Specific Accreditation Criteria

Manufactured Goods ISO/IEC 17025 Annex

Electromagnetic Compatibility (EMC) testing

January 2018

Electromagnetic Compatibility (EMC) testing

This document provides interpretative criteria and recommendations for the application of ISO/IEC 17025 for EMC testing.

Applicant and accredited facilities must also comply with ISO/IEC 17025 and the NATA ISO/IEC 17025 Standard Application Document (SAD).

The clause numbers in this document follow those of ISO/IEC 17025 but since not all clauses require interpretation the numbering may not be consecutive.

Scope of Accreditation

The Scope of Accreditation will include identification of the test sites, such as Open Area Test Sites (OATS) and Anechoic Chambers.

Note Addition of test sites will be processed as a variation to the Scope of Accreditation following receipt of a written request from a facility.

5.4 Test and calibration methods and method validation

Pre-screening of equipment

Facilities using OATS with ambient signals above the limits which would place them in categories b) or c) as defined in CISPR 16.1.4, are to apply pre-screening of equipment under test and to maintain records of this activity. This is to ensure that emissions which might be masked by ambient signals are identified and quantified. Compliance with the relevant clause of the standard cannot be stated unless the testing has been performed over the entire frequency range defined.

US FCC rules

Facilities seeking accreditation for US FCC Rules must demonstrate that they have adequate systems in place to ensure that their copies of FCC Rules are up-to-date and that they have a reliable system for monitoring new FCC rulings relating to this area.

Facilities seeking accreditation for US FCC Rules Part 15 must meet the requirements for accreditation to CISPR 22 or ANSI C63.4 as well as the additional requirements specified in Part 15 itself.

Radiated and Conducted RF Immunity

Facilities must ensure that data used to correlate the forward RF power to the output level (field strength, induced current or voltage as applicable) is stored appropriately for each test performed, so that tests could be reproduced using the same reference forward power data if necessary.

Data can be manually or automatically recorded; if automatic (e.g. computer controlled) systems are used, the stored reference data and test results must be identified with the relevant software version details. The laboratory records system must be able to link every test performed to an applicable set of calibration data, captured at the time of the test.

The facility must be able to demonstrate that power amplifiers used for radiated and conducted immunity tests have sufficient power to produce the required output whilst meeting any requirements for harmonics and distortion contained in the applicable standard. For tests requiring amplitude modulation (for example, 80% AM, as required by IEC 61000-4-3 and IEC 61000-4-6), the additional voltage swing at the output level required to accommodate the modulated waveform must be taken into account.

Antenna calibration methods

For antenna calibrations (refer section 5.6 for limits on applicability), the methods used are to be consistent with those referenced by the test standards within the Scope of Accreditation. The facility shall take necessary precautions to ensure that any systemic imperfections or responses in the calibration/verification site are not transferred to testing, for example by using different sites for calibration/verification activities and testing activities, or using different parts of the same site. Appropriate uncertainty budgets for antenna calibrations and reference checks, in accordance with any requirements in the referenced methods, are also necessary.

Facilities that perform calibrations on antennas that are used for IEC/CISPR radiated emission testing are expected to demonstrate that the site meets the applicable CALTS requirements of CISPR 16.1.5.

Facilities which have a reference antenna calibrated externally by an accredited facility and use a substitution method to calibrate working antennas would not normally require an additional calibration assessor to be present at assessment.

Testing Above 1 GHz for IEC/CISPR Standards

At assessment, facilities must be able to demonstrate the ability to test above 1 GHz, otherwise the Scope of Accreditation will be restricted to an appropriate frequency range.

5.5 Equipment

For emissions testing to radiated emission standards based on the relevant IEC/CISPR Standards, the applicable equipment, instrumentation and test facilities are all expected to comply with the requirements of the relevant parts of the CISPR 16 series, as well as any requirements of relevant product-specific standards.

Antennas for compliance measurements

Antennas must have appropriate correction factors to allow an estimate of the field strength to be formed from the measured voltage at their terminals

(commonly termed an “antenna correction factor”). The antennas must comply with any ground clearance, directivity, polarisation or other specifications within the relevant standards.

Facilities must be able to demonstrate access to particular types of antennas where these are specified by test standards within the scope (e.g. MIL STD 461 specifies particular antenna types for some tests).

Uncertainty budgets for radiated emission tests must properly account for test distance and antenna type, where the interaction between these two parameters can influence the measurement result.

EMI receiver compliance with CISPR

Receivers used for IEC/CISPR tests must be compliant with CISPR 16 specifications.

It is recognised that the CISPR requirements for pulse response calibration present difficulties in sourcing complete and traceable calibrations. Other parameters can be calibrated by accredited facilities within Australia.

In the absence of either a CISPR pulse calibration service by the NMI or an accredited facility within Australia, facilities are required to source what calibrations are available. This approach will be revisited by NATA periodically and may change should resources be identified.

