# Modular RICH Detector Simulation – Testing Rayleigh Scattering

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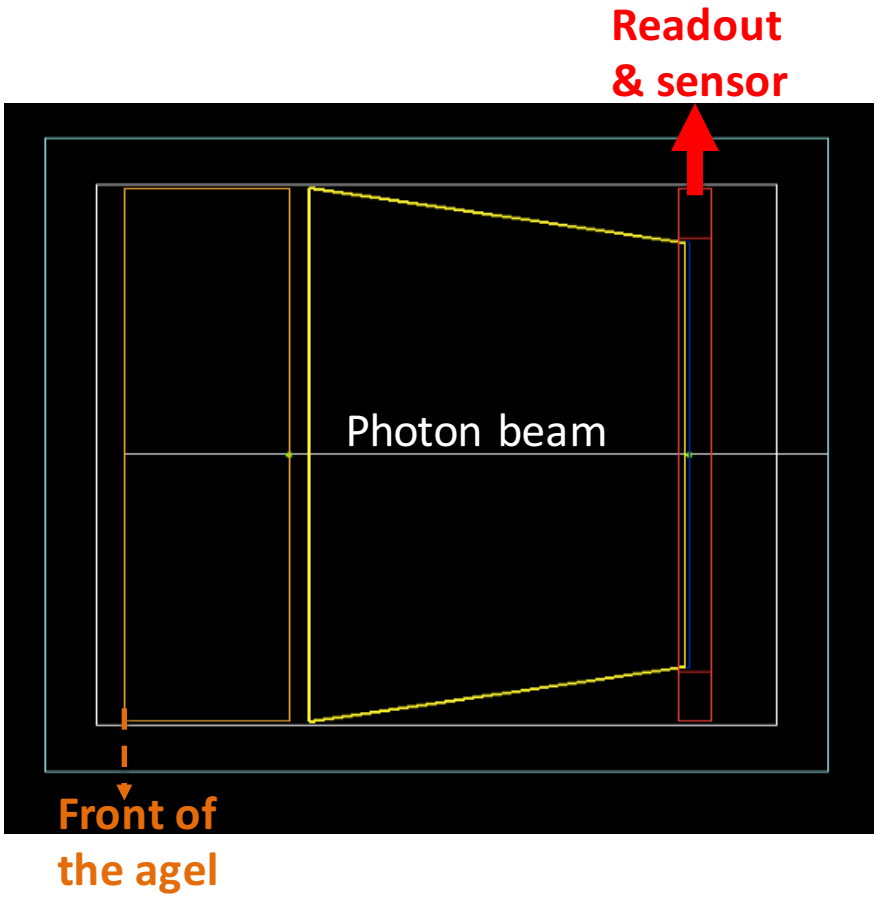
# This Week

- Changed analysis code for Rayleigh Scattering (see slide 4)
- Running simulation with acrylic holder box
  - Analysis result will be shown on next meeting

