

Klong_hits8a

November 23, 2024

1 Klong beam simulation: GlueX detector hits, take 8 (cylindrical beam pipe shielding)

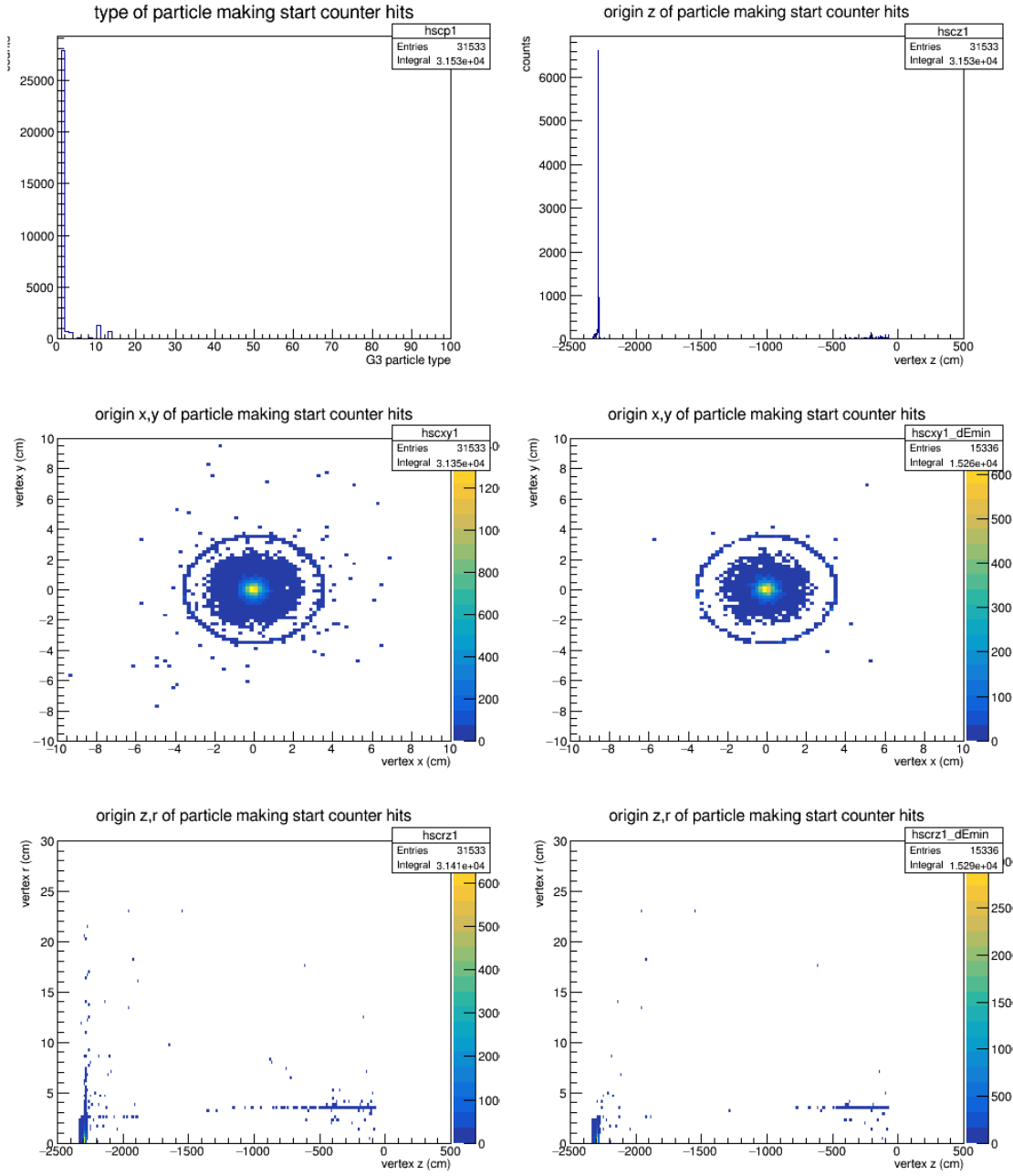
In previous studies of the Klong beam simulation, the focus was on the flux of particles of different kinds at the entry to the GlueX detector. Initial results showed that the principal background components are

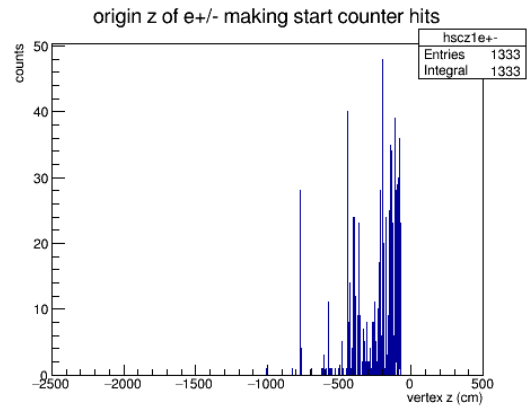
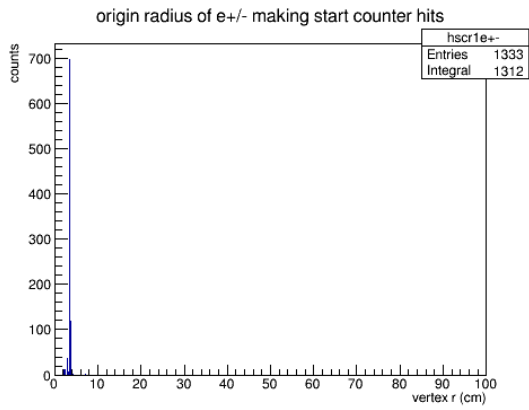
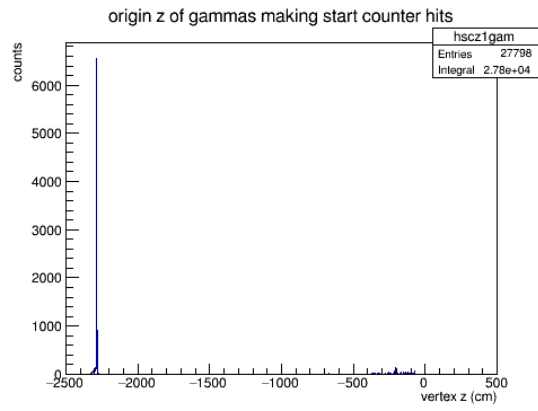
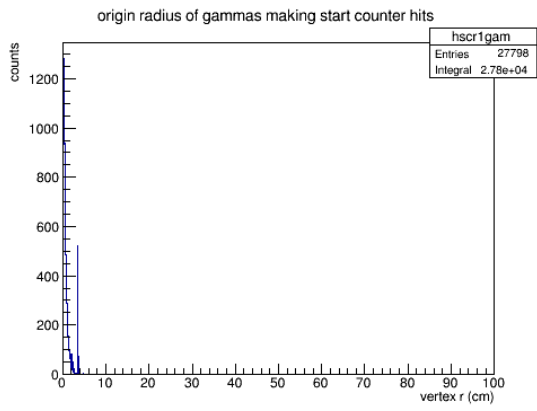
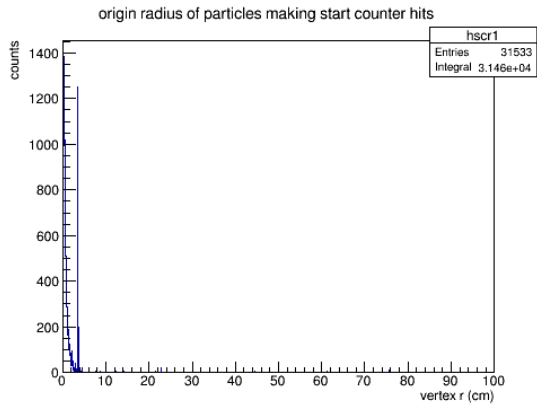
1. soft gammas with 1-10 MeV energy, half inside the beam pipe and the other half spread out over an area including the innermost rings of the CDC;
2. low-energy neutrons with a peak energy around 1 MeV, with exponentially dropping flux all the way up to ~ 1 GeV;
3. high-energy muons spread out in two broad lobes peaking 100 cm above and below the beam centerline, as a result of the sweeping magnet

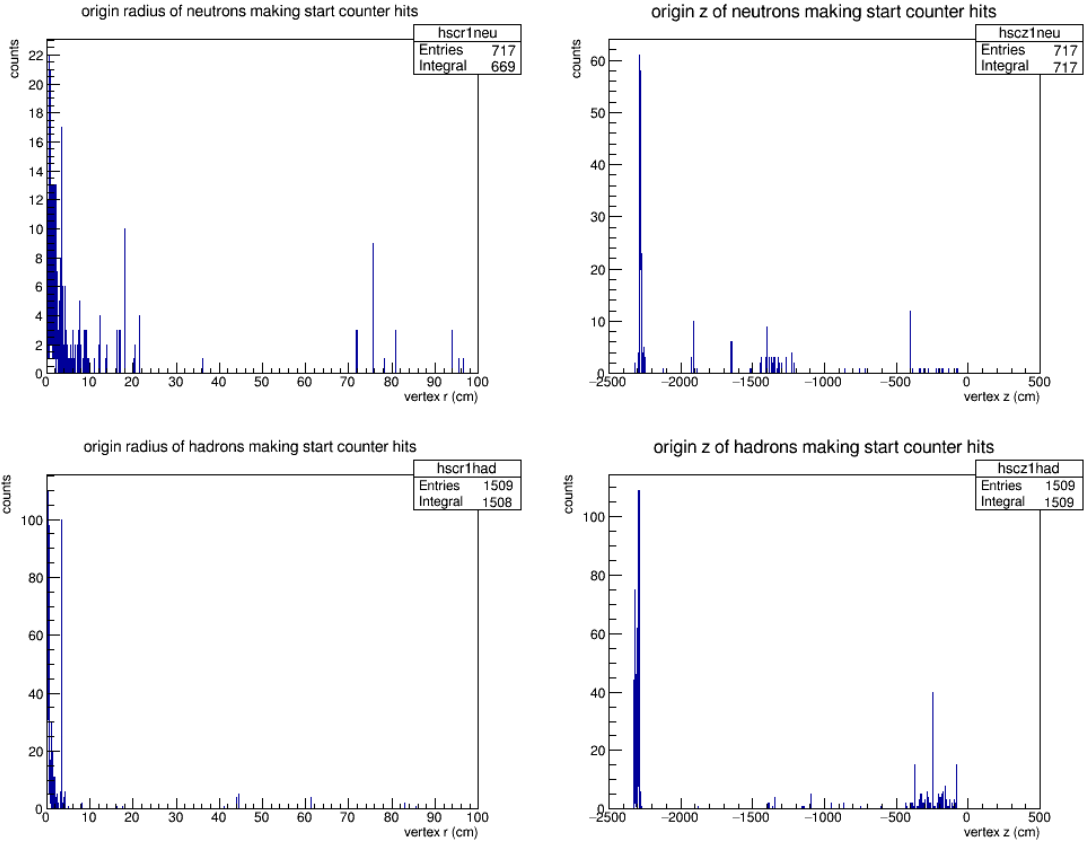
One of the big unanswered questions that came up during the KLF Readiness Review in August, 2024 was what impact these backgrounds will have on our ability to trigger on the desired klong reactions in the presence of the background, and how the reconstruction of these reactions will be impacted by extra hits in the detector coming from background particles.

This is an eighth simulation of the KLF beam in Hall D, with the same statistics as the first. The only change from take 7 is that an iron tube was wrapped around the beam pipe starting 2m downstream from the pair spectrometer and ending 3m upstream of the entrance to the GlueX detector, approximately 5m in length. The shielding tube fits tightly around the existing beam pipe (outer radius 3.6cm) and has an outer radius of 8.5cm. Everything else about the simulation is unchanged from take 7.

1.1 Plots of origin vertex positions of particles that produce hits in the GlueX detectors



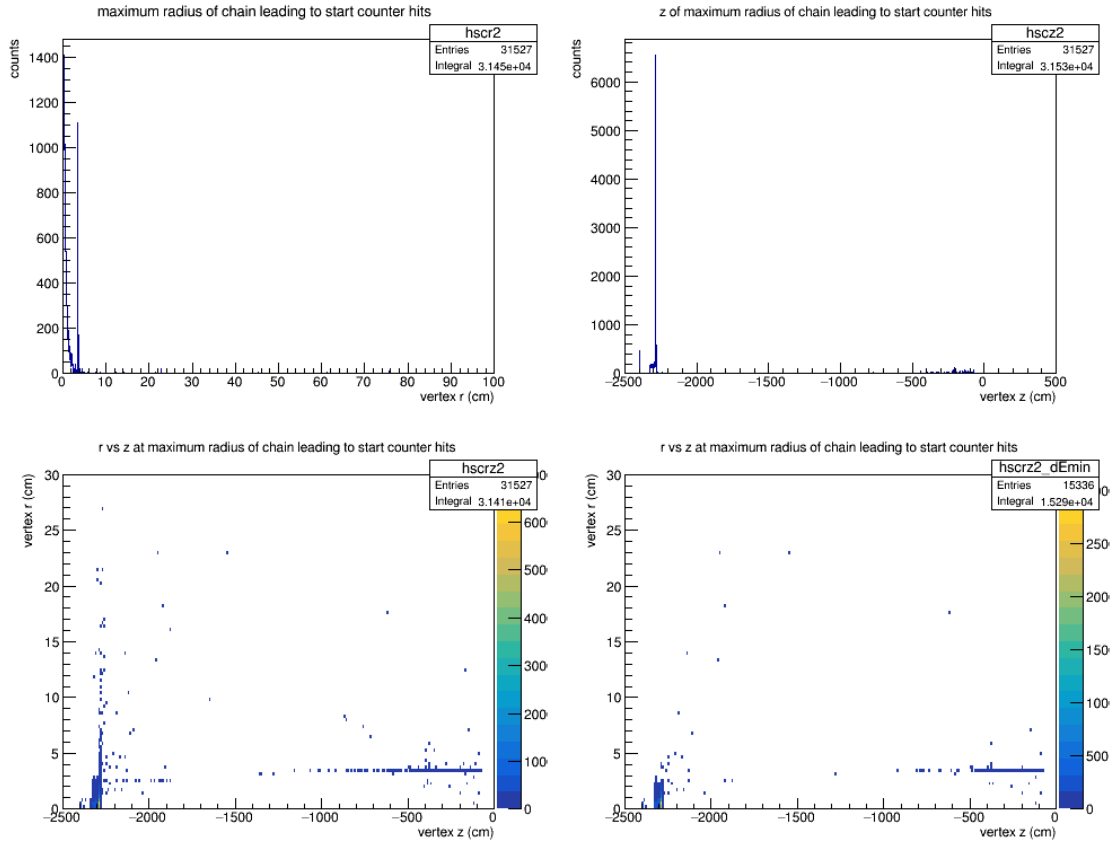




1.2 Find the maximum radius of the background sources

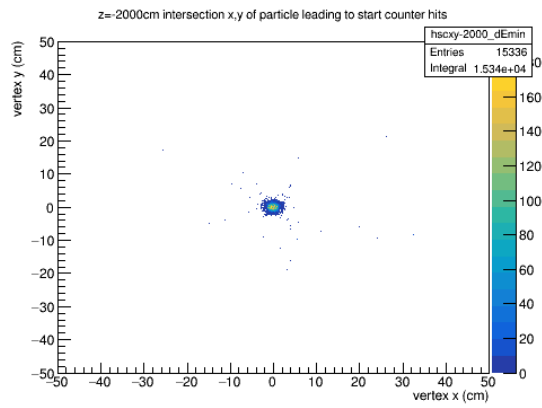
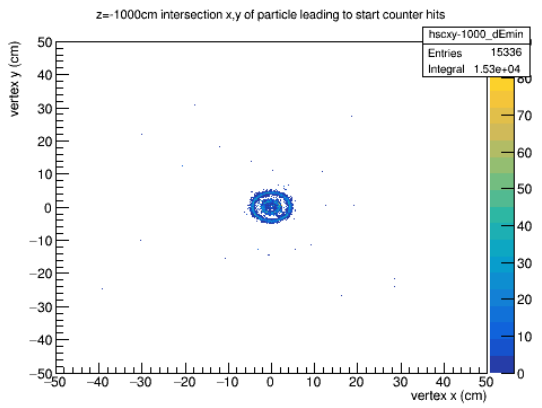
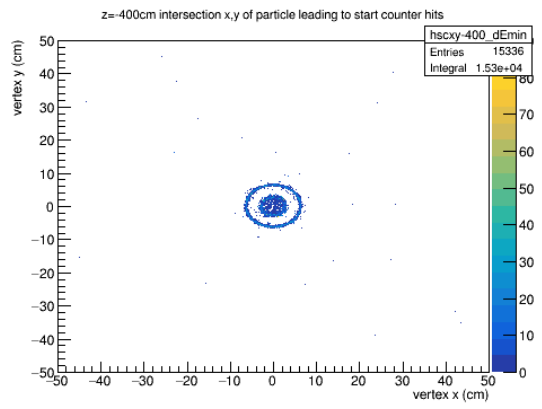
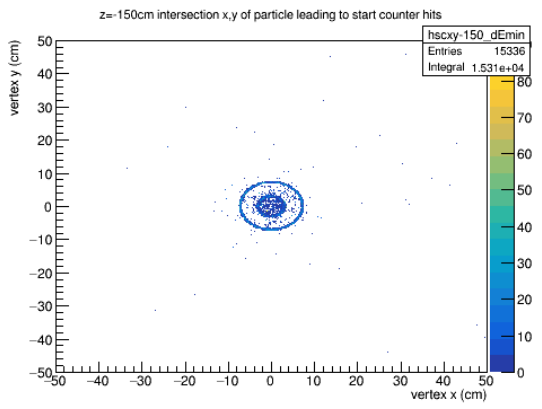
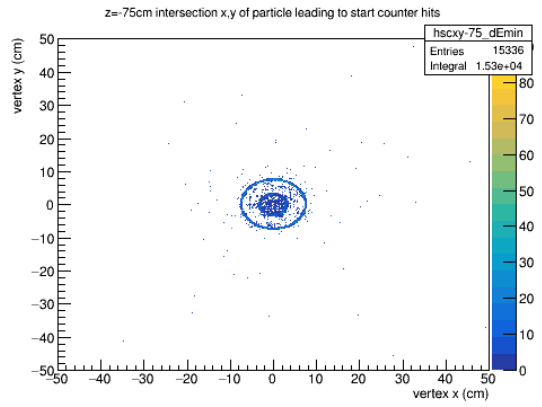
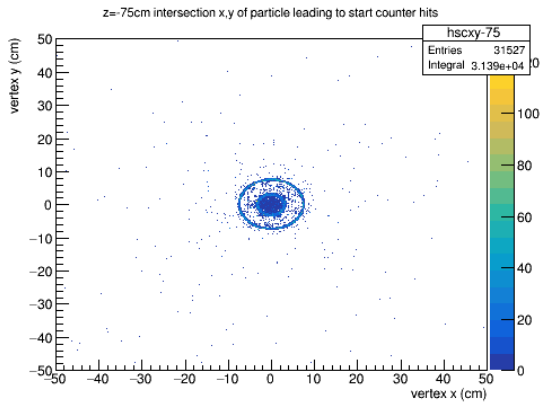
Follow the chain of interactions all the way from the incident beam photon at the KPT target down to the interaction in the start counter, and find the maximum distance from the beam axis that is probed by the particle chain. This can tell us where adding shielding around the beam line might have an effect on the background rate, and where it cannot.

