NAL PROPOSAL No. 17

Correspondent: B. G. Reynolds
Physics Department
Ohio University
Athens, Ohio 45701

FTS/Off-net 614-469-6600
594-5511

$\bar{p}d$ INTERACTIONS FROM 20 TO 60 GeV/c

J. M. Bishop, D. O. Huwe, B. G. Reynolds and H. L. Yarger

Ohio University

June 10, 1970

$\bar{p}d$ INTERACTIONS FROM 20 TO 60 GeV/c

ABSTRACT

We will study the reaction $\bar{p}n \rightarrow \bar{p}p\pi^-(p)$ at 20, 40, and 60 GeV/c in a bubble chamber experiment using a sample of 1,000,000 pictures.

J.M. Bishop, D.O. Huwe, B.G. Reynolds, and H.L. Yarger

OHIO UNIVERSITY

June 10, 1970

B.G. Reynolds -- Correspondent

II. THE PHYSICS OF THE EXPERIMENT

Studies of the reaction

$$pp \rightarrow p\pi^{+}n \tag{1}$$

up to 24 GeV/c have shown that this process is dominated by Δ^{++} production and that the process

$$pp \rightarrow \Delta^{++}N \tag{2}$$

can well be explained by a single pion exchange model. Furthermore, studies of the scattering at the virtual pion-nucleon vertex are in good agreement with results obtained in real pion-nucleon scattering experiments.

Corresponding studies of the reaction

$$\bar{p}n \rightarrow \bar{p}\pi^{-}p \tag{3}$$

at lower momenta show similar features. Again the dominant process is found to be

$$\bar{p}n \rightarrow \overline{\Delta^{++}}p \tag{4}$$

and reaction (4) is well explained by single-pion exchange. We propose to study reaction (3) in the region of 20-60 GeV/c (or higher if the experimental facilities are available). We will look for departures from single-pion exchange in process (4). By going to higher energies one can study the effect of higher-lying Regge trajectories on process (4).

Although there are experimental problems associated with a deuterium target, these problems are far outweighed by the advantage of working with the four-constraint events of reaction (3) (assuming that the spectator proton is detected). This latter advantage is of significant importance when separating out events of reaction (3) from other final states with the same topology. Thus we feel that reaction (3) is the best final state

for our proposed study.

III. EXPERIMENTAL ARRANGEMENT:

Standard secondary beam and bubble chamber configuration.

IV. APPARATUS:

We will need either the NAL bubble chamber or perhaps the BNL 80" chamber if such an arrangement is possible. Estimates based on the 80" chamber and extrapolation of PP data using a simple P_{lab}^{-2} rule indicate that we will require 1,000,000 pictures allocated as follows:

MOMENTUM (GeV/c)	NUMBER OF PICTURES
20	100,000
40	300,000
60	600,000

In the event that a larger chamber is used, the number of pictures could be reduced.