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Waveform Analysis of a 240 pixel TES for X-rays and charged particles using a function of triggering neighboring pixels

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An innovative function, called group trigger, is implemented in a 240 pixels X-ray Transition Edge Sensors to store waveforms of both a triggered pixel and surrounding pixels. It is a useful diagnostic tool to investigate an experimental environment. It can record X-ray pulses, associated cross talk events. Under the high rate of charged particle background such as an accelerator, it enables us to investigate signals from any types of combination of trigger pattern when a pixel is triggered. We utilized this function throughout the entire experiment at J-PARC for the measurement of the Kaonic atom X-rays in 2018. In this experiment, the primary pixel is distributed to the four physically nearest pixels for a practical purpose. This function is used to investigate the effect of charged particles, thermal and electrical cross talks for the X-ray signals. When a charged particle triggers the pixel, the waveforms of the neighbored pixels showed small pulses which can be considered as thermal crosstalk; while when an X-ray triggers the pixel, the nearby pixels expect for geometrically next pixel in multiplexer chips did not show thermal cross talk events. It means that X-ray events are distinguished from other events by using waveform of the nearby pixels. We further utilized the geometrical pattern of group trigger for a charged particle and an X-ray to understand the nature the cross talk events.

Less than 5 years of experience since completion of Ph.D

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