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Development of 40 channel waveform sampling CMOS ASIC board for Positron Emission Tomography

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We have designed and fabricated 10 channel/6bit waveform sampling ASICs using ROHM 0.35 um CMOS technology. This chip was designed for GSO-APD gamma-ray detector and provides a function of "waveform recording"at a sampling frequency of 100MHz. This chip has 10channel inputs and each channel has preamp/variable gain amplifier/6-b folding ADC. The folding ADC greatly reduces the number of comparators and the power consumption of the chip. This chip provides a full function of recording a transient behavior of detector charge signals for each pulse. Self trigger function is equipped with the system and this will enable simultaneous record of all input waveforms. Each channel has 64 word FIFO where each waveform data are stored. Stored data are converted to serial data and passed to an FPGA where we can implement a detailed signal processing. This chip is operated at 3.3 V and the power consumption is 1.2W/chip.

We have developed a data acquisition board using 4 bare chips. This board has 40 input channels and we plan to use this board for APD-based DOI-PET detector system which utilizes several different crystals to recognize depth positions by the difference in their decay times.

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