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# IAS CALIBRATION and TESTING LABORATORY ACCREDITATION PROGRAMS DEFINITIONS

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## REFERENCES

NIST Special Publication 330

International vocabulary of metrology — Basic and general concepts and associated terms (VIM) Edition 2008 (VIM 2008)

NIST Handbook 150-2006

## DEFINITIONS

**ACCREDITATION:** Formal recognition that a laboratory is competent to carry out specific tests or calibrations or types of tests or calibrations.

**ACCREDITATION CRITERIA:** Set of requirements used by an accrediting body which a laboratory must meet in order to be accredited.

**APLAC:** Asia Pacific Laboratory Accreditation Cooperation.

**ASSESSMENT:** Examination typically performed on-site of a testing or calibration laboratory to evaluate its compliance with conditions and criteria for accreditation.

**AUTHORIZED REPRESENTATIVE:** Individual who is authorized by the laboratory or parent organization to sign the accreditation application and commit the laboratory to fulfill the accreditation criteria.

**BASE QUANTITY:** Quantity in a conventionally chosen subset of a given system of quantities, where no subset quantity can be expressed in terms of the others.

**CALIBRATION:** Operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication

**CALIBRATION AND MEASUREMENT CAPABILITY (CMC):** Smallest uncertainty of measurement a laboratory can achieve within its scope of accreditation, when performing more-or-less routine calibrations of nearly ideal measurement standards intended to define, realize, conserve or reproduce a unit of that quantity or one or more of its values, or when performing more-or-less routine calibrations of nearly ideal measurement instruments designed for the measurement of that quantity.

**CALIBRATION PROCEDURE:** A documented, verified, and validated procedure that specifically describes a set of operations used in the performance of particular measurements according to a given method.

**CALIBRATION PROGRAM:** Calibration programs include external calibration providers and internal calibration providers, the calibrations performed, and the management and control systems and procedures to oversee the calibration actions and providers.

**CALIBRATION PROVIDER:** Laboratory or facility including personnel that perform calibrations in an established location or at customer location(s). May be external or internal, including subsidiary operations of a larger entity.

**CERTIFIED REFERENCE MATERIAL:** Reference material accompanied by documentation issued by an authoritative body and providing one or more specified property values with associated uncertainties and traceability using valid procedures.

**CERTIFICATE OF ACCREDITATION:** Document issued by IAS to a laboratory that has met the conditions and criteria for accreditation. A current Certificate of Accreditation, accompanied by a Scope of Accreditation, may be used as proof of accredited status.

**CUSTOMERS:** Any person or organization that engages the services of a testing or calibration laboratory.

**COMBINED STANDARD MEASUREMENT UNCERTAINTY:** Standard measurement uncertainty that is obtained using the individual standard measurement uncertainties associated with the input quantities in a measurement model.

**COMPETENCE:** Ability of a laboratory to meet the conditions and conform to the criteria established for specific test and calibration methods.

**CONTRACT STAFFING:** Calibration or testing laboratory employees assigned to a customer location and/or customer calibration facilities under a contract arrangement.

**COVERAGE FACTOR:** Number larger than one by which a combined standard measurement uncertainty is multiplied to obtain an expanded measurement uncertainty.

**DEFICIENCY:** Non-fulfillment of conditions and/or criteria for accreditation, sometimes referred to as a non-conformance.

**DERIVED QUANTITY:** Quantity, in a system of quantities, defined in terms of the base quantities of that system

**DESK REVIEW:** Examination typically performed prior to an on-site assessment, of the Quality Manual, application package, and other materials and documentation as necessary and appropriate to determine to the extent possible the laboratory's conformance to the conditions and criteria for accreditation. Desk review may also be performed for minor scope expansions.

**ERROR OF MEASUREMENT:** Result of a measurement minus the accepted true value of the measurand.

**EQUIVALENCE:** An acceptance of the competence of other NMI's, accreditation bodies, and/or accredited organizations in other countries as being essentially equal to the NMI, accreditation body, and/or accredited organizations within the host country.

**EXPANDED MEASUREMENT UNCERTAINTY:** Product of a combined standard measurement uncertainty and a factor larger than the number one.

**GAGE R&R:** Gage Repeatability and Reproducibility study, which (typically) employs numerous instruments, personnel, calibration actions over a period of time to capture quantitative observations. The data captured is analyzed statistically to obtain Type A uncertainty as a component of Calibration and Measurement Capability (CMC), which is expressed as an uncertainty with a coverage factor of  $k=2$  to approximate 95%. The number of instruments, personnel, calibration actions, and length of time are established to be statistically valid consistent with the size and level of activity of the organization. Type B uncertainty components are included using a root-sum-square approach to develop the expanded uncertainty and CMC.

