RHICf data analysis status
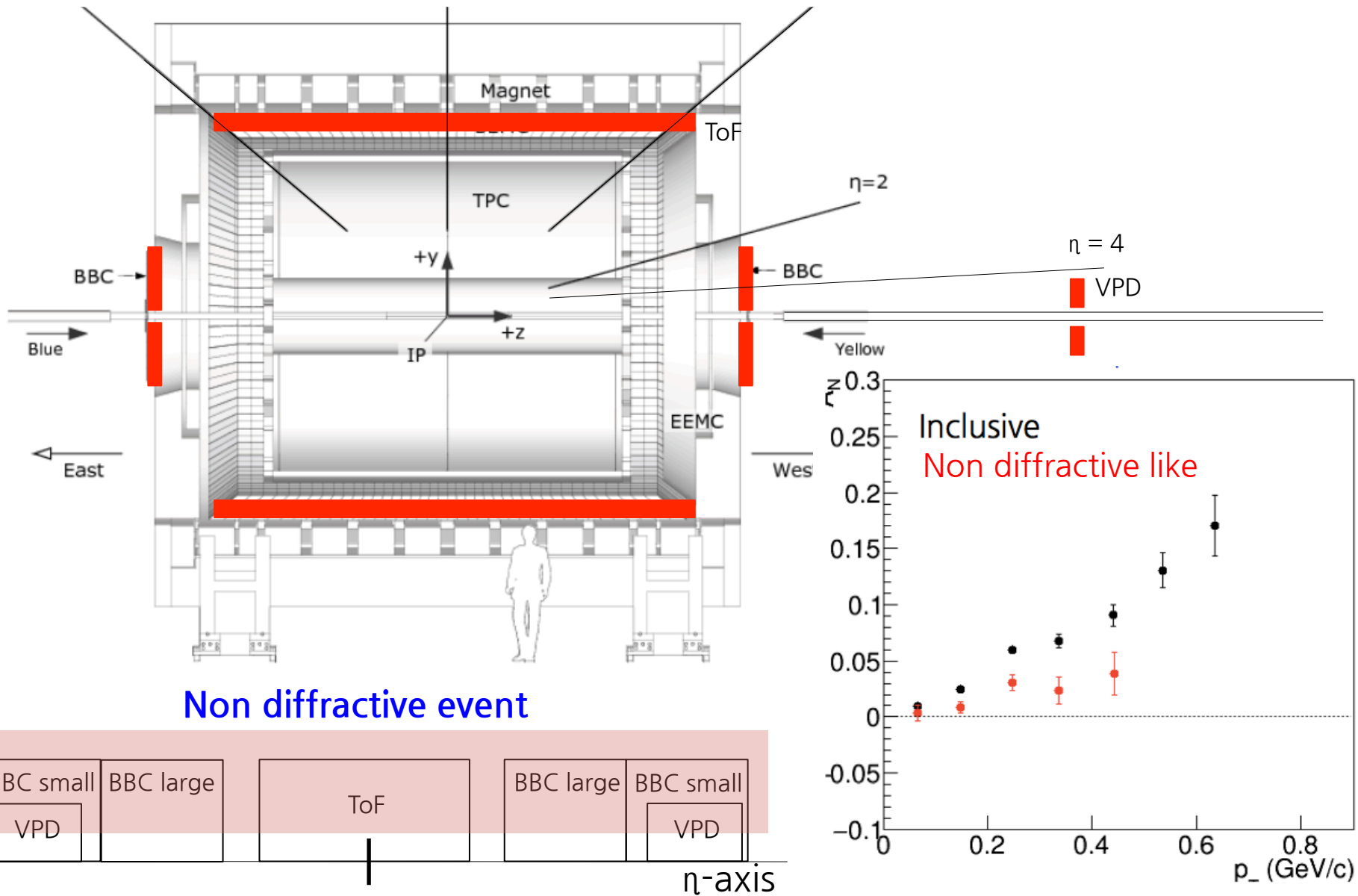
26 Jan 2021
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The figure shows A_N vs x_F for $p^\uparrow + p \rightarrow \pi^0 + X$ with the following legend:
- RHICf π^0 $6<\eta$ $\sqrt{s}=510$ GeV $0.00<p_T<0.07$ GeV/c
- RHICf $0.07<p_T<0.19$ GeV/c
