ILAC Policy on Traceability of Measurement Results

ILAC-P10:2002

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PREAMBLE

ILAC has the objective to develop and maintain a Mutual Recognition Arrangement between the nationally recognised accreditation bodies. To ensure confidence between the accreditation bodies, it is considered necessary to have appropriate harmony between key practices and policies of the accreditation bodies. Traceability of measurement results is a fundamental topic for development of a harmonised policy.

ILAC identified a number of features of traceability of measurement results, which would be desirable in an ideal world (see chapter 2). However, it is recognised that the complete achievement of such an ideal could take many years because some of the features of an ideal international system for traceability are outside the direct control of ILAC. ILAC will continue to co-operate closely with the CIPM and BIPM and will continue to encourage the further development, harmonisation and completion of those features by external bodies, such as the BIPM, the Regional Metrology Organisations and the individual national metrology institutes in the economies of ILAC members.

Among others due to the urgent request of ILAC several years ago, the CIPM (International Committee for Weights and Measures), being the Governing Board of the BIPM, has realized under the scope of the Metre Convention a CIPM MRA on the Mutual Recognition of National Measurement Standards and of Calibration and Measurement Certificates issued by National Metrology Institutes. This CIPM MRA is now being implemented.

Factors, which influence the development and implementation of a harmonised ILAC policy on traceability of measurement results, include the following:

(a) Few economies have the complete range of national measurement standards and best measurement capabilities needed to support the calibration and testing needs of all potential applicants for accreditation in their economy;

(b) Access to suitable national measurement standards is more complex in those economies whose national metrology institutes do not hold the relevant standards nor have the best measurement capabilities needed to support the calibration and testing activities of all accredited laboratories in their economies;

(c) The concept of traceability of measurement results in fields such as the chemical and biological sciences is still partly under international debate and progression towards a unified understanding and use of this concept is not yet complete;

(d) The role of certified reference materials in providing traceability of measurement results has not yet been fully established internationally;

(e) There are cases in almost every economy where some links (i.e. calibration laboratories) in the traceability chain are not accredited.

PURPOSE

To provide a policy on traceability of measurement results which is intended to be implemented by ILAC members and to encourage the development of supporting bodies such as CIPM/BIPM.

Unless otherwise noted in the text for some clauses, this policy is effective as of 1 January 2003.

AUTHORSHIP

This publication was initially prepared by the ILAC Technical Accreditation Issues Committee and endorsed for publication by the ILAC General Assembly in 2001.

1 ILAC CONCEPT OF TRACEABILITY OF MEASUREMENTS RESULTS

1.1 The criteria on traceability which laboratories have to meet are laid down in chapter 5.6 of ISO/IEC 17025 – *General requirements for the competence of testing and calibration laboratories.*

1.2 ILAC has published a guidance document on traceability of measurement results. (ILAC-G2:1994 is *Traceability of Measurements).* This document is in harmony in terms of the concept of traceability of measurement results and should be consulted for a more detailed understanding of the topic.

1.3 The formal definition of traceability is given in the *International Vocabulary of Basic and General Terms in Metrology* (VIM- 1993) as: "6.10 **traceability:** property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties."

1.4 Traceability (as given in both ILAC G2 and VIM) is characterised by:

(a) **an unbroken chain of comparisons** going back to stated references acceptable to the parties, usually a national or international standard;

(b) **uncertainty of measurement;** the uncertainty of measurement for each step in the traceability chain must be calculated or estimated according to agreed methods and must be stated so that an overall uncertainty for the whole chain may be calculated or estimated;

(c) **documentation;** each step in the chain must be performed according to documented and generally acknowledged procedures; the results must be recorded.

(d) **competence;** the laboratories or bodies performing one or more steps in the chain must supply evidence for their technical competence (e.g. by demonstrating that they are accredited);

(e) **reference to SI units;** the chain of comparisons must, where possible, end at primary standards for the realisation of the SI units;

(f) **calibration intervals;** calibrations must be repeated at appropriate intervals; the length of these intervals will depend on a number of variables (e.g. uncertainty required, frequency of use, way of use, stability of the equipment).

2 ILAC POLICY ON TRACEABILITY OF MEASUREMENT RESULTS

ILAC Member Bodies agree that the following policy on traceability of measurement results be adopted by the regional bodies and by ILAC Member Bodies.

