Simulation of LUXE calibration target in GEANT4 Geometry

Gamma Spectrometer

Oleksandr Borysov

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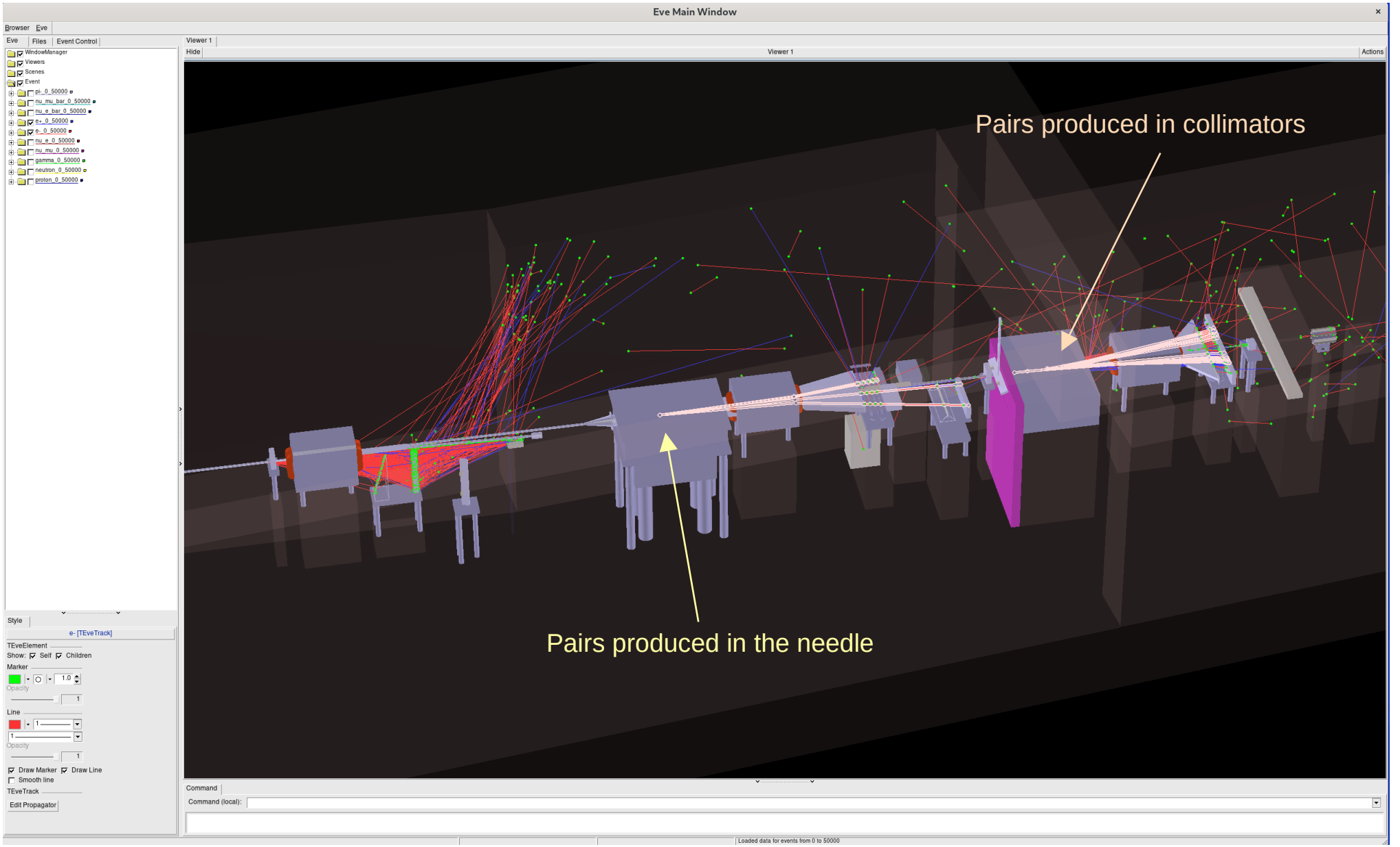
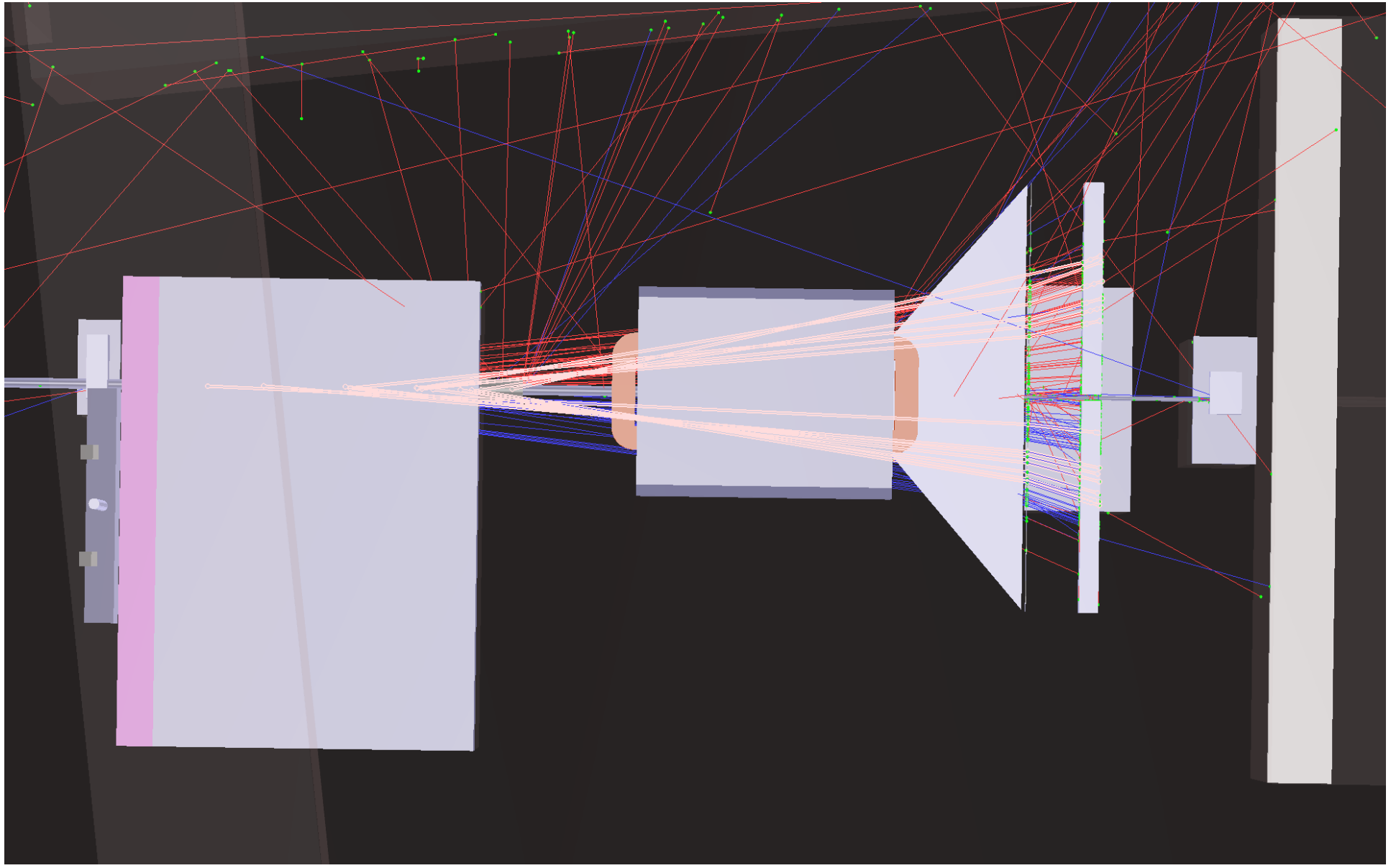
γ-laser mode, calibration with the needle in IP

