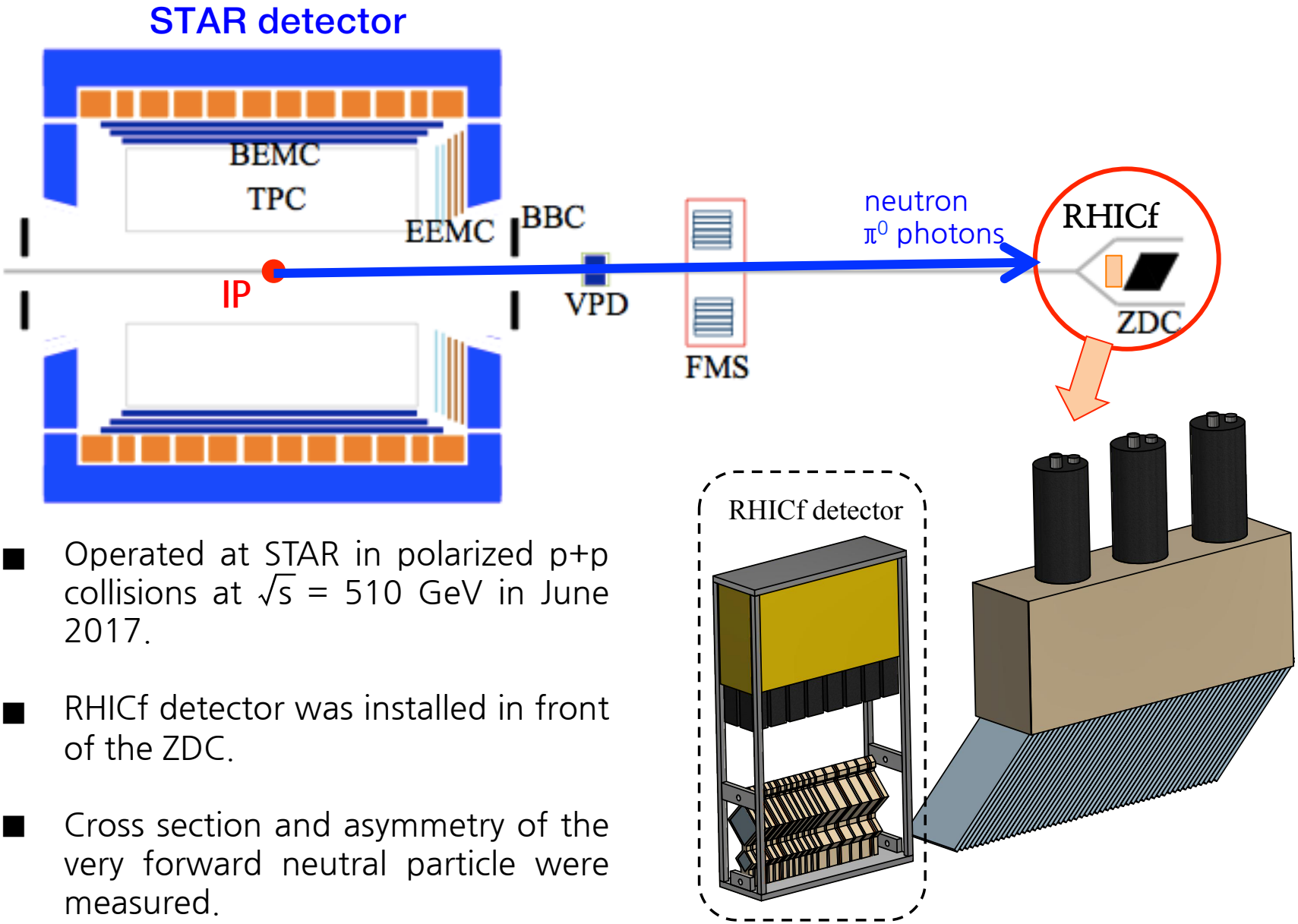
Status of the RHICf-STAR combined analysis

