Erratum: Second-order equation of state with the full Skyrme interaction: Toward new effective interactions for beyond-mean-field models [Phys. Rev. C **85, 044323 (2012)]**

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Some aspects of the presented formal derivation were not correct. Equations (6), (7), and (11) (for the neutron-neutron, proton-proton, and neutron-proton contributions) are correct in the case of symmetric matter and of a simple $t_0 - t_3$ model with only central terms and without spin or velocity dependence (see, e.g., p. 217 of Ref. [1]). The more general procedure to evaluate the second-order correction should, however, be amended. This error affects all the subsequent equations, as well as the detailed expressions that appear on pages 4 and 5 and in the Appendices. A signature is the fact that even-odd partial waves of the interaction mix at second order due to this error, whereas they should not mix. We provide all the correct formulas in Ref. [2]. Equation (3) is valid here for a general interaction. The new equations that correspond to the analytic results for symmetric and pure neutron matter are provided in Secs. II A 1 and II A 2 of Ref. [2], respectively. It was not possible to find analytic expressions that amend those obtained in the paper, for the case of matter having a general asymmetry. Reference [2] includes, nevertheless, correct numerical results for this case.

Due to the same reason, the tables and figures of the paper are also not fully correct. There is a clear correspondence between tables and figures of the paper and tables and figures of Ref. [2]: Fig. 2 is to be replaced by Fig. 1 of [2], and so on. This correspondence is clear from the captions.

Despite the extensive corrections, the general conclusions of the paper are not changed. It is possible to generate sets of parameters for regularized Skyrme-type interactions, for different values of the cutoff on the transferred momentum q , that provide reasonable second-order equations of state (EOS) for symmetric, asymmetric, and pure neutron matter. In particular, the qualitative statements that the refit of the parameters is possible for an interaction that includes the full velocity dependence ($t_1 - t_2$ terms in addition to $t_0 - t_3$), and that in this refit the three EOSs can be adjusted simultaneously, do remain true.

[1] R. D. Mattuck, *A Guide to Feynman Diagrams in the Many-Body Problem* (Dover, New York, 1967).

[2] C. J. Yang, M. Grasso, X. Roca-Maza, G. Colò, and K. Moghrabi, *Phys. Rev. C* **94**, 034311 (2016).