scattered neutron were unknown. Events were fitted to elastic scattering kinematics and a chi-squared was determined. A clean elastic signal at small χ^2 was found even at large momentum transfers. Elastic events were binned according to their reconstructed incident neutron momentum.

Only data for $|t| < 6$ $(GeV/c)^2$ have been analyzed so far. Some of our results (based on about one-third of the total sample of data) are given in the summary talk of Didden's. On the basis of preliminary analysis our n-p differential cross sections agree quite well with available p-p data throughout this momentum range. At 7 GeV/c our cross sections fall off very smoothly with increasing $|t|$. As the beam momentum increases a kink gradually develops near $|t| = 1.2$ $(GeV/c)^2$ and becomes quite pronounced by 12.0 GeV/c.

NEUTRON-PROTON AND NEUTRON-NUCLEUS TOTAL CROSS SECTIONS FROM 40 TO 300 GeV*

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These measurements were carried out in a neutron beam at Fermi Laboratory. The standard transmission technique was employed with a 1.2 -m long hydrogen target. A total absorption calorimeter was used to determine the neutron energy with a precision of about ± 6%.

The measured cross sections were extrapolated to zero solid angle in the usual way. Because the smallest counter used subtended an extremely small solid angle, this correction was usually ~ 0.1 mb. Significant corrections for beam contamination had to be made below approximately 100 GeV/c; the corresponding uncertainties limit the accuracy of our cross sections at low energy.

Our results for n-p total cross-sections are given in Didden's summary talk and compared to existing n-p and p-p data. Our n-p results agree rather well with previous n-p and p-p data, but are significantly higher than the p-p total cross sections presented by Kycia et al at this conference. Our results indicate a gradual rise of about 1.5 mb in the n-p total cross section between 50 and 300 GeV/c. Our data and all the n-p data above 20 GeV/c available before this conference can be well fitted with the expression

$$\sigma = 38.4 + 0.85 \left| \ln (s/95) \right|^{1.47} \text{ mb.}$$

We have also measured n-d and n-nucleus total cross sections. The n-d results are given in Figure 1.

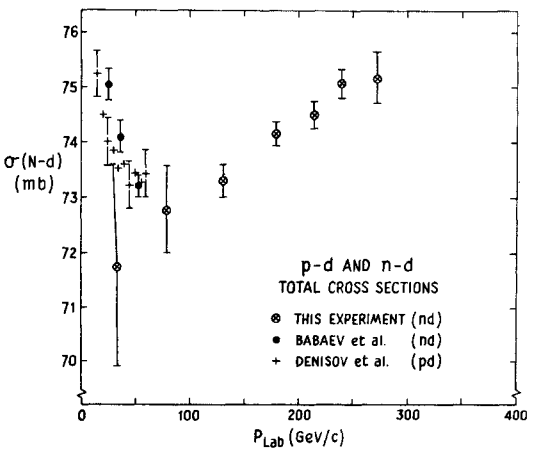

Fig.1 p-d and n-d total cross sections (RL 16531)

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* This work is reported in greater detail in paper 1074 submitted to the conference.

The discrepancy between the p-p total cross sections measured previously by our group [1] at 200 and 300 GeV/c and those presented by Kycia et al [2] at the conference deserves comment. Our measurement differed from the latter in at least two important respects. In our case the transmission counters were immediately followed by the total absorption calorimeter. This allowed us to reject low energy particles which "filled in" for inelastically scattered protons. This reduced the slope of the extrapolation to zero solid angle and allowed us to investigate how the extrapolation charges as a function of the energy required of the transmitted particles. We were also able to measure the transmission at much smaller solid angles (or $|t|$).As a result the corrections to our cross sections due to the finite solid angle subtended by the detector were <1%, while those of the Kycia et al were ≃ 7%. In our case this extrapolation could be done with various energies required for the transmitted particles. The resulting total cross sections were found to be stable at the 0.1% level. They were also stable if any of the smaller counters were dropped from the fit.

We find that the slope of the extrapolation increases markedly as less energy is required for the transmitted particles. When no energy requirement is made, as in the experiment of Kycia et al, our slopes are considerably larger than those they find at larger $|t|$. This suggests that they may be underestimating the curvature in the extrapolation, which would lead to low total cross sections. This curvature may be associated with the high multiplicity of charged particles (including secondaries and tertiaries). If so, any systematic error would increase with increasing energy.

References

1. H R Gustafson et al., PHys.Rev.Lett. 32, 441 (1974).
2. T F Kycia, Session A1, Proceedings of this conference.
3. M J Longo, et al., paper 470.
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SIMULTANEOUS MEASUREMENT OF SPINS IN pp ELASTIC SCATTERING

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I will discuss p-p elastic-scattering experiments at 6 GeV/c with polarized beam and polarised targets. The results to be presented are the initial phase of scattering-amplitude measurements with Argonne ZGS polarized beam.

Papers (897,899,1010) presented by Michigan-ANL (ARF)-St Louis collaboration mainly cover the large $|t|$ region ($0.55 < |t| < 2.40$) and a paper (804) by Northwestern-ANL (HEP) collaboration covers the small $|t|$ region.

First, let me make an introductory remark on scattering-amplitude measurements. Define three unit vectors, N,L and S for each particle in the laboratory systems as: