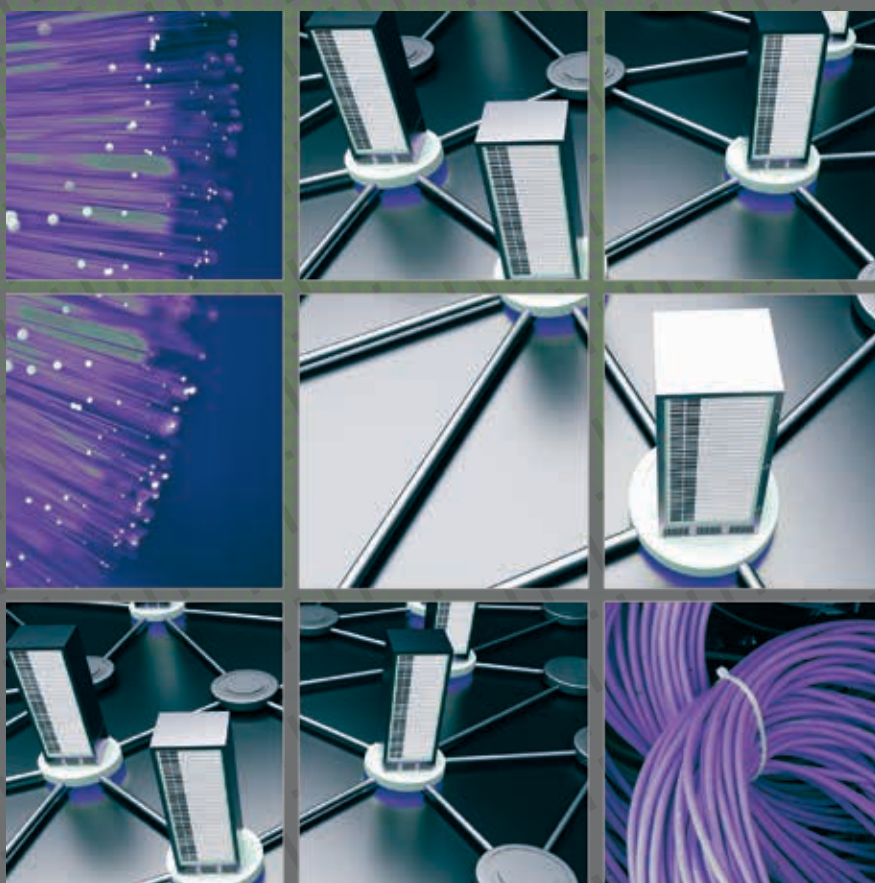


INFRASTRUCTURE

# Establishing Conformity AND INTEROPERABILITY REGIMES

Complete Guidelines



15  1865  
2015

Telecommunication Development Sector





# **Establishing conformity and interoperability regimes: Complete guidelines**

*February 2015*



These guidelines provide information on the necessary elements to establish a conformity assessment and interoperability regime in a developing country. It draws upon existing successful experiences in establishing such a capability including test labs, institutional arrangements and cost considerations. For further information please contact ITU focal point: Mr. Riccardo Passerini, [ricardo.passerini@itu.int](mailto:ricardo.passerini@itu.int)



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## Foreword

The availability of high performing products that comply with international standards accelerates the widespread deployment of ICT infrastructure, technologies and associated services. It grants people unrestricted access to the Information Society regardless of location or choice of device, which ultimately brings us closer to the Millennium Development Goals.

As recalled by the Dubai Action Plan (WTDC-14), widespread conformance and interoperability of telecommunication/ICT equipment and systems lead to increased market opportunities, greater reliability and streamlined global integration and trade.

The guidelines presented here are part of the ITU conformity and interoperability programme and address membership needs for more in-depth information, beyond the contents of the basic guidelines previously published.

Compiled from a careful collection of international best practices, these guidelines provide information for developing countries that are now planning or reviewing their conformity and interoperability regimes. They offer a blueprint for the right type of approval system, the legislation required to promote an orderly telecommunication service and marketplace, the calculation of fees, and the ideal enforcement and surveillance framework.

This report also points the way to better coordination with other national regulatory agencies while stressing the relevant international standards and ICT equipment references, and it reviews compliance mechanisms in light of international agreements. Such is the scope of the general guidelines in this report, that they may be fine-tuned and tailored by any country considering the introduction of ICT products in the market.

The coordinated work of ITU in the field of conformance and interoperability has already made valuable complementary resources available for the development, implementation and management of mutual recognition arrangements and agreements (MRAs) on conformity assessment of telecommunication equipment, as well as on establishing conformity assessment test labs in different regions, and a feasibility study for conformance testing.

Under the Connect 2020 Agenda to ensure the continued role of ICTs as a key enabler for social, economic and environmentally sustainable growth and development worldwide, and bearing in mind the power of C&I regimes to support this vision, it is my hope that the guidance shared herein will both support, and steer our membership towards, prime sustainable results for the benefit of their constituency.

Brahima Sanou

Director

Telecommunication Development Bureau



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## **1 Internationally accepted and standardized conformity assessment and interoperability regimes for the ICT sector**

Service providers and operators specify standards and requirements for equipment and systems that they employ to provide services to their customers. National regulators mandate regulations, standards and specifications for equipment and systems that are deployed and used in their territories.

Users of the equipment and systems along with the service providers and national regulators require evidence and proof that the equipment and systems conform to the appropriate standards and specifications and that they interoperate with each other as specified. The process used to obtain the evidence and proof is called conformity assessment – the demonstration that specified requirements relating to a product, process, system, person or body are fulfilled.

The conformity assessment committee (CASCO) of the International Organization for Standardization (ISO)<sup>1</sup> had developed an extensive set of standards and guidelines that deal with all aspects of conformity assessment. These standards include:

- ISO/IEC 17000:2004 Conformity Assessment – Vocabulary and general principles
- ISO/IEC 17001:2005 Conformity Assessment – Impartiality – Principles and requirements
- ISO/IEC 17002:2004 Conformity Assessment – Confidentiality – Principles and requirements
- ISO/IEC 17003:2004 Conformity Assessment – Complaints and appeals – Principles and requirements
- ISO/IEC 17004:2005 Conformity Assessment – Disclosure of Information – Principles and requirements
- ISO/IEC 17005:2008 Conformity Assessment – Use of Management systems – Principles and requirements
- ISO/IEC 17007:2009 Conformity Assessment – Guidelines for drafting normative documents suitable for use for conformity assessment
- ISO/IEC 17011:2004 Conformity Assessment – Requirements for accreditation bodies accrediting conformity assessment bodies
- ISO/IEC 17020:2012 Conformity Assessment – Requirements for the operation of various types of bodies performing inspection
- ISO/IEC 17021:2011 Conformity Assessment – Requirements for bodies providing audit and certification of management systems
- ISO/IEC 17024:2012 Conformity Assessment – General requirements for bodies operating certification of persons
- ISO/IEC 17025:2005 Conformity Assessment – General requirements for the competence of testing and calibration laboratories
- ISO/IEC 17030:2003 Conformity Assessment – General requirements for third-party marks of conformity
- ISO/IEC 17040:2005 Conformity Assessment – General requirements for peer assessment of conformity assessment bodies and accreditation bodies
- ISO/IEC 17043:2005 Conformity Assessment – General requirements for proficiency testing
- ISO/IEC 17050-1:2007 Conformity Assessment – Supplier’s declaration of conformity – Part 1: General requirements
- ISO/IEC 17050-2:2007 Conformity Assessment – Supplier’s declaration of conformity – Part 2: Supporting document

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<sup>1</sup> [www.iso.org/iso/home/about/conformity-assessment/casco.htm](http://www.iso.org/iso/home/about/conformity-assessment/casco.htm)

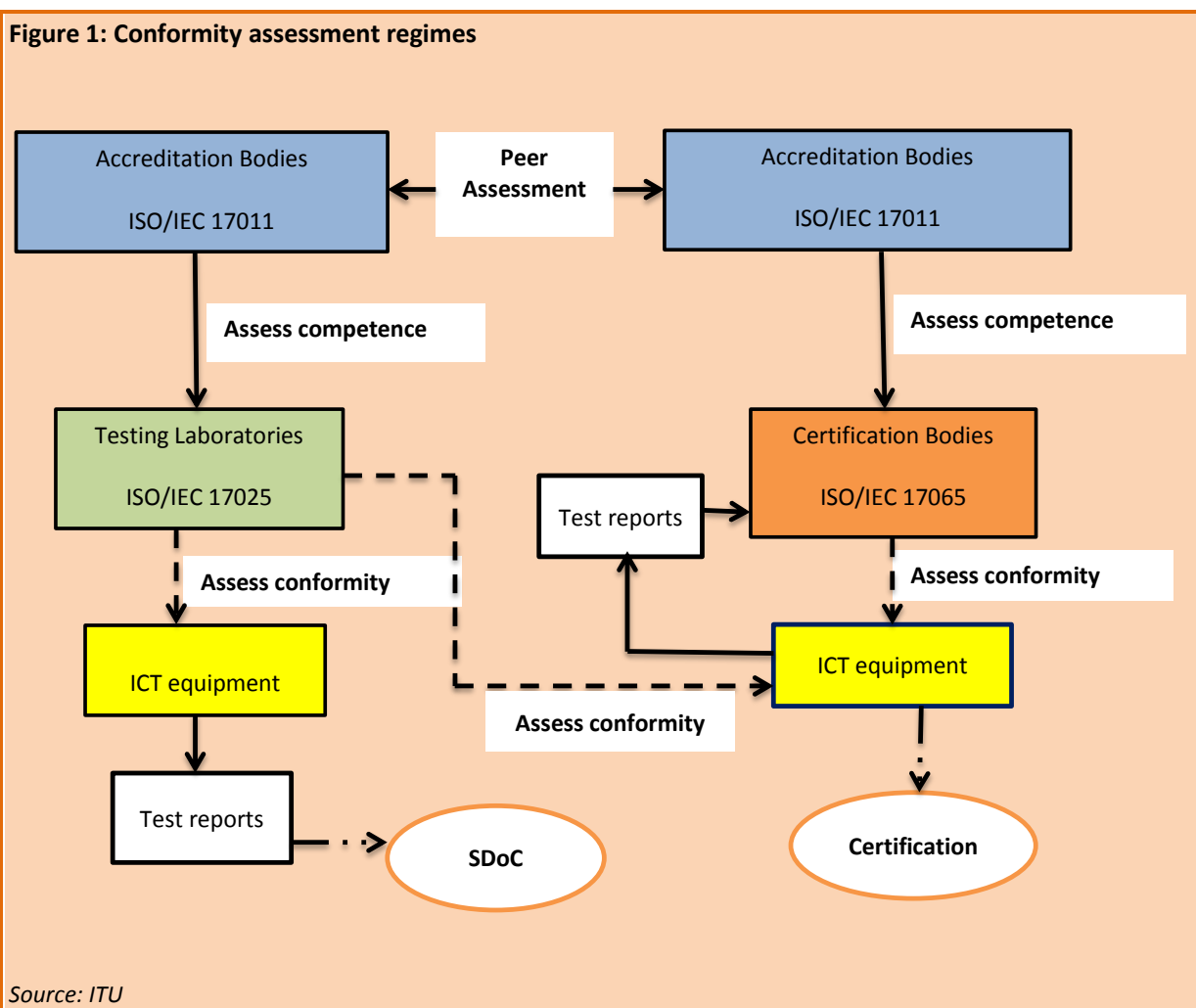
- ISO/IEC 17065:2012 Conformity Assessment – Requirements for bodies certifying products, processes and services
- ISO/IEC 17067:2013 Conformity Assessment – Fundamentals of product certification and guidelines for product certification schemes

The above standards and the consideration of risk also apply in the conformity assessment regimes or schemes for the ICT sector. When the risk and the consequences of nonconformity are low, the problems generated by nonconformity can be easily addressed and solved. In this case, the supplier declaration of conformity may be sufficient to demonstrate that the equipment conforms to the appropriate standards.

On the other hand, when the risk and consequences of nonconformity are significant, it may be necessary to obtain assurance that the equipment conforms to the requirements prior to allowing the equipment on the market. One method to achieve this result is called product certification.

For ICT equipment, including telecommunication equipment, the internationally accepted conformity assessment schemes, namely certification and supplier declaration of conformity (SDoC) are shown in Figure 1.

Figure 1: Conformity assessment regimes

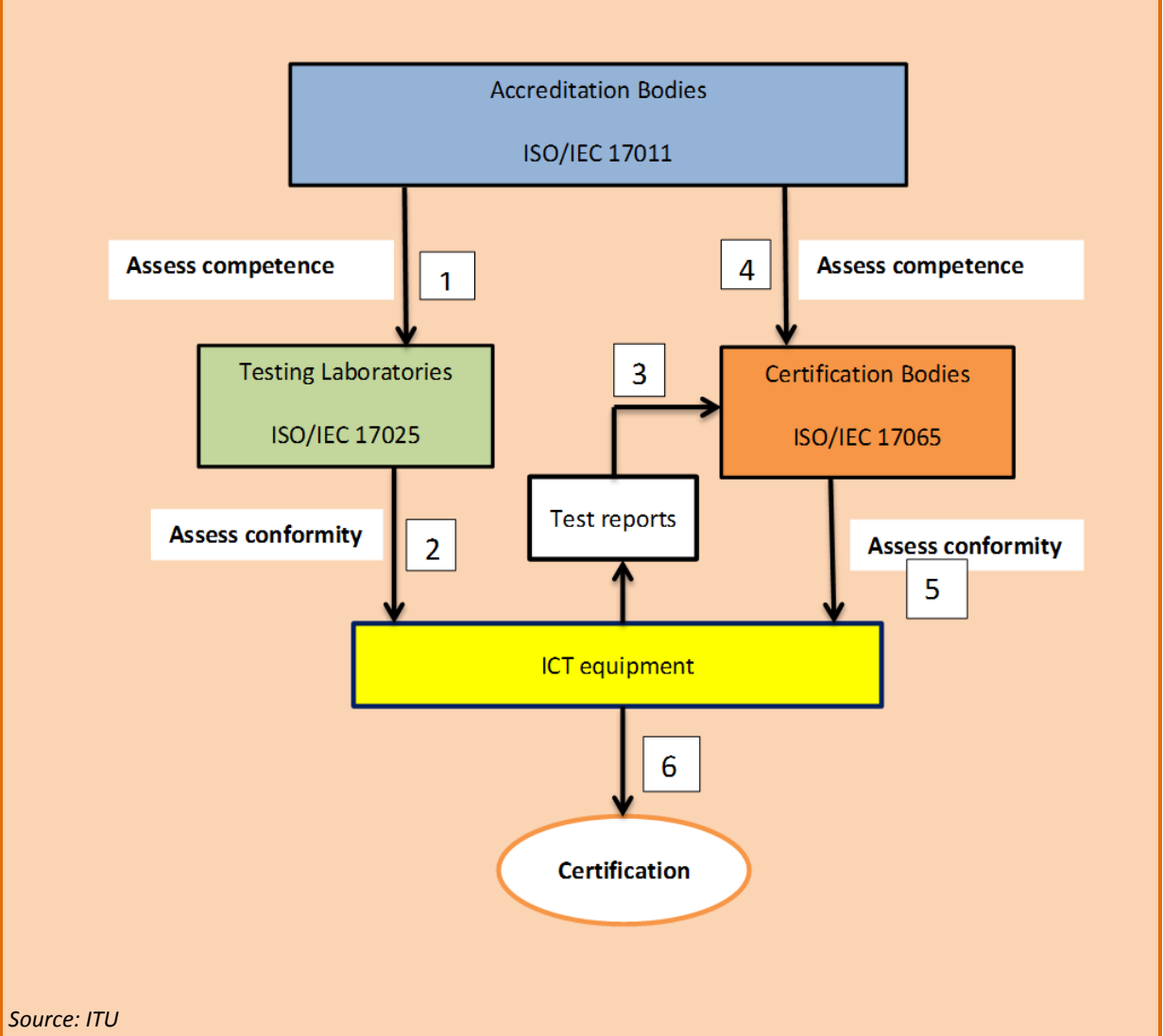


Source: ITU

### 1.1 Certification

Certification is a third-party attestation related to products, processes, systems or persons. Certification of equipment is the confirmation that the equipment meets the requisite conditions – normally indicated by the use of documentary evidence such as test reports attesting to this fact. Certification is the conformity assessment scheme for equipment employing new technologies and equipment that has a high degree of risk associated with non-compliance considering such aspects as safety, health or environmental impacts.

**Figure 2: Conformity assessment scheme: Certification**



Source: ITU

For ICT equipment, the first step towards certification is to conduct testing of the equipment (step 2) by an ISO/IEC 17025 compliant testing laboratory (step 1). The test report produced by the testing laboratory along with the appropriate administrative information will then be sent (step 3) to a third party ISO/IEC 17065 compliant certification body (step 4) for assessment and certification (step 5). If the conformity assessment result is positive, the certification body will issue a certificate for the equipment (step 6). For equipment designed to meet mandatory standards, this certificate will indicate to the regulator that the equipment meets the appropriate standards. For voluntary standards, this certificate may be used by suppliers to market their equipment.

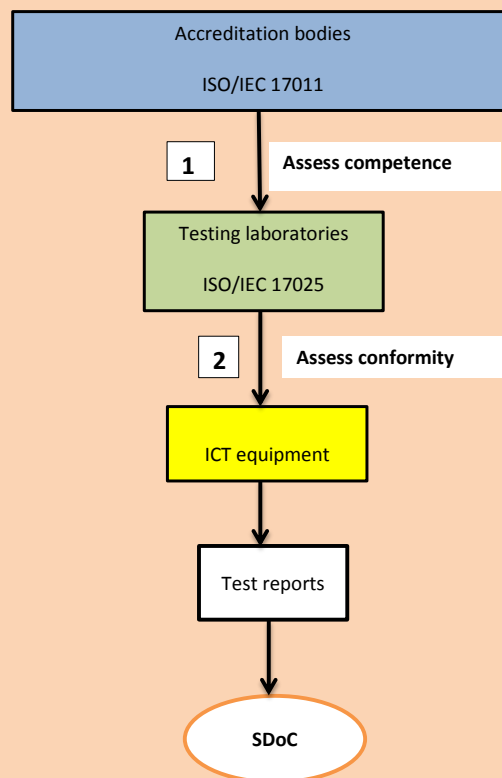
## Type approval

Type approval is a special kind of certification. Type approval simply means the equipment is certified to meet certain requirements for its type, whatever that may be. Compliance to type approval requirements is often denoted by a marking on the equipment or package.

### 1.2 Supplier declaration of conformity

The supplier declaration of conformity (SDoC) is the conformity assessment scheme used for low risk and mature products. Upon meeting a set of conditions, a supplier can self-declare that the equipment conforms to the appropriate requirements (ISO/IEC 17050 Conformity Assessment – Supplier’s declaration of conformity, and the WTO committee on conformity assessment<sup>2</sup>). There are four different schemes of SDoC.

Figure 3: Conformity assessment scheme: Supplier declaration of conformity (SDoC)



Source: ITU

<sup>2</sup> WTO committee on conformity assessment: [www.wto.org/english/tratop\\_e/tbt\\_e/tbt\\_wrkshop\\_note\\_21march05\\_e.doc](http://www.wto.org/english/tratop_e/tbt_e/tbt_wrkshop_note_21march05_e.doc)

**Table 1: Conformity assessment scheme: Supplier declaration of conformity (SDoC)**

<p><b>SDoC I</b> (e.g. Industry Canada (Canada) conformity assessment requirement for CS-03, terminal attachment equipment)</p>	<p>The conditions for SDoC I are:</p> <ul style="list-style-type: none"> <li>• testing of the equipment (step 2 of Figure 3) to be performed by an ISO/IEC 17025 compliant testing laboratory (step 1 of Figure 3) which is recognized by the regulator;</li> <li>• test reports have to be kept for a prescribed period;</li> <li>• supplier has to register the declaration with the regulator.</li> </ul>
<p><b>SDoC II</b> (e.g. FCC (USA) conformity assessment for Part 15, EMC)</p>	<p>The conditions for SDoC II are:</p> <ul style="list-style-type: none"> <li>• testing of the equipment (step 2 of Figure 3) to be performed by an ISO/IEC 17025 compliant testing laboratory (step 1 of Figure 3) which is recognized by the regulator;</li> <li>• test reports have to be kept for a prescribed period;</li> <li>• supplier does not have to register the declaration with the regulator.</li> </ul>
<p><b>SDoC III</b></p>	<p>The conditions for SDoC III are:</p> <ul style="list-style-type: none"> <li>• testing of the equipment to be performed by a testing laboratory;</li> <li>• test reports have to be kept for a prescribed period;</li> <li>• supplier has to register the declaration with the regulator.</li> </ul>
<p><b>SDoC IV</b> (e.g. Industry Canada (Canada) conformity assessment for ICES-003 EMC)</p>	<p>The conditions for SDoC IV are:</p> <ul style="list-style-type: none"> <li>• testing of the equipment to be performed by a testing laboratory;</li> <li>• test reports have to be kept for a prescribed period.</li> </ul>

### 1.3 Transition from certification to SDoC

Certification is the preferred and often recommended conformity assessment scheme for ICT equipment using new technologies and equipment which has safety and health concerns. The rigorous process of certification addresses these concerns. With the maturing of the production process and the technologies, it may not be necessary to maintain the certification process. It is often recommended to change the conformity assessment scheme from certification to SDoC. This would reduce production cost and the time to bring the equipment to market.

### 1.4 Testing laboratories

Testing laboratories play a very important role in the operation of conformity assessment schemes including certification and the SDoC. Many regulations require that the testing laboratory has to be ISO/IEC 17025 compliant. ISO/IEC 17025 compliant testing laboratories operate a management system, are technically competent and are able to generate technically valid results. Test reports prepared by testing laboratories are necessary information to support certification and SDoC.

## 2 Development and review of regulatory framework and roadmap for the establishment of C&I regimes

### 2.1 Telecommunication act provisions: placing products in the market; institutions rights and responsibilities; identification of approved products

The fundamental building block of an enforceable regime for addressing the establishment of an orderly telecommunication service and equipment marketplace is the enabling legislation. Many, if not most ITU Member States have established this legislation under various names and with varying levels of scope.

Such legislation may be titled in short form as Telecommunication Act, Radiocommunication Act, or created as a combined act including telecommunications, radio communications, and possibly other elements such as metrology and principles for establishment of fees for services aspects<sup>3</sup>. Such Acts are “the law of the land” and are further interpreted by regulatory requirements that deal with such practical matters as penalties for infractions, setting fees, obligations of parties, importation, market surveillance and so on.

For the purpose of these C&I guidelines, the term *Telecommunications Act* is used to refer to the general case with a particular focus on the regime of telecommunication equipment, including radio communications apparatus, broadcast equipment, and electromagnetic radiation aspects.

A Telecommunication Act reflects the policy of the sovereign state in question and can include a clear statement of the underlying policy. This statement would cover such elements as the following:

- orderly development of a telecommunications system;
- reliable and affordable telecommunications services of high quality;
- highlight the role of telecommunications to enhance efficiency and competitiveness;
- ensure that regulation, where required, is efficient and effective;
- stimulate research and development and encourage innovation in the provision of telecommunications services;
- respond to the economic and social requirements of users of telecommunications services;
- contribute to the protection of the privacy of persons.

Telecommunications legislation can also address the following key areas:

Operational matters: Regulations pertaining to service provision.

Rates, facilities and services:

- provision of services;
- connection of facilities;
- provision of information.

Telecommunication apparatus and administration:

- application to apparatus subject to regulation;
- government powers and exercise of powers;
- certification and marking;
- appeals and evidence;
- regulations including fees and mandatory requirements.

Investigation and enforcement:

- administrative and monetary penalties;
- offences;
- inspection and market surveillance;

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<sup>3</sup> See Radiocommunications Act, Canada: <http://laws-lois.justice.gc.ca/eng/acts/r-2/page-1.html>, and Telecommunication Act, Canada: <http://laws-lois.justice.gc.ca/eng/acts/t-3.4/>



- forfeiture;
- civil liability.

### Issues specific to radiocommunications

An omnibus telecommunications act dealing with radiocommunications may also contain the following sections<sup>4</sup>:

Prohibitions:

- No person shall, except under and in accordance with a radio authorization, install, operate or possess radio apparatus, unless expressly exempted by the act.
- No person shall manufacture, import, distribute, lease, offer for sale or sell any radio apparatus, interference-causing equipment or radio-sensitive equipment for which a technical acceptance certificate is required under this Act, otherwise than in accordance with such a certificate.
- No person shall manufacture, import, distribute, lease, offer for sale or sell any radio apparatus, interference-causing equipment or radio-sensitive equipment for which technical standards have been established under paragraph, unless the apparatus or equipment complies with those standards.

### Ministerial powers

The Minister may, taking into account all matters that the Minister considers relevant for ensuring the orderly establishment or modification of radio stations and the orderly development and efficient operation of radiocommunication:

- *issue:*
  - technical acceptance certificates in respect of radio apparatus, interference-causing equipment and radio-sensitive equipment, and
  - any other authorization relating to radiocommunication that the Minister considers appropriate,and may fix the terms and conditions of any such certificate or authorization including, in the case of a radio licence and a spectrum license, terms and conditions as to the services that may be provided by the holder thereof;
- *amend the terms and conditions of any certificate or authorization;*
- *establish technical requirements and technical standards in relation to:*
  - radio apparatus,
  - interference-causing equipment, and
  - radio-sensitive equipment, or any class thereof;
- *test radio apparatus for compliance with technical standards established under this Act;*
- *appoint inspectors for the purposes of the Act;*
- *take such action as may be necessary to secure, by international regulation or otherwise, the rights of the sovereign state in telecommunication matters, and consult with other authorities with respect to any matter that the Minister deems appropriate;*

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<sup>4</sup> *Ibid.*

- *make determinations as to the existence of harmful interference and issue orders to persons in possession or control of radio apparatus, interference-causing equipment or radio-sensitive equipment that the Minister determines to be responsible for the harmful interference to cease or modify operation of the apparatus or equipment until such time as it can be operated without causing or being affected by harmful interference;*
- *undertake, sponsor, promote or assist in research relating to radiocommunication, including the technical aspects of broadcasting; and*
- *do any other thing necessary for the effective administration of the Act.*

Among the many other elements that may need to be covered in legislation are the following:

- *Regulations respecting technical requirements and technical standards in relation to:*
  - radio apparatus
  - broadcast equipment
  - interference-causing equipment
  - radio-sensitive equipment
  - terminal equipment directly connected to public networks
  - exposure limits for radiofrequency energy.
- *Powers of Inspectors: An inspector may, at any reasonable time, for the purpose of enforcing the relevant legislation,*
  - enter any place in which the inspector believes on reasonable grounds there is any radio apparatus, interference-causing equipment or radio-sensitive equipment;
  - examine any radio apparatus, interference-causing equipment or radio-sensitive equipment found therein;
  - examine any logs, books, reports, test data, records, shipping bills, bills of lading or other documents or papers found therein that the inspector believes on reasonable grounds contain information relevant to the enforcement of the relevant legislation, and make copies thereof or take extracts therefrom.
- *Warrants and use of force (Note that there are usually additional permissions required, including warrants when an inspector requires admission to a dwelling house):*
  - in executing a warrant an inspector shall not use force unless the inspector is accompanied by a peace officer and the use of force is specifically authorized in the warrant;
  - the owner or person in charge of a place entered by an inspector shall give the inspector all reasonable assistance to enable the inspector to carry out the inspector's duties under the relevant legislation, and shall give the inspector any information that the inspector reasonably requests;
  - where an inspector is carrying out inspection duties no person shall resist or wilfully obstruct the inspector or knowingly make a false or misleading statement, either orally or in writing, to the inspector;
- *Offences and punishments;*
- *Fines;*
- *Forfeiture of radio apparatus;*
- *Liabilities;*
- *Civil actions;*
- *Jurisdiction of the courts.*

The Radiocommunications Act, Canada, and the Telecommunication Act, Canada<sup>5</sup> provide good examples of the kind of details which would normally be included in such legislation.

Thus in summary, the provisions of a typically well formulated telecommunication act address all foreseen issues arising from placing telecommunication products in the marketplace. These include the rights and responsibilities of institutions as regards enforcement and related matters, the necessity of identification of approved products and record keeping, and operational matters including ownership and civil liability.

## **2.2 Methodology to calculate the fee of type approval process, including issue and/or renewal of certification**

### **Schedule of fees**

Fees are typically based on the principle of recovery of costs. The number and type of fees varies from country to country but in general there are four types of fees applicable in the type approval process. The two most basic fees are those for assessment of conformity to the regulatory requirements, and the fee for the technical expertise required to perform the assessment. Beyond that there may be a fee for registration of the product and related data and a further fee for listing on a publicly available database of products approved for deployment in the marketplace in question.

In some jurisdictions radiocommunications licensing fees for service providers are deemed to include a fee for purposes of registering hands-free equipment and in such cases there is no separate registration fee for such apparatus.<sup>6</sup>

### **Assessment and reassessment fee**

The assessment and reassessment fee relates to administrative costs involved in reviewing certification applications to ensure that the equipment complies with the appropriate technical requirements, specifications or standards. This fee is assessed per product model regardless of the number of standards being assessed. The fee includes a charge for the administration of the application, the technical examination, and the review of the brief and the issuance or renewal of a certificate.

### **Technical expertise fee**

Technical expertise may be provided by the type approval authority for services such as assistance in evaluating the technical competence of conformity assessment bodies, performing reassessment, as well as reviewing applications for multiple listings, family approval or transfer of a certificate. This fee would also include equipment set-up time, testing time, report preparation, examination and approval of the report by the laboratory supervisor. This fee is calculated at the established rate per person-hour or part thereof of the type approval authority in the relevant jurisdiction. Upon request, a type approval authority can usually provide an estimate of the cost for testing services or technical support to its clients. The type approval authority may request full payment of the estimated cost before service is provided in order to be assured of cost recovery. Progress payments would normally be required for situations where longer than normal test times are needed. In cases where travel is required, travel expenses are also be factored into the estimated cost.

### **Listing fees**

The listing fee is for the administrative action required to record the equipment in the relevant list of approved apparatus. This fee may apply to each product model listed.

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<sup>5</sup> <http://laws-lois.justice.gc.ca/eng/acts/r-2/page-1.html>

<http://laws-lois.justice.gc.ca/eng/acts/t-3.4/>

<sup>6</sup> Industry Canada fees: [www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/trc-49-i8-oct2011.pdf/\\$file/trc-49-i8-oct2011.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/trc-49-i8-oct2011.pdf/$file/trc-49-i8-oct2011.pdf)

### Registration fees

As part of the conformity assessment process, equipment may also require to be registered with the type approval authority. In this case a registration fee is assessed to cover the development and maintenance cost of the approval programme and the administration required in recording the equipment on the list of approved products. This fee may apply to each product model listed or to a family of products that are electrically identical.

### Payment of fees

In the general case fees are payable before services are rendered. For example, in most cases, the fee is payable at the time of making the application for assessment, reassessment, listing and/or registration.

## 2.3 Law enforcement and surveillance; safeguards; post-market surveillance; sanctioning and other legal provisions and procedures

### Market surveillance

The objective of market surveillance of deployed telecommunication equipment is to ensure that products placed on the market do not cause electromagnetic interference, harm the public telecommunications network, and endanger health, safety or any other aspect of protection of public interests<sup>7</sup>.

In practice, market surveillance includes any necessary action (e.g. prohibitions, withdrawals, recalls) to stop the circulation of products that do not comply with all the requirements set out in the relevant legislation and regulations, to bring the products into compliance and to apply sanctions.

Market surveillance is vital to the smooth functioning of the telecommunications marketplace. It is essential in protecting consumers and workers against risks presented by non-compliant products. In addition, market surveillance helps to protect responsible businesses from unfair competition by unscrupulous economic operators who ignore the rules or cut corners.

Many regulatory bodies worldwide have specific legal requirements for the organization of market surveillance. Regulations characteristically set out clear obligations for market surveillance authorities, stipulating that they must have the necessary powers, resources and knowledge to properly perform their functions. The regulation requires procedures to be put in place for following up complaints, monitoring accidents, verifying that corrective action has been taken and gathering scientific and technical knowledge concerning safety issues. In addition, ITU Member States must establish, implement and periodically update national market surveillance programs and review and assess the functioning of their surveillance activities periodically e.g. every few years.

Information exchange and effective cross-border co-operation between market surveillance authorities in different ITU Member States is very helpful in ensuring efficient, comprehensive and consistent market surveillance in the region. Mutual recognition arrangements/agreements on conformity assessment of telecommunication equipment among like-minded regulatory authorities can facilitate such trusted cooperation, based on robust credentials of the participants.

### Investigation of possibilities to use the adopted C&I regime integrated with national procedures to combat counterfeit ICT equipment in the marketplace

The fast development of the information society has led to the arrival of new problems associated with the counterfeit of ICT equipment. One of the most important problems is in regard to protecting intellectual property items, including software, and ICT products including mobile telecommunications products which have attracted more than their share of counterfeit attacks. At present in many countries, including countries with developed economies, the legislation has proved to be unprepared to resolve such issues although this is changing with a number of countries introducing targeted legislation dealing explicitly with

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<sup>7</sup> Market surveillance EEC: [www.erodocdb.dk/docs/doc98/official/pdf/eccrep015.pdf](http://www.erodocdb.dk/docs/doc98/official/pdf/eccrep015.pdf)

fraud and counterfeit. This is one of a number of key problems associated with the development of an information society. Legislation must be backed up with market surveillance and enforcement with stiff penalties for infractions in order to be effective.

### **Combatting counterfeiting**

ITU-T Study Group 11 approved in 2014 a comprehensive report on counterfeit equipment<sup>8</sup>. The following section is adapted from the SG 11 draft report.<sup>9</sup>

One very basic tool for combatting counterfeiting is by marking products so that they can be authenticated. Labels and embossing that are difficult to forge can be attached to products and serial numbers assigned that can be used to authenticate that the item is genuine. This approach has been used in the telecommunication equipment industry for many years. Nevertheless mobile phones are especially targeted with some 250 million counterfeits sold that constitute an estimated 15 to 20 per cent of the global market in terms of units sold annually. This shows that such robust marking is by no means fool proof and that the mobile telecommunications customer equipment market in particular is rife with counterfeit equipment. Even government sanctioned regulatory markings with stiff penalties for infractions have failed to dissuade counterfeiters.

Strict control of supply chains, and possibly of complete product lifecycles, is required with testing and certification as necessary to ensure that quality standards are met. In addition, customs officials need to be given the tools to identify counterfeit products and market surveillance and enforcement measures may be employed. In addition importers with a track record of ignoring import controls can be identified and put on a special list. When shipments of ICT equipment are being imported by rogue importers regulatory authorities can be notified so that a decision can be made to carry out inspections and enforcement should this be warranted.

The legal instruments to combat counterfeiting are largely in place but enforcement is still weak. The 2008 OECD report on the economic impact of counterfeiting<sup>10</sup> concluded that the “magnitude and effects of counterfeiting and piracy are of such significance that they compel strong and sustained action from governments, business and consumers. More effective enforcement is critical in this regard, as is the need to build public support to combat the counterfeiting and piracy. Increased co-operation between governments, and with industry, would be beneficial, as would better data collection.”

