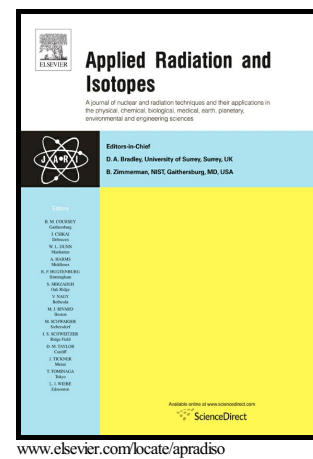


Rising time restoration for nuclear pulse using a mathematic model

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Rising time restoration for nuclear pulse using a mathematic model

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Abstract

The rising time of a nuclear pulse is slowed before being digitized because of the effect of distributed capacitance and resistance. This results in the waveform distortion of a shaped pulse. In this study, the effect of distributed capacitance and resistance is equivalent to the result of RC network. The mathematical model of the network is established to restore the rising time of the input nuclear pulse. Experimental results show that the leading edge of the nuclear pulse becomes steep after rising time restoration, and the shape of the shaped pulse is also improved. The energy spectrum obtained with rising time restoration is compared with that without rising time restoration. The comparison result indicates that using rising time restoration can extend the measurement range of pulse amplitude without affecting the energy resolution of the system.

Key words: nuclear pulse, rising time, mathematical model, trapezoidal pulse shaping

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1 Introduction

With the development of FPGA and digital signal processing (DSP), nuclear radiation measuring systems are gradually digitized, and great improvements have been made in the optimization of the structure, stability, and accuracy of these systems. For example, the output of a detector can be collected directly by using a DSP module (including the front-end circuit, ADC, FPGA, or DSP) ^[1, 2], and the

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