

Chroma Simulation

8Silicon35_87

DIFFUSE

July 23, 2024

Pocar Lab
Lab 21
nEXO Collaboration

1) Experiment Details

- Experiment Name: 8Silicon35_87
- Number of Particles: 100000000
- Random Seed: 1042
- Run ID: 1
- Excluded Geometry: [1, 3, 5, 7]
- PTE: 0.0018 ± 0.0000 .

2) Material Properties

2.1) Bulk Materials

| name | refractive_index | absorption_length | scattering_length | density |
|------------------|------------------|-------------------|-------------------|---------|
| liquid xenon | 1.69 | 3500000000000.0 | 350000000000000.0 | 2.942 |
| copper | 0.9733 | 0.05 | 1000000 | 8.96 |
| silicon | 0.682 | 1000000.0 | 10000000 | 2.329 |
| steel | 1.29 | 100000000.0 | 1000000000 | 7.75 |
| teflon | 0.0 | 100000000.0 | 1000000000 | 7.75 |
| silica | 1.644 | 100000000.0 | 1000000000 | 2.202 |
| aluminum | 0.09216 | 1000000.0 | 10000000 | 2.7 |
| killing material | 1.0 | 100000000.0 | 1000000000 | 0.0 |

| name | abs(r_i_error) | eta | k | abs(eta_error) | abs(k_error) |
|------------------|----------------|---------|--------|----------------|--------------|
| liquid xenon | 0.0 | 0.0 | 0.0 | 0 | 0 |
| copper | 0.0 | 0.972 | 1.5004 | 0 | 0 |
| silicon | 0.0 | 0.83987 | 1.9019 | 0 | 0 |
| steel | 0.0 | 0.0 | 0.0 | 0 | 0 |
| teflon | 0.0 | 0.0 | 0.0 | 0 | 0 |
| silica | 0.0 | 0.0 | 0.0 | 0 | 0 |
| aluminum | 0.0 | 0.09216 | 1.9217 | 0 | 0 |
| killing material | 0.0 | 0.0 | 0.0 | 0 | 0 |

2.2) Surface Properties

| name | outer_mat | inner_mat | model_id | reflect_specular | reflect_diffuse |
|-----------------|--------------|-----------|----------|------------------|-----------------|
| FBK HD3 | liquid xenon | silicon | 5 | 0 | 0 |
| Cu-Xe | liquid xenon | copper | 8 | 0 | 1 |
| silicon-Xe | liquid xenon | silicon | 4 | 0 | 1 |
| killing surface | None | None | 8 | 0 | 0 |

3) Results

3.1) Photon Transmission Efficiency

The Photon Transmission Efficiency (PTE) for this experiment was 0.0018 ± 0.0000 .

3.2) Tallies

| Tally | Count |
|-------|-------|
| | |

| | |
|------------------|----------|
| NO_HIT | 30103639 |
| BULK_ABSORB | 1952 |
| SURFACE_DETECT | 181417 |
| SURFACE_ABSORB | 69712982 |
| REFLECT_DIFFUSE | 2 |
| REFLECT_SPECULAR | 0 |

