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Contents

Newly constructed wing of the IAEA calibration laboratory (credit: L. Czap/IAEA)

From the editor

This issue of the SSDL Newsletter contains the report of the 12th SSDL Scientific Committee (SSC) Meeting held at the IAEA Headquarters from 7-10 March 2006. The SSC conducts biennial reviews and evaluations of the Dosimetry and Medical Radiation Physics activities. Following each meeting, the report of the SSC is addressed to the Directors General of the IAEA and WHO and circulated subsequently to Member States through this Newsletter. The report is pending acceptance by the IAEA and WHO.

The second article is a brief note on the polarity of electrometers. The IAEA has received many queries from SSDLs on the definitions used by manufacturers of ionization chambers concerning the sign of the polarity of the chamber-electrometer connecting systems. The lack of clarity has also induced mistakes in some dosimetry comparison exercises where inconsistent polarities were used by some participants. It is hoped that this note will help clarify the issue.

The readers were informed in the SSDL Newsletter No. 51 on the extension of the calibration facilities at Seibersdorf. It is a pleasure to announce that less than one year later, the construction of the new wing was completed. The inauguration ceremony was held on June 1 2006.

IAEA International Atomic Energy Agency

STAFF OF THE DOSIMETRY AND MEDICAL RADIATION PHYSICS (DMRP) SECTION

International Atomic Energy Agency, Wagramer Strasse 5, P.O. Box 100, A-1400 Vienna, Austria

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

Name	Position/tasks	E-mail address	Extension
Shortt, Ken	Section Head	k.shortt@iaea.org	21662
Bera, Pranabes	Senior Laboratory Technician, TLD	p.bera@iaea.org	28330
Czap, Ladislav	Senior Laboratory Technician Ionization chamber calibration	l.czap@iaea.org	28332
Drew, John	Medical Physicist	j.drew@iaea.org	21655
Girzikowsky, Reinhard	Senior Laboratory Technician High dose and Mammography	r.girzikowsky@iaea.org	28328
Izewska, Joanna	TLD Officer, Head, Dosimetry Laboratory Unit	j.izewska@iaea.org	21661
Meghzifene, Ahmed	SSDL Officer Editor, SSDL Newsletter	a.meghzifene@iaea.org	21653
McLean, Ian Donald	Medical Radiation Physicist Diagnostic Radiology	i.mclean@iaea.org	21663
Vatnitsky, Stanislav	Medical Radiation Physicist Treatment Planning Systems	s.vatnitsky@iaea.org	21660
Bokulic, Tomislav	Medical Physicist	t.bokulic@iaea.org	21659
Ubani, Martyn	Clerk (DIRAC)	m.ubani@iaea.org	21672
Flory, Rosemary	Secretary	r.flory@iaea.org	21662
Ciortan, Simona	Secretary	s.ciortan@iaea.org	21634
Danker, Sabine	Secretary (part-time)	s.danker@iaea.org	21665
DMRP Section		dosimetry@iaea.org[a]	21662

[a] This is the general e-mail address of the DMRP Section where all correspondence not related to specific tasks of the staff above should be addressed. Please note also that there is a considerable circulation of the staff of the Agency, so that messages addressed to someone who has left might be lost. All incoming messages to this mailbox are internally distributed to the appropriate staff members.

SERVICES PROVIDED BY THE IAEA PROGRAMME IN DOSIMETRY AND MEDICAL RADIATION PHYSICS

The IAEA's Dosimetry and Medical Radiation Physics programme is focused on services provided to Member States through the IAEA/WHO SSDL Network and 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 TLD postal dose assurance service for SSDLs and radiotherapy centres, and the International Dose Assurance Service (IDAS) for SSDLs and radiation processing facilities, mainly for food-irradiation and sterilisation of medical products.

The IAEA Calibration and Measurement Capabilities (CMCs) have been reviewed and published in the CIPM's (Comité International des Poids et Mesures) Appendix C. Additional information can be found at the 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 (radiotherapy, diagnostic radiology including mammography and radiation protection, including environmental dose level).	x-rays (10-300kV) and gamma rays from ^{137}Cs and ^{60}Co
Calibration of well-type ionization chambers for Low Dose Rate (LDR) brachytherapy.	γ-rays from ^{137}Cs
Comparison of therapy level ionization chamber calibrations (for SSDLs).	γ-rays from ^{60}Co
TLD dose quality audits for external radiotherapy beams for SSDLs and hospitals.	γ-rays from ^{60}Co and high energy x-ray beams
TLD dose quality audits for radiation protection for SSDLs.	γ-rays from ^{137}Cs
Reference irradiations to dosimeters for radiation protection (for IAEA internal use).	x-rays (40-300 kV) and γ rays from ^{137}Cs and ^{60}Co

Member States who are 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 through the Internet at the web site: http://www-naweb.iaea.org/nahu/dmrp/ssdl.asp

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

Telephone: +43 1 2600 21662
Fax: +43 1 26007 21662
E-mail: dosimetry@iaea.org

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

Report of the Twelfth Meeting of the SSDL Scientific Committee

IAEA, Vienna
7-10 March 2006

1. FOREWORD

The Scientific Committee (SSC) of the IAEA/WHO network of Secondary Standards Dosimetry Laboratories (SSDLs) is a standing committee 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 Subprogramme and reporting the results of the reviews to the Directors General of the IAEA and the WHO. The report of the eleventh meeting (held in March 2004) of the SSC (SSC-11) was published in the SSDL Newsletter No. 50 in February 2005.

The twelfth meeting was held in Vienna at Agency Headquarters from 7-10 March 2006. Opening remarks were made by Mr. W. Burkart, Deputy Director General and Head of the Department of Nuclear Sciences and Applications; Mr. P. Andreo, Director of the Division of Human Health (NAHU); Ms. G. Voigt, Director of the Agency's Laboratories at Seibersdorf (NAAL); Mr. H. Østensen (WHO), of the Department of Essential Health Technologies and Co-Secretary of the IAEA/WHO SSDL Network; and Mr. K. Shortt, Head of the Section of Dosimetry and Medical Radiation Physics (DMRP) and Co-Secretary of the IAEA/WHO SSDL Network.

1.1. Introductions

Mr. Burkart welcomed SSC to Vienna. He reminded the committee that their role is to help the DMRP to develop a strategy for the future. This will be the final meeting for most participants, and he thanked them for their service.

The DMRP has responded to the advice of the SSC and major changes have been made. He believes the Division can take pride in its strengthening of dosimetry activities. Following the advice of SSC-11, construction of a bunker to expand the irradiation facilities at the Agency's dosimetry laboratories (DOL) at Seibersdorf was completed on schedule and within budget. The approved budget also provides for a 4th technician to join those who work at NAAL. A new cobalt unit has been ordered and should be installed in the new bunker in the next few months, and X ray equipment for the new irradiation facility will be ordered in the near future. The Agency will hold a ceremony to open the new facilities on June 1.

Mr. Burkart recalled that SSC-11 had been asked to consider the DMRP's budget, and consider activities that could be discontinued to reduce costs. In response, SSC-11 recommended closing the International Dose Assurance Service (IDAS). The recommendation followed from an assessment of the cost of maintaining the ESR service for a relatively small number of users. The service has since been discontinued, and an African laboratory has been assisted through TC mechanisms to provide a service for neighbouring countries.

The Deputy Director General explained that the Mutual Recognition Arrangement has strengthened the DMRP and the DOL. The DOL Quality Management System (QMS) underwent peer-review in 2004 and at its 14th meeting in May 2005, the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB) formally acknowledged that the DOL QMS satisfies the requirements of the CIPM MRA. Developing this strong quality management system has given the DOL greater confidence and credibility.

A radionuclide dosimetry capability had been supported by the SSC but was not achieved at Seibersdorf, because space identified for it continues to be occupied and used for an existing activity. Mr. Burkart believes it is better now to finish implementing the new dosimetry facility before attempting to develop a radionuclide dosimetry capability.

Mr. Burkart noted that the radiation therapy physics handbook edited by Ervin Podgorsak has been well received. In fact, the German medical physics society is proposing to declare this text their official standard for training medical physicists.

A new programme, the Quality Assurance Team for Radiation Oncology (QUATRO) was expanded from an earlier program, the Medical Physics Investigation Team (MPIT). QUATRO has both proactive and reactive capabilities, and will help member states identify deficiencies in their QA programs.

Similarly, an Agency initiative, the Programme of Action for Cancer Therapy (PACT), to which the DMRP has contributed, will have significant impact on lives of human patients.

Finally, Mr. Burkart noted that the Division of Human Health is planning a QA conference to be held in November 2006. He expects this conference to make major contributions to quality assurance in radiation medicine and encouraged the committee members to attend.

Mr. Andreo welcomed the committee and offered his thanks for their contributions that have strengthened the DMRP. Mr. Andreo reminded the SSC that even with the addition of the new bunker and an additional staff member, the workload is still very high. The DMRP, with guidance from the SSC, must moderate its enthusiasm for new capabilities, and should not try to start too many new projects. He noted the problems associated with developing the radionuclide laboratory and suggested that it was too expensive and too complicated to implement. There is now an urgent need to optimize the workflow. He suggested that the DMRP consider outsourcing some of its activities. He noted that while the Agency has spent 30 years building the SSDL Network, it might not yet be taking full advantage of its capabilities. The DMRP should consider relying on the SSDLs to help the Agency with some of the requests it receives. For example, when countries without an SSDL request instrument calibrations, they might be directed to a neighbouring country rather than to the Agency. As another example, he also mentioned the Agency's plan to refer Northern African countries seeking the IDAS capability to an African laboratory.

Mr. Andreo also expressed his concerns regarding the effort needed to support the Agency's participation in the MRA. It is clear that the MRA increases confidence of Member States in the DOL, but the MRA itself doesn't alter the quality of the work performed. In fact, the Agency's participation encourages others to participate in the MRA at the risk of increasing the documentation workload and detracting from efforts to improve quality. He emphasized that a balance must be found between administrative work and scientific measurements.

Mr. Andreo mentioned a report presented the day before by the DG, which included material regarding the protection of patients in radiology. The part of this report provided by the Division of Nuclear Safety contained considerably more about protection of patients than did the part of the report provided by the Division of Human Health. Mr. Andreo felt that this imbalance was inappropriate. NAHU should play a greater role in radiation protection and safety of patients. He thought that the SSC might be able to help NAHU emphasize protection of patients, to balance and make more realistic its relationship with other departments. Further emphasis on imaging, and on quality assurance through the QUATRO program, might help establish this balance.

Mr. Andreo also described his pleasure in the recognition given to Dr. Podgorsak for publication of the handbook entitled "Radiation Oncology Physics: A Handbook for Teachers and Students". This represented a significant concession from the Agency, and Mr. Andreo anticipates that until Agency policy is changed, it will continue to be a problem to get proper recognition for authors of future publications.

The Agency is currently sponsoring the development of a similar handbook for training of physicists in diagnostic radiology. Associated with its preparation will be the Agency's first course on imaging physics, to be held in Mexico in June. Mr. Andreo noted that this is an important new direction for the Agency.

Mr. Andreo concluded by reiterating that he values the contributions made by the SSC. In fact, he sees the SSC as a model that could be expanded to conduct a review of the entire division (NAHU). He believes the interaction with independent reviewers is very valuable, and DMRP has clearly benefited from the SSC reviews.

Ms. G. Voigt began by acknowledging the close relationship between the DMRP and the Seibersdorf laboratories. The SSC review is very important, particularly to the laboratory, and the DOL has worked hard to implement the SSC recommendations. She mentioned the quality management system as a specific example of a SSC recommendation that had been adhered to by the DOL.

She described some activities of the NAAL laboratories, including the production of reference materials. NAAL will apply to have their facilities accredited for this function.

Ms. Voigt welcomed the SSC to visit the laboratories as planned on March 8, but mentioned that it will be International Women's Day, so she won't be available in Seibersdorf. However, she was sure the SSC would be pleased to see the new bunker. Construction was started in June 2005 and was completed in January 2006, which she acknowledged was faster than most other Agency projects. She showed floor plans and described the new facilities, and explained that they would be inaugurated on June 1, 2006.

Mr. Østensen began by stating that he was pleased for several reasons to be a part of the SSC review. He felt that the SSC is recognized as a panel of experts that make a valuable contribution to the Agency. He felt honoured to participate as an observer and co-secretary of the IAEA/WHO SSDL Network. He announced that this would be his last meeting, as he is retiring from the WHO.

Mr. Østensen explained that the SSC performs important work, and the results affect a lot of people around the world. He hopes that the collaboration can be intensified in the future. He was very pleased to hear Mr. Andreo's express his belief that the DMRP must strike the appropriate balance between documentation and what he described as the real work, addressing the fundamentals of radiation dosimetry and medical physics. He explained that many countries have no medical physicist at all, and the medical physicists in a number of developing countries need more training.

Mr. Østensen also described a need to intensify collaboration with WHO through PACT. He explained that throughout much of the world, 99 % of cancer patients are not offered curative treatment, and only receive palliative therapy. Radiation Oncology needs desperately to be improved in many countries. He explained that a key to adequate treatment is timely diagnosis. He said that while installing advanced imaging systems such as CT and MRI may prove beneficial in special settings, the ultimate and only need in most mid-size and small hospitals in many developing countries is simple, general purpose X ray machines and general purpose ultrasound equipment installed and properly handled.

1.2. General discussion

The comments of several of the speakers stimulated a short discussion. Mr. Andreo said that it was true that many cancer patients in the developing world get only palliative care. However, he felt it was necessary to understand that this situation is in part a social problem, and not entirely one of availability of facilities. He believed that it is important to require countries to commit to providing medical care to their populations. Mr. Østensen agreed and said he felt there were opportunities to do this.

Mr. Shortt added his welcome to the SSC. He explained that some of the committee members would change following this meeting. He has been pleased with the reviews and recommendations of the committee, and thanked the members. He also thanked his staff; he stated that he was grateful that he could depend so much on them. He acknowledged that one senior staff member had left the DMRP in the last year, and another would be leaving in the next few days. He was disappointed to lose valuable members of his staff at a time when there were many important and interesting projects to be done. Mr. Shortt said he often felt frustrated that the DMRP had many valuable projects, but limited resources to carry them out. Still, he was very pleased that SSC had supported the new bunker, and looked forward to inaugurating the new facilities.

Ms. Allisy-Roberts thanked Mr. Burkart and the other speakers. She said that the SSC would carefully consider Mr. Andreo's advice to find an appropriate balance between the requirements for quality management and documentation, and carrying out the important scientific and service work of the Agency. Ms. Allisy-Roberts also said that the SSC has very much appreciated the input and advice of the WHO expert on radiation medicine during its deliberations. As the collaboration between the Agency and the WHO is crucial to the success of the IAEA/WHO SSDL Network, the SSC encourages the two organizations to continue this focused representation of radiation medicine and its applications world-wide at future SSCs.

1.2.1. Confirmation of Chair and Rapporteur

At this point, Mr. Shortt asked for confirmation of the chair and rapporteur. Both were confirmed. The list of participants in the meeting and the meeting agenda are attached as Appendices I and II, respectively.

1.2.2. Programme of Meeting

Mr. Shortt began the meeting program by presenting an overview of the DMRP Subprogramme. Several DMRP staff members then presented reports on the activities of the Section during the remainder of the first day of the meeting. The morning of the second day was spent discussing the first biennial external peer review of the DOL Quality Management System. The afternoon of the second day was spent taking a tour of the DOL and the new laboratory facilities at Seibersdorf. The SSC-12 met with Mr. Shortt later that afternoon to review in detail specific activities and the DMRP's responses to previous recommendations. On the third day, the SSC-12 met in closed session, deliberating on the accomplishments and direction of the Agency's sub-programme, and developing specific recommendations. The draft recommendations were refined on the morning of the fourth day, after which the SSC-12 heard final comments from the DMRP staff. The draft recommendations were discussed with Mr. Shortt and several staff members on the afternoon of the fourth day.

The SSC reviewed the activities reported by the DMRP for the 2004–2005 biennium and discussed the planned sub-programme for the Section for 2006–2007. In addition, the SSC reviewed an initial proposal for the bien-

nium 2008–2009. The scope of the SSC-12 evaluation addressed the questions of:

- The objectives of the sub-programme areas.
- The impact (benefit to the Member States).
- Opportunities to reduce costs by eliminating projects or transferring them to other laboratories.
- The continuing relevance of Agency activities.
- The distribution of effort between work on the sub-programme projects and support of the quality management.

Specific recommendations from the SSC are underlined throughout the text, and are also reiterated at the end of the report.

2. INTRODUCTION

The SSC-12 wishes to thank 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 2004-2005. The availability of this report in advance of the meeting enhanced the Committee's ability to develop thoughtful and appropriate recommendations.

The SSC-12 is pleased to note that most of the recommendations of SSC-11 have been implemented. The SSC notes that the DMRP intends in the current biennium to implement the remaining outstanding SSC-11 recommendations.

During the biennium 2004–2005, the DMRP Section's projects and their titles were:

- PROJECT F.3.01: Network of Secondary Standards Dosimetry Laboratories (SSDLs)
- PROJECT F.3.02: Quality Assurance and Dose Audits
- PROJECT F.3.03: Development of Radiation Dosimetry Techniques
- PROJECT F.3.04: Developments in Medical Radiation Physics Quality Assurance.

In this format, F.3.01 and F.3.02 addressed the provision of services to Member States while all CRPs (research and development) were moved to F.3.03 and F.3.04. This SSC report is organized following the new project numbers. An illustration of the arrangement of these major projects appears in Figure 1, reproduced here from page 3 of the DMRP report.

