Modular RICH Detector Simulation Detector Update

Cheuk-Ping Wong

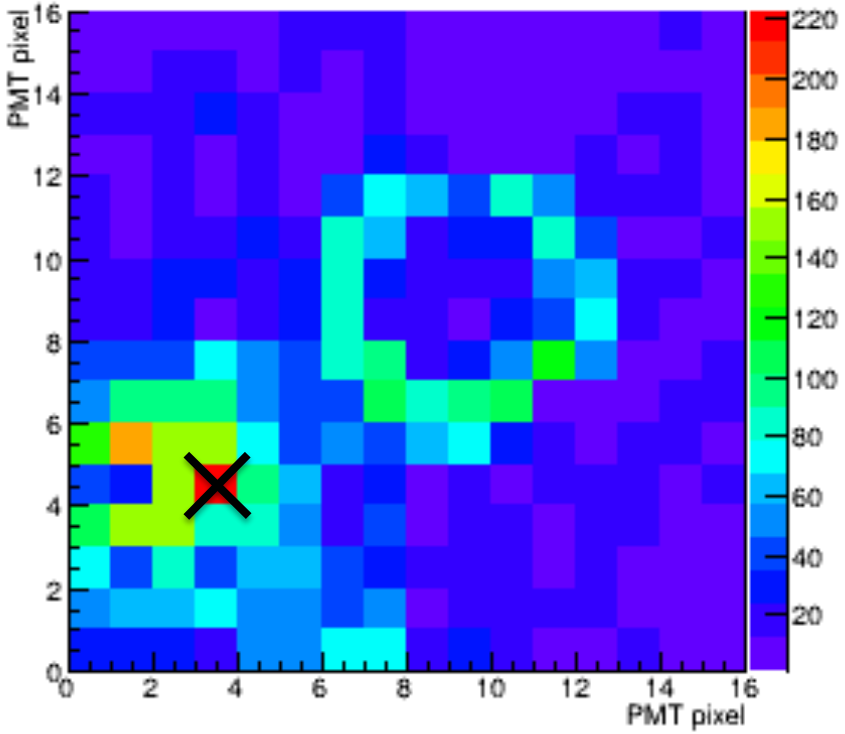
Georgia State University

07-18-2016

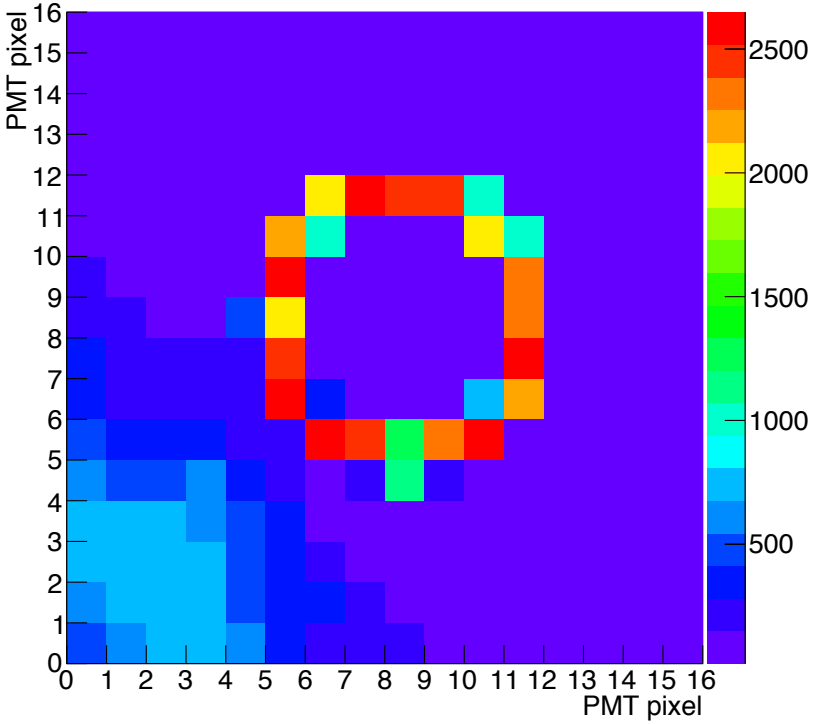
Previous Simulation Result

