Update on LUXE GEANT4 Geometry

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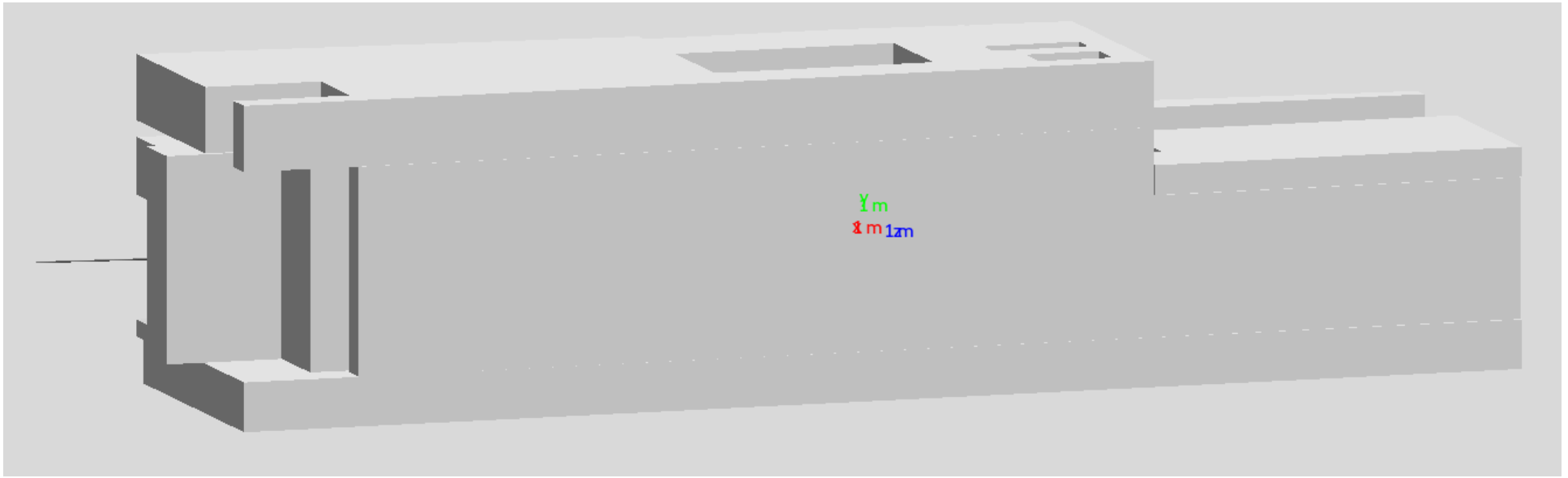
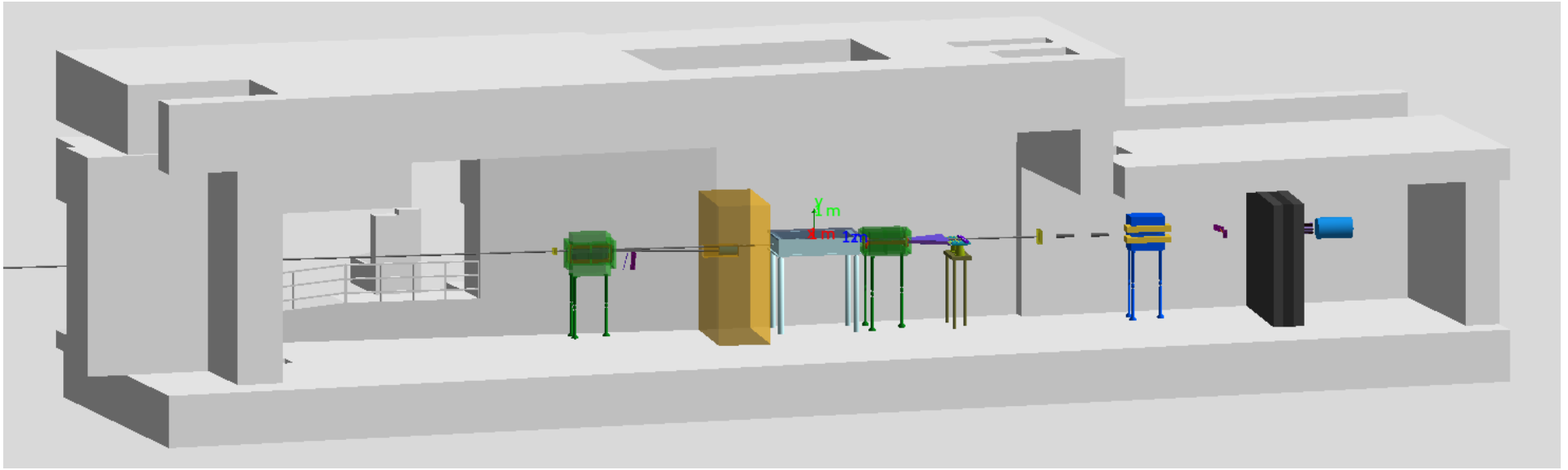
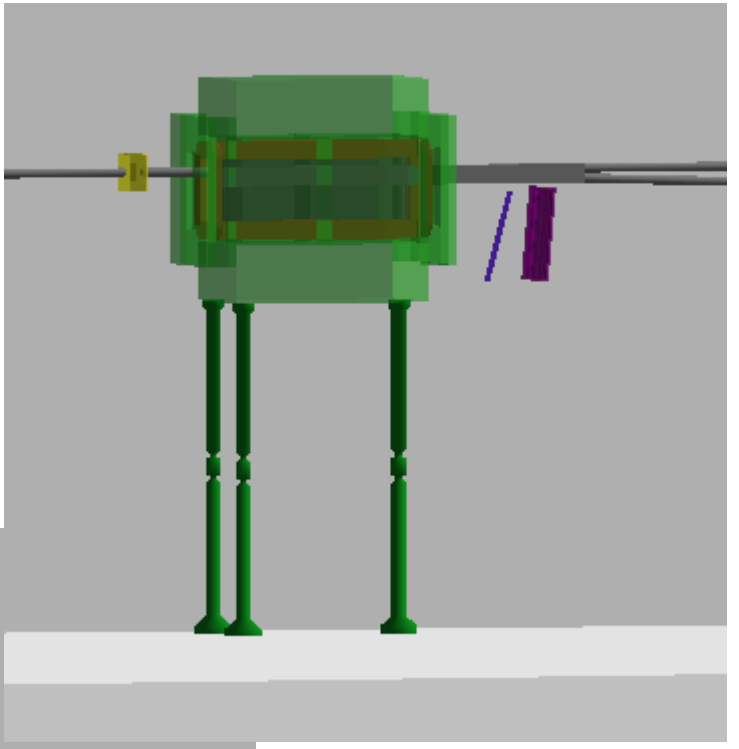
LUXE Meeting
August 18, 2020

