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Photo-neutron Production on HT-7 Superconducting Tokamak

YUBAO ZHU, JUEQUAN CHEN, YANZHANG FU, Institute of Plasma Physics, Chinese Academy of Sciences — Experimental studies of photo-neutron production on HT-7 superconducting tokamak are presented. Time-resolved and spatial-distributed neutron fluxes are obtained using several polyethylene moderated BF_3 and ^3He proportional counters as well as $\text{ZnS}(\text{Ag})$ scintillator. Comparisons of neutron production between helium and deuterium discharges are performed. Beside the commonly observed photo-neutron at the early times of plasma start-up and the late disruption stage, remarkable photo-neutrons are also observed on the discharges plateau period under low plasma density regime and non-inductively current driven conditions. The magnitude and time-evolution of neutron flux correlate very well with hard X-ray and γ emissions. Photo-neutron flux distribution has a characteristic of toroidal asymmetry, which implies the localization of photonuclear reactions. The analyses confirm that photo-neutron productions are closely related to plasma density, loop voltage, MHD instability, energetic particles, impurity population and plasma-wall interactions.

Yubao Zhu
Institute of Plasma Physics, Chinese Academy of Sciences

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