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## The complete twist-4 contributions to the SIDIS process $e^-N \rightarrow e^-q(jet)X$ at high energies

*Tuesday 17 April 2018 10:30 (20 minutes)*

The talk will present the complete twist-4 result for the semi-inclusive deeply inelastic scattering  $e^-N \rightarrow e^-qX$  with polarized electron and proton beams at the tree level of pQCD. The calculations have been carried out using the formalism obtained after collinear expansion where the multiple gluon scattering are taken into account and gauge links are obtained automatically in a systematical way. The results show in particular that there are twist-4 contributions to all the eight twist-2 structure functions for  $e^-N \rightarrow e^-hX$  that correspond to the eight twist-2 transverse momentum dependent parton distribution functions. Such higher twist effects could be very significant and therefore have important impacts on extracting these three-dimensional parton distribution functions from the asymmetry data on  $e^-N \rightarrow e^-hX$ . The talk will first show the formalism obtained using collinear expansion then present the results for the structure functions and the azimuthal asymmetries. At the end, the talk will present also a discussion of the results obtained and a suggestion of an approximate way for a rough estimation of such higher twist contributions.

### References

- [1] Shu-yi Wei, Yu-kun Song, Kai-bao Chen, Zuo-tang Liang, Twist-4 contributions to semi-inclusive deeply inelastic scatterings with polarized beam and target, Phys. Rev. D95, 074017 (2017).
- [2] Yu-kun Song, Jian-hua Gao, Zuo-tang Liang and Xin-Nian Wang, Azimuthal asymmetries in semi-inclusive DIS with polarized beam and/or target and their nuclear dependences, Phys. Rev. D89, 014005 (2014).
- [3] Zuo-tang and Xin-Nian Wang, Azimuthal and single spin asymmetry in deep-inelastic lepton-nucleon scattering, Phys. Rev. D75, 094002 (2007).

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