HSWG

CLAS Collaboration Meeting
JLab, October 22 2015

Early Morning

- **08:30 - 08:50** Opening remarks - *Marco Battaglieri*
- **08:50 - 09:10** Towards the Electromagnetic Transition Form Factor of the eta' meson with g12 and CLAS12 - *Michael Kunkel - remote*
- **09:10 - 09:30** Update on JPAC activities - *A.Szczepaniak*
- **09:30 - 09:50** Development of a new 2pi event generator based on JLab-Moscow model: reasons, status, and prospects - *Iuliia Skorodumina*
- **09:50 - 10:10** A consistent isobar analysis of cascading decays in the high-mass baryon sector - *Eric Gutz*
- **10:10 - 10:30** New and old analysis projects - *General Discussion*

Coffee Break

Late Morning

- **11:00 - 11:20** Interpretation of recent pentaquark LHCb results - *Adam Szczepaniak*
- **11:20 - 11:40** Photoproduction of Hidden-Charm Pentaquark in CLAS12 - Untagged - *Valeri Kubarovsky*
- **11:40 - 12:00** Photoproduction of Hidden-Charm Pentaquark in CLAS12 - Tagged - *Andrea Celentano*
- **12:00 - 12:20** An update on search for excited eta mesons in gamma proton-> proton pi+ pi- eta - *Cathrina Sowa*
- **12:20 - 12:40** A Study of 3π production in γp → nπ + π + π – and γp → Δ ++ π + π – π – from g12 data set - *Aristeidis Tsaris - remote*
- **12:40 - 13:00** The Photoproduction of Strange Mesons in γp→ΛK+ π+π- (from g12?) - *Hussein Al Ghoul*

Early afternoon

- **14:00 - 14:20** Spin density matrix elements in Lambda(1520) photoproduction - *Will Levine*
- **14:20 - 14:40** Determination of the Polarization Transfer Coeffecients Cx' and Cz' for gamma d to K0 Lambda (p) From g13 Data - *Colin Gleason*
- **14:40 - 15:00** Polarization observables in 2pi photo-production with circularly polarized photons off transversely polarized protons (g9b) - *Lelia Net*

Coffee Break

Late afternoon

- **15:30 - 15:50** Summary of 3 independent analyses of gn->pi^- p from g14 (HDice) da
- **15:50 - 16:10** Coherent Rho Meson Photoproduction off Deuteron in g10 Data Set
- **16:10 - 16:30** Quasi-free mechanism of the reaction gamma+deuterion->kaon+Lamb
- **16:30 - 16:45** Utilizing the STart counter as a polarimeter - *Nick Zachariou*
- **16:45 - 17:30** Analysis review status
  - Analysis of gamma p to K0K0 from the g12 Data Set (PI: K.Hicks/S.Chandavar]) - *Carlos Salgado*
  - Pentaquark search in g10 by using the MMSA method (PI: K.Hicks) - *Stepan Stepanyan*
  - 2pi from e1-6 (PI: E.Golovach) - *R.Gothe*
  - Exclusive Photo-Production Measurement of K+Sigma*- off Quasi-Free Neutrons in Deuterium (PI: H.Lu) - *Nick Zachariou*
  - 2pi from e1-6 (PI: E.Isupov) - *B.Briscoe*
  - KLambda and KSigma from FROST (PI: N.Waldorf) - *Steffen Strauch*
  - Polarized structure function sigmaLT from the single pi0 electroproducion on the proton in the resonance region (PI:N.Markov) - *Volker Crede*
  - Spin observables in omega photoproduction (PI: B.Vernarsky) - *Franz Klein*
  - Analysis of K+K photo-production from the g11 Data Set (PI: S.Lombardo) - *Paul Eugenio*
  - Polarization Observables in g(pol)p(pol)->ppi+pi-Using the g9a (FROST) Target and CLAS (PI: V. Krede) - *Ken Livingston*
  - gamma p -> eta p, gamma p -> eta' p and gamma p -> omega p beam asymmetries (PI: P.Collins - M.Dugger) - *Lei Guo*
- **17:30 - 18:00** g12 Run Group review
- **17:30 - 17:40** G12 Anayses Status - *Lei Guo*
- **17:40 - 17:50** Analysis Review status: g12 Run Group review - *Eugene Pasyuk*
- **17:50 - 18:10** Discussion

Agenda

- ✳ Dedicated sub session on pentaquark (theory + proposals for CKLAS12)
- ✳ Open discussion about on-going / new-analysis

Activities

- ✳ Regular report at HSWG on JPAC activity to strengthen exp/the connection
- ✳ Selected talks on more advanced analysis on plenary session at the CLAS Collaboration Meeting (R.Schumacher f1(1285) analysis)

Talks

- ✳ Good communication with CSC to coordinate HSWG presence in major conferences/ workshops Ask for a list of topics and potential speakers to WG representatives
- ✳ REMINDER: Communicate talks and proceedings to the CSC
- ✳ JSA-TFC funds allocated: $17.2k over $20k available in 2015
- ✳ JSA-TFC funds renewed with $20k for 2016!!!!

External collaborators

- ✳ New requests from external collaborators require to define a work plan to coordinates ongoing with new analysis (discussion today)

Analysis Reviews

- ✳ Great attention on analysis review processes (discussion this eve)

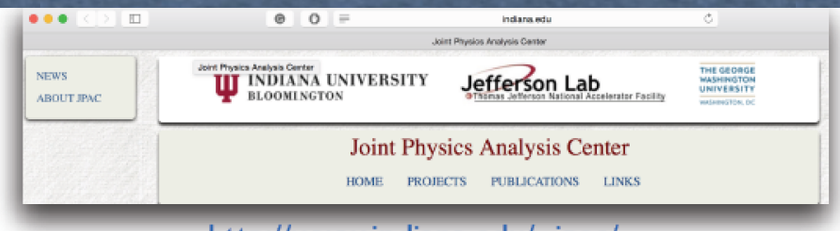
Hadron Reaction and Spectroscopy Studies at JPAC

Adam Szczepaniak
Indiana University
Jefferson Lab

Who we are and we do

Recent/ Current Projects

General approach: Role of reaction theory



http://www.indiana.edu/~jpac/

- First cycle of postdocs ended
- Meetings, papers, web portal, schools
- Theoretical support in
  - amplitude analysis
  - hadronic resonance hunting
  - production mechanisms
  - data interpretation
  - from simple to complex final states
  - link to the lattice calculations

Adam Szczepaniak (IU/JLab)
Mike Pennington (JLab)
Tim Londergan (IU)
Geoffrey Fox (IU)
Emilie Passemar (IU/JLab)
Cesar Fernandez-Ramirez (JLab)
Vincent Mathieu (IU)
Micheal Doering (GWU)
Ron Workman (GWU)

Vladyslav Pauk (Mainz → JLab)
Alessandro Pilloni (Rome → JLab)
Astrid Blin (Valencia)
Andrew Jackura (IU)
Lingyun Dai (IU/JLab → Valencia)
Meng Shi (JLab → Beijing)
Igor Danilkin (JLab → Mainz)
Peng Guo (IU/JLab → CSU)
…

GlueX collaboration
Matthew Shepherd (IU)
Justin Stevens (JLab)
…

CLAS collaboration
Diane Schott (GWU/JLab)
Viktor Mokeev (JLab)

HASPECT
Marco Battaglieri (Genova)
Derek Glazier (Glasgow)
Raffaella De Vita (Genoa)
…

BESIII collaboration
Medina Ablikim (Beijing)
Ryan Mitchell, (IU)
…

LHCb collaboration
T.Skwarnicki (Syracuse)
J.Rademacker, (Bristol)
…

COMPASS collaboration
Mikhail Mikhasenko (Bonn)
Fabian Krinner (TUM)
Boris Grube (TUM)
…

BaBar collaboration
Antimo Palano (Bari)
…

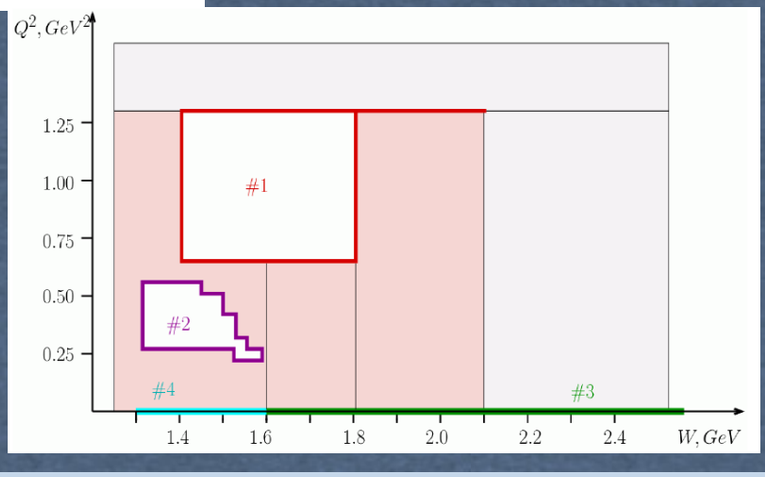
Development of a New 2pi Event Generator Based on JLab-Moscow Model: Reasons, Status, and Prospects

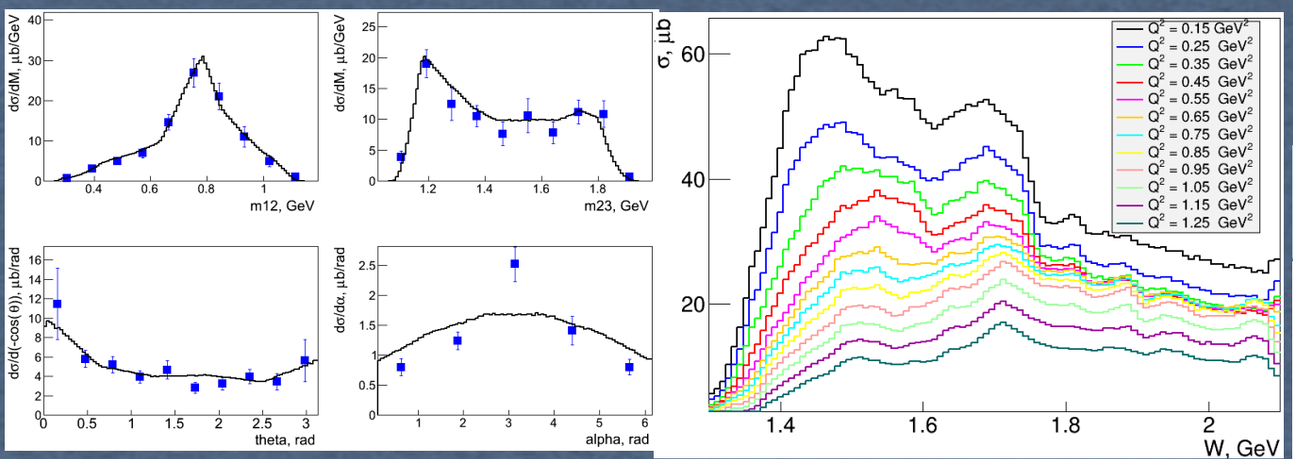
Speaker: Iuliia Skorodumina
(University of South Carolina)

From experiment

From JM model (fit to the data)

$$\frac{d^7\sigma_e}{dW\,dQ^2 d^5\tau} = \Gamma_v \frac{d^5\sigma_v}{d^5\tau}$$





✳ Powerful tool to explore 2pi production in CLAS12 kinematics

✳ Can be used to generate realistic pseudo-data for CLAS6 acceptance/ efficiency calculation

Development of a New 2pi Event Generator Based on JLab-Moscow Model: Reasons, Status, and Prospects

Results and advantages:

- Based on new version of JM model that fits to all available 2pi-data
- Written on C++
- Works well in the region W: 1.2375 – 2.0875 GeV, Q^2: 0.0003 – 1.3 GeV^2 and will work up to W = 3 GeV and at extremely low Q^2
- Takes into account cross section change with beam energy
- Allows to obtain cross section value from EG
- New efficient method of generation is used: EG generates flat distributions and applies the cross section as weight to each event

Things to be done:

- Extension toward W > 2.0875 GeV
- Extrapolation to the Q^2 > 1.3 GeV^2
- Add radiative effects
- Pass through the reconstruction procedure

A consistent isobar analysis of cascading decays in the high-mass baryon sector

Eric Gutz

II. Physikalisches Institut
Justus-Liebig-Universität Gießen, Germany

✳ New collaborators from Europe are joining CLAS

✳We need to provide data and tools in a usable format

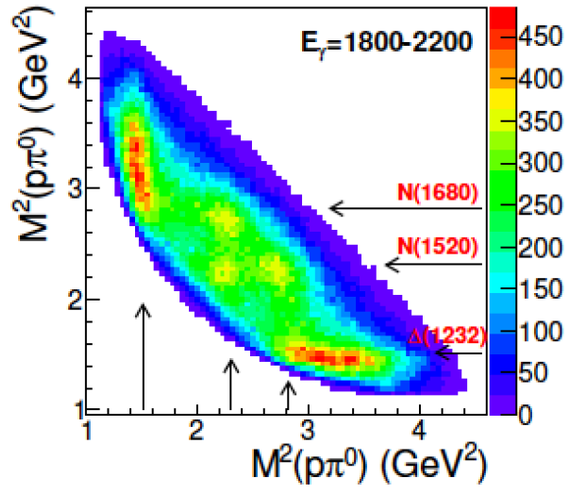
✳ 4-vectors + MC pseudo data for eff evaluation

✳2pi is the prototype

Isobar Analysis of Cascading High-Mass Baryon Decays

Analysis proposal:

- Investigate decay chains of high-mass baryons in an isobar framework
- Isolate isobars in Dalitz plot
- Check excitation functions, angular distributions for signatures yielding information about nature of decaying states, close collaboration with theory



- Check feasibility of approach with g11-/g12-run data in $\gamma p \to p\pi^+\pi^-$
- Check high-mass (scalar) meson isobars also in KK-decays
- Extension of analysis program to hyperon spectrum

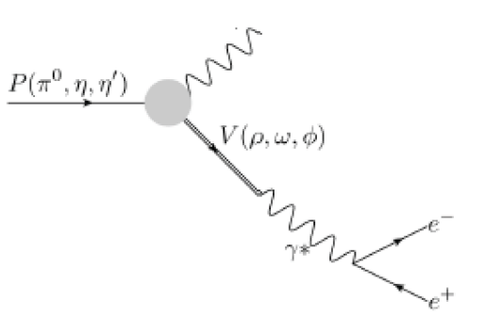
cf. A.Thiel, V. Sokhoyan, E. Gutz, H. van Pee *et al.*, Phys. Rev. Lett. **114** (2015) 091803, V. Sokhoyan, E. Gutz, H. van Pee *et al.*, Phys. Lett. B **746** (2015) 127

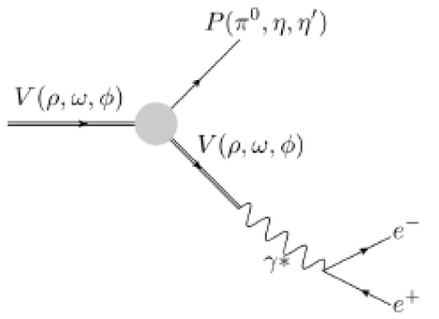
Towards the Electromagnetic Transition Form Factor of the η' meson with g12 and CLAS12

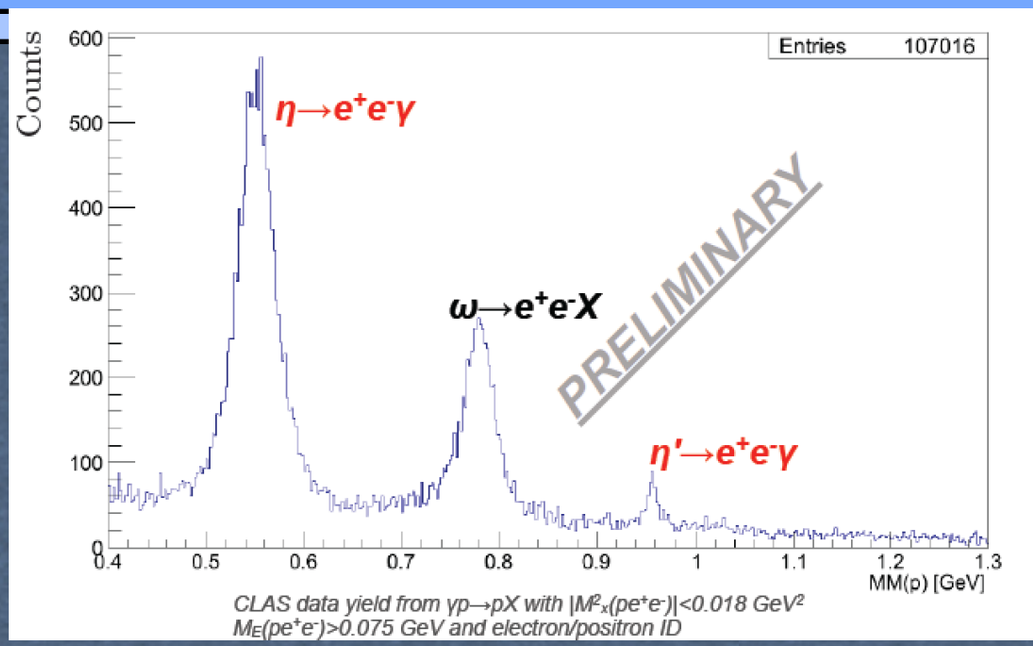
Michael C. Kunkel
Forschungszentrum Jülich GmbH

Transition Form Factors

Michaela Schever, Michael C. Kunkel, Susan Schadmand, Jim Ritman;
Institut für Kernphysik, Forschungszentrum Jülich

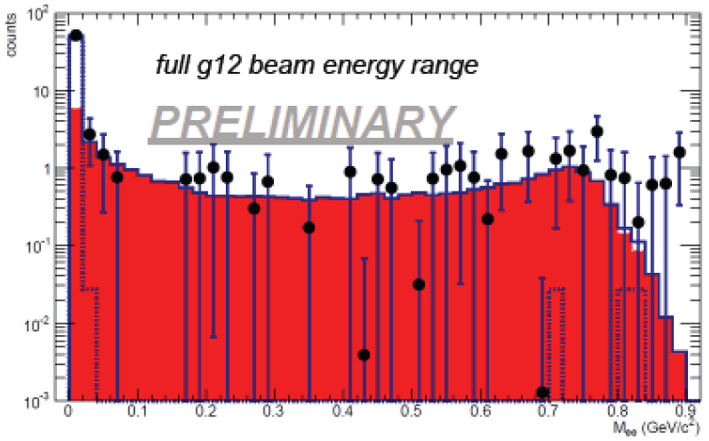






CLAS data yield from γp→pX with $|M^2_X(pe^+e^-)|<0.018$ GeV²
$M_E(pe^+e^-)>0.075$ GeV and electron/positron ID

η′→γee : M_{ee} distribution

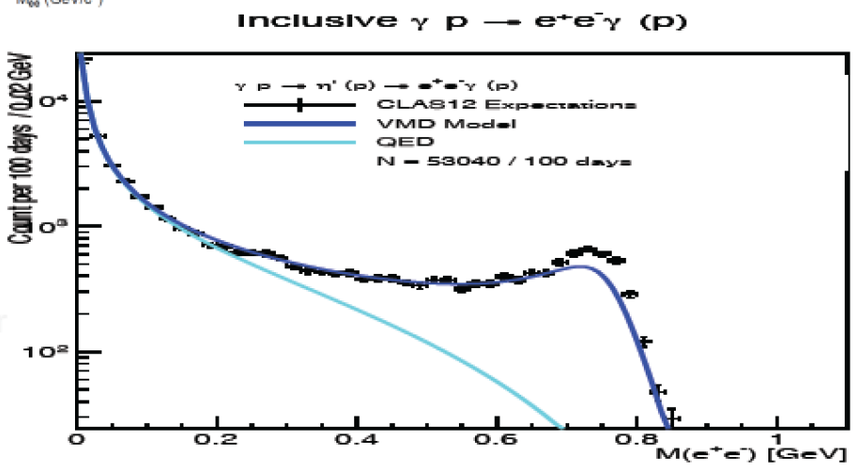


With CLAS6 (g12)

symbols: data (signal weight)
filled: η′→γee simulation
dotted: η′→γγ simulation
solid: summed simulations
rel BR =0.0262492 +- 0.013001 (fit errors)

With CLAS12

Within 100 days of beam-time CLAS12 can measure the η′ transition form factor with a statistical uncertainty ~1%



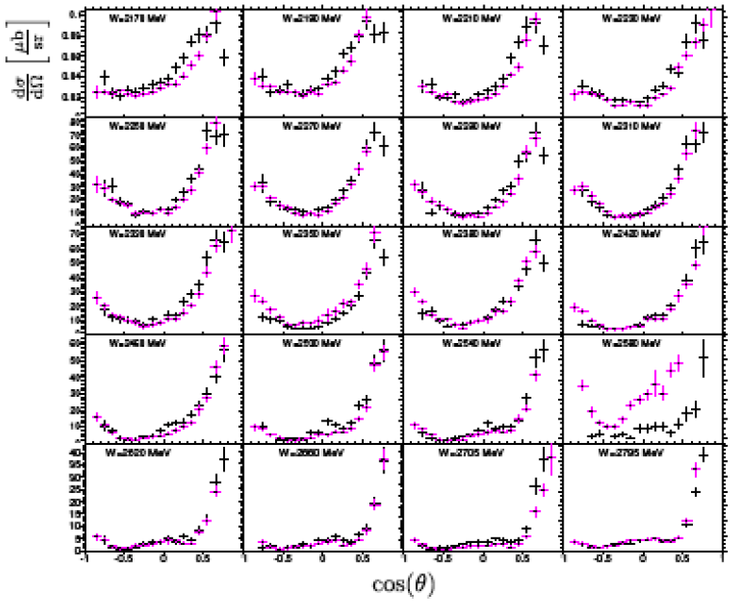
Photoproduction of Excited η Resonances
$\gamma p \rightarrow p\pi^+\pi^-\eta$ at CLAS

Cathrina Sowa

Ruhr-Universität Bochum
Institut für Experimentalphysik I

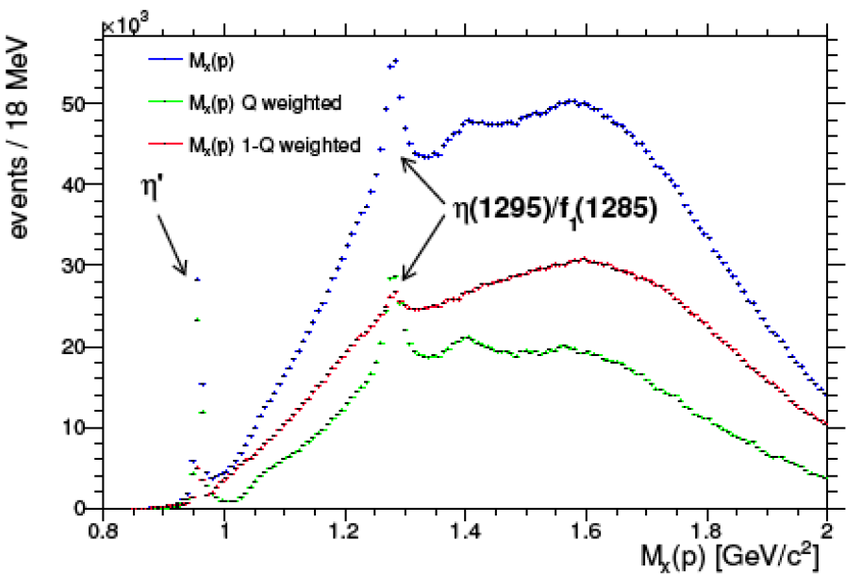
$\gamma p \rightarrow p\pi^+\pi^-(\eta)$

- Supernumerous resonance with $J^{PC} = 0^{-+}$
- $\eta(1295)$
  - Seen in $\pi^- p$ scattering experiments
  - Seen by DM2 in $J/\psi \rightarrow \gamma\pi^-\pi^+\eta$
  - No further observation
  - Interference with $f_1(1285)$
  - Artifact of f_1?
- $\eta(1405)$
  - Only seen in gluon rich processes like $\overline{p}p$ annihilations and radiative J/ψ decays
  - Not seen in photoproduction or $\gamma\gamma$ fusion
  - Decays to $K\overline{K}\pi$ and $\pi\pi\eta$
  - Glueball candidate
- $\eta(1475)$
  - Strong coupling to $K\overline{K}\pi$
  - Not yet seen in $\pi\pi\eta \rightarrow$ weak coupling



- Q-factor method applied to η'
- Approximately $70 \cdot 10^3$ η' events in g12 data set
- Extracted $\gamma p \rightarrow p\eta'$ cross section on g12 data set

➔ Good agreement between g11 and g12

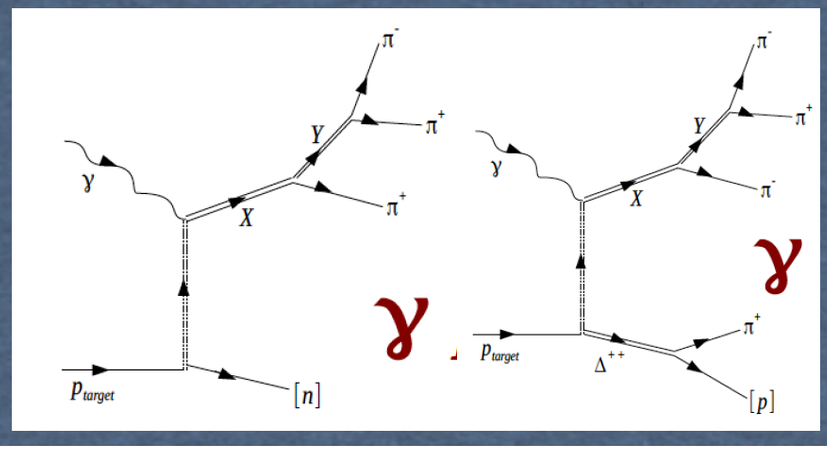


- Q-factor method applied to missing η
- Approximately $18 \cdot 10^6$ $p\pi^+\pi^-\eta$ events
- Observed enhancements at η', $\eta(1295)/f_1(1285)$ and $\eta(1405)$ mass

➔ Extract cross section of enhancement at 1290 MeV/c^2 and 1417 MeV/c^2

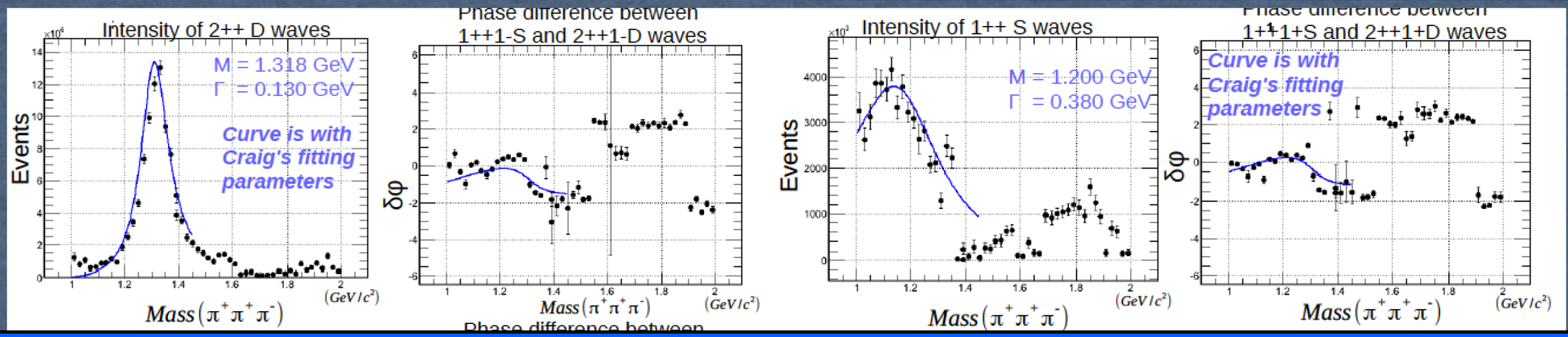
A Study of 3π production in $\gamma p \to n\pi^+\pi^+\pi^-$ and $\gamma p \to \Delta^{++}\pi^+\pi^-\pi^-$ with CLAS at Jefferson Lab

