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The effect of the temperature on the Gamow-Teller excitations in nuclei

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The nuclear weak interaction processes (beta decay, electron capture, neutrino-nucleus scattering etc.,) is known to play an important role in the supernovae evolution and formation of the chemical elements. The calculation of these processes necessitates accurate knowledge on the spin-isospin excitations as well as the ground state properties of nuclei [1,2]. In this framework, the proton-neutron quasiparticle random phase approximation (PNQRPA) based on the relativistic energy density functionals provides a consistent and reliable approach for the description of the spin-isospin excitations over the nuclide map [3-5]. In addition, it has been known that the nuclear weak interaction processes in stellar environments mainly take place at finite temperatures. Therefore, the current theoretical models should be extended to include the temperature and pairing effects simultaneously in order to obtain more reliable results.
In this work, the relativistic proton-neutron QRPA with density dependent meson-nucleon couplings is extended to include temperature effects. The pairing correlations are taken into account in the BCS scheme. We performed calculations using DD-ME2 functional for the Gamow-Teller excitations in open-shell nuclei. The effect of the temperature on the strength functions and excitation energies of the Gamow-Teller excitations is investigated for the selected nuclei. In addition, the interplay between the temperature and pairing effects is discussed at low temperatures, where both effects are relevant.

[1] F. Osterfeld, Rev. Mod. Phys. 64, 491 (1992).
[2] N. Paar et al., Rep. Prog. Phys. 70, 691 (2007).
[3] N. Paar, T. Nikšić, D. Vretenar, and P. Ring, Phys. Rev. C 69, 054303 (2004).
[4] Y. F. Niu, N. Paar, D. Vretenar, and J. Meng, Phys. Rev. C 83, 045807 (2011).
[5] T. Nikšić, T. Marketin, D. Vretenar, N. Paar, P. Ring, Phys. Rev. C 71, 014308 (2005).

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