Improved determination of the astrophysical S(0) factor of the $^{15}N(p,\alpha)^{12}C$ reaction

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We present new improved R matrix fits of direct data and indirect Trojan Horse data for the $^{15}N(p,\alpha)^{12}C$ reaction and provide a more accurate recommended value of S(0) = 73.0 ± 5.0 MeVb from direct Redder data [1] and S(0) = 70.0 ± 13.5 MeVb from the Trojan Horse data [2]. We also analyze a recent fit by Barker [3] and demonstrate that, when all the uncertainties are taken into account, our results overlap with his S(0)= 82 ±10 MeVb obtained from the fit of the Redder data [1] and 79 ± 13 MeVb from the fit to the direct data [4]. We also provide a fit of the Trojan Horse data that properly takes into account finite residual energy resolution of the data. In Fig. 1 the S(0) factors obtained by extrapolation of direct measurements [1,4,5] are compared with the measured indirect value [2] and the full R matrix extrapolation [3], and with the recommended values in the most recent compilations, namely NACRE [6] and Adelberger *et al.* [7]. Fig. 1 demonstrates that all the experimental values are in agreement with each other within the experimental uncertainties, resulting in S(0)= 62 MeVb [5], S(0) = 78 ±13 MeVb [4], S(0) = 65 ± 4.0 MeVb [1] and S(0) = 68 ± 11 MeVb [2]. The compilations by NACRE [6] and Adelberger *et al.* [7] recommended S(0) = 65±7 MeVb and S(0) = 67.5 ± 4.0 MeVb, correspondingly, relying on the results from [4]. The paper has been published to Phys. Rev. C **80**, 012801 (R) (2009).

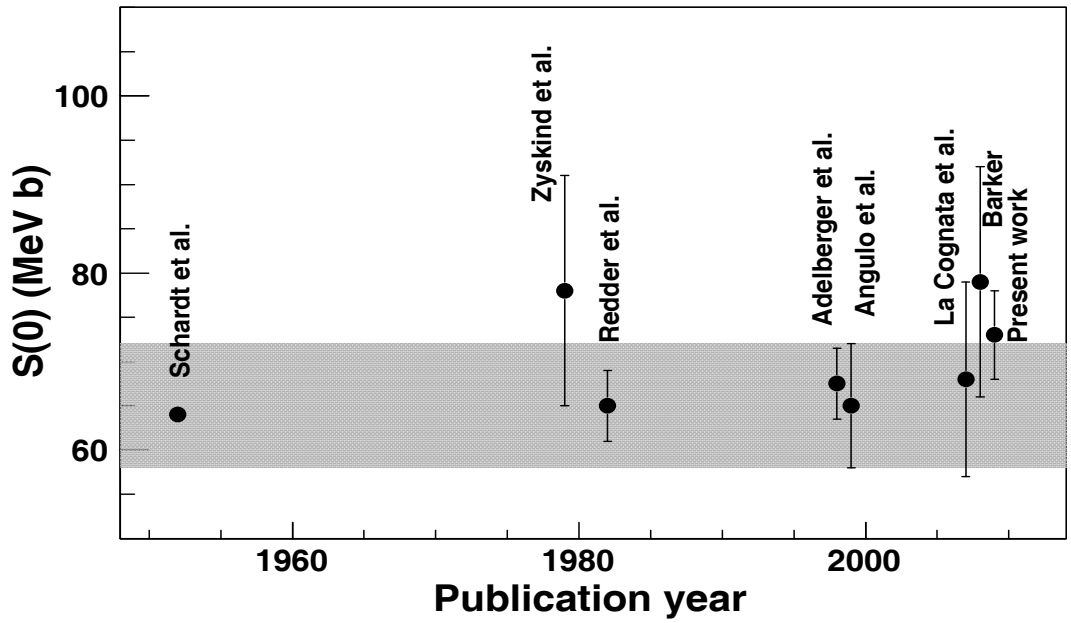

FIG. 1. Summary of the available astrophysical S(0) factors of the $^{15}N(p,\alpha)^{12}C$ reaction.

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