



UPSILON - HADRON AZIMUTHAL CORRELATIONS IN PYTHIA-SIMULATED PROTON-PROTON COLLISIONS AT 500 GeV

O. MEZHENSKA¹, J. BIELČÍK¹, L. KOSARZEWSKI²

*[1] Faculty of Nuclear Sciences and Physical
Engineering, Czech Technical University in
Prague, Prague 115 19, Czech Republic*

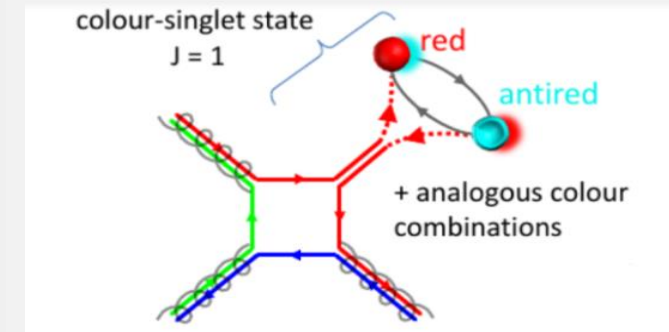
*[2] Ohio State University, Columbus, OH
43210, USA.*

*23rd ZIMÁNYI SCHOOL
WINTER WORKSHOP ON HEAVY ION PHYSICS
December 4-8, 2023
Budapest, Hungary*

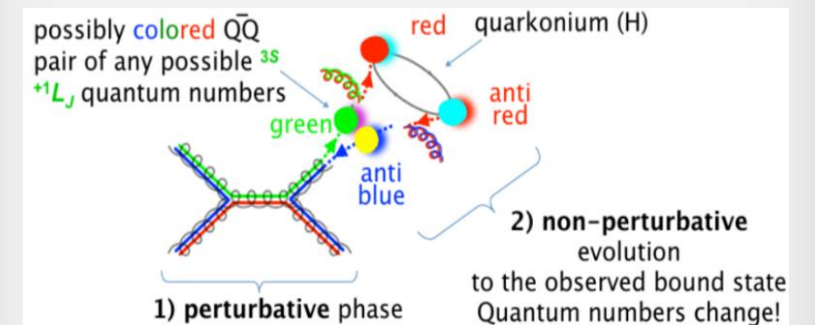
Introduction

- In heavy ion collisions, quarkonium can be used as a probe of quark-gluon plasma(QGP) properties.
- The production mechanism of heavy quarkonium is not fully understood by current models, e.g;
- **Physics Goal:** Investigate CS and CO Upsilon production mechanism by looking at Upsilon-hadron azimuthal correlations
- We employ the **PYTHIA event** generator to simulate pp collisions at 500 GeV to study **azimuthal angular correlation**.
- This study will be used as a reference for STAR measurements.
- Pion selection:
 - $p_T > 0.2$ GeV/c;
 - $|\eta| < 1$ (Central pseudorapidity range) or $2.4 < \eta < 4$ (Forward rapidity range) -> the double peak is expected [E. Basso et al., PoS, EPS-HEP2015, 191 (2016)].
- Upsilon selection:
 - directly produced Upsilon(1S) - no feed-down contribution;
 - dielectron decay ($\Upsilon(1S) \rightarrow e^-e^+$) only.

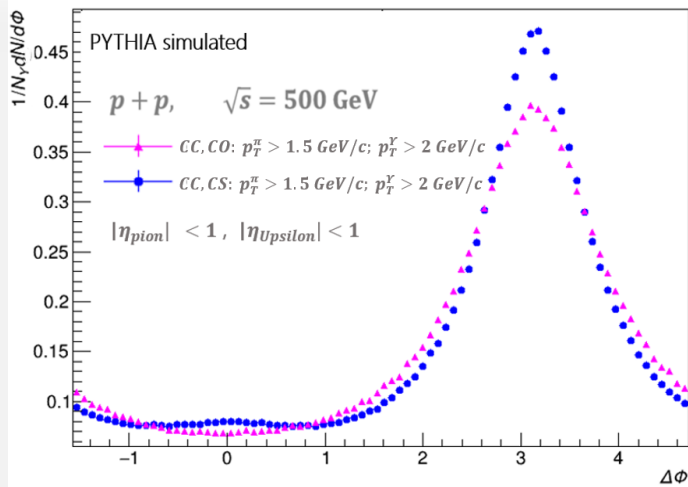
Color singlet (CS): $Q\bar{Q}$ produced directly in a color-neutral state in association with a gluon



