K* photoproduction from the proton at CLAS

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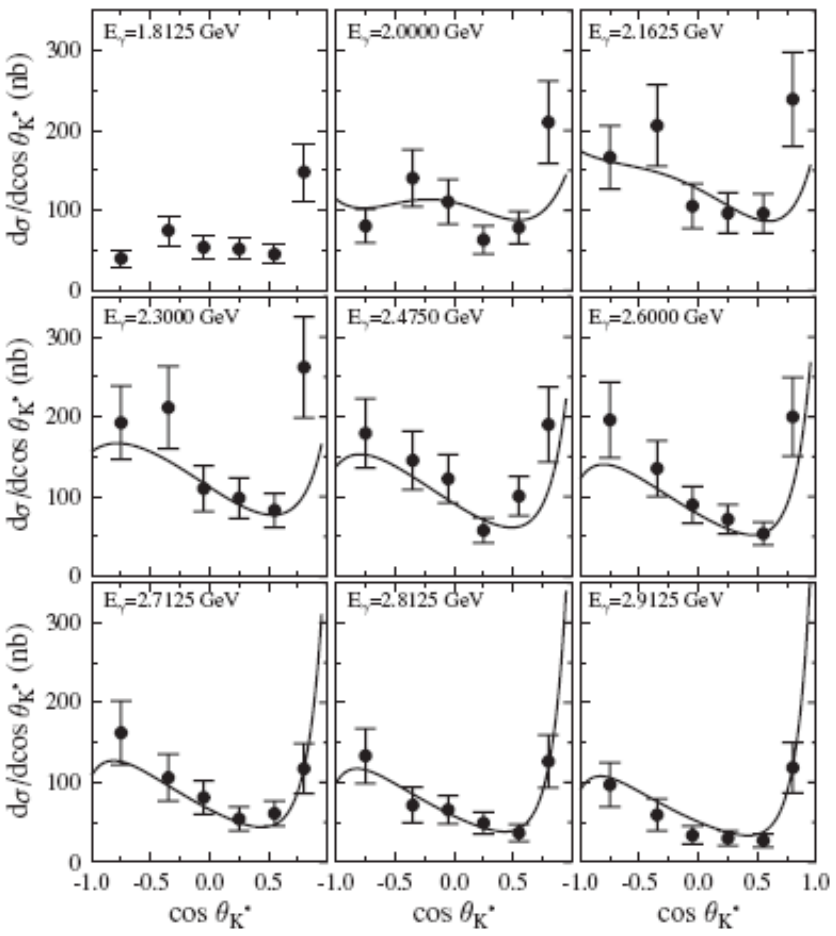
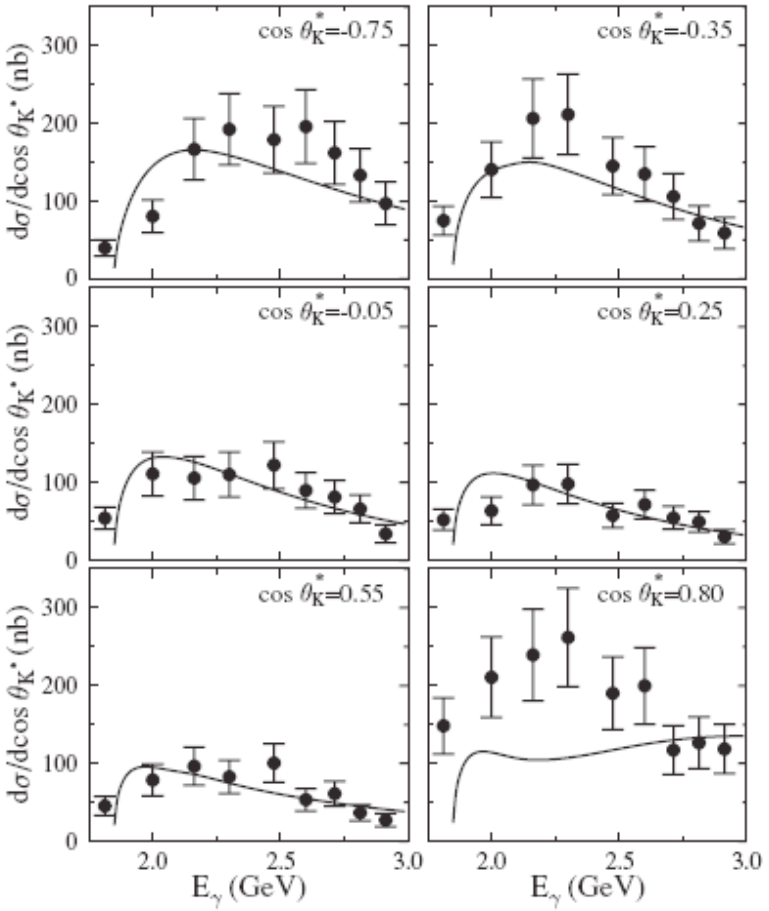
OUTLINE

- Review of K* photoproduction data
- Theoretical motivation
- Preliminary results

CLAS $K^{*0}\Sigma^{+}$ data (2007)

I. Hleiqawi et al., Phys. Rev. C 76 (2007) 039905E.





Conf.