- RHICf $0.19<p_T<0.30$ GeV/c
- RHICf $0.50<p_T<0.69$ GeV/c
- PHENIX π^0 $3.1<\eta<3.8$ $\sqrt{s}=62.4$ GeV
- E704 π^0 $\sqrt{s}=19.4$ GeV
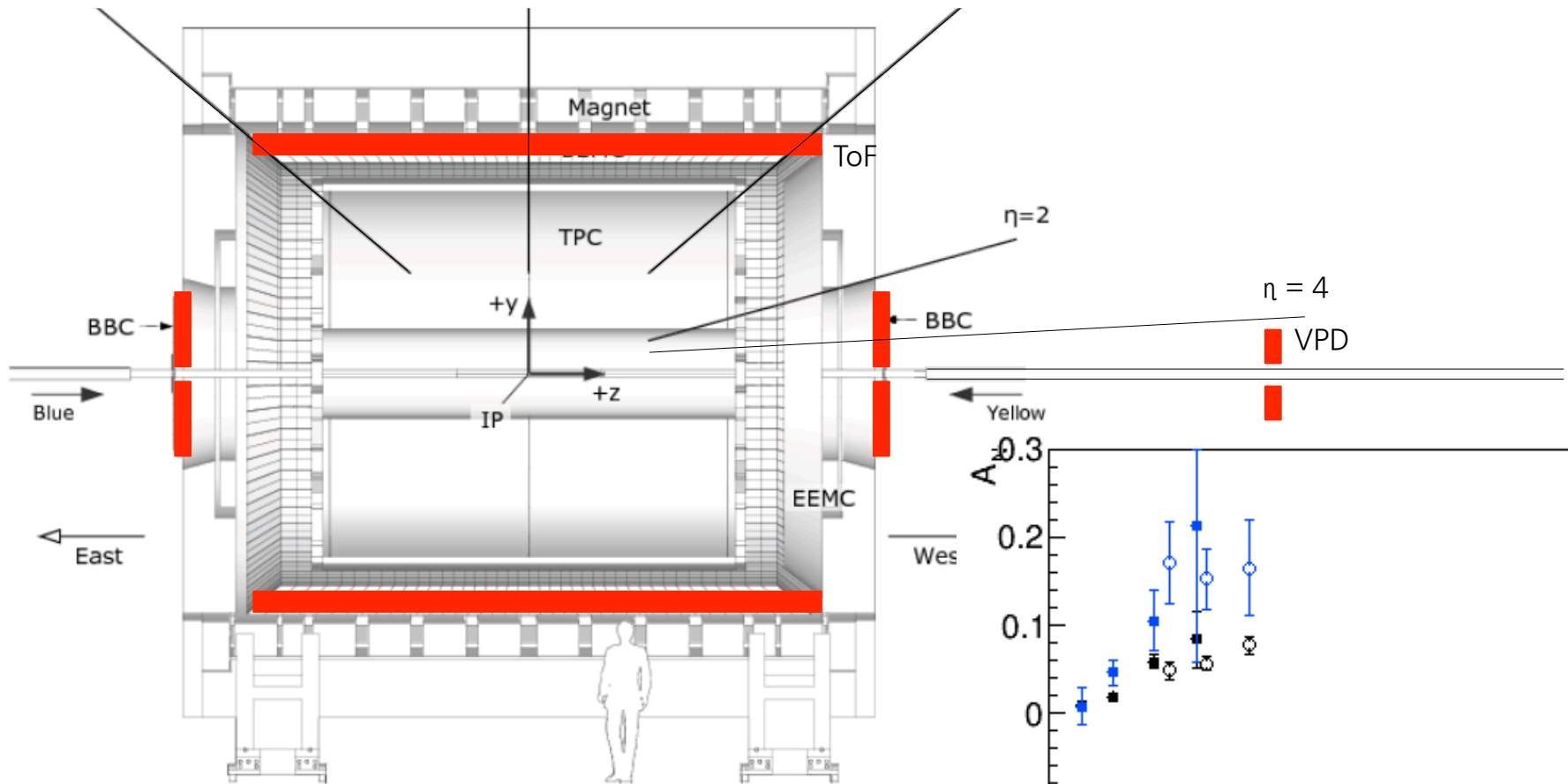- STAR π^0 $<\eta>=3.3$ $\sqrt{s}=200$ GeV
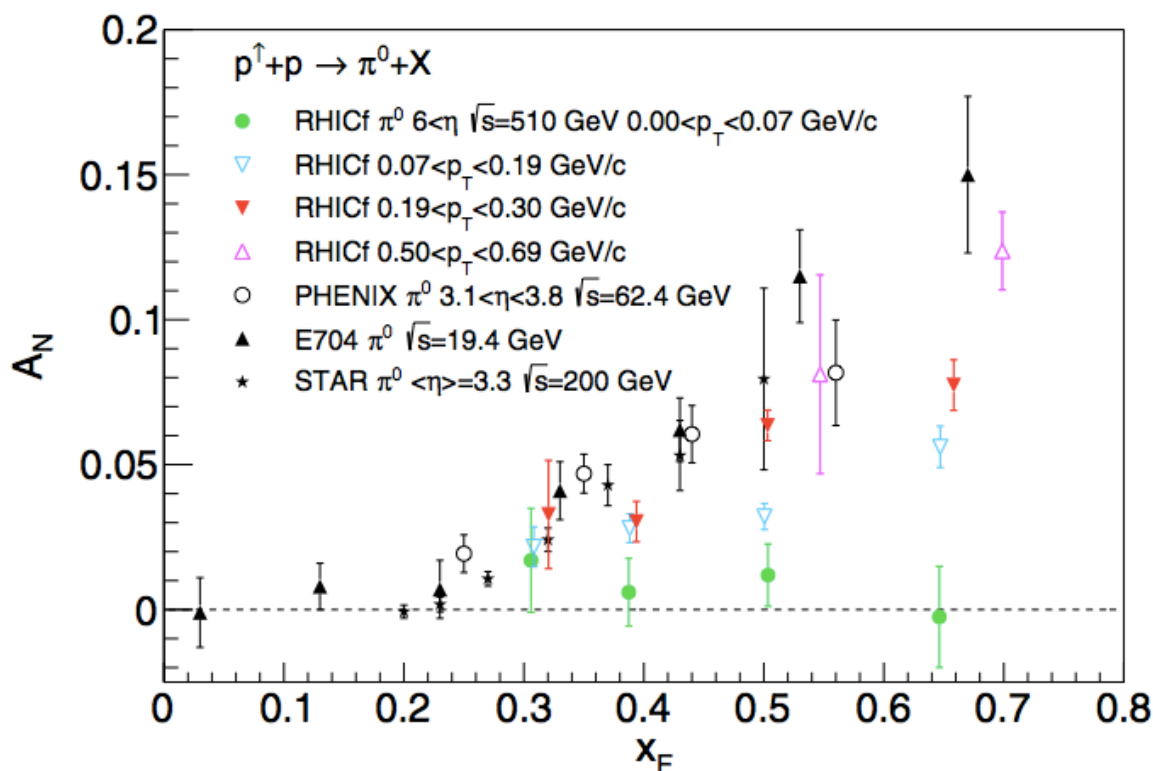
■ At very low $p_T < 0.07$ GeV/c, the asymmetries are consistent with zero.

