

Nuclear structure and reaction studies of very heavy nuclei at GANIL using the European multi-detector AGATA

Experimental nuclear physics

The internship will be prepared in the framework of the research field of very heavy and superheavy nuclei, using the European multi-detector gamma detection array AGATA presently at GANIL combined with the magnetic spectrometer VAMOS, in combination with an additional X-ray detection array, ID-fix, consisting of three Low Energy Photon Spectrometers (LEPS). The scientific aim of a planned experiment is to establish production cross sections of neutron-rich actinides in the uranium region close to the deformed neutron shell gap at $N=126$. This is the basis for future nuclear structure studies aiming at the understanding of the development of collectivity and deformation (possible higher order like dynamic and static octupolar shapes) in that area of the Segrè chart of nuclides. This understanding is important for models predicting nuclear structure features and stability of the heaviest nuclear species at high mass A and atomic charge Z , and the envisaged as long sought for “*island of stability*” of superheavy elements (SHE).

An experiment to study reaction dynamics in the reaction $^{238}\text{U}+^{238}\text{U}$ has been recently accepted by the GANIL international Program Advisory Committee. The experiment will most probably be ready to be performed in 2021 using the magnetic spectrometer VAMOS in conjunction with the AGATA Ge-detector array and a dedicated X-ray detector array. ID-fix will provide the atomic charge (Z) determination via the detection of characteristic X-rays of the detected reaction products. The internship will deal with the implementation and integration of ID-fix into the existing set-up in GANIL’s experimental area G1, including the continued characterization of the set-up by additional source test, and the necessary modifications of the data acquisition software to be used in the experiment at the combined set-up VAMOS+AGATA+ID-fix.

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