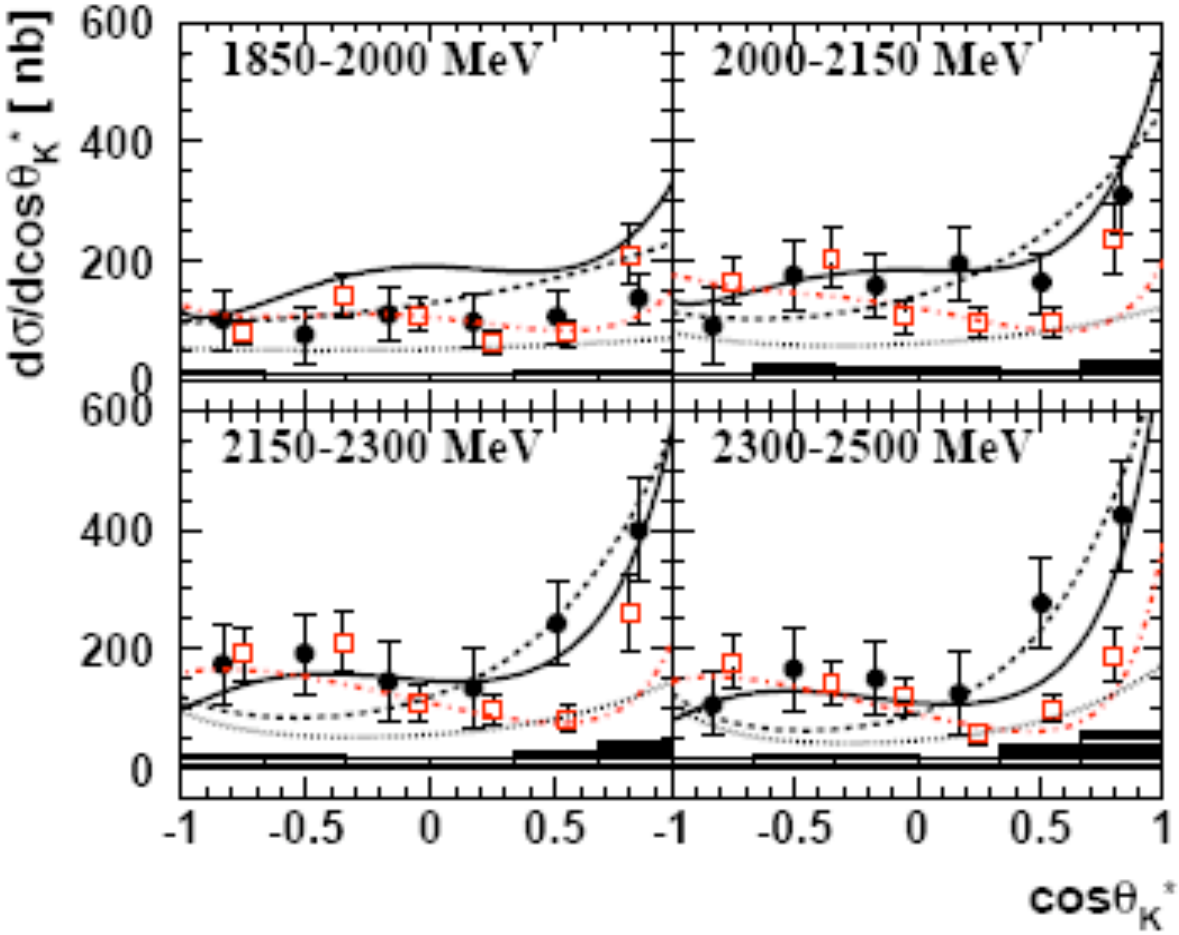
New K*^{0} Data from CB-ELSA

$K^0\pi^0\Sigma^+$ and $K^{*0}\Sigma^+$ photoproduction off the proton

M. Nanova[1], J. C. S. Bacelar[2], B. Bantes[3], O. Bartholomy[4], D. Bayadilov[4,5], R. Beck[4], Y.A. Beloglazov[5], R. Castelijns[2,a], V. Crede[6], H. Dutz[3], A. Ehmanns[4], D. Elsner[3], K. Essig[4], R. Ewald[3], I. Fabry[4], K. Fornet-Ponse[3], M. Fuchs[4], Ch. Funke[4], R. Gothe[3,b], R. Gregor[1], A. B. Gridnev[5], E. Gutz[4], P. Hoffmeister[4], I. Horn[4], I. Jaegle[7], J. Junkersfeld[4], H. Kalinowsky[4], S. Kammer[3], V. Kleber[3], Frank Klein[3], Friedrich Klein[3], E. Klempt[4], M. Konrad[3], M. Kotulla[1], B. Krusche[7], M. Lang[4], J. Langheinrich[3,b], H. Löhner[2], I.V. Lopatin[5], J. Lotz[4], S. Lugert[1], D. Menze[3], J. G. Messchendorp[2], T. Mertens[7], V. Metag[1], C. Morales[3], D.V. Novinski[5], R. Novotny[1], M. Ostrick[3,c], L. M. Pant[1,d], H. van Pee[4], M. Pfeiffer[1], A. Radkov[5], A. Roy[1,e], S. Schadmand[1,a], Ch. Schmidt[4], H. Schmieden[3], B. Schoch[3], S. V. Shende[2], V. Sokhoyan[4], A. Süle[3], V. V. Sumachev[5], T. Szczepanek[4], U. Thoma[1,4], D. Trnka[1], R. Varma[1,e], D. Walther[3,4], Ch. Weinheimer[4,f], and Ch. Wendel[4]
(The CBELSA/TAPS Collaboration)

