

Effect of Rosy Field and Polarity

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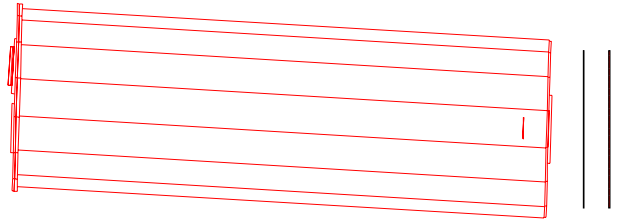
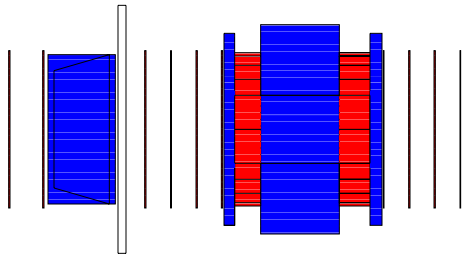
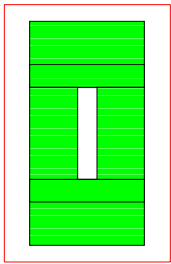
11-Aug-01

Geometry used:-

The following table gives the positions of the detectors in E907mc Monte carlo used for this simulation. The mother volume is called CAVE and is a tube. All positions are with respect to the center of this tube in Centimeters. The co-ordinate system employed is z axis along tube axis along the beam direction , y axis is vertical and x axis is horizontal forming a right handed co-ordinate system.

Object	Z position (cm)
Target	-843.5
Jolly Green Giant	-739.98
Rosy	12.998 vertical aperture=36" default
RICH	947.7
Chamber 1	-552.9
Chamber 2	-487.3
Chamber 3	-290.5
Chamber 4	-241.3
Chamber 5	-192.1
Chamber 6	-142.9
Chamber 7	168.7
Chamber 8	217.9
Chamber 9	267.1
Chamber 10	316.3
Chamber 11	1529.9
Chamber 12	1579.1

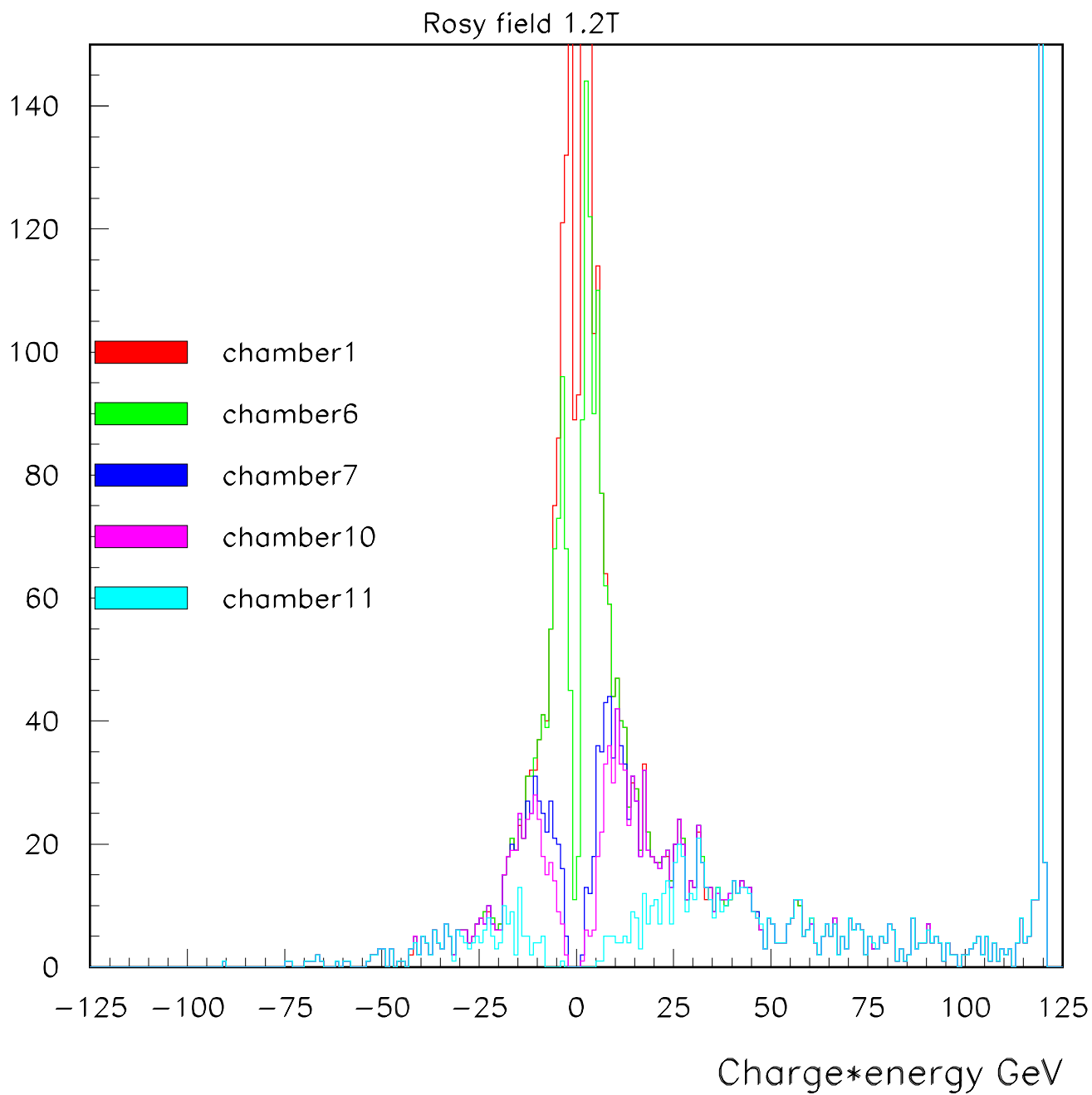
The following picture shows the experiment cut along a vertical plane passing through $x=0$

