Amplitude analysis of GlueX $(p\eta'\pi^0)$ data

Florida International University 2020

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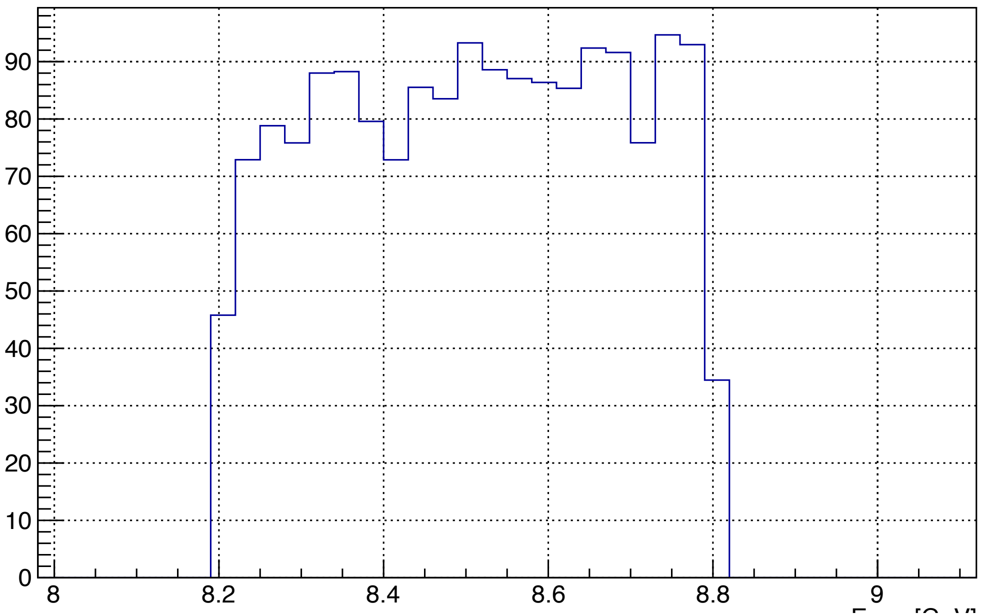
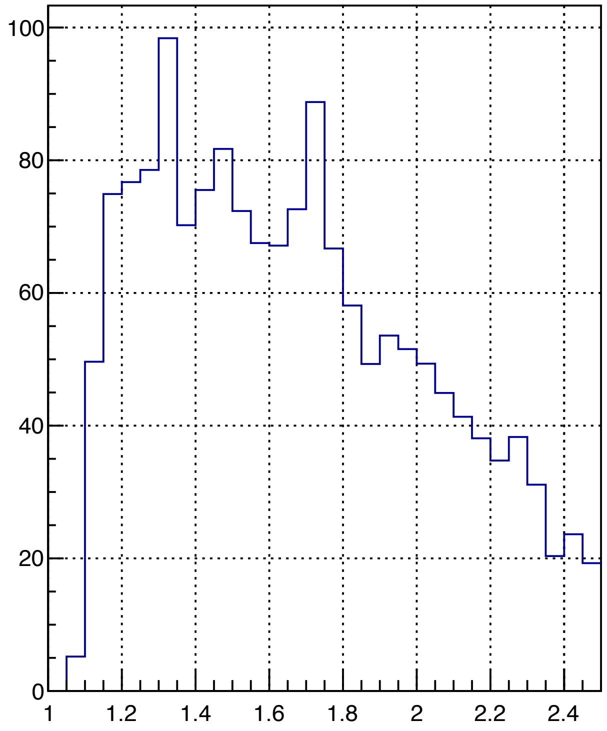
9598 GlueX ($p\eta'\pi^0$) events for 0^o polarization

Φ=0 Deg.
$P_\gamma = 0.3519$

Signal-Background separation using Probabilistic Weighing Method
Reaction $\gamma p \rightarrow p\eta'\pi^0$
η'-> $\pi^+\pi^-\eta$, $\eta \rightarrow \gamma\gamma$

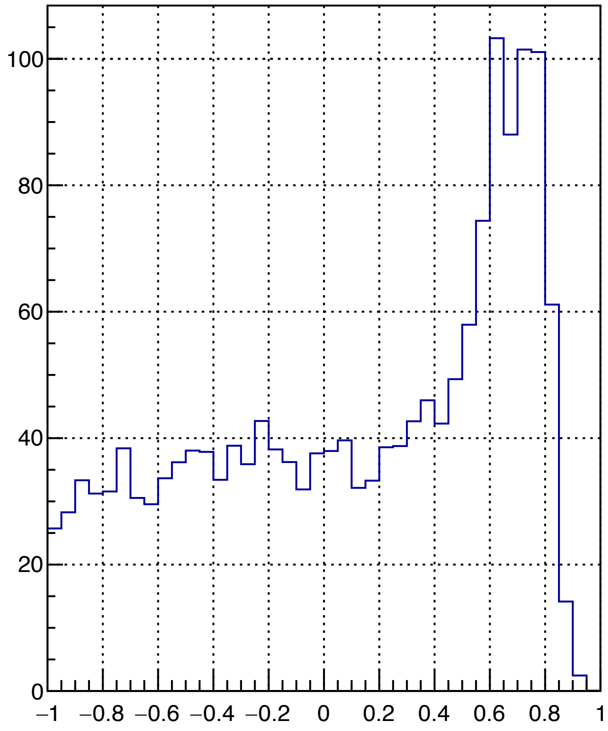


E_{beam} [GeV]



$M(\eta'\pi^0)$ [GeV/c^2]