Aristeidis Tsaris
Florida State University



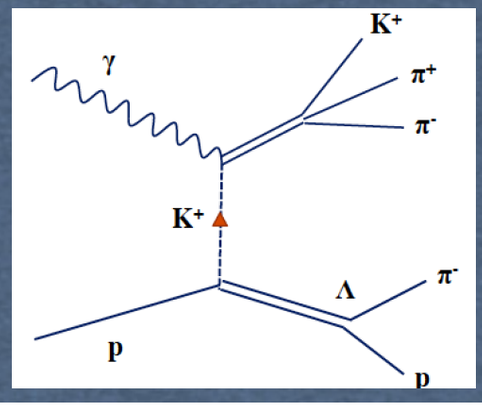
- ✳ 3pi analysis from C.Bookwalter resumed
- Full PWA undergoing
- ✳ New channel(s) added
- ✳ Analysis note and paper in preparation

- $\gamma p \to n\pi^+\pi^+\pi^-$:
  - The $a_2(1320)$ and the $a_1(1260)$ are observed
  - The $\pi_2(1670)$ is observed
  - The $J^{PC}=1^{-+}$ appears to have no phase motion relative to the $\pi_2(1670)$
- $\gamma p \to \Delta^{++}\pi^+\pi^-\pi^-$:
  - A first time PWA of the $\Delta^{++}3\pi$ system
  - The $a_2(1320)$ and the $a_1(1260)$ are observed
  - The $\pi_2(1670)$ is observed



The Photoproduction of Excited Strange Mesons in $\gamma p \rightarrow \Lambda K^+ \pi^+ \pi^-$ With CLAS at Jefferson Lab

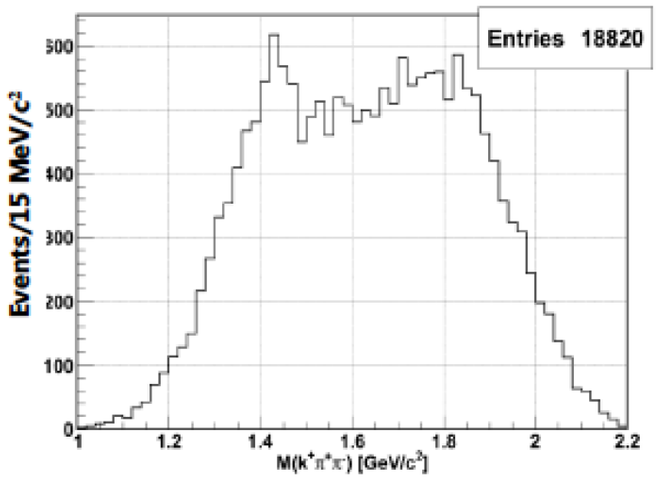
Hussein Al Ghoul

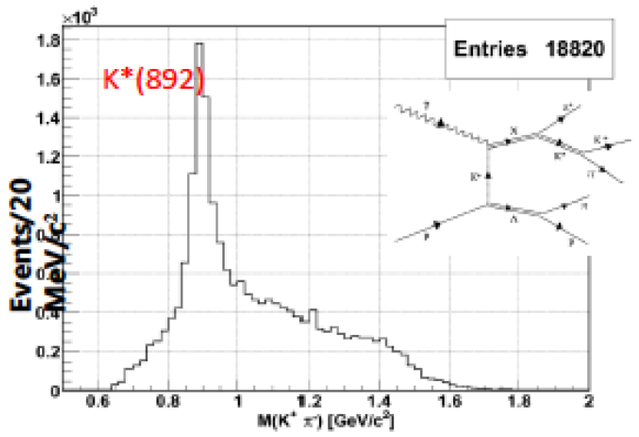


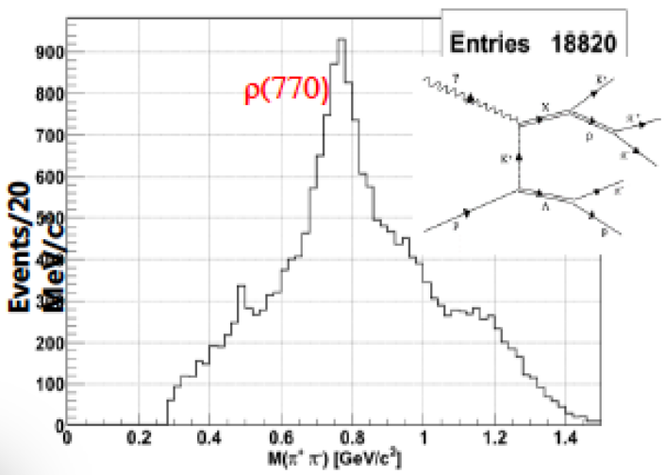
✳ Complementary to 3pi analysis

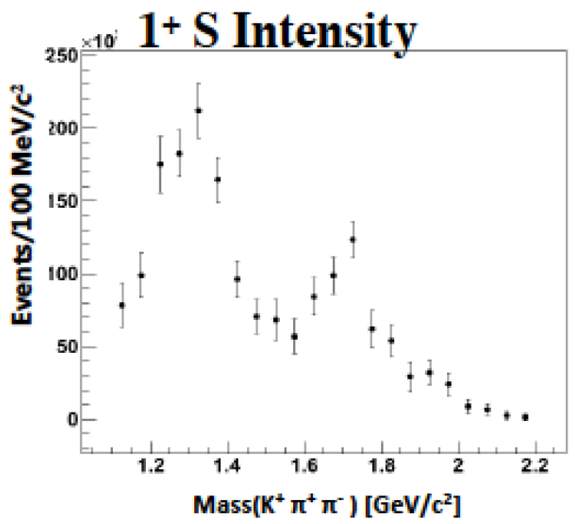
The Photoproduction of Excited Strange Mesons in
$\gamma p \rightarrow \Lambda K^+ \pi^+ \pi^-$
With CLAS at Jefferson Lab
Hussein Al Ghoul