■ As p_T increases, the asymmetries of the very forward π^0 increases approximately reproducing the ones of the forward π^0.

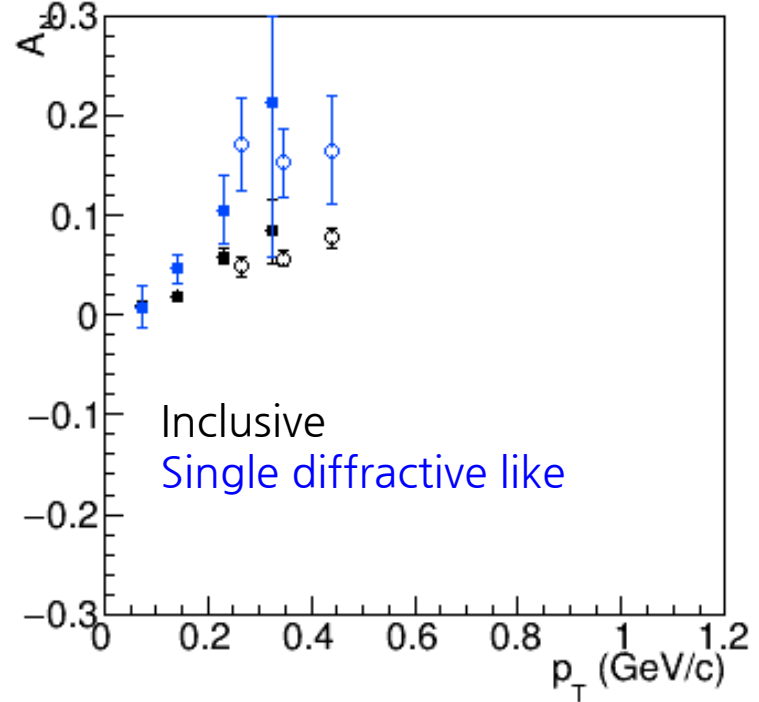■ What makes the non-zero asymmetry of the very forward π^0?

Non diffractive event

Inclusive
Non diffractive like

Single diffractive event

| BBC small	BBC large		ToF		BBC large	BBC small	
VPD						VPD	

η-axis

Inclusive
Single diffractive like
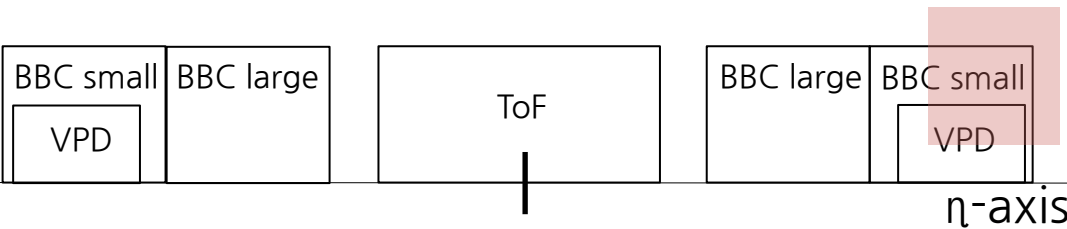
1. π^0: TODO

■ RHICf library and reconstruction code needs to be inserted into STAR server.

