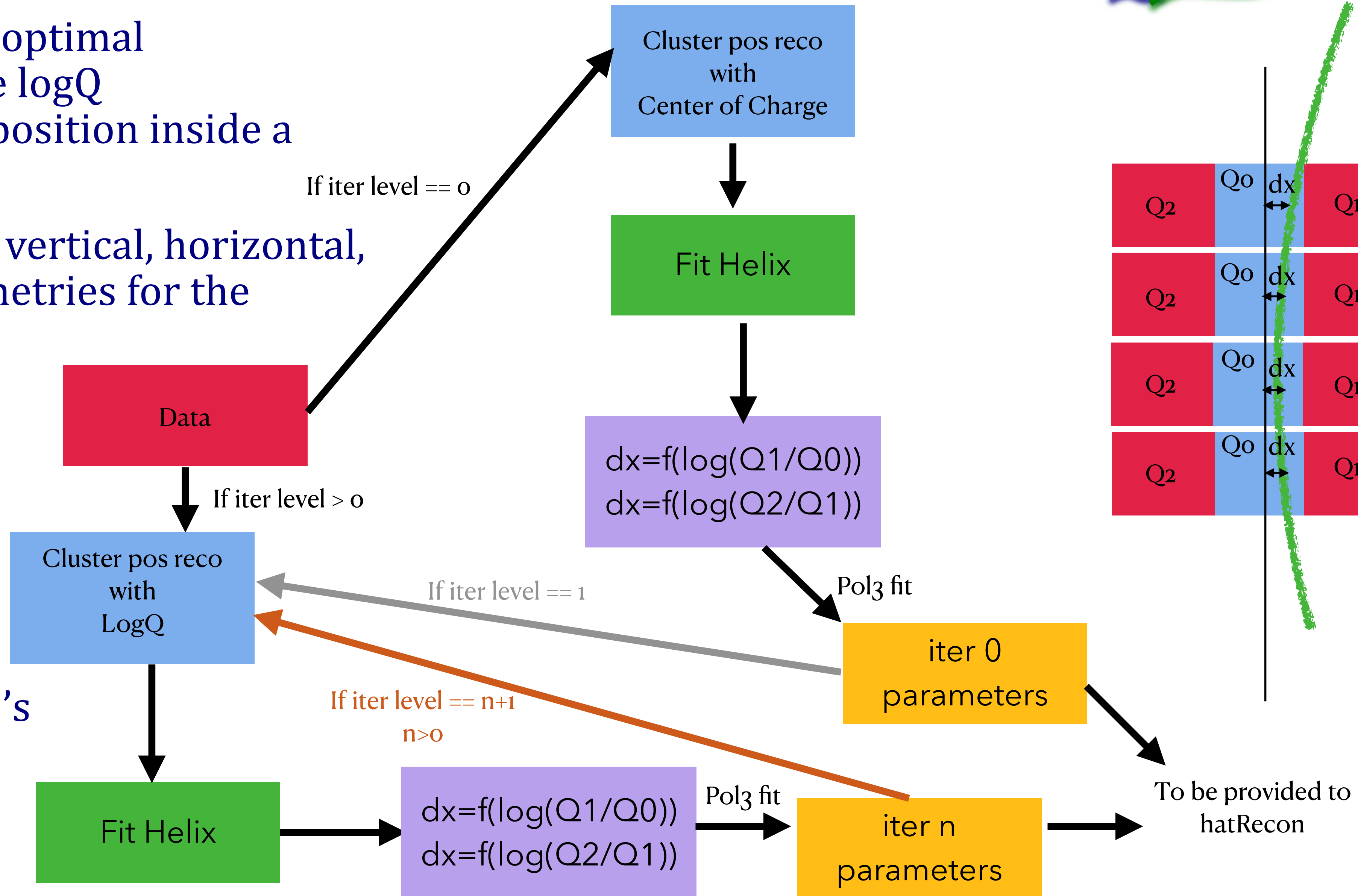


High and Low RC logQ tuner + HA-TPC p_L and p_R study

logQ tuner (reminder)

- Iterative process to find optimal parameterization for the logQ reconstruction of track position inside a cluster
- 3 different orientations: vertical, horizontal, diagonal (different geometries for the charge spreading)
- 10 ranges of drift: larger the drift is, larger is the spreading due to the diffusion in the HA-TPC's gas
- Parameterization dependant on the ERAM's characteristics (RC...)

