SSDL
NETWORK
CHARTER
SSDL NETWORK CHARTER

Second Edition

THE IAEA/WHO NETWORK OF SECONDARY STANDARDS DOSIMETRY LABORATORIES
FOREWORD

In 1976, the International Atomic Energy Agency (IAEA) together with the World Health Organization (WHO) established a Network of Secondary Standards Dosimetry Laboratories (SSDLs), known as the IAEA/WHO SSDL Network. This Network, through SSDLs designated by the IAEA Member States, provides a traceability route of national dosimetry standards to the International System of Units (SI). The aim of the Network is to disseminate and encourage correct use of the dosimetry quantities and units through the proper calibration of field instruments by the SSDLs. The Network has proved to be of value in improving national capabilities for instrument calibration and the awareness of the need for better accuracy and traceability.

The SSDL Charter was originally drawn up and published in 1999, explaining the privileges, rights and duties of members in the Network. This second edition of the SSDL Network Charter has been modified to accommodate the changes and the developments in the field. It has become clear that in some instances the obligations and the benefits of the Network membership have not been clear. Consequently, the Scientific Committee which advises the Network Secretariat has recommended that the Charter should be updated to incorporate more guidance and recent developments with a view to strengthening the links of the SSDL Network to the SI.

This updated version of the SSDL Charter aims to clarify the duties and responsibilities as well as the benefits related to the SSDL Network membership. In addition, the Charter describes how the SSDLs can be designated, how the Network functions and the scope of the work of the SSDLs. In updating this Charter the principles and commitments of the original Charter have been maintained. However, the updates take into account (i) the IAEA experience in coordinating the activities of the SSDL Network for more than 40 years, (ii) the mutual recognition arrangement for the national measurement standards and recognition of the validity of calibration and measurement certificates established by the International Committee for Weights and Measures in 1999 (CIPM MRA), and (iii) the requirement for SSDLs to have a quality management system according to the ISO/IEC 17025 standard.

The IAEA wishes to express its gratitude to all authors and reviewers of this publication, as listed at the end of the document. The final editorial contribution of P. Allisy-Roberts from Bureau International des Poids et Mesures (BIPM), France is gratefully acknowledged.

The IAEA officers responsible for this publication were A. Meghzifene, I. Gomola and P. Toroi of the Division of Human Health.
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1. INTRODUCTION

Accurate radiation dose measurements are needed in every country in which ionizing radiation is used. Each country should either maintain a national measurement standard for relevant quantities, or make arrangements for ready access to such standards established and maintained in another country. National measurement standards for a given quantity should be recognized in a regulatory form by the competent authorities. Such standards should be traceable to the International System of Units (SI) and may be either a primary standard maintained at a primary standards dosimetry laboratory (PSDL) or a secondary standard that is traceable to a primary standard and maintained at a secondary standards dosimetry laboratory (SSDL).

Often measurements are performed to determine dose levels for patients, staff or public. The Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, the BSS [1], states that the calibration of all dosimeters used for dosimetry of patients and those for the calibration of sources should be traceable to a standard dosimetry laboratory. The need for traceability for radiation dose measurements is highlighted in the medical use of radiation, particularly in radiation therapy [2], where successful treatment depends critically on the accuracy of dose delivery to the patient. When considering radiation protection of patients undergoing other medical procedures, the uncertainty in the dosimetry may be greater than for radiation therapy, but traceability of the measurements with a defined level of uncertainty is equally as important [3]. The BSS [1] stresses the importance of accurate patient dosimetry in diagnostic imaging; as such clinical investigations are responsible for the vast majority of the man-made radiation burden.

The BSS [1] specifies dose limits for occupational and public exposure and requests the use of appropriately calibrated monitoring equipment. Traceability at a defined level of uncertainty is still essential for a radiation protection purpose although the uncertainty level may be even greater than for patient dosimetry [4]. In radiation sterilization, under-dose could result in bacterial or viral contamination of foodstuffs or of medical supplies. All of these applications relate directly or indirectly to human health and emphasize the importance of traceability in dosimetry in avoiding unintended detriment for individuals.

In 1976, the IAEA in collaboration with the WHO established the IAEA/WHO SSDL Network to ensure traceability of measurements, particularly for countries that are not members of the Metre Convention or do not have access to PSDLs. An SSDL that is a member of the Network is a laboratory that has been designated by the competent national authorities and undertakes the duties of providing a link in the traceability of radiation dosimetry for users within that country. Its standards are traceable to primary standards and to the SI in some cases through the intermediate step of IAEA calibrations. The objective of the SSDL Network is to provide and maintain the links between the end users of dosimeters, SSDLs and the international measurement system. In addition, the Network provides a forum in which national SSDLs can regularly perform measurement comparisons and thus strengthen confidence in radiation dosimetry coherence worldwide.

