

Background study at the TOF
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Background simulation sample

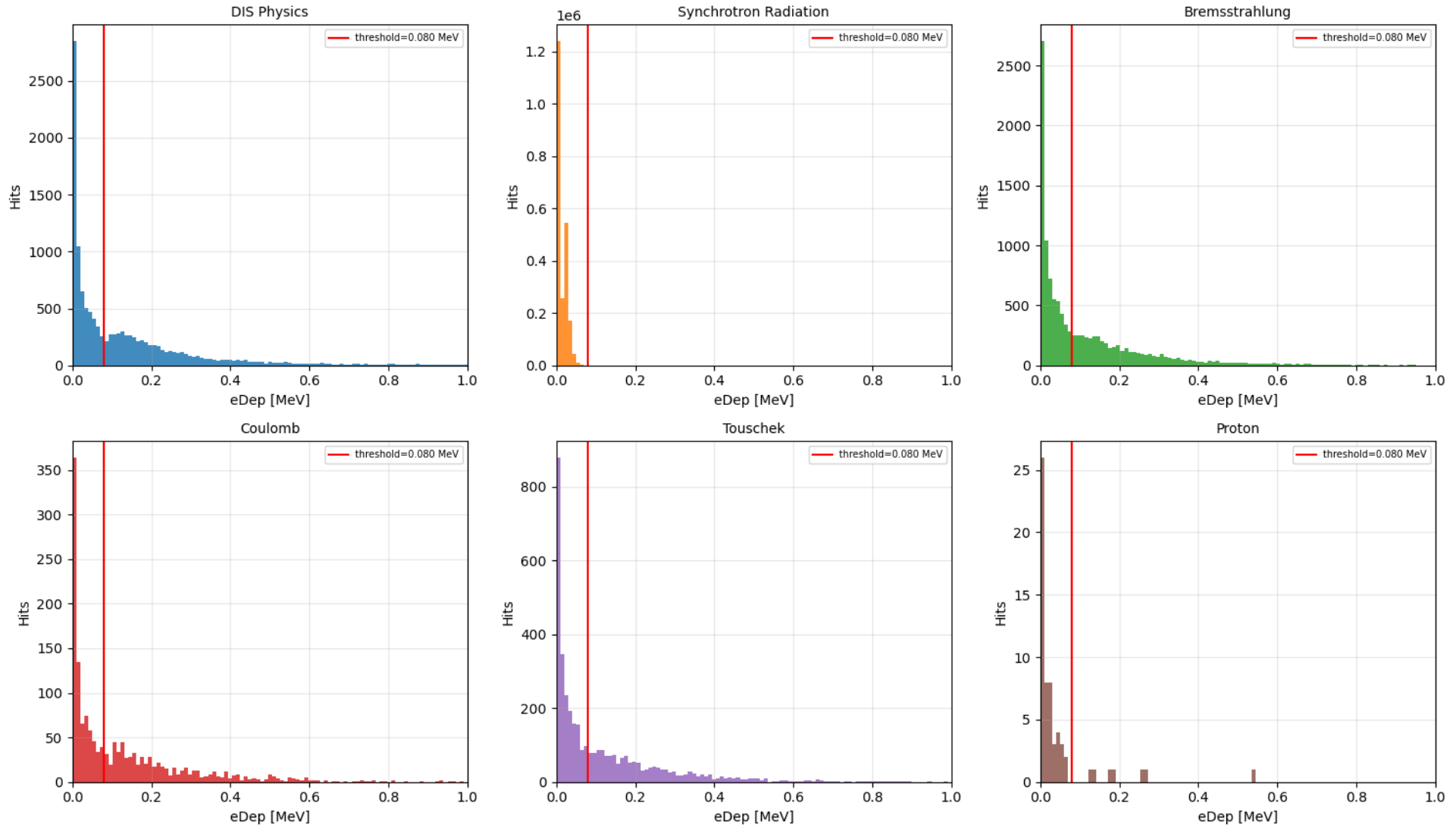
- Use simulation sample prepared for Streaming DAQ study
 - Thanks to Takuya Kumaoka-san
- 10x100 GeV DIS sample with various background processes
 - 1000 events = events/2ms
 - `pythia8NCDIS_10x100_minQ2eq1_WBKG.edm4hep.root`

- No hit to track or truth particle association yet

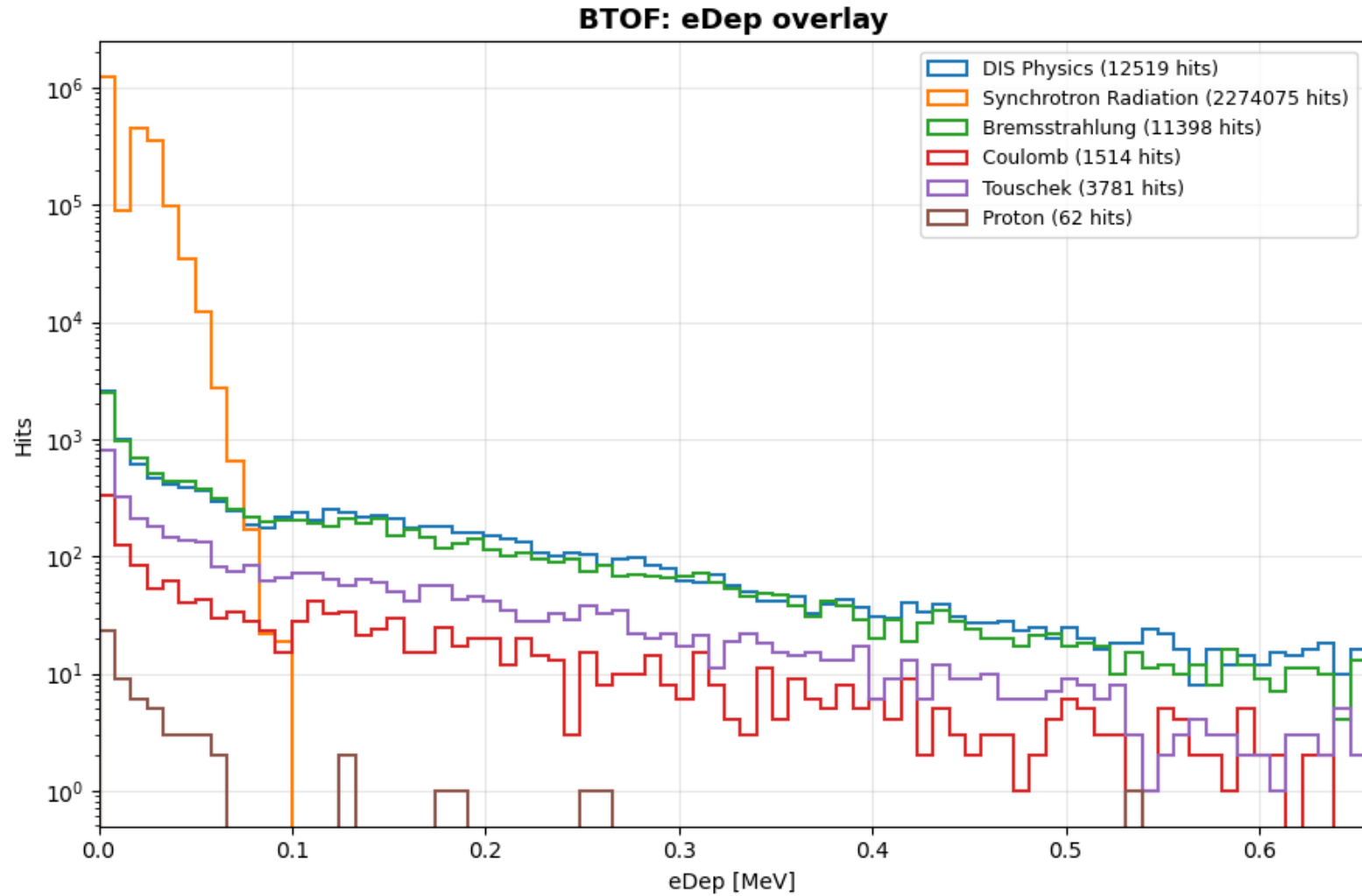
BTOF

BTOF; Hits by process

TOFBarrelHits (BTOF): eDep by Process [MeV] [threshold line = 0.080 MeV]

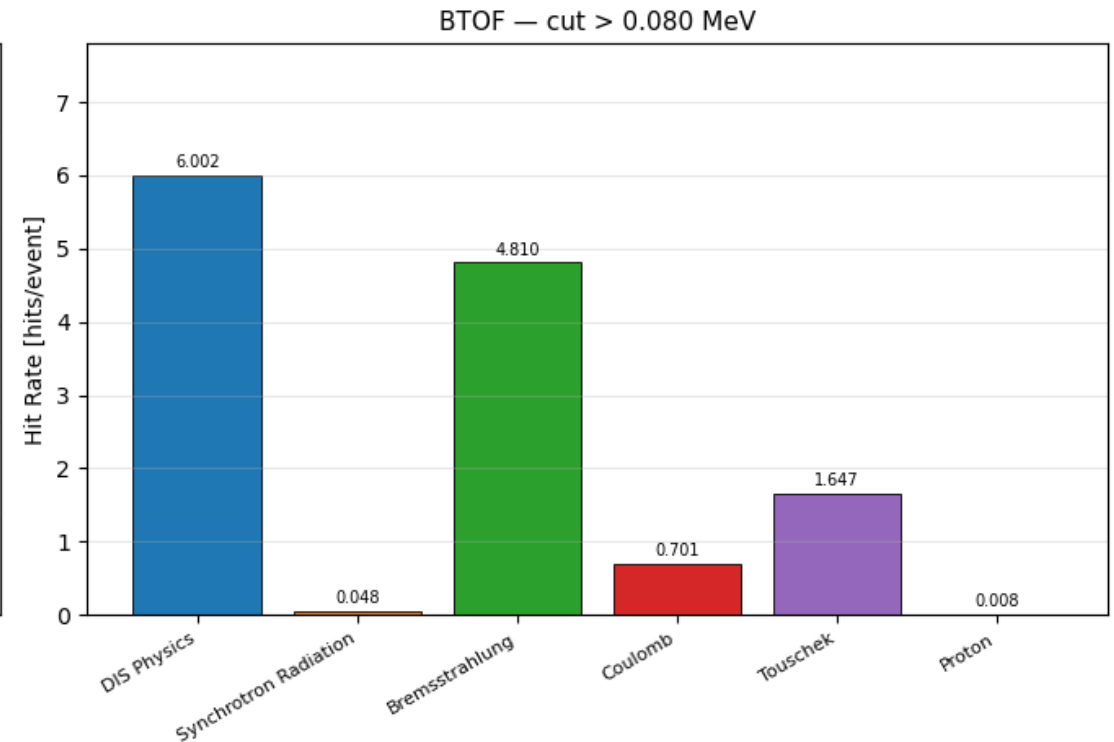
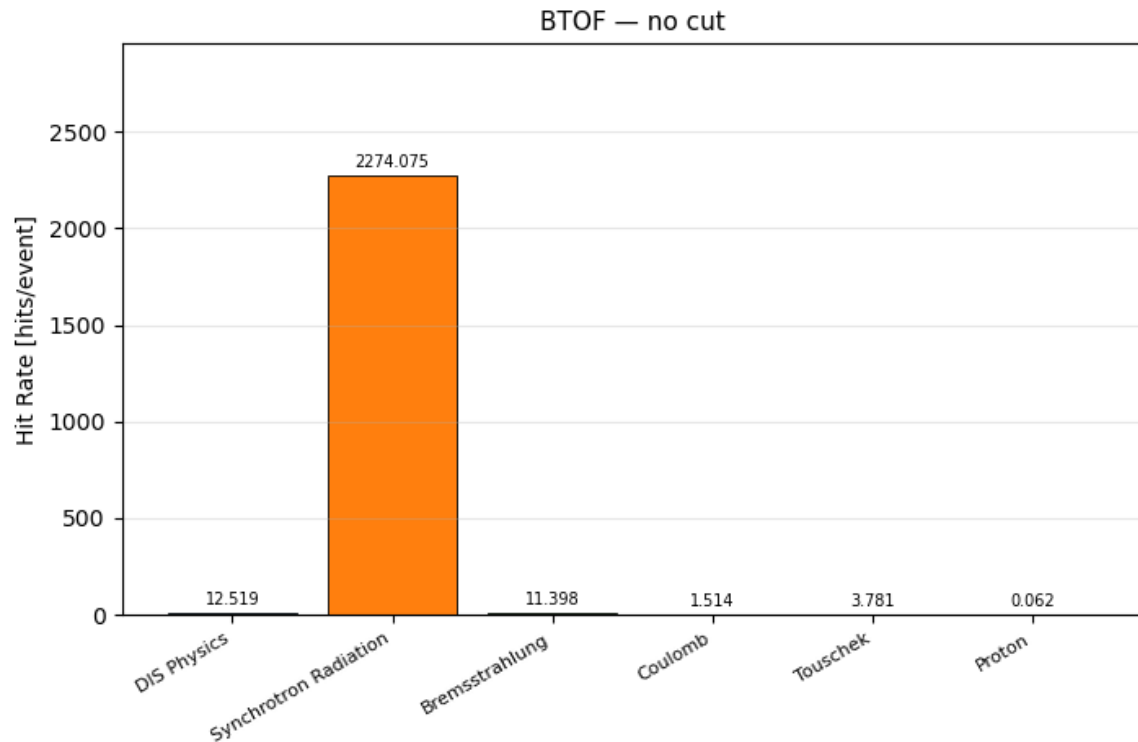


