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



Trigger Condition and Logic

- **e_FAEC**: R(98-230)cm, Q²>=1 GeV²
- 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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Has overlap

SIDIS coin (Duke SIDIS generator)
Hadron coin (Bggen genertor)

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SIDIS coin (Duke e⁻ hadron generator) Has overlap, and how much?
Hadron coin (Bggen genertor)

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

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+ <mark>1.8</mark>	61.15+1.1+1.87	Not change
FA hadron no e ⁻	29+ <mark>3.6+5.3</mark>	32.3+ <mark>3.6+5.9</mark> (10%)	Not change
LA e ⁻	4.1+3.6+2.6	4.2+3.7+ <mark>2.7</mark>	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+ <mark>4.0+3.97=</mark> 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



What's the influence on Physics and PID performance?

PID performance FAEC enhanced baseline



PID performance FAEC enhanced baseline



Calorimeter pion and electron efficiency





Transversity and tensor charge uncertainties influence



Sivers uncertainties



Summary and Outlook

- SIDIS uplimit 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



E/p cut efficiency

Offline analysis FAEC baseline



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FA hadron no e ⁻	29+ <mark>3.6+5.3</mark>	Not change	Not change
LA e ⁻	4.1+3.6+2.6	3.49+ <mark>3.09+2.16</mark> (15%)	3.3+2.93+2.03
LA hadron no e ⁻	7.7+6.5+3.8	8.7+6.48+5.27	6.8+4.4+3.5
hadron trigger	8013+2591+3887	Not change	Not change
SIDIS coin	31.2	31.2	31.0
Hadron coin	14.7+2.52+2.61= 19.83	15.27+ <mark>2.36+3.4</mark> =21.03	14.08+2.41+2.61 =19.1
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: ³He target, π^+

Gain 3% statistics

