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# **KLF beam simulation detector hit rates with variable W-plug**

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# Geant4 simulation of KLong beam

- new features in this update
  1. empty GlueX target
  2. adjustment of tungsten plug material to get density  $16.5 \text{ g/cm}^3$
  3. continuous variation in plug thickness in the range [10, 20] cm
  4. addition of recording the z of particles in start counter, cdc straws
- same model of photon beam from CPS
  1. 5B bremsstrahlung photons from 12 GeV electrons
  2. only CPS flux in the range [2,12] GeV was included
  3. statistics equivalent to 1.2 ms of beamtime at 5uA
  4. with x1000 factor in phi(1020) photoproduction at KPT

# CPS Photon flux at the Klong target, corrected

Electron beam energy  GeV

Electron beam current   $\mu\text{A}$

Electron beam emittance  m

Electron beam circular polarization

Radiator thickness  m

Radiator secondary tilt  rad

Photon spectrum peak energy  GeV

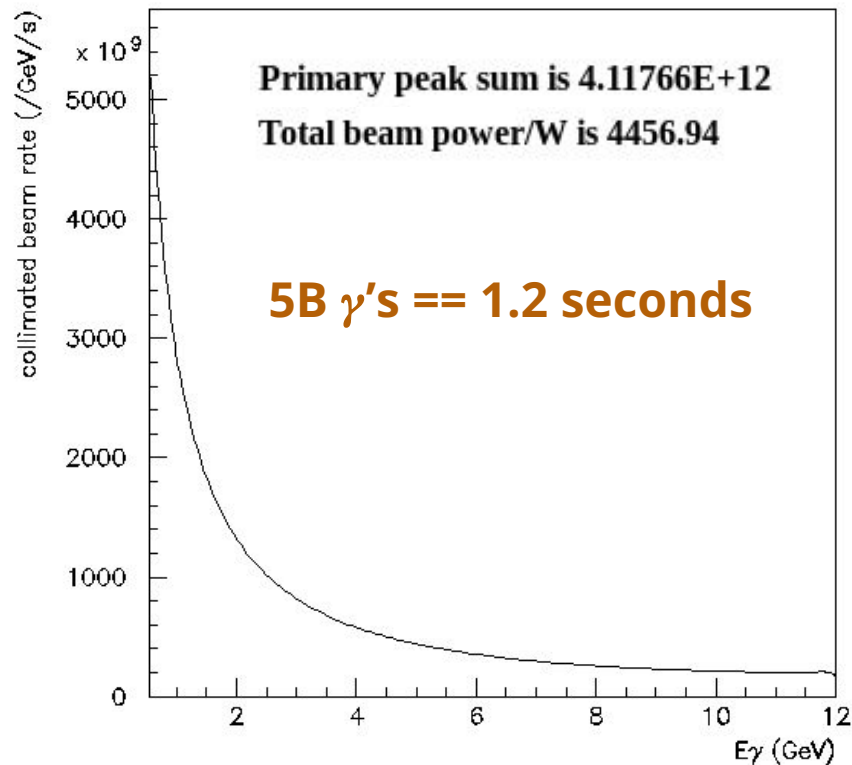
Number of bins in photon spectrum

Photon spectrum energy maximum  GeV

Photon spectrum energy minimum  GeV

Radiator-collimator distance  m

Collimator diameter  m



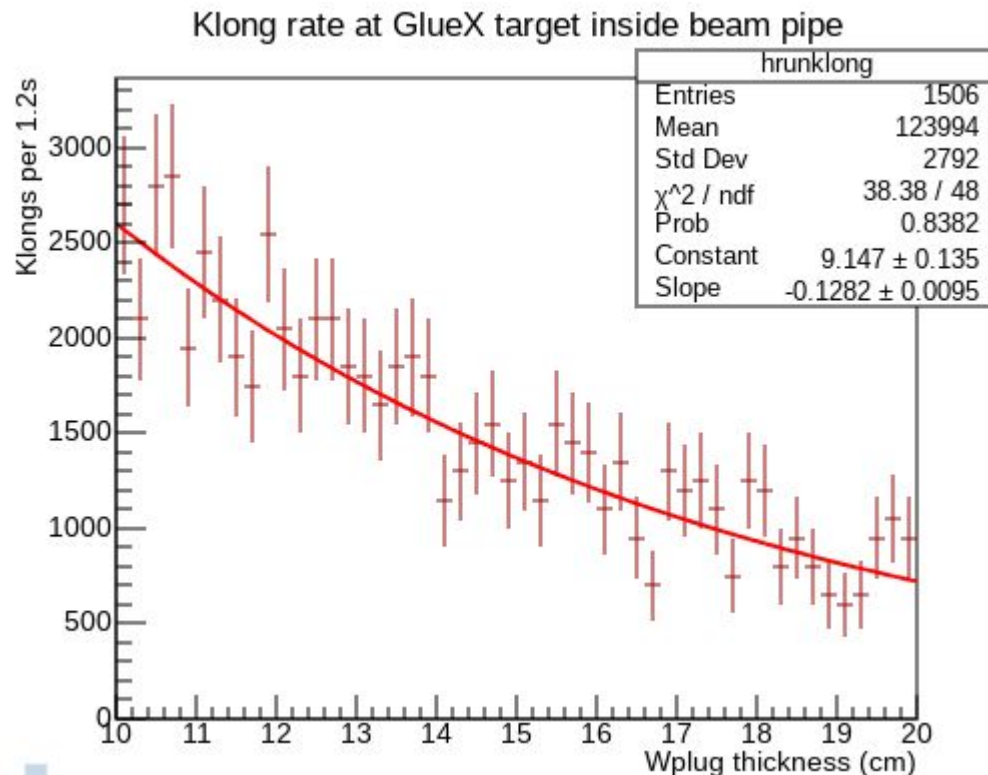
# Results from 1.2ms of beam

- total of 5B bremsstrahlung photons simulated in the range [2,12] GeV
  - 500k beam photons in range [2,12] GeV simulated per run
  - 10,000 runs, differ only in tungsten plug thickness, cavity around it
    - $W_{\text{plug\_length}} = (10 + n * 0.001)$  cm,  $n=\text{range}(1,10000)$
- when appropriate, vertical axes scaled to 1.2ms per bin in  $W_{\text{plug\_length}}$

