Abstract Submitted
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Level densities and γ-ray strength functions of heavy nuclei in the static-path plus random-phase approximation[1] PAUL FANTO, YORAM ALHASSID, Yale University — We apply the static-path plus random-phase approximation (SPA+RPA) to calculate nuclear level densities and γ-ray strength functions (γSFs), which are important inputs to statistical models of compound-nucleus reactions. Formulated in the configuration-interaction (CI) shell model framework, the SPA+RPA includes static fluctuations beyond the mean field and small-amplitude time-dependent quantal fluctuations. Using effective interactions that include pairing plus multipole-multipole terms, we calculate state densities of $^{148-155}$Sm in the SPA+RPA and find them to be in excellent agreement with exact densities obtained with the shell-model Monte Carlo (SMMC) method. We compare the SPA+RPA densities to mean-field densities and find that the SPA+RPA repairs deficiencies of the mean-field approximation associated with broken symmetries. In particular, we reproduce the rotational enhancement in deformed nuclei, and resolve the problem of the unphysical negative entropy associated with the pairing condensate. Using a quadrupole-quadrupole interaction in *sd*-shell nuclei, we also find that the SPA+RPA $E2$ and $M1$ γSFs reproduce the qualitative features of the exact CI shell model γSFs. We provide an outlook for applications to lanthanide nuclei.

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