

# Chroma Simulation

## Sebastian\_08.01.2023(liquefaction)\_correctedSiPM

## 8Silicon-SPECULAR

July 23, 2024

**Pocar Lab**  
Lab 21  
nEXO Collaboration

### 1) Experiment Details

- Experiment Name: Sebastian\_08.01.2023(liquefaction)\_correctedSiPM
- Number of Particles: 100000000
- Random Seed: 1042
- Run ID: 1
- Excluded Geometry: []
- PTE:  $0.0032833 \pm 5.7e-06$ .

## 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	1	0
killing surface	None	None	8	0	0

## 3) Results

### 3.1) Photon Transmission Efficiency

The Photon Transmission Efficiency (PTE) for this experiment was  $0.0032833 \pm 5.7\text{e-}06$ .

### 3.2) Tallies

Tally	Count
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## 4) Plots

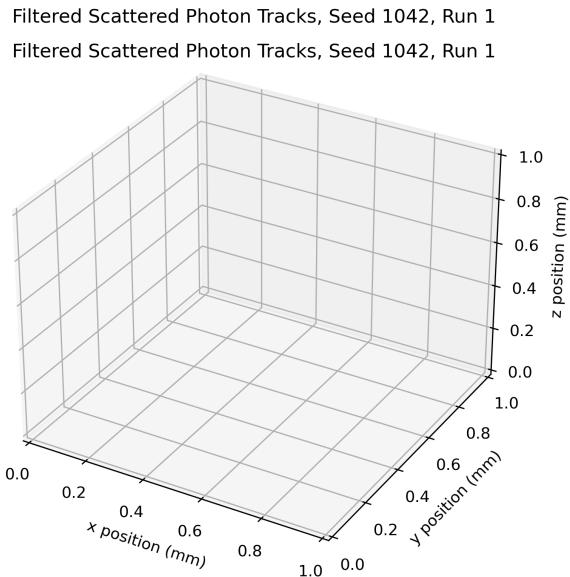


