

## Update on Tracking Performances for TDR

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	Momentum Resolution	Spatial Resolution
Backward (-3.5 to -2.5)	$\sim 0.10\% \times p \oplus 2.0\%$	$\sim 30/p_T \mu\text{m} \oplus 40 \mu\text{m}$
Backward (-2.5 to -1.0)	$\sim 0.05\% \times p \oplus 1.0\%$	$\sim 30/p_T \mu\text{m} \oplus 20 \mu\text{m}$
Barrel (-1.0 to 1.0)	$\sim 0.05\% \times p \oplus 0.5\%$	$\sim 20/p_T \mu\text{m} \oplus 5 \mu\text{m}$
Forward (1.0 to 2.5)	$\sim 0.05\% \times p \oplus 1.0\%$	$\sim 30/p_T \mu\text{m} \oplus 20 \mu\text{m}$
Forward (2.5 to 3.5)	$\sim 0.10\% \times p \oplus 2.0\%$	$\sim 30/p_T \mu\text{m} \oplus 40 \mu\text{m}$

# Tracking Performances Code

Track Parameters:  $(l_0, l_1, \theta, \phi, 1/p)$

**Outward-->Inward fitting (smoothing)**

$$p = 1./(1/p)$$

$$p_z = p \cos\theta$$

$$p_T = \sqrt{p^2 - p_z^2}$$

$$p_x = p_T \cos\phi$$

$$p_y = p_T \sin\phi$$

$l_0$ --> Extrapolate to vertex DCA<sub>xy</sub>

$l_1$ --> Extrapolate to vertex DCA<sub>z</sub>

[Script shared with the group](#)

**Script to extract tracking performances:**

CentralCKFTrackParameters (Truth Seeding)

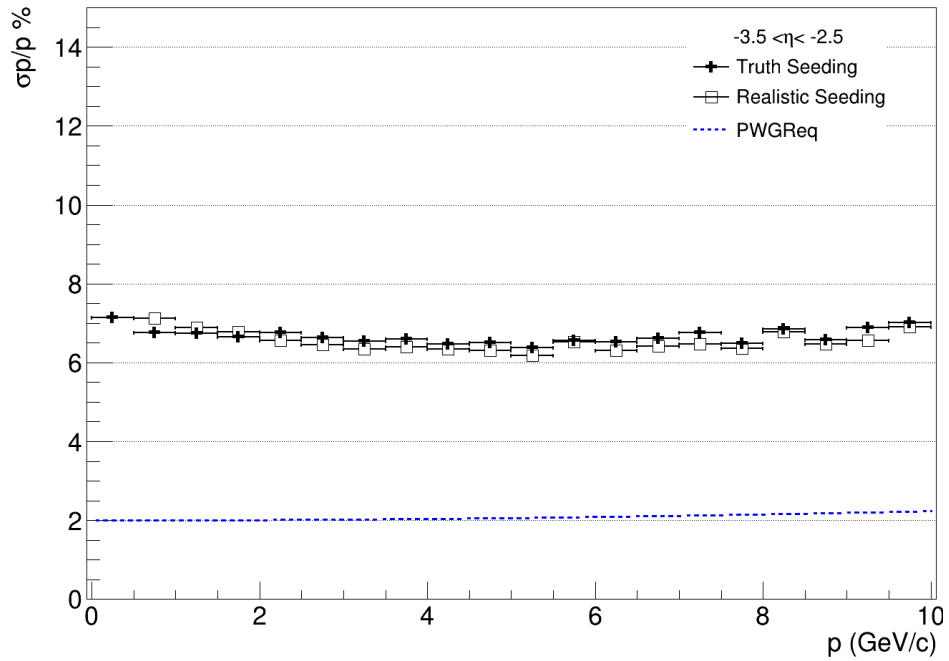
CentralCKFSeededTrackParameters (Realistic Seeding)

## Steps:

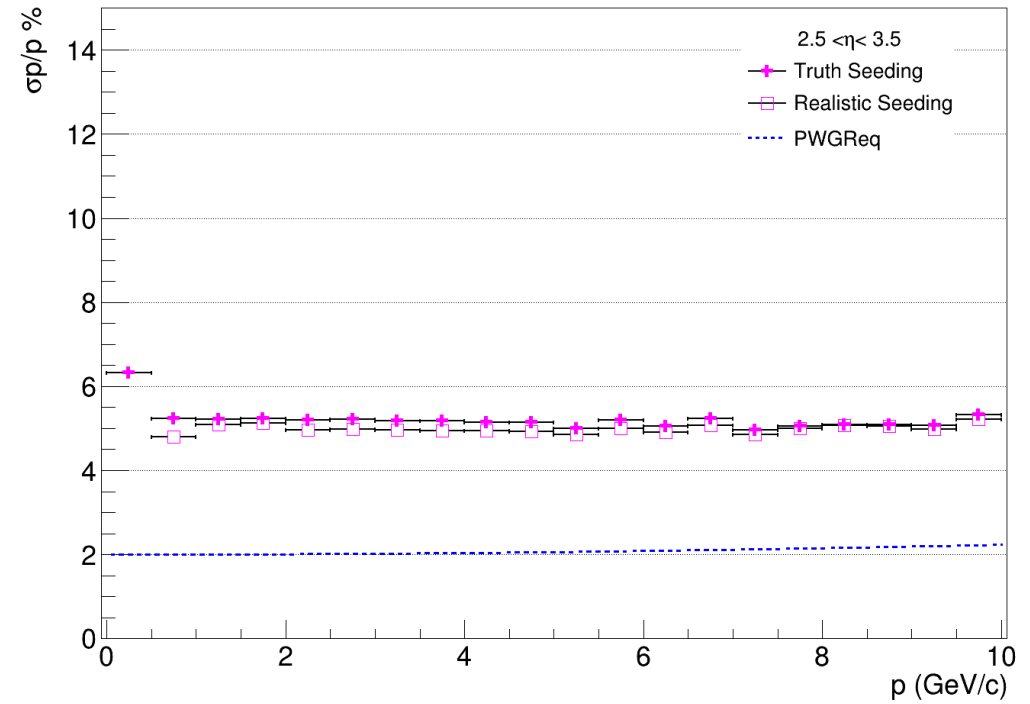
1. Put the tracking file in Full\_EPC\_Output/ directory and rename to tracking\_output.edm4eic.root
2. Run draw\_BasicPerformances.C to produce eta vs momentum generated and reco histograms
3. Go to Tracking\_Performances/Fit\_Result and do source Script\_widebin.sh (suggested) or source Script\_finebin.sh (eta bin width of 0.5) then it will produce all debug plots and comparison plots
4. Comparison plots are in Final\_Results/ (Shown in the slides)
5. Check intermediate debug plots in Mom\_Resol\_Code/ and Pointing\_Resol\_Code/ directory for truth and realistic seeding
6. Main code is Plot\_Rec\_MC\_tree.C in Mom\_Resol\_Code/ and Plot\_Pointing\_Resol\_pt.C in Pointing\_Resol\_Code/
7. Also fitting of distributions are in the code which can be called if required (can also be extended quickly to any eta binning)

