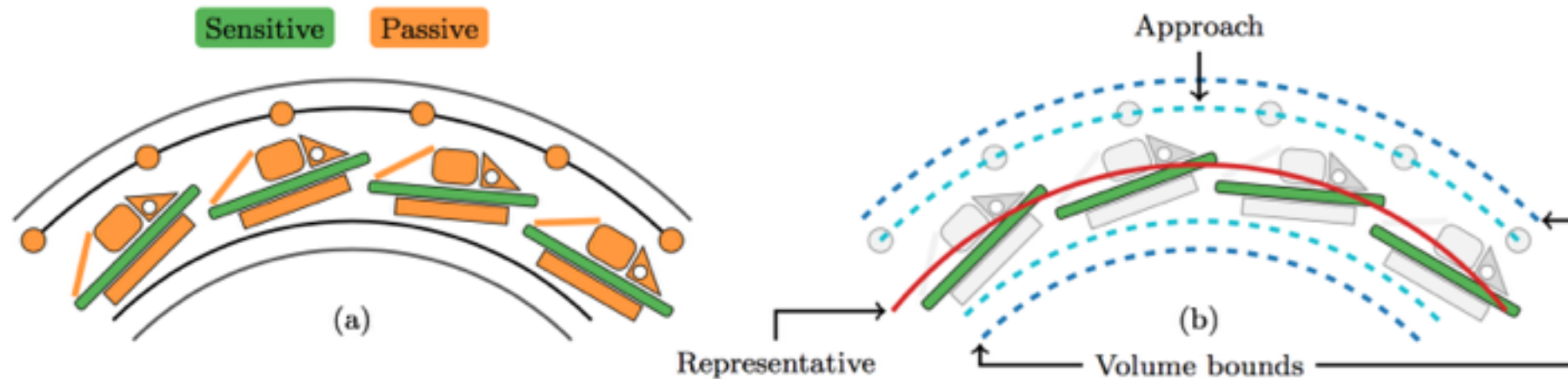


Track reconstruction in ATHENA software

Wenqing Fan (Lots of help from Shujie)

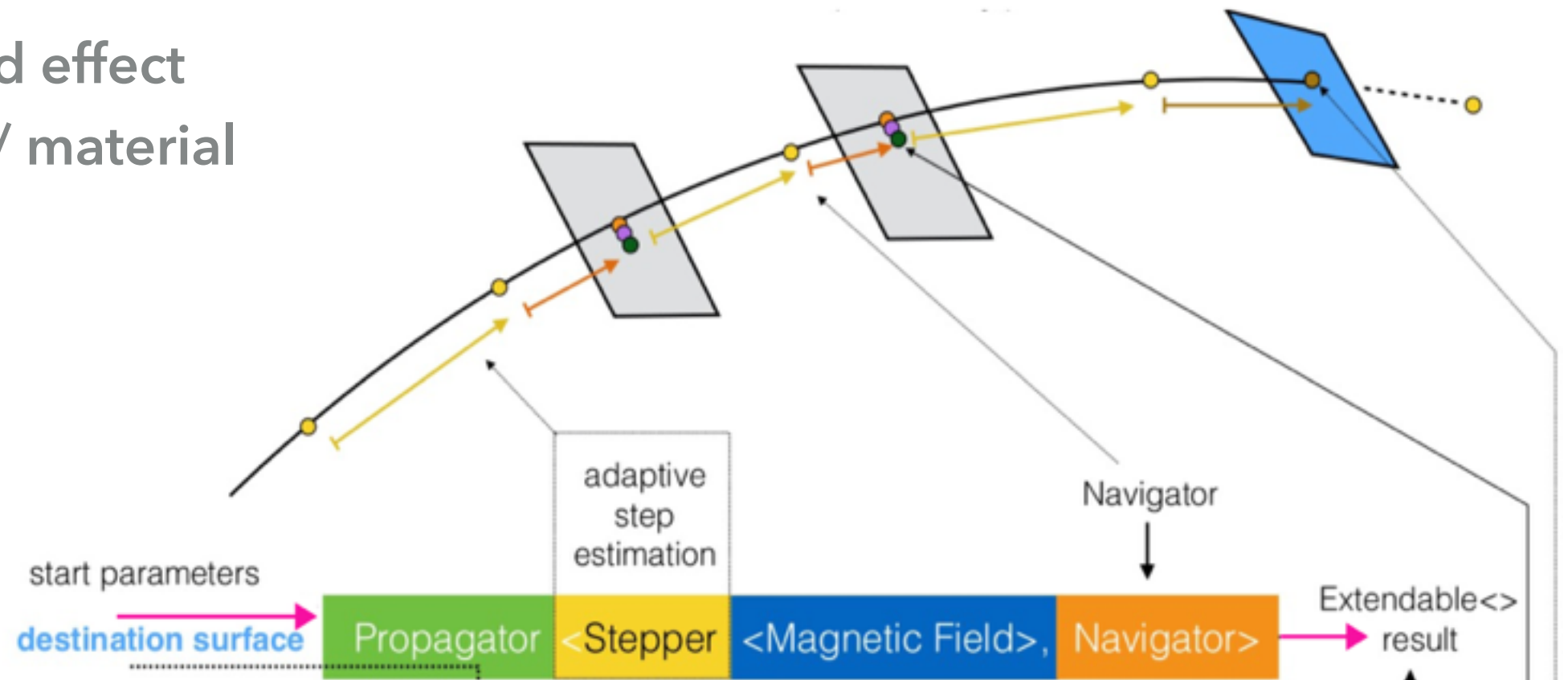
LBNL

- ▶ Simplify detector geometry to surfaces



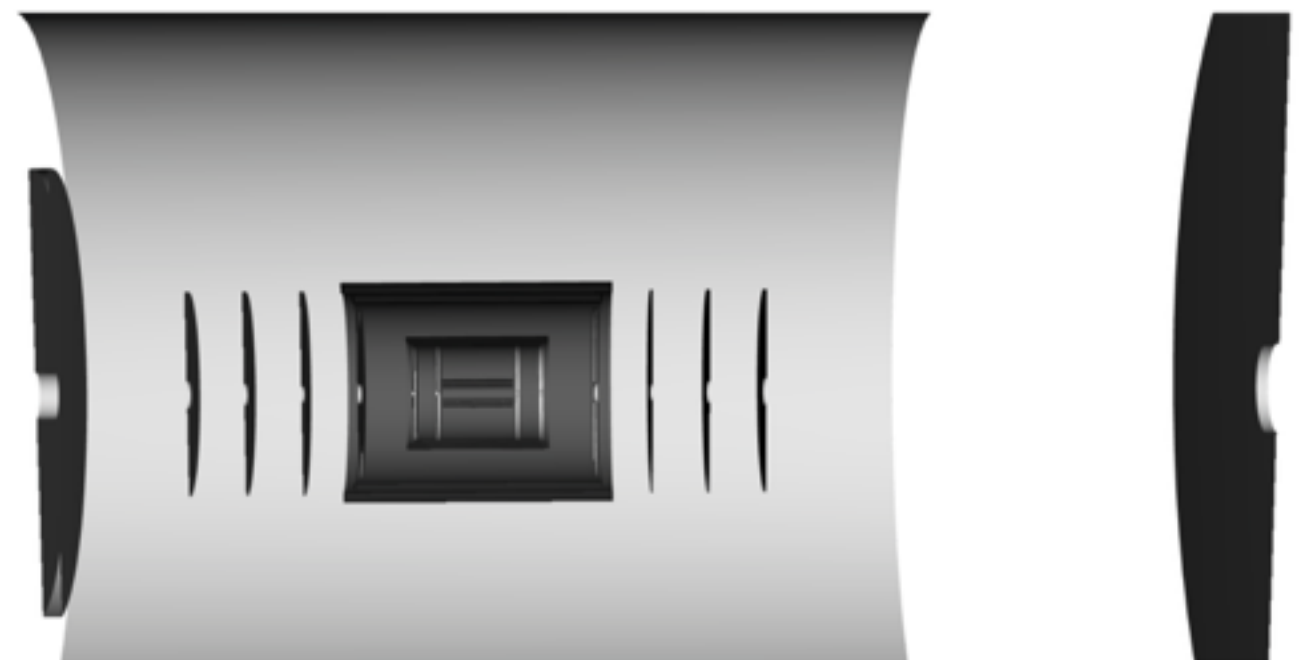
- ▶ Propagate track (parameters) out from a starting point (0,0,0) with initial parameter (truth position and momentum direction)

