Tracker performance

Updates:

- Simulations done with mapped B field from Peng Xu: Integral Bx*dz = 1.13844 T*m (x=y=0)
- Post-simulation analysis uses mapped B field to back propagate tracks to converter (needed to reconstruct X_γ and Y_γ).

Simulation Details:

- 1 converted photon per event. 5000 events per photon energy. Flat E distribution from 4 to 30 GeV in steps of 0.5 GeV.
- All beam effects turned on.
- Mapped B field used (was always treated as ideal in the past).
- New lumi system Z location after recent change (another relocation may be needed).
- 2 pixel AC-LGAD tracking layers in front of each PS CAL, spaced by 10 cm.

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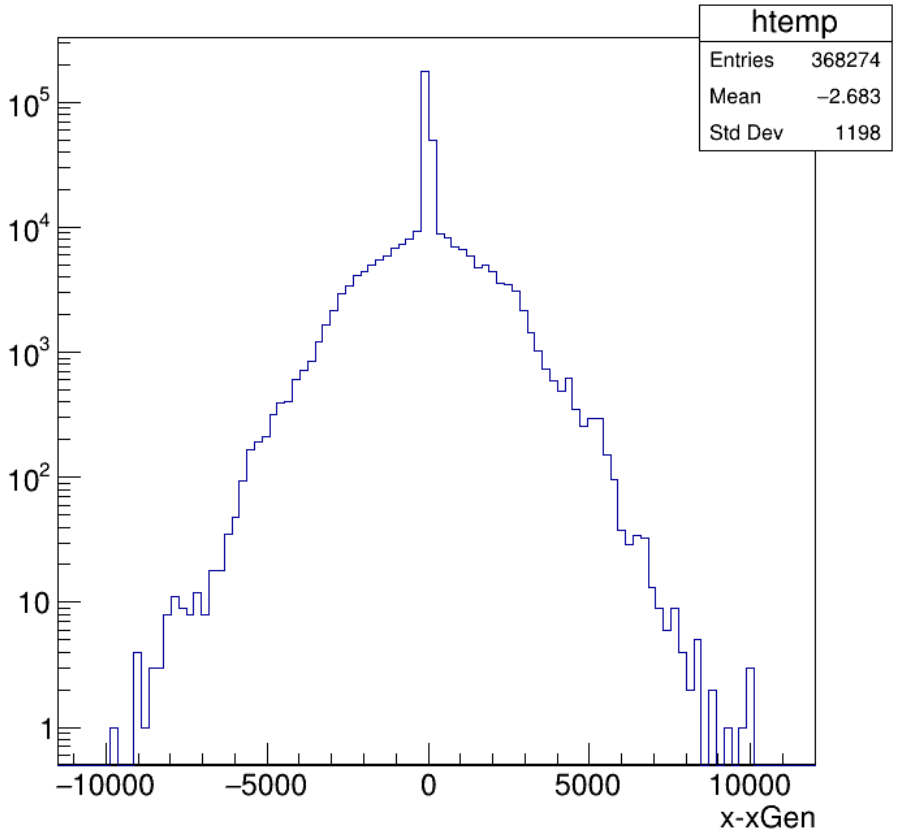
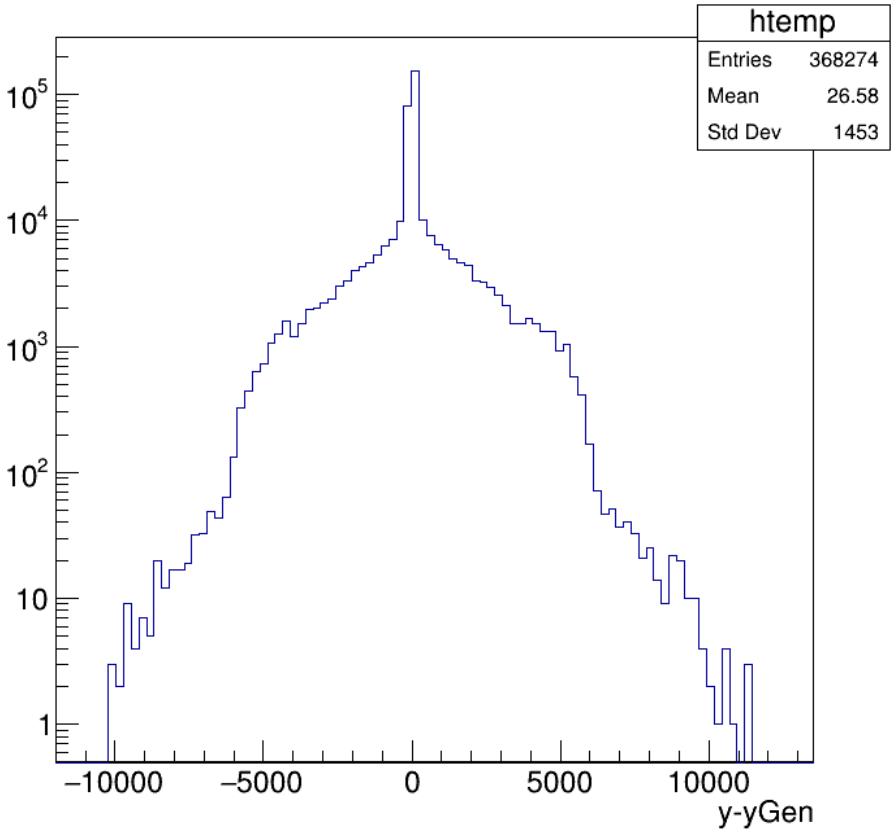
Nov 21st 2023

