Kaon LT Status Update

June 14th, 2022

Richard Trotta

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

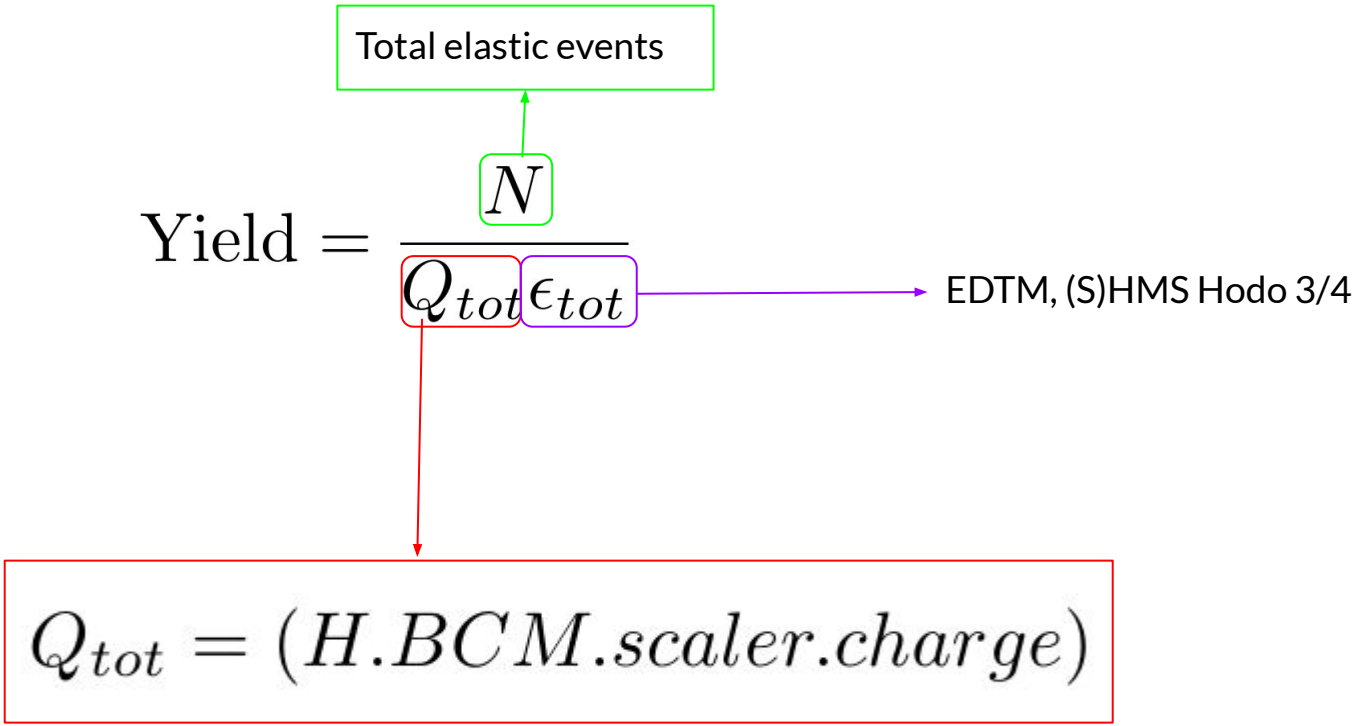
2. Efficiencies and offsets

- 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)

Yield Calculation



Cuts

- Cointime peak cut

SHMS

- (evt.P_hod_goodstarttime == 1) & (evt.P_dc_InsideDipoleExit == 1)
- (evt.ssdelta>=-10.0) & (evt.ssdelta<=20.0) & (evt.ssxptar>=-0.06) & (evt.ssxptar<=0.06) & (evt.ssyptar>=-0.04) & (evt.ssyptar<=0.04)

HMS

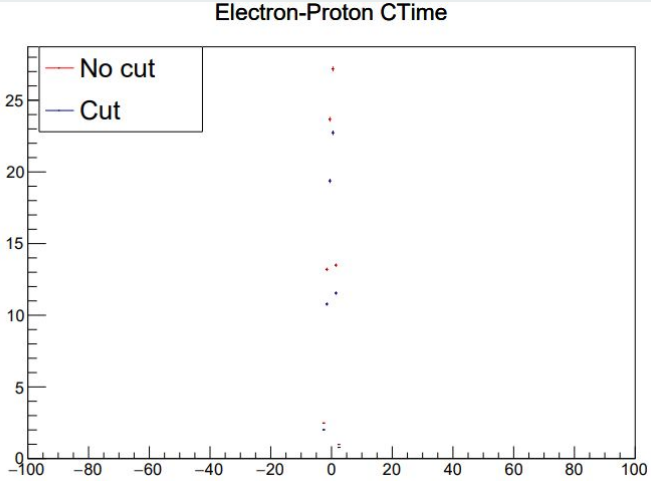
- (evt.H_hod_goodstarttime == 1) & (evt.H_dc_InsideDipoleExit == 1)
- (evt.hsdelta>=-8.0) & (evt.hsdelta<=8.0) & (evt.hsxptar>=-0.08) & (evt.hsxptar<=0.08) & (evt.hsyptar>=-0.045) & (evt.hsyptar<=0.045)