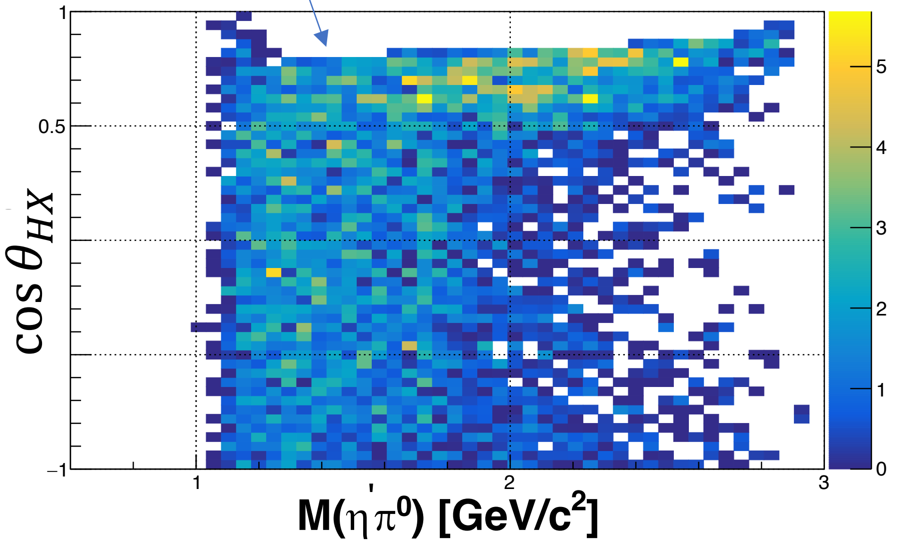
cosθ



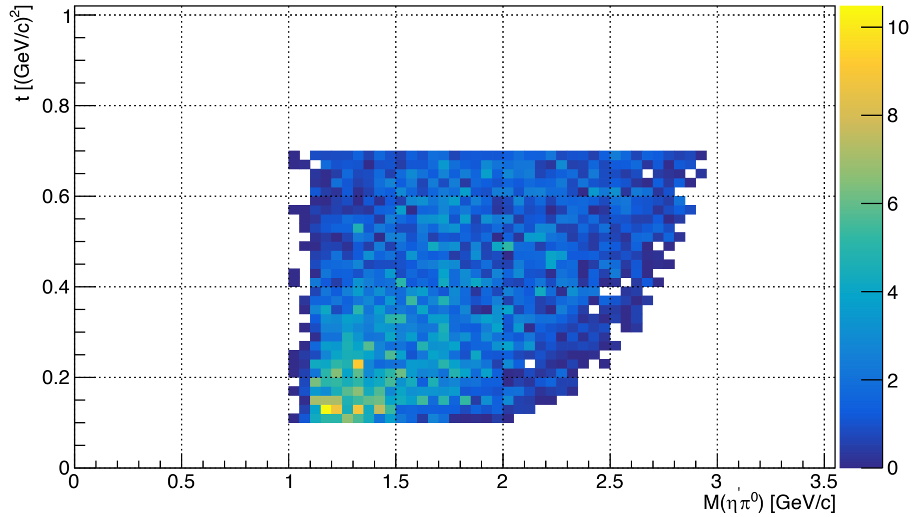
$\cos\theta_{HX}$

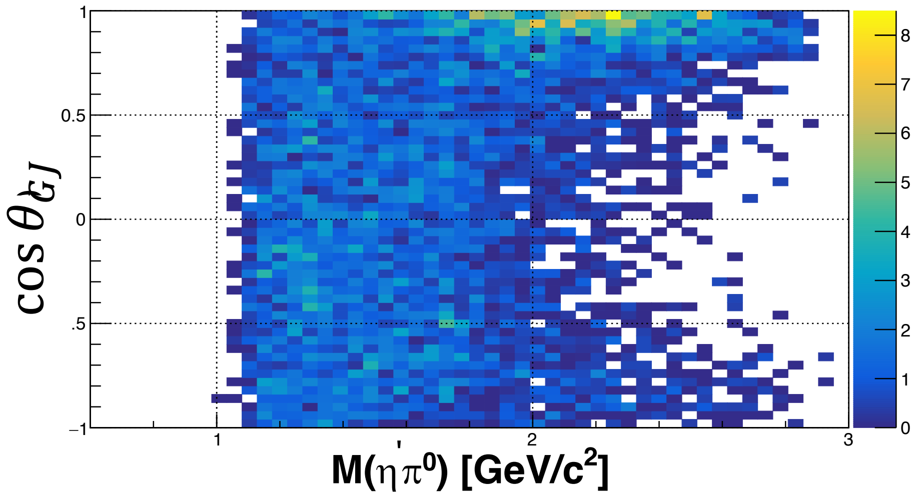
Generated $5*10^6$ $(p\eta'\pi^0)$ events with AmpTools

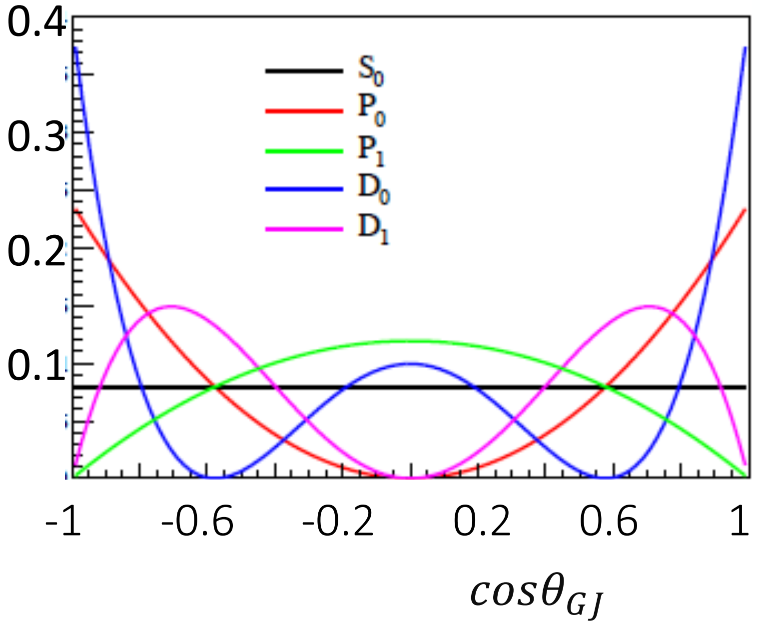
Δ^+ rejection($0.0\ GeV/c^2 < M_{\pi^0 p} < 1.4\ GeV/c^2$)



t [(GeV/c)^2]







$M(\eta'\pi^0)$ [GeV/c^2]

