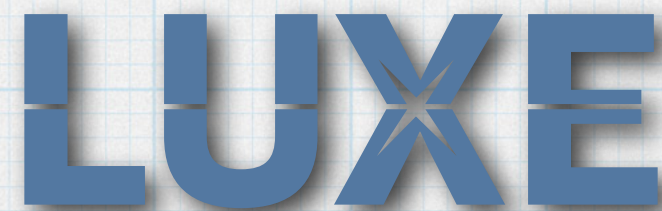


Shielding studies

Borysova Maryna (KINR)

29/06/21

LUXE simulation and analysis TF

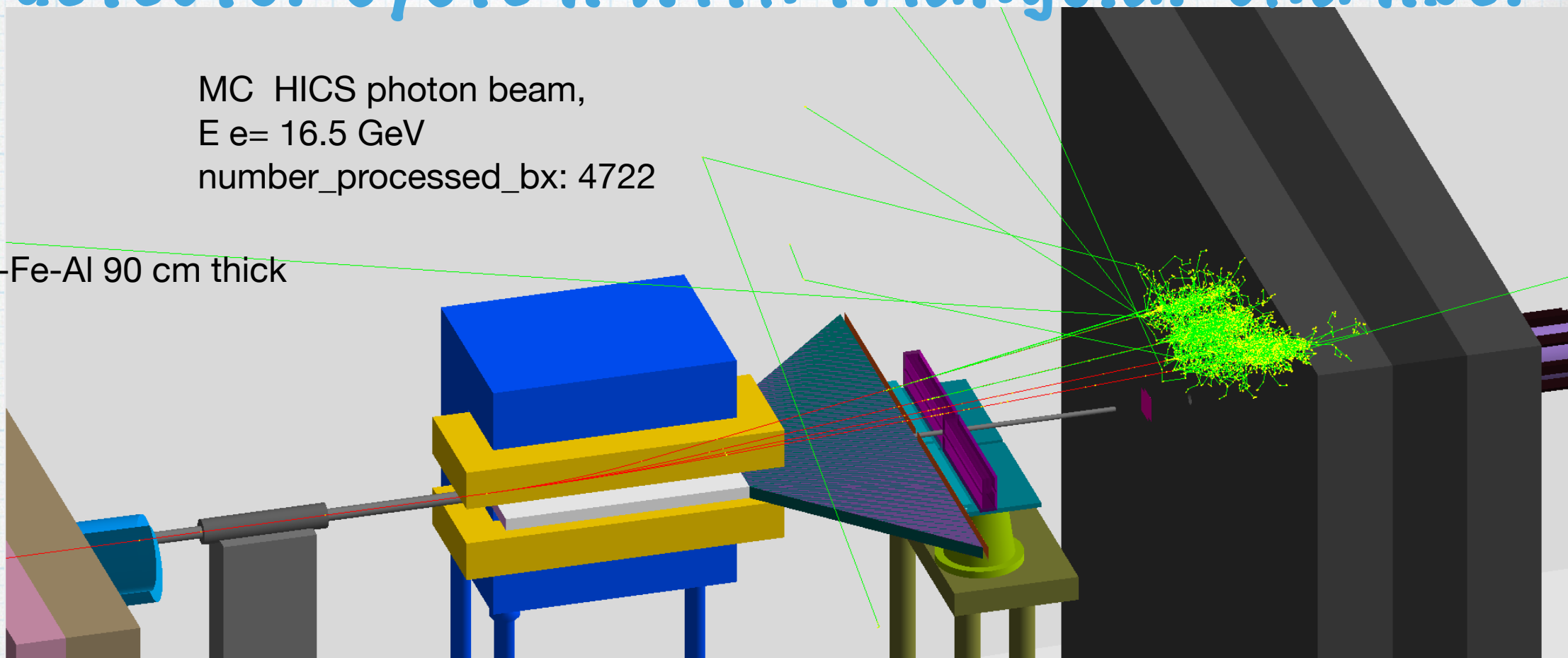
The logo for the LUXE experiment, featuring the word "LUXE" in a bold, blue, sans-serif font. The letter "X" is stylized with a grey, multi-pointed star or cross shape in the center, creating a focal point.

Forward detector system with triangular chamber

Beam Pipe 4.2 cm +
Triang chamber
Al window 0.5 mm

MC HICS photon beam,
 $E_e = 16.5$ GeV
number_processed_bx: 4722

Shielding - 3-layer Al-Fe-Al 90 cm thick



Shielding - Concrete 30 cm vs 80 cm vs 90 cm AlFeAl

30 cm shielding

number_processed_events: 68500000
=> 4% of BX

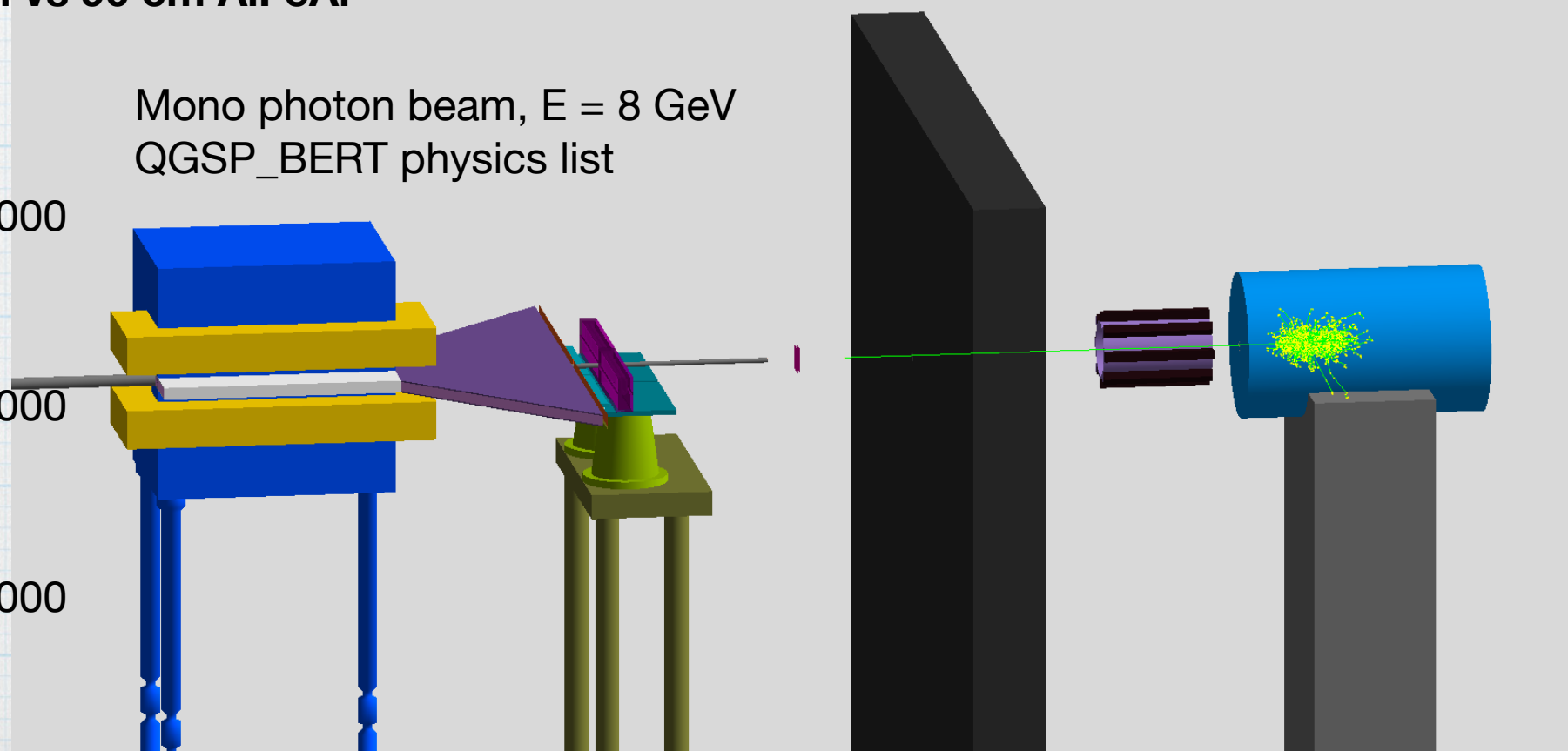
80 cm shielding

number_processed_events: 18290000
=> 1% of BX

90 cm AlFeAl shielding

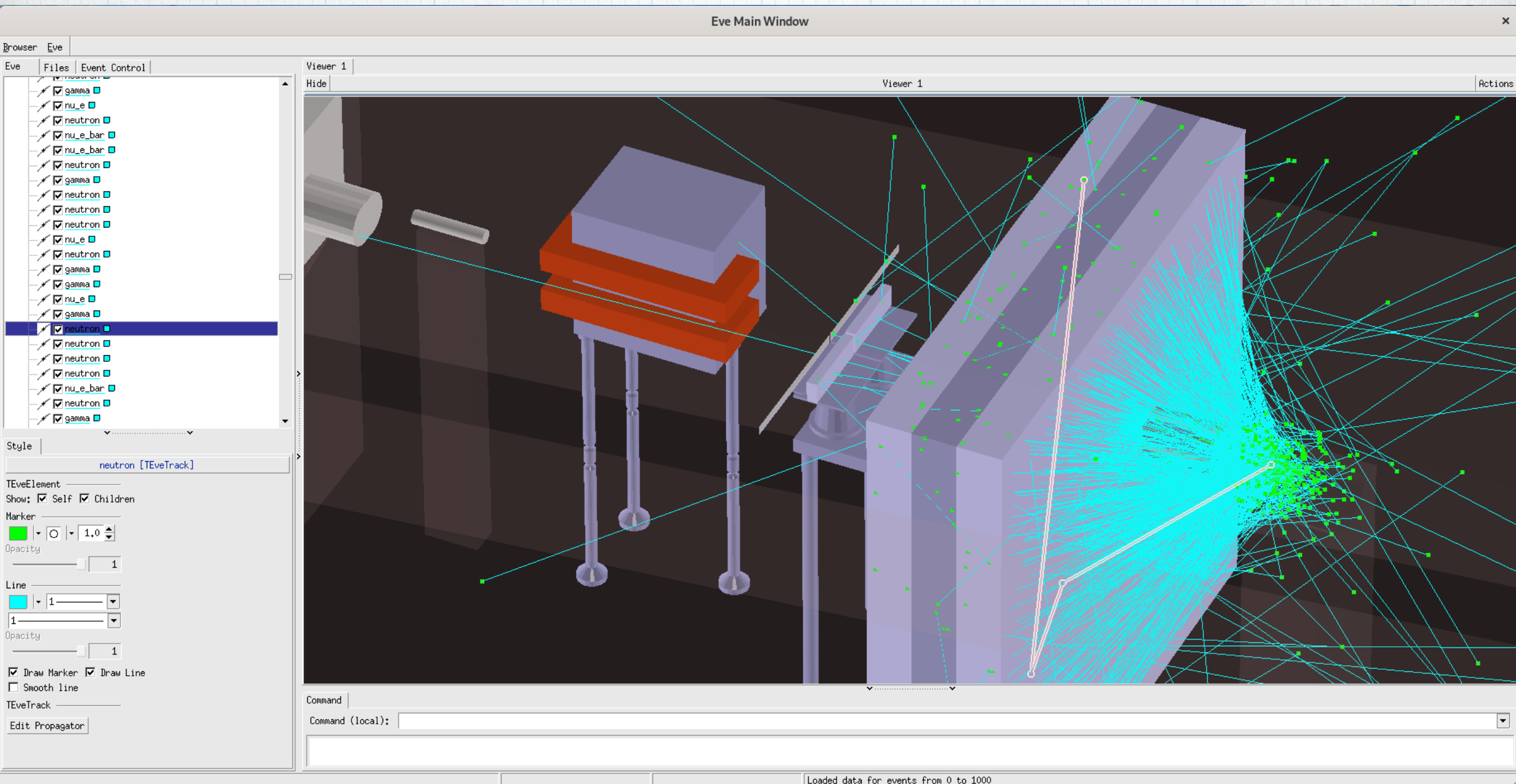
number_processed_events: 40100000
=> 2% of BX

Mono photon beam, $E = 8$ GeV
QGSP_BERT physics list

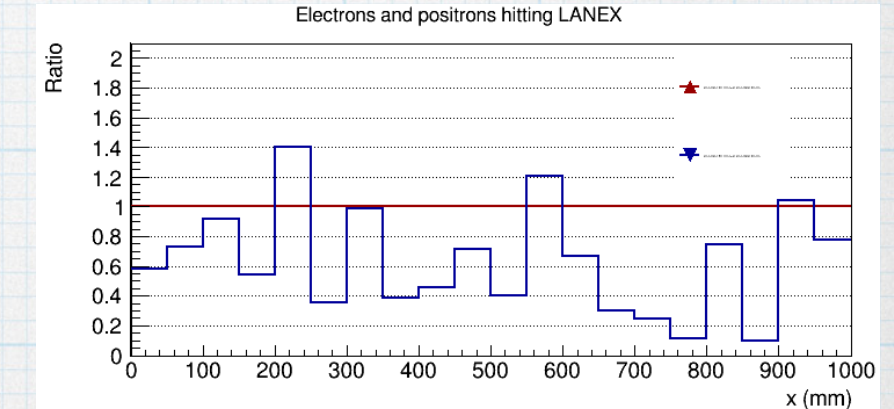
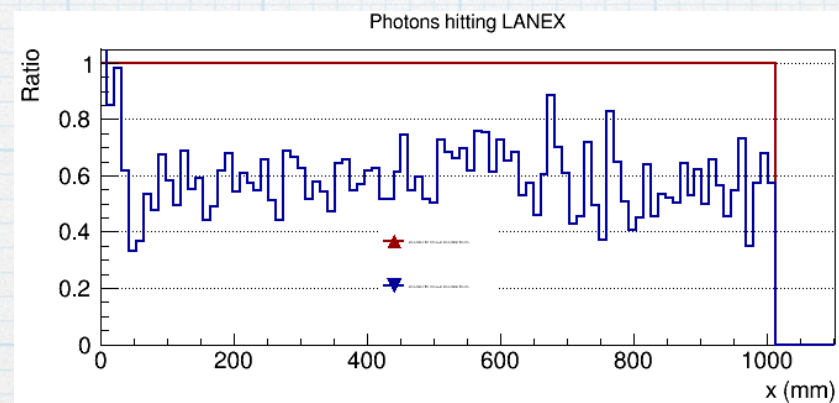
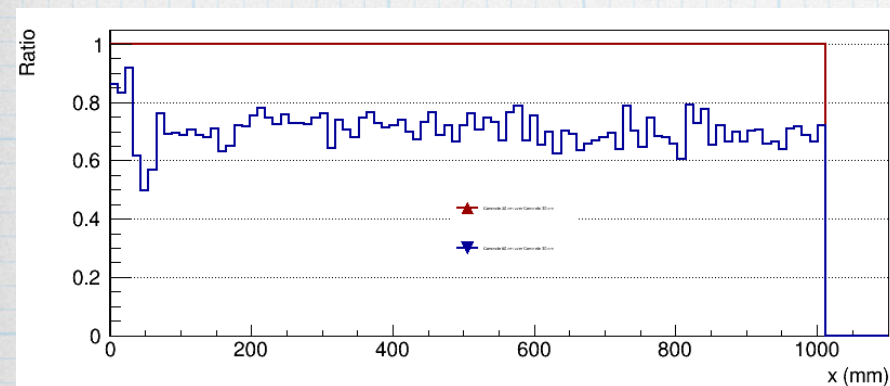
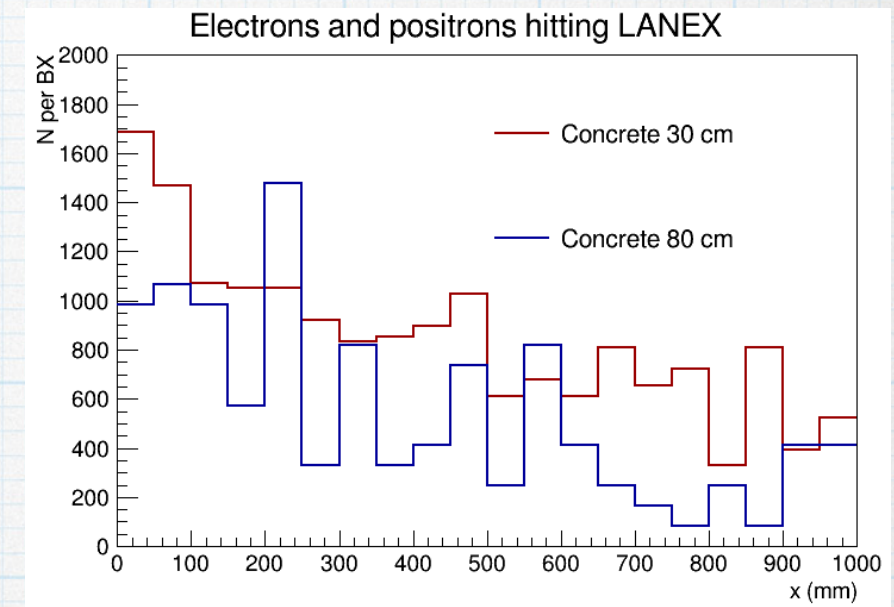
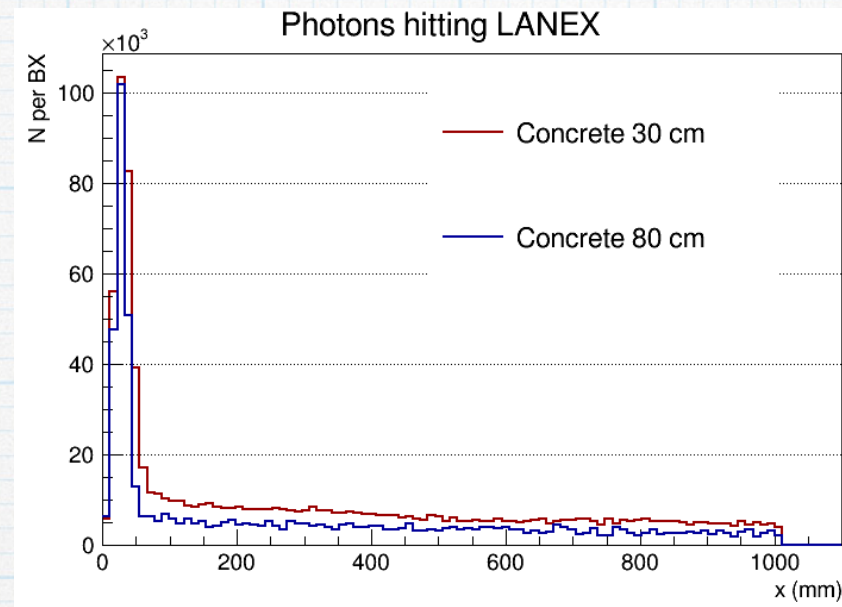
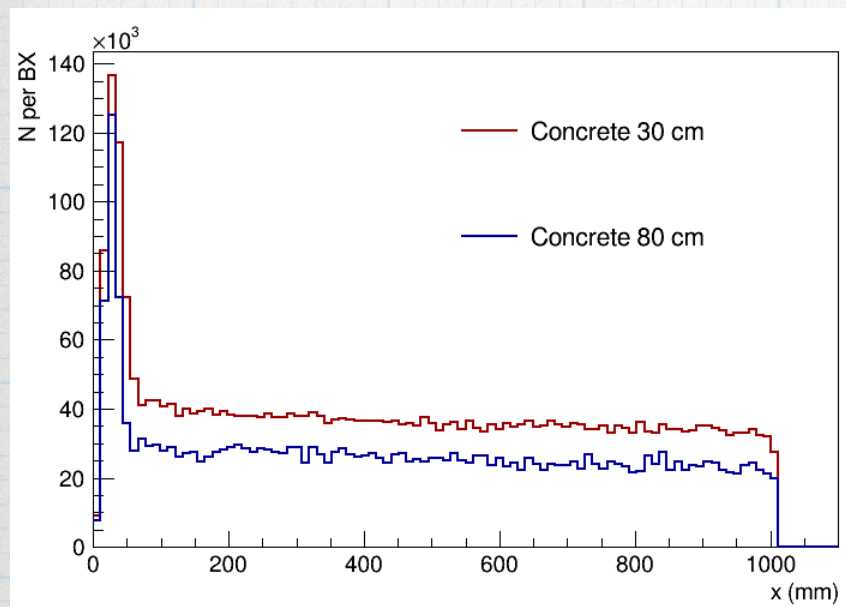


