



# Fall 2017 Commissioning Trigger PID Threshold Scans

Hall-C Commissioning Meeting

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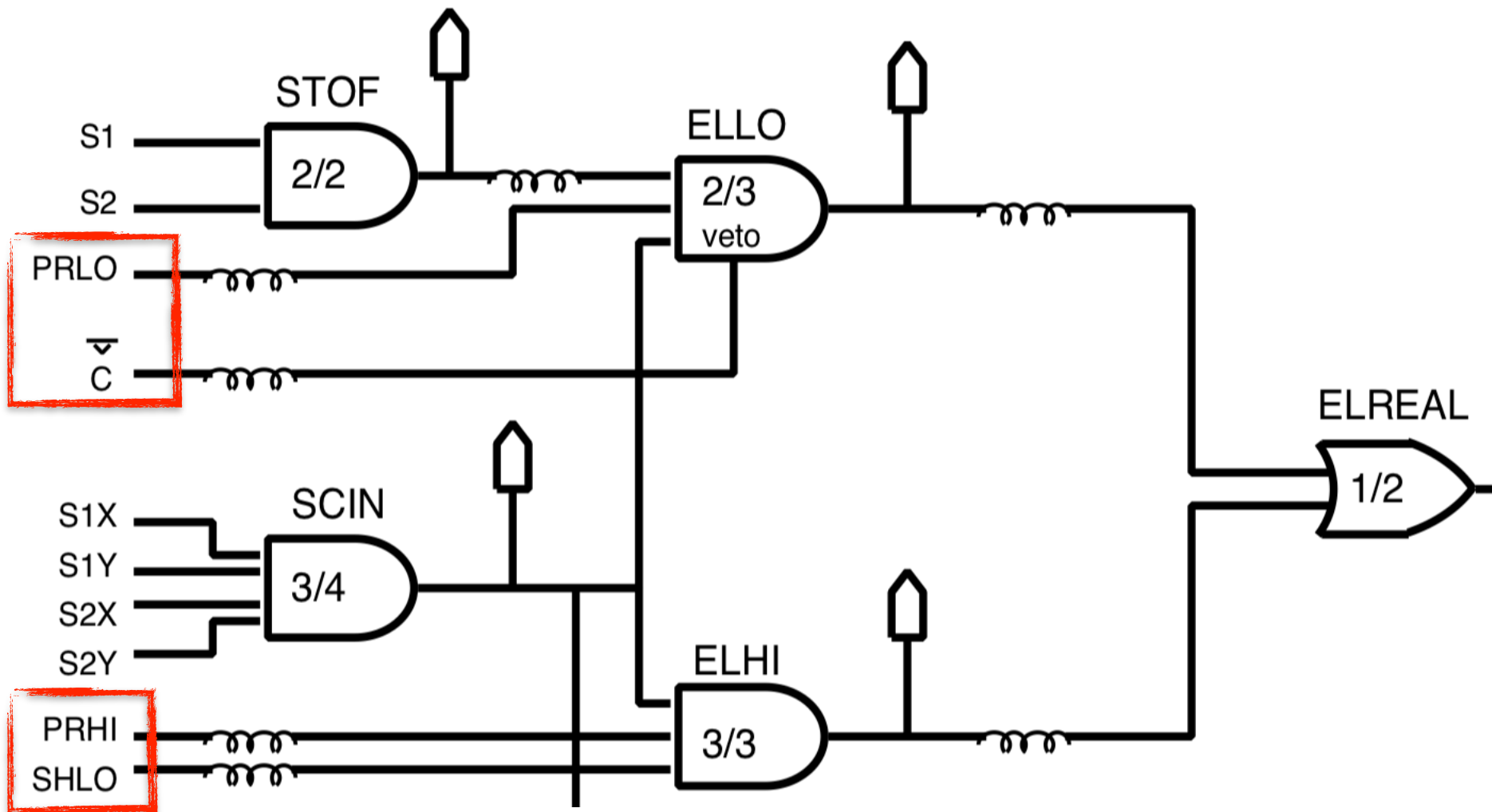
On behalf of the DAQ/Trigger working group



# Low-Level Trigger PID Threshold Scans

- Threshold scans were performed for the various low-level PID trigger legs
- HMS threshold scans
  - Runs 1255-1265
  - $P = -1.0$  GeV,  $\theta = -14^\circ$ , 0.5% C
- SHMS threshold scans
  - Runs 1678-1684
  - $P = -1.785$  GeV,  $\theta = 7.45^\circ$ , 0.5% C

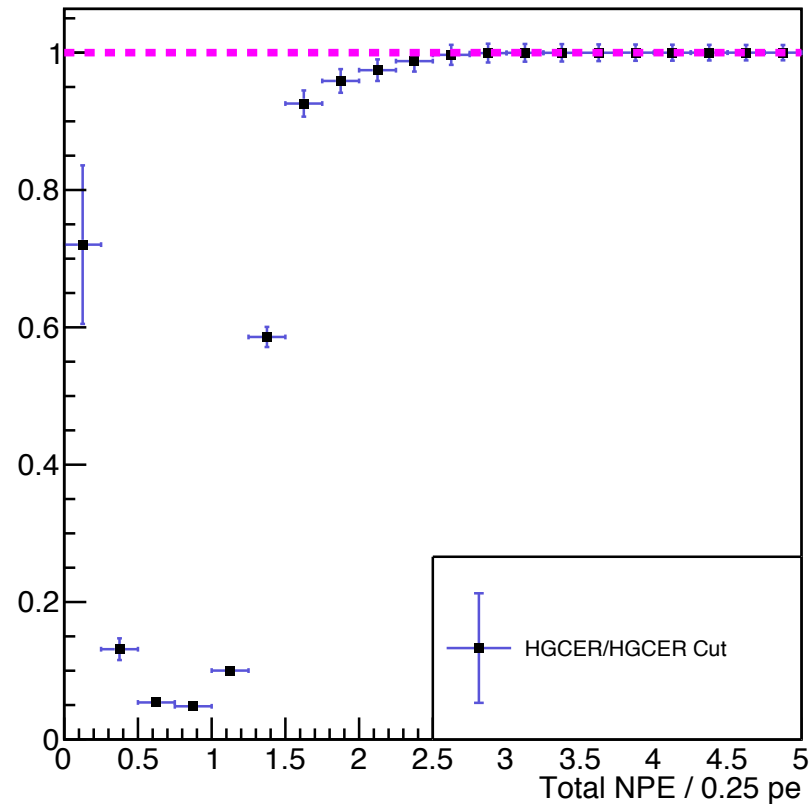
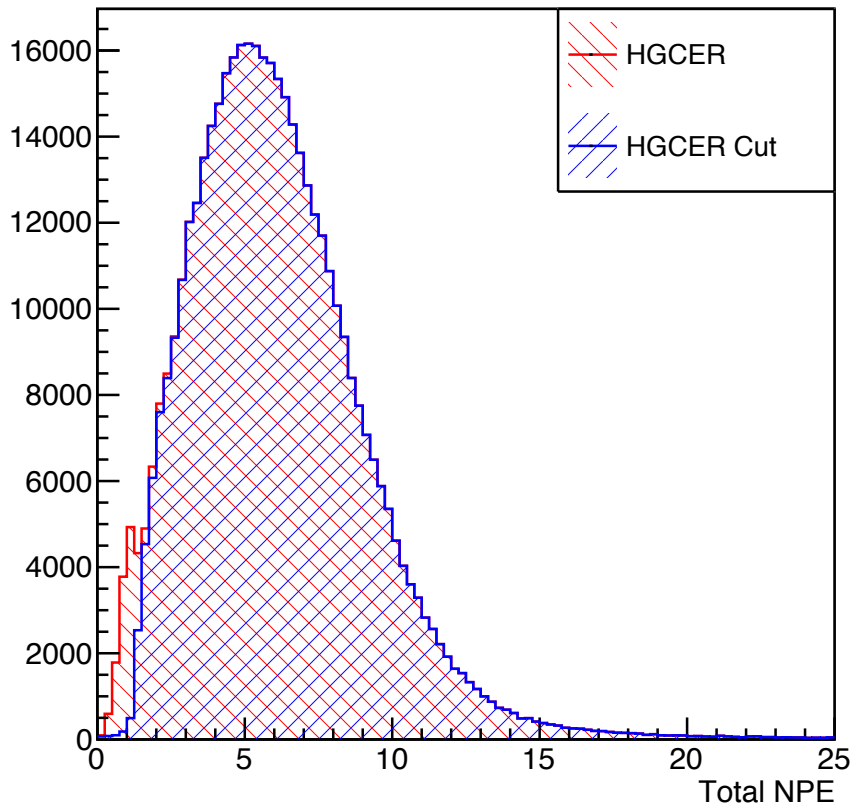
# Low-Level Trigger PID Threshold Scans



