Simulation Progress

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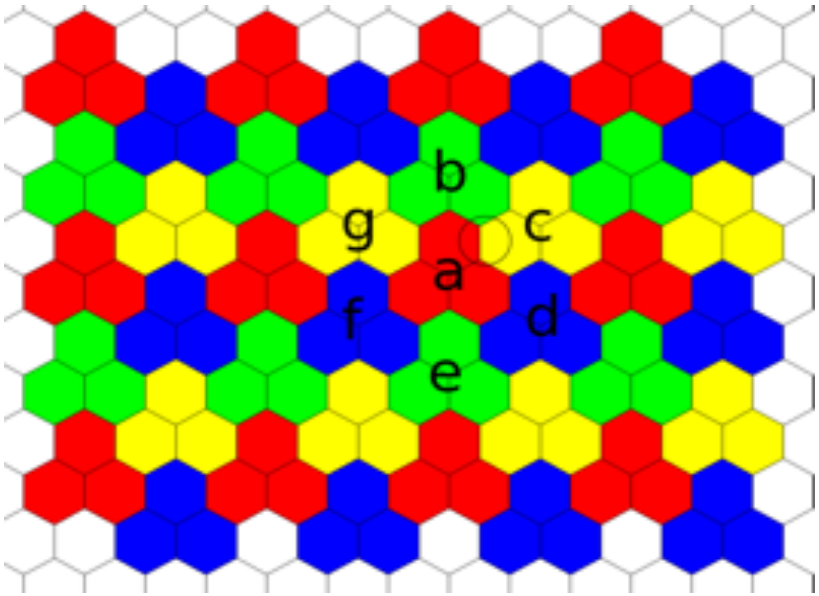
- SIDIS Trigger Rate Updates
- Baseline Trigger Rate and influence
- Summary and Outlook

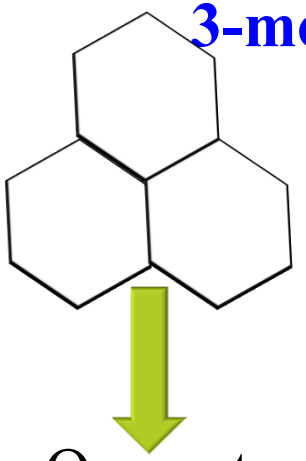
ECAL trigger pattern for baseline and enhanced baseline



1) a+b+c
2) a+c+d
3) a+d+e
4) a+e+f
5) a+f+g
6) a+g+b

Baseline configuration

3-module

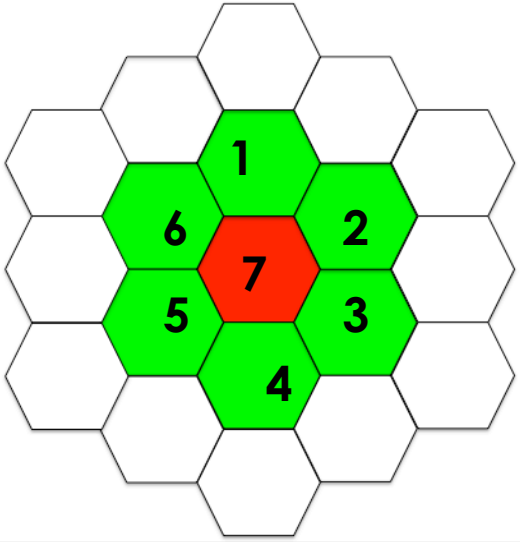


One output channel

Trigger_energy= E_{3*3}^{Max}

9 modules

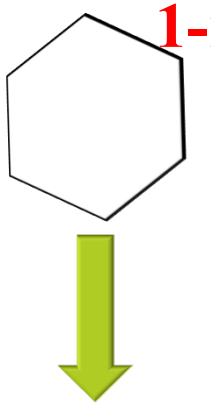
Enhanced Baseline configuration



Trigger_energy= E_{6p1}^{Max}

7 modules

1-module



One output channel

Trigger Condition and Logic

- **e_FAEC**: R(98-230)cm, Q^2>=1 GeV^2
- **e_ LAEC**: R(83-140)cm, P>3.0GeV
- **h_FAEC**: R(98-230)cm, below MIP
- **e_LGC**: at least 2 PMT and each has at least 2 photons
- **e_FASPD** and **h_FASPD**: Edep>0.5MeV below MIP
- **e_LASPD**: Edep>1.5MeV below MIP

Single e trigger (e_FAEC[e,h]+e_LAEC[e,h]):
e_FAEC: e_FAEC & e_LGC & e_FASPD
e_LAEC: e_LAEC & e_LASPD

Hadron trigger (h_FAEC[e,h]):
h_FAEC & h_FASPD

SIDIS trigger rates Update

- **Single e (e_FAEC[e,h]+e_LAEC[e,h]):** 128.1kHz>100kHz
- **Hadron (h_FAEC[e,h]):** 14491kHz
- **Random coin**: assuming no correlation between electron and hadron trigger:

  (e_FAEC[e,h]+e_LAEC[e,h])*(h_FAEC[e,h])*time window (30ns)

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- ❖ **SIDIS coin (Duke SIDIS generator)**
- ❖ **Background Hadron coin (Bggen genertor)**

Has overlap

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Has overlap

$$Trigger\ rate_{total} = \left(e^{-}_{TR} - Coin^{SIDIS}_{TR} - Coin^{bggenhadron}_{TR}\right) * h_{TR} * TW + Coin^{SIDIS}_{TR} + Coin^{bggenhadron}_{TR}$$

SIDIS Trigger Rates Updates with 3.4GeV trigger threshold for LAECAL

Rate (kHz)	7 modules **3 GeV** trigger threshold for LAEC	9 modules **3 GeV** trigger threshold for LAEC	9 modules **3.4 GeV** trigger threshold for LAEC
FA e^-	59+1.1+1.8	61.15+1.1+1.87	Not change
FA hadron no e^-	29+3.6+5.3	32.3+3.6+5.9 (10%)	Not change
LA e^-	4.1+3.6+2.6	4.2+3.7+2.7	3.3+2.93+2.03
LA hadron no e^-	7.7+6.5+3.8	12.9+11.4+8.2 (80%)	6.8+4.4+3.5
hadron trigger	8013+2591+3887	8062.81+2607+3906 .5 (0.5%)	Not change
SIDIS coin	31.2	31.95	31.0
Hadron coin	14.7+2.52+2.61= 19.83	16.1+4.0+3.97= 24.0	14.08+2.41+2.61 =19.1
Total rate	**<84.5**	<96.6(14%)	**<84.55**

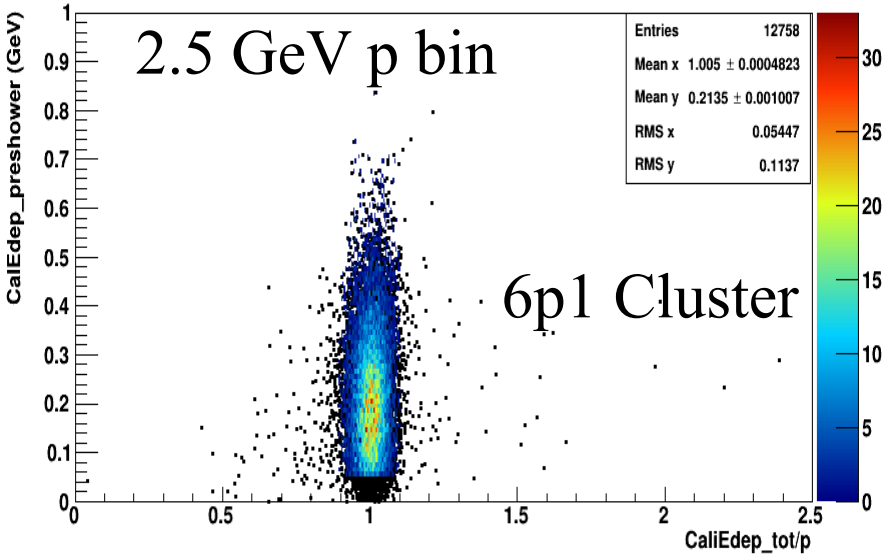
Influence of changing LAEC trigger condition

