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Lepton angular distributions of Drell-Yan process in pQCD and a geometric approach

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Measuring lepton angular distributions of Drell-Yan process provides a powerful tool to explore the reaction mechanisms and related parton distributions. For example, the Lam-Tung relation has been proposed as a benchmark of the pQCD effect in Drell-Yan process. Nevertheless, the violation of Lam-Tung relation was observed in the measurements of fixed-target experiments. Precision data of gamma*/Z production from LHC collider experiments are recently available. Strong transverse-momentum and rapidity dependencies are observed for the angular coefficients. Violation of Lam-Tung relation appears in the large transverse-momentum regions.

In this talk, we present a comparison of data with the fixed-order pQCD calculations by which the baseline of pQCD effects is illustrated. Then using an intuitive geometric approach, we show that these dependencies can be readily understood. The violation of the Lam-Tung relation, appearing at large transverse-momentum region, is attributed to the presence of a "non-coplanarity"effect. This interpretation is consistent with the appearance of violation beyond LO-QCD effect in the pQCD calculation.

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