γ – LASER Mode Beam Monitoring

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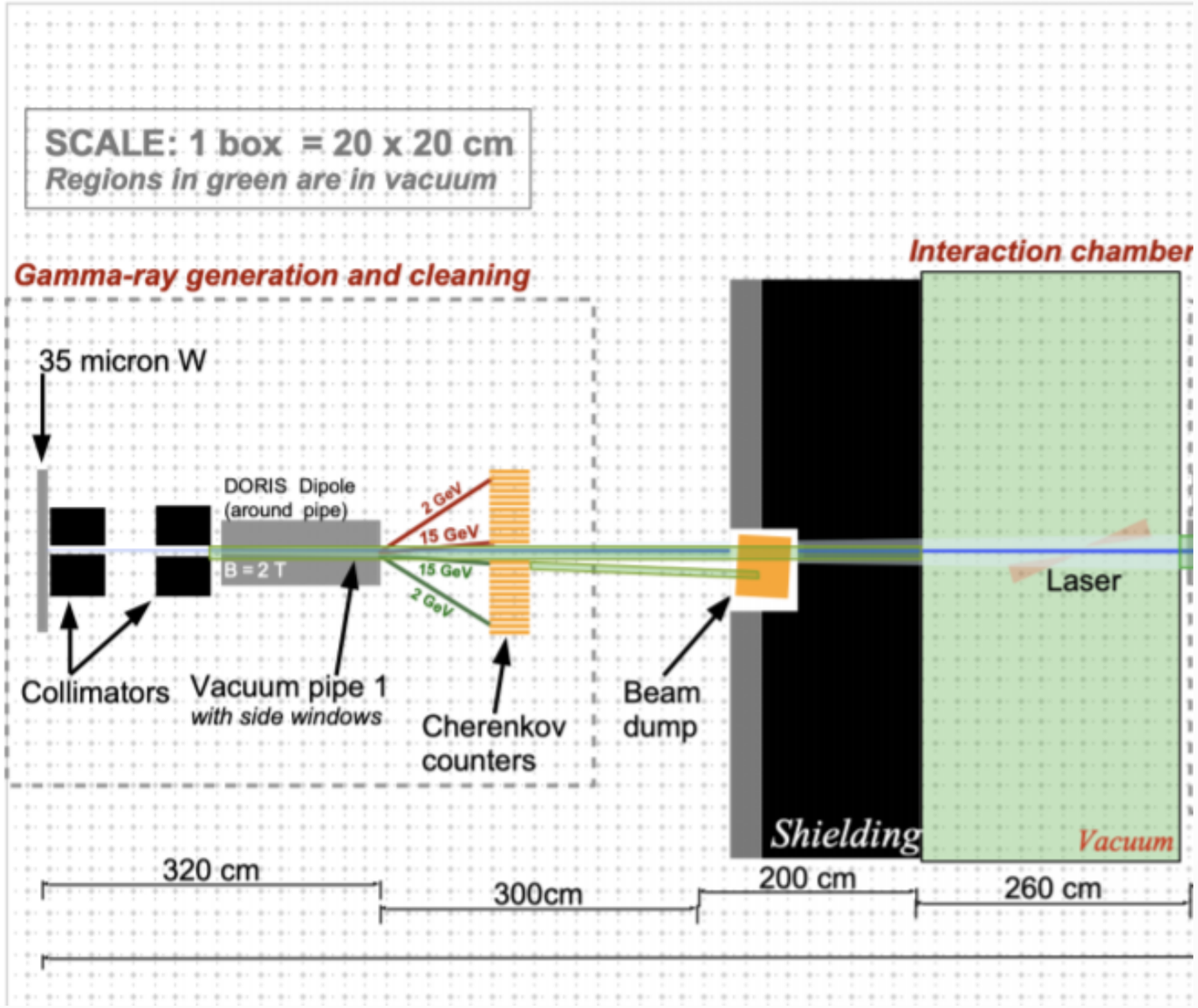
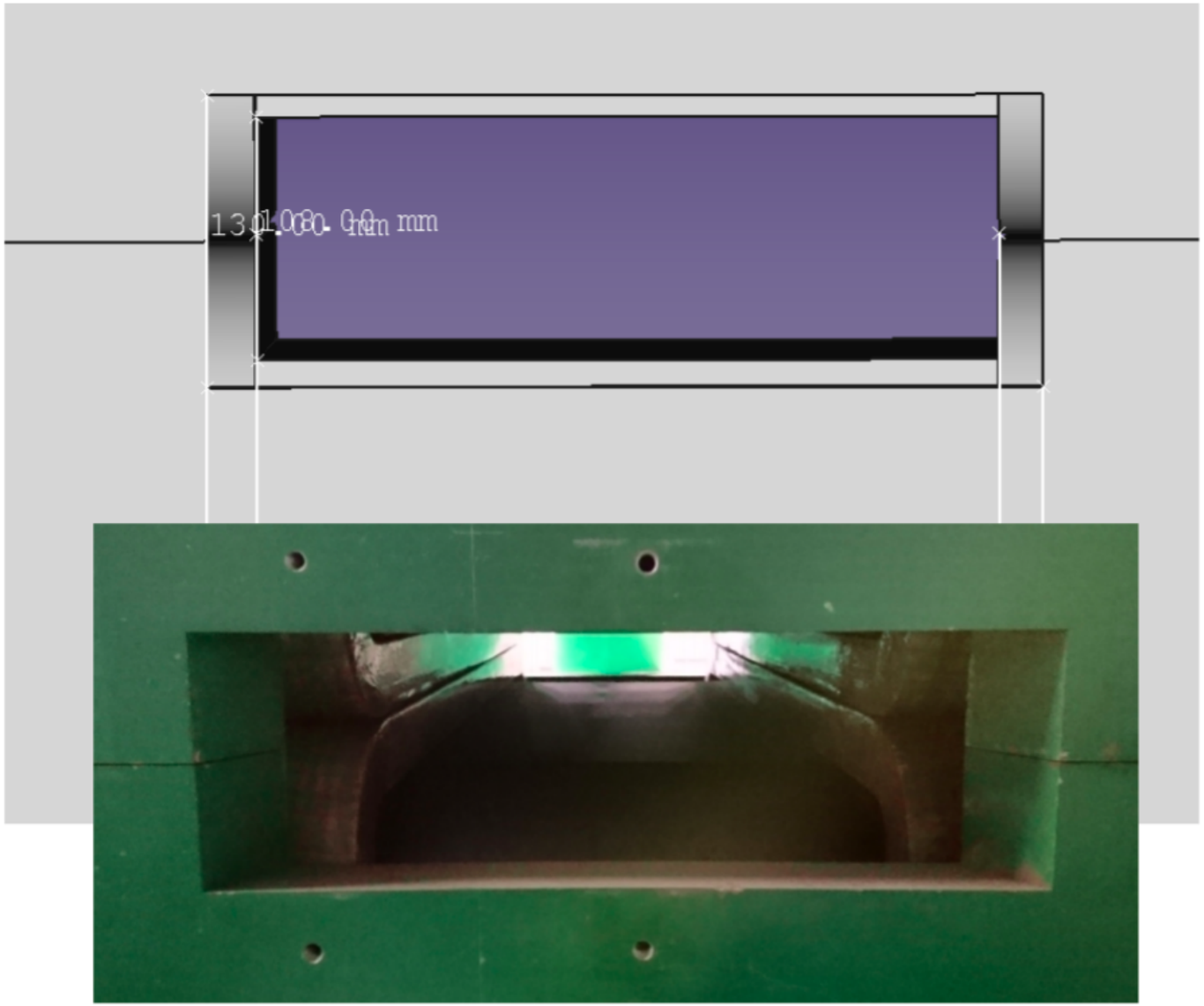
LUXE