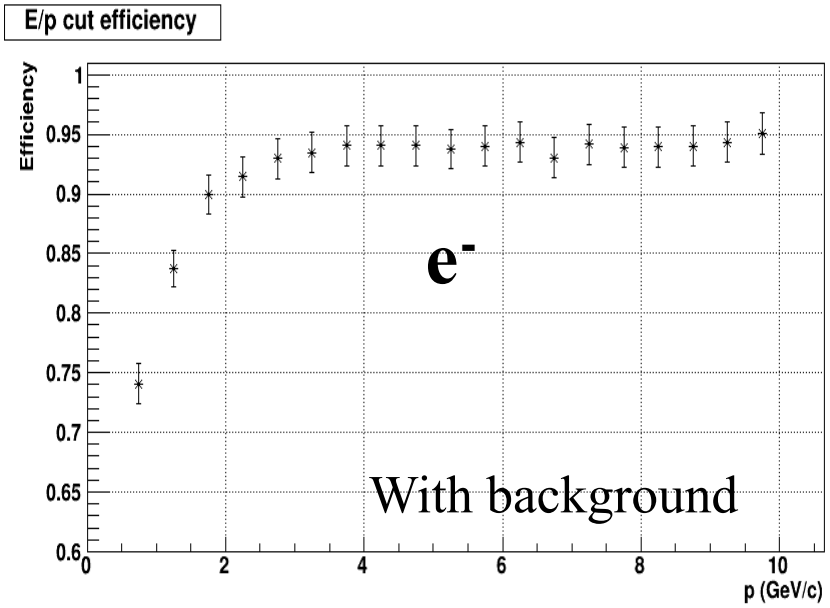
$$TR_{total}^{enhanced} = TR_{total}^{baseline} < \mathbf{84.5\ kHz}$$

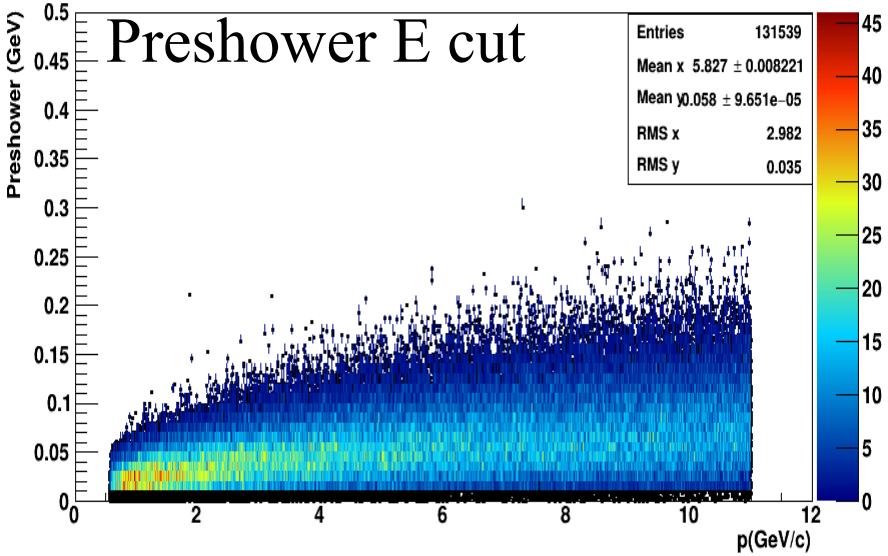
e_ LAEC: P>3.4GeV **e_ LAEC**: P>3.0GeV

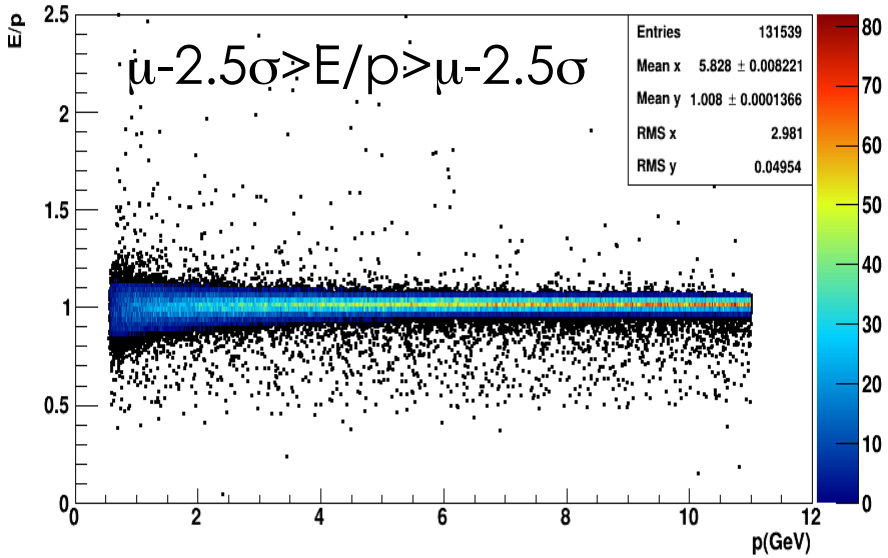
What's the influence on Physics and Detector performance ?