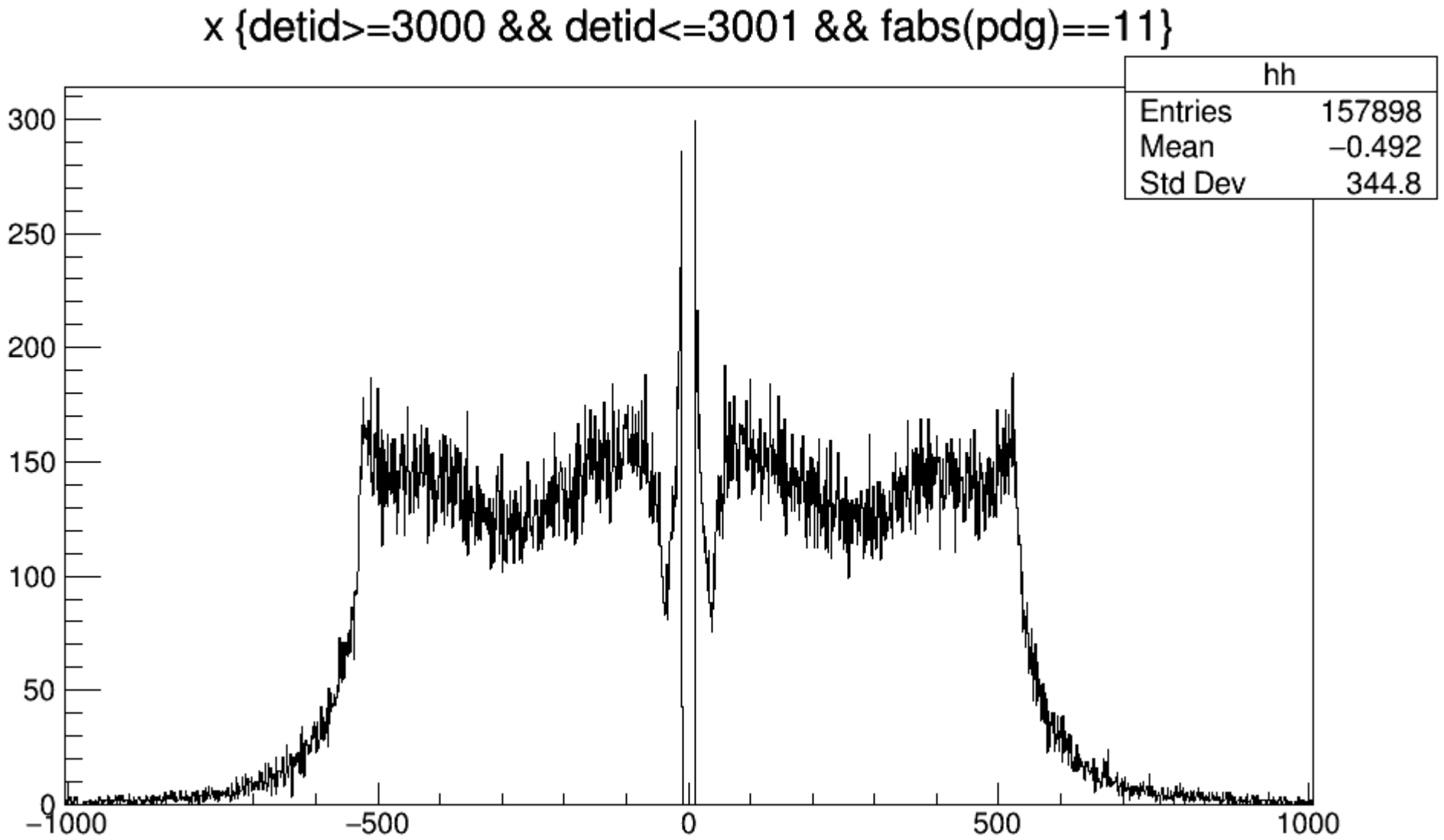
- 0.5M simulated electrons;
- Only e+ and e- are shown.



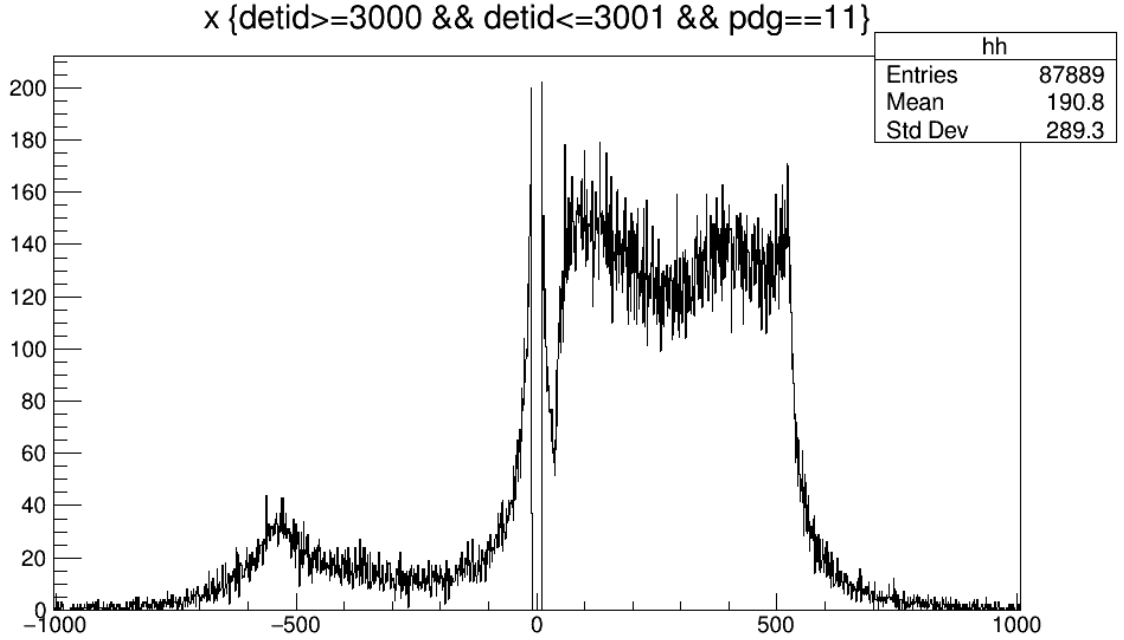
e+, e- hitting GS screens

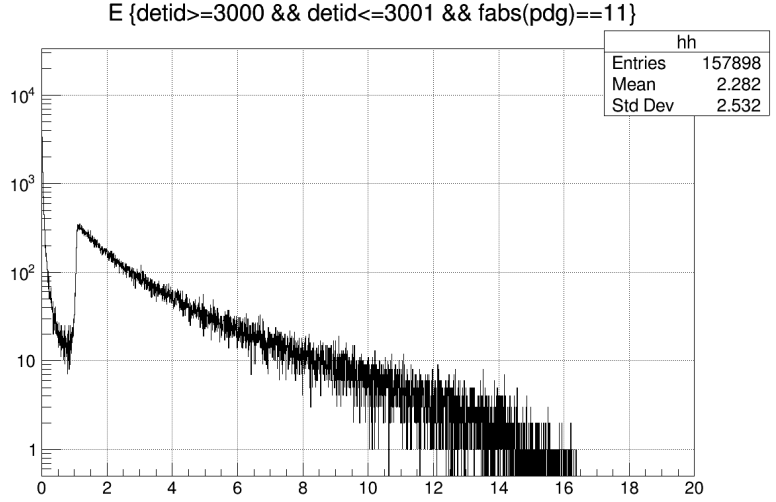


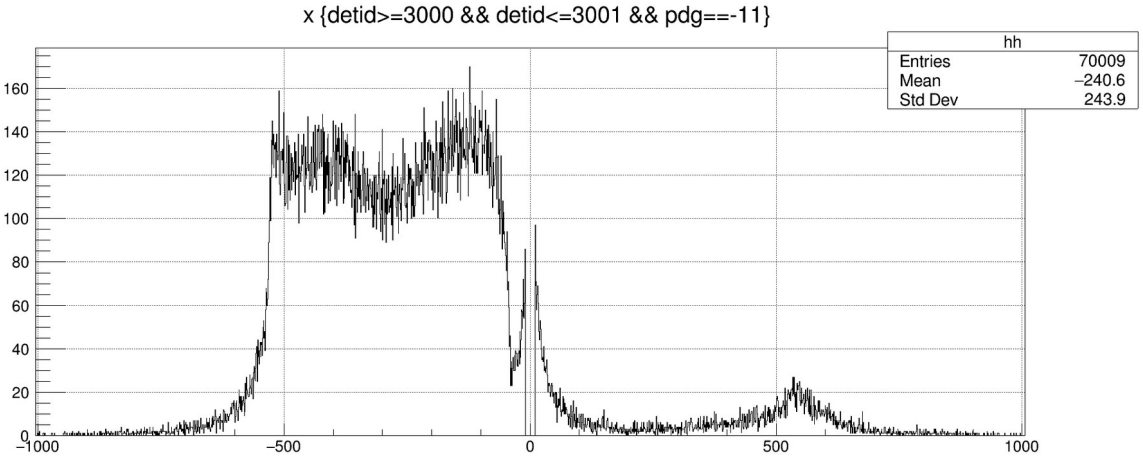
Electrons and positrons hitting the screens of gamma spectrometer



