Contribution ID: **49** Type: **Poster**

Silicon PIN-photodiode and CsI(Tl) scintillator in application to a portable dosimeter

ICRP has recommended an equivalent dose limit for the eye-lens be 20mSv per year, averaged over defined periods of 5 years, with no single year exceeding 50mSv. The reduction of the limit for occupational exposure for the eye-lens has significant implication in view of the application to planned exposure situations for the different areas of occupational exposure and needs adequate approaches for eye protection and eye dose monitoring.
A portable dosimeter for personal dose equivalent Hp(3) measurements based on silicon PIN-photodiode coupled to CsI(Tl) scintillator was designed and tested in this paper. The composition structure of the dosimeter is shown in the figure below. Silicon semiconductor detectors are mainly operated in current or pulse mode to collect the charge produced by radiation interactions. Current mode was selected for this dosimeter. A transresistive, non-polarized amplification current-to-voltage conversion stage was designed and built to amplify the PIN diode signal. The electronics is based on a Texas Instruments operational amplifier and provides a closed loop gain of 108 at zero frequency. The output voltage is directly proportional to the photocurrent generated in the photodiode by radiation interactions. A Monte Carlo simulation of the detector was performed with the GEANT4 code in order to model and fully understand, in particular, the impact of the sensor casing on the low energy response of the device.
The Hp(3) dosimeter was tested in a reference radiation field of narrow spectrum X-ray and 137Cs nuclide sources with an ISO standard plate phantom. The conventional values Hp(3) on the test point of the reference radiation fields were calculated using the air kerma Kair and the conversion coefficients Hp(3,α) recommended by ICRP 116 recommendation. The Kair can be measured by standard ionization chamber dosimeter. Then the conventional true value Hp(3) on test point was provided and compared with dosimeter measured values. Dose rate measurement accuracy is better than 40% in range 10μSv/h-10mSv/h due to the special preamplifier circuit with low input bias current.
The batch-to-batch reproducibility of different batches of diodes and scintillators was also experimentally investigated, showing a linear correlation between PIN-photodiode readout and the conventional true value Hp(3) of the reference radiation field. Therefore, this portable dosimeter based on silicon PIN-photodiode and CsI(Tl) scintillator appears promising for the eye-lens dose monitoring.

Name of Member State/Organization

CHINA

Speakers affiliation

China Institute for Radiation Protection

Speakers email

wangyu110ah@163.com

Author: Mr WANG, Yu

Presenter: Mr WANG, Yu

Session Classification: Session 2. Monitoring and dose assessment of occupational radiation exposures

Track Classification: 3. Monitoring and dose assessment of occupational radiation exposures