RADEN における計数型中性子イメージング検出器 μNID の開発

Development of the μNID event-type neutron imaging detector at RADEN

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At the RADEN instrument [1] of the J-PARC MLF, we take advantage of the accurate measurement of neutron energy by time-of-flight to perform *energy-resolved neutron imaging* using event-type neutron imaging detectors. These techniques allow one to image the macroscopic distributions of microscopic properties of bulk materials *in situ*, including crystallographic structure, nuclide-specific density and temperature, and internal/external magnetic fields. To better carry out these techniques at RADEN, we are continually improving our event-type neutron imaging detectors for better spatial resolution and increased count rate performance. In particular, we are actively developing a ^{3}He-based gaseous micropattern detector known as the **Micro-pixel chamber based Neutron Imaging Detector (μNID)** [2]. The μNID currently provides 100 μm spatial resolution with a 10 cm × 10 cm field-of-view, 0.25 μs time resolution, 26% detection efficiency for thermal neutrons, and an ultra-low gamma sensitivity. Through improvements to the detector hardware and analysis algorithms, we have increased the effective peak count rate of the μNID from 0.4 Mcps to over 1 Mcps [3]. We are also developing a new readout element with reduced pitch for improved spatial resolution, and a μNID with boron converter for further increased count rate. In this presentation, we will describe these ongoing development efforts, including the results of test measurements performed at RADEN.

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References

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