Event display

1000 photons of 8 GeV energy



Dump induced background in photon spectrometer



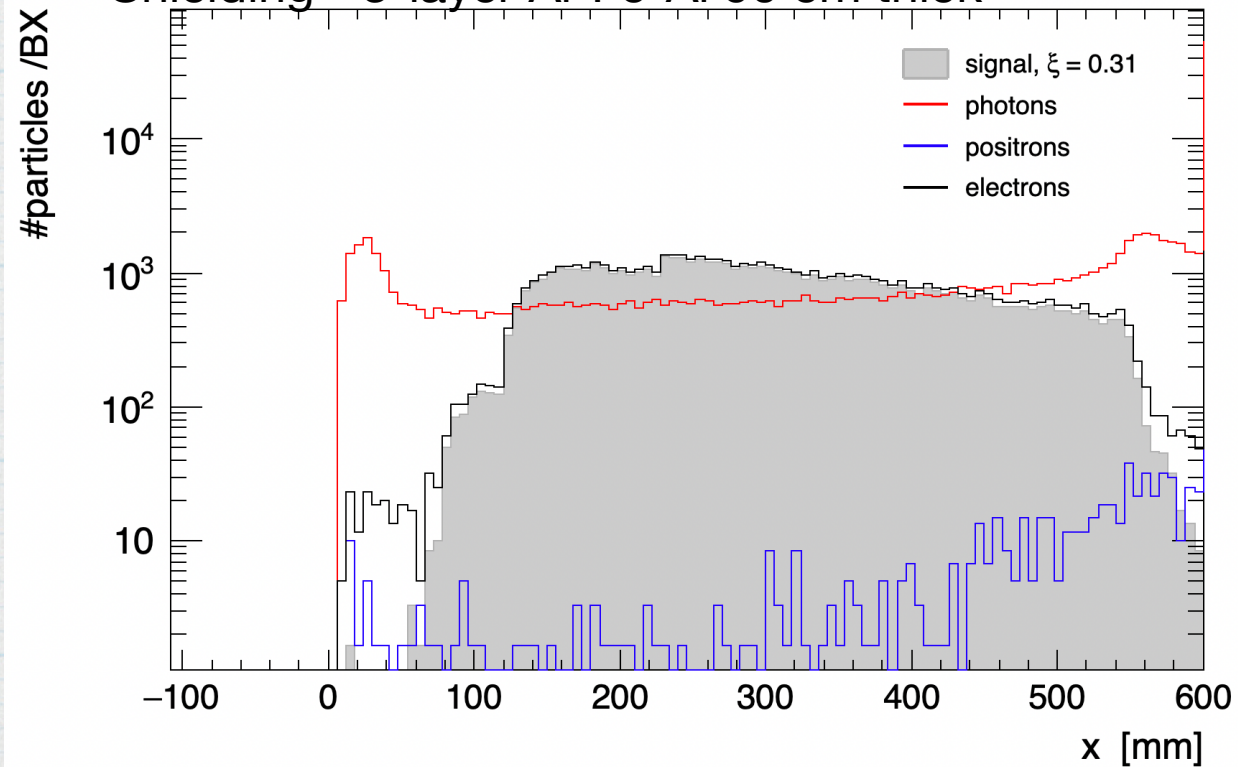
Material	X0, cm	Thicknes	d in X0
Concrete	10.7	30	2.80
Concrete	10.7	80	7.48
			$7.48/2.80 = 2.6$

Material	X0, cm	Thicknes	d in X0
Al	8.9	60	6.74
Fe	1.76	30	17.05
			$17.05+6.74=23.8$

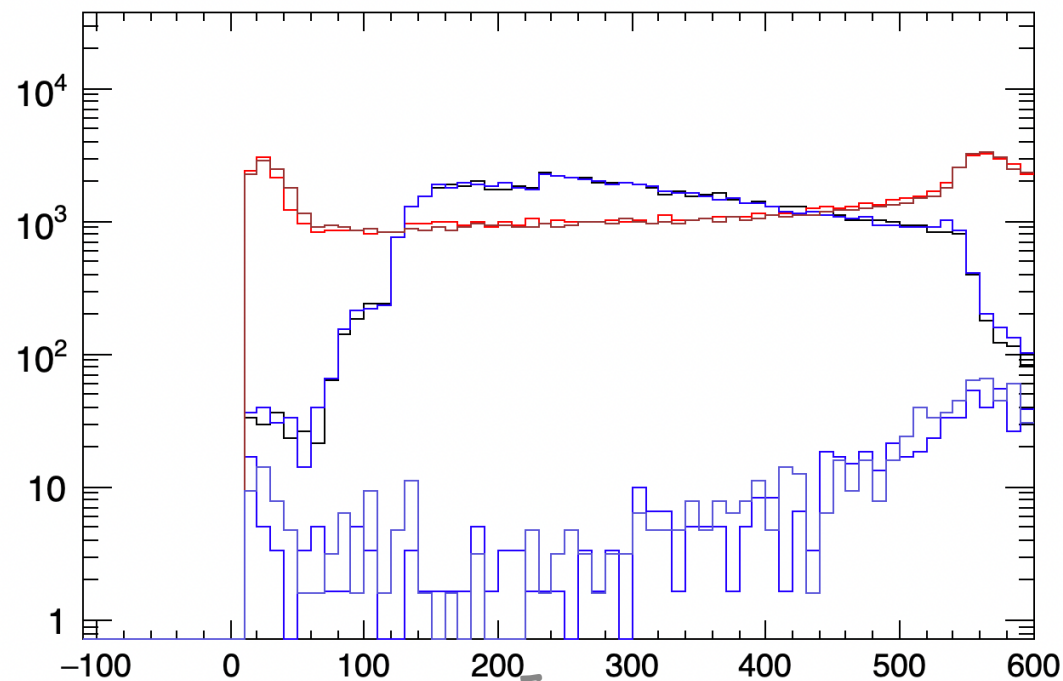
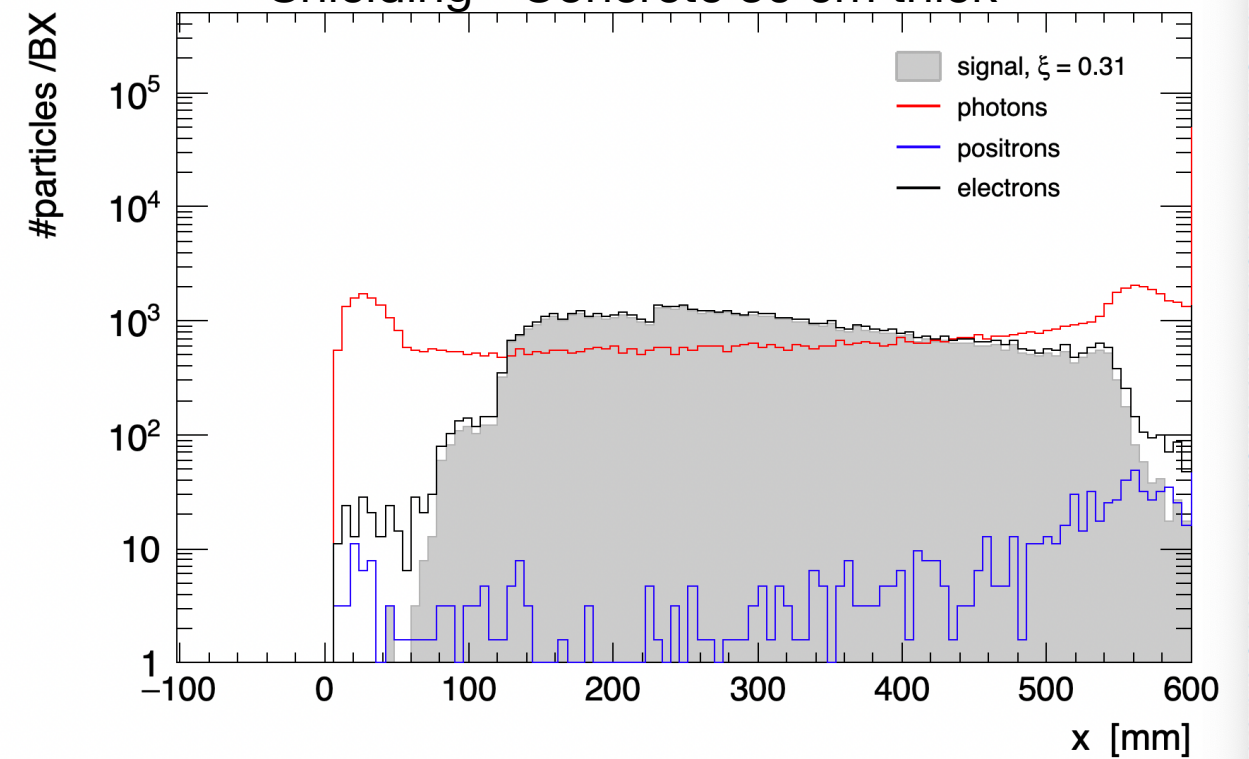
Comparing signal in lanex

