

*New results on narrow structure in the pion nucleon elastic scattering from the EPECUR experimentn.*

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# Pentaquark antidecuplet

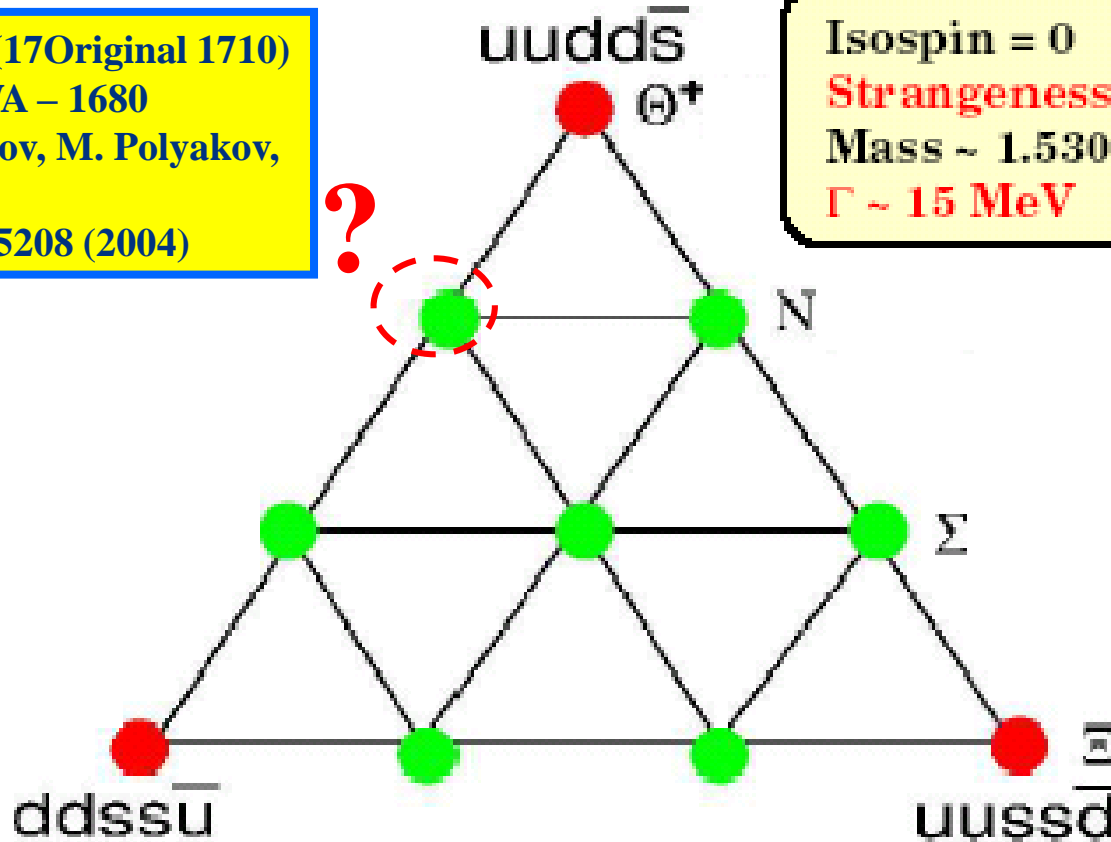


$[\bar{10}]$  Spin =  $\frac{1}{2}$  NEW MULTIPLET

D.Diakonov et al. Z. Phys A359, 1997, 305

prediction – N\*\*\*(17Original 1710)  
 From modified PWA – 1680  
 R. Arndt, Ya. Azimov, M. Polyakov,  
 IS, R. Workman,  
 Phys Rev C 69, 035208 (2004)

