Kaon LT Status Update September 8th, 2022

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Analysis Phases

1. Calibrations 🗸

- Calorimeter, aerogel, HG cer, HMS cer, DC, Quartz plan of hodo
- Assure we are replaying to optimize our physics settings
- 2. [~2 months] Efficiencies and offsets Current step
 - Luminosity, elastics, Heeps, etc.
- 3. [3-4 months] First iteration of cross section On-deck
 - Extract the kaon electroproduction cross section
- 4. [~1 months] Fine tune
 - Fine tune values to minimize systematics
- 5. [~3+ months] Repeat previous two steps
 - Repeat until acceptable cross sections are reached
 - This will highlight any potential complications
- 6. [~1 month] Possible attempt at form factor extraction
 - The Rosenbluth separation technique** is used to isolate the longitudinal term and thus the form factor can be extracted

2. Efficiencies and offsets

- 10.6 GeV -> Richard
- 8.2 GeV -> Ali
- 6.2 GeV -> Ali/Richard
- ✓ 3.8/4.9 GeV -> Vijay
- Goal: Finish these up by the summer time (more iterations will be needed in the future)
- 3. First iteration of cross section
- Goal: By the start of summer, start looking at Bill's code and getting cross-sections (even if previous step is not quite finished)

Scaler Yield Calculation



Yield Calculation



Lumi Cuts

- tdcTimeRaw cuts on pTrigs and EDTM
- Evttype cuts (HMS Evttype==2, SHMS Evttype==1)
- abs(current-setcurrent) < 2.5

SHMS (pion)

- P_hgcer_npeSum > 1.5
- P_aero_npeSum > 1.5
- P_cal_etotnorm < 0.9

HMS (electron)

- H_cer_npeSum > 6.0
- H_cal_etotnorm > 0.08

Track Lumi Cuts

- tdcTimeRaw cuts on pTrigs and EDTM
- Evttype cuts (HMS Evttype==2, SHMS Evttype==1)
- abs(current-setcurrent) < 2.5
- (P)H_goodscinhits == 1
- abs(P_gtr_beta-1) > 0.3

SHMS (pion)

- P_hgcer_npeSum > 1.5
- P_aero_npeSum > 1.5
- P_cal_etottracknorm < 0.9

HMS (electron)

- H_cer_npeSum > 6.0
- H_cal_etottracknorm > 0.08





Run 5154



Lumi Cuts

- tdcTimeRaw cuts on pTrigs and EDTM
- Evttype cuts (HMS Evttype==2, SHMS Evttype==1)
- abs(current-setcurrent) < 10.0
- (P)H_goodscinhits == 1
- abs(P_gtr_beta-1) > 0.3

SHMS (electron)

- P_hgcer_npeSum > 1.5
- P_aero_npeSum > 2.0
- P_cal_etotnorm > 0.25

HMS (electron)

- H_cer_npeSum > 6.0
- H_cal_etotnorm > 0.08

Run 7841



P_aero_npeSum

Run 7948









Tracking makes things a bit worse but seeing the heavy trend in no track there are still some dependencies leaking into the cuts













Yields look dramatically better. No longer have a drop in tracking



Yields look dramatically better. No longer have a drop in tracking





Still can see scaler yield effects



Still can see scaler yield effects and SHMS trends (although opposite direction)

То Do...

• Key topics

- 1. Looking at offsets now that all issues are resolved
- 2. Luminosity analysis, continue iterating on cuts
- 3. Heep and luminosity uncertainty calculations
- 4. Continue looking at Bill's cross section code (lots of hard coded info to adjust and move)

• Other topics

- 1. Figure out Heep singles/efficiencies singles issue
- 2. Calorimeter calibrations
- 3. HGCer efficiency calculation (Ali has a write up for me)