

# **SSDL** Newsletter

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

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### From the Editor

This issue of SSDL Newsletter (No 68) is dedicated to the report of 18th Scientific Committee of the IAEA/WHO Network of Secondary Standards Dosimetry Laboratories SSC-18. The meeting was held at the IAEA Headquarters in March 2018. The SSC-18 reviewed the activities reported by the Dosimetry and Medical Radiation Physics (DMRP) section for the biennium 2016 – 2017 and noted the actions following the SSC-17 recommendations. Particularly, the activities of the present and future programmes for biennium 2018 – 19 and 2020 – 21 were discussed and prioritized recommendations were made. These recommendations will be used to target our activities accordingly.

One big activity for our section is the upcoming International Symposium on Standards, Applications and Quality Assurance in Medical Radiation Dosimetry (IDOS 2019). The conference will be organised 18-21 June 2019, Vienna, Austria. More information can be found from the website which is now open for abstract submission: https://www.iaea.org/events/idos2019 The 2<sup>nd</sup> edition of the SSDL Charter was published in February 2018 and a Spanish translation was released in April 2018. Both of them are available on our SSDL Network website: https://ssdl.iaea.org/.

One of the requirements for SSDL Network members is to submit the annual report. We are currently collecting the Annual Report part 2 and I would like to remind all the members to submit their report to us. Please note that the calibration service data in the <u>DOLNET</u> database will be based on the annual reports so your accurate input is very much appreciated.

DMRP welcomes the new Dosimetrist Mr Joao Cardoso from Portugal to our dosimetry laboratory team. I am also happy to announce the three new SSDL Network members from Jordan, Israel and United Arabic Emirates.



Participants of the 18th Meeting of the Scientific Committee of the IAEA/WHO SSDL Network (see page 4)

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# 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: http://kcdb.bipm.org/AppendixC/search.asp?met=RI

The range of services is listed below.

Services	Radiation quality
Calibration of ionization chambers (radiation therapy, diagnostic radiology including mammography, and radiation protection including environmental dose level)*	X rays (10–300kV) and $\gamma$ rays from $^{137}Cs$ and $^{60}Co$
Comparison of radiation therapy, radiation protection and diagnostic radiology level ionization chamber calibrations coefficients for SSDLs*	$\gamma$ rays from $^{60}\text{Co}$ and $^{137}\text{Cs}$ and X rays
Dosimetry audits (RPLD) for external radiation therapy beams for SSDLs and hospitals**	$\gamma$ rays from $^{60}\text{Co}$ and high energy X ray beams
Dosimetry audits (OSLD) for radiation protection for SSDLs	γ rays from <sup>137</sup> Cs
Reference irradiations to dosimeters for radiation protection	X rays (40–300 kV) and $\gamma$ rays from $^{137}Cs$ and $^{60}Co$ beams

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

\*\*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: <u>dosimetry@iaea.org</u>

### 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.

### Scientific Committee of the IAEA/WHO Network of Secondary Standards Dosimetry Laboratories

#### Report of the Eighteenth Meeting of the SSDL Scientific Committee IAEA, Vienna, 12-16 March 2018

#### 1. FOREWORD

The Scientific Committee of the IAEA/WHO network of Secondary Standards Dosimetry Laboratories (SSDLs) is a standing committee (SSC) within the framework of the International Atomic Energy Agency. It is tasked with conducting periodic reviews and evaluations of the Dosimetry and Medical Radiation Physics (DMRP) Subprogramme and reporting the results of the reviews to the Directors General of the IAEA and the WHO. The report of the seventeenth meeting (held in March 2016) of the previous SSC was published in the SSDL Newsletter No. 65 in September 2016.

The eighteenth meeting was held in Vienna at the Agency Headquarters from 12 to 16 March 2018. Opening remarks were made by Ms May Abdel-Wahab, Director of the Division of Human Health (NAHU); Ms Adriana Vélazquez Berumen, Senior advisor on medical devices, Innovation access and use of Essential Medicines and Health products (EMP) of the World Health Organization, Geneva, the Co-Secretary of the IAEA/WHO SSDL Network; and Ms Debbie van der Merwe, Head of the Section of Dosimetry and Medical Radiation Physics and Co-Secretary of the IAEA/WHO SSDL Network. Members of the SSC-18 are: Ms María-Ester Brandan, Instituto de Física, National University of Mexico (UNAM), Mr David T. Burns, Ionizing Radiation Department, International Bureau of Weights and Measures (BIPM), Sèvres, Mr David S. Followill, MD Anderson Cancer Center, USA, Mr Konstantinos Hourdakis, Ionizing Radiation Calibration Laboratory, Greek Atomic Energy Commission, Greece, Mr Hans-Georg Menzel, (Chairman) ICRU Bethesda (who was unable to be present), Mr Carl Ross, Ionizing Radiation Standards Group, National Research Council, Canada and Mr George Sgouros, Division of Nuclear Medicine, Johns Hopkins University, USA.

#### **1.1 Introductions**

Ms May Abdel-Wahab, Director of NAHU, opened the 18th biennial meeting of the SSC and welcomed all the members saying that she looked forward to hearing their advice on the DMRP programme. She remarked that the committee had first been established in 1985 for the laboratory and then expanded in 1988 to include all DMRP activities. She expressed the view that having independent advice had contributed to the success of the DMRP programme and the impact it had on Member States, in particular noting that five persons were appointed by the Director General and two were nominated from international organizations, the Bureau International des Poids et Mesures (BIPM) and the International Commission for Radiation Units and Measurements (ICRU). Regarding the impact on Member States she cited a new Member State in Asia that had a recently installed comprehensive cancer centre and they had already used the IAEA website to implement appropriate guidance. She explained that the SSC-18 report would be published in the SSDL Newsletter to give it maximum exposure. She then ran briefly over the DMRP programme saying that the breadth of expertise in the SSC would enable a full and thorough evaluation of the programme and she looked forward to the recommendations to be made by the SSC for the biennium 2020/2021. These would be presented to the Deputy Director General, Mr Aldo Malavasi on the last day of the meeting, although unfortunately she would not be able to be present.

Ms Adriana Velázquez Berumen, the Joint Secretary of the SSDL Network and Senior Adviser on Medical Devices at the WHO joined the meeting by video conference and gave a short presentation about the WHO involvement. She explained goal number 3 of the 17 sustainable development goals (SDG) for 2030: Ensuring healthy lives and promoting well-being for all at all ages and the WHO strategic priorities to keep the world safe, improve health and serve the vulnerable, where it includes providing medical devices to improve health and well-being. She apologized for not being

present in person but would follow the meeting, discuss the recommendations and join again by video conference on the last day. The WHO is very supportive of the DMRP programme, as quality audits in medicine and particularly dosimetry lead to the highest standards of treatment. Quality audits and the IAEA/WHO Network are key components of the Agency's DMRP sub-programme, and these services result in the detection and prevention of serious dosimetry errors, with the independent calibration of the measurement equipment. The collaborations between the IAEA and the WHO on the SSDL Charter and the publication on "Worldwide implementation of Digital imaging in Radiology" had been very fruitful. She explained that in the next two years the WHO would be looking to review worldwide Implementation of digital imaging for mammography, to consolidate the data of DIRAC which is used in WHO assessments of need and to review for approval and endorsement the book on "Selecting Megavoltage Treatment Technologies in External Beam Radiotherapy". She expressed the view that the committee work is a challenge and wished the SSC-18 members a very successful meeting.

