Neutronic Calculations for the Planning of the In-Vessel Neutron Calibration Campaigns

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The absolute calibration of the detection efficiency for the measurement of the total neutron yield in the whole plasma is one of the most important issues in neutron diagnostics. In ITER, a compact deuterium-tritium (D-T) neutron generator will be used as a neutron source for the neutron calibration prior to the D-T plasma experiments, where the neutron source will move in the vacuum vessel. Neutronics simulations of neutron calibration have been carried out for the strategy and scheduling of the calibration experiments. We have established a simplified 360° ITER model for the simulation, which includes neutron flux monitors in an equatorial port, micro fission chambers, diverter neutron flux monitors, and a neutron activation system. At first, angular neutron spectra of the compact D-T neutron generator have been evaluated by MCNP calculations. We evaluate the discrepancies among the detection efficiencies to be obtained by the neutron calibration experiment, those by idealistic D-T ring source, and actual detection efficiencies for the plasma neutron source. Point efficiency measurement using the compact D-T neutron generator facing NFM in EQ#1 is an effective method for the NFM calibration.