

Status Report of BEV for

Section I of the Consultative Committee for Ionising Radiation (CCRI) - 2001

Activities and Projects in the Period 1999 to 2001 at the Dosimetry Laboratory of the BEV*

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In the period covered by this report the dosimetry laboratory of the BEV was involved in the following activities and projects:

Project EUROMET 526:

The dosimetry laboratory of the BEV co-ordinates the project EUROMET 526:

Calibration of dosimeters used in mammography with different X-ray qualities

(tube voltages from 20 kV to 50 kV). This project has now been agreed among 14 European laboratories and has the following background:

A set of X-ray qualities containing different anode (Mo, W, Rh) and filter materials (Mo, Rh, Pd) for mammographic X-ray equipment is defined in table 1 of IEC 1223-3-2:1996 (Acceptance tests - Imaging performance of mammographic X-ray equipment). For the calibration of dosimeters used in mammography for the time being only qualities produced by a Mo-anode are defined in IEC 61267:1994.

At this time only a few standard and calibration laboratories are equipped with X-ray tubes with Mo-anode capable of providing these X-ray qualities for calibration purposes. On the other hand a number of "similar" radiation qualities from X-ray tubes with W-anode are available at these laboratories worth to be considered as an alternative to the X-ray qualities defined in IEC 61267. These alternatives include qualities defined by BIPM-CCEMRI: 1972 and ISO 4037-1:1996 (narrow and high air kerma rate spectra) as well as the X-ray qualities from IEC 1223-3-2 which can be produced by the existing X-ray tubes with W-anode. The availability of all these and other relevant radiation qualities as well as dosimeters / detectors was ascertained by the results of a questionnaire completed by different metrological institutes. Therefore this project was initiated in order to validate the different radiation qualities with respect to their suitability for the calibration of dosimeters used in mammography.

Within this project it has been agreed to calibrate **four different instruments** given below in all participating laboratories. Two of the instruments are ionisation chambers, the other two instruments contain semiconductor detectors. These instruments are circulated during the year 2001 among the participating laboratories. However, all participants are free to choose other instruments for additional investigations under this running project. Results of this project will be available in 2002.

Instrument	Model / type	Manufacturer	Nominal response
1 ionisation chamber	Model 10x5-6M, 6 cm ³	Radcal	0.2 nC/mGy
1 ionisation chamber	Type 77334, 1 cm ³	PTW	0.05 nC/mGy
1 dosimeter (semicond. type)	Diados type 11003 - Detector type 60005	PTW	20 nC/mGy
1 dosimeter (semicond. type)	Mult-O-Meter model 508	Unfors	-

For the calibration of the dosimeters and ionisation chambers the **radiation qualities** given below will be used as far as they are available at the different laboratories:

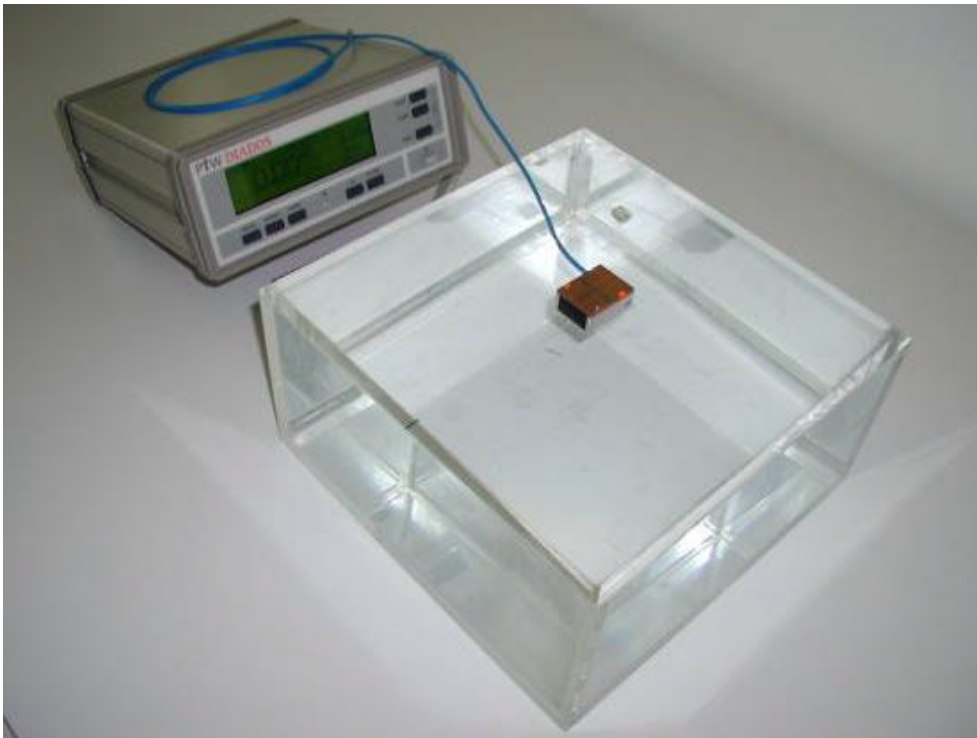
Group of radiation qualities no.	Anode material	Tube voltage kV	Added filtration	1. half value layer approx.*) mm Al	Recommended air kerma rate mGy/s	Recommended air kerma mGy	Remarks
1.	Mo	25, 28, 30, 35, 40, 50	30 µm Mo	0.28 – 0.44	1	10 – 100	unattenuated beam
2.	Mo	25, 28, 30, 35, 40, 50	30 µm Mo + 2 mm Al	0.58 – 0.97	0.1 – 0.2	1 – 10	attenuated beam
3.	Mo	28, 30, 32	25 µm Rh	0.39 – 0.42	1	10 – 100	unattenuated beam
4.	Rh	25, 30, 35, 40	25 µm Rh	0.34 – 0.51	1	10 – 100	unattenuated beam
5.	Rh	30, 35	25 µm Rh + 2 mm Al	0.80 – 0.85	0.1 – 0.2	1 – 10	attenuated beam
6.	W	23, 25, 28, 30, 35, 40, 50	60 µm Mo	0.33 – 0.44	1	10 – 100	unattenuated beam
7.	W	23, 25, 28, 30, 35, 40, 50	60 µm Mo + 2 mm Al	0.56 – 0.97	0.1 – 0.2	1 – 10	attenuated beam
8.	W	30	50 µm Rh	0.50	1	10 – 100	unattenuated beam
9.	W	30	50 µm Rh + 2 mm Al	0.82	0.1 – 0.2	1 – 10	attenuated beam
10.	W	30	40 µm Pd	0.47	1	10 – 100	may be skipped because of similarity to rad. qual. no. 8 and no. 9 ?
11.	W	30	40 µm Pd + 2 mm Al	0.87	0.1 – 0.2	1 – 10	
12.	W	25	0.4 mm Al	0.24	1	10 – 100	BIPM - CCEMRI
13.	W	30	0.52 mm Al	0.38	1	10 – 100	ISO 4037 high air kerma rate
14.	W	20, 25, 30	1 mm Al – 4 mm Al	0.32 – 1.2	0.1 – 0.2	1 – 10	ISO 4037 narrow spectrum series

*) half value layers can vary within certain limits from laboratory to laboratory

EA - Interlaboratory Comparison IR 4:

Calibration of a Personal Dosimeter for Personal Dose Equivalent Hp(10)

The dosimetry laboratory of the BEV presently organises an interlaboratory comparison of the European Co-operation for Accreditation (EA). The dosimeter without the phantom given in the picture below is circulated among 19 participating laboratories for calibration in terms of Personal Dose Equivalent Hp(10). The instrument will be calibrated in the ^{137}Cs and/or ^{60}Co beams of the laboratories in the dose range from 1 mSv to 10 mSv using the procedure agreed with the national accreditation body. Two Non-European laboratories (one in the United States and one in South Africa) will also be included in this exercise. Results of this comparison will be available in 2002.



International Comparisons

The dosimetry laboratory of the BEV participated in the **CCRI(I)-K4** key comparison for the dissemination of the quantity for absorbed dose to water in November 1999 and in the **BIPM.RI(I)-K2** key comparison for X - rays with tube voltages from 10 kV to 50 kV in March 2001. In the BIPM.RI(I)-K2 key comparison the free air chambers of the BIPM and BEV for low energy X - rays were compared in the BIPM X -ray beam. At the same time calibration factors of a transfer chamber (Exradin A11TW) were compared. This chamber was calibrated against the free air chambers in the laboratories of the BEV and the BIPM. The report is in progress.