BTOF; Overlaid eDep



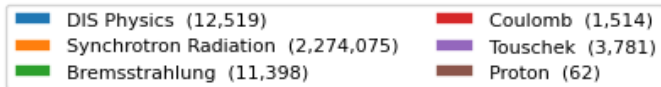
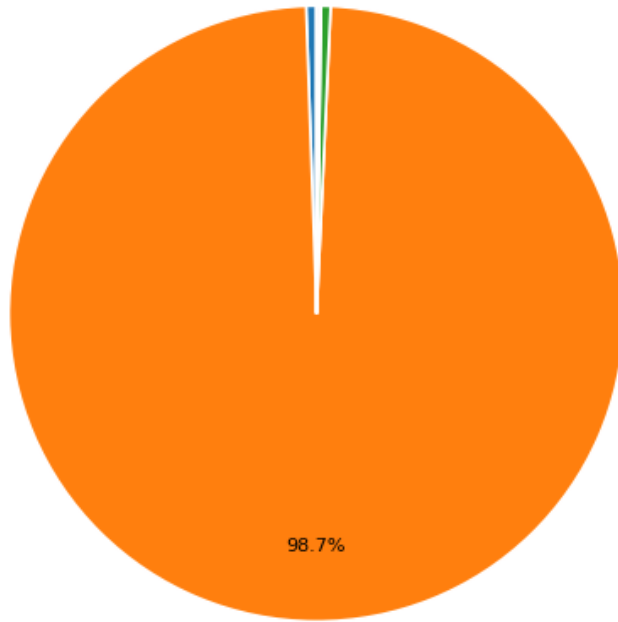
BTOF; Hit rate by process

- Huge but very small hits from SR
 - Can be suppressed by applying threshold (@80 keV)

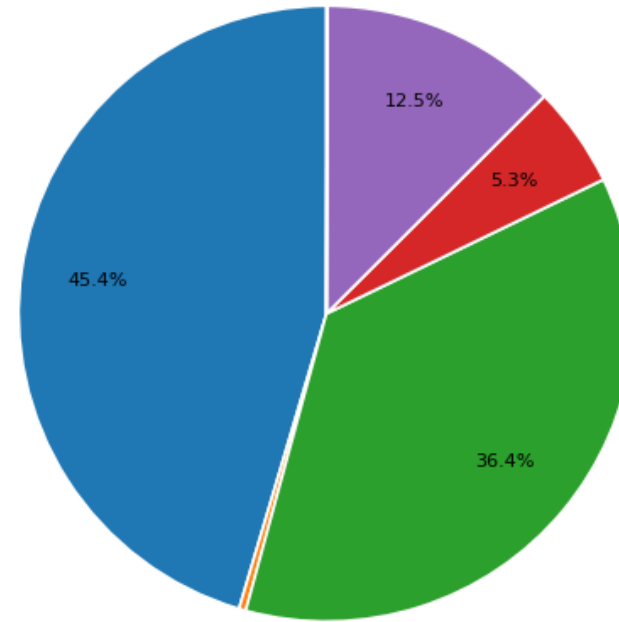


BTOF; Hit rate by process (Circle)

BTOF — no cut
total=2,303,349 hits

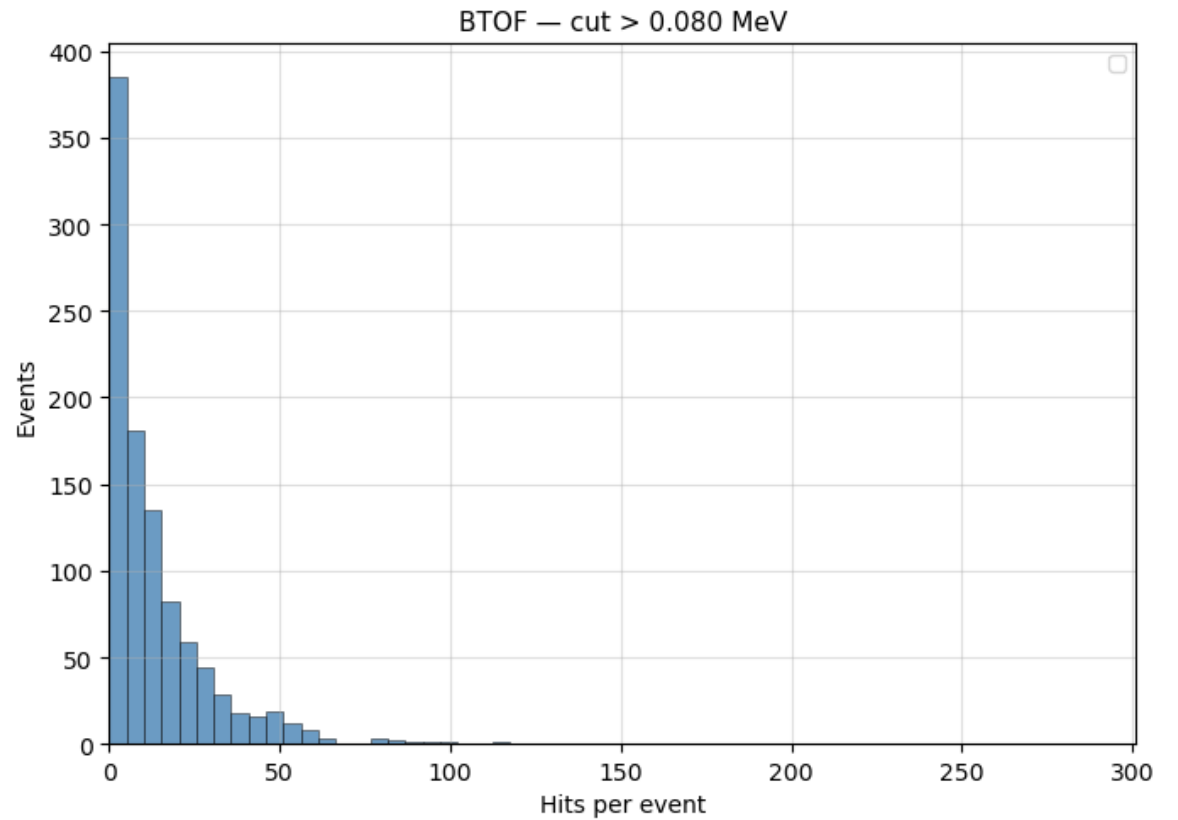
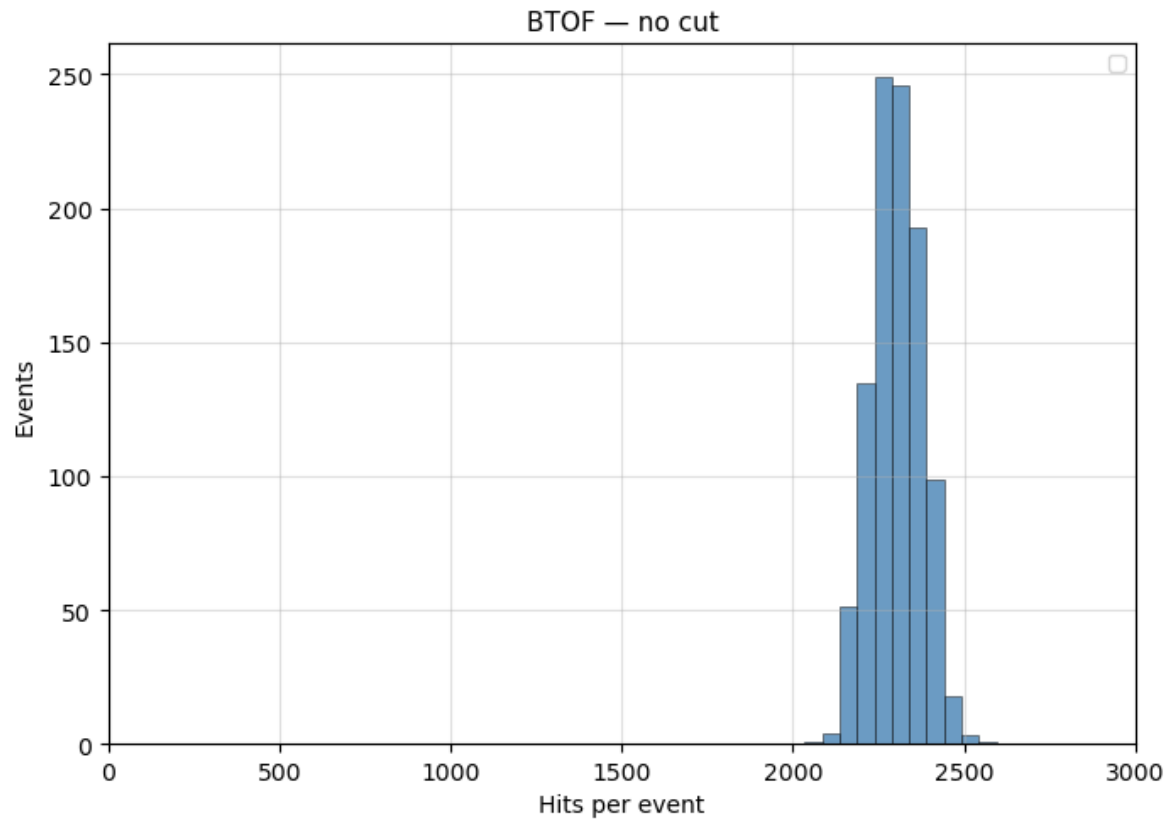