DESY.


SCALE: 1 box = 20 x 20 cm
Regions in green are in vacuum
Gamma-ray generation and cleaning
Interaction chamber
35 micron W
DORIS Dipole
(around pipe)
B = 2 T
2 GeV
15 GeV
15 GeV
2 GeV
Laser
Collimators
Vacuum pipe 1
with side windows
Cherenkov
counters
Beam
dump
Shielding
Vacuum
320 cm
300cm
200 cm
260 cm

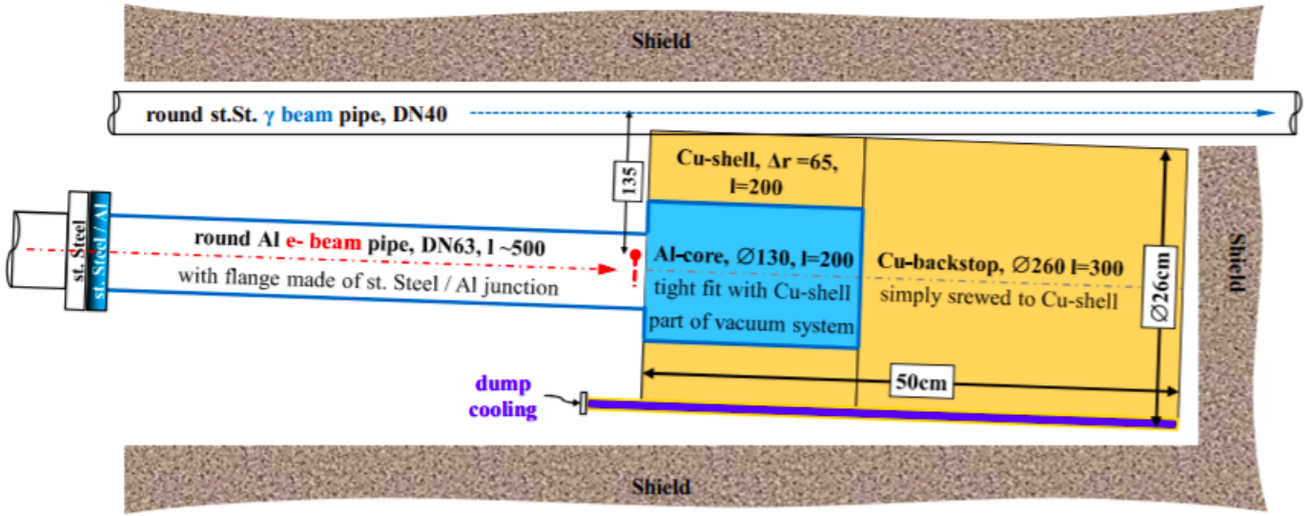
Magnet front (back) plate

Field = 2T
(up to 2.2T)