Some countries, such as Colombia for example have taken direct action to combat counterfeiting. In 2011 the Ministry of Information and Communication Technologies of Colombia issued Decree 1630 for the purpose of establishing mechanisms aimed at controlling the marketing and sale of both new and used terminal devices and creating two types of centralized databases, one that has a registry of the International Mobile Equipment Identity (IMEI). The draft report highlights the concrete actions of some 12 countries and two major regional bodies in combatting counterfeit products.

### **International Mobile Equipment Identity (IMEI)**

As already noted mobile phones have been a particularly attractive target for counterfeiters and, in response, the Mobile Manufacturers Forum has created a website giving information for consumers on how to spot counterfeit phones and batteries - [spotafakephone.com](http://spotafakephone.com). They advise that one should get to know the appearance, capabilities, availability and price of the genuine articles and also check the IMEI number. The IMEI is a unique identifier for each mobile phone and counterfeits often do not have an IMEI or have a fake number. A tool to check the validity of an IMEI is provided by international numbering plans.

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<sup>8</sup> [www.itu.int/pub/T-TUT-CCICT-2014](http://www.itu.int/pub/T-TUT-CCICT-2014)

<sup>9</sup> ITU SG 11 TD GEN 0341 Rev.1 draft technical report on counterfeit equipment: [www.itu.int/md/t13-sg11-140221-td-gen-0341/en](http://www.itu.int/md/t13-sg11-140221-td-gen-0341/en)

<sup>10</sup> OECD ICCT product classification report: [www.oecd.org/sti/ieconomy/2771160.pdf](http://www.oecd.org/sti/ieconomy/2771160.pdf)

Today, there are a number of systems based on IMEI registration, which are operated or planned by individual administrations and regulatory authorities to identify genuine and legally imported mobile terminals. Different regional initiatives and approaches have been already launched to implement national, regional and international actions and measures for information exchange on mobile terminal devices of illegal origin. To assist the regulatory authorities in protecting consumers, operators and governments from the negative effects of counterfeit mobile devices, the regional regulatory associations recommended that ITU will conduct studies and provide guidelines and recommendations.

International standards development bodies are also active in the fight to combat counterfeiting. Among these, International Committee ISO/IEC 15459 defines unique identifiers for supply chain tracking that can be represented in Automatic Identification and Data Capture (AIDC) media such as barcodes and RFID.

ISO Technical Committee 246 is chartered to produce standard anti-counterfeiting tools. This committee is developing a standard on the performance criteria for authentication solutions for combating the production of counterfeit goods.

ITU-T is working on systems for accessing multimedia information triggered by the tag-based identification of things. As part of this work a description of the various identification schemes that could be used, for example, for ICT products, is being produced. ITU-T Recommendation X.668 provides an important tool for specifying the information and justification to be provided when requesting an object identifier (OID) for such identification schemes, and the procedures for the operation of a registration authority.

### **ITU engagement**

Resolution COM5/4 of the 2014 ITU Plenipotentiary Conference<sup>11</sup> “invites Member States and Sector Members to bear in mind the legal and regulatory frameworks of other countries concerning equipment that negatively affects the quality of their telecommunication infrastructure and services, in particular recognizing the concerns of developing countries with respect to counterfeit equipment”.

Resolution COM5/4 also instructs the Directors of the three Bureaux to “assist Member States in addressing their concerns with respect to counterfeit telecommunication/ICT devices through information sharing at regional or global level, including conformity assessment systems”.

According to the *Guidelines for developing countries on establishing conformity assessment testing labs in different regions* published by the ITU Telecommunication Development Bureau in May 2012<sup>12</sup> Member States indicated that counterfeit equipment is having a measureable impact on conformance and interoperability problems. It is noted that “suspicion of dumping of sub-standard products in the marketplace which have failed testing in other countries is a further cause of concern as is the importation and deployment of counterfeit products. A key component of the answer to such concerns is to have a robust type approval regime and testing laboratory working from a set of technical standards, a testing regime and testing capability to approve and monitor communications technologies which are being deployed on the marketplace, backed up by surveillance, audit and enforcement. If there are no established technical requirements, type approval regime and testing labs available to a country or region then the marketplace is left largely unprotected”.

WTDC 2014 Resolution 79<sup>13</sup> entitled “The role of telecommunications/information and communication technologies in combating and dealing with counterfeit telecommunication/information and communication devices” captures these issues in some detail and already workshops and seminars have been announced to begin the conversation on how to achieve the objectives of this important Resolution. Most of the text is repeated here below for ready reference as it captures very well the full scope of actions needed:

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<sup>11</sup> [www.itu.int/en/plenipotentiary/2014/Documents/final-acts/pp14-final-acts-en.pdf](http://www.itu.int/en/plenipotentiary/2014/Documents/final-acts/pp14-final-acts-en.pdf)

<sup>12</sup> [www.itu.int/ITU-D/tech/ConformanceInteroperability/ConformanceInterop/Guidelines/Test\\_lab\\_guidelines\\_EV8.pdf](http://www.itu.int/ITU-D/tech/ConformanceInteroperability/ConformanceInterop/Guidelines/Test_lab_guidelines_EV8.pdf)

<sup>13</sup> [www.itu.int/md/D10-WTDC14-C-0118/en](http://www.itu.int/md/D10-WTDC14-C-0118/en)

*recognizing*

a) that counterfeit telecommunication/ICT products and devices have become a growing problem in the world, adversely affecting to a large extent all stakeholders in the ICT field (vendors, governments, operators and consumers);

b) that several countries have introduced some awareness-raising campaigns, practices and regulations in their markets in order to limit and deter counterfeit products and devices, which have had a positive impact, and that developing countries may benefit from this experience,

*taking into account*

a) that, with the boom in telecommunications/ICTs, counterfeit telecommunication/ICT devices have increased noticeably in recent times;

b) that these counterfeit devices affect economic growth and intellectual property rights, impede innovation, are hazardous to health and safety and have an impact on the environment and the increasing amount of harmful e-waste;

c) that ITU and relevant stakeholders have a key role to play in fostering coordination between the parties concerned to study the impact of counterfeit devices and the mechanism for limiting them and to identify ways of dealing with them internationally and regionally,

*aware*

a) that governments play an important role in combating the manufacture of and international trade in counterfeit and copied devices by formulating appropriate strategies, policies and legislation;

b) of the current work and studies in Study Group 11 of the ITU Telecommunication Standardization Sector (ITU-T) and of relevant activities in other relevant forums;

c) of the current work and studies in Study Group 1 of the ITU Telecommunication Development Sector (ITU-D) under Question 24/1, on strategies and policies for the proper disposal or reuse of telecommunication/ICT waste material;

d) of the current work and studies in ITU-T Study Group 5, on the health and environmental impact of telecommunication equipment, particularly peripheral, mobile and handheld equipment,

*resolves to instruct the Director of the Telecommunication Development Bureau, in close collaboration with the Director of the Telecommunication Standardization Bureau and the Director of the Radiocommunication Bureau*

1 to continue to increase and develop ITU activities on combating, and ways of limiting the spread of, counterfeit devices;

2 to assist Member States, particularly developing countries, in addressing their concerns regarding counterfeit devices;

3 to continue to work in collaboration with stakeholders (such as the World Trade Organization (WTO) and World Intellectual Property Organization (WIPO)), including academia and relevant organizations, to coordinate activities relating to combating counterfeit devices through study groups, focus groups and other related groups;

4 to organize seminars and workshops to raise awareness of the health and environmental risks of using counterfeit devices and ways of limiting them, particularly in developing countries, which are the most at risk from the dangers of counterfeit devices;

5 in collaboration with WTO, WIPO and other relevant bodies, to restrict the trading, export and circulation of counterfeit devices internationally;

6 to submit periodic reports on the implementation of this resolution,



*instructs ITU-D Study Group 1, in collaboration with the relevant ITU study groups*

- 1 to prepare and document examples of best practices on limiting counterfeit and copied devices, for distribution to ITU Member States and Sector Members;
- 2 to prepare guidelines, methodologies and publications to assist Member States in identifying counterfeit devices and methods of increasing public awareness to restrict trade in these devices, as well as the best ways of limiting them;
- 3 to study the impact of counterfeit telecommunication/ICT devices being transported to developing countries;
- 4 to continue studying safe ways of disposing of the harmful e-waste from the counterfeit devices currently in circulation in the world,

*invites Member States*

- 1 to take all necessary measures to combat counterfeit devices;
- 2 to cooperate and exchange expertise among themselves in this area;
- 3 to incorporate policies to combat counterfeit devices in their national telecommunication/ICT strategies,

*invites telecommunication operators*

to cooperate with governments, administrations and telecommunication regulators in combating counterfeit devices, restricting trade in these devices and disposing of them safely,

*encourages Member States, Sector Members and Academia*

to participate actively in ITU-D studies relating to combating counterfeit devices by submitting contributions and in other appropriate ways.”

## **2.4 Coordination and harmonization of the C&I regime with other national regulatory agencies**

Design and implementation of a new telecommunications regulatory regime, together with the necessary up-front policy and legislative work, is a daunting task. A fully developed regulatory system requires a trusted and recognized accreditation system, testing laboratories, certification bodies, market surveillance, and audit and enforcement capabilities to determine compliance and assess penalties for non-compliance. The absence of any one of these components may result in the regulations having little positive impact on compliance in the marketplace.

These challenges all have significant financial and expert resource implications. Consequently, some developing countries have adopted an interim measure in lieu of establishing their own regulatory system namely by recognizing regulatory and certification marks of other jurisdictions. These then are used as mandatory requirements for importation and deployment of telecommunication equipment in their marketplaces. Amongst such recognized markings are those of the EU, FCC, IC and ANATEL, and in some cases all four, or even additional marks. The benefit of such an approach is that it can reduce the level of chaos in the marketplace with minimal investments by the regulatory or government authority, and within a short timeframe. Potential shortcomings of the approach can include the problem of remaining up to date with what technical requirements underpin the mark, deviations in local requirements from foreign marked product capabilities, and no real laboratory capability to assess compliance with adopted marks.

### **Mutual recognition arrangements/agreements**

Another approach to the financial, expertise and resource problems mentioned above may be possible through sharing of facilities using the instrument of mutual recognition arrangements/agreements (MRAs). MRAs on conformity assessment of telecommunication equipment are already in operation in many world regions, between and among countries and between regions. In such cases MRAs based on appropriately robust credentials of the parties and agreed operational processes can permit a wide spectrum of sharing



of facilities and services. The MRA simply recognizes and accepts the competence of the MRA partner to carry out its defined and agreed regulatory procedures. These may be limited to production of test result for purposes of certification, or include both testing and certification and marking. However it is an essential requirement for entering into an MRA that the parties have the requisite authority to negotiate and develop the MRA. This is because MRAs have implications related to delegation of sovereign powers between the parties, such as production of test results for purposes of certification, acceptance of test results and providing certification, affixing registered marks on behalf of the MRA partner and recognizing other competencies such as in calibration of equipment and related metrology functions.

### **Harmonization of technical requirements**

A further approach to reducing resource and expertise costs may be that of harmonization of technical and/or administrative procedures between and among parties. This approach may be possible between and amongst parties with very similar regulatory requirements. However in some jurisdictions, even those with very similar technical and administrative procedures, it has proved difficult to achieve success. The difficulties include coordination of deviations in technical specifications and therefore test suites, differences in regulatory philosophies, scope of regulations and so on.

So one pragmatic way forward for a region with like-minded authorities and similar problems in scarcity of resources and funding for a fully developed national telecommunication regulatory system could be to establish a forum, or use an existing one to discuss how to proceed in a cooperative way to deal with this matter. A framework MRA for example could provide the basis for such a cooperative effort. The discussion would then focus on how to establish shared accreditation, testing and certification capabilities, on what basis these would be funded, how to acquire and deploy the needed expertise, recover costs, establish fees, survey and enforce compliance in the marketplace and so on.

## **3 Definition and publication of ICT reference standards, interface specifications, essential requirements (EMC, safety, SAR) aimed at conformity assessment of ICT equipment**

### **3.1 Basic international standards, standards development processes and case examples covering the essential requirements for ICT products (e.g. health and safety, EMC, protocols, interfaces)**

In the context of these C&I guidelines the pre-eminent category of ICT products under consideration is those with telecommunications capabilities. In this field a specific large sub-category of equipment has mandatory technical specifications as part of the regulatory requirements which must be met in order to be deployed in the marketplace. These requirements (essential requirements) may be expressed in discrete categories as follows: broadcasting equipment standards, radio equipment standards, digital television standards (DTV), electromagnetic compatibility standards, and terminal equipment - technical specifications.

These standards are developed primarily in accordance with decisions made and ratified in the International Telecommunication Union (ITU), International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) combined with regional, national and industry standards requirements and are therefore a complex and very complete set of requirements which are vitally important to an interference free and safe environment for ICT products. A number of regional standards bodies serving specific regional policies, regulations and requirements are heavily engaged in development and promulgation of the product standards and include the European Telecommunications Standards Institute, USA Telecommunications Industry Association, and various important forums and consortia such as 3GPP.

The process to arrive at many of these equipment standards and specifications stems primarily from the basic work of the ITU membership at the ITU World Telecommunications Standardization Assembly (WTSA), and from the ITU world radiocommunication conferences (WRCs) where decisions are made regarding what services are to be defined in specific frequency bands. This in turn guides national and regional decisions on determining their frequency band plans for various services including broadcast and other

radiocommunications services and usage. Following this, frequency band plan guides are developed for national and regional frequency allocations, known as standard radio system plans.

The final step is the development of radio equipment standards which establish the frequency spectrum masks and related requirements for the radiocommunication equipment taking into account band separation, filtering, signal power levels and so on.

ITU-T SG11 is continuously updating the living list<sup>14</sup> of Recommendations and related specifications within key technologies suitable for C&I testing and the reference table<sup>15</sup> listing ITU-T Recommendations which are under ICT industry testing practice.

### **3.2 Consideration of World Trade Organization (WTO) rules and the Agreement on Technical Barriers to Trade**

The primary purpose of the World Trade Organization (WTO) is to open trade for the benefit of all<sup>16</sup>. The WTO Agreement on Technical Barriers to Trade, commonly referred to as the TBT agreement tries to ensure that regulations, standards, testing and certification procedures do not create unnecessary obstacles, while also providing members with the right to implement measures to achieve legitimate policy objectives, such as the protection of human health and safety, or the environment. It is therefore an important recommendation that unless there are overriding national considerations, technical specifications, procedures and requirements for ICT products should be based on open and transparent international standards and norms.

Technical regulations and product standards may vary from country to country but having many different regulations and standards makes life difficult for producers and exporters. Furthermore technical standards and regulations could be used as an excuse for protectionism, in effect becoming an intentional technical barrier to trade. The Principles of the TBT agreement are as follows:

- (1) Avoidance of unnecessary obstacles to trade,
- (2) Non-discrimination and national treatment,
- (3) Harmonization,
- (4) Equivalence of technical regulations,
- (5) Mutual recognition of conformity assessment procedures, and
- (6) Transparency.

For example, members shall accord equal treatments for other members on technical regulations, standards and conformity assessment procedures to all products, including ICT products. The agreement also requires members to use relevant international standards or to use a part of relevant parts of them if they exist, as a basis for their technical regulations, standards and conformity assessment procedures.

The TBT agreement requires all WTO Members to notify technical regulations and conformity assessment procedures - when they are not in accordance with the technical content of relevant international standards or if such standards do not exist - through the WTO Secretariat to the other WTO Members. This allows other WTO Members to become acquainted with new product requirements and to comment on them in case they are not in compliance with the TBT agreement. It also allows an exchange of views to be initiated

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<sup>14</sup> [www.itu.int/en/ITU-T/C-I/Pages/CI-living-list-table.aspx](http://www.itu.int/en/ITU-T/C-I/Pages/CI-living-list-table.aspx)

<sup>15</sup> [www.itu.int/en/ITU-T/C-I/Pages/CI-reference.aspx](http://www.itu.int/en/ITU-T/C-I/Pages/CI-reference.aspx)

<sup>16</sup> [www.wto.org/english/docs\\_e/legal\\_e/17-tbt.pdf](http://www.wto.org/english/docs_e/legal_e/17-tbt.pdf)

with the authorities of third countries before the adoption of the measure, which can lead to a modification or even a withdrawal of the proposal. In order to facilitate this, the WTO publicizes a list of National Inquiry Points.

The TBT agreement is a substantial document and therefore is not repeated in these C&I Guidelines<sup>17</sup>. Articles 5 through 9 of the agreement deal specifically with “Conformity with Technical Regulations and Standards” and Article 12 deals with “Special and Differential Treatment of Developing Country Members”.

### 3.3 List of ICT equipment requiring conformity assessment

A non-exhaustive list of such equipment would include:

- broadcasting transmitters
- portable radio transmitters
- digital scanner receivers
- remote car alarms and starters
- garage door openers
- wireless computer links
- cellular phones
- cordless phones
- fax machines
- GSM telephones
- mobile radios
- modems
- wireless remote devices
- PABXs (including small business systems and key systems)
- pagers
- radio receivers
- radio transmitters
- telephone instruments
- telex equipment
- other equipment emitting a radio signal;
- any customer premises equipment to be attached to any part of a licensed telecommunication network.

Standards and conformity assessment apply to the following types of “radiating” equipment<sup>18</sup>:

- **Radio apparatus:** A device or combination of devices intended for, or capable of being used for, radiocommunication (includes a broad range of equipment from remote car alarms to high-powered broadcast transmitters).
- **Interference-causing equipment:** Any device, machinery or equipment, other than radio apparatus, that can cause interference to radiocommunication (includes digital equipment that

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<sup>17</sup> For the full text see: [www.wto.org/english/docs\\_e/legal\\_e/17-tbt.pdf](http://www.wto.org/english/docs_e/legal_e/17-tbt.pdf)

<sup>18</sup> See Industry Canada certification/standards: [www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h\\_sf06165.html](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf06165.html)

uses a microprocessor or microcontroller, and Industrial, Scientific and Medical equipment such as switching power supplies used in halogen lamps).

- **Radio-sensitive equipment:** Any device, machinery or equipment, other than radio apparatus, that can be adversely affected by radiocommunication emissions (includes consumer electronics and industrial controls).

In some jurisdictions, for simplicity and ease of reference the list of relevant standards and equipment types are divided into two categories<sup>19</sup>, **Category I and Category II** defined as follows:

**Category I** equipment which must meet technical standards and requires a certificate (Certification) in certain countries.

Examples of Category I equipment:

- high power licensed transmitters such as broadcast transmitters,
- taxi or police mobile radios,
- point-to-point broadband wireless links,
- satellite telephones,
- cellular and Personal Communication System (PCS) telephones,
- low power licence-exempt transmitters and receivers such as Wi-Fi routers,
- vehicle remote keyless entry,
- alarm motion sensors,
- Family Radio System (FRS),
- General Mobile Radio system (GMRS),
- licence-exempt personal communication system (PCS) such as DECT phones,
- Ultra Wideband (UWB) equipment.

**Category II** equipment must meet technical standards but does not have to be certified in certain countries.

Examples of Category II equipment:

- very low power transmitters and standalone receivers such as remote control toys,
- wireless mouse and keyboards,
- GPS receivers,
- television satellite receivers,
- many consumer electronic devices emitting unintentional RF radiation such as microwave ovens,
- DVD players,
- computers,
- game consoles,
- digital coffee machines,
- vehicle ignition systems,
- broadband over power lines (BPL),
- electronic transformers,
- alarm keypads,

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<sup>19</sup> See Industry Canada spectrum/standards: [www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h\\_sf01375.html](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf01375.html)

- intelligent battery chargers,
- VCRs.

### 3.4 Member State example of structure and scope of telecommunication technical requirements

The following section provides an example of how regulatory standards in telecommunications are structured in a particular ITU Member State (in this case Canada) for broadcasting, radiocommunications, wireline equipment, electromagnetic compatibility (EMC) and specific absorption rate (SAR). The example also shows how the listings of the standards can be displayed as **Category I** and **Category II** lists as explained above<sup>20</sup> and a selection of the more widely used standards is provided below.

#### Radio equipment standards

- Radio Standards Specifications (RSS)
  - RSS-Gen — General Requirements and Information for the Certification of Radio Apparatus  
Issue 3, December 2010
  - RSS-102 — Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)  
Issue 4, March 2010
  - RSS-112 — Land Mobile and Fixed Equipment Operating in the Band 1670-1675 MHz  
Issue 1, February 2008
  - RSS-119 — Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services in the Frequency Range 27.41-960 MHz  
Issue 11, June 2011
  - RSS-123 — Licensed Low-Power Radio Apparatus  
Issue 2, February 2011
  - RSS-125 — Land Mobile and Fixed Radio Transmitters and Receivers 1.705 to 50.0 MHz, Primarily Amplitude Modulated  
Issue 2, Revision 1, March 25, 2000
  - RSS-130 — Mobile Broadband Services (MBS) Equipment Operating in the Frequency Bands 698-756 MHz and 777-787 MHz  
October 2013
  - RSS-133 — 2 GHz Personal Communications Services  
Issue 6, January 2013
  - RSS-191 — Local Multipoint Communication Systems in the Band 25.35-28.35 GHz; Point-to-Point and Point-to-Multipoint Broadband Communication Systems in the Bands 24.25-24.45 GHz and 25.05-25.25 GHz; and Point-to-Multipoint Broadband Communications in the Band 38.6-40.0 GHz  
Issue 3, April 2008
  - RSS-192 — Fixed Wireless Access Equipment Operating in the Band 3450-3650 MHz  
Issue 3, January 2008
  - RSS-210 — Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment  
Issue 8, December 2010
  - RSS-213 — 2 GHz Licence-exempt Personal Communications Service Devices (LE-PCS)  
Issue 2, December 2005
  - RSS-310 — Licence-exempt Radio Apparatus All Frequency Bands): Category II Equipment  
Issue 3, December 2010
- Category I Equipment Standards

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<sup>20</sup> Full details on each element can be seen at the following website [www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h\\_sf01375.html](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf01375.html)

BETS-1 - Technical Standards and Requirements for Low Power Announce Transmitters in the Frequency Bands 525-1,705 kHz and 88-107.5 MHz

Issue 1, November 1, 1996

BETS-4 - Technical Standards and Requirements for Television Broadcasting Transmitters

Issue 1, November 1, 1996

BETS-5 - Technical Standards and Requirements for AM Broadcasting Transmitters

Issue 1, November 1, 1996

BETS-6 - Technical Standards and Requirements for FM Broadcasting Transmitters

Issue 2, August 2005

RSS-102 - Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Updated December 2010,

Issue 4, March 2010

RSS-111 - Broadband Public Safety Equipment Operating in the Band 4940-4990 MHz

Issue 4, January 2012

RSS-112 - Land Mobile and Fixed Equipment Operating in the Band 1670-1675 MHz

Issue 1, February 2008

RSS-118 - Land and Subscriber Stations: Voice, Data and Tone Modulated, Angle Modulation Radiotelephone Transmitters and Receivers Operating in the Cellular Mobile Bands

824-849 MHz and 869-894 MHz

Issue 2, August 19, 1990

RSS-119 - Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41-960 MHz

Issue 11, June 2011

RSS-123 - Low Power Licensed Radiocommunication Devices

Issue 2, February 2011

RSS-191 - Local Multipoint Communication Systems in the Band 25.35-28.35 GHz; Point-to-Point and Point-to-Multipoint Broadband Communication Systems in the Bands 24.25-24.45 GHz and 25.05-25.25 GHz; and Point-to-Multipoint Broadband Communications in the Band 38.6-40.0 GHz

Issue 3, April 2008

RSS-192 - Fixed Wireless Access Equipment Operating in the Band 3450 - 3650 MHz

Issue 3, January 2008

- Category II Equipment Standards

BETS-3 - Technical Standards and Requirements for Radio Apparatus that Form Part of a Master Antenna Television (MATV) Broadcasting Undertaking

Issue 1, November 1, 1996

BETS-7 - Technical Standards and Requirements for Radio Apparatus Capable of Receiving Television Broadcasting

Issue 1, November 1, 1996

ICES-001 - Industrial, Scientific and Medical Radio Frequency Generators

Issue 4, June 2006

ICES-002 — Vehicles, Boats and Other Devices Propelled by an Internal Combustion Engine, Electrical Means or Both

Issue 6, March 2013

ICES-003 — Information Technology Equipment (ITE) - Limits and methods of measurement

Issue 5, August 2012

ICES-004 - Alternating Current High Voltage Power Systems

Issue 3, December 2001

ICES-005 - Radio Frequency Lighting Devices

Issue 3, May 2009

ICES-006 - AC Wire Carrier Current Devices (Unintentional Radiators)

Issue 2, June 2009

RSS-Gen - General Requirements and Information for the Certification of Radiocommunication

Equipment

Issue 3, December 2010

RSS-102 - Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

Updated December 2010, Issue 4, March 2010

RSS-310 - Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands):

Category II Equipment

Issue 3, December 2010

- License-exempt Radio Apparatus Standards

RSS-Gen — General Requirements and Information for the Certification of Radiocommunication Equipment

Issue 3, December 2010

RSS-210 — Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands):

Category I Equipment

Issue 8, December 2010

RSS-213 — 2 GHz Licence-exempt Personal Communications Service Devices (LE-PCS)

Issue 2, December 2005

RSS-215 — Analogue Scanner Receivers

Issue 2, June 2009

RSS-220 — Devices Using Ultra-Wideband (UWB) Technology

Issue 1, March 2009

RSS-236 — General Radio Service Equipment Operating in the Band 26.960 to 27.410 MHz (Citizens Band)

Issue 1, September 2012

RSS-310 — Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands):

Category II Equipment

Issue 3, December 2010

### Special note on specific absorption rate (SAR)

#### Limits of human exposure to radiofrequency electromagnetic energy in the frequency range from 3 kHz to 300 GHz

This is intended as an important note to explain in a little more detail the reason and purpose for technical compliance to standards in the area of exposure limits to humans of radiofrequency energy.

At the international level the International Commission on Non-Ionizing Radiation Protection (ICNIRP)<sup>21</sup> has published a set of “Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz – 100 kHz)”. The main objective of this publication is to establish guidelines for limiting exposure to electric and magnetic fields (EMF) that will provide protection against all established adverse health effects. This document provides a detailed treatment of the issue with scientific findings, examples, and specific commentary on potential health effects where reasonable limits are exceeded. This international guidelines document may be viewed at<sup>22</sup>

The limits of human exposure to radiofrequency electromagnetic energy take into account the total RF exposure from all sources of RF energy. For example, in a given area, the combined RF energy from all cell towers and other wireless infrastructure are not to exceed the limits specified by the national body responsible for establishing these limits. These limits are normally established by the national body responsible for the health of the public in a Member State e.g. Department of Health or equivalent agency. Therefore, no adverse health effects are expected from exposure to RF emitting devices if the devices adhere to these limits. This is the case for example for radio frequency transmission towers, cellular

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<sup>21</sup> [www.icnirp.org/en/home/index.html](http://www.icnirp.org/en/home/index.html)

<sup>22</sup> [www.icnirp.de/documents/LFgdl.pdf](http://www.icnirp.de/documents/LFgdl.pdf)

telephones, laptops and other devices which may adversely affect human tissue by being in close contact with the body or by transmitting radiofrequency energy at significant levels from a distance.

As a practical example, in Canada the exposure limits have been established by scientific studies related to thermal and possible non-thermal effects of RF energy on biological systems. Safety factors have been incorporated into these limits to add an additional level of protection. A safety factor of 10 has been incorporated for exposures in controlled environments such as radio tower facilities. A safety factor of 50 has been incorporated for exposures in uncontrolled environments such as in use of cellular phones or other devices whose proximity to various parts of the human body may vary in positioning. The regulation in this matter in Canada is known as Safety Code 6<sup>23</sup> and is the responsibility of the Canadian Department of Health.

Specialized measurement systems have been developed to permit determination of the SAR value of a given product or system in order to assess compliance with the Safety Code 6, or a similar standard in another jurisdiction. Operation of these measurement systems require specialized training and may include the selection and use of special fluids to simulate brain and body fluids, robotics for automated measurements and probing, mannequins to simulate body parts and other highly technical equipment.

### **Broadcasting equipment standards**

- Broadcasting Equipment Technical Standards (BETS)

BETS-1 — Technical Standards and Requirements for Low Power Announce Transmitters in the Frequency Bands 525-1,705 kHz and 88-107.5 MHz, Issue 1, November 1, 1996

BETS-3 — Technical Standards and Requirements for Radio Apparatus that Form Part of a Master Antenna Television (MATV) Broadcasting Undertaking, Issue 1, November 1, 1996

BETS-4 — Technical Standards and Requirements for Television Broadcasting Transmitters, Issue 1, November 1, 1996

BETS-5 — Technical Standards and Requirements for AM Broadcasting Transmitters, Issue 1, November 1, 1996

BETS-6 — Technical Standards and Requirements for FM Broadcasting Transmitters, Issue 2, August 2005

BETS-7 — Technical Standards and Requirements for Radio Apparatus Capable of Receiving Broadcasting, Issue 2, June 2008

- Broadcasting Certificate Exempt Radio Apparatus List

BETS-1 - Technical Standards and Requirements for Low Power Announce Transmitters in the Frequency Bands 525-1,705 kHz and 88-107.5 MHz, Issue 1, November 1, 1996

BETS-3 - Technical Standards and Requirements for Radio Apparatus that Form Part of a Master Antenna Television (MATV) Broadcasting Undertaking, Issue 1, November 1, 1996

### **Digital television standards (DTV)**

ITU has a comprehensive set of international standards dealing with digital and analogue television services. Examples of these standards may be accessed at the following webpage address<sup>24</sup>. For a single country example, the Advanced Television Systems Committee, Inc. standards are used in Canada for digital audio compression standards and digital television standards<sup>25</sup>.

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<sup>23</sup> [www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01904.html](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01904.html)

<sup>24</sup> [www.itu.int/rec/R-REC-BT/en](http://www.itu.int/rec/R-REC-BT/en)

<sup>25</sup> [www.atsc.org/cms/index.php/standards](http://www.atsc.org/cms/index.php/standards)



### Electromagnetic compatibility standards

At the international level, ITU-T has a comprehensive set of international standards in the K-series from Study Group 5 dealing with electromagnetic compatibility and related topics including immunity<sup>26</sup>. The following series of standards are examples of EMC standards of a single country, Canada, largely adopted or adapted from the IEC CISPR (International Special Committee on Radio Interferences) standards dealing with EMC interference aspects.

ICES-001 — Industrial, Scientific and Medical (ISM) Radio Frequency Generators, Issue 4, June 2006

ICES-002 — Vehicles, Boats and Other Devices Propelled by an Internal Combustion Engine, Electrical Means or Both, Issue 6, March 2013

ICES-003 — Information Technology Equipment (ITE) - Limits and methods of measurement, Issue 5, August 2012

ICES-004 — Alternating Current High Voltage Power Systems, Issue 4, June 2013

ICES-005 — Radio Frequency Lighting Devices, Issue 3, May 2009

ICES-006 — AC Wire Carrier Current Devices (Unintentional Radiators), Issue 2, June 2009

### Terminal equipment standards

The standard referenced here “*CS-03 — Compliance Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility*” is an eight part standard<sup>27</sup> that provides the technical requirements for connection of terminal equipment to public networks and for hearing aid compatibility with handsets. It contains the compliance specifications for terminal equipment, terminal systems, network protection devices, connection arrangements and hearing aid compatibility. The document contains the following parts and may be viewed in full at the following link<sup>28</sup>:

- Part I specifies the requirements for analogue terminal equipment intended for connection to the public switched network (e.g. equipment connected to loop start lines, tie trunks, etc.).
- Part II specifies the requirements for digital terminal equipment intended for connection to 1.544 Mbps (DS-1) digital facilities.
- Part III specifies acceptable methods of connection for terminal equipment. Updated June 2013.
- Part IV is a glossary of terms used throughout the document.
- Part V specifies the requirements for the magnetic output from handset telephones for the purpose of coupling with hearing aids. These technical requirements are intended to ensure compatibility between hearing aids and handsets, thus providing persons with hearing aids reasonable access to the telephone network.
- Part VI specifies requirements for Integrated Services Digital Network (ISDN) terminal equipment.

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<sup>26</sup> Examples of these standards may be accessed at: [www.itu.int/ITU-T/recommendations/index.aspx?ser=K](http://www.itu.int/ITU-T/recommendations/index.aspx?ser=K)

<sup>27</sup> Industry Canada: compliance specifications: wireline, hearing aid compatibility: [www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h\\_sf01590.html](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf01590.html)

<sup>28</sup> [www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h\\_sf01590.html](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf01590.html)

- Part VII specifies technical requirements for limited distance modem terminal equipment and digital sub-rate terminal equipment.
- Part VIII specifies technical requirements for a range of Digital Subscriber Line (xDSL) terminal equipment.

### Reference standards and products case study

Table 2 is an extract from the C&I assessment study<sup>29</sup> carried out in the SADC region for ITU by eminent telecommunication consultants from the African region. It gives further concrete examples of international standards, regional standards and forum and consortia standards used in the SADC region.

**Table 2: Example of reference standards and products<sup>30</sup>**

Category	Product	Standard	Technical requirement
User equipment	Mobile	3GPP	Power; frequency stability, frequency in-band emission.
	Landline phone	IEC	Electrical, sound pressure, acoustic chock protection
	PABX	ITU-T Rec. G.711: Pulse code modulation (PCM) of voice frequencies ITU-T Rec. Q.921: ISDN user-network interface – Data link layer specification	protocols
	Charge and Power Adapter	ITU-T Rec. L.1000	Power, energy efficiency, eco-environment specifications
	Personal Area Communication	National Frequency Allocation	Gain, transmission power, bandwidth, frequency stability.
	Residential Optical Unit	ITU-T G.984	Power; frequency stability, frequency in-band emission, SAR limits.
	UTP Cable	ISO/IEC 11801	Return Loss, FEXT, NEXT, bandwidth
RTTE	Mobile-Broadband Base Station	ETSI	Gain, transmission power, bandwidth.
	Antenna	ETSI	Radiation Diagram, Gain, VSWR.
	Broadcast Transmitter	ETSI	Gain, transmission power, frequency width.
	Earth Station Equipment/VSAT	ETSI	Gain, transmission power, bandwidth.

<sup>29</sup> SADC C&I assessment southern Africa region:  
[www.itu.int/en/itu-d/technology/documents/conformanceinteroperability/sadc%20assessment%20study\\_final\\_november13.pdf](http://www.itu.int/en/itu-d/technology/documents/conformanceinteroperability/sadc%20assessment%20study_final_november13.pdf)

<sup>30</sup> SADC C&I assessment southern Africa region:  
[www.itu.int/en/itu-d/technology/documents/conformanceinteroperability/sadc%20assessment%20study\\_final\\_november13.pdf](http://www.itu.int/en/itu-d/technology/documents/conformanceinteroperability/sadc%20assessment%20study_final_november13.pdf)

Category	Product	Standard	Technical requirement
Network equipment	Transmission equipment	ITU-T Rec. G.707	protocols
	Network Switches and Routers	MPLS - G.8121 Ethernet - G.8021 IPTV - H.62X	protocols
	Cables	ISO/IEC 11801	Return Loss, FEXT, NEXT, bandwidth
	IPTV	ITU-T Rec.	See Standard
Electromagnetic Compatibility	All equipment	ITU-T Rec. K.48	Radiated spurious emission, conducted spurious emission, resistibility
Safety	All equipment	ITU-T Rec. K.21	Electrical chock protection, fire protection, overcurrent protection

A similar situation exists in other world regions where a mix of regional, national and international standards is used in deployed systems and products. The problem of non-interoperability experienced by all parties involved in telecommunications systems implementation and operation is further complicated by deviations in products from national and international standards, and the presence of proprietary standards at all levels of system structures. This is why the achievement of smooth interoperability is such a challenge and so complex and often results in performance and service degradations and even the inability to deploy features across various platforms.