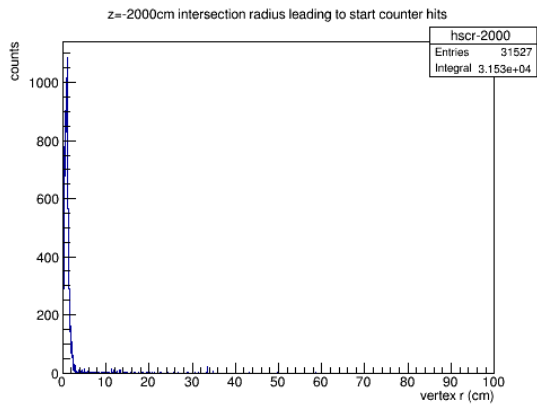
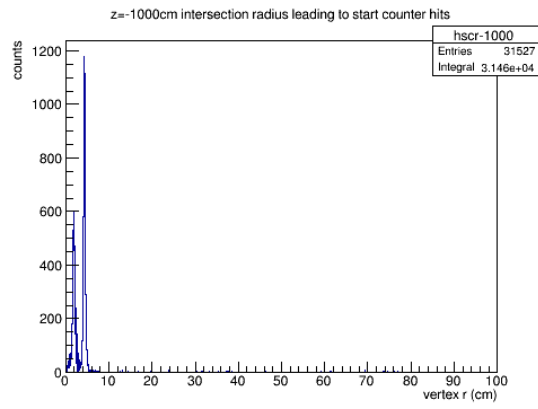
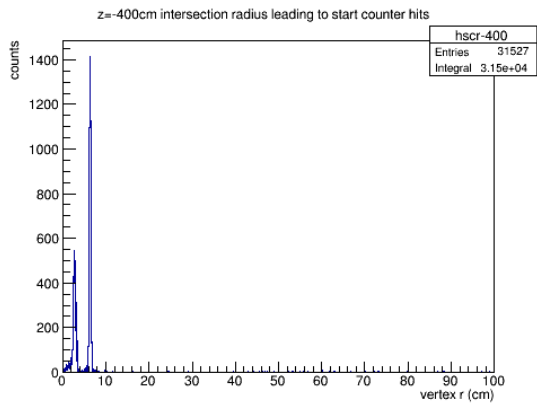
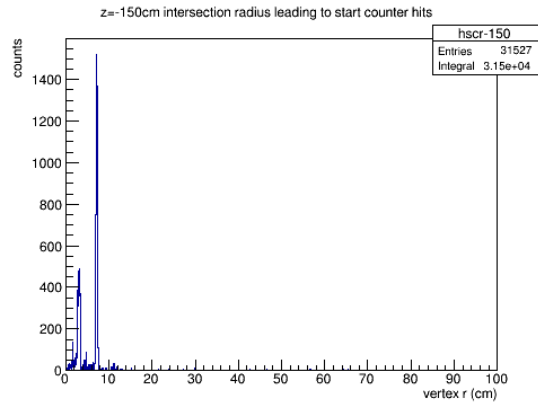
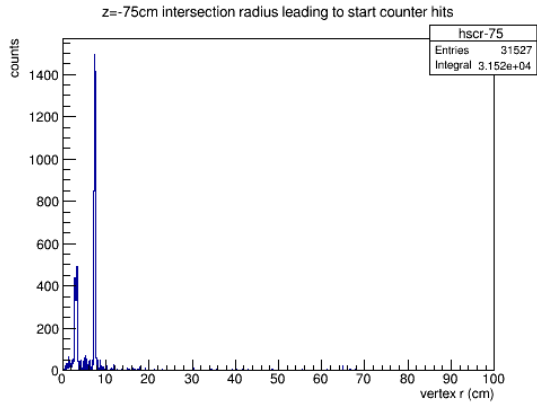
total fraction beyond 4cm is 0.00696



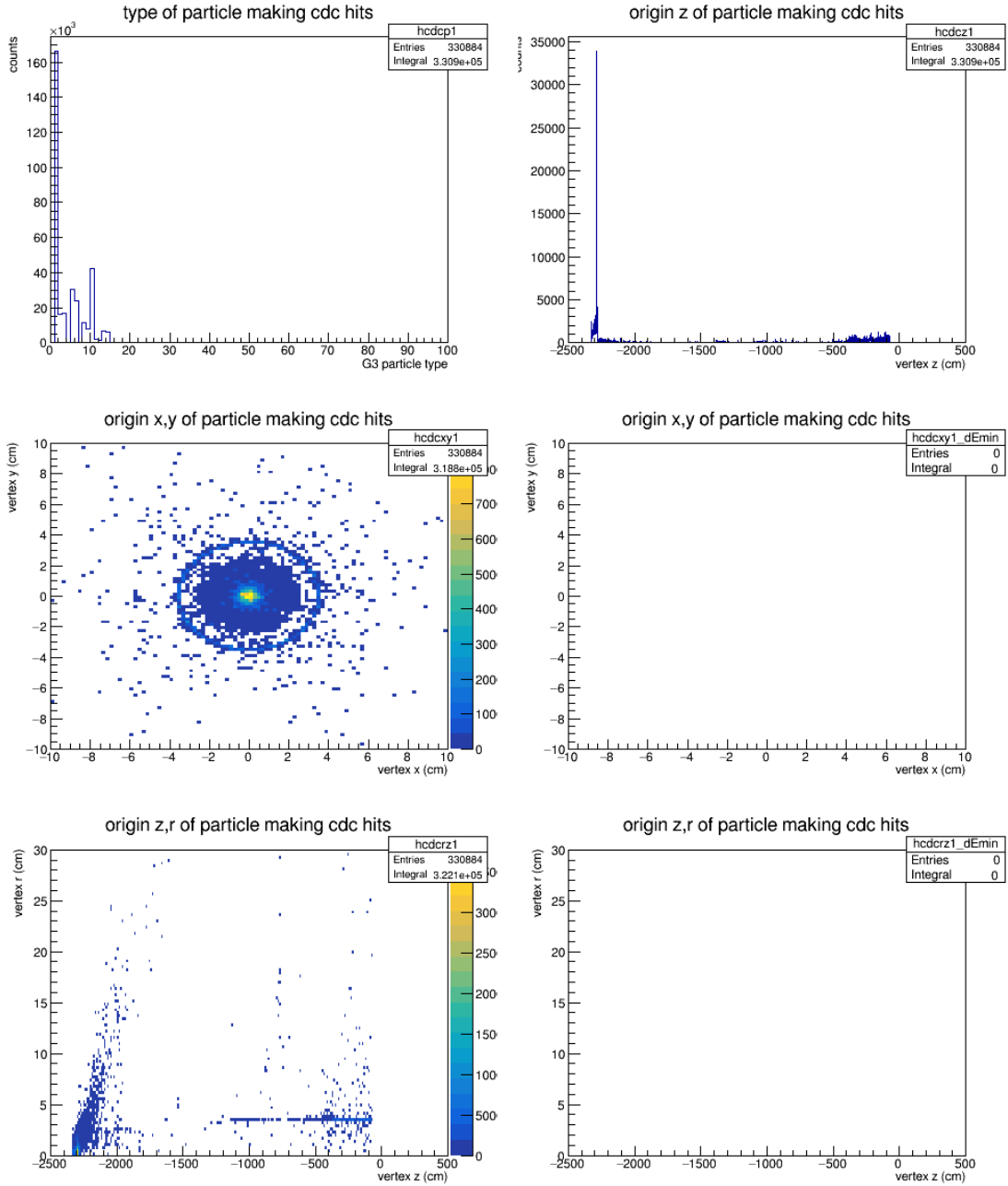
1.3 Find the intersection of the background trace at the entrance to the target

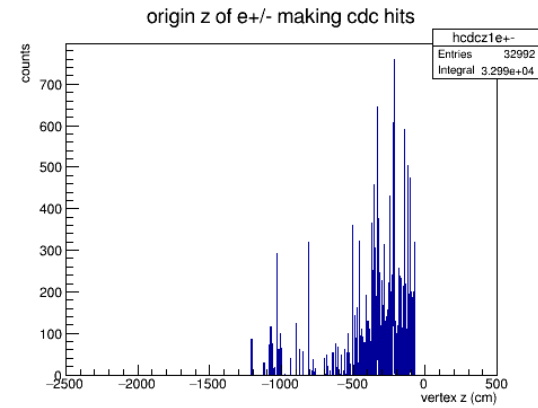
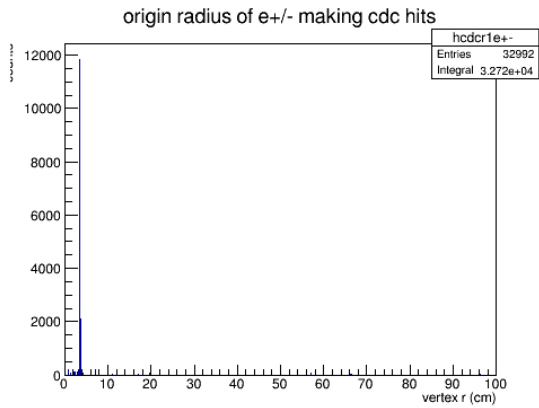
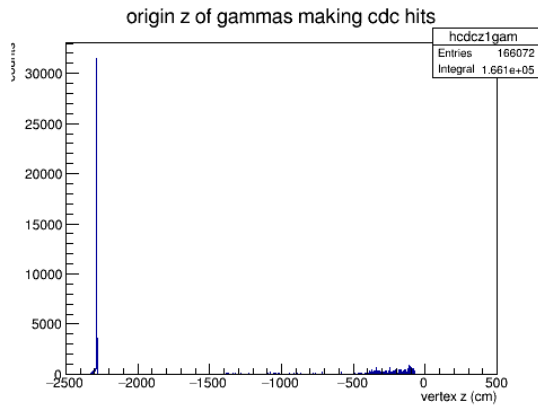
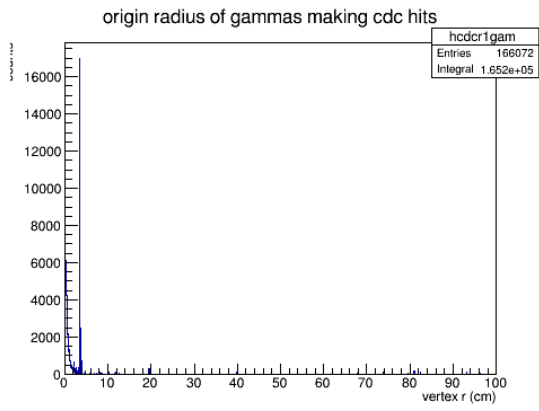
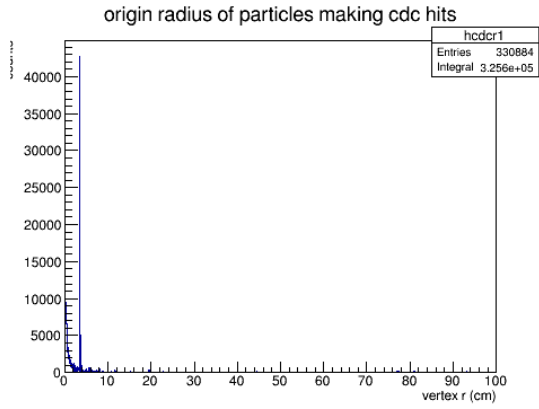
Just upstream of the liquid hydrogen target assembly there is a virtual detector plane denoted DET5 in the beamline geometry. It is shown in the above plots by a wall-to-wall and ceiling-to-floor plane in the above projection plots, located at $z = -75\text{cm}$. Look at the transverse distribution of the intersection of whatever particle produces a hit in the start counter, either by interacting in the start counter itself later on after passing through DET5, or by producing secondaries that eventually generate a hit in the start counter.

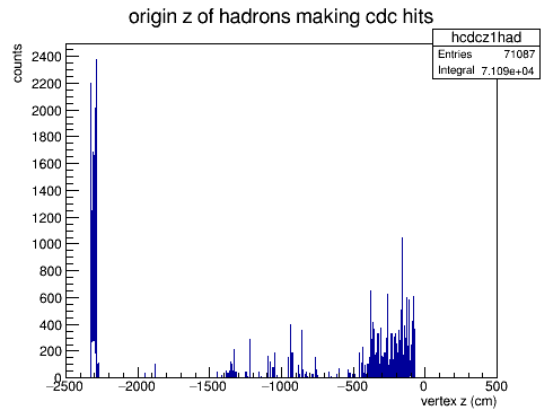
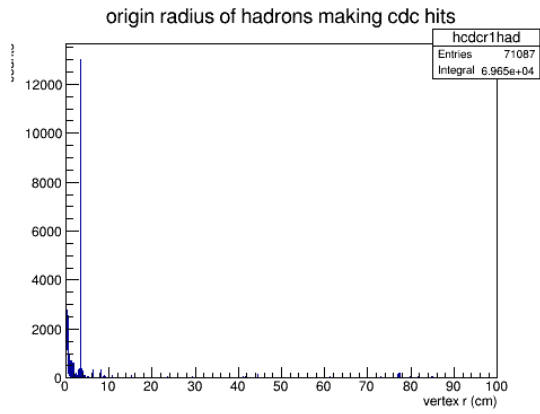
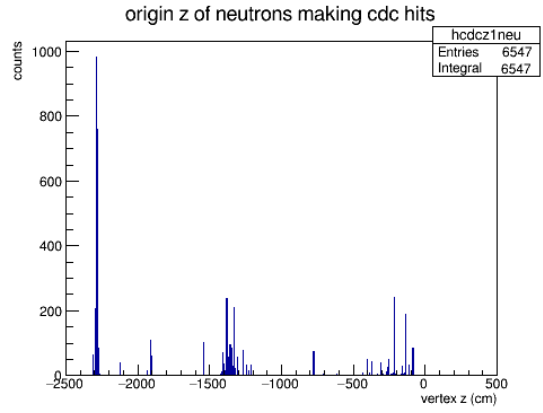
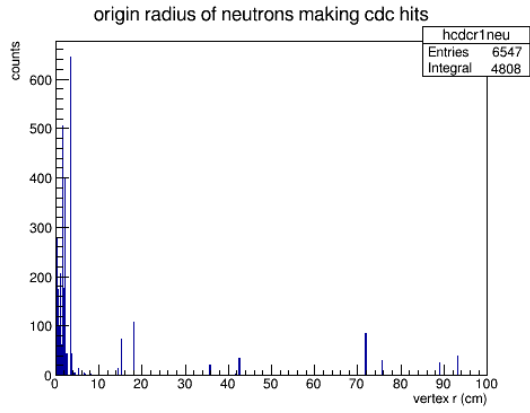




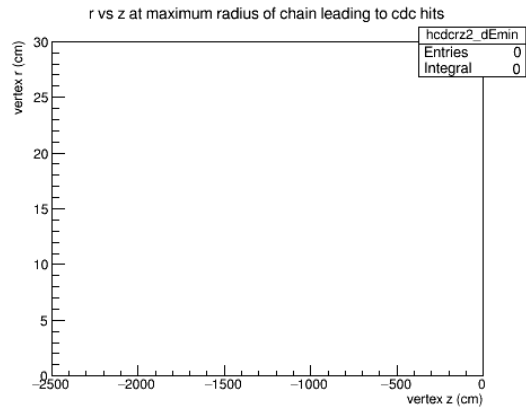
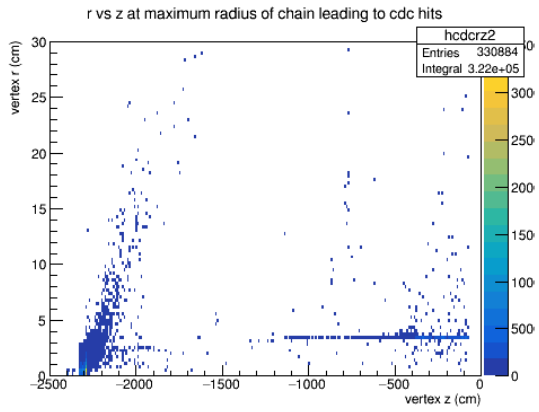
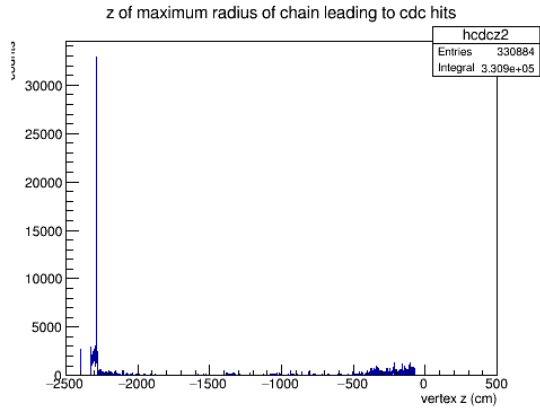
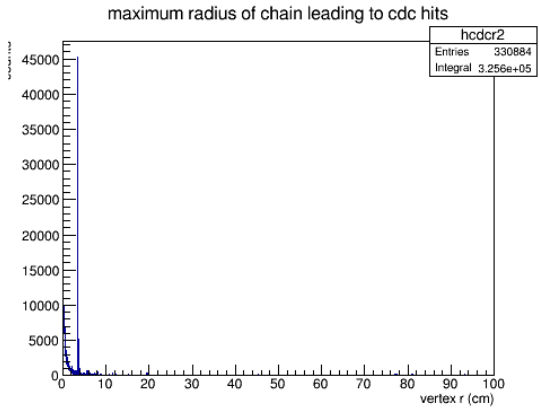
1.4 Repeat all of the same plots for the CDC

