

Progress Report on the Radiation Dosimetry at OMH

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Gamma-ray dosimetry

- The three years laboratory reconstruction has been finished with the installation of a new **PC controlled measuring bench**. The reproducibility of the three-dimensional detector positioning system is ± 0.5 mm. The beam profiles of the ^{137}Cs and ^{60}Co sources are well defined, 'flat' and the dose rates follow the inverse square law strictly up to 10 metres thanks to the low scattering collimator.
- A new **100 TBq ^{60}Co source** is under way for the therapy level irradiation facility.
- Calibrations of three transfer chambers in term of absorbed dose to water in the frame of **CCRI(I)-K4** key comparison have been carried out
- An indirect comparison of primary standards of air kerma of **OMH and ENEA** for ^{60}Co radiation has been performed and the preliminary result is under evaluation.
- A new Euromet project No. 813 was initiated and launched by the OMH to support the degrees of equivalence and the relevant CMC lines of the 26 participants. The title is '**Comparison of air kerma and absorbed dose to water measurements of ^{60}Co radiation in radiotherapy**' The identifications in the BIPM KCDB are **EUROMET.RI(I)-K1 and EUROMET.RI(I)-K4**. *(Under the project two key comparisons are running in parallel for measurements of the two quantities. Almost the same protocol cover them. Two sets of transfer instruments (PTW UNIDOS 2.3 dosimeter with PTW 30001 and Wellhöffer FC65-G chambers, and PAM 2001 electrometer with NE 2561 and OMH ND 1006 chambers) should be calibrated in terms of absorbed dose to water at 5 cm depth in standards water phantom. In term of air kerma free in air all the four chambers with both electrometers should be calibrated. The N_{Kair} and N_{Dw} calibration coefficients are the comparison parameters. Detailed uncertainty budgets of the calibration coefficients and national standards, or traceability descriptions if they are not primary standards, are required separately for the two quantities. An interim publication of the 12 secondary standard labs' results without discovering the calibration coefficients will be published in October 2006.)*

X-ray dosimetry

- The standard diagnostic radiation qualities **RQR** and **RQA**, established in the IEC 61267 standard, has been installed.
- Within the Euromet project No. 738 **EUROMET.RI(I)-S5** 'Comparison of the Hp(10) for photon radiation (ISO 4037 narrow spectra series' the transfer chamber was calibrated using the N-15, N-20, N-30, N-60, N-120 beam qualities and 0° , 45° , 60° , 75° angles. Expanded ($k = 2$) uncertainties of the calibration factors were between (4,1%-8.6%)
- Within the Euromet project No.545 **EUROMET.RI(I)-S3** 'Comparison of the air kerma for ISO 4037 narrow spectra spectrum series (30 kV-300 kV)' three transfer chambers having different volumes TK 30 diam. 44 mm, LS 01 diam. 140 mm, LS 10 diam. 275 mm were calibrated using 10 beam qualities from N30 to N300. . Expanded ($k = 2$) uncertainties of the calibration factors were between (0.76%-1.16%)

Legal metrology

- Type tests of therapy dosimeters Scanditronix DPD-510 with RK8305 and NACP02 ionisation chambers and PTW Multidos 14004 with PTW 30006 and PTW 30010 ionisation have been performed. A new Hungarian electrometer type PAM 2001 was also type tested.
- Reference irradiations and yearly performance test for the personal dosimetry service have been carried out.

International activities

- In conclusion of a four years discussion 20 CMC dosimetry service items have been accepted and published at the BIPM database.

Future works

- Review of the correction factors of low energy free-air chamber particularly the correction for fluorescence radiation.
- Calibration of therapy and diagnostic ionisation chambers in term of absorbed dose to water, and air kerma length respectively, using a few medium energy X-ray beam qualities.
- Determination of radiation characteristics (beam profile, spectra etc.) of the new therapy ^{60}Co source
- Cooperation with other PSDL to restart the measurements of absorbed dose to water by graphite calorimeter.

Publications

Csete I., Machula G.: Calibration of dosemeters used in mammography (Sugárvédelmi Továbbképző Tanfolyam, Mátrafüred 2003)

Csete I.: Ionizing radiation measurements at the OMH (10.th Conference of Medical physicist, Kaposvár 2003)

P. J. Allisy-Roberts, I. Csete: Comparison of the standards of absorbed dose to water of OMH and the BIPM for ^{60}Co γ -rays (BIPM Rapport 03/08)

Csete (OMH), Ludwig Büermann (PTB): results supporting calculated wall correction factors for cavity chambers (Physics in Medicine and Biology, 48 (2003) 3581-3594).

Csete (OMH), Ludwig Büermann: (PTB) RECENT DEVELOPMENTS AND CURRENT STATUS OF AIR KERMA STANDARDS (Invited paper) (Standards and Codes of Practice in Medical Radiation Dosimetry IAEA STI/PUB/1153, 984 pp.; 196 figures; 2003, ISBN 92-0-111403-6,

Csete: New quantities in the radiation protection and their measurements (Hungarian Journal of Physics 2004/7).

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