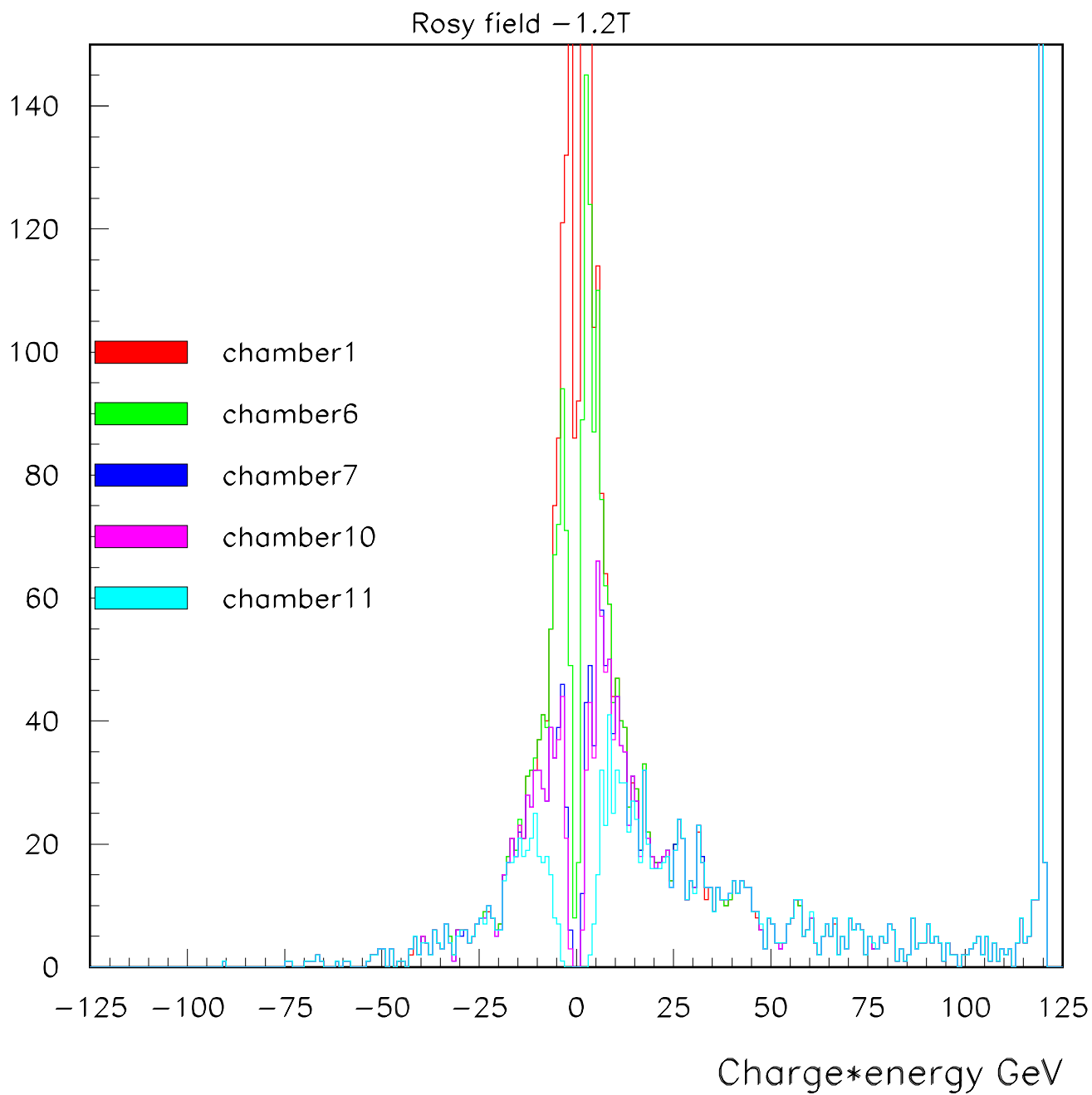


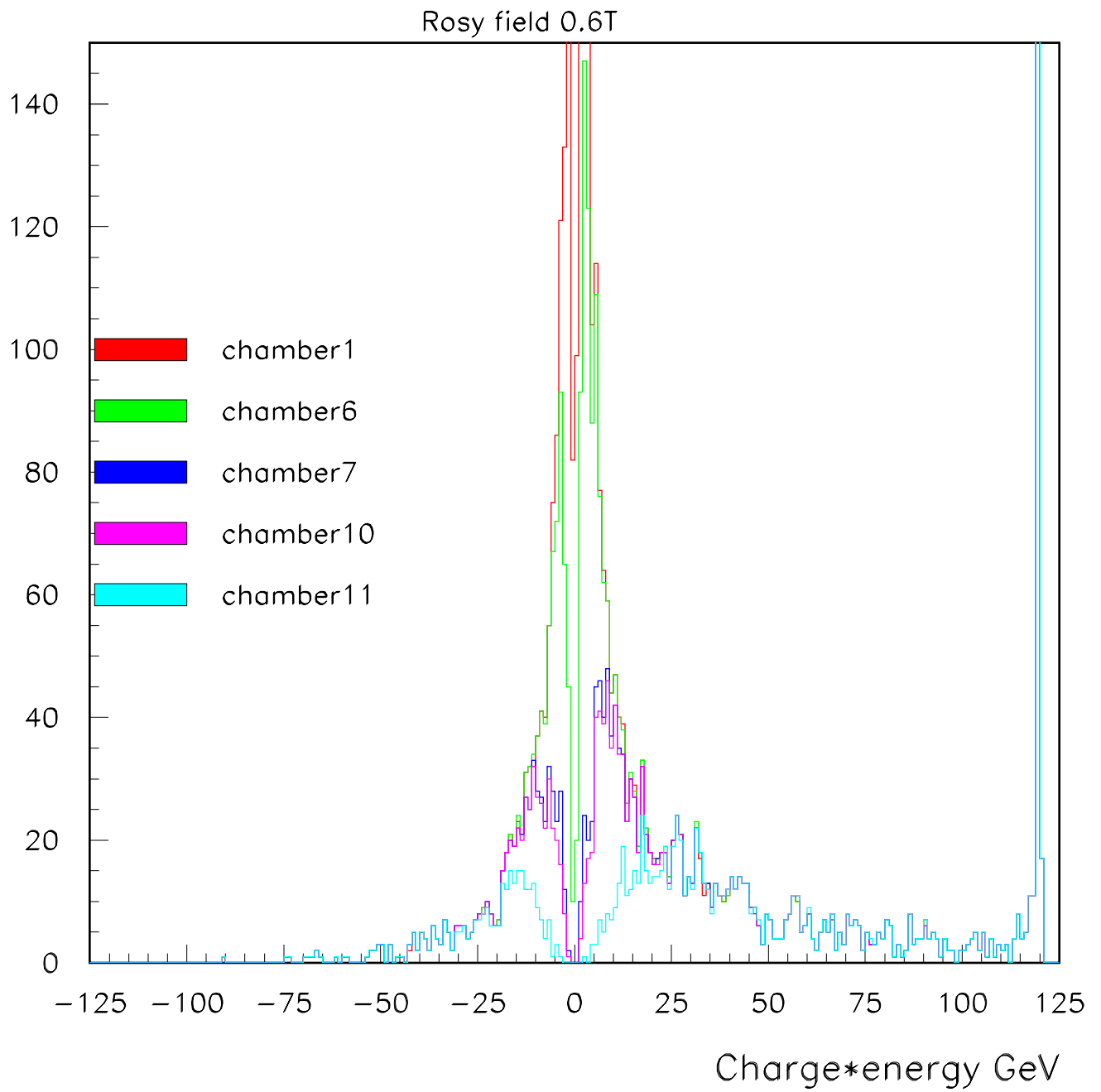
The following set of pictures show the charged particle spectra for 120 GeV pp interactions (PYTHIA, 1000 events)

