JAGIELLONIAN UNIVERSITY
IN KRAKOW

Close to threshold η′ meson production in proton-proton collisions at COSY-11

Eryk Czerwiński
on behalf of COSY-11 Collaboration

13th International Workshop on Meson Production, Properties and Interaction
Cracow, 29.05.-03.06.2013

Motivation

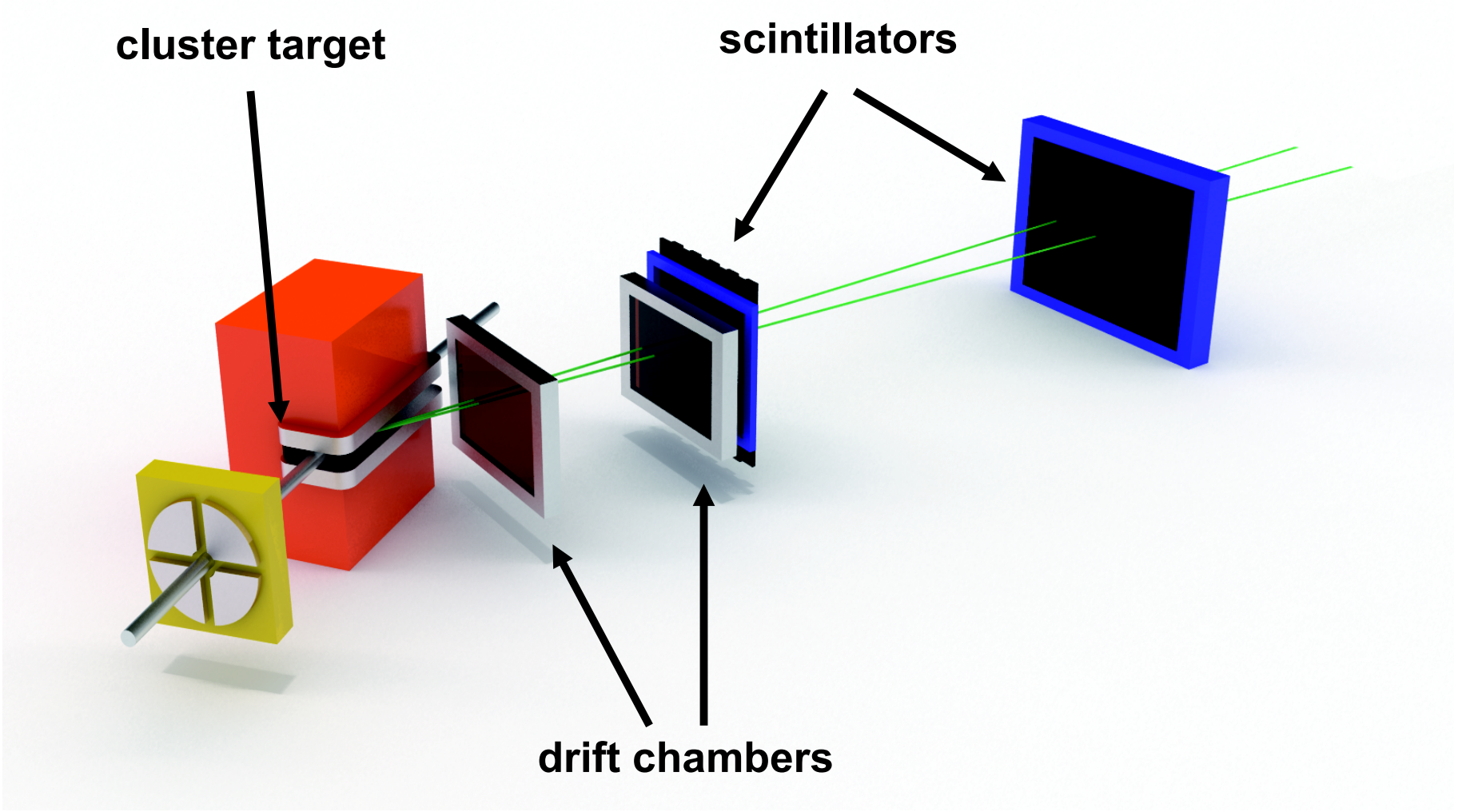
- η' production cross-sections

- pp FSI

- Nη' interaction

