RESONANCE PRODUCTION IN THE REACTION $\pi^- \, p \rightarrow n \, \pi^- \, \pi^+ \, \pi^0 \, \pi^0$

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1 Introduction

The flux-tube model of meson structure predicts characteristic decays of hybrid mesons. States having exotic quantum numbers typically decay to L=0, L=1 meson pairs.[1] Several states are predicted to have large decay widths to either $\pi \, a_2(1320)$, or $\pi \, a_1(1260)$. Both of these decays lead to 4π final states.

In this contribution we show some preliminary data for the reaction $\pi^- \, p \rightarrow n \, \pi^- \, \pi^+ \, \pi^0 \, \pi^0$, taken in BNL experiment E852. A description of the experiment can be found in the papers presented at this conference by N. Cason and by B. Brabson. About 8% of the 4π data sample is shown here. None of the data have been corrected for experimental acceptance.

2 Results

The $\pi^+\pi^-\pi^0$ mass spectrum, Fig. 1a, shows sharp peaks at the η and ω masses. Selecting events in the ω peak and combining with the

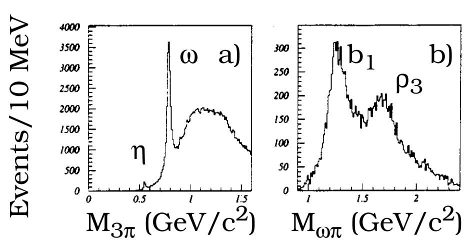

Figure 1: Invariant mass of a), $\pi^+\pi^-\pi^0$ and b), $\omega\pi^0$.

remaining π^0 produces the mass spectrum in Fig. 1b. Prominent

a. The full author list is given in "Study of the $\eta\pi^-$, $\eta\pi^0$, and $\eta\eta$ systems in π^- p interactions at 18 GeV", presented by N. Cason, in these proceedings.

peaks are observed at the $b_1(1235)$ and $\rho_3(1690)$ masses. Fig. 2 shows the 2π mass spectra for four different charge states. Strong excitation of ρ^+ and ρ^- is observed, with much less strength going to the neutral

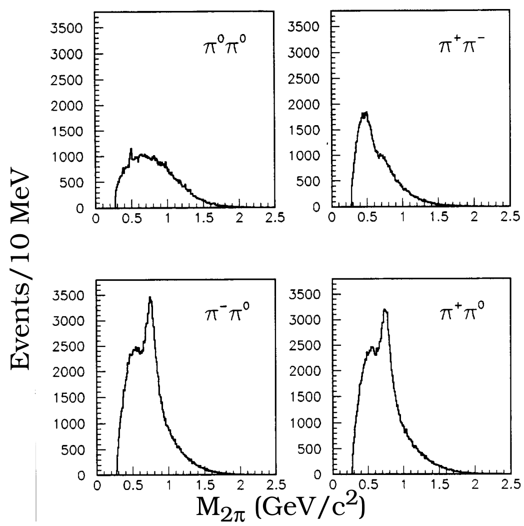

Figure 2: Invariant mass of $\pi\pi$ pairs.

channel. A significant fraction of the charged ρ production appears in the $\rho^+\rho^-$ final state. Fig. 3a shows the $\pi^+\pi^0$ mass distribution for those events which have $\pi^-\pi^0$ invariant mass in the ρ^- region. The background in this spectrum was estimated by averaging the yield in the adjacent mass bins. The mass spectrum after background subtraction, indicating the $\rho^+\rho^-$ yield, is depicted in Fig. 3b.

One advantage of the present detector arrangement is that several charge-states of $\rho\pi$ can be studied in the same experiment. The mass spectra for those events which have $\pi\pi$ mass in the region of a charged ρ (see Fig. 2) are shown in Fig. 4. These data show resonant behavior at the a_2^+ and a_2^-, but no clear evidence for a_2^0. Accepting events which fall in the a_2 mass region yields about 4800 counts for $a_2^+ \pi^-$ plus $a_2^- \pi^+$, including double entries for the ambiguous events. Therefore the entire data set will provide about 6 x 10^4 events for the partial-wave analysis.

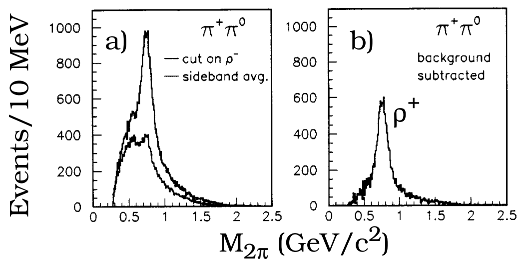

Figure 3: Mass of $\pi^+\pi^0$ after selecting the $\pi^-\pi^0$ mass.

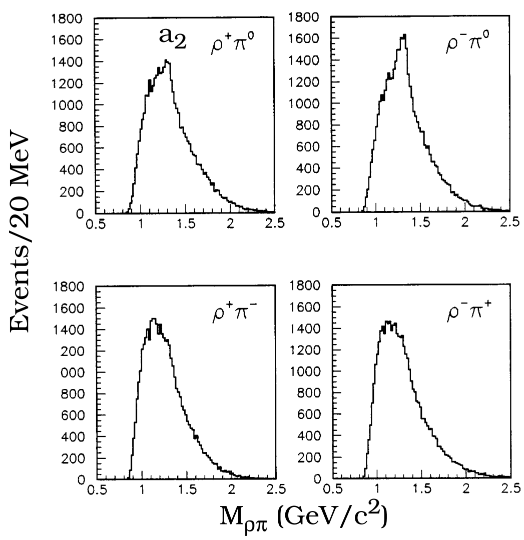

Figure 4: Invariant mass of $\rho\pi$ pairs.

References

1. N. Isgur, R. Kokoski, and J. Paton, Phys. Rev. Lett. **54**, 869 (1985); John Merlin and Jack Paton, Phys. Rev. D **35**, 1668 (1987).