Ms Debbie van der Merwe, Section Head of the DMRP, supported by Mr Ahmed Meghzifene, the previous Section Head present at the meeting as a Consultant, thanked the SSC members for coming to the meeting and expressed how much the advice of the SSC was welcomed and that having representatives from the WHO, the ICRU and the BIPM on the SSC is key in supporting the appropriate activities of the SSDL network. She explained that María-Ester Brandan and Adriana Velázquez Berumen would join the meeting as and when they could, using web-based facilities provided by the Agency as neither of them could attend in person on this occasion.

Ms van der Merwe then outlined the structure of the meeting which would include presentations by the staff on the 2016/17 programme and an introduction by herself on the programme for 2018/19 that had been formulated with the advice of the SSC-17. There would be a visit to the Seibersdorf facility. which would include staff presentations. Finally, she would present the outcome of the brainstorming session with her staff for the SSC-18 to consider in their recommendations for the 2020/21 programme. She requested that the SSC-18 prioritize their recommendations (high, medium or low) and any additional comments on the programme would also be acknowledged and implemented where appropriate. She explained that, once the SSC-18 report had been submitted and approved by the Director General (DG), the programme would be

finalized and implementation could start. She expressed her thanks to David Followill who would chair the meeting and to Penelope Allisy who would act as *Rapporteur*.

Mr David Followill expressed his honour to be appointed as Chairman in Mr Hans Menzel's absence. He said the Committee members were pleased to be present and to assist in the evaluation of the DMRP's work for NAHU and the SSDL network. It was satisfactory to learn that the SSC-18 report will be perceived as useful in planning for the Agency programme and budget for 2020 to 2021 and future programmes. As Chairman he then presented the agenda explaining that it represented a full week's work, and the agenda was then duly adopted.

#### **1.2 General discussion**

#### 1.2.1 Programme of the Meeting

The first item on the agenda was to review the actions following the SSC-17 recommendations. This was reported by Ms van der Merwe and was followed during the remainder of the first day of the meeting by DMRP staff members presenting reports on the activities of the Section. On the second day, the SSC-18 was taken to Seibersdorf where further presentations were made by staff on the laboratory's scope of work and the SSC-18 was able to see the laboratories and work at first hand, including the foundations of the building to house the linear accelerator. On the third day there was a wrap-up session on the DMRP activities and then the SSC-18 met in closed session, deliberating on the accomplishments and direction of the DMRP's sub-programme, and developing specific recommendations for the current and particularly the next biennial programme. Discussion continued on the draft recommendations and their prioritization on the fourth day. The main draft recommendations were discussed with Ms van der Merwe and Mr Meghzifene and presented to the DMRP staff and the Deputy Director General, Mr Aldo Malavasi, Head, Department of Nuclear Sciences and Applications on the afternoon of the last day. During the feedback, the Chairman of the SSC-18 thanked the DMRP staff on behalf of the whole committee, for the very full DMRP written report (submitted prior to the SSC18 meeting), for their carefully prepared presentations and their full responses to the committee's questions.

#### *1.2.2 Programme evaluation*

In preparation for its report, the SSC-18 reviewed the activities reported by the DMRP for the 2016/17 biennium,

noted the outcomes of the recommendations made by the SSC-17 and discussed the present sub-programme activities for 2018/19, making some further recommendations. The SSC also considered input from the DMRP for the biennium 2020/21 and then made some prioritized recommendations for this future programme. The SSC-18 evaluation was similar to that of previous SSCs and considered:

- The objectives of the sub-programme areas.
- The impact (benefit to the Member States).
- Opportunities to increase efficiency or reduce costs.
- The continuing relevance of Agency activities.

Specific recommendations from the SSC-18 are identified throughout this report and are also listed, in just two priority categories of high and medium, at the end of the report. Comments regarding specific aspects of the DMRP subprogramme are made throughout the report and the more important comments are also listed at the end of the report.

#### 2. INTRODUCTION

The SSC-18 expressed its thanks to the DMRP staff members for preparing a comprehensive report covering the activities of the sub-programme on Dosimetry and Medical Radiation Physics during the biennium 2016/17. This report had been provided well in advance of the meeting, enhancing the Committee's ability to develop relevant recommendations.

The SSC-18 was pleased to learn that the 48 recommendations of the SSC-17 were already being implemented as far as possible and were due to be completed during the present biennium. It was reported that the project-specific comments of the SSC-17 had been helpful and these were all in progress or under consideration, as detailed in the written DMRP report.

The DMRP Section projects and titles are:

- Project 2.2.4.1: Calibration and auditing service
- Project 2.2.4.2: Developments in radiation dosimetry
- Project 2.2.4.3: Clinical medical radiation physics for imaging and radiation therapy

The SSC-18 report follows the format established by previous reports and begins with a general discussion of administrative items and collaborative ventures within the Agency. The three project areas are then discussed in turn. In general, the report mentions only those activities of the DMRP Section for which the SSC-18 has comments or recommendations at this time. It should be noted that when a particular service provided by the DMRP is not mentioned specifically, the SSC-18 strongly endorses its continuation and is particularly pleased to see the continuing support and involvement of the DMRP in appropriate TC projects. A list of acronyms is given in the Appendix.

#### **3. REPORT**

#### 3.1 General Organizational Items and Major Facilities

The SSC-18 is pleased with the progress already made implementation of **SSC-17** towards the the recommendations for the 2018 and 2019 programme (with 16 recommendations already implemented, 32 in progress and only one postponed) as well as the comments made by the SSC-17 being noted in progress for the biennium. It is also very positive to note that the preparations for the International Dosimetry Symposium (IDOS) in 2019 are well in hand. The quality and volume of work produced by the DMRP is impressive and the Deputy Director General, Mr Aldo Malavasi, and the Director of the NAHU, Ms May Abdel-Wahab, are thanked sincerely for the support they give to the DMRP programme and budget.

