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Anisotropic flow and the valence quark skeleton of hadrons

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We developed a formalism to study momentum anisotropy, in particular, the collective flow v_2, in the ultra-relativistic onium-onium scattering. We derived the impact-parameter dependent cross section up to the next-to-leading order in the eikonal approximation. With this formalism, we are able to interpret the origin and behavior of v_2 in the dilute limit, by investigating the elementary dipole-dipole scattering, $q\bar{q} + q\bar{q} \to g + X$. We calculated v_2 in the $\pi + \pi \to g + X$ process at a comprehensive coverage of impact parameter and transverse momentum. The valence sector light-front wave function of the π is obtained numerically from the Basis Light-Front Quantization, a non-perturbative light-front Hamiltonian approach, in a holographic basis. For comparison and as a complementary study, we also calculated v_2 in the $J/\psi + J/\psi \to g + X$ process. The J/ψ light-front wavefunction is built analytically from the phenomenological framework of Small-basis Light-Front Wavefunction. With this work, we have shown that momentum anisotropy can develop due to the interference of the valence quarks. This formalism is generic and can be applied to other hadrons and photons in the future.

Experiment/Theory

Theory/Phenomenology

Affiliation

Universtiy of Santiago de Compostela, Shandong University

Hauptautoren: LI, Meijian (University of Santiago de Compostela); QIAN, Wenyang (University of Santiago de Compostela); WU, Bin (Universidade de Santiago de Compostela); Prof. ZHANG, Hong (Shandong University)

Vortragende: LI, Meijian (University of Santiago de Compostela); Prof. ZHANG, Hong (Shandong University)

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