IAEA WHO

SSDL Newsletter

Prepared by the Joint IAEA/WHO Secretariat of the Network of Secondary Standards Dosimetry Laboratories https://ssdl.iaea.org

ISSN 1001-2669

No. 71, April 2020

Contents

From the Editor

Lately many of you have probably faced changes in the working arrangements due the COVID-19. Most of the IAEA staff is currently working remotely and this issue of the SSDL Newsletter (No 71) was also prepared out of office. When physical measurements are not possible, it is a good time to do the paperwork which is often left behind. Therefore, I encourage everybody to update their Quality Management System (QMS), and to work on their developments and research papers.

The IAEA Dosimetry Laboratory has updated the QMS and it is now fully compliant with the ISO/IEC 17025:2017 standard. In addition, some technical changes in the calibration services were implemented from the beginning of the year (page 5).

Due to the rotation policy at the IAEA, the professional staff is changing regularly (at least every 7 years). The following changes took place during the last year. We said goodbye to Joanna Izewska, Tomislav Bokulic, Paulina Wesolowska, Harry Delis and Gian Luca Poli. Karen Christaki changed her position and now she is the new head of our Dosimetry Laboratory. Godfrey Azangwe was appointed as new Quality Manager. A new dosimetrist position for the linear accelerator related work was filled by Krzysztof Chelminski and Alexis Dimitriadis started to work as an audit dosimetrist. The medical physics team was complemented with Virginia Tsapaki (diagnostic radiology), Daniel Berger (radiotherapy) and Peter Knoll (nuclear medicine).

The SSDL Charter provides information about the SSDL Network membership and last year it was translated into Russian. There are also some membership changes in the IAEA/WHO SSDL Network, and we are happy to welcome Morocco, Azerbaijan, Nigeria and Turkey (Ankara) as new members of the Network.

This issue covers many IAEA activities performed in 2019 and the beginning of 2020. The IDOS-2019 gathered together many professionals working in the field of dosimetry (page 11). In addition, many other smaller meetings were organized, and short summaries are given in this Newsletter.

DMRP group of professional staff at the IAEA in March 2020 (Photo by: R. Cruz-Suarez)

Staff of the Dosimetry and Medical Radiation Physics (DMRP) Section

International Atomic Energy Agency, Vienna International Centre, P.O. Box 100, 1400 Vienna, Austria

Telephone: (+43-1) 2600+extension; Fax: (+43-1) 26007, E-Mail: Official.Mail@iaea.org

Name	*Position/tasks*	*Email address*	*Extension*
van der Merwe, Debbie	Section Head	D.Van-Der-Merwe@iaea.org	21653
Azangwe, Godfrey	Quality Manager	G.Azangwe@iaea.org	21661
Babu Rao, Paul	Consultant	P.R.Babu-Rao@iaea.org	21659
Baumgartner, Andreas	Consultant	A.Baumgartner@iaea.org	28493
Berger, Daniel	Radiotherapy Medical Physicist	D.Berger@iaea.org	21655
Cardoso, Joao	Dosimetrist (Calibrations)	J.Cardoso@iaea.org	28328
Carrara, Mauro	Consultant	M.Carrara@iaea.org	21659
Chelminski, Krzysztof	Dosimetrist (Linac)	K.Chelminski@iaea.org	28329
Christaki, Karen	Head of Dosimetry Laboratory	K.Christaki@iaea.org	28331
Ciortan, Simona-Mihaela	Team Assistant	S.M.Ciortan@iaea.org	21634
Czap, Ladislav	Dosimetrist (Calibrations)	L.Czap@iaea.org	28332
Danker, Sabine	Team Assistant	S.Danker@iaea.org	28351
Dimitriadis, Alexis	Dosimetrist (Quality Audits)	Al.Dimitriadis@iaea.org	28443
Gutt, Federico	Consultant	V.Gutt-Blanco@iaea.org	26909
Hakimy-Sadiq, Nargis	Team Assistant	N.Hakimy@iaea.org	21662
Kazantsev, Pavel	Dosimetrist (Quality Audits)	P.Kazantsev@iaea.org	28330
Knoll, Peter	Medical Physicist, Nuclear Medicine	P.Knoll@iaea.org	26674
Loreti, Giorgia	Training Officer (Medical Physics)	G.Loreti@iaea.org	21374
Pirkfellner, Agnes	Dosimetry Services Assistant	A.Pirkfellner@iaea.org	28207
Toroi, Paula	Medical Radiation Physicist - SSDL Officer, Editor of the Newsletter	P.Toroi@iaea.org	21660
Tsapaki, Virginia	Medical Physicist, Diagnostic Radiology	V.Tsapaki@iaea.org	21663
DMRP Section*	Dosimetry Contact Point	dosimetry@iaea.org ssdl@iaea.org	21662

*This is the e-mail address to which general messages on dosimetry and medical radiation physics should be addressed, i.e. correspondence not related to specific tasks of the staff above. Each incoming general correspondence to the DMRP Section mailbox will be dealt with accordingly.

Services provided by the IAEA in DMRP Section

The IAEA's Dosimetry and Medical Radiation Physics Section focuses on services provided to Member States through the IAEA/WHO SSDL Network and on a system of dose quality audits. The measurement standards of Member States are calibrated, free of charge, at the IAEA's Dosimetry Laboratory. The audits are performed through the IAEA/WHO postal dose assurance service for SSDLs and radiotherapy centres by using radiophotoluminescence and optically stimulated luminescence dosimeters (RPLDs and OSLDs).

The Dosimetry Laboratory's Quality Management System has been reviewed and accepted by the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB). The IAEA Calibration and Measurement Capabilities (CMCs) have been reviewed and published in Appendix C of Comité International des Poids et Mesures (CIPM), Mutual Recognition Arrangement (MRA).

The IAEA CMCs can be found at the following web site: https://www.bipm.org/kcdb/

The range of services is listed below.

Services	*Radiation quality*
Calibration of ionization chambers (radiation therapy, brachytherapy*, radiation protection, and diagnostic radiology including mammography)**	X rays and γ rays from ^{137}Cs and ^{60}Co beams ^{137}Cs, ^{60}Co and ^{192}Ir brachytherapy sources
Comparison of ionization chamber calibrations coefficients (radiation therapy, radiation protection, and diagnostic radiology including mammography) for SSDLs**	X rays and γ rays from ^{137}Cs and ^{60}Co beams
Dosimetry audits (RPLD) for external radiation therapy beams for SSDLs and hospitals***	γ rays from ^{60}Co and high energy X ray beams
Dosimetry audits (OSLD) for radiation protection for SSDLs	γ rays from ^{137}Cs
Reference irradiations to dosimeters for radiation protection	X rays and γ rays from ^{137}Cs and ^{60}Co beams

* Brachytherapy calibration services are not included in the IAEA CMCs.

** Technical procedures and protocols for calibrations and comparisons are available on our website https://ssdl.iaea.org/

***Thermoluminescence dosimeters (TLDs) were replaced by RPLDs in 2017.

Member States interested in these services should contact the IAEA/WHO SSDL Network Secretariat, for further details, at the address provided below. Additional information is also available at the web site: *https://ssdl.iaea.org*

IAEA/WHO SSDL Network Secretariat
Dosimetry and Medical Radiation Physics Section
Division of Human Health
Department of Nuclear Sciences and Applications
International Atomic Energy Agency
P.O. Box 100
1400 Vienna
Austria

Telephone: +43 1 2600 21660
Fax: +43 1 26007 81662
Dosimetry Contact Point Email: dosimetry@iaea.org

SSDL Contact Point Email: ssdl@iaea.org

Note to SSDLs using IAEA calibration and audit services:

1. To ensure continuous improvement in IAEA calibration and audit services, SSDLs are encouraged to submit suggestions for improvements to the Dosimetry Contact Point.

2. Complaints on IAEA services can be addressed to the Dosimetry Contact Point.

3. Feedback can be provided using the form on our website: https://ssdl.iaea.org/

https://iris.iaea.org/public/survey?cdoc=DOL00100

Notification of changes in the IAEA Dosimetry Laboratory calibration services

IAEA Dosimetry Laboratory QMS and implementation of ISO/IEC 17025:2017

The Dosimetry Laboratory of the IAEA (DOL) is a central laboratory of the IAEA/WHO SSDL Network. The DOL Quality Management System was prepared based on the ISO 17025:2005. The review process of the QMS by representatives of regional metrology organizations on behalf of the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB) was completed on 6 October 2006 and found to be adequate leading to DOL Calibration and Measurement Capabilities (CMCs) being listed on the Key Comparison Database (KCDB).

