Probing hadronic rescattering via K^{*0} resonance production at RHIC

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Abstract

Relativistic heavy-ion collisions provide a unique setting to investigate QCD matter under varied temperatures and densities. As the collision energy rises, the baryon chemical potential (μ_B) decreases, resulting in a mid-rapidity region rich in baryons at the lower Beam Energy Scan (BES) program energies and in mesons at top RHIC energies. Short-lived resonances like K^{*0} (lifetime $\sim$ 4.16 fm/c) are effective probes of the hadronic medium. As they primarily decay within the fireball, their decay products undergo in-medium effects like rescattering and regeneration, potentially modifying K^{*0} properties. However, due to change in the chemical composition of the system produced at low and high collision energies, distinct difference in the particle interaction can be expected. The measurement of K^{*0} meson over a broad collision energy range will help shed light on this phenomenon.

In this presentation, we will report precision measurements of K^{*0} mesons in isobar (Zr+Zr and Ru+Ru) collisions at $\sqrt{s_{NN}} = 200$ GeV and in Au+Au collisions at $\sqrt{s_{NN}}$ =7.7,11.5,14.6,19.6, and 27 GeV, using high-statistics STAR BES-II data. Results will include transverse momentum (p_T) spectra, yields (dN/dy), and mean transverse momentum ($\langle p_T \rangle$). Additionally, the K^{*0}/K ratio as a function of multiplicity across different systems and energies will be discussed, providing insights into the underlying physics of the hadronic medium.