

# Performance study of a large CsI(Tl) scintillator with an MPPC readout for nanosatellites used to localize gamma-ray bursts

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Currently, we are developing a fleet of nano-satellites for detection and position determination of short gamma-ray bursts (SGRBs) for the proposing CAMEROT (Cubesats Applied for MEasuring and LOcalising Transients) mission. We synchronize time information of each satellite by using a global positioning system, and plan to use large-area CsI(Tl) scintillators which provide a high light output and readout by multi-pixel photon counters (MPPC), which have low power consumption that is suitable for nanosatellite platform. We plan to use one of the latest-model MPPCs provided by Hamamatsu Photonics, namely, S13360-6050CS, which have an active area of  $6 \times 6 \text{ mm}^2$ . We compared the performance of two scintillators of different sizes ( $150 \times 75 \times 5 \text{ mm}^3$ ,  $100 \times 75 \times 5 \text{ mm}^3$ ); the bigger one is the maximum size that can be mounted on a three-unit satellite we are planning to apply, and found the difference of light yield was only  $\sim 13\%$ . We also tested two-MPPC readout to improve the energy threshold and uniformity by using signals from  $^{241}\text{Am}$  source. We confirmed the same energy threshold as one-MPPC readout of  $\sim 10 \text{ keV}$  at  $25^\circ\text{C}$  and energy resolution got better by  $7\%$  thanks to the improved uniformity. Then we investigated the optimum position of two-MPPCs on the scintillator by using ray-tracing Monte Carlo simulator, and found that symmetrical configurations against to the center of the scintillator gives the best performance of light yield.

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