G12 Summary

25 February 2016 | Michael C. Kunkel

Review

G12 Review

Key Issues

- Some aesthetics
- Normalization systematic
- Beam Polarization
- TOF knockout clarification
- Momentum Corrections with Beam Energy Corrections
- Single Track Particle efficiency

G12 Review

Aesthetics

- Answered questions but forgot to propagate to note
    - Fixed
- Forgot to place ω cross-sections into note
    - Fixed
- Suggestion to move Fiducial cuts subsection 5.4 from section 5 to section 3.
    - Loved it, done

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Normalization Systematic

- You take as systematic uncertainty estimate for normalized yield the overall shift between two beam intensities. You did not comment on the width of the distribution for given intensity. Is it consistent with the expected statistical width? If it is large than statistical you should add this to your systematics.
    - The width of the normalized yields distributions for given intensity in fact is consistent with the expected statistical widths.

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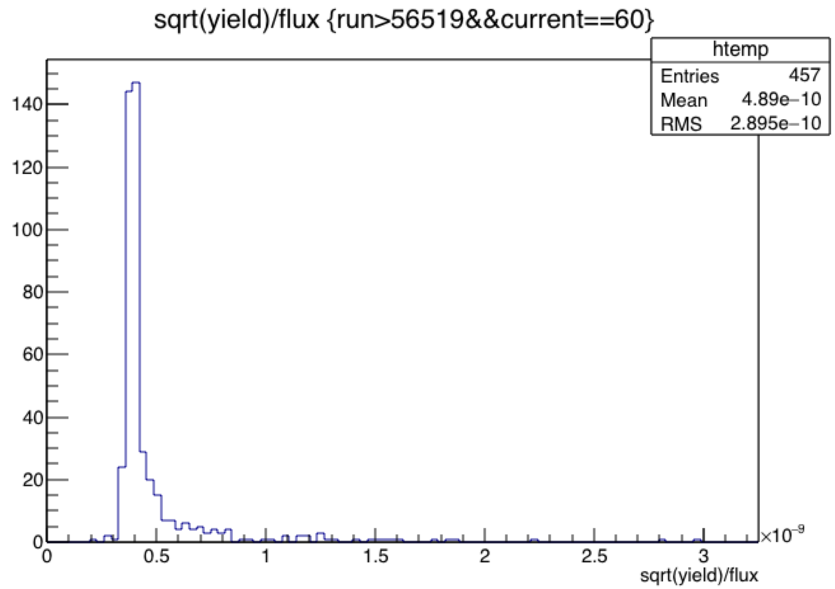
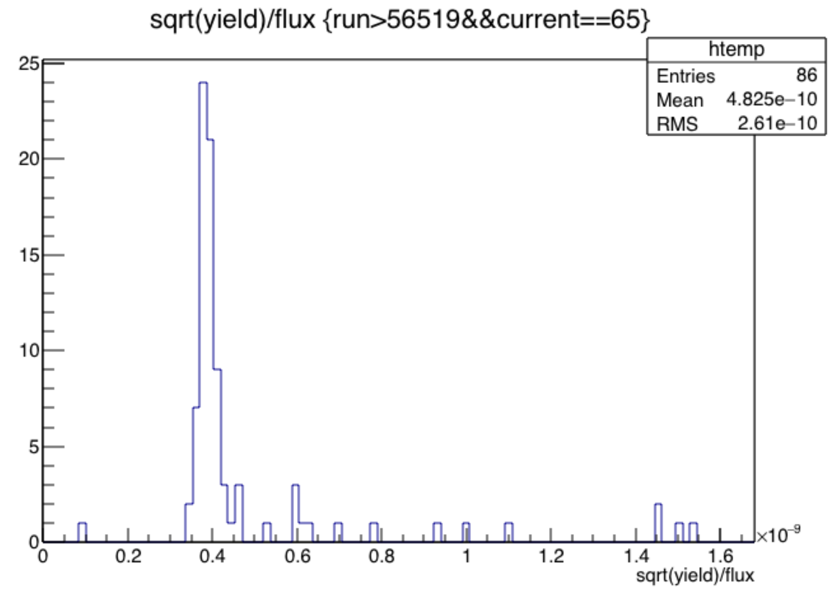
Normalization Systematic



4.9E-10 (60nA, RMS: 2.6E-10)



4.8E- 10(65nA, RMS: 2.9E-10)

- These are consistent with each other and we should stick to the currently quoted lower bound of the systematic uncertainty for the g12 normalization of 5.7%

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Beam Polarization

- Provide a table with the information which Moller measurement should be used for given run range. Also indicate run numbers when half wave plate was changed
  - Half-wave plate actually was not changed
  - One more Moller run at 57317 at the end of the running period. Its consistent with run 57283
  - Changed the table to make it clear what the polarization value is valid for wha run range

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TOF knockout clarification

- From the note is not clear what is the final knock out list. Please clarify this in the note
    - The multiple tables are a bit confusing,because the address different reasons for the knockout
    - We provide a final knock out list in a new table at the end of the TOF knock out section

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Momentum Corrections with Beam Energy Corrections

- Clarify if the photon-energy corrections derived and reported in the note were obtained after the application of the phi-dependent momentum cor- rections reported in 3.3.1. This correction should be derived after e-loss and phi-dependent momentum corrections are applied.
    - Before

