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Two-dimensional transverse charge distributions of the Δ baryon: Interpolation between the nonrelativistic and ultrarelativistic limits

In this talk, we present the results of a recent investigation on the behavior of the charge distributions of the Δ baryon, both unpolarized and transversely polarized, as a function of longitudinal momentum (P_z) in a Wigner phase-space perspective. Specifically, we examine how the charge distributions change as P_z increases from 0 to ∞ . We find that the charge distribution of a longitudinally polarized Δ baryon remains spherically symmetric regardless of P_z . On the other hand, for a transversely polarized Δ baryon along the x -axis, a quadrupole contribution emerges at rest ($P_z = 0$), and as P_z increases, electric dipole and octupole moments are induced. The current analysis reveals that the induced dipole moment dominates over higher multipole contributions and drives the deformation of the Δ baryon's charge distribution. These findings provide insights into the underlying physics of the Δ baryon and its charge structure.

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