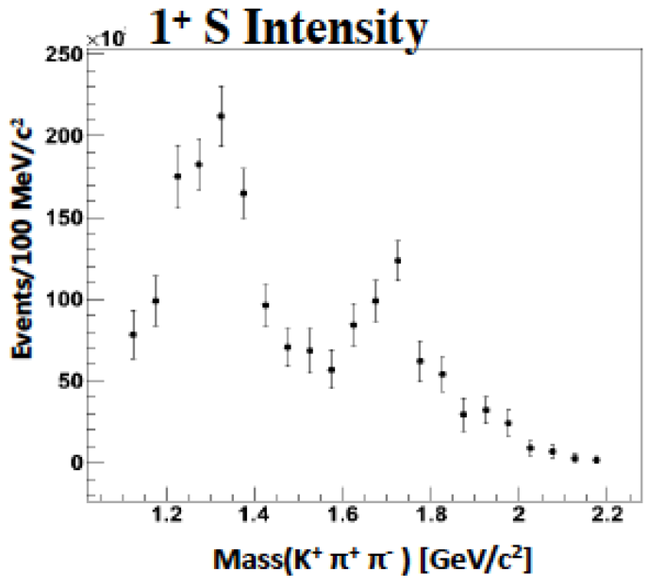
Florida State University





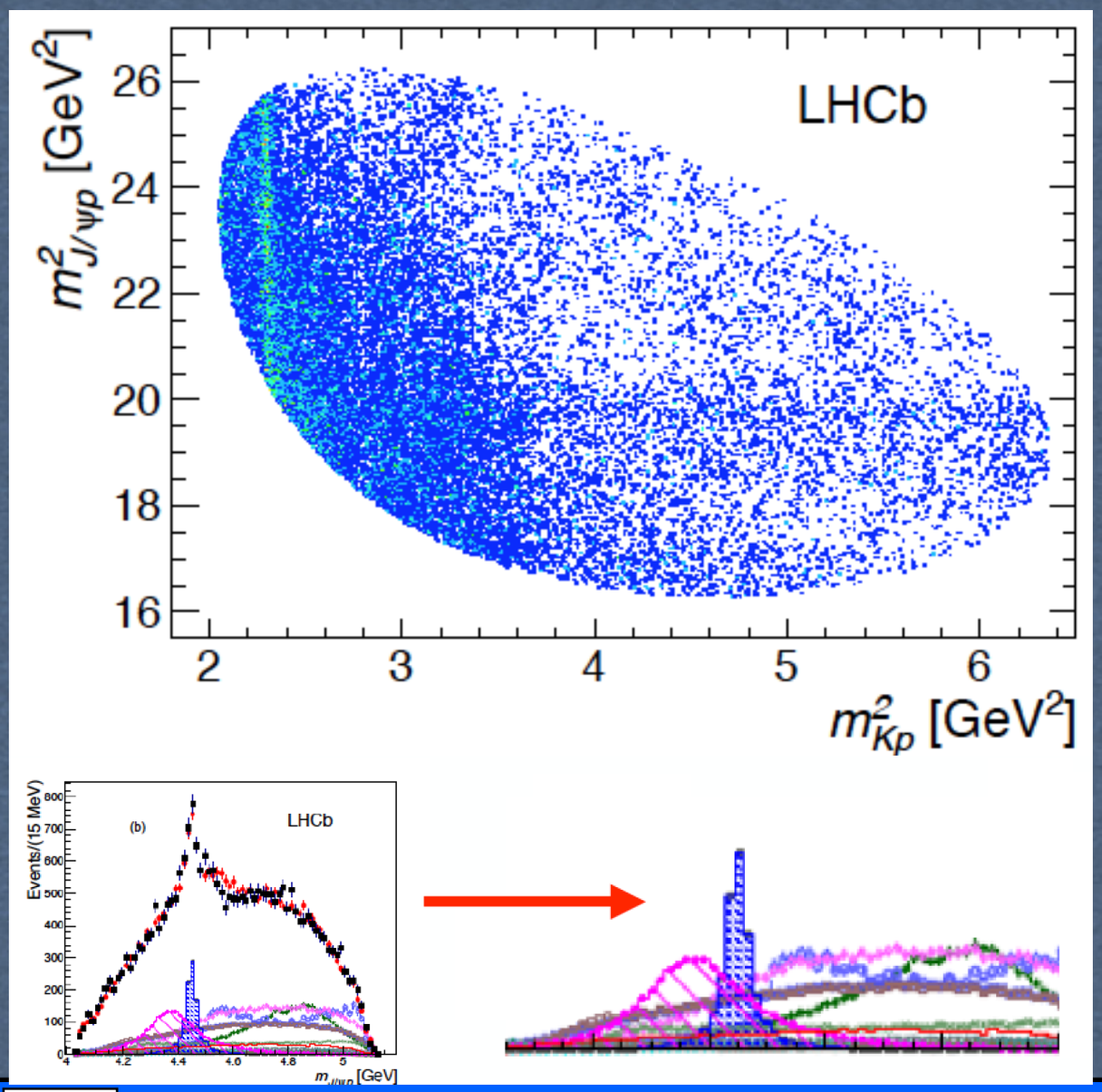




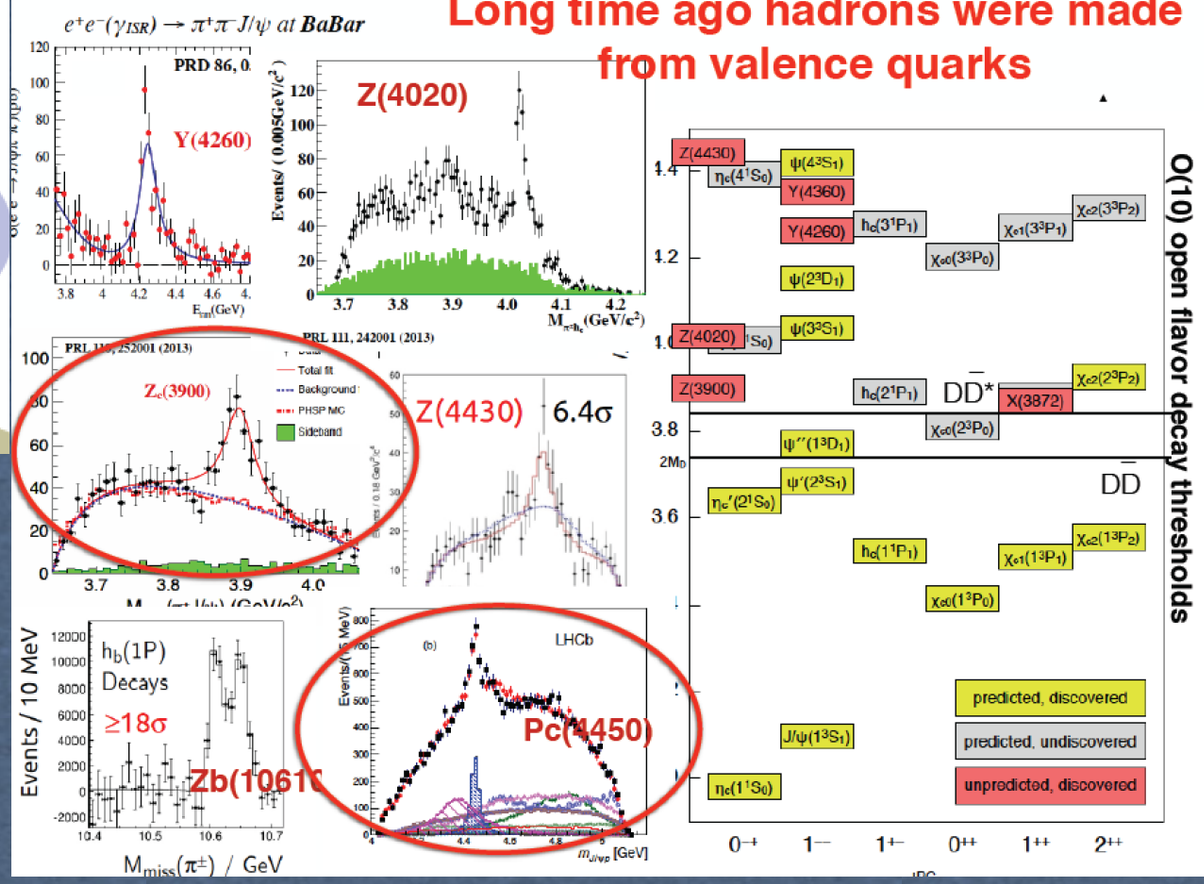


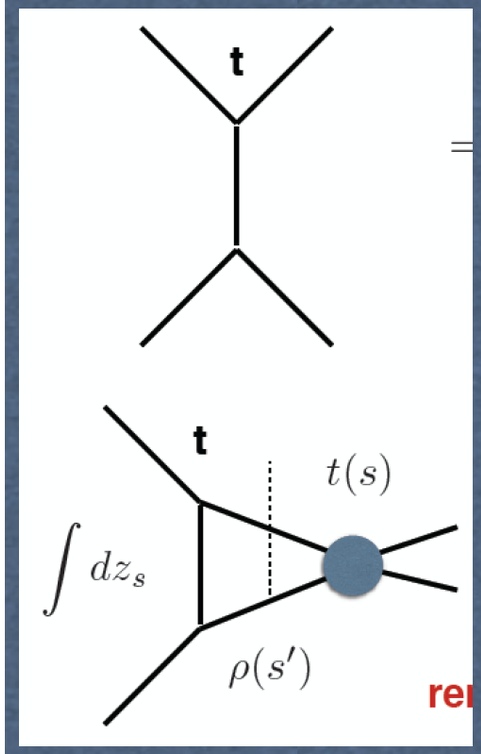
On a possible Interpretation of the 5q signal

Adam Szczepaniak
Indiana University
Jefferson Lab



Long time ago hadrons were made from valence quarks





✳ Final state interaction on specific waves may produce fake peaks and band in the Dalitz plot

✳ Needs to vary the kinematics to be sure that we are seeing a genuine 5q resonance

✳s-channel direct production (eg g J/Psi ->p J/Psi) could clarify

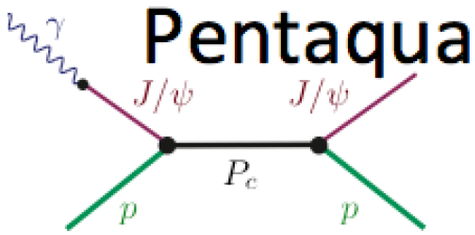
Photoproduction of Hidden-Charm Pentaquark with CLAS12

Valery Kubarovsky

Jlab

Valery Kubarovsky, Jlab

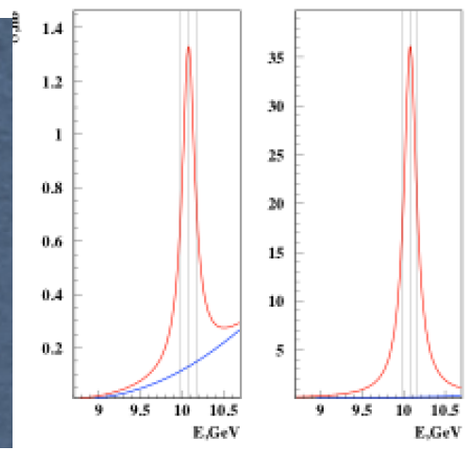
Pentaquark Photoproduction



$$\sigma \sim Br^2(P_c \to J/\psi p)$$

$$BR(P_c \to J/\psi p) = 1\%$$

Unknown for a moment



The S/B ratio is **extremely good** even for such small BR=1%

	$P_c(4380)$	$P_c(4450)$
σ, min-max (at pole)	0.15-4.7 nb	1.2-36 nb
Events/day, min-max	**12-380**	**19-576**

V.Kubarovsky, M. B. Voloshin, Phys.Rev. D92 (2015) 3, 031502, arXiv:1508.00888.

- Resolving between the models and clarifying the nature of the discovered hidden-charm pentaquark peaks requires further experimental studies.
- CLAS12 has unique opportunity to detect pentaquark and measure this branching ratio. It will definitely help with the resolving between different models.
- Naturally, **any** observation of the P_c peaks in the γp cross section would strongly disfavor the interpretation in terms of 'accidental' singularities in the Λ_b decays.
- Charmonium molecule model predicts sizable BRs to $J/\psi p\pi$ and $J/\psi p\pi\pi$. CLAS can definitely detect these decay modes of pentaquark.

Photoproduction of Hidden-Charm Pentaquark in CLAS12 - MesonEx

Andrea Celentano

INFN-Genova

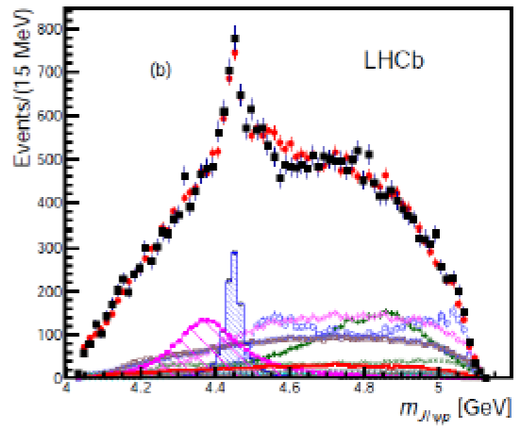
J/ψ tagged photo-production in CLAS12

Goal: measure the J/ψ photo-production cross-section on the proton, searching for s-channel resonances.

Confirm (or not!) the recent LHCB claim for the states $P_c(4380)$ and $P_c(4450)$

Measurement strategy:

- 11 GeV e^- beam impinging on LH_2 target
- Proton and / or J/ψ decay products measured in CLAS12
- Low-angle scattered e^- measured in the Forward Tagger



Potentially very-high photo-production cross section:

$$\sigma_{max} \simeq \frac{2J+1}{4} B_{out}^2 \cdot 2.26 \mu\text{barn}$$

General features:

- Invariant mass resolution depends only on e- energy resolution in FT (25 MeV @ 1 GeV)

$$W^2 = M_p^2 + 2E_0 M_P - 2E' M_p \longrightarrow \sigma_W = \sigma_{E'} \cdot \frac{M_p}{W} \simeq 0.21 \cdot \sigma_{E'} \simeq 5.2 \text{ MeV}$$

- Expected number of events from equivalent photon flux approximation

$$R_{meas} = R_{gen} \cdot BR_{J/\psi \to e^+e^-} \cdot \varepsilon \simeq 1.5 \cdot 10^3 \cdot \sigma_0^\gamma \text{ events / day / } \mu\text{barn}$$

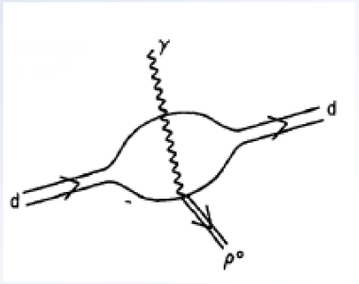
- This measurement is **complementary** to the untagged one: higher resolution, lower requirements on CLAS12, but lower statistics
  - Untagged measurement: discovery potential
  - Tagged measurement: precise measurement of the p-J/ψ line-shape

Coherent Vector Meson Photoproduction off Deuterium

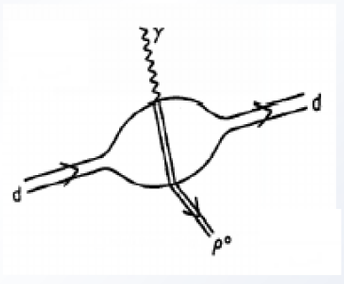
Taya Chetry
Nick Compton
Ken Hicks
ohio University

