Search for Hybrid Baryons with CLAS12 in Hall B $_{\rm (Dated:\ April\ 19,\ 2016)}$

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Λ (σ=0.0350982) $Σ^0$ (σ=0.031<u>9231</u>) $\Lambda \& \Sigma^0$ 6.6, GeV. +1500 A 2000 2000 Z 3 W, GeV 200 1.115±0.0 1.115±0.0 0000 0000 0000 2.5 2000 0000 0000 0000 0000 0 1.5 2 Q², GeV² 1.2 1.3 MM(K⁺), GeV ō 0.5 1 1.1 1.1 1.2 1.3 MM(K⁺), GeV 1.1 1.2 1.3 MM(K⁺), GeV $\Lambda \& \Sigma^0$ Λ (σ=0.0216348) $Σ^0$ (σ=0.019032) 6.6, GeV. -1500 A 1.997e+04 ± 7.797e+ 1.116 ± 0.0 2000 Z W, GeV Nev Nev 0000 0000 0000 2.5 0000 0000 0000 0000 ٥ 0 1.2 1.3 MM(K⁺), GeV 1.2 1.3 MM(K⁺), GeV 1.2 1.3 MM(K⁺), GeV 0.5 1.5 2 Q², GeV² 1.1 1.1 Λ (σ=0.0345332) Λ & Σ⁰ Σ^{0} (σ =0.031₂₉₆₄) 6.6, GeV. +3375 A 3 2000 2000 Nev Nev W, GeV 0000 0000 2.5 5000 0000 0000 0000 5000 5000 0 0.5 1.5 2 Q², GeV² 1.1 1.2 1.3 MM(K⁺), GeV 1.2 1.3 MM(K⁺), GeV 1.2 1.3 MM(K⁺), GeV ō 1.1 1.1 Λ (σ=0.011<u>1969)</u> Σ^0 $\Lambda \& \Sigma^0$ (σ=0.0102411) 6.6, GeV. -3375 A 3000 8000 Nev 2 2000 W, GeV ± 8.81e -04 ± 8.81 c 1.116±0.0 1.116±0.00 0.0112±0.

A. Run condition

FIG. 1: ...

1.2 1.3 MM(K⁺), GeV

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0000

1.1

1.2 1.3 MM(K⁺), GeV 0000

0000

C

1.2 1.3 MM(K⁺), GeV

0000

2000

1.5 2 Q², GeV²



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	$Q^2_{min},{ m GeV^2}$	$\begin{array}{c} \Lambda \\ \text{separation, } \% \end{array}$	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 $K^+\Lambda$

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 × 92% × 64% × 30 days $\approx 1.5 \times 10^8$ events.

...

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

... 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).

TABLE II: The minimal values of the photocouplings for the beam energy 6.6 GeV and the torus current -3375 Å 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.

$Q^2, { m GeV}^2$	$J_R = 1/2$		$J_R = 3/2$		
	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.

$Q^2, { m GeV}^2$	$J_R = 1/2$		$J_R = 3/2$		
	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 $Q^2=0.5$ GeV² 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 $Q^2=0.5$ GeV² 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.