ELECTROMAGNETIC FORM FACTORS OF NUCLEON EXCITATIONS FROM LATTICE QCD

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Variational analysis techniques in lattice QCD are powerful tools that give access to the full spectrum of QCD. At zero momentum, these techniques are well established and can cleanly isolate energy eigenstates of either positive or negative parity.

In order to compute the form factors of a single energy eigenstate, we must perform a variational analysis at nonzero momentum. When we do this with baryons, we run into issues with parity mixing, as boosted baryons are not eigenstates of parity. Due to this parity mixing, care must be taken to ensure that the projected correlation functions provided by the variational analysis correspond to the same states at zero momentum. This can be achieved through the parity-expanded variational analysis (PEVA) technique, a novel method developed at The University of Adelaide for ensuring the successful and consistent isolation of boosted baryons.

By utilising this technique, we are able to compute the form factors of both positive and negative parity excitations of baryons without contamination from other states. I present the worlds first comprehensive lattice QCD determination of the electromagnetic structure of nucleon excitations.