Launch at (x,y)=(-24,-24)mm

Beam Test : run 88



Simulation

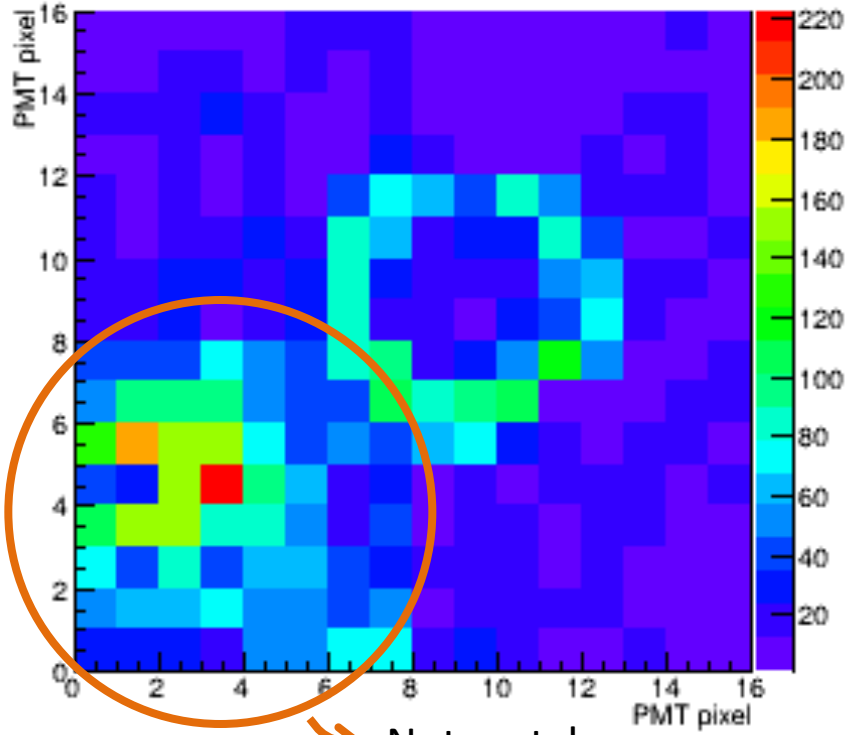


120 GeV Proton beam

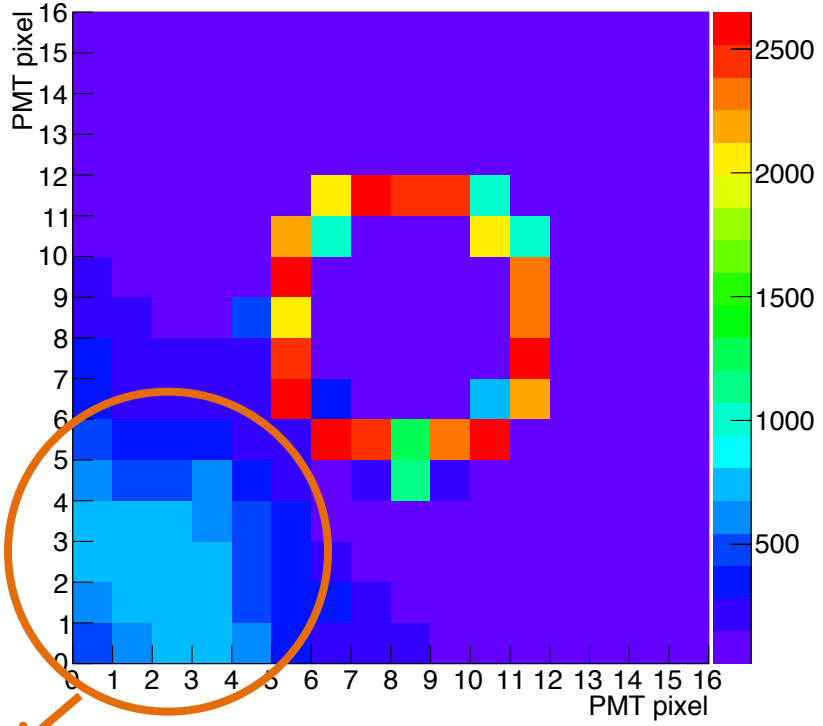
Previous Simulation Result

Launch at (x,y)=(-24,-24)mm

