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P3.133 Neutronics analysis for ITER UP18 preliminary design

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The nuclear heat and the shut-down dose rate (SDDR) in the ITER upper port 18 (UP18) was estimated to provide the nuclear heat load for the structural analysis of UP18 and to provide the basis for the further SDDR mitigation strategy of UP18. The UP18 MCNP model has been developed based on the actual CAD model, which was integrated into C-model, the global MCNP model for ITER. While ITER UP18 accommodates three tenant systems of VUV(Vacuum Ultra-Violet)-edge Spectrometer, Neutron Activation System (NAS), and Upper Vertical Neutron Camera (UVNC), detailed models of VUV-edge and NAS were included in the UP18 MCNP model and UVNC was represented as conceptual stainless steel boxes due to lack of detailed model. For SDDR estimation, overall SDDR at the UP18 interspace were estimated as well as the SDDR contributions from tenant systems. The SDDR result includes the crosstalk from neighboring ports which are filled with general port models included in C-model. Several SDDR mitigation options were also evaluated such as to use low Co contents material, to place B4C shielding at the rear box of port plug and to use lead shielding at the interspace floor. The results indicate that evaluated options can contribute to the mitigation of SDDR in interspace, and especially to place B4C shielding at the rear box region of port plug structure can effectively mitigate the SDDR behind the closure plate.

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