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Defeating The Sign Problem in the Auxiliary-Field Monte Carlo Method for Nuclear Structure: Level Densities and Other Properties¹ ERICH ORMAND, GERGANA STOITCHEVA, Lawrence Livermore National Laboratory — The auxiliary-field Monte Carlo method (AFMC) within the thermal formalism permits an opportunity to probe structure properties such as nuclear level densities and Gamow-Teller strength distributions. These properties play an essential role for estimates of reaction rates in various astrophysical nucleosynthesis processes. Most conventional calculations of the nuclear level density are based on the back-shifted Fermi gas model. These calculations involve empirical parameters that can lead to large uncertainties in determining the reaction rates. The AFMC is the only approach that allows the determination of nuclear properties at finite temperature that includes the full effect of correlations among the valence nucleons in large model spaces. Using the shifted-contour method to defeat the sign problem we report on the first results of various nuclear properties, including nuclear level densities, using fully realistic shell-model interactions.

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