The SSC-18 was extremely pleased to learn that the Renovation of the Nuclear Applications Laboratories (ReNuAL) project to renovate and upgrade the DMRP's Dosimetry Laboratory has begun. The SSC-18 was also pleased to learn that a Varian TrueBeam linear accelerator (linac), including treatment couch, treatment planning system and maintenance contract, has been obtained (see Figure 1). Such a machine will permit the DOL/DMRP to extend its work and provide dosimetry services and education/training to Member States for the most widelyused techniques in radiation therapy as well as for new advanced technologies in this field. The linac will be used for multiple projects once it is commissioned and this facility will be of enormous benefit to the Member States. The SSC-18 notes that the well-documented work plan for the use of the new linac will be followed.

The linac will be installed in the bunker currently under construction under the ReNuAL project (see schema in Figure 2).



Figure 1 Varian TrueBeam Linear Accelerator to be installed in the new bunker



Figure 2 Plan for the radiation-shielded bunker for the linac and adjacent control room

[R1] The SSC18 recommends that the DMRP collects and reports 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.

At the same time, the SSC-18 encourages the DMRP, the Division and other partners to assess the long-term plans for support for nuclear medicine and believes there would be an advantage in acquiring a dual modality single-photon emission computed tomography (SPECT) together with x-ray computed tomography (CT), known as SPECT/CT as the most appropriate tool for studying and providing education in patient specific dosimetry.

While noting that the outdated gamma camera facility has been closed, combination devices such as SPECT/CT provide the ability to collect CT images as well as the radioactivity distribution at each time-point so that the activity distribution may be localized to specific tissues or tissue sub-regions. Both density and tissue composition distinctions from the CT images are important in Monte Carlo transport-based dosimetry calculations. Anthropomorphic phantom images can be used in training courses to develop these imaging-based dosimetry approaches. Such images could also be used as part of a comprehensive end-to-end audit for dosimetry of radiopharmaceutical therapy that would be important for the Member States using such techniques. The output of DMRP activities in the future based on such a facility could include training materials, guidance documents, establishment of audit procedures and code of practice documents. The CT portion of the system could also be used for diagnostic radiology studies and for treatment planning studies related to the linac. Consequently:

**[R2] The SSC-18 recommends that funding be identified for the purchase, installation and maintenance of a SPECT/CT system (possibly as part of ReNuAl).** A plan should be developed for the system to be used in diagnostic and therapeutic nuclear medicine, in diagnostic radiology and in treatment planning studies. Provisions for the purchase of diagnostic (e.g. <sup>99m</sup>Tc) and therapeutic radiopharmaceuticals (e.g. <sup>90</sup>Y, <sup>177</sup>Lu, <sup>131</sup>I) should also be made to enable studies in phantoms.

The SSC-18 strongly supports the continuation of all the present services provided by the DMRP for Member States, such as the calibration services (with the exception of the <sup>137</sup>Cs brachytherapy calibrations and the changes to calibrations for operational quantities that are mentioned specifically in this report); hospital and SSDL audits; the follow-up of audit discrepancies; the DMRP databases DIRAC, DAN and DOLNET; education and training activities, and all the other activities that support the Member States, particularly under Technical Cooperation (TC) and Coordinated Research Projects (CRP), with a special mention for the collaborative projects with the NMDI, the ARBR and the NSRW. The new IAEA/WHO SSDL Network website is also much appreciated as is the media outreach, including training videos, with significant benefit to the Member States particularly in support of education and training. The SSC-18 particularly supports the development of new training courses based on published

guidelines and methodologies resulting from the DMRP activities.

The SSC-18 emphasizes that the DMRP databases are a unique resource for the IAEA, the WHO and the Member States. It includes, among many other data sets, the Directory of Radiotherapy Centres (DIRAC), the only reasonably complete listing of radiation therapy sites and equipment around the world. The SSC-18 congratulates the DMRP for the considerable effort given to the DIRAC project that aims to provide all Member States with up-todate information on radiotherapy resources. The WHO remarked that it has used DIRAC information to complement Ministry of Health information on availability of radiation technology per country in the World Health Statistics, published annually for the World Health Assembly and in the WHO Global Health Observatory. The SSC-18 noted that the DIRAC and DAN databases are currently being supported through work by consultants and interns. However, due to the importance of these databases for the WHO and the Member States the SSC-18 reiterates a previous recommendation as follows:

[R3] The SSC-18 recommends that a technical staff member be assigned to the DMRP whose main role would be to interact with the NAHU database administrator to develop and enhance the databases established by the DMRP, especially the Dosimetry Audit Network (DAN), the Dosimetry Laboratory Network (DOLNET) and the Directory of Radiotherapy Centres (DIRAC).

The SSC-18 proposes that this is not specifically an IT person, but rather someone able to understand the radiotherapy and metrology communities and to implement processes to establish improved mechanisms for updating and expanding these important databases, such as obtaining complete data from large countries.

The DMRP staff undertake multiple essential services and have responsibilities across a relatively wide spectrum of activities. Accordingly, efforts to improve processes and increase efficiencies will have an overall positive impact on the ability of DMRP to carry out its mission. Activities related to Technical Cooperation are one such essential mission that can be particularly time consuming, given that TC activities could include travel, logistics (e.g., equipment delivery), and interaction with both TC office personnel and Member State individuals. To optimize the time expenditure on these TC-related activities while also retaining institutional memory related to common or routine aspects of TC activities:

[R4] The SSC-18 recommends that the DMRP staff establish procedures, for section staff with specific responsibilities as Technical Officers for TC projects, that streamline the process for addressing the increasing number of TC requests.

Although now recognized in the International Labour Organization classification as members of the health workforce, many Member States have not yet established a national certification procedure for medical physicists. This is seen as a serious impediment to the full recognition of the medical physics profession. The International Medical Physics Certification Board (IMPCB) has recently developed a certification model to assist Member States to create their own national certification boards. While these boards are being established, the IMPCB is promoting the individual certification of medical physicists. The IAEA has supported the IMPCB in this effort. To assure success, the recognition of the IMPCB certification by the national Health and Radiation Protection authorities is essential.

[R5] The SSC-18 recommends the continued collaboration of the IAEA with the IMPCB in the certification of medical physicists and the establishment of new national certification boards and that the DMRP develops guidelines on certification and promotes the use of those guidelines in the Member States.

With regard to the organization of the SSC meeting by the Agency, the SSC-18 was very pleased to have all the documents in electronic format only. This has worked well for the present meeting and should be encouraged for future SSC meetings. The SSC-18 also appreciated the visit to the Agency Dosimetry Laboratory (DOL) at Seibersdorf and trusts that the next SSC will have the opportunity to visit the new linac facility. The SSC-18 proposes that a visit to the DOL should normally take place every other SSC meeting although new SSC members should always have the possibility of a visit.

## 3.2 Project 2.2.4.1: Calibration and Auditing Service

This project covers the dosimetry audit services and dosimetry calibration services including related development and activities. The audit services are considered to be very important by the SSC-18. The IAEA/WHO dosimetry audit programme helps hospitals in the Member States, either directly or through national audit networks, to have confidence in the doses they are delivering to their patients, a crucial factor for proper patient treatment.