PID performance FAEC enhanced baseline

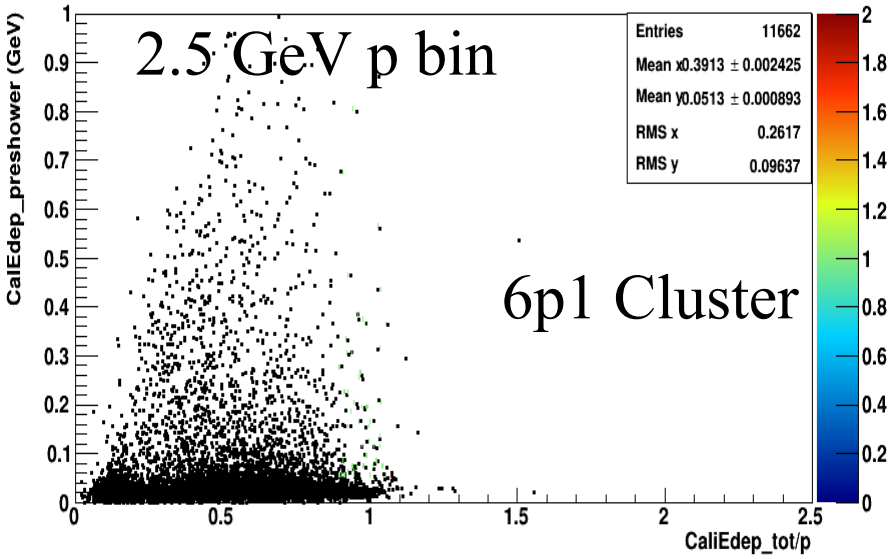


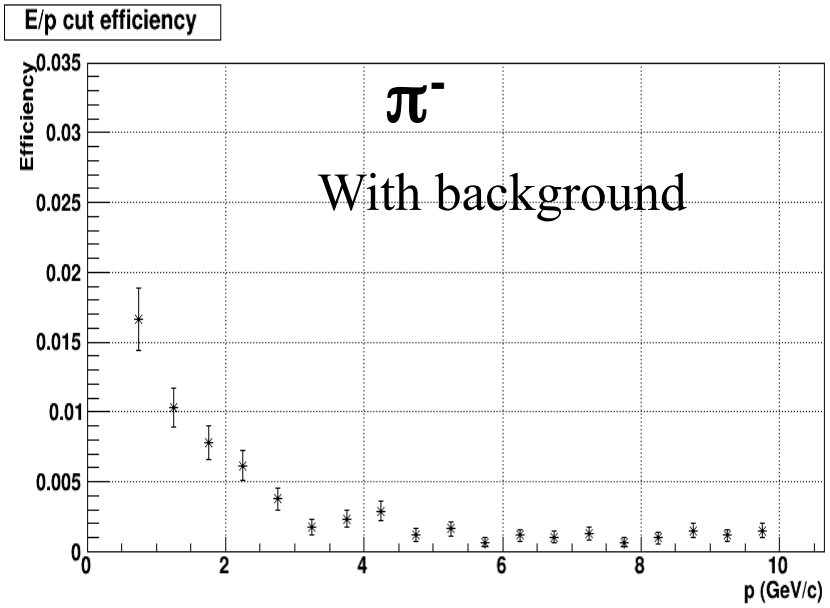


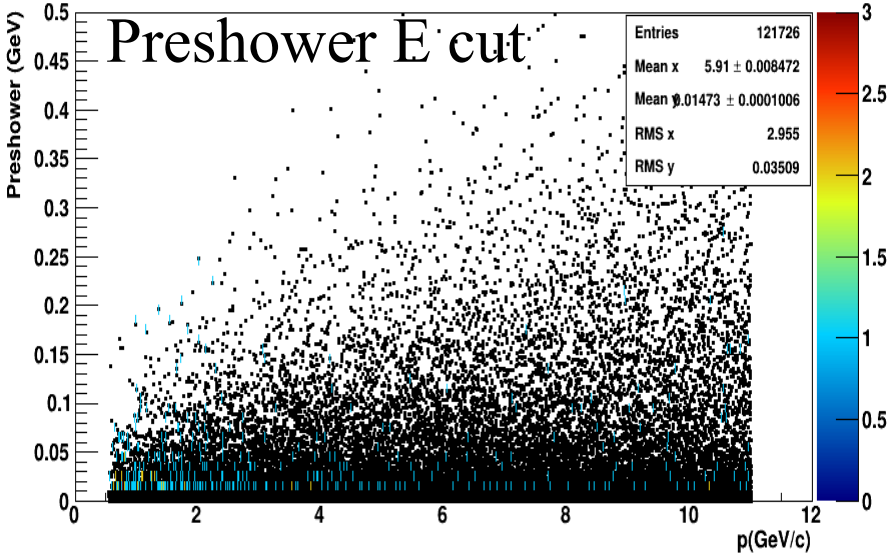


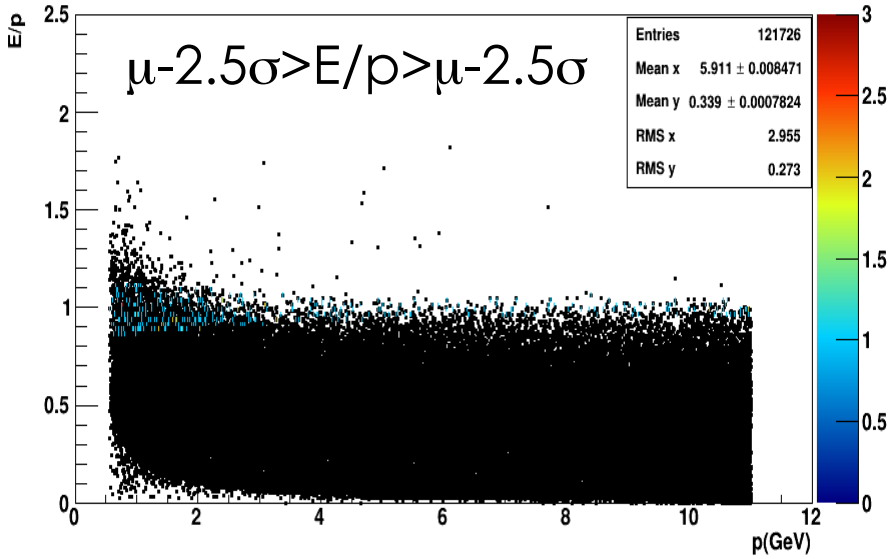


PID performance FAEC enhanced baseline

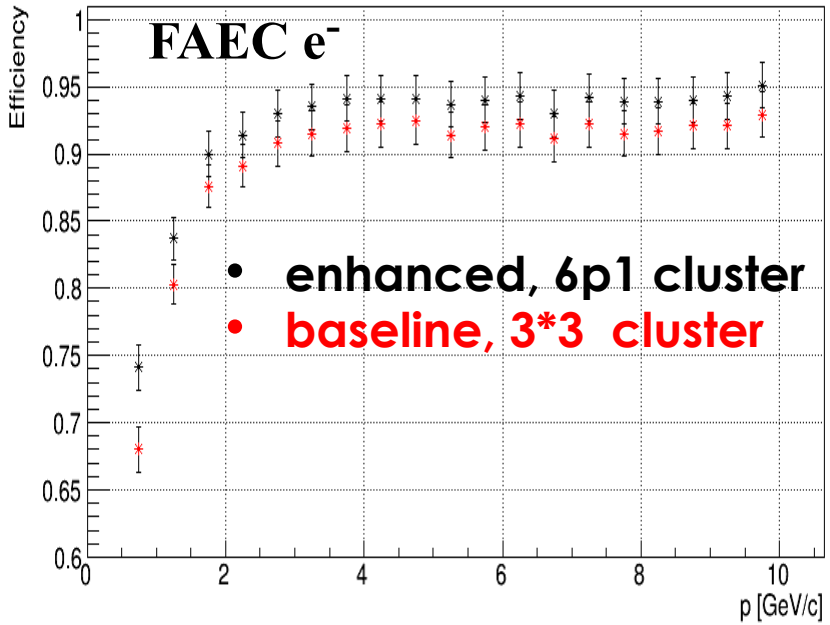


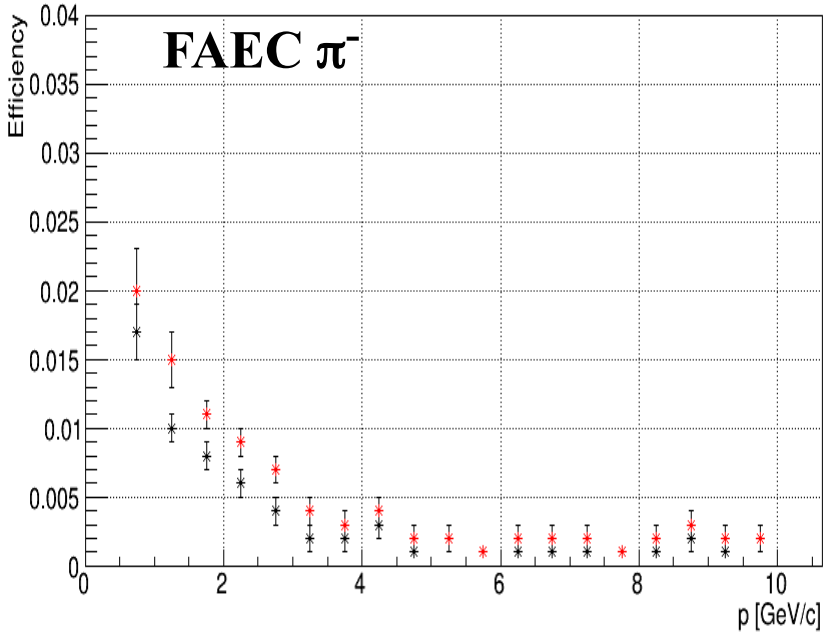


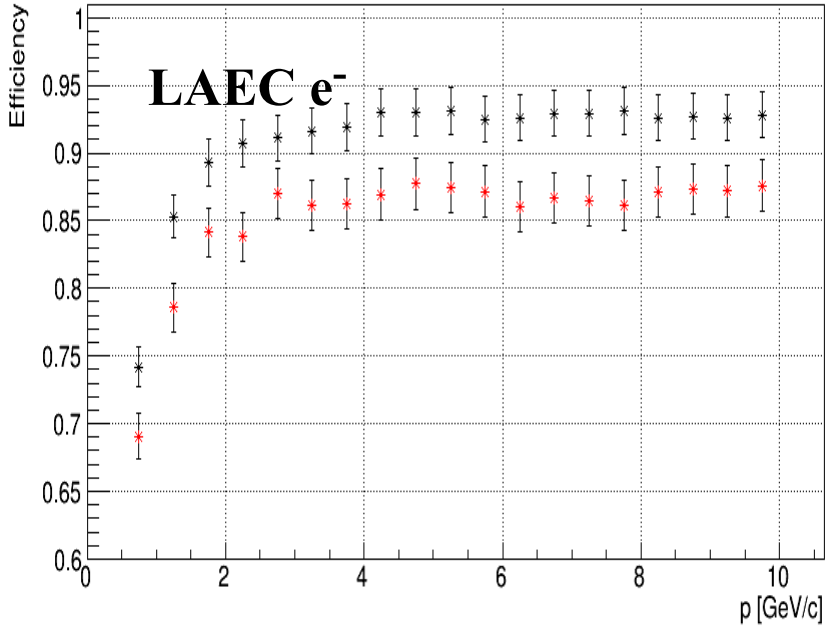


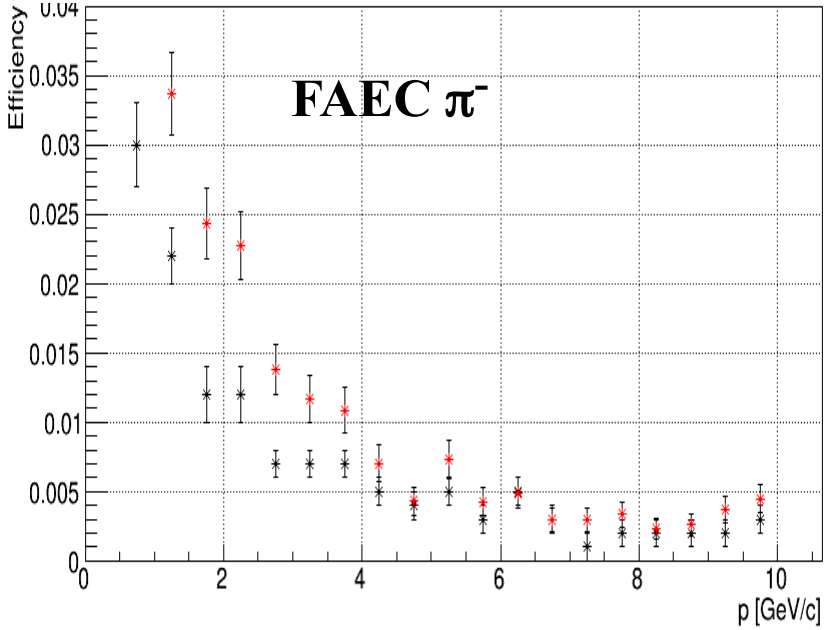


Calorimeter pion and electron efficiency

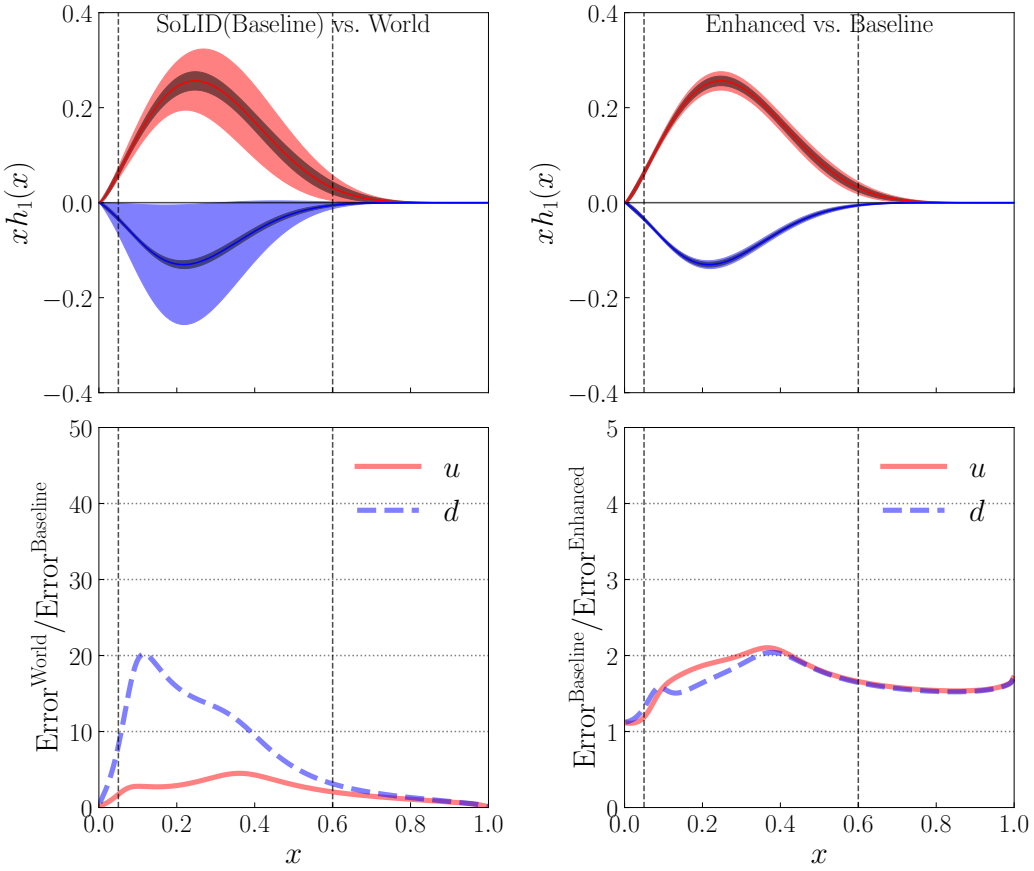


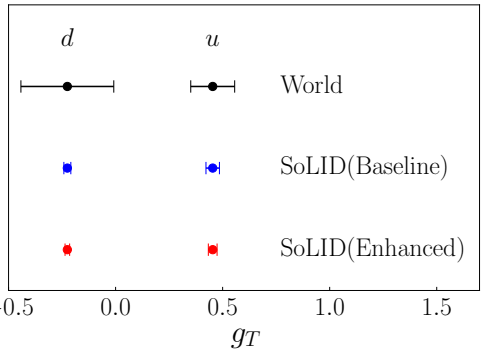






