First double-differential measurement of kinematic imbalance in neutrino interactions with the MicroBooNE detector

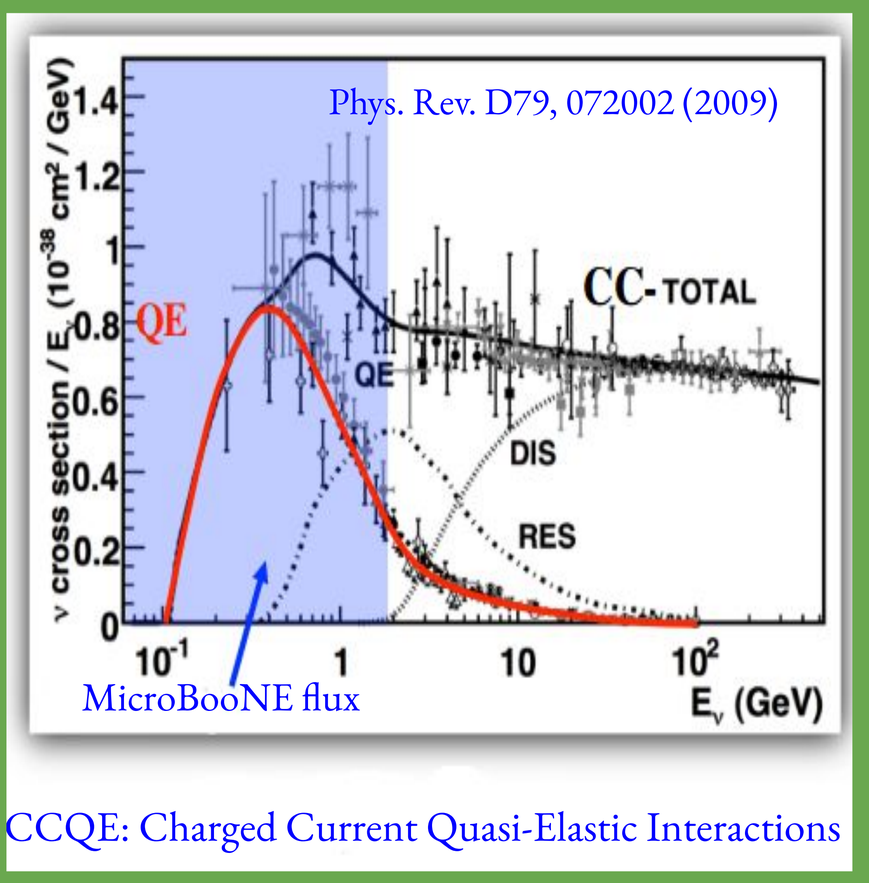
A.Papadopoulou on behalf of the MicroBooNE collaboration

arXiv: 2301.03706 (accepted to PRL)
arXiv:2301.03700 (accepted to PRD)

Why charged-current quasi-elastic interactions?
·Simplest nuclear process with two particles in the final state
·Dominant at low energies relevant for MicroBooNE

The transverse missing momentum (δp_T) and its angular orientation ($\delta\alpha_T$) are sensitive to the nuclear ground state and the final state interactions (FSI)

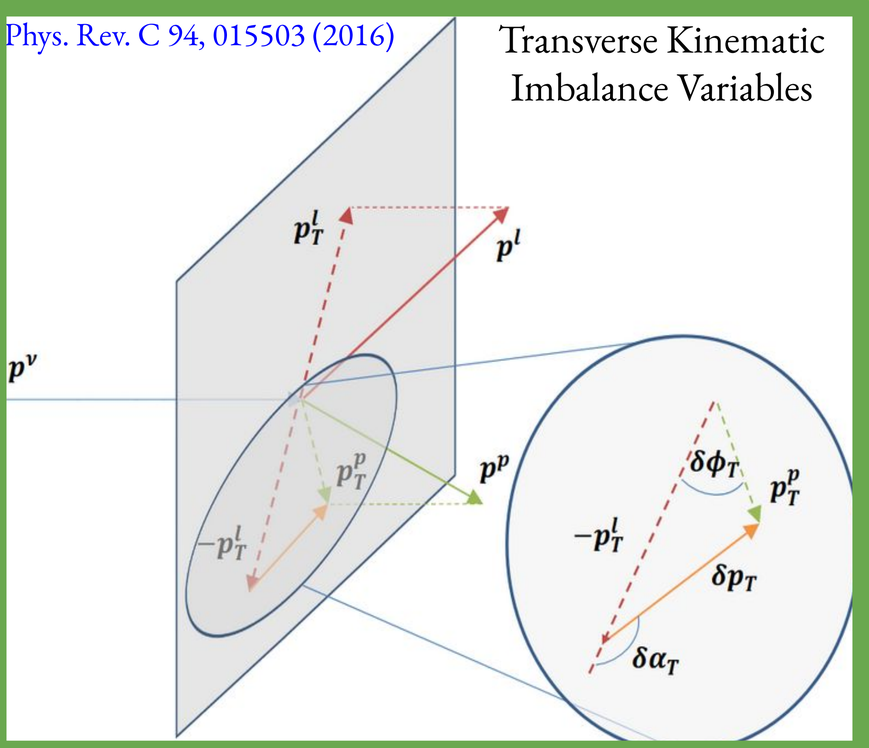
Multi-differential results in both variables simultaneously reveal further details



CCQE: Charged Current Quasi-Elastic Interactions

· Results in δp_T with low $\delta\alpha_T$ include minimal FSI effects and allow for nuclear ground state studies
· Results in δp_T with high $\delta\alpha_T$ are ideal to study FSI effects

· Results in $\delta\alpha_T$ with low δp_T illustrate an isotropic behavior indicative of quasi-elastic dominance
· Results in $\delta\alpha_T$ with high δp_T show a pronounced asymmetric behavior associated with strong FSI effects



First multi-differential measurement of neutrino-argon cross sections for transverse kinematic imbalance observables using quasielasticlike events with a single muon ($0.1 < P_\mu < 1.2$ GeV/c), a single proton ($0.3 < P_p < 1$ GeV/c), no neutral mesons, and no charged pions ($P_\pi > 70$ MeV/c)