

# **Correction of the measured theta angle depending on the Z position of the interaction point and pi0 reconstruction using this correction**

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BOX Gen 10 000 events with multiplicity one photon per event;

Energy = 500MeV;

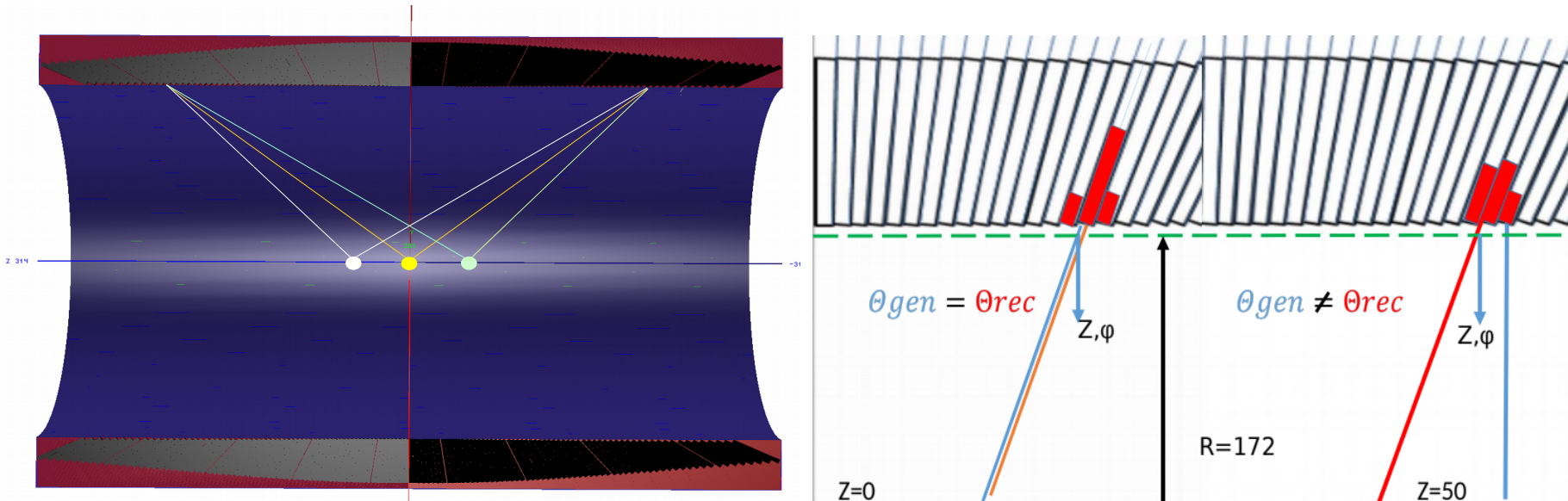
Interaction point in some Z positions: [-50; 0; 50] cm;

Angles:  $\varphi = 89.2^\circ$ ,  $40^\circ < \theta < 140^\circ$

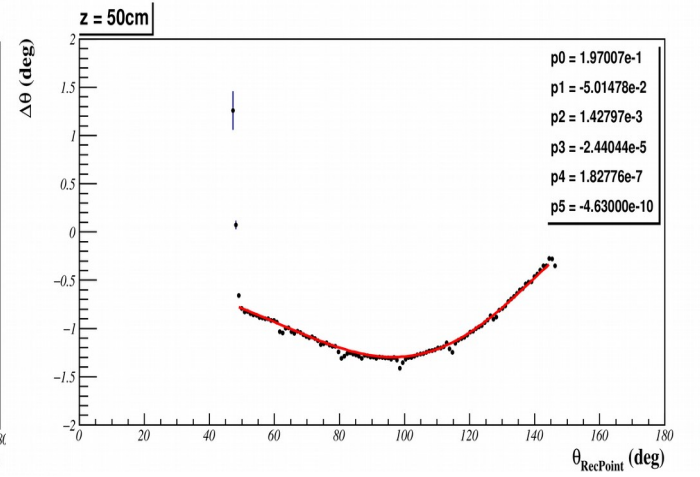
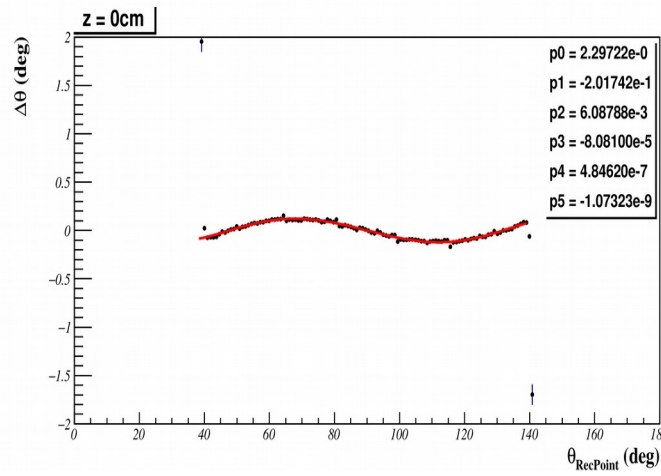
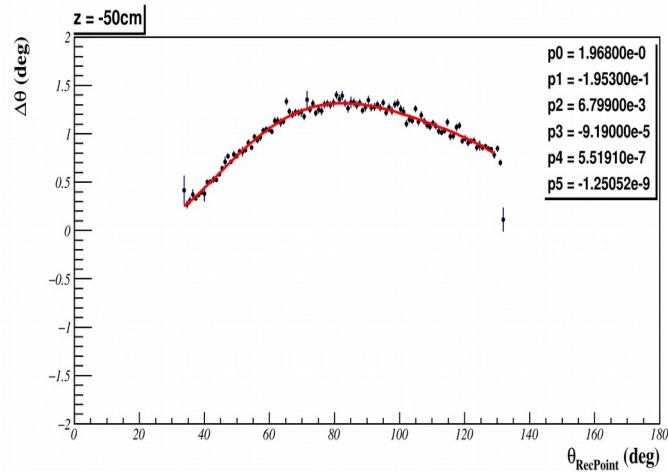
Using AZ method;

$E_{\text{digit}} > 5\text{MeV}$ ;

$\theta_{\text{RecPoint}}$  - the weighted angle of the reconstructed point, but recalculated by the position of the emission of photons on Z, using the inner radius of the calorimeter (172 cm);

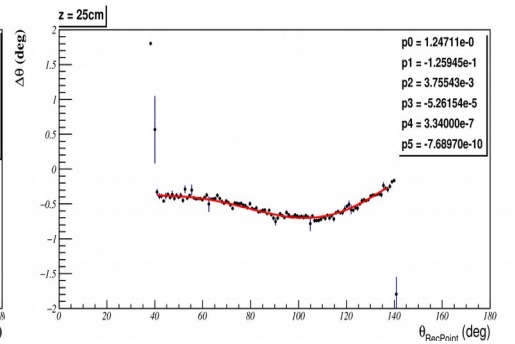
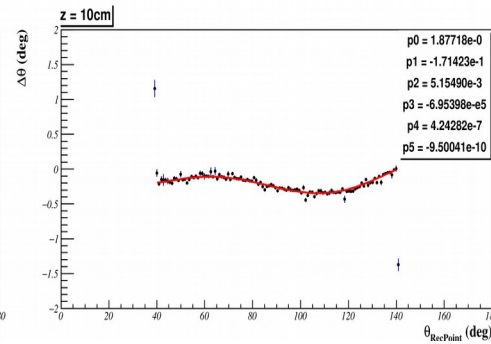
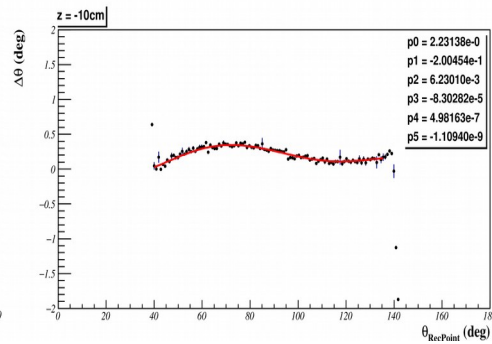
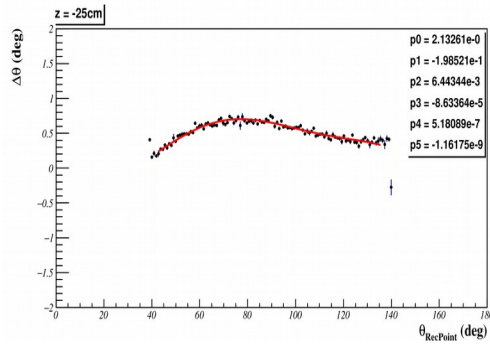


