08:30 - 10:00 Hadron Spectroscopy Working Group - I

https://bluejeans.com/796421854

Convener: Dr. Marco Battaglieri (INFN-GE)

08:30 **HSWG Business** *20'*
Speaker: Dr. Marco Battaglieri (INFN-GE)

08:50 **JPAC update** *30'*
Speaker: Dr. Vincent Mathieu (JLab)
Material: **Slides**

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10:00 - 10:30 Coffee break

10:10 - 12:10 Hadron Spectroscopy Working Group - II

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Convener: Dr. Marco Battaglieri (INFN-GE)
Location: L102-104

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Speaker: Utsav Shrestha (Ohio University)

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HSWG

CLAS Collaboration Meeting
JLab, Mar 7 2019

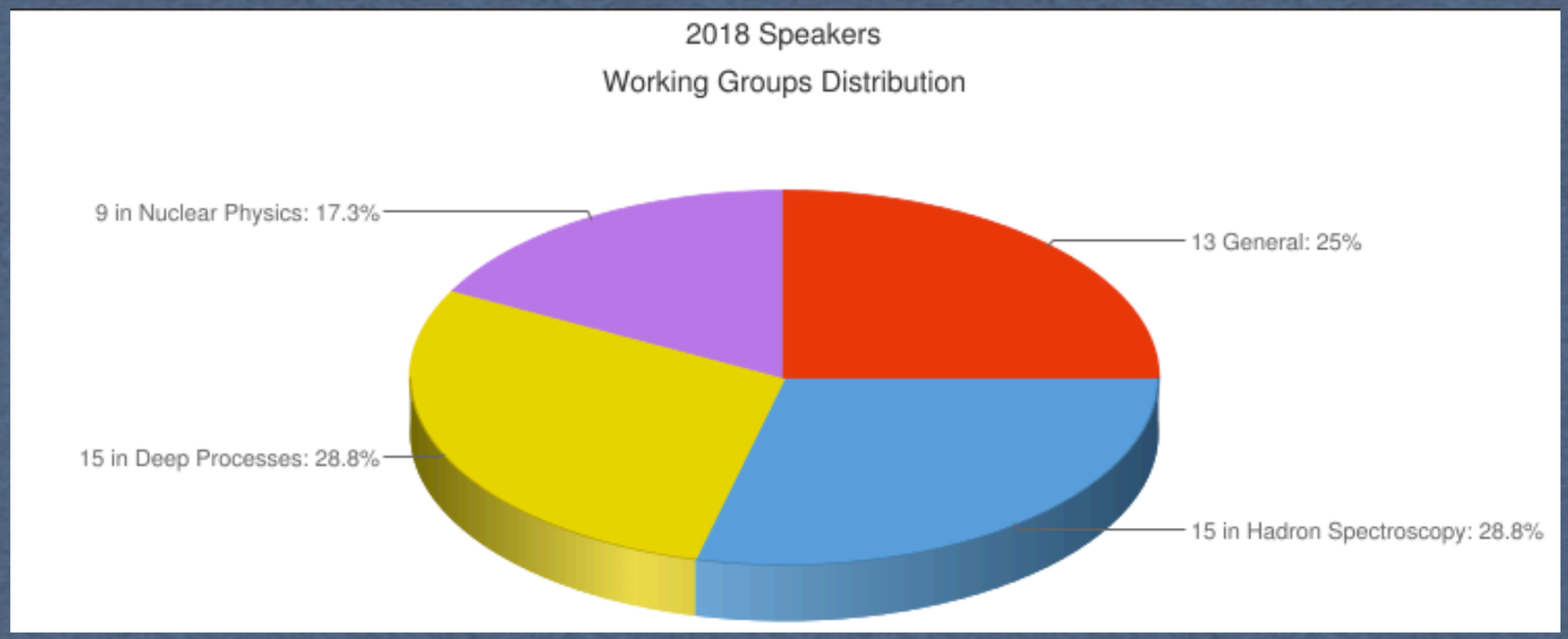
+ HS/Deep/Nuclear CLAS12 analyses joint session

Agenda

- ✳ CLAS6 data analysis
- ✳ Status of ongoing analysis (update from previous collaboration meeting)
- ✳ Dedicated (joint) session for CLAS12
  - Data processing readiness review
  - Reorganisation of analysis review process

Talks

- ✳ Over all CLAS contributions, HSWG-related are 29% in 2018
- ✳ HSWG representatives in the CSC
  - A.d'Angelo (currently CSC chair)
  - L.Guo
- ✳ JSA-TFC $18k granted for 2019



CLAS12-related Activities

- ✳ Bi-weekly HSWG meeting focused on Low-Q2 specific needs:
  - FT Calibration (in coordination with the CALCOM and FirstExperiment)
  - MesonExTrigger studies
  - pId task force
  - review the status of current analysis (similar to Fall '18 DNP preparation)
- ✳ Meeting on Tuesday at 11:00 (JLab-time) every other week
- ✳ All groups are encouraged to look at the data (low/high level) to check calibration, possible issues, …
- ✳ List of ongoing analysis on HSWG wiki page

For discussion

- ✳ Analysis framework: discussion in the plenary session
- ✳ Analysis tools validation:
  - needs to be discussed
- ✳ Analysis review optimization
  - guide lines

For the next meeting

- ✳ HSWG nominating committee (vote in July, term starts in September)

Reaction	CLAS running period	Principal Investigator(s)	Graduate Student	Adviser(s)	Contact person(s)	Status
$\gamma^* p \to \pi^0 p$ and eta p	RG-A	Andrea Bianconi, Luca Venturelli			mailto:andrea.bianconi@unibs.it	
Q^2-dependent cross sections for $\gamma^* p \to \pi^+ \pi^- p$ at $Q^2 > 2$ GeV2	RG-A	Krishna Neupane		Ralf Gothe		Underway
$\gamma^* p \to \pi^+ \pi^- p$	RG-A	Adam Thornton		Derek Glazier		Underway
3pi	RG-A	Derek Glazier		Derek Glazier		No Signal Yet
rho beam asymmetry	RG-A	Michael Dugger		Michael Dugger		Underway
Survey of photoproduced cascade states	RG-A	Michael Dugger		Michael Dugger		No Signal Yet
survey of Cascade and Omega baryons	RG-A	Nicholas Zachariou		Nicholas Zachariou		Underway
Omega- cross section	RG-A	Will Phelps				Underway
Inclusive and elastic cross section studies	RG-A	Nikolay Markov			Nikolay Markov	Under way
Single pion electroproduction in the resonance region	RG-A	Nikolay Markov			Nikolay Markov	Under way
Single pion exclusive structure functions at Q2 > 5 GeV2	RG-A	Evgeny Isupov			Evgeny Isupov	Under way
$\gamma^* p \to \pi^+ \pi^- p$ cross sections at Q2 > 5 GeV2	RG-A	Evgeny Golovach			Evgeny Golovach	Under way
Exclusive Two K-short electroproduction cross sections	RG-A	Ken Hicks			Ken Hicks	Just started
N* structure: KY cross section, pol. transfer at Q2 > 1 GeV2	RG-A	Daniel S. Carman			Daniel S. Carman	Under way
Extraction of the nucleon resonance electroexcitation amplitude from $\gamma^* p \to \pi^+ \pi^- p$ electroproduciton off protons with the CLAS12.	RG-A	Viktor Mokeev			Viktor Mokeev	Under way
Evaluation of the resonant contribution into inclusive structure functions.	RG-A	Astrid Hiller Blin			Astrid Hiller Blin	Under way
eta.pi	RG-A	Carlos Salgado		Carlos Salgado		Did not start Yet (in January)
J/psi photoproduciton near threshold	RG-A	Stepan Stepanya	Joseph Newton	Nathan Baltzell, Rafayel Paremuzyan, Valery Kubarovsky		Analysis started
η' and ω decays					Susan Schadmand	Did not start yet

- CLAS12 data analysis
- List on HSWG wiki (https://www.jlab.org/Hall-B/secure/hadron/wiki/index.php/CLAS12_Analysis_projects)
- Keep it updated

WG Reviews status

Released

Vector-Meson Photoproduction decaying to Multitrack-Final States using CLAS-g12 Data
PI: Z.Akbar
RC: John Price (Chair), Susan Schadmand , Eugene Pasyuk
Status: started on Jan 1, progressing, the committee received the author's response, NEED TO GIVE FEEDBACK ASAP

New since last meeting

Analysis of the polarization observables H and P from the reaction gamma p -> pi+ n
PI: R.Lee
RC:
Status: about to start

WG Reviews status

In progress

Measurement of the G Double-Polarisation Observable in Positive Pion Photoproduction
PI: L.Zana
RC: S.Strauch (Chair), P.Cole, D.Sokhan
Status: 1 round of comments sent on August, waiting for the response; still waiting now ….

Polarization Observables T and F in the $\vec{p}(\vec{\gamma},\pi 0)p$ Reaction
PI:H.Jiang
RC: Barry Ritchie (Chair), Volker Crede , Bryan McKinnon
Status: the group is working on major issue, after a thorough review, it is almost done

WG Reviews status

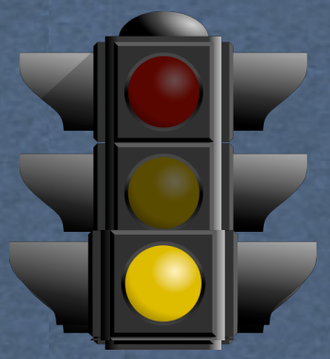
In progress

Exclusive pi- Electroproduction off the Neutron in Deuterium in the Resonance Region

PI: Y. Tian
RC: Nikolay Markov (Chair), Mikhail Bashkanov , Eugene Isupov
Status: 1st round in August, waiting for response from PI, response received, II round uploaded on Feb 8

Exclusive Photo-Production Measurement of K+Sigma*- off Quasi-Free Neutrons in Deuterium

PI: H.Lu (SCU) et al.
RC: N.Zachariou, M.Dugger, D.MacGregor
Started in 2012 (!)
Status: the PI is working on it: may be a month?



Dalitz Plot Analysis of eta' to eta pi pi − from CLAS g12 Data Set

PI: S. Ghosh
RC: V. Crede (chair), A. Rizzo, E. Pasyuk
Status: Started in July'17; first round of comments on Sept 17: no response from the PI since then.
Scarce communication with the review committee. Is the analysis dead ?????
Ankhi is taking over but a lott of work needs to be done

WG Reviews status

Photoproduction of the 3π mesons in the reaction $\gamma p \rightarrow \pi+\pi+\pi-n$ with CLAS detector at 6 GeV/c2

PI:P.Eugenio
RC: D.Glazier (chair), A.Filippi, M.Dugger
Status: 2nd round, response received, almost done

Exclusive Photo-Production Measurement of K+Sigma*- off Quasi-Free Neutrons in Deuterium

PI: H.Lu (SCU) et al.
RC: N.Zachariou, M.Dugger, D.MacGregor
Started in 2012 (!)
Status: ?????????????

Dismissed

KLambda and KSigma from FROST
PI: N.Walforf et al.
RC: S.Strauch, M.Holtrop, P.Mattione,

Radiative decay of eta' to pi+ pi- gamma from g11 data set
PI:G. Mbianda Njencheu
RC: R. Schumacher,S.Schadmand,A.Celentano

Pentaquark search in g10 by using the MMSA method
PI: Kenneth Hicks et al.
RC: Stepan Stepanyan (Chair), Lei Guo , Bryan McKinnon

Spin observables in eta meson photoproduction on the proton from FROST data
PI: R.Tucker (ArizonaU) et al.
RC: K.Livingston, J.Price, Xiangdong Wei

Actions

- Remove these analyses from the list of active analyses
- Share this information to the whole HSWG to see if ay resources could be allocated to continue (assuming full collaboration from the former PI!)

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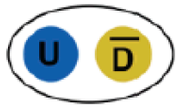
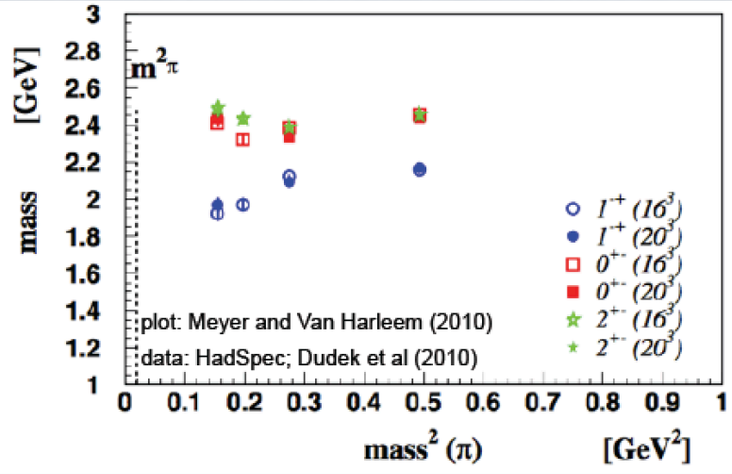
Discovering Exotic Mesons @CLAS12

Vincent MATHIEU

Ordinary mesons



$$\vec{J} = \vec{L} \oplus \vec{S}$$
$$P = -(-1)^L$$
$$C = (-1)^{L+S}$$



Examples of quantum numbers

QNs			Names		
J^{PC}	(I^G)		(I^G)		
1^{++}	(1^-)	a_1	(0^+)	f_1	f_1'
1^{--}	(1^+)	ρ_1	(0^-)	ω_1	ϕ_1
0^{-+}	(1^-)	π_0	(0^+)	η_0	η_0'
$\mathbf{1^{-+}}$	$\mathbf{(1^-)}$	$\boldsymbol{\pi_1}$	$\mathbf{(0^+)}$	$\boldsymbol{\eta_1}$	$\boldsymbol{\eta_1'}$
2^{-+}	(1^-)	π_2	(0^+)	η_2	η_2'
$\mathbf{0^{+-}}$	$\mathbf{(1^+)}$	$\mathbf{b_0}$	$\mathbf{(0^-)}$	$\mathbf{h_0}$	$\mathbf{h_0'}$
1^{+-}	(1^+)	b_1	(0^-)	h_1	h_1'
$\mathbf{2^{+-}}$	$\mathbf{(1^+)}$	$\mathbf{b_2}$	$\mathbf{(0^-)}$	$\mathbf{h_2}$	$\mathbf{h_2'}$

Meyer and Van Harleem (2010)

hybrid mesons

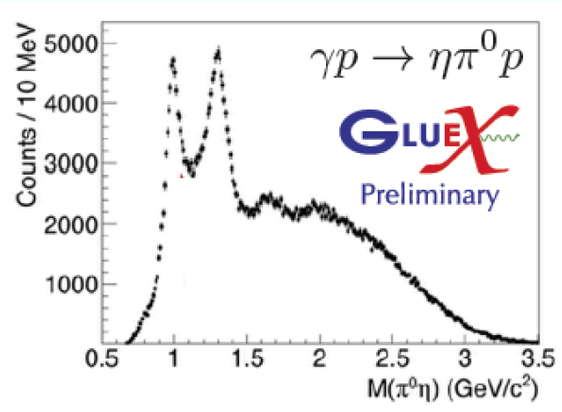
$$\eta_1 \to \eta\eta', a_2\pi, K_1 K, \ldots$$
$$\pi_1 \to \eta\pi \quad \eta'\pi, \rho\pi, b_1\pi, \ldots$$

$$\gamma p \to \eta\pi^0 p$$
$$\gamma p \to \eta\pi^- \Delta^{++}$$

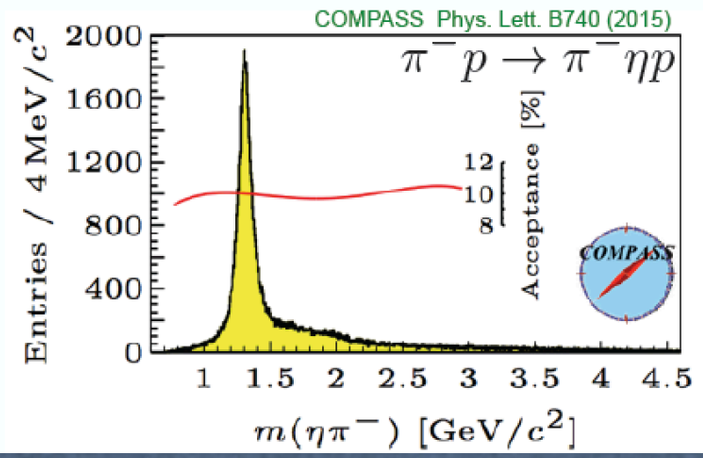
in P-wave

Eta-Pi Production

$E_{\text{beam}} = 9$ GeV

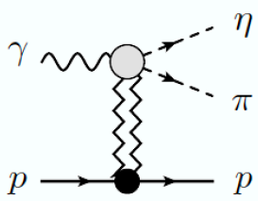


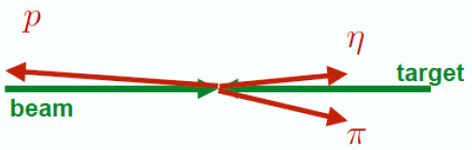
$E_{\text{beam}} = 190$ GeV

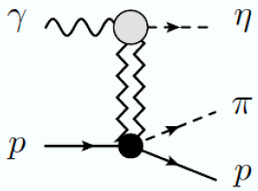


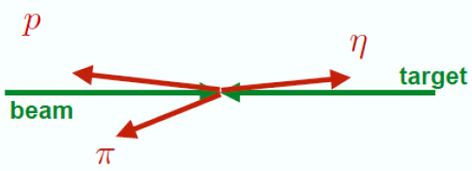
Longitudinal Plot

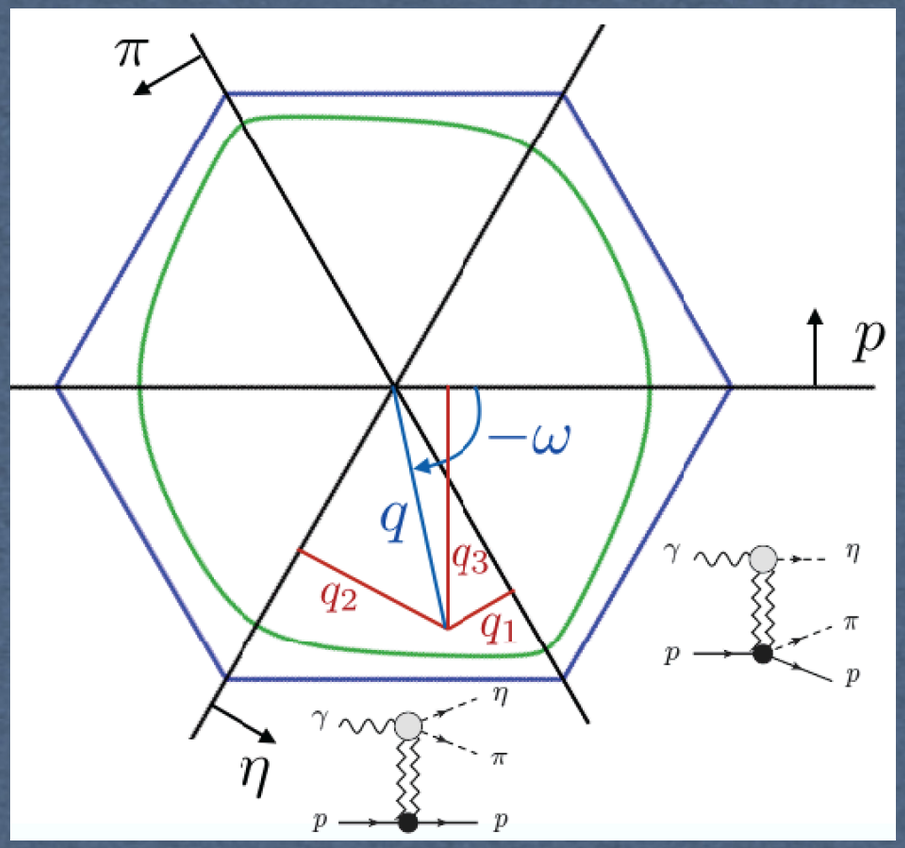
How do we select beam fragmentation ? → Boost in the rest frame



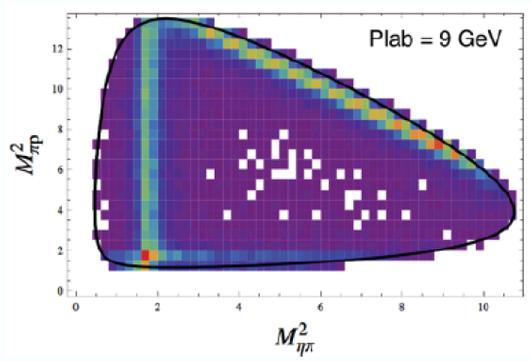


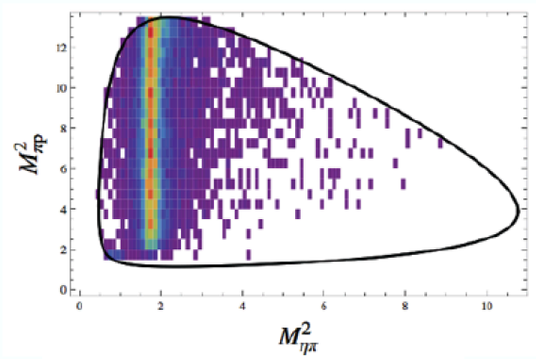


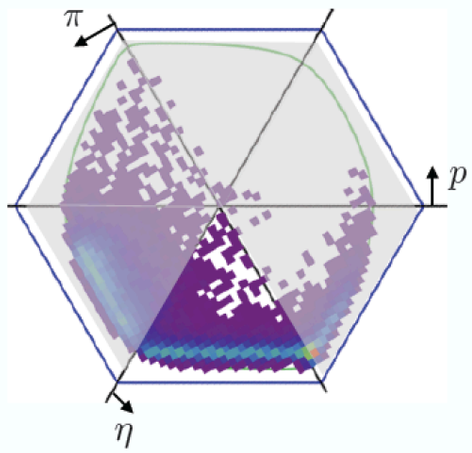


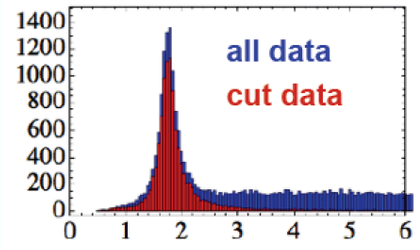


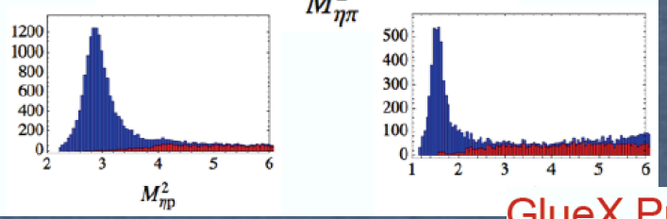
Cut in Longitudinal Angle







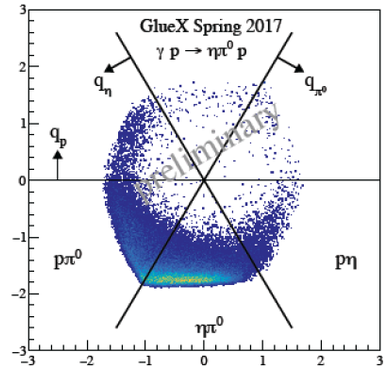


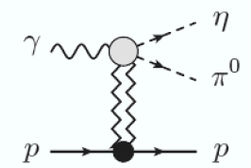


GlueX Preliminary Results

not corrected for acceptance

$\gamma p \to \eta\pi^0 p$





Measured Intensities

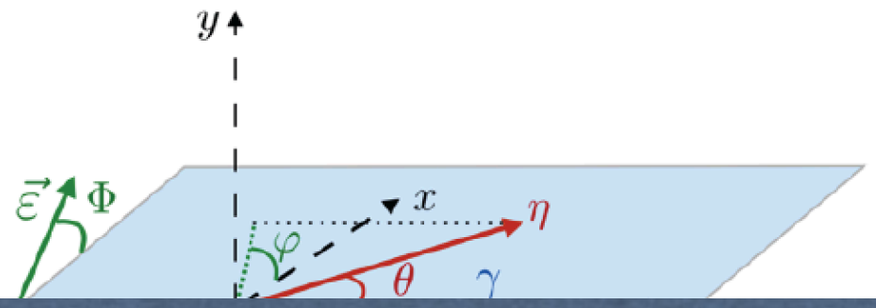
10

$$I(\Omega,\Phi) = I^0(\Omega) - P_\gamma I^1(\Omega)\cos 2\Phi - P_\gamma I^2(\Omega)\sin 2\Phi + \mathcal{O}(Q^2)$$

polarization angle

η decay angles

$\Omega = (\theta, \phi)$



Observables: Moments of Angular distribution

11

$$I(\Omega,\Phi) = I^0(\Omega) - P_\gamma I^1(\Omega)\cos 2\Phi - P_\gamma I^2(\Omega)\sin 2\Phi + \mathcal{O}(Q^2)$$

$$H^0(LM) = \frac{1}{2\pi}\int I(\Omega,\Phi)\, d^L_{M0}(\theta)\cos M\phi \,\mathrm{d}\Omega\mathrm{d}\Phi$$

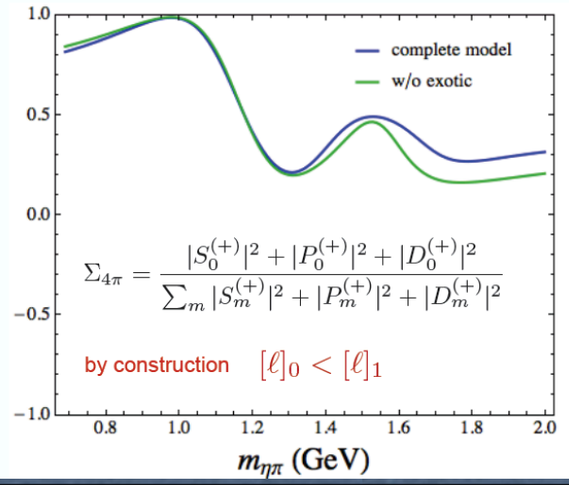
$$H^1(LM) = \frac{-1}{\pi P_\gamma}\int I(\Omega,\Phi)\cos 2\Phi\, d^L_{M0}(\theta)\cos M\phi \,\mathrm{d}\Omega\mathrm{d}\Phi$$

$$\mathrm{Im}\, H^2(LM) = \frac{1}{\pi P_\gamma}\int I(\Omega,\Phi)\sin 2\Phi\, d^L_{M0}(\theta)\sin M\phi \,\mathrm{d}\Omega\mathrm{d}\Phi$$

Beam Asymmetries

$$\Sigma_{\mathcal{D}} = \frac{1}{P_\gamma}\frac{\int_{\mathcal{D}} I^{\parallel}(\Omega) - I^{\perp}(\Omega)\mathrm{d}\Omega}{\int_{\mathcal{D}} I^{\parallel}(\Omega) + I^{\perp}(\Omega)\mathrm{d}\Omega}$$

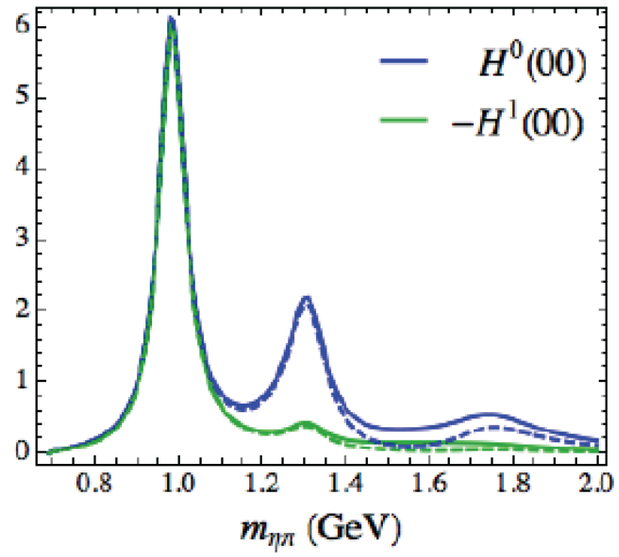
$\Sigma_{4\pi}$ = fully integrated

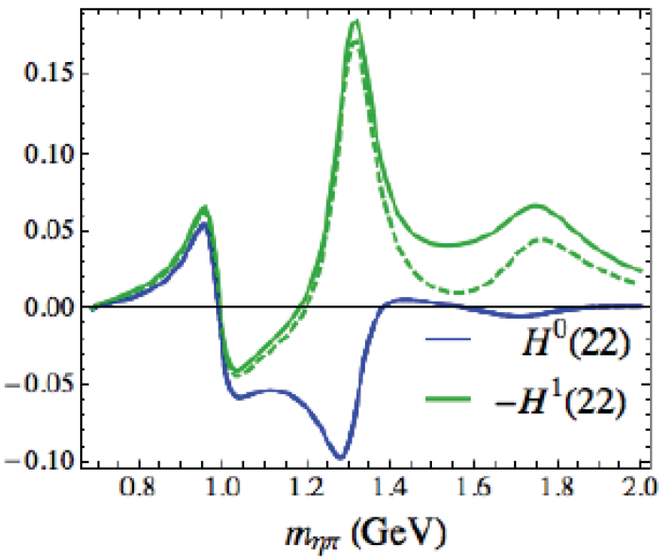


$$\Sigma_{4\pi} = \frac{|S_0^{(+)}|^2 + |P_0^{(+)}|^2 + |D_0^{(+)}|^2}{\sum_m |S_m^{(+)}|^2 + |P_m^{(+)}|^2 + |D_m^{(+)}|^2}$$

by construction $[\ell]_0 < [\ell]_1$

Moments



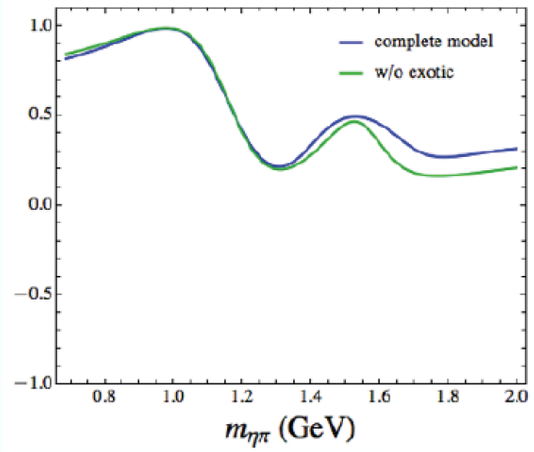


solid lines: *S* + *P* + *D* waves

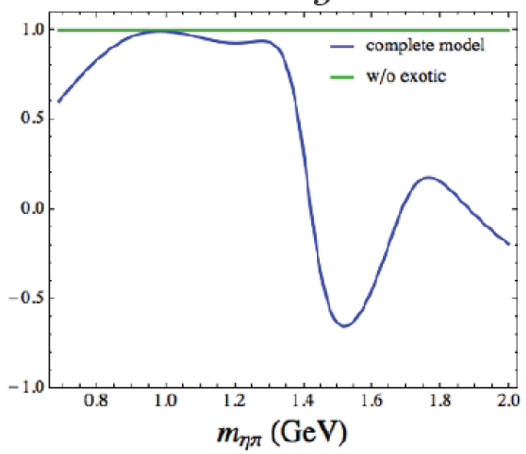
dashed lines: *S* + *D* waves

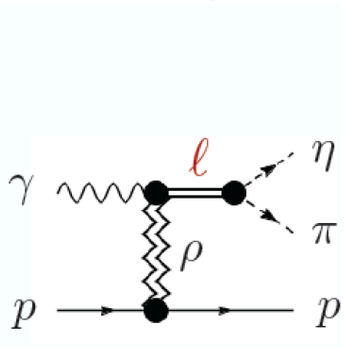
Beam Asymmetries

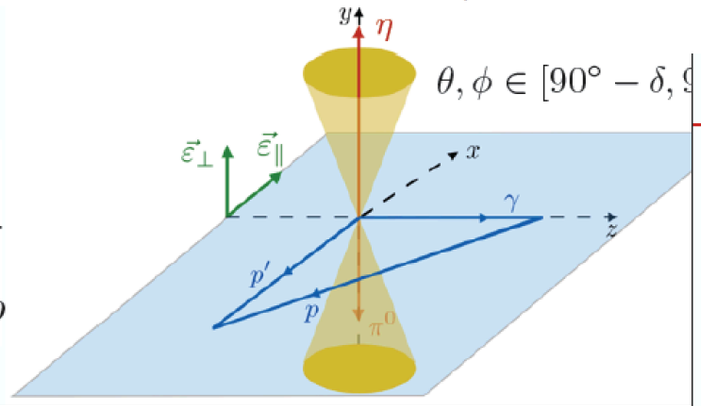
$\Sigma_{4\pi}$



Σ_{y}



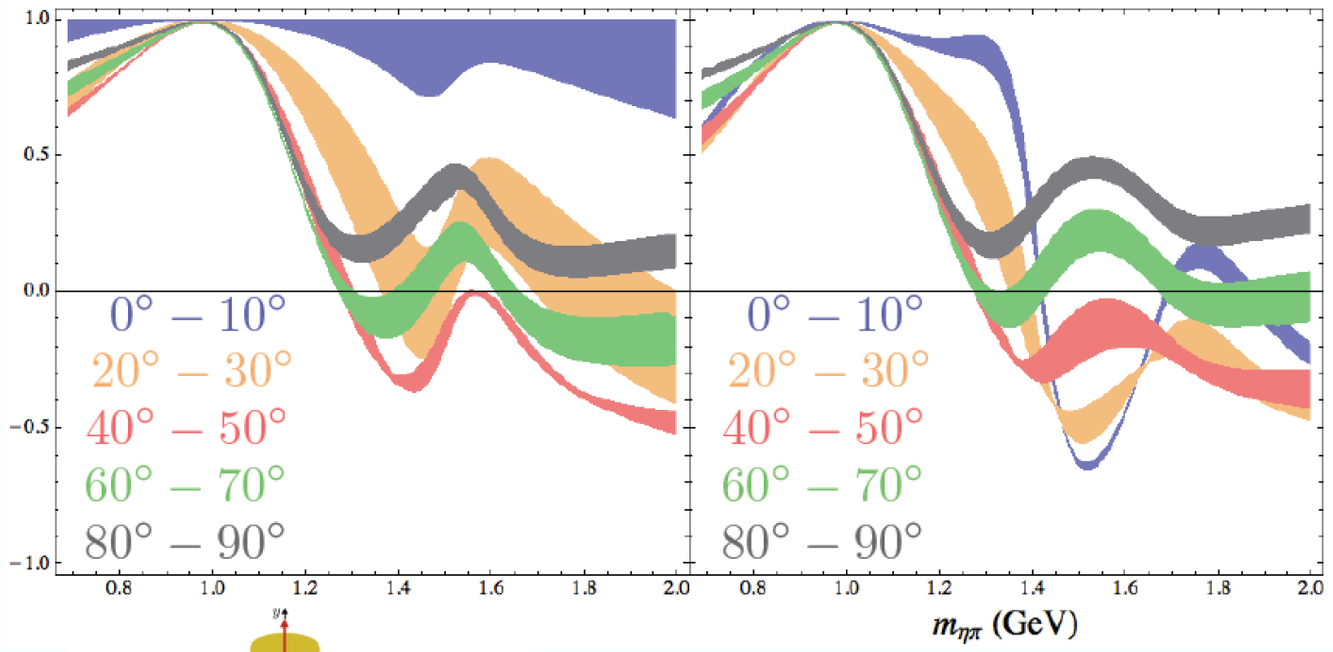


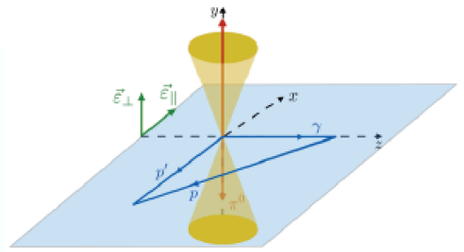


Beam Asymmetries: $\Sigma_{y\pm\delta°}$

only S and D waves

S, P and D waves





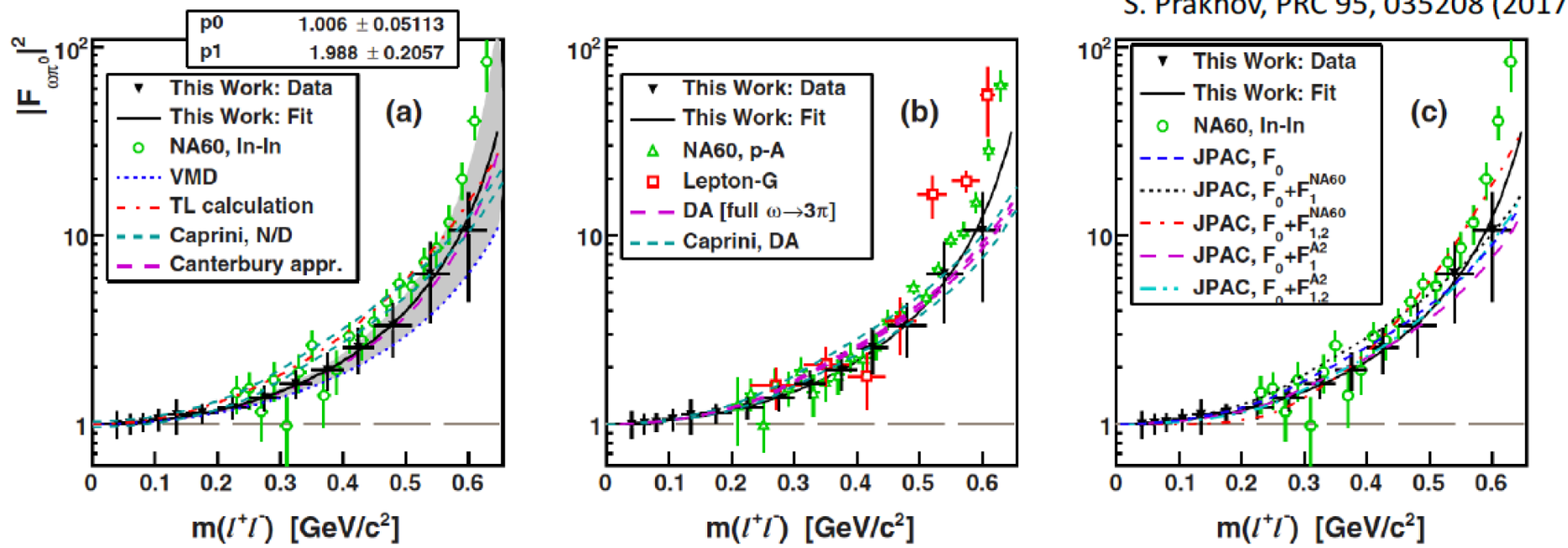
with an opening angle greater than 30° the observables is not sensitive to the P-wave (with our model)

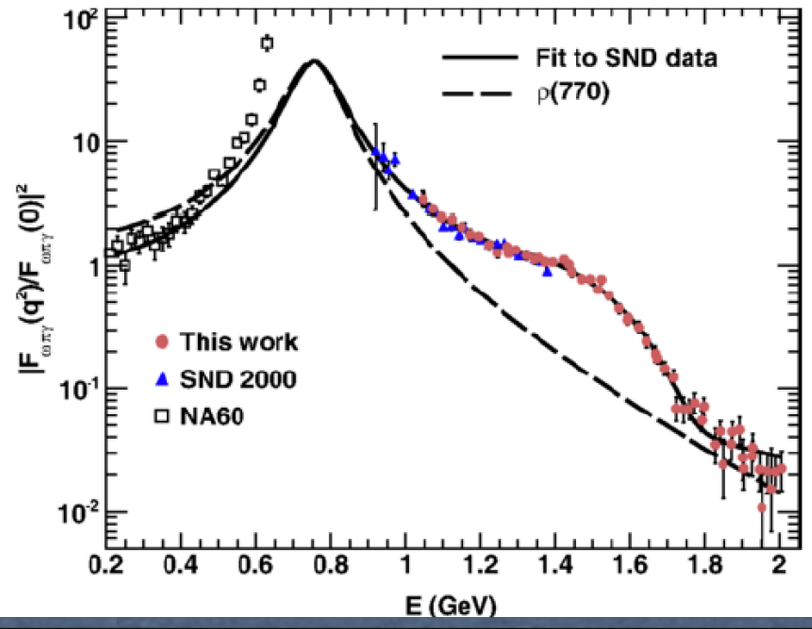
An update on omega->pi0e+e- analysis from g12

