ID de Contribution: **32**

Type: **Poster**

Innovative Multi-Energy Deterministic Method to treat core-reflector interfaces

mardi 16 mars 2021 15:12 (2 minutes)

One of the current challenges of heavy-material-reflector reactors is the need to precisely model space and energy flux variations at the core-reflector interface. Incorrect representations of reflector effects can introduce significant errors in the resulting calculation (reactivity and reaction rates).
This paper aims to describe a methodology that provides a deterministic solver with the capability of better describing local heterogeneities and strong transients without sacrificing calculation time. It investigates the use of domain decomposition methods with cross sections of different energy meshes within the IDT deterministic solver. In this novel method, subdomains have different energy discretizations and no overlap. Boundary fluxes are condensed or reconstructed to account for spectral differences between subdomains to make the boundary condition fully consistent across all subdomains. Multi-grid cases, where subdomains have different energy discretizations are compared to cases with the same energy discretizations over the entire configuration.
Varying boundary flux expressions have been examined. The gains in precision and computation time using this methodology have been estimated on a core configuration inspired by the well-known C5G7-benchmark. Preliminary results are promising both in terms of time and precision.

Language

English

Field

Neutronics

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Classification de Session: Poster advertising session

Classification de thématique: Physics