Moment studies with polarized photon beam

Florida International University 2020

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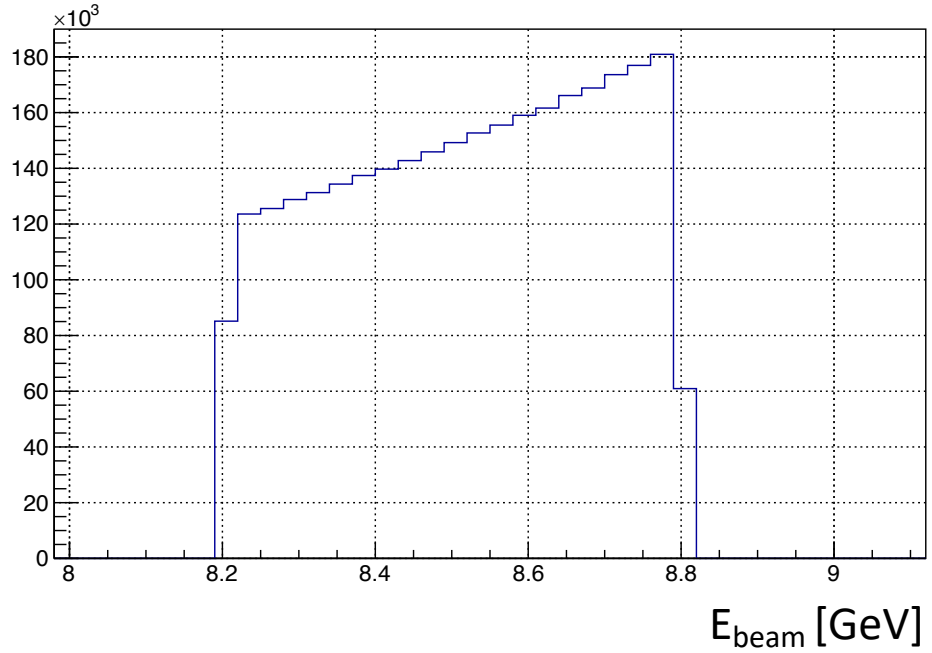
Extracting moments with acceptance

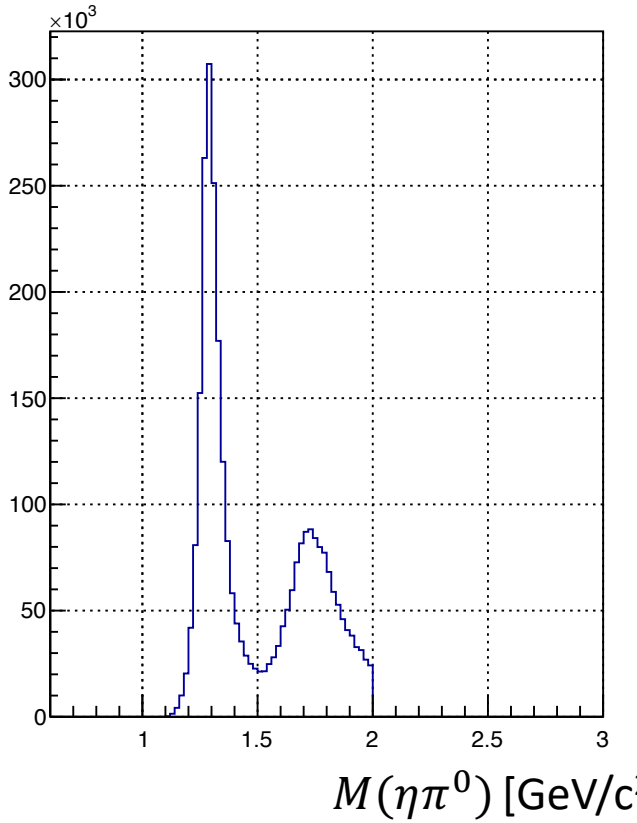
Generated 3*10⁶ $(p\eta'\pi^0)$events with AmpTools

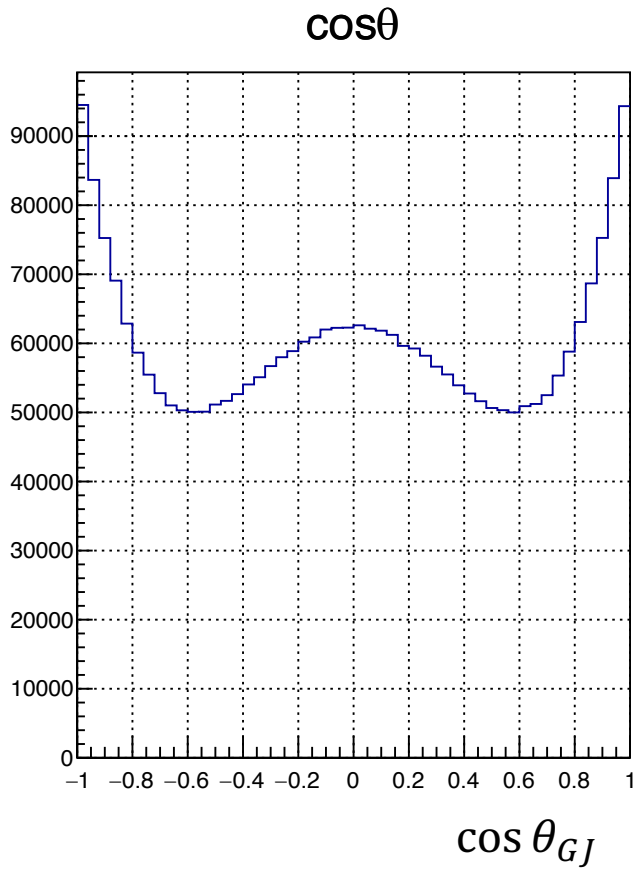
Generated amplitudes are
- D/a_2 (1320 MeV)
- D/a_2' (1700 MeV)

J	M	ε	Real	Imaginary	BW Mass	BW Width
2	0,1,2	+1	350	350	1.306	0.114
2	0,1,2	+1	150	150	1.722	0.247