In 2017 a new version of ISO/IEC 17025:2017 was published and it was recommended to implement it within three years. In 2019, the DOL QMS was updated accordingly and it is fully compliant with the new version of the standard. In addition, radiation safety and nuclear security related considerations were integrated into the QMS to introduce an integrated management system.

From 2012, the JCRB recommended that DOL QMS should be reviewed in turns by all RMOs in 10-year cycles. The first RMO to review DOL QMS was EURAMET with an initial presentation in 2012 and a re-evaluation in 2017. To date, the DOL QMS has been peer reviewed in 2012 and 2016 under EURAMET on behalf of the JCRB with the final peer review under EURAMET scheduled for the last quarter of 2020.

ISO 4037:2019 and updated set-up for radiation protection calibrations

The ISO 4037:2019 gives standard conditions for radiation protection calibrations and some changes according to this standard were implemented from the beginning of the year. The calibration distance from the gamma source and X-ray focus was harmonized and now 2.5 m distance is used as a refence distance for radiation protection calibrations. The IAEA uses ISO Narrow X-ray qualities and they were adjusted and new HVL values were measured.

Brachytherapy calibration services

We are happy to inform that the calibration services for high dose rate (HDR) brachytherapy has finally been fully established. A bilateral comparison was organized between the IAEA and PTB (report on pages 7 - 10). In addition, the IAEA participated in the APMP.RI(I)-K8 key comparison but those results are not published yet. This new service is not yet included in our CMS published in the KCDB but it will be submitted in the next revision.

The IAEA DOL is using ^{60}Co and ^{192}Ir HDR brachytherapy sources for calibrations. Please be informed that the brachytherapy calibration service will be done in slots. The aim is to have a slot for ^{60}Co calibration from April to September and then the other half of the year would be dedicated for ^{192}Ir calibrations. We are still planning to keep our low dose rate (LDR) ^{137}Cs available for LDR calibrations throughout the year. This year the slot for ^{60}Co calibrations is delayed due to the COVID-19 crisis but we hope to be able to provide this service in summer (June) and ^{192}Ir calibrations in autumn (October).

Figure 1. IAEA DOL high dose rate brachytherapy afterloader.

Discontinued services

The IAEA provides calibrations for member states and calibrates national standards and reference dosimeters. Typically, field dosimeters which are used in radiation protection are calibrated for operational quantities, but the reference values are determined based on air kerma measurements and standardized conversion factors. Air kerma is also the dosimetric reference quantity for kerma-area and kerma-length product quantities which are used in diagnostic radiology. Therefore, these calibration services are normally established using the traceability of the air kerma standard. Hence the IAEA calibration service for the derived quantities (operational quantities for radiation protection and kerma-area and kerma-length product for diagnostic radiology) have been discontinued in agreement with the SSC.

Linear accelerator

A linear accelerator and a high precision robotic calibration bench system were installed at the IAEA DOL. In addition to the calibration and comparison service, this equipment will be used for training purposes and development of new audit methodologies. The calibration procedures and documentation are currently under development.

Changes in uncertainties

Most of the IAEA standards have been re-calibrated in the primary standard dosimetry laboratories and the ICRU 90 changes are fully implemented. This has introduced some changes in the uncertainties of the calibration coefficients provided by us and the changes can be seen in our revised uncertainty budgets. However, in some cases the uncertainties decreased, and this will be fully implemented only after the change has been approved on our revised CMC list.

Feedback

We are looking forward to getting your feedback. Please use the following link to give your opinion on our services:

https://iris.iaea.org/public/survey?cdoc=DOL00100

Figure 2. The IAEA DOL linear accelerator and robotic calibration bench

John Robert "Jack" Cunningham

(1927 - 2020)

John Robert "Jack" Cunningham (photo from Wikipedia)

The Dosimetry and Medical Radiation Physics Section at the IAEA would like to remember the pioneering role of Dr J. R. Cunningham in the field of medical physics. For many medical physicists around the world “The Physics of Radiology”, co-authored with Dr Harold E. Johns and first published in 1953, was one of the primary sources of their knowledge. Several editions and reprints were produced over 30 years and it remains a key reference text today, historical as well as scientific. The comprehensive contents of this book laid the foundation for the breadth and depth of the responsibilities that medical physicists have as health professionals today. “Jack’s” scientific work is an important legacy that will continue to inspire and guide us to continue in our endeavors to improve the diagnosis and treatment of patients worldwide.

Report of the IAEA – PTB bilateral comparison: Reference air kerma rate for high dose rate ^{192}Ir and ^{60}Co brachytherapy sources

L. Czap[1], T. Bokulic[1], P. Toroi[1], Dr. R. Behrens[2], F. Grote[2], A. Kasper[2]

[1] International Atomic Energy Agency (IAEA), Vienna, Austria

[2] Physikalisch-Technische Bundesanstalt (PTB), Germany

Abstract

A comparison of the standards for reference air kerma rate of the Physikalisch-Technische Bundesanstalt (PTB) and of the International Atomic Energy Agency (IAEA) was carried out with ^{192}Ir and ^{60}Co high dose rate brachytherapy sources in May 2017. Comparison results were calculated based on the calibration coefficients for the transfer standard and expressed as the ratio of the IAEA and the PTB values. The comparison results were 1.0022 (u_c = 0.0065) and 1.0022 (u_c = 0.0065), k = 1, for ^{192}Ir and ^{60}Co sources, respectively.

1. Introduction

The Dosimetry Laboratory (DOL) of the International Atomic Energy Agency (IAEA), Seibersdorf, Austria, has established a new calibration service for high dose rate brachytherapy (HDRBT) reference standards using ^{192}Ir and ^{60}Co sources. As a signatory of the Mutual Recognition Arrangement (CIPM MRA), the Quality Management System (QMS) complying with ISO/IEC 17025 [1] is maintained in the IAEA and dosimetry calibration and measurement capabilities (CMCs) are published in Appendix C of the CIPM MRA key comparison database (KCDB). A published comparison result is required as a "supporting evidence" for the CMCs in addition to the traceability of the measured quantities.

A comparison of the standards for reference air kerma rate (RAKR) of the Physikalisch-Technische Bundesanstalt (PTB) and of the IAEA was performed by calibrating a transfer ionization chamber with ^{192}Ir and ^{60}Co brachytherapy sources at the IAEA and at the PTB. The objective of the comparison was to verify the newly established well-type ionization chamber calibration procedure for high dose rate (HDR) ^{192}Ir and ^{60}Co brachytherapy sources at the IAEA. The results of this comparison will be used as the supporting evidence for the CMC to be submitted by the IAEA to the BIPM Key Comparison Database (KCDB).

2. Materials and Methods

2.1 Transfer chamber and calibration procedure

A well-type chamber HDR-1000 Plus (s.n. #A13342), manufactured by Standard Imaging and provided by the IAEA, was used as the transfer instrument. The transfer chamber was calibrated at the PTB in May 2017 and at the IAEA before and after the measurements at PTB.

The source holder 70110 (Standard Imaging) was used and the operating polarizing voltage for the chamber was +300 V (applied to the collector). The signal connection of the chamber was triaxial TNC. The measurement conditions at IAEA and PTB were very similar (Table 1). All measurements were normalized to the reference conditions of 20°C air temperature and 101.325 kPa air pressure. Detailed description of calibration methods at IAEA and PTB is given in the following sections.

Table 1. Measurement conditions of the well type chamber at IAEA and PTB.

Connection system	Triaxial TNC
Polarizing voltage	+ 300 V applied to collector
Correction for polarity effect	None
Source positioning in the chamber	Universal plastic catheter LAA1400-GYN
Source holder in the chamber	70110 (Standard Imaging)
Source types	^{192}Ir and ^{60}Co
Sweet spot* at IAEA	50 mm
Sweet spot at PTB	54 mm (^{192}Ir), 56 mm (^{60}Co)
Reference ambient conditions	T = 20°C; p = 101.325 kPa
Chamber position at IAEA	About 1 m distance from the nearest walls; about 0.8 m height
Chamber position at PTB	About 1.5 m distance from the nearest walls; about 1.3 m height

*) sweet spot – the point of maximum response of the well type chamber (distance from the center of the source to the bottom of the well chamber).

