Measurements of the polarisation observables require the accurate monitoring of the polarisation degree. In the recent measurements of the analysing power at COSY-11 (reported in [1, 2, 3]) beam polarisation determination have been performed using the COSY-11 polarimeter. For this purpose the elastically scattered events have been registered in two mutually perpendicular planes: In the plane perpendicular to the polarization vector and in the plane comprising polarisation vector but perpendicular to the beam. COSY-11 is only an one-arm detection setup. In order to measure the asymmetry in the subsequent cycles of the COSY operation the proton spin has been flipped. Thus the asymmetry for the elastically scattered protons under a given polar angle Θ can be expressed as:

$$\varepsilon = \frac{N_L - N_R}{N_L + N_R}, \qquad (1)$$

where N_L and N_R refer to the number of elastically scattered protons which were registered at the angle Θ in the plane perpendicular to the polarisation vector, during the spin down and up cycles, respectively. The duration of a single cycle was 300 s, being significantly less than the time scale (10 hours) for a substantial changes of the density of the target. Anyhow, the small luminosity variation between the spin up and down cycles was taken into account by normalizing N_L and N_R from equation 1 to the number of elastic triggers in the vertical plane - N_0^{dn}(for spin down) and N_0^{up}(for spin up) - which were registered by an independent sub-detector system operating in parallel presented in figure 1 [5, 6, 7].

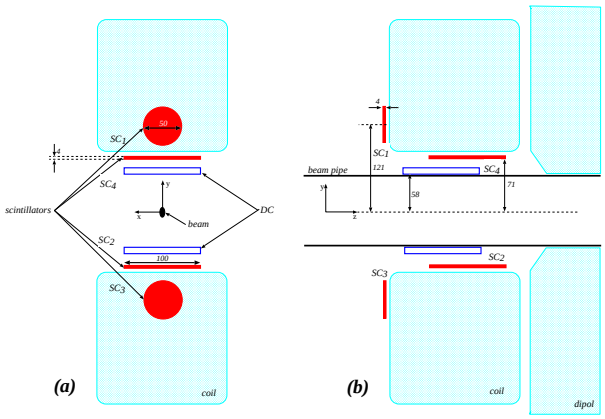

Fig. 1: Schematic view of the detection subsystem for registration of the elastically scattered events in the polarisation plane. (a) Front view. (b) Side view.

For N_0^{dn} and N_0^{up} determination the coincidences of the following scintillators was chosen[1]: $(SC_1 \wedge SC_2) \vee (SC_3 \wedge SC_4)$. The final formula[1] for the polarisation degree as a function of the proton scattering angle in the centre-of-mass system (θ) reads:

$$P(\theta) = \frac{1}{A_y^{el}(\theta)} \frac{N_R(\theta)/N_0^{up} - N_L(\theta)/N_0^{dn}}{N_R(\theta)/N_0^{up} + N_L(\theta)/N_0^{dn}}. \qquad (2)$$

For the calculations the three ranges of the centre-of-mass angle has been chosen, spanned from $\theta_{min} = 37\,^\circ$ to $\theta_{max} = 49\,^\circ$. Analysing powers for the proton-proton elastic scattering (A_y^{el}) were taken from reference [8]. The results of the polarisation determination are presented by full black circles in figure 2.

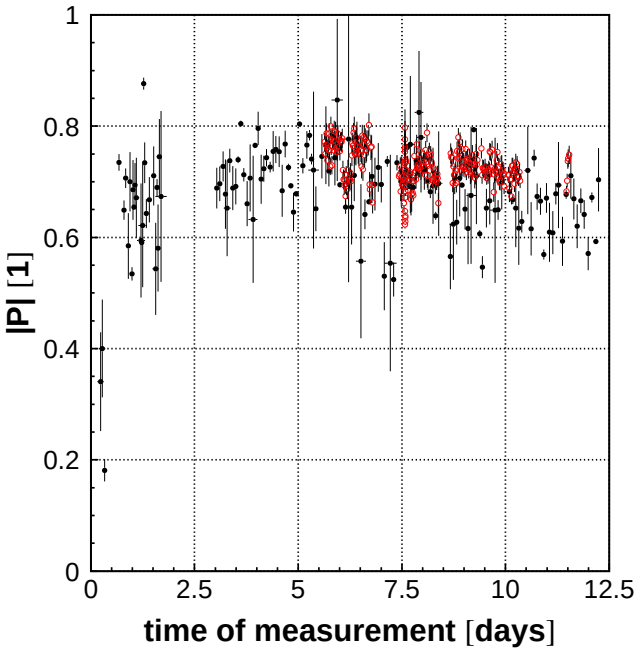

Fig. 2: Polarisation degree versus the time of the measurement as obtained during the COSY-11 April 2003 run.

Since in the former experiments we have also used the alternative methods for monitoring of the polarisation level which were based on the measurements with the EDDA polarimeter [9] or with the Hamburger polarimeter [10, 11], the comparison of the COSY-11 data with the polarisation values obtained by means of the latter method was possible and is presented in figure 2. In that figure, data of [11] are presented as open red circles. Both COSY-11 – and the Hamburger polarimeter results are in good agreement. The average polarisation value was extracted to be P = 0.729± 0.002 (statistical uncertainty).

More details of the determination of the absolute value of polarisation has been presented in [7]. The important feature is that one is able to monitor the absolute values of polarisation for both spin ”up” and ”down” orientations, which is desirable for decreasing the systematical error in the analysing power calculation.

[1] For a detailed discussion reader is referred to [7].

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