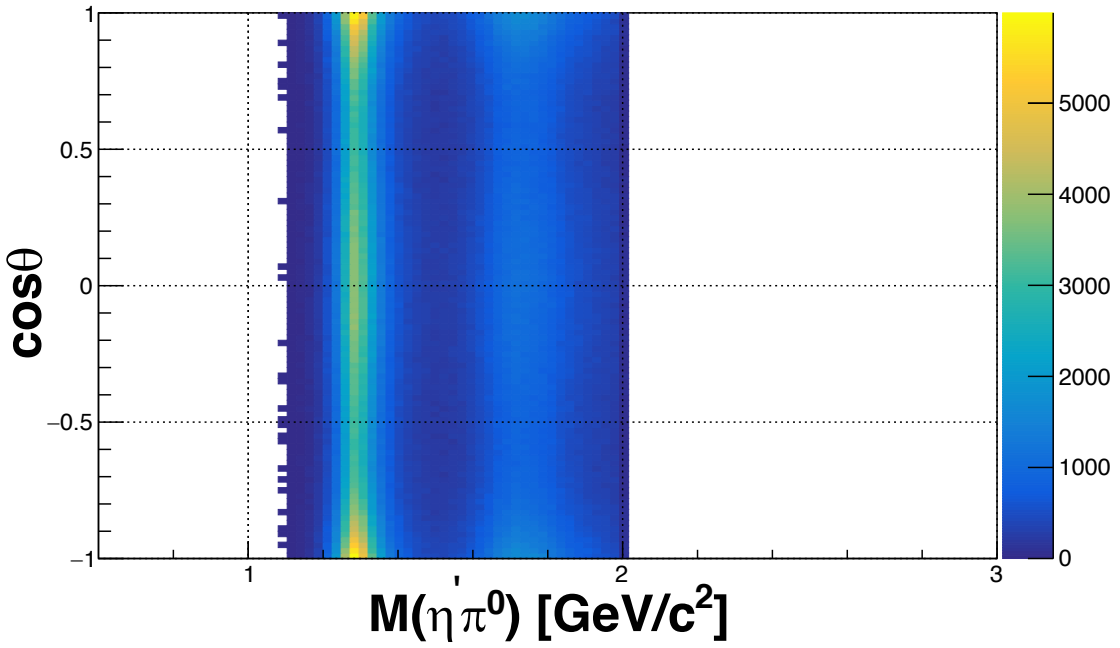
Φ=1.77 Deg.
P_γ =0.3

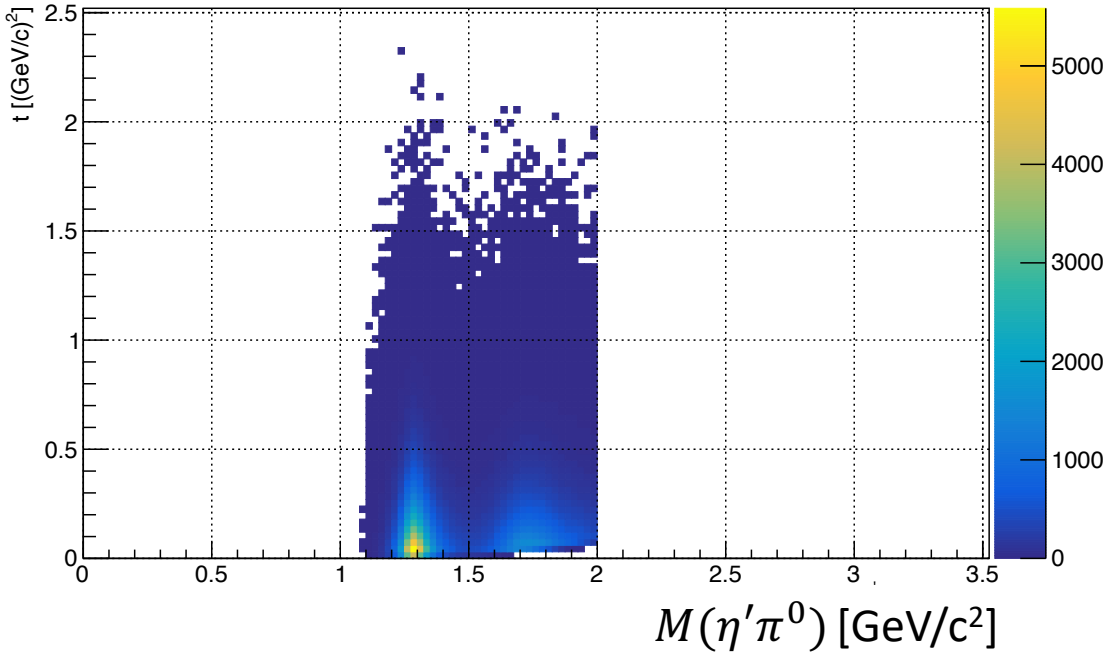


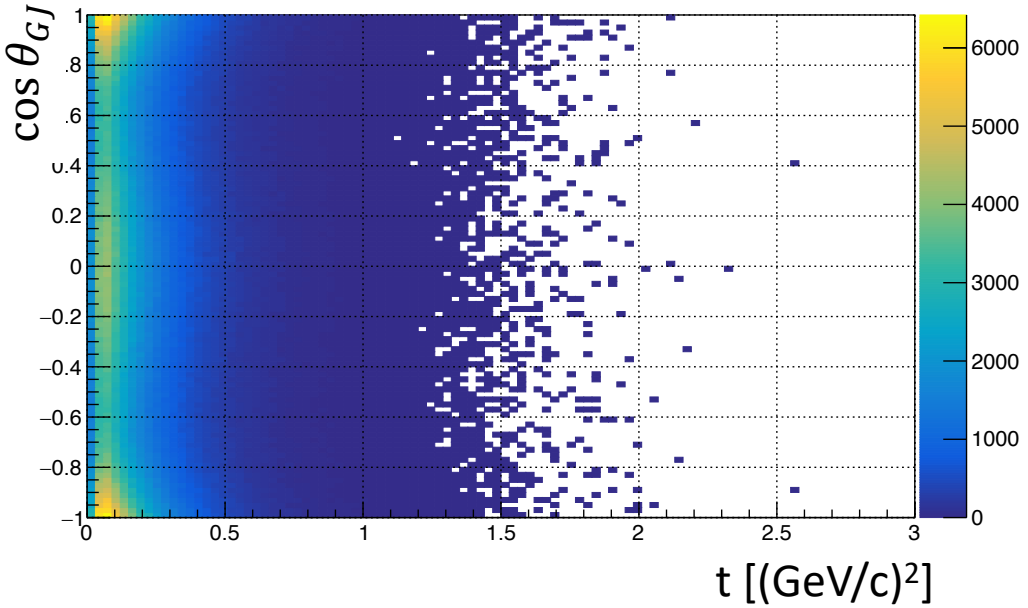




Generated 2*10⁶ $(p\eta'\pi^0)$events with AmpTools