Susan Schadmand, IKP

transition form factor of the ω meson

S. Prakhov, PRC 95, 035208 (2017)



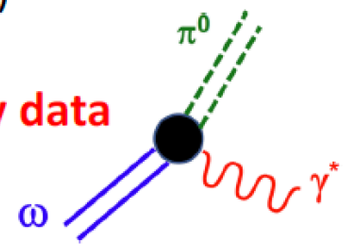


M. N. Achasov *et al.*, Phys. Rev. D 94, (2016) 112001

SND $e^+e^- \to \omega\pi^0$ cross section

fitted vector meson dominance model (three ρ-like states)

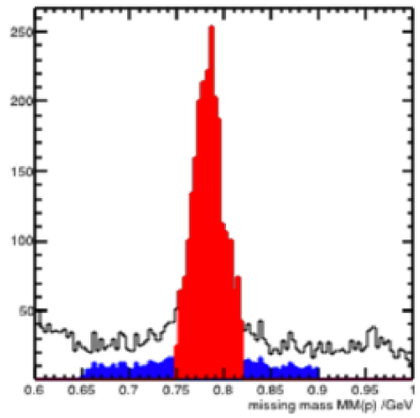
conflict with decay data

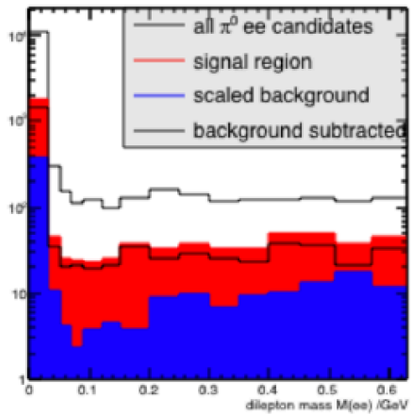


preliminary look at ω-π⁰ transition form factor

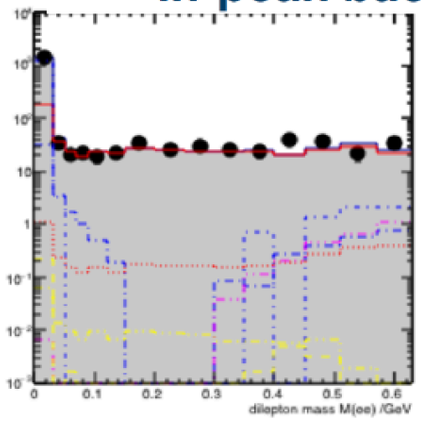
$$\gamma p \to p\omega$$

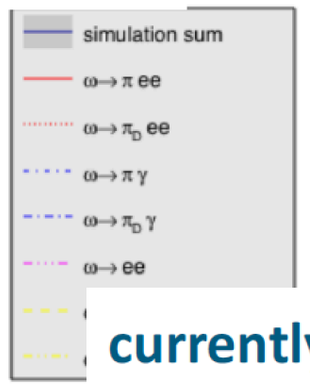
smooth background subtraction



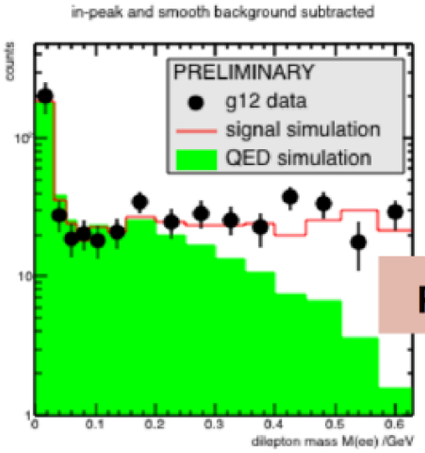


in-peak background

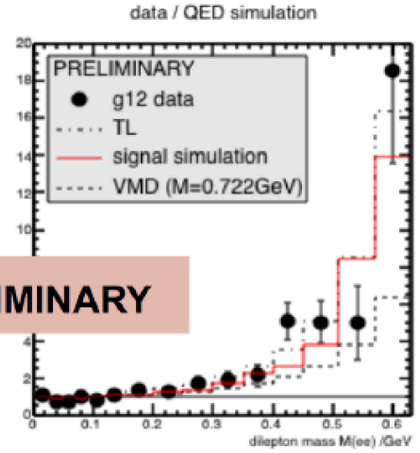




in-peak and smooth background subtracted



data / QED simulation



PRELIMINARY

simulations for in-peak backgroun

- **external conversion** at small
- **combinatorics** at large masse
- influence of rho/omega dilepto

- effect of (strict) cut-based anal
- **new analysis**
  - **statistics**
  - **combinatorics**

preliminary analysis:
so far, consistent with A2 result (and 'extended' VMD)

C. Terschlüsen and S. Leupold, Phys. Lett. B 691, 191 (2010)

currently

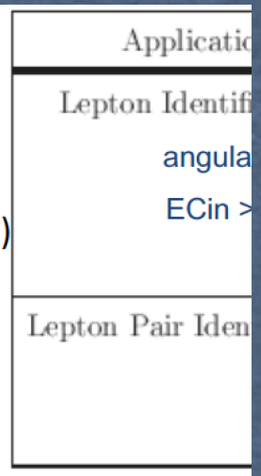
- the available trees:
  - g7leptons
  (based on CLASnote-2006-???)
  - 1 and only one p, e-, e+

- want for new trees:
  - full multiplicities
  - charged particles
  with info on g7lepton parameters

- **have now from clasevent (pass1 presorts)**
  - **MaybeLeptons (EC or CC or TOF)**
  - **pi+, pi- included in the array**

- check on:
  - g7lepton pair multiplicity
  - lepton pair multiplicity for varied conditions

- **goal:**
  - **improved statistics (doubtful)**
  - **systematic study of lepton cuts**
  - **study combinatorics**



Analysis of the reaction $\gamma p \rightarrow p\pi^0\eta$ with the g12 dataset

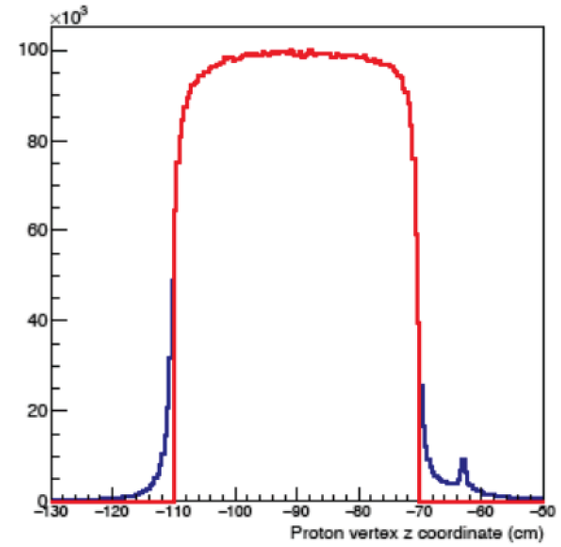
A.Celentano

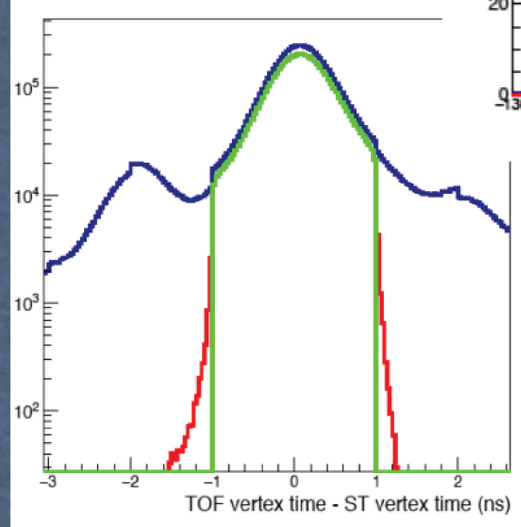
Runs selection:

- Using g12runs –t pass1 –t flux –i
- Selecting only runs after 56653 (trigger)
- 462 runs selected, 48403 BOS files

- Due to the pseudoscalar nature of the two mesons, the $\pi^0\eta$ final state is a good candidate to search for exotics. **Any P-wave resonance would be a 1^{-+} exotic state.**
- This channel has been investigated by past experiments (VES, **E852**, Crystal Barrel): a possible exotic signal - π_1 (1400) - has been seen but still a definite answer is missing.
- I analyze the photo-production $\gamma p \rightarrow p\pi^0\eta$ reaction using data from the CLAS-g12 dataset, exploiting the two-photons decay of both mesons
  - **Large statistics**
  - **High-energy photon beam**
  - **Trigger optimized for neutrals in the final state**

Proton vertex cut:
-110 cm < vz < -70 cm

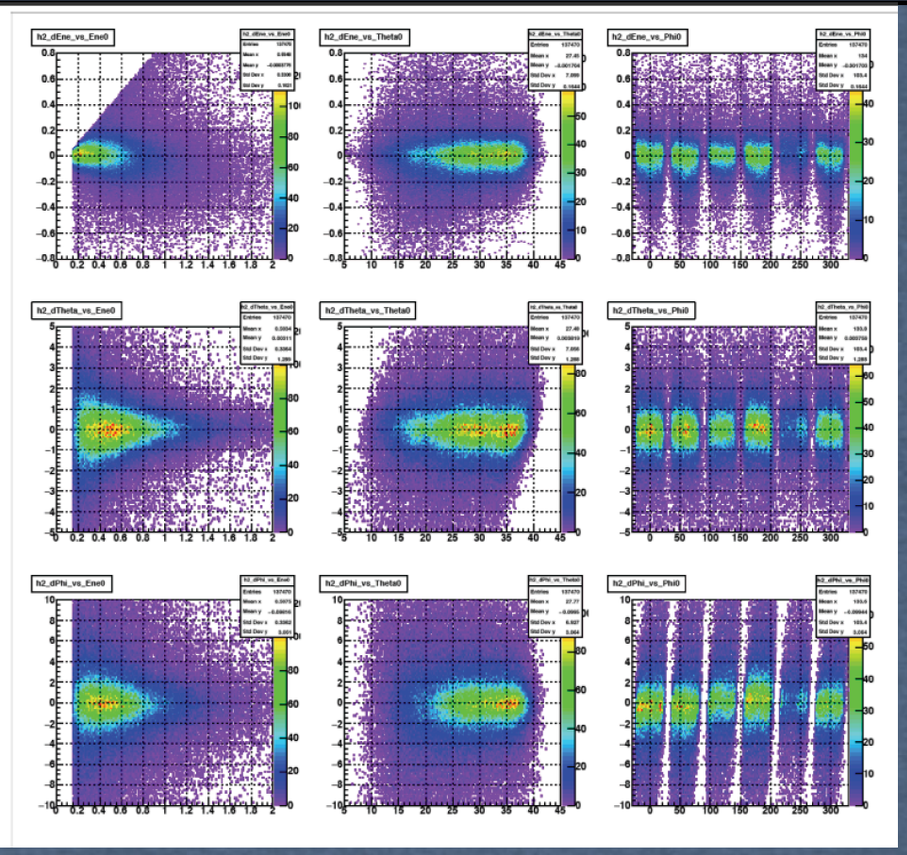




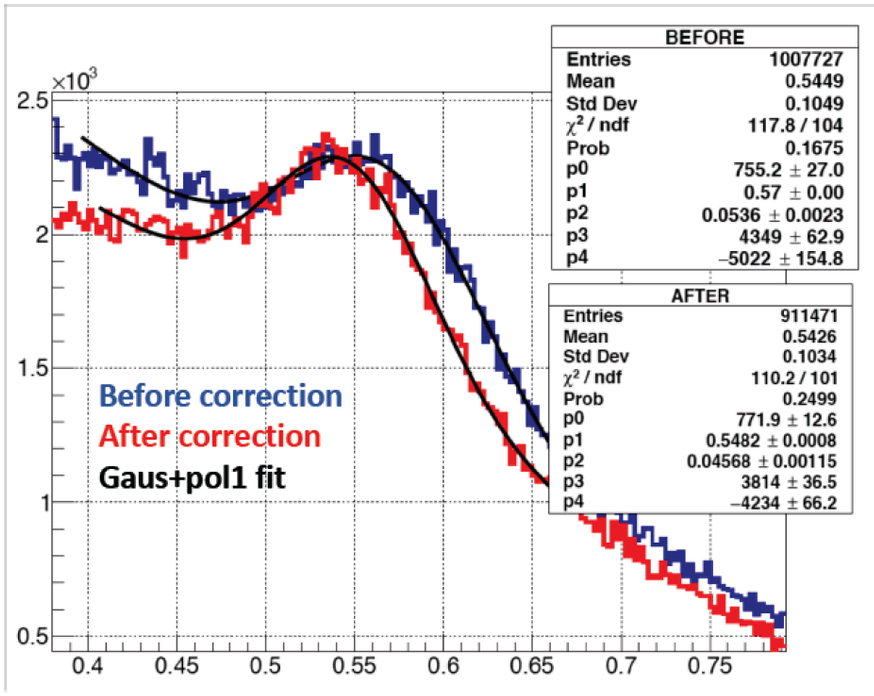
TOF vertex time – ST-time

EC photon corrections and covariance matrix DATA

- $\Delta = x_T - x_M \; vs \; x_T$ for g12 photons, where "x" is $E \; - \; \theta - \varphi$
- No major shifts are present
- Following corrections have been implemented
  - μ_{EE} , $\mu_{\theta\theta}$, $\mu_{\varphi\varphi}$ $(first\ order)$
  - $\mu_{E\varphi}$, $\mu_{\theta\varphi}$ $(second\ order)$



- π^0 and η invariant mass from two photons decay



Kinematic fit with neutrals in g12

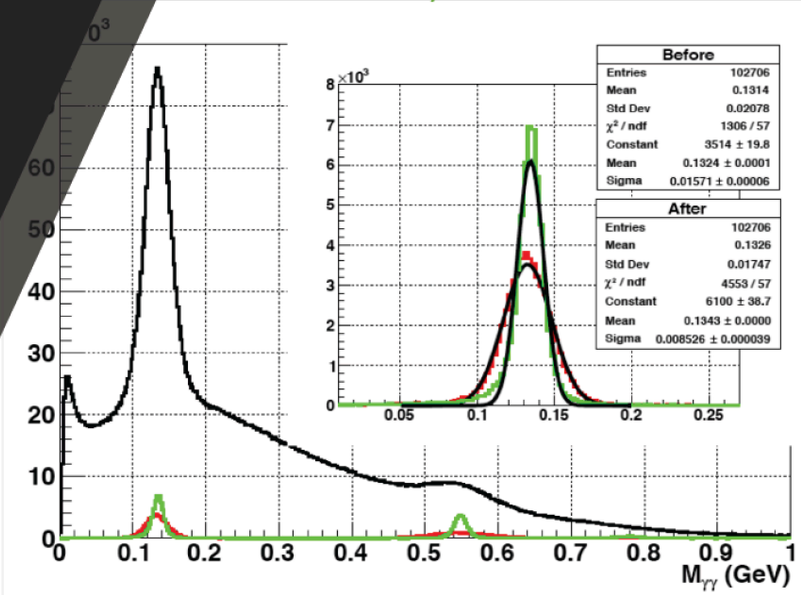
- g12 has a working package for kin. fit on reactions involving only charged particles
- I extended it to work for photons – using the covariance matrix I derived.
  - Resolutions factor are over-estimated: the contribution from missing photon obtained from the kin. fit in the $\gamma p \; \rightarrow p\pi^0 \rightarrow pe^+e^-(\gamma)$ reaction is re-absorbed in the measured photon resolution
  - I tuned the kin. fit with neutrals on the reaction $\gamma p \; \rightarrow p\gamma\gamma$, introducing 3 global scale factors for the resolution
  - Best configuration is that providing the smallest normalized CL slope in the range (0.5-1)

Two photons invariant mass

All events

CL> 0.1, original 4-momenta

CL> 0.1, corrected 4-momenta



Reaction selection with sPlot technique

Technique used to isolate events belonging to the $\gamma p \to p\pi^0\eta$, based on the knowledge of the PDF for a "discriminating" variable (can be more than one)

Allows to determine event-by-event weight for each event source (typically signal and background)

Application to this reaction:

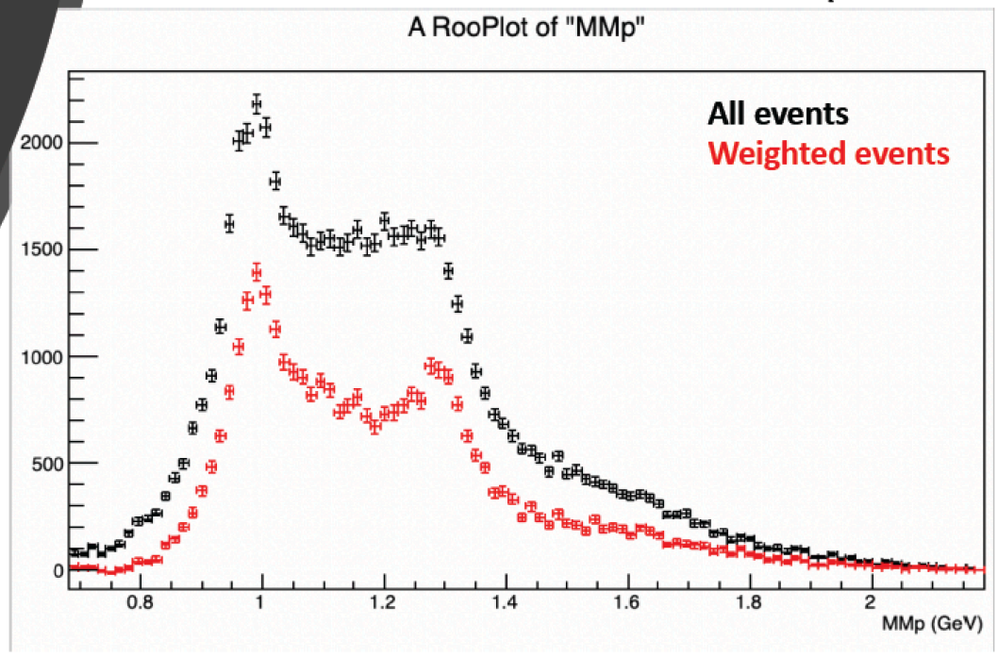
- Discriminating variable: $M_{\gamma_3\gamma_4}$
- Two events sources: signal / background
- Signal PDF: Gaus w exponential tails
- Background PDF: polynomial

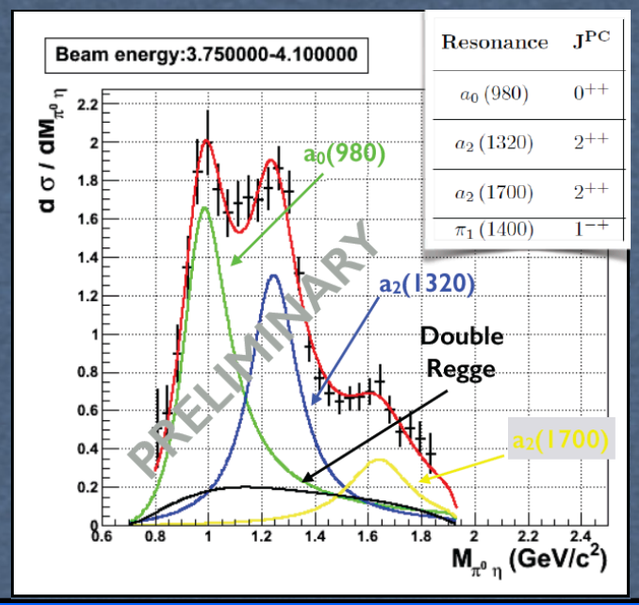
Only events with $M_{\gamma_3\gamma_4}$ in the range (0.4-0.7) GeV were considered

Event weight for source "n", among the Ns sources.
f_j is the PDF for source j, evaluated at event *e*

$$ {}_s\mathcal{P}_{\mathrm{n}}(y_e) = \frac{\sum_{j=1}^{\mathrm{N}_s} \mathbf{V}_{\mathrm{n}j} f_j(y_e)}{\sum_{k=1}^{\mathrm{N}_s} N_k f_k(y_e)} $$

Other variables: MM_p





old g11 analysis

Select events with trigger bit 1 or 4 set, having at least two photons in different EC sectors, both with large (>1 GeV) energy. These should satisfy by design trigger bit 5.

Events with bit #5 set

$$ \varepsilon_{ECP\times 2} = \frac{N_{(1-or-4)\&\&5}}{N_{1-or-4}} $$

Total number of events

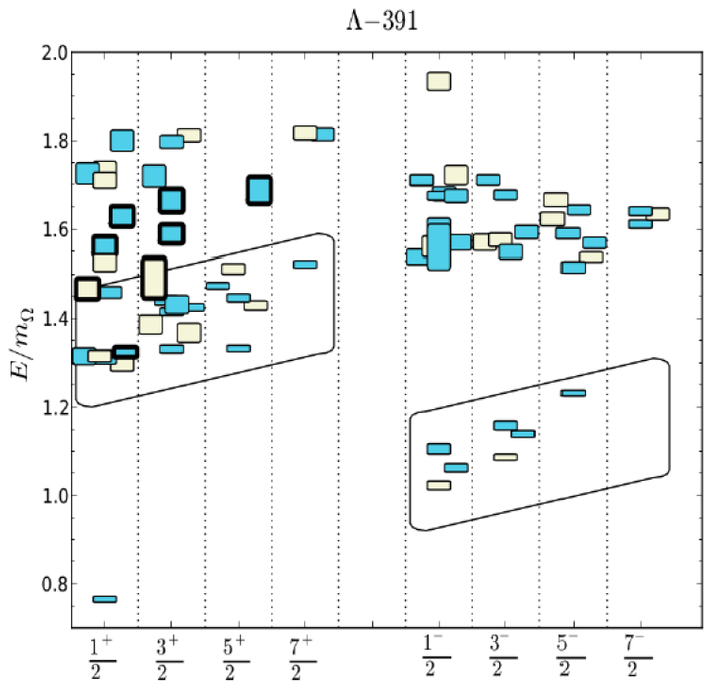
= 83.6+ 0.7%

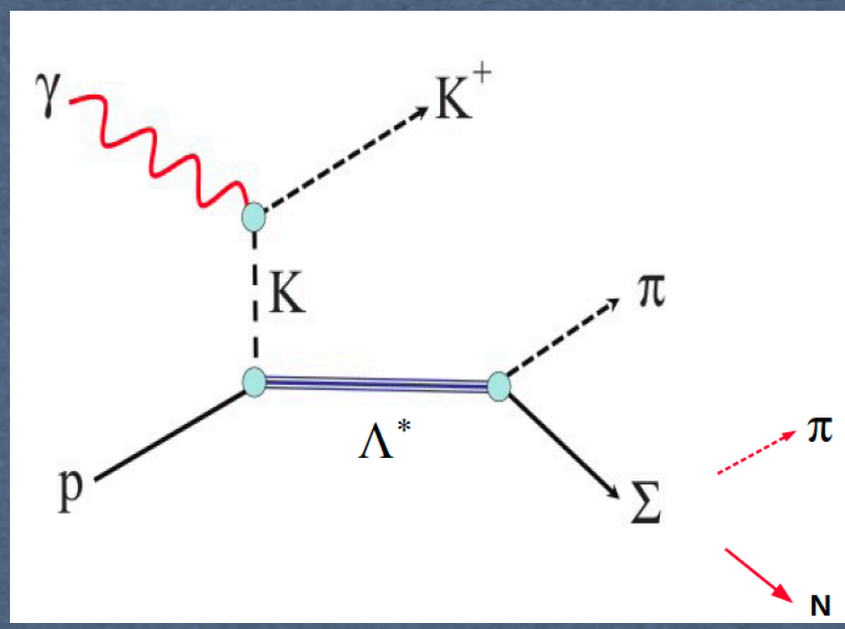
Photoproduction of Λ* Resonances at CLAS

U. Shrestha, T. Chetry and K. Hicks
Ohio University

Λ*

J^P	$(D, L_N^P)\,S$		Octet members			Singlets
$1/2^+$	$(56,0_0^+)$	$1/2\,N(939)$	$\Lambda(1116)$	$\Sigma(1193)$	$\Xi(1318)$	
$1/2^+$	$(56,0_2^+)$	$1/2\,N(1440)$	$\Lambda(1600)$	$\Sigma(1660)$	$\Xi(1690)^\dagger$	
$1/2^-$	$(70,1_1^-)$	$1/2\,N(1535)$	$\Lambda(1670)$	$\Sigma(1620)$	$\Xi(?)$	$\Lambda(1405)$
				$\Sigma(1560)^\dagger$		
$3/2^-$	$(70,1_1^-)$	$1/2\,N(1520)$	$\Lambda(1690)$	$\Sigma(1670)$	$\Xi(1820)$	$\Lambda(1520)$
$1/2^-$	$(70,1_1^-)$	$3/2\,N(1650)$	$\Lambda(1800)$	$\Sigma(1750)$	$\Xi(?)$	
				$\Sigma(1620)^\dagger$		
$3/2^-$	$(70,1_1^-)$	$3/2\,N(1700)$	$\Lambda(?)$	$\Sigma(1940)^\dagger$	$\Xi(?)$	
$5/2^-$	$(70,1_1^-)$	$3/2\,N(1675)$	$\Lambda(1830)$	$\Sigma(1775)$	$\Xi(1950)^\dagger$	
$1/2^+$	$(70,0_2^+)$	$1/2\,N(1710)$	$\Lambda(1810)$	$\Sigma(1880)$	$\Xi(?)$	$\Lambda(1810)^\dagger$
$3/2^+$	$(56,2_2^+)$	$1/2\,N(1720)$	$\Lambda(1890)$	$\Sigma(?)$	$\Xi(?)$	
$5/2^+$	$(56,2_2^+)$	$1/2\,N(1680)$	$\Lambda(1820)$	$\Sigma(1915)$	$\Xi(2030)$	
$7/2^-$	$(70,3_3^-)$	$1/2\,N(2190)$	$\Lambda(?)$	$\Sigma(?)$	$\Xi(?)$	$\Lambda(2100)$
$9/2^-$	$(70,3_3^-)$	$3/2\,N(2250)$	$\Lambda(?)$	$\Sigma(?)$	$\Xi(?)$	
$9/2^+$	$(56,4_4^+)$	$1/2\,N(2220)$	$\Lambda(2350)$	$\Sigma(?)$	$\Xi(?)$	