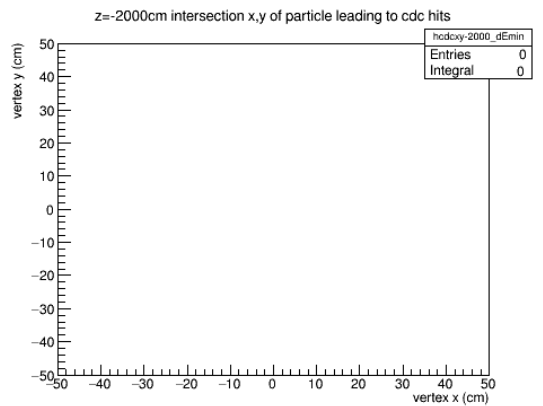
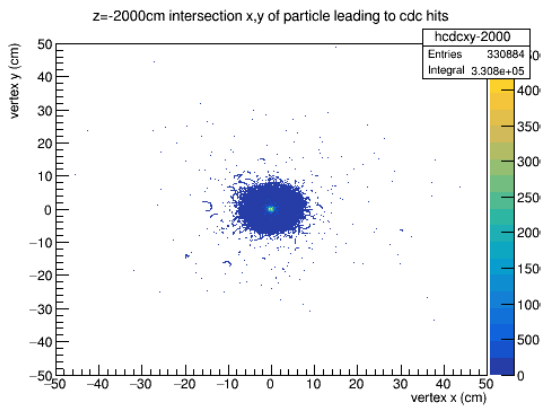
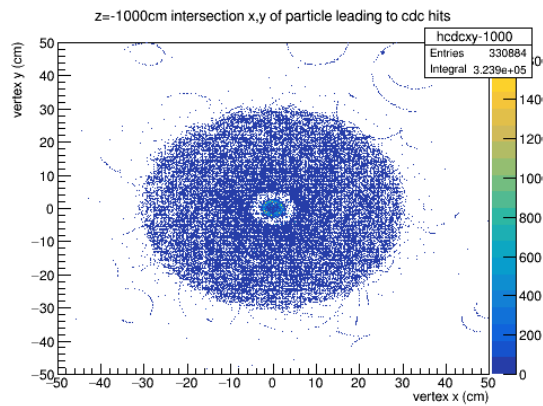
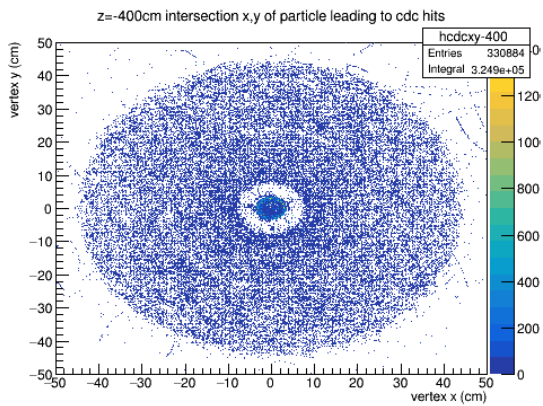
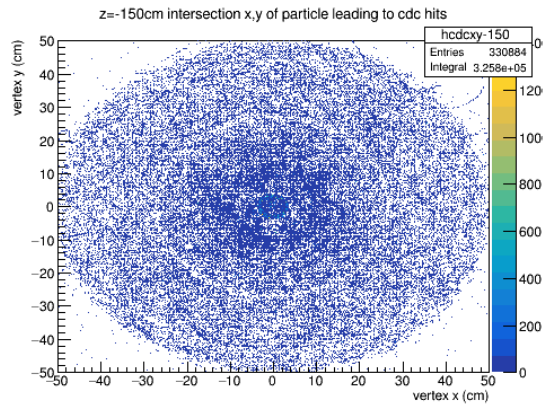
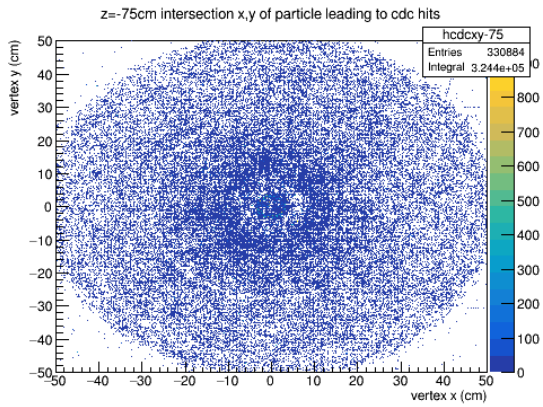


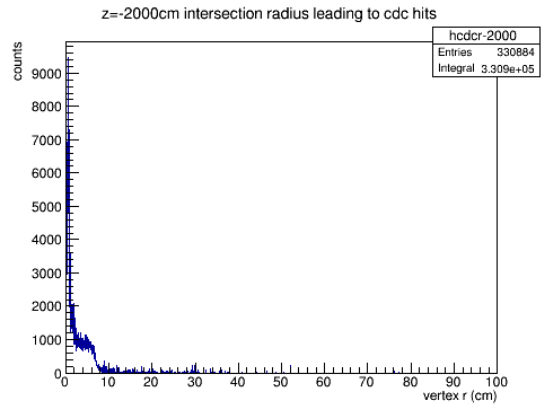
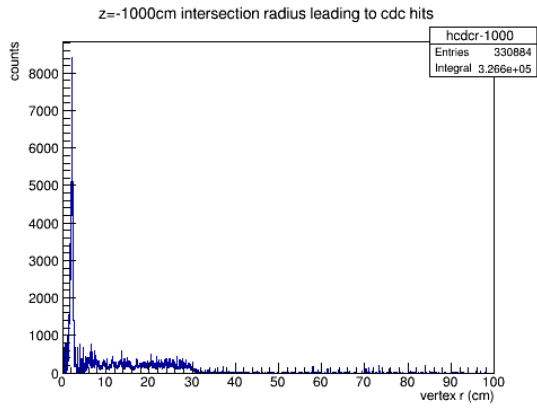
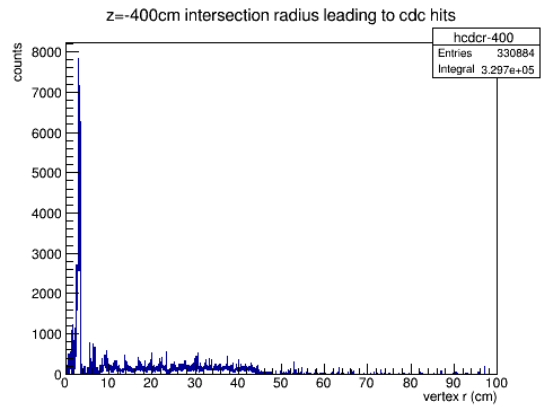
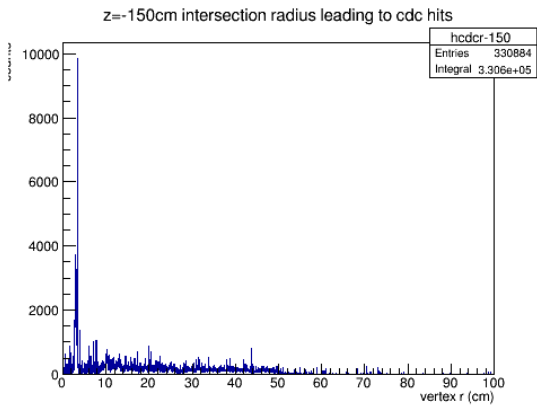
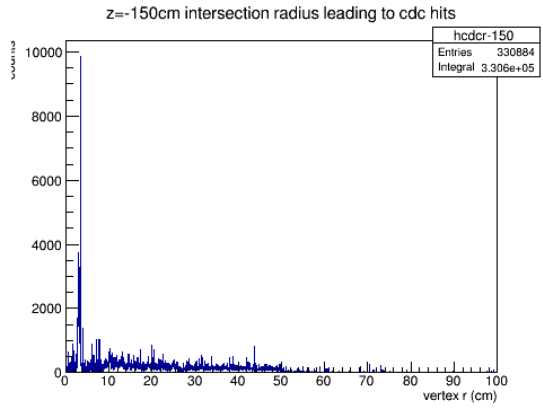
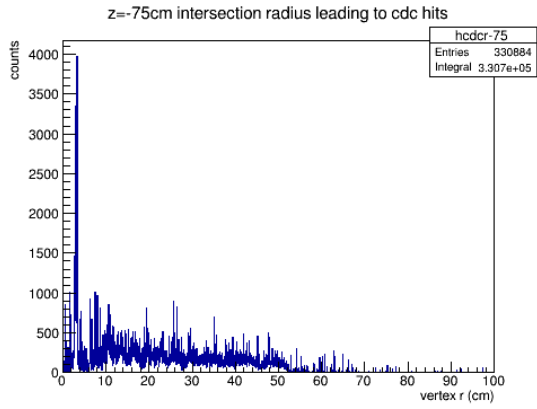


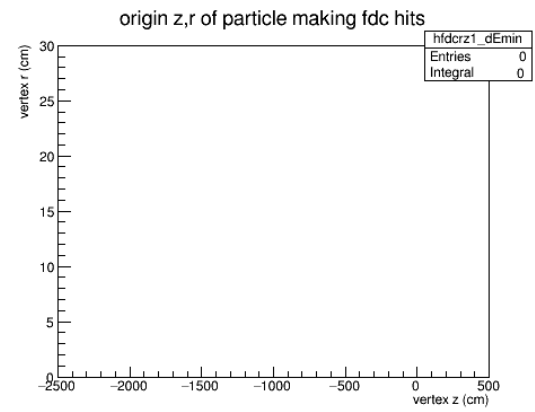
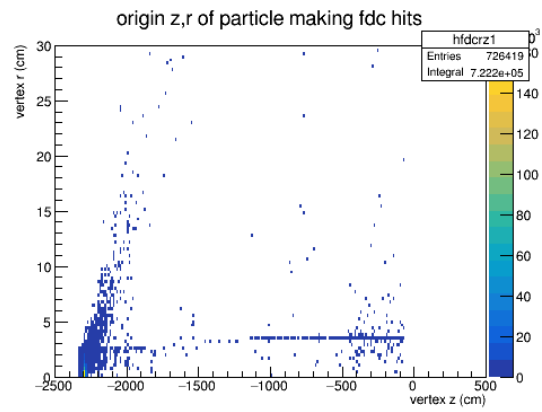
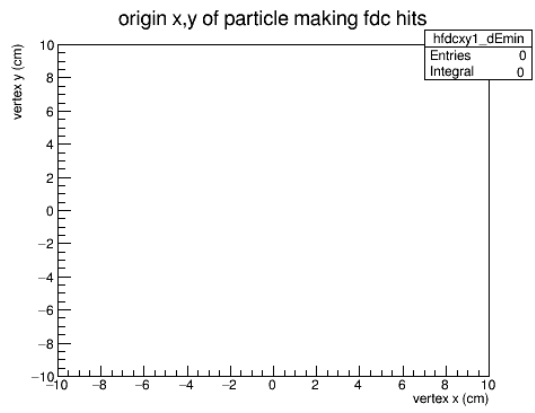
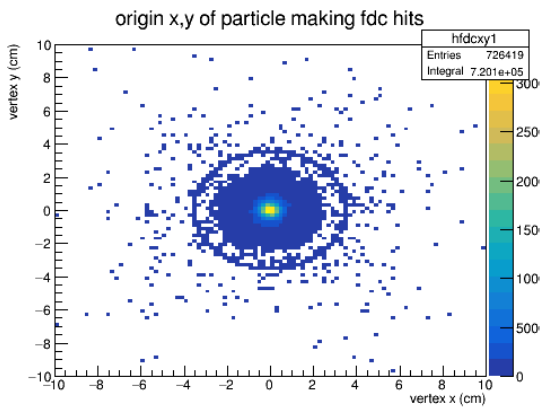
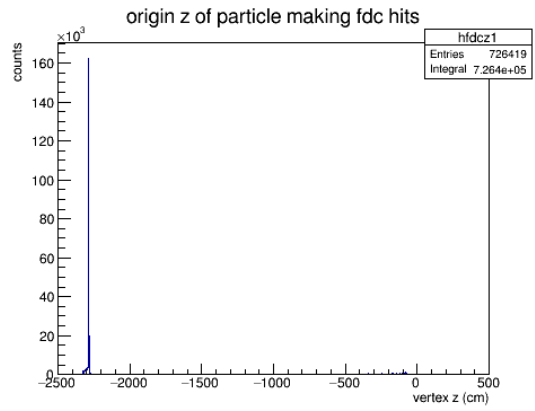
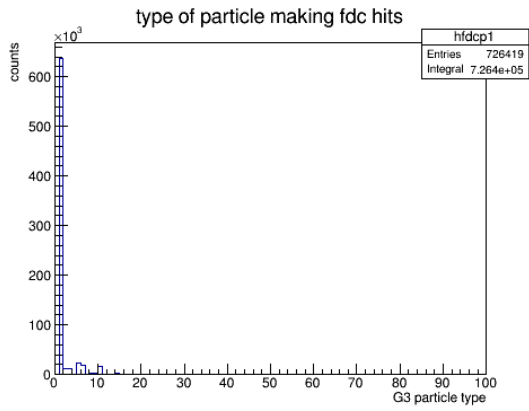


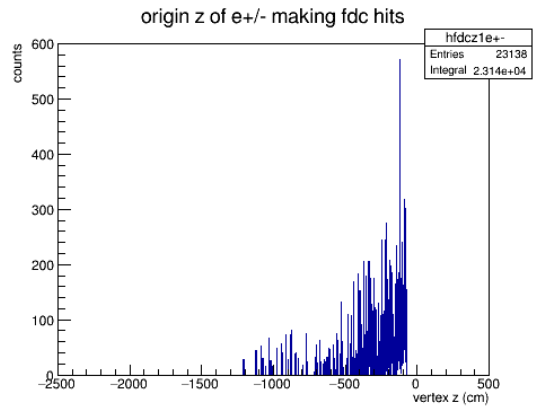
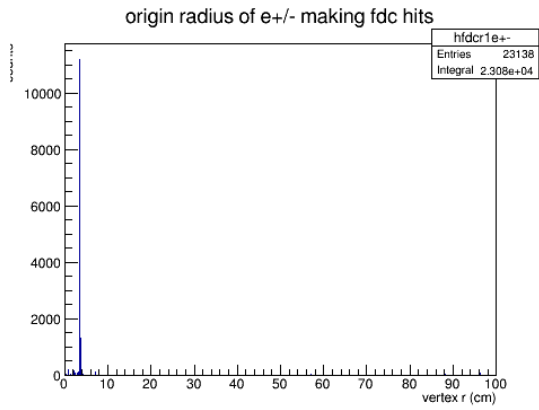
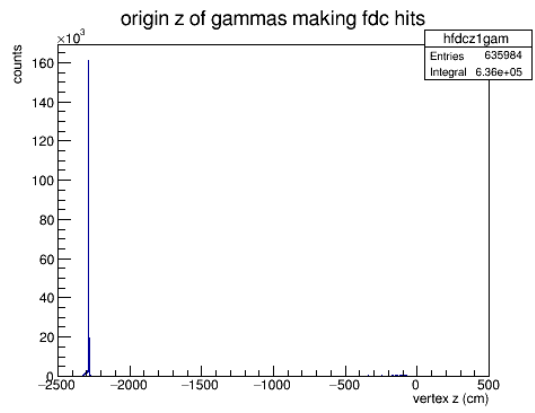
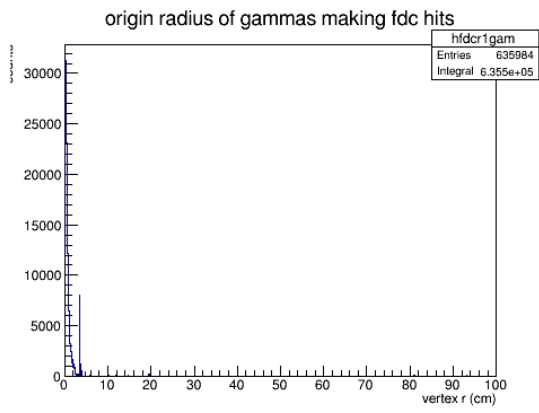
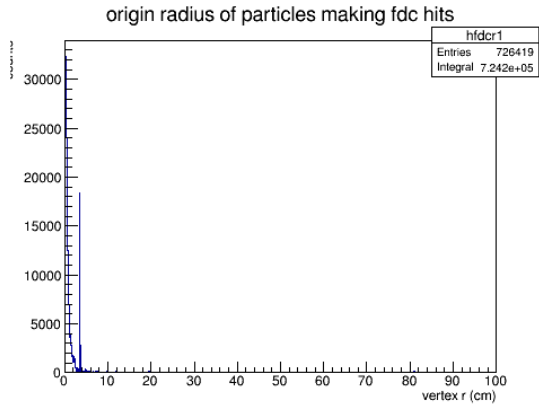
total fraction beyond 4cm is 0.0537

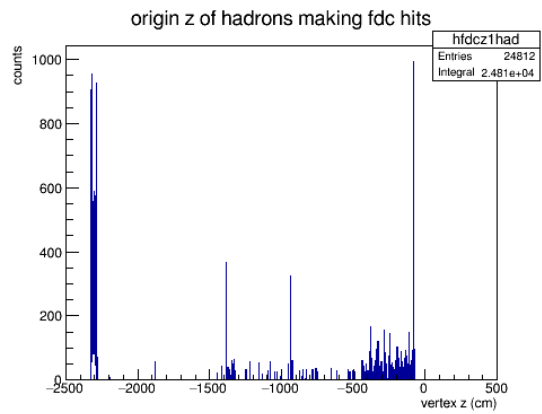
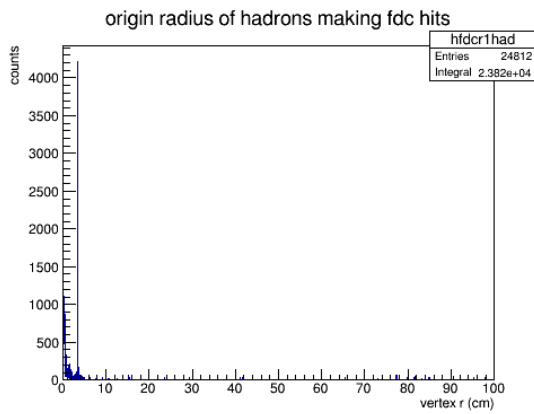
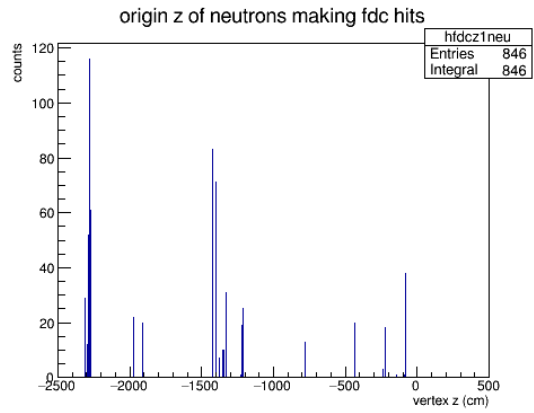
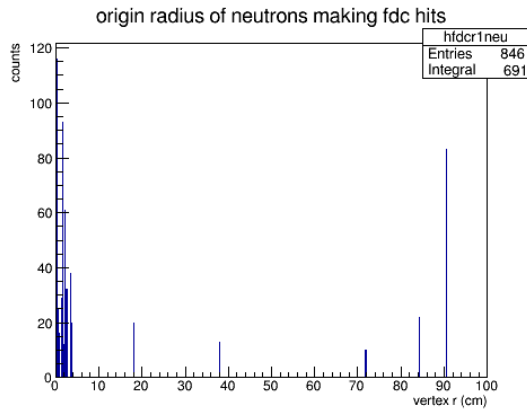




