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12.22 Initial operation results of NE213 scintillation detector for the time-resolved triton burnup measurements in KSTAR

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For the purpose of time-resolved triton burnup measurements in the KSTAR deuterium plasmas, an NE213 liquid scintillation detector has been installed and operated during the 2017 KSTAR campaign. The detector is composed of a 2-inch diameter NE213 scintillator and a photomultiplier tube (PMT). The PMT pulse signal is processed by the data acquisition system of which the field programmable gate array circuit and the pulse processing software can discriminate the pulse signals from gamma-ray and neutron. In order to achieve a good neutron and gamma-ray discrimination performance, the maximum count rate was retained under 10^5 counts per seconds by shielding the scintillator with 5 cm thick lead blocks and 20 cm thick borated polyethylene blocks. To determine an appropriate threshold level of 14 MeV neutron signal resulting from triton burnup, the NE213 scintillation detector has been calibrated by the 2.5 MeV neutron source in NFRI and the Intense 14 MeV Neutron Source Facility, OKTAVIAN, of Osaka University, Japan. The operation result is compared with the parameters related to the triton birth and confinement characteristics of KSTAR deuterium plasmas, e.g. 2.5 MeV neutron emission rate, plasma current, and electron Coulomb collision time.

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