10/22/2015

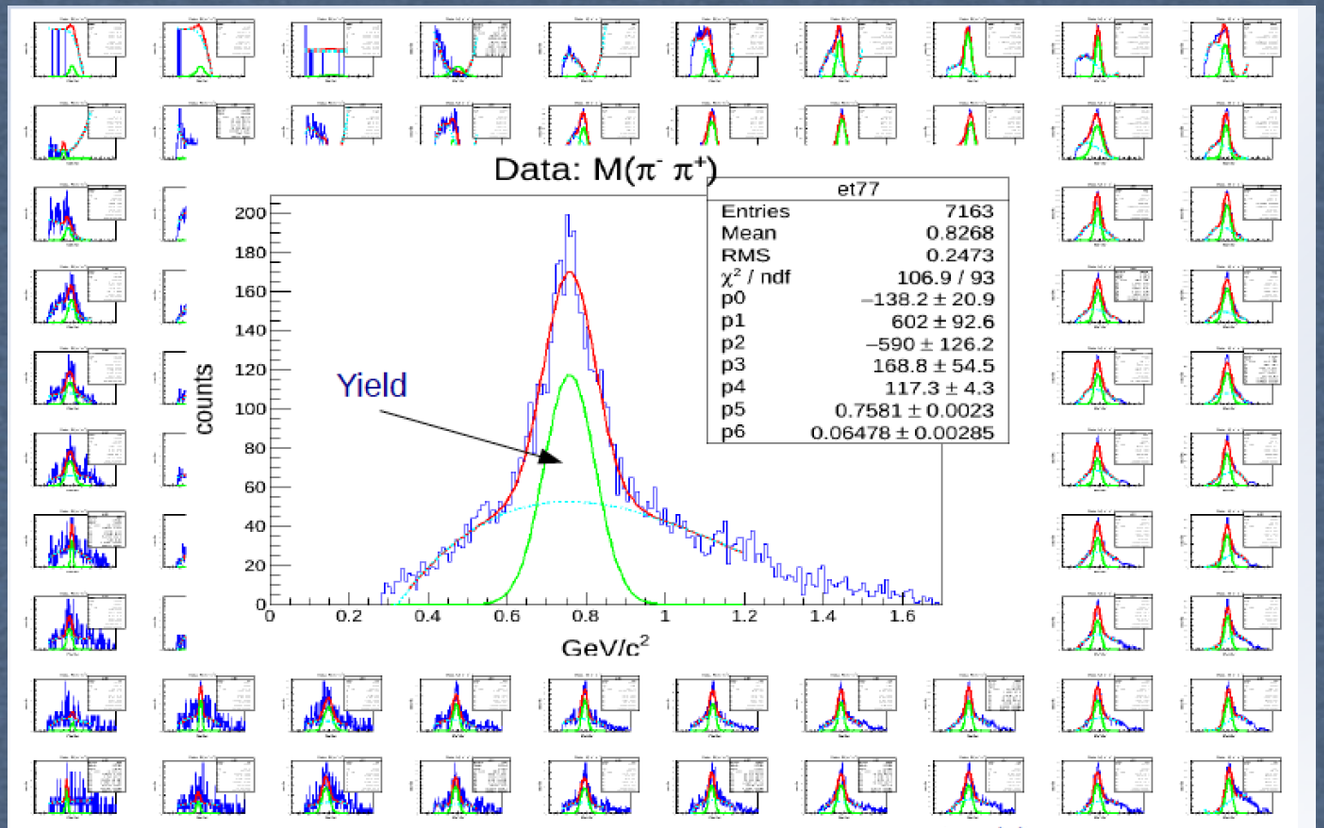
$\gamma d \rightarrow \rho d$



Single scattering

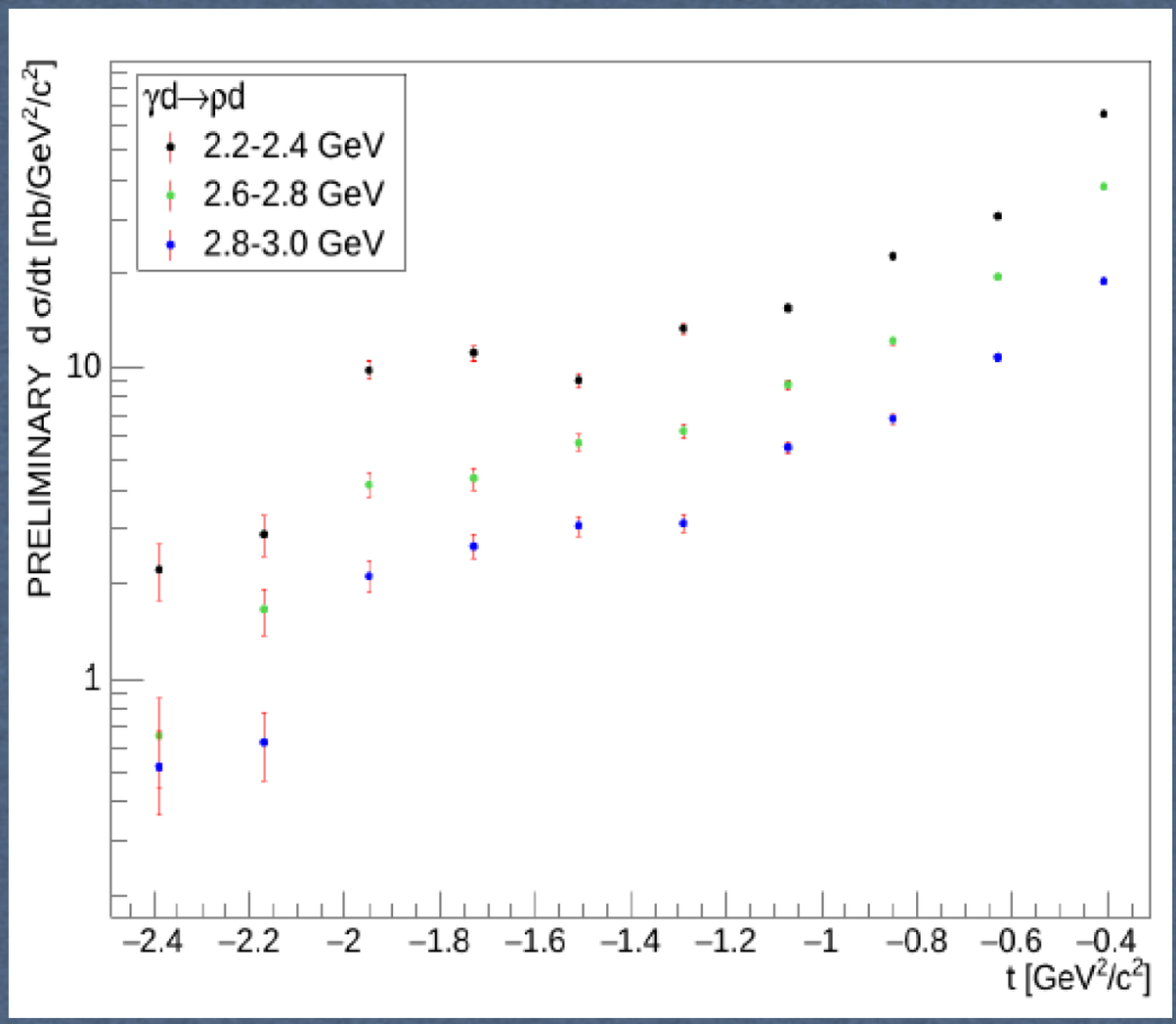


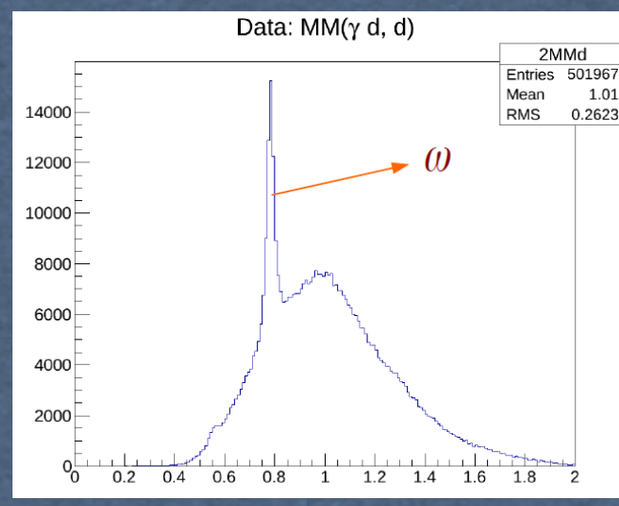
Double scattering



|t|-bins

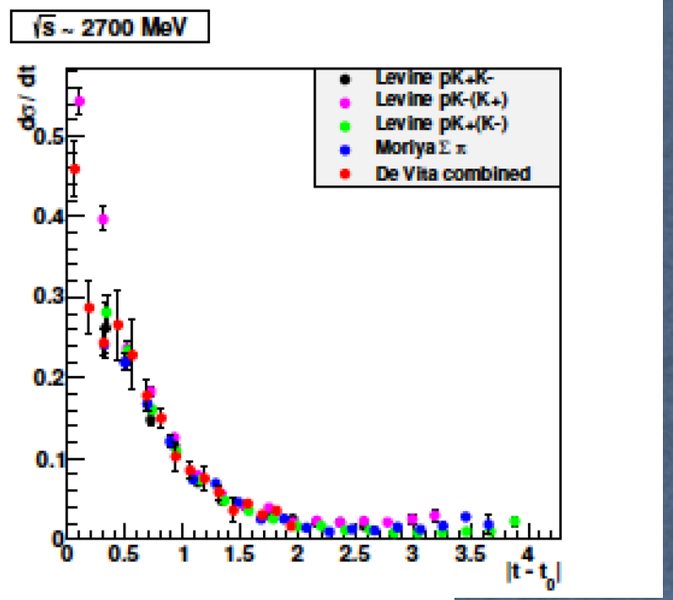
$M_\rho \equiv M_\rho(E_\gamma, |t|)$

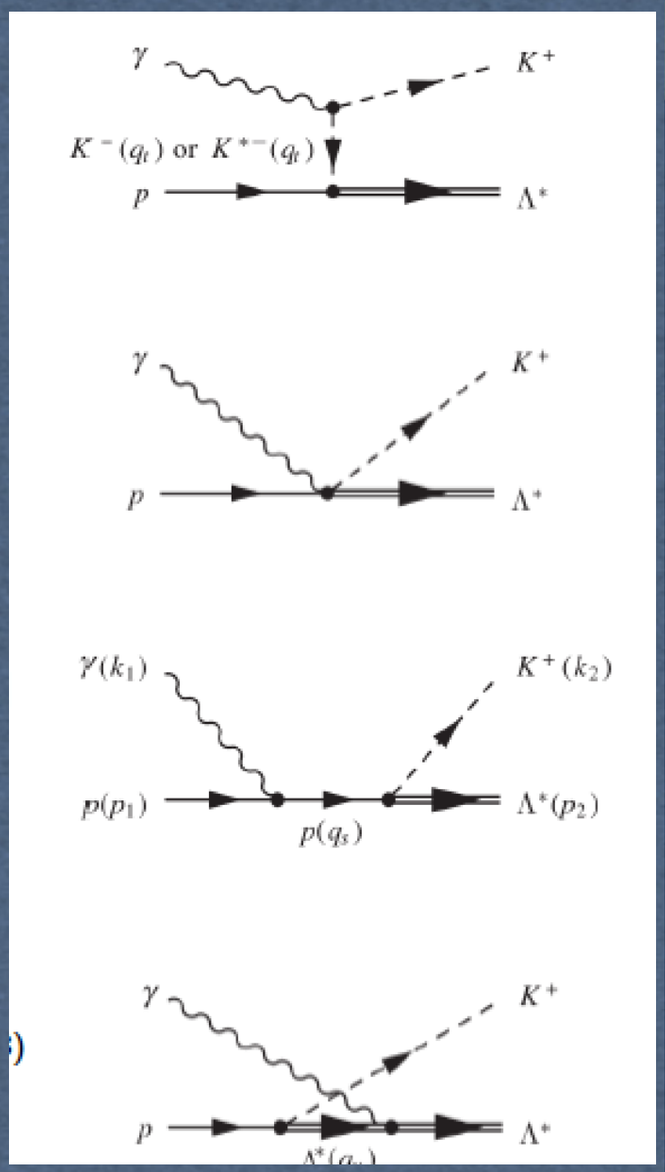




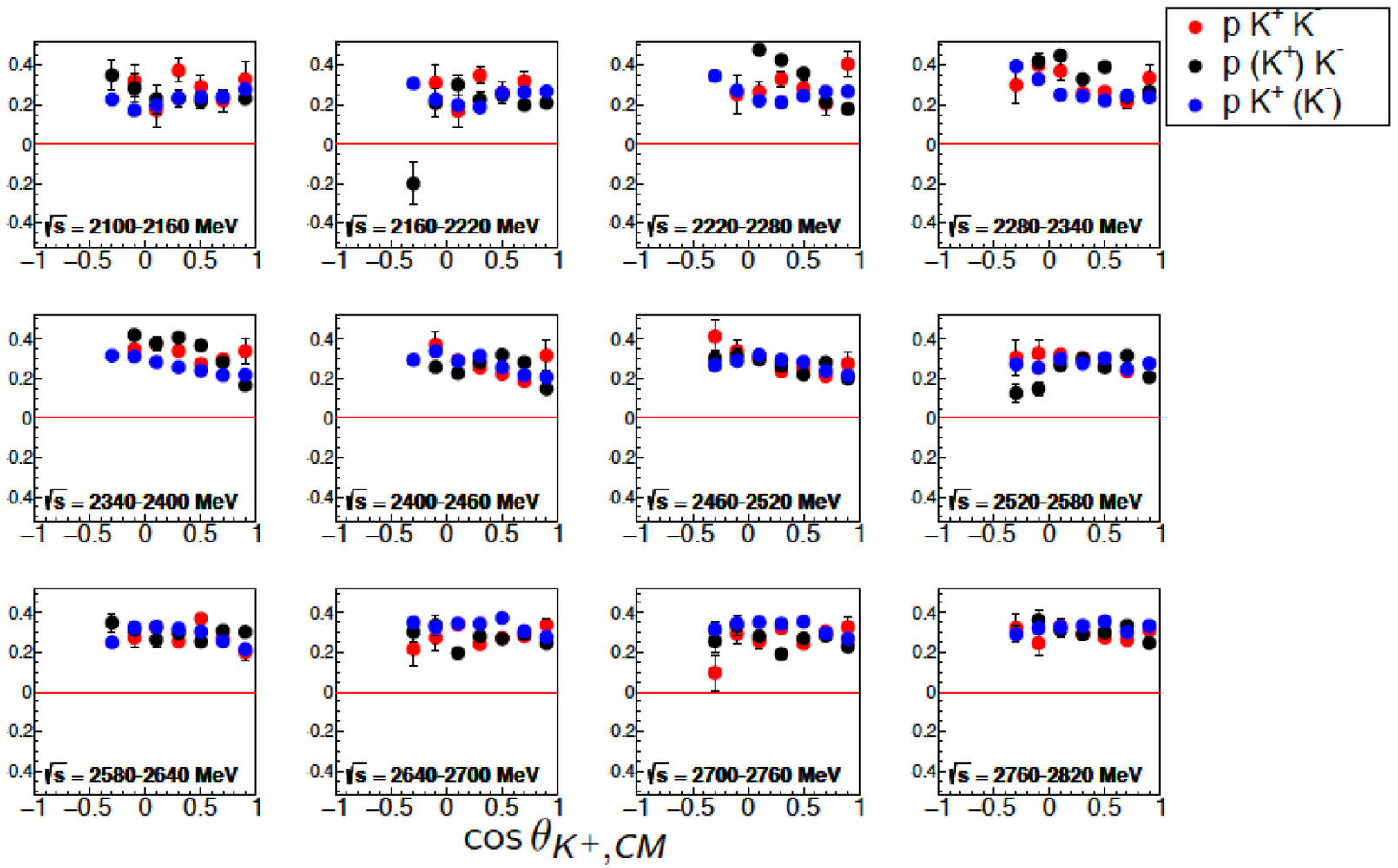
Spin density matrix elements in Λ(1520) photoproduction

Will Levine





Spin density matrix: ρ_{11}



Polarization observables in double pion photo-production with circularly polarized photons off transversely polarized protons(g9b-FROST)

CLAS Collaboration Meeting

Lelia Aneta Net, Steffen Strauch

$$\gamma p \rightarrow p\pi^+\pi^-$$

g9b(FROST) experiment

Electron beam: - longitudinally polarized; $\bar{P}_e = 87\%$
- beam energy: 3081.73 MeV

Photon beam: - circularly polarized

Targets:

- FROzen Spin Target (FROST) = transversely polarized butanol (C_4H_9OH) L=5 cm, d=1.5 cm

1) Integrated Method

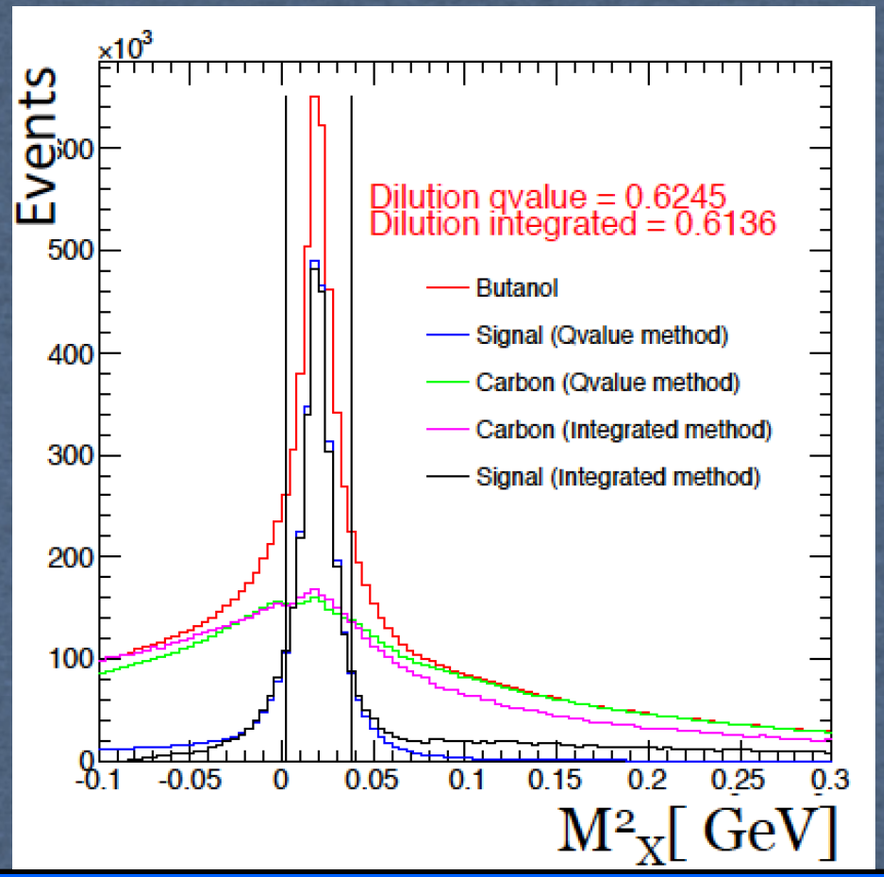
2) Event-based background subtraction

Q-factor = an event-based quality factor equal to the probability for one given event to come from a signal distribution

