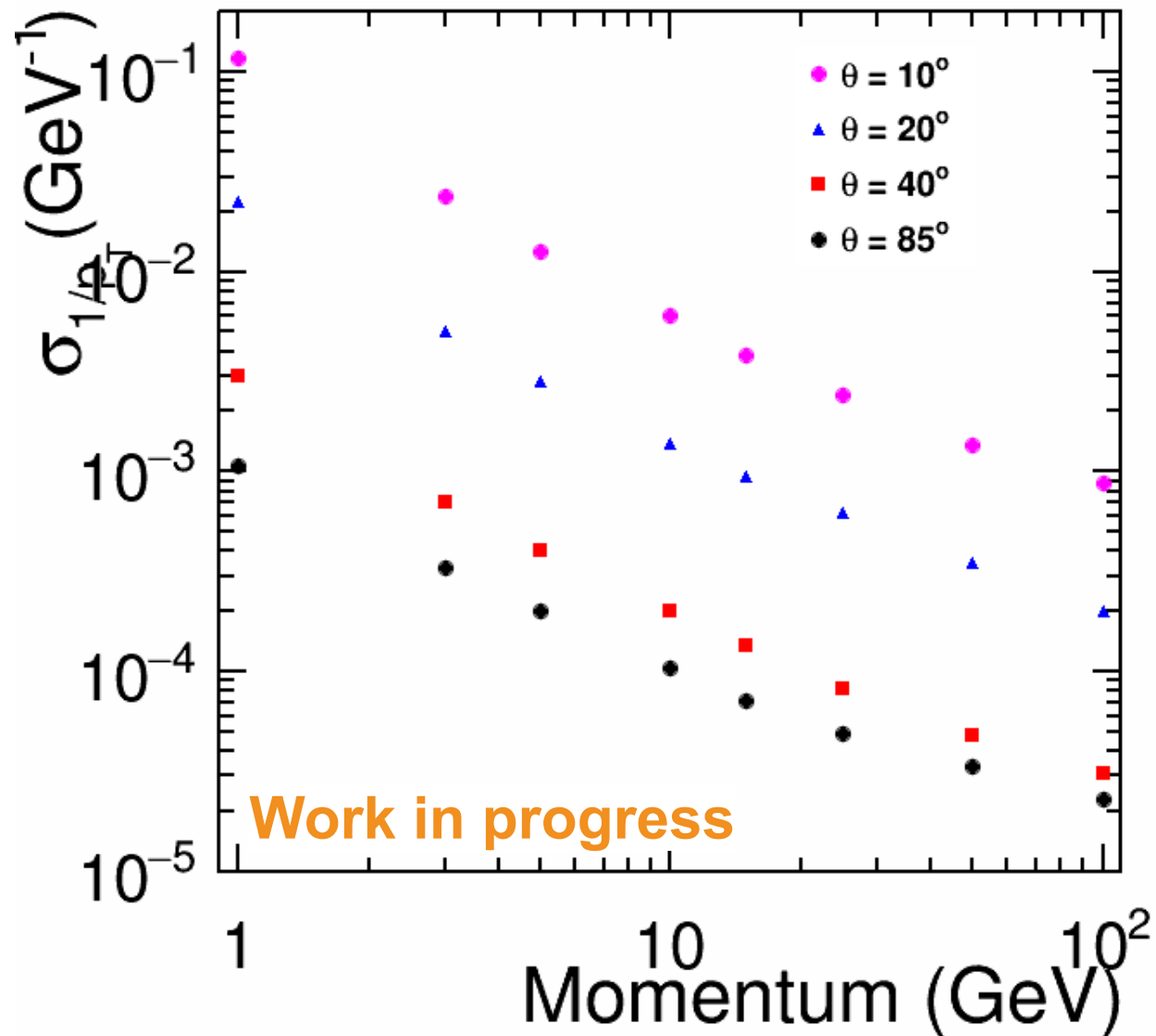


Impact Parameter Resolution

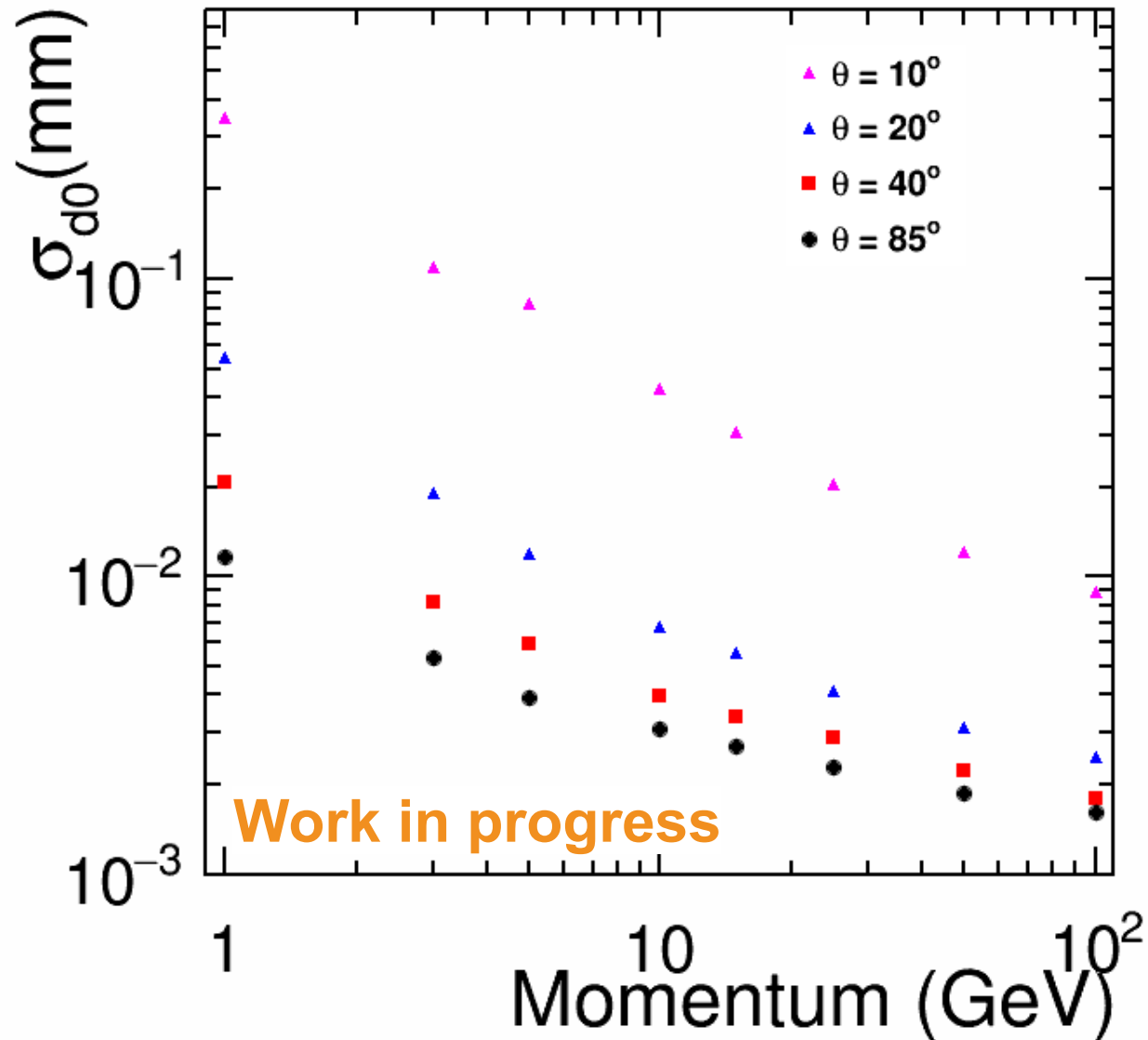


ILD concept with FTD all pixel disks

Momentum Resolution

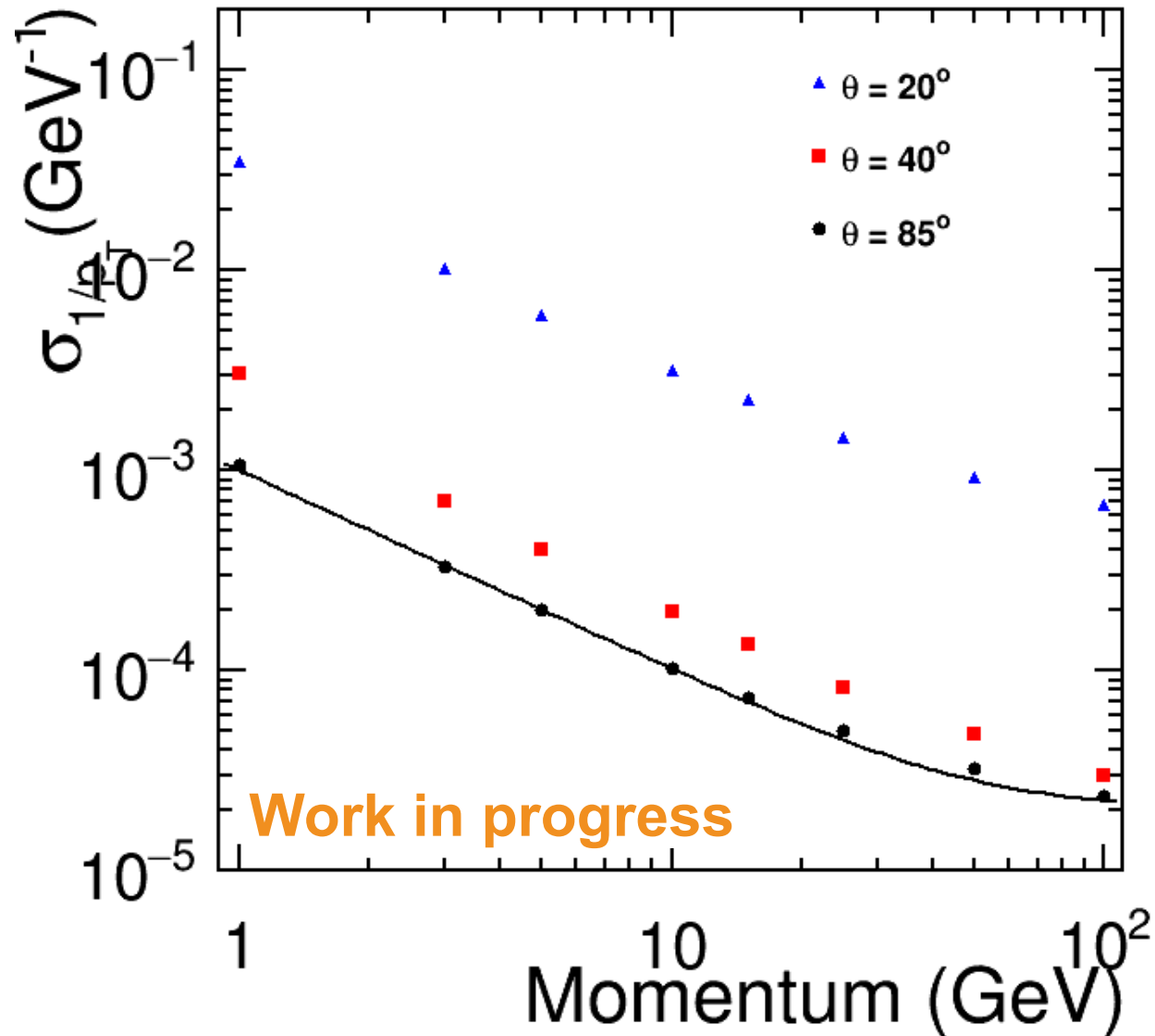


