Search for Hybrid Baryons with CLAS12 in Hall B

(Dated: April 19, 2016)

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A. Run condition

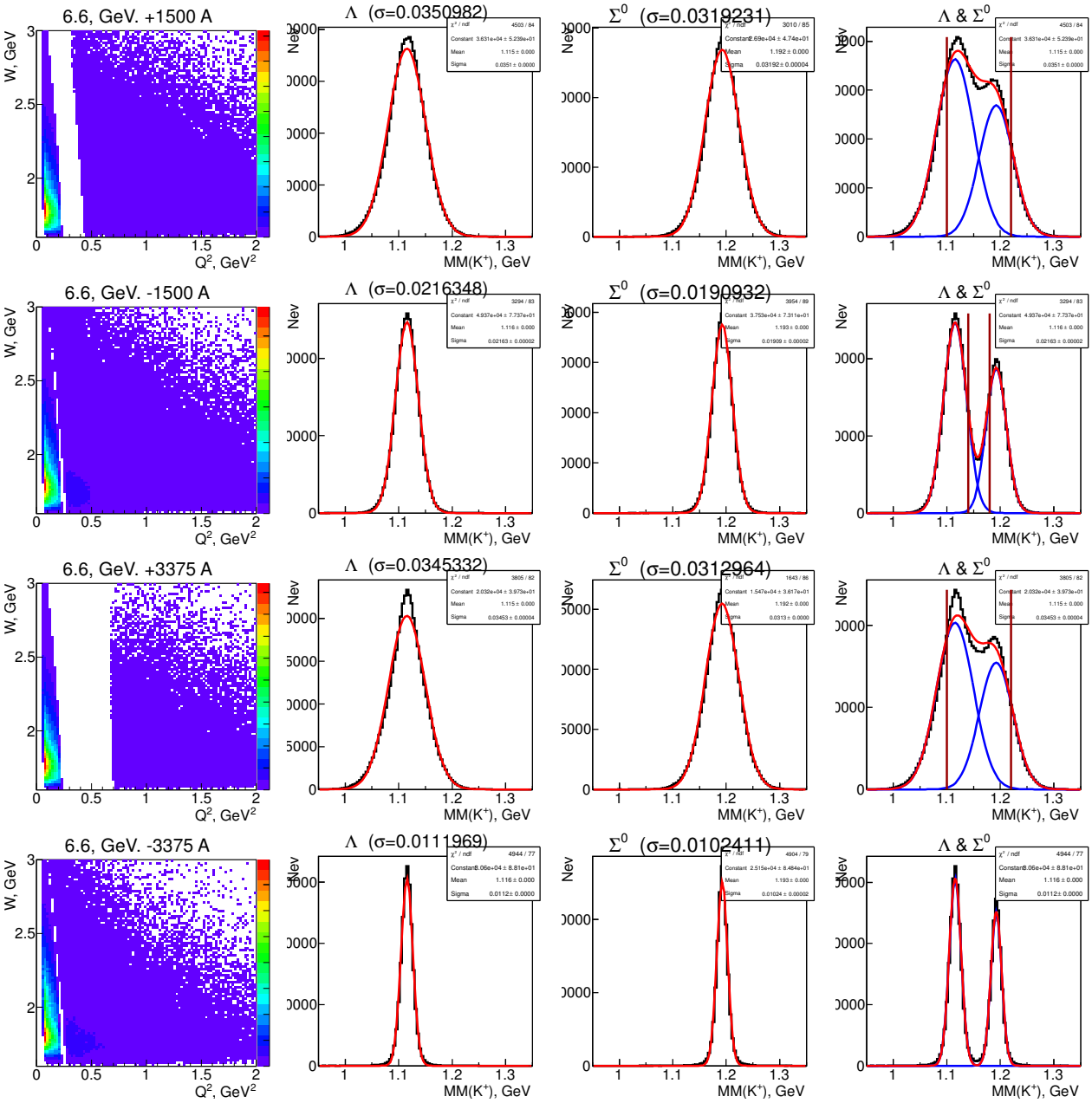

FIG. 1: ...