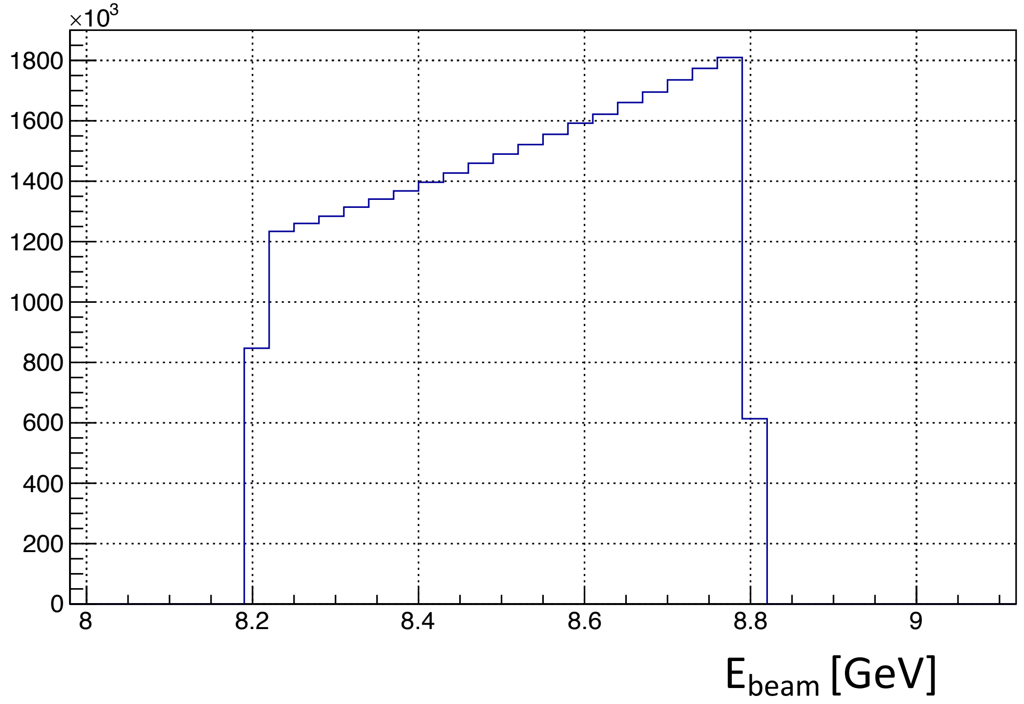
Fit in M and t bins

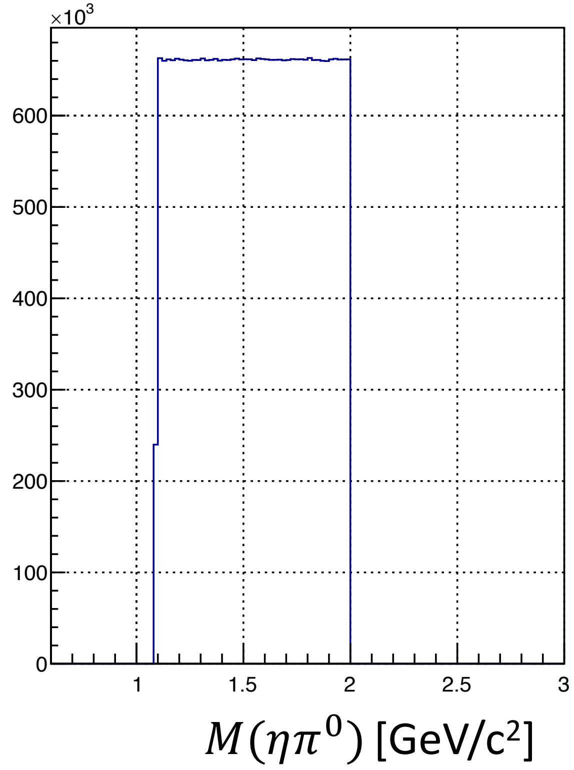
1.1-2 GeV/c^2 20 bins

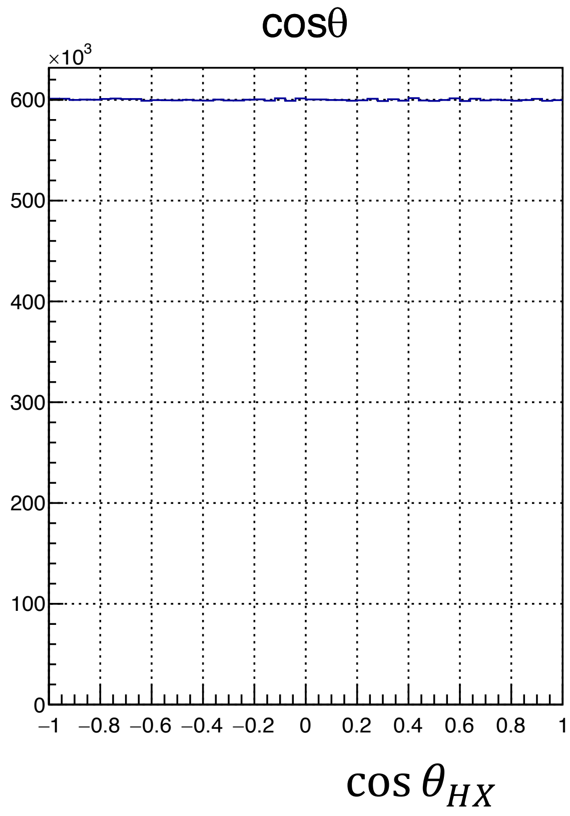
0.1-0.7 (GeV/c)^2 2 bins

Generated $30*10^6$ $(p\eta'\pi^0)$ flat events with AmpTools

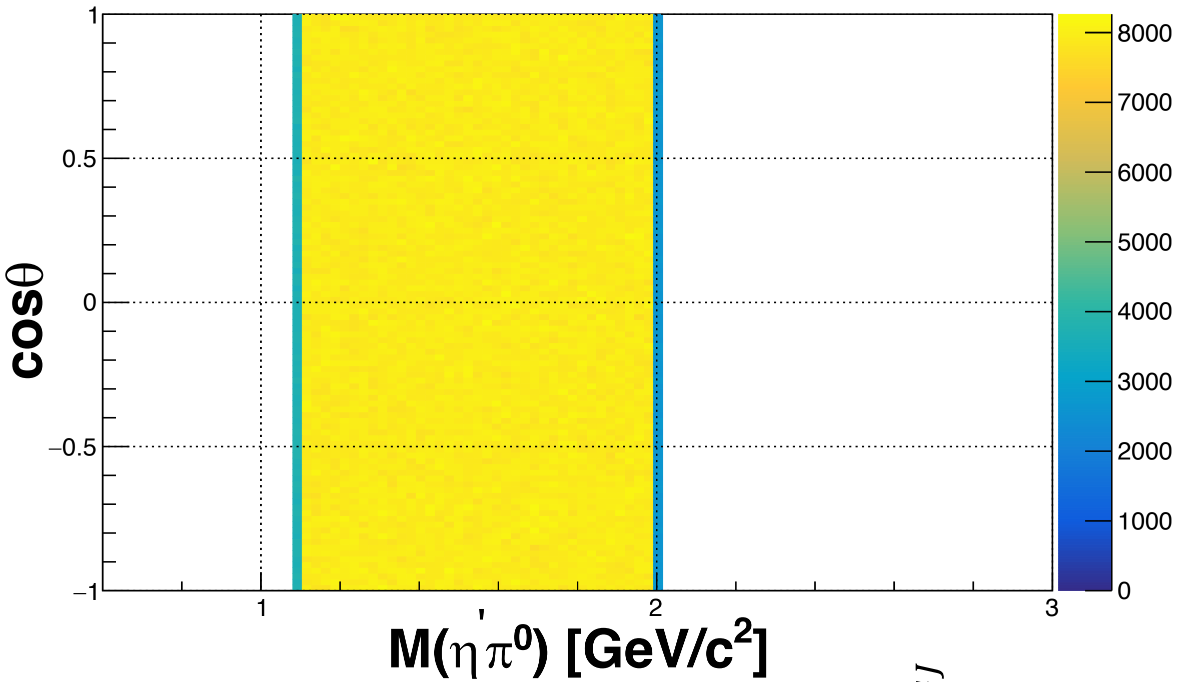
- Flat in $\cos\theta_{GJ}$
- Flat in $M(\eta\pi^0)$