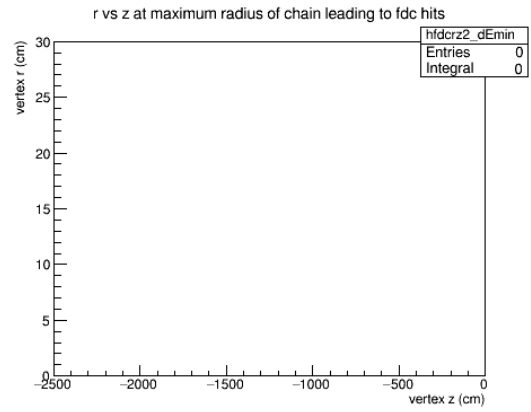
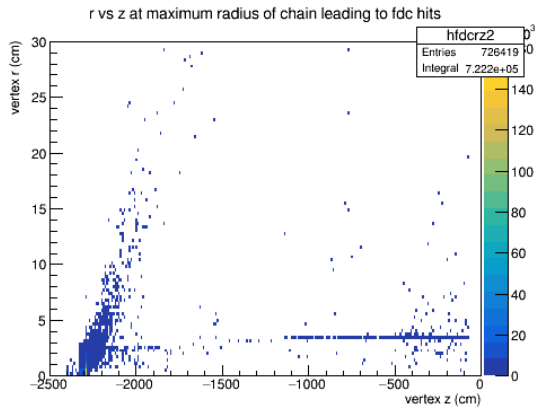
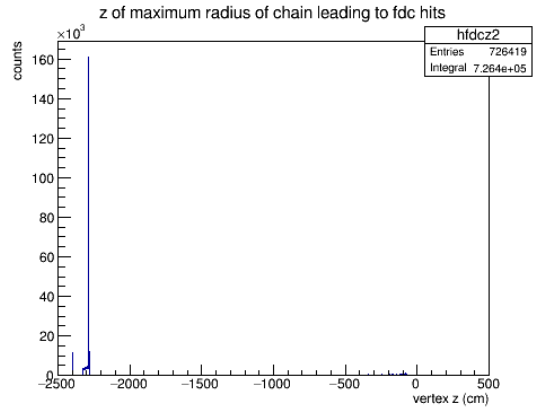
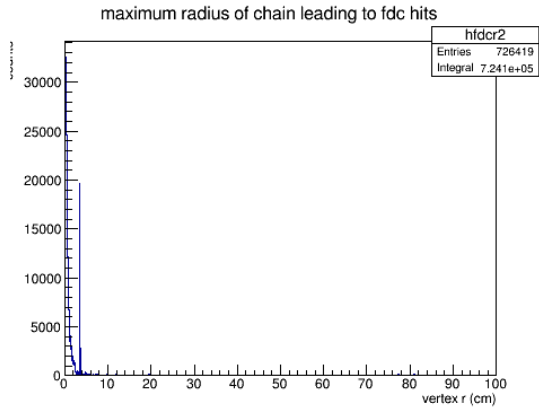


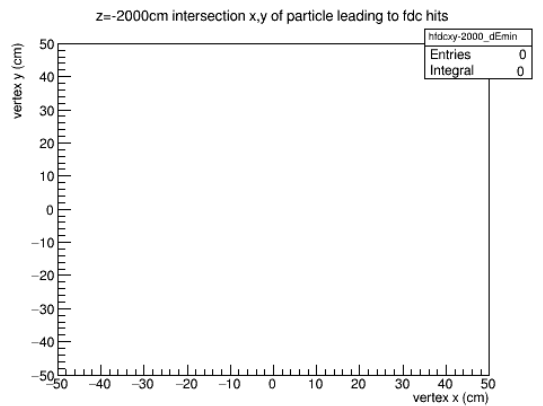
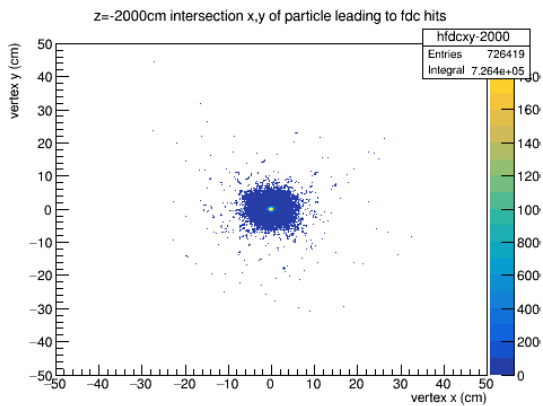
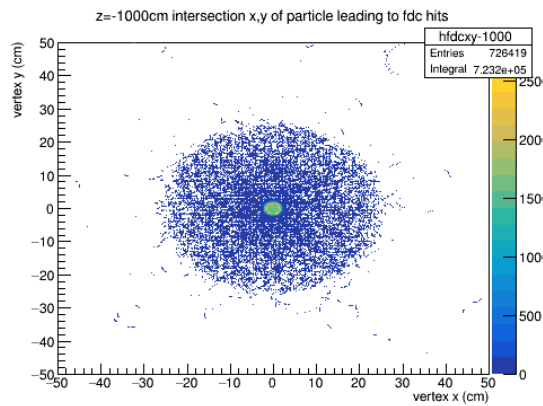
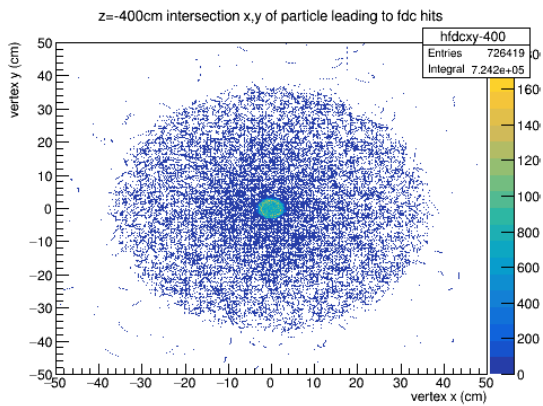
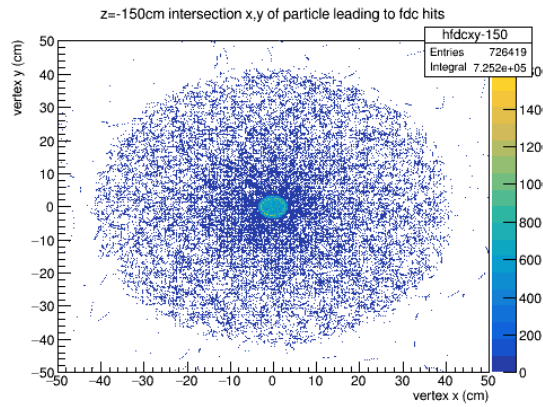
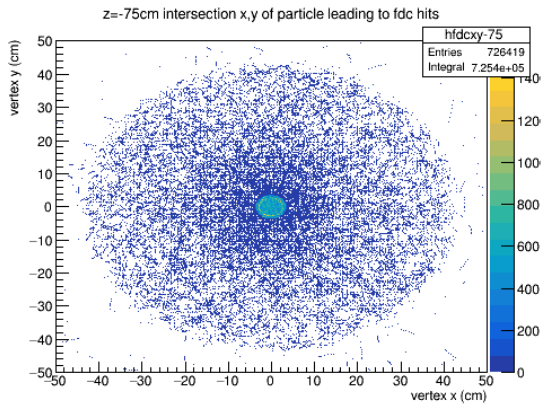


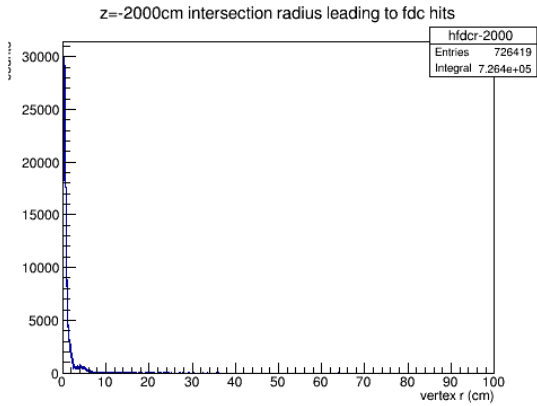
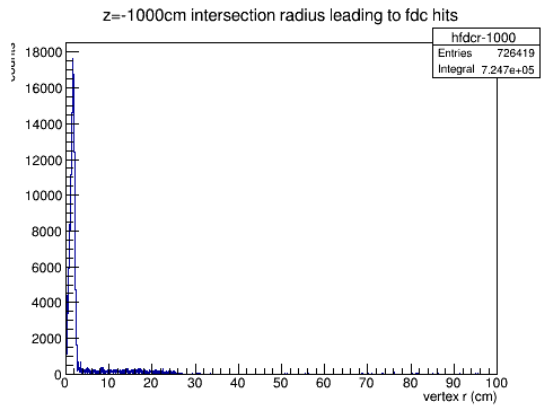
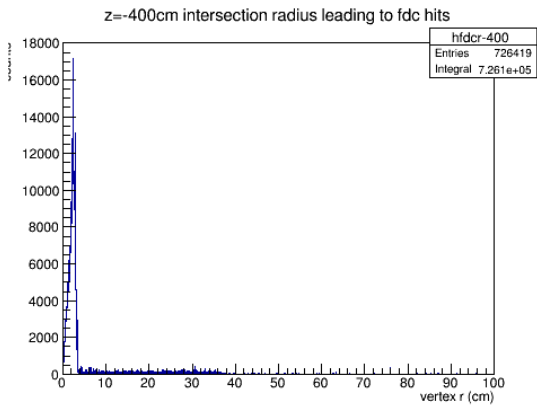
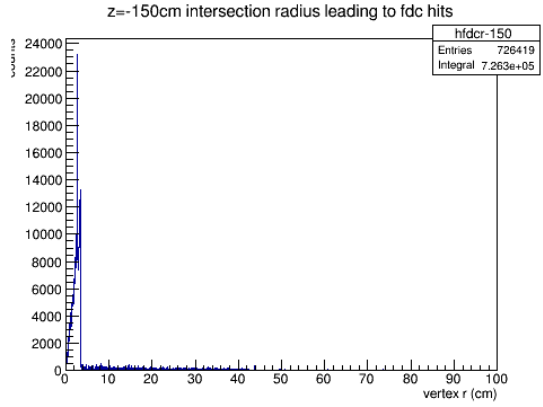
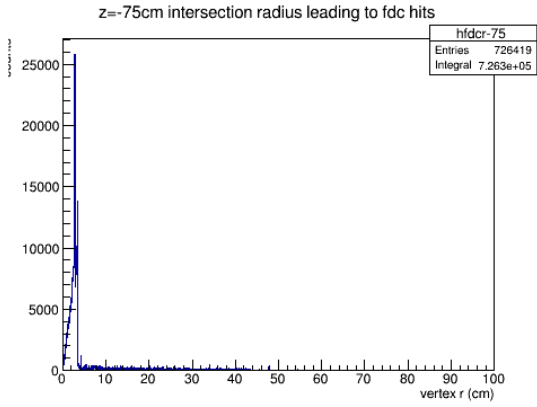


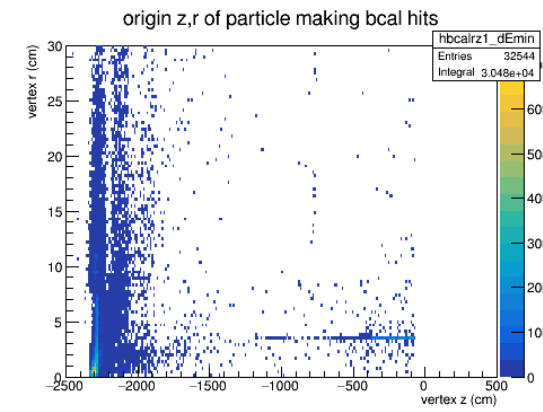
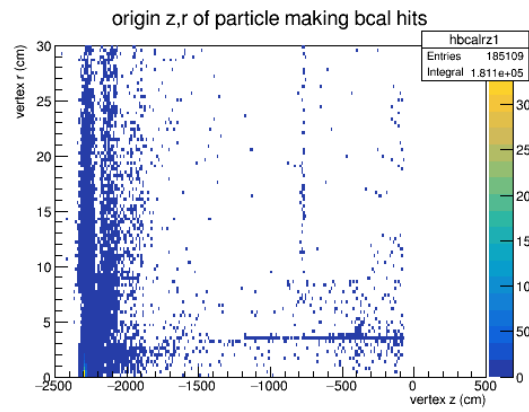
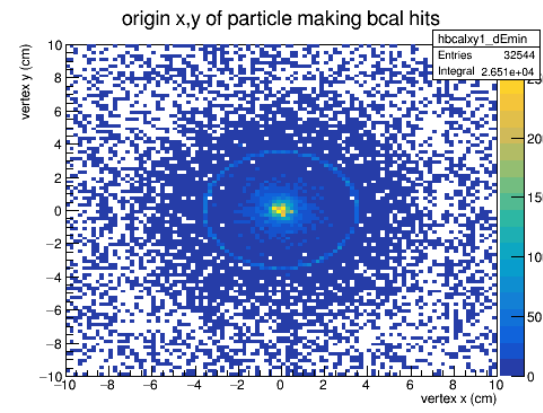
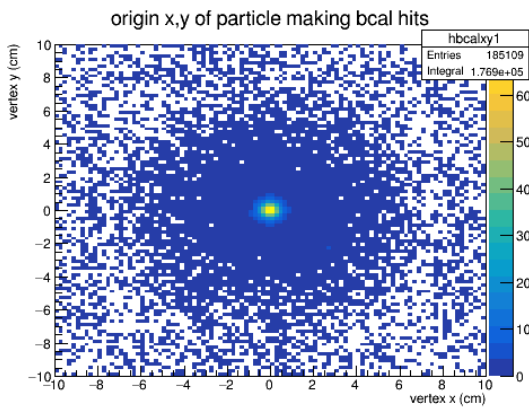
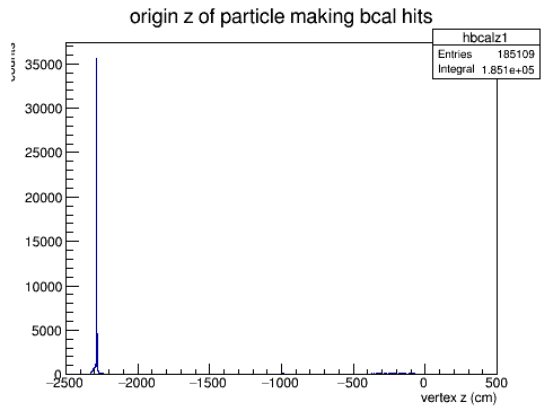
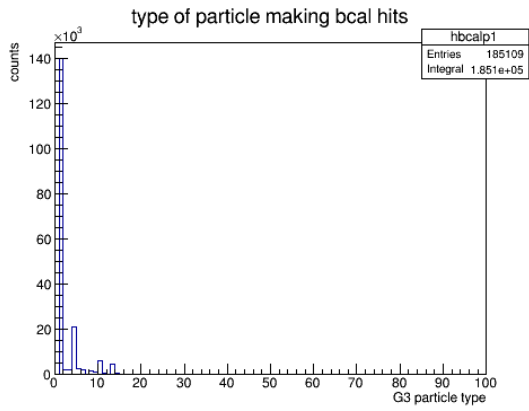


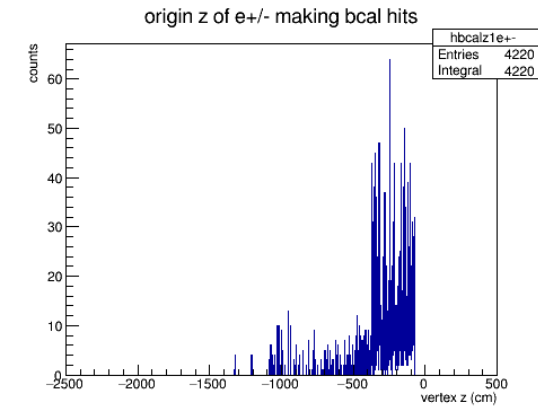
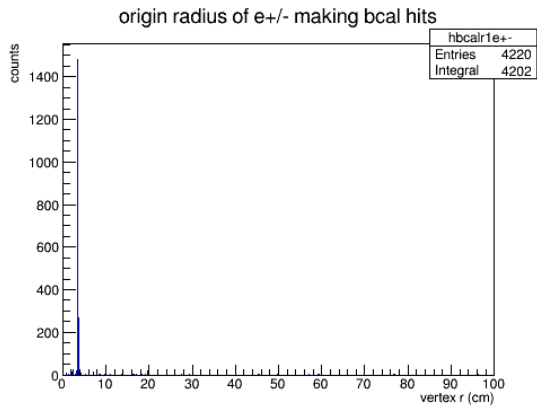
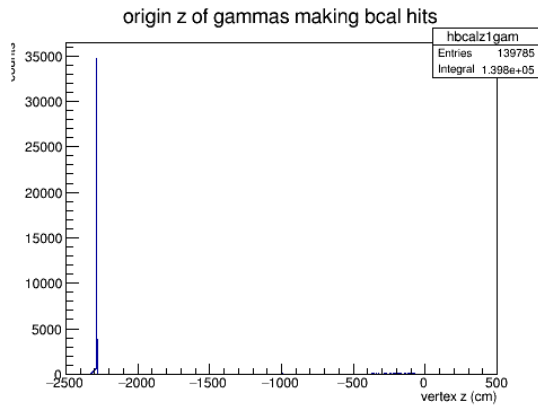
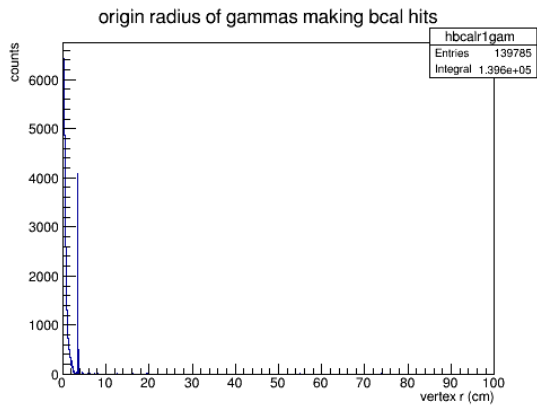
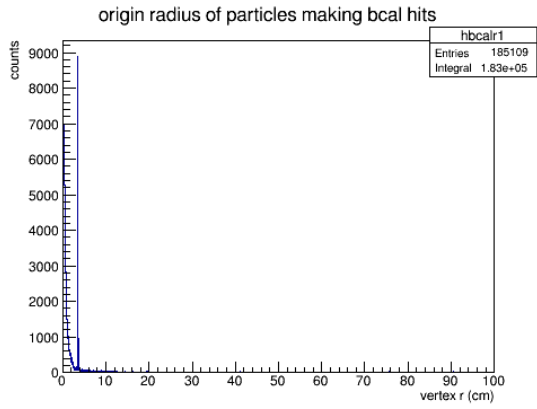
total fraction beyond 4cm is 0.0151