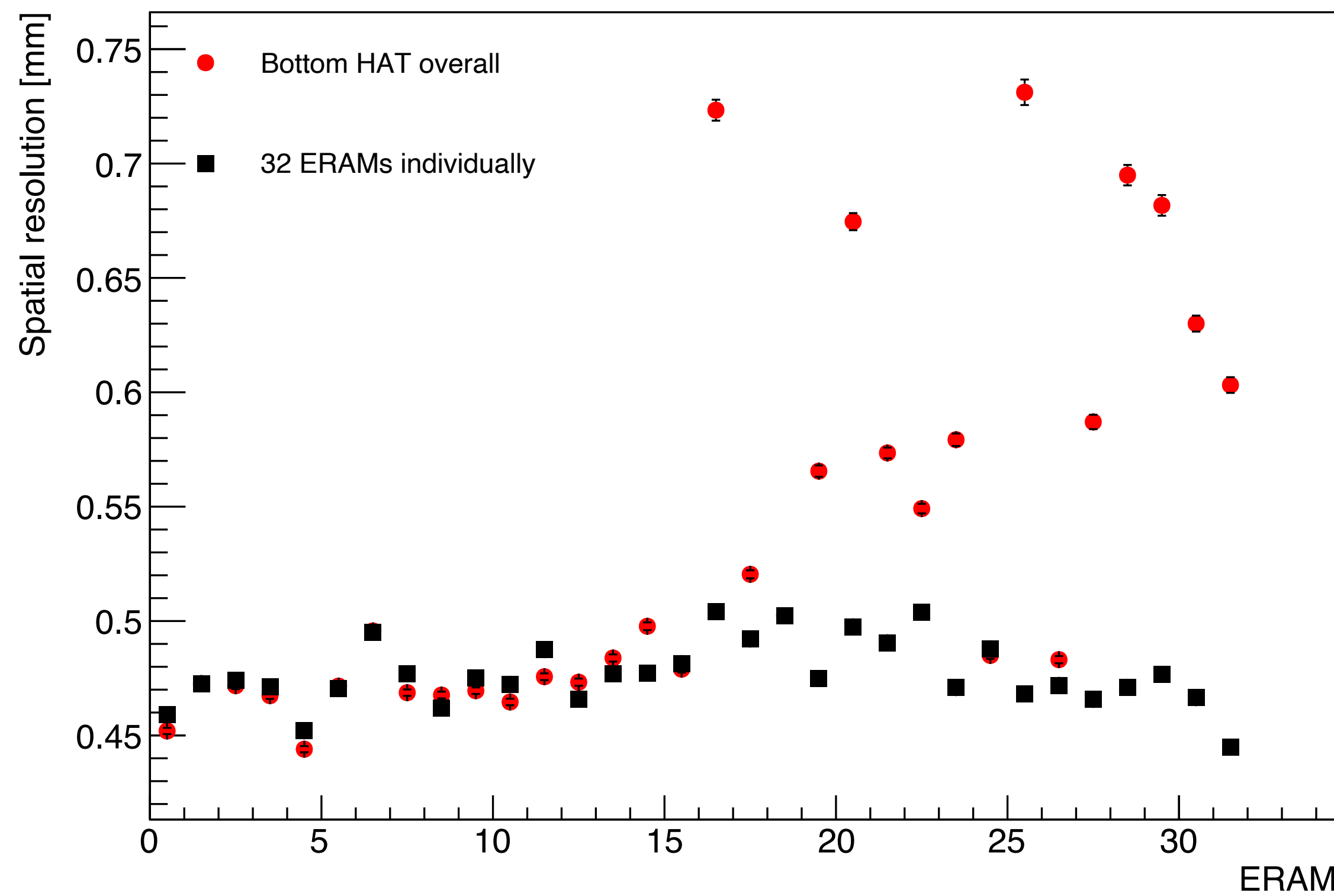
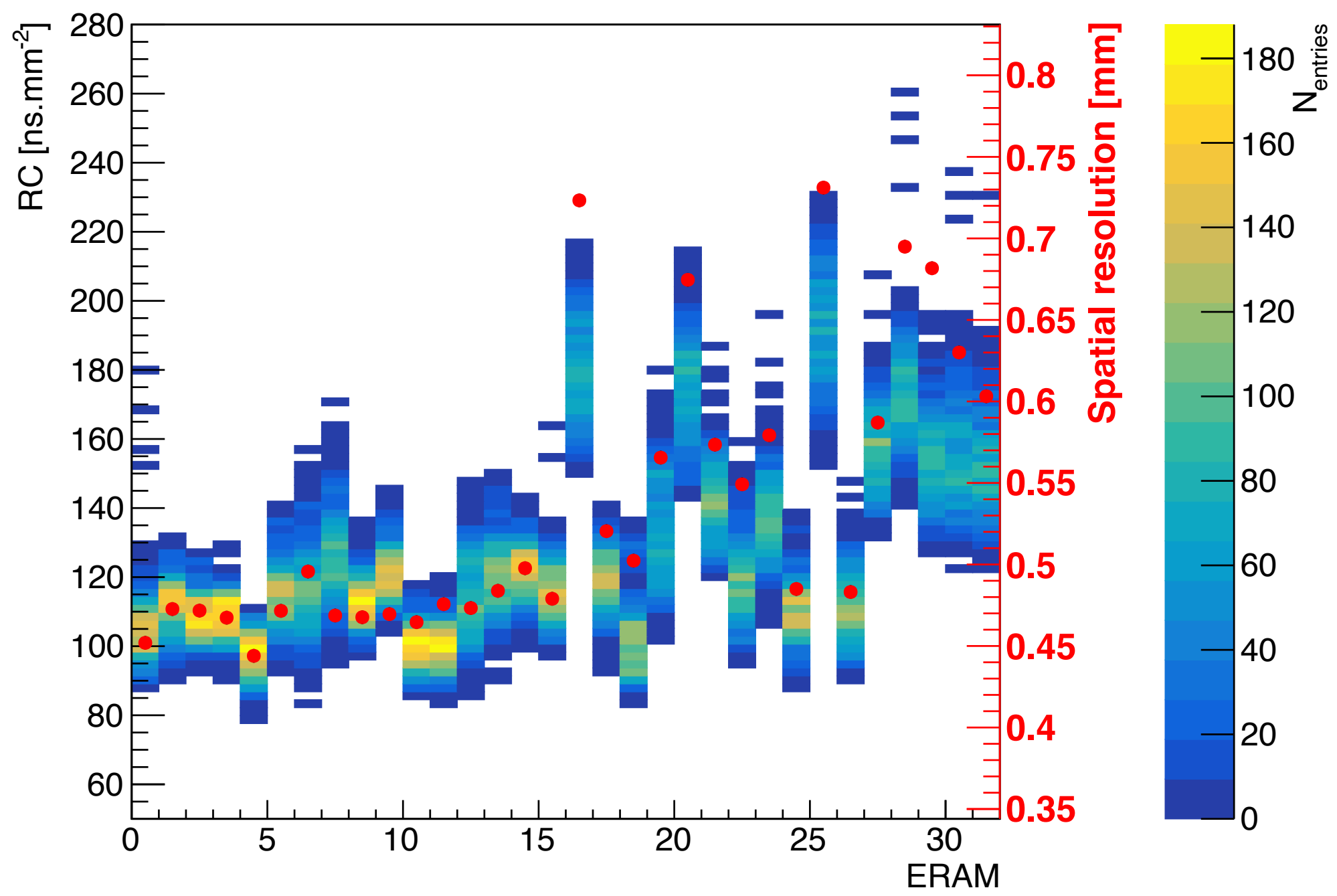


