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Time Resolved Triton Burnup Measurements Using the Scintillating Fiber Detector on KSTAR

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For the purpose of fusion triton confinement study on KSTAR, square shaped scintillating fiber detector has been installed and tested during the 2017 KSTAR campaign. It is composed of scintillating fiber bundles which are immersed in the lead matrix. Totally 1,056 scintillating fibers whose cross-sectional area is 1 mm^2 are immersed. The scintillation light is detected by Hamamatsu R878 photo-multiplier tube (PMT) and its anode signal is digitized and processed by CAEN DT5751. From the d-d neutron calibration experiments in National Fusion Research Institute (NFRI) and d-t neutron calibration experiments in the Intense 14 MeV Neutron Source Facility, OKTAVIAN, of Osaka University, the appropriate discrimination level for 14 MeV neutron signal is determined. The operation results in the various plasma conditions are described. In the resonant magnetic perturbation driven edge localized mode (ELM) control experiment case, it is observed that as the RMP applied, ELM mitigated and the amount of burned up triton increased. Each observed results are analyzed by considering possible orbits and slowing down characteristics of fusion triton.

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