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Parton distribution functions of Δ^+ on the lattice

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We perform a first calculation for the unpolarized parton distribution function of the Δ^+ baryon using lattice QCD simulations within the framework of Large Momentum Effective Theory. Two ensembles of $N_f = 2+1+1$ twisted mass fermions are utilized with a pion mass of 270 MeV and 360 MeV, respectively. The baryon, which is treated as a stable single-particle state, is boosted with momentum P_3 with values $\{0.42, 0.83, 1.25\}$ GeV, and we utilize momentum smearing to improve the signal. The unpolarized parton distribution function of Δ^+ is obtained using a non-perturbative renormalization and a one-loop formula for the matching, with encouraging precision. In particular, we compute the $\overline{d}(x) - \overline{u}(x)$ asymmetry and compare it with the same quantity in the nucleon, in a first attempt towards resolving the physical mechanism responsible for generating such asymmetry.

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