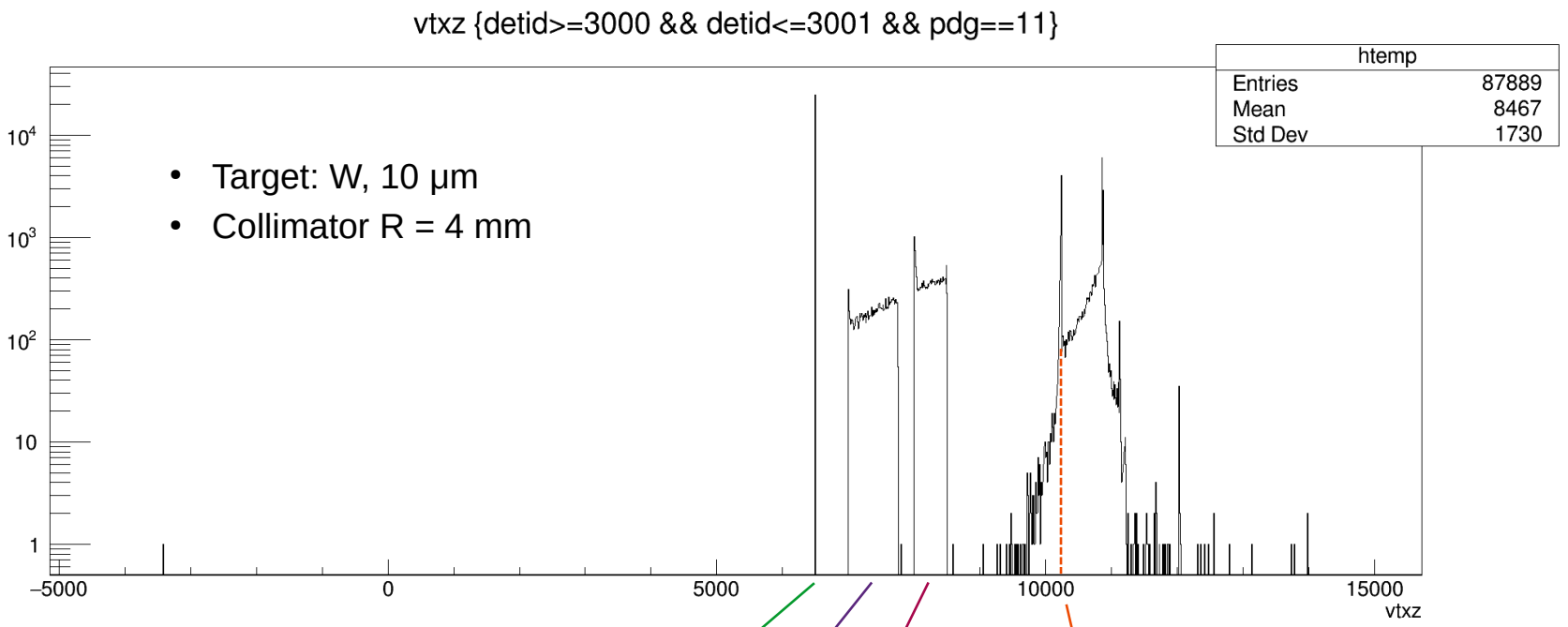
Electrons and positrons hitting the screens of gamma spectrometer

