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P4.133 Study of the ports effects on the CFETR radiation shielding

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China Fusion Engineering Test Reactor (CFETR) is a tokamak reactor under design. Due to the maintenance, assembly of the blanket and heating, diagnostics of the plasma, ports must be opened on the vacuum vessel and the blanket module of CFETR. However, the ports affects the radiation shielding performance of CFETR, especially the equatorial ports where the neutron wall loading appears a peaking value. In this paper, the study focuses on the effects of ports on the CFETR radiation shielding performance.

The analyses have been performed with the Monte Carlo code MCNP and nuclear cross-section data from the FENDL-3.1b data library to estimate the radiation load of the various components around the ports. The three-dimensional MCNP model of CFETR was generated from the reference CAD model with the McCad geometry conversion tool. The model includes blanket modules, shield, divertor, vacuum vessel, upper port, equatorial port, lower port, thermal shield, TF coils, PF coils, CS and cryostat. The neutron flux densities, the nuclear power density, the displacement damage rate, the helium production rate of the vacuum vessel and thermal shield around the ports and the radiation load on the toroidal field superconducting magnet coils behind the ports were calculated. The calculation shows a significant increase of the radiation load around the ports. The detail results will be presented in this conference.

Keywords: CFETR, Port, Radiation Shielding

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