

ABSTRACT

Statistical decays using approximate shell model calculations

Oliver C. Gorton

San Diego State University

The nuclear shell model is an under-utilized source of statistical nuclear properties such as nuclear level densities and gamma-ray strength functions, both of which are fundamental to statistical nuclear reaction models used in nuclear data evaluations. In part, this is because accurate calculations for nuclei of astrophysical interest often require model spaces exceeding our computational resources. The large numbers of states required for statistical analysis compounds with the larger model spaces typically needed to include excitations of both parities, a pre-requisite for E1 gamma-ray strength functions. To address this, we have applied our proton-neutron shell model truncation scheme to approximate the wave functions typical shell model calculations cannot handle. In our benchmark cases, we find that this is an effective way to estimate the gamma-ray strength functions, while better methods already exist for nuclear level densities.

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract No. DE-AC52-07NA27344 with support from the ACT-UP award.