# Results from 1.2ms of beam

- Klongs from  $\phi(1020)$  decays only
- x1000 photo-XS factor, 5B photons = 1.2s
- attenuation length in the tungsten plug

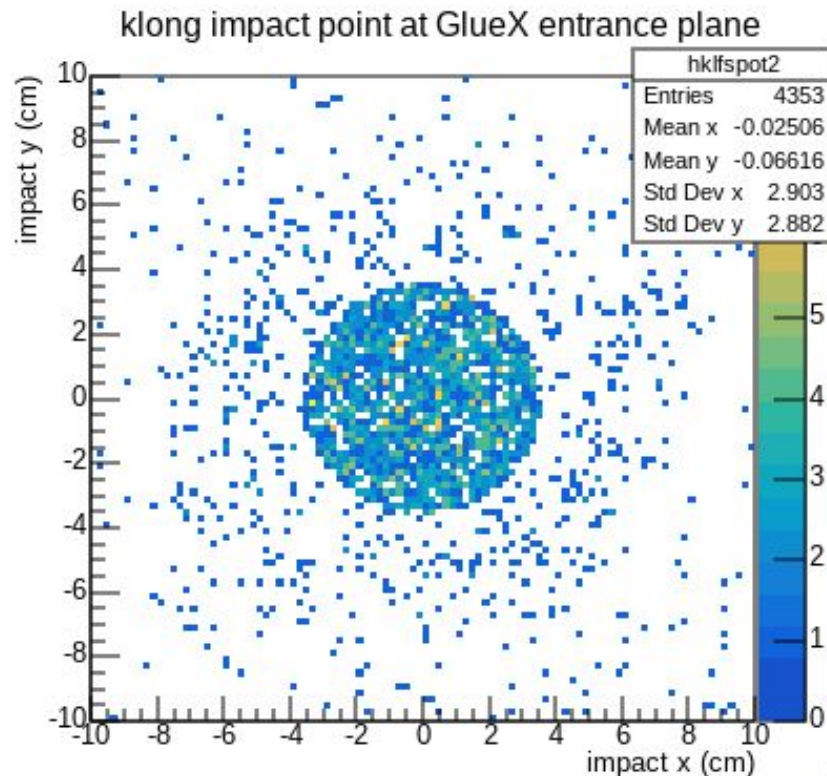
$$\lambda = 7.8 \pm 0.6 \text{ cm}$$



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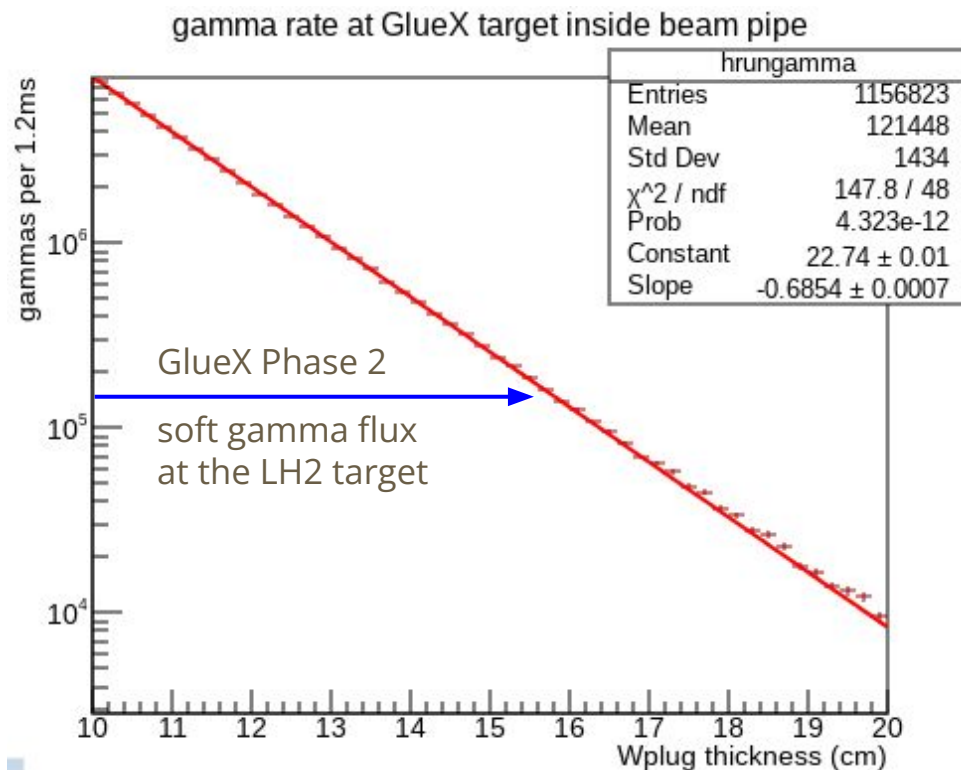


