

ANALYZING POWER MEASUREMENTS IN HIGH- P_{\perp}^2 p-p ELASTIC SCATTERING*

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ABSTRACT

The analyzing power in 28 GeV/c proton-proton elastic scatter-
ing was measured at $P_{\perp}^2 = 5.95$ and 6.56 (GeV/c)² using a polarized
proton target and an unpolarized proton beam at the Brookhaven
National Laboratory AGS. Results indicate that the analyzing power,
A, is rising sharply with P_{\perp}^2 .

Previous measurements¹ of the analyzing power, A, in p + p +
p + p suggested a rise in A at large- P_{\perp}^2 , but the statistical
uncertainty in the highest point at $P_{\perp}^2 = 5.95$ (GeV/c)² made it im-
possible to determine the magnitude of the increase. In an effort
to clarify this situation, we made new measurements of A at $P_{\perp}^2 =$
5.95 and 6.56 (GeV/c)².

An unpolarized beam of typically 5×10^{10} 28 GeV/c protons from
the AGS at Brookhaven National Laboratory was incident upon the
University of Michigan polarized proton target. This target con-
tains irradiated ammonia beads cooled to 0.5° K by a ³He-⁴He evapora-
tion refrigerator, in a 2.5 T magnetic field. The polarizing
transitions are driven by a 70 GHz microwave system. The polariza-
tion of the hydrogen protons is measured with a 107 MHz NMR system,
and is typically $P_T = 45\%$ with beam and 60% without beam.

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MASTER

Elastic proton events were detected in the double-arm forward-backward spectrometer shown in Fig. 1 consisting of six magnets and six scintillation counter hodoscopes with a P_{\perp}^2 acceptance of about 1 (GeV/c)^2 .

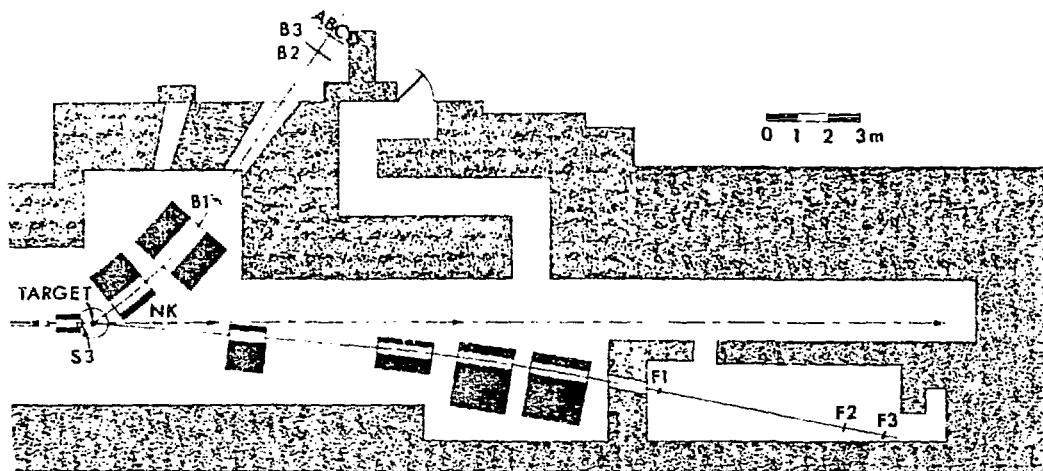


Fig. 1. Double-arm forward-backward spectrometer.

The analyzing power for these measurements is obtained, following the Basel convention, from

$$A = - \frac{1}{P_T} \frac{N(\uparrow) - N(\downarrow)}{N(\uparrow) + N(\downarrow)}$$

where $N(\uparrow)$ and $N(\downarrow)$ are the numbers of events with the target polarization up and down, respectively. The new values for A are:

$P_{\perp}^2 \text{ [(GeV/c)}^2]$	$A \text{ [%]}$
5.95	16 ± 5.7
6.56	51 ± 17

The point at $P_{\perp}^2 = 5.95 \text{ (GeV/c)}^2$ includes our earlier data.² These points are plotted in Fig. 2 along with earlier data from the AGS^{1, 2} and CERN.³ Notice the sharp increase in A near $P_{\perp}^2 = 6 \text{ (GeV/c)}^2$, which was totally unexpected.

DISCLAIMER

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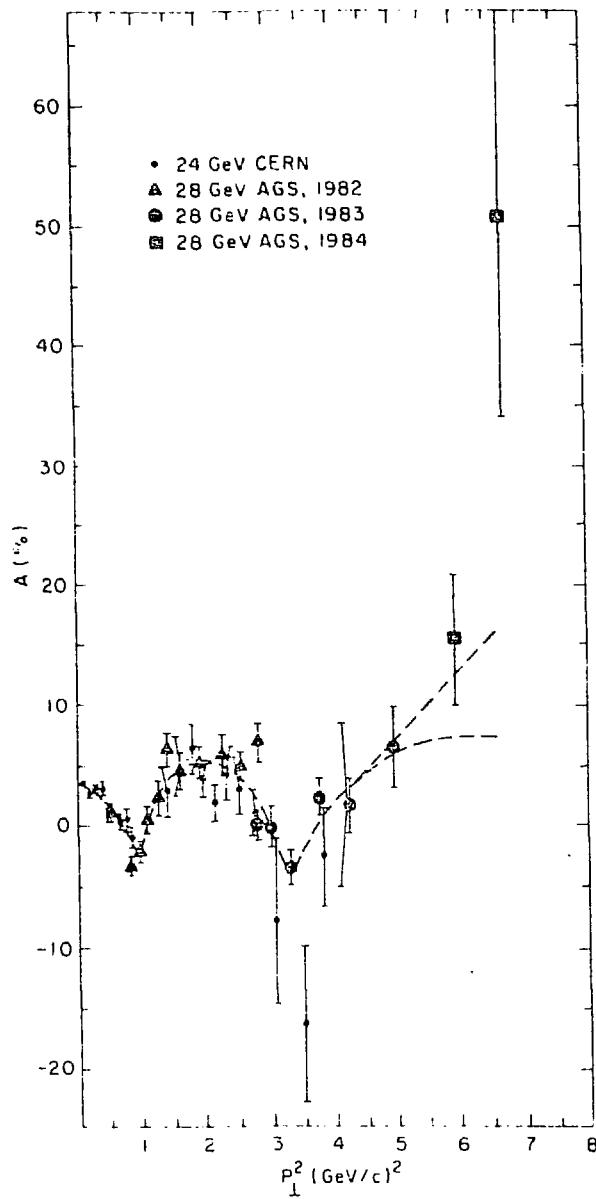


Fig. 2. Analyzing power for proton-proton elastic scattering as a function of P_{\perp}^2 .

REFERENCES

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