USC]

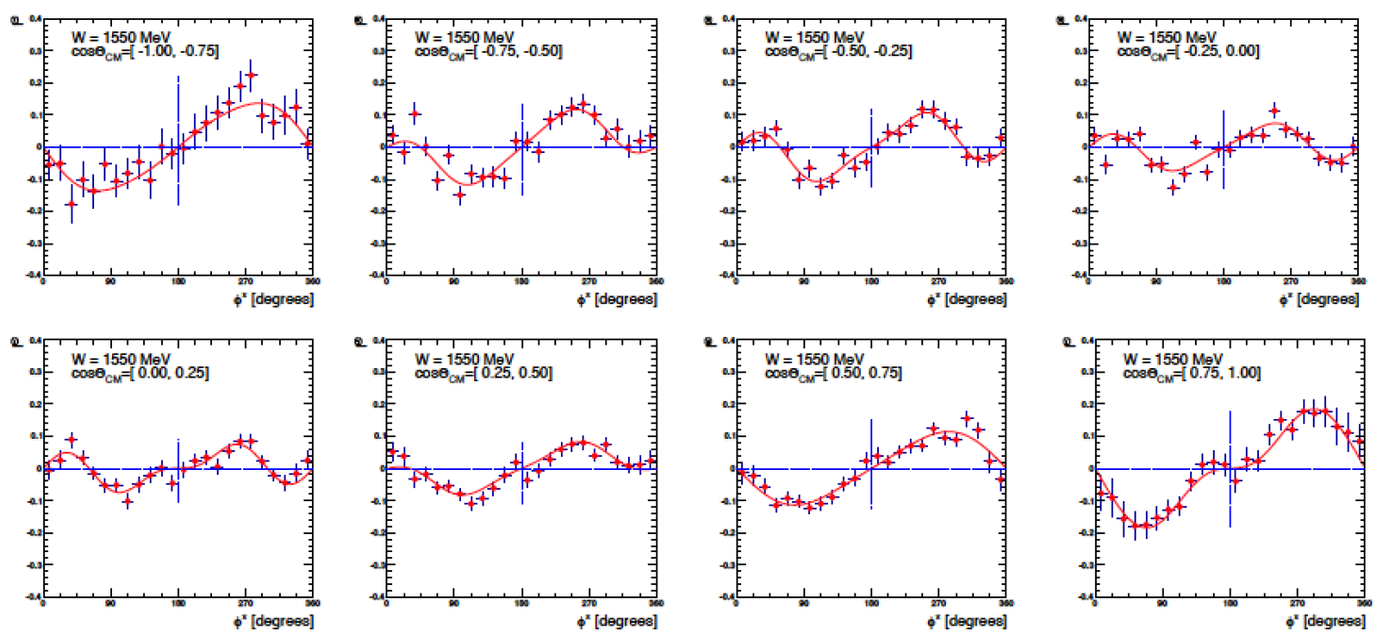
Beam

Target \ Beam	unpolarized	circular	linear	
unpolarized	I_0	$I^{\odot}$	I^s, I^c	g1c g8 g9
longitudinal	P_z	$P^{\odot}_z$	P^c_z, P^s_z	
transversal	P_x, P_y	$P^{\odot}_x$, $P^{\odot}_y$	P^c_x, P^c_y, P^s_x, P^s_y	



$I^{\odot}$

W=1550 MeV
$\cos\theta_{CM}$=[-1,1]



Determination of the Polarization Observables C_x, C_z, and P_y for the Quasi-Free Mechanism in

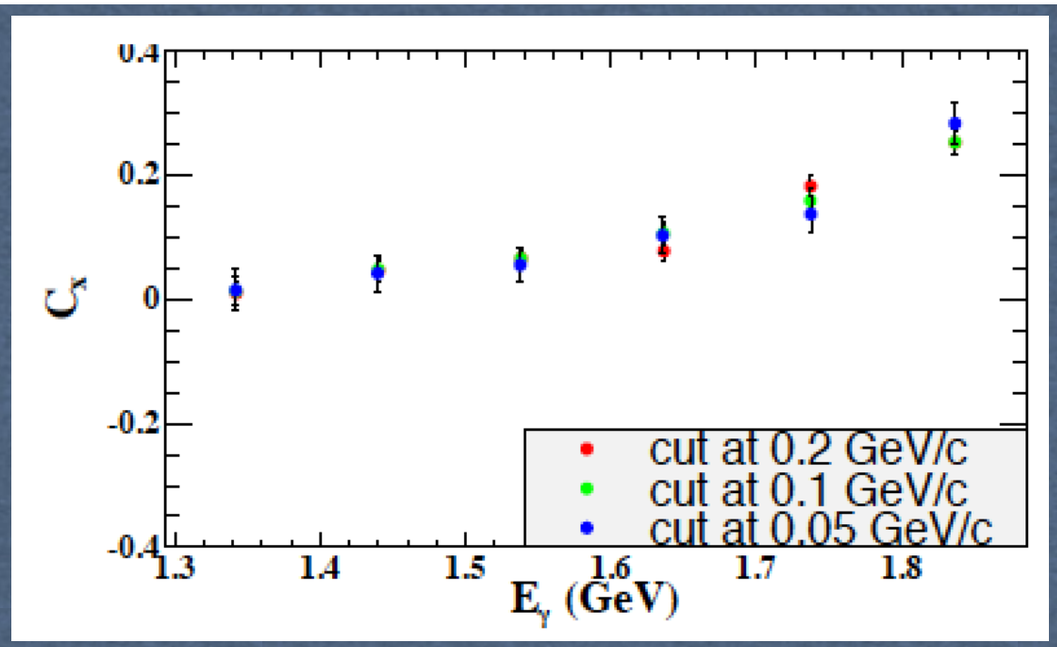
$$\vec{\gamma} d \to K^+ \vec{\Lambda} n$$

Tongtong Cao

The g13a Experiment

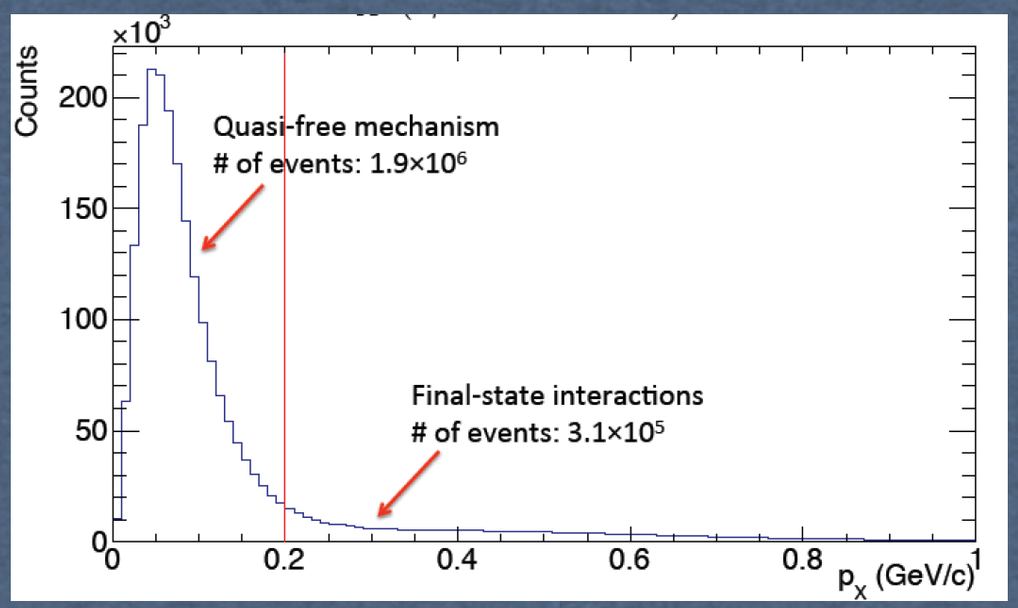
- Circularly polarized photon beam
- E_e = 2 GeV; 2.65 GeV

$$\frac{d\sigma}{d\Omega}^{\pm} = \sigma_0(1 \pm \alpha \cos\theta_{x'} P_{circ} C_{x'} \pm \alpha \cos\theta_{z'} P_{circ} C_{z'} + \alpha P_{y'} \cos\theta_{y'})$$

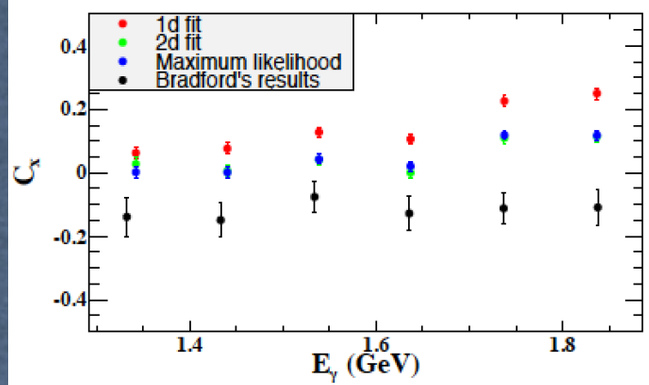


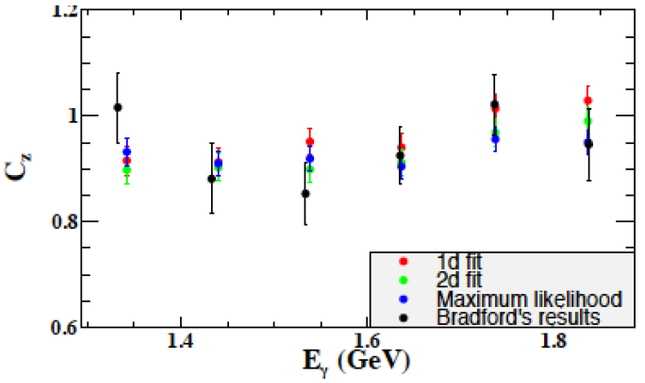
$$\vec{\gamma} d \to K^+ \vec{\Lambda} n \qquad \vec{\Lambda} \to p\pi^-$$

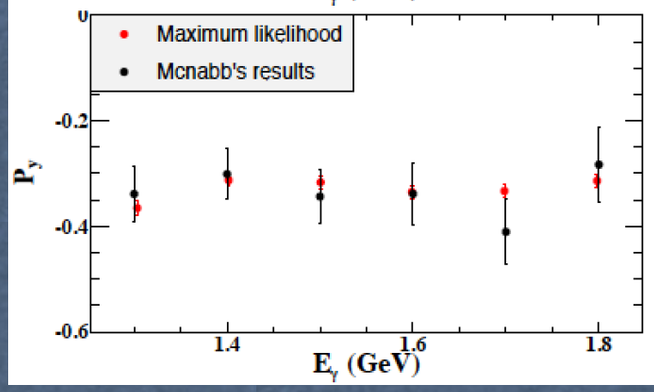
Detected in CLAS



Comparison With g1c Results







$\cos\theta_K$: [0.35, 0.55]

C_x and C_z from Robert K. Bradford
P_y from John W.C. McNabb

- Dataset: g1c
- Reaction: $\vec{\gamma} p \to K^+ \vec{\Lambda}$

9

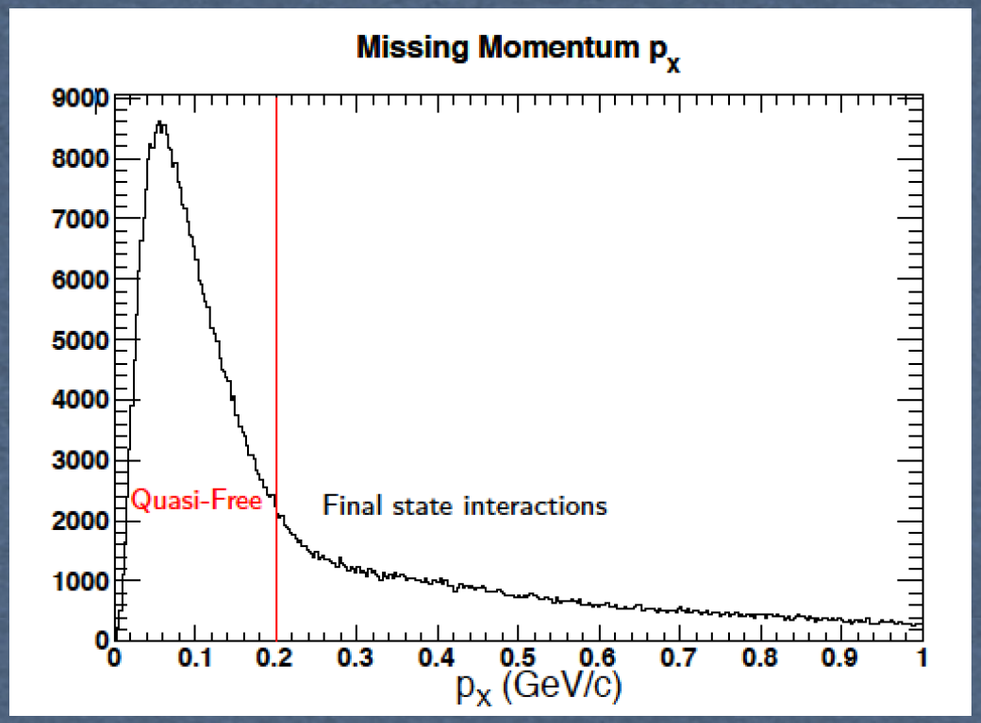
Determination of the Polarization Observables $C_{x'}$, $C_{z'}$, and $P_{y'}$ for $\vec{\gamma}\mathrm{d} \to K^0\vec{\Lambda}(p)$ From g13 Data