T2K

RC value and logQ parameterization



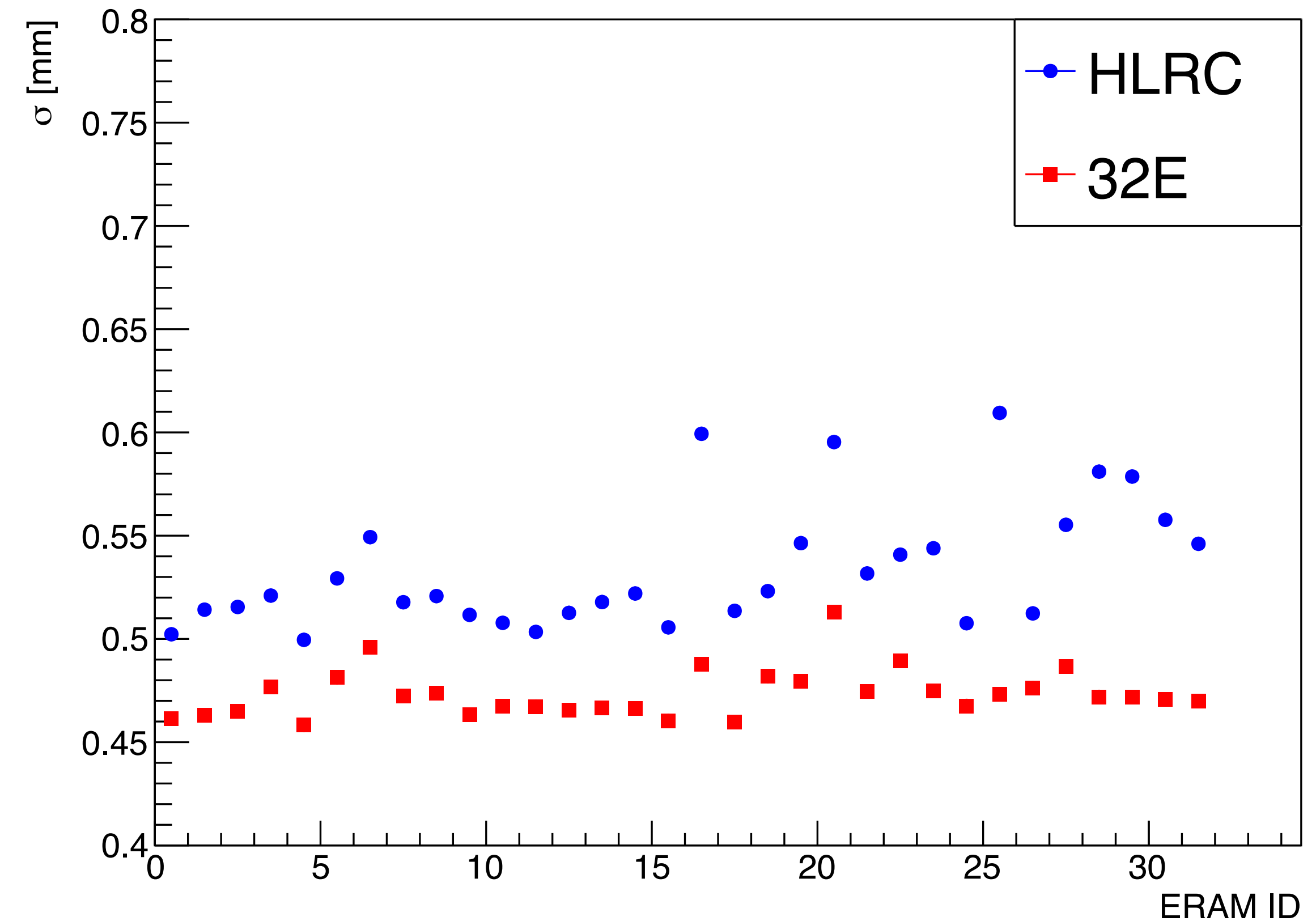
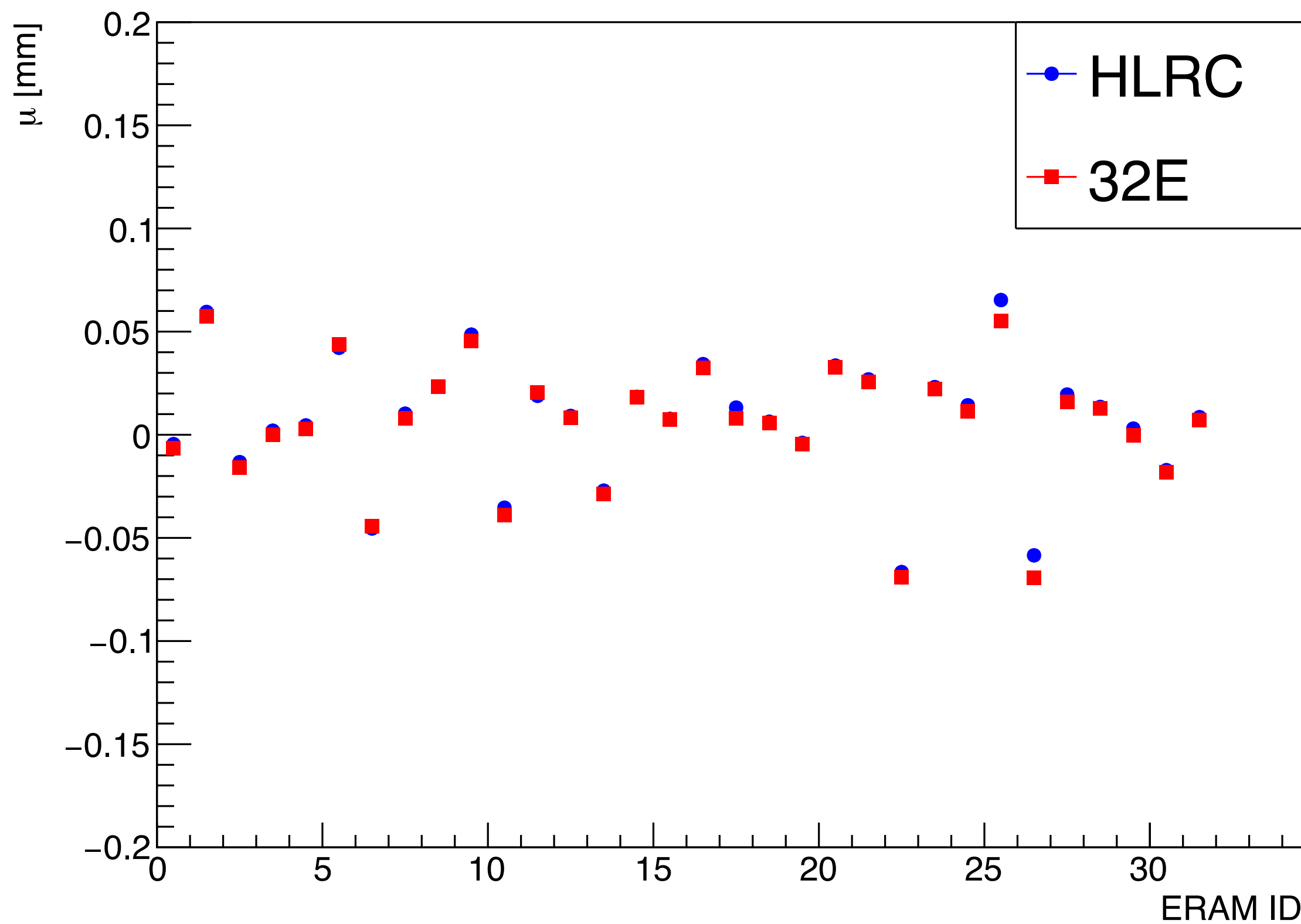
- Initially tuned on Bottom HAT data, logQ was giving worse spatial resolution for Top HAT ERAMs, especially the ones with the largest RC
- A different tuning was therefore done for each of the 32 ERAMs



From 32 to 2 different logQ parameterizations



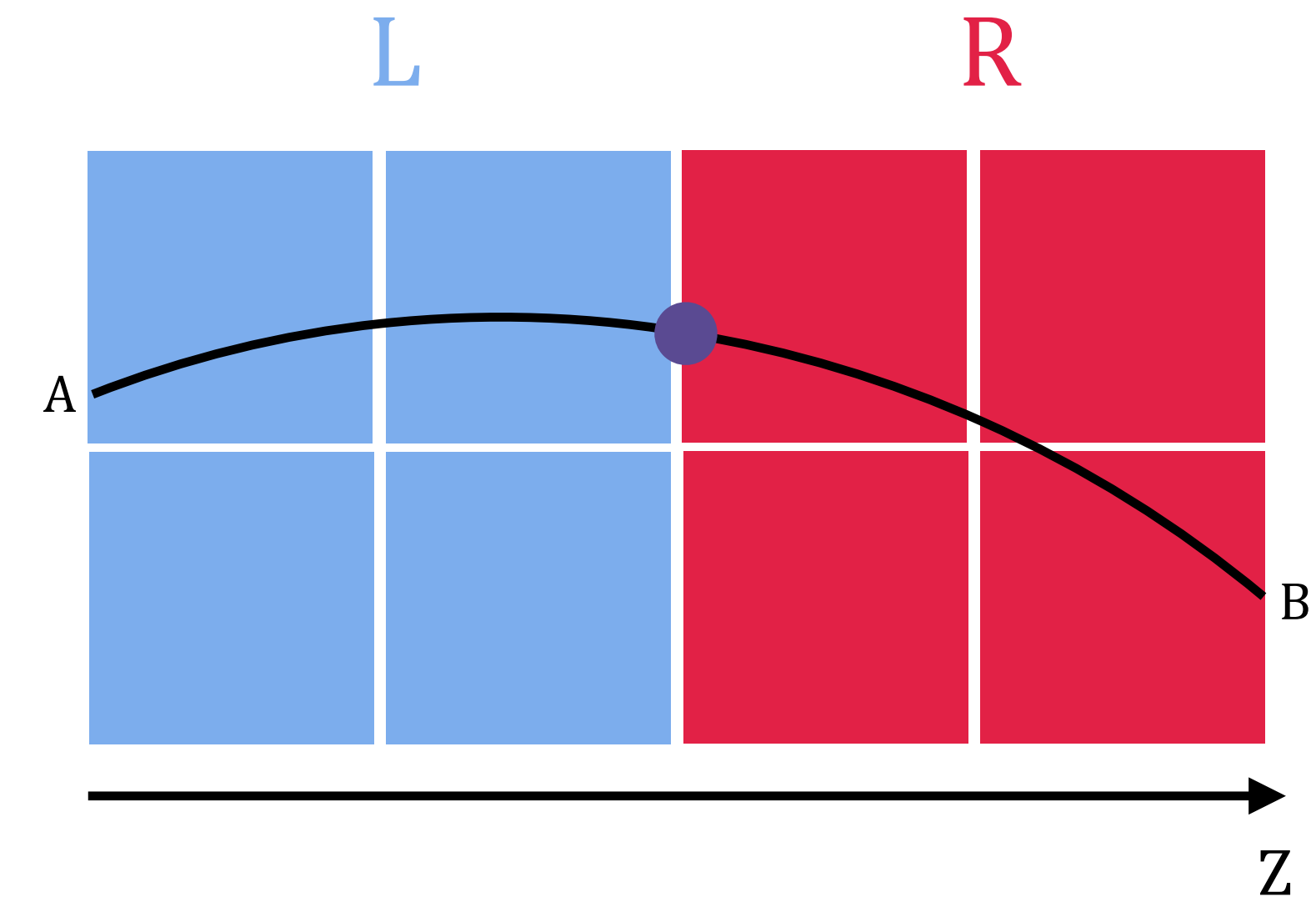
- In order to be in agreement with the MC where there are only 2 values of RC, the tuning of logQ was done separating the ERAMs into 2 groups:
Low RC: Bottom HAT + {17,18,22,24,26}
High RC: Top HAT \ {17,18,22,24,26}
- Bias comparable but spatial resolution is less good (I only select horizontal tracks with $|\text{dir}_z| > 0.8$)



