

Exit Report
FUSTIPEN visit
April 10 - 18, 2012

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I was in France from April 10 till April 18 for FUSTIPEN exploratory visit. This was first my visit to GANIL. This visit has been hosted by Marek Ploszajczak. I had very extensive discussions with him on subject of his and mine scientific interests. In addition, very interesting exchanges of ideas with P. van Isacker took place on subject of proton-neutron pairing in the $N \sim Z$ nuclei. This is topic of high interest which is full of controversies. We both agree/disagree on the existence of isovector/isoscalar proton-neutron pairing. The highlights of experimental activities at GANIL have been introduced to me by N. Alahari. We also discussed with him the role of some single-particle orbitals in nuclei around ^{132}Sn .

During my visit, I have also presented an invited talk entitled “The structure of heavy nuclei in DFT: from actinides to superheavies” at FUSTIPEN topical meeting “The structure of heavy nuclei” which took place at GANIL during April 16-17. This meeting has been attended mostly by theorists, and the discussion during and following the talks have been very interesting in many respects. This is a consequence of theoretical uncertainties in the localization of the island of stability of superheavy elements. Different models such as non-relativistic and relativistic DFT and microscopic+macroscopic methods disagree in the predictions of the center of this island and the studies of different properties of lighter nuclei (actinides) such as single-particle spectra and fission barriers do not provide conclusive evidences on which model(s) have more predictive power for superheavy nuclei.

This visit also gave me an opportunity to participate in collaboration meeting organized by Thomas Duguet at CAE, Saclay, France, during April 10-11, 2012. At this meeting, I learned a lot about recent progress in the framework of non-relativistic DFT based on Skyrme forces and had an opportunity to present a talk entitled “Single-particle degrees of freedom within the covariant EDF method” which was followed by extensive and interesting discussion. The density functional theory is very powerful method which allows microscopic description of many aspects of the single-particle motion such as deformation polarization properties and rotational alignments of the single-particle orbitals. However, it also has some limitations in the description of the energies of the single-particle states and their fragmentation. To overcome this problem, the coupling of single-particle motion with vibration has to be taken into account, as it was illustrated for spherical nuclei. I had very interesting discussions on this subject with T. Duguet and P.-H. Heenen.

I hope this productive visit will be followed by more extensive collaborations in the next years. This was very simulating week and I would like to thank FUSTIPEN Governing board for this grant and local staff at GANIL (especially, Marek Ploszajczak) for their hospitality.