# Simulation Setup

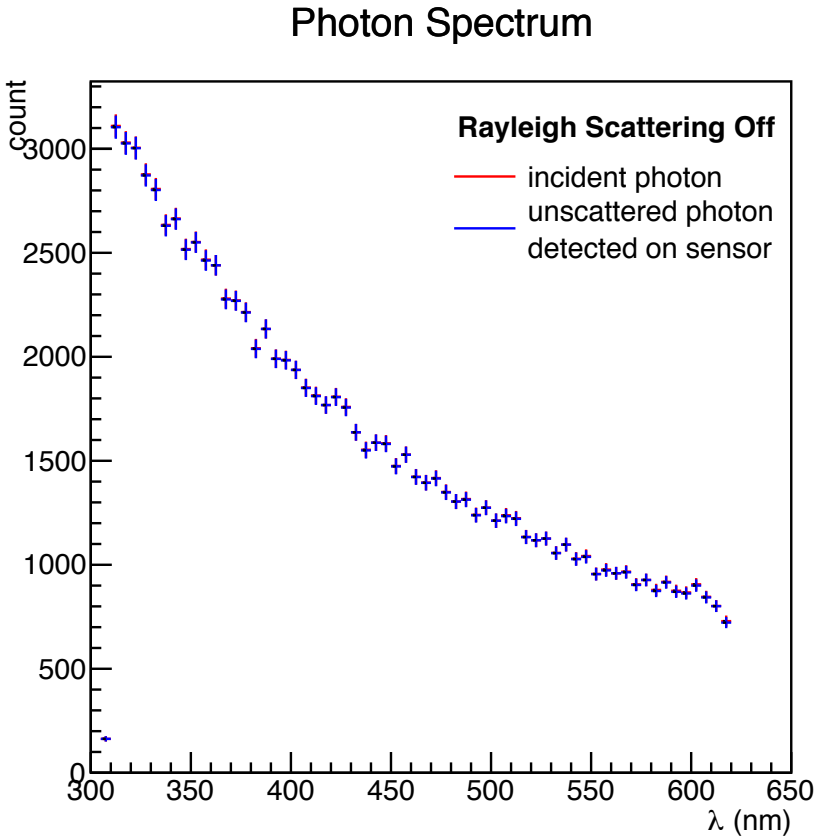
- 100,000 Photon
  - Momentum=2-4 eV
  - Launched in front of the aerogel
- Aerogel
  - 3cm thick
  - 1.03 refractive index
- Remove Fresnel lens
- Optical air holder box
- Rayleigh Scattering On & Off
- GEMC ver2.3

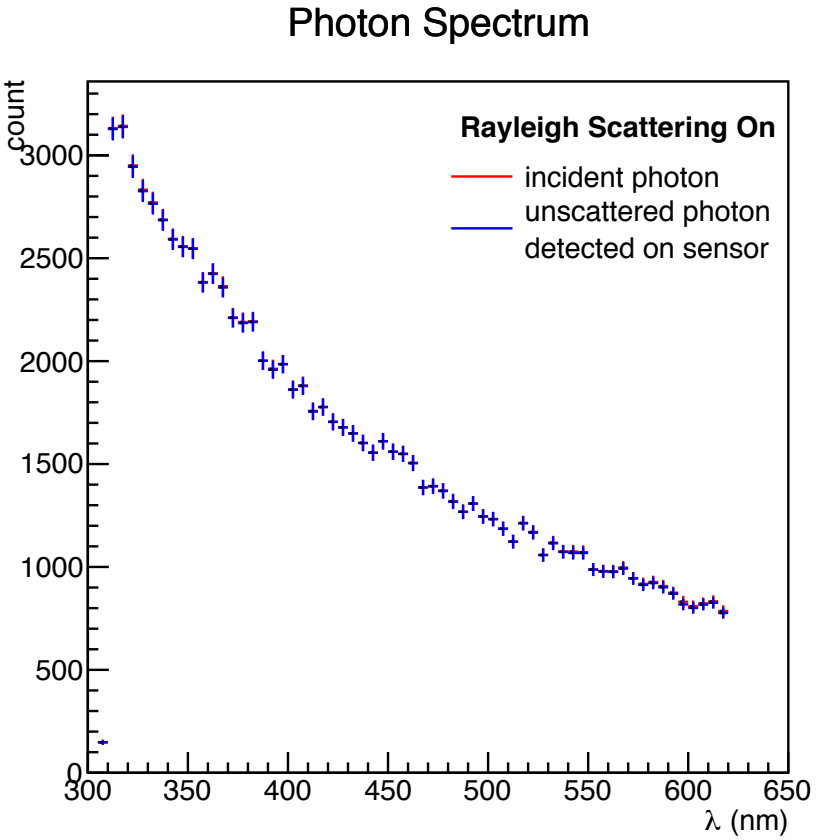


# Analysis

- Un-scattered photons
  - Move forward (not reflected)
  - Hit at the center of the xy plane (as the same as the launching xy position)

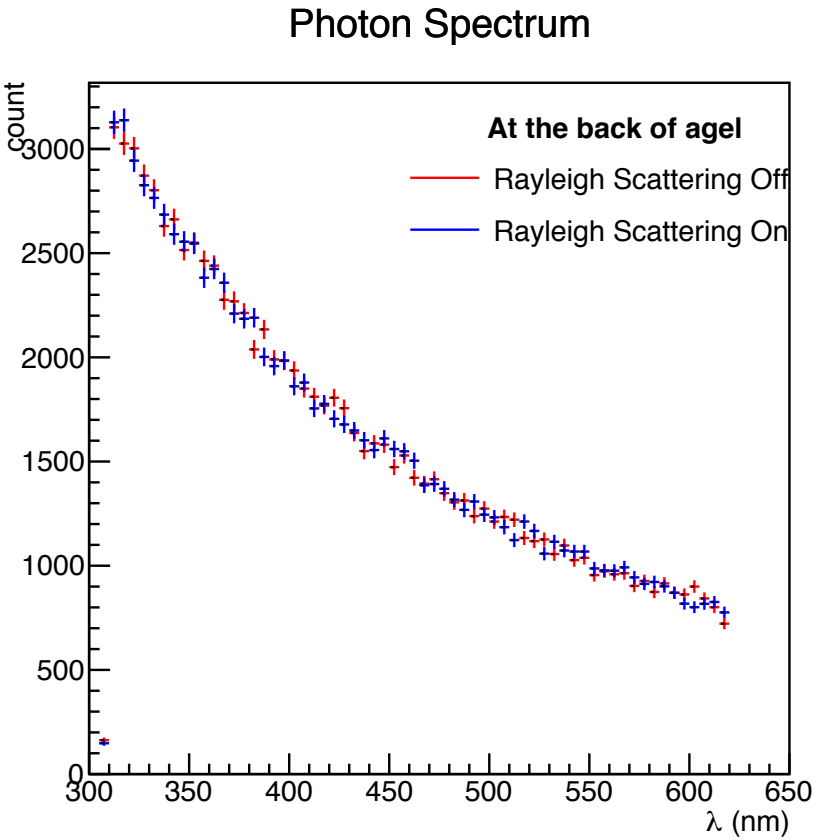
# Compare Wavelength Distribution of Incident Photon & Photon Detected on Sensor

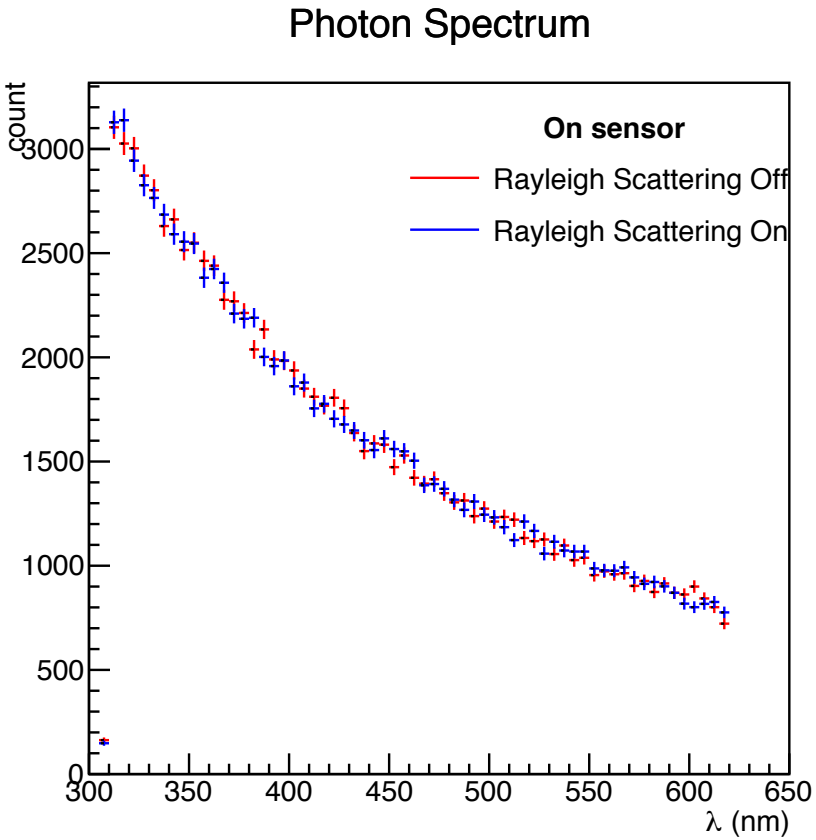



Wavelength distribution of photon detected on sensor is close to wavelength distribution of incident photons (see slide 7)

