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P1.4: MPPC-based gamma camera with pinhole collimator to locate Cs-137 sources at high doses for the Fukushima nuclear power plant

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The Fukushima Daiichi Nuclear Power Plant was severely damaged during the 2011 Great east Japan earthquake. Currently, investigations and various decontamination efforts are underway to de-commission the plants. However, it is difficult to perform decommissioning inside the reactor because the exact structure of the reactor is not yet known; the radiation level inside the reactor is extremely high, with a maximum of approximately 100 Sv/h. Under these circumstances, it is necessary to locate the radioactive sources to proceed with the work efficiently. Therefore, we developed a pinhole gamma camera consisting of a high-speed scintillator array (YGAG with a decay time of ˜70 ns, Proterial Ltd.) and multi-pixel photon counters (MPPCs) that can detect individual gamma-ray photons to locate radioactive sources at high dose rates (˜100 Sv/h). In this presentation, we report the system of the developed gamma camera and the measurement results of an extremely high dose of 137Cs (34 TBq) using the developed gamma camera. The gamma ray source position was determined with an angular size of ˜4.5° at 2-m distance from the radiation source (˜0.3 Sv/h). The direct gamma rays with a photoelectric peak at 662 keV and scattered gamma rays can be discriminated from the measured spectrum. We will also show that the imaging capability of the 137Cs depends on the detected gamma ray energies and the discussed details.

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