MC HICS photon beam, $E_e = 16.5$ GeV
number_processed_bx: 4722

Shielding - 3-layer Al-Fe-Al 90 cm thick

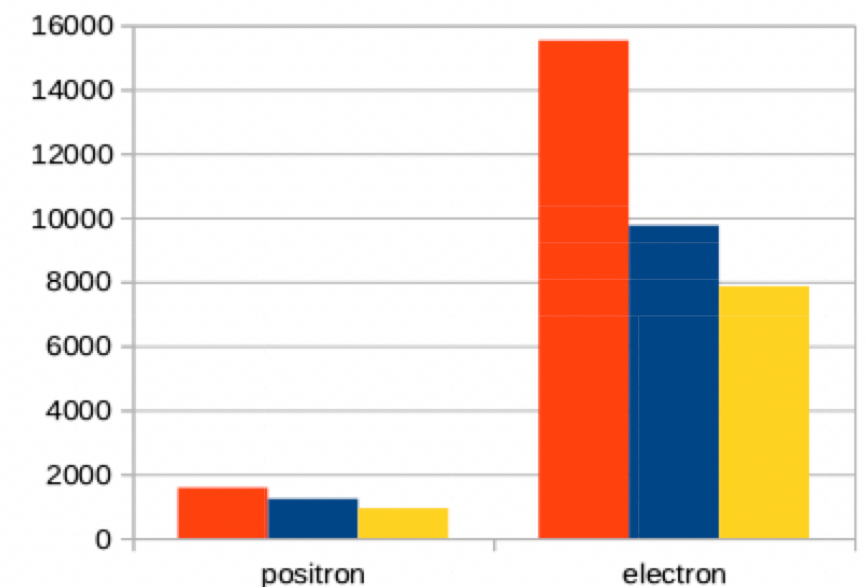
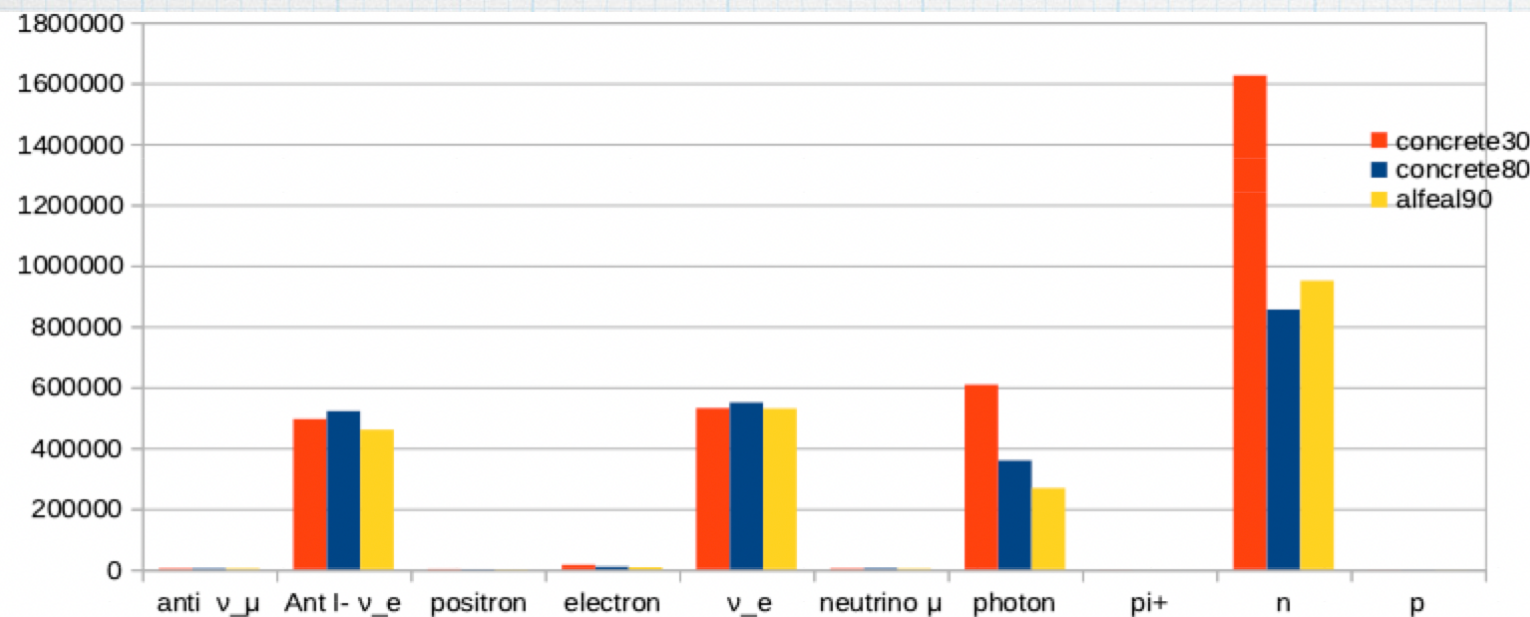
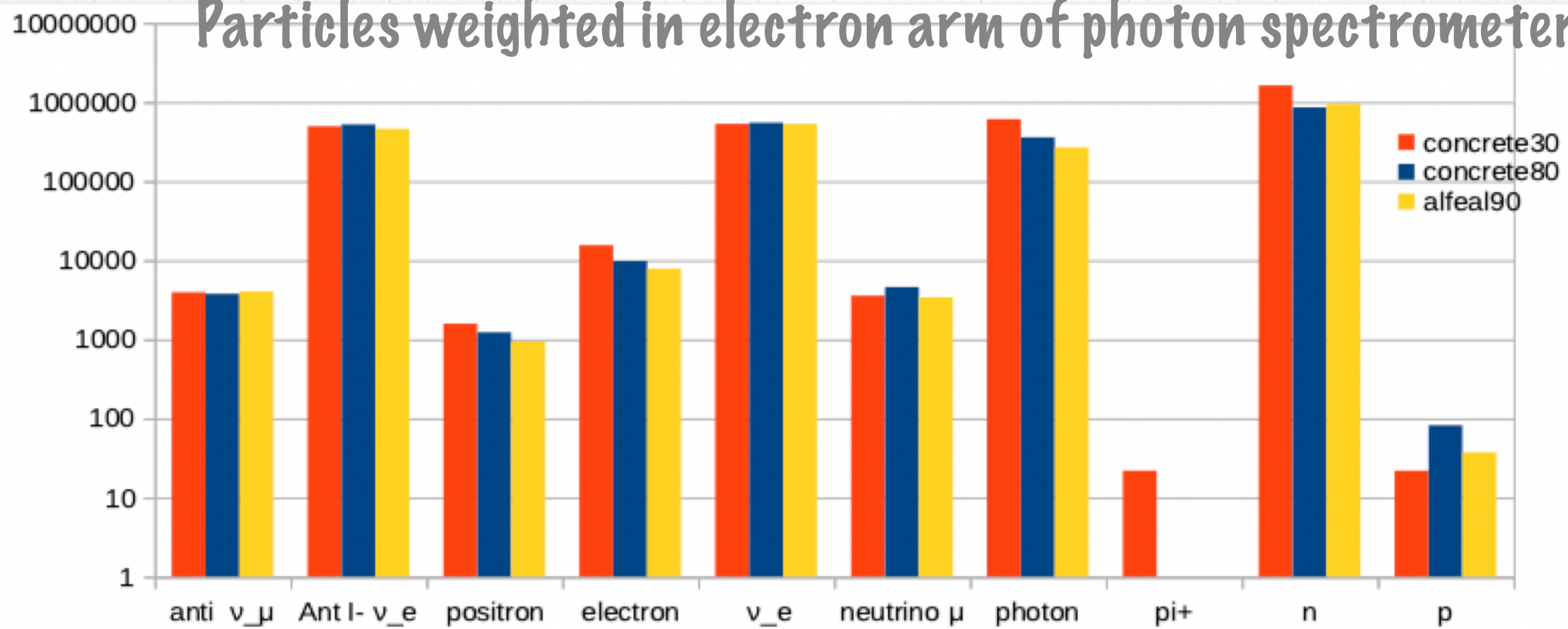


Shielding - Concrete 30 cm thick

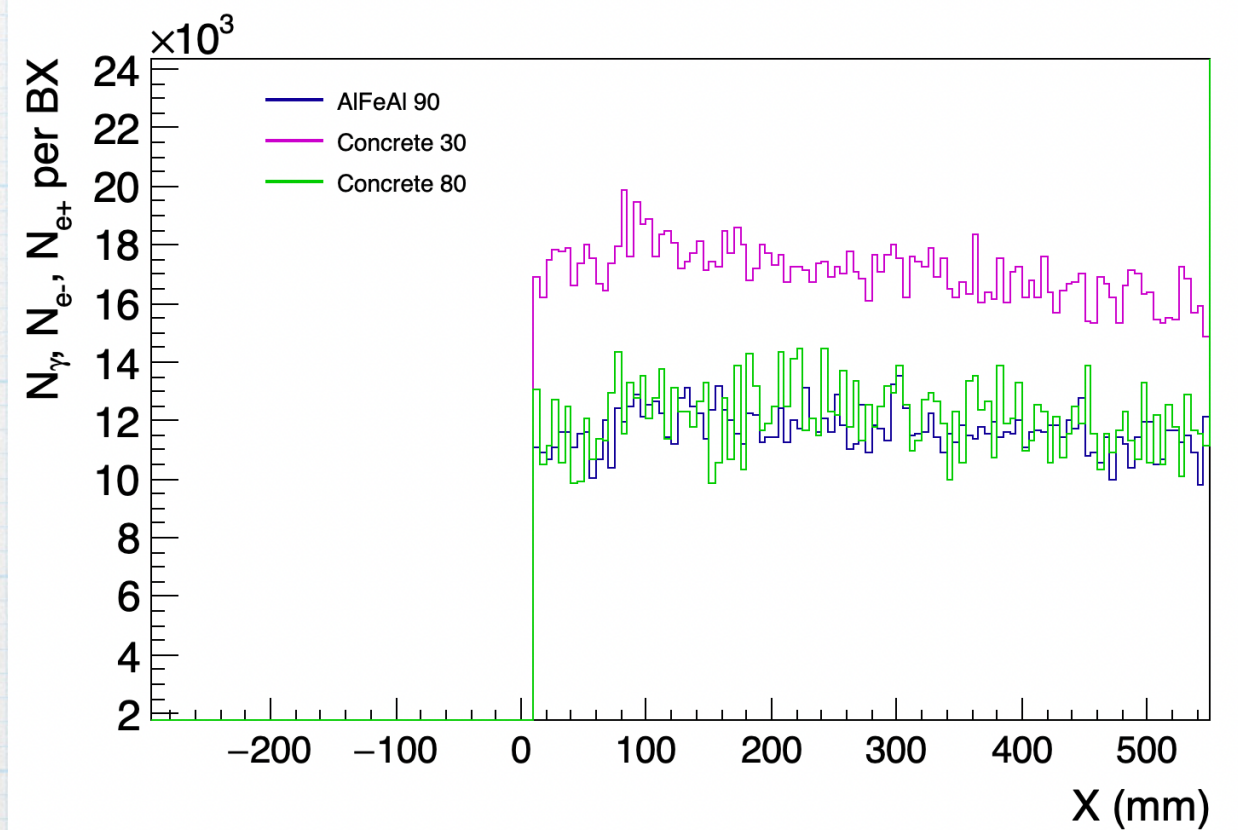
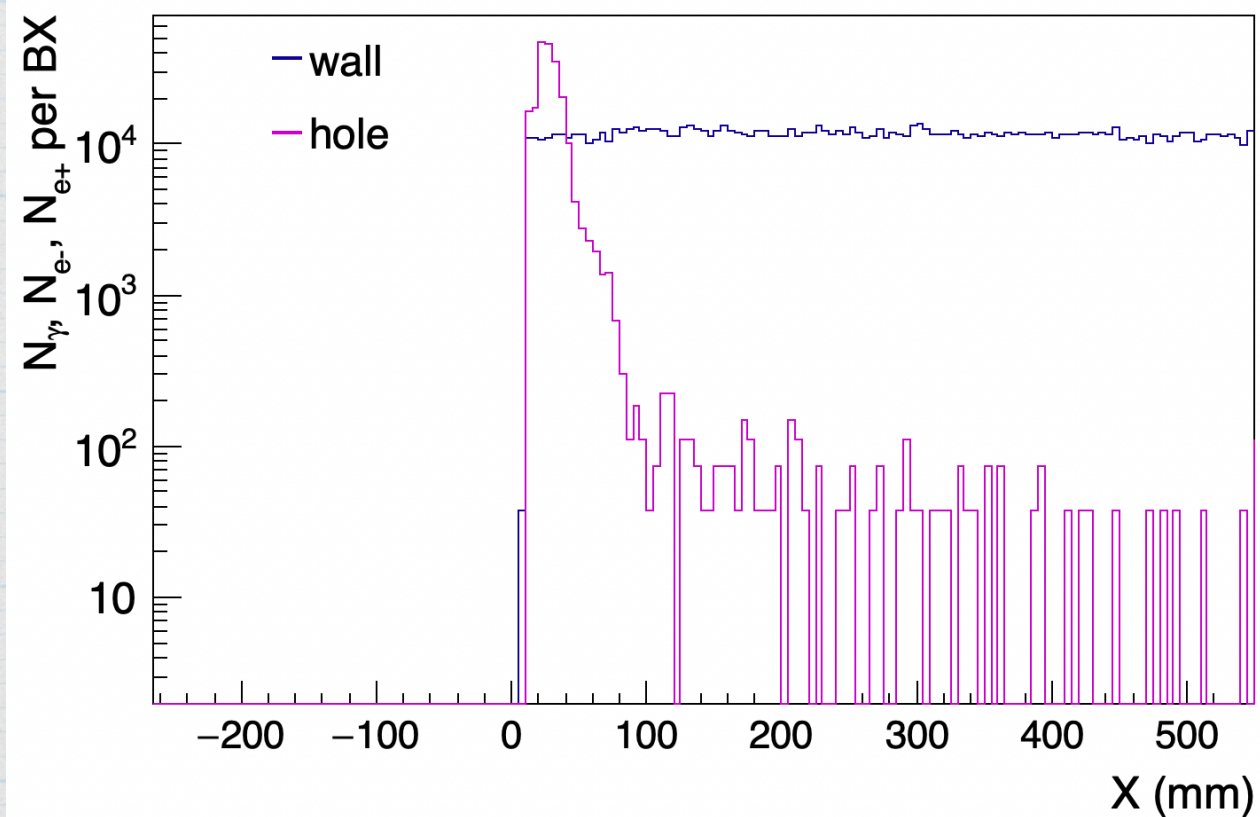
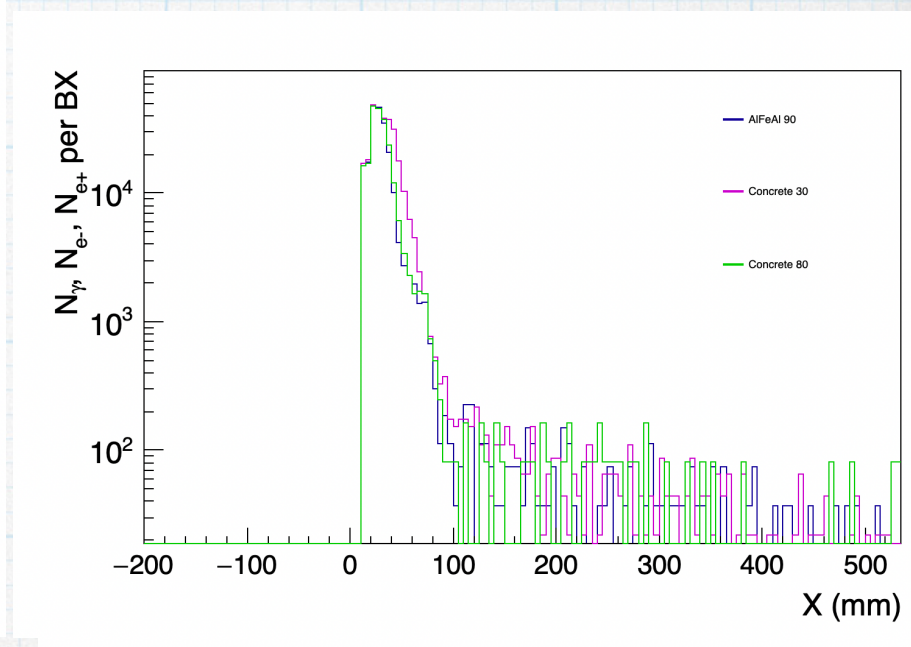
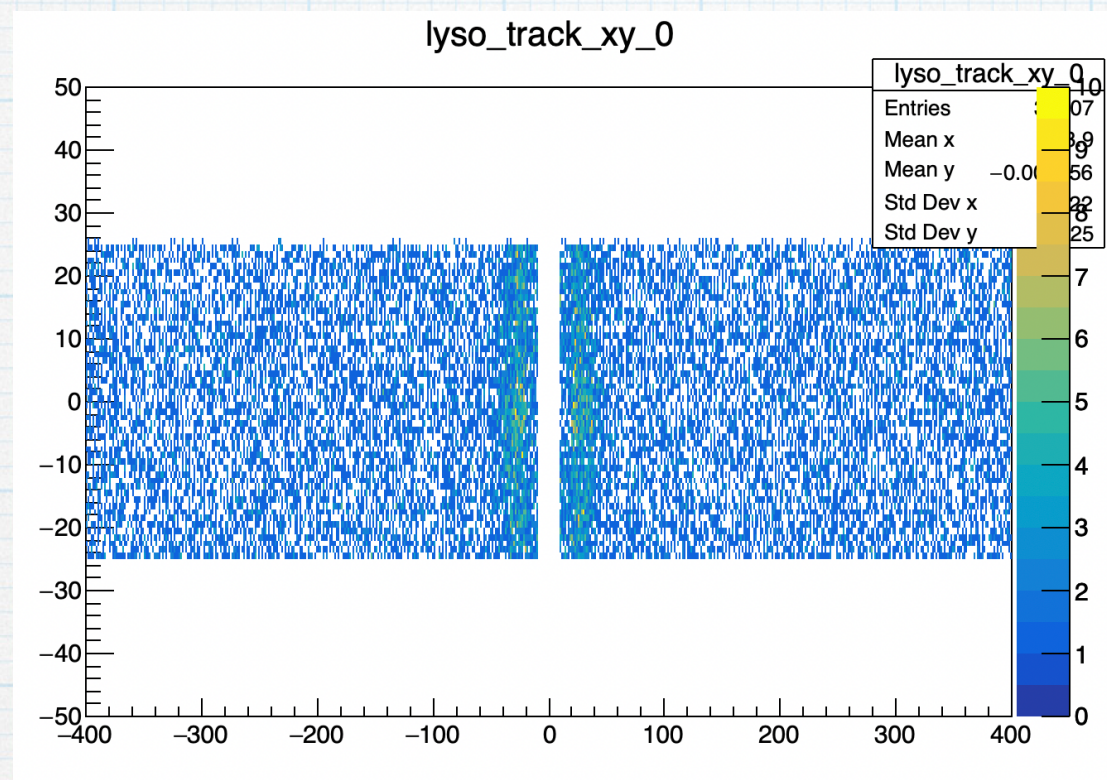
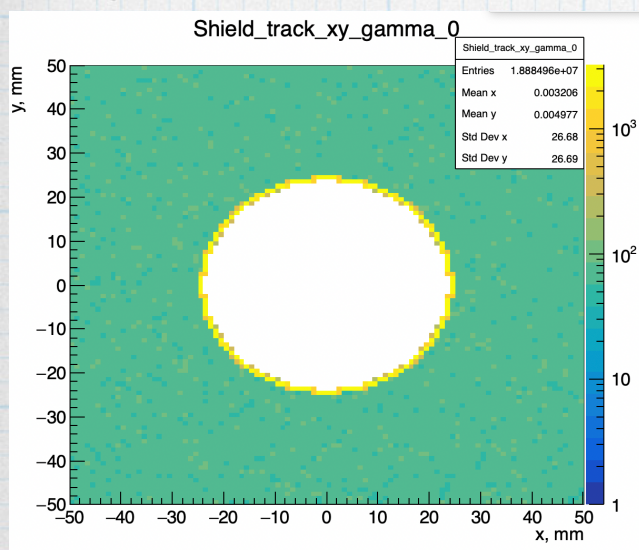


Comparing background in lanex

Particles weighted in electron arm of photon spectrometer per (BX):