So conformity assessment is readily achievable in the context of regulatory compliance, where interoperability is not the challenge. It is therefore important to realize this difference so that expectations of interoperability are realistic and the requirements for interoperability are clearly stated in system acquisition specifications when requests for proposals are formulated.

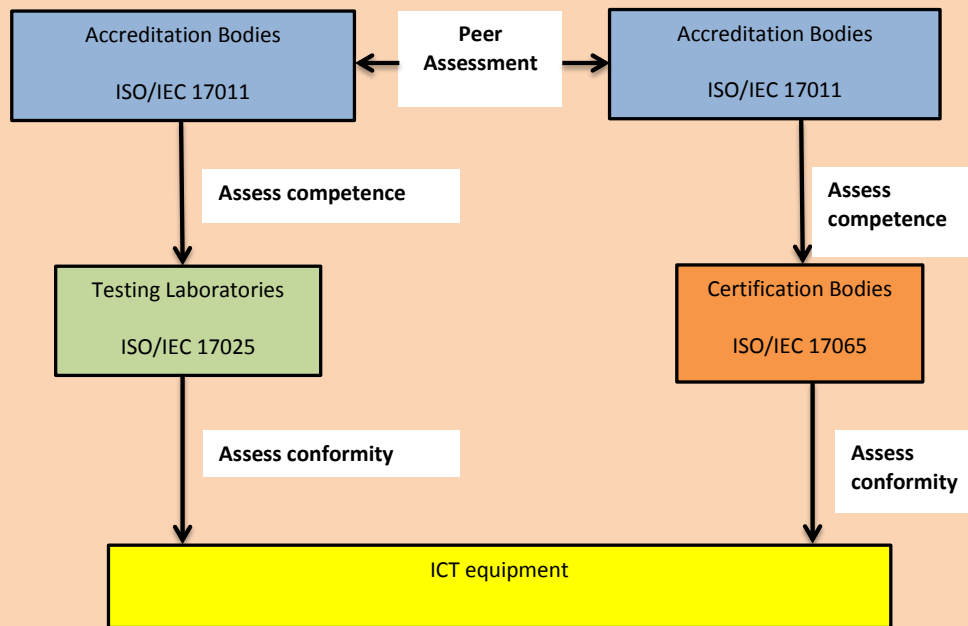
#### 4 Accreditation, recognition and acceptance of conformity assessment bodies and qualified professional

A number of conformity assessment bodies play important roles in the structures and operations of conformity assessment regimes, namely, testing laboratories and certification bodies. In addition, accreditation bodies play an important role in the qualification of testing laboratories and certification bodies.

In the hierarchy of conformity assessment entities and functions (Figure 4), conformity assessment bodies (testing laboratories and certification bodies) assess conformity of ICT equipment to meet specific requirements. It is recommended that testing laboratories have to be ISO/IEC 17025 compliant and certification bodies have to be ISO/IEC 17065 compliant. Accreditation bodies assess the competence of the conformity assessment bodies and accredit these bodies if they are compliant with ISO/IEC 17025 for testing laboratories and with ISO/IEC 17065 for certification bodies.

It is recommended that the accreditation bodies have to be ISO/IEC 17011 compliant. Since there is no entity in this hierarchy higher than the accreditation bodies, the compliance of accreditation bodies with ISO/IEC 17011 is done by peer assessment groups of accreditation bodies. This section describes the qualifications, appointments of these bodies and the inter-relations between these bodies.

**Figure 4: Conformity assessment of ICT equipment**



Source: ITU

#### 4.1 Designation/recognition of accreditation bodies, certification bodies, and testing laboratories

##### Appointment and peer assessment of accreditation bodies

Accreditation is the third-party attestation related to a conformity assessment body conveying formal demonstration of its competence to carry out specific conformity assessment tasks. An accreditation body is an authoritative body that performs accreditation. The authority of an accreditation body is generally derived from government and an accreditation body is usually appointed by the regulatory authority.

It is recommended that an appointed accreditation body meets the requirements of ISO/IEC 17011. Internationally the proof of competence with ISO/IEC 17011 is done by peer assessment.

The International Laboratory Accreditation Cooperation (ILAC)<sup>31</sup> organizes and conducts peer assessment of accreditation bodies that accredit testing laboratories. Accreditation bodies that are successful in the peer assessment become signatories of the ILAC Mutual Recognition Arrangement (ILAC MRA)<sup>32</sup>.

<sup>31</sup> [www.ilac.org/](http://www.ilac.org/)

<sup>32</sup> [www.ilac.org/ilacarrangement.html](http://www.ilac.org/ilacarrangement.html).

ILAC recognizes signatories of the following regional cooperation bodies: the European cooperation for Accreditation (EA)<sup>33</sup>, the Asia Pacific Laboratory Accreditation Cooperation (APLAC), and the Inter-American Accreditation Cooperation (IAAC).

The International Accreditation Forum (IAF)<sup>34</sup> organizes and conducts peer assessment of accreditation bodies that accredit certification bodies. Accreditation bodies that are successful in the peer assessment become signatories of the IAF Multilateral Recognition Arrangements (IAF MLA)<sup>35</sup>. The IAF MLA relies heavily on the MLA of the three regional accreditation groups; the European co-operation for Accreditation (EA), the Pacific Accreditation Cooperation (PAC)<sup>36</sup> and the Inter-American Accreditation Cooperation (IAAC), as it is these groups which perform the majority of the peer evaluation activity not the IAF.

### **Designation/recognition of certification bodies**

For conformity assessment schemes which require certification, the regulators will only accept certifications performed by certification bodies which they have designated or recognized. Similarly for the private sector, service providers and purchasers will only accept certifications performed by certification bodies which they have recognized or specified.

It is recommended that the first step for a certification body to complete the designation/recognition process is to get accreditation by an accreditation body to meet ISO/IEC 17065 requirements.

For mandatory requirements, the certification body will submit the results of its accreditation along with administrative and other information to its regulator for designation. If the scope of accreditation covers requirements of a foreign country and the regulator is engaged in an MRA with that foreign country, the regulator after its designation of the certification body will send the same information to the regulator of its MRA partner for recognition.

For voluntary requirements, the certification body will submit the results of its accreditation along with other information to its clients which would include service providers, associations etc. for recognition. With successful designation/recognition, the certification body will be able to certify ICT equipment to meet the mandatory requirements and the requirements of its clients.

### **Designation/recognition of testing laboratories**

For conformity assessment schemes which require certification or SDoC, the regulators may only accept certifications or SDoCs with test results performed by testing laboratories which they have designated or recognized. Similarly in the private sector, the service providers or purchasers may only accept certifications or SDoCs with test results performed by testing laboratories which they have recognized or specified.

It is recommended that the first step for a testing laboratory to complete the designation/recognition process is to get accreditation by an accreditation body to meet ISO/IEC 17025 requirements.

For mandatory requirements, the testing laboratory will submit the results of its accreditation along with administrative and other information to its regulator for designation. If the scope of accreditation covers requirements of a foreign country and the regulator is engaged in an MRA with that foreign country, the regulator after its designation of the testing laboratory will send the same information to the regulator of its MRA partner for recognition.

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<sup>33</sup> [www.european-accreditation.org/](http://www.european-accreditation.org/)

<sup>34</sup> [www.iaf.nu/](http://www.iaf.nu/)

<sup>35</sup> [www.iaf.nu/articles/IAF\\_MLA/14](http://www.iaf.nu/articles/IAF_MLA/14)

<sup>36</sup> [www.apec-pac.org/](http://www.apec-pac.org/)

For voluntary requirements, the testing laboratory will submit the results of its accreditation along with other information to its clients which would include service providers, associations etc. for recognition. With successful designation/recognition, the testing laboratory will be able to test ICT equipment to meet the mandatory requirements and the requirements of its clients.

#### **4.2 Recommendations on policies and strategies for developing conformity assessment testing laboratories compliant with international standards<sup>37</sup>**

The following are recommendations on policies and strategies for developing testing laboratories compliant with ISO/IEC 17025.

##### **Legal status/legal entity**

The testing laboratory has to be established as an entity that can be held legally responsible for its activities.

##### **Financial policy**

Start-up cost includes building, infrastructure development, and procurement of equipment. It is difficult especially in developing countries to cover operating costs from earned income. One of the important tasks will be to develop plans to secure both medium and long term funding for the testing laboratories. One potential source of funding is from government. A commitment from government especially in developing countries to provide long term financial support is a prerequisite in the effort to building a testing laboratory.

##### **Management structure**

There is a need to establish a procedure to ensure that departments of a testing laboratory with conflicting interests do not adversely influence compliance with ISO/IEC 17025. For example the finance, administration, quality assurance, IT, the safety officer, and human resources departments do not report to the laboratory management department.

##### **Personnel**

It is essential to recruit staff members who have both theoretical training and adequate practical experience. It may be necessary to deploy staff for an extended period of time in a working laboratory in order to gain experience and to maintain their necessary skill set. Remuneration of staff is an important financial issue. The testing laboratory should have adequate funds in its budget to ensure that fully trained staff is paid well enough in order to keep them in the organization.

##### **Training system**

Training is an important part of the laboratory plan and programme. A training programme has to be put in place to train new staff and to keep staff up to date with technological change and evolution.

##### **Premises**

There are a number of tasks in the planning and development of the testing laboratory premises, including:

- The selection of test site location is an important issue to be considered. For example an Open Area Test Site (OATS) should be located in an electronic “quiet” area in order to minimize electronic interference.
- An important task in the planning and development of the laboratory premises is the effective separation between neighbouring areas where the activities of these areas are incompatible.

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<sup>37</sup> See *Guidelines for developing countries on establishing conformity assessment testing labs in different regions*: [www.itu.int/ITU-D/tech/ConformanceInteroperability/ConformanceInterop/Guidelines/Test\\_lab\\_guidelines\\_EV8.pdf](http://www.itu.int/ITU-D/tech/ConformanceInteroperability/ConformanceInterop/Guidelines/Test_lab_guidelines_EV8.pdf)

- An example is the separation of wire line and wireless test stations. Another example is the separation of office and laboratory spaces.
- Access to test and calibration areas shall be strictly controlled and limited to authorized personnel. An example of access control is the use of ID cards.
- The location of windows of the building housing the laboratory is an important factor in the design of the building. Proper orientation of the windows of the building is necessary to avoid direct sunlight in order to protect sensitive test equipment. For example in the northern hemisphere, the windows should be located on the north side of the building.
- Environmental control: There should be a long term plan for environmental control. For example when testing telecommunication equipment, building temperature should be kept between 15 to 30 degrees Celsius and relative humidity should be less than 70 per cent.
- Continuity of electricity supply: Uninterrupted power supplies have to be deployed if necessary. Electricity supply variance can affect test equipment and thereby have effects on test results. Voltage stabilizers are required if the voltage variance is greater or less than 5 per cent.

### **Equipment**

Test equipment is an important tool and asset of the testing laboratory. It is important that proper studies and decisions are made before the purchasing of test equipment which has to conform to specifications relevant to the tests being offered by the testing laboratory. The availability of maintenance and technical support from the supplier/manufacturer of the equipment is an important issue to be considered in the process to select the suppliers for the equipment.

Price is not the only deciding factor to be considered when buying test equipment. It is much better to buy a slightly more expensive equipment for which maintenance is available than a less expensive option for which there is no technical support, in the country or in neighbouring countries. The criteria to be considered when selecting an equipment vendor include:

- the vendor equipment meets the required specifications;
- the vendor has a leading position in the market place;
- the design, development and manufacture of the equipment take place in a quality system environment such as ISO 9001;
- the vendor provides installation, familiarization and training services; and
- the vendor provides phone and on-site support in local language.

The following steps are necessary in the installation and documentation of equipment:

1. Verify that the location where the equipment is being installed meets the environmental specifications as defined by the equipment vendor.
2. Install the equipment hardware according to the vendor specifications.
3. Install software and start-up according to the vendor specifications.
4. Document the hardware and software being installed including vendor's name, model number, serial number and location of installation.

After installation, equipment should be tested for calibration and for performance verification and the steps to be followed include:

1. Develop test procedures and test protocols.
2. Define acceptance criteria based on documented specifications.
3. Ensure that the test engineers have the appropriate qualifications.
4. Perform tests and document test results.

5. Label equipment with status, dates of last and next calibration.
6. Maintain records of calibration and checks.
7. Establish programme and procedures for equipment calibration to ensure equipment continues to meet the testing laboratory's specifications. Such a programme and procedures though costly in some situation, are necessary to enable the testing laboratory to produce consistent and accurate results.

#### **4.3 Recommendations on how to become accredited by International accreditation bodies (ILAC, IAF, APLAC, IECEE, etc.) in the relevant ICT scope<sup>38</sup>**

An important task in the establishment of a testing laboratory compliant with ISO/IEC 17025 is to obtain accreditation of the testing laboratory to meet ISO/IEC 17025 by an accreditation body which is compliant with ISO/IEC 17011. The International Laboratory Accreditation Cooperation (ILAC)<sup>39</sup> is the organization which organizes and conducts peer assessment of accreditation bodies which accredit testing laboratories.

Similarly an important task in the building of a certification body compliant with ISO/IEC 17065 is to obtain accreditation of the certification body to meet ISO/IEC 17065 by an accreditation body which is compliant with ISO/IEC 17011. The International Accreditation Forum (IAF)<sup>40</sup> is the organization which organizes and conducts peer assessment of accreditation bodies which accredit certification bodies.

The criteria to be considered in the selection of an accreditation body include:

- language;
- proximity to the country if an in-country accreditation body is not available;
- accreditation cost, which can vary between different accreditation bodies, will also depend on the assessors employed for the accreditation and the scope of the accreditation;
- for testing laboratory, accreditation body is a signatory to ILAC MRA or a member of regional cooperation bodies recognized by ILAC;
- for certification body, accreditation body is a signatory to IAF MLA or a member of regional cooperation bodies recognized by IAF.

The testing laboratory or certification body should create a team with a team leader to:

- define the scope of accreditation;
- learn the ISO/IEC 17025 requirements for testing and ISO/IEC 17065 for certification;
- conduct gap analysis and subsequently prepare a task list to resolve the deficiencies;
- estimate costs;
- obtain management decision.

Once decision is made to go ahead, the testing laboratory or certification body should create a team to obtain accreditation and the steps include:

1. The selection of an accreditation body.
2. The development of documentation for the accreditation process.
3. Training of staff.
4. Internal audit and corrections.

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<sup>38</sup> Ibid.

<sup>39</sup> [www.ilac.org/](http://www.ilac.org/)

<sup>40</sup> [www.iaf.nu/](http://www.iaf.nu/)



5. Pre-assessment and corrections.
6. Accreditation audit.

Long term financial and managerial support is necessary to maintain accreditation and the testing laboratory or certification body should have the necessary processes in place to obtain and maintain financial and managerial support.

## **5 Mutual Recognition Agreement/Arrangement (MRA)**

National regulators require ICT equipment to meet their mandatory standards and requirements before it can be sold or deployed in their territories. They also require that the equipment is assessed under the conformity assessment regimes specified by them by conformity assessment bodies designated or recognized by them. In most cases, these conformity assessments are performed in the territory of the national regulator by domestic conformity assessment bodies. Most regulators legally will not accept conformity assessment results not prepared in their territories and not by conformity assessment bodies which they have designated or recognized.

Equipment whose conformity to requirements are assessed in foreign territories and by conformity assessment bodies which are not designated or recognized by the national regulators will not be accepted by the regulators. This equipment, even though it was assessed in foreign territories will have to be assessed again locally by conformity assessment bodies recognized or designated by their regulators. The resultant “double” conformity assessment for imported ICT equipment would create delay in placing ICT products on the market and increase the cost of production of these products.

To expedite the trade of ICT equipment, many countries have developed and implemented mutual recognition agreements/arrangements (MRAs) on conformity assessment for ICT equipment. A couple of features of the MRAs have proven to be useful in the implementation and streamlining of conformity assessment schemes.

This section gives an overview of MRAs and describes two MRA procedures which are useful in the implementation and streamlining of conformity assessment schemes.

### **5.1 Purpose: What is a conformity assessment MRA?**

A mutual recognition arrangement/agreement on conformity assessment is a voluntary arrangement/agreement (procedures and processes) between parties for recognition of conformity assessment results for telecommunication equipment. A Party is a body (private or public) that chooses to join an MRA. Parties to an MRA select “Arrangement” or “Agreement” for their MRA depending on their legal and administrative requirements. In general:<sup>41</sup>

- a mutual recognition agreement is a formal legal commitment between parties for recognition of conformity assessment results for telecommunication equipment. It deals with regulatory requirements and it is referred to in the text as “regulatory MRA”. Often Agreements are made bilaterally, regionally or multilaterally between two or more governments;
- a mutual recognition arrangement is a voluntary arrangement between parties for recognition of conformity assessment results for telecommunication equipment. It deals with non-regulatory requirements and it is referred to in the text as “non-regulatory MRA”. An example of a mutual recognition arrangement is amongst accreditation bodies to mutually recognize the conformity assessment results from accredited conformity assessment bodies.

Participating parties are obliged to implement the processes and procedures to support the MRA for mutual benefit. The procedures and processes contain in this text apply to both mutual recognition arrangement and mutual recognition agreement.

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<sup>41</sup> See also section 5.3. Types of MRAs.

An MRA does not undermine regulatory authority within the jurisdiction of the parties. To implement the MRA certain procedures must be followed. These apply to distinct bodies identified in the MRA such as:

- A Party that agrees to participate in the MRA.
- Designating authority: A government authority or duly accepted competent body appointed by a Party for the purpose of designating a conformity assessment body to perform conformity assessment procedures under the MRA.
- Accreditation body: A body that is responsible for assessing and recognizing the specific competencies of testing laboratories and/or certification bodies in accordance with international standards.
- Conformity assessment body: A body, which may include a third party or a supplier testing laboratory, or a certification body, that is designated to perform conformity assessment to another Party's telecommunications requirements under the MRA.
- Joint committee: A committee of the parties established for the purpose of managing initiation and implementation of the MRA and dealing with on-going adjustments and any other matters related to the smooth operation of the MRA, including future changes and adjustments.
- Regulatory authority: An entity with legal authority responsible for telecommunications requirements.

Certain functions such as *Designation*, *Accreditation* and *Recognition* are typically carried out by one or more organizations within the territory of a Party. MRAs can play a number of useful roles in the ITU conformance and interoperability(C&I) testing programme<sup>42</sup>

For example they can promote the establishment of C&I programmes within a region or sub-region. They can provide a vehicle for sharing of costly resources such as accreditation, certification and testing services and expertise amongst regional and sub-regional MRA parties thereby avoiding unnecessary duplication of services and leading to more efficient use of scarce resources. MRAs can also play a useful role in promoting transparency in regulatory systems since regulatory technical requirements are posted on the MRA host database.

## 5.2 Benefits of MRAs

A number of important benefits accrue from MRAs. MRAs on conformity assessment are intended to promote efficiency and sharing of conformity assessment resources and to streamline the flow of products amongst participating parties which may include UN/ITU Member States, government agencies and departments, private sector organizations such as testing laboratories, certification bodies and accreditation bodies. MRAs provide for the recognition of competence of third parties to carry out national regulatory/type approval processes such as mandatory testing and certification, or testing and certification of products conforming to non-regulatory requirements. MRAs have the potential to reduce the cost of carrying out testing and/or certification due to facilitating integrated manufacturing, testing and certification for target markets, which in addition can significantly reduce time to market. In the regulatory sector they permit obtaining the required national certificates for products locally by manufacturers, help avoid rejection of consignments of products and eliminate redundant procedures. In the non-regulatory case they provide a basis for sharing of testing and certification services among parties with the establishment of trust based on agreed credentials and usually evidenced by a formal certification process.

A further benefit of MRAs is that they promote transparency in market access. For example in MRAs dealing with regulated products they constrain the parties to follow the agreement which spells out in detail the procedures for market access. This has a major impact on removal of predatory and non-transparent procedures which may favour national industries and deny national treatment to other signatory parties thereby damaging the competitive edge of those parties in that marketplace. Estimates of savings obtained

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<sup>42</sup> [www.itu.int/en/ITU-T/C-I/Pages/default.aspx](http://www.itu.int/en/ITU-T/C-I/Pages/default.aspx)

through MRAs are based on the elimination of re-testing, re-shipment to destination marketplaces for certification, and removal of the need for local staff of the originating Party to be present in the destination marketplace to handle the interface with testing laboratories, accreditation and certification bodies.

MRAs dealing with regulated products have most meaning when there is a regulatory system in place in the marketplaces of the signatories, specifying among other things mandatory technical requirements and procedures for products to be legally in the marketplace. Therefore an additional side benefit of such MRAs is to raise the awareness of the need for and benefits of a regulatory system which prevents harmful interference amongst deployed systems and prevents both network harm and harm to persons using or working with telecommunication products and systems. Such regulatory systems may also be said to reflect the value system of the society in which they are deployed since they specifically address safety of life and interference-free service delivery to the marketplace.

It is important to note that regulatory requirements have no interoperability objectives *per se* nor does meeting them substantially advance the likelihood of achieving widespread interoperability in a particular marketplace. The focus of the MRA is both on sharing of testing and certification resources and to advance the likelihood of interoperability.

Experience shows that MRAs, by virtue of sharing ideas and observing best practices of other authorities, also reduce diversity of procedures and methods for compliance assurance thereby producing additional cost savings especially for equipment suppliers dealing with diverse foreign markets. MRAs are in fact a significant step towards achievement of the ultimate goal of the supplier community, namely, “one test, done once, valid worldwide”. It is also worth noting that the World Trade Organization (WTO) Agreement on Technical Barriers to Trade<sup>43</sup> strongly encourages WTO Members to engage in such agreements<sup>44</sup>. Benefits from one example of a working MRA for telecommunications products, the APEC TEL MRA, include:

For manufacturers:

- an opportunity to test and certify products one time to the requirements of multiple markets and ship products without further conformity assessment;
- increase certification efficiency for products exported to foreign markets, thus increasing export opportunities for small and medium-sized enterprises (SMEs); and
- decreasing time-to-market for companies manufacturing telecommunication equipment with shorter and shorter product life cycles, thus maximizing export opportunities and allowing for rapid reinvestment in research and development for next-generation technologies.

For conformity assessment bodies:

- allowing conformity assessment bodies (CABs) to increase the value of their service by offering their clients a substantially wider portfolio, including testing and certifying products for multiple markets.

For regulators:

- reduction of regulatory resources required to certify terminal attachment and radio equipment;
- an opportunity to reallocate a portion of these former certification costs to other areas;
- a potential stepping stone towards further harmonizing of technical requirements and of regional and national conformity assessment systems; and
- access to a pool of knowledge about the latest global trends and experiences regarding conformity assessment and regulatory systems.

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<sup>43</sup> [www.wto.org/english/docs\\_e/legal\\_e/17-tbt.pdf](http://www.wto.org/english/docs_e/legal_e/17-tbt.pdf)

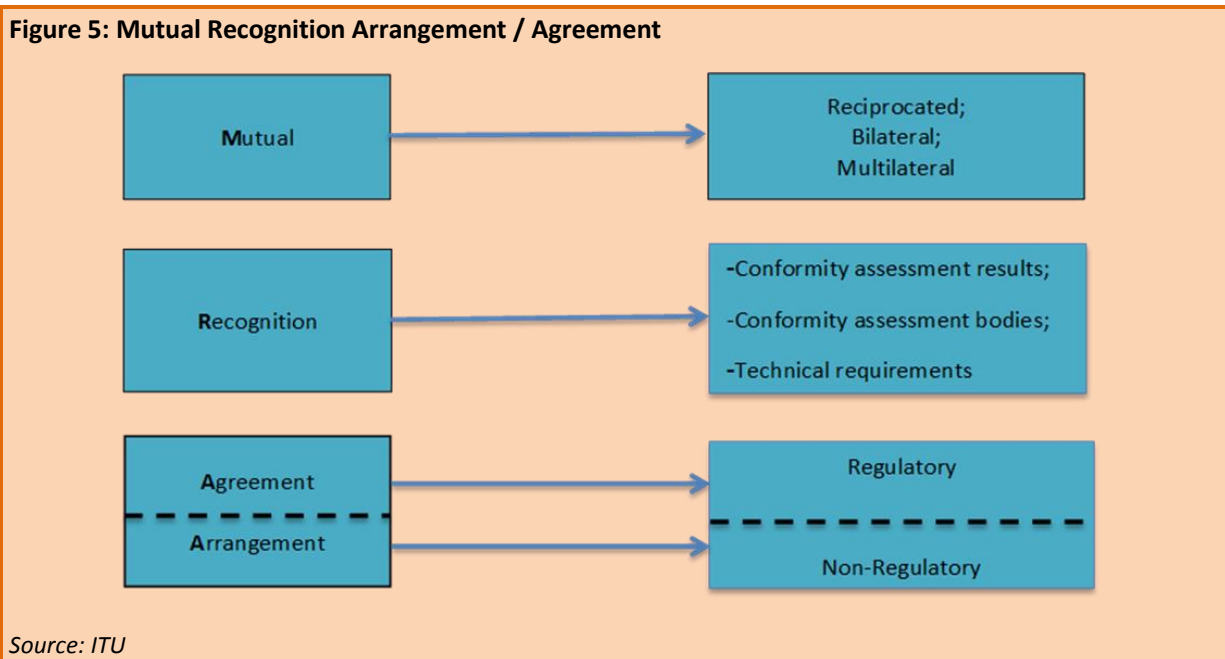
<sup>44</sup> [www.wto.org/english/tratop\\_e/tbt\\_e/tbt\\_e.htm](http://www.wto.org/english/tratop_e/tbt_e/tbt_e.htm)

For consumers

- increasing consumer access to the widest variety of available technology;
- faster access to equipment at a lower cost; and
- speeding the development of telecommunications and Internet infrastructure.

### 5.3 Types of MRAs

There are two usages of the abbreviation MRA in common use today – mutual recognition agreements and mutual recognition arrangements. These two similar sounding terms embody significantly different legal interpretations. Figure 5 provides a simple pictorial illustration of the MRA terminology explaining the meaning of the words mutual, recognition, agreement and arrangement in this context.



Source: ITU

In general, a mutual recognition agreement is deemed to be a legally binding instrument and therefore may require a high level of approval and ratification within a party.

A mutual recognition arrangement is deemed to be non-binding and approval and ratification procedures may be vested with lower level agencies and officials in the case of governments, or in designated representatives of private sector parties participating in an MRA, as decided by the parties<sup>45</sup>.

In recent years for government purposes many countries have gone exclusively to mutual recognition agreements for formal commitments among themselves and with other countries especially where regulatory requirements are involved. In the case of private sector there are now many examples worldwide of the use of mutual recognition arrangements to frame and manage cooperative work amongst the parties.

<sup>45</sup> [http://en.wikipedia.org/wiki/Mutual\\_recognition\\_agreement](http://en.wikipedia.org/wiki/Mutual_recognition_agreement)

## 5.4 Framework MRAs

MRAs are established between two parties. These MRAs are identified as bilateral MRAs. Each of these bilateral MRAs contains specific attributes, technical and administrative requirements as agreed to by the two parties.

When three or more parties wish to establish MRAs, they could develop framework MRAs. These MRAs are identified as multilateral MRAs. These parties are normally located within a geographic region or belong to a trading block and they share similar economic and technical interests. A framework MRA promotes and expedites the development of MRAs. Parties which endorse a framework MRA agree to develop and implement MRAs based on the framework MRA. A bilateral MRA can be established based on the framework MRA along with specific technical and administrative requirements as agreed by the two parties. Many bilateral MRAs can be established based on one framework MRA.

## 5.5 Examples MRAs on conformity assessment

During the 1990s, many parties have successfully established and implemented MRAs on conformity assessment. Examples of bilateral MRAs are:

- United States/European Union MRA<sup>46</sup>
- Canada/Switzerland MRA<sup>47</sup>

An example of a framework MRA is the Asia Pacific Economic Cooperation (APEC) Mutual Recognition Arrangement for Conformity Assessment of Telecommunications Equipment (APEC TEL MRA, 1998) developed by the Telecom Working Group of APEC. All 21 economies of APEC have endorsed the APEC TEL MRA and a number of economies have implemented bilateral MRAs based on the APEC TEL MRA.<sup>48</sup>

Examples of these MRAs are:

- United States/Japan MRA<sup>49</sup>
- Republic of Korea/Canada MRA<sup>50</sup>

Another example of a framework MRA is the Inter-American Mutual Recognition Agreement for Conformity Assessment of Telecommunications Equipment (CITEL MRA, 1999)<sup>51</sup> by the *Comisión Interamericana de Telecomunicaciones* (CITEL) of the Organization of American States (OAS).

All 34 Member States of the OAS have endorsed the CITEL MRA and a number of Member States have implemented bilateral MRAs based on the CITEL MRA. Examples of these MRAs are:

- United States/Mexico MRA<sup>52</sup>
- Mexico/Canada MRA<sup>53</sup>

Parties to the above mentioned MRAs reported that good progress was made in the implementations of the MRAs and with anticipated results. For example, the APEC TEL MRA was endorsed by all 21 APEC

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<sup>46</sup> <http://transition.fcc.gov/oet/ea/mra/apec.html>

<sup>47</sup> [www.ic.gc.ca/eic/site/mra-arm.nsf/eng/nj00022.html](http://www.ic.gc.ca/eic/site/mra-arm.nsf/eng/nj00022.html)

<sup>48</sup> [www.apec.org/groups/som-steering-committee-on-economic-and-technical-cooperation/Working-groups/telecommunications-and-information/apec\\_tel-mra.aspx](http://www.apec.org/groups/som-steering-committee-on-economic-and-technical-cooperation/Working-groups/telecommunications-and-information/apec_tel-mra.aspx)

<sup>49</sup> <http://gsi.nist.gov/global/index.cfm/11-4/L2-16>

<sup>50</sup> [www.ic.gc.ca/eic/site/mra-arm.nsf/eng/nj00018.html](http://www.ic.gc.ca/eic/site/mra-arm.nsf/eng/nj00018.html)

<sup>51</sup> [www.ic.gc.ca/eic/site/mra-arm.nsf/vwapi/citel\\_mra.pdf/\\$file/citel\\_mra.pdfdeveloped](http://www.ic.gc.ca/eic/site/mra-arm.nsf/vwapi/citel_mra.pdf/$file/citel_mra.pdfdeveloped)

<sup>52</sup> <http://gsi.nist.gov/global/index.cfm/11-4/12-16/13-266>

<sup>53</sup> [www.ic.gc.ca/eic/site/mra-arm.nsf/eng/nj00100.html](http://www.ic.gc.ca/eic/site/mra-arm.nsf/eng/nj00100.html)

economies. More than two thirds of the 21 APEC economies are participating in Phase 1 procedures (mutual recognition of testing laboratories and test results) and at least six economies are participating in Phase 2 procedures (mutual recognition of certification bodies and equipment certification).

## **5.6 Key attributes of an MRA**

### **Designation**

Designation is the nomination by a designating authority of a conformity assessment body as competent to perform conformity assessment activities under the terms of an agreement or arrangement. A designating authority is a body with authority to designate, monitor, suspend designation, or withdraw designation of conformity assessment bodies under its jurisdiction. A testing laboratory or certification body to be designated should be legally identifiable as to name and geographical location.

The testing laboratory or certification body should be accredited to local or foreign requirements for which it seeks designation or recognition, in accordance with the latest edition of ISO/IEC 17025, “General requirements for the competence of testing and calibration laboratories”<sup>54</sup>, or ISO/IEC 17065, “Conformity assessment -- Requirements for bodies certifying products, processes and services”<sup>55</sup>. Accreditation can be obtained from an appointed national accreditation body or a recognized foreign accreditation body.

### **Accreditation**

Accreditation is a procedure by which a duly appointed authoritative body gives formal recognition that a body or person is competent to carry out specific tasks.

### **Recognition**

Recognition is the acceptance of a designated conformity assessment body by a regulatory authority in the case of a regulatory MRA or duly authorized competent body in the case of a non-regulatory MRA. When an application for designation to technical requirements is successful, the designating authority will notify the appropriate MRA Party authority of the designation so that recognition of the testing laboratory or certification body may take place.

If more information is required by the designating authority to make a decision, the testing laboratory or certification body will be contacted.

Following the granting of recognition by the appropriate MRA Party authority, the designating authority will issue a letter confirming that the conformity assessment body has been recognized. The confirmation letter will state the standards or specifications for which recognition has been granted. The conformity assessment body (testing laboratory or certification body) will be added to the list of recognized conformity assessment bodies maintained by the designating authority.

All documents submitted to the designating authority in support of a conformity assessment body designation or recognition will be retained on file.

## **5.7 A typical MRA operation**

### **Regulatory MRA**

The following is a brief description of a typical MRA operation for the case of a regulatory MRA.

Party A and Party B are signatories of a bilateral MRA. They have procedures and processes in place to implement the MRA and have exchanged information on technical regulations, standards and specifications

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<sup>54</sup> [www.iso.org/iso/catalogue\\_detail.htm?csnumber=39883](http://www.iso.org/iso/catalogue_detail.htm?csnumber=39883)

<sup>55</sup> [www.iso.org/iso/catalogue\\_detail?csnumber=46568](http://www.iso.org/iso/catalogue_detail?csnumber=46568)

under the MRA coverage. They have also exchanged information on points of contact, designating authorities, regulatory authorities and accreditation bodies. They have also formed a joint committee.

Conformity assessment body A of Party A wishes to be designated by Party A to perform conformity assessment (Phase 1 - test reports or Phase 2 – certification) of telecommunication equipment meeting the requirements of Party B. It takes the following steps:

1. Conformity assessment body A seeks accreditation by accreditation bodies appointed by the designating authority of Party A or by foreign accreditation bodies recognized by Party A to conduct conformity assessment of telecommunication equipment meeting the requirements of Party B.
2. If the accreditation of conformity assessment body A is successful, conformity assessment body A sends the accreditation results along with the appropriate information required by designating authority A with its request for designation to designating authority A.
3. Designating authority A may ask for clarification or additional information from conformity assessment body A. If designating authority A is satisfied with the application, it designates conformity assessment body A and notifies the regulatory authority B of this designation along with a request for recognition.
4. Regulatory authority B may ask for clarification or additional information from designating authority A. If the regulatory authority B is satisfied with the designation, it recognizes conformity assessment body A and notifies designating authority A of this recognition.
5. Subsequent to its recognition of conformity assessment body A, regulatory authority B will accept test reports prepared by conformity assessment body A for certification and will accept telecommunication equipment certified by conformity assessment body A.
6. Designating authority A and regulatory authority B will add conformity assessment body A to their lists of recognized conformity assessment bodies to be monitored.