Beam Test 88



Simulation

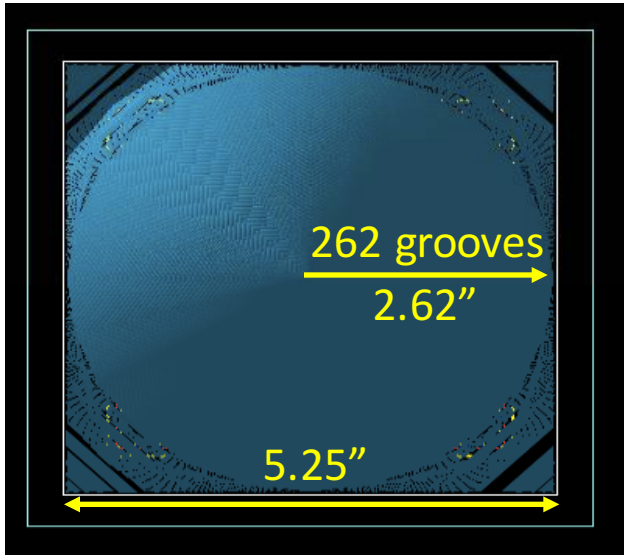


Not match

- Different shapes of background/noise
- strong unknown background/noise

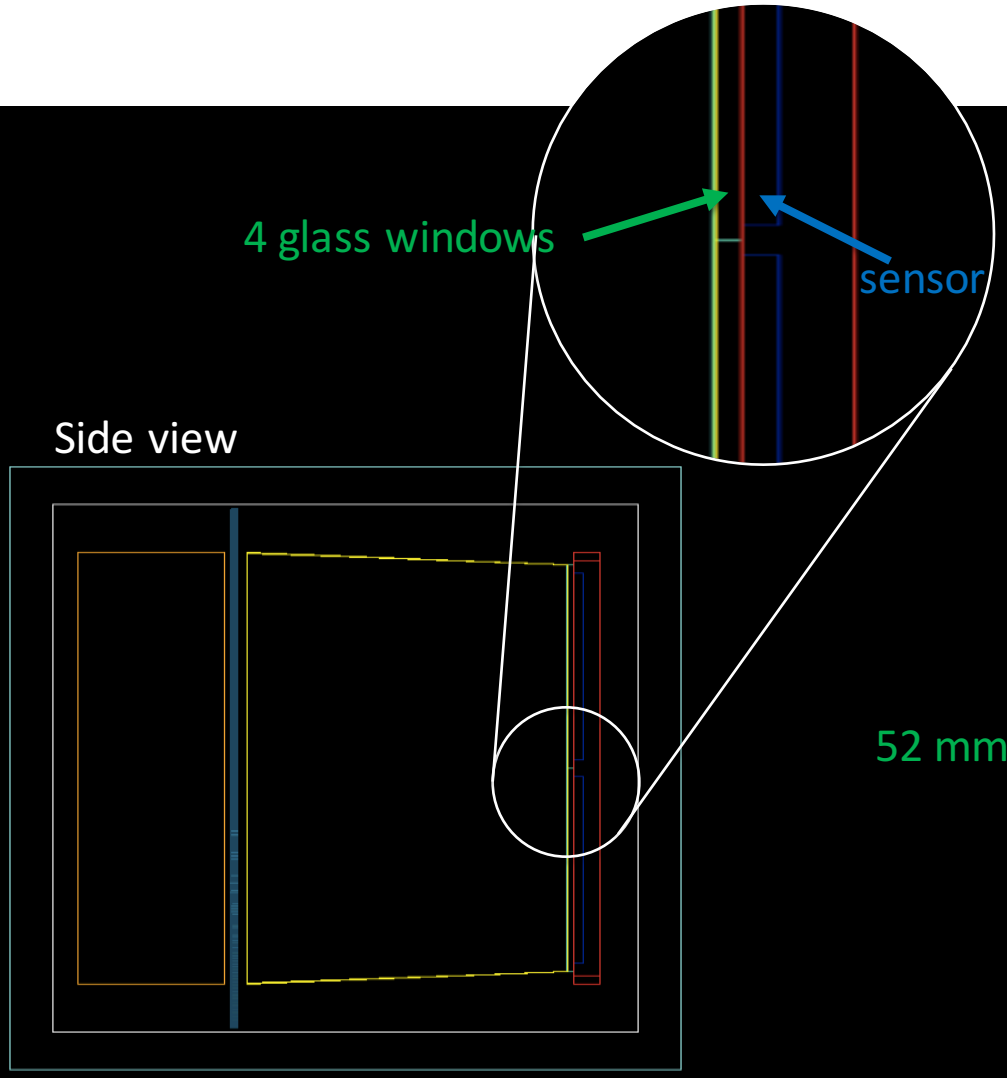