Isospin = 0  
 Strangeness = +1  
 Mass ~ 1.530 MeV  
 $\Gamma \sim 15$  MeV

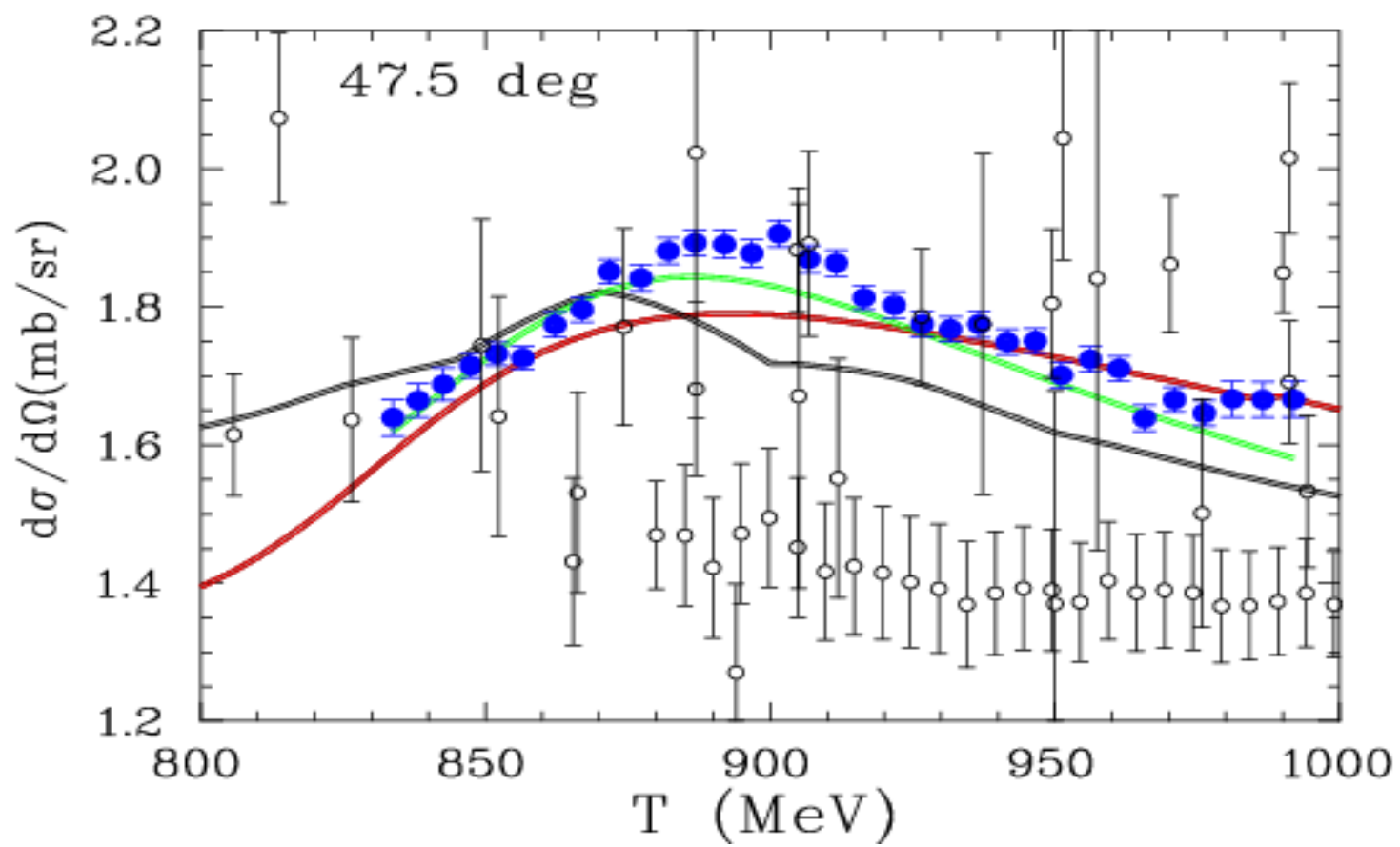


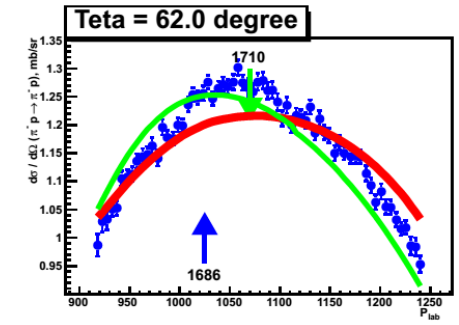
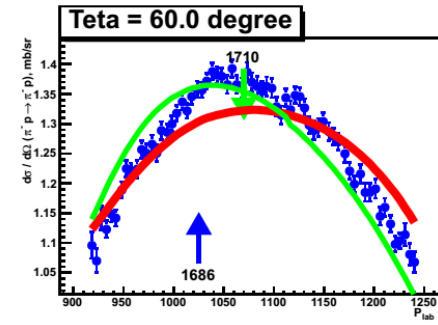
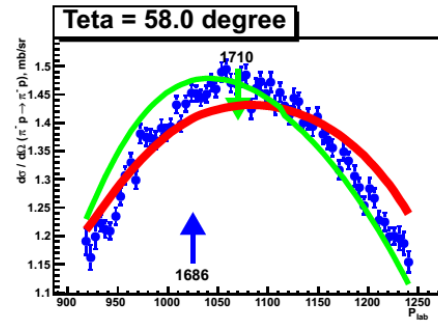
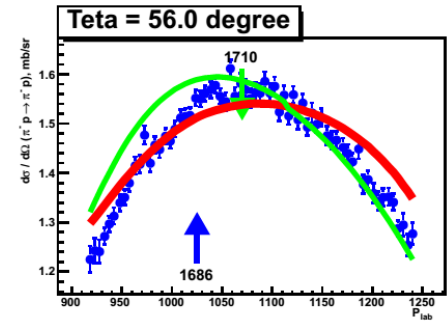
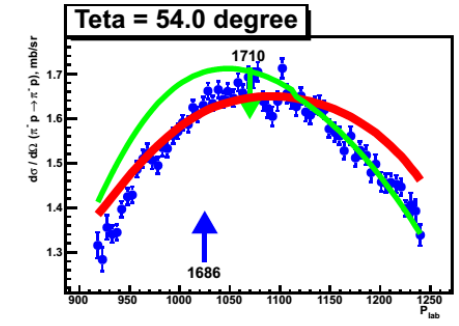
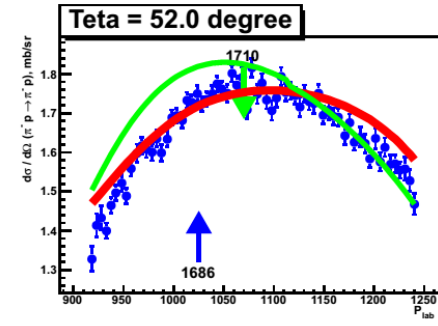
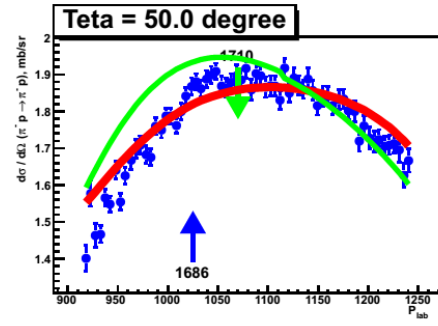
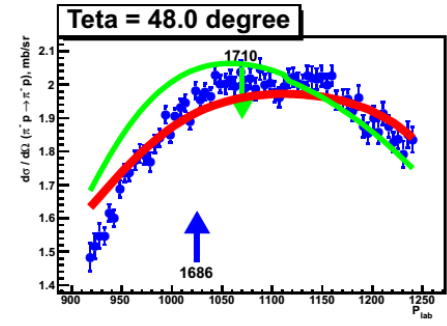
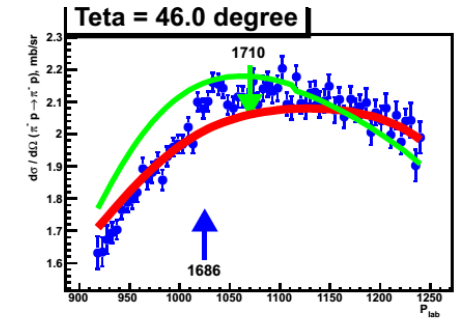
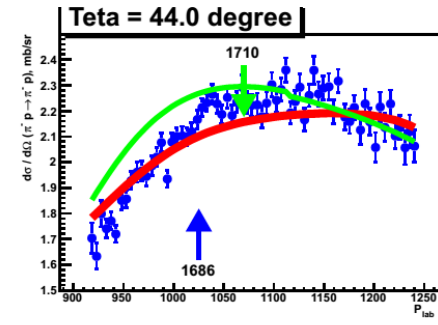
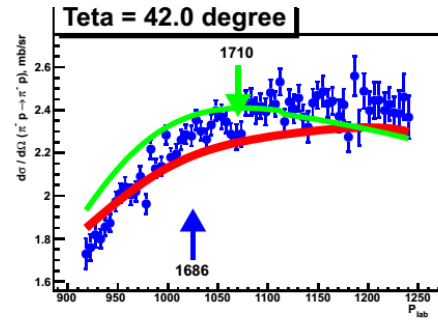
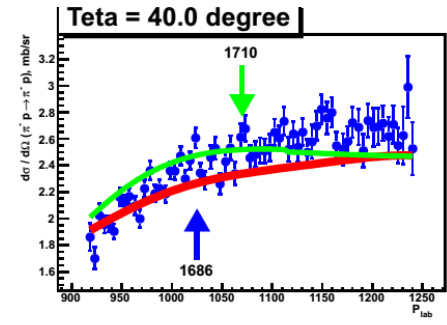


*Теория предсказывает слабую связь с  $\pi N$  сектором-эксперимент должен иметь хорошую точность.*

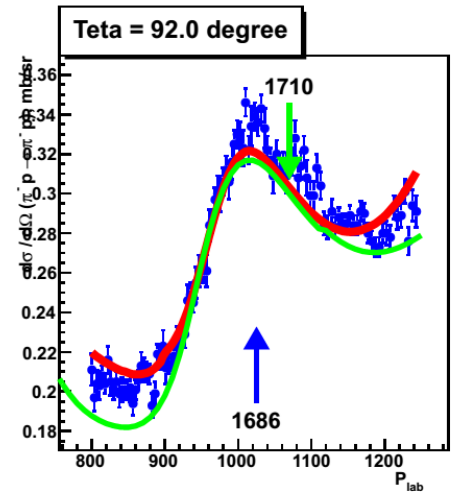
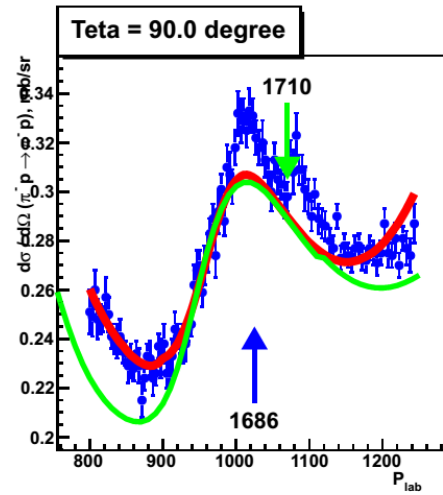
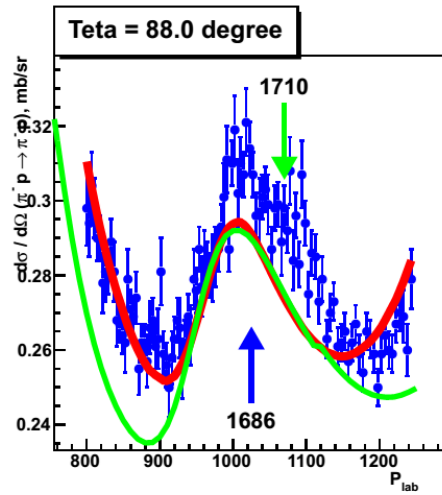
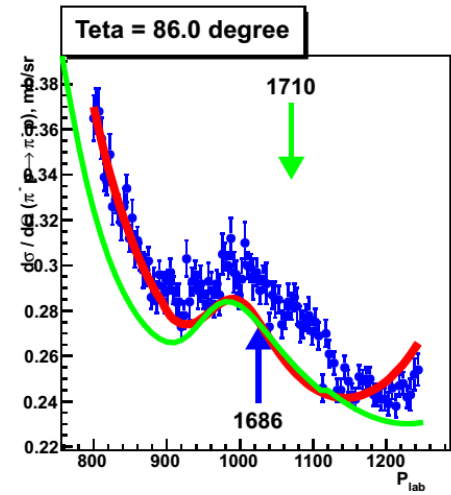
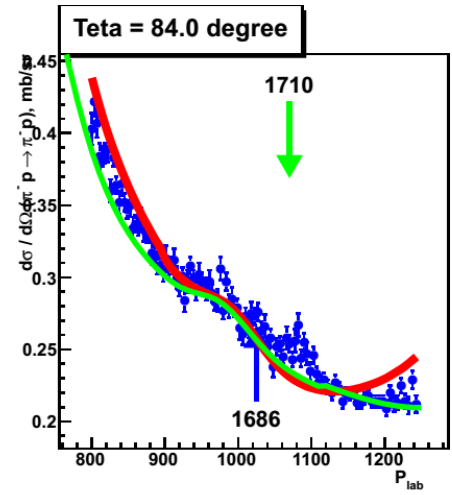
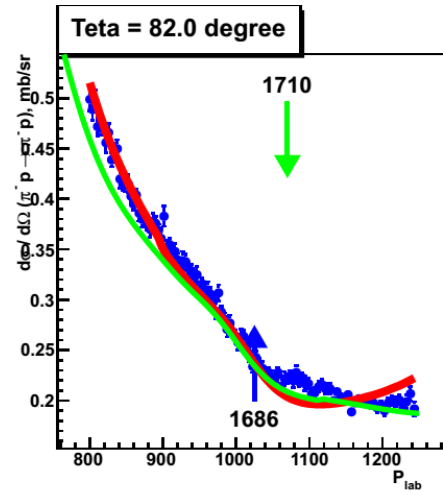
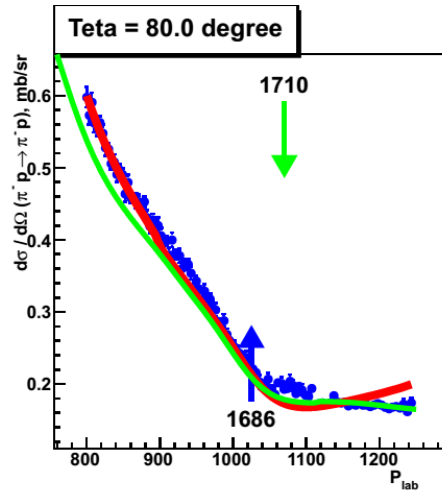
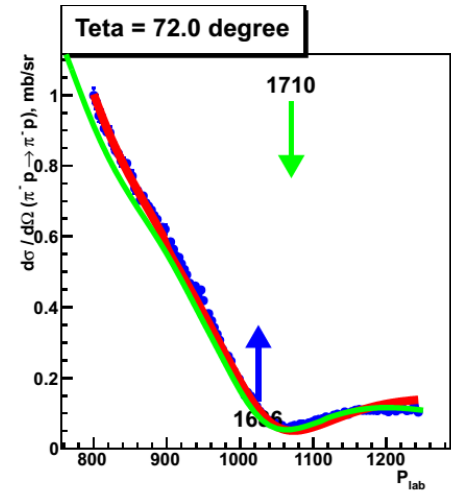
*Но есть и преимущества:*

