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Comment on "Missing-Energy Dependence of the Separated Response Functions for the Reaction $^{12}\text{C}(e,e'p)$ "

In a recent Letter, Ulmer *et al.*¹ presented the results of a longitudinal-transverse (L/T) separation of the reaction $^{12}\text{C}(e,e'p)$ in the quasielastic region. Their main result is a large reduction of the L/T ratio with respect to the impulse approximation for s -shell knockout. We agree on this point as we recently found a similar behavior in another $^{12}\text{C}(e,e'p)$ experiment using a different method.² There are, however, two other points we want to comment on.

The first concerns the occupation numbers obtained by Ulmer *et al.*¹ for proton knockout from ^{12}C . They compare the integrated yield of each shell in a limited range for $\mathbf{p}_r$ with a distorted-wave impulse-approximation (DWIA) calculation of that same yield, finding (on average) $4.05 \pm 0.07 \pm 0.65$ for the p shell and $1.29 \pm 0.03 \pm 0.19$ for the s shell. Now the determination of spectroscopic factors is strongly dependent on the assumed bound-state wave function (BSWF) and final-state interaction (FSI), unless the momentum distribution has been measured over a large range of $\mathbf{p}_r$. In the latter case the parameters of the BSWF are constrained by the shape of the momentum distribution and the FSI treatment can be checked.^{3,4} Since the data of Ulmer *et al.*¹ were obtained in a relatively small range of $\mathbf{p}_r$ centered around values of $\mathbf{p}_r$ close to 0 MeV/c, such checks could not be carried out, which introduces additional uncertainties. It should also be remarked that the actual FSI calculation employed in Ref. 1 is of a relatively simple nature. The calculation is based⁵ on a (factorized) WKB treatment of the FSI with use of a less favorable⁴ optical potential and a harmonic-oscillator BSWF. Considering the aforementioned uncertainties, we believe that the occupation numbers obtained by Ulmer *et al.*¹ do not contradict the much more accurate value ($2.26 \pm 0.17 \pm 0.23$) for the p shell obtained in Ref. 4 from momentum distributions measured in a large $\mathbf{p}_r$ range.

Our second comment concerns the L/T ratio reported in Ref. 1 for the p shell. Their result 0.89 ± 0.21 is consistent with the value 0.67 ± 0.08 obtained from an earlier experiment⁶ carried out at NIKHEF-K. (The error 0.22 mentioned in Ref. 1 for our measurement corresponds to the error of only one of the measured data

points in this kinematical region.) The quoted NIKHEF result was not corrected for differences in the distortion between the longitudinal and transverse part of the cross section. In Ref. 7 this correction is calculated by means of an *unfactorized* DWIA code. In the notation of Ref. 1 this yields for the corrected L/T ratio 0.73 ± 0.08 . Ulmer *et al.*¹ claim that the effects of the FSI have been taken into account in their result. However, the FSI calculation presented in Ref. 1 is based on a *factorized* DWIA approach.⁵ In this approach the distortions of the longitudinal and transverse response functions are the same implying that the FSI effects cancel in an L/T ratio.⁶ Therefore only an unfactorized DWIA calculation can be used to evaluate the FSI effects in an L/T separation.

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