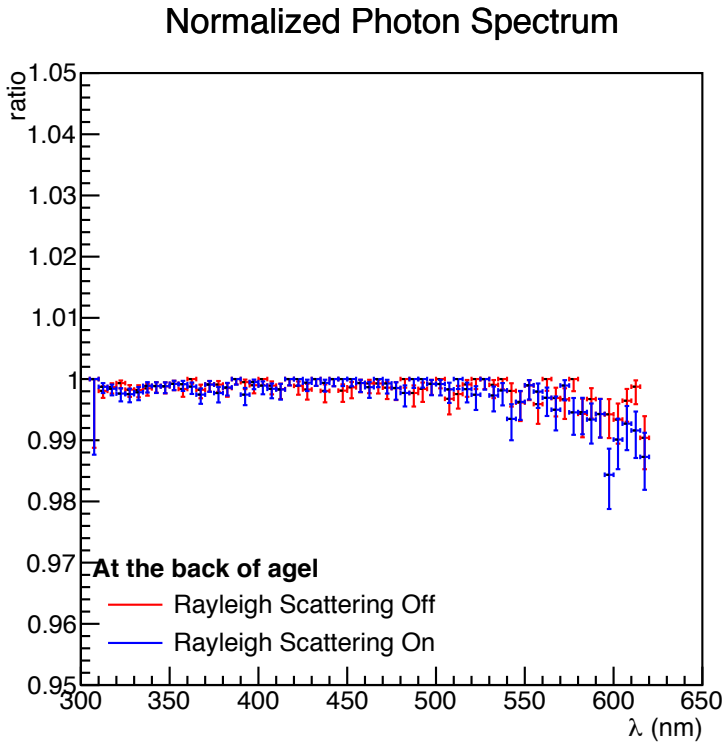
# Wavelength Distribution of Detected Photon with Rayleigh Scattering On/Off

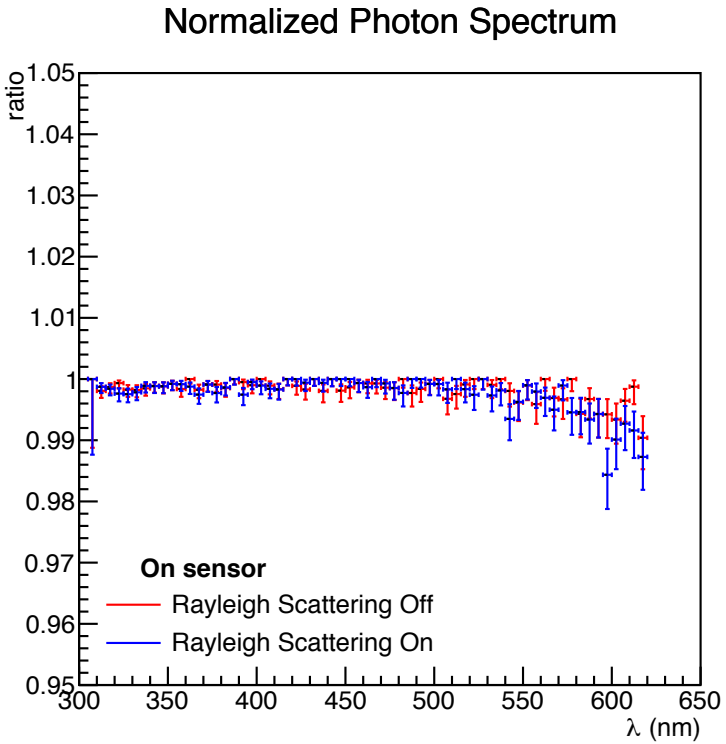



Plots on the left and right are identical → all the photons survived in the aerogel arrive on the sensor

# Normalized Wavelength Distribution




- Wavelength distribution of detected photon (slide 6) normalized by the wavelength distribution of incident photon (slide 5)
- Normalized Wavelength distributions from **both Rayleigh Scattering on and off are close to 1**
- Normalized Wavelength distributions from both Rayleigh Scattering on and off are **less than or equal to 1** → photon absorption and reflection
- **No "S" shape** shown from Rayleigh Scattering On

