Gamma Rate & Hit Rate on DT Chamber

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Task

Calculation of Gamma Rate and Hit Rate on DT chamber:

Gamma Rate = number of photons per unit time per unit area

Hit Rate = Gamma Rate x Conversion Efficiency

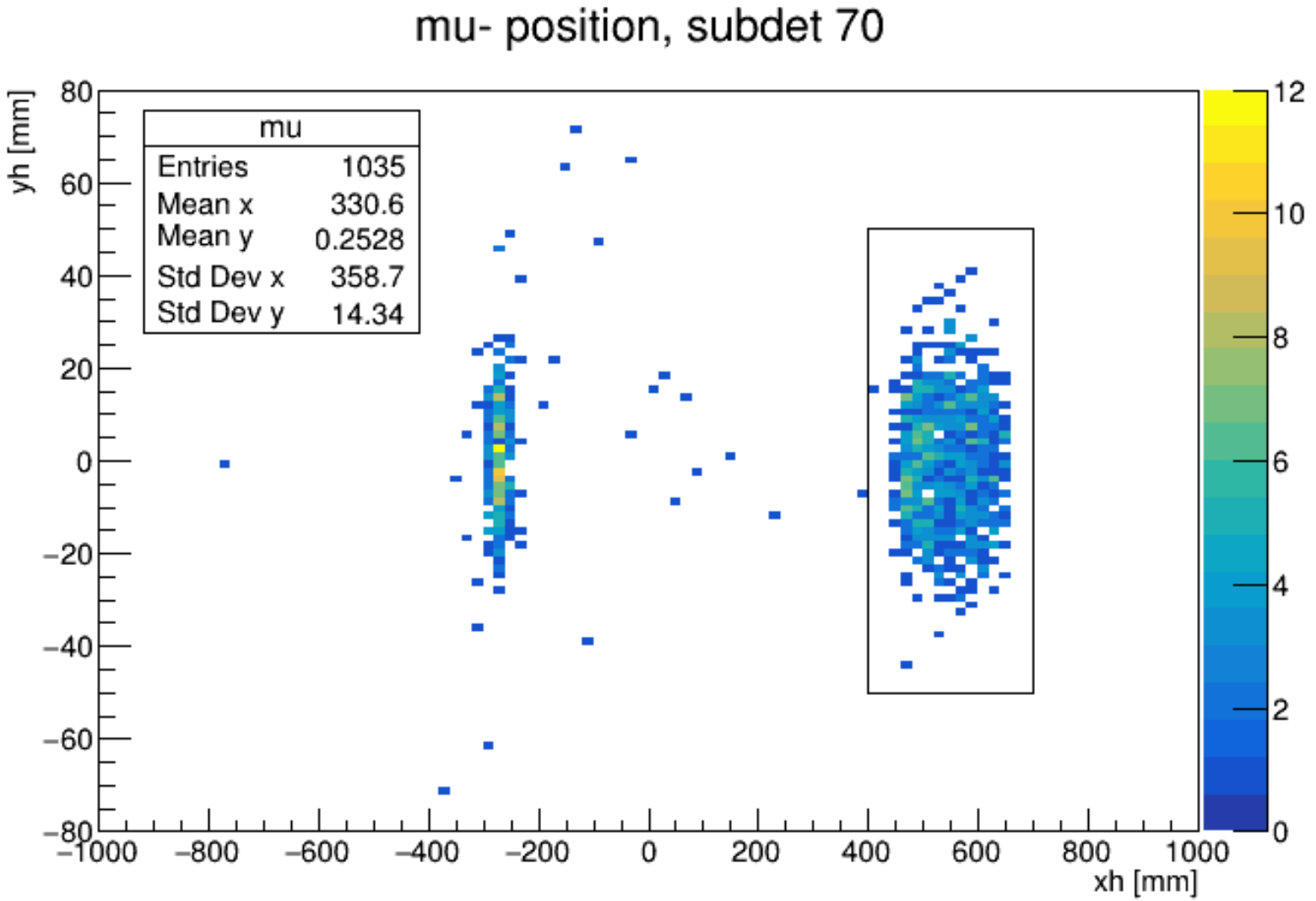
Data

Two simulations:

- 1M events with cross section of AnnihiToMuPair amplified by a factor 10^3
- 1M background events (Physic List: FTFP_BERT_EMV)