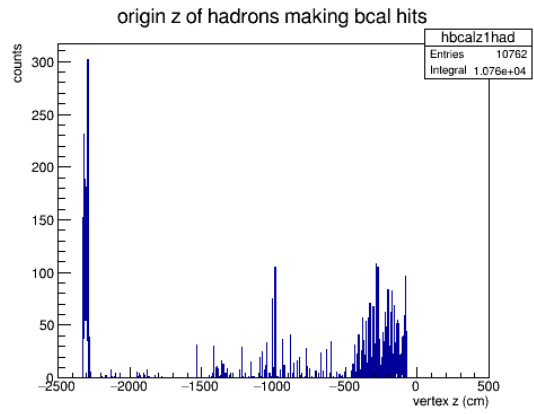
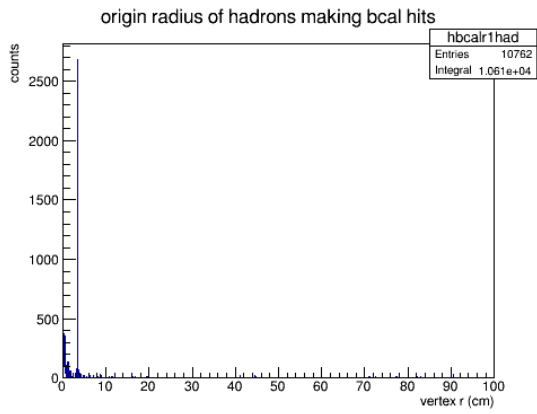
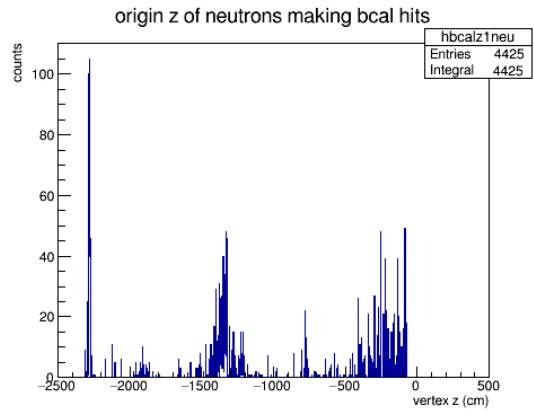
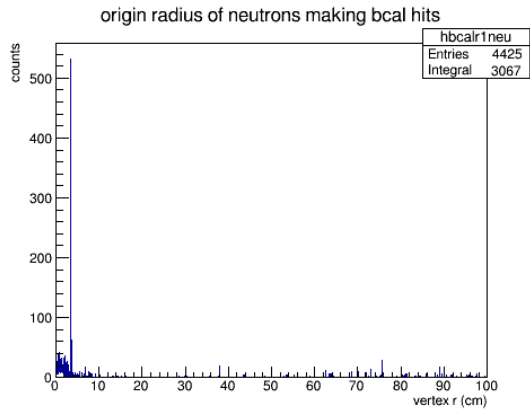




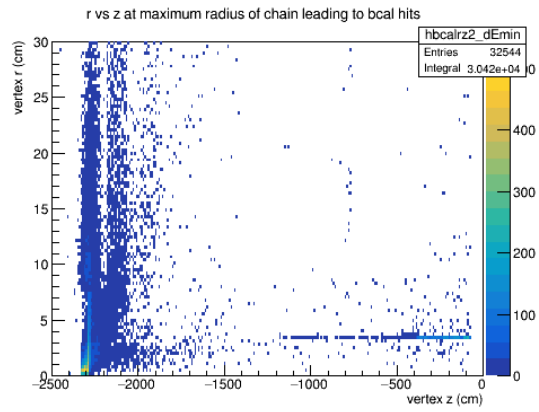
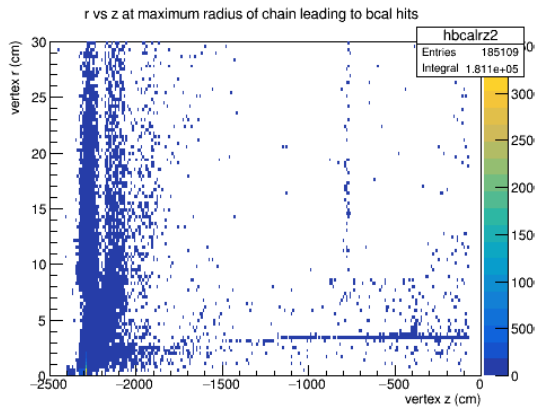
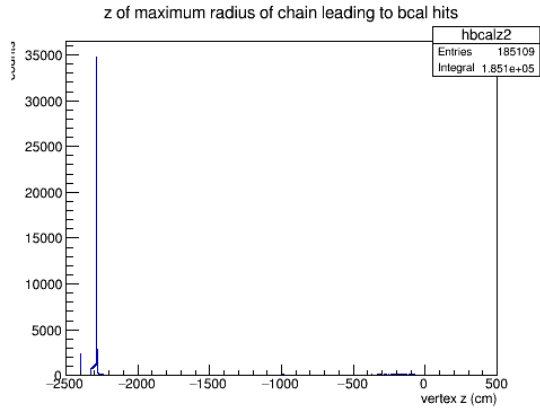
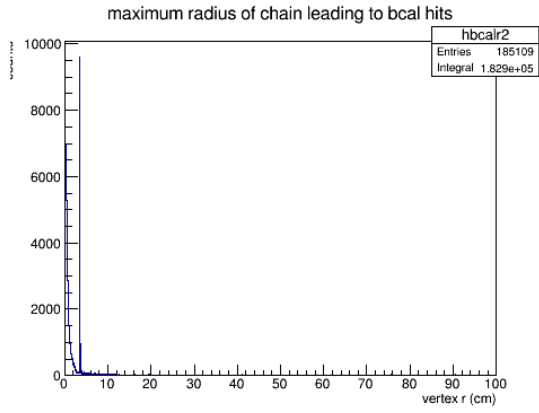


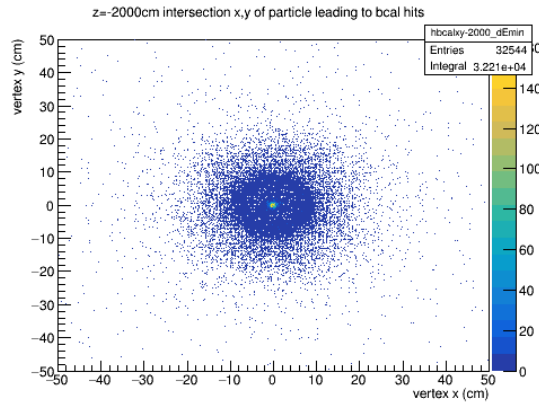
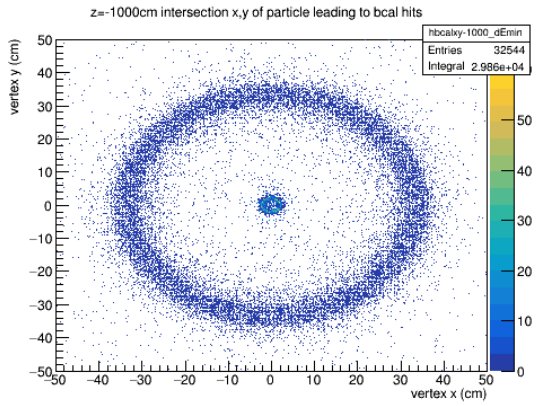
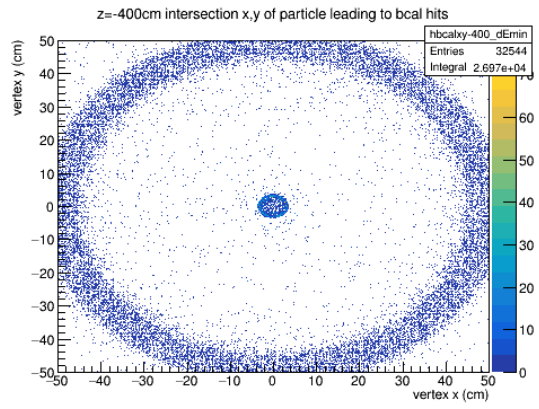
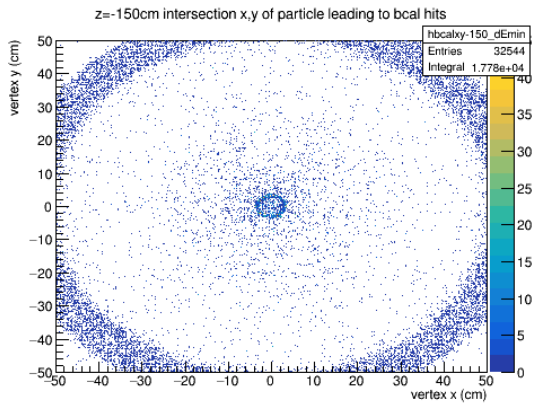
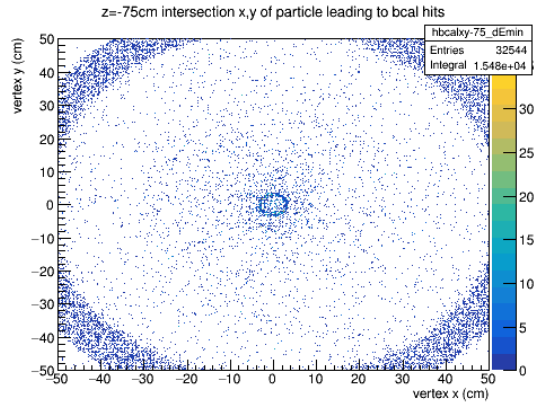
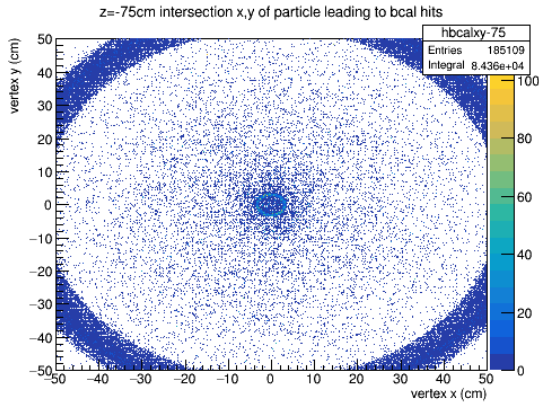


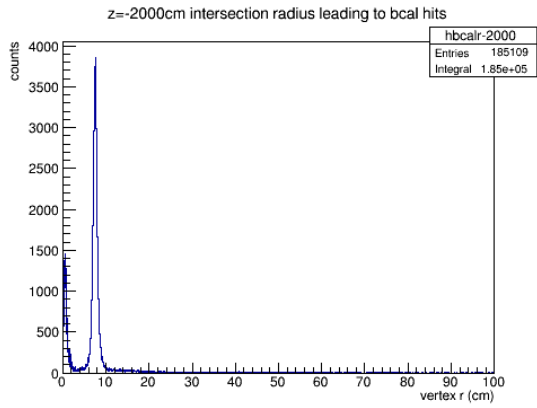
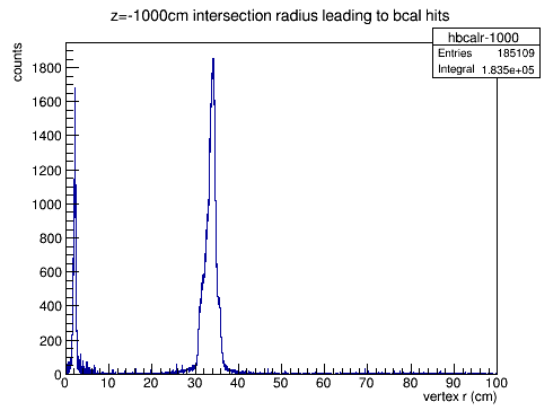
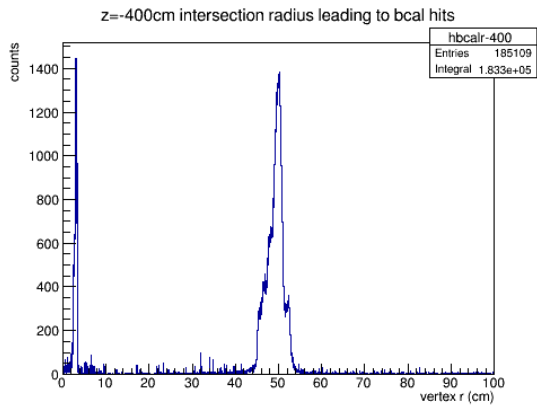
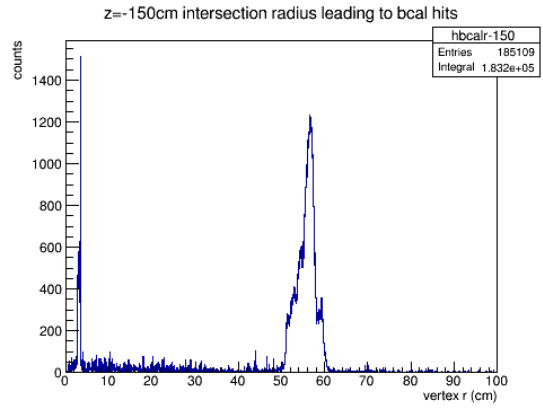
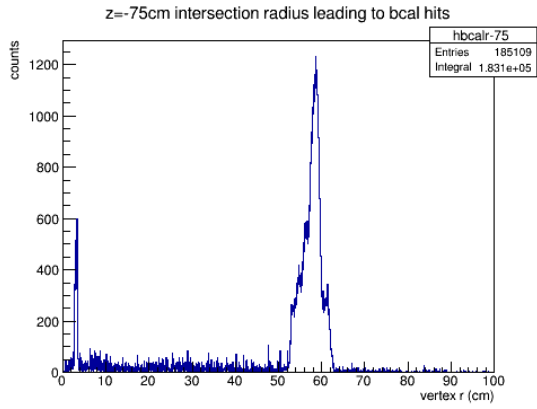


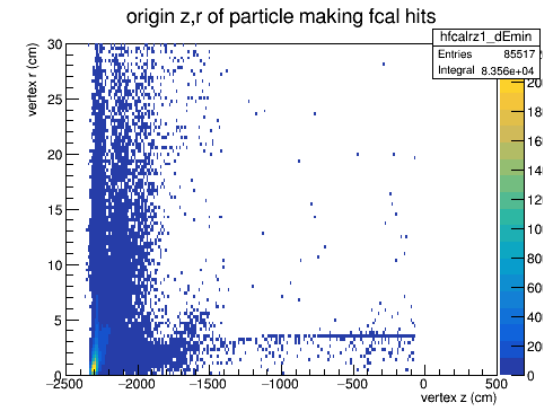
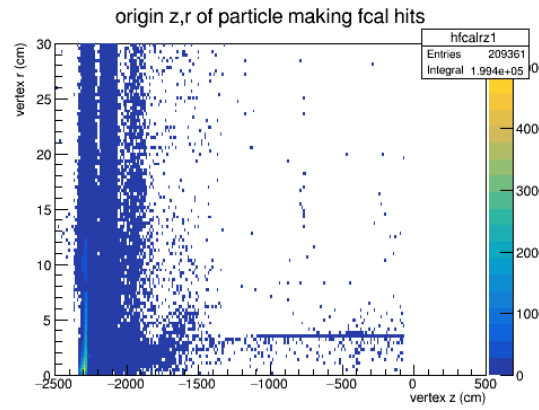
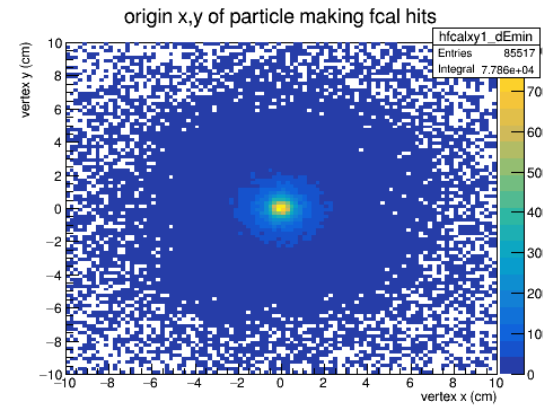
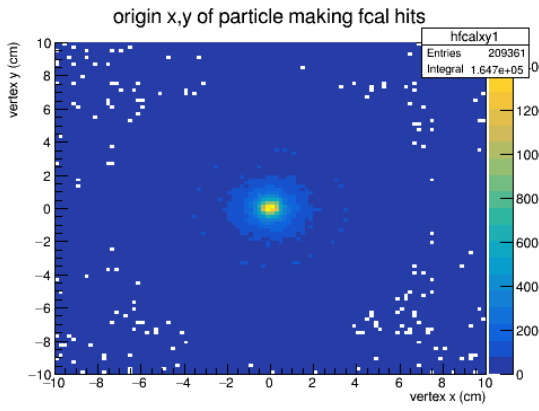
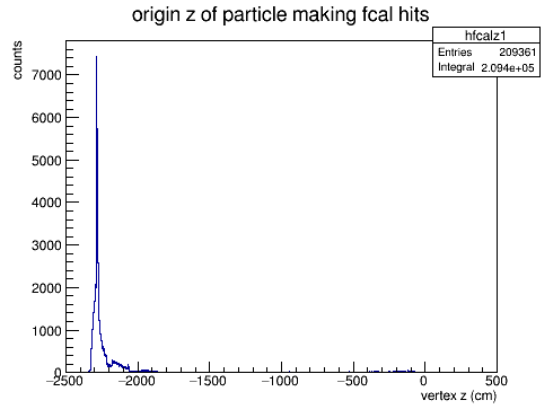
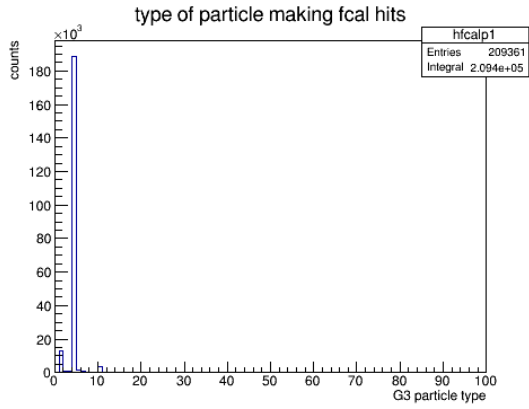