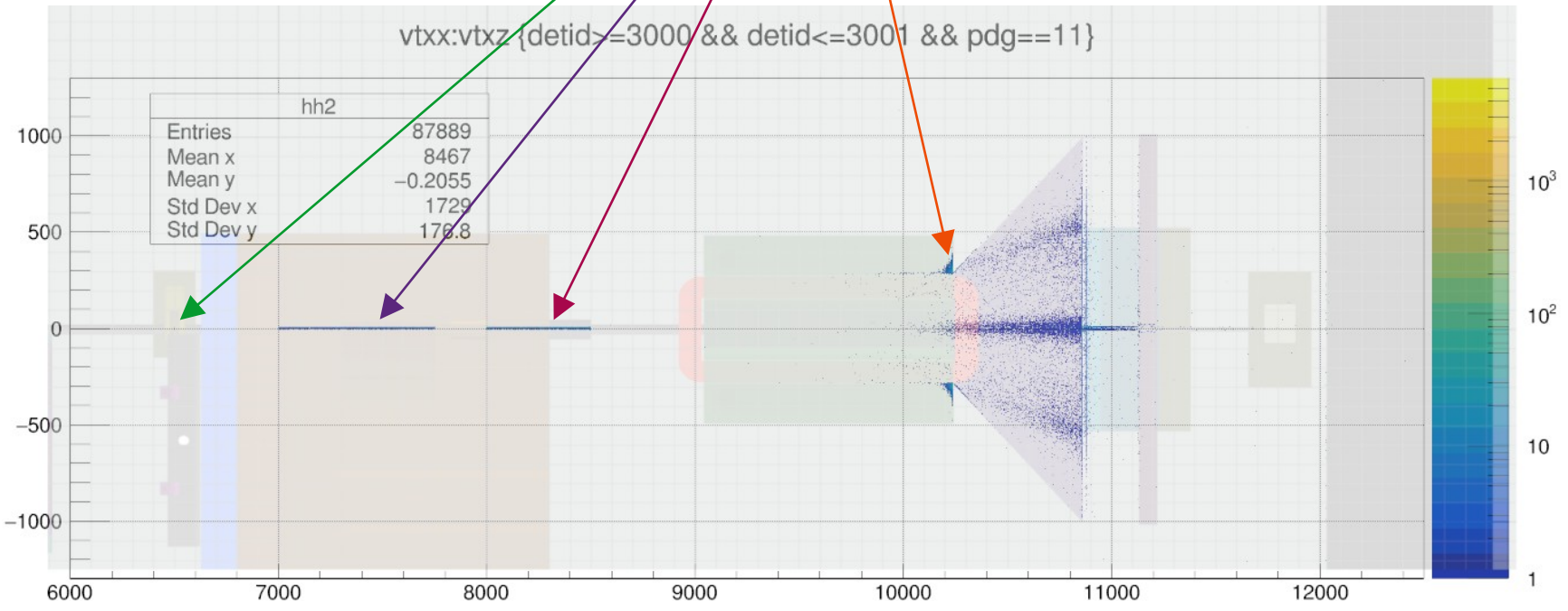






Vertices of electrons

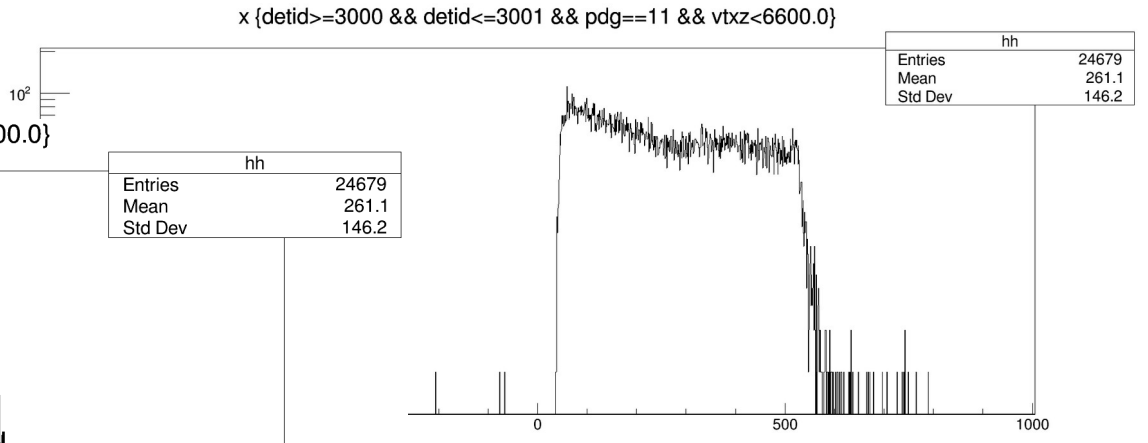


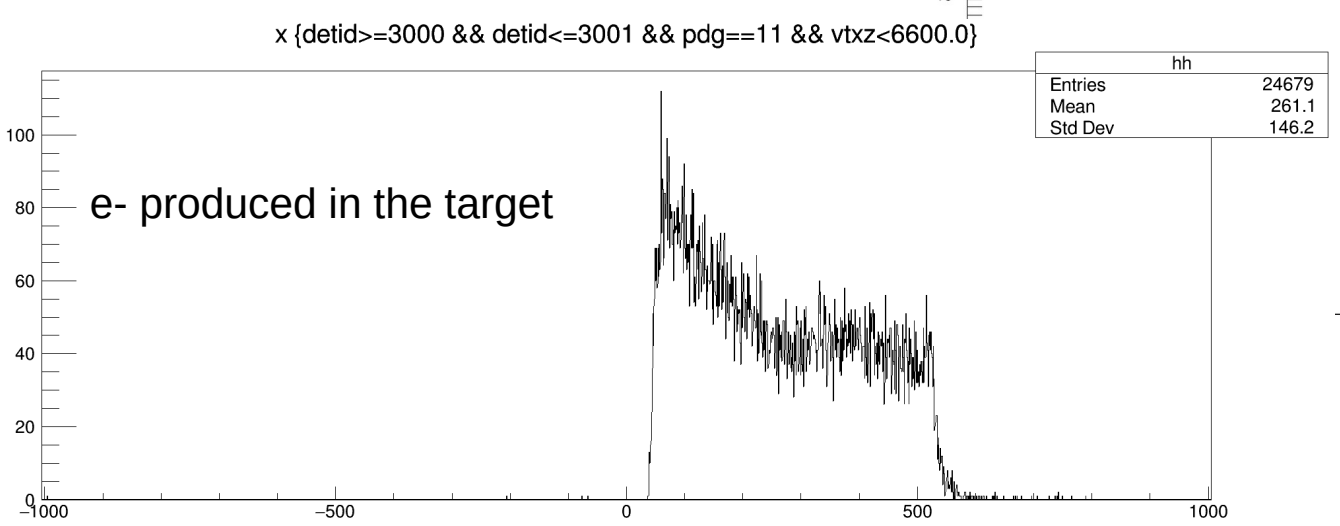


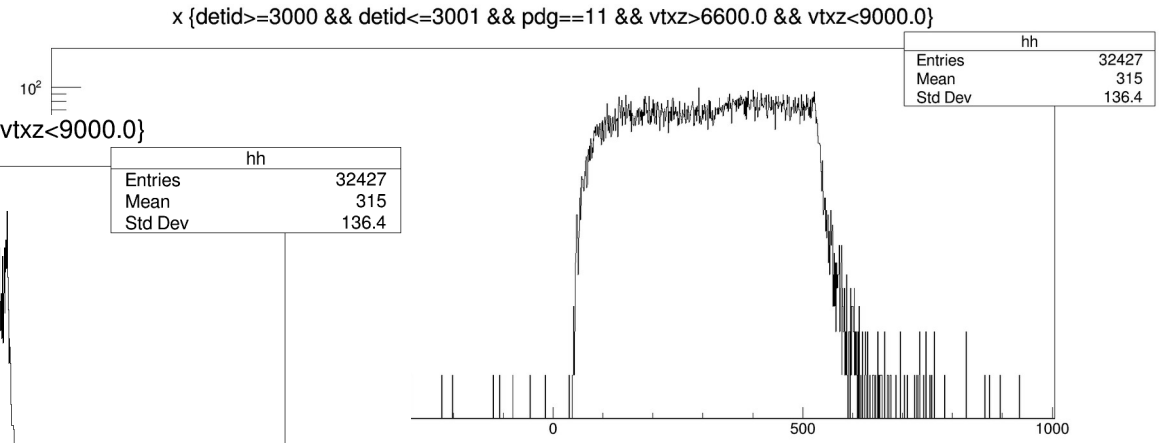
Electrons from the target and collimators

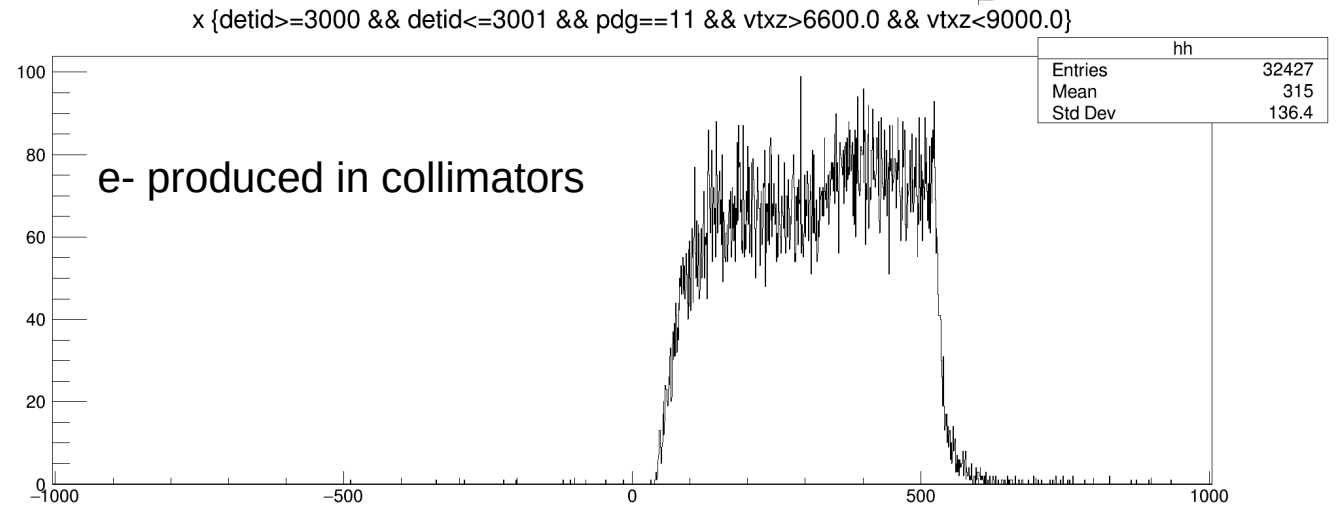
- ~43% from the target
- ~57% from the collimators
- Their spectra are different

