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Evaluation of Fission Energy Deposition in the SAFARI-I Nuclear Reactor

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Abstract content (Max 300 words) Formatting & Special chars

The knowledge of the amount of energy released during a nuclear fission reaction is extremely important for the safety analysis of a nuclear reactor. In this work, we estimate the fission Q-Value of the SAFARI-I nuclear reactor using the MCNP-5 (Monte Carlo N-Particle) code. MCNP is a probabilistic transport code that has the capability of calculating most of the heating contributions due to particle interactions with matter. In particular, we present the calculations performed to obtain the energy deposited by fission products, prompt neutrons and photons as well as neutron induced photons. Currently, the MCNP-5 code cannot calculate the heat deposition due to beta particles and gamma rays produced during fission product decay. Such values were therefore estimated using typical values reported in the libraries. The calculations were performed for the beginning and end of cycle of a typical operation cycle of SAFARI-I. Using the ENDF-VII data, the fission Q-value for SAFARI-I was calculated as 197 MeV. Typical fission Q-values reported for nuclear reactors are around 200MeV. Further studies will focus in the improvement of the accuracy of our calculations by performing energy deposition calculations due to fission products decay of typical used fuel elements in SAFARI-1.

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Hons

Main supervisor (name and email) and his / her institution

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