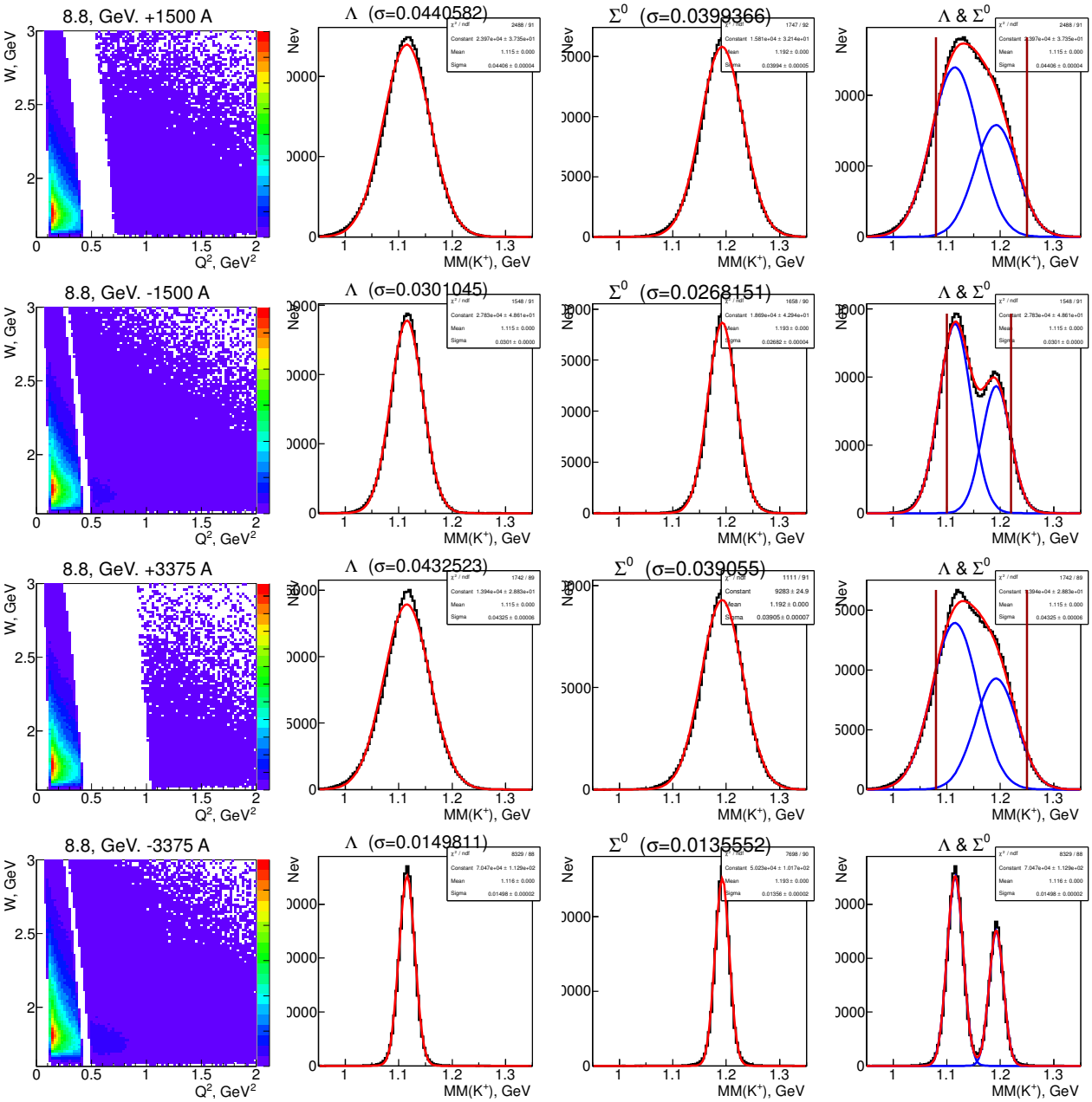

FIG. 2: ...