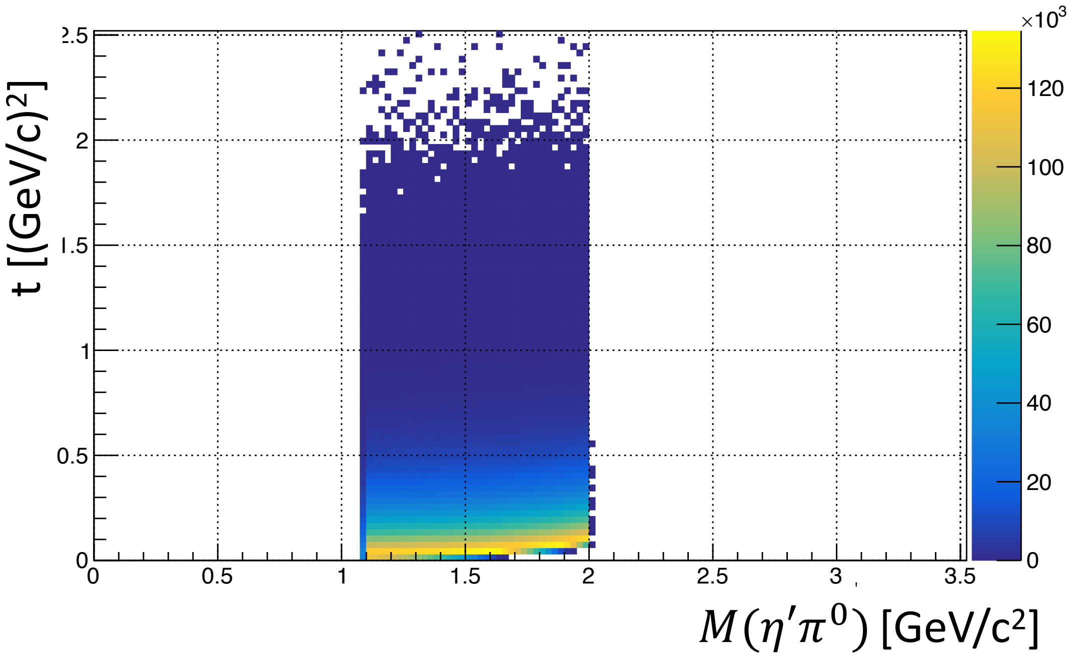


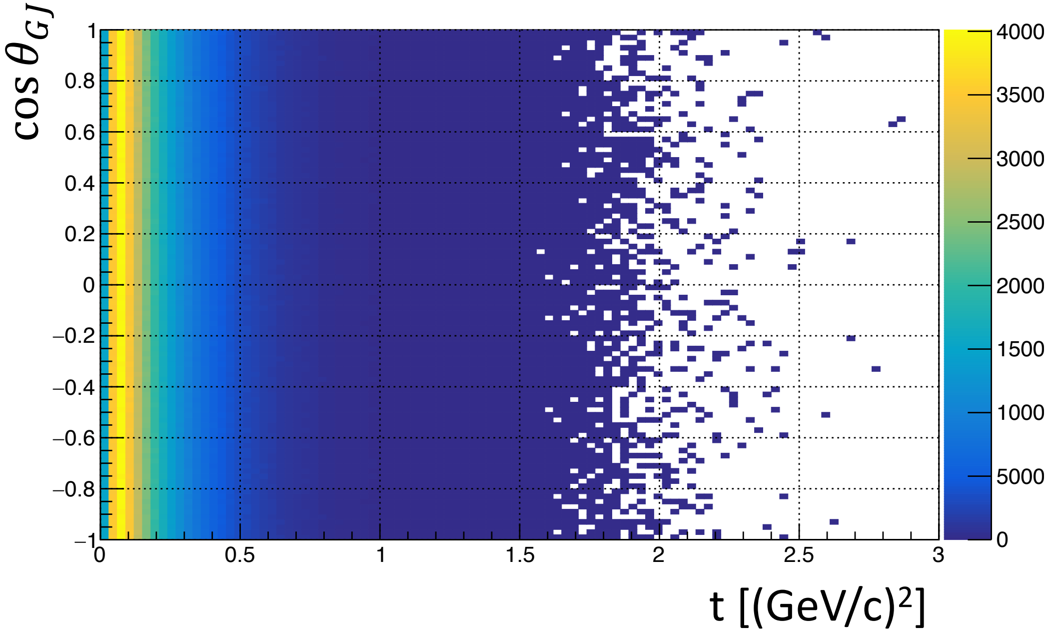




Generated 30*10^6 $(p\eta'\pi^0)$ flat events with AmpTools





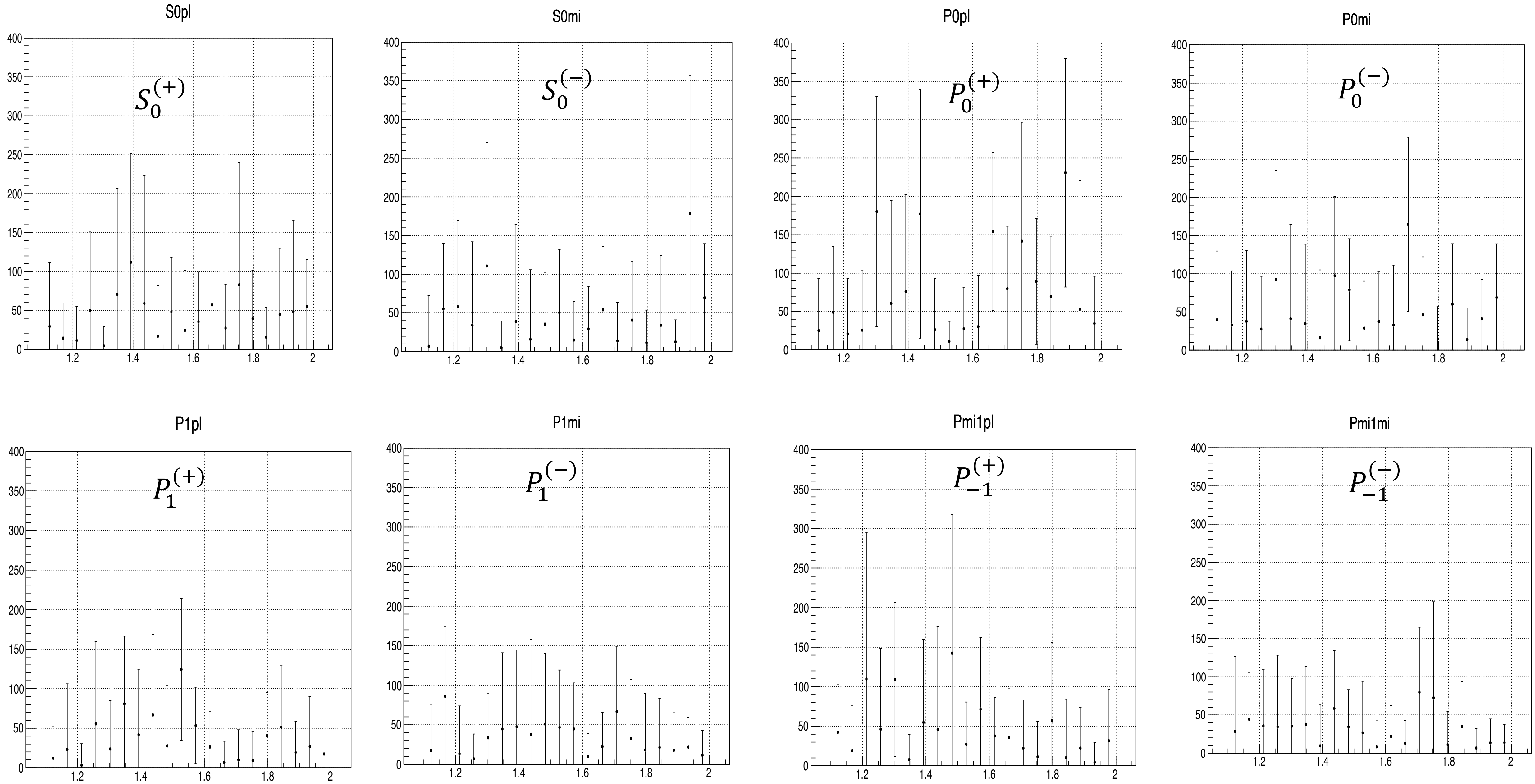


Analysis strategy

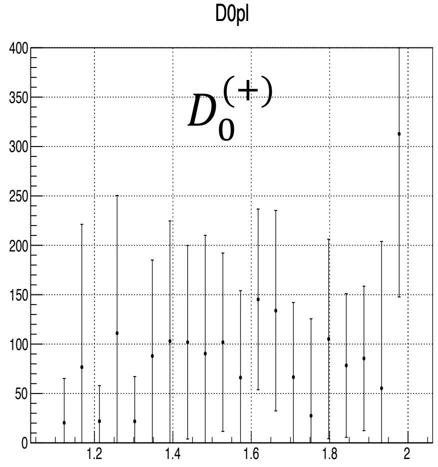
1. Fit intensity with different wave sets:
   - $S_0, P_{0,\pm 1}, D_{0,\pm 1,\pm 2}$ ε=± 1
   - $S_0, P_{0,1}, D_{0,1,2}$ ε=± 1
   - $S_0, P_{0,1}, D_{0,1,2}$ ε=$+1$

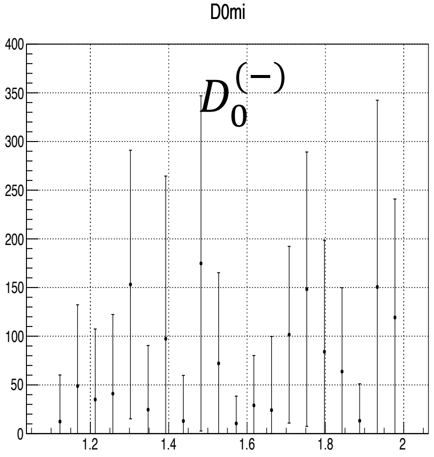
2. Compare different fit results

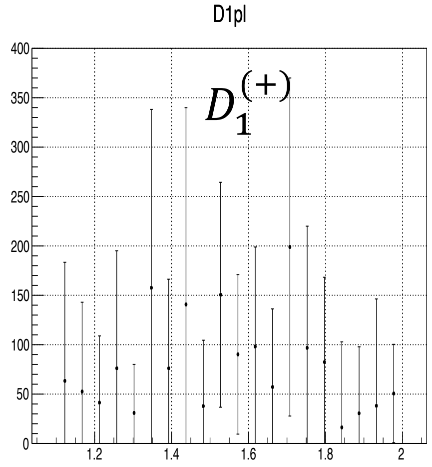
Fit with $S_0, P_{0,\pm1}, D_{0,\pm1,\pm2}$ ε=± 1

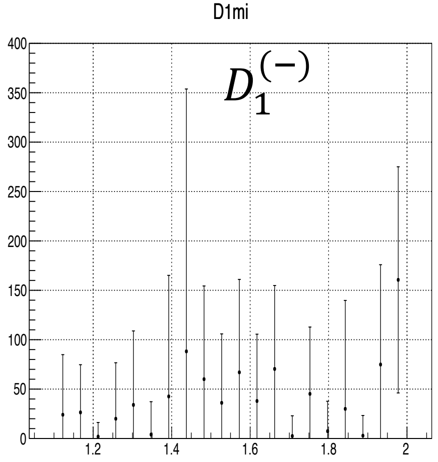


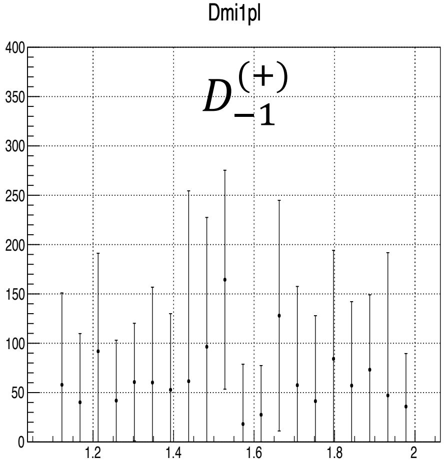
Fit with $S_0, P_{0,\pm1}, D_{0,\pm1,\pm2}$ ε=±1

