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BACKWARD  $K^-p$  ELASTIC SCATTERING AND  $0^\circ \Sigma^- \pi^+$  PRODUCTION

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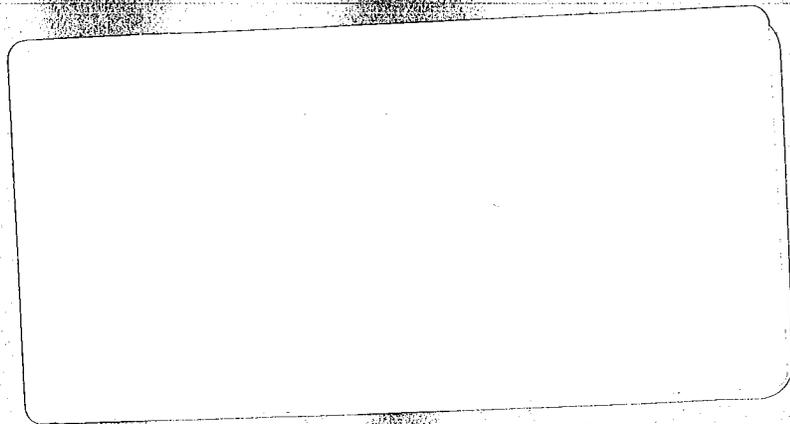
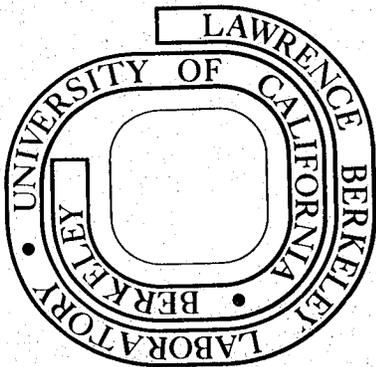
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ABSTRACT

A high precision measurement of the momentum dependence of backward  $K^-p$  elastic scattering from 476 to 1077 MeV/c incident momentum has been performed at the Brookhaven National Laboratory Alternating Gradient Synchrotron. With the same apparatus we have also measured the  $0^\circ$  production of pions in the reaction  $K^-p \rightarrow \Sigma^- \pi^+$ .

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## INTRODUCTION

The forward and backward angular distributions decomposed into partial waves are particularly simple since the Legendre polynomials are either  $\pm 1$ , and the spin-flip amplitude is absent. The forward elastic cross section is well determined through the total cross section using the optical theorem and dispersion relations.<sup>(1)</sup> The backward elastic cross section has been found by bubble chamber experiments<sup>(2)</sup> to quite small, generally an order of magnitude smaller than the forward cross section. This is easily understood; the many absorption channels present make the amplitudes largely imaginary so that even and odd parity states cancel in their contributions to backward scattering. For this reason a small resonant amplitude will be expected to reveal itself most prominently in the backward direction. If a resonance has too small an elasticity to be seen in the elastic channel, but has a large branching fraction into  $\Sigma\pi$  then it should be observed at  $0^\circ$  in this reaction.

METHOD

The apparatus to measure the momentum spectra of particles at  $0^\circ$  is shown in Fig. 1. The  $K^-$  beam is focused on an 8" liquid hydrogen target, with suitable counters in front of the target to define the beam and identify

METHOD (continued)

those particles which are K mesons. Immediately following the target is a bending magnet whose purpose is to sweep away the unscattered beam and most of the unwanted particles at  $0^\circ$ . This is immediately followed by a pair of quadrupoles capable of capturing approximately 10 msr. of solid angle in the forward direction and another bending magnet to yield a high dispersion at the image of the target 2 meters beyond the magnet. A thin counter (P) directly in front of the first quadrupole defines the solid angle acceptance and a counter hodoscope (H) at the focus counts the desired particles and measures the spectrum of particles of nearby momenta. Time-of-flight between the beam counter (M) and the timing counter (T) 8 meters from the target serve to further define the particles of interest.

Runs were made at all momenta with the target full and empty and a subtraction performed. A small background from other reactions was also subtracted.

RESULTS

Figures 2 and 3 show preliminary results for both reactions together with the predictions of two recent phase shift analyses.<sup>(3)</sup> In both reactions the results agree well with the predictions. We find no evidence for the narrow structures between 500 and 600 MeV/c reported by Carroll et al.<sup>(4)</sup>

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FIGURE CAPTIONS

1. Experimental Apparatus
2. Differential Cross-section for  $K^-p \rightarrow K^-p$  at  $180^\circ$
3. Differential Cross-section for  $K^-p \rightarrow \Sigma^- \pi^+$  at  $0^\circ$

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