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P4.135 A sophisticated remote maintenance method for the target assembly of Advanced Fusion Neutron Source

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Remote maintenance (RM) of highly activated components in the test cell (TC) is a key issue of design of accelerator-driven (IFMIF-type) fusion neutron sources. We newly propose a sophisticated RM method for the target assembly (TA) of an IFMIF-type Advanced Fusion Neutron Source (A-FNS), aiming at improving maintainability of the in-TC components in this study. Basic ideas of the proposed RM method are (i) to make the larger clearance of 50 mm between the TA and test module (TM) than that of the IFMIF/EVEDA design, 2 mm, and (ii) to reach out the RM manipulators to the TA from the beam dump side, not behind the TA backplate. We performed a kinematics analysis with detailed CAD data of the TA and RM tools. The analysis results indicate that the TA can be removed/installed by the newly proposed RM method without removal of the TM, and the TA RM can be independent of any TM RM schemes. The newly proposed RM method can drastically improve the maintainability of the in-TC components and the availability of neutron irradiation. A neutronics analysis has been performed to check the compatibility of the newly proposed RH method with the TM nuclear properties. The analysis indicates that the larger clearance brings decrease in the gradient of the neutron irradiation damage rate (dpa/fpy) at the material test specimen in the TM, which is beneficial for post-irradiation experiments of the irradiated specimen. Although the dpa/fpy is decreased by the larger clearance, but it can fully satisfy the requirements for the neutron irradiation damage for evaluation of material mechanical properties and DEMO design. We conclude that the newly proposed TA RM method is technically feasible and also compatible with the neutron irradiation tests.

Presenter: NAKAMURA, Makoto (Rokkasho Fusion Institute National Institutes for Quantum and Radiological Science and Technology)

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