■ Since the neutron analysis also needs STAR library, the works which need to touch the STAR framework would be the second priority.

■ The work which need to touch the RHICf data only will be the first one.

2. n: Quick glance of the neutron A_N

Middle position run
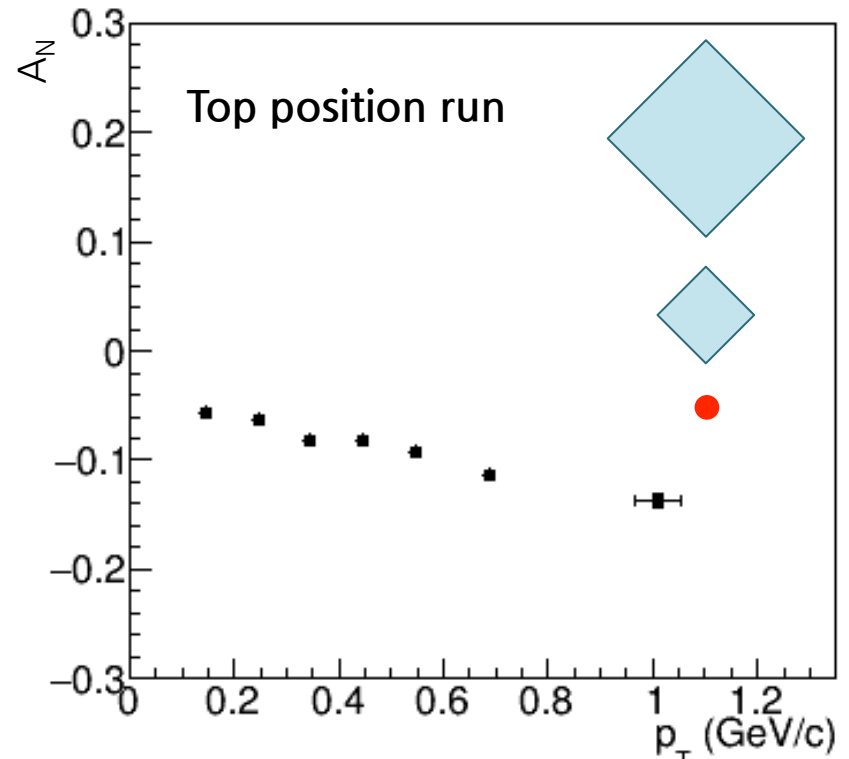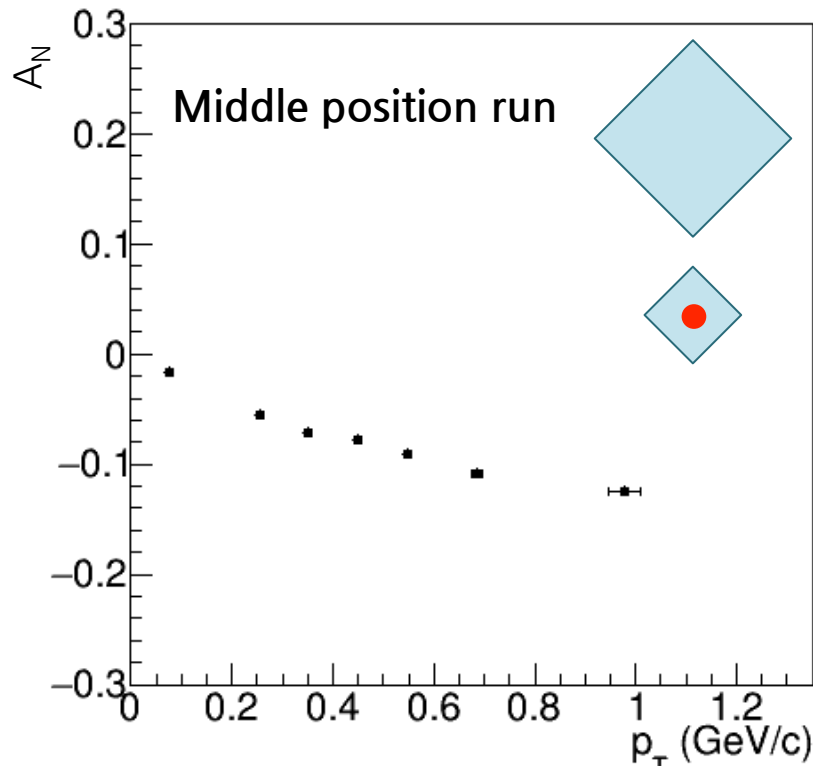
Top position run

- ■ Increasing asymmetries as a function of p_T is clearly shown.

