**Nucleon resonance structure from the studies of space- and timelike baryon excitation amplitudes**

The spectrum and structure of nucleon resonances (N\*), as revealed via N\* electroexcitation amplitudes, contain fundamental information about strong-coupling QCD that is crucial to validating any proposed solution to the theory. However, extracting such information is challenging, owing primarily to the overlap of distinct resonances and substantial contributions from non-resonant processes. Precise data from both electron and pion beams are necessary for developing robust approaches for amplitude analyses, capable of delivering sound results for N\* quantum numbers and excitation amplitudes over a broad range of *q*2. The spacelike (q2<0) region has been explored more intensively, particularly at JLab, but efforts are well under way in studying the timelike (q2>0) region with HADES at GSI. E45 is now on the horizon. The J-PARC Experiment E45 will complement CLAS12 of JLab for the N\* → ππN reaction, thereby allowing for a coupled-channel approach towards extracting the amplitudes. The same N\* resonance must be found in different reaction channels in the same way. Further, this coordinated work will afford opportunities for strengthening transpacific experimental and theoretical synergies between JLab and J-PARC. E45 has been approved to run in the later part of 2025 using the Hyperon Spectrometer in the K1.8 beamline. Recent theoretical advances have shown the importance of coupled-channels effects in an amplitude analysis, such as PWA. To make progress on nucleon resonance structure, it is necessary to complement the high-quality data on the πN → πN channel with similar-quality data for the πN → ππN and πN → KY reactions. The latter two reactions were measured with only modest precision over four decades ago. The primary goal for E45 is to measure the πN → ππN reaction, and to search for evidence of new baryon resonances through a dynamical coupled-channel amplitude analysis. We expect to collect 130x the world’s data on the two-pion decay mode of excited resonances using π+ and π- beams. Context for this spacelike and timelike work on the importance of a coupled-channel approach for q2<0 and q2>0 is addressed in the article *Exploring the production of N\*s with pion and electron beams*, in the quarterly online journal The Innovation Platform, which was published in December 2022 and can be found in the link: <https://edition.pagesuite.com/html5/reader/production/default.aspx?pubname=&edid=34216959-80ec-4ce6-af9a-b90be9d71c84&pnum=288>).