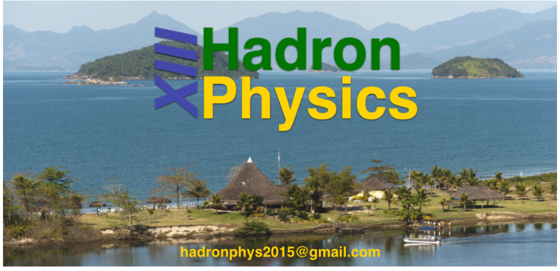

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Dirac-Hartee-Bogoliubov calculation for spherical and deformed hot nuclei

We present relativistic mean field (RMF) calculations in the Dirac-Hartree-Bogoliubov (DHB) formalism for hot nuclei considering not only the self-consistent temperature and density dependence of the relativistic interaction, but also the vapour phase to take in account the unbound nucleon states. The temperature dependence of the pairing gaps, nuclear deformation, radii, binding energies, entropy and caloric curves of spherical and deformed nuclei is obtained where the temperature is introduced in the DHB approximation by using the Matsubara formalism. We do not include the Fock term and use a zero-range approximation to the relativistic pairing interaction to calculate proton–proton and neutron–neutron pairing gaps and energies. A vapor subtraction procedure is used to account for unbound states and to remove long range Coulomb repulsion between the hot nucleus and the gas as well as the contribution of the external nucleon gas. We show that n–n pairing gaps in the $^1S_0$ channel vanish for low temperatures in the range $T_{c^p} = 0.4 - 1.0$ MeV both for spherical nuclei such as ^{90}Zr and ^{140}Ce and the deformed nuclei ^{150}Sm and ^{168}Er. Thus, the nuclear superfluid phase - at least for this channel - can only survive at very low nuclear temperatures. For these nuclei the shell effects and nuclear deformation disappear at slightly higher temperatures of $T_{c^s} = 2.0 - 4.0$ MeV.

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