Calculation of # of Cherenkov photons

$$\frac{dN}{dx} = 2\pi\alpha Z^2 \int \frac{d\lambda}{\lambda^2}(1 - \frac{1}{n^2\beta^2})$$

- Integration range is 300 nm ~ 610 nm,(Simulation range) and gives consistent result with G4.(#=154 in theory)—previous result.(5MeV e beam)

- New beam: Since Detector has nothing to do with hadronic process, 1GeV pi+ beam is equivalent with 3.59MeV e beam.(v=0.9925) # will be 136~143 [#ce/3cm].

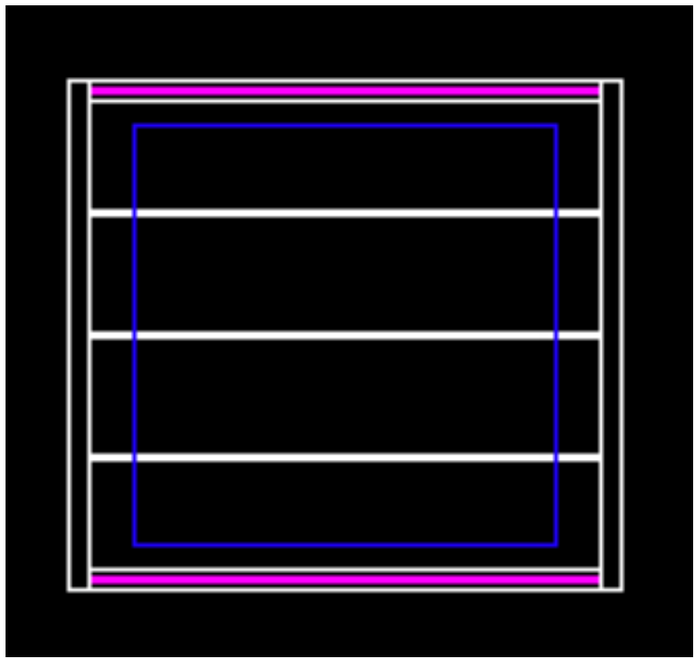
$$\sum_{310}^{620} \frac{1}{n}\Big|_{n\in Z_{10}} \leq -\int_{300}^{610} \frac{dx}{x^2} \leq \sum_{300}^{620} \frac{1}{n}\Big|_{n\in Z_{10}}$$