Position in detectors

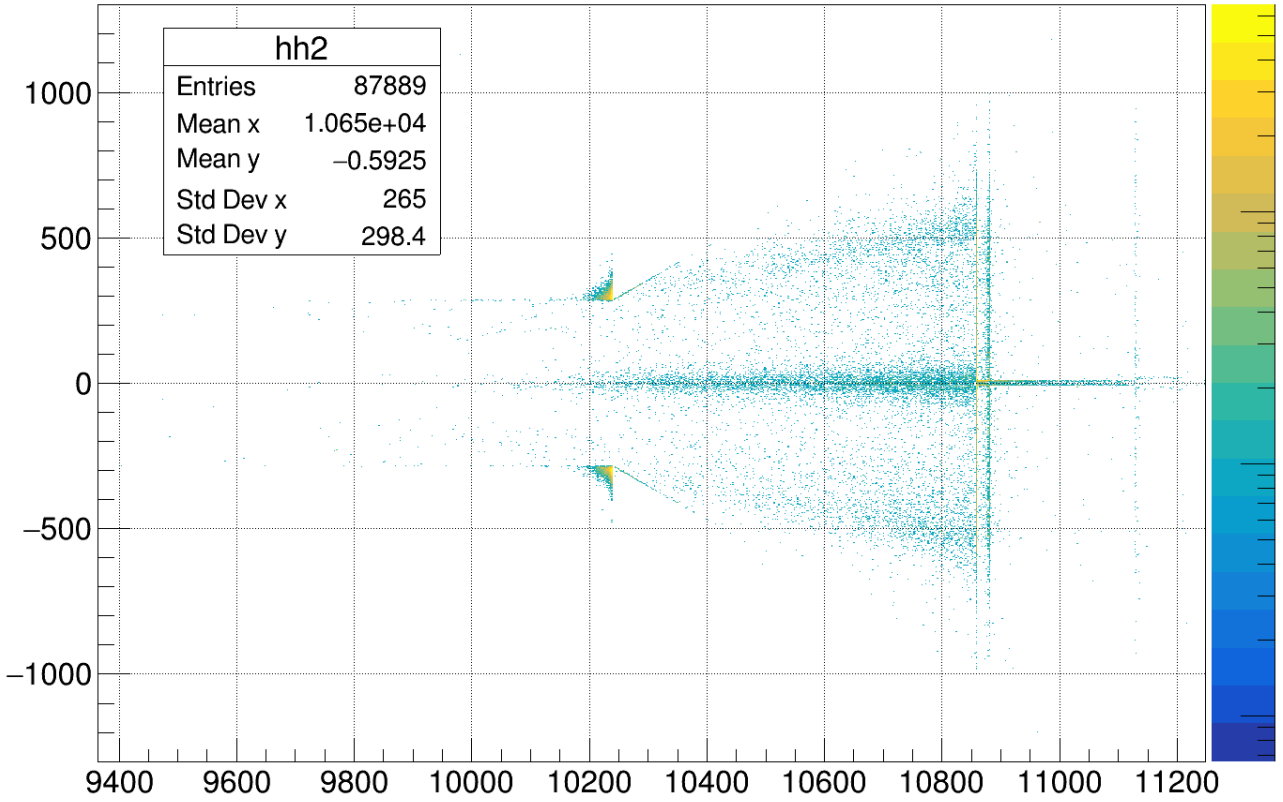




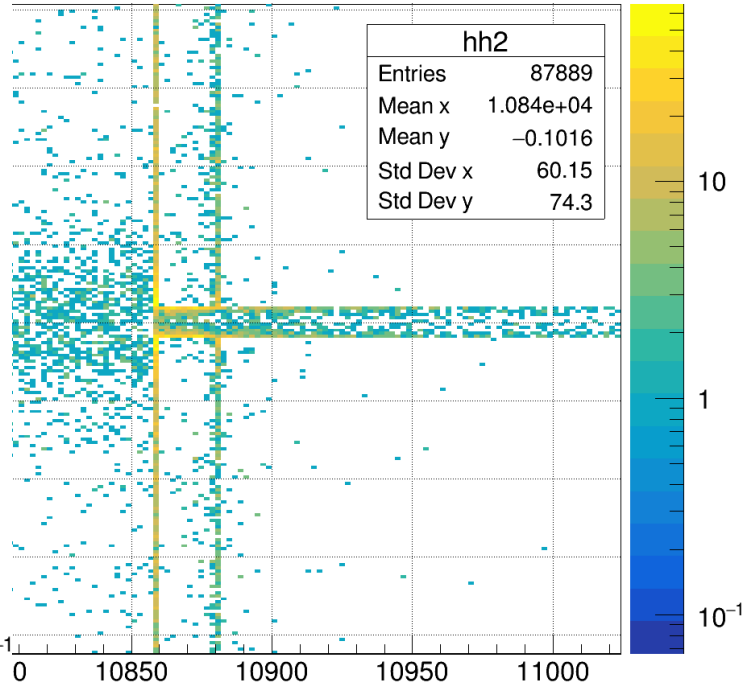




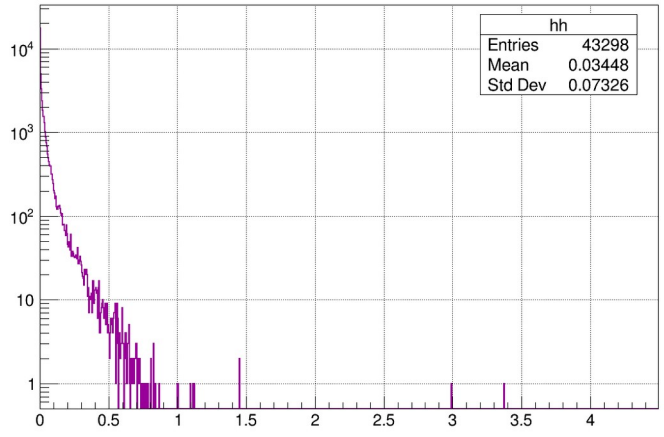
vtxx:vtxz {detid>=3000 && detid<=3001 && pdg==11}



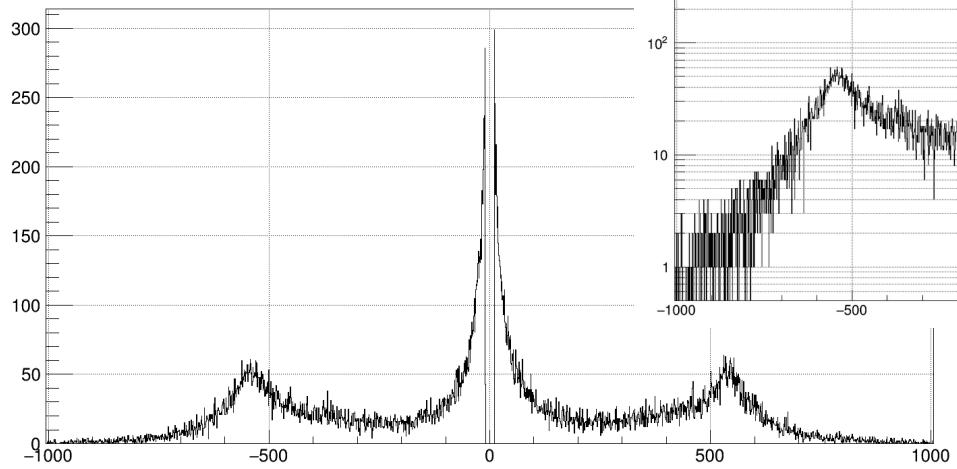
tid>=3000 && detid<=3001 && pdg==11}



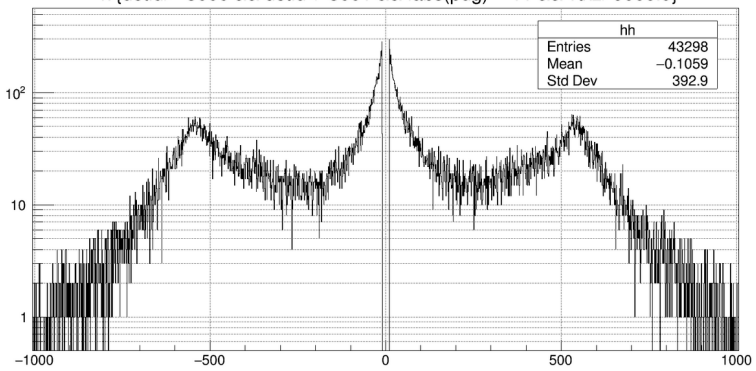
E {detid>=3000 && detid<=3001 && fabs(pdg)==11 && vtxz>9000.0}



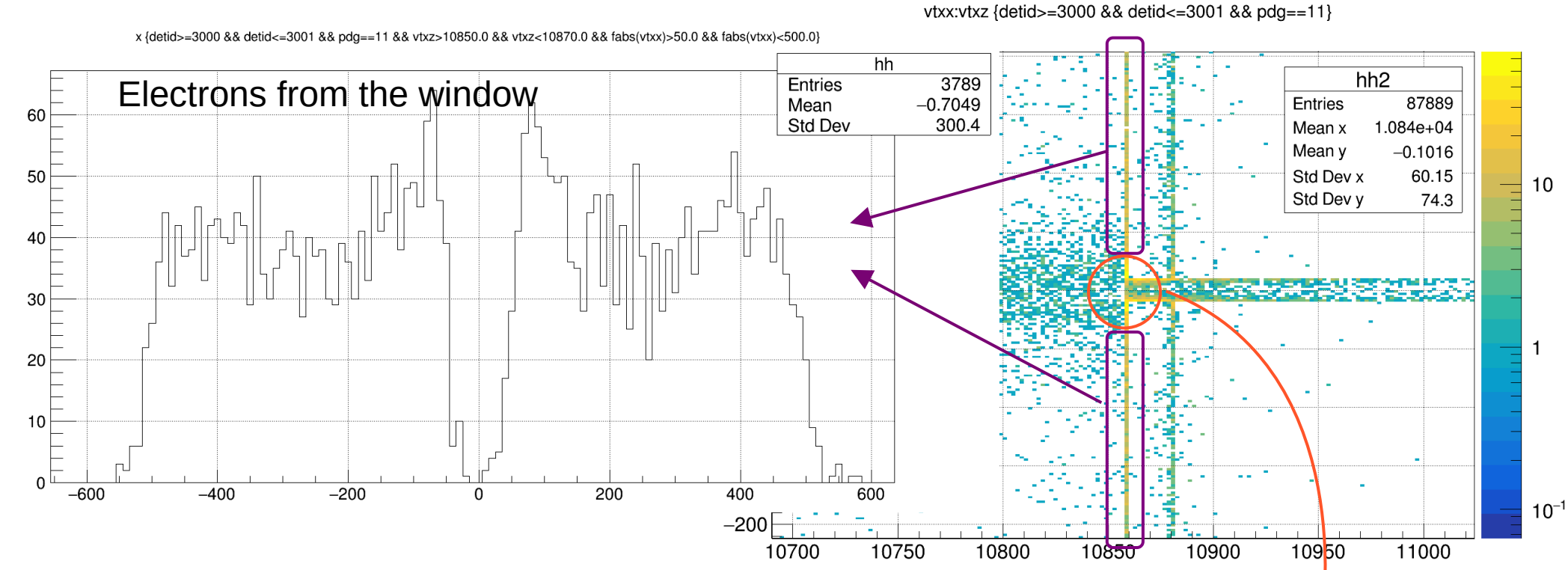
x {detid>=3000 && detid<=3001 && fabs(pdg)=