# SHMS Heavy Gas Cherenkov PID

## Heavy Gas Cerenkov PID

P.hgcer.npeSum {P.hgcer.npeSum>0.0&&T.shms.pHGCSUM\_tdcTimeRaw>0.0}

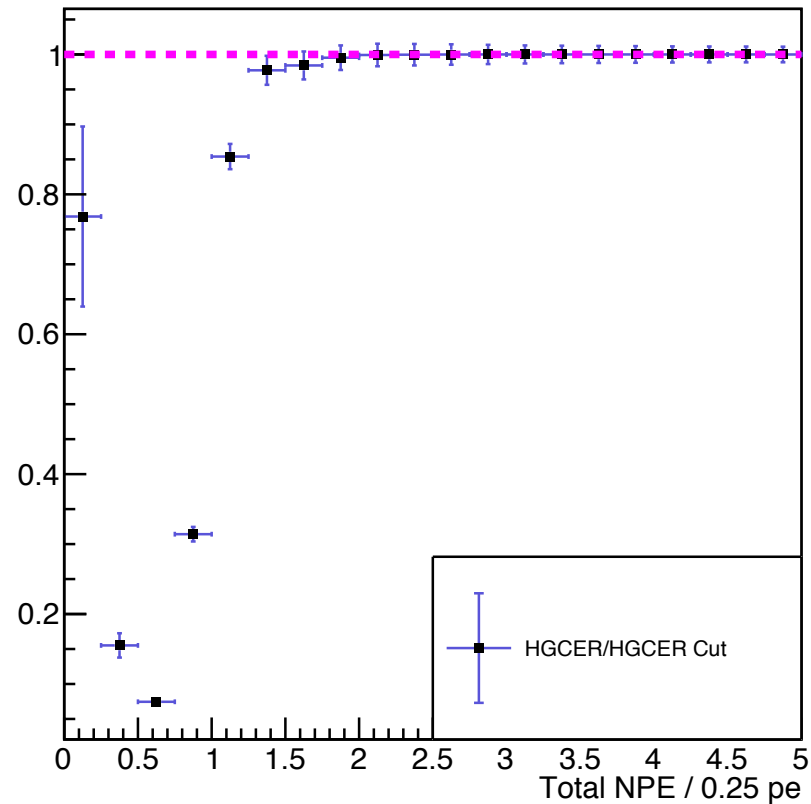
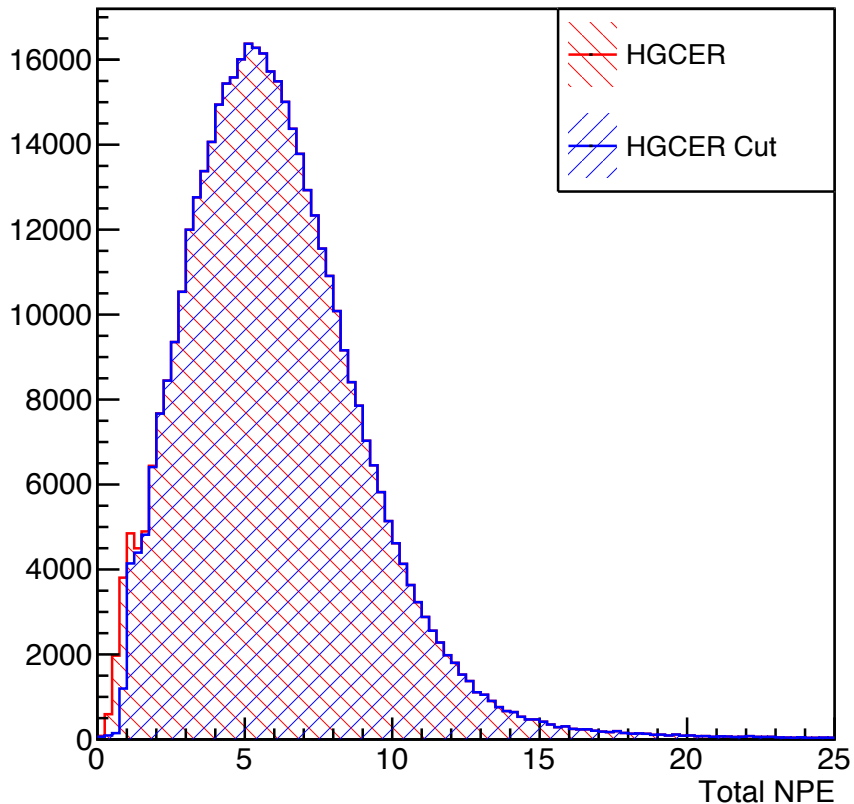


