π^0 Analysis Update

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π^0 Analysis Update

Outline

- Recap: DataSets, General Cuts, Yields
- Yield Fits and Cross Sections
- Cross Section Comparisons with Ilya
- Modified Yield Fits (learning tool only)
- Fitting Ilya's Data (very preliminary)
- My Combined Yield Fits (very preliminary)
- Summary and Future Work

DataSets Analyzed

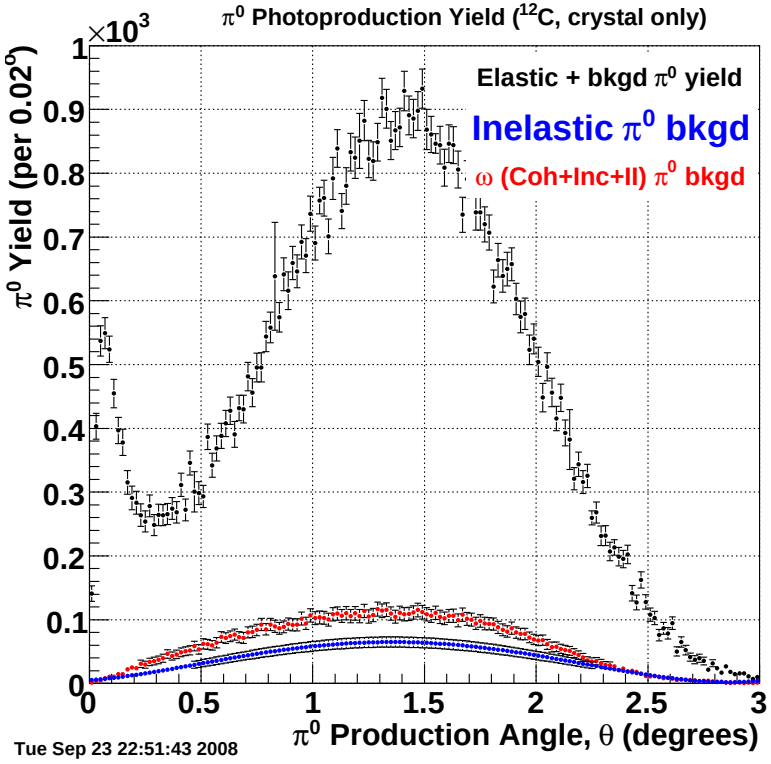
Target	Total Runs	Run Number Ranges
^{12}C	160	4740 – 4768, 4976 – 5059; 5159 – 5242
^{208}Pb	76	4882 – 4913, 5083 – 5114, 5266 – 5330

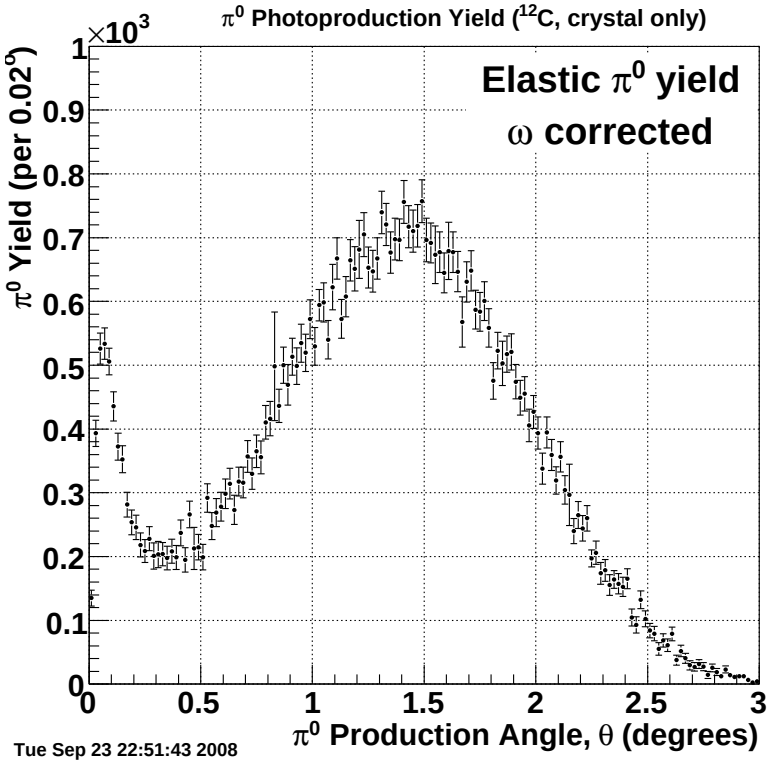
Table 1: Run number ranges used in this analysis for ^{12}C and ^{208}Pb targets. Both sets consist of only radiator B runs. Note that bad runs in these ranges are removed.

General Cuts and Event Selection

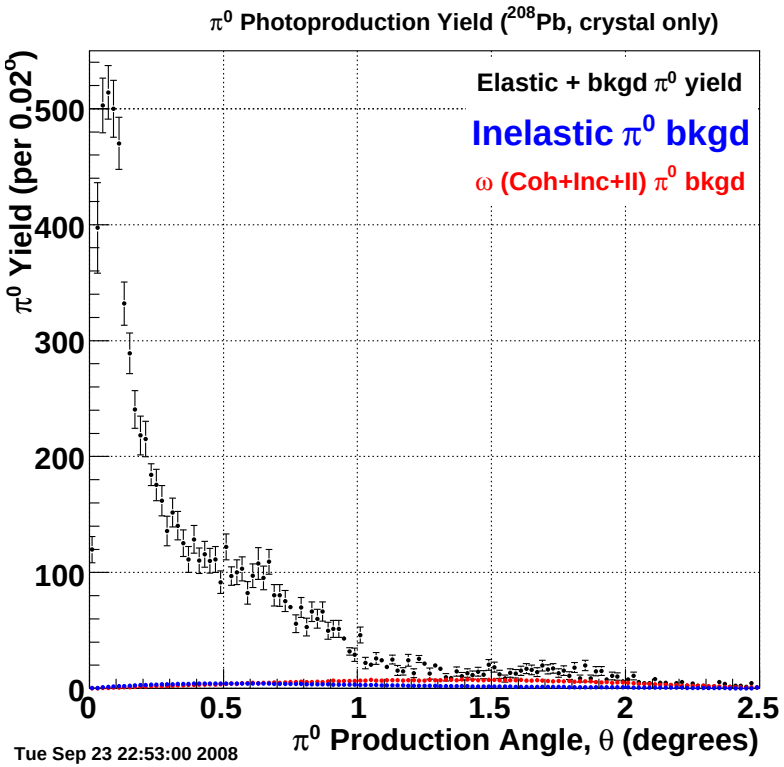
- Accepted $PbWO_4$ hits only (excluding inner and outer-most layer)
- Standard skim cuts, minimum cluster energy: 0.1GeV, no kinematic constraints for $m_{\gamma\gamma}$, elasticity, or θ_{π^0}.
- Best timing candidate selection with tdiff cut: $\pm$4ns

^{12}C Yield


π^0 Photoproduction Yield (^{12}C, crystal only)
$\times 10^3$
π^0 Yield (per 0.02°)
Elastic + bkgd π^0 yield
Inelastic π^0 bkgd
ω (Coh+Inc+II) π^0 bkgd
π^0 Production Angle, θ (degrees)
Tue Sep 23 22:51:43 2008


π^0 Photoproduction Yield (^{12}C, crystal only)
$\times 10^3$
π^0 Yield (per 0.02°)
Elastic π^0 yield
ω corrected
π^0 Production Angle, θ (degrees)
Tue Sep 23 22:51:43 2008