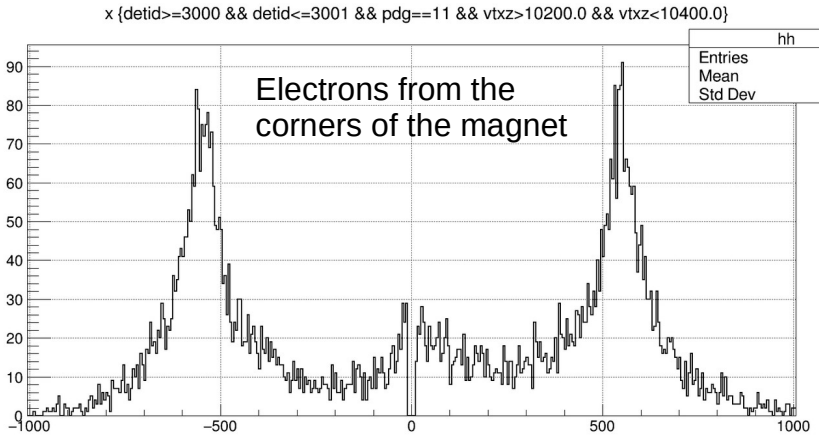


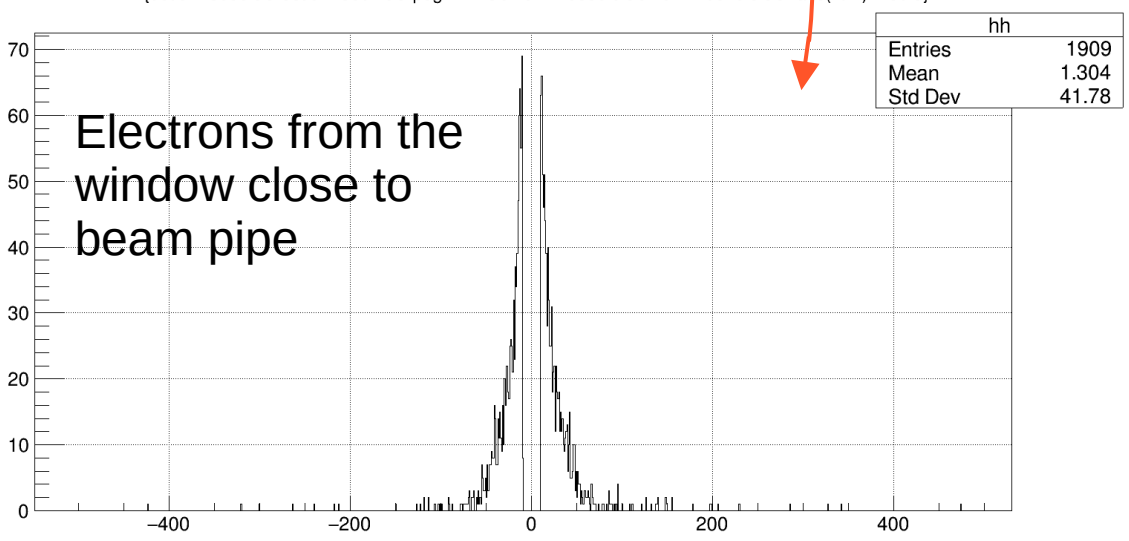
x {detid>=3000 && detid<=3001 && fabs(pdg)==11 && vtxz>9000.0}