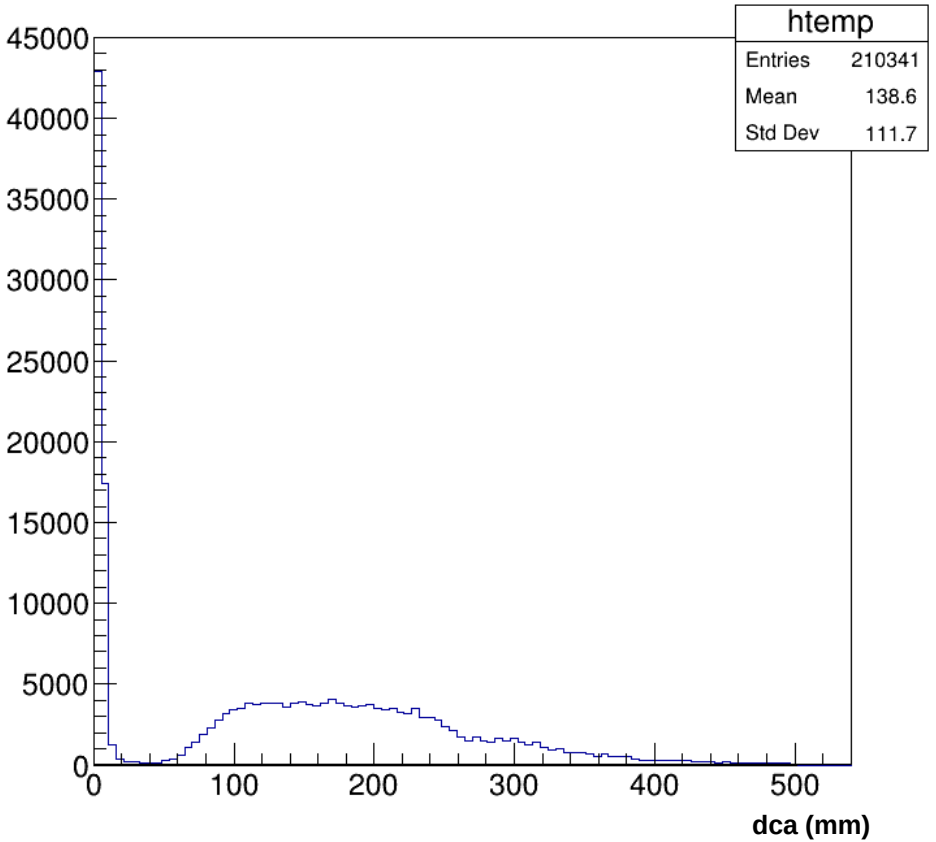
Raw X_γ and Y_γ resolutions

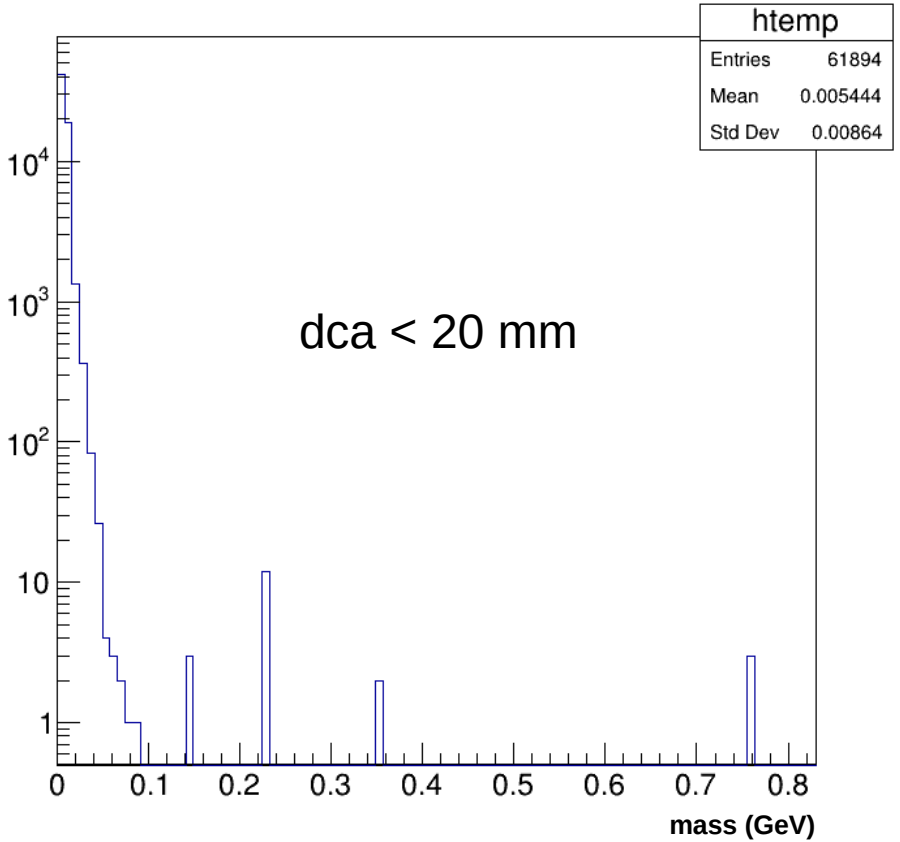




- Lots of bad tracks. Clearly