Comparison: CLAS, CB-ELSA

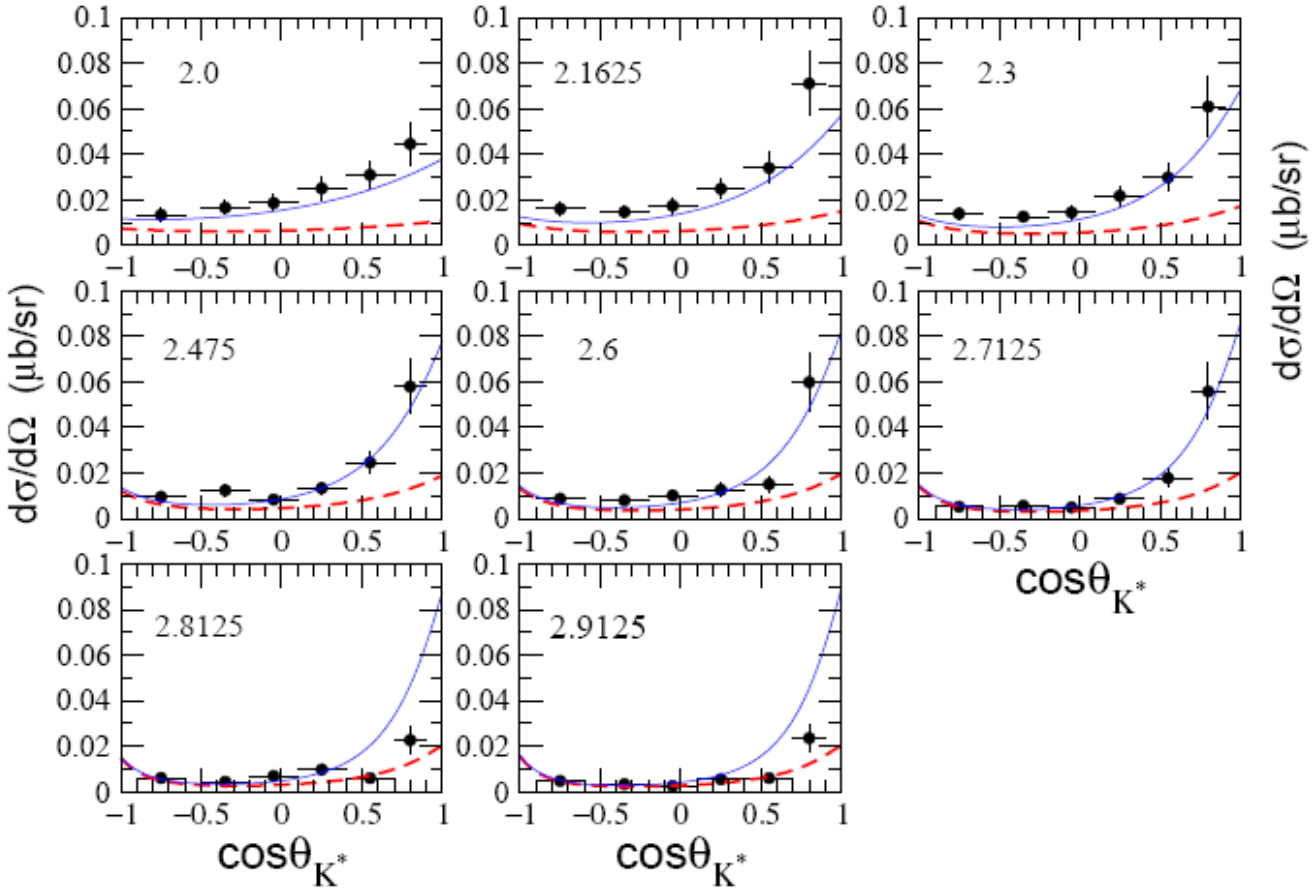
Red (open) = CLAS, Black (solid) = TAPS



Note the strong forward-peaking of TAPS data at higher photon energies.

Y. Oh and H. Kim, hep-ph/0605105.

Theory calculations: $K^{*0}\Sigma^{+}$

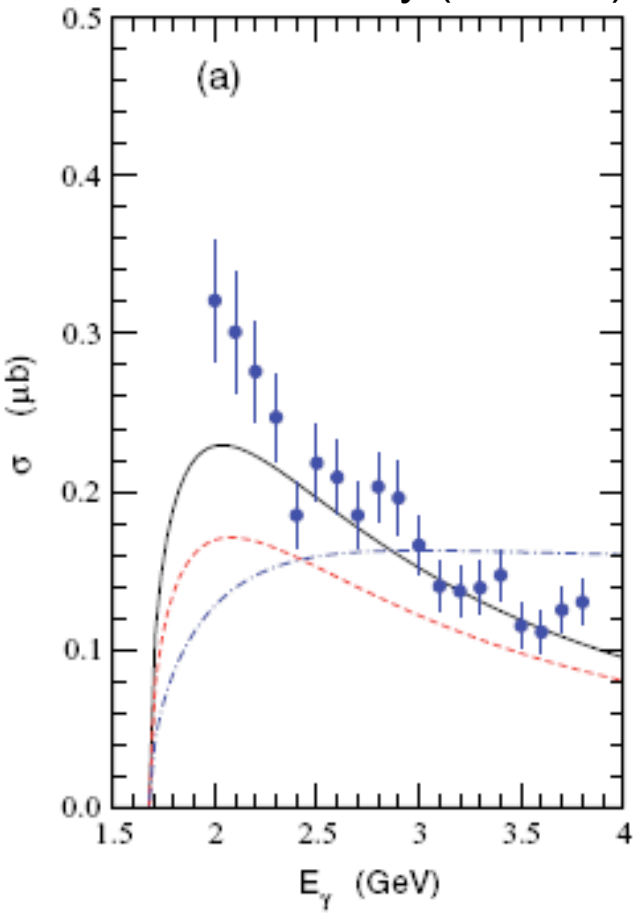


Model I (blue): no kappa form factor; Model II (red): with kappa form factor.

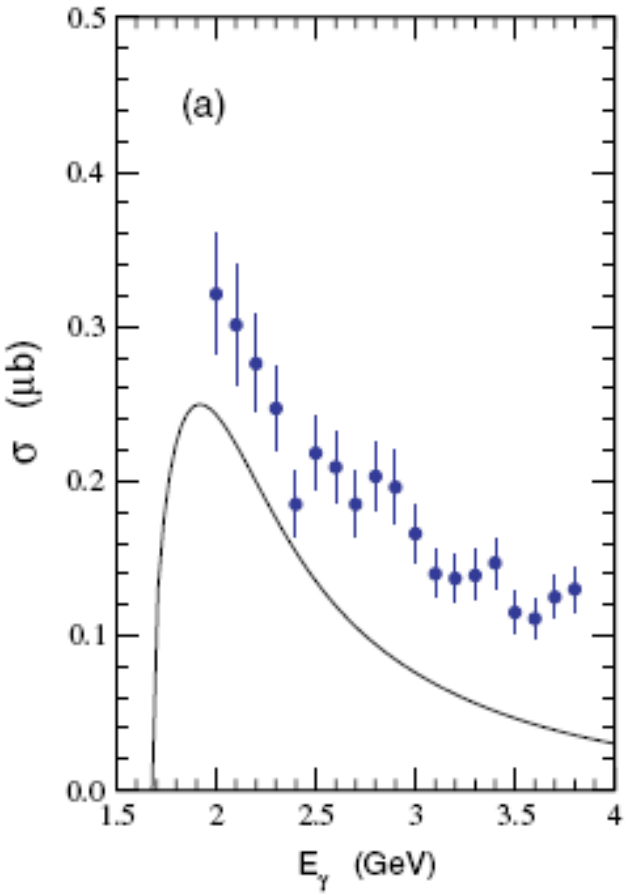
Y. Oh and H. Kim, PRC 73:065202 (2006).

