Photoproduction of the exclusive $\gamma p \to K^{*+} Y(\Lambda or \Sigma^0)$ reaction at CLAS

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APS April Meeting

Feb. 14, 2010

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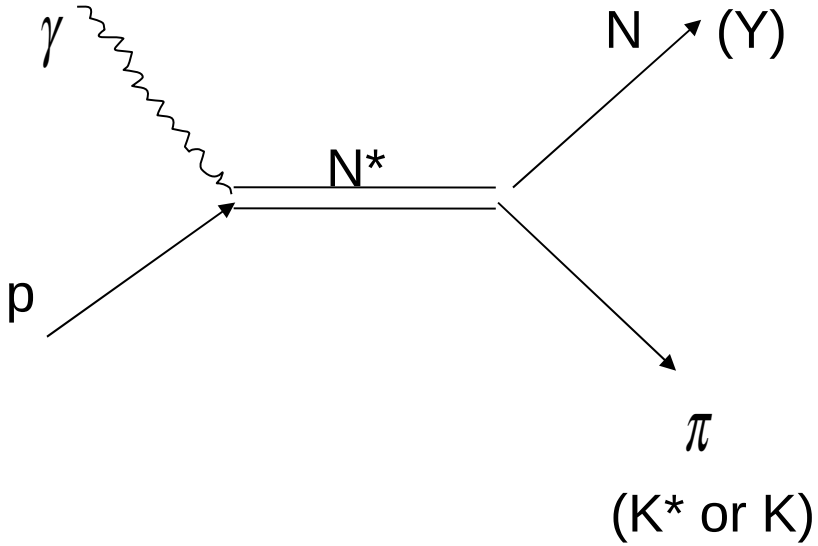
1. Previous work

Most data analyses used πN coupling



Koniuk and Isgur et .al suggested search of other couplings for missing N*.

K Y coupling

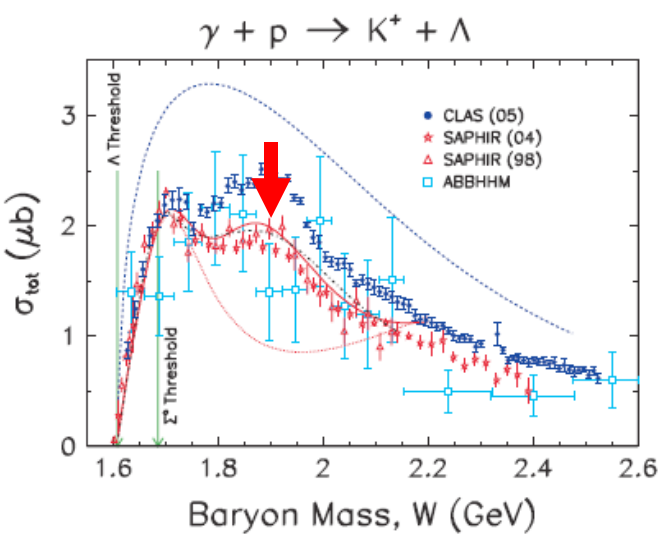
K*Y coupling

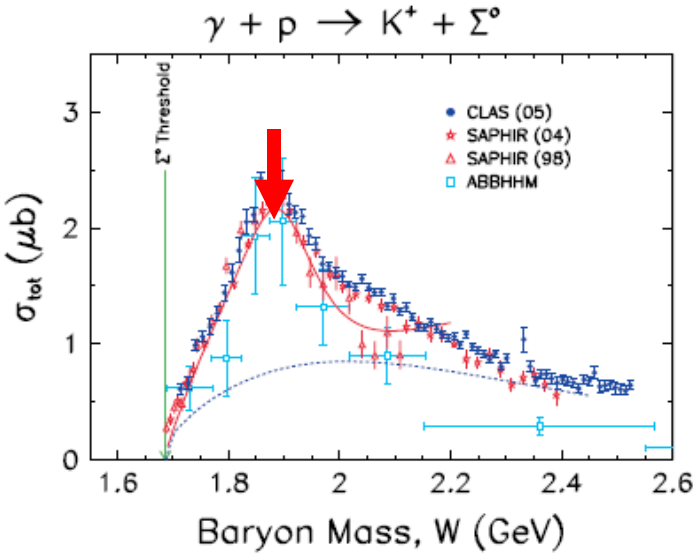
K --- kaon

Y --- hyperon

KY coupling

Many works have been published for KY coupling. There are some evidence of the existence of the missing baryon states.