- ■ The asymmetry slope of middle and top position run looks different.
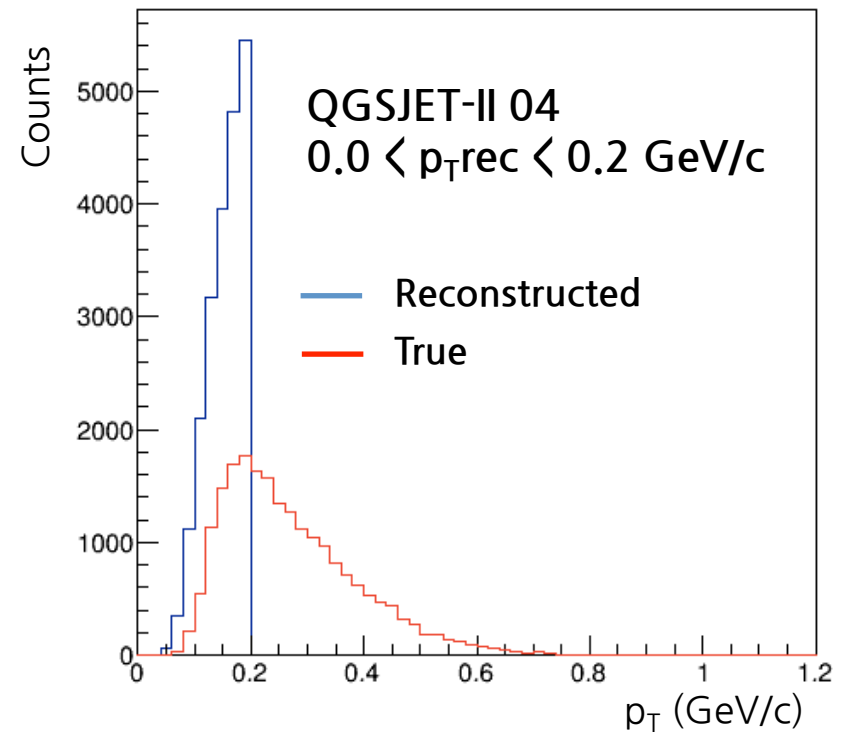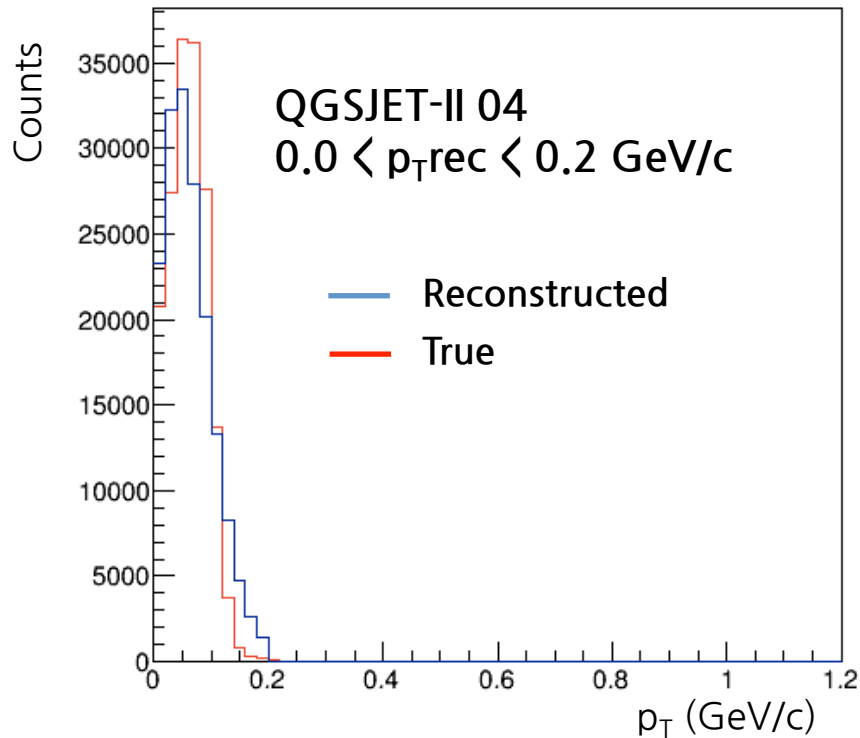
- If the zero-degree position of the beam is inside a tower, p_T smearing in low p_T region can not be identified well.

- If it is outside a tower, the smearing should be clearly shown.

$A_N = -0.34 p_T$ was assumed.

