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Wigner Distribution and Orbital Angular Momentum of Quarks

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Wigner distributions offer a multidimensional phase–space representation of quarks, simultaneously encoding spatial and momentum correlations. They form a natural bridge between generalized parton distributions (GPDs) and transverse–momentum–dependent distributions (TMDs), providing direct access to quark orbital angular momentum (OAM). In this talk, I will present the light-front formulation of quark Wigner distributions and discuss their relation to canonical and kinetic OAM through generalized transverse–momentum–dependent distributions (GTMDs). Model predictions, polarization-dependent correlations, and recent progress in lattice QCD extractions will be highlighted. These results shed light on the quark contributions to the nucleon spin and deepen our understanding of the three-dimensional structure of hadrons.

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