Exit Report for Goran Arbanas (Oak Ridge National Laboratory, U.S.A.)
FUSTIPEN-sponsored visit to GANIL, France, June 1-12, 2015

The purpose of this exploratory visit to GANIL was to initiate computations of neutron capture cross sections on neutron-rich tin isotopes near mass number 132, using the Coupled-Channel Gamow Shell Model (CC-GSM) framework developed by Marek Ploszajczak and Nicolas Michel at GANIL. These capture cross sections (i.e. their corresponding capture rates) are of interest to astrophysical nucleosynthesis models that are known to be particularly sensitive to those capture rates. Application of CC-GSM toward computation of capture cross section in this mass range is made feasible by a treatment of valence particle-holes in the Berggren basis and approximating the doubly-closed ^{132}Sn core by a Woods-Saxon potential. By virtue of the GSM the computations of capture will include the effects of multi particle-hole configurations in the resonant and bound states, and the effects of the continuum, whose effect on capture (or other) cross sections may be significant because of a low neutron separation energy of tin isotopes above ^{132}Sn.

During the visit the GSM code has been successfully installed on the Oak Ridge National Laboratory (ORNL) Institutional Cluster, where I could run GSM on as many as 48 nodes, with 12 cores and 24 GB per node. On this hardware, and in preparation for the use of the CC-GSM code, I have reproduced the results of the GANIL's group previous publications. To gain intuitive understanding I have studied the effect of various input parameters and approximations schemes (e.g. variations in the shell model space and the cutoffs in multi-configuration space).

The CC-GSM code (that is run in conjunction with the GSM code) to compute cross sections, was being modified with respect to its stability and optimization during my visit, and vigorous effort were made by GANIL Theory Group to have the testing of the new version of the CC-GSM code complete during my trip.

The interaction parameters for these tin isotopes were fitted (to binding and excitation energies of several tin isotopes) by members of the Theory Group at GANIL, under supervision of Nicolas and Marek. These interaction parameters will be used for GSM and CC-GSM computations of structure and reactions on neutron rich tin isotopes.

In addition to running the GSM codes, I have spent a considerable amount of time studying detailed derivation notes maintained by Nicolas Michel, in conjunction with their considerable list of publications.

I appreciate the hospitality extended to me by Nicolas and Marek, along with other Theory Group members at GANIL, besides many stimulating discussions we had during my most pleasant visit graciously sponsored by FUSTIPEN.