# Momentum Resolution

## Negative $\eta$

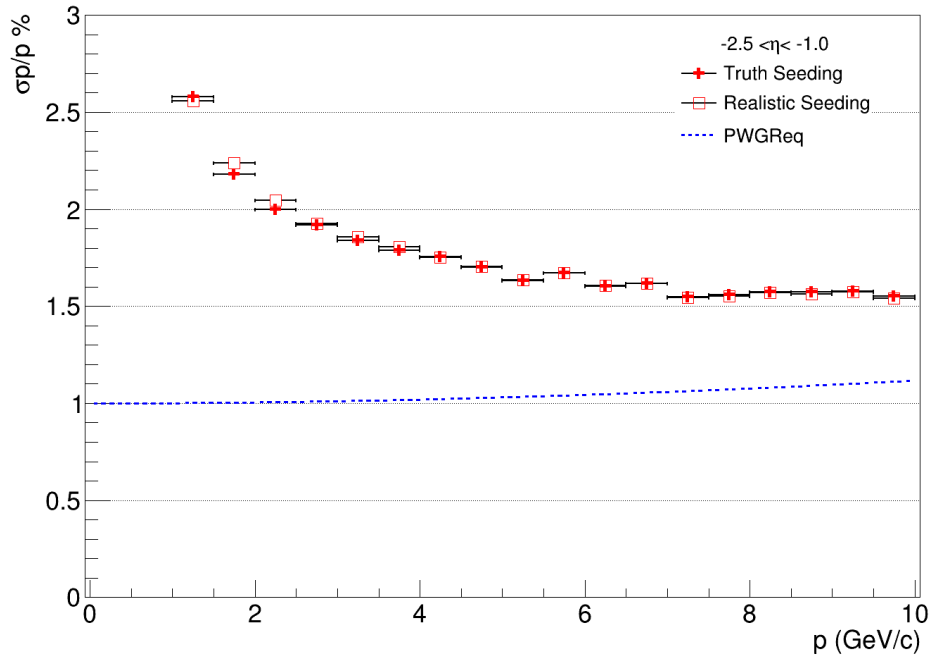


## Positive $\eta$

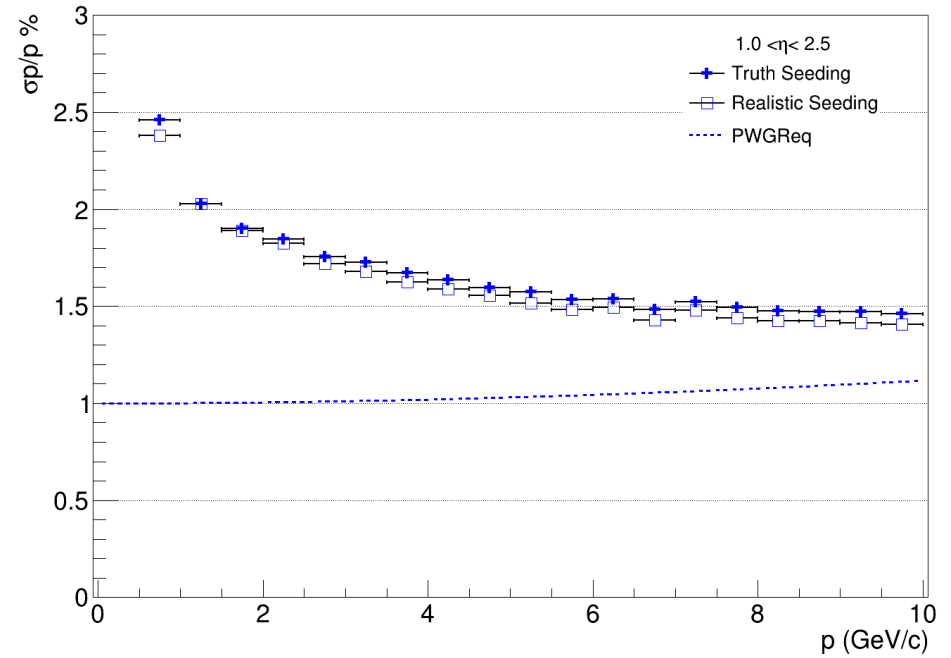


# Momentum Resolution

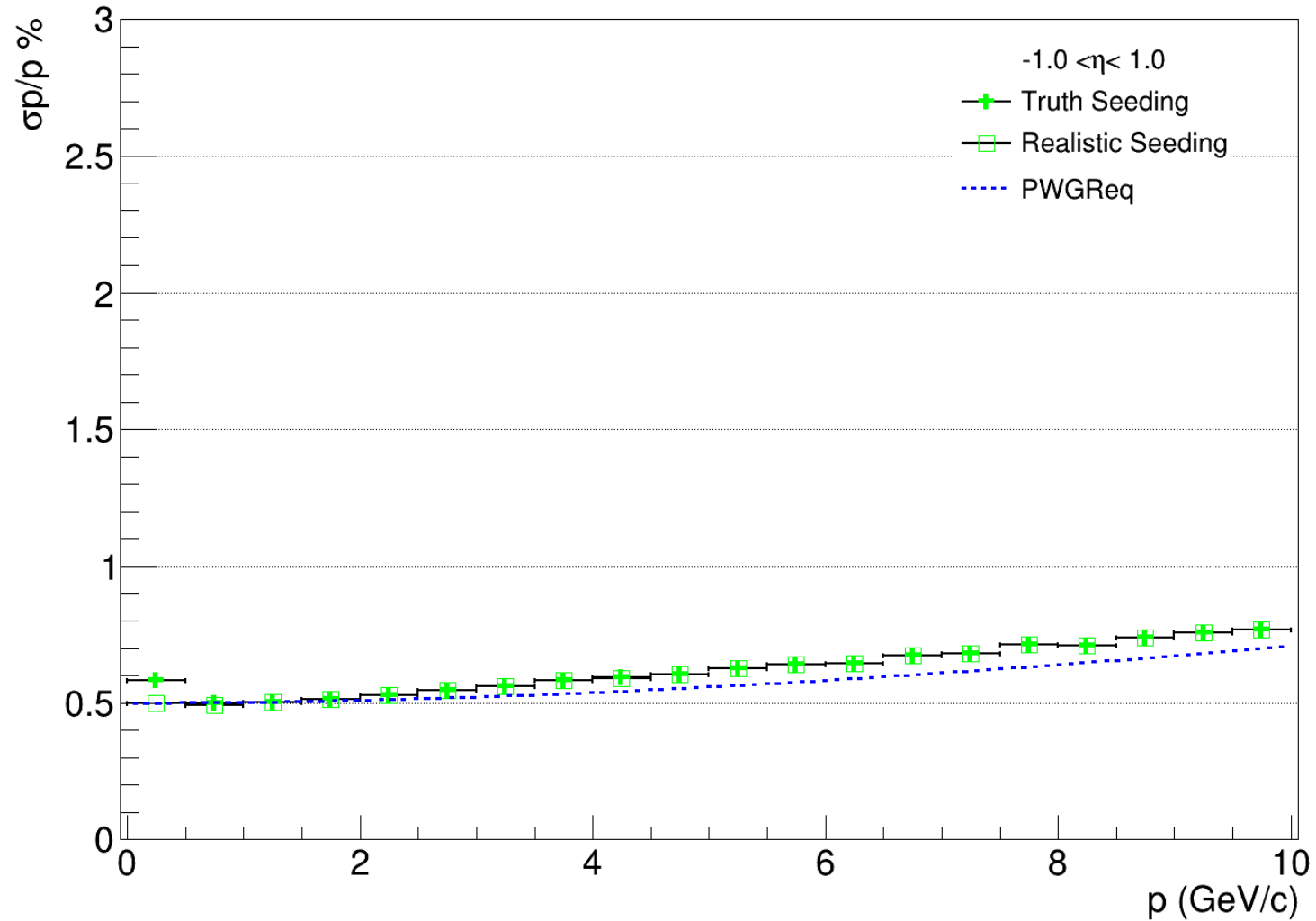
