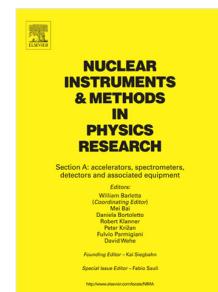


# Accepted Manuscript

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PII: S0168-9002(18)30405-4

DOI: <https://doi.org/10.1016/j.nima.2018.03.053>

Reference: NIMA 60695

To appear in: *Nuclear Inst. and Methods in Physics Research, A*

Received date: 11 August 2017

Revised date: 13 March 2018

Accepted date: 15 March 2018

Please cite this article as: M. Nakhostin, K. Hitomi, Pulse-height loss in the signal readout circuit of compound semiconductor detectors, *Nuclear Inst. and Methods in Physics Research, A* (2018), <https://doi.org/10.1016/j.nima.2018.03.053>

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# Pulse-height loss in the signal readout circuit of compound semiconductor detectors

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## Abstract

8 Compound semiconductor detectors such as CdTe, CdZnTe, HgI<sub>2</sub> and TlBr are known to  
9 exhibit large variations in their charge collection times. This paper considers the effect of  
10 such variations on the measurement of induced charge pulses by using resistive feedback  
11 charge-sensitive preamplifiers. It is shown that, due to the finite decay-time constant of the  
12 preamplifiers, the capacitive decay during the signal readout leads to a variable deficit in the  
13 measurement of ballistic signals and a digital pulse processing method is employed to  
14 correct for it. The method is experimentally examined by using sampled pulses from a TlBr  
15 detector coupled to a charge-sensitive preamplifier with 150  $\mu$ s of decay-time constant and  
16 20 % improvement in the energy resolution of the detector at 662 keV is achieved. The  
17 implications of the capacitive decay on the correction of charge-trapping effect by using  
18 depth-sensing technique are also considered.

19 Keywords: Compound semiconductor detectors; Pulse-height loss; Ballistic deficit effect;  
20 Signal readout; Digital signal processing;

21

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