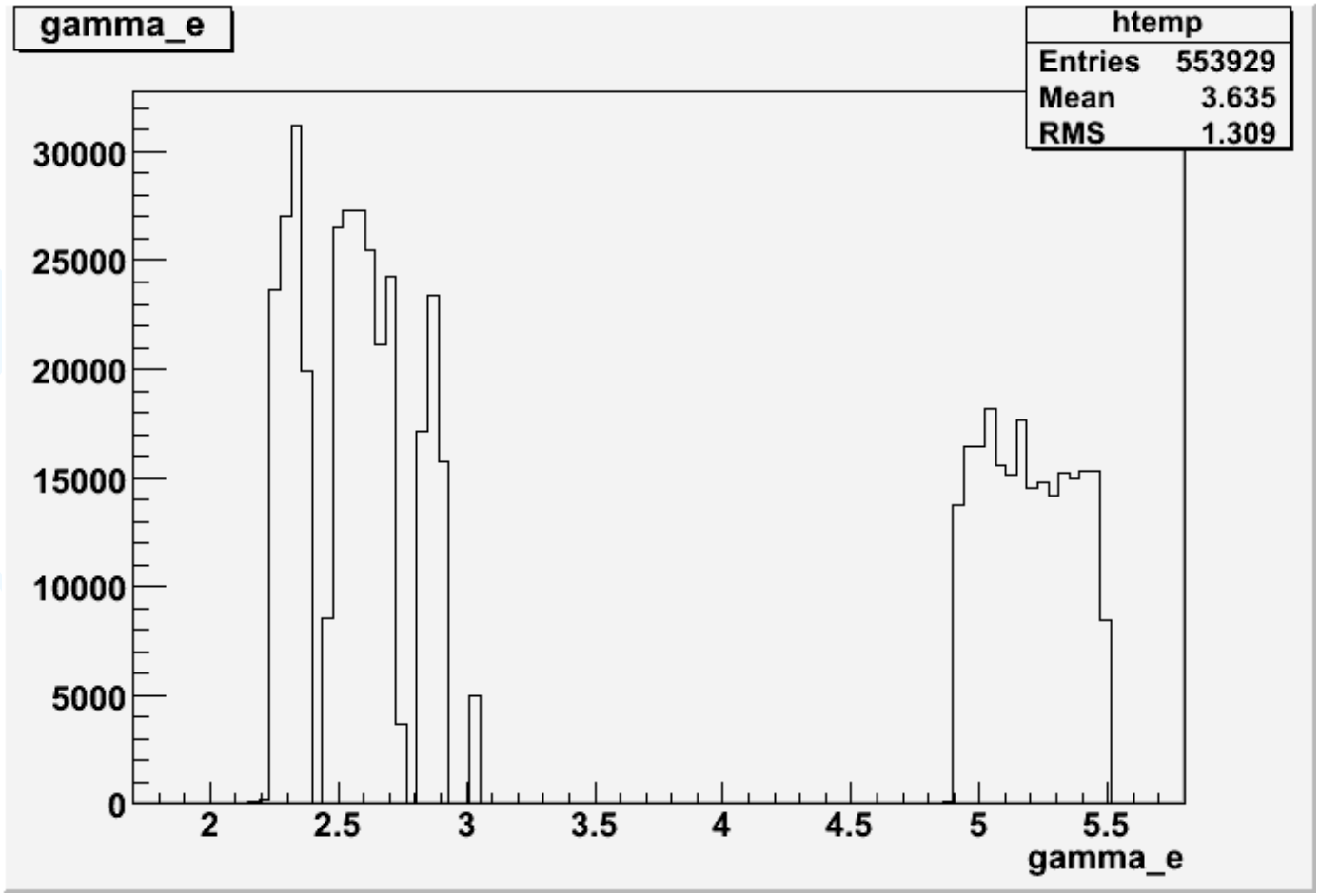
Status of Analysis of Compton Scattering

Yelena Prok

July 21, 2009


gamma_e
htemp
Entries 553929
Mean 3.635
RMS 1.309
30000
25000
20000
15000
10000
5000
0
2
2.5
3
3.5
4
4.5
5
5.5
gamma_e

Binning

10 bins of 11 echannels each for 4.9-5.5 GeV

6 ‘hand-formed’ bins for 2.0-3.1 GeV

- 460-475
- 492-502
- 505-520
- 511-530
- 552-562
- 563-575

Basic Analysis

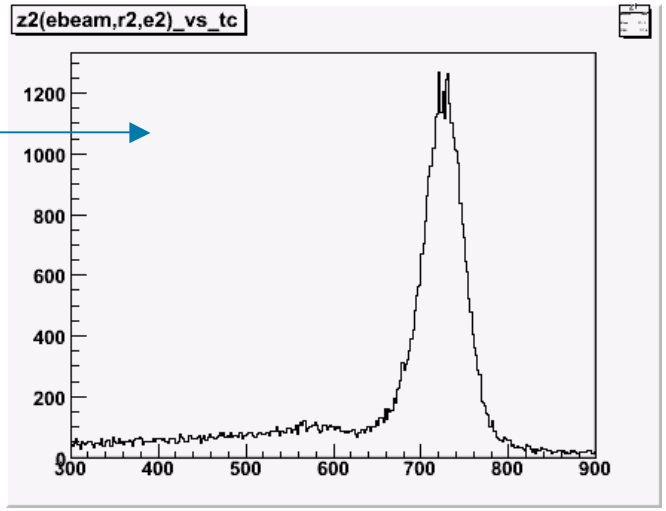
Starting with raw (not skim) files
Applying cuts used to create skim files
- $(e_1+e_2)>3.5$ (1.0) GeV
- $|px_1+px_2|<0.025$ GeV
- $|py_1+py_2|<0.025$ GeV
- $|(e_1+e_2)/eb-1.|<0.5$

Choose first recorded bit 2 per event to give HyCal time
Look for photons within 10 ns window of HyCal
Choose the one "closest" in time to Hycal
Form all possible combinations of clusters in events with at least 2 clusters, with $e_{min}=0.5$ GeV
Central region and pair-affected areas are cut out geometrically

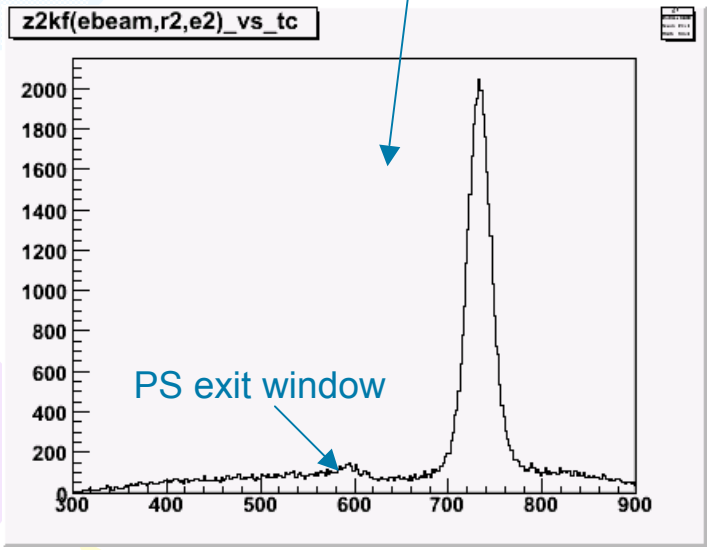
Event Selection (Be)

Reconstruct the vertex of Compton reaction

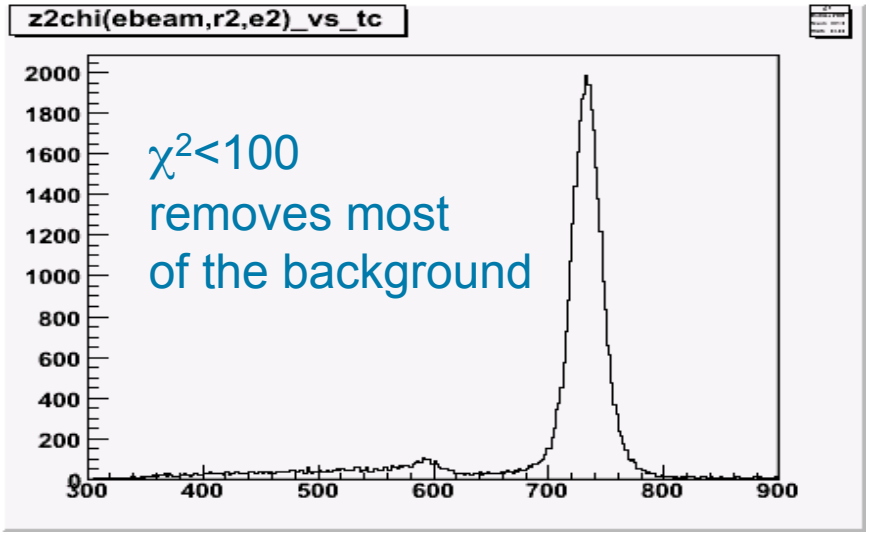
$Z=(x^2+y^2)^{0.5}[\alpha/(E/e-1)]^{0.5}$



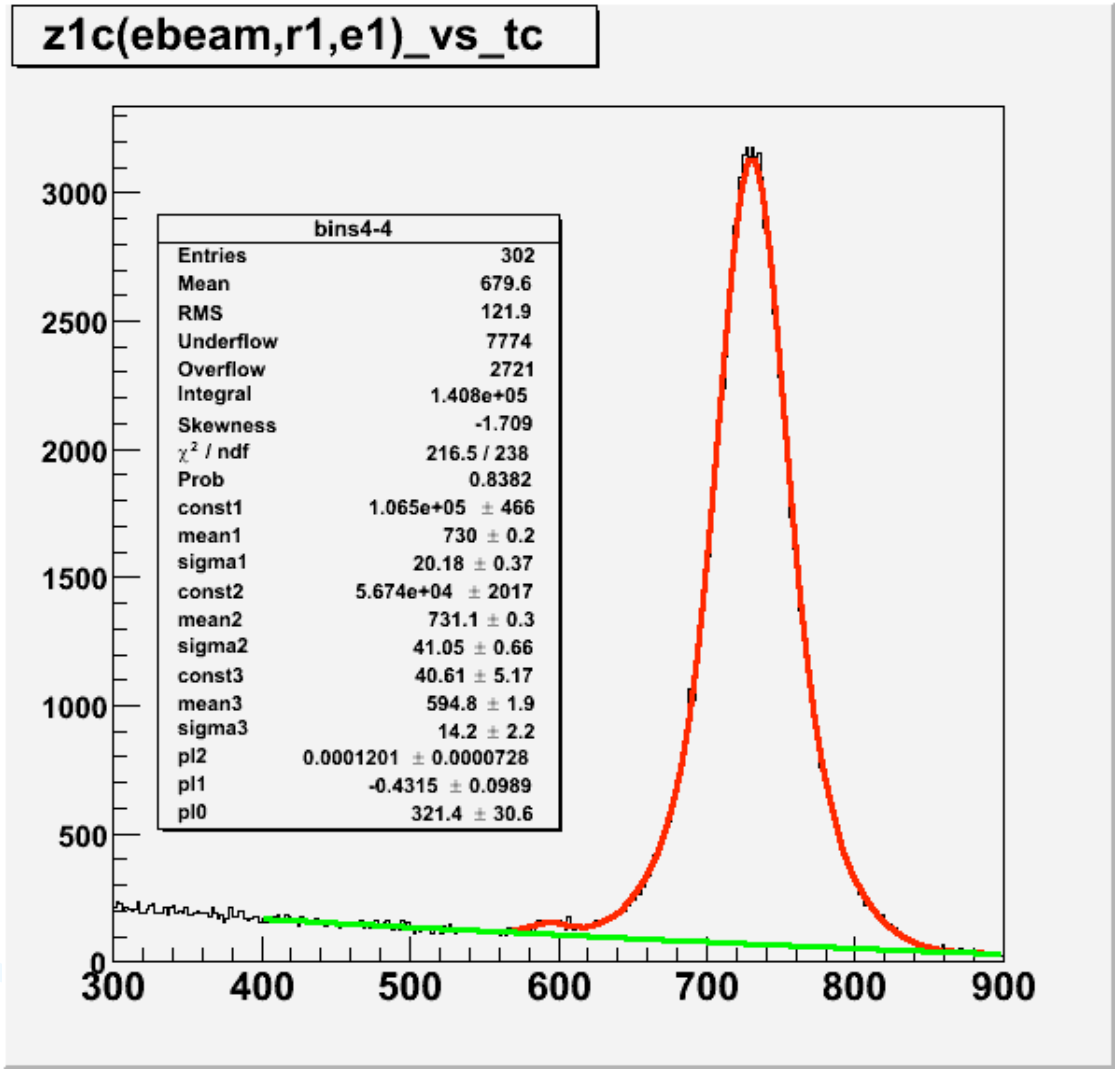
Apply kinematic constraints:
energy and momentum conservation
Reconstruct Z again



Z (cm)

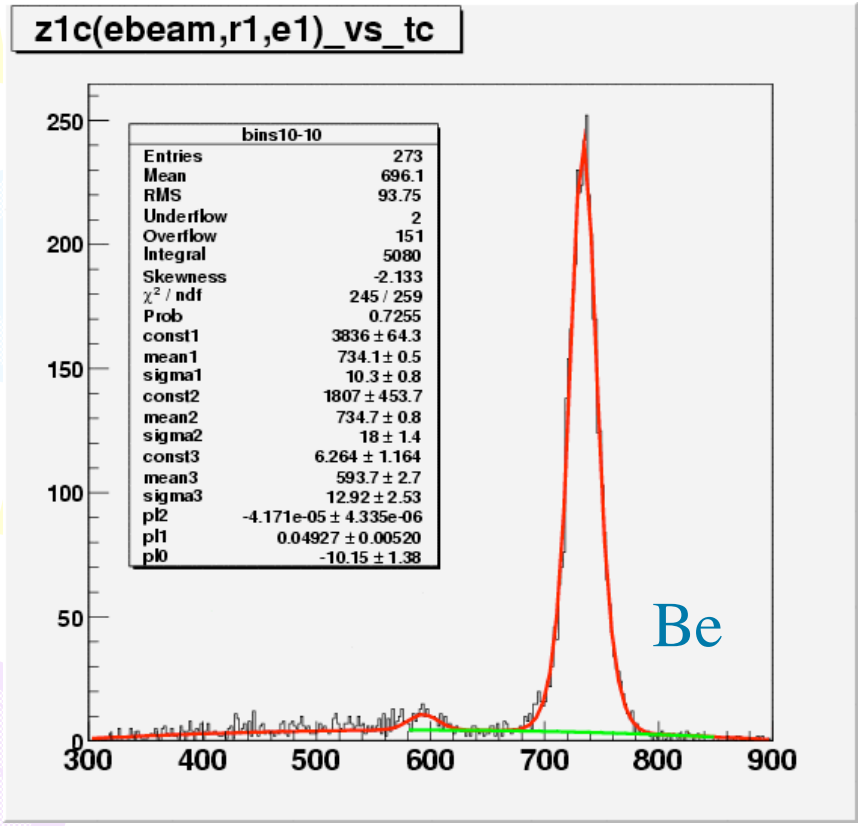


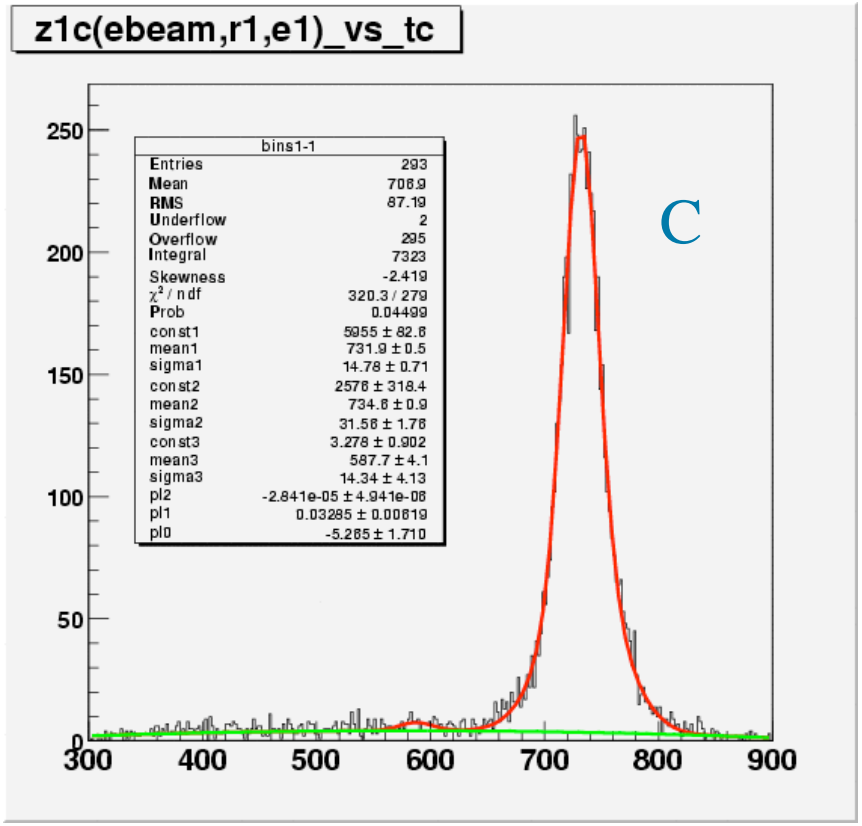
Z (cm)