The above steps also apply to conformity assessment bodies designated by designating authority B and recognized by the regulatory authority A.

### **Non-regulatory MRA**

For the non-regulatory MRA case where the focus is on conformance to voluntary standards and interoperability there are a number of reputable organizations such as the Global Certification Forum (GCF)<sup>56</sup> which have developed similar sets of processes and procedures to those above. These are private sector, membership driven bodies whose membership may include manufacturers, service providers and observers. Conformity assessment bodies are required to be accredited to the relevant ISO/IEC standards for testing labs and certification bodies, or to other sets of robust credentials prescribed by the bodies and trusted by the membership. Their intention, among other goals, is to minimize duplicative testing, reduce time to market, and increase the likelihood of interoperability of devices when deployed in the marketplace. Thus the principles of mutual recognition of competence, trust based on robust credentials, and peer recognition<sup>57</sup> based on performance, which is the hallmark of successful MRA schemes are to be found in these non-regulatory MRA operations.

Parties to non-regulatory MRAs which are private sector entities employ attributes similar to the ones found in regulatory MRAs. They may not follow the same steps outlined in 12.1 for the operation of non-regulatory

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<sup>56</sup> [www.globalcertificationforum.org/](http://www.globalcertificationforum.org/)

<sup>57</sup> [www.globalcertificationforum.org/news-events/press-releases/36-rto-feb-2013.html](http://www.globalcertificationforum.org/news-events/press-releases/36-rto-feb-2013.html)



MRAs. However they employ similar steps achieving the same result which is the mutual recognition of conformity assessment bodies and the mutual recognition of conformity assessment results.

The following reference provides links to a number of these private sector bodies which have been in successful operation for some years already using the vehicle of MRAs based on strong credentials, mutual recognition of competence for defined scopes of operation, and mutual trust.<sup>58</sup>

## **5.8 MRA procedures**

There are three MRA procedures that can play significant roles in the implementation and streamlining of conformity assessment schemes:

1. mutual recognition of conformity assessment bodies;
2. mutual recognition of test reports;
3. mutual acceptance of certification.

### **Mutual recognition of conformity assessment bodies**

An important procedure implemented by MRA parties is the mutual recognition of conformity assessment bodies, including testing laboratories and certification bodies. To enable mutual recognition of conformity assessment bodies, a conformity assessment body has to be accredited by accreditation bodies to the appropriate standards, namely ISO/IEC 17025 for testing laboratories and ISO/IEC 17065 for certification bodies. The accreditation bodies are normally appointed by the regulators.

It is recommended that the accreditation bodies are ISO/IEC 17011 compliant.

When the regulator is satisfied with the results of accreditation with the appropriate scopes including standards and specifications of its MRA partner, it will designate this conformity assessment body, notify the regulator of its MRA partner of its designation and request recognition of this conformity assessment body by its MRA partner. If the regulator of the MRA partner is satisfied with the designation, it will recognize the designated conformity assessment body.

This procedure applies equally to the conformity assessment of the MRA partner. After successful implementation of the MRA, MRA partners will accept ICT equipment which had been assessed by their recognized conformity assessment bodies and local assessment of this equipment is not necessary.

Exporters of ICT equipment can use recognized conformity assessment bodies to assess equipment in their territories and this equipment will be accepted by MRA partners without additional assessment to be performed in the MRA partner territories.

### **Mutual recognition of test reports**

Another important procedure implemented by MRA partners is the mutual recognition of test reports prepared by recognized testing laboratories. MRA partners will accept test reports prepared by testing laboratories they had recognized (Figure 6).

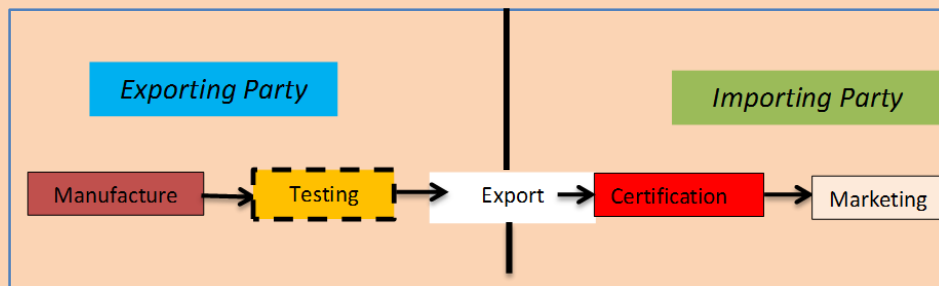
Test reports are important elements in the operations of the SDoC and certification conformity assessment schemes. With the acceptance of test reports by MRA partners, the operations of the SDoC and certification conformity assessment schemes are expedited and streamlined.

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<sup>58</sup> [www.itu.int/en/ITU-T/C-I/conformity/Pages/Cschemes.aspx](http://www.itu.int/en/ITU-T/C-I/conformity/Pages/Cschemes.aspx)



Figure 6: Mutual acceptance of test reports



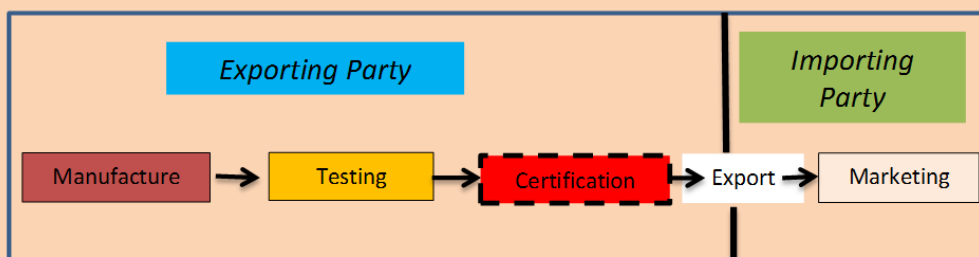
Source: ITU

### Mutual acceptance of certification

Another important procedure implemented by MRA partners is the mutual recognition of certification prepared by recognized certification bodies. MRA partners will accept certifications prepared by certification bodies which they had recognized (Figure 7).

Exporters of ICT equipment can use recognized certification bodies to certify equipment in their territories and this equipment will be accepted by MRA partners without additional certification to be performed in the MRA partner territories.

Figure 7: Mutual recognition of certification



Source: ITU

Implementation of the above mentioned MRA procedures will significantly streamline the operations of conformity assessment schemes.

### 5.9 ITU programme to promote the establishment of MRAs and/or laboratories, as appropriate

In the framework of the ITU Conformity & Interoperability Programme, conformity and interoperability assessment studies are being conducted in the regions<sup>59</sup>. These studies aim to identify all the necessary elements to promote collaboration among regional and sub-regional organizations for establishing a

<sup>59</sup> [www.itu.int/en/ITU-D/Technology/Pages/CI\\_AssessmentStudyRegional.aspx](http://www.itu.int/en/ITU-D/Technology/Pages/CI_AssessmentStudyRegional.aspx)

common conformity and interoperability regime through mutual recognition agreements (MRA) and/or regional test centres, as appropriate. Possible scenarios to meet the needs of Member States and regions on conformity and interoperability are identified during the assessment studies.

The results and recommendations from these studies are presented to countries in regional workshops<sup>60</sup>. Three options have been presented for consideration to establish C&I regimes in the regions:

- 1 establishment of in-country (national) testing laboratories;
- 2 establishment of a regional testing centre; and
- 3 establishment of MRAs.

It has been recommended that a Task Force be established under the leadership of the concerned regional organization to guide and follow up actions for the implementation of C&I programmes in the regions, including definition and establishment of MRAs. The results of the workshops have been submitted through the secretariat of the ICT committees of such regions to the attention of Ministerial Committees.

## **6 Framework and initial implementation roadmap for setting up a type approval system, including certification and testing services.**

Type approval simply means that the product is certified to meet certain requirements for its **type**, whatever that may be, for example cellphones operating in a certain frequency band. Type approval is granted to a product that meets a minimum set of regulatory, technical and safety requirements. The type approval is based on test results derived from a representative sample of the product. The certification or declaration of conformity is contingent upon continued compliance for all production runs of that type and is usually subject to spot checks and audit for compliance throughout the life of the type. Compliance to type approval requirements is often denoted by a marking on the product or packaging. Formal assertion of claims of compliance may also be indicated by a supplier declaration of conformity (SDoC), or certification of compliance issued by a certification body.

For the ICT sector, principal concerns addressed in type approvals are network harm, interference and safety of life issues. Compliance to performance measures, particularly in mature markets, is usually left to marketplace players (customers) and mandatory requirements are kept to a minimum.

Type approval systems normally embody the concept of “family of products” approvals, which means that products which are electrically and functionally identical or similar, but differ for example in colour or packaging, can be type approved based on test results from one representative sample from the family. Compliant products receive an approval Mark from the approval authority. Such a Mark carries, or points to, key data for regulatory authorities and marketplace surveillance activities to identify the product and if necessary retrieve and review the test results based on which it received its type approval. Approval authorities in general charge a fee for the type approval service and this may be in the form of a labelling fee per product, or a listing fee for publicizing the product on an official list or database of approved products. Database listing of all compliant products has become the norm for ICT products which can be legally deployed in the specific country marketplace.

A type approval system with well published requirements promotes transparency in market access and assures and maintains the confidence of suppliers, importers, end users and new technology developers. It is in the interest of equipment suppliers, network operators and end users to encourage well publicized and readily available requirements for market access in all jurisdictions to avoid unfair and capricious practices regarding market access. Ideally every country should have a type approval system or equivalent transparent process for market access in place.

This section describes the framework and the steps to set up a type approval system.

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<sup>60</sup> [http://www.itu.int/en/ITU-D/Technology/Pages/CI\\_Events.aspx](http://www.itu.int/en/ITU-D/Technology/Pages/CI_Events.aspx)

## 6.1 Legal framework

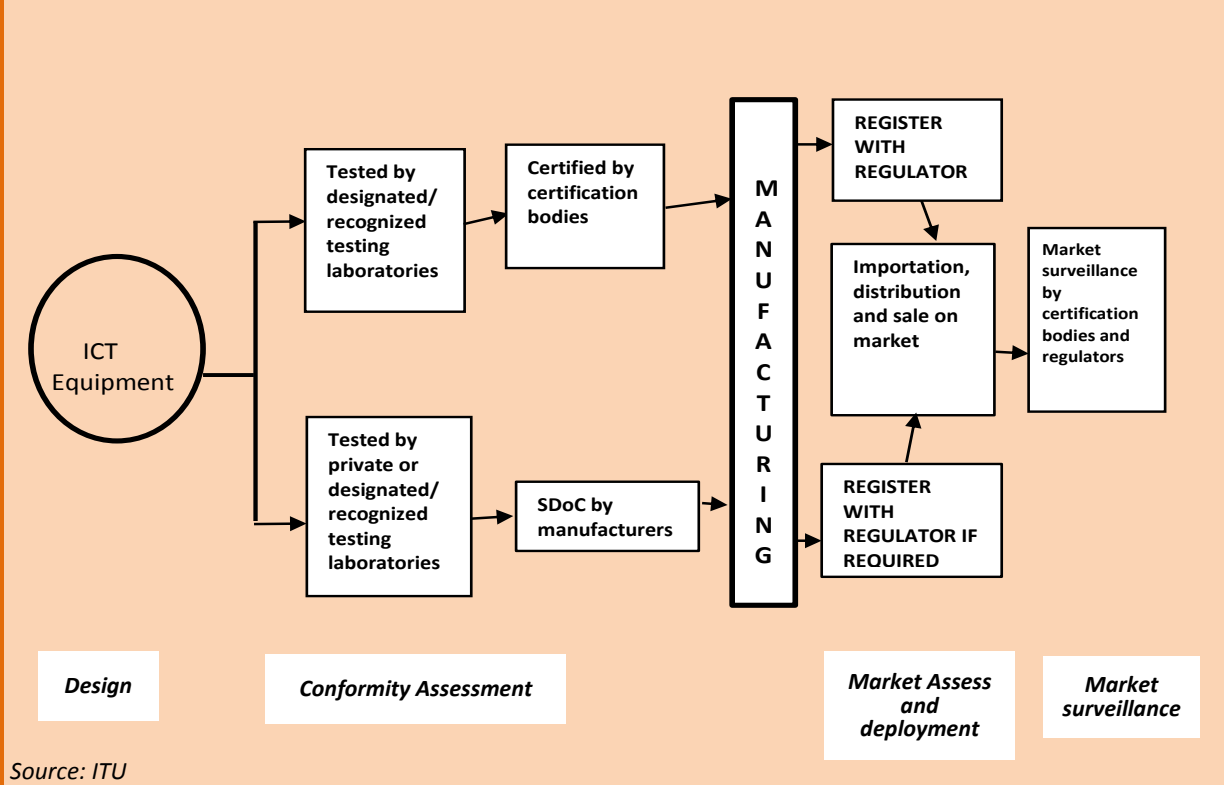
In order to have a robust, efficient type approval system, enabling legislation and regulations have to be put in place to:

- Define regulations respecting technical requirement and technical standards in relation to ICT equipment: Technical requirements and technical standards should be placed in regulation for ICT equipment. This equipment has to meet the appropriate requirement and standards before it can be sold, imported and use in the market place.
- Define the required conformity assessment schemes: For ICT equipment the two main conformity assessment schemes are certification and SDoCs. The legislation and regulations should define the appropriate schemes for the ICT equipment meeting the appropriate requirements and standards. Provisions should be provided for the migration of the ICT equipment from one conformity assessment to another when the equipment matures and is deemed to be low risk.
- Define the procedures to accredit/designate/recognize testing laboratories and certification bodies: Regulations should specify processes and procedures which testing laboratories and certification bodies should follow to gain accreditation, designation and recognition.
- Specify authority and conditions for the appropriate government authority to negotiate Mutual Recognition Agreements/Arrangements (MRAs) with foreign partners: To expedite the trade of ICT equipment and to take advantage of the MRA procedures to expedite and streamline the conformity assessment schemes, authorities should be given to the appropriate government authority to negotiate MRAs with foreign partners. This should include specific authority to negotiate with particular partners and the procedures to obtain approval from the government on the negotiated MRAs.
- Prescribe prohibitions, penalties when ICT equipment do not meet the technical requirements and technical regulations and when conformity assessment bodies are not functioning according to the legislation and regulations: The penalties can include administrative and monetary fines, forfeitures etc. when ICT equipment do not meet the technical requirements and regulations. The regulators can remove designations or recognized of the conformity assessment bodies if they are not functioning according to the legislation and regulations.

### Outline market surveillance procedures

In order to ensure that the equipment produced continues to maintain compliance after it was granted certification or after it was declared compliant using one of the SDoC schemes, it is necessary to follow up with the appropriate market surveillance procedures to be conducted by both regulators, manufacturers and conformity assessment bodies.

Figure 8: A logical flow of activities in a typical type approval system for ICT equipment



## 6.2 Infrastructure

A number of entities are required to be in place to enable a smooth operation of a type approval system (Figure 8).

### Accreditation bodies

The conformity assessment bodies, namely testing laboratories and certification bodies in a type approval system are required to meet international standards. Testing laboratories have to be ISO/IEC 17025 compliant while certification bodies have to be ISO/IEC 17065 compliant.

To demonstrate compliance, the conformity assessment bodies have to be accredited by accreditation bodies which in turn have to be ISO/IEC 17011 compliant.

Compliance with ISO/IEC 17011 is demonstrated by peer assessment by other accreditation bodies. Internationally, for testing laboratories, the International Laboratory Accreditation Cooperation (ILAC) is the organization which organizes the assessment. Accreditation bodies which have passed the peer assessments will be signatories of the ILAC Mutual Recognition Agreement.

Internationally for certification bodies, the International Accreditation Forum (IAF) is the organization which organizes the assessment. Accreditation bodies which have passed peer assessments will be signatories of the IAF Multilateral Recognition Arrangement (IAF MLA).

Accreditation bodies derive their authorities from government. Normally the national regulator appoints its domestic accreditation bodies or recognized foreign accreditation bodies. If there are no domestic accreditation bodies, the conformity assessment bodies can use foreign recognized accreditation bodies for accreditation. It is recommended that both the appointed and recognized accreditation bodies are ISO/IEC 17011 compliant and are signatories to the ILAC MRA or the IAF MLA.

### **Conformity assessment bodies**

The key player in a type approval system is the conformity assessment body either a testing laboratory or a certification body. It is recommended that these conformity assessment bodies have to be accredited to meet ISO/IEC 17025 for testing laboratories and ISO/IEC 17065 for certification bodies. Domestic conformity assessment bodies once accredited accordingly will be required to seek designation by the regulator by submitting the results of accreditation along with the appropriate completed administrative procedures. If the regulator is implementing Mutual Recognition Agreements with foreign partners, these conformity assessment bodies can also seek recognition via their regulators by the foreign MRA partners.

### **Regulators and service providers**

The regulator needs to put in place its regulation, procedures and processes under which the type approval system will operate. In the private sector, the service providers, users and purchasers will assume the roles of the regulator and put in place the requirement for the ICT equipment which the type approval system will test and certify.

## **6.3 Initial implementation roadmap**

### **Appointment and recognition of accreditation bodies**

The regulator shall appoint domestic accreditation bodies which are ISO/IEC 17011 compliant. If domestic accreditation bodies are not available, the regulator can recognize foreign accreditation bodies directly or via the implementation of MRAs.

### **Regulations, standards and procedures**

The regulator shall publish the regulations, standards and procedures for ICT equipment. In the private sector, the service providers and purchasers shall issue their requirements for ICT equipment.

### **Accreditation of conformity assessment bodies**

Potential conformity assessment bodies shall seek accreditation by the domestic accreditation bodies. If no domestic accreditation bodies are available they can seek accreditation by recognized foreign accreditation bodies.

### **Designation/recognition of conformity assessment bodies**

Once they have been accredited, the conformity assessment bodies shall submit to their regulators for designation or recognition by foreign MRA partners if MRAs are in place. Once designation or recognition is granted, these conformity assessment bodies will form a key part of a type approval system providing testing and certification services.

### **Market surveillance**

To support the operation of a type approval system and in order to ensure continued compliance of products and services produced by the type approval system, all entities of the type approval system including the regulator, conformity assessment bodies, manufacturers, accreditation bodies have to put in place market surveillance procedures to audit, monitor and assess the products and services. Appropriate actions will have to be taken by these entities to address and correct the problems resulting from the actions of the market surveillance procedures.

## **7 Processes, procedures, organization structures and regulatory aspects to set up type approval systems and services**

To ensure a smooth and transparent operation of a type approval system, a number of procedures and processes have to be put in place by the entities which operate with the system. The regulator has to specify

the regulations and specifications for the ICT equipment which the type approval system is required to approve. This section describes these procedures and processes required to set up a type approval system and the organization structure of a typical type approval system.

### **7.1 Regulatory aspects**

It is the responsibilities of the regulator to prescribe the regulations and specifications which the ICT equipment has to meet within the territory of the regulator. Similarly, the purchaser or service provider has to specify the standards and specifications for the ICT equipment which it intends to purchase.

To demonstrate that the equipment meets its specifications and standard, the regulator also specifies the conformity assessment procedures. The regulator will also specify procedures and processes to set up a type approval system and procedures and processes to be used in the operation of a type approval system. The regulator may also prescribe market surveillance procedures to be conducted by a type approval system for the equipment it approves.

### **7.2 Organization structures**

For ICT equipment, a type approval system has two main components which are conformity assessment bodies, namely certification body and testing laboratory. The certification body is used to certify equipment when certification is the conformity assessment procedure required by the regulator or purchaser. For both certification and SDoCs, a testing laboratory is used to test the equipment.

For a type approval system which has both a certification body and a testing laboratory, the management and operations of these two entities have to be separate in order to avoid the conflict of interest. A certification body shall not provide any other services and products which might compromise the objectivity, confidentiality, impartiality of its certification decisions or processes (ISO/IEC 17065 section 4.2).

### **7.3 Procedures and processes**

#### **Accreditation procedures**

Accreditation bodies have their own accreditation procedures which a conformity assessment body has to follow and they may include:

- administrative requirements such as information on the applicant and fees;
- scope of accreditation;
- assessment rating guides which follow the requirements of the appropriate ISO standards, namely ISO/IEC 17025 for testing laboratories and ISO/IEC 17065 for certification bodies. These rating guides are used by assessors to conduct their assessments of the conformity assessment bodies.

#### **Designation procedures**

A regulator issues designation procedures which a conformity assessment body has to complete in order to be designated by the regulator. Once designated, the conformity assessment body will be able to conduct conformity assessment of ICT equipment to be sold and used within the territory of the regulator. These procedures may include:

- criteria for designation;
- scope of accreditation;
- name of accreditation body and expiry date of accreditation;
- administrative requirements such as information on the applicant and fees.

Most regulators will issue separate procedures for testing laboratories and certification bodies.

### **Recognition procedures**

When a regulator has entered into a mutual recognition agreement with another regulator, it will also issue recognition procedures which a foreign conformity assessment body has to complete in order to be recognized by the regulator. Once recognized the conformity assessment body will be able to conduct conformity assessment of ICT equipment to be sold and used within the territory of the regulator. These procedures may include:

- criteria for recognition;
- scope of accreditation;
- name of accreditation body and expiry date of accreditation;
- administrative requirements such as information on the applicant and fees;
- most regulators will issue separate procedures for testing laboratories and certification bodies.

### **Requirements for certification bodies**

In addition to the requirement that a certification body has to be accredited to ISO/IEC 17065, a regulator may issue additional requirements which may include:

- internal audit to be conducted by the certification body including types and number of samples;
- submission of assessment reports;
- subdivision of scope of accreditation into several different scopes in the event the scope is too large or extensive;
- requirements for contracted testing laboratories if there are permitted;
- retention periods for certification results;
- marking and labelling requirements for equipment which the certification body has certified;
- notification to regulator on the certificates issued by the certification body.

### **SDoC procedures**

A regulator issues procedures for different types of SDoCs and these procedures may include:

- testing requirements including the use of accredited/designated/recognized testing laboratories;
- technical briefs which include test results and test methods used;
- retention period of testing results;
- marking or labelling requirements for equipment declared under the SDoC procedures;
- audit requirements;
- registration requirements for equipment declared under the SDoC procedures.

## **8 Consultation process, procedures and market surveillance**

### **8.1 The need for consultation**

In the case of conformity assessment of telecommunication equipment there are many parties which have a vested interest in both the procedures for such conformity assessment, in the results of testing for compliance, and how these results are recorded and may be accessed. These vested interests are better

served when there is widespread consultation with all parties during the formulation of a conformity assessment regime within a Member State.

To date in respect of the ITU conformity assessment and interoperability programme, there has been substantial consultation in each region with the use of comprehensive workshops and questionnaires<sup>61</sup>. Useful information has been received and processed and a general feeling of consensus established on a variety of related issues. These questionnaires are relevant to this C&I guidelines document and to the elaboration of the C&I Action Plan endorsed by Council<sup>62</sup>. The ITU C&I assessment studies<sup>63</sup> are targeting communities and regions by workshops on conformity and interoperability in those regions. These studies aim to identify all the necessary elements to promote collaboration among regional and sub-regional organizations for establishing a common conformity and interoperability regime through mutual recognition agreements (MRAs) and/or regional test centres, as appropriate.

The affected and interested parties in this matter include manufacturers, importers, certification bodies, testing laboratories, government bodies such as border control agencies, the media, and regulatory authorities and in some cases citizens at large or citizen's advocacy groups and associations. All these parties to a greater or lesser degree can provide useful information on what are a country's needs.

The various perspectives on needs may include citizen concerns about non-ionization radiation emitted from devices such as cell phones, laptops and radiocommunication towers and antennae, with the specific concern related to transmitted power levels, especially for devices held in close proximity to human body parts such as the head.

There may also be concerns with reliability and safety, including electrical safety of products allowed into the marketplace. On the network operators side there are concerns about network harm from poorly designed filters on apparatus, excessive transmitted power, and other interference-related matters.

Border control agencies, inspectors and government regulatory authorities will have concerns about improper marking and identification of products, fraudulent products and non-conforming products claiming conformity with mandatory requirements.

Therefore a consultation process which embraces all these communities of interest will yield the best result in establishing the appropriate conformity assessment regime which of course needs to be backed up with appropriate legislation, regulation, enforcement and penalties for infraction.

### **Questionnaire**

Appendices 2 and 3 contain questionnaires adapted from the SADC Questionnaire of 2013, recommended for use in finding out the needs of developing countries in conformity assessment capabilities including availability of facilities, or access to: accreditation, certification, test labs, border controls, legislation, regulation, importation monitoring, market surveillance and enforcement<sup>64</sup>.

## **8.2 Consultation on market surveillance and enforcement issues**

Where there is a regulatory regime in place with published technical and related requirements it is the responsibility of manufacturers, importers, distributors and vendors to ensure that products imported into a country and deployed in the marketplace comply with the current regulations. This requirement is met

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<sup>61</sup> SADC C&I assessment southern Africa region:  
[www.itu.int/en/itu-d/technology/documents/conformanceinteroperability/sadc%20assessment%20study\\_final\\_november13.pdf](http://www.itu.int/en/itu-d/technology/documents/conformanceinteroperability/sadc%20assessment%20study_final_november13.pdf)  
ITU questionnaire: Committed to connecting the world:  
[www.itu.int/itu-d/cds/gg/generic/questionnaire.asp?projectid=193](http://www.itu.int/itu-d/cds/gg/generic/questionnaire.asp?projectid=193)

<sup>62</sup> [www.itu.int/md/S12-CL-C-0048/en](http://www.itu.int/md/S12-CL-C-0048/en)

<sup>63</sup> see section 5.9 of these Guidelines.

<sup>64</sup> SADC C&I assessment southern Africa region:  
[www.itu.int/en/itu-d/technology/documents/conformanceinteroperability/sadc%20assessment%20study\\_final\\_november13.pdf](http://www.itu.int/en/itu-d/technology/documents/conformanceinteroperability/sadc%20assessment%20study_final_november13.pdf)



through the use of conformity assessment and testing by accredited conformity assessment bodies which can include both testing laboratories and certification bodies. The requirement for compliance is a continuing requirement and is met through declarations of conformity, certification of compliance and placing of suitable marking on the product or in the product packaging. Where a declaration of conformity is made or type approval is used for demonstration of compliance, it must be borne in mind that all products placed on the marketplace will be subject to market surveillance, audit and enforcement actions at any time during the product lifetime in the marketplace.

Manufacturers, importers, distributors and vendors have a legal obligation to ensure that all regulated equipment imported into a country and/or deployed in the marketplace has been certified or declared to comply with local regulatory requirements. Where testing shows that equipment does not comply with an applicable standard, these entities are responsible for taking prompt and effective remedial action.

Consequently the consultation process for assessment of a country's needs in conformity assessment should include consultations on the level of readiness of legal, institutional and operational players to support all the actions necessary to protect, survey and enforce mandatory requirements for entry into the country and deployment of products in the marketplace. This has implications for border control agencies, regulatory bodies, enforcement agencies and legislators. It is not useful to have mandatory requirements but no market surveillance, or to have both mandatory requirements and market surveillance but no enforcement. Therefore consultations are needed which engage all these parties which have complementary and necessary roles so that they can be fully aware of how their individual responsibilities relate to each other to establish a secure and properly functioning marketplace of compliant products and systems. It is also noted that these functions can carry a significant cost burden and this has to be taken into account in both determining the level of activity and how to fund such activities e.g. through fees for performance of market access functions such as certification and registration of products and/or penalties for infractions.

### **Consultations on market surveillance intelligence and experience**

An important aspect of effective market surveillance is that of sharing of information and consulting with other countries which have a market surveillance and enforcement programme in place. In particular, countries within the same region, sharing a common language and perhaps common spectrum management and frequency assignments for services need to be engaged in consultations about collaboration. This has been realized for example within the European Community<sup>65</sup> where there are formal mechanisms established for sharing such information and conducting consultations known as "campaigns" for assessment of the needs and degree of compliance in various areas of deployed telecommunication technologies and products within Member States. This coordination mechanism is known as The Administrative Cooperation Group on R&TTE (ADCO). This European regional initiative has recently been broadened to include consultation and collaboration with some North America like-minded bodies and with the possibility of expanding the coverage of such activities.

One potential benefit of consultations with bodies conducting such collaboration efforts is to receive a heads-up notice, or advance warning from collaborators on compliance problems with technologies and products which may have early deployment in a particular country or region. This serves to alert the collaborative partners to the potential for non-compliance of such products or technologies when they are deployed more broadly and therefore can be targeted for inspection and audit. The sheer volumes and varieties of telecommunication products arriving on the marketplace each month means that market surveillance and enforcement can only be done on a small sampling of these products for simple economic reasons. Therefore sharing of market surveillance findings is one way of achieving a greater coverage of deployed products and technologies for little increase in the cost of the surveillance.

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<sup>65</sup> Market surveillance EEC: [www.erodocdb.dk/docs/doc98/official/pdf/eccrep015.pdf](http://www.erodocdb.dk/docs/doc98/official/pdf/eccrep015.pdf)

### **Consultations on border controls and importation**

Border control agencies and importers are on the front line of protection from a whole range of problem products coming onto to marketplace. The foreseen problem products may include fraudulent, non-compliant, or products with the potential for causing safety and network harm issues.

Therefore it is important that consultations be held with representatives of these two frontline bodies so that they are aware of the concerns of telecommunications authorities responsible for protection of the marketplace.

It must be pointed out that market intervention by border control agencies or importers comes at a price and therefore such consultations should include discussions on the following topics and issues:

- How are the border agency control officers to be trained for detection of non-compliant products?
- Who pays for the training (e.g. which government department or agency)?
- Which Marks are accepted by the telecommunication authorities?
- Since some border inspections may involve unloading shipping containers and truck loads of products, who pays for such costs?
- What about low value shipments which are often not inspected at all? What (if any) procedures can be agreed on to ensure that this does not become an unacceptable back door for non-compliant products entering a country?
- Can border control agencies provide “look-out” advance warnings to telecommunication authorities regarding suspected importations of non-conforming products?
- Is the legislation, under which border control agencies operate, robust enough to allow the desired freedoms of sharing information with telecommunications authorities?
- How can the consultations with the importer associations resolve objections related to cost increases related to inspections? Such resistance may be expected particularly by well-respected companies with excellent track records.
- Can telecommunication authorities in concert with border control agencies grant immunities to certain organizations who have gained respect for compliance over time so that their importations can be fast tracked?
- Is there a need for consultations with legal authorities to ensure that existing legislation can allow the necessary measures for granting such immunities?

### **Consultations with additional parties**

In consulting on a country’s needs in conformity assessment there are additional parties which may be able to play a useful role and provide additional information and additional perspectives. These include consumers associations or advocates, and telecommunication service providers.

#### **Consumers associations**

Where these bodies exist they are usually well versed in the kinds of problems being experienced in the marketplace by citizens. They often have a good assessment of the degree of non-compliance in certain product areas including telecommunication consumer equipment.

Communications devices such as cell phones, smart phones, etc. are perhaps among the most numerous devices to be found in societies today in most areas of the world. Therefore consulting with them on the topic of conformity assessment of hand-held telecommunications devices and related communications products can provide a unique insight into the impact and frustrations experienced by unsafe, non-performing, poorly-performing, and fraudulent products.

This in turn can help telecommunication authorities articulate better the social and economic impacts of having a non-compliant telecommunication marketplace and begin to understand how this can impede the

development and deployment of new telecommunication-based services and ultimately improved economic activity. Examples of such services that depend on an orderly and properly operating marketplace may include remote education and health services. An awareness of this, armed with the results of the consultations can also help to secure the necessary funding and resources to establish a robust conformity assessment regime.

### Telecommunication service providers

Telecommunications service providers are important organizations to consult in assessing a country's needs in conformity assessment. In general their services will explicitly support a certain set of connective devices, both hard-wired and wireless and they will have marketplace information that drives their preferences. Therefore it is important that establishment of a conformity assessment regime take this into account especially as regards choices of technologies such as CDMA, GSM, LTE, DSL and so on.

They are also able to provide detailed technical information regarding their network infrastructure requirements including transmit powers levels, spectrum masks, service coverage, and related safety requirements. Many of the items in the list of questions in section 1 of Appendix 1 are aimed specifically at the telecommunication service provider community.

## 8.3 High level government consultation mechanisms

It is worth mentioning that governments in many countries and regions maintain high level mechanisms for both informing and consulting on a wide basis on important initiatives being taken such as new draft legislation, new proposed regulations and related matters. Two examples from countries with well-established legal and regulatory instruments and institutions are provided below for reference.

### Canada

The *Canada Gazette* is the official newspaper of the Government of Canada. It was first published on October 2, 1841. While originally it published all acts of the Parliament of Canada, it later also published treaties, hearing and tribunals, proclamations and regulations, and various other official notices as required. The Gazette is most often read to find new acts, regulations and proclamations<sup>66</sup>.

Publication in the Gazette is considered official notice to all Canadians. After a regulation has been approved by the government, the regulation is published in the Gazette. If a regulation has not been published in the Gazette, a person cannot be convicted of the offence. This speaks to an important procedure which may result from market surveillance and enforcement should a non-compliance be found by inspection authorities. Note also that Canada's Provinces all have their own versions of the Gazette.

Structurally, the *Gazette* is published in three parts. For purposes of these C&I guidelines and the subject of consultations related to conformity assessment, only part I is included here.

### Part I

Part I is published each Saturday. It contains public notices, official appointments and **proposed regulations**, as well as miscellaneous notices from the private sector that are required to be published by federal statute or by regulations. The **proposed regulations** are published in Part I as a way for the public to comment on them. Once the regulations are pre-published, the department that sponsored the legislation collects public comments to allow for any changes to be made to the regulation. Any area covered by the Gazette notice may be the subject of comment and feedback, rather than being restricted to a specific list of topics such as in a questionnaire. A recent example of the use of the Canada Gazette consultation process on "Public Safety Radio Interoperability" is provided below and may be viewed in detail at<sup>67</sup>.

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<sup>66</sup> The full description of the Canada Gazette process may be viewed at: [www.gazette.gc.ca/gazette/home-accueil-eng.php](http://www.gazette.gc.ca/gazette/home-accueil-eng.php)

<sup>67</sup> [www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08649.html#sect1](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08649.html#sect1)

## Intent

As announced in *Canada Gazette* Industry Canada is releasing this consultation paper to seek comments on guidelines that will outline different levels of radio interoperability between public safety users. In addition it will propose methods that the Department may use to ensure the capability of public safety systems to meet the appropriate level of radio interoperability. The issue of radio interoperability is a broad and complex matter. It involves the convergence of issues such as governance through the cooperation of all public safety agencies, standard operating procedures for the different types of usage situations, training of personnel and exercises to ensure full functionality as well as the technology to allow communications.