Theory: $K^{*+}\Lambda$

Full calculation (solid line)
K^+ t-channel only (dashed)

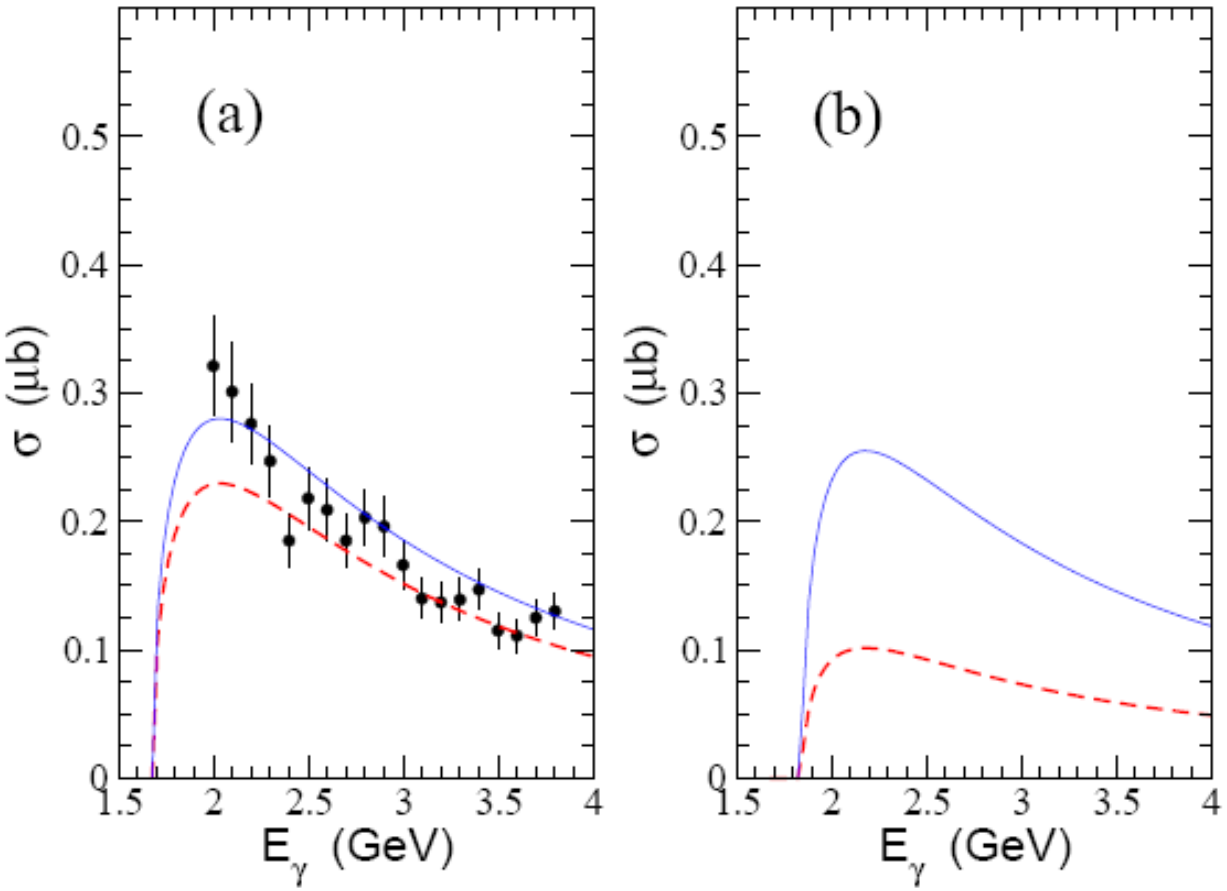


Regge model (kaon trajectory)



Y. Oh and H. Kim, hep-ph/0605105.

Theory: a) $K^{*+}\Lambda$, b) $K^{*0}\Sigma^{+}$

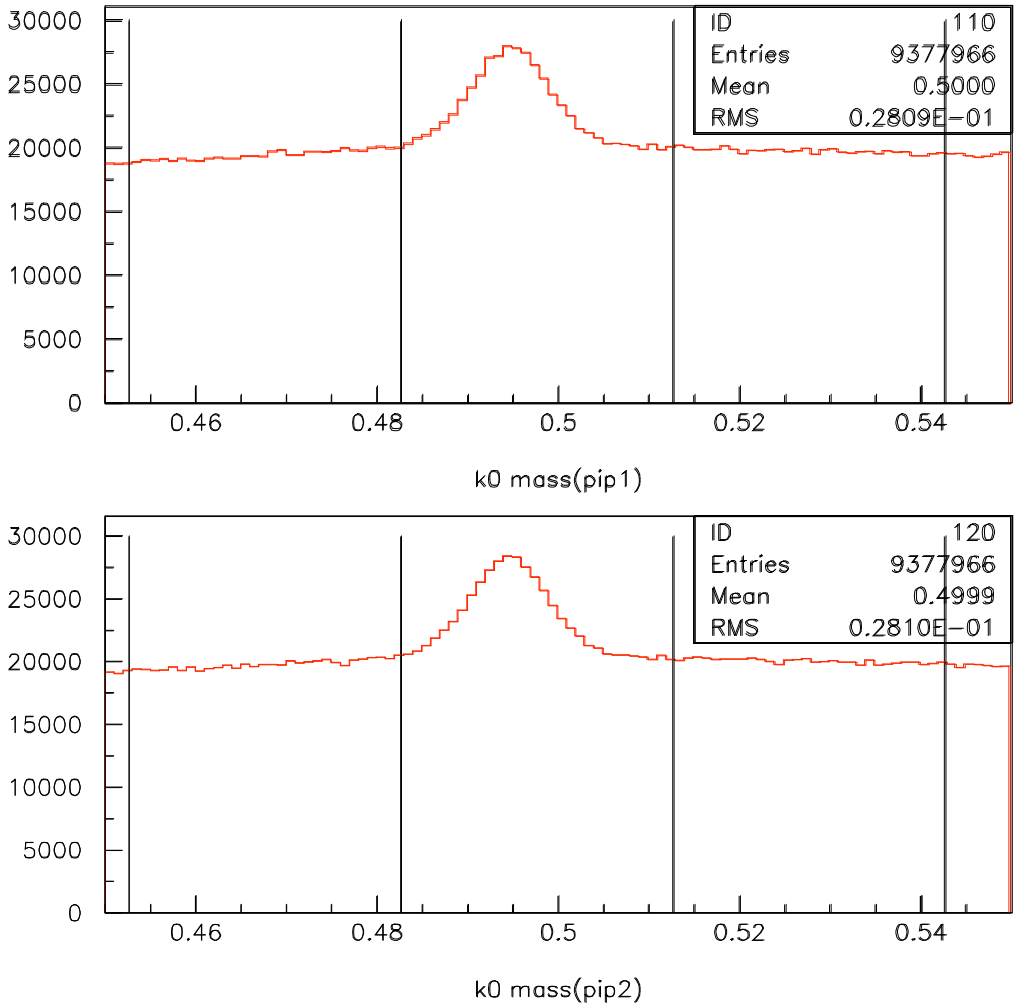


SOLID BLUE: no kappa form factor; DASHED RED: with kappa form factor

K^{*+} Photoproduction

- Using CLAS g11 data set
- Detecting: $\pi^+\pi^-$ pair and another π^+.
- Missing mass of Lambda and Sigma
- Preliminary acceptance using GSIM
- Absolute normalization
  - Checked using $K^0\Sigma^+$ photoproduction.