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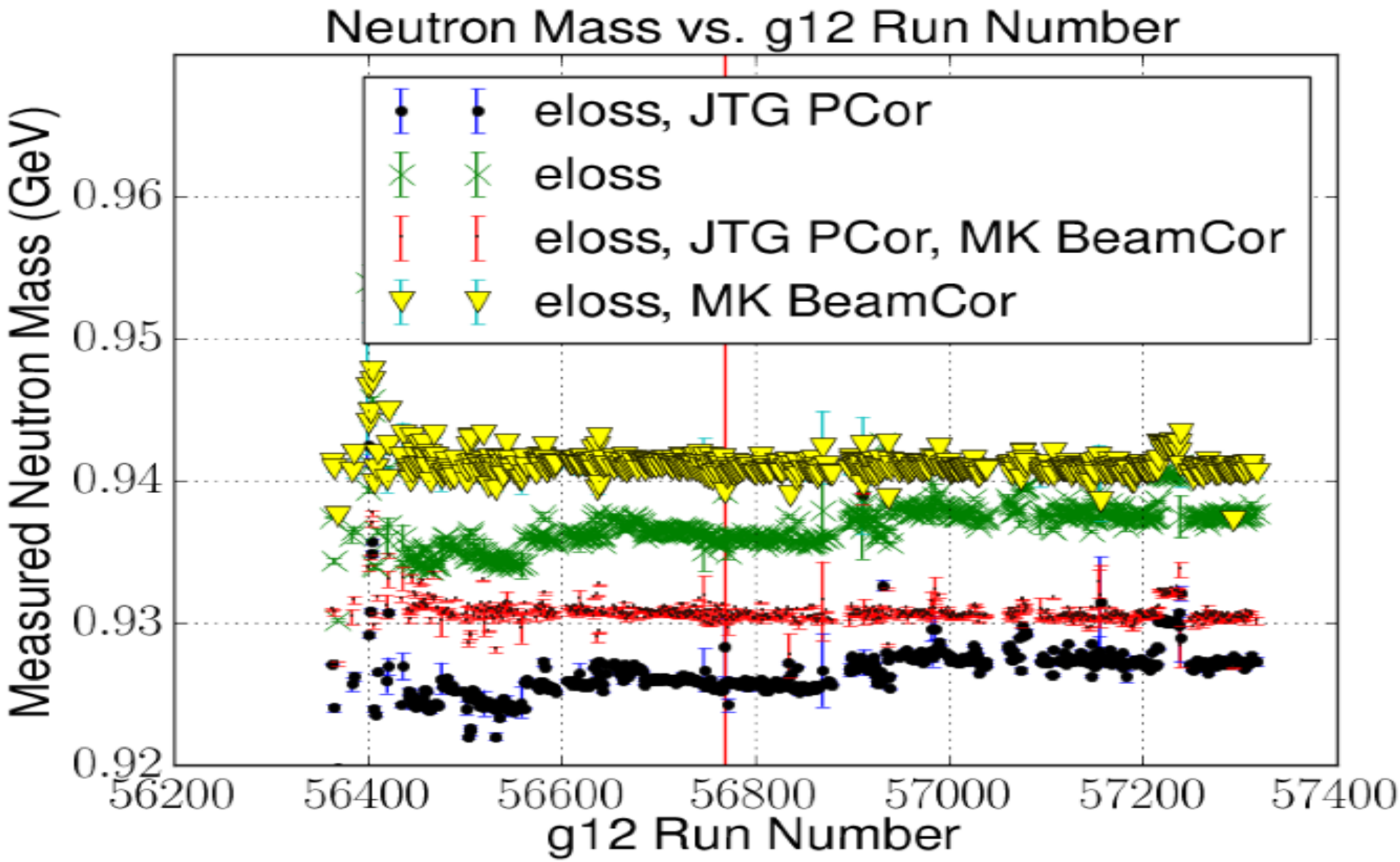

Neutron Mass vs. g12 Run Number
eloss, JTG PCor
eloss
eloss, JTG PCor, MK BeamCor
eloss, MK BeamCor
Measured Neutron Mass (GeV)
0.96
0.95
0.94
0.93
0.92
56200
56400
56600
56800
57000
57200
57400
g12 Run Number

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Beam Energy Corrections

- Some of us are concerned that the photon energy correction may ab- sorb any remaining systematic biases in the pion momenta. In such a case, the method by which the photon energy correction is derived en- sures that the missing mass peaks are placed right at the nominal mass of the missing particle, but the calculated kinematics at which you report your observables (W, Cm angles) will be incorrectly estimated. We would like to see control distributions that provide evidence that after e-loss and phi-dependent momentum corrections, there are no remaining systematic biases in the particles' momenta:"
    - The observables in which we report (W, C.M. angles) agree well with previous measurements of CLAS and other reputable institutions

