Neutronic perturbation of the uranium target in SPIRAL2

M. Fadil[1*], J. Crevel[2], J.F. Greuez[2], B. Rannou[1]

[1]*GANIL, Boulevard Henri Becquerel, B.P. 55027, 14076 Caen Cedex 5*
[2]*ENSICAEN, Boulevard Maréchal Juin, 14050 Caen Cedex*
[*]*Author: fadil@ganil.fr*

Over the next 5-10 years, the accelerator and experimental facilities at GANIL (Caen/France) will receive a new facility called SPIRAL2. It will be constituted in a superconducting linear accelerator which will drive deuterons beam of 40 MeV energy (5 mA; 200 kW). These accelerated particles will produce a very high neutron flux ($\sim 10^{15}$ n/s) with a fast spectrum (the energy range between 1 keV and 40 MeV). With the neutron-induced fission of the depleted uranium, an intense beams of neutron-rich nuclei will be created and will become available at SPIRAL2.

During the irradiation, and under the neutron flux, the target will be modified by the production of the actinides, the fission fragments and activation products. This evolution will perturb the neutron spectrum and then the condensed cross sections.

To quantify this perturbation, we modelled the uranium target by using MCNPX and TRIPOLI codes. We calculated the neutron spectrum as function of the evolution of the target during the irradiation. The evolution was calculated by using the French code DARWIN PEPIN2. Results showed a strong evolution of the thermal part of the spectrum (about 65 %) between the first and the end of the irradiation. However, the thermal part of the spectrum remains unchanged. The fission yield of the uranium target does not know any evolution. The target system is subcritical (Keff $\sim$ 0.78) and thus remains during all the irradiation.

Keywords: uranium target, evolution, fission yields, criticality, simulation