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Quark Wigner distributions Using Light-front Wave Functions

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The quasi-probabilistic Wigner distributions are the quantum mechanical analog of the classical phase-space distributions. We investigate quark Wigner distributions for a quark state dressed with a gluon, which can be thought of as a simple composite and relativistic spin-1/2 state with a gluonic degree of freedom. We calculate various polarization configurations, namely unpolarized, longitudinally polarized and transversely polarized quark and the target state using light-front wave functions in this model. At leading twist, one can define 16 quark Wigner distributions, however, we obtain only 8 independent non-zero Wigner distributions in our model. We compare our results with other model calculations.

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