(a) Laboratories accredited by ILAC Member Bodies shall be able to demonstrate that calibration of critical equipment, and hence the measurement results generated by that equipment, relevant to their scopes of accreditation, are traceable to the International System of Units (SI units). Where such traceability is not technically possible or reasonable, the laboratory and the client and other interested parties may agree to using certified reference materials provided by a competent supplier or using specified methods and/or consensus standards that are clearly described and agreed by all parties concerned; (See: Notes 1and 2).

Note 1:
It is recognised by ILAC that, due to the nature of some tests, it is not possible, realistic or relevant to expect traceability of measurement results to be demonstrated. ILAC Member Bodies have agreed to investigate this issue and develop guidelines on such exceptions and areas where requirements for traceability are difficult to apply.

Note 2:
"Critical " equipment used by testing and calibration laboratories is considered by ILAC to be those items of equipment necessary to perform a test or calibration from the scope of accreditation and which have a significant effect on the uncertainty of measurement of test or calibration results. ILAC Member Bodies have agreed to investigate this issue further and to develop guidelines to differentiate between calibrations that are critical and less critical and to indicate how in the latter case the traceability requirements may be less rigorous.

(b) Accredited calibration laboratories, for equipment and calibrations relevant to their scopes of accreditation, shall in all cases, where possible, derive their traceability either:

- directly from an appropriate national metrology institute or
- from a calibration laboratory that can demonstrate competence, measurement capability and traceability with appropriate measurement uncertainty, e.g. an accredited calibration laboratory (See: Notes 3 and 4).

Note 3:
It is recognised by ILAC that in some economies calibrations performed by verifying authorities appointed under their economies' legal metrology frameworks are also accepted. Legal metrology laboratories should also be encouraged by Accreditation Bodies and through their international and regional organisations to seek accreditation to ensure competence and safeguard proper traceability of their measurement and calibration results and to make their competence transparent to third parties.

Note 4:
ILAC considers an "appropriate " national metrology institute to be one that participates regularly and successfully in relevant international interlaboratory comparisons performed by BIPM and/or by regional metrology bodies.
ILAC encourages BIPM and regional bodies to conduct and publish details of as broad a range of international comparisons as possible to provide transparency on the equivalence and linkages of national measurement standards, which underpin accreditation activities. ILAC has taken note that the results of international comparisons carried out in the scope of the Metre Convention are published in Appendix B of the CIPM MRA (www.bipm.org).

(c) Where the concept of traceability is relevant and technically possible, accredited testing laboratories shall be required by ILAC Member Bodies to ensure the traceability of their in-house calibration and/or accredited test results to an external calibration provider that is accredited for suitably small uncertainties or that can otherwise demonstrate its competence, or to a national metrology institute or national reference laboratory or to a certified reference material or mutual consent standard or agreed method (See: Notes 3 and 4).

(d) ILAC shall require applicant accreditation bodies, seeking membership in its Mutual Recognition Arrangement or a Regional Multilateral Arrangement, to provide the following details when submitting their applications:

(i) the sources of traceability to national standards of measurement available to accredited or applicant laboratories in their economy and details of how these standards are linked to internationally recognised primary standards;
(ii) the best measurement capabilities available from the sources in (i) above for each field of measurement provided to accredited laboratories in their economy; and
(iii) the accreditation body's written policy on acceptable sources of traceable measurement results.

Note 5:
ILAC has taken note that the information necessary for accreditation bodies to demonstrate the traceability of their accredited laboratories is published in Appendix C of the CIPM MRA (www.bipm.org). This will ensure effective implementation of clauses 3(d)(i) and (ii).

(e) Laboratories holding only management systems certification will be deemed to have not demonstrated the necessary technical competence.

3 FUTURE DEVELOPMENTS

ILAC Member Bodies agree that the above policy will need to be reviewed in light of experience in its implementation and as related international influences become further developed such as: greater use of uncertainties in the chemical and biological sciences; greater international transparency in the certification of reference materials; and availability of additional information from BIPM, APMP, COOMET, EUROMET, SADCMET and SIM on the equivalence and/or linkages between the standards of national metrology institutes or national reference laboratories.