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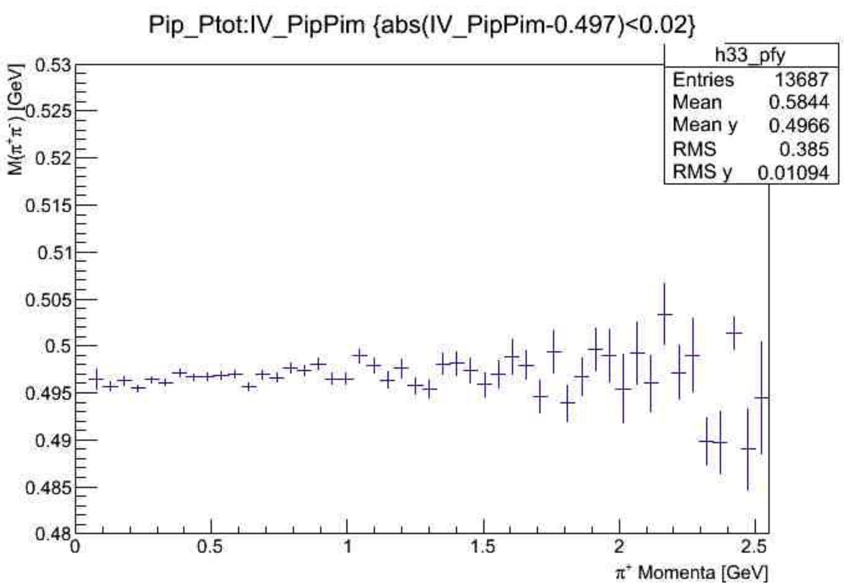
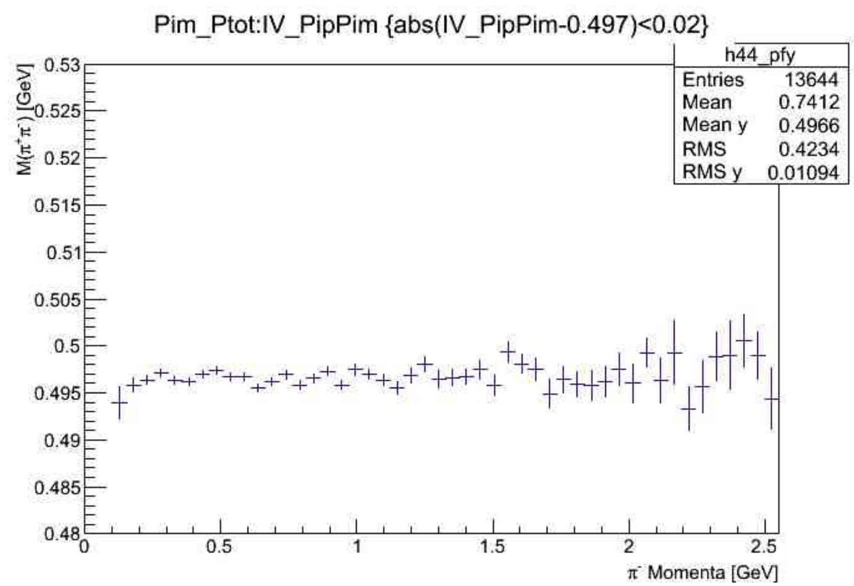
Beam Energy Corrections

- Plot the $\pi^+\pi^-$ invariant mass (Ks) as a function of the π^+ and π^- momenta. On each plot show with a solid line the mean of the integrated invariant-mass distribution.





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Beam Energy Corrections

- Plot the $\pi^+\pi^-$ invariant mass (Ks) as a function of the π^+ and π^- theta lab angles. On each plot show with a solid line the mean of the integrated invariant-mass distribution.
    - For some bins of θ and φ the K_s mass difference (from PDG value) are more than 1 MeV, this is due to the number of entries and the fit performed for that bin. See Appendix for fits.

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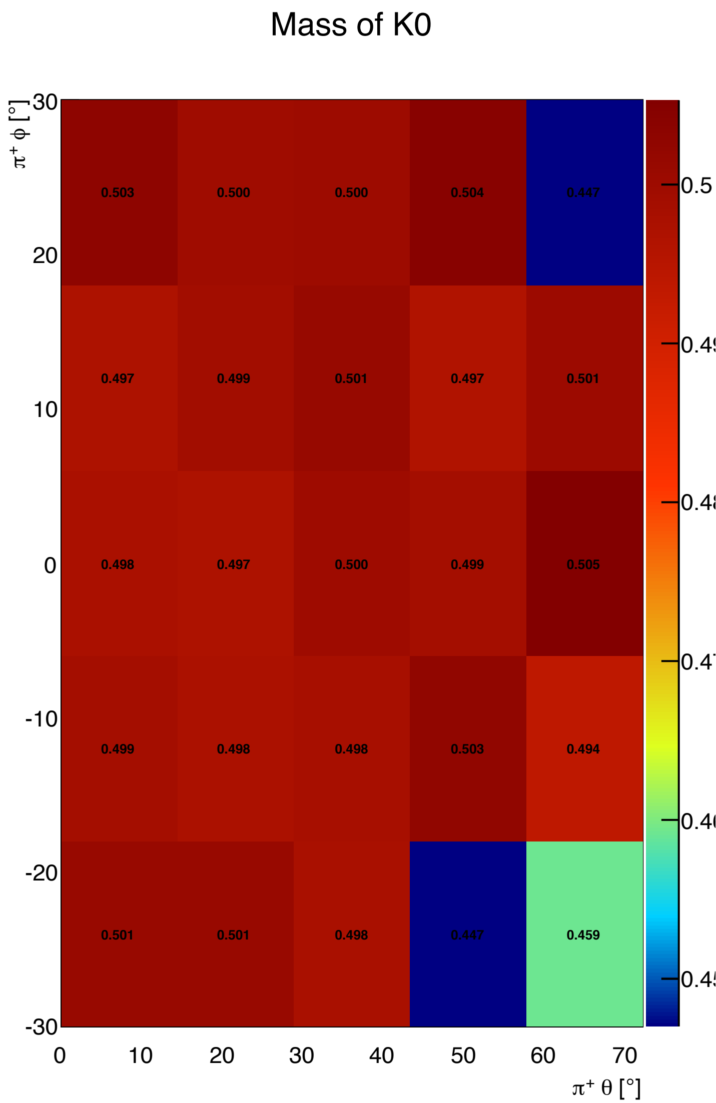
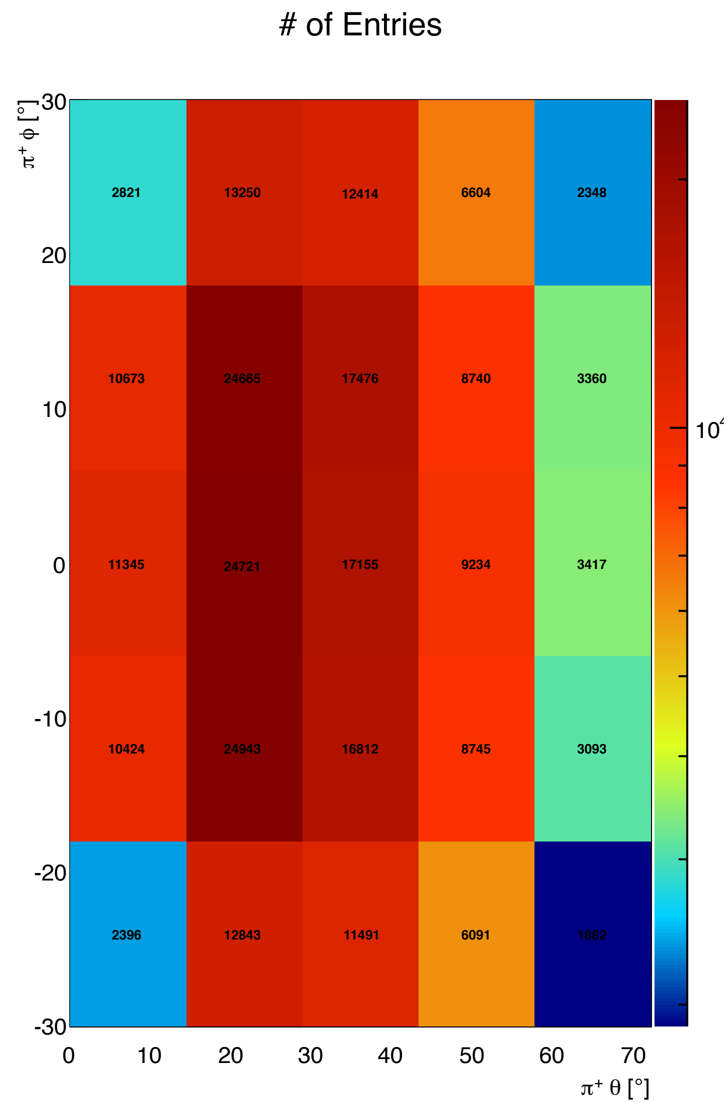