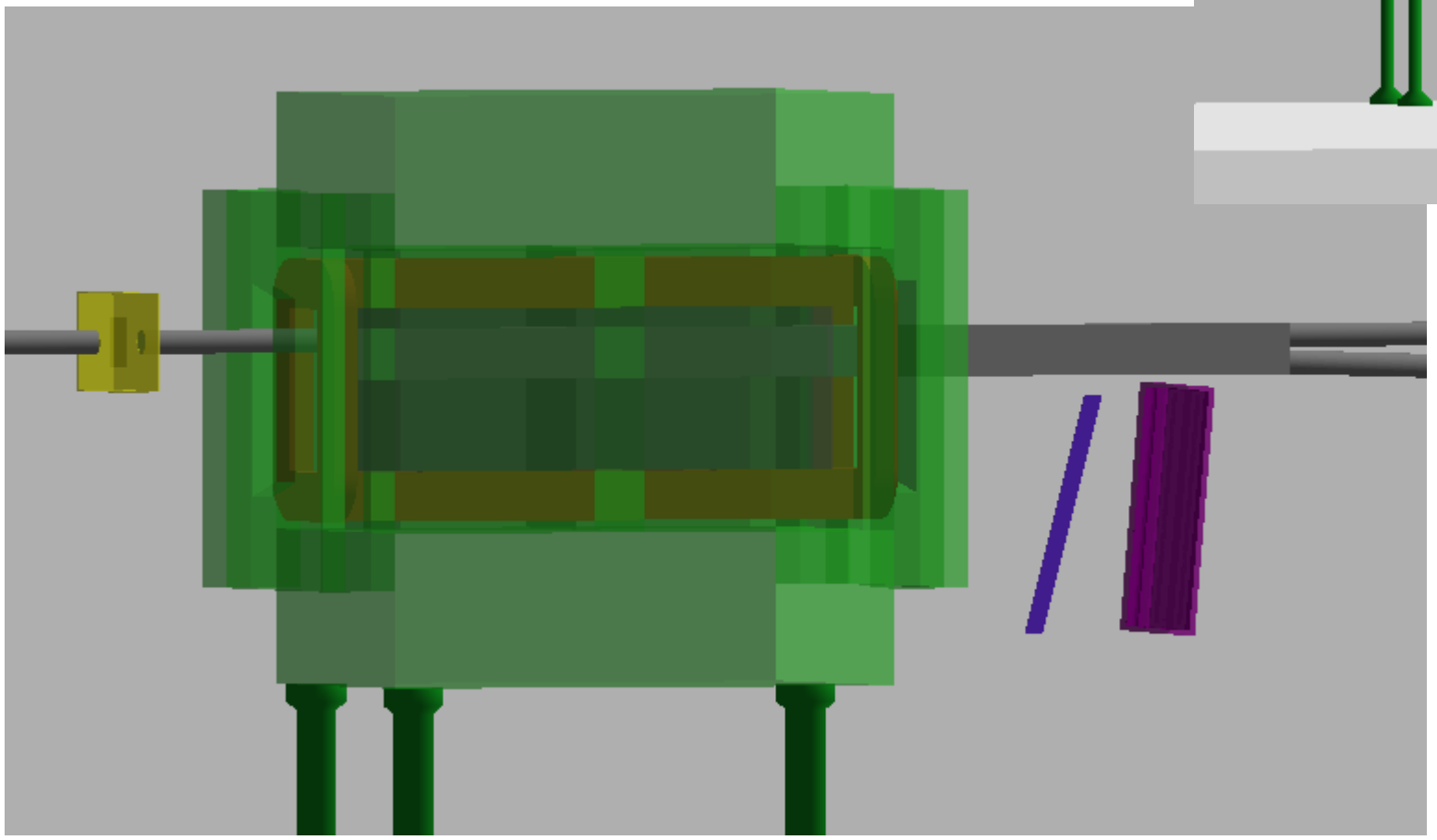
Infrastructure



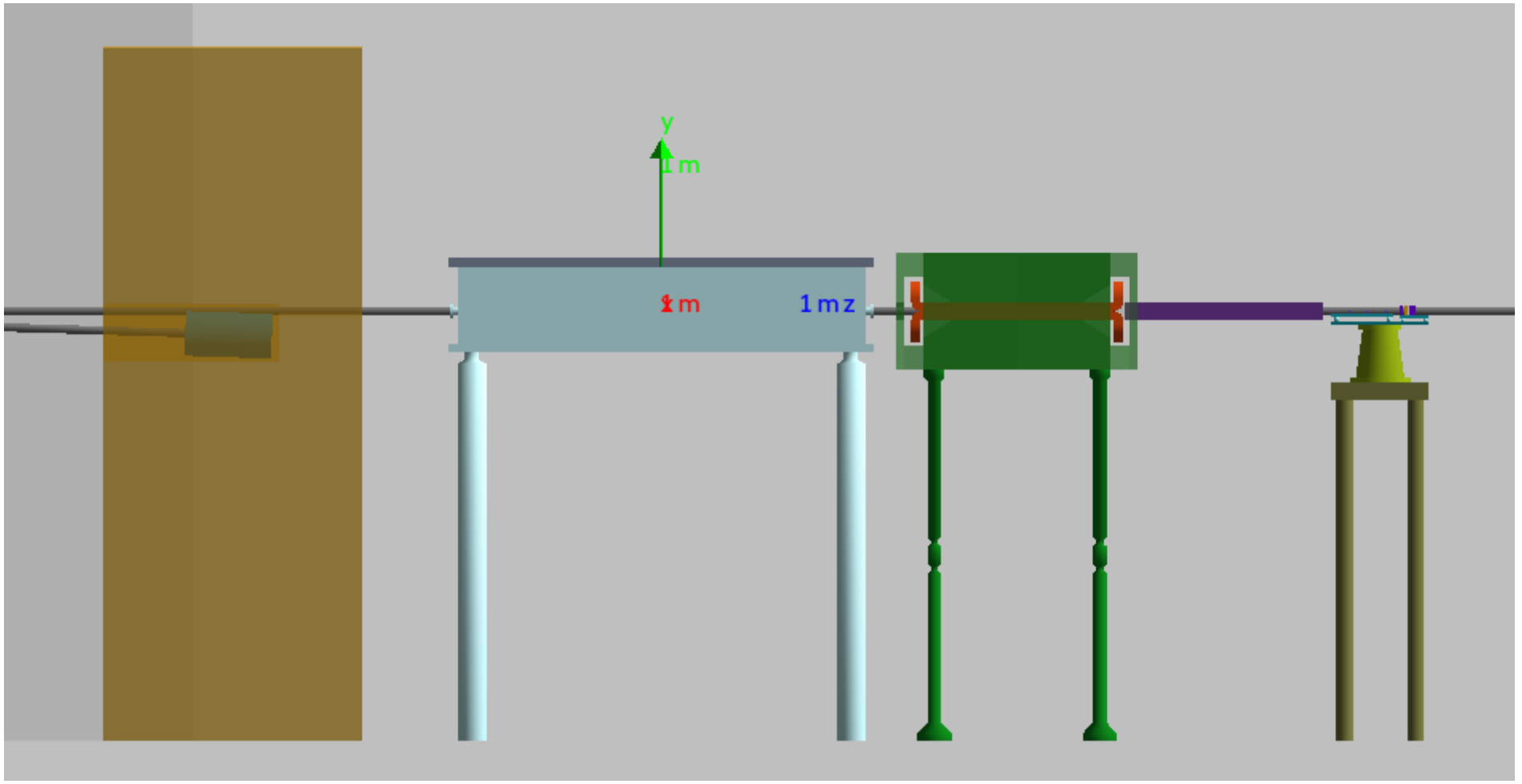


Bremsstrahlung target, electron dump magnet, scintillator screen and Cherenkov detectors

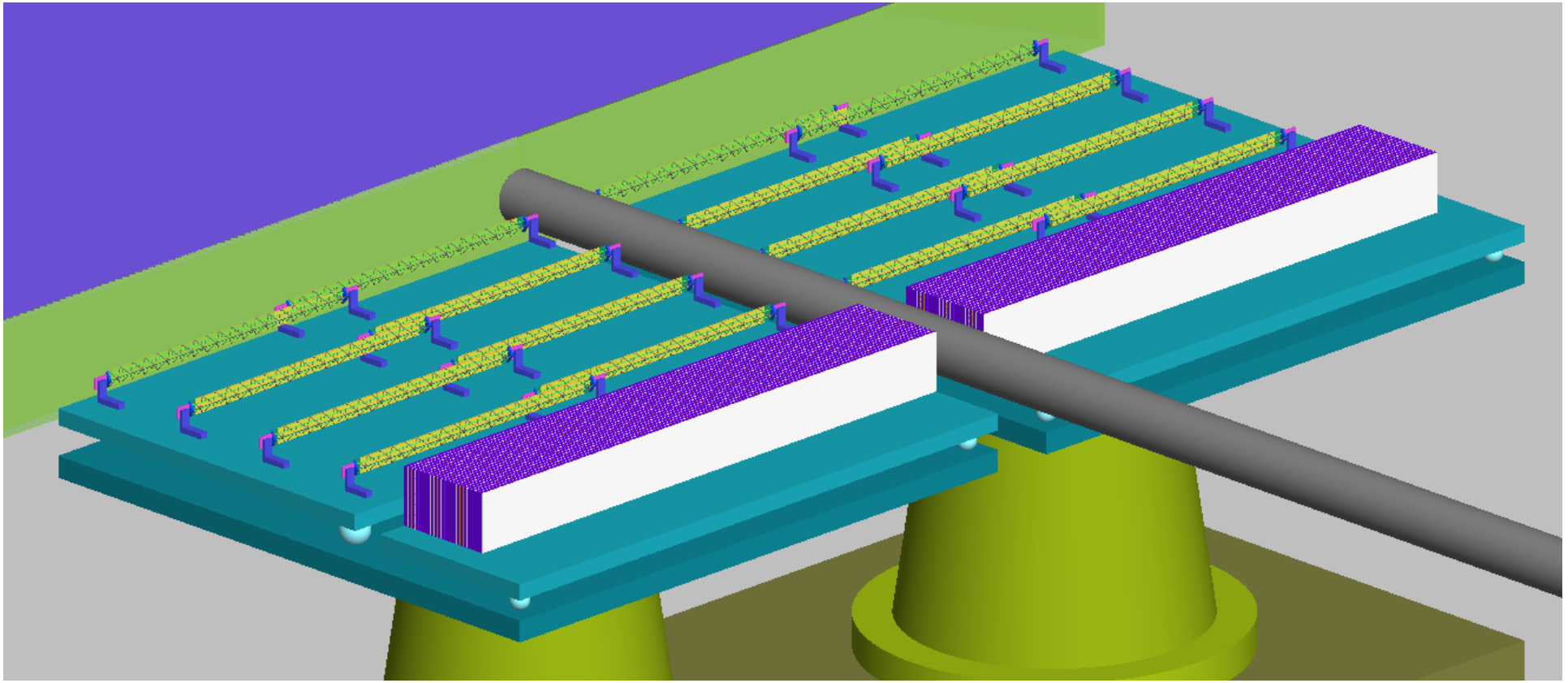




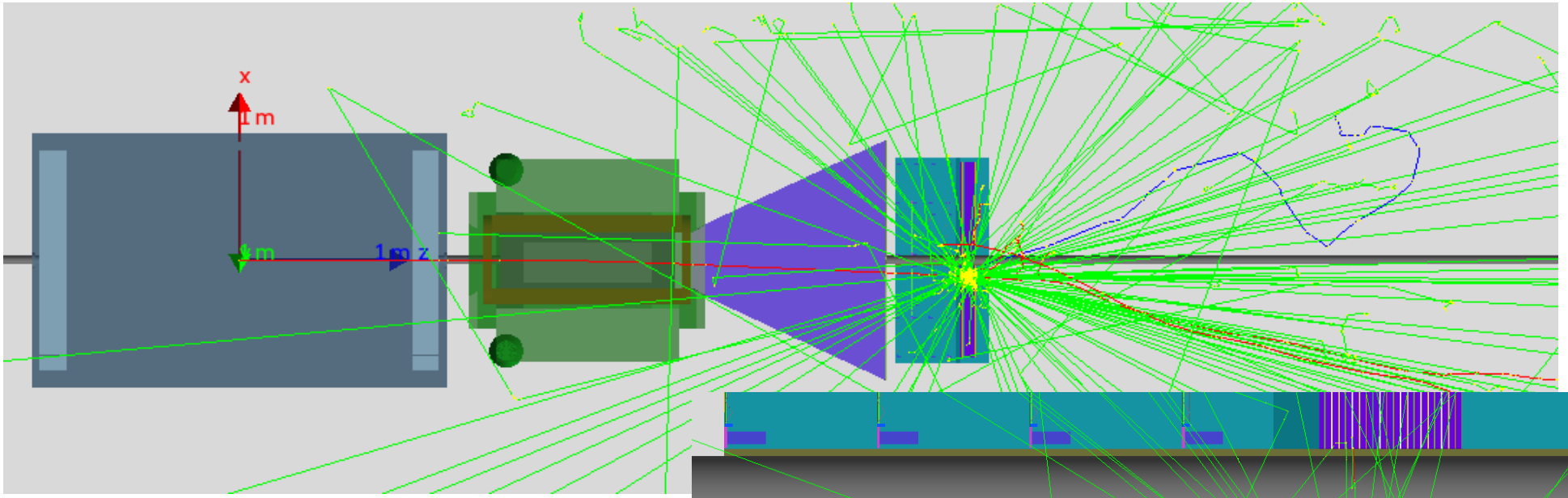
Electron beam dump, shielding, IP chamber, OPPP magnet and detector

