PRESENT STATUS AND PERSPECTIVES OF SHE ACIVITIES AT GANIL

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As developed in various theoretical approaches and hypothesized for more than five decades, nuclei with enhanced stability would exist in terms of relatively long half-lives in the upper part of the Segré chart. These Super-Heavy Nuclei (SHN) predicted as unbound nuclei according to macroscopic considerations, owe their existence only to microscopic corrections (shell effects) that provide them with additional stability. The search for this island of stability is one of the burning topics currently in the focus of the major nuclear physics facilities. Moreover, this research has triggered great experimental efforts leading to exciting results and substantial contributions to SHN research, reaching out to species with up to 118 protons and 177 neutrons. However, the synthesis of these SHN is still an experimental challenge because it suffers from the extremely low cross-section offered by the involved nuclear reactions. As a consequence of this low production rate for nuclei of interest and the limitations of state-of-the-art technologies, only scarce information for only a few observables (mainly half-lives, radioactive decay modes, branching ratios and decay energies of SHN) with large uncertainties are measured, and only a limited number of isotopes was investigated. In order to go beyond the present studies, it is mandatory to perform detailed studies of already synthesized nuclei in terms of understanding the nuclear structure properties in spectroscopic investigations and the reaction mechanism leading to the production of these heavy species. To reach this goal, higher statistics are essential. In this context, France has now the chance to contribute notably to this research with the unprecedented high intensity beams from the superconducting linear accelerator (LINAG) of the new SPIRAL2 infrastructure at GANIL in conjunction with the "Super Separator Spectrometer" (S^3)[1]. We propose to report on the envisaged experimental program[2] and the technical developments of S^3 [3] which includes a rotating target[4] to sustain the highly intense heavy ion beams, a two-stage separator (momentum achromat followed by a mass spectrometer) and coupled to it the implantation-decay station SIRIUS or to a gas catcher[5].

References
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