Under the Department legislative mandate for ensuring the orderly development and efficient operation of radiocommunication, the focus of this consultation is on the issue of radio interoperability among public safety agencies in the area of technology, including radio frequency issues. Specifically, the intent of this consultation paper is to seek comments on the definition of radio interoperability and other associated terms, as well as an outline of different levels of radio interoperability, and the method that the Department would use to ensure that prospective users meet the appropriate level of radio interoperability. *Canada Gazette* notice invites interested parties to submit their comments by “date/named authority/address”<sup>30</sup>.

## United States of America

The official government sanctioned public consultation process in the United States of America, under the authority given to the Federal Communications Commission (FCC) for establishing the rules (regulations) governing telecommunications matters is known as “rule making”<sup>68</sup>. The term itself implies that the process is one of making the rules or regulations for implementing the legislation governing matters of telecommunications.

Most FCC rules are adopted by a process known as “notice and comment” rulemaking. Under that process, the FCC gives the public notice that it is considering adopting or modifying rules on a particular subject and seeks the public’s comment. The FCC considers the comments received in developing final rules.

The rulemaking process was prepared to help the public better understand how the rulemaking process works so that members of the public may more effectively participate in it. Therefore it is intended to be a consultation on the widest possible scale, taking into account all views on proposed rules including all interested parties whether businesses or private citizens. In this sense it is similar in intent to the Canadian Gazette process described above. The rulemaking process can lead to the issuance of a new rule, an amendment to an existing rule, or the repeal of an existing rule.

There are three basic types of rules. (Rules are also sometimes called “regulations”). They are:

- a. Legislative (sometimes called “substantive”) rules: These rules create legally binding rights and obligations for the agency and the public. For example, a legislative rule might say that broadcast towers must have lights to reduce the hazard to aviation.
- b. Non-legislative rules: These rules are of two subtypes:
  - i. Interpretive rules: As the name suggests, these rules interpret the meaning of statutes or legislative rules that the FCC administers.
  - ii. Policy statements: These tell the public how the agency plans to exercise some discretionary power that it has. For example, a policy statement might explain the typical fines for particular violations of the FCC rules.
- c. Organizational and procedural rules: These rules describe the agency’s structure and the way in which its determinations are made. For example, such rules may delegate authority to make certain decisions to a particular Bureau within the FCC or set a deadline for filing comments with the FCC.

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<sup>68</sup> FCC rulemaking process: [www.fcc.gov/encyclopedia/rulemaking-process-fcc#q1](http://www.fcc.gov/encyclopedia/rulemaking-process-fcc#q1)

### **Notice of proposed rulemaking**

In notice-and-comment rulemaking, an agency must first issue a notice of proposed rulemaking (NPRM) and provide an opportunity for public comment on the proposal before it can issue a final rule. There are exceptions to the requirement for notice and comment. For example, notice and comment may be waived for “good cause” for such things as emergencies.

The NPRM explains the need, source of authority, and reasons for the proposed rule changes. The NPRM will contain either the text of a proposed rule or a description of the subjects and issues involved. The agency’s explanation of its proposal may include how the agency chose its proposed solution to the problem or alternative solutions that the agency is considering. Although the public may comment on anything in the proposal, the agency usually will include specific questions on which it particularly wants public comment and data. The NPRM also includes such information as the deadline for public comments, how and where to file comments, and people to contact for further information about the proposal.

### **Public comment period**

Generally, the FCC will allow at least 30 days for the public to file comments on an NPRM with the FCC. Sometimes, especially for highly technical and complex matters, we provide much longer periods. Shorter periods may be used where there is a need to act quickly. The public may request more time to comment and if a clear reason is provided this can result in a decision to extend the comment period.

### **Public comments**

The volume and length of comments received in response to an NPRM vary depending on the nature and scope of the proposed rule changes. Public comments are in general viewed as very helpful to the decision making process.

### **The final rule**

After the comment period closes and the FCC has reviewed and analysed the comments received, a decision is made whether to proceed with the proposed rulemaking, issue a new or modified proposal, or take no action on the proposal.

Any final rule must include an explanatory preamble and the rule text. The preamble includes a response to the significant, relevant issues raised in public comments and a statement providing the basis and the purpose (i.e. an explanation) of the rule. The FCC is not required to respond to each commenter; similar comments may be grouped together with an opening statement such as “several commenters suggested that” or the commenters may be referred to by name.

### **Final rule publication**

The final rule is published in the *Federal Register* or in rare cases personally served on affected entities. In addition, a copy is placed in the rulemaking docket. The Office of the Federal Register, on a rolling, annual basis, updates the *Code of Federal Regulations* (C.F.R.), which contains the federal agency rules currently in effect. The FCC rules are in volume 47 of the C.F.R.

### **Final comment on consultation processes**

The two consultation processes described above in overview are good examples of how two different countries engage a wide body of their public with government and its agencies in formulating rules and regulations which affect their lives and businesses. In many ways they are parallel processes reaching the same ultimate goals of arriving at robust decisions on the formulation of regulations and rules governing, in this case, deployment of telecommunications apparatus and services.

While the target of these C&I guidelines is focused somewhat narrowly on conformity assessment regimes, it is nevertheless a topic which can benefit from widespread consultation such as is facilitated by the above rulemaking and regulatory consultation processes. Other countries and regions, such as Australia and the European Union, employ similar models with equal success.

## 9 Establishment of conformity assessment testing laboratory and budget

### 9.1 The case for national or regional conformity assessment laboratories

The following sections are adapted from the ITU *Guidelines for developing countries on establishing conformity assessment testing labs in different regions*<sup>69</sup> with updates and additional material. This material is intended to provide sufficient background to enable a better understanding of the kinds of costs and overall budget associated with establishment and operation of a conformity assessment testing laboratory. Furthermore it is deemed useful to provide some data on the amount of activity that is carried out in such a facility and the kind of decisions that need to be made to provide adequate assessments and enforcement of compliance in the marketplace with limited resources.

Sources for the accompanying data, laboratory unit equipment set-ups, statistical data and standards have included a number of operational conformity assessment laboratories which have provided useful practical information. In particular the Certification and Engineering Bureau of Industry Canada has provided excellent overviews of their operations in Canada, and have accommodated site visits and technical briefings in preparation of this section of these C&I guidelines.

### 9.2 Marketplace needs

There are many factors that underlie creation of an orderly marketplace in telecommunication products and services. A primary requirement is the establishment of robust technical requirements for products entering the marketplace. Such requirements address safety of personnel, both the user community and the network service provider personnel, and the establishment of an interference free environment for telecommunication services.

Interference free services – wireless and wireline – are implicated in the economic development of a society as participation in the global digital economy demands robust, secure and dependable telecommunication platforms over which the economic activity takes place. Furthermore a market access regime that is well defined, well managed, non-discriminatory and transparent inspires trust and confidence in equipment suppliers, service providers and people in general. Such a regime backed up by an appropriate legislative framework is a fundamental building block to deliver the requisite quality of national and international connectivity crucial to participation in the global digital economy. In fact in a very real way it reflects the priorities and values of a society.

In many developing countries there are no basic requirements established in law for telecommunication apparatus importation and deployment in the marketplace. Such decisions may be left entirely to service providers which are often local branches of international service providers. Therefore the starting point for countries intending to introduce guidelines and requirements to address problems, or even chaos in the marketplace, can vary widely. In some countries, there may be no technical standards or requirements, in others technical requirements may exist for some product types such as cell phones but where, at the same time, no market surveillance, audit or testing capability exist to check for compliance or enforce conformance.

#### Example 1 – Adoption of an existing regime

This example is based on the process adopted by several countries with no established indigenous technical requirements for marketplace entry for telecommunication equipment. It is driven by an urgent need to redress problems of interference, network harm and safety issues but where the expertise or financial resources are insufficient to establish national requirements. It is based on placing trust in one or more national requirements from other developed countries, using their compliance marking and technical requirements as evidence of adequate quality of products for importation and deployment by service providers and users. In some countries the scarce resources that are available are put into inspection and

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<sup>69</sup> [www.itu.int/ITU-D/tech/ConformanceInteroperability/ConformanceInterop/Guidelines/Test\\_lab\\_guidelines\\_EV8.pdf](http://www.itu.int/ITU-D/tech/ConformanceInteroperability/ConformanceInterop/Guidelines/Test_lab_guidelines_EV8.pdf)



follow up with regards to deployed telecommunication equipment, rather than the larger task of establishment a national system. The two most popular markings adopted for recognition and acceptance are those of the Federal Communications Commission (FCC Mark) in the United States of America, and the European Community (CE Mark) in the European Union. Clearly there are many shortcomings of such an approach, including maintaining up to date information on approved products, changes and versions, but testimonials from officials with oversight responsibility from such countries report a market improvement in compliance-related incidents. Nevertheless they view such an approach as an interim solution until they are able to establish their own regime.

### **Example 2 – Fully fledged national system**

This example is based on the type of market entry and deployment requirements of developed countries based on the regulatory frameworks of developed countries, such as the USA and the Members of the European Community. In all cases the requirements begin with a robust legal framework for market entry with assessed penalties for non-compliance. The legal framework reflects the overall policy for dealing with telecommunication products legitimately placed on the market, and is interpreted in regulations which add the necessary details regarding technical specifications and standards, processes for accreditation, testing, certification and marking, and assessed penalties for infractions. They may also include various authorities and procedures for inspection, ticketing, post market surveillance and audit. The technical specifications generally cover the following areas of product and activity:

- wireless and wireline apparatus;
- EMC requirements;
- SAR limits;
- broadcast equipment.

In practice implementation alternatives for an orderly telecom equipment marketplace often include a mix of the activities and procedures outlined in the two examples. The important thing is to recognize the nature of problems being encountered in a specific country, prioritizing them and dealing with them on that basis as resources permit.

## **9.3 Importance of assessing conformity**

### **Type approval testing issues**

Many developing countries are moving quickly from uncontrolled market access for telecommunication equipment to controlled access driven by a variety of concerns. These include concerns about health effects of non-ionizing radiation, quality of service, performance of equipment and safety. To address these concerns conformity assessment of telecommunication equipment intended to be placed on the marketplace is an essential requirement. Specific mandatory technical standards provide the fundamental basis for this conformity assessment process, complemented by trusted marking of conforming products. The large volumes of ICT products on the marketplace makes it prohibitively expensive to test each individual product coming off the production line and therefore the type approval method is used in most cases. This means that a representative product is tested for conformity to the mandatory requirements, with further sampling from the production line as required to ensure continued compliance throughout production runs of potentially hundreds, thousands or even millions of the same apparatus.

Many are already using the adoption method described in the example above or a mix of the processes described in both examples to improve orderliness in the telecom marketplace, and many more have moved already to explore the costs and requirements to implement testing labs, accreditation and certification systems.

Others are actively seeking financial assistance from funding agencies, training sources, developed country experts and ITU to establish test centres and improve quality, performance and interoperability of systems including interoperation with legacy systems. Consultations and surveys have borne out the magnitude and

complexity of non-interoperability and non-compliance and the impact these have on service levels, frustration of users and service providers, loss of business and general economic loss.

### **Business opportunities for conformity assessment testing laboratory**

In concert with the desire on everyone's part to have the basic expertise and tools to assess compliance and deal with non-interoperability there is also a growing recognition of a potential business opportunity associated with having conformity assessment testing lab(s), expertise and facilities which could lead to a particular testing laboratory becoming a testing laboratory(s) of choice for regional needs. This model has already been proven in the mutual recognition agreements/arrangements (MRAs) on conformity assessment that exist amongst the European Community, Americas region, and Asia and Pacific region countries. MRAs permit the recognition of competence of MRA partners to carry out each other's conformity assessment procedures including production of test reports, certification and marking. Thus a conformity assessment testing laboratory recognized in an MRA partner country with competitively priced services could potentially capture a major share of the conformity assessment testing business amongst the parties.

Even in the absence of MRAs, conformity assessment testing labs which have robust credentials based on ISO/IEC standards may be accessed by any product supplier or other body for trusted testing and conformity assessment. Appendix 5 provides a short list of such testing labs available in various geographic areas worldwide.

## **9.4 Interoperability testing issues**

Interoperability testing is at another level of complexity beyond regulatory type approval testing. It deals with fully understanding complex communication protocols, their implementation and interactions between and among complete devices – i.e. system testing. It is complementary to conformance testing but has a much greater requirement for programming language and computer science expertise and expertise in test suite languages, formal description languages, and operation of sophisticated software test tools.

Type approval conformity assessment testing laboratory expertise however can ease the transition to interoperability testing. Therefore there may be merit for some developing countries transitioning through the establishment and operation of testing related to mandatory requirements such as spectrum masks, signal power levels and safety requirements before attempting complex interoperability testing. Furthermore, gaining familiarity with test equipment set-ups, test equipment, test methodologies and procedures for type approvals would be helpful in establishing the expertise base needed to move on to more complex tasks.

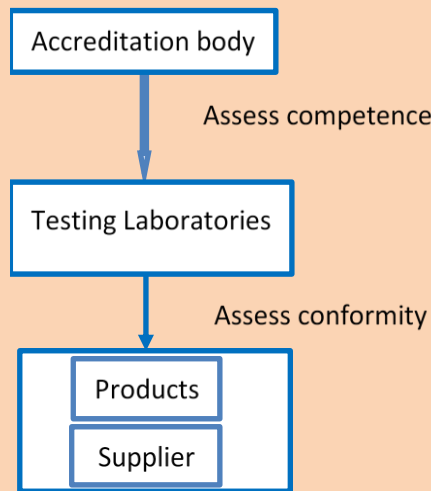
## **9.5 Trusted credentials for conformity assessment testing laboratory**

Figure 9 shows the hierarchy of the approval process which results in a product being ready for the marketplace with a robust set of credentials asserting its compliance.

In the regulated sector, the regulator sets specifications and standards for interfaces and equipment which telecommunication products have to meet before they can be sold or used in the territory of the regulator. Similarly in the private sector, service providers and users set specifications and standards for the telecommunication equipment they are going to procure while manufacturers set specifications and standards for the telecommunication equipment they are going to produce.



**Figure 9: Conformance testing**



Source: ISO CASCO

In both the regulated and private sectors, the interested parties require evidence and proofs that the telecommunication equipment meet the specifications and standards set by the regulators and the service providers and users.

### 9.6 Conformity assessment testing labs

Many conformity assessment testing labs are in operation on a global basis (Appendix 5) offering testing services in the telecommunication field which include testing for product compliance to mandatory standards, and also for interoperability testing of products and systems. The trusted credentials for such conformity assessment test facilities are generally based on robust and widely accepted ISO/IEC standards. Conformity assessment testing labs advertise their services, scopes and fees and compete for the global testing market which is substantial. De facto standards development forums and consortia also cooperate in testing activities in support of their memberships and will often offer these services also to non-members at a premium price.

Appendix 5 provides a list of worldwide testing labs which offer telecommunication testing services and provides the hyperlinks to their respective websites. More conformity assessment testing laboratory websites are appearing on the web on a regular basis and it is therefore recommended to check for new sites on a regular basis.

In the context of this report which is intended primarily for developing country use, conformity assessment testing labs whose services may be widely shared are likely of most interest. Conformity assessment testing labs can be very expensive to establish and operate with significant capital equipment outlay and on-going expenses for expert staff, administration and up-keep of test gear and even maintenance of internationally recognized credentials such as those provided by accreditation to ISO/IEC Standards. These aspects are dealt with in more detail in other sections of these guidelines.

In many cases conformity assessment testing labs provide services to a particular community of interest within their sovereign state or region and considerations such as language of operation and scope of services are key factors in determining both their business case and general utility to the region. Ideally in the case where financial resources are very limited for construction of testing facilities, it could be envisaged that a shared cost model for establishment of a conformity assessment testing laboratory could be used. However there are often sovereignty issues, legal issues and operational issues which may complicate such

a shared cost facility model and therefore caution must be exercised and such issues confronted before proceeding with the shared model arrangement.

In all cases conformity assessment testing labs need to have well established credentials in order to meet the demands for trust by their customer base.

Conformity assessment testing labs may offer the following types of services:

- conduct conformance testing of equipment to meet specific standards and specifications as required by vendors, manufacturers, service providers and network operators;
- conduct interoperability testing of equipment on specific networks;
- conduct testing and evaluation of equipment which employs new technologies before deployment in networks.

They may be established as:

- private conformity assessment testing labs belonging to manufacturers and testing laboratories (Appendix 5) which test for compliance of equipment belonging to the manufacturers or equipment specified by the customers;
- conformity assessment testing labs which serve a specific community based on, for example specific technologies;
- Conformity assessment testing labs operating at the international or regional levels such as the ETSI Plugtests or the test centre established by the Central Scientific – Research Institute of Communication (ZNIIS) of the Russian Federation which tests equipment to meet international standards (ISO) and Recommendations (ITU).

## **9.7 Requirements for ISO/IEC 17025: 2005 compliant testing laboratories**

*The text in this section taken from ISO/IEC 17025:2005 – General requirements for the competence of testing and calibration laboratories, is reproduced with the permission of the International Organization for Standardization, ISO. This standard can be obtained from any ISO member and from the Web site of the ISO Central Secretariat at the following address<sup>70</sup>. Copyright remains with ISO.*

ISO/IEC 17025:2005/Cor1:2006 “General requirements for the competence of testing and calibration laboratories”

ISO/IEC 17025:2005 was updated to bring its quality system requirements more in line with ISO 9001:2000 – “Quality Management Systems – Requirements”<sup>71</sup>. It addresses both management system elements and technical competence in a systemic and consistent way. There are two main requirements sections, namely management requirements and technical requirements.

ISO/IEC 17025 is applicable to all organizations performing test and/or calibration including first-, second- and third-party laboratories. Such tests may be required to demonstrate the fulfilment of regulatory, safety or contractual requirements.

ISO/IEC 17025 addresses both management system elements and technical competence in a systemic and consistent way. There are two main requirements sections, namely management requirements and technical requirements.

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<sup>70</sup> [www.iso.org](http://www.iso.org)

<sup>71</sup> [www.iso.org/iso/catalogue\\_detail?csnumber=46486](http://www.iso.org/iso/catalogue_detail?csnumber=46486).

## **Management requirements**

### **Organization**

The laboratory or the organization of which it is part shall be an entity that can be held legally responsible. In carrying out its activities, the laboratory is responsible for meeting the requirements of ISO/IEC 17025; the needs of its clients; the regulatory authorities and the organizations providing recognition. The management system shall cover work at the laboratory's permanent facilities; at sites away from its permanent facilities; or in associated temporary or mobile facilities. If the laboratory is involved in activities other than testing and/or calibration, its organizational arrangement shall be such to ensure that key personnel do not have a conflict of interest and their responsibilities are clearly defined.

### **Laboratory requirements**

- The laboratory shall have managerial and technical personnel with authorities and resources needed to carry out their duties including implementation, maintenance and improvement of the management system.
- There shall be arrangements to ensure management and personnel are free from undue internal and external pressures and influences that may adversely affect the quality of their work.
- There shall be policies and procedures for the protection of client's confidential information and proprietary rights including electronic storage and transmission of results.
- There shall be policies and procedures to avoid involvement in activities that would diminish confidence in the laboratory's competence and integrity.
- Organization and management structure of the laboratory shall be defined including its relationship within a larger organization; relationships between quality management, technical operations and support services.
- The responsibility, authority and inter-relationship of personnel involved in management, performance or verification of work affecting the quality of tests and/or calibrations shall be defined.
- There shall be adequate supervision of testing and calibration staff including trainees.
- The laboratory shall have technical management with overall responsibility for technical operations and the provision of resources needed to meet the quality of laboratory operations.
- The laboratory shall:
  - have an appointed quality manager with the access to the highest level of management;
  - have deputies for key personnel; and
  - ensure its personnel are aware of the importance of their activities and how they contribute to the objectives of the quality system.

### **Management system**

- The laboratory shall establish, implement and maintain a management system appropriate to the laboratory scope of activities with documented policies, procedures and instructions.
- The quality policy shall be defined in a quality manual and issued under the authority of top management. The quality objectives must be measurable.
- Top management shall provide evidence of its commitment to the development, implementation and improvement of the management system.
- The roles and responsibilities of technical management and quality manager shall be defined in the quality manual.
- The integrity of the management system shall be maintained when changes in management system are made.

## **Document control**

### General

The laboratory shall have procedures to control all documents as part of its management system including internally generated and from external sources.

### Document approval and issue

- Documents shall be reviewed and approved by authorized personnel.
- A master list shall be established and be readily available.
- Authorized editions of documents shall be available at all locations where operations essential to effective functioning of the laboratory is performed.
- Documents shall be reviewed periodically for continuing suitability and compliance.
- Documents which are invalid or obsolete shall be promptly removed and those which are retained shall be identified with suitable marking to guard against unintended use.
- Document shall be uniquely identified with date of issue, page numbers or mark indicating end and issuing authority.

### Document changes

- Changes to documents shall be reviewed and approved by original function that performed the original review.
- Altered or new text shall be identified where practicable.
- There shall be procedures for describing how changes in documents maintained in computerized systems are made and controlled.
- If hand written amendments are allowed, pending the re-issue of a document, the procedures and authorities for such amendments shall be defined.

## **Review of requests, tenders and contracts**

- The laboratory shall have procedures for reviews of requests, tenders and contracts to ensure that:
  - requirements, including methods to be used are adequately documented and understood;
  - it has resources and capabilities to meet the requirements;
  - the appropriate tests or calibrations are selected and are capable of meeting the customer's requirements.
- Any differences between the request or tender and the contract shall be resolved before commencing work and each contract shall be acceptable to the laboratory and its customer.
- Records of the review shall be maintained and clients shall be informed of any deviation from the contracts.
- The review shall cover any work that is subcontracted by the laboratory.
- The same subcontracting work shall be repeated for any amendments after work has started.

## **Subcontracting**

- Subcontracting work shall be placed with competent laboratories (e.g. those which meet the requirement of ISO/IEC 17025).
- The laboratory shall in writing, advise the customers of the subcontracting test and where appropriate obtain their approval.

- The laboratory is responsible to the customer for the subcontractor's work, except in the case where the customer or a regulatory authority specifies which subcontractor is to be used.
- The laboratory shall maintain a register of all subcontractors used and a record of ISO/IEC 17025 compliance for the work in question.

#### **Purchasing services and supplies**

- The laboratory shall have procedures for selecting and purchasing of services and supplies affecting quality of work.
- Purchased services and supplies shall not be used until they have verified as complying with requirements.
- Purchasing documents shall adequately describe the services and products ordered and they shall be reviewed and approved for technical contents before being released.
- Suppliers shall be evaluated by the laboratory before used and a list of approved suppliers shall be maintained.

#### **Service to customer**

- The laboratory shall be willing to cooperate with customers or their representatives to clarify requests and monitor its performance in relation to the work, while ensuring confidentiality to other customers.
- The laboratory shall seek feedback both positive and negative from customers and feedbacks from customers shall be analysed for improvement.

#### **Complaints**

- The laboratory shall have a policy and procedures for the resolution of customer complaints.
- The laboratory shall maintain records of complaints and investigations and corrective actions taken.

#### **Control of nonconforming testing**

- The laboratory shall have a policy and procedures that shall be implemented in the case of the testing does not conform to its own procedures or customer requirements. The policy and procedures shall ensure that:
  - there is an evaluation of significance of nonconforming work;
  - corrective action is taken immediately including the decision about the acceptability of the nonconforming work;
  - responsibilities and authority for taking action are designated;
  - where necessary the customer is notified and work is recalled;
  - the authority for resumption of work is defined;
  - where the evaluation points to the possibility of recurrence of the nonconforming work, corrective action shall be taken in accordance with ISO/IEC 17025.

#### **Improvement**

The laboratory shall continually improve the effectiveness of its management system through the use of the audit results, analysis of data, corrective and preventive actions and management review.

#### **Corrective action**

- The laboratory shall have policies and procedures for corrective action and shall designate appropriate authorities for the implementation of corrective actions.

- Corrective actions procedures shall include root cause analysis and selection and implementation of corrective actions.
- The laboratory shall monitor the results of corrective actions to ensure their effectiveness.
- Additional audits shall be taken when compliance with the laboratory's own policies or the requirements of ISO/IEC 17025 are in doubt.

#### **Preventive action**

- Needed improvements and sources of potential nonconformities shall be identified.
- If there are identified improvement opportunities or required preventive actions, plans shall be developed, implemented and monitored to reduce the likelihood of non-conformities.

#### **Control of records**

- The laboratory shall have procedures for the identification, collection, indexing, access, filing, maintenance and disposal of quality and technical records.
- Records shall be readily retrievable and stored in a manner to prevent damage and loss. Retention times shall be specified.
- Records shall be confidential and be held in a secure place.
- The laboratory shall have a policy and procedures for back up of records stored electronically and to prevent unauthorized access to or amendment of these records.
- The laboratory shall retain for a defined period of time:
  - original observations;
  - derived data;
  - sufficient information to establish an audit trail;
  - calibration records;
  - staff records;
  - a copy of each test report or calibration certificate issued.
- Test or calibration records shall contain sufficient information enabling:
  - identification of factors contributing to measurement uncertainty;
  - tests to be repeated under conditions as close as possible to the original tests;
  - identification of personnel responsible for the sampling, performance and checking of results.
- Observation, data and calibration must be identifiable to specific tasks.
- Mistakes in records shall be crossed through but be still legible with the correction entered next to the original information.
- Each alteration shall be signed or initialled by the person making the correction.

#### **Internal audits**

- Internal audits shall be conducted periodically and within a predetermined schedule and procedure.
- All elements of management system shall be covered including testing activities.
- The quality manager is responsible for planning and carrying out internal audits.
- Auditors shall be trained and qualified personnel who are, where resources permit, independent of the activity to be audited.

- Where audit findings cast doubt on the effectiveness of the laboratory's operation, the laboratory shall:
  - take timely corrective action;
  - shall notify customers in writing if investigations show that the laboratory results may have been affected.
- The area of activities audited, the audit findings and corrective action shall be recorded.
- There shall be follow-up to the audit to verify and record the implementation and the effectiveness of corrective actions taken.

#### **Management reviews**

- Management reviews shall be conducted periodically (typically once per year) in accordance with a predetermined schedule and procedure to:
  - review the effectiveness and suitability of the laboratory's management system and its test or calibration activities;
  - introduce necessary changes or improvements.
- Management review shall cover:
  - the suitability of policies and procedures;
  - reports from managerial and supervisory personnel;
  - the outcome of recent internal audits;
  - corrective and preventive actions;
  - assessment by external bodies;
  - the results of inter-laboratory comparisons or proficiency tests;
  - changes in the volume or type of work;
  - customer feedback;
  - complaints;
  - recommendations for improvements;
  - other relevant factors such as quality control activities, resources and staff training.

#### **Technical requirements**

##### **General**

- Factors determining the correctness and reliability of the tests include:
  - human, environmental conditions, test methods and method validation;
  - equipment, measurement traceability, sampling and handling of test items.
- The laboratory shall take these factors into account when developing tests, procedures, training and qualification of personnel and selection of equipment.

##### **Personnel**

- The laboratory shall:
  - ensure the competence of all who operate equipment, perform tests, evaluate and sign test reports and calibrate certificates;
  - set goals related to education, training and skills of its personnel;
  - have policies and procedures for training programmes and evaluation of their effectiveness.

- The laboratory shall maintain job descriptions for managerial, technical and support staff.
- Management shall authorize specific personnel to:
  - perform particular types of sampling and testing;
  - issue test reports and calibration certificates;
  - operate specific types of equipment;
  - give opinions or interpretations.
- The laboratory shall maintain records of relevant authorizations, competence, qualifications and experience, including those under contract.

#### **Accommodation and environmental conditions**

- Laboratory facilities (including energy source, lighting, environmental) shall be suitable for performing tests correctly. Special care shall be taken when tests are performed at a location other than the laboratory's permanent facility.
- Technical requirements for accommodation and environmental conditions that can affect results shall be documented.
- Environmental conditions shall be monitored, controlled and recorded.
- Testing shall be stopped when conditions jeopardize test results.
- There shall be effective separation between incompatible activities.
- Measures shall be taken to avoid cross-contamination.
- Access to and use of areas affecting quality of testing shall be controlled. The laboratory shall determine what is necessary based on its particular circumstances.
- The laboratory shall practise good housekeeping.

#### **Test and calibration methods and method validation**

- The laboratory shall use appropriate methods and procedures for all tests in its scope.
- The laboratory shall have instruction on the use and operation of all relevant equipment and on the preparation and handling of all test items where the absence of such information might jeopardize the tests. All information shall be kept up-to-date and made readily available to personnel.
- Any deviations from test methods shall be documented, justified, authorized and shall be accepted by the customer.
- The introduction of laboratory developed methods shall be a planned activity and shall be assigned to qualified personnel with adequate resources.
- Plans shall be updated as development proceeds and shall be communicated to all involved personnel.
- The use of non-standard method shall:
  - be subject to agreement with the customer;
  - include a clear specification of the customer's requirements and the purpose of the test or calibration;
  - be validated before use.



### Validation of methods

- The laboratory shall validate non-standard methods, laboratory-designed/developed methods, standard methods used outside their intended scope to confirm that the methods are fit for the intended use.
- The laboratory shall record the results, the procedures used for validation and a statement on whether the method is fit for the intended use. The range and accuracy of values obtained shall be relevant to the customer's needs.

### Estimation of uncertainty of measurement

- The laboratory shall have procedures for estimation of uncertainty for types of tests and calibrations.
- Where the test method may preclude rigorous analysis, the laboratory shall at least:
  - attempt to identify all components of uncertainty;
  - make a reasonable estimation based on knowledge of the performance of the method and on the measurement scope;
  - ensure that the form of reporting does not give a wrong impression of uncertainty.

### Control of data

- Calculation of data transfer shall be subject to appropriate checks.
- Computer software shall be suitably validated.
- The laboratory shall have procedures for protecting data, integrity and confidentiality of data collection, data storage, data transmission and data processing.
- The computers and automated equipment shall be cared for as required to ensure proper functioning and maintenance of integrity of the test data.

### **Equipment**

- The laboratory shall be furnished with test equipment for correct performance of tests.
- When it is necessary to use equipment outside of its control, the laboratory shall ensure that all applicable requirements of ISO/IEC 17025 are met.
- Equipment shall be calibrated or checked to ensure that it meets the laboratory's specifications before being put into use.
- Equipment shall be operated by authorized personnel.
- Up-to-date instructions shall be readily available to the laboratory's personnel.
- Equipment shall be uniquely identified.
- Records of equipment shall be maintained relevant to the tests performed.
- The laboratory shall have procedure for safe handling, transport and storage of equipment to ensure its proper functioning and to avoid cross-contamination.
- Equipment shall be marked or indicated if it is defective or outside specified limit.
- Equipment shall be labelled with calibration status.
- Equipment which has been subject to mishandling or found to be defective shall be:
  - taken out of service;
  - isolated or clearly marked to indicate that it is out of service until repaired and calibrated.
- An investigation shall be conducted to determine if the defective equipment has had any impact on previous results and appropriate corrective action shall be taken.

- Whenever equipment has been out of the laboratory's control for whatever reason, the function and calibration status shall be checked before it is returned to service.
- Where intermediate checks are required, these checks shall be performed in accordance with defined procedures.
- Where calibration gives rise to correction factors, the laboratory shall ensure that these factors are correctly updated.
- Equipment shall be safeguarded from adjustments which would invalidate test or calibration results.

#### **Measurement traceability**

- All equipment having a significant effect on test results shall be calibrated.
- The laboratory shall have an established programme and procedures for calibration of its equipment.
- Calibration of equipment shall be traceable to SI (*Système international d'unités*) units through a series of unbroken calibrations or comparisons linked to relevant primary standards, typically through national metrology institutes.

#### **Reference standards and reference materials**

- Where applicable, the laboratory shall have a programme and procedure for the calibration of its reference standards and access to appropriate reference materials.
- Reference standards and materials shall be traceability to SI units of measurement, or to certified reference materials.
- Checks needed to maintain confidence in the calibration status of reference, primary, transfer or working standards and reference materials shall be carried out according to defined procedures and schedules, including transportation and storage.

#### **Sampling**

- The laboratory shall have a sampling plan and procedures when it carries out sampling.
- Records with appropriate sampling data shall be kept when there are any deviations, additions or exclusions to the sampling requirements.
- Records shall include the sampling procedures, identification of the sampler, environmental conditions, diagrams and where necessary statistics upon which sampling is based.

#### **Handling of test and calibration items**

- The laboratory shall have procedures for the identification, transportation, handling, storage, retention or disposal of test items.
- Identification of test items shall be retained throughout their life in the laboratory.
- Abnormalities or departure from normal or specified conditions when received by the laboratory shall be recorded.
- Where there is doubt about the suitability of an item for test, or the test or calibration is not adequately described, the customer shall be consulted before proceeding.
- The laboratory shall have procedures and facilities to avoid deterioration and loss and to protect the integrity of the test items.

#### **Assuring the quality of test and calibration results**

- The laboratory shall have procedures for monitoring validity of tests undertaken.

### Reporting the results

- The laboratory shall report results accurately, clearly, objectively and in accordance with any specific instruction in the test methods.
- The test report shall include information requested by the customer and necessary for the interpretation of the test results.
- Simplified test reports may be prepared for test conducted internally or by agreement with a customer, provided that any information required in a full report shall be readily available in the laboratory where the tests or calibrations were performed.
- Tests performed by subcontractors shall be clearly identified in the reports.

### Test reports and calibration certificates

- Test reports shall as a minimum contain the following:
  - a title (e.g. “Test Report” or “Calibration Certificate”);
  - name and address of the laboratory and location where tests/calibration were performed;
  - a unique identification (such as a serial number) of the test report/calibration certificate;
  - identification of the test report on each test page;
  - indication of number of pages or end of report;
  - name and address of customer;
  - identification of test method used;
  - description of condition and clear identification of test item;
  - date of receipt of test item where this is critical to the validity and application of the results;
  - date of test or calibration;
  - reference to sampling plan and procedures used by the laboratory or other bodies where relevant to validity or application of the results;
  - test or calibration results where appropriate, with units of measurement;
  - name(s), function(s), signature(s) of person(s) authorizing certificates or test reports;
  - statements, where relevant that test results relate only to the item used.

### **Test reports**

- Test reports shall contain where necessary for test result interpretation:
  - any deviation from, addition to or exclusion from the test method;
  - information on test conditions such as environmental conditions;
  - a statement of compliance/non-compliance where relevant;
  - where applicable a statement on the estimated uncertainty of measurement. The statement is applicable when required for validity or application of results when the customer requires it or when it affects compliance with specified limits;
  - where appropriate opinions and interpretations;
  - other information that may be required by specific methods or by the customer.
- In addition, if sampling is used the report shall include:
  - date of sampling;
  - clear identification of samples;

- location of sampling (e.g. when the sample is taken as part of a product or artefact);
- reference to the sampling plan and procedures used;
- details of any environmental conditions during sampling that might affect results;
- any standard or specification for the sampling method or procedure;
- any deviation, addition to or exclusion from the procedure.

#### Calibration certificates

- Calibration certificates shall also contain:
  - environmental conditions;
  - measurement uncertainty statements;
  - evidence that measurements are traceable.

#### Opinions and interpretations

- When opinions and interpretations are included, the laboratory shall:
  - document the basis on which they are made;
  - clearly identify them as such in the test report.

#### Testing and calibration results obtained from subcontractors

When a test report includes results from a subcontractor, these results shall be clearly identified in the report. The laboratory is still responsible for the work it has subcontracted.

