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The study of fusion neutrons captured in Tritium breeding blanket of Tokamak wall using GEANT4

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This work studies the phenomenon of neutron transport simulation and the ratio between incident neutrons and produced tritium breeding of fusion blanket on various materials. The aim is to investigate the local Tritium Breeding Ratio (TBR) after neutrons pass through 5 meters thickness of the 30 degrees angle of cylindrical-shape breeding blanket of different materials using GEANT4 simulation framework. For all simulations, G4HadronPhysicsQGSP_BIC_HP Physics list, materials i.e., 6Li+7Li, 6Li, Li2O, Li17Pb83, Li4SiO4, Li2ZrO3, and Li2TiO3 are used. The results show that the local TBR of Li2O and Li17Pb83, two of the most popular materials, are 0.9595 and 0.96091, respectively, for 0.025 eV neutron energy at room temperature. For 50 eV neutron energy, the local TBR of Li2O and Li17Pb83 are 0.35613, and 0.36256 respectively. Their local TBR decreases when faster neutrons pass through the blanket. Still, they stand out from other components, i.e., Li4SiO4, Li2ZrO3, and Li2TiO3. In addition, temperature effects on the local TBR is also investigated. It is found that higher temperature only slightly decreases the local TBR on all materials. This research is supported by TSRI Fundamental Fund project number 91525.

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