In 1999, the International Committee for Weights and Measures (CIPM) established a mutual recognition arrangement (CIPM MRA) [5, 6] for Member States of the Metre Convention and Associate States of the General Conference of Weights and Measures. The CIPM MRA provides a possibility for the eligible SSDLs to get an international approval for their calibration and measurement capabilities (CMCs). To achieve international recognition within the CIPM MRA, a laboratory has to take part in relevant measurement comparisons and demonstrate the quality of their measurements through a quality management system (QMS) in line with the ISO/IEC 17025 [7].

The IAEA’s Dosimetry laboratory works as a central laboratory in the SSDL Network and
provides calibrations, reference irradiations, comparison programmes and dosimetry audit services for the Member States. The IAEA signed the CIPM MRA in 1999 and its CMCs are published in the key comparison database (KCDB). The IAEA has a comprehensive QMS in place for its own CMCs and it is peer-reviewed periodically by external experts. This provides confidence to the SSDL Network for the traceability of their calibrations performed by the IAEA.

The CIPM MRA is achievable only for SSDLs which belong to the Member States of the Metre Convention. However, a general goal is to achieve an appropriate level of quality in each SSDL. The SSDL Network supports its members in reaching this goal. At present, some of the SSDLs do not fulfil all of the requirements requested for a full membership, perhaps because the obligations and the benefits of the Network membership are not clearly understood by the Network members. This document presents the minimum criteria to be met when a Member State wishes to nominate a national SSDL for membership in the IAEA/WHO Network. It may also serve as a recommendation to governments in the process of designating a laboratory to become a national dosimetry and calibration laboratory.

2. THE IAEA/WHO SSDL NETWORK

2.1. OBJECTIVE

The IAEA/WHO SSDL Network is an association of national SSDLs that have agreed to cooperate in promoting the objectives of that Network under international auspices. Its objectives are:

- Accuracy: to provide dosimetry services and create and distribute knowledge in radiation dosimetry in order to improve the accuracy level in dose measurements;
- Traceability: to establish and facilitate links between end users of dosimeters, the SSDL members and the SI system for radiation measurements;
- Consistency: to promote international recommendations on methods applied for calibration and performance of dosimetry in order to achieve consistency of measurements in all countries;
- Cooperation: to promote further the exchange of experience between the members and the metrology community, and to provide support to each other where necessary.

2.2. ORGANIZATION

In April 1976, the IAEA and the WHO concluded a Working Agreement concerning the establishment and operation of a Network of SSDLs, based on a relationship agreement of 1959 between the two organizations. After 9 years of operation of the SSDL Network, a new arrangement was agreed and signed by the two Directors General in October–November 1985. This arrangement that defines the responsibilities of the IAEA and the WHO in the operation and support of the Network is still in force. To maintain their involvement, the WHO is the co-secretary of the IAEA Scientific Committee for the SSDL Network, which meets biennially to determine the collaborative actions to support the Network.

The SSDL Network is operated by the Network Secretariat and advised by the above mentioned SSDL Scientific Committee. The Committee was established in 1984 and the members are rotated every 5 years. The current composition and role of this Committee is given on the SSDL...
Network website [8]. The Secretariat functions of the SSDL Network are shared between the IAEA and the WHO, the IAEA being responsible for supporting the member laboratories in any technical developments. The Head of the Dosimetry and Medical Radiation Physics Section functions as the IAEA Joint Secretary of the SSDL Network. The Secretary is supported in the functions by the SSDL Officer who also provides full-time support to the Network.

SSDL Network Membership of a laboratory does not impose any liability on the IAEA, WHO or other collaborating institutions in connection with the performance of the work within the laboratory.

2.3. NETWORK MEMBERS

There are three different types of membership in the SSDL Network:

- **Full member**: This is an SSDL that complies with all the requirements of the Charter. Full members will have access to all benefits described in the Charter. A full member may act as a regional designated centre supporting the SSDL Network by coordinating the activities in a particular region.

- **Provisional member**: This is a temporary position of an SSDL that does not fully comply with the Charter, and consequently might not receive all the benefits.

- **Affiliated member**: This is typically a primary standards dosimetry laboratory (PSDL) that cooperates with the IAEA in the operation of the SSDL Network. An affiliated member can also be an international organization with a mandate in the field of dosimetry or metrology.

At the end of 2017, there were 83 full members, 1 provisional members, 16 PSDLs and 5 other affiliated members in the Network. The up-to-date list of Network members is included in every issue of the SSDL Newsletter and it is also available on the SSDL Network website [8]. The list includes contact information as a way of facilitating direct interaction between the member SSDLs. This enables SSDLs to communicate with other colleagues and to share common experiences and technical expertise. The IAEA maintains a database that includes the details of the SSDL Network member laboratories and services provided.

