

Nuclear and astrophysics aspects for the rapid neutron capture process in the era of multimessenger observations



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Pygmy Modes and Astrophysical Reaction Rates

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The new low-energy dipole and quadrupole modes in charge-asymmetric nuclei have been studied in a EFT-based approach by HFB and extended QRPA methods, accounting for anharmonicities by the coupling to up to 6 quasiparticle (QP) configurations. The spectroscopy of pygmy dipole (PDR) and quadrupole (PQR) states is discussed with focus on the region of N=50,82 isotones and the Z=50 Sn-isotopes. Multi-QP coupling is found to provide the proper energy shifts and fragmentation pattern of experimentally observed strength distributions. The spectroscopic results are used in calculations of astrophysical reaction rates. The pygmy modes lead to a significant enhancement of (n,g) capture rates, thus altering the nucleosynthesis scenarios.

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