

High-Performance Code for Nuclear Level Density

- This slide highlights recent developments of the JMOMENTS code, which is used to calculate shell model nuclear level densities.
- The JMOMENTS code is parallelized using MPI, and it is continuously benchmarked on the NERSC machines. As one can see from the upper-right graph, the latest version scales very well (strong scaling presented) up to 4,000 cores. Work is in progress to make it scalable for tens and hundreds thousand cores.
- The main features of the algorithm are presented in the upper-left side of the slide.
- The main physics we plan to solve using the code is the evolution of the rp-process flow (see lower-left part of the slide), for which the precise knowledge of the reaction rates around some waiting point nuclei, such as ^{64}Ge and ^{68}Se , is necessary. Improvements in the accuracy of the cross sections used for nuclear engineering applications might also be possible.
- The plot in the lower-right corner compares the calculated nuclear level densities of ^{64}Ge in two model spaces. Please note the associated shell model m-scheme dimensions.
- Persons involved in this project at Central Michigan University (CMU) are: Mihai Horoi (PI) and Roman Senkov (postdoc).