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Chiral-even axial twist-3 GPDs of the proton from lattice QCD

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We present the first lattice-QCD calculation of the proton's twist-3 axial quark GPDs using the LaMET approach. The lattice computation is performed using one ensemble of $N_f = 2 + 1 + 1$ maximally twisted mass fermions with a clover term at a single lattice spacing of 0.093 fm and a pion mass of 260 MeV, employing three proton boosts up to 1.67 GeV. The light-cone GPDs are defined in the symmetric frame, at $-t = 0.69, 1.38$ and 2.76 GeV^2 and at zero skewness. We extract the leading combinations with twist-2 helicity GPDs, $\tilde{H} + \tilde{G}_2$ and $\tilde{E} + \tilde{G}_1$. We also isolate $\tilde{G}_2$ and calculate the suppressed GPD $\tilde{G}_4$, while $\tilde{G}_3$ is confirmed to vanish at zero skewness. We also present several consistency checks, including the local limit of the twist-3 GPDs and the Burkhardt-Cottingham-type and Efremov-Teryaev-Leader-type sum rules.

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