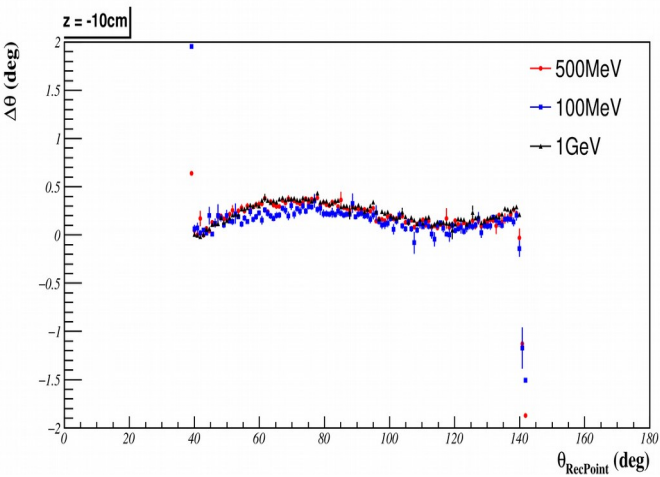
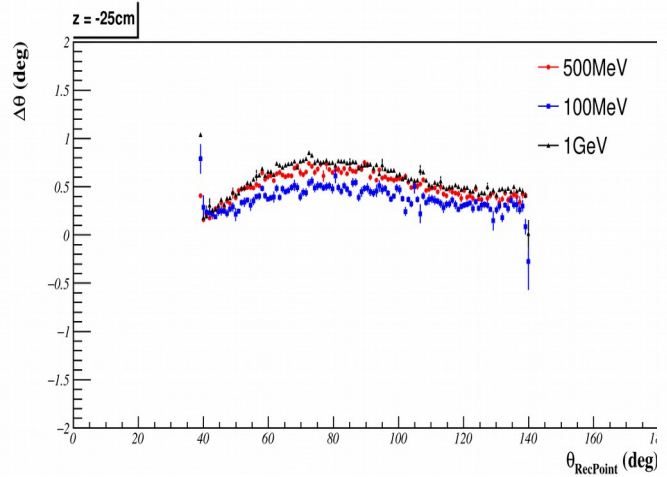
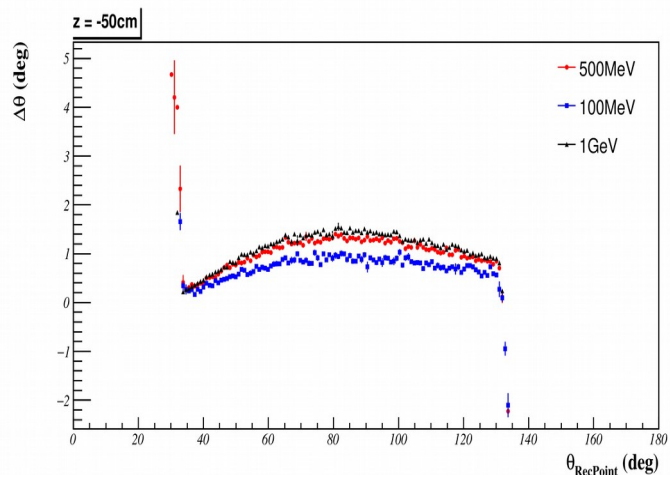