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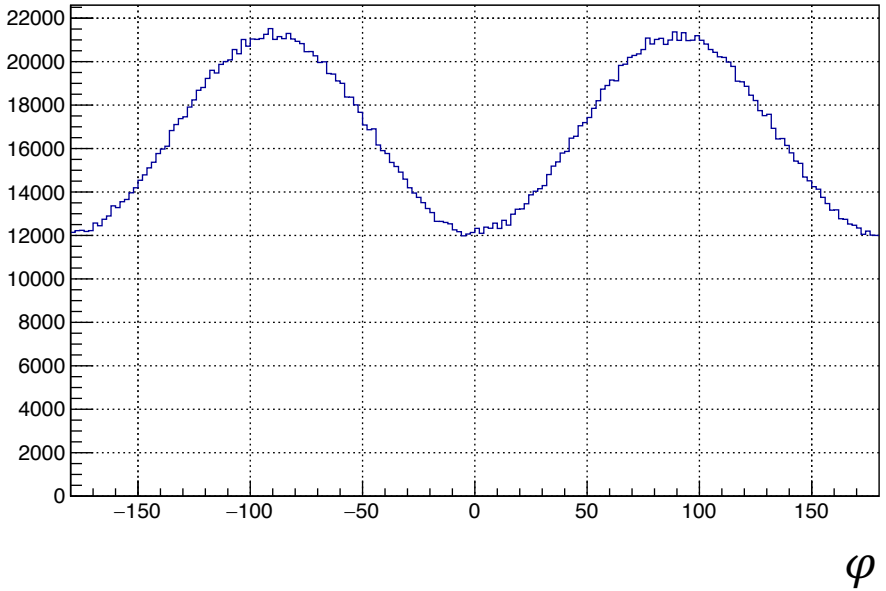
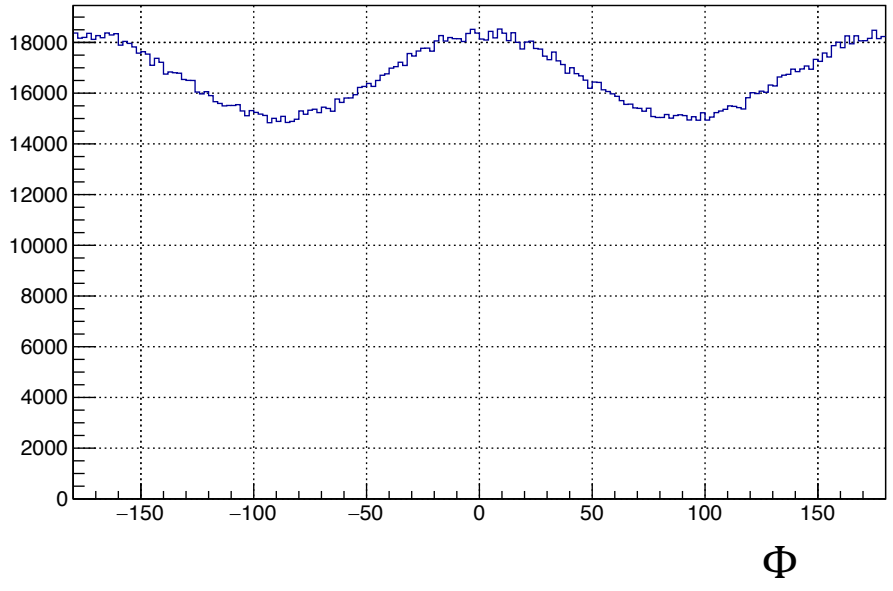
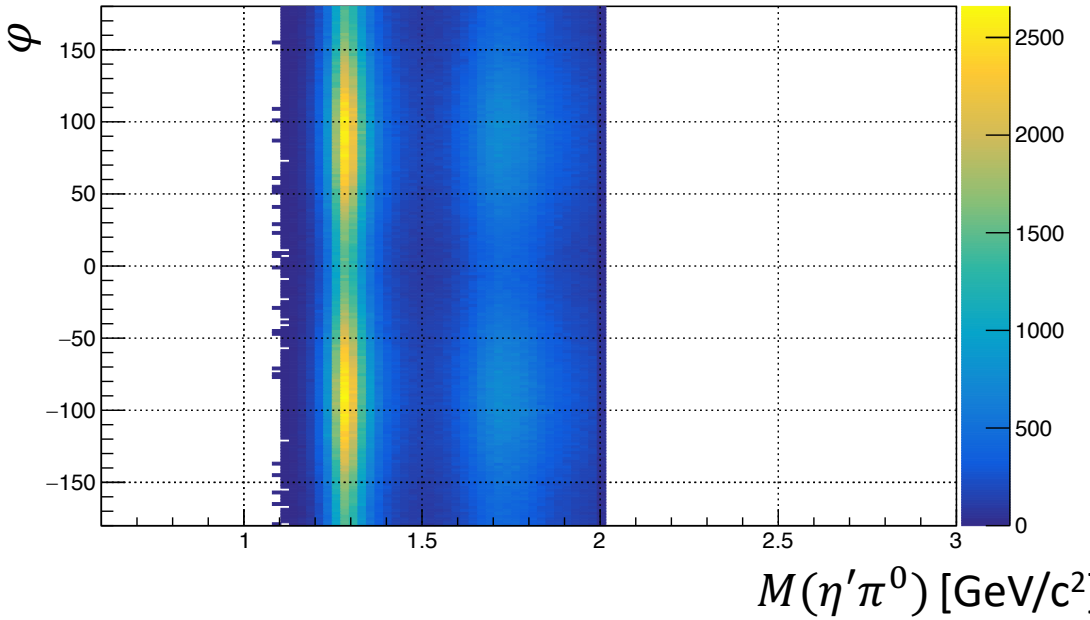
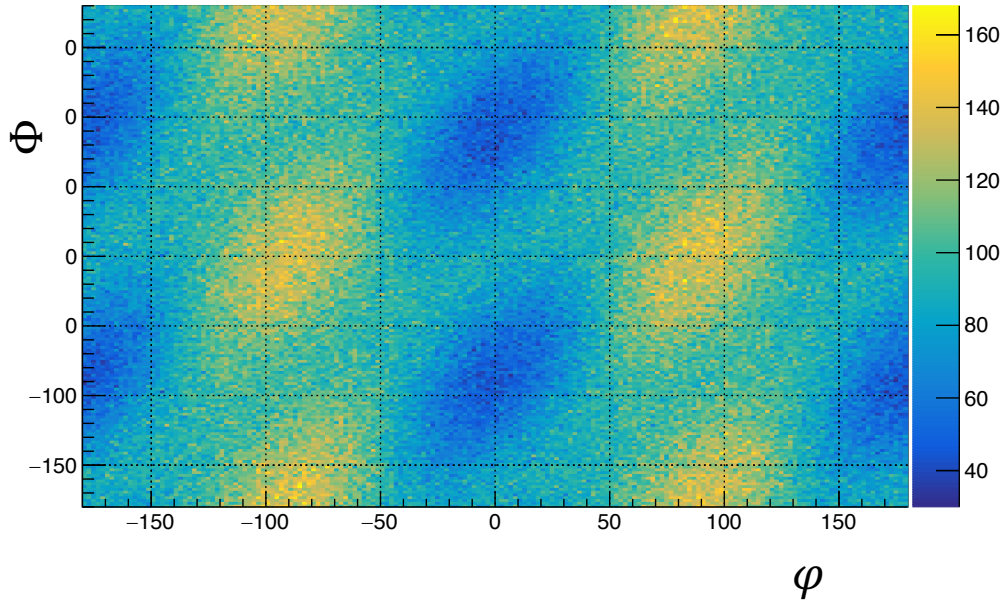