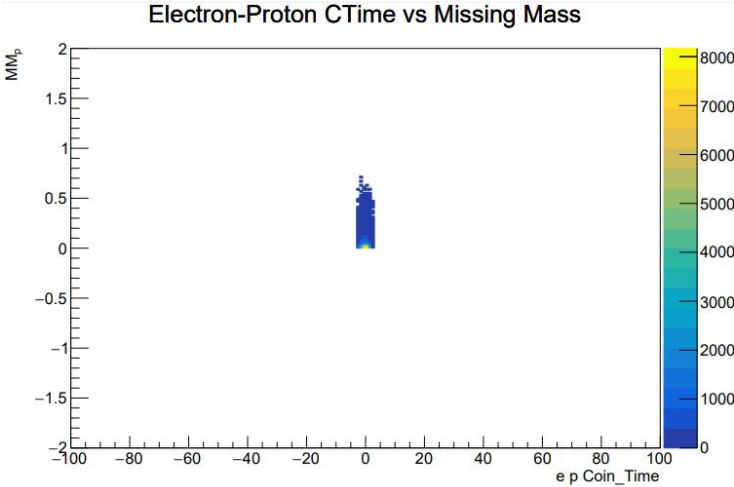
10.6 GeV

COIN

P_{HMS}= -6.590
θ_{HMS}= 18.845
P_{SHMS}= +4.840
θ_{SHMS}= 26.147
PS1=5
PS3=1

$$\text{Yield} = \frac{N}{Q_{tot}\epsilon_{tot}}$$





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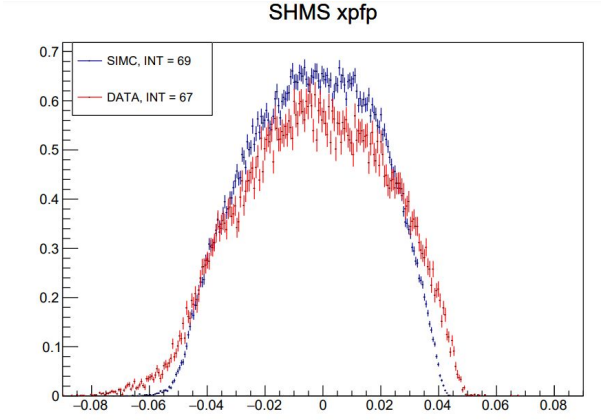

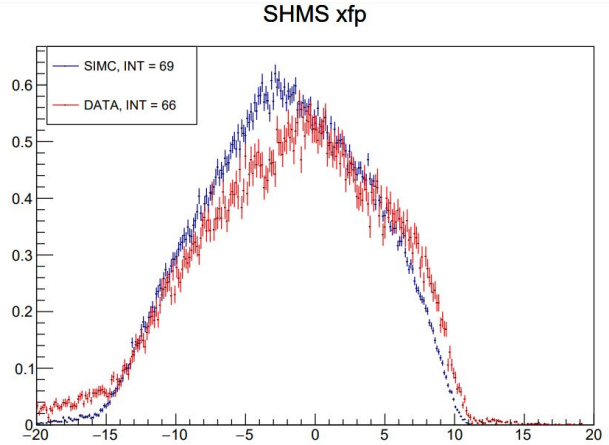

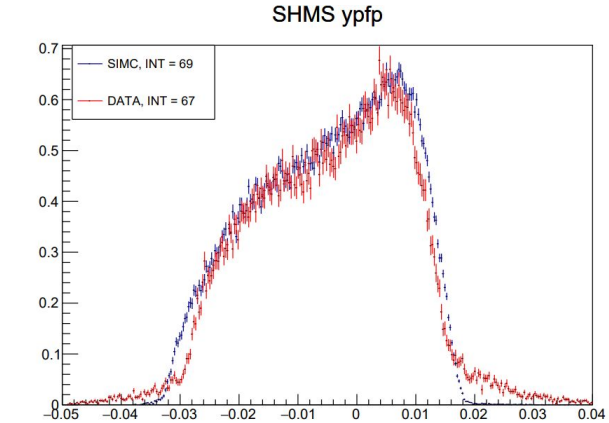

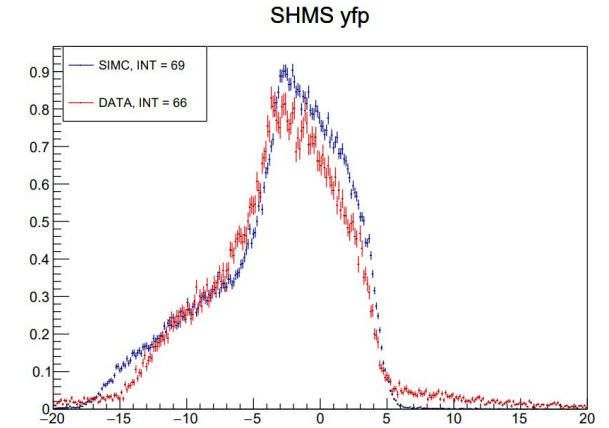

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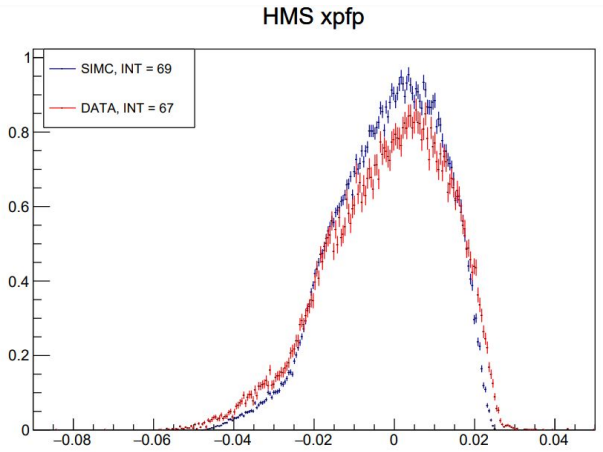

