About Detector…

- Same as before.
- Failed to track exact hit position, hence pmt geometry were directly substituted.(Counting was possible)
- Due to some reason, some Cerenkov photons were missed.

Tracking Algorithm

- Analyzed optical process log from terminal. (exported to text file)
- Cannot get exact Hit position.
- By dividing detectors into some pixels, I might track position.

Lost++
Track Off

Cerenkov

Track On

Reflection++

Det2 ++
Track Off

Cerenkov2

Track On2

```
Photon at Boundary!
thePrePV:  World
thePostPV: WOut
Old Momentum Direction: (0.759484,0.0865875,0.644738)
Old Polarization:       (0.64341,-0.246182,-0.724857)
*** SameMaterial ***

Exiting from G4Cerenkov::DoIt -- NumberOfSecondaries = 9
Photon at Boundary!
thePrePV:  aerogel2r
thePostPV: World
Old Momentum Direction: (-0.170909,-0.113538,-0.978723)
Old Polarization:       (-0.983332,-0.0428933,0.17669)
New Momentum Direction: (-0.177745,-0.11808,-0.976967)
New Polarization:       (0.419447,0.888987,-0.183759)
*** FresnelRefraction ***
Photon at Boundary!
thePrePV:  World
thePostPV: sl1
Old Momentum Direction: (-0.177745,-0.11808,-0.976967)
Old Polarization:       (0.419447,0.888987,-0.183759)
New Momentum Direction: (-0.177745,-0.976967,-0.11808)
New Polarization:       (-0.419447,0.183759,-0.888987)
*** SpikeReflection ***
Photon at Boundary!
thePrePV:  sl1
thePostPV: World
*** StepTooSmall ***
Photon at Boundary!
thePrePV:  World
thePostPV: detd2
Old Momentum Direction: (-0.177745,-0.976967,-0.11808)
Old Polarization:       (-0.419447,0.183759,-0.888987)
*** NoRINDEX ***
Photon at Boundary!
thePrePV:  aerogel2r
thePostPV: World
Old Momentum Direction: (0.207581,-0.310685,-0.927569)
Old Polarization:       (0.470025,-0.799914,0.373115)
New Momentum Direction: (0.215884,-0.323113,-0.921408)
New Polarization:       (-0.555689,0.735279,-0.388039)
*** FresnelRefraction ***
```

