Three-dimensional Numerical Model of Neutron Flux in Hex-Z Geometry

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Abstract

We present a method for solving the multigroup system of neutron diffusion equations. Their stationary solution characterizes an equilibrium state of a nuclear reactor core whose actual geometry defines the solution domain. In the case of the investigated VVER-1000 type reactor, the domain comprises non-overlapping prismatic nodes with hexagonal cross-sections. The described nodal method effectively combines a whole-core, coarse-mesh finite-difference calculation with more detailed computation of fluxes over several horizontal cuts through the core. These refined fluxes are obtained by solving the transverse-integrated diffusion equations over pairs of neighbouring hexagonal meshes within each cut. The paper is concluded by sample numerical demonstrations.