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Developing an Arduino-Based Peak Detector Circuit for Gamma Spectrum Measurement

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In this article, we describe the development of an electronic circuit for measuring the pulse amplitude of scintillation detectors using an Arduino Mega2560pro (Embed). The amplified analog signals are fed into a peak detector circuit (Lew Counts and Mark Murphy, Analog Dialogue 24-2, 1990). In addition to this circuit, we have incorporated components such as opamp comparators, flip-flops, and analog switches to ensure accurate signal sampling through the Arduino. To test the system's performance, we used standard pulses with amplitudes ranging from 200mV to 3200mV generated by the RIGOL DG4062 pulse generator. The survey results show a full-scale non-linearity of less than 0.5%. Furthermore, we measured the energy spectrum of gamma rays emitted by various isotopes such as Ba-133, Na-22, Cs-137, and Co-60 using a NaI(Tl) detector (model 44-10) and counter (model 4612) manufactured by Ludlum Measurements, Inc, and our system. The results indicate that the Full Width at Half Maximum (FWHM%) at 81KeV is 15.46%, at 356KeV is 9.90%, at 511KeV is 8.57%, at 662KeV is 8.36%, at 1173KeV is 5.24%, and at 1332KeV is 6.15%. This is a simple and cost-effective design that can be used to construct gamma-ray spectroscopy devices for educational purposes.

Minioral

Yes

IEEE Member

No

Are you a student?

No

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