Iranian Journal of Physics Research, Vol. 20, No. 1, 2020

The effect of operating parameters on the dead time of Geiger-Muller counter using non-paralyzing model by two-source method

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(Received 18 January 2019 ; in final form 13 May 2020)

Abstract

This paper investigates the effect of such operating parameters as ambient temperature and applied voltage on the dead time of a thin-walled Geiger-Muller (GM) counter using the non-paralyzing model and the two-source method. Experimental studies are conducted using ^{137}Cs and ^{90}Sr sources at voltages ranging from 600 to 800 V and in the temperature range of -27-70 ^{0}C. The results of the investigations for applied voltage indicate that the dead time behavior in terms of voltage can be classified into three distinct regions. In the region I (low voltages), the dead time is decreased with increasing voltage; in the region II (voltage close to the operating voltage), the dead time is almost constant. The dead time in the region III (voltages above 740V) increases slowly and linearly with increasing voltage. The variation in the dead time in the region I is greater than that in region III. Region II with the minimum dead time and the minimum variation of the operating voltage is the best operating region. Studies show that the variation of dead time and the range of the dead time plateau (District II) for ^{137}Cs and ^{90}Sr sources are different. The dead time using ^{137}Cs source is obtained to be between 58 and 87 μs; by using ^{90}Sr source, it is between 79 and 130 μs. In general, the variations of dead time versus voltage for each of the Regions I, II and III for ^{90}Sr and ^{137}Cs sources are almost the same. Experimental results also show that the dead time increases with raising temperature.

Keywords: Geiger-Muller counter, deadtime, temperature dependence, applied voltage

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