Argonne NATIONAL LABORATORY

PHY Seminar

Special Physics Division Seminar

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Nuclear Structure of SHN – State of the Art and Perspectives at S^3

Host: Filip Kondev

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The new separator-spectrometer combination S^3, presently under construction at the new SPIRAL2 facility of GANIL, Caen, France, together with the high intensity beams of SPIRAL2's SC LINAC, will offer exciting perspectives for a wide spectrum of nuclear and atomic physics topics. Among the mayor features to be studied, apart from nuclei in the N=Z region, nuclei of astrophysical relevance and some atomic physics issues, are the properties of the heaviest nuclei (superheavy nuclei – SHN). The installation is designed to employ nuclear physics methods like decay spectroscopy after separation or atomic physics methods like laser spectroscopy and mass measurements.

The nuclear physics studies will include particle and photon correlation studies, attacking the open questions in the field, which have been revealed in earlier studies at facilities like e.g. GSI with the velocity filter SHIP and the gas-filled separator TASCA, Jyväskylä with RITU and its numerous auxiliary detection set-ups, the DGFRS and VASSILISSA/SHELS separators at FLNR/JINR in Dubna, the FMA at ANL etc. The research subjects include K-isomers, isotopic and isotonic trends of low lying nuclear excitations and gamma-electron-alpha and gamma-electron-fission coincidences. The detection array SIRIUS at the focal plane of S^3, presently being constructed for this purpose, is also an ideal tool to study delayed processes like isomeric states and β-delayed fission.

A low energy set-up - Low Energy Branch (LEB) - including a gas stopping cell, laser spectroscopy instrumentation and a Multi-Reflection Time-of-Flight Mass Spectrometer (MRToF MS), will be used to study nuclei in the N=Z region as well as the heaviest nuclear species. In a farer future the synthesis and investigation of, also so far unknown, highest-Z systems is envisaged, for which the earlier experiments will produce the basis.

A selection of results obtained by Decay Spectroscopy After Separation (DSAM) will be presented (e.g. ^{270}Ds, ^{258}Db, and their decay products), perspectives at the present GANIL cyclotron facilities with e.g. the study of the reaction ^{238}U+^{238}U at VAMOS+AGATA, and for the physics program at S^3 will be given in this presentation.