Run	HG CER	PRLO	PRHI
1678	40	40	60

# SHMS Heavy Gas Cherenkov PID

## Heavy Gas Cerenkov PID

P.hgcer.npeSum {P.hgcer.npeSum>0.0&&T.shms.pHGCSUM\_tdcTimeRaw>0.0}

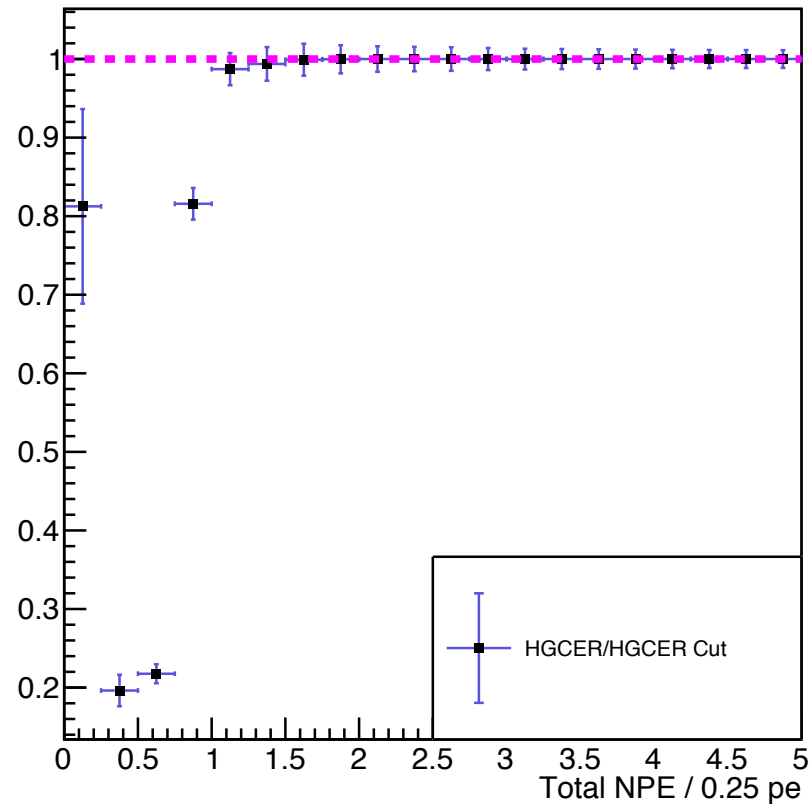
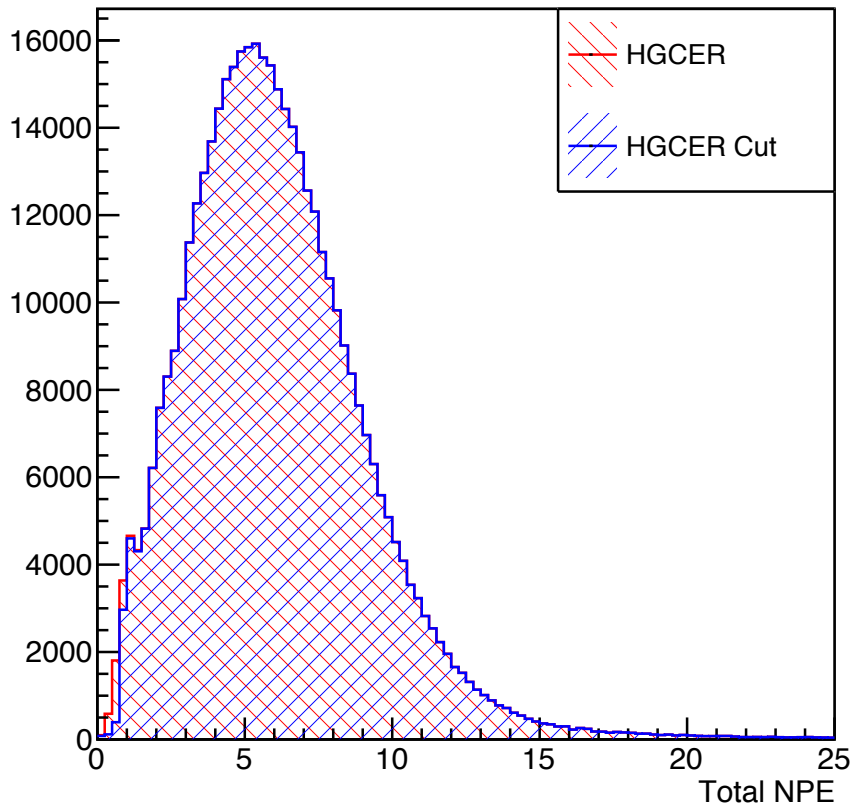