TABLE I: Minimal achievable Q^2 (Q^2_{min}) and the percentage of the Λ and Σ^+ events that can be isolated from each other at different run conditions.

E_{beam}, GeV	Tor. current, A	Q^2_{min}, GeV^2	Λ separation, %	Σ^0 separation, %
6.6	+1500	0.05	33	19
6.6	−1500	0.05	86	73
6.6	+3375	0.05	31	19
6.6	**−3375**	0.05	100	100
8.8	+1500	0.1	21	8
8.8	−1500	0.1	31	16
8.8	+3375	0.1	21	8
8.8	**−3375**	0.1	100	100

B. Count rates from $K^+\Lambda$

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The obtained event rate should be reduced by 8%, as 8% of the events do not have reconstructed kaon and by 36%, since the Λ decay branching fraction to the channel (p, π^-) is 64%. Assuming the Λ electroproduction rate is 100 Hz, we expect to collect in 30 days of the beam time 100 Hz $\times$ 92% $\times$ 64% $\times$ 30 days $\approx 1.5 \times 10^8$ events.

C. Monte-Carlo studies of the for hybrid baryon manifestation in exclusive KY electroproduction

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The number of evens in each multidifferential bin was calculated assuming the total number of $K\Lambda$ events to be collected in the experiment is 1.5×10^8 (see section B).

D. ...

TABLE II: The minimal values of the photocouplings for the beam energy 6.6 GeV and the torus current -3375 A for the resonances with the spin (J_R) 1/2 and 3/2. A_{12}, A_{32} and S_{12} are in the units of $10^{-3}\times\text{GeV}^{-1/2}$. When determining the minimal value of A_{12} we varied only A_{12} setting the other photocouplings to zero. The minimal values of A_{32} and S_{12} were obtained in the same way.

Q^2, GeV^2	J_R=1/2		J_R=3/2		
	A_{12}	S_{12}	A_{12}	A_{32}	S_{12}
0.1	13	13	17	12	12
0.5	19	20	20	22	14
1.0	18	23	18	20	11

TABLE III: The minimal values of the photocouplings for the beam energy 8.8 GeV and the torus current -3375 A for the resonances with the spin (J_R) 1/2 and 3/2. A_{12}, A_{32} and S_{12} are in the units of $10^{-3}\times\text{GeV}^{-1/2}$. When determining the minimal value of A_{12} we varied only A_{12} setting the other photocouplings to zero. The minimal values of A_{32} and S_{12} were obtained in the same way.

Q^2, GeV^2	J_R=1/2		J_R=3/2		
	A_{12}	S_{12}	A_{12}	A_{32}	S_{12}
0.3	14	14	16	14	11
0.5	21	22	22	24	15
1.0	18	23	18	20	11

Figs. 3 through 6 present examples of the comparison of the model to the model plus resonance one- and two fold differential cross sections. The model plus resonance cross section was calculated when the photocoupling was set to its minimal value from the Table III.