Others:

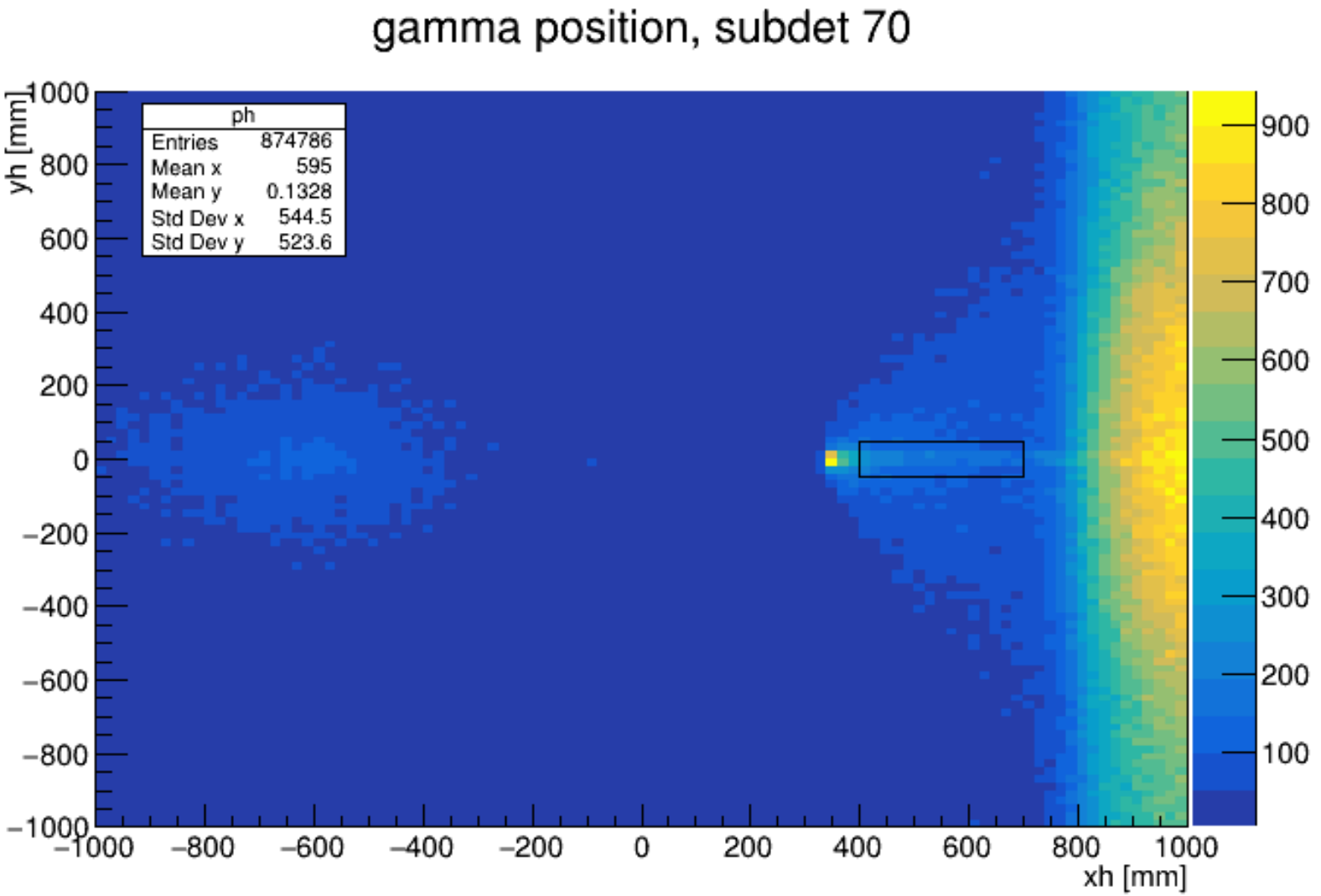
- Beam: 5 10^6 e^+/spill, 1 spill = 4.8 s
- DT Chamber dimension: 2 m x 2 m
- Conversion efficiency: 0.2% (for 662keV photons of GIF++)