Effect of the wall

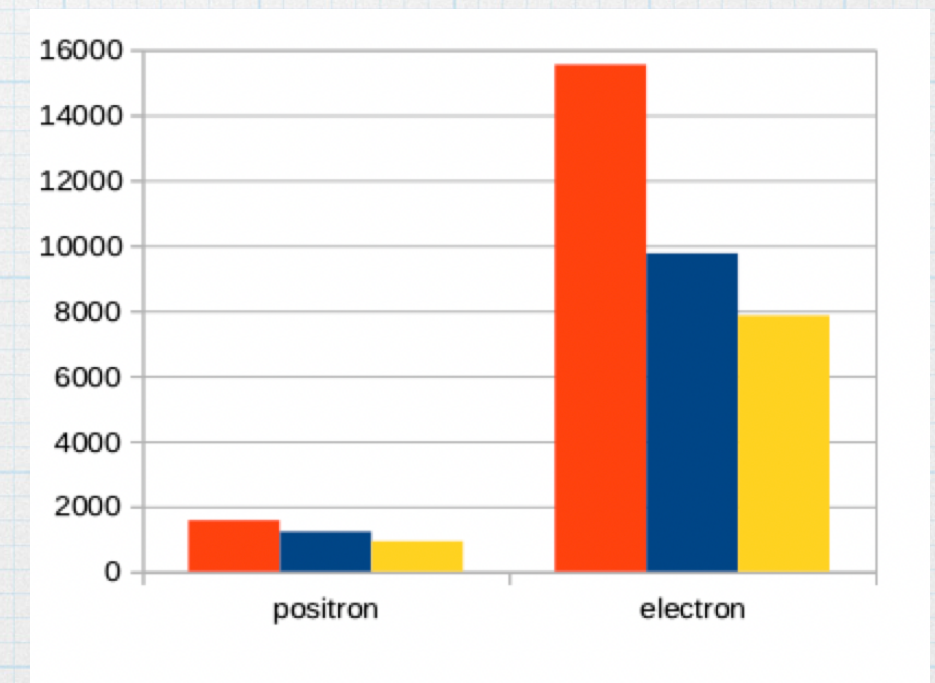
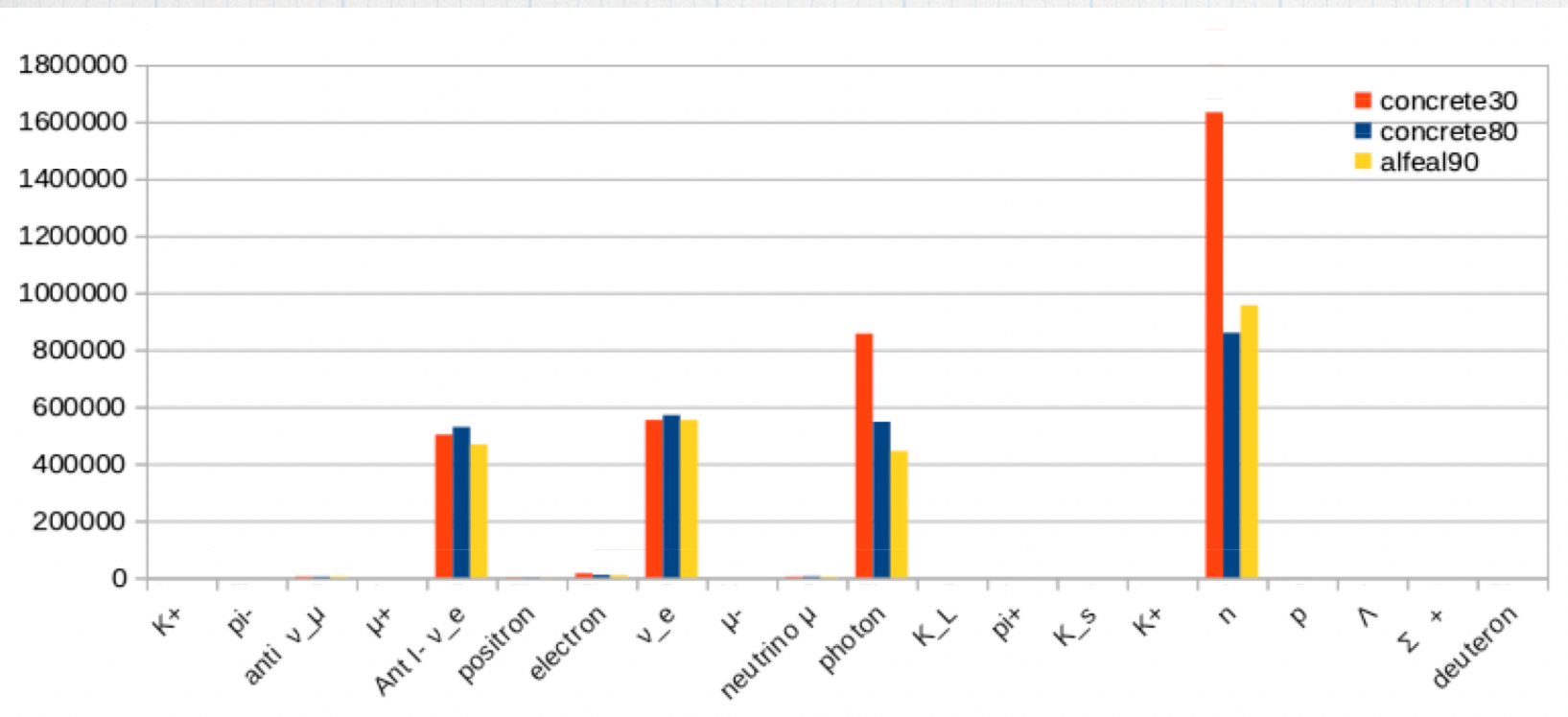
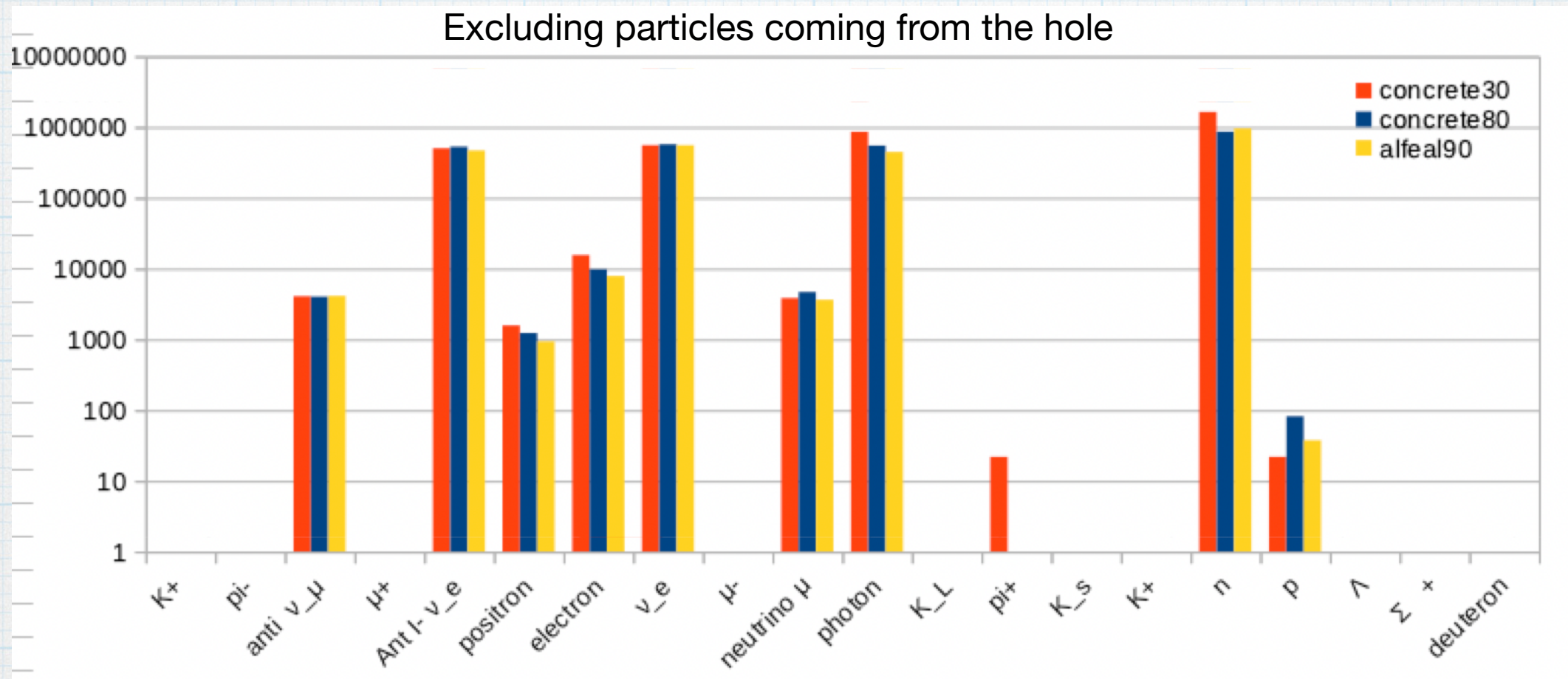


Outlook

- * Studied the dump induced background in the shielding and in the forward spectrometer
- * 3 thicknesses of the shielding and 3 different mono energies were compared
- * Compared Signal for concrete and composite wall - no big difference
- * Compared background: excluding particles coming directly from the hole the thickest shielding does the best job but effect is small, so the wall made of standard 80 cm concrete block seems to be the best choice.

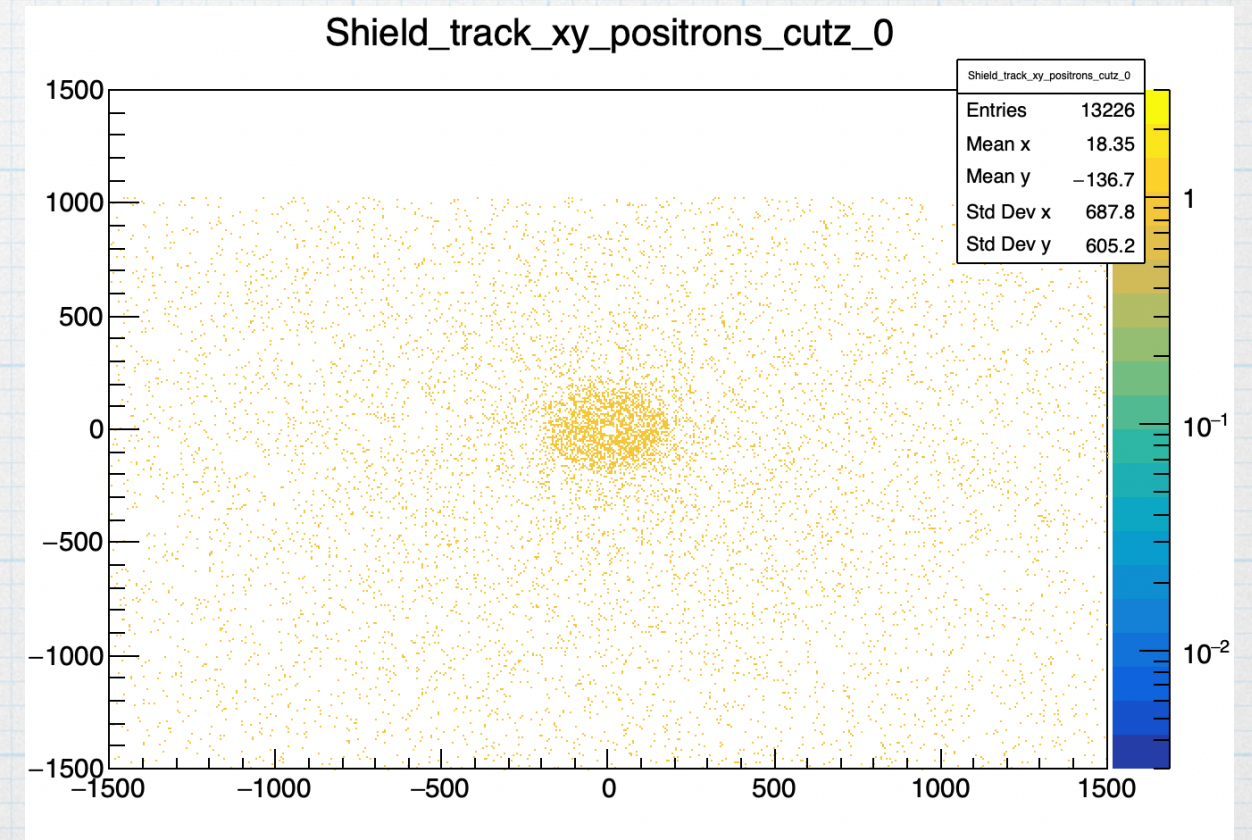
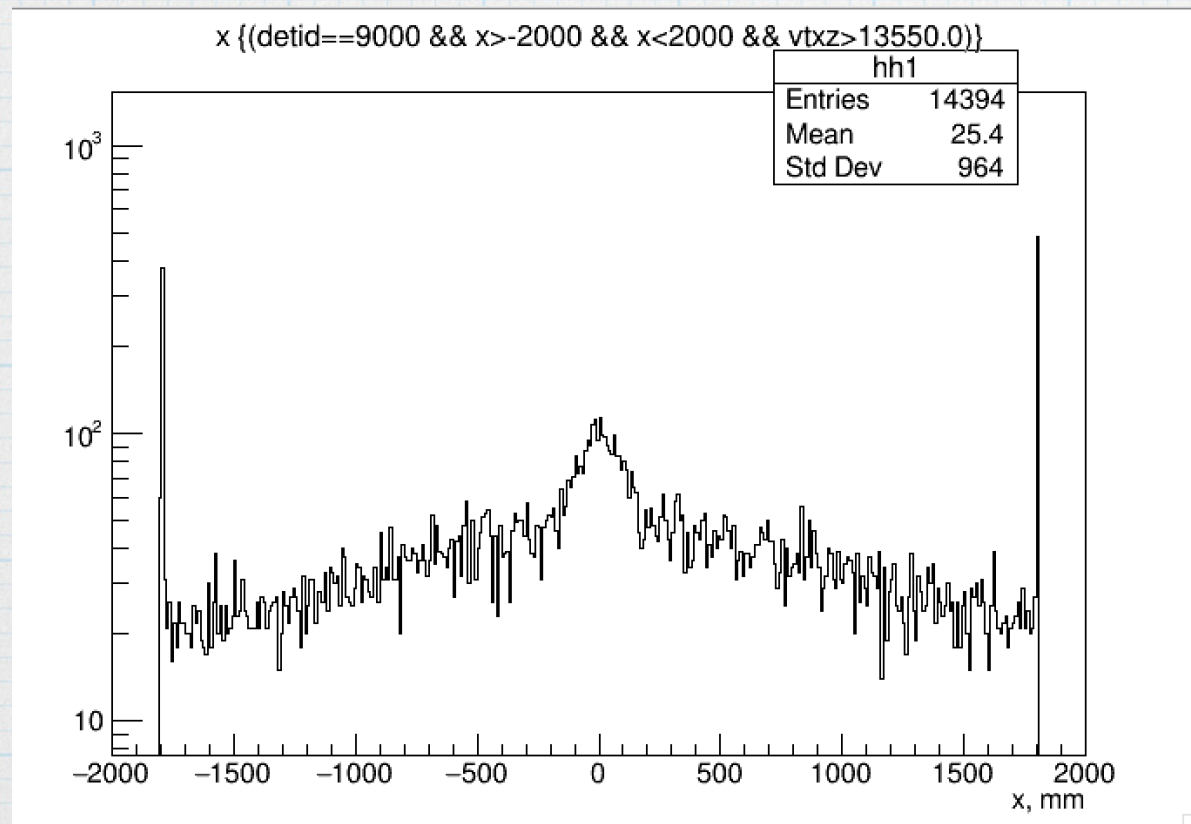
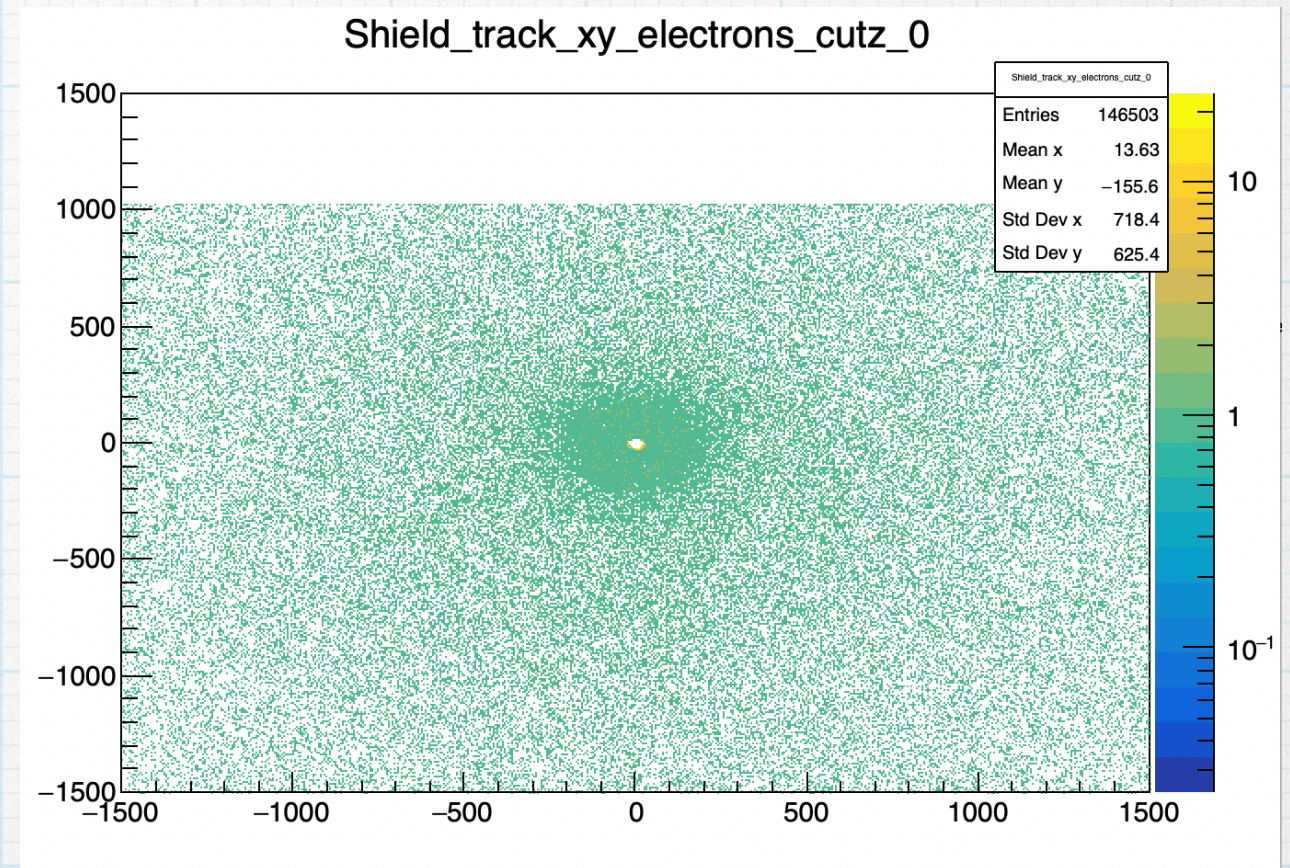
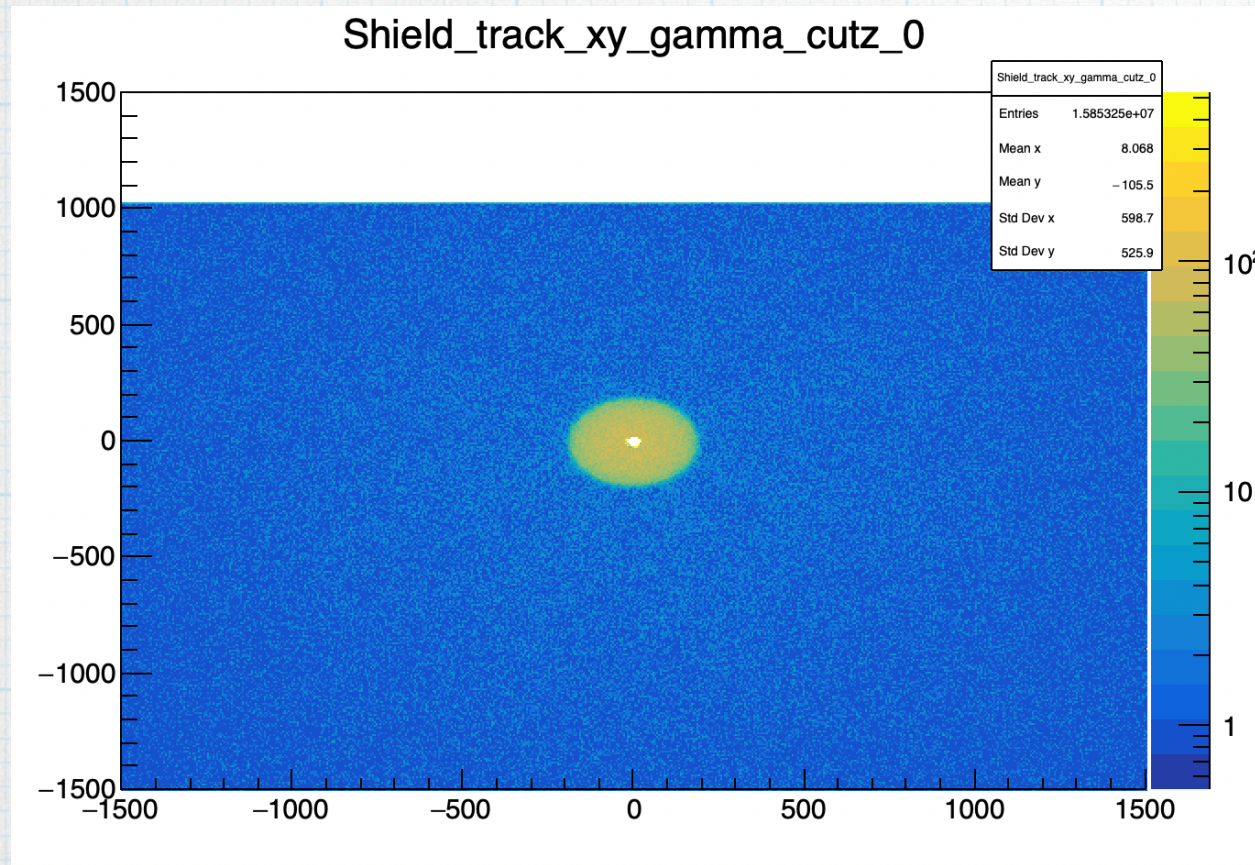
Back up

