SKIM AKREDITASI MAKMAL MALAYSIA (SAMM)
LABORATORY ACCREDITATION SCHEME OF MALAYSIA

SC 1.4 - SPECIFIC CRITERIA FOR ACCREDITATION IN THE FIELD OF ELECTRICAL, RADIO FREQUENCY AND ELECTROMAGNETIC COMPATIBILITY TESTING

Issue 2, 30 April 2020

(Supplementary to MS ISO/IEC 17025)

MS ISO/IEC 17025

JABATAN STANDARD MALAYSIA
Department of Standards Malaysia

TABLE OF CONTENTS

INTRODUCTION

The SC 1.4 document shall be used by Department of Standards Malaysia (Standards Malaysia) to provide appropriate criteria for the assessment and accreditation of laboratories providing electrical, radio frequency (RF) and electromagnetic compatibility (EMC) testing services.

Laboratory is also reminded of the need to comply with any relevant statutory or legislative requirements for example Energy Commission (ST) and Malaysian Communications and Multimedia Commission (MCMC).

This document shall be read in conjunction with MS ISO/IEC 17025, *Skim Akreditasi Makmal Malaysia* (SAMM) policies and other relevant requirements published by Department of Standards Malaysia (Standards Malaysia).

The clause numbers in this document correspond to those of MS ISO/ IEC 17025 but since not all clauses require additional requirements, the numbering may not be continuous.

1 Scope

Under *Skim Akreditasi Makmal Malaysia* (SAMM) the field of electrical testing covers tests of an essentially electrical nature (including RF and EMC) performed on materials, component, devices, appliances and equipment (classes of test are attached in Appendix 1).

All applicants and accredited laboratories intending to apply for the EMC testing for Asia-Pacific Economic Cooperation Mutual Recognition Arrangement for Conformity Assessment of Telecommunications Equipment (APEC-TEL MRA) / The Federal Communications Commission of The United States of America (US FCC) are also required to comply with relevant requirements of US FCC. The laboratories are required to complete the ***Accredited Testing Laboratory FCC Technical Assessment Checklist (Appendix 1, KDB 853844).** The checklist shall be submitted during application or prior to upcoming assessment, wherever applicable, and will be verified by Standards Malaysia assessors during the onsite assessment.

2 Normative References

The following documents are referred to in the text in such a way that some or all their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document, including any amendments applies.

i. MS ISO/IEC 17025 - General requirements for the competence of testing and calibration laboratory.

ii. ISO/IEC 17000 Conformity assessment - Vocabulary and General Principles

iii. MS 1042 Safety in Laboratory - Code of Practice - Part 1: General

iv. ILAC-G24 Guidelines for the Determination of Calibration Intervals of Measuring Instruments

v. International Vocabulary of Basic and General Terms in Metrology (VIM)

vi. IEC 60050-161: International Electrotechnical Vocabulary (IEV) - Part 161: Electromagnetic compatibility

vii. CISPR 16-1 Specification for radio disturbance and immunity measuring apparatus and methods

viii. ANSI C63.2: Specifications of Electromagnetic Interference and Field Strength Measuring Instrumentation

ix. ANSI C63.4: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

x. ANSI C63.5: American National Standard for Electromagnetic Compatibility-Radiated Emission Measurements in Electromagnetic Interference (EMI) Control Calibration of Antennas (9 kHz to 40 GHz).

xi. KDB 974614 - Accredited Testing Laboratories Roles and Responsibilities (Applicable to APEC-TEL/ US FCC)

3 Terms and Definitions

For the purposes of this document, the relevant terms and definitions given in ISO/IEC 17000, IEC 60050-161 and VIM apply.

4 General Requirements

Same as in MS ISO/IEC 17025.

5 Structural Requirements

Same as in MS ISO/IEC 17025.

6 Resource Requirements

The following clause numbers correspond to those in MS ISO/IEC 17025.

6.1 General

Same as in MS ISO/IEC 17025.

6.2 Personnel

Same as in MS ISO/IEC 17025.

The laboratories personnel shall comply with the necessary regulatory requirements and where required, they shall have additional supplementary certificates in relevant fields specified by the regulatory authorities or organizations providing recognition.

6.3 Accommodation and environmental conditions

Same as in MS ISO/IEC 17025.