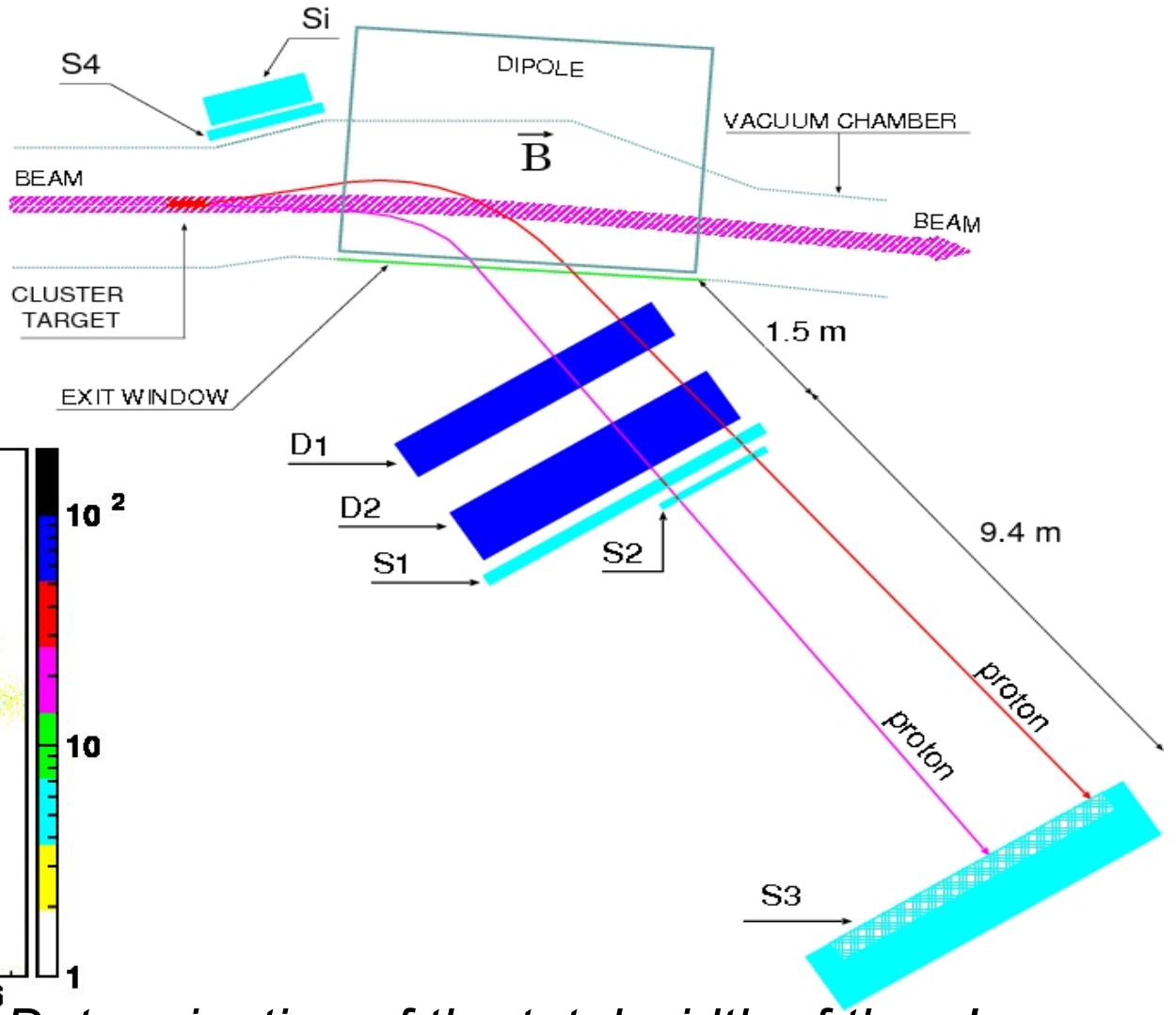
- η' mesic nuclei

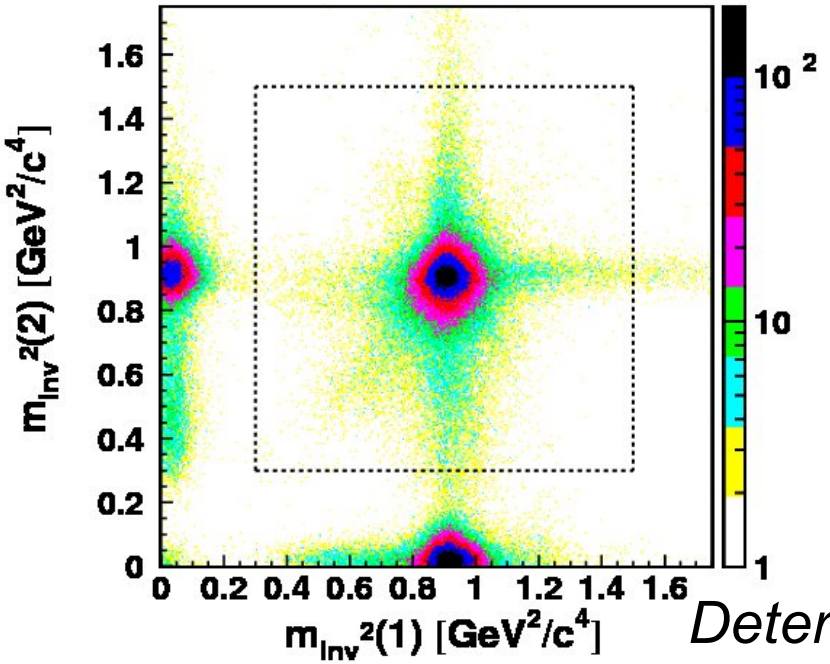
COSY-11 setup



Principle of measurement

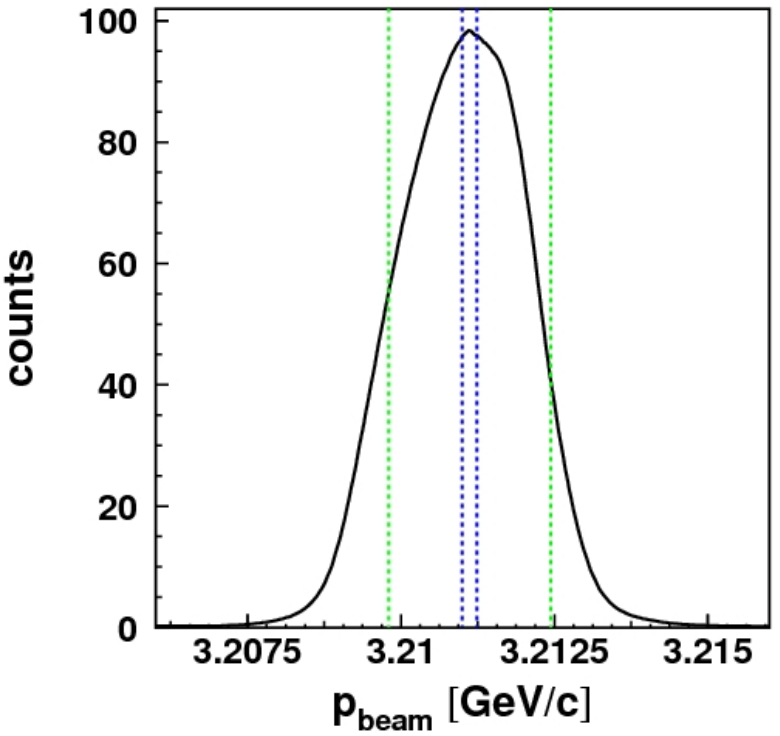
$p\,p \rightarrow p\,p\,\eta'$

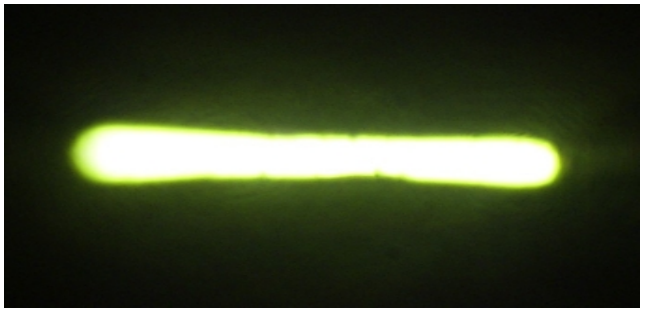




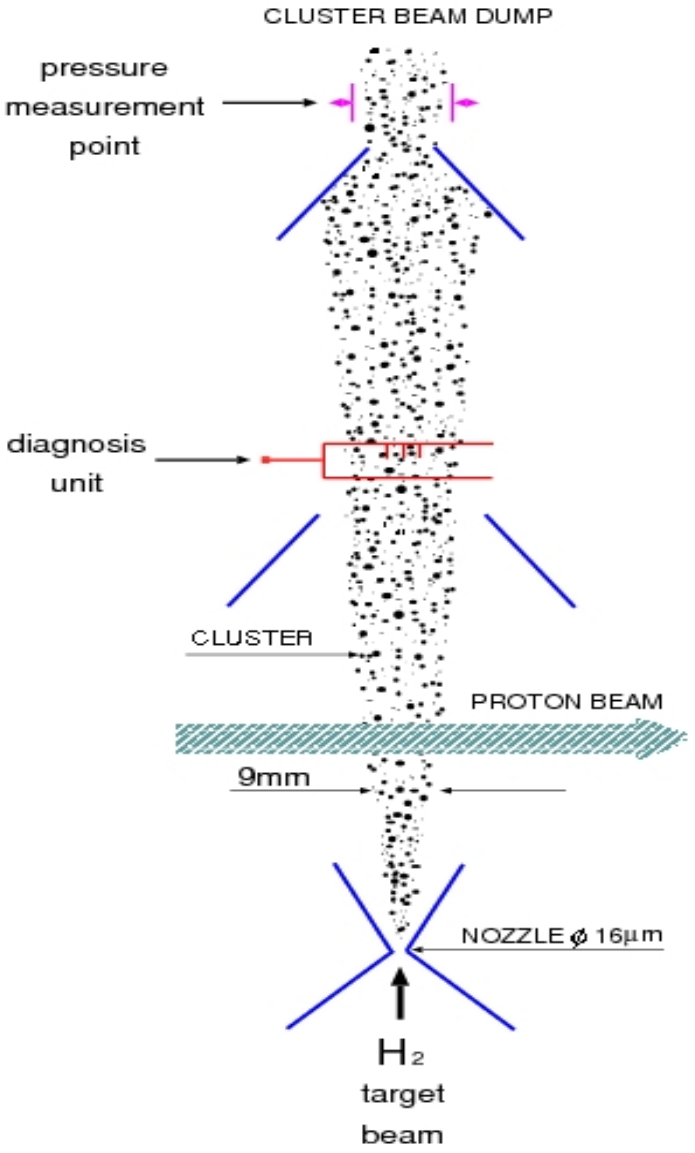
Determination of the total width of the η' meson
COSY-11 : Phys.Rev.Lett. 105 (2010) 122001