we need to use cuts in this 2-tracker setup.

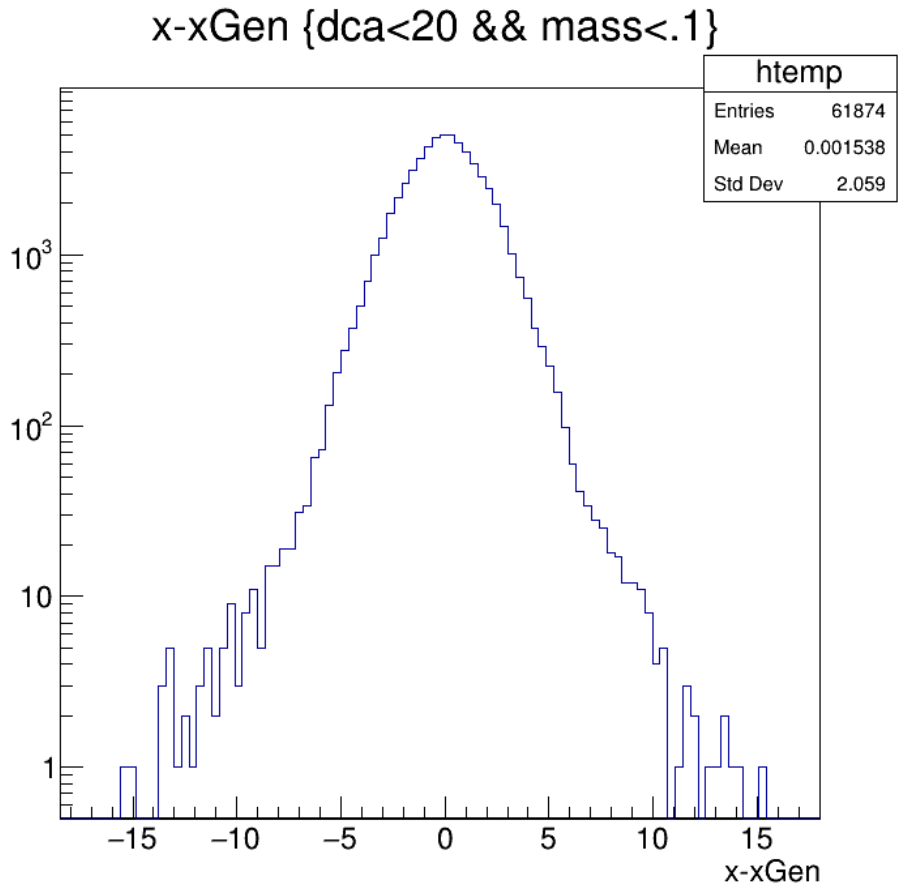
Cut variables: dca of e+e- at converter and ɣ Inv mass

