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Physics opportunities with SPIRAL2

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The SPIRAL 2 facility [1], an ambitious extension of the GANIL accelerator complex, has entered recently in the construction phase. In the frame of this project, a new superconducting linear accelerator delivering high intensity, up to 40 MeV, light (proton, deuteron, 3-4He) beams as well as a large variety of heavy-ion beams with mass over charge ratio equal to 3 and energy up to 14.5 A.MeV will be constructed in the coming two years (SPIRAL2 Phase 1). Using a dedicated converter and the 5 mA deuteron beam, a neutron-induced fission rate is expected to approach 1014 fissions/s for high-density UCx target. The versatility of the SPIRAL 2 driver accelerator will also allow using fusion-evaporation, deep-inelastic or transfer reactions in order to produce very high intensity Rare Isotope Beams and exotic targets. The energies of accelerated RIB will reach up to 7-8 A.MeV for fission fragments and 20 A.MeV for neutron-deficient nuclei (SPIRAL2 Phase 2).

The physics case of SPIRAL 2 based on the use of high intensity Radioactive Ion Beams and stable light- and heavy-ion beams as well as on possibilities to perform several experiments simultaneously will be discussed and illustrated with recent high-light results obtained at GANIL/SPIRAL. In particular, it will be shown that a use of these beams at the low-energy ISOL facility (DESIR) and their acceleration to several A.MeV as well as of high neutron flux at the n-tof like facility will open new possibilities in study of heavy and super-heavy nuclei, in nuclear structure physics and nuclear astrophysics and in reaction dynamics studies. This exciting scientific program as well as relatively moderate intensities and high cost of radioactive beams impose a use of the most efficient and innovative detection systems as the magnetic spectrometer VAMOS, the 4P gamma-array EXOGAM2 and AGATA as well as charged particle detectors like MAYA, MUST 2 and TIARA. Several new concepts of the detection systems (ACTAR TPC, DESIR, FAZIA, GASPARD, PARIS) and a new separator/spectrometer S3 located in dedicated experimental halls are currently under construction or design.

References:

[1] 1. <http://pro.ganil-spiral2.eu/>

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