Transversity and tensor charge uncertainties influence





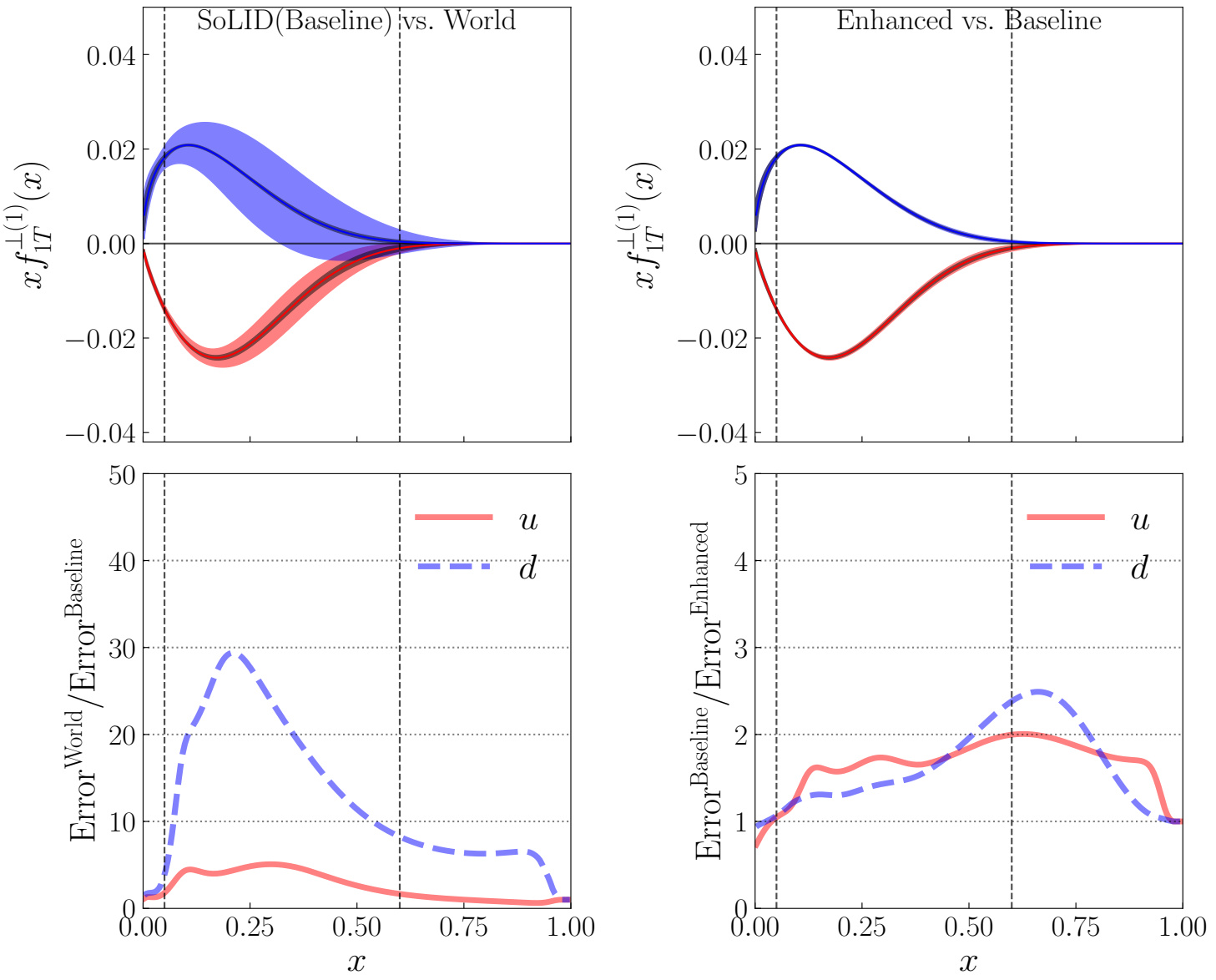
From Tianbo

- GEM tracking efficiency
- EC readout channel
- MRPC P<2.5 GeV

Baseline: miss low momentum pion data at the forward angle

Sivers uncertainities

From Tianbo



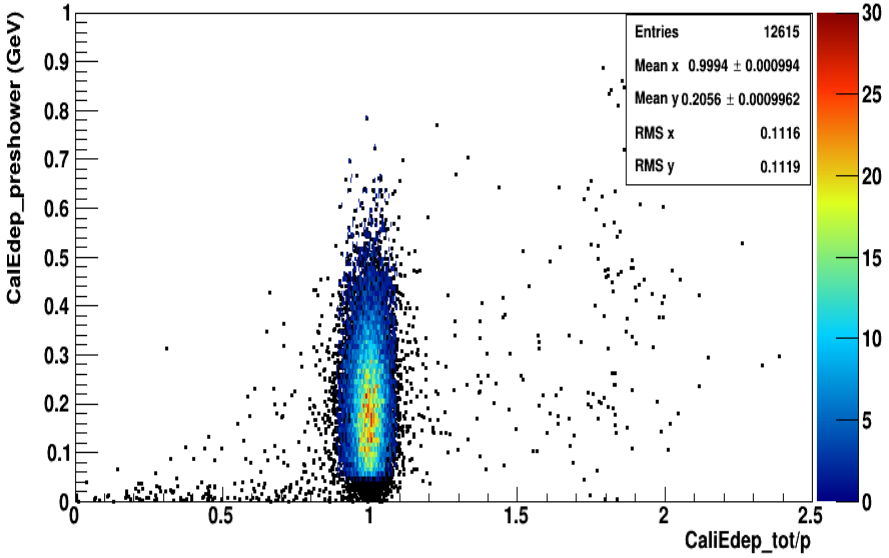
Summary and Outlook

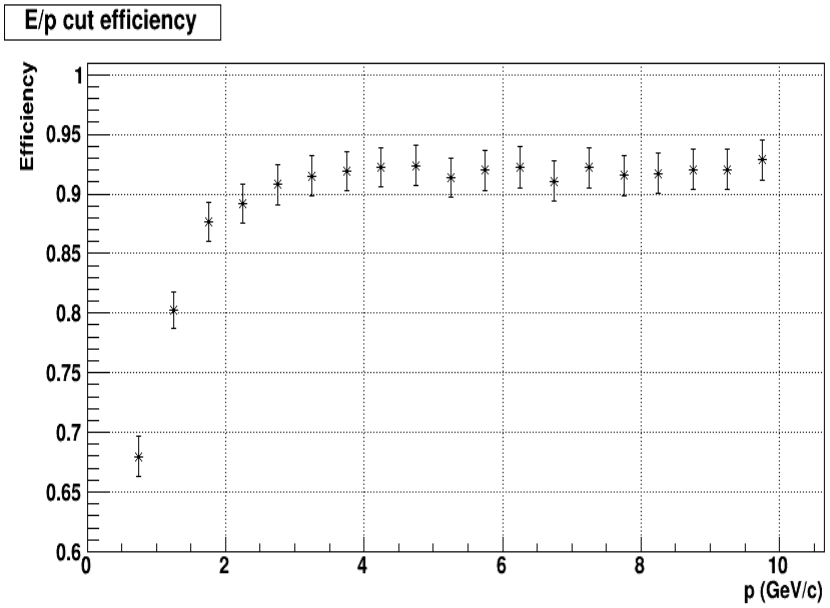
- SIDIS total trigger rate is estimated as 84.5 kHz with current simulation knowledge, which is satisfy the DAQ limit.
- For the enhanced baseline configuration, we can lower our trigger threshold for the large angle EC from 3.4 GeV to 3 GeV while keeping the same electron detection efficiency and total trigger rate.
- From baseline configuration to the enhanced baseline configuration, the increased number of readout channels will also improve EC PID performance and position resolution.
- The study shows that the transversity, tensor charge, and Sivers uncertainties from the enhanced baseline configuration measurement will be further reduced on average by a factor of 1.5 for both u and d quark compared with those from the baseline configuration.