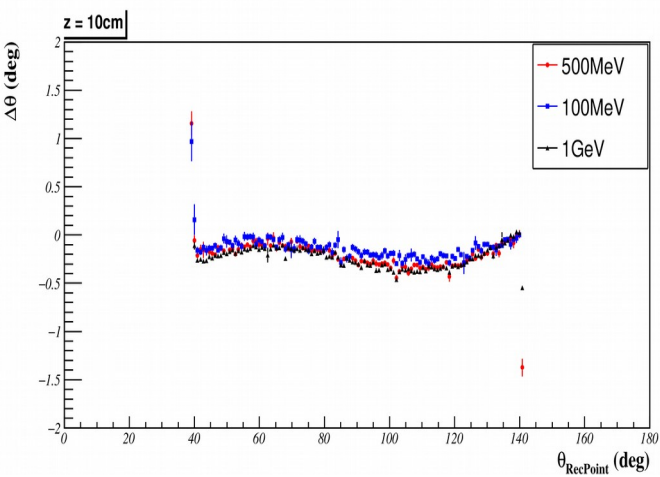
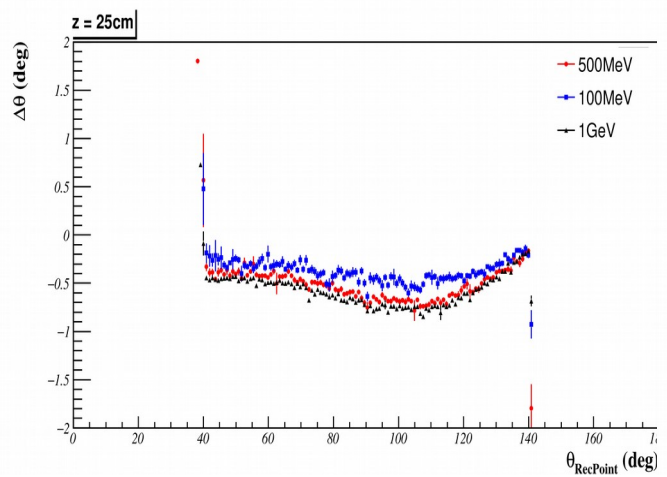
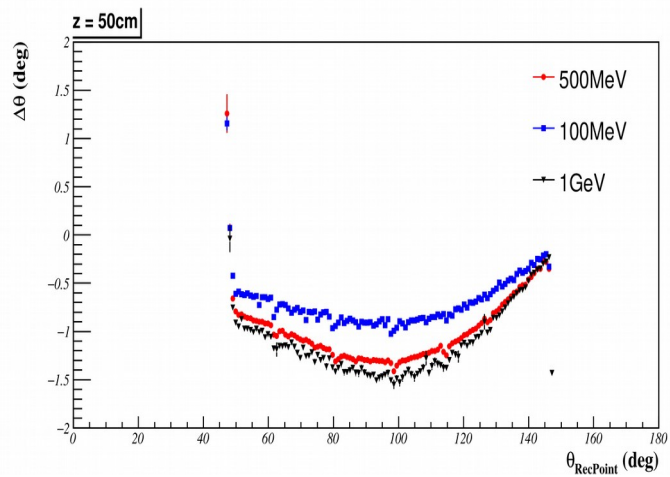
# E = 500MeV



