

Development of pixel X/gamma detector based on SiPMs and ToT-ASIC

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I. Background

A silicon photomultipliers (SiPMs) are promising photo detectors for Positron Emission Tomography (PET) and X/gamma imaging system because of its high gain and photon counting capability. The individual readout is necessary to achieve a better spatial resolution especially in high flux applications.

In the last conference, 0.5 mm fine-pitch SiPM was presented. Here a prototype of sub-mm PET detector using individual readout based on SiPMs and ASICs will be reported. Also 64 channel SiPMs with 500 μm pixel will be introduced.

resolution. The ASIC was fabricated with 0.25 μm CMOS TSMC process using 2.5 V where power consumption is approximately 200 mW per chip.

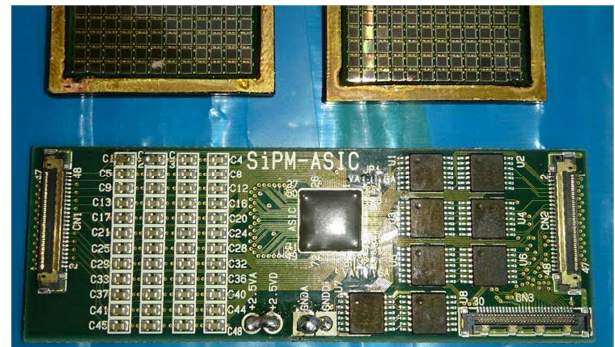


Fig.1 Fabricated SiPMs and TOT-ASIC

II. Materials and Results

In this study a prototype of photon counting detector using SiPMs and Time over Threshold (ToT) ASIC was designed and fabricated for sub-mm PET and X/gamma ray applications. The fabricated photo detector consists of 12 x 12 pixels with the pitch of 1.9 mm using KETEK PM1150 SiPMs. All channels are individually coupled to ToT ASIC through micro-coaxial cables. Figure 1 shows the picture of ASIC board with 48 channels input/outputs.

48 channels TOT-ASIC consists of current buffers and current comparators with internal DACs (digital-to-analog converter) of the 6 bit



Fig. 2 TOT energy spectrum and captured signal

III. Conclusions and Future Works

In this study a new 12 x 12 SiPM array is designed and fabricated coupled to TOT-ASIC. The various characteristics, such as timing resolution, energy resolution and detector performance will be presented at the conference.