THE UTILIZATION OF MCNPX 2.4 FOR ADS TARGET CALCULATION

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The Accelerator Driven System (ADS), is an innovative reactor which is being developed as a dedicated burner in a Double Strata Fuel Cycle to incinerate nuclear waste [1]. The ADS consist of a sub-critical assembly driven by accelerator delivering a proton beam on a target to produce neutrons by a spallation reaction. The spallation module constitutes the physical and functional interface between the accelerator and the sub-critical reactor. For this reason it is probably the most innovative component of the ADS. The target design is a key issue to investigate in designing ADS and its performances are characterized by the number of neutrons emitted per incident proton, the mean energy deposited in the target for neutron produced, the neutron spectrum and the spallation product distribution. To design an ADS target it is necessary to use models for the spallation reaction, such as Bertini, Cugnon, Isabel, etc. and the transport of the secondary particles through the target. The MCNP-X [2] (Monte Carlo N-particle Transport Code System for Multi particle and High Energy Application), developed by Los Alamos National Laboratory, is internationally one of the most used code to realize this type of calculation. This paper intends to make a sensitivity analysis of the models existing in MCNPX (BERTINI, ISABEL and CEM) in reproducing results for a cylindrical target of lead (thick target), in order to compare the differences among the models. Also, for thin targets, several experimental results are available from Titarenko[3], mainly for the yield of residual products, and in this paper we will utilize the MCNPX to reproduce some of these experimental data.

References

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[2] *MCNPX User's Manual, Version 2.4.0*,LA-CP-02-408, 2002.
[3] Y.E. Titarenko et al, *Experimental and Theoretical Study of the Yields of Residual Product Nuclei Produced in Thin Targets Irradiated by 100-2600 MeV Protons*,ndc/ccp/434, 2000.