

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

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Pentaquark antidecuplet

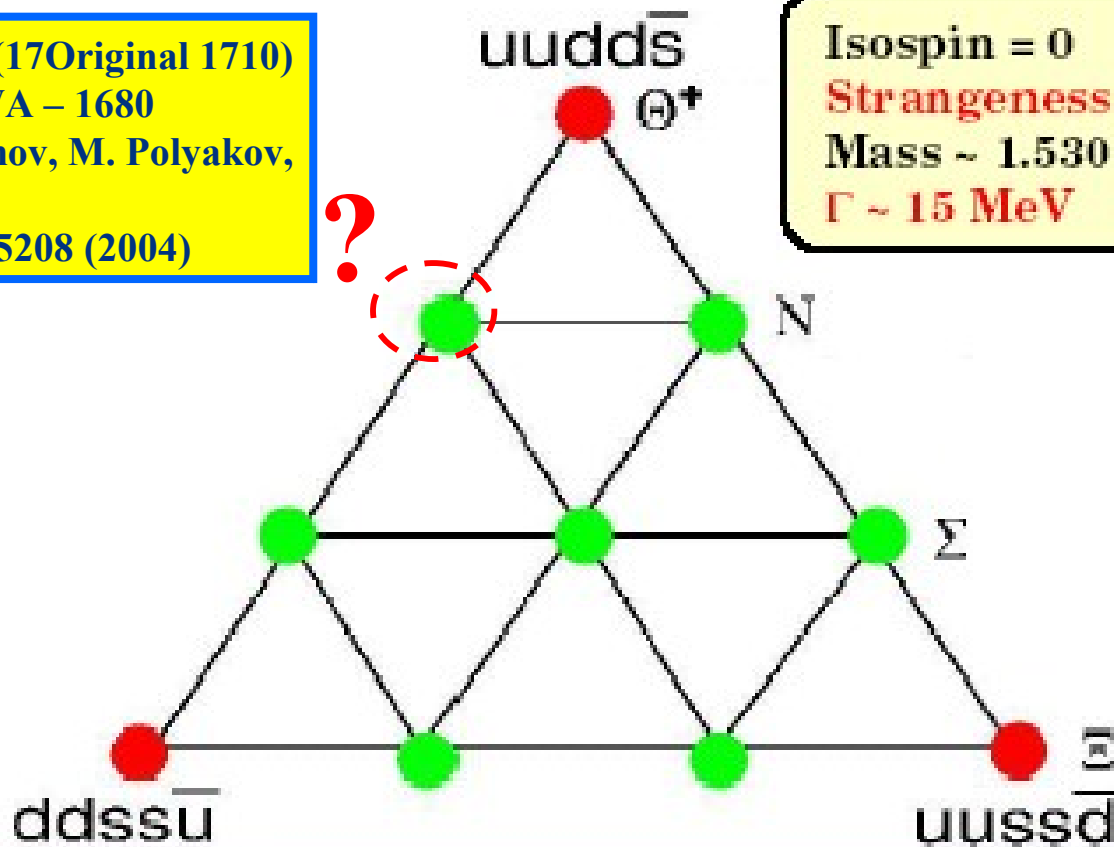


$[\bar{10}]$ Spin = $\frac{1}{2}$ NEW MULTIPLET

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

prediction – N*** (17 Original 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

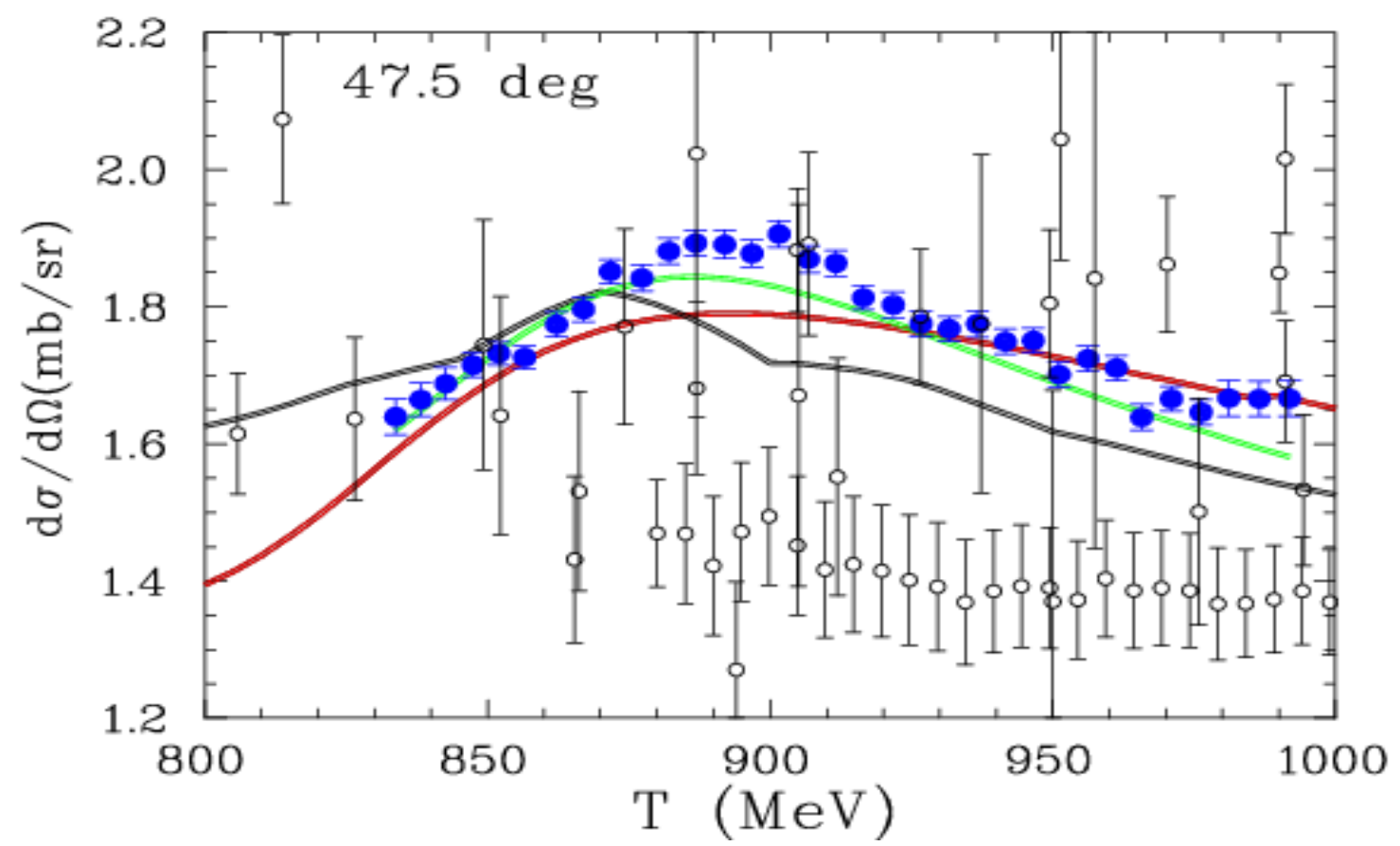


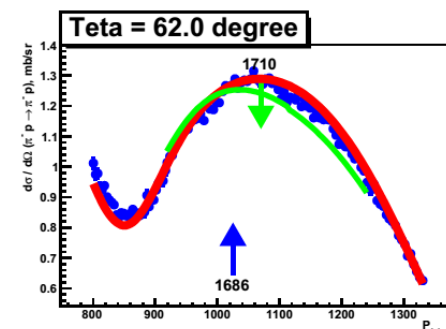
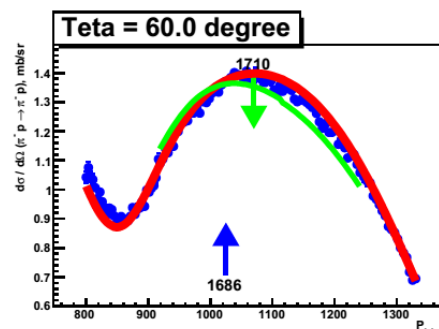
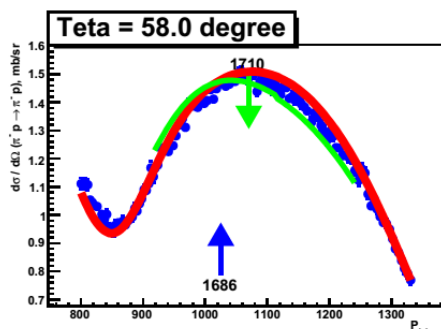
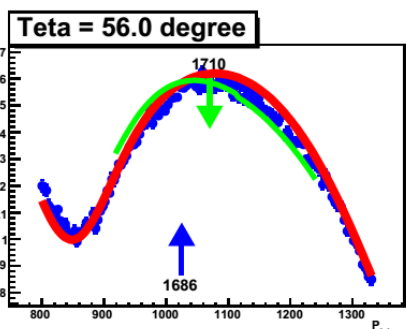
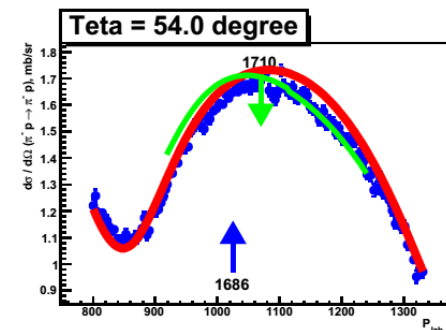
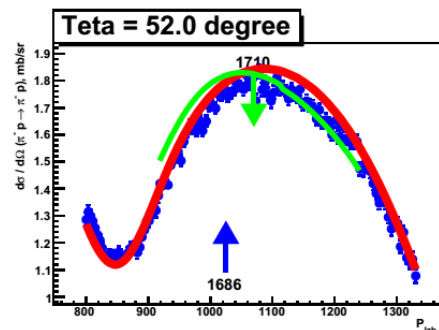
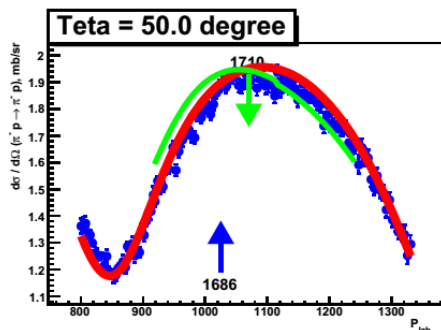
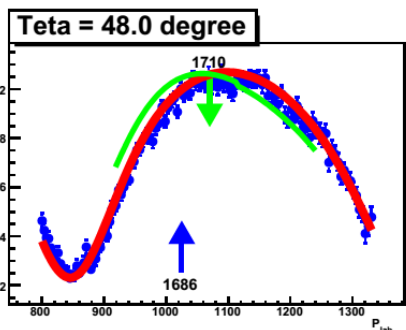
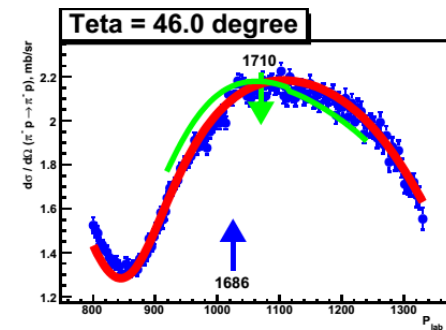
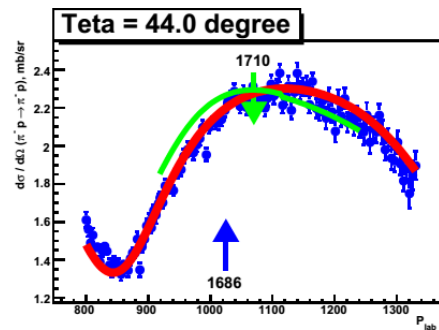
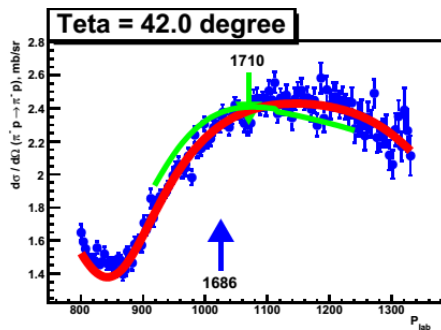
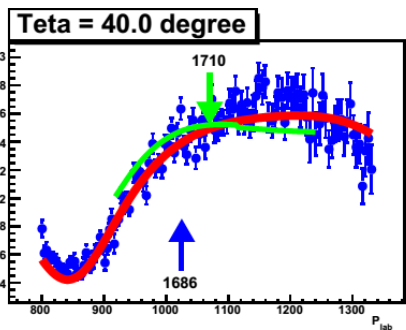


