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III. Inelastic two-body and quasi-two-body reactions

(by D.M. Manley, Kent State University)

Since our 1992 edition, no new data nor partial-wave analyses have been published for the inelastic two-body reactions $\pi N \to N\eta$, $\pi N \to \Lambda K$, and $\pi N \to \Sigma K$. There are recent indications [1] that much of the $\pi N \to N\eta$ data [2] used for the Rutherford partial-wave analysis [3] had poorly determined energies; thus, except for the $N(1535)\,S_{11}$, $N\eta$ branching fractions are omitted from the Baryon Summary Table in this edition. A recent review of these reactions and the quasi-two-body reaction $\pi N \to N\omega$ can be found in Ref. 4.

Essentially all information on quasi-two-body reactions such as $\pi N \to \Delta\pi$ and $\pi N \to N\rho$ comes from isobar-model analyses of $\pi N \to N\pi\pi$ reactions. Since the last edition, the Kent State multichannel resonance analysis has been published [5]. Although couplings from this analysis were listed in the 1992 edition, the present edition includes new, updated estimates for couplings and branching fractions of many resonances observed in two or more isobar-model analyses. A brief review of $\pi N \to N\pi\pi$ analyses can be found in the 1992 edition; for a more recent and extensive review, the interested reader should see Ref. 6.

Since the last edition, there have been two reports [7,8] of resonances observed in $\pi N \to N4\pi$ reactions. One report [7] of $\pi^- p \to p\pi^+\pi^-\pi^-\pi^0$ data from the CERN liquid-hydrogen bubble chamber gives evidence for an N^* resonance with mass 1700 MeV and width 150 MeV, which decays by the channels $p\eta$, $\Delta 2\pi$, $p3\pi$. The other report [8] of $\pi^+ p \to p\pi^+\pi^+\pi^-\pi^0$ data from the ZhVK-205 liquid-hydrogen bubble chamber (Moscow) gives evidence for an N^* resonance with mass 1780 ± 40 MeV and width 250 ± 80 MeV, which decays by the $p\omega$ channel.

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IV. Electromagnetic interactions

(by R.L. Crawford, University of Glasgow)

Nearly all the entries in the Listings relating to electromagnetic properties of the N and Δ resonances are couplings for decay to $N\gamma$. These couplings, the helicity amplitudes $A_{1/2}$ and $A_{3/2}$, have been obtained in a large number of partial-wave analyses of single-pion photoproduction, $\gamma N \to \pi N$, on protons and neutrons. The large amount of data has permitted an accurate evaluation of the couplings for many of the resonances with masses below 2 GeV, and has given at least qualitative information about most of the others. Most photoproduction analyses use as input information on the existence, masses, and widths of the resonances from the $\pi N \to \pi N$ analyses, and only determine the $N\gamma$ couplings. A brief description of the various methods of analysis of photoproduction data may be found in our 1992 edition [1].

The Listings omit a number of analyses that are now obsolete. Most of the older results may be found in our 1982 edition [2]. The errors quoted for the couplings in the Listings are calculated in different ways in different analyses and therefore should be used with care. In general, it is likely that the systematic differences between the analyses caused by using