## Correction by Z

z	-50	0	50	Z < 0	Z > 0	z	z	z	z	z	z
		V0		V0 + step*z[cm]		-25	-10	10	25	35	17
p0	1.968	2.29722	0.197007	-0.0065844	-0.04200426	2.13261	2.231376	1.8771774	1.2471135	0.8270709	1.58314758
p1	-0.1953	-0.201742	-0.0501478	0.00012884	0.003031884	-0.198521	-0.2004536	-0.17142316	-0.1259449	-0.09562606	-0.150199972
p2	0.006799	0.00608788	1.42E-03	1.42224E-05	-0.00093298	0.00644344	0.006230104	0.0051549	0.00375543	0.00282245	0.004501814
p3	-9.19E-05	-8.08E-05	-2.44E-05	-2.20546E-07	1.128294E-06	-8.633635E-05	-8.302816E-05	-6.953976E-05	-5.261535E-05	-4.133241E-05	-6.16417E-05
p4	5.51E-07	4.85E-07	1.83E-07	1.32842E-09	-0.000000006	5.180895E-07	4.981632E-07	4.245398E-07	0.000000334	2.736918E-07	3.823024E-07
p5	-1.25E-09	-1.07E-09	-4.63E-10	-3.49E-12	1.222122E-11	-1.16175E-09	-1.1094E-09	-0.000000001	-7.689695E-10	-6.467573E-10	-8.66739E-10





### Correction by Energy

Fit pol5	-50			-25			0			25			50			10			-10		
coeff P3	3.97			3.93			3.89			3.84			3.69			3.8711422			3.90514456		
coeff P4	0.006			0.006			0.006			0.00634			0.0075			0.0060884007			0.0059926607		
pol5	100MeV	500MeV	1GeV	100MeV	500MeV	1GeV	100MeV	500MeV	1GeV	100MeV	500MeV	1GeV	100MeV	500MeV	1GeV	100MeV	500MeV	1GeV	100MeV	500MeV	1GeV
p0	1.968			2.13261			2.29722			1.2471135			0.197007			1.8771774			2.231376		
p1	-0.1953			-0.198521			-0.201742			-0.1259449			-0.0501478			-0.17142316			-0.2004536		
p2	0.006799			0.00644344			0.00608788			0.00375543			1.43E-03			0.0051549			0.0062301		
p3	-9.38E-05	-9.19E-05	-9.12E-05	-8.7249E-05	-8.63E-05	-8.60E-05	-8.082E-05	-8.08E-05	-8.08E-05	-5.1954E-05	-5.26E-05	-5.27E-05	-2.31563E-05	-2.44E-05	-2.48E-05	-6.922E-05	-6.95E-05	-6.96E-05	-8.33751E-05	-8.30E-05	-8.29E-05
p4	5.63E-07	5.51E-07	5.47E-07	5.23494E-07	5.18E-07	5.16E-07	4.8494E-09	4.85E-07	4.85E-09	3.2939E-07	3.34E-07	3.34E-07	1.736722E-07	1.83E-07	1.86E-07	4.2145E-07	4.25E-07	4.24E-07	4.996384E-07	4.98E-07	4.97E-07
p5	-1.25E-09			-1.16E-09			-1.07E-09			-7.69E-10			-4.63E-10			-9.50E-10			-1.11E-09		
$9x+8x+7x+6x+5x = p3[500] = -9.19e-5$ $X = -9.19e-5/35 \rightarrow -0.26257e-5$ $P3[100] = 9x \rightarrow -2.3631e-5 * \text{coeff}$ recalculate X $\rightarrow p3[100]+8x+7x+$ $6x+5x = -2.024e-5 \rightarrow x = 0.022e-5$																					
p3 step (x)	7.37E-08			3.51038E-08			8.8791E-10			-1.8899E-08			-3.56603E-08			-9.067E-09			9.915986E-09		

	Calculate p3
100	$9x \Rightarrow p3[100] +$
200	+8x    0.08 per MeV
300	+7x    0.07 per MeV
400	+6x    0.06 per MeV
500	+5x    0.05 per MeV
600	+4x    0.04 per MeV
700	+3x    0.03 per MeV
800	+2x    0.02 per MeV
900	+x     0.01 per MeV
1000	+1/x   0.005 per MeV
1100	