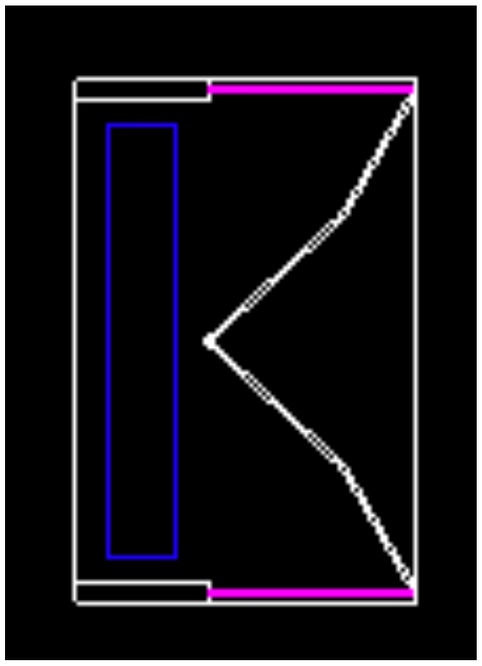
Adding Rayleigh Scattering

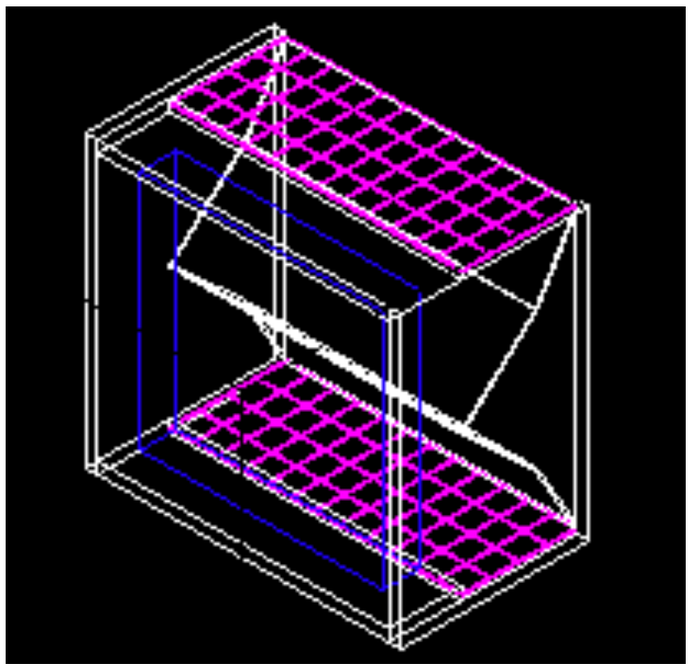
- Rayleigh scattering length depends on 4th power of wavelength, $\frac{\lambda^4}{b}$
- b= 7.54 e-25(1/m^3) were chosen.[Ref: R.Siudak et al,"*A threshold Cherenkov detector for K^p=p^p separation using silica aerogel*"]
- b may be changed.

Detector Geometry

- Vertical Mirror was removed.
- Detection area were divided into 12X4 pixels.(Purple)