The dosimetry services provided by the DOL to Member States have a critical impact on patient health. An important aspect of these services is the continuity of expertise and institutional memory in dosimetry audits, particularly to hospitals, and assured calibrations of equipment that is essential to the SSDLs. In addition to the already welldocumented procedures, the DMRP should consider crosstraining of staff and perhaps alternating recruitment cycles. In view of some imminent staff retirements and the specific and long-term laboratory need:

# [R6] The SSC-18 recommends that the DMRP investigates all options to preserve the long-term continuity in dosimetry expertise that is essential for the calibration and dosimetry audit services.

The SSC-18 recognizes the vital importance of conducting the postal dose audits of radiotherapy centres. The results of these audits continue to improve as discrepancies are identified and corrected with the assistance of the DMRP staff. The DOL has historically used TLD to perform the audits, but has this past year transitioned to the use of glass dosimeters. These postal dose audits currently only verify photon doses from 60Co units or linacs. The use of glass dosimeters is a much more efficient process that has allowed some effort to be directed towards other audit activities. The SSC-18 believes that these efforts should be directed towards implementation of audits of electron beam doses used by Member States to treat patients. A subset of electron energies could be audited at each radiotherapy site or for new linac installations. The SSC-18 understands that implementing this remote electron dosimetry audit will require some start-up effort (see Figure 3) but it will be beneficial in reducing potential accidents in patient treatment.



Figure 3 The glass dosimeter and electron beam output audit device.

[R7] The SSC-18 recommends that the DMRP implements an electron beam dosimetry audit service on a routine basis for a limited set of electron beams at each presently unaudited facility, with a focus on auditing low energy electron beams, instead of increasing the number or frequency of photon beam audits.

The DOL has converted from using thermoluminescence dosimeters (TLD) to radio-photoluminescence (RPL) glass dosimeters (see Figure 4) and the SSC-18 is pleased to note the increased efficiency in terms of workflow that will enable an increase in the number of dosimetry audits in line with the increasing number of facilities supported by the Agency. However, the reading of the glass dosimeters is highly dependent on the glass dosimeter reading magazine. The SSC-18 commented that the DOL should develop a QA programme to assess the performance of the magazines periodically in order to ensure there is no change in the consistency of the readouts due to degradation of the reading magazines.



Figure 4 Glass dosimeter reading magazine and positional response of the magazine.

The number of requests for calibrations continues to increase as new national calibration laboratories are established. The DMRP responds to these requests within its resources and the SSC-18 proposes some modifications to the programme to help with the increasing workload.

Following the SSC-17's [R2] recommendation on the establishment of an electrometer calibration service to increase efficiency and reduce workload, the DOL has developed a calibration method based on electrical standards having collected data from the calibration of different electrometers.

[R8] The SSC-18 recommends that the DOL findings on electrometer calibration methods are published, that an appropriate procedure and corresponding uncertainty be adopted, and that guidance be provided to the SSDLs on the use of equipment calibrated according to the adopted method, for example through the SSDL Newsletter.

The demand by the SSDLs for radiation protection-level calibrations for <sup>137</sup>Cs in terms of operational quantities (personal and ambient dose equivalent) is extremely small. Traceability can be assured by calibrations in terms of air kerma and the use of an appropriate conversion coefficient. In addition, ICRU recommendations that are pending regarding operational quantities are expected to support this procedure. Consequently:

[R9] The SSC-18 recommends that the DOL no longer invests in its reference standard for operational quantities, rather concentrating on the air-kerma standard and providing calibrations in terms of air kerma and, when required, operational quantities based on appropriate conversion coefficients.

Regarding the importance of traceability of the IAEA to the BIPM for radiation protection in <sup>137</sup>Cs, it is noted that the <sup>137</sup>Cs facility at the BIPM has been temporarily suspended. Within the framework of the Memorandum of Understanding (MoU) between the IAEA and the BIPM, the SSC-18 encourages the DMRP to continue to work with the BIPM to maintain international traceability in terms of air kerma.

Following the recommendation of SSC-17, the DOL has established a dosimetry service for high dose-rate (HDR)

brachytherapy using 192Ir and 60Co micro-sources (see Figure 5).



Figure 5 HDR brachytherapy unit used to calibrate well-type ionization chambers

[R10] The SSC-18 recommends that the DOL investigates the relationship between the calibration coefficients for <sup>192</sup>Ir and <sup>60</sup>Co brachytherapy microsources in terms of a  $k_Q$  factor for a given instrument type, with the aim of enabling the SSDLs to use a <sup>60</sup>Co calibration to satisfy their dissemination needs for <sup>192</sup>Ir.

The SSC-18 was pleased to hear about the DMRP's efforts to recognize and address the quality of radiotherapy advanced technologies as they are being implemented in Member States. These advanced technologies include, but are not limited to, intensity modulated radiation therapy (IMRT), stereotactic radiosurgery (SRS), stereotactic body radiotherapy (SBRT), image-guided radiation therapy (IGRT), proton and carbon-ion radiation therapy, and high dose-rate brachytherapy. The DMRP, in collaboration with external consultants, have established methodologies to audit some of these advanced radiation treatment modalities. Examples of these QA audits include verifying small field dosimetry, IMRT delivery and multi-leaf collimation performance and heterogeneity corrections for dose calculations. More recently, the DMRP has conducted a multi-centre study using an anthropomorphic shoulder, head and neck QA phantom (SHANE) during an on-site visit to a participating radiotherapy institution to verify IMRT. See Figure 6.





Figure 6 The DMRP's IMRT remote audit phantom and the on-site visit IMRT SHANE phantom.

# **3.3 Project 2.2.4.2 Developments in Radiation Dosimetry**

This project focuses on research and development activities in radiation dosimetry, including the development and updates of dosimetry Codes of Practice.

In view of the need for the SSDLs to be recognized both within and outside their region as providing a quality calibration service, there is a need for them to be audited as for any other service. Establishing an on-site service to undertake such a review organized by the DMRP would enable the calibration and measurement capabilities of an SSDL to be recognized formally through the audit of their quality system and calibration procedures. This could be set up along the lines of the other quality audits undertaken by the Agency with recommendations, comments and opportunities for improvement submitted to the SSDL. [R11] The SSC-18 recommends that a quality audit for dosimetry laboratories (QUADOL) be established to provide the SSDLs with an audit report as a step towards enabling their calibration and measurement capabilities (CMCs) to be recognized internationally.