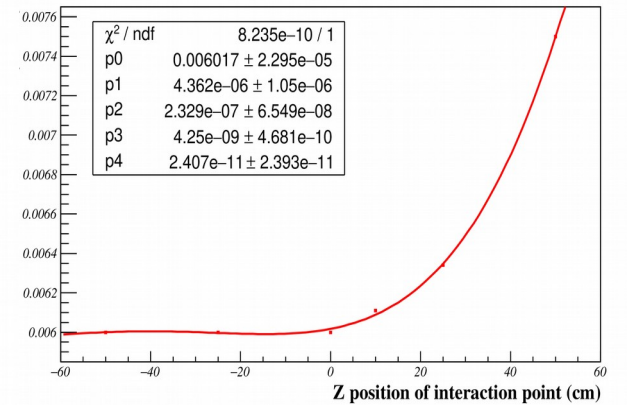
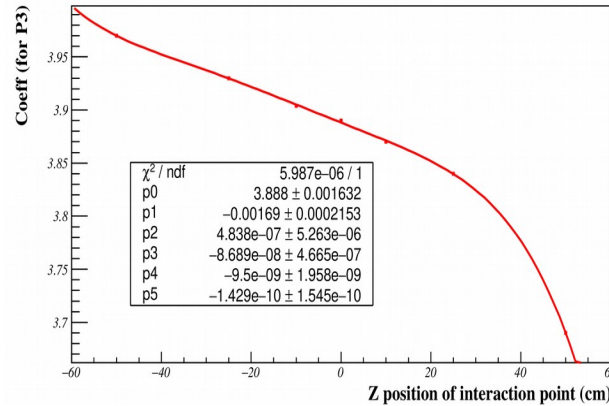
Calculate p4
$P4[i] = P3[i] * \text{coeff}P4[i]$

**Fit Coeff P3**

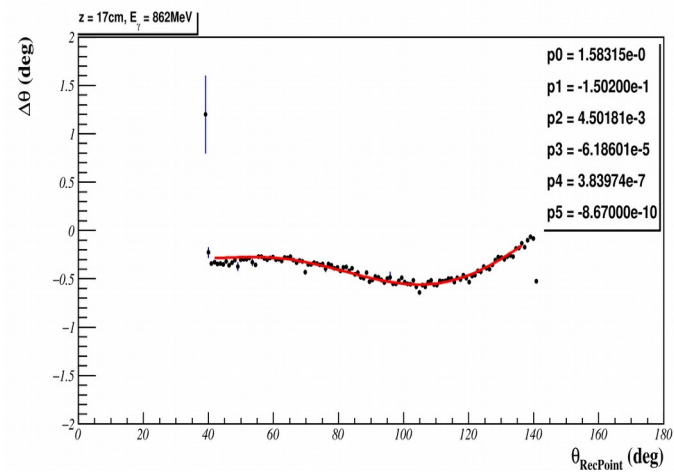
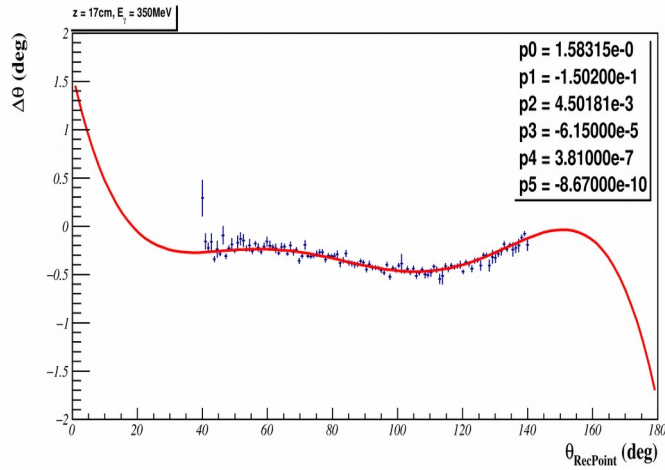
p0	3.888
p1	-0.00169
p2	4.84E-07
p3	-8.69E-08
p4	9.50E-09
p5	-1.43E-10