Comparing background in lanex



Tracks xy, rear surface

Shielding - Concrete 80 cm thick , 8 GeV



The source of background in FDS

* Background in the photon spectrometer depends on combined influence of the shielding and the design of the beam dump

Gamma dump modifications

Lanex

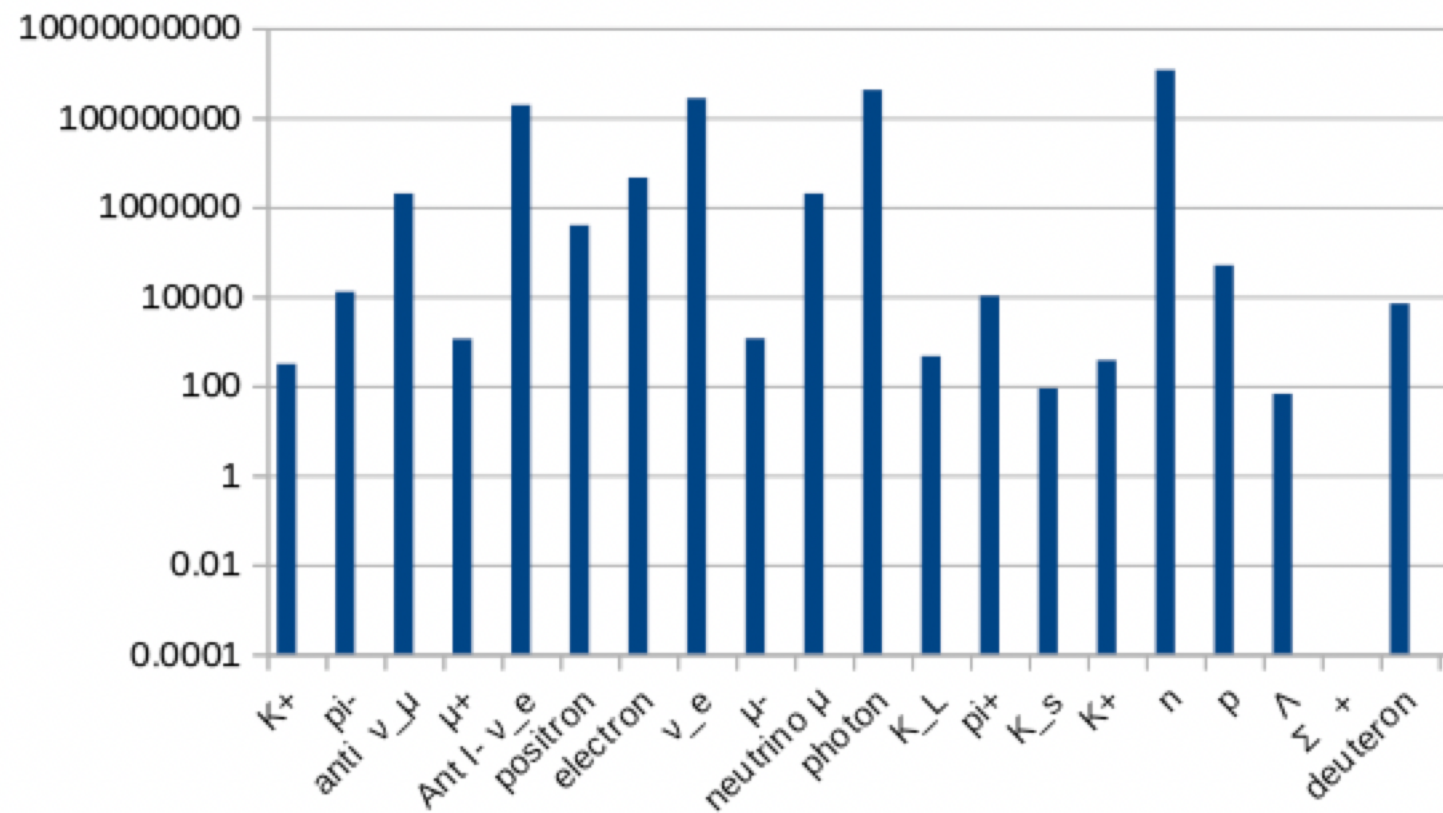
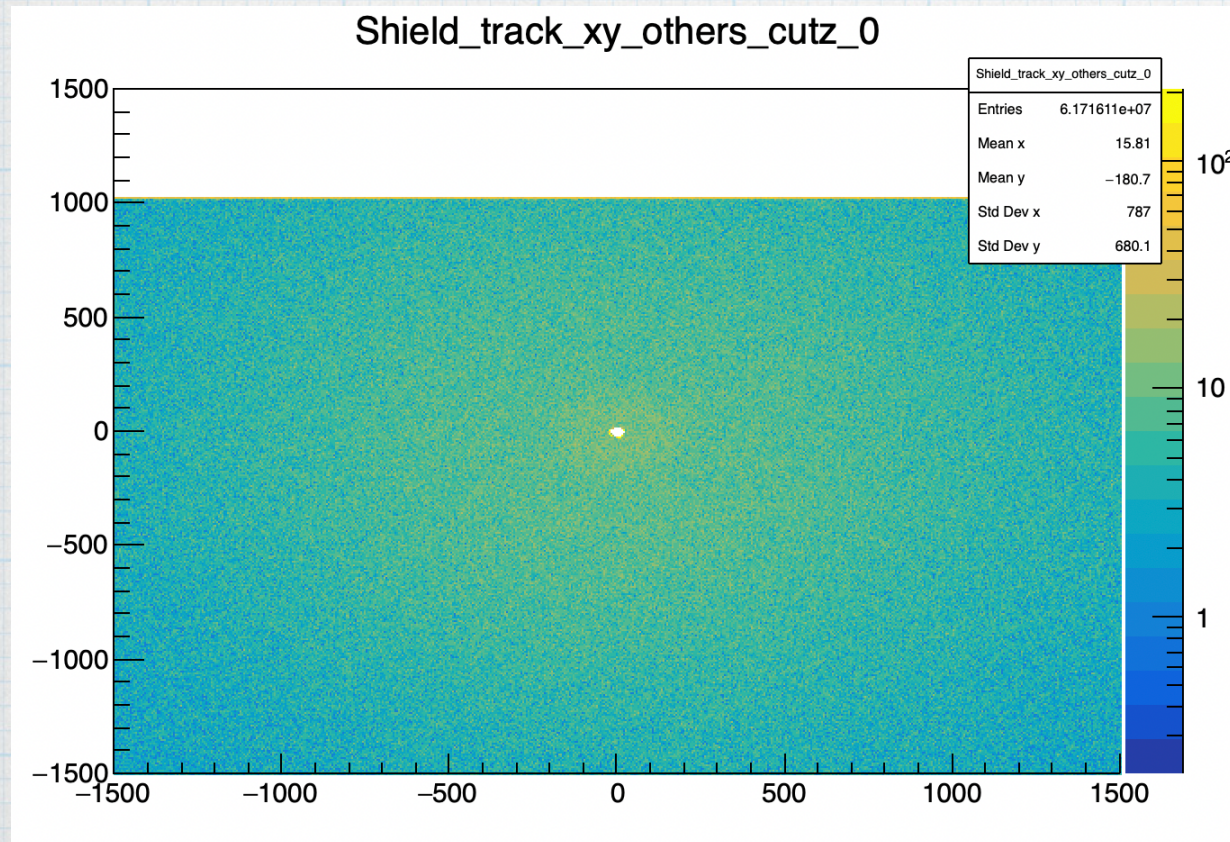
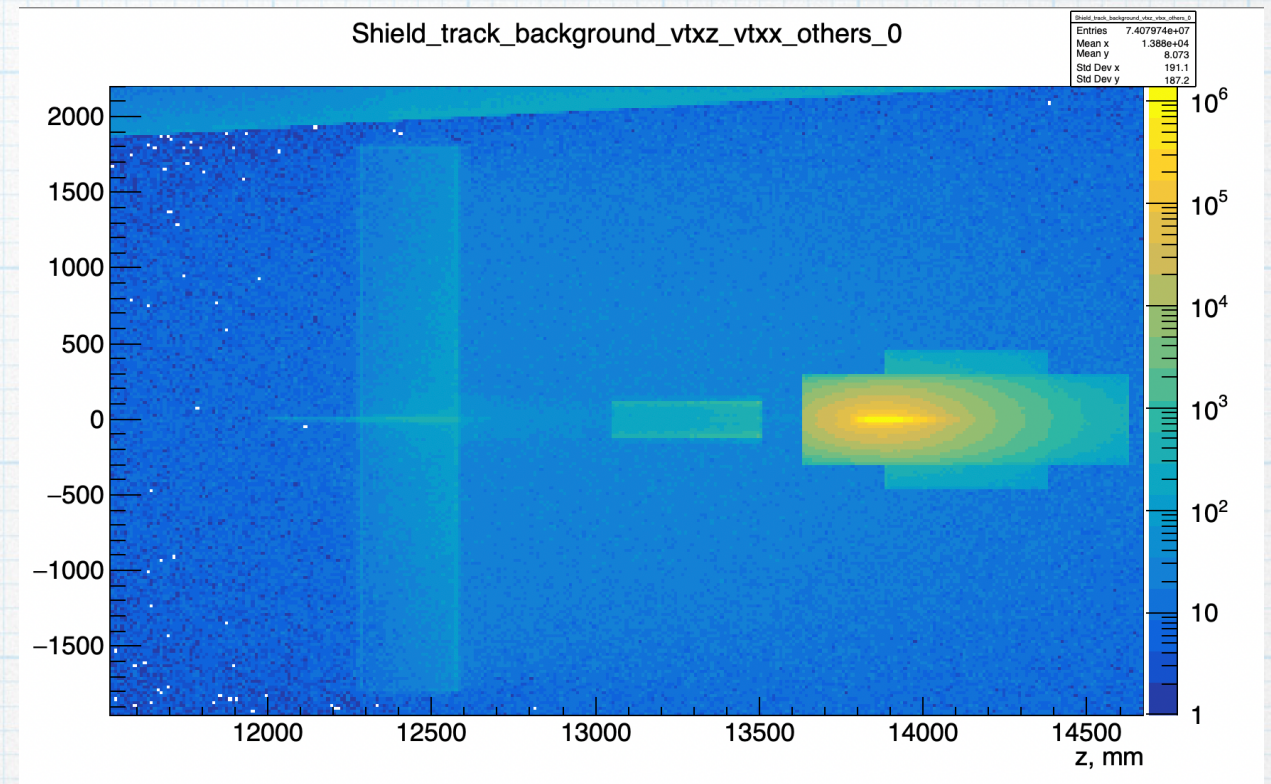
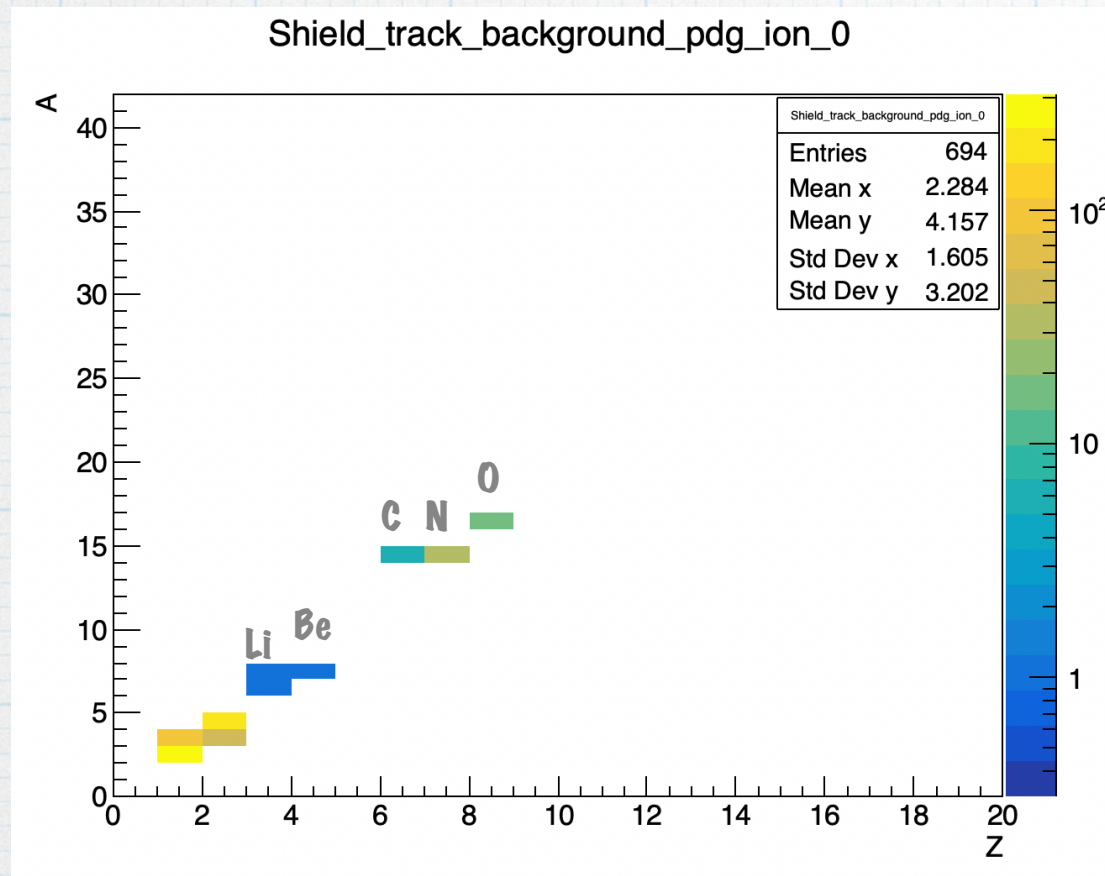
Shielding

