

TEMPERATURE RESPONSE FACTOR OF DIODE DETECTORS FOR IN VIVO RADIOTHERAPY

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Abstract

In Vivo Dosimetry (IVD) is part of Quality Assurance Program. In Vivo Dosimetry is either performed with semiconductor diodes or thermoluminescent dosimeters (TLD). IVD is the ultimate method used in most radiation tumor treatment centers to verify that dose is delivered to patient's organ as planned. Semiconductor detectors are superior to TLD detectors as their reading is given live, they have a very good spatial resolution and they are sturdy devices mechanically. However, diode detectors response to radiation varies with photon beam energy, irradiation rate, temperature, angle between photon beam axis and diode axis etc. At Hygeia Hospital Tirana cancer patients are treated with high energy photons produced by Elekta Synergy Platform Accelerators. As dose detectors were being used silicon semiconductor probes made of three diodes product of PTW/Freiburg, Germany which were connected to a PTW Multidos electrometer for signal measurements. IVD, has not, to our knowledge, been practiced in Albanian cancer treatment centers as yet. Calibration of detectors is the first step, in establishing an IVD method. In this paper are presented our experimental work, data and findings of diode variance with temperature. In clinical use, as detectors are placed on patient's skin, their temperature rises from room temperature of about 20 Centigrades to skin temperature, typically of about 32 Centigrades. Ideally readings would be proportional to dose received and would not be affected by temperature variation. In our experiment probes were immersed in a water tank and irradiated with a 6 MV photon beam by Elekta Synergy Platform Accelerators, within a field size 10 cm x 10 cm at a Source Skin Distance (SSD) of 100 cm. Water temperature was raised by one degree from 18°C to 36°C. Readings were taken for every consecutive degree. It was found that variation of detector response was linear with temperature with sensitivity variations of 0.03±0.01. Our results show that p type silicon semiconductor diodes are suitable for In Vivo Dosimetry in cancer treatment clinics and their temperature dependence, in particular, is not a significant factor.

Keywords: *IVD, diode detector, temperature dependence, PTW*