Mass of K0
0.503 0.500 0.500 0.504 0.447
0.497 0.499 0.501 0.497 0.501
0.498 0.497 0.500 0.499 0.505
0.499 0.498 0.498 0.503 0.494
0.501 0.501 0.498 0.447 0.459
π+ φ [°]
π+ θ [°]


# of Entries
2821 13250 12414 6604 2348
10673 24665 17476 8740 3360
11345 24721 17155 9234 3417
10424 24943 16812 8745 3093
2396 12843 11491 6091 1882
π+ φ [°]
π+ θ [°]

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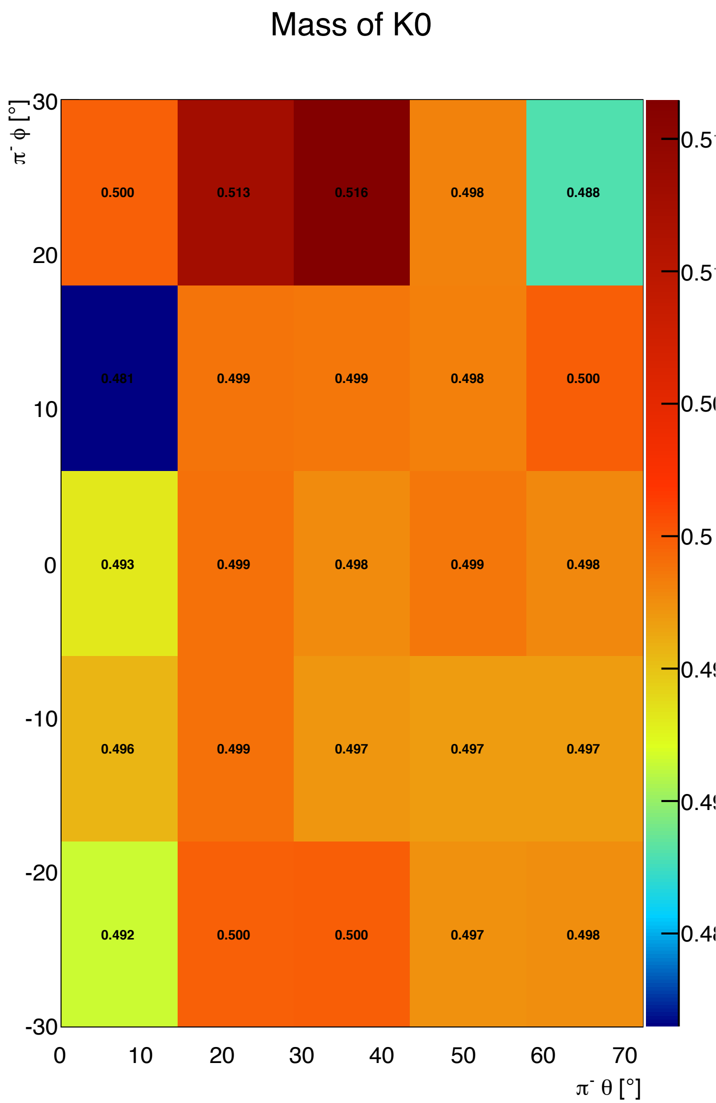
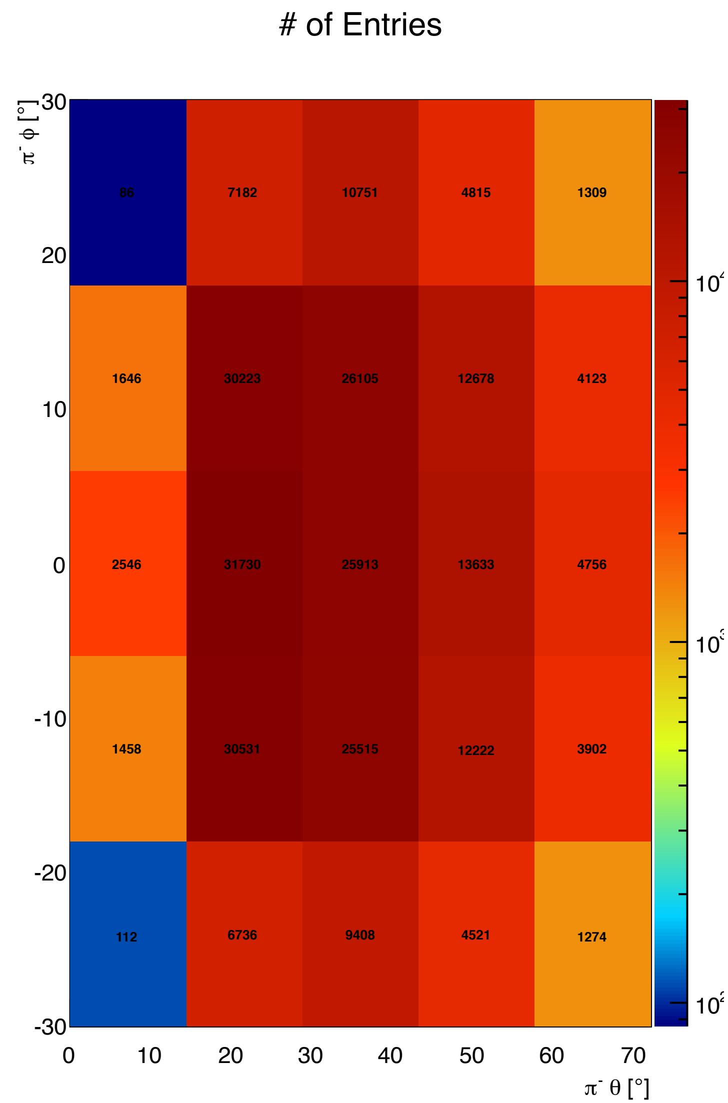