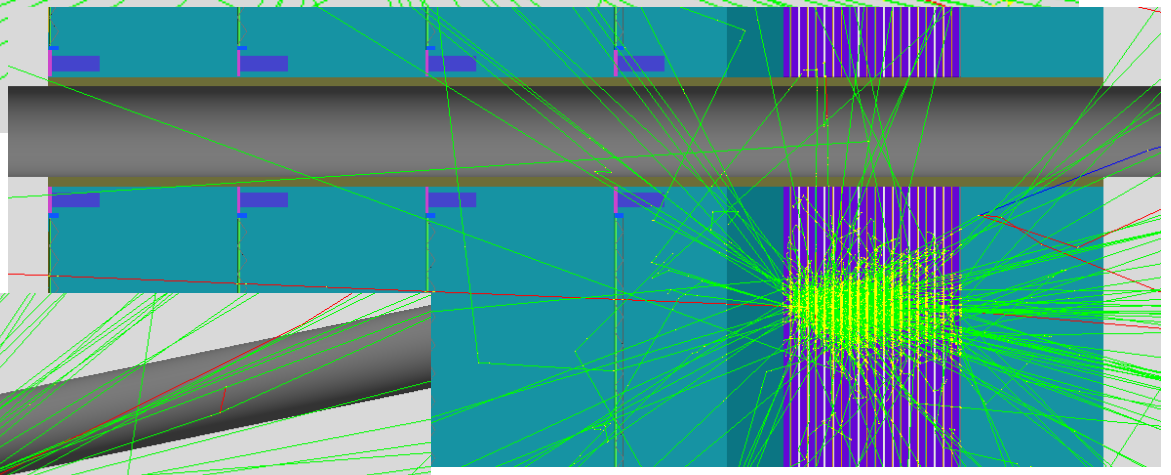


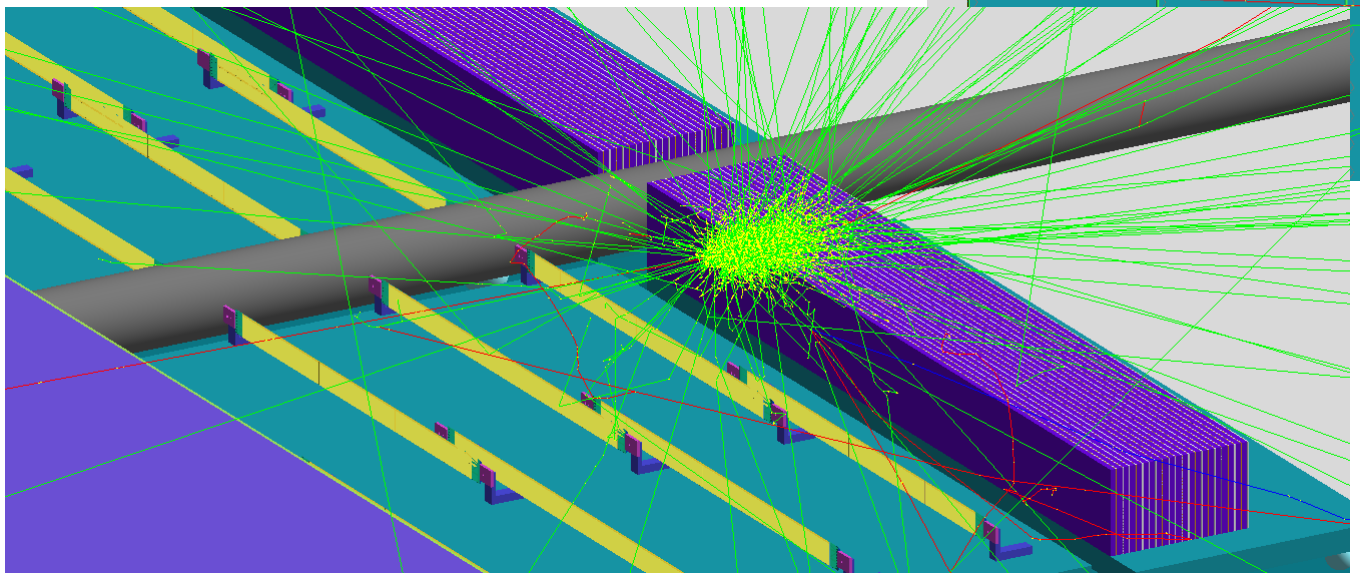
OPPP tracking layers and calorimeters



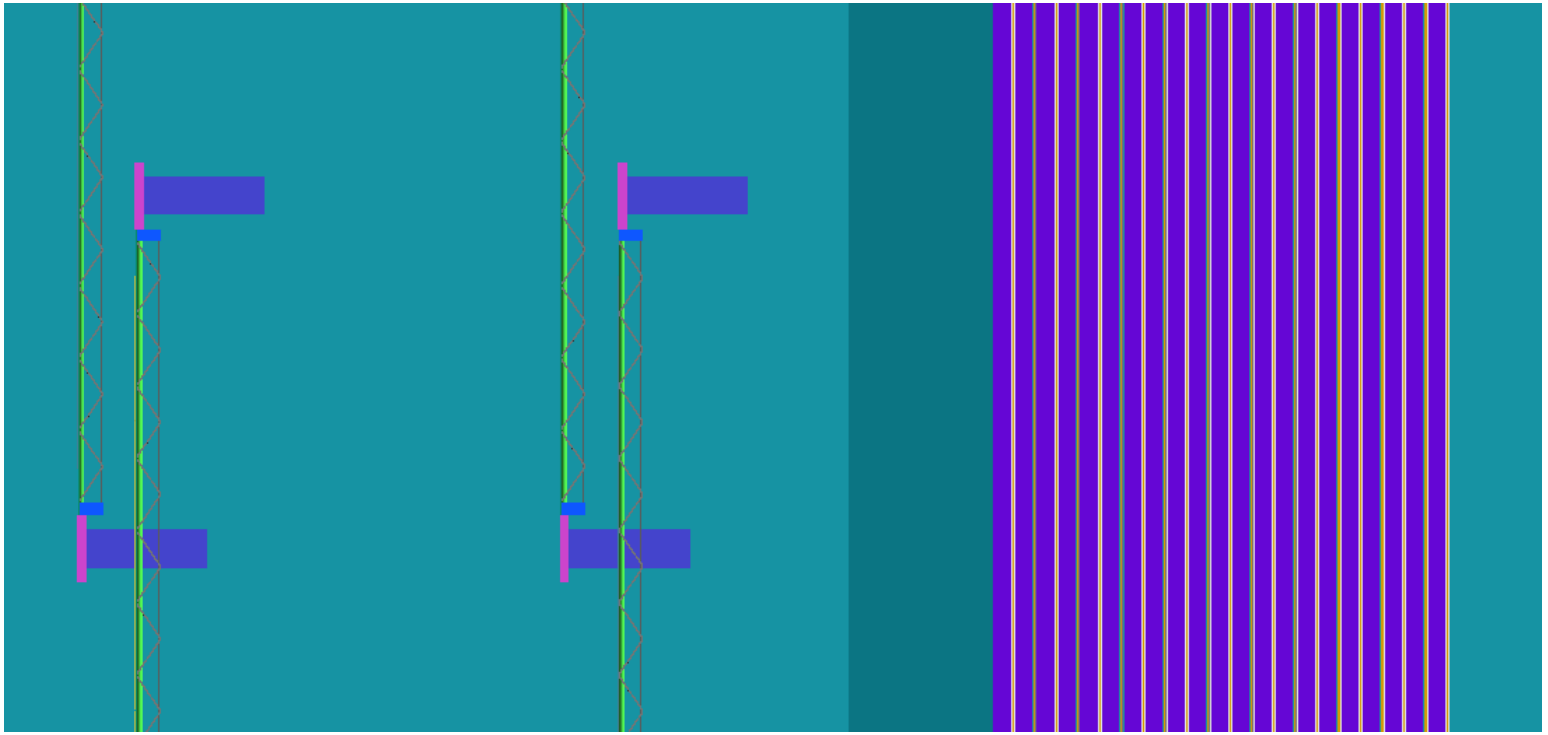
e- 12.5 GeV

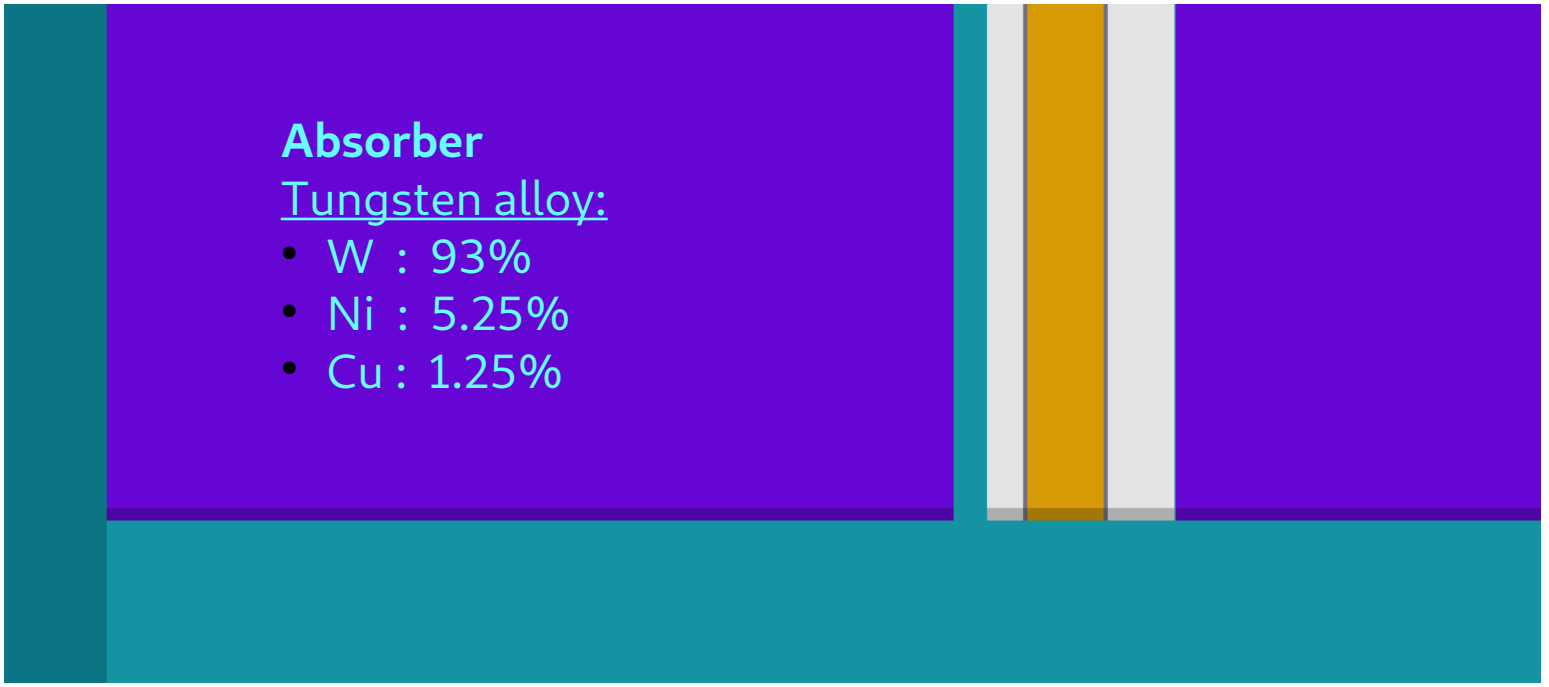






ECal implementation





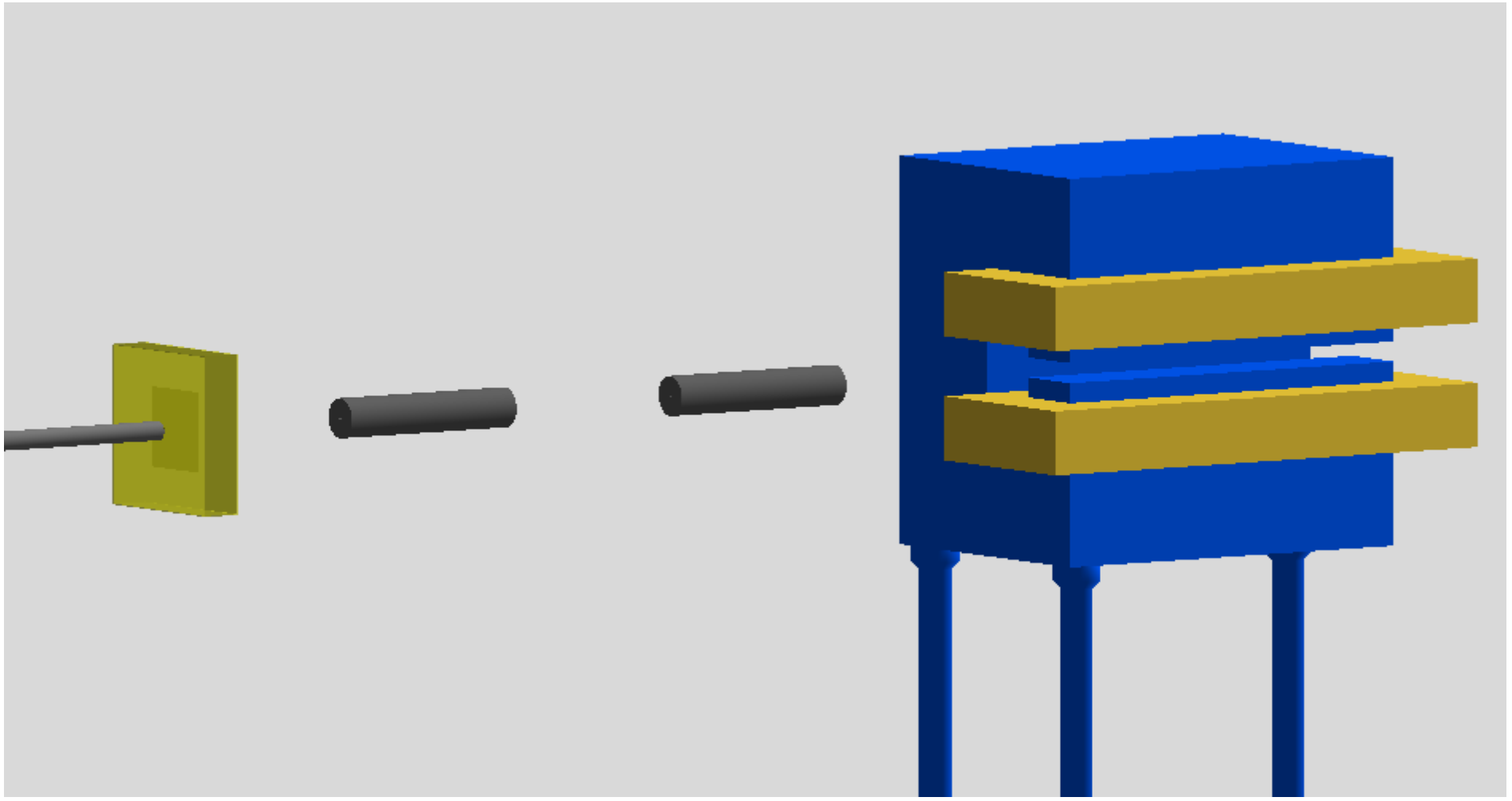
Fanout and HV Kapton: mixture of
- Kapton,
- epoxy,
- Cu.

Fractions are proportional to layers thickness.

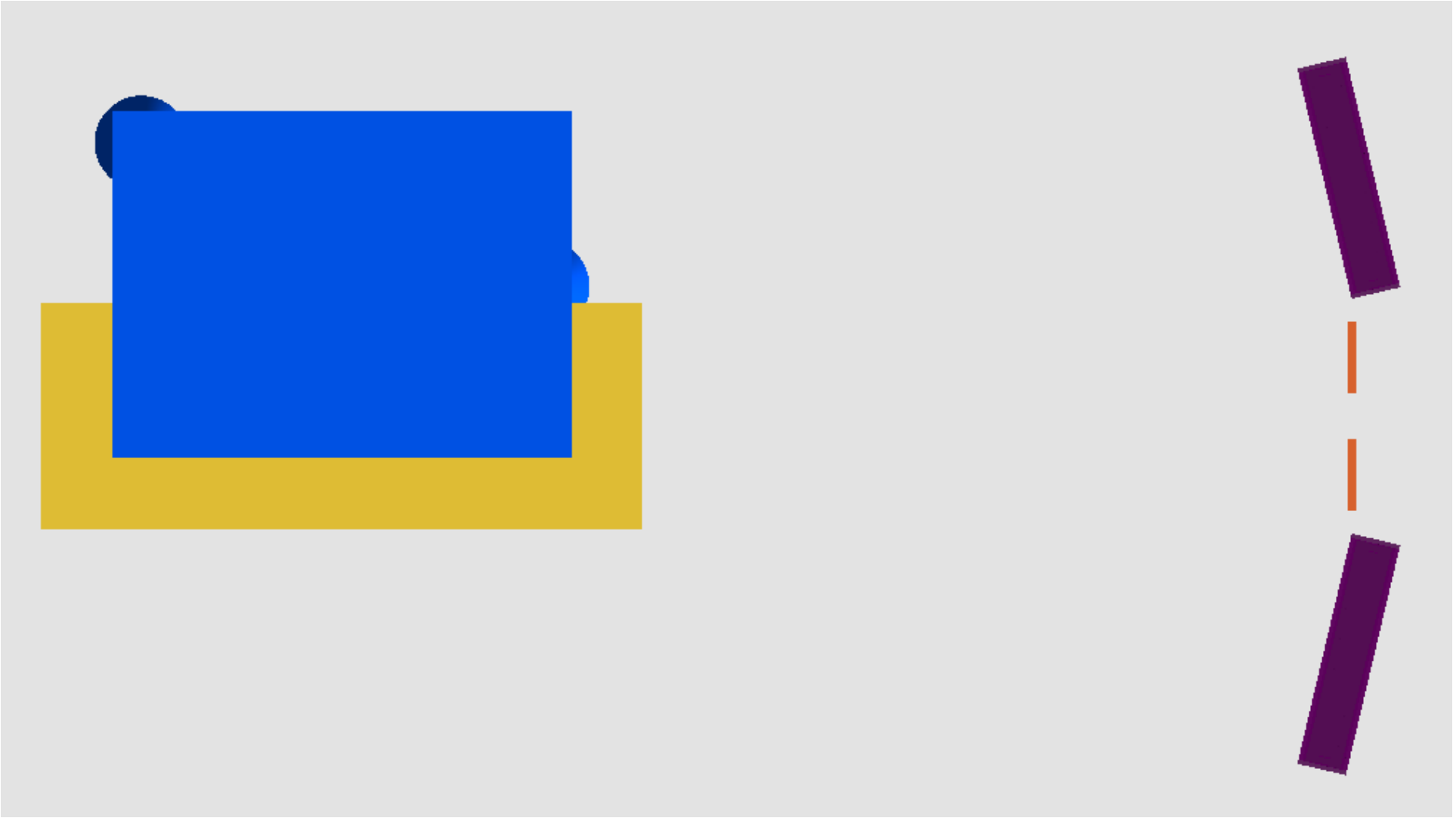
Silicon sensor: Si 320 um.