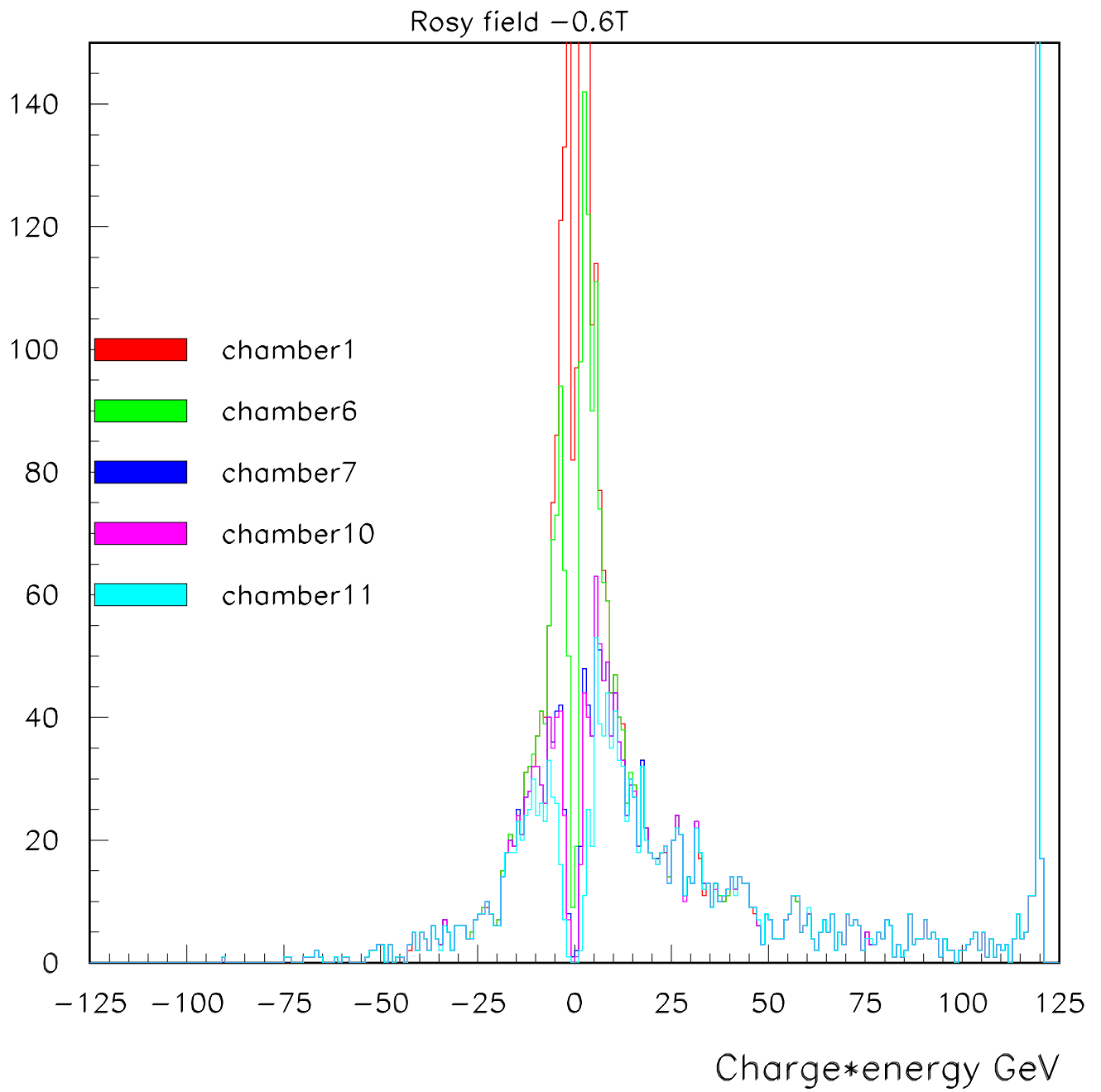
At chamber 1 (just downstream of Jolly Green Giant), chamber 6(just upstream of ROSY), chamber 7(just downstream of ROSY) chamber 10(just upstream of RICH) and Chamber 11 (downstream of RICH). The ROSY field is assumed to be constant over its volume (we are awaiting an 8 coil field map) to be either 1.2 T or 0.6 T of either polarity. The aim of this study is to determine the relative polarity and strength of the ROSY field with respect to the Jolly Green Giant field which is taken to be 0.7194 Tesla at its maximum point. The field map is taken from E910.

What is plotted are the particle energies (GeV) times the charge so that negative particles will appear with negative energies. For each field configuration, the spectra are plotted at the above mentioned chambers. It can be seen that there is a progressive loss of low energy particles as one proceeds downstream, as one would expect from the action due to the magnets.

