

Radiation Response of Vacuum Photoelectric Tube and a Temporal Method for Reducing Its Effect

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Abstract: Vacuum photoelectric tube is a kind of almost near-ideal light receiver and amplifier so that it is widely in scintillation detectors for converting weak light output to electrical signal than can be measured directly. When in use, the tube is usually placed in the interesting radiation field and inevitably radiated by incident or scattered radiation so that a little unwanted output signal is formed. This signal isn't related to the designed scintillator and possibly affects the designed pulsed radiation performance of whole detector when some scintillator with low light yield is adopted. In the paper, signal formation mechanism of the radiation response is for the first time theoretically analyzed. Then the sensitivity is also estimated and experimentally tested. At last, through well-designed reversed experiment, it is demonstrated that not only Cerenkov emission generally accepted, but also fluorescence emitted isotropically both play primacy role in the radiation response of the tube. In addition, a temporal layout has been designed and proved to be effective for reducing effect of radiation response.