G12 $\omega \to 3\pi$ Analysis with AmpTools

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$\omega \to 3\pi$ Decay Analysis

Goals

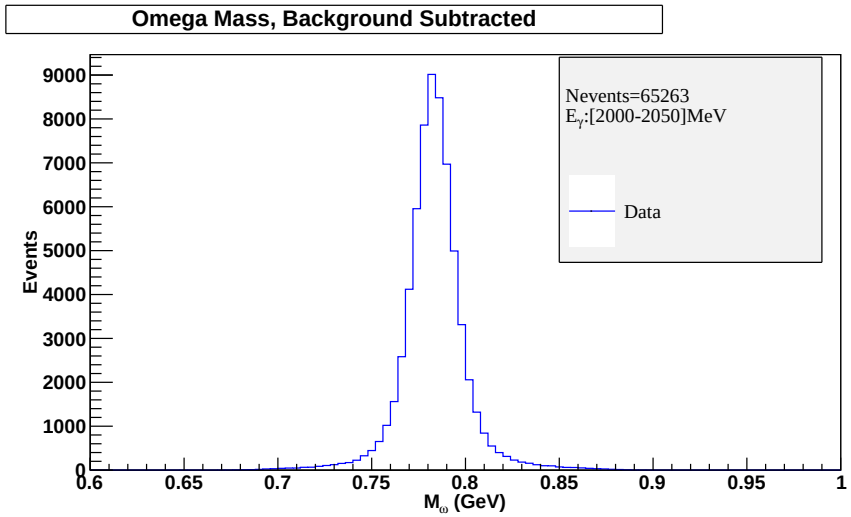
- Dalitz plot analysis of the $\omega \to 3\pi$ decay.
- Event-based likelihood fits performed with AmpTools.
- Fitted decay amplitude is drawn from Igor *et.al.*'s paper "Dispersive Analysis of $\omega/\eta \to 3\pi$, $\pi\gamma^*$ ",

  I.V.Danilkin *et.al.*, arXiv:1409.7708v1 [hep-ph] (2014).

CLAS G12 Data

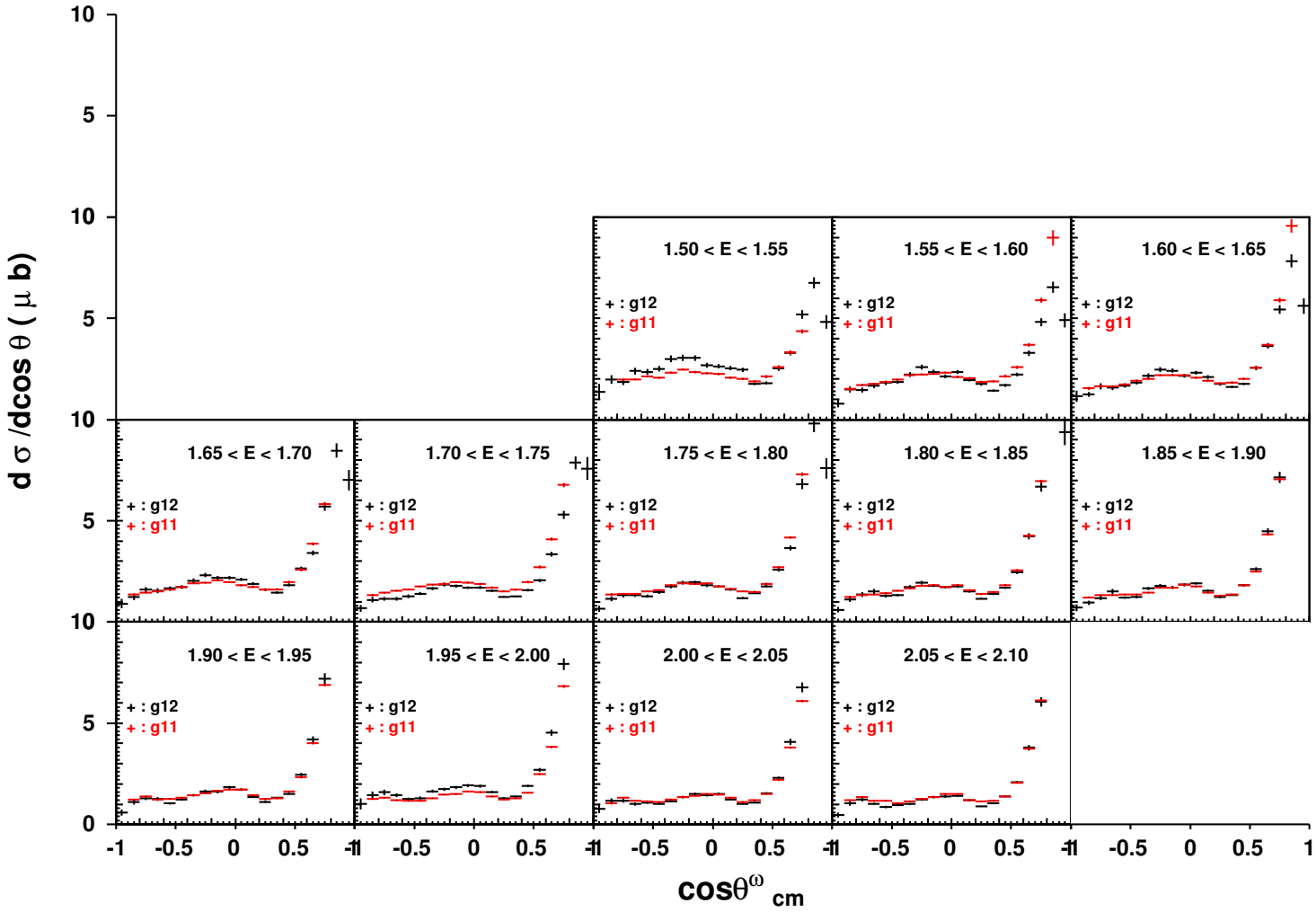
Data	Total Events
-data	8,200,000
-genMC	14,000,000
-accMC	1,500,000

Average Acceptance $\approx$ 0.107



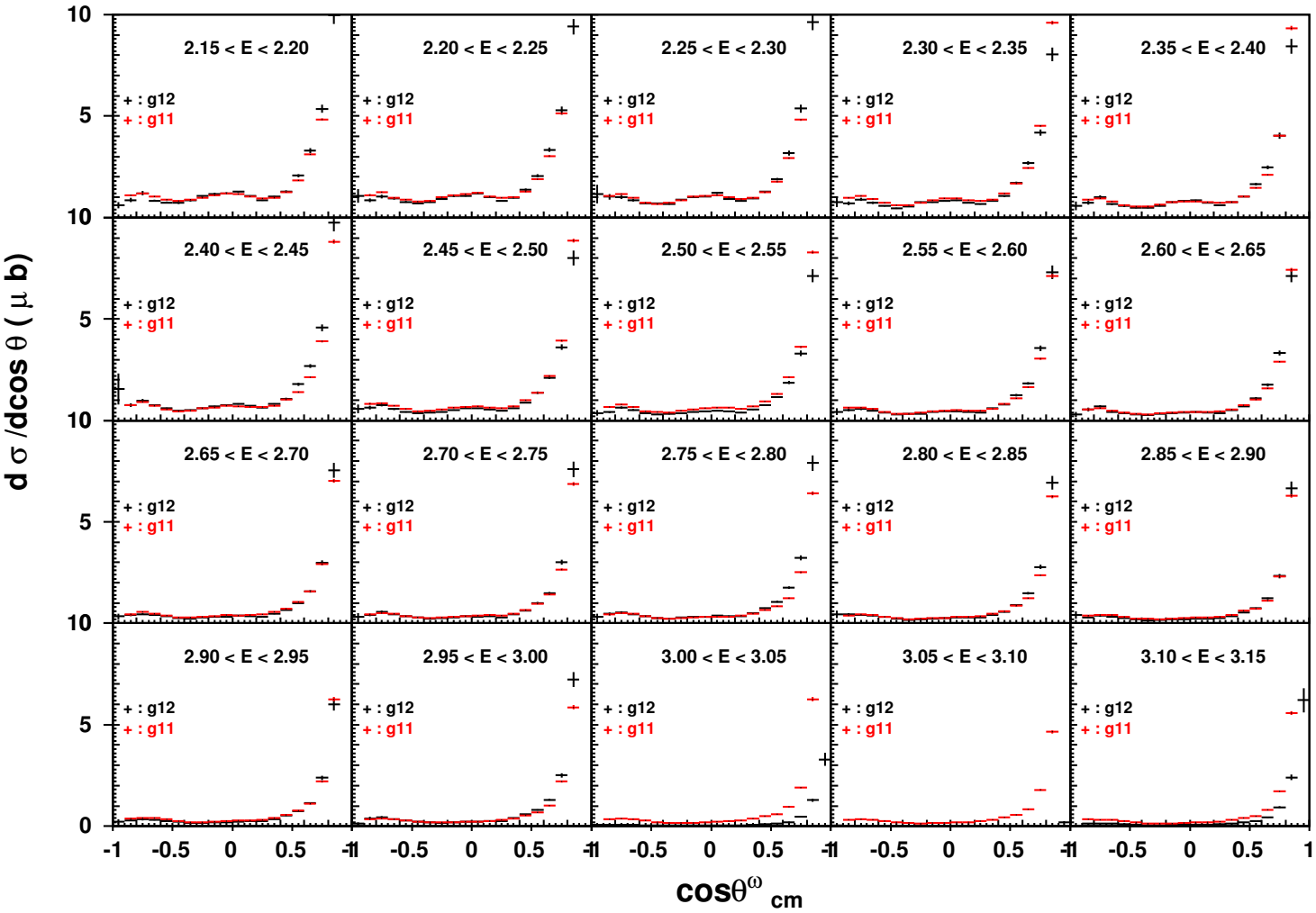
- Our G12 data has incoming photon energy range E_γ:[1150-5400]MeV
- Using G11 x-section and SDME's data, range E_γ:[1107.4-3828.9]MeV
- Have G12 x-section E_γ:[1150-3800]MeV, extending to 5400MeV, need G12 SDME's still
- We then consider range E_γ:[1150-3800]MeV at 50MeV, 10MeV wide bins