Figure 1: filtered scattered photon tracks, seed 1042, run 1 seed 1042 run 1

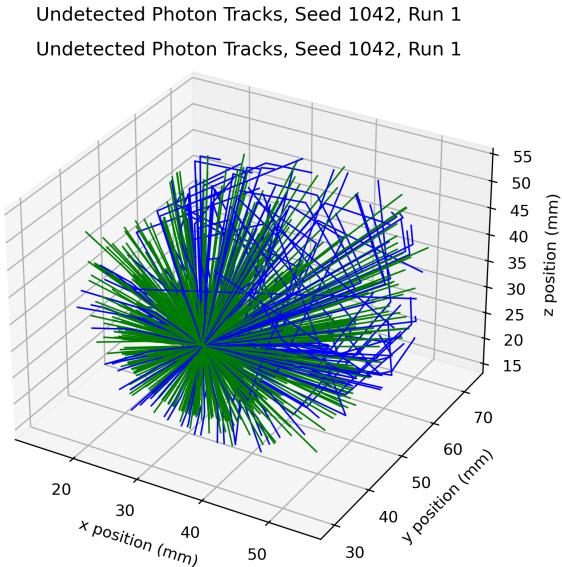


Figure 3: undetected photon tracks, seed 1042, run 1 seed 1042 run 1

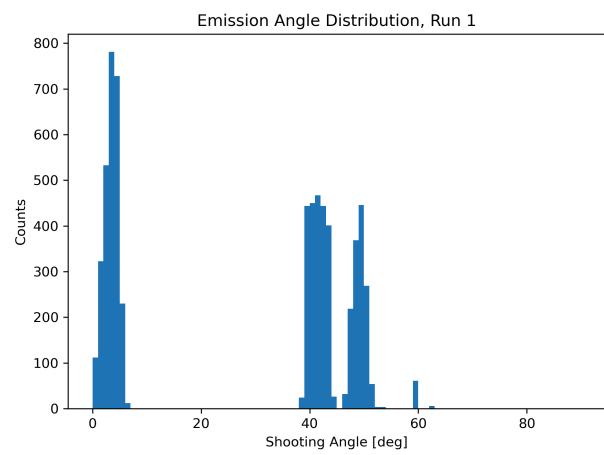


Figure 2: emission angle distribution seed 1042 run 1

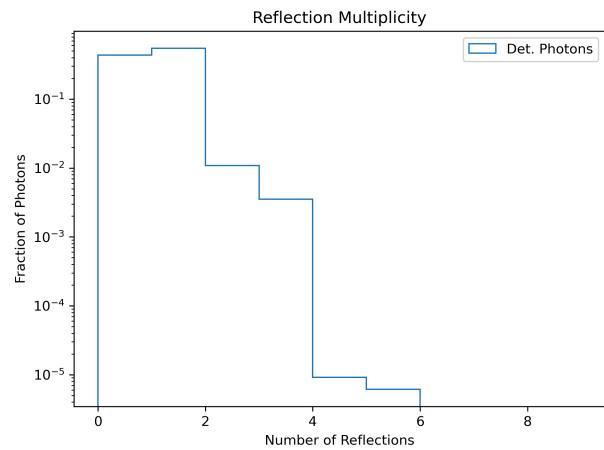


Figure 4: reflection multiplicity seed 1042 run 1

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

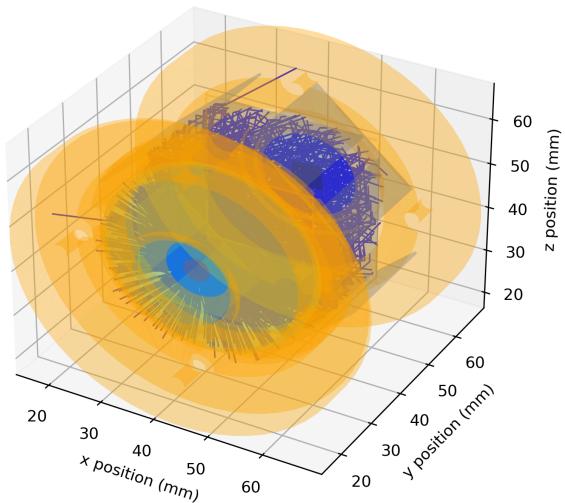


Figure 5: reflected photon tracks, seed 1042, run 1  
1 seed 1042 run 1

Detected and Reflected Photon Tracks, Seed 1042, Run 1  
Detected and Reflected Photon Tracks, Seed 1042, Run 1

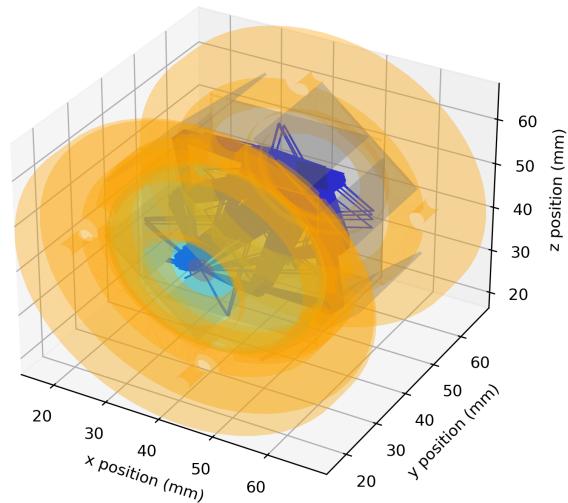


Figure 6: detected and reflected photon tracks,  
seed 1042, run 1 seed 1042 run 1