2.4. INTERNATIONAL METROLOGICAL TRACEABILITY

The various levels of measuring instruments referred to in this publication are defined as follows [9]:

- **Primary standard**: An instrument of the highest metrological qualities that allows determination of the required quantity through measurements of basic physical quantities, and the accuracy of which has been verified by comparison with equivalent standards of other institutions participating in the international measurement system;

- **Secondary standard**: An instrument of high accuracy and long-term stability that is calibrated against a primary standard or using an intermediate measuring system;

- **Working standard**: A calibrated secondary standard that is used routinely to calibrate or verify the end users’ measuring instruments or measuring systems.

The BIPM together with the PSDLs ensure the realization of the fundamental dosimetry measurement quantities. They are the first link in the unbroken calibration chain required to maintain the traceability of all radiation measurements (Figure 1). The role of the BIPM among the
PSDLs is unique. According to the decisions of the Consultative Committee for Ionizing Radiation, the BIPM primary standards are the international reference standards of dosimetry quantities. The PSDLs periodically compare their standards directly with the BIPM primary standards and these comparisons are known as CIPM key comparisons.

An SSDL can be traceable to the SI and international measurement system in different ways (Figure 1). Some SSDLs are traceable to a PSDL or directly to the BIPM, if there is no national primary standard and the country is a member of the Metre Convention. Many SSDL Network Members are traceable to primary standards through the IAEA.

![Figure 1. A simplified representation of the international measurement system for radiation dosimetry. The arrows represent the calibrations which ensure the traceability chain to the international measurement standards and the dotted lines indicate comparisons of primary and secondary standards. The dashed arrow represents exceptional calibration of a user instrument by the IAEA in the event that a country has no SSDL and has very limited resources.](image)

The IAEA’s Dosimetry laboratory maintains secondary dosimetry standards. The IAEA calibration services contribute to the dissemination of dosimetry standards in the areas of radiation therapy\(^1\), diagnostic radiology\(^2\) and radiation protection in the IAEA Member States. These services are important because the BIPM and the PSDLs are unable to meet the demand for calibration services resulting from the widespread need for accurate and traceable measurements. The IAEA also works as a central laboratory in the SSDL Network and provides reference irradiations, comparison programmes and dosimetry audit services for the SSDLs and radiation therapy centres.

The CIPM MRA is the framework through which National Metrology Institutes (NMI) demonstrate the international equivalence of their measurement standards and the calibration and measurement certificates they issue \(^{[5, 6]}\). It ensures that the CMCs of each signatory NMI, which have been approved, would be accepted by all the other signatories and are publicly available in the key comparison database (KCDB) of the BIPM.

The CMCs submitted by the NMI are reviewed by all the other signatories through regional metrology organizations (RMOs) that have been established to facilitate the worldwide acceptance

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1 Radiation therapy includes external beam radiation therapy and brachytherapy.

2 Diagnostic radiology is used here as a general term for different modalities of X-ray imaging.
of measurement standards at all levels. Currently six RMOs are recognized within the framework of the CIPM MRA:

- Intra-Africa Metrology System (AFRIMETS);
- Asia Pacific Metrology Programme (APMP);
- Euro-Asian Cooperation of National Metrological Institutions (COOMET);
- European Association of Metrology Institutes (EURAMET);
- Gulf Association for Metrology (GULFMET);
- Inter-American Metrology System (SIM).

The IAEA was one of the first signatories of the CIPM MRA and published its CMCs in the KCDB after a peer-review by all RMOs and endorsement by the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB).

To ensure that the calibration services provided by an SSDL Network member are competent and follow international guidelines listed in Table 1, the SSDL should participate in comparisons. The comparison can be arranged by the IAEA or by one of the RMO’s or with a pilot laboratory that has proven its link to the SI. Any SSDL can take part in a regional calibration comparison by linking to its NMI. However, their results cannot be included in the KCDB unless their NMI is a signatory to the CIPM MRA and the SSDL is specifically mentioned as a designated laboratory for ionizing radiation standards. The IAEA-organized dosimetry comparison programmes are open for all SSDL Network members and they provide a strong link to the CIPM MRA and to the SI for those IAEA Member States that would otherwise be excluded.

In 2017, 60 out of the total of 83 SSDL Network members were signatories to the CIPM MRA and only 13 had had their CMC’s published. This means that many of the SSDLs are not able to submit their results to the KCDB, nor have their CMCs published. For these SSDLs in particular, both the traceability of their standards through the IAEA and the radiation dosimetry comparisons with the IAEA are crucial support for the credibility of their measurement infrastructure.
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3 This table includes some selected reports and standards of the following organizations: International Commission on Radiation Units & Measurements (ICRU), International Commission on Radiological Protection (ICRP), International Electrotechnical Commission (IEC) and International Organization for Standardization (ISO). Please visit the webpages to find the full list of available and up-to-date releases. All IAEA reports can be freely downloaded from the IAEA publications web site [45].
3. IAEA SUPPORT FOR THE SSDL NETWORK

The IAEA/WHO Network of SSDLs was set up to improve the accuracy in radiation dosimetry. The IAEA plays a key role by providing reference dosimeter calibrations, comparisons at radiation therapy, diagnostic radiology and radiation protection levels, reference irradiations, and postal dose-audit programmes. These services give confidence to the SSDL Network members, the supporting organizations and end users. Technical support and training in all related areas, such as in setting up new facilities or upgrading existing laboratories and training new SSDL staff, are provided to the SSDL Network members through IAEA technical cooperation projects (see Section 3.4). Membership and activity in the Network not only help individual SSDL members to achieve confidence in their measurement capabilities but also to facilitate international cooperation and provide robustness to the whole dosimetry measurement system. Details of the support offered by the IAEA/WHO Network of SSDLs to its members are given in this section of the Charter.