## Negative $\eta$



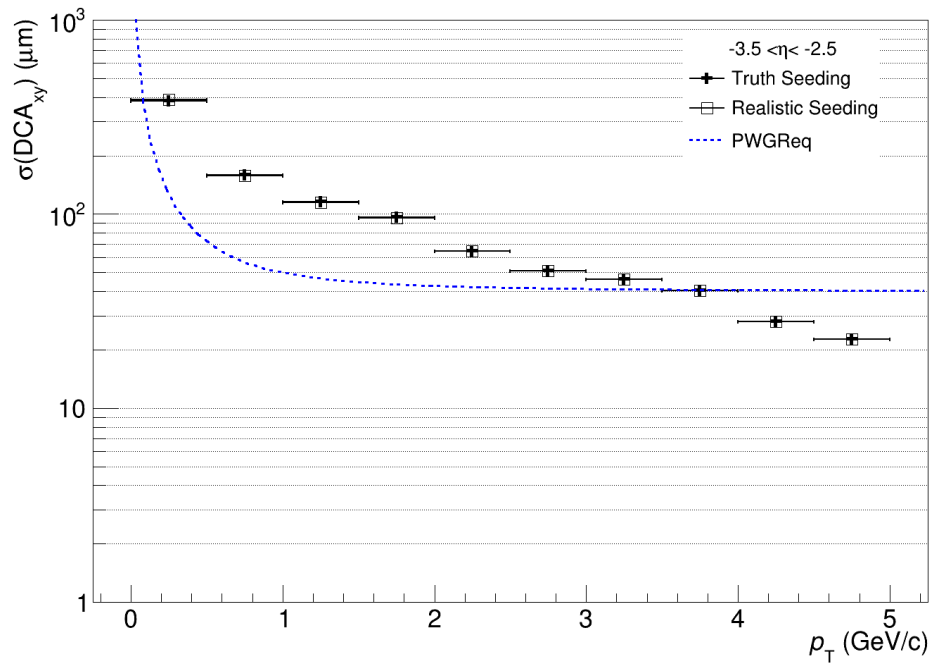
## Positive $\eta$



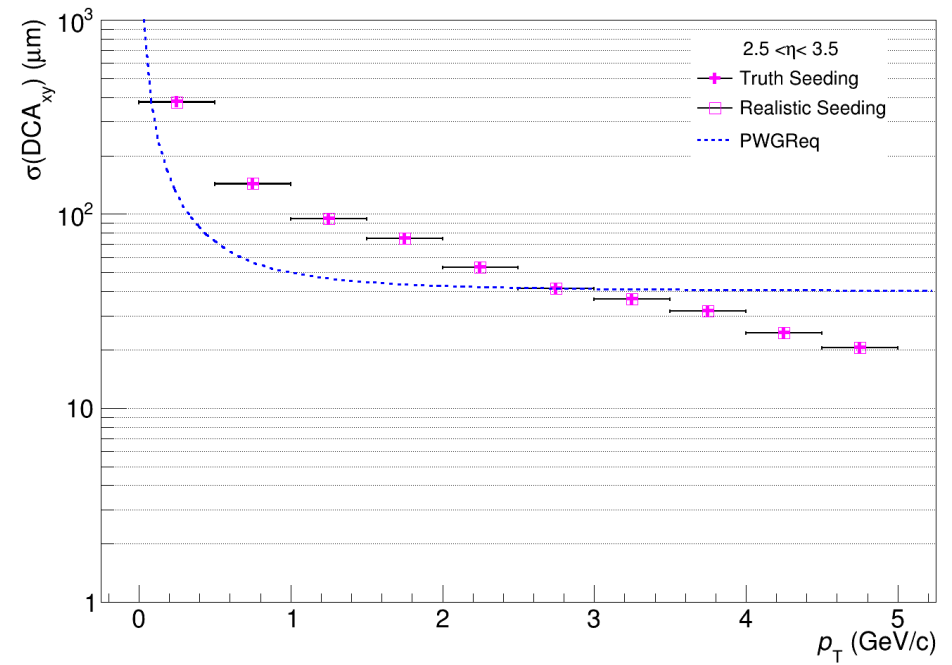
# Momentum Resolution



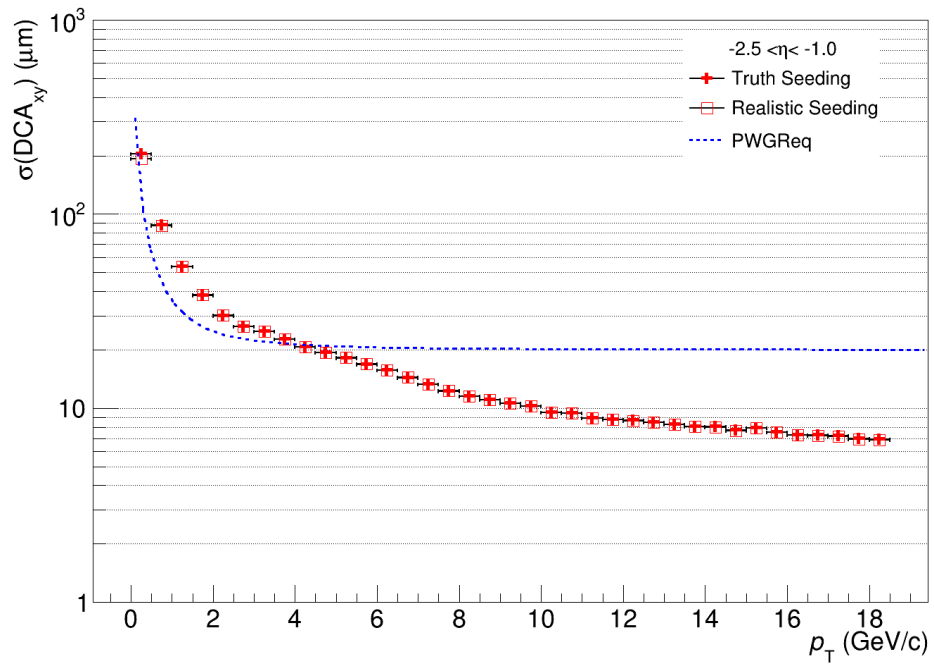