The SSC-18 appreciates the improvements to the DAN, DIRAC and DOLNET databases and also the update of information that has been included in the websites. However:

[R12] The SSC-18 recommends that the DOLNET be expanded to store more information on calibration and measurement capabilities, infrastructure, human resources, training activities, etc. for better data access and analysis. The use of low dose-rate (LDR) sources for brachytherapy has declined in recent years in favour of high dose-rate (HDR) sources. The DMRP continues to maintain a <sup>137</sup>Cs LDR calibration service but it is rarely used by Member States. Furthermore, radiation safety procedures require that radioactive sources be replaced every ten years, adding to the cost of maintaining the service. Thus:

# [R13] The SSC-18 recommends that the DMRP terminates the <sup>137</sup>Cs LDR calibration service and decommissions the relevant sources.

Recognizing the efficiency of using existing tungsten-anode x-ray tubes to establish traceability for mammography, the SSC-17 recommended the further development of tungstenanode qualities at the DOL. While reference dosimeters such as ion chambers are relatively insensitive to spectral differences related to the anode material (tungsten or molybdenum), solid state detectors show significantly larger variations.

**[R14]** The SSC-18 recommends that the DMRP provides guidance to the SSDLs regarding the use of solid state detectors in the clinic, particularly in relation to the choice of mammography calibration qualities. The underlying work required might be undertaken in the context of a CRP.

Initial efforts by the DMRP to gauge the need for a Code of Practice (CoP) for brachytherapy met with a mixed response in 2013, with some feeling that it might have been premature at that time. A white paper was drafted but not published. However, representatives from Member State dosimetry audit networks have indicated recently that there is a need for a CRP to develop QA audit methodology for HDR brachytherapy, which was approved and should begin in 2019. The protocol is expected to include the use of all relevant clinical radioactive sources. Consequently, it is recognized that a CoP will indeed be required in the very near future.

**[R15]** The SSC-18 recommends that the brachytherapy white paper be updated and published. In addition, it is recommended that a Brachytherapy Code of Practice (CoP) be developed. The CoP should have links to the HDR QA audit CRP and an updated survey of brachytherapy clinical practices.

## **3.4 Project 2.2.4.3 Clinical medical radiation physics for imaging and radiation therapy**

This project aims at developing guidelines and training material for best practice in clinical medical radiation

physics. It also promotes comprehensive audits and research in the clinical environment through CRPs. The project includes diagnostic radiology and nuclear medicine imaging physics as well as radiotherapy physics.

The SSC-18 was most encouraged by all the education material that is now available through the DMRP and the Human Health Campus, notably the slide sets for the Medical Physics Handbooks, the video tutorials and course material. It was also interesting to see the positive impact of the courses on participants through the questionnaires completed pre- and post-course attendance. This work is strongly supported by the SSC-18.

Regarding the introduction of new advanced technologies for cancer therapy in Member States, the SSC-18 is pleased to recognize the work accomplished thus far in terms of advanced technologies. However, the SSC-18 would like to see more efforts directed towards the implementation of new radiotherapy processes in Member States. One of the most prominent advances in radiotherapy is the incorporation of image guidance in the delivery of daily radiotherapy doses to patients. As radiotherapy institutions in Member States continue to purchase new linacs that include on-board imaging capabilities, these imaging devices will play a greater role in guiding the accurate and safe treatment of patients. In view of these evolving imaging and treatment techniques:

**[R16]** The SSC-18 recommends that the DMRP develop a CRP on implementation, commissioning, image quality and dosimetry, and quality control testing of imageguided radiation therapy (IGRT) systems. A result of this CRP will be the development of a guidance document and, potentially, QA methodologies.

The doctoral contracts are a CRP activity awarded to institutions in low and middle-income countries for the benefit of students enrolled in a Ph.D. programme at a university of a Member State. The projects developed by these students are aimed at improving the care of cancer patients in Member States. The SSC-18 believes that a doctoral CRP is an efficient and justifiable activity that reduces the risk of "brain drain", strengthens the local expertise in medical physics research, promotes the establishment of long-lasting academic collaborations and furthers the objectives of the Agency to educate and train scientists in Member States to promote quality and safe healthcare. The benefit of these doctoral CRPs is evident in the number of peer-reviewed publications that have resulted from these efforts. [R17] The SSC-18 expresses enthusiasm for doctoral CRPs in promoting quality and safe healthcare and recommends that the DMRP continues their implementation with a specific need for assessing advanced imaging modalities in radiation oncology such as research on the evaluation of combining radiotherapy doses and imaging doses delivered to patients.

In nuclear medicine, there are 21 radiopharmaceutical therapeutics (RPTs) in active development, three of these ( $^{131}$ I,  $^{177}$ Lu,  $^{90}$ Y) are beta-particle emitters and four ( $^{225}$ Ac,  $^{227}$ Th,  $^{212}$ Pb/ $^{212}$ Bi,  $^{223}$ Ra) are alpha-particle emitters. The alpha-emitters are associated with 13 distinct RPTs. Because of the short range (600 µm to 800 µm) and high potency (RBE~3 to 8) of alpha-particle emitters, new dosimetry methods are needed that account for the microscale distribution of these agents. The assumption of a uniform distribution within normal or tumour tissue is especially inappropriate for alpha-emitter RPTs. In the majority of cases, calculations based on such assumptions will not predict toxicity and efficacy. Accordingly:

## [R18] The SSC-18 recommends that a doctoral CRP programme be formulated on the dosimetry of alphaemitters in readiness for Member States implementing radiopharmaceutical therapies.

Ideally, the end result of such an effort recommended above [R18] would be to identify techniques that may be implemented in Member States for dosimetry and treatment planning of alpha-emitter based RPTs. In addition to scientific peer-reviewed publications and a thesis, this effort could also lead to a guidelines document.

The SSC-18 observed that the IAEA Human Health Campus includes information about clinical applications, quality of practice, and educational resources, among others, on Nuclear Medicine, Radiopharmacy, and Radiation Oncology but does not have a specific tab for Diagnostic Radiology; adding this as a tabular heading to the Health Campus website would emphasize the importance of this specialization that is the biggest user of medical ionizing radiation (over 3600 million examinations conducted annually worldwide). Recognizing that audits for Diagnostic Radiology are under-utilized among Member States, partly due to the absence of a culture of quality and formal quality procedures:

[R19] The SSC-18 recommends that the DMRP investigate additional ways to promote QUAADRIL (e.g., by learning activities in regions where these have

not taken place recently) with the help of the NMDI and particularly the WHO.

Radiopharmaceutical therapy (RPT) involves the use of pharmaceuticals that either bind specifically to tumours or accumulate through a broad array of physiological mechanisms indigenous to the neoplastic cells to deliver radiation specifically to the targeted cells. In chemorefractory and radiotherapy-ineligible patients, RPT offers viable treatment options. Thousands of patients have benefitted from this treatment modality, with approximately 25% showing definite tumour responses in the near absence of serious side effects. Perhaps the most successful RPT and the most successful systemic cancer therapeutic in general is radioiodine treatment of differentiated thyroid cancer.

In light of the potential importance of radiopharmaceutical therapy in the next 5 to 10 years:

[R20] The SSC-18 recommends that the DMRP takes the steps necessary to establish an audit system (including an end-to-end QA phantom analogous to the SHANE phantom project) for radiopharmaceutical therapy. Towards this end a CRP beginning in 2021 to investigate possible approaches for implementing such a scheme is recommended.

The DMRP should decide which new advanced technology updates need to be included in the development of new guidelines and methodologies.

[R21] The SSC-18 recommends that several publications, whose purpose is to facilitate education in Member States, be updated to include radiotherapy advanced technologies. These publications might include, but may not be limited to:

- **1.** Radiation Oncology Physics, A Handbook for Teachers and Students
- 2. Setting up a Radiotherapy Programme
- 3. QUATRO guidelines

The SSC-18 is pleased to see that the Handbook of Basic QC for Radiology is close to completion. However, guidelines on quality control (QC) in Diagnostic Radiology are needed to ensure that the effort reaches its full impact.

[R22] The SSC-18 recommends that the DMRP makes educational material available that could include a training video associated with the Handbook of Basic QC for Radiology. In addition to their use in Diagnostic Radiology, digital images have become fundamental in the practice of Radiation Oncology. Digital detectors are now current practice for image acquisition. These developments and their optimum clinical use require the use of digital tools for image processing and analysis, medical imaging optimization, and evaluation of appropriate performance indexes for digital detectors.

# [R23] The SSC-18 recommends the development of guidelines on digital tools for image processing and analysis, medical imaging optimization, and evaluation of appropriate performance indices for digital detectors.

The SSC-18 was impressed with the nuclear medicine spreadsheet on staffing requirements and found it to be a very useful approach to evaluating operational needs in general. Since radiopharmaceutical therapy is a relatively new area in the field of nuclear medicine, general guidance on operational needs specifically related to this activity would be helpful in establishing such efforts in currently existing nuclear medicine departments. This is especially important since Member States and institutional leadership involved in implementing radiopharmaceutical therapy may not realize that additional preparation is needed even if requirements for diagnostic nuclear medicine have already been met. Radiopharmaceutical therapy is not yet a routine and widespread practice and there will be technological changes that will impact implementation of RPT in the near future. Accordingly:

[R24] The SSC-18 recommends that the DMRP investigate the need/feasibility of developing a spreadsheet analogous to the one used for nuclear medicine staffing, that also identifies equipment, software and methodology needs for implementing dosimetry-based treatment planning for different radiopharmaceutical therapeutics in order to assist Member States setting up such a service.

#### 4. SSC-18 RECOMMENDATIONS (INDICATED AS HIGH OR MEDIUM PRIORITY)

#### **High priority recommendations**

[R1] The SSC18 recommends that the DMRP collects and reports 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.

[R2] The SSC-18 recommends that funding be identified for the purchase, installation and maintenance of a SPECT/CT system (possibly as part of ReNuAl).

[R3] The SSC-18 recommends that a technical staff member be assigned to the DMRP whose main role would be to interact with the NAHU database administrator to develop and enhance the databases established by the DMRP, especially the Dosimetry Audit Network (DAN), the Dosimetry Laboratory Network (DOLNET) and the Directory of Radiotherapy Centres (DIRAC).

[R6] The SSC-18 recommends that the DMRP investigates all options to preserve the long-term continuity in dosimetry expertise that is essential for the calibration and dosimetry audit services.

[R7] The SSC-18 recommends that the DMRP implements an electron beam dosimetry audit service on a routine basis for a limited set of electron beams at each presently unaudited facility, with a focus on auditing low energy electron beams, instead of increasing the number or frequency of photon beam audits.

[R8] The SSC-18 recommends that the DOL findings on electrometer calibration methods are published, that an appropriate procedure and corresponding uncertainty be adopted, and that guidance be provided to the SSDLs on the use of equipment calibrated according to the adopted method, for example through the SSDL Newsletter.

[R9] The SSC-18 recommends that the DOL no longer invests in its reference standard for operational quantities, rather concentrating on the air-kerma standard and providing calibrations in terms of air kerma and, when required, operational quantities based on appropriate conversion coefficients.

[R10] The SSC-18 recommends that the DOL investigates the relationship between the calibration coefficients for <sup>192</sup>Ir and <sup>60</sup>Co brachytherapy microsources in terms of a  $k_Q$  factor for a given instrument type, with the aim of enabling the SSDLs to use a <sup>60</sup>Co calibration to satisfy their dissemination needs for <sup>192</sup>Ir.

[R11] The SSC-18 recommends that a quality audit for dosimetry laboratories (QUADOL) be established to provide the SSDLs with an audit report as a step towards enabling their calibration and measurement capabilities (CMCs) to be recognized internationally.

[R15] The SSC-18 recommends that the brachytherapy white paper be updated and published. In addition, it is recommended that a Brachytherapy Code of Practice (CoP) be developed. The CoP should have links to the HDR QA audit CRP and an updated survey of brachytherapy clinical practices.

[R16] The SSC-18 recommends that the DMRP develop a CRP on implementation, commissioning, image quality and dosimetry, and quality control testing of imageguided radiation therapy (IGRT) systems.

[R17] The SSC-18 expresses enthusiasm for doctoral CRPs in promoting quality and safe healthcare and recommends that the DMRP continues their implementation with a specific need for assessing advanced imaging modalities in Radiation Oncology such as research on the evaluation of combining radiotherapy doses and imaging doses delivered to patients.

[R19] The SSC-18 recommends that the DMRP investigate additional ways to promote QUAADRIL (e.g., by learning activities in regions where these have not taken place recently) with the help of the NMDI and particularly the WHO.

[R20] The SSC-18 recommends that the DMRP takes the steps necessary to establish an audit system (including an end-to-end QA phantom analogous to the SHANE phantom project) for radiopharmaceutical therapy. Towards this end, a CRP beginning in 2021 to investigate possible approaches for implementing such a scheme is recommended.

#### Medium priority recommendations

[R4] The SSC-18 recommends that the DMRP staff establish procedures, for section staff with specific responsibilities as Technical Officers for TC projects, that streamline the process for addressing the increasing number of TC requests.

[R5] The SSC-18 recommends the continued collaboration of the IAEA with the IMPCB in the certification of medical physicists and the establishment

of new national certification boards and that the DMRP develops guidelines on certification and promotes the use of those guidelines in the Member States.

[R12] The SSC-18 recommends that the DOLNET be expanded to store more information on calibration and measurement capabilities, infrastructure, human resources, training activities, etc. for better data access and analysis.

[R13] The SSC-18 recommends that the DMRP terminates the <sup>137</sup>Cs LDR calibration service and decommissions the relevant sources.

[R14] The SSC-18 recommends that the DMRP provides guidance to the SSDLs regarding the use of solid state detectors in the clinic, particularly in relation to the choice of mammography calibration qualities.