G12, G11 Cross-Section Comparison



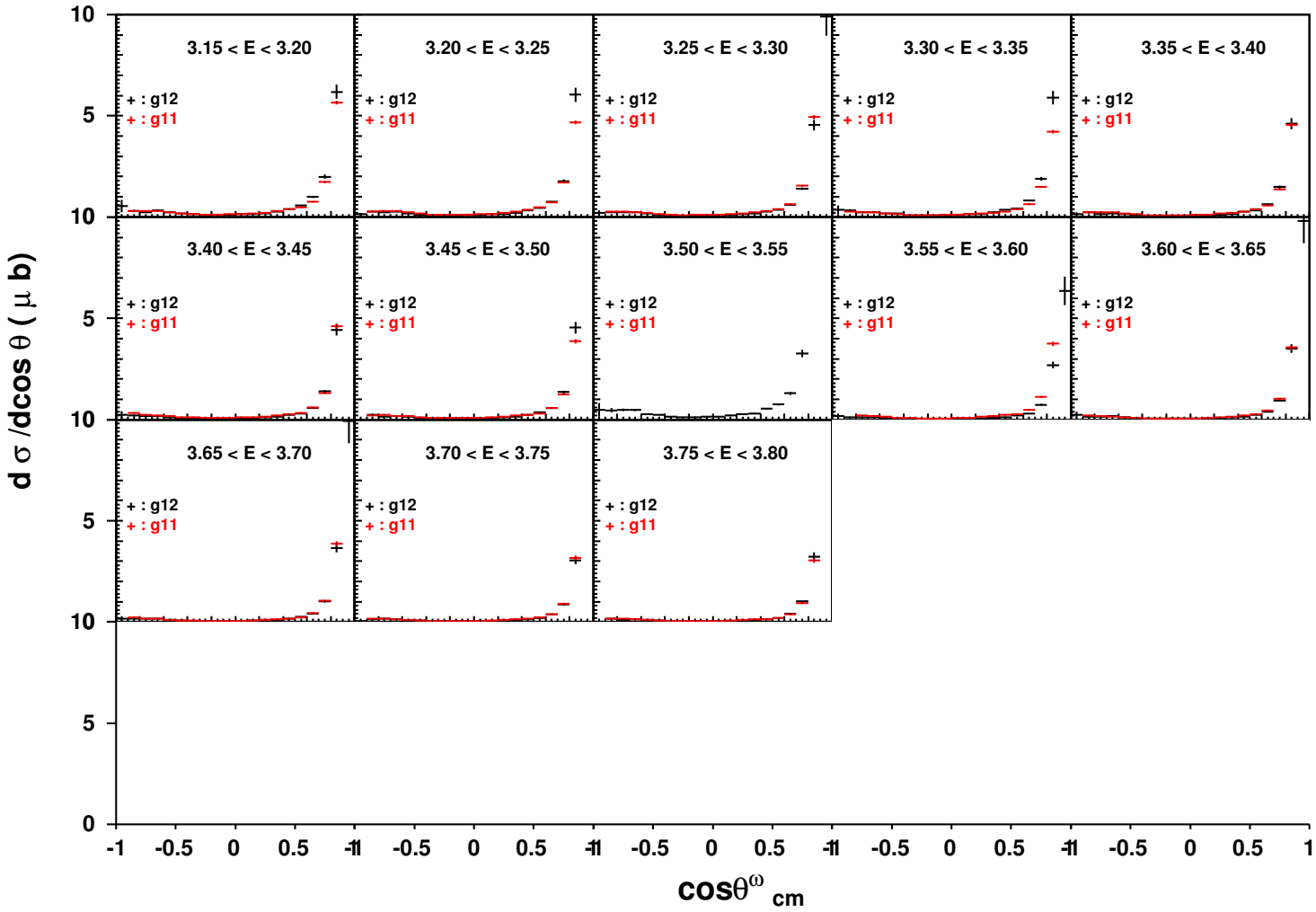
$E\gamma$:[1500-2010]MeV, Zulkaida Akbar

G12, G11 Cross-Section Comparison



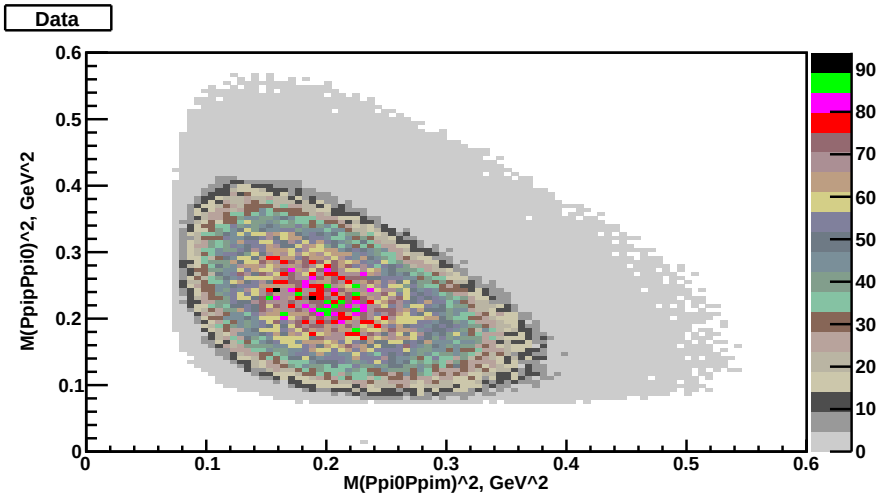
$E\gamma$:[2150-3150]MeV, Zulkaida Akbar

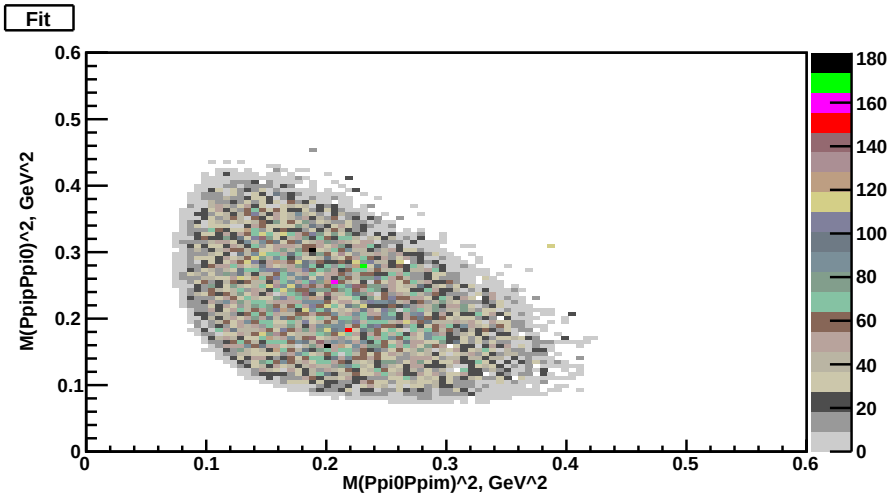
G12, G11 Cross-Section Comparison

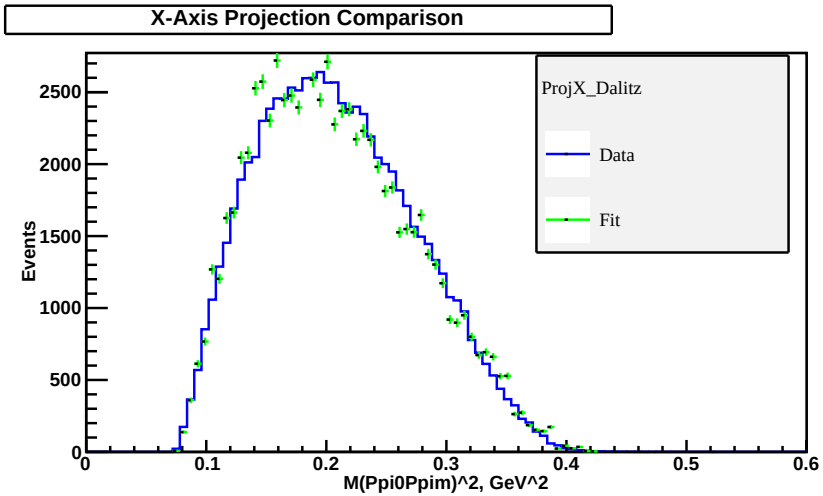


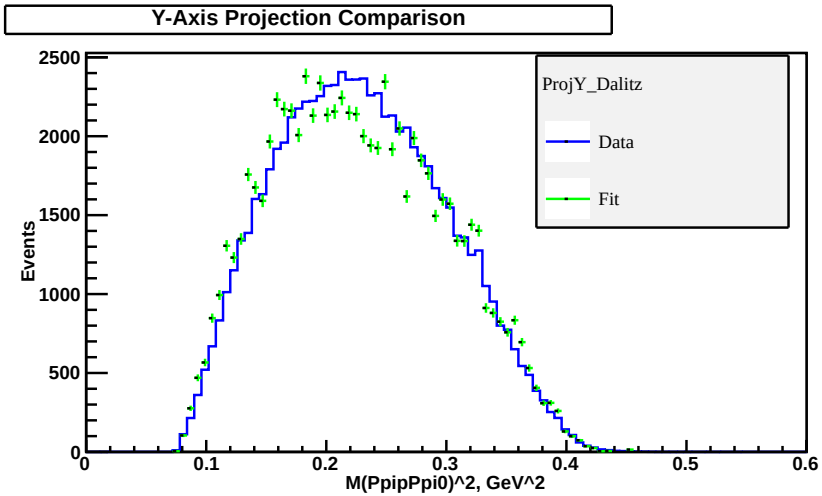
$E\gamma$:[3150-3800]MeV, Zulkiada Akbar

