Motivation

Quarkonium as an sQGP thermometer

- Due to Debye-screening, Quarkonium states are expected to dissociate at different temperatures in the sQGP, providing a “thermometer” for the medium [1]
- J/ψ suppression was suggested to be a smoking gun signature for QGP [2]. However, effects such as quark pair recombination (in the plasma) and feed-down, co-mover absorption (in the hadronic phase) complicate the interpretation of J/ψ measurements

Upsilon in RHIC: a cleaner probe

- Recombination and co-mover absorption are negligible at RHIC energies.
- Central 193 GeV U+U collisions provide the highest energy density at RHIC, where the strongest suppression of Y states are expected.
- Models with different formalisms and assumptions, however, give different predictions. Two popular examples are Refs. [3,4]. Precise data are needed to constrain the models.

Measurement

Experiment: Solenoidal Tracker at RHIC

- Reconstruction in the dielectron channel Y→e⁺e⁻ (BR~2%) at mid-rapidity (|y|<1.0), in 3 centrality and p_T bins.
- The Upsilon is not abundant: identification and background rejection is a challenge.

Acceptance and efficiency

- Geometrical acceptance, trigger, tracking, matching and cluster compactness cut efficiencies are from embedded simulation.
- E/p and dE/dx efficiencies are calculated using single identified electron samples.
- Around 2-3% of the Y are reconstructed.

Upsilon yield

Peak extraction

Combimatorial background: double exponential fit on like-sign e⁺e⁻ pairs

Because of scarcity of statistics, the peak parameters are fixed from embedded MC. The relative suppression of the excited states is taken from the 0-60% centrality data. This decreases random fluctuation, but shows up in the systematics.

Spectrum and x-section

Yield in current measurement

Average value: N_AA x AA

Acceptance efficiency

Yield from the Glauber model:

Reference yield

N_corr x AA

N_PP x pp

Conclusion

- As expected, data trend towards stronger suppression of Y(1S+2S+3S) with higher number of participants
- This indicates an increased dissociation of the Y states with energy density
- Potential model ‘A’ of Ref. [3], based on heavy quark free energy, is disfavored

References: