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Nucleon axial, tensor, and scalar charges and σ -terms from lattice QCD

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We determine the nucleon axial, scalar and tensor charges at the continuum limit including all contributions from valence and sea quarks by analyzing three $N_f = 2 + 1 + 1$ twisted mass fermion ensembles with all quark masses tuned to approximately their physical values. We use the Akaike Information Criterion to evaluate systematic errors due to excited states and the continuum extrapolation. For the nucleon isovector axial charge we find $g_A^{u-d} = 1.250(24)$, in agreement with the experimental value. We compute the axial, tensor and scalar charges for each quark flavor, offering crucial input for the intrinsic spin in the nucleon and experimental searches for physics beyond the standard model. Moreover, we extract the nucleon σ -terms and find for the light quark content $\sigma_{\pi N} = 41.0(7.6)$ -MeV and for the strange $\sigma_s = 35(16)$ -MeV.

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