Mass of K0
0.500 0.513 0.516 0.498 0.488
0.481 0.499 0.499 0.498 0.500
0.493 0.499 0.498 0.499 0.498
0.496 0.499 0.497 0.497 0.497
0.492 0.500 0.500 0.497 0.498
π⁻ φ [°]
π⁻ θ [°]



# of Entries
86 7182 10751 4815 1309
1646 30223 26105 12678 4123
2546 31730 25913 13633 4756
1458 30531 25515 12222 3902
112 6736 9408 4521 1274
π⁻ φ [°]
π⁻ θ [°]

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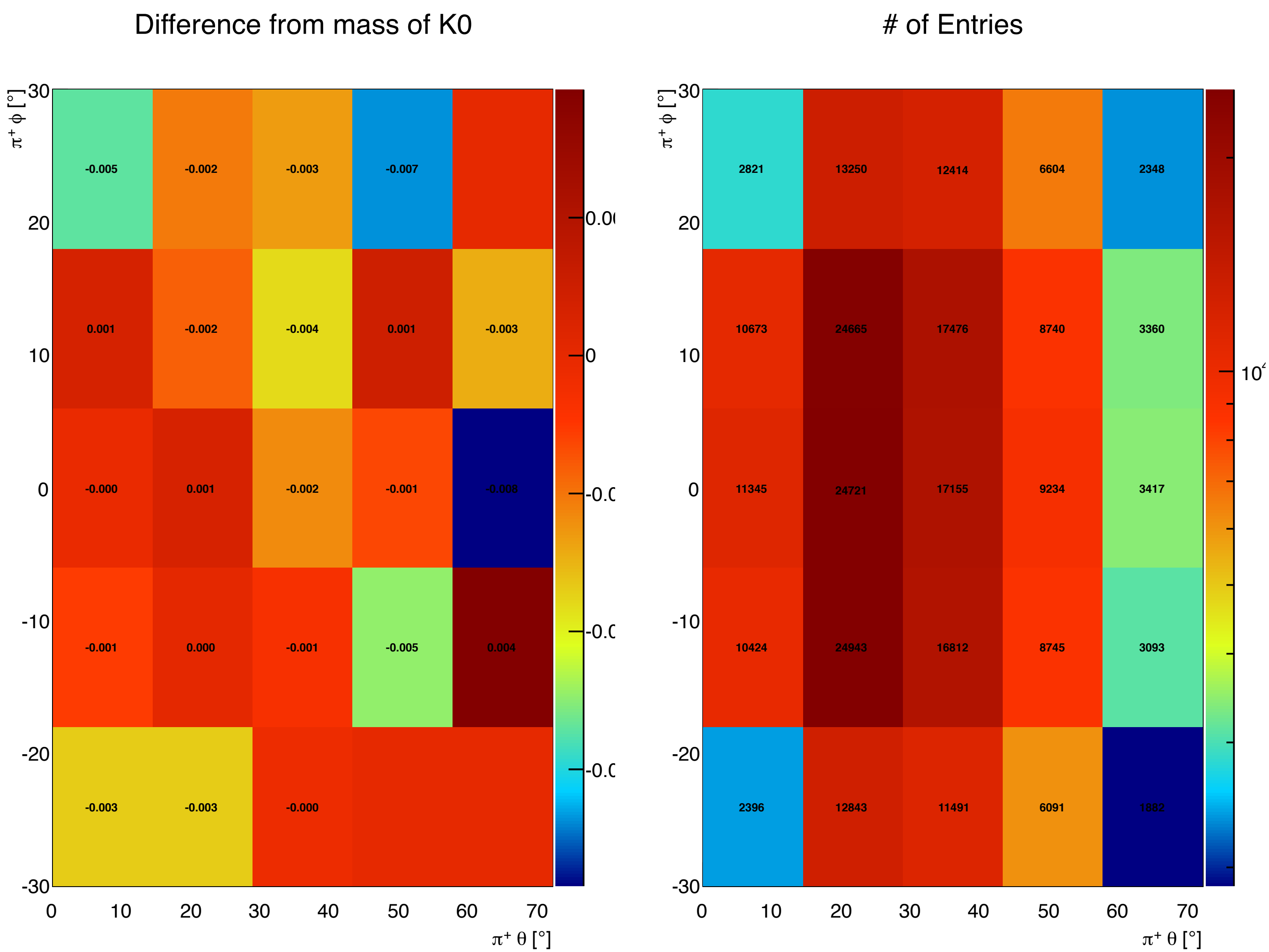

