Neutron Simulation with WCSim (2) (adding trigger and dark noise, checking trigger efficiency and avg. PMT hits)

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Adding Trigger + Dark Noise

~89% effective pc, 0.1 Gd, 5 MeV neutrons

Trigger Settings

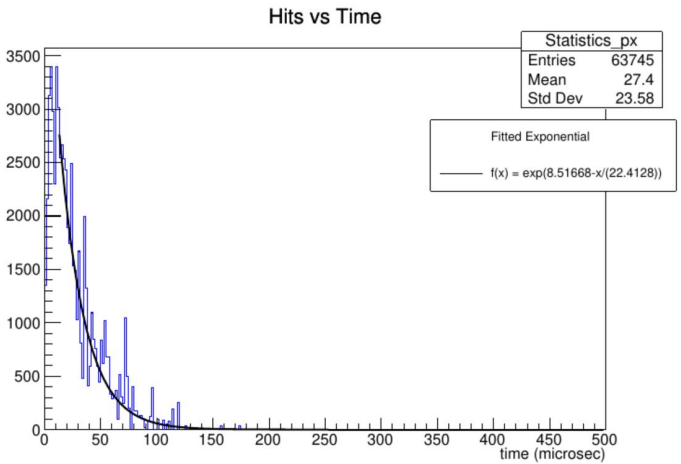
- 25 digitised hits threshold
- 15 ns trigger window
- -5 ns event pre-trigger window
- 200 ns event post-trigger window (a little long just for now)

Case 2

With constant 300 Hz dark noise from t=0 to t=200 microseconds, 1,000 generated neutrons

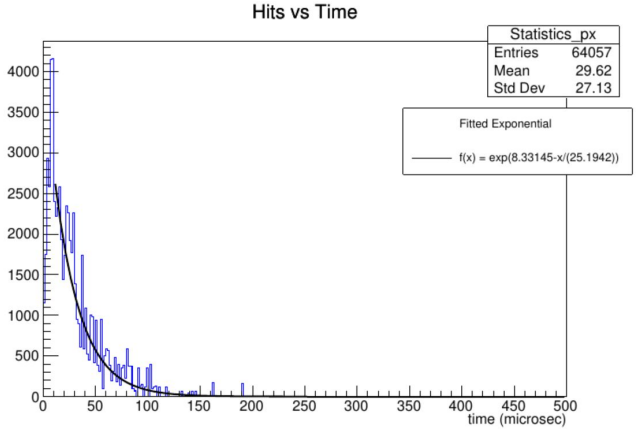
Number of Triggers: 665

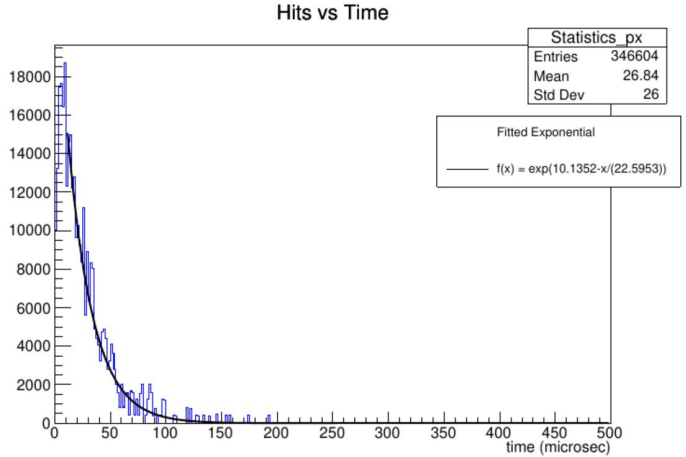
Average number of PMTs in detector active in a 15ns window with a dark noise rate of 0.3kHz is 0.029592 (6576 total PMTs)



Case 1

without dark noise, 1,000 generated neutrons
Number of Triggers: 645





Case 3

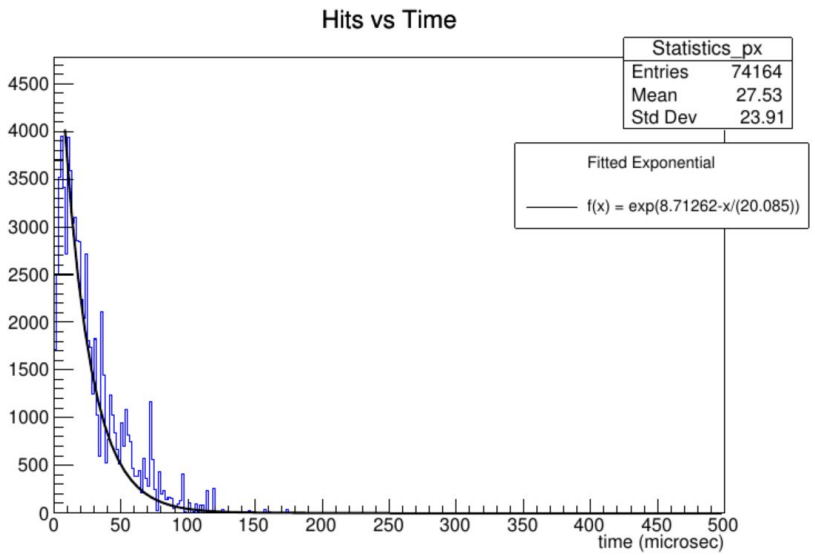
With constant 300,000 Hz dark noise from t=0 to t=200 microseconds, 1,000 generated neutrons

Number of Triggers: 16498

Average number of PMTs in detector active in a 15ns window with a dark noise rate of 300kHz is 29.592 (6576 total PMTs)

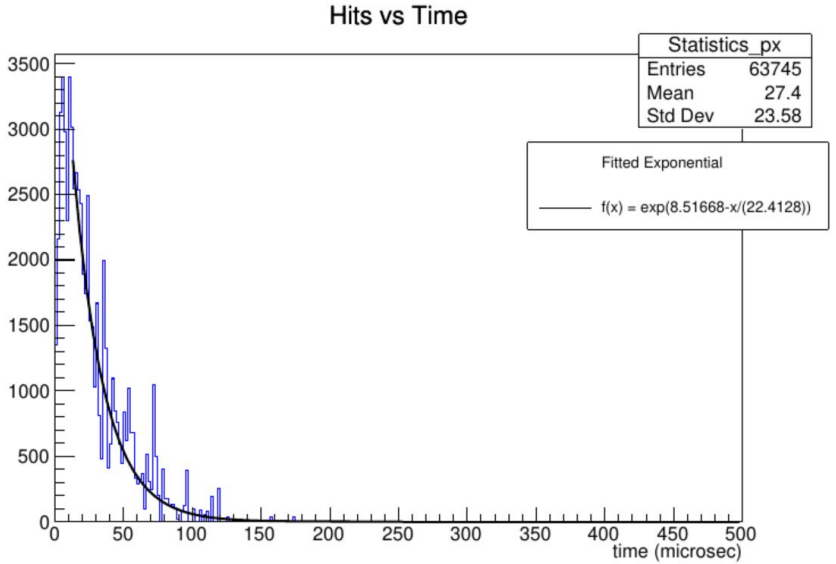
Comparing the New Trigger to the “NoTrigger” Mode

(300 Hz dark noise with NoTrigger mode, 1,000 5 MeV neutrons)