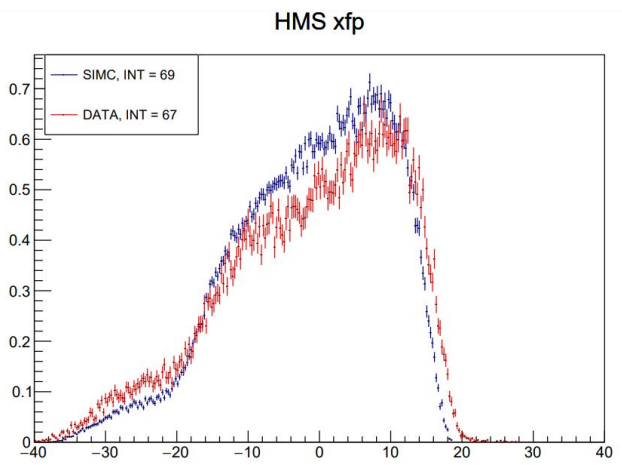

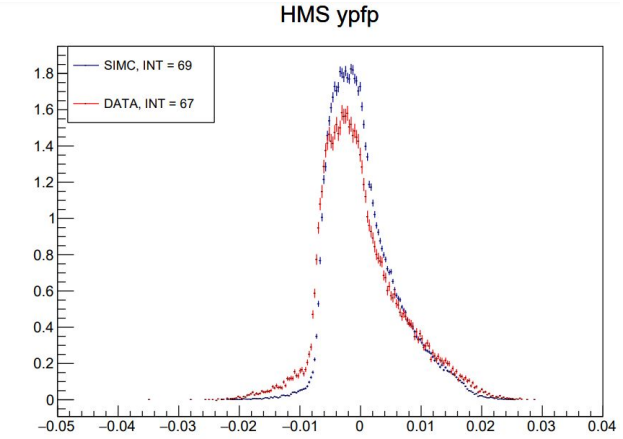

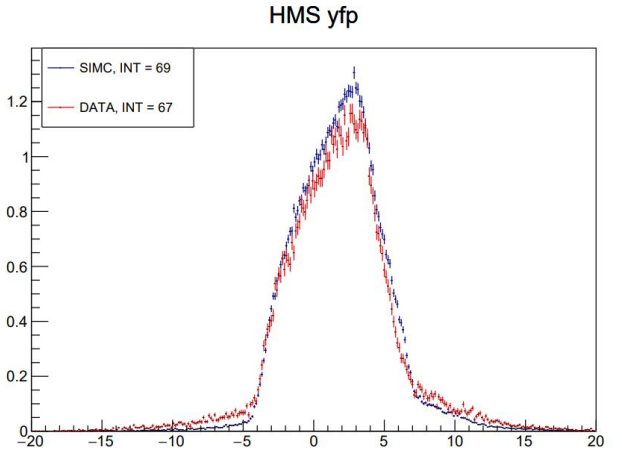

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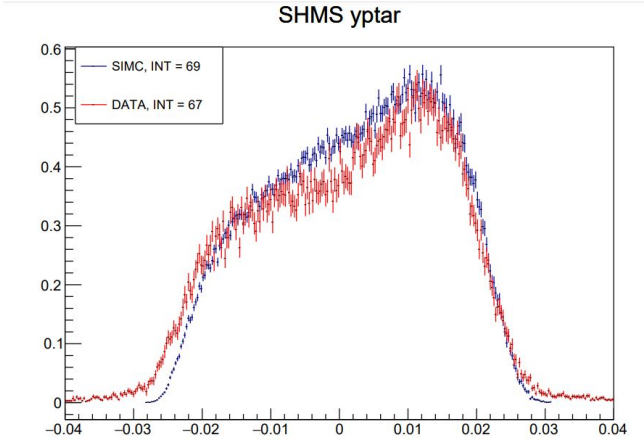