^{208}Pb Yield


π0 Photoproduction Yield (208Pb, crystal only)
Elastic + bkgd π0 yield
Inelastic π0 bkgd
ω (Coh+Inc+Il) π0 bkgd
π0 Yield (per 0.02°)
π0 Production Angle, θ (degrees)
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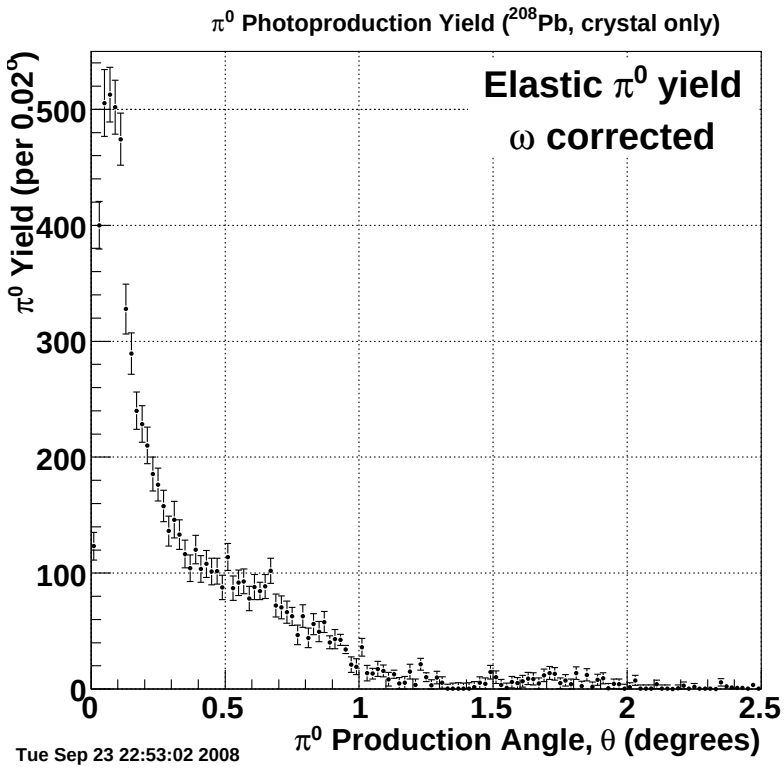
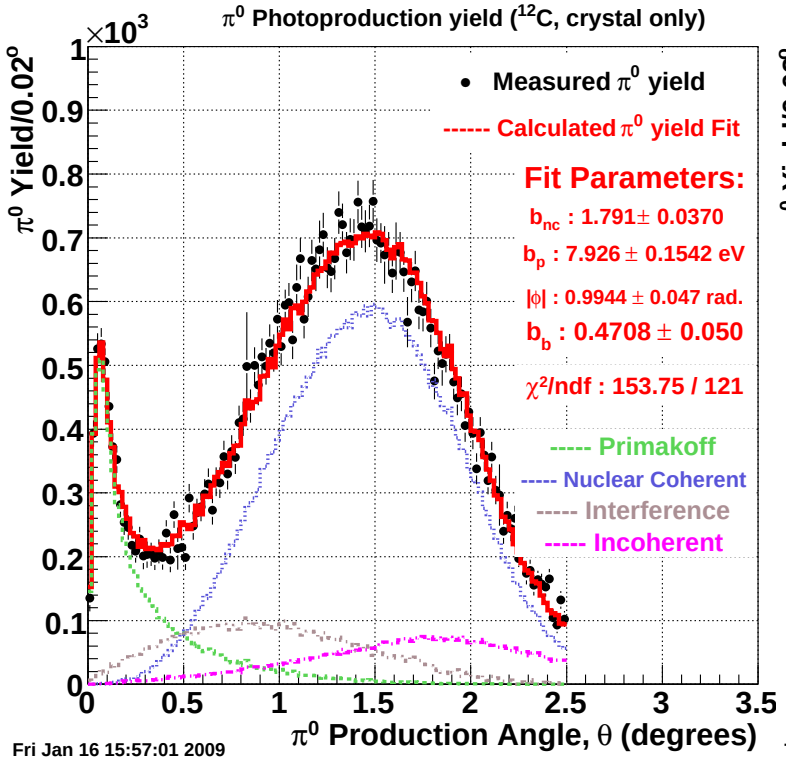
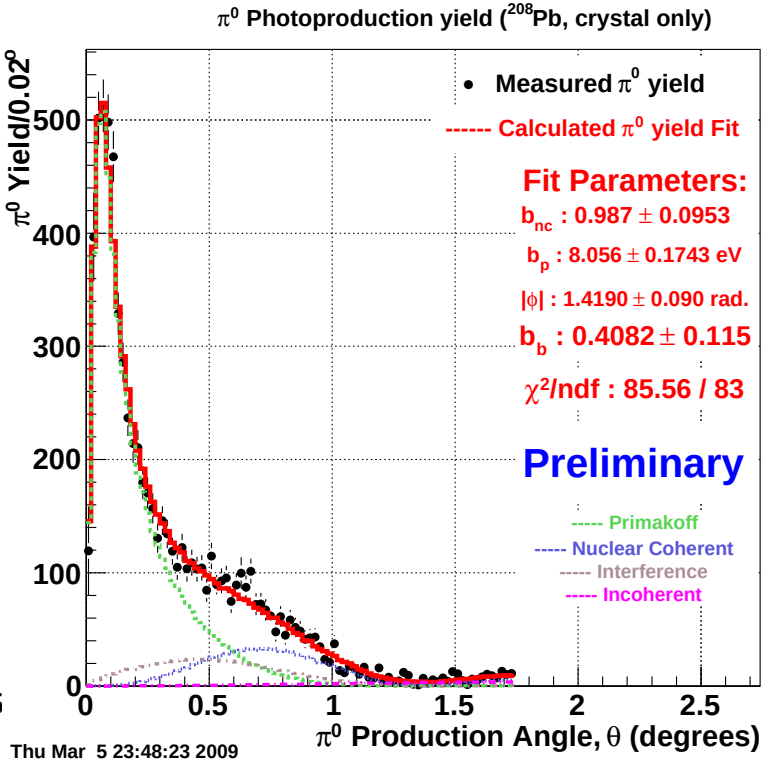
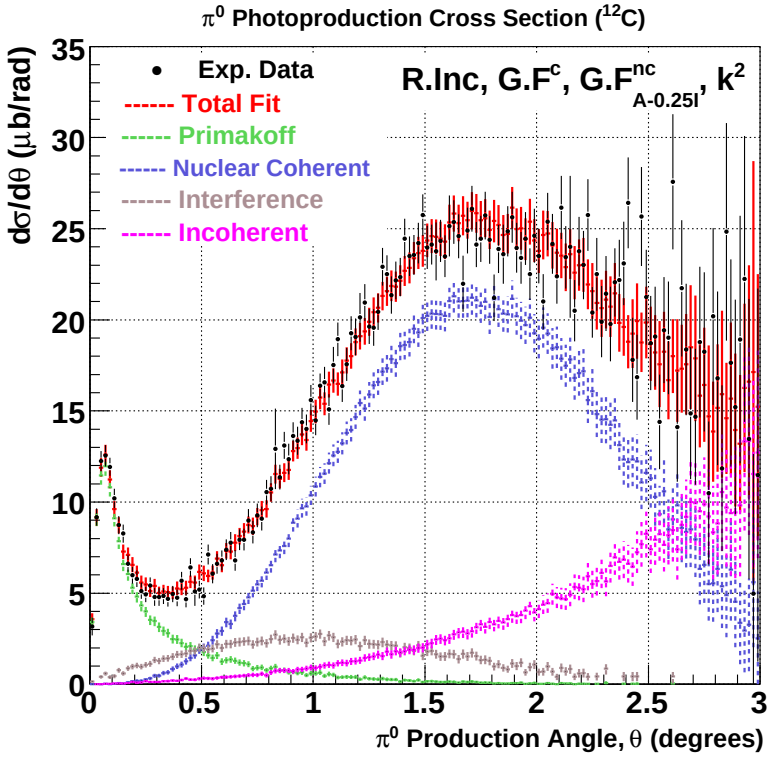

