

Measurement of J/ψ energy correlator in $p+p$ collisions at $\sqrt{s} = 500$ GeV at STAR

Dandan Shen (for the STAR Collaboration)
Shandong University

Abstract

1 The J/ψ meson, consisting of a charm quark and its antiquark, serves as an
2 exceptional testing ground of Quantum Chromodynamics (QCD). However, our
3 understanding of its underlying production mechanism remains incomplete. One
4 of the principal challenges lies in experimentally disentangling perturbative from
5 non-perturbative process contributions. The recently proposed J/ψ -energy corre-
6 lator[1] observable shows a remarkable ability to distinguish between soft and hard
7 processes, thereby establishing the observable as a potent tool for investigating
8 J/ψ production mechanism. Theoretical calculations [1] further indicate that the
9 J/ψ -energy correlator, observed within the J/ψ helicity frame, possesses a strong
10 discriminatory power against existing models.

11 In this talk, we will present the first measurement of the J/ψ -energy correlator
12 in hadron collisions. The study is conducted by reconstructing the J/ψ via its di-
13 electron decay channel at mid-rapidity ($|y| < 1$), within the transverse momentum
14 range of $5 < p_T < 10$ GeV/ c , in proton-proton collisions at $\sqrt{s_{\text{NN}}} = 500$ GeV
15 at RHIC-STAR experiment. By comparing J/ψ energy correlator with different
16 model calculations, we aim to provide a robust basis for distinguishing among the
17 existing J/ψ production models.

[1] An-Ping Chen, Xiaohui Liu, and Yan-Qing Ma. Shedding light on hadronization by quarkonium energy correlator. *Physical Review Letters*, 133(19):191901, 2024.