BTOF — cut > 0.080 MeV
total=13,216 hits



BTOF; Multiplicity per event

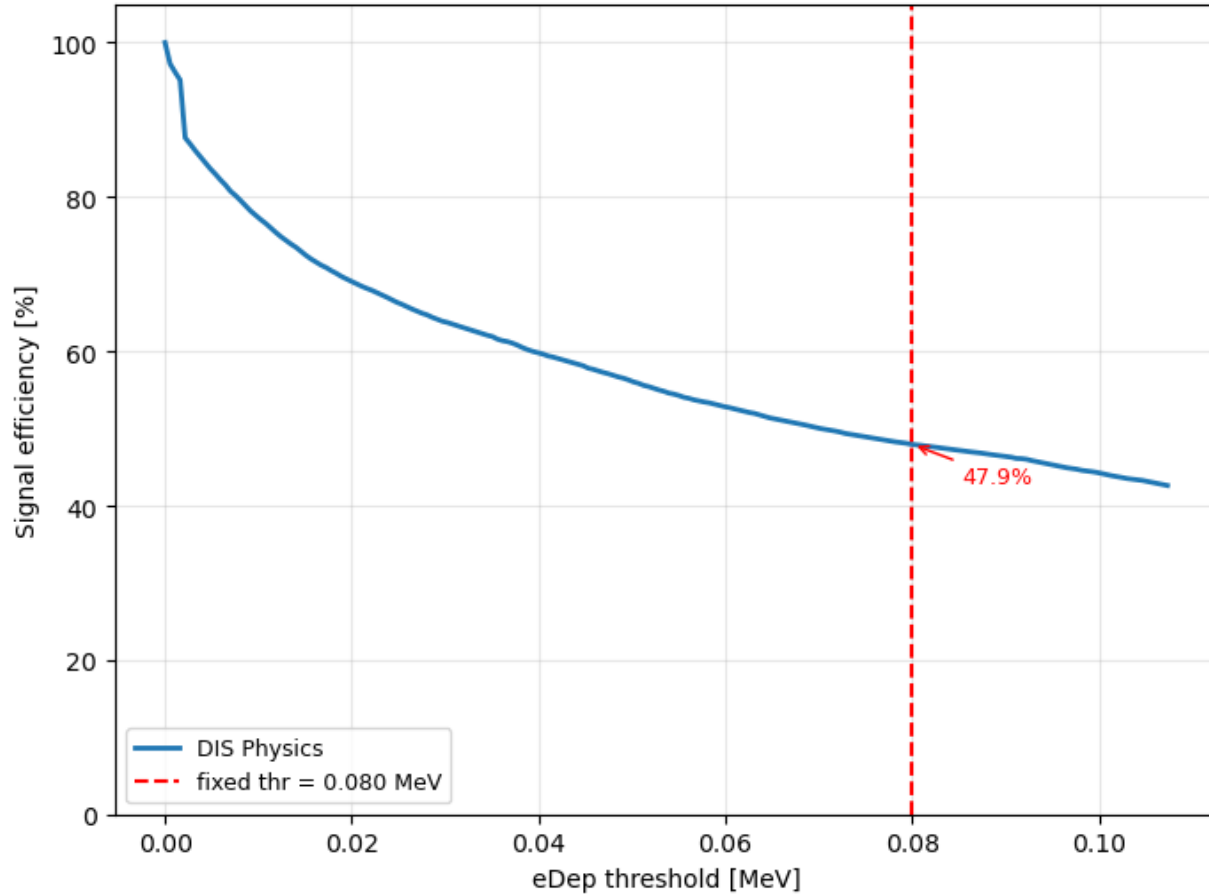
- High but small eDep hits
 - Can be suppressed by eDep cut



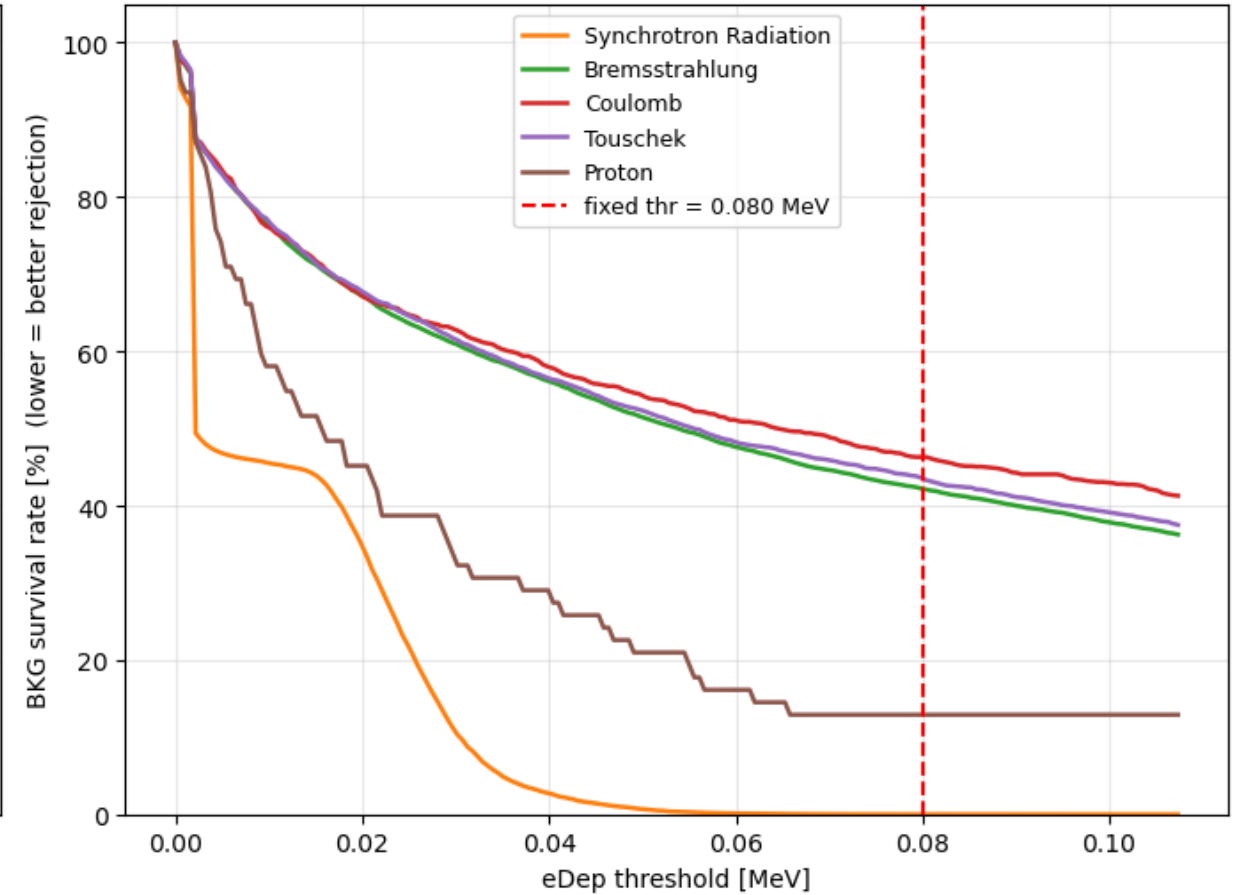
BTOF; Signal efficiency vs threshold

TOFBarrelHits (BTOF): eDep Threshold Scan

DIS Physics — Signal Efficiency

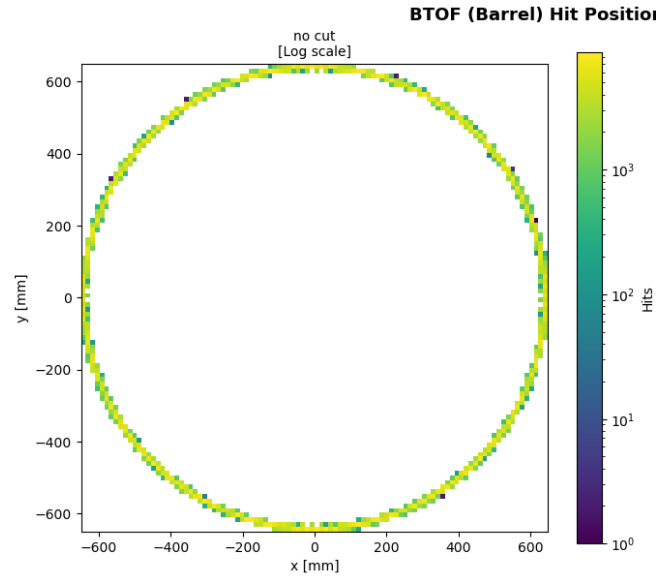


Background — Survival Rate
(= 1 - rejection)