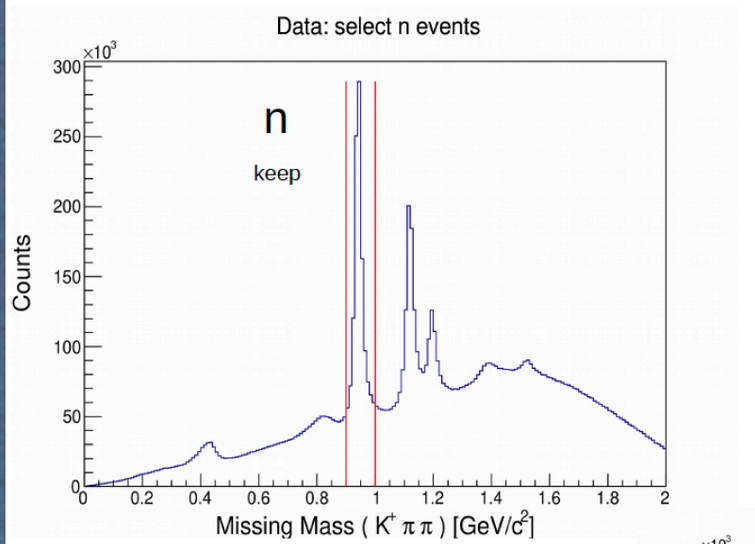


$$\gamma + p \rightarrow K^+ + \Lambda^*$$

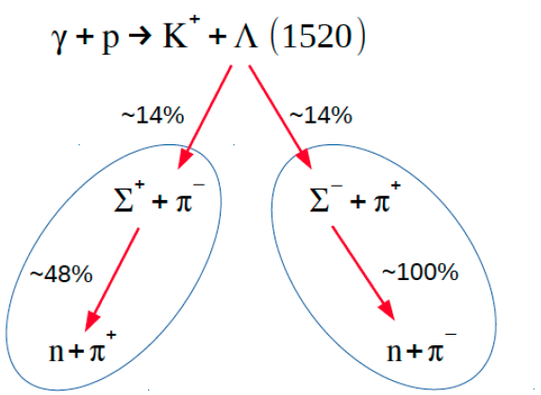
$$\Lambda^* \rightarrow \Sigma^+ + \pi^-$$

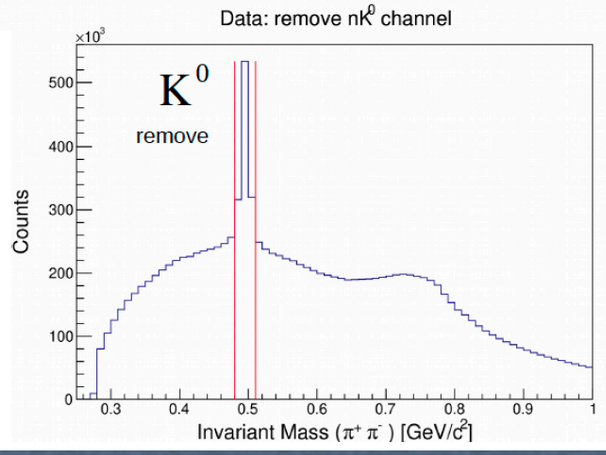
$$\Lambda^* \rightarrow \Sigma^- + \pi^+$$

Cuts



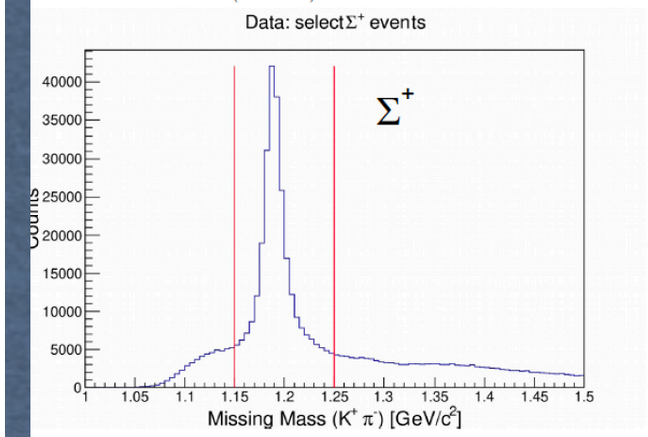
$0.9 < MM(K^+\pi\pi) < 1.0$ [GeV]



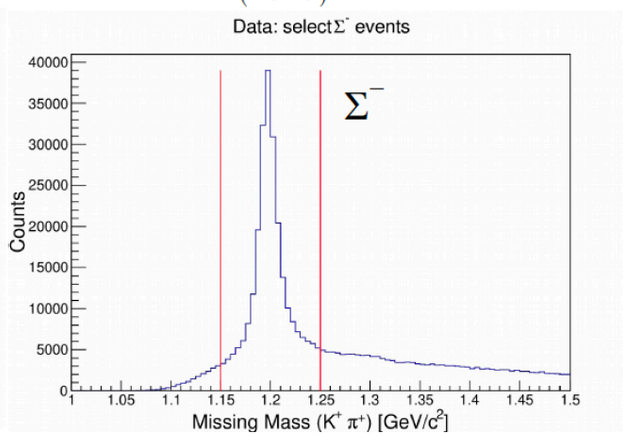


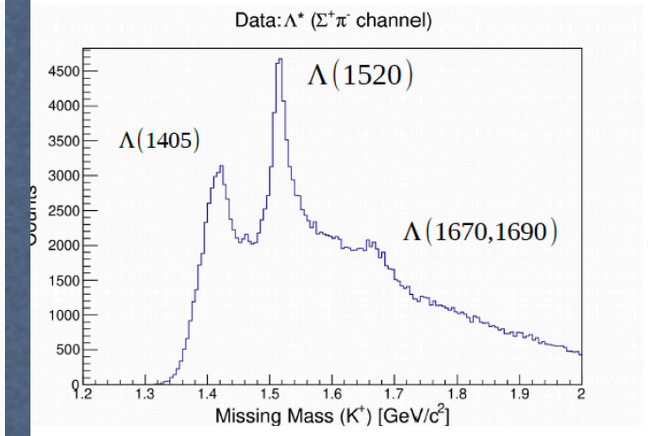
Cuts

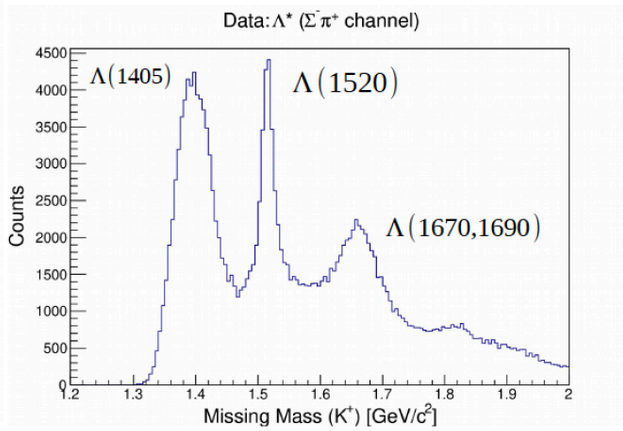
$\Lambda(1520) \rightarrow \Sigma^+ + \pi^-$

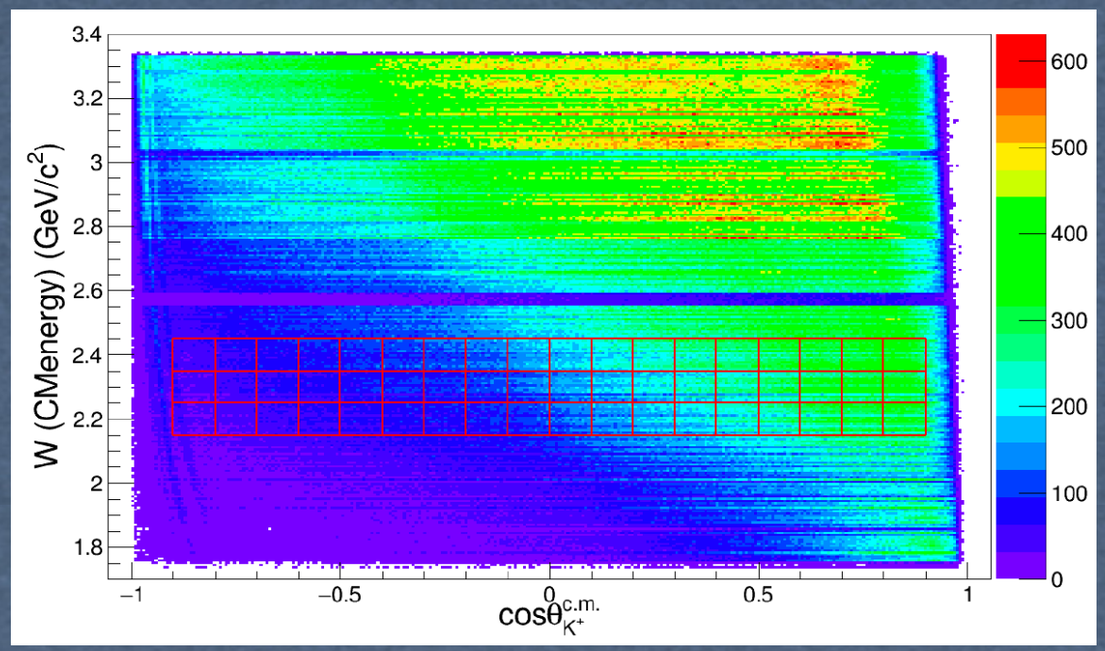


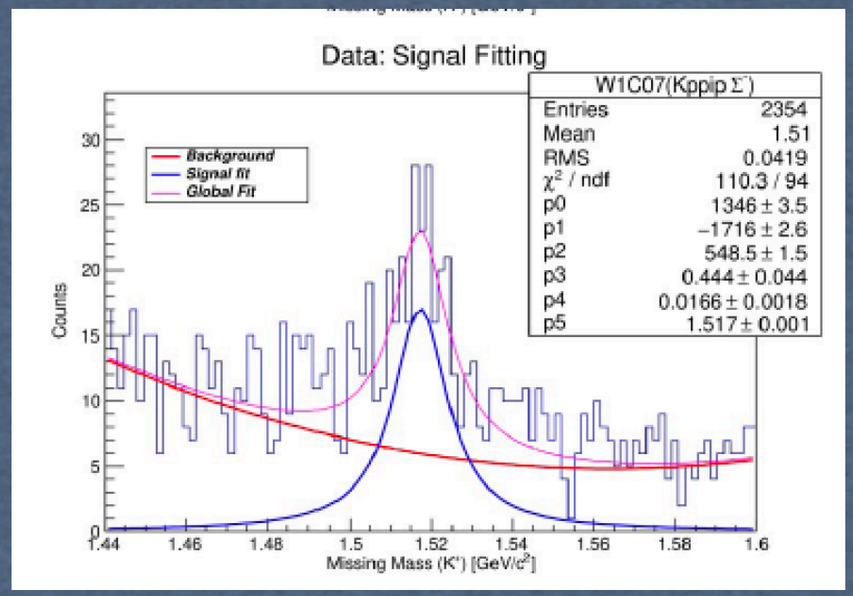
$\Lambda(1520) \rightarrow \Sigma^- + \pi^+$