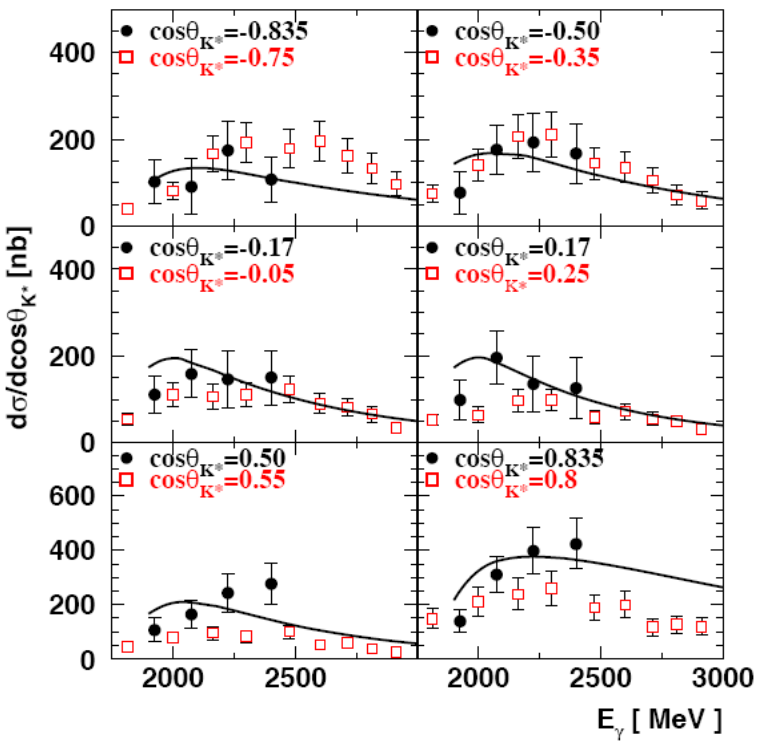


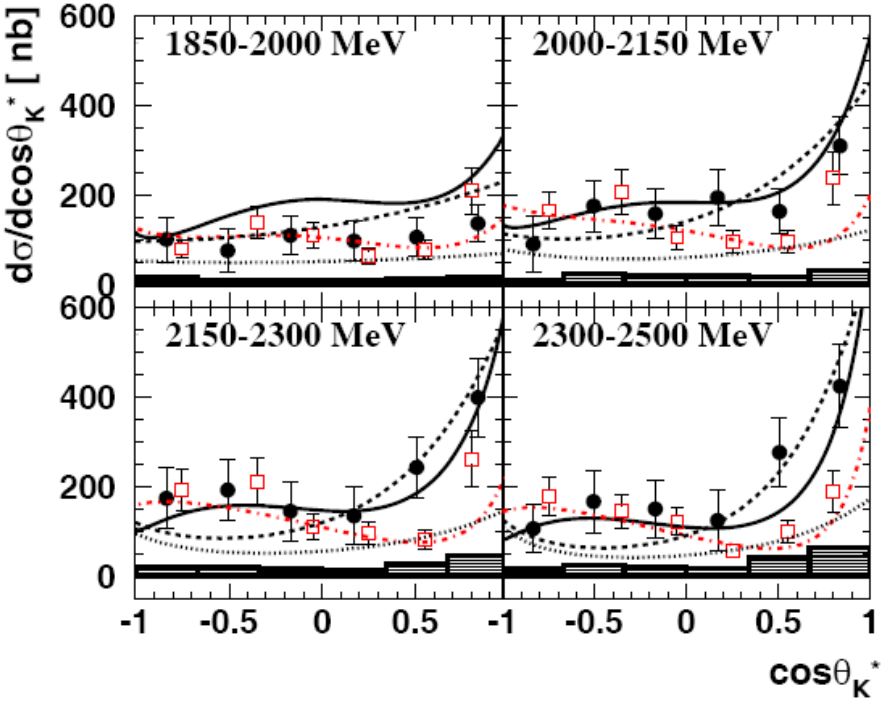


Bradford et al. Phy Rev. C 73, 035202 (2006)

What about K*Y coupling?