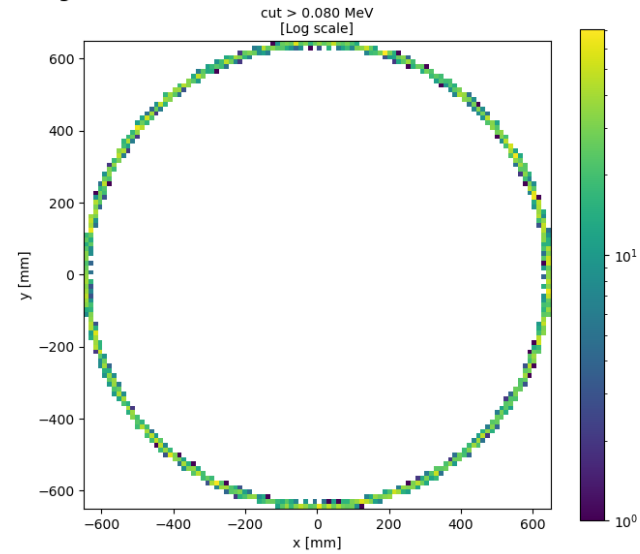


BTOF; Hit profile in 1000 events

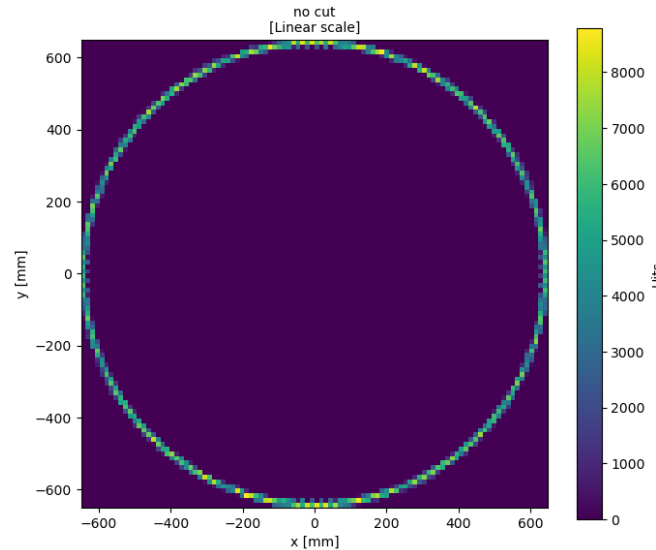
No min edep
Log scale



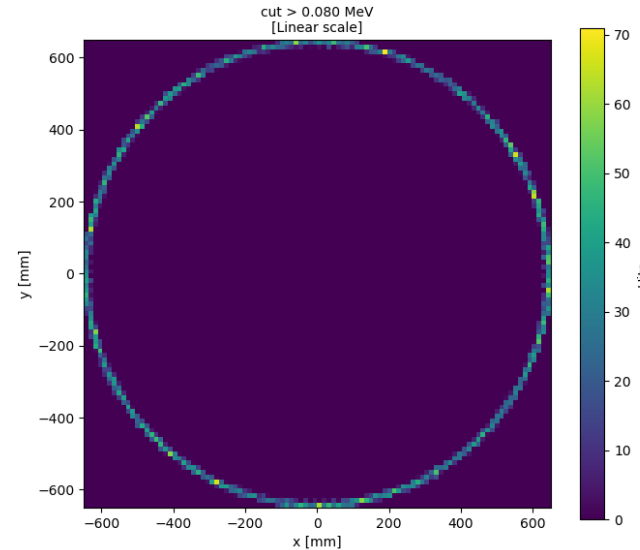
edep > 80 keV
Log scale



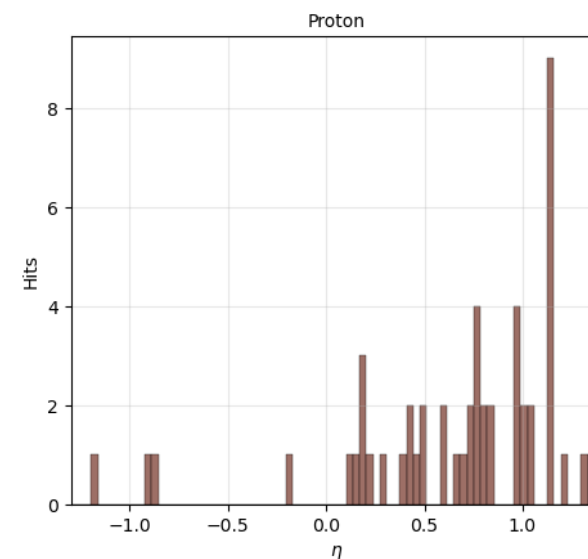
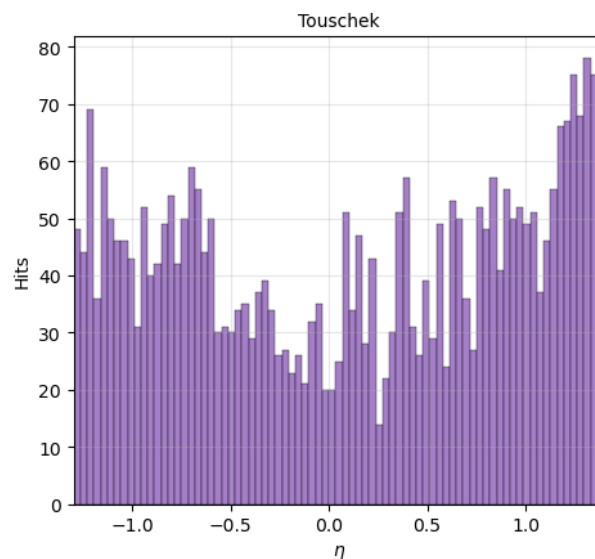
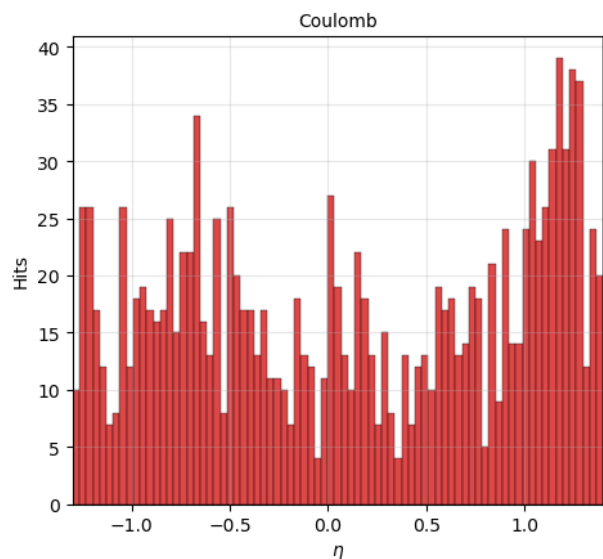
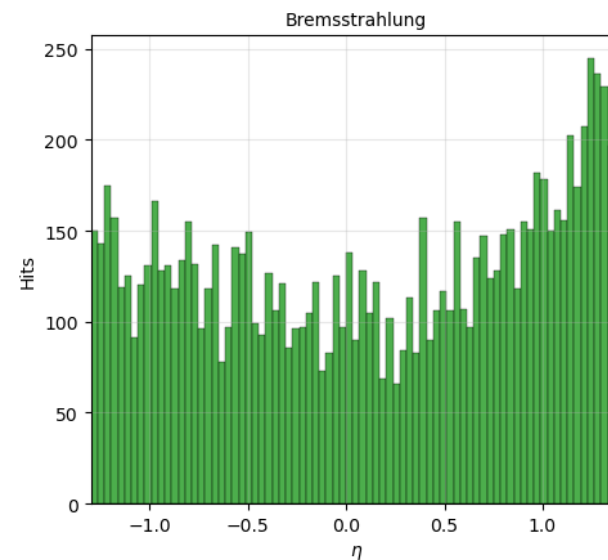
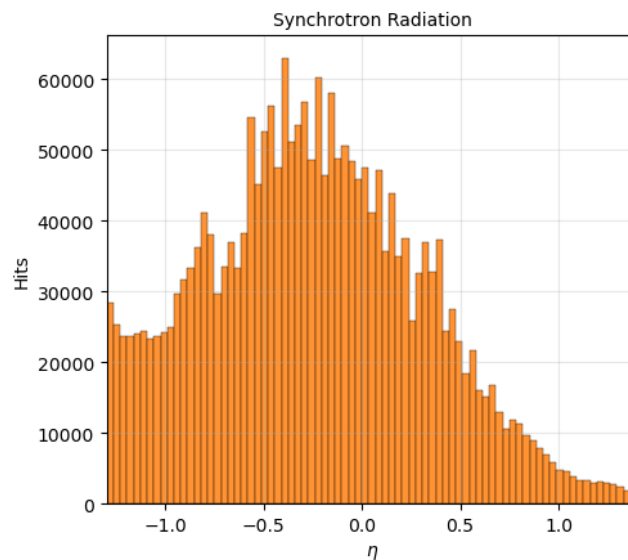
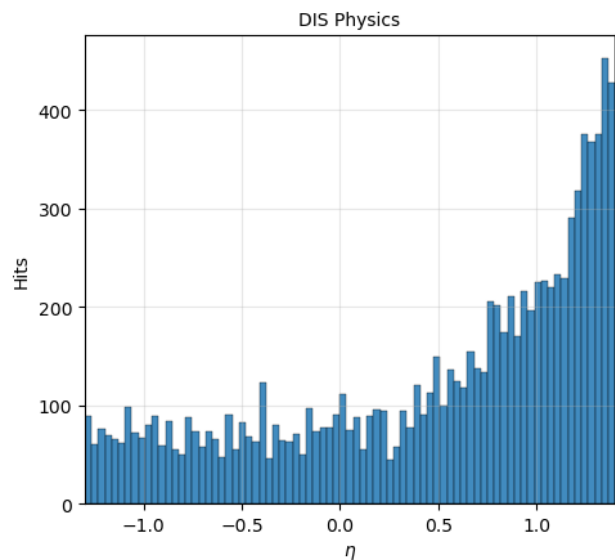
No min edep
Linear scale