Photon Tracking

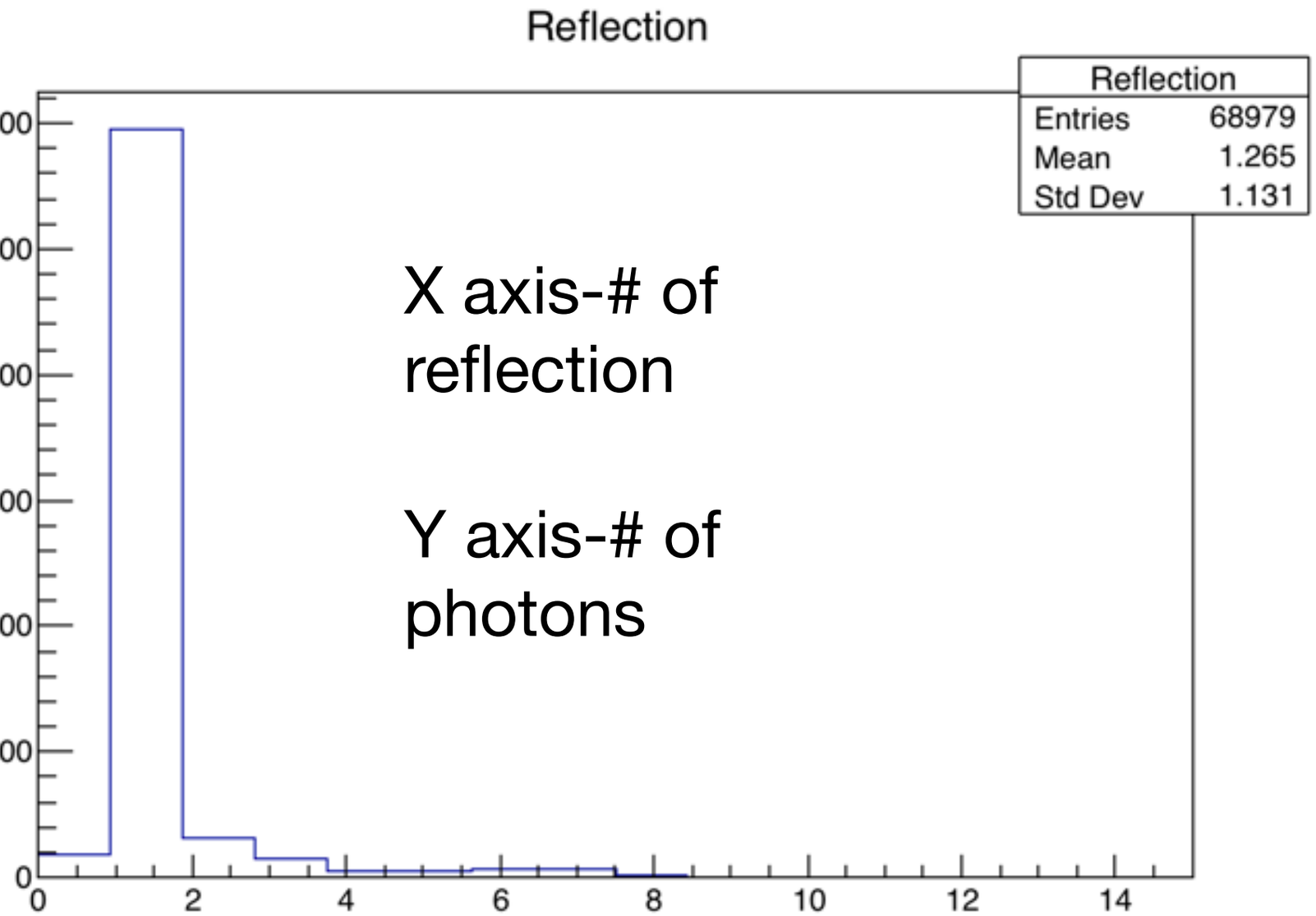
```
New Polarization:       (-0.154026,-0.90639,-0.393361)
*** SpikeReflection ***
Photon at Boundary!
thePrePV:  sl1
thePostPV: World
*** StepTooSmall ***
Photon at Boundary!
thePrePV:  World
thePostPV: ivr
Old Momentum Direction: (-0.831182,-0.0963966,0.54758)
Old Polarization:       (-0.154026,-0.90639,-0.393361)
New Momentum Direction: (-0.831182,-0.0963966,0.54758)
New Polarization:       (-0.154026,-0.90639,-0.393361)
*** Absorption ***
Photon at Boundary!
thePrePV:  aerogel2r
thePostPV: World
Old Momentum Direction: (-0.17865,-0.512109,-0.840136)
Old Polarization:       (-0.482065,-0.698808,0.52847)
New Momentum Direction: (-0.185796,-0.532593,-0.825727)
New Polarization:       (0.0526473,0.833755,-0.549618)
*** FresnelRefraction ***
Photon at Boundary!
thePrePV:  World
thePostPV: sl1
Old Momentum Direction: (-0.185796,-0.532593,-0.825727)
```