p_L and p_R study in the HA-TPC



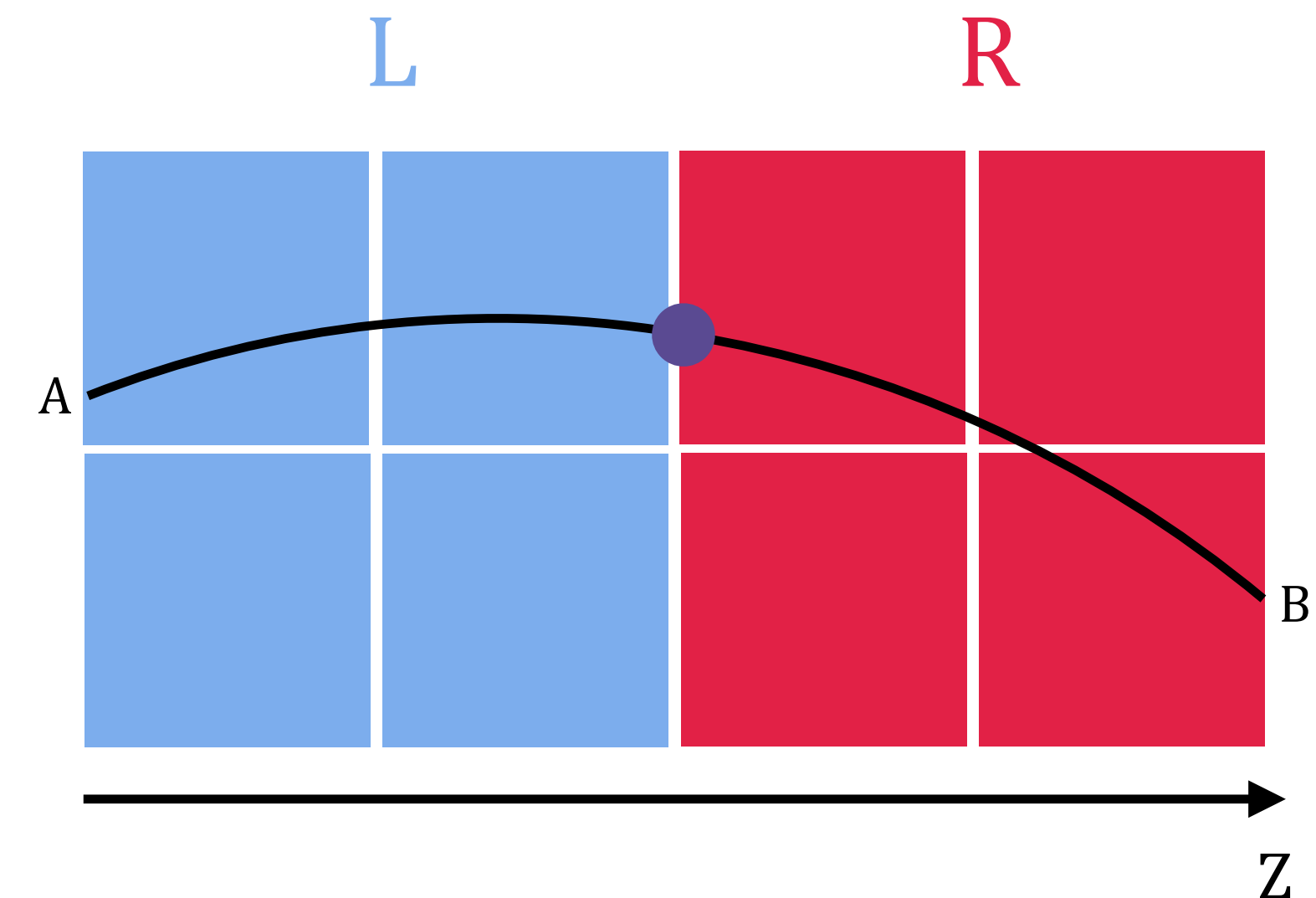
- E field distortions can shift ionization electrons during their path towards the anode plane
- An apparent modification of the curvature of the tracks leads to a biased measurement of the momentum
- To better understand this effect, separate each endplate in 2 regions: low Z and high Z