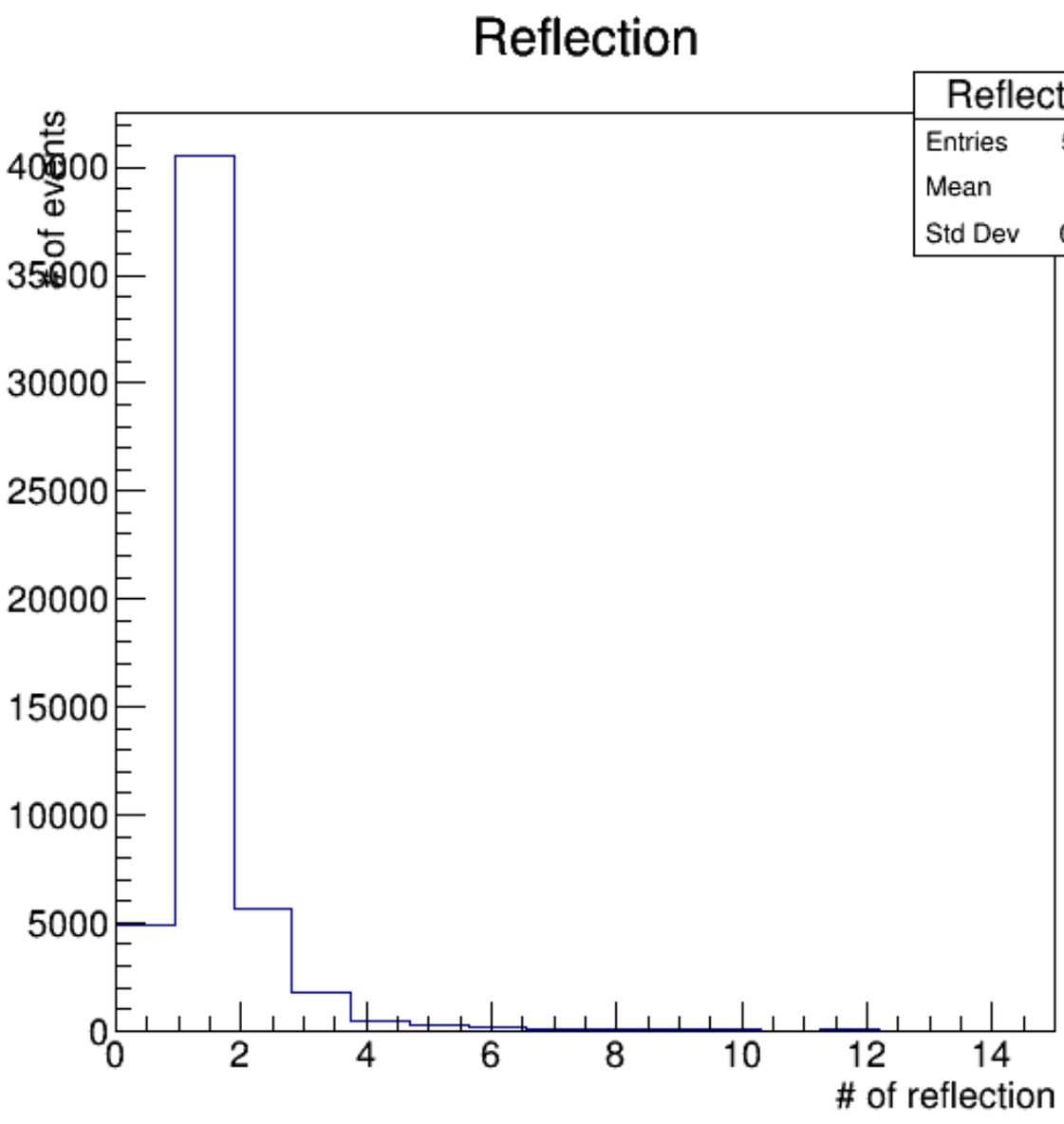


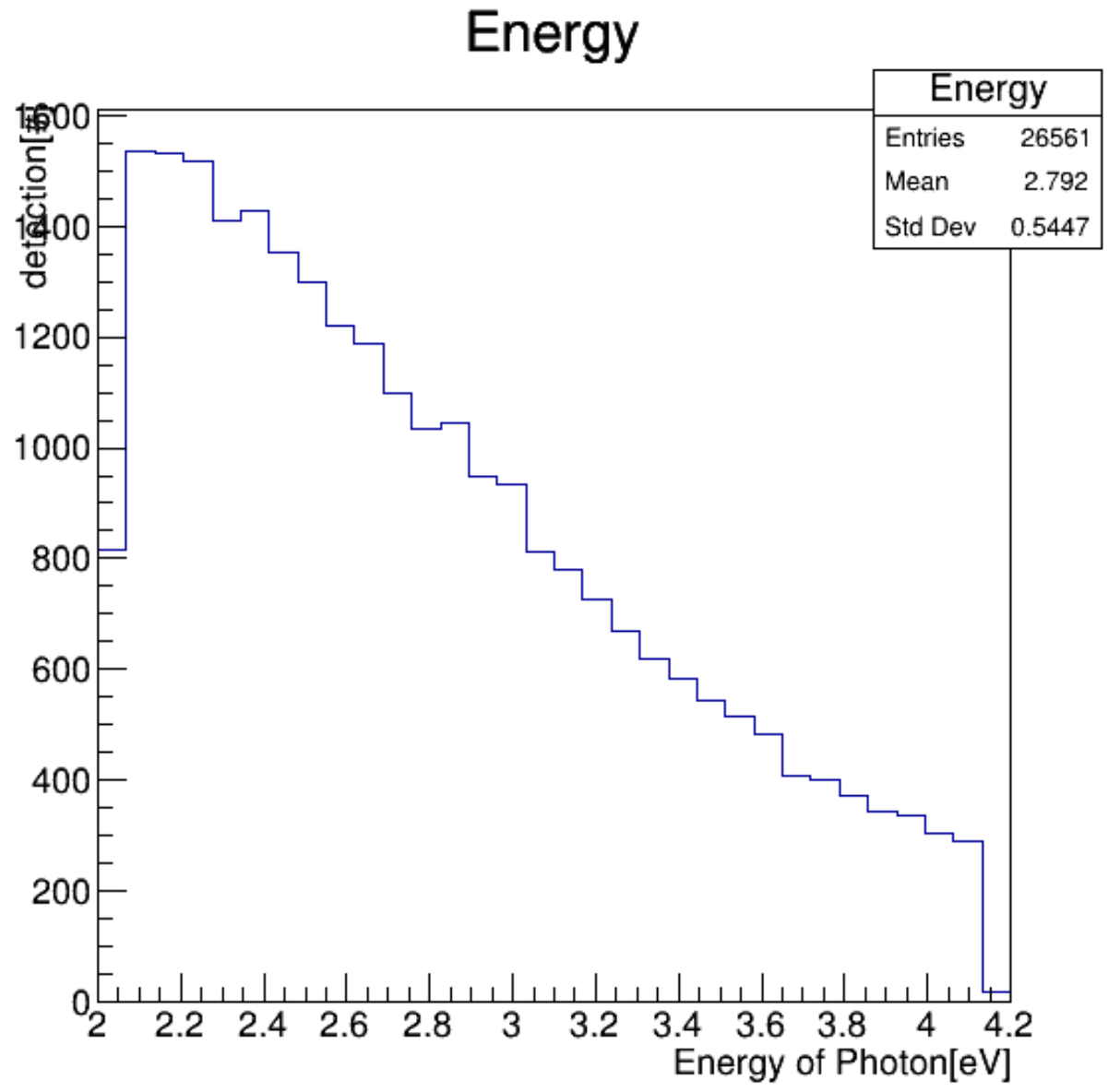




- Beam Direction(0,0,1)-Left//Horizontal Direction(1,0,0)-Mid// OverallView(1,1,1)-Right