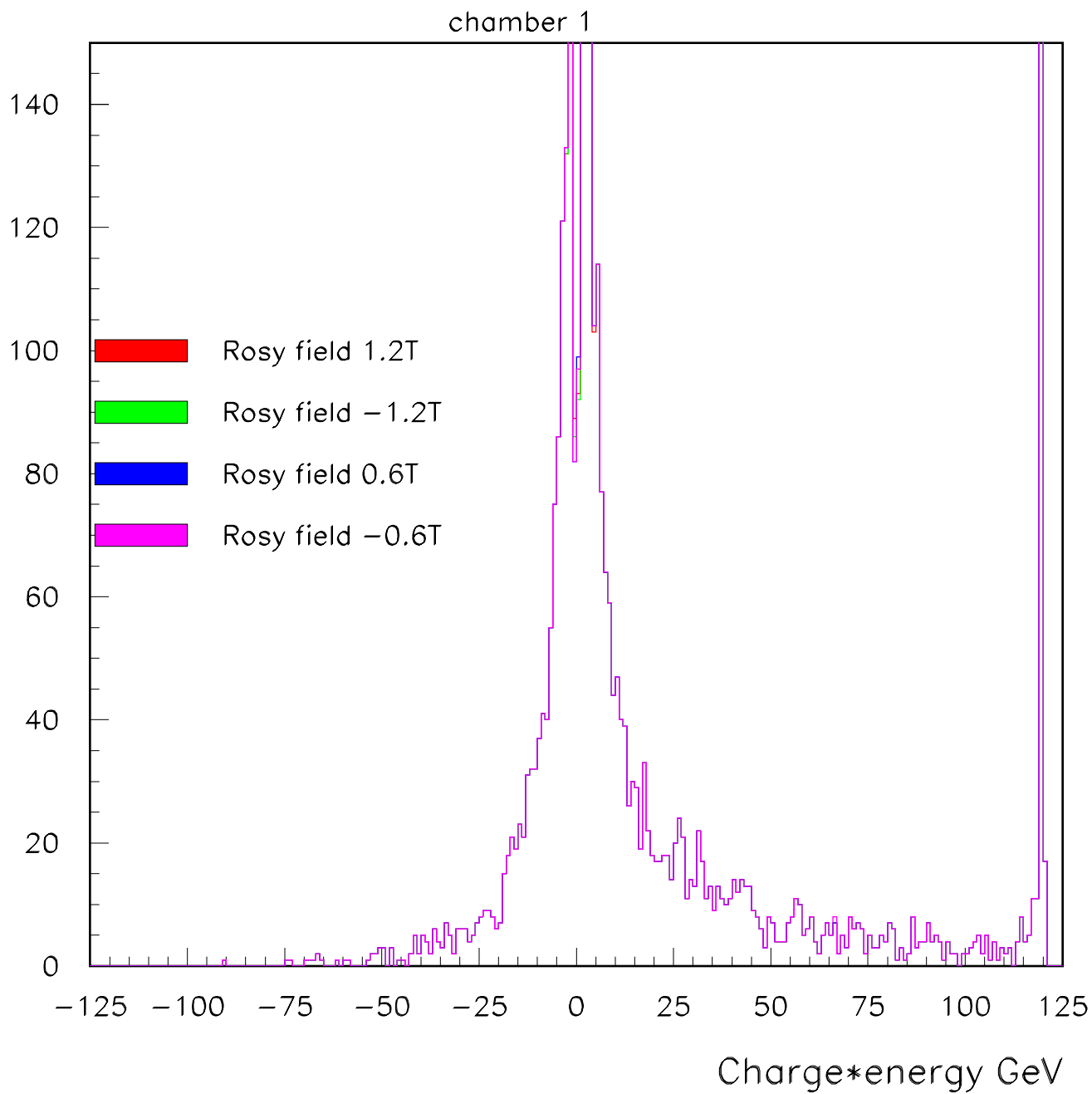




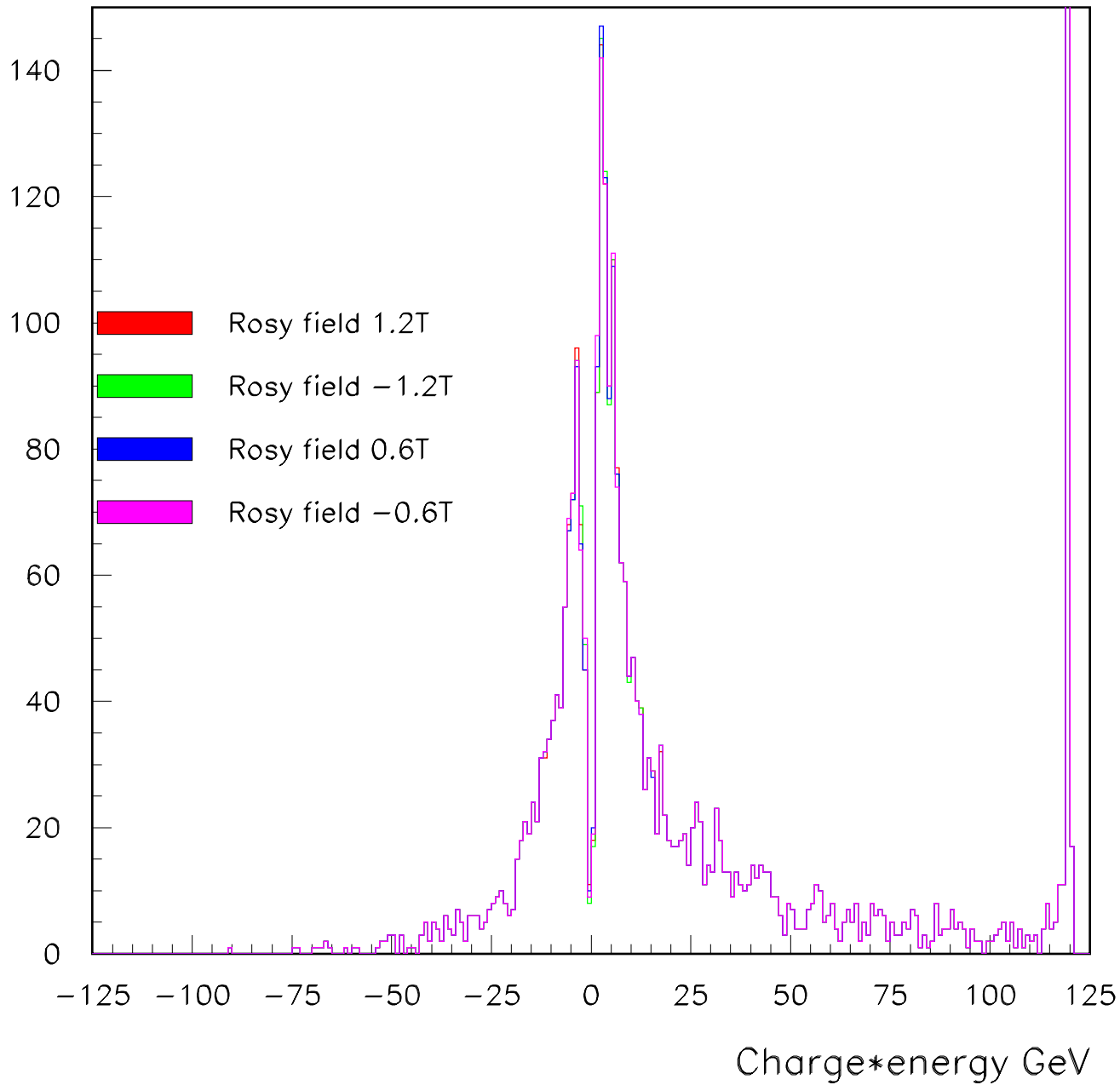


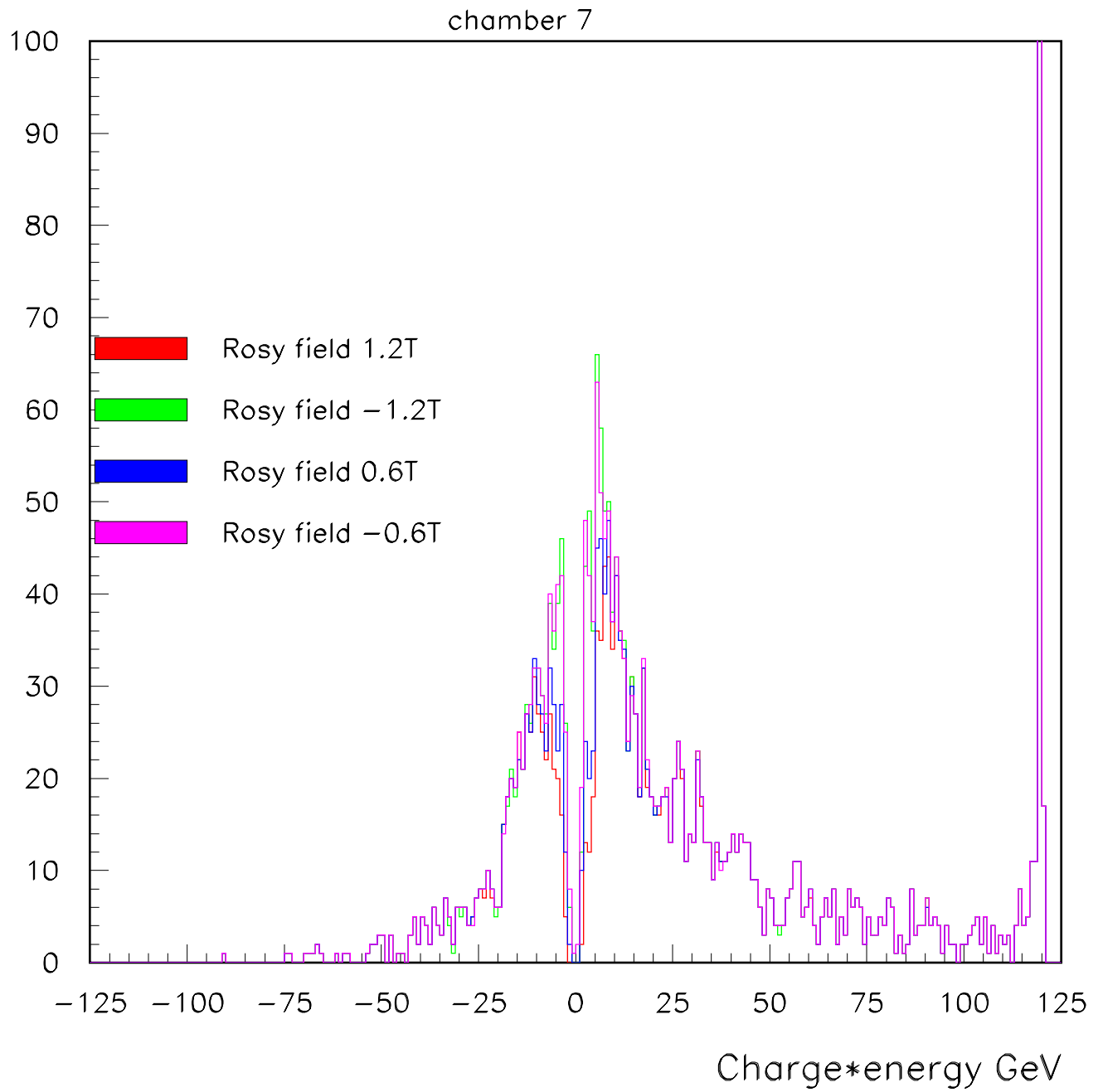


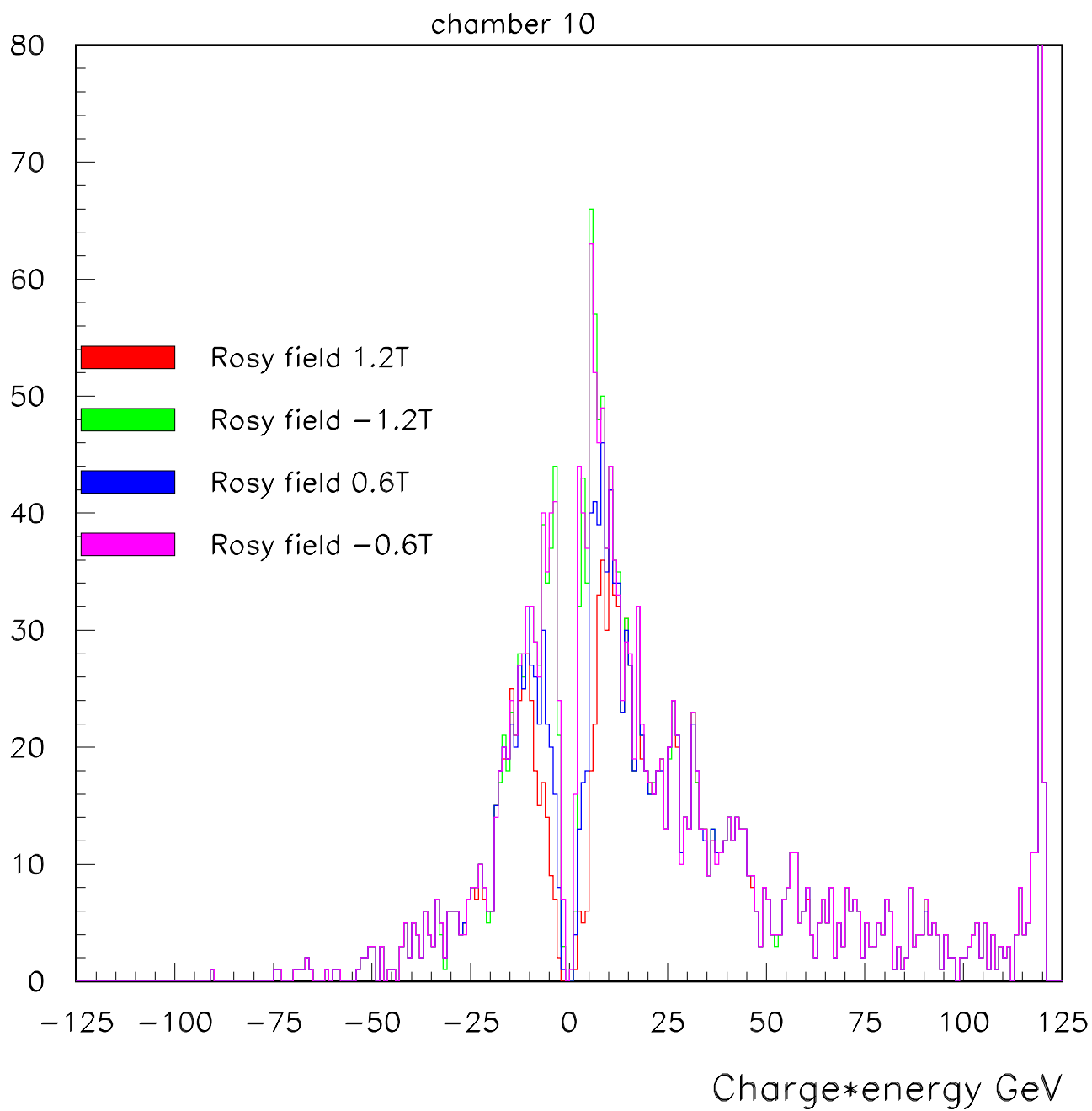
As can be seen from the above pictures, the acceptance at the RICH improves if one runs the magnets at opposite polarity, since the low energy particle ($\sim 7.5\text{GeV}$) will get swept back towards the RICH in this case. We further illustrate this effect by looking at Spectra at chambers as a function of the field. It can be seen that the spectra at chamber 7, just downstream of ROSY are largest for ROSY field of -0.6T (-1.2 T seems to overcorrect Jolly Green Giant). The effect is more pronounced for chamber 10 (upstream of RICH) and chamber 11 (downstream of RICH).