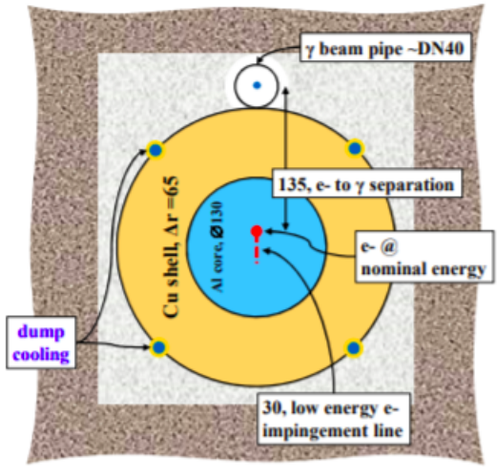
C-shape magnet

Field
1.4 T
~20 x 100 cm^2



Longitudinal Cut

lenghts without units are in mm



Front View

lenghts without units are in mm

Can we place the shielding further away from a magnet operating with a lesser B-field to get the same displacement in x between γ-beam & e-beam?

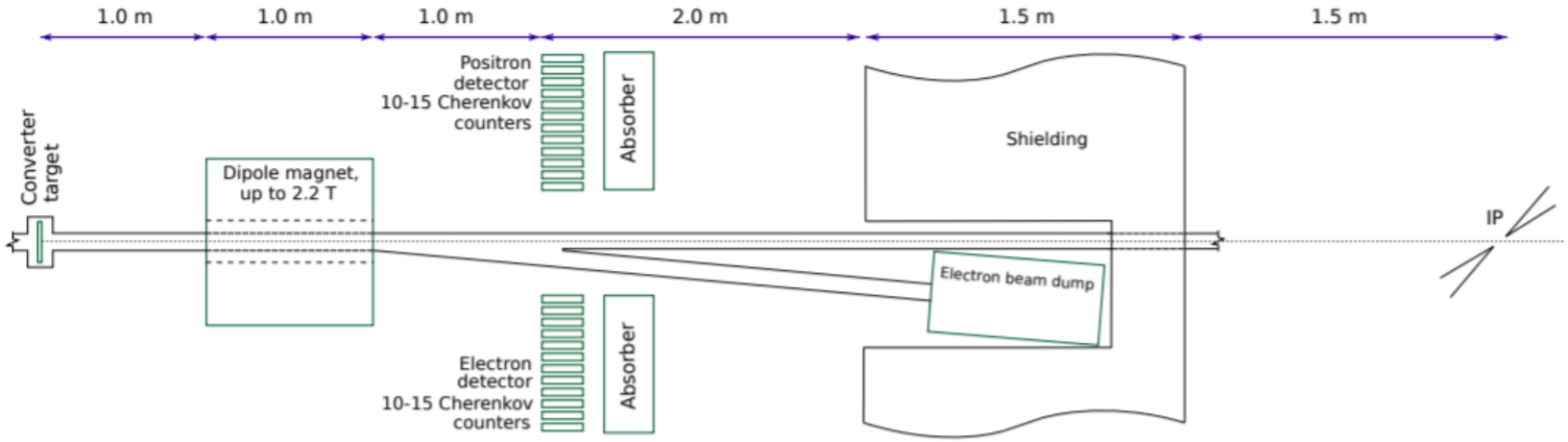
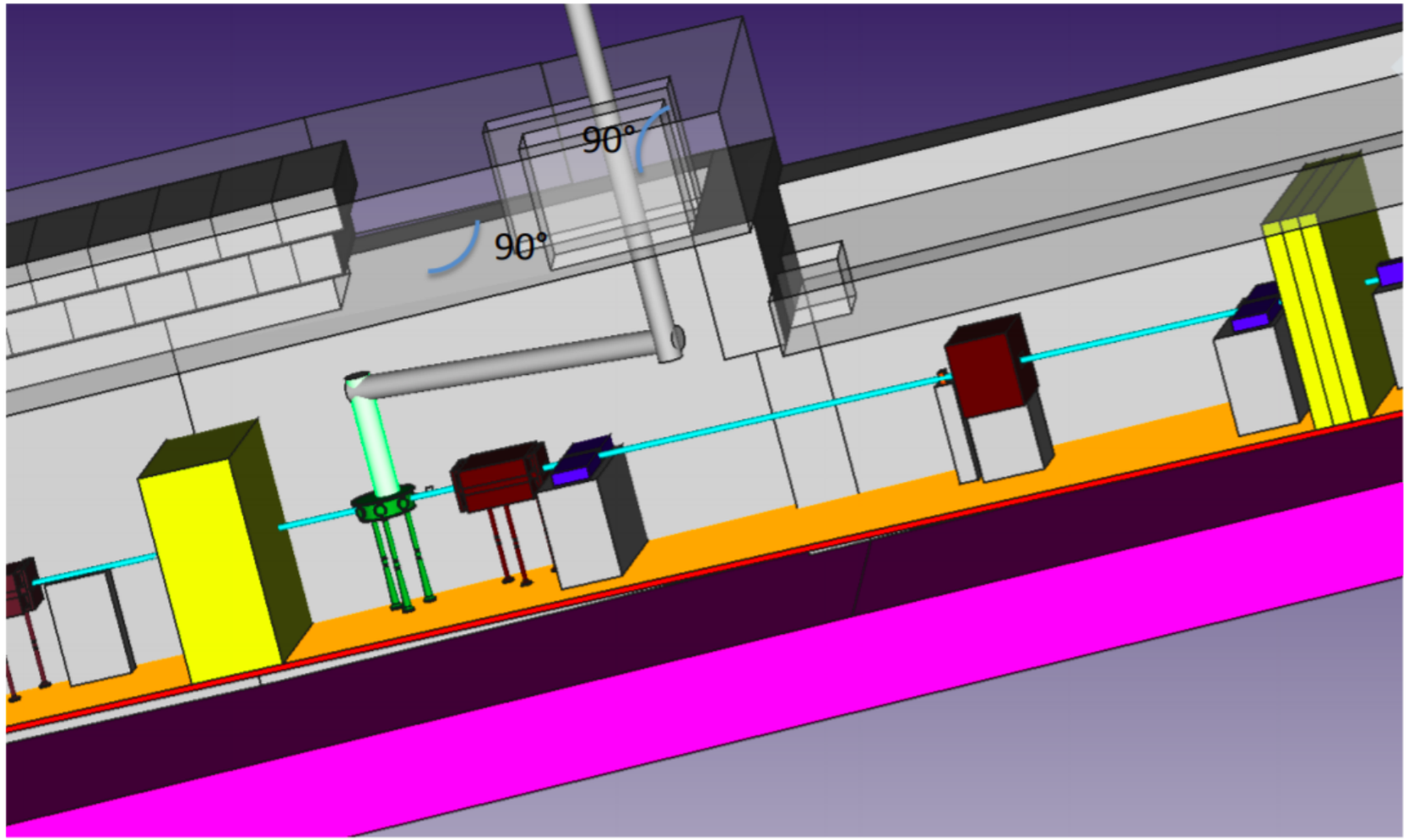


