NUCLEON FORM FACTORS ABOVE 6 GeV

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I. INTRODUCTION

This report describes the results from a preliminary analysis of an elastic electron-proton scattering experiment, performed at the Stanford Linear Accelerator Center. The experiment is being carried out by a collaboration of physicists from SLAC, Cal Tech, and M.I.T.*

The preceding paper by G. Weber has summarized the data on proton form factors obtained from other accelerators at momentum transfers squared (q^2) up to 10 $(GeV/c)^2$. We have measured cross sections for e-p scattering in the range of q^2 from 0.7 to 25.0 $(GeV/c)^2$, providing a large region of overlap with previous measurements. In this experiment we measure the cross section by observing electrons scattered from a beam passing through a liquid hydrogen target. The scattered particles are momentum analyzed by a magnetic spectrometer and identified as electrons in a total absorption shower counter.

Data have been obtained with primary electron energies from 4.0 to 17.8 GeV and at scattering angles from 12.5 to 35.0 degrees. In general, only one measurement of a cross section has been made at each momentum transfer. In these circumstances, separation of the electric and magnetic form factors (G_E and G_M) cannot be made from our data. However, since the relation $G_E = G_M/\mu$ has been shown to hold at low momentum transfers and the contribution of G_E to the cross section falls off rapidly with increasing q^2, we are able to indicate the behavior of the magnetic form factor at high momentum transfers.

II. THE EXPERIMENTAL EQUIPMENT

A general layout of the beam line from the accelerator to the target area (end station A) is shown in Fig. 1. The primary electron beam is momentum analyzed and transported to the target by a magneto-optic system in the beam switchyard. A simplified drawing of this system is shown in Fig. 2. The beam is collimated and passed through the first bending magnet (BM1) and then through momentum defining slits (S). Quadrupoles image the collimator on the slits. The slits may be adjusted to define a momentum pass band ($\Delta p/p$) in the range 0.1 - 2.5%, and the transmitted beam is then focussed onto the target. The focussing is achromatic.

The momentum spread of the beam used in the experiment was generally less than 0.5% to maintain kinematic separation between the elastic peak and inelastic cross section varies rapidly with energy. Extensive magnetic measurements and