Neutron-proton temperature-dependent pairing effects

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Neutron-proton (np) temperature-dependent pairing gap equations have been established in the isovector case using a path integral approach. These equations generalise the BCS ones for the pairing between like-particles at finite temperature.

The various pairing gap parameters (i.e. Δ_n, Δ_p and Δ_{np}) have been studied as a function of the temperature within the one-level model using the parameters of refs [1,2], that is: a total degeneracy of pairs Ω=11, N=6 neutrons, Z=4 protons and pairing-strengths G_n=G_p=0.242. The corresponding results are given in figure 1 for G_{np}=0.75 G_p. It appears that Δ_{np} has a behaviour analogous to those of Δ_n and Δ_p in the pairing between like-particles case. In particular, there exists a critical temperature beyond which the np pairing effects vanish. Moreover the isovector pairing effects remain beyond the critical temperature that corresponds to the pairing between like-particles.

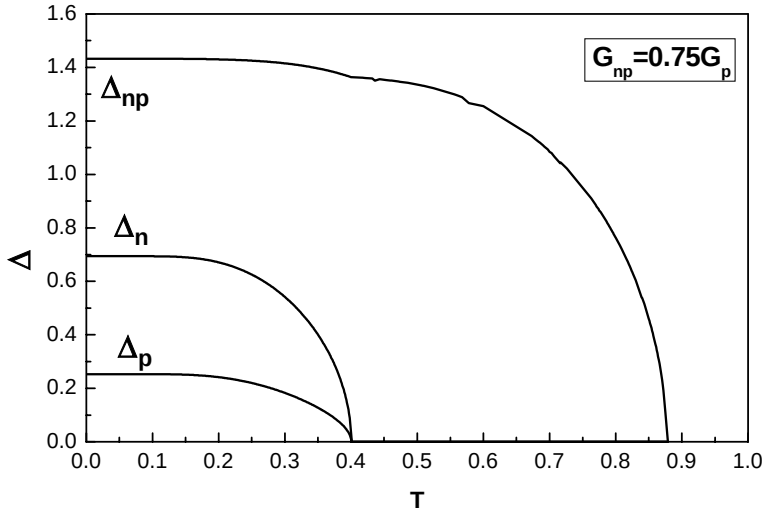

Figure 1: Variations of the pairing parameters
Δ_n, Δ_p and Δ_{np} as a function of the temperature.

[1] O. Civitarese and M. Reboiro, Phys Rev. **C56**, 1179 (1997)
[2] D. Mokhtari, N.H. Allal and M. Fellah, Heav. Ion Phys. **19**, 187 (2004).