6.3.1 Safety

It is recommended that accredited laboratory refers to, and practices code of good practice in MS 1042.

6.4 Equipment

6.4.1 All test equipment requiring calibration shall undergo an initial calibration before being put into service. The initial calibration period shall be of a nominal maximum period as follows:

a) One year for electrical, electronic and mechanical test equipment, or

b) As recommended by the manufacturer of the instrument.

c) As allowed by legal requirements.

6.4.2 Thereafter, the maximum calibration interval applied shall be appropriate to assure that the accuracy of the equipment remains within the specifications stated by the laboratory. Assigned calibration intervals shall consider, as a minimum, the past calibration results, the environmental conditions and handling to which the equipment is exposed.

6.4.3 Reduction of calibration intervals shall be made, when necessary so equipment is maintained within the accuracies indicated by the laboratory. The decision shall be made by a person or persons with general experience of measurements, or knowledge of the particular measuring equipment to be calibrated.

6.4.4 Laboratories having well established and documented procedures for the adjustment of calibration intervals for test devices may continue to operate according to these procedures.

6.4.5 Intermediate check and calibration interval is recommended to be established with reference to ILAC-G24 or as required by the relevant

normative documents. In lieu of ILAC-G24, Appendix 2 may be used as a guide.

6.4.6 Appendix 2 sets out nominal recommended maximum periods between successive calibrations for a number of measuring instruments. It must be stressed that these periods are generally considered to be the recommended maxima appropriate in each case providing that:

a) the equipment is of good quality and of proven adequate stability, and

b) the laboratory has both the equipment capability and staff expertise to perform adequate internal checks, and

c) if any doubt or indication of overloading or mishandling arises, the equipment will be checked immediately and thereafter at frequent intervals until it can be shown that stability has not been impaired, and

d) The frequency and quality of intermediate checks within the calibration interval commensurate with test requirements.

Where the above criteria cannot be met, appropriate shorter intervals will be specified.

6.4.7 Extension of calibration interval based on factors such as history of stability, frequency of use, accuracy required and ability of staff to perform regular checks may be considered. It is the responsibility of the accredited testing laboratory to provide evidence that its calibration system ensures that confidence in the equipment can be maintained.

6.5 Metrological Traceability

Same as in MS ISO/IEC 17025 and SAMM Policy 2 (SP2) - Policy on Traceability of Measurement Results.

6.6 Externally Provided Product and Services

Same as in MS ISO/IEC 17025.

7 Process Requirements

7.1 Review of requests, tenders and contracts

7.1.1 General

The review process shall address the availability of ancillary apparatus, accessories and software needed to perform the tests and identify any which must be supplied by the customer.

7.1.2 National and international standards
The review phase of the standards shall address the following:

a) The customer's requirements for testing for multiple markets and regulatory frameworks are clearly understood;

b) The version and amendment status of the standards to which the tests are to be conducted are explicit.

7.1.3 Test plans
The management system shall ensure the following matters are addressed in the review phase and that records are maintained.

a) Test plans;

b) The statement of conformity for the equipment under test and the modes of operation under which the tests are to be conducted.

7.1.4 Mutual recognition agreements
Where applicable the laboratory shall have personnel, who are familiar with the requirements of the destination economy including any specific deviations or interpretation of the standards.

7.2 Selection, Verification and Validation of Methods
Same as in MS ISO/IEC 17025.

7.2.1 Selection and verification of methods
Where EUT configuration is not detailed in the standard but is critical to the test, laboratories need to develop the configuration to be used and ensure that:

a) The configurations are in strict accordance with the requirements of the applicable standard(s).

b) The personnel shall take a consistent approach to EUT configuration where there is limited detail in the applicable standard.

c) The EUT configuration established need to be agreed by the customers.

7.3 Sampling
Not applicable.

7.4 Handling of Test and Calibration Items

Same as in MS ISO/IEC 17025.

7.5 Technical Records

Same as in MS ISO/IEC 17025.

7.6 Evaluation of Measurement Uncertainty

Same as in MS ISO/IEC 17025 and SAMM Policy 5 (SP5) - Policy on Measurement Uncertainty Requirements for SAMM Testing Laboratories.