[R18] The SSC-18 recommends that a doctoral CRP programme be formulated on the dosimetry of alphaemitters in readiness for Member States implementing radiopharmaceutical therapies.

[R21] The SSC-18 recommends that several publications, whose purpose is to facilitate education in Member States, be updated to include radiotherapy advanced technologies. These publications might include, but may not be limited to:

- 1. Radiation Oncology Physics, A Handbook for Teachers and Students
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[R22] The SSC-18 recommends that the DMRP makes educational material available that could include a training video associated with the Handbook of Basic QC for Radiology.

[R23] The SSC-18 recommends the development of guidelines on digital tools for image processing and analysis, medical imaging optimization, and evaluation of appropriate performance indices for digital detectors.

[R24] The SSC-18 recommends that the DMRP investigate the need/feasibility of developing a spreadsheet analogous to the one used for nuclear medicine staffing, that also identifies equipment, software and methodology needs for implementing dosimetry-based treatment planning for different radiopharmaceutical therapeutics (RPTs) in order to assist Member States setting up such a service.

#### 5. SSC-17 COMMENTS

#### **5.1 General Comments**

- With regard to the organization of the SSC meeting by the Agency, the SSC-18 was very pleased to have all the documents in electronic format only. This has worked well for the present meeting and should be encouraged for future SSC meetings.
- The SSC-18 also appreciated the visit to the Agency Dosimetry Laboratory (DOL) at Seibersdorf and trusts that the next SSC will have the opportunity to visit the new linac facility. The SSC-18 proposes that a visit to the DOL should normally take place every other SSC meeting although new SSC members should always have the possibility of a visit.
- The establishment of new facilities and dosimetry services at the DOL, notably the clinical accelerator and the HDR brachytherapy facility, provides an opportunity for the DOL to further develop its training activities and educational guidelines. The SSC-18 supports the proposal of the DMRP to complement its existing educational activities with training programmes that make use of these new facilities.
- The SSC-18 noticed that both the old and the new SSDL network websites can be accessed depending on the search terms. This should be resolved by removing the old website once all the information has been updated.

#### • 5.2 Project 2.2.4.1 Comments

- The SSC-18 is pleased to see that the DOL has converted to using glass dosimeters for their auditing of beam outputs. The reading of the glass dosimeters is highly dependent on the glass dosimeter reading magazine. The DOL should develop a QA program to assess the performance of the magazines periodically in order to ensure there is no change in the consistency of the readouts due to degradation of the reading magazines.
- Regarding the importance of traceability of the IAEA to the BIPM for radiation protection in <sup>137</sup>Cs, it is noted that the <sup>137</sup>Cs facility at the BIPM has been temporarily suspended. Within the framework of the

MoU between the IAEA and the BIPM, the SSC-18 encourages the DMRP to continue to work with the BIPM to maintain this traceability in terms of air kerma.

- The SSC-18 encourages the DOL to keep at least one hands-on comparison a year, in a different field each year at Seibersdorf, to consolidate the training aspects of comparisons for the SSDL staff of Member States. The selection of participating labs should be in accordance with the SSDL Charter. For comparison services it is recognized that mailing equipment is more efficient and should be the preferred option when training is not required, as long as the Member State's local environment permits this. However, it is recognized that customs problems and damage can be serious constraints for mailed equipment.
- The success of the multi-centre study using the SHANE phantom was very impressive. The DMRP should investigate the need to conduct a national-level audit using the SHANE anthropomorphic end-to-end audit phantom.

#### • 5.3 Project 2.2.4.2. Comments

- The SSC-18 supports the one-year extension of the CRP on small field dosimetry to complete this project.
- The SSC-18 recognizes that since the Workshop on uncertainty was such a great success, this educational effort should be repeated. An effort should be made to develop e-learning material in this topic.
- The SSDL newsletter is an excellent platform for exchanging information between the IAEA and the SSDLs. Contributions from the SSDLs should be encouraged. The areas of its content may be broadened to include lessons learned, dosimetry audit results, safety, security and radiation protection aspects, practical aspects and examples, uncertainty topics, QMS topics, etc.

#### • 5.4 Project 2.2.4.3. Comments

• The SSC-18 was most encouraged by all the education material that is now available through the DMRP and the Human Health Campus, notably the slide sets for the Handbooks, the video tutorials and course material. It was also interesting to see the positive impact of the courses on participants

through the questionnaires completed pre- and post course attendance. This work is strongly supported by the SSC-18.

- In light of the introduction of advanced technologies in Member State radiotherapy facilities, the DMRP should investigate the need to develop guidelines for advanced radiotherapy technologies. These technologies might include, but are not limited to:
  - Particle radiotherapy
  - SBRT/SRS radiotherapy
  - Treatment planning algorithms and their accuracy
  - The role of IT in radiation oncology
  - Motion management in radiation oncology
  - Disease specific radiopharmaceutical therapy
  - Digital imaging
  - MRI-guided radiotherapy

• To provide a broader recognition and adoption of the work, including among Member States that have a close interaction with the WHO, the SSC-18 suggests that the title for the guidance document on pediatric dosimetry should be changed to "Dose to the fetus and to the nursing infant following a radiopharmaceutical procedure to the mother".



The members of the Committee present in person at the 18th Scientific Committee meeting: (from left) David Followill, Costas Hourdakis, George Sgouros, Penelope Allisy (Rapporteur), Carl Ross, David Burns



The participants of the 18th Scientific Committee meeting

#### Acronyms used in the Report

ARBR	Applied Radiation Biology and Radiotherapy Section of the Agency
BIPM	Bureau International des Poids et Mesures / International Bureau of Weights and
	Measures
CIPM	International Committee for Weights and Measures
CMC	Calibration and Measurement Capability
СоР	Code of Practice
CRP	Coordinated Research Project (of the Agency)
СТ	Computed Tomography
DAN	Dosimetry Audit Network
DG	Director General (of the Agency)
DIRAC	Directory of Radiotherapy Centres
DMRP	Dosimetry and Medical Radiation Physics Section (of the Agency)
DOL	Dosimetry Laboratory (of the Agency)
DOLNET	Dosimetry Laboratories Network (Register)
HDR	High dose-rate (brachytherapy)
IAEA	International Atomic Energy Agency
ICRU	International Commission on Radiation Units and Measurements
IGRT	Image-guided radiation therapy
ILO	International Labour Organization
IMPCB	International Medical Physics Certification Board
IMRT	Intensity modulated radiation therapy
IT	Information Technology
LDR	Low dose-rate brachytherapy
MRI	Magnetic resonance imaging
NAHU	Division of Human Health (of the Agency)
NMDI	Nuclear Medicine and Diagnostic Imaging (of IAEA)
NSRW	Radiation, Transport and Waste Safety (of IAEA)
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
QUAADRIL	Quality assurance audit for diagnostic radiology improvement and learning
QUADOL	Quality audit for dosimetry laboratories
QUANUM	Quality assurance in nuclear medicine
QUATRO	Quality Assurance Team for Radiation Oncology
QS	Quality system
RBE	Radio-biological effect
RPL	Radio-photoluminescence
RPT	Radio-pharmaceutical therapy
SBRT	Stereotactic Body Radiation Therapy,
SHANE	Shoulder, head and neck (phantom)
SPECT	Single photon emission computed tomography
SRS	Stereotactic Radiosurgery
SSC	SSDL Scientific Committee
SSDL	Secondary Standards Dosimetry Laboratory