GM

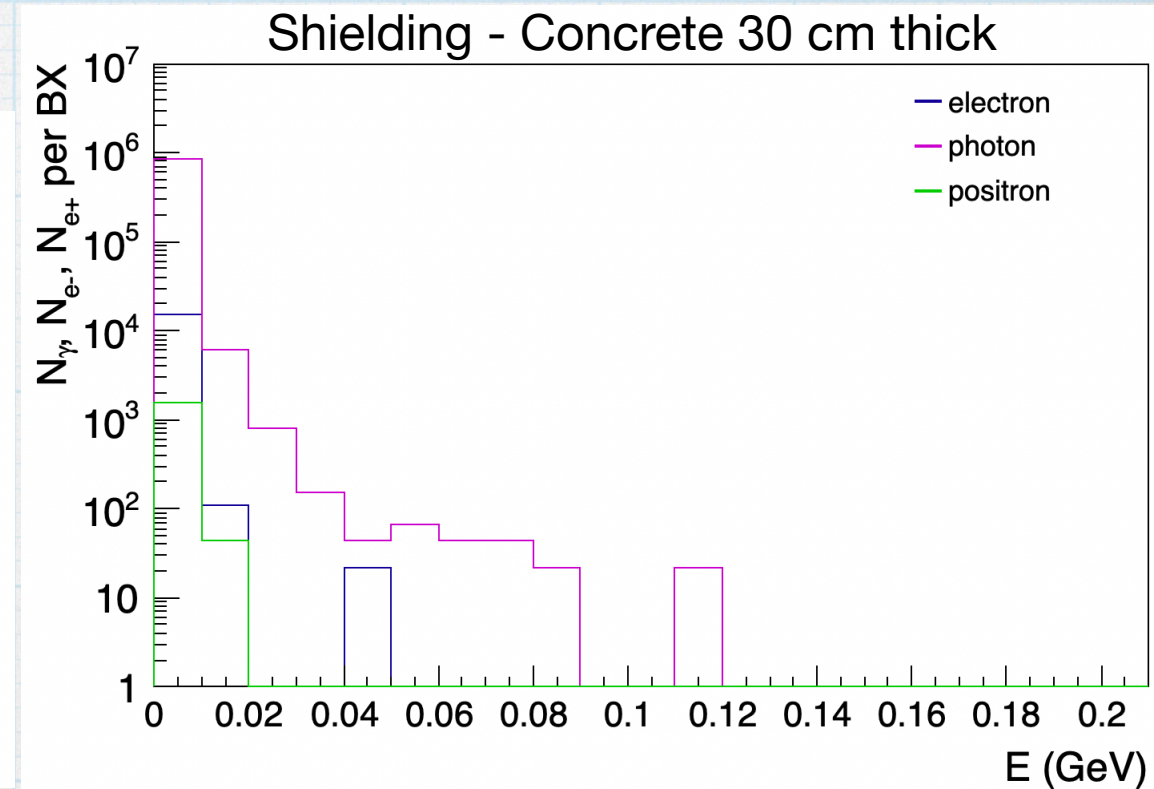
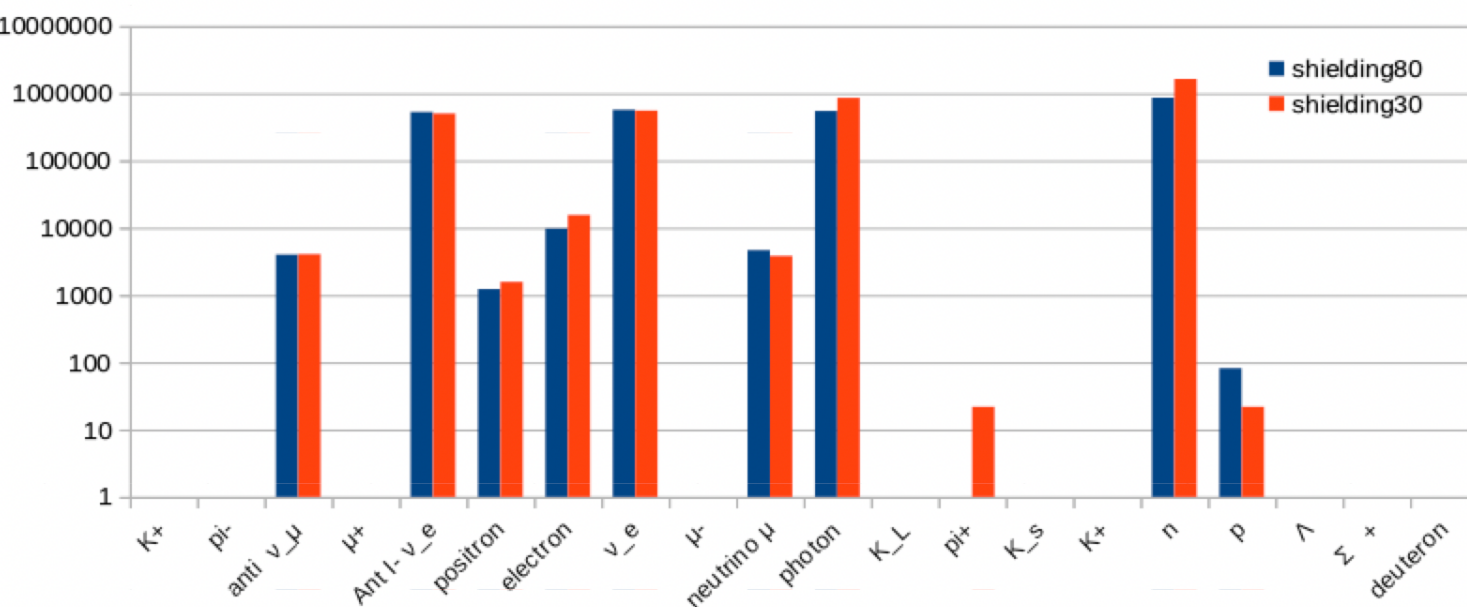
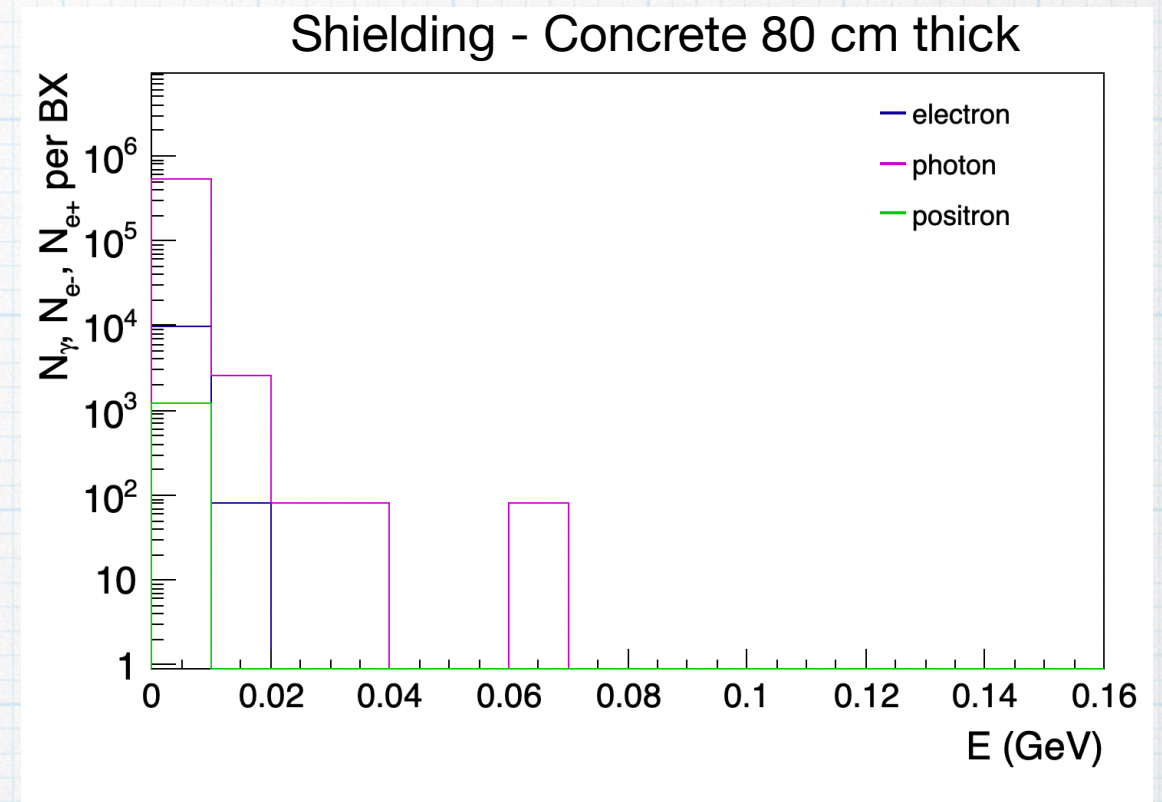
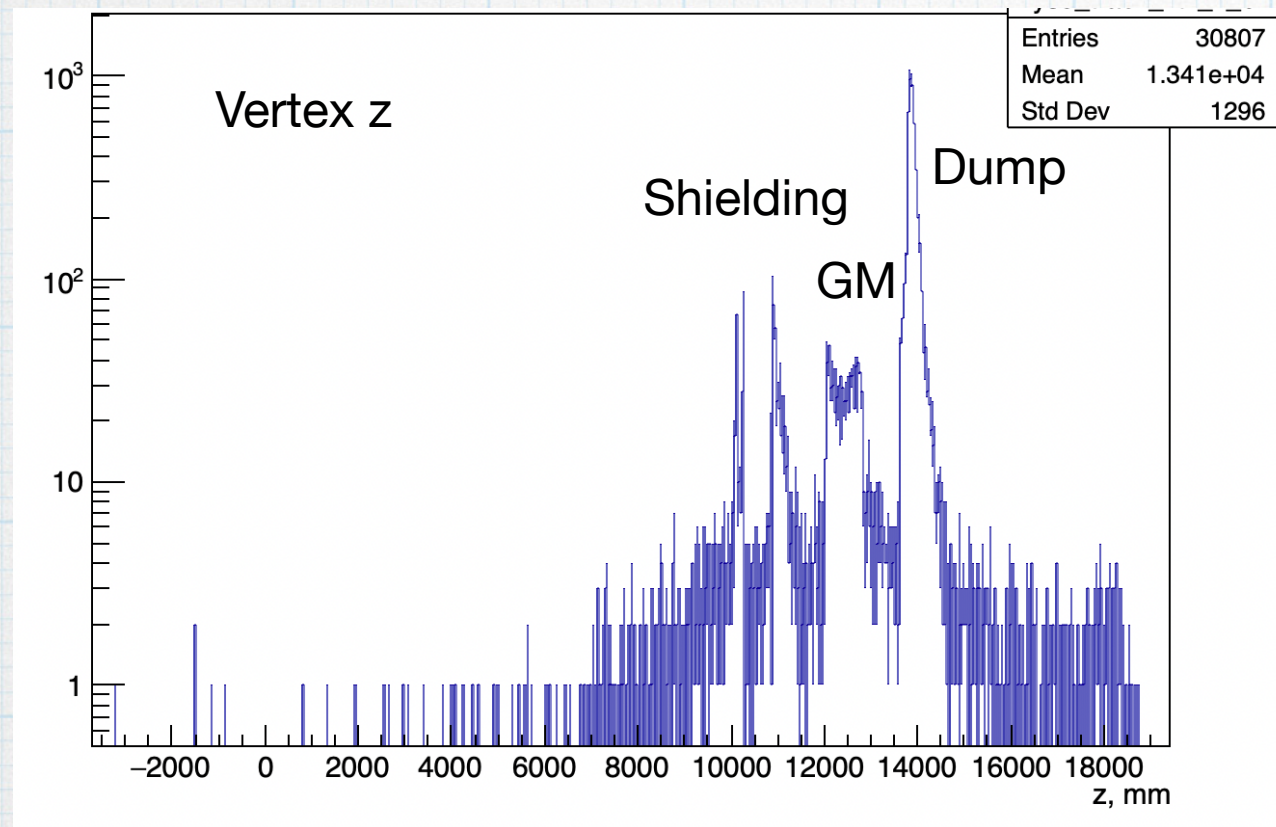
Dump

