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Neutron spectrum determination at the ITER material irradiation stations at JET

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The experiments that are planned over the next few years at the Joint European Torus (JET), notably including a deuterium-tritium (DT) experimental phase, are expected to produce large neutron yields, up to 1.7E21 neutrons. The scientific objectives of the experiments are linked with a technology programme, WPJET3, to deliver the maximum scientific and technological return from those operations, with particular emphasis on technology exploitation via the high neutron fluxes predicted in and around the JET machine. Importantly, the programme aims to extract experimental data relevant to the international effort to design, construct and operate ITER. The data expected to be retrieved under the JET experimental program will support, develop and improve the radiation transport and activation simulation capabilities via benchmarking and validation in relevant operational conditions. Such capabilities are important and are applied extensively to predict a wide range of nuclear phenomena and impacts associated with components and materials that will be used in ITER operations.

This paper reports the status of activities conducted as part of the ACT sub-project collaboration under WPJET3. The aim of the subproject is to take advantage of the significant 14 MeV neutron fluence expected during JET operations to irradiate samples of materials that will used in the manufacturing of main ITER tokamak components. The paper will provide analysis of the characterisation work at irradiation stations at JET performed in a previous deuterium campaign using dosimetry foil measurements, and give the status of irradiation experiments at JET that are ongoing in 2018 using real ITER materials. The experimental results are further used, together with calculated dosimetry foil response functions (Ti, Mn, Co, Ni, Y, Fe, Co, Sc, Ta) and spectrometry unfolding methodologies, to derive neutron spectrum information at irradiation positions, which are compared to those derived from neutron transport simulations.

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