Schedule of Accreditation

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Electronic Test and Calibration Ltd

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Calibration performed at the above address only

DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks
DC RESISTANCE	100 μΩ to 10 MΩ	270 ppm + 0.30 μΩ	Measurement and generation
	10 mΩ to 1.0 Ω	120 ppm + 1.0 μΩ	
	1.0 Ω to 20 Ω	15 ppm + 80 μΩ	
	20 Ω to 200 Ω	12 ppm	
	200 Ω to 2.0 kΩ	11 ppm	
	2.0 kΩ to 20 kΩ	12 ppm	
	20 kΩ to 200 kΩ	11 ppm	
	200 kΩ to 2.0 MΩ	28 ppm	
	2.0 MΩ to 10 MΩ	30 ppm	
	10 MΩ to 2.5 GΩ	0.040 %	Measurement only
	2.5 GΩ to 250 GΩ	0.060 %	
	250 GΩ to 2.0 TΩ	0.15 %	
	10 Ω	10 ppm	Generation only
	100 Ω	8.0 ppm	
	1.0 kΩ	8.0 ppm	
	10 kΩ	8.0 ppm	
	100 kΩ	8.0 ppm	
	1.0 MΩ	20 ppm	
	10 MΩ	20 ppm	
	10 MΩ to 2.5 GΩ	0.040 %	
	2.5 GΩ to 250 GΩ	0.060 %	
	250 GΩ to 2.0 TΩ	0.15 %	
DC VOLTAGE	0 mV to 200 mV	13 ppm + 0.50 μV	
	200 mV to 2.0 V	10 ppm	
	2.0 V to 20 V	10 ppm	
	20 V to 200 V	11 ppm	
	200 V to 1000 V	14 ppm	
	1.0 kV to 40 kV	0.15 %	Sources available up to 30 kV
DC CURRENT	20 μA to 200 μA	20 ppm	Measurement and generation
	200 μA to 200 mA	17 ppm	
	200 mA to 1.0 A	27 ppm	
	1.0 A to 10 A	100 ppm	
	10 A to 100 A	0.15 %	

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks
DC CURRENT (cont'd)	10 pA to 2.0 nA 2.0 nA to 200 nA 200 nA to 20 μA 100 A to 250 A 250 A to 1000 A	0.090 % 0.045 % 0.020 % 0.17 % 0.31 %	Measurement only
	10 pA to 2.0 nA 2.0 nA to 200 nA 200 nA to 20 μA	0.12 % 0.050 % 0.030 %	Generation only
AC VOLTAGE	*100 mHz to 10 Hz* 2.5 mV_{rms} to 707 V_{rms} (1000 V_{pk})	0.15 % + 5.0 μV	
	10 Hz to 30 Hz 200 mV to 2.0 V 2.0 V to 20 V 20 V to 200 V	200 ppm 200 ppm 200 ppm	
	30 (40) Hz to 300 Hz 2.0 mV to 200 mV 200 mV to 2.0 V 2.0 V to 20 V 20 V to 200 V 200 V to 1000 V	190 ppm + 5.0 μV 120 ppm 125 ppm 125 ppm 140 ppm	
	300 Hz to 1.0 kHz 2.0 mV to 200 mV 200 mV to 2.0 V 2.0 V to 20 V 20 V to 200 V 200 V to 1000 V	170 ppm + 5.0 μV 120 ppm 130 ppm 130 ppm 140 ppm	
	1.0 kHz to 10 kHz 2.0 mV to 200 mV 200 mV to 2.0 V 2.0 V to 20 V 20 V to 200 V 200 V to 1000 V	200 ppm + 5.0 μV 170 ppm 170 ppm 170 ppm 180 ppm	
	10 kHz to 30 kHz 2.0 mV to 200 mV 200 mV to 2.0 V 2.0 V to 20 V 20 V to 200 V 200 V to 1000 V	400 ppm + 5.0 μV 300 ppm 300 ppm 300 ppm 300 ppm	
	30 kHz to 100 kHz 2.0 mV to 200 mV 200 mV to 2.0 V 2.0 V to 20 V 20 V to 200 V 200 V to 700 V	600 ppm + 5.0 μV 350 ppm 350 ppm 500 ppm 550 ppm	

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks
AC VOLTAGE (cont'd)	*100 kHz to 300 kHz*		
	200 mV to 2.0 V	0.10 %	
	2.0 V to 20 V	0.10 %	
	300 kHz to 1.0 MHz		
	200 mV to 2.0 V	0.50 %	
	2.0 V to 20 V	0.50 %	
	40 Hz to 1000 Hz		
	1.0 kV to 4.0 kV	1.0 %	Sources are available up to 6.0 kV at 50 Hz only
	At 50 Hz		
	1.0 kV to 27 kV	0.30 %	
AC CURRENT	*10 Hz to 30 Hz*		
	10 uA to 200 uA	200 ppm	
	200 uA to 2.0 mA	200 ppm	
	2.0 mA to 20 mA	200 ppm	
	20 mA to 200 mA	200 ppm	
	200 mA to 1.0 A	250 ppm	
	30 Hz to 1.0 kHz		
	10 uA to 200 uA	200 ppm	
	200 uA to 2.0 mA	200 ppm	
	2 mA to 20 mA	200 ppm	
	20 mA to 200 mA	200 ppm	
	200 mA to 1.0 A	250 ppm	
	1.0 A to 10 A	310 ppm	
	1.0 kHz to 5.0 kHz		
	10 uA to 200 uA	300 ppm	
	200 uA to 2.0 mA	300 ppm	
	2.0 mA to 20 mA	300 ppm	
	20 mA to 200 mA	300 ppm	
	200 mA to 1.0 A	400 ppm	
	1.0 A to 10 A	500 ppm	
CAPACITANCE	*Frequency 100 Hz and 1.0 kHz*		
	10 pF to 100 nF	0.20 %	Measurement and generation
	100 pF to 1.0 μF	0.050 %	
	1.0 μF to 10 μF	0.070 %	
	10 μF to 100 μF	0.30 %	
DISSIPATION FACTOR	*Frequency 1.0 kHz*		
	0 to 0.01	0.000 26	Dissipation factor (tan δ) can be reported for capacitance values in the range 1.0 nF to 10 μF
	0.01 to 0.1	0.000 27	
	0.1 to 0.5	0.000 54	
	0.5 to 1.0	0.000 85	
INDUCTANCE	*At 100 Hz and 1.0 kHz*		Measurement capability only. The generation of known inductance values may be undertaken over the range of 1.0 mH to 1.0 H but the uncertainties may be increased.
	1.0 μH to 10 μH	0.90 %	
	10 μH to 100 μH	0.30 %	
	100 μH to 10 H	0.15 %	