Detector system upgrade

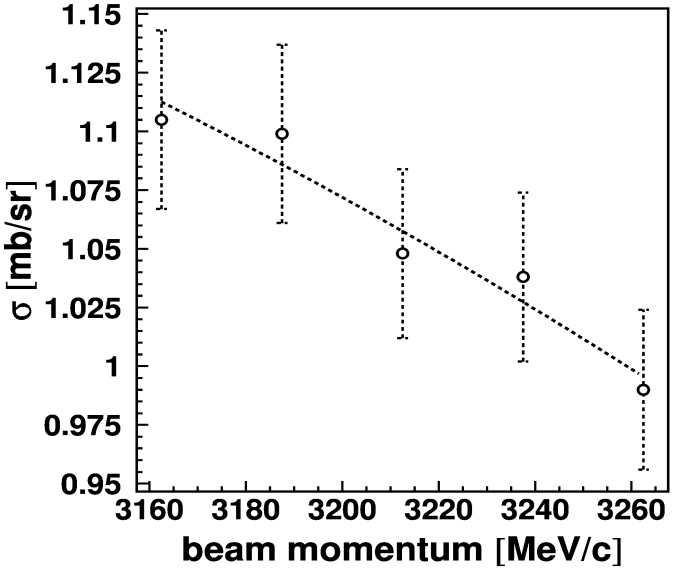




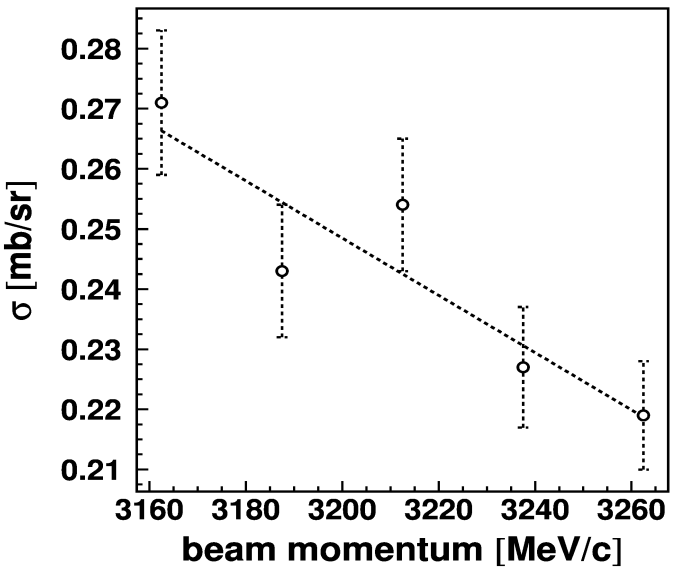
Detector system upgrade



Luminosity determination



angle CM 41deg



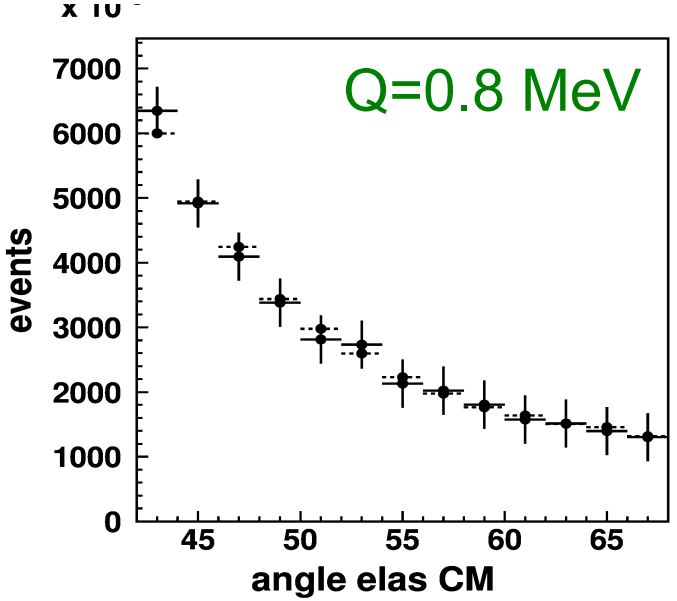
angle CM 59deg

points
EDDA data
pp→pp

line
2nd order
polynomial
fit

Comparison with differential cross-section
for elasticaly scattered pp from EDDA collaboration
Eur. Phys. J. A 22, 125 (2004)
Phys. Rev. Lett. 78, 1652 (1997)

Luminosity determination



EDDA
COSY-11

pp→pp

Comparison with differential cross-section
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Eur. Phys. J. A 22, 125 (2004)
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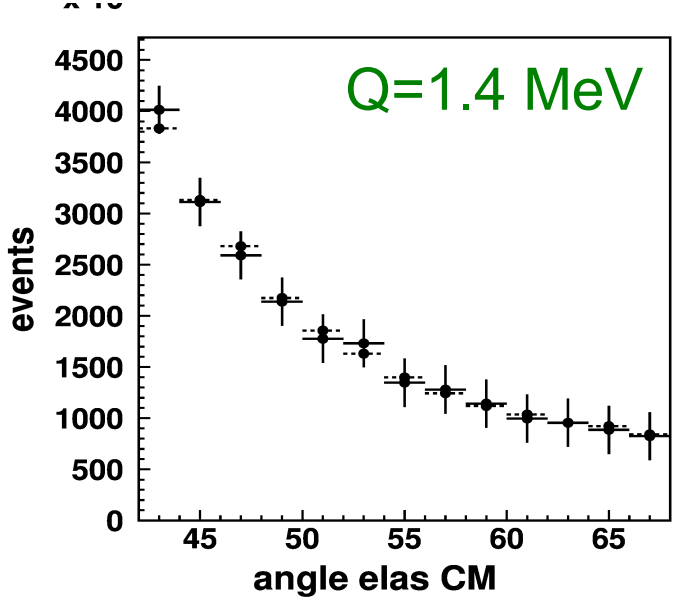
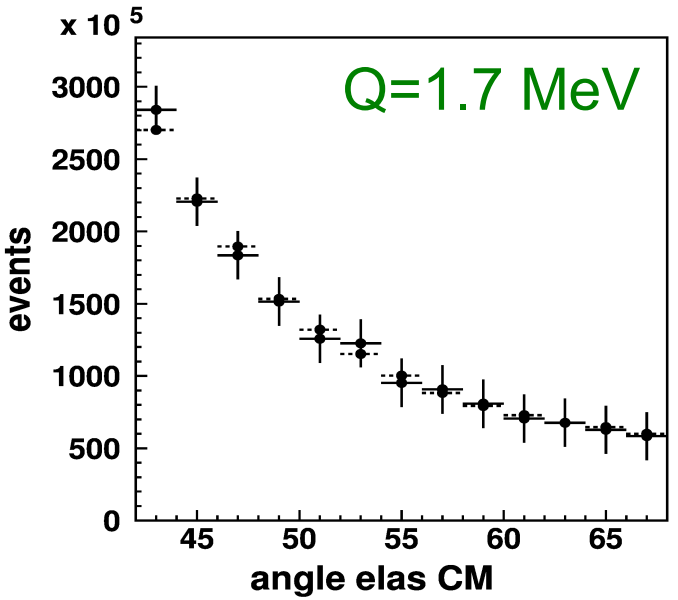
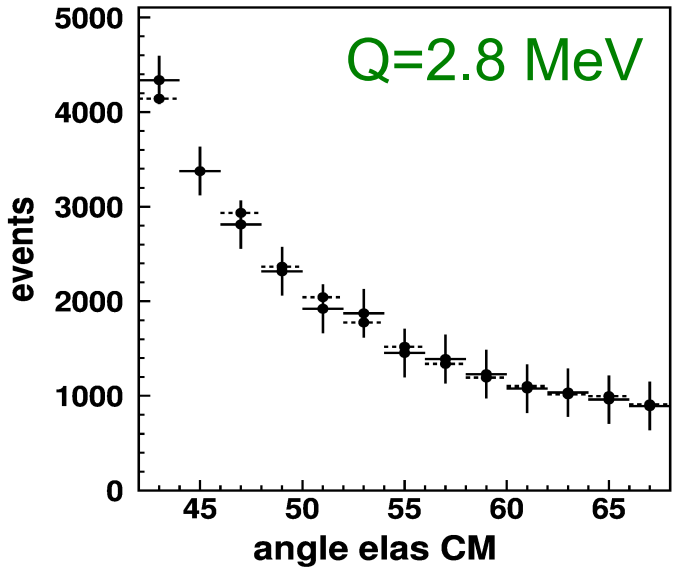
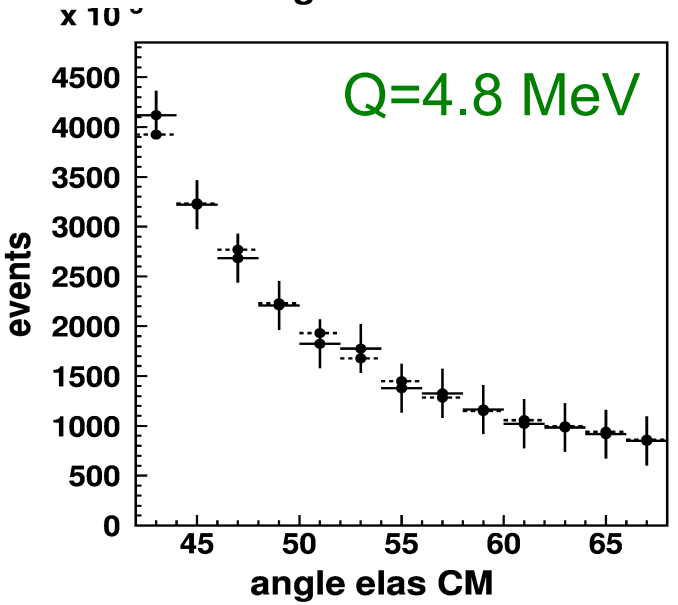
Luminosity determination