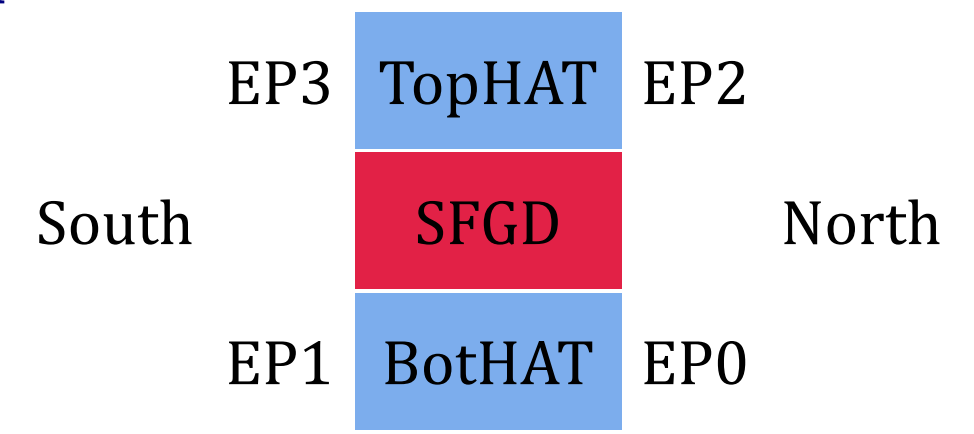
p_L and p_R study in the HA-TPC



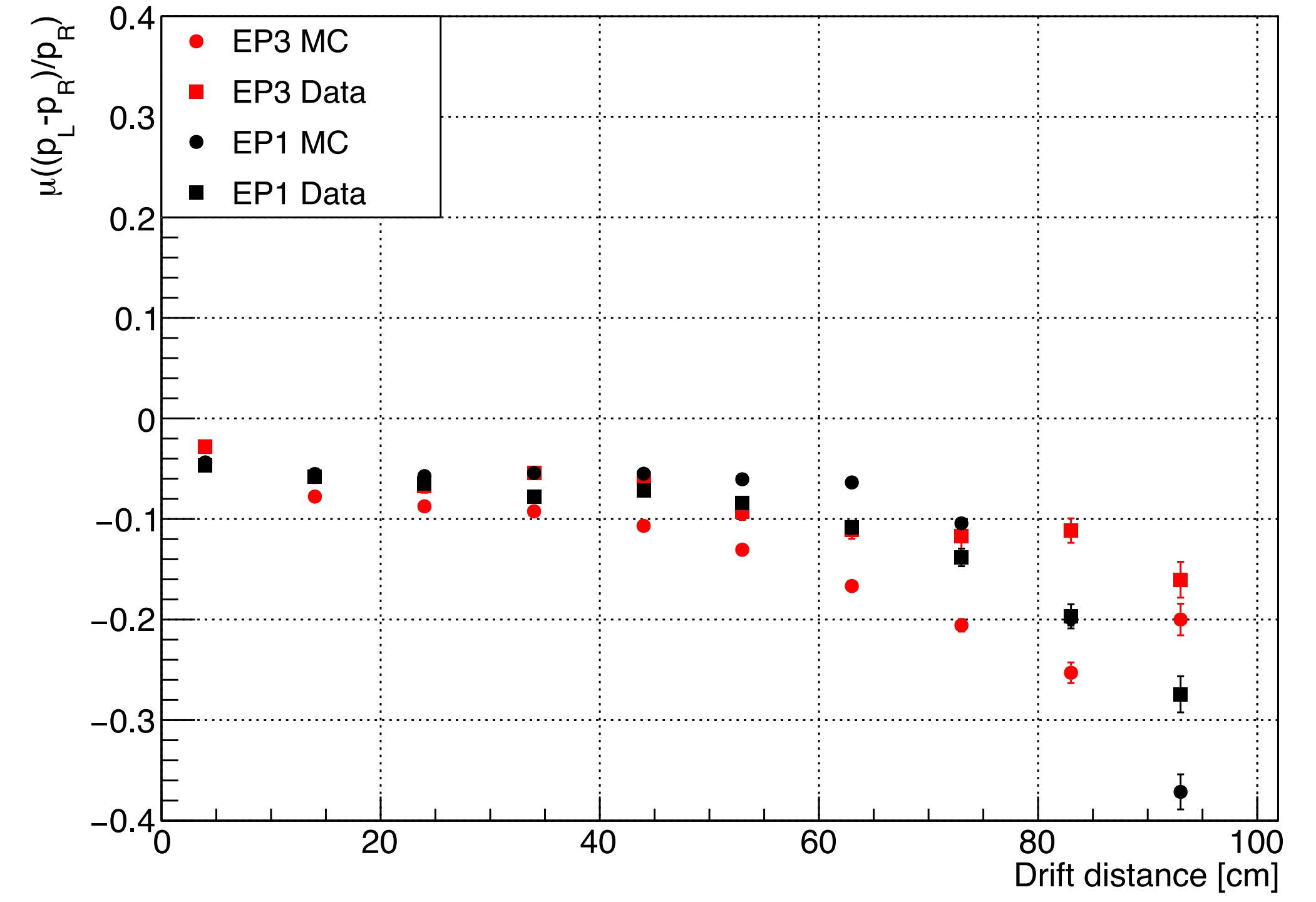
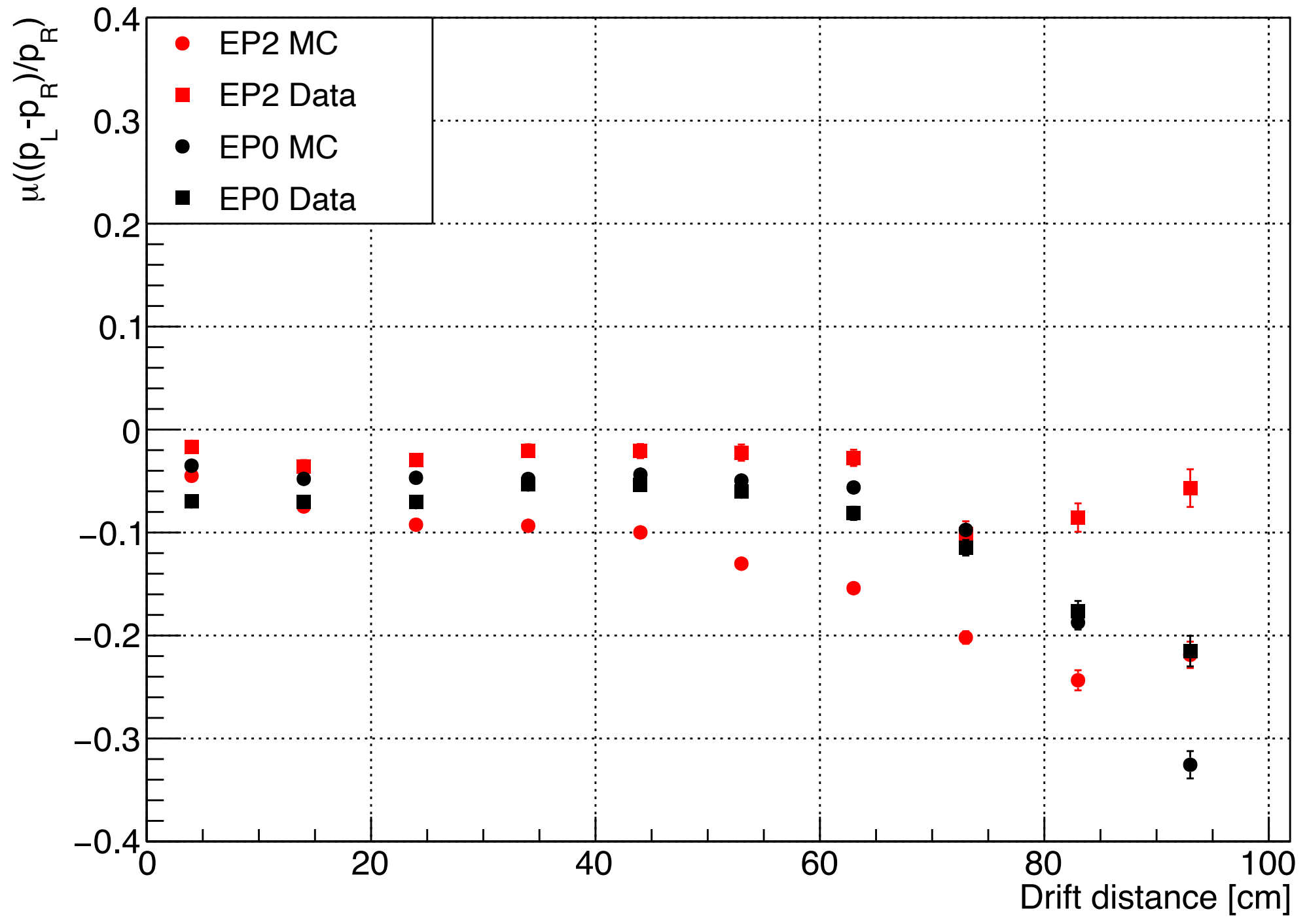
- For a same track reconstruct indepently the portion in the blue (low Z) and red (high Z) regions
- Compare the respective momenta p_L and p_R
- Take initial position, direction and curvature of A and B tracks, project them at a given Z at the frontier of blue and red region
- Considered as two parts of the same track if $\Delta x < 2$ cm



