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Development of a low-noise analog front-end ASIC for APD-PET detectors

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We report on the development of the front-end ASIC for high spatial resolution PET detectors with time-of-flight capability based on LYSO scintillator arrays coupled with position-sensitive avalanche photodiode (APD) arrays. The ASIC is designed on the basis of the Open-IP LSI project led by JAXA and realized in TSMC 0.35um CMOS technology. It is composed 8 channels of charge sensitive amplifier, band-pass filters, differentiators, energy and timing discriminators, and 2 channels of time-to-amplitude comverters. As a result, the energy resolution is 9.7% (FWHM) at 511 keV, and a time resolution is below 970 ps. We will also report on the current status of developing 2nd version ASIC which is designed to have 32 channels analog circuits with improved time resolution.

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