○ Ideal

● Detector smearing
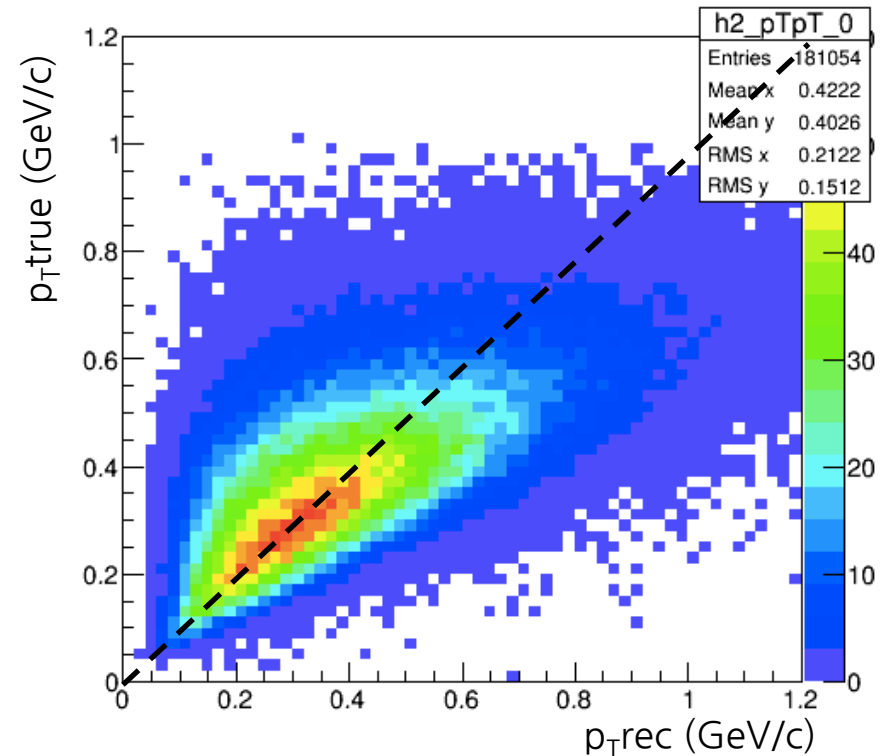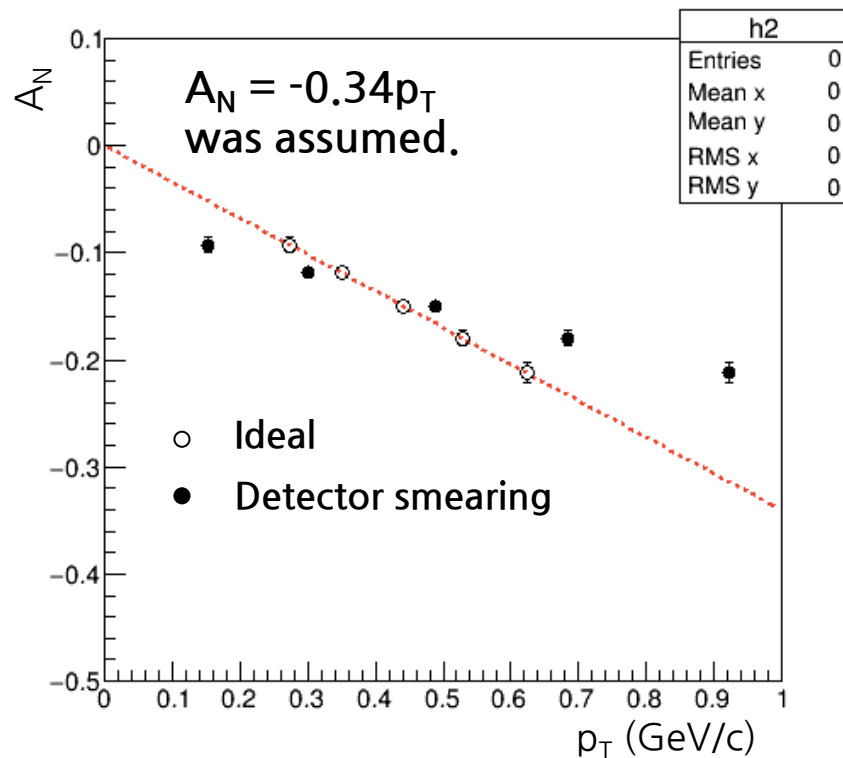
- If the neutron has smaller energy, it is usually underestimated.

- Bigger energy one is usually overestimated.