Run	HG CER	PRLO	PRHI
1680	30	30	50

# SHMS Heavy Gas Cherenkov PID

## Heavy Gas Cerenkov PID

P.hgcer.npeSum {P.hgcer.npeSum>0.0&&T.shms.pHGCSUM\_tdcTimeRaw>0.0}

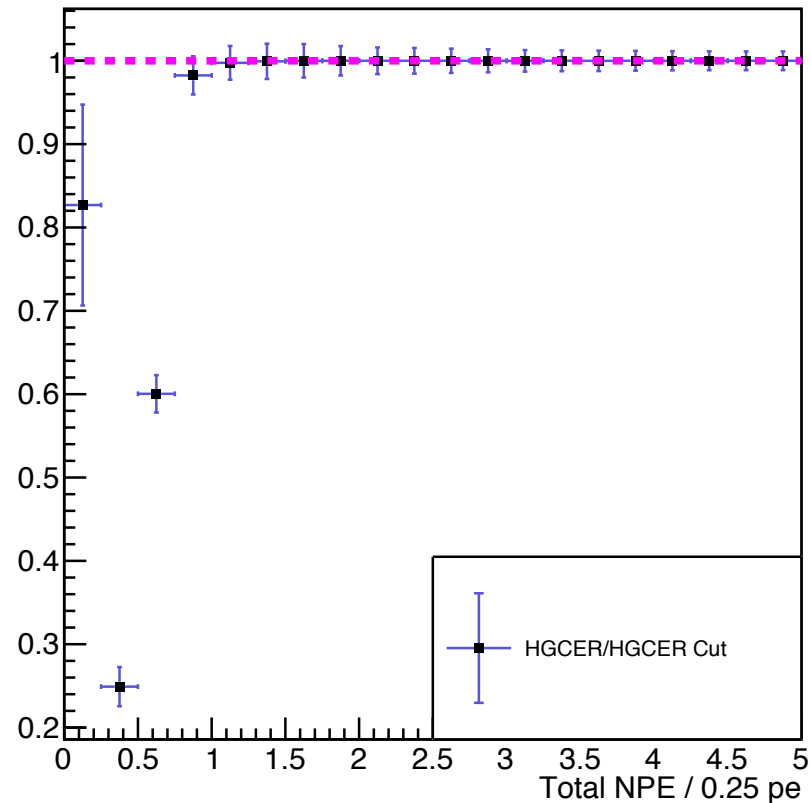
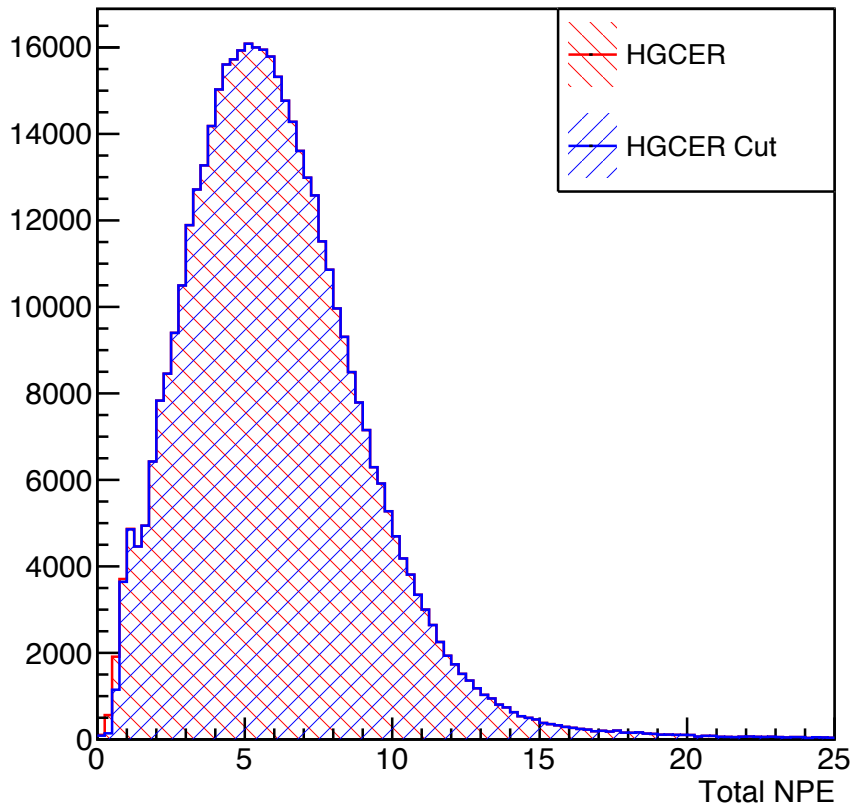


Run	HG CER	PRLO	PRHI
1681	25	25	40

# SHMS Heavy Gas Cherenkov PID

## Heavy Gas Cerenkov PID

P.hgcer.npeSum {P.hgcer.npeSum>0.0&&T.shms.pHGCSUM\_tdcTimeRaw>0.0}

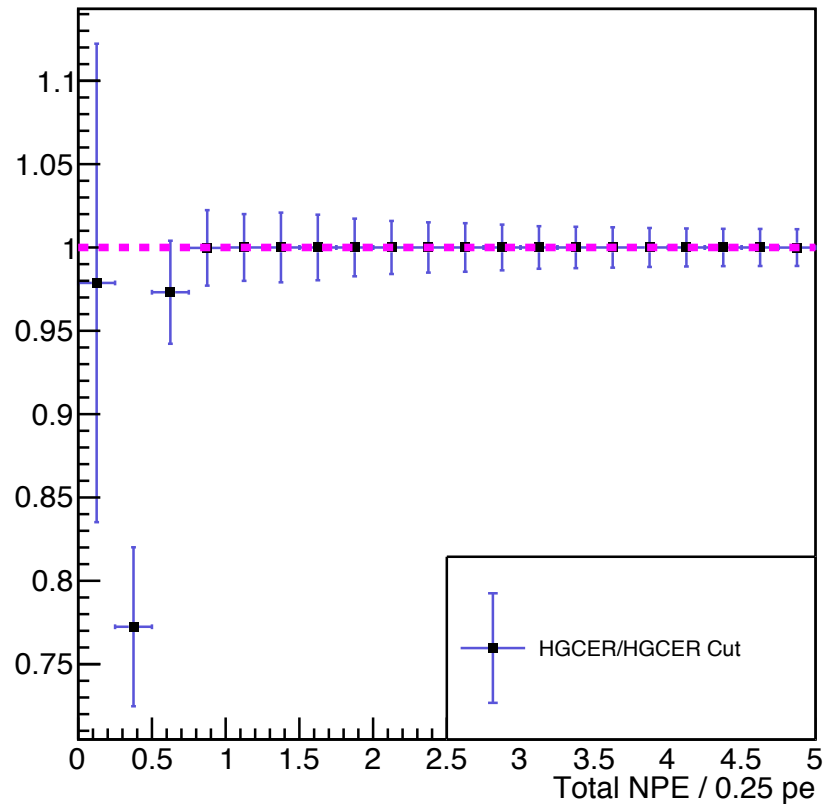
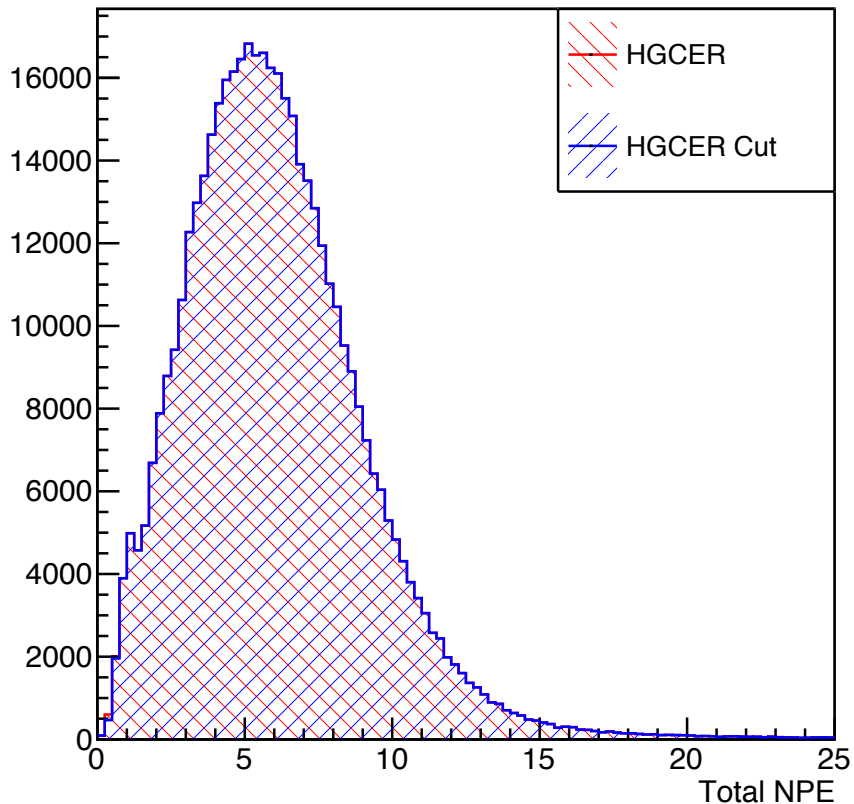