K^0 mass peak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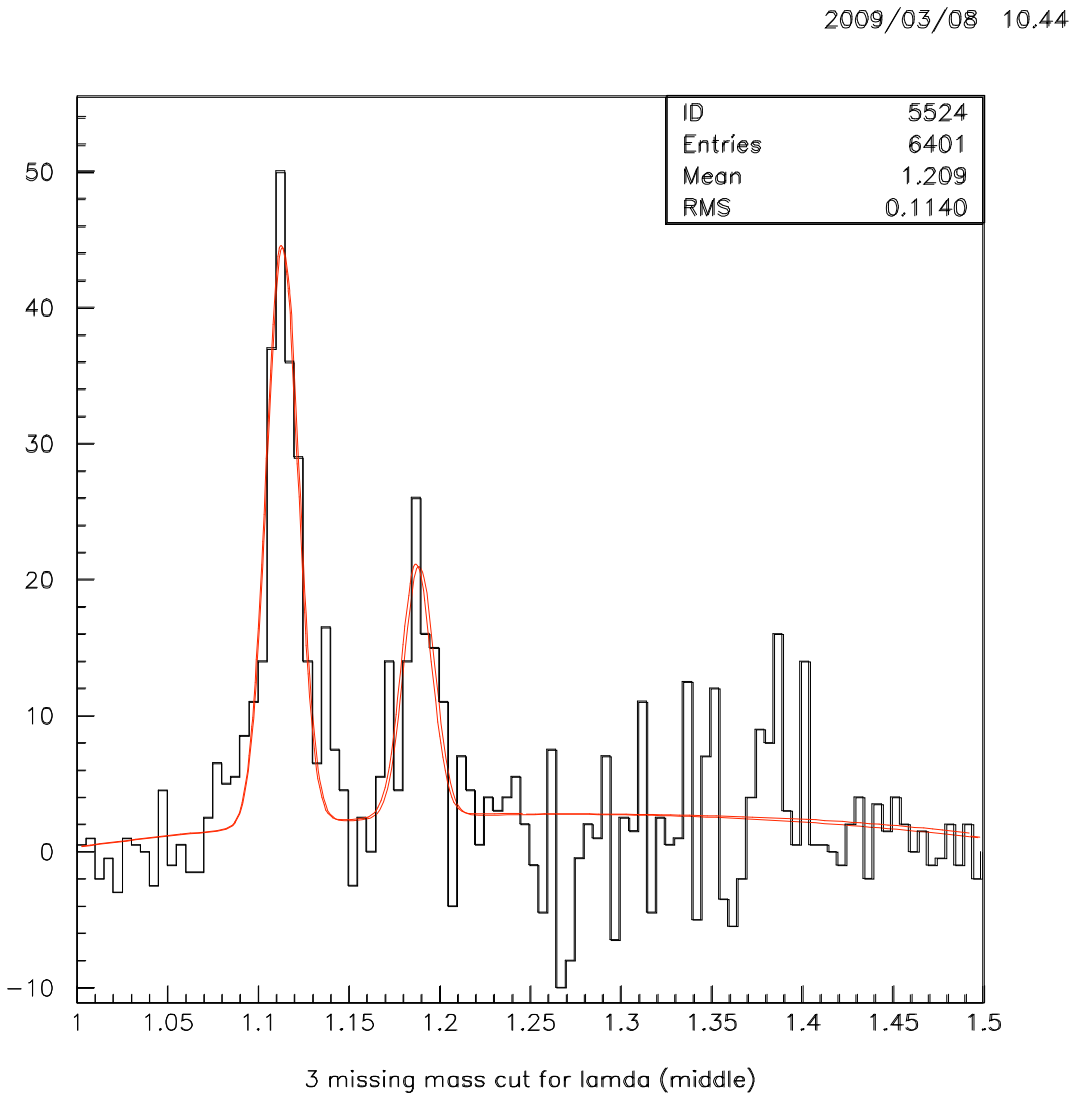
RMS 0.2809E-01
30000
25000
20000
15000
10000
5000
0
0.46
0.48
0.5
0.52
0.54
k0 mass(pip1)
ID 120
Entries 9377966
Mean 0.4999
RMS 0.2810E-01
30000
25000
20000
15000
10000
5000
0
0.46
0.48
0.5
0.52
0.54
k0 mass(pip2)

