

# LUXE Background Study in Geant4 Simulation

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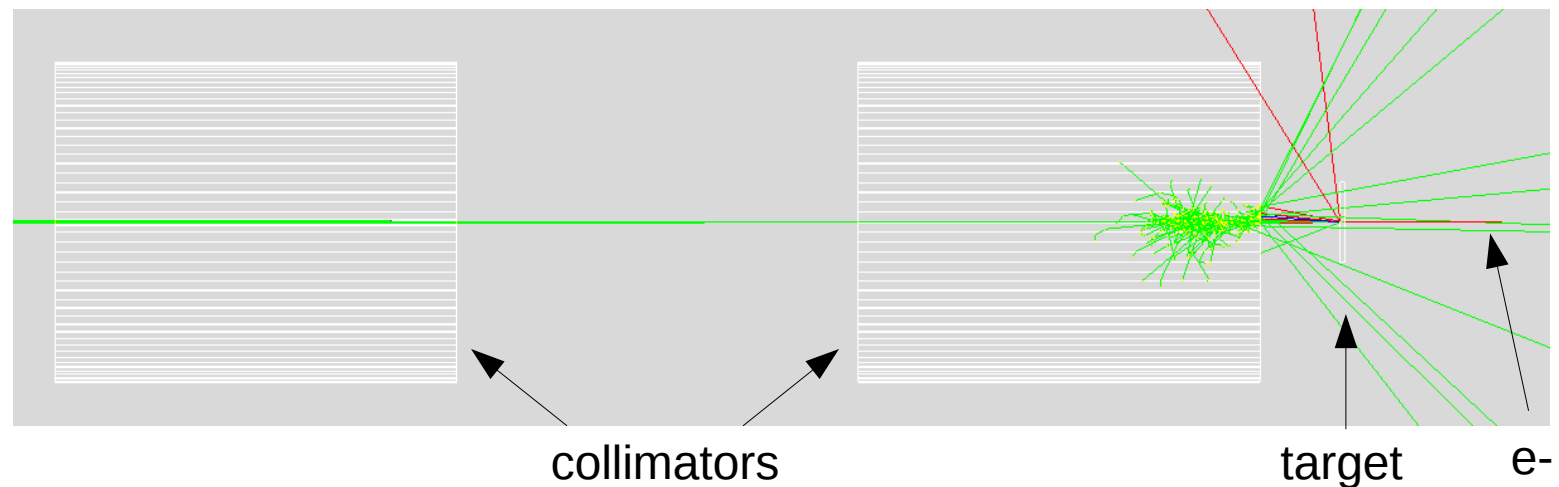
LUXE Meeting  
August 26, 2019

# Simulation of two collimators

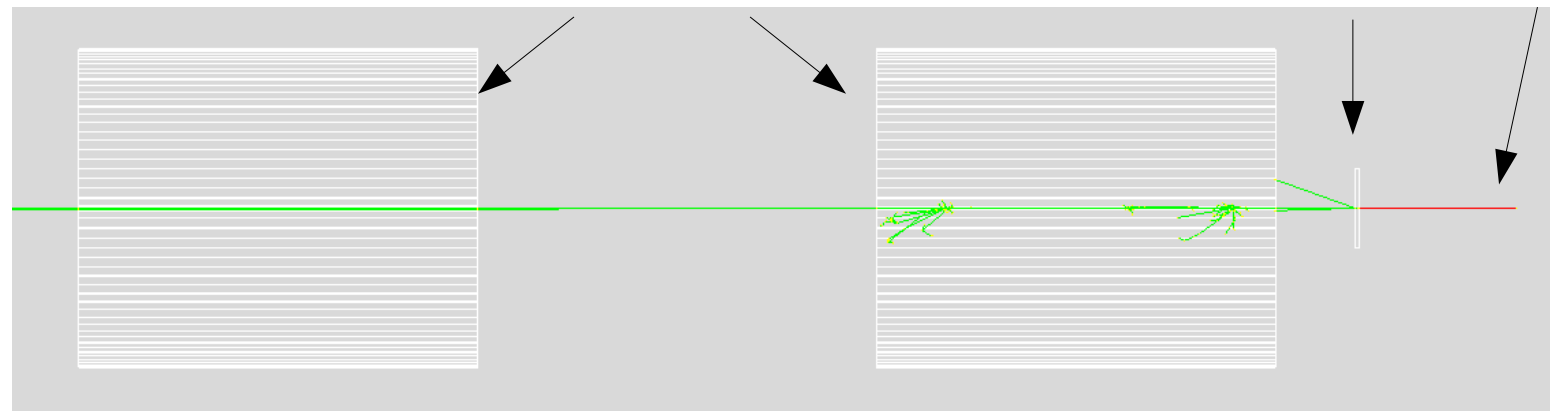
Simple simulation to check the angular distribution and source of the photons after passing through collimators. Three cases are simulated:

1. Tungsten converter and two lead collimators 0.5 m long with a gap of 0.5 m between them. Holes diameters are 1 mm and 4 mm;
2. Without collimators;
3. With the collimators, but all electrons and positrons are “killed” right after the target.