**IAF:** International Accreditation Forum

**ILAC:** International Laboratory Accreditation Cooperation.

**ILC/PT:** Interlaboratory comparison/proficiency test.

**INTERLABORATORY COMPARISONS:** Organization, performance, and evaluation of tests or calibrations on the same or similar items or materials by two or more laboratories in accordance with predetermined conditions.

**INTERNAL AUDIT:** Systematic and documented process for obtaining evidence and evaluating it objectively to verify that a laboratory's operations comply with the requirements of its quality system.

**INTERNATIONAL STANDARD:** (documentation) A document outlining and/or defining requirements and/or conditions, recognized by international agreement to serve as a common basis for evaluation of affected systems, protocols, and/or methods (e.g. ANS/ISO/IEC Standard 17025:2005). (Measurement) Standard recognized by international agreement to serve internationally as the basis for assigning values to other standards of the quantity concerned (e.g. Meter).

**INTERNATIONAL SYSTEM OF QUANTITIES (ISQ):** System of quantities based on the seven base quantities: length, mass, time, electric current, thermodynamic temperature, amount of substance, and luminous intensity.

**INTERNATIONAL SYSTEM OF UNITS (SI):** System of units, based on the International System of Quantities, their names and symbols, including a series of prefixes and their names and symbols, together with rules for their use, adopted by the General Conference.

**LABORATORY:** Organization that performs tests and/or calibrations in a permanent, temporary, or remote location. When a laboratory is part of an organization that carries out activities additional to testing/calibration, the term laboratory then refers to only the part(s) of the organization involved in testing and/or calibration process.

**LABORATORY ACCREDITATION BODY:** Body that conducts and administers a laboratory accreditation system in accordance with ISO/IEC 17011:2004 and grants accreditation.

**LABORATORY ACCREDITATION SYSTEM:** System with its own defined rules of procedure and management, consistent with ISO/IEC 17011:2004, for carrying out laboratory accreditation.

**LEVEL OF CONFIDENCE:** Defines an interval about the measurement result that encompasses a large fraction  $p$  of the probability distribution characterized by that result and its combined standard uncertainty, and  $p$  is the *coverage probability or level of confidence* of the interval. Effectively, the coverage level expressed as a percent.

**MEASUREMENT UNCERTAINTY (VIM 2008, section 2.26):** Non-negative parameter characterizing the dispersion of the quantity values being attributed to a measurand, based on the information used.

**MEASUREMENT UNCERTAINTY (NIST Handbook 150-2006 Section 1.5.31):** See Uncertainty of Measurement.

**MEASURAND:** Particular quantity subject to measurement.

**MEASUREMENT:** Set of operations having the object of determining a value of a quantity.

**MEASUREMENT ACCURACY:** Closeness of agreement between a measured quantity value and a true quantity value of a measurand.

**MEASUREMENT ERROR:** Measured quantity value minus a reference quantity value.

**MEASUREMENT PRECISION:** closeness of agreement between indications or measured quantity values obtained by replicate measurements on the same or similar objects under specified conditions.

**MEASUREMENT PROCEDURE:** Detailed description of a measurement according to one or more measurement principles and to a given measurement method, based on a measurement model and including any calculation to obtain a measurement result.

**MEASURING INSTRUMENT:** Device intended to make measurements, alone or in conjunction with supplementary device(s).

**METROLOGY:** Science of measurement and its application.

**METROLOGICAL TRACEABILITY (VIM 2008, Section 2.41):** Property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty. (See also Traceability)

**METROLOGICAL TRACEABILITY CHAIN:** Sequence of measurement standards and calibrations that is used to relate a measurement result to a reference.

**MANAGEMENT REVIEW:** Formal, periodic, and scheduled examination by top management of the status and adequacy of the quality system in relation to quality policy and objectives.

**MOBILE OPERATIONS:** Operations that are independent of an established calibration laboratory facility. Mobile operations may work from an office space, home, vehicle, or use a virtual office.

**MRA:** Mutual Recognition Arrangement.

**NATIONAL METROLOGY INSTITUTE (NMI):** A laboratory considered to be the primary source of standards in a given country.

**NATURAL CONSTANT:** Fundamental values upon which scientists base descriptions of our universe and theories that describe our natural world. Examples include the speed of light, the gravitational constant and the charge of an electron.

**ON-SITE OPERATIONS:** Operations that are based in and/or directly supported by an established calibration or testing laboratory facility, but actually perform the calibration or testing activities at customer locations. This includes climate-controlled mobile laboratories such as converted motor homes.

**ORGANIZING BODY:** An independent organization that coordinates ILC/PT on behalf of one or more accrediting bodies, and/or one or more laboratories. The organizing body oversees the ILC/PT process, and develops and publishes appropriate reports, in accordance with the standards defined in this policy.