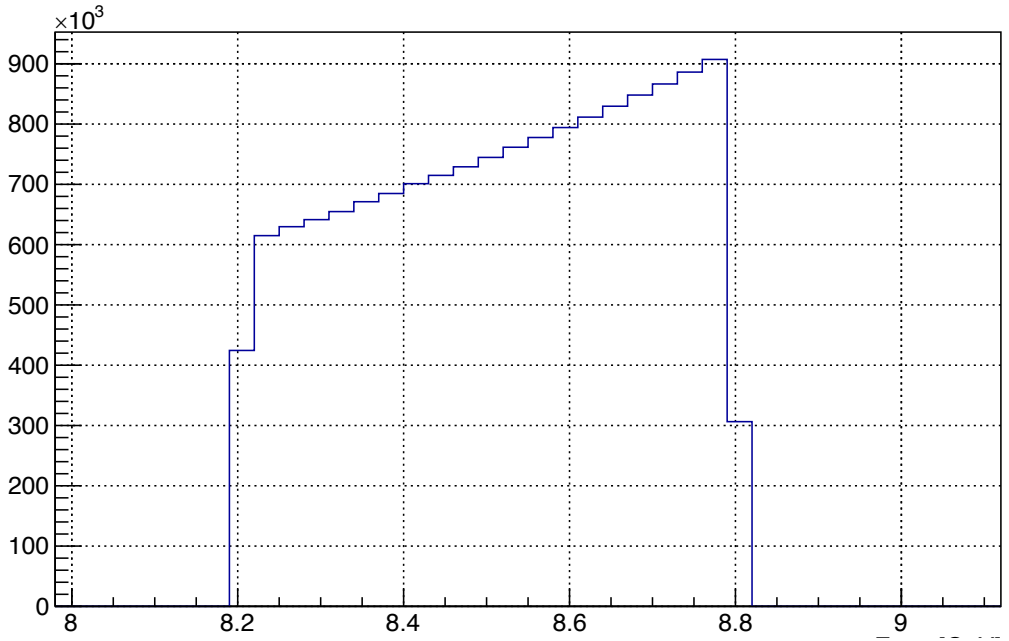




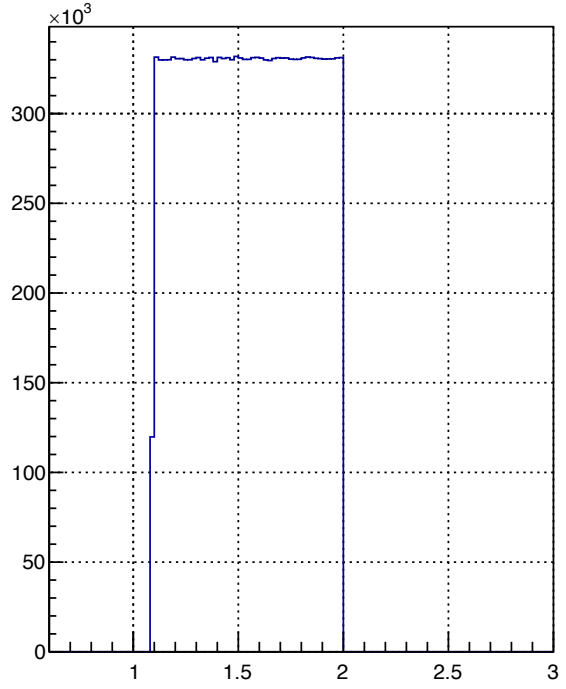


Generated 40*10⁶ $(p\eta'\pi^0)$ flat events with AmpTools

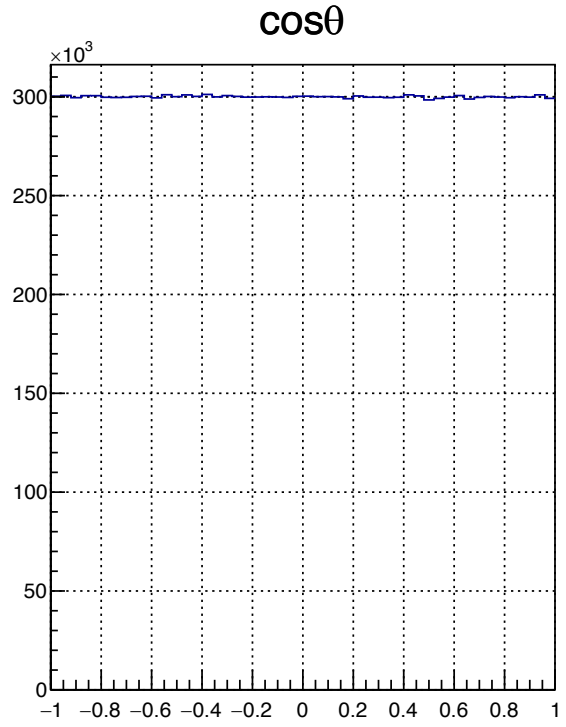
- Flat in $\cos\theta_{GJ}$
- Flat in $M(\eta\pi^0)$



E_{beam} [GeV]

