

# Correlations in Signals Generated by Runaway Electrons in the GOLEM Tokamak measured using the Timepix3 Detection Modules

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## Abstract

An application study of modern pixel semiconductor detectors for characterization of runaway electron events in a tokamak is presented. This study is a continuation of our work presented at the conference IEEE NSS/MIC in Sydney, 2018. The tokamak on which the study was performed is the same remotely-operated tokamak GOLEM used also in the previous work. On this tokamak, comparative techniques utilizing spectroscopy and timing measurements of X-rays produced by the runaway electrons were used. These techniques were performed using two Advapix detection modules, each of these modules was based on a Timepix3 R/O chip with a 1 mm thick silicon sensor. The modules were placed at different positions around the tokamak chamber and were triggered by a common trigger signal. It allows comparison not only of the measured energy spectra but also time evaluations of the X-ray glints. We have observed that energy spectra measured by two modules in the same place are identical. The spectra measured in different places show variations which are detectable but not significant. More interesting results were obtained from the timing measurements. The time evolution of the signals from the detection modules are well correlated with a time shift of not more than 1 microsecond depending on the relative position of the detection modules. The time shift of 1 microsecond was repeatedly registered also in the case when these two modules were placed at same position over each other.

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