Run	HG CER	PRLO	PRHI
1682	20	20	30

# SHMS Heavy Gas Cherenkov PID

## Heavy Gas Cerenkov PID

P.hgcer.npeSum {P.hgcer.npeSum>0.0&&T.shms.pHGCSUM\_tdcTimeRaw>0.0}



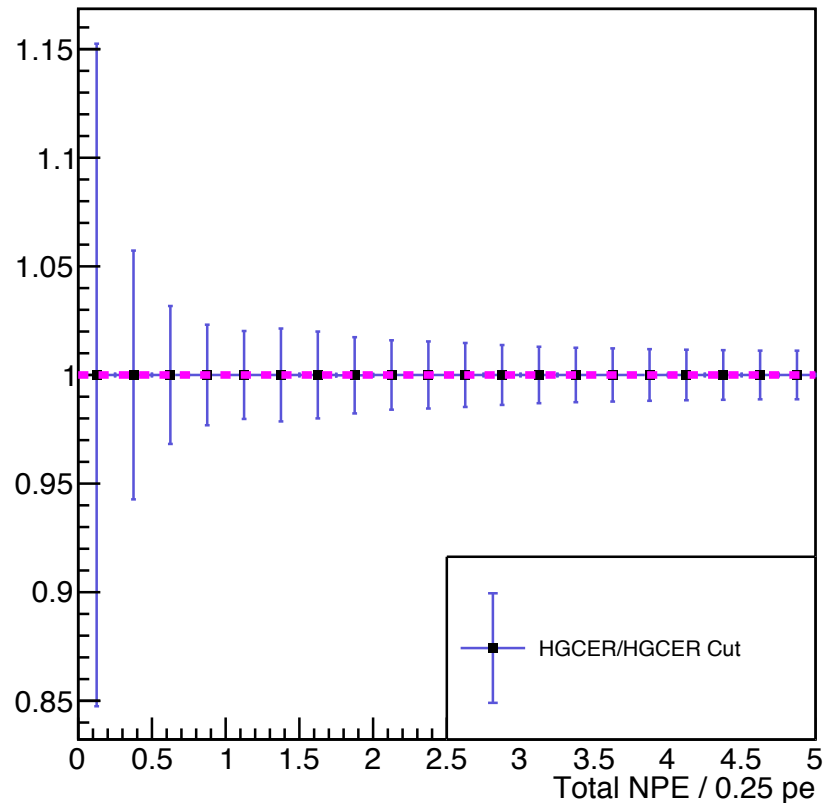
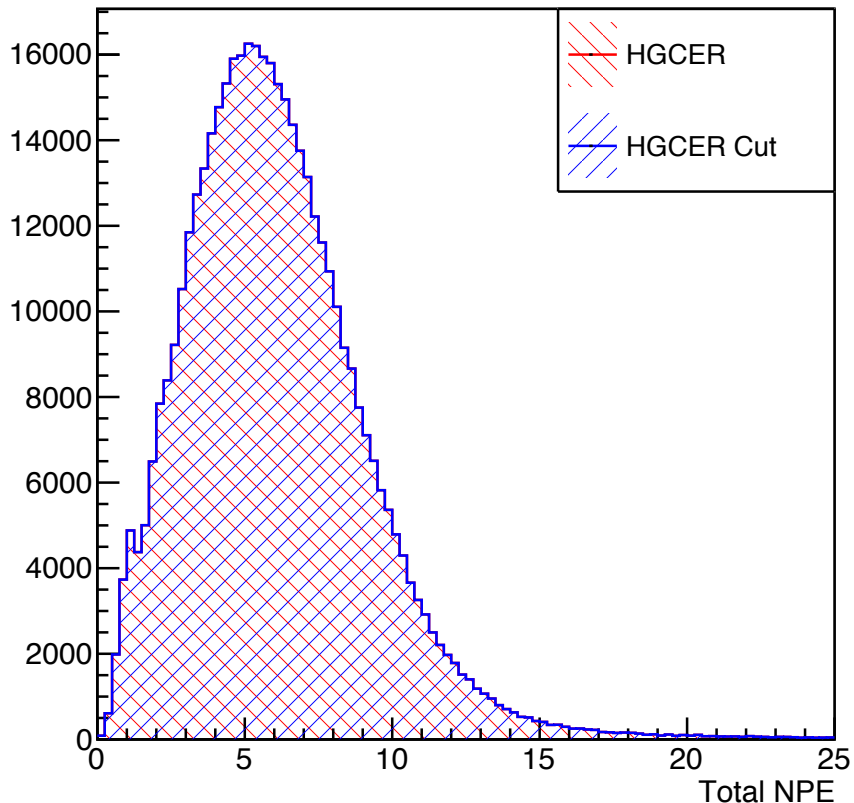
Run	HGCER	PRLO	PRHI
1683	15	15	20