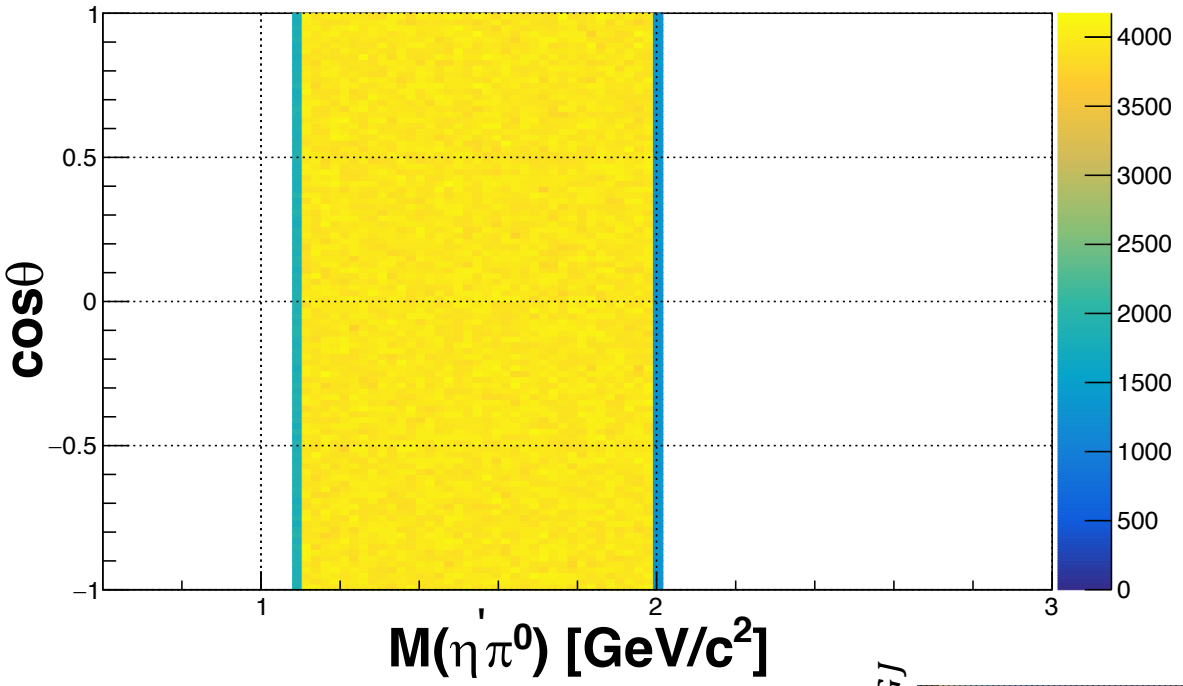


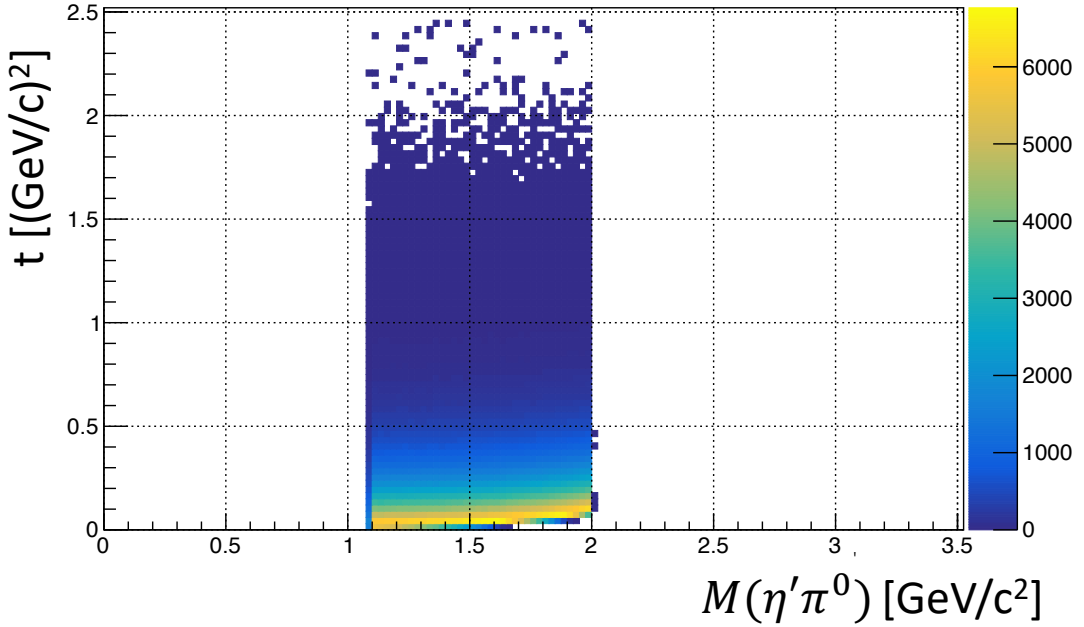
$M(\eta\pi^0)$ [GeV/c²]

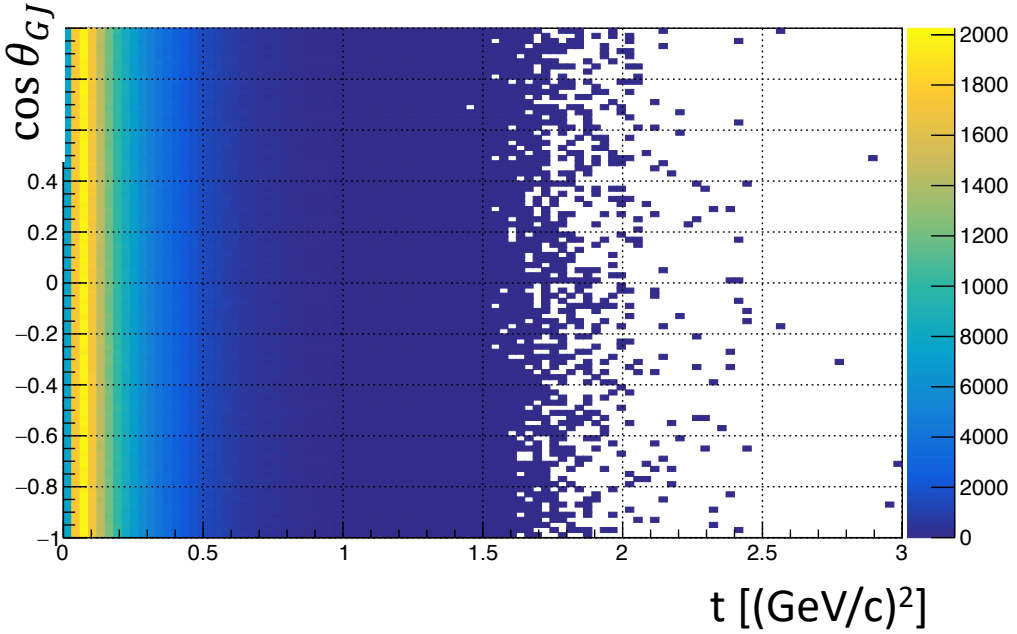


$\cos\theta_{GJ}$

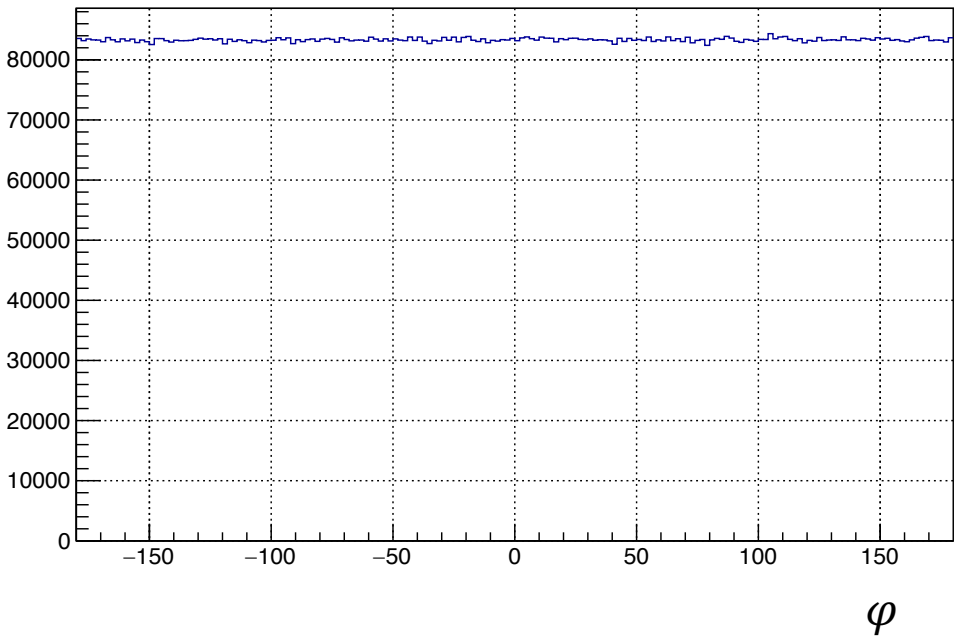
Generated 15*10⁶ $(p\eta'\pi^0)$ flat events with AmpTools

