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General heavy-flavor mass scheme for charged-current DIS at NNLO and beyond

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Incompleteness in current knowledge of neutrino interactions with nuclear matter imposes a primary limitation in searches for leptonic CP violation carried out at long-baseline neutrino experiments like DUNE. In this talk, we summarize a recent computation that elevates the theoretical accuracy to next-to-next-to-leading order in QCD for charged-current DIS processes relevant for ongoing and future neutrino programs as well as the Electron-Ion Collider. Mass-dependent quark contributions are consistently included across a wide range of momentum transfers in the simplified-ACOT-χ general-mass scheme. When appropriate, we further include next-to-next-to-next-to-leading order corrections in the zero-mass scheme. We highlight theoretical predictions for neutrino experiments and the EIC, demonstrating that our approach reduces perturbative uncertainties to $\sim 1\%$; this level of precision will be valuable for achieving target sensitivities at future charged-current DIS measurements to signatures of leptonic mixing, CP violation, and the partonic substructure of hadrons and nuclei.

Submitted on behalf of a Collaboration?

No

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