EDDA

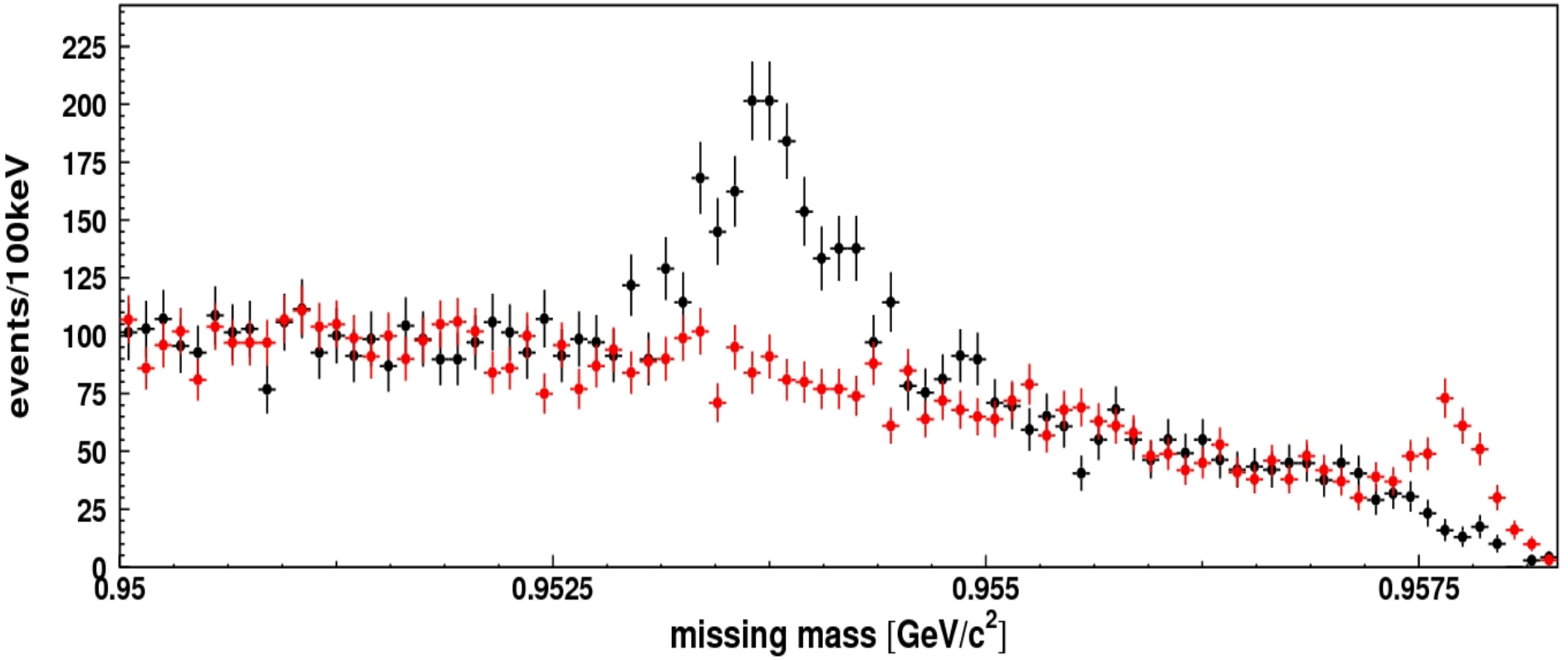
COSY-11

pp→pp

Background subtraction

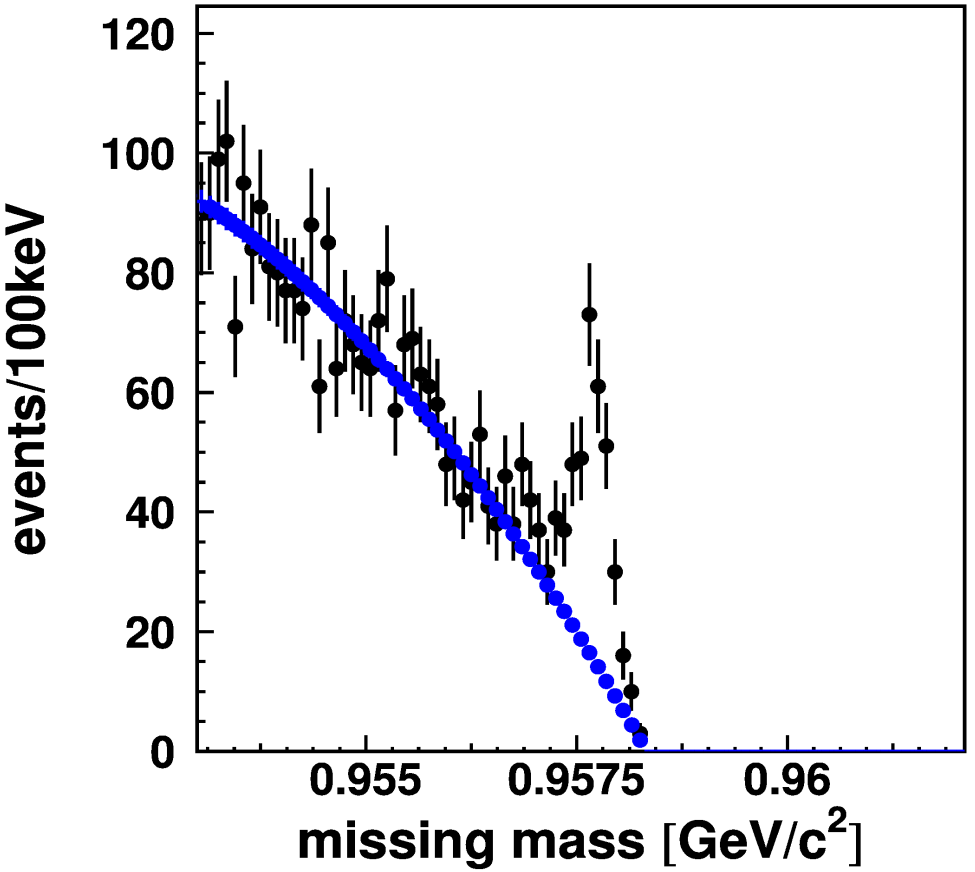
Q = 0.8 MeV data

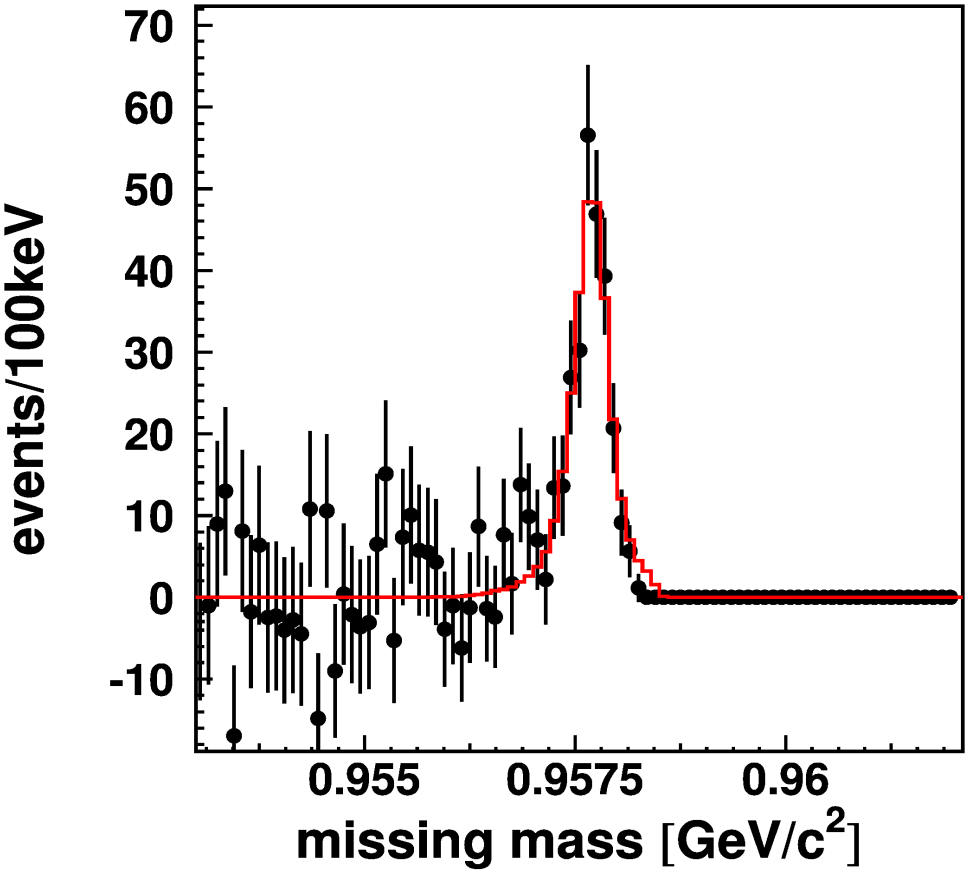
Q = 4.8 MeV data shifted and normalized to Q = 0.8 MeV data