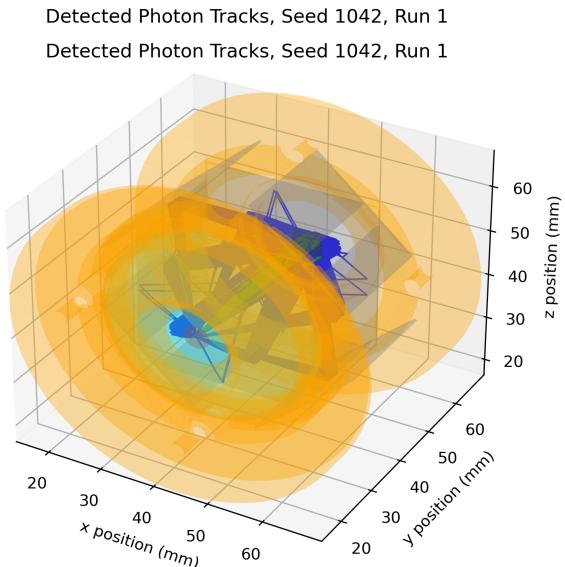


Figure 7: detected photon tracks, seed 1042, run  
1 seed 1042 run 1

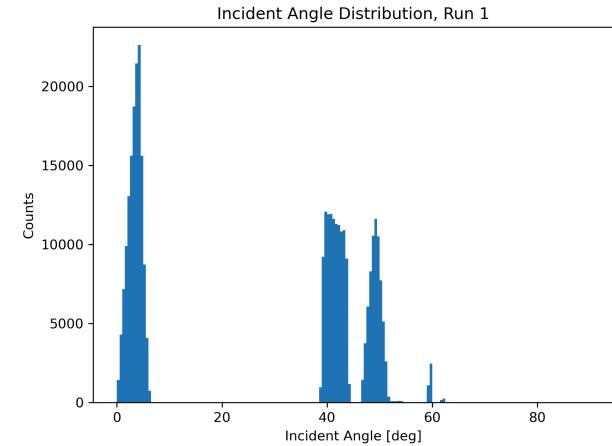


Figure 8: incident angle distribution seed 1042  
run 1

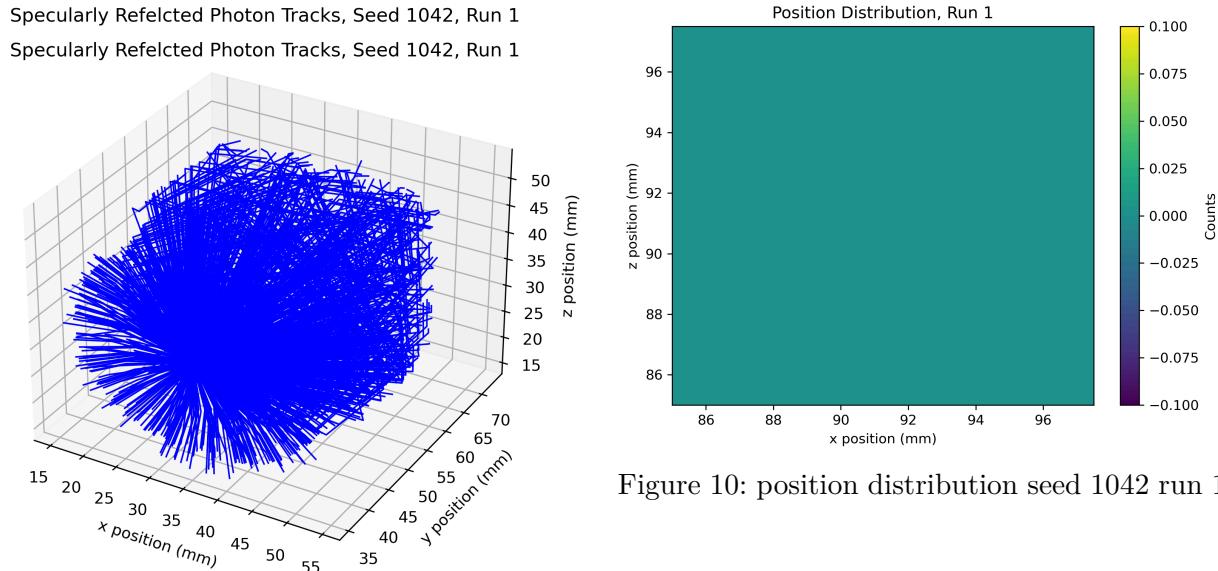


Figure 9: specularly refelcted photon tracks,  
seed 1042, run 1 seed 1042 run 1

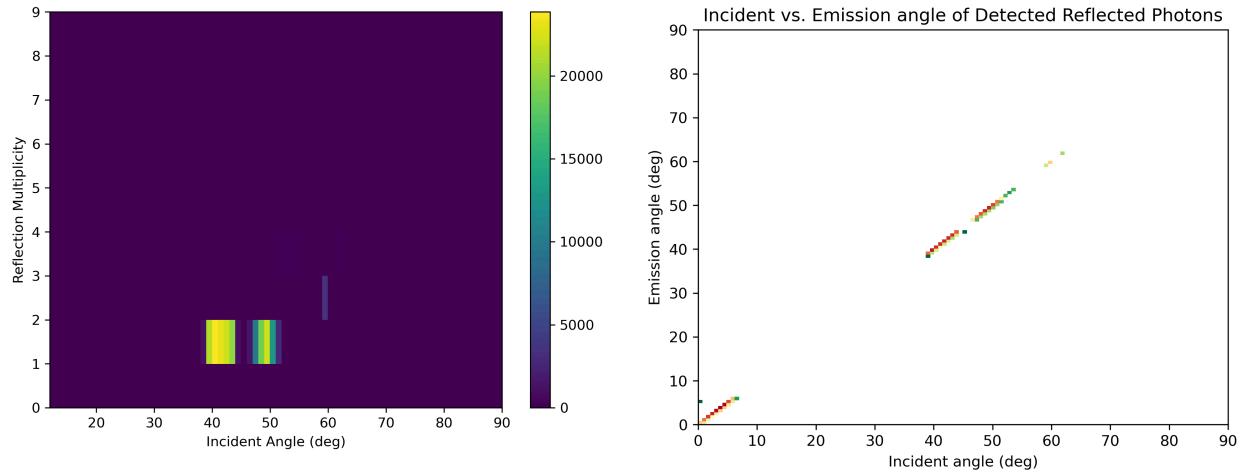


