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|---|---|---|---|
| **Laboratory** | **Centre of Excellence for Electronic Products (CEEP), Plot No. 638, GIDC Makarpura, Vadodara, Gujarat** | | |
| **Accreditation Standard** | **ISO/IEC 17025: 2005** | | |
| **Certificate Number** | **CC-2952** | **Page** | **1 of 6** |
| **Validity** | **16.02.2019 to 15.02.2021** | **Last Amended on** | **14.03.2019** |

**"In view of the transition for ISO/IEC 17025:2017, the validity of this accreditation certificate will cease on 30.11.2020"**

| Sl. | Quantity Measured / Instrument | Range/Frequency | *Calibration Measurement Capability (±) | Remarks |
|---|---|---|---|---|
| | **ELECTRO TECHNICAL CALIBRATION** | | | |
| **I** | **MEASURE** | | | |
| **1.** | **Voltage Dips & interruption#** | | | |
| | a) Generator Output Voltage at NO Load | 0 to 100% | 2.60% | Using Oscilloscope with HV probe and Digital Multimeter as per IEC 61000-4-11 Ed 2.0 |
| | b) Dips/ interruption Time | 10 ms to 5 s | 3.00% | Using Oscilloscope with HV probe as per IEC 61000-4-11 Ed 2.0 |
| **2.** | **Combination Wave Surge Test#** | | | |
| | Voltage Amplitude | ±0.5 kV to ±8.0 kV | 3.1% | Using Oscilloscope and HV Differential Probe as per IEC 61000-4-5 Ed 3.0 |
| | Voltage Front Time | 1.2 µs ±30%<br>10 µs ±30% | 7.8%<br>2.28% | |
| | Voltage Pulse Duration | 50 µs ±20%<br>700 µs ±20% | 3.10%<br>1.10% | |
| | Current Amplitude | ±0.25kA to ±4kA<br>±12.5A to ±200 A | 3.10% | Using Oscilloscope and Current Clamp as per IEC 61000-4-5 Ed 3.0 |
| | Current Front Time | 8 µs ±20%<br>5 µs ±20% | 3.12%<br>3.48% | |
| | Current Pulse Width | 20 µs ±20%<br>320 µs ±20% | 3.41%<br>1.0% | |

**Shally Sharma**
**Convenor**

**Battal Singh**
**Program Manager**

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| **3.** | **Ring Wave Generator 12 Ω and 30 Ω#** | | | |
| | Voltage Rise Time (Open Circuit) | 0.5µs ±30% | 1.0% | Using CRO and HV Differential Probe as per IEC 61000-4-12 |
| | Current Rise Time (Short Circuit) | 0.2 µs to 1.0 µs | 1.0% | Using CRO and Current Probe as per IEC 61000-4-12 |
| | Frequency | 100 kHz ±10% | 2.11% | Using CRO and HV Differential Probe as per IEC 61000-4-12 |
| | Decay in Voltage | 0.4 < Ratio of Pk2 to Pk1 < 1.1<br>0.4 < Ratio of Pk3 to Pk2 < 0.8<br>0.4 < Ratio of Pk4 to Pk3 < 0.8 | 4.42% | |
| | Repetition rate | 1/ min or faster | 2.0% | |
| | Open Circuit Voltage | 250 V to 6 kV ±10% | 3.05% | |
| | Short Circuit Current | 20.8 A to 500 A ±10% @ 12 Ω<br>8.3 A to 200 A ±10% @ 30 Ω | 2.58% | Using CRO and Current Probe as per IEC 61000-4-12 |
| **4.** | **Electrical Fast Transient Test System, With Cdn And Capacitive Coupling Clamp#** | | | |
| | Pulse Amplitude | ±0.25 kV to ±5.0 kV ±10% | 3.29% | Using CRO & Dividers (50Ω & 1000 Ω) as per IEC 61000-4-4 |
| | Pulse Rise Time | 5 ±1.5 ns | 3.93% | |
| | Pulse Width | 50 ± 15 ns | 2.44% | |
| | Repetition Frequency | 5 kHz ± 20 %,<br>100 kHz ± 20 %,<br>1MHz ± 20 % | 1.0% | |
| | Burst Duration | 15 ± 3 ms | 1.0% | |
| | Burst Period | 300 ± 60 ms | 1.0% | |
| | Pulse Amplitude in 1000Ω | ±0.25 kV to ±5.0 kV ± 20% | 3.29% | |

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| | Pulse Width in 1000Ω | 50ns (-15 ns to +100 ns) | 2.44% | |
| | Pulse Amplitude Capacitive coupling Clamp | 2.0 kV ±200V | 3.29% | |
| | Peak voltage -CDN | ±0.25 kV to ±5.0 kV ± 10% | 3.29% | |
| | Pulse Width-CDN | (45 ± 15) ns. | 2.44% | |
| | Pulse Rise Time-CDN | (5.5 ± 1.5) ns | 3.93% | |
| 5. | **Electrostatic Discharge Generator[$]** | | | |
| | **Contact Discharge** | | | |
| | First Peak Current | ±7.5 A to ±112.5 A (±15 %) (± 2 kV to ± 30 kV) | 3.78% | Using CRO & ESD Target Attenuator Cable Chain as per IEC 61000-4-2 |
| | Rise Time | 0.8 ns ± 25 % | 8.21% | |
| | Current at 30 ns | ±4.0A to ±60 A (±2 kV to ±30 kV) | 3.79% | |
| | Current at 60 ns | ±2.0 A to ±30 A (± 2 kV to ± 30 kV) | 3.79% | |
| | **Air Discharge** | | | |
| | Generator DC output voltage | ±2 kV to ±30 kV (±5%) | 3.44% | Using DMM with Divider as per IEC 61000-4-2 |
| 6. | **Target – Attenuator Cable Chain[$]** | | | |
| | Low Frequency Transfer Impedance | 0.02 Ω to 0.2 Ω ±1% | 1% | Using DMM or VNA as per IEC 61000-4-2 |
| | DC Resistance | < 2.1 Ω | 0.73% | Using DMM as per IEC 61000-4-2 |
| 7. | **Impedance[$]** | | | |
| | Line Impedance Stabilization Network-LISN, Coupling & Decoupling-CDN | 9 kHz to 250 MHz 1Ω to 300Ω | 5.0% to 10.1% | Using Vector Network Analyzer by Direct Method as per CISPR 16-1-2: Ed. 2.0 2017-11, CISPR 32 |