3.1. CALIBRATION SERVICE AND TRACEABILITY

The SSDL Network serves as a means of achieving worldwide coherence in radiation measurements that can be traced back to the SI as illustrated in Figure 1. One of the main activities of the IAEA is to maintain the reference standards for dosimetry in radiation therapy, radiation protection and diagnostic radiology. The technical details of the actual calibration capabilities of the IAEA can be found on the IAEA SSDL website and in the CMCs of the IAEA. The IAEA provides periodic calibration for SSDL reference standards and reference irradiations for passive dosimeters. The services are provided through the SSDL Network, free of charge. Only the transportation cost to the IAEA should be covered by the SSDL.

The calibration hierarchy ensures the metrological traceability of measurements (Figure 1). The IAEA provides calibrations which are traceable to the primary standards. However, it is the responsibility of an SSDL and that of an end user to maintain the integrity of the traceability chain by using appropriate calibration coefficients and methods for calibrations and measurements. The IAEA supports this task by providing dosimetry Codes of Practice and other guidance for the Member States (Table 1).

3.2. EXTERNAL CHECKS

Dosimetry comparisons and dose audits can be used to check the integrity of the traceability chain at different levels. The dissemination of each type of calibration must be verified periodically through comparisons or external dose audits. Clinical dose audits are needed to ensure the correct dose delivery at the end point which includes the correct implementation of calibration coefficients.

3.2.1. Comparisons

The IAEA is the central laboratory of the IAEA/WHO SSDL Network and organizes comparisons for the Network members. The SSDL Network provides direct bilateral comparisons with the IAEA standards for their members. The comparison programme enables SSDL Network members to verify the consistency of their national standards and validate the calibration procedure applied at the SSDL. The IAEA has comparison programmes for radiation therapy, radiation protection and diagnostic radiology, including appropriate acceptance limits. As a part of these programmes, calibrated IAEA transfer ionization chambers are sent to participating SSDLs to be calibrated using their own calibration procedure. The IAEA evaluates the comparison results and prepares a confidential comparison report. If any result is not within the acceptance limits, the
IAEA is ready to provide further support to help resolve discrepancies. Upon request from the participants, the IAEA also provides assistance in the process of publishing the comparison results in an open-access literature to support the CMC claims of the participant.

### 3.2.2. Dose audits

The IAEA provides radiation dosimetry audit services to the SSDL Network members. Detailed information about the services is given on the Postal Dose Audit Service webpage [46]. The programme helps the SSDLs to verify the implementation of their national dosimetry standards. The SSDL dose audit programme checks beam calibrations in the field of radiation therapy and radiation protection. In the audit process, first a passive dosimeter is provided to the participating SSDLs to be irradiated under reference conditions with a specified air kerma for radiation protection level audits and absorbed dose to water for radiation therapy level audits. Then, the irradiated dosimeters are sent back to the IAEA to be evaluated. After the evaluation, a confidential report of the results as well as scientific support to resolve any possible discrepancies are provided to the SSDL.

For accurate patient dosimetry, the entire chain of traceability from a primary standards laboratory to the end user is important. The IAEA/WHO postal dose audit network offers dose audit services to radiation therapy centres in the Member States to verify clinical dosimetry practices, especially the application of dosimetry codes of practice in radiation therapy. Radiation therapy centres are supplied with IAEA dosimeters and are asked to irradiate them under reference conditions in a water tank to a specified absorbed dose to water. The IAEA evaluates the irradiated dosimeter read outs, provides a confidential report of the results to the participating radiation therapy centres and organizes scientific support in cases where discrepancies occur. Some SSDLs are engaged in the resolution of dosimetry discrepancies in radiation therapy centres in their country. Several SSDLs provide national postal dosimetry audit services for radiation therapy and the IAEA supports these activities by providing guidance and calibrations, as well as by exchanging dosimeters for quality assurance of national dose audit systems.

### 3.3. GUIDANCE AND TRAINING

A shortage of adequately trained staff is a serious obstacle to the appropriate operation of an SSDL. Members of the SSDL Network can obtain technical support and guidance through the IAEA to enable their staff to gain experience in measurement procedures and practices appropriate to their responsibilities. Support to SSDL members is also provided by the SSDL Officer at the IAEA.

