Proton-Proton Elastic Scattering Excitation Functions at Intermediate Energies

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The EDDA experiment at the Cooler Synchrotron COSY at Jülich is dedicated to a precision measurement of proton-proton elastic scattering observables in the beam energy range 0.5 – 2.5 GeV. Excitation functions are acquired with an internal target during beam acceleration.

The EDDA experiment has been designed to provide a consistent and precise data set of $\vec{p}+\vec{p}$ observables in the COSY energy range. Apart from contributing to the input for a global phase shift analysis, the experiment will be sensitive to the (non-)existence of dibaryonic states coupling to the elastic channel.

The detector consists of a *large acceptance* (85% of 4π), segmented scintillator hodoscope detecting both final state protons in coincidence. An angular resolution of better than $1.5°$ in the center-of-mass has been obtained.

It is used in conjunction with an *internal* target to acquire excitation functions in small energy steps and over a wide angular range by repeated measurements *during beam acceleration*.

EDDA has just completed the measurement of the unpolarized differential cross-section using a thin CH_2 fiber target. Background from reactions on carbon (mainly quasi-elastic scattering) has been measured with a pure carbon target and subtracted statistically. Relative normalization is accomplished by a concurrent measurement of the δ-electron and secondary electron emission yields from the target. The absolute luminosity is fixed by normalizing to existing data at lower energies[2]. Shifts in the COSY beam position, width and angle during acceleration have been deduced. They are small and are taken into account in the data analysis.

An example of an excitation function at $\theta_{\mathrm{c.m.}} = 41°$ is shown in Fig. 1. Statistical error-bars are about the size of the symbols, systematic errors are still under study.

Currently, preparations for measurements of the spin observables A, A_{NN}, A_{SS}, and A_{LS} with a polarized COSY beam and a polarized atomic beam target are under way.

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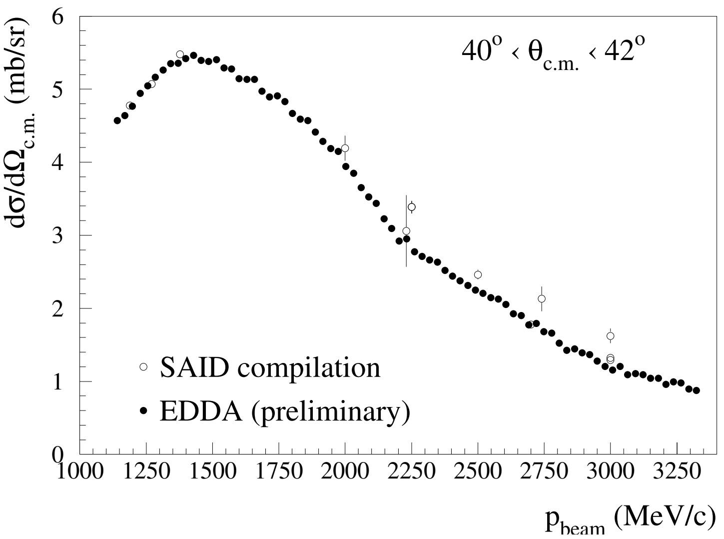

Figure 1: Differential cross section vs. proton beam momentum at $\theta_{c.m.}$=41$^o \pm 1^o$ measured by EDDA (solid symbols, preliminary). The previous world data set (open symbols) has been taken from the SAID [3] database.

References

1. D. Albers[b], J. Bisplinghoff[a], R. Bollmann[b], K. Büßer[b], P. Cloth[c], R. Daniel[a], O. Diehl[a], F. Dohrmann[b], V. Drüke[c], H. P. Engelhardt[a], J. Ernst[a], P. D. Eversheim[a], D. Filges[c], M. Gasthuber[b], R. Gebel[a], J. Greiff[b], A. Groß[b], R. Groß-Hardt[a], S. Heider[a], A. Heine[a], F. Hinterberger[a], M. Igelbrink[b], R. Jahn[a], M. Jeske[a], I. Koch[b], R. Langkau[b], J. Lindlein[b], R. Maier[c], R. Maschuw[a], T. Mayer-Kuckuk[a], G. Mertler[a], B. Metsch[d], F. Mosel[a], M. Müller[b], M. Münstermann[b], H. Paetz gen. Schieck[e], H. R. Petry[d], D. Prasuhn[c], H. Rohdjeß[a], D. Rosendaal[a], U. Roß[a], P. von Rossen[c], H. Scheid[a], N. Schirm[b], M. Schulz-Rojahn[a], F. Schwandt[a], V. Schwarz[a], W. Scobel[b], B. Steeg[b], S. Steinbeck[b], G. Sterzenbach[c], S. Thomas[a], H. J. Trelle[a], A. Wellinghausen[b], W. Wiedmann[a], K. Woller[b], R. Ziegler[a]
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2. A. J. Simon et al. *Phys. Rev.* **C48** (1993) 662 and **C53** (1996) 30.
3. R. A. Arndt *Phys. Rev.* **D45** (1992) 3995 and interactive program SAID