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Baryonic spectra from multichannel amplitudes[1]

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Ongoing and future experiments at precision electromagnetic facilities around the world have ushered in a renaissance in hadronic reaction theory. These high-statistics experiments offer comprehensive kinematic coverage and a large number of new polarization observables – including the exciting prospect of a complete measurement for several reactions – and will provide stringent constraints on reaction parameterizations and models. The recent developments promise to shed new light on the physics of baryon resonance spectroscopy, providing a window into the non-perturbative regime of QCD. Though the reaction theory is a mature field, complex phenomenological and theoretical challenges remain. Phenomenologically, amplitudes must be determined in a manner consistent with unitarity while fitting a multichannel set of unpolarized and polarized observables. The SAID amplitudes for $\pi N \to \pi N$ and $\pi N \to \eta N$, as a model example of such a phenomenology, are discussed in some detail and compared with other parameterizations. Efforts to enlarge the said approach to describe the photo- and hadro-production globally have recently yielded promising developments, including a simultaneous description of $\pi-$ and $\eta-$ photoproduction amplitudes. Theoretically, multichannel, unitary dynamical models have recently undergone significant developments. An overview of these approaches are considered by comparing results from several recent calculations.

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