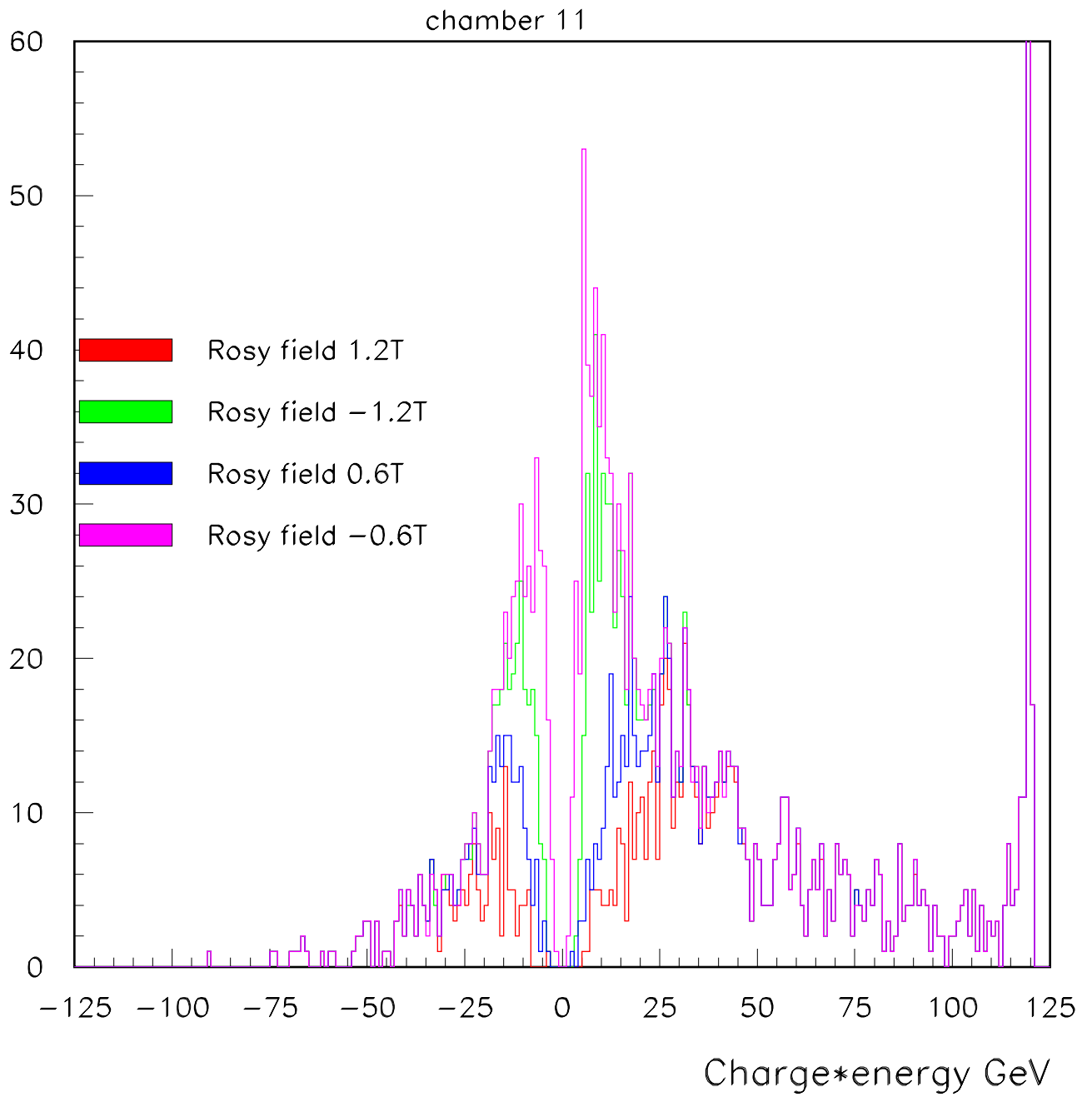


chamber 6

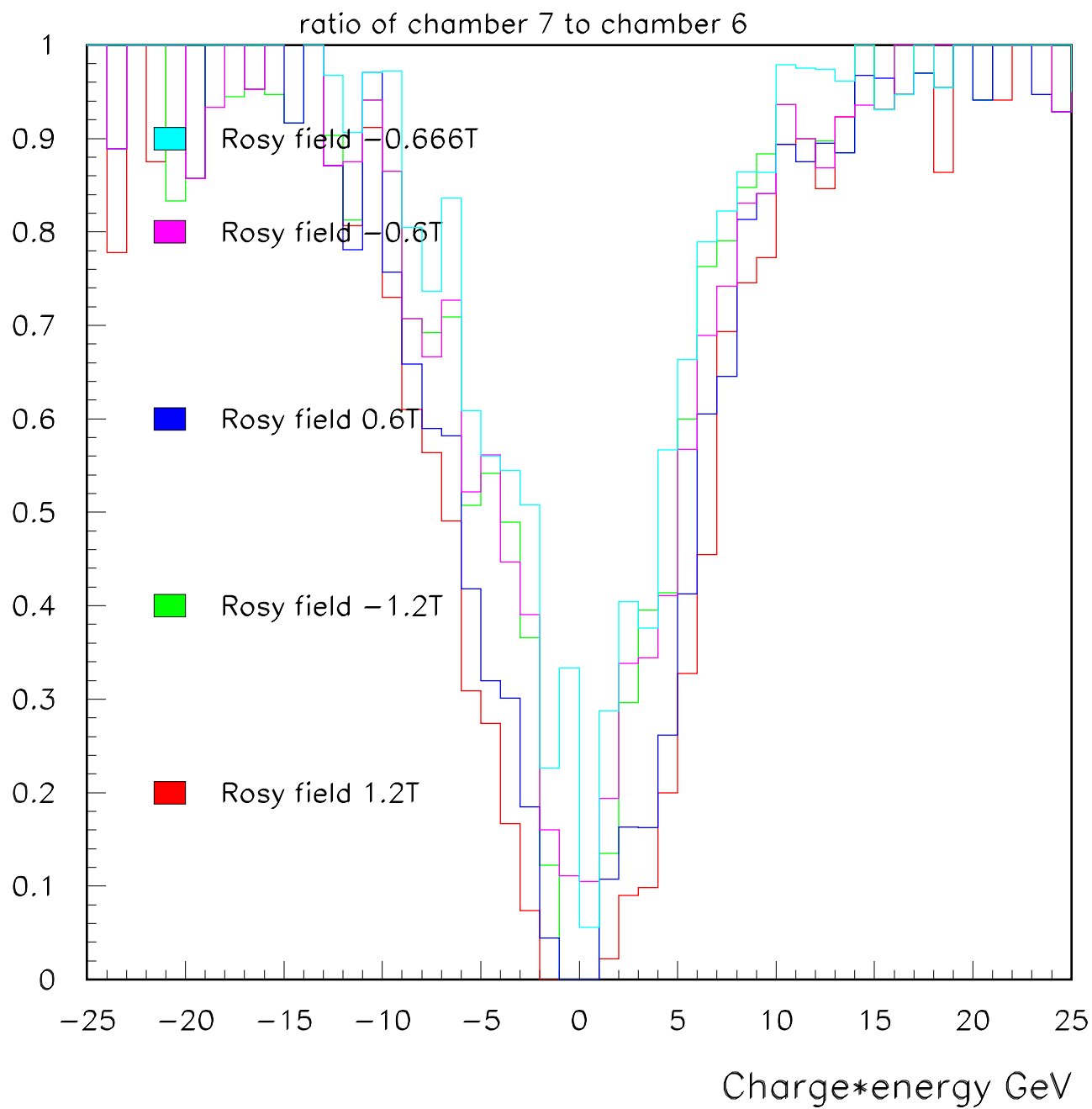


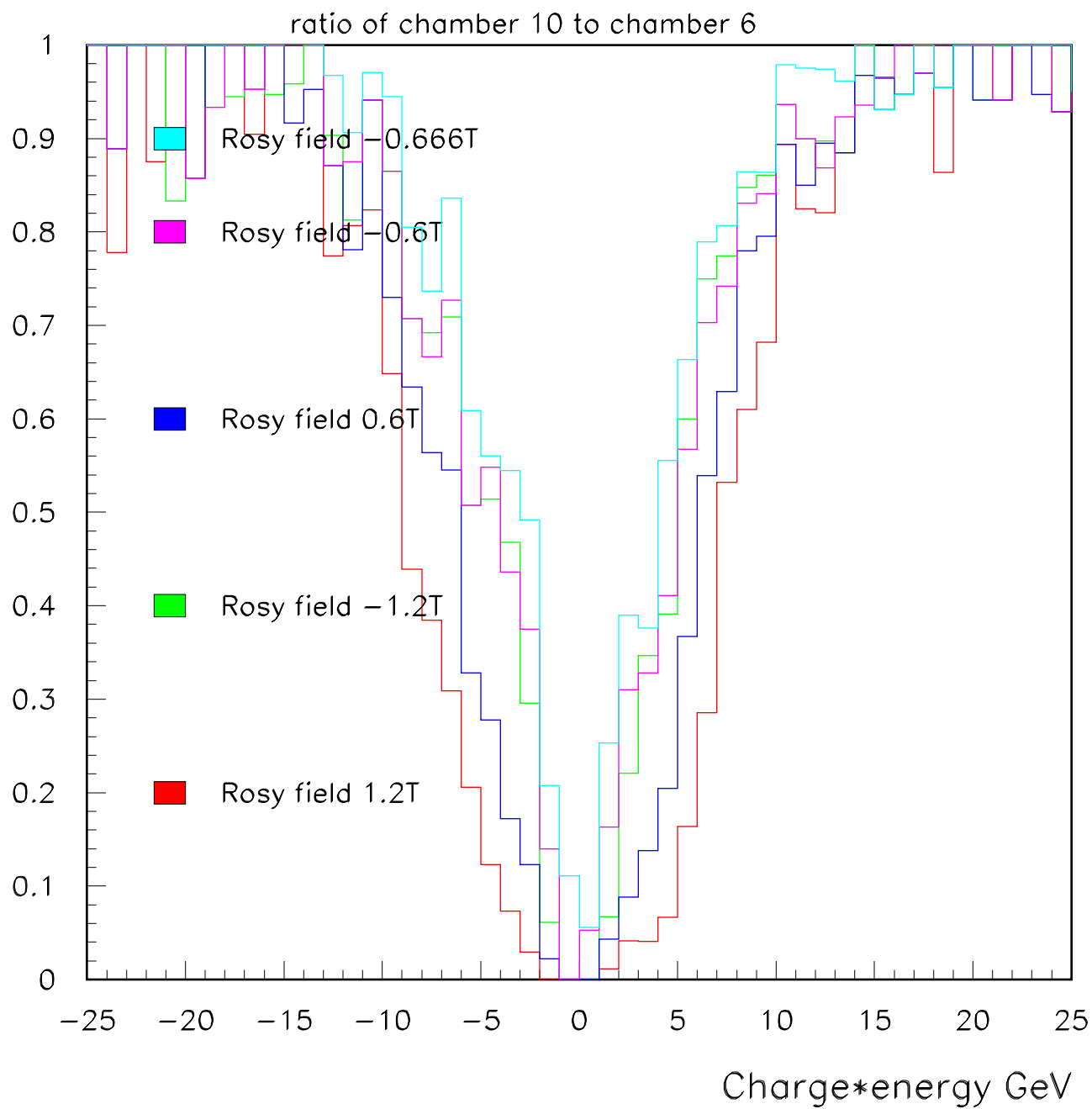


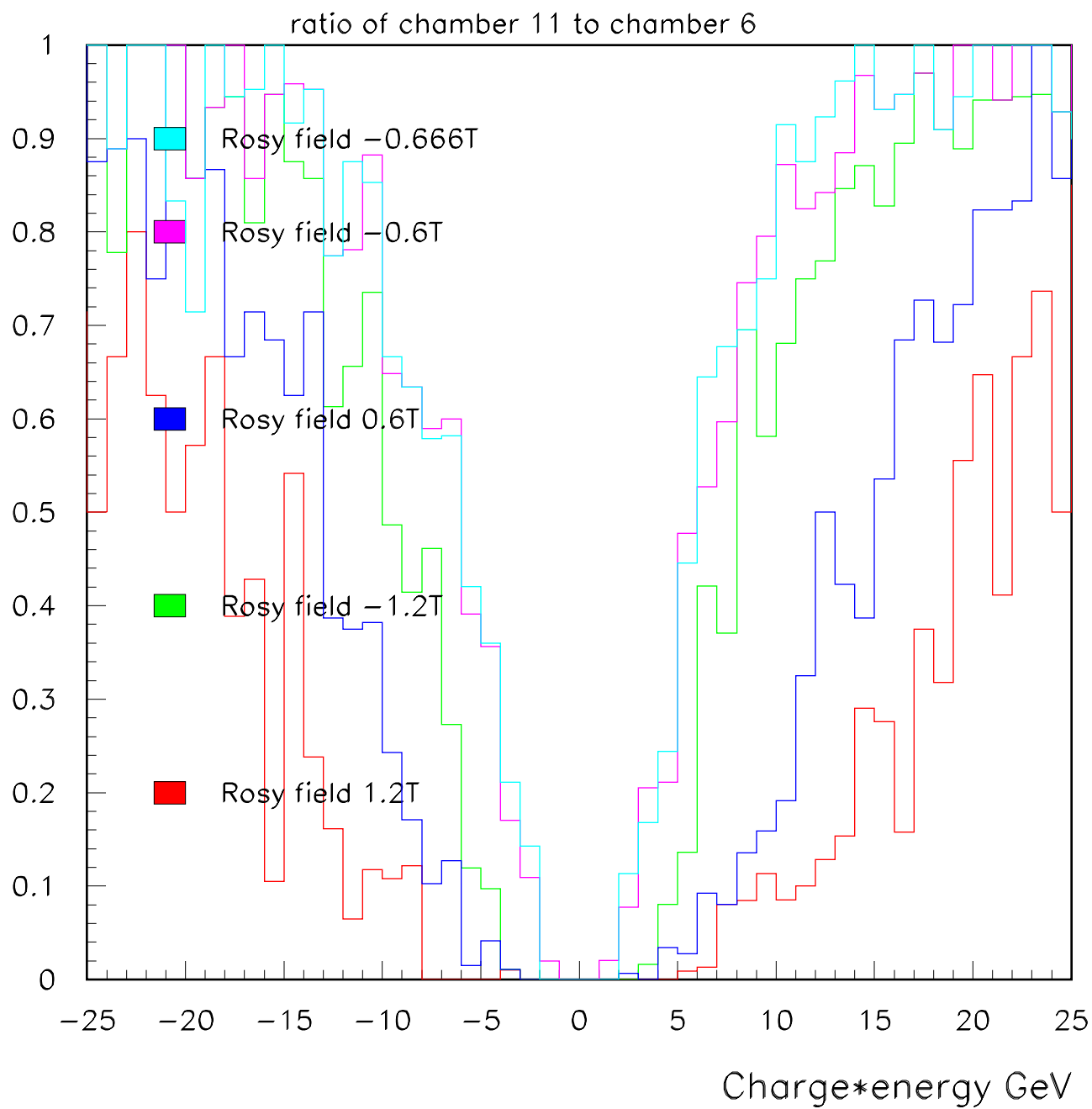




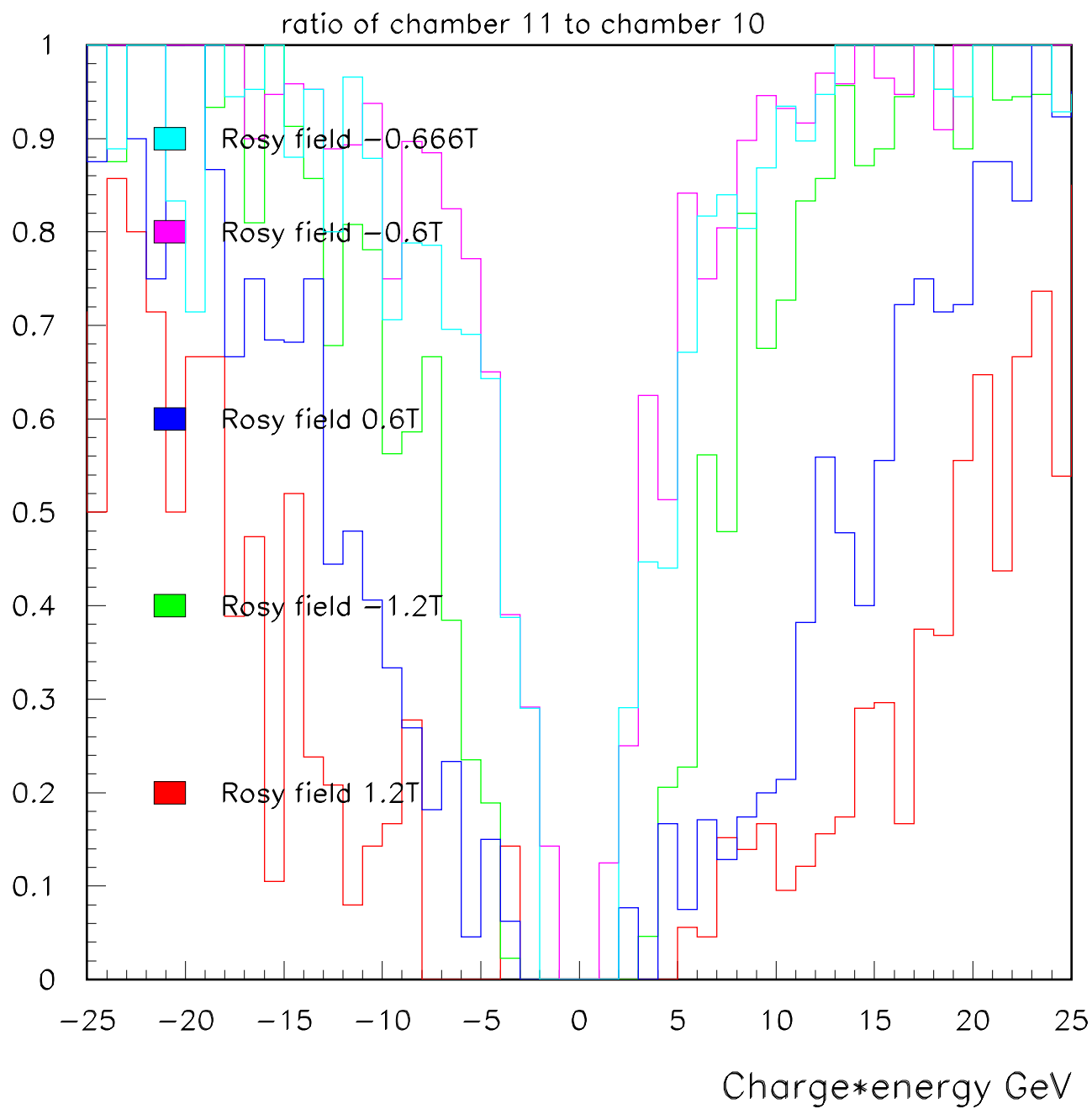
We now plot the ratio of spectra at chambers 7,10 and 11 to that in chamber 6. Chamber 6 is upstream of ROSY and so is unaffected by ROSY currents. Again it is evident that a current of $-0.6T$ in ROSY maximizes the acceptance of low momentum particles ($\sim 7.5\text{GeV}$) at the RICH. 7.5 GeV is the lower end of the RICH acceptance. $+1.2T$ gives the worst acceptance. In order to investigate the dependence of the ROSY vertical aperture, we have re-run the $-0.6T$ point with a vertically widened ROSY with 30cm more aperture. This curve we tag as $-0.666T$ (Sorry guys, this is a preliminary writeup). It can be seen that the vertical aperture is NOT what is causing the loss of particles, it is the momentum kick by ROSY.







Finally we plot the ratio of spectra in chamber 11 (downstream of RICH) to chamber (10) just upstream of RICH. This gives the efficiency of a particle making it through the full length of the RICH. Again $-0.6T$ is seen to be the best among the 4 fields considered. It now remains to be investigated as to what the flip in field strength does to the momentum resolution. That study will also reveal the chamber