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KANIT SANGSUWAN: PHOTODIODE BASED RADIATION DETECTION

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X-rays are widely used in medicine, not only for diagnosis but also for the treatment of diseases. In these applications, the equipment must be carefully operated in such a way that hazards from radiography are kept under control. A number of performance checks should be carried out at regular intervals to ensure that the x-ray equipment is correctly operated. Care is necessary in the selection of instruments for monitoring x-rays. Ion chambers are probably the most suitable equipment although they are sometimes lacking in sensitivity.

The purposes of this study, which was part of a quality assurance program for hospital x-ray equipment in 1998, were to assess the dosimetric characteristics of a semiconductor photodiode detector studied in parallel with an ion chamber for their responses to tube current, tube voltage, dose-rate measurements, linearity, energy response and repeatability.

In the calibration of the x-ray generator, the coefficient of variation in tube voltage and tube current readings were found to be less than 2 %, which is very well accepted. The linear observed relationship between exposure factors and the pin photodiode output signals was ($r = 0.948$). The output signals measured by the pin photodiode detector was found to be highly correlated with the dose-rate measured by ion chamber ($r = 0.979$). It had a high energy resolution and the repeatability of output signals measurements of 0.056 was well accepted within the standard limit.

The development of a semiconductor photodiode as presented in this study might allow an alternative detector for monitoring x-rays. This could be used as a routine dosimeter in quality assurance programs for x-ray apparatus. Further development with some modifications is recommended. This would be of great benefit in the fields of radiation dosimetry and radiation protection.