RHICf meeting for the JSPS grant

Nov 23

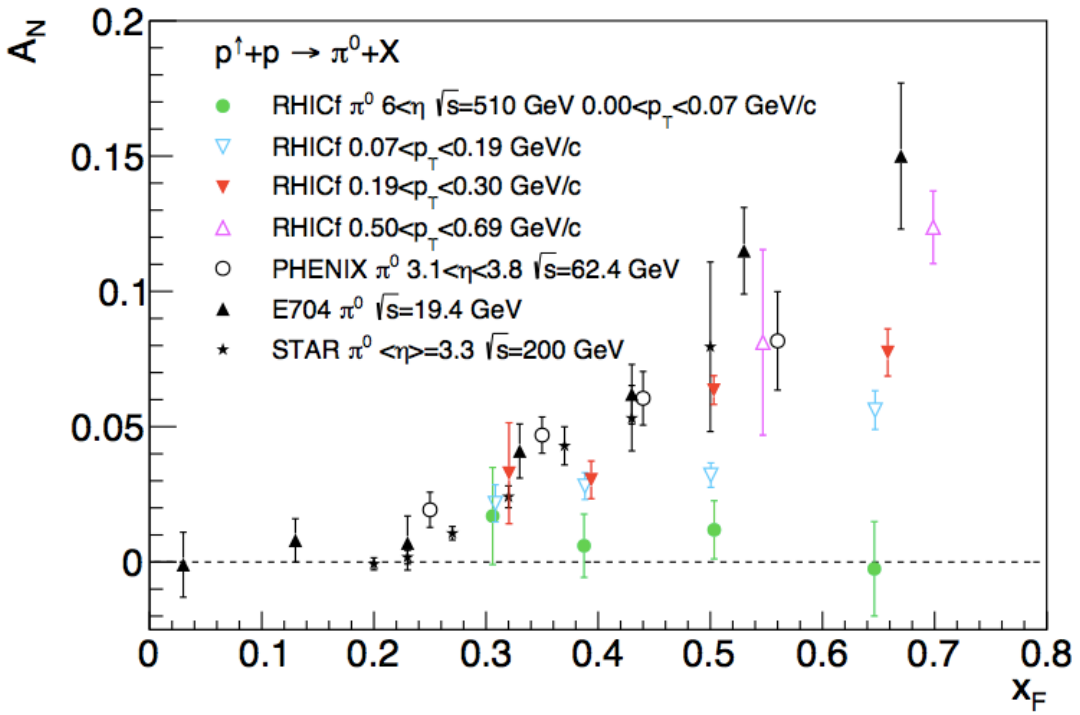
Minho Kim

RHICf experiment



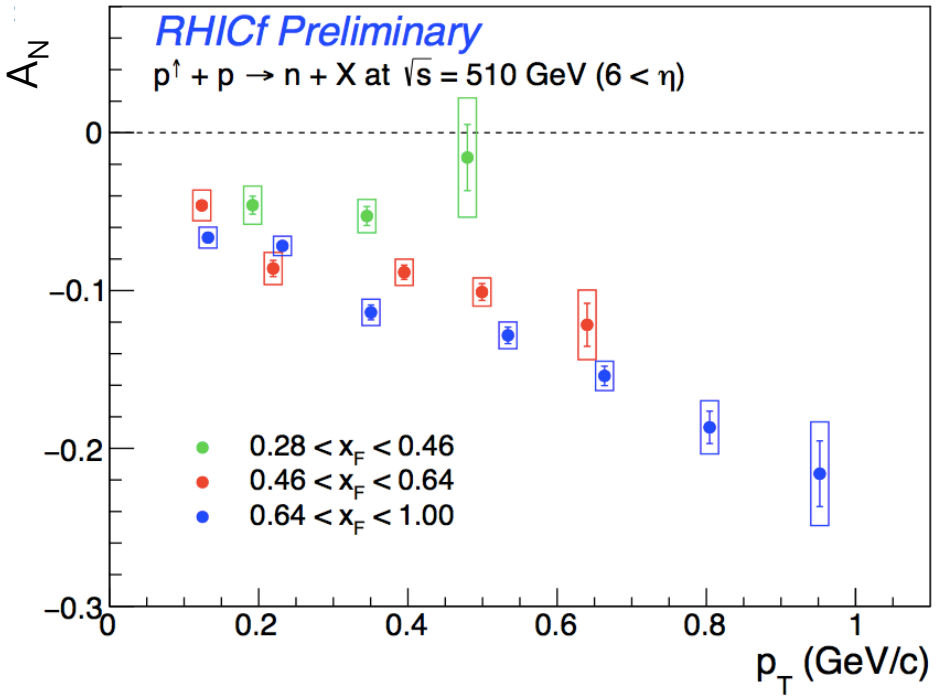
- Operated at STAR in polarized p+p collisions at $\sqrt{s}$ = 510 GeV in June 2017.
- RHICf detector was installed in front of the ZDC.
- Cross section and asymmetry of the very forward neutral particle were measured.