# Results from 1.2ms of beam

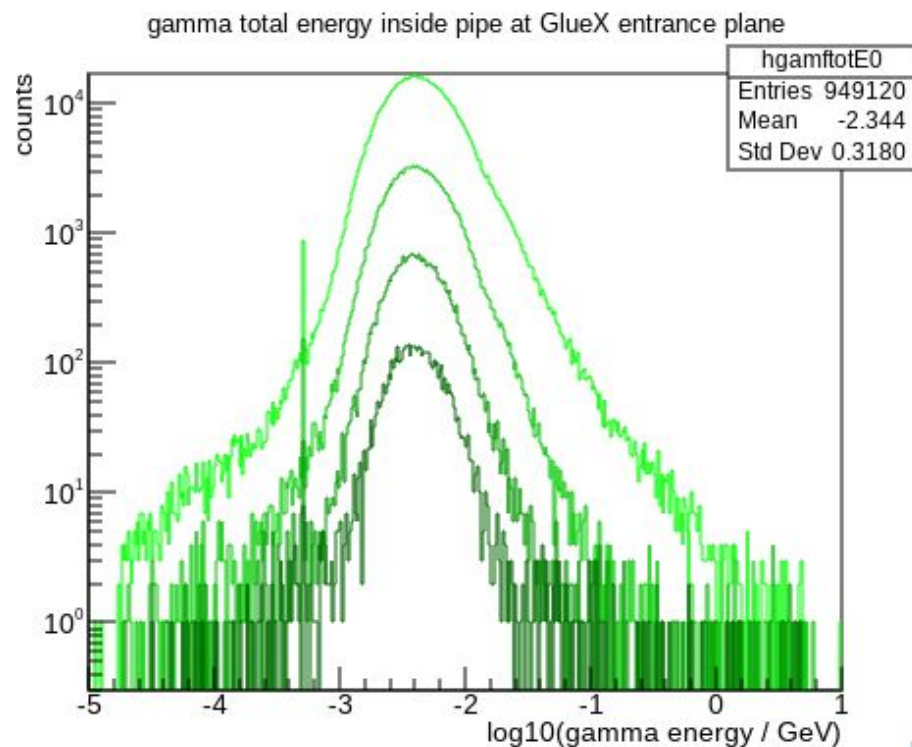
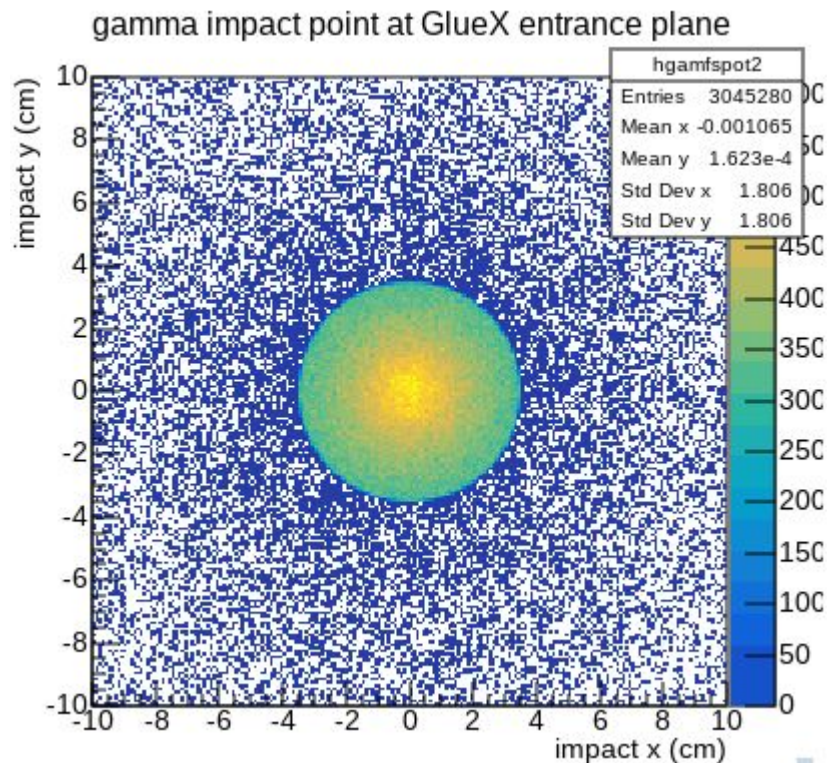
- gamma flux at GlueX
- attenuation length in the tungsten plug