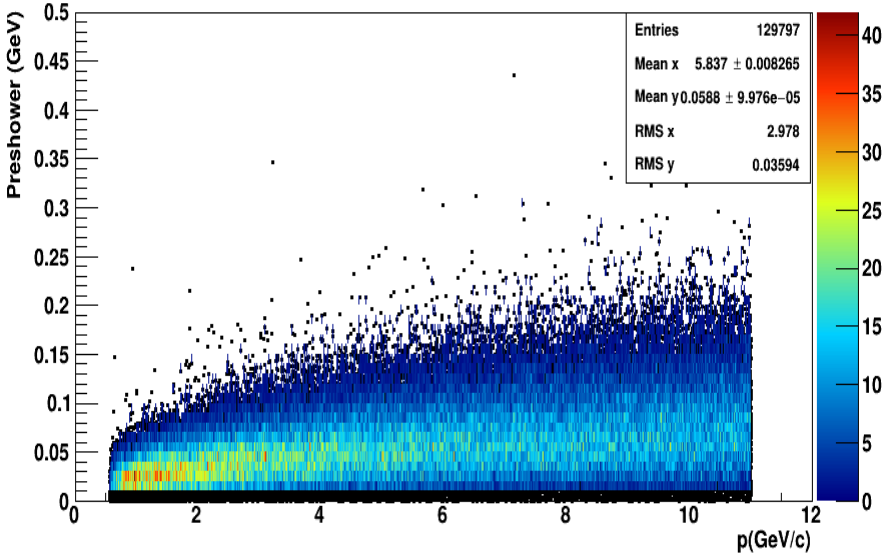
Any comments and suggestions ?

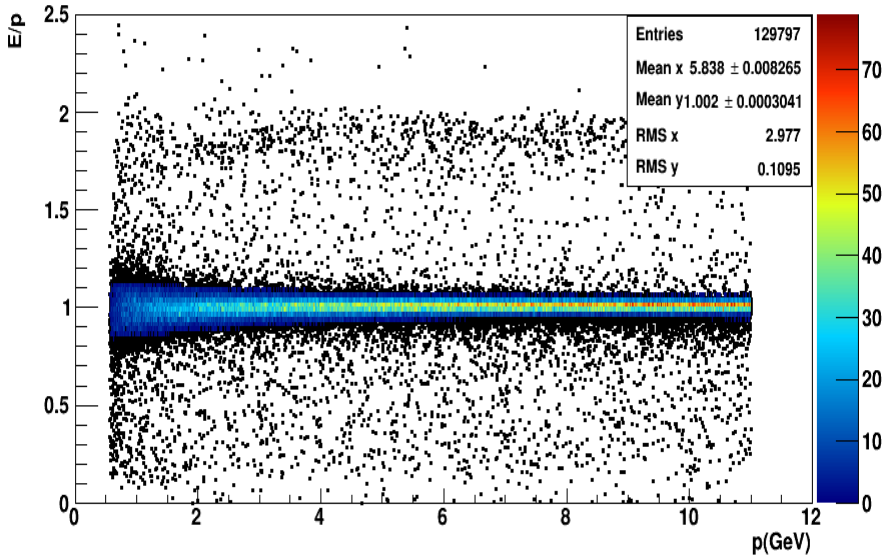
Backup

Offline analysis FAEC baseline









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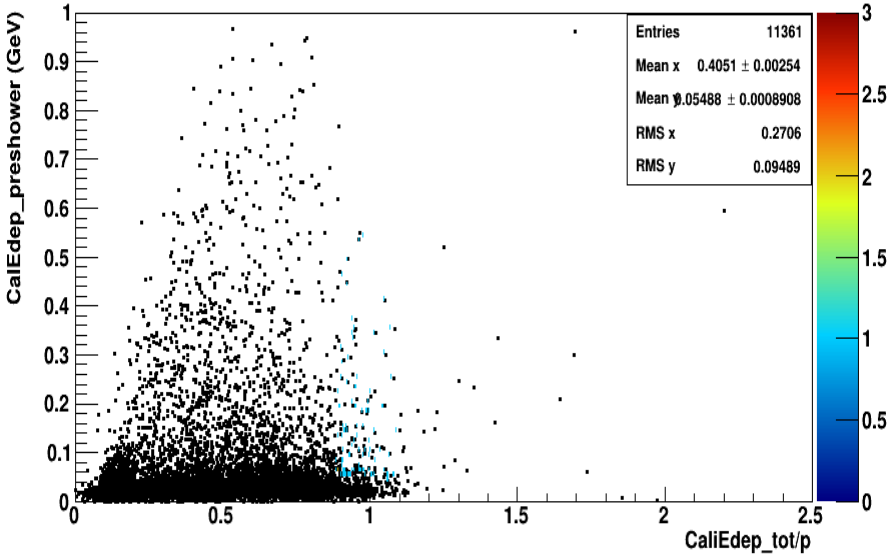