- Momentum of single photon will not change without Optical process.

```
Photon at Boundary!
thePrePV:  World
thePostPV: WOut
Old Momentum Direction: (0.759484,0.0865875,0.644738)
Old Polarization:       (0.64341,-0.246182,-0.724857)
*** SameMaterial ***

Exiting from G4Cerenkov::DoIt -- NumberOfSecondaries = 9
Photon at Boundary!
thePrePV:  aerogel2r
thePostPV: World
Old Momentum Direction: (-0.170909,-0.113538,-0.978723)
Old Polarization:       (-0.983332,-0.0428933,0.17669)
New Momentum Direction: (-0.177745,-0.11808,-0.976967)
New Polarization:       (0.419447,0.888987,-0.183759)
*** FresnelRefraction ***
Photon at Boundary!
thePrePV:  World
thePostPV: sl1
Old Momentum Direction: (-0.177745,-0.11808,-0.976967)
Old Polarization:       (0.419447,0.888987,-0.183759)
New Momentum Direction: (-0.177745,-0.976967,-0.11808)
New Polarization:       (-0.419447,0.183759,-0.888987)
*** SpikeReflection ***
Photon at Boundary!
thePrePV:  sl1
thePostPV: World
*** StepTooSmall ***
Photon at Boundary!
thePrePV:  World
thePostPV: detd2
Old Momentum Direction: (-0.177745,-0.976967,-0.11808)
Old Polarization:       (-0.419447,0.183759,-0.888987)
*** NoRINDEX ***
Photon at Boundary!
thePrePV:  aerogel2r
thePostPV: World
Old Momentum Direction: (0.207581,-0.310685,-0.927569)
Old Polarization:       (0.470025,-0.799914,0.373115)
New Momentum Direction: (0.215884,-0.323113,-0.921408)
New Polarization:       (-0.555689,0.735279,-0.388039)
*** FresnelRefraction ***
```