π0 Photoproduction Yield (208Pb, crystal only)
Elastic π0 yield
ω corrected
π0 Yield (per 0.02°)
π0 Production Angle, θ (degrees)
Tue Sep 23 22:53:02 2008

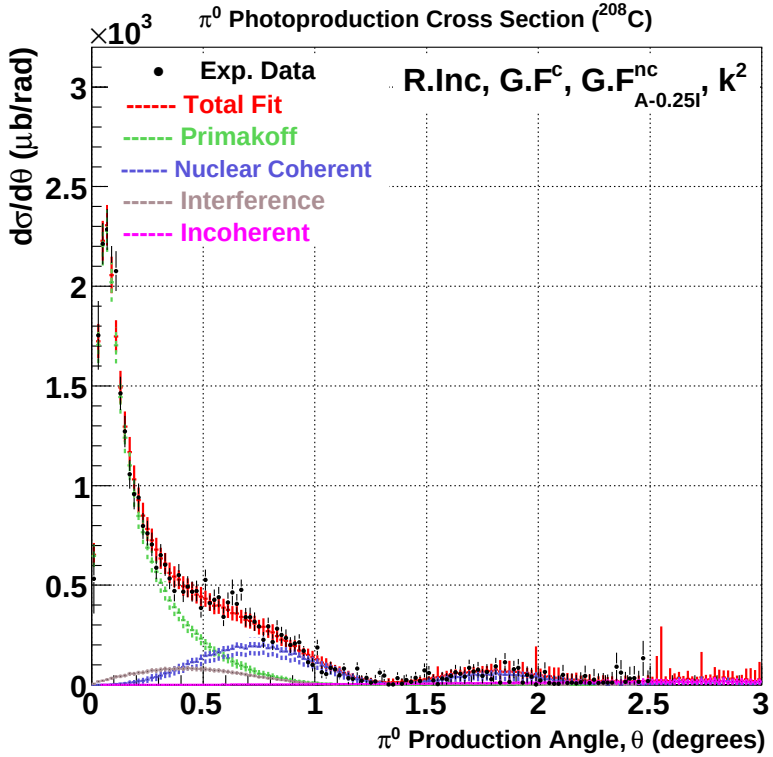
Sample Yield Fits
(using $\psi = 0.25$, and Rinc)



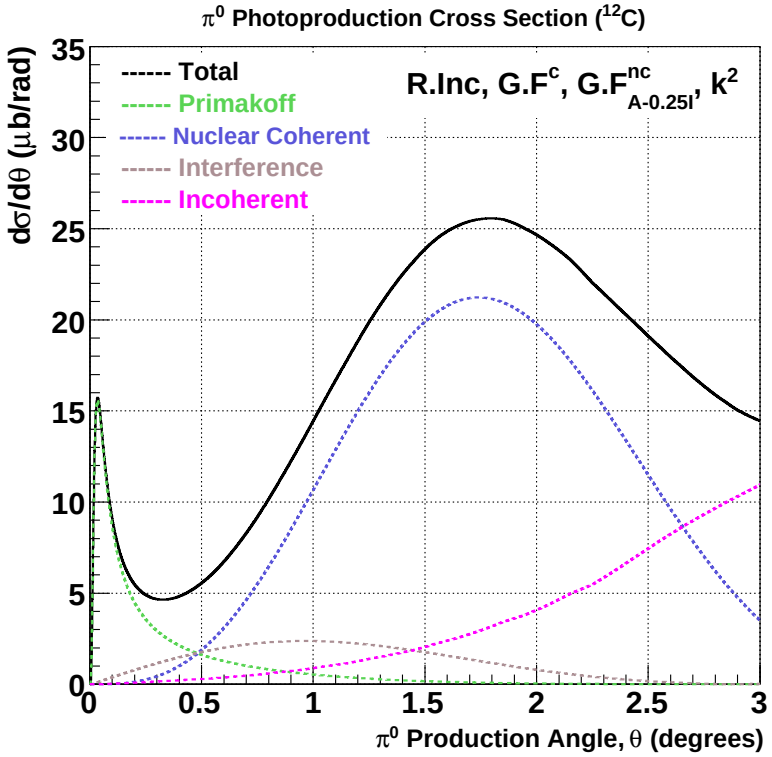


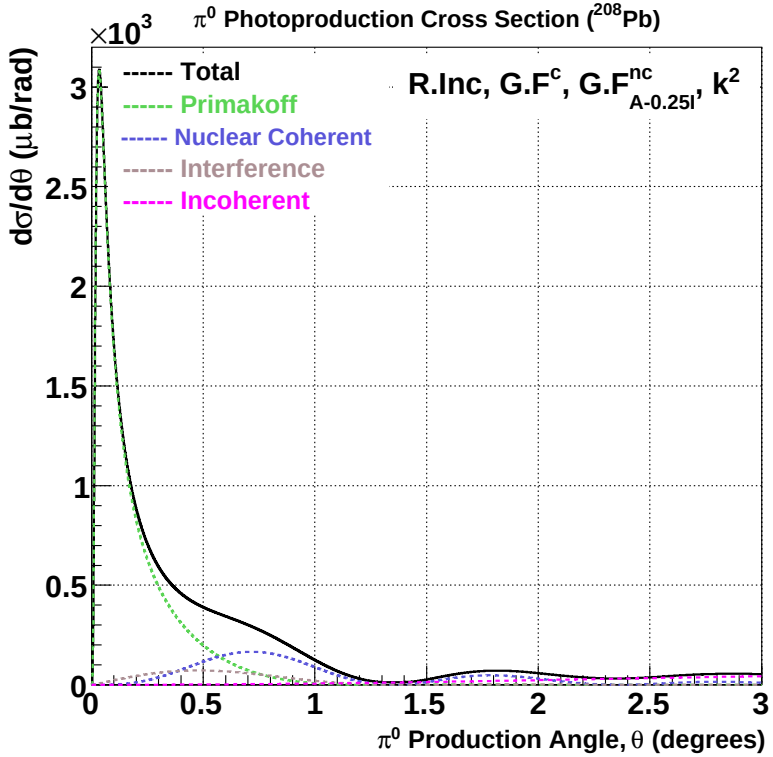
Component Cross Sections with Data (from Experiment)