Sample fit: one E_γ bin

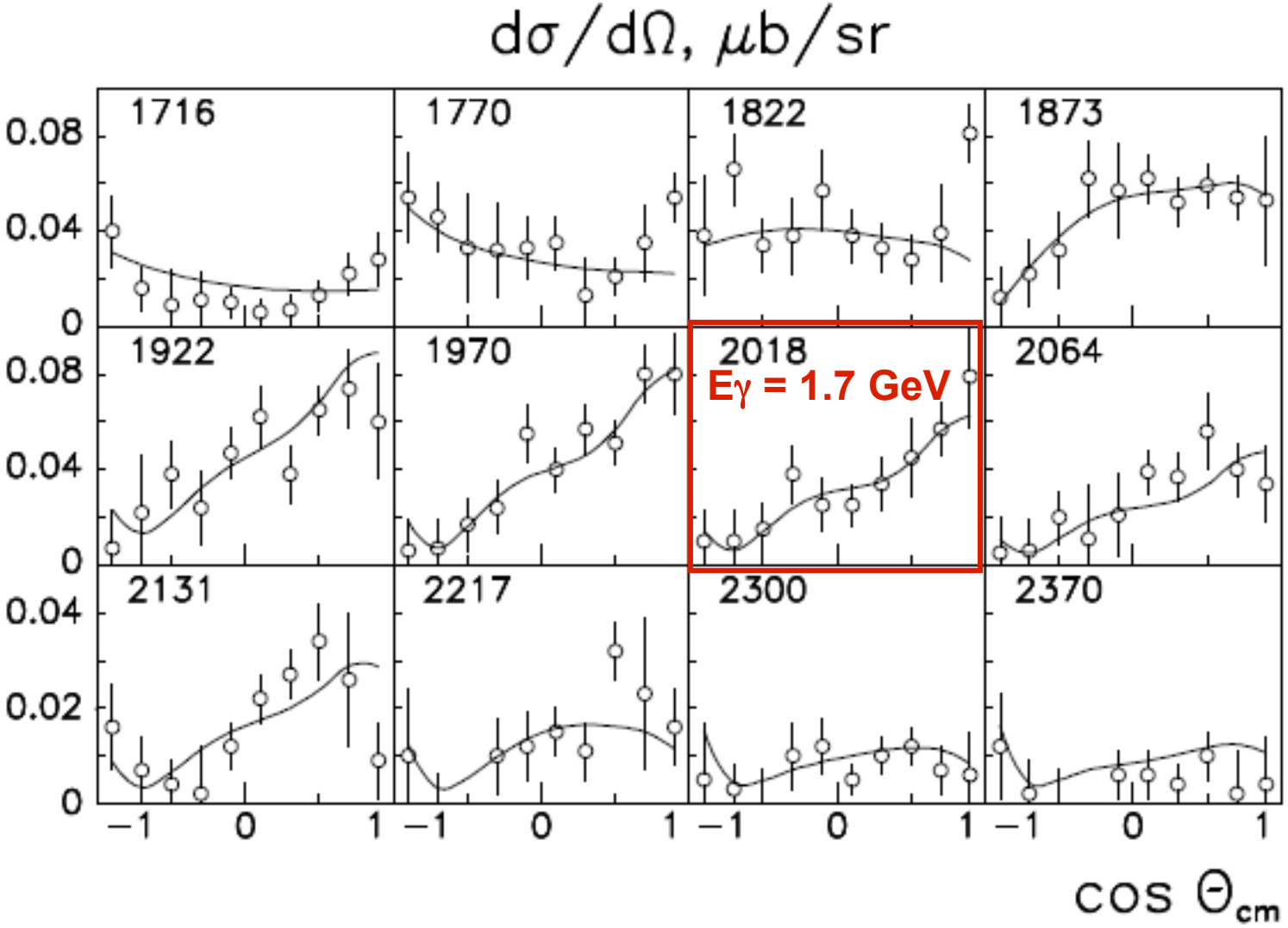


Calibration: $\gamma p \rightarrow K^0\Sigma^+$ reaction

- Same K^0 identification in final state
- Same photon flux, target, etc.
- Similar simulation calc. (minus one pion)
- Other data exist
  - CLAS (unpub.) B. Carnahan PhD (2003).
  - SAPHIR: R. Lawall et al., Eur. Phys. J. (2005).

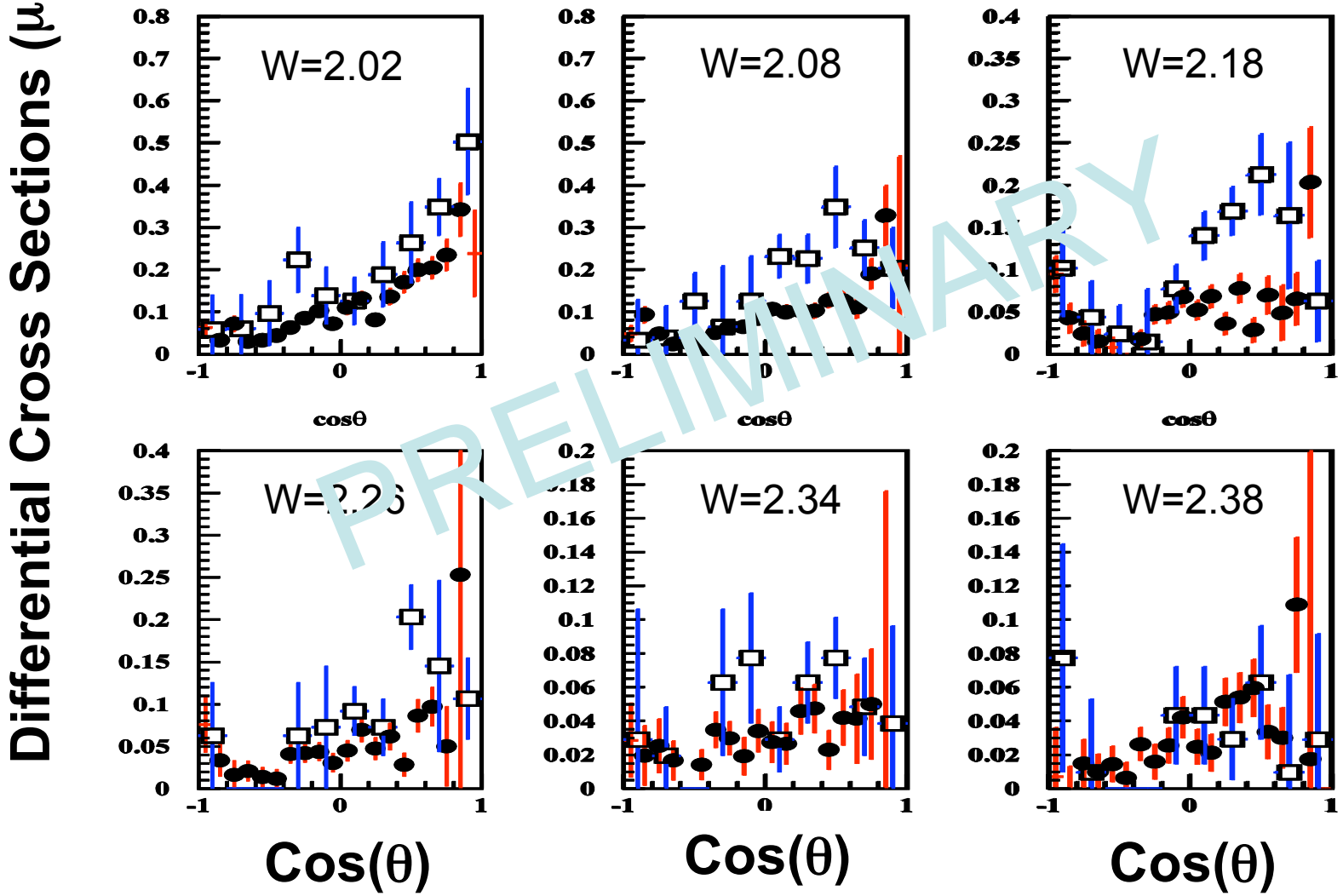
Sarantsev et al., Eur. Phys. J. A25, 411 (2005).