Figure 21. Schematic of the area around the photon target during γ_B–laser running. After the target, a high-field dipole magnet is placed to separate electron–positron pairs produced in the target as well as the electrons from the initial beam which underwent Bremsstrahlung to some degree. Cherenkov counters are foreseen to measure electrons and positrons with absorbers placed behind these to measure the total energy and serve as a dump for the electrons and positrons. An electron beam dump to capture the high energy electrons follows, as well as shielding to protect the IP from stray radiation.

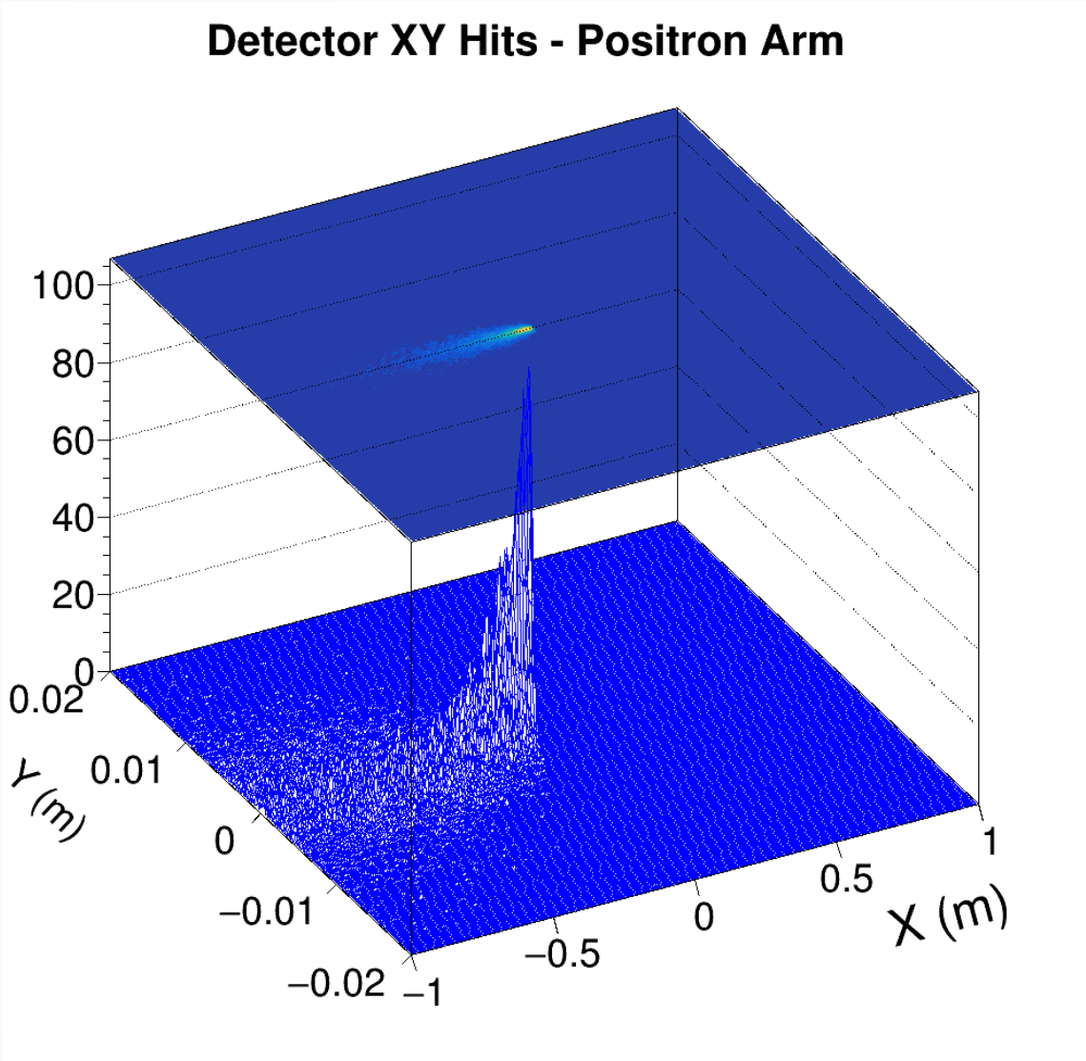
Magnet Field	Distance Magnet to Beam Dump
2.2T	~ 3.08m
2.0T	~ 3.44m
1.4T	~ 5.13m