- 1. Структура  $\pi N$  амплитуды намного проще чем в фоторождении*
- 2. Парциальные амплитуды довольно хорошо известны из фазовых анализов.*
- 3. Можно использовать изоспиновую симметрию.*
- 4. Меньше число свободных параметров.*











## *K-matrix approach with effective Lagrangians.*

P.F.A. Goudsmit et al Nucl.Phys A575 (1994)673

A.B. Gridnev, N.G. Kozlenko. Eur.Phys.J.A4:187-194, (1999).

T. Feuster and U. Mosel Phys. Rec. C 58 457 (1998).





*It is assumed that the  $K$ -matrix, being a solution of the equation for scattering amplitude, can be considered as a sum of the tree-level Feynman diagrams with the effective Lagrangians in the vertices.*

*4\* resonances in  $s$  and  $u$  channels and sigma, rho like exchange in  $t$  channel.*

*Multichannel:*

- 1. elastic scattering*
- 2. two pion production (effective)*
- 3.  $\eta$   $n$  production*
- 4.  $K$   $\Lambda$  production*
- 5.  $K$   $\Sigma$  production*



*Free parameters  $\rightarrow$  coupling constants.*

*We concentrate on elastic scattering and treat inelastic channels approximately to save the number of free parameters.*

*Database:*

*EPECURE results.*

*SAID single energy solutions up to 800 MeV.*

*$\eta$   $n$  total cross section*

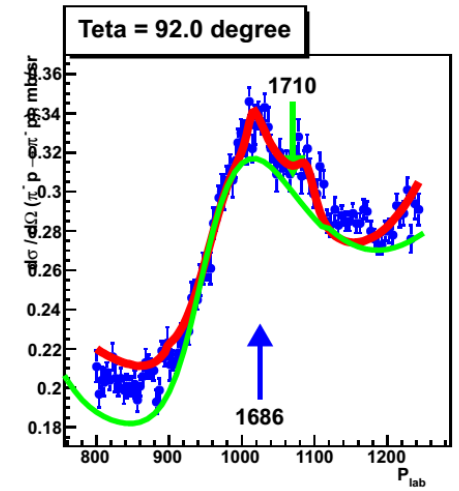
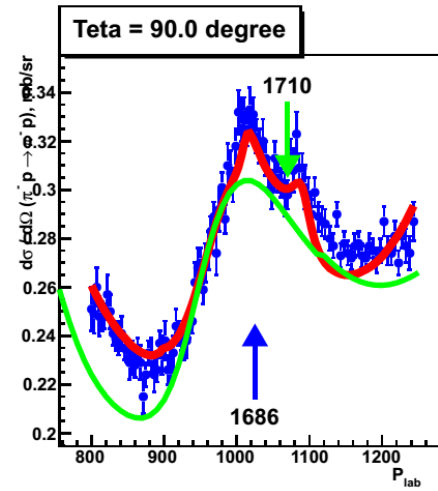
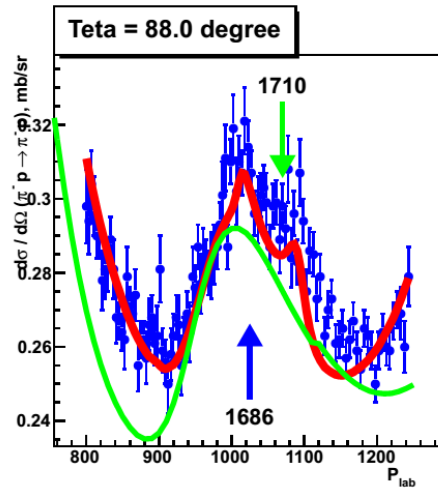
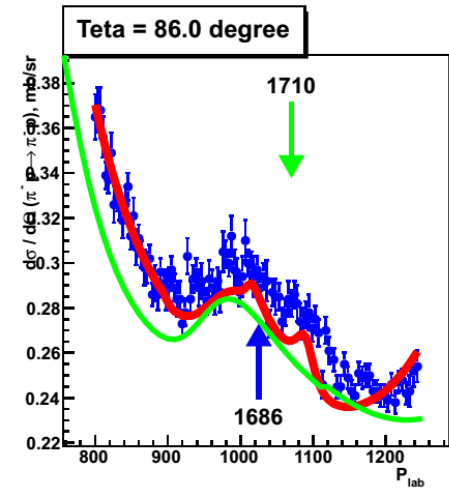
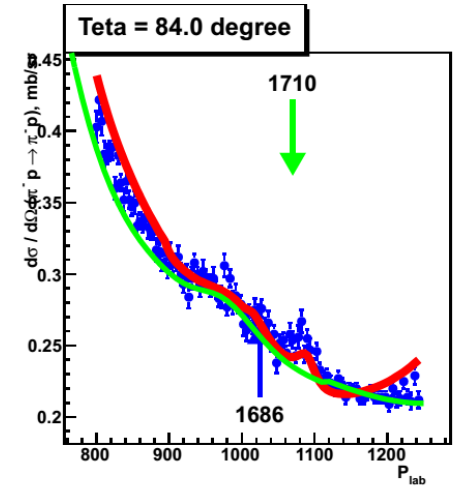
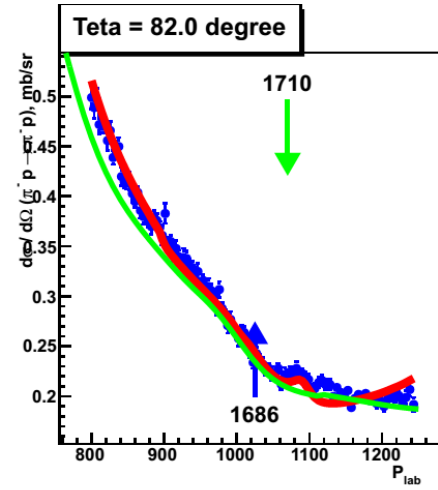
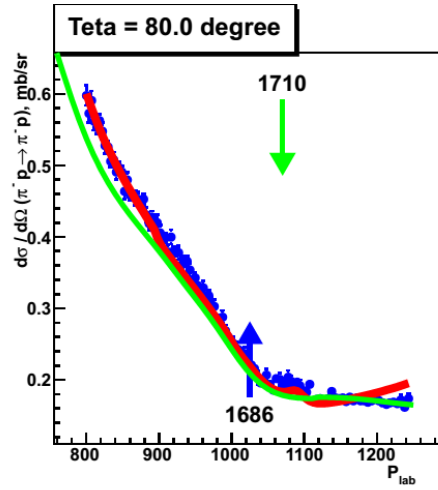
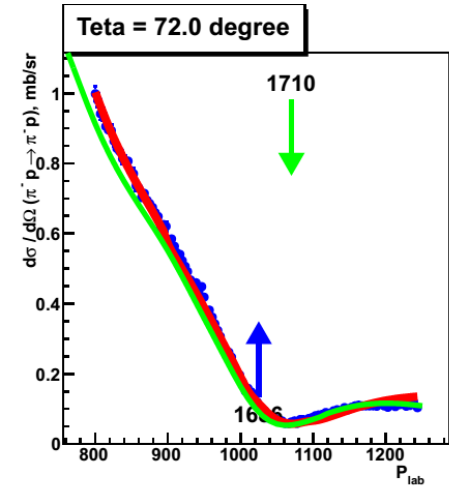
*$K$   $\Lambda$  differential cross section*