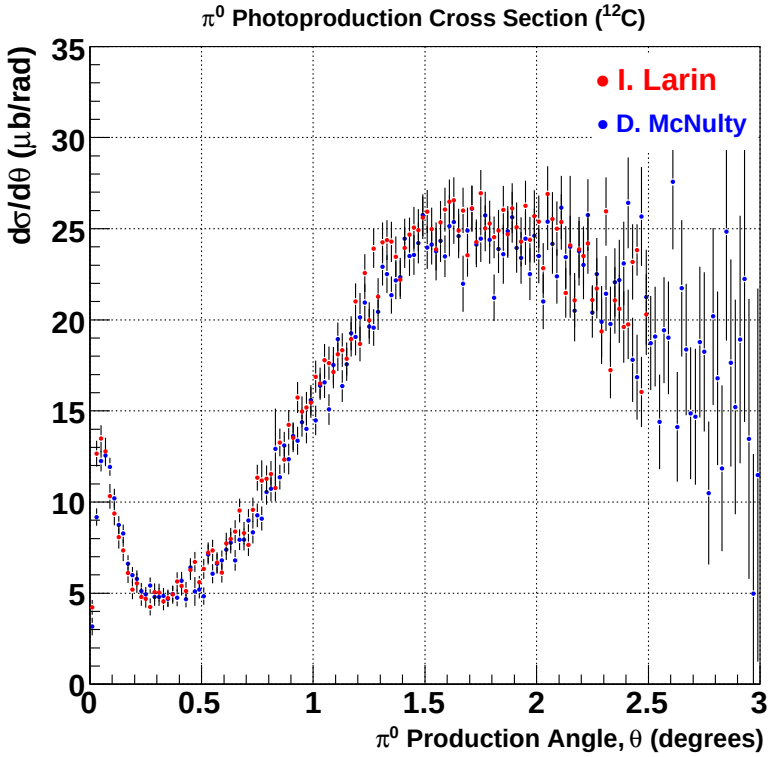


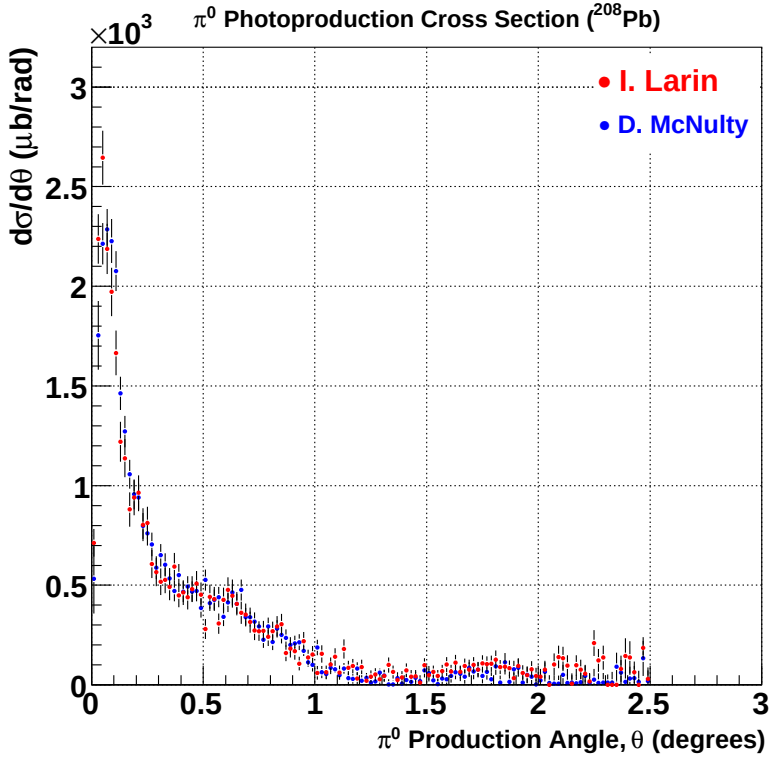
Component Cross Sections (from Theory using fit parms)



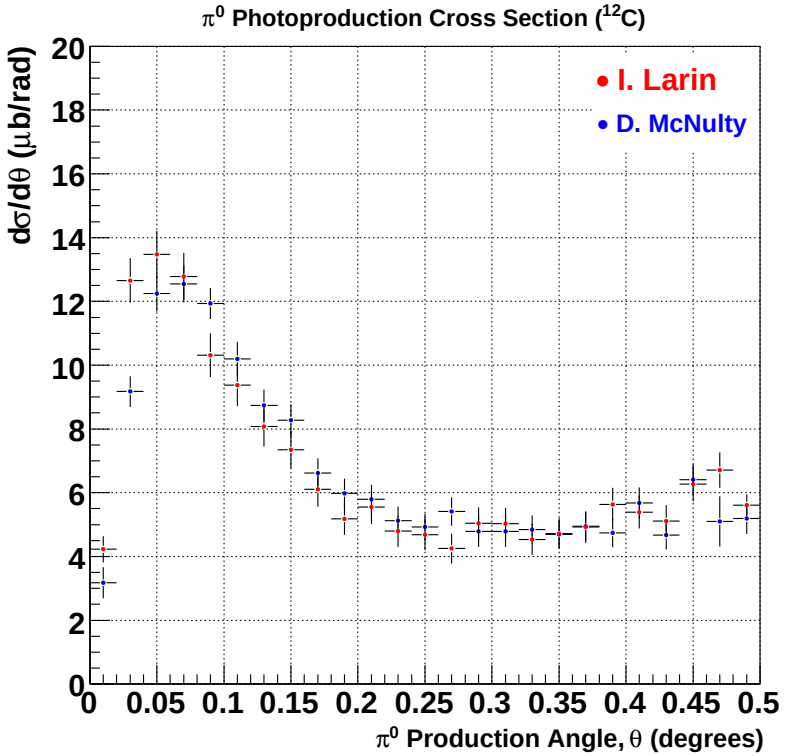


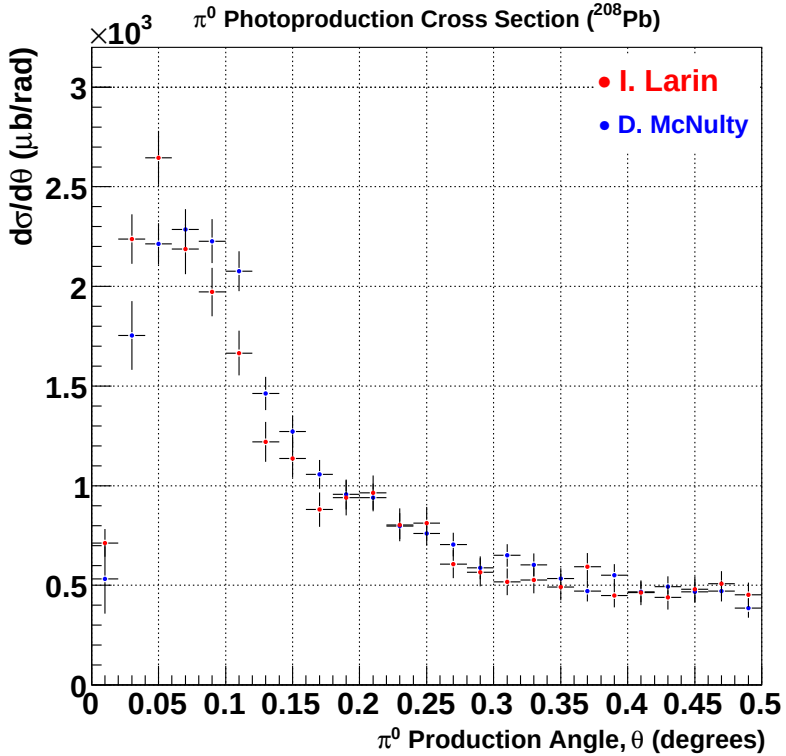
Cross Sections
(Compared with Ilya)



