Studies on the production mechanism and structure of the η meson are part of the scientific program of the COSY-11 team. For this purpose the analysing power for the $\vec{p}p \to pp\eta$ reaction at different excess energies has been measured. For more detailed argumentation of this choice of the observable the reader is referred to [1, 2] or to the original theoretical papers [3, 4]. Feasibility studies from a first measurement of the analysing power of the $\vec{p}p \to pp\eta$ reaction were reported in [5]. Data gathered at the excess energy of Q = 40 MeV yielded rather small values of the analysing power, indicating pure *s*-wave production of the η meson, however they are afflicted with relatively large uncertainties. The origin of such large uncertainties lies mainly in the low polarisation level (about 50%) of the proton beam used at the time of the first measurement (January 2001). With the development of the quality of polarised beams at the COSY accelerator, the analysing power measurements have been continued at Q = 10 and 37 MeV. Partial results of the data analysis for a measurement at Q = 10 MeV are reported herein.

The method of the determination of the analysing power at COSY-11 has been introduced in reference [6]. The observables required to derive the analysing power are: i) the proton beam polarisation, ii) relative luminosity of the spin up and down cycles, and iii) the number of $\vec{p}p \to pp\eta$ events registered during spin up and spin down cycles (which correspond to the scattering to the left or the right side with respect to the polarisation plane).

The polarisation of the beam has been measured by two independent polarimeters. One installed close to the COSY-11 target [7], the other being the internal COSY polarimeter [9, 10] positioned about 10 meters further along the beam line. Data taken in parallel using both detection systems have been analysed. The results of both systems are in line and indicate the significant increase of the spin averaged polarisation up to P = 0.729± 0.002 (statistical uncertainty) compared to the above mentioned polarisation level available in January 2001.

Elastically scattered events, recorded in parallel, have also been used for the relative luminosity determination. The centre-of-mass region of proton angles that were registered by the COSY-11 acceptance has been divided into nine subranges of 2 degrees each for which the relative luminosity has been calculated according to the formula:

$$L_{rel}(\theta) = \frac{N_{up}(\theta)}{N_{down}(\theta)} \frac{1 + A_y^{el}(\theta)P}{1 - A_y^{el}(\theta)P}, \qquad (1)$$

where $N_{up}(\theta)$ and $N_{down}(\theta)$ are the numbers of elastically scattered events for spin up and down cycles into the solid angle around the direction given by the θ polar angle, P is the polarisation degree averaged over the spin up and down cycles and $A_y^{el}(\theta)$ are the analysing powers for the elastic scattering which were measured by the EDDA collaboration [11]. The averaged value of the relative luminosity was found to be $L_{rel} = 1.003 \pm 0.003(\text{stat})$ indicating good stability of the luminosity in the neighbouring cycles with different spin orientation.

Figure 1 depicts the missing mass distribution as obtained during the May 2003 run. The number of η mesons in the clear peak which is visible over the wide multipionic background was estimated to be around 3000, however for the more refined evaluation a precise estimation of the multipion background is required. Till now the data were corrected for effects caused by the relative position shifts between the beam and the target applying the method described in reference [8]. Using the momentum distribution of the elastically scattered protons we determined also the dimension of the proton beam and its momentum spread, a factors necessary to perform reliable simulations of the studied $\vec{p}p \to pp\eta$ and the background reactions.

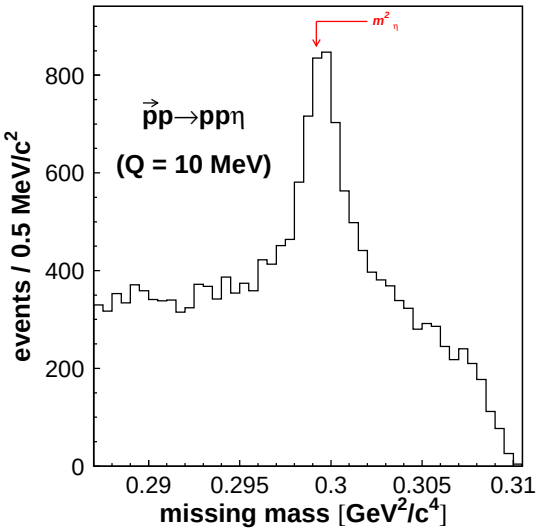

Fig. 1: Missing mass spectrum for the $\vec{p}p \to pp\eta$ reaction at the excess energy Q=10 MeV as measured by means of the COSY-11 setup.

At present the multi-dimensional acceptance corrections are being performed along with the simulations of the multipionic background events. The final results of the analysis should be available by summer 2005.

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