Impact Parameter Resolution

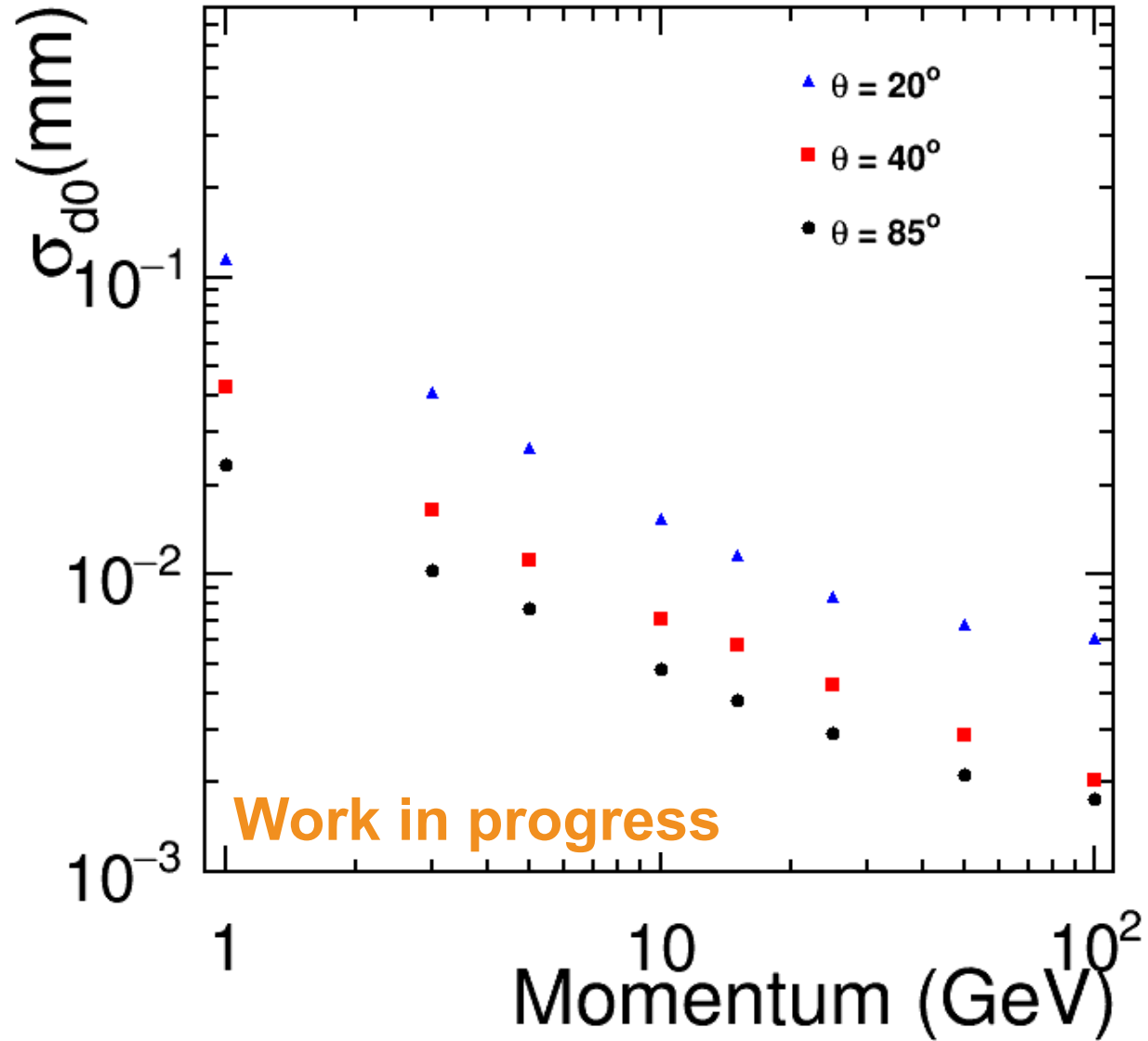


ILD concept with CLICdp style vertex detectors

Momentum Resolution



Impact Parameter Resolution



Summary

- ConformalTracking algorithm shows better tracking efficiency than ILD standard reconstruction
 - not quite as good as with the CLIC detector
- Using the CLIC vertex detector with (spiralling) end-cap we observe
 - significant improvement in tracking efficiency
 - degraded impact parameter resolution
 - both *as expected*
- Replacing the ILD FTD strip disks with pixel readout we observe
 - slight improvement in impact parameter resolution in fwd direction
 - (not quite as good as reported previously)