Simulation Update

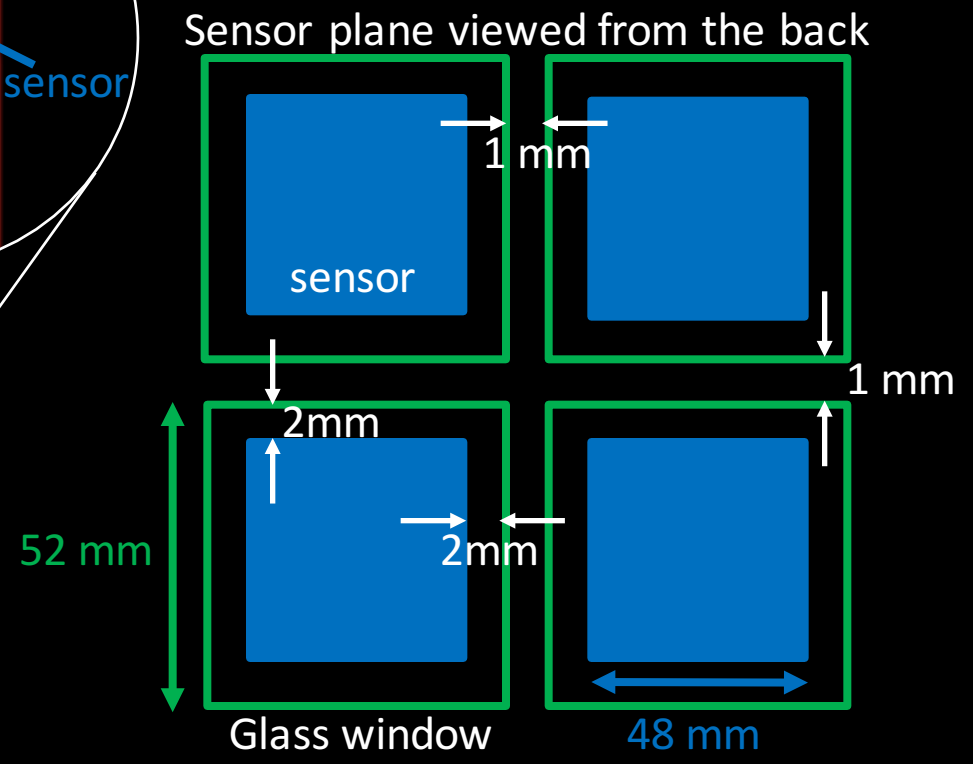
- Fresnel lens
  - 5.25” x 5.25”
  - 262 grooves (100 grooves/inch)
  - Focal length = 76.2mm
  - Absorption length = 25.25cm
  - Lens thickness 2.04mm