$$\lambda = 1.459 \pm 0.002 \text{ cm}$$

- not the radiation length



# Results from 1.2ms of beam

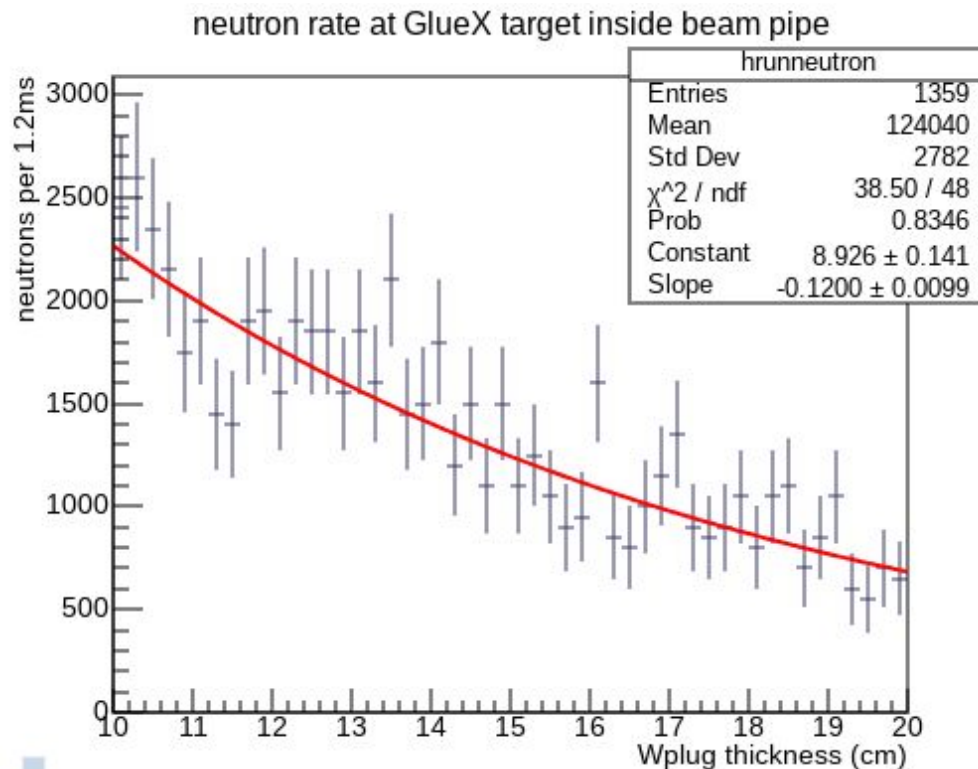




# Results from 1.2ms of beam

- neutron flux at GlueX
- attenuation length in the tungsten plug

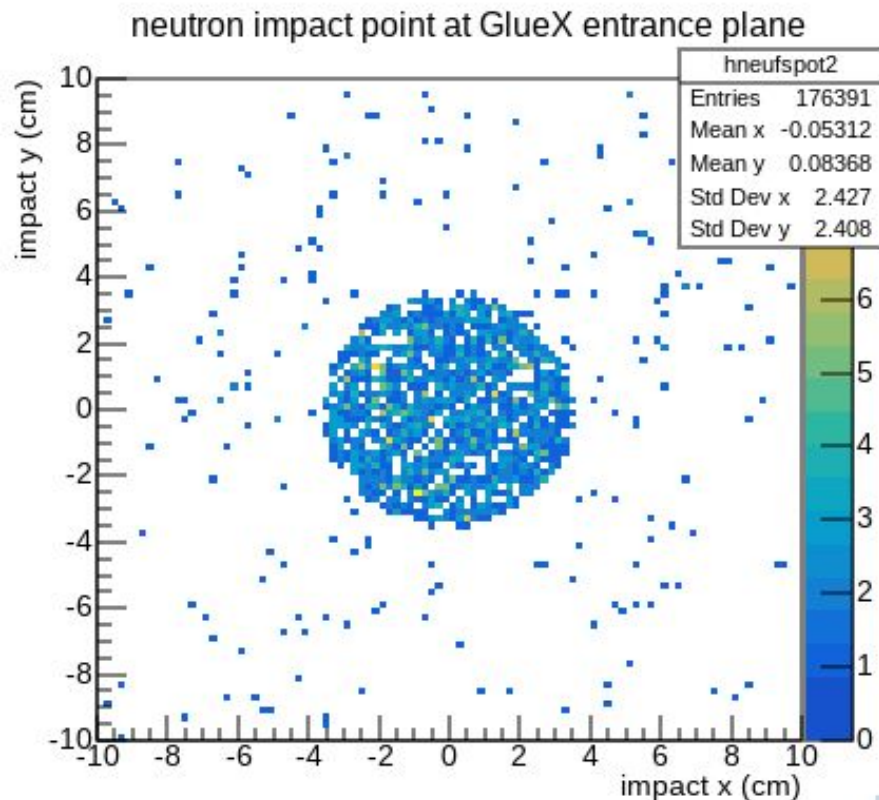
$$\lambda = 8.3 \pm 0.7 \text{ cm}$$



# Results from 1.2ms of beam

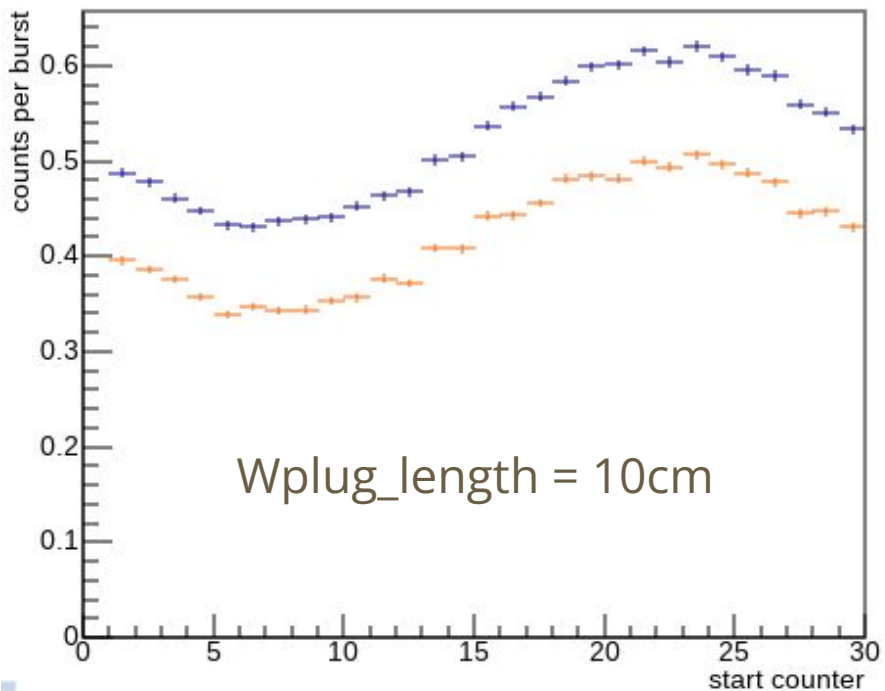
- neutron flux at GlueX
- attenuation length in the tungsten plug