## Negative $\eta$



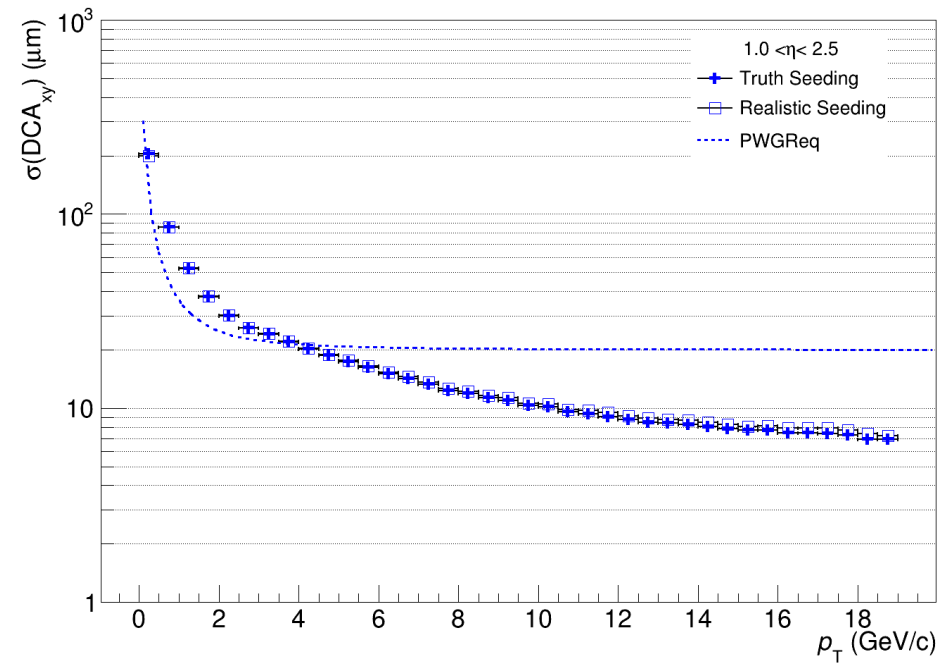
## Positive $\eta$

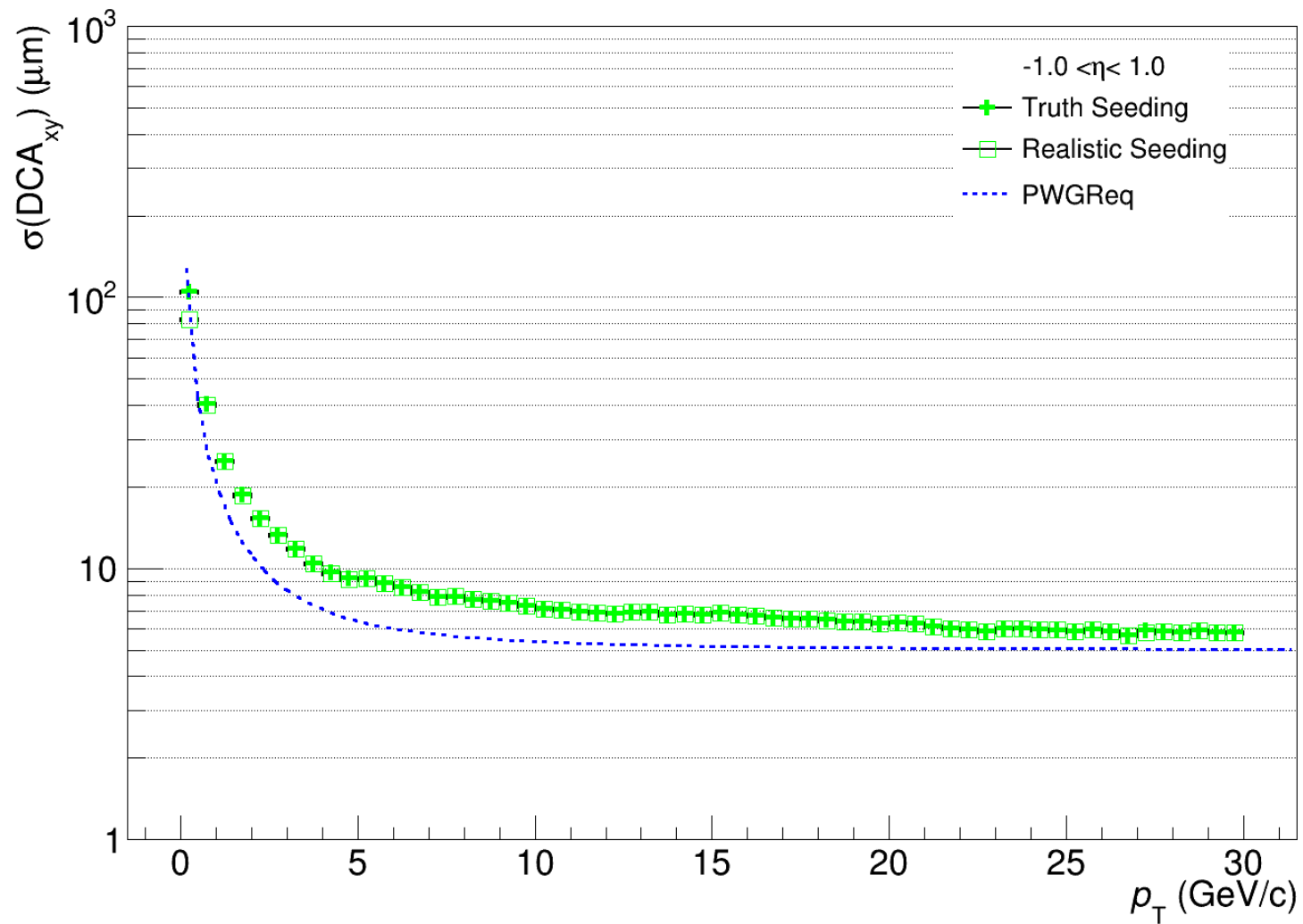


## Negative $\eta$



## Positive $\eta$

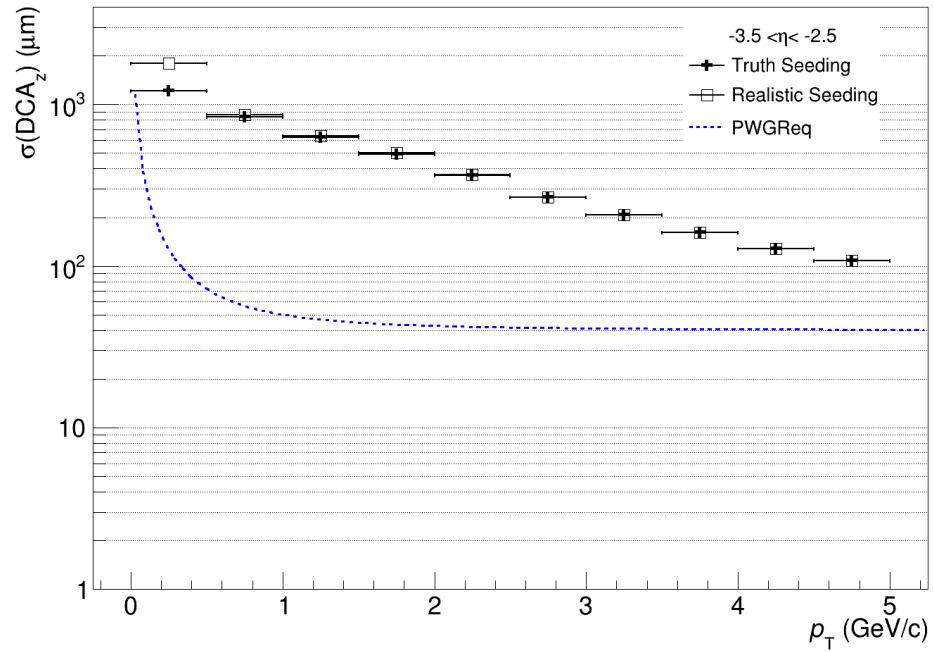




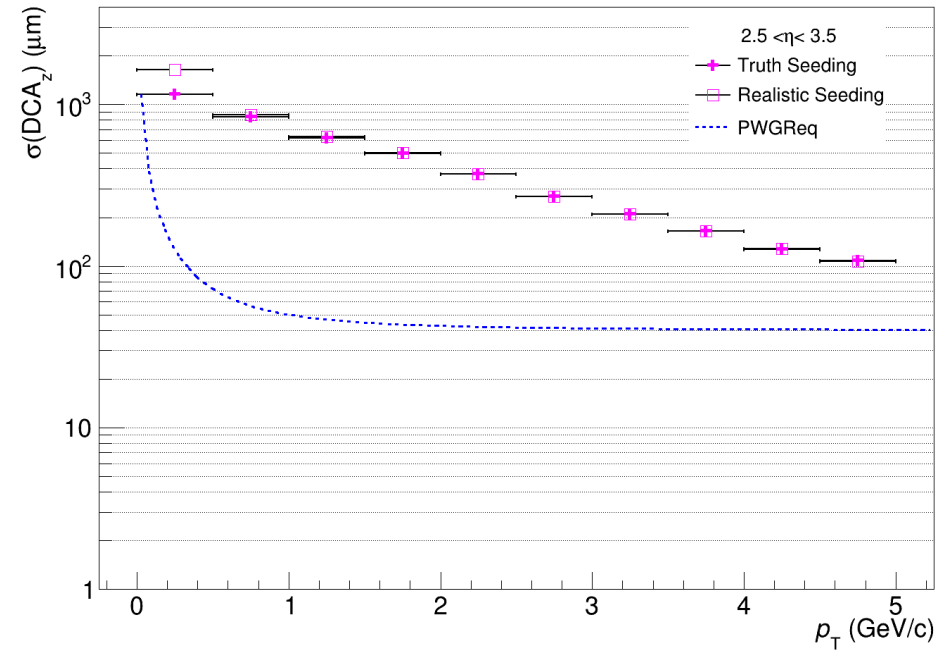