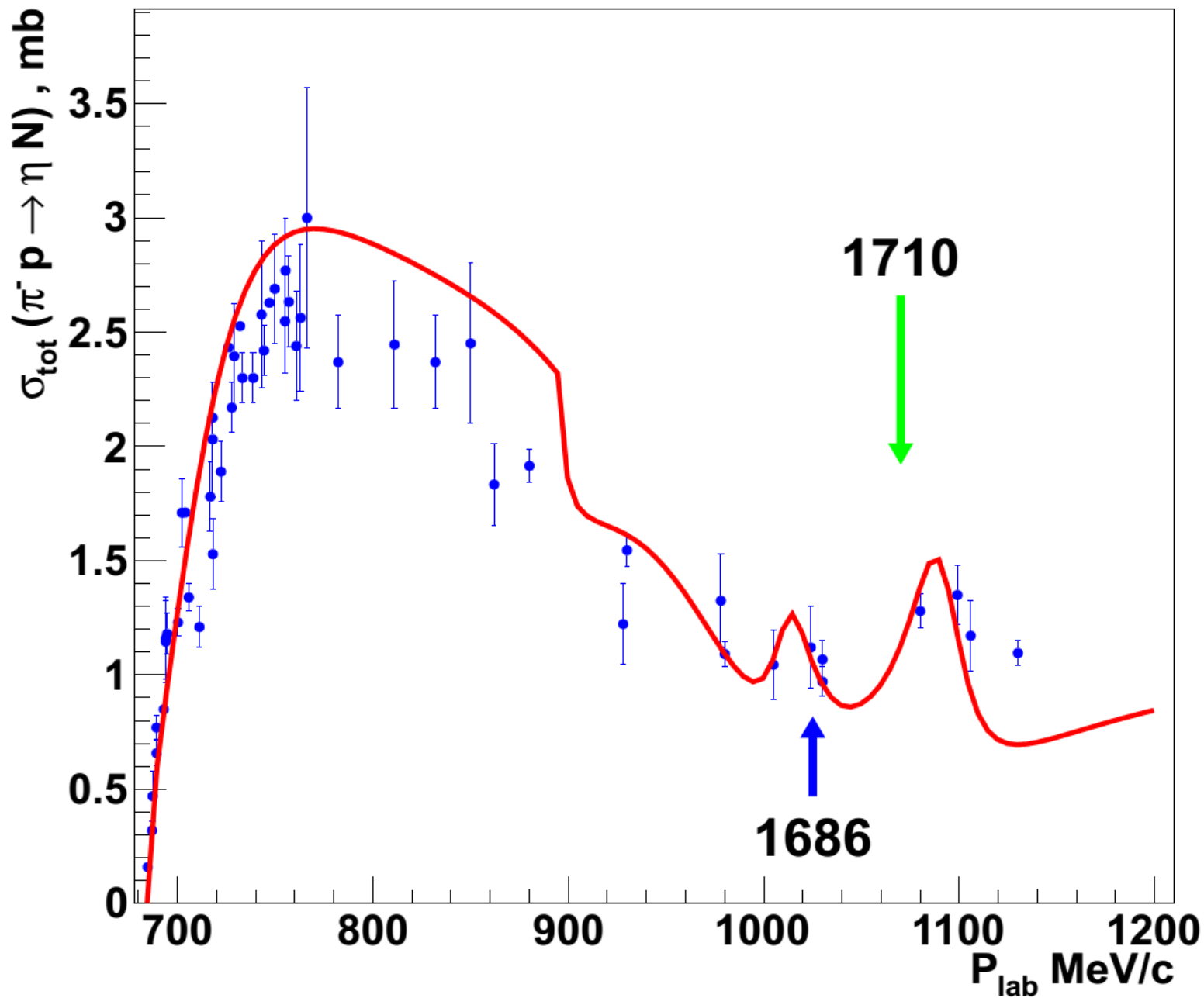
*$K^0$   $\Sigma^0$  differential cross section*

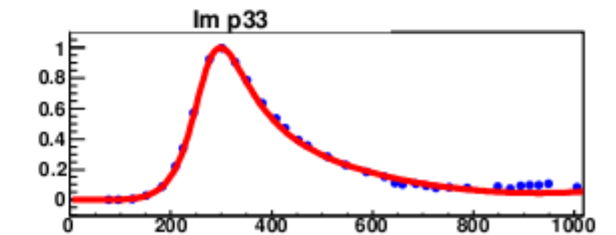
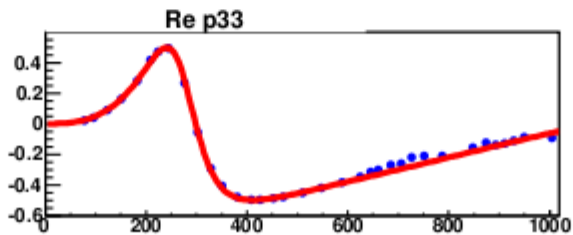
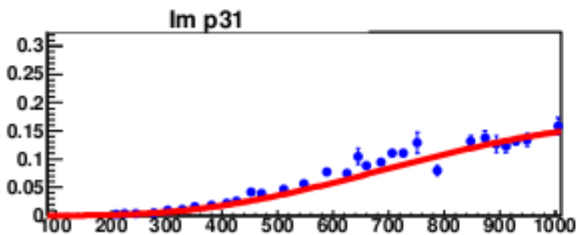
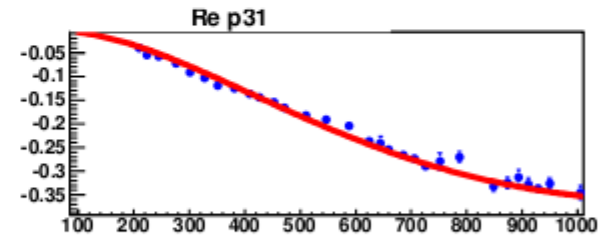
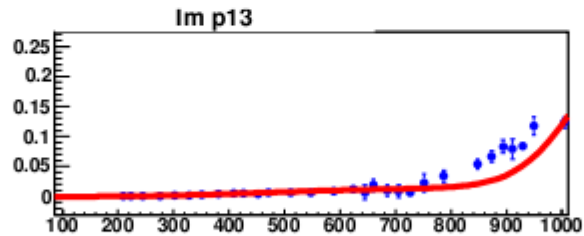
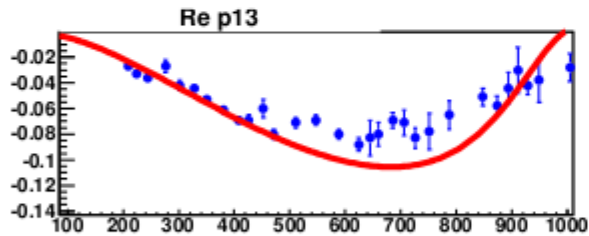
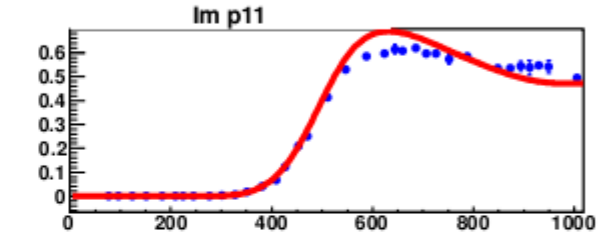
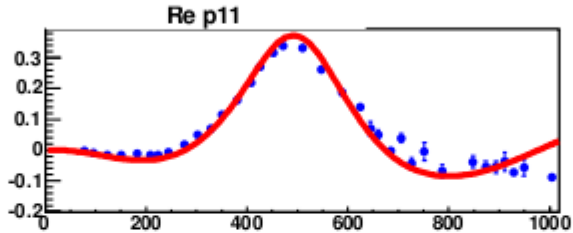
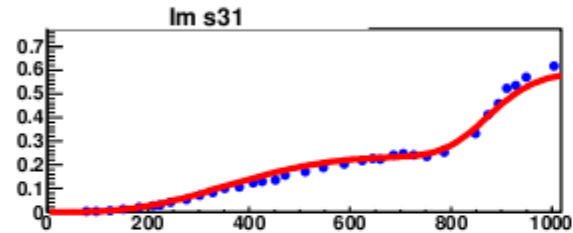
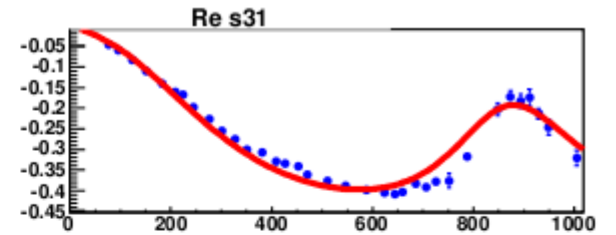
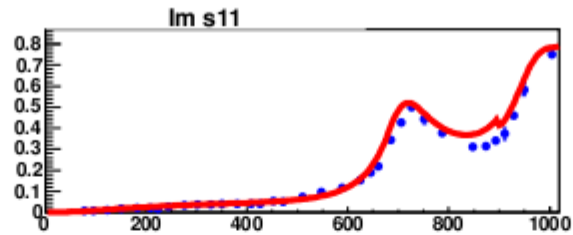
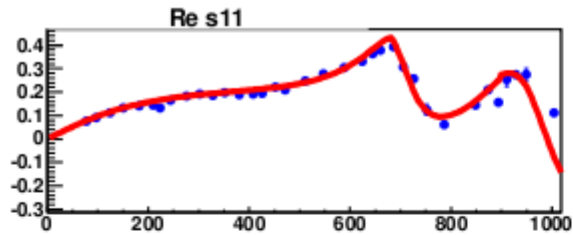
*$K^+$   $\Sigma^+$  differential cross section*