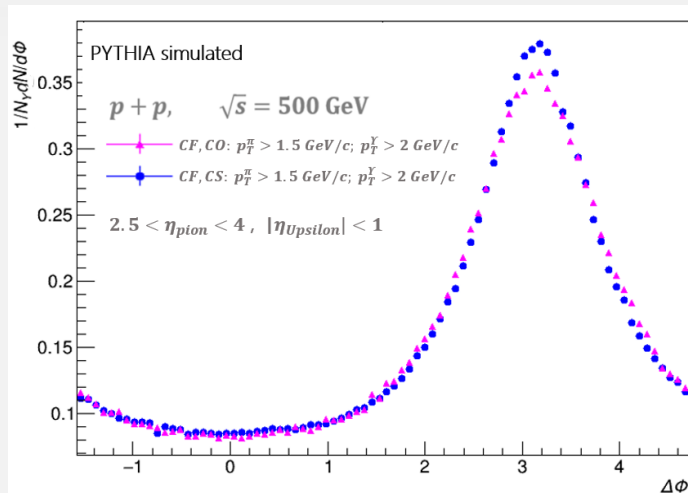
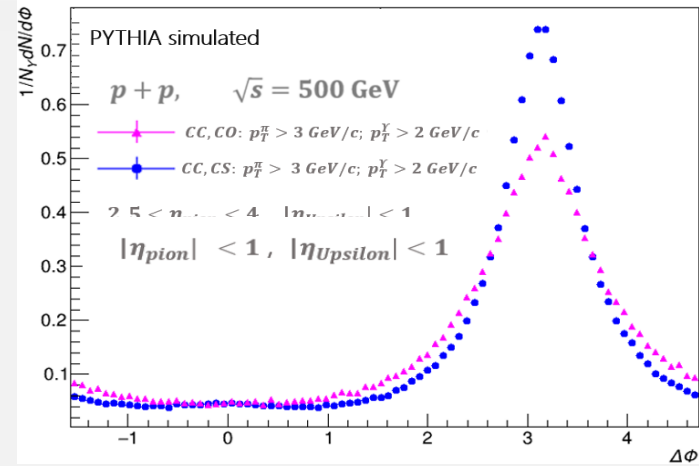
Color Octet (CO): $Q\bar{Q}$ can be produced in any colored or color-neutral state, with any quantum numbers ^+1L_J



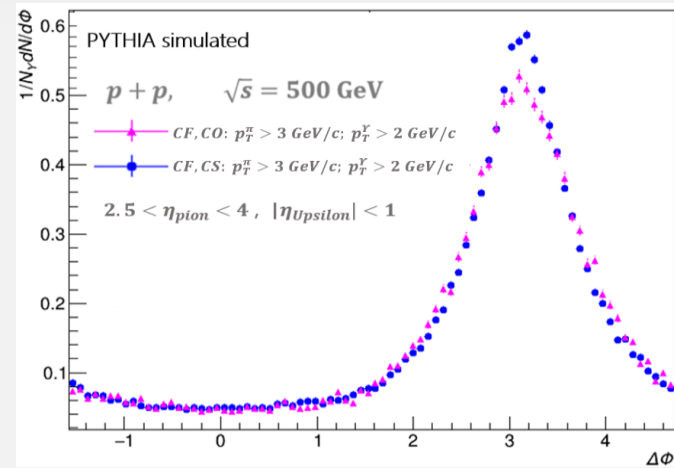
Results



Υ + hadron azimuthal correlations for CS and CO production mechanism for central – central pseudorapidities



Υ + hadron azimuthal correlations for CS and CO production mechanism for central – forward pseudorapidities.



Conclusions

- The Υ + hadron correlation is characterized by an away-side peak at $\Delta\Phi = \pi$.
- Upsilon – hadron azimuthal correlations were obtained for the Υ particles generated for both the CS and CO production mechanisms.
- Stronger correlation in CS case compared to the CO.
- Correlation with a double-peak structure hasn't been observed in the production of Υ particles via a color singlet state for pions located with forward pseudorapidities.
- The results of the simulation will serve as a basis for comparison with the experimental data gathered from the STAR experiment conducted at the RHIC in BNL

Thank you for attention!