

Analysis of experimental data about thick targets irradiated by heavy ion beams

TTNY program (Thick Target Neutron Yields), driven at GANIL since 2014, allowed to perform several measurements of double differential neutron spectra induced by the reaction of heavy ions on thick targets. The energy of incident beams covered the interval [4 ; 100] MeV/n for target masses between 12 and 93. The target was extracted just at the end of the irradiation and transported to a laboratory dedicated to spectroscopy measurements.

The main objective of this internship is the analyzing of the experimental data that were collected during different TTNY measurement campaigns.

These analysis studies are of great and obvious interest for the community working in nuclear data and transport codes. In fact, they will allow to validate some codes dedicated to the simulation of nuclear reactions. These codes, and especially those based on Monte Carlo method, are widely used in nuclear physics and the related applications (MCNP, FLUKA, PHITS...). During last ten years, several nuclear models to quantify the production rate (or production cross sections) of residual heavy nuclei generated by incident heavy ions nuclear interactions were integrated to these codes. This was/is justified by the more and more important needs on such data for particles accelerators but also for different applications like nuclear waste transmutation, radiotherapy, radioprotection...Several new accelerator facilities are now under construction (SPIRAL2 in France, FAIR in Germany, SPES in Italy...) and the needs on reliable models in calculation and modeling with incident heavy ions are strongly justified and very timely.

This subject could be divided on two main topics, according to the quantity of the work to perform and to the efficiency of the student(s):

1. The analysis of the collected experimental data,
2. The simulation of nuclear reactions of interest using the Japanese code PHITS and the European one FLUKA.

Expected skills: Nuclear physics knowledge, good level in programming (C or C++), interest for experimental work and analysis, knowledge on spectroscopy gamma measurements

This internship may be appropriate for two students. It is planned to continue this work on a PhD.

Contact : Manssour FADIL
phone : +33(0)231454488
E-mail : fadil@ganil.fr