Data: signal: double gaussian
background : gaussian +p3

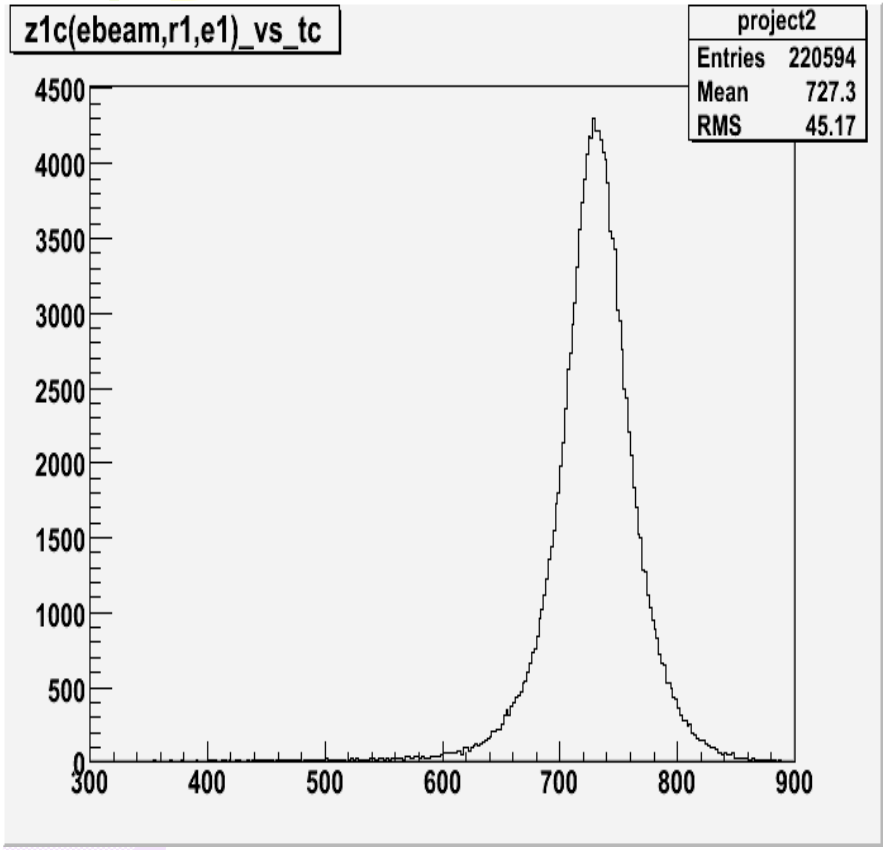
Experimental Z-distributions

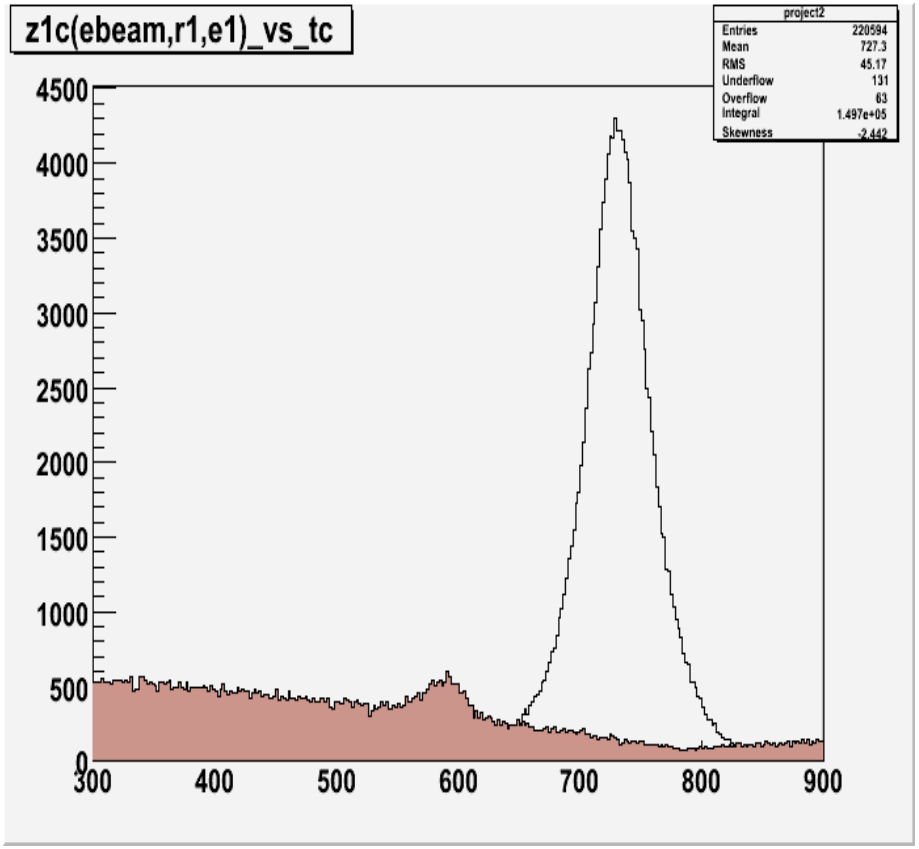




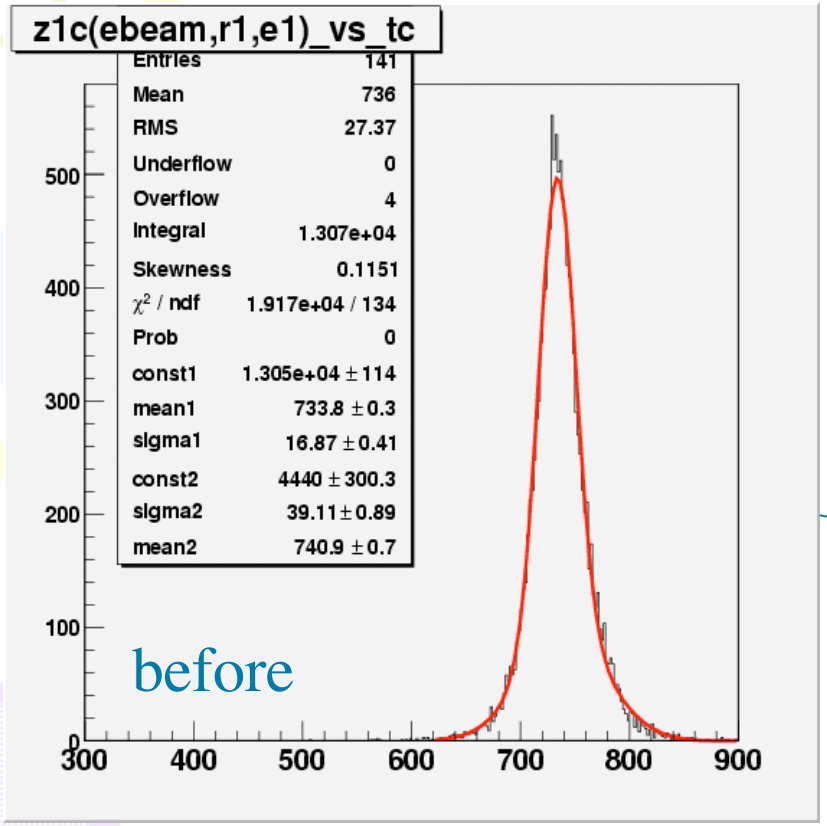
Background/Signal ~ 21 % (carbon), 27% (Be)