The technical support available includes training courses and seminars held at operating SSDLs in the Member States. Each course is guided by an IAEA appointed expert from an SSDL, and may be complemented by expert lecturers provided by the IAEA. Upon request from an SSDL, and when space in the schedule can be made available, SSDL staff members are accepted for a visit or training at the IAEA, which is mainly through technical cooperation.

In addition, the IAEA has prepared training manuals and publications in the area of radiation dosimetry (Table 1). The IAEA training manuals and other publications form the basis of the technical procedures used by members of the SSDL Network. The list of the IAEA publications is available on the IAEA website under publications [45].
3.4. TECHNICAL COOPERATION

The IAEA’s technical cooperation programme (TCP) has played an important role in the establishment of many of the SSDLS which now form the SSDL Network. Depending on government priorities and financial resources, a technical cooperation project can cover different tasks. For example, setting up an SSDL may require one or several visits of an expert, training of staff, completion of necessary infrastructure, and the provision of basic SSDL equipment (e.g., dosimetry standards, irradiation facilities and radiation safety installations). Similarly, support in the form of a technical cooperation project may be requested to upgrade and expand the facilities and the services of an SSDL. In general, participation requests in TCP activities are made within the framework of active national or regional projects by submitting applications through the relevant national authorities [47], e.g. the National Liaison Officer (NLO) of the applicant’s country, to the IAEA.

Practical training of the SSDL staff can be provided to Network members, with the financial support of the IAEA through TCPs. The main forms of training tailored for SSDL staff included in the TCP are:

- **Scientific Visits** are awarded to senior staff and are intended to broaden the scientific or managerial qualifications of specialists in developing countries and the maximum duration of such a visit is two weeks; scientific visits can be beneficial, for instance, to the head of an SSDL responsible for calibration procedures and certification.

- **Fellowships** can be awarded as part of a technical cooperation project or on an individual basis as a direct contribution to the manpower development of the country's programme. The duration ranges from one to several months generally up to one year; fellowships can be beneficial, for instance, to SSDL staff involved in calibration measurements.

- **International Experts** recruited by the IAEA through its TCP upon request of a SSDL Network Member, can undertake field missions to provide advice and on-site training to SSDL staff (also in the form of “National Training Course”); this can be especially beneficial to facilitate the launching of new laboratory activities.

- **Interregional/ Regional Training Courses** are organized by the IAEA in cooperation with its Member States to offer unique learning opportunities to SSDL staff; in general official invitation letters announcing these courses are issued by the IAEA.

The training could be organized at an SSDL Network laboratory (SSDL or PSDL), a regional designated centre or the IAEA. When SSDL staff members come to the IAEA for practical training, they are encouraged to bring along their dosimetry equipment and participate in its calibration with the IAEA staff. Through the TCP, Members of the SSDL Network can also officially request the visit of an IAEA-recruited international expert, who can provide advice and perform technical audits in line with ISO/IEC 17025 [7].

3.5. NETWORKING

Maximum benefits will accrue to those SSDLS that participate actively in all aspects of the SSDL Network. The extent to which an SSDL involves itself in the Network will depend on individual circumstances but it should take advantage of all opportunities offered for sharing similar experiences.

3.5.1. Information sharing

Information about the SSDL Network is given on the [website of the SSDL Network] [8] and topical information notes are published there on the [Notice Board]. The SSDL Newsletter is the
principle means of communication among members of the SSDL Network. The SSDL newsletter is published in digital form and Members receive it by e-mail. All published Newsletters can be found from the IAEA publications web site [45]. The Newsletter can be used to publish the results of experiments conducted by individual SSDLs to share the information with other members. The Newsletter also provides information about recent publications to keep all members of the SSDL Network aware of the new developments in the field. A list of upcoming meetings and courses keeps the SSDL staff informed about training opportunities.

3.5.2. Regional centres

In some geographical areas, an SSDL can be designated as a regional or a collaborating centre following an agreement within the region [47]. In this case, countries with limited resources are encouraged to seek calibrations and technical assistance in dosimetry from the designated regional centre. This promotes a more effective use of local resources until the demand for dosimetry has reached a level to warrant a national SSDL.

3.5.3. Coordinated research projects

One opportunity for networking is to take part in an IAEA coordinated research project (CRP). Information about open, active and completed CRPs are given on the web page of Coordinated Research Activities [48]. The CRPs cover a wide range of topics related to radiation metrology and quality assurance procedures. Research activities supported through CRPs are designed to encourage the acquisition and dissemination of new knowledge in the field of dosimetry and medical physics. A typical SSDL-related CRP is associated with the development of or updating of dosimetry codes of practice. The CRPs offer scientists from both developing and developed countries opportunities to meet and exchange knowledge, experience and ideas focusing on well-defined areas of research.