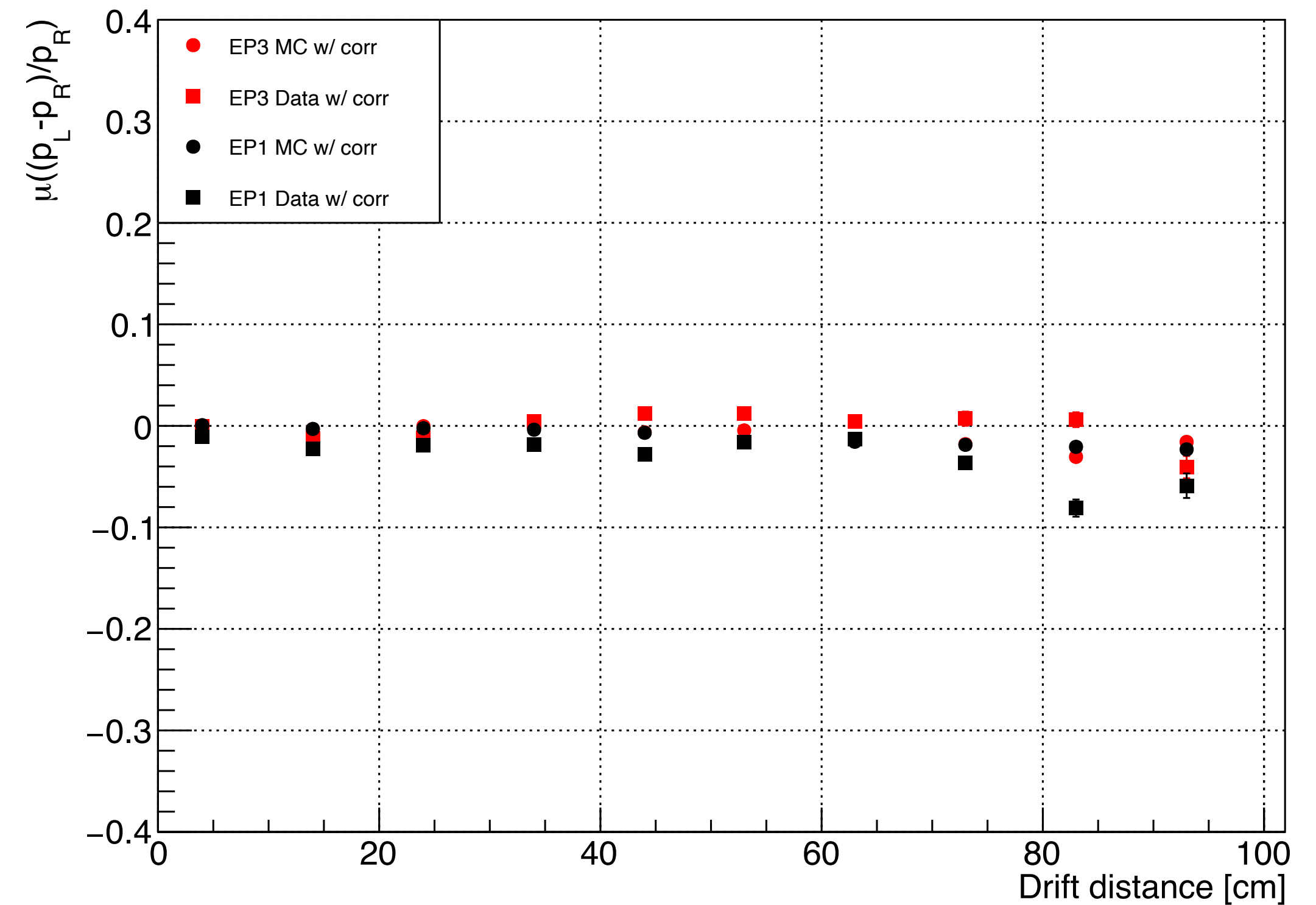
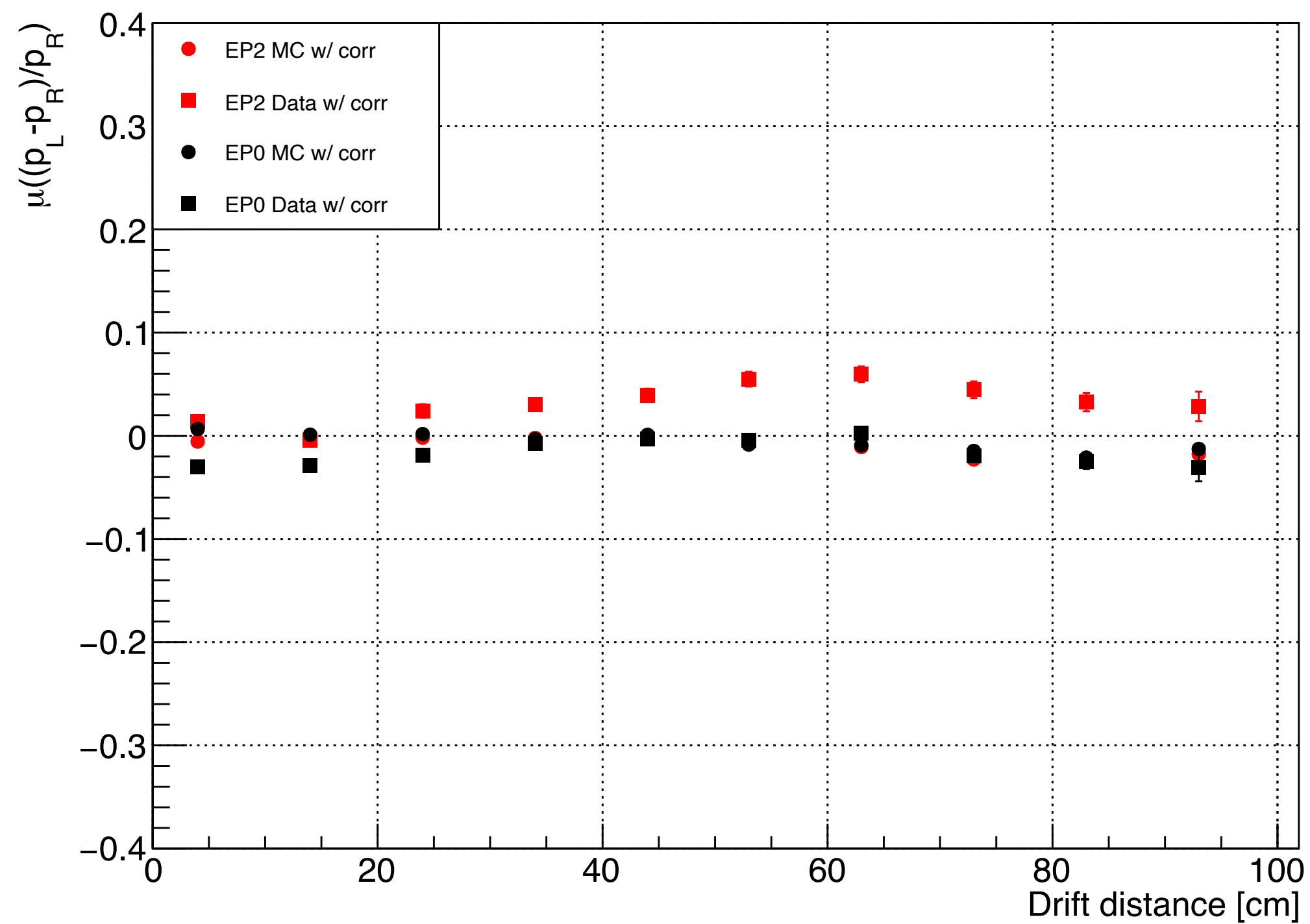
Bias on $(p_L - p_R)/p_R$ (no correction)



