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Peripheral transverse densities of the baryon octet from ChPT and dispersion analysis

Content

The baryon electromagnetic form factors are expressed in terms of two-dimensional densities describing the distribution of charge and magnetization in transverse space at fixed light-front time. We calculate the transverse densities of the spin-1/2 flavor-octet baryons at peripheral distances $b = \mathcal{O}(M_\pi^{-1})$ using methods of relativistic chiral effective field theory (χEFT) and dispersion analysis. The densities are represented as dispersive integrals over the imaginary parts of the form factors in the timelike region (spectral functions). The isovector spectral functions on the two-pion cut $t > 4M_\pi^2$ are calculated using relativistic χEFT including octet and decuplet baryons. The χEFT calculations are extended into the ρ-meson mass region using an N/D method that incorporates the pion electromagnetic form-factor data. The isoscalar spectral functions are modeled by vector-meson poles. We compute the peripheral charge and magnetization densities in the octet-baryon states, estimate the uncertainties, and determine the quark flavor decomposition. The approach can be extended to baryon form factors of other operators and the moments of generalized parton distributions.

Summary

Primary author(s) : Dr. HILLER BLIM, Astrid Nathalie (Johannes Gutenberg University of Mainz)

Co-author(s) : Dr. ALARCÓN, Jose Manuel (JLab); Dr. WEISS, Christian (JLab); Prof. VICENTE VACAS, Manuel José (Universidad de Valencia)

Presenter(s) : Dr. HILLER BLIM, Astrid Nathalie (Johannes Gutenberg University of Mainz)