RESULT



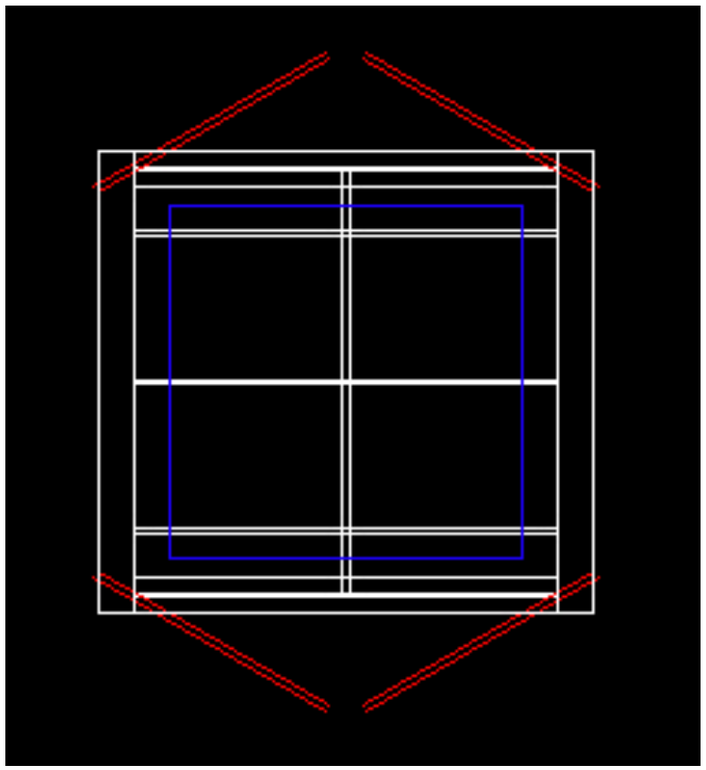
X axis-# of reflection

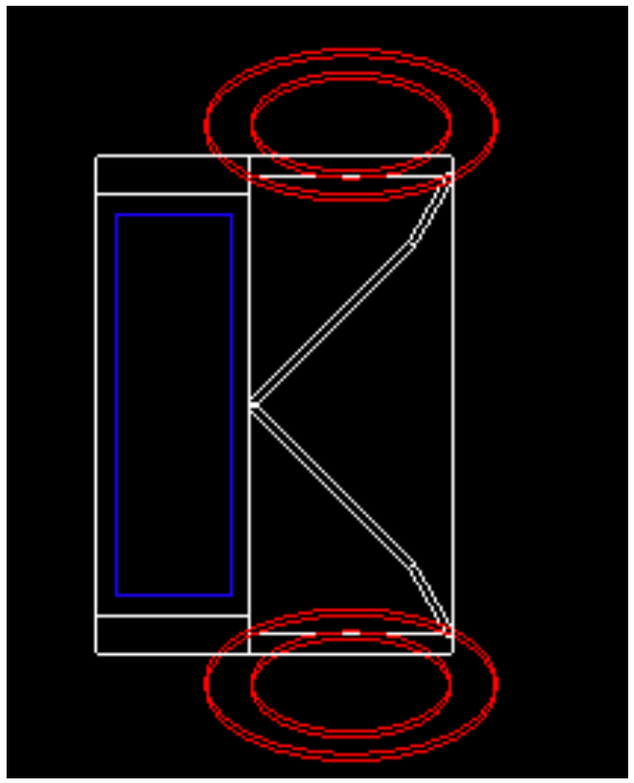
Y axis-# of photons

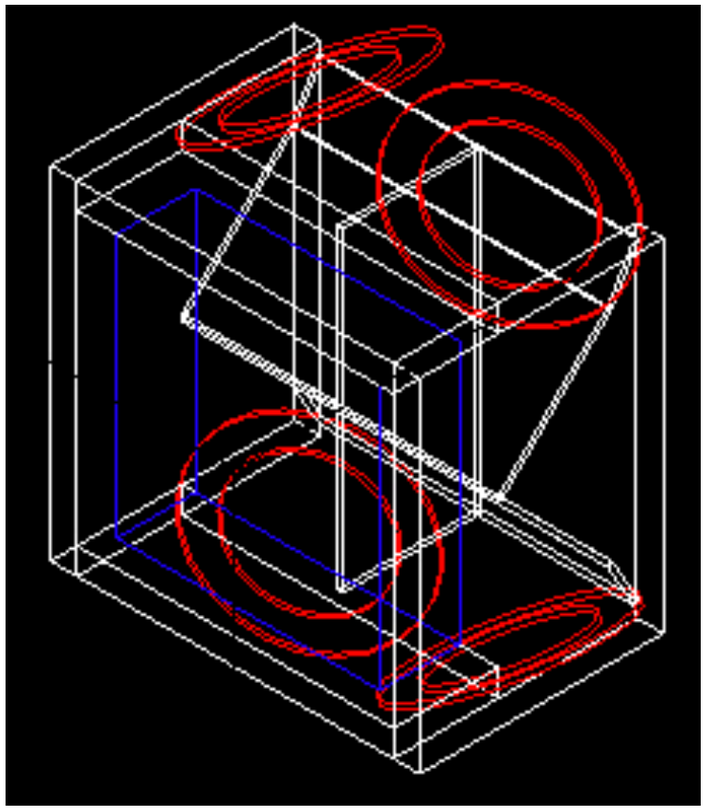
- 1000 run.
- Detection efficiency: 42.6%[68979 among 162127]
- Most of the photons were reflected once.

Backup

- Detector Geometry







Backup

- Every single photons were tracked.

```
*** StepTooSmall ***
Photon at Boundary!
thePrePV:  World
thePostPV: WOut
Old Momentum Direction: (0.719572,0.00100383,-0.694417)
Old Polarization:       (0.580887,-0.548823,0.601135)
*** SameMaterial ***
Number of Cerenkov photons produced in this event : 162127
for the entire run


Processing analysis.cc...
Info in <TCanvas::MakeDefCanvas>:  created default TCanvas with name c1
u1=16720 u2=17818  d1=16303  d2=18138   lost=82500   absorb=10648
Number of detected Photons: 68979
Number of Cerenkov Photons: 162127
root [1]
```