



CLINICAL DOSIMETER BASED ON DIAMOND DETECTOR

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Diamond detectors have found application in the relative dosimetry and their parameters have been described elsewhere [1]. Today, the exclusive producer of the diamond detector is the Institute of Physical and Technical Problems, Russia, and exclusive dealer is the PTW-Freiburg. The main features of the diamond detector are good long time stability, suitable range of the energy dependence for photon and electron beams in clinical use, independence of the measured dose from temperature and pressure.

The high sensitivity per volume unit of the diamond detector (1500 times higher than ionization chamber) allowed using detectors with very small volume (1-5 mm³) and rather simple electronics for ionization current registration.

The new dosimeter consists of the diamond detector itself, 40 m registration cable, pre-amplifier, micro-processor block for data handling and absorbed dose calculation using the calibration factor of diamond detector in terms of absorbed dose to water. Dosimeter has the possibility to work with PC using standard RS-232 interface. The main features of the dosimeter are as follows:

- the range of dose rate measurements for photon, electron and proton beams is within 0.01-1.0 Gy/s;
- the energy ranges for photons are 0.08 – 25 MeV, and 4 –25 MeV for electrons, with energy dependence no more than $\pm 2\%$;
- the main uncertainty of the dose measurements is within $\pm 2\%$;
- the pre-irradiation dose for diamond detector is no more than 10 Gy;
- the sensitive volume of the used diamond detectors is within 1-5 mm³;
- the weight of the dosimeter no more than 2 kg.

The new dosimeter was evaluated at the Central Research Institute of Roentgenology and Radiology, St. Petersburg, Russia to verify its performance. The dosimeter was used as a reference instrument for dose measurements at Cobalt-60 unit, SL75-5 and SL-20 linear accelerators and the test results have shown that the device have met the specifications. It is planned to produce dosimeter as serial device by the Institute of Physical and Technical Problem after completion of the tests.

REFERENCES

- [1] VATNITSKY, S.M., KHRUNOV, V.S., FOMINYCH, V.I. AND SCHUELE, E. Diamond detector dosimetry for medical applications. Radiat. Prot. Dosim. 47, No 1/4 (1993) 515-518