# Multiplicity dependence of $\Upsilon$ and $J/\psi$ production in $p$+$p$ collisions at $\sqrt{s} = 510$ GeV

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Studying quarkonium production allows us to probe the properties of strongly interacting matter, such as the quark-gluon plasma and the gluonic matter in heavy nuclei. While such a probe is widely used, a complete understanding of the quarkonium production mechanism is not yet achieved, even for $p$+$p$ collisions. Therefore, quarkonium studies in $p$+$p$ collisions are essential for advancing the field. Measuring the dependence of self-normalised quarkonium yield on self-normalised charged particle multiplicity can elucidate the interplay of involved soft- and hard-QCD processes. While proposed explanatory mechanisms, including multi-parton interactions, string screening, and gluon radiation, converge at low values of self-normalised multiplicity, their divergence at higher values emphasises the potential for new insights by extending experimental reach in multiplicity.

Herein we present measurements of $\Upsilon$(1S+2S+3S) and $J/\psi$ production, reconstructed through the dielectron decay channel, in $p$+$p$ collisions at $\sqrt{s} = 510$ GeV recorded by the STAR detector in 2017. Observables include transverse momentum and rapidity distributions, as well as the self-normalised $\Upsilon$ and $J/\psi$ yields as a function of self-normalised charged particle multiplicity. The presented analysis utilises a large sample of quarkonia with up to a factor of 10 increase in statistics compared to previous STAR measurements, therefore both improving precision and extending the reach into higher multiplicity.