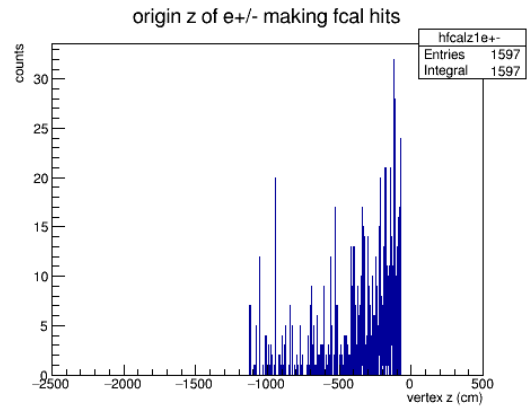
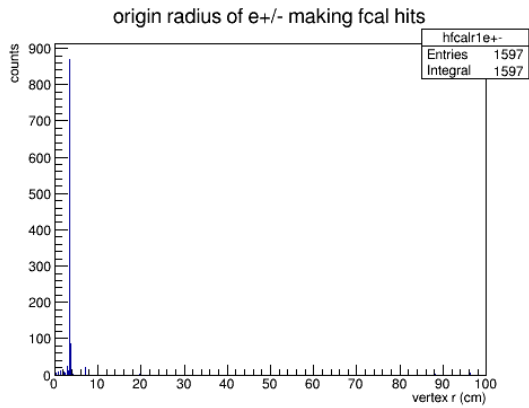
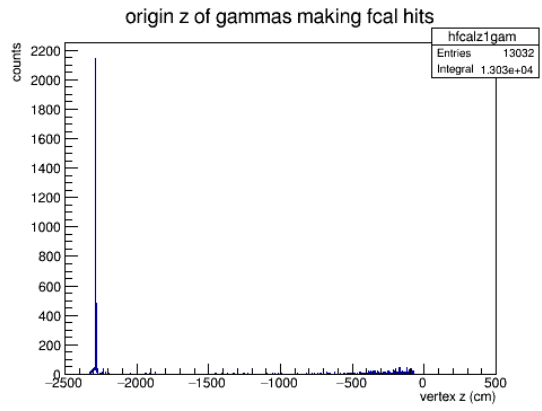
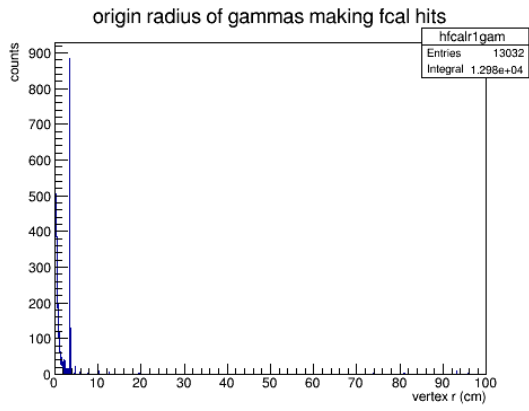
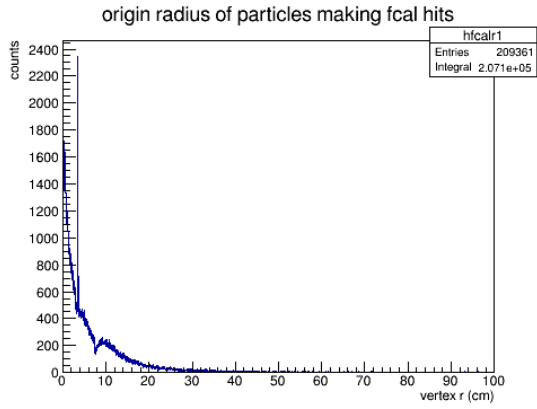
total fraction beyond 4cm is 0.0708

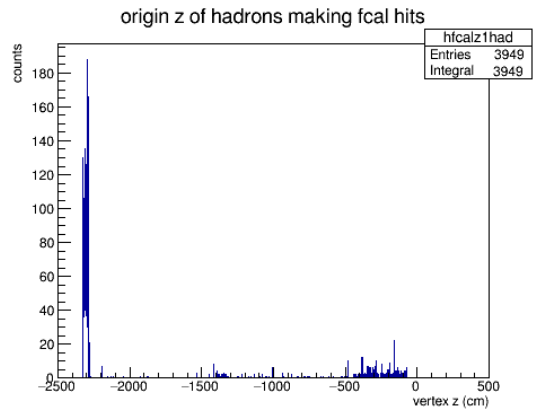
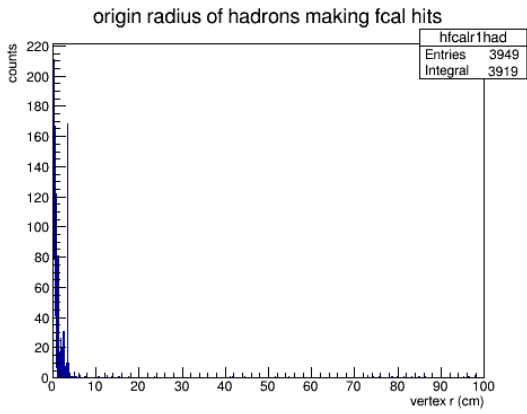
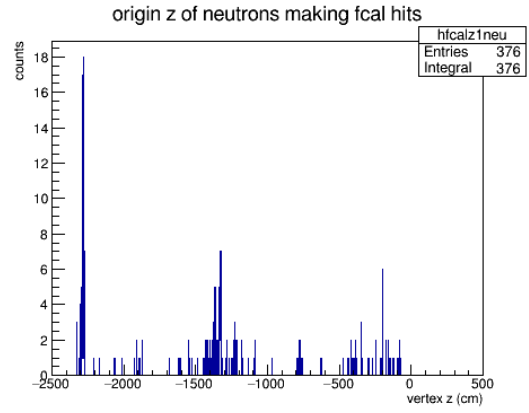
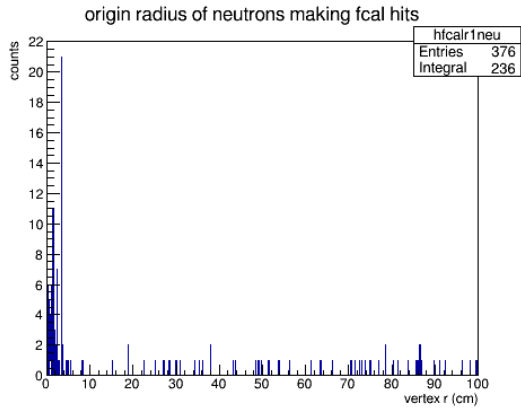




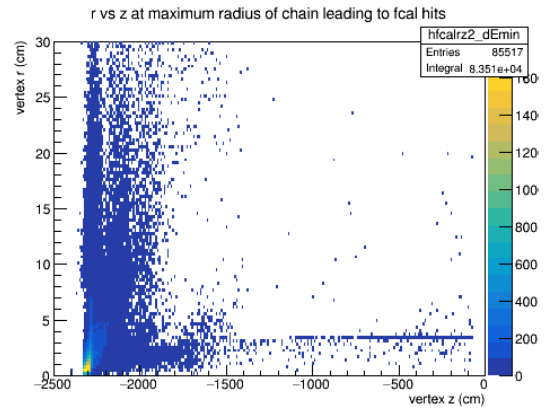
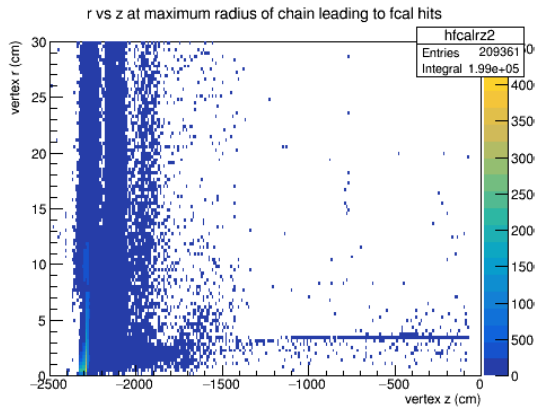
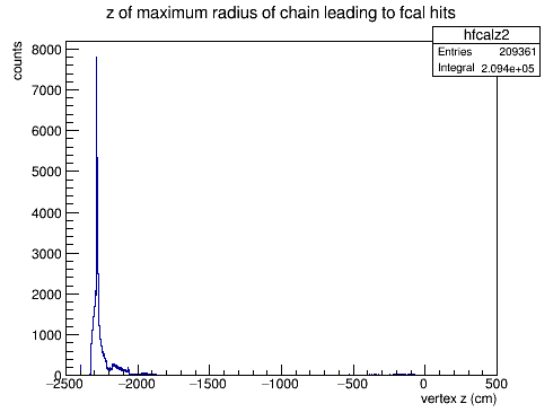
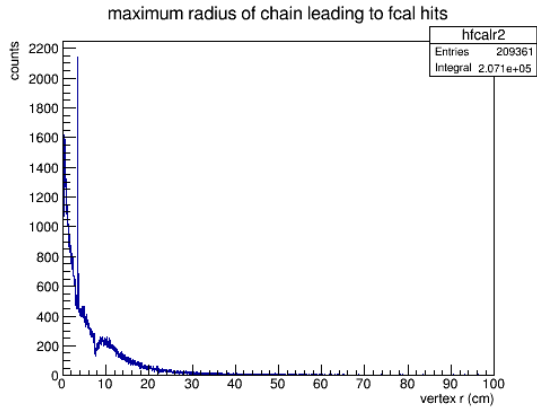


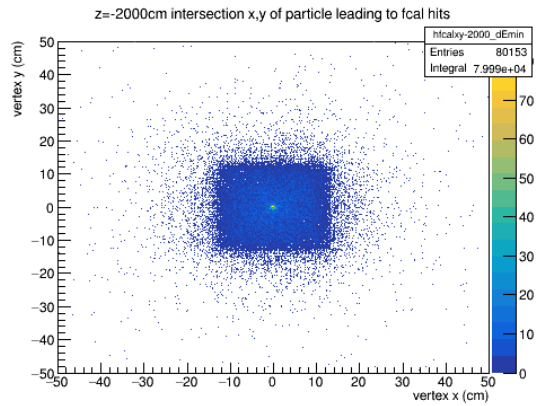
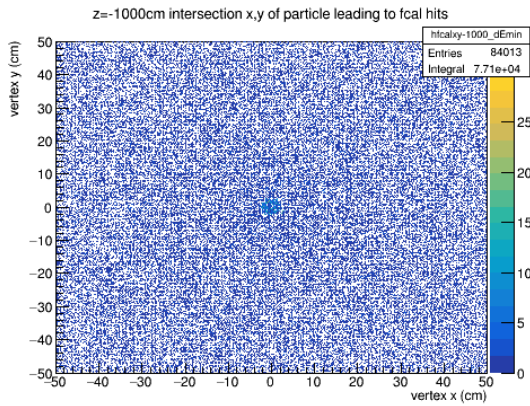
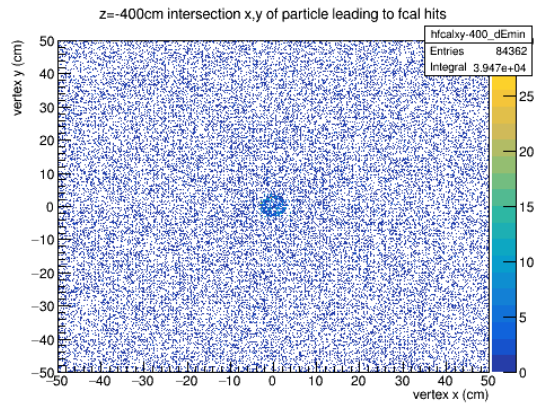
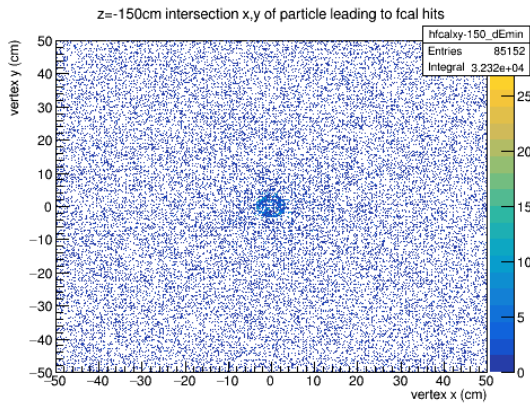
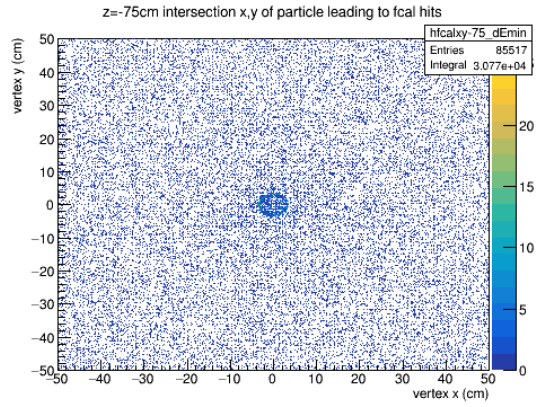
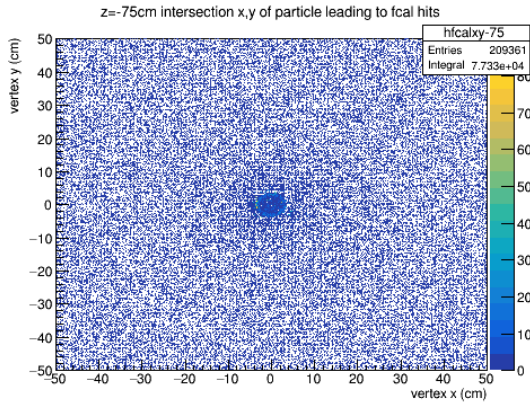


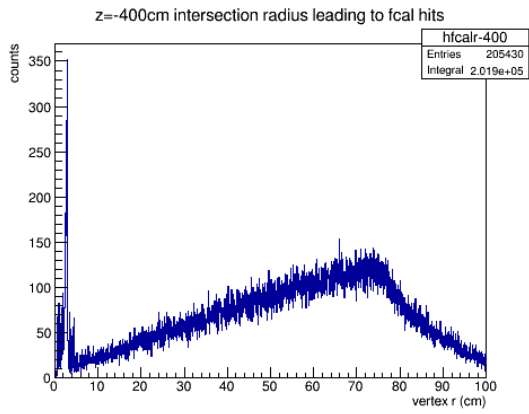
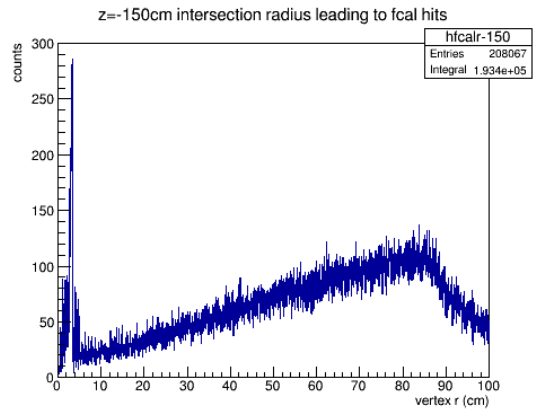
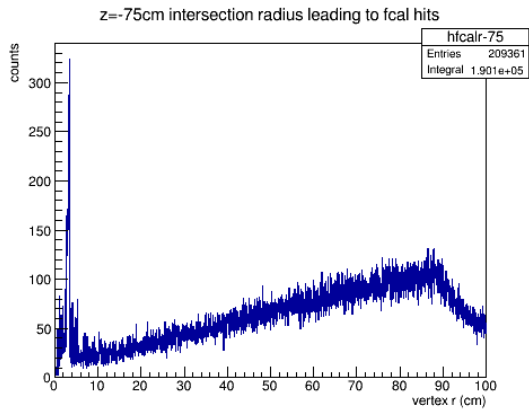


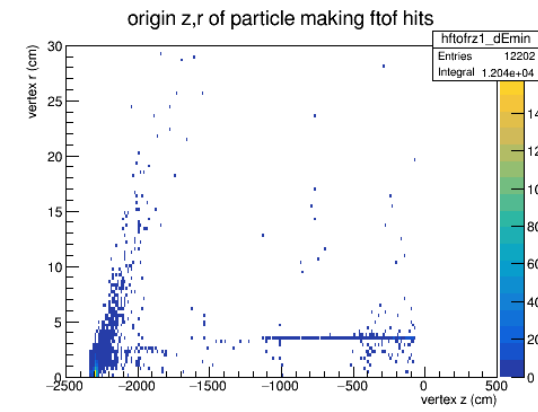
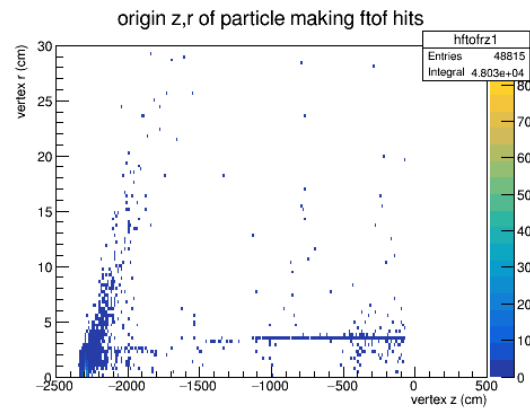
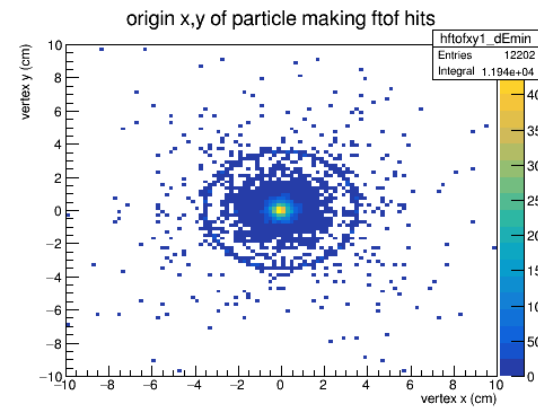
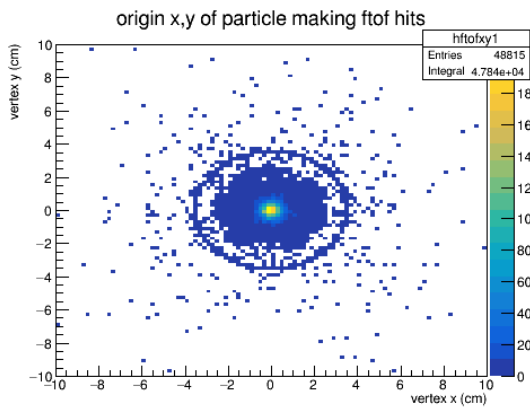
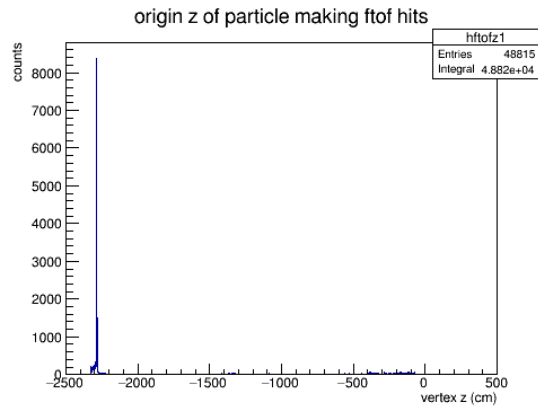
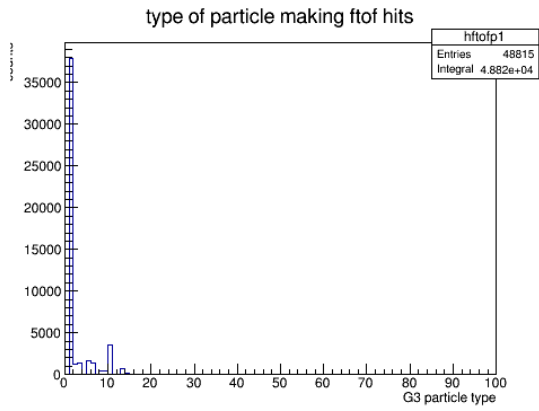