- Asymmetry slope becomes softer than original one.
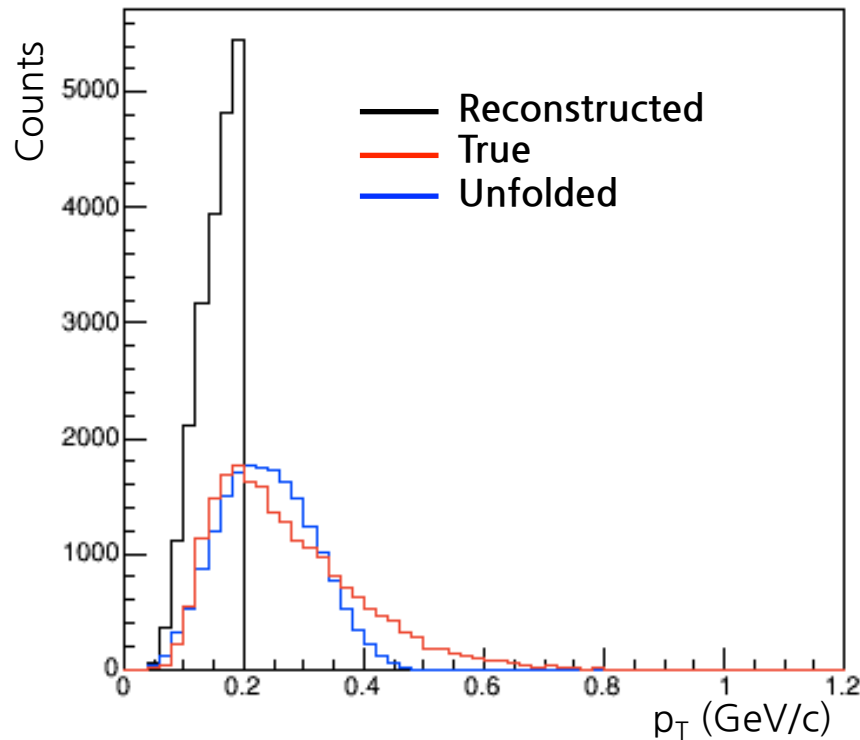
2. n: Unfolding in Geant4
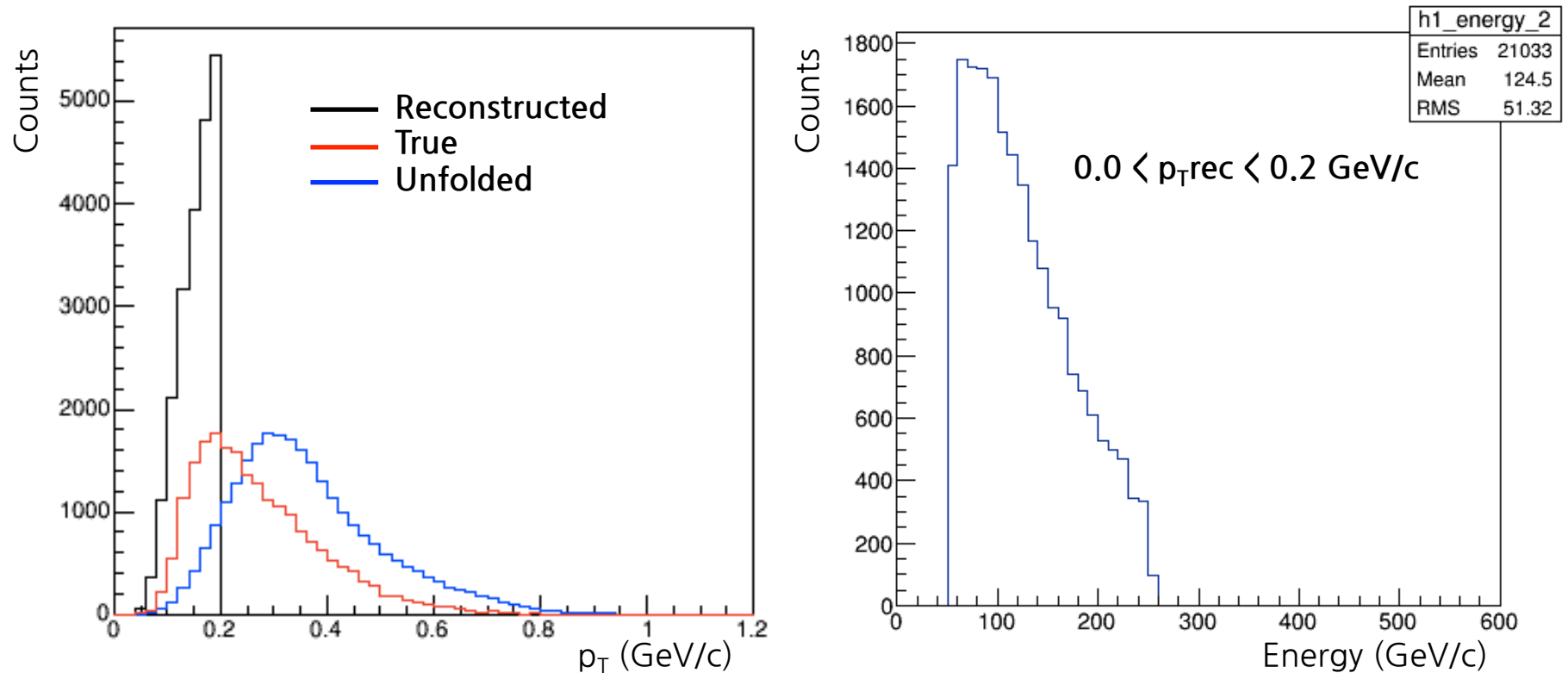
- One can see that the unfolded p_T is overestimated.