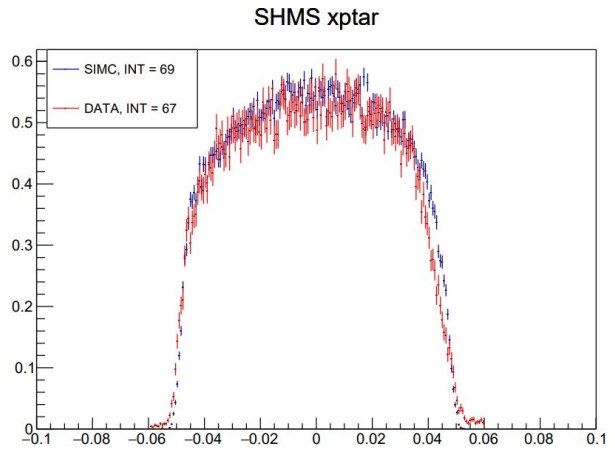

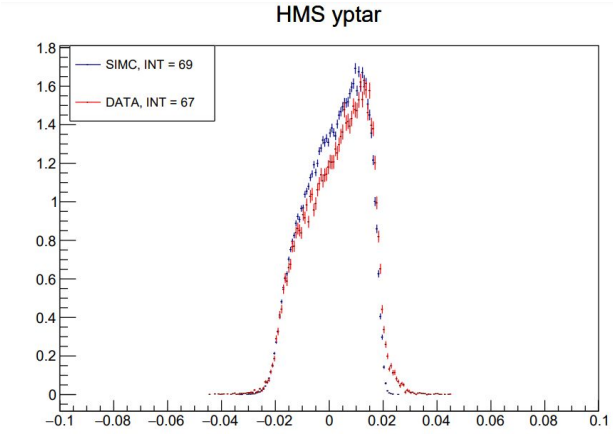

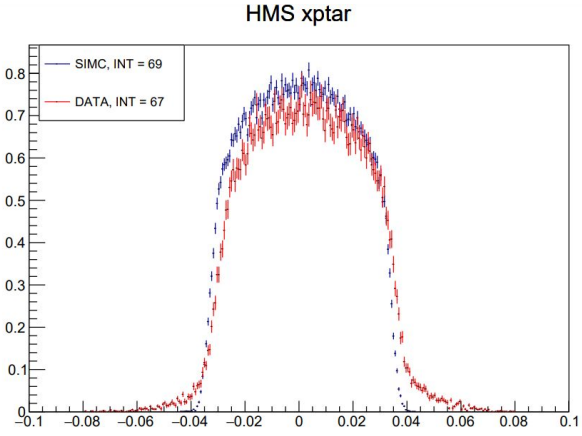

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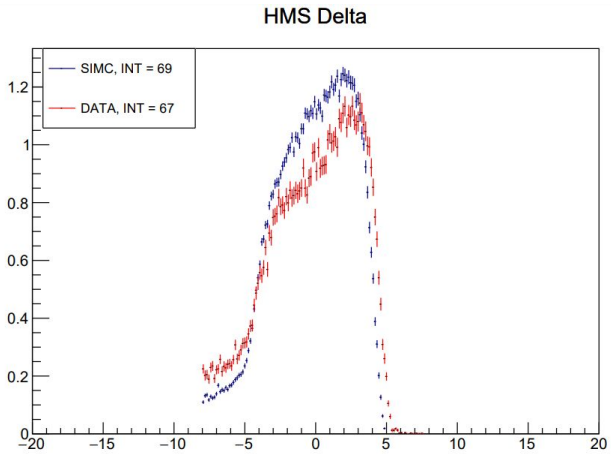
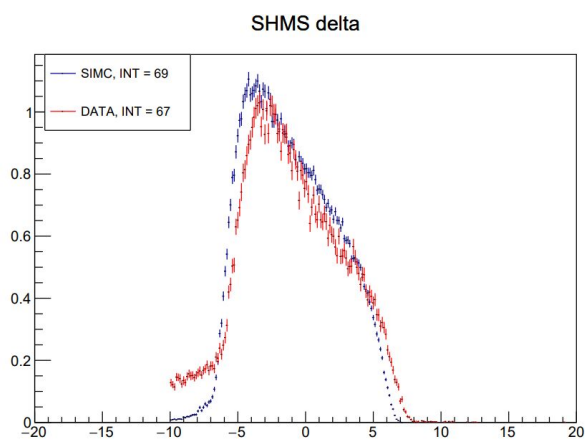
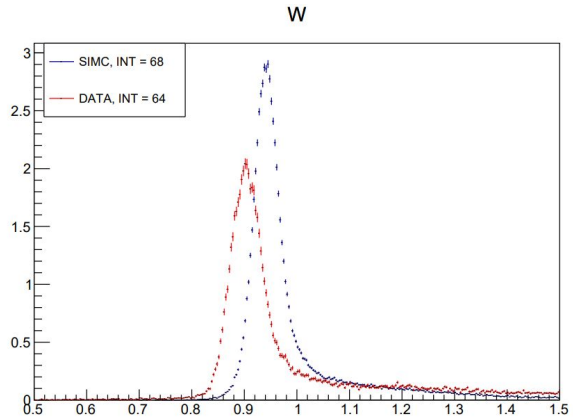
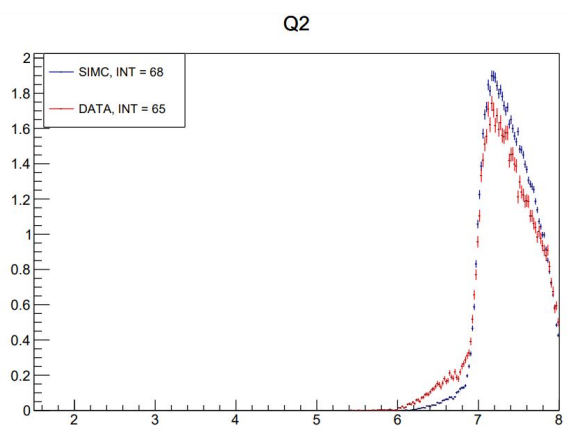
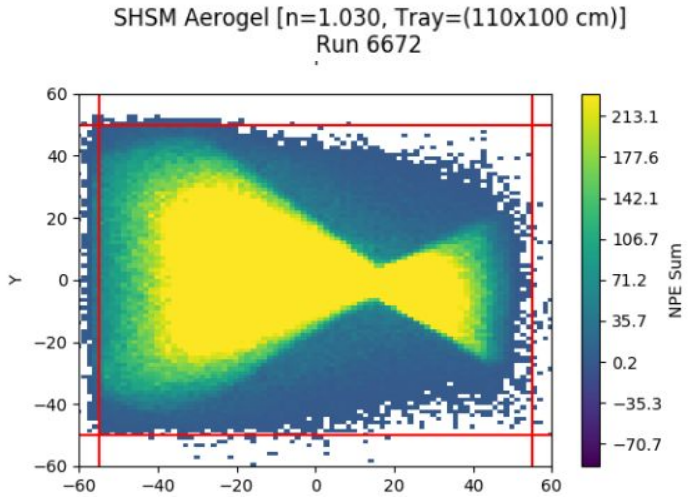








