Introduction

We measured the inclusive jet cross section in proton-proton collisions at \( \sqrt{s} = 200 \) GeV using data collected with the STAR detector during RHIC Run-6. The jet cross section is an essential quantity to test the predictive power of Quantum Chromodynamics (QCD). We have made several improvements since the previous measurement from STAR [1]; the data size increased from 0.3 pb\(^{-1}\) to 5.4 pb\(^{-1}\); while the previous measurement used the Time Projection Chamber (TPC) and only the west side of the Barrel Electromagnetic Calorimeter (BEMC), which corresponds to the acceptance of \( 0 < \eta < 1 \), this measurement used the TPC and both sides of the BEMC (\(-1 < \eta < 1\)).

Jet Definition

Jets are sprays of particles which are moving approximately in the same direction from the collision point. We used the mid-point cone jet-finding algorithm with the cone radius 0.7 to define jets. Jets can be defined at three different levels: the parton level, the hadron level, and the detector level. The parton-level jets are outgoing partons of the hard interactions. The hadron-level jets are composed of products of hadronization and particle decay of the outgoing partons. They are predominantly hadrons, but may contain leptons and photons as well. The detector-level jets are detector responses to the hadron-level jets. They are made of energy deposited in BEMC towers and charged tracks reconstructed in the TPC.

Hadron-level Jet Yields

We estimated the hadron-level jet yields from the detector-level jet yields by inverting the response of the detector using a MC simulation. Consequently, the results have a tendency to be biased toward the predictions of the MC simulation. To minimize this bias, we used MC events which describe the data well.

Results

The results are in agreement with next-to-leading-order (NLO) perturbative QCD predictions which include corrections for non-perturbative effects. This agreement is evidence that the measured inclusive jet \( A_{LL} \) [1,2,3] can be interpreted in the framework of the QCD factorization. Furthermore, having a theoretical model that well describes the inclusive jet production is a crucial step toward dijet measurements.