Study of K*Y coupling $\gamma + p \rightarrow K^{*0}\Sigma^{+}$



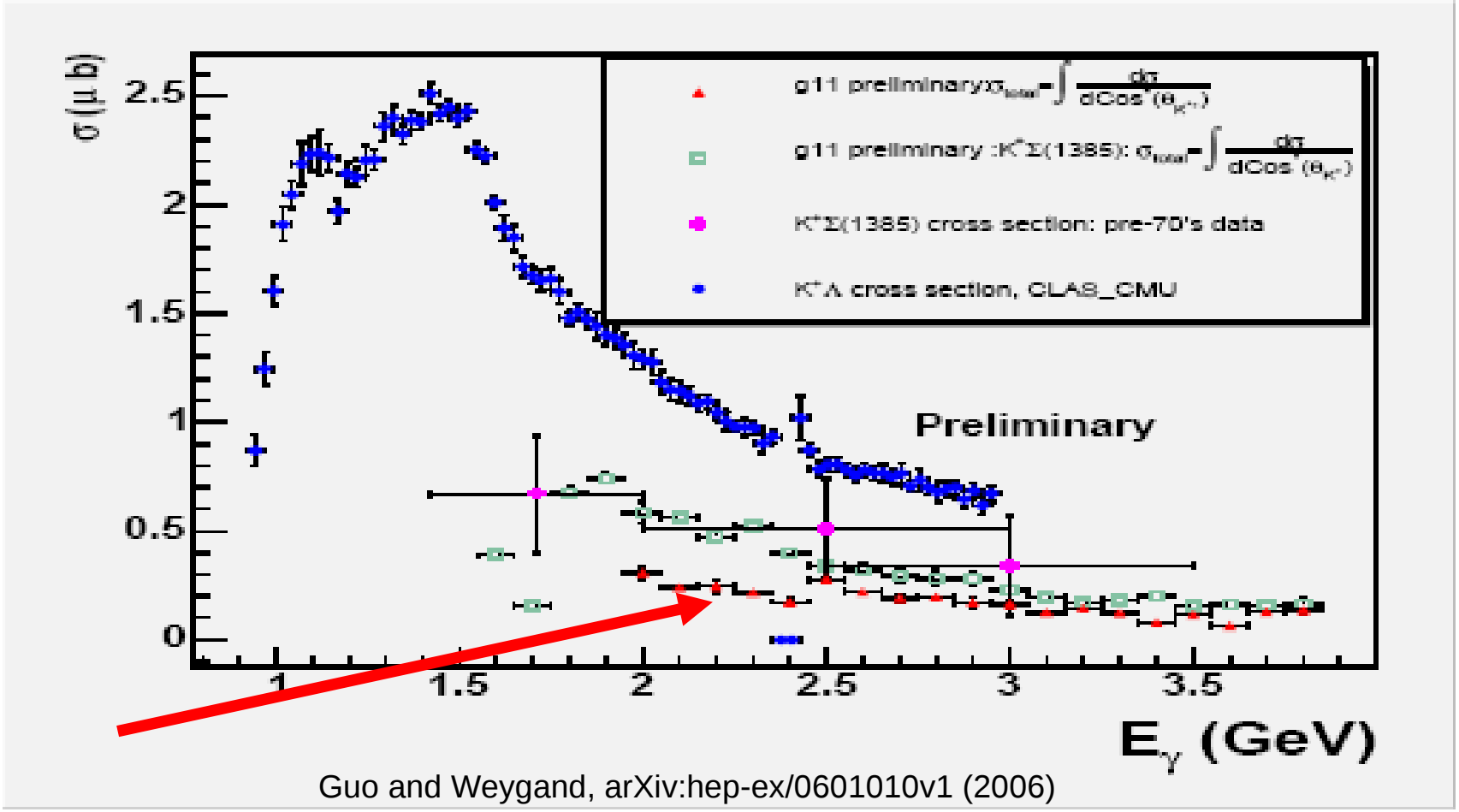


Full circle CBELSE data, empty square CLAS data.

Nanova et al. Eur.Phys.J.A 35, 333-342(2008)

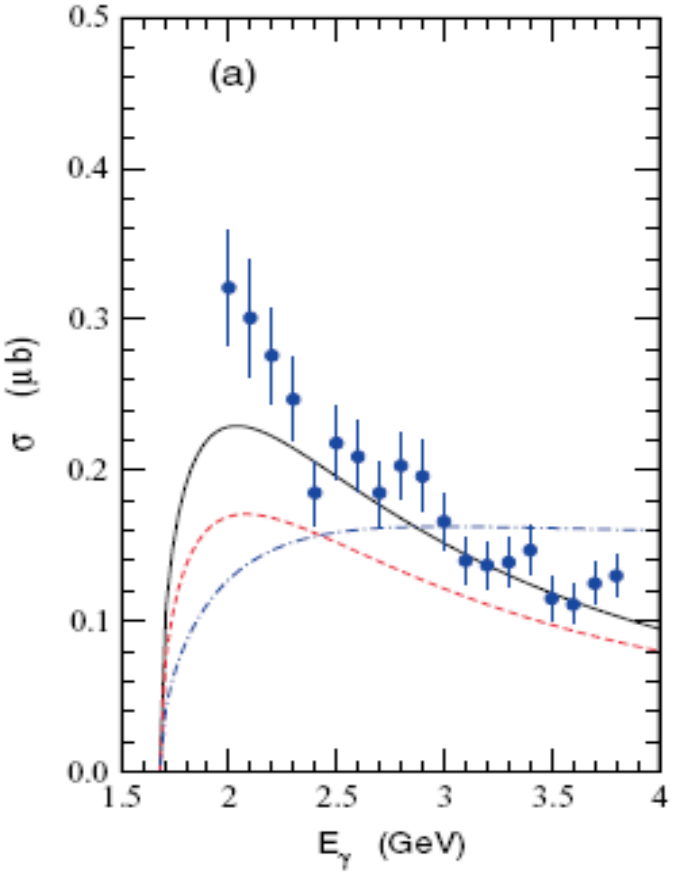
Hleiqawi et al. Rev.C 75, 042201 (2007) and Rev. C 76, 039905(2007)

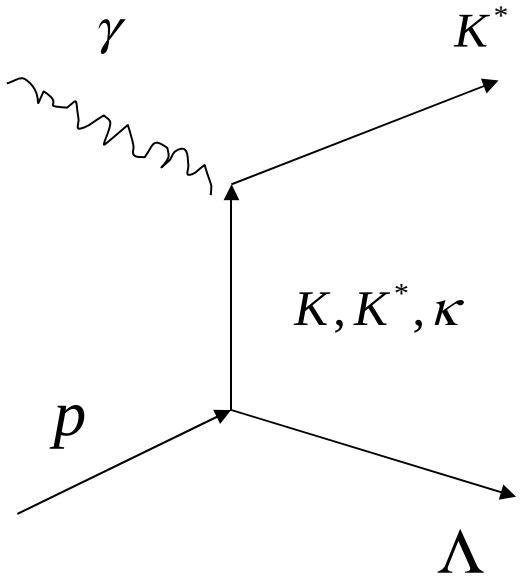
Preliminary measurement of the Photoproduction of $K^{*+}\Lambda$ at JLAB



Guo and Weygand, arXiv:hep-ex/0601010v1 (2006)

