

# *u*-Channel: PID Corrections

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- PID cuts for protons look something like:

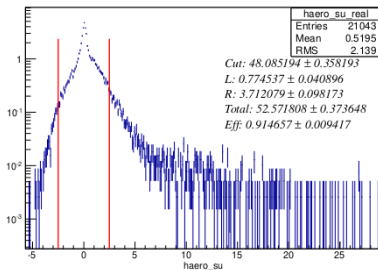
```
P.aero.npeSum<4 && RFTIME.SHMS_RFtimeDist<1.7 &&  
P.hgcer.npeSum<2 && !hgc_hole
```

- The aerogel has an “efficiency” in that some good proton events will Cherenkov due to knock-on electrons
- Garth suggests calling this the “knock-on correction”
- Need to quantify
- What about RF and HGC efficiency?
- HGC hole not considered as an efficiency since same cut is applied to data and SIMC

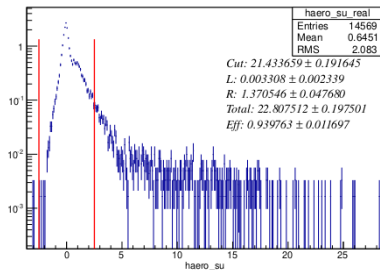
# Previous Approach



- Bill's thesis, *5.3.8 HMS ACD Cut Study for the  $\omega$  Analysis*
- Used Heep Coin data for clean proton sample
- Applied PID, acceptance, coin time, and missing energy cut
- Averaged efficiency over 2 Heep settings  $92.7 \pm 1.6\%$
- Applied as global factor to all  $\omega$  data



(a)  $Q^2 = 4.42 \text{ GeV}^2$



(b)  $Q^2 = 5.42 \text{ GeV}^2$



- Using standard efficiency approach,  $\text{Eff}_{\text{AGC}} = n_{\text{Did}}/n_{\text{Should}}$
- Cuts used for Heep study:

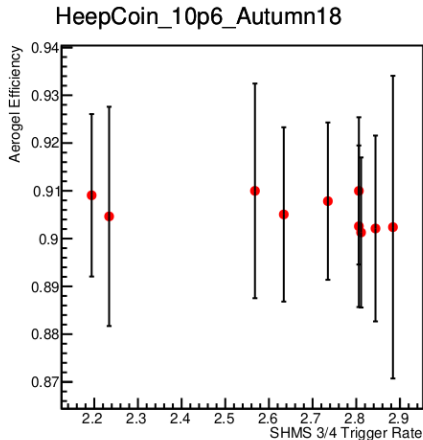
```
Should = abs(CTime.ePCoinTime_ROC1)<2  
&& abs(P.kin.secondary.emiss)<0.05  
&& P.kin.secondary.pmiss<0.05  
&& H.cal.etottracknorm>0.8 && H.cer.npeSum>5  
&& P.hgcer.npeSum<0.05
```

```
Did = nShould && P.aero.npeSum<4
```



$E_B$	$P_{SHMS}$	$\epsilon_{AGC}$
10.6	4.84	$90.1 \pm 0.7 \%$
8.2	4.67	$91.4 \pm 0.7 \%$
6.2	3.49	$93.3 \pm 0.5 \%$

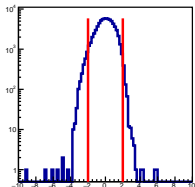
- No rate-dependence visible over available range of rate
- Some dependence on SHMS momentum  $\rightarrow$  trend as expected



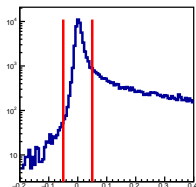
# HeeP Coin Plots 10p6



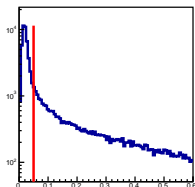
CTime.epCoinTime\_ROC1



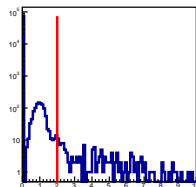
P.kin.secondary.pmiss



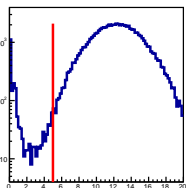
P.kin.secondary.emiss



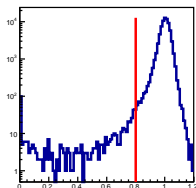
P.hgcer.npeSum



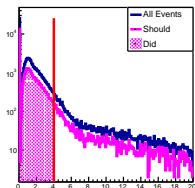
H.cer.npeSum



H.cal.etotracknom



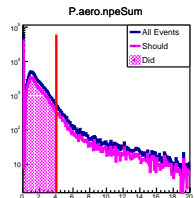
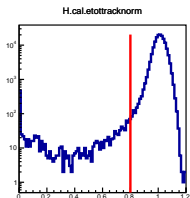
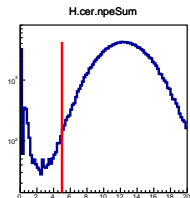
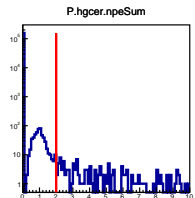
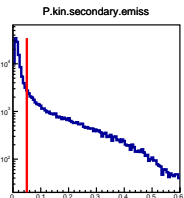
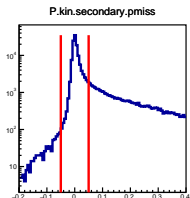
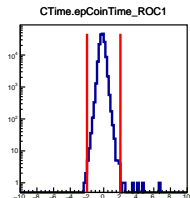
P.aero.npeSum



nShould = 40228.0

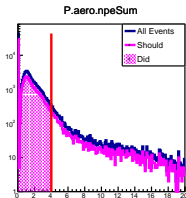
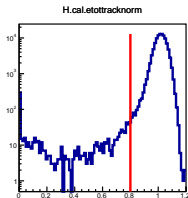
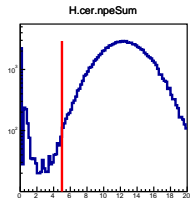
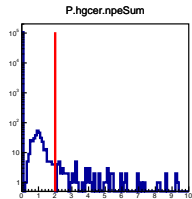
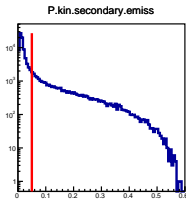
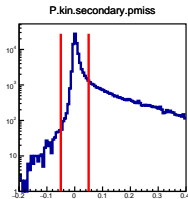
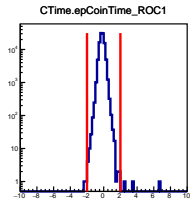
nDid = 36244.0

Efficiency = 0.901±0.007



nShould = 31600.0  
nDid = 28879.0  
Efficiency = 0.914 +/- 0.007

# HeeP Coin Plots 6p2



nShould = 73676.0  
nDid = 68726.0  
Efficiency = 0.933 +/- 0.005



- When calculating the missed triggers correction, we saw that a number of events created knock-ons
- Will this accurately simulate the effect of knock-ons in the aerogel?
- No
- **shmsPA** counts Cherenkov photons, not photo-electrons



- Should be able to do the same calculation in data with a sufficiently clean proton sample
- Why? Larger range of SHMS momentum
- Validate with comparison to Heep coin at similar  $p_{SHMS}$
- Only for settings with functional RF (low  $\epsilon$ )
- Difficulty is acquiring sufficiently clean sample *without AGC*