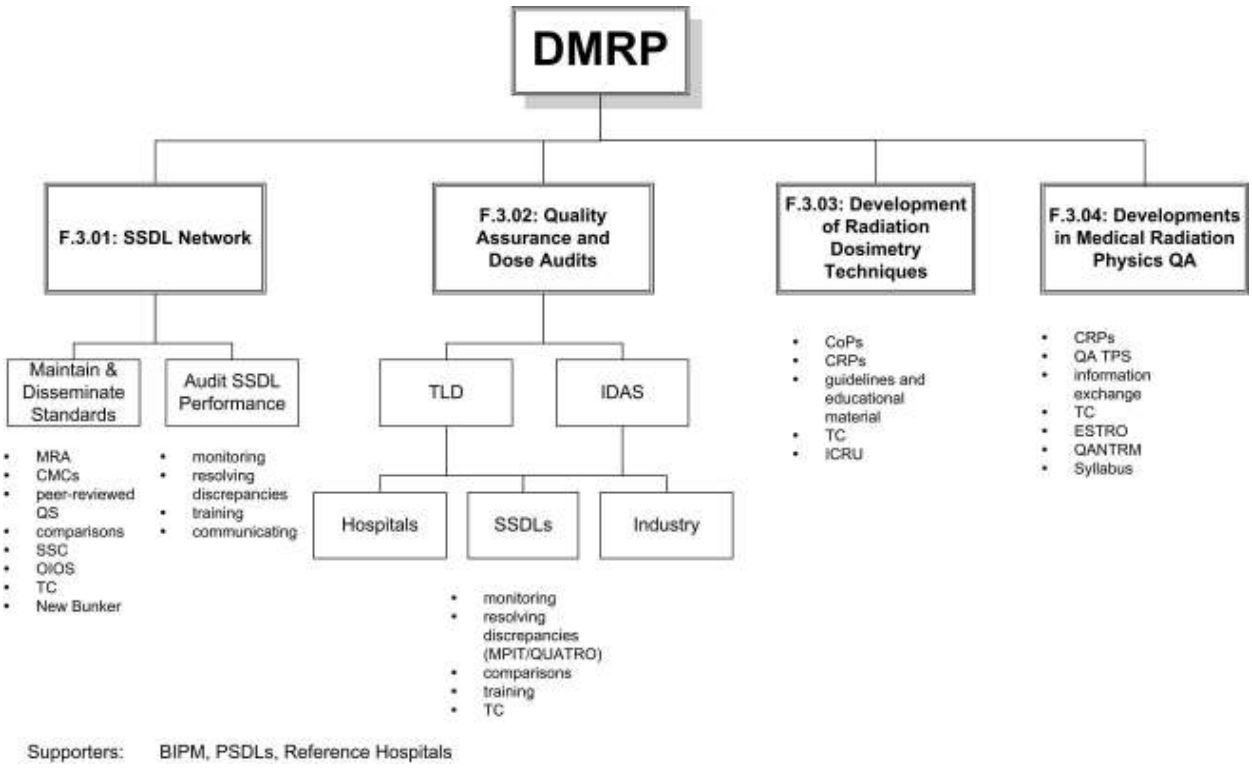

Figure 1: *Overview of the major projects of the IAEA DMRP Sub-orgramme 2004-2005*

Beginning with the biennium 2006–2007, the DMRP Section's projects and their titles are:

- PROJECT F.4.01: Quality Audits in Radiotherapy Dosimetry
- PROJECT F.4.02: Radiation Metrology supporting the Network of Secondary Standards Dosimetry Laboratories
- PROJECT F.4.03: Dosimetry Codes of Practice and Guidelines for Radiation Measurement in Radiotherapy, Diagnostic Radiology and Nuclear Medicine
- PROJECT F.4.04: Medical Physics Developments for Quality Assurance and Clinical Applications of Ionizing Radiation

This report begins with a general discussion of administrative items and collaborative efforts within the Agency. Selected projects are then discussed in turn. The report mentions only those particular activities of the section for which the SSC has comments or recommendations at this time. Exclusion of specific activities should be interpreted positively, as concurrence by the SSC with the activity as described in the DMRP Report.

3. REPORT

3.1. General Organizational Items

The SSC-12 is very pleased to see how well the majority of recommendations of the SSC-11 have been implemented and congratulates the Agency on the strengths of its DMRP section on achieving this. It notes however, that the success of the DMRP encourages Member States and indeed other sections of the Agency to demand more input from the DMRP. This has produced an overload on the DMRP resources that may jeopardize the quality of the services unless additional staff members are appointed or the work load is reduced significantly. The SSC-12 has made a number of recommendations on both of these aspects, staffing and workload.

3.1.1. Timing for the SSC Meeting

The SSC-12 is pleased that the meeting was again scheduled early enough in the planning process to have impact on preparations for the programme of the biennium 2006–2007. Future SSCs should also be able to review the programme early in the biennium and impact on preparations of the programme for the subsequent biennium. The SSC-12 is also pleased to note that the meeting of SSC-13 is tentatively scheduled for mid- or late-March 2008, which is sufficiently early in the biennium programme for the SSC to make a contribution to the programme.

3.1.2. Staffing issues

The SSC-12 welcomes the actions of the Agency in closing the IDAS programme in view of the lack of support for this work, and commends the DMRP for the method in which it closed this service and assisted, through TC mechanisms, in establishing a facility at an SSDL to take over the work on a regional basis.

The SSC-12 is pleased to note the recognition by the Agency of the need for the involvement of the DMRP in an increasing number of TC projects but feels strongly that there should be an appropriate increase in staff resources to cover this need. A further drain on DMRP present resources that is likely to increase in the future is the pressure for scientific support for PACT.

1. Consequently, the SSC-12 recommends that additional members of scientific staff, with expertise in clinical medical physics, be appointed to the DMRP team to support these additional needs expressed by the Members States. In making this recommendation now, the SSC also foresees the issue of staff changes in the near future and the need to transfer existing expertise as staff rotates out of the Agency.

2. The SSC-12 is pleased to note that there are plans in hand for succession and also for training the new staff member at the laboratory. However, the SSC-12, in view of the recognised need for long-term stability in personnel for calibration and TLD work, is concerned that the newly appointed member of the laboratory staff will be engaged on a post that is subject to the rotation policy. Consequently, the SSC-12 recommends that the possibility for this post to be made into a long-term contract should be considered seriously.

3. The SSC-12 notes that some technical members of staff at the laboratory are currently undertaking secretarial functions that are adding to their work load. Consequently the SSC-12 recommends that adequate secretarial support should be provided to release technical staff time for the scientific work of the section.

3.1.3 Recognition of Medical Physicists

The SSC-12 is pleased to see that the Agency, in response to a recommendation of the 2002 Dosimetry Symposium, is supporting the IOMP's initiative with the ILO for the recognition of the profession of Medical Physics, and that this is likely to result in a successful

outcome during the next programme. This outcome will be particularly important for Member States in which the profession is not recognized presently and should ensure an improvement in medical physics services, including dosimetry, delivered to hospitals.

4. The SSC-12 recommends that the term Medical Physicist be included during discussions on the revision of the Basic Safety Standards (BSS) and indeed for all aspects of patient protection. As a consequence, the SSC-12 also recommends that the DMRP be more closely involved in radiation safety issues related to patient protection.

3.1.4. Facilities at the Dosimetry Laboratory

The SSC records with pleasure the success of the Agency in the timely construction of the new radiation bunkers for radiation dosimetry and that this was achieved within the budget allocated.

The SSC members were pleased to see firsthand the new bunker and to note that the cobalt unit and a measurement cart have been ordered. The SSC-12 anticipates that this equipment will be installed and the radiation safety surveys completed in time for inauguration on 1 June 2006. However, no additional annual equipment budget has been allocated for the DOL, and the SSC-12 identifies this as a need that should be addressed.

5. The SSC-12 recognizes the urgent need to replace the X ray equipment at DOL and recommends that the Agency give priority to replacing the 160 kV X ray unit. The SSC-12 also recommends the Agency considers selecting a single supplier to provide all the necessary X ray equipment in view of optimizing the maintenance contract.

6. The SSC-12 notes that doubling the radiation bunker space will enable the DMRP to provide better training facilities and optimized scheduling of calibrations at the DOL. Consequently, this expansion is not expected to lead immediately to an increase in the number of calibrations. Indeed, the SSC-12 recommends that the DMRP encourages Member States to request training at DOL through TC mechanisms so that the new training facilities will be used to train the SSDLs to undertake more calibrations in their own regions.

3.1.5. Quality Management System

The SSC-12 congratulates the Agency on the successful outcome of the recent one-day peer review of the DOL quality system documentation and is pleased to see that there were no non-conformance issues. The SSC endorses the peer-review recommendation to update the Quality Manual to ISO 17025:2005 and the peer-review suggestion to use ISO clause numbering wherever possible to avoid problems with cross-referencing that will assist future audits.

7. The DOL's Quality Manual would be a valuable tool for SSDLs in developing their own quality system documentation. Consequently, the SSC recommends that the DOL Quality Manual be made available on the Agency website, together with templates that can be used by the SSDLs. To reduce the workload of DMRP staff and to provide useful training, the SSC-12 further recommends that an external assistant such as a research fellow from an SSDL developing its own quality manual, update the DOL quality system documentation, in accordance with the peer review, and develop the version and templates for the web site.

8. The SSC recommends that the QMS documentation be modified to address the new facilities and endorses the annual internal audits with a peer review every 4 years. The SSC further recommends that any time a new CMC is introduced or a major change is made requiring inter-RMO review, a focused review should be made, possibly in conjunction with a meeting of the SSC.

3.2. Project F.3.01: Network of Secondary Standards Dosimetry Laboratories (SSDLs)

3.2.1. SSDL Network Membership Issues

The SSC-12 is pleased to see the enthusiasm with which the IAEA/WHO SSDL Network continues to be viewed by the Member States and recognises that this is due in no small part to the efficient way in which the Network is supported by the DMRP. Agreement between SSDLs and the DOL is shown by the comparison in Figure 2 of instrument calibrations. The figure indicates that all of the instrument calibration coefficients supplied by the twelve participating SSDLs fell within 1.5 % of the IAEA value. Individual members who fail to fulfil their responsibilities under the Charter have to be removed from the Network so as to maintain its credibility.

