Production of η mesons at the Cosy-11 Installation

Cosy-11 collaboration

Measurement of the $pp \to pp\eta$ reaction was performed at beam momenta of 1.993 GeV/c and 1.981 GeV/c (i.e.: 11 MeV/c above and 2 MeV/c below the threshold). The details of the Cosy-11 experimental setup are described in [1] . Only events with two reconstructed tracks were analyzed. The following conditions were required for each of the track:

• it have to cross the start and stop scintillators in the area determined by means of the Monte-Carlo simulation (plus reserve of 50%).

• an invariant mass of detected particle $m^2 = P^2(1/\beta^2 - 1)$ have to be the proton mass, where the momentum P was determined from deflection in the magnetic field, while its velocity β from time of flight.

Spectra of the missing mass (squared) for the beam momenta of 1.993 and 1.981 GeV/c are shown in the fig 1a,b. The mean value of the η peak is 548 MeV compared to the η mass of 547.45 MeV and the width is about 2 MeV FWHM.

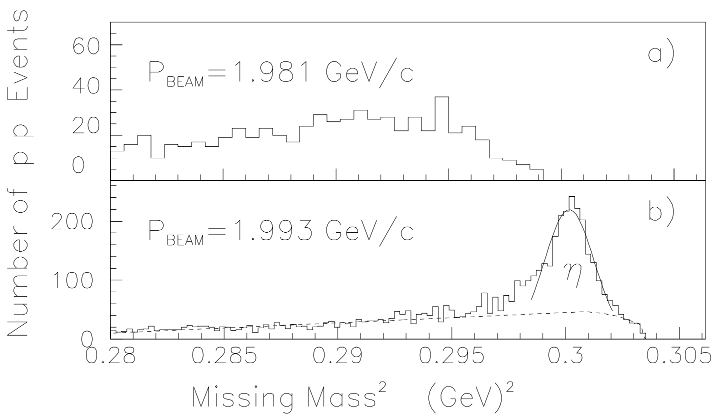

Figure 1: Spectra of the missing mass (squared) for beam momentum of 1.993 (a) and 1.981 GeV/c (b).

In order to evaluate an absolute value of the cross section the acceptance and the luminosity has to be calculated. The acceptance was determined by means of Monte-Carlo simulation. The integrated luminosity was calculated from normalization of simultaneously measured p-p elastic scattering to existing data [2].

Obtained value of the cross section for $pp \to pp\eta$ reaction (fig. 2) is equal to 0.77 μb with following errors: statistical of 3%, luminosity of 6%, background subtraction of 17% and acceptance determination of 10%. The results agree well with existing measurements from other groups.

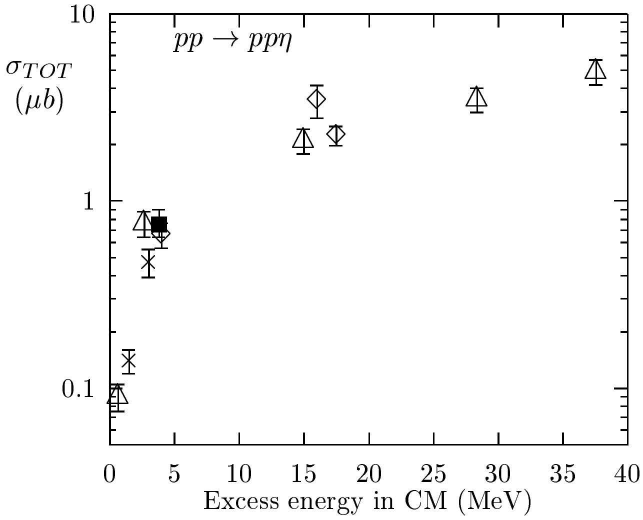

Figure 2: Cross section for $pp \to pp\eta$ reaction. The Cosy-11 point ($\square$), is consistent with results of Calén ($\triangle$) [3], Chiavassa ($\times$) [4] and Bergdolt ($\diamond$) [5].

References

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[5] A.M. Bergdolt et.al., Phys. Rev. D48 (1993) R2969.