



INTERLABORATORY COMPARISON EXERCISE USING OSL PERSONAL DOSIMETERS BETWEEN THE LMRI-DEN/UFPE, BRAZIL, AND LCD/LAF-RAM, NICARAGUA.

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Introduction: This document presents the methodology and the results obtained in the intercomparison exercise organized by the Ionizing Radiation Metrology Laboratory at the Federal University of Pernambuco (LMRI-DEN/UFPE) and the Radiation Physics and Metrology Laboratory (LAF -RAM) of the National Autonomous University of Nicaragua, Managua (UNAN-Managua). The comparison aimed to assess the technical capabilities of the the Dosimetry Calibration Laboratory (LCD) belonging to LAF-RAM for the irradiation of personal dosimeters in terms of Hp(10) magnitudes with a ¹³⁷Cs radiation beam. The BeO OSL dosimeters were shipped by LMRI-DEN/UFPE to LAF-RAM for irradiation in March 2020.

Material and method: The transfer instrument for the Hp(10) determination was a personal Optically Stimulated Dosimeter, manufactured by Dosimetrics GmbH. This dosimeter uses one beryllium oxide (BeO) chip as the detector element for Hp(10). The Hp(10) detector is covered with a filter made of 2,4 mm Teflon.

These dosimeters were irradiated, according to the procedures of the LCD/LAF-RAM, on an ISO water slab phantom of 30cm x 30cm x 15cm depth to represent the human torso, at 0° angle incidence and a distance of 2,5m from the source. The conversion coefficients adopted were under ISO Standard 4037-3:2019.

The dosimeters were read and evaluated at the LMRI-DEN/UFPE laboratory with the BeOSL calibrated reader manufactured by Dosimetrics. According to the comparison protocol for irradiation 3 dosimeters were irradiated at doses of 2 mSv and 3 dosimeters with 4 mSv.

Results: The performance evaluation of the participating laboratory was carried out according to the ISO Standard 17043:2010, through the common En value determined according to equation 1.

$$E_n = \frac{(x - X)}{\sqrt{U_{lab}^2 + U_{ref}^2}} \quad Eq. 1$$

Where: x: is the participant's result; X: is the assigned value; U_{lab}: is the expanded uncertainty of a participant's result; U_{ref}: is the assigned value for the expanded uncertainty of the reference laboratory.

The criteria evaluation for En numbers were established from ISO Standard 17043:2010 as:

- |E_n| ≤ 1,0 Satisfactory.
- |E_n| > 1,0 Unsatisfactory.

Table 1 shows the results provided by the reference laboratory received in April 2020.

Table 1. Results obtained and calculation of the En.

Dosimeter code	Nominal value Hp(10) [mSv]	Uncertainty [%]	Net result [mSv] (L-BG)	Net average dose [mSv]	Uncertainty [%]	En
80010848	2	4,1	1,98	1,997	10	-0,0154
80017196			2,02			
80020789			1,99			
80025690			4,19			
80026529	4	4,1	4,33	4,212	10	0,468
80030592			4,11			

Conclusions: The results obtained from the criteria evaluation En were less than 1,0, therefore, the irradiation procedures from LCD/LAF-RAM are adequate and satisfactory.

References:

1. ISO 4037-3:2019, Radiological protection — X and gamma reference radiation for calibrating dosimeters and doserate meters and for determining their response as a function of photon energy — Part 3: Calibration of area and personal dosimeters and the measurement of their response as a function of energy and angle of incidence.
2. ISO/IEC 17043:2010, Conformity assessment— General requirements for proficiency testing.