Origin of the baryon magnetic polarisability

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Lattice QCD results for the magnetic polarisabilities of octet baryons hint at an interesting non-monotonic quark-mass dependence. This work aims to provide a new understanding of this quark mass dependence by drawing on a constituent quark model description of the magnetic polarisability. The model reveals interplay between contributions from magnetic transitions to nearby states and contributions associated with the distribution of charge within the baryon.

While qualitative trends are predicted for the octet baryons, we advance the approach by considering fractionally charged baryons. Here the contributions from individual quark sectors are isolated by setting the electric charge of spectator quark sectors to zero. This provides an unprecedented opportunity to learn the origin of the magnetic polarisability of a baryon and an opportunity to separate the direct quark mass dependence of contributions and the environmental mass dependence of contributions.

This synthesis provides fresh insight into the origin of the baryon magnetic polarisability. The confrontation of the quark model predictions with lattice QCD results acts as a catalyst to new understandings of the magnetic polarisability.