

Double J/ψ Polarization as a Probe of Higher-twist Effects

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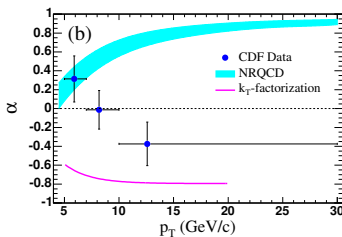
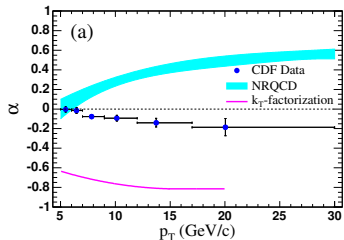
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Overview

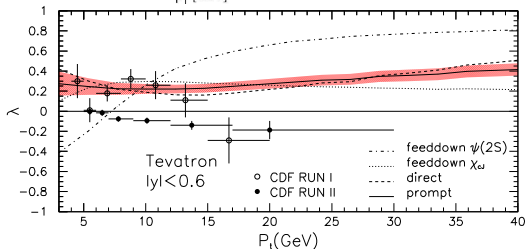
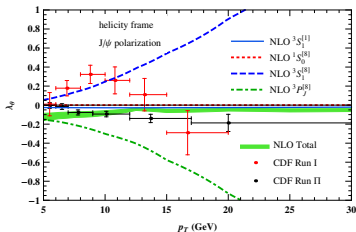
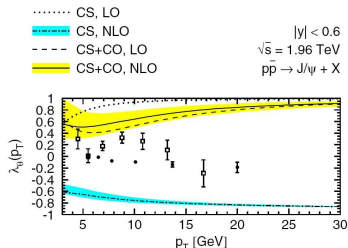
Overview

J/ψ Polarization Puzzle

- J/ψ and ψ' polarization measurement by CDF (CDF Collaboration, PRL 99, 132001 (2007))

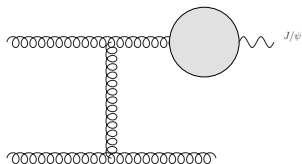


J/ψ Polarization at QCD NLO



Factorization Paradox

- Diagram for J/ψ polarization (${}^3S_1^{[8]}$)



- Paradox
 - Experiment: High multiplicity dominates (polarization should be random)
 - Theory: Low order dominates (polarization is determined by partonic processes)

Question

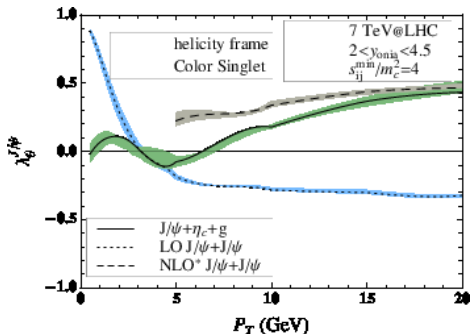
- Question: Is it possible to study the polarization of hadrons (also to test the factorization picture) through other observables?

Double J/ψ Polarization

Double J/ψ Polarization

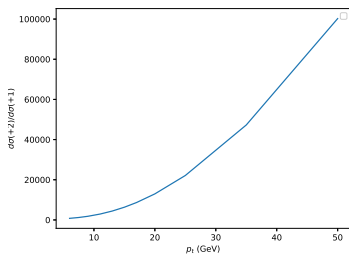
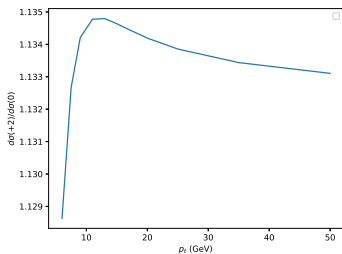
Double J/ψ Production

- Double J/ψ polarization might provide crucial information
- Polarization of one J/ψ which is produced associated with another ([PRL 111, 122001 \(2013\)](#))



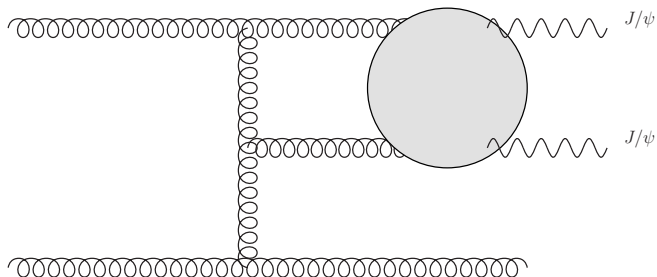
Associated J/ψ Polarization

- Double J/ψ polarization near threshold ($M_{J/\psi J/\psi} \approx 2M_{J/\psi}$)
- Total helicity ratio



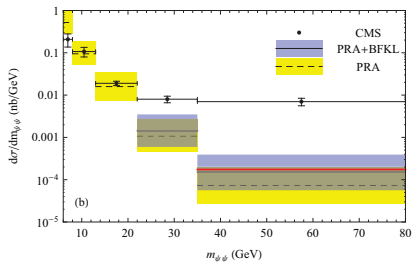
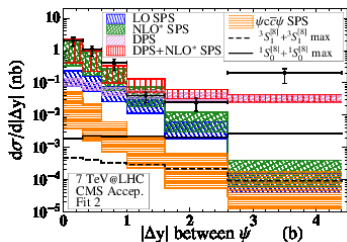
Fragmentation Analysis

- Double gluon fragmentation picture



Robustness

- Double J/ψ production in low invariant mass region



Conclusion

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Conclusion

- Double J/ψ (associated) polarization can provide strong test of factorization picture
- This test does not rely on quarkonium production mechanism (e.g. NRQCD)

Thanks

Thanks!