# DCA<sub>z</sub> Resolution

## Negative $\eta$

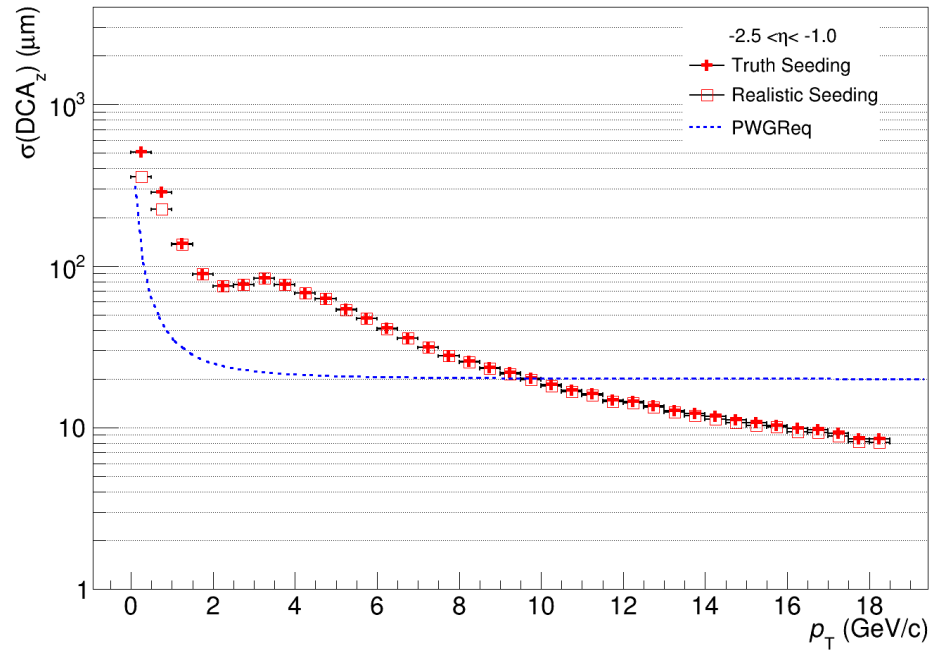


## Positive $\eta$

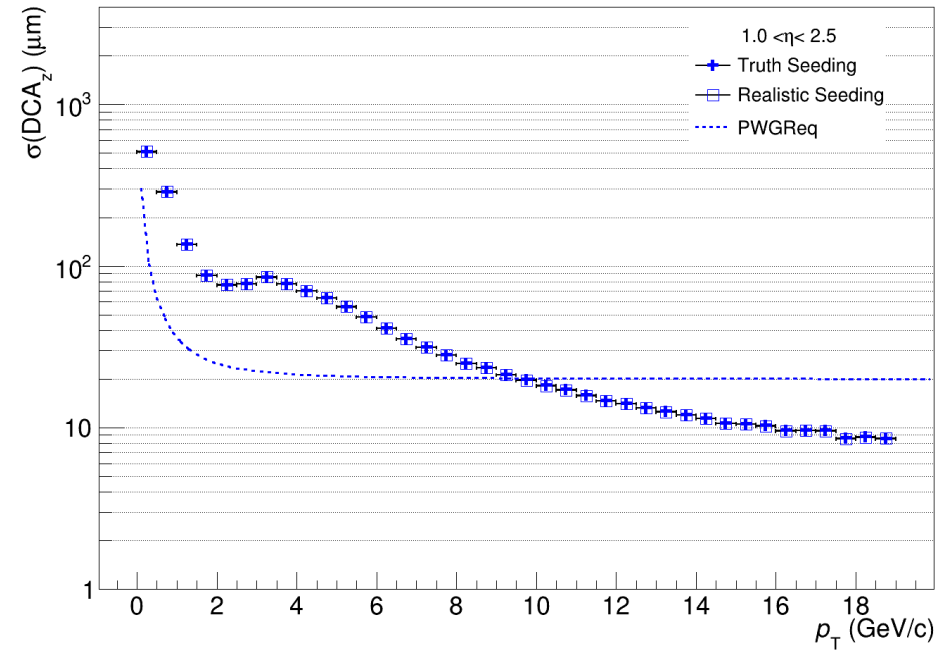


# DCA<sub>z</sub> Resolution

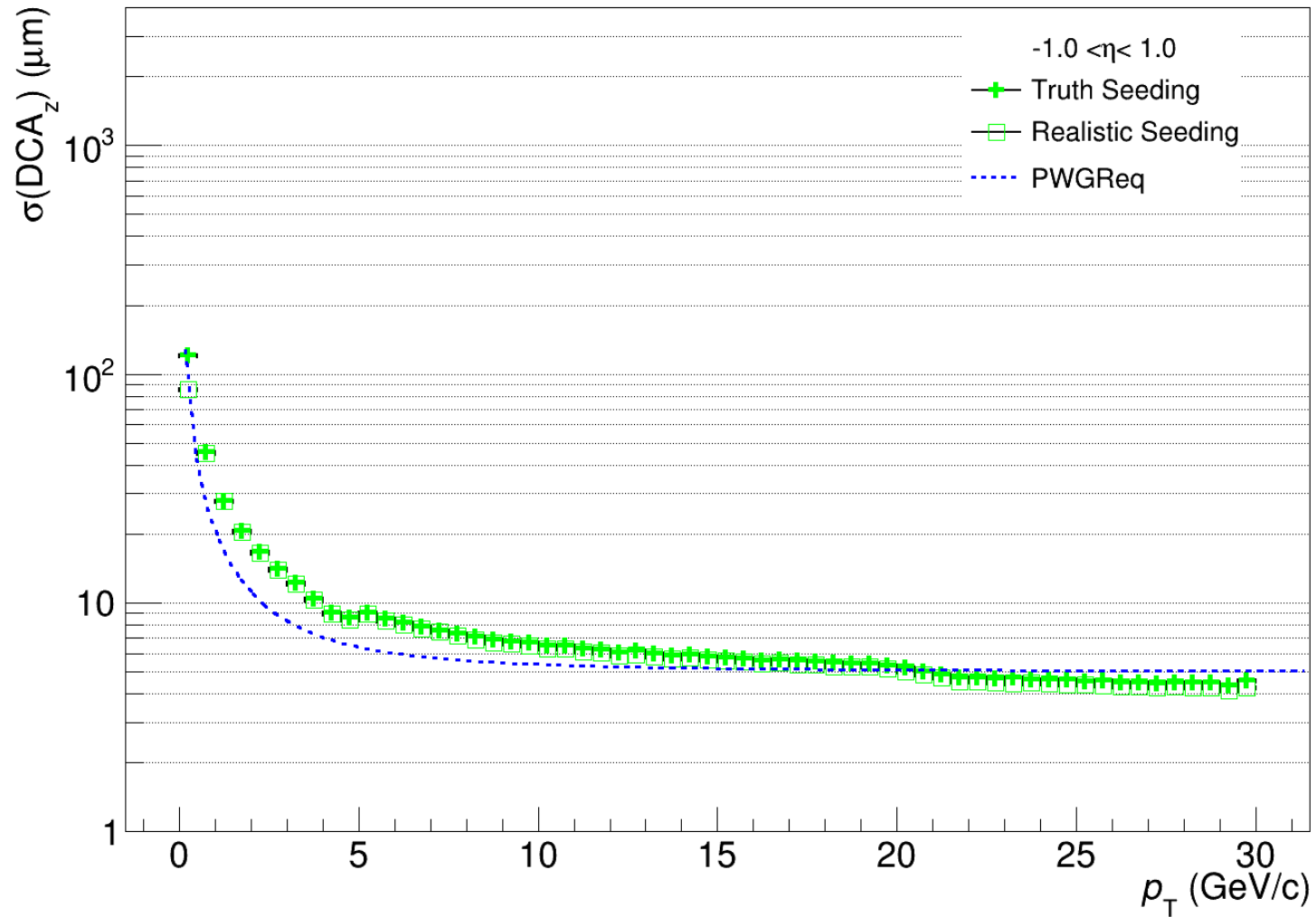
## Negative $\eta$



## Positive $\eta$



# DCA<sub>z</sub> Resolution



# Summary

- The code to extract the tracking performances for the TDR is ready
- In the meantime trying to understand some strange intermediate distributions reported in the last meeting
- Further trying to add code to the benchmarks
- Further we can material budget plot for the tracker (might be useful)

Thank you !!!

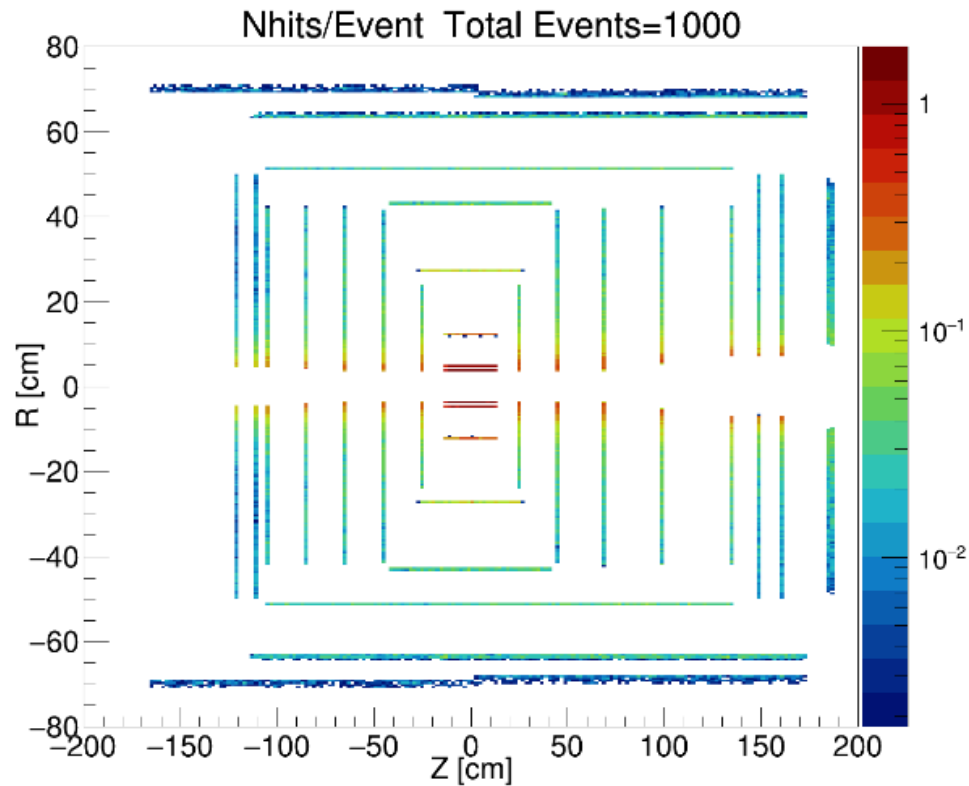
# Plot for Background hits

From my slides

[https://indico.bnl.gov/event/21093/contributions/83212/attachments/5118/5/87555/Background\\_Radiation\\_ShyamKumar21Nov23.pdf](https://indico.bnl.gov/event/21093/contributions/83212/attachments/5118/5/87555/Background_Radiation_ShyamKumar21Nov23.pdf)

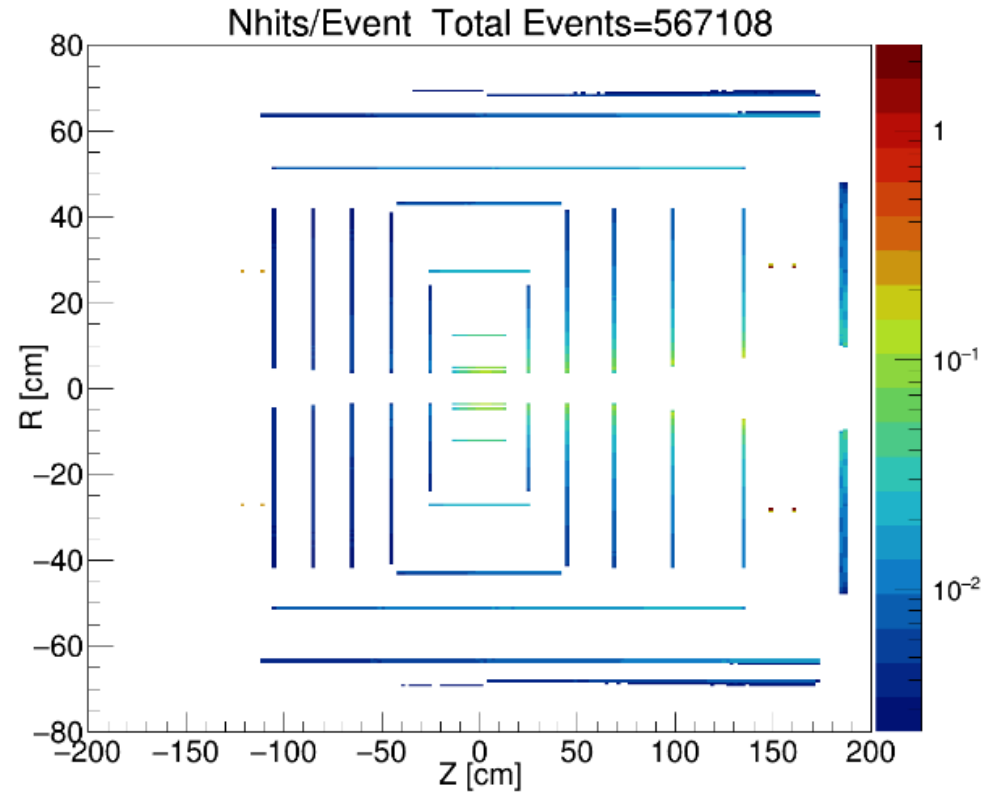
Nhits/Event is Nhits/2 $\mu$ s in case of with background

With Background



Nhits/Event is Nhits/e-p Event in case of Campaign

Without Background (Simulation Campaign)



# ePIC Version

```
shyam@shyam:~/eic/epic$ git tag -l
22.10.0
22.10.1
22.10_rc1
22.11.0
22.11.1
22.11.2
22.11.3
22.12.0
23.01.0
23.03.0
23.05.0
23.05.1
23.05.2
23.06.0
23.06.1
23.07.0
23.07.1
23.07.2
23.08.0
23.09.0
23.09.1
23.10.0
23.11.0
23.12.0
24.02.0
24.02.1
shyam@shyam:~/eic/epic$
```

```
shyam@shyam:~/eic/EICrecon$ git tag -l
v0.1.0
v0.2.0
v0.2.1
v0.2.2
v0.2.3
v0.2.4
v0.2.5
v0.2.6
v0.2.7
v0.2.8
v0.3.0
v0.3.1
v0.3.2
v0.3.3
v0.3.4
v0.3.5
v0.3.6
v0.3.6.1
v0.3.6.2
v0.3.7
v0.4.0
v0.4.1
v0.4.2
v0.5.0
v0.5.1
v0.5.2
v0.5.3
v0.5.4
v0.6.0
v0.6.1
v0.6.2
v0.6.3
v0.6.4
v1.0.0
v1.1.0
v1.1.1
v1.10.0
v1.2.0
v1.2.1
v1.3.0
shyam@shyam:~/eic/EICrecon$
```

[epic\\_craterlake\\_tracking\\_only](#)