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| | | | | |
| 8. | **Phase Angle**[$] LISN | 9 kHz to 250 MHz (-)90° to +90° | 3.1° | Using Vector Network Analyzer by Direct Method as per CISPR 16-1-2, CISPR 32 |
| 9. | **Power Frequency Magnetic Field Immunity**[#] | | | |
| | Current : Continuous & Short Duration- 1s to 3s, Current Values Standard Coil:1 m X 1m,1mX2.6m | 1 A/m to 1000 A/m ±2.0% | 2% | Using Current clamp with DMM and Clamp on Meter As per IEC 61000-4-8 |
| 10. | **Impulse Magnetic Field**[#] | | | |
| | Short Circuit Peak Current | 100 A to 1000 A ±10 % | 2.38% | Using CRO & Current Probe As per IEC 61000-4-9 |
| | Current Front Time: | 8 µs ± 20 % | 2.02% | |
| | Duration | 20 µs ± 20 % | 1.0% | |
| 11. | **Frequency**[$] | 9kHz to 15 GHz | 1.17ppm | Using Vector Network Analyzer By Direct Method |
| 12. | **RF Parameters**[$] | | | |
| | Attenuation, Voltage Division Factor / Coupling Decoupling Factor/Isolation, Insertion loss/ Bulk Current Injection, Directional Coupler, Attenuator, Adapter LISN, Impedance Stabilization Network , ESD Target, Resistive HV Dividers, EM Clamp, Cable | 9 kHz to 15GHz 0.1 dB to 70 dB | 0.4 dB | Using Vector Network Analyzer By Direct Method |
| | | 9 kHz to 3.2 GHz 0.1 dB to 70 dB | 0.25 dB | Using Signal Generator and Power meter By Direct Method |

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| | | | | |
| **13.** | **RF Power Amplifier**[$] | | | |
| | Gain | 9 kHz to 6 GHz<br>5 dB to 65 dB | 0.4 dB to 0.56 dB | Using Signal Generator, Power Meter By Direct Method |
| | Harmonics Level | 9 kHz to15GHz<br>5 dBc to 80 dBc | 0.52dB to 0.7 dB | Using Vector Network Analyzer With Spectrum By Direct Method |
| | Power Measurement | 9kHz to 6GHz<br>+15dBm to -60dBm | 0.38 dB to 0.56 dB | Using Signal Generator Power Sensor By Direct Method |
| | | 9kHz to 6GHz<br>+60dBm | 0.56 dB | Using Signal Generator Power Sensor with Attenuator By Direct Method |
| **14.** | Amplitude Modulation[$] | 9kHz to 3.2 GHz<br>10% to 90% | 3.30% | Using CRO By Direct Method |
| | | 3.2 GHz to 15 GHz<br>10% to 90% | 4.20% | Using Vector Network Analyzer With Spectrum By Direct Method |

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|---|---|---|---|---|
| **15.** | Return Loss (VSWR)/ Attenuator, Antenna, Amplifier, Termination, RF Load, Directional Coupler, Adapter Line | 9 kHz to 15GHz<br>1 dB to 46 dB | 0.40dB | Using Vector Network Analyzer By Direct Method |
| | | 9 kHz to 3.2 GHz<br>1 to 46 dB | 0.35dB | Using Signal Generator , Power meter / Vector Network Analyzer With Spectrum & Directional Coupler By Direct Method |
| **16.** | **Antenna Factor (Antenna)$** | | | |
| | 2M Loop Antenna, Monopole/ ROD Antenna | 9 kHz to 30 MHz | 1.0 dB | Using Signal Generator, Vector Network Analyzer With Spectrum as per CISPR 16-1-4 |
| **17.** | Transfer Impedance – RF Current Clamp$ | 10 kHz to 500 MHz | 0.4dB | Using Vector Network Analyzer By Direct Method |
| **II.** | **SOURCE** | | | |
| **1.** | Frequency# | 20 Hz to 3.2GHz | 3.1 ppm to 1.16ppm | Using Signal Generator by Direct Method |
| **2.** | Power Measurement# | 9kHz to 3.2GHz<br>+15dBm to -60dBm | 0.25 dB to 0.35 dB | Using Signal Generator and Power Sensor by Comparison method |

*** Measurement Capability is expressed as an uncertainty (±) at a confidence probability of 95%**
**$ Only in Permanent Laboratory**
**# The laboratory is also capable for site calibration however, the uncertainty at site depends on the prevailing actual environmental conditions and master equipment used.**

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**Program Manager**