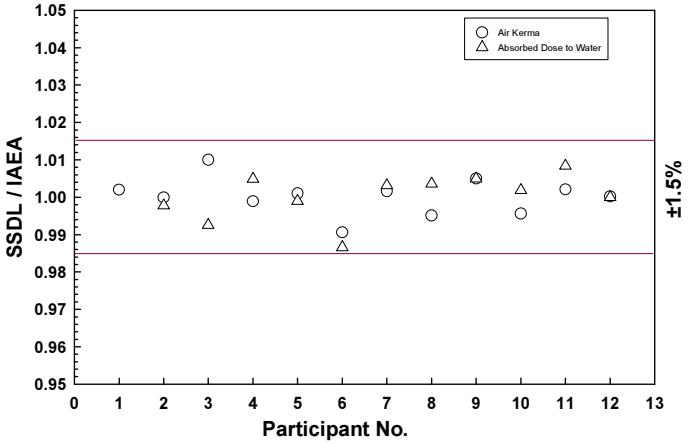

Figure 2*: Ratios of ion chamber calibration coefficients supplied by SSDLs to those measured by the IAEA. Circles correspond to air kerma coefficients and triangles to absorbed dose to water coefficients*

9. Consequently, the SSC-12 recommends that the Agency advise the Bolivian SSDL that it will be made a provisional member for a stated period after which it will be removed from the Network unless it responds in a positive and acceptable manner to the Agency.

10. The SSC-12 also notes that if a Member State requests the inclusion into the IAEA/WHO Network of a nationally accredited laboratory that happens to be commercially based, the Agency will, after consultation with the WHO, normally accept them. The SSC-12 recommends, however, that the DMRP not use its resources to support such members of the Network, but looks to them to provide support for the others.

11. The SSC-12 is pleased to see the development of regionally-designated SSDLs in Africa that would be available to serve neighbouring Member States that do not have their own SSDLs. The SSC-12 recommends that the Agency develop procedures to audit and monitor the metrological performance of such regionally designated SSDLs.

3.2.2. Establishment of Priorities for Calibrations

Recognizing that the DMRP was unable to take part in the 545 EUROMET comparison as it coincided with the closure of the DOL building for remodelling, the SSC-12 encourages the DMRP to undertake a bilateral comparison with one of the participating EUROMET laboratories as soon as it is practicable to do so.

3.2.3. CIPM Mutual Recognition Arrangement

The DOL quality management system (QMS) was subjected to a peer review in early 2004. In the JCRB's follow up to this review, the DOL's QMS was determined to satisfy the requirements of the CIPM MRA, and the Agency's CMCs were retained in Appendix C of the MRA. Subsequently, changes were made by the DMRP to the uncertainties assigned to several measurement capabilities. These changes were reviewed by the SSC-12, with particular attention to uncertainties that were reduced.

12. The SSC has assessed the Agency's dosimetry CMCs that have been recently revised by the DMRP, in order to provide a process equivalent to an intra-RMO review. The SSC agrees with the reductions made to the uncertainties caused by changes to the reference primary standards to which the measurements are traced. Consequently, the SCC recommends that the Agency forward the CMCs to the JCRB so that the appropriate inter-RMO review can be undertaken.

3.2.4. Brachytherapy Dosimetry

SSC-12 recognizes that the use of brachytherapy is evolving throughout the developed, and the developing world, and is pleased that the DMRP's new facilities at Seibersdorf will allow an expansion of their brachytherapy capabilities, as well as other measurement and auditing programs.

SSC-12 is pleased to learn that NIST will calibrate the Agency's 137Cs reference standards, and thanks NIST for offering to provide this service. Repeated calibration of these Agency sources at 10-year intervals should be acceptable. SSC-12 encourages the Agency to adopt a revised value of half life for 137Cs that is expected to be published at the end of 2006.

SSC-12 acknowledges the world-wide increase in use of high-activity 192Ir sources for HDR remote-afterloading brachytherapy, and compliments the DMRP for developing a calibration capability for high-activity 192Ir sources, based on an interpolation technique, as is used at several other calibration laboratories.

13. SSC-12 recommends that the Agency issue a measurement report rather than a calibration certificate for high-activity 192Ir sources.

3.2.5. Dosimetry for Diagnostic X-Rays

SSC-12 is pleased to note the increased activity and planning in diagnostic radiology. The committee appreciates the role of medical physics in ensuring image quality as well as determining the dose values associated with clini-

cal procedures. To assist in this goal of achieving optimal image quality, the SSC suggests that more extensive consultation with medical experts in diagnostic radiology be encouraged.

There is a natural link between the work on diagnostic radiology within DMRP and the work on diagnostic imaging in the WHO. The committee suggests this link could be strengthened by co-operation on and adoption of documents of mutual importance. Having learned that the WHO has already produced a document on basic diagnostic radiology equipment, the SSC-12 believes that the Agency should consider adopting it rather than proceeding with its proposed task entitled "development of guidelines for basic equipment and operational procedures in diagnostic radiology." In regards to the clinical use of such equipment, the WHO has endorsed a document produced by the European Commission, based on the Royal College of Radiology's document on the appropriateness of clinical procedures. The SSC-12 encourages the Agency to examine and consider endorsing this document, thereby further strengthening its relationship with the WHO.

14. SSC-12 supports a CRP on developing procedures for dosimetry auditing in diagnostic radiology by the SSDLs and recommends that it focus on procedures with potential for high doses, such as fluoroscopy and CT, on computed radiography and digital imaging procedures in which increased doses can be delivered inadvertently, and on other procedures where consistency with current practice involves the coupling of image quality to dose (e.g., TLD auditing in mammography in the USA).

15. SSC-12 recommends that the DMRP proceed with the task to conduct a CRP to test implementation of the Code of Practice for diagnostic imaging dosimetry in clinical practice.

16. SSC-12 encourages DMRP to hold a CM in diagnostic radiology to link physical measurements to clinically meaningful doses (e.g. mean glandular dose in mammography). Techniques are now needed for high-dose, high-risk modalities, including CT and interventional techniques.

3.3. Project F.3.02: Quality Assurance and Dose Audits

3.3.1. The TLD audit program

The SSC heard presentations from the DMRP regarding the TLD programmes maintained by the DOL. It was clear that these programmes were a significant benefit to Member States and to the SSDL Network. Figure 3 illustrates the results of the recent TLD audits, showing that with few exceptions, the results fell within the DOL's 3.5 % criterion. However, it also became apparent that there were stresses on several aspects of the programmes. In particular, the SSC was concerned about the volume of work being conducted by the DOL staff, and the need for attention to the workload.

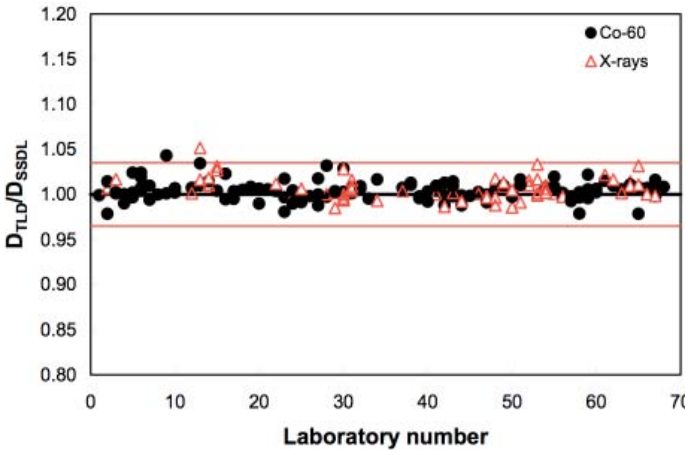

Figure 3: *Results of the IAEA/WHO TLD batches 2004/1, 2004/2, 2005/1 and 2005/2. Data in the graph correspond to the ratio of the Agency's determined dose from the TL-response (D_{TLD}) to that stated by the SSDL (D_{SSDL}). Each point corresponds to the average of three dosimeters.*

17. In view of the limited resources currently available to the DMRP, the SSC-12 recommends that the number of audits of therapy beams at the SSDLs be reduced. Furthermore, the SSC-12 recommends that for radiation protection calibrations of ionization chambers, the DMRP could use a decay calculation over the course of a year, rather than the presently-used substitution method. These savings in staff effort could release some time for the calibrations of equipment and the TLD measurements needed for the QUATRO programme.

18. To ensure the quality of the dosimetric chain in Member States through an independent means of verification of the dose to be delivered to the patients during radiotherapy, the SSC-12 recommends that the TLD audit in radiation therapy for hospitals in collaboration with the WHO be continued at least at current levels. Auditing in diagnostic radiology could be given a lower priority.

The SSC heard from DOL staff about the results of TLD audits of the SSDLs for radiation protection services. The SSDLs do not perform as well at radiation protection levels as they do at therapy levels. In part, this is due to the greater uncertainty of measurements, and of TLD meas-

urements at the lower air-kerma levels used for radiation protection work. Figure 4 illustrates the ratio of air kerma stated by the SSDLs to that determined by the DOL. A significant number of measurements fall outside the DOL's established criterion of ±5 %. The DOL conducts a repeat measurement each time a reading falls outside the acceptance limit, leading to a considerable amount of extra work for the laboratory staff.

