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An FPGA Based Fast Linear Discharge Method for Nuclear Pulse Digitization

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Inspired by Wilkinson ADC method, we implement a fast linear discharge method based on FPGA to digitize nuclear pulse signal. In this scheme, we use a constant current source to discharge the charge on capacitor which is integrated by the input current pulse so as to convert the amplitude of the input nuclear pulse into time width linearly. Thanks to the high precision of TDC measurement that we have achieved in FPGA, we can increase the current value of the discharge to make the discharge time short, so as to obtain a small measurement of dead time. We have realized a single channel fast linear discharge circuit which contains only one dual supply amplifier, two resistors and one capacitor. The rest part can be implemented in an FPGA (Field Programmable Gate Array). Leakage current from the sensor would cause the base line drifting slowly, which can influence the measuring precision. Our method solve this problem without losing the linearity of measurement. We have built the circuit and experimental setup for evaluation. Using them to measure energy spectrums of PET detectors of PMT coupled with LYSO and LaBr3 crystal, the energy resolution is 12.67% and 5.17% respectively. The test results show that our circuit is rather simple, stable and conducive for multi-channel integration.

Minioral

Yes

Description

Algo Wilkinson ADC

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