Aerogel Breakdown (n=1.030)



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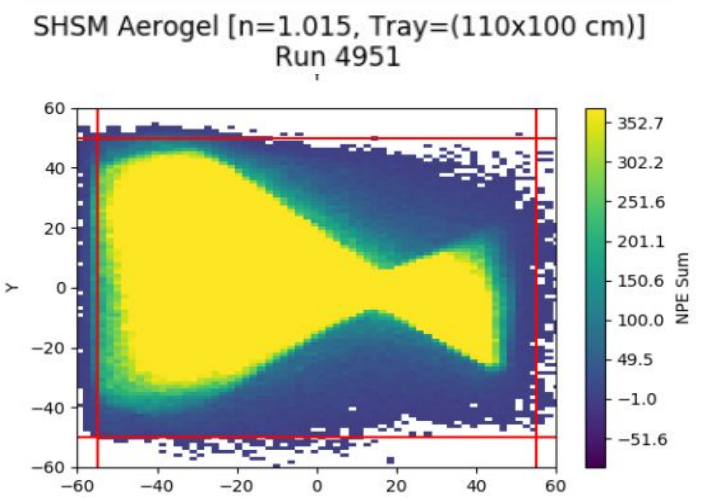

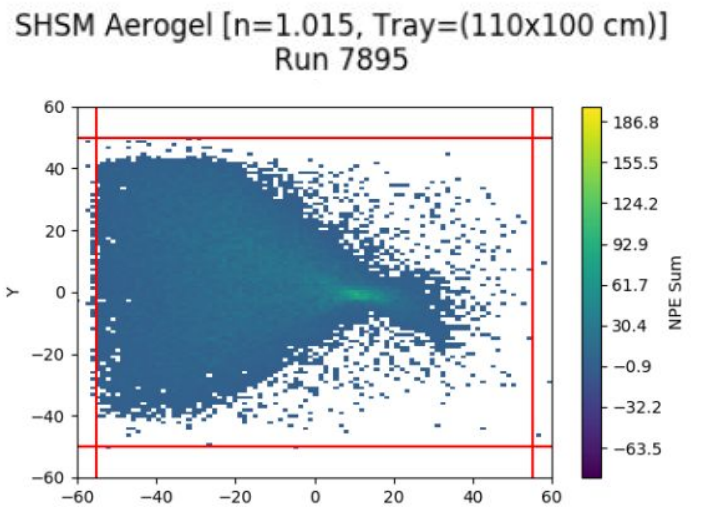

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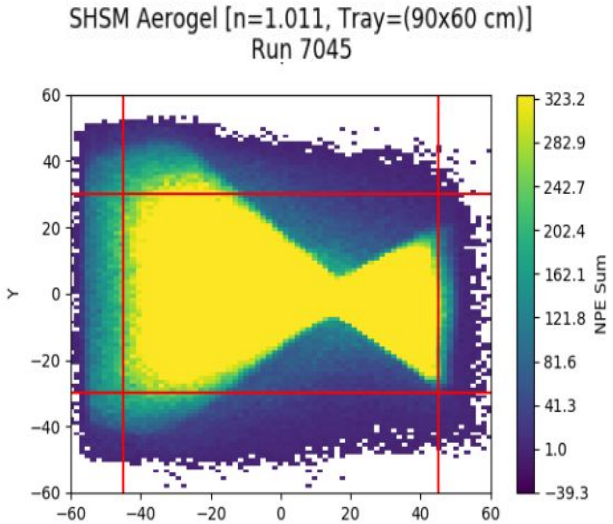
