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Progress in diffractive and annihilation production and exotic baryon

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The study of baryonic excited states provides fundamental information on the internal structure of the nucleon and on the degrees of freedom that are relevant for QCD at low energies. N are composite states and are sensitive to details of the how quarks are confined.
One of the still open problems in the description of the baryon spectrum by Quark Models or lattice QCD is the missing observation of a sizable number of nucleonic resonances.
Significant progress has been made in recent years and is evident in several new entries of N and Δ states in the latest editions of the Review of Particle Properties (PDG), as well as the inclusion of the transition form factor measurement for several excited states.
Most of the newly discovered states have masses in the range 1.85 GeV to 2.1 GeV where precise photoproduction data were driving the new observations, however the mass region above 2.1 GeV has hardly been studied. This is the region where the gluonic excitations are expected to occur, representing the focus of the task in the search of exotic baryons.
The availability of polarized photon beams impinging on polarized targets provide access to single and double polarization observables of meson photo-production processes, which strongly constrain the reaction amplitudes and proved to be the new key information in the discovery of the new resonances.
Electro-production of the same mesons-baryon final states produced in photo-reactions allows for the extraction of the resonance electro-couplings and the study of their evolution as a function of the Q2 photon virtuality. This additional information allows to picture the evolution of the effective-degrees N freedom as a function of the distance scale and to assess the possible hybrid nature of new resonances.

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