Proposals for participation in a CRP should be prepared by institutes in the IAEA Member States and submitted directly to the Research Contracts Administration Section. Once the proposal has been accepted, the IAEA may offer institutes a contract or an agreement. Research is conducted in the countries of the participating institutes. The Chief Scientific Investigator for each contract/agreement is invited to periodic Research Coordination Meetings for face to face discussions, exchanges of information and to facilitate the formation of professional relationships that may outlast the lifetime of the CRP.
4. MEMBERSHIP IN THE SSDL NETWORK

A laboratory fulfilling the general criteria set forth in this Charter may become, at the request of its government, a full member of the IAEA/WHO SSDL Network. Further guidelines for Member States on the designation of SSDLs, as well as information about the facilities needed for an SSDL and about the duties of the members in the Network are presented in this section of the Charter.

4.1. APPLYING FOR MEMBERSHIP

Applications for membership in the IAEA/WHO SSDL Network must be based on a nomination from the national competent authority in the respective Member State. The national competent authority of a Member State will designate an SSDL that maintains the relevant national standards, undertakes calibrations, and may perform other services in radiation dosimetry at a national level. The application for membership should be submitted to the IAEA SSDL Network Secretariat through the Dosimetry Contact Point. All information requested below must be provided for formal consideration by the IAEA.

The application should include:

- A nomination from the appropriate national authority;
- Organizational structure of the proposed SSDL and its relationship to the national metrology infrastructure including the legal regulation;
- Full contact details of the SSDL;
- Full contact details and CV of the Head of the SSDL;
- Staffing structure of the SSDL;
- Layout of the facilities and statement on the safety and security issues;
- List of available measuring equipment and irradiators;
- List of secondary standards including traceability route, date of the last calibration and comparison results, if any;
- List of calibration services and other activities provided to end users and CMCs (if available);
- Number of calibrations typically performed in a year4;
- Description of the quality management system of the SSDL, accreditation document or peer-review report, if any;
- Statement that the SSDL accepts the responsibilities and will fulfil the duties listed in the Charter.

Normally, the national competent authority of a Member State will designate a single SSDL for the IAEA/WHO Network and this SSDL will undertake calibrations and perform other services in radiation dosimetry. Exceptionally, more than one SSDL from a country may participate in the

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4 Newly established SSDLs can survey the estimated need for calibrations.
Network when e.g.:

- different services for different quantities and radiation qualities are provided; or
- different geographical locations are necessary.

In any case, reference standards for a specific quantity and radiation quality in a given country have to be traceable to the same national reference standard. As the work of SSDLs is of the metrological nature, it is essential that each SSDL be legally identifiable. It is preferable that the SSDL is linked to or collaborates with the NMI and, if eligible, has designated status in the frame of the CIPM-MRA.

4.2. REQUIREMENTS FOR THE MEMBERSHIP

Calibration work requires accurate measurements and uncertainty assessment is an essential component. This sets strong quality requirements for an SSDL and its services. Establishing an SSDL from nothing is a long process and involves different steps related to human resources, infrastructure and service development. This charter contains only the most important points required for the SSDL Network membership. More detailed information about quality management and technical implementation can be found from the ISO/IEC 17025 standard [7] and from the references in Table 1.

4.2.1. Human resources

The SSDL shall have technical and managerial personnel who have the authority, qualifications and competence to operate the specific equipment needed for radiation measurements, perform calibrations, evaluate the results and authorize calibration certificates. The personnel shall be qualified on the basis of appropriate education, training, experience or demonstrated skills, as required. All personnel should be free from any undue external pressures and influences that may adversely affect the quality of the services offered by the SSDL.

The head of the laboratory should be a physical scientist with several years of experience in radiation measurement and calibration. The head has the overall responsibility for the work performed at the laboratory and should hold a full-time appointment. The responsibilities include:

- Specifying the responsibility and authority of each SSDL staff member and supervising them;
- Ensuring adequate documentation of calibration procedures, approving the calibration results and ensuring their integrity;
- Implementing the quality assurance programmes in line with the quality management system of the SSDL;
- Determining the resources required for the calibration services;
- Ensuring the occupational radiation safety of the staff according to the national regulations;
- Ensuring the continuing education and training of the SSDL staff; Communicating and cooperating with the local authorities, the IAEA, other SSDLs in the Network and the customers.

4.2.2. Premises and calibration facilities

The laboratory shall not share space with incompatible activities, which could jeopardize quality of the service, safety or security. The following minimum requirements for premises shall be fulfilled:
Access to the calibration areas must be restricted to assure the quality of measurements and for radiation safety and security [1, 7];

At least one appropriately shielded irradiation room is required for calibrations. Other shielded rooms may be necessary depending on the work load and radiation sources used [2–4];

A separate room to control radiation sources and perform measurements is necessary;

The irradiation setups should comply with the relevant standards and IAEA publications listed in Table 1.

The design of the calibration facilities must conform to the relevant national and international safety regulations and should take into account the International Basic Safety Standards [1].

