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TOFPET ASICS

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The TOFPET is a low power, low noise SiPM readout ASIC targeted, but not limited to, Time-of-Flight applications. It consists of a 64-channel analogue block, calibration circuitry, golden-references, bias generators and a global controller, featuring all-LVDS digital interface. It integrates signal conditioning and discrimination circuitry and high-performance TDCs for each of its 64 independent channels. One edge is free of pins, such that a rotated twin chip can be abutted to build a compact 128 channel module. Time and energy information are extracted with a dual-threshold technique. The time information is extracted with a leading edge discriminator and a low-power TDC with 50 ps (option 25 ps) time binning. The intrinsic time resolution of the channel is below 25 ps r.m.s., owing to the good SNR of the front-end. A second time stamp, derived from the falling edge of the pulse, is used for energy measurements using the information of the time-over- threshold. The rate capability per channel was proven with laser tests to exceed 80 kHz without measurable degradation due to baseline drift. Using Hamamatsu S12643-050CN MPPC 4x4 pixel matrices, the single-photon time resolution measured is 235 ps FWHM. System-level tests with 2 ASICs on board reading eight 3.5x3.5x15 mm3 LYSO 4x4 crystal matrices (128 active channels) show a CTR of 300 ps FWHM.

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