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





K*Y sensitive to Kappa-meson coupling, Kappa doesn't couple to KY t-chanel

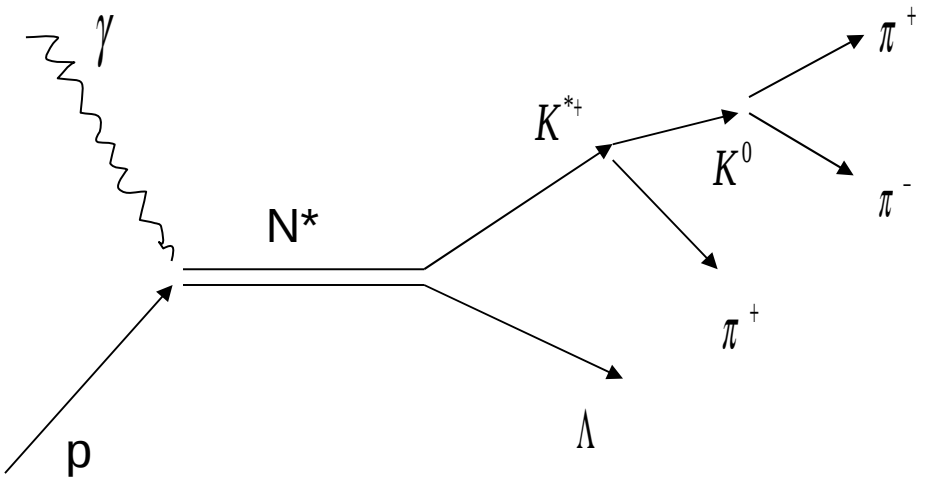
Oh and Kim, Phys Rev c 73, 065602(2006)

Our Measurement

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

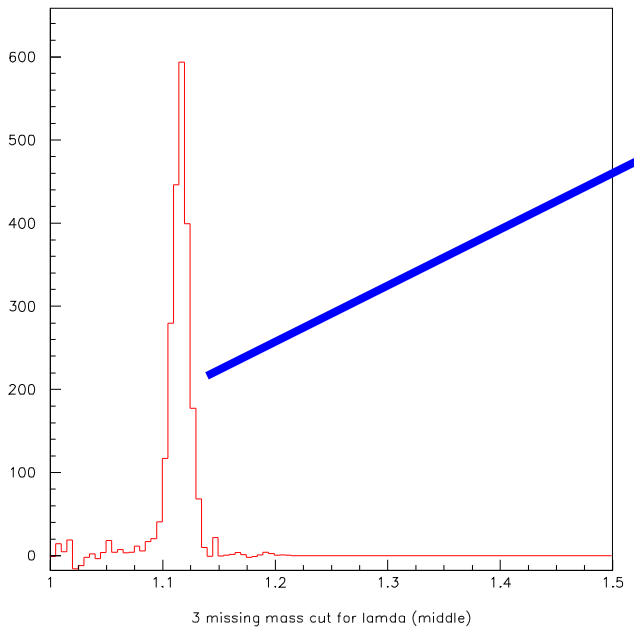
$$K^{*+} \rightarrow K^0 + \pi^+$$

$$K^0 \rightarrow \pi^+ + \pi^-$$

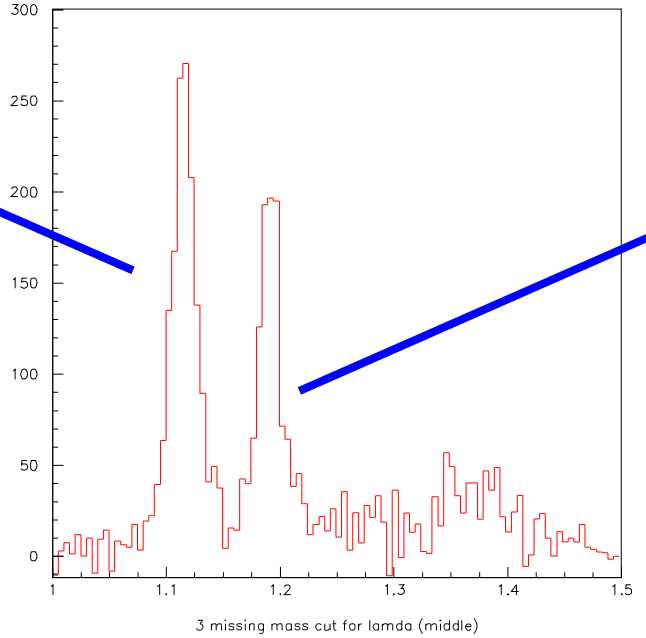


Detecting $\pi^+ \pi^+ \pi^-$ and the missing mass gives the invariant mass of either Λ or Σ