4.2.3. Dosimetry standards

At least one of the secondary standards must be retained in the laboratory as a basic reference instrument. Methods for checking its stability are essential. The calibration of secondary standards must be traceable to a primary standard either directly or through the IAEA or in an exceptional case through another SSDL. The initial calibration of the secondary standard must be performed for each radiation quality and quantity that will be used for the calibration service. Should there be any significant changes to the secondary standard or to its link to the primary standard, a recalibration is required.

4.2.4. Services

The SSDL Network member shall provide calibration services and calibration certificates for radiation therapy, diagnostic radiology or radiation protection level measuring instruments or any combination of these. The SSDL has to ensure the traceability chain for the standards used for the services and estimate the related uncertainties. The main service of the SSDL Network members is the dissemination of radiation dosimetry quantities to end users by (i) instrument calibration, and (ii) assistance in how to use the calibration results in their particular application. By offering these services, the traceability of the radiation dosimetry measurements throughout the Network countries is ensured. The SSDLs that have appropriate facilities and expertise may provide reference irradiations for dosimetry services and conduct radiation therapy dose audits at national level.

If the SSDL has the additional expertise, resources and equipment necessary, it is encouraged to provide other services and training, where appropriate, including:

- Training courses in radiation measurement and calibration techniques;
- Maintenance of the users’ instrumentation;
- Advice on quality assurance and technical programmes;
- Cooperation with universities in study programmes;
- Hosting IAEA fellows and other postgraduates in the field of radiation dosimetry.

It is recommended that the SSDL staff should not undertake the duties of a Medical Physicist or Radiation Safety Officer at the end user’s facility, even if they are appropriately qualified and experienced.

4.2.5. Comparisons

In order to maintain confidence in the traceability chain it is recommended that SSDLs providing calibration services participate in relevant comparison programmes at least every 5 years, or whenever their reference standards, irradiation setups and/or the measurement technique have
changed. The SSDLs may, for example, participate in the IAEA or RMO dosimetry comparisons.

4.2.6. Quality management system

The SSDL interested in becoming a member of the Network should have at least the first draft of their QMS established in line with the ISO/IEC 17025 standard [7]. The IAEA can advise the Network members in developing their QMS within a TCP.

4.3. DUTIES OF THE SSDL

When an SSDL is designated by a country to be its representative in the SSDL Network, the SSDL agrees to participate in achieving the objectives of the Network. The SSDL may then access the benefits of membership as described in detail in Section 3 above.

The scope of work conducted at an SSDL may vary from broad to restricted depending on the individual need of the country. Nevertheless, there are certain duties that all SSDLs are required to fulfil to retain full membership in the IAEA/WHO SSDL Network. The SSDLs are obligated to:

1. Ensure appropriate human resources, facilities, equipment, safe and secure working environment at the SSDL for all available calibration services;
2. Ensure the traceability for all the dosimetry secondary standards and other key measuring equipment to the SI by periodical calibrations detailed in the QMS;
3. Monitor the long term stability of the SSDL secondary standards in accordance with the recommendations from the IAEA technical reports [2–4];
4. Provide dosimetry calibrations for at least one of the services listed in Section 4.2.4 with calibration certificates indicating traceability route and estimated uncertainties;
5. Provide relevant information about calibration services to the end user including changes to the SSDL standards or capabilities if these have an effect on the calibration result;
6. Cooperate with the SSDL Network members and other metrological laboratories to exchange information and to improve calibration and measurement instruments and techniques;
7. Remain up to date on progress in radiation metrology measurement techniques to provide good quality calibration services;
8. Participate in dosimetry comparisons and/or audit programmes according to their Technical Protocols, cooperating in resolving any dosimetry discrepancies identified during a comparison or an audit.;
9. Implement a Quality Management System in line with ISO17025 [7];
10. Submit an annual report of activities to the IAEA including up-to-date contact information.

SSDLs which do not fulfil all these requirements and duties of a full member may become a provisional member of the Network. This may be the case when the SSDL has only recently been established and/or its quality management system has not yet been approved. Another example of a provisional member is an SSDL that is temporarily unable to fulfil all of the basic requirements of a full member. In such a case the SSDL is classified as a provisional member for an interim period during which their benefits may be restricted until the situation is rectified. The provisional status can be maintained up to five years assuming that annual reports are submitted.
Any change of the SSDL’s membership status to provisional membership will also be notified to the nominating authority. The Member State may request technical assistance from the IAEA to address the shortcomings. If the obligations remain unfulfilled and no reasons for the delay are provided, the SSDL will be withdrawn from the Network.

4.4. WITHDRAWAL OF THE MEMBERSHIP

Once an SSDL has been accepted as a full member of the SSDL Network it must comply with all of the duties described in detail in Section 4.3 to maintain its membership. The Network Secretariat will inform the Member State if its SSDL consistently fails to comply with the Charter despite reminders. If the membership status is withdrawn both the nominating authority and the SSDL are informed in writing. An SSDL may also voluntarily withdraw the membership from the SSDL Network but in doing so it must inform the Network Secretariat in writing.