Data and Fit Comparison, Dalitz Plots



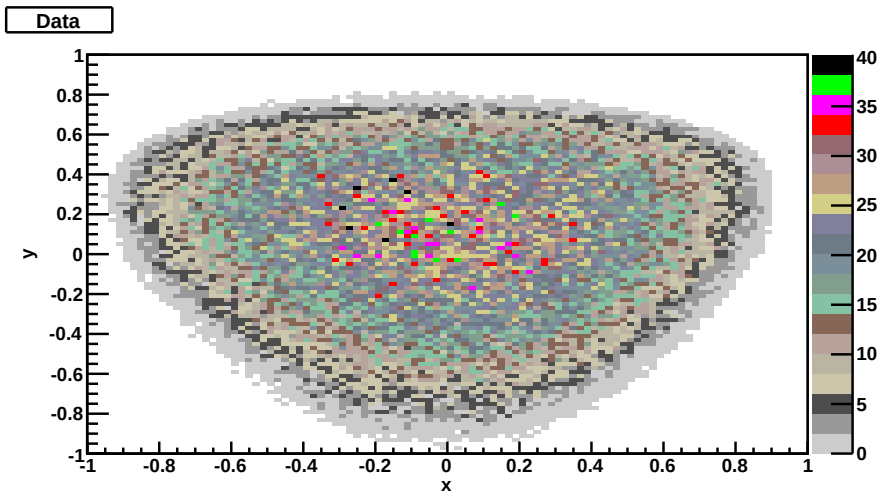


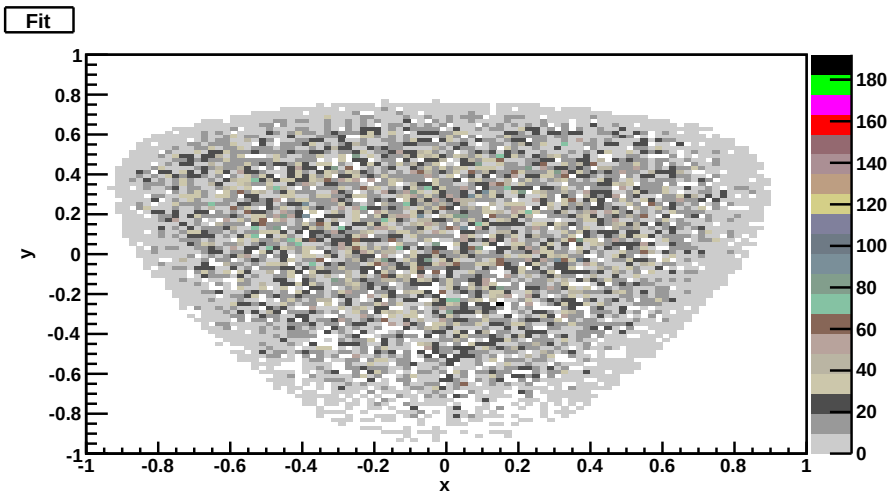


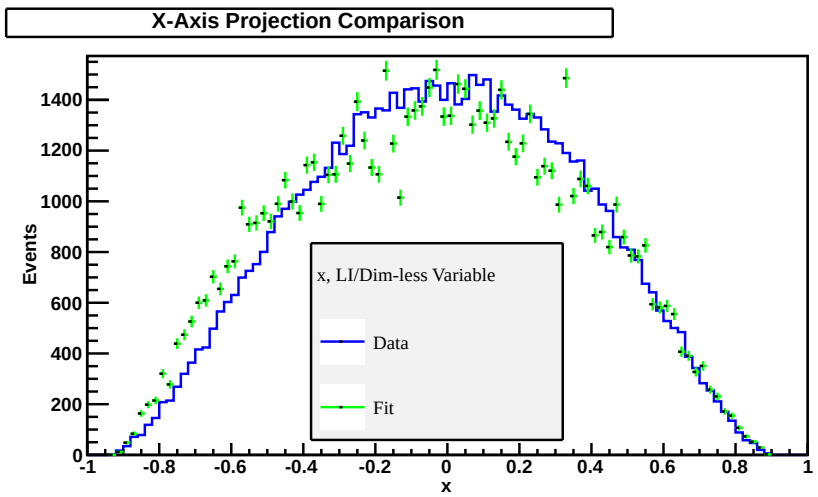


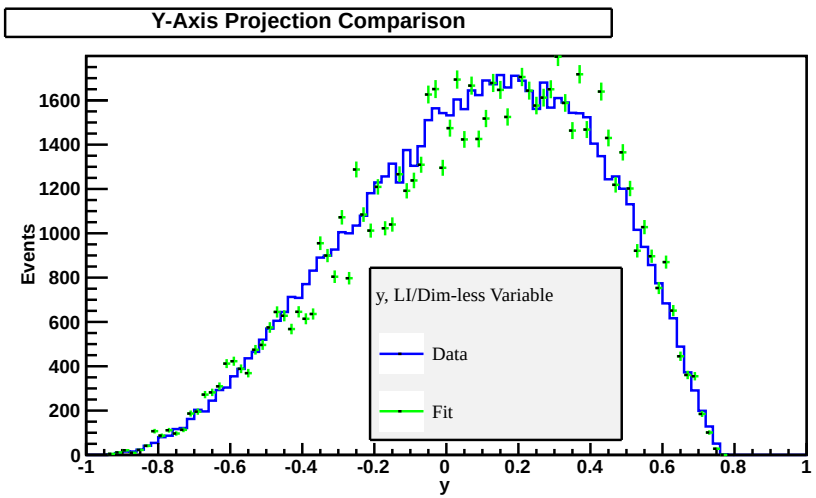
$E\gamma$:[1600-1650]MeV

Data and Fit Comparison, Dalitz Lor. Inv. Variable Plots



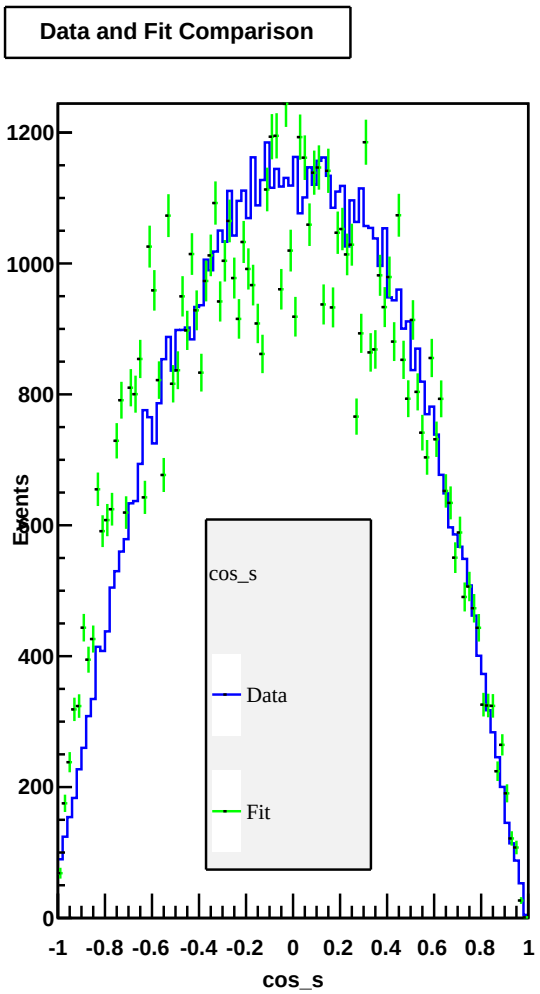


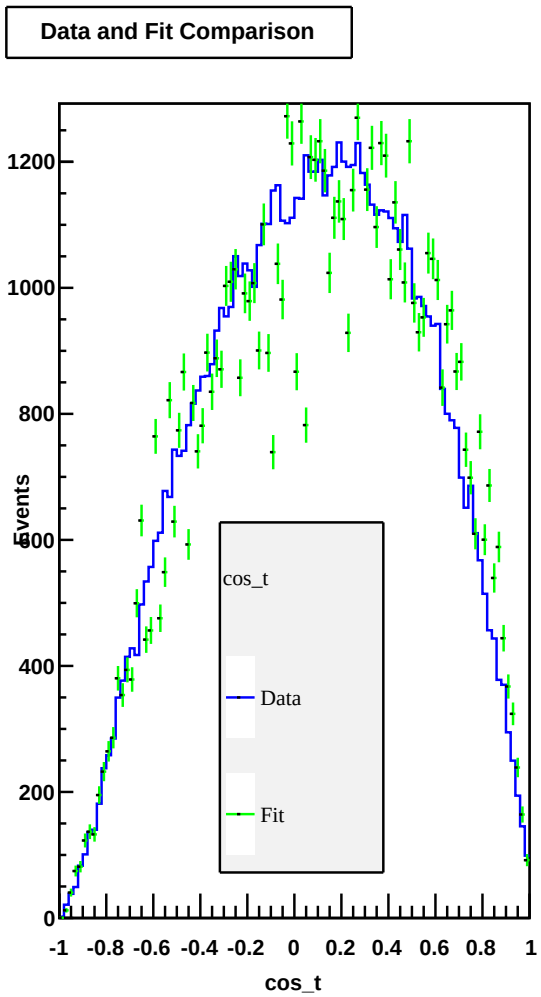


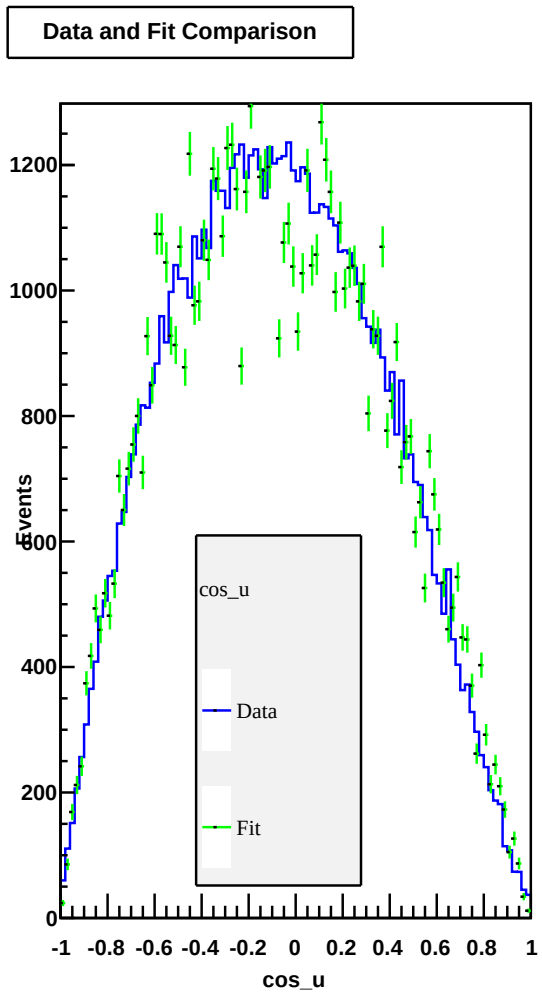


$E\gamma$:[1600-1650]MeV

Data and Fit Comparison, Pion Angle Plots

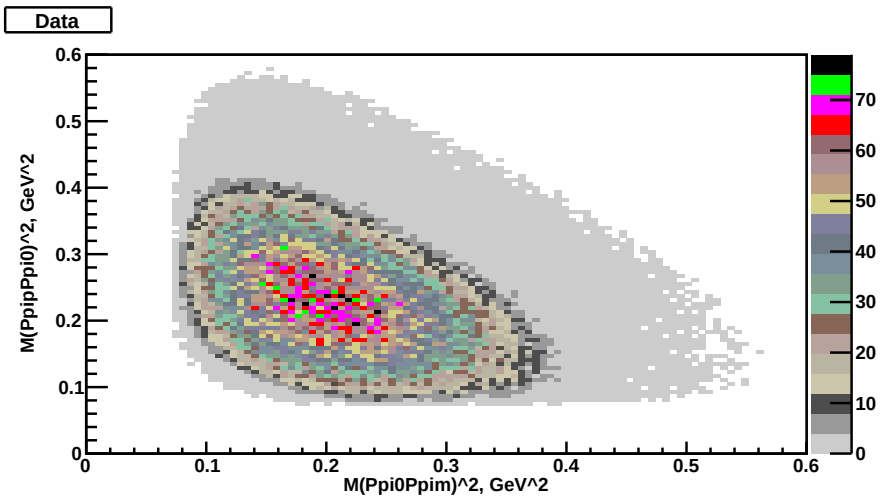


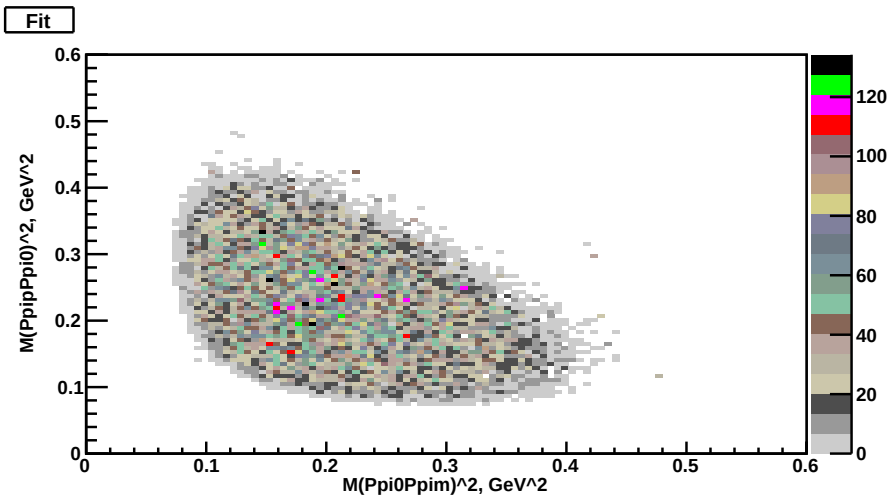


