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The Super Separator Spectrometer S3 and the associated focal plane detection systems SIRIUS and REGLIS3

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The Super Separator Spectrometer (S3) will receive the very high intensity stable ion beams from the superconducting LINAG accelerator of SPIRAL2, with energies ranging from 0.75 to 14.5 MeV/u and currents beyond 1 μ A. 16 Letters of Intent have been submitted by a large physics community [1]. Special emphasis is on the study of rare nuclei, such as superheavy elements and neutron-deficient isotopes, produced by fusion evaporation reactions. S3 includes a rotating target to sustain the high-energy deposition, a two-stage separator (momentum achromat followed by a mass spectrometer) that can be coupled to the implantation-decay station SIRIUS or to a gas catcher.

The SIRIUS detection system [2] will include tracking detectors and a silicon box [3] surrounded by germanium detectors to perform delayed spectroscopy. The gas catcher, combined with a set of RFQs, multi-reflection time-of-flight mass spectrometer and a last generation laser system, constitute the Low Energy Branch [4]. It will make possible ground state properties measurements or will deliver the reaction products to the DESIR facility.

S3 will combine very high transmission with high mass resolution, thanks to large aperture superconducting magnets with sextupolar and octupolar corrections. The project is in the construction phase and will be completed by end 2016. We present the current status of the main elements of the facility (target station, magnets, detection set-up, low energy branch) with a focus on the specific issues due to the handling of very high power beams (heat dissipation, induced radioactivity, beam rejection...). Included are detailed results of tracking single ions through 3D fields maps of all elements using a recently updated version of Tracewin [5] software, and the resulting performance for various physics cases and optical configurations.

[1] S3 First Day letters of Intent: <http://pro.ganil-spiral2.eu/spiral2/instrumentation/s3/working-documents/loi-day-1-experiments>

[2] J. Piot and the S3 collaboration, Acta Phys. Pol. B 43 (2012) 285

[3] H. Faure, F. Déchery et al., 2013 3rd International Conference on Advancements in Nuclear Instrumentation, Measurement Methods and Their Applications, ANIMMA 2013.

[4] R. Ferrer & al. Nucl. Inst. and Meth. B, Volume 317 (2013) 570.

[5] R. Duperrier, N. Pichoff and D. Uriot, ICCS conference, Amsterdam, 2002.

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