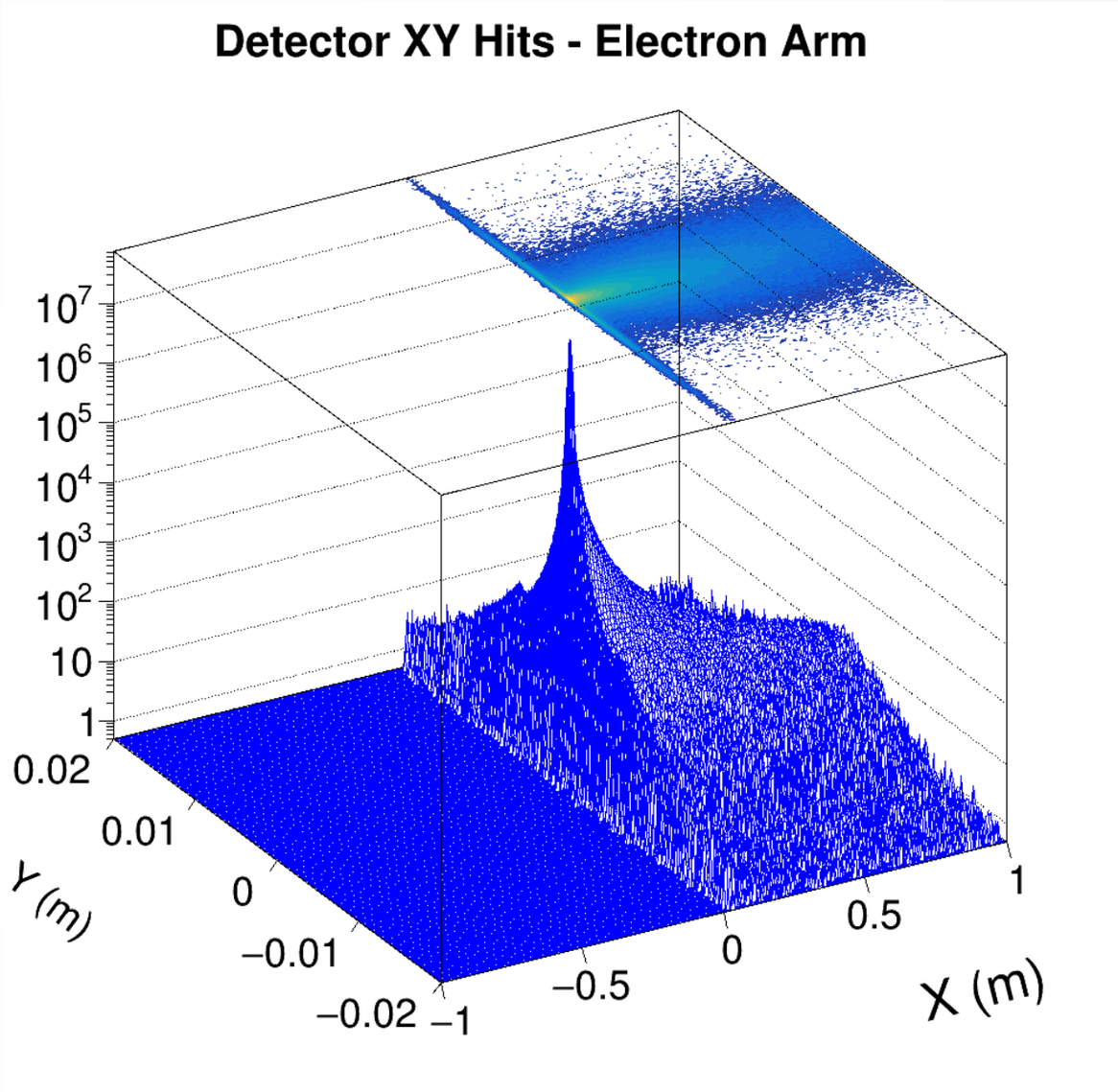


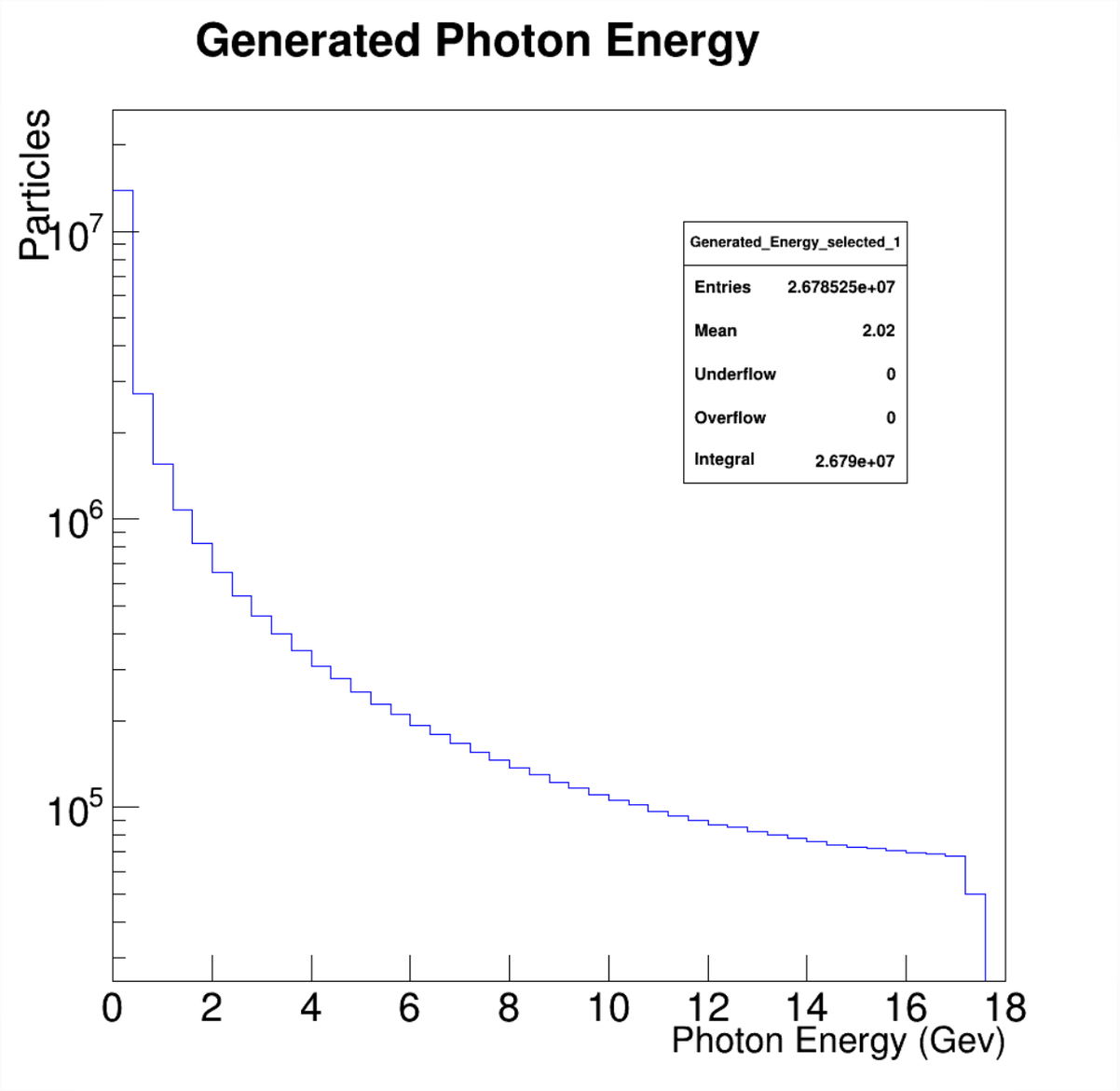
Space for ~2m down the beamline?