# Summary

- No "S" shape shown on the Normalized Wavelength Distribution
- No obvious difference shown on Normalized Wavelength Distributions between Rayleigh Scattering on and off
- Normalized Wavelength Distribution is less then or equal to 1

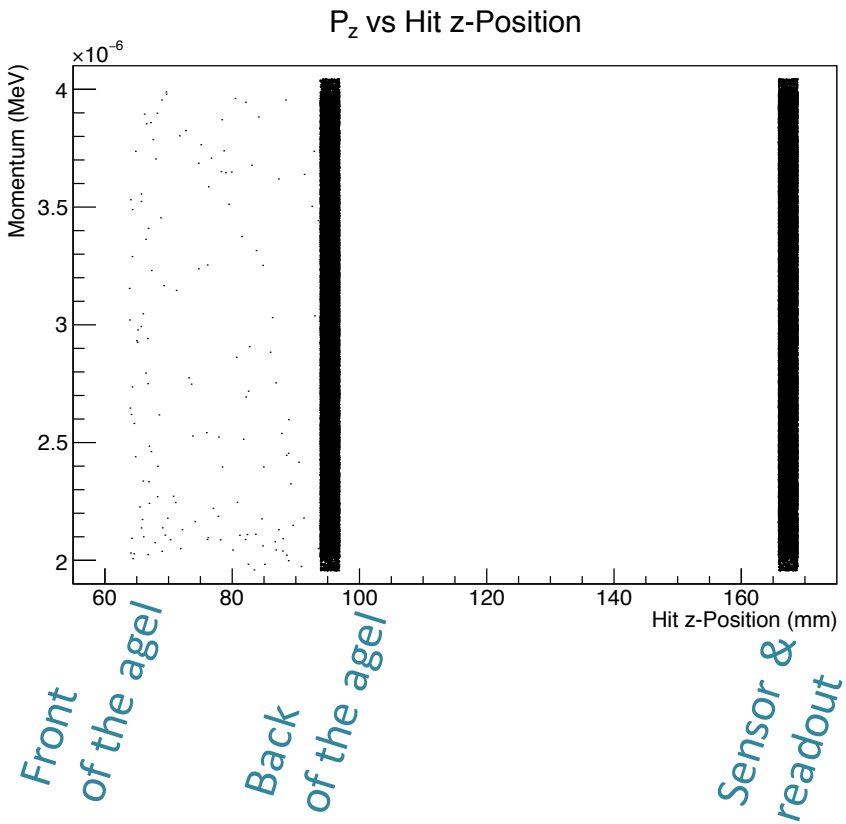
# Next

- Study effect from acrylic holder box
- Prior to re-run Likelihood analysis
  - Implement Quantum Efficiency
  - Implement Rayleigh Scattering