- ◆ Magnetic field effect
- ◆ Interaction w/ material

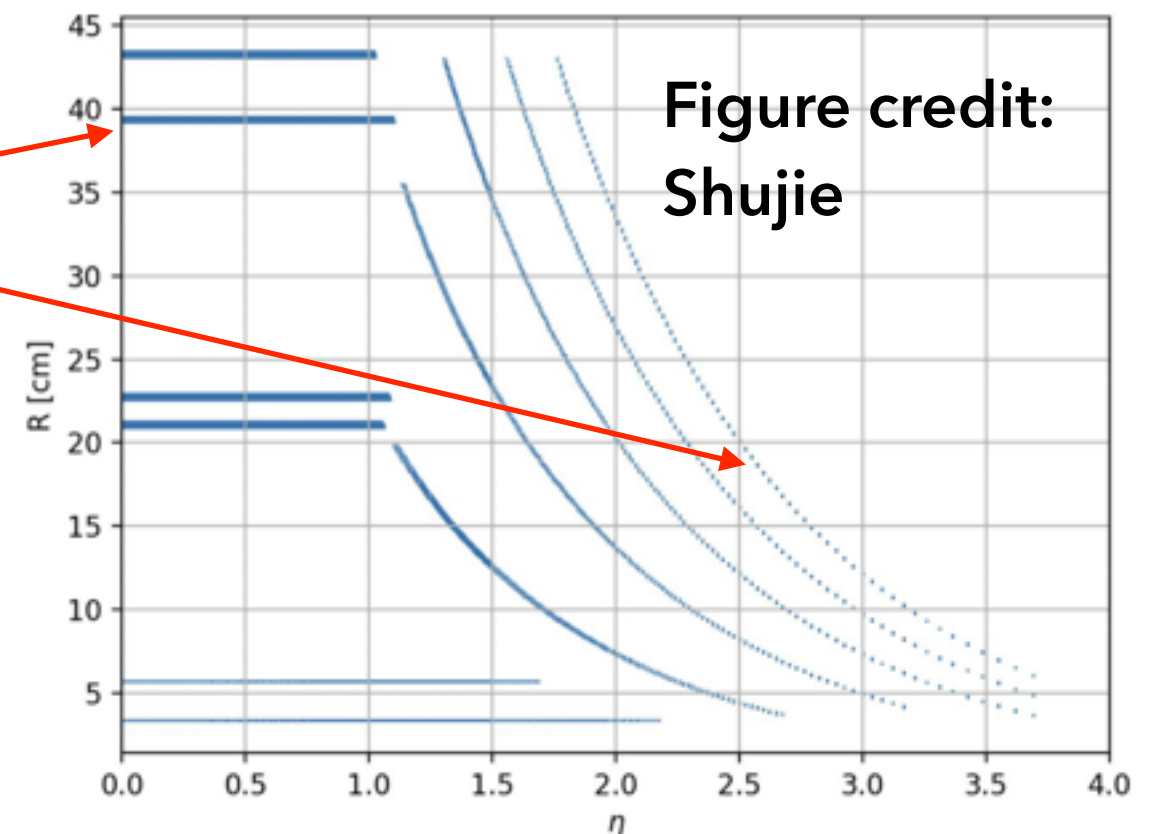


- ▶ Tracking information from ACTs
 - ◆ Specify a track state: pathlength, local position on surface
 - ◆ If track state at TOF surface: path length for TOF calculation