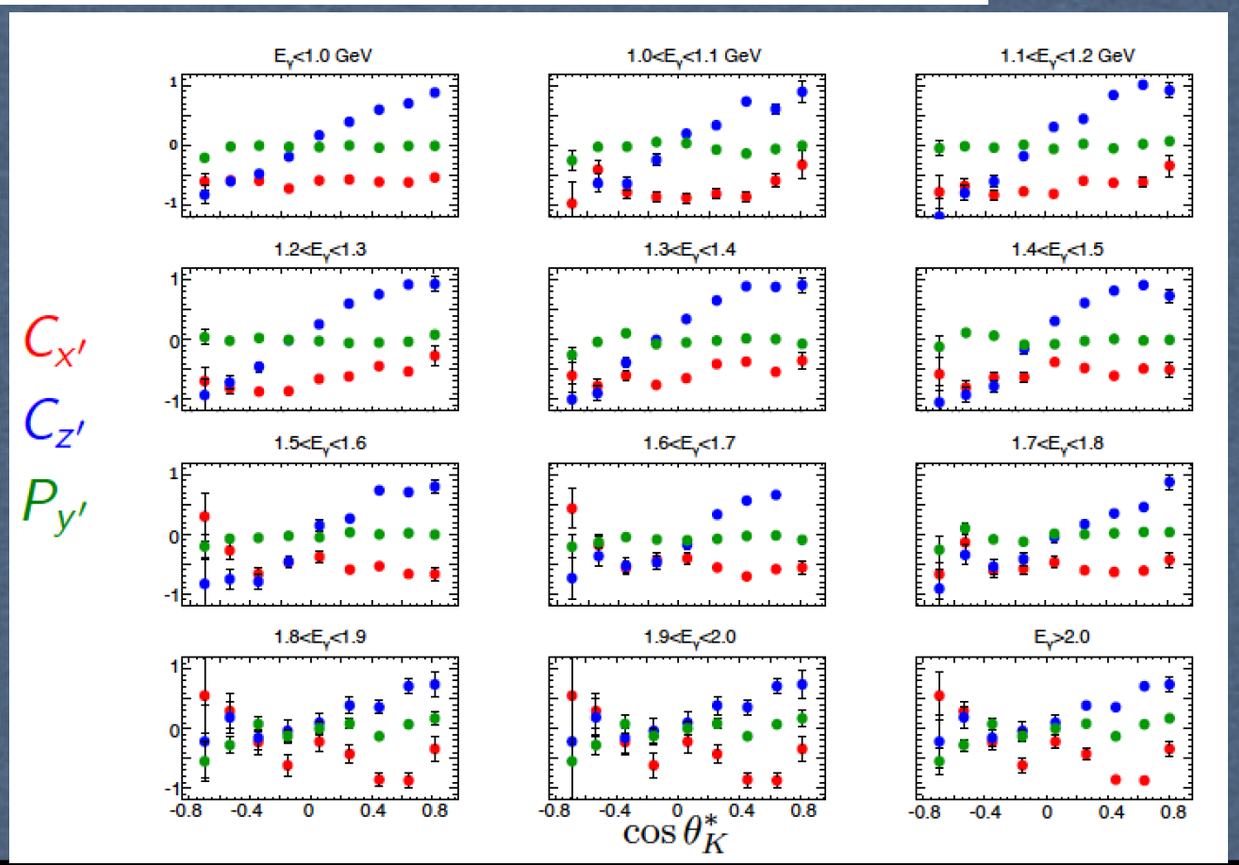
CLAS Collaboration Meeting

Colin Gleason

Person	Channel	Observable
Tongtong Cao	$\vec{\gamma}d \to K^+\vec{\Lambda}n)$	C_x, C_z, P_y
Nick Compton and Charles Taylor	$\gamma d \to K^0\Lambda(p)$	$\frac{d\sigma}{d\Omega}$
Olga Cortes	$\vec{\gamma}d \to \omega(n)$ and $\vec{\gamma}d \to \omega(p)$	Σ, ...
Derek Glazier (Neil Hassal)	$\vec{\gamma}d \to K^0\vec{\Lambda}(p)$	Σ
Paul Mattione	$\gamma d \to K^{*0}\Lambda(p)$ and $\gamma d \to K^+\Sigma^{*-}(p)$	$\frac{d\sigma}{d\Omega}$
Daria Sokhan	$\vec{\gamma}d \to p\pi^-(p)$	Σ
Nicholas Zachariou	$\vec{\gamma}d \to K^+\vec{\Lambda}n$	Σ, O_x, O_z

$$\frac{d\sigma}{d\Omega}^{\pm} = \sigma_0(1 \pm \alpha \cos\theta_{x'} P_{circ} C_{x'} \pm \alpha \cos\theta_{z'} P_{circ} C_{z'} + \alpha P_{y'} \cos\theta_{y'})$$





Summary of 3 independent analyses of $\gamma n \to \pi^- p$ from g14 (HDice) data

Dao Ho, Tsuneo Kageya, Peng Peng, A. Sandorfi, R. Schumacher, F. Klein, and the g14 run group

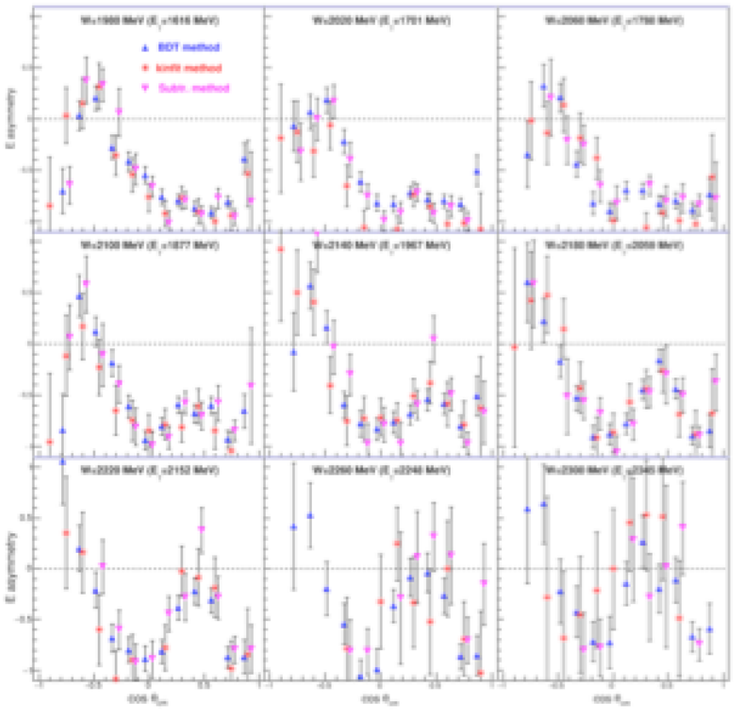
Three independent analyses to extract *E* asymmetry for $\gamma n \to \pi^- p$ from HDice data

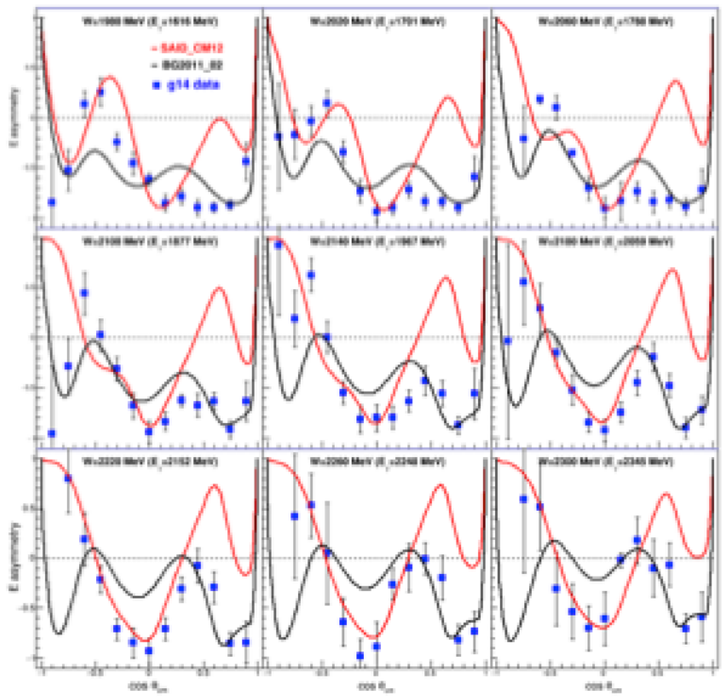
(1) standard 1-D cuts and Background subtraction

(2) kinematic fit of $\gamma(n) \to \pi^- p$

(3) BDT method

- *consistent results for ~240 data points at 1480 < W < 2320 MeV*
- *missing momentum dependence studied*
- *systematics for all 3 approaches studied*
- *Analysis note being prepared*
- *results at higher W will have impact on PWA*

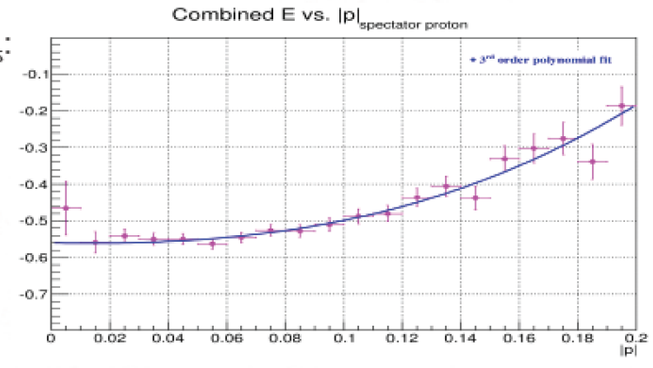




Dependence of *E* on missing momentum

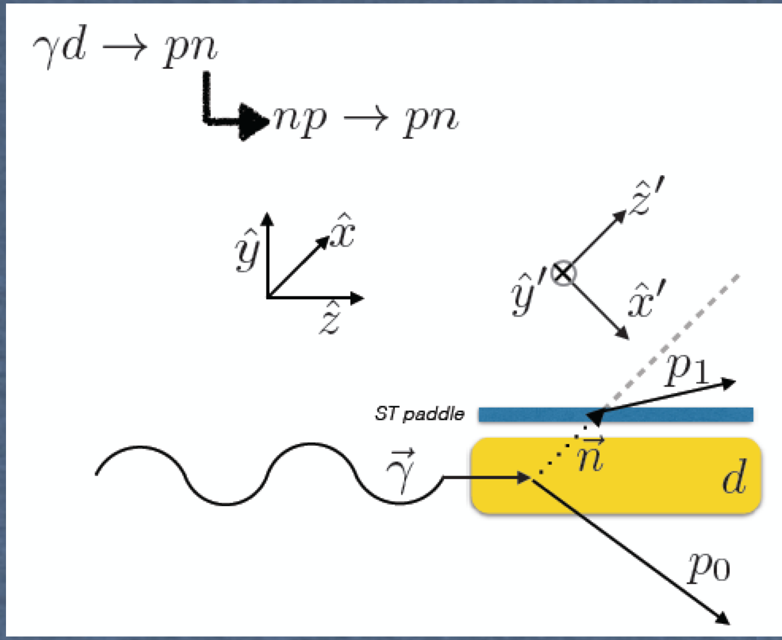
large miss.mom.: final-state interactions, deuteron D-state contributions

- consider average E as fcnt. of P_{miss}:
- BDT correction: 8.6%
- Backgrnd subtr.: 3.6%



Utilising the CLAS Start Counter as a Neutron Polarimeter

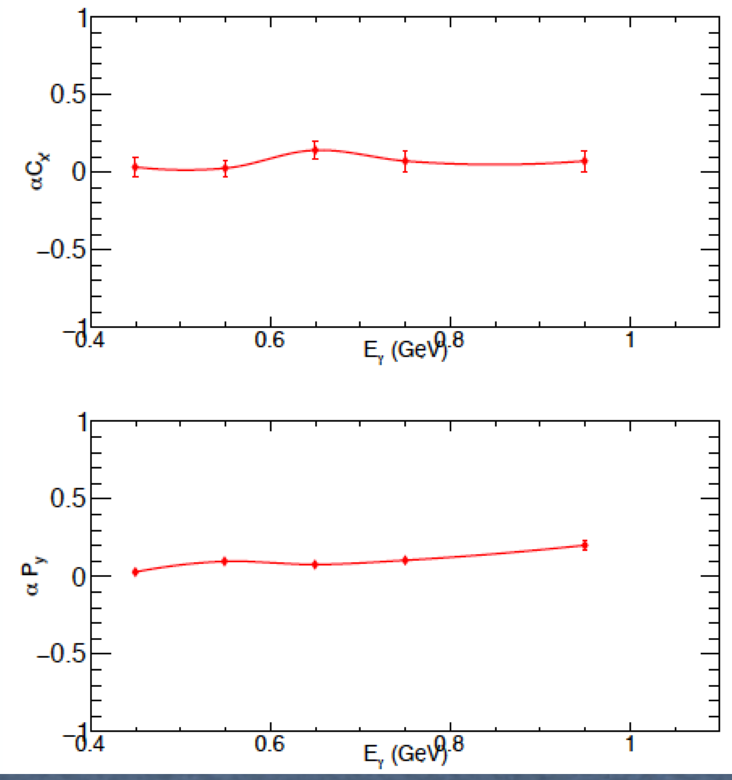
Nicholas Zachariou
University of Edinburgh