Air gap

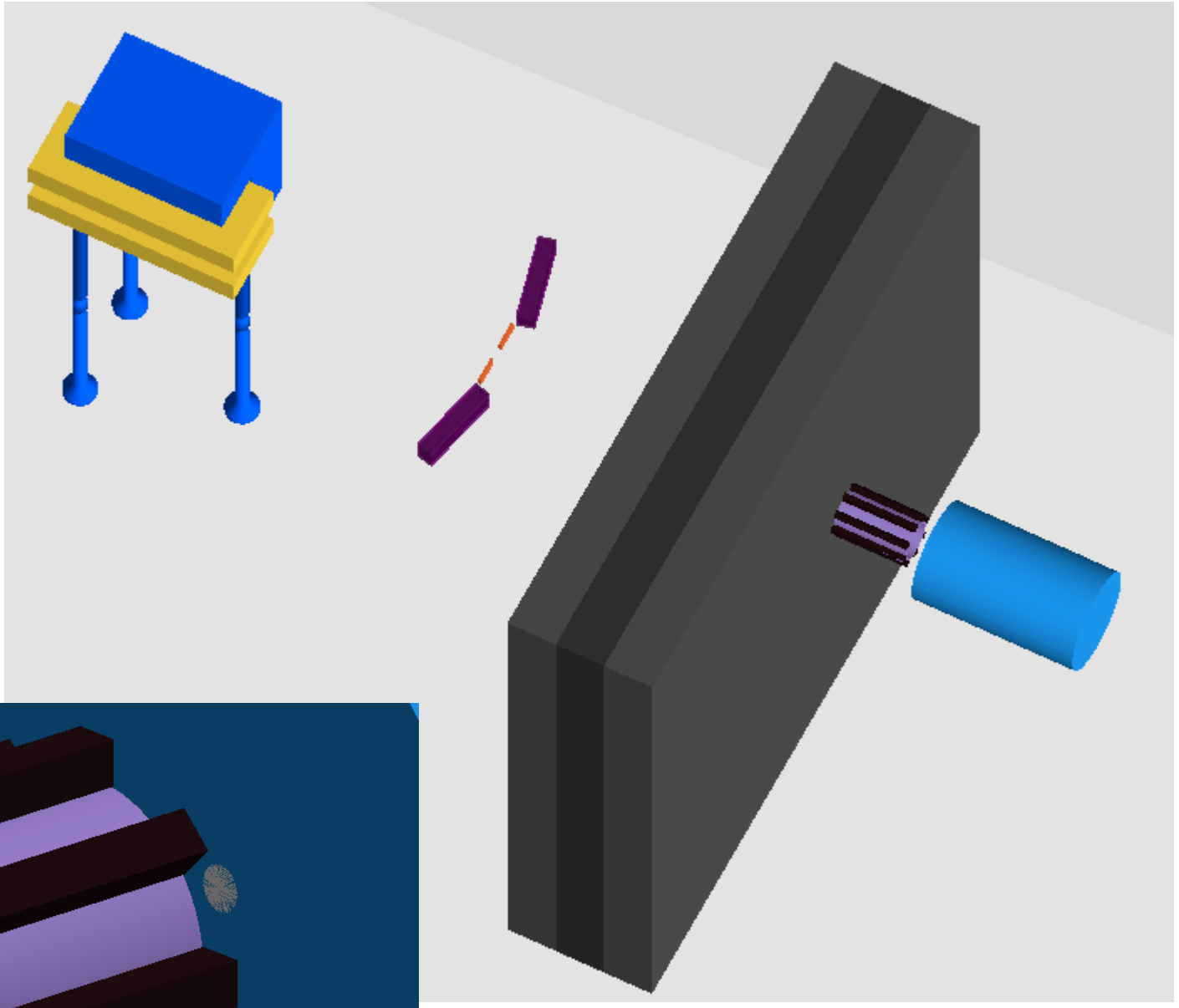
Photon target, collimators, C-shape magnet