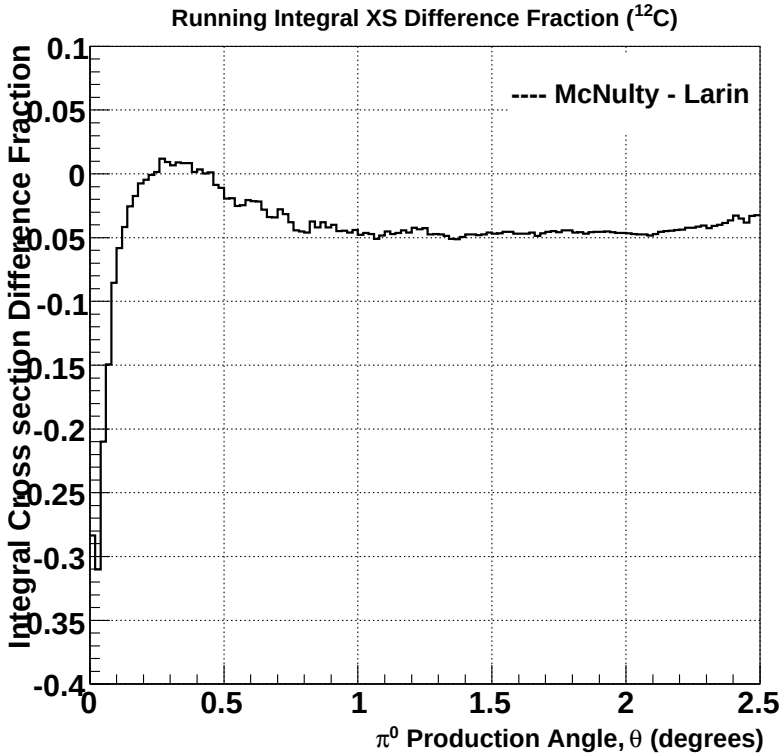


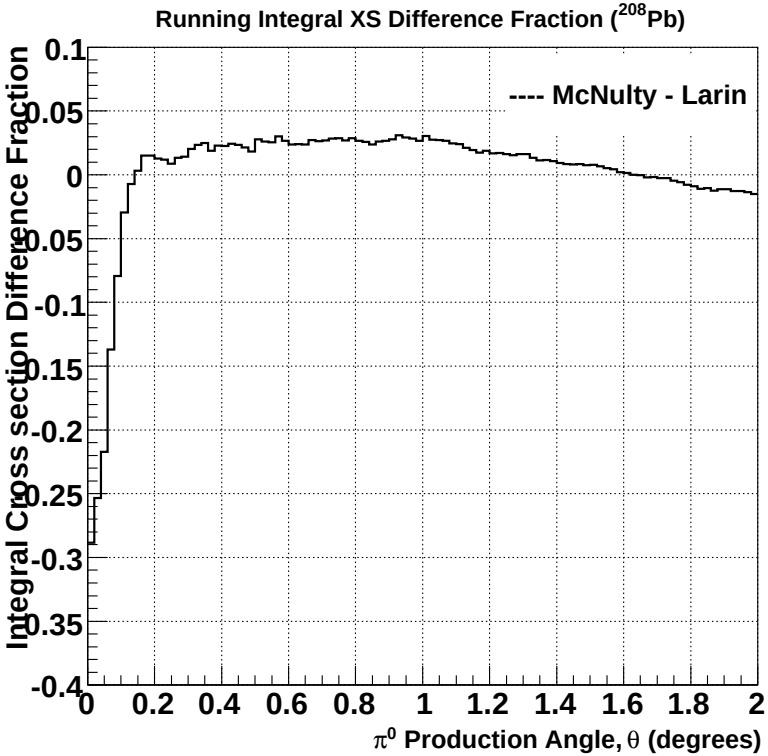
Zoom in: Cross Sections (Compared with Ilya)



