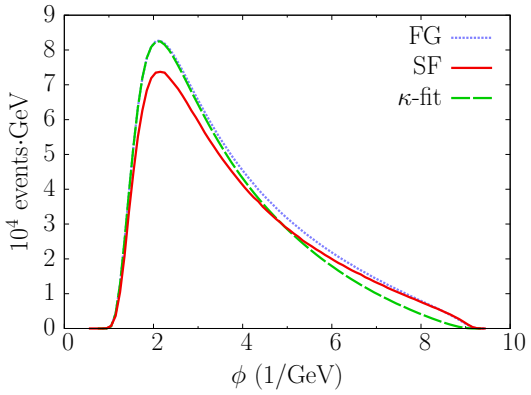

FIG. 8. (color online). Same as in Fig. 7, but plotted as a function of the variable ϕ, defined in Eq. (21).

significant fraction of the observed CCQE events, independent of neutrino energy.

The failure of the IA is clearly exposed by the comparison between the full nuclear matter response and the IA result, discussed in Section III, showing that at momentum transfers $|\mathbf{q}| < 2p_F$ the contributions of more complex reaction mechanisms become important, or even dominant.

While our calculations focus on the effects of factorization of the final state, it must be pointed out that different mechanisms should also be considered. For example, meson exchange currents, which are long known to provide appreciable contributions to the electron-nucleus cross section at the quasi elastic peak and beyond, are also expected to contribute to the background in the case of neutrino-nucleus scattering.

The development of a consistent treatment of scattering processes at low and high momentum transfer within a formalism easily implementable in MC simulation, while being feasible, involves severe difficulties, and will require a significant effort in the years to come. On the other hand, we believe that introducing *ad hoc* modifications of the available models, lacking a sound physical interpretation, will not help to clarify the origin of the disagreement between theoretical predictions and observations.

Among the issues related to data analysis, identification of CCQE processes appears to be prominent. The discussion of Section IV A, based on the results of MC simulations, indicates that it may be at least partly responsible for the disagreement between the values of the axial mass recently reported by K2K and MiniBooNE and those obtained from different measurements.

Improving event identification will require a more realistic description of FSI, combining the intranuclear cascade approach with a fully realistic description of the target nucleus, and including the relevant inelastic channels leading to pion production. The key elements needed to pursue this project, i.e. in-medium nucleon and pion cross sections and nuclear wave functions including correlation effects, can be extracted from the available data and from theoretical results of accurate many-body calculations.

Finally, we suggest that data analysis might be improved using a new kinematical variable which, unlike $Q^2_{\rm rec}$, can be defined in terms of measured quantities only. In addition, using the new variable would allow one to reject both the region of low statistics and the region where effects beyond the IA are expected to be important with a single cut. As a result, the extraction of the axial mass would be based on higher event statistics.

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