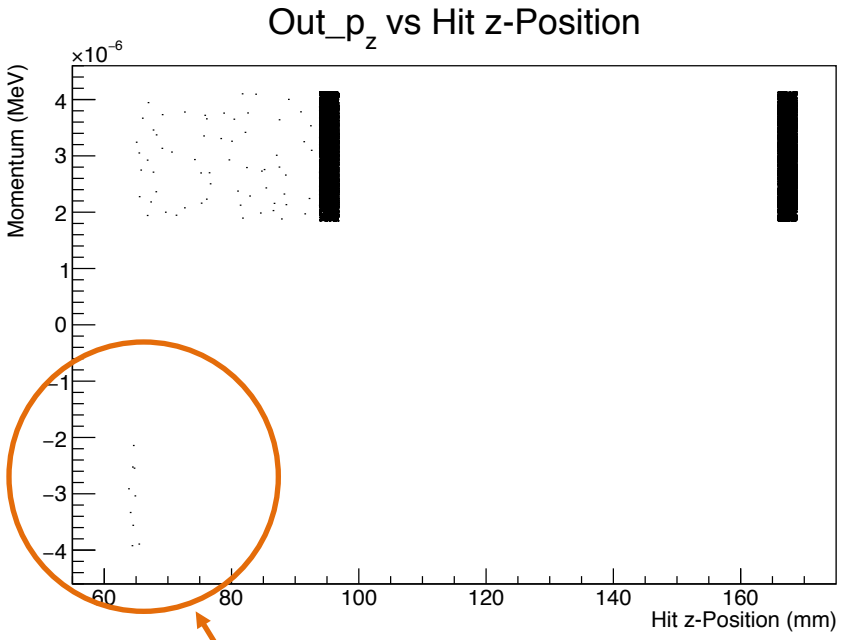
# Back Up

# Momentum vs Hit z-Position
# Rayleigh Scattering Off

## Using pz



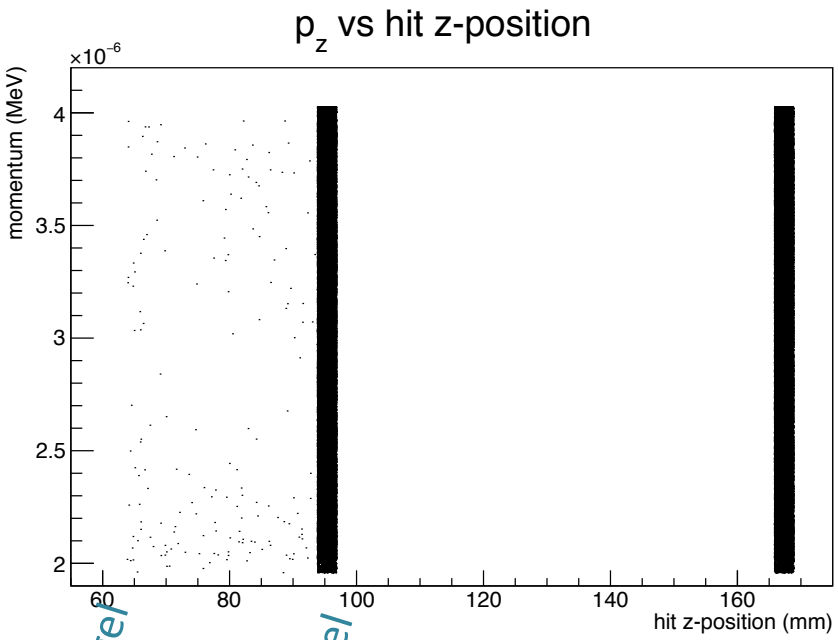

## Using out_pz



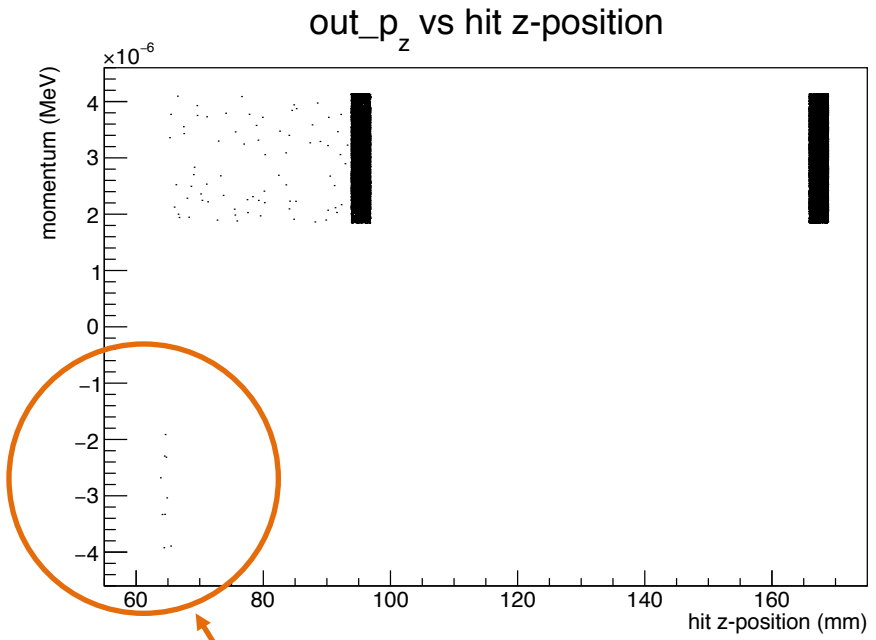

- Bounced back at the front of the aerogel
- 19 counts

# Momentum vs Hit z-Position Rayleigh Scattering On

## Using pz




## Using out_pz

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