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P2.1011 High-energy neutron characterisation of scintillator and solid-state detectors for lost fast ions measurements in JT-60SA and ITER

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Present day Fast Ion Loss Detectors (FILD) installed in tokamaks and stellarators are usually made of a scintillator coupled to a suitable optical system. For the conceptual design of an ITER-relevant FILD prototype for JT-60SA (using a scintillator as sensitive element) it was suggested that the neutron flux that will be produced by D-D reactions may be a cause of possible concern for detector operations. This will be even more relevant for high-power plasma discharges in ITER, where the neutron flux is expected to be roughly the same as the flux of ions. As a result, it may be possible that a very high neutron-induced background is present in FILD measurements, thus harming or even forbidding correct data interpretation. For this reason, neutron sensitivity of the selected scintillator for FILD application was thoroughly investigated, along with possible alternatives. In this poster we present the results of the characterization of the response of the TG-GREEN scintillator [1] to neutrons of both 14 MeV and 2.5 MeV energy. Tests were performed at the Frascati Neutron Generator [2], and accompanied by a GEANT4 [3] simulations apparatus for data interpretation. Further, Single-crystal Diamond Detectors (SDD) and Silicon Carbide Detectors (SiC) were also studied and identified as suitable alternatives for FILD application to the use of a scintillator coupled with a light detection system.

[1] M. Garcia-Munoz et al., JINST 6 P04022 (2011) [2] A. Pietropaolo et al., J. Phys.: Conf. Ser. 1021 012004 (2018) [3] S. Agostinelli et al., Nucl. Instr. Meth. A 506 (No. 3) 250 (2003)

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