7.6.1 For RF and EMC Testing Laboratories

a) Internal calibrations
Laboratories need to have uncertainty estimates for any internal calibration work performed by laboratory staff. This includes cables loss measurements and site attenuation measurements.

b) Method of calculation (EMC)
Measurement uncertainty evaluations for EMC tests shall preferably be based on the general principles of the ISO Guide to Uncertainty of Measurement (ISO GUM).

c) The sample uncertainty budgets in CISPR 16-4-2 are not entirely consistent with the ISO document but may be adopted provided laboratories input their own values for each uncertainty component based on sound rationale.

d) Two points should be noted about the CISPR approach.

i. The approach of defining “target” uncertainties does not absolve a laboratory from the determination of uncertainty budgets.

ii. Not all measurements called up by the various emission standards have sample uncertainty budgets or “target” values to be achieved. In these cases, the requirements of this clause apply fully.

e) Uncertainty estimates shall also be determined for immunity testing systems from the perspective of ensuring that the test stimuli meet the requirements of the standards. For example, in performing tests for susceptibility to radiated fields (IEC 61000-4-3), the uncertainty of the measurement of field strength shall be documented to show that the validation data for the uniformity of the applied field is within the tolerances defined in the standard.

7.7 Ensuring the Validity of Results

Same as in MS ISO/IEC 17025.

7.7.1 As well as comparison testing between testing personnel, laboratories having multiple sites shall ensure that proficiency / intercomparison testing is conducted on suitable artifacts at all sites as a means of ensuring internal consistency.

7.8 Reporting the Results

7.8.1 Test reports based on standards shall make unambiguous reference to the relevant tests conducted and exclusions from the specification. In particular, reports covering electrical safety testing shall address all relevant safety test requirements of the test standard or specifications. When any of such tests are not conducted, they shall be explicitly indicated in the report.

7.8.2 For RF and EMC Testing Laboratories

The following information shall be included in reports on EMC tests:

a) Reference to any test plans applicable to the testing;

b) Photographs and descriptions that will both adequately identify the EUT and any counter-measures added in the course of testing;

c) Photographs or diagrams that show test configurations critical to the measurement results (including any counter-measures); and

d) For radiated emission tests performed at an OATS other than category a) as described by CISPR 16-1-4 clause 5, a note that techniques have been used to identify emissions masked by ambient signals. A description of the technique shall be documented.

7.9 Complaints

Same as in MS ISO/IEC 17025.

7.10 Nonconforming work

Same as in MS ISO/IEC 17025.

7.11 Control of data and information management

Same as in MS ISO/IEC 17025.

8 Management System Requirements

Same as in MS ISO/IEC 17025.

8.1 Options

Same as in MS ISO/IEC 17025.

8.2 Management system documentation (option A)

Same as in MS ISO/IEC 17025.

8.3 Control of management system documents

8.3.1 Standards

The laboratory shall have a copy of each standard for which testing is performed including national versions of international parent documents.

The system for the control of standards shall ensure that there are mechanisms to track the status of international and foreign standards.

8.3.2 Superseded standards

The document control system shall provide control over standards in a manner that allows for the marking of old versions as being superseded but not obsolete.

APPENDIX 1

Classes of Test

Laboratory is accredited for classes of test. Individual laboratory may be accredited for the performance of a single class of test, for any combination of the classes of test listed or even for one specific test within a class of test.

Divisions in the list of classes of test are based essentially on the nature of instruments, equipment, components or materials under test. While some exceptions to the general principle have been inevitable, this method of division of the field has been adopted to reduce repetition. As the scope of accreditation of any individual laboratory normally details the range of frequency, current, voltage, etc., in which measurements are made, it is possible for each class of test to cover the work of laboratory with widely differing interests.

The list of classes of test is used with flexibility to ensure that the scope of accreditation of each laboratory is fully informative, to the advantage of both the laboratory and its customers.

