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Measurement of the Spin Correlation Parameter $A_{ookk}(pp \to pp)$ between 0.72 and 1.1 GeV

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The aim of this experiment was to measure the spin correlation parameter A_{ookk} in the energy range of possible dibaryonic resonances and to contribute to extending the pp amplitude analysis above 1 GeV. This measurement with longitudinal beam and target polarizations is a first part of a complete sets of experiments to determine the pp scattering amplitudes in the energy range up to 3 GeV.

The polarized beam of SATURNE II was extracted in the "Nucleon-Nucleon" beam line onto the Saclay frozen spin target. This facility allows measurements with three orthogonal directions of both beam and target polarization. The spin correlation parameter $A_{ookk}(pp)$ was measured at 0.719, 0.834, 0.874, 0.934, 0.995 an 1.095 GeV kinetic energy in the angular range of 45° to 90° CM.

In order to obtain a longitudinally polarized beam with the same position and direction at the polarized target at all energies, we use a movable magnet system described in ref.[1]. The beam polarization was flipped every burst and all measurements were done with two opposite directions of the target polarization. In addition we have measured the parameter A_{oosk} (pp) with transversally polarized beam incident on the same target. During the A_{ookk} measurements, the beam polarization at the polarized target presented small residual components in the vertical ($\vec{n}$) and transverse ($\vec{s}$) directions. These components were continuously measured with a special polarimeter[2]. The effect of the residual $\vec{n}$ component is large but can be eliminated in the results using the known value of the A_{oono}. For the residual $\vec{s}$ component this was not possible since A_{oosk}, although is known to be small, is not known with sufficient precision.The results of our measurements, shown in Figs 1a-f , are the linear combinations $(A_{ookk} + \delta A_{oosk})$ where the coefficients $|\delta|$ are also small, varying from 0.034 to 0.138,depending on the energy.

Above 0.9 GeV the angular distributions show that A_{ookk} is decreasing when approaching 90° CM [3] with evidence for structure in the angular distribution especially at 0.934 GeV.

The Fig.1 shows also the results for A_{ookk} from Argonne [4,5] and the predictions of the phase shift analyses [6,7].

Our additional measurement at 0.874 GeV with transverse beam polarization yields the parameter A_{oosk} (Fig. 2). We find in fact that the values of A_{oosk} are comprises between +0.1 and -0.1. Our results at $\theta_{CM} \geqq 50°$ connect smoothly to the Argonne data [5] at smaller angles. The curve in Fig.2 shows the PSA prediction [7].

The present data for $(A_{ookk} + \delta A_{oosk})$ at six energies and for A_{oosk} at one energy will be used to extend the phase shift analysis up to 1.1 GeV. They increase considerably the data base of pp elastic scattering data between 0.7 and 1.1 GeV. The main new features are the structures in the angular dependence at higher energies and the energy dependence at fixed angle, in particular at $\theta_{CM} = 90°$.