K^{*+}missing mass



Λ



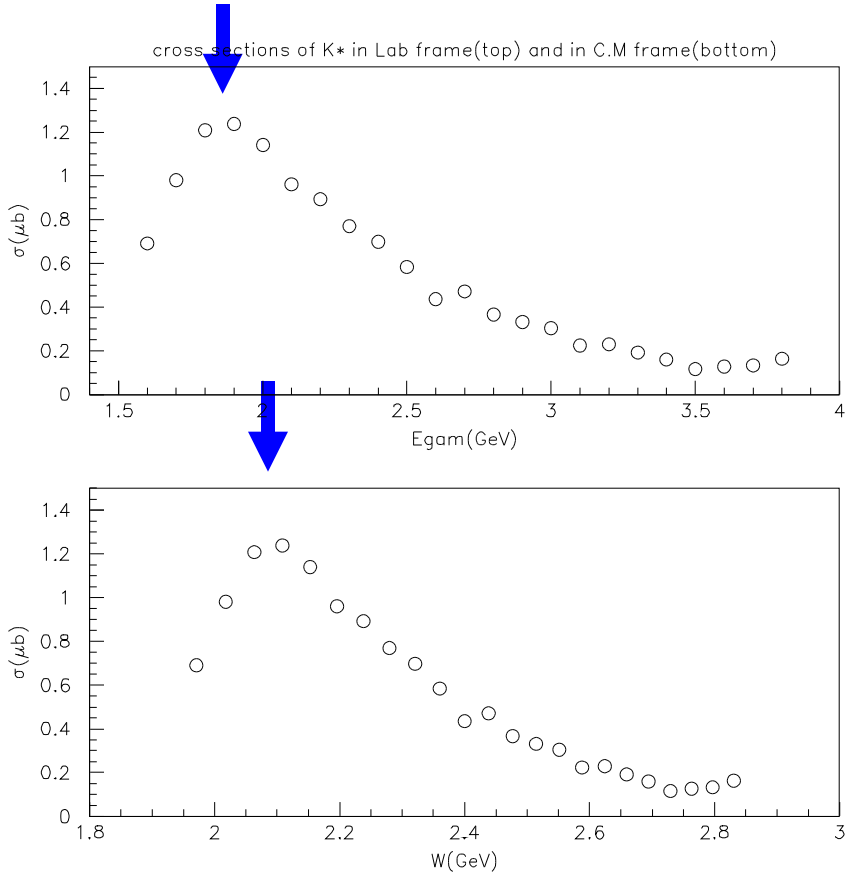
Σ

Left : data for photon energy between 1.6-1.7 GeV. (cos (K*) -1.0 –0.78)

Right : data for photon energy between 2.3-2.4 GeV. (cos(K*) -0.11 -0.11).

Total cross section

$$d\sigma/d\cos(\theta) = Y(\text{counts})/(N_{target} * N_{gflux} * \varepsilon * \Delta\cos(\theta) * f_{dt})$$

