A SEARCH FOR $\rho^0\rho^0\pi^-$ ENHANCEMENT IN ANTIPROTON-NEUTRON ANNIHILATION IN THE T-MESON REGION

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The work of Kalbfleisch et al.[1] on the reaction $\bar{p}p \to \rho^0\rho^0\pi^0$ in the T-meson region has been discussed by the previous speaker. They reported a 0.5 ± 0.1 mb enhancement at 1.33 GeV/c (average of 1.31, 1.33, and 1.35 GeV/c data) for this state relative to zero cross-section at neighbouring momenta of 1.11 and 1.52 GeV/c. This effect was attributed to the formation of an $I^G = 1^-$ state, the $\pi^*(2190)$. We have studied the reaction

$$\bar{p}d \to p_s\rho^0\rho^0\pi^- \to p_s 2\pi^+ 3\pi^- \ , \qquad (1)$$

where p_s is a spectator proton, at incident momenta of 1.06, 1.16, 1.27, 1.40, 1.60, 1.75, 1.85, 2.00, 2.15, 2.30, 2.45, 2.60, and 2.90 GeV/c. The events are highly constrained (4C or 4C with weak constraints on the spectator proton) bubble chamber events. The half width at half maximum spread, due to beam optics and energy loss in the deuterium in the region near 1.3 GeV/c, is typically ±25 MeV/c, or ±9 MeV c.m. energy. To this one must fold in the Fermi motion of the neutron target, estimated to be ±20 MeV c.m. energy. Hence, the final c.m. energy resolution is $\sim$ ±22 MeV. The Kalbfleisch et al. effect is observed equally at three momenta (1.31, 1.33, and 1.35 GeV/c) and not at 1.11 and 1.52 GeV/c, implying a width of $20 \leq \Gamma \leq 80$ MeV. Hence, if the width of the effect were 20 MeV, we would probably not be very sensitive to the effect at our closest point, 1.27 GeV/c. On the other hand, if the width were 50 MeV, for example, we would be quite sensitive to the effect, both at 1.27 and 1.40 GeV/c.

Our cross-section data are shown in Fig. 1. No cuts have been made on the spectator momentum. No enhancement is observed in the cross-sections for $\bar{p}n \to 2\pi^+ 3\pi^-$, or the subset of cross-sections for $\rho^0\pi^+ 2\pi^-$ and $\rho^0\rho^0\pi^-$. In the latter case, a direct comparison is made with the Kalbfleisch et al. data, multiplied by two to account for incident isospin in a direct channel I = 1 resonant model. We note that rather strong correlations were observed in fitting the single and double ρ final states. However, the determination of the average number of ρ's, also shown in the figure, does not have this ambiguity and is clearly without structure. We note that any substantial peaking in $\rho^0\rho^0\pi^-$ would be accompanied by a dip in $\rho^0\pi^+ 2\pi^-$. Neither effect is seen.

REFERENCE

1) G. Kalbfleisch, R. Strand and V. Vanderburg, Phys. Letters 29 B, 239 (1969).

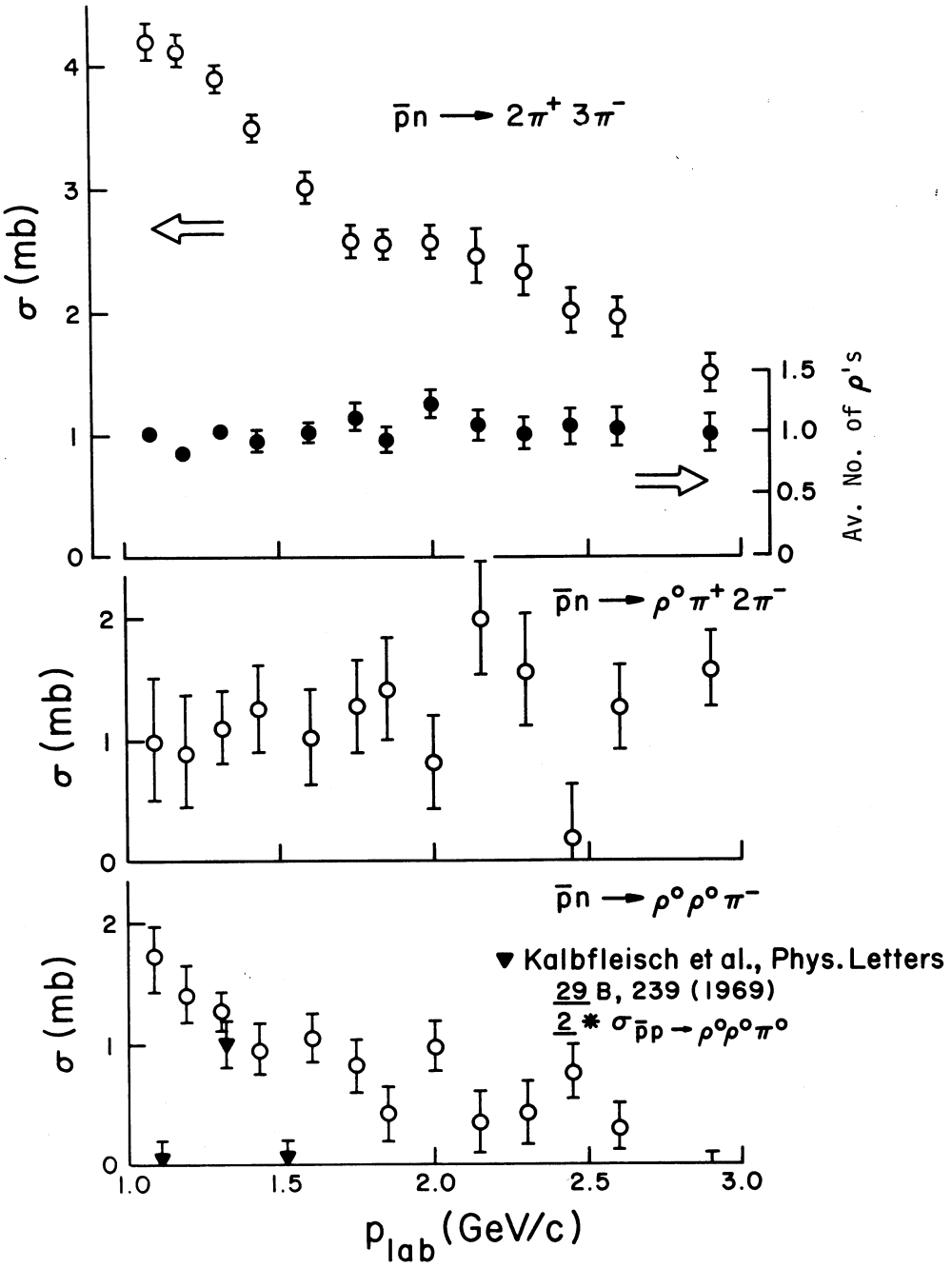

Fig. 1

D I S C U S S I O N

- *Cresti:*

We have made an analysis of a resonance production in the $\rho\rho\pi$ channel. We found the same results as Smith showed, with a little more uncertainty. I also agree that there are problems with rescattering, which is clearly present, and something is going on there.

- *Duboc:*

Your results seem to be in disagreement with the Liverpool-Paris et al., Collaboration where we see no signal in the $\rho\rho\pi^0$ channel.

- *Smith:*

I am sorry, I should have mentioned that. Kalbfleisch, at the Boson Spectroscopy Conference at North-Eastern University this spring, compared various people's data.