2.2 Measurements at the IAEA

The transfer chamber was calibrated at the IAEA against the reference standard with the IAEA ^{192}Ir and ^{60}Co brachytherapy sources. The SagiNova (Eckert & Ziegler BEBIG) afterloading unit was used at the IAEA for 2 different HDR source types (Table 2). The reference standard of the IAEA is the well-type chamber HDR-1000 Plus, s.n. #A150776, calibrated at PTB in July 2016 in terms of RAKR for HDR ^{192}Ir and ^{60}Co brachytherapy sources.

Table 2. HDR brachytherapy sources used for measurements at the IAEA.

	Source type / ser. no.	Nominal RAKR/ mGyh^{-1}	Ref. date
^{192}Ir	IR2.A85-2 / D90E-108	42	13-10-2015 00:00 UTC
^{192}Ir	IR2.A85-2 / D90E-258	42	15-09-2017 00:00 UTC
^{60}Co	Co0.A86 / BB-AC610	24	09-11-2015 00:00 UTC

The calibration coefficients of the transfer chamber in terms of reference air kerma rate were determined at IAEA as:

$$N_{K,\mathrm{IAEA}} = \frac{\dot{K}_{\mathrm{R,IAEA}}}{(M_{\mathrm{raw}} - M_{\mathrm{leak}}).k_{\mathrm{elec}}.k_{\mathrm{ion}}.k_{\mathrm{pT}}.k_{\mathrm{decay}}},$$

where:

$\dot{K}_{\mathrm{R,IAEA}}$	is the RAKR determined with the IAEA reference standard
M_{raw}	is the raw ionization current measured with the IAEA reference electrometer
M_{leak}	is the leakage current
k_{elec}	is the electrometer calibration factor
k_{ion}	is the ion recombination correction factor
k_{pT}	is the ambient condition correction factor
k_{decay}	is the decay correction factor.

No correction for polarity effect was applied as the calibration was performed at the same polarity of the collecting electrode. The transfer instrument was calibrated at the IAEA before and after the measurements at PTB. The mean value of these two groups of calibrations was used for comparison. The uncertainty budget is given in Table 4.

2.3 Measurements at the PTB

The reference standard of the PTB is a spherical 1-liter ionization chamber calibrated in terms of RAKR for HDR ^{192}Ir and ^{60}Co brachytherapy sources [2]. A PTB built afterloading unit was used for 2 different HDR source types (Table 3) from PTB.

Table 3. HDR brachytherapy sources used for measurements at the PTB:

	Source type / ser. no.	Nominal RAKR/ mGyh^{-1}	Ref. date
^{192}Ir	MicroSelectron V2 / NLF 01 D362327	44.61	12-09-2016 12:00 UTC
^{60}Co	Co0.A86 / BB-AC239	10.80	01-10-2013 00:00 UTC

The calibration coefficients of the transfer chamber in terms of reference air kerma rate were determined at PTB as:

$$N_{K,\mathrm{PTB}} = \frac{\dot{K}_{\mathrm{R,PTB}}}{(M_{\mathrm{raw}} - M_{\mathrm{leak}}).k_{\mathrm{elec}}.k_{\mathrm{ion}}.k_{\mathrm{pT}}.k_{\mathrm{decay}}},$$

where:

$\dot{K}_{\mathrm{R,PTB}}$	is the RAKR determined with the PTB reference standard
M_{raw}	is the raw ionization current measured with the PTB reference electrometer
M_{leak}	is the leakage current
k_{elec}	is the electrometer calibration factor
k_{ion}	is the ion recombination correction factor
k_{pT}	is the ambient condition correction factor
k_{decay}	is the decay correction factor.

No correction for polarity effect was applied as this was also the case at IAEA. The uncertainty budget is given in Table 4.

Table 4. Uncertainty budgets of N_K determination at the IAEA and PTB

RAKR determination	**IAEA (%)**	**PTB (%)**
Calibration via LS01		1.25
Calibration from PSDL	1.25	
Long term stability Ref. Std.	0.1	0.1
Temperature	0.2	0.17
Pressure	0.1	0.1
Source position	0.01	0.01
Current measurement	0.1	0.1
Recombination correction	0.04	0.1
Decay correction	0.2	0.2
N_K determination		
Temperature	0.2	0.17
Pressure	0.1	0.1
Source position	0.01	0.01
Current measurement	0.1	0.1
Recombination correction	0.04	0.1
Decay correction	0.2	0.2
Total relative uncertainty ($k = 1$)	1.33	1.33
Total relative uncertainty ($k = 2$)	2.67	2.67

3. Results

The results of the comparison were determined as the ratio:

$$R_{\mathrm{IAEA,PTB}} = \frac{N_{K,\mathrm{IAEA}}}{N_{K,\mathrm{PTB}}},$$

where

$N_{K,\mathrm{IAEA}}$ is the reference air kerma calibration coefficient determined at IAEA (mean value of the two measurements)

$N_{K,\mathrm{PTB}}$ is the reference air kerma calibration coefficient determined at PTB.

The uncertainty u_R of the comparison result was determined. The correlation of uncertainty components between IAEA and PTB was taken into account (see Table 4). Table 5 summarizes the conditions and results of the comparison.

Table 5. Calibration coefficients N_K, reference air kerma rates RAKR and results $R_{\mathrm{IAEA,PTB}}$ of the IAEA and PTB comparison.

	^{192}Ir		**^{60}Co**	
	N_K	**RAKR**	***N_K***	**RAKR**
	$\mu Gyh^{-1}nA^{-1}$	$mGyh^{-1}$	$\mu Gyh^{-1}nA^{-1}$	$mGyh^{-1}$
IAEA (1)	469.28	~ 0.4	492.52	~ 20
PTB	468.23	~ 3.9	491.47	~ 6.7
IAEA (2)	469.26	~ 38	492.56	~ 18
$R_{\mathrm{IAEA,PTB}}$	1.0022		1.0022	
u_R ($k = 2$)	0.013		0.013	

The comparison results are strongly correlated as the IAEA Reference Standard, well-type chamber, see above, was calibrated against the PTB (u_c = 1.25 %) about one year before the comparison. For the purpose of the comparison the correlated uncertainty contributions were excluded. Therefore, the total uncorrelated uncertainty contributions of $N_{K,\mathrm{IAEA}}$ and $N_{K,\mathrm{PTB}}$ are both 0.46 % (k = 1) hence the uncertainty of the ratio $R_{\mathrm{IAEA,PTB}}$ is 0.65 % (k = 1).

4. Conclusions

The comparison verified the newly established well-type ionization chamber calibration procedure for HDR ^{192}Ir and ^{60}Co brachytherapy sources at the IAEA. The same ratio $R_{\mathrm{IAEA,PTB}}$ was obtained for both, ^{192}Ir and ^{60}Co, and the calibration coefficients from the two laboratories agree well within the uncertainty. The small systematic deviation of 0.22 % between the laboratories for both radioactive sources might be caused by differences in the calibration of electrometers, different scatter conditions at IAEA and PTB or the different position of the sweet spots within the chamber. The latter could, however, also be attributed to different behaviors of the catheters within the chamber due to the different afterloading systems used. The results obtained can support IAEA's CMC claim and demonstrate that the procedure for well-type chamber calibration is appropriate to obtain valid calibration factors with small uncertainty.

References

[1] ISO, GeneralRequirements for the Competence of Testing and Calibration Laboratories, ISO/IEC 17025:2017, ISO, Geneva (2017).

[2] H. J. Selbach and L. Büermann, "Vergleich zweier Verfahren zur Darstellung der Einheit der Kenndosisleistung für ^{192}Ir-HDR-Brachytherapie-quellen," in Medizinische Physik 2004 — Tagungsband der 35. Jahrestagung der DGMP (Deutsche Gesellschaft für Medizinische Physik, Leipzig, 2004), p. 82, ISBN 3-925218-84-X

IDOS 2019

18 - 21 June 2019, IAEA, Vienna

IAEA staff: Debbie van der Merwe (Scientific Secretary), DMRP staff supported by other sections of the IAEA

Summary

The IAEA in cooperation with several professional societies and international organizations, organized the International Symposium on Standards, Applications and Quality Assurance in Medical Radiation Dosimetry (IDOS 2019) in Vienna on 18 to 21 June 2019. The major goal of IDOS 2019 was to provide a forum where advances in radiation dosimetry, at standards laboratories and hospitals, were reviewed and discussed. The Symposium also facilitated interactions between radiation metrologists, medical physicists, safety specialists and researchers in radiation dosimetry, and participation from all income settings was encouraged. The Symposium included topics related to dosimetry standards, medical dosimetry and radiation protection dosimetry with a specific focus on areas where research and development is needed. Very few international meetings facilitate interaction between radiation metrologists, clinical medical physicists and scientists engaged in the development of new standards, computational dosimetry, the traceability chain, codes of practices and cross-cutting research and in so doing, encourage collaborative opportunities in these fields. Participants submitted research contributions, which were reviewed by a scientific committee, and 110 talks and 84 posters were presented. The IDOS 2019 was attended by 424 participants from 77 Member States, including 54 observers.