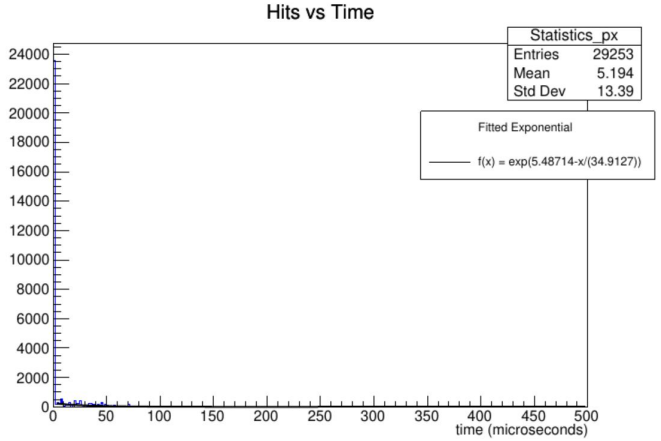
(reminder that NoTrigger mode just acts as one big long trigger taking everything)

(300 Hz from last page)



Generating Two Initial Events (5 MeV Neutron + Gamma) (1,000 instances)

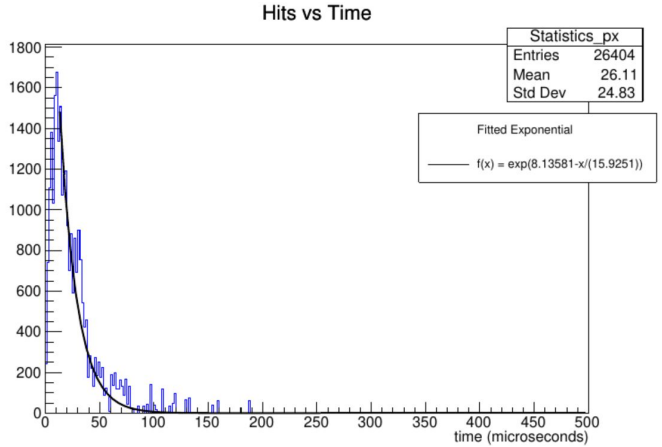
Used 40% pc. Neutrons and gammas uncorrelated besides both being generated at the same time and at the detector center (can generally see 2 separate triggers with timing of what we would expect)



First triggers (for either case of 1 trigger or 2 triggers), Should be the gamma

Trigger Settings

- 25 digitised hits threshold
- 15 ns trigger window
- 0 ns event pre-trigger window
- 200 ns event post-trigger window
- MultiDigitsPerTrigger == false *(saves only earliest hit on a PMT in the trigger window)*
- Constant dark noise of 300 Hz from t=0 to t=200 microseconds



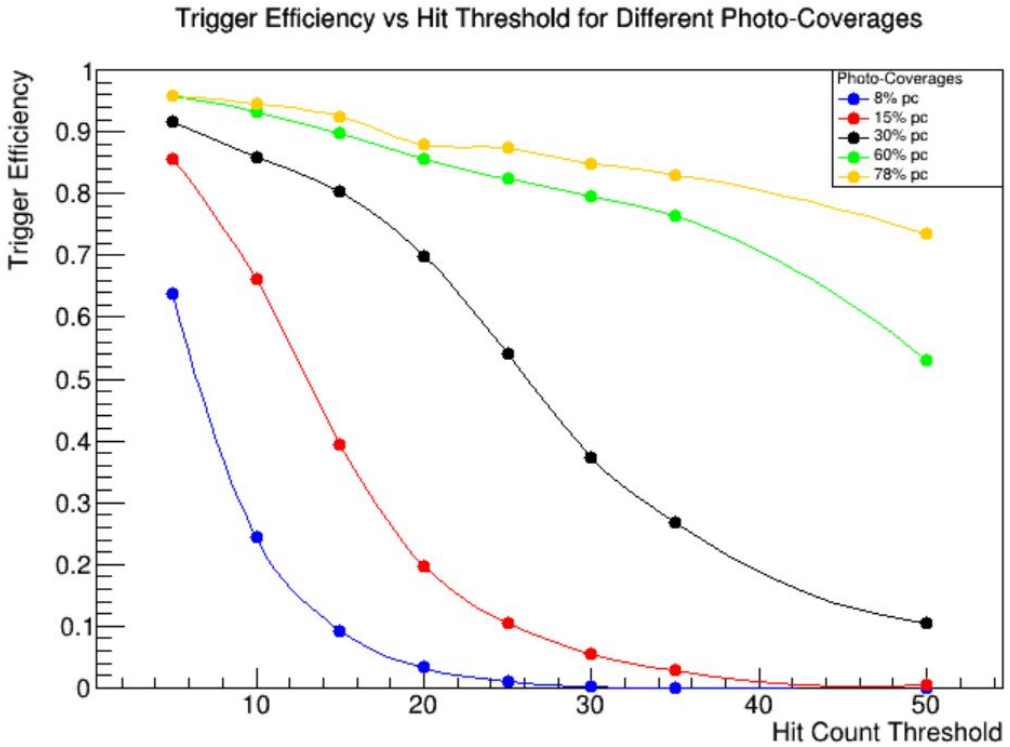
Second triggers (of cases with 2 triggers), Should be the neutron

Plotting Trigger Efficiency of 5 MeV Gamma with Neutron

Trigger efficiency defined as (number of triggers / number of events generated) (2,000 events generated for each hit threshold, 1,000 photons and 1,000 neutrons)

Trigger Settings

- 15 ns trigger window
- -5 ns event pre-trigger window
- 200 ns event post-trigger window
- MultiDigitsPerTrigger == false *(saves only earliest hit on a PMT in the trigger window)*
- Constant dark noise of 300 Hz from t=0 to t=200 microseconds



Now doing the same and checking trigger efficiency for other cases

Other Cases (Energies of 2, 4, 6 MeV each, 1,000 generated particles for each)

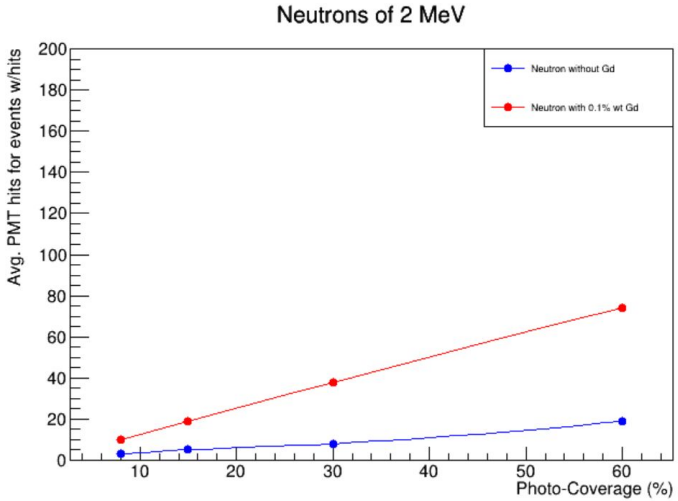
- 1 Neutron (without Gd)
- 1 Neutron (with Gd)
- 1 Gamma
- 1 Electron

Trigger Settings (same for all slides below)

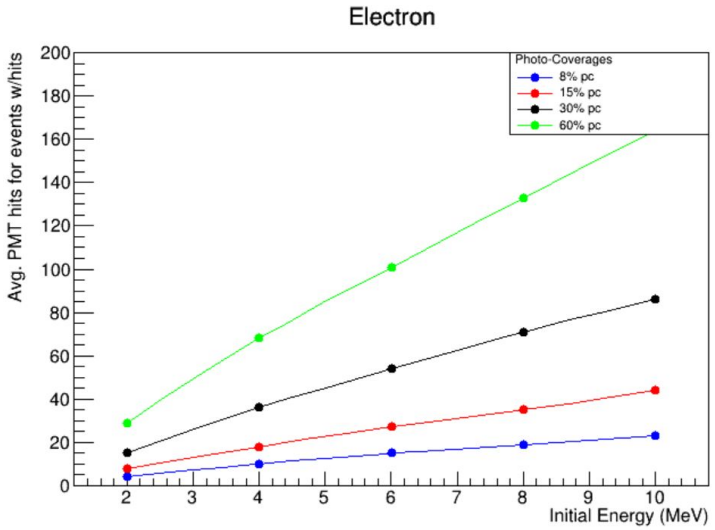
- 15 ns trigger window
- -5 ns event pre-trigger window
- 200 ns event post-trigger window
- MultiDigitsPerTrigger == false *(saves only earliest hit on a PMT in the trigger window)*
- Constant dark noise of 300 Hz from t=0 to t=200 microseconds
- Particles generated uniformly everywhere in the tank

