Errata

Constraints on the low-energy $E1$ cross section of $^{12}$C$(\alpha, \gamma)^{16}$O from the $\beta$-delayed $\alpha$ spectrum of $^{16}$N

R. E. Azuma, L. Buchmann, F. C. Barker, C. A. Barnes, J. M. D’Auria, M. Dombsky,
U. Giesen, K. P. Jackson, J. D. King, R. G. Korteling, P. McNeely, J. Powell,
G. Roy, J. Vincent, T. R. Wang, S. S. M. Wong, and P. R. Wrean

[S0556-2813(97)01109-6]

PACS number(s): 95.30.Cq, 23.60.+e, 27.20.+n, 99.10.+g

The paper cited above omitted the explanation of our energy calibration of the $^{16}$N $\beta$-delayed $\alpha$ spectrum sent to us by Professor H. Wäffler [1]. Although this spectrum was not used in any way in our experiment or in its analysis, we showed a comparison of this spectrum (referred to below for brevity as the Mainz spectrum) with our $^{12}$C-$\alpha$-coincidence $\alpha$ spectrum in Fig. 15 of our paper. We present here a clarification of the calibration procedure.

The Mainz spectrum consists of a quarter of the data on the basis of which the Mainz group first reported [2] the detection of the parity-violating group of $\alpha$ particles from the $2^-$ excited state of $^{16}$O, now known to be at $E_\alpha=8.8719\pm0.0005$ MeV [3]. The apparatus for this experiment was described in a paper published a year earlier, which also reported the observation of a narrow $\alpha$ group resulting from the first-forbidden $^{16}$N $\beta$ decay to the $2^+$ $^{16}$O state [4], now known to be at $E_\alpha=9.8445\pm0.0005$ MeV [3]. A third paper describes further work by the Mainz group, with improved apparatus, and $\sim4$ times the number of $\alpha$ particles detected for the 1970 letter, establishing the parity-violating $\alpha$ width of the $2^-$ state more precisely [5].

The location of the $\alpha$ groups from the $2^-$ and $2^+$ $^{16}$O states, with energies of $1282.3\pm0.5$ and $2011.5\pm0.6$ keV, respectively, and the identification by Dr. Wäffler of the position in the spectrum corresponding to the $\alpha$ group from the $2^-$ $^{16}$O state, made it possible for us to calibrate the true $E_\alpha$ energy scale for the Mainz spectrum. As noted in our paper, our coincidence $\alpha$ spectrum was calibrated independently by the $\beta$-delayed $\alpha$ particles from $^{18}$N and $^{20}$Na, in exactly the same experimental geometry as our measurement of the $^{16}$N $\alpha$ spectrum. It is clear from Fig. 15 of our paper that the two spectra agree on the high-energy side of the main peak well within the stated accuracy of either calibration, but the Mainz spectrum shows evidence of an enhancement on the low-energy side of the peak that is likely to be the result of the low-energy tail of the system response function. In the case of our experiment, it was possible to remove this tail of degraded pulses because of the two-dimensional, coincidence data acquisition and the good energy resolution of the experiment.

We note that a similar calibration of the Mainz spectrum by the $2^-$ $^{16}$O states was made by F. C. Barker more than 25 years ago [6], and this calibrated spectrum has been employed in several subsequent publications [7–10].

We thank R. H. France III and M. Gai for pointing out the omission of the procedure for calibrating the Mainz spectrum.