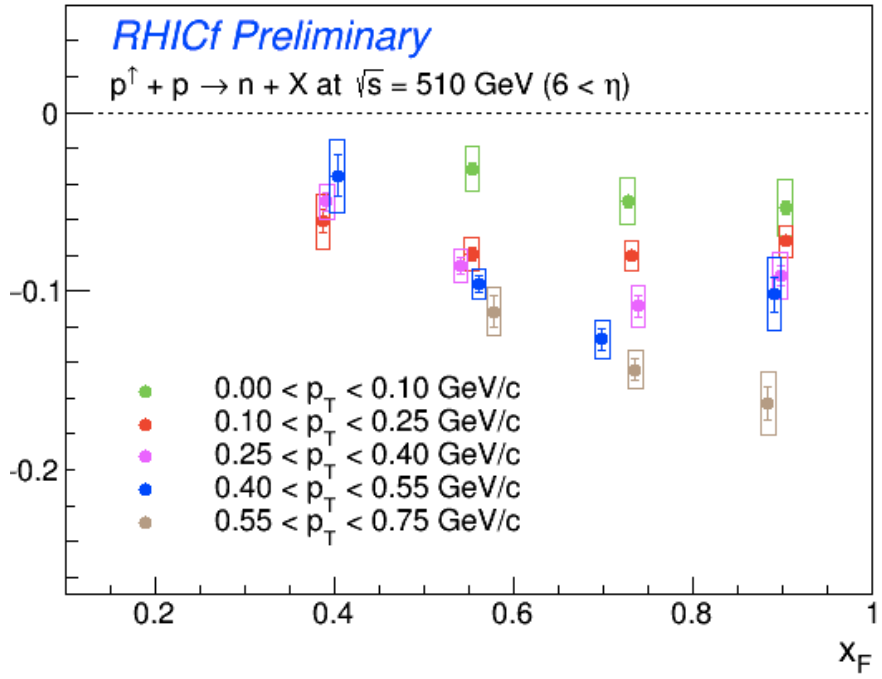
RHICf result: π^0 asymmetry



- Finite asymmetry was observed even in the very forward π^0 production.
- Observed π^0 asymmetry showed a similar behavior with the one of the forward π^0 as the p_T increased.