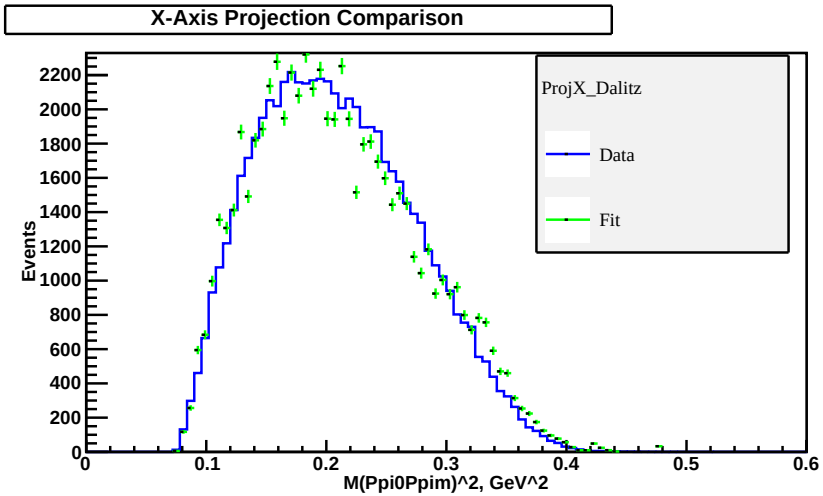


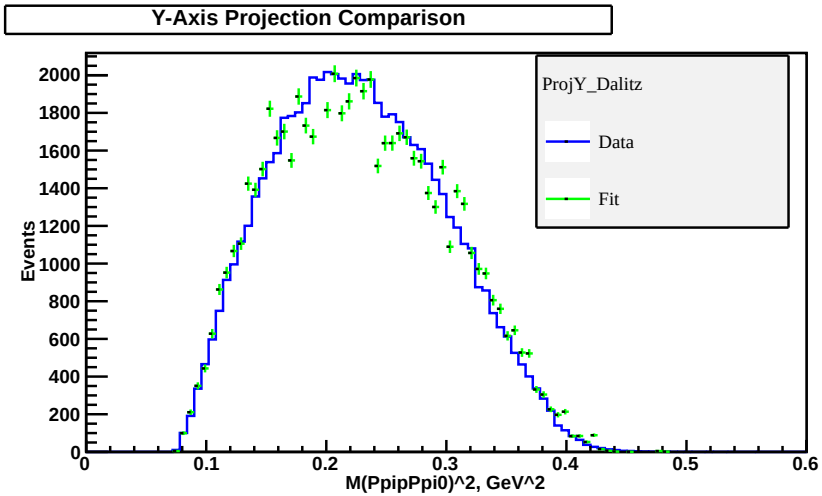
$E\gamma$:[1600-1650]MeV

Data and Fit Comparison, Dalitz Plots



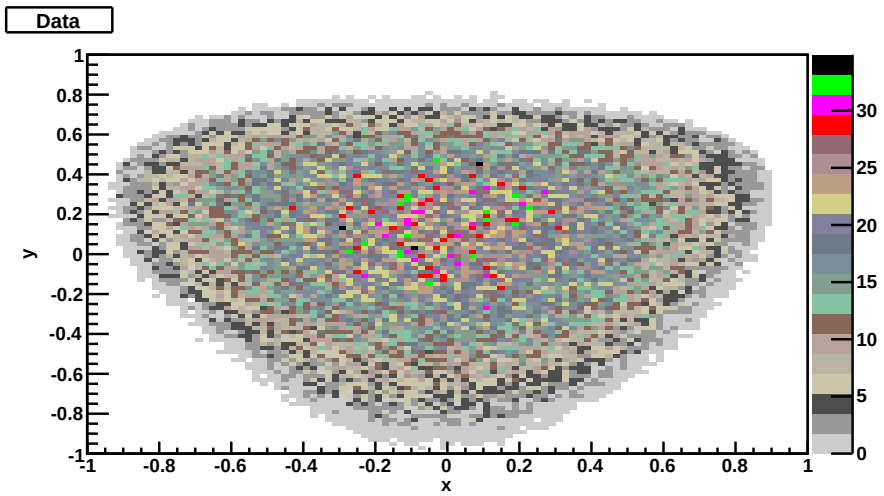


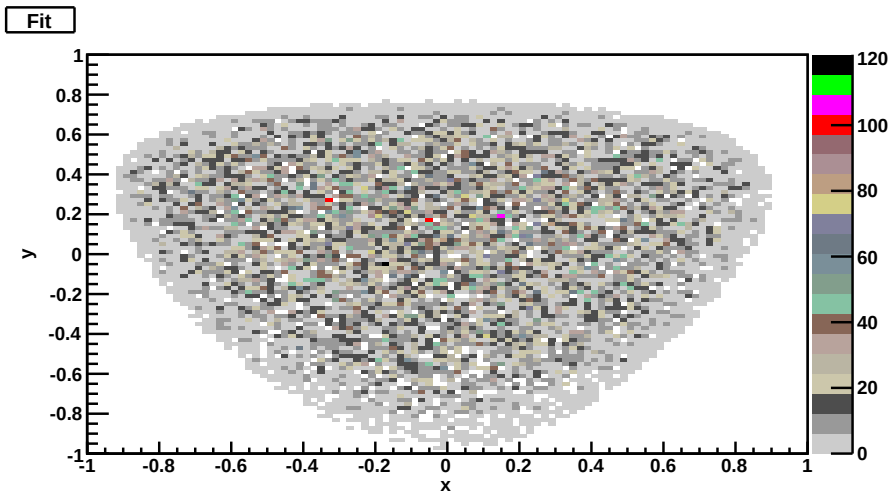


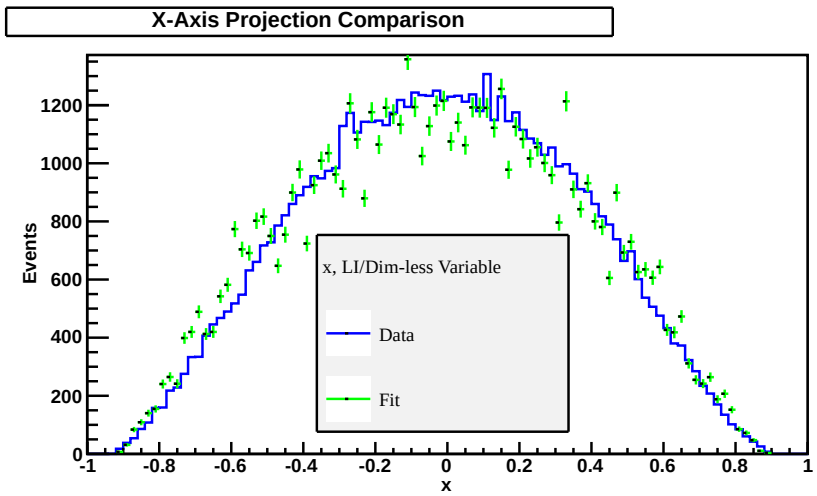


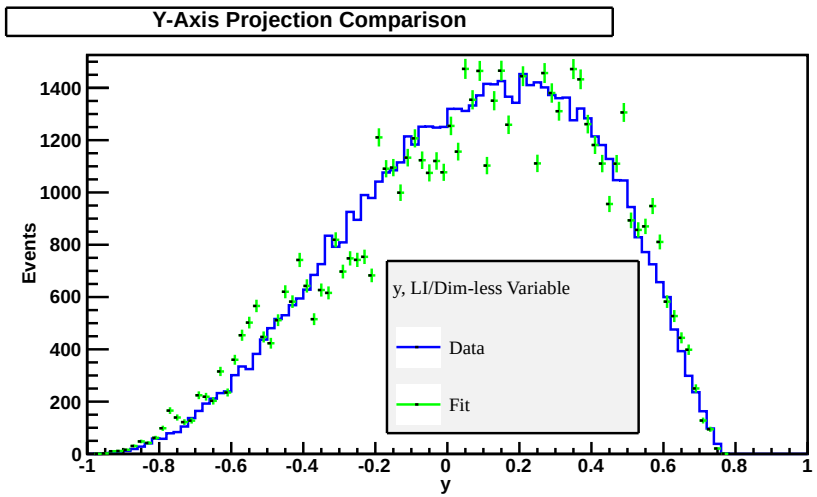
$E\gamma$:[2000-2050]MeV

Data and Fit Comparison, DalitzLI Plots



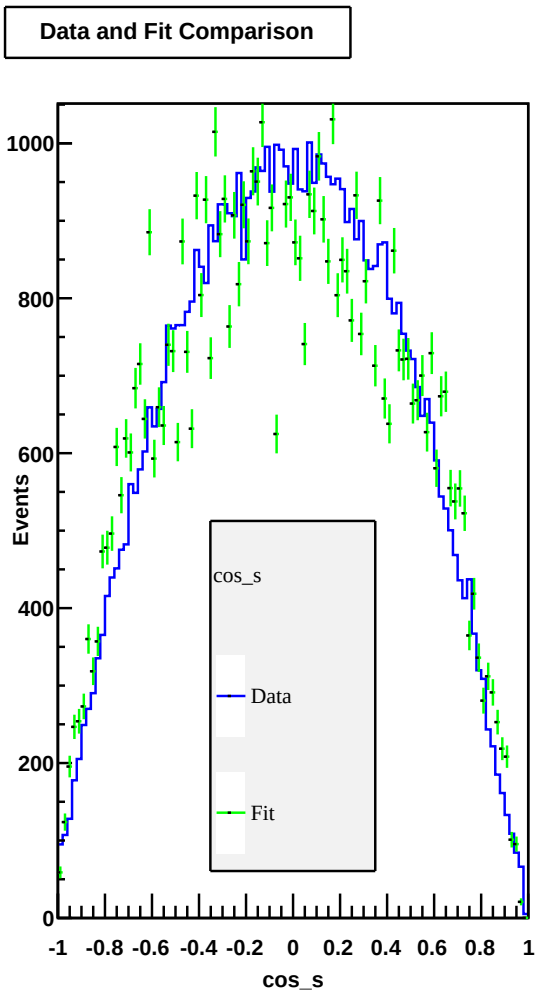


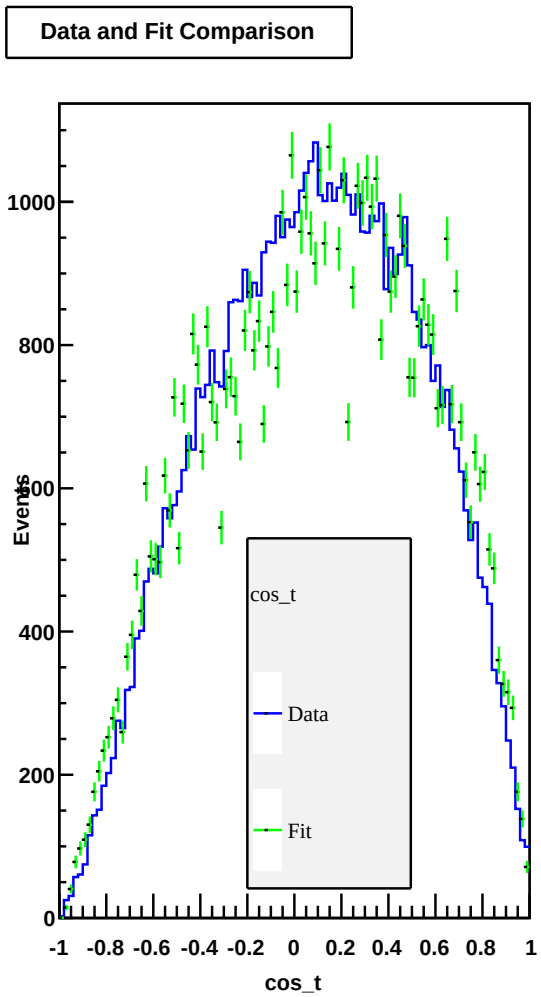


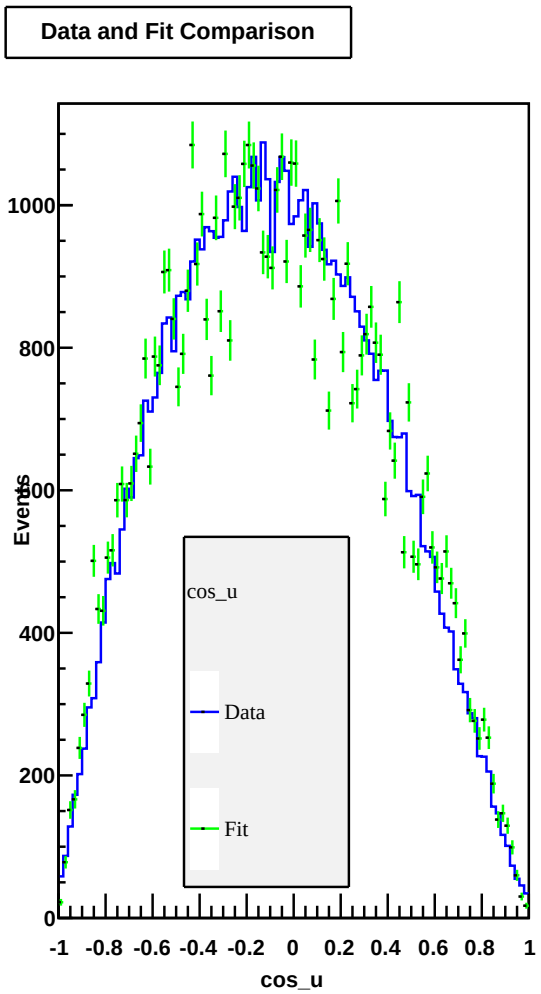


$E\gamma$:[2000-2050]MeV

Data and Fit Comparison, Pion Angle Plots

