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Selfconsistent nuclear pairing at finite temperature

An selfconsistent theory for nuclear pairing at finite temperature is proposed, which includes the effects due to the quasiparticle-number fluctuation and dynamic coupling to quasiparticle RPA vibrations at finite temperature T. The numerical calculations of pairing gaps, total energies, and heat capacities are carried out within a doubly-folded multilevel model and realistic stable tin isotopes as well as neutron-rich nickel isotopes. The results obtained show that, in the region of moderate and strong couplings, the sharp transition between the superconducting and normal phases is smoothed out, resulting in a thermal pairing gap, which does not collapse at the BCS critical temperature, but has a tail, which extends to high T. The dependency of quasiparticle-number fluctuation and coupling to QRPA on the particle number and configuration space are discussed.

Primary author: Dr DINH DANG, Nguyen (Heavy-Ion Nuclear Physics Laboratory - RIKEN Nishina Center for Accelerator-Based Science)

Co-author: Mr QUANG HUNG, Nguyen (Heavy-Ion Nuclear Physics Laboratory - RIKEN Nishina Center for Accelerator-Based Science)

Presenter: Dr DINH DANG, Nguyen (Heavy-Ion Nuclear Physics Laboratory - RIKEN Nishina Center for Accelerator-Based Science)

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