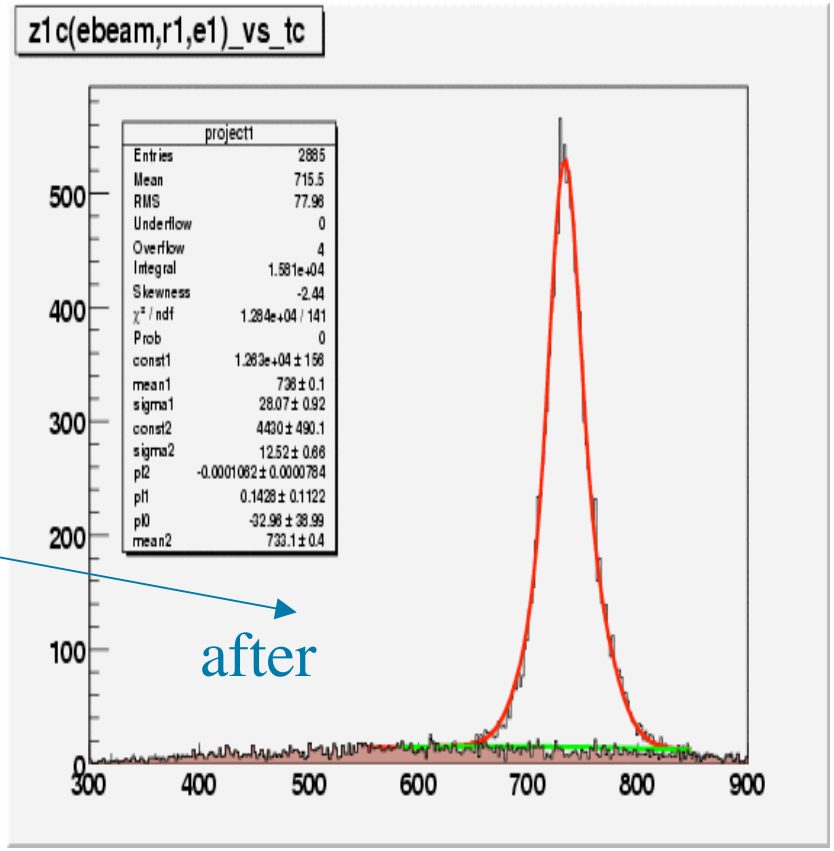
Adding background to MC





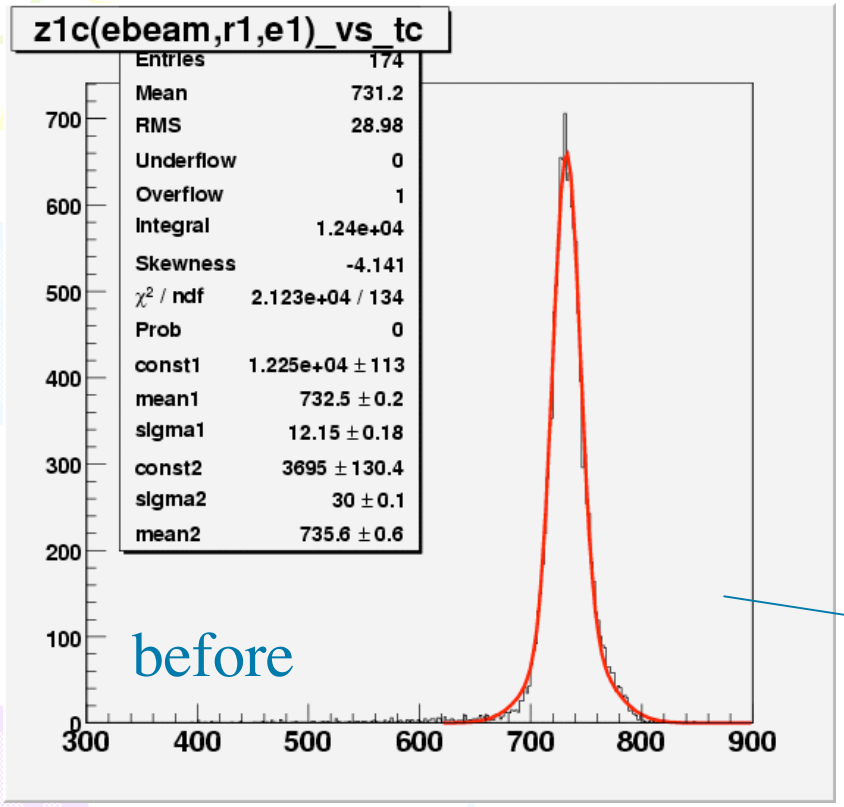
MC z-distributions: Carbon

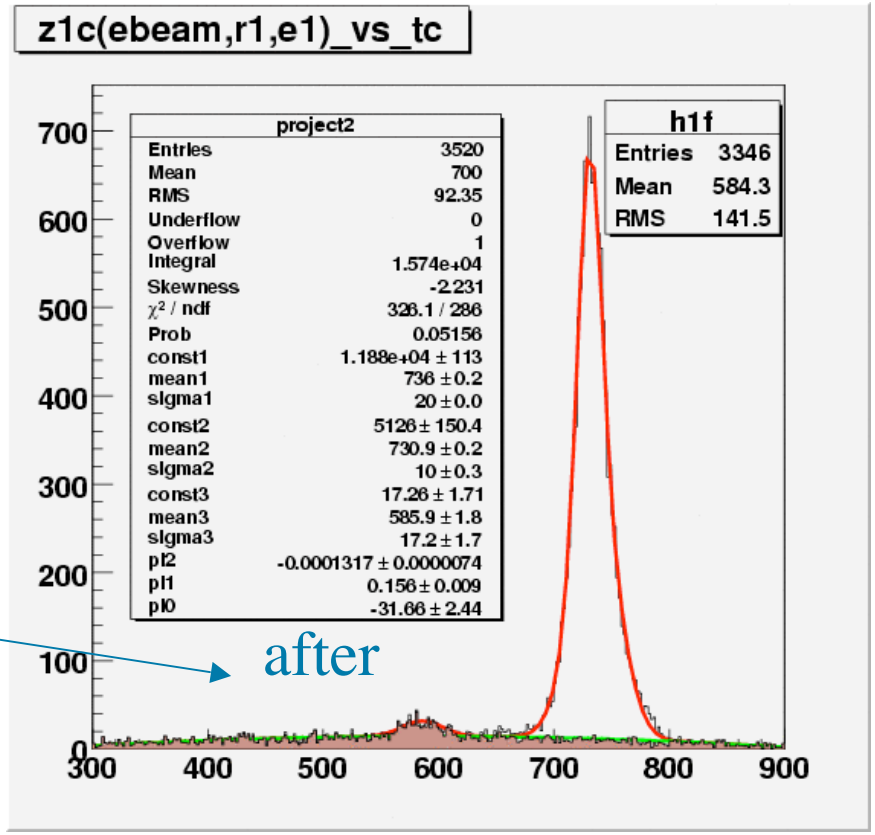




Added inelastic background -> efficiency went down by 2-3%

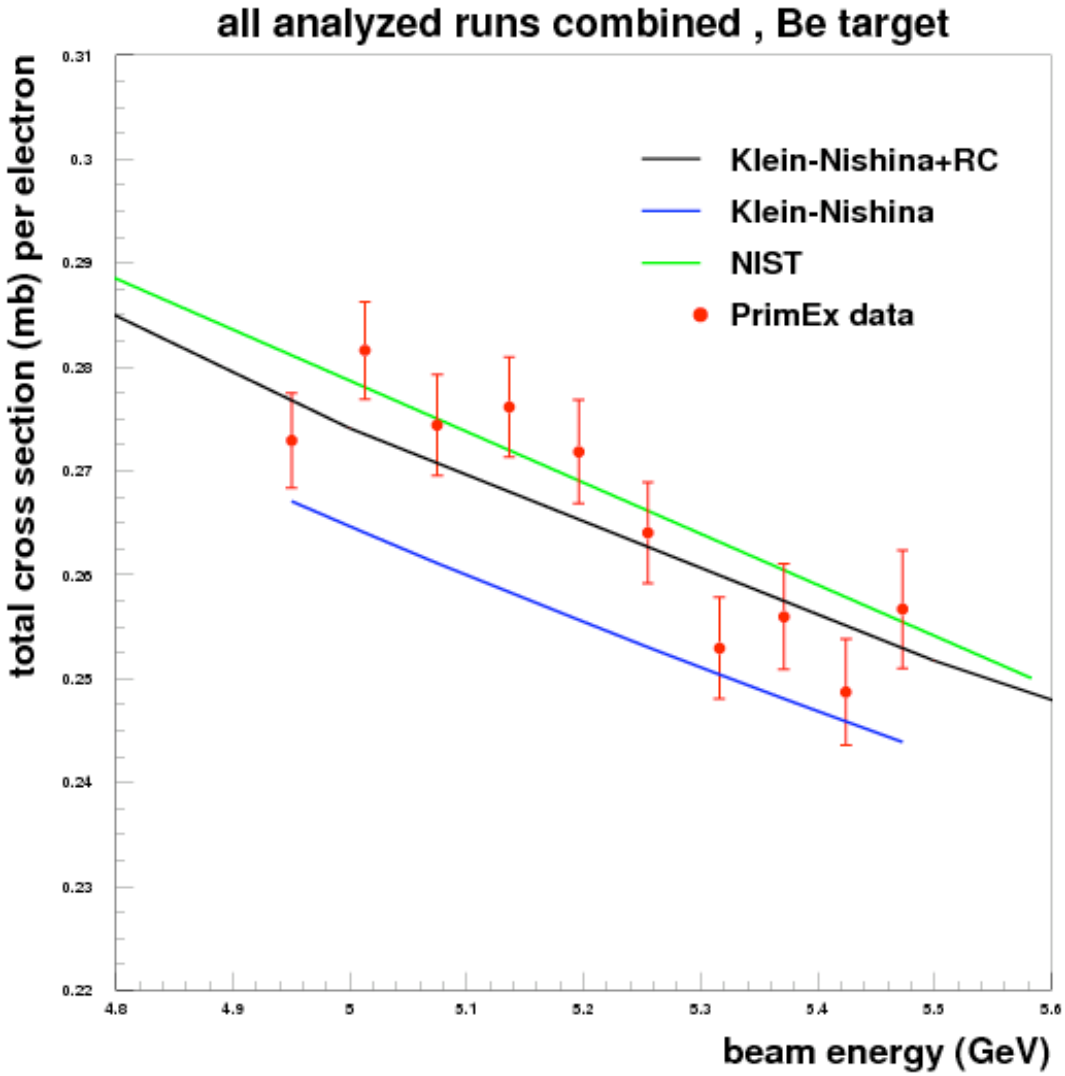
MC z-distributions: Be



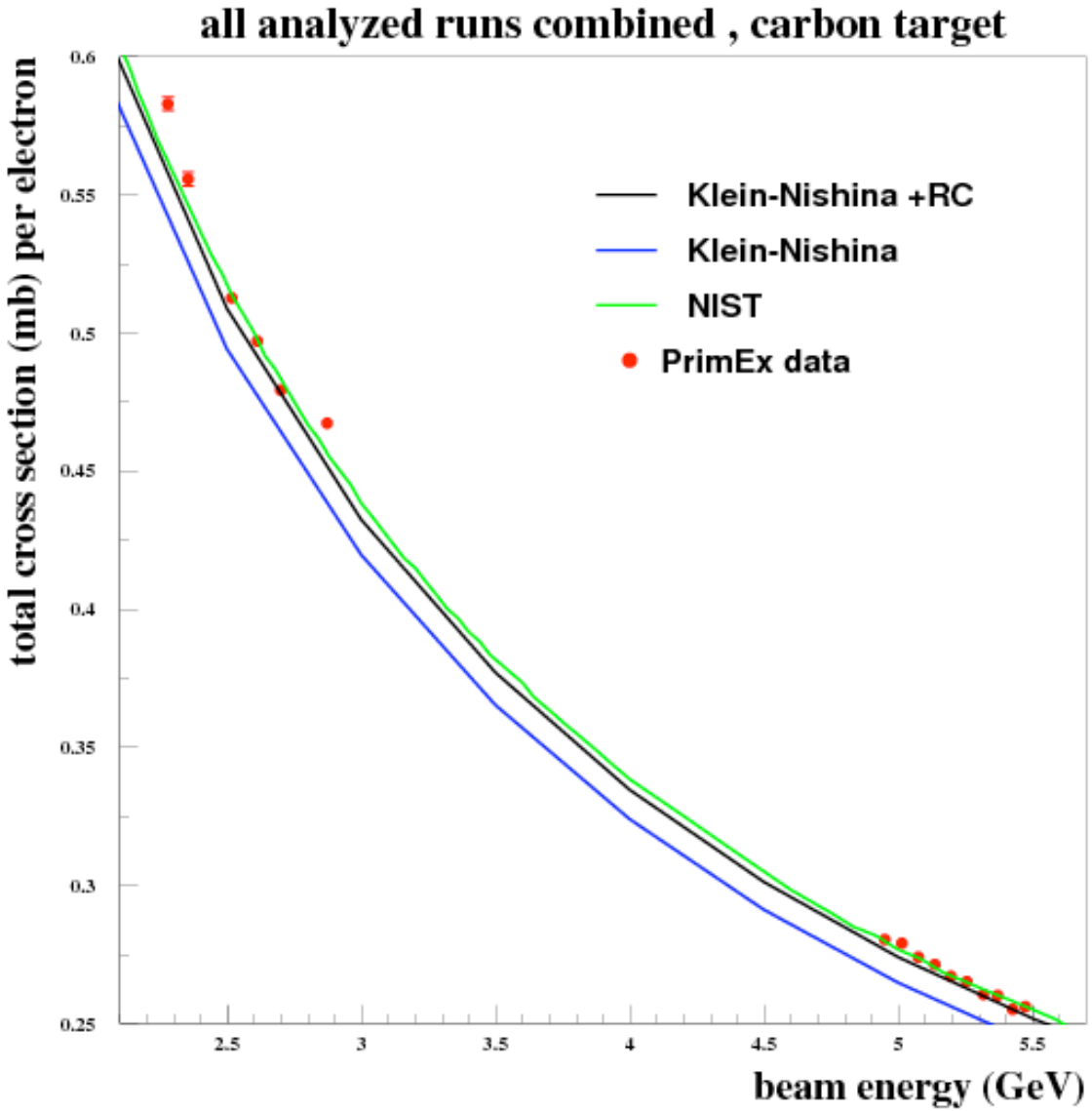