1. Materials
   - Conducting Materials
   - Insulating Materials
   - Magnetic Materials
   - Antistatic Materials
   - Optical Materials

2. Component
   - Solenoids and coils
   - Cells, Batteries and Solar Cells
   - Cables
   - Electronic Components
   - Electrical Components
   - Optoelectronic Components

3. Devices
   - Resistance Boxes and Potential Dividers
   - Power Supplies
   - Power Stabilisers
   - Power Rectifiers
   - Circuit Switching and Breaking Devices
   - Transformers (current, voltage and isolation)

4. Appliances
   - Luminaires
   - Domestic Appliances and Accessories
   - Non-Domestic Appliances and Auxiliary Apparatus
   - Approval Tests on Electrical Appliances
   - Performance Tests on Electrical Appliances and Accessories

5. Equipment
   - Test & Measurement Equipment
   - Communications Systems and Equipment
   - Power Supply Systems and Equipment
   - Electrical Equipment for Hazardous Environment
   - Electromedical Equipment
   - Power transformers and reactors
   - Electrical Machinery

APPENDIX 2

Recommended Calibration Intervals of Common Electrical and Electronic Measuring Equipment

Types of Equipment	Maximum Period Between Successive Calibrations
Attenuators	Three years (attenuation and frequency response). Resistance and return loss check annually where appropriate.
Bridges	Three years (full calibration). Range check annually.
Capacitors	Three years. Intercompare annually.
Digital meters	One year
Digital calibrators with self-checking	Two years
Inductors	Three years. Intercompare annually.
Instruments, indicating and recording (analogue only)	Five years. Intercompare every six months or more frequently as required.
Ratio transformers	Five years. Regular checks using an artefact or inter-comparison to detect major problems.
Potentiometers	Five years.
Resistors	Three years after initial drift rate has been established. Intercompare annually.
RF noise sources	Two years
RF power measuring equipment	One year for power references. Three years for thermistor and diode sensors. Annual check of VSWR.
Signal generators	One year (frequency accuracy, output level and attenuator ratio)
Standard cells and electronic references	One year. Intercompare at least three monthly to establish drift rate of a group. One cell in a group needs to be calibrated annually.
Time interval, and frequency standards	One year but calibration interval dependent on equipment frequency type and accuracy required.

Types of Equipment	Maximum Period Between Successive Calibrations
Transfer standards, AC-DC	Five years maximum with annual self-check for a stand-alone instrument.
Volt ratio boxes	Three years. Annual resistance checks.
Watthour meters (Electro-mechanical)	One year. Intercompare every three months.
Wattmeters and Watthour meters (Electronic)	Two years with regular intercomparisons - intervals to be based on history of performance.
Ancillary Equipment	
Accelerometers	One year.
Anemometers	One year.
Environmental chambers	Three years initially. Five years subsequent calibration. Time and spatial variation (temperature variations, recovery time, rate of ventilation).
Hygrometers	
(i) Assman and sling type psychrometers	Six months (compare thermometers at room temperature with wick dry). Five years (complete calibration).
(ii) Recorders accurate to ± 1 %	One year initially. Two years subsequently.
(iii) Other recorders including hair types	Three months (with Assman psychrometer).
Micrometers, dial gauges, calipers, etc	One to two years depending on use and accuracy required.
Pressure gauges	One year.
- working	Three months initially. Six months subsequently.
Thermocouples	
(i) Rare metal	100 hours use or three years whichever is the sooner.
(ii) Base metal	Calibration intervals to suit the particular application.

Types of Equipment	Maximum Period Between Successive Calibrations
Thermometers	
(i) working liquid-in-glass	Five years (full calibration). Check ice point immediately after initial calibration then at least every six months
(ii) electronic (sensors that are thermocouples, thermistors or other integrated circuit devices)	One year (full calibration)
(iii) Resistance Working resistance	Working hand-held resistance thermometers can be checked using the alternative procedure for glass thermometers above.
EMC and Electrical Safety Testing Equipment	
Absorbing Clamps	Annual check
Antennae	Three years
Artificial networks (EMC and Telecoms)	Annual checks of voltage division factor, rf
(LISN etc)	impedance, and mains voltage drop at 0 rated current and no load.
Attenuators, cables, couplers and preamplifiers	Annual checks.
Harmonic and voltage fluctuation measuring equipment.	Annual calibration. Intermediate checks as appropriate.
Immunity field strength meters	Three years
Impact hammers	Five years
Impulse testers	Annual checks
ESD testers	Annual full calibration for two years then three years with intermediate checks on voltage network in house.
Receivers	Annual calibration.
Surge generators and other immunity testing equipment	Intermediate checks as appropriate

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