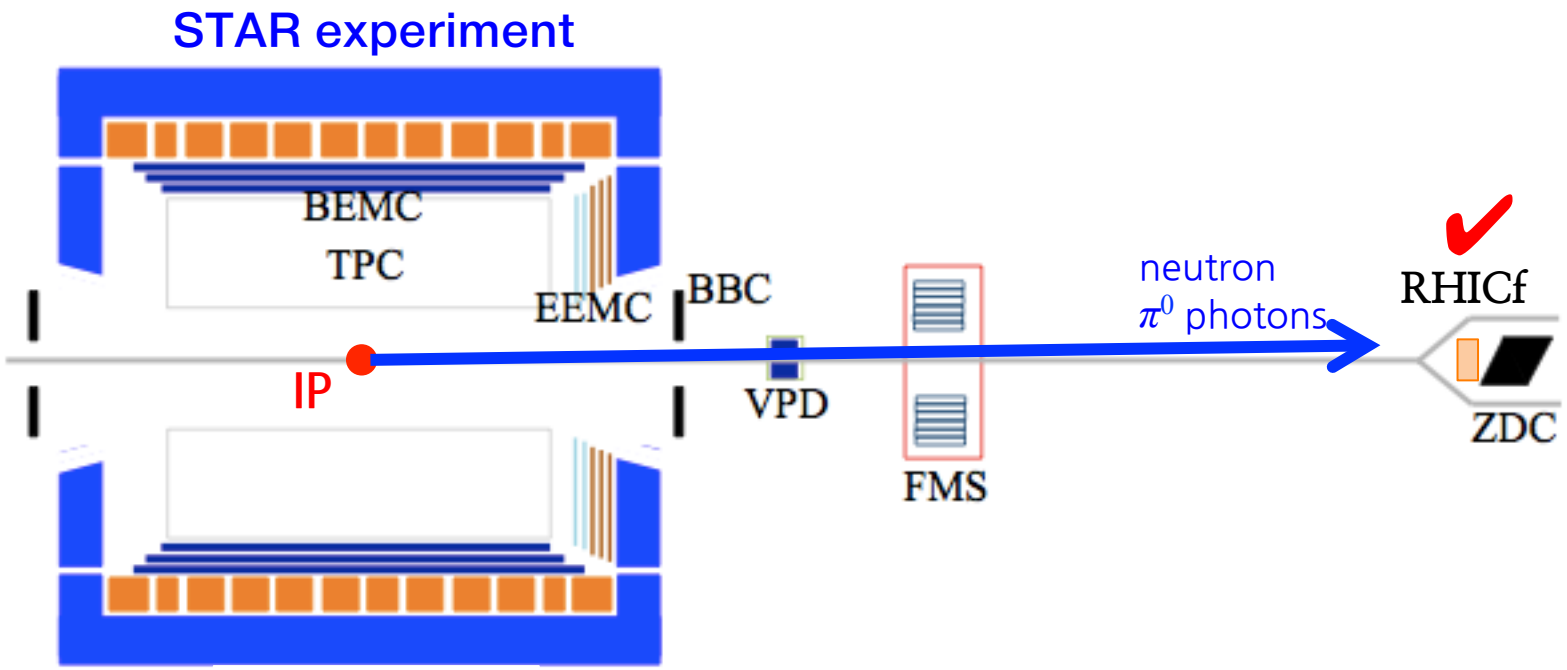
RHICf result: neutron asymmetry





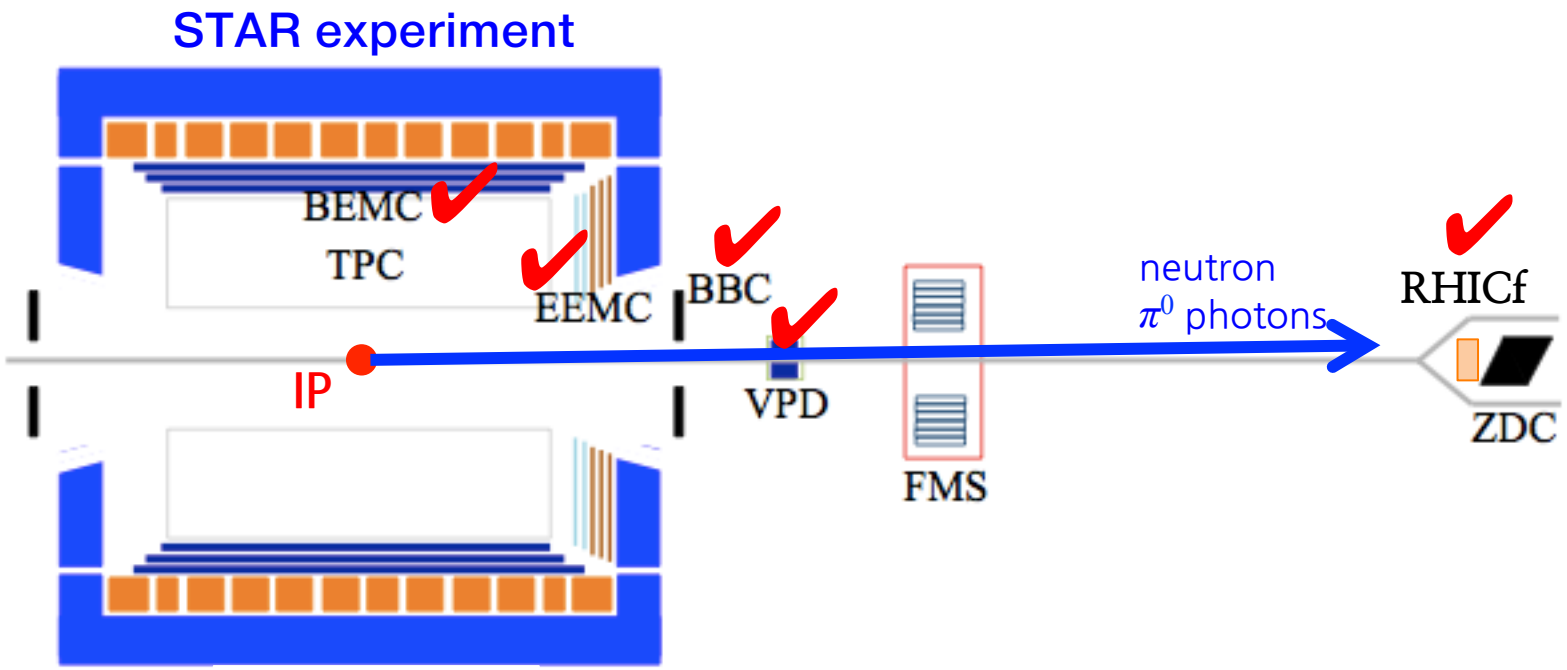
- For $p_T < 0.4$ GeV/c, π and a_1 exchange model predicted the neutron asymmetry would increase in magnitude with p_T.
- Neutron asymmetry explicitly increases in magnitude with p_T in a wide p_T coverage even larger than 0.4 GeV/c.
- A clear x_F dependence was observed when $p_T > 0.25$ GeV/c.

RHICf-STAR combined analysis



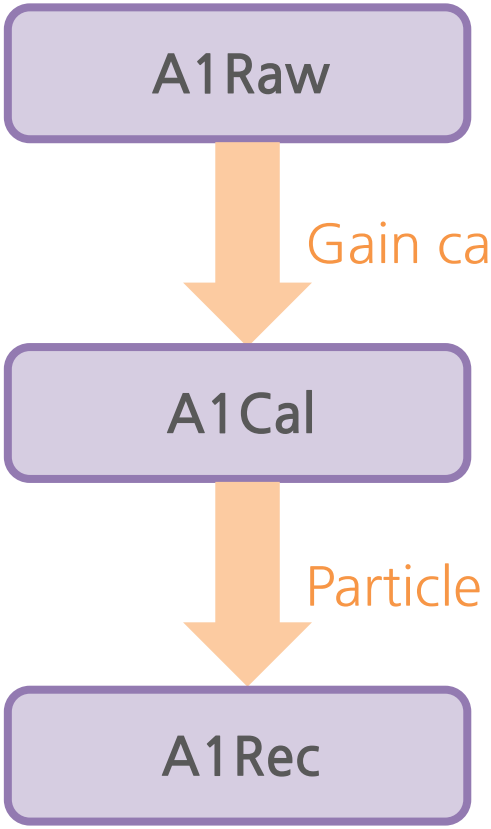
- Current RHICf results are based on the inclusive analysis.
- It is hard to understand the origin of their x_F-dependent behaviors with the inclusive analysis only.