#### Electronic transmission of results

- When the laboratory transmits test results electronically, it has to meet all applicable ISO/IEC 17025 requirements.

#### Amendments to test reports and calibration certificates

- Once a test report or calibration certificate has been issued, material changes or amendments shall be only in the form of a further document or data transfer containing the following statement:
  - “Supplement to test reports (or calibration certificate) number [serial number] (or as otherwise identified)” or equivalent wording.
  - If it is necessary to issue a new report, it shall have a unique identification and shall refer to the report it replaces.

## **9.8 Conformity assessment testing laboratory structure**

This section provides an overview of the various elements that would form the structure of a conformity assessment testing laboratory offering a wide range of services. The intention is to provide as complete a portfolio of services as might be practical in a well-resourced situation but recognizing that in a particular case only a sub-set of such facilities and services might be established. For example, interoperability testing is an order of magnitude more costly and complex than testing to establish regulatory compliance to requirements such as transmitter power limits, frequency masks, and safety and network harm constraints. This would be beyond the interest and scope of a telecommunication regulatory authority concerned with compliance with regulatory standards and mandatory technical requirements.

In the general case a conformity assessment testing laboratory will typically consist of various functional units. These units include facilities with specialized test set-ups as described in the following sections. Each laboratory unit set-up would be tailored to the various technologies being tested to cover conformance and interoperability testing as well as the capabilities to address testing methodologies, service platform testing and many other supporting functions. Supporting the conformity assessment testing labs, there is a

requirement for databases for the test data and a knowledge database for the storage of related data on testing, implementations, standards, product registration and training.

To perform its basic functions as an operating conformity assessment testing lab, there also needs to be interactions with the larger conformance and interoperability community that includes related organizations such as vendors (for equipment purchases and testing), operators (for network implementations and interoperability testing), R&D organizations (for advances in technology and test methodology), training organizations (for course offerings and capacity building), and Standards Development Organizations (SDOs) such as the ITU-T and ISO/IEC, for protocol standards, conformance testing and test specifications.

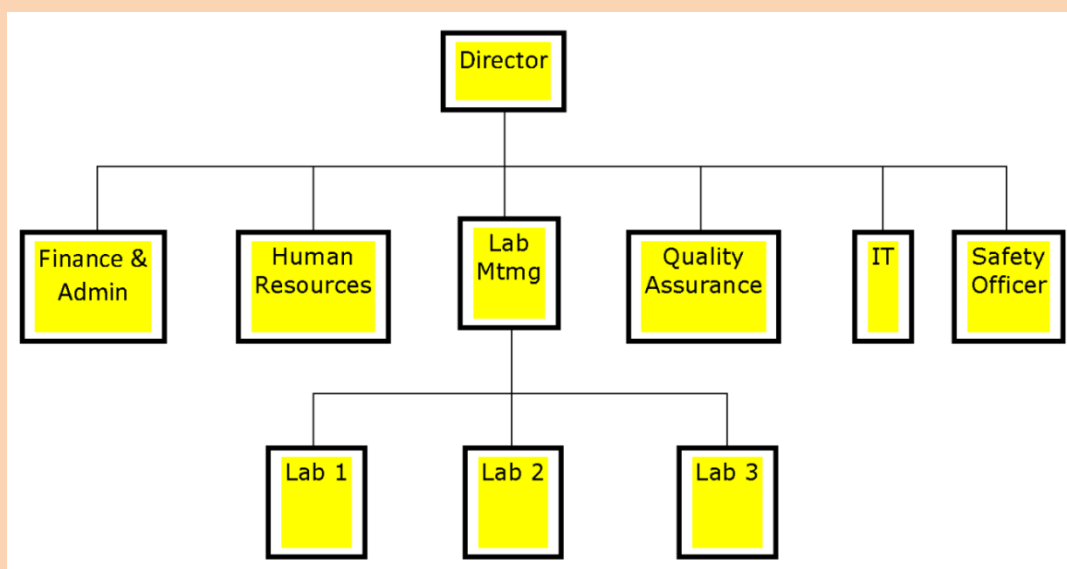
Testing laboratory business operations would normally include:

- customer interface (marketing, reception, etc.);
- financial operations and billing systems;
  - funding (e.g. consortium, government participation);
  - income stream (e.g. testing contracts, training programmes);
- human resources (hiring staff, attracting experts);
- data base/document filing system;
- training programmes (training new staff, training staff for new technologies);
- shipping and receiving functions.

### Management structure

There is a need to establish a procedure to ensure that departments of a conformity assessment testing laboratory with conflicting interests do not adversely influence compliance with ISO/IEC 17025. In Figure 10, the finance, administration, quality assurance, IT, the safety officer, and human resources departments do not report to the laboratory management department.

Figure 10: A typical management structure



Source: Labcompliance, ISO/IEC 17025 Accreditation Package, 2009.

If the testing laboratory is part of a larger organization, responsibilities of key personnel will have to be well defined in order to identify potential conflicts of interest.

## Personnel

It is essential to recruit staff members who have both theoretical training and adequate practical experience. It may be necessary to deploy staff for an extended period of time in a working conformity assessment testing laboratory in order to gain experience and to maintain their necessary skill set.

Remuneration of staff is an important financial issue and such considerations will vary from country to country depending on the norms in a particular environment. The conformity assessment testing laboratory should have adequate funds in its budget to ensure that fully trained staff are paid well enough in order to maintain a stable and experienced body of expertise and keep them in the organization.

## Training system

Training is an important part of the laboratory plan and programme. A training programme has to be put in place to train new staff and to keep staff up to date with technological change and evolution. A good model to follow is that of rotating all technical staff from time to time through the various sub-labs in order to gain experience and be trained on the job by the current experts in the sub-lab's work, test equipment, technologies and procedures. Section 11 and Appendix 6 provides additional detailed information on training.

## 9.9 Conformity assessment testing laboratory units

This section is intended to provide both a detailed description of the laboratory units that constitute a fully functioning conformity assessment laboratory and to include some photographs of actual conformity assessment laboratory set-ups used in operational situations. This will lend context and visual appreciation for the budget section (9.10).

Testing laboratory modules typically include:

- wireless testing laboratory unit;
- wireline testing laboratory unit;
- EMC testing laboratory unit;
- SAR testing laboratory unit;
- Open area test site (OATS) unit;
- mechanical testing laboratory (e.g. vibration effects) unit;
- calibration laboratory unit.

*Note: Calibration laboratory costs are generally high due to the high standards that must be maintained for calibration equipment. It is often more cost effective to contract for these services to a national body specializing in calibration services.*

In addition there are specialized test chambers that are essential complements to the testing laboratory portfolio of equipment. These include:

- anechoic chamber for EMC and antennae testing;
- environmental chamber e.g. for temperature, humidity, high voltage and lightning surge testing;
- electromagnetic shielded room.

## Wireless testing laboratory unit equipment

Laboratory mandate:

- market surveillance activities on Wireless equipment in support of spectrum management;
- compliance assessments performed as per the Member State's standards in accordance with applicable provisions set forth in the legislation and corresponding regulations;

- measurement studies supporting national and international standards development activities.

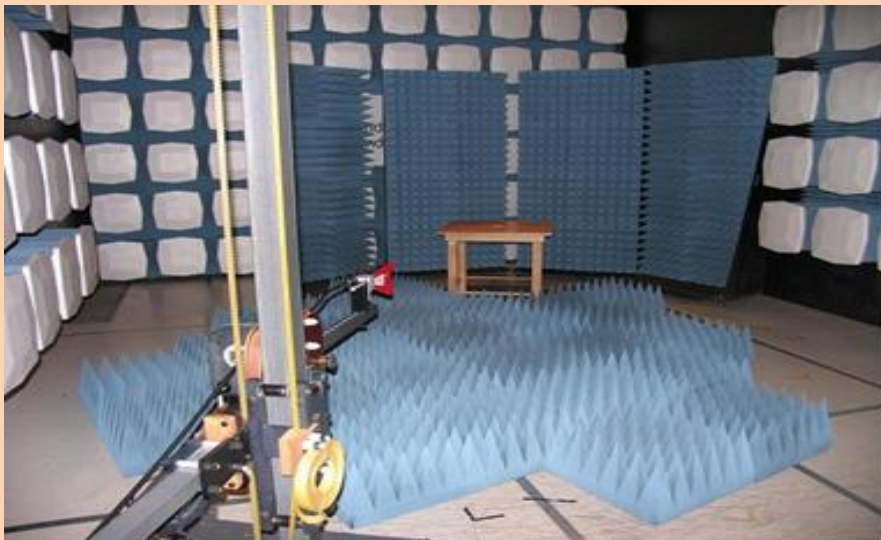
Below are some typical equipment set-ups used in a wireless testing laboratory unit.

**Figure 11: Temperature chamber for frequency stability tests**



Source: ITU

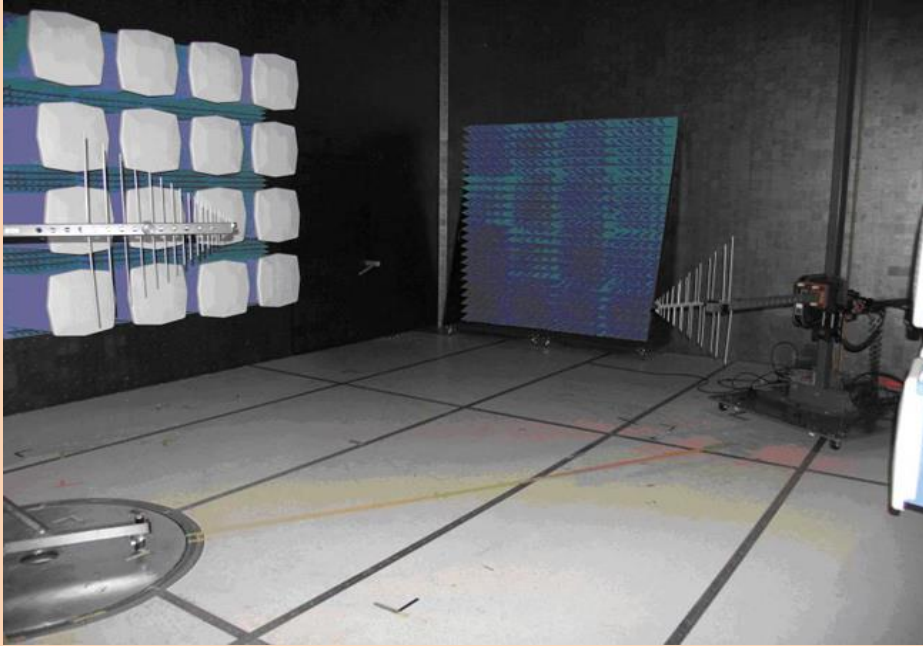
**Figure 12: Radiated setup in anechoic chamber for frequencies above 1 GHz**



Source: ITU



Figure 13: 3m anechoic chamber site validation set-up



Source: ITU

Figure 14: Shielded room inside view



Source: ITU



**Figure 15: Open area test site showing ground plane and test equipment building**



Source: ITU

**Figure 16: Open area test site (OATS) building**



Source: ITU

**Equipment to consider:**

- Antenna Tower
- Antennas (Loop, Biconical, Dipole, Monopole)
- Audio Analyzer
- Controller
- DC Power Supply
- Horn Antenna
- Hybrid Junction
- Line Impedance Stabilization Network (LISN)
- Log Periodic Antenna
- Miscellaneous (attenuators, connectors, adapters)
- Modulation Analyzer
- Multimeter
- Oscilloscope
- Power Divider
- Power Meter
- Power Sensor
- Preamplifier
- Radio Communications Analyzer
- Semi-Anechoic Chamber (SAC)
- Shielded Room
- Signal Generator
- Spectrum Analyzer
- Test Receiver
- Turntable

**Wireline testing laboratory unit**

Unit mandate:

- market surveillance activities on wireline equipment in support of Member State telecommunication programme;
- compliance assessments are performed as per the standards developed pursuant to the applicable provisions set forth in the legislation;
- measurement studies supporting national and international standards development activities.

Figure 17 is a typical equipment set-up used in a wireline testing laboratory unit.

**Figure 17: Wireline and hearing aid compatibility test set-up**



Source: ITU

**Equipment to consider:**

- AC Power Source Analyzers
- Dielectric Withstand Tester
- Differential Probe
- DSLAM
- Feeding boxes
- Feeding Bridge
- Function Generators
- Function/Arbitrary Wave Form Generator
- HAC Probe-Axial
- HAC Probe-Radial
- Head and Torso Simulator (HATS)
- Robot and Mannequin body shapes for HATS
- Line Simulator
- Longitudinal Test Circuit
- Multimeters
- Surge and EFT Couple
- Surge Network
- Switch/Control System
- Transverse Balance Circuit Box
- Vector Signal Analyzers (VSA)

**SAR testing laboratory unit**

Unit mandate:

- market surveillance activities on Radio equipment in relation to the RF exposure requirements set forth in mandatory standards when the device is operating within 20 cm of the human body;
- compliance assessments are performed as per the standards developed pursuant to the applicable provisions set forth in legislation and corresponding regulations;
- measurement studies supporting national and international standards development activities.

Figure 18 is a typical equipment set-up used in a SAR testing laboratory unit.

**Figure 18: SAR robot and phantoms**



Source: ITU

### Equipment to consider:

- Amplifiers
- Analogue Signal Generator
- Attenuators (3 dB, 10 dB, 20 dB)
- Data Acquisition Electronics
- Dielectric Probe Kit
- Dual Directional Coupler
- Isotropic E-Field Probe
- Power Meter
- Power Sensors
- Radio Communication Analyzer
- Reference Dipole Antennas
- SAR Compliance Test System
- Signal Generators Tissues Simulating Liquid (TSL)

### Safety/environmental/mechanical testing laboratory units

Equipment to consider:

- Electrostatic Discharge Simulator
- Electrodynamics shaker (ejecting force 10 000 N, shock force 25 000 N, frequency range 20-3000 Hz, acceleration 75 g, work load 160 kg)
- Climatic chamber (temperature range  $-75^{\circ}\text{C}$  to  $+180^{\circ}\text{C}$ ; relative humidity 10-95 %)
- Thermal oven (up to  $350^{\circ}\text{C}$ )
- Voltage depression/over-voltage simulators
- Disturbance simulators

### Calibration unit

For completeness below is a view of a calibration laboratory unit with rack mounted network analysis and calibrator equipment capabilities.

**Figure 19: Calibration laboratory**



Source: ITU

### Interoperability – model network lab

Interoperability labs must be equipped to test the set of architectures, systems and services most relevant to the region. Equipment to consider for NGN-related testing:

#### Call/ session control system

- Media Gateway Controller (MGC)
- Proxy server SIP (PS)
- IP Multimedia Subsystem (IMS)

#### Voice and signalling transmission system

- Media Gateway (GW)
- Signalling Gateway (SG)
- Transport Network Environment (TNE)

#### Application servers

- Application server (AS)
- Media server (MS)
- Messaging server (MeS)

#### Management and billing system

- Management system (MS)
- Billing system (BS)

#### Access environment

- NGN access devices (NGN-AD)
- Media Gateway for Legacy Terminal Equipment (GW-LTE)

Other architectures tested may require additional or different components. Examples include:

#### Transmission equipment

- PDH/SDH/WDM
- Metro/Global Ethernet
- Access networks transmission equipment
- Digital TV transmission (broadcasting) equipment

#### Access service network equipment

- xDSL/FTTH/Metro Ethernet/PON/GPON
- VoIP/SIP Phones
- PBX
- Call centre equipment

#### Radio network equipment

- Broadband wireless access networks equipment, including WiFi, WiMAX
- GSM/UMTS/HSPA/HSPA+/LTE BSS equipment
- Femto Cell equipment
- CDMA 2000/EVDO (IMT MC 450)/TETRA/DECT BSS equipment

#### Radio handset equipment

- GSM/UMTS/GSM-UMTS/LTE Handsets
- CDMA 1x (IMT MC 450) Handsets
- WiFi/WiMAX user equipment (CPE)

### 9.10 Budget considerations for conformity assessment testing laboratory structure, equipment and operations

A fundamental decision that needs to be made by those contemplating establishing a conformity assessment testing laboratory is its primary purpose. For example is it to be a conformity assessment testing laboratory offering services to manufacturers of telecommunication equipment for purposes of product testing for regulatory compliance, certification and type approval and eventual deployment legally in a particular marketplace? Or is it a conformity assessment testing laboratory that will function primarily as an audit facility in support of market surveillance and enforcement to check and test for continuing compliance of products placed on the market?

The former purpose has implications for a much larger conformity assessment testing laboratory operation with potentially larger staff levels, especially technical staff, and more demanding service standards such as short turn-around times driven by manufacturer's desire for early approvals to get their products to the



market in the shortest possible time. Pressure from manufacturers for quick product approvals, test results, certification and listing frequently arise shortly before festive seasons when gift-giving and other commercial considerations are at their peak resulting in a sudden influx of request for service by the conformity assessment bodies. The pressure of such a situation is somewhat relieved where mutual recognition arrangements/agreements are in place, providing manufacturers with multiple sources for the needed services from MRA partner conformity assessment bodies.

Sources of funding are therefore a major consideration in establishing a conformity assessment testing lab. The financial resources will ultimately determine the scope of testing operations. Although the testing operations will eventually be a source of income, this will not be immediate and the lead times from initial decision to operational services may be significant and in fact span many months or even years. Significant funds are needed prior to initiating operations – primarily for facilities and equipment, and often funding sources have timeout constraints and must be disbursed within tight timeframes. A cost analysis must be performed to provide the best estimates of the actual operating budget necessary to establish and operate the conformity assessment testing laboratory for the suite of services envisaged. The cost analysis must include both capital costs (e.g. facilities, building property, equipment, vehicles) and operating costs (e.g. staff salaries, services, utilities). The complete financial analysis, must take into account current funding, projected income, capital costs, and operating costs, as this provides the constraints within which the conformity assessment testing laboratory must operate.

In some cases regional conformity assessment testing labs may be the best and perhaps only solution in a region where there is no single entity with the resources to establish a multi-functional conformity assessment testing lab. The consortium model has been discussed in this context as a means for funding a regional conformity assessment testing lab. Although it is entirely feasible for a single entity (e.g. government, regional organization, operator) to finance the creation of the conformity assessment testing lab, a consortium can provide several advantages. The first advantage is the sharing of costs for establishing the conformity assessment testing lab. In addition to providing financing, a consortium of stakeholders can provide a more critical mass for participation in the conformity assessment testing laboratory activities and enhance the probability of success. It can also become a source for expertise to support testing functions and define a stakeholder group that is committed to come together to test and mutually solve problems. In the case of interoperability testing as an example, the University of New Hampshire laboratory is 100 per cent funded by a consortium of more than 150 telecommunication industry companies.

#### **Conformity assessment testing laboratory facilities budget: Broad scope of services**

Cost estimates for the conformity assessment testing laboratory facility depend on the many variables involved in establishing and operating a laboratory of this type. The conformity assessment testing laboratory location and size are two major factors that will greatly influence costs, since costs vary by region. These variations exist in local labour and materials costs, importation and tax regime costs, and the costs of basic utilities like electricity and water services.

In developed countries a conformity assessment test facility and testing programme to adequately address the full scope of type approval, conformance and interoperability testing could cost as much as 20-30 million USD. In addition, annual upgrades for software and equipment for such a laboratory could easily reach 1 million USD. A rule of thumb of 10 per cent annual costs for equipment upgrades and replacement is often quoted by operational labs. One has to consider that the testing and certification services required are always at the leading edge of technologies as they are primarily driven by new products and new technologies coming onto the marketplace. This means that the test equipment must be of commensurate modernity, which can present quite a challenge as regards replacement and upgrade costs each year of operation.

Facility space at some of the large testing facilities can be as much as 30 000 – 50 000 sq.ft. (2 800-3 700 sq. metres). For example, the University of New Hampshire laboratory in the USA has a 32 000 sq. ft. testing facility with a full-time staff of 20 complemented by 100 university student employees. Major vendors with their own test facilities may employ as many as 30-50 test engineers for product testing.

A facility of this magnitude may not be practical for a given region, and the conformity assessment testing laboratory rollout plan may call for a modest start-up operation with a phased approach to the schedule of building and equipping facilities in future phased expansions. The modular nature of the conformity assessment testing laboratories and systems enables flexibility for initial facility design, expansion decisions, and costs.

#### **Conformity assessment testing laboratory facilities budget: Regulatory requirements only**

Where interoperability testing is not in view and the focus is limited to type approval in support of regulatory compliance, there are examples of conformity assessment labs in North America, Europe, and North Africa which have been built for around 5 to 7 million USD with an additional equipment inventory cost of 3 to 5 million USD. Such conformity assessment bodies can provide services in all the critical areas of regulatory compliance for telecommunications apparatus such as radio communications, broadcasting, SAR, wireline/terminal equipment, environmental and electromagnetic compatibility.

For illustrative purposes only, activity levels in such a conformity assessment laboratory might typically include the following:

Market surveillance and audit:

- Desk audits – examining submitted test reports
- Physical audits – physical testing of products for compliance

Measurements and measurement studies in radio communications:

- Typically 10 000 – 65 000 measurements per Quarter

Certification of Radio Equipment and Registration of Telecommunications Equipment:

- 100 certifications assessed in-house with up to another 1000 assessed by private Certification Bodies labs under delegation from the regulatory authority

Open Area Test Site Registrations (for radiated measurements):

- Typically 150 -200 test site registrations processed annually

Process submissions for registration of products claiming compliance with regulatory requirements and maintain the official record of approved Radio Equipment and Telecommunications Equipment Lists:

- Typically 300 – 400 submissions processed for registration in the Telecommunications Equipment List (TEL list) annually
- Typically 4000 – 5000 radio certification notifications processed for listing in the Radio Equipment List (REL list) annually

Maintain Conformity Assessment Laboratory public website for approved products:

- In this activity a conformity assessment laboratory will typically be maintaining lists of tens of thousands of wireless and wireline approved equipment

Recognized Competence of other Certification Bodies (CBs):

- Typically 30 - 80 CBs including local and foreign CBs

Registered Radio Frequency Testing Sites:

- Typically 500 – 1 000 laboratories including local and foreign laboratories
- Additionally 600 – 1 000 test sites within the total number of laboratories

Recognized Competence of Wireline Equipment Laboratories:

- Typically 60 – 100 laboratories

As an illustrative example, Table 3 provides estimated floor space requirements for an average size facility that would still be effective to support a wide range of testing programmes. The table shows a facility

designed for 20-30 staff members with an available space of 12 000 sq. ft. (1100 sq. m) for both business and testing operations (e.g. Wireless Lab, Wireline Lab, Model Network Lab, Anechoic Chamber, Shielded Room, Environmental Chamber, Finance and Administration). Such a facility would typically have the following associated costs with activity levels as mentioned above.

**Principal cost elements** (average figures) for a facility supporting 20-25 staff, 1200 sq. metres, four testing laboratory units, two vehicles, shipping and receiving dock, utilities and communications costs.

- Basic building cost 4M - 7M USD
- Overall book value of the facility 8 million USD
- Wireless laboratory unit 750K –1.5M USD
- Wireline laboratory unit 400K - 600K USD
- SAR lab unit 750K - 1M USD
- Metrology laboratory unit 1M - 2M USD
- Annual salary costs (20 -25 staff) 1.4M - 1.9M USD
- Annual operational costs (utilities, etc.) 400K - 600K USD
- Capital Costs 150K - 400K USD

**Table 3: Conformity assessment facility**

Conformity assessment facility	Area (sq. ft.)	Area (sq. metres)
Entry Foyer	1000	93
Reception	300	28
Director's office	180	17
Staff offices for 24 people	2400	223
Conference room	500	47
Model Network testing	600	56
Wireless laboratory unit	400	37
Wireline laboratory unit	400	37
Calibration unit	400	37
SAR laboratory unit	400	37
Shielded room	400	37
Anechoic chamber	900	84
Environmental chamber	150	14
Storage for test gear	1000	93
LAN server room	400	37
Finance and admin space	300	28
Filing room	900	84
Shipping and receiving	300	28
Garage for vehicles	1000	93
Washrooms	300	28
<b>TOTALS</b>	<b>12 230</b>	<b>1 138</b>



In order to operate effectively, conformity assessment testing laboratory modules must have the appropriate test equipment. In addition to the cost of equipment, there are the initial costs of installation, calibration and maintenance. Calibration can be accomplished internally, if a calibration laboratory is part of the conformity assessment testing laboratory plan. Calibration laboratory costs are generally high due to the high standards that must be maintained for calibration equipment including positive pressure and temperature controlled rooms. It is often more cost effective to contract for these services.

In addition, for testing service demands which are in-frequent, such as conformity assessment of satellite phones for example it may be more cost effective to contract out such testing to a specialized facility. The same may be true also for some aspects of SAR testing where a multi frequency device could take as much as six months to test completely in all frequency bands, tying up an expensive SAR test system for an unacceptable length of time. Equipment costs vary for the various conformity assessment testing laboratory units, but equipment costs are significant. A detailed list of equipment, components, and systems is provided in Appendix 4.

These cost figures are provided to give order-of-magnitude estimates for planning purposes. It is clear that a selection of components from the list of equipment shown in Appendix 4 could easily cost upwards of 1 million USD, without even considering the cost of special facilities such as SAR, Dosimetric Assessment System, Environmental Test Chamber, Semi-Anechoic Chamber, and Open Area Test Site (OATS). These special facilities alone could cost an additional 2.5 – 4 million USD to acquire and install.

#### **Comment**

There also would be significant additional costs for equipping a conformity assessment laboratory to handle interoperability testing challenges, with model network components such as servers (e.g. call, session, application, media, messaging), signalling and media gateways, management and billing systems, transmission equipment, specialized radio network equipment, protocol test equipment, and terminal equipment. Budget estimates for interoperability testing are beyond the scope of this document but are estimated to be in the range of 2 to 4 million USD depending on the extent to which full telecommunication carrier field offices are duplicated or simulated for interoperability trials.

Furthermore protocol testing, which is fundamental to interoperability testing requires detailed formal specifications and mathematically precise test suites. Producing test specifications within the conformity assessment testing laboratory and/or contracting to produce specifications could be costly and time-consuming. The existence of test specifications does not necessarily mean they are readily available to a lab. Although some specifications are available free of charge, other documentation may be available only to forum and consortium or private organization members, test event participants, or product/service customers. Some documentation may be available through negotiation of confidentiality agreements or specific contracts. Funds need to be allocated and a system must be in place to identify and obtain the required test specifications. Estimates for production of formal descriptions of complex protocol specifications and the accompanying test suites are in the hundreds of thousands of dollars and require highly specialized computer engineers and further sophisticated test tools. These tools may be available for use under license, or alternatively an interoperability laboratory may establish its own core team of experts, or contract out such work to tool makers.

## **10 Test reports and certification processes**

An orderly telecommunication marketplace requires that certain mandatory requirements are placed on the importation and deployment of telecommunication equipment entering the marketplace. There are many examples still in 2014 where telecommunication marketplaces are chaotic due to the absence of such mandatory requirements. The net result includes frustration of individual citizens dealing with fraudulent and non-operating products, and business communities placed at a competitive disadvantage through non-performing or poorly performing telecommunication equipment and systems. At the Member State level there is the economic penalty resulting from delayed introduction of reliable telecommunication equipment and services for delivery of educational, medical, business and a host of other services and opportunities to the population at large.

Where there is telecommunication policy, legislation and a robust regulatory regime for telecommunication equipment and systems there also needs to be a number of supporting institutional arrangements. These include market surveillance, audit and enforcement, and access to conformity assessment services which can check for compliance of telecommunication equipment deployed in the marketplace. A foundational building block of conformity assessment is compliance testing and the test report produced by a conformity assessment laboratory attesting to the compliance of the tested device to mandatory technical and administrative requirements.

This section of the C&I guidelines focuses on the processes and procedures for production and handling of test reports and certification of compliant products. It draws upon the experience of existing and well-functioning conformity assessment bodies which includes test laboratories and certification bodies.

## **10.1 Test report**

What is a test report? A test report is the documented findings or results of testing a system or device for compliance with a set of standards or technical and administrative requirements.

For test reports on testing performed on telecommunication equipment claiming compliance with regulatory requirements, permission to deploy the tested device in the intended marketplace will only be granted by the legal authority after it receives a satisfactory test report. Such permission may be indicated by reason of a declaration of compliance by the product supplier or a recognized body, or by the granting of certification by the authority responsible for such compliance, depending on the regulatory requirements for the product in question. The method of testing of equipment for certification purposes may also have a requirement that the testing laboratories have certain credentials on file with the authority responsible for such compliance.

The following section outlines the procedures to be followed for certification of radio equipment and is adapted from procedures used by a number of respected conformity assessment bodies.

## **10.2 Radio equipment test reports and certification procedures**

Certification is based on the review of a technical report that demonstrates that a unit, which is representative of the final production model, complies with the applicable standard(s).

Certified radio equipment must be labelled in accordance with the equipment labelling requirements of the applicable standard for the unit type.

Certification typically requires that the equipment model is assigned a unique model number by the manufacturer.

The test report submission and application for certification must include the following information:

1. a completed and signed original copy of the “Application and agreement for certification services” (see below);
2. a covering letter explaining the type of certification services requested and a brief description of the radio equipment;
3. a completed and signed original copy of the test report cover sheet;
4. a detailed test report meeting the technical requirements of the applicable Radio Standards Specification;
5. a completed and signed copy of A and B and, if applicable of evidence of compliance with the radio frequency exposure compliance of radiocommunication apparatus (all frequency bands);
6. photographs and product literature of the new model;
7. schematic diagrams and block diagrams; and
8. a drawing, sample or illustration of the product label;

9. occupied bandwidth;
10. type of emission;
11. power or field strength;
12. frequency range.

Family certification (multiple models) may be granted where the equipment has many models that are electrically identical, provided that each model is assigned a unique model number by the manufacturer.

#### **Open air test site (OATS) filings**

Certain radio equipment will require the use of an open air test site in order to perform radiated emission testing. In such cases the test site must be registered with the telecommunication authority.

### Application and agreement for certification services

The application and agreement for certification would typically take the following form and require the following information and official signatures to be in the submission:

<p>Applicant and Address:</p> <p>Contact Name:</p> <p>E-Mail address:</p> <p>Telephone No.:</p> <p>Facsimile No.:</p> <p>Local/National Representative and Address:</p> <p>Contact Name:</p> <p>E-Mail Address:</p> <p>Telephone No.:</p> <p>Facsimile No.:</p> <p>Company Number and UPN Number:</p> <p>Model Number:</p> <p>Specification Standard:</p> <p>Type of Service: ___Single ___New Family ___Previous Family ___Multiple Listing___Reassessment</p> <p>If payment by cheque/ amount:</p> <p>Cheque Number:</p> <p>Card Holder is: ___Applicant or___Test facility</p> <p>Authorized Amount:</p> <p>Card Holder's Name:</p> <p>Credit Card Type: (VISA, MASTERCARD or AMEX)</p> <p>Credit Card No.:</p> <p>Expiry Date:</p> <p>Card holder's signature:</p>
<p>I agree to pay the total amount entered above in accordance with the credit card holder's agreement.</p> <p><b>Agreement: The applicant agrees to:</b></p> <ul style="list-style-type: none"><li>• accept responsibility for all charges arising from this application;</li><li>• meet all requirements in accordance with radio standards procedures and other applicable procedures;</li><li>• warrant that the test results submitted are a true representation of the characteristics of the radio equipment type for which certification is requested; and</li><li>• inform the telecommunications authorities of any changes to the information submitted.</li></ul> <p>Name and Title of Applicant:</p> <p>Signature of Applicant:</p> <p>Date:</p> <p style="text-align: center;">This form must be completed and is required to be provided with the submission.</p>

### Test report cover sheet

The test report cover sheet typically takes the following form and requires the following information to be included together with valid signatures of appropriate official representatives.

Company Number:
Model Number:
Manufacturer:
Tested to Radio Standards Specification No.:
Open Area Test Site Number:
Frequency Range (or fixed frequency):
RF Power in Watts:
Field Strength (at what distance):
Occupied Bandwidth (99% BW):
Type of Modulation:
Emission Designator:
Transmitter Spurious (worst case):
Receiver Spurious (worst case):
ATTESTATION: I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned required standard(s), and that the radio equipment identified in this application has been subject to the entire applicable test conditions specified in the required standards and all of the requirements of the standards have been met.
Signature:
Date:
Name and Title (Please print or type):
Note: This information must be provided with the submission.

### 10.3 Declaration of conformity procedure and registration

This section describes a typical procedure that suppliers of telecommunications wireline equipment must follow to declare conformity to applicable technical specifications and to register their equipment with the telecommunication authority.

#### Testing

A representative sample of the final product must be tested to the applicable technical specifications to verify compliance. These specifications are established by the appropriate telecommunication authority in the Member State.

Testing shall be performed by a testing laboratory that is:

- a. accredited by the telecommunication authority or a recognized accreditation organization; or
- b. in the case of foreign testing laboratories, designated by a mutual recognition agreement/arrangement partner and recognized by the telecommunication authority.

The methods of measurement for testing are normally prescribed in the applicable technical specifications documents prepared by the telecommunication authority. In some cases alternative test methods may be accepted if accompanied by an engineering analysis that demonstrates the validity of the alternate test method.

### **Test reports**

The recognized testing laboratory shall document all test results and test methods used, and prepare a report.

The declaring party shall retain on file, for a specified period (typically 10 years) from the date of registration, a compliance folder that includes the test report.

Upon request, a compliance folder shall be submitted to the telecommunication authority. The compliance folder shall contain the following information:

- a. a copy of the test report showing that the product fully meets the applicable technical specifications;
- b. a copy of the instruction manual(s) as supplied with the equipment. If not included in the instruction manual(s), the following information shall be attached:
  - i. complete operating and maintenance instructions;
  - ii. complete schematic diagrams and a list of parts and components; and
  - iii. sufficient photographs (approximately 20 cm x 25 cm) of the unit to show details of external appearance and internal construction;
- c. a copy of current advertising literature, if available; and
- d. a drawing, sample or illustration of the product label.

### **Checklist for test report**

The test report shall contain the following information:

- a. Title (identifying the model and testing to which standards).
- b. The date the report has been issued.
- c. The name and postal address of the test facility and the location (postal address) where the tests were actually carried out.
- d. The name and postal address of the customer and/or applicant for the equipment under test.
- e. The name(s), function(s), and signature(s) or equivalent identification of person(s) responsible for the test report.
- f. Unique identification of the test report (such as a test report number).
- g. A table of contents, and on every page an apparent identification, so that a page can be recognized as a part of the test report. In addition, a clear identification of the end of the test report shall be included.
- h. A description as well as unambiguous identification of the equipment under test. Where more than one sample is required for technical reasons, each specific test shall identify which unit was tested.
- i. A summary of all the tests listed in the applicable standard, with a notation of whether it passed or not.
- j. The results of measurements conducted on the device as described in the applicable standard or technical specification(s).

