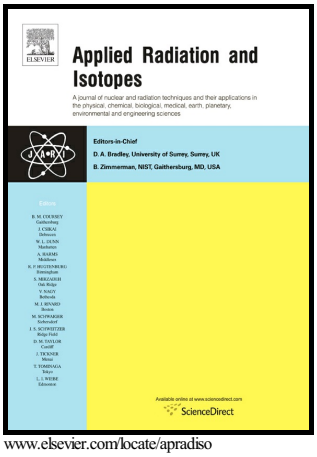

www.elsevier.com/locate/apradiso

Rising time restoration for nuclear pulse using a mathematic model

Min Wang, Xu Hong, Jian-Bin Zhou, Ying Liu, Peng Fei, Wen-Jie Wan, Wei Zhou, Ying-Jie Ma, Yi Liu, Wei-Cheng Ding

PII: S0969-8043(17)30013-1
DOI: https://doi.org/10.1016/j.apradiso.2018.01.018
Reference: ARI8226

To appear in: *Applied Radiation and Isotopes*

Received date: 6 January 2017
Revised date: 20 June 2017
Accepted date: 12 January 2018

Cite this article as: Min Wang, Xu Hong, Jian-Bin Zhou, Ying Liu, Peng Fei, Wen-Jie Wan, Wei Zhou, Ying-Jie Ma, Yi Liu and Wei-Cheng Ding, Rising time restoration for nuclear pulse using a mathematic model, *Applied Radiation and Isotopes,* https://doi.org/10.1016/j.apradiso.2018.01.018

Rising time restoration for nuclear pulse using a mathematic model

MinWang, XuHong*, Jian-BinZhou, YingLiu, Peng Fei, Wen-JieWan, WeiZhou, Ying-JieMa, YiLiu, Wei-ChengDing

College of Nuclear Technology and Automation Engineering, Chengdu University of Technology, Chengdu 610059, China

*Corresponding author E-mail: hongxucdut@163.com

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

PACS: 29.30.Kv

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