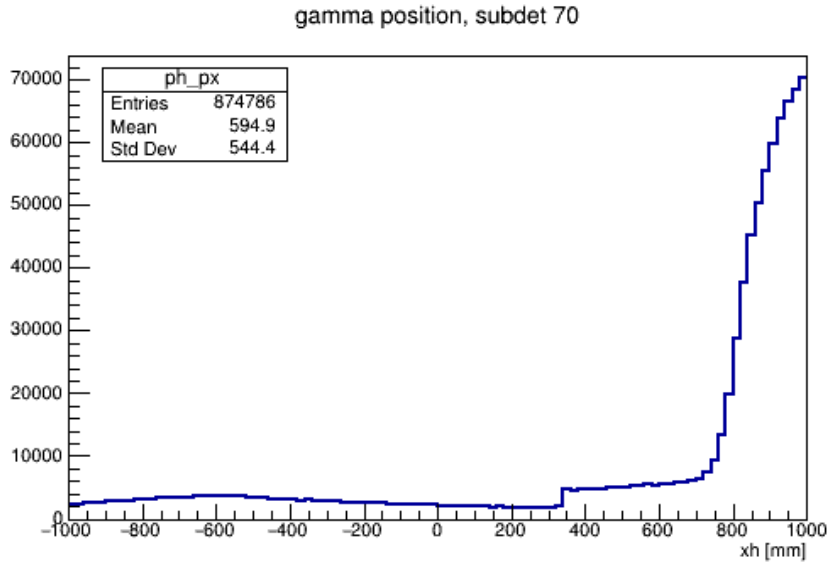


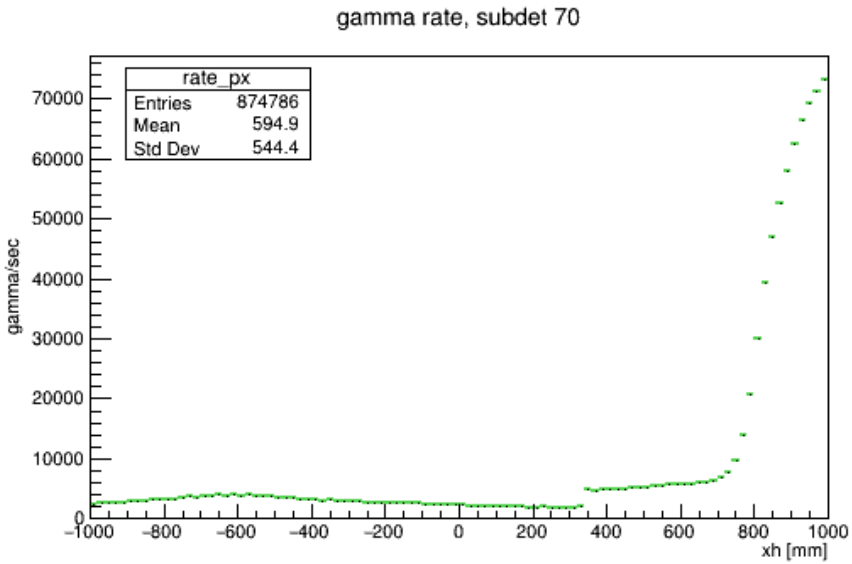
BOX:

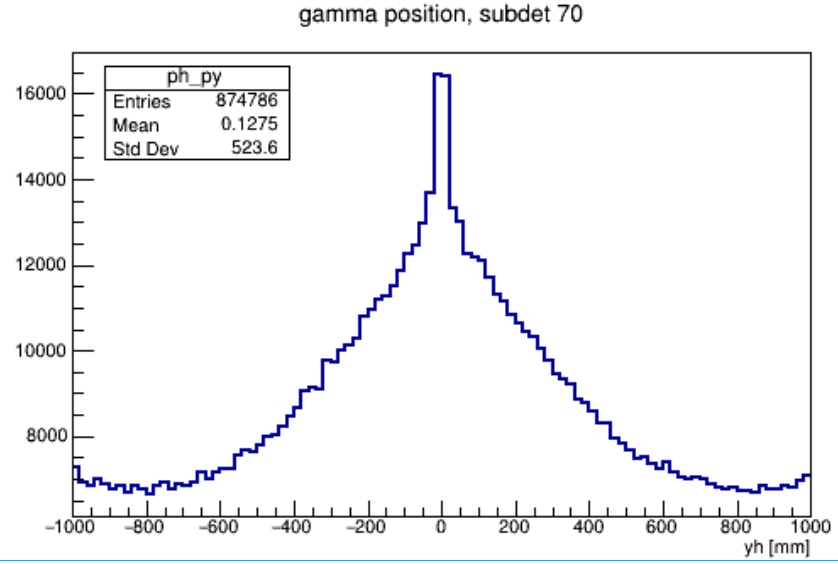
400mm < xh < 700mm

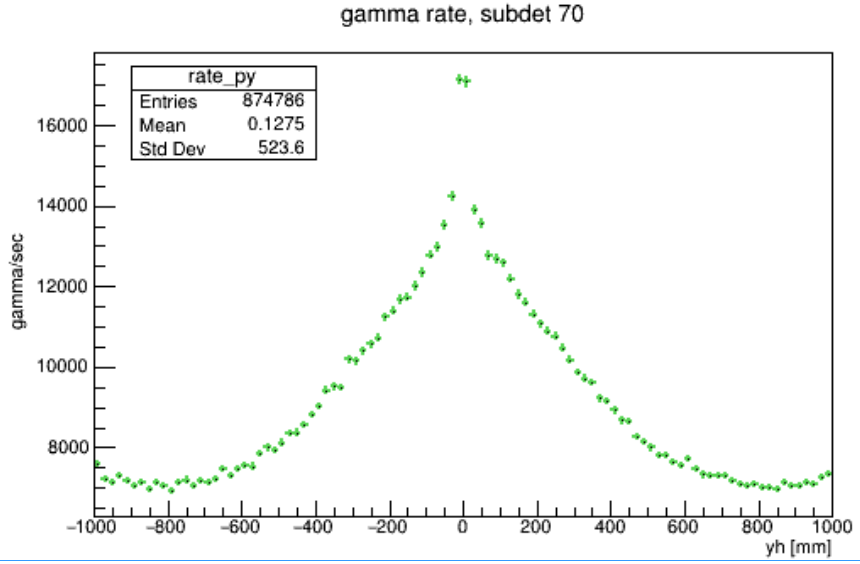
-50mm < yh < 50mm

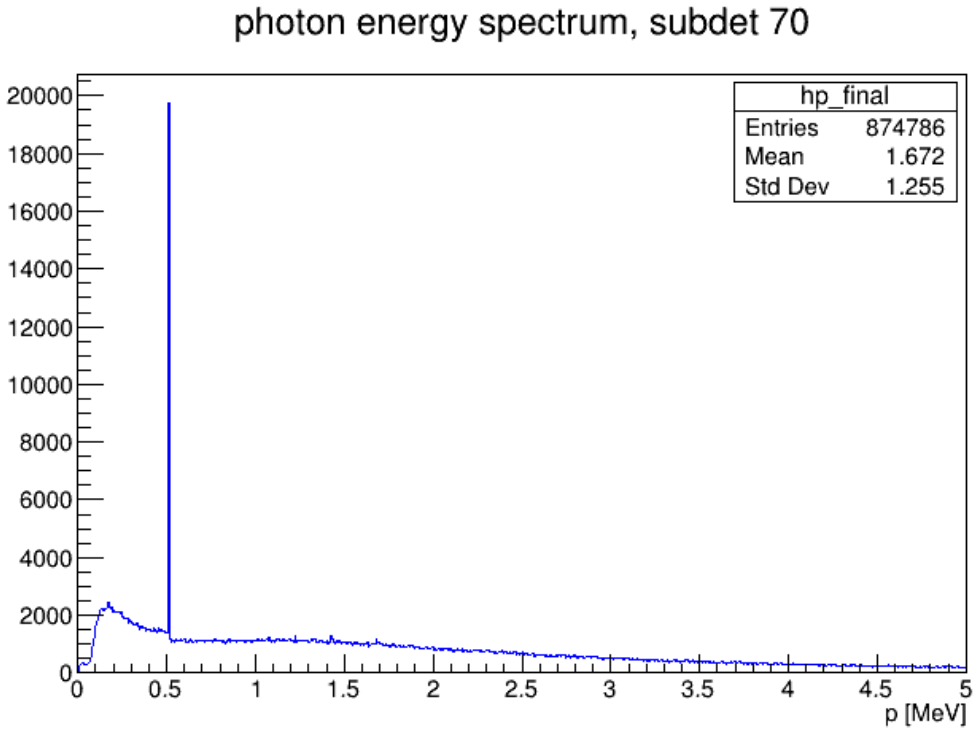

gamma position, subdet 70
ph
Entries 874786
Mean x 595
Mean y 0.1328
Std Dev x 544.5
Std Dev y 523.6
yh [mm]
xh [mm]
1000
800
600
400
200
0
−200
−400
−600
−800
−1000
900
800
700
600
500
400
300
200
100