Difference from mass of K0
# of Entries
-0.005
-0.002
-0.003
-0.007
0.001
-0.002
-0.004
0.001
-0.003
-0.000
0.001
-0.002
-0.001
-0.008
-0.001
0.000
-0.001
-0.005
0.004
-0.003
-0.003
-0.000
2821
13250
12414
6604
2348
10673
24665
17476
8740
3360
11345
24721
17155
9234
3417
10424
24943
16812
8745
3093
2396
12843
11491
6091
1882
$\pi^+ \phi$ [°]
$\pi^+ \theta$ [°]

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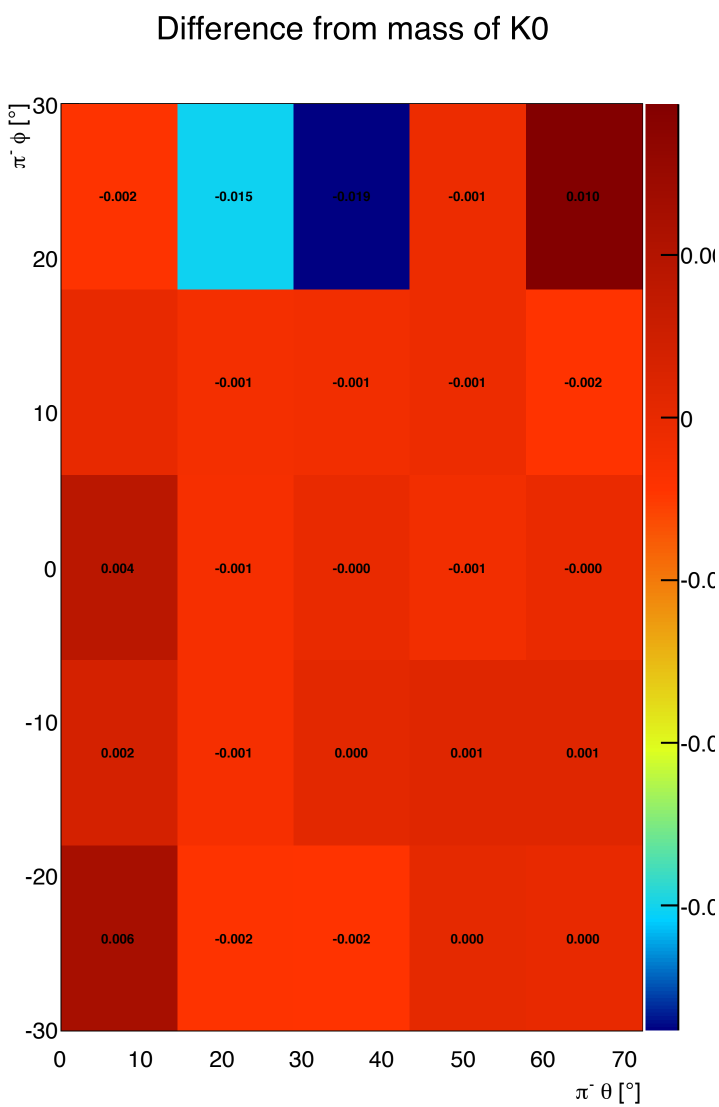
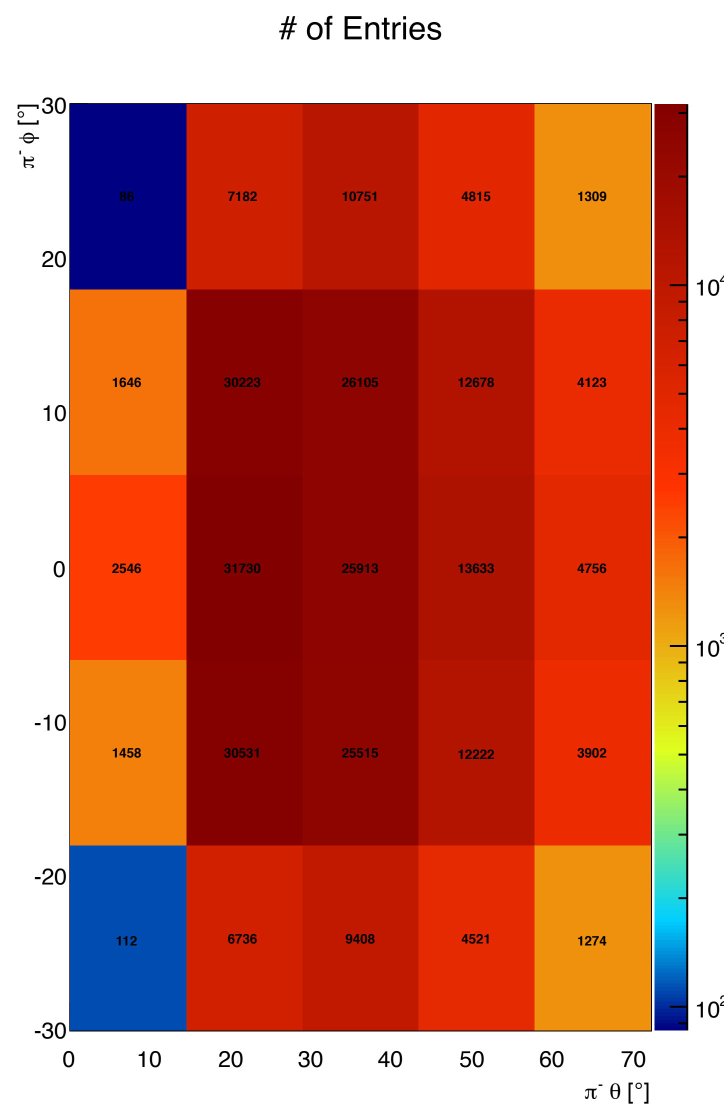