SAPHIR: $K^0\Sigma^+$ data

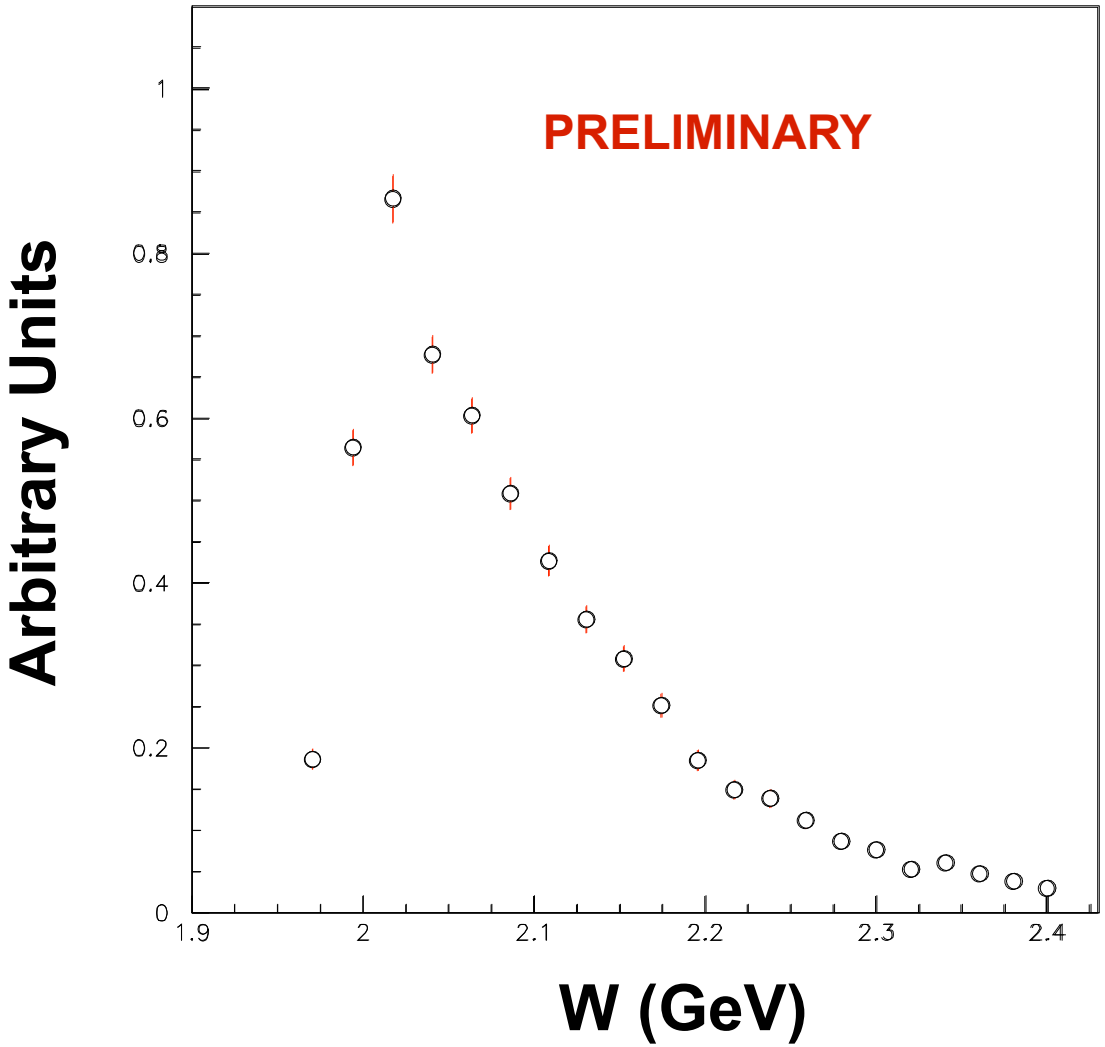


Open points = SAPHIR data, **Closed points = CLAS data**

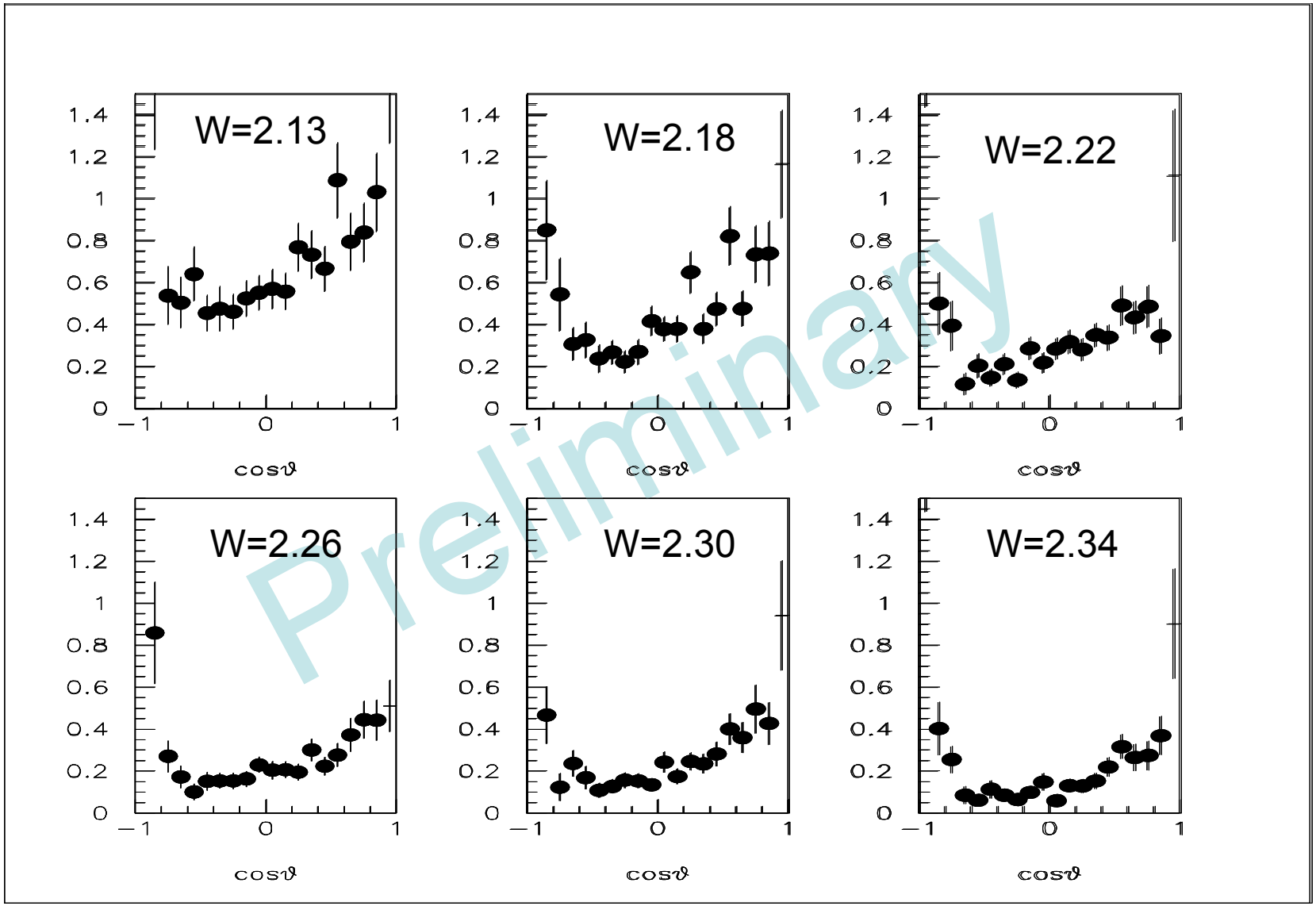
Calibration: $K^0\Sigma^+$ cross sections