RHICf-STAR combined analysis



- We have decided to study the detector correlation between the RHICf and STAR detectors to better understand the π^0 and neutron asymmetries.
- We will proceed with the combined analysis at STAR side.

RHICf data structure

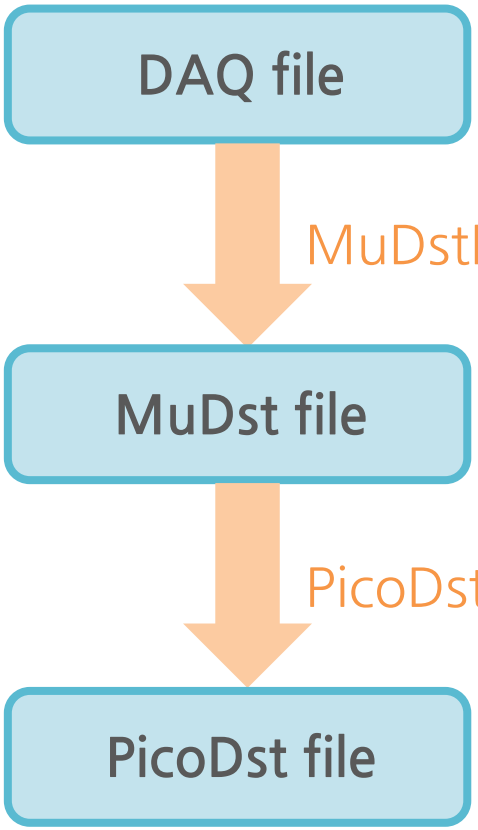


Raw ADC and DAQ information

Energy deposits of the GSO plates and bars