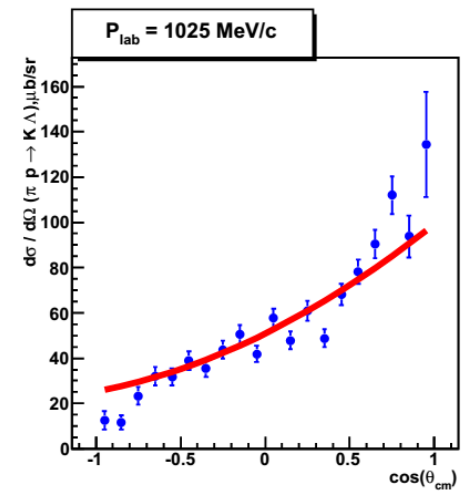
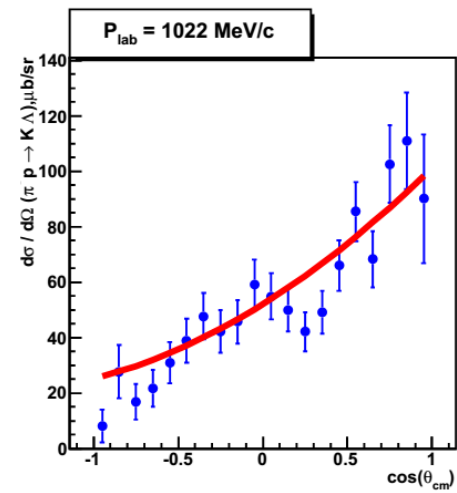
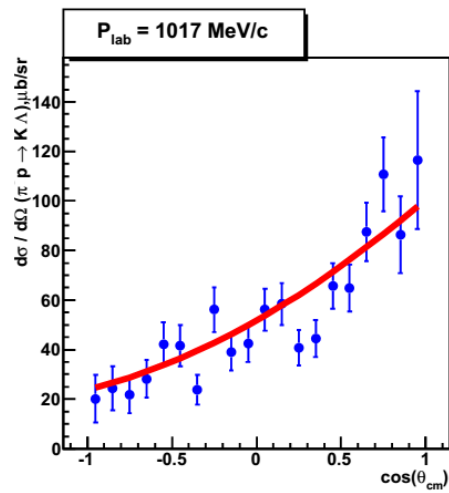
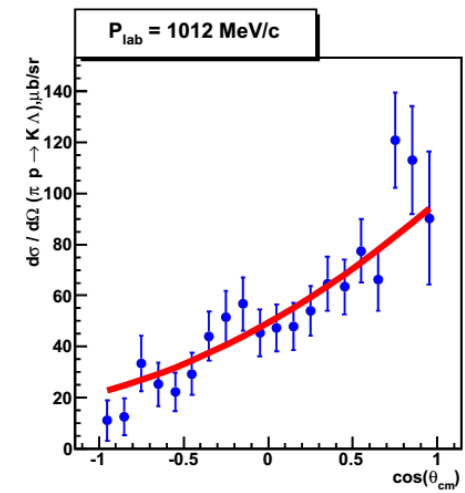
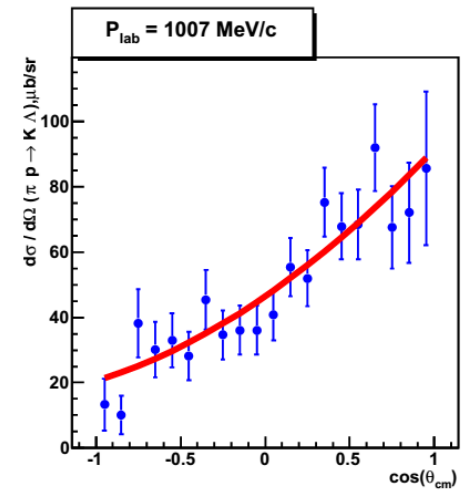
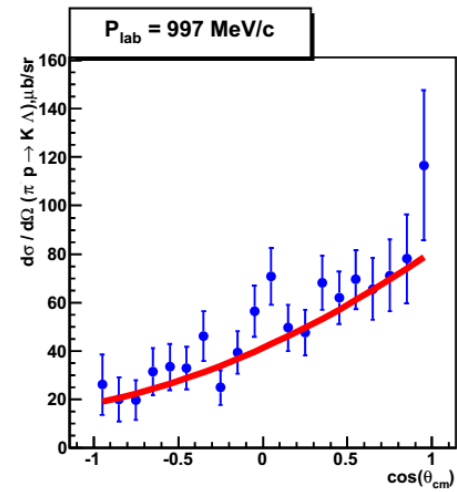
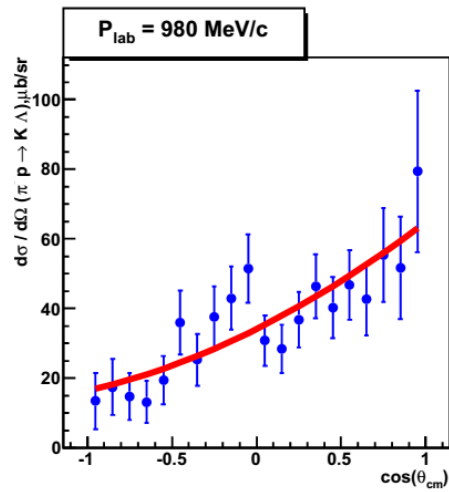
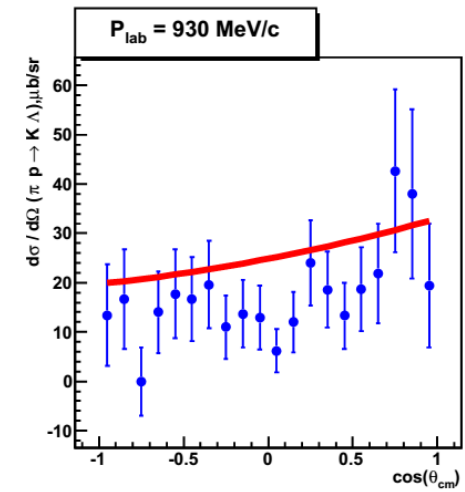
*$K^+$   $\Sigma^-$  differential cross section*