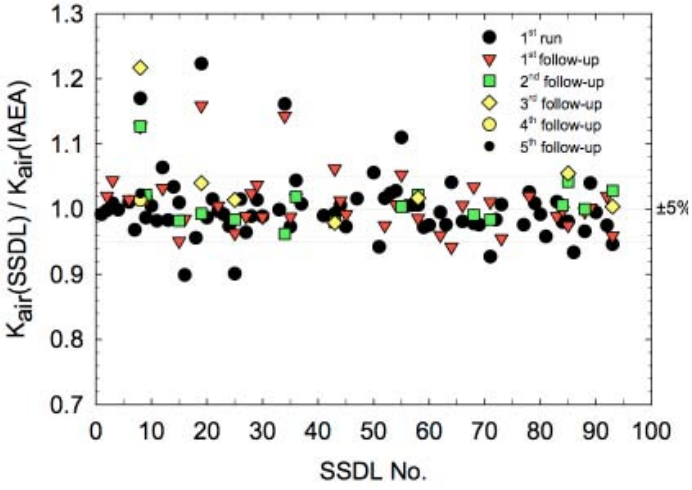

Figure 4: *Ratios of the air kerma stated by SSDLs to the TLD measured value at the Agency's Dosimetry Laboratory for runs in 1999–2005 (acceptance limit 5 %).*

19. The SSC-12 recommends that the acceptance limit for TLD audits of the SSDLs at radiation protection levels should be increased to 7 %. This recommendation is in light of the fact that the present 5 % level is unwarranted and is causing a substantial increase in the workload of DMRP staff.

3.3.2. Medical Physics Investigation Team (MPIT)

The SSC-12 notes with pleasure that the Medical Physics Investigation Team (MPIT) concept has been expanded into a more comprehensive analysis programme called the Quality Assurance Team for Radiation Oncology (QUATRO). The guidelines for the comprehensive audits to be conducted by QUATRO are being developed, and will consist of both reactive and proactive audits. A few QUATRO missions have been scheduled and several have taken place. Auditors are presently being trained in the audit methodology.

3.4. Project F.3.03: Development of Radiation Dosimetry Techniques

3.4.1. International Symposium on Standards and Codes of Practice in Medical Radiation Dosimetry

The SSC-12 is pleased to note that the recommendation of the SSC-11 for a consultant to produce a final report of the outcome of the 91 recommendations developed at the 2002 international symposium on medical radiation dosimetry has been planned for 2006.

20. Endorsing the SSC-11 recommendation, the SSC-12 strongly recommends that the next dosimetry symposium be held in 2008, and that the consultant's report on the outcomes of the first symposium be reviewed during the symposium.

3.4.2. TRS-398 Calibration Protocol

21. Noting that the TRS-398 Code of Practice will have been available for about 8 years, the SSC-12 recommends that the 2008 international symposium on medical radiation dosimetry include a session on the application of, and experience with, the code. The SSC-12 further recommends that if the outcome of the 2008 symposium indicates that an update of TRS-398 is necessary, that this be included in the appropriate biennial programme of the DMRP.

3.4.3. Complex Treatment Techniques

SSC-12 compliments DMRP on their initiative to assist Member States to implement complex treatment techniques, including IMRT. DMRP has planned a technical meeting, to be held in September 2006, on managing the physics aspects of the transition from conventional treatments to 3D conformal radiotherapy. SSC-12 supports this strongly. DMRP and the Section of Applied Radiation Biology and Radiotherapy (ARBR) have also planned a technical meeting on IMRT, to be held in June 2006. Both of these technical meetings should provide useful guidance to assist Member States to implement modern technology in radiotherapy.

SSC-12 recognizes that there are a number of pressures on Member States to implement IMRT and other complex procedures, including inducements from vendors, pressure from peers, and demands from patients. SSC-12 reminds DMRP to discourage states from implementing IMRT prematurely.

22. SSC-12 recommends that the 2008 conference on medical radiation dosimetry include a session on calibration dosimetry of IMRT and especially of small radiation fields, and based on the recommendations from that session, DMRP should focus on developing a Code of Practice and related guidelines for dosimetry for IMRT, and give this project a high priority at that time.

23. SSC-12 recommends that the QUATRO proactive mechanism should be triggered when Mem-

ber States request a TC project aiming at initiating complex treatment techniques such as IMRT.

24. SSC-12 recommends that the DMRP should be prepared to implement the QUATRO reactive mechanism in the event of an accident involving IMRT or another complex treatment technique.

25. SSC-12 recommends that quality assurance procedures for dosimetry needed for complex treatment techniques, including IMRT, should be developed and implemented.

26. SSC-12 believes that a CRP on auditing complex treatment techniques, such as IMRT, is needed, and recommends that DMRP move forward on this. Such an auditing mechanism could be used for credentialing institutions to participate in clinical trials involving complex treatment techniques.

27. SSC-12 recognizes that 3D imaging techniques in radiotherapy are widespread throughout the developed world, and they are being introduced in developing countries. SSC-12 recommends that a CRP be developed on the use of imaging equipment in radiotherapy to provide guidelines for Member States.

DMRP has developed TRS-430, which – in conjunction with IEC 62083 – covers all conventional (non-Monte Carlo-based) treatment planning systems (TPSs). The SSC-12 is aware that there might be special issues regarding Monte Carlo TPSs, such as statistical criteria and smoothing of results, and so holds open the possibility that projects to investigate such issues could be of value in the future.

3.4.4. Improvements in Independent Verification of Treatment Time/Monitor Unit Setting

28. Noting the possible dangers of relying exclusively on data generated by treatment planning systems, the SSC-12 recommends that the DMRP put a high priority on plans for a consultants' committee to produce a guidance document on developing an independent verification of time or monitor unit settings for complex treatment techniques. Patient specific checks and treatment plan verification procedures for conventional techniques will be covered in the CRP E2.40.13 that will be finished in 2007.

3.4.5. Standards for Radioactivity in Nuclear Medicine

SSC-12 is pleased to note the closer collaboration developing between the DMRP and the Nuclear Medicine section, for example on the PET/CT document, and looks forward to the update of this particular document in the next biennium. However, SSC-12 is disappointed that the radioactivity standards programme could not be fully established. At the current time, no laboratory programmes are being conducted. The calibration of activity is a critical need, and the radioactivity standards programme supports therapy as well as diagnosis. In the case of the CRP on standardizing radioactivity measurements, SSC-12 recognizes that funds designated for radioactivity laboratory supplies are now being used to contract private companies to prepare calibration sources for users in the Member States but regards these actions as not being sufficient in view of formulating a durable long-term strategy for DMRP.

29. Consequently the SSC-12 recommends that the Agency consider alternative space and additional resources for setting up an appropriate laboratory for radioactivity calibration work.

30. SSC-12 recommends that the DMRP support the nuclear medicine related CRP on the use of radiopharmaceuticals for treatment of non Hodgkins lymphoma and – if appropriate resources can be found – on development of techniques for voxel-based calculations of organ dose from radionuclide administrations, whether for diagnostic or therapeutic purposes.

3.5. Project F.3.04: Developments in Medical Radiation Physics Quality Assurance

3.5.1. Maintenance of the Agency's Databases

The SSC-12 strongly endorses the DIRAC project surveying world-wide radiotherapy resources and believes that the Agency is the best organization to carry out the project. The SSC-12 noted that the current data status of the project is not sufficiently reliable for some countries, such as the USA and Japan. Accurate DIRAC data would be very valuable to governments of Member States and their health departments, radiotherapy institutions, and hospital administrations, in both developing and developed countries. Once the web edition is advertised, institutions and countries will be encouraged to keep their data up to date.

31. The SSC-12 encourages the DMRP to cooperate with the Radiation Oncology section (ARBR) on the DIRAC project but recommends that the DMRP, in view of its world-wide contacts, re-

mains the driving force behind the project. The SSC-12 recommends the Agency to allocate sufficient funds and effort to enable more efficient data collection and updating of DIRAC. In addition, the SSC-12 recommends that the DMRP further expand its interactions with external stakeholders that may have an interest in DIRAC such as UNSCEAR and the office of the Organization for Economic Cooperation and Development (OECD). The SSC-12 recommends that DIRAC be given special focus through a project of 6 to 12 months duration to improve the data quality for those countries for which data are missing or require updating.

3.5.2. Training and educational efforts

The SSC-12 is pleased to see that the textbook: "Radiation Oncology Physics: A Handbook for Teachers and Students" has been published by the IAEA in August 2005 and that the book has already received positive reviews. SSC-12 is also pleased to see that the editor of the textbook, as well as the individual authors of chapters, have been recognized in the book. The SSC-12 endorses the development of a companion slide set to the Radiation Oncology Physics textbook for course instructors and as a study aid for students and is pleased that the work is slated for completion by September 2006. The SSC-12 also endorses the DMRP work on developing the next textbook in this educational series: "Diagnostic Radiology Physics: A Handbook for Teachers and Students".

32. The SSC-12 recommends the development of companion slides to the Diagnostic Radiology Physics textbook and also recommends that the DMRP consider developing a further textbook in the series, and slides, on Nuclear Medicine Physics. To ensure the quality of these books and slide sets, the SSC-12 strongly recommends prominent recognition of their authors and editors. Indeed, the SSC-12 encourages the IAEA to consider the recognition of all editorship and authorship in future publications of this type.

3.6. Recommendations on DMRP staffing

The SSC-12 has made a number of recommendations for changes to the DMRP staff, and for adjustments to the volume of work, to better optimize the effort of the DMRP toward meeting the goals of the Agency and the needs of the measurement and radiation medicine communities.

3.7. Conclusions

The current review of the Agency's Dosimetry and Medical Radiation Physics (DMRP) sub-programme by the SSC took place in March 2006. The Committee was suitably impressed with the implementation of its previous recommendations and commends the Agency for the breadth, diversity and quality of the services provided to its Member States by the DMRP. It is evident that the Member States appreciate the sub-programme as their requests to use the DMRP services increase each year. Understanding that an ever-increasing budget cannot be provided to fund such demands, the SSC has made a number of recommendations concerning the direction and priorities for the biennium 2006-2007.