η' counting

Q=0.8 MeV





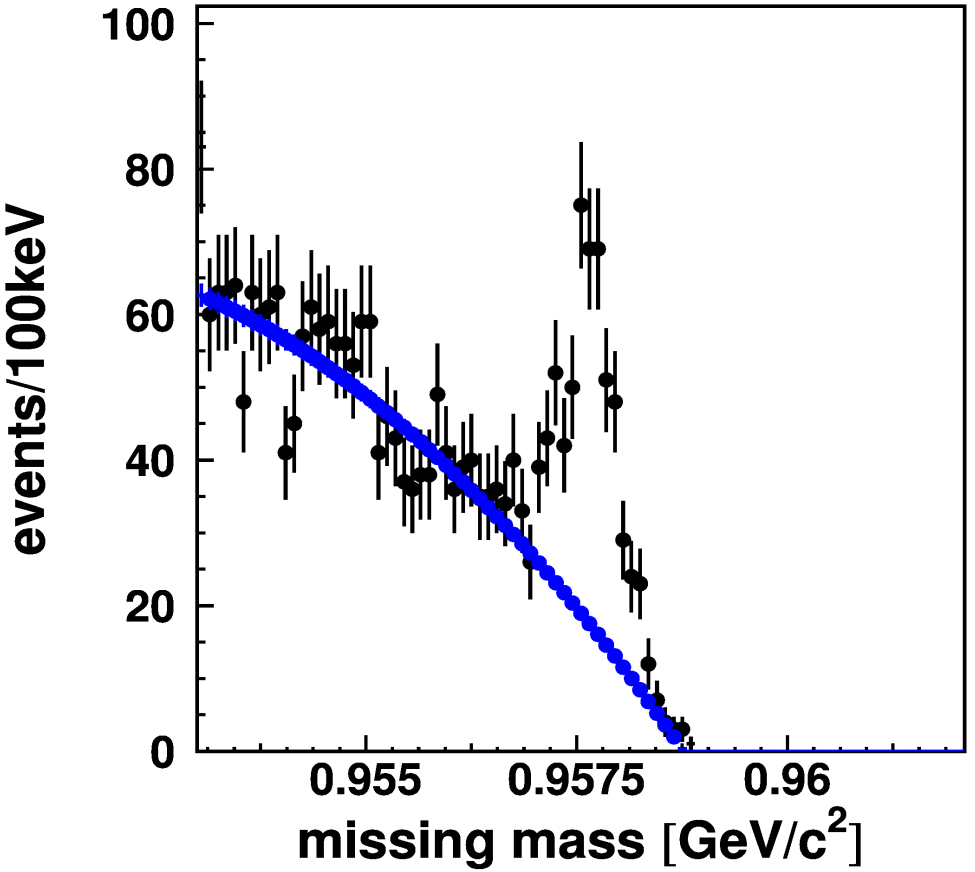
DATA

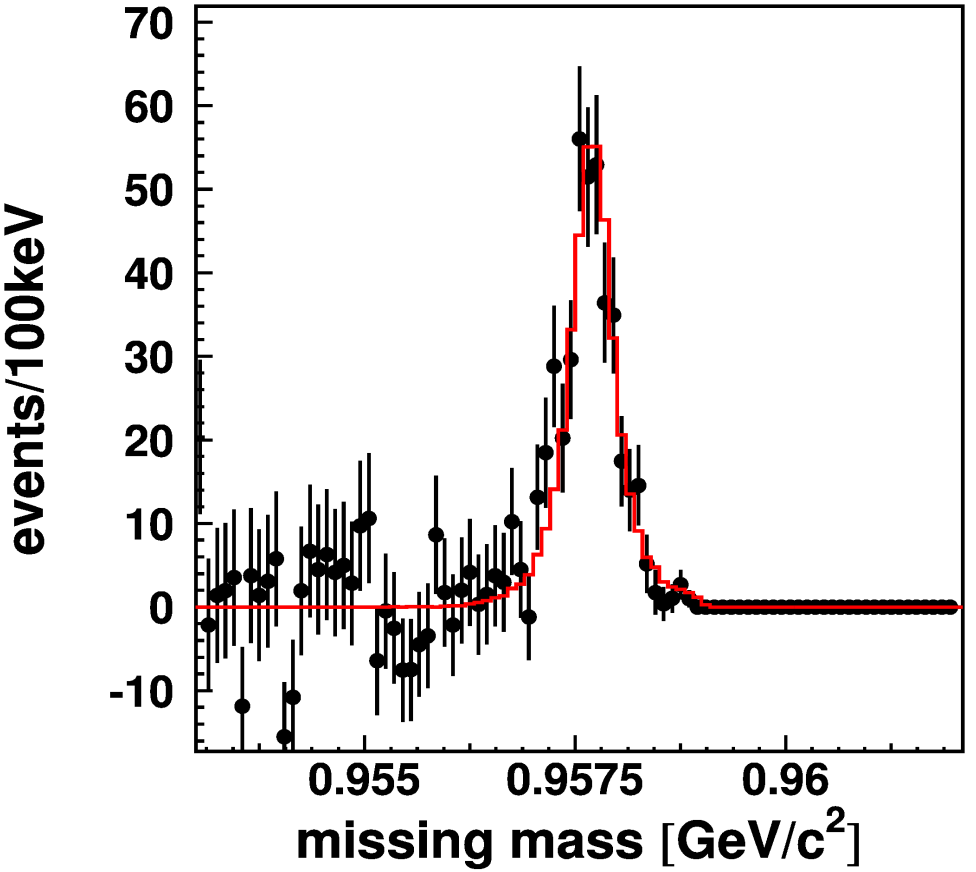
MC

shifted and normalized 2nd order polynomial fit to data for another Q

η' counting

Q=1.4 MeV





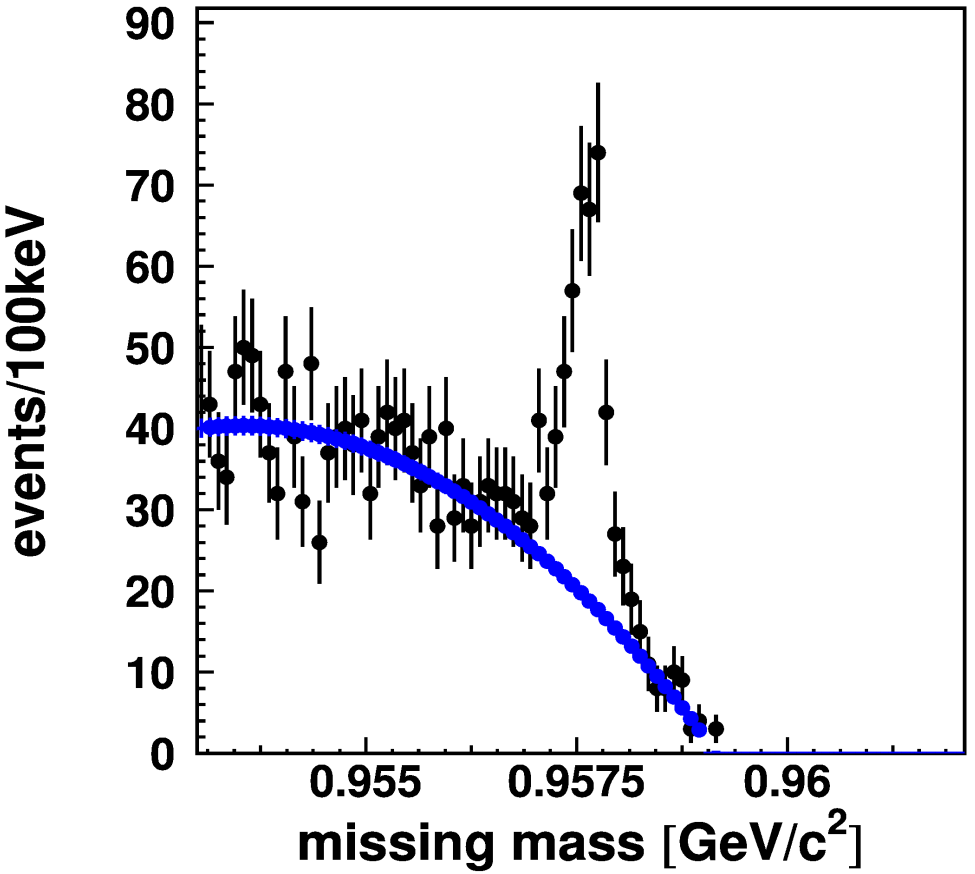
DATA

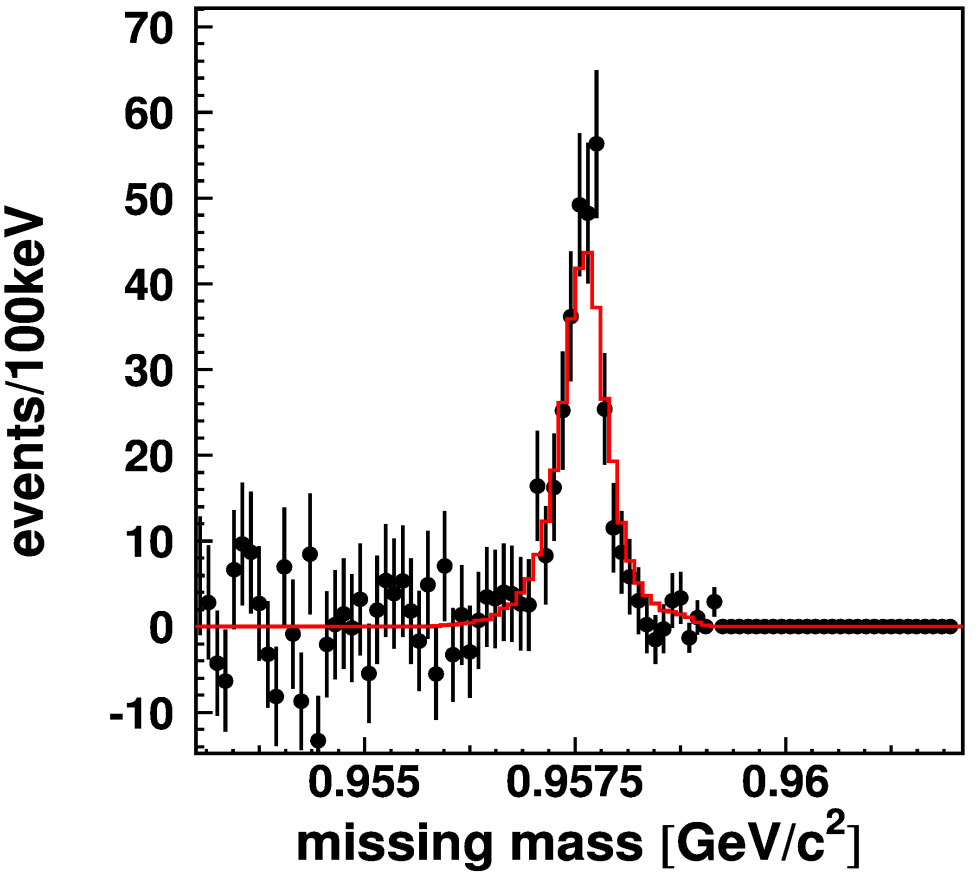
MC

shifted and normalized 2nd order polynomial fit to data for another Q

η' counting

Q=1.7 MeV





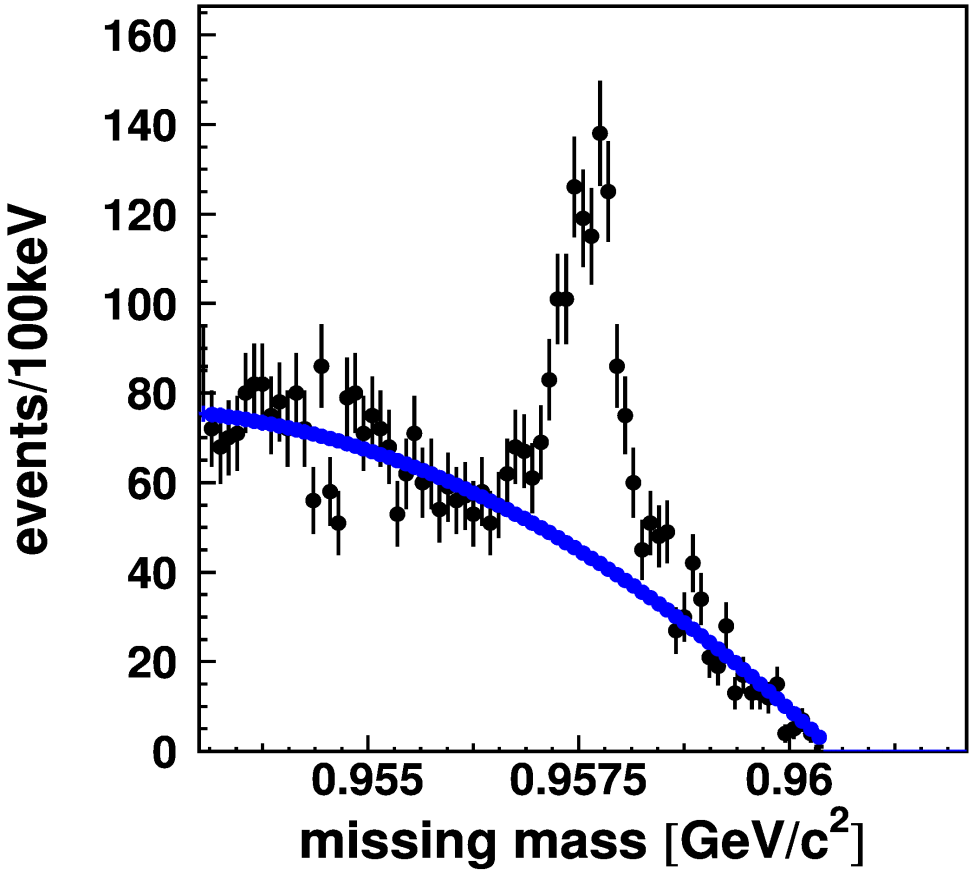
DATA