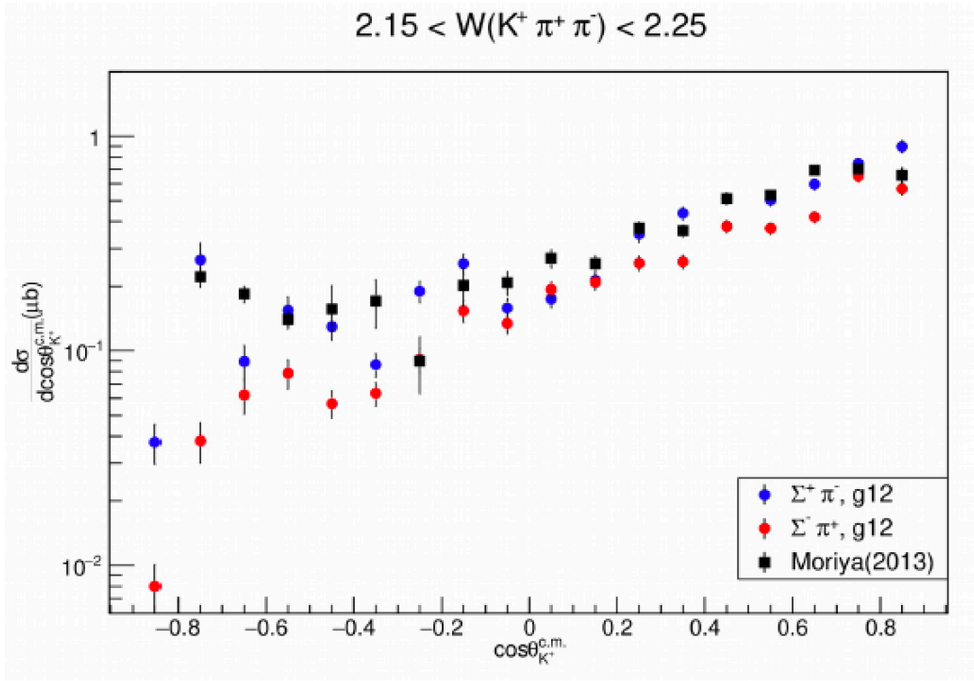


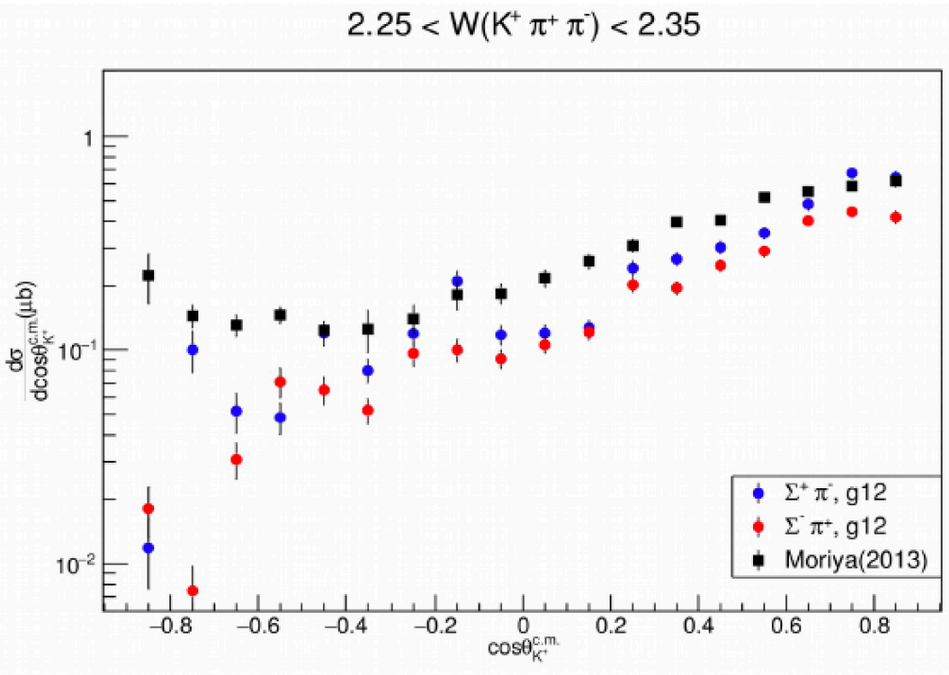


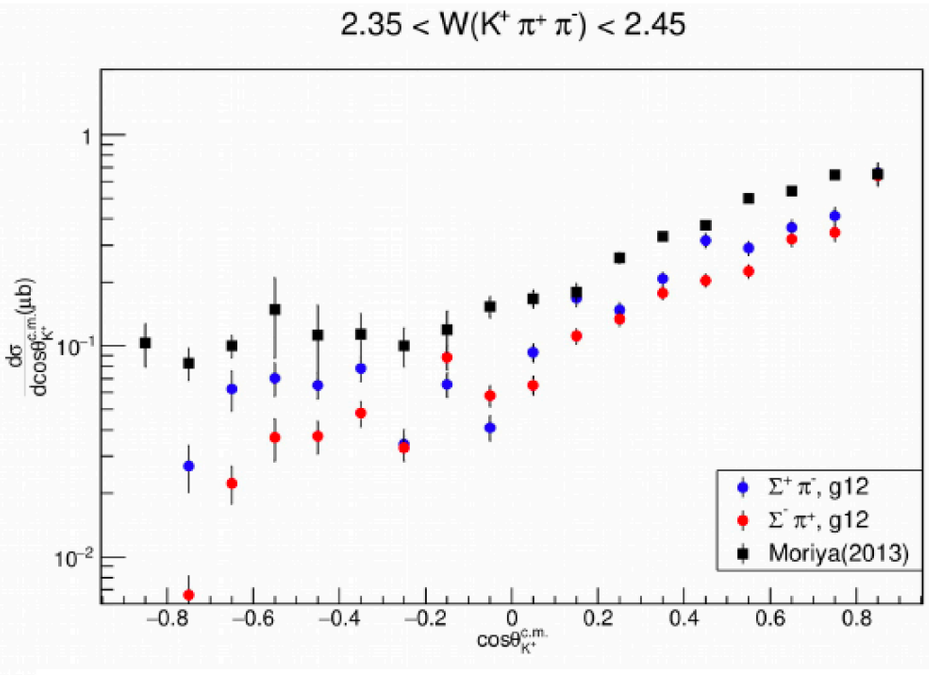


Differential Cross-section

Λ(1520) dcs for $\Sigma^+\pi^-$ & $\Sigma^-\pi^+$ channels with g11 CLAS results







Preliminary!!!

The np -> d π^0 reaction measured with g11 data

K. Hicks and N. Compton (Ohio U.)

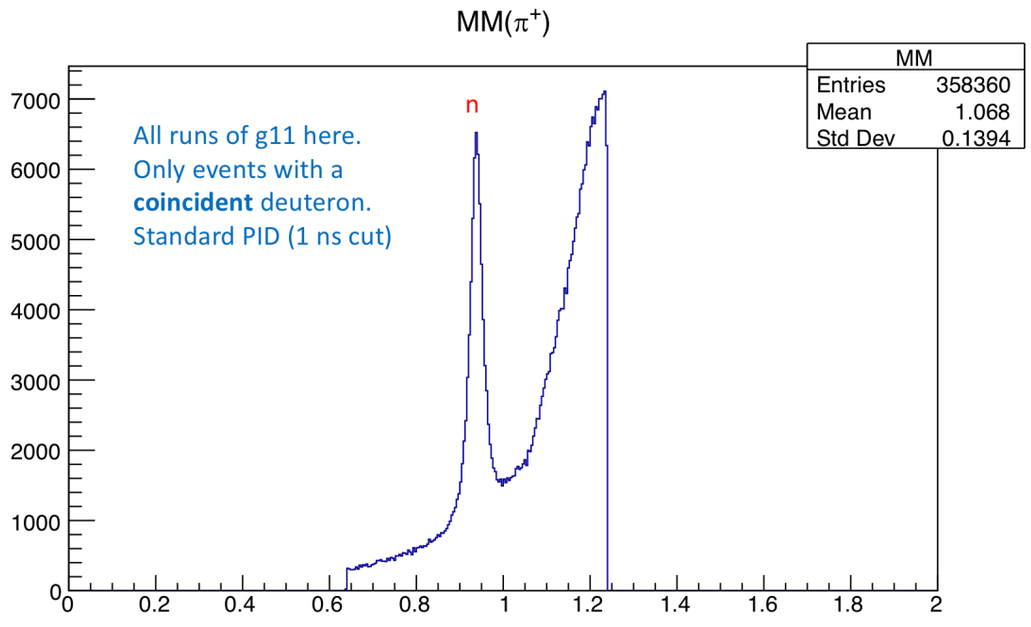
Motivation

- We want to demonstrate that secondary-scattering reactions are possible to measure with CLAS
  - Some hadronic reactions are possible where a beam can't be produced.
  - Example: Lambda-proton scattering, K0-proton scattering, etc.
  - To demonstrate it, we need to show we can reproduce a known reaction.
- Additionally, neutron reactions are hard to measure
  - There are few (none?) existing data for the np -> d π^0 reaction.
  - There is existing data on pp -> d π^+, which is related by isospin.
  - These data strengthen the case for a N-Δ resonance from other reactions.

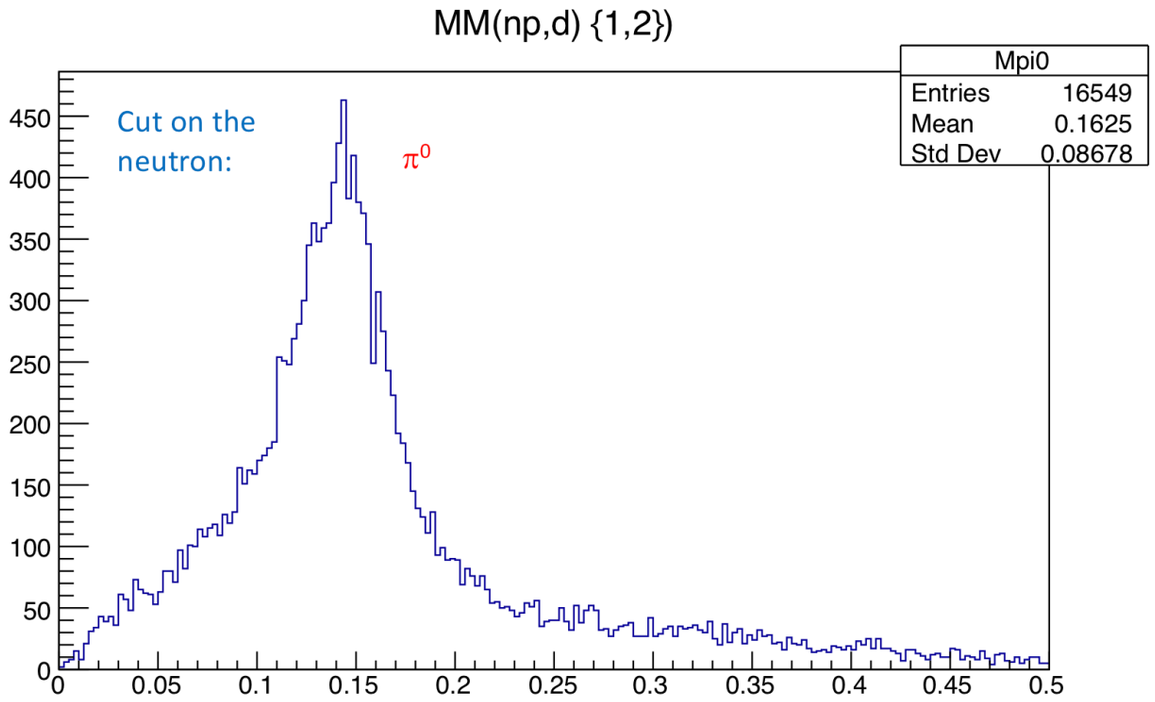
What do we measure

- Incident beam/target: GeV photons on 40-cm LH2 target
- Detected particles: coincidence of π^+ and deuteron.
  - At first, this sounds ridiculous: γp --> d π^+ violates: baryon #, charge conserv.
- Two-step process:
  - Step 1: produce a neutron: γp --> π^+ n
  - Step 2: neutron rescatters: np --> d $\pi 0$
- Use missing mass:
  - Step 1: neutron 4-vector from MM(γp,π^+)
  - Step 2: π^0 4-vector from MM(np,d)

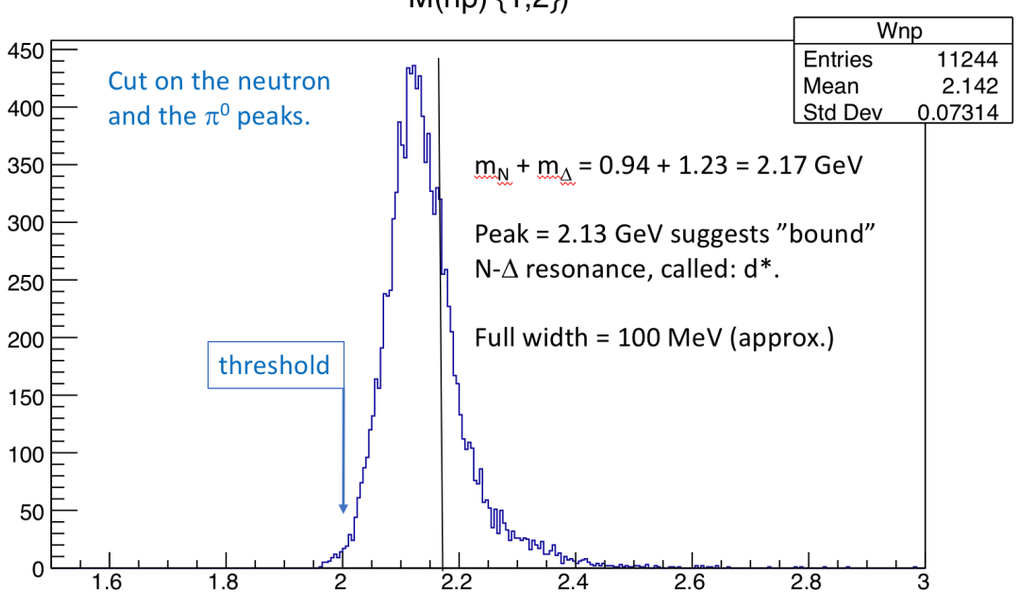
Step 1: Missing mass of γp --> π^+ n.



Step 2: Missing mass of np -> d π^0.

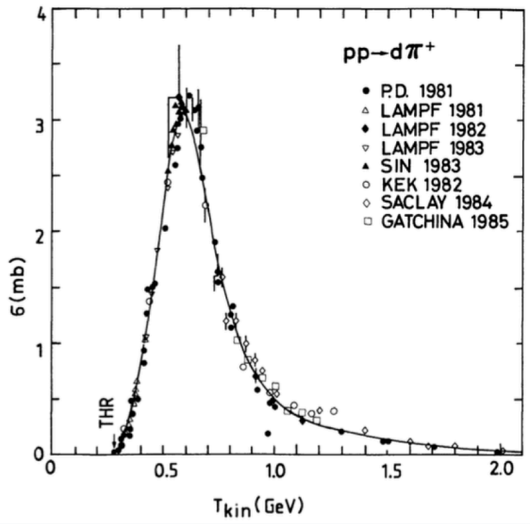


W-dependence: strong resonance shape



Previous data: pp -> d π^+

Plot from: J. Bystricky et al., J. Physique 48 (1987) 1901.



Data from a variety of facilities, shown by the legend.