$$\lambda = 8.3 \pm 0.7 \text{ cm}$$

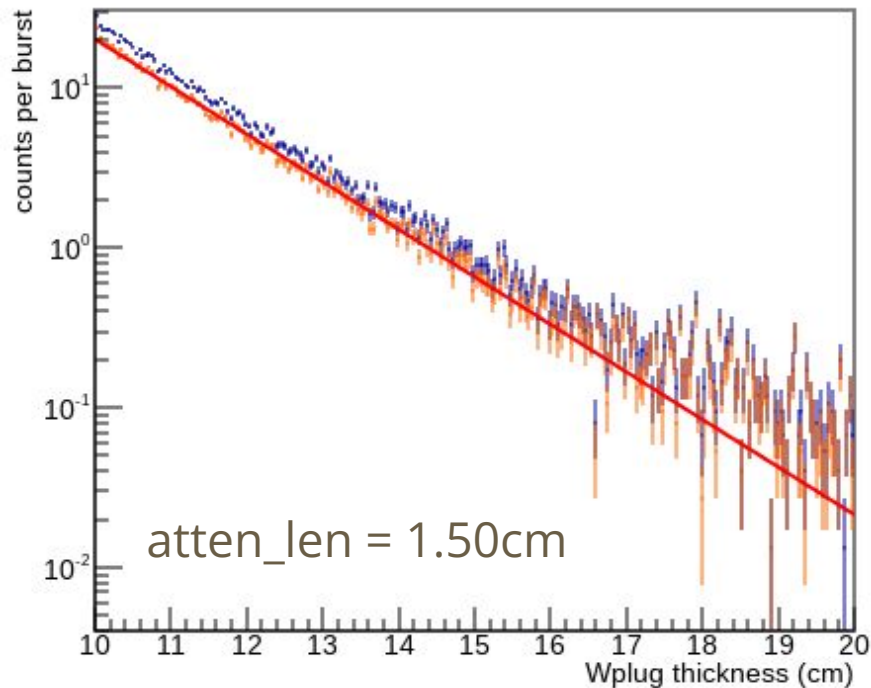


# Start counter hits

start counter hits per 64ns burst

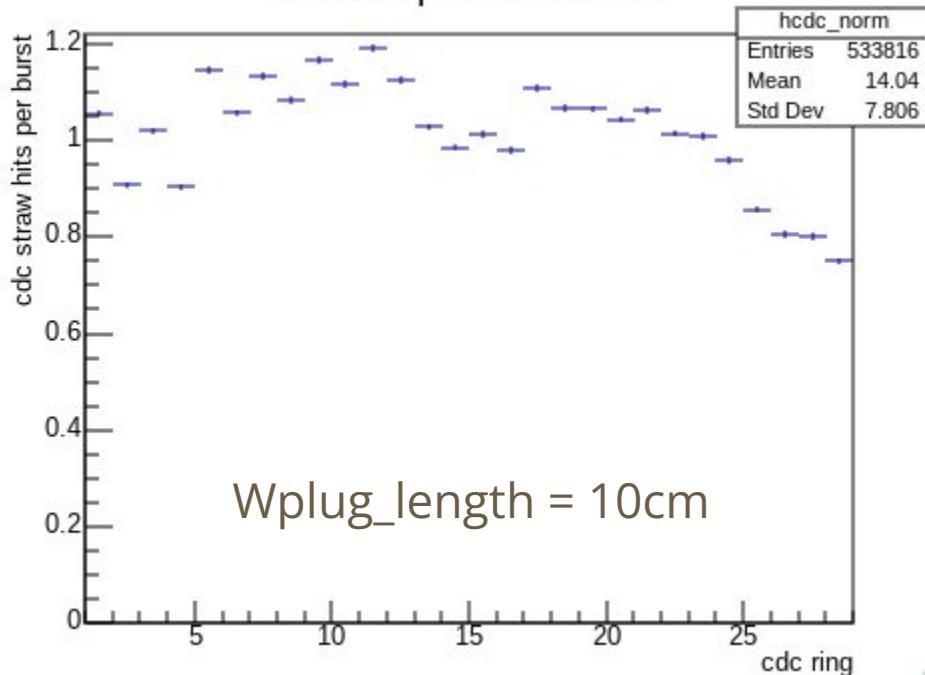


start counter hits per 64ns burst

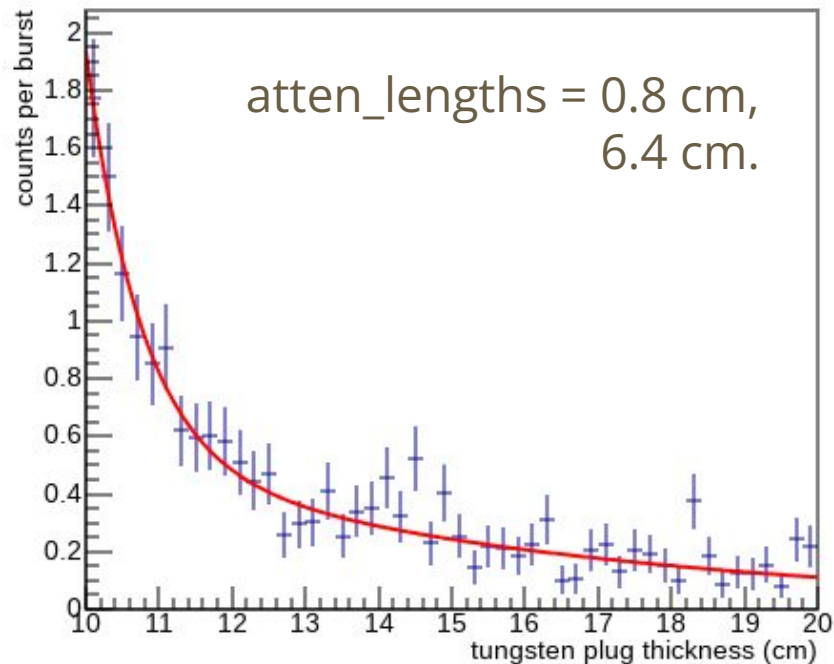