Position of electrons generated in windows, pipe and magnet corners



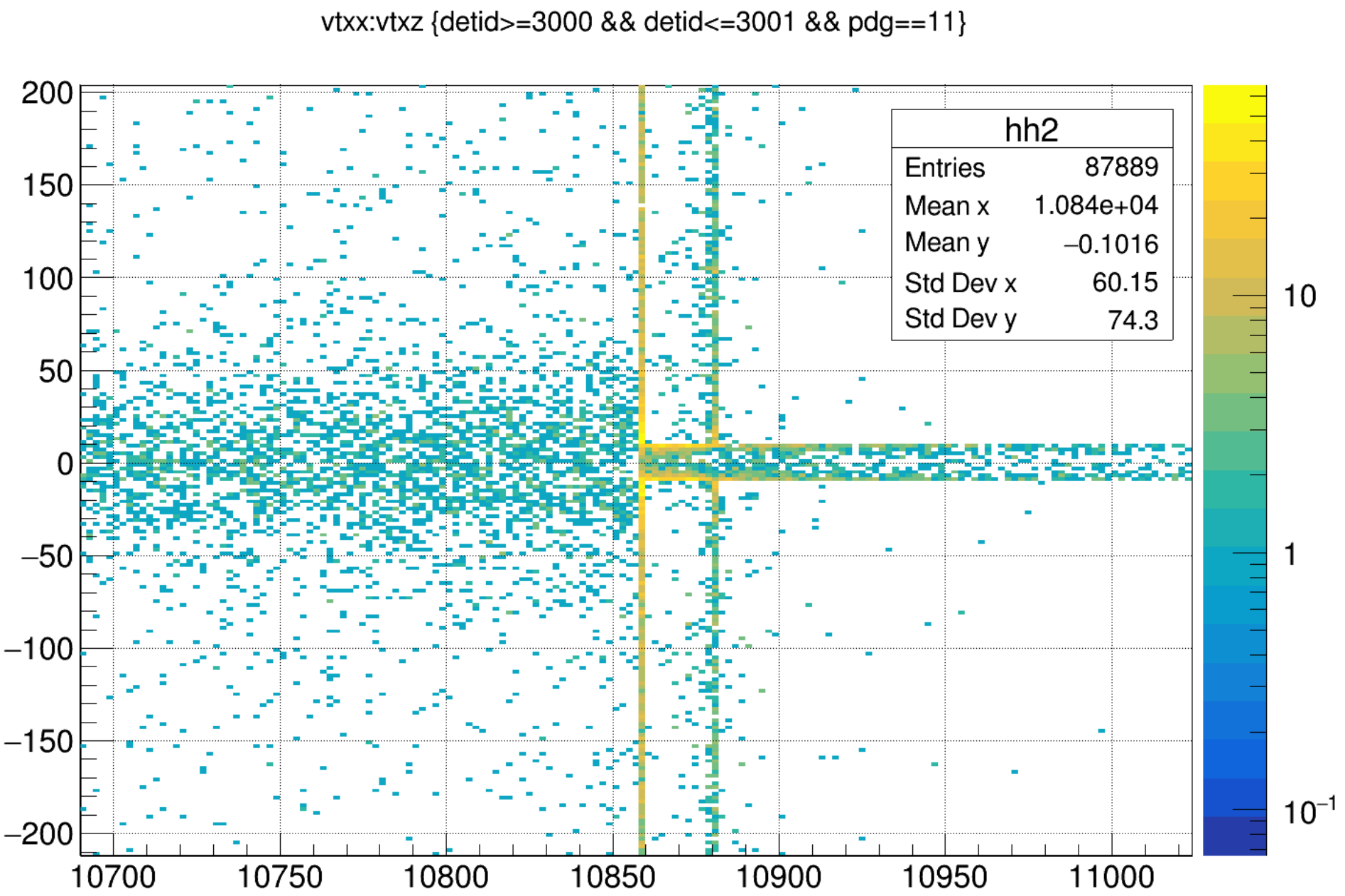


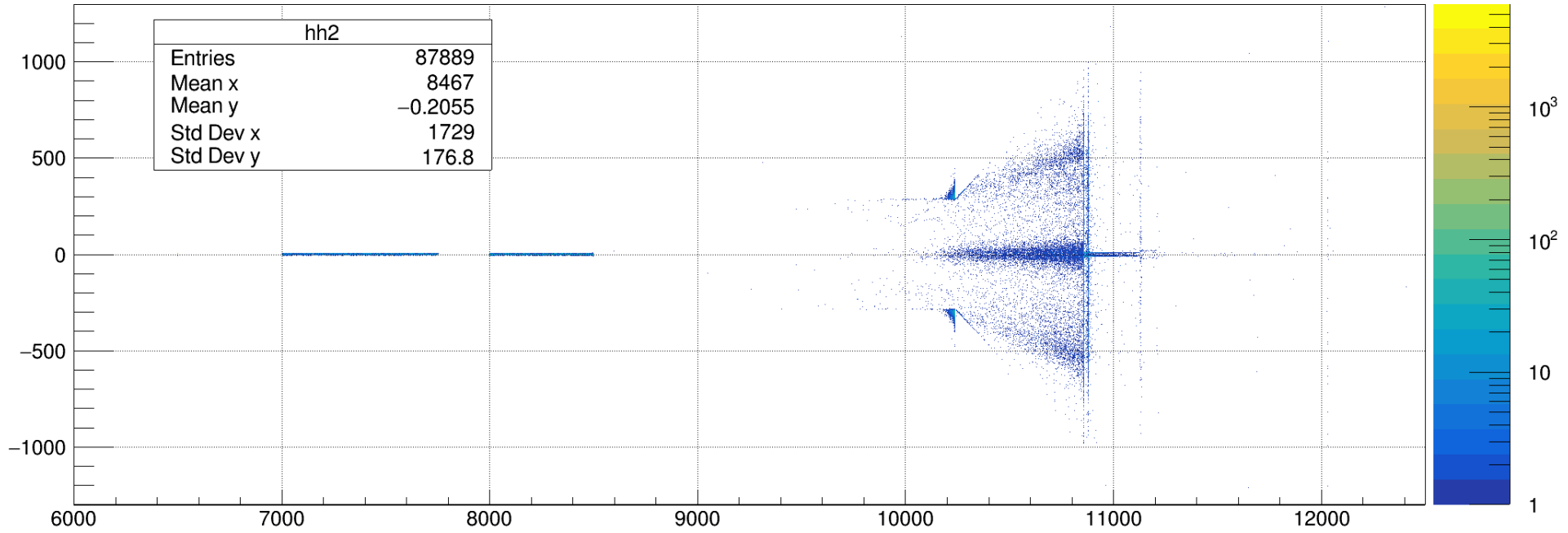


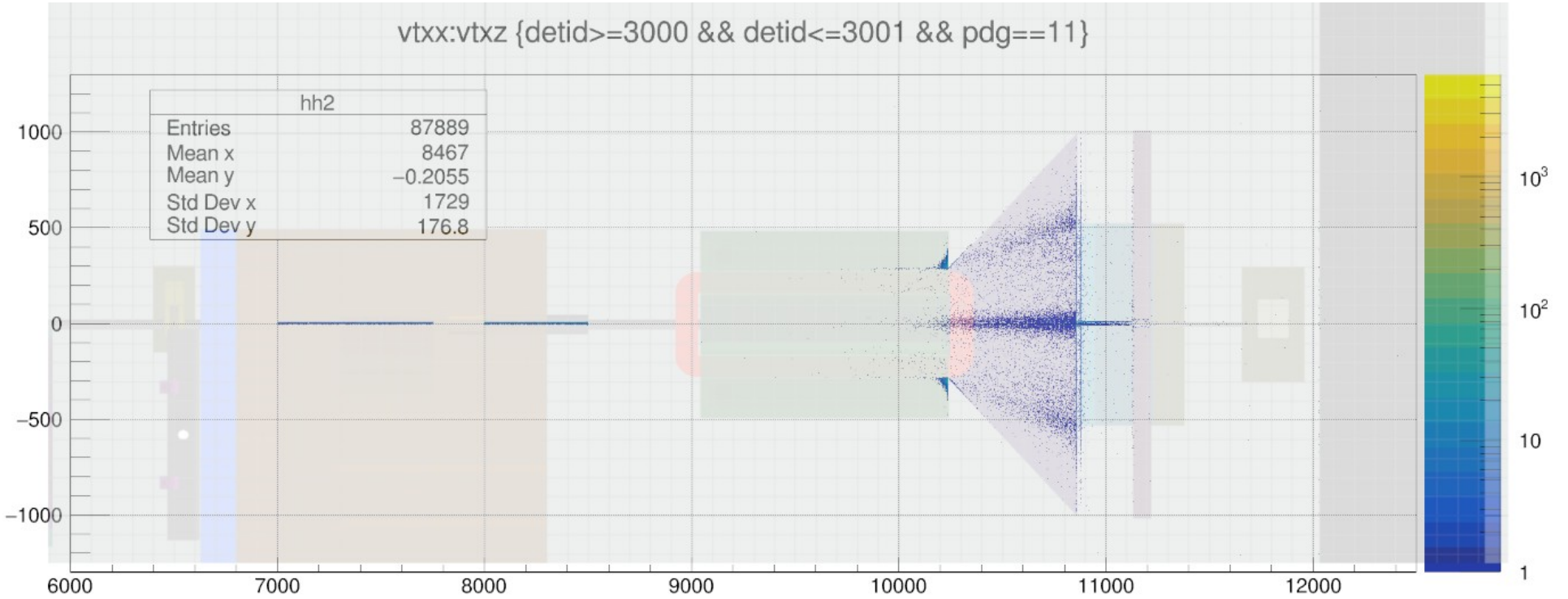
Summary

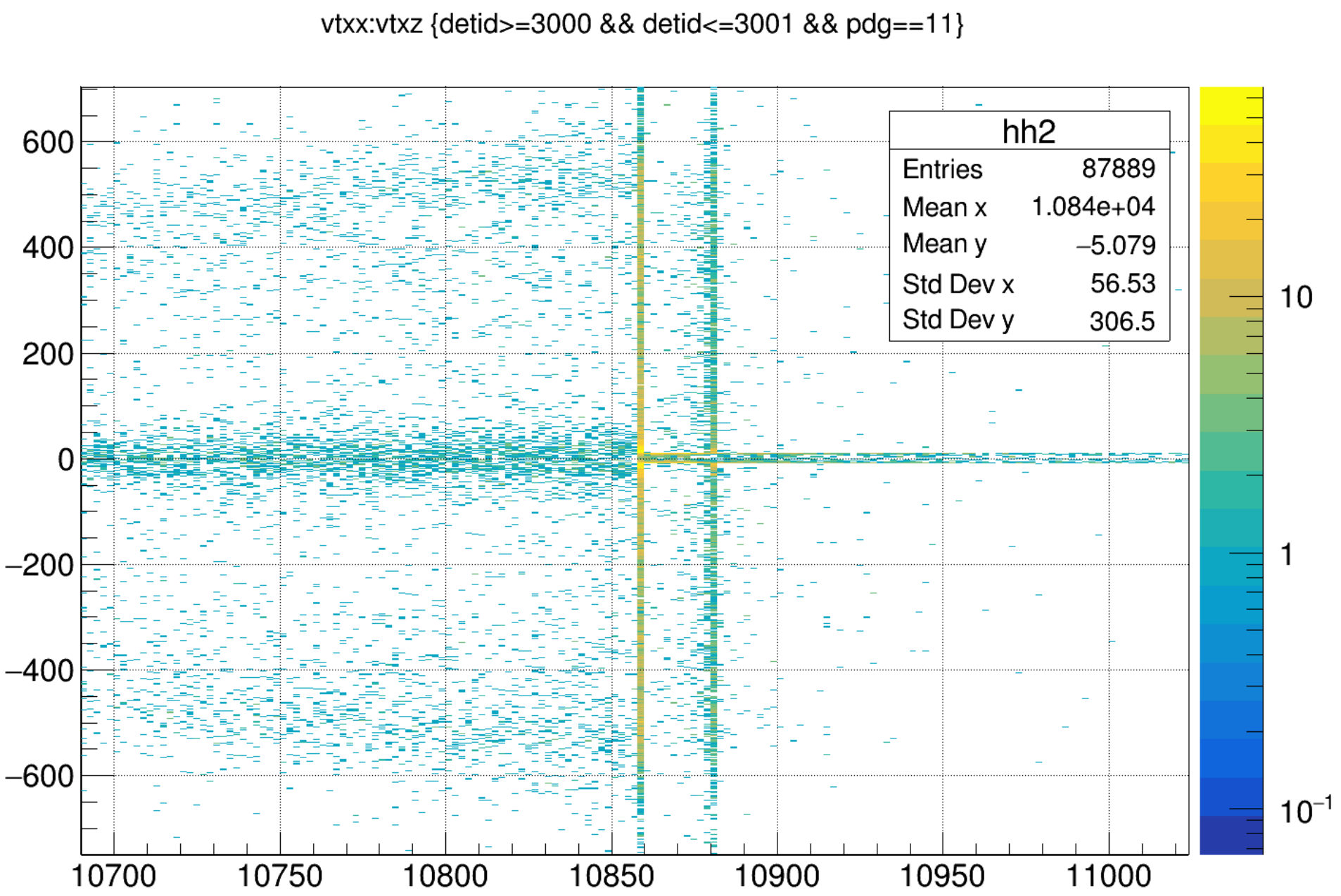
- In γ-laser mode 57% of pairs hitting gamma spectrometer screens are produced in collimators and 43 in the converter target.
- The spectra of pairs produced in the target and in collimators are different.
- There are background contributions from the magnet corners, windows and beam pipe, but their affect on measurements is probably not big.