Added inelastic background-> efficiency went down by 1.5-2%

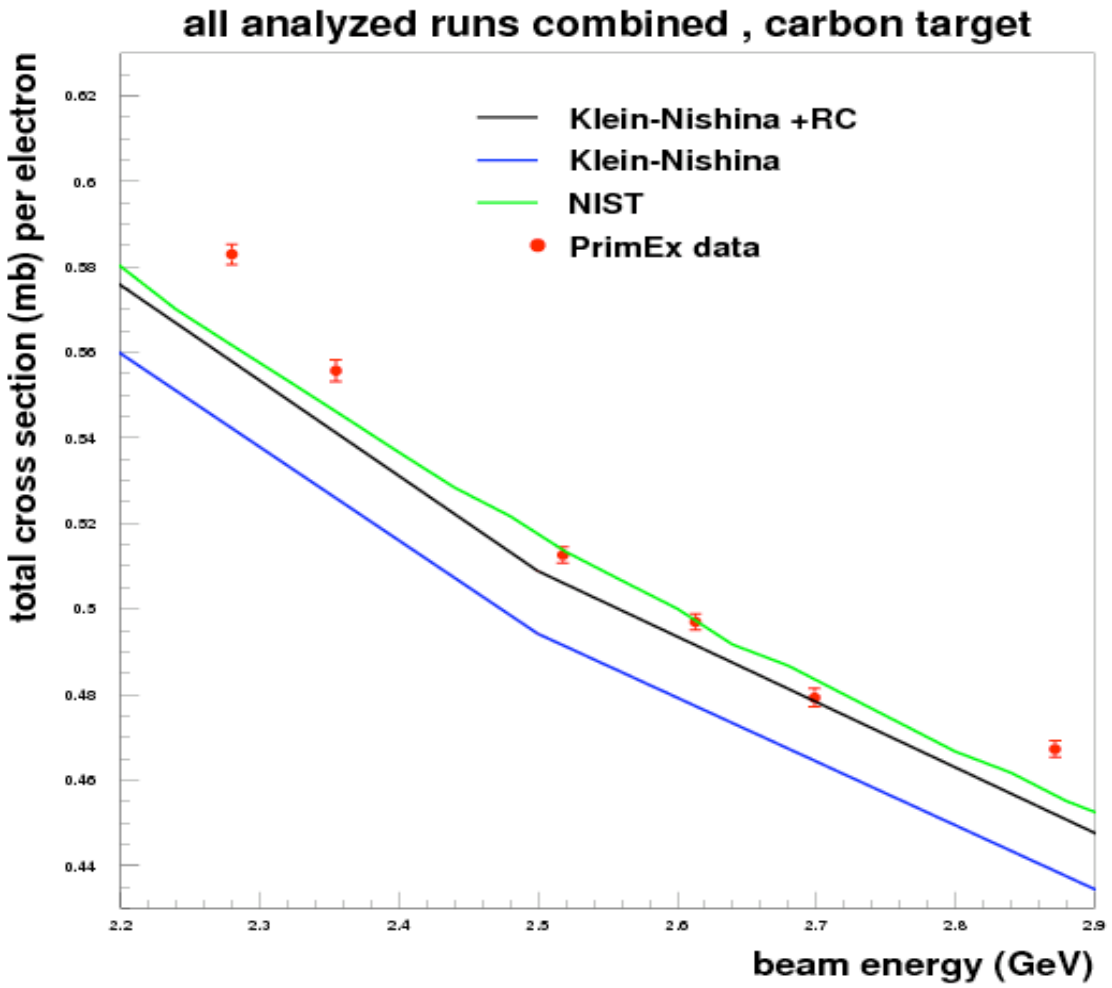
Total Xsec, Be, 4.9-5.5 GeV



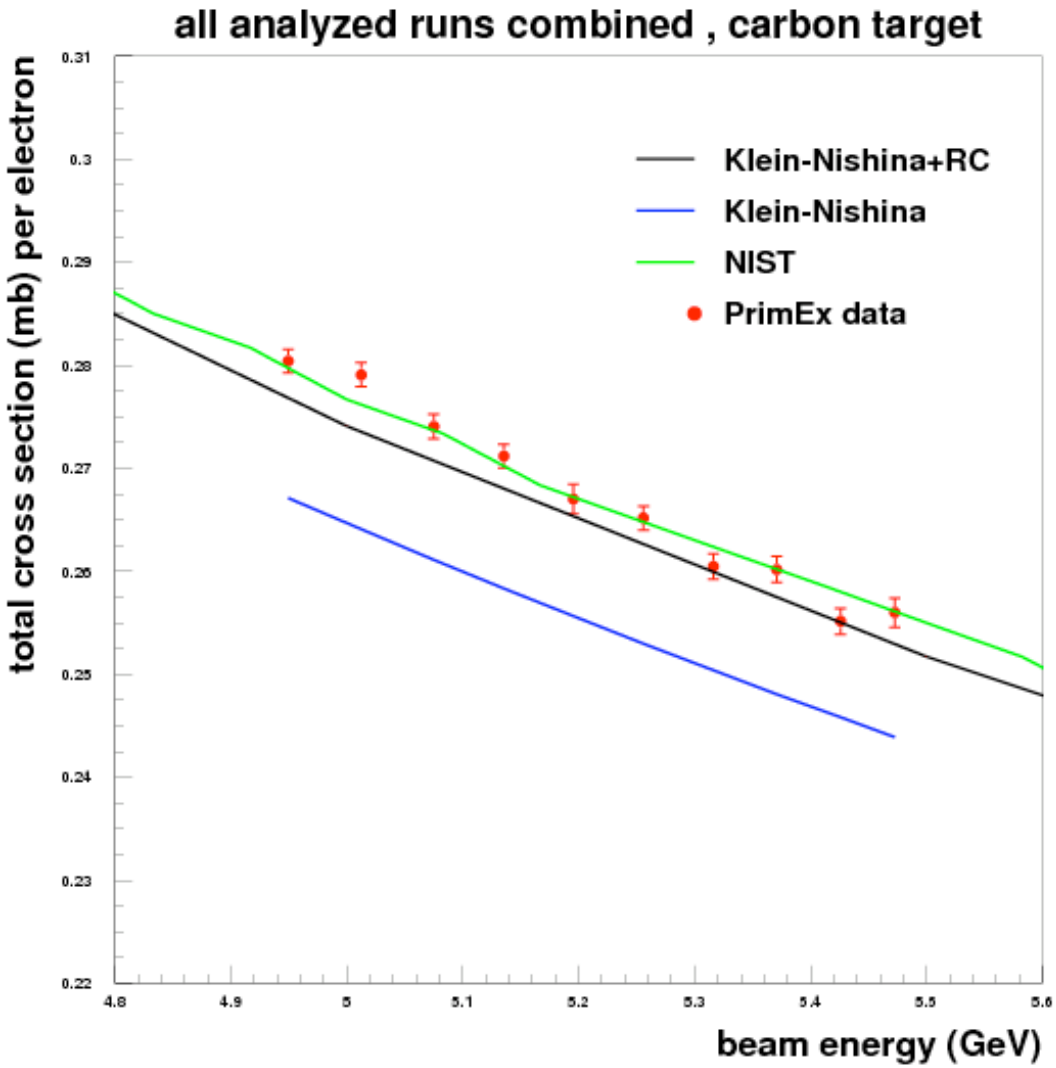
Total Xsec, C, 2.0-5.5 GeV



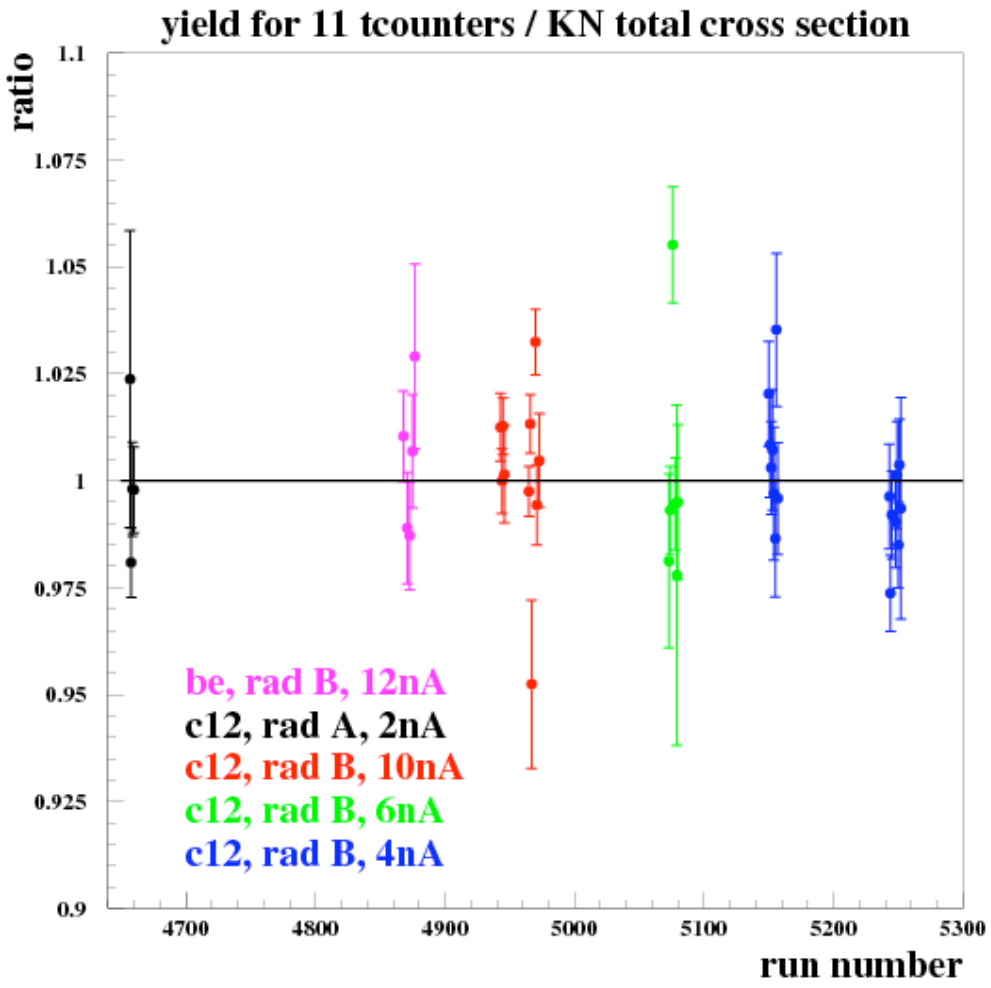
Total Xsec,C, 2.0-3.1 GeV

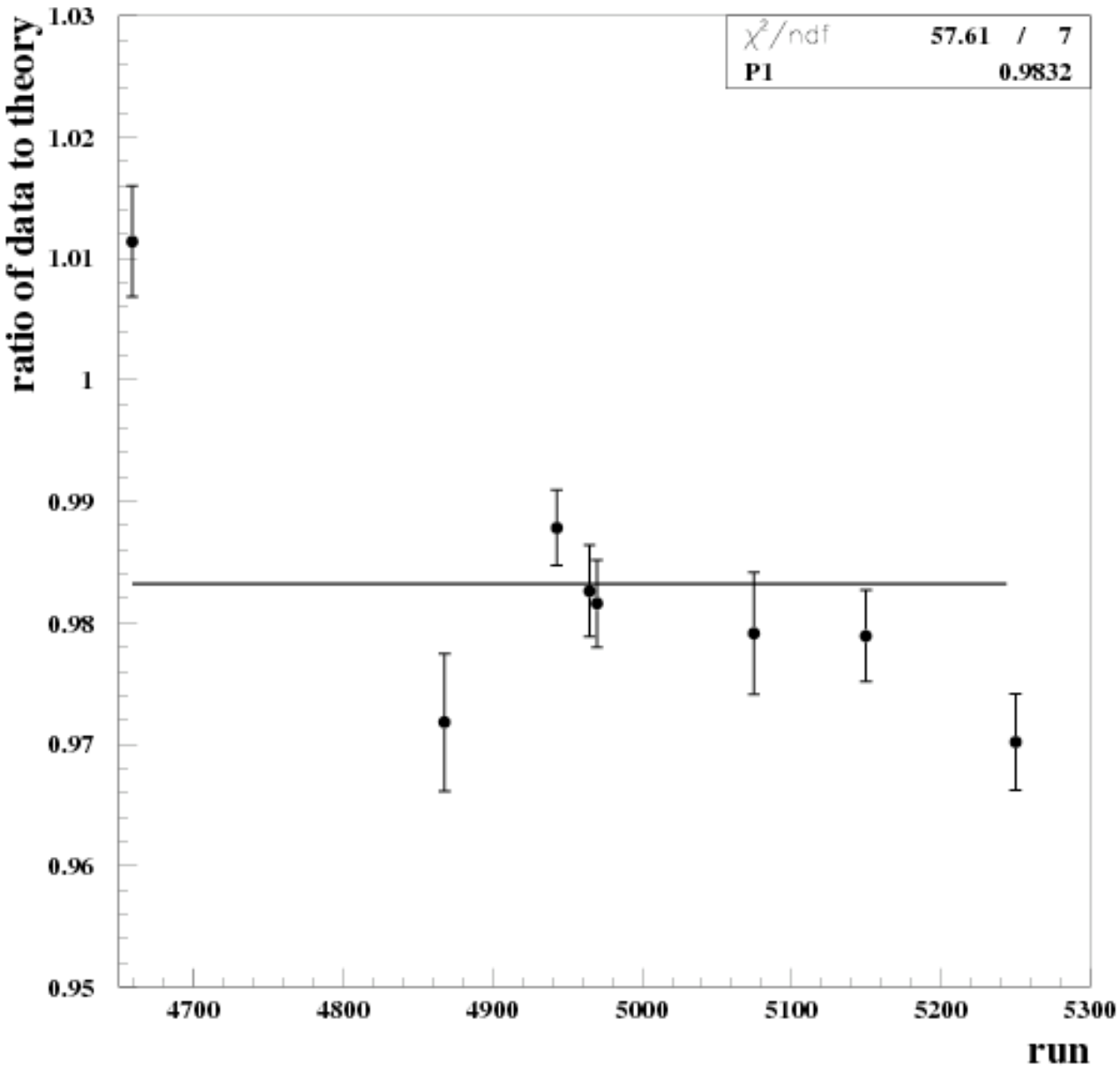


Total Xsec, C, 4.9-5.5 GeV