Energy and position of a single particle

STAR data file

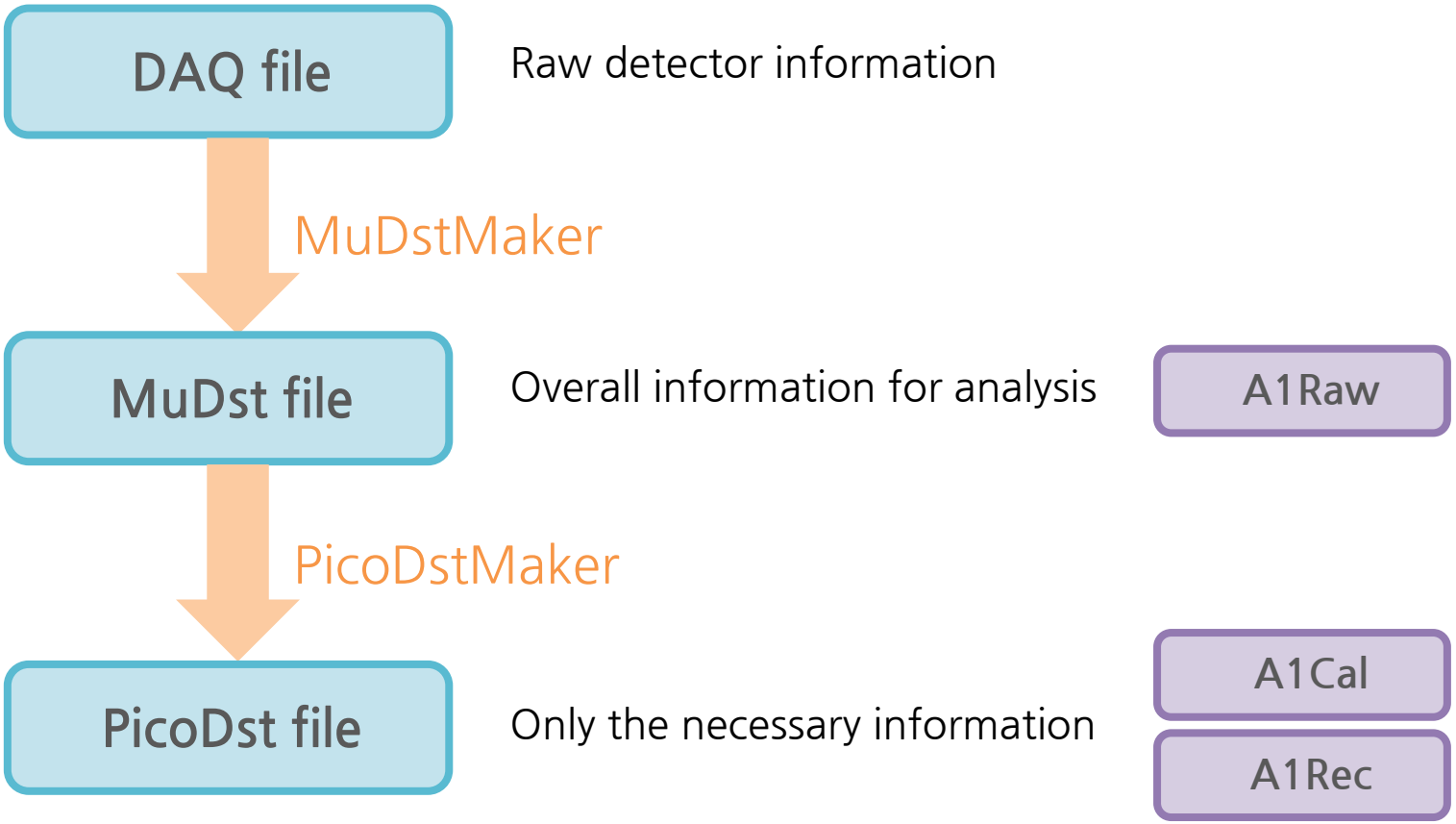


Raw detector information

Overall information for analysis

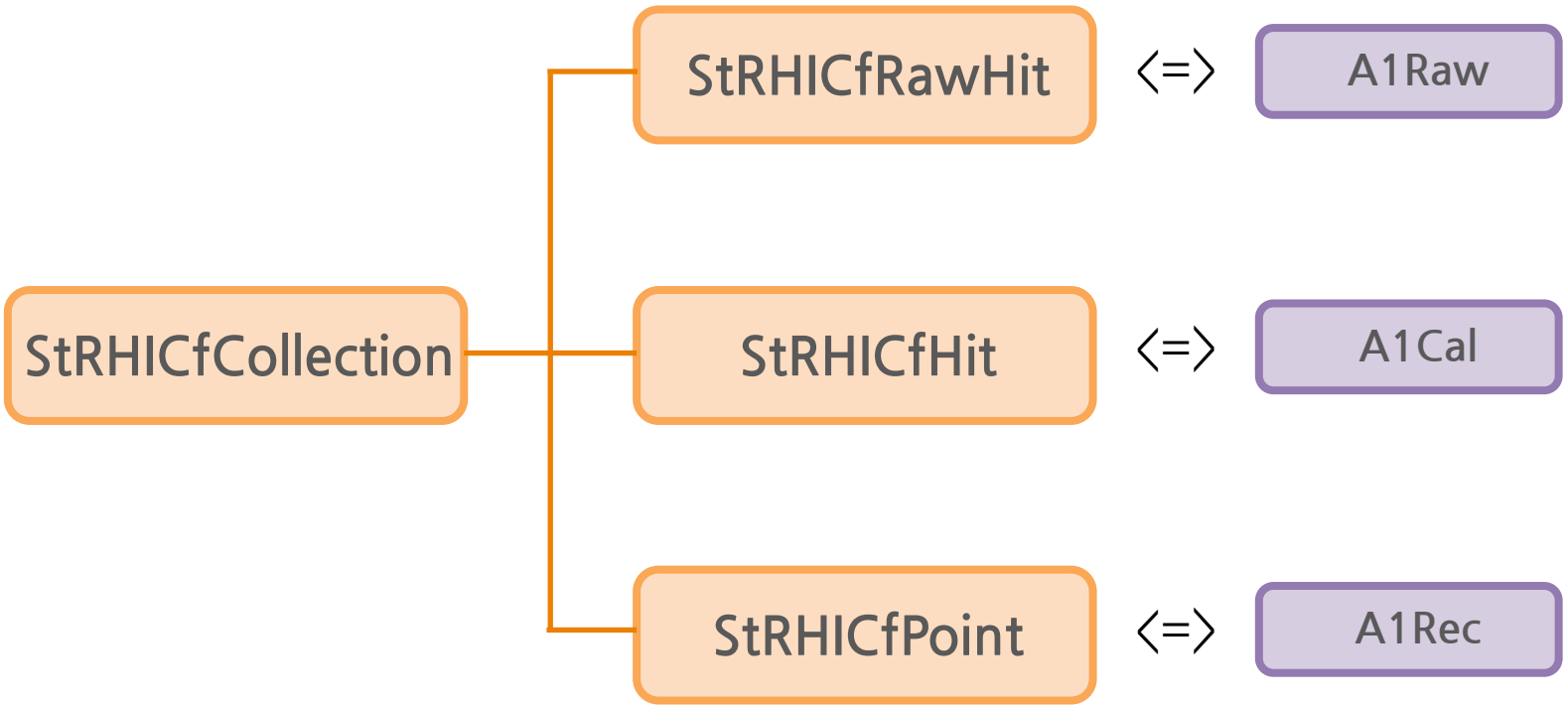
Only the necessary information

STAR data file

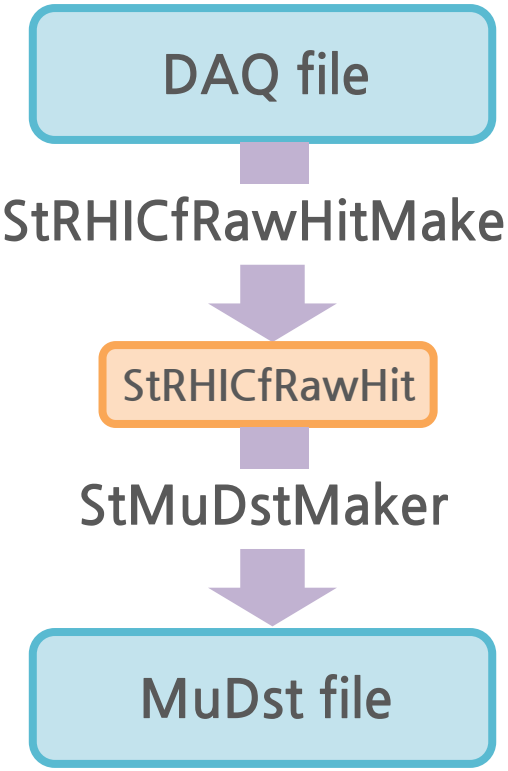