Ions & other particles in Shielding

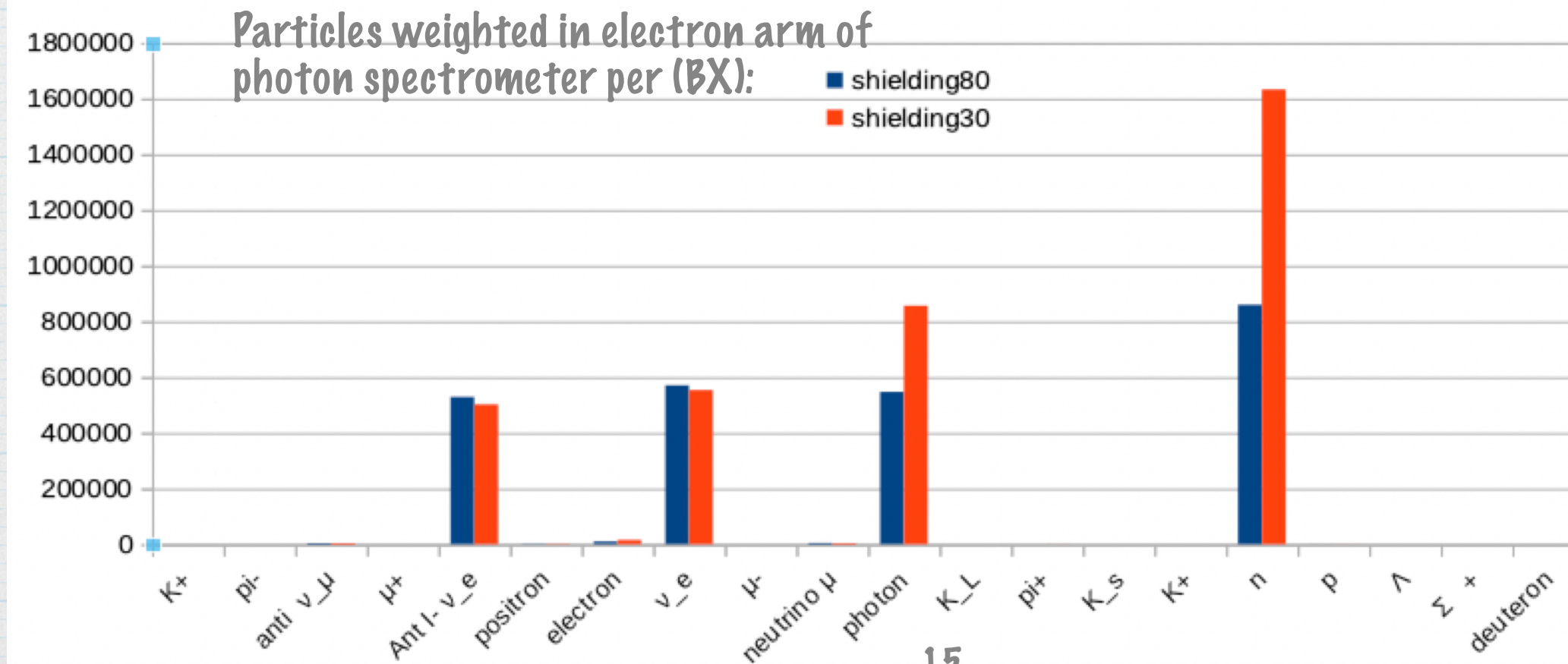
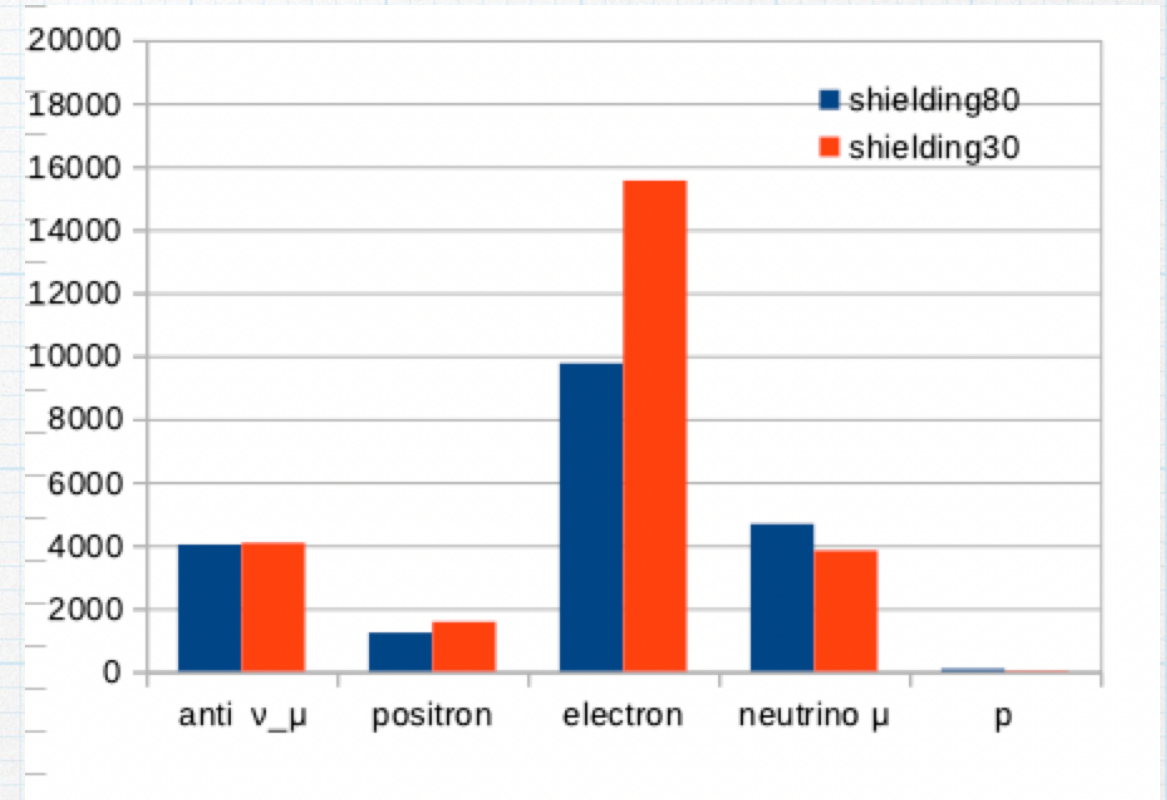
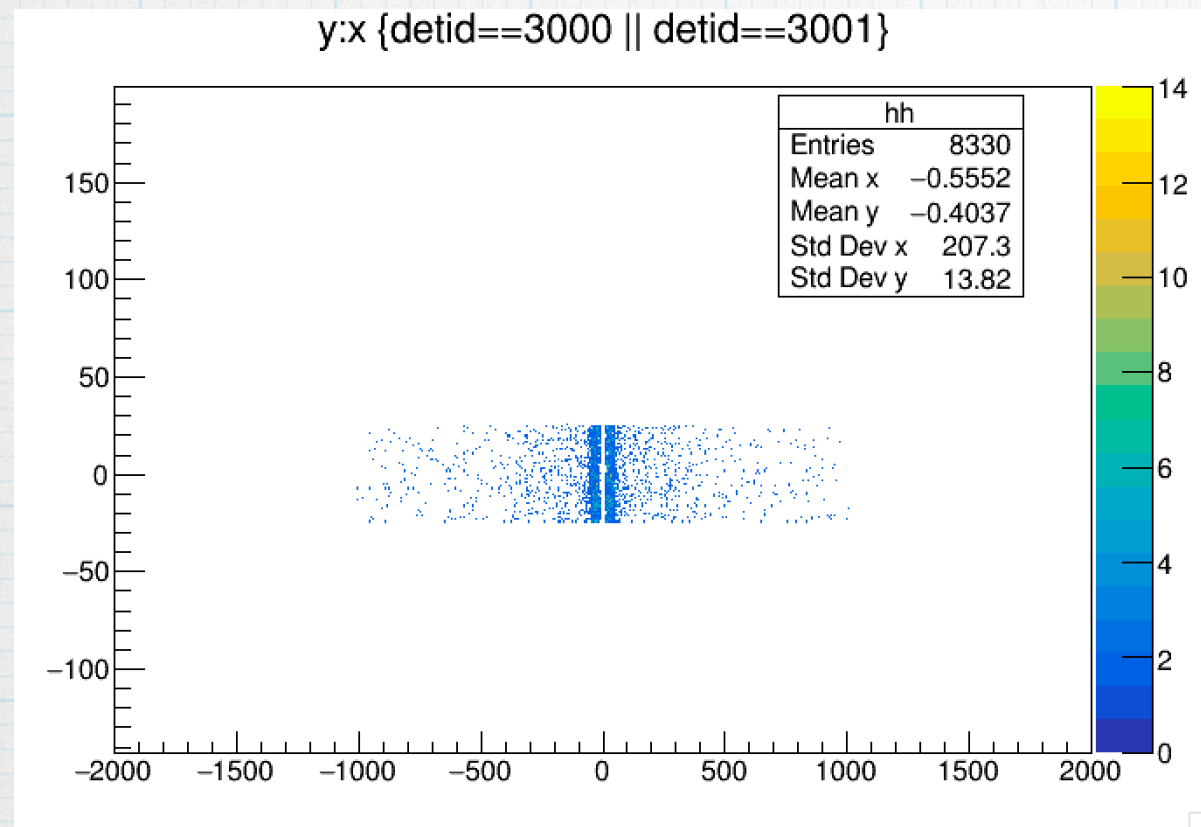
Shielding - Concrete 30 cm thick



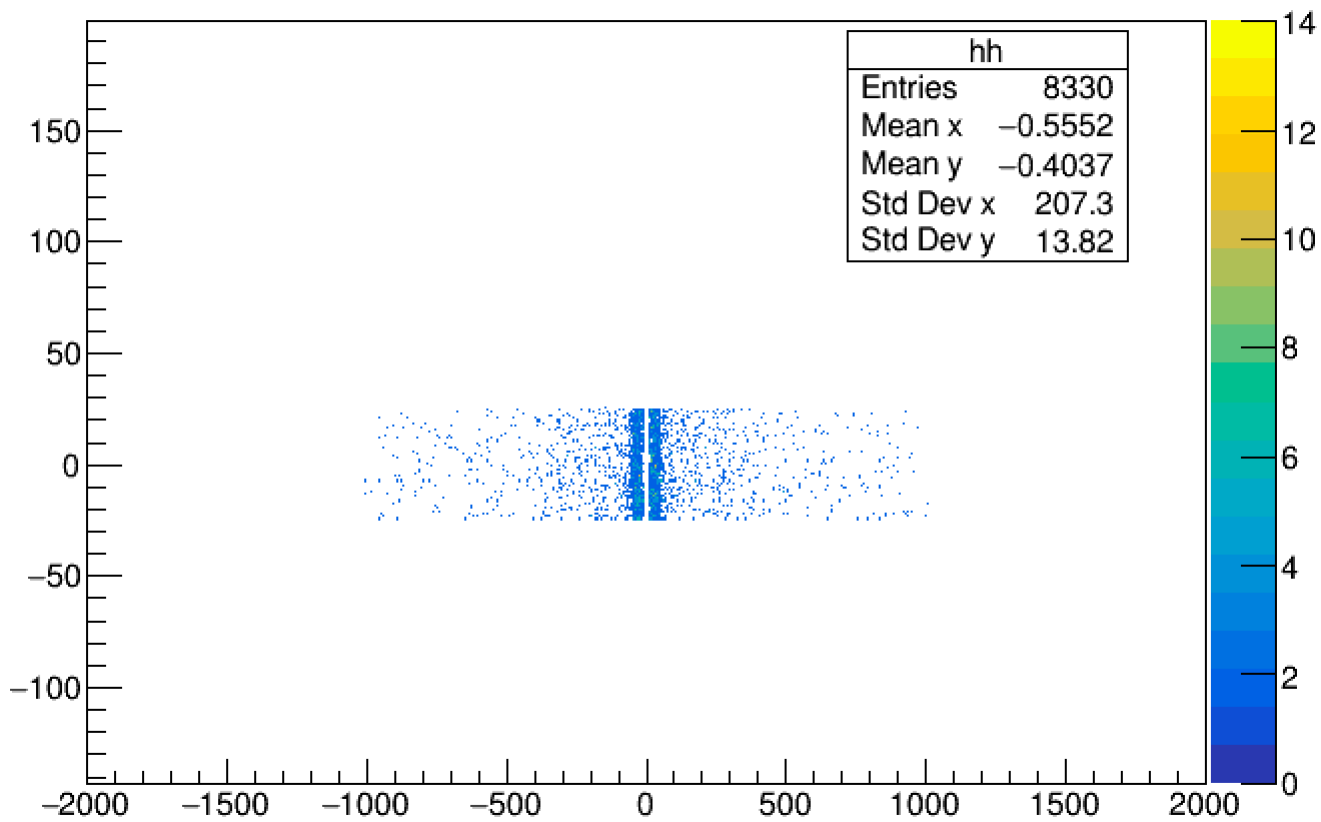
Dump induced background in photon spectrometer



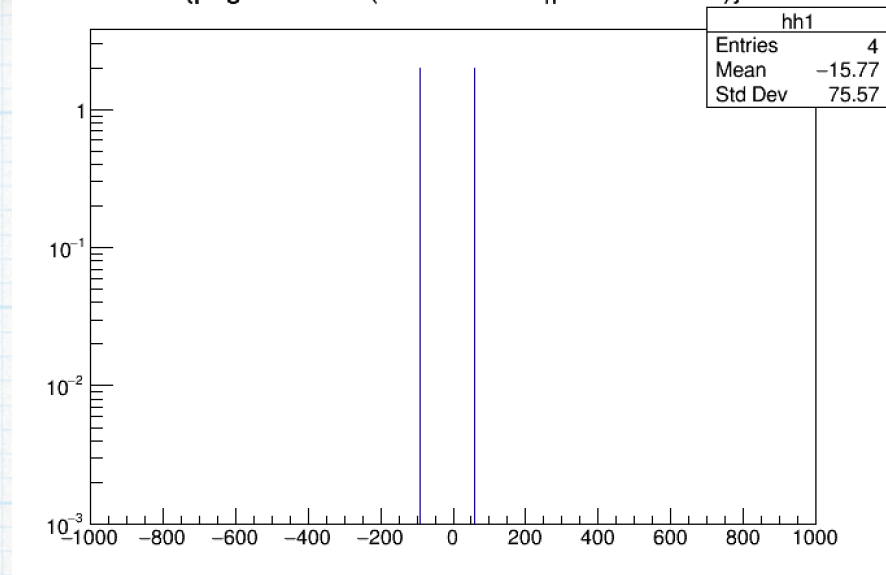
Dump induced background in photon spectrometer



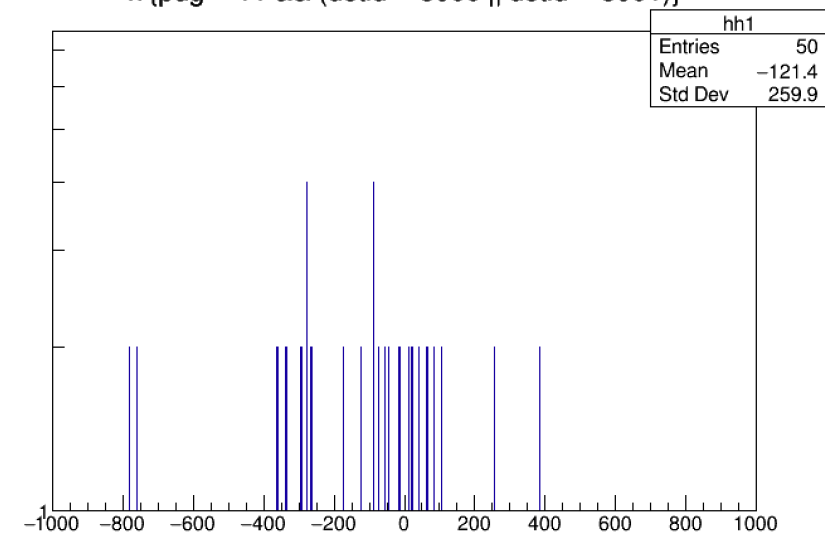
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x {pdg==11 && (detid==3000 || detid==3001)}