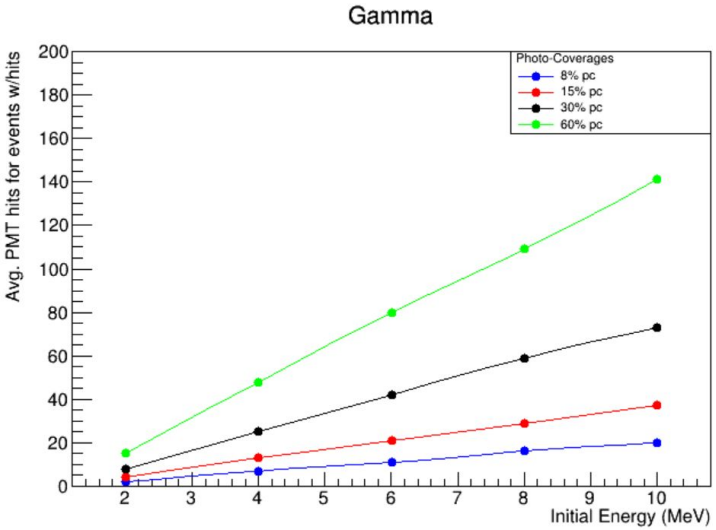
Average PMT Hit Counts

(no dark noise, generated uniformly in detector, 1,000 events each, did not include events with no hits in the average calculation)



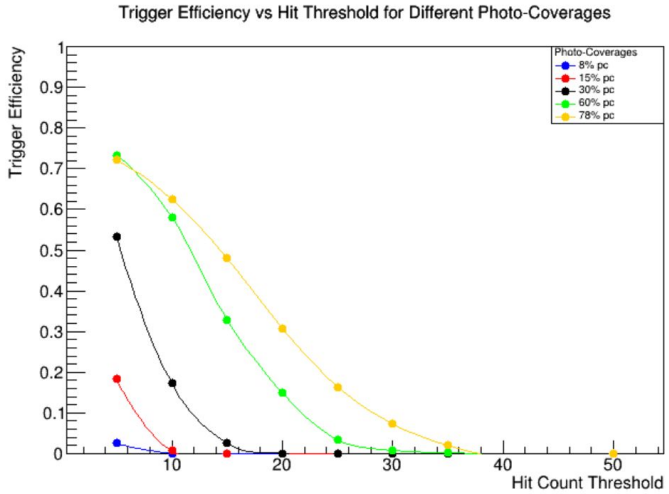
(different energies for neutrons should not change anything so just one energy is graphed here)