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- TC Department of Technical Cooperation (of the Agency)
- TLD Thermoluminescent dosimeter, or thermoluminescence dosimetry
- WHO World Health Organization

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### International Symposium on Standards, Applications and Quality Assurance in Medical Radiation Dosimetry

18–21 June 2019 Vienna, Austria

Organized by the International Atomic Energy Agency

YEARS 1969 – 2019 of IAEA/WHO Dosimetry Audits



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### **New IAEA Publications**

#### Medical Physics Staffing Needs in Diagnostic Imaging and Radionuclide Therapy:

#### An Activity Based Approach

Over the last decades the rapid technological development of diagnostic and interventional radiology and nuclear medicine has made them major tools of modern medicine. However, at the same time the involved risks, the growing number of procedures and the increasing complexity of the procedures require competent professional staff to ensure safe and effective patient diagnosis, treatment and management. Medical physicists (or clinically qualified medical physicists) have been recognized as vital health professionals with important and clear responsibilities related to quality and safety of applications of ionizing radiation in medicine. This publication describes an algorithm developed to determine the recommended staffing levels for clinical medical physics services in medical imaging and radionuclide therapy, based on current best practice, as described in international guidelines.

(Information taken from <u>www.pub-iaea.org</u>)



# Courses, Meetings and Consultancies in 2018 and 2019

#### TC Courses and Workshops related to DMRP activities

- RER6033: Regional Training Course on Radiobiology for Radiation Oncologists and Medical Physicists, Moscow, Russian Federation, 01—12 October 2018
- RER6033: Regional Training Course on Commissioning and Quality Assurance for Radiotherapy Treatment Planning Systems, Moscow, Russian Federation, 15 October—02 November 2018
- Joint ICTP-IAEA Advanced School on Quality Assurance and Dosimetry in Mammography, Trieste, Italy, 22—26 October 2018
- RAF6050: RTC on the Implementation of IAEA TRS 430, Cairo, Egypt, 22 October-02 November 2018
- THA6040: IAEA/AAPM Code of Practice for the Dosimetry of Static and Small Photon Fields, Bangkok, Thailand, 25-29 October 2018
- RER6036: In-Holland/VMAT Treatment Planning Hands-on course for MPs, Haarlem, The Netherlands, 29 October—02 November 2018
- RER6033: Regional Training Course on Radiation Protection and Safety and Accident Prevention in Radiotherapy, A.I.Burnazyan Federal Medical Biophysical Center, Moscow, Russia, 29 October 02 November 2018
- IRA6011: QA for IMRT, Iran, 12—16 November 2018
- RAF6053: Regional Training Course on Quality Assurance in Medical Imaging Bulawayo, Zimbabwe. 19–23 November 2018
- NIR6027: 2D to 3D EBRT, Abuja, Nigeria, 26-30 November 2018
- RLA6077: Image quality for Medical Physicist in Diagnostic Radiology and Nuclear Medicine, Bogota, Colombia, 03-07 December 2018
- RLA9085: Regional Training Course on X-Ray Calibration in Secondary Standards Dosimetry Laboratories, Toluca, Mexico, 03–07 December 2018
- IAEA/Argonne: IAEA/AAPM Code of Practice for the Dosimetry of Static and Small Photon Fields, Chicago, USA, 06–10 December 2018
- RAF6050: IAEA/AAPM Code of Practice for the Dosimetry of Static and Small Photon Fields, Rabat, Morocco, 06–10 December 2018
- RLA9086: Regional Training Course on Radiation Therapy Calibrations in Secondary Standards Dosimetry Laboratories, NPL, UK, 10–14 December 2018
- RAF6050: Regional Training Course on Train-the-Trainer for clinical training of Medical Physicists, Abuja, Nigeria, 18–20 December 2018
- Joint ICTP-IAEA Advanced School on Quality Assurance Requirements in the Digital Era of Diagnostic Radiology, Trieste, Italy, 11—15 November 2019
- Joint ICTP-IAEA Workshop on Uncertainty Estimations for Radiation Measurements in SSDLs and Hospitals, Trieste, Italy, 02—06 December 2019

#### **ESTRO** Courses

• RER6036: ESTRO/Best practice in radiation oncology - Train the RTT (Radiation Therapists) Trainers - Part I, Vienna, Austria, 22—26 October 2018

#### **DMRP** Meetings and Consultancies

- Consultants' Meeting to Define the contents of a competency framework document for training the staff of Secondary Standards Dosimetry Laboratories, Vienna, Austria, 05–09 November 2018
- Consultancy Meeting on the Need of a Guidance Document on QA/QC of Nuclear Medicine Non-Imaging Equipment, Vienna, Austria, 12—14 November 2018
- Consultancy Meeting to Review the Draft Guidance Document on Dosimetry in Radionuclide Therapy, Vienna, Austria, 26–30 November 2018
- Third Research Coordination Meeting of the CRP on Evaluation and Optimization of Paediatric Imaging, Vienna, Austria, 10—14 December 2018
- Consultancy Meeting to Prepare the first Draft of an International Code of Practice for Brachytherapy Dosimetry, Vienna, Austria, 10—14 December 2018
- Training Activity on the Establishment of a Secondary Standards Dosimetry Laboratory and a Quality Management System, Vienna, Austria, 17–21 December 2018
- Third Research Coordination Meeting on Testing of Code of Practice on Small Field Dosimetry, Vienna, Austria, 18-22 February 2019
- Consultancy Meeting to Draft a Guidance Document on Quality Assurance and Quality Controls of Nuclear Medicine Non-imaging Equipment, Vienna, Austria, 25—29 March 2019
- Technical Meeting on Development and Trends in Secondary Standards Dosimetry Laboratories, Vienna, Austria, 01-05 April 2019
- Second Research Coordination Meeting of the CRP on Dosimetry in Radiopharmaceutical Therapy for Personalized Patient Treatment, Vienna, Austria, 13—17 May 2019
- International Symposium on Standards, Applications and Quality Assurance in Medical Radiation Dosimetry (IDOS-2019), Vienna, Austria, 18—21 June 2019
- Training Activity on Uncertainties in Dosimetry for SSDLs, Seibersdorf, Austria, 24-26 June 2019
- 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, 05–09 August 2019

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