Test illustration of the performance with  $\sim 10$   $e^-$

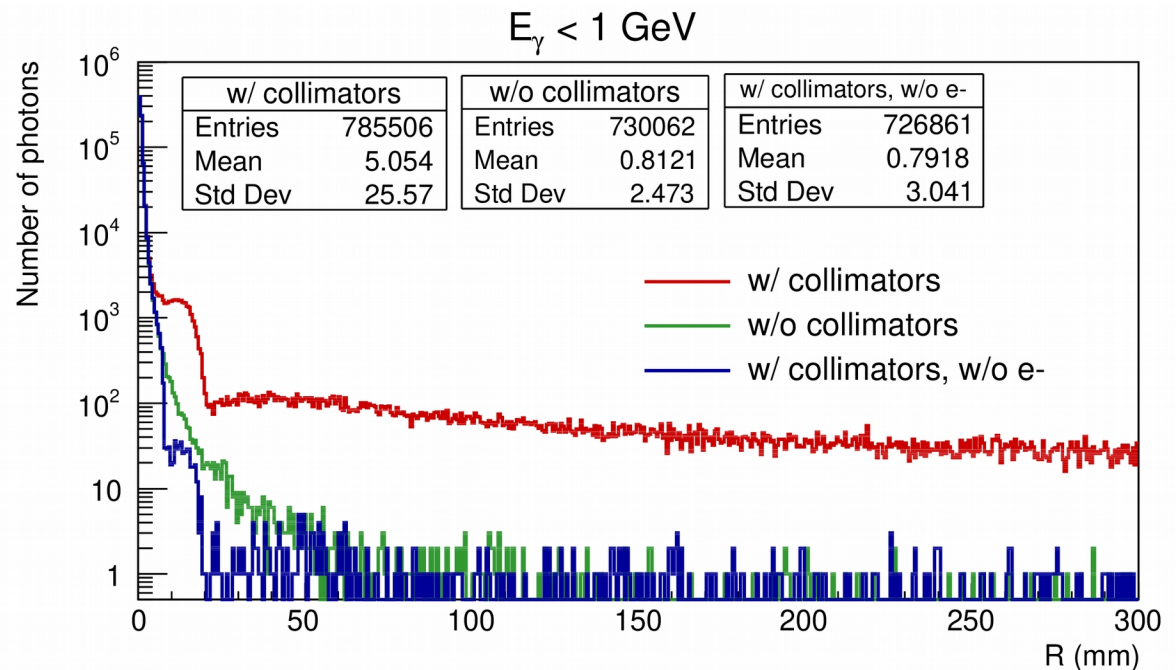
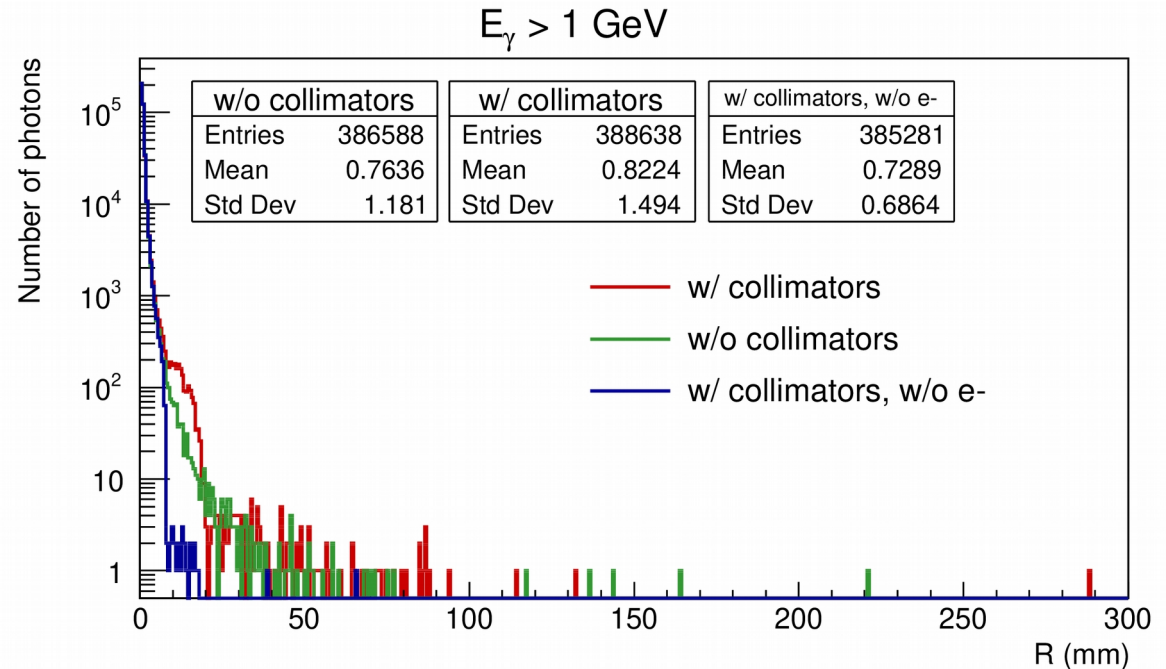


$e^+$ ,  $e^-$  are killed after the target



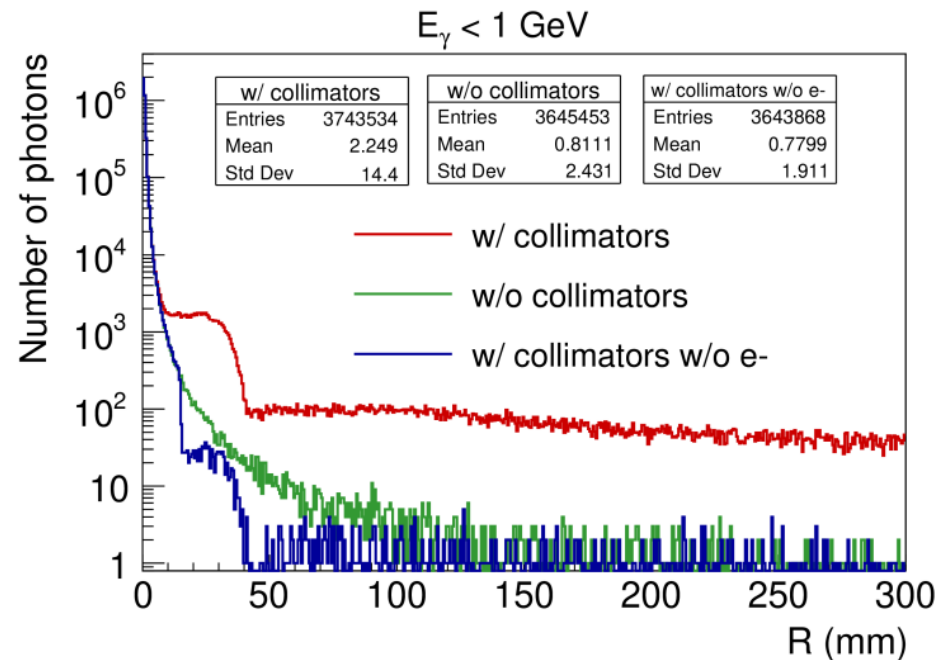
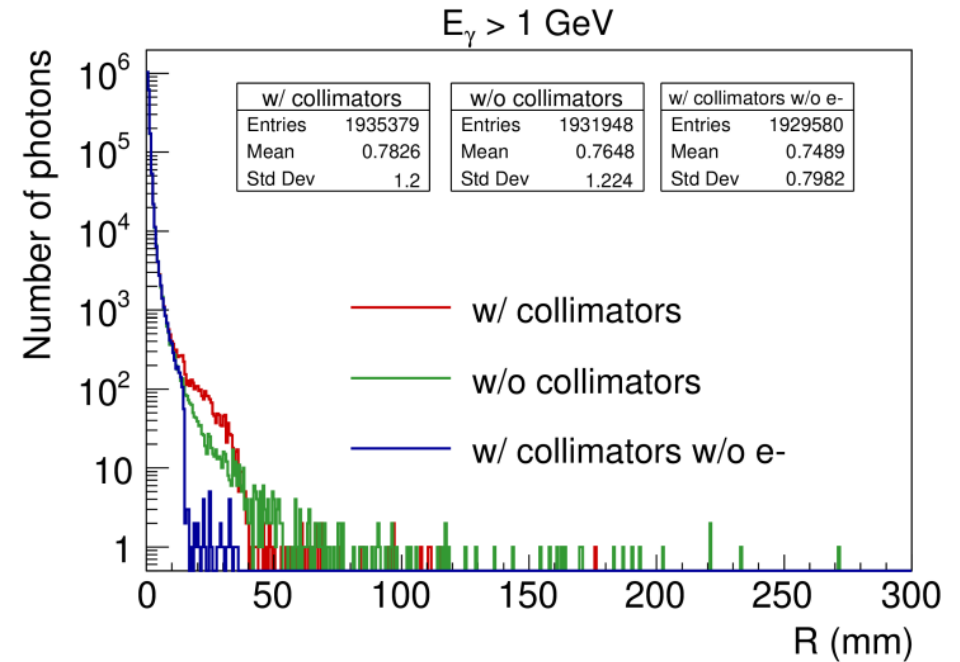
# Effect of Collimators

- 12.5M e- are simulated;
- Photons are observed 8.8 m downstream from the target (IP); Their radial distribution is plotted.
- The statistics is small, but there is substantial number of photons with energies above 1 GeV generated by electrons and positrons in collimators which can (and do) reach IP.
- Their number is bigger than for the case without collimators
- Very high flux of low energy photons is created by the electrons and positrons in collimators. This can create substantial occupancy for the tracking detectors.



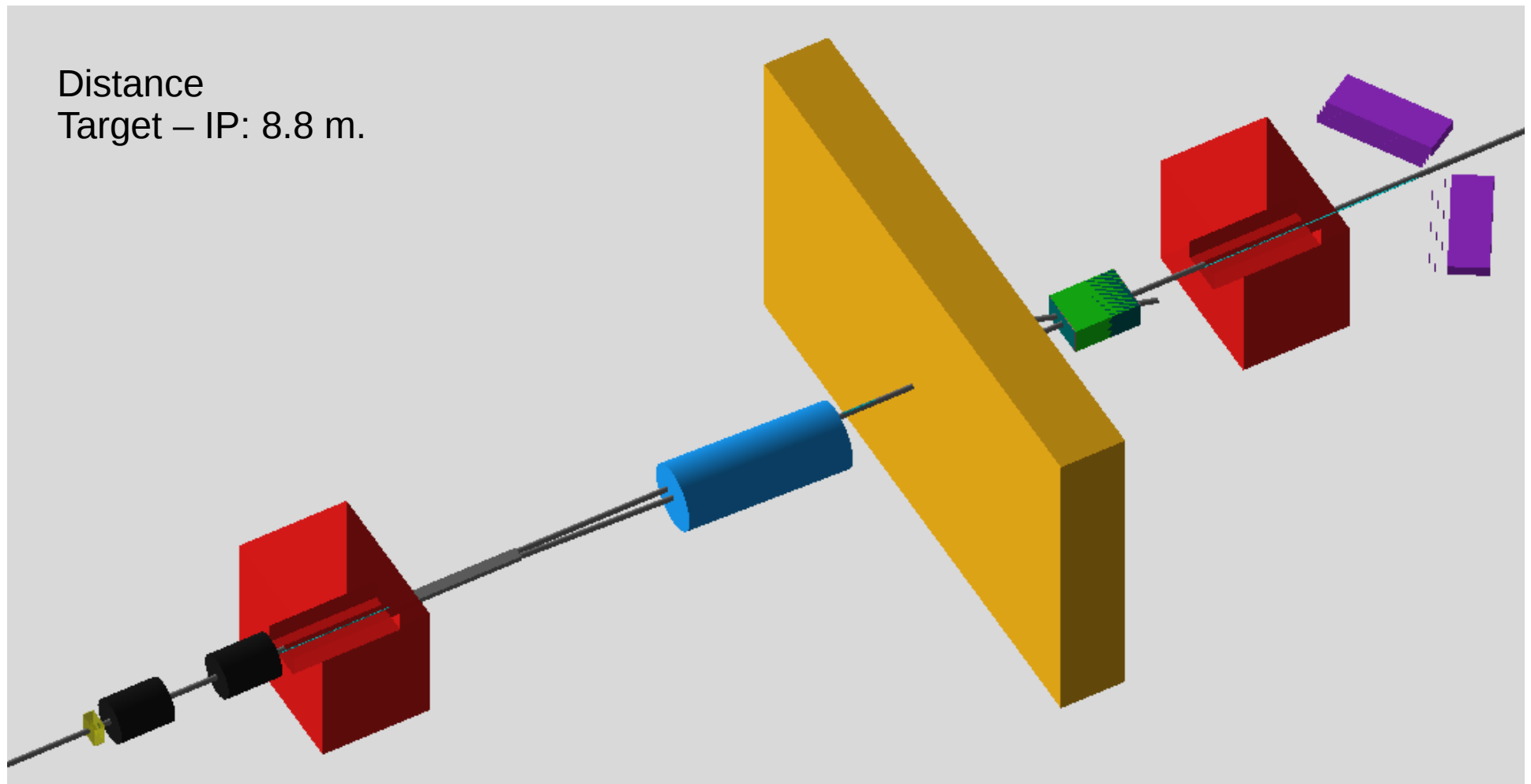
# Effect of Collimators

- The same type of geometry, just the holes are bigger in the collimators: radii are 1 mm and 4 mm;
- Simulation 62.5M e<sup>-</sup>
- 8.8 m from the target to IP.



# Two lead collimators

... Two cylindrical collimators are then placed after that. The collimators are both 50 cm long, are made of Pb, and are separated by 50 cm. The hole in the first collimator has a diameter of 1 mm and in the second a diameter of 4 mm. The first DORIS magnet



# Background with two collimators between target and dump magnet

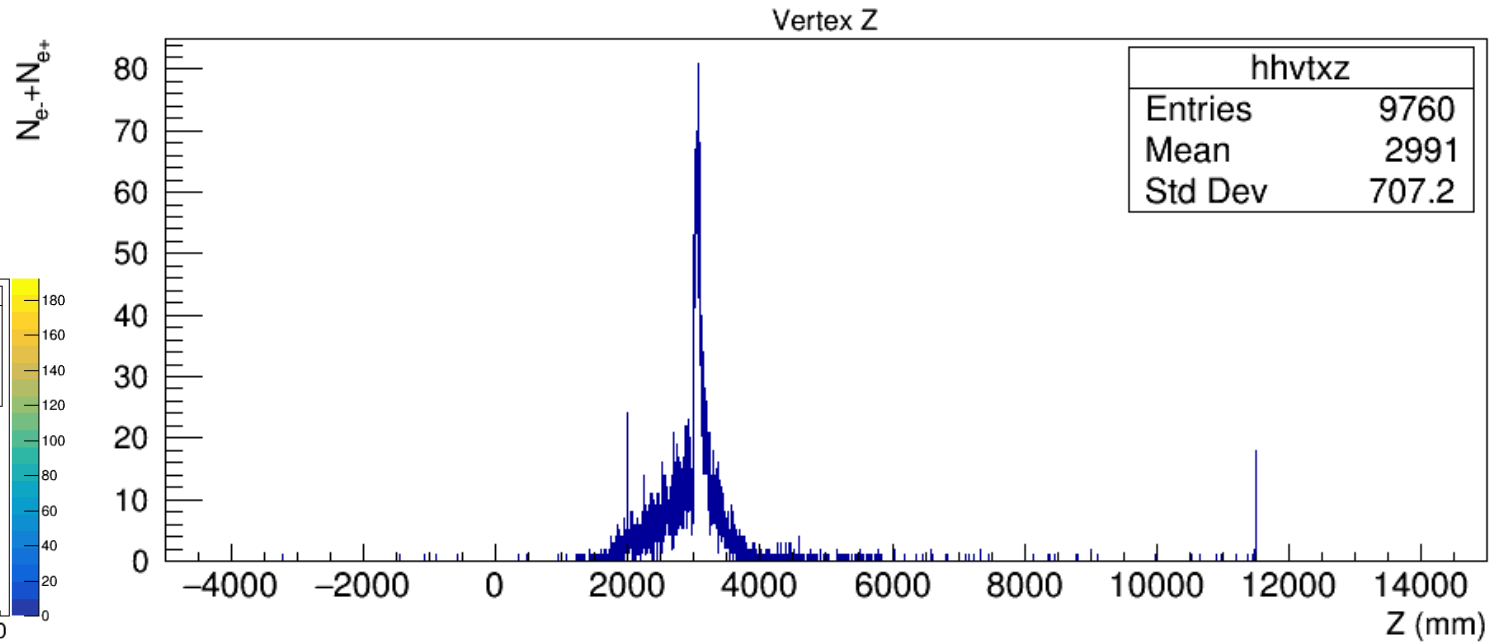
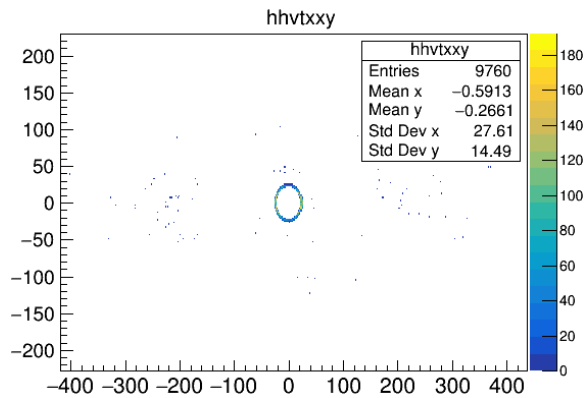
Production vertexes, hits and spectra of  $e^+$ ,  $e^-$  hitting the detector volume