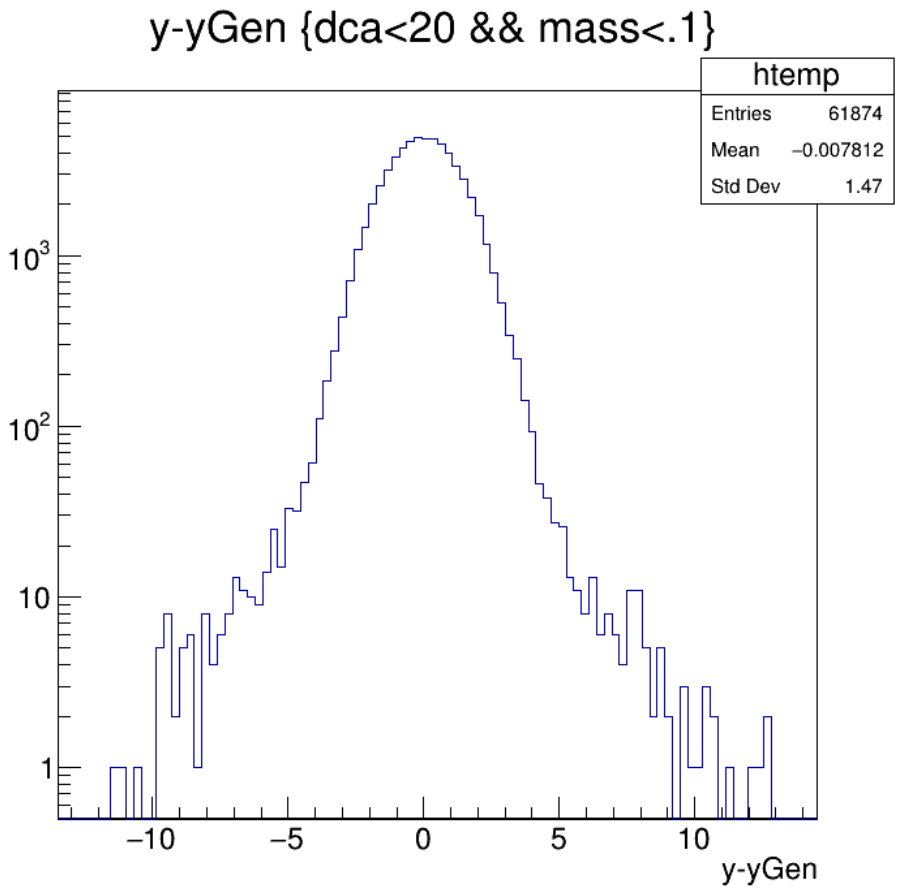




- Dca and inv mass are good cut candidates.
- Using dca < 20 mm && InvMass < 0.1 GeV