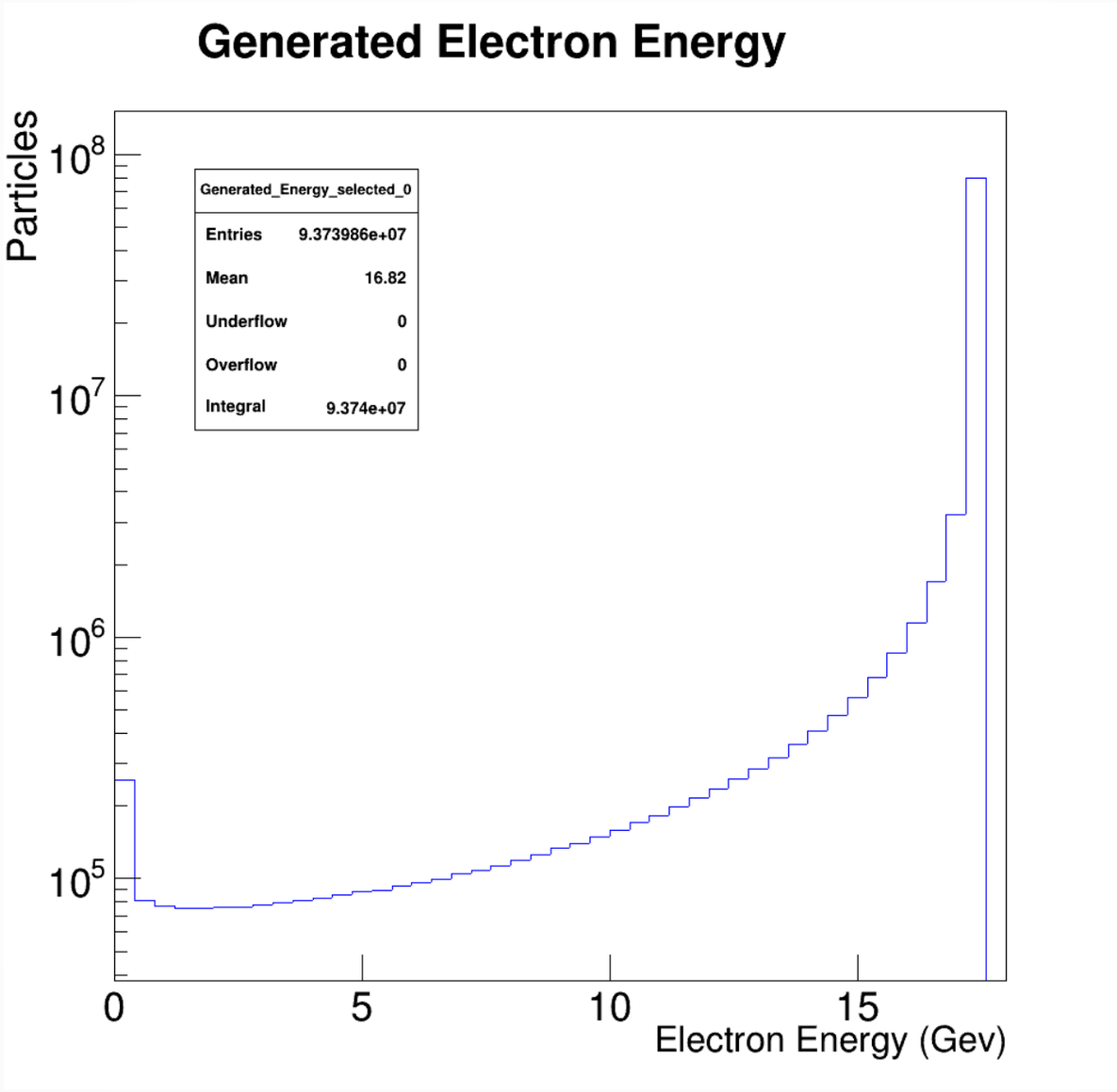
Backup

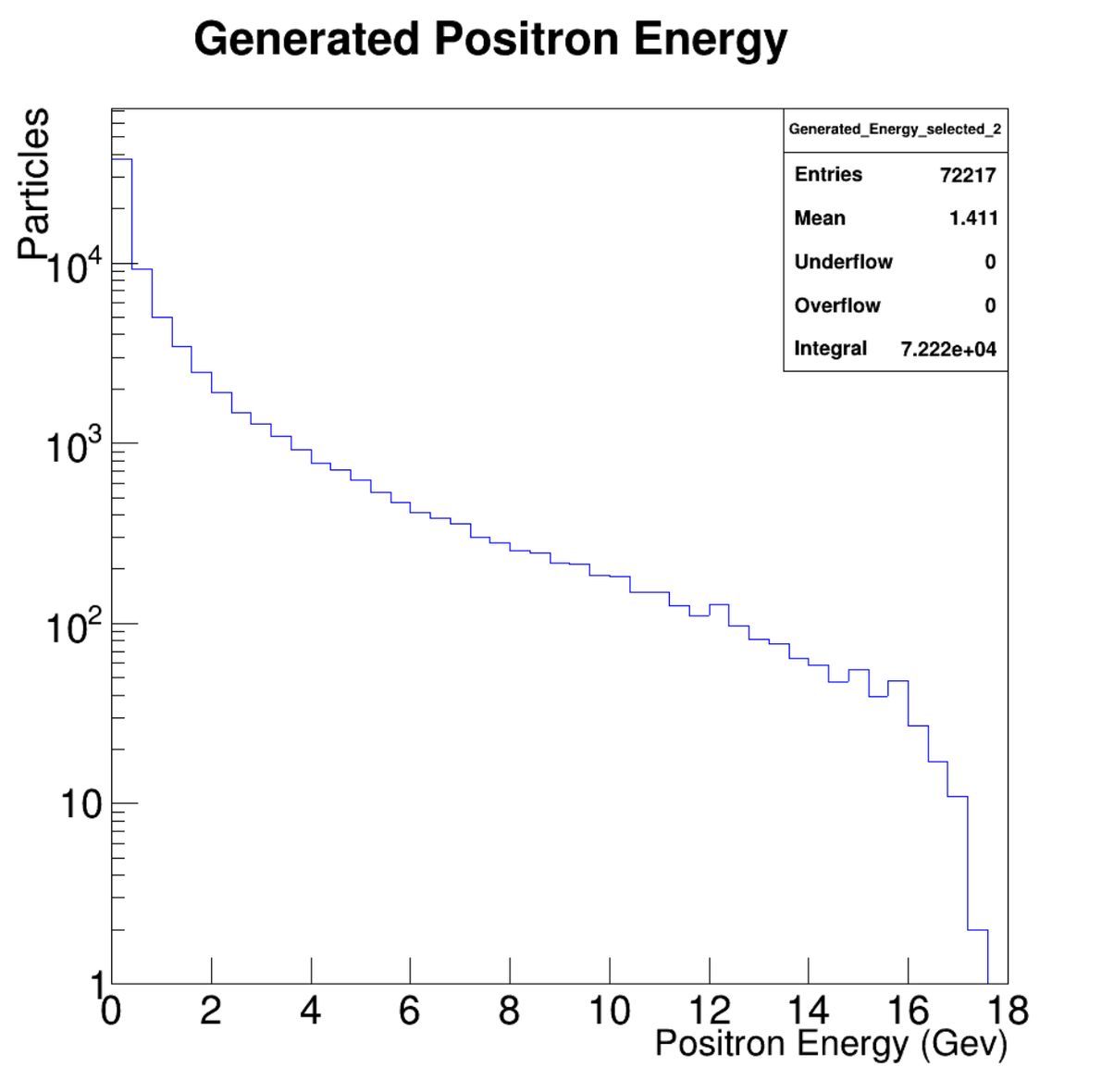
Could C-shaped magnet feature more “fringe” field and so exhibit more bending?


