Radiological impact in the nuclear facilities SPIRAL1 and S3

The modeling of a nuclear facility is a necessary tool to define the radiological environment and to draw the rays map. This quantification is an important phase in the conception of a facility. It allows to know how the facility respects the safety constraints as well as the general operating for what it is authorized. This work deals with two facilities very important for the major evolution of GANIL facilities :

1. **SPIRAL1**: The upgrade of SPIRAL1 is one of the most important achievements in GANIL these last years. This upgrade will soon allow the production and the acceleration of new radioactive ion beams covering all the interval [Z=2 ; Z=40] and up to A=91.

For the safety reasons, GANIL is asked to study the radioactive impact of any new ECS "Target Source Block" before its irradiation. The objective of this part is to study and quantify:

1. The direct and indirect activation of the target irradiated by incident stable ion beam,
2. The neutrons production,
3. The neutron activation of the air of the irradiation area,
4. The radiological ambiance near the irradiated ECS,
5. And, eventually, the radioactive releases.

2. **S3**: The Super Separator Spectrometer (S3) is a device of SPIRAL2 dedicated to the experiments with high intensity stable beams to study heavy and super heavy nuclei, especially the neutron deficient ones. Light nuclei, namely those produced by transfer reaction, will also be available in S3. In this work we will mainly study the radiological impact of light particles and compare it to the impact induced by heavy ions.

This work (both SPIRA1 and S3) will need to use Monte Carlo simulations.

Expected skills: Nuclear physics knowledge, good level in programming, interest for nuclear simulation, basic knowledge on Monte Carlo methods

This internship may be appropriate for two students. It is not planned to continue this work on a PhD.

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