# SHMS Heavy Gas Cherenkov PID

## Heavy Gas Cerenkov PID

P.hgcer.npeSum {P.hgcer.npeSum>0.0&&T.shms.pHGCSUM\_tdcTimeRaw>0.0}

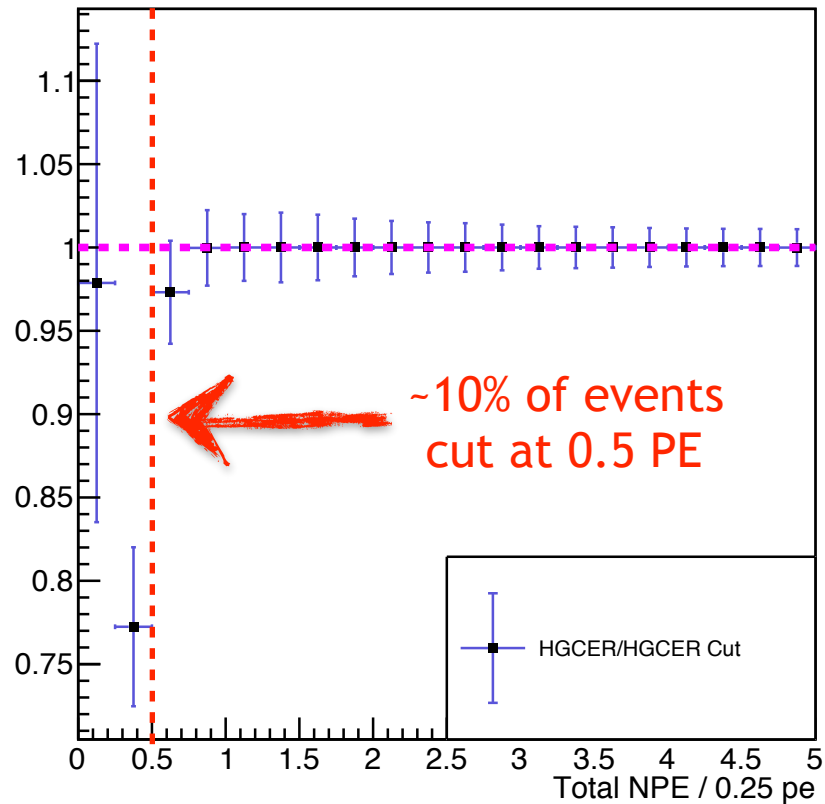
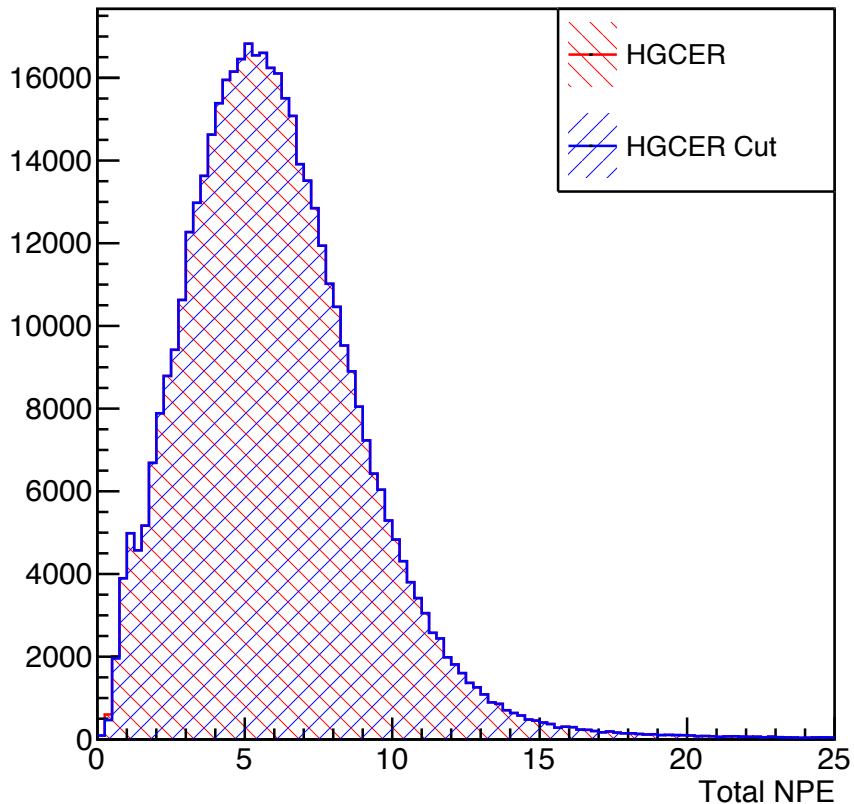


Run	HG CER	PRLO	PRHI
1684	10	10	10

# SHMS Heavy Gas Cherenkov PID

## Heavy Gas Cerenkov PID

P.hgcer.npeSum {P.hgcer.npeSum>0.0&T.shms.pHGCSUM\_tdcTimeRaw>0.0}



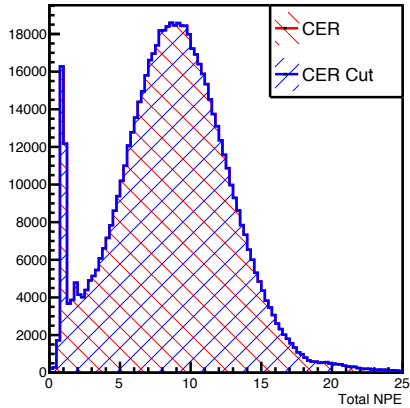
Run	HG CER	PRLO	PRHI
1683	15	15	20

# SHMS Trigger PID Threshold Scans

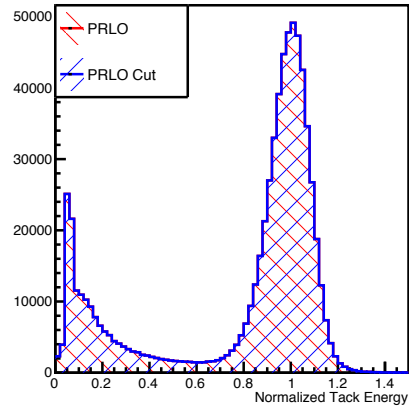
- The ideal threshold for the SHMS Cherenkov trigger was found to be -15 mV
  - Due to the low yield of photo-electrons in the HGC, the NGC will serve as the CER PID leg of the trigger for the spring 2018 run
  - Another threshold scan will need to be conducted for the NGC once beam is available
- The SHMS pre-shower LO & HI leg could not be analyzed since there was a -40 mV DC offset present at the discriminator which went unnoticed during the threshold scans
  - Tools have been developed which will determine the appropriate thresholds in a timely manner
  - DC offsets will be closely monitored in the spring run
  - Threshold scan will be conducted during the spring run