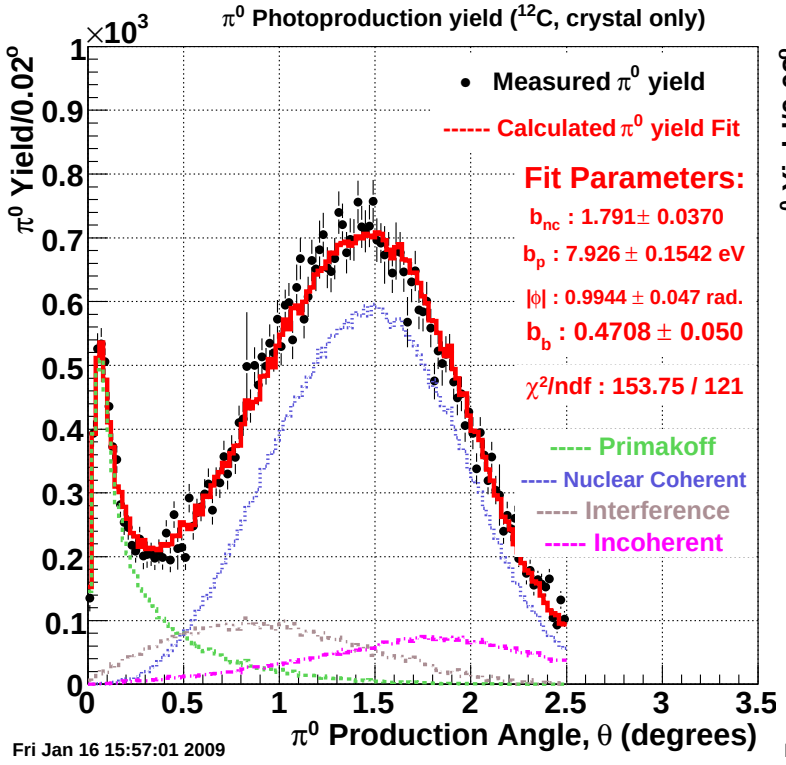


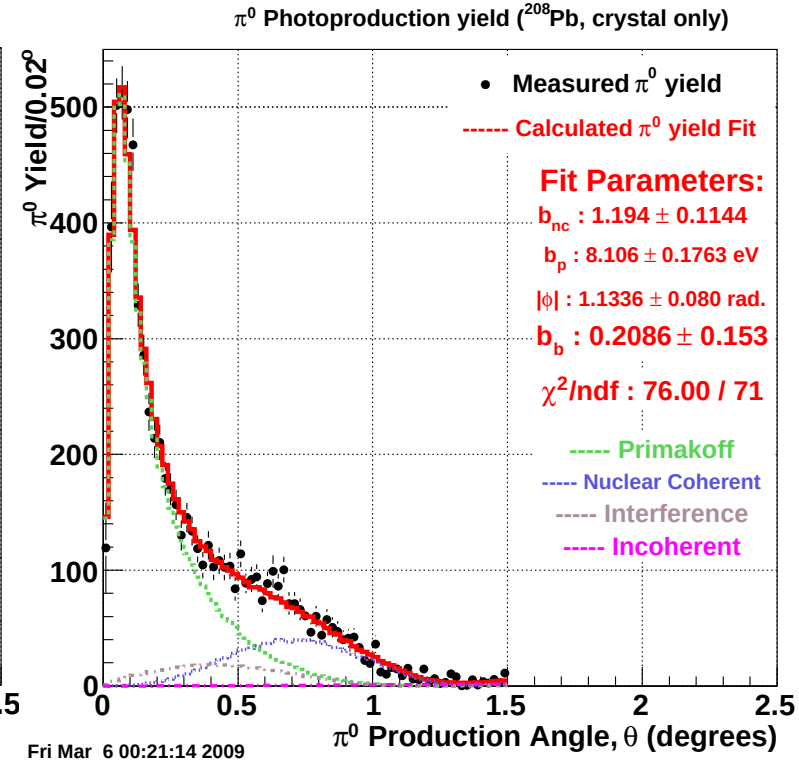
Cross Section Integral Differences



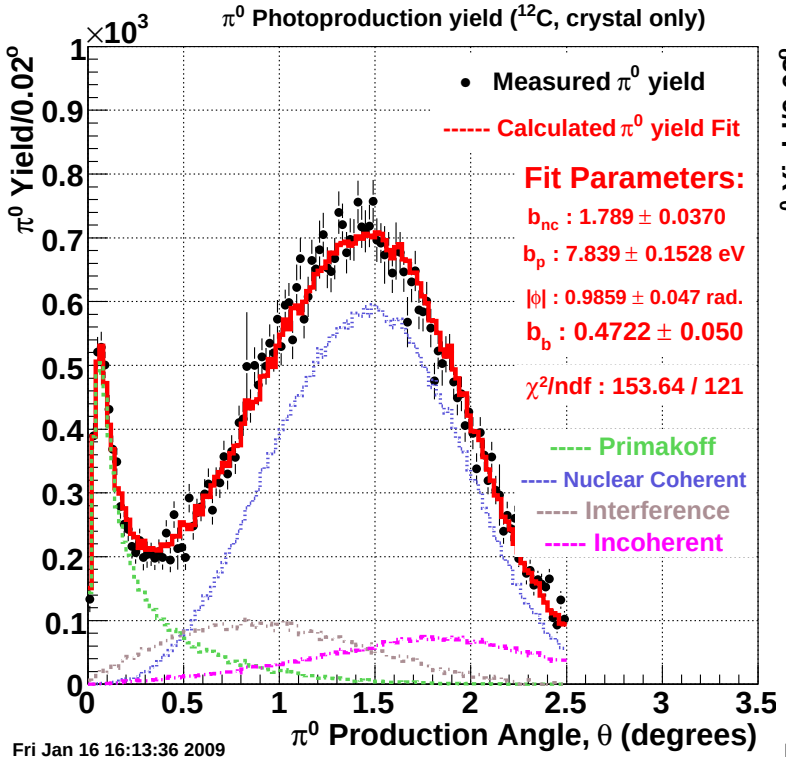


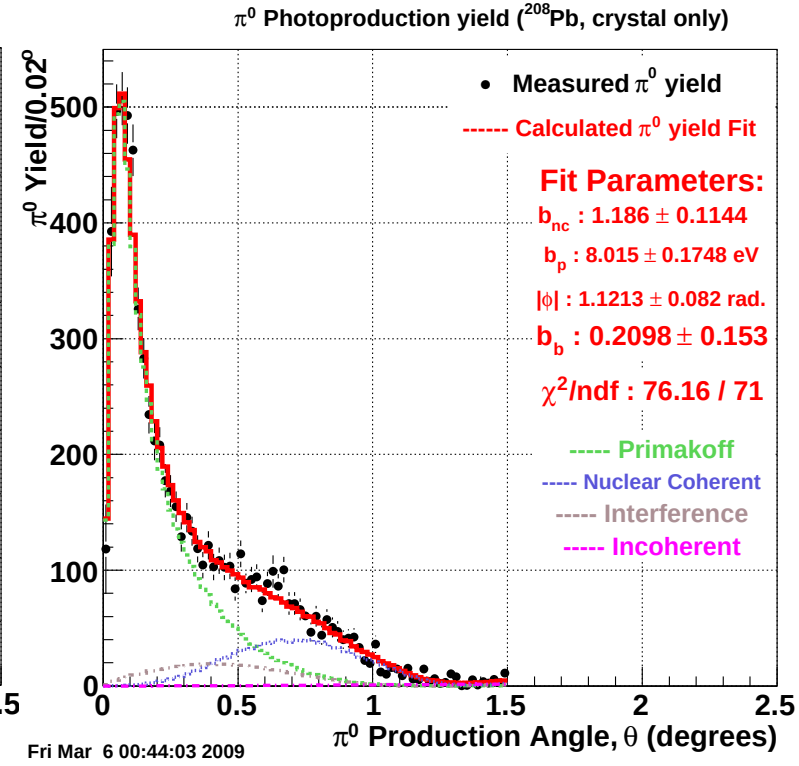
unModified Yield Fits
(My Yields)



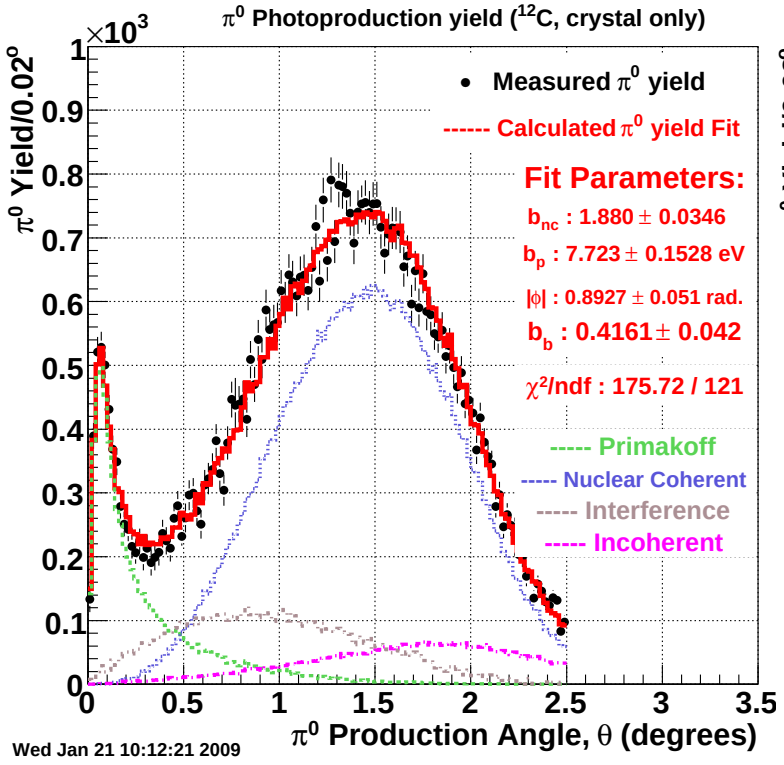


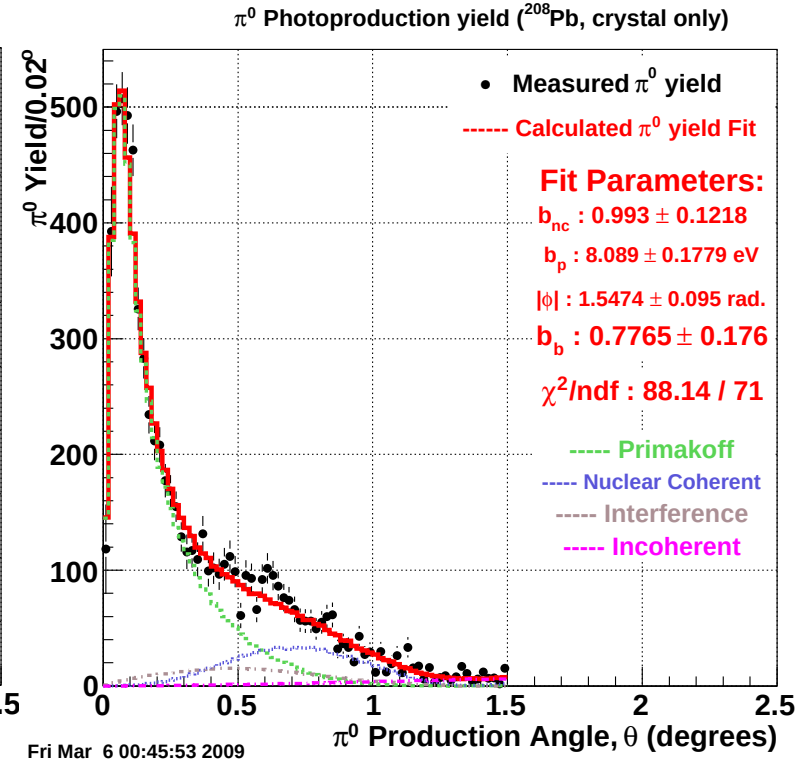
Modified Yield Fits (My Yield*0.99:[0,0.3] + My Yield:[0.3,end])