100M  $e^-$

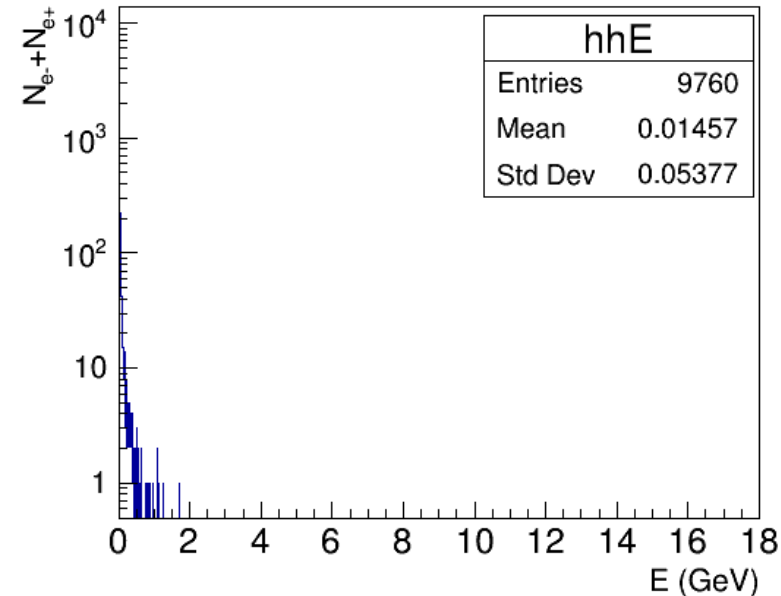
Collimators:

D0 = 1 mm;

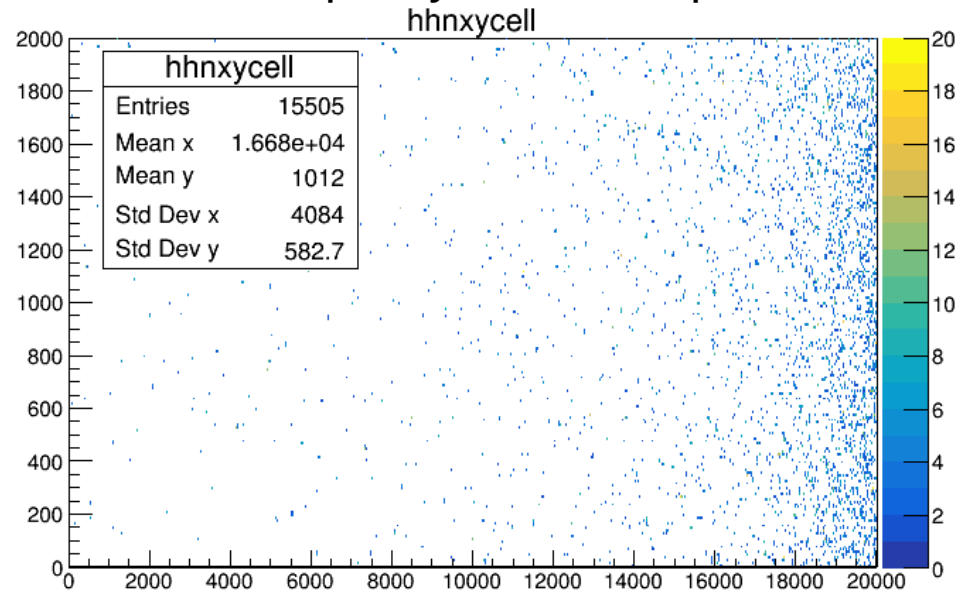
D1 = 4 mm;