# HMS PID

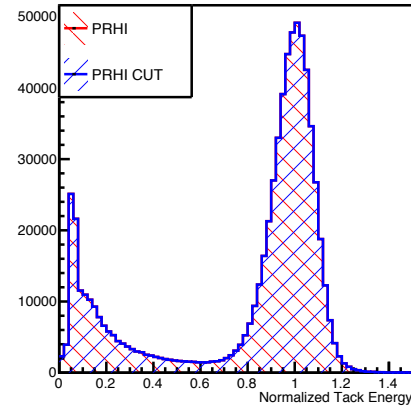
Cerenkov PID



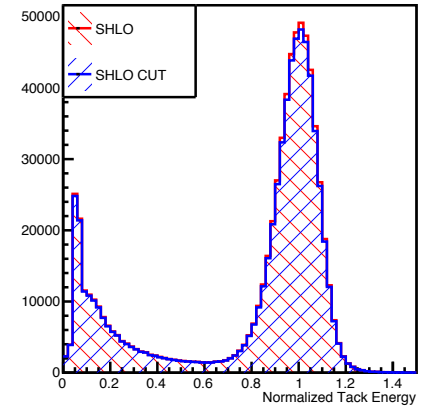
PRLO PID



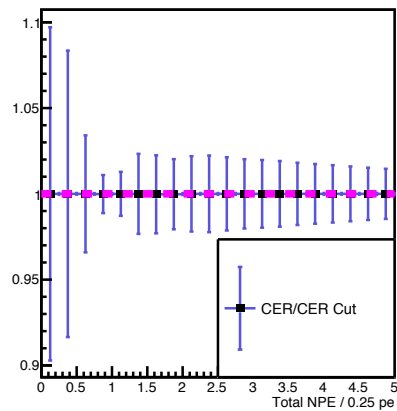
PRHI PID



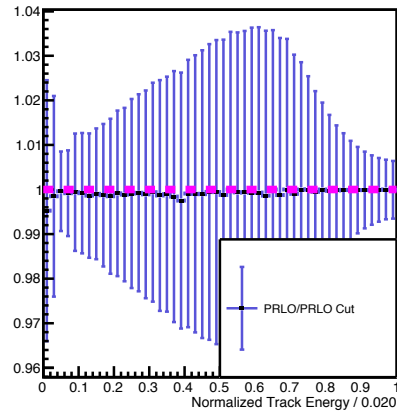
SHLO PID



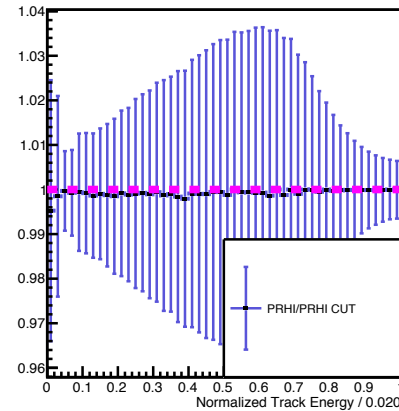
H.cer.npeSum (H.cer.npeSum>0.0&&T.hms.hCERSUM\_idcTimeRaw>0.0)



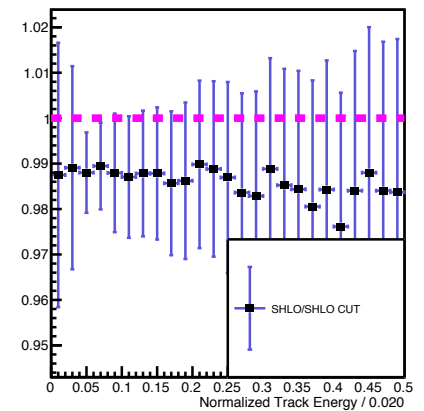
H.cal.etotracknorm (H.cal.etotracknorm>0.0&&T.hms.hPSHWPRLO\_idcTimeRaw>0.0)



H.cal.etotracknorm (H.cal.etotracknorm>0.0&&T.hms.hPSHWPRHI\_idcTimeRaw>0.0)



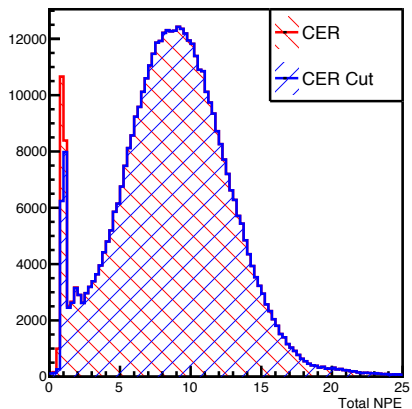
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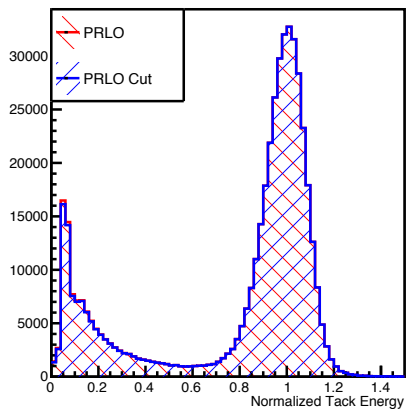
Run	HGCER	PRLO	PRHI	SHLO
1261	10	10	10	10

# HMS PID

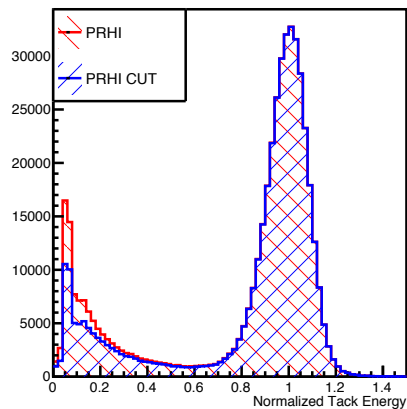
Cerenkov PID



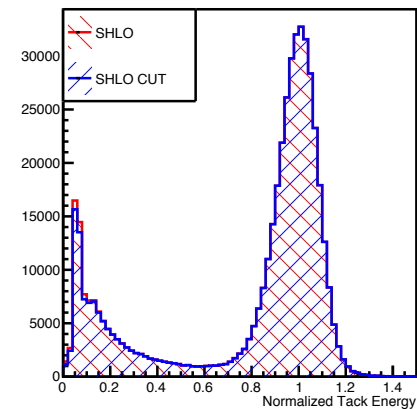
PRLO PID



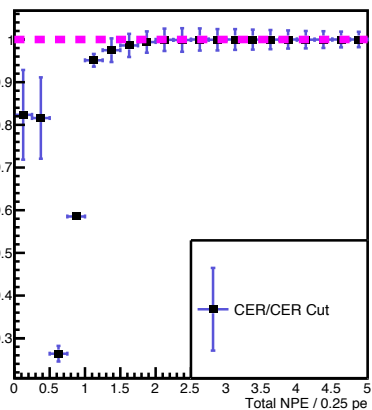
PRHI PID



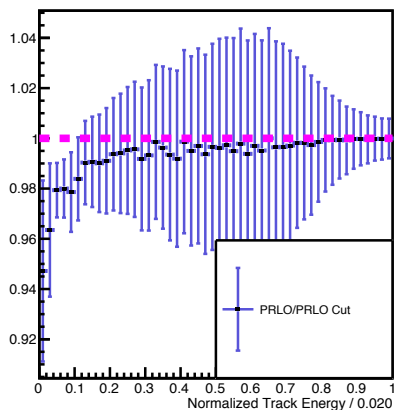
SHLO PID



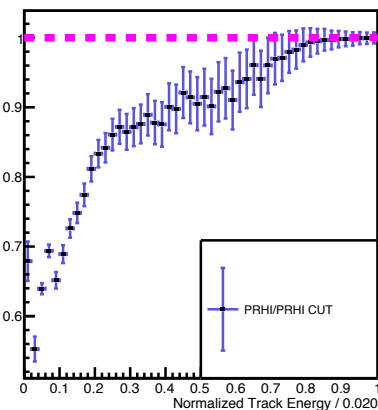
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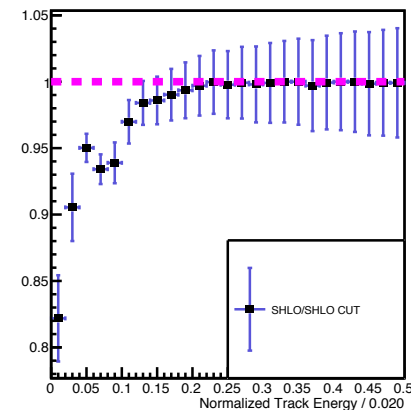
H.cal.etotracknorm (H.cal.etotracknorm>0.0&&T.hms.hPSHWPRLO\_idcTimeRaw>0.0)