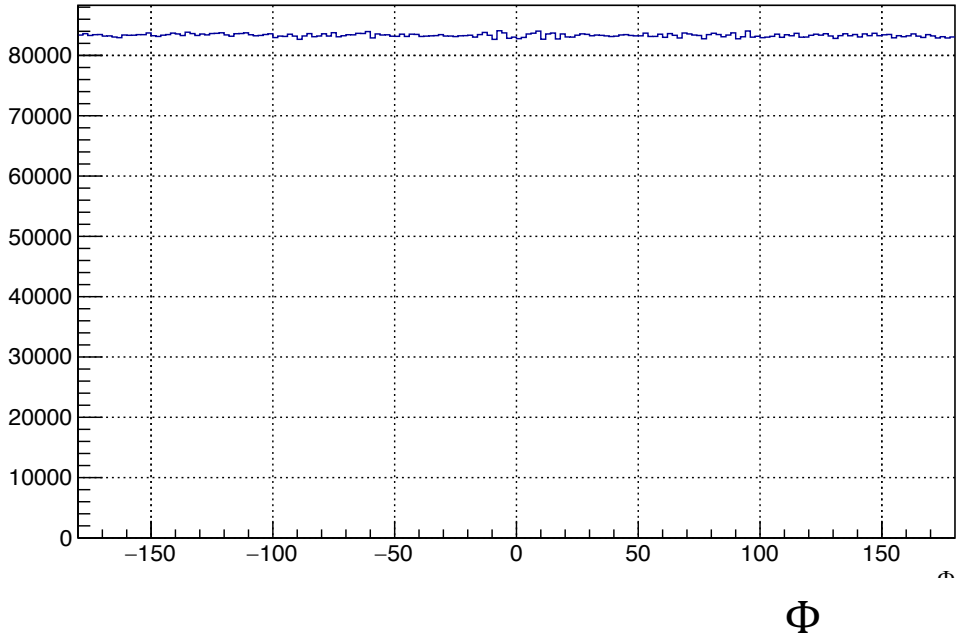






Generated 40*10⁶ $(p\eta'\pi^0)$ flat events with AmpTools





Analysis strategy

1. Assume perfect acceptance and fit intensity to extract partial waves and calculate moments.
2. Compare to the moments extracted with the GlueX acceptance

- Process generated data through GlueX detector to have the effect of acceptance on it
- Process reconstructed events through analysis code to apply particle identification cuts
- Repeat the steps for generated flat (in M and angles) MC sample to obtain accepted MC sample. Both MC samples are used in MC integration of Intensity in Amptools.

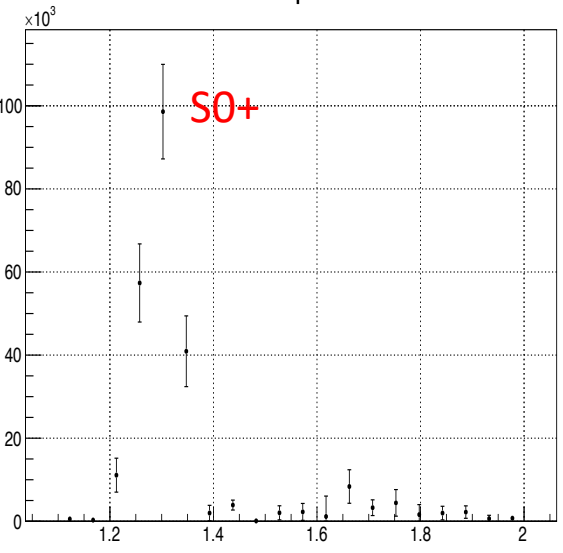
Cuts applied on reconstructed data

1. Missing mass squared, coherent beam energy and timing selection (select prompt peak)
2. Reject major $\pi^0\ \pi^0$ events
3. Select eta and pi0 mass region in the $M_{\gamma\gamma}$
4. Select η' mass window in the $M_{\pi^+\pi^-\eta}$

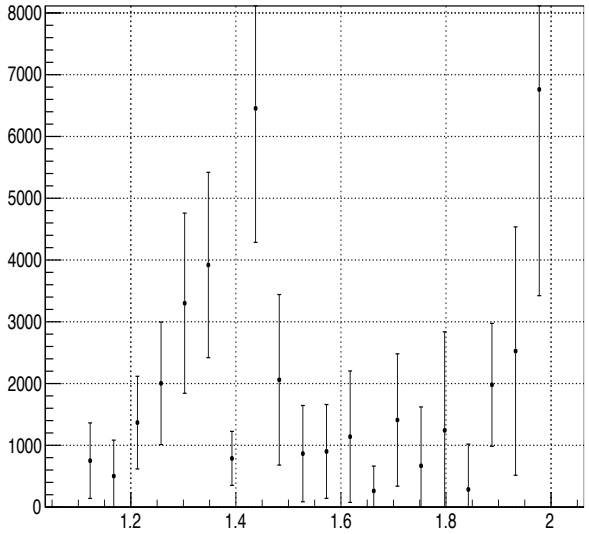
Fit with GlueX acceptance

Fitting with amplitude set: S0+, P0+, P1+, D0+, D1+, D2+.