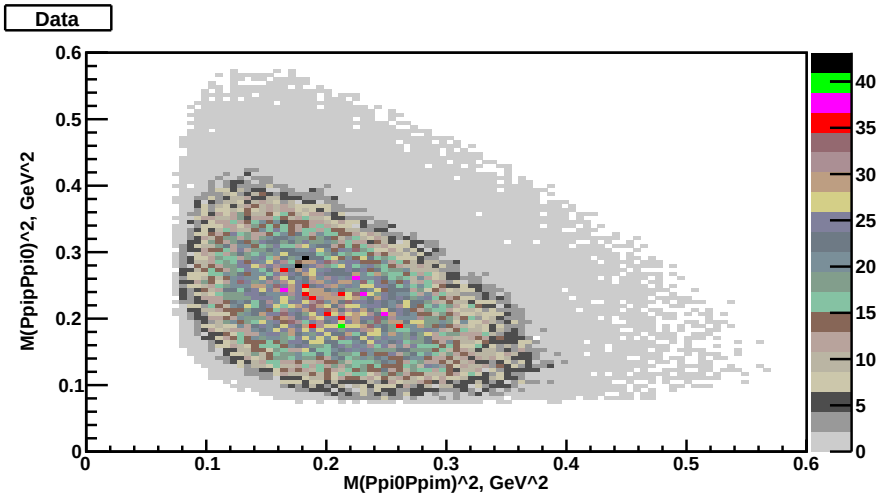


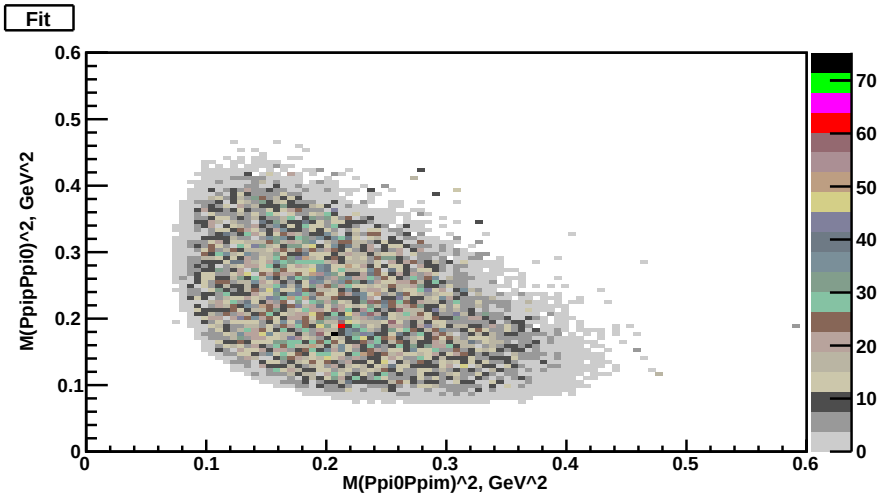


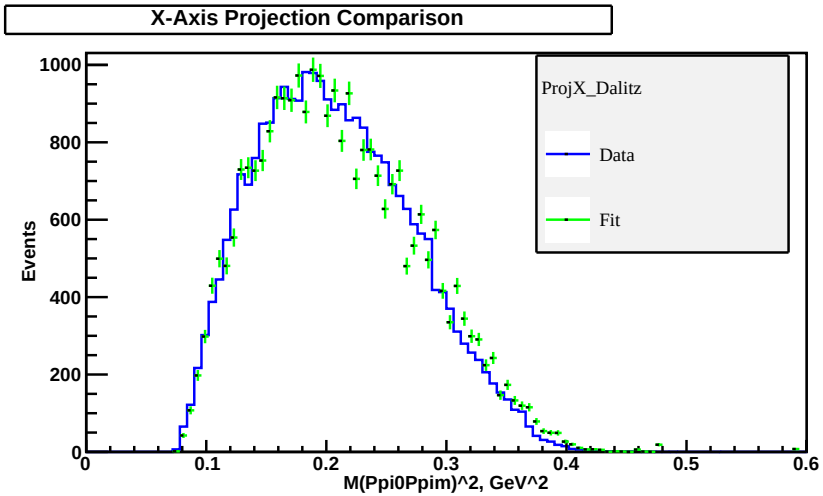


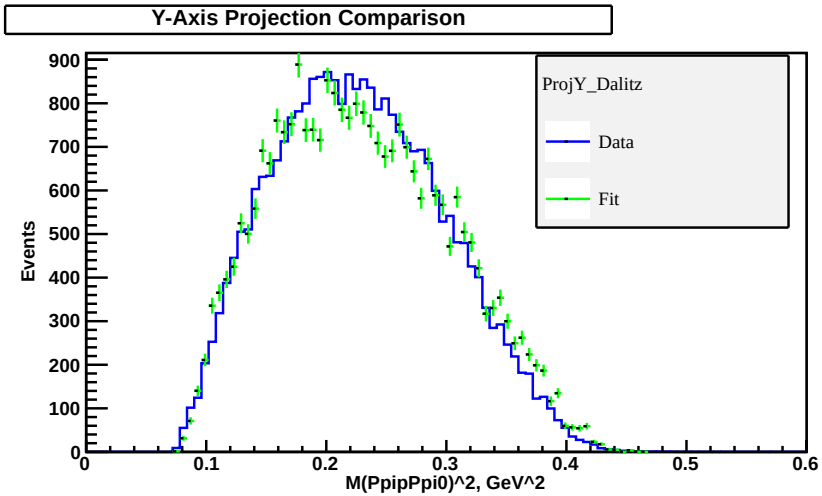
$E\gamma$:[2000-2050]MeV

Data and Fit Comparison, Dalitz Plots



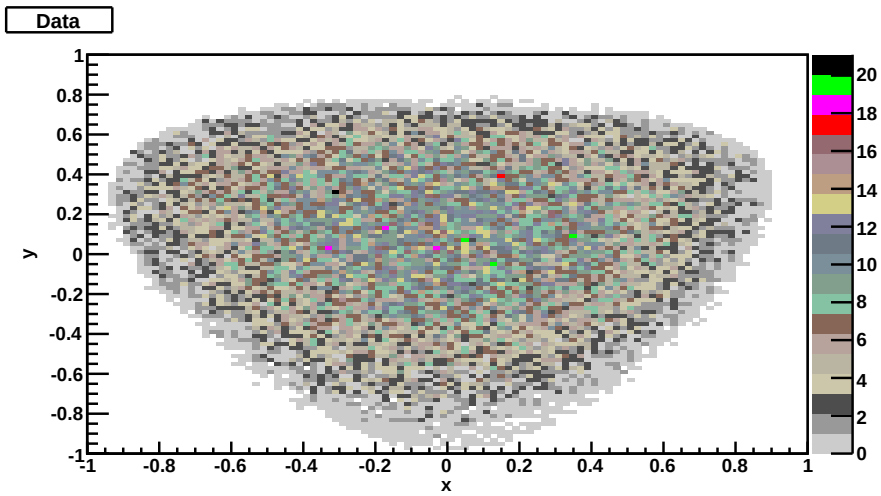


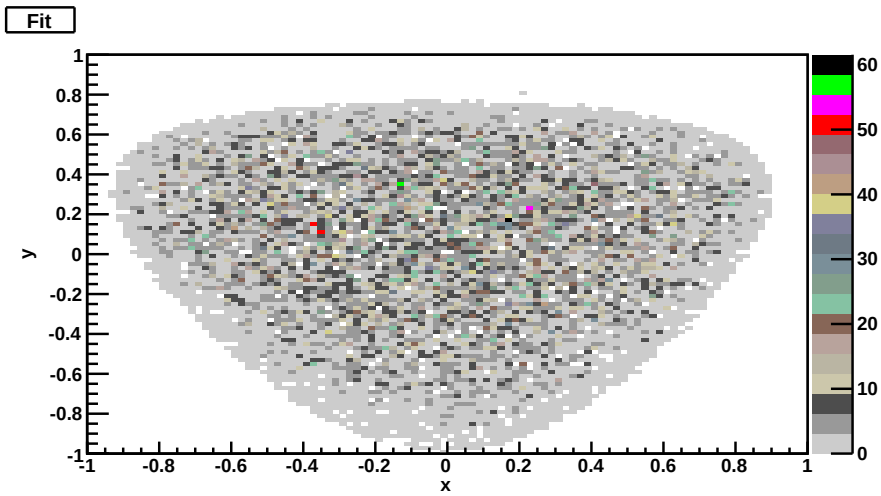


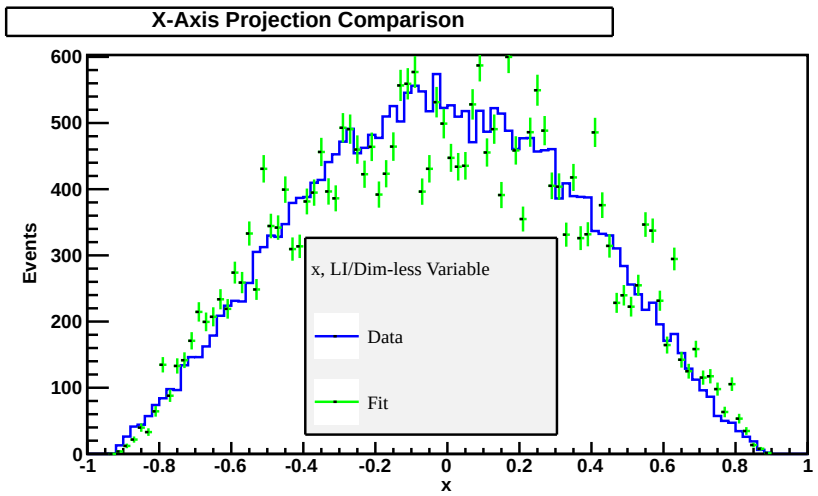


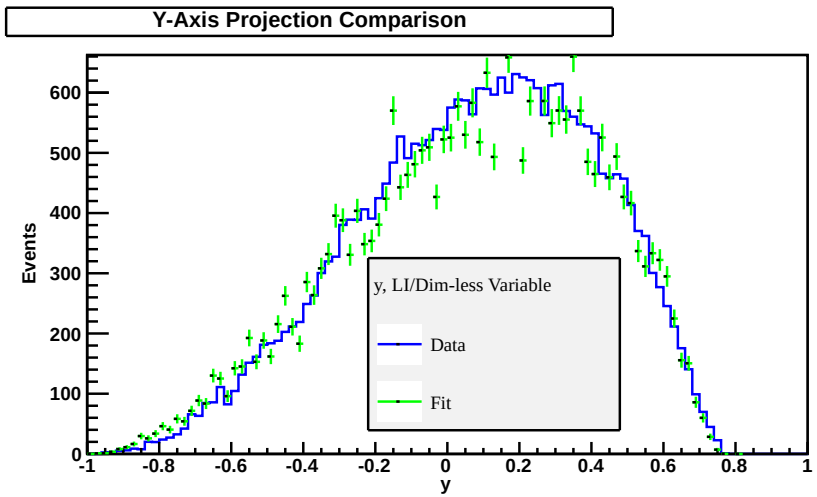
$E\gamma$:[2500-2550]MeV

Data and Fit Comparison, DalitzLI Plots



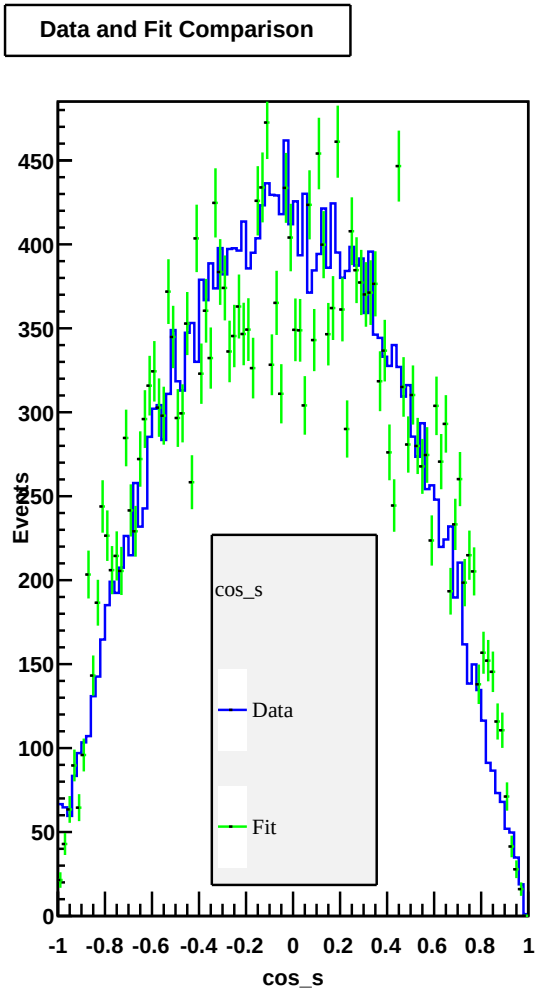


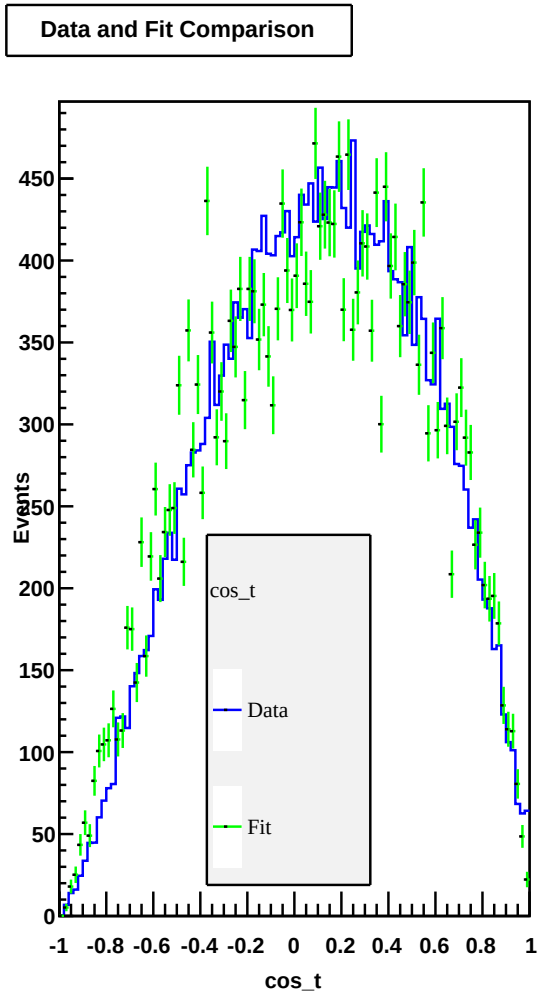


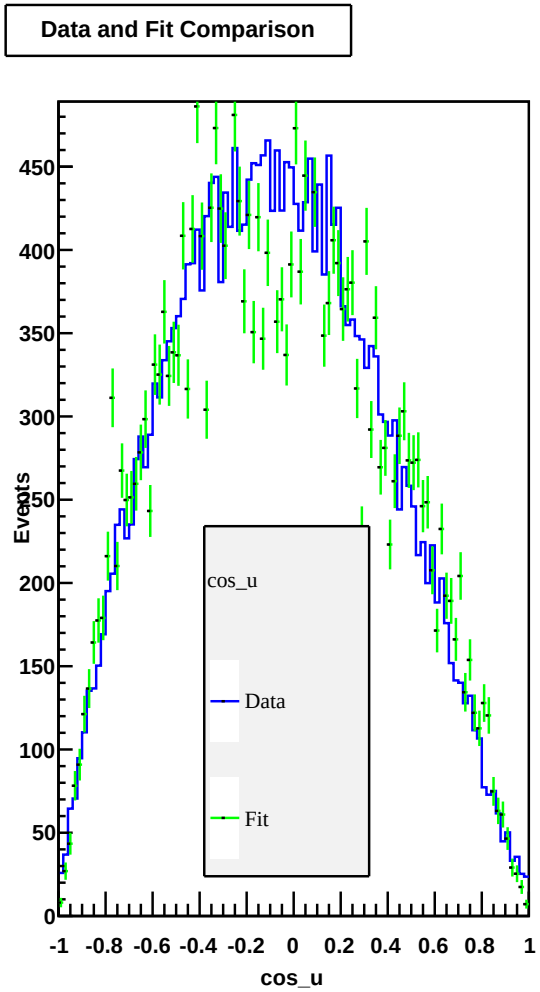