4 REFERENCES

- ILAC G2: 1994 – *Traceability of measurements.*
- *International vocabulary of basic and general terms in metrology* – BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML (1993).
- *Guide to the Expression of Uncertainty in Measurement* - BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML (corrected and reprinted, 1995).
- ISO/IEC 17025:1999 – *General requirements for the competence of testing and calibration laboratories*
- CITAC – *CITAC Policy on traceability*
- CIPM MRA

The International Laboratory Accreditation Cooperation (ILAC) is the principal international forum for the exchange of ideas and information on laboratory accreditation.

Established in the late 1970s, ILAC membership has grown rapidly and includes representatives from the world's major laboratory accreditation systems in Europe, Asia, North America, Australia and the Pacific. Countries that are developing their own laboratory accreditation systems are also welcome to participate and contribute.

ILAC operates a series of committees which investigate issues such as the harmonisation of international laboratory accreditation practices, the effectiveness of mutual recognition agreements in facilitating trade and the promotion of the aims and awareness of laboratory accreditation around the world.

There are regular meetings of individual ILAC committees as well as a major plenary meeting of all ILAC members.

The activities of ILAC affect a diverse range of areas including standardisation, accreditation, certification, testing, calibration, and regulation in both the public and private sectors.

ILAC has a comprehensive website at www.ilac.org which contains a wealth of information regarding accreditation, testing, trade related publications and other information of interest to industry, regulators, government, trade bodies, laboratories, accreditation bodies, and users of testing and calibration services.

The following ILAC publications are available free of charge on the ILAC website at www.ilac.org:

Brochures
ILAC Information Brochure
Why Use An Accredited Laboratory?
Why Become An Accredited Laboratory?
How Does Using an Accredited Laboratory Benefit Government & Regulators?
The Advantages of Being An Accredited Laboratory (86 kb)

Information Documents (I Series)

ILAC-I1:1994	Legal Liability in Testing
ILAC-I2:1994	Testing, Quality Assurance, Certification and Accreditation
ILAC-I3:1996	The Role of Testing and Laboratory Accreditation in International Trade
ILAC-I4:1996	Guidance Documents for the Preparation of Laboratory Quality Manuals

Guidance Documents (G Series)

ILAC-G2:1994	Traceability of Measurement
ILAC-G3:1994	Guidelines for Training Courses for Assessors
ILAC-G4:1994	Guidelines on Scopes of Accreditation
ILAC-G7:1996	Accreditation Requirements and Operating Criteria for Horseracing Laboratories
ILAC-G8:1996	Guidelines on Assessment and Reporting of Compliance with Specification
ILAC-G9:1996	Guidelines for the Selection and Use of Certified Reference Materials
ILAC-G10:1996	Harmonised Procedures for Surveillance & Reassessment of Accredited Laboratories
ILAC-G11:1998	Guidelines on Assessor Qualification and Competence
ILAC-G12:2000	Guidelines for the Requirements for the Competence of Reference Material Producers
ILAC-G13:2000	Guidelines for the Requirements for the Competence of Providers of Proficiency Testing Schemes
ILAC-G14:2000	Guidelines for the Use of Accreditation Body Logos and for Claims of Accreditation Status
ILAC-G15:2001	Guidance for Accreditation to ISO/IEC 17025
ILAC-G17:2002	Introducing the Concept of Uncertainty of Measurement in Testing in Association with the Application of the Standard ISO/IEC 17025

Secretariat Documents (S Series)

ILAC-S1:2000	Guidelines for the Proposal, Drafting, Approval and Publication of ILAC Documents
ILAC-S2:1998	Rules

Procedural Documents (P Series)

ILAC-P1:2000	ILAC Mutual Recognition Arrangement (Arrangement): Requirements for Evaluation of Accreditation Bodies
ILAC-P2: 2000	ILAC Mutual Recognition Arrangement (Arrangement): Procedures for the Evaluation of Regional Cooperation Bodies for the Purpose of Recognition
ILAC-P3: 2002	ILAC Mutual Recognition Arrangement (Arrangement): Procedures for the Unaffiliated Bodies for the Purpose of Recognition
	ILAC Mutual Recognition Arrangement (Arrangement): Terms of Reference and Composition of the Arrangement Management Committee
	ILAC Mutual Recognition Arrangement (Arrangement)
	ILAC Mutual Recognition Arrangement (Arrangement): Policy Statement