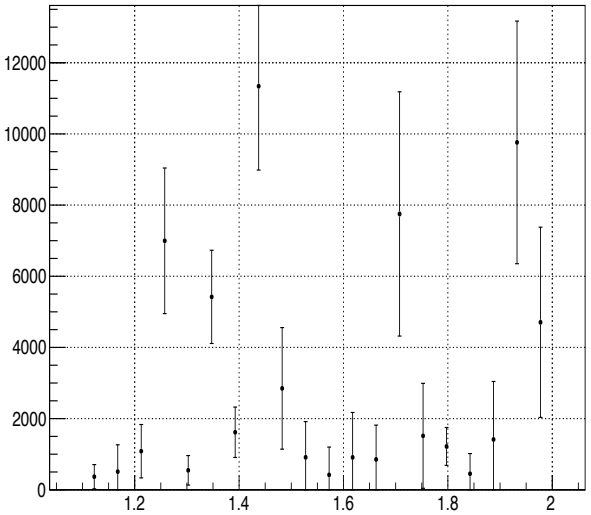
S0pl



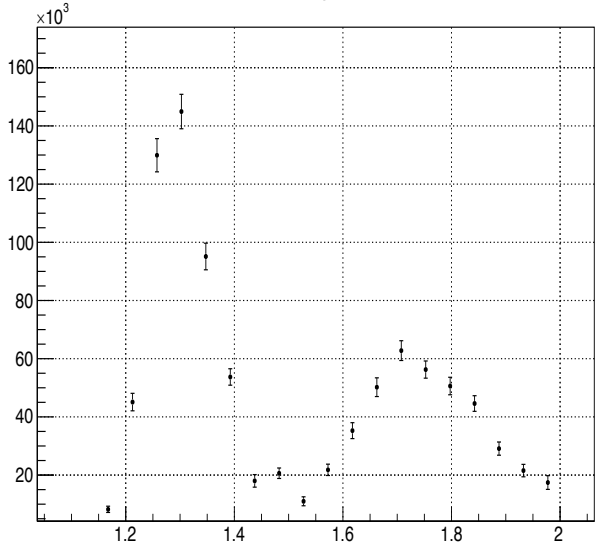
P0pl



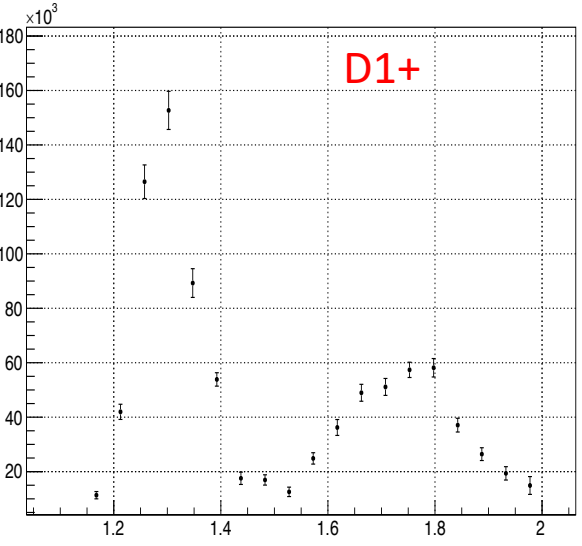
P1pl



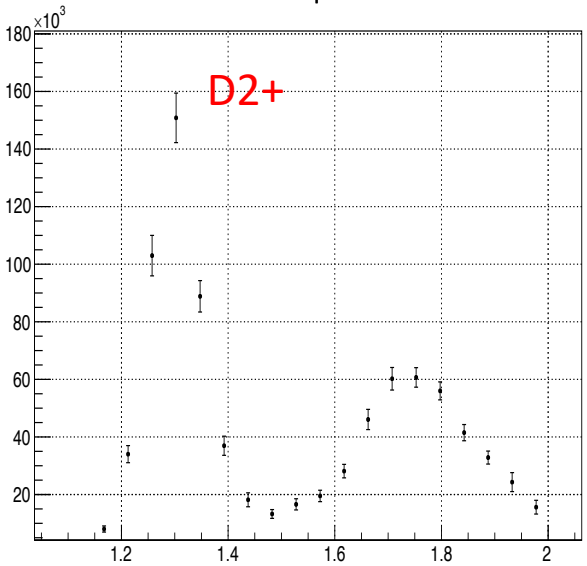
D0pl



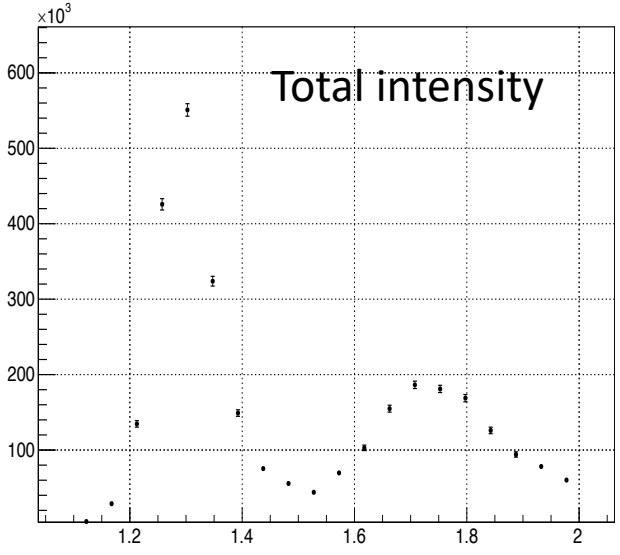
D1pl



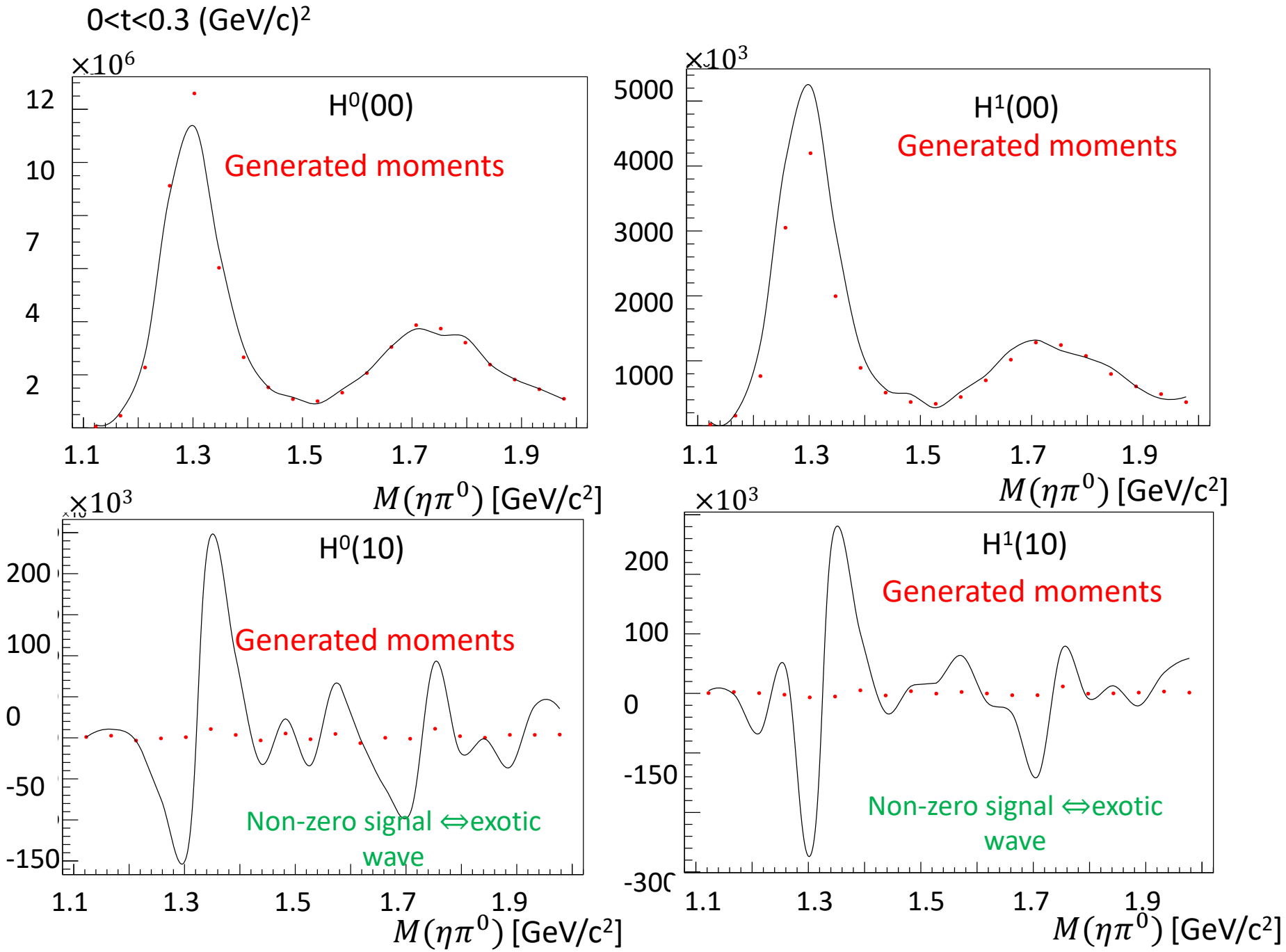
D2pl



All waves



Polarized moments calculated with partial waves and GlueX acceptance don't agree with generated moments