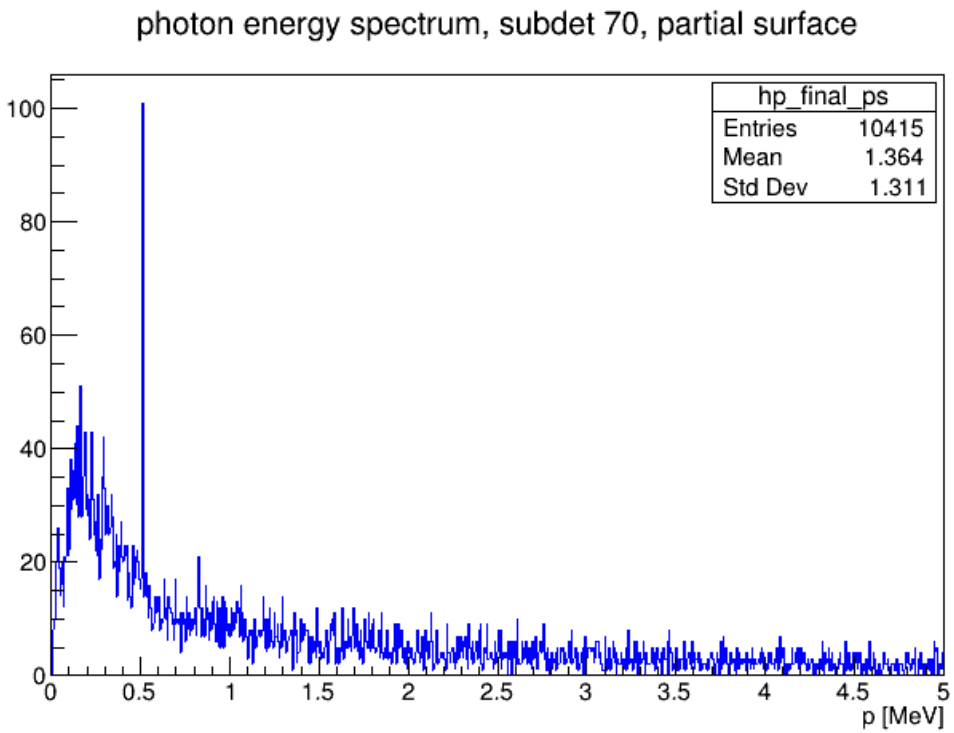

gamma position, subdet 70
ph_px
Entries 874786
Mean 594.9
Std Dev 544.4
xh [mm]


gamma rate, subdet 70
rate_px
Entries 874786
Mean 594.9
Std Dev 544.4
gamma/sec
xh [mm]


gamma position, subdet 70
ph_py
Entries 874786
Mean 0.1275
Std Dev 523.6
yh [mm]


gamma rate, subdet 70
rate_py
Entries 874786
Mean 0.1275
Std Dev 523.6
gamma/sec
yh [mm]


photon energy spectrum, subdet 70
hp_final
Entries 874786
Mean 1.672
Std Dev 1.255
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
p [MeV]


photon energy spectrum, subdet 70, partial surface
hp_final_ps
Entries 10415
Mean 1.364
Std Dev 1.311
100
80
60
40
20
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
p [MeV]

Results

Total Surface

Gamma rate = 22.78 Hz/cm^2
Hit rate = 0.046 Hz/cm^2

Partial Surface

Gamma rate = 36.16 Hz/cm^2
Hit rate = 0.072 Hz/cm^2

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GIF++ (without filters)

Gamma rate = 3 10^6 Hz/cm^2
Hit rate = 6000 Hz/cm^2

GIF++ (with filter F100)

Hit rate = 60 Hz/cm^2