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Reactivity Coefficient Calculation of CANDU Fuel Lattices by MCNP

Gyuhong Roh and Hangbok Choi
Korea Atomic Energy Research Institute
P.O. Box 105, Yuseong
Taejon, 305-600, Korea
ghroh@nanum.kaeri.re.kr; choih@nanum.kaeri.re.kr

ABSTRACT

The reactivity coefficient calculations have been performed for the standard and advanced CANDU fuels using a Monte Carlo code MCNP-4B in order to validate lattice codes WIMS-AECL and HELIOS. New MCNP libraries were generated from ENDF/B-VI in order to consider the full isotopic composition and the temperature effect. The lattice codes were benchmarked by MCNP for the major safety parameters of the CANDU fuel lattices. For WIMS-AECL, the difference of the infinite multiplication factor increases as the fuel burnup increases with the maximum value of 7.58mk for DUPIC fuel at discharge burnup. The void coefficient and Doppler constant agree with those of MCNP within 1.67σ and 3.31σ, respectively. For HELIOS, the infinite multiplication factors agree with those of MCNP calculations with slightly smaller difference compared with WIMS-AECL and the void and Doppler constant are slightly larger than those of WIMS-AECL for both fuel lattices.