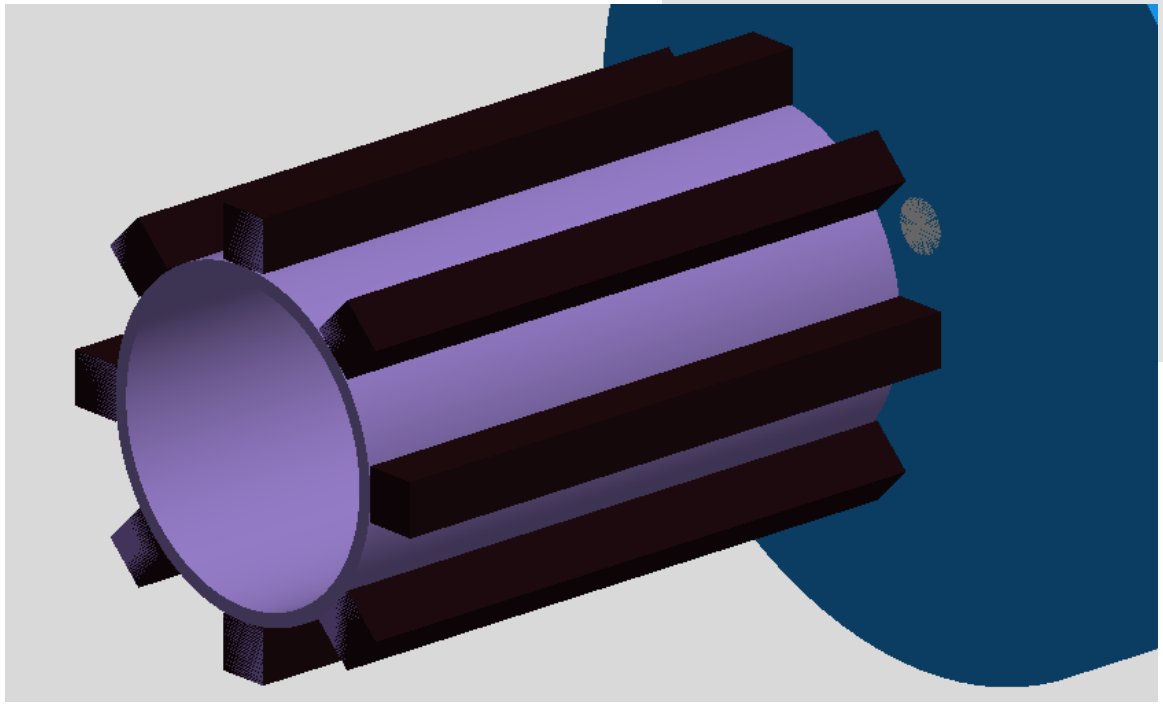


C-shape magnet, LYSO crystals and Cherenkov detectors

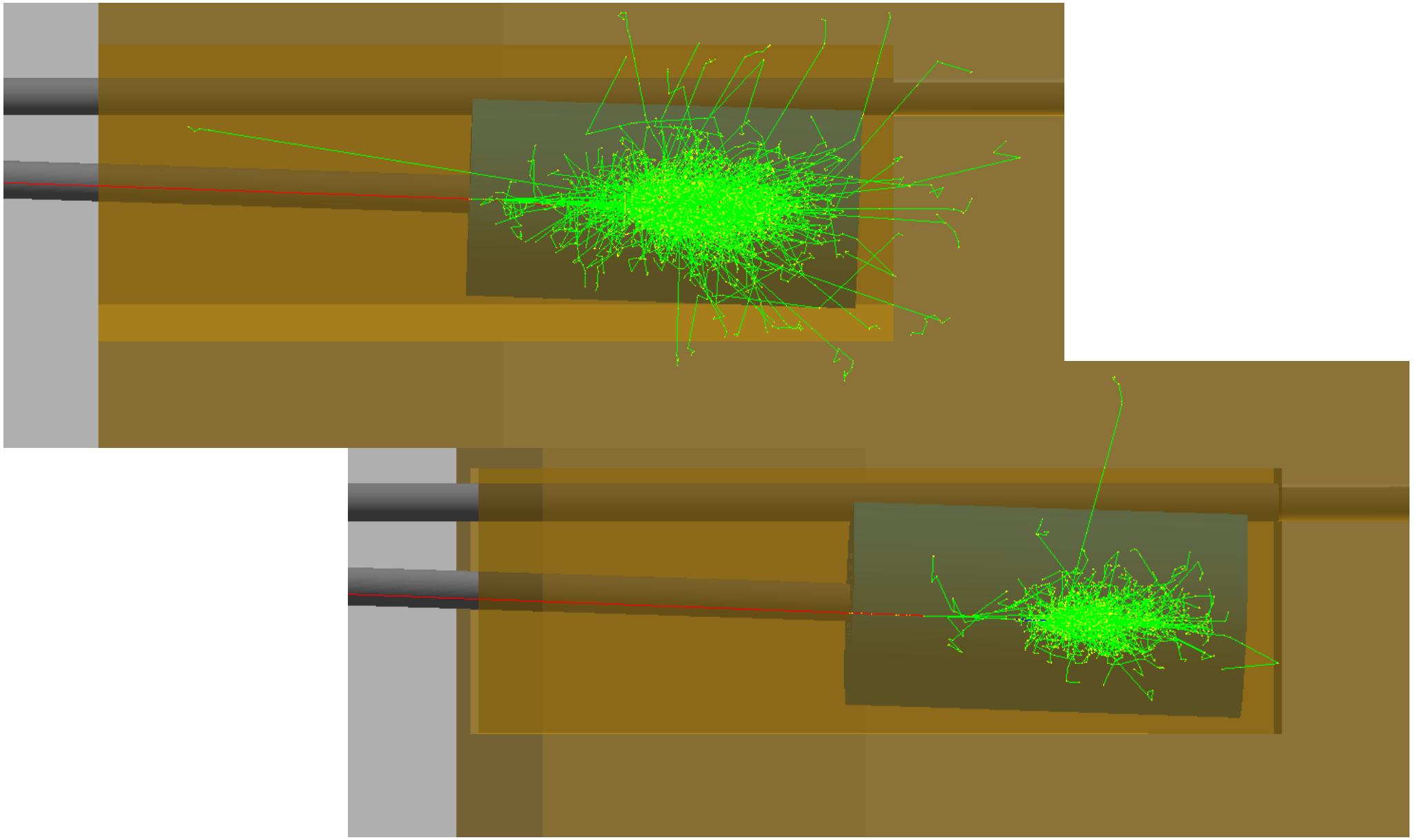


Photon spectrometer, shielding, photon monitor, dump

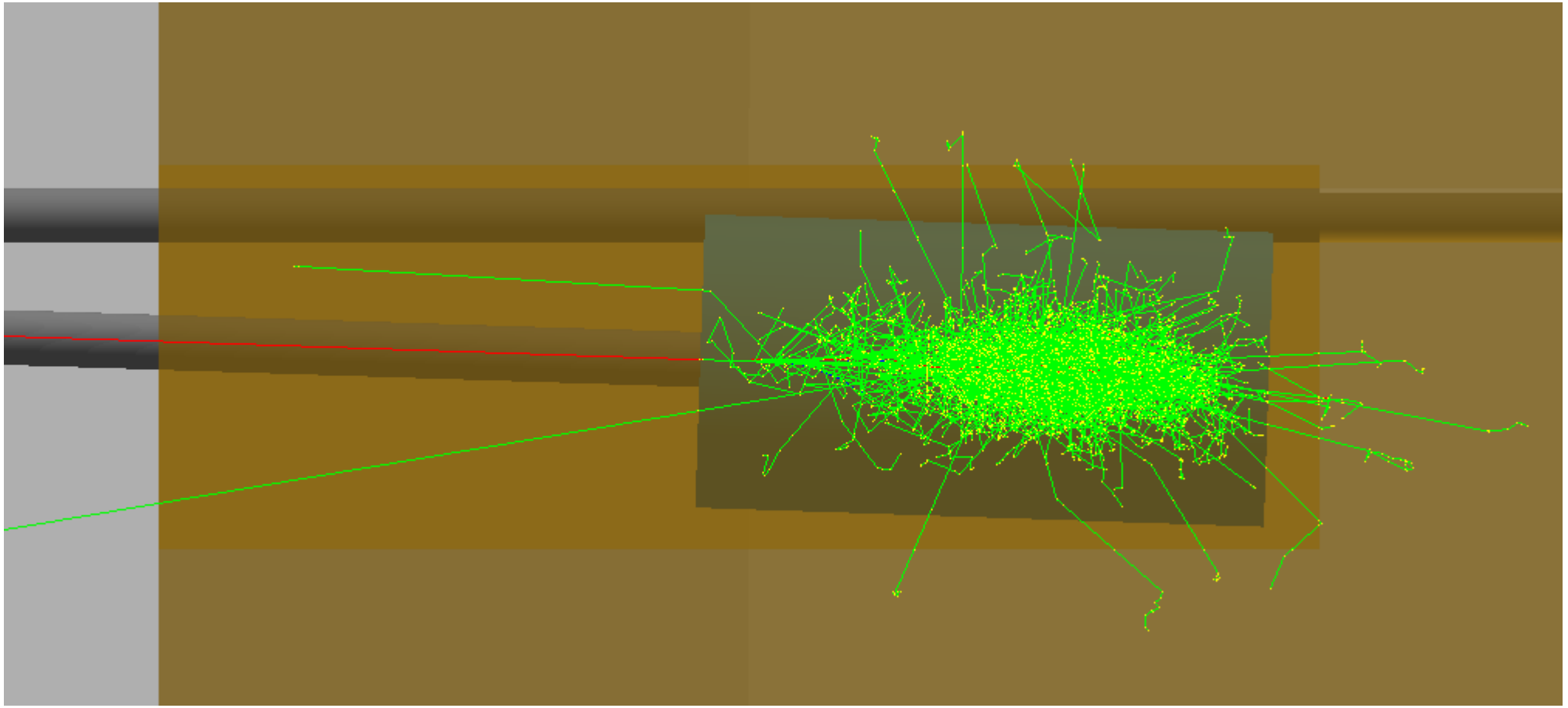




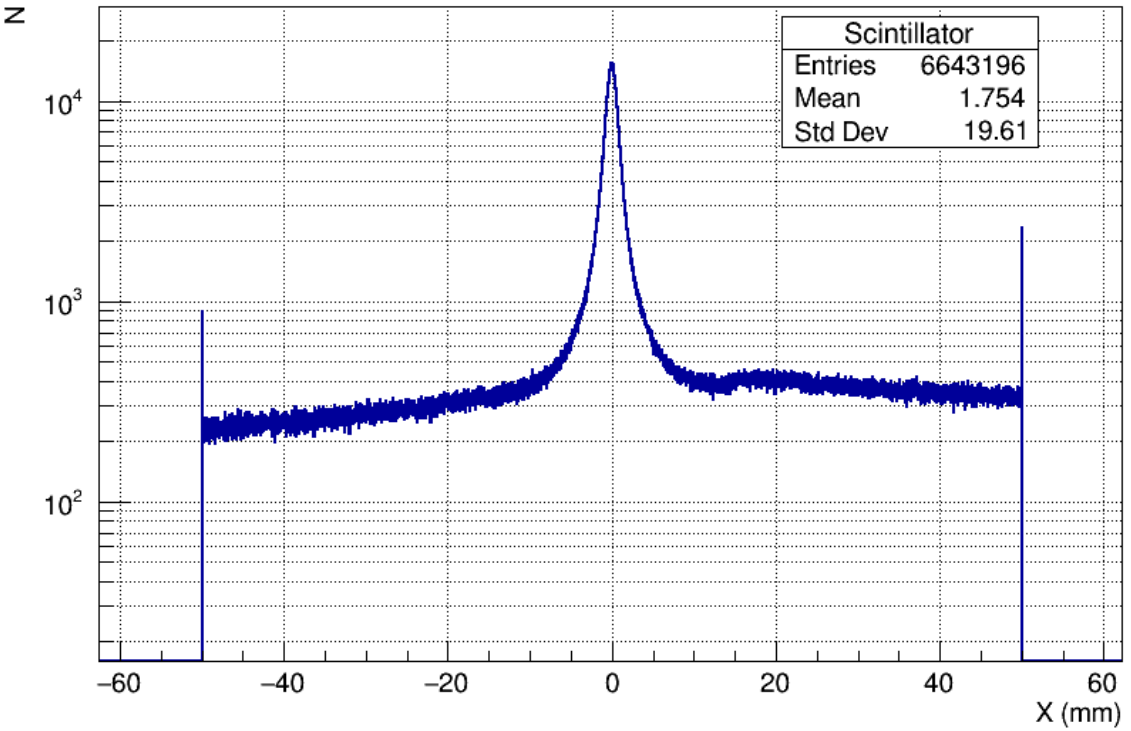
2 T, 17.5 GeV and 16.5 GeV

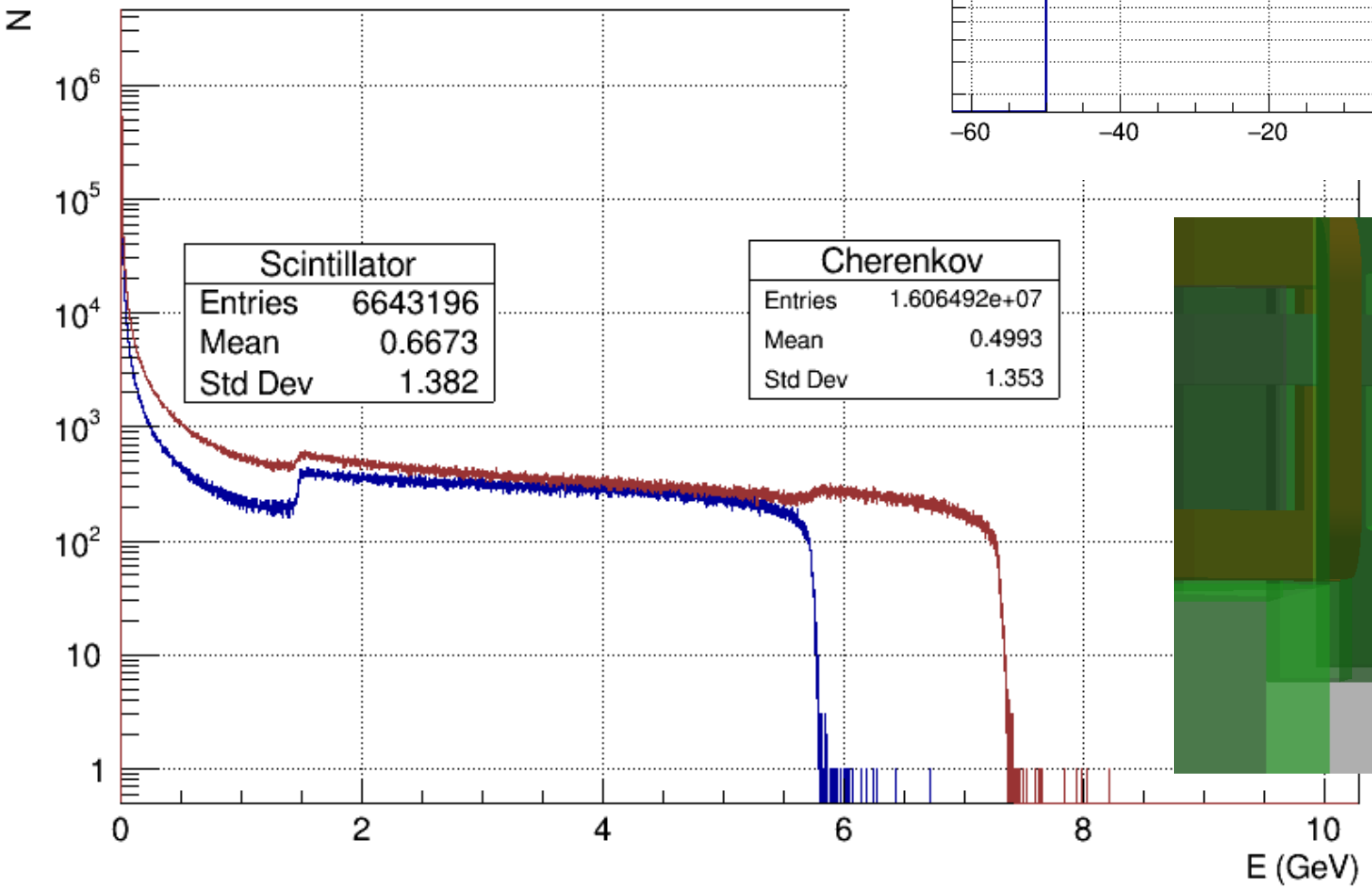


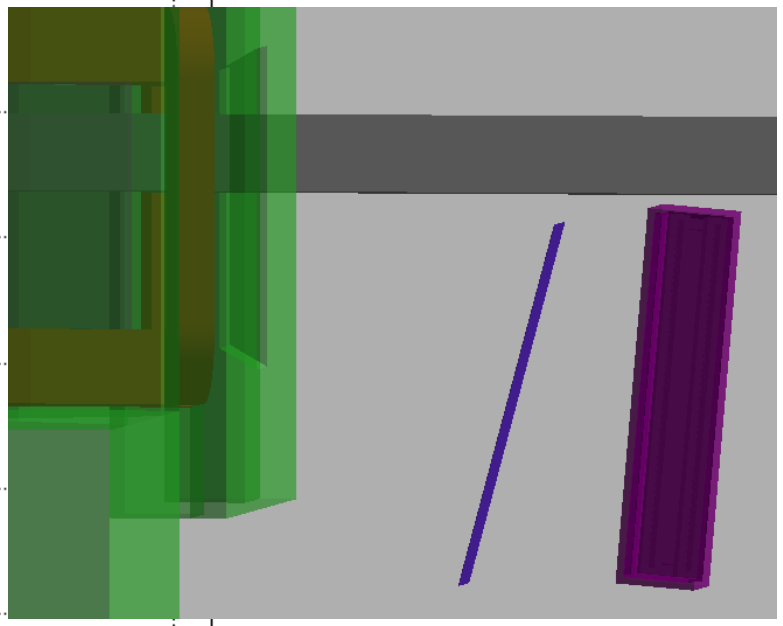
1.8 T, 16.5 GeV



Scintillator screen and Cherenkov

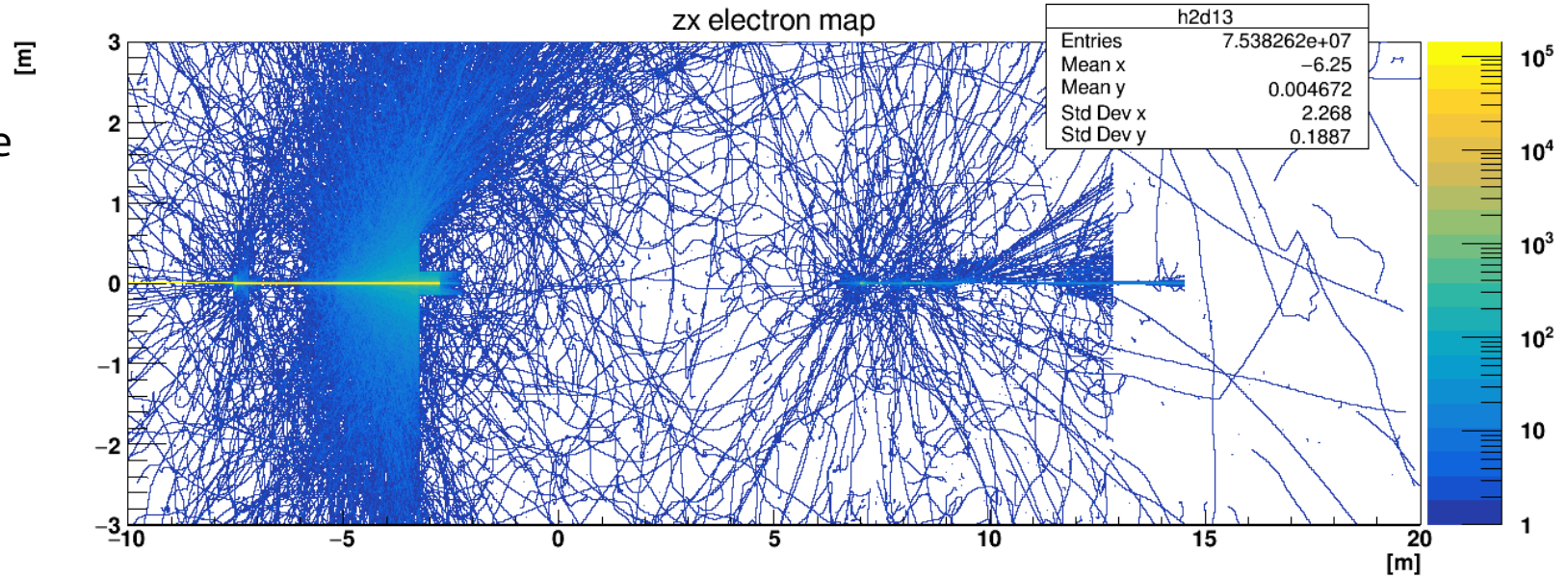




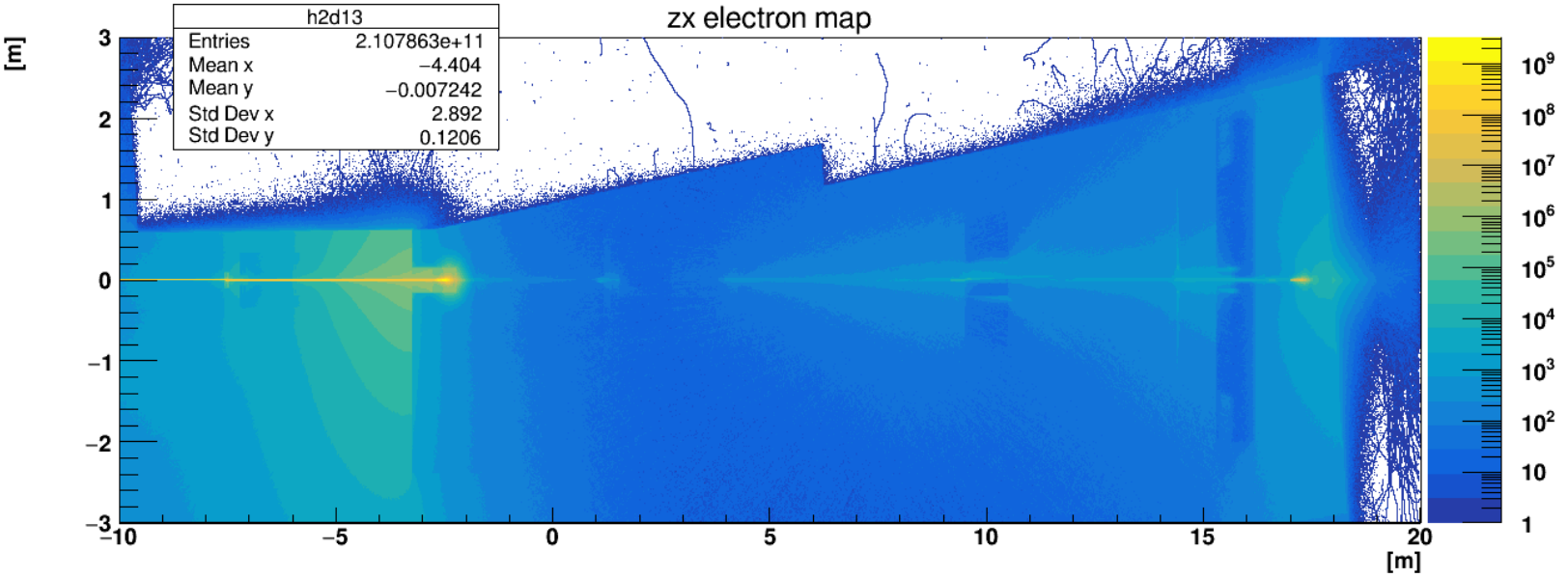


Fast simulation

- Tracks crossing the shieldings and dumps are killed.
- 10^5 e- in 5 minutes
- 10^{10} e- 1000 jobs for 10h.



- 10^5 e- in 3.5h