Energy spectrum



Occupancy of the first plane

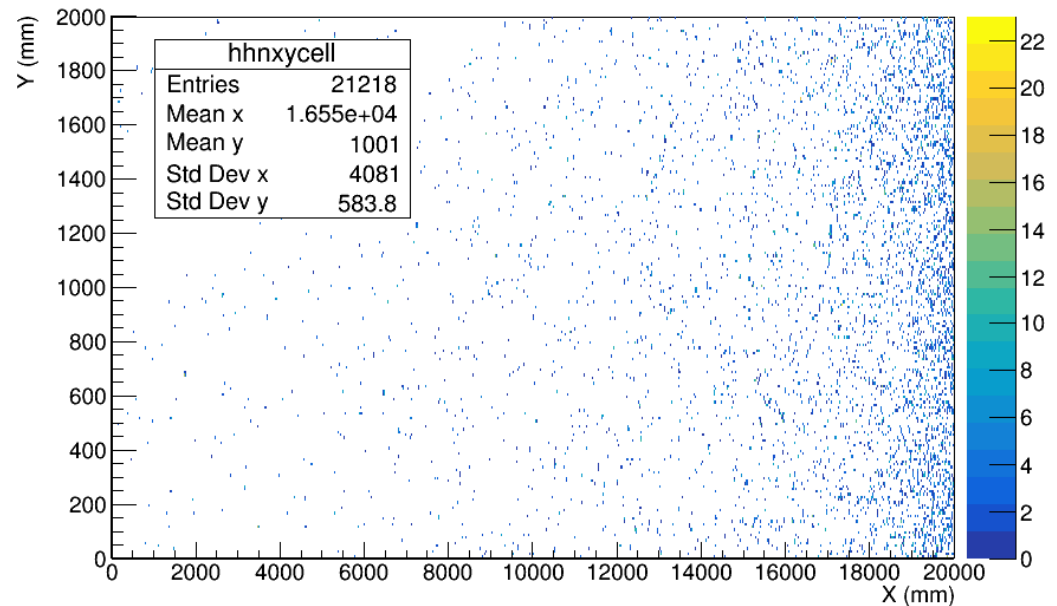
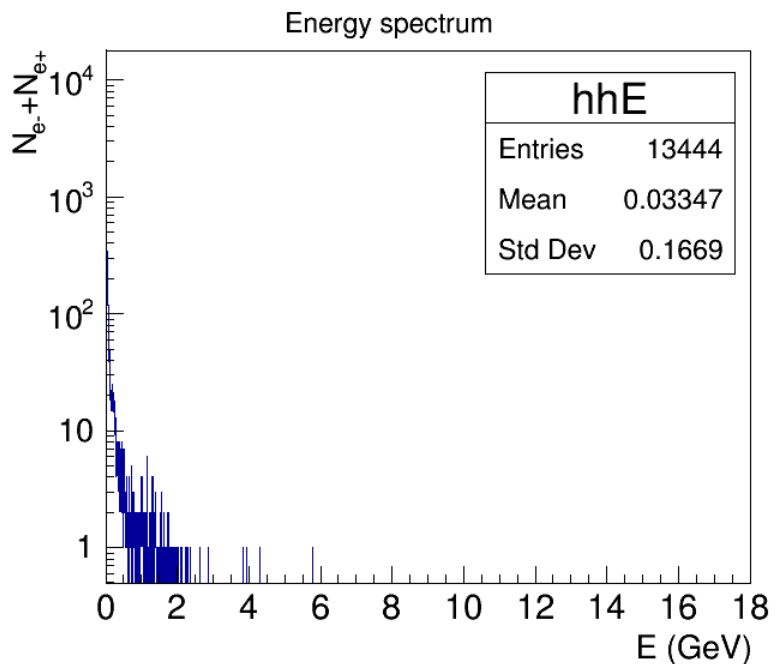
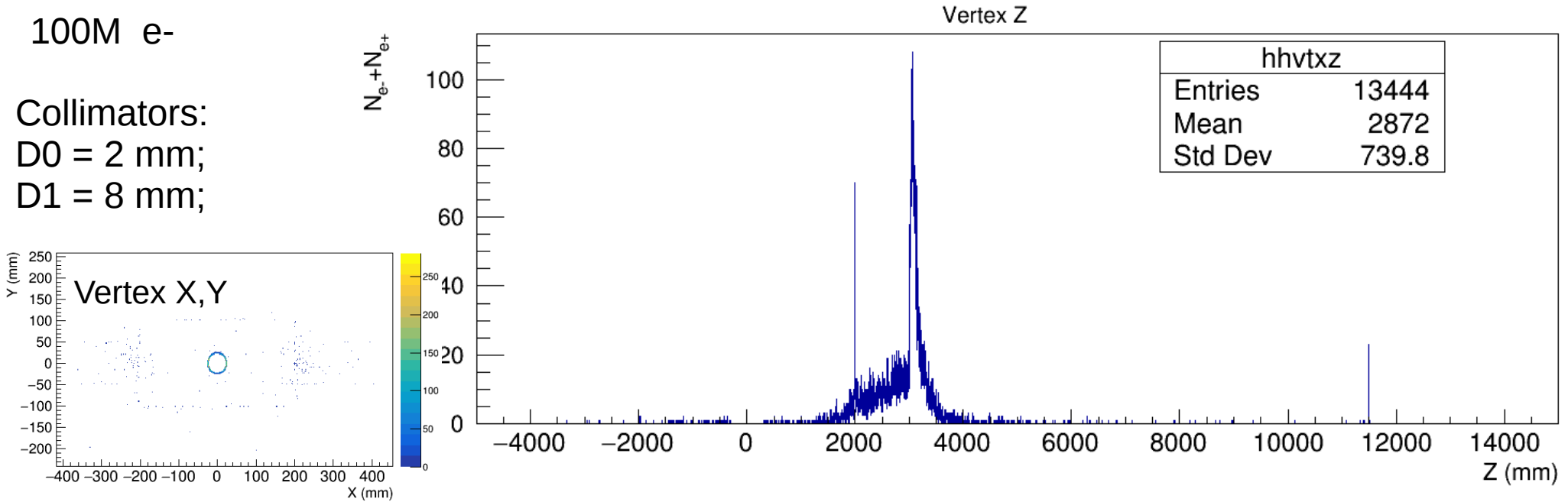


# Background with two collimators between target and dump magnet

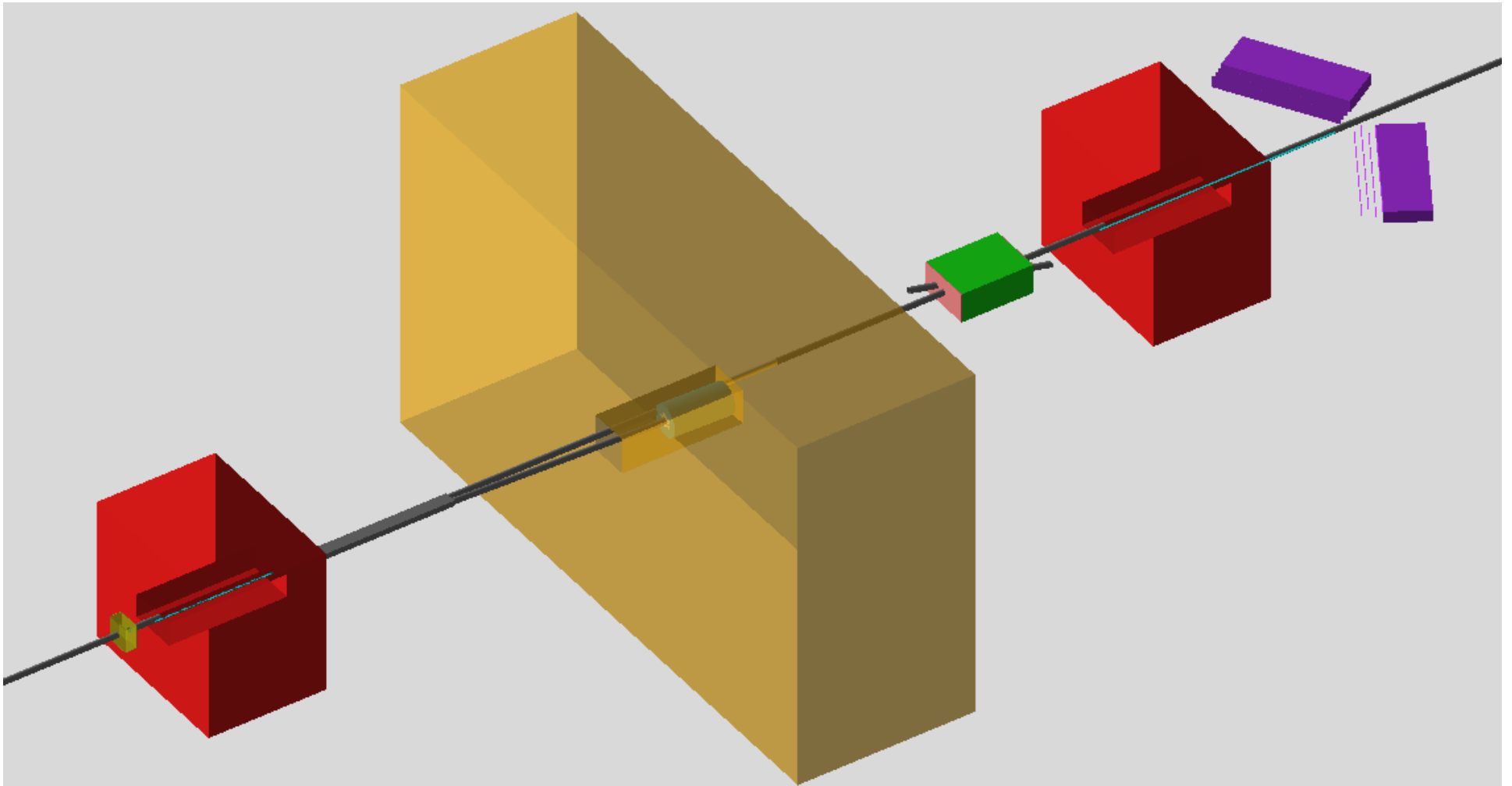
Production vertexes, hits and spectra of  $e^+$ ,  $e^-$  hitting the detector volume

100M  $e^-$

Collimators:  
D0 = 2 mm;  
D1 = 8 mm;