Difference from mass of K0
-0.002
-0.015
-0.019
-0.001
0.010
-0.001
-0.001
-0.001
-0.002
0.004
-0.001
-0.000
-0.001
-0.000
0.002
-0.001
0.000
0.001
0.001
0.006
-0.002
-0.002
0.000
0.000
π⁻ φ [°]
π⁻ θ [°]



# of Entries
86
7182
10751
4815
1309
1646
30223
26105
12678
4123
2546
31730
25913
13633
4756
1458
30531
25515
12222
3902
112
6736
9408
4521
1274
π⁻ φ [°]
π⁻ θ [°]

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Beam Energy Corrections

- Plot the $\pi^+\pi^-$ invariant mass (Ks) as a function of run number. On the plot show with a solid line the mean of the integrated invariant- mass distribution.

    - In figure 62, where the top panel is for run 56515 and the bottom panel is for run 57130, which depicts a plot of the Ks mass being 1 MeV in difference. Since, the proton mass from 56515 and 57130 was 0.930 and 0.939 respectively it was determined that the beam was the culprit

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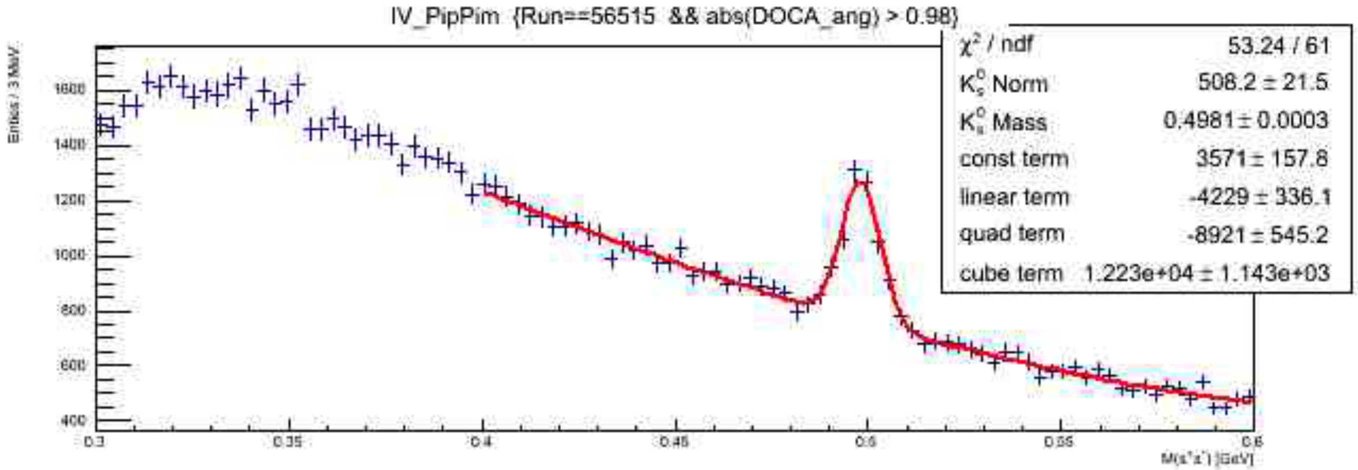
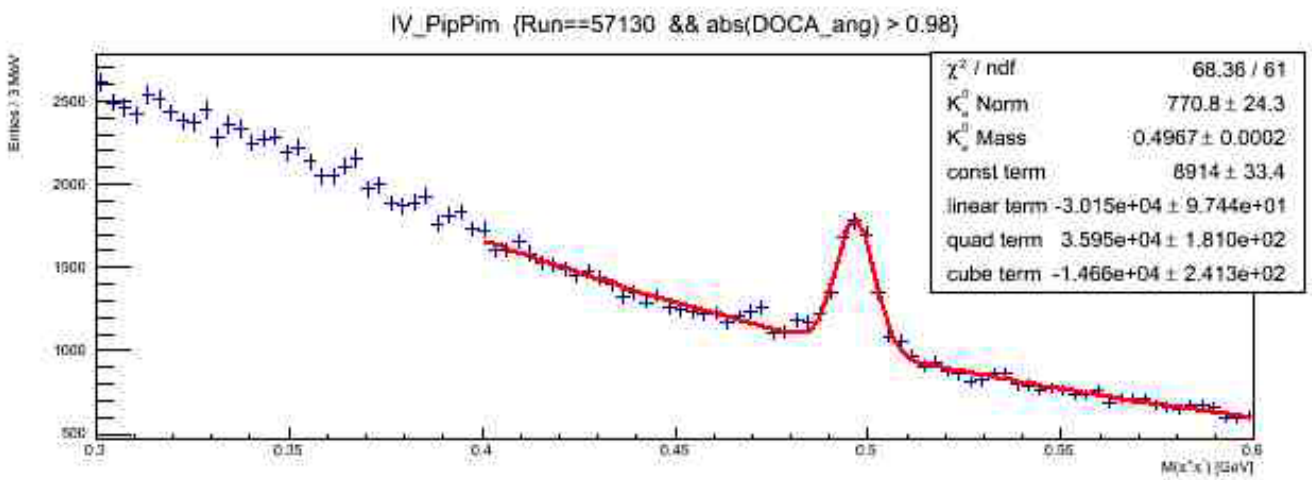