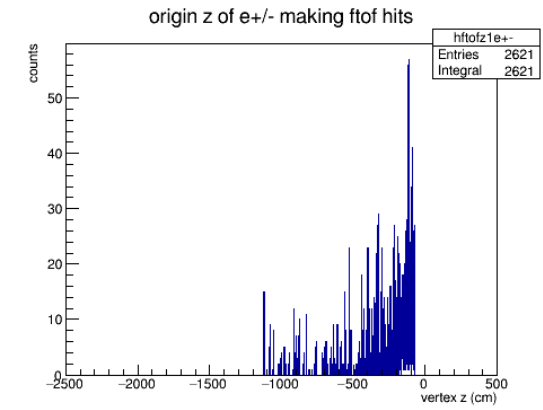
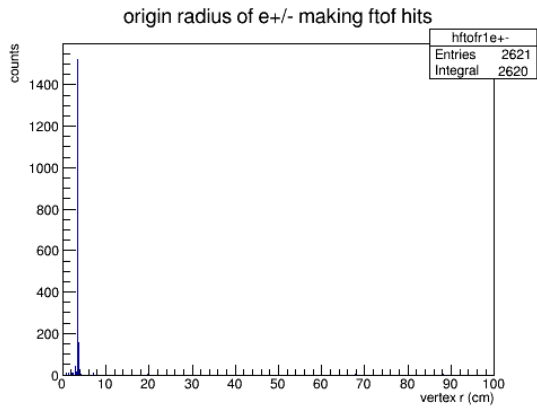
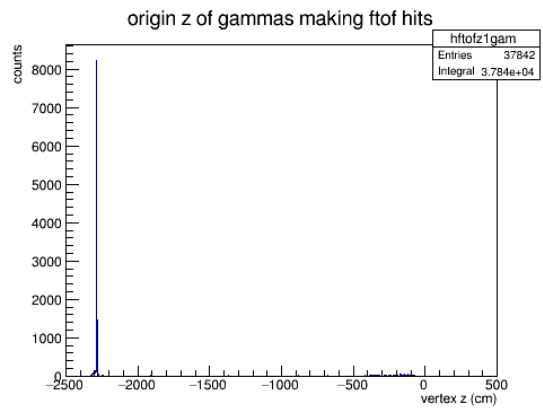
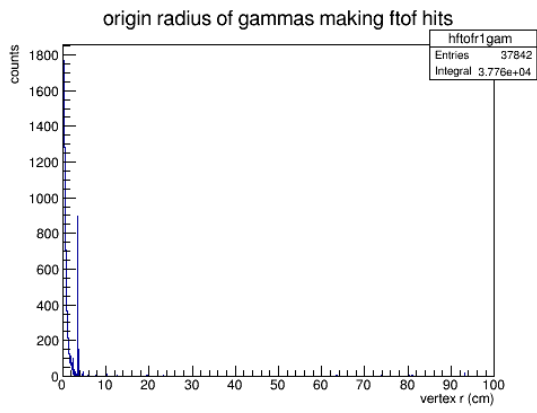
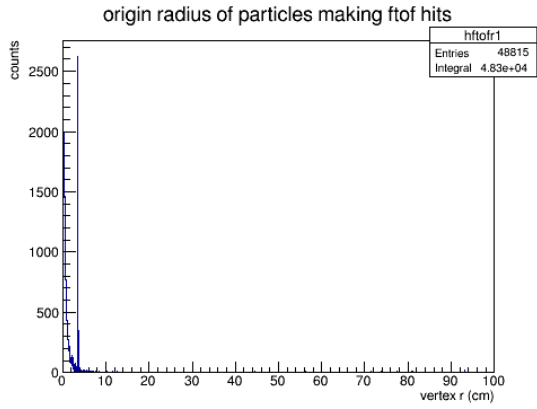
total fraction beyond 4cm is 0.471



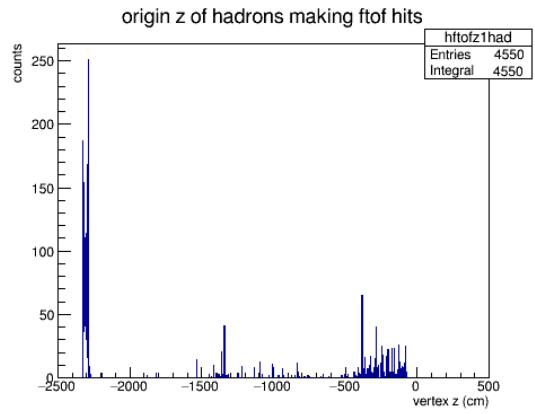
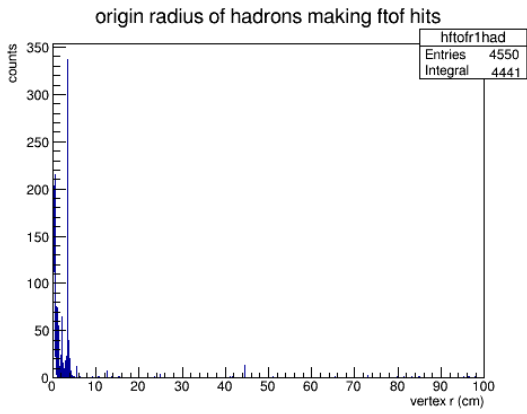
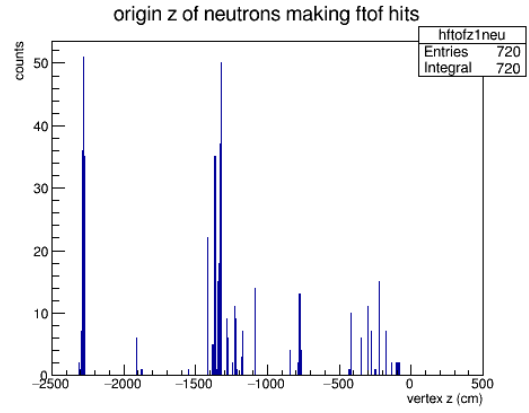
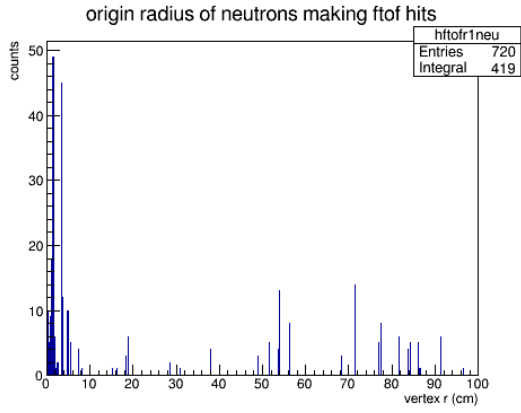




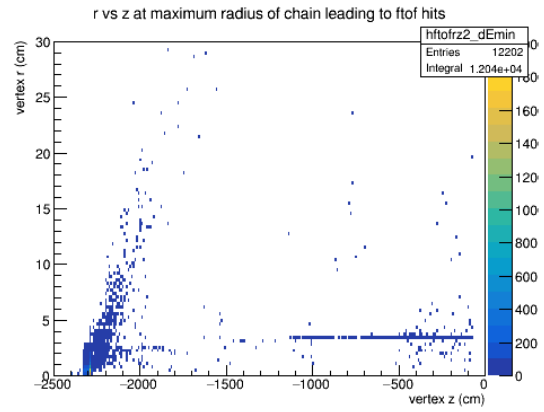
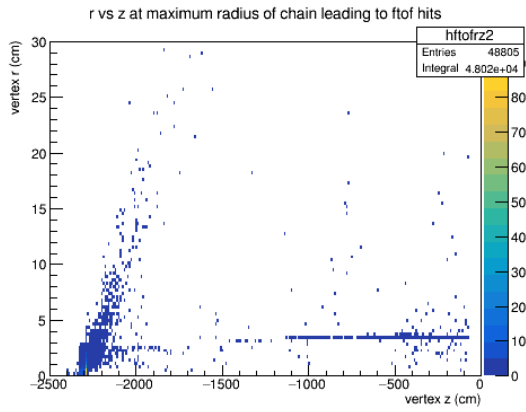
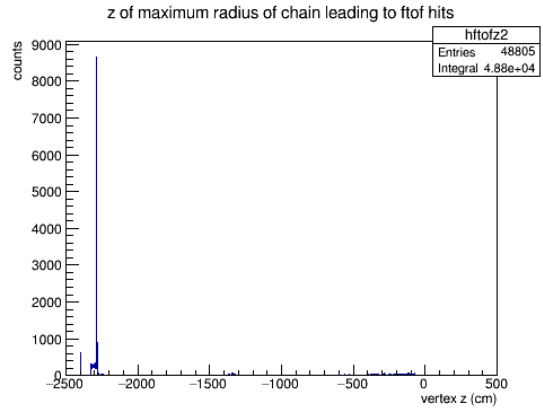
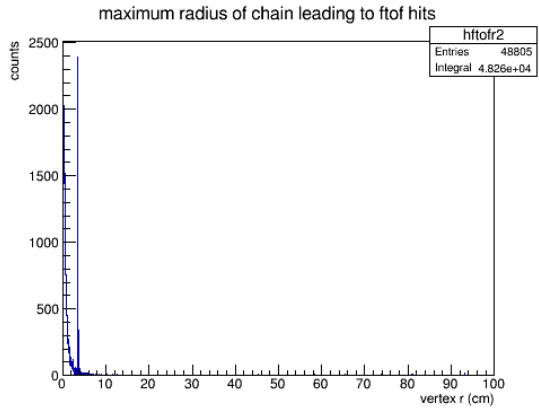


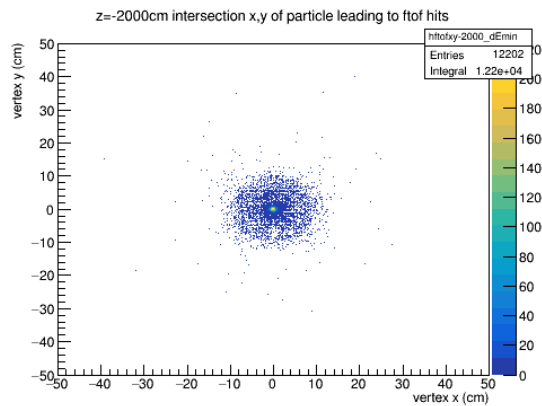
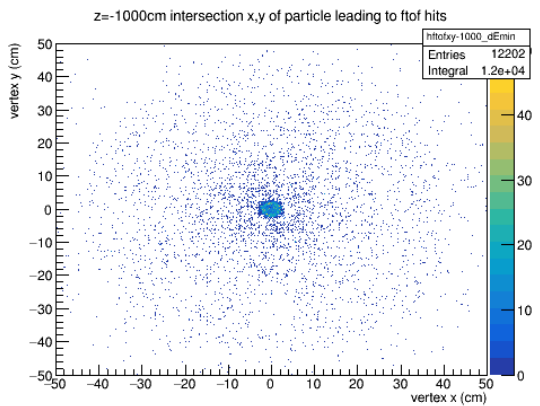
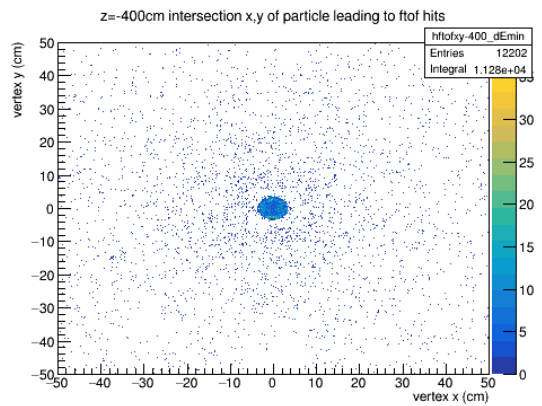
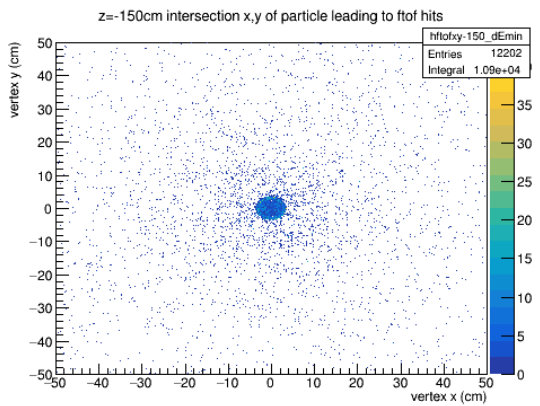
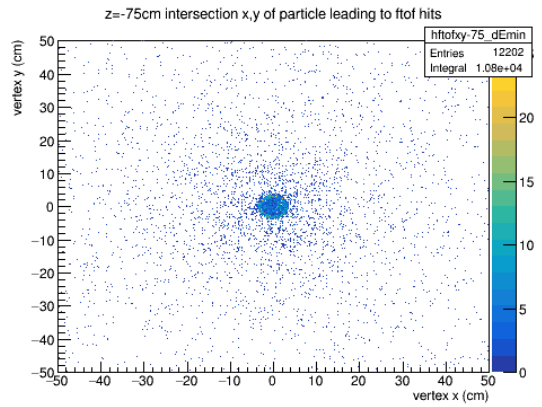
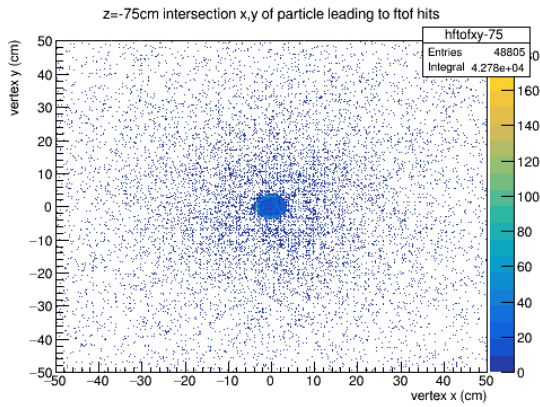


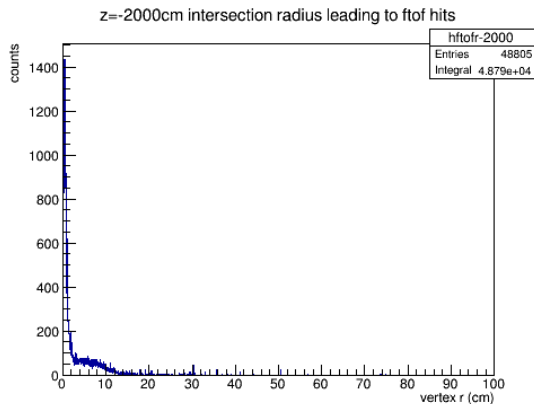
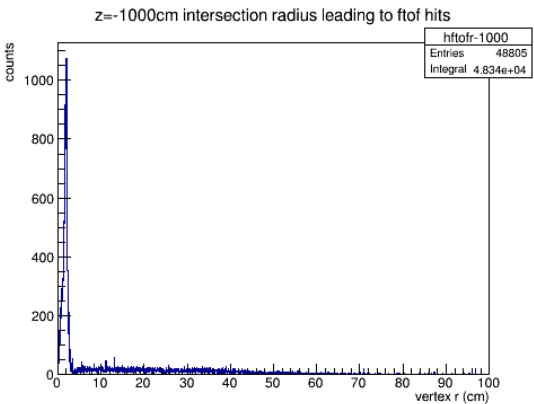
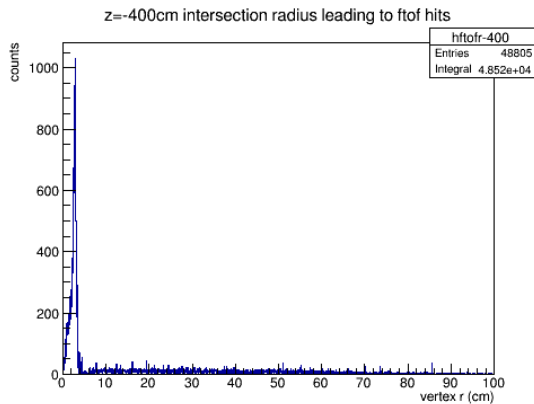
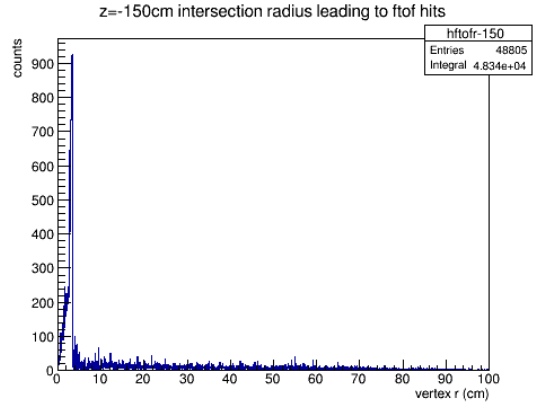
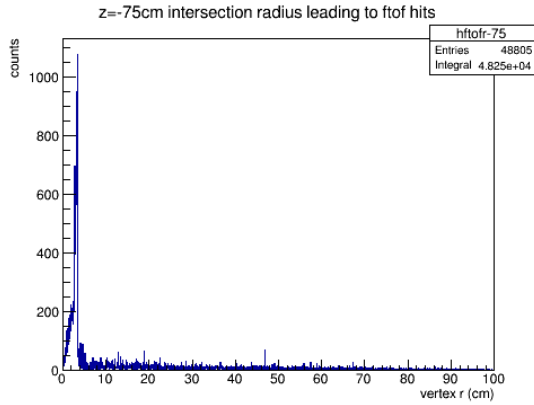
fill_histograms read a total of 9999 tree files, 4999500000.0 records



total fraction beyond 4cm is 0.0189







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hscp1;1      type of particle making start counter hits      31533  Tue Nov 19 18:59:54 2024
hscz1;1      origin z of particle making start counter hits  31533  Tue Nov 19 18:59:54 2024
hscxy1;1     origin x,y of particle making start counter hits  31533  Tue Nov 19 18:59:54 2024
hscrz1;1     origin z,r of particle making start counter hits  31533  Tue Nov 19 18:59:54 2024
hscr1;1      origin radius of particles making start counter hits 31533  Tue Nov 19 18:59:54 2024
hscr2;1      maximum radius of chain leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscz2;1      z of maximum radius of chain leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscrz2;1     r vs z at maximum radius of chain leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr-75;1    z=-75cm intersection x,y of particle leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr-75;1    z=-75cm intersection radius leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr-150;1   z=-150cm intersection x,y of particle leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr-150;1   z=-150cm intersection radius leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr-400;1   z=-400cm intersection x,y of particle leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr-400;1   z=-400cm intersection radius leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr-1000;1  z=-1000cm intersection x,y of particle leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr-1000;1  z=-1000cm intersection radius leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr-2000;1  z=-2000cm intersection x,y of particle leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr-2000;1  z=-2000cm intersection radius leading to start counter hits 31527  Tue Nov 19 18:59:54 2024
hscr1gam;1   origin radius of gammas making start counter hits  27798  Tue Nov 19 18:59:54 2024