**Fit Coeff P4**

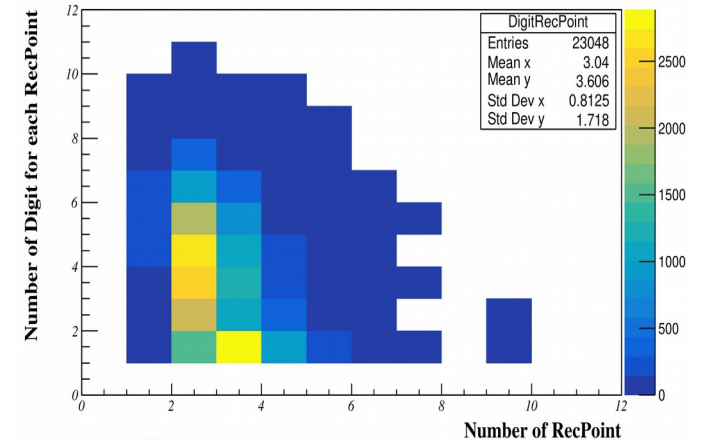
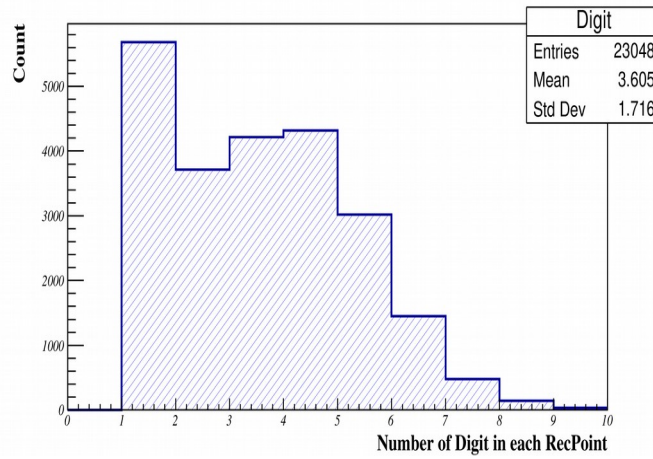
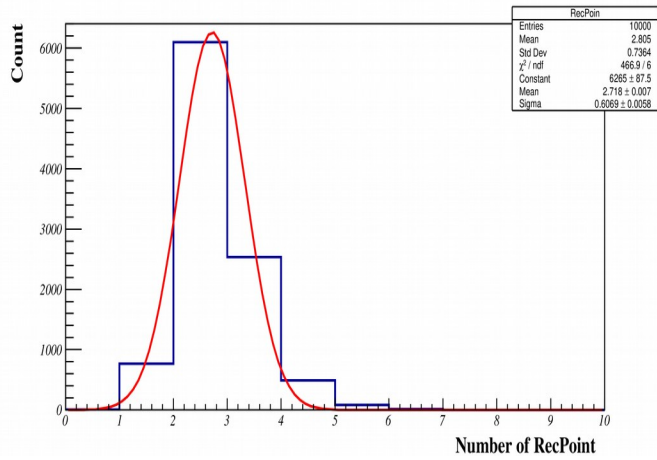
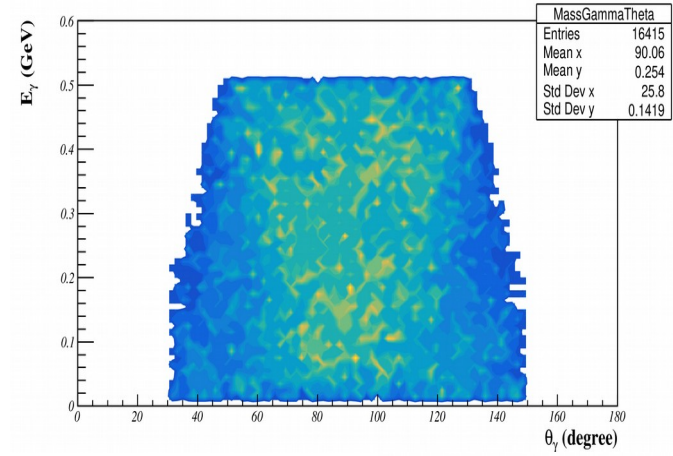
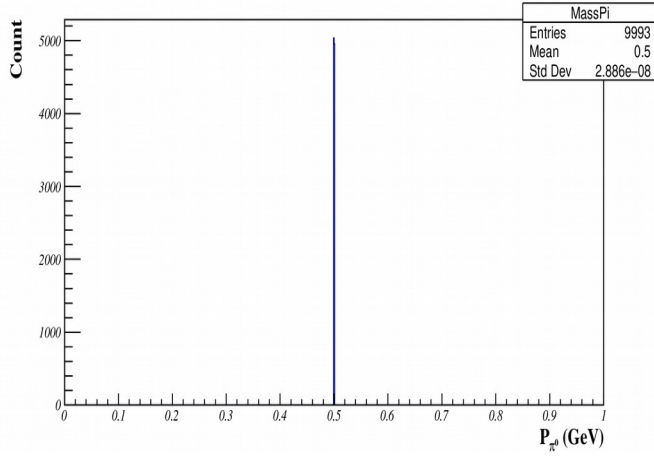
p0	0.006017
p1	4.36E-06
p2	2.33E-07
p3	4.25E-09
p4	2.41E-11