Detector XY Hits - Positron Arm
100
80
60
40
20
0
0.02
0.01
0
−0.01
−0.02
Y (m)
−1
−0.5
0
0.5
1
X (m)

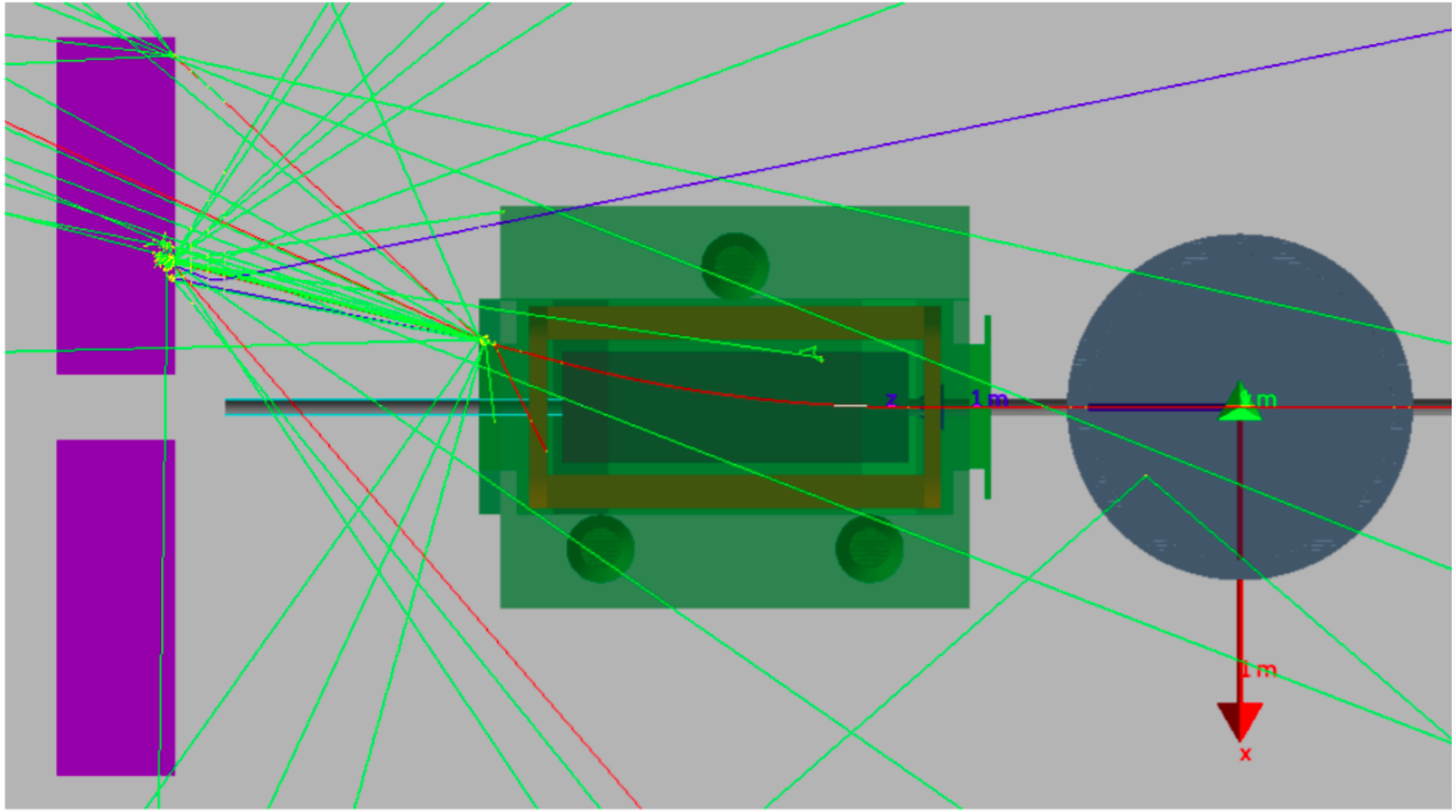

Detector XY Hits - Electron Arm
10^7
10^6
10^5
10^4
10^3
10^2
10
1
0.02
0.01
0
−0.01
−0.02
Y (m)
−1
−0.5
0
0.5
1
X (m)


Generated Photon Energy
Particles
10^7
10^6
10^5
0
2
4
6
8
10
12
14
16
18
Photon Energy (Gev)
Generated_Energy_selected_1
Entries 2.678525e+07
Mean 2.02
Underflow 0
Overflow 0
Integral 2.679e+07


Generated Electron Energy
Particles
10^8
10^7
10^6
10^5
Generated_Energy_selected_0
Entries 9.373986e+07
Mean 16.82
Underflow 0
Overflow 0
Integral 9.374e+07
0
5
10
15
Electron Energy (Gev)


Generated Positron Energy
Generated_Energy_selected_2
Entries 72217
Mean 1.411
Underflow 0
Overflow 0
Integral 7.222e+04
Particles
10^4
10^3
10^2
10
1
0 2 4 6 8 10 12 14 16 18
Positron Energy (Gev)

1.7 GeV electron



Scintillation light output with limited steel aperture