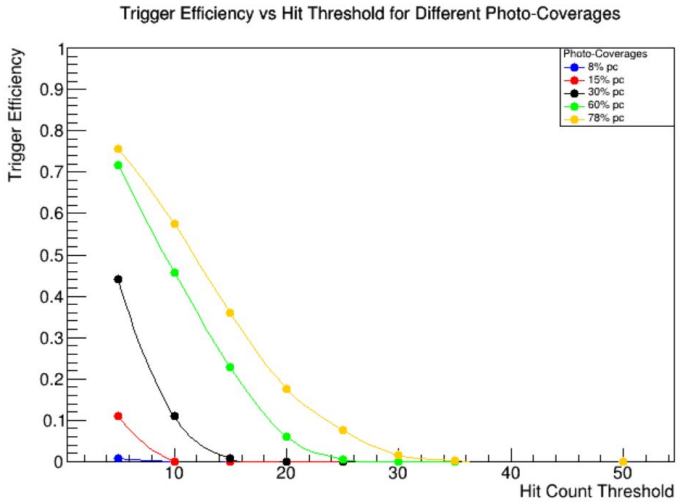




2 MeV

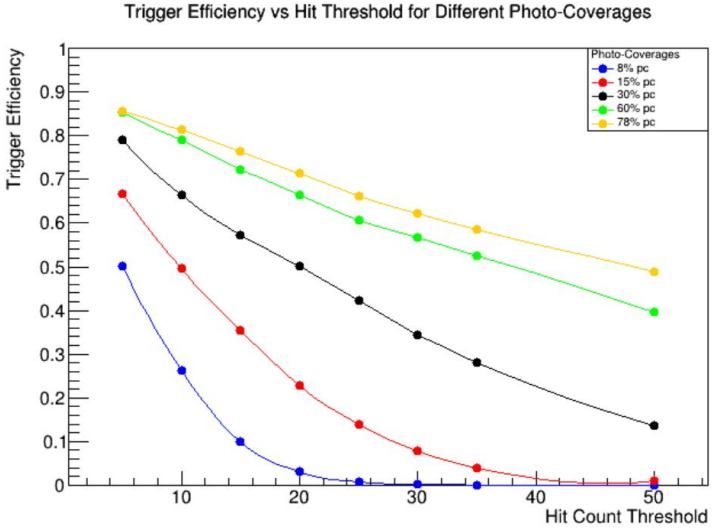
Neutron without Gd

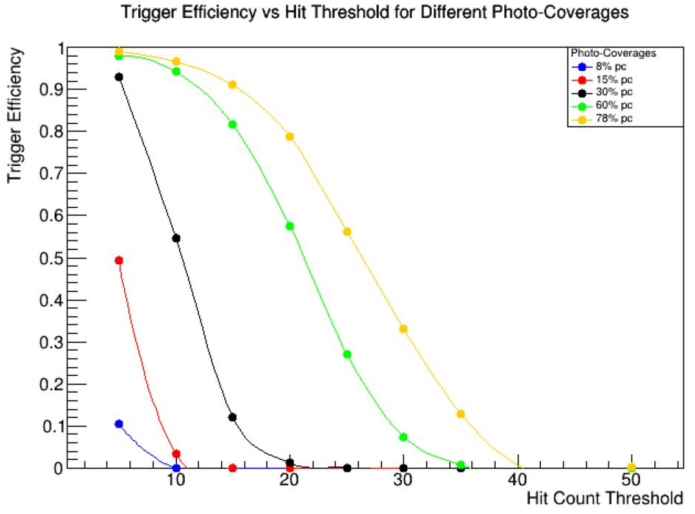




Gamma

Neutron with Gd





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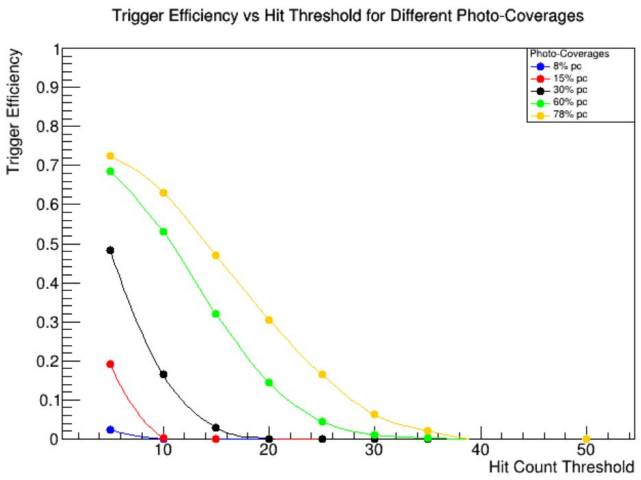
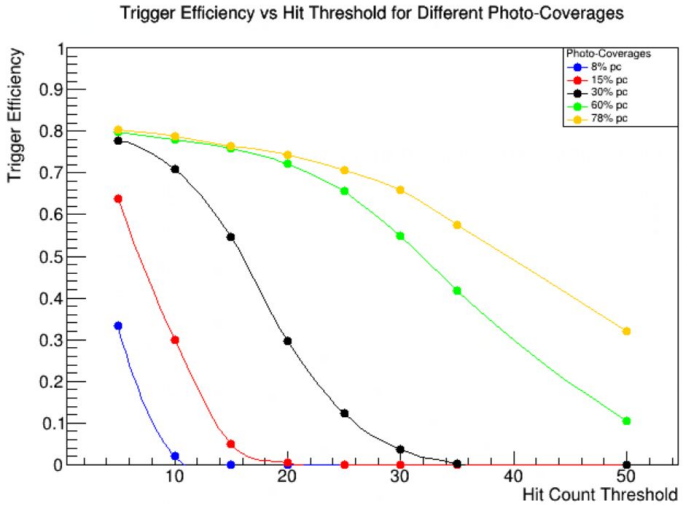
4 MeV

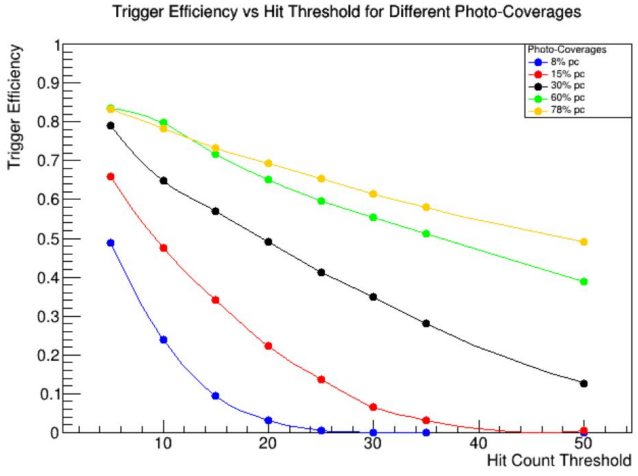
Neutron without Gd

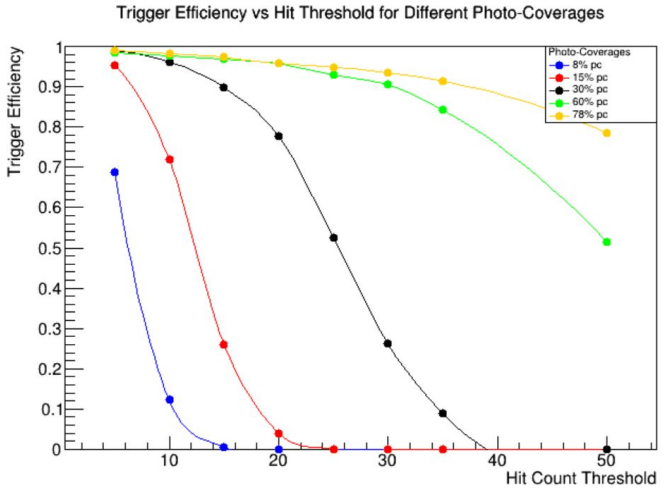




Gamma

Neutron with Gd





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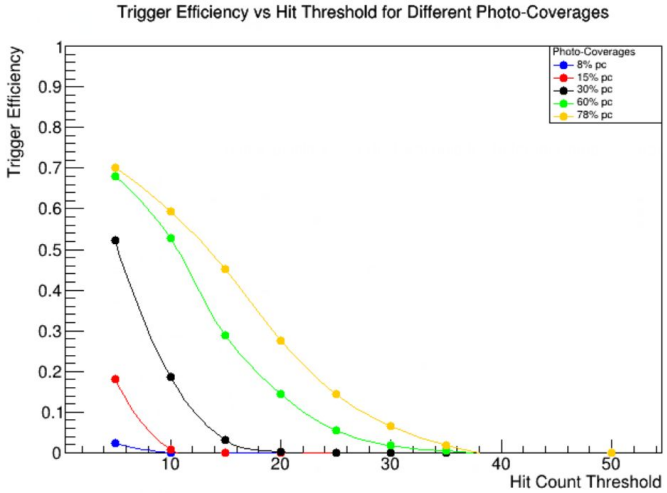
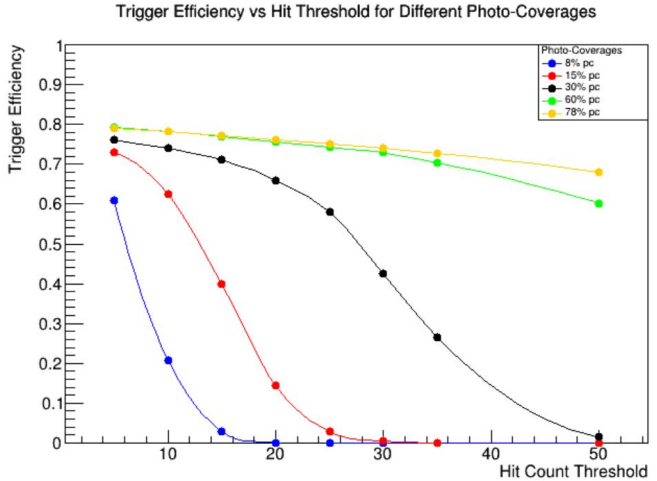
(neutron graphs don't really change as for considered energies, all need to be thermalized)

6 MeV

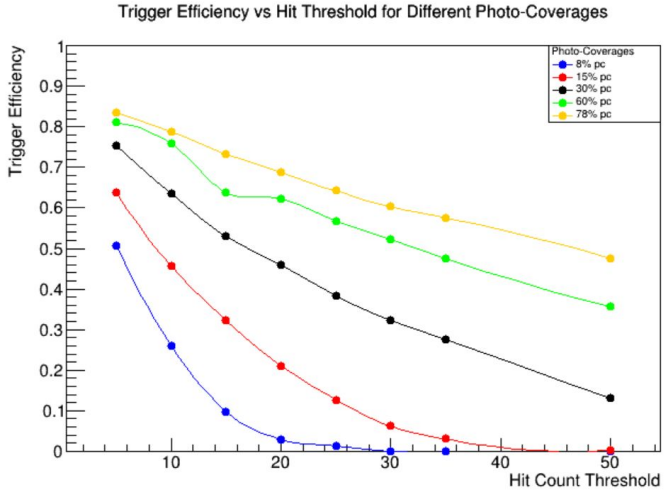
Neutron without Gd

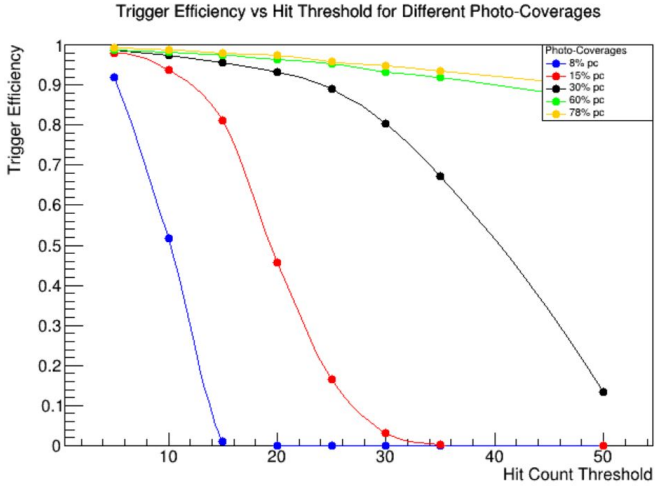




Gamma

Neutron With Gd





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Conversions of set pc to effective pc (limiting geometry) and # of PMTs

