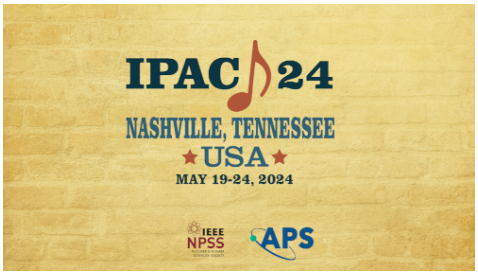

Contribution ID: **798** Contribution code: **THPS43** Type: **Poster Presentation**

Comparative study of decay heat calculations with FLUKA and MCNP/CINDER2008

Thursday, 23 May 2024 16:00 (2 hours)

In designing a high-power tungsten target, decay heat driven temperature rise in the spallation volume is a safety concern during maintenance and in loss of coolant accidents. As tungsten hydrates and becomes volatile in steam at above 800 ◦C, it is important to keep the target temperature below this threshold when active cooling is unavailable. Decay heat in a target is calculated with particle transport simulation codes combined with transmutation codes. The calculated decay heat usually differs depending on the nuclear cross sections and the decay particle transport models built in the code architecture. In this paper, we calculated decay heat of a water-cooled tungsten target using popular particle transport codes, FLUKA and MCNP6® paired with CINDER2008 and compared the results. The target-moderator-reflector (TMR) system is modeled with a water-cooled solid tungsten target, water premoderators, liquid hydrogen cold moderators and beryllium reflectors. Water-cooled stainless-steel shielding
is modeled around the TMR system. The tungsten volume is clad with a thin layer of erosion/corrosion resistant material. This study provides information about the uncertainty range in decay heat prediction of high-power spallation targets for hazard analysis.

Footnotes

Funding Agency

Paper preparation format

LaTeX

Region represented

North America

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Presenter: LEE, Yong Joong (Oak Ridge National Laboratory)

Session Classification: Thursday Poster Session

Track Classification: MC7: Accelerator Technology and Sustainability: MC7.T20 Targetry and Dumps