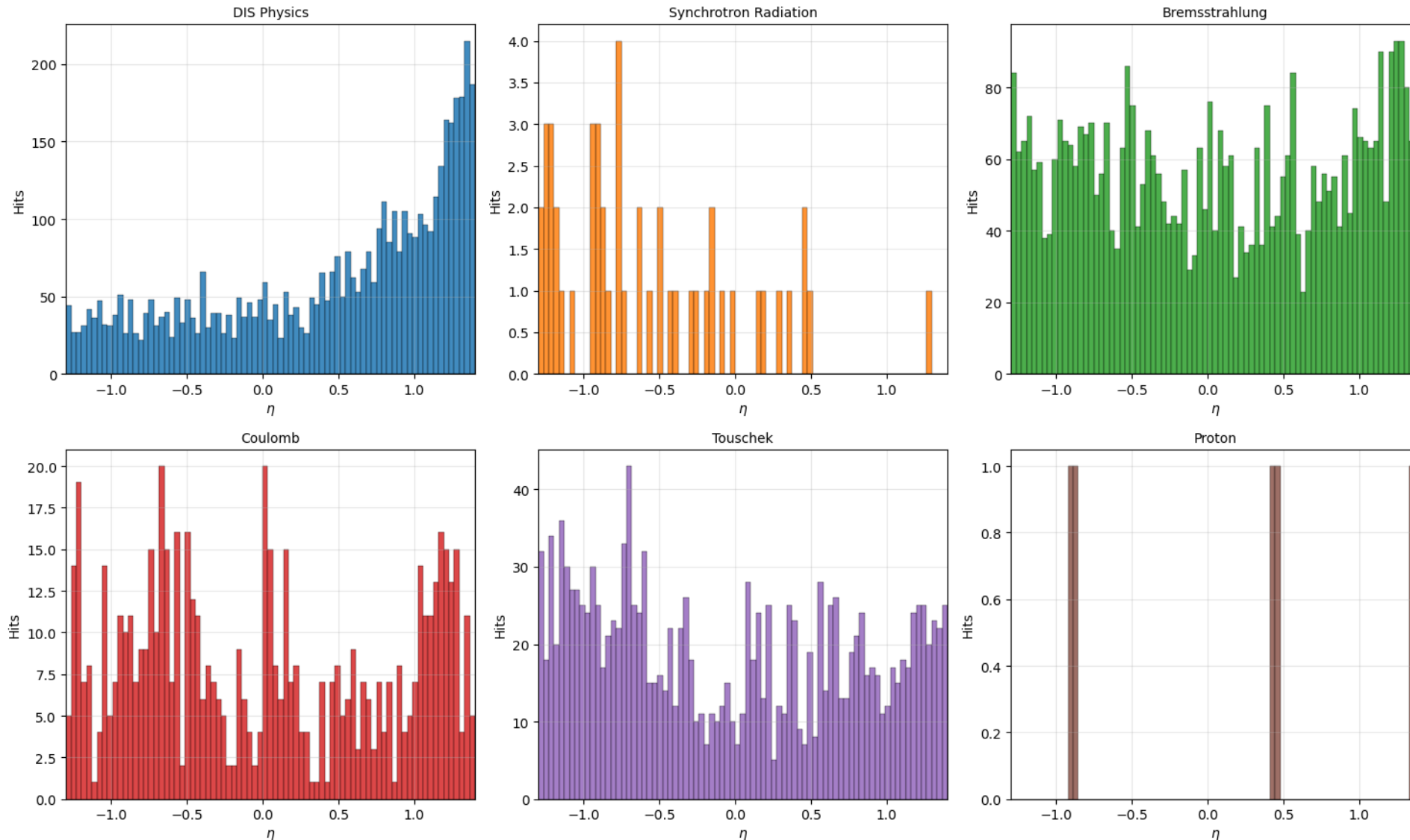
edep > 80 keV
Linear scale



BTOF; Eta distribution by Process



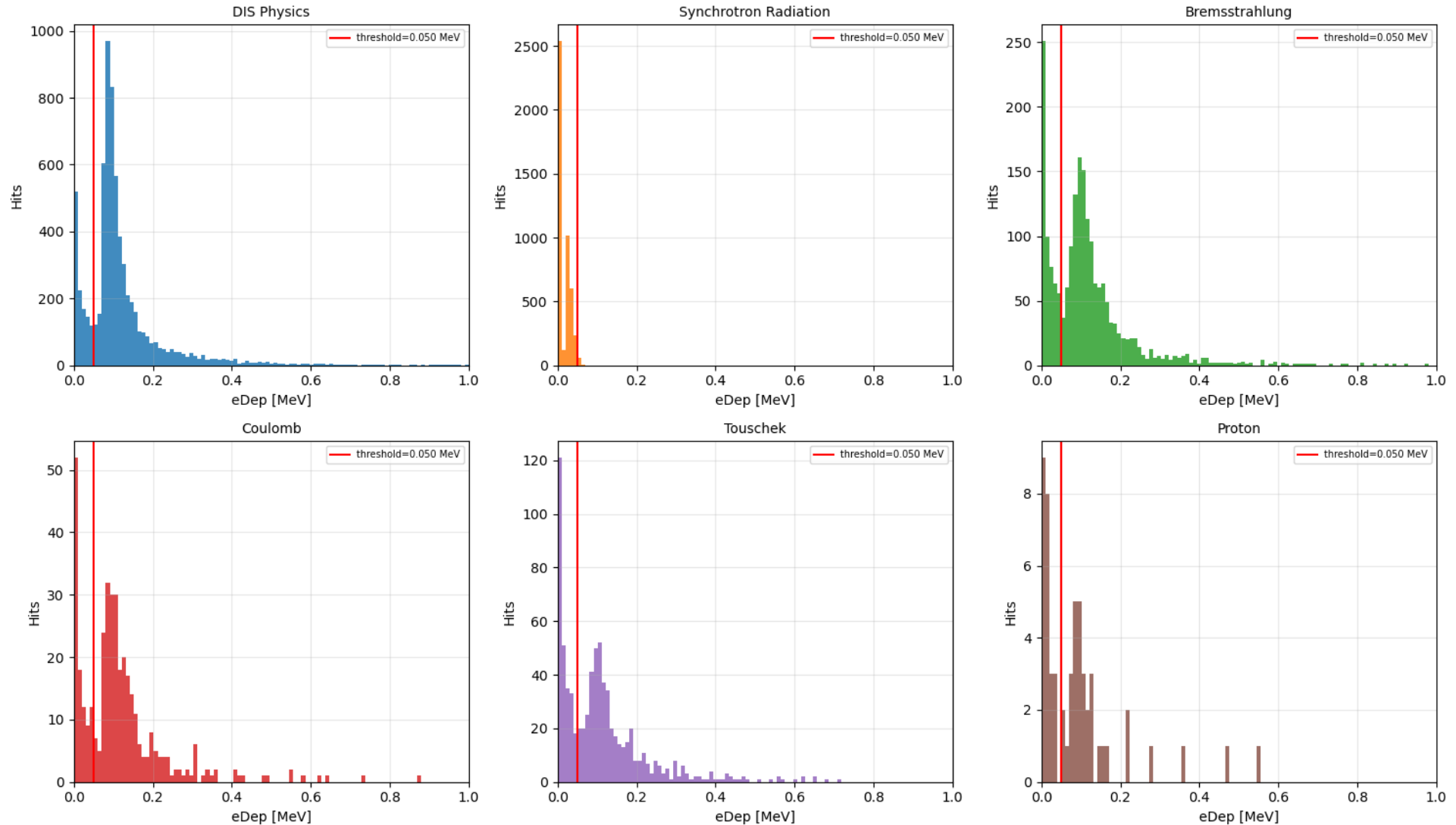
BTOF; Eta distribution by Process (eDep > 80 keV)



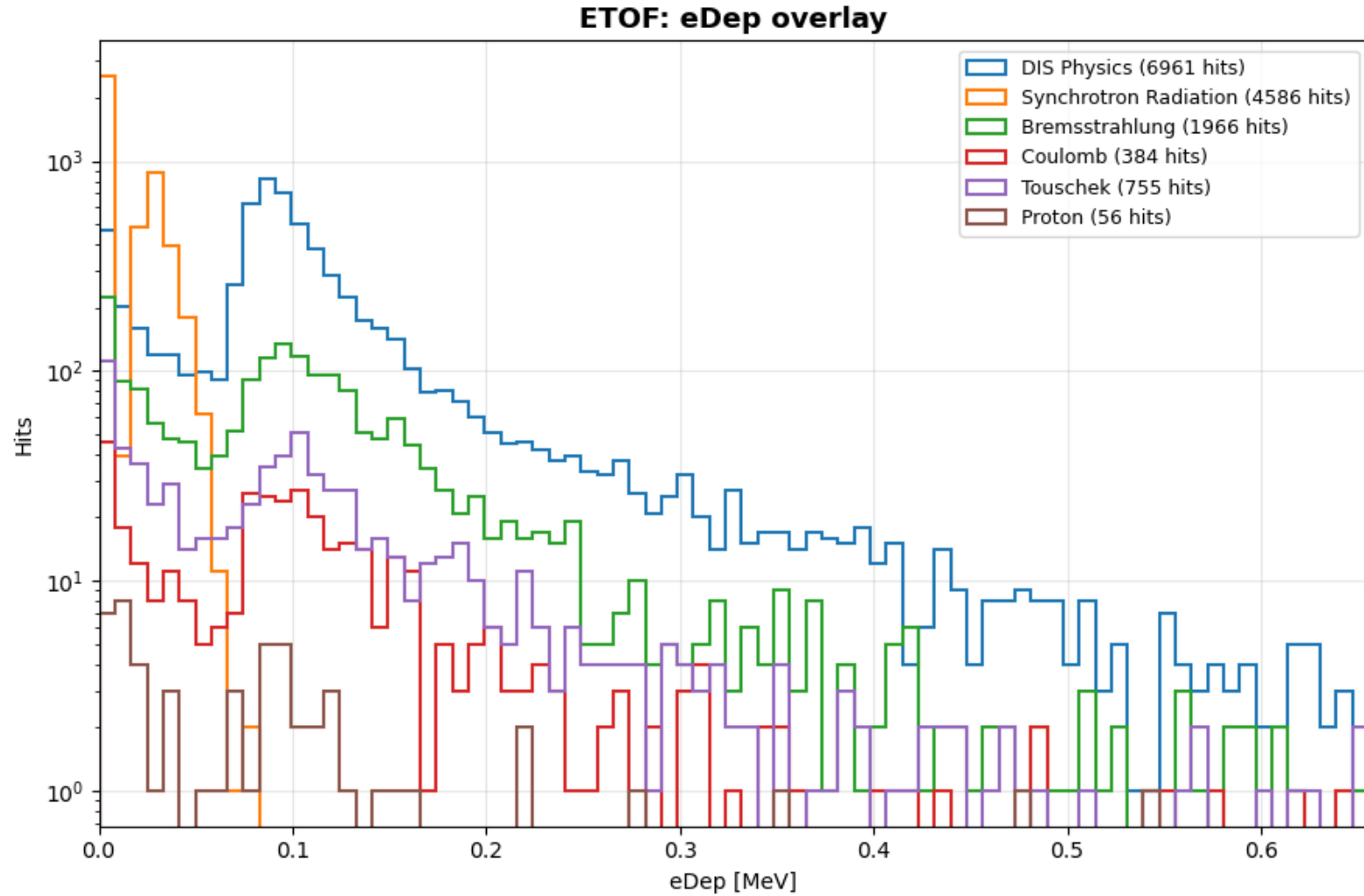
ETOF

ETOFF; Hits by process

TOFEndcapHits (ETOFF): eDep by Process [MeV] [threshold line = 0.050 MeV]

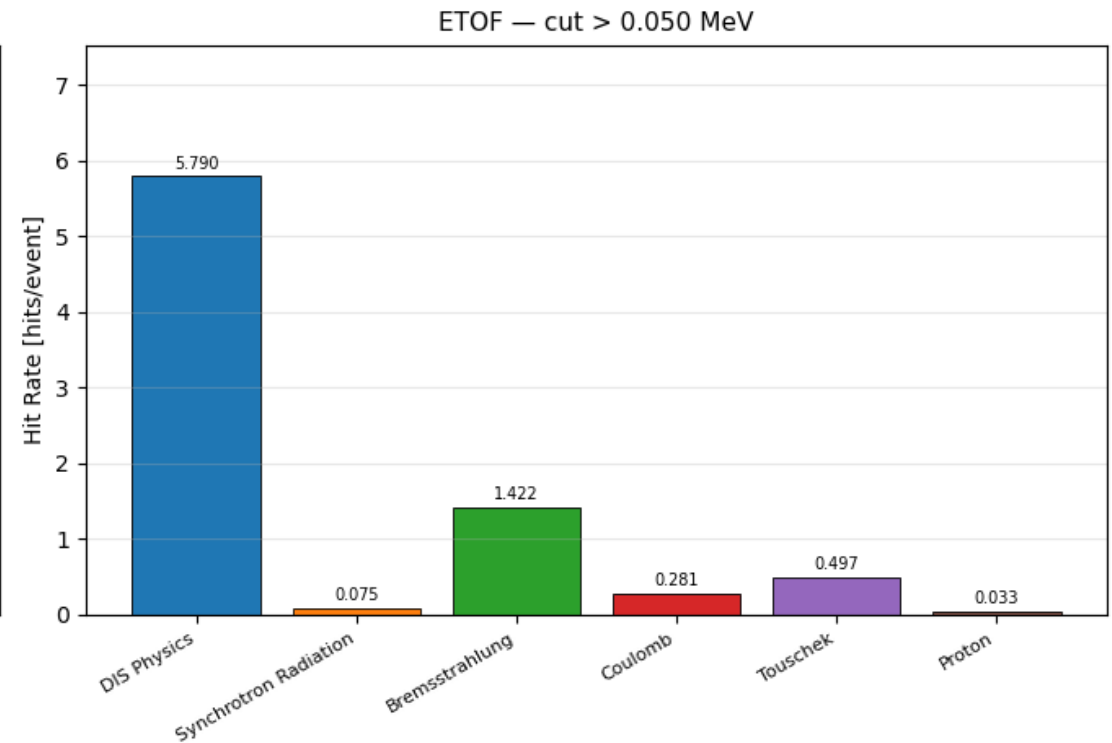
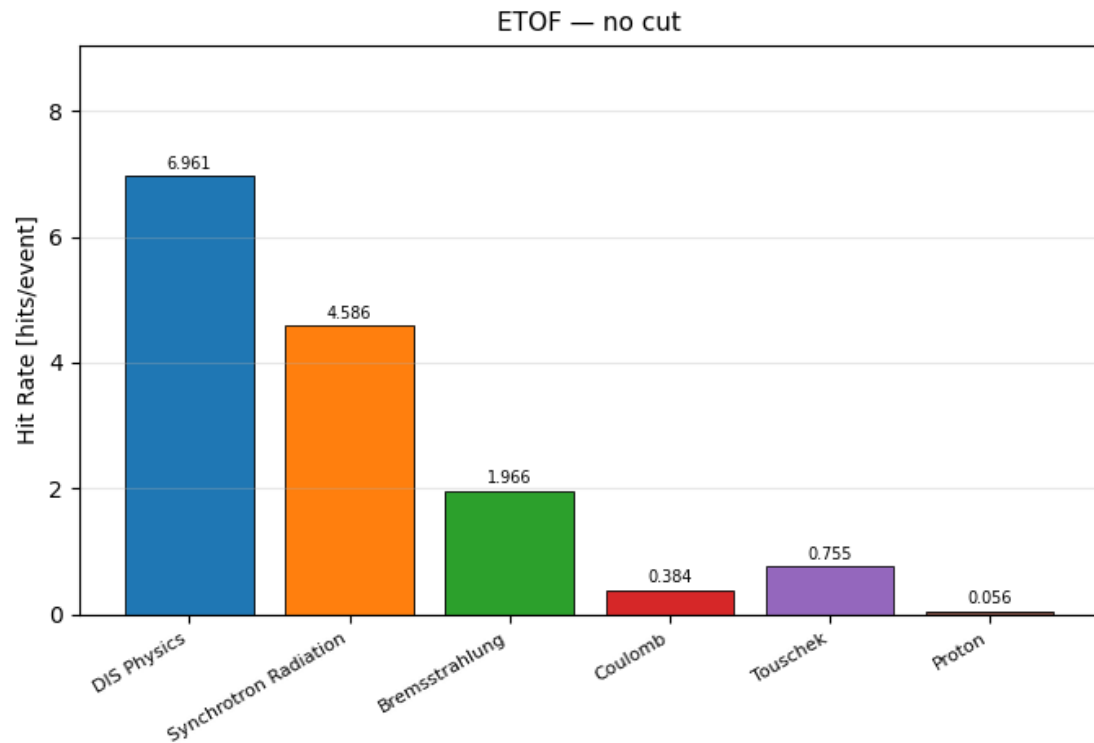