8% pc -> 7.57% effective pc, 536 total PMTs, avg. dark noise PMT hits = 0.002412

15% pc -> 14.06% effective pc, 999 total PMTs, avg. dark noise PMT hits = 0.0044955

30% pc -> 26.5% effective pc, 1984 total PMTs, avg. dark noise PMT hits = 0.008928

60% pc -> 54.9% effective pc, 3956 total PMTs, avg. dark noise PMT hits = 0.017802

78% pc -> 69.5% effective pc, 5056 total PMTs, avg. dark noise PMT hits = 0.022752

(avg. dark noise PMT hits meaning the average number of PMTs in the detector active in a 15ns window with a dark noise rate of 0.3kHz)

Below are values for the above graphs

5 MeV Neutron + Gamma (Gd)

8% Number of Triggers per Threshold
5 hits: 1277 -> 0.6387
10 hits: 486 -> 0.243
15 hits: 185 -> 0.0925
20 hits: 66 -> 0.033
25 hits: 22 -> 0.011
30 hits: 3 -> 0.0015
35 hits: 1 -> 0.0005
50 hits: 0 -> 0

15% Number of Triggers per Threshold
5 hits: 1711 -> 0.8555
10 hits: 1321 -> 0.6605
15 hits: 789 -> 0.3945
20 hits: 394 -> 0.197
25 hits: 211 -> 0.1055
30 hits: 111 -> 0.0555
35 hits: 55 -> 0.0275
50 hits: 8 -> 0.004

30% Number of Triggers per Threshold
5 hits: 1831 -> 0.9155
10 hits: 1718 -> 0.859
15 hits: 1604 -> 0.802
20 hits: 1399 -> 0.6995
25 hits: 1083 -> 0.5415
30 hits: 746 -> 0.373
35 hits: 535 -> 0.2675
50 hits: 212 -> 0.106

60% Number of Triggers per Threshold
5 hits: 1914 -> 0.957
10 hits: 1865 -> 0.9325
15 hits: 1794 -> 0.897
20 hits: 1710 -> 0.855
25 hits: 1647 -> 0.8235
30 hits: 1592 -> 0.796
35 hits: 1526 -> 0.763
50 hits: 1059 -> 0.5295

78% Number of Triggers per Threshold
5 hits: 1914 -> 0.957
10 hits: 1891 -> 0.9455
15 hits: 1850 -> 0.925
20 hits: 1795 -> 0.8795
25 hits: 1748 -> 0.874
30 hits: 1698 -> 0.849
35 hits: 1661 -> 0.8305
50 hits: 1470 -> 0.735

Values of Avg. PMT Hits for Slide page 14

Neutron without Gd 8 pc
- 2 MeV: 3

Neutron without Gd 15 pc
- 2 MeV: 5

Neutron without Gd 30 pc
- 2 MeV: 8

Neutron without Gd 60 pc
- 2 MeV: 19

Neutron with Gd 8 pc
- 2 MeV: 10

Neutron with Gd 15 pc
- 2 MeV: 19

Neutron with Gd 30 pc
- 2 MeV: 38

Neutron with Gd 60 pc
- 2 MeV: 74

Gamma 8 pc
- 2 MeV: 2
- 4 MeV: 7
- 6 MeV: 11
- 8 MeV: 16
- 10 MeV: 20

Gamma 15 pc
- 2 MeV: 4
- 4 MeV: 13
- 6 MeV: 21
- 8 MeV: 29
- 10 MeV: 37

Gamma 30 pc
- 2 MeV: 8
- 4 MeV: 25
- 6 MeV: 42
- 8 MeV: 59
- 10 MeV: 73

Gamma 60 pc
- 2 MeV: 15
- 4 MeV:48
- 6 MeV: 80
- 8 MeV: 109
- 10 MeV: 141

Electron 8 pc
- 2 MeV: 4
- 4 MeV: 10
- 6 MeV: 15
- 8 MeV: 19
- 10 MeV: 23

Electron 15 pc
- 2 MeV: 8
- 4 MeV: 18
- 6 MeV: 27
- 8 MeV: 35
- 10 MeV: 44

Electron 30 pc
- 2 MeV: 15
- 4 MeV: 36
- 6 MeV: 54
- 8 MeV: 71
- 10 MeV: 86

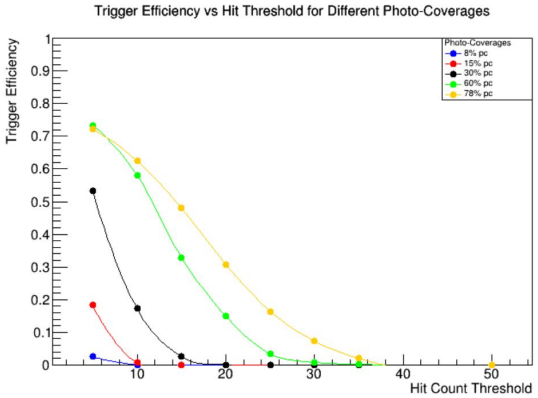
Electron 60 pc
- 2 MeV: 29
- 4 MeV: 68
- 6 MeV: 101
- 8 MeV: 133
- 10 MeV: 164

Neutron without Gd (2 MeV)

8% Number of Triggers per Threshold
5 hits: 25 -> 0.025
10 hits: 1 -> 0.001
15 hits: 0 -> 0
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

15% Number of Triggers per Threshold
5 hits: 183 -> 0.183
10 hits: 7 -> 0.007
15 hits: 0 -> 0
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

60% Number of Triggers per Threshold
5 hits: 733 -> 0.733
10 hits: 580 -> 0.580
15 hits: 328 -> 0.328
20 hits: 149 -> 0.149
25 hits: 35 -> 0.035
30 hits: 8 -> 0.008
35 hits: 2 -> 0.002
50 hits: 0 -> 0



30% Number of Triggers per Threshold
5 hits: 532 -> 0.532
10 hits: 172 -> 0.172
15 hits: 25 -> 0.025
20 hits: 1 -> 0.001
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

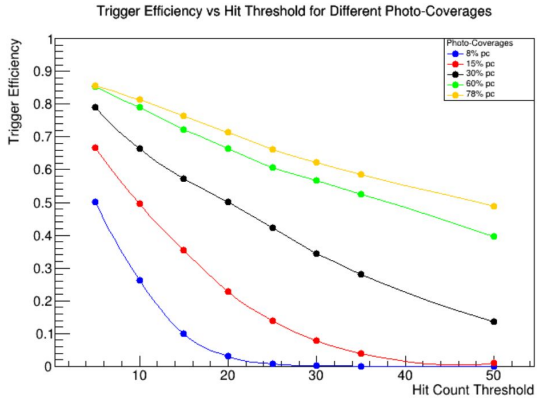
78% Number of Triggers per Threshold
5 hits: 722 -> 0.722
10 hits: 624 -> 0.624
15 hits: 481 -> 0.481
20 hits: 308 -> 0.308
25 hits: 163 -> 0.163
30 hits: 73 -> 0.073
35 hits: 20 -> 0.020
50 hits: 0 -> 0

Neutron with Gd (2 MeV)

8% Number of Triggers per Threshold
5 hits: 501 -> 0.501
10 hits: 264 -> 0.263
15 hits: 99 -> 0.099
20 hits: 30 -> 0.030
25 hits: 7 -> 0.007
30 hits: 2 -> 0.002
35 hits: 1 -> 0.001
50 hits: 0 -> 0