The services provided to support the IAEA/WHO network of SSDLs are crucial in addressing the dosimetric needs for the quality of cancer treatment, particularly of the Members States that are developing their cancer facilities. In addition to dosimetric traceability and verification through the TLD-based comparisons, the SSC feels that the Medical Physics support provided by the DMRP is well focused on the Agency's mission to improve the quality of cancer treatment and of radiation medicine in general. This support includes training, development and use of codes of practice, and development of syllabi on the physics of radiation oncology, nuclear medicine and radiological imaging.

The work of the SSC was facilitated by the comprehensive DMRP report and the very clear presentations made to the Committee by the staff. Their enthusiasm and dedication in responding to the needs of Member States is exemplary whether this is for a service facility, for training or through collaboration, for example in the Coordinated Research Projects.

The recommendations of the SSC for the next programme of the DMRP, copied hereinafter from the main text, are in the order that they appear in the report of the Committee and so not necessarily in priority order. Recommendations have only been made when the SSC feels that a change in direction or priority is necessary. Consequently, if an aspect of the current programme has not been mentioned, it is because the Committee feels that the service is being delivered at the correct level and should be so maintained.

4. SUMMARY

1. The SSC-12 recommends that additional members of scientific staff, with expertise in clinical medical physics, be appointed to the DMRP team to support these additional needs expressed by the Members States. In making this recommendation now, the SSC also foresees the issue of staff changes in the near future and the need to transfer existing expertise as staff rotates out of the Agency.

2. The SSC-12 is pleased to note that there are plans in hand for succession and also for training the new staff member at the laboratory. However, the SSC-12, in view of the recognised need for long-term stability in personnel for calibration and TLD work, is concerned that the newly appointed member of the laboratory staff will be engaged on a post that is subject to the rotation policy. Consequently, the SSC-12 recommends that the possibility for this post to be made into a long-term contract should be considered seriously.

3. The SSC-12 notes that some technical members of staff at the laboratory are currently undertaking secretarial functions that are adding to their work load. Consequently the SSC-12 recommends that adequate secretarial support should be provided to release technical staff time for the scientific work of the section.

4. The SSC-12 recommends that the term Medical Physicist be included during discussions on the revision of the Basic Safety Standards (BSS) and indeed for all aspects of patient protection. As a consequence, the SSC-12 also recommends that the DMRP be more closely involved in radiation safety issues related to patient protection.

5. The SSC-12 recognizes the urgent need to replace the X ray equipment at DOL and recommends that the Agency give priority to replacing the 160 kV X ray unit. The SSC-12 also recommends the Agency considers selecting a single supplier to provide all the necessary X ray equipment in view of optimizing the maintenance contract.

6. The SSC-12 notes that doubling the radiation bunker space will enable the DMRP to provide better training facilities and optimized scheduling of calibrations at the DOL. Consequently, this expansion is not expected to lead immediately to an increase in the number of calibrations. Indeed, the SSC-12 recommends that the DMRP encourages Member States to request training at DOL through TC mechanisms so that the new training facilities will be used to train the SSDLs to undertake more calibrations in their own regions.

7. The DOL's Quality Manual would be a valuable tool for SSDLs in developing their own quality system documentation. Consequently, the SSC recommends that the DOL Quality Manual be made available on the Agency website, together with templates that can be used by the SSDLs. To reduce the workload of DMRP staff and to provide useful training, the SSC-12 further recommends that an external assistant such as a research fellow from an SSDL developing its own quality manual, update the DOL quality system documentation, in accordance with the peer review, and develop the version and templates for the web site.

8. The SSC recommends that the QMS documentation be modified to address the new facilities and endorses the annual internal audits with a peer review every 4 years. The SSC further recommends that any time a new CMC is introduced or a major change is made requiring inter-RMO review, a focused review should be made, possibly in conjunction with a meeting of the SSC.

9. The SSC-12 recommends that the Agency remove from the IAEA/WHO SSDL Network those individual members who fail to fulfil their responsibilities under the Charter, so as to maintain its credibility. The SSC-12 further recommends that the Agency advise the Bolivian SSDL that it will be made a provisional member for a stated period after which it will be removed from the Network unless it responds in a positive and acceptable manner to the Agency.

10. The SSC-12 also notes that if a Member State requests the inclusion into the IAEA/WHO Network of a nationally accredited laboratory that happens to be commercially based, the Agency will, after consultation with the WHO, normally accept them. The SSC-12 recommends, however, that the DMRP not use its resources to support such members of the Network, but looks to them to provide support for the others.

11. The SSC-12 is pleased to see the development of regionally-designated SSDLs in Africa that would be available to serve neighbouring Member States that do not have their own SSDLs. The SSC-12 recommends that the Agency develop procedures to audit and monitor the metrological

performance of such regionally designated SSDLs.

12. The SSC has assessed the Agency's dosimetry CMCs that have been recently revised by the DMRP, in order to provide a process equivalent to an intra-RMO review. The SSC agrees with the reductions made to the uncertainties caused by changes to the reference primary standards to which the measurements are traced. Consequently, the SCC recommends that the Agency forward the CMCs to the JCRB so that the appropriate inter-RMO review can be undertaken.

13. The SSC-12 compliments the DMRP for developing a calibration capability for high-activity 192Ir sources, based on an interpolation technique, as is used at several other calibration laboratories. Due to the use of the interpolation technique the SSC-12 recommends that the Agency issue a measurement report rather than a calibration certificate for high-activity 192Ir sources.

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17. In view of the limited resources currently available to the DMRP, the SSC-12 recommends that the number of audits of therapy beams at the SSDLs be reduced. Furthermore, the SSC-12 recommends that for radiation protection calibrations of ionization chambers, the DMRP could use a decay calculation over the course of a year, rather than the presently-used substitution method. These savings in staff effort could release some time for the calibrations of equipment and the TLD measurements needed for the QUATRO programme.

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19. The SSC-12 recommends that the acceptance limit for TLD audits of the SSDLs at radiation protection levels should be increased to 7 %. This recommendation is in light of the fact that the present 5 % level is unwarranted and is causing a substantial increase in the workload of DMRP staff.

20. Endorsing the SSC-11 recommendation, the SSC-12 strongly recommends that the next dosimetry symposium be held in 2008, and that the consultant's report on the outcomes of the first symposium be reviewed during the symposium.

21. Noting that the TRS-398 Code of Practice will have been available for about 8 years, the SSC-12 recommends that the 2008 international symposium on medical radiation dosimetry include a session on the application of, and experience with, the code. The SSC-12 further recommends that if the outcome of the 2008 symposium indicates that an update of TRS-398 is necessary, that this be included in the appropriate biennial programme of the DMRP.

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32. The SSC-12 recommends the development of companion slides to the Diagnostic Radiology Physics textbook and also recommends that the DMRP consider developing a further textbook in the series, and slides, on Nuclear Medicine Physics. To ensure the quality of these books and slide sets, the SSC-12 strongly recommends prominent recognition of their authors and editors. Indeed, the SSC-12 encourages the IAEA to consider the recognition of all editorship and authorship in future publications of this type.

Acronyms used in the SSC-12 Report

3-D	3-dimensional
ARBR	Applied Radiation Biology and Radiotherapy Section of the Agency
BIPM	Bureau International des Poids et Mesures
BSS	Basic Safety Standards (refers to « International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources », Agency publication No. 115 in the Safety Series)
CIPM	International Committee of Weights and Measures (BIPM)
CM	Consultants' meeting of the Agency
CMC	Calibration and Measurement Capability
CoP	Code of Practice
CRP	Coordinated Research Project of the Agency
CT	Computed tomography
DG	Director General (of the Agency)
DIRAC	Directory of Radiotherapy Centres
DMRP	Dosimetry and Medical Radiation Physics Section of the Agency
DOL	Agency's Dosimetry Laboratory
ESR	Electron spin resonance
ESTRO	European Society for Therapeutic Radiology and Oncology
EUROMET	European Collaboration in Measurement Standards
HDR	High dose rate
IAEA	International Atomic Energy Agency
ICRU	International Commission on Radiation Units and Measurements
IDAS	International Dose Assurance Service
IEC	International Electrotechnical Commission
ILO	International Labour Office
IMRT	Intensity modulated radiation therapy
IOMP	International Organization for Medical Physics
ISO	International Organization for Standardization
JCRB	Joint Committee of Regional Metrology Organizations and the BIPM
MPIT	Medical Physics Investigation Team of the Agency
MRA	Mutual Recognition Arrangement
MRI	Magnetic resonance imaging
NAAL	Agency's Laboratories Division, Vienna and Seibersdorf
NAHU	Division of Human Health of the Agency
NIST	National Institute of Standards and Technology (USA)
OECD	Organisation for Economic Cooperation and Development
OIOS	Office of Internal Oversight Services of the Agency
PACT	Programme of Action for Cancer Therapy of the Agency
PET/CT	Positron Emission Tomography/Computed Tomography
PSDL	Primary Standards Dosimetry Laboratory
QA	Quality assurance
QANTRM	The Agency's International Conference on Quality Assurance and New Techniques in Radiation Medicine, to be held 13-15 November 2006
QMS	Quality management system
QS	Quality system
QUATRO	Quality Assurance Team for Radiation Oncology
RMO	Regional Metrology Organization
SSC	SSDL Scientific Committee
SSDL	Secondary Standards Dosimetry Laboratory
TC	Department of Technical Cooperation of the Agency
TL	Thermoluminescent, or thermoluminescence
TLD	Thermoluminescent dosimeter, or thermoluminescence dosimetry
TPS	Treatment Planning System
TRS	Technical Reports Series (an Agency publication series)
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
WHO	World Health Organization

Understanding the high voltage polarity of electrometers

L. Czap, A. Meghzifene, IAEA
C. Pychlau, PTW

The IAEA has received many queries from SSDLs on the definitions used by manufacturers of ionization chambers concerning the sign of the polarizing voltage of chamber-electrometer systems with different connectors. The lack of clarity has also induced mistake in some dosimetry comparison exercises where inconsistent polarities were used by some participants. The purpose of this short note is to show how high voltage polarity is implemented at the IAEA and also by some manufacturers.