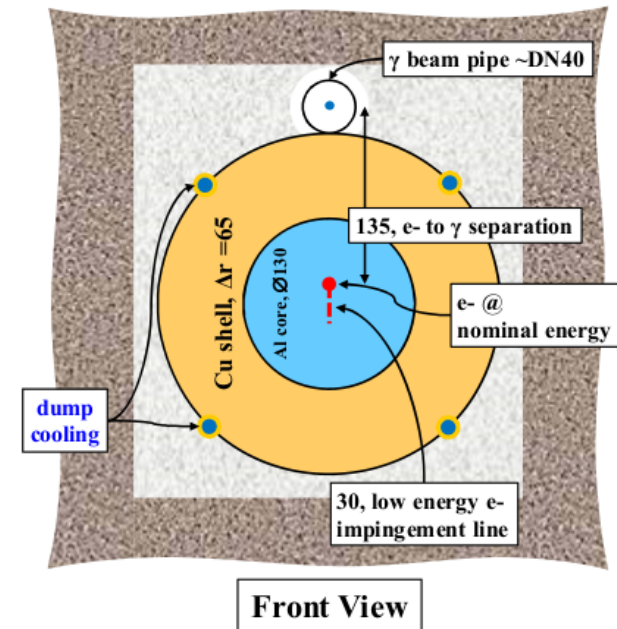
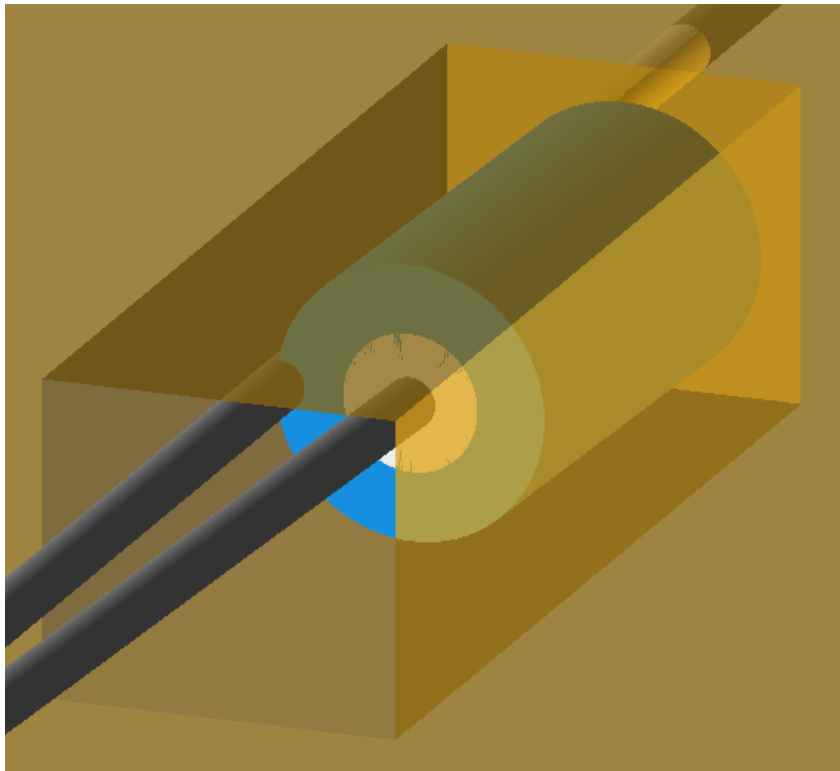
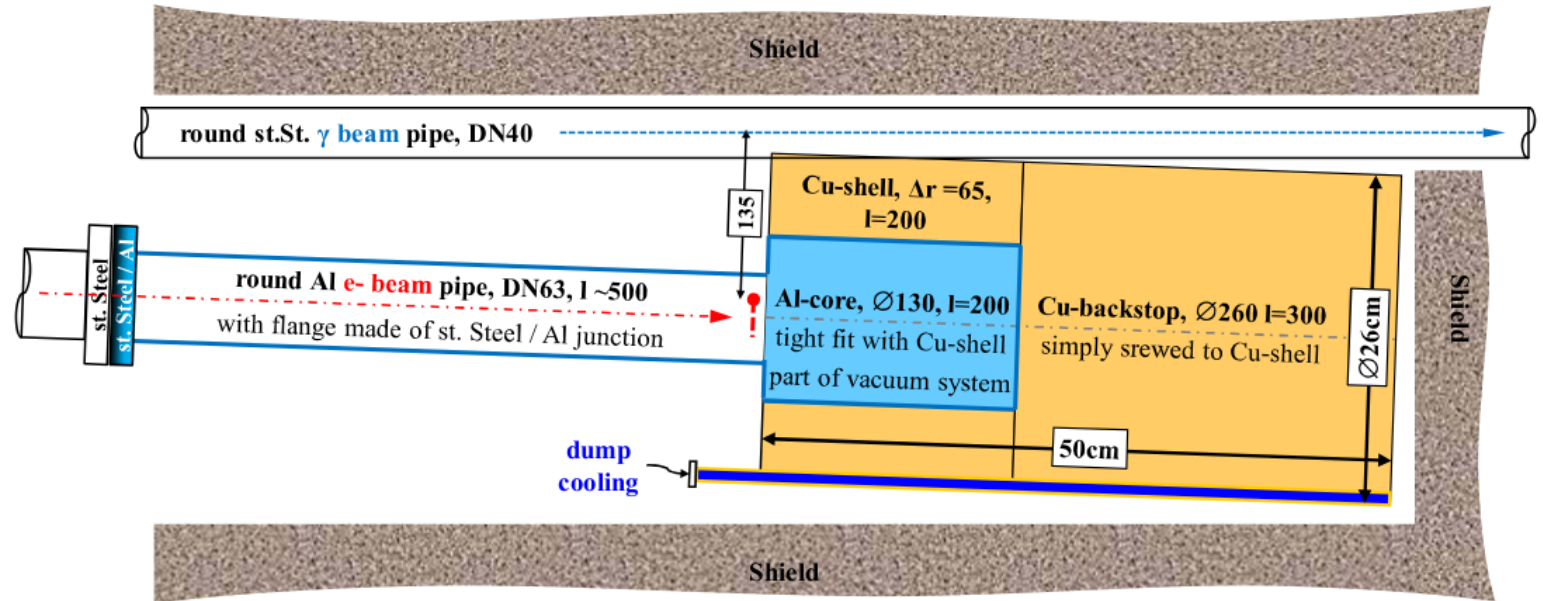
# Beam dump combined with shielding