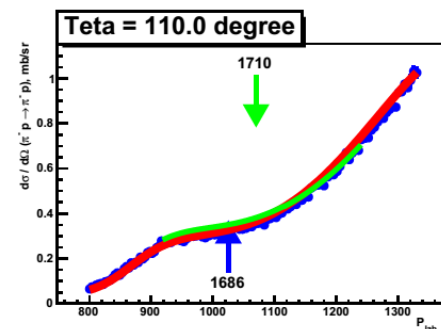
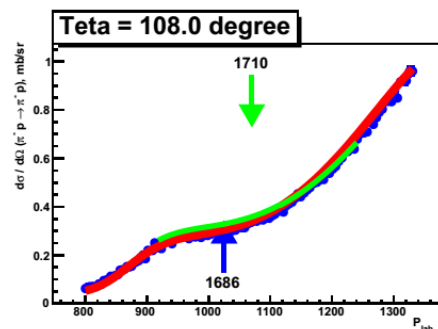
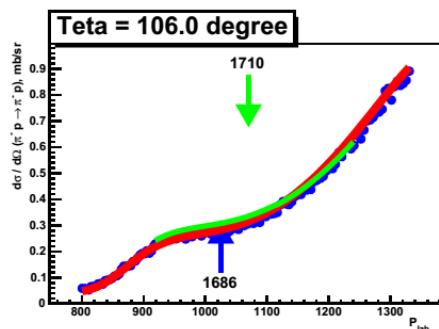
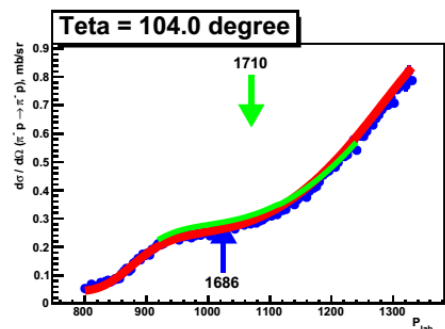
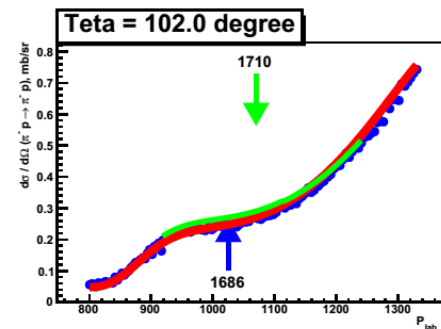
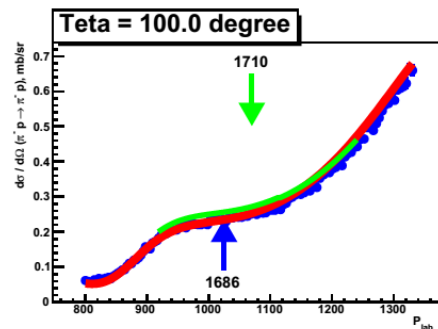
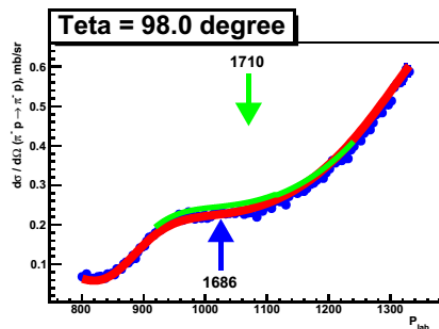
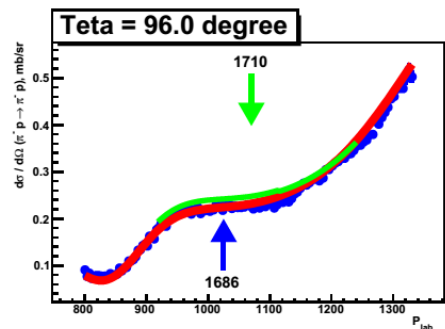
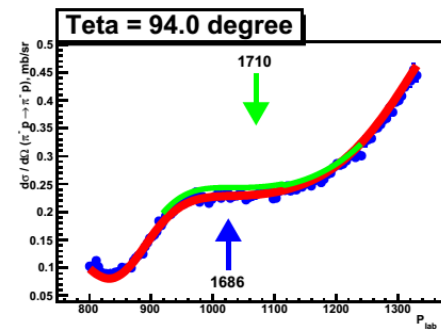
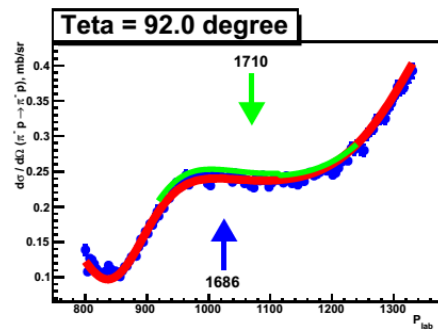
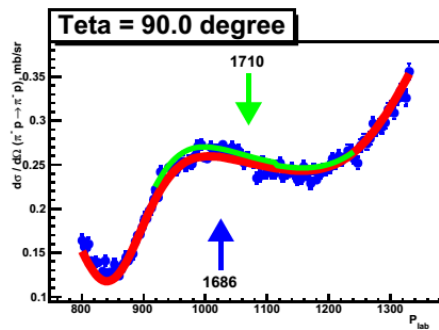
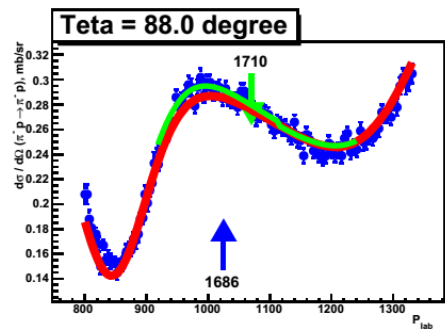
Why pions? Theory gives weak coupling to πN sector.

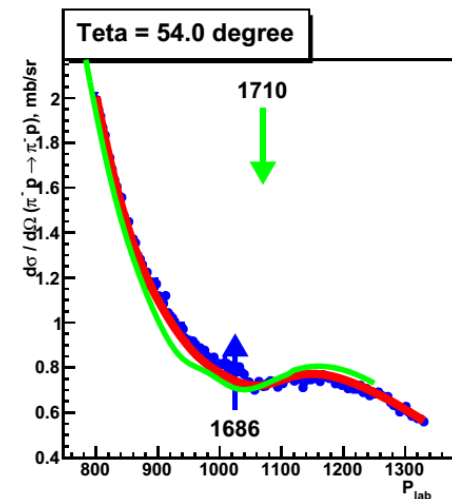
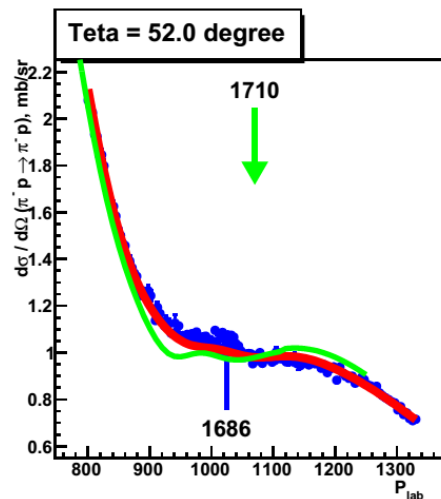
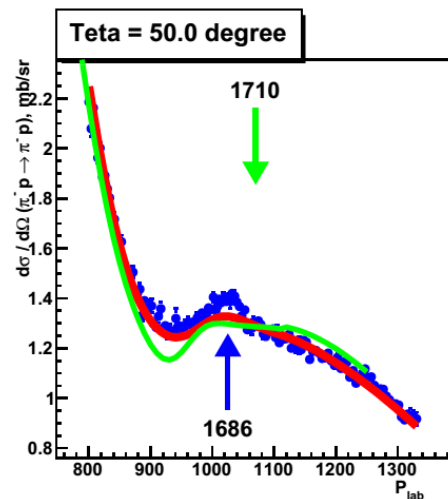
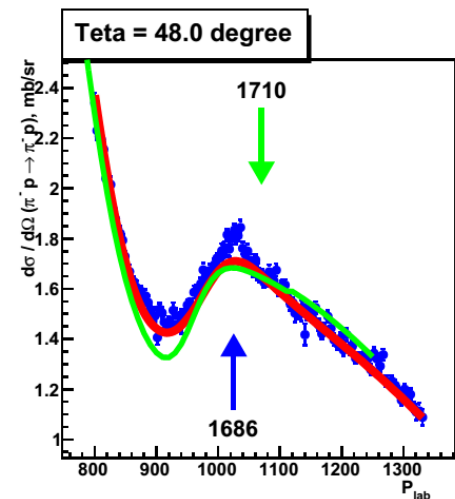
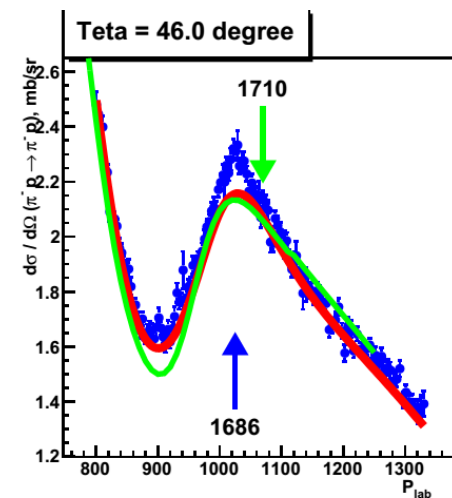
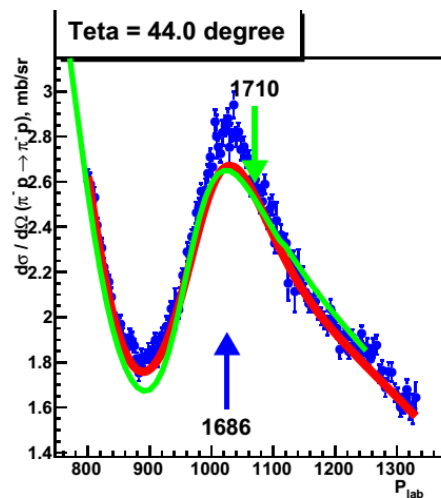
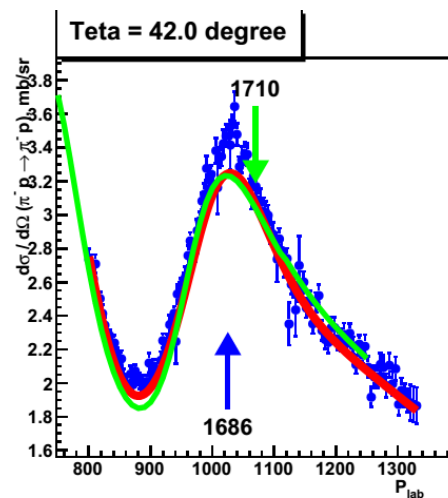
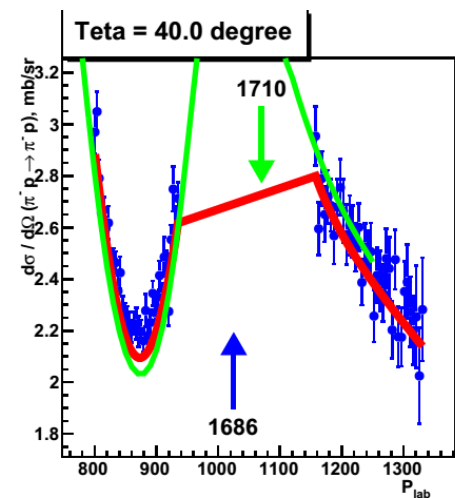
Advantages:

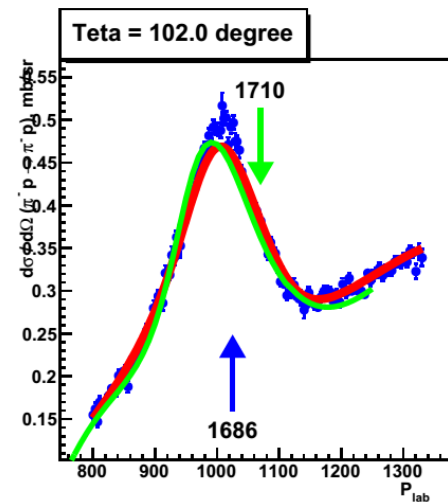
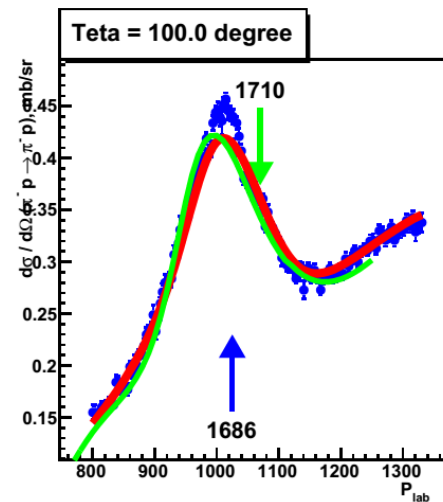
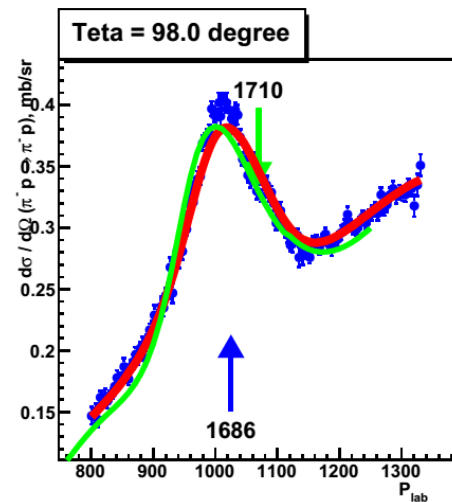
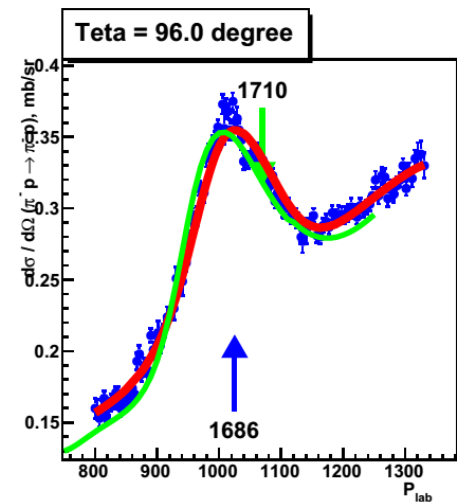
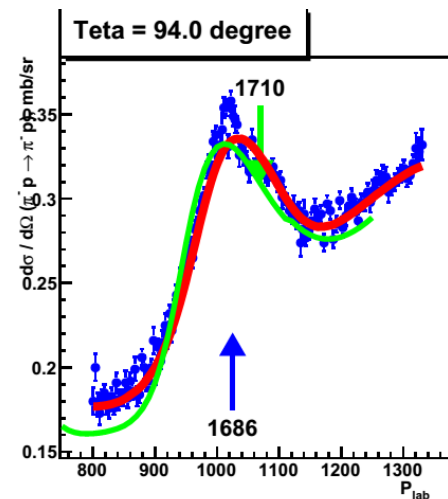
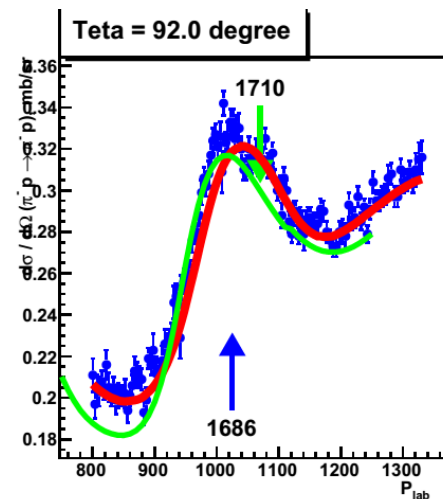
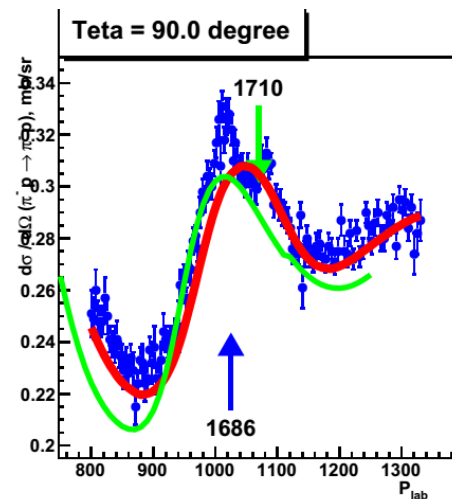
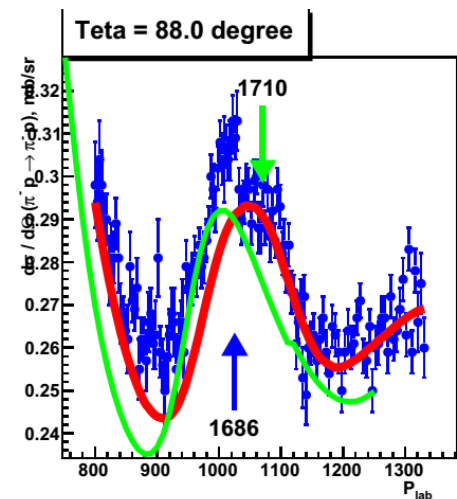
- 1. The structure of the πN amplitude is much more simpler than in photoproduction*
- 2. The πN partial waves are known very well from phase shift analysis.*
- 3. There is isospin symmetry.*
- 4. The number of free parameters smaller because there is no photocouplings*













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 σ , ρ like exchange in t channel.*

Multichannel:

- 1. elastic scattering*
- 2. two pion production (effective)*
- 3. η n production*
- 4. K Λ production*
- 5. K Σ 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 1 GeV.

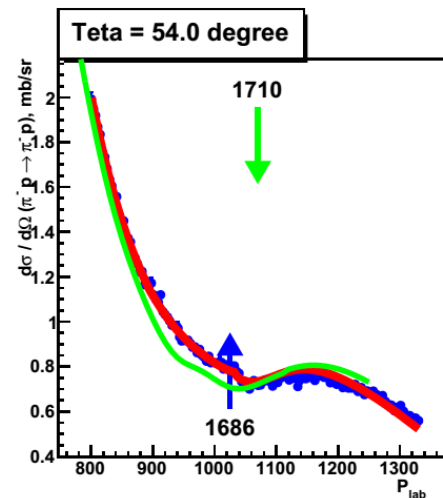
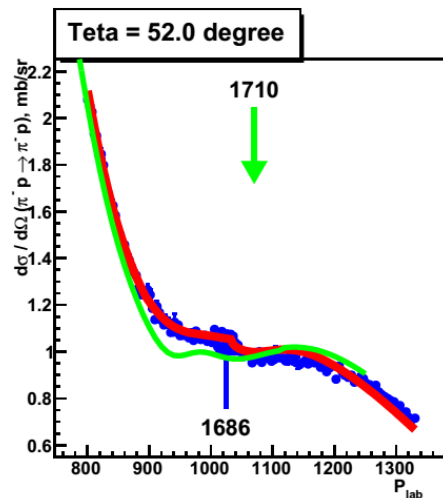
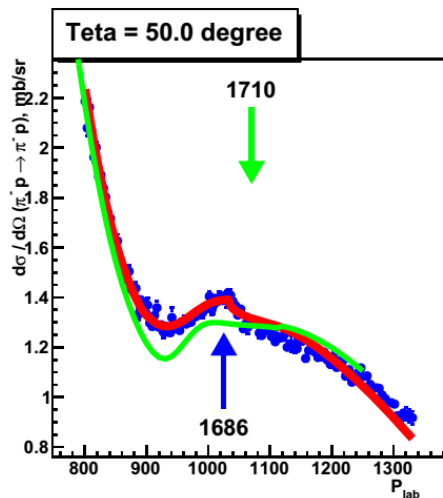
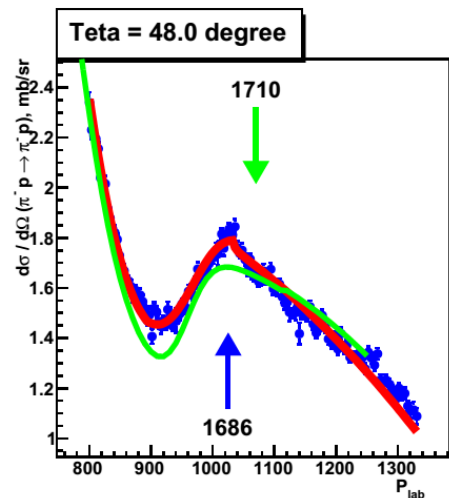
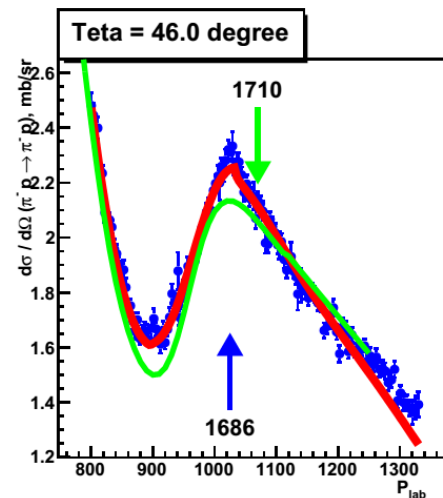
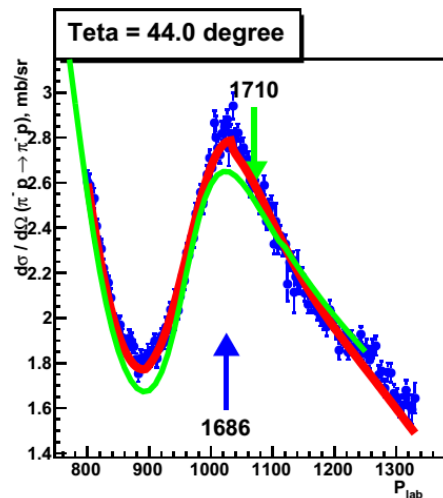
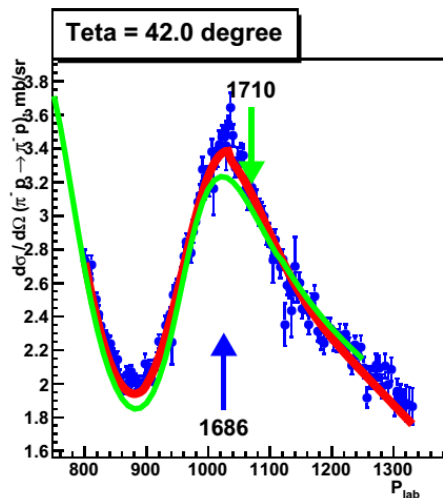
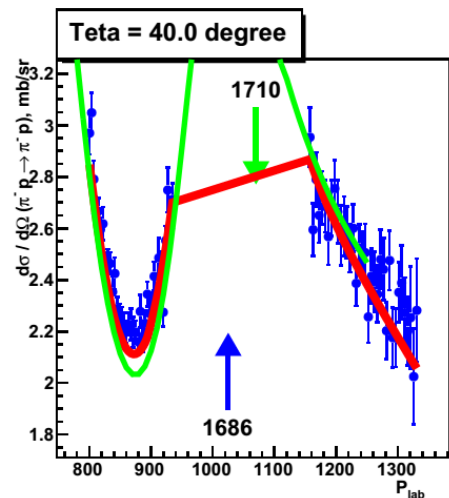
η n total cross section

K Λ differential cross section

K^0 Σ^0 differential cross section

K^+ Σ^+ differential cross section

K^+ Σ^- differential cross section



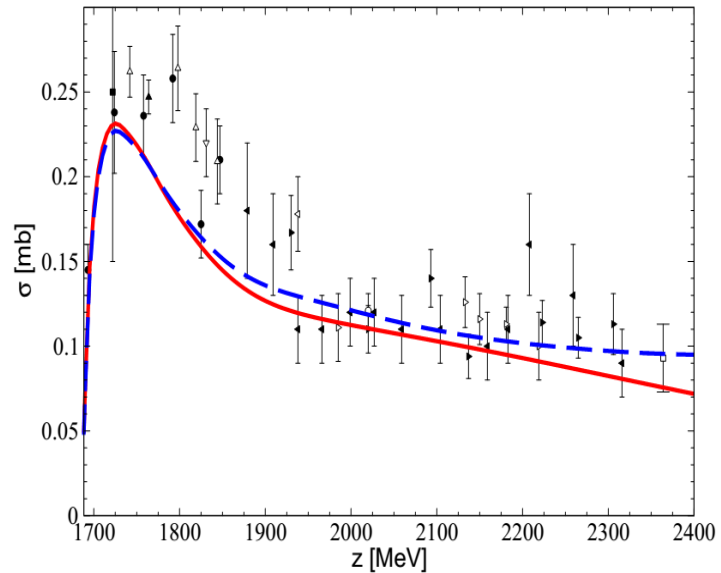


FIG. 22: Total cross section of the reaction $\pi^- p \rightarrow K^0 \Sigma^0$.

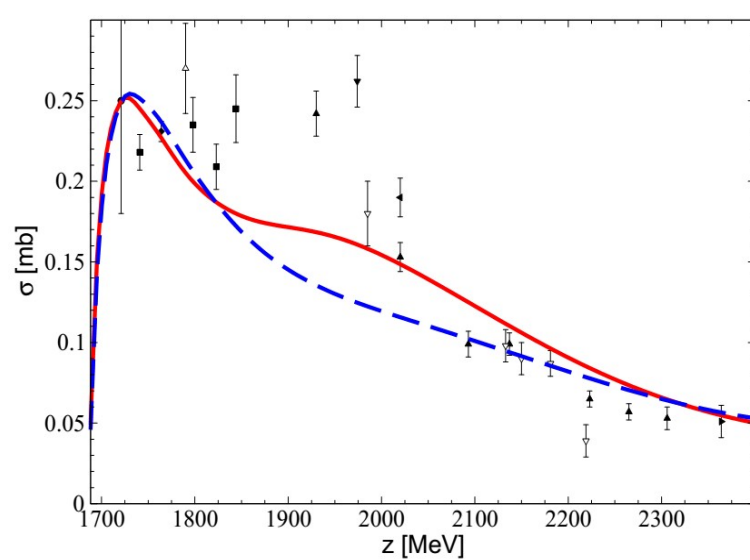


FIG. 28: Total cross section of the reaction $\pi^- p \rightarrow K^+ \Sigma^-$.