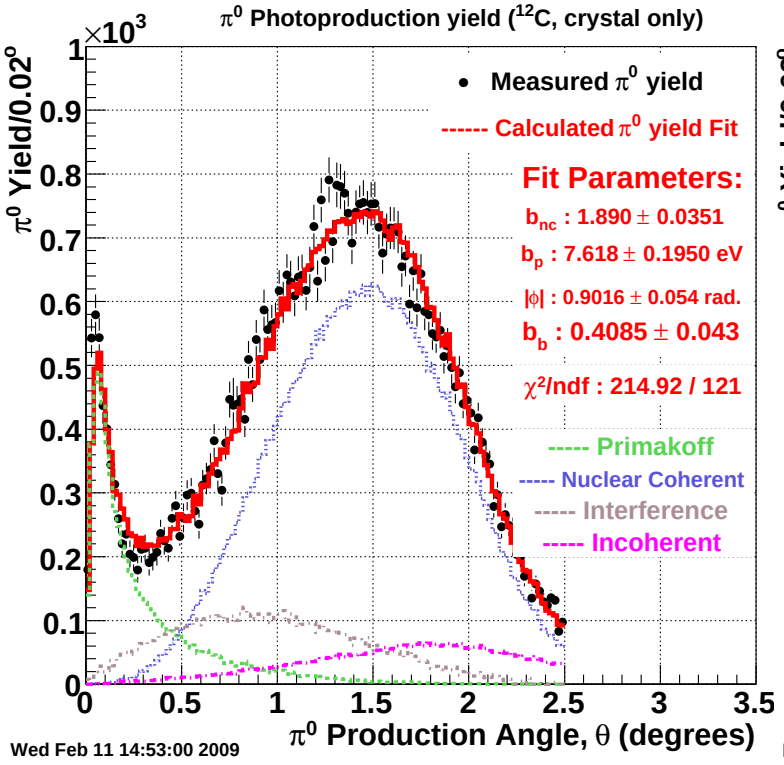


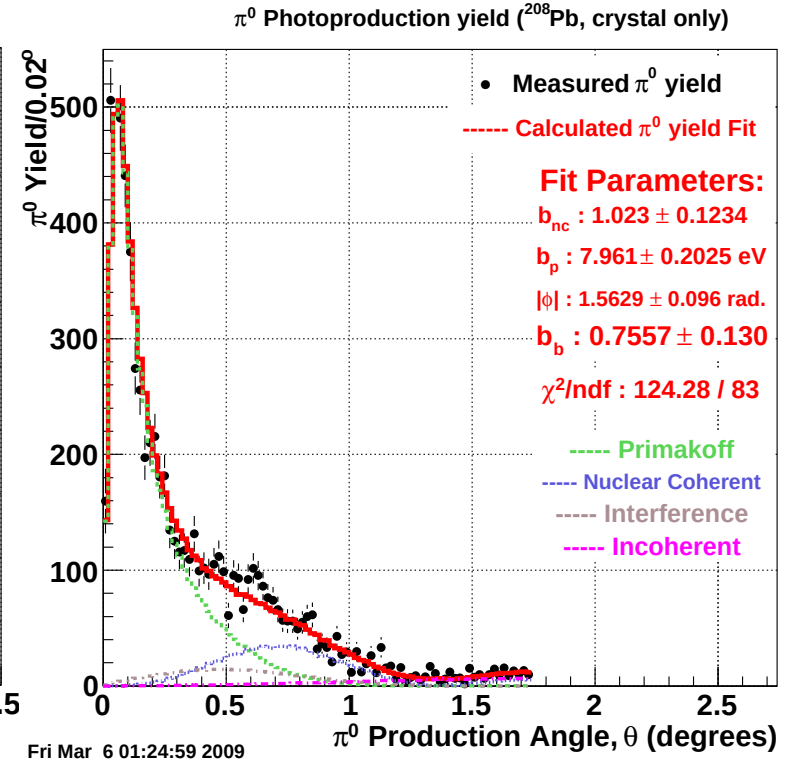
Modified Yield Fits (My Yield*0.99:[0,0.3] + Ilya's Yield:[0.3,end])



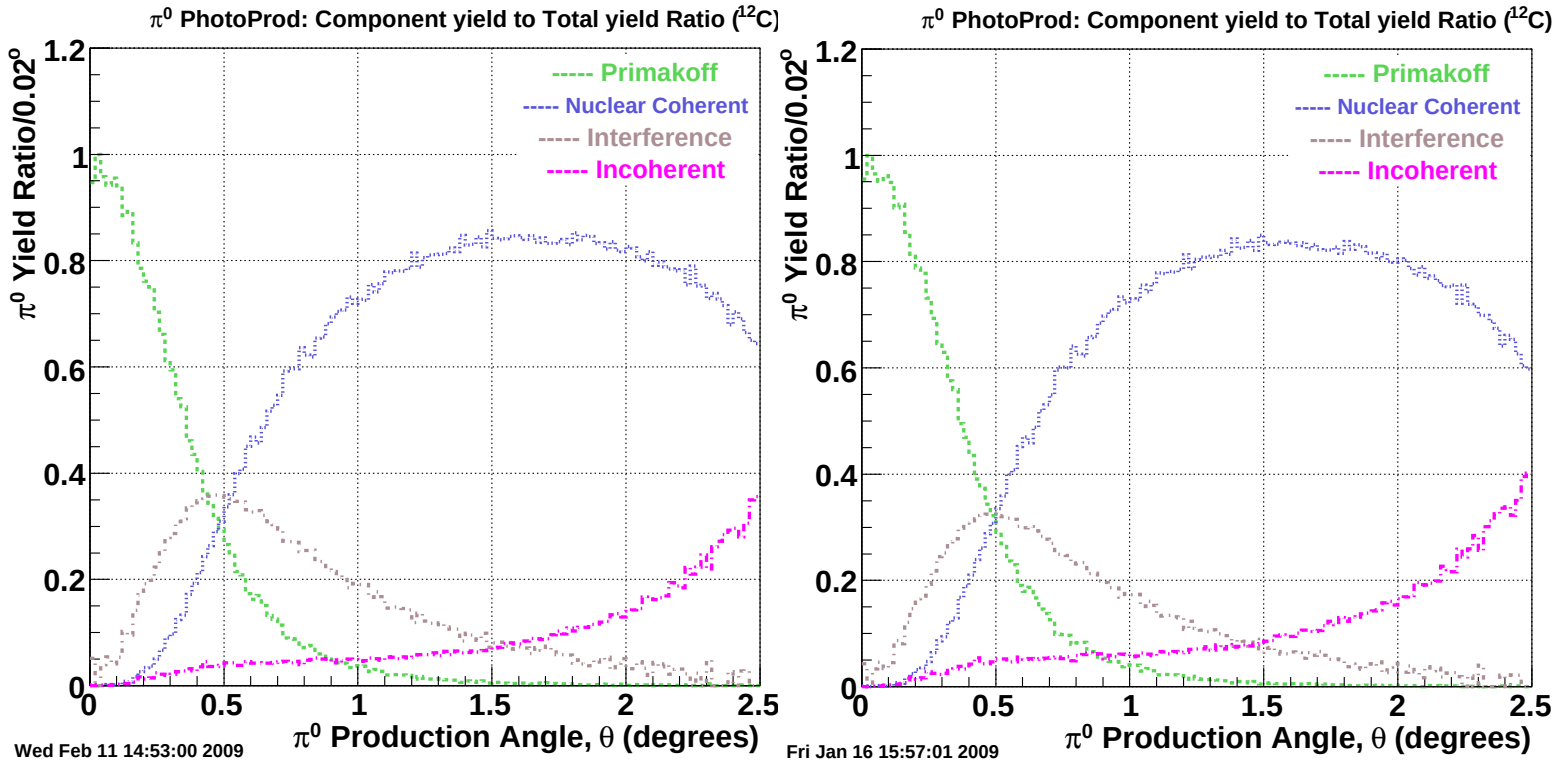


Fits to Ilya's Data–from Sep2008 (same shapes used)