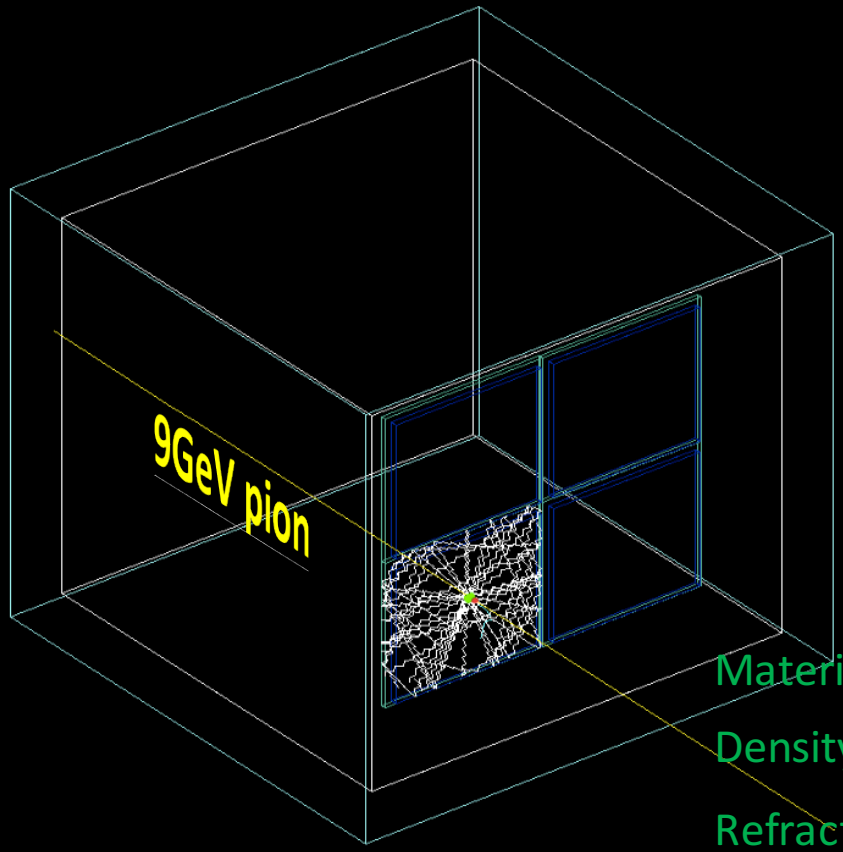
- Photon sensor
  - Effective area = 4.8cm x 4.8cm (each sensor)
  - Pixel size = 6mm x 6mm
  - 1.5mm glass window