# Central drift chamber hits

cdc hits per 64ns burst

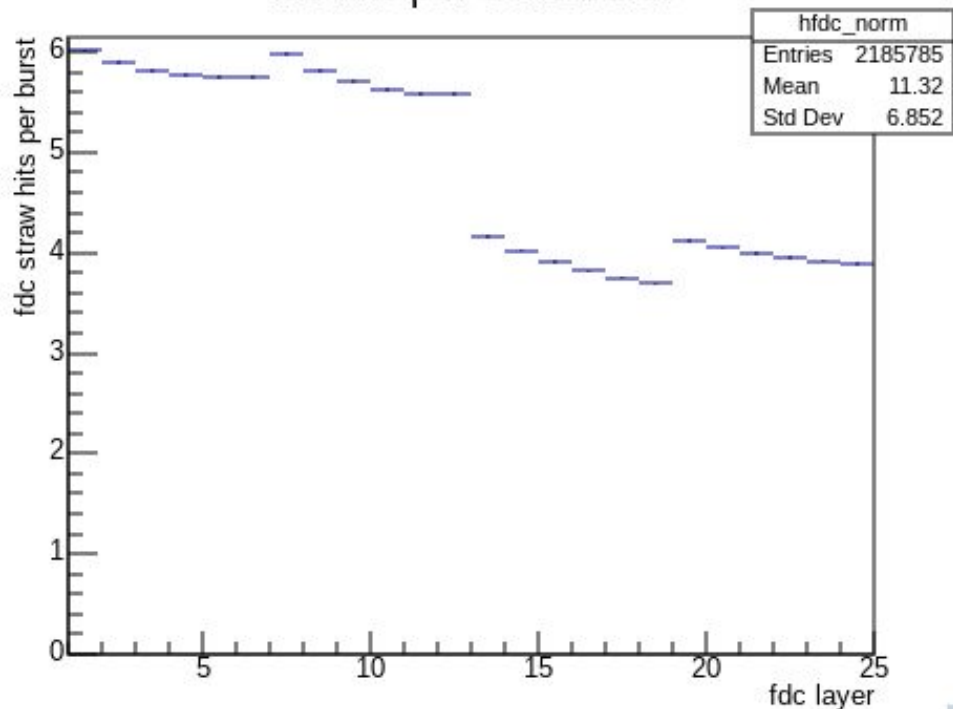


cdc ring 1 hits per 64ns burst

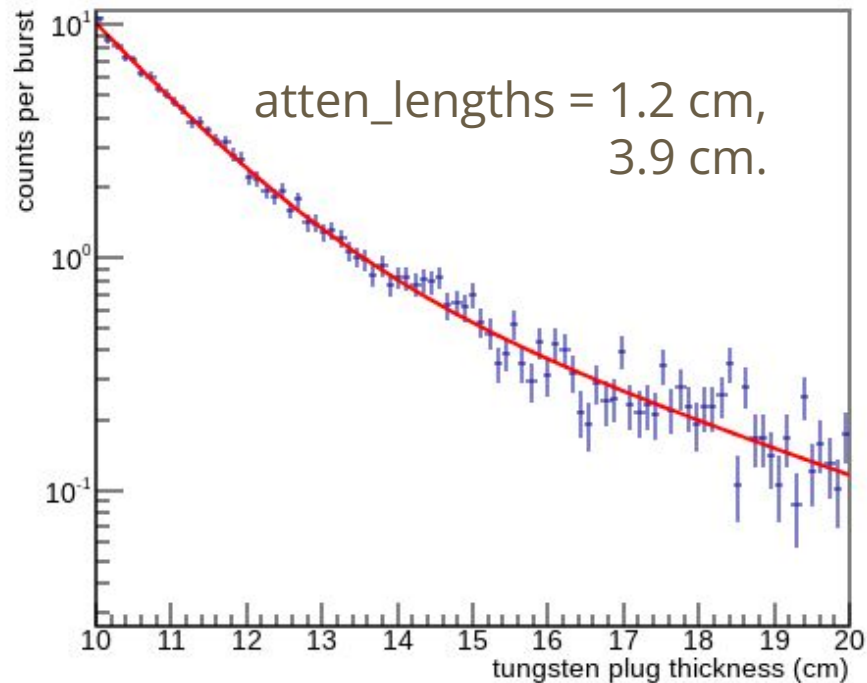


# Forward drift chamber hits

fdc hits per 64ns burst

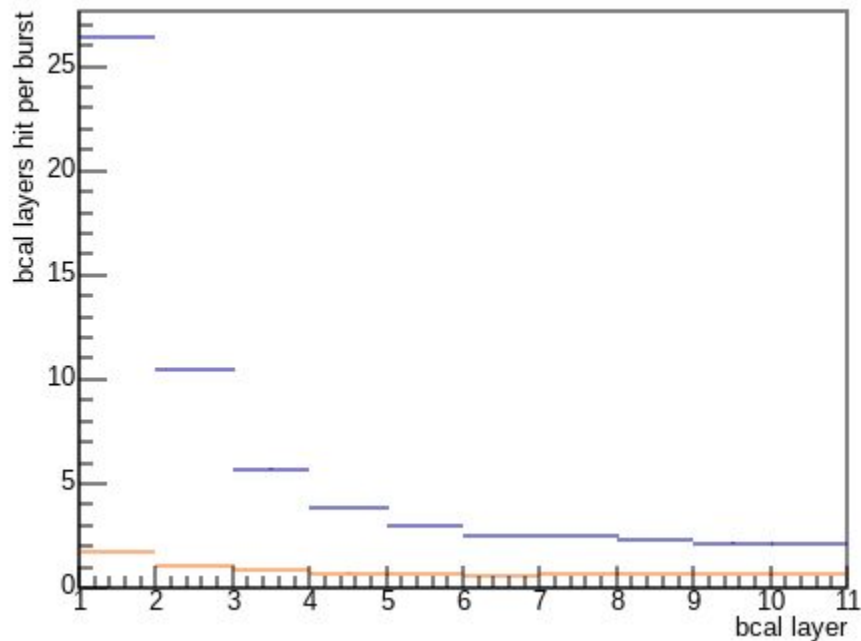


fdc layer 1 hits per 64ns burst