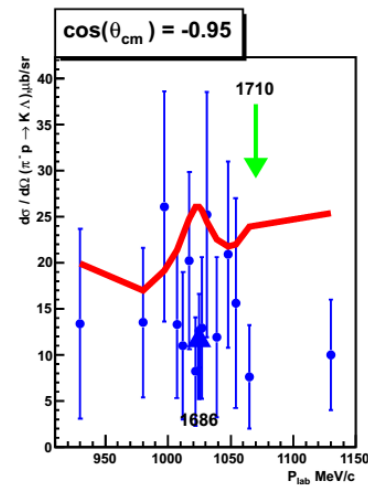
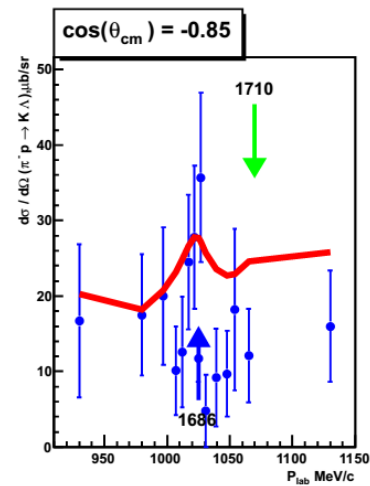
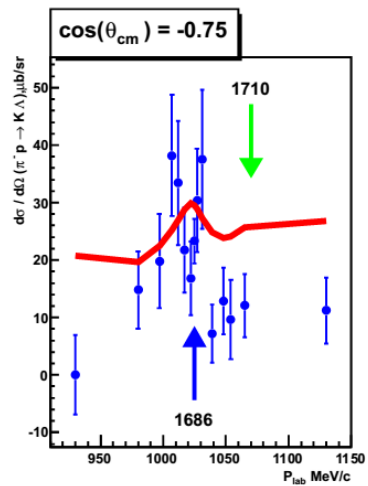
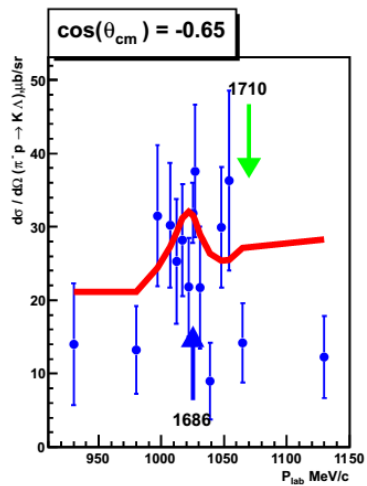
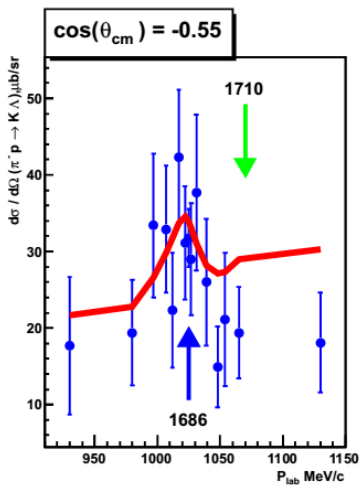
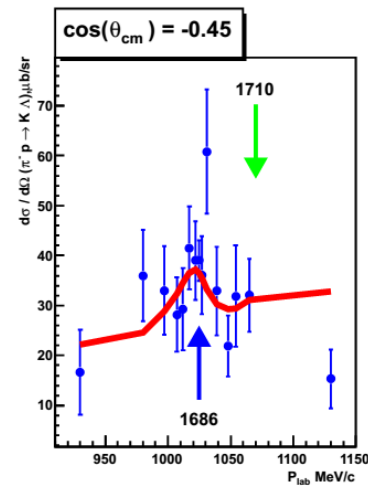
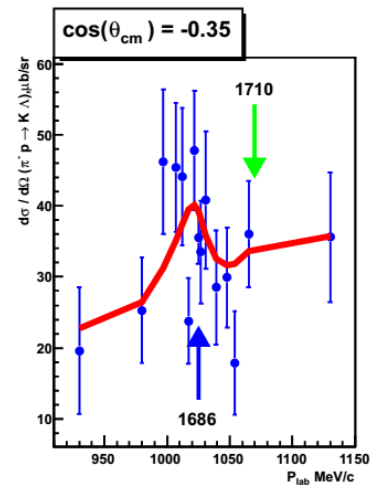
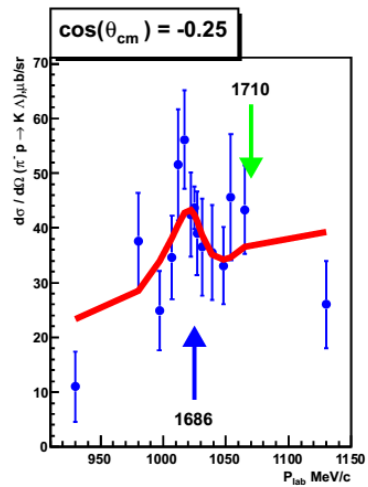
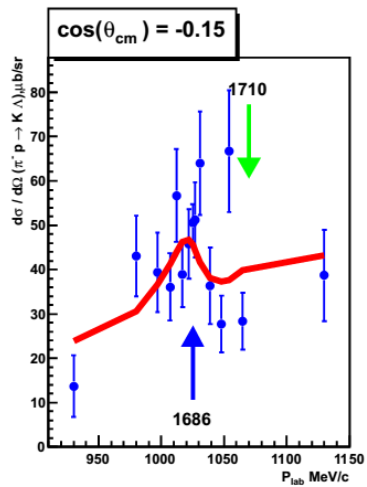
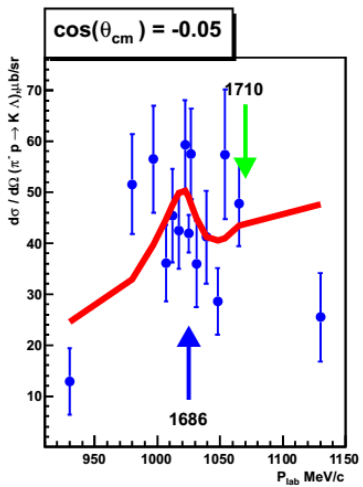




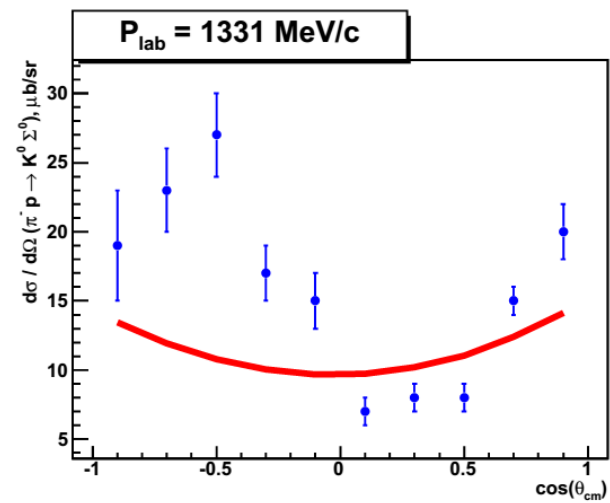
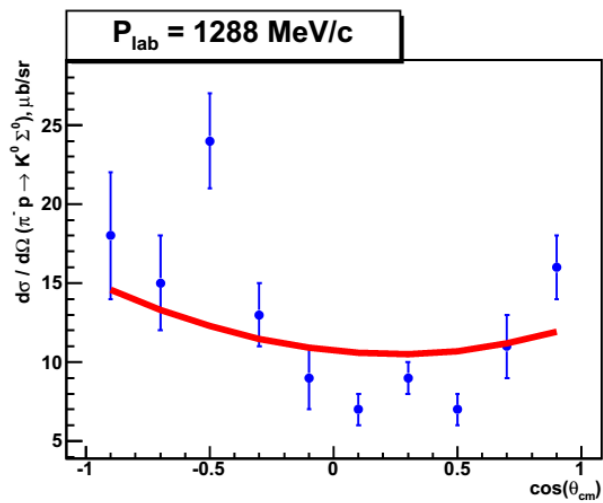
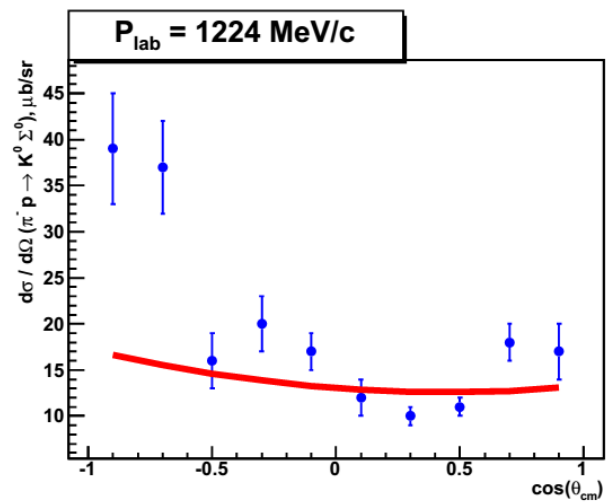
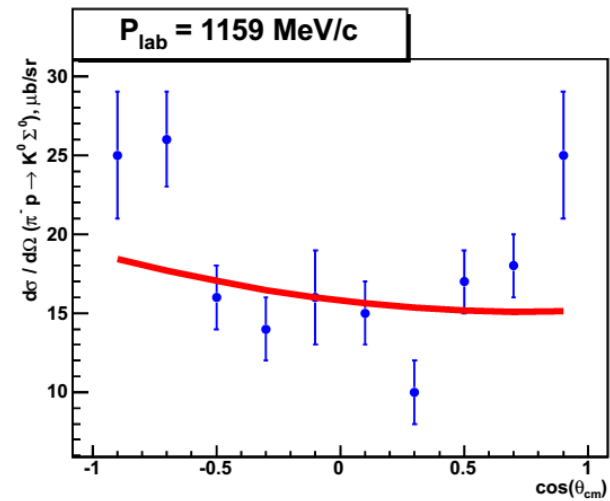
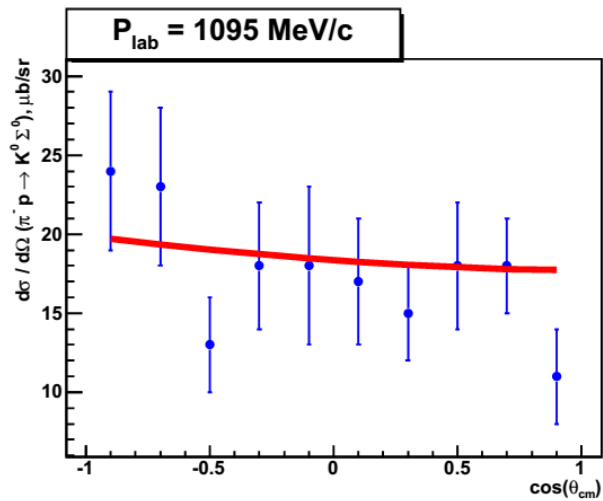
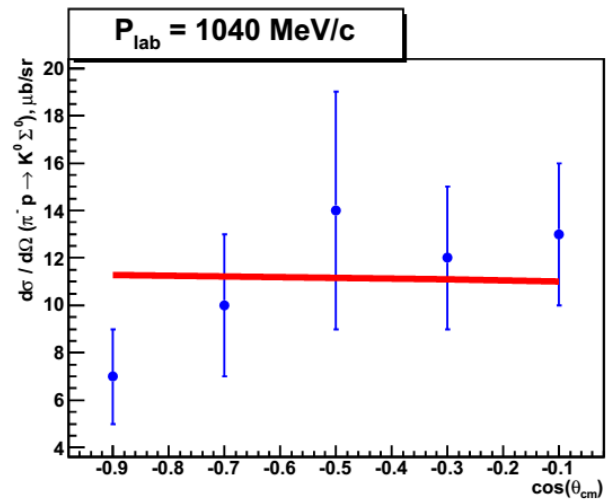