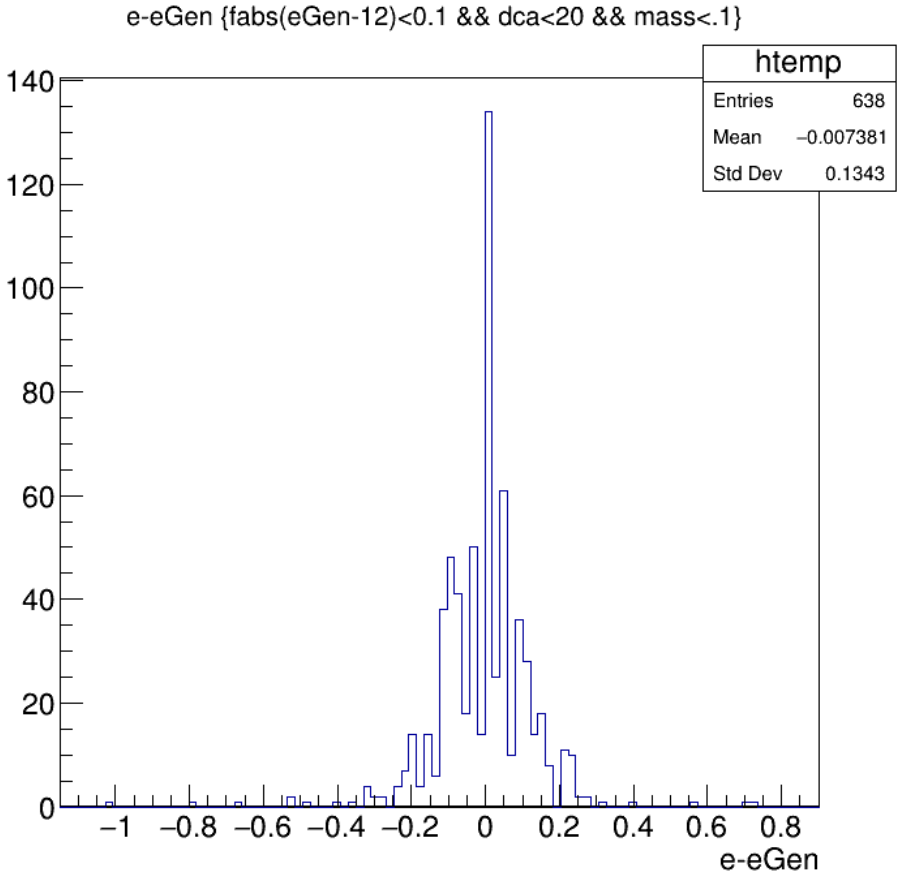
X_γ and Y_γ resolutions

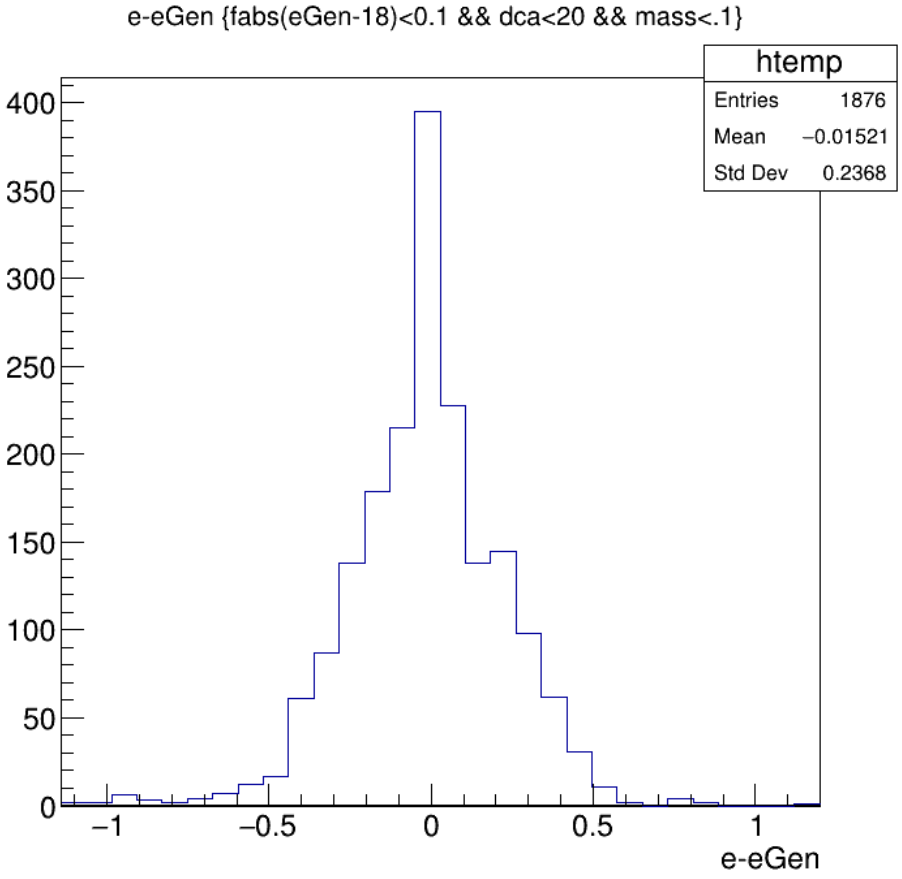




- Photon X and Y resolutions ~ 2 mm.
- Comparing entries before and after cuts suggests 1 in 6 tracks are good tracks. The bad subset is dominated by tracks with secondary hits.