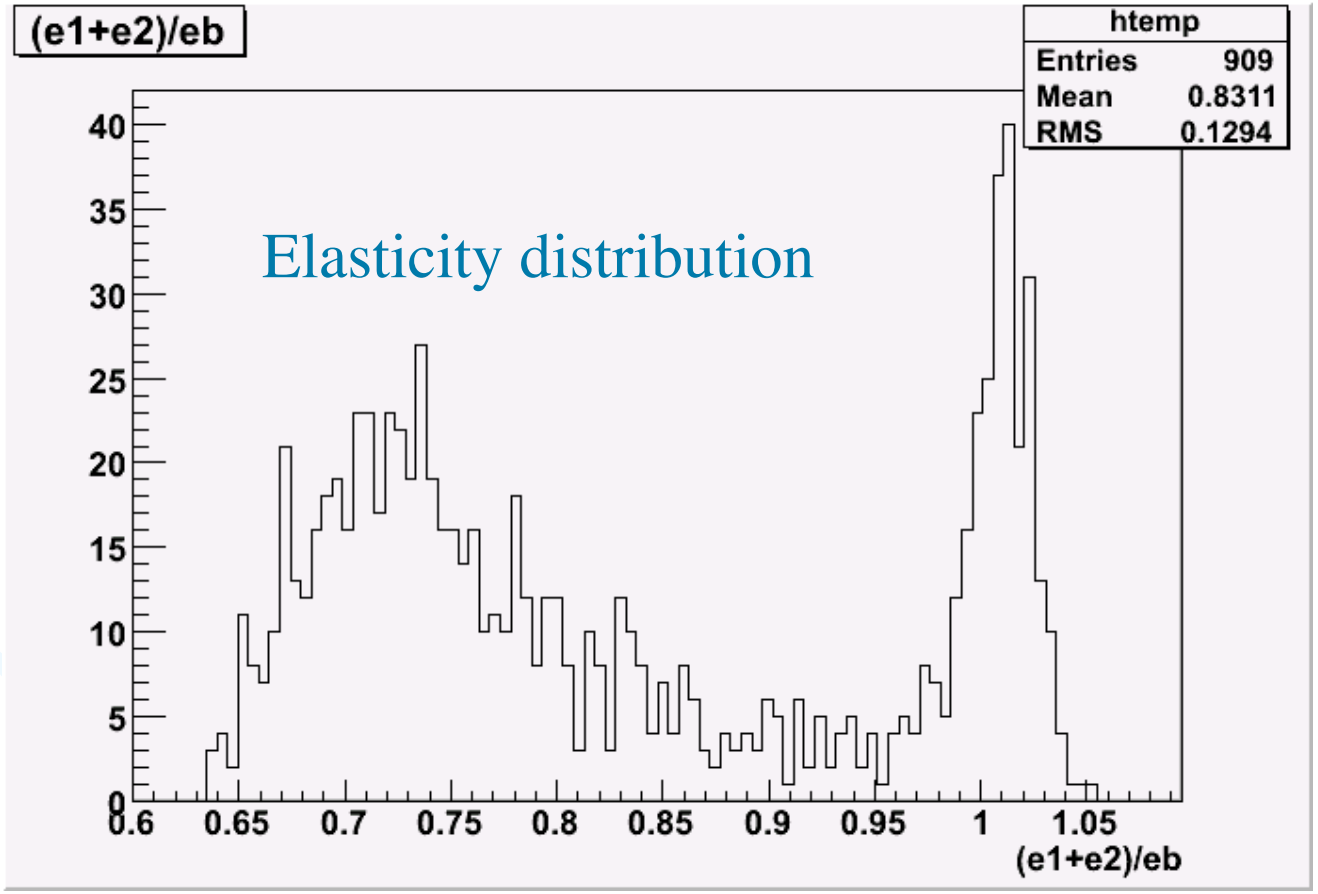


Yield Stability

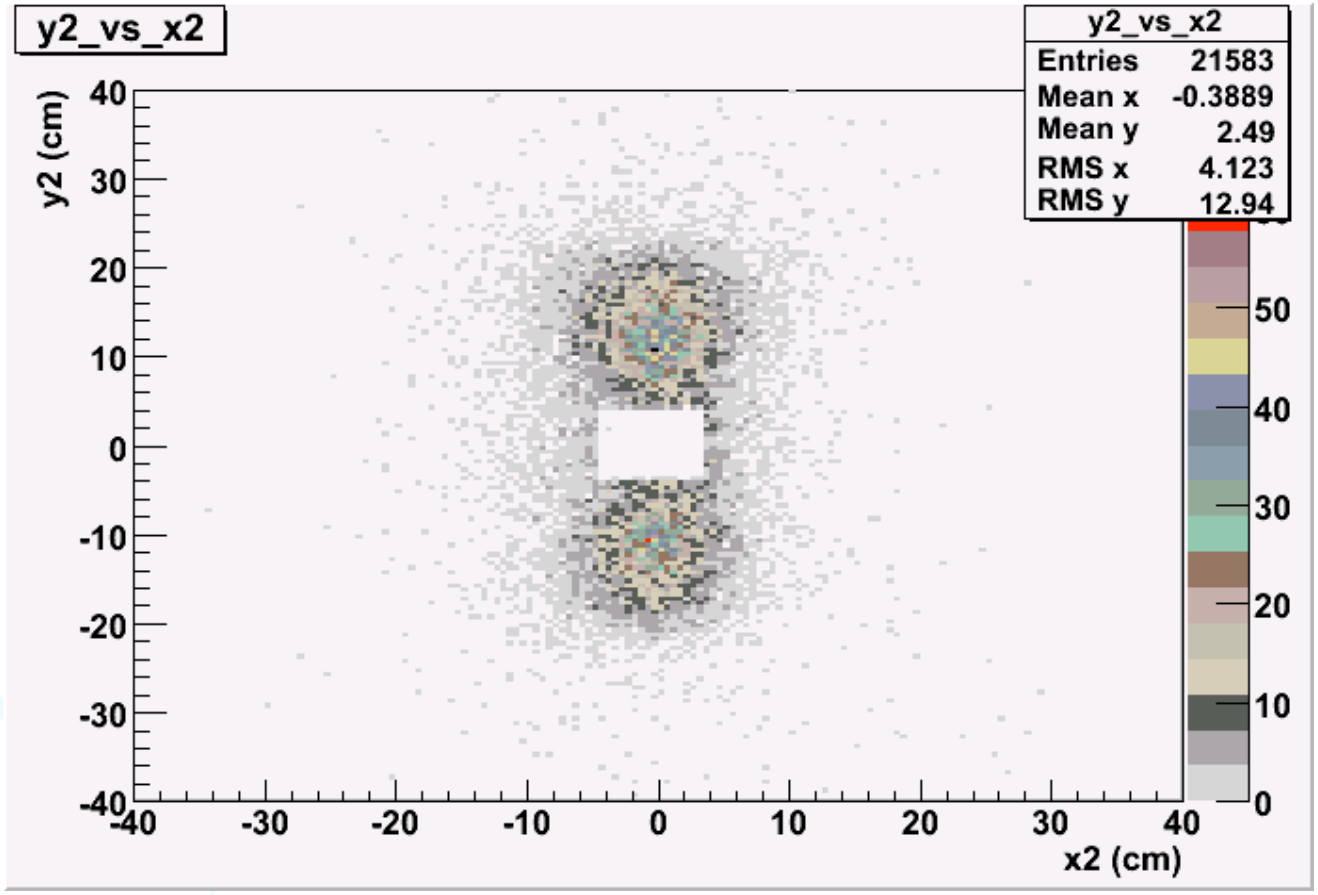



χ²/ndf 57.61 / 7
P1 0.9832
ratio of data to theory
1.03
1.02
1.01
1
0.99
0.98
0.97
0.96
0.95
4700
4800
4900
5000
5100
5200
5300
run

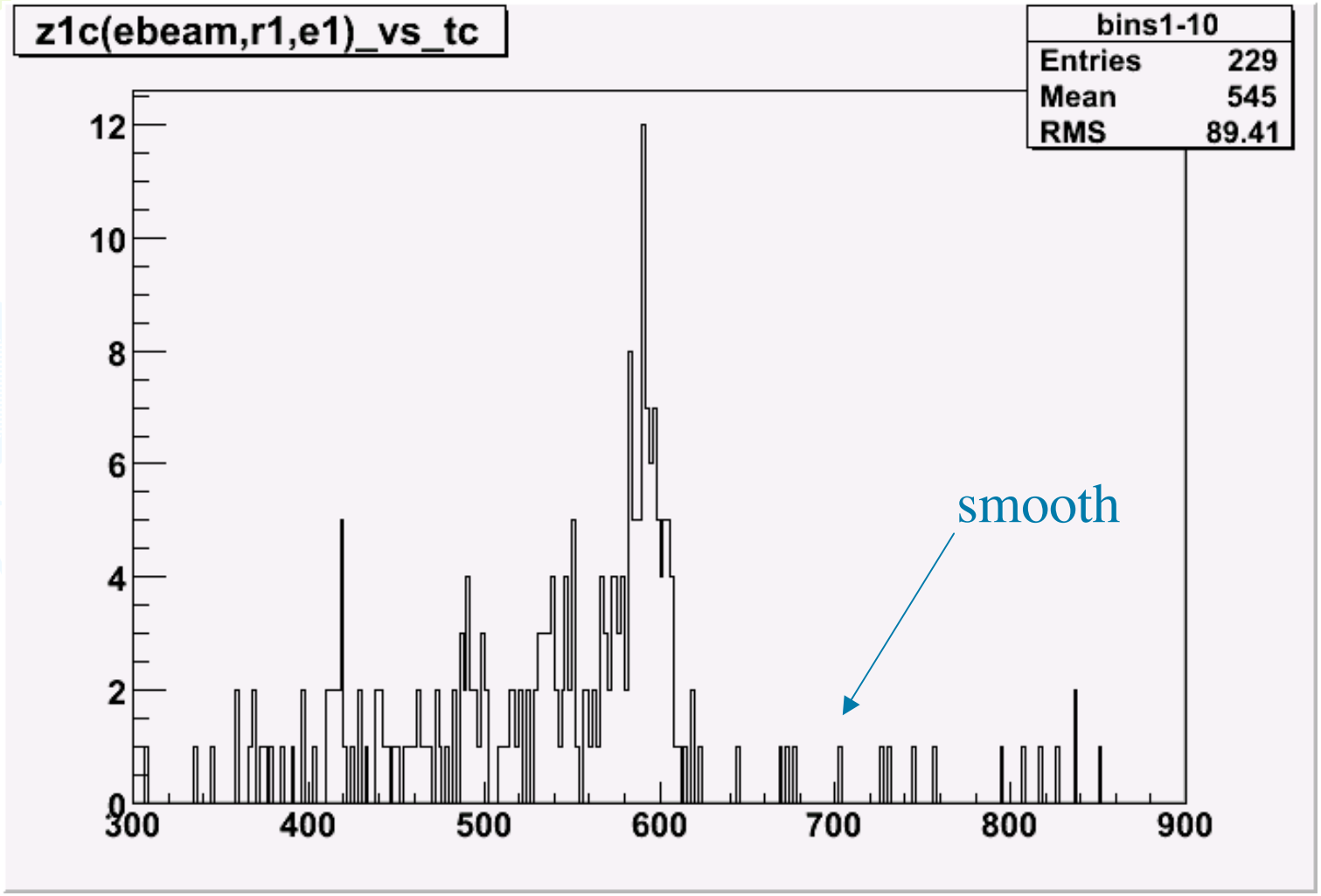
Empty Target



Y vs X


y2_vs_x2
y2_vs_x2
Entries 21583
Mean x -0.3889
Mean y 2.49
RMS x 4.123
RMS y 12.94
y2 (cm)
x2 (cm)
40
30
20
10
0
-10
-20
-30
-40
50
40
30
20
10
0

Z-distribution



Item	2.0<E<3.1 GeV, C	4.9<E<5.5 GeV, C	4.9<E<5.5 GeV, Be
Target thickness	0.1?%	0.1?%	0.1?%
Tagging ratio stability	1.3%	1.3%	1.3%
Photon flux	1.0%	1.0%	1.0%
Efficiency	0.3%	0.25%	0.25%
Beam alignment	0.3%	0.3%	0.3%
Hycal gains	0.2%	0.1%	0.1%
Minimum energy cut	0.4%	0.3%	0.3%
Kinematical fitting	0.4%	0.4%	0.3%
Background subtraction	1.2%	1.4%	1.2%
Total	2.2%	2.3%	2.2%

Data Set	2.0<E<3.1 GeV, C	4.9<E<5.5 GeV, C	4.9<E<5.5 GeV, Be
$\langle \sigma_{RC}^{expt} / \sigma_{RC}^{thr} \rangle$	1.02	1.01	1.00
<Statistical error>	0.3%	0.6%	2.0
Systematic error	2.2%	2.3%	2.2%