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Measurements of low-energy X-rays with a detector using a plastic scintillator and an MPPC

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A MPPC (Multi-Pixel Photon Counter) has some advantages in a low-voltage operation and easily making a multi-element type detector, when comparing with a photomultiplier tube. We tried to detect soft X-rays of less than 6 keV with a scintillation detector using an MPPC. The detector consists of a plastic scintillator (Pilot U, 2.5×2.5 mm^2, 1 mm thick) and an MPPC (Hamamatsu Photonics, S13360-6642, 3×3 mm^2, pixel size: 25 μm, without a resin window). We measured pulse-height spectra using a charge-sensitive preamplifier (Canberra 2005, 22.7 mV/pC), cooled down to −10℃. The detector could clearly distinguish 6 keV X-rays from noise signals. We also measured time spectra of X-ray pulse structure of 2-ns intervals in the multibunch operating mode of a Photon Factory ring. A time resolution (Full width of half-maximum) of 0.51±0.06 ns was obtained at a bias voltage of +60 V and at −10℃, using a fast amplifier having a gain of 100.

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