ETOF; eDep



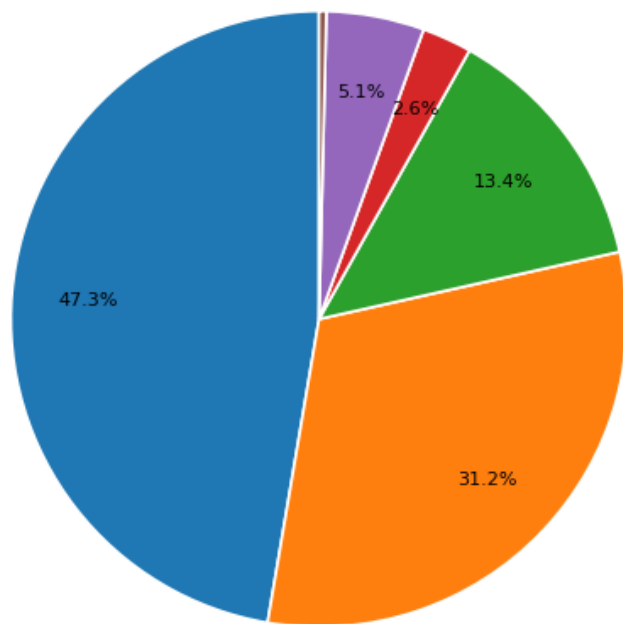
FTOF; Hit rate by process

- The occupancy is very low

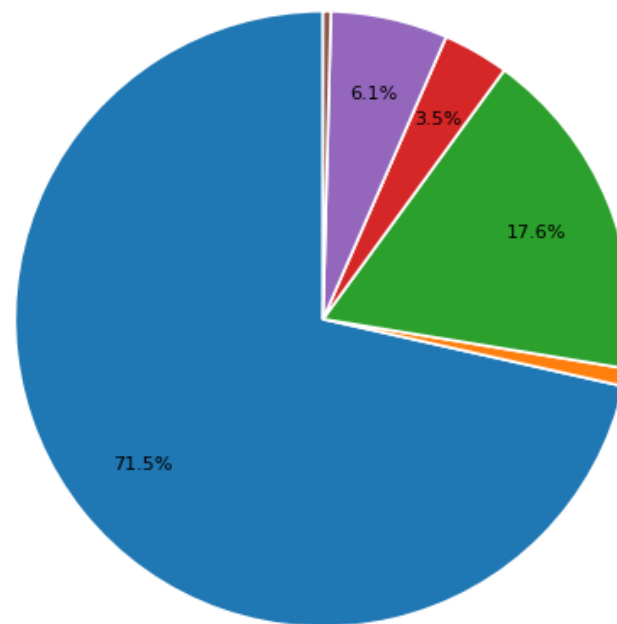


ETOF; Hit rate by process (Circle)

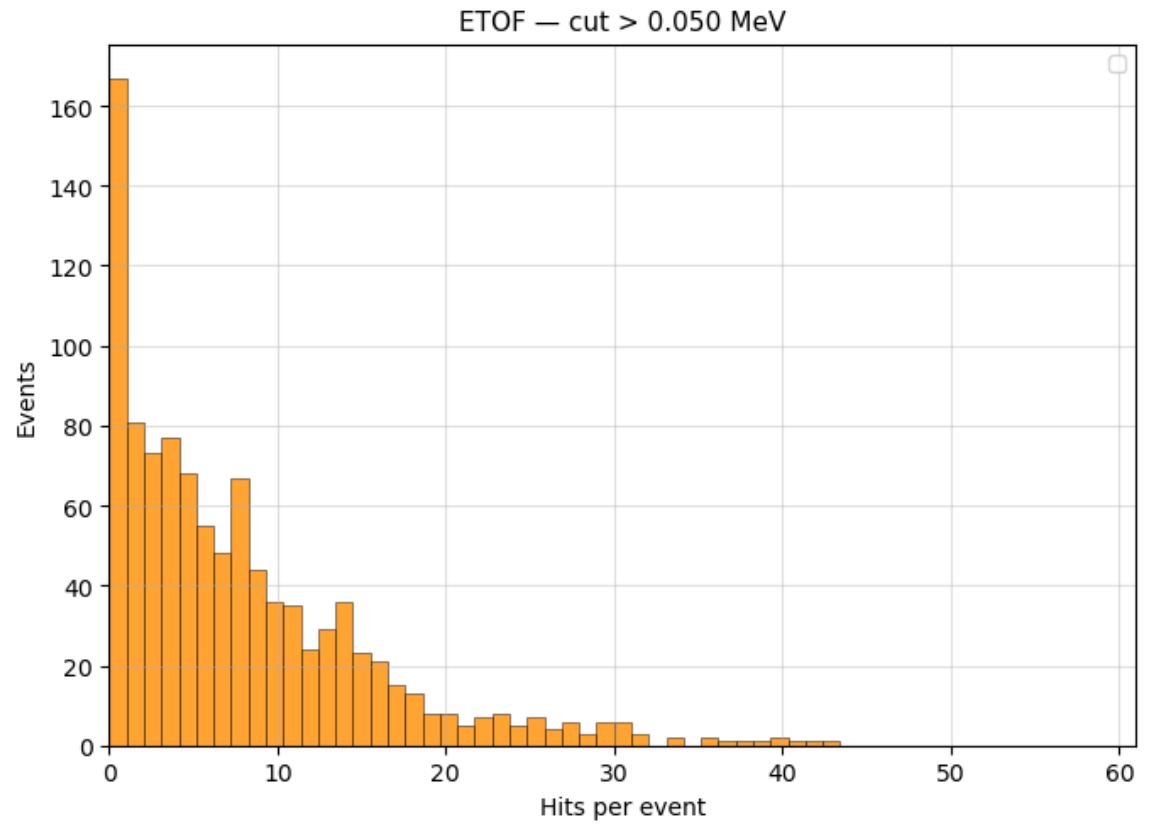
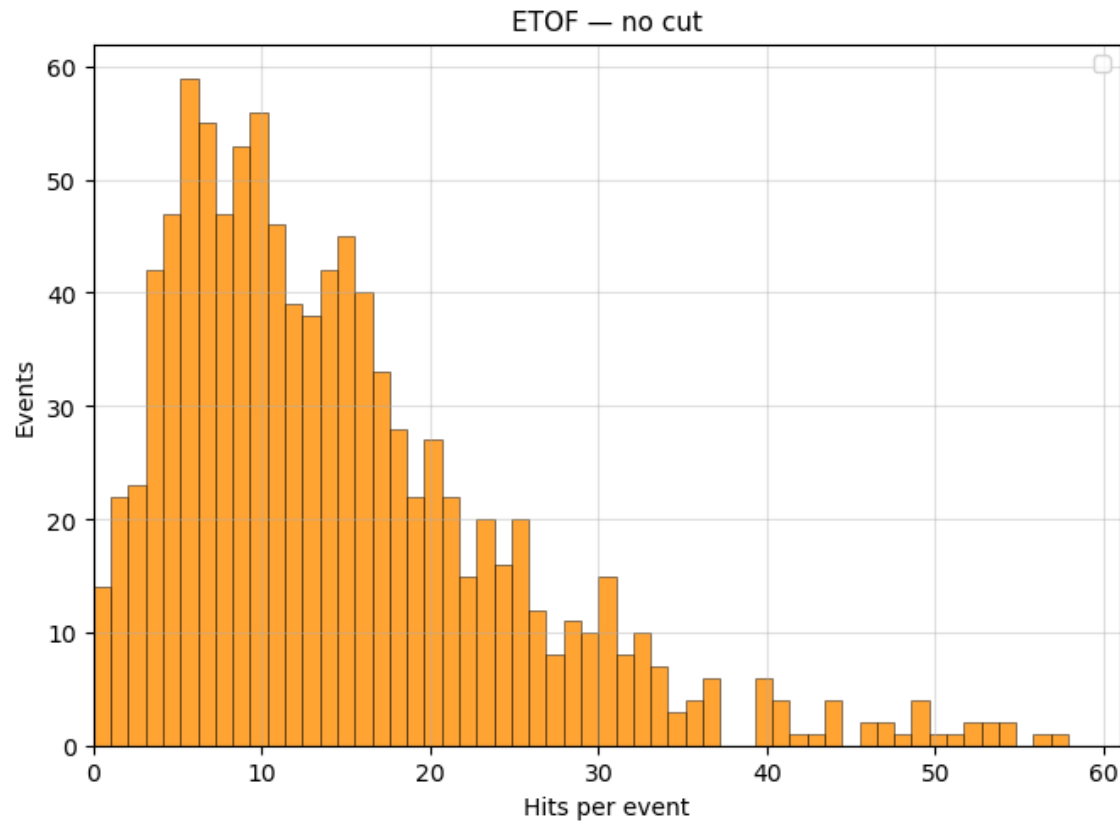
ETOF — no cut
total=14,708 hits