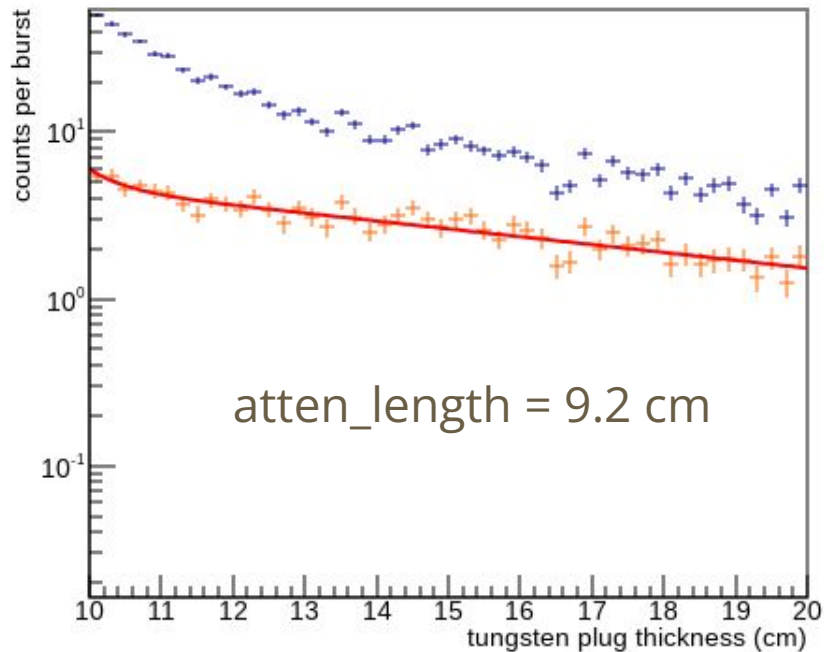


# Barrel calorimeter hits

bcal hits per 64ns burst

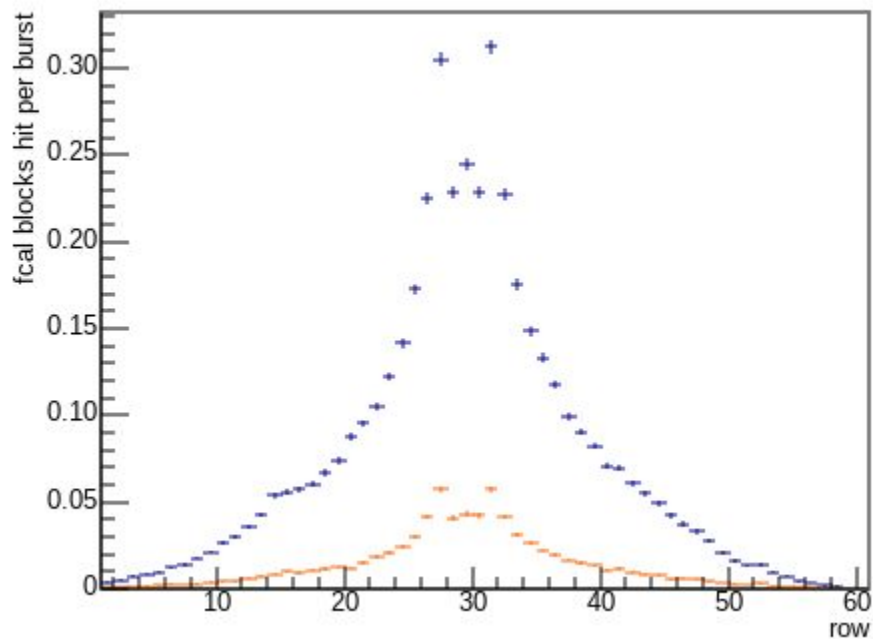


bcal layer 1 hits per 64ns burst

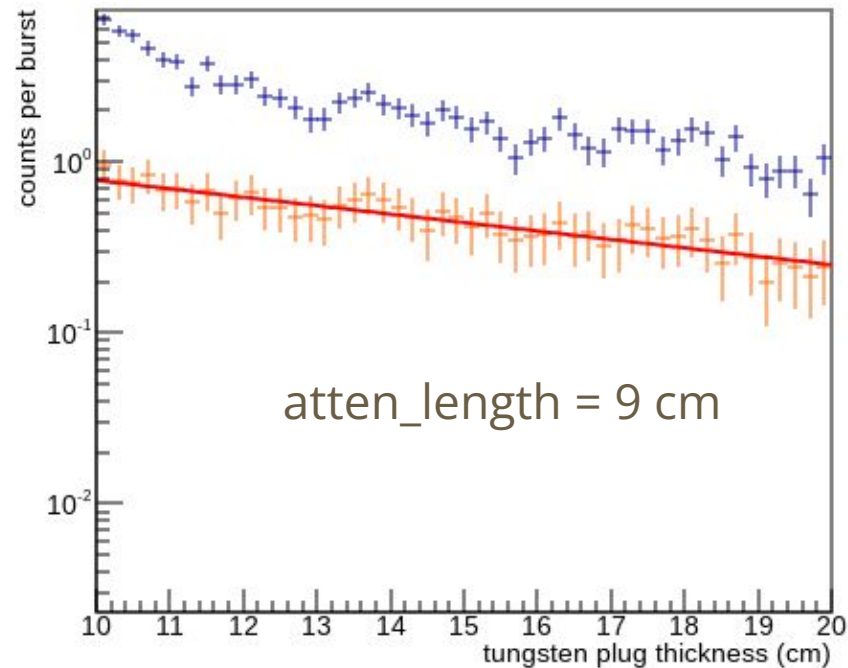


# Forward calorimeter hits

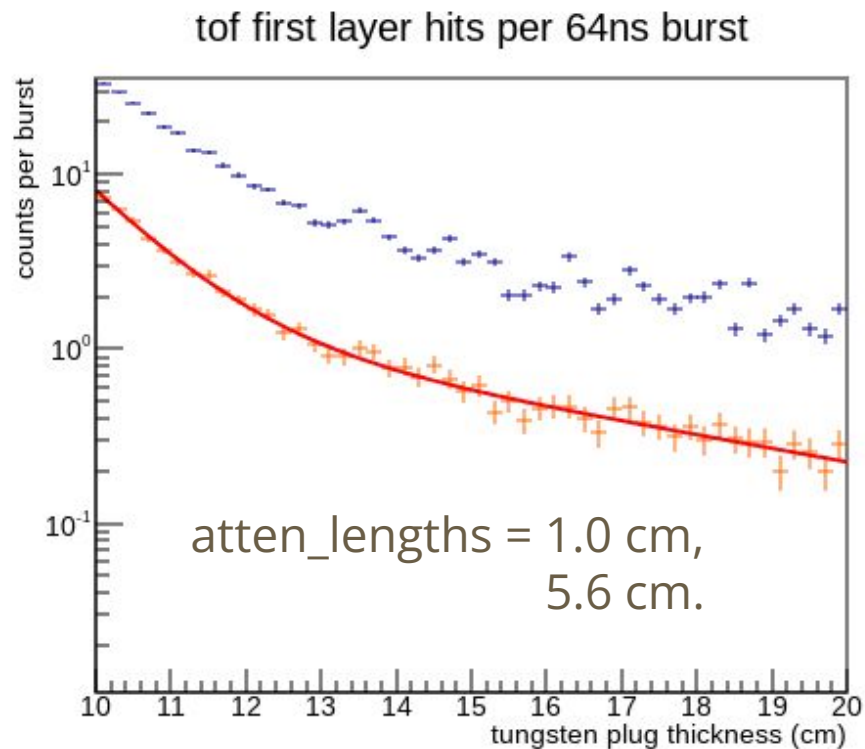