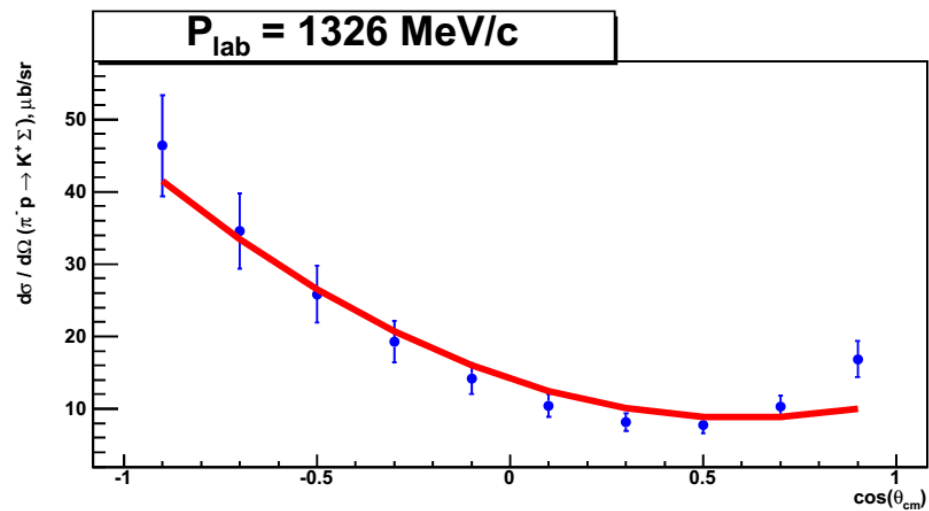
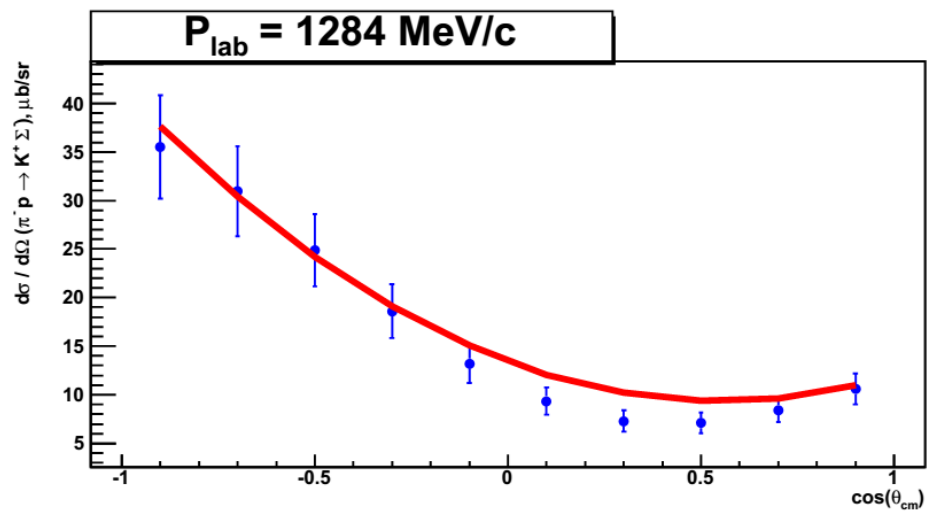
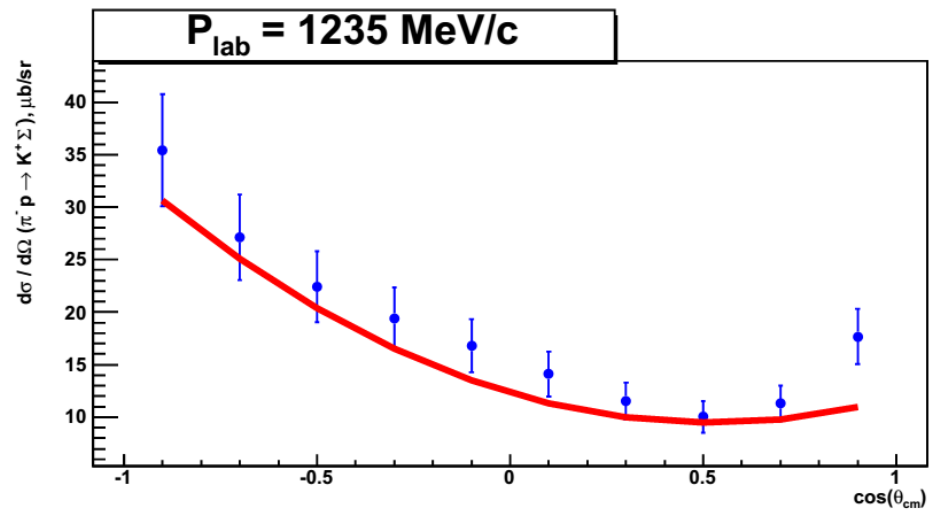
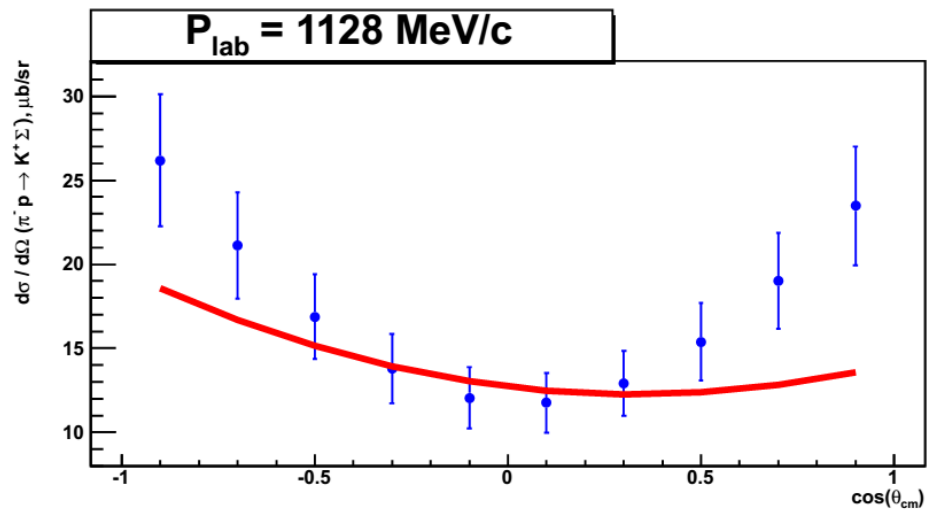