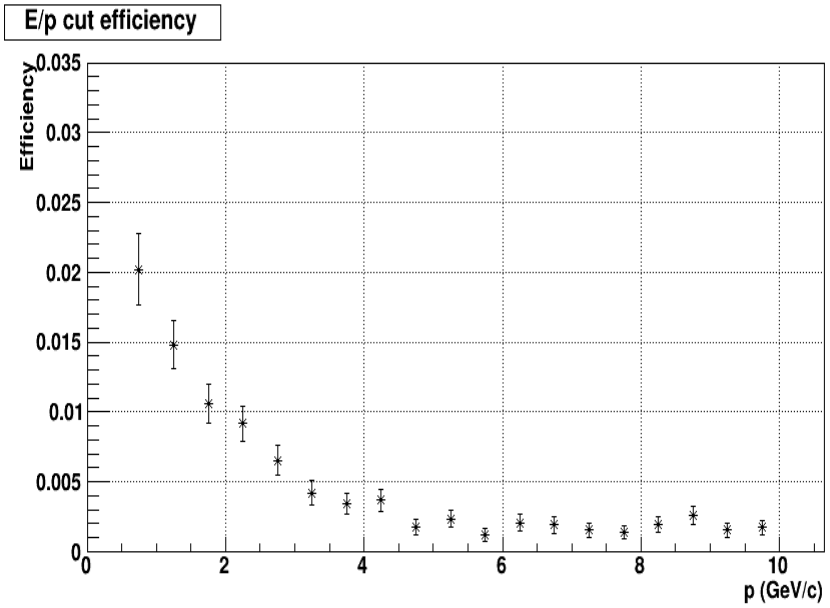

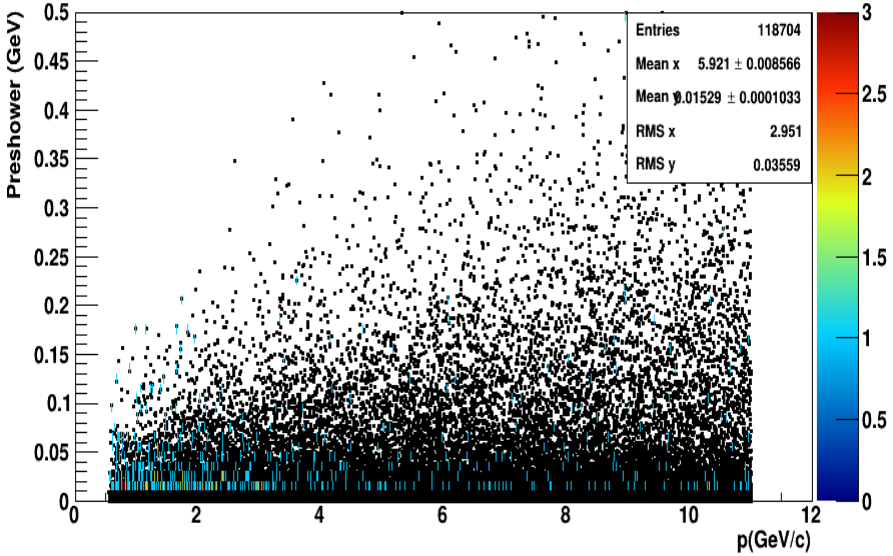

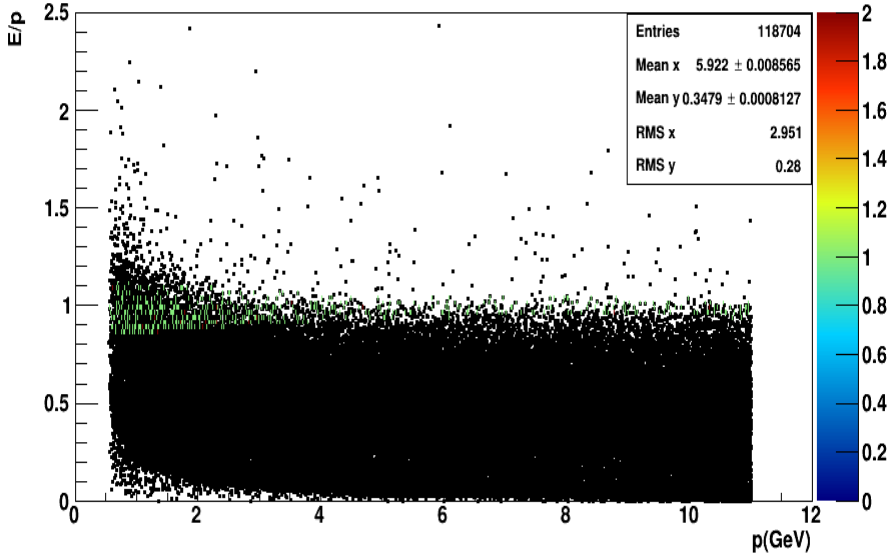

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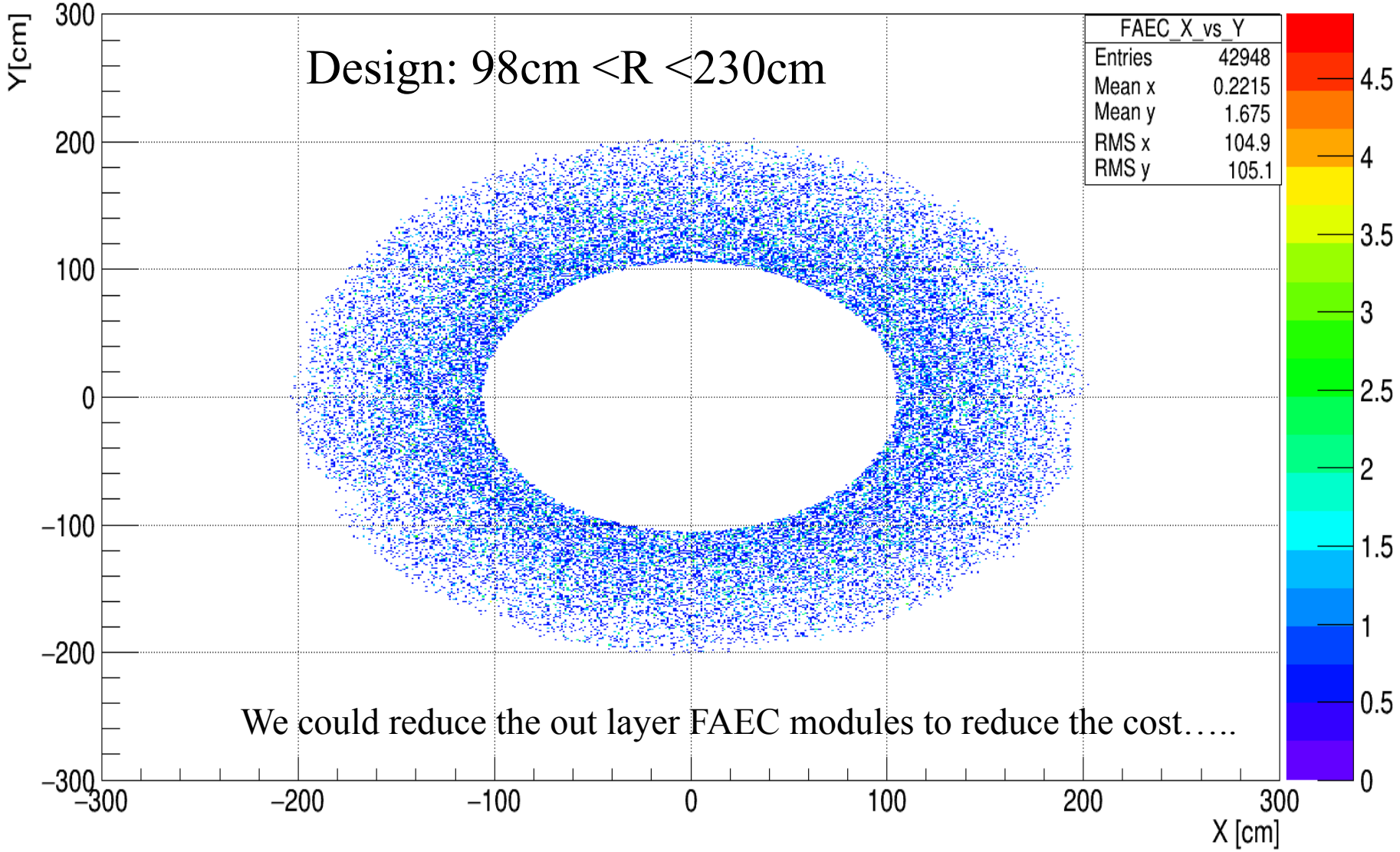
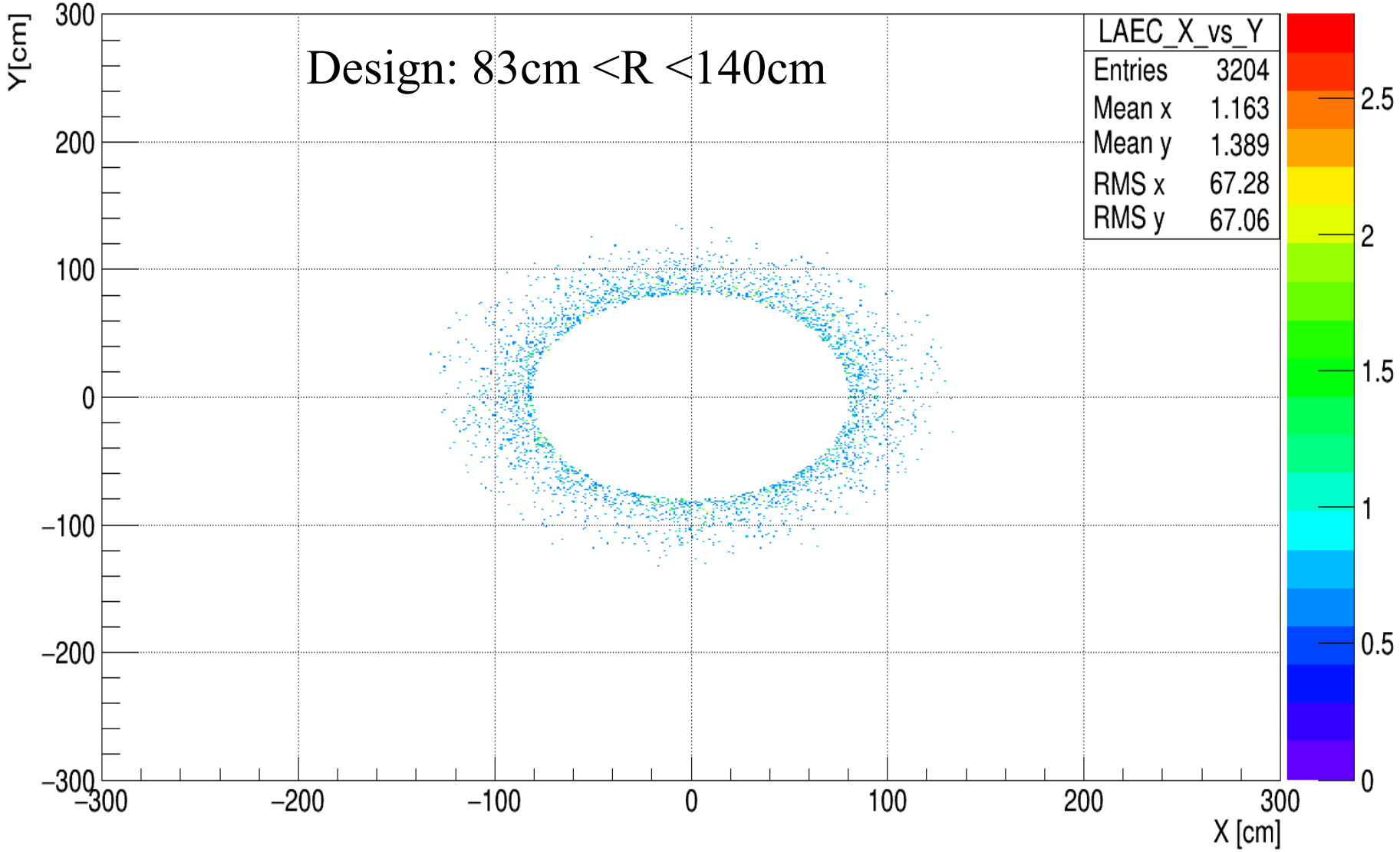
Total rate	**84.5**	88.47(4.7%)	**84.55**