ETOF — cut > 0.050 MeV
total=8,098 hits



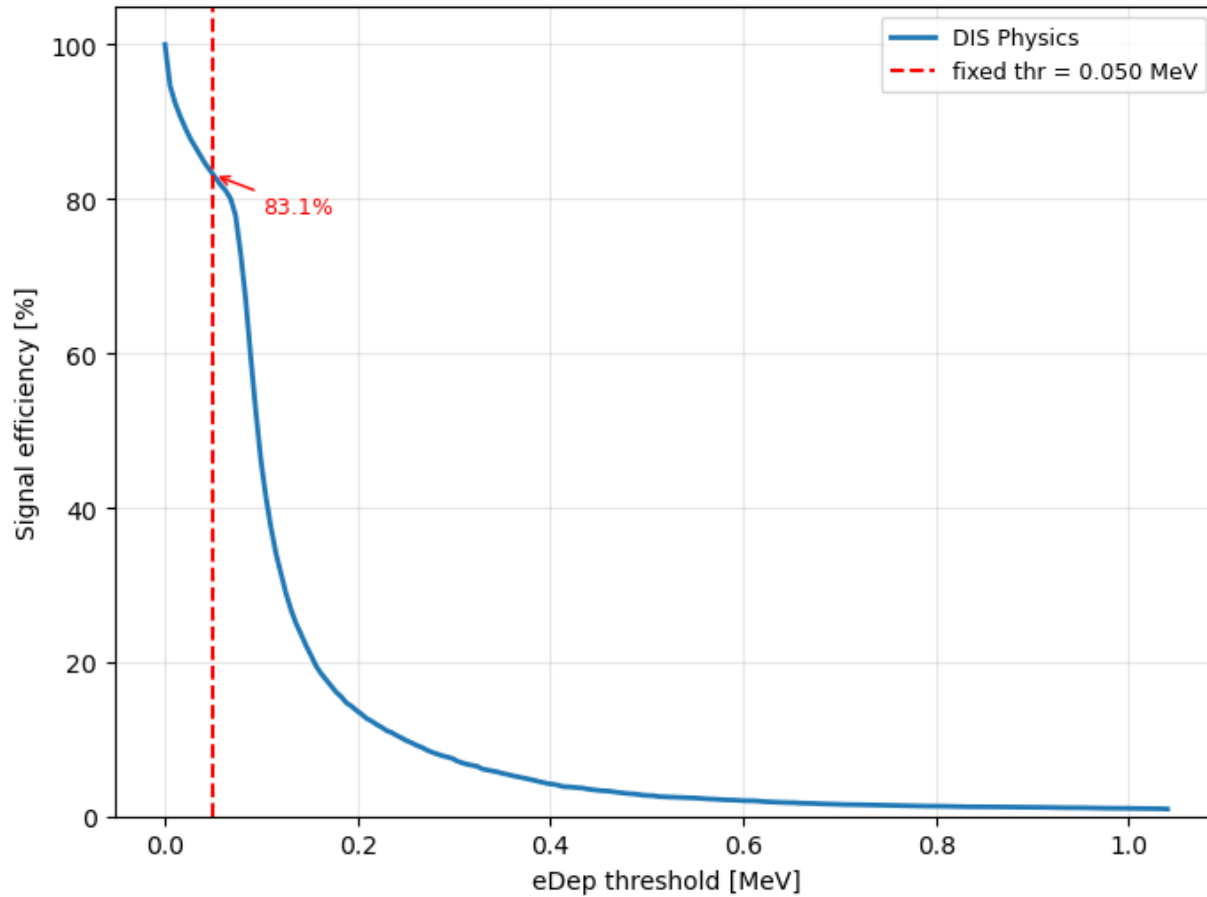
ETOF; Multiplicity per event



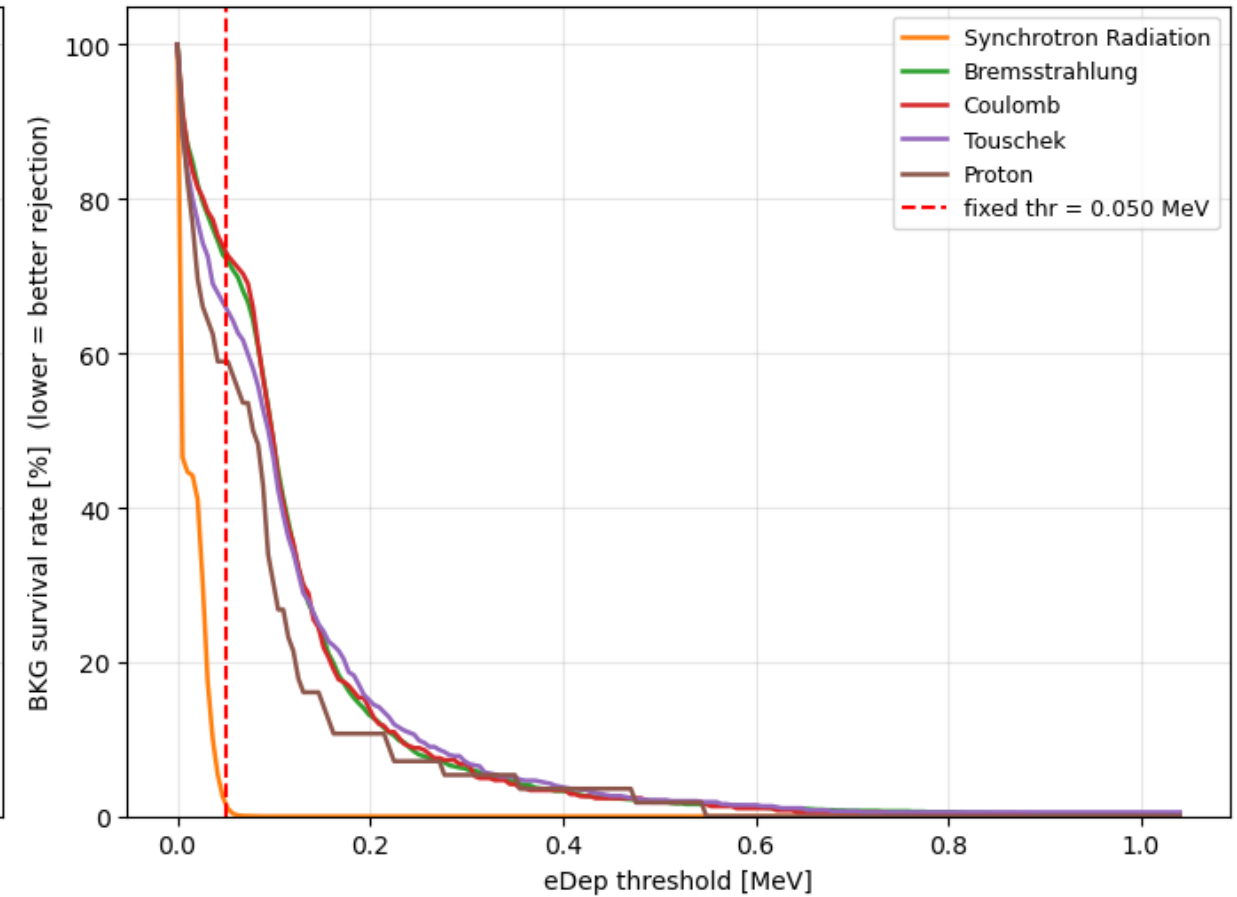
ETOF; Signal efficiency vs threshold

TOFEndcapHits (ETOF): eDep Threshold Scan

DIS Physics — Signal Efficiency

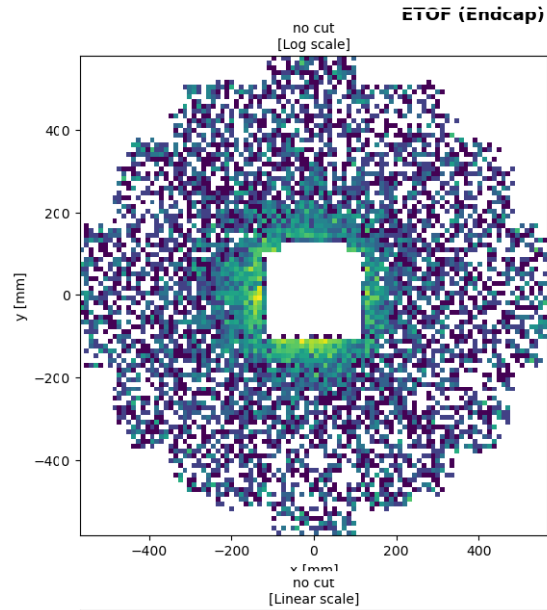


Background — Survival Rate
(= 1 - rejection)