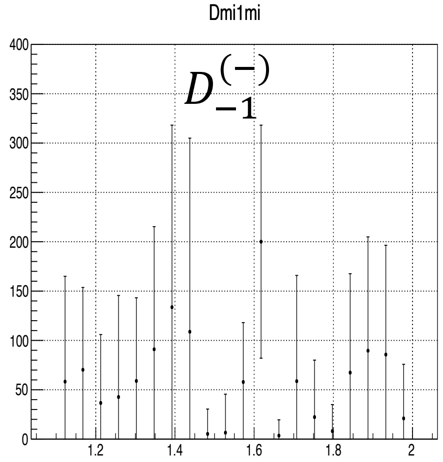


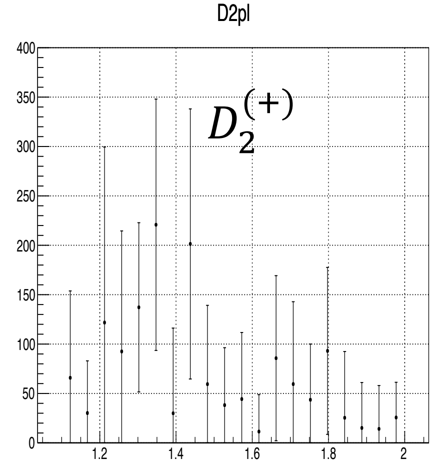


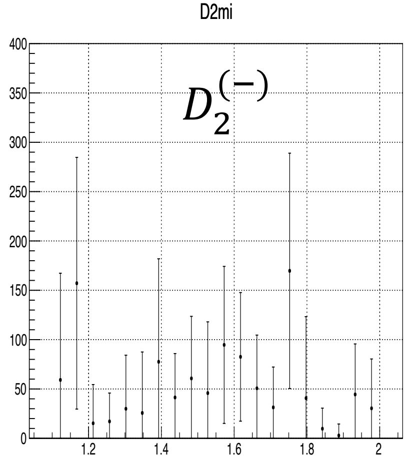


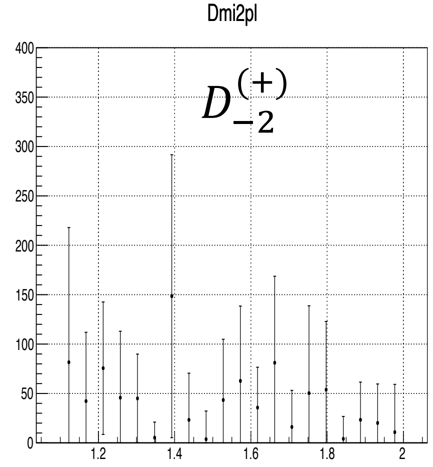


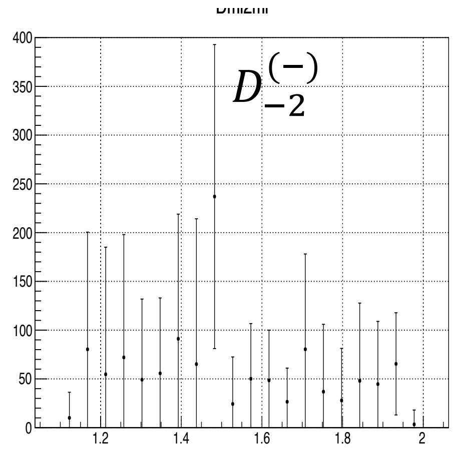


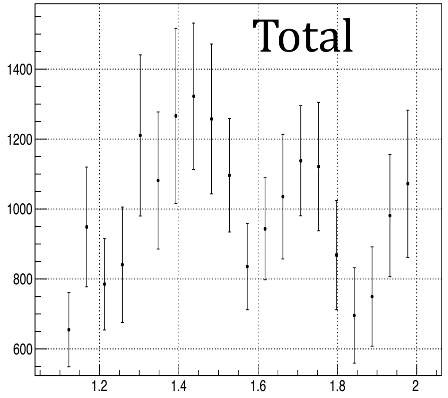




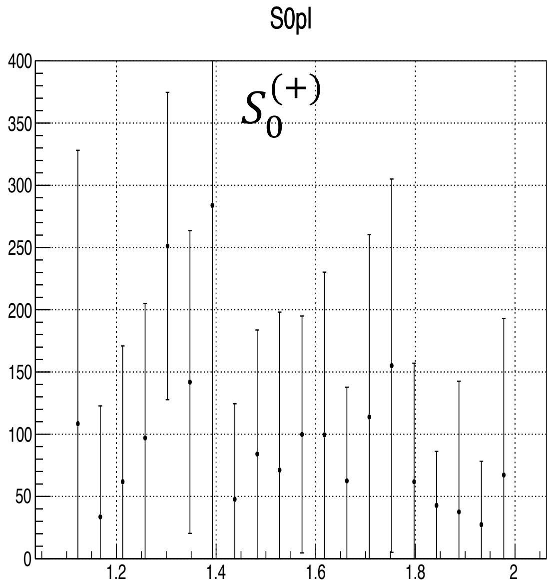


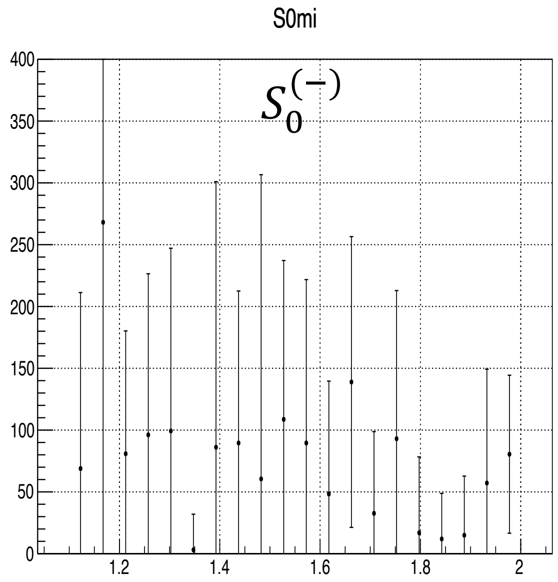


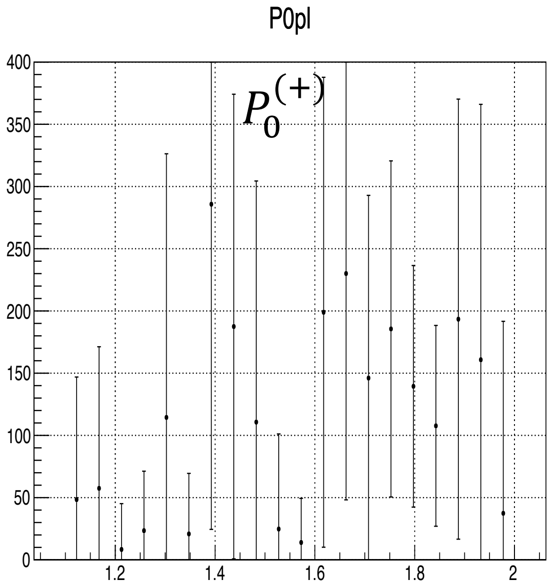


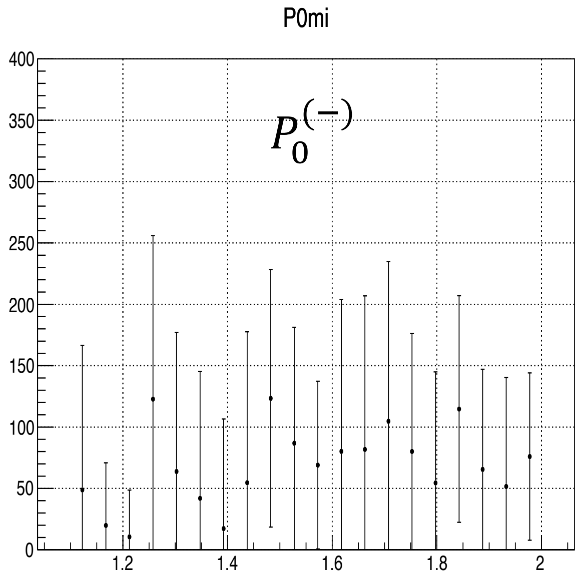


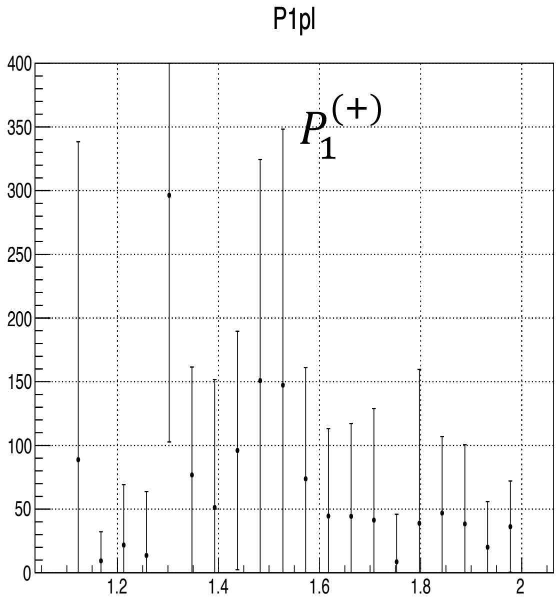
Fit with $S_0, P_{0,1}, D_{0,1,2}$ $\varepsilon=\pm1$