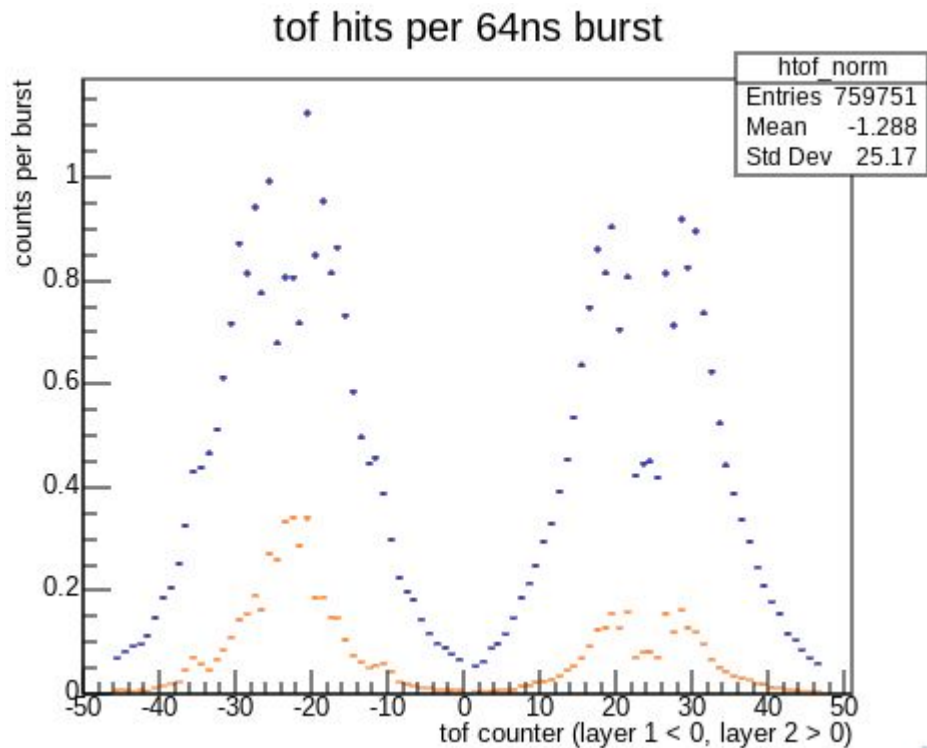
fcal hits per 64ns burst



fcal hits per 64ns burst



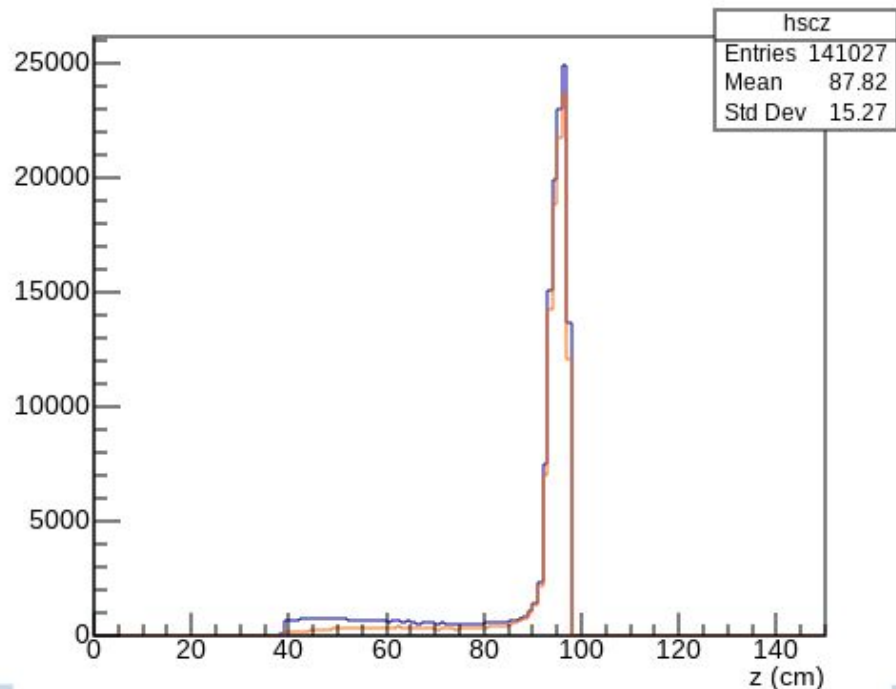
# Forward time-of-flight hits





# z-profile of hits in inner detectors

start counter hit z



cdc straw hit z