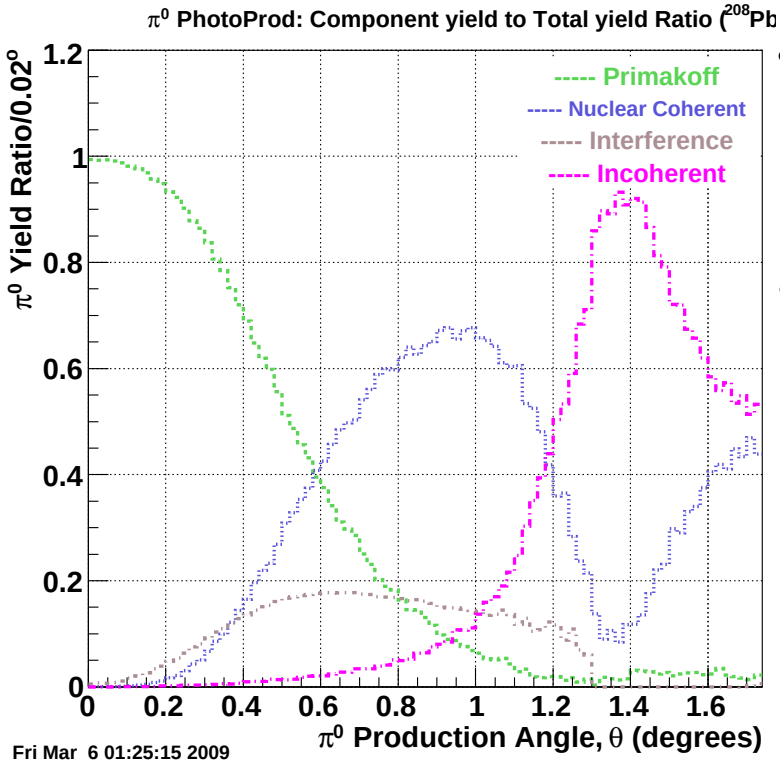


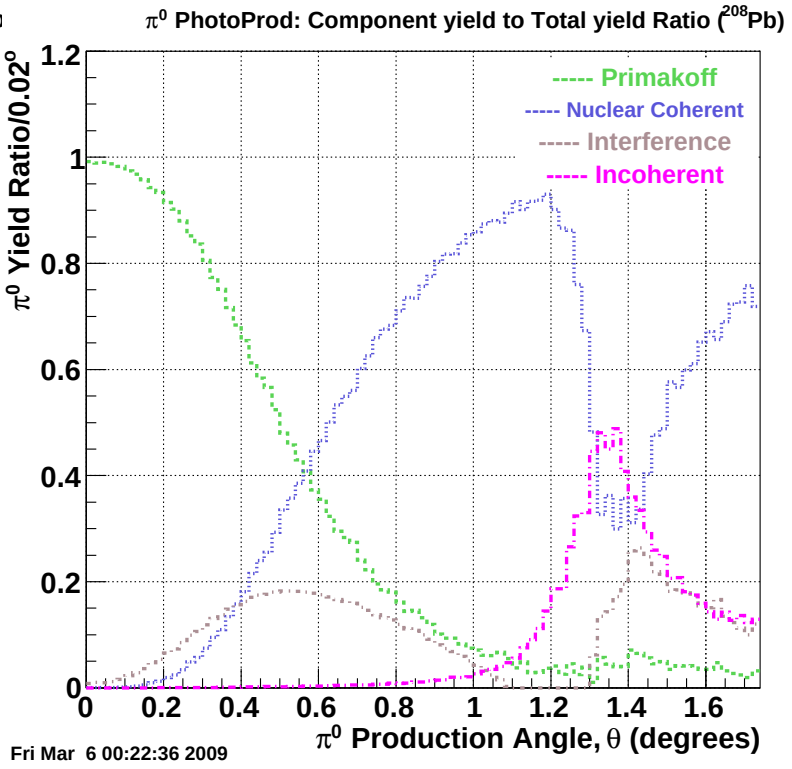


Yield Fit Ratio Comparisons for ^{12}C Ilya(Left) and Mine(Right)

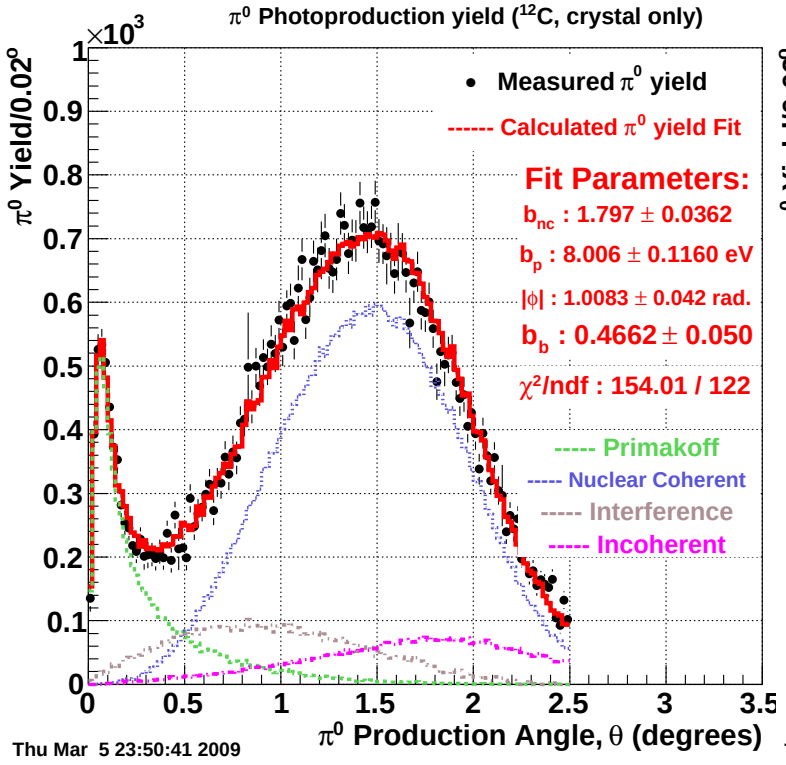


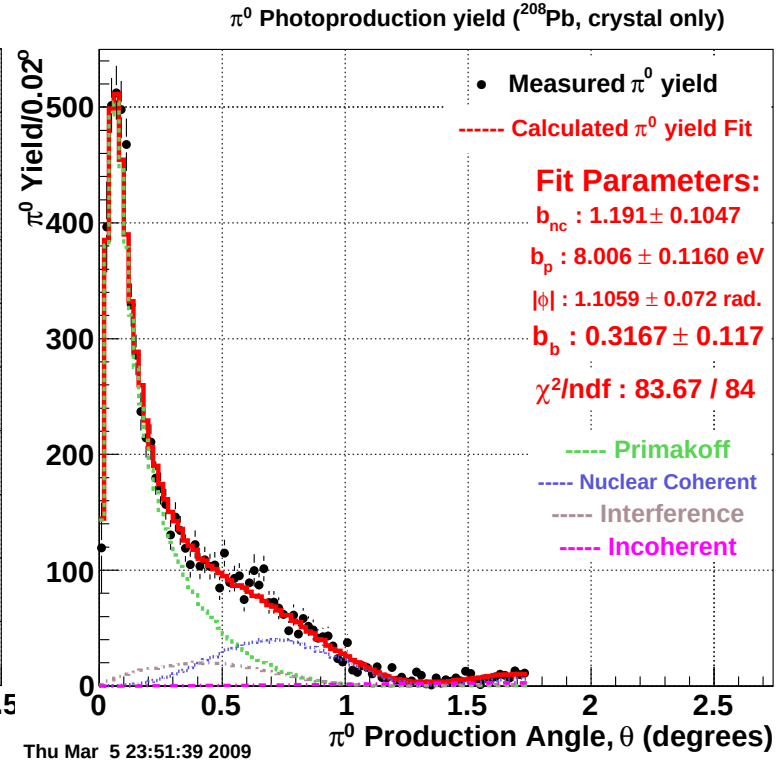
Yield Fit Ratio Comparisons for ^{208}Pb Ilya(Left) and Mine(Right)





Combined Fits– my Yields (Combined $\Gamma_{\gamma\gamma}$ only)





Summary

- Bkgd $\omega \rightarrow \pi^0\gamma$ production in ^{12}C and ^{208}Pb subtracted from yields
- Fits done with the theoretical predicted phase angle + global phase
- Latest theoretical shapes employed in fits–G coulomb and strong FF(with shadowing) and both G and R incoherent calc.
- 1^{st} Modified yield fits show that fit follows cross section differences in the Primakoff region
- 2^{nd} Modified yield fits show that fit widths are sensitive to the cross sections at larger angles and non-trivial parameter correlations
- Fit widths to Ilya's data agree for ^{12}C: 7.65 eV (7.62 eV) [-0.4%]
- Fit widths to Ilya's data disagree for ^{208}Pb: 7.64 eV (7.96 eV) [4.2%] – implying a significant analysis difference for ^{208}Pb.
- My prel. combined fit gives result $\Gamma_{\gamma\gamma} = 8.01 \pm 0.12$ eV

Future Work

- More combined fits (matching phase and/or incoherent parm)
- Fit and make comparisons to Ilya's new data
- Compare Ilya's and my component cross sections (with and without experimental resolutions)
- Detailed evaluation of the empty target background and Veto Efficiency
- Finish and write-up systematic error evaluations
- Include a discussion of the fitting error matrix and the correlations
-