Contribution ID: **48** Type: **Oral Presentation**

An analysis and quantification of typical errors in the deterministic calculational path for research reactor modelling

Wednesday, 1 July 2015 14:40 (20 minutes)

Abstract content
   (Max 300 words)
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The objective of this work is to analyse and quantify modelling errors introduced by approximations made in the deterministic calculational path. These approximations are introduced in order to make a model practically solvable with a diffusion code, and they are classified as follows: spatial homogenization, energy (spectral) condensation, diffusion approximation and environmental dependency. In this work, a two-node model consisting of a SAFARI-1 reactor fuel assembly next to a water node is modeled, because it is a typically encountered configuration and fairly sensitive to spatial and spectral approximations. The analysis and quantification of modelling errors introduced in the calculational path was performed. Errors introduced by the four approximations in the calculational path are quantified by investigating the effective multiplication factor (k-eff) and leakages as an integral measure of difference between two models. All calculations were performed with the transport codes NEWT and HEADE and the diffusion code MGRAC. This error analysis will help understand where to focus on improving the modelling accuracy for the deterministic approach to reactor modelling. Preliminary results indicated that for the fuel-water model, environmental dependency error and the diffusion approximation are the largest contributors to the total calculational error.

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Session Classification: NPRP

Track Classification: Track B - Nuclear, Particle and Radiation Physics