H.cal.etotracknorm (H.cal.etotracknorm>0.0&&T.hms.hPSHWPRHI\_idcTimeRaw>0.0)



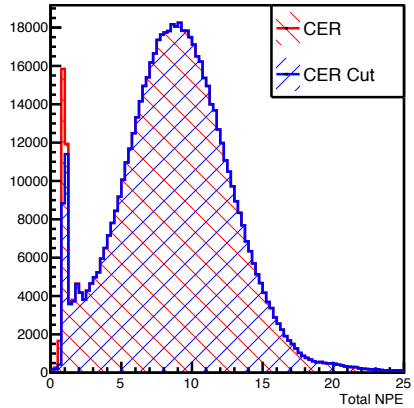
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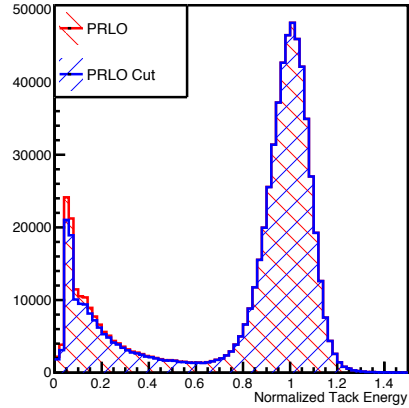
Run	HGCER	PRLO	PRHI	SHLO
1262	15	15	25	25

# HMS PID

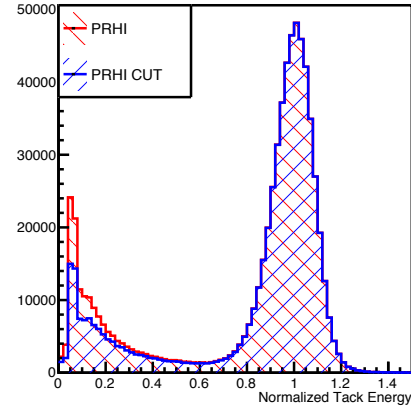
Cerenkov PID



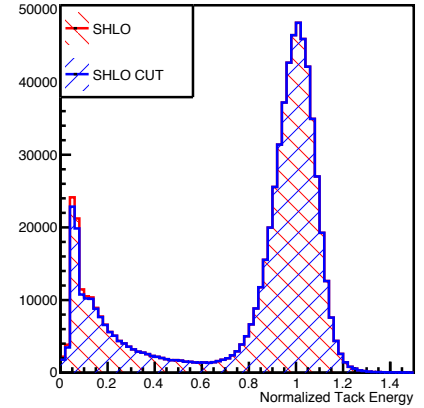
PRLO PID



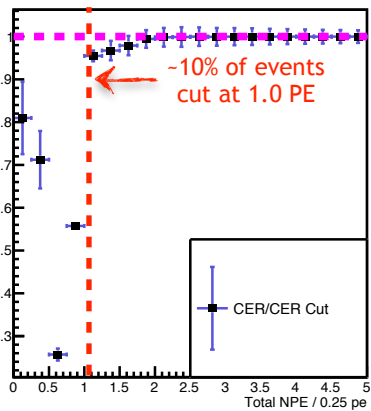
PRHI PID



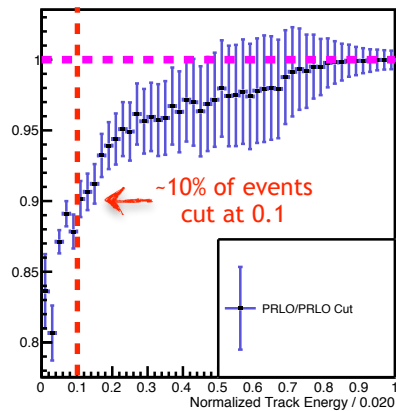
SHLO PID



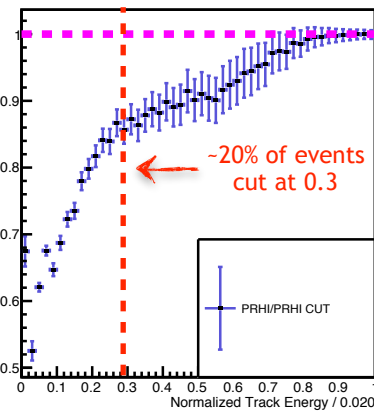
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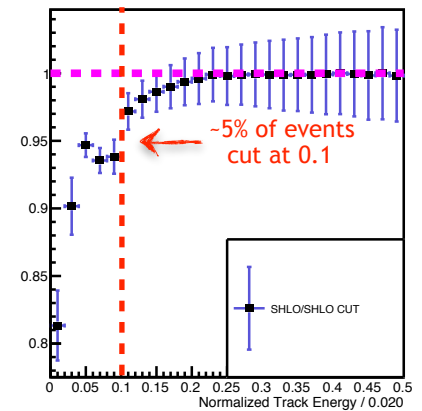
H.cal.etotracknorm (H.cal.etotracknorm=0.0&T.hms.HPSHWLO\_idcTimeRaw=0.0)



H.cal.etotracknorm (H.cal.etotracknorm=0.0&T.hms.HPSHWRH\_idcTimeRaw=0.0)



H.cal.etotracknorm (H.cal.etotracknorm=0.0&T.hms.HPSHWL\_idcTimeRaw=0.0)



Run	HGCER	PRLO	PRHI	SHLO
1265	15	20	25	25

# HMS Trigger PID Threshold Scans

- The ideal thresholds for the HMS trigger were found to be:
  - CER = -15 mV, PRLO = -20 mV
  - PRHI = -25 mV, SHLO = -25 mV
- Both SHMS and HMS PID trigger thresholds are extremely low
  - ~ 2% of FADC dynamic range
  - Can we not increase the gain of the Cherenkov & calorimeter PMT's to increase the signal sizes?

# Looking Forward

- PID legs of trigger proven to behave as expected during the fall 2017 commissioning run
- Multiple failure points regarding the trigger PID legs and thresholds were identified and understood
  - Control measures are now in place to ensure these types of failures do not occur in the future
- Tools have been developed which allow trigger PID thresholds to be examined in real time
- Standard run plan for future trigger PID threshold scans have been developed and will be executed during the spring 2018 commissioning period