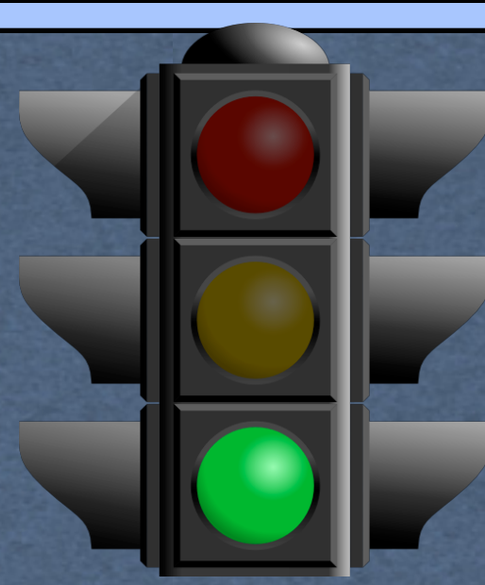
$$I(\theta_{sc},\phi_{sc}) = I_0(\theta_{sc})[1 + A(\theta_{sc})(P_y \cos\phi_{sc} - C_{x'} P_\gamma^{\odot} \sin\phi_{sc})]$$

- Determination of the neutron polarisation from deuteron photodisintegration utilising CLAS data (g13) is underway $\gamma d \to pn$ ↳ $np \to pn$
- Distance of closest approach between γ and each proton allows us to identify the proton from $\gamma d \to pn$ and thus reconstruct the neutron
- Angular distributions of second proton with respect to neutron are determined
- Monte Carlo simulations will be used to obtain the effective analysing power
- First results on neutron polarisation transfer weighted by the effective analysing power were determined

Preliminary Results



WG Reviews status



New
since last meeting

Gamma p to K0K0 from the g12 Data Set
PI: Kenneth Hicks and Shloka Chandavar
RC: Carlos Salgado (Chair), Derek Glazier , Lorenzo Zana
I round of comments

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

2pi photoproduction from g11
PI: Evgheny Golovach et al.
Ralf Gothe (Chair), Lei Guo ,Alessandro RizzoStepan
I round of comments

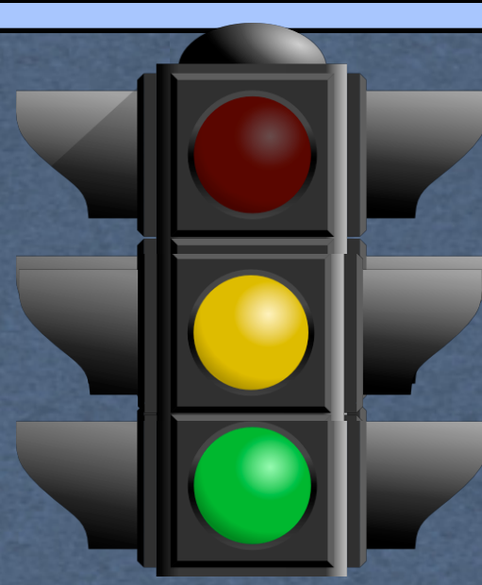
KLambda and KSigma from FROST
PI: N.Walforf et al.
RC: S.Strauch, M.Holtrop, P.Mattione,
I round of comments, waiting for a revised version of the note

2pi electroproduction at large Q2 from E1-6 run
PI: E.Isupov et al.
RC: B.Briscoe, M.Guidal, M.Ripani
Almost done

Photoproduction of the f1(1285)
PI: R.Schumacher (CMU) et al.
RC: D.Weygand, B.McKinnon, D.Watts

DONE!

WG Reviews status

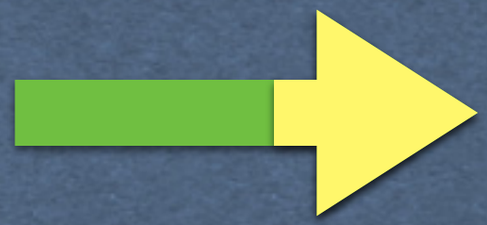


Exclusive Photo-Production Measurement of K +Sigma*- off Quasi-Free Neutrons in Deuterium

PI: H.Lu (SCU) et al.

RC: N.Zachariou, M.Dugger, D.MacGregor

Status: resumed with reshuffled committee



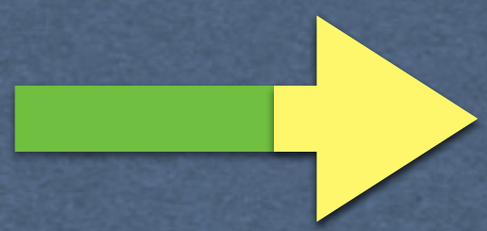
Polarized structure function sigmaLT from the single pi0 electroproducion on the proton in the resonance region

PI: Nick Markov

RC: V.Crede, Ralf Goethe, Yelena Prok

Started Sept 2014

Status: delayed but resumed



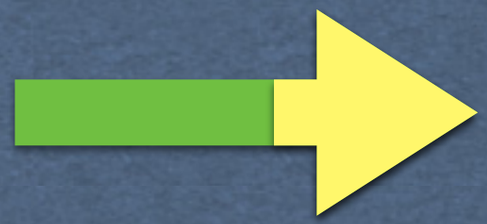
Spin observables in omega production

PI: Brian Vernarsky

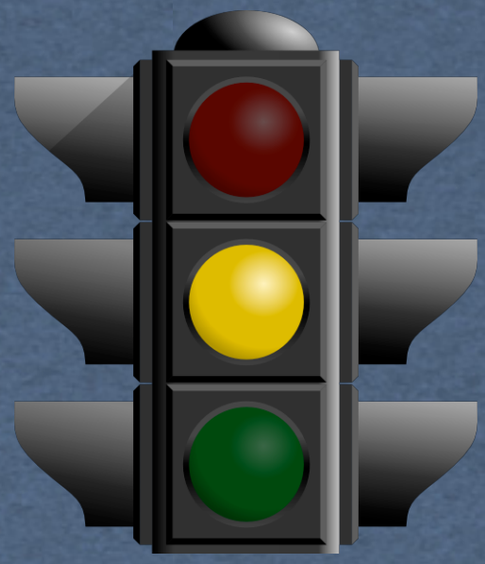
RC: F.Klein, A.Filippi, S.Strauch

Started Sept 2014

Status:LOST CONTACT



WG Reviews status



Polarization Observables in g(pol)p(pol)->ppi +pi-Using the g9a (FROST) Target and CLAS
PI: V.Crede (FSU) et al.
RC: K.Livingston, V. Ziegler, E. Golovach
Timeline: Sep 12 2013 started, Oct 14 Ist round
Status: almost ready to submit the new (broader) note

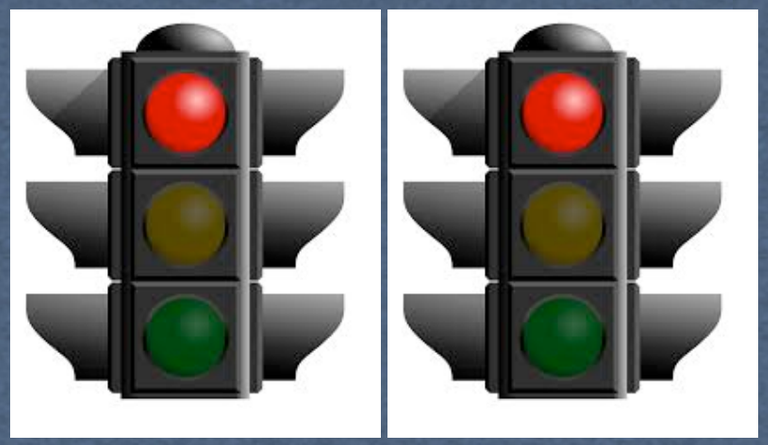
later today

gamma+p -> p K+ K- reaction
PI: S.Lombardo (Cornell)
RC: P.Eugenio, D. Schott, D. Carman
Timeline: started Jan 17 2014
Status: eventually the PI responded to the RC comments

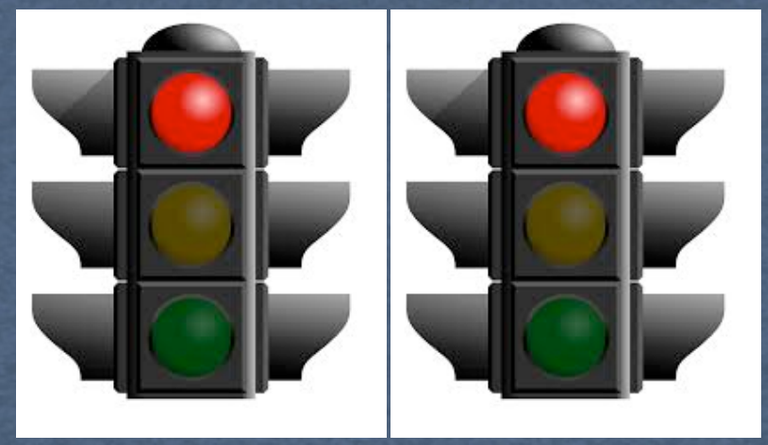
later today

Data analysis technique for obtaining gamma p -> eta p, gamma p -> eta' p and gamma p -> omega p beam asymmetries from the g8b running period
PI: Mike Dugger (Patrick Collins)
RC: L.Guo, D.Sober, E.Golovach
Timeline: Jan 2013started, Feb 1st round
Status: new analysis note to the RC in 1 month

later today



WG Reviews status



Run Group Review

g12 status

- g12 group review ongoing (second round)
- Key issues:
  - MC/Data Comparison
  - Normalization
- Key results
- Road forward

Lei Guo, Florida International University, g12 group

- We would like to thank the review committee
- All corrections (standard/g12 specific) performed and systematics checked
- g12 cross sections (strange/lepton/hadron) all in good agreement with prior results
- Polarization measurements also consistent with existing results
- Multiple results ready for review (Thesis/Analysis/Paper draft written)
  - π^0 cross section (MK)
  - Meson->K_sK_s (Schloka/Ken)
  - Ξ^- polarization (Jason)
  - Ξ^- cross section and Ξ^{-*} upper limit (Johann)
  - ρ/ω interference (MP)
  - Many other analysis are in mature stage (PWAs, Asymmetries, ….)

g12 procedures review

Eugene Pasyuk

for the review committee

What can be approved?

- Calibration quality is adequate
- Momentum corrections
- Beam energy correction
- Kinematic fit should be reviewed by individual analysis
- "Lepton ID"
  - we can approve as "l be tighter.
- PID and event selecti individual analysis
- Inclusive "Good" run
  - could be reduced in

g12 Analysis Procedures Cheat Sheet

August 21, 2015

Use of this cheat sheet assumes you have read and understood every word in the official *g12 Analysis Procedures, Statistics and Systematics* CLAS note. The authors are not responsible for lost time due to blindly following the steps described herein.

1 environment

For all analyses:

```
setenv CLAS_PARMS /group/clas/parms
```

For hadron analyses, use the g12 run index (and run 56855 for MC):

```
setenv CLAS_CALDB_RUNINDEX calib_user.RunIndexg12
```

For lepton analyses, use this run index (and run 10 for MC):

```
setenv CLAS_CALDB_RUNINDEX calib_user.RunIndexg12_mk
```

2 simulation

2.1 Digitization

```
gsim_bat -ffread /home/clasg12/ffread.g12 \
-kine 1 -mcin events.part \
-bosout events.gsim -trig 2000000
```

For lepton analyses, use this ffread file:

```
/home/clasg12/lepton.ffread.g12
```

2.2 Smearing

```
gpp -Y -s -S -a2.73 -b1.7 -c1.93 -f1 -R56855 \
-P0x7f -oevents.gpp \
-A/home/clasg12/gpp_tagger_profile.bos \
events.gsim
```

For lepton analyses, use the option -R10.

2.3 Reconstruction

```
aic -T4 -ct1930 -cm0 -cp0 -X0 -d1 -F \
-P0x1bff -z0,0,-90 -Aprlink_tg-90pm30.bos \
-oevents.aic events.gpp
```

2.4 Analysis of Simulation

1. Topology dependent event slection
2. Standard eloss correction
3. g12 TOF knock-out
4. g12 Fiducial cuts
5. Notice:
   (a) no beam corrections
   (b) no momentum corrections

3 Analysis of Data

1. Topology dependent event selection. Analyze only complete runs, refer to the good-run list and sorting of bos event in the CLAS note.
2. Standard eloss
3. g12 Beam energy corrections
4. g12 Momentum corrections
5. g12 TOF knock-out
6. g12 Fiducial cuts
7. Notice for leptons:
   (a) g12 EC/CC particle identification cuts
   (b) g12 EC knock-out
   (c) g12 EC-specific fiducial cuts

3.1 Absolute Normalization Corrections

Use g12-gflux-all found in /home/clasg12/local/scripts to generate flux for "good" scalar intervals of the runs listed in the file *filelist.txt*:

```
g12-gflux-all filelist.txt good > flux.txt
```

1. Photon multiplicity correction (necessary if the -A option in gpp is not used)
2. Track-dependent efficiency map. The map was derived without using the start counter and addresses inaccurate simulation of other detector elements
3. If analyses require start counter timing selection, efficiency of the timing cut and detector efficiency must be applied

Run Group Review

Lesson learned

- After 1year of review HSWG has a better understanding of the run group review (RGR)
- Not all can be approved but many procedures are common to different analysis
- Cheat sheet very useful for future collaborators willing to analyse g12 (data mining)
- Fast track for analysis relying on standards: reduced review committee made by 1 new + 1 supervisor from the RG review committee
- Should be extended to all run groups?
- Important lesson for CLAS12: not waiting for (9 years!) to set up the RG review!
- We need to have 1 run group representative in the committee
- We'll keep testing with FROST and g14 run groups
- Major issues with students that leave the field: advisor responsibility?
- Formal extended presentation at the HSWG before to assign a review committee
- We would assign a 'tutor' (nominated by HSWG and run group) to review the analysis from the very beginning (the same will serve in the final review committee)
- Need to be discussed by the whole collaboration (next Coll Meeting?)