4) Plots

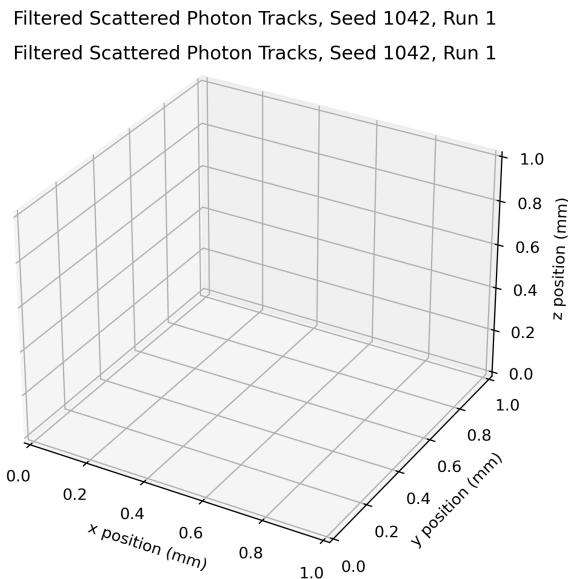


Figure 1: filtered scattered photon tracks, seed 1042, run 1 seed 1042 run 1

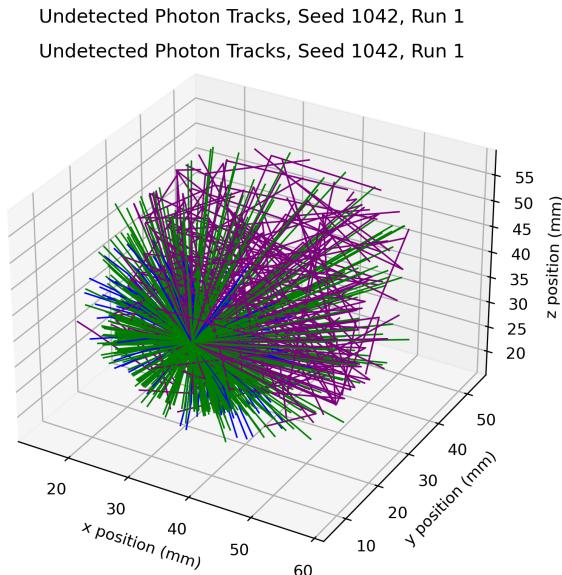


Figure 3: undetected photon tracks, seed 1042, run 1 seed 1042 run 1

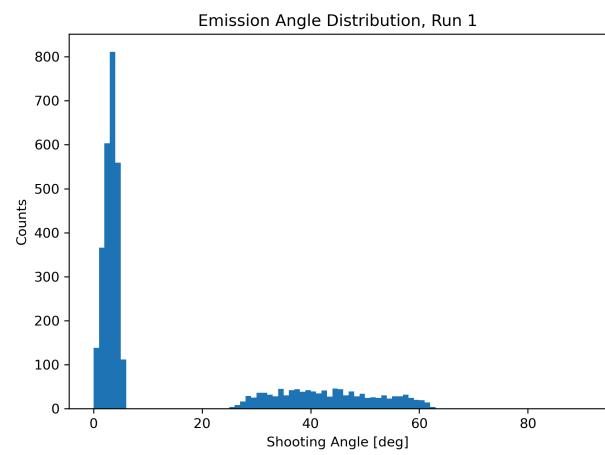


Figure 2: emission angle distribution seed 1042 run 1

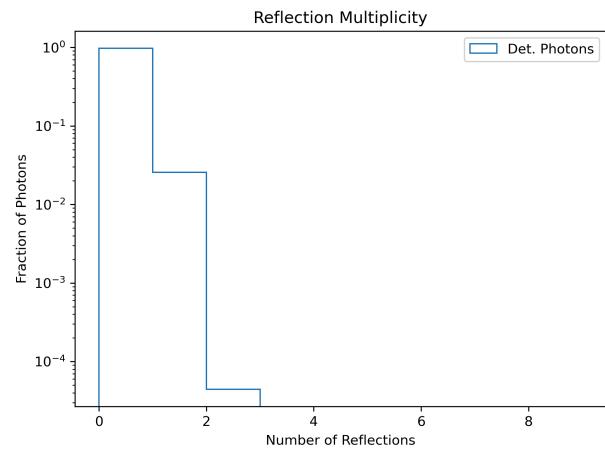


Figure 4: reflection multiplicity seed 1042 run 1

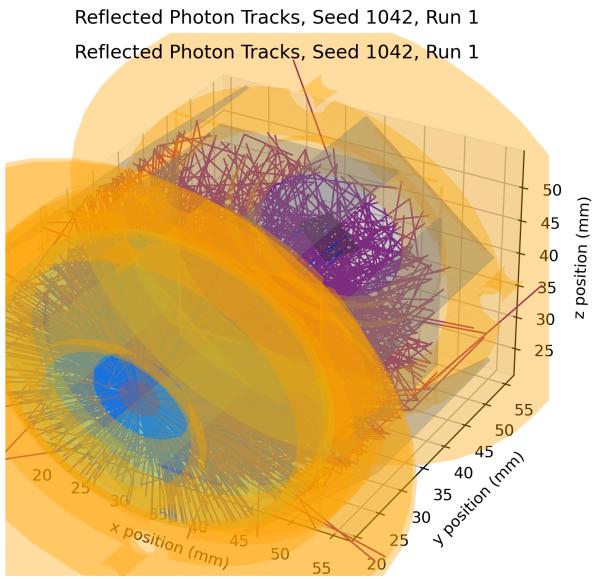