$K^{*+}\Lambda$ Total Cross Sections



$K^{*+}\Lambda$ Normalized Yields

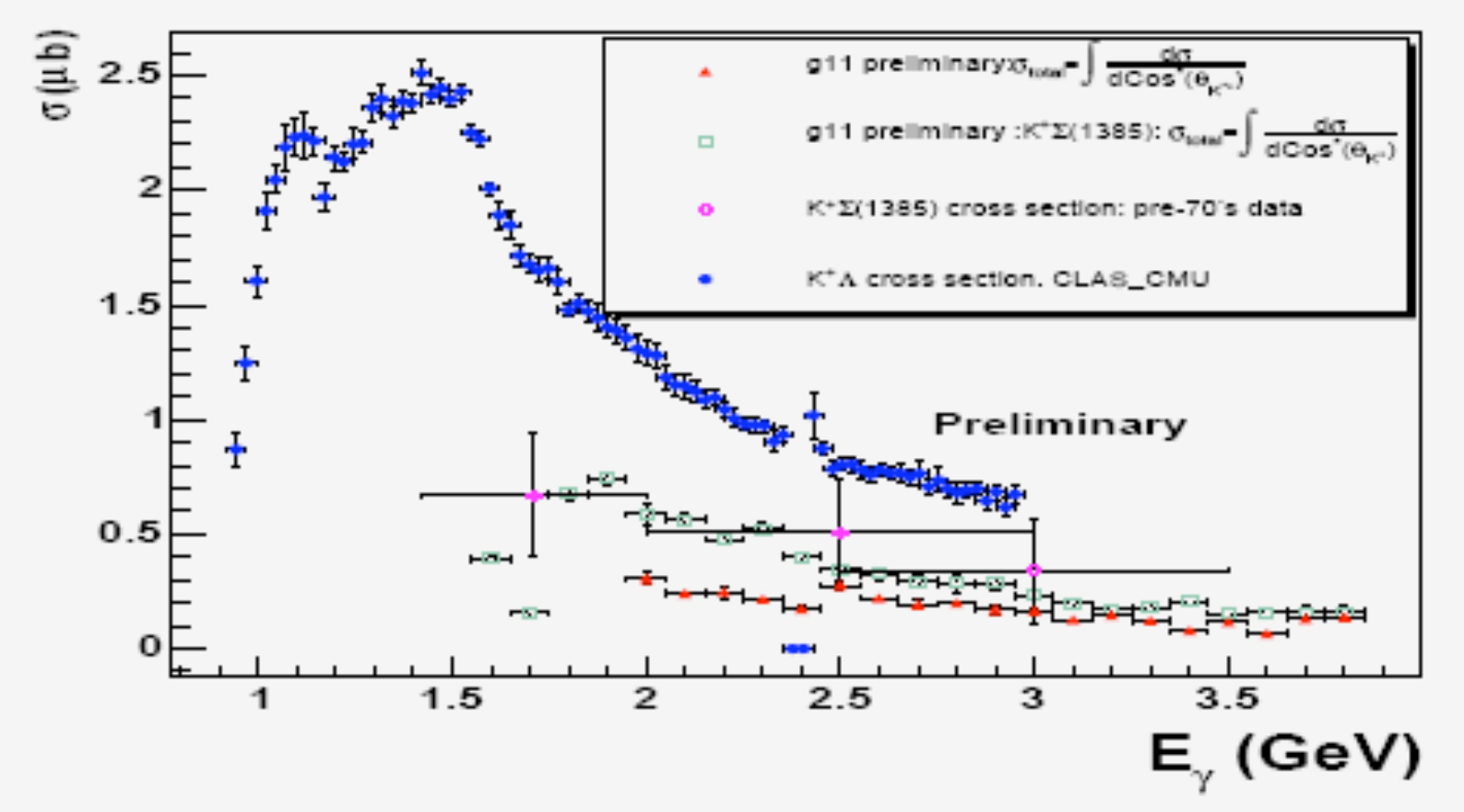


Summary

- $K^{*+}\Lambda$ cross sections are nearly final.
  - Normalizations appear to be understood.
  - Good agreement with most of the SAPHIR data for $K^0\Sigma^+$, but higher precision.
  - For K^{*+}, we will also do Λ polarization.
- In addition to the K^{*+} we plan to redo K^{*0} cross sections with higher precision.
  - Together, these data can be used to test theoretical models including a kappa meson.

$K^{*+}\Lambda$ (CLAS preliminary)

L. Guo and D. Weygand, N* 2005 Conf., hep-ex/060101.



K^{*+} Λ shown by the RED points, quoted with 20% uncertainty.

Details on data and cuts

- Runs 43526 – 44107 used (E=4.02 GeV).
- Bad paddles were removed.
- Photon identified using 1.0 ns time cuts.
- Particle ID from SC and tagger time cuts.
- Standard fiducial and vertex cuts applied.
- Sideband subtraction to isolate K^0 events.
- K^{*+} mass cut from 0.80-0.98 GeV.