Erratum: Improving the feasibility of economical proton-boron-11 fusion via alpha channeling with a hybrid fast and thermal proton scheme [Phys. Rev. E 106, 055215 (2022)]

Ian E. Ochs, Elijah J. Kolmes, Mikhail E. Mlodik, Tal Rubin, and Nathaniel J. Fisch

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In Eq. (16) of this paper, there was a slight error in the expression for bremsstrahlung power from a thermal electron plasma. The equation should read

$$P_B \approx 7.56 \times 10^{-11} n_e^2 x^{1/2} [Z_{\text{eff}}(1 + 1.78x^{1.34}) + 2.12x(1 + 1.1x + x^2 - 1.25x^{2.5})] \text{ eV cm}^3/\text{s}. \tag{16}$$

In the original paper, the x^2 term in the second set of parentheses was missing.

With the change in bremsstrahlung power, agreement with Putvinski [1] requires the kinetic fusion enhancement factor from Appendix B [discussed after Eq. (B12)] to be slightly modified, so that ϕ_k is a piecewise linear function of T_p, going from $\phi_k(0 \text{ keV}) = 1.178$ to $\phi_k(700 \text{ keV}) = 1$, and then $\phi_k(T_p > 700 \text{ keV}) = 1$ thereafter.

Under this change, the figures are mostly visually the same, and all the reported numbers with regard to the change in parameters (with the exception of a few noted below) are the same to the reported accuracy. The only noticeable change is that, for the thermonuclear-like cases without alpha channeling, the optimal proton temperature actually drops slightly to ∼290 keV, with a corresponding drop of electron temperature from 163 to 159 keV. This change affects Fig. 4 in the original paper, which is reprinted here. This new optimum temperature actually reflects the finer-scale interpolators used in the current version of the code, but has no noticeable impact on the final values of P_L or τ_E^*, due to the fairly broad (∼10 keV) region of comparable performance near the optimal point.

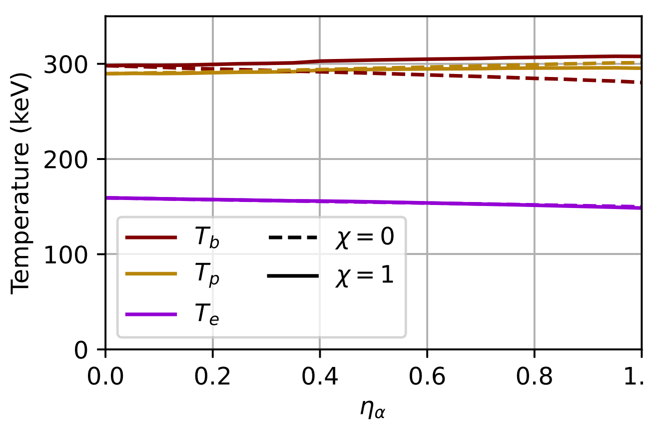

FIG. 4. Temperature of different species with changing fractions of fusion power η_α channeled to protons. The protons heat up, while the electrons cool. For $\chi = 0$, the boron cools with increasing η_α, while for $\chi = 1$, the boron very slightly heats.

The change also introduces a small modification to the fit function in Eq. (26), which changes very slightly to

$$\tau_E^* = \frac{\tau_{E0}^*}{1 + \eta_\alpha^{1.24}(1.78 + 3.86\chi^{1.14})}, \tag{26}$$

where $\tau_{E0}^* = 459$ s is the value of τ_E^* at $\eta_\alpha = 0$.

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[1] S. Putvinski, D. Ryutov, and P. Yushmanov, Nucl. Fusion **59**, 076018 (2019).

