

Neutronic analysis of IFMIF-DONES Test Cell cooling system

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IFMIF-DONES (International Fusion Materials Irradiation Facility –DEMO-Oriented Neutron Source) is an accelerator based d-Li neutron source which aims at the qualification of materials at the irradiation conditions of a DEMO fusion power reactor as being developed in the frame of EUROfusion's Power Plant and Technology (PPPT) programme. The high intense neutron radiation produced in the liquid lithium target results in a strong activation of the Test Cell (TC) with the High Flux Test Module (HFTM), housing the irradiation specimens, the TC steel liner and the water cooled concrete walls. The activation and decay heat generation of the cooling pipes need to be assessed for maintenance, decommissioning and waste management purposes and the related safety analyses.

This paper presents the analyses performed within the ENS (Early Neutron Source) project of EUROfusion/PPPT for providing up-to-date estimates of the activity inventories and the decay heat generation in the DONES TC facility. To this end, a series of coupled McDeLicious transport and FISPACT inventory calculations were performed using the 2017 DONES TC model and nuclear cross-section data from the FENDL-3.1 data library. Activity inventories and decay heat data were assessed for the water pipes assumed for cooling the walls.

The paper discusses the results obtained for the activity and the decay heat as a function of the decay time after radiation and also addresses the issue of the radiation dose loads which are to be expected due to the activated components/systems including the cooling water system.

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