The conclusions from IDOS can be found in the paper published in Medical Physics International Journal, vol.7, No.1, 2019:

http://www.mpijournal.org/pdf/2019-03/MPI-2019-03-p342.pdf

The IDOS livestreamed sessions and the recordings of all the educational courses are available on Human Health Campus:

https://humanhealth.iaea.org/HHW/MedicalPhysics/e-learning/IDOS2019/index.html

Figure. IDOS participants (Photo by: G. Hinterleitner)

Consultancy Meeting to draft a guidance document on quality assurance and quality controls of nuclear medicine non-imaging equipment

25-29 March 2019, IAEA, Vienna

Experts: Pilar Oropesa Verdecia (Centro de Isótopos, La Habana, Cuba), Søren Holm (Rigshospitalet, Copenhagen, Denmark), Pat Zanzonico (Memorial Sloan-Kettering Cancer Center, New York, USA) and Mr Alan Britten (St George's Hospital, London, UK)

IAEA staff: Gian Luca Poli (Scientific Secretary)

Summary

The IAEA TECDOC No. 602 (Quality Control of Nuclear Medicine Instruments 1991) has been superseded for the imaging part (SPECT and PET) by more recent publications, but it still represents the IAEA guidance document of reference for QA/QC of non-imaging instrumentation used in nuclear medicine. Due to the technological advancements in the field, there is a need to update the old TECDOC with a guidance document covering QA/QC of activity meters, thyroid probes, sentinel lymph node probes, gamma counters, chromatography systems and radiation protection equipment used in nuclear medicine.

The SSDL Scientific Committee has recommended the Dosimetry and Medical Radiation Physics section to produce a publication updating the TECDOC-602 for QA/QC for currently used non-imaging devices (e.g., thyroid probes, dose calibrators, whole-body counters). It was also recommended that this document be translated into additional Member State languages (French and Spanish).

During a first consultant's meeting held in November 2018, the group of consultants considered the need and scope of a document on Quality Control of Non-Imaging Equipment Used in Nuclear Medicine and have concluded that this project is viable and recommend that such a document be produced as a Human Health Series Publication.

Consultancy Meeting to draft a report on the findings of CRP E2.40.20 on Evaluation and Optimization of Paediatric Imaging

27-30 August 2019, IAEA, Vienna

Experts: Peter Homolka (Medizinische Universität Wien, Vienna, Austria), Michael Lassmann (Universitätsklinik Wurzburg, Wurzburg, Germany), Harry Delis (University of Patras, Patras, Greece), Claire-Louise Chapple (Freeman Hospital, Newcastle upon Tyne, United Kingdom), Frederic Fahey (Childrens Hospital Boston, Boston MA, USA)

IAEA staff: Gian Luca Poli (Scientific Secretary)

Summary

Paediatric patients consist of a critical group of patients for medical imaging, due to special dose (increased radiosensitivity) and imaging (range of body sizes) requirements. Optimized paediatric imaging applying ionizing radiation depends not only on the application of established protocols, but also on the experience of the personnel and the suitability of the equipment. This leads to wide variations on image and dose characteristics between departments, which have to be investigated and optimized. The purpose of the CRP E2.40.20 was to enhance the potential of the Member States to develop and implement state of the art research and optimization strategies in paediatric imaging.

The purpose of the meeting was to draft a report on the findings of CRP E2.40.20 on Evaluation and Optimization of Paediatric Imaging. During the 4 days meeting the findings of the CRP were summarized in two reports, one for Diagnostic Radiology and one for the Nuclear Medicine component of the CRP. Additionally, a report with the results of a survey on paediatric nuclear medicine practices in LMI countries was prepared.

Regional training course on radiation protection calibrations in Russian language

23-27 September 2019, Almaty region, Kazakhstan

Course Director: Nassyr Mamurbek

Experts:

Gonzalo Walwyn Salas (Centro de Protección e Higiene de las Radiaciones, Cuba), Ilkka Jokelainen (Radiation and Nuclear Safety Authority - STUK, Finland), Siarhei Saroka (Belgim, Belarus)

IAEA staff: Paula Toroi (Technical Officer), Federico Gutt (consultant), Katherina Deufrains (Project Management Officer)

Summary

The training course on protection level calibrations was an IAEA-Technical Cooperation event and performed in the framework of the national project KAZ6012 *Strengthening Calibration Services at the Secondary Standard Dosimetry Laboratory*. It was organized in the premises of the SSDL of Kazakhstan by the National Center for Expertise and Certification. There were 17 participants from Estonia, Kazakhstan, Latvia, Tajikistan, Turkmenistan and Uzbekistan. The participants were supported through their own respective national Technical Cooperation projects.

The focus was on radiation protection calibrations, but also an overview on radiation therapy and diagnostic radiology calibration services were provided. The training included lectures given by experts, discussions and practical hands-on sessions. The course was held in Russian language.

Figure 1.

Just before this meeting, the SSDL Charter was published in Russian language and this is available on our website: https://ssdl.iaea.org/Content/SSDL_Charter_2nd_Edition_Russian.pdf

Figure 2. Participants of the regional training course in Kazakhstan.

Consultancy Meeting to Finalize the guidance document on QA and QC of Nuclear Medicine Non-Imaging Equipment

11-13 September 2019, IAEA, Vienna

Experts: Pilar Oropesa Verdecia (Centro de Isótopos CENTIS, La Habana, Cuba), Søren Holm (Rigshospitalet, Copenhagen, Denmark), Pat Zanzonico (Memorial Sloan-Kettering Cancer Center, New York, USA) and Mr Alan Britten (St George's Hospital, London, UK)

IAEA staff: Gian Luca Poli (Scientific Secretary)

Summary

The IAEA TECDOC No. 602 (Quality Control of Nuclear Medicine Instruments 1991) has been superseded for the imaging part (SPECT and PET) by more recent publications, but it still represents the IAEA guidance document of reference for QA/QC of non-imaging instrumentation used in nuclear medicine. Due to the technological advancements in the field, there is a need to update the old TECDOC with a guidance document covering QA/QC of activity meters, thyroid probes, sentinel lymph node probes, gamma counters, chromatography systems and radiation protection equipment used in nuclear medicine.

During the meeting the draft of the guidance document on QA/QC of non-imaging instrumentation used in nuclear medicine was finalized.

Consultancy Meeting to finalize the "Supplement to TRS-398 Code of Practice for proton beams"

15-17 October 2019, IAEA, Vienna

Experts: Stan Vatnisky (BG MedAustron GmbH, Wiener Neustadt, Austria), Stefaan Vynckier (Cliniques Universitaires St. Luc, Bruxelles, Belgium), Oliver Jäckel (German Cancer Research Center, Heidelberg, Germany), Hugo Palmans (Bratislava, Slovakia)

IAEA staff: Karen Christaki (Scientific Secretary)

Summary

TRS-398 Code of Practice describes the reference dosimetry and recommendations for relative dosimetry in external beam radiotherapy. It is based upon a calibration coefficient in terms of absorbed dose to water N_{D,w,Q_o} for a dosimeter in a reference beam of quality Qo.

The IAEA is preparing an update of TRS-398 to include the developments in dosimetry of external radiotherapy beams since its publication 2000. The chapter for proton beams is extended to describe the reference dosimetry and recommendations for relative dosimetry of pencil beam scanning delivery. However, there is a need to provide recommendations on methods and procedures for calibrating dose monitors of proton beam delivery systems since these methods are substantially different than for the broad-beam delivery system.

Since the dose monitor calibration issues are outside the scope of the TRS-398 Code of Practice it was decided to prepare the supplement to the proton chapter of the updated TRS-398 to provide a guidance to the proton community on its practical implementation.

Consultancy Meeting to review the draft white paper on reference dosimetry of dynamic photon beams

21-23 October 2019, IAEA, Vienna

Experts: Jan Seuntjens (Montreal General Hospital, Montreal, Canada), Hugo Bouchard (University of Montreal, Montreal, Canada), Hugo Palmans (National Physical Laboratory NPL, Teddington, UK), Stephen Kry (MD Anderson Cancer Center, Houston, USA), Vimal Kirti Desai (Madison, USA)

IAEA staff: Karen Christaki (Scientific Secretary)

Summary

In 2008, the IAEA/AAPM published a formalism to support the development of a new generation of Codes of Practice for non-standard radiotherapy beam reference dosimetry (Alfonso et al 2008). The IAEA/AAPM addressed the dosimetry of small static radiotherapy beams (IAEA TRS483) but the question remained on if it was time to start to write a Code of Practice for composite radiotherapy beams. A draft white paper was written to address this issue. The aim of this meeting was to review the white paper and give recommendations on the way forward for the dosimetry of composite radiotherapy beams.

Consultancy Meeting to finalize the Human Health Report on the results of the CRP E24041; Testing IAEA TRS 483

11-15 November 2019, IAEA, Vienna

Experts: Wolfgang Lechner (AKH Wien, Vienna, Austria), Rodolfo Alfonso-Laguardia (Faculty of Nuclear Sciences and Technologies, Havana, Cuba), Otto Sauer (Klinik und Poliklinik für Strahlentherapie, Würzburg, Germany)

IAEA staff: Karen Christaki (Scientific Secretary)

Summary

The first research coordination meeting (RCM) for CRP E24021, Testing the small field code of practice (TRS 483) was held in November 2015. The meeting included three agreement holders and nine contract holders from three regions. Since that time the CRP participants have tested TRS483 for a range radiotherapy treatment machines and detectors. The final RCM was held in February 2019 where the results were collated and discussed. The aim of this meeting was to finalize the report of the mentioned CRP that would be published as an IAEA Human Health Report.

IAEA-ICTP Advanced School on Quality Assurance Requirements in the Digital Era of Diagnostic Radiology

11 - 15 November 2019, Trieste, Italy

Course Director: Virginia Tsapaki

Local organizers: Renato Padovani, Suzie Radozic

Experts: Paola Bregant (Trieste Hospital), Mario De Denaro (Trieste Hospital), Harry Delis (Greece), Paddy Gilligan (Ireland), Renato Padovani (ICTP), Ehsan Samei (AAPM), Annalisa Trianni (Udine Hospital).

Summary

The IAEA together with the International Centre for Theoretical Physics (ICTP) organized an advanced school on Quality Assurance Requirements in Digital Radiology with co-sponsorship from the American Association of Physicists in Medicine (AAPM). The school took place in the Adriatico Guest House. Practical sessions were held at the Trieste hospital and the ICTP Informatics Laboratory.

A total of 44 participants from 22 countries attended the training course (including 12 students of the ICTP master's in medical physics). Gender and regional distribution of participants is shown in the graphs below:

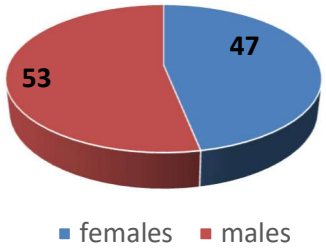


Figure 1. Gender distribution of participants (%)

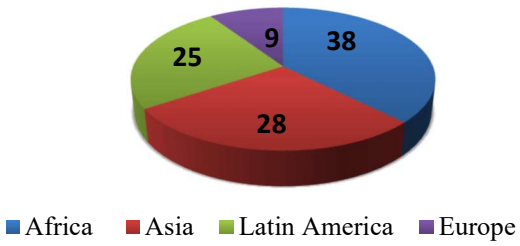


Figure 2. Regional distribution of participants (%)

The school included the following list of topics:

- Physics of digital imaging,
- Quantitative image analysis,
- Adapting QC protocols for digital imaging modalities,
- Structured DICOM images and their use,
- Images printing and display,
- Image processing and analysis tools (imageJ).

The participants, with the support of local and international experts, were asked to address specific questions and tasks based on a structured program. Dose and image quality measurements from the practical sessions in the hospital were analyzed at the ICTP Laboratory using the free to download software ImageJ.

Figure 3. Participants and experts during practicals.

Part of the practical exercises was devoted to drafting an X-ray tender by all groups. The participants had the chance to present their work to the audience and accept questions. Each presentation was followed by group discussion.

Figure 4. Participant presenting the group exercise results

On the last day the participants had the opportunity to discuss their findings from the practical part of the course with the experts. Questions were answered and clarifications were given so that participants would leave the course without any confusion or misunderstanding regarding practicals.

For the first time, the participants were invited to submit an abstract for a poster presentation during the course. There were 3 themes identified:

1) the role of the medical physicist in diagnostic radiology,
2) QA/QC in digital radiology and
3) the status of medical physics in diagnostic radiology in their country.

The participants presented their work during the school to the team of experts. The 3 best posters were each awarded a certificate and a small financial award of 100 euros each.

Figure 5. Poster session during the ICTP 2019 advanced school

The school was very successful, and feedback of participants was very positive. The knowledge gained from the training course was through pre and post-course tests, which the participants had during the first and last day (live through their mobile devices), and the results indicated an improvement of almost 50% in the average scores.

The practical sessions were appreciated by the participants, as despite their short duration, they provided a hands-on experience in the evaluation of image quality and dose in digital radiology. As the installation of digital systems is exponentially growing in LMI countries, the need for such schools was acknowledged and underlined by participants. Similar courses on digital radiology will be planned soon with the objective to strengthen the capacities of Member States to support quality and safety in digital radiology.

More details can be found here:

http://indico.ictp.it/event/8730/other-view?view=ictptimetable

Acknowledgements

The IAEA acknowledges the financial and organizational support provided by ICTP, as well as the financial support of AAPM. The IAEA would also like to thank the experts for the time devoted for the preparation and execution of the course.

Figure 6. Group photo

Consultancy Meeting to advise on the collection and reporting of annual metrics to indicate the success/benefit from the use of the linac

25-28 November 2019, IAEA, Vienna

Experts: Malcolm McEwen (NRC, Canada), Steven Judge (BIPM, France), Zakithi Msimang (NMISA, South Africa)

IAEA staff: Debbie van der Merwe (Scientific Secretary)

Summary

The SSC-18 meeting made a recommendation for DMRP to "collect and report annual metrics to indicate the success/benefit from the use of the linac to provide megavoltage calibrations for SSDL dosimeters, audits and training, noting that the training should include guidance on the dissemination of these calibrations by the SSDLs when they calibrate hospital dosimetry equipment." Therefore, there is a need to devise metrics that can inform this reporting.

Since the process of completing the clinical commissioning of the linac was underway, and the robotic calibration bench was due to be delivered in December 2019, it was opportune to deliberate how metrics should be captured and shared. The main purpose of the meeting was to develop a set of metrics for the linac at the Dosimetry Laboratory in Seibersdorf.

Consultancy Meeting to assist with the set-up and commissioning of the robotic calibration bench system

9-13 December 2019, IAEA, Vienna

Expert: Philippe Roger (BIPM, Sèvres, France)

IAEA staff: Paula Toroi (Scientific Secretary), Ladislav Czap

Summary

The IAEA Dosimetry Laboratory (DOL) is establishing dosimetry services to the IAEA Member States using the recently installed medical linear accelerator (linac). One application of the linac will be to perform calibrations of dosimetry instruments for the Secondary Standards Dosimetry Laboratories (SSDLs). A specific high accuracy robotic calibration bench system (RCBS) was installed in order to achieve accurate positioning of dosimetry equipment as required for the calibration work. The delivery of the RCBS took place in November 2019. Special expertise was required in order to achieve appropriate set-up for calibrations and to perform comprehensive commissioning of the RCBS. The aim of the consultancy was to assist the DOL staff with the set-up of the RCBS and to provide support on the commissioning.

Joint ICTP-IAEA Workshop on Uncertainty estimations for Radiation Measurements in SSDLs and Hospitals

2-6 December 2019, ICTP, The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

Experts: Mauro Carrara (IRCCS National Cancer Institute, Italy), Massimo Pinto (ENEA-INMRI, Italy), Costas Hourdakis (Greek Atomic Energy Commission (EEAE), Greece), Andrew Fenwick (National Physical Laboratory (NPL), UK)

IAEA staff: Paula Toroi (Scientific Secretary) and Giorgia Loreti

Summary

The uncertainty is an important part of scientific expression of measurement results. The importance of accurate dosimetry is recognized particularly when patient dose in medical exposure is measured. In this workshop the participants were provided with an understanding of the methods used for the assessment of various uncertainty components and given guidance on how to report measurement uncertainties related to their calibration services and clinical dosimetry measurements in a way that is consistent with the International Guide to the Expression of Uncertainty in Measurement. The whole chain of dosimetry from the primary standards dosimetry laboratory to the hospital was covered. Using tutorials adapted to practical situations, the candidates learned how to prepare an uncertainty budget.

There were altogether 65 participants, from 51 countries. Twenty-eight presentations were provided on the first three days covering tools for uncertainty estimations, different sources of uncertainties and practical information on uncertainties in specific radiation measurements and different fields. On Thursday the participants worked in groups and prepared uncertainty budgets, which were presented and evaluated on Friday. The workshop also included homework sessions, a wrap-up presentation, pre- and post-course tests and a course evaluation survey.

The workshop provided an excellent opportunity for radiation metrologists from different standards dosimetry laboratories and medical physicists from hospitals, to meet and discuss the importance and challenges of uncertainty estimations. Based on the knowledge assessment results the participants learned and internalized the topics covered during the workshop. In addition, the feedback provided by the participants was excellent and the need for this kind of training was emphasized. All the presentations were recorded, and this material will be used for preparation of e-learning module on uncertainties.

Figures. Participants of the ICTP-IAEA uncertainty training course.

How lower radiation doses can be achieved in diagnostic imaging of paediatric patients

CRP E24020: Evaluation and Optimization of Paediatric Imaging 2015-2019

Virginia Tsapaki, IAEA Department of Nuclear Sciences and Applications

IAEA project officers: Harry Delis and Gian Luca Poli Dosimetry and Medical Radiation Physics Section

Participating Countries: Austria, Brazil, Chile, Cuba, Egypt, Germany, Ghana, Indonesia, United Kingdom of Great Britain and Northern Ireland, United States of America

Summary

A recently evaluated IAEA Coordinated Research Project, *Evaluation and Optimization of Paediatric Imaging*, has shown that reduced amounts of radiation can be used in paediatric radiology and nuclear medicine exams, and highlighted the necessity of close coordination among medical physicists and radiology and nuclear medicine teams.

The overall objective of the research was to enhance the capabilities of IAEA Member States to improve the efficiency of existing modalities for paediatric medical imaging, and to optimize the radiation dose administered to paediatric patients, while maintaining the image quality needed to make a clear diagnosis.

Both Nuclear Medicine and Diagnostic Radiology examinations were included in the research, which had the following specific objectives:

- To quantify, in terms of dose and image quality, the practices involving paediatric patients in diagnostic radiology and nuclear medicine.
- To develop tools suitable for training or information for paediatric clinical practice.
- To provide guidelines and assist Member States on the evaluation of paediatric practices and optimization methodologies.
- To assess the impact of training on optimization with particular emphasis on typical delivered doses and administered activities, with respect to Diagnostic Reference Levels.

The CRP resulted in new guidance for radiology and nuclear medicine departments in Member States. It was found that a key element for a successful optimization strategy is medical physicists working closely with the radiation technologists and clinicians.

For further information related to this CRP, please see the CRP page: https://www.iaea.org/projects/crp/e24020

Figure. Participants from the first Research Coordination Meeting of the CRP on Evaluation and Optimization of Paediatric Imaging.

The international day of Medical Physics

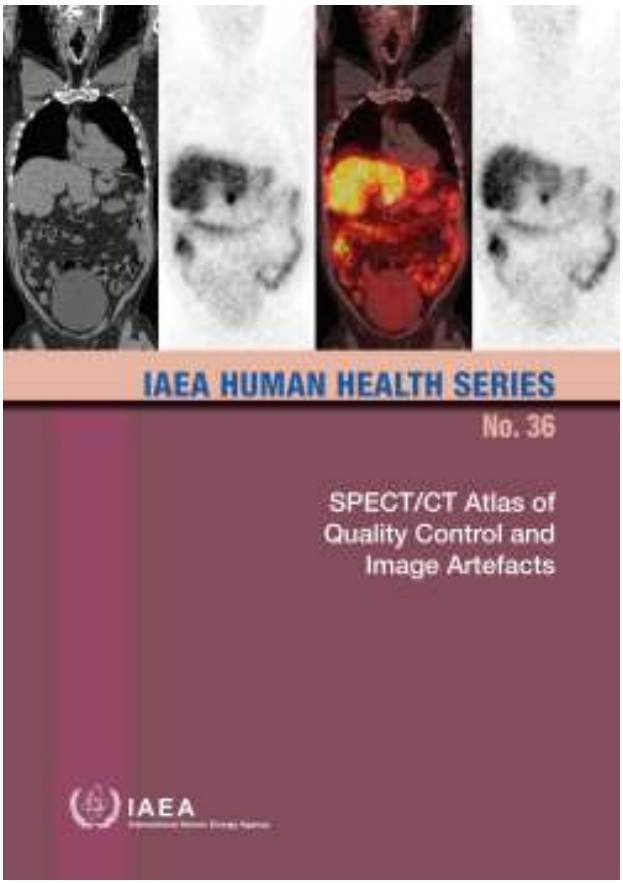
7 November 2019

On Thursday 7 November 2019, the IAEA joined all medical physicists around the world and the International Organization for Medical Physics (IOMP) in the celebration of the 7th International Day of Medical Physics (IDMP). In 2019 the topic chosen by IOMP was “It’s a Medical Physics World!”.

https://humanhealth.iaea.org/HHW/MedicalPhysics/TheMedicalPhysicist/IDMP/2019/index.html

Figures. DMRP staff celebrating International Day of Medical Physics at headquarters (above) and Seibersdorf Dosimetry Laboratory (below)

New IAEA Publications



SPECT/CT Atlas of Quality Control and Image Artefacts

Multi-modality imaging has become increasingly prevalent in nuclear medicine and diagnostic radiology. To accurately interpret single photon emission computed tomography/computed tomography (SPECT/CT) images in addition to understanding the principles of image formation and the biological distribution of the radiopharmaceutical, it is important to understand the image artefacts that can arise from these imaging systems. This atlas presents an overview of quality control procedures in SPECT and SPECT/CT and guides the reader through pitfalls and image artefacts that can be faced using these imaging modalities. In addition to examples of artefacts themselves, descriptions are given on their causes, and the steps that can be taken to avoid their recurrence. The atlas is intended to be used as a guide for nuclear medicine and diagnostic radiology professionals (medical physicists, nuclear medicine physicians, radiologists, medical radiation technologists and service engineers) on how to take appropriate quality control measures, and to assist with problem analyses and prevention. (*Information taken from https://www.iaea.org/publications*). The new publication has been released on the Internet:

https://www.iaea.org/publications/13407/spect/ct-atlas-of-quality-control-and-image-artefacts

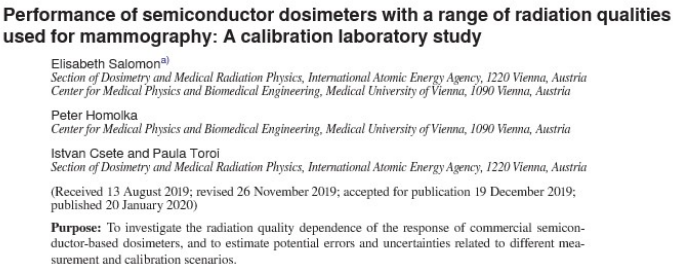
---

Research paper on mammography dosimetry

An article on mammography dosimetry, prepared based on measurements performed at the IAEA Dosimetry Laboratory, was published in the Medical Physics. It is Open Access publication and available for all.

Salomon, E., Homolka, P., Csete, I. and Toroi, P. (2020), Performance of semiconductor dosimeters with a range of radiation qualities used for mammography: A calibration laboratory study. Med. Phys., 47 (3), March 2020: 1372-1378. doi:10.1002/mp.14005

https://aapm.onlinelibrary.wiley.com/doi/epdf/10.1002/mp.14005



Performance of semiconductor dosimeters with a range of radiation qualities used for mammography: A calibration laboratory study

Elisabeth Salomon[a)]
Section of Dosimetry and Medical Radiation Physics, International Atomic Energy Agency, 1220 Vienna, Austria
Center for Medical Physics and Biomedical Engineering, Medical University of Vienna, 1090 Vienna, Austria

Peter Homolka
Center for Medical Physics and Biomedical Engineering, Medical University of Vienna, 1090 Vienna, Austria

Istvan Csete and Paula Toroi
Section of Dosimetry and Medical Radiation Physics, International Atomic Energy Agency, 1220 Vienna, Austria

(Received 13 August 2019; revised 26 November 2019; accepted for publication 19 December 2019; published 20 January 2020)

Purpose: To investigate the radiation quality dependence of the response of commercial semiconductor-based dosimeters, and to estimate potential errors and uncertainties related to different measurement and calibration scenarios.

Courses, Meetings and Consultancies in 2020

Please note that due COVID-19 crisis many events have have been postponed and the dates are still to be decided (TBD). In some cases, new dates have been proposed but there might still be some further changes.

TC Courses and Workshops related to DMRP activities

- E2-TR-1905979 Joint ICTP–IAEA Workshop on Dosimetry in Radionuclide Therapy and Diagnostic Nuclear Medicine, Trieste, Italy, 28 September – 2 October 2020
- E2-TR-1904408 Joint ICTP – IAEA Workshop on Medical Physics Aspects of Stereotactic Radiotherapy Techniques, Trieste, Italy, 12 – 16 November 2020
- RLA9088: RTC on Calibration of Radiation Protection Equipment, Bogota, Colombia, TBD September 2020
- RAS6095: Coordination Meeting to Prepare a Methodology for SSDL Quality Audits, Kuala Lumpur, Malaysia, TBD
- RAS6095: Regional Training Course on Diagnostic Radiology Calibrations for SSDLs, Kuwait, TBD

Training courses and ESTRO Courses

- SP-RER6036-1907249 IAEA/ESTRO Training Course on Target Volume Determination – from Imaging to Margins, Brussels, Belgium, 24 – 27 May 2020 (POSTPONED until 2021)
- SP-RER6036-1907252 IAEA/ESTRO Training Course on Physics for Modern Radiotherapy (a Joint Course for Clinicians and Physicists), Izmir, Turkey, 6 – 10 September 2020
- SP-RER6036-1907253 IAEA/ESTRO Training Course on Dosimetry Audits, London, United Kingdom, 14 – 18 September 2020
- SP-RER6036-1907257 IAEA/ESTRO Training Course on Image-Guided and Adaptive Radiotherapy in Clinical Practice, Ljubljana, Slovenia, 4 – 8 October 2020
- SP-RER6036-1907247 IAEA/ESTRO Training Course on Dose Modelling Verification for External Beam Radiotherapy, Barcelona, Spain, 11 – 15 October 2020 (POSTPONED from May 2020)
- SP-RER6036-1907262 IAEA/ESTRO Training Course on Best Practice in Radiation Oncology - Train the RTT (Radiation Therapists) Trainers – Part I, Vienna, Austria, 19 – 23 October 2020
- SP-RER6036-1907251 IAEA/ESTRO Training Course on Evidence Based Radiation Oncology, Bucharest, Romania, 15 – 19 November 2020 (POSTPONED from May 2020)
- E2-TR-1805156 Joint IAEA and Argonne National Laboratory Training Activity on Comprehensive Clinical Audits in Diagnostic Radiology under the Quality Assurance Audit for Diagnostic Radiology Improvement and Learning (QUAADRIL) Tool, Argonne, United States of America, 16 – 20 November 2020 (POSTPONED from April 2020)

DMRP Meetings and Consultancies

- Consultancy Meeting on Drafting a Document on Audit of Clinical Training in Medical Physics, Vienna, Austria, 22 – 26 June 2020 (TBC)
- Consultancy Meeting on Staffing required for a first proton facility and the training recommended for each discipline, Vienna, Austria, 4 – 7 August 2020
- Consultancy Meeting on Revision of the IAEA Document “Setting up a Radiotherapy Programme”, Vienna, Austria, 5 – 7 August 2020
- Consultancy Meeting on the Preparation of Code of Practice for Radiation Protection calibrations, Vienna, Austria, 10 – 14 or 17 – 21 August 2020 (TBD)
- Consultancy Meeting on the Update of TRS–398, Vienna, Austria, 5 – 9 October 2020

- Consultancy Meeting to Provide suggestions on the update of IAEA TRS–457, Vienna, Austria, 19 – 23 October 2020
- Consultancy Meeting on Ethics issues in medical physics, Vienna, Austria, 27 – 30 October 2020
- Consultancy Meeting on the Preparation of the CRP on Utilization of digital imaging in Diagnostic Radiology and Advanced tools for quality and dosimetry, Vienna, Austria, 2 – 6 November 2020
- Consultancy Meeting on the preparation of the CRP on CoP 457 report update, Vienna, Austria, 9 – 13 November 2020
- Consultancy Meeting to review and update IAEA-TCS-56 guidelines, Vienna, Austria, 1 – 4 December 2020

Other events

- International Conference on Radiation Safety: Improving Radiation Protection in Practice, Vienna, Austria, 9 – 13 November 2020 https://www.iaea.org/events/international-conference-on-radiation-safety-2020
- International Conference on Molecular Imaging and Clinical PET–CT in the Era of Theranostics (IPET-2020), Vienna Austria, 23 – 27 November 2020 https://www.iaea.org/events/ipet-2020
- International Conference on Advances in Radiation Oncology (ICARO-3), Vienna, Austria, 23 – 26 February 2021 https://www.iaea.org/events/icaro-3

Member Laboratories of the IAEA/WHO Network of SSDLs

Country	City	Contact person	E-mail
ALBANIA	Tirana	Ms Nikaj Klotilda	klotildanikaj@hotmail.com
ALGERIA	Algiers	Mr Ammar Herrati	ammar.herrati@yahoo.fr
ARGENTINA	Ezeiza	Ms Amalia Stefanic	stefanic@cae.cnea.gov.ar
AUSTRIA	Seibersdorf	Mr Christian Hranitzky	christian.hranitzky@seibersdorf-laboratories.at
AZERBAIJAN	Baku	Ms Shahla Musayeva	shahla_musayeva@mail.ru
BANGLADESH	Dhaka	Mr Shakilur Rahman	shakilurssdl@baec.gov.bd
BELARUS	Minsk	Mr Siarhei Saroka	siarhei.saroka@belgim.by
BELGIUM	Mol	Mr Liviu-Cristian Mihailescu	lmihaile@sckcen.be
BOSNIA AND HERZEGOVINA	Sarajevo	Ms Amra Šabeta	amra.sabeta@met.gov.ba
BRAZIL	Rio de Janeiro	Ms Angelica Wasserman	angelica@ird.gov.br
BULGARIA	Sofia	Mr Tsvetelin Tsrunchev	tsetso@ncrrp.org
CHILE	Santiago	Mr Carlos H. Oyarzún Cortes	carlos.oyarzun@cchen.cl
CHINA	Beijing	Mr Fei Gao	gaofei@ciae.ac.cn
CHINA	Shanghai	Mr Tang Fangdong	tangfd@simt.com.cn
CHINA	TaiYuan	Mr Qingli Zhang	zhangqing_li@sina.com
CHINA	Beijing	Mr Jinsheng Cheng	chengjs3393@163.com
CHINA	Hong Kong SAR	Mr Francis Lee	leekh4@ha.org.hk
COLOMBIA	Bogotá	Mr Julian Niño	janino@sgc.gov.co
CROATIA	Zagreb	Mr Robert Bernat	rbernat@irb.hr
CUBA	Havana	Mr Gonzalo Walwyn Salas	gonzalo@cphr.edu.cu
CYPRUS	Nicosia	Mr Nicolaos Papadopoulos	nicolaos.papadopoulos@gmail.com
CZECH REP.	Prague	Mr Vladimír Sochor	vsochor@cmi.cz
CZECH REP.	Prague	Mr Libor Judas	libor.judas@suro.cz
DENMARK	Herlev	Mr Peter Kaidin Frederiksen	pkfr@sis.dk
ECUADOR	Quito	Mr Enrique Arévalo	enrique.arevalo@meer.gob.ec
EGYPT	El-Giza	Mr Ahmed El Sersy	nemadnis@netscape.net
ETHIOPIA	Addis Ababa	Mr Biruk Hailemariam	birukgirma123bg@gmail.com
FINLAND	Helsinki	Ms Reetta Nylund	reetta.nylund@stuk.fi
GEORGIA	Tbilisi	Mr Simon Sukhishvili	s.sukhishvili@gmail.com
GERMANY	Freiburg	Mr Christian Pychlau	pychlau@ptw.de
GERMANY	Schwarzenbruck	Mr Frantisek Gabris	frantisek.gabris@iba-group.com
GHANA	Legon / Accra	Mr Joseph K. Amoako	jk.amoako@gaecgh.org
GREECE	Athens	Ms Eleftheria Carinou	eleftheria.carinou@eeae.gr
GUATEMALA	Guatemala City	Mr Edgar Monterroso	edgar.andres.monterroso@gmail.com
HUNGARY	Budapest	Mr László Szucs	szucs.laszlo@bfkh.gov.hu
HUNGARY	Paks	Mr Mihaly Orbán	orbanmi@npp.hu
INDIA	Mumbai	Mr Sathian Vilippalil	sathian@barc.gov.in
INDONESIA	Jakarta	Ms Caecilia Tuti Budiantari	tuticb@batan.go.id
IRAN	Karaj-Rajaei Shahr	Ms Sedigheh Kashian	skashian@aeoi.org.ir
IRELAND	Dublin	Mr Christopher Burbidge	c.burbidge@epa.ie
ISRAEL	Yavne	Mr Hanan Datz	datz@soreq.gov.il
ISRAEL	Tel Hashomer	Mr Mark Smekhov	mark.smekhov@moh.gov.il
JORDAN	Amman	Mr Mamoun Alzoubi	mamoun.alzoubi@jaec.gov.jo
KAZAKHSTAN	Kapchagai	Mr Nassyr Mamyrbek	ssdlkz@gmail.com
KENYA	Nairobi	Mr Collins Omondi	cyallar@kebs.org
KUWAIT	Kuwait City	Ms Elham Kh. Al Fares	ealfares2002@yahoo.com

Country	City	Contact person	E-mail
LATVIA	Salaspils	Ms Oksana Skrypnik	oksana.skripnika@lvgmc.lv
MADAGASCAR	Antananarivo	Mr Joel Rajaobelison	rajaobelisonjoel@gmail.com
MALAYSIA	Kajang	Mr Mohd Taufik Bin Dolah	taufik@nm.gov.my
MEXICO	Mexico City	Mr Héctor J. Mendoza Nava	hector.mendoza@inin.gob.mx
MOROCCO	Salé	Mr Mohammed Tazi Saisout	cnrp.ma@gmail.com
NIGERIA	Ibadan	Mr Akerele Olumide	akereleolu@yahoo.com
NORWAY	Østerås	Mr Per Otto Hetland	per.otto.hetland@nrpa.no
PAKISTAN	Islamabad	Mr Mahmood Khalid	khalidm@pinstech.org.pk
PERU	Lima	Mr Enrique Rojas	erojas@ipen.gob.pe
PHILIPPINES	Quezon City	Ms Kristine M. Romallosa	kmdromallosa@pnri.dost.gov.ph
PHILIPPINES	Manila	Ms Nieva O. Lingatong	nolingatong@fda.gov.ph
POLAND	Warsaw	Mr Wojciech Bulski	w.bulski@zfm.coi.pl
PORTUGAL	Bobadela LRS	Mr João Alves	jgalves@ctn.ist.utl.pt
PORTUGAL	Lisbon	Ms Miriam Moreno	mmoreno@ipolisboa.min-saude.pt
RUSSIA	St. Petersburg	Mr Sergey Trofimchuk	s.g.trofimchuk@vniim.ru
RUSSIA	St. Petersburg	Ms Galina Lutina	gallutina@mail.ru
SAUDI ARABIA	Riyadh	Mr Mehenna Arib	marib@kfshrc.edu.sa
SERBIA	Belgrade	Mr Milos Zivanovic	milosz@vinca.rs
SINGAPORE	Singapore	Mr Kiat Loo Howe	loo_howe_kiat@nea.gov.sg
SINGAPORE	Singapore	Mr James Lee	trdjas@nccs.com.sg
SLOVAKIA	Bratislava	Mr Gabriel Kralik	gkralik@ousa.sk
SLOVENIA	Ljubljana	Mr Matjaz Mihelic	matjaz.mihelic@ijs.si
SOUTH AFRICA	Pretoria	Mr Sibusiso Jozela	sjozela@nmisa.org
SRI LANKA	Orugodawatta	Mr Mahakumara Prasad	prasad@aeb.gov.lk
SUDAN	Khartoum	Mr Ayman A. E. Beineen	beineen2006@yahoo.com
SWEDEN	Stockholm	Ms Linda Persson	linda.persson@ssm.se
SYRIA	Damascus	Mr Anas Ismail	aismail@aec.org.sy
NORTH MACEDONIA	Skopje	Ms Lidija Nikolovska	nikolovska@gmail.com
TANZANIA	Arusha	Mr Mwalongo Dennis Amos	denis.mwalongo@taec.go.tz
THAILAND	Nonthaburi	Mr Siri Srimanoroth	siri.s@dmsc.mail.go.th
THAILAND	Bangkok	Mr Vithit Pungkun	vithit.p@oap.go.th
TUNISIA	Tunis	Ms Latifa Ben Omrane	benomrane.latifa@planet.tn
TURKEY	Istanbul	Mr Enis Kapdan	enis.kapdan@taek.gov.tr
TURKEY	Ankara	Ms Çiğdem Yıldız	cigdem.yildiz@taek.gov.tr
UAE	Abu Dhabi	Mr Olivier Aranjo	olivier.aranjo@fanr.gov.ae
URUGUAY	Montevideo	Mr Guillermo Balay	guillermo.balay@miem.gub.uy
VENEZUELA	Caracas	Mr José Durán	jduran@ivic.gob.ve
VIET NAM	Hanoi	Mr Quyet Nguyen Huu	nhquyet@vinatom.gov.vn

Collaborating Organizations Associated with the IAEA/WHO Network of SSDLs

Bureau International des Poids et Mesures (BIPM)

International Commission on Radiation Units and Measurements (ICRU)

International Electrotechnical Commission (IEC)

Organisation Internationale de Métrologie Légale (OIML)

International Organization of Medical Physics (IOMP)

Affiliated Members of the IAEA/WHO Network of SSDLs

Bundesamt für Eich und Vermessungswesen (BEV)	Vienna, AUSTRIA
Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)	Yallambie, AUSTRALIA
National Research Council of Canada (NRC-CNRC)	Ottawa, CANADA
National Institute of Metrology (NIM)	Beijing, CHINA
Bureau National de Métrologie (BNM)	Gif-sur-Yvette, FRANCE
Physikalisch-Technische Bundesanstalt (PTB)	Braunschweig, GERMANY
Hungarian Trade Licensing Office (MKEH)	Budapest, HUNGARY
Ente per le Nuove Tecnologie L'Energia e L'Ambiente (ENEA)	Rome, ITALY
National Metrology Institute of Japan, AIST (NMIJ/AIST)	Ibaraki, JAPAN
NMi Van Swinden Laboratorium (VSL)	Delft, NETHERLANDS
National Radiation Laboratory (NRL)	Christchurch, NEW ZEALAND
Scientific Research Institute for Physical-Technical and Radiotechnical Measurements (VNIIFTRI)	Moscow, RUSSIAN FEDERATION
Laboratory of Ionizing Radiation, Slovak Institute of Metrology (SMU)	Bratislava, SLOVAKIA
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT)	Madrid, SPAIN
National Physical Laboratory (NPL)	Teddington, UNITED KINGDOM
National Institute of Standards and Technology (NIST)	Gaithersburg, UNITED STATES OF AMERICA

Impressum

SSDL Newsletter No. 71, April 2020

The SSDL Newsletter is prepared by the Dosimetry and Medical Radiation Physics Section,
Division of Human Health, Department of Nuclear Sciences and Applications

International Atomic Energy Agency
Vienna International Centre, PO Box 100, 1400 Vienna, Austria
Printed by the IAEA in Austria, June 2020

20-01370