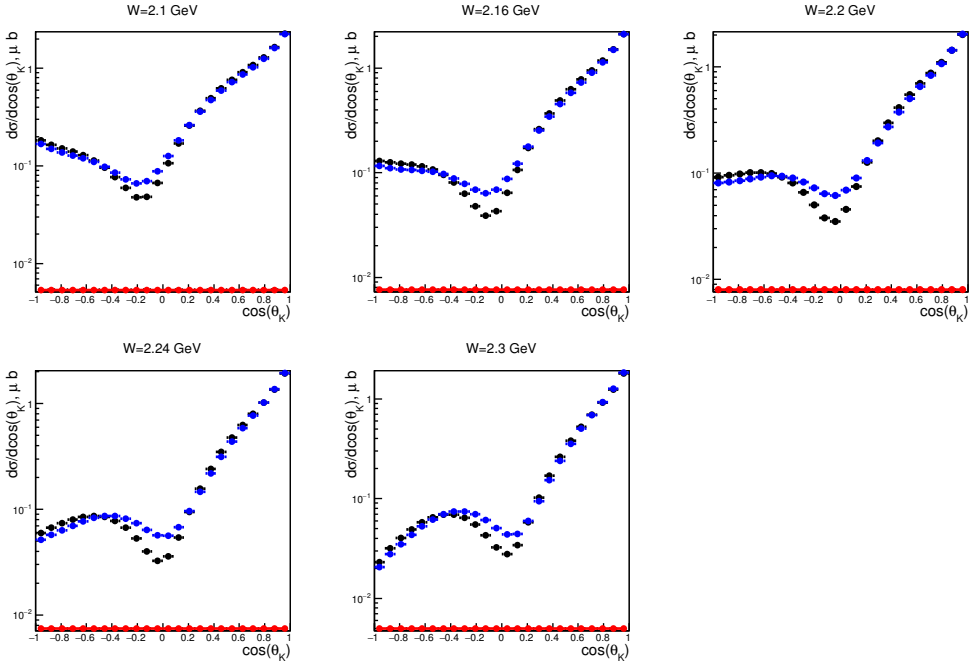

FIG. 3: Comparison of the model cross section $d\sigma/d\cos(\theta_K)$ (black points) with the model plus resonance cross section (blue points) for the beam energy 8.8 GeV and the torus current -3375 A at Q^2=0.5 GeV^2 and at few values of W. The cross section of the resonance contribution is shown in red. The spin of the resonance is 1/2 and the A_{12} is 19×10^{-3}GeV$^{-1/2}$, it corresponds to the minimal A_{12} from the table III. Statistical errors are negligible.

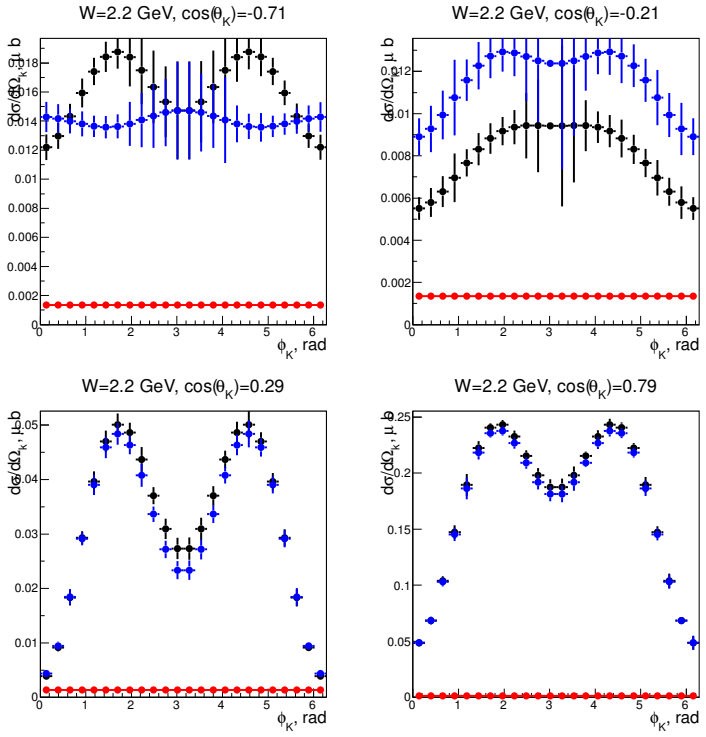

FIG. 4: Comparison of the model cross section $d\sigma/d\Omega(\theta_K)$ with the model plus resonance cross section at $W = M_R$ and few values of $cos(\theta_K)$. The same run condition and Q^2 as in Fig. 3. The errors are statistical.