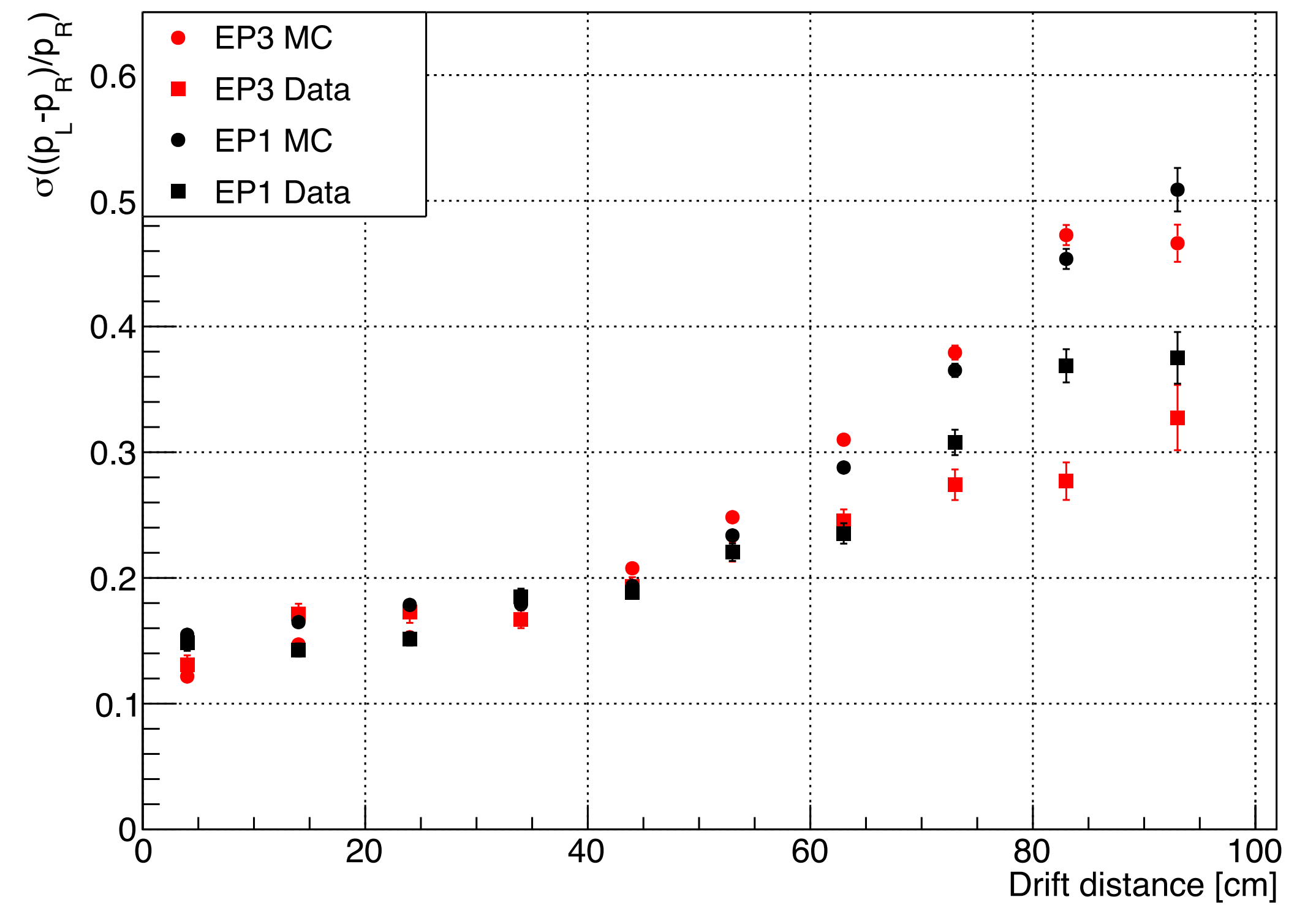
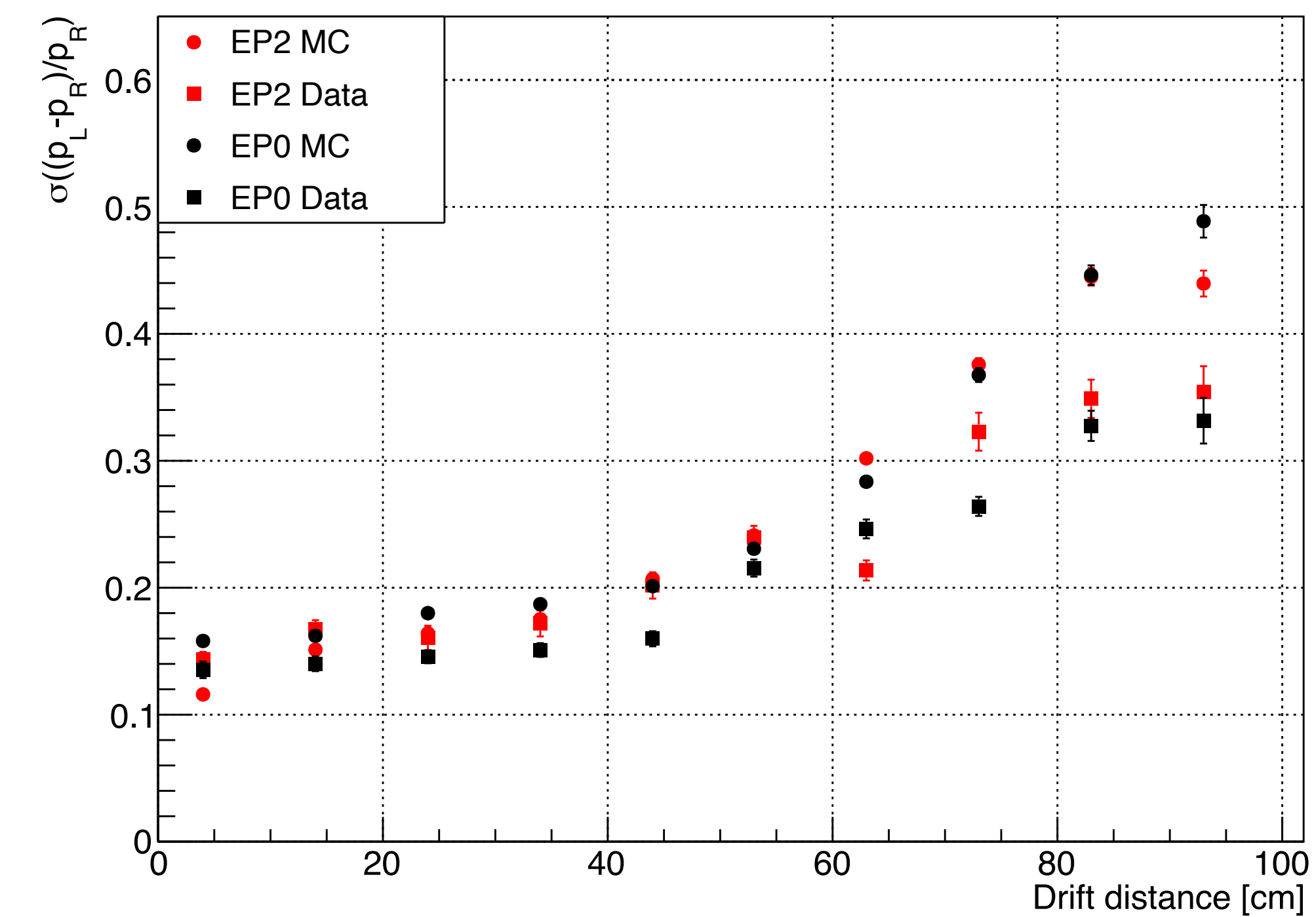
From J-Parc's target