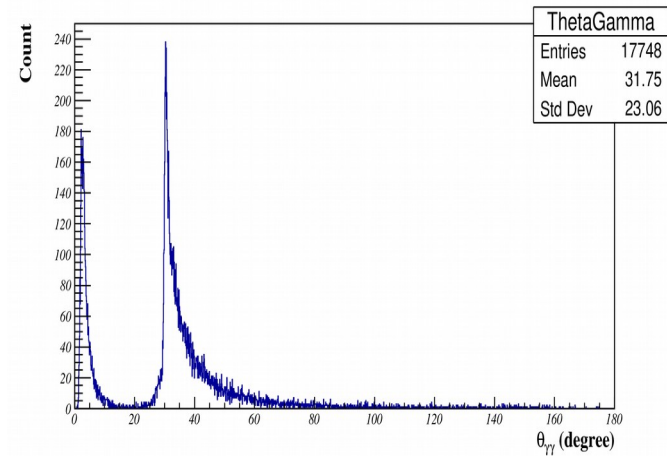
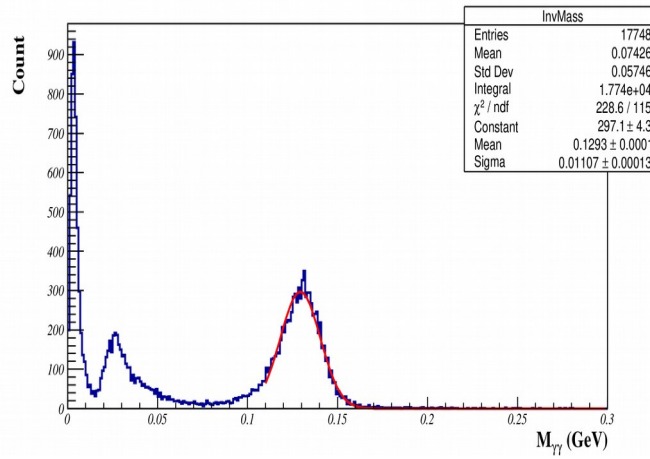
z	17			
coeff P3	3.8595734796			
coeff P4	0.0061813527			
pol5	100MeV	500MeV	350	862
p0	1.58314758			
p1	-0.150199972			
p2	0.004501814			
p3	-6.12E-05	-6.16E-05	-6.15E-05	-6.18E-05
p4	3.78E-07	3.82E-07	3.80E-07	3.822E-07
p5	-8.67E-10			
p3 step (x)	-1.79E-08			



**Z = 0cm**



**Cut by Digits > 3 not work!**



$\pi^0$  with E=500MeV, Z = -50cm

$\pi^0$  with E=500MeV, Z = -10cm

$\pi^0$  with E=1GeV, Z = -50cm