IV_PipPim {Run==56515 && abs(DOCA_ang) > 0.98}
χ^2 / ndf 53.24 / 61
K_s^0 Norm 508.2 ± 21.5
K_s^0 Mass 0.4981 ± 0.0003
const term 3571 ± 157.8
linear term -4229 ± 336.1
quad term -8921 ± 545.2
cube term 1.223e+04 ± 1.143e+03


IV_PipPim {Run==57130 && abs(DOCA_ang) > 0.98}
χ^2 / ndf 68.36 / 61
K_s^0 Norm 770.8 ± 24.3
K_s^0 Mass 0.4967 ± 0.0002
const term 8914 ± 33.4
linear term -3.015e+04 ± 9.744e+01
quad term 3.595e+04 ± 1.810e+02
cube term -1.466e+04 ± 2.413e+02

G12 Review

Single Track Particle efficiency

- The only independent (of analysis) g12 argument at this time that can be acceptable in my view about the validity of the correction would be that after the corrections, the omega cross sections from three-track and two-track events are consistent with each other, but I did not see a comparison of these in MKs thesis

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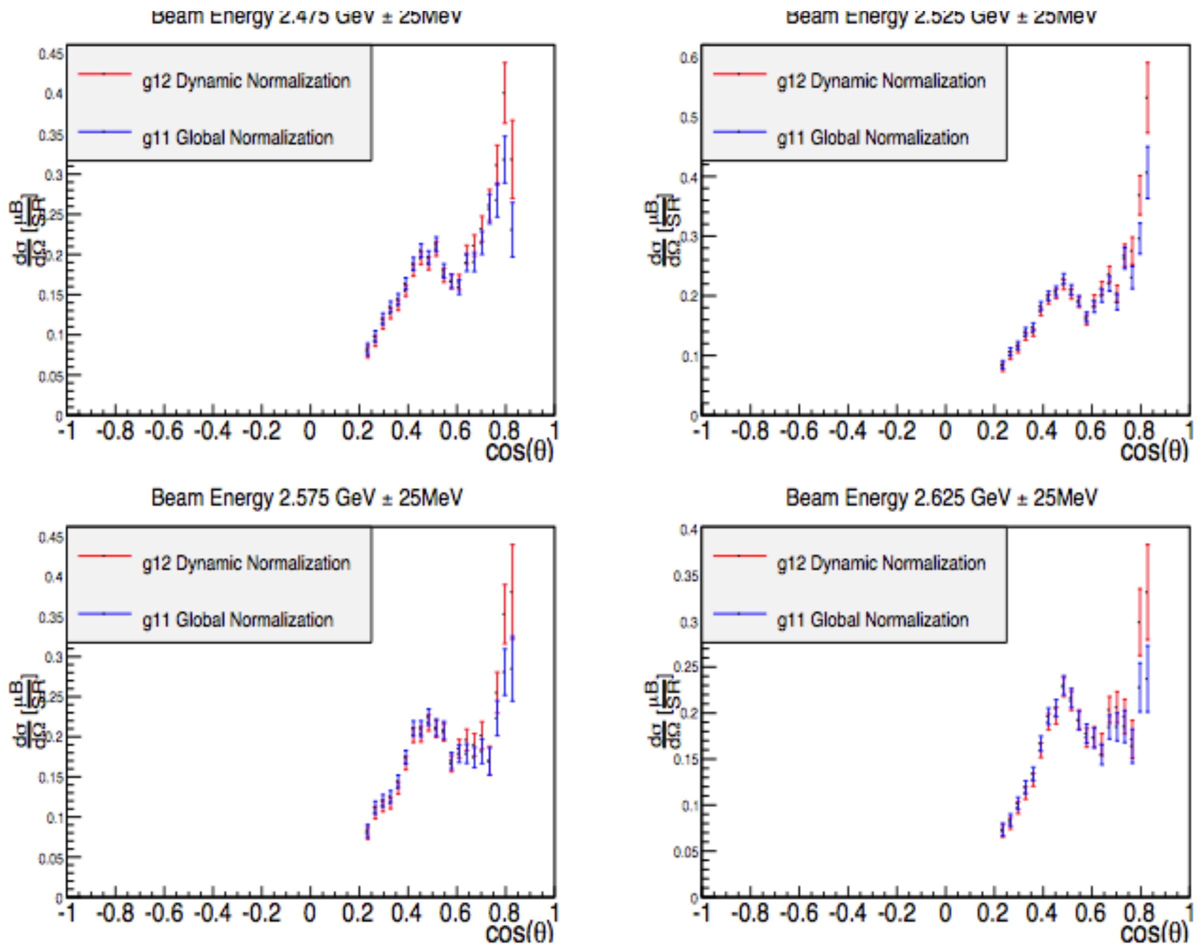

FIG. 107. $\frac{d\sigma}{d\Omega}$ vs. $\cos\theta$ plot showing the *g12* π^0 differential cross-section when the *g11* global normalization is used (blue) and when the *g12* dynamic normalization is used (red) for various bins of beam energy inside lepton trigger acceptance.

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Thanks!