Λ-production at $\approx$ 80 MeV above Threshold at COSY-11

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Inspired by the successfully performed measurements of the Λ-hyperon production close to threshold [1–3], COSY-11 has extended its program to Σ^0-production [4] and observed an unexpected large cross section ratio.

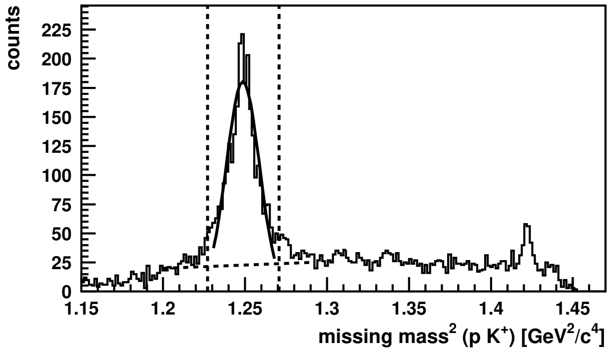

Fig. 1: Missing mass spectrum at an excess energy of 12.9 MeV above the Σ^0 threshold. Production of the Λ- and the Σ^0-hyperon is visible above a continuous background.

Simultaneously to the near–threshold Σ^0-production, Λ-production at excess energies of about 80 MeV was detected. Though the acceptance at 80 MeV is only in the order of 10^{-4}, a large amount of Λ-events could be identified as shown in Fig. 1. A detailed discussion of the consequences of the low acceptance is given in [5].

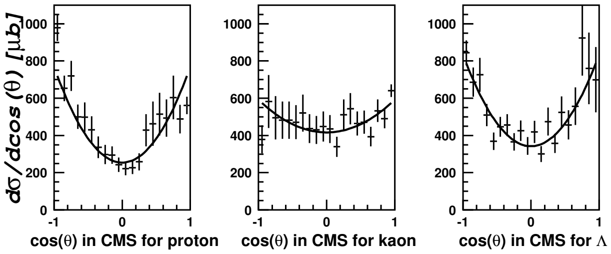

Fig. 2: Angular distributions of the Λ-events of Fig. 1.

Acceptance corrected angular distributions of Λ-production events are shown in Fig. 2. Legendre-polynominal fits to these distributions have been performed. The determined a_2/a_0-ratio is shown in Fig. 3. The angular distributions can be integrated to calculate the total cross sections. The extracted values are shown in Fig. 4 together with data observed close to threshold at COSY-11 and at excess energies of 55 MeV and 138 MeV at the COSY-TOF experiment [6]. Due to the low acceptance systematical errors might occur, but the observed cross sections are qualitatively in good agreement with COSY-TOF data.

COSY-11 will extend these measurements of Σ^0- and Λ-production to higher excess energies in order to extract the energy dependence of the cross section ratio for both reaction channels and to observe the transition from a Λ/Σ^0-ratio of about 28 at threshold to about 2-3 at excess energies ≥ 300 MeV.

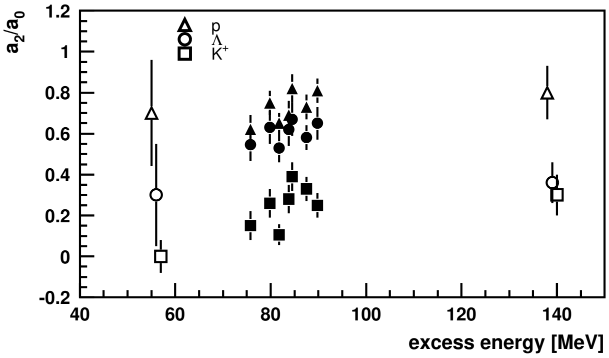

Fig. 3: Values of the a_2/a_0-ratio determined by Legendre-polynominal fits to the angular distributions from Fig. 2 are plotted as filled symbols. The open symbols correspond to COSY-TOF data.

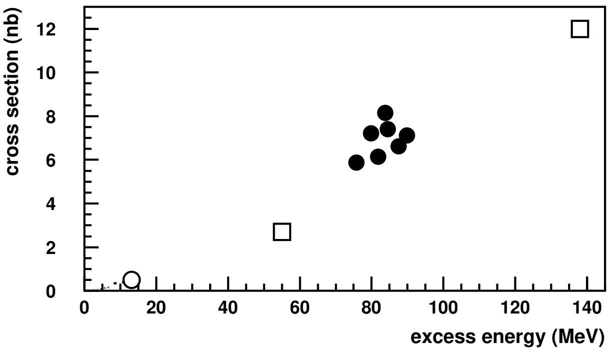

Fig. 4: Total cross sections of the reaction $pp \longrightarrow pK^+\Lambda$. Data measured at COSY-11 are shown as circles, values obtained at COSY-TOF [6] are plotted as squares.

References:

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