PURE SEA-QUARK CONTRIBUTIONS TO THE MAGNETIC FORM FACTORS OF Σ BARYONS

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We propose the pure sea-quark contributions to the magnetic form factors of Σ baryons, $G^u_{\Sigma^-}$ and $G^d_{\Sigma^+}$, as priority observables for the examination of sea-quark contributions to baryon structure, both in present lattice QCD simulations and possible future experimental measurement. $G^u_{\Sigma^-}$, the u-quark contribution to the magnetic form factor of Σ^-, and $G^d_{\Sigma^+}$, the d-quark contribution to the magnetic form factor of Σ^+, are similar to the strange quark contribution to the magnetic form factor of the nucleon, but promise to be larger by an order of magnitude. We explore the size of this quantity within chiral effective field theory, including both octet and decuplet intermediate states. The finite range regularization approach is applied to deal with ultraviolet divergences. Drawing on an established connection between quenched and full QCD, this approach makes it possible to predict the sea quark contribution to the magnetic form factor purely from the meson loop.
In the familiar convention where the quark charge is set to unity $G^u_{\Sigma^-} = G^d_{\Sigma^+}$. We find a value of $-0.38^{+0.16}_{-0.17}\,\mu_N$, which is about seven times larger than the strange magnetic moment of the nucleon found in the same approach. Including quark charge factors, the u-quark contribution to the Σ^- magnetic moment exceeds the strange quark contribution to the nucleon magnetic moment by a factor of 14.