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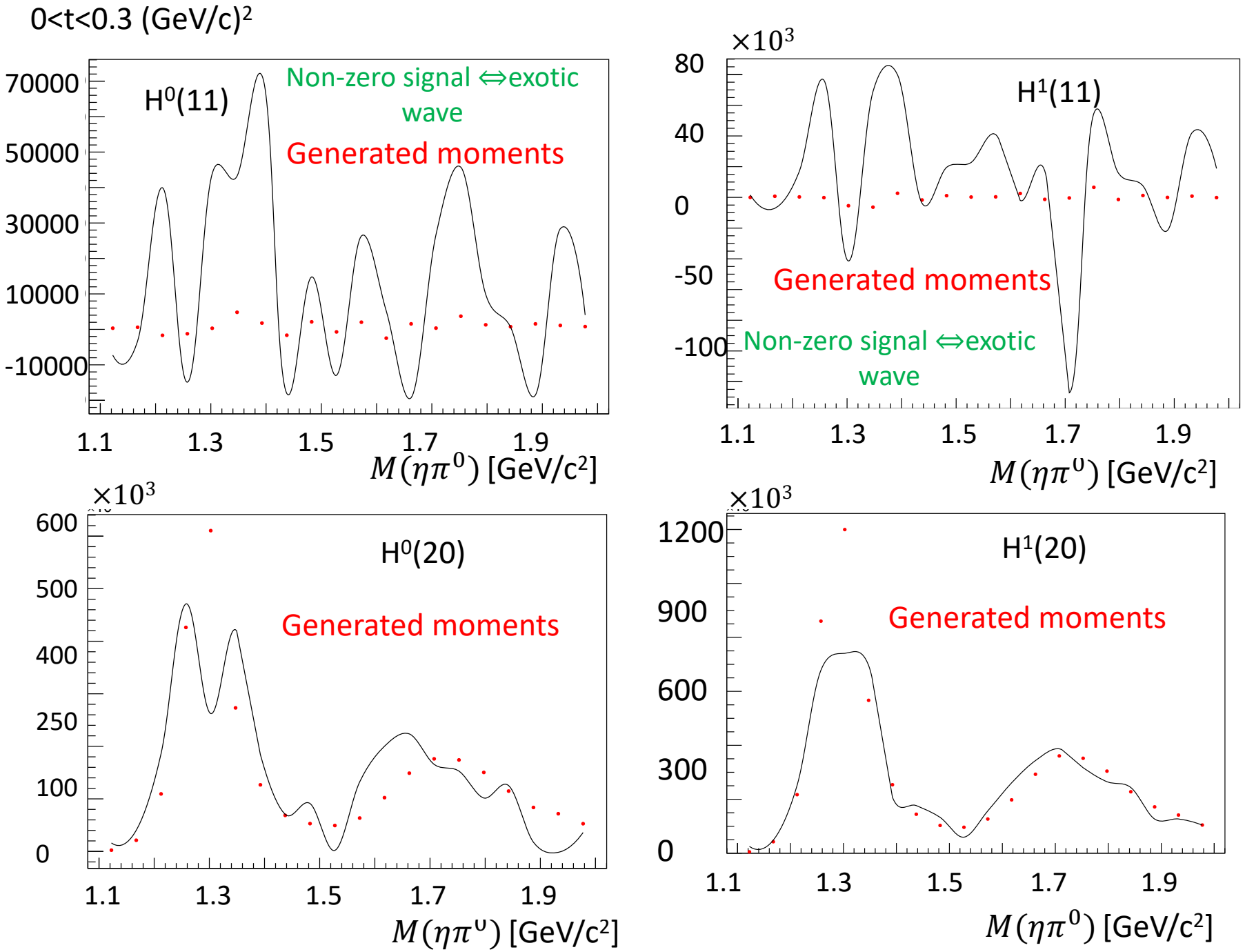
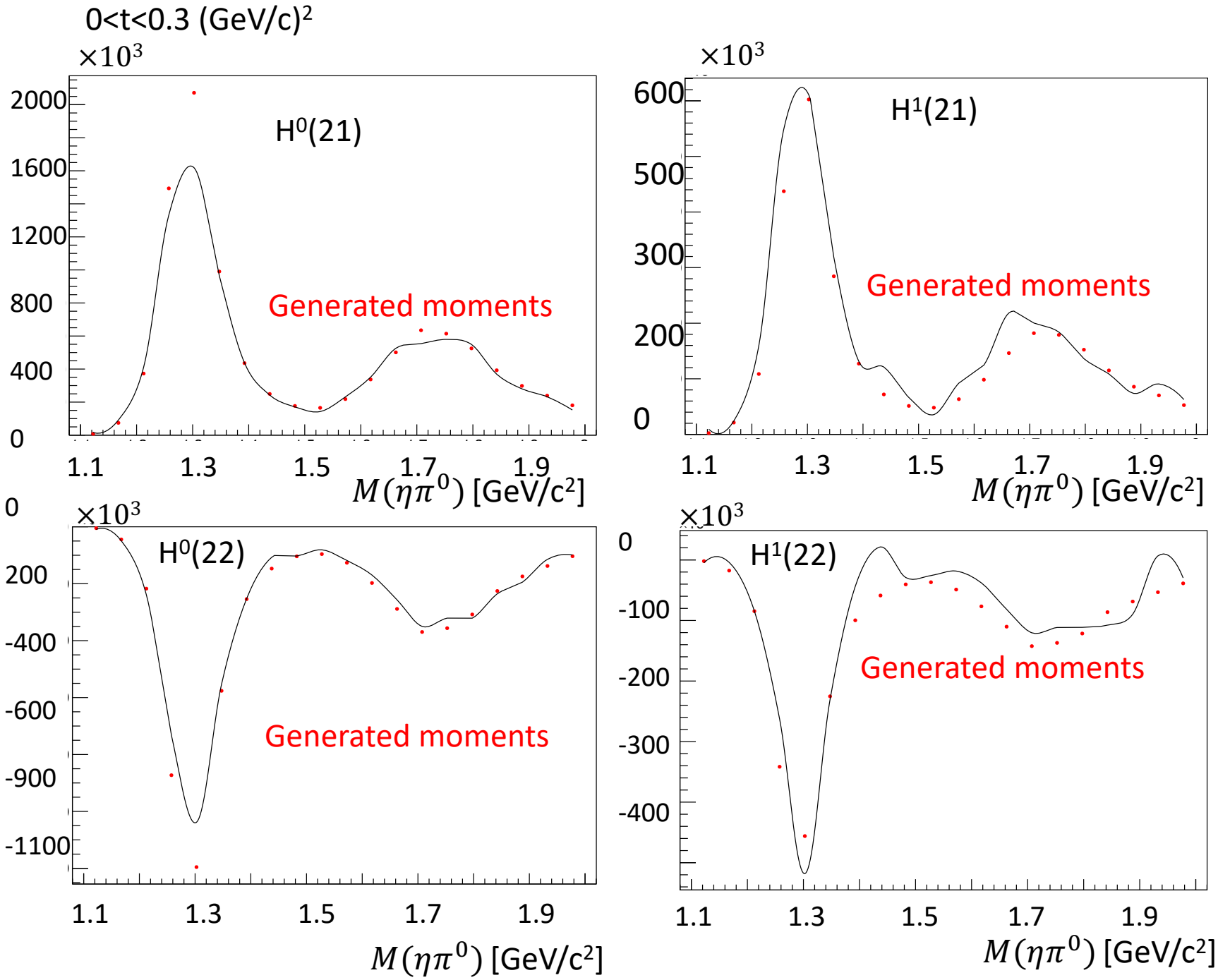
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