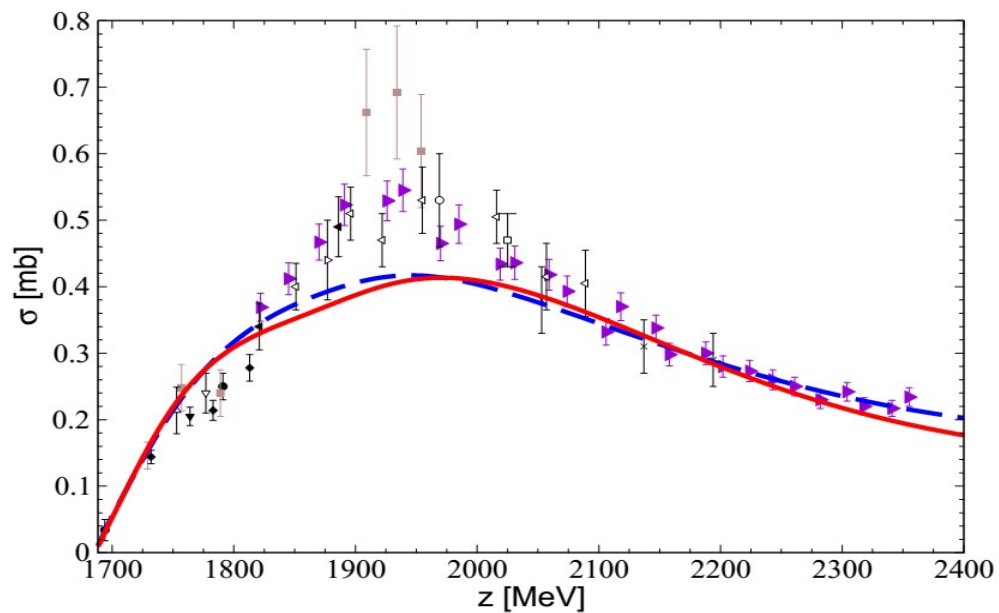
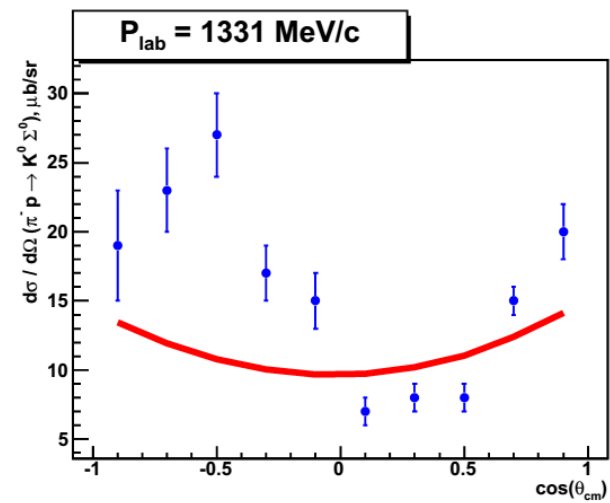
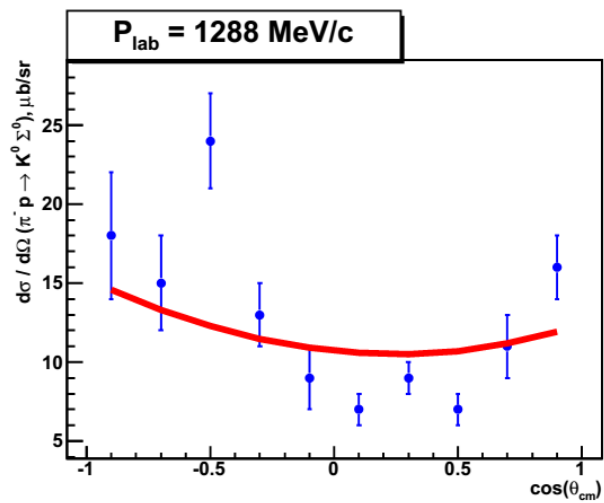
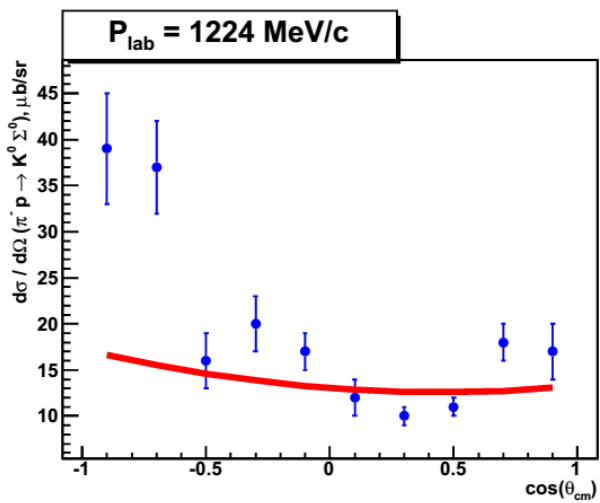
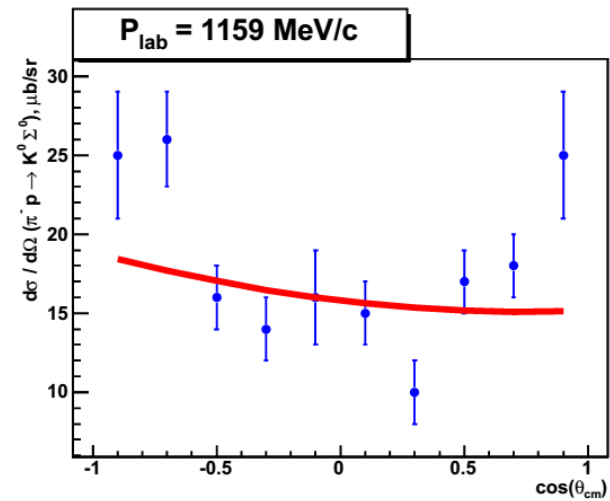
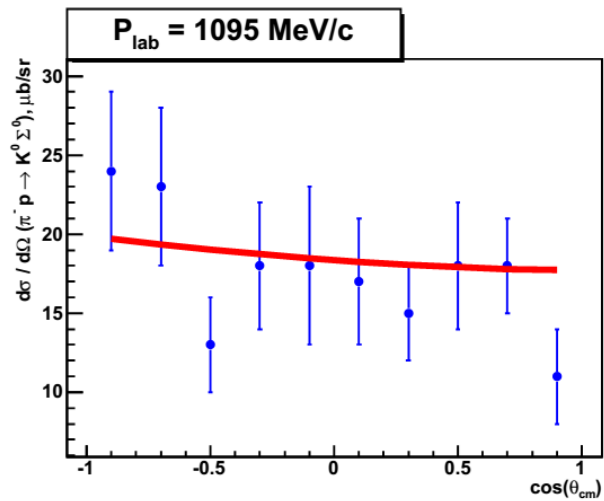
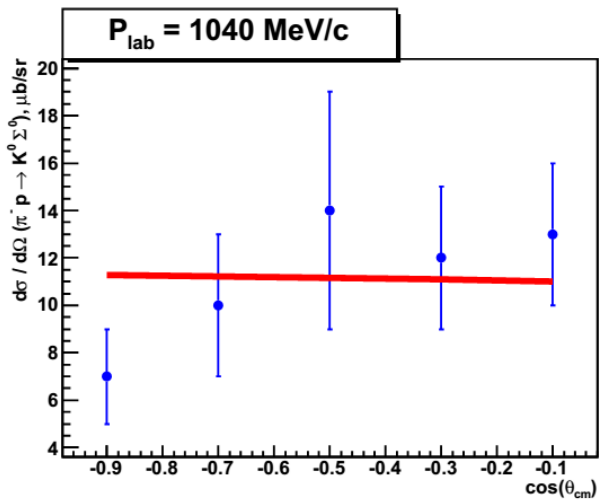
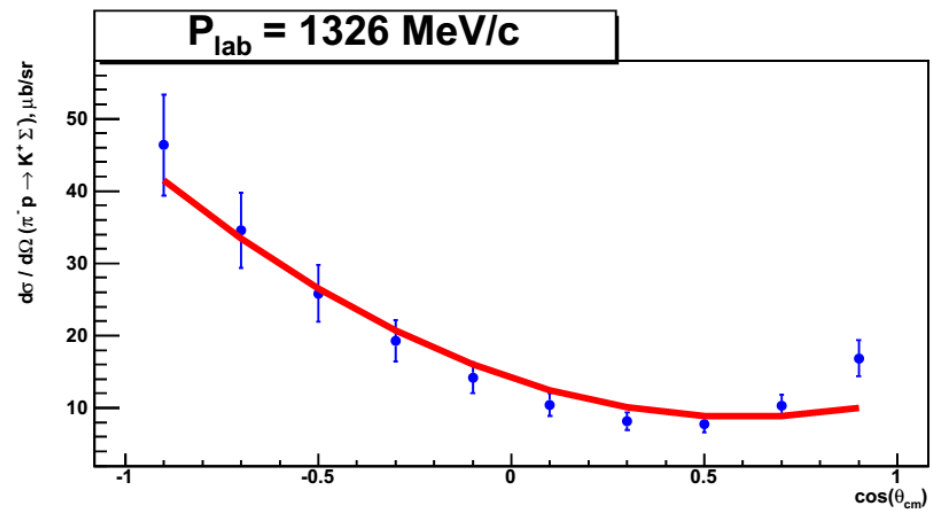
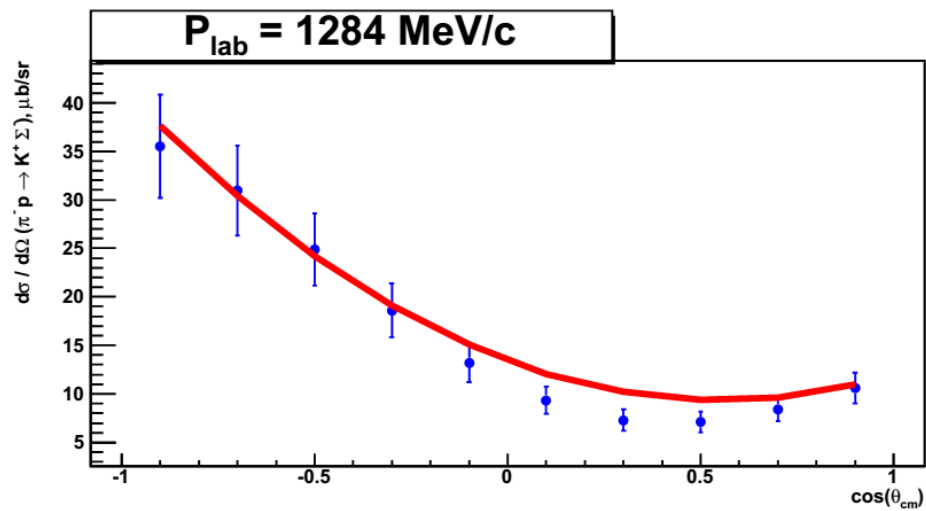
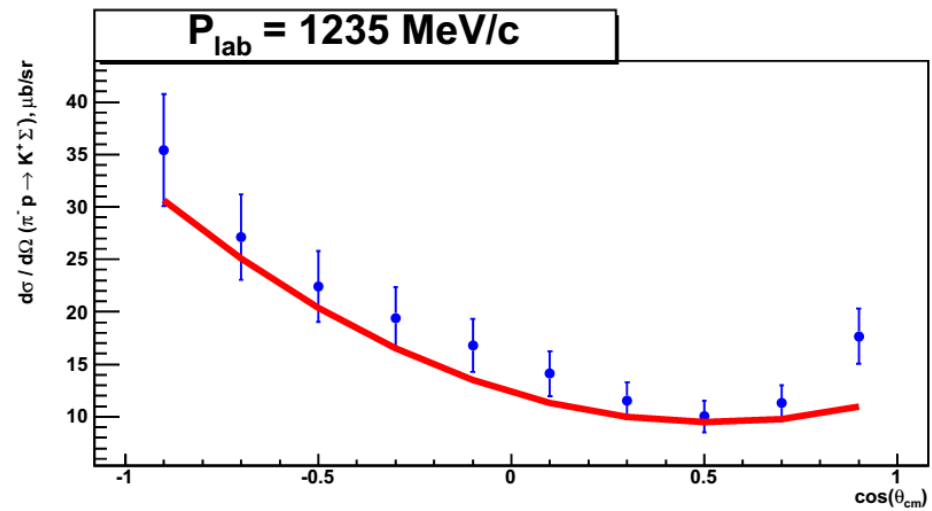
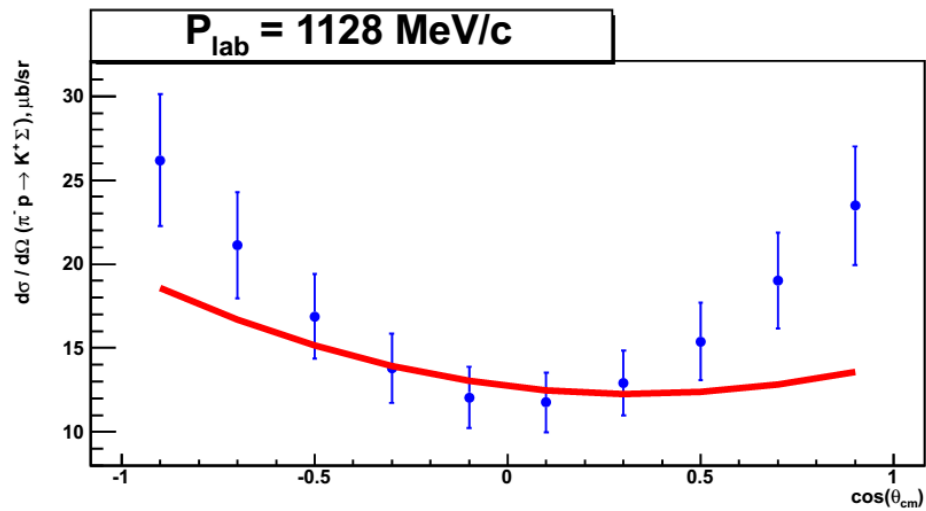
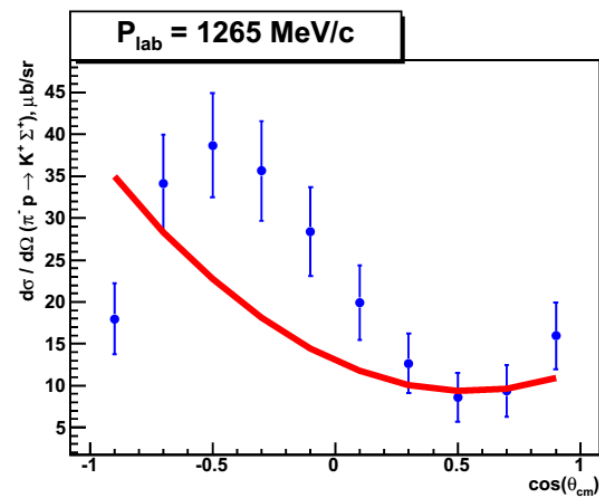
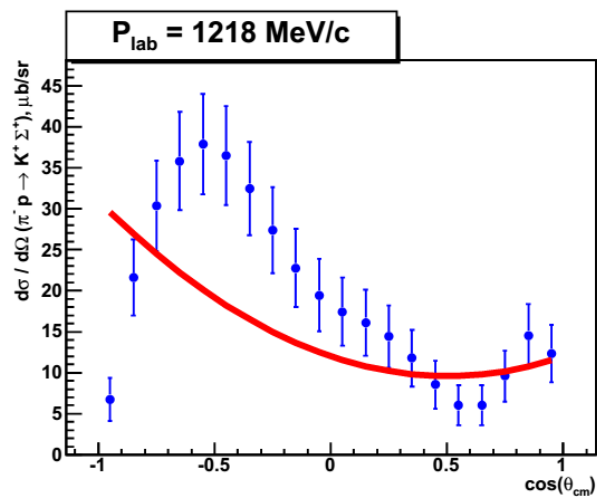