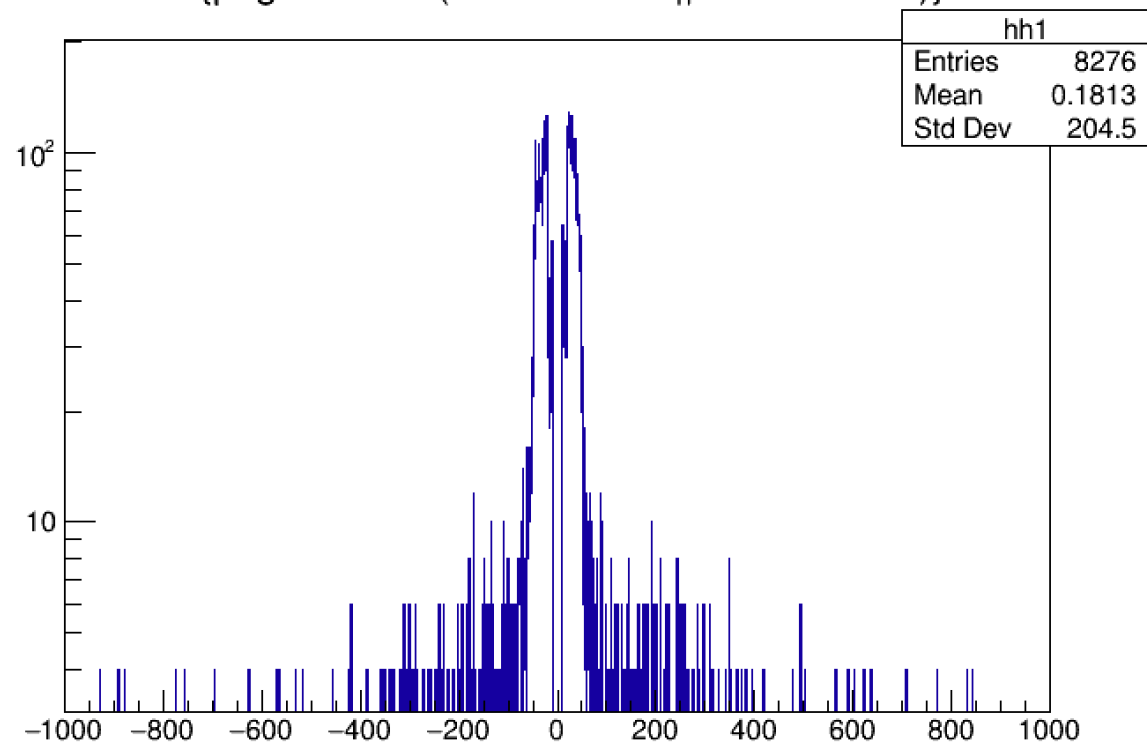


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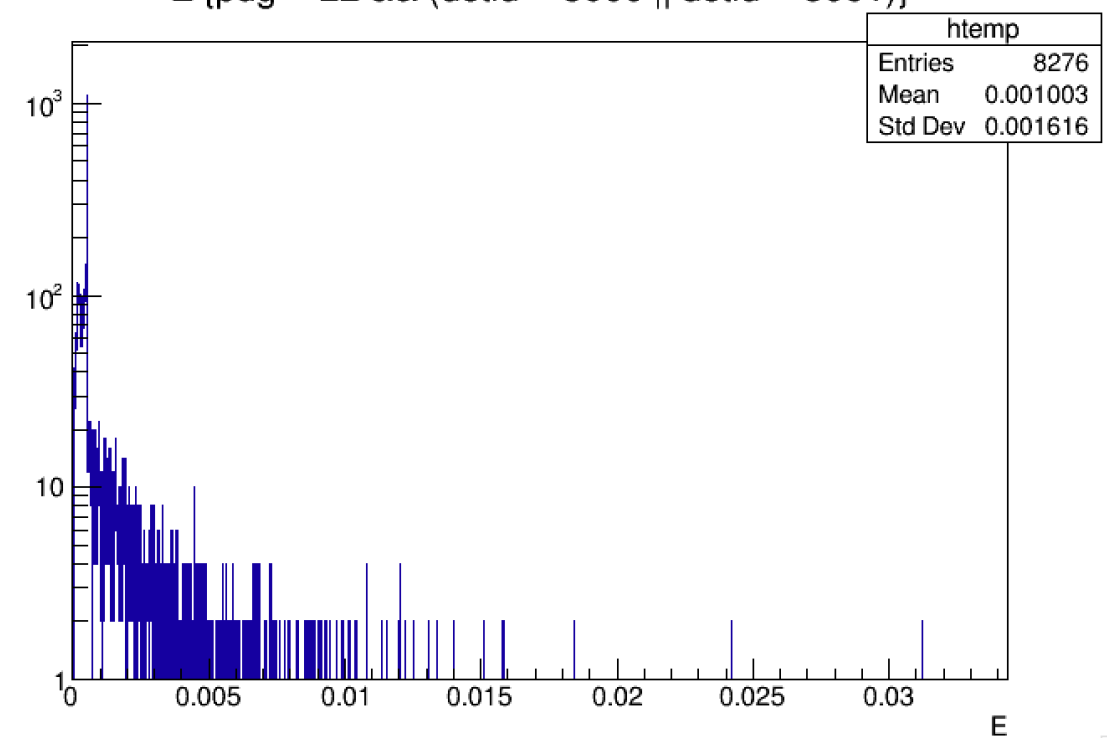


Mono photon beam, E = 8 GeV

x {pdg==22 && (detid==3000 || detid==3001)}

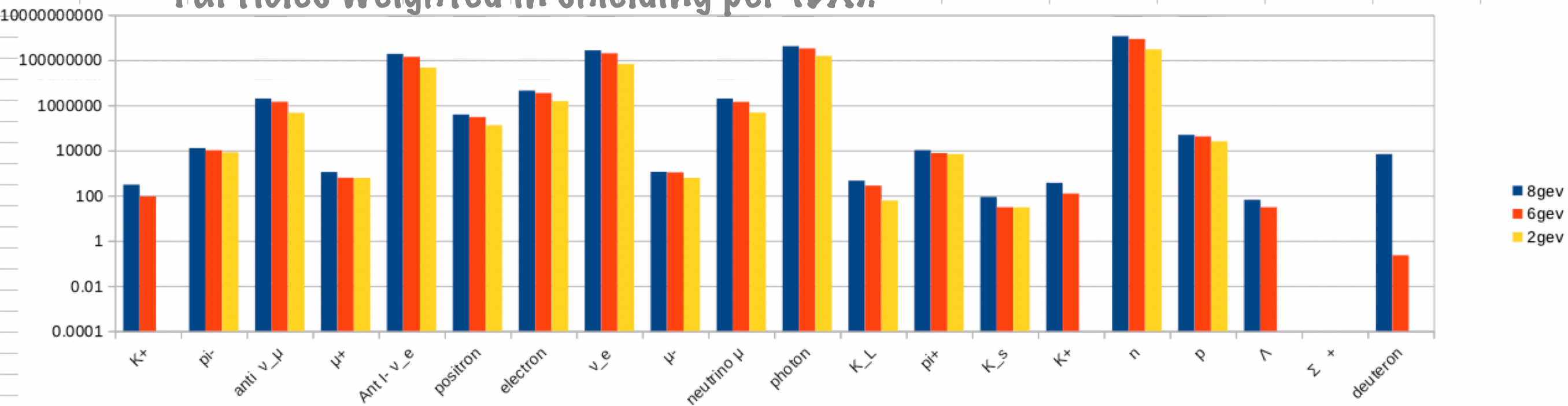


E {pdg==22 && (detid==3000 || detid==3001)}

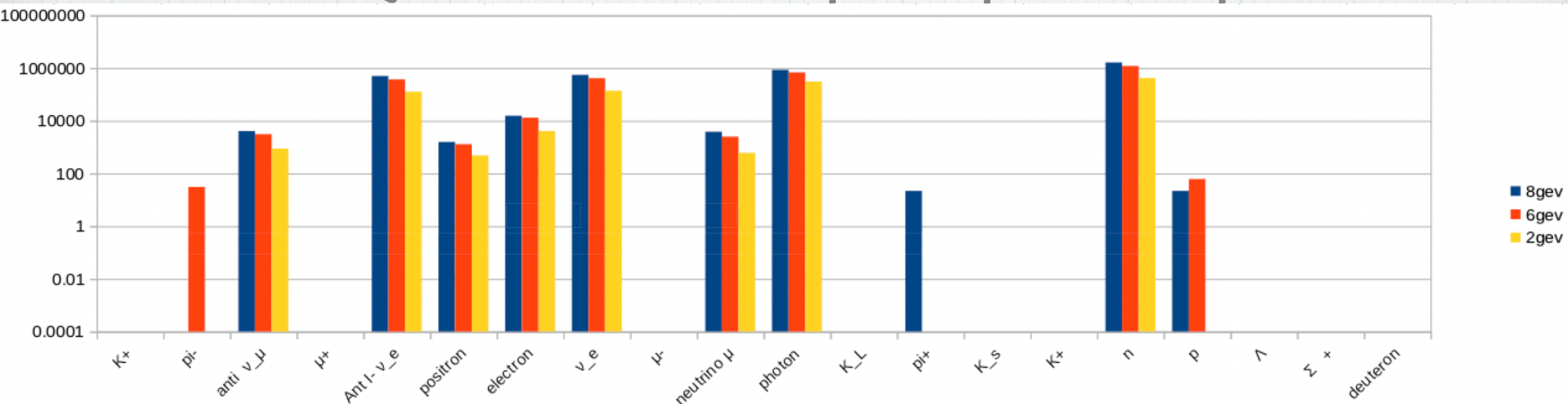


Energy dependence

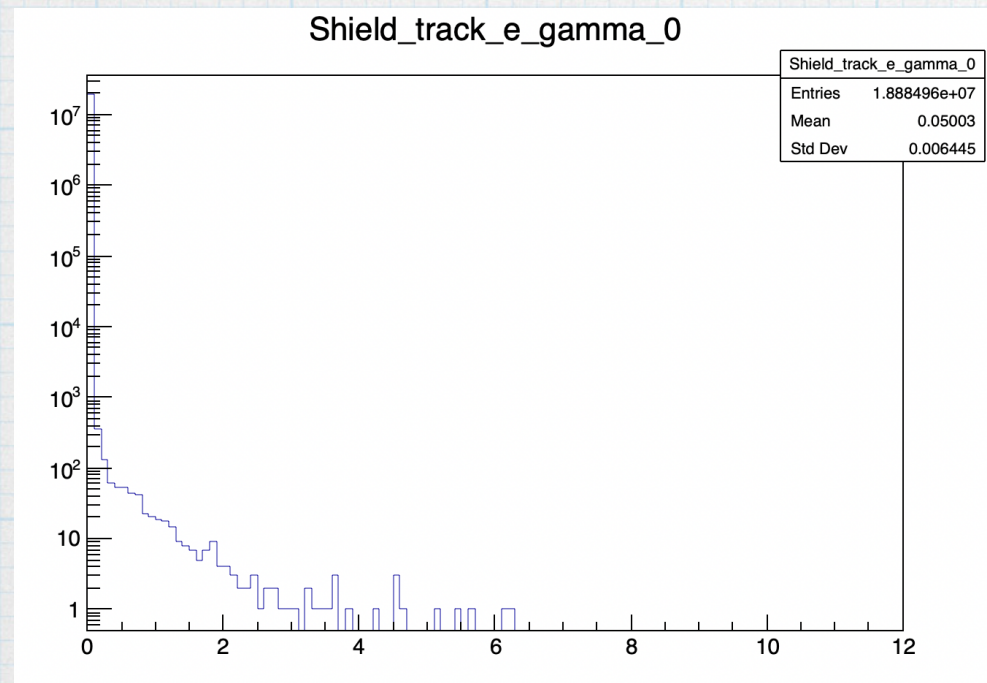
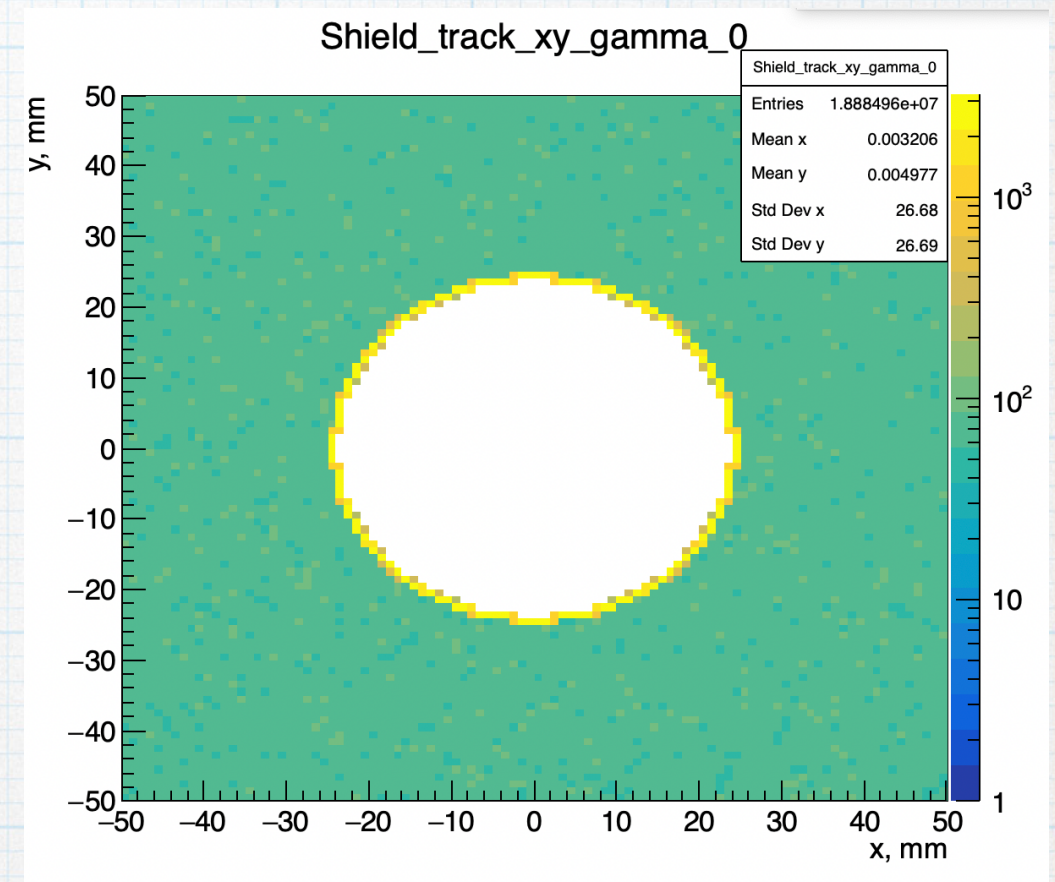
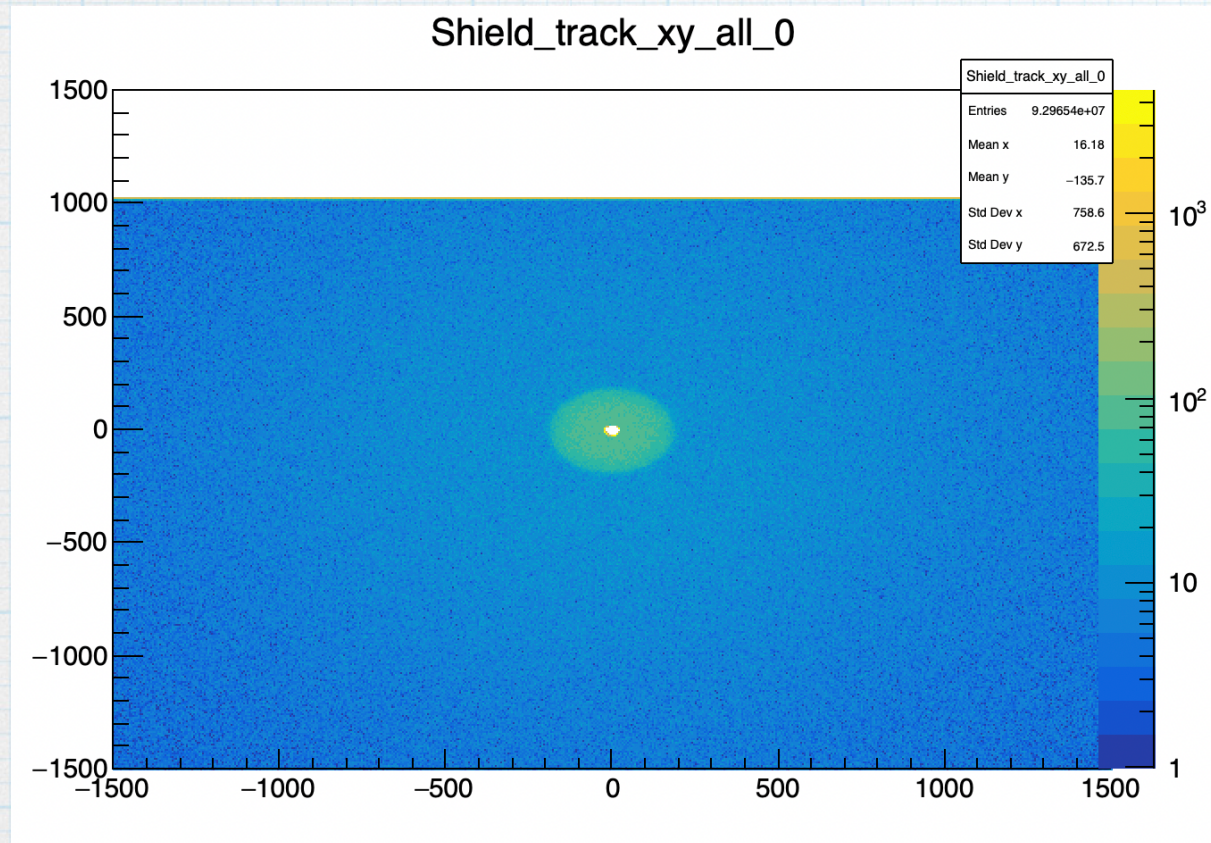
Particles weighted in shielding per (BX):



Particles weighted in electron arm of photon spectrometer per (BX):



Tracks at the front plane of Shielding



In shielding

Shield_track_background_pdg_ion_0