Test sites– ambient signals

OATS must also comply with the applicable requirements of AS/NZS CISPR 16.1.4 for the entire frequency range indicated within the applicable test requirements. Sites with broad frequency bands masked by ambient signals such that they would be classified as being in category d) of clause 5.4 in AS/NZS CISPR 16.1.4 will not be considered acceptable for accreditation.

In the case of anechoic test chambers, the facility must also be able to demonstrate that testing is not affected by any unwanted signals in the test environment, for example, due to leakage from support equipment.

It is not acceptable to exclude part of the frequency range from testing due to unwanted emissions.

Note: Facilities seeking accreditation for radiated measurements conducted at an OATS will be asked to submit details of ambient signals prior to lodging an application.

The ambient levels for the OATS must be monitored and records made available at assessment. Facilities will be expected to demonstrate their management of sites with high ambient levels through their methodology, procedures and records.

Test sites - validation

When performing a normalised site validation procedure, it must be remembered that the data obtained will have uncertainties of a magnitude which

make it very difficult to determine unequivocally compliance with the CISPR requirement for all points to be within ±4 dB of the theoretical curve. As such, consideration should be given to how these uncertainties may be kept to a minimum.

The Normalised Site Attenuation or Voltage Standing Wave Ratio (CISPR 16.1.4 above 1GHz) for the site must comply with CISPR 16.1.4.

5.6 Measurement traceability

Active electronic test equipment (e.g., signal generators, spectrum analysers), field sensors (electric, magnetic), transient immunity generators, working antennas (passive and active) and passive equipment items (e.g., cables, attenuators, filters, coupling devices) are recommended to have a recalibration interval of 12 months, unless the facility has demonstrated suitable stability to extend the recalibration interval or the relevant test standard and/or equipment manufacturer has recommended a different interval.

Reference antennas (i.e. not used for ongoing EMC testing) are recommended to have a 3 year recalibration interval. The NSA for test sites is recommended to occur at least every 12 months.

Facilities are advised to consider factors affecting the stability of test and measurement equipment when determining recalibration intervals, including:

- whether equipment is used outside the laboratory's normal premises (e.g. subject to possible transit wear/damage due to frequent field work, transport to OATS)
- the effect of high transmit power on immunity equipment that is also used for emissions tests (e.g. antennas, coupling-decoupling networks)
- the effect of exposure to the moisture and temperature cycling, especially on items that are used in outdoor tests (e.g. cables and amplifiers that may be used at an OATS)
- the effect of high current loads, including high inrush currents, on items that carry EUT supply current (e.g. LISNs, transient immunity generators and coupling devices)

Equipment verifications or calibrations typically performed in-house by accredited EMC facilities may be assessed at the time of the assessment. This can include RF absorber quality checks, performance checks on transient and power immunity generators, NSA (or site VSWR) measurements, insertion loss/gain measurements and antenna calibration to SAE/ARP958. For other equipment, additional assessment resources may be required in order to have the method and traceability of in-house calibrations adequately assessed.

5.10 Reporting the results

In addition to the normal requirements specified for test reports (including any client or regulatory requirements), the following information is to be included in reports on EMC tests covered by the Scope of Accreditation:

- For CISPR-based testing, where other than a 'category a)' OATS has been used, a statement that additional screening procedures have been used to identify emissions masked by ambient signals;

- Information which will adequately identify any modifications made to the equipment under test for compliance purposes in the course of the testing;

- Where appropriate, diagrams or photographs which show test configurations critical to the measurement results; and

- Clear identification of any ambient emissions in cases where test results are provided in a tabular or graphical form.

Facilities accredited for Part 15 of the FCC Rules must provide customers who intend to use a Declaration of Conformity for their product reports with the additional information required by the FCC. These reports must also bear the NATA endorsement to ensure that they are acceptable in an audit situation.

References

This section lists publications referenced in this document. The year of publication is not included as it is expected that only current versions of the references shall be used.

ANSCI 63.4	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 khz to 40 ghz
AS/NZS 1052	CISPR specification for radio interference measuring apparatus and measurement methods
AS/NZS 61000.4.3	Electromagnetic compatibility (EMC) Testing and measurement techniques – Radiated radiofrequency electro-magnetic field immunity test
AS/NZS CISPR 16-1	Specification for radio disturbance and immunity measuring apparatus
CISPR 22	Compliance Test of Power-Line Transmission Systems
US FCC Regulations	(Federal Communications Commission) Part 15 Radio Frequency Devices

Amendment Table

The table below provides a summary of changes made to the document with this issue.

AMENDMENT TABLE	
Section	**Amendment**
New Document	This document represents a direct adoption of the former PAT Appendix B – Electromagnetic compatibility testing (EMC) as circulated for Public Comment in December 2016. The technical content is unchanged.