SIDIS $e\pi^+$ triggered events at FAEC



SIDIS $e\pi^+$ triggered events at LAEC

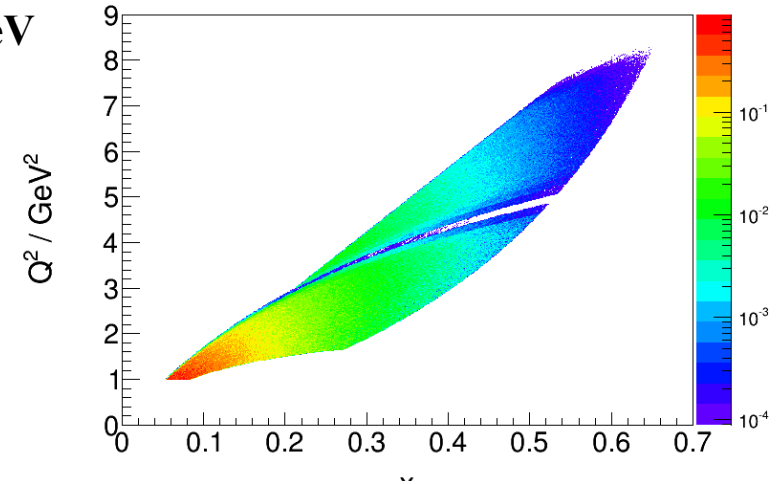


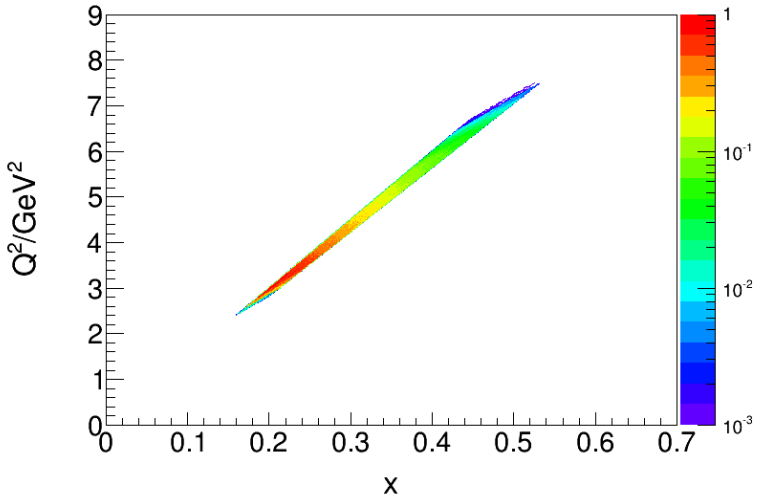
From Tianbo

SIDIS: ^{3}He target, π^+

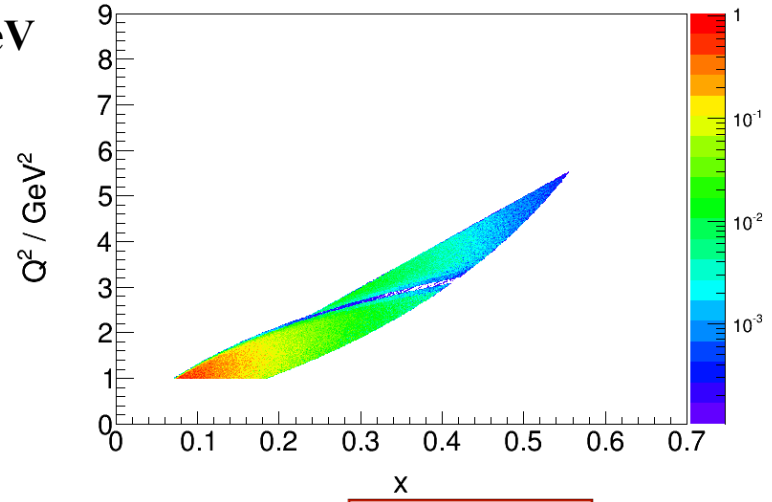
Gain 3% statistics

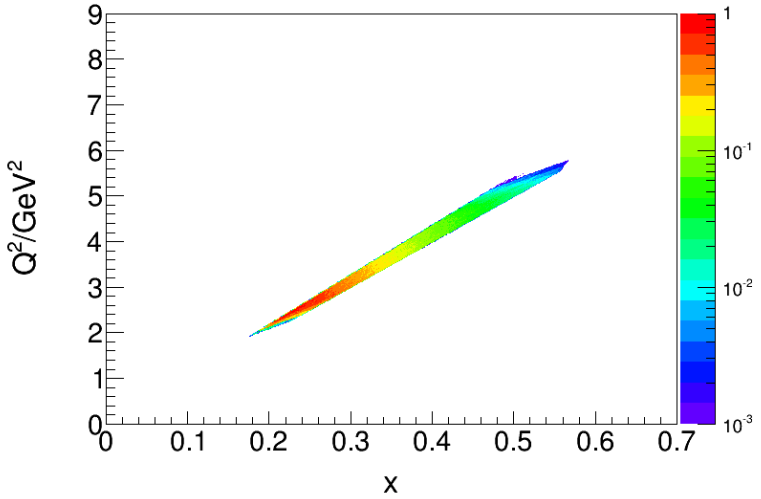
11GeV





8.8GeV





FA + LA (P > 3.5 GeV)

LA (3.0 < P < 3.5 GeV)