15% Number of Triggers per Threshold
5 hits: 666 -> 0.666
10 hits: 496 -> 0.496
15 hits: 353 -> 0.353
20 hits: 227 -> 0.227
25 hits: 139 -> 0.139
30 hits: 78 -> 0.078
35 hits: 40 -> 0.040
50 hits: 9 -> 0.009

60% Number of Triggers per Threshold
5 hits: 852 -> 0.852
10 hits: 789 -> 0.789
15 hits: 723 -> 0.723
20 hits: 664 -> 0.664
25 hits: 607 -> 0.607
30 hits: 566 -> 0.566
35 hits: 526 -> 0.526
50 hits: 395 -> 0.395



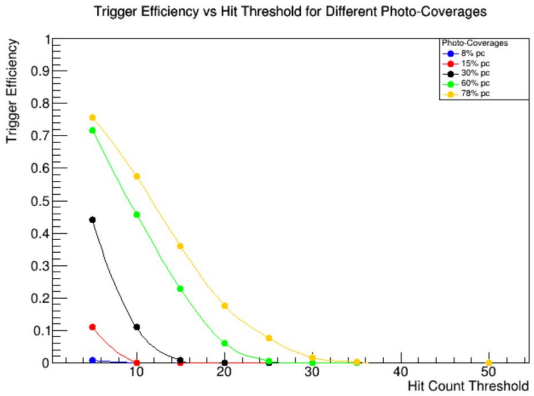
30% Number of Triggers per Threshold
5 hits: 789 -> 0.789
10 hits: 663 -> 0.663
15 hits: 573 -> 0.573
20 hits: 502 -> 0.502
25 hits: 422 -> 0.422
30 hits: 345 -> 0.345
35 hits: 282 -> 0.282
50 hits: 136 -> 0.136

78% Number of Triggers per Threshold
5 hits: 857 -> 0.857
10 hits: 813 -> 0.813
15 hits: 763 -> 0.763
20 hits: 714 -> 0.714
25 hits: 662 -> 0.622
30 hits: 621 -> 0.621
35 hits: 586 -> 0.586
50 hits: 489 -> 0.489

Gamma 2 MeV

8% Number of Triggers per Threshold

5 hits: 8 -> 0.008
10 hits: 0-> 0
15 hits: 0-> 0
20 hits: 0-> 0
25 hits: 0-> 0
30 hits: 0-> 0
35 hits: 0-> 0
50 hits: 0-> 0



15% Number of Triggers per Threshold

5 hits: 111 -> 0.111
10 hits: 1 -> 0.001
15 hits: 0-> 0
20 hits: 0-> 0
25 hits: 0-> 0
30 hits: 0-> 0
35 hits: 0-> 0
50 hits: 0 -> 0

30% Number of Triggers per Threshold

5 hits: 442 -> 0.442
10 hits: 109 -> 0.109
15 hits: 7 -> 0.007
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

60% Number of Triggers per Threshold

5 hits: 716 -> 0.716
10 hits: 457 ->0.457
15 hits: 228 -> 0.228
20 hits: 60 -> 0.060
25 hits: 6 -> 0.006
30 hits: 1-> 0.001
35 hits: 0-> 0
50 hits: 0-> 0

78% Number of Triggers per Threshold

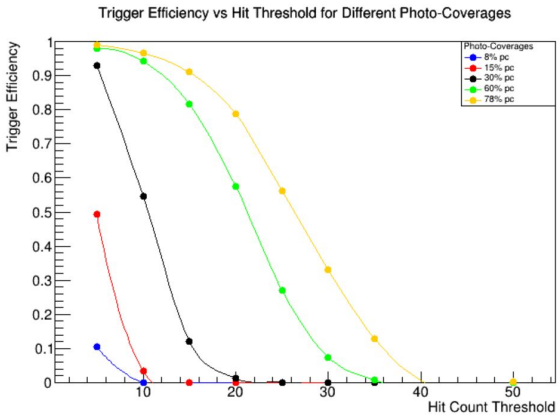
5 hits: 757 -> 0.757
10 hits: 574 -> 0.574
15 hits: 359 -> 0.359
20 hits: 176 -> 0.176
25 hits: 77 -> 0.077
30 hits: 15 -> 0.015
35 hits: 2 -> 0.002
50 hits: 0 -> 0

Electron 2 MeV

8% Number of Triggers per Threshold
5 hits: 105 -> 0.105
10 hits: 0 -> 0
15 hits: 0 -> 0
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

15% Number of Triggers per Threshold
5 hits: 494 -> 0.494
10 hits: 33 -> 0.033
15 hits: 0-> 0
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

60% Number of Triggers per Threshold
5 hits: 979 ->0.979
10 hits: 942 ->0.942
15 hits: 817 -> 0.817
20 hits: 574 -> 0.574
25 hits: 270 -> 0.270
30 hits: 74 -> 0.074
35 hits: 8 -> 0.008
50 hits: 0 -> 0

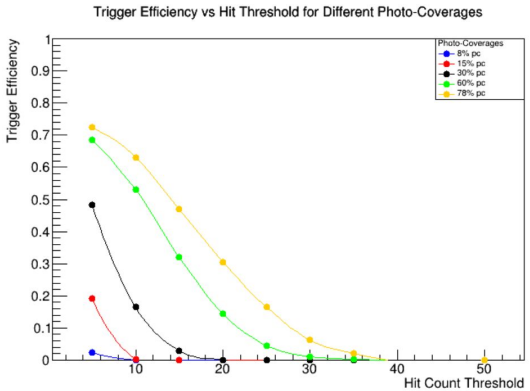


30% Number of Triggers per Threshold
5 hits: 929 -> 0.929
10 hits: 547 -> 0.547
15 hits: 121 -> 0.121
20 hits: 12 -> 0.012
25 hits: 1 -> 0.001
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

78% Number of Triggers per Threshold
5 hits: 991 -> 0.991
10 hits: 965 -> 0.965
15 hits: 910 -> 0.910
20 hits: 788 -> 0.788
25 hits: 563-> 0.563
30 hits: 331 -> 0.331
35 hits: 128 -> 0.128
50 hits: 2 -> 0.002

Neutron without Gd (4 MeV)

8% Number of Triggers per Threshold
5 hits: 23 -> 0.023
10 hits: 0 -> 0
15 hits: 0 -> 0
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0



15% Number of Triggers per Threshold
5 hits: 192 -> 0.192
10 hits: 3 -> 0.003
15 hits: 0 -> 0
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

30% Number of Triggers per Threshold
5 hits: 484 -> 0.484
10 hits: 164 -> 0.164
15 hits: 29 -> 0.029
20 hits: 1 -> 0.001
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

60% Number of Triggers per Threshold
5 hits: 686 ->0.686
10 hits: 529 -> 0.529
15 hits: 320 -> 0.320
20 hits: 144 -> 0.144
25 hits: 45 -> 0.045
30 hits: 10 -> 0.010
35 hits: 3 -> 0.003
50 hits: 0 -> 0

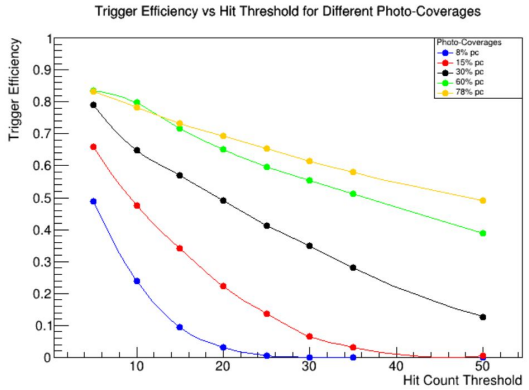
78% Number of Triggers per Threshold
5 hits: 725 -> 0.725
10 hits: 631 -> 0.631
15 hits: 471 -> 0.471
20 hits: 305 -> 0.305
25 hits: 163 -> 0.164
30 hits: 62 -> 0.062
35 hits: 20 -> 0.020
50 hits: 1 -> 0.001