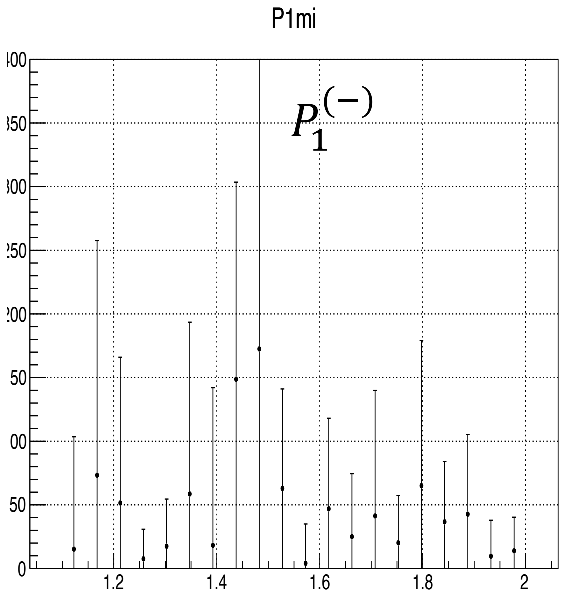




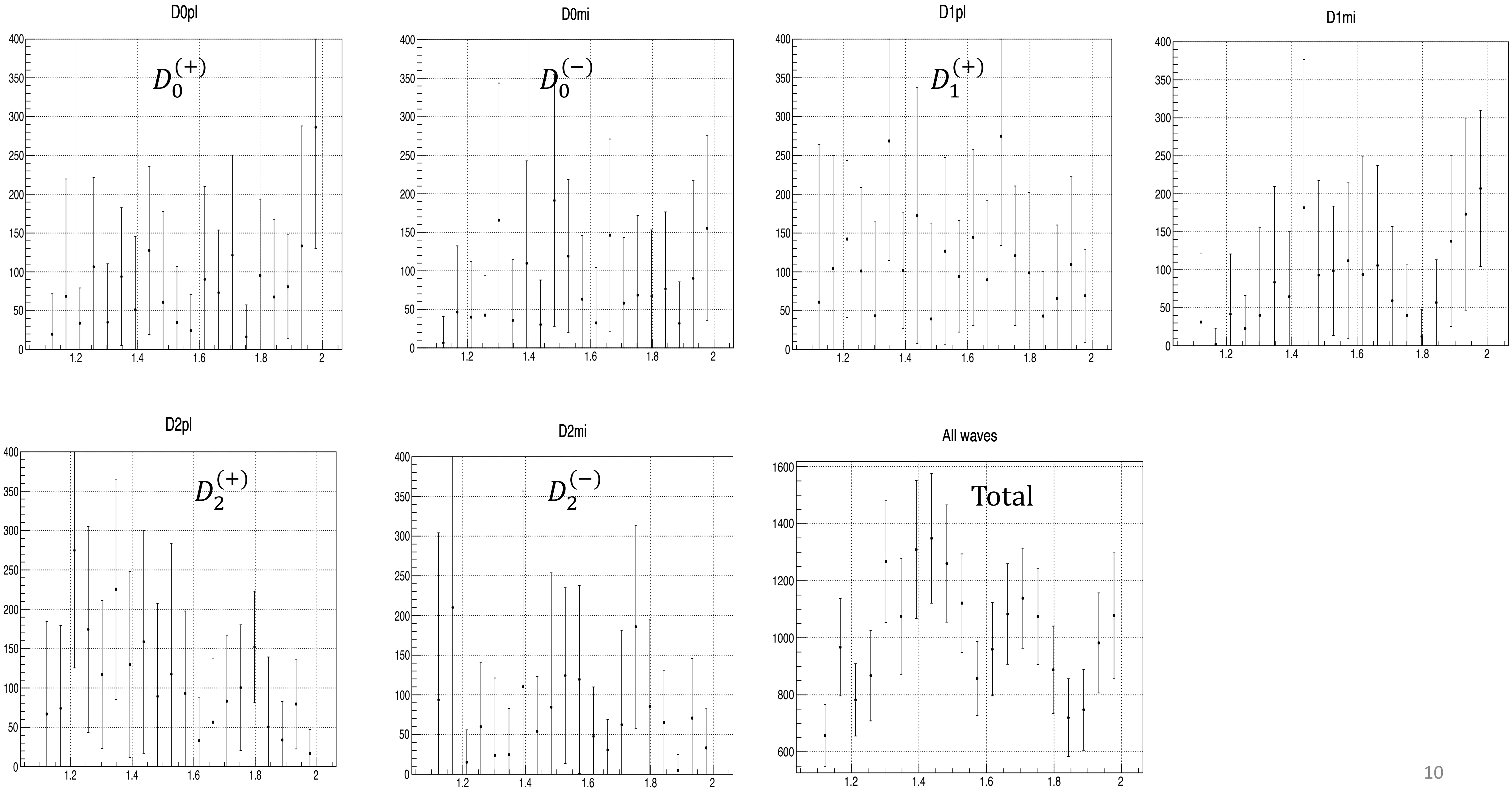




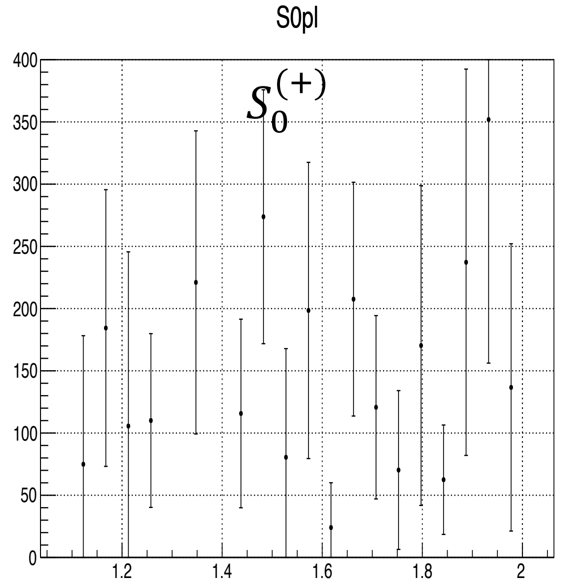


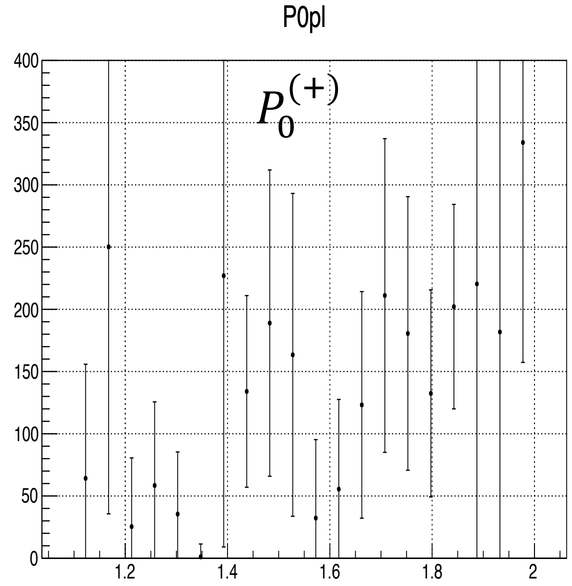


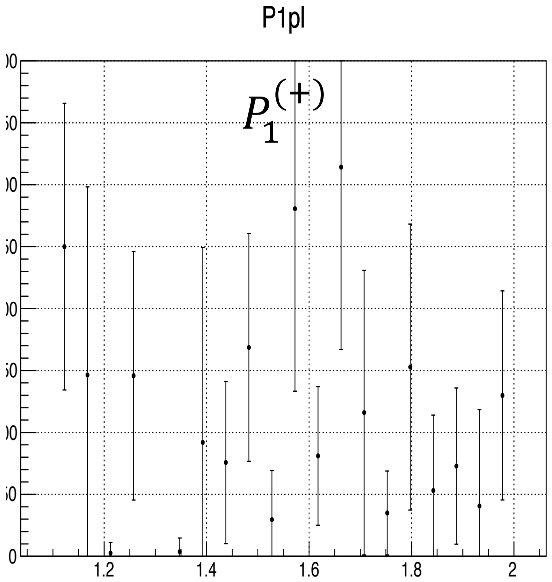
Fit with $S_0, P_{0,1}, D_{0,1,2}$ ε=± 1

