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Generalized form factors of the pion and kaon using twisted mass fermions

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We present an update on our lattice calculations of the Mellin moments of PDFs and GPDs for the pion and kaon, using momentum-boosted meson states. In particular, we focus on the calculation of the scalar and tensor local operators, as well as the vector operator with up to three-covariant derivatives. The corresponding matrix elements allow us to extract the scalar and tensor charges, as well as $\langle x^n \rangle$ with $n = 1, 2, 3$. In addition, we introduce momentum transfer between the initial and final meson state that leads to the scalar, vector, and tensor form factors, and the generalized form factors up to three covariant derivatives. The above results are obtained using two ensembles of maximally twisted mass fermions with clover improvement with two degenerate light, a strange, and a charm quark ($N_f = 2 + 1 + 1$) at lattice spacings of 0.093 fm and 0.081 fm. The pion mass of the ensembles is about 260 MeV. We study excited-states effects by analyzing four values of the source-sink time separation (1.12 - 1.67 fm). We also examine discretization and volume effects. The lattice data are renormalized non-perturbatively, and the results are presented in the $\overline{\text{MS}}$ scheme at a scale of 2 GeV.

Topical area

Structure of Hadrons and Nuclei

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