 - ◆ If track state at PID surface and transform local position to global position: projection point at PID (similar story for calorimeter)
- ▶ Test in Athena software framework (check path length first)
 - ◆ Simplistic setup containing only the tracking detectors without support cones or shells

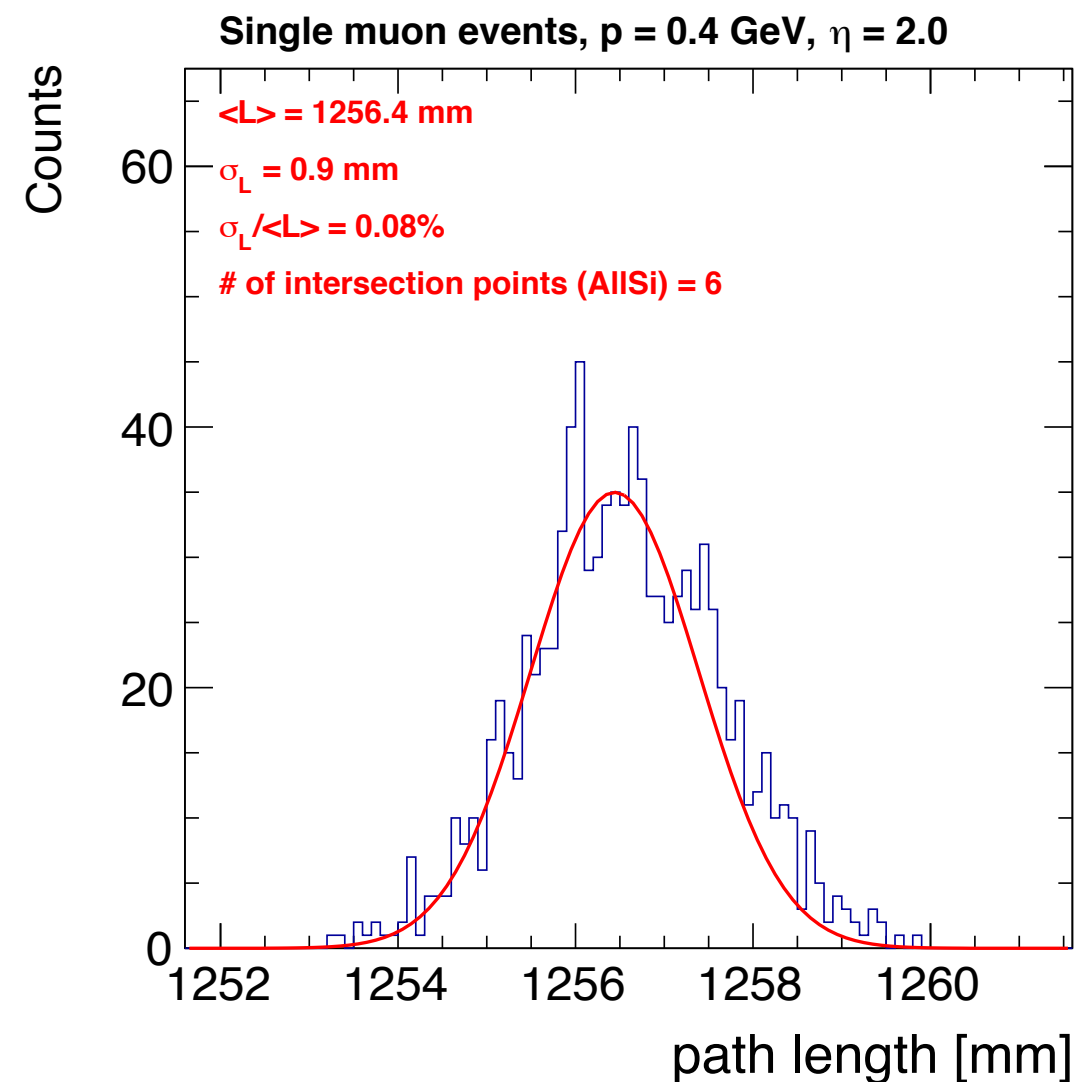
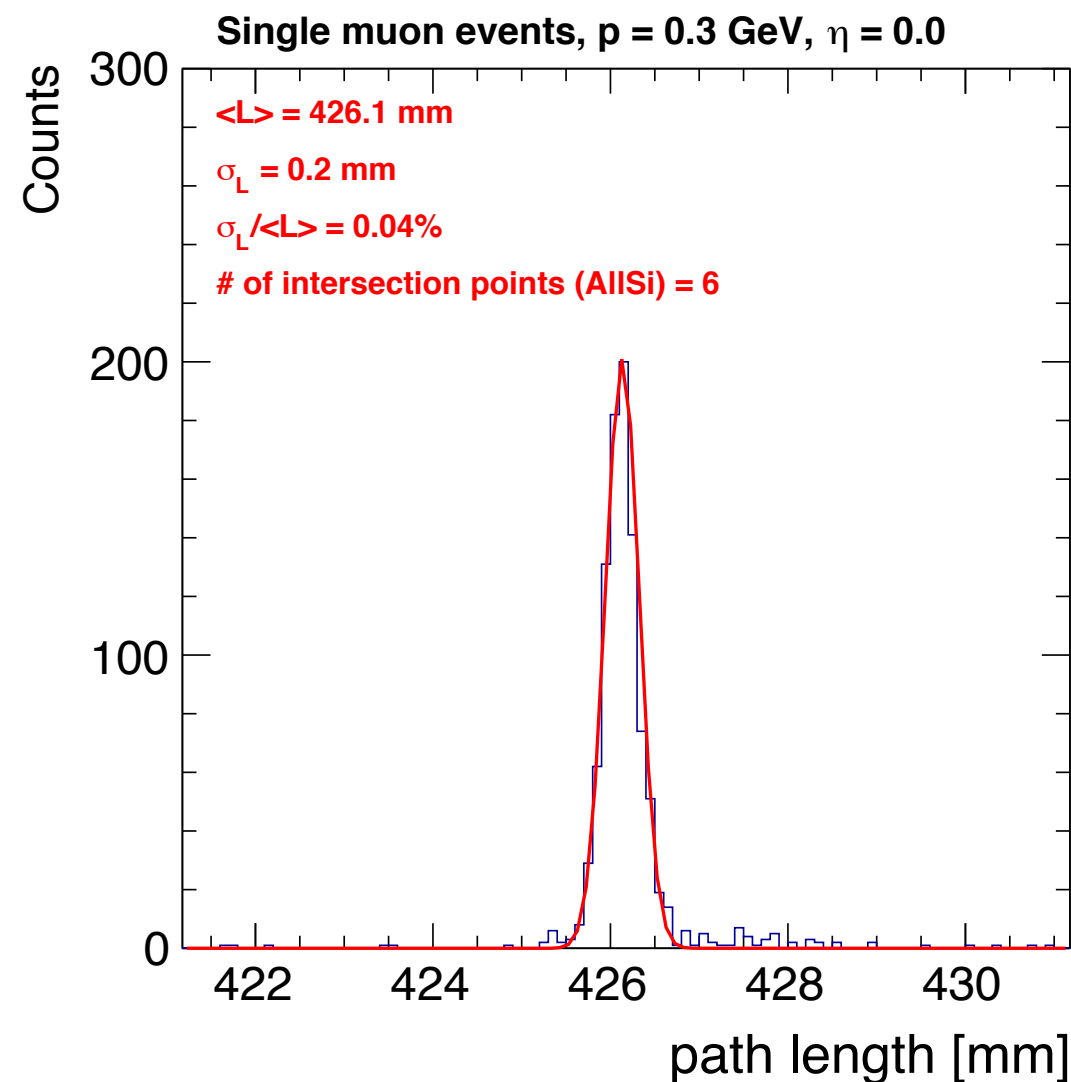
Figure credit: Shujie



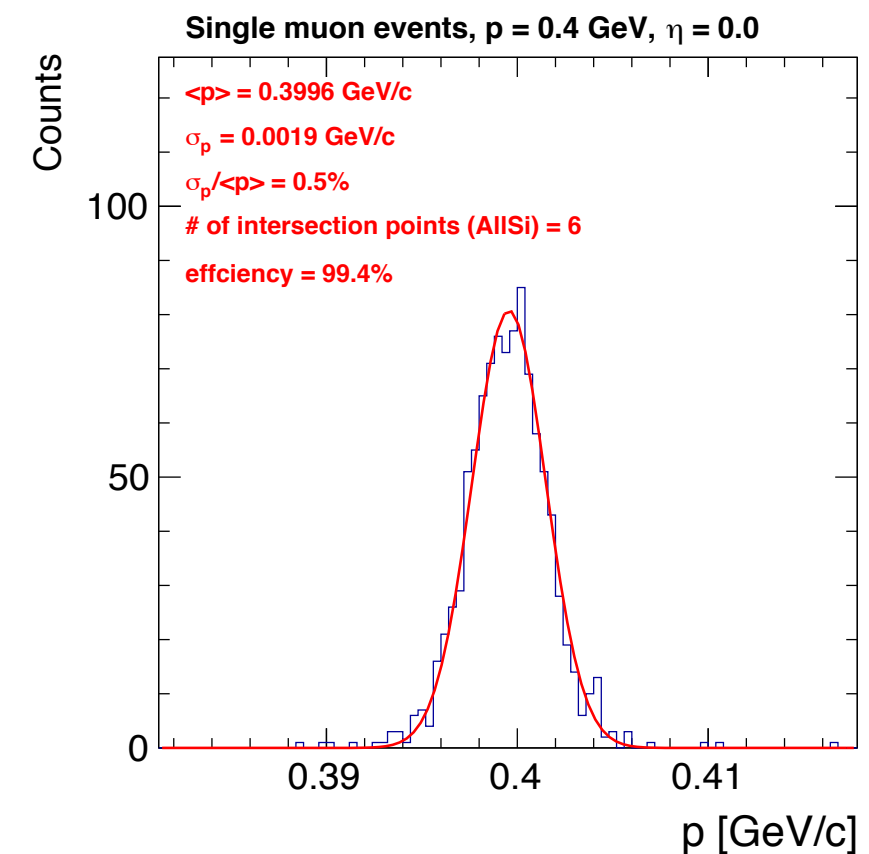
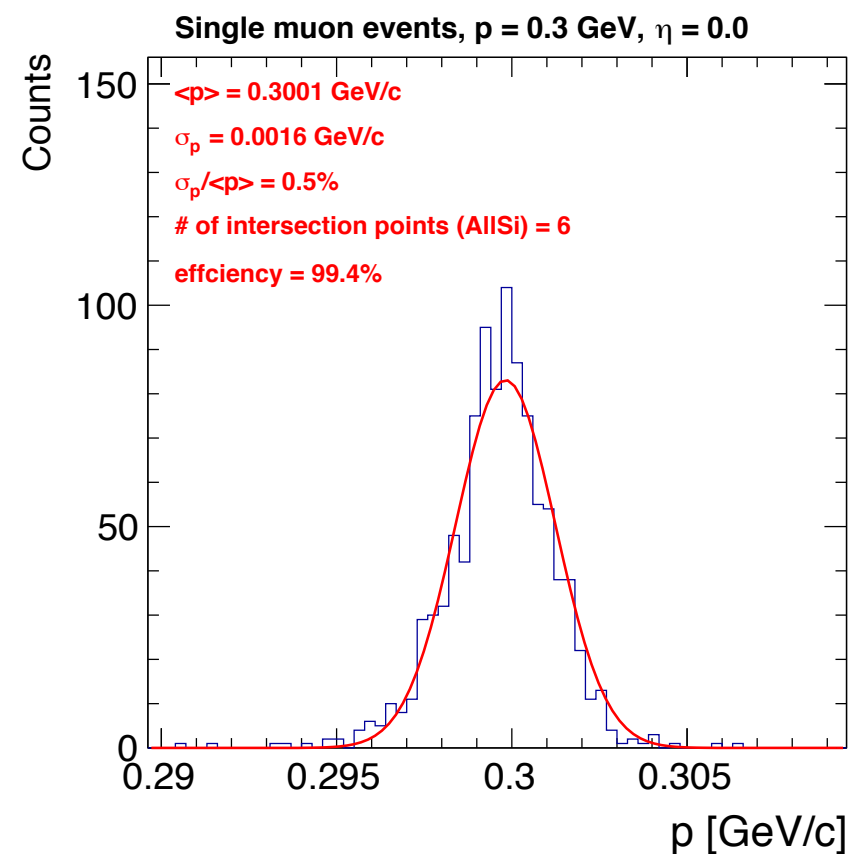
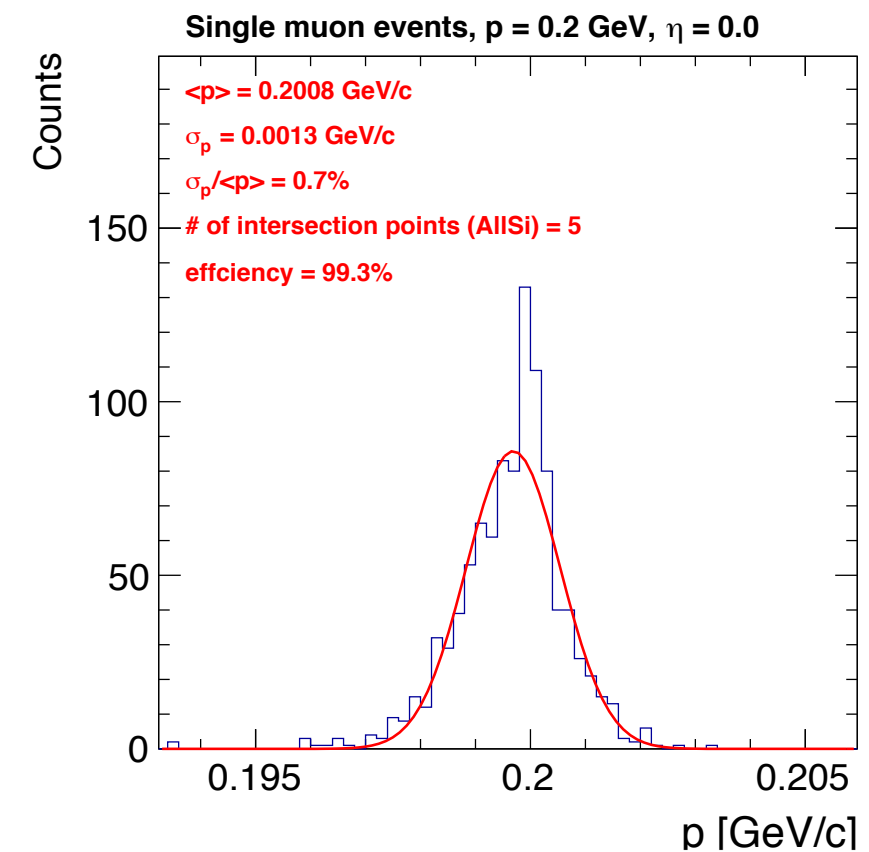
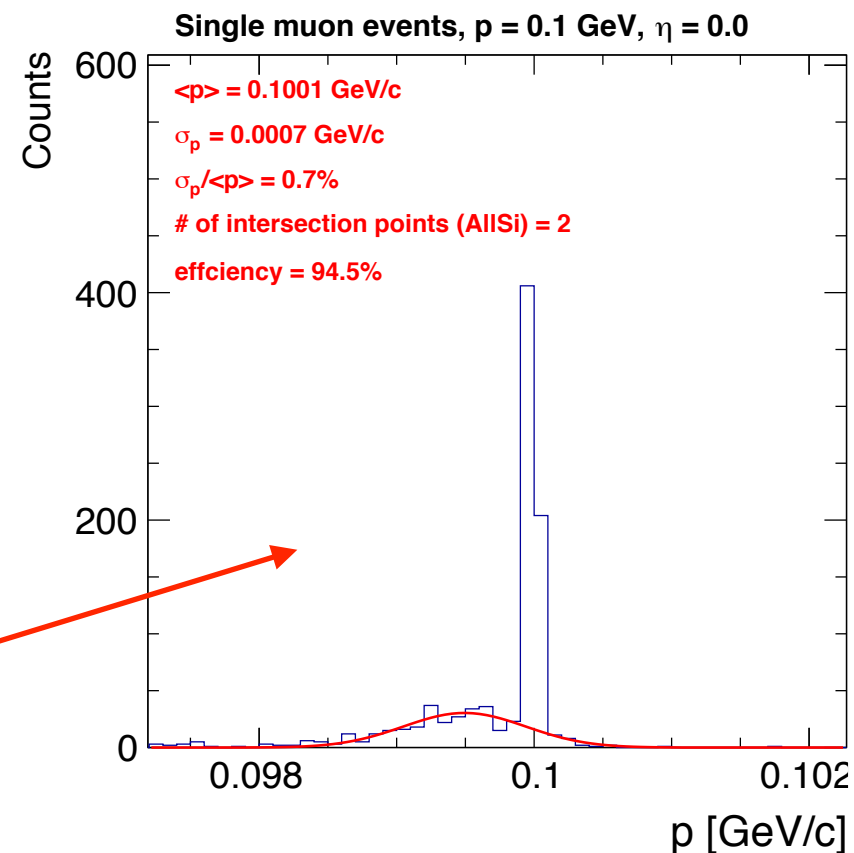
- ▶ Tracking information from ACTs
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- ▶ Test in Athena software framework (check path length first)