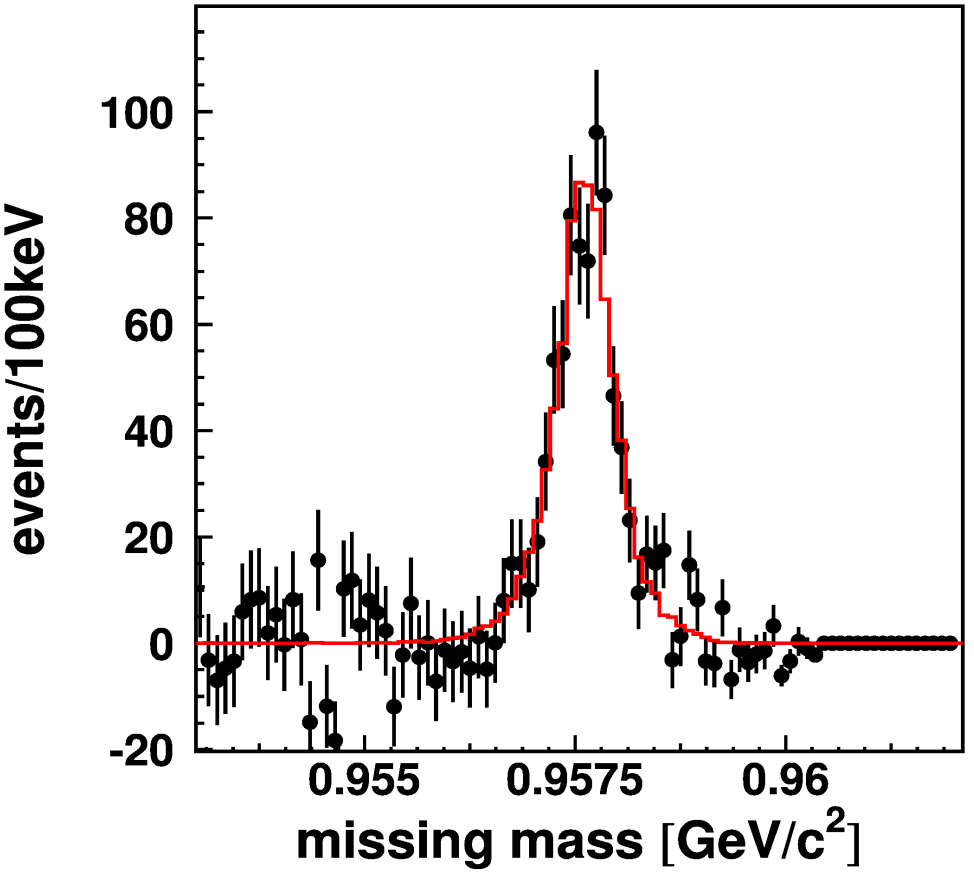
MC

shifted and normalized 2nd order polynomial fit to data for another Q

η' counting

Q=2.8 MeV





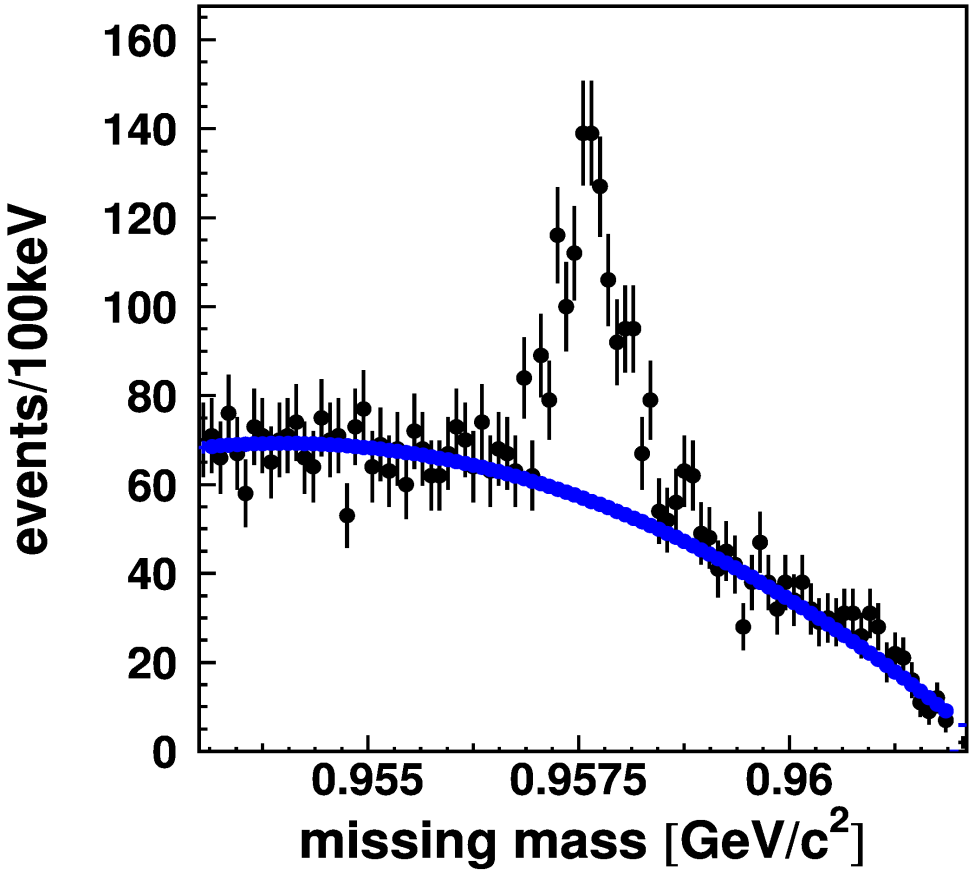
DATA

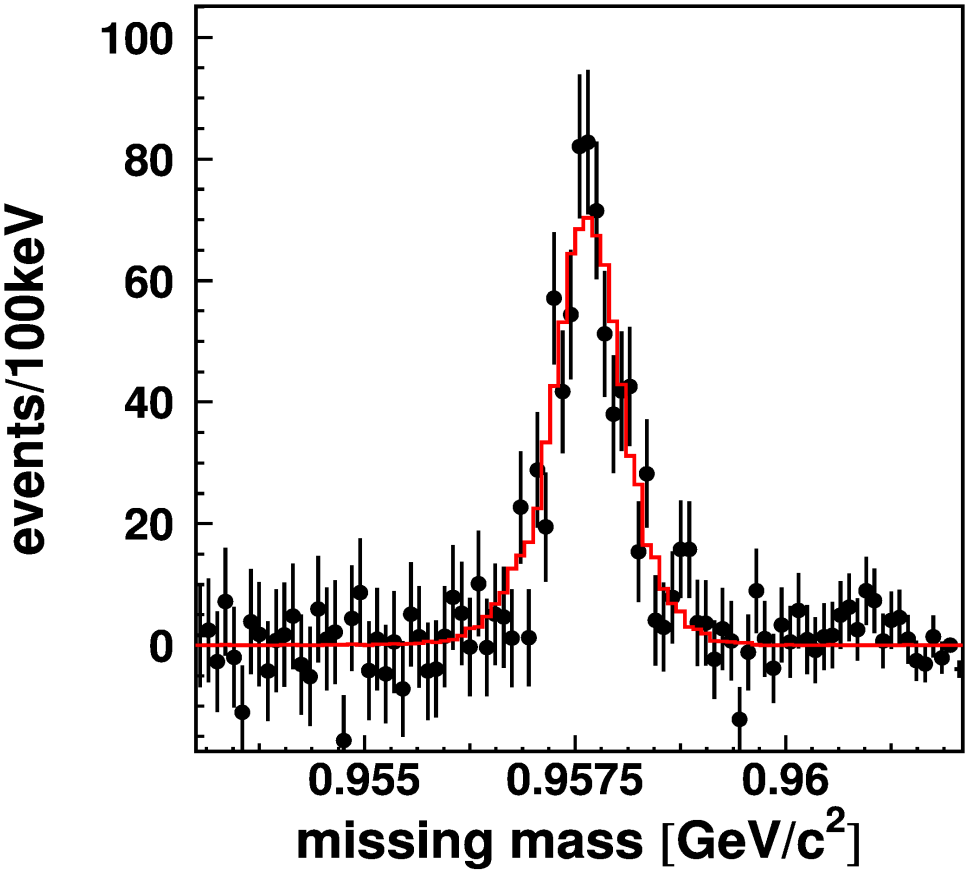
MC

shifted and normalized 2nd order polynomial fit to data for another Q

η' counting

Q=4.8 MeV



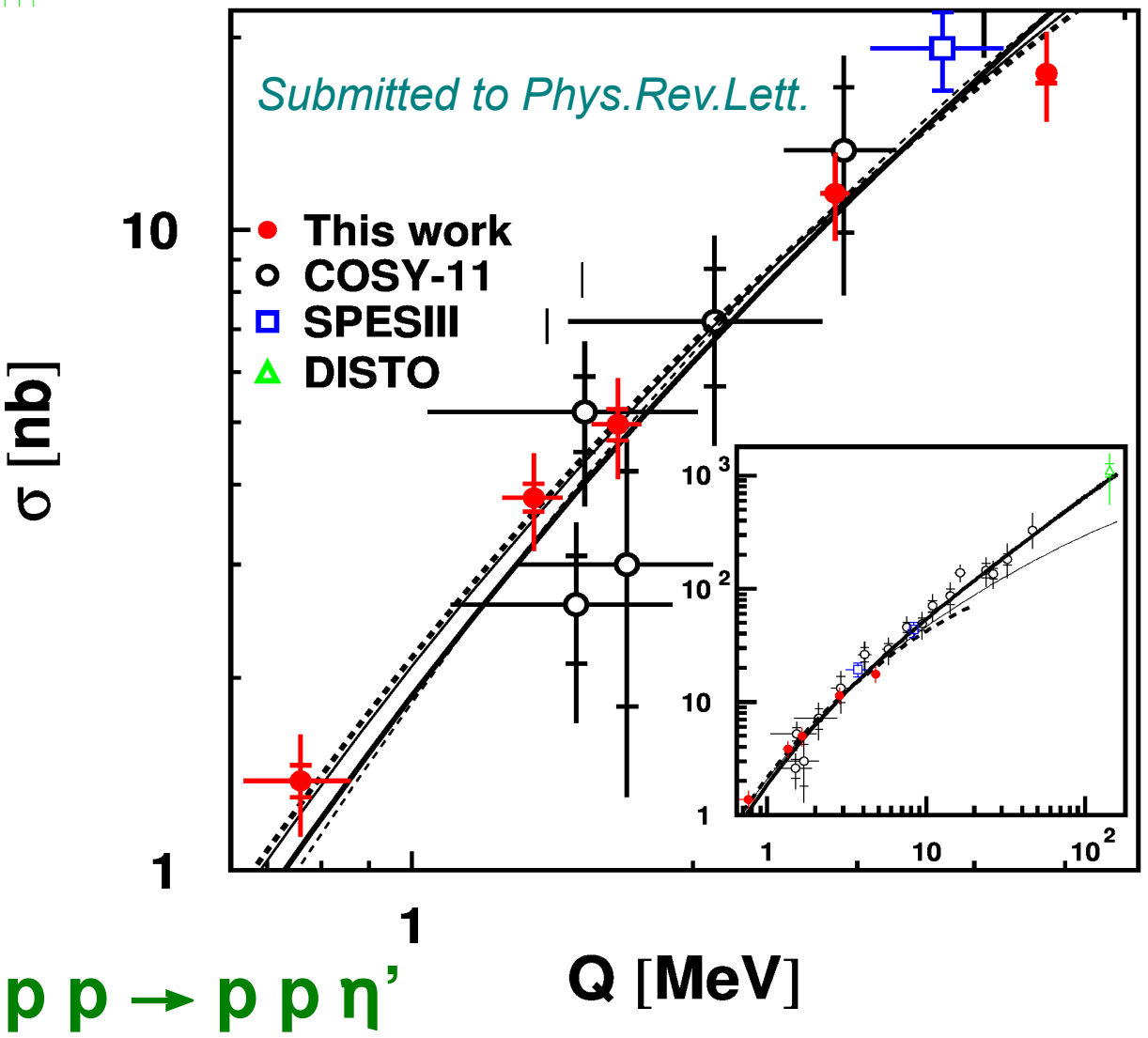


DATA

MC

shifted and normalized 2nd order polynomial fit to data for another Q

Result



p p → p p η'

DATA

COSY-11