Figure 11: reflection angle distribution seed 1042  
run 1

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

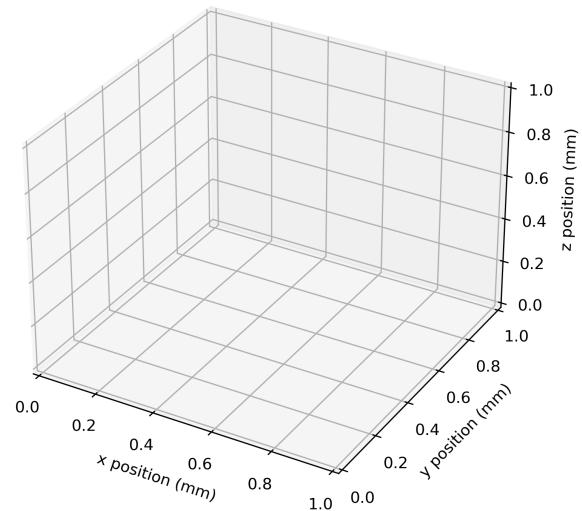


Figure 13: diffusively reflected photon tracks,  
seed 1042, run 1 seed 1042 run 1

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

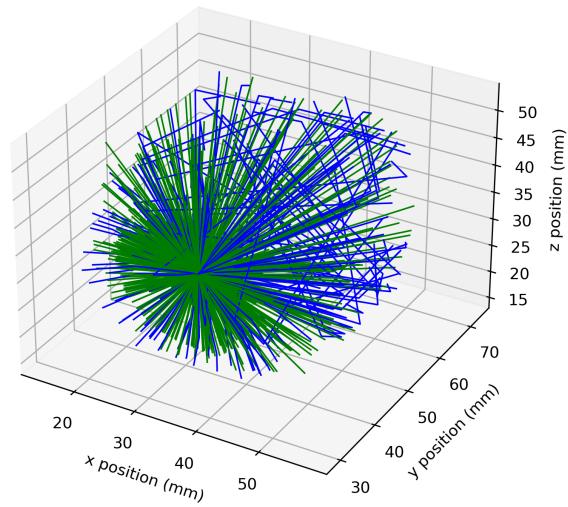


Figure 14: photon tracks, seed 1042, run 1 seed  
1042 run 1