



CALIBRATION PROCEDURES FOR MAMMOGRAPHY DOSEMETERS IN POLAND

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Breast cancer is the most frequent tumour in women and the effectiveness of the treatment depends dramatically on the early detection of the disease. That is the reason why in Poland the mammography control examinations are strongly supported by the Centre of Oncology. In Poland there are over 400 mammography units which account for about 300,000 examinations per year. An investigation performed by the Medical Physics Department of the Centre of Oncology in Warsaw at about 100 mammography facilities proved that in most cases the doses absorbed by the patients could be reduced without decrease of image quality [1]. This is one of the reasons why the Polish Secondary Standard Dosimetry Laboratory (SSDL) dealing mainly with calibration of radiotherapy dosimeters is extending its activities and therefore new facilities and equipment adapted for calibration of mammographic dosimeters have been installed.

The mammography dosimetry calibration equipment is permanently installed in the same laboratory room where the radiotherapy dosimeters are calibrated. A base of a mammography unit no longer in clinical use, together with its movable system has been adapted to handle ionization chamber holders. An X-ray tube with a 50 kV high frequency generator was also installed. The tube, a Varian type OEG-50-2, (designed for laboratory applications) with molybdenum anode of an anode angle $23,7^{\circ}$ and with a large focus, effective size approximately 5 mm^2 , has an inherent filtration of 0,25 mm beryllium. It is installed in a housing with 2mm lead shielding; a cone shaped beam is formed by a system of three collimators.

The X-ray beam was thoroughly examined. The following beam parameters were measured: beam homogeneity, the dose as the function of high voltage and current and a function of distance; the half value layers were determined and compared with the values given by the IAEA dosimetry laboratory [2].

The calibrations were performed using the substitution method, comparing the response of the detector to be calibrated with that of a reference instrument. The detector positioning is remotely controlled without the necessity of switching of the radiation beam. An ionization chamber from PTW Freiburg, type N77337-0039 (chamber volume 1 cm^3) with Keithley 617 electrometer was used as a secondary standard. The chamber was calibrated at the PTW laboratory [3].

The results of calibration coefficient measurements for PTW-semiconductor detector W60005-189 with Diados electrometer, and Keithley ionization chamber type 96035B No 81133 (chamber volume 15 cm^3) with Keithley 617 electrometer are given in Table 1. Calibrations of other detector types are being carried out. Calibration coefficients for the detector W60005-189 determined by PTW in 1997 are given in the last column of the Table 1 [4].

TABLE 1. Calibration coefficients given by the SSDL (Warsaw) and PTW (Freiburg)

		PTW	SSDL	SSDL	PTW
High voltage U (kV)	HVL (mm Al.)	PTW-N77337-0039	Keithley 96035B-81133	PTW-W60005-189	PTW-W60005-189
28	0.216	1.067	0.990	1.083	1.055

30	0,238	1.058	0.981	1.057	1.042
35	0,286	1.040	0.967	1.013	1.015
40	0,327	1.028	0.960	0.989	0.996

- Calibration set-up (X-ray tube with relatively large focus and remote control of the detector positioning) allows for quick and accurate calibrations.
- the calibration coefficients of the PTW semiconductor detector type W60005 determined by the SSDL in 2001 are in very good agreement to those determined at the PTW in 1997.

REFERENCES

- [1] Tolwinski J, ed. Evaluation of mammography facilities in Mazovian and Holy-Cross regions and selected urban areas in Poland in 2000 (in Polish). Warsaw, Ignis, 2001.
- [2] Pernicka F, Andreo P., Meghzifene A, Czap L, Girzykowski R. Standards for radiation protection and diagnostic radiology at the IAEA dosimetry laboratory. SSDL Newsletter 1999, (41): 12-23.
- [3] PTW Freiburg test certificate No 992938 of 1999 for detector type N77337-0039.
- [4] PTW Freiburg test certificate No 970428 of 1997 for detector type W 60005-189.

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