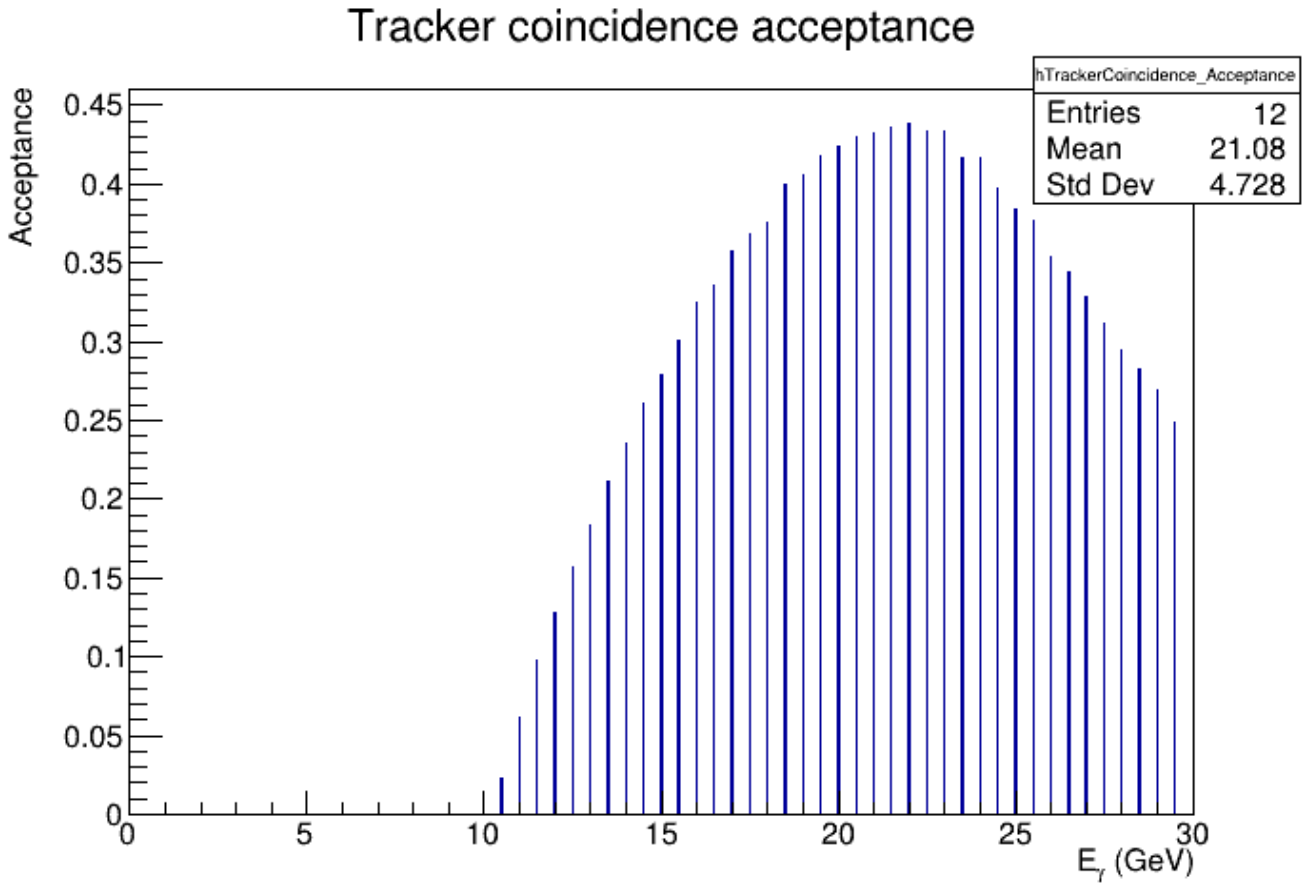
Energy resolutions





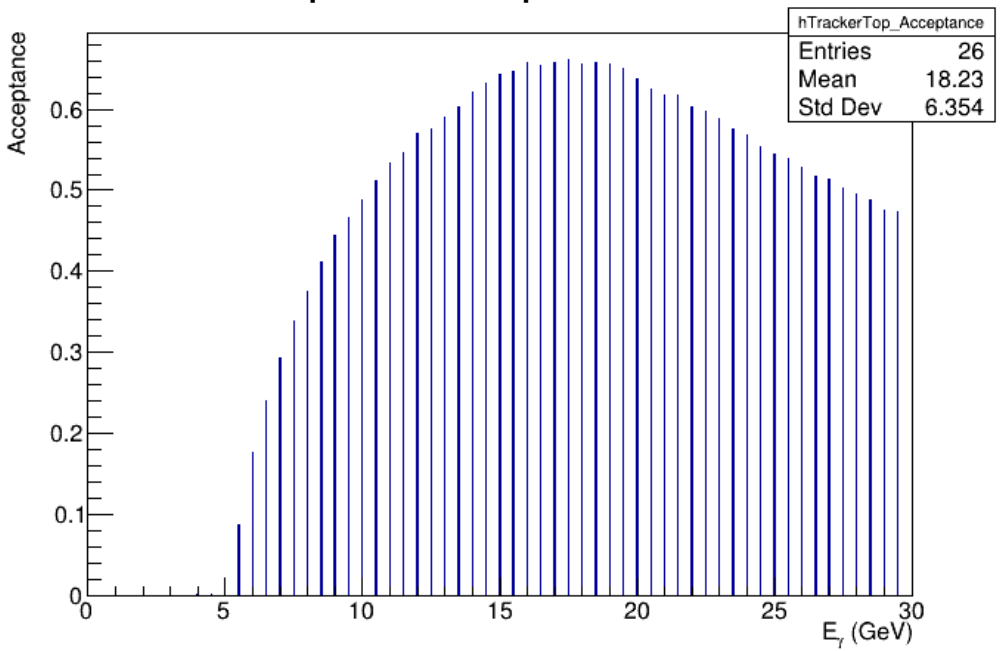
- Energy resolutions 1-2%
- Better at low E (larger slope in trackers). Opposite wrt CALs.