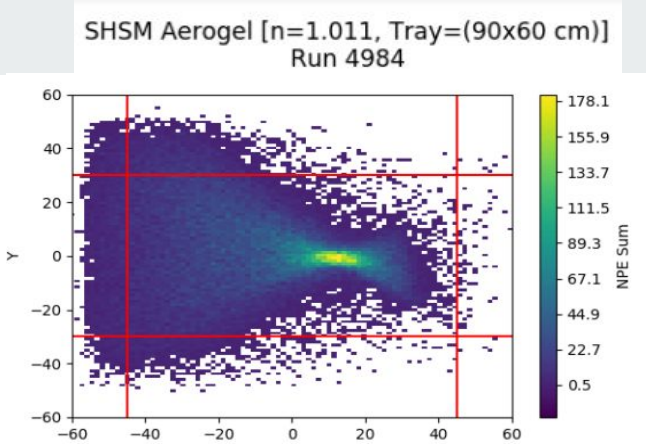
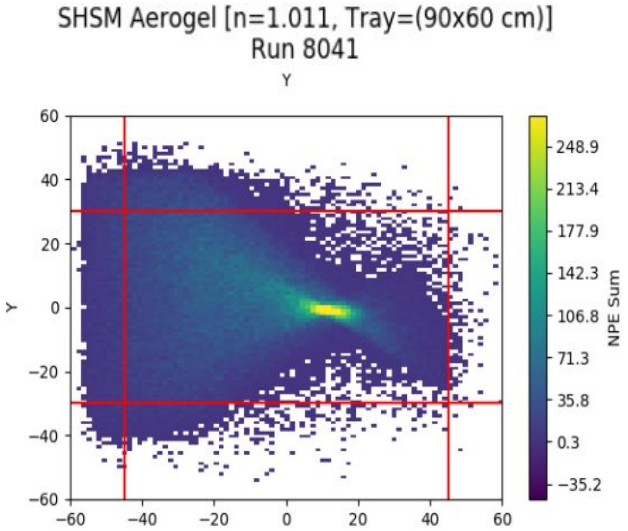
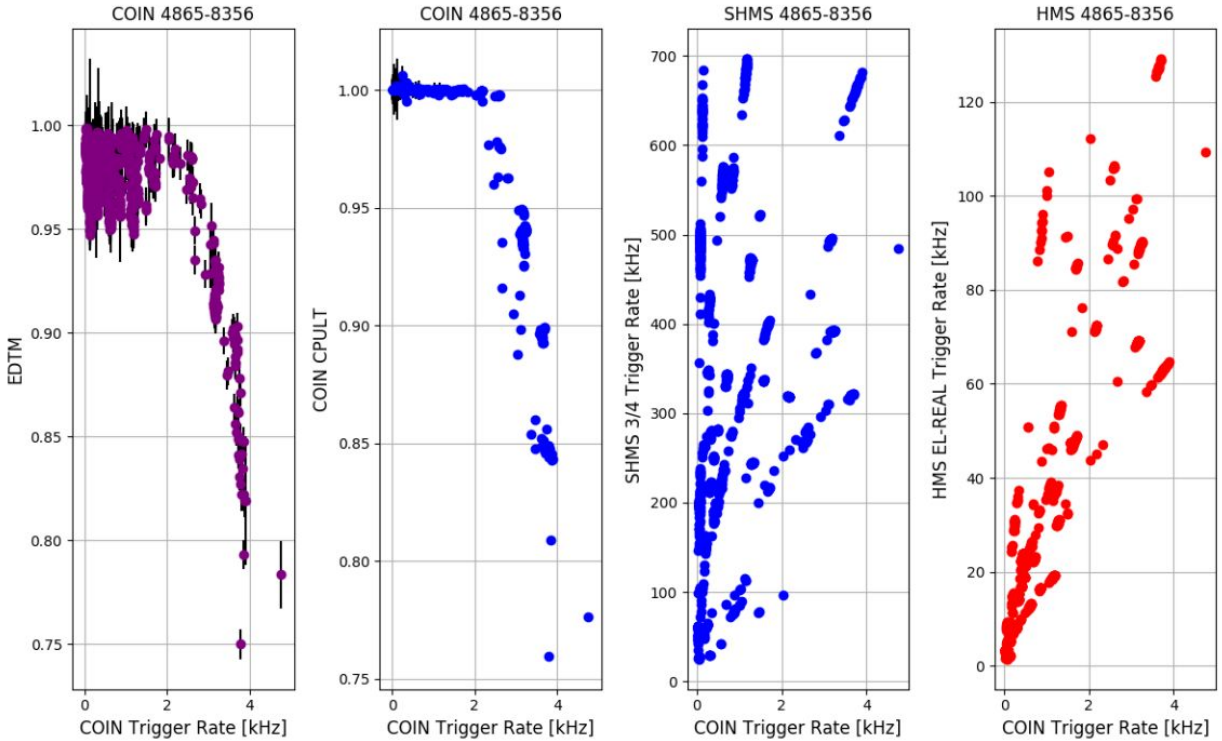






All Production Efficiency Plots



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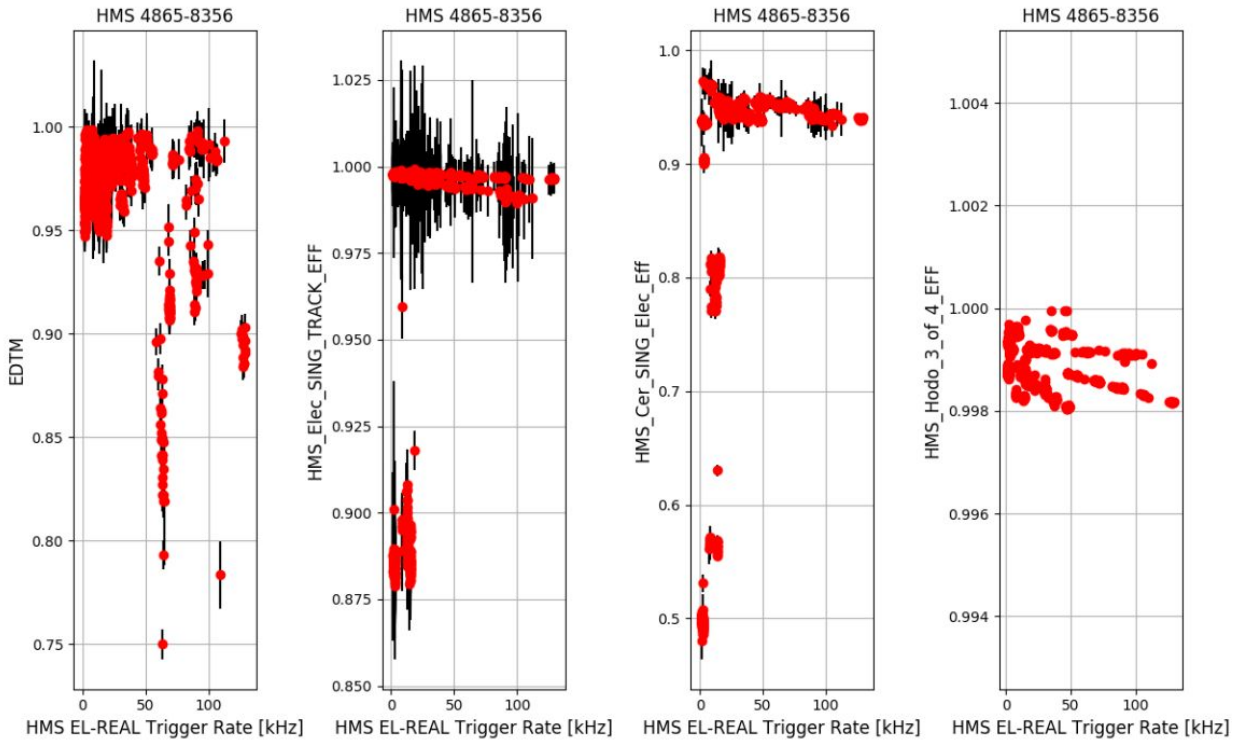