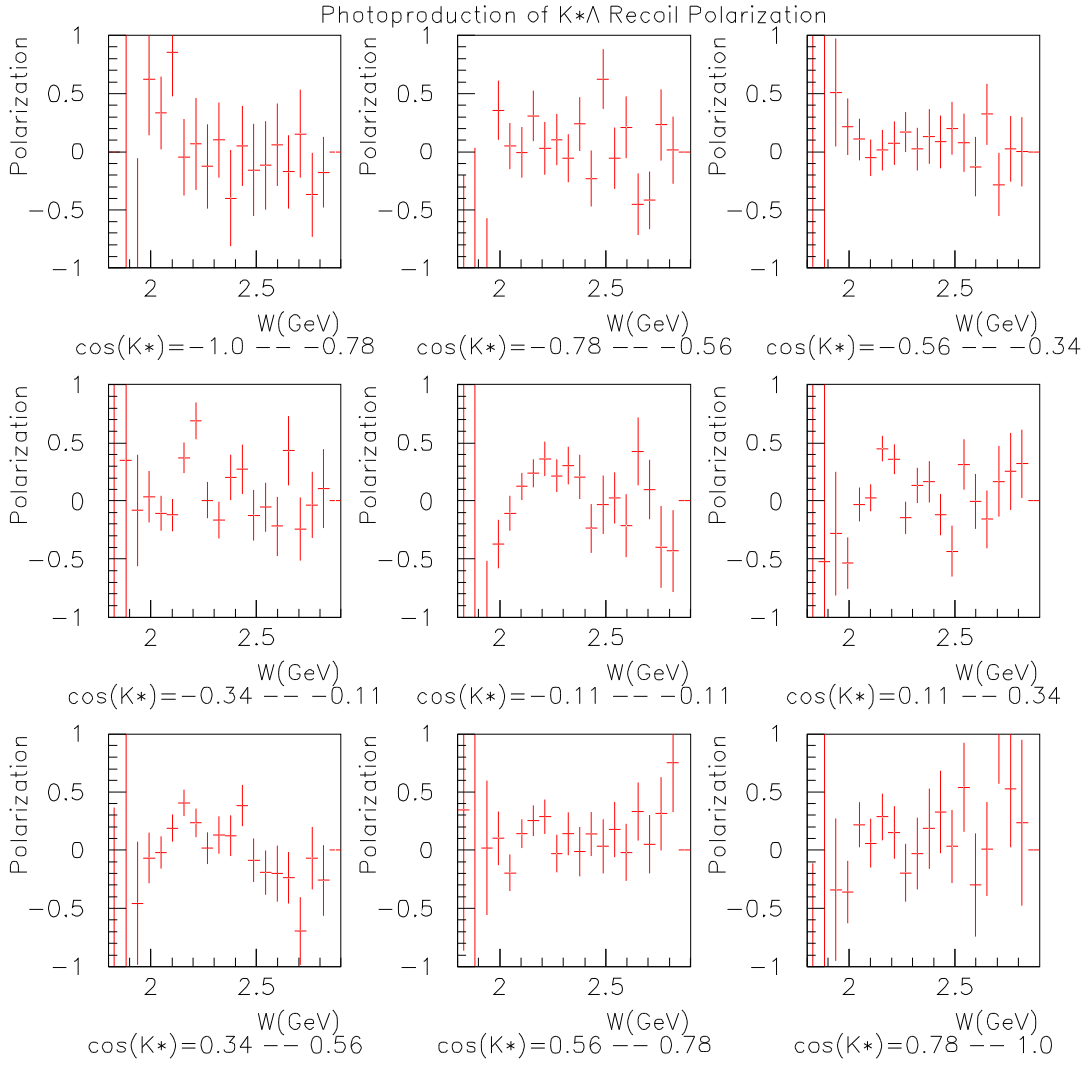


Preliminary total cross section of

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

Peak around W=2.1 GeV

PDG: N(2190), N(2220), N(2250)



Preliminary result of $K^{*+}\Lambda$ recoil polarization

Summary

1. These are the world's first high-statistics data for $K^*\Lambda$ photoproduction.

2. We measured cross section of the reaction $\gamma + p \rightarrow K^{*+} + \Lambda$ at CLAS, and found a resonance-like peak around W=2.1 GeV, High-mass resonances may couple directly to this reaction, but more theoretical studies are needed.

3. Existence of the kappa meson can be studied by comparing these new data and theory.

4. We also measured the recoil polarization, and this will provide a large constraint on theoretical models of K* photoproduction, similar to constraints seen for K photoproduction as measured by CLAS.

Thank you !