

QUALITY CONTROL AND QUALITY ASSURANCE PHILOSOPHY INTRODUCED IN NATIONAL PERSONNEL DOSIMETRY SERVICE

Trousil J., Zelenka Z., Kvasnička O.

National Personnel Dosimetry Service (NPDS) Ltd. , Prague

There in NPDS the implementation of the control system to guarantee the credibility of the measured personal dose equivalents results was given on the basis of the international recommendations published by the European Commission and the IAEA and in particular of the decree of the SÚJB No. 132/2008 Coll. [1, 2, 3, 4].

The quality control and the quality assurance are carried out in all three personal dosimetry services introduced in NPDS: in the film badge, thermoluminescent (TL) and neutron dosimetry [5, 6].

A) QUALITY CONTROL

1. Film badge dosimetry

The quality control is ensured by the current processing of the following film dosimeters inserted in each processed film dosimeters group:

- 12 pcs of film dosimeters irradiated by air kerma K_a of ^{137}Cs known values (range from 0.2 to 200 mGy)
- 11 pcs of film dosimeters irradiated by air kerma K_a of X ray (~ 45 keV) known values (range from 0.15 to 10 mGy)
- 6 pcs of background film dosimeters.

The computer program fits calibration points by the 3rd to 6th order polynomial in the current curve monotonicity check by the second derivative. The program calculates the absolute and the relative deviation for each calibration point and the root-mean-square deviation of the polynomial. The polynomial is satisfactory, if the root-mean-square deviation is less than $\pm 5\%$ ($k = 1$) and the relative deviation is not higher than $\pm 10\%$ for each calibration value. If the above written conditions are not satisfied, the program does not continue in operating film dosimeters measurements and in personal dose equivalents calculations and it is required the intervention of the official.

2. Thermoluminescent dosimetry

The quality control is based on insert 6 pcs irradiated TL dosimeters (standards) by air kerma K_a of ^{137}Cs known value 2 mGy and 6 pcs background TL dosimeters in each jointly measured TL dosimeters group. One part of this control is also the heating element temperature and the corresponding response of the heated element under the nitrogen atmosphere measurement.

The computer program calculates the average value and the standard deviation of this value ($k = 1$). The standard deviation must be less than $\pm 5\%$ for measured standards and less than $\pm 10\%$ for the background dosimeters. At the same time the sensitivity (digit / mGy) and its consensus with the long-term average value for this TL detectors group is checked.

In the case of the disagreement the program does not continue in further measurements and it is required the intervention of the official.



SK09K0022

3. Neutron dosimetry

The quality control is based on insert 6 pcs irradiated dosimeters (standards) by dose equivalent H of ^{252}Cf known value 10 mSv and 6 pcs non-irradiated detectors in each jointly measured neutron dosimeters group. The standards and the non-irradiated detectors are not used to a calibration but to a check of etching conditions [5, 6].

The computer program calculates the average number of tracs behind the individual radiators of the irradiated standards. If these values are more than $\pm 10\%$ outside of the long-term averages value range, the program does not continue in operating dosimeters measurements and it is required the intervention of the official.

B) QUALITY ASSURANCE

This methodology is based on insert dosimeters, which are irradiated by the official on the PMMA phantom in Hp(10) into the measured dosimeters group of each personal dosimetry services introduced in NPDS. This value is not known to workers, who take dosimeters measurements. The official checks the accuracy of measurements. In the case of the disagreement, he must analyse these causes and ensure the redress.

One part of the quality assurance is also a regular verification of the quantity Hp(10) measurement accuracy, which is carried out by Czech Metrology Institute - Inspectorate of Ionizing Radiations. The measured values must match the requirements of international recommendations.

Furthermore NPDS takes part in the international intercomparison organized by the IAEA and the EU.

REFERENCES

- [1.] Decree of the SÚJB No. 132/2008 Coll. "on the Quality System in the Implementation and Delivery of Activities Related to the Utilisation of Nuclear Energy and in Radiation Activities and on Quality Assurance of Classified Equipment with a View to their Inclusion into Safety Classes"
- [2.] Assessment of Occupational Exposure Due to External Sources of Radiation Safety Guide No. RS-G-1.3, IAEA, Vienna (1999)
- [3.] ICRP Publication No. 75: General Principles of the Radiation protection of Workers, Ann. ICRP 27 (1) (1997)
- [4.] Council Directive 96/29/EUROATOM of 13 May 1996, OJ of the EC, L159, Vol. 39 (29 June 1996)
- [5.] Trousil J. Et al. Basic dosimetric characteristics of the Czechoslovak thermoluminescent and neutron dosimeters, Kernenergie 27, 246-254 (1984)
- [6.] Trousil J., Spurný F, and Plichta J. Personal neutron dosimeter of the CR – results of international intercomparison 2003. Presented at the XXVIth Days of Radiation protection, Luhačovice, November 2004