$E\gamma$:[2500-2550]MeV

Data and Fit Comparison, Pion Angle Plots

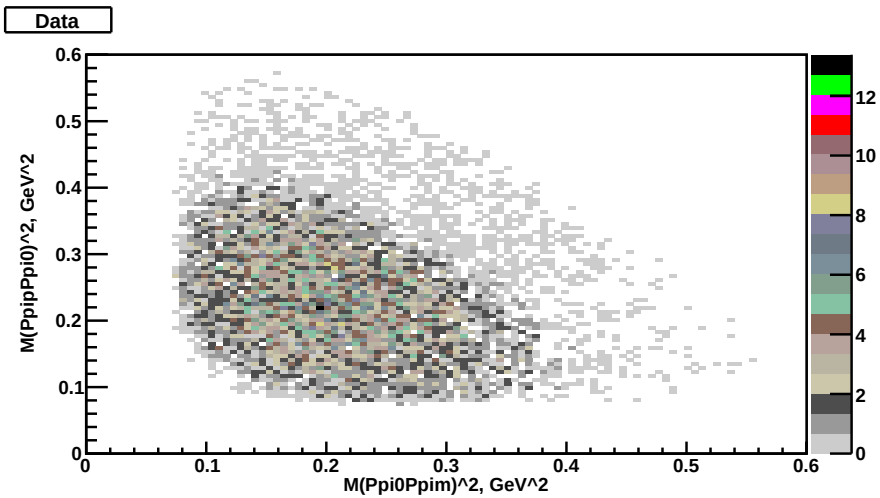


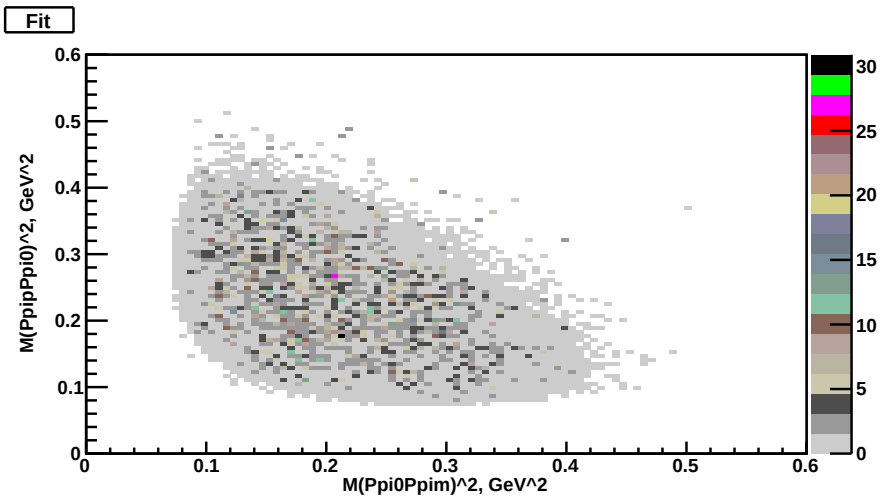


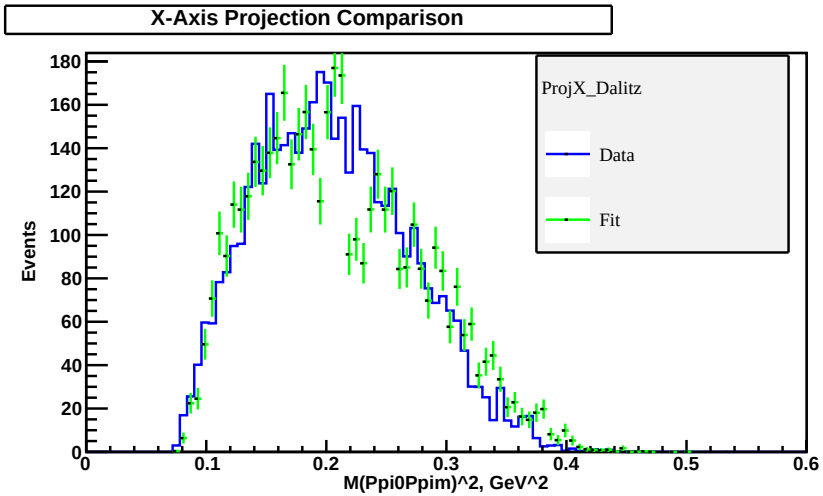


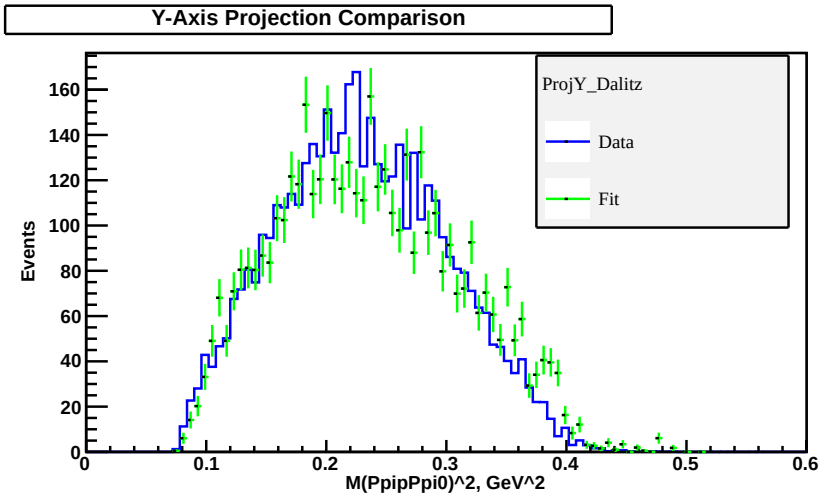
$E\gamma$:[2500-2550]MeV

Data and Fit Comparison, Dalitz Plots



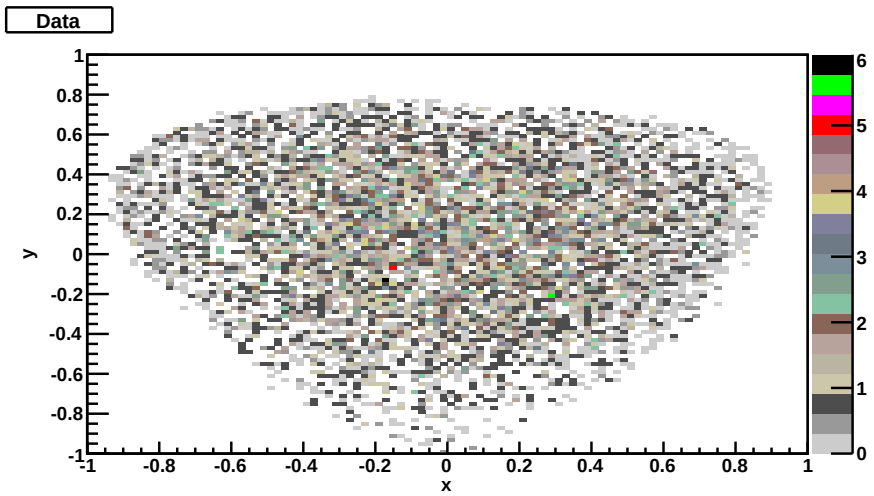


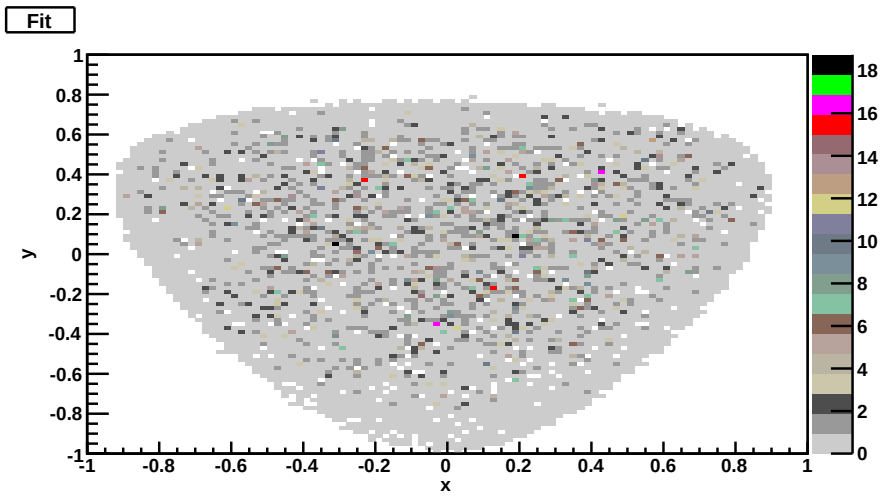


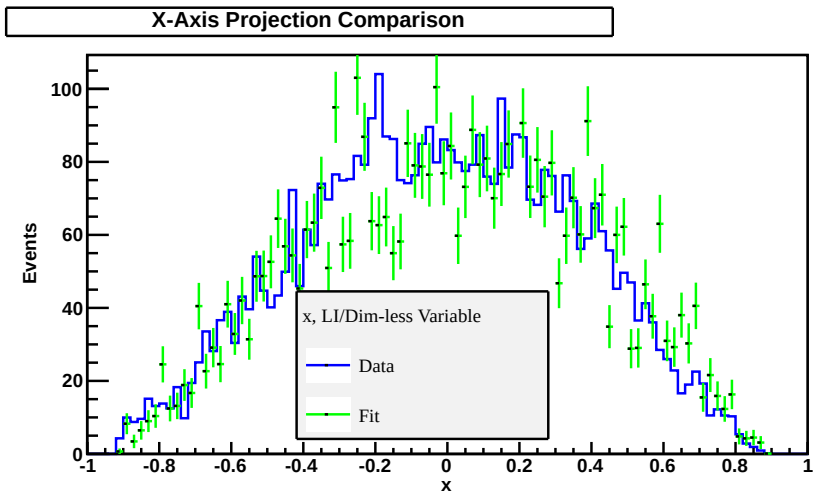


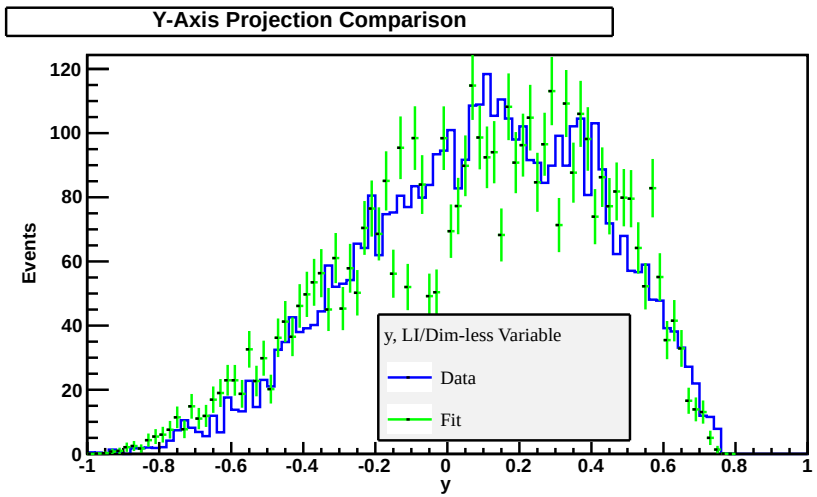
$E\gamma$:[3100-3150]MeV

Data and Fit Comparison, DalitzLI Plots



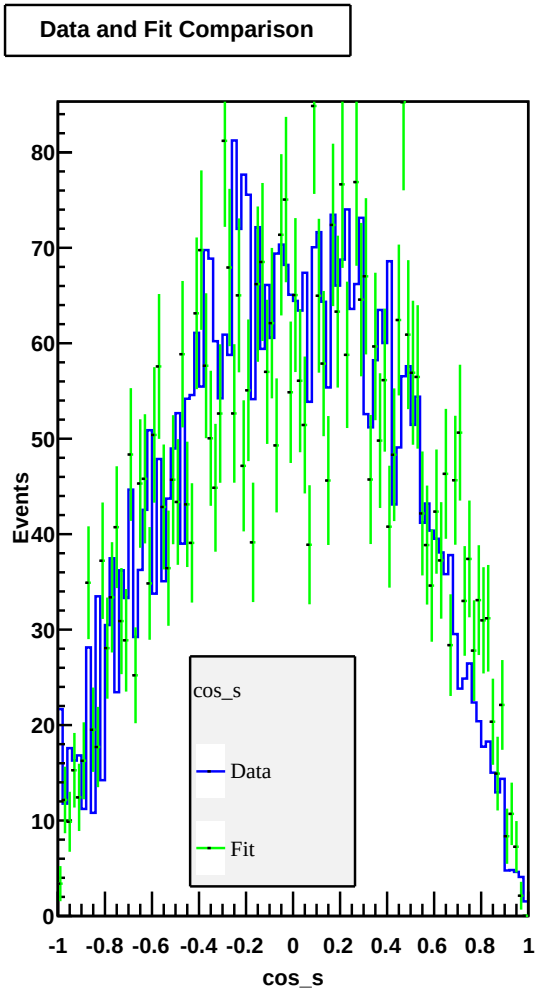