Neutron with Gd (4 MeV)

8% Number of Triggers per Threshold
5 hits: 489 -> 0.489
10 hits: 240 -> 0.240
15 hits: 93 -> 0.093
20 hits: 32 -> 0.032
25 hits: 6 -> 0.006
30 hits: 1 -> 0.001
35 hits: 0 -> 0
50 hits: 0 -> 0

15% Number of Triggers per Threshold
5 hits: 659 -> 0.659
10 hits: 475 -> 0.475
15 hits: 342 -> 0.342
20 hits: 222 -> 0.222
25 hits: 126 -> 0.136
30 hits: 66 -> 0.066
35 hits: 32 -> 0.032
50 hits: 4 -> 0.004

60% Number of Triggers per Threshold
5 hits: 835 ->0.835
10 hits: 797 ->0.797
15 hits: 717 -> 0.717
20 hits: 651 -> 0.651
25 hits: 597 -> 0.597
30 hits: 553 -> 0.553
35 hits: 511 -> 0.511
50 hits: 388 -> 0.388

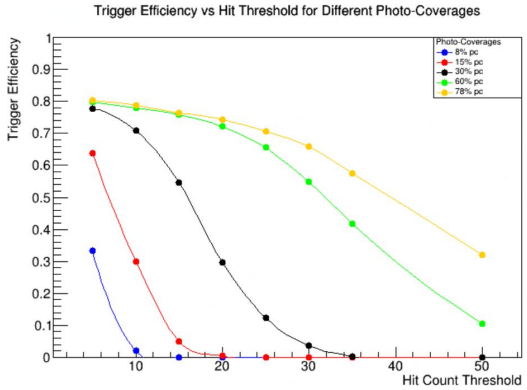


30% Number of Triggers per Threshold
5 hits: 789 -> 0.789
10 hits: 648 -> 0.648
15 hits: 570 -> 0.570
20 hits: 491 -> 0.491
25 hits: 413 -> 0.413
30 hits: 349 -> 0.349
35 hits: 280 -> 0.280
50 hits: 127 -> 0.127

78% Number of Triggers per Threshold
5 hits: 831 -> 0.831
10 hits: 783 -> 0.783
15 hits: 733 -> 0.733
20 hits: 694 -> 0.694
25 hits: 654 -> 0.654
30 hits: 613 -> 0.613
35 hits: 579 -> 0.579
50 hits: 491 -> 0.491

Gamma (4 MeV)

8% Number of Triggers per Threshold
5 hits: 332 -> 0.332
10 hits: 20 -> 0.020
15 hits: 0 -> 0
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0



15% Number of Triggers per Threshold
5 hits: 637 -> 0.637
10 hits: 300 -> 0.300
15 hits: 50 -> 0.050
20 hits: 4 -> 0.004
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

30% Number of Triggers per Threshold
5 hits: 778 -> 0.778
10 hits: 709 -> 0.709
15 hits: 545 -> 0.545
20 hits: 297 -> 0.297
25 hits: 123 -> 0.123
30 hits: 36 -> 0.036
35 hits: 3 -> 0.003
50 hits: 0 -> 0

60% Number of Triggers per Threshold
5 hits: 797 -> 0.797
10 hits: 779 ->0.779
15 hits: 758 -> 0.758
20 hits: 721 -> 0.721
25 hits: 655 -> 0.655
30 hits: 549 -> 0.549
35 hits: 417 -> 0.417
50 hits: 106 -> 0.106

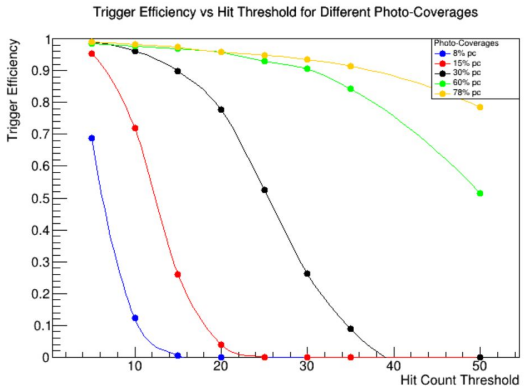
78% Number of Triggers per Threshold
5 hits: 802 -> 0.802
10 hits: 788 -> 0.788
15 hits: 765 -> 0.765
20 hits: 744 -> 0.744
25 hits: 705 -> 0.705
30 hits: 659 -> 0.659
35 hits: 575 -> 0.575
50 hits: 319 -> 0.319

Electron (4 MeV)

8% Number of Triggers per Threshold
5 hits: 688 -> 0.688
10 hits: 123 -> 0.123
15 hits: 6 -> 0.006
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

15% Number of Triggers per Threshold
5 hits: 952 -> 0.952
10 hits: 718 -> 0.718
15 hits: 260 -> 0.260
20 hits: 39 -> 0.039
25 hits: 1 -> 0.001
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

60% Number of Triggers per Threshold
5 hits: 985 ->0.985
10 hits: 976 ->0.976
15 hits: 970 -> 0.970
20 hits: 957 -> 0.957
25 hits: 930 -> 0.930
30 hits: 905 -> 0.905
35 hits: 842 -> 0.842
50 hits: 515-> 0.515



30% Number of Triggers per Threshold
5 hits: 989 -> 0.989
10 hits: 962 -> 0.962
15 hits: 899 -> 0.899
20 hits: 777 -> 0.777
25 hits: 524 -> 0.524
30 hits: 262 -> 0.262
35 hits: 88 -> 0.088
50 hits: 0 -> 0

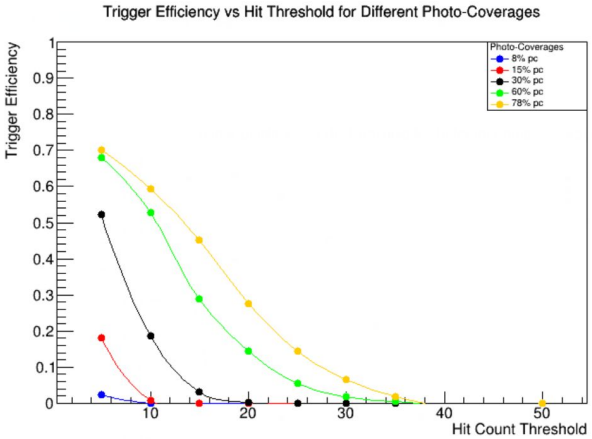
78% Number of Triggers per Threshold
5 hits: 989 -> 0.989
10 hits: 983 -> 0.983
15 hits: 973 -> 0.973
20 hits: 958 -> 0.958
25 hits: 949 -> 0.949
30 hits: 934 -> 0.934
35 hits: 914 -> 0.914
50 hits: 785-> 0.785

Neutron without Gd (6 MeV)

8% Number of Triggers per Threshold
5 hits: 24 -> 0.024
10 hits: 0 -> 0
15 hits: 0 -> 0
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

15% Number of Triggers per Threshold
5 hits: 181 -> 0.181
10 hits: 8-> 0.008
15 hits: 0 -> 0
20 hits: 0 -> 0
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

60% Number of Triggers per Threshold
5 hits: 680 ->0.680
10 hits: 527 ->0.527
15 hits: 288 -> 0.288
20 hits: 145-> 0.145
25 hits: 55 -> 0.055
30 hits: 17 -> 0.017
35 hits: 4 -> 0.004
50 hits: 0-> 0