Figure 5: reflected photon tracks, seed 1042, run 1 seed 1042 run 1

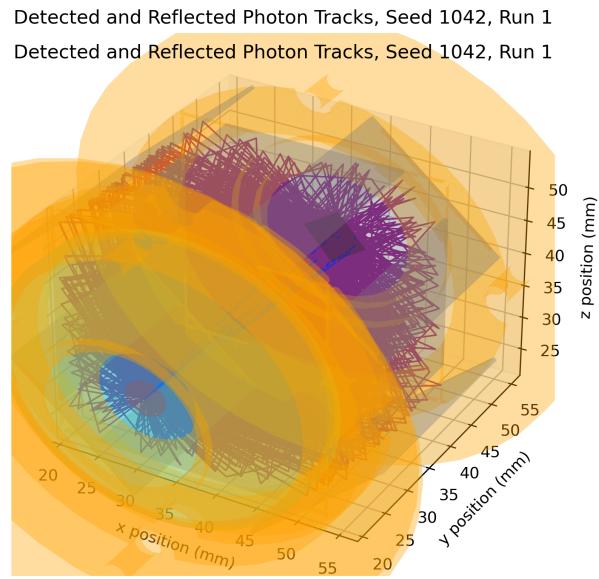


Figure 6: detected and reflected photon tracks, seed 1042, run 1 seed 1042 run 1

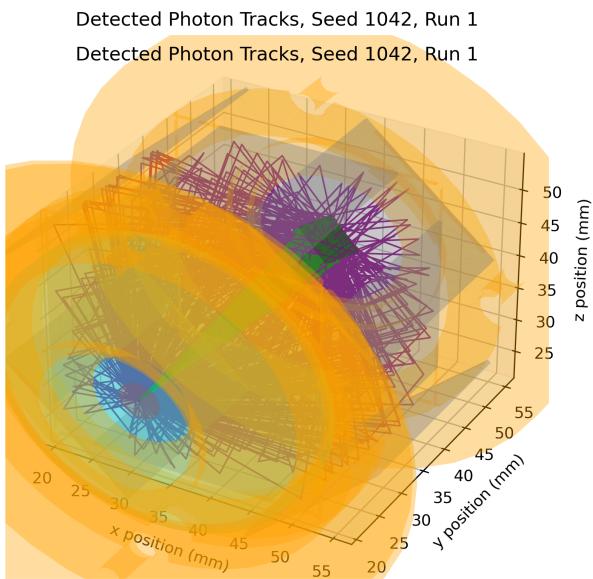


Figure 7: detected photon tracks, seed 1042, run 1 seed 1042 run 1

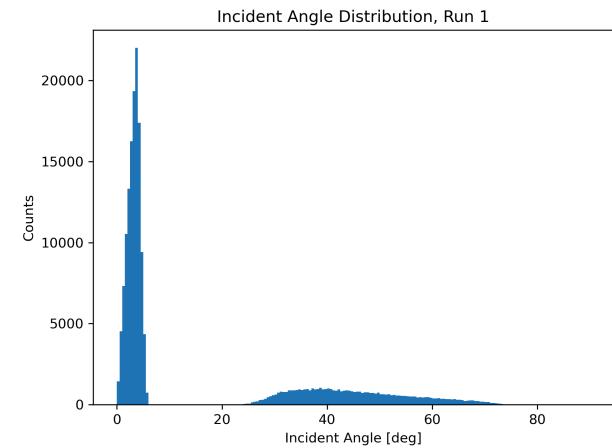


Figure 8: incident angle distribution seed 1042 run 1

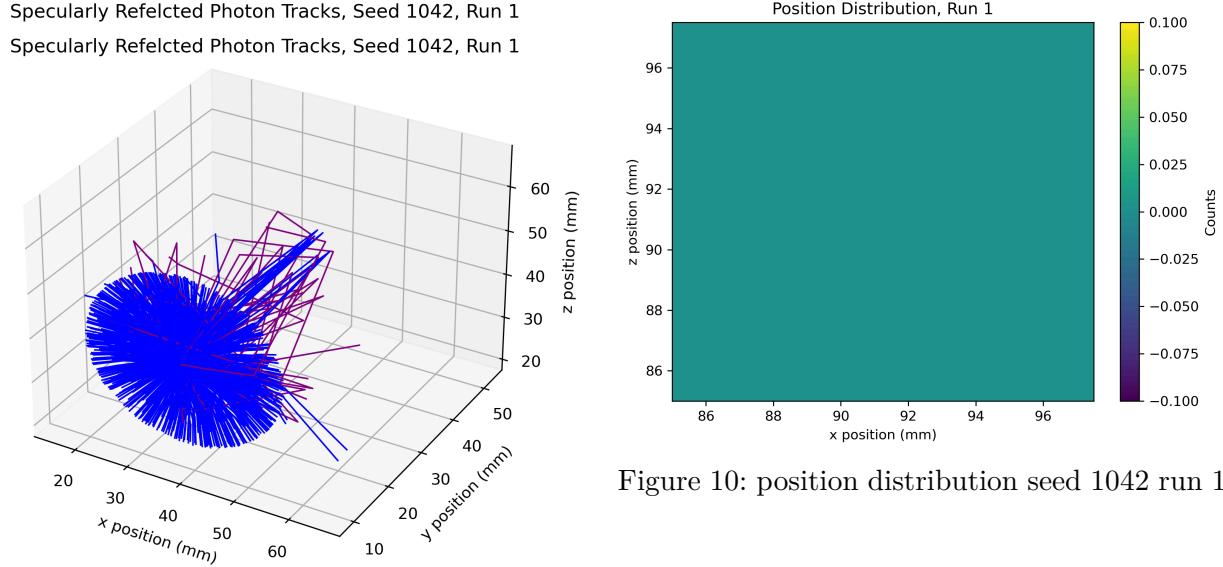


Figure 9: specularly reflected photon tracks,
seed 1042, run 1 seed 1042 run 1