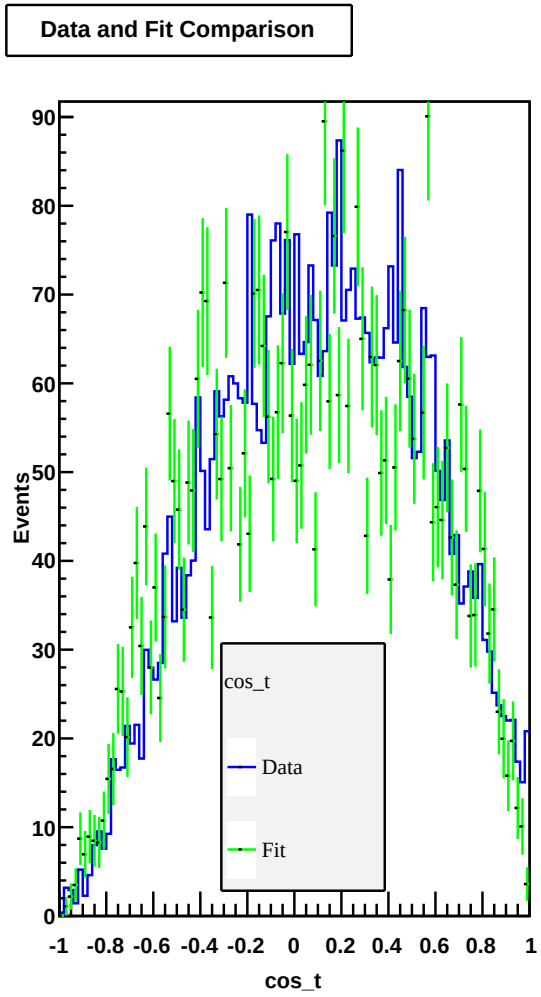


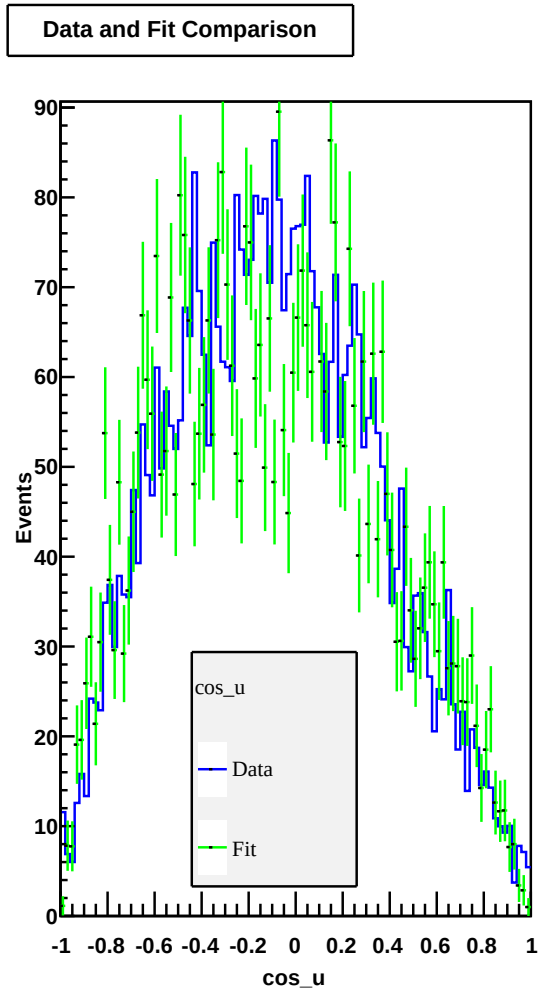


$E\gamma$:[3100-3150]MeV

Data and Fit Comparison, Pion Angle Plots

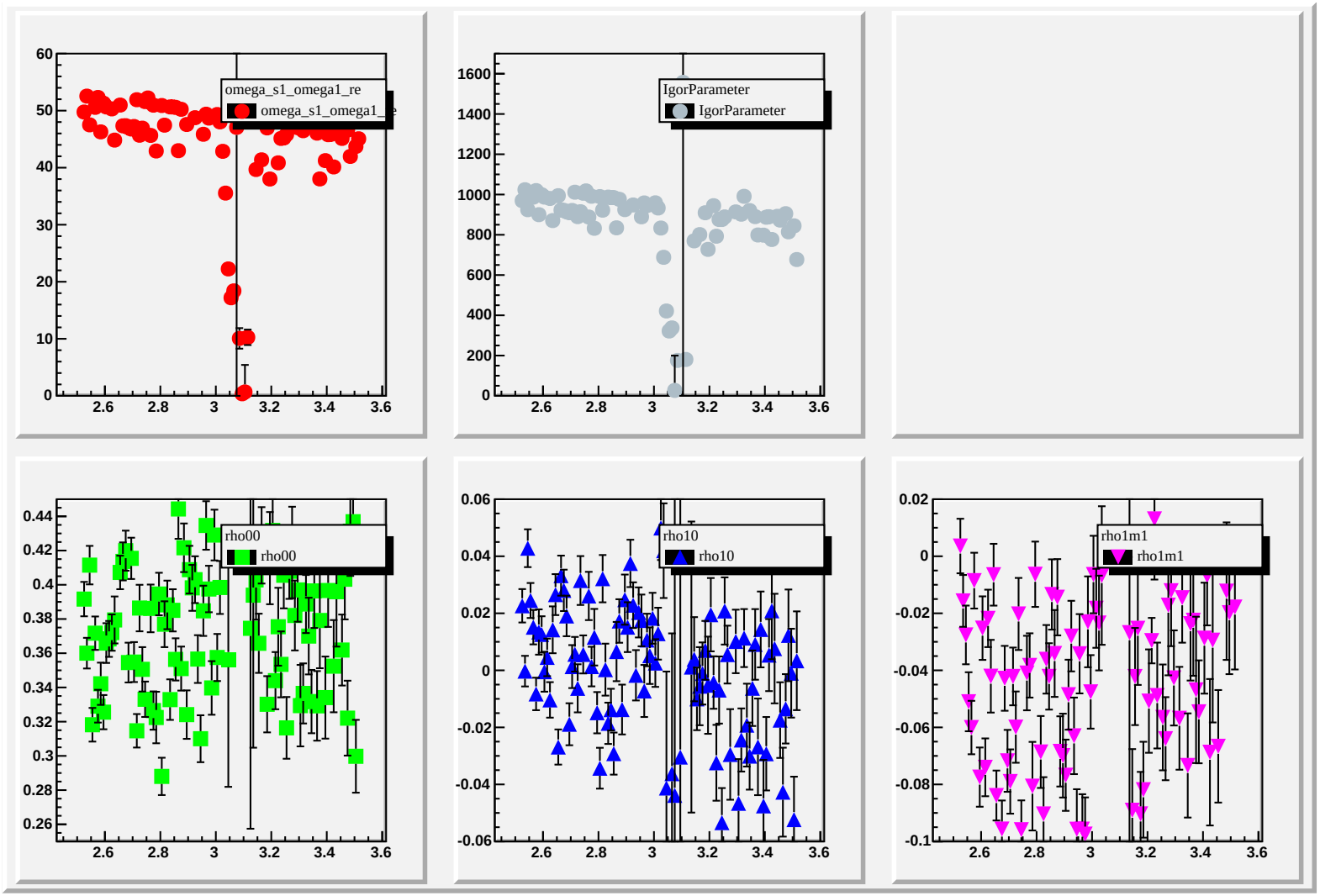






$E\gamma$:[3100-3150]MeV

Parameter Values and Errors, $E\gamma$:[2500-3500]MeV



Note: Broken paddle, $E\gamma$:[3000-3100]MeV

Outstanding AmpTools Analysis Questions

- In comparing, the data with the 'fitted, accepted-Monte-Carlo events', what parameters ought I analyze to determine whether or not I have a "good" fit?
- Is added benefit to comparing acceptance-corrected data with the 'fitted, generated-Monte-Carlo events' in comparison to that above?
- Are there more parameters I ought to extract from Amptools (such as those in *eq*.40) than the 'Amptools-registered' parameters, i.e. *IgorParameter*, *rho*00, *rho*10, *rho*1*m*1, *omegas*1*omega*1*re* (last one is presumed to be global fit parameter)?
- The polarization ME's (*rho*00, *rho*10, *rho*1*m*1) are used along with the cross-section to correct acceptance production. What's the nature related to why these variables are free to vary (free parameters) during the fit for the ω decay process?