**PAC:** Pacific Accreditation Cooperation

**PRECISION:** Repeatability of measurement data; the similarity of successive independent measurements of a single magnitude generated by repeated applications of a process under specified conditions.

**PROFICIENCY TESTING:** Determination of laboratory testing performance by means of interlaboratory comparisons conducted by an authorized third party.

**QUALITY MANUAL:** Document stating the quality policy and describing the quality management system of an organization.

**QUALITY SYSTEM:** Organizational structure, procedures, processes, and resources needed to implement quality management.

**QUANTITY:** Property of a phenomenon, body, or substance, where the property has a magnitude that can be expressed as a number and a reference.

**RANDOM MEASUREMENT ERROR:** Component of measurement error that in replicate measurements varies in an unpredictable manner.

**REFERENCE MATERIAL:** Material or substance one or more of whose property values are sufficiently homogeneous and well-established to be used for the calibration of an apparatus, for the assessment of a measurement method, or for assigning values to materials.

**REFERENCE STANDARD:** Measurement standard generally having the highest metrological quality available at a given location or in a given organization, from which measurements made there are derived.

**REQUIREMENT:** Provision that conveys criteria to be fulfilled.

**SCOPE OF ACCREDITATION:** Document issued by IAS, to a laboratory that lists the calibration or testing methods or services for which the laboratory is accredited. The scope of accreditation is always accompanied by a Certificate of Accreditation.

**STANDARD, PRIMARY:** Standard that is designated or widely acknowledged as having the highest metrological qualities and whose value is accepted without reference to other standards of the same quantity.

**STANDARD, SECONDARY:** Standard whose value is assigned by comparison with a primary standard of the same quantity.

**STANDARD, WORKING:** Standard that is used routinely to calibrate or check material measures, measuring instruments, or reference materials.

**STANDARD MEASUREMENT UNCERTAINTY:** Measurement uncertainty expressed as a standard deviation.

**STATEMENT OF UNCERTAINTY:** Statement on the calibration certificate or test report of the value of measurement uncertainty for any specific test or calibration.

**SYSTEM OF QUANTITIES:** Set of quantities together with a set of noncontradictory equations relating those quantities.

**SYSTEMATIC MEASUREMENT ERROR:** Component of measurement error that in replicate measurements remains constant or varies in a predictable manner.

**TRACEABILITY (NIST Handbook 150-2006 Section 1.5.30):** 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. (See also Metrological Traceability)

**TYPE A EVALUATION OF MEASUREMENT UNCERTAINTY (VIM 2008 Section 2.28):** Evaluation of a component of measurement uncertainty by a statistical analysis of measured quantity values obtained under defined measurement conditions.

**TYPE B EVALUATION OF MEASUREMENT UNCERTAINTY (VIM 2008 Section 2.29):** Evaluation of a component of measurement uncertainty determined by means other than a Type A evaluation of measurement uncertainty.

**UNCERTAINTY BUDGET:** Statement of a measurement uncertainty, of the components of that measurement uncertainty, and of their calculation and combination.

**UNCERTAINTY OF MEASUREMENT (NIST Handbook 150-2006 Section 1.5.31):** Parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand.

**UNCERTAINTY, Type A (evaluation of) (NIST Handbook 150-2006 Section 1.5.32):** Method of evaluation of uncertainty by the statistical analysis of series of observations.

**UNCERTAINTY, Type B (evaluation of) (NIST Handbook 150-2006 Section 1.5.33):** Method of evaluation of uncertainty by means other than the statistical analysis of series of observations.

**UNCERTAINTY, Type A:** An uncertainty component obtained by a Type A evaluation is represented by a statistically estimated standard deviation  $s_i$ , equal to the positive square root of the statistically estimated variance  $s_i^2$ , and the associated number of degrees of freedom. For such a component the standard uncertainty is  $u_i = s_i$ .

**UNCERTAINTY, Type B:** In a similar manner, an uncertainty component obtained by a Type B evaluation is represented by a quantity  $u_j$ , which may be considered an approximation to the corresponding standard deviation; it is equal to the positive square root of  $u_j^2$ , which may be considered an approximation to the corresponding variance and which is obtained from an assumed probability distribution based on all the available information. Since the quantity  $u_j^2$  is treated like a variance and  $u_j$  like a standard deviation, for such a component the standard uncertainty is simply  $u_j$ .

**VALIDATION:** Substantiation by examination and provision of objective evidence that verified processes, methods, and/or procedures are fit for intended use.

**VERIFICATION:** Confirmation by examination and provision of objective evidence that specified requirements have been fulfilled.