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ABSTRACTS**

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Results of IMS participation in international intercomparisons for whole body dosimeters – 10 years of study

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The regular participation of an accredited individual monitoring service (IMS) in the international and/or interlaboratory intercomparisons (IC) is required according to ISO/IEC 17025:2017 standard, General requirements for the competence of testing and calibration laboratories. By taking the part in an IC, IMS shows competence, reliability, and has an opportunity to learn further and improve its measurement method. The European Dosimetry Group (EURADOS) Working Group 2 (WG2) has acknowledged the value of the regular IC and also found that data and results from it are fundamental for the harmonization of the measurement process [1]. Thus, EURADOS started a self-sustained program of IC for IMS for external radiation on a biannual basis. The results of an accredited IMS at the Department of Radiation and Environmental Protection, “VINČA” Institute of Nuclear Sciences, Belgrade, Serbia (IMS VINS) in the EURADOS IC for the period 2010-2020 (excluding 2014) are presented.

IMS VINS use thermoluminescent whole body dosimeters based on two TLD-100™ (Thermo Scientific™ Harshaw™, USA) detectors. The readouts are done on the Harshaw TLD™ Model 6600 Plus Automated Reader (Thermo Fisher Scientific, USA). The whole glow curve is used for dose estimation (all of 200 channels). The calibration of the dosimetric system is done twice a year in S-Cs (previously in S-Co) field at the secondary standard dosimetry laboratory (SSDL VINS), according to ISO 4037-3:2019.

The IC had 40 different reference values of personal dose equivalent, $H_p(10)$ in noted period ranging from 0.431 mSv to 501 mSv. There were 20, 16, 22, 22, 20 dosimeters irradiated in year 2010, 2012, 2016, 2018, 2020, respectively. The radiations were done in 12 different fields: N-60, S-Co, S-Cs, N-40, N-150, S-Cs+Sr-90, S-Cs+N-40, W-110, S-Cs+W-250, W-60, S-Cs+W-80, and S-Cs+N-150. The relative response (R) range is from 0.23 to 2.26. Quantile values for R are: 0.23, 0.79, 0.90, 1.1, and 2.26, respectively for (0%, 25 %, 50 %, 75 % and 100 % of points). Mean and standard deviation of R are 0.97 and 0.30, respectively.

The performance limits are established according to ISO 14146 trumpet-curve [1]. Due to trumpet-curve there were 6 outliers (2 in 2010, 4 in 2016). All of the outliers were for reference dose around 1 mSv and lower. One outlier from 2010 was irradiated in N-40 field and 30° of incident angle. The other outlier was irradiated in the S-Cs field, without any rotation, and thus should have had a satisfying response. The possible explanation is an insensitive TL detector. The outliers in 2016 were all for N-40 quality and ±60° angle. Thus, considering the low number of outliers (only one true outlier) and expected dosimeters faulty response for given irradiation parameters, we conclude that the IMS VINS dosimetry system had satisfactory behavior during IC from 2010-2020.

Keywords: Whole body dosimeter, $H_p(10)$, intercomparison, IMS, external radiation dosimetry

References

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