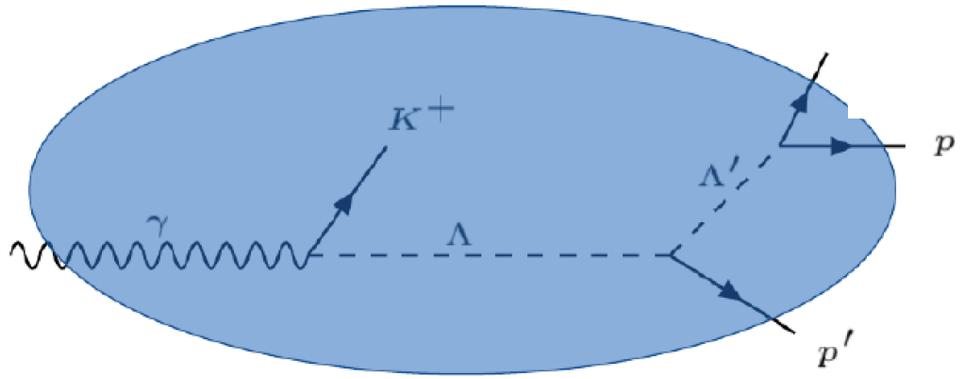
Peak at T_{kin} = 0.55 GeV
Convert to W = 2.137 GeV

Full width (W) = 100 MeV

Update on Lambda-Nucleon Scattering with g12

J.Rowley

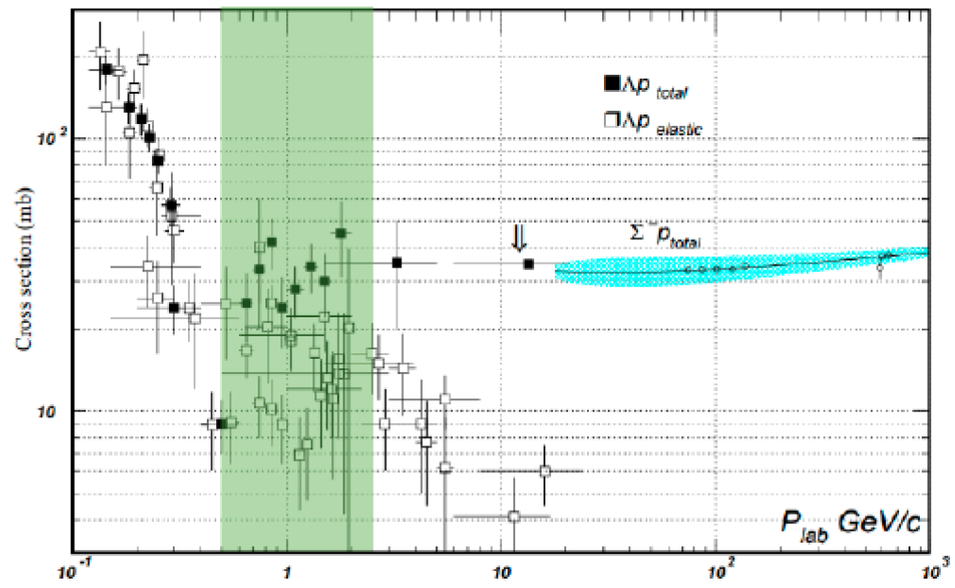
Reaction



- p, p', π^- detected
- $\Lambda p'$ scatter elastically

Motivation

- Currently very little data for ΛN scattering compared to other elastic scattering processes (NN, KN or πN).
-
- ΛN scattering is important to understand the interior of neutron stars. (Haidenbauer and Meissner, PRC 72, 044005 (2005).)



Procedure Analysis

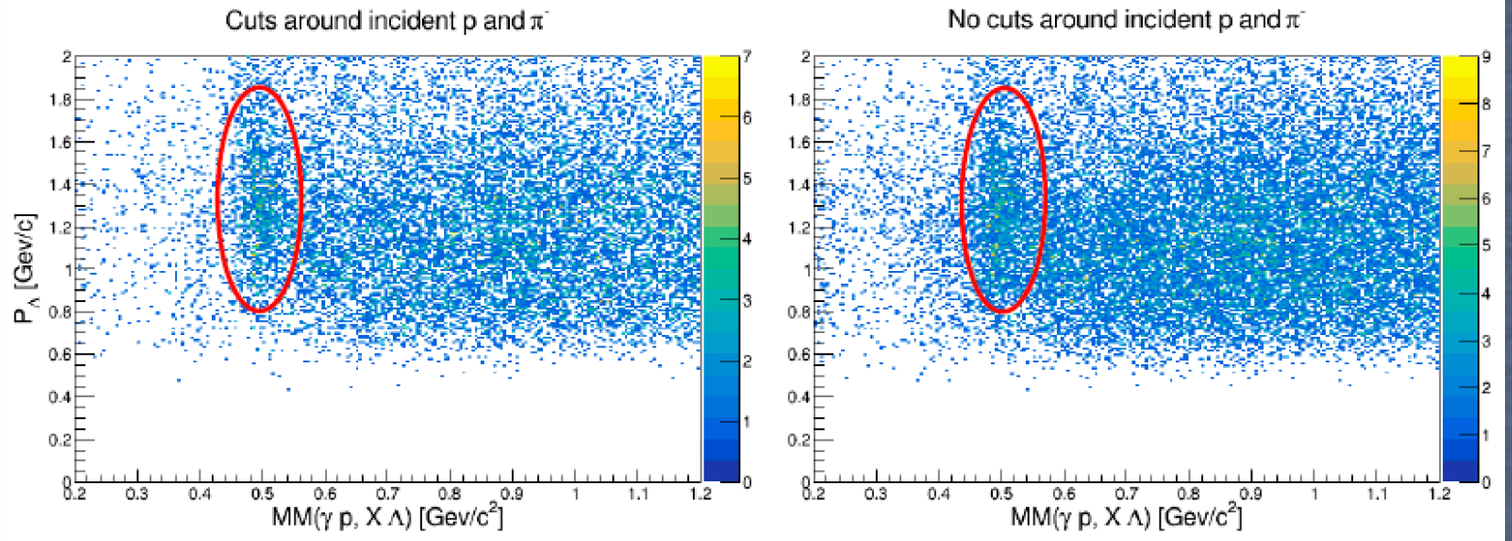
$$\gamma p \rightarrow K^+ \Lambda \hookrightarrow \Lambda p \rightarrow \Lambda' p' \rightarrow p' p \pi^-$$

- Data from g12
- Reconstruct the Λ' mass: M(Λ') = M(pπ-)
- Reconstruct incident Λ
- Identify K^+ by missing mass

Cross Section

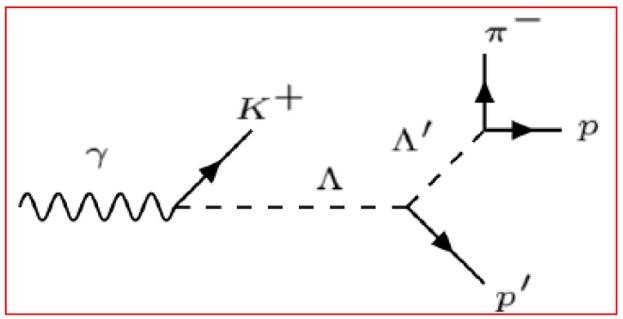
$$\frac{d\sigma}{dcos(\theta)}(E) = \frac{Y}{A * \mathcal{L} * \text{b.r.} * \Delta\cos(\theta)}$$

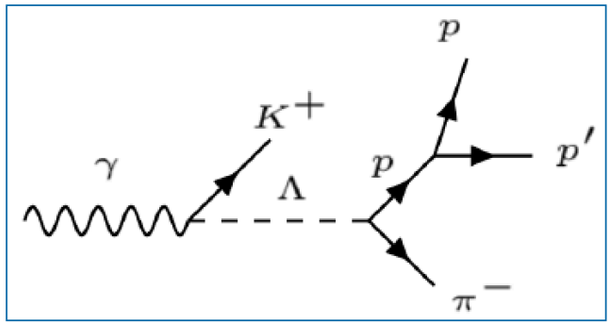
Additional Cuts

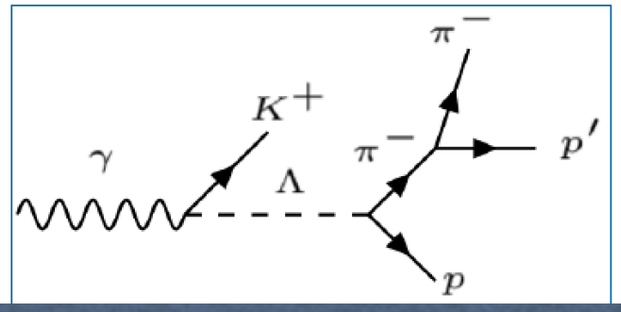


~4887 events ⟶ ~2622 events

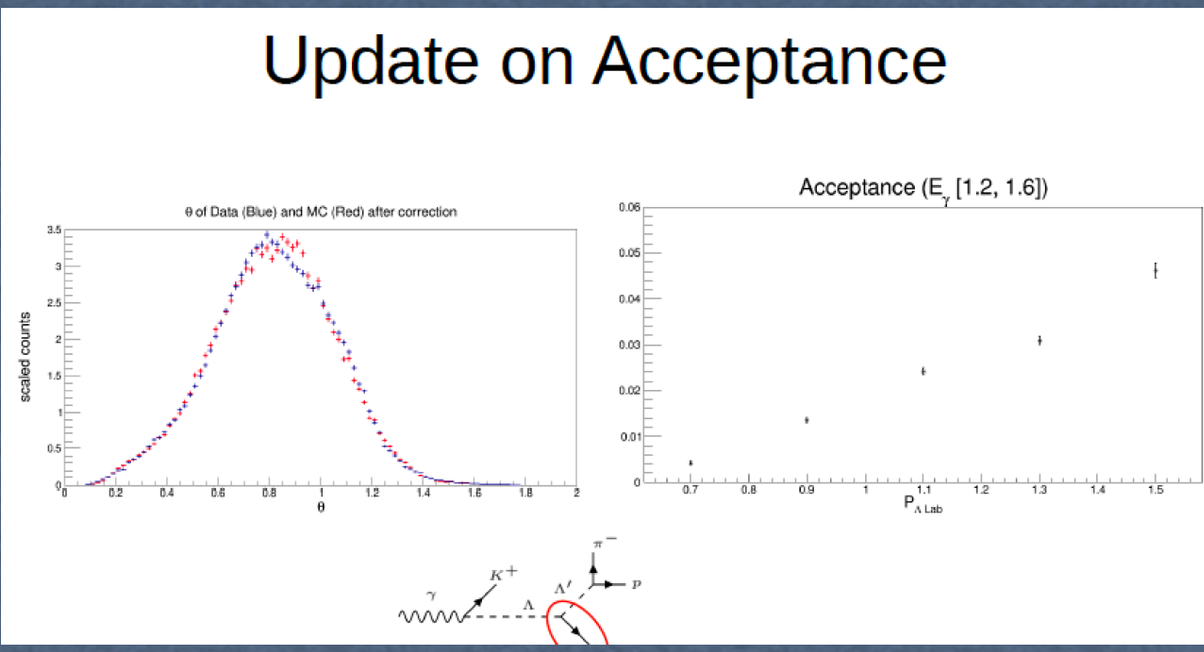
Additional Cuts



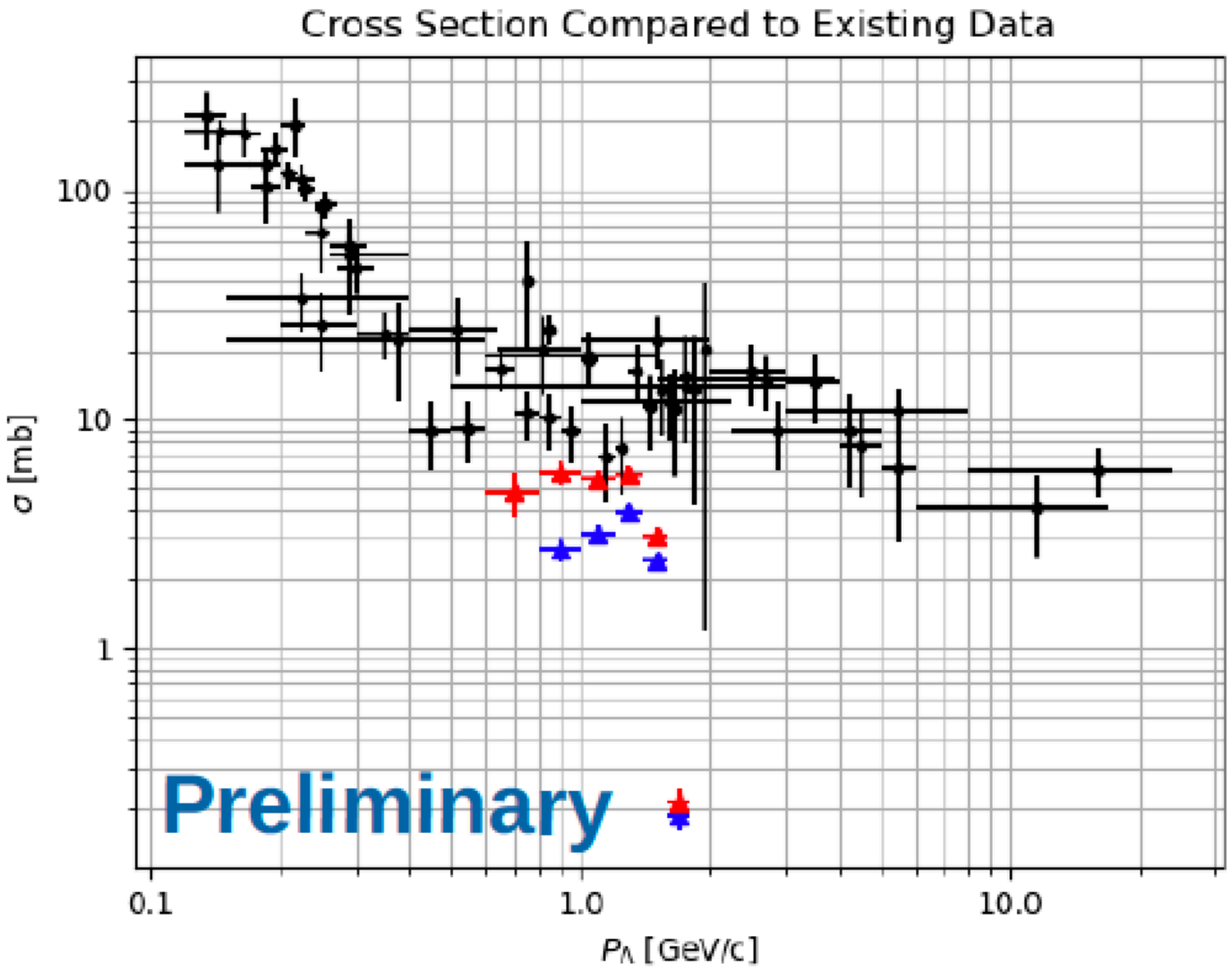




Update on Acceptance



Results



Red: Previous Results

Blue: Current results