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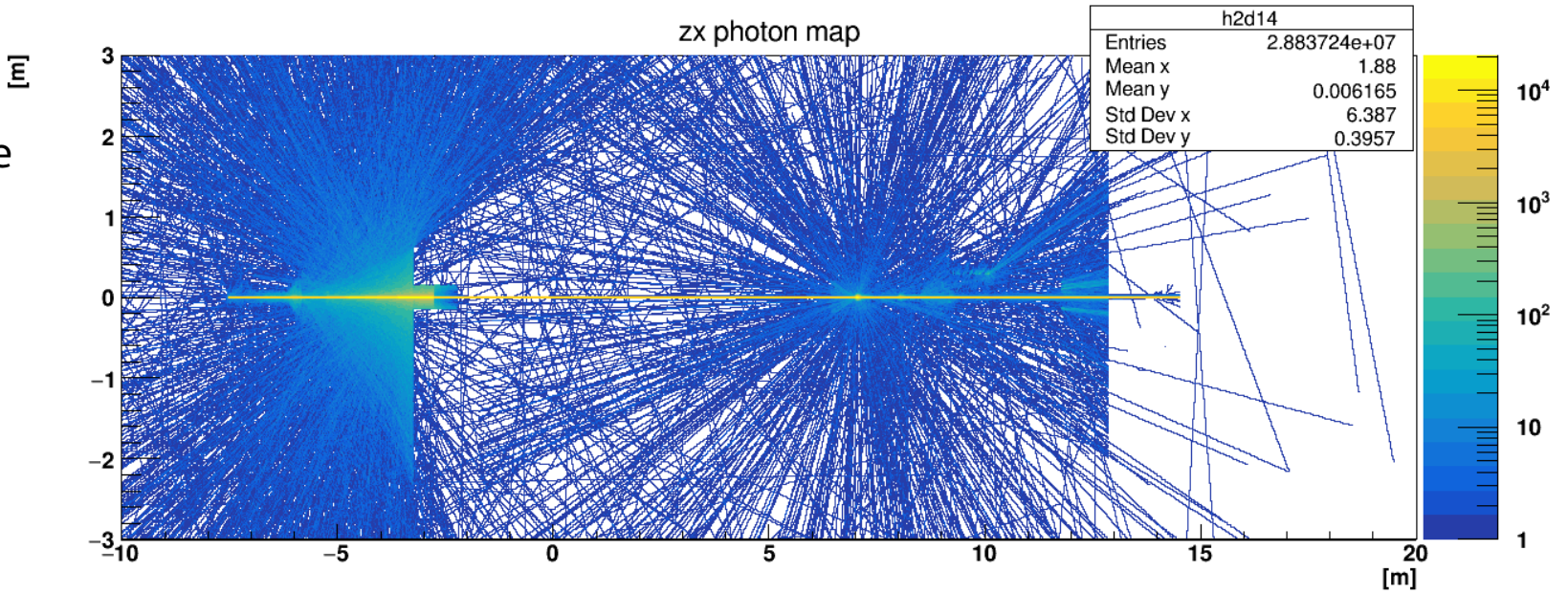
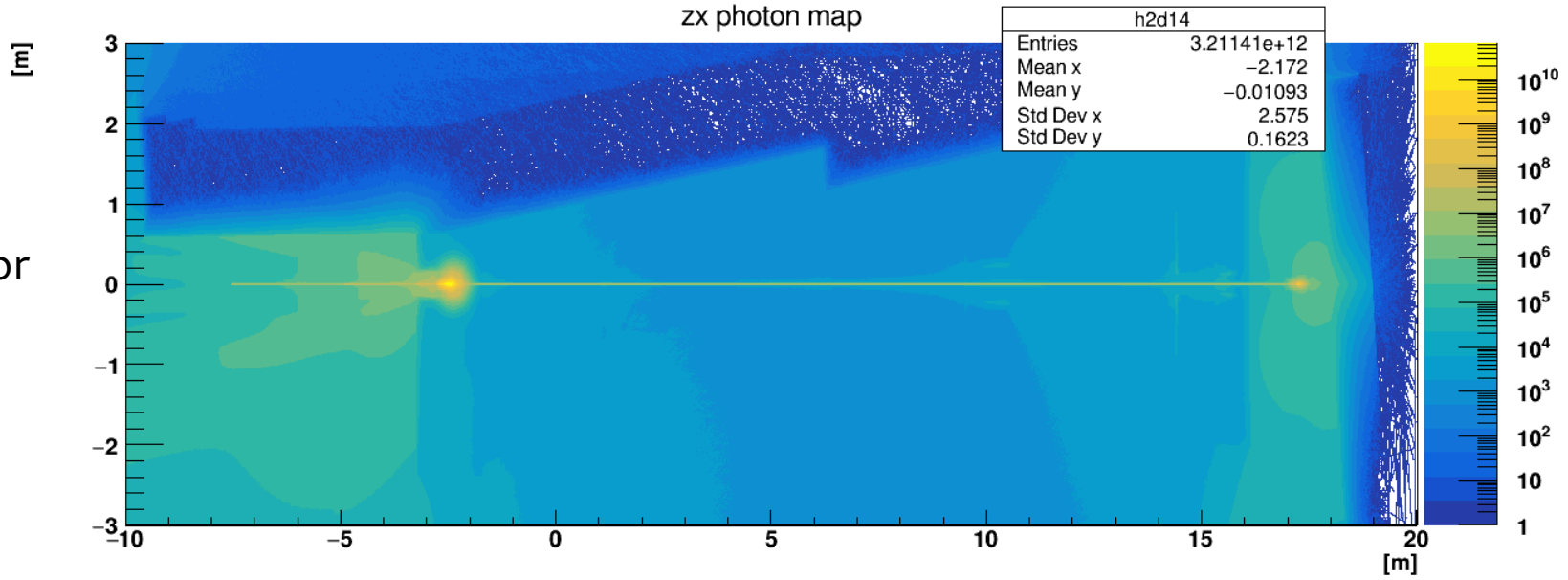


- 10^5 e- in 3.5h
- 10^{10} e- 10^4 jobs for 40h



Summary and plans

- Tracker and calorimeter geometry is implemented for OPPP detector.
- Photon spectrometer with collomators, C-shape magnet, LYSO and Cherenkov detectors.
- Tested version for fast background simulation.

Environment on NAF (or wherever CVMFS is available), Geant4 v 10.06:

```
. /cvmfs/sft.cern.ch/lcg/releases/LCG_97/Geant4/10.06.p01/x86_64-centos7-gcc8-opt/Geant4-env.sh
. /cvmfs/sft.cern.ch/lcg/releases/LCG_97/Geant4/10.06.p01/x86_64-centos7-gcc8-opt/bin/geant4.sh
# use cmake /cvmfs/sft.cern.ch/lcg/releases/LCG_97/CMake/3.14.3/x86_64-centos7-gcc8-opt/bin/cmake
```

Backup

1 Specifications and Parameters of Forward Spectrometer

Technical Specifications	
Target	
Material	W
Thickness (z)	10 μm
Width (y)	20 cm
Height (x)	20 cm
Collimators	
Material	Pb
Length	50 cm
Inner Radius	0.4 cm
Outer Radius	5.0 cm
Separation	50 cm
Magnet	
Field Strength	Up to 1.4 T
Effective Length (z)	98 cm
Effective Width (y)	18 cm
Effective Height (x)	5 cm
Yoke Material	Fe
Coil Material	Cu (hollow; water cooled)
Total Length (z)	128 cm
Total Width (y)	73.75 cm
Total Height (x)	97 cm
Detector	
Material	LYSO Scintillator
Crystal Size	1 mm $\times$ 2 mm $\times$ 2 cm
Screen Size	5 cm $\times$ 15 cm $\times$ 2 cm
Off-axis Displacement	5 cm (symmetric)