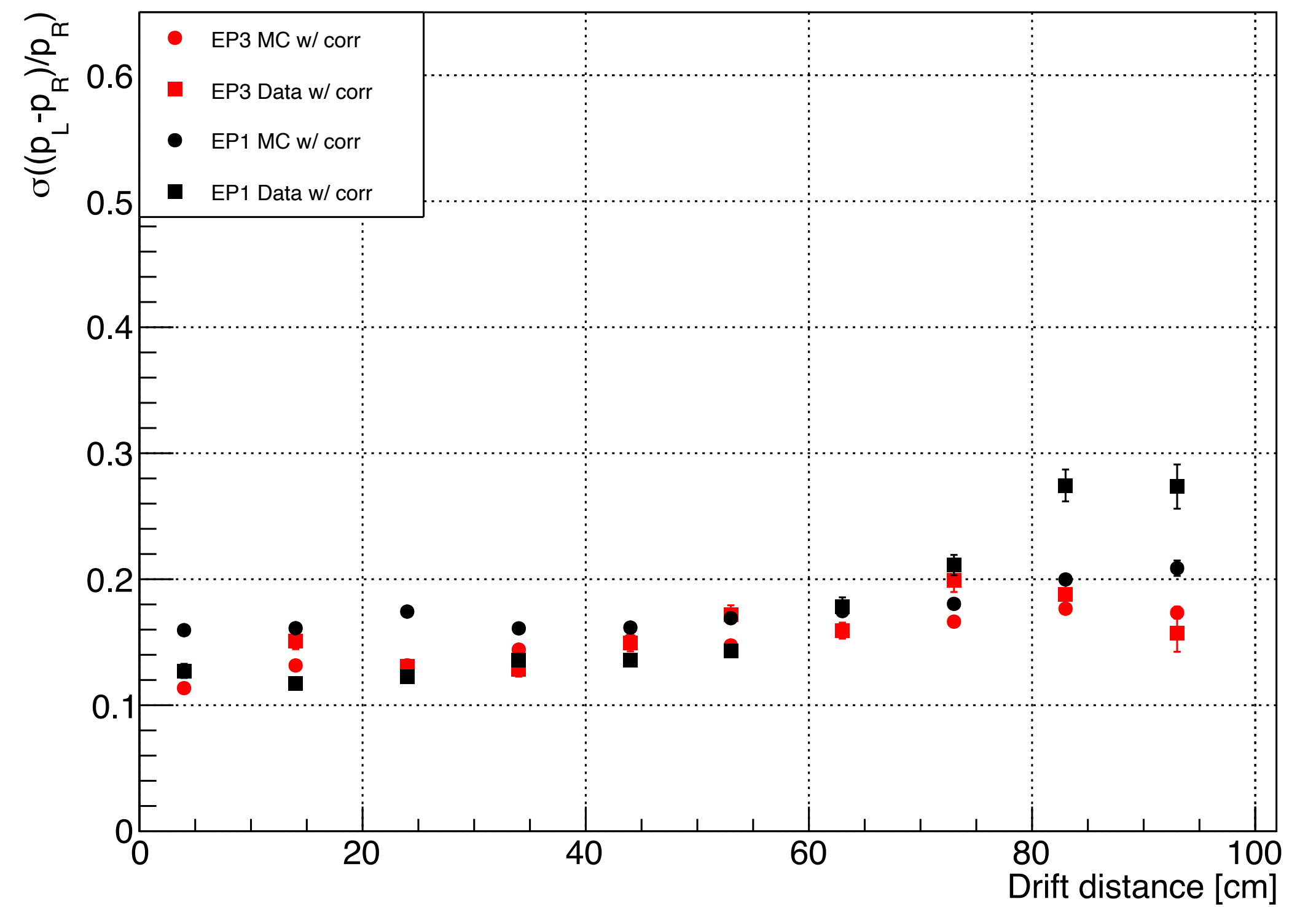
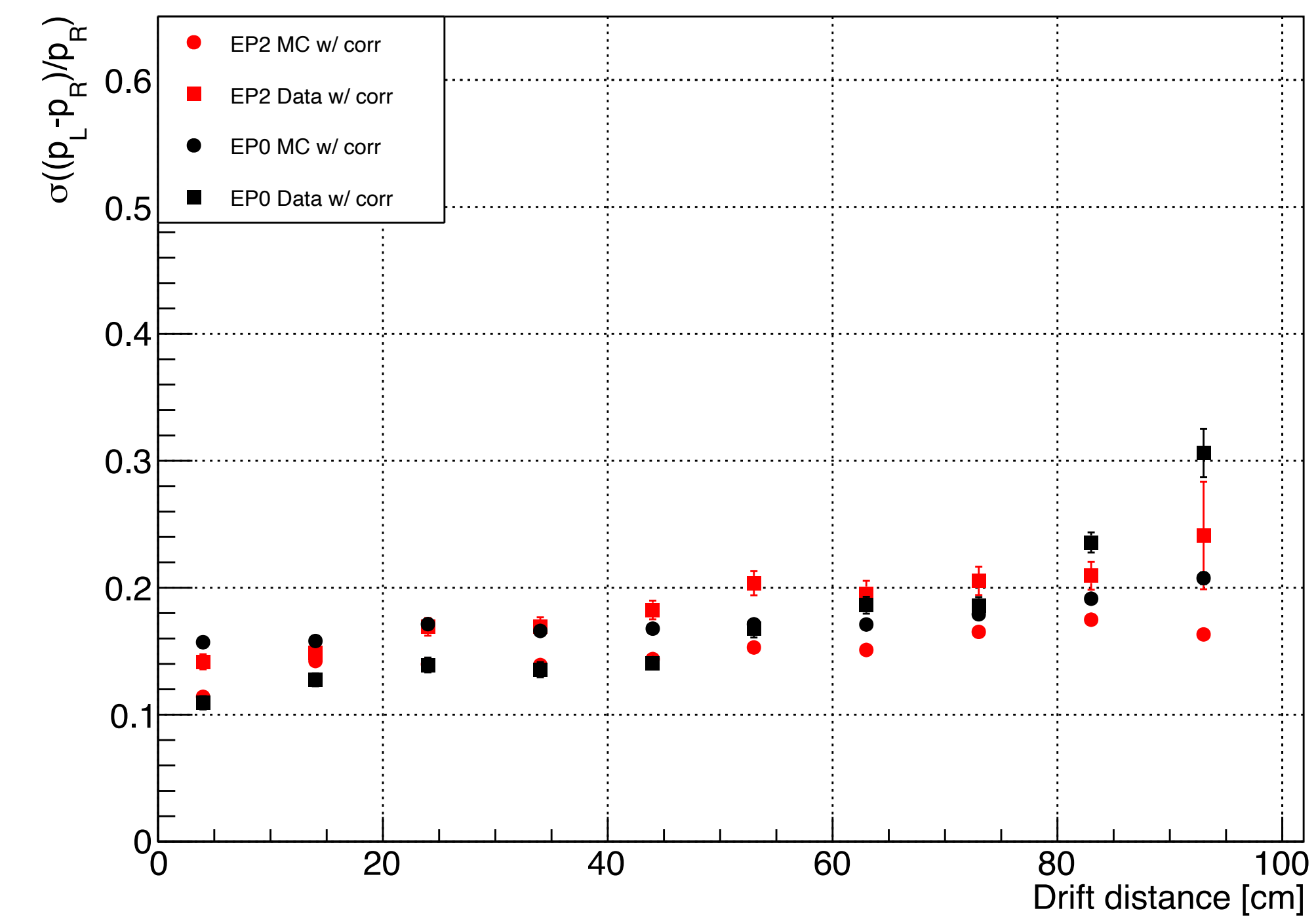
Bias on $(p_L - p_R)/p_R$ (corrected)



Resolution on $(p_L - p_R)/p_R$ (no correction) **T2K**



Resolution on $(p_L - p_R)/p_R$ (corrected)



Summary



- logQ part:
 - ▶ Spatial resolution is less good when using parameterization tuned on high and low RC compared to 32 ERAMs independently, but still better than taking only bottom HAT data
 - ▶ But I should try it on MC to see if it improves Data/MC agreement
- E field distortions with p_L and p_R study:
 - ▶ Momentum bias and resolution improved when correction E field distortions effect
 - ▶ Same behaviors for Data and MC
 - ▶ Useful to study systematics on the momentum reconstruction as the length of HA-TPC is approximately the double of its height (we will have mostly vertical tracks coming from SFGD)