Calibration of measuring equipment for EMC testing

The issues

Electromagnetic compatibility (EMC) is the ability of a device or system to function in its electromagnetic environment without introducing intolerable electromagnetic disturbances to other apparatus in its environment. To ensure EMC, testing is required to evaluate the electromagnetic environment created by various electrical and electronic goods, and to measure the immunity of those goods to electromagnetic disturbance. Both national and global recognition of EMC testing relies on the use of accredited testing laboratories. To obtain accreditation, testing laboratories must show their traceability of measurement to national primary standards.

NMI’s capabilities

The National Measurement Institute (NMI), Australia, based at Lindfield, Sydney, has developed facilities to calibrate or verify a wide range of measuring equipment for EMC testing and provide traceability for the testing of commercial goods. These facilities are available for all testing laboratories – wherever they are in the Asia-Pacific region.

Features

NMI provides fast turnaround times and low measurement uncertainty calibration services for the following artefacts:

- **Dipole, biconical, log-periodic and similar antennas** are calibrated above the 20 m by 30 m flat reflecting plane of the antenna calibration site at Lindfield using a three-antenna method at frequencies between 30 MHz to 1 GHz. Free-space antenna factors and antenna factors for horizontally polarized antennas at fixed heights above the flat reflecting plane can be measured. Antennas can also be calibrated for the precise measurement of NSA (Normalised Site Attenuation) at 10 m and 3 m sites.

- The free-space antenna factors of **above 1 GHz EMC antennas**, such as dipole, biconical, log-periodic and double-ridged horn antennas are determined using a three-antenna method in a fully anechoic microwave chamber. At each frequency, averaging processes are applied to the measured antenna factors at different separation distances within a quiet zone of the chamber, in order to remove the antenna mutual coupling effect and chamber reflections.

- **Loop antennas** can be calibrated in the frequency range from 9 kHz to 30 MHz. The magnetic antenna factor of electrically small loop antennas is measured in a calculable magnetic field created by a circular single-turn balanced loop.
• We calibrate electric field probes for immunity testing in a gigahertz transverse electromagnetic (GTEM) cell. The GTEM cell is calibrated by a transfer probe which itself is calibrated within a micro-TEM cell whose dimensions are traced to the primary standards of length, impedance and radio frequency power. The micro-TEM cell is sufficiently small that the field strength in it can be calculated with a sufficiently low uncertainty.

• Single-phase and three-phase AMN (artificial mains networks)/LISN (Line Impedance Stabilizing Network) can be calibrated and verified in accordance with CISPR 16-1-2. The AMN impedance can be verified and the radio frequency voltage division factor can be calibrated from 9 kHz to 30 MHz. The 50 Hz voltage drop and saturation properties of up to 30 A can be verified.

• ESD (Electrostatic Discharge) generators can be verified in accordance with IEC 61000-4-2. The rise time, peak current, current at 30 ns and current at 60 ns can be verified at 2 kV, 4 kV, 6 kV, 8 kV levels and up to 30 kV.

• The transfer impedance of a current probe can be calibrated and the insertion impedance verified in accordance with the procedures of CISPR 16-1-2 for current probes used for conducted emission testing from 150 kHz to 30 MHz.

• The absorbing clamp factor can be obtained from the measured insertion loss in accordance with CISPR 16-1-3 for absorbing clamps used for disturbance power measurements from 30 MHz to 300 MHz. The clamp decoupling factors can be verified using a measurement jig in accordance with the standard.

• These calibration facilities for EMC testing equipment are traceable to our other long-standing Australian primary standards and calibration services:
  – Attenuation up to 40 GHz
  – Impedance and Reflection Coefficient up to 40 GHz
  – Power up to 40 GHz
  – Voltage up to 1 GHz
  – Antenna gain up to 18 GHz
  – Radiation hazard meters at 2.45 GHz.

For further information or advice contact:

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