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Neutronic study and shielding performance analyses for CFETR blankets

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The fundamental parameters calculations addressing tritium breeding ratio (TBR), neutron wall loading (NWL) and nuclear power generation on a Chinese Fusion Engineering Testing Reactor (CFETR) neutronic analysis model were performed using MCNP code to investigate the feasibility of the helium cooled pebble bed breeder blanket. The neutronic model was created as a 11.25°torus sector of tokamak manually based on the engineering data of one CAD program, including the first wall(FW), breeding unit, manifold, back plate, shield, vacuum vessel(VV), thermal shield and TFC. One major requirement of the machine is to provide sufficient protection for the vacuum vessel and superconducting components against the radiation penetrating in-vessel components and vessel. The neutron fluxes across the inboard torus mid-plane and the radiation hazard such as the accumulated displacement damage(DPA) and helium production in steel which may deteriorate the material performance were also calculated and presented in this paper.Results show that neutrons are attenuated and slowed down efficiently by components placed between plasma and TF coils. And the achievable results can mainly be acceptable.

Eligible for student paper award?

No

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