The response of some ionization chambers changes significantly when the sign of the polarizing potential is changed. This polarity effect often depends on the radiation energy, on the magnitude of the polarizing potential, and on the field size.

When a new chamber is purchased, the effect on its reading of using polarizing potentials of opposite polarity should be checked during the commissioning process. For most chambers, this effect may be negligible in photon beams, except for very thin window chambers used for low energy X rays [1].

When an ionization chamber is calibrated at the IAEA, only one magnitude and sign of polarizing potential is used. The calibration coefficient, given in the IAEA calibration certificate, refers to that magnitude and sign of the polarizing potential.

For example, PTW refers to the polarity of their dosimeters' polarizing voltage as the potential that is applied to the chamber wall with respect to the guard (see PTW technical note below). Other conventions and terminology are also used to refer to the polarity of the polarizing voltage by other manufacturers. However, these differences do not affect the physics of charge collection in an ionization chamber. Some manufacturers and calibration laboratories (e.g. Keithley, Wellhöfer, IAEA) refer to the polarity of the polarizing voltage as the potential applied to the collecting electrode. Negative ions are then collected when positive polarizing voltage is applied to the collector. In case the chamber performance with different electrometers is to be compared, special attention has to be paid to the polarity. For example: for chambers calibrated at IAEA Dosimetry Laboratory (collecting electrode positive) used with the UNIDOS electrometer, the HV-polarity switch (at the rear panel of UNIDOS) must be set to the "-" position.

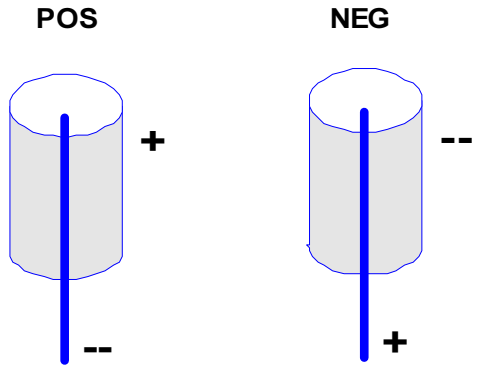

Figure 1*: The polarity of the polarizing voltage is defined by the potential of the chamber wall with respect to the guard (approx. the central electrode)*

A technical note explaining the classic PTW definition of polarity has been made available on the internet under www.ptw.de in the service / download area. To reach a maximum number of users this information is also presented here:

PTW refers to the polarity of the dosimeter's polarizing voltage as the potential that is applied to the chamber wall with respect to the guard. Both positive and negative polarizing voltages are shown in figure 1.

Triaxial connecting systems, BNT or TNC, connect the chamber wall to earth, whereas a PTW M connecting system connects the guard to earth. In either case, negative ions generated in the chamber volume will be attracted by the chamber wall when a positive polarizing voltage is applied and to the central or collection electrode when a negative polarizing voltage is applied.

Reference:

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Absorbed Dose Determination in External Beam Radiotherapy: An international Code of Practice for Dosimetry Based Standards of Absorbed Dose to Water, Technical Reports Series No. 398, IAEA, Vienna (2000).

International Conference on Quality Assurance and New Techniques in Radiation Medicine

13 - 15 November 2006
Vienna, Austria

Organized by the
International Atomic Energy Agency

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American Association of Physicists in Medicine (AAPM)
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Scientific Secretariat of the Conference

Mr. K. R. Shortt
Division of Human Health
International Atomic Energy Agency
Wagramer Strasse 5, P.O. Box 100
1400 Vienna, Austria
Tel: (+43 1) 2600 21664
Fax: (+43 1) 2600 7 21662
E-mail: k.shortt@iaea.org

Administration and organization

Ms. R. Perricos
Conference Services Section, Division of Conference and Document Services, IAEA-CN-146
International Atomic Energy Agency
Wagramer Strasse 5, P.O. Box 100
1400 Vienna, Austria
Tel: (+43 1) 2600 21315
Fax: (+43 1) 2600 7
E-mail: r.perricos@iaea.org

COURSES, MEETINGS AND CONSULTANCIES TO BE HELD DURING 2006

Courses and workshops

Regional Training Course for the IAEA/TRS-430 Implementation: Quality Assurance in TPS (RLA/6/051), Bogotá, Colombia, 6–11 March 2006

Workshop on Comprehensive Audits in Radiotherapy (Quality Assurance Team for Radiation Oncology (QUATRO), IAEA, Vienna, 20–22 March 2006

National Workshop on Improvement of Quality Assurance in Radiation Oncology, Prague, Czech Republic, 26–27 April 2006

Regional (AFRA) Training Course on QA in Non-Imaging Nuclear Medicine Instrumentation (RAF/6/032), Algiers, Algeria, 6–10 May 2006

Regional (AFRA) Training Workshop on the Organization and Performance of Audit Missions in Radiotherapy (RAF/6/031), Rabat, Morocco, 5-9 June 2006

Regional Training Workshop on Clinical Usage of Telemedicine Network (RLA/6/048), Santiago, Chile, 24–28 July 2006

Regional (AFRA) Workshop on the Organization and Performance of Audit Missions in Radiotherapy (RAF/6/031), Johannesburg, South Africa, 25–29 September 2006

IAEA/RCA Regional Training Workshop on Implementation of IAEA TRS-430 in Quality Assurance for Radiotherapy Treatment Planning Systems, Hong Kong, China, 9–14 October 2006

Regional (AFRA) Training Workshop on QC of Simulators and Computed Tomography for Radiotherapy Treatment Planning (RAF/6/031), Cairo, Egypt, 15-19 October 2006

Meetings and consultancies

Consultants Meeting on Development of Procedures for In-Vivo Dosimetry in Radiotherapy, IAEA, Vienna, 3–7 April 2006

Consultants Meeting on Writing CT QA chapter in the Technical Document on PET/CT Quality Assurance, Vienna, 6–12 June 2006

Technical Meeting on the Evaluation of Intensity Modulated Radiation Therapy (IMRT) as a Treatment Modality in Radiotherapy, IAEA, Vienna, 13–16 June 2006

Consultants Meeting on Revising and Updating TRS-374 “Calibration of Dosimeters used in Radiotherapy”, IAEA, Vienna, 26–30 June 2006

Experts Steering Meeting for Developing Clinical Education Modules for Radiotherapy Medical Physics, IAEA, Vienna, 10-14 July 2006

Consultants Meeting on Protocols for Acceptance Testing and Commissioning of Radiotherapy Treatment Planning Systems, IAEA, Vienna, 7–11 August 2006

Consultants Meeting on the Preparation of Guidelines on Transition from Conventional to 3D Conformal Radiotherapy Programme, IAEA, Vienna, 25-29 September 2006

Meeting of Dose Datamed Project to be hosted by DMRP, IAEA, Vienna, 9–10 November 2006

International Conference on Quality Assurance and New Techniques in Radiation Medicine (QANTRM), IAEA, Vienna, 13–15 November 2006

Research Coordination Meeting on the CRP E2.40.12 “Development of TLD Based Quality Audits for Radiotherapy Dosimetry in Non-Reference Conditions”, IAEA, Vienna, 13–18 November 2006

Consultants Meeting on the Development of Handbook of Diagnostic Radiology Physics, IAEA, Vienna, 16-17 November 2006

Consultants Meeting on the Harmonization of Mammography QC Protocols, IAEA, Vienna, 11-15 December 2006

MEMBER LABORATORIES OF THE IAEA/WHO NETWORK OF SSDLs[1]