- This is because MC inputs and detector response were made by whole energy spectrum.

2. n: $p_T$rec versus $p_T$true
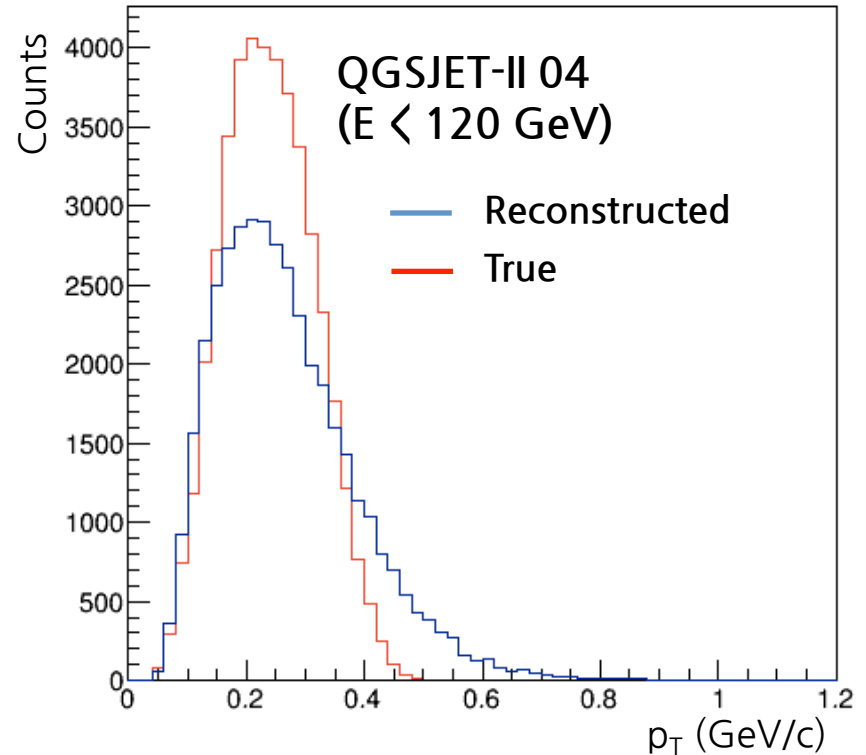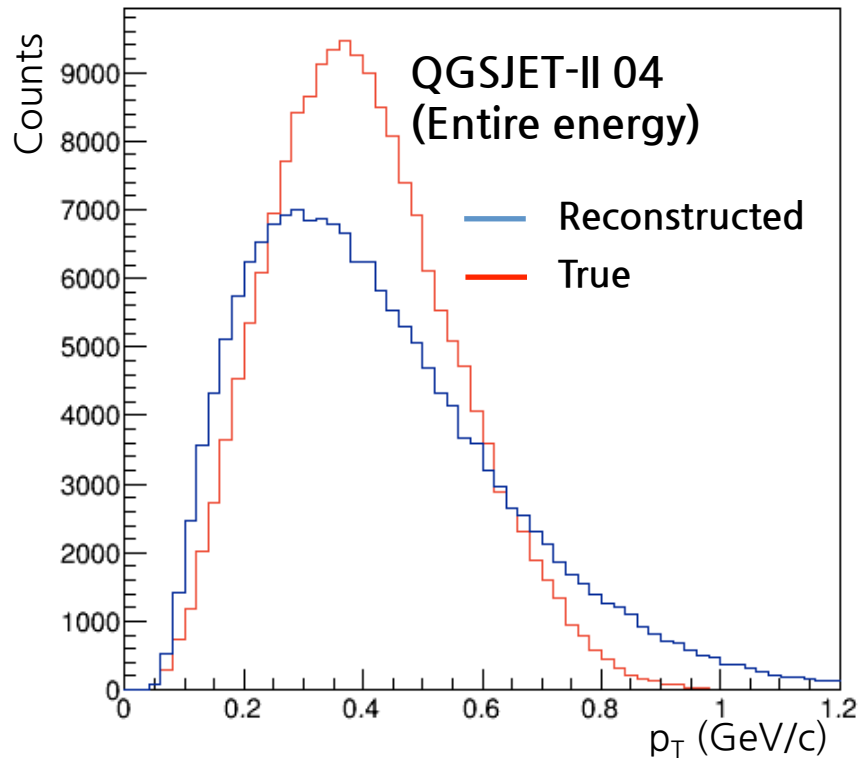
- The $p_T$true is relatively more forward than $p_T$rec in the entire energy case.

- Unfolded p_T becomes bigger in the entire energy input.

2. n: Taking into account E

■ One can see that If the MC inputs are made based on more correct condition, the unfolding performance is better. (No tail is due to energy cut.)

■ We're preparing abundant neutron MC statistics for (E, p_T) 2-dimensional unfolding.