Distance from the bremsstrahlung target to IP is 7.25 m

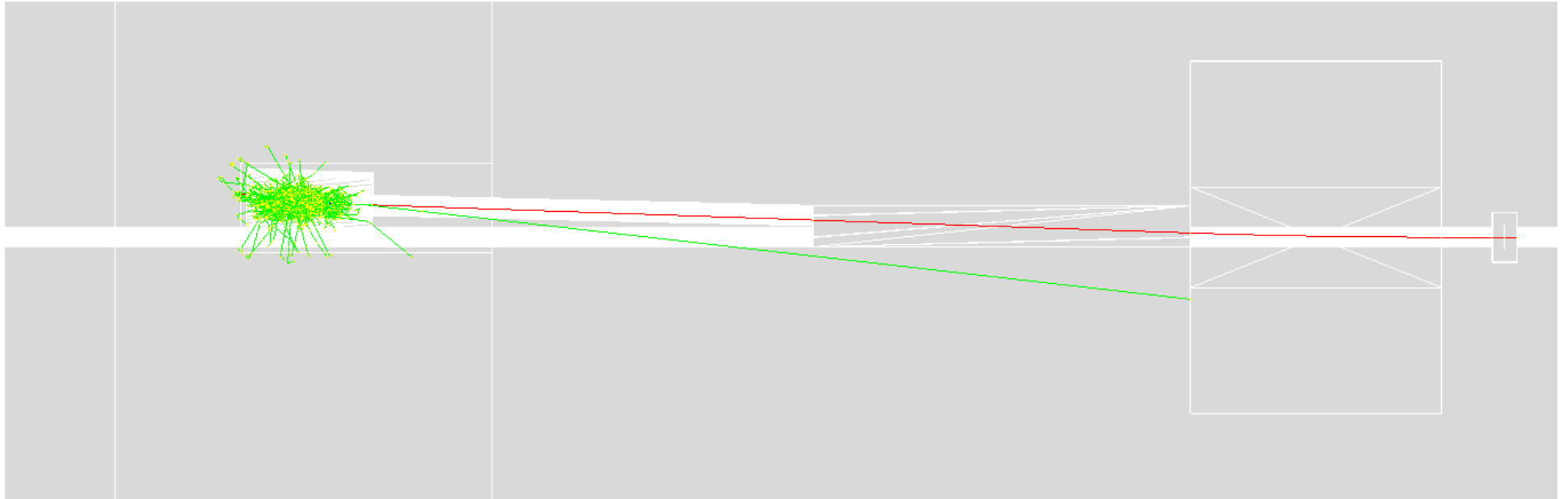


# Beam dump combined with shielding



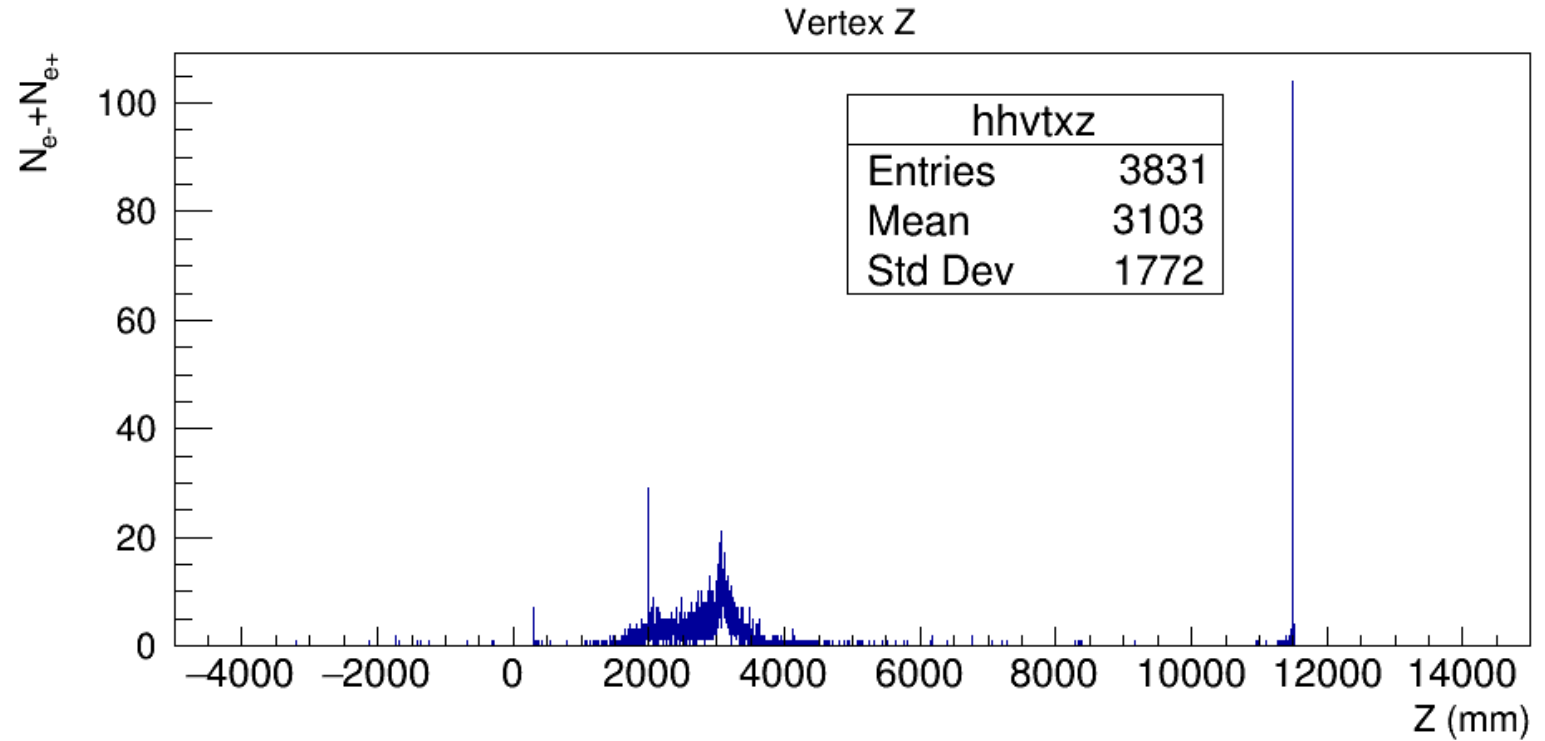
lengths without units are in mm

# e- in beam dump

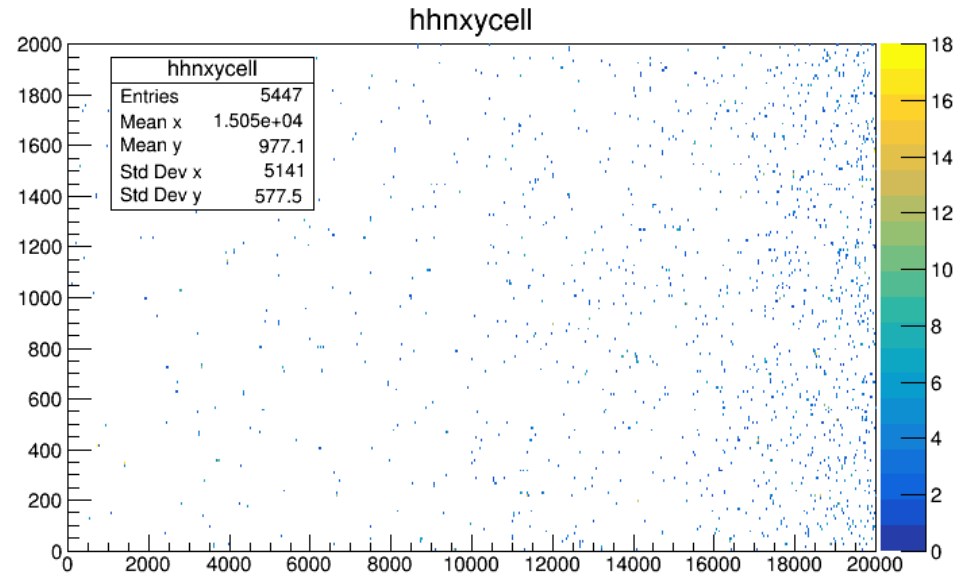
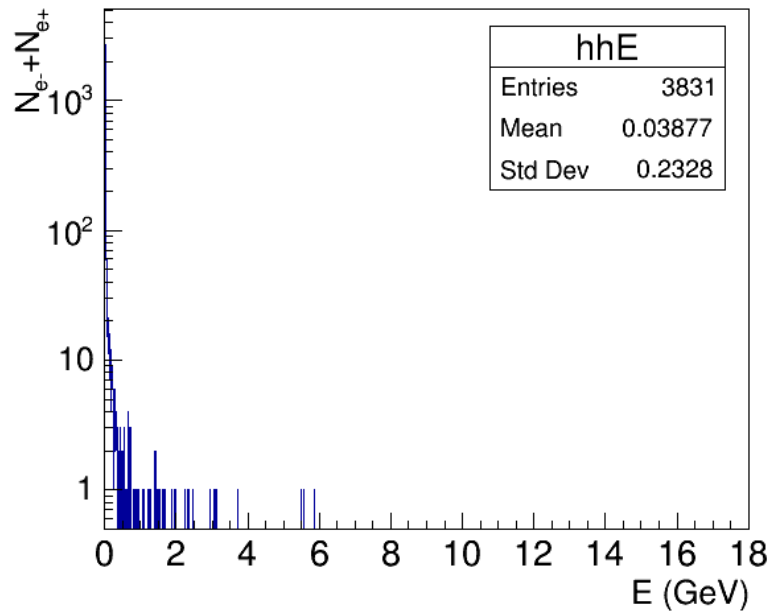