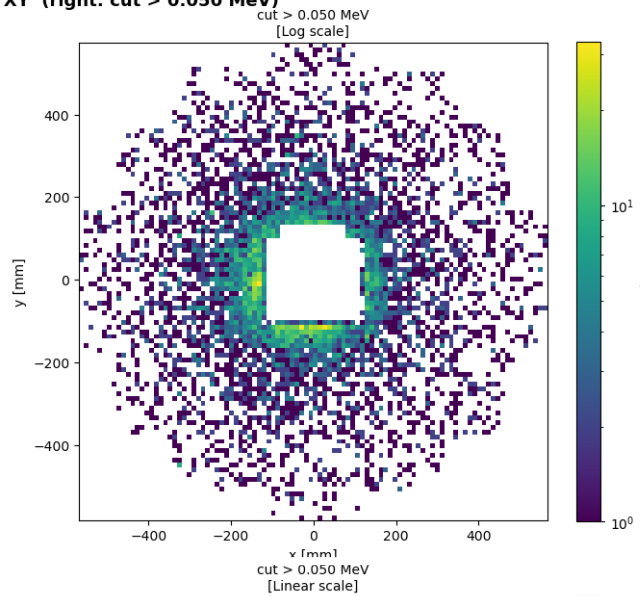


ETOF; Hit profile

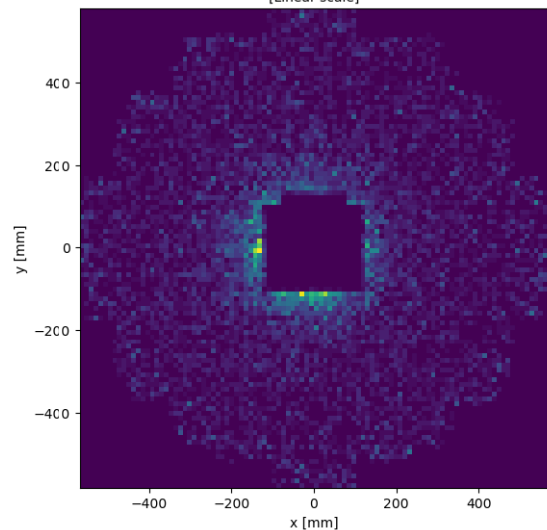
No min edep
Log scale



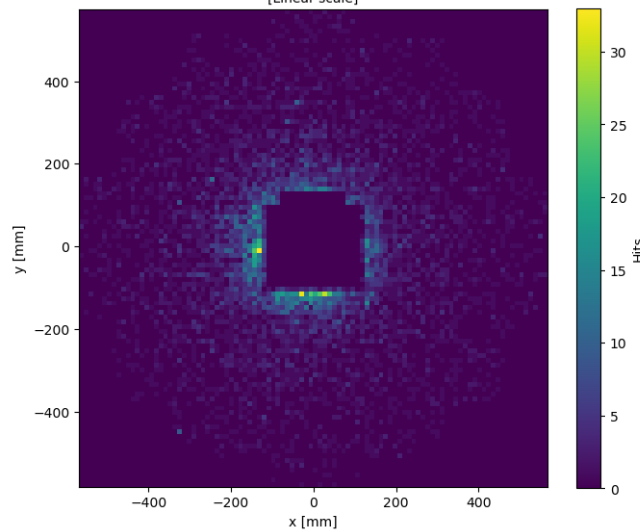
edep > 80 keV
Log scale



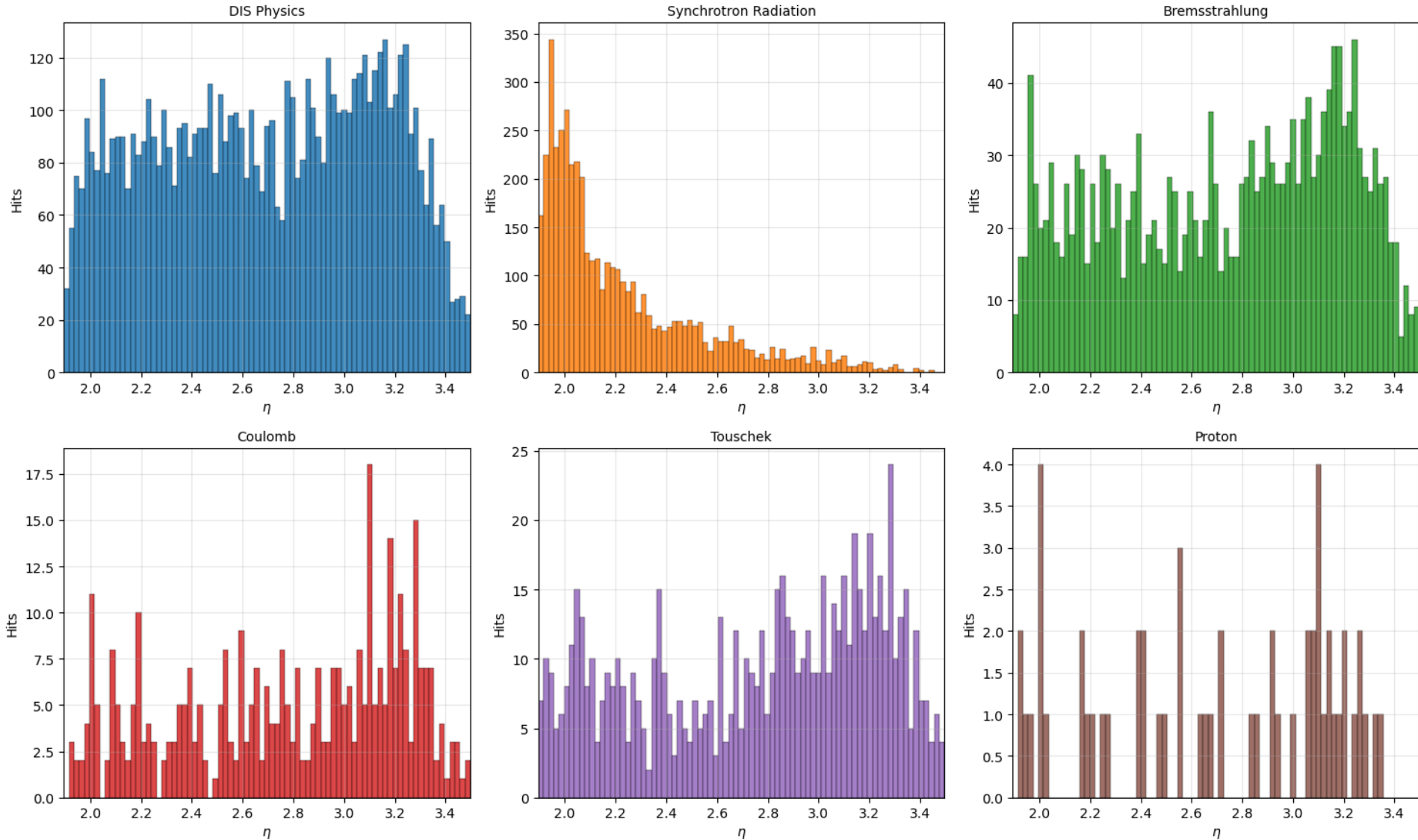
No min edep
Linear scale



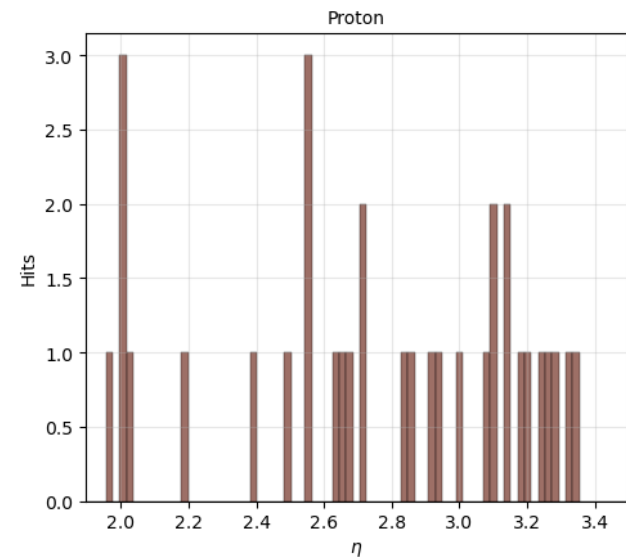
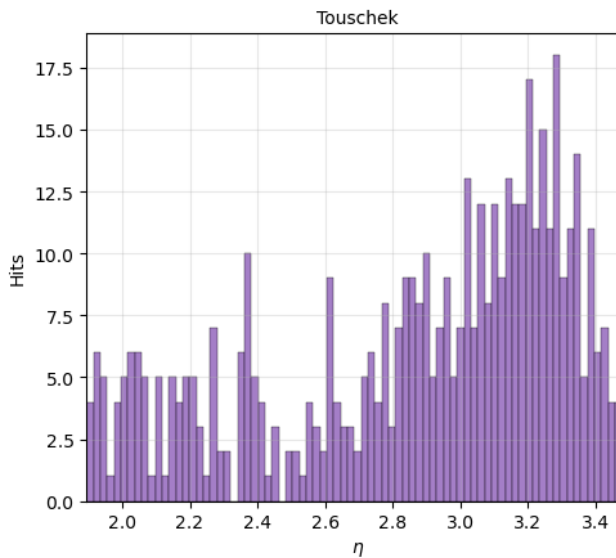
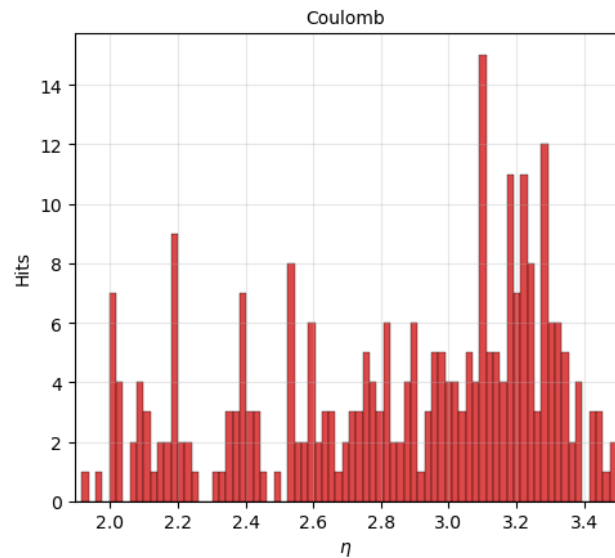
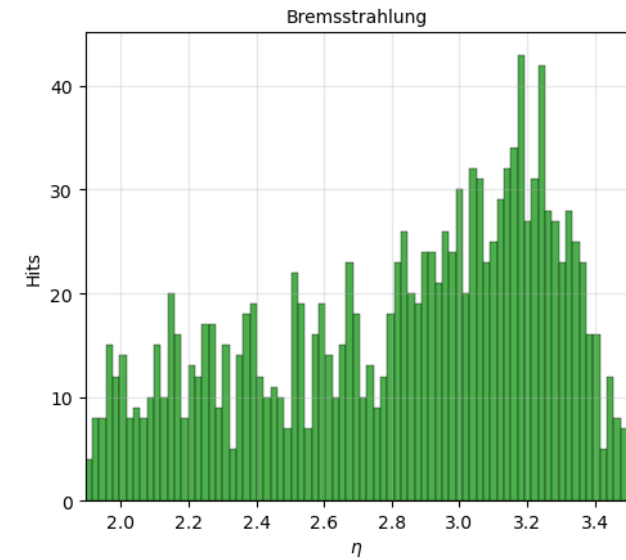
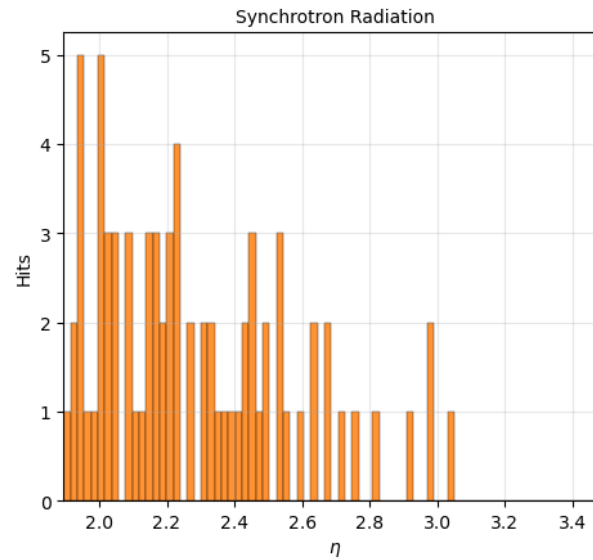
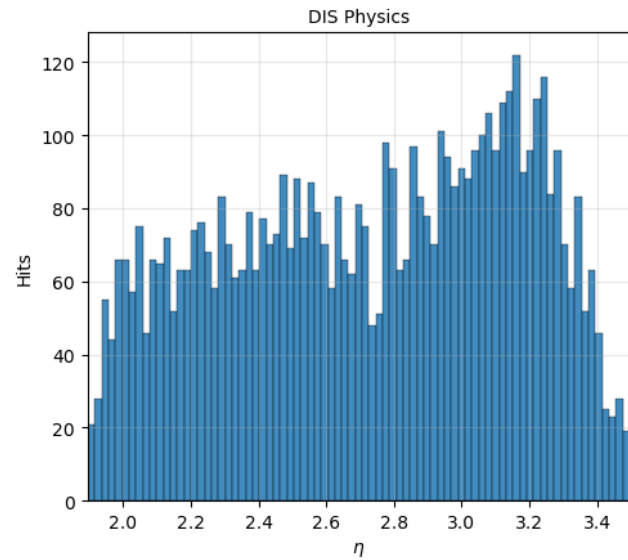
edep > 80 keV
Linear scale



ETOF; Eta distribution by Process



ETOF; Eta distribution by Process (eDep > 50 keV)



Summary

BTOF

- Huge SR hits can be suppressed by requiring cut for eDep
 - In the simulation, 80 keV cut eliminate SR

ETOF

- Hit occupancy is very low
- Background rate is not significant in both BTOF and ETOF

Next

- Check
 - the PID performance with background condition
 - the angular resolution
 - same checks using centrally produced MC
- Any suggestions?