- k. Photographs of the equipment and any manufacturer supplied accessories to be used with it under normal operating conditions that are relevant for the purpose of performing the testing.
- l. Identification and description of any operating software/firmware for both the normal operating mode and special test modes for compliance testing.
- m. The measurement uncertainty of the instrumentation.
- n. A description and a block diagram of the test setup.
- o. The following information for each test provision deemed applicable:
  - Operating conditions for the device under test (including firmware, specific software settings, and input/output signals to the equipment).
  - Modifications made to the device (if any).
  - The results of the test in the form of tables, spectrum analyzer plots, charts, sample calculations, and so on, as appropriate for each test procedure.
  - The test equipment used identified by type, manufacturer, serial number, or other identification and the date on which the next calibration or service check is due. The test equipment must be within its calibration cycle at the time of testing.
  - The name of the person(s) who has performed the testing.

#### **Checklist for wireline equipment registration**

- Obtain a company number from the telecommunication authority, if not previously assigned.
- Obtain a letter signed by the representative in the Member State authorizing the declaring party to use it as its representative (if applicable).
- Complete and sign a supplier declaration of conformity (SDoC) for the equipment, and a registration form.
- Pay applicable fees.

A separate filing is typically required for each model of equipment, except where the applicant demonstrates to the satisfaction of the telecommunication authority that two or more models are identical in respect to the requirements, as demonstrated by their schematic diagrams, parts list, operation and maintenance manuals, and such tests as may be necessary.

A certificate holder may obtain family approval certification for a terminal equipment device, based on that certificate holder's previously certified equipment, provided that the proposed new equipment is nearly identical in design and construction to the previously certified device.

A terminal equipment certification may typically be transferred to another person or corporation by a holder upon application being made to and approved by the telecommunication authority. A transfer must be made only to an eligible individual or corporation. The new holder assumes the responsibility for the equipment bearing the old certification number. Normally, testing of the equipment involved would not be required.

#### **Certification retention and audits**

Certificate holders must typically ensure that all production units of certified equipment continue to meet the applicable procedural and technical requirements that were included in the test report. Post-certification audits are an important function of regulatory authorities in order to ensure continuing compliance.

The adherence of subsequent production units to the technical quality and characteristics presented in the test report under which certification was originally obtained is implicit. To this end, periodic testing must be carried out by the certificate holder to ensure continuing compliance with the technical standards.

The regulatory authority may request from a certificate holder random equipment samples at the certificate holder's expense for post-certification audit testing, or as a result of complaints or inspection activity. If the samples fail the tests, the certificate holder will be required to take corrective action.

## **11 Training for testing laboratory activities and C&I programmes**

Training is an important part of the laboratory's plan and programme. A training programme has to be put in place to train new staff and to keep staff up to date with technological change and evolution.

There are multiple choices for training courses in telecommunication in general and conformity assessment specifically, readily available in multiple languages, various countries and including hands-on training in laboratories if required. A simple browser search using the words "telecommunication training courses" is sufficient to identify many excellent sources of training, ranging from fully and partially subsidized courses from industry and governments to commercially available courses delivered by professional institutes (see Appendix 6: Telecommunication training courses).

Among the options are targeted courses for subjects such as conformity assessment and type approval, training with hands-on experience working in an operational laboratory with experts, and sponsored courses with fully funded travel, accommodation and instruction. In addition there are partially sponsored courses with on-site living expenses paid, but travel funds required and private sector "for profit" courses with fully loaded fees including fees for instructors.

Company sponsored training is another option where telecommunication product suppliers will provide hands-on laboratory facilities dealing largely or exclusively with promotion of their technologies but nevertheless providing quality training specific to their commercial goals<sup>72</sup>.

ITU has a human capacity building programme, which is carried out through regular ITU-D programme activities involving special projects, ITU centres of excellence programme, Internet training centres and on-request advisory and consulting services.

In the framework of the C&I Programme<sup>73</sup>, ITU is providing regional training events covering overview of test equipment and test setup, laboratory accreditation, EMC fundamentals, type approval of mobile terminal, international standards, practical measurements in laboratory and case studies of regional and national C&I programmes in place, including market surveillance.

Also, in accordance with the revised PP-14 Resolution 177<sup>74</sup>, ITU Secretariat has started the development of the new Conformity and Interoperability Training Programme (CITP) building on the existing ITU Academy environment as well as on past C&I training and guidelines.

The ITU centres of excellence programme provides regional focal points for training and education. It is supported by donors and other partners and is operating in Africa, the Americas, Arab States, Asia-Pacific, CIS countries, Caribbean and Europe. This programme is now being merged into a global training network of shared resources providing a worldwide service in training and education in telecommunication and related subject matter. This is complemented by the ITU Internet Training Centres (ITCs) which focus on creation and enhancement of ICT and related skills. In this initiative BDT works through partnerships with university and training bodies to set up ITCs which provide access to affordable quality training using face-to-face and distance learning. ITCs complement technical training with soft skills such as entrepreneurial skills to facilitate self-employment.

Training is also widely available for both telecommunication senior management and technical staff through private and semi-private organizations with excellent credentials and experience. Training programmes are

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<sup>72</sup> Excellent training and education programmes are available through the auspices of ITU-D:  
[www.itu.int/en/itu-d/technology/pages/citrainingactivities.aspx](http://www.itu.int/en/itu-d/technology/pages/citrainingactivities.aspx)

<sup>73</sup> [www.itu.int/en/ITU-T/C-I/Pages/default.aspx](http://www.itu.int/en/ITU-T/C-I/Pages/default.aspx)

<sup>74</sup> [www.itu.int/en/plenipotentiary/2014/Documents/final-acts/pp14-final-acts-en.docx](http://www.itu.int/en/plenipotentiary/2014/Documents/final-acts/pp14-final-acts-en.docx)



very up to date covering the latest topics in technology and services. Numerous funding organizations exist which are interested in financing telecommunication programmes and providing training courses and assistance in cooperation with ITU.

Appendix 6 provides examples of such courses from three typical organizations in this business to provide a reference point for readers. It should be noted that the issue of language used in training is an important one, since trainers and trainees need to be able to engage in a rich level of communication. So as one example, in Russian speaking countries there are companies offering a wide variety of telecommunication training in Russian such as the JSC Scientific Technical Centre "KOMSET" and other bodies. These examples do not imply any special endorsement from ITU.

## **11.1 Training programme scope**

### **Comprehensive programmes for C&I training**

A training programme for candidates planning to work in the conformity assessment and interoperability area may be expected to include the topics covered in BDT C&I training courses<sup>75</sup>. A training course with this kind of scope would provide both the context in which conformity assessment and interoperability is carried out (e.g. legislative, regulatory, testing), and a hands-on component which provides indispensable familiarity with the tools for testing, rigor of measurement procedures and reporting on results.

#### **Background**

- Overview of ICT technology and standards.
- Overview of ITU C&I programme for ICTs.
- Overview of the status of the C&I action plan implementation.
- Overview of ITU guidelines and feasibility studies completed to date.
- Overview of procedures to establish C&I regimes.
- Vocabulary, definitions and elements of conformity assessment regimes:
  - accreditation;
  - certification;
  - technical requirements;
  - declaration of conformity;
  - product marking;
  - fees and fee structures.
- Telecommunications, Radiocommunications and Broadcast Act provisions:
  - placing products in the market;
  - institutions rights and responsibilities.

#### **Operational considerations**

- Handling of queries for new product acceptance.

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<sup>75</sup> [www.itu.int/en/ITU-D/Technology/Documents/Events2014/CI\\_Workshop\\_Maghreb\\_Tunis\\_December14/CI\\_Workshop\\_Maghreb\\_December14\\_DraftProgramme.pdf](http://www.itu.int/en/ITU-D/Technology/Documents/Events2014/CI_Workshop_Maghreb_Tunis_December14/CI_Workshop_Maghreb_December14_DraftProgramme.pdf)

and

[www.itu.int/en/itu-d/technology/documents/events2013/ci\\_training\\_afr\\_tunisoctober13/ci\\_training\\_afr\\_tunis\\_october13\\_%20annex1\\_programme.pdf](http://www.itu.int/en/itu-d/technology/documents/events2013/ci_training_afr_tunisoctober13/ci_training_afr_tunis_october13_%20annex1_programme.pdf)

- Issuing and validating a certificate of conformity and homologation.
- Practical example of a complete query for approval for:
  - mobile radio products;
  - other wireless and broadcast products;
  - wireline products;
  - EMC compliance;
  - SAR compliance.
- Importation procedures for regulated products.
- Border controls and inspection.
- Real examples of conformity assessment workflow from the international experience.
- Identifying a list of ICT equipment and reference standards for conformity assessment.
- Issues involved in harmonized technical requirements across a region or sub-region.
- Procedures for designation and recognition of certification bodies, testing laboratories and test reports.
- Mutual recognition arrangement/agreement frameworks and benefits.
- Enforcement and market surveillance.

#### **Equipment and measurement**

- Radiocommunication devices
- Broadcast devices
- Wireline devices
- EMC requirements
- SAR measurements
- Safety requirements
- Instrumentation and calibration
- Equipment under test (EUT) configurations
- Test reports and filing/records management
- Test uncertainty issues
- Aspects regarding accreditation of laboratory according ISO/IEC 17025

#### **Hands-on laboratory instruction**

This section of training would require having access to a conformity assessment laboratory facility equipped with experienced personnel and instrumentation appropriate to the scope of the training plan. Ideally it would be an operational conformity assessment body dealing in all aspects of conformity assessment including production of test results, certification, calibration and measurement capabilities in all the technology areas.

The hands-on training would require sessions where actual tests were executed in the various areas of technology, including instruction on the use of sophisticated test instruments such as signal generators, automated test set-ups, spectrum analyzers, various kinds of antennae systems, audio/acoustic simulators, environmental test equipment and sophisticated computer driven automatic test sets. Furthermore for SAR testing, training may be required by the SAR equipment manufacturer as such systems are highly specialized and highly automated using robotic technology and other technologies not usually associated with

telecommunications even in its broadest sense. An example is the use of simulated brain fluids and mannequins in testing for compliance to SAR standards.

If the training requirement is related to interoperability testing, then a much greater scope of instrumentation and expertise would be required.

### **Targeted in-depth training related to EMC and Radiocommunications**

The scope of this training course<sup>76</sup> is to provide an in-depth review of EMC and radiocommunications theory and technology, the new direction of European R&TTE Directives in this field, and to develop a familiarity with relevant measurement techniques and test equipment, and the accompanying regulations.

### **Theory and practical EMC and radio training**

Theory EMC directive and measurements:

- New approach directives in European context
- The EMC phenomena
- The EMC harmonized standards
- The EMC instrumentation and measures
- Case study for conformity document analysis
- Quality requirements for testing laboratories and uncertainty measurement

Practical EMC measurements:

- Reminder about EMC theory
- Overview of EMC instrumentation
- Emission tests in laboratory
- Immunity tests in laboratory

Regulatory requirements and practical radio measurements:

- Regulatory requirements for radio equipment: the R&TTE directive<sup>77</sup>
- Essential requirements of the R&TTE directive
- Theory radio measurements
- Practical radio measurements

### **Expected results from the training**

- Capacity to analyse conformity document
- Be aware of what is required to prove compliance of a product

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<sup>76</sup> [www.itu.int/en/ITU-D/Technology/Documents/Events2013/CI\\_Training\\_AFR\\_TunisOctober13/CI\\_Training\\_AFR\\_Tunis\\_October13\\_%20Annex1\\_Program.pdf](http://www.itu.int/en/ITU-D/Technology/Documents/Events2013/CI_Training_AFR_TunisOctober13/CI_Training_AFR_Tunis_October13_%20Annex1_Program.pdf)

and

[www.itu.int/en/ITU-D/Technology/Documents/Events2013/CI\\_Training\\_AFR\\_TunisOctober13/UIT\\_EMC\\_standards.pdf](http://www.itu.int/en/ITU-D/Technology/Documents/Events2013/CI_Training_AFR_TunisOctober13/UIT_EMC_standards.pdf)

<sup>77</sup> [www.itu.int/en/ITU-D/Technology/Documents/Events2013/CI\\_Training\\_AFR\\_TunisOctober13/UIT\\_new%20approach%20directives.pdf](http://www.itu.int/en/ITU-D/Technology/Documents/Events2013/CI_Training_AFR_TunisOctober13/UIT_new%20approach%20directives.pdf)

- Knowledge about new approach directives
- Theoretical and practical basis for EMC measures and directive
- Knowledge about ITU recommendations
- Master the Radio frequency instrumentation
- Understand the procedures for assessing the conformity of equipment incorporating radio modules
- Understand the essential requirements of R&TTE directive (safety, health, EMC, spectrum management)<sup>78</sup>
- Theoretical and practical basis for radio measures

## **11.2 Arrangements for training**

While there are many valuable courses available for training staff who will be working in the conformity assessment area, there is really no substitute for hands-on training in an actual operational conformity assessment body. In particular developing familiarity and confidence in operating complex testing equipment is essential to both the clients of a conformity assessment body and to the reputation of the conformity assessment body itself. Conformity assessment functions require an especially dedicated staff committed to precise measurements, precise understanding and study of compliance requirements, and a determination to record faithfully the results of testing and to report these accurately and without prejudice. These functions can affect millions of dollars of client production and if done badly or unprofessionally can destroy both the reputation of a conformity assessment body and prove costly to the clients of the services offered.

Therefore it is recommended that well-reputed operational conformity assessment bodies be approached by potential new entrants in order to explore the possibilities of having their staff trained under some mutually agreed arrangement for a period of time before launching into public service offerings. This topic is also included in the recommendations at the end of these C&I guidelines.

There may also be a role for ITU to play in brokering such arrangements based on its neutrality, knowledge, experience, and interest in global orderly telecommunications systems and services supported by well-functioning institutional infrastructure.

## **12 Market surveillance, import monitoring, marking, use of HS codes and audit**

To ensure that ICT equipment which has passed the appropriate conformity assessment procedures (by certification or SDoC) and had been placed on the market continues to comply with the regulations, standards and specifications, a regulator may prescribe and issue market surveillance procedures to be conducted by the parties which are part of conformity assessment regime including accreditation bodies, testing laboratories, certification bodies, manufacturers and service providers. Each of these parties has a unique role to play in the market surveillance of ICT equipment.

### **12.1 Regulatory aspects**

It is the regulator which plays an important role in market surveillance. It is important that the regulator has the mandate and authority to prescribe and act on the market surveillance procedures and follow on actions which include:

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<sup>78</sup> [www.itu.int/en/itu-d/technology/documents/events2013/ci\\_training\\_afr\\_tunisoctober13/uit\\_new%20approach%20directives.pdf](http://www.itu.int/en/itu-d/technology/documents/events2013/ci_training_afr_tunisoctober13/uit_new%20approach%20directives.pdf)

### Marking of ICT equipment

A regulator may require that ICT equipment sold and used in its territory has a special mark on the equipment to indicate that the equipment meets its requirements. The mark is normally put on the equipment by the manufacturer after the equipment had passed the conformity assessment. There is normally no cost for using the mark. But if the regulator does charge for using its mark, it should charge all user of such mark in a transparent and non-discriminate way.

### Fines, recalls and withdraw of equipment from the market place

If the equipment fails to meet the requirements specified by the regulator, the regulator has the authority and option to fine the user, the manufacturer or service provider; to recall and remove the equipment from the market place or to withdraw its approval of the equipment.

Typically the regulator will work with the user, manufacturer or the service provider to resolve the problem. In most cases, the problems would be resolved without having the regulator to take measures such as fines and recalls. In extreme cases, where there are safety, health and operational concerns the regulator may have to impose fines or take action to recall the equipment from the market place.

### Import monitoring

With the globalization of the trade of ICT equipment, the regulator will need to have a method to track the equipment imported into its territory. Internationally, the *Harmonized Commodity Description and Coding Systems* generally referred to as “Harmonized System” or simply “HS Code” is a six digit standardized numerical method of classifying traded products developed and maintained by the World Customs Organization<sup>79</sup>.

HS Code is a universal trading language for products and HS numbers are used by customs and authorities around the world to identify products for application of customs duties, taxes and regulations. The HS classification system is defined by the World Custom Organization at the two, four and six digit levels.

The HS Code comprises of 21 sections and 96 chapters. Chapter is the name for the two-digit code in the Harmonized System. Each chapter is denoted by a two-digit code which is further divided into several four-digit codes called headings. These headings (four digit code) are subdivided into six digit codes which is called subheadings (six digit code). So four digit headings are created by adding two digit to two digit chapters, and six digit sub-headings are formed through adding two digit to four digit headings.

HS Code up to six digit level is followed internationally and is common to all countries. For example, HS Code “851712” is “cell phone” in all countries’ customs. A country can assign more than six digits in the tariff schedule according to its needs for a variety of reasons (e.g. to obtain more detailed statistics, to apply customs duties on the basis of more detailed product codes).

A regulator through the appropriate department in its territory can assign the HS Code to the ICT equipment and through its customs department can monitor the ICT equipment which is imported into its territory. The data collected can help its operation in the event of a recall of the equipment. HS Codes can be used by the regulator to stop the equipment from entering its territory if the equipment is determined to be non-compliant and the regulator has safety, health and other concerns.

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<sup>79</sup> World Customs Organization: [www.wcoomd.org/en/topics/nomenclature/overview.aspx](http://www.wcoomd.org/en/topics/nomenclature/overview.aspx)

### **Monitoring of appointed/recognized accreditation bodies, designated/recognized conformity assessment bodies**

After it has appointed/recognized accreditation bodies and it has designated/recognized conformity assessment bodies, the regulator has to develop a routine or process to check the status and the work of these bodies to ensure that they are still compliant with the appropriate ISO/IEC standards and if necessary audit the work and results of these bodies if there are concerns expressed by other entities within the type approval system.

#### **Audits**

Audit is an important process of market surveillance. In order to ensure the equipment on the market is compliant with its requirements, the regulator has to have a procedure in place to conduct both desk (document only) and technical audits of equipment. The audit can be either random or targeted if there are concerns expressed by other parties. Data collected from audits will be useful to the regulator to fine tune its plans for future audits.

The regulator can also mandate the conformity assessment bodies and manufacturers to conduct audits in addition to the ones already stated in the ISO/IEC standards. Failure to conduct audits as specified by the regulator can result in the remove of designation/ recognition of the conformity assessment bodies by the regulator and the remove of approval of the equipment by the regulator.

### **12.2 Accreditation bodies, conformity assessment bodies, and manufacturers**

The accreditation bodies have to follow the procedures as listed in ISO/IEC 17025 for testing laboratories and ISO/IEC 17065 for certification bodies to reassess these conformity assessment bodies to ensure that they remain compliant with the appropriate standards. In addition, the accreditation bodies themselves have to follow the peer assessment procedures as set out by ILAC and IAF and by ISO/IEC 17011 to ensure that they remain compliant with ISO/IEC 17011.

The conformity assessment bodies have to conduct audits of the equipment they tested or certified as required by ISO/IEC 17025 and ISO/IEC 17065 and also as mandated by their regulators. In addition to its internal audit process for equipment it manufactures, the manufacturer has to conduct audit of equipment on the market as mandated by its regulator.

## **13 ITU Conformity Database**

### **13.1 Objective**

The ITU conformity database<sup>80</sup> is an informative, voluntary tool permitting companies (vendors, manufacturers, service providers) to make a public declaration that their products conform to ITU Recommendations<sup>81</sup>.

### **13.2 Rationale**

The initial intent of the ITU conformity database was to provide data that would be helpful to promote common and compatible implementations of standards and Recommendations implicated in achieving interoperability of products and systems.

A declaration of conformity with an ITU-T Recommendation may refer also to standards produced by other SDOs, forums and consortia qualified in accordance with Recommendation ITU-T A.5, or by organizations

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<sup>80</sup> [www.itu.int/net/itu-t/cdb/ConformityDB.aspx](http://www.itu.int/net/itu-t/cdb/ConformityDB.aspx)

<sup>81</sup> [www.itu.int/en/ITU-T/C-I/conformity/Pages/cdb.aspx](http://www.itu.int/en/ITU-T/C-I/conformity/Pages/cdb.aspx)

that signed a memorandum of understanding (MoU) with ITU that are included in ITU-T Recommendations as normative references.

Tests can be performed for all or part of the parameters considered in ITU-T Recommendations and/or in their normative references. Details on testing results and certifications have to be requested directly from the vendor as this kind of information is outside the scope of the database for such reasons as are mentioned above.

In summary the rationale for the ITU-T conformity database is to make it easier for organizations which are developing requests for proposals or other similar pre-purchasing statements of requirements, to be better informed about potential product and system acquisitions for which there are credible claims related to interoperability with other products and systems. A survey and review of the database information, and investigation of its links to detailed product and system specifications and technical information can better inform the interested party on what is available, from whom and with what claims of interoperability with other products and systems.

### **13.3 Access**

The ITU conformity database can be accessed and populated by both ITU and non-ITU members. It contains only information submitted directly by companies/testing labs. Information and details not available in the conformity database (e.g. options implemented, test suites, results and others) should be requested directly from the participating companies/testing labs.

**ITU is not a certifier – disclaimer:** ITU is not participating in any aspects of the accreditation, testing or certification processes. The ITU-T conformity database is not certified to be either accurate or complete, but only reflects the information that has been communicated to the ITU secretariat. The ITU secretariat has not verified the veracity or accuracy of such information, nor the relevance of the products to ITU Recommendations. However, the criteria put in place to populate a credible conformity database give reasonable credentials to the information provided. ITU shall not be held liable or bear any responsibility with regard to the contents and to the use of the conformity database but reserves the right to reject or to remove any submission it deems to be false.

### **13.4 Mandatory conformity assessment**

In the area of mandatory conformity assessment it may be of interest to developing countries to have a database providing hyperlinks to mandatory conformity assessment data for telecommunication equipment that products must meet in order to be legally imported and deployed in the marketplace. Depending on resources available at ITU and the level of interest in developing countries such a database could be established as a partition in the C&I database. This could be a timely tool as many developing countries are in the process of establishing regulatory regimes. Rather than develop these regimes from scratch, conformity assessment bodies could benefit greatly from such access, permitting accelerated understanding and development of the best way forward.

### **13.5 Examples of well-established conformity assessment regimes**

#### **USA**

The FCC oversees the authorization of equipment using the radio frequency spectrum in the USA<sup>82</sup>. Such equipment may not be imported or marketed unless it meets the technical standards specified by the FCC. Equipment may be subject to verification (in which manufacturers test the device), declaration of conformity (which requires testing by an accredited testing laboratory) or certification (which is issued by

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<sup>82</sup> <http://transition.fcc.gov/oet/ea/>

the FCC or a designated telecommunications certification body based on test results submitted by the supplier) depending upon its capabilities.

### Canada

The Certification and Engineering Bureau of Industry Canada<sup>83</sup> provides a testing capability and certification service for radio and terminal equipment in Canada.

### European Commission

The Radio and Telecommunications Terminal Equipment (R&TTE) Directive (199/5/EC)<sup>84</sup> defines a harmonized regulatory framework for the approval of terminal equipment in the European Union. It is based on the supplier declaration of conformity to basic requirements intended to ensure that the equipment is safe to use and does not cause interference with other equipment.

### ITU

**Global Mobile Communications by Satellite (GMPCS):** The ITU acts as a depository of information related to the type approval of terminal equipment for GMPCS under the provisions of the GMPCS Memorandum of Understanding<sup>85</sup>. ITU maintains a list of GMPCS-MoU signatories, system operators, terminal manufacturers and a registry of type approval letters.

### Others

A number of regulatory authorities provide databases of approved equipment. For example,

- the Croatian Post and Electronic Communications Agency provides a database of equipment approved in accordance with the EU R&TTE directive<sup>86</sup>;
- the FCC provides a database on equipment authorizations<sup>87</sup>; and
- the Industry Canada, Certification and Engineering Bureau maintain lists of terminal equipment<sup>88</sup> and radio equipment<sup>89</sup> that has been certified for use in Canada.

## 13.6 Dependence of the database on contributions

The actual utility of the database depends on the extent to which voluntary contributions are made by product and system suppliers to populate the database with a rich variety of data. It is recognized that competitive interests and other concerns about intellectual property may impact the amount of data posted but nevertheless survey data has shown that developing countries especially have shown a strong interest in such data and it is anticipated that these expectations may be addressed by the supplier community.

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<sup>83</sup> [www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/Home](http://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/Home)

<sup>84</sup> [http://ec.europa.eu/enterprise/sectors/rtte/index\\_en.htm](http://ec.europa.eu/enterprise/sectors/rtte/index_en.htm)

<sup>85</sup> [www.itu.int/osg/gmpcs](http://www.itu.int/osg/gmpcs)

<sup>86</sup> [www.hakom.hr/default.aspx?id=561](http://www.hakom.hr/default.aspx?id=561)

<sup>87</sup> <https://apps.fcc.gov/oetcf/eas/reports/GenericSearch.cfm>

<sup>88</sup> [http://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/h\\_tt00050.html](http://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/h_tt00050.html)

<sup>89</sup> [http://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/h\\_tt00020.html](http://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/h_tt00020.html)



In the case of conformity assessment related to regulatory requirements and compliance, as mentioned above, individual regulatory agencies of Member States provide and maintain comprehensive databases with a wide variety of information on their technical standards, compliance requirements, and so on. These are usually available in the public domain and easily accessible via the Internet. It remains to be determined if it would be useful for the ITU C&I Database to provide pointers to these databases for the convenience of developing countries so that the wealth of information contained therein could be readily accessed without requiring prior knowledge of, or research into which countries have such data available.

## **14 Recommendations**

The following recommendations are focused on preparatory work needed to create a solid foundation in developing countries for establishing conformity assessment and testing facilities. These facilities may be intended to meet both home country needs and also the needs of other developing countries in the region. It is recommended that:

- 1 Certification and supplier declaration of conformity (SDoC) are the preferred conformity assessment schemes for ICT equipment.
- 2 The conformity assessment bodies and accreditation bodies are accredited or assessed to meet International standards, namely ISO/IEC 17011 for accreditation bodies, ISO/IEC 17025 for testing laboratories and ISO/IEC 17065 for certification bodies.
- 3 Certification is the conformity assessment scheme for ICT equipment employing new technologies and equipment which has safety and health concerns.
- 4 Supplier declaration of conformity (SDoC) is the conformity assessment scheme for ICT equipment which employs mature technologies and mature production processes.
- 5 Countries consider the transition from certification to SDoC while technologies and production processes mature to reduce cost of production and the time to bring the equipment to market.
- 6 Countries implement Mutual Recognition Agreements (MRAs) to streamline the operations of the conformity assessment schemes.
- 7 Developing countries join together to share expertise and cost of development and operation regional testing laboratories.
- 8 Countries have legislation, regulations, standards, procedures and processes in place to enable the smooth and transparent operations of conformity assessment schemes for ICT equipment.
- 9 A survey be taken of experienced and operational conformity assessment bodies which are willing to host hands-on training for groups of new recruits from developing countries to the conformity assessment field. The survey should also invite comment on what level of support they may be able to provide trainees, if any and what cost might be incurred for such training, if any.
- 10 Countries take advantage of training offered by ITU and private training organizations in order to accelerate the building of expertise and capacity in the conformity assessment of telecommunication equipment.
- 11 Countries which currently have no requirements for market access for telecommunication products consider establishing them as soon as practical to reduce marketplace chaos and improve the overall quality of services and equipment experienced by their citizens.
- 12 Countries consider carefully the applicability of conformity assessment and testing procedures and processes that are already established in developed countries before deciding to develop their own from first principles.
- 13 Countries prioritize areas of concern related to telecommunication products and systems in preparation for dealing with these through establishment of technical requirements, testing and conformity assessment, market surveillance and audit.

- 14 Due consideration should be given to establishing legislative tools aimed at discouraging non-compliance, such as assessment of penalties and product recalls.

## Appendix 1: Questionnaire on conformity assessment

This questionnaire has been adapted from the questionnaire used for the SADC Assessment Study<sup>90</sup>

### *Assessment of a country's needs including importation, border controls, enforcement and market surveillance*

#### 1 Geography and ICT Indicators

You are encouraged to expand your answer to each point to the fullest extent so that a more comprehensive picture of the situation in your country or region can be compiled.

- Penetration of Telecoms and Internet including wireless, broadband and ICTs:
- Number of voice subscribers (fixed):
- Number of voice subscribers (mobile):
- Penetration of voice subscribers (fixed):
- Penetration of voice subscribers (mobile):
- Number of internet subscribers:
- Number of wireless internet subscribers:
- Number of fixed internet subscribers:
- Number of internet subscribers using mobile phones for access:
- Penetration of internet subscribers:
- Penetration of fixed internet subscribers:
- Penetration of wireless internet subscribers:
- % of telecommunications coverage:
- % of 3G/wireless broadband coverage:
- % of coverage for fixed access infrastructure (fibre and copper):
- Penetration of internet in rural areas:
- Penetration of voice in rural areas:

#### 2 Service providers

You are encouraged to expand your answer to each point to the fullest extent so that a more comprehensive picture of the situation in your country or region can be compiled.

- Number of mobile network operators:
- Number of fixed telephony operators:
- Number of mobile network operators providing 3G (WCDMA, HSDPA, HSPA+) services:
- Number of service providers deploying WiMAX:
- Number of service providers deploying LTE:
- Number of service providers providing Internet:
- Number of fixed Internet service providers:
- Number of wireless Internet service providers:

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<sup>90</sup> [www.itu.int/en/ITU-D/Technology/Documents/ConformanceInteroperability/SADC%20Assessment%20Study\\_Final\\_November13.pdf](http://www.itu.int/en/ITU-D/Technology/Documents/ConformanceInteroperability/SADC%20Assessment%20Study_Final_November13.pdf)

- Number of telecom infrastructure providers:
- Number of telecom infrastructure providers (fibre/copper):
- Number of telecom infrastructure providers (tower):
- Number of foreign owned telecom service providers:

### 3. Regulatory framework and institutions (per country)

- Is there any regulatory framework and regulation which establishes technical requirements for products and services to be legally imported and deployed in the marketplace?
  - If yes, what products/services/areas does it cover? (indicate all that apply)
  - If yes, indicate the Conformity Assessment Schemes adopted for market entry (check all that apply):
    - certification
    - self-declaration
    - third party declaration (through conformity assessment body)
    - labelling
    - use of proxies such as EU, IEC, FCC, ETSI, IC, etc.
    - others (specify)
- Are these Conformity Assessment Schemes based on the ISO/CASCO set of Guidelines and standards?
- If there is legislation and regulation dealing with ICT and telecom products and services and related areas such as electrical safety and environmental issues, how is it applied? Is it compulsory or voluntary?
- Where such legislation and regulation exists does it permit delegation of authorities to foreign entities under arrangements such as Mutual Recognition Agreements (MRAs) on Conformity Assessment e.g. for certification?
- Is there a national standards system and national standards development organisation (SDOs)? (indicate YES/NO in the following table).
- Where such SDOs exist are they committed to adoption of international standards wherever possible rather than developing national standards which may deviate from the international ones?
- Is there Metrology legislation and any National Institute of Metrology responsible to maintain the national measurement standards in the country; to establish and maintain their metrological traceability to the units of the International System of Units (SI)?
- If Metrology legislation exists in your country does it permit delegation of authorities to foreign entities under arrangements such as MRAs e.g. for calibration of equipment?
- Is there any Institution responsible for the Development of conformity assessment programs?
- If, YES, which areas of conformity assessment does it cover? (indicate all areas that apply).

\* indicate whether conformance assessment in this area is mandatory (M)

^ indicate whether conformance assessment in this area is voluntary (V)

- What are these Institutions involved in the development of conformance assessment programs?
- What are the possible resources from National/Regional/International Funds to assist private and public sector to invest in infrastructure, e.g., Labs and human resources? (list all)

- Is there legislation and regulation which establishes importation requirements for products and services such as ICTs including telecom products, electrical safety and environmental aspects?
- How is importation control of the products entering the country/region enforced e.g. at point of entry, spot checks and post market surveillance?
- Is there a post market surveillance, audit and enforcement regime established for products entering the country/region, and deployed in the country/region, and a schedule of penalties for infractions?
- What actions, if any, are undertaken to identify counterfeit products and what actions are taken to remove such products from the marketplace and to deal with parties responsible for bringing them into, or deploying them in the country/region?
  - counterfeit products are identified by (list all means);
  - the actions taken to remove counterfeit products include (list/state all);
  - action taken against parties that bring into and deploy counterfeit products include (list all actions).

#### **4 Accreditation**

- Is there any Accreditation Body (ISO/IEC 17011) (not only in ICT)?
- In which field/s does it accredit organisations and with what scopes?

#### **5 Laboratories**

What are the Laboratories identified in the country/region and what service levels do they provide (e.g. 1st, 2nd and 3rd party testing)?

- Are they (Labs) Accredited (ISO 17025) or is there any kind of peer evaluation of the lab?
- What are the fields and scopes of such Labs?
- How is the laboratory funded? (By Government, Organisations and Individuals). Indicate all that apply

#### **6 Certification bodies and marking**

- What Certification Bodies (ISO/IEC 17065) are in the country, where are they located?
- What are the fields and scopes of the Certification Bodies? (e.g. ICTs and Telecom)
- What Marks of conformity are on products in your country/region that are trusted – i.e. trusted Marks e.g. EU, FCC, IEC, ETSI, IC etc.

#### **7 Official language(s)**

What is the situation regarding official languages and “language of operation” in your country?

## Appendix 2: Questionnaire on testing laboratory requirements

This questionnaire is intended to solicit information of a general nature about existing laboratories which may have capabilities for conformity assessment. It is also intended to assist those contemplating establishment of a conformity assessment laboratory to think about the larger issues than just test equipment, testing and certification. These additional issues can include connectivity, electrical power supply and back-up, staff facilities, storage of excess equipment, disposal and storage of possible toxic waste such as may arise from fluids used in SAR test set-ups, and special construction issues that may arise from rooftop installations of antennae and other measurement apparatus.