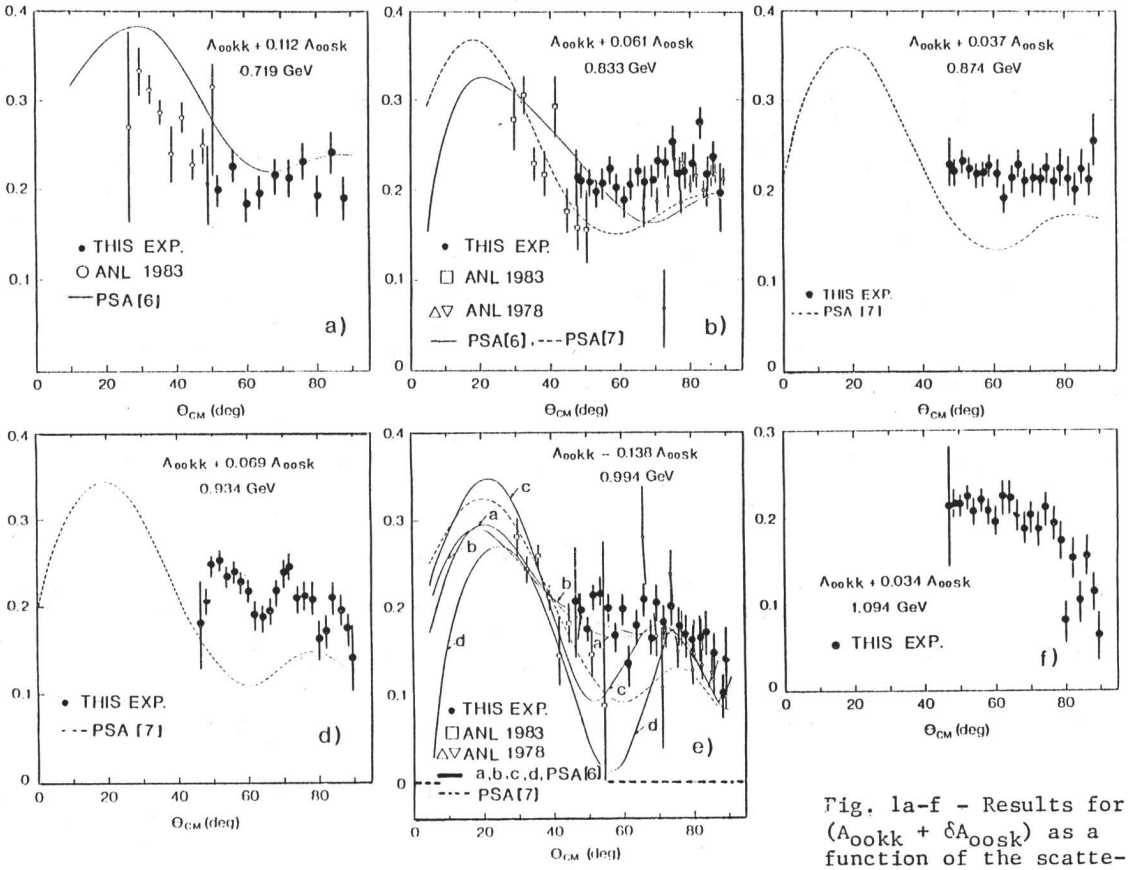

Fig. 1a-f - Results for (A_{ookk} + δA_{oosk}) as a function of the scattering angle at six energies. Argonne data and PSA predictions are results for A_{ookk} .

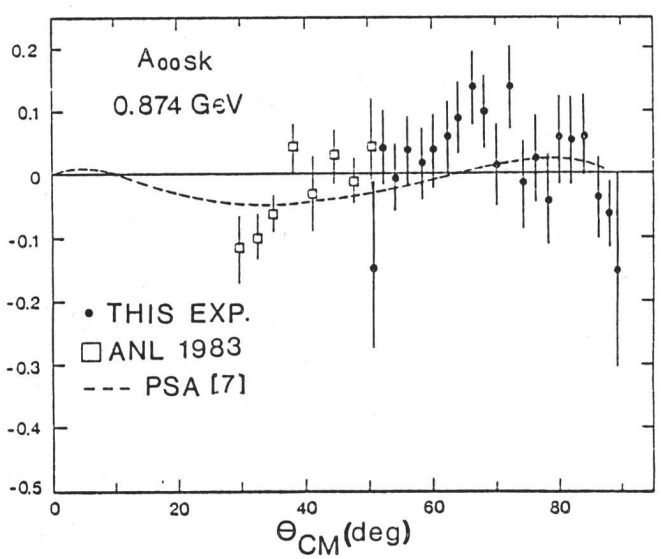

Fig. 2 - The full dots are the results for A_{oosk} assuming the values for A_{oono} from ref. [6]. The open circles show the results from ref. [4] .

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