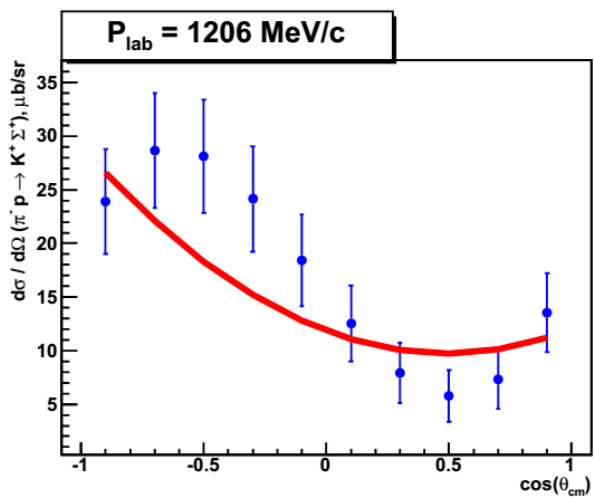
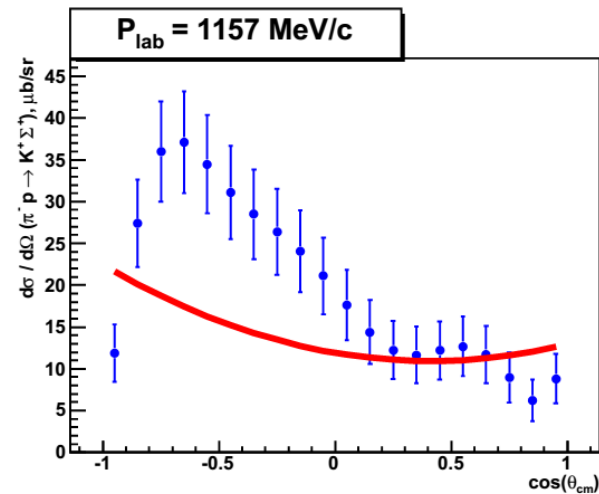
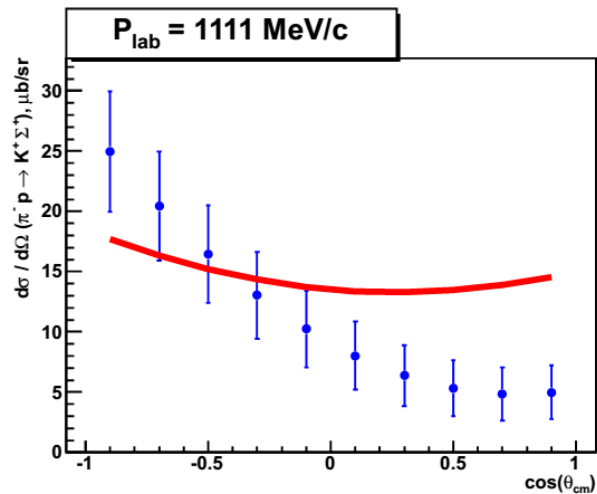
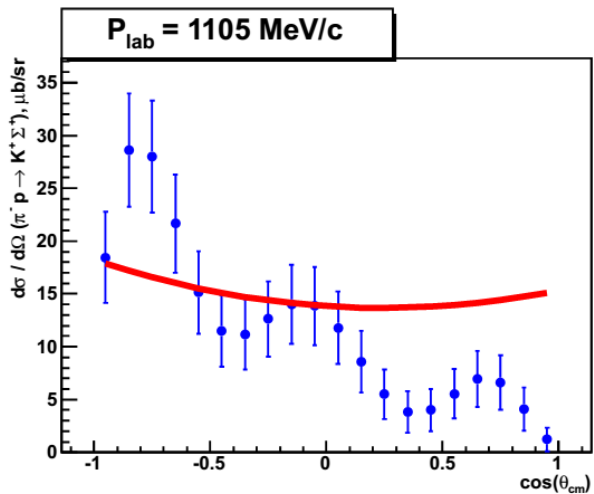
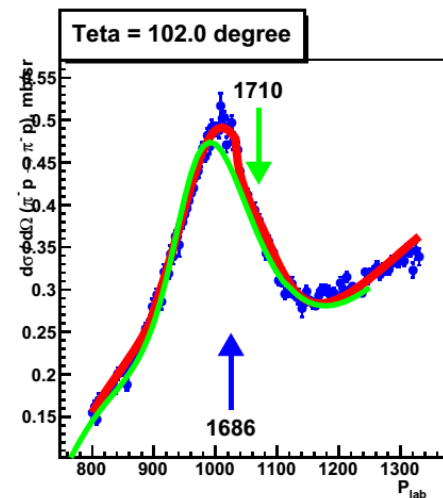
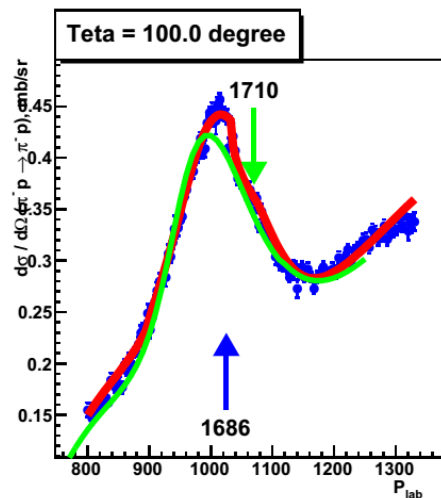
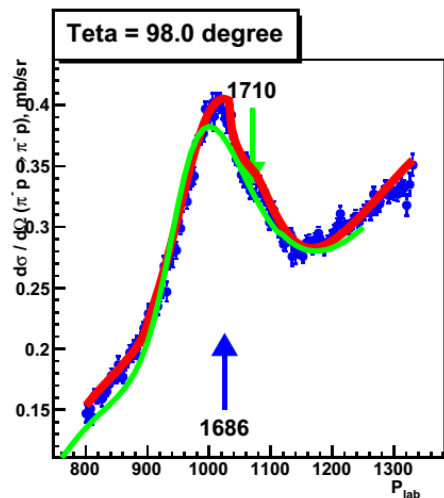
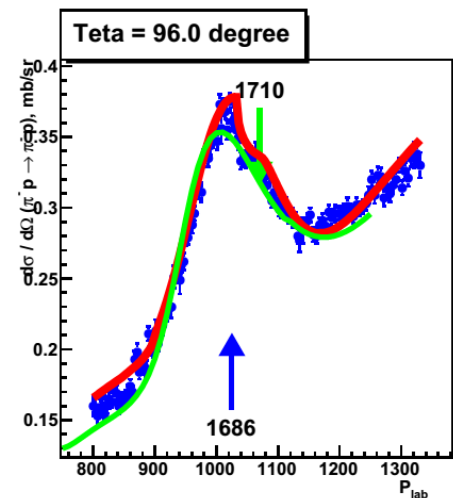
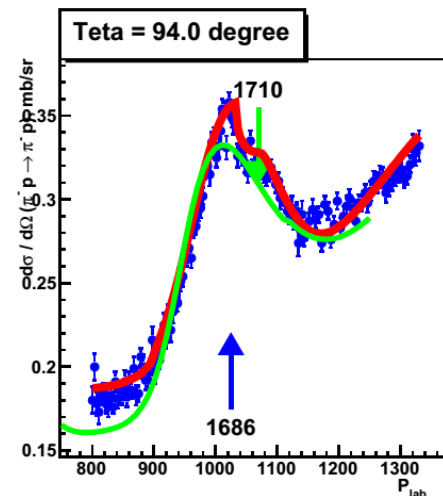
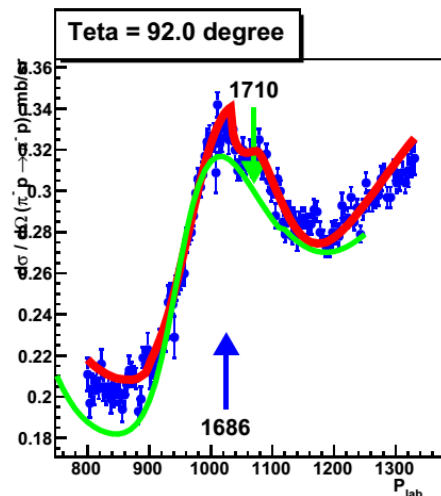
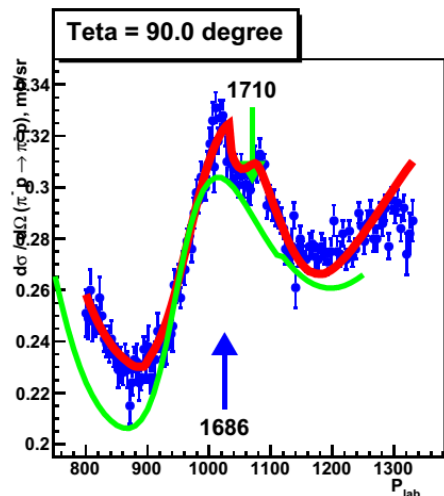
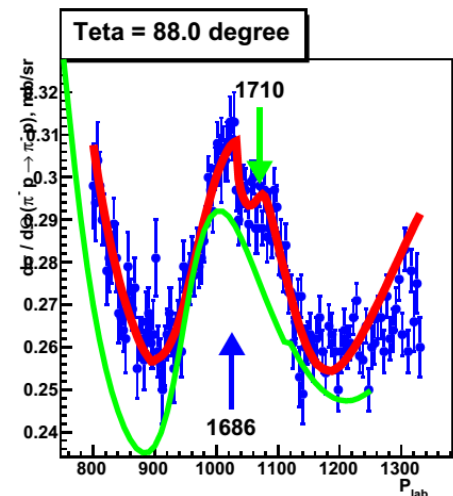