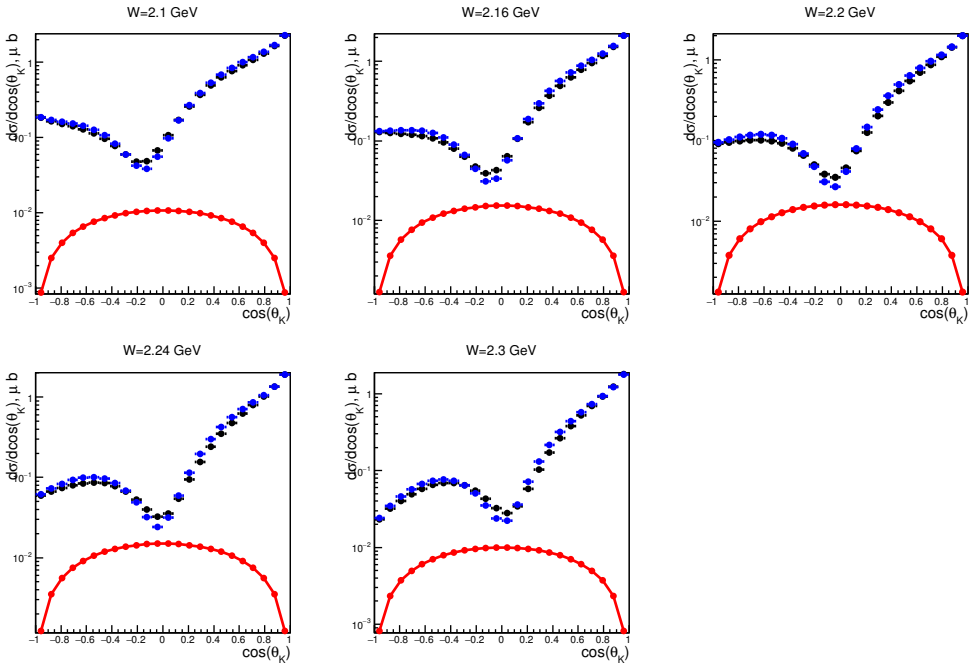

FIG. 5: Comparison of the model cross section $d\sigma/d\cos(\theta_K)$ (black points) with the model plus resonance cross section (blue points) for the beam energy 8.8 GeV and the torus current -3375 A at Q^2=0.5 GeV^2 and at few values of W. The cross section of the resonance contribution is shown in red. The spin of the resonance is 3/2 and the A_{32} is 24×10^{-3}GeV$^{-1/2}$, it corresponds to the minimal A_{32} from the table III. Statistical errors are negligible.

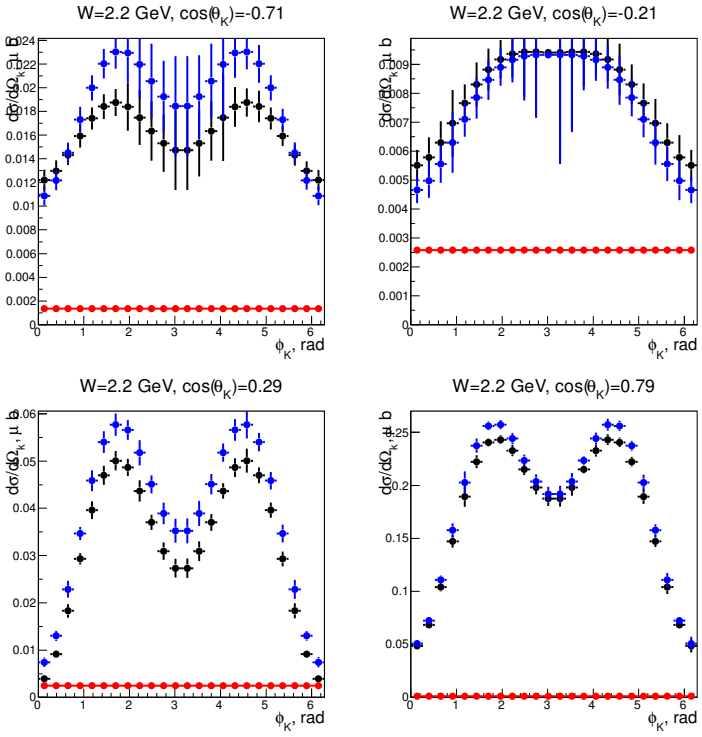

FIG. 6: Comparison of the model cross section $d\sigma/d\Omega(\theta_K)$ with the model plus resonance cross section at $W = M_R$ and few values of $cos(\theta_K)$. The same run condition and Q^2 as in Fig. 5. The errors are statistical.