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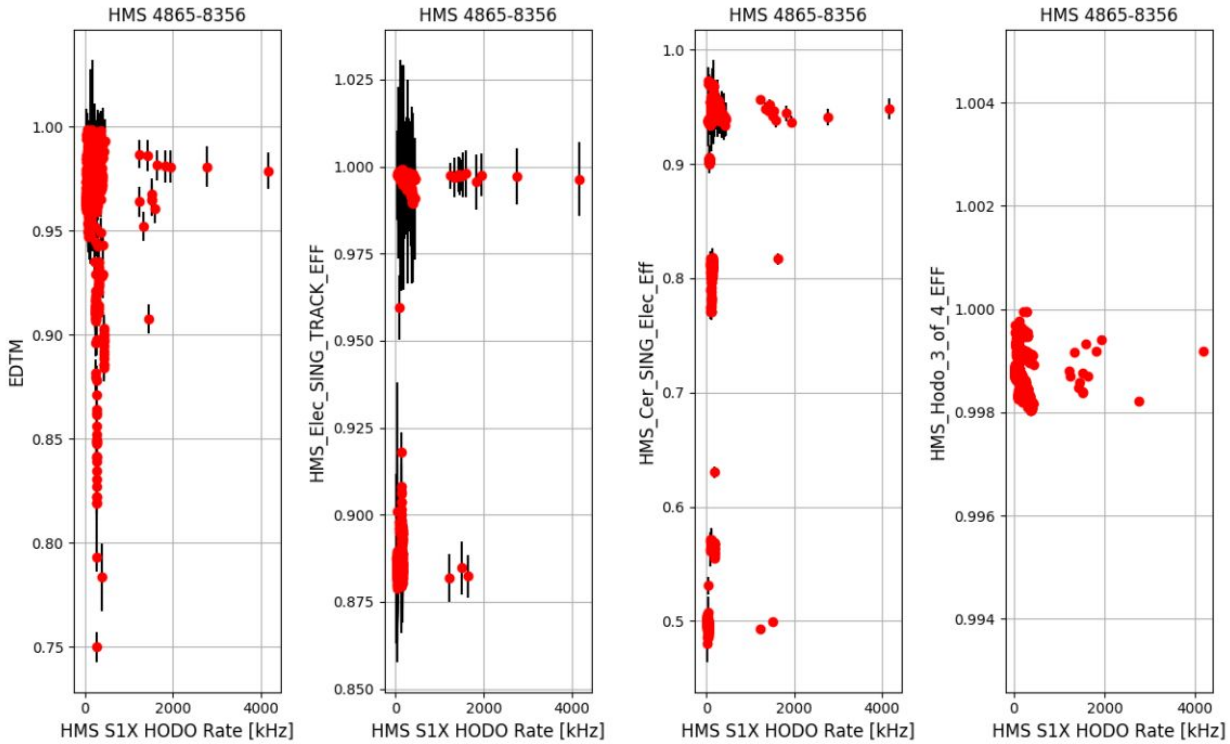