apertures. What then remains is to vary the positions of the elements to optimize acceptances and resolutions. This will undoubtedly involve bringing the elements closer to each other and shortening the apparatus. What we have just completed is a preliminary look at the magnitude of the effects.



Acceptance results with new chamber positions

R.Raja 8-Aug-02

We now compute the chamber acceptances with E690 chambers (the first 4) and the University of Iowa chambers (5 and 6). The positions of the elements have been changed in the Monte Carlo to use the final positions. The RICH has moved upstream. The new positions are included below.

E907 Experiment Elements

From 9200.001-ME-397568, revised 3/28/02.

Moved NCAL, Shower downstream to clear interference with RICH.

E907 element	z Halfwidth (cm)	z Positions (cm)					
		Center		Upstream		Downstream	
		Coordinate System					
		Gary Smith	Target Zero	Gary Smith	Target Zero	Gary Smith	Target Zero
Target	1.000	-832.549	0	-833.549	-1.000	-831.549	1.000
Jolly Green Giant	160.002	-739.998	92.551	-900.000	-67.451	-579.996	252.553
TPC	127.000	-739.998	92.551	-866.998	-34.449	-612.998	219.551
Chamber 1(E690)	12.700	-607.535	225.014	-620.235	212.314	-594.835	237.714
E690 Cerenkov	64.770	-540.859	291.690	-605.629	226.920	-476.089	356.460
Chamber 2 (E690)	12.700	-445.819	386.730	-458.519	374.030	-433.119	399.430
