UNRAVELING THE EXCITATION SPECTRUM OF THE NUCLEON: THE N* PROGRAM AT JEFFERSON LAB

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The low energy structure of QCD lies encoded in the excited-state spectrum of the nucleon, which is a complicated overlap of many resonances that must be disentangled. Nonetheless, recent Lattice-QCD calculations have reaffirmed a long-standing Quark-Model prediction of many more excited N* levels than have yet been identified. A new set of complete experiments in meson photo-production has recently been concluded at Jefferson Lab. Here the designation of complete refers to measurements of most if not all of the possible reaction observables, of which there are 16 involving spins of the beam, target and recoil baryon. The photo-production of hyperons affords attractive opportunities, since their weak decays provide an efficient self-analysis of their spin. When the beam and target are also polarized, the resulting triple polarization measurements determine the full suite of observables. This has been the focus in the g9/FROST and g14/HDice experiments on polarized protons and polarized neutrons (in deuterium) that are now under analysis. The ultimate goal is an experimental determination of the production amplitude as a curve in the complex plane, which will serve as the starting point for an analytic continuation in a search for poles. We will describe the measurements, recent results and discuss the trends emerging from preliminary multipole analyses of K+ Lambda production, using as yet incomplete polarization results.