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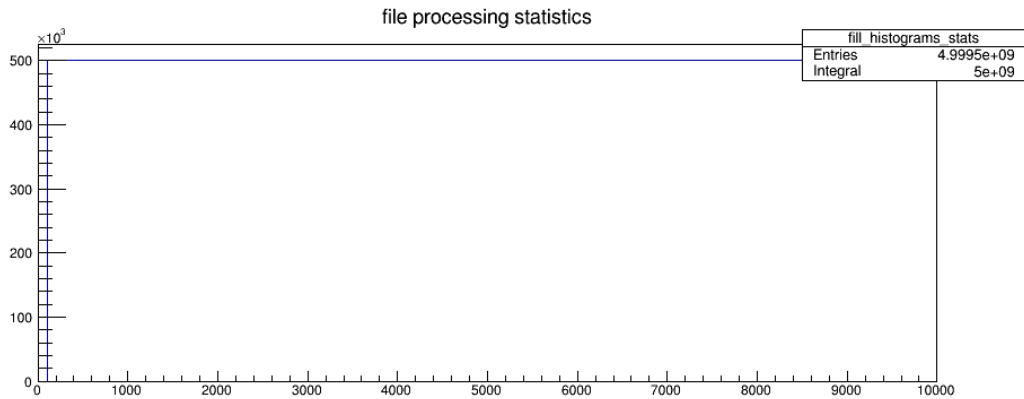
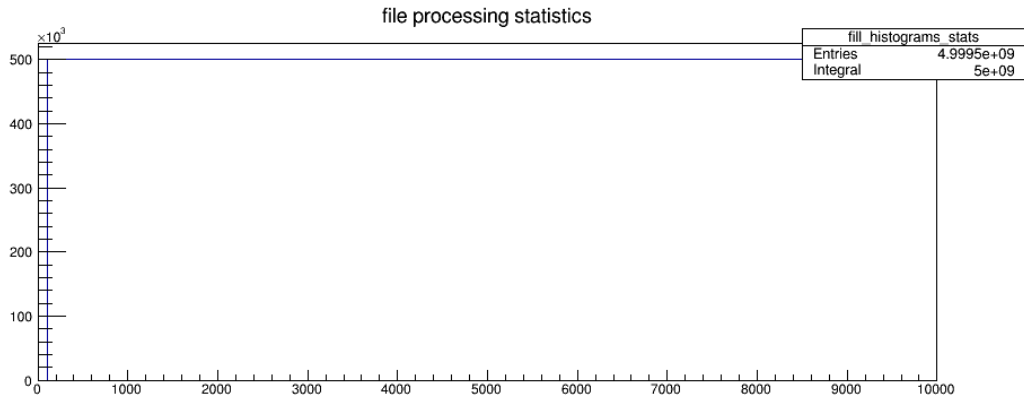

hbcalrhad_dEmin;1	origin radius of hadrons making bcal hits	3485	Tue Nov 19 18:59:55 2024
hbcalz1gam_dEmin;1	origin z of gammas making bcal hits	2638	Tue Nov 19 18:59:55 2024
hbcalz1e+-_dEmin;1	origin z of e+/- making bcal hits	1050	Tue Nov 19 18:59:55 2024
hbcalz1neu_dEmin;1	origin z of neutrons making bcal hits	950	Tue Nov 19 18:59:55 2024
hbcalz1had_dEmin;1	origin z of hadrons making bcal hits	3485	Tue Nov 19 18:59:55 2024
hfcalp1;1	type of particle making fcal hits	209361	Tue Nov 19 18:59:55 2024
hfcalz1;1	origin z of particle making fcal hits	209361	Tue Nov 19 18:59:55 2024
hfcalxy1;1	origin x,y of particle making fcal hits	209361	Tue Nov 19 18:59:55 2024
hfcalrz1;1	origin z,r of particle making fcal hits	209361	Tue Nov 19 18:59:55 2024
hfcalr1;1	origin radius of particles making fcal hits	209361	Tue Nov 19 18:59:55 2024
hfcalr2;1	maximum radius of chain leading to fcal hits	209361	Tue Nov 19 18:59:55 2024
hfcalz2;1	z of maximum radius of chain leading to fcal hits	209361	Tue Nov 19 18:59:55 2024
hfcalrz2;1	r vs z at maximum radius of chain leading to fcal hits	209361	Tue Nov 19 18:59:55 2024
hfcalxy-75;1	z=-75cm intersection x,y of particle leading to fcal hits	209361	Tue Nov 19 18:59:55 2024
hfcalr-75;1	z=-75cm intersection radius leading to fcal hits	209361	Tue Nov 19 18:59:55 2024
hfcalxy-150;1	z=-150cm intersection x,y of particle leading to fcal hits	208067	Tue Nov 19 18:59:55 2024
hfcalr-150;1	z=-150cm intersection radius leading to fcal hits	208067	Tue Nov 19 18:59:55 2024
hfcalxy-400;1	z=-400cm intersection x,y of particle leading to fcal hits	205430	Tue Nov 19 18:59:55 2024
hfcalr-400;1	z=-400cm intersection radius leading to fcal hits	205430	Tue Nov 19 18:59:55 2024
hfcalxy-1000;1	z=-1000cm intersection x,y of particle leading to fcal hits	204526	Tue Nov 19 18:59:55 2024
hfcalr-1000;1	z=-1000cm intersection radius leading to fcal hits	204526	Tue Nov 19 18:59:55 2024
hfcalxy-2000;1	z=-2000cm intersection x,y of particle leading to fcal hits	196878	Tue Nov 19 18:59:55 2024
hfcalr-2000;1	z=-2000cm intersection radius leading to fcal hits	196878	Tue Nov 19 18:59:55 2024
hfcalr1gam;1	origin radius of gammas making fcal hits	13032	Tue Nov 19 18:59:55 2024
hfcalr1e+-;1	origin radius of e+/- making fcal hits	1597	Tue Nov 19 18:59:55 2024
hfcalr1neu;1	origin radius of neutrons making fcal hits	376	Tue Nov 19 18:59:55 2024
hfcalr1had;1	origin radius of hadrons making fcal hits	3949	Tue Nov 19 18:59:55 2024
hfcalz1gam;1	origin z of gammas making fcal hits	13032	Tue Nov 19 18:59:55 2024
hfcalz1e+-;1	origin z of e+/- making fcal hits	1597	Tue Nov 19 18:59:55 2024
hfcalz1neu;1	origin z of neutrons making fcal hits	376	Tue Nov 19 18:59:55 2024
hfcalz1had;1	origin z of hadrons making fcal hits	3949	Tue Nov 19 18:59:55 2024
hfcalp1_dEmin;1	type of particle making fcal hits	85517	Tue Nov 19 18:59:55 2024
hfcalz1_dEmin;1	origin z of particle making fcal hits	85517	Tue Nov 19 18:59:55 2024
hfcalxy1_dEmin;1	origin x,y of particle making fcal hits	85517	Tue Nov 19 18:59:55 2024
hfcalrz1_dEmin;1	origin z,r of particle making fcal hits	85517	Tue Nov 19 18:59:55 2024
hfcalr1_dEmin;1	origin radius of particles making fcal hits	85517	Tue Nov 19 18:59:55 2024
hfcalr2_dEmin;1	maximum radius of chain leading to fcal hits	85517	Tue Nov 19 18:59:55 2024
hfcalz2_dEmin;1	z of maximum radius of chain leading to fcal hits	85517	Tue Nov 19 18:59:55 2024
hfcalrz2_dEmin;1	r vs z at maximum radius of chain leading to fcal hits	85517	Tue Nov 19 18:59:55 2024
hfcalxy-75_dEmin;1	z=-75cm intersection x,y of particle leading to fcal hits	85517	Tue Nov 19 18:59:55 2024
hfcalr-75_dEmin;1	z=-75cm intersection radius leading to fcal hits	85517	Tue Nov 19 18:59:55 2024
hfcalxy-150_dEmin;1	z=-150cm intersection x,y of particle leading to fcal hits	85152	Tue Nov 19 18:59:55 2024
hfcalr-150_dEmin;1	z=-150cm intersection radius leading to fcal hits	85152	Tue Nov 19 18:59:55 2024
hfcalxy-400_dEmin;1	z=-400cm intersection x,y of particle leading to fcal hits	84362	Tue Nov 19 18:59:55 2024
hfcalr-400_dEmin;1	z=-400cm intersection radius leading to fcal hits	84362	Tue Nov 19 18:59:55 2024
hfcalxy-1000_dEmin;1	z=-1000cm intersection x,y of particle leading to fcal hits	84013	Tue Nov 19 18:59:55 2024
hfcalr-1000_dEmin;1	z=-1000cm intersection radius leading to fcal hits	84013	Tue Nov 19 18:59:55 2024
hfcalxy-2000_dEmin;1	z=-2000cm intersection x,y of particle leading to fcal hits	80153	Tue Nov 19 18:59:55 2024
hfcalr-2000_dEmin;1	z=-2000cm intersection radius leading to fcal hits	80153	Tue Nov 19 18:59:55 2024
hfcalr1gam_dEmin;1	origin radius of gammas making fcal hits	970	Tue Nov 19 18:59:55 2024
hfcalr1e+-_dEmin;1	origin radius of e+/- making fcal hits	423	Tue Nov 19 18:59:55 2024
hfcalr1neu_dEmin;1	origin radius of neutrons making fcal hits	216	Tue Nov 19 18:59:55 2024
hfcalr1had_dEmin;1	origin radius of hadrons making fcal hits	1957	Tue Nov 19 18:59:55 2024
hfcalz1gam_dEmin;1	origin z of gammas making fcal hits	970	Tue Nov 19 18:59:55 2024
hfcalz1e+-_dEmin;1	origin z of e+/- making fcal hits	423	Tue Nov 19 18:59:55 2024
hfcalz1neu_dEmin;1	origin z of neutrons making fcal hits	216	Tue Nov 19 18:59:55 2024
hfcalz1had_dEmin;1	origin z of hadrons making fcal hits	1957	Tue Nov 19 18:59:55 2024
hftofp1;1	type of particle making ftof hits	48815	Tue Nov 19 18:59:55 2024
hftofz1;1	origin z of particle making ftof hits	48815	Tue Nov 19 18:59:55 2024
hftofxy1;1	origin x,y of particle making ftof hits	48815	Tue Nov 19 18:59:55 2024
hftofrz1;1	origin z,r of particle making ftof hits	48815	Tue Nov 19 18:59:55 2024
hftofr1;1	origin radius of particles making ftof hits	48815	Tue Nov 19 18:59:55 2024
hftofr2;1	maximum radius of chain leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofz2;1	z of maximum radius of chain leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofrz2;1	r vs z at maximum radius of chain leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofxy-75;1	z=-75cm intersection x,y of particle leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofr-75;1	z=-75cm intersection radius leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofxy-150;1	z=-150cm intersection x,y of particle leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofr-150;1	z=-150cm intersection radius leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofxy-400;1	z=-400cm intersection x,y of particle leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofr-400;1	z=-400cm intersection radius leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofxy-1000;1	z=-1000cm intersection x,y of particle leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofr-1000;1	z=-1000cm intersection radius leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofxy-2000;1	z=-2000cm intersection x,y of particle leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofr-2000;1	z=-2000cm intersection radius leading to ftof hits	48805	Tue Nov 19 18:59:55 2024
hftofr1gam;1	origin radius of gammas making ftof hits	37842	Tue Nov 19 18:59:55 2024
hftofr1e+-;1	origin radius of e+/- making ftof hits	2621	Tue Nov 19 18:59:55 2024
hftofr1neu;1	origin radius of neutrons making ftof hits	720	Tue Nov 19 18:59:55 2024
hftofr1had;1	origin radius of hadrons making ftof hits	4550	Tue Nov 19 18:59:55 2024
hftofz1gam;1	origin z of gammas making ftof hits	37842	Tue Nov 19 18:59:55 2024
hftofz1e+-;1	origin z of e+/- making ftof hits	2621	Tue Nov 19 18:59:55 2024
hftofz1neu;1	origin z of neutrons making ftof hits	720	Tue Nov 19 18:59:55 2024
hftofz1had;1	origin z of hadrons making ftof hits	4550	Tue Nov 19 18:59:55 2024
hftofp1_dEmin;1	type of particle making ftof hits	12202	Tue Nov 19 18:59:55 2024
hftofz1_dEmin;1	origin z of particle making ftof hits	12202	Tue Nov 19 18:59:55 2024
hftofxy1_dEmin;1	origin x,y of particle making ftof hits	12202	Tue Nov 19 18:59:55 2024
hftofrz1_dEmin;1	origin z,r of particle making ftof hits	12202	Tue Nov 19 18:59:55 2024
hftofr1_dEmin;1	origin radius of particles making ftof hits	12202	Tue Nov 19 18:59:55 2024
hftofr2_dEmin;1	maximum radius of chain leading to ftof hits	12202	Tue Nov 19 18:59:55 2024
hftofz2_dEmin;1	z of maximum radius of chain leading to ftof hits	12202	Tue Nov 19 18:59:55 2024
hftofrz2_dEmin;1	r vs z at maximum radius of chain leading to ftof hits	12202	Tue Nov 19 18:59:55 2024
hftofxy-75_dEmin;1	z=-75cm intersection x,y of particle leading to ftof hits	12202	Tue Nov 19 18:59:55 2024

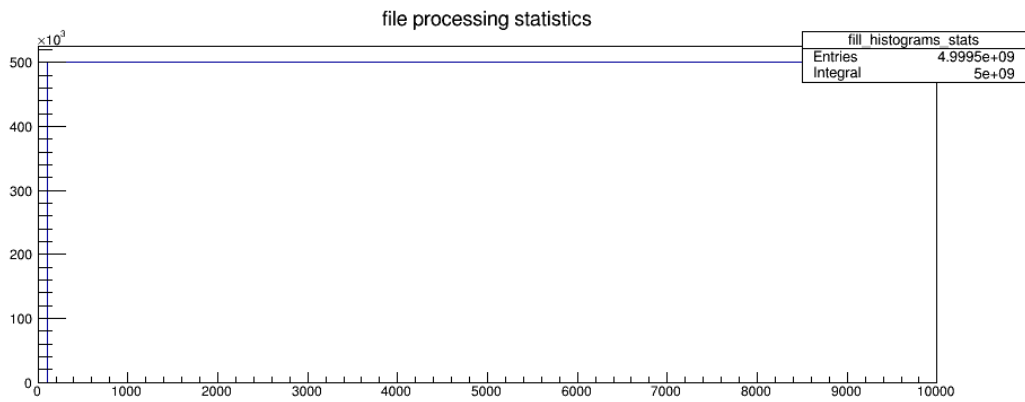
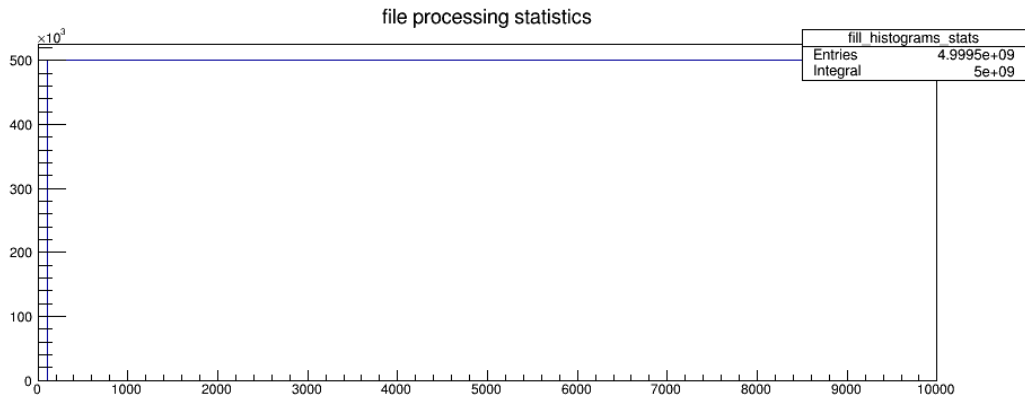
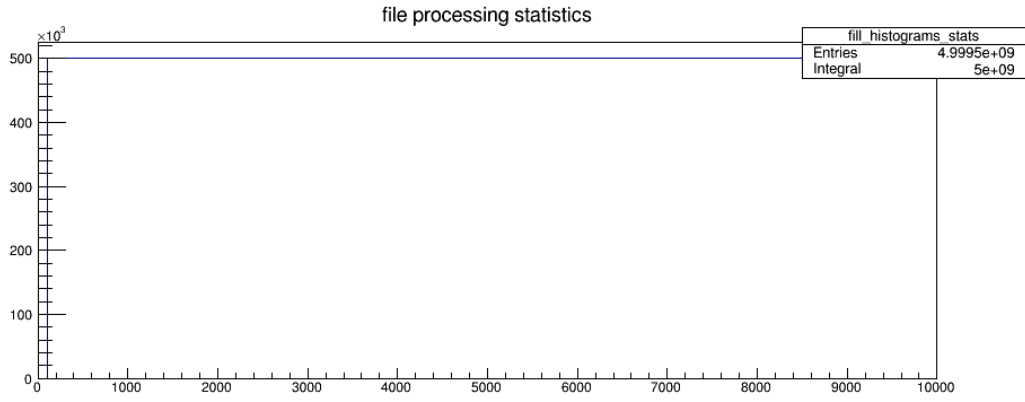

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hftofr-75_dEmin;1 z=-75cm intersection radius leading to ftof hits      12202  Tue Nov 19 18:59:55 2024
hftofxy-150_dEmin;1 z=-150cm intersection x,y of particle leading to ftof hits      12202  Tue Nov 19 18:59:55 2024
hftofr-150_dEmin;1 z=-150cm intersection radius leading to ftof hits      12202  Tue Nov 19 18:59:55 2024
hftofxy-400_dEmin;1 z=-400cm intersection x,y of particle leading to ftof hits      12202  Tue Nov 19 18:59:55 2024
hftofr-400_dEmin;1 z=-400cm intersection radius leading to ftof hits      12202  Tue Nov 19 18:59:55 2024
hftofxy-1000_dEmin;1 z=-1000cm intersection x,y of particle leading to ftof hits     12202  Tue Nov 19 18:59:55 2024
hftofr-1000_dEmin;1 z=-1000cm intersection radius leading to ftof hits     12202  Tue Nov 19 18:59:55 2024
hftofxy-2000_dEmin;1 z=-2000cm intersection x,y of particle leading to ftof hits     12202  Tue Nov 19 18:59:55 2024
hftofr-2000_dEmin;1 z=-2000cm intersection radius leading to ftof hits     12202  Tue Nov 19 18:59:55 2024
hftofr1gam_dEmin;1 origin radius of gammas making ftof hits              7940   Tue Nov 19 18:59:55 2024
hftofr1e+-_dEmin;1 origin radius of e+/- making ftof hits              921    Tue Nov 19 18:59:55 2024
hftofr1neu_dEmin;1 origin radius of neutrons making ftof hits            71     Tue Nov 19 18:59:55 2024
hftofr1had_dEmin;1 origin radius of hadrons making ftof hits            1382   Tue Nov 19 18:59:55 2024
hftofz1gam_dEmin;1 origin z of gammas making ftof hits                  7940   Tue Nov 19 18:59:55 2024
hftofz1e+-_dEmin;1 origin z of e+/- making ftof hits                   921    Tue Nov 19 18:59:55 2024
hftofz1neu_dEmin;1 origin z of neutrons making ftof hits                71     Tue Nov 19 18:59:55 2024
hftofz1had_dEmin;1 origin z of hadrons making ftof hits                 1382   Tue Nov 19 18:59:55 2024
fill_histograms_stats;1 file processing statistics                        4999500000  Tue Nov 19 18:59:55 2024

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[50]: 313





file processing statistics