- We have decided to put only the A1raw in the MuDst but A1Cal and A1Rec in the PicoDst to easily update the calibration and reconstruction codes.

RHICf data structure at STAR



RHICf MuDst

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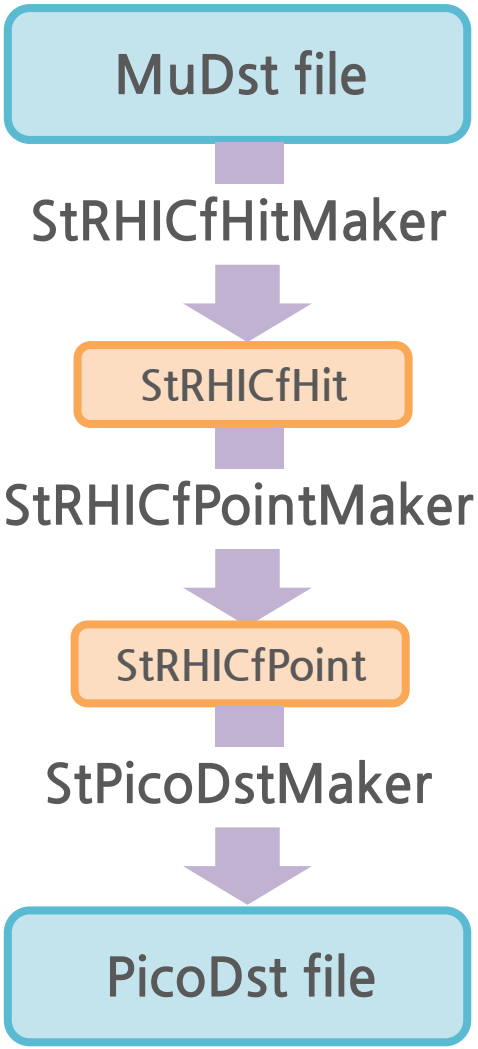
RHICf_Analysis

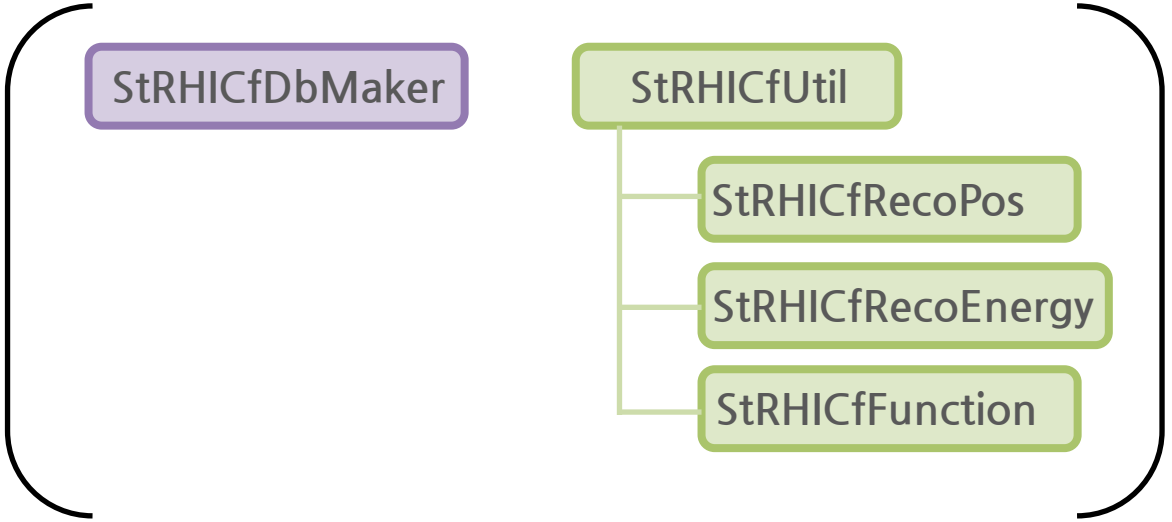
RUN 2730
NUMBER 7742
TIME 1498397896 476338
TRGM 3416082

ADC0
 952  124  962  124  992  128 1065  135
1008  130 1126  144 1079  140 1100  141
1292  165 1199  152 1207  154 1229  156
1194  150 1218  154 1291  165 1061  133
 950  124  941  121  956  123  987  126
 970  125 1071  138 1061  137 1114  143
```

- During the operation, necessary raw RHICf information was saved at STAR.
- The StRHICfRawHitMaker fills this raw information into the StRHICfRawHit.

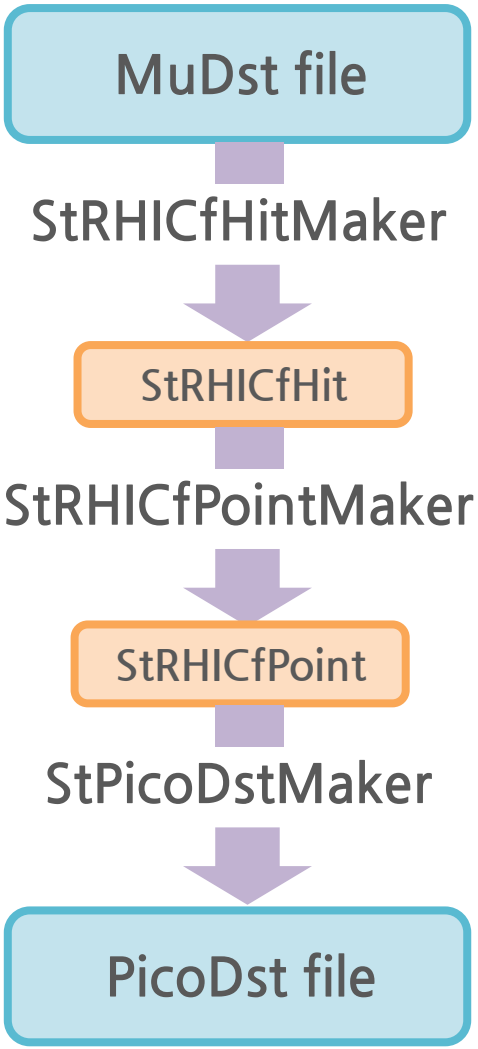
RHICf PicoDst

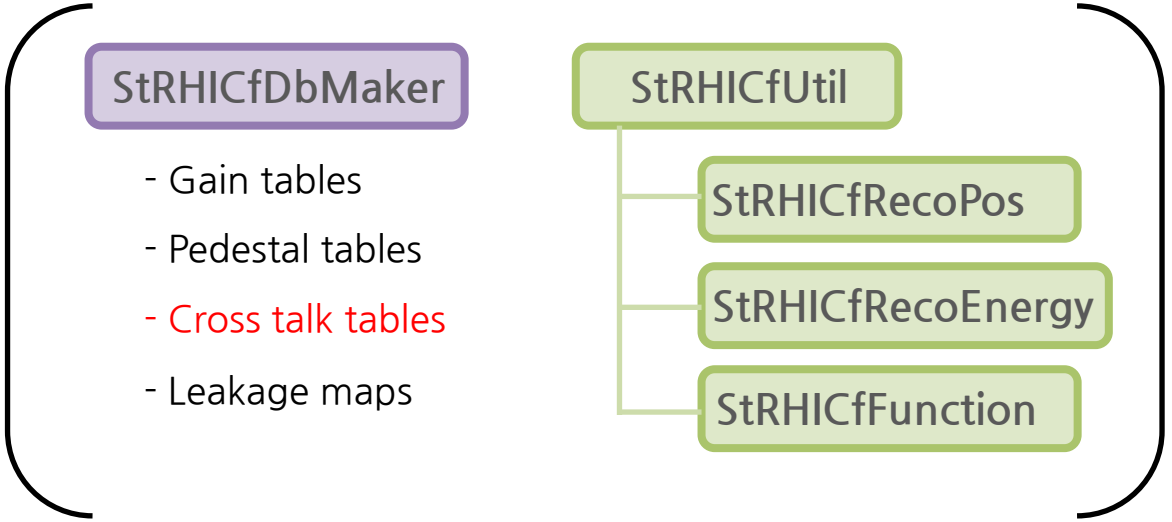




- StRHICfHitMaker and StRHICfPointMaker correspond to the calibration and reconstruction procedures, respectively.
- StRHICfDbMaker and StRHICfUtil classes are used as a tool for this process.

Current status





- Every part except the cross talk tables has been prepared.
- We will request STAR's review with another report on Wednesday night this week.
- We will also report our status at the STAR cold QCD PWG soon.

Plan

2022 Dec

- STAR will be reviewing the RHICf data structure.
- MuDst production.

2023 Jan ~ Feb

- PicoDst production.
- We can start the combined analysis in earnest.

2023 June

- We will visit BNL to actively work with the STAR cold QCD PWG.

2023 Dec

- Preliminary result.