Comment on "Reconciling Coulomb Dissociation and Radiative Capture Measurements"

Esbensen, Bertsch, and Snover [1] suggest that higher order Coulomb Interactions and an $E2$ correction are important to Coulomb dissociation (CD) of ^{8}B [1]. It is claimed that "S_{17} values extracted from CD data have a significantly steeper slope as a function of $E_{\rm rel}$, the relative energy of the proton and the ^{7}Be fragment, than the direct result." Hence they reanalyze CD data and claim that corrections of the original analyses yield slope values in better agreement with direct capture (DC) data.

Specifically they calculate a very large (20%) correction for the RIKEN2 [2] data at the lowest energy and suggest a substantial (50%) correction of the b-slope parameter. The corrections of other CD data are small and in some case(s) vanish due to fortuitous cancellation [1]. They imply for the RIKEN2 data "slope corrections similar in magnitude to the 0.25 MeV^{-1} average slope difference between CD and direct results as shown in Fig. 19" of [3]. Note that here they refer to the b-slope fit parameter (in units of MeV^{-1}) used in Ref. [3], $S_{17}(E) = a(1 + bE)$, and not the usual physical slope $S' = dS/dE$.

In Fig. 1 we show the RIKEN2 S_{17} data [2] using analysis employing first order Coulomb dipole ($E1$) interaction only, and compare it, for example, to the Seattle data [3] on DC. These data were also compared to DC data in [4] from which it is clear that the slope of the RIKEN2 data is in agreement with DC data. Kikuchi *et al.* on the other hand [2] have already emphasized an agreement with the DC data available at that time. We observe in Fig. 1 good agreement between the slope of the published RIKEN2 CD data above 300 keV ($S' = 6.4 \pm 1.5$ eV b/MeV and $b = 0.4 \pm 0.1$ MeV^{-1}) and the slope of the Seattle DC data ($S' = 5.8 \pm 0.6$ eV b/MeV and $b = 0.32 \pm 0.02$ MeV^{-1}).

From Fig. 1 it is also clear that the different b slope plotted in Fig. 19 of [3] is due to their use of a subset of the RIKEN2 data and a neglect of the systematic error (8.6%) discussed by Kikuchi *et al.* [2]. The five data points shown in Fig. 1 (for $E_{\rm rel} = 375$, 625, 875, 1125, and 1375 keV, $S_{17} = 17.48(171)$, 19.84(108), 21.44(105), 22.52(230), 24.13(164), eV b, respectively) include the (8.6%) systematic error discussed in [2] or a slightly smaller systematic error. In Ref. [2] a less refined systematic error with only one value (8.6%) is quoted. No systematic errors were included in the fit of [3]. As discussed in [2] these systematic errors are due mainly to the subtraction of the background from the dissociation in the helium bag which varies among data points; see Fig. 1 of our Letter publication [2]. Such a (varying) systematic error must be considered for each data point separately (in the same way that one considers background subtracted from a peak in a spectrum).

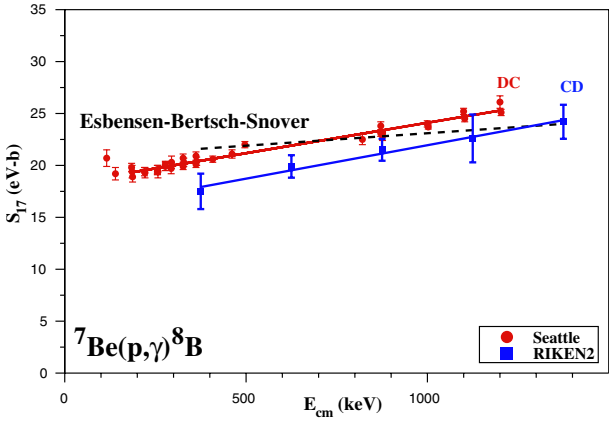

FIG. 1 (color online). Extracted S_{17} from the RIKEN2 CD data [2] using first order electric dipole interaction as shown in [4], compared to the DC capture data published by the Seattle group [3]. The shown RIKEN2 data include systematic uncertainties (equal or slightly smaller) than published [2].

For the RIKEN2 [2] published data ($b = 0.4 \pm 0.1$ MeV^{-1}) the implied correction of 0.25 MeV^{-1} [1], yields $b = 0.15 \pm 0.1$ MeV^{-1}, more than a factor of 2 smaller than the so-called average b slope of DC data [3]. The corrected RIKEN2 data are not shown but discussed in Ref. [1], where it is stated that S_{17} is increased by 20% at low energy and slightly smaller at $E_{\rm rel} \approx 1.375$ MeV. In Fig. 1 we show the so-described slope with a dashed line. The corrected slope is smaller than the slope of DC (e.g., Seattle) data. The proposed corrections [1], in fact, lead to a disagreement and do not reconcile the slopes of the RIKEN2 CD and DC data.

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[1] H. Esbensen, G. F. Bertsch, and K. Snover, Phys. Rev. Lett. **94**, 042502 (2005).
[2] T. Kikuchi *et al.*, Phys. Lett. B **391**, 261 (1997); Eur. Phys. J. A **3**, 213 (1998).
[3] A. R. Junghans *et al.*, Phys. Rev. C **68**, 065803 (2003).
[4] F. Schumann *et al.*, Phys. Rev. Lett. **90**, 232501 (2003).