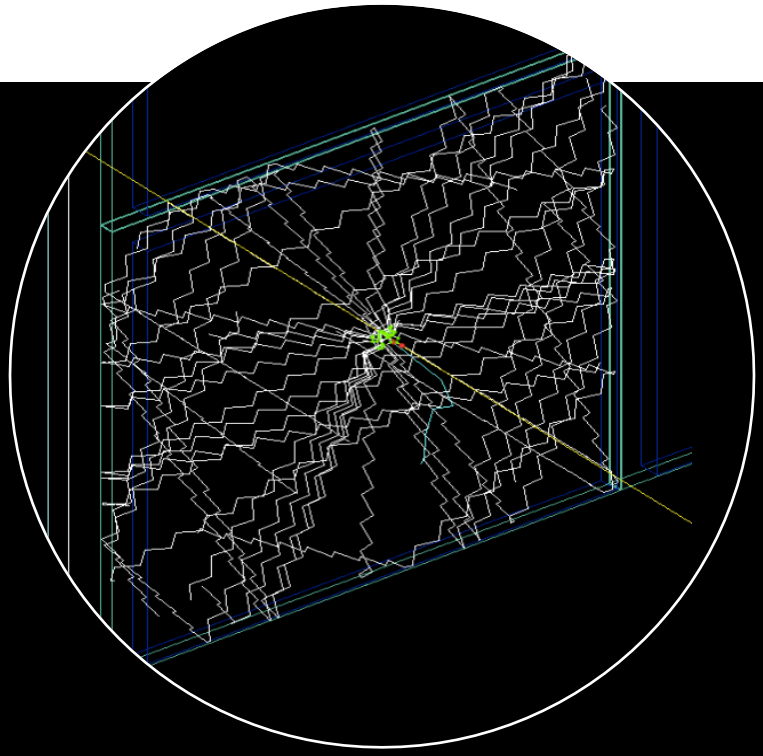
Simulation Update





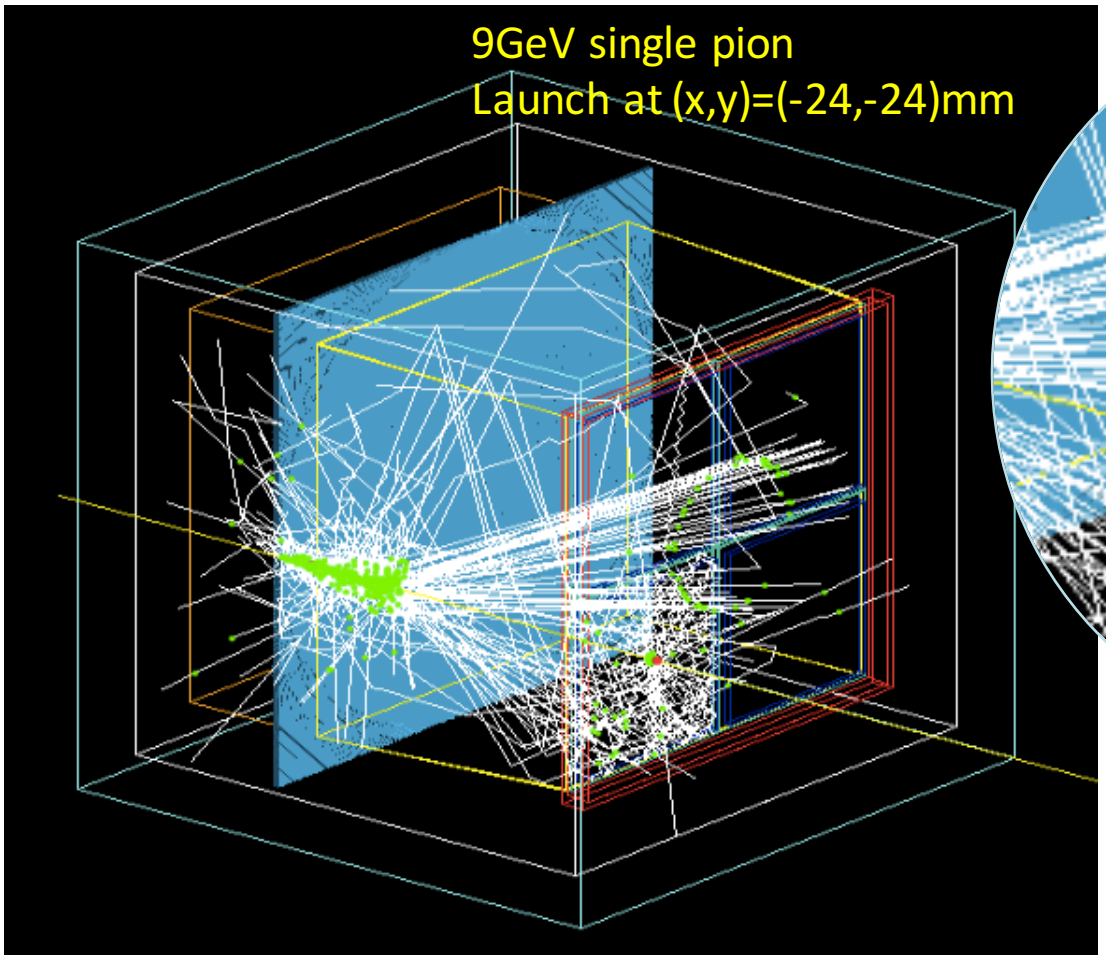
Internal Reflection inside Glass Window

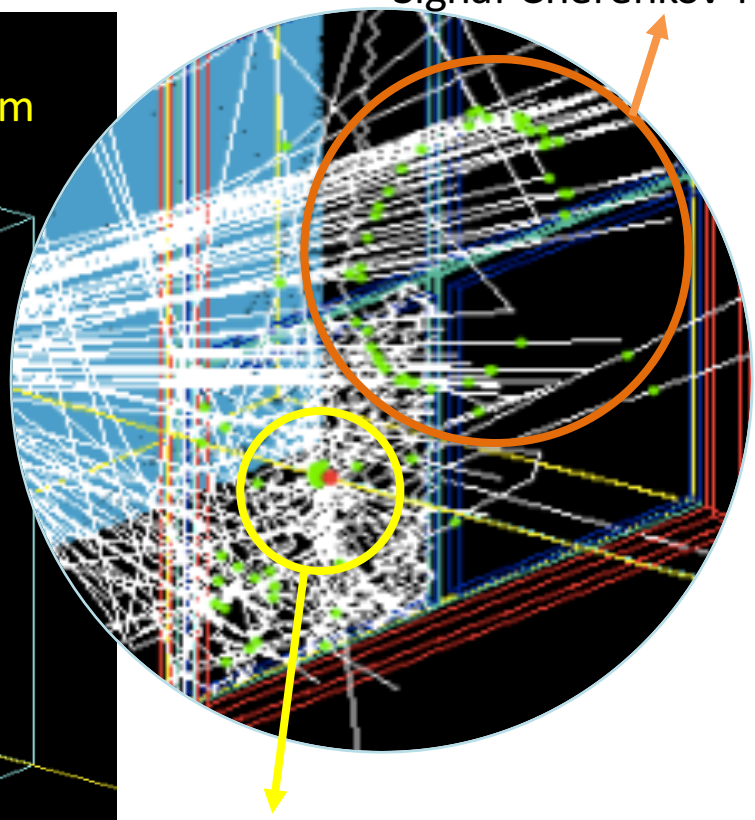




Material	Pyrex glass (Borosilicate glass)
Density	2.23 g/cm^3
Refractive index	1.47
transmittance	92% in 400-700nm wavelength region

After Detector Update





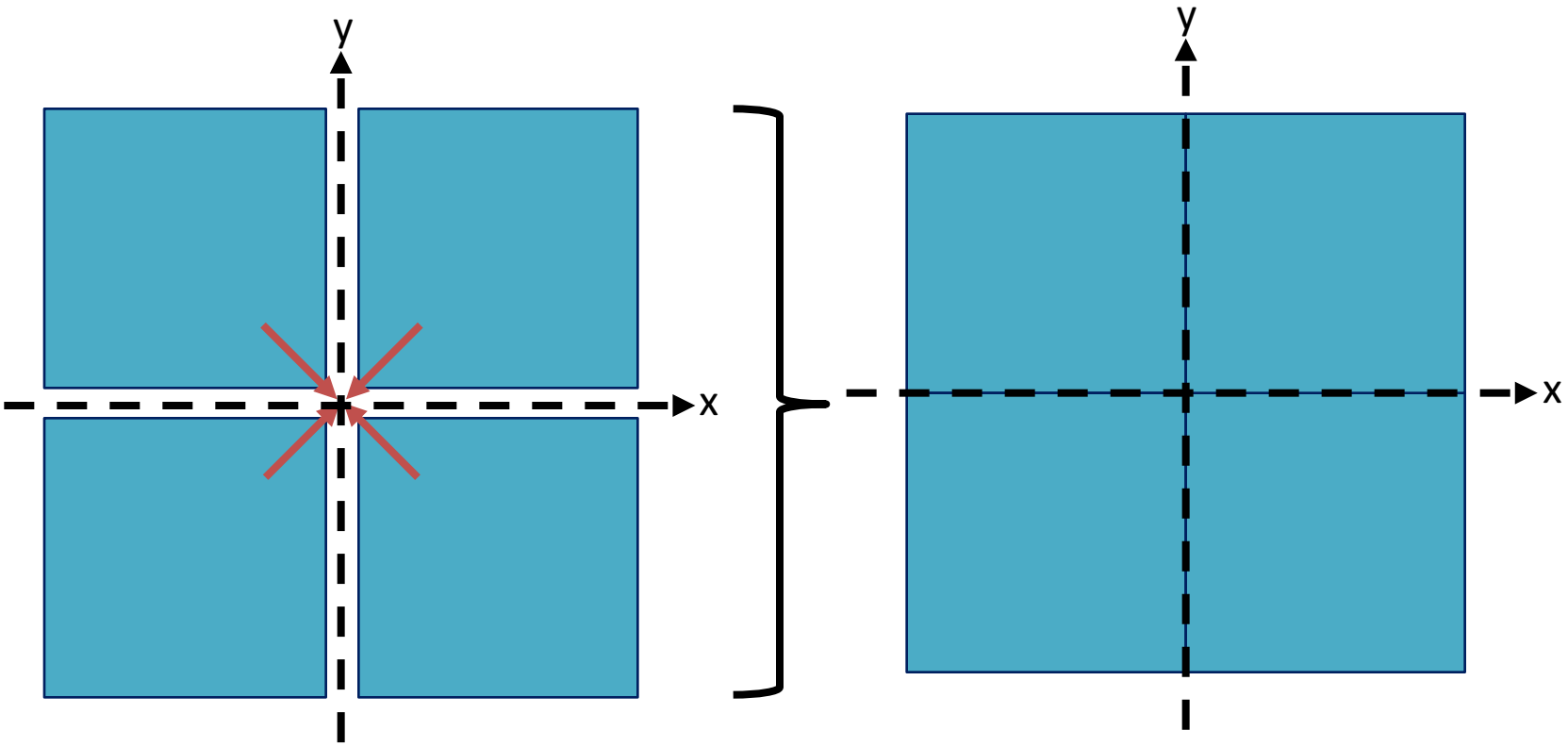
Simulation Setup

- Full Setup with Marco's aerogel
- 120 GeV Proton
- Launch perpendicular to the xy-plane