30% Number of Triggers per Threshold
5 hits: 522 -> 0.522
10 hits: 187 -> 0.187
15 hits: 31 -> 0.031
20 hits: 3 -> 0.003
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

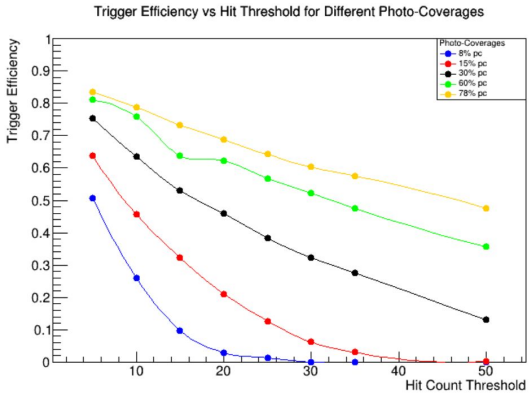
78% Number of Triggers per Threshold
5 hits: 701 -> 0.701
10 hits: 594 -> 0.594
15 hits: 452 -> 0.452
20 hits: 276 -> 0.276
25 hits: 144 -> 0.144
30 hits: 65 -> 0.065
35 hits: 18 -> 0.018
50 hits: 1 -> 0.001

Neutron with Gd (6 MeV)

8% Number of Triggers per Threshold
5 hits: 507 -> 0.507
10 hits: 261 -> 0.261
15 hits: 98 -> 0.098
20 hits: 28 -> 0.028
25 hits: 13 -> 0.013
30 hits: 1 -> 0.001
35 hits: 0 -> 0
50 hits: 0 -> 0

15% Number of Triggers per Threshold
5 hits: 637 -> 0.637
10 hits: 456 -> 0.456
15 hits: 323 -> 0.323
20 hits: 211 -> 0.211
25 hits: 127 -> 0.127
30 hits: 62 -> 0.062
35 hits: 30 -> 0.030
50 hits: 2 -> 0.002

60% Number of Triggers per Threshold
5 hits: 810 ->0.810
10 hits: 759 ->0.759
15 hits: 638 -> 0.638
20 hits: 622 -> 0.622
25 hits: 567 -> 0.567
30 hits: 522-> 0.522
35 hits: 475 -> 0.475
50 hits: 356 -> 0.356



30% Number of Triggers per Threshold
5 hits: 754 -> 0.754
10 hits: 635 -> 0.635
15 hits: 530 -> 0.530
20 hits: 459 -> 0.459
25 hits: 382 -> 0.382
30 hits: 322 -> 0.322
35 hits: 276 -> 0.276
50 hits: 130 -> 0.130

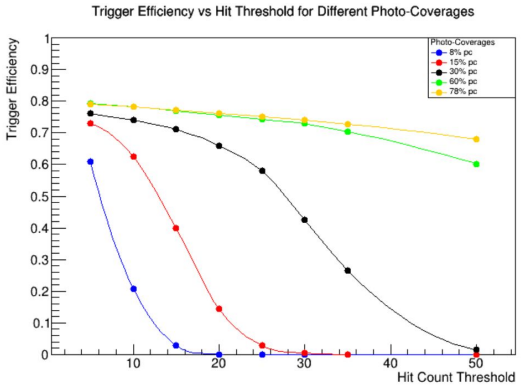
78% Number of Triggers per Threshold
5 hits: 834 -> 0.834
10 hits: 788 -> 0.788
15 hits: 733 -> 0.733
20 hits: 687 -> 0.687
25 hits: 642 -> 0.642
30 hits: 603 -> 0.603
35 hits: 576 -> 0.576
50 hits: 476 -> 0.476

Gamma (6 MeV)

8% Number of Triggers per Threshold
5 hits: 609 -> 0.609
10 hits: 208 -> 0.208
15 hits: 29 -> 0.029
20 hits: 1 -> 0.001
25 hits: 0 -> 0
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

15% Number of Triggers per Threshold
5 hits: 730 -> 0.730
10 hits: 625 -> 0.625
15 hits: 400 -> 0.400
20 hits: 143 -> 0.143
25 hits: 28 -> 0.028
30 hits: 4 -> 0.004
35 hits: 0 -> 0
50 hits: 0 -> 0

60% Number of Triggers per Threshold
5 hits: 792 ->0.792
10 hits: 782 ->0.782
15 hits: 770 -> 0.770
20 hits: 756 -> 0.756
25 hits: 743 -> 0.743
30 hits: 729 -> 0.729
35 hits: 704 -> 0.704
50 hits: 602 -> 0.602



30% Number of Triggers per Threshold
5 hits: 760 -> 0.760
10 hits: 740 -> 0.740
15 hits: 711 -> 0.711
20 hits: 660 -> 0.660
25 hits: 579 -> 0.579
30 hits: 425 -> 0.425
35 hits: 265 -> 0.265
50 hits: 15 -> 0.015

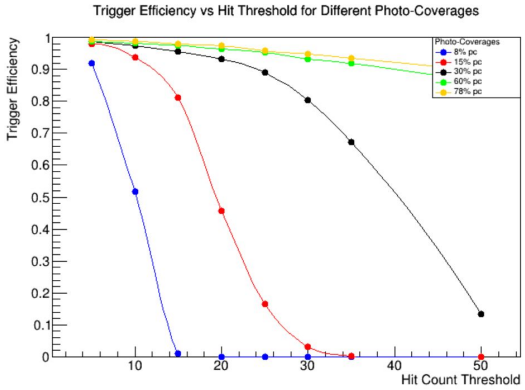
78% Number of Triggers per Threshold
5 hits: 791 -> 0.791
10 hits: 781 -> 0.781
15 hits: 771 -> 0.771
20 hits: 761 -> 0.761
25 hits: 751 -> 0.751
30 hits: 740 -> 0.740
35 hits: 728 -> 0.728
50 hits: 681 -> 0.681

Electron (6 MeV)

8% Number of Triggers per Threshold
5 hits: 920 -> 0.920
10 hits: 516 -> 0.516
15 hits: 116 -> 0.116
20 hits: 9 -> 0.009
25 hits: 1 -> 0.001
30 hits: 0 -> 0
35 hits: 0 -> 0
50 hits: 0 -> 0

15% Number of Triggers per Threshold
5 hits: 980 -> 0.980
10 hits: 937 -> 0.937
15 hits: 810 -> 0.810
20 hits: 457 -> 0.457
25 hits: 165 -> 0.165
30 hits: 32 -> 0.032
35 hits: 2 -> 0.002
50 hits: 0 -> 0

60% Number of Triggers per Threshold
5 hits: 987 -> 0.987
10 hits: 981 ->0.981
15 hits: 975 -> 0.975
20 hits: 964-> 0.964
25 hits: 952 -> 0.952
30 hits: 933 -> 0.933
35 hits: 918 -> 0.918
50 hits: 859 -> 0.859



30% Number of Triggers per Threshold
5 hits: 988 -> 0.988
10 hits: 973 -> 0.973
15 hits: 955 -> 0.955
20 hits: 933 -> 0.933
25 hits: 890 -> 0.890
30 hits: 803 -> 0.803
35 hits: 671 -> 0.671
50 hits: 133 -> 0.133

78% Number of Triggers per Threshold
5 hits: 992 -> 0.922
10 hits: 988-> 0.988
15 hits: 979 -> 0.979
20 hits: 974 -> 0.974
25 hits: 958 -> 0.958
30 hits: 948 -> 0.948
35 hits: 935 -> 0.935
50 hits: 895 -> 0.895