Tracker Coincidence acceptance

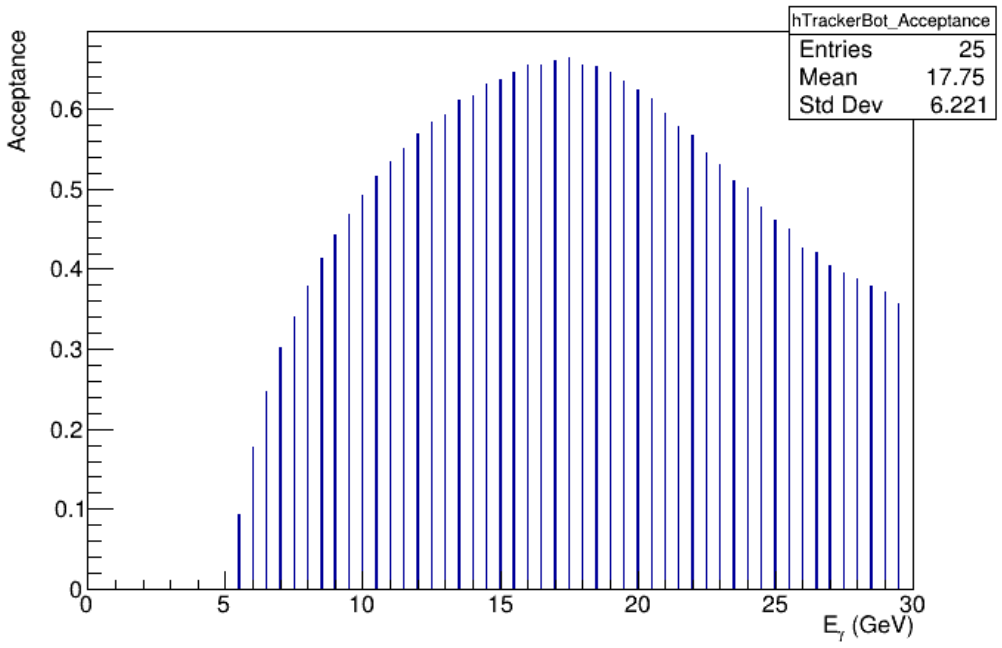


Tracker top/bot acceptance

Top tracker: positrons



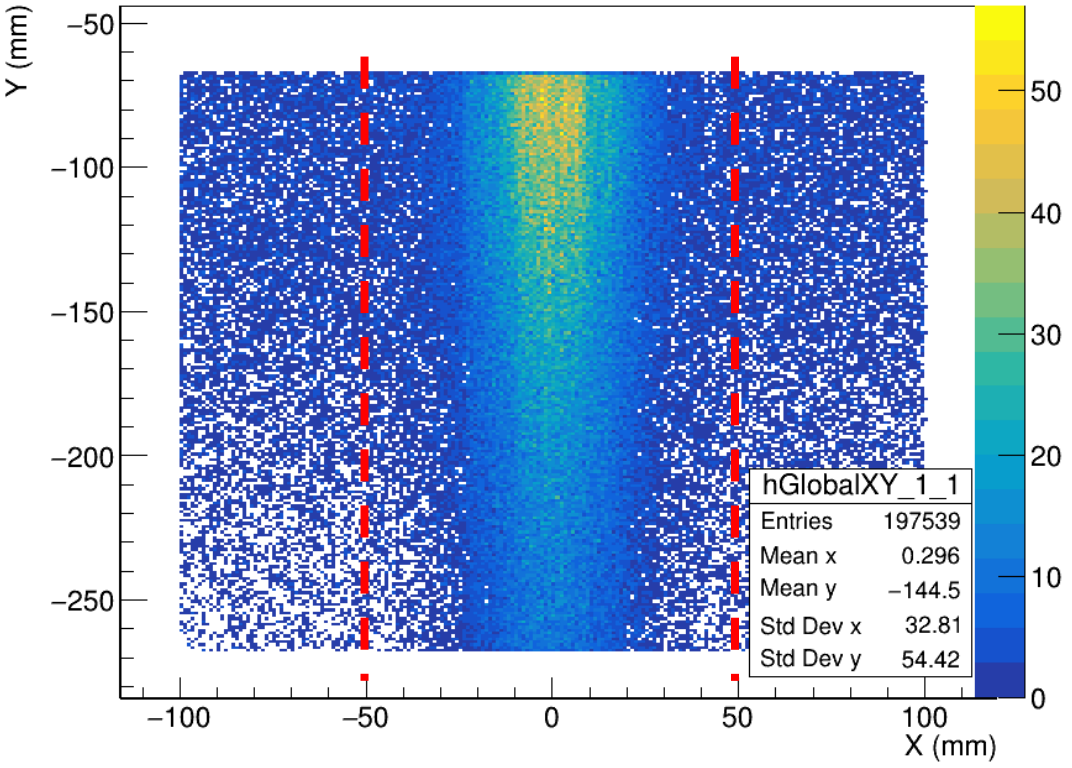
Bot tracker: electrons



- Small difference between top and bottom at high energy. Looking into the cause...

Tracker Occupancies

Bottom tracker plane in front of CAL

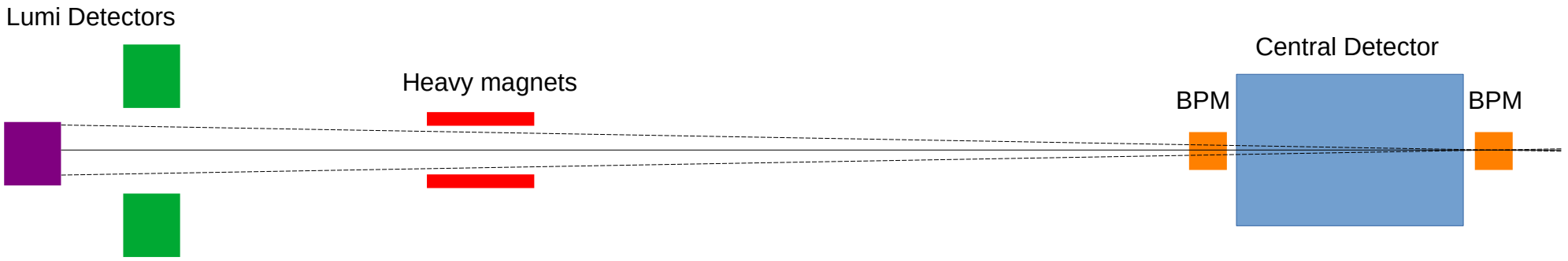


Much of the tracking planes have low occupancy.

To save on costs, we could ½ the size of the tracking planes.

However, we need to allow for migrations of the electron beam angle at the IP → migrations of photon beam.

Electron beam alignment



- We can expect that things will be somewhat misaligned just before commissioning of the EIC.
- “Golden orbits” that maximize Lumi and minimize backgrounds have to be found online and cannot be precisely predicted before hand.
- Golden orbits for different EIC energy configurations will be different.
- That will generally lead to the electron beam straying from θ = 0°
- Lumi Detectors can be placed on precisely movable tables but we probably don’t want to move the heavy magnets.
- Need to reconsider if the 5*sigma bore in the magnets provides enough clearance