FIG. 31: Total cross section of the reaction $\pi^+ p \rightarrow K^+ \Sigma^+$.











*Total $h_i^{**2/p}$ 2.4*

960 – 1140 MeV/c

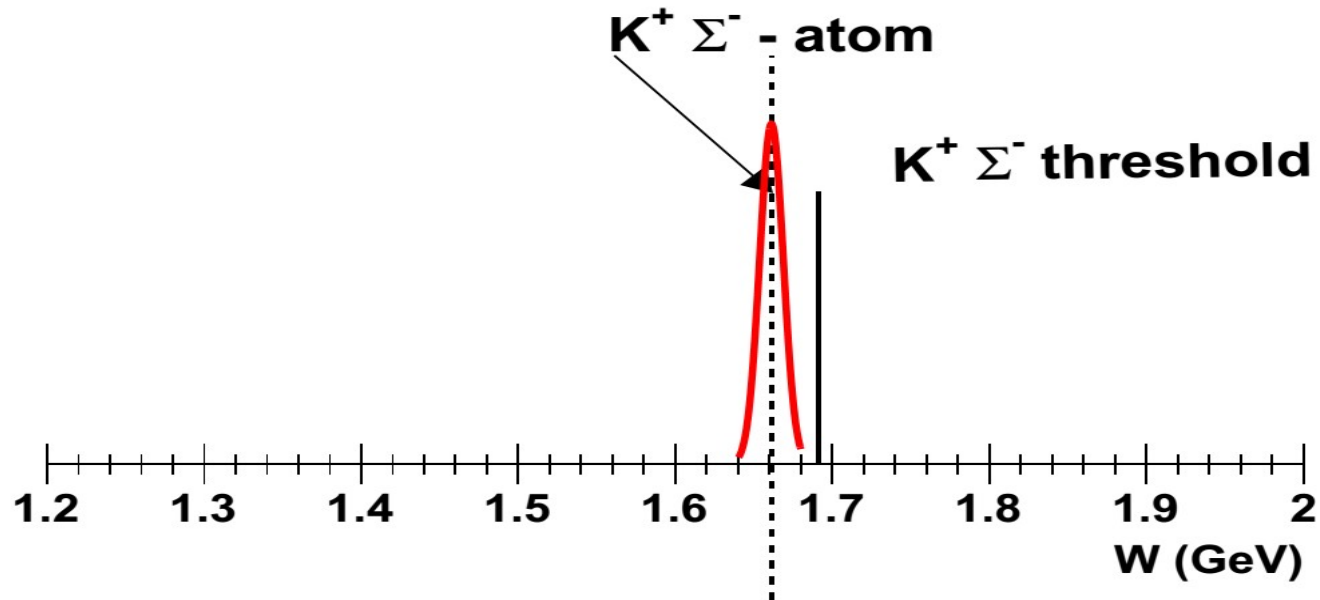
Background 2.6

P11 1.6

S11 and P11 1.5



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

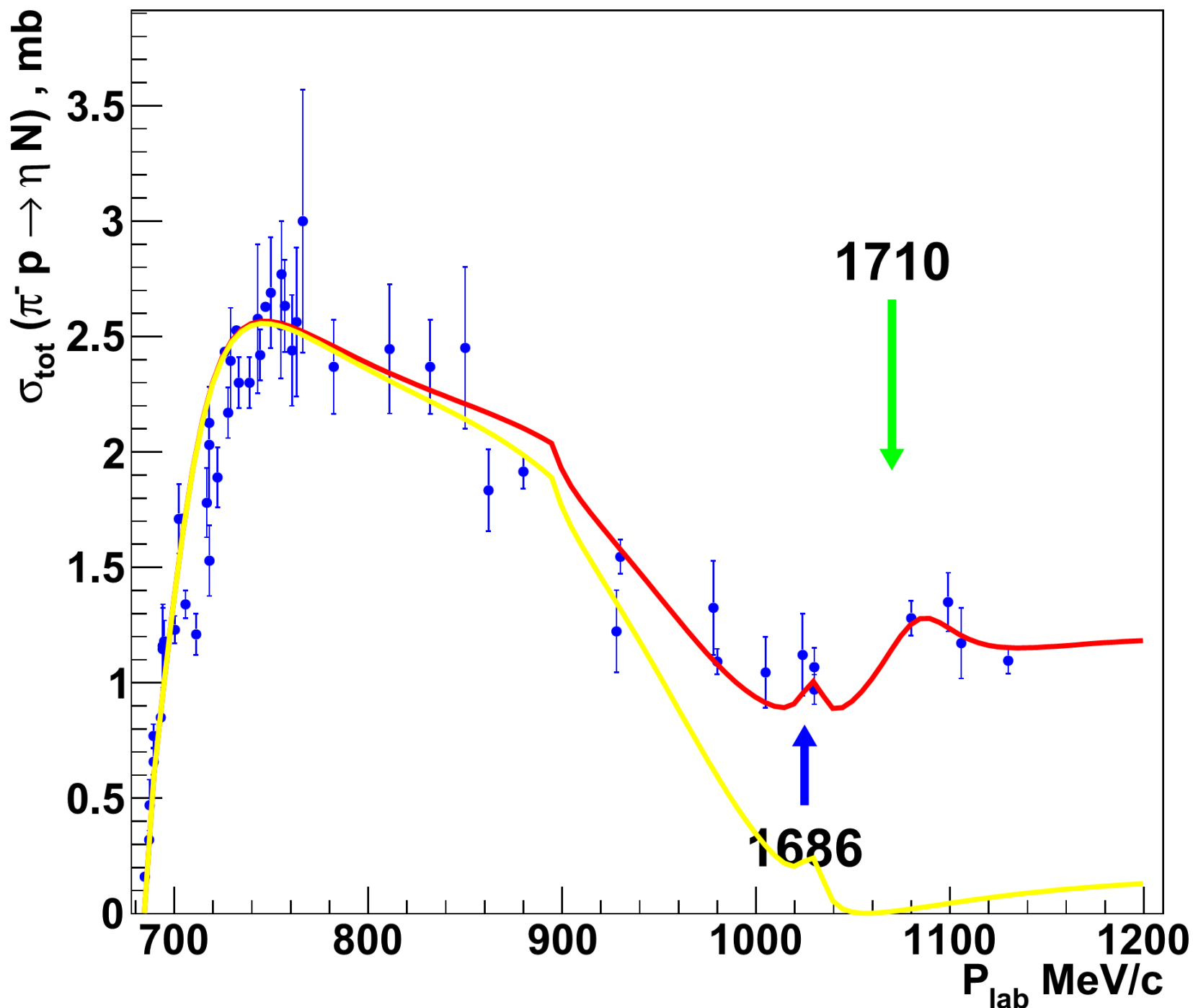


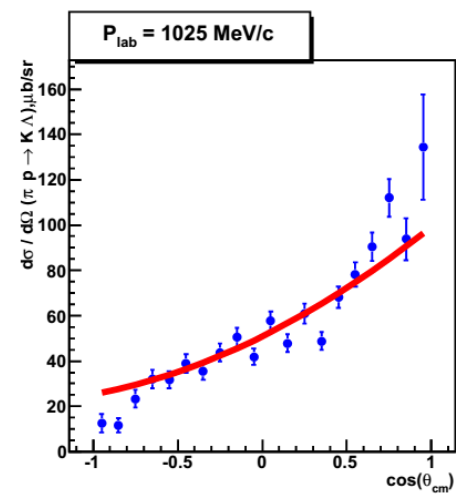
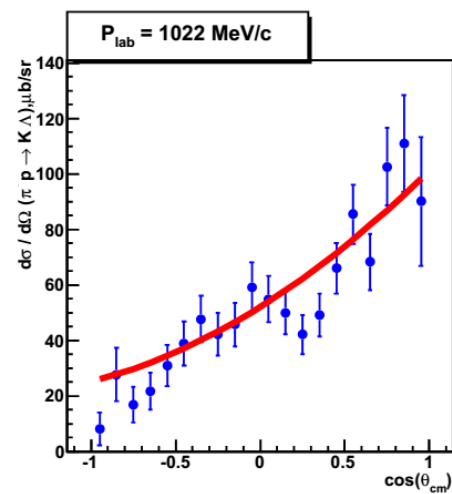
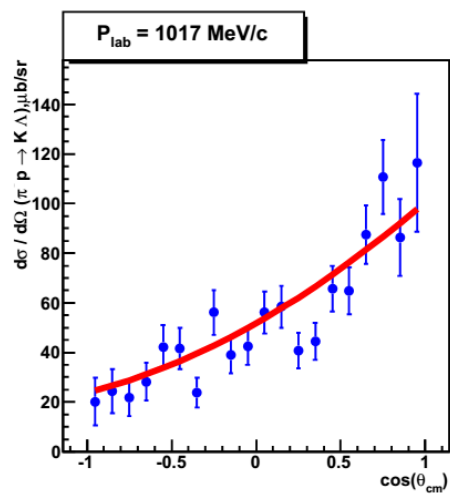
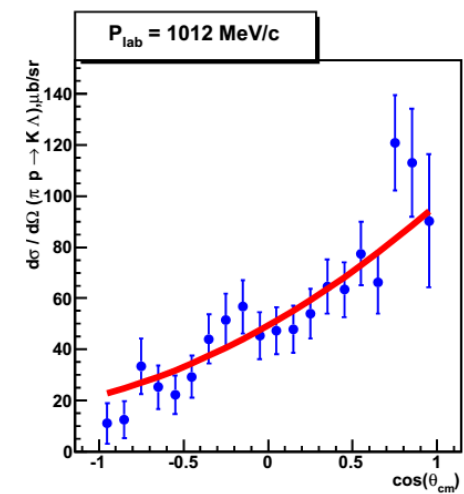
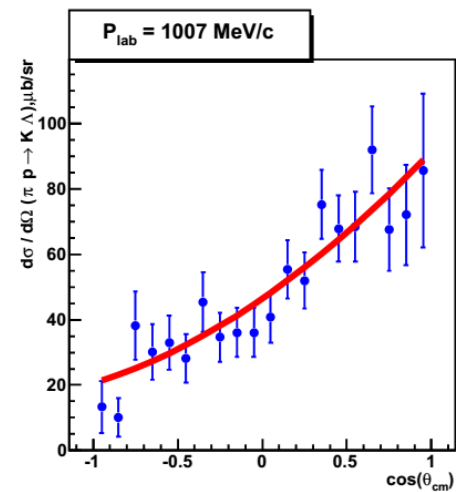
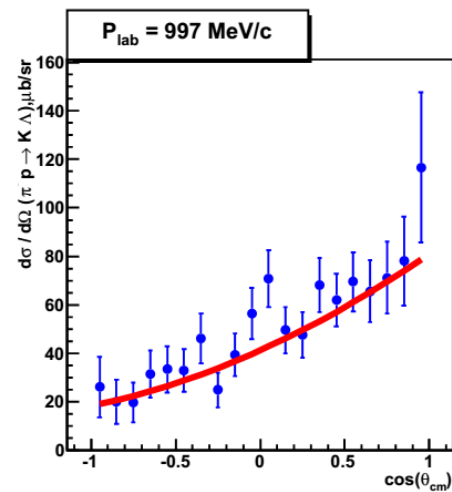
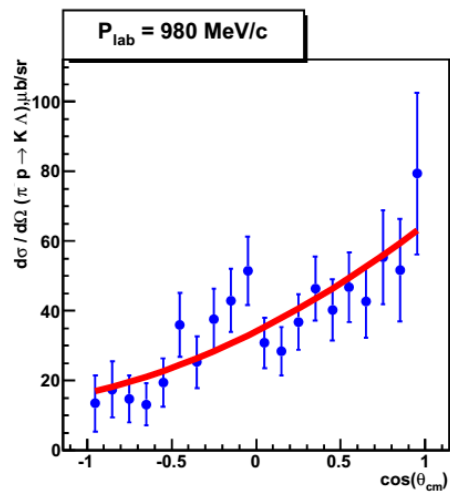
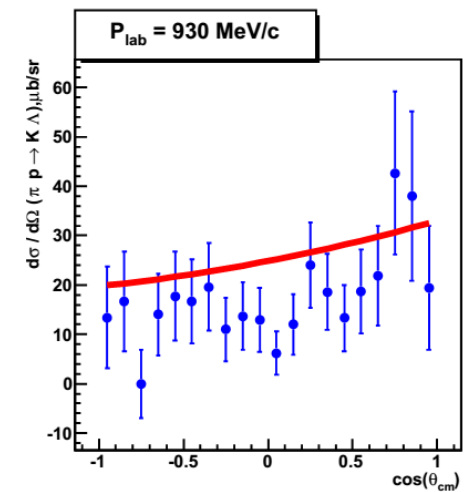
Experimental check:

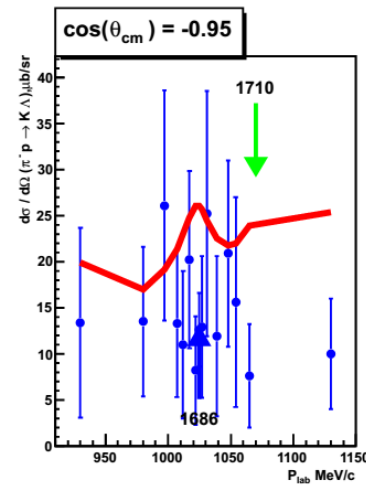
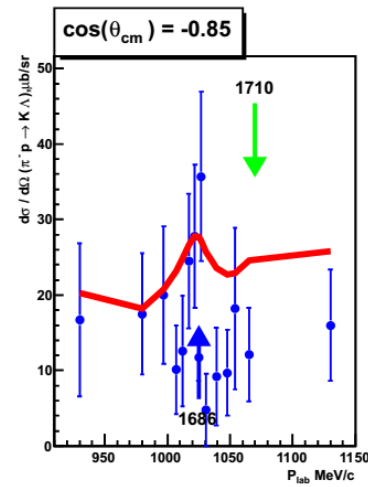
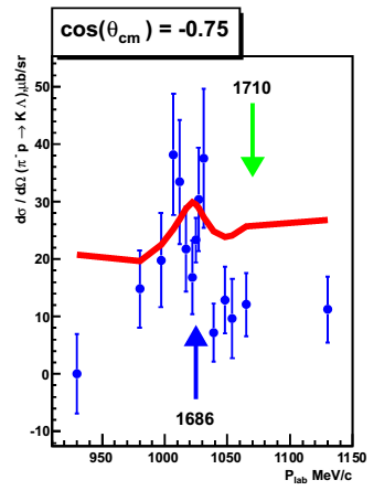
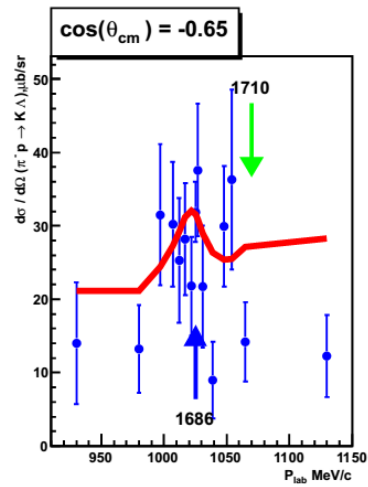
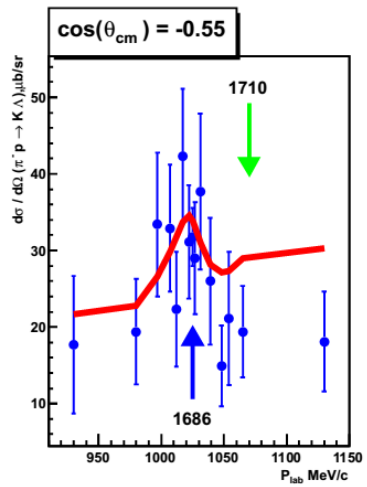
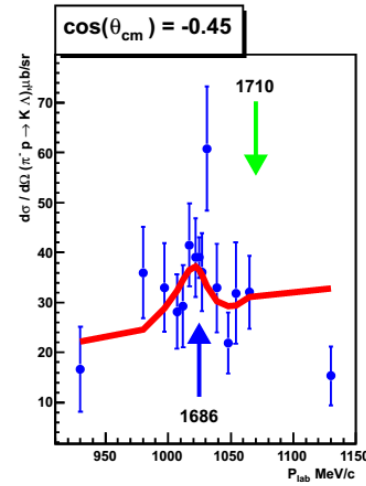
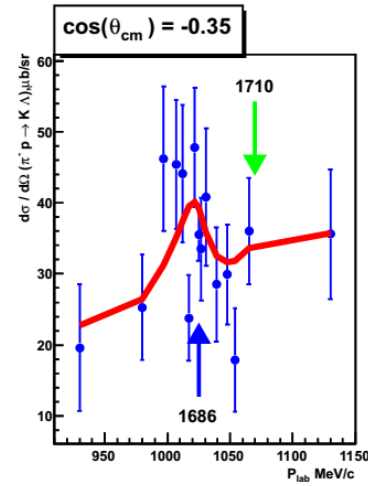
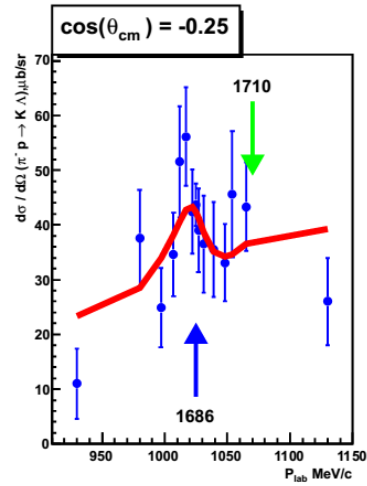
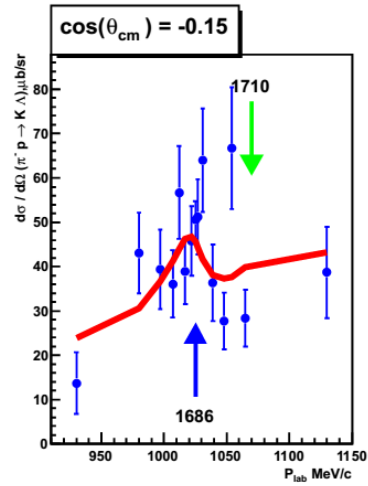
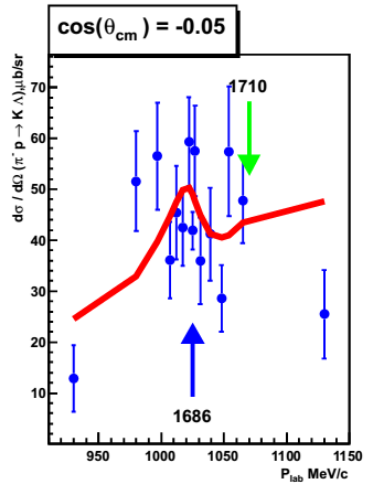
$\pi p \rightarrow \text{elastic}, \eta n, k \Lambda.$

Isospin symmetry

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







preliminary



S11

P11

P11

$$M=1686(1.5)$$

$$M=1724(2.0)$$

$$M=1717(2.0)$$

$$\Gamma_{tot} = 32.4 \text{ MeV}$$

$$\Gamma_{tot} = 35.7 \text{ MeV}$$

$$\Gamma_{tot} = 35.0 \text{ MeV}$$

$$\Gamma_{el} = 10.0 \text{ MeV}$$

$$\Gamma_{el} = 0.35 \text{ MeV}$$

$$\Gamma_{el} = 0.5 \text{ MeV}$$

$$\Gamma_{2\pi} = 7.9 \text{ MeV}$$

$$\Gamma_{2\pi} = 0.4 \text{ MeV}$$

$$\Gamma_{2\pi} = 0.8 \text{ MeV}$$

$$\Gamma_{\eta n} = 13.2 \text{ MeV}$$

$$\Gamma_{\eta n} = 7.6 \text{ MeV}$$

$$\Gamma_{\eta n} = 9.8 \text{ MeV}$$

$$\Gamma_{K\Lambda} = 1.3 \text{ MeV}$$

$$\Gamma_{K\Lambda} = 11.4 \text{ MeV}$$

$$\Gamma_{K\Lambda} = 9.5 \text{ MeV}$$

$$\Gamma_{K\Sigma} = 16.0 \text{ MeV}$$

$$\Gamma_{K\Sigma} = 14.4 \text{ MeV}$$



Благодарю за внимание!