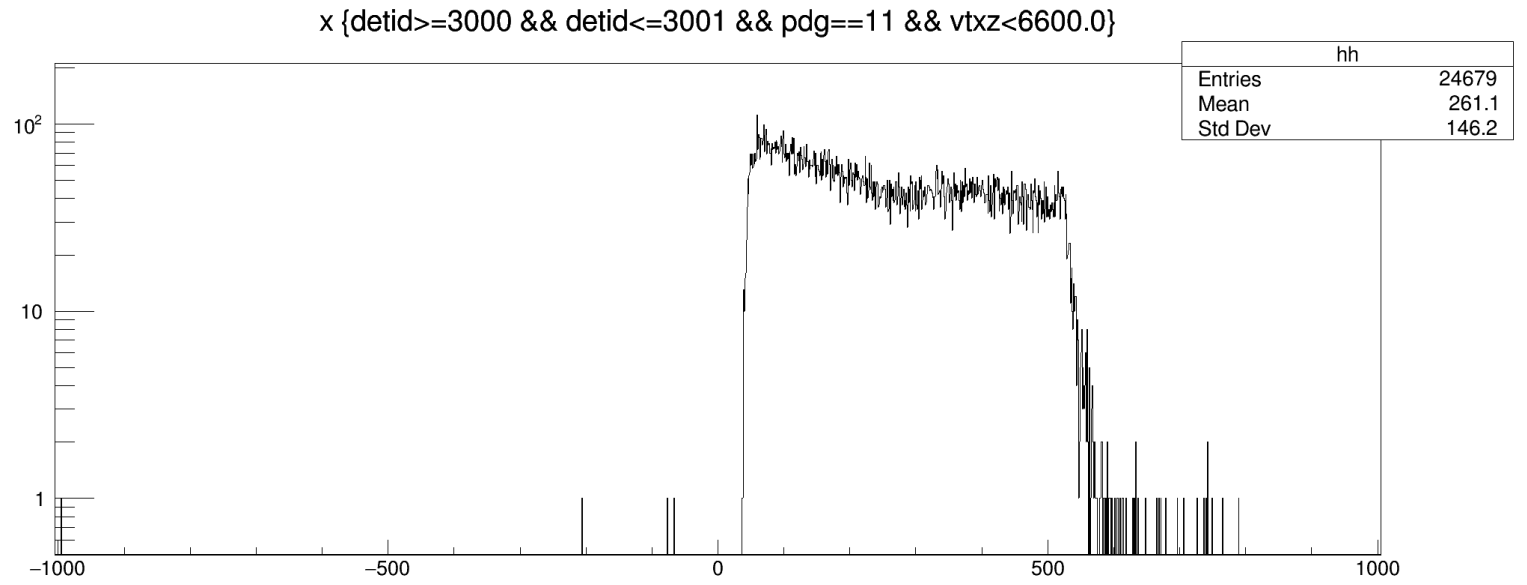
backup

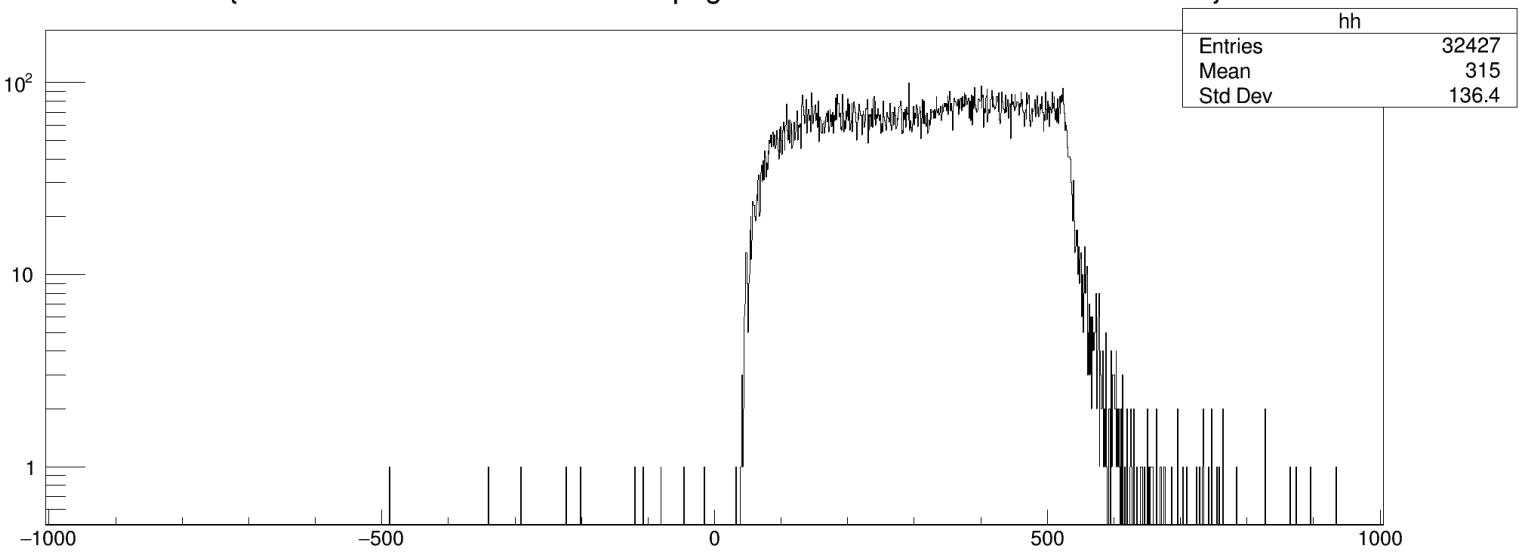

vtxx:vtxz {detid>=3000 && detid<=3001 && pdg==11}
hh2
Entries 87889
Mean x 1.084e+04
Mean y −0.1016
Std Dev x 60.15
Std Dev y 74.3
200
150
100
50
0
−50
−100
−150
−200
10700
10750
10800
10850
10900
10950
11000
10
1
10^{-1}


hh2
Entries 87889
Mean x 8467
Mean y −0.2055
Std Dev x 1729
Std Dev y 176.8
1000
500
0
−500
−1000
6000
7000
8000
9000
10000
11000
12000
10^3
10^2
10
1


vtxx:vtxz {detid>=3000 && detid<=3001 && pdg==11}
hh2
Entries 87889
Mean x 8467
Mean y −0.2055
Std Dev x 1729
Std Dev y 176.8
1000
500
0
−500
−1000
6000
7000
8000
9000
10000
11000
12000
10^3
10^2
10
1


vtxx:vtxz {detid>=3000 && detid<=3001 && pdg==11}
hh2
Entries 87889
Mean x 1.084e+04
Mean y −5.079
Std Dev x 56.53
Std Dev y 306.5
600
400
200
0
−200
−400
−600
10700
10750
10800
10850
10900
10950
11000
10
1
10^{-1}


x {detid>=3000 && detid<=3001 && pdg==11 && vtxz<6600.0}
hh
Entries 24679
Mean 261.1
Std Dev 146.2
10²
10
1
−1000
−500
0
500
1000


x {detid>=3000 && detid<=3001 && pdg==11 && vtxz>6600.0 && vtxz<9000.0}
hh
Entries 32427
Mean 315
Std Dev 136.4
10²
10
1
−1000
−500
0
500
1000