Chamber 3 (E690)	12.700	-316.135	516.414	-328.835	503.714	-303.435	529.114
TOF	2.540	-283.699	548.850	-286.239	546.310	-281.159	551.390
ROSY	151.917	-121.619	710.930	-273.536	559.013	30.298	862.847
Chamber 4 (E690)	12.700	43.009	875.558	30.309	862.858	55.709	888.258
Chamber 5 (Iowa)	12.700	134.074	966.623	121.374	953.923	146.774	979.323
RICH	532.065	746.249	1578.798	214.184	1046.733	1278.314	2110.863
Chamber 6 (Iowa)	12.700	1311.581	2144.130	1298.881	2131.430	1324.281	2156.830
Shower Detector	58.000	1351.590	2184.139	1293.590	2126.139	1409.590	2242.139
Calorimeter	100.000	1510.630	2343.179	1410.630	2243.179	1610.630	2443.179

Cerenkov Apex wrt Upstream w	51.419
Desired distance	277.482
Actual	277.339

Ratios of spectra from Chamber 4/chamber 3, chamber 5/chamber 3 and chamber 6/chamber 3 are shown in the subsequent plots. Chamber 3 corresponds roughly to Chamber 6 in the idealized previous scheme, in that both are upstream of ROSY. We also plot the ratio of Chamber 6/Chamber 5.

In all cases, new acceptances are better than previously, largely due to moving the RICH closer to ROSY. It looks as though a ROSY current of approximately $-0.6T$ will give the best acceptances in the RICH of the particle of interest (>7.5 GeV).

(The anomalous ratio of 1 at very low momenta for rosy-1.2 T in the first two plots is caused by one event which makes it though to chamber 4).

