Argonne NATIONAL LABORATORY

PHY Seminar

Physics Division Seminar

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Lattice QCD Investigations of Quark Transverse Momentum in Hadrons

Host: Paul Reimer

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An ongoing program of evaluating transverse momentum-dependent parton distributions (TMDs) and their off-forward generalizations (GTMDs) within Lattice QCD is reviewed. These lattice calculations are based on a definition of TMDs through hadronic matrix elements of quark bilocal operators containing staple-shaped gauge connections. A parametrization of the matrix elements in terms of invariant amplitudes serves to cast them in the Lorentz frame preferred for a lattice calculation. Recent progress with respect to several challenges faced by such calculations is summarized. Results exhibited include data on the naively T-odd Sivers and Boer-Mulders effects, as well as the transversity and a worm-gear distribution. Generalizing to non-zero momentum transfer, i.e., the Fourier conjugate to impact parameter, allows one to correlate the latter with transverse momentum, and thus extract quark orbital angular momentum directly. Exploratory results on a continuous, gauge-invariant interpolation between the Ji and Jaffe-Manohar definitions of quark orbital angular momentum are presented.