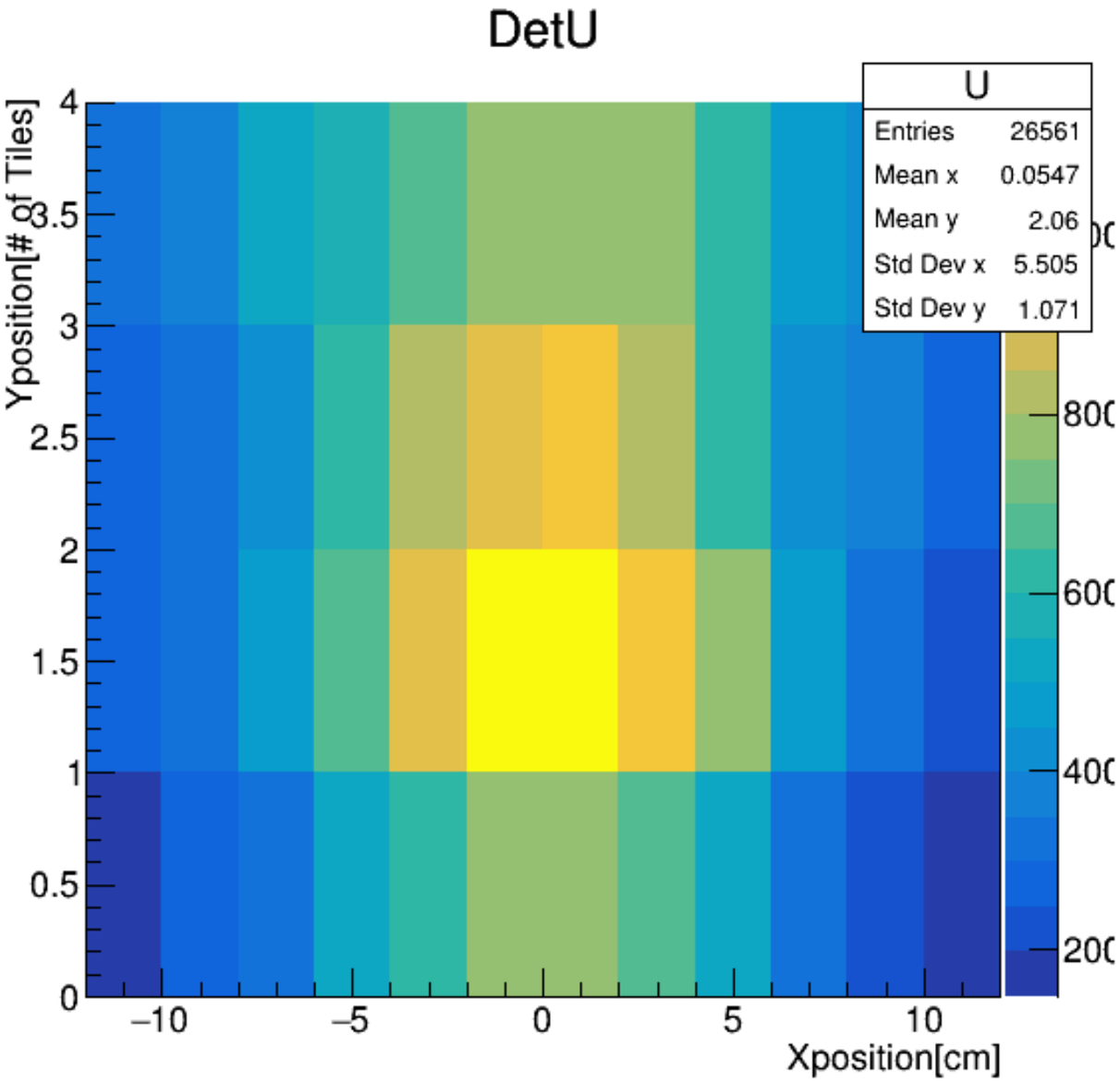
Detected photon

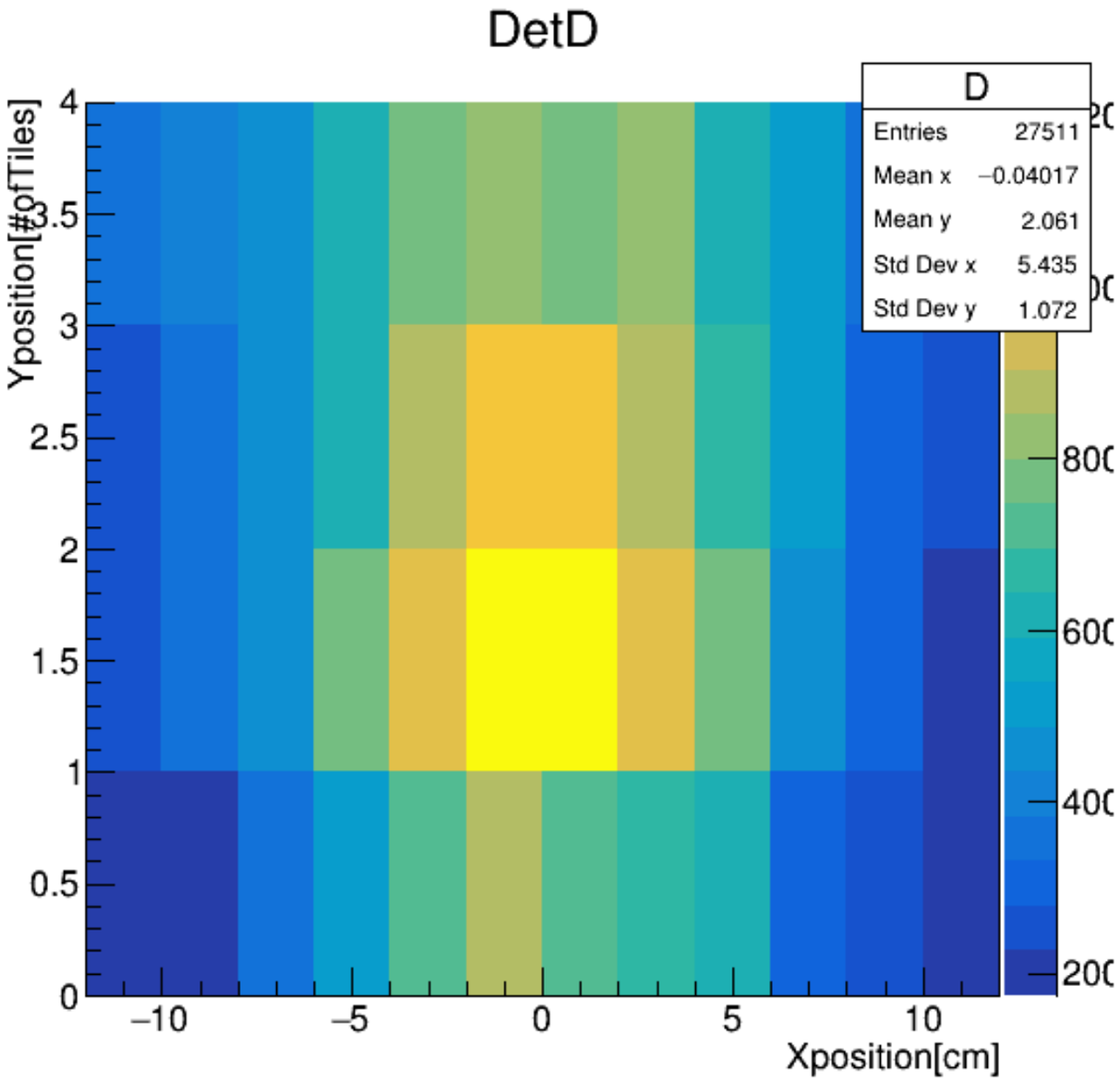




Hit pattern

- Parameter set for center-focusing.(Maybe changed due to mirror geometry)





Result

- x axis is [cm], while y axis is # of tiles. It would be tedious to set exact length for y, since length of y is changed while scanning.

- Size of the PMT is (including shell) about ~7.5 cm, hence only 3, not 5, can be at each side…

- # of c.p. is consistent with theory.(~143)(total 1000 run, hence avg. #ce is 142.627

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u113=345    d113=287
lost=4756   absorb=83799    eff=0.379115
Number of detected Photons: 54072
Number of Cerenkov Photons: 142627
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