In simulation

- 1000 protons
- Beam size : diameter = 1cm
- Energy cut applied in analysis code

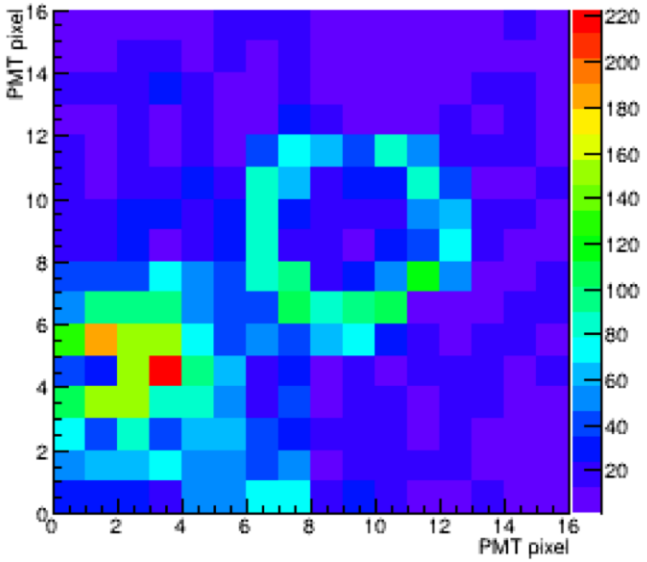
Simulation Analysis



Hit position is shifted toward the center to match the beam test display

Launch at (x,y)=(-24,-24)mm

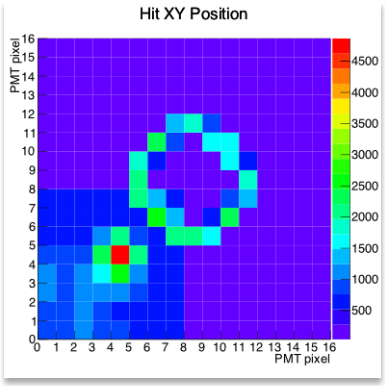
Beam Test: run 88



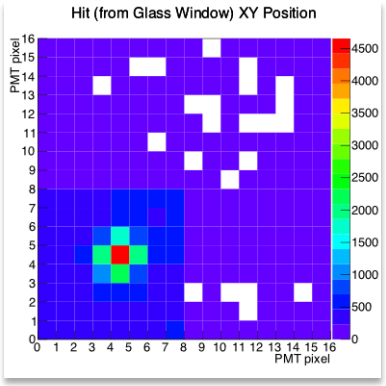
Most of the background from the glass window are confined in one quadrant because of the gap between glass window

Simulation

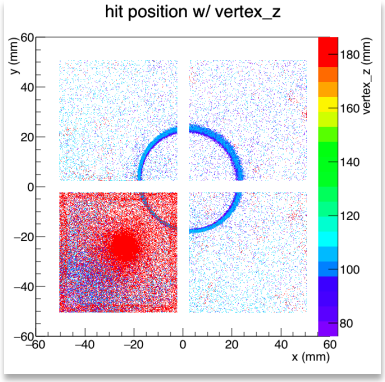
All Photon Hits



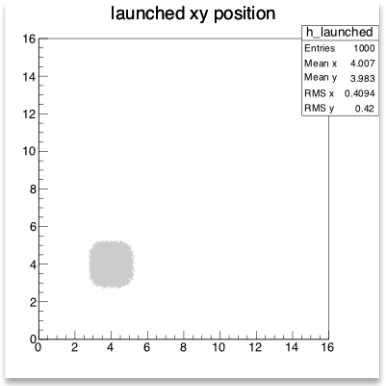
Photon hits emitted in Glass Window



All Photon Hits with generated position shown on z-axis



Beam Position



Summary

Detector Update

- Separated sensor plane to four individuals
- Added glass window on each sensor

Follow Up

- Insert Copper sheet to mimic photon sensor electronics