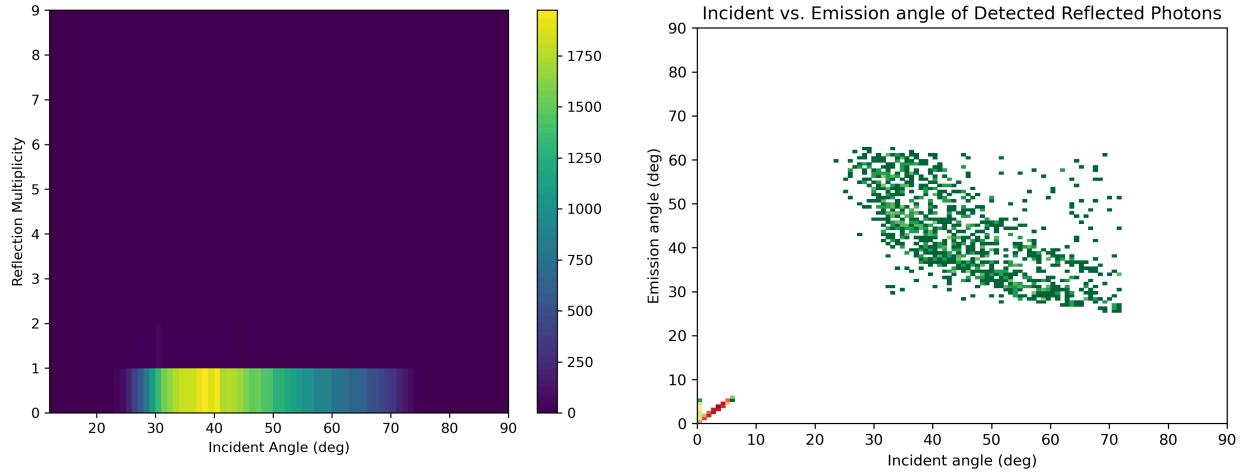


Figure 11: reflection angle distribution seed 1042
run 1

Figure 12: incident vs emission angle seed 1042
run 1

Diffusively Reflected Photon Tracks, Seed 1042, Run 1
Diffusively Reflected Photon Tracks, Seed 1042, Run 1

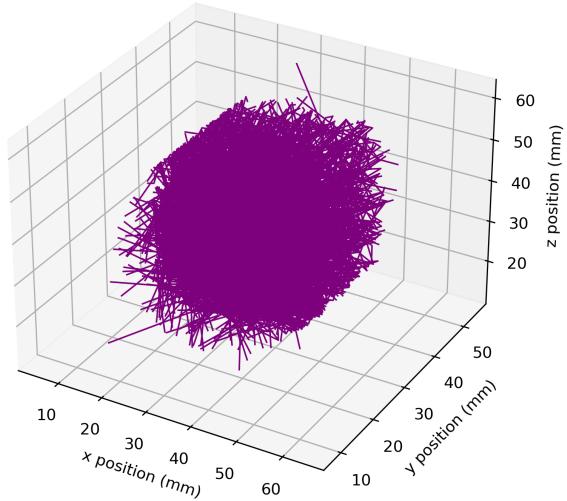


Figure 13: diffusively reflected photon tracks, seed 1042, run 1

Photon Tracks, Seed 1042, Run 1
Photon Tracks, Seed 1042, Run 1

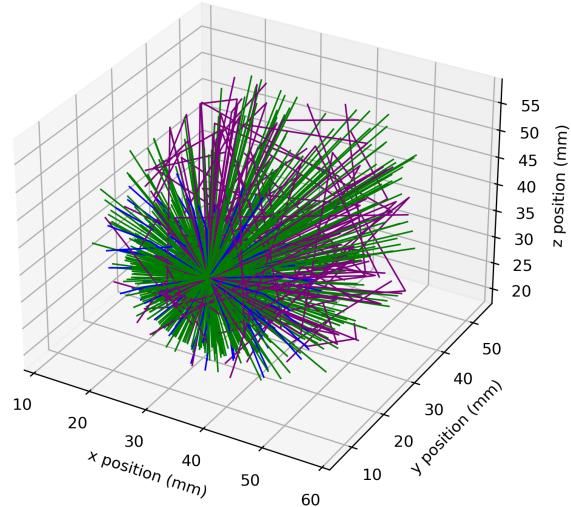


Figure 14: photon tracks, seed 1042, run 1