# Beam dump combined with shielding

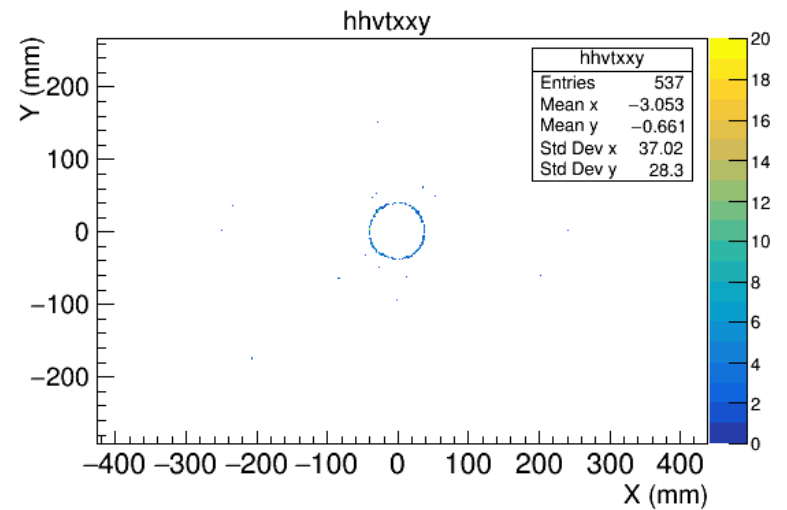
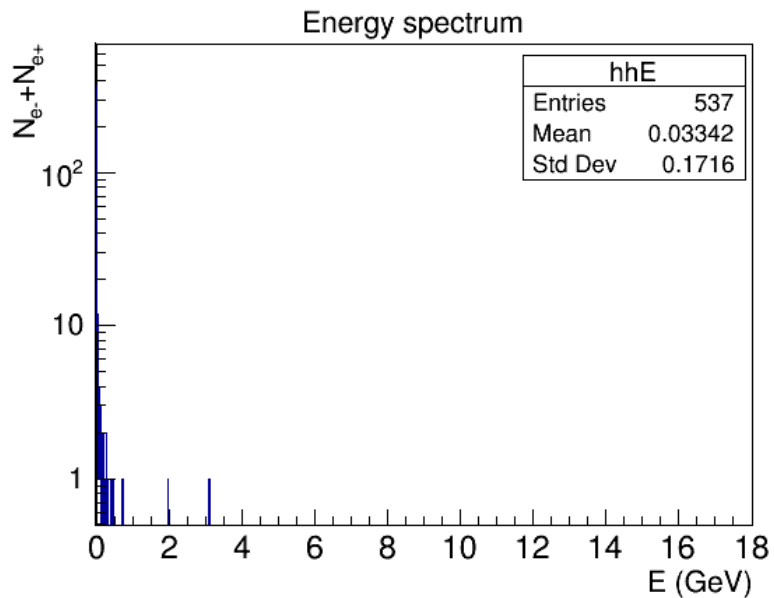
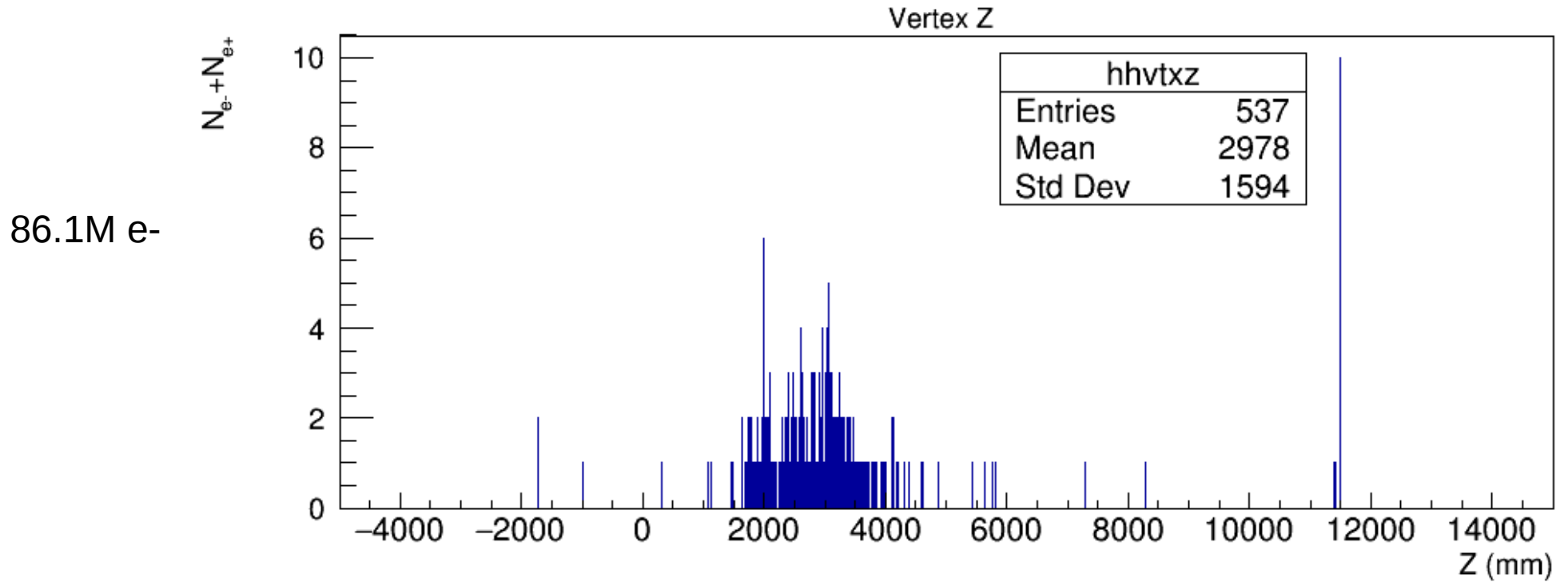
600M e-



Energy spectrum



# Beam dump combined with shielding



# Beam dump combined with shielding