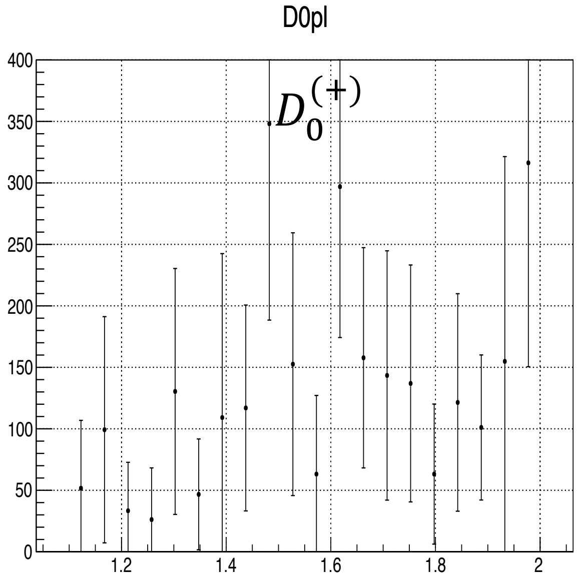


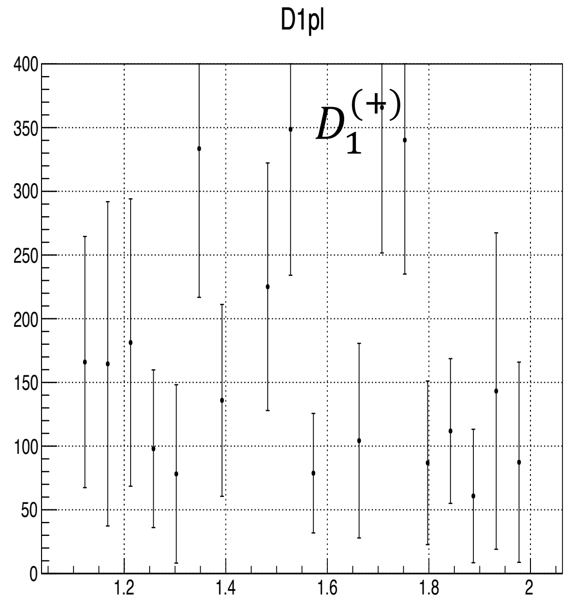
Fit with $S_0, P_{0,1}, D_{0,1,2}$ ε=+1

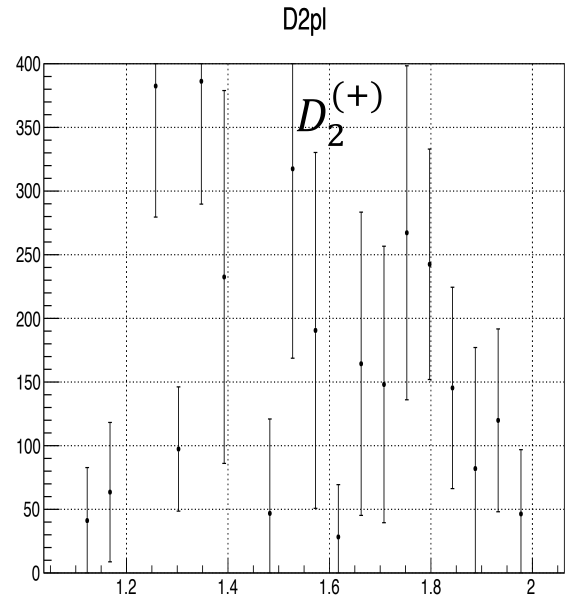


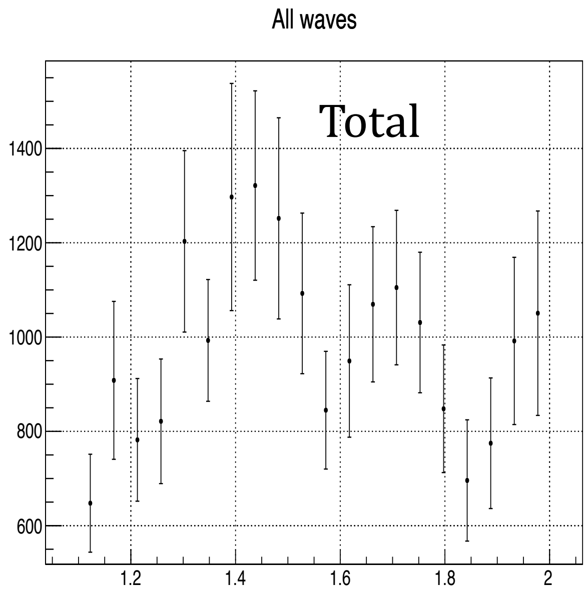






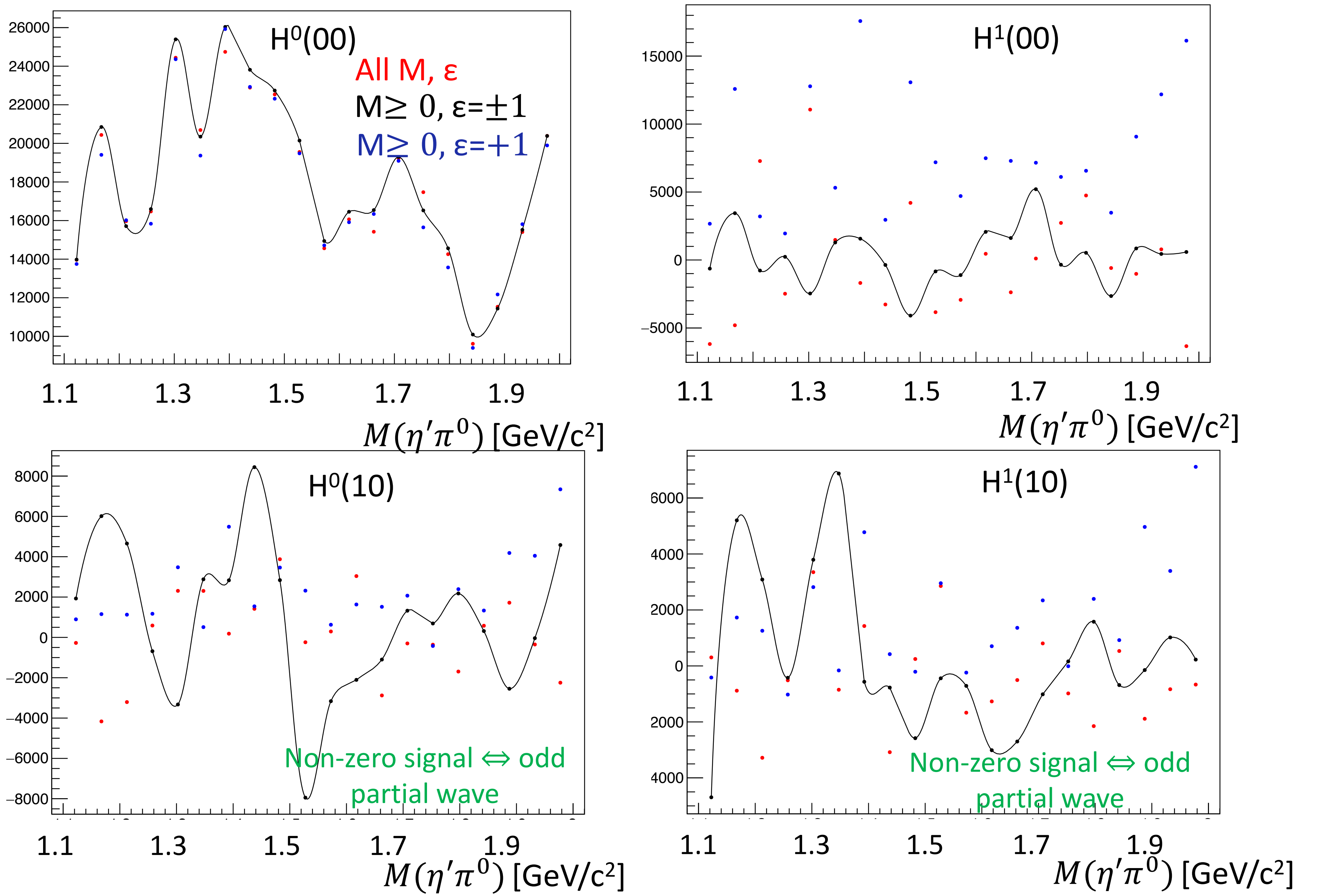






Comparison of moments from different fit results

0<t<0.3 $(GeV/c)^2$



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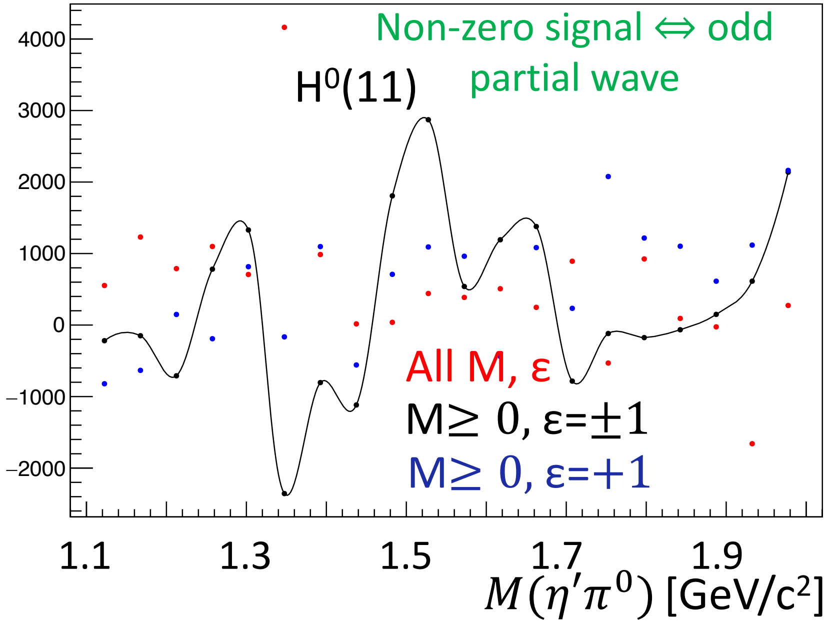

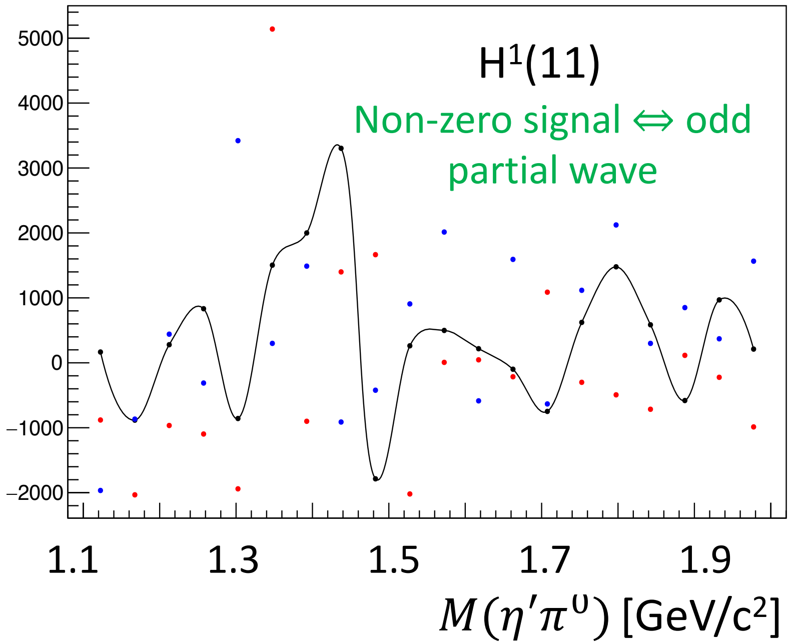

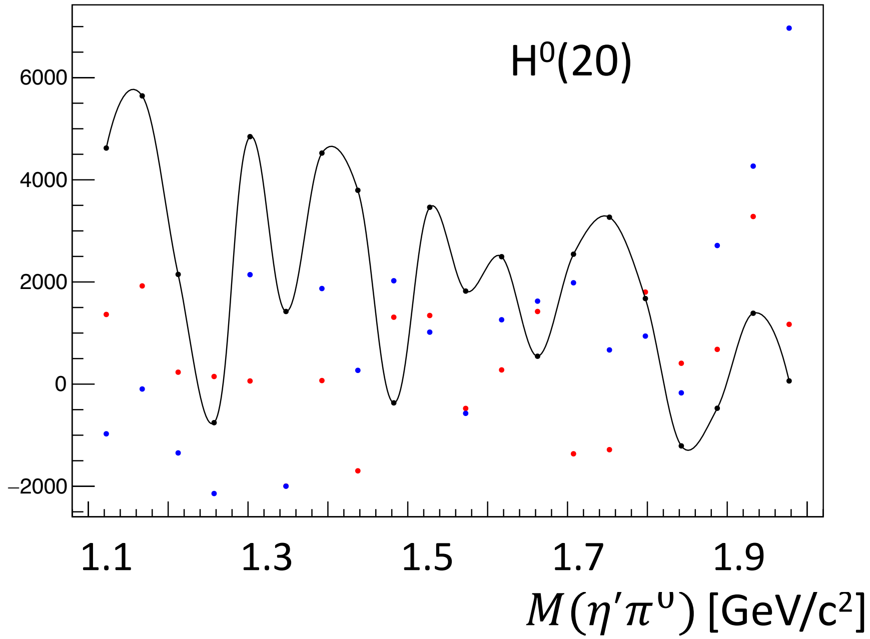

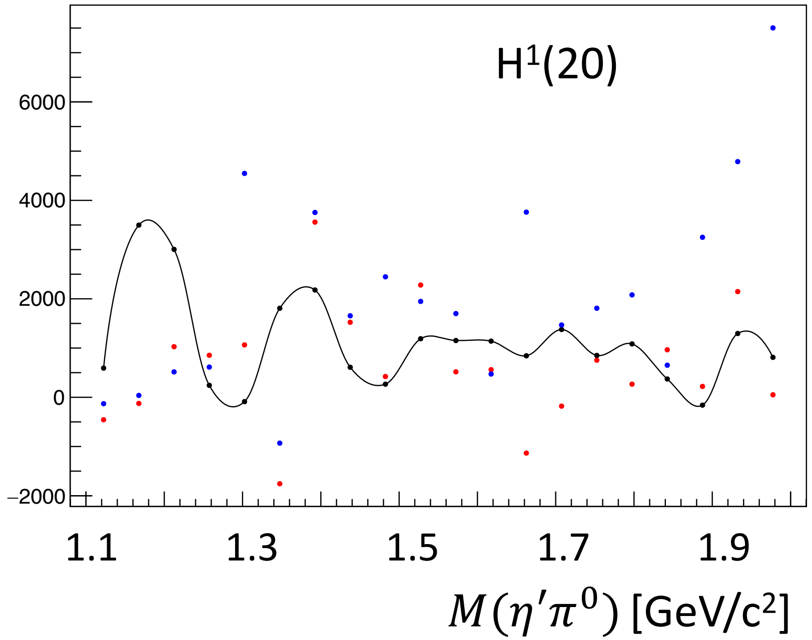

Comparison of moments from different fit results

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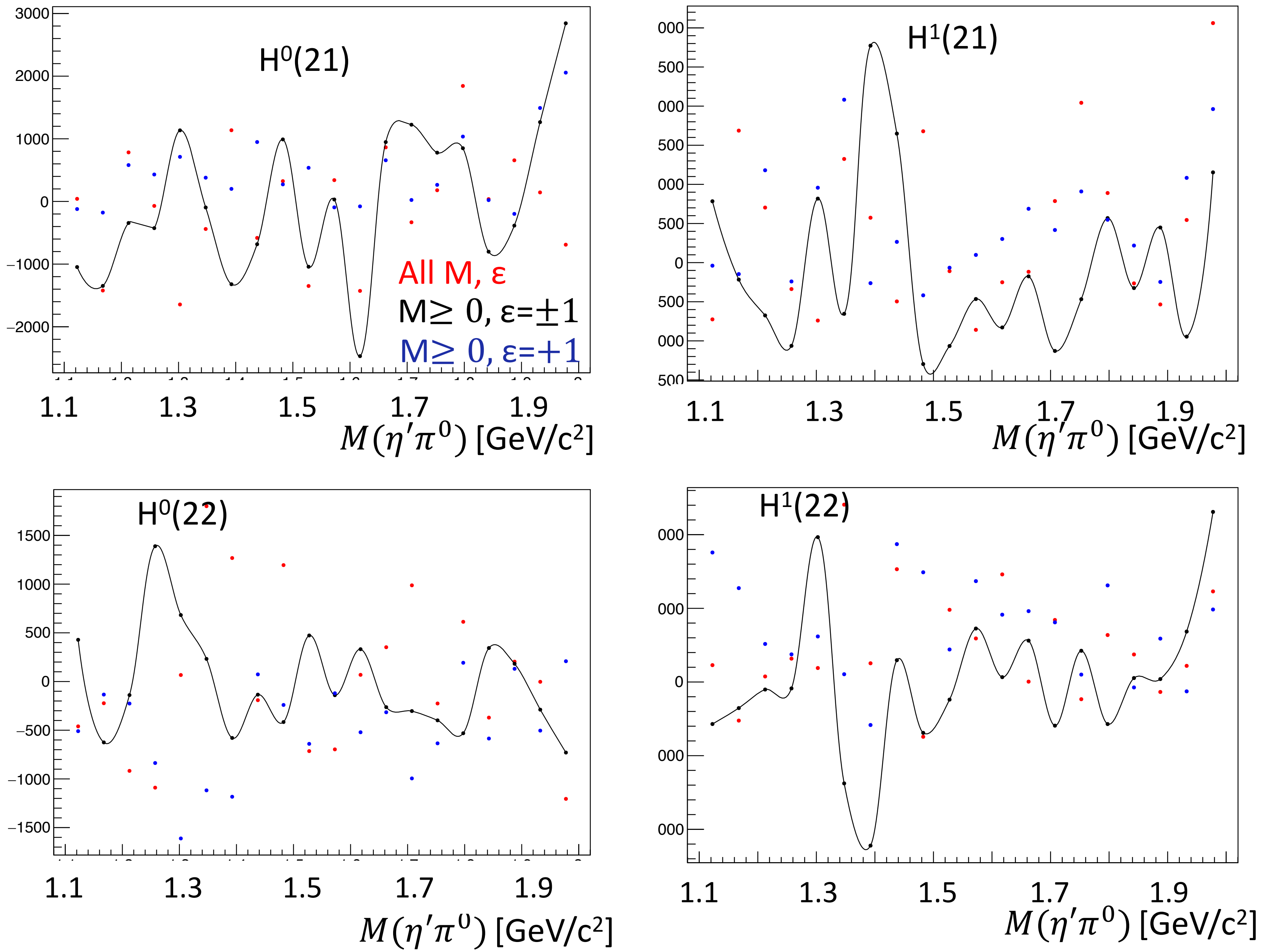

Summary

- Use new feature in Amptools that allows to fit data using sideband subtraction to select signal events
- Improve fitting using new feature in Amptools that does multiple fits with randomized initial parameters, to choose good starting parametrs
- Use new loop statement to fit data for different polarization angles together
- Use only P and D waves in the fit?