 - ◆ Simplistic setup containing only the tracking detectors without support cones or shells
 - ◆ Using the 5th barrel layer and last disk as reference surface for path length calculation



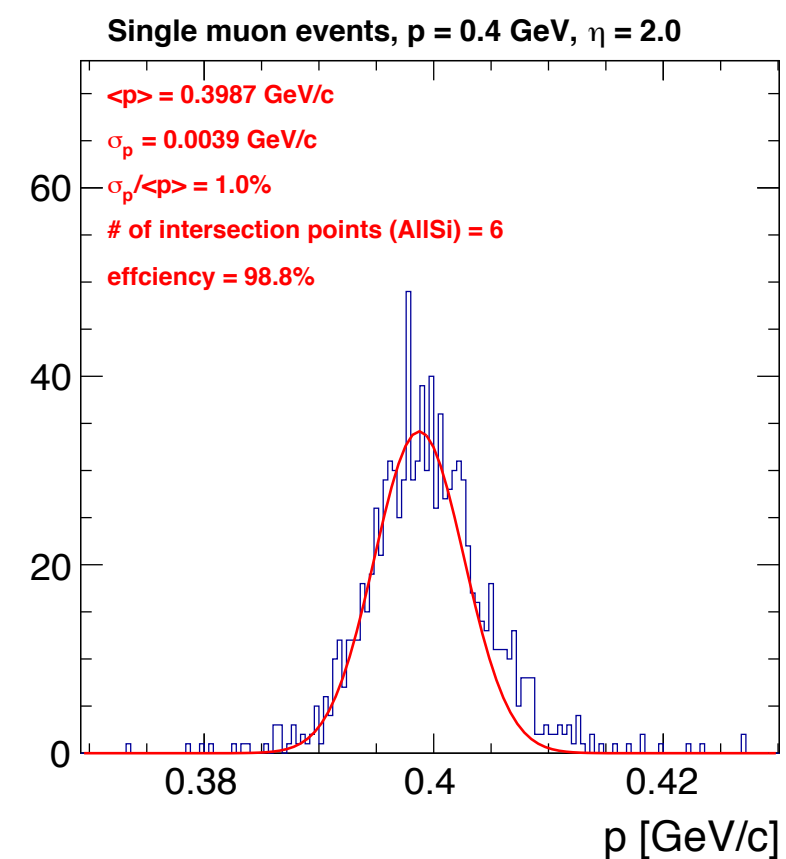
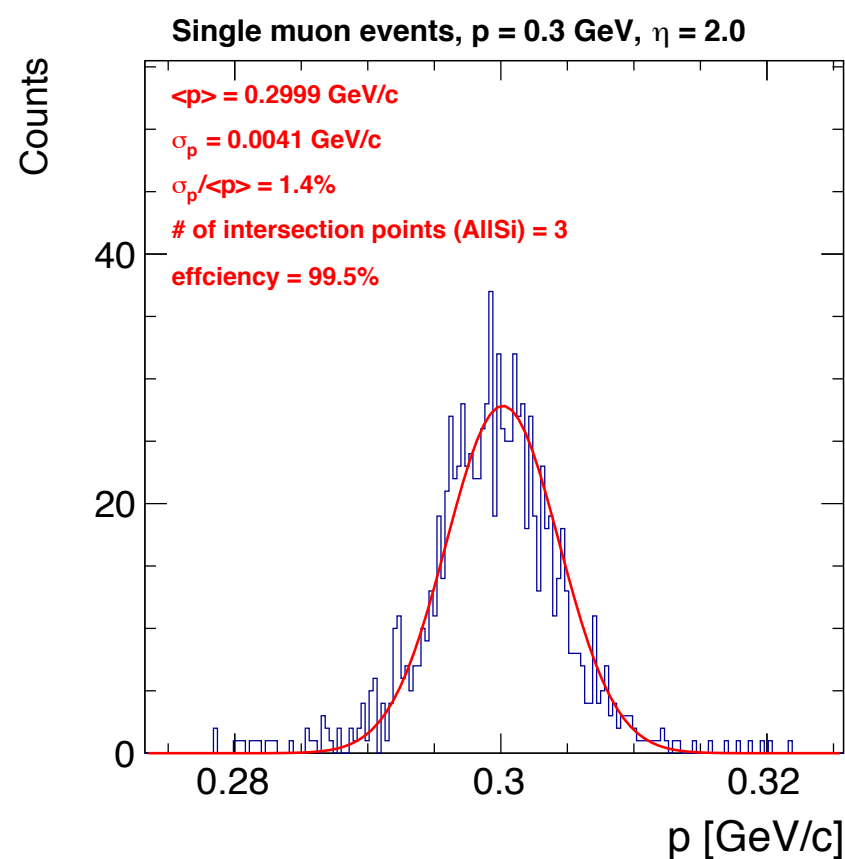
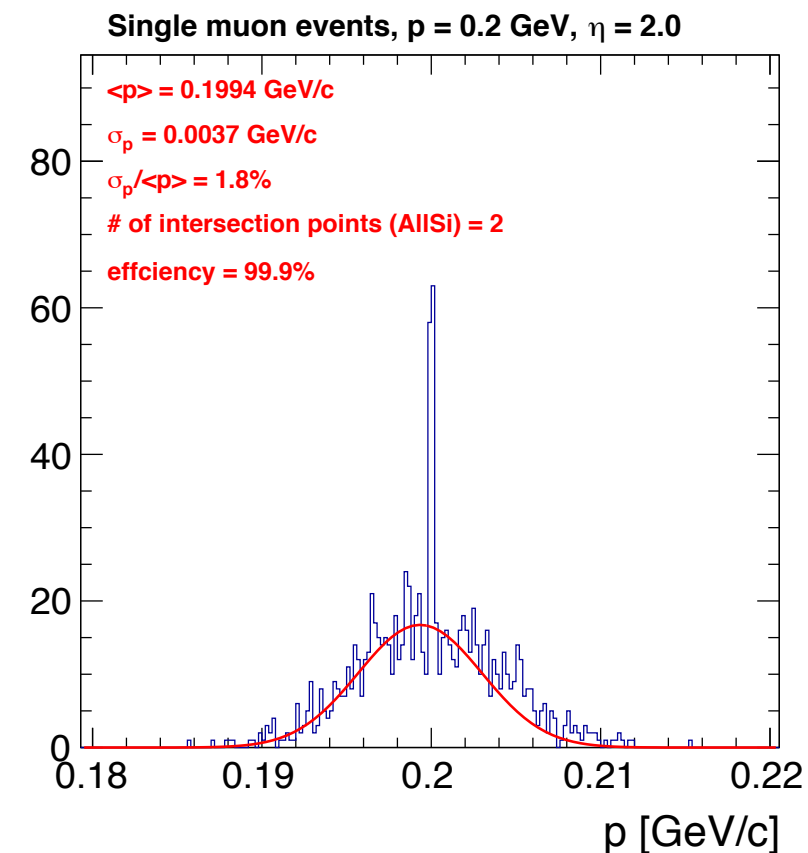
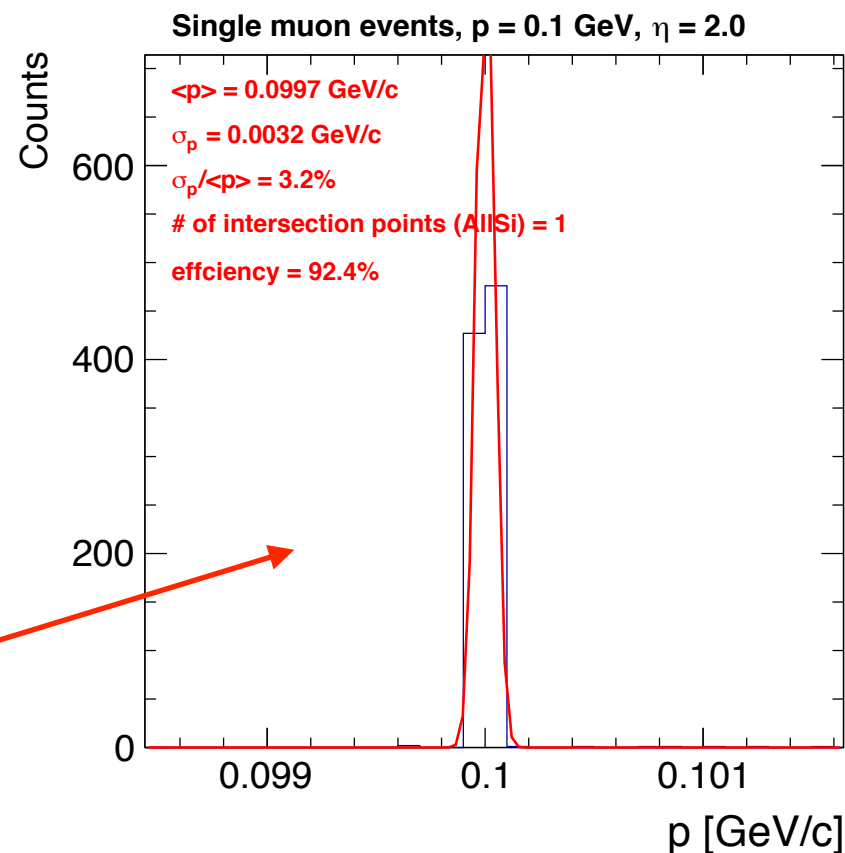
- ▶ Single muon events with fixed momentum and eta (1000 events)
 - ◆ Currently focusing on low momentum: 0.1, 0.2, ..., 1.0 GeV
 - ◆ η : -3, -2, -1, 0, 1, 2, 3
 - ◆ Output: reconstructed momentum, path length, # of intersection points with All-Si layers



- ▶ In addition, low p tracks reconstructed with reasonable resolution
- ◆ p (0.1 GeV) reconstructed even just hitting <3 layers? (might be related to the truth seeding)



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- ◆ p (0.1 GeV) reconstructed even just hitting <3 layers? (might be related to the truth seeding)



- ▶ Can read out path length info, results look reasonable
 - ◆ Use LGAD as reference layer and check the $\pi/K/p$ separation as function of p
 - ◆ Impact on the heavy flavor hadron reconstruction
- ▶ Try to read out projection point at PID and calorimeters
 - ◆ Check angular resolution
- ▶ Low momentum threshold seems good ($\sim 0.2\text{GeV}$ at midrapidity)
 - ◆ Need to understand why p reconstructed even with <3 intersection
 - ◆ This may change with realistic seeding and especially if adding background