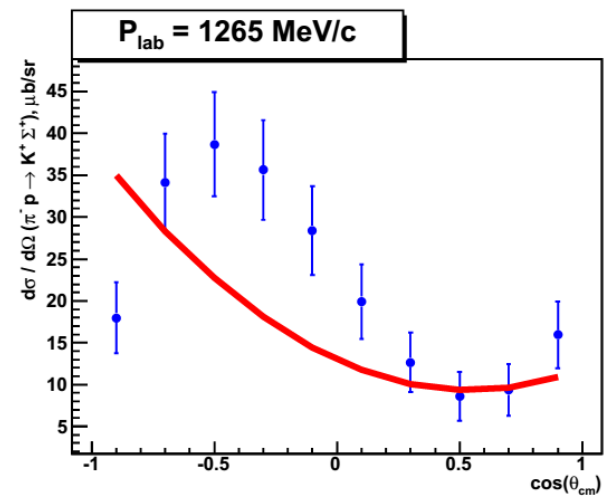
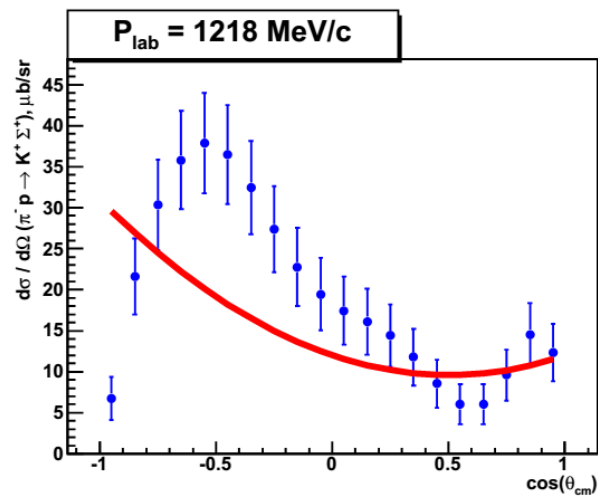
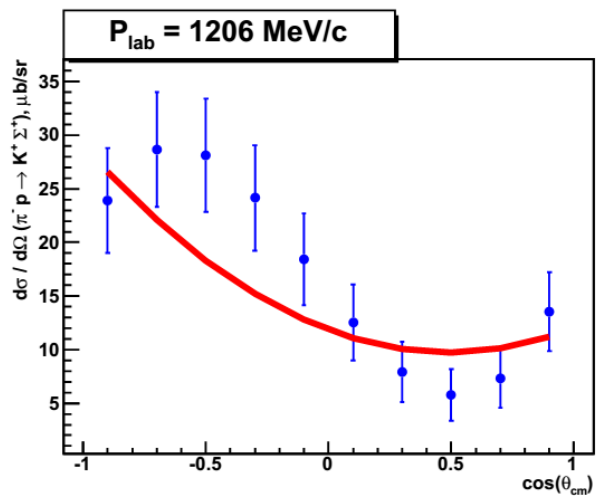
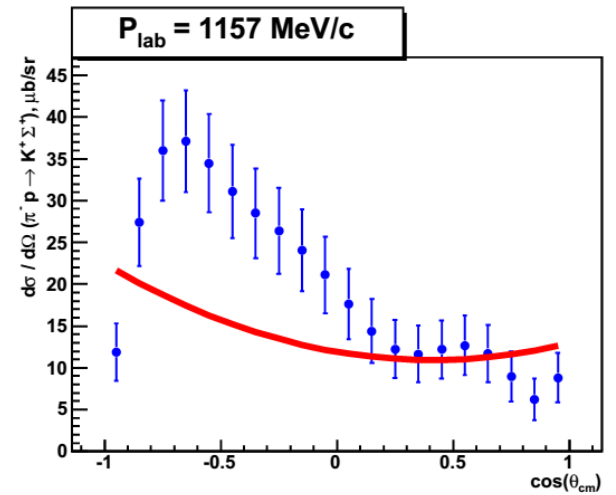
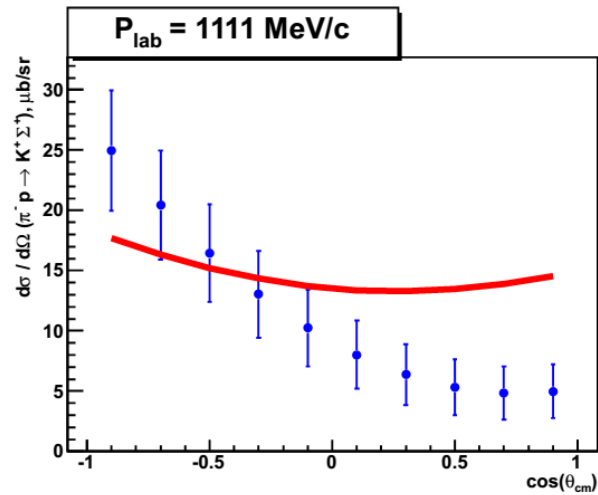
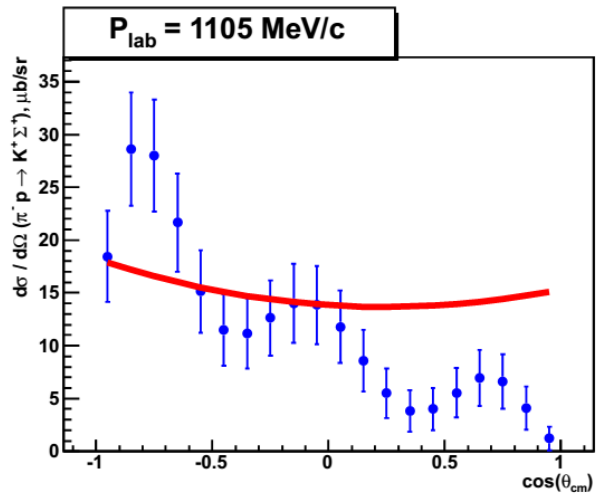












# Very preliminary



*S11*

$$M=1680(1.5)$$

$$\Gamma_{tot}=17.2 \text{ MeV}$$

$$\Gamma_{el}=0.4 \text{ MeV}$$

$$\Gamma_{2\pi}=10.0 \text{ MeV}$$

$$\Gamma_{\eta n}=6.7 \text{ MeV}$$

$$\Gamma_{K\Lambda}=0.1 \text{ MeV}$$

*P11*

$$M=1725(2.0)$$

$$\Gamma_{tot}=24.9 \text{ MeV}$$

$$\Gamma_{el}=4.0 \text{ MeV}$$

$$\Gamma_{2\pi}=12.0 \text{ MeV}$$

$$\Gamma_{\eta n}=7.1 \text{ MeV}$$

$$\Gamma_{K\Lambda}=0.8 \text{ MeV}$$

$$\Gamma_{K\Sigma}=1.0 \text{ MeV}$$



$M=1686 \quad S11 \rightarrow P11 \rightarrow \chi^2 \uparrow 15\%$

$M=1710 \quad P11 \rightarrow S11 \rightarrow \chi^2 \uparrow 25\%$

*Another explanations (for  $\eta$  photoproduction)*

*1. Interference effects.*

*Interference of well-known resonances*

*Interference of  $S11(1650)$  and  $P11(1710)$ .*

*V. Shklyar, H. Lenske, U. Mosel, PLB650 (2007) 172 (Giessen group)*

*Interference of  $S11(1535)$  and  $S11(1650)$ .*

*A. Anisovich et al. EPJA 41, 13 (2009) (Bonn-Gatchina group);*

*We not found such solution*

*2. Cusp effect*

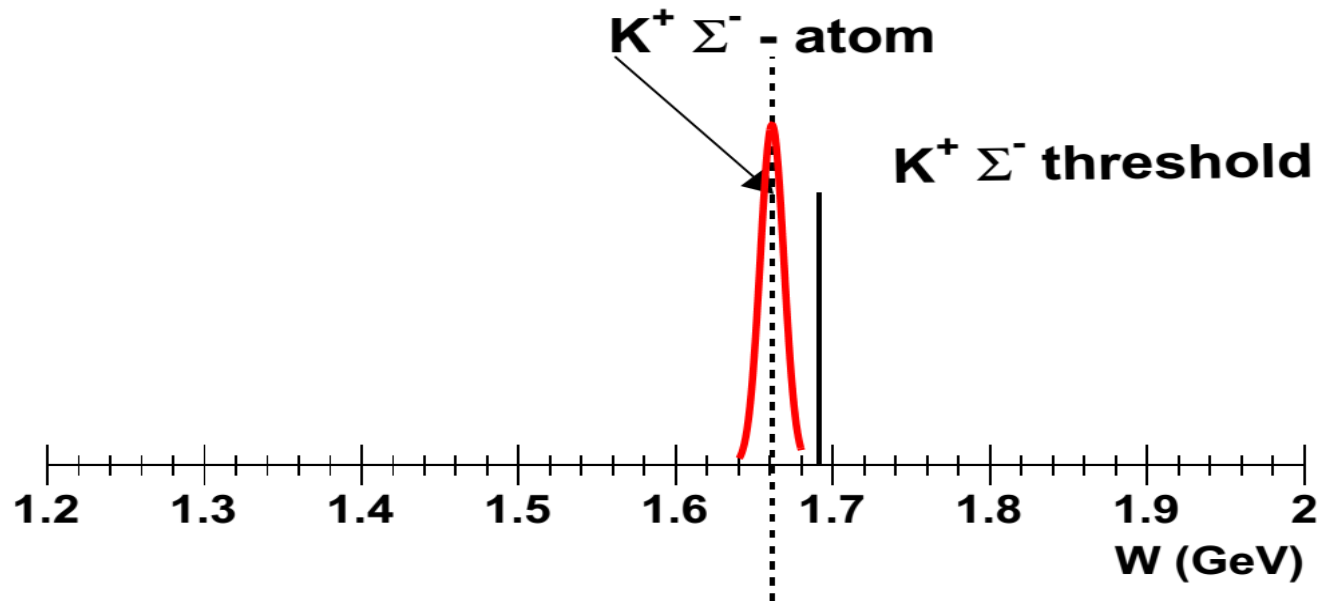
*M. Doring, K. Nakayama, PLB B683:145 (2010)*

*We are working on this possibility*



*The electromagnetic effects.*

$\pi^- p$  elastic ,  $\gamma n \rightarrow \eta n$



*Experimental check:*

$\pi^- p \rightarrow$  elastic,  $\eta n$ ,  $k \Lambda$ .

*Isospin symmetry*

$\pi^+ n \rightarrow$  elastic,  $\eta n$ ,  $k \Lambda$ .



Благодарю за внимание!