### LABORATORY GENERAL INFORMATION

1. COMPANY:
2. UNIT:
3. NAME OF LABORATORY PROGRAM:
4. LABORATORY REPRESENTATIVE:
5. REPRESENTATIVE PHONE NUMBER:
6. REPRESENTATIVE E-MAIL:
7. LABORATORY MANDATE:
8. LABORATORY MAIN DAILY ACTIVITIES:
9. WHERE IS YOUR LABORATORY(S) CURRENTLY LOCATED:
10. HOW IS YOUR LABORATORY CLASSIFIED E.G. A METROLOGY LABORATORY, SOFTWARE LABORATORY, HARDWARE LABORATORY OR INTEGRATED SOFTWARE AND HARDWARE LABORATORY:
11. IS YOUR LABORATORY A TECHNICAL LABORATORY, CERTIFICATION AND TESTING LABORATORY, AN INTEROPERABILITY TESTING LABORATORY OR A MIX OF THESE:

### LABORATORY STAFF

12. HOW MANY STAFF MEMBERS WORK IN YOUR LABORATORY AT ANY GIVEN TIME:
13. HOW MANY STAFF ARE ENGAGED IN TECHNICAL WORK E.G. TESTING, MEASUREMENT
14. HOW MANY STAFF ARE ENGAGED IN ADMINISTRATION AND SUPPORT
15. HOW MANY PEOPLE ON AVERAGE ARE WORKING IN THE LABORATORY:
16. DO YOU PROVIDE LUNCH ROOMS AND EXERCISE ROOMS FOR STAFF

### LABORATORY ENVIRONMENTAL CONSIDERATIONS

17. DOES YOUR LABORATORY HAVE ENVIRONMENTAL ISSUES SUCH AS; VIBRATION, TEMPERATURE, LIGHT, ELECTROMAGNETIC BACKGROUND NOISE ETC... THAT WOULD AFFECT YOUR PROGRAM NEGATIVELY:

### LABORATORY SECURITY REQUIREMENTS

18. DO ANY OF THE PROGRAMS CONDUCTED IN THE LABORATORY HAVE ANY SECURITY REQUIREMENTS INCLUDING COMMERCIAL CONFIDENTIALITY REQUIREMENTS:
19. IF YOUR LABORATORY IS USED TO DELIVER PROGRAMS WITH A SECURITY ELEMENT PLEASE ELABORATE THE SECURITY REQUIREMENTS THAT MUST BE MET IN ORDER TO BE COMPLIANT:

#### **LABORATORY ACCESS CONSIDERATIONS**

20. DOES ANY OF YOUR LABORATORY EQUIPMENT REQUIRE OVER SIZED ACCESS DOORS:
21. DOES YOUR LABORATORY REQUIRE IMMEDIATE ACCESS FROM THE OUTSIDE SUCH AS REQUIRED BY SHIPPING AND RECEIVING OPERATIONS:

#### **LABORATORY HAZARDOUS MATERIALS**

22. DOES YOUR LABORATORY HAVE ANY HAZARDOUS MATERIALS AND OR CHEMICALS THAT REQUIRES STORAGE IN OR NEAR THE LAB:
23. DOES YOUR LABORATORY REQUIRE A HAZARDOUS WASTE DISPOSAL PROGRAM:
24. IF YOUR LABORATORY REQUIRES A HAZARDOUS WASTE DISPOSAL PROGRAM, DOES IT HAVE ONE NOW, IF SO PLEASE ELABORATE:

#### **LABORATORY STORAGE REQUIREMENTS**

25. DOES YOUR LABORATORY REQUIRE EQUIPMENT STORAGE SPACE
26. DOES YOUR LABORATORY REQUIRE SEPARATE STORAGE SPACE:

#### **LABORATORY ROOF TOP EQUIPMENT**

27. DOES YOUR PROGRAM INCLUDE A ROOF TOP STRUCTURE OF ANY KIND:
28. IF YOUR PROGRAM INCLUDES A ROOF TOP STRUCTURE PLEASE INDICATE THE EXACT LOCATION:
29. DO YOU HAVE ANY EQUIPMENT IN ANY STRUCTURE THAT IS LOCATED ON A ROOF TOP:
30. IF YOU HAVE EQUIPMENT WITHIN OR NEAR A ROOF TOP STRUCTURE PLEASE LIST THE EQUIPMENT AS WELL AS ANY CONNECTIVITY AND OR INFRASTRUCTURE REQUIREMENTS TO SUPPORT THIS EQUIPMENT:

#### **ADDITIONAL SITE OR OFF SITE LABORATORIES**

31. DOES YOUR PROGRAM INCLUDE A STAND ALONE STRUCTURE THAT RELIES ON INFRASTRUCTURE FROM AN ADJACENT OR NEAR BY BUILDING AND OR TRAILER:
32. DOES YOUR LABORATORY HAVE AN OPEN AREA TEST SITE (OATS) BUILDING
33. IF YOUR PROGRAM INCLUDES A STAND ALONE STRUCTURE OTHER THAN A ROOF TOP STRUCTURE PLEASE INDICATE THE EXACT LOCATION AND ITS SUPPORTING INFRASTRUCTURE AND PURPOSE:

#### **LABORATORY INFRASTRUCTURE SUPPORT**

34. DOES YOUR LABORATORY REQUIRE SPECIAL CONNECTIVITY:
35. DOES YOUR LABORATORY HAVE REQUIREMENTS FOR HIGH VOLTAGE OR HIGH CURRENT CIRCUITRY

#### **LABORATORY INFRASTRUCTURE SUPPORT**

36. IF YOUR LABORATORY REQUIRES SPECIAL CONNECTIVITY PLEASE ELABORATE:
37. DOES YOUR LABORATORY REQUIRE STAND ALONE COMPUTERS, IF SO HOW MANY:
38. DOES YOUR LABORATORY HAVE SPECIAL CABLING REQUIREMENTS FOR EXAMPLE OPTICAL FIBRE, COAXIAL CABLE, WIRE PAIRS:
39. HOW MANY FIXED TELEPHONES DO YOU REQUIRE IN YOUR LABORATORY:

40. HOW MANY DATA PORTS DO YOU REQUIRE IN YOUR LABORATORY:
41. HOW MUCH DESK SPACE DOES YOUR PROGRAM REQUIRE IN YOUR LABORATORY:
42. DOES YOUR PROGRAM REQUIRE CLOSED AND OPEN OFFICE SPACE - ELABORATE
43. DOES YOUR LABORATORY REQUIRE OPEN SHELVING:
44. IF YOUR LABORATORY REQUIRES OPEN SHELVING, WHAT DEPTH AND HEIGHT OF SHELVING, AND HOW MANY LINEAR FEET IN TOTAL:

#### **LABORATORY SUB-LAB AREA REQUIREMENTS**

45. DOES YOUR LABORATORY HAVE SUB-LABS WITH SPECIAL REQUIREMENTS:
46. HOW MANY SUB-LABS DO YOU HAVE AND WHAT ARE THEIR SPACE REQUIREMENTS
47. PROVIDE SUMMARIES OF EQUIPMENT TO BE LOCATED IN EACH SUB-LAB
48. IF YOUR LABORATORY HAS A DEMONSTRATION FACILITY, WHAT SPACE WOULD BE REQUIRED:
49. WHAT ARE THE CONNECTIVITY REQUIREMENTS FOR YOUR DEMONSTRATION AREA:
50. WHAT PERMANENT EQUIPMENT IS REQUIRED IN THE DEMONSTRATION AREA:
51. CAN THIS EQUIPMENT BE SHARED WITH THE SUB-LABS:
52. FOR EACH SUB-LAB DOES THE USER OF THE EQUIPMENT HAVE TO BE CERTIFIED OR DESIGNATED:
53. WHAT ARE THE OVERALL FURNITURE REQUIREMENTS FOR EACH AREA OF THE LABORATORY:

#### **SHEILDED LABORATORIES**

54. DOES YOUR PROGRAM REQUIRE A SHEILDED ROOM:
55. IF YOUR PROGRAM REQUIRES A SHEILDED ROOM DO YOU HAVE ONE NOW, IF SO WHERE IS IT LOCATED:
56. IF YOUR PROGRAM REQUIRES A SHEILDED ROOM, CAN IT BE SHARED:
57. DOES YOUR LABORATORY REQUIRE FARADAY CAGES:
58. IF YOUR LABORATORY REQUIRES FARADAY CAGES, HOW MANY, WHAT SIZES AND IN WHAT CONFIGURATION:
59. DOES YOUR PROGRAM REQUIRE AN ANECHOIC CHAMBER:
60. DOES YOUR PROGRAM HAVE AN ANECHOIC CHAMBER NOW, IF SO WHERE IS IT LOCATED:
61. WHAT SIZE OF ANECHOIC CHAMBER DO YOU HAVE OR PLAN TO HAVE E.G. 3 METER, 10 METER:
62. IF YOUR PROGRAM CURRENTLY HAS AN ANECHOIC CHAMBER IS IT SUFFICIENT:
63. IF YOUR PROGRAM REQUIRES AN ANECHOIC CHAMBER, CAN IT BE SHARED:



**LABORATORY SUPPORT SPACE**

64. DO YOU HAVE VEHICLES IN SUPPORT OF YOUR MANDATE ANF IF SO HOW MANY
65. ARE THE VEHICLES STORED INSIDE THE LABORATORY BUILDING
66. ARE ANY VEHICLES SPECIALIZED WITH SPECIALIZED EQUIPMENT SUCH AS EXTENDABLE AND ROTATABLE ANTENNAE MOUNTED ON THE VEHICLE
67. DO SUCH VEHICLES REQUIRE SPECIAL GARAGE FACILITIES
68. WHAT ARE THE NOTIONAL SPACE REQUIREMENTS TO HOUSE YOUR VEHICLES
69. WHAT KIND OF PHYSICAL FILING AND RECORDS MANAGEMENT SYSTEM DO YOU HAVE
70. WHAT EQUIPMENT DO YOU REQUIRE TO BE IN YOUR BUSINESS CENTER:
71. DOES YOUR UNIT HAVE OR USE A TECHNICAL LIBRARY:
72. ANY OTHER ISSUES YOU WOULD LIKE TO REPORT ON.

### **Appendix 3: Questionnaire on status of conformance and interoperability of equipment and systems in ITU Member States**

This questionnaire was circulated to Member States for their input in 2010 and while some 30 Member States responded, it would have been very helpful in formulation of the on-going C&I work programme to have received data from a larger number of respondents. This questionnaire may be found at the following website<sup>91</sup>:

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<sup>91</sup> [www.itu.int/ITU-D/CDS/gg/generic/questionnaire.asp?ProjectID=193](http://www.itu.int/ITU-D/CDS/gg/generic/questionnaire.asp?ProjectID=193)

## Appendix 4: Equipment data and order-of-magnitude cost figures

Equipment	Description	Order-of-Magnitude Cost Figures (USD)
<b>AMPLIFIERS:</b>		
AMPLIFIER, RF	Frequency Range: 20 Hz to 20 kHz	7 000
AMPLIFIER, RF	Frequency Range: 100 kHz-26.5 GHz	41 000
AMPLIFIER, VERTICAL DUAL CHANNEL		3 000
AMPLIFIER, DISTRIBUTION HF		1 300 to 8 000
AMPLIFIER, BROADBAND		3 000 to 13 000
<b>ANALYZERS:</b>		
ANALYZER, RADIO COMMUNICATION	Frequency Range: 300 kHz to 3 GHz	17 000
ANALYZER, RADIO COMMUNICATION	Frequency Range: 30 MHz to 2.7 GHz	61 000
ANALYZER, AUDIO		77 000
ANALYZER, SPECTRUM	Frequency Range: 9 kHz to 6.5 GHz	38 000
ANALYZER, SPECTRUM	9 kHz to 40 GHz Portable Millimetre Wave Spectrum Analyser	75 000
ANALYZER, SPECTRUM	Monitors RF, microwave, and millimetre - wave signals from 3 Hz to 50 GHz	115 000
ANALYZER, AC POWER	750 VA, 300 V, 6.5 A	10 000
ANALYZER, VECTOR NETWORK MICROWAVE	VSA with W-CDMA Capability, DC to 2.65 GHz	65 000
ANALYZER, VECTOR NETWORK MICROWAVE	Frequency Range: 10 MHz to 67 GHz	180 000
ANALYZER, SIGNAL	Frequency Range: 20 Hz-26.5 GHz	37 000
<b>ANTENNAS:</b>		
ANTENNA – Double-Ridged Waveguide Horn	Frequency Range: 1 GHz-18 GHz	5 000
ANTENNA – passive loop antenna	Frequency Range: 10 kHz-30 MHz	1 400
ANTENNA, DIPOLE	Frequency Range: 140-400 MHz	2 000
ANTENNA, DIPOLE – BROADBAND	Frequency Range: 1-6 GHz	12 000
ANTENNA, BICONICAL	Frequency Range: 30-300 MHz	2 700
ANTENNA, BICONICAL	Frequency Range: 26 MHz to 2 GHz	6 000
ANTENNA, DF	Frequency Range: 30 MHz to 1 GHz	5 000
ANTENNA, LOG PERIODIC	Frequency Range: 200 MHz to 2 GHz	3 500
ANTENNA, MICROWAVE		1 300
ANTENNA, MASS		19 000
ANTENNA TOWER		22 000
<b>CALIBRATORS:</b>		
CALIBRATION UNIT, DC REF STANDARD	Frequency range: 100 kHz to 2600 MHz	3 500
MULTIFUNCTION CALIBRATOR	10 Hz to 30 MHz to cover to RF voltmeters	60 000
AM/FM CALIBRATOR	Frequency range: 150 kHz to 1300 MHz	10 000
COAXIAL DIPOLE 1600 MHz		5 000
CONTROLLER		6 800
COUNTER, FREQUENCY		17 000
COUPLER, CONNECTING NETWORK		2 800
EXCITER – RADIO TRANSMITTER		20 000 to 55 000

Equipment	Description	Order-of-Magnitude Cost Figures (USD)
FM TRANSMITTER SYSTEM		50 000
GENERATORS:		
RINGING GENERATOR, SIGNAL	Feeding bridge for analogue telephone measurements	15 000
MICROWAVE SIGNAL GENERATOR	Frequency Range: 10 MHz to 40 GHz	43 000
GENERATOR, SIGNAL RF	4 GHz RF Reference Source	46 000
GENERATOR, WAVEFORM		2 000 to 6 000
HIGH TEMPERATURE DIELECTRIC PROBE		9 200
HUB, LAN 10 BASE-2 ETHERNET		26 000
INVERTER		500
LABELLING MACHINE		500
MASK-TESTER & ADAPTER		9 000
MEASURING AMPLIFIER		20 000
METER, CURRENT		9 000
METER, FIELD STRENGTH		30 000
METER, P.D.		8 000 to 10 000
MILLIMETER, MIXTURE		28 000
MIXER, AUDIO VISUAL		6 000
MODULE, ELECTRONIC CAL.		6 000 to 11 000
MONOPOLE		4 000
MULTIMETERS:		
MULTIMETER	True-rms ac voltage and current – 100 kHz ac bandwidth	550
MULTIMETER	100 µA to 10 A current range	1 300
MULTIMETER	DC range from 200 mV to 1 Kv; Bandwidth for AC measurements extends to 1 MHz	21 000
OSCILLOSCOPES:		
OSCILLOSCOPE	500 MHz Digital Storage Oscilloscope	23 000
OSCILLOSCOPE	2 GHz to 13 GHz real-time oscilloscope	120 000
POWER SUPPLY		1 000 to 4 000
PREAMPLIFIER, MICROWAVE SYSTEM		3 000 to 14 000
PROBE, MAGNETIC FIELD		12 200
PROBE, ELECTRIC FIELD		5 000 to 10 000
PROBE, HIGH VOLTAGE		1 000 to 2 000
RADIO FILTER, BAND REJECT RF TUNABLE		2 500 to 5 000
RADIO FILTER, BANDPASS ELECTRONIC		1 200 to 2 000
RADIO, 2 WAY HAND HELD		180
MEASURING RECEIVER:		60 000 to 142 000
TEST RECEIVER	EMI Test Receiver, 20 Hz-40 GHz	142 000
TEST RECEIVER	EMI Receiver MODIFIER – 20 Hz-7 GHz	99 000
TEST RECEIVER	Frequency Range: 20 Hz to 26.5 GHz – For calibrating RF-level and analogue modulation	60 000
RECEIVER, SENDER DIGITAL		3 000 to 10 000

Equipment	Description	Order-of-Magnitude Cost Figures (USD)
RESISTOR, LOAD STANDARD		3 000 to 5 000
RF VECTOR NETWORK ANALYZER 30 KHz-3 GHz		48 000
SENSOR, POWER		2 000 to 6 000
SIMULATOR, WIRELINE xDLS		185 000
SIMULATOR, HEAD AND TORSO		31 000
SPLITTER		2 000 to 4 500
SWITCH, TELECOMMUNICATION		2 000 to 4 500
TEST SET MEASURE		18 000 to 32 000
TEST SYSTEM, TELEPHONE		17 000
TESTER		3 000
TRANSCIVER		100 to 850
TRANSMITTERS:		
AM TRANSMITTER	Output Power: 5 W to 550 W – Frequency Range: 522 kHz to 1705 kHz	10 000
FM TRANSMITTER	Output Power: FM + HD Radio: 300 W to 700 W; Frequency Range: 87.5 MHz to 108 MHz, programmable in 10 kHz steps	15 000
FIBER OPTIC TRANSMITTER	Max. Distance 50m; Operating Temp. – 10°C to +70°C	5 600
TRIPOD		5 000 to 6 000
BRIDGE, POWER DIVIDER		1 600
OPTO-EXTENDER		1 650
SPECIAL FACILITIES/SYSTEMS:		
SAR		250 000
ISAR		135 000
DOSIMETRIC ASSESSMENT SYSTEM		240 000
ENVIRONMENTAL TEST CHAMBER		536 000
SEMI ANECHONIC CHAMBER	3 metre	420 000
SEMI ANECHONIC CHAMBER	10 metre	1 650 000
OPEN AREA TEST SITE (OATS)	Ground plane, basement, installation, construction	350 000

## Appendix 5: Worldwide testing Labs

1. USA NIST  
<http://ts.nist.gov/standards/scopes/programs.htm>  
<http://ts.nist.gov/standards/scopes/ect.htm>
2. Australia  
[www.austest.com.au/about\\_us.php](http://www.austest.com.au/about_us.php)
3. Europe  
<http://start.europadev.com/Home/consultancy-1>
4. A4Labs  
[www.at4wireless.com/testing-certification-services/accreditations.html](http://www.at4wireless.com/testing-certification-services/accreditations.html)
5. Tunisia  
[www.cert.nat.tn](http://www.cert.nat.tn)
6. FCC Q&A site  
[www.bureauveritas.com/wps/wcm/connect/bv\\_com/group/home/news/did-you-know-that/fcc\\_faqs?presentationtemplate=bv\\_master/news\\_full\\_story\\_presentation](http://www.bureauveritas.com/wps/wcm/connect/bv_com/group/home/news/did-you-know-that/fcc_faqs?presentationtemplate=bv_master/news_full_story_presentation)
7. Middle East  
[www.uaelab.ae/UAELAB/about\\_UAELAB.htm](http://www.uaelab.ae/UAELAB/about_UAELAB.htm)  
[www.goglobalcompliance.com/](http://www.goglobalcompliance.com/)  
[www.ntra.gov.eg/arabic/main.asp](http://www.ntra.gov.eg/arabic/main.asp)  
[www.contractlaboratory.com/labclass/telecommunications.cfm](http://www.contractlaboratory.com/labclass/telecommunications.cfm)  
[www.intertek.com/it/](http://www.intertek.com/it/)
8. Russian Federation  
<http://zniis.ru/ITTC.html>
9. Slovenia (SINTESIO LABORATORY)  
[www.sintesio.org/about\\_us/](http://www.sintesio.org/about_us/)
10. Canada (INDUSTRY CANADA)  
[www.ic.gc.ca/eic/site/smt-gst.nsf/eng/home](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/home)  
[www.nemko.com/](http://www.nemko.com/)
11. Africa, China, ASEAN, CIS, South America  
[www.itu.int/dms\\_pub/itu-t/oth/06/24/T06240000010009MSWE.doc](http://www.itu.int/dms_pub/itu-t/oth/06/24/T06240000010009MSWE.doc)

## Appendix 6: Telecommunication training courses

### Commonwealth Telecommunications Organization (CTO): [www.cto.int](http://www.cto.int)

- A professional training and capacity building programme covering telecommunications and ICT
- Offered to all parties – Ministries, regulators, operators and others
- The programme is funded through annual financial contributions from its members
- Lower fees for members – about 50 per cent lower
- Visit CTO course schedules and fees at:

### Sample of CTO courses and fees: [www.cto.int/PDT/ScheduledCourses/tabid/219/Default.aspx](http://www.cto.int/PDT/ScheduledCourses/tabid/219/Default.aspx)

- [ICT Tools for Management and Planning](#) Nairobi, Kenya 17/05/2010 to 20/05/2010 GBP 699/ GBP 1 099
- [Next Generation Networks](#) Ndola, Zambia 14/06/2010 to 18/06/2010 GBP 799/ GBP 1 199
- [Fibre Optic Access Networks](#) Limbe, Cameroon 28/06/2010 to 02/07/2010 GBP 799/ GBP 1 199
- [Convergence & Talent Management](#) Botswana 05/07/2010 to 09/07/2010 GBP 799/ GBP 1 199
- [IP Networking including Bandwidth Optimization & Expansion](#) Suva, Fiji Islands 26/07/2010 to 30/07/2010 GBP 799/ GBP 1 199
- [GSM Technologies \(2G, 2.5G, EDGE, GPRS\)](#) Gaborone, Botswana 02/08/2010 to 06/08/2010 GBP 799/ GBP 1 199
- [Frequency Planning & Spectrum Management\\*](#) Bamenda, Cameroon 09/08/2010 to 13/08/2010 GBP 799/ GBP 1 199
- [Internship in Marketing \(exchange program\)\\*](#) South Africa 16/08/2010 to 20/08/2010 GBP 799/ GBP 1 199
- [Internship on ADSL Technology\\*](#) South Africa 16/08/2010 to 20/08/2010 GBP 799/GBP 1 199

### (EUROPE) Lever Technology Group PLC: [www.lever.co.uk](http://www.lever.co.uk)

Delivers a wide range of Wireline Telecoms training courses and Wireless courses covering the following technologies and more:

[LTE Training Courses](#)

[UMTS Training Courses](#)

[WiMAX Forum® Training Courses](#)

[TCP/IP, IP and IPv6 Training Courses](#)

[VoIP Training Courses](#)

[Fixed Mobile Convergence \(FMC\) Training Courses](#)

[Telecoms Training Courses](#)

[Voice Telephony Training Courses](#)

[WiFi Wireless \(WLAN\) Training Courses](#)

[Certified Wireless Network Professional \(CWNP\) Training Courses](#)

[RF and Wireless Training Courses](#)

[TETRA Training Courses](#)

[Bluetooth and ZigBee Training Courses](#)

[Satellite Communications \(VSAT\) Training Courses](#)

[Billing Training Courses](#)

[Network Security Training Courses](#)

[Cisco Training Courses](#)

### Sample of training courses

#### LTE training courses

##### **4G and LTE – Non-Technical Appreciation training course<sup>92</sup>**

A 1-day LTE/4G training course – A Non-Technical Appreciation of the Next Generation of Mobile Communications.

##### **LTE and 4G – Technical Overview training course<sup>93</sup>**

A 1-day LTE and 4G training course – A high-value seminar covering all aspects of LTE motivations, timescales, goals, technical features, and aspects of UMTS that will change to support LTE.

##### **LTE (Long Term Evolution) – In-Depth training course<sup>94</sup>**

A 3-day LTE training course – A high-value training course covering all aspects of LTE, including environment, drivers, MIMO, CDMA, OFDM, air interface, architectural and core network changes.

#### RF and wireless training courses

##### **Intro to Radio Planning for Mobile Networks training course<sup>95</sup>**

A 1-day Radio Planning training course – The What, Why and something of the How.

##### **Fundamentals of Wireless Systems and Networks training course<sup>96</sup>**

A 5-day Wireless training course – A unique, high-value, fast-track coverage of today's current and emerging Wireless communications networks, systems and technologies: RF Fundamentals, LTE, UMTS, HSPA+, EDGE, GSM, GPRS, WiMAX, TETRA, Wi-Fi, ZigBee, Bluetooth.

##### **Understanding Mobile and Wireless Communications training course<sup>97</sup>**

A 2-day Wireless training course – A complete and essential overview of all modern Mobile and Wireless communications technologies, for non-technical professionals.

#### **(North America) NEOTELIS: [www.neotelis.com](http://www.neotelis.com)**

- Founded in 1997 and headquartered in Montreal, Canada
- Assists telecommunication organizations worldwide in consulting and telecom training

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<sup>92</sup> [http://www.lever.co.uk/training/courses/lte\\_4g\\_seminar\\_710.html](http://www.lever.co.uk/training/courses/lte_4g_seminar_710.html)

<sup>93</sup> [http://www.lever.co.uk/training/courses/lte\\_4g\\_711.html](http://www.lever.co.uk/training/courses/lte_4g_711.html)

<sup>94</sup> [http://www.lever.co.uk/training/courses/lte\\_714.html](http://www.lever.co.uk/training/courses/lte_714.html)

<sup>95</sup> [http://www.lever.co.uk/training/courses/rf\\_radio\\_planning\\_602.html](http://www.lever.co.uk/training/courses/rf_radio_planning_602.html)

<sup>96</sup> [http://www.lever.co.uk/training/courses/wireless\\_mobile\\_rf\\_lte\\_umts\\_gsm\\_603.html](http://www.lever.co.uk/training/courses/wireless_mobile_rf_lte_umts_gsm_603.html)

<sup>97</sup> [http://www.lever.co.uk/training/courses/wireless\\_mobile\\_692.html](http://www.lever.co.uk/training/courses/wireless_mobile_692.html)



- Clients in Africa, the Americas and the Caribbean, Asia, Europe, the Middle East and Oceania
- Has performed mandates in more than 100 countries around the world for operators, regulators, governments and policy-makers
- Offers a wide range of Training Programs in the key areas of the telecommunication sector: Strategy and Management, Marketing and Sales, Engineering Operations, Finance, Human Resources, Policies and Regulation and Information and Communications, Technologies for Development (ICT4D)

#### **Sample of training courses**

- **ENG-000 Private Training in Engineering, Networks and Technologies<sup>98</sup>**
- **ENG-100 Overview of Telecom Technologies & Services<sup>99</sup>**
- **ENG-103 QoS in Telecommunication Networks<sup>100</sup>**
- **ENG-207 Next Generation Networks<sup>101</sup>**
- **ENG-404 TCP/IP Networks: Switching<sup>102</sup>**
- **ENG-502 GSM Network Technology<sup>103</sup>**
- **ENG-508 Wireless Local Area Networks (WLAN): Advanced<sup>104</sup>**
- **ENG-509 3G Mobile Networks<sup>105</sup>**
- **ENG-510 4G Mobile Networks<sup>106</sup>**
- **ENG-511 3G & 4G Network Technologies & Strategies<sup>107</sup>**
- **ENG-513 Wireless Technologies in 2013<sup>108</sup>**
- **FIN-104 Revenue Leakage in Telecommunications<sup>109</sup>**

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<sup>98</sup> [www.neotelis.com/repertoire\\_services\\_fiche.php?type=evenements\\_gabarits&id=227&action=change\\_langue&langue=EN](http://www.neotelis.com/repertoire_services_fiche.php?type=evenements_gabarits&id=227&action=change_langue&langue=EN)

<sup>99</sup> [www.neotelis.com/repertoire\\_services\\_fiche.php?type=evenements\\_gabarits&id=2&action=change\\_langue&langue=EN](http://www.neotelis.com/repertoire_services_fiche.php?type=evenements_gabarits&id=2&action=change_langue&langue=EN)

<sup>100</sup> [www.neotelis.com/repertoire\\_services\\_fiche.php?type=evenements\\_gabarits&id=5&action=change\\_langue&langue=EN](http://www.neotelis.com/repertoire_services_fiche.php?type=evenements_gabarits&id=5&action=change_langue&langue=EN)

<sup>101</sup> [www.neotelis.com/repertoire\\_services\\_fiche.php?type=evenements\\_gabarits&id=15&action=change\\_langue&langue=EN](http://www.neotelis.com/repertoire_services_fiche.php?type=evenements_gabarits&id=15&action=change_langue&langue=EN)

<sup>102</sup> [www.neotelis.com/repertoire\\_services\\_fiche.php?type=evenements\\_gabarits&id=15&action=change\\_langue&langue=EN](http://www.neotelis.com/repertoire_services_fiche.php?type=evenements_gabarits&id=15&action=change_langue&langue=EN)

<sup>103</sup> [www.neotelis.com/ser-e/en\\_gsm\\_network\\_technology](http://www.neotelis.com/ser-e/en_gsm_network_technology)

<sup>104</sup> [www.neotelis.com/ser-e/en\\_wireless\\_local\\_area\\_networks\\_wlan\\_advanced](http://www.neotelis.com/ser-e/en_wireless_local_area_networks_wlan_advanced)

<sup>105</sup> [www.neotelis.com/repertoire\\_services\\_fiche.php?type=evenements&id=44&type\\_service=prive](http://www.neotelis.com/repertoire_services_fiche.php?type=evenements&id=44&type_service=prive)

<sup>106</sup> [www.neotelis.com/ser-e/en\\_4g\\_mobile\\_networks](http://www.neotelis.com/ser-e/en_4g_mobile_networks)

<sup>107</sup> [www.neotelis.com/ser-e/en\\_3g\\_4g\\_network\\_technologies\\_strategies](http://www.neotelis.com/ser-e/en_3g_4g_network_technologies_strategies)

<sup>108</sup> [www.neotelis.com/ser-e/en\\_wireless\\_technologies\\_in\\_2013](http://www.neotelis.com/ser-e/en_wireless_technologies_in_2013)

<sup>109</sup> [www.neotelis.com/ser-e/en\\_revenue\\_leakage\\_in\\_telecommunications](http://www.neotelis.com/ser-e/en_revenue_leakage_in_telecommunications)

- **FIN-109 Fraud Management in Telecommunications II**<sup>110</sup>
- **ICT-101 Funding ICT for Development (ICT4D) Projects**<sup>111</sup>
- **ICT-102 Current Trends in the Use of ICTs for Development**<sup>112</sup>
- **REG-000 Private Training in Policies & Regulations**<sup>113</sup>
- **REG-100 Telecom Regulation for Today's World**<sup>114</sup>
- **REG-101 Management of Regulatory Affairs**<sup>115</sup>
- **REG-102 Spectrum Management**<sup>116</sup>
- **REG-103 Regulation of New Telecom Services & Applications**<sup>117</sup>
- **REG-104 Telecom Law Essentials**<sup>118</sup>
- **REG-106 Beyond Regulation - Stimulating Telecom Competition**<sup>119</sup>

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<sup>110</sup> [www.neotelis.com/ser-e/en\\_fraud\\_management\\_in\\_telecommunications\\_ii](http://www.neotelis.com/ser-e/en_fraud_management_in_telecommunications_ii)

<sup>111</sup> [www.neotelis.com/ser-e/en\\_funding\\_ict\\_for\\_development\\_ict4d\\_projects](http://www.neotelis.com/ser-e/en_funding_ict_for_development_ict4d_projects)

<sup>112</sup> [www.neotelis.com/ser-e/en\\_current\\_trends\\_in\\_the\\_use\\_of\\_icts\\_for\\_development](http://www.neotelis.com/ser-e/en_current_trends_in_the_use_of_icts_for_development)

<sup>113</sup> [www.neotelis.com/ser-e/en\\_Private\\_Training\\_in\\_Policies\\_Regulations](http://www.neotelis.com/ser-e/en_Private_Training_in_Policies_Regulations)

<sup>114</sup> [www.neotelis.com/ser-e/en\\_telecom\\_regulation\\_for\\_today\\_s\\_world](http://www.neotelis.com/ser-e/en_telecom_regulation_for_today_s_world)

<sup>115</sup> [www.neotelis.com/repertoire\\_services\\_fiche.php?type=evenements\\_gabarits&id=136&action=change\\_langue&langue=EN](http://www.neotelis.com/repertoire_services_fiche.php?type=evenements_gabarits&id=136&action=change_langue&langue=EN)

<sup>116</sup> [www.neotelis.com/ser-e/en\\_spectrum\\_management](http://www.neotelis.com/ser-e/en_spectrum_management)

<sup>117</sup> [www.neotelis.com/ser-e/en\\_regulation\\_of\\_new\\_telecom\\_services\\_applications](http://www.neotelis.com/ser-e/en_regulation_of_new_telecom_services_applications)

<sup>118</sup> [www.neotelis.com/ser-e/en\\_telecom\\_law\\_essentials](http://www.neotelis.com/ser-e/en_telecom_law_essentials)

<sup>119</sup> [www.neotelis.com/ser-e/en\\_competition\\_issues\\_in\\_telecommunications](http://www.neotelis.com/ser-e/en_competition_issues_in_telecommunications)

## References

1. Guidelines for developing countries on establishing conformity assessment testing labs in different regions: [www.itu.int/ITU-D/tech/ConformanceInteroperability/ConformanceInterop/Guidelines/Test\\_lab\\_guidelines\\_EV8.pdf](http://www.itu.int/ITU-D/tech/ConformanceInteroperability/ConformanceInterop/Guidelines/Test_lab_guidelines_EV8.pdf)
2. Industry Canada fees: [www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/trc-49-i8-oct2011.pdf/\\$file/trc-49-i8-oct2011.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/trc-49-i8-oct2011.pdf/$file/trc-49-i8-oct2011.pdf)
3. Industry Canada spectrum/standards: [www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h\\_sf01375.html](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf01375.html)
4. Industry Canada certification/standards: [www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h\\_sf06165.html](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf06165.html)
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## Acronyms and abbreviations

3GPP	Third Generation Partnership Project
AB	Accreditation Body
APEC TEL	Asia Pacific Economic Cooperation Telecommunications and Information Working Group
APLAC	Asia Pacific Laboratory Accreditation Cooperation
APT	Asia Pacific Telecommunity
BDT	Telecommunication Development Bureau of ITU
C&I	Conformance and Inter-operability
CAB	Conformity Assessment Body
CASCO	ISO committee on conformity assessment
CB	Certification Body
CISPR	<i>Comité International Special des Perturbations Radioelectriques</i>
CITEL	Inter-American Telecommunication Commission
DA	Designation Authority
DSL	Digital Subscriber Line
EA	European co-operation for accreditation
EC	European Commission
EMC	Electro Magnetic Compatibility
ETSI	European Telecommunications Standards Institute
FCC	Federal Communication Commission
GPON	Gigabit-capable Passive Optical Network
GSM	Global System for Communications
HAC	Hearing Aid Compatibility
HATS	Head and Torso Simulator
IAAC	InterAmerican Accreditation Cooperation
IAF	International Accreditation Forum
ICT	Information and Communications Technologies
IEC	International Electrotechnical Commission
IECEE CB	IEC System for conformity testing and certification of electrical and electronic components, equipment and products certification body
ILAC	International Laboratory Accreditation Cooperation
IPTV	Internet Protocol Television
ISDN	Integrated Services Digital Network
ISO	International Standardization Organization
ITC	Information Technology Committee

ITTC	International Telecommunication Test Centre
ITU	International Telecommunication Union
LTE	Long Term Evolution
MRA	Mutual Recognition Agreement/Arrangement
NIST	National Institute of Standards and Technology
OATS	Open Area Test Site
PAC	Pacific Accreditation Cooperation
PCC.I	Permanent Consultative Commission One
PON	Passive Optical Network
RFID	Radio Frequency Identification
RFP	Request for Proposal
SAR	Specific Absorption Rate
SDO	Standards Development Organization
SDoC	Supplier Declaration of Conformity
SG	Study group
TA	Type Approval
TBT	Technical Barriers to Trade
TCP/IP	Transport Control Protocol/Internet Protocol
TETRA	TErrestrial TRunked RAdio
TIA	Telecommunications Industry Association
TSAG	Telecommunication Standards Advisory group
TSB	Telecommunication Standardization Bureau of ITU
UMTS	Universal Mobile Telecommunications System
UNI	User to Network Interface
UNIDO	United Nations Industrial Development Organization
URL	Uniform Resource Locator
WiFi	Wireless Fidelity
WTDC	World Telecommunication Development Conference
WTO	World Trade Organization
WTSA	World Telecommunication Standardization Assembly

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