Acta Phys. Polon. B 45, 739 (2014)
SPESIII
Phys. Lett. B 438 (1998) 41
DISTO
Phys. Lett. B 491 (2000) 29

THEORY
pp-FSI parametrized as:

inverse of the squared Jost function
Z. Phys. A 359, 205 (1997).

inverse of the squared Jost function, full Q range
Z. Phys. A 359, 205 (1997).

Niskanen-Goldberger-Watson model
Phys. Lett. B 426, 1 (1998).

as in Ref. Phys. Rev. C 4, 995 (1971), Annu. Rev. Nucl. Part. Sci. 22, 465 (1972), Nucl. Phys. A 278, 506 (1977).

Summary

$Q\ [MeV]$	$\sigma(pp \to pp\eta')\ [nb]$
0.76 ± 0.10	$1.38 \pm 0.08 \pm 0.17$
1.35 ± 0.10	$3.82 \pm 0.19 \pm 0.47$
1.66 ± 0.10	$4.97 \pm 0.28 \pm 0.61$
2.84 ± 0.10	$11.41 \pm 0.40 \pm 1.39$
4.78 ± 0.10	$17.58 \pm 0.64 \pm 2.15$

$$\mathrm{Re}(a_{p\eta'}) = 0.00 \pm 0.43_{stat}\ \mathrm{fm}$$ (syst. err. negligible)

$$\mathrm{Im}(a_{p\eta'}) = 0.37\ ^{+0.02_{stat}\ +0.38_{sys}}_{-0.11_{stat}\ -0.05_{sys}}\ \mathrm{fm}$$

Thank you

Danke

Grazie

Merci

Dziękuję

ありがとう