Country	City	Contact person	Fax	E-mail
ALGERIA	Algiers	Mr. Mehenna Arib	+213 21 43 4280	mehenna.arib@ifrance.com
ARGENTINA	Buenos Aires	Ms. Margarita Saraví	+54 11 6779 8228	saravi@cae.cnea.gov.ar
AUSTRALIA	Menai	Mr. Dimitri Alexiev	+612 9717 3257	jbd@ansto.gov.au
AUSTRIA	Seibersdorf	Mr. Hannes Stadtmann	+43 2254 7802502	hannes.stadtmann@arcs.ac.at
BANGLADESH	Dhaka	Mr. Md. Shakilur Rahman	+ 8802 8613051	shakilurssdl@yahoo.com
BELARUS	Minsk	Mr. Valery Milevsky	+375 17 2130938	ion@belgim.belpak.minsk.by
BELGIUM	Ghent	Mr. Hubert Thierens	+32 92646699	hubert.thierens@rug.ac.be
BOLIVIA**	La Paz	Mr. Ismael Villca	+591 2 433063	ibten@caoba.entelnet.bo
BRAZIL	Rio de Janeiro	Mr. Carlos J. da Silva	+ 5521 2442 1605	carlos@ird.gov.br
BULGARIA	Sofia	Ms. Katya Sergieva	+359 2 9432 144	sergievakm@abv.bg
CANADA	Ottawa	Mr. Brian R. Gaulke	+1 613 9578698	brian_gaulke@hc-sc.gc.ca
CHILE	Santiago	Mr. Carlos Oyarzún Cortes	+56 2 27318723	coyarzun@gopher.cchen.cl
CHINA*	Beijing	Mr. Gan Zeuguei	+86 10 444304	
CHINA	TaiYuan, Shanxi	Mr. Zhang Qingli		zhangqing_li@hotmail.com
CHINA	Shanghai	Mr. Liu Shu-lin	+86 2164701810	simtt@stn.sh.cn
CHINA	Beijing	Mr. Li Kaibao	+86 10 62012501	kaibaoli@hotmail.com
CHINA	Hong Kong	Mr. C.L. Chan	+852 29586654	cchan@ha.org.hk
CHINA	Beijing	Mr. Guo Wen	+86 1 69357178	rmcssdl@iris.ciae.ac.cn
COLOMBIA	Bogotá	Mr. Uriel Chica Villegas	+57 1 3153059	uchica@ingeominas.gov.co
CUBA	Ciudad Habana	Mr. Gonzalo Walwyn Salas	+537 579573	gonzalo@cphr.edu.cu
CYPRUS	Nicosia	Mr. Stelios Christofides	+357 2 801 773	cstelios@cytanet.com.cy
CZECH REP. *	Prague	Ms. I. Horakova	+4202 738330	ihorak@suro.cz
CZECH REP.	Prague	Mr. Pavel Dryák	+4202 66020 466	pdryak@cmi.cz
CZECH REP.	Prague	Mr. D. Olejár	+4202 67313119	dolejar@suro.cz
DENMARK	Herlev	Mr. Klaus Ennow	+45 44 543450	kln@sis.dk
ECUADOR	Quito	Mr. Marcos M. Frías Sánchez	+593 2 2563336	comecen1@comecenat.gov.ec
EGYPT	El-Giza	Mr. Mokhtar Sharaf	+20 2 386 7451	mokhtar_sharaf@yahoo.com
ETHIOPIA	Addis Ababa	Mr. Worku Wodaje	+251 1 62 04 95	nrpa@telecom.net.et
FINLAND	Helsinki	Mr. Antti Kosunen	+358 9 75988450	antti.kosunen@stuk.fi
FRANCE	Cedex	Ms. Isabelle Clairand	+33 1 47 46 97 77	isabelle.clairand@irsn.fr
GERMANY	Neuherberg	Mr. Dieter F. Regulla	+49893187192224	regulla@gsf.de
GERMANY	Freiburg	Mr. Christian Pychlau	+49 761 4905570	pychlau@ptw.de
GHANA	Legon-Accra	Mr. Cyril Schandorf	+233 21 400807	rpbgaec@ghana.com
GREECE	Paraskevi-Attiki	Mr. Costas J. Hourdakis	+30 210 650 67 48	khour@eeae.gr
GUATEMALA	Guatemala C. A.	Mr. Angel Osorio	+502 2 762007	arot23@yahoo.com
GEORGIA	Tbilisi	Mr. Simon Sukhishvili	+99 532 613500	simoniko@list.ru
HUNGARY*	Budapest	Mr. Istvan Csete	+36 1 2120147	icsete@omh.hu
HUNGARY	Budapest	Mr. Gabor Kontra	+36 1 2248620	kontra@oncol.hu
HUNGARY	Paks	Mr. Mihaly Orbán	+36 1 3551332	orbanmi@npp.hu
INDIA	Mumbay	Mr. Shri V.V. Shaha	+91 22 2550 5151	vvshaha@apsara.barc.ernet.in
INDONESIA	Jakarta Selatan	Mr. Susetyo Trijoko	+621 21 7657950	strijoko@batan.go.id
IRAN	Karaj	Mr. Mostafa Ghafoori	+98261 4411106	mghafoori@nrcam.org
IRELAND	Dublin	Ms. Lorraine Currivan	+353 12697437	rpii@rpii.ie
ISRAEL	Yavne	Mr. Ben Shlomo	+972 8 9434696	abenshlomo@hotmail.com
KOREA, REP	Seoul	Mr. Heekyo Jeong	+82 2 351 3726	dowha@kfda.go.kr
KUWAIT	Kuwait City	Ms. Ilham Elfares	+965 4862537	ssyyy12@yahoo.com

Country	City	Contact person	Fax	E-mail
LATVIA	Salaspils	Mr. Antons Lapenas	+371 790 1210	alap@latnet.lv
LIBYA	Tripoli	Mr. Saleh A. Ben Giaber	+218 21 3614143	BenGiaber@yahoo.com
MADAGASCAR	Antananarivo	Mr. Raoelina Andriam-bololona	+261 202 235583	instn@dts.mg
MALAYSIA	Kajang	Mr. Taiman Bin Kadni	+603 892 50575	taiman@mint.gov.my
MEXICO	Mexico, D. F.	Mr. Victor M. Tovar Munoz	+52 55 3297302	vmtm@nuclear.inin.mx
NORWAY	Osteras	Mr. Hans Bjerke	+47 67 147407	Hans.Bjerke@nrpa.no
PAKISTAN	Islamabad	Mr. Waheed Arshed	+92 51 9290275	warshed@pinstech.org.pk
PERU	Lima	Mr. Tony Benavente A.	+51 1 488 5101	tbenavente@ipen.gob.pe
PHILIPPINES*	Diliman, Quezon	Ms. Estrella S. Caseria	+63 2 9201646	escaseria@pnri.dost.gov.ph
PHILIPPINES	Sta. Cruz, Manila	Ms. Nieva O. Lingatong	+632 711 6016	nolingatong@doh.gov.ph
POLAND	Warsaw	Mr. Wojciech Bulski	+48 22 6449182	w.bulski@rth.coi.waw.pl
PORTUGAL	Sacavém	Mr. J.A. Ferro de Carvalho	+351 21 9941995	aferroc@itn.pt
PORTUGAL	Lisbon	Mr. Paulo Ferreira	+351 21 7229877	radfisica@ipolisboa.min-saude.pt
ROMANIA	Bucharest	Mr. Constantin Milu	+40 21 3183635	cmilu@ispb.ro
RUSSIA	St. Petersburg	Mr. V.I. Fominykh	+7 812 323-96-17	info2101@vniim.ru
RUSSIA	St. Petersburg	Mr. G. Lutina	+7 812 596-6705	crirr@peterlink.ru
SAUDI ARABIA	Riyadh	Mr. Abdalla N. Al-Haj	+9661 4424777	abdal@kfshrc.edu.sa
SERBIA & MONTENEGRO	Belgrade	Mr. Milojko Kovačević	+381 11 2455943	milojko@vin.bg.ac.yu
SINGAPORE*	Singapore	Mr. Eng Wee Hua	+ 65 7384468	
SINGAPORE	Singapore	Mr. Stephen Chong	+65 2262353	sckmipil@pacific.net.sg
SINGAPORE	Singapore	Mr V.K. Sethi	+65 2228675	trdwac@nccs.com.sg
SLOVENIA	Ljubljana	Matjaz Stuhec	+386 1 477 38 41	matjaz.stuhec@ijs.si
SLOVAK REP.	Bratislava	Ms. Viera Laginová	+421 2 52923711	vlaginov@ousa.sk
SOUTH AFRICA	Pretoria	Ms. Zakithi Msimang	+27 12 841-2131/4458	zmsimang@csir.co.za
SUDAN**	Khartoum	Mr. Mamdouh Osman	+249 11774179	mamdouhyas@hotmail.com
SWEDEN	Stockholm	Mr. Jan-Erik Grindborg	+46 8 7297108	ssi@ssi.se
SYRIA	Damascus	Mr. M. Takeyeddin	+963 116112289	atomic@aec.org.sy
TANZANIA	Arusha	Mr. Wilbroad E. Muhogora	+255 27 2509709	taec@habari.co.tz
THAILAND*	Bangkok	Mr. Kriengsak Bhadrakom	+66 2 5806013	
THAILAND	Bangkok	Mr. Siri Srimanoroth	+66 2 2239595	siri@dmsc.moph.go.th
THAILAND	Bangkok	Ms. Wimann Thongmitr	+66 2 5613013	wimann@oaep.go.th
TURKEY	Istanbul	Mr. Ata Türer	+90 212 5482234	dogan.yasar@taek.gov.tr
TUNISIA	Tunis	Ms. Latifa Ben Omrane	+216 71 571697	sadok.mtimet@rns.tn
URUGUAY	Montevideo	Mr. Alejandro San Pedro	+598 2 9021619	calibraciones@dinaten.miem.gub.uy
VENEZUELA	Caracas	Ms. Lila Carrizales	+58 212 5041577	lcarriza@ivic.ve
VIETNAM	Hanoi	Mr. Dang Duc Nhan	+84 4 8363295	ddnhan@mail.vaec.gov.vn

** **Provisional Network members**

* SSDL Organization

[1] Kindly notify the Dosimetry and Medical Radiation Physics Section if the information here is incorrect or changes.

COLLABORATING ORGANIZATIONS ASSOCIATED WITH THE IAEA/WHO NETWORK OF SSDLs

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Wagramer Strasse 5, P.O. Box 100,
A-1400 Vienna, Austria

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