4.5. AFFILIATED MEMBER

An affiliated member is a PSDL or an international organization which facilitates the operation of the SSDL Network. They are engaged to be actively involved in the Network activities by means of cooperation and assistance, for example by (i) ensuring traceability for Network members by calibrations, (ii) performing reference irradiations for the IAEA dose audit programmes, (iii) acting as a linking laboratory in comparisons organized to support CMC claims, (iv) providing expert services to IAEA missions, CRPs, publications, and training courses, (v) hosting IAEA fellows, and by (vi) other types of knowledge transfer to the SSDLs. This membership status can be granted on individual request addressed to the Network Secretariat.

5. CONCLUSION

This updated version of the SSDL Network Charter has been modified to accommodate the changes and the developments in the field since the first Charter was established in 1999. The international measurement system was reinforced in 1999 by the CIPM MRA [5, 6], and in 2017, the requirements related to quality management systems for calibration laboratories in the ISO/IEC 17025 [7] standard were updated. By clearly explaining the duties and responsibilities as well as the benefits related to the SSDL Network membership, this updated version of the SSDL Charter strives to encourage Member States to obtain and maintain a full membership status for their SSDLs.
REFERENCES


[15] INTERNATIONAL COMMISSION ON RADIATION UNITS AND MEASUREMENTS, Patient Dosimetry for X Rays Used in Medical Imaging, ICRU


[25] INTERNATIONAL ELECTROTECHNICAL COMMISSION, Radiation Protection Instrumentation — Measurement of Personal Dose Equivalents Hp(10) and Hp(0,07) for X, Gamma, Neutron and Beta Radiations — Direct Reading Personal Dose Equivalent Meters, IEC 61526:2010, IEC, Geneva (2010).


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The revision of the Charter is a result of the efforts of the following experts who participated in the meetings listed below and have drafted and reviewed the text. The IAEA acknowledges the assistance of the following:

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Consultant Meetings

Consultant meeting on the Revision of the SSDL Network Charter (19-23 Nov 2012)
External experts: Ms Allisy-Roberts, Mr Kapsch, Mr Kosunen, Ms Msimang and Mr Shortt

Other Meetings

External expert: Ms Velazquez Berumen
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AFRIMETS</td>
<td>Intra-Africa Metrology System</td>
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<td>APMP</td>
<td>Asia Pacific Metrology Programme</td>
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<tr>
<td>BIPM</td>
<td>International Bureau of Weights and Measures (Bureau International de Poids et Mesures)</td>
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<tr>
<td>BSS</td>
<td>Basic Safety Standards (Radiation Protection and Safety of Radiation Sources)</td>
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<tr>
<td>CIPM</td>
<td>International Committee for Weights and Measures</td>
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<td>CIPM MRA</td>
<td>International Committee for Weights and Measures Mutual Recognition Arrangement</td>
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<tr>
<td>CMCs</td>
<td>Calibration and Measurement Capabilities</td>
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<td>COOMET</td>
<td>Euro-Asian Cooperation of National Metrological Institutions</td>
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<td>CRP</td>
<td>Coordinated Research Project</td>
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<tr>
<td>CV</td>
<td>Curriculum Vitae</td>
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<td>EURAMET</td>
<td>European Association of Metrology Institutes</td>
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<td>GULFMET</td>
<td>Gulf Association for Metrology</td>
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<tr>
<td>IAEA</td>
<td>International Atomic Energy Agency</td>
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<td>IAEA TRS</td>
<td>International Atomic Energy Agency Technical Report Series</td>
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<td>ICRP</td>
<td>International Commission on Radiological Protection</td>
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<td>ICRU</td>
<td>International Commission on Radiation Units and Measurements</td>
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<td>IEC</td>
<td>International Electrotechnical Commission</td>
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<td>ISO</td>
<td>International Organization for Standardization</td>
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<td>JCRB</td>
<td>Joint Committee of the Regional Metrology Organizations and the BIPM</td>
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<tr>
<td>KCDB</td>
<td>Key Comparison Database</td>
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<td>NLO</td>
<td>National Liaison Officer</td>
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<td>NMI</td>
<td>National Metrology Institute</td>
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<td>PSDL</td>
<td>Primary Standards Dosimetry Laboratory</td>
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<tr>
<td>QMS</td>
<td>Quality Management System</td>
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<td>RMO</td>
<td>Regional Metrology Organization</td>
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<td>SI</td>
<td>International System of Units</td>
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<tr>
<td>SIM</td>
<td>Inter-American Metrology System</td>
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<tr>
<td>SSDL</td>
<td>Secondary Standards Dosimetry Laboratory</td>
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<tr>
<td>TCP</td>
<td>Technical Cooperation Programme</td>
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