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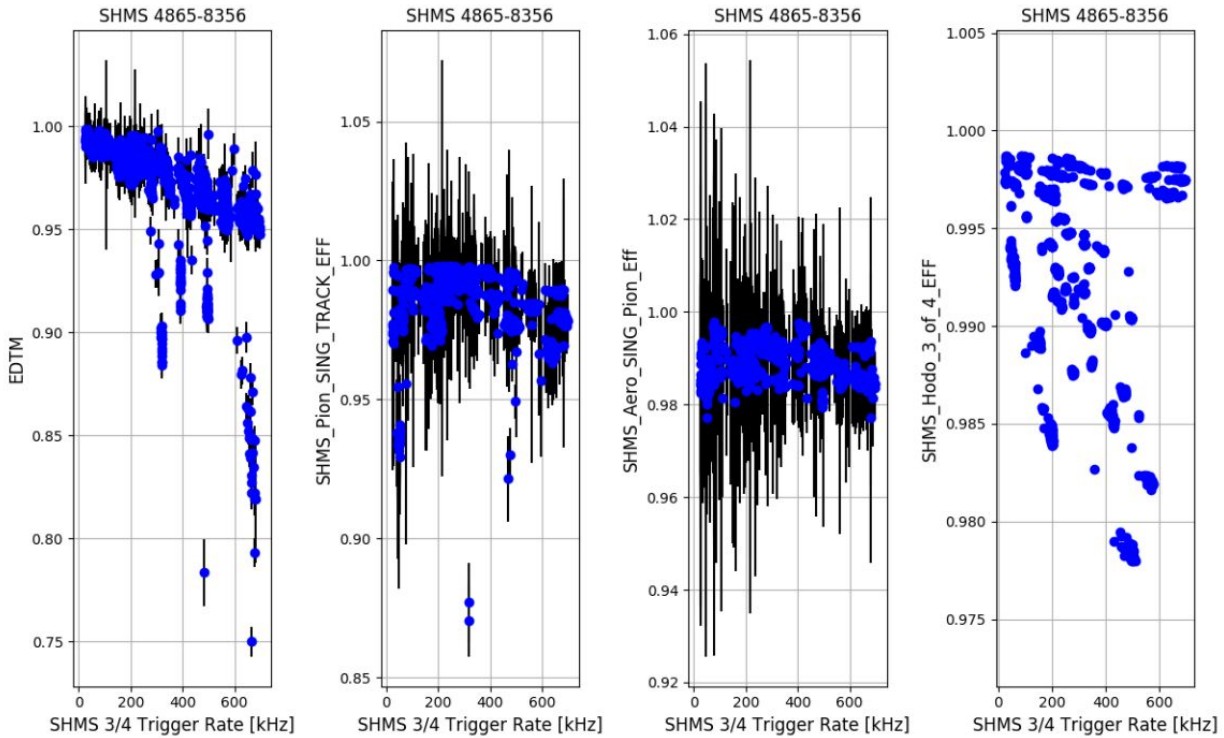

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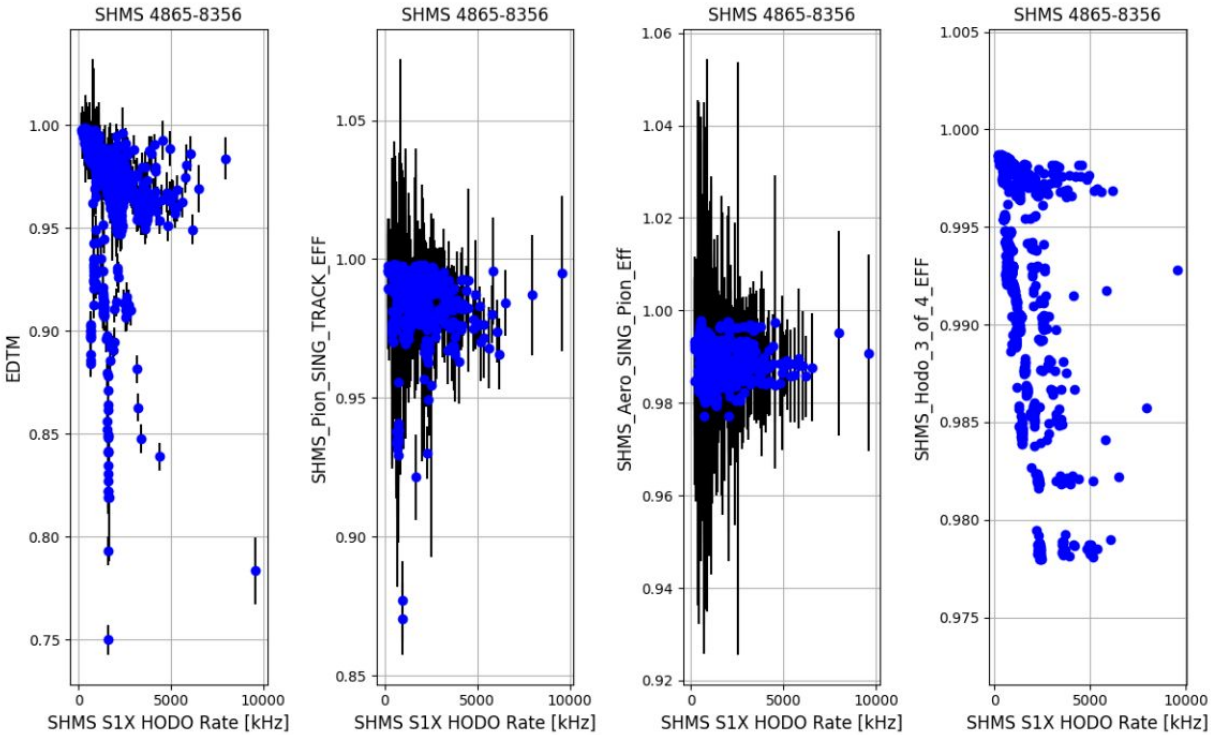

To Do…

- Key topics
  1. Start looking at offsets now that all issues are resolved (minus the discrepancies in momentum calculations between simc and hcana that Ali is working on)
  2. Check out singles again with updated fixes
  3. Breakdown efficiency plots by setting
  4. Implement other efficiency scripts (e.g. HGcer efficiency)
- Other topics
  1. Replay PionLT 2019 data
  2. Hodo/calorimeter calibrations
  3. Improvements to ltsep package implemented to all analysis scripts
  4. Start looking at Bill's cross section code