Abstract for an Invited Paper
for the DNP10 Meeting of
The American Physical Society

Nuclear Structure Calculations for r-Process Modeling[1]

PETER MOLLER, Los Alamos National Laboratory

A large number of nuclear-structure quantities, for example fission barriers, ground-state masses, beta-decay half-lives and delayed-neutron emission probabilities have been calculated in the macroscopic-microscopic FRDM model for all nuclei heavier than 16O, from the proton to the neutron drip line [1-4]. We present very briefly some essential features of the model. We discuss why we feel it can be used to reliably model properties of currently unknown nuclei. Support for this belief comes from two observations: 1) published calculated masses agree with more than 500 masses discovered after publication to even better accuracy than the agreement with masses to which the model was adjusted, and 2) a large number of nuclear properties can be modeled with a single parameter choice in a consistent fashion with good agreement with experimental data. We also show the impact on results of optimizing the single-particle spin-orbit and diffuseness parameters by presenting results of calculations based on two different choices of spin-orbit strength and potential diffuseness. We conclude by discussing recent improvements in mass model accuracy to 0.57 MeV an about 15% improvement over the accuracy 0.669 MeV obtained in the last published model [1].

[1] ADNDT 59 (1995) 185
[2] ADNDT 66 (1997) 131
[3] PRC 67 (2003) 055802
[4] PRC 79 (2009) 064304

[1]This work was carried out under the auspices of the National Nuclear Security Administration of the U. S. Department of Energy at Los Alamos National Laboratory under Contract No. DE-AC52-06NA25396.