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X-ray/Neutron Flat-Panel Detector using LCD Technology (in-person)

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In this study, we present the results of our evaluation of a newly created flat panel detector. We have adapted the liquid crystal display technology to create an array of thin-film transistors and photodiodes, which can be used for flat-panel detector for radiation imaging. Our prototype flat-panel detector has a pixel size of 50 μm square and 252 x 256 pixels. By combining this panel with a scintillator, we implemented a flat panel detector for X-rays and neutrons. The scintillator was ZnS/LiF with a thickness of 0.4 mm. First, we evaluated the spatial resolution of the flat-panel detector using X-ray. The X-ray tube voltage was set to 30-160 kV and the tube current to 3 mA. The time for total area scanning were 227 ms, and we repeated 1000 times for averaging the images. The spatial resolution was measured up to 2.5 LP/mm. Secondly, we evaluated the flat-panel detector using neutron beam in Japan Proton Accelerator Research Complex (J-PARC) MLF BL-10. The neutron intensity at BL-10 was $4.8\times10^7 n/s/cm^2$ with neutron energies below 0.4 eV at the sample position. The total-area scanning was repeated 1000 times and images were integrated as in the case of X-rays. As a result, the images were successfully obtained for the neutron beam as well. We evaluated the spatial resolution using a Gd resolution gauge. As a result, 0.2 mm pitch (2.5 LP/mm) strips could be discriminated, and the spatial resolution was comparable to that of the X-ray cases.

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