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks
FREQUENCY MEASUREMENT			Can be expressed as time (1/f) for repetitive wave forms
Specific Values	1.0 MHz and 10 MHz	1 in 10^{10}	
Other Values	1.0 Hz to 1.0 GHz 1.0 GHz to 26.5 GHz	16 in 10^{9} 16 in 10^{9}	 Generation limited to 20 GHz
TIME INTERVAL	10^{5} s to 1.0 ns	16 in 10^{9} + 1 3 ns (Full waveform) 17 in 10^{9} + 1 3 ns (Part waveform)	Single Event
HARMONIC AMPLITUDE	30 mV to 300 V	5.8 % of full-scale deflection	Full-scale ranges from 30 mV to 300 V in 3-10-30 sequence. All frequency components must be in the range 10 Hz to 76 kHz.
DISTORTION FACTOR	300 mV to 100 V	3.5 % of full-scale deflection	Fundamental frequency range 20 Hz to 20 kHz; distortion component range up to 100 kHz. Full-scale ranges from 300 mV to 100 V in 3-10-30 sequence.
TEMPERATURE	0 °C to 100 °C	0.25 °C	As a support activity for determination of reference junction temperature when simulating temperature measurements electrically
ELECTRICAL SIMULATION OF TEMPERATURE			
Thermocouple			Measurement and Generation linearity
Type K	-270 °C to 1372 °C	0.050 % + 2.0 μV	
Type J	-210 °C to 1200 °C	0.050 % + 2.0 μV	
Type E	-270 °C to 1000 °C	0.050 % + 2.0 μV	
Type N	-270 °C to 1300 °C	0.050 % + 2.0 μV	
Type T	-270 °C to 400 °C	0.050 % + 2.0 μV	
Type S	0 °C to 1768 °C	0.050 % + 2.0 μV	
Type R	0 °C to 1768 °C	0.050 % + 2.0 μV	
Type B	0 °C to 1820 °C	0.050 % + 2.0 μV	
Thermocouple CJC		0.30 °C	
PRT	-200 °C to 850 °C	0.050 % + 10 mΩ	

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks
RF POWER	- 60 dBm to + 20 dBm		50 ohm systems only
	10 kHz to 10 MHz	0.080 dB	
	- 70 dBm to - 20 dBm		
	10 MHz to 50 MHz	2.1 %	
	50 MHz to 1.0 GHz	1.7 %	
	1.0 GHz to 5.0 GHz	1.8 %	
	5.0 GHz to 10 GHz	2.3 %	
	10 GHz to 15 GHz	3.1 %	
	15 GHz to 18 GHz	3.1 %	
	- 20 dBm to + 20 dBm		
	10 MHz to 50 MHz	1.4 %	
	50 MHz to 1.0 mW	0.8 %	
	50 MHz to 1.0 GHz	1.1 %	
	1.0 GHz to 5.0 GHz	1.3 %	
	5.0 GHz to 10 GHz	1.6 %	
	10 GHz to 15 GHz	1.7 %	
	15 GHz to 18 GHz	1.7 %	
	+ 20 dBm to + 47 dBm		
	10 MHz to 30 MHz	0.24 dB	
	30 MHz to 1.0 GHz	0.23 dB	
	1.0 GHz to 5.0 GHz	0.23 dB	
	5.0 GHz to 18 GHz	0.28 dB	
Calibration Factor			
	100 kHz to 0.5 MHz	0.60 %	50 ohm systems only. Nominal level + 10 dBm.
	0.5 MHz to 1.0 MHz	0.70 %	
	1.0 MHz to 5.0 MHz	0.70 %	
	5.0 MHz to 10 MHz	0.70 %	
	10 MHz to 50 MHz	1.5 %	50 ohm systems only. Nominal level 0 dBm.
	50 MHz to 1.0 GHz	0.80 %	
	1.0 GHz to 5.0 GHz	1.0 %	
	5.0 GHz to 10 GHz	1.6 %	
	10 GHz to 15 GHz	1.6 %	
	15 GHz to 18 GHz	1.8 %	
	10 MHz to 50 MHz	1.4 %	50 ohm systems only. Nominal level - 30 dBm.
	50 MHz to 1.0 GHz	0.90 %	
	1.0 GHz to 5.0 GHz	1.1 %	
	5.0 GHz to 10 GHz	1.8 %	
	10 GHz to 15 GHz	2.0 %	
	15 GHz to 18 GHz	2.2 %	
RF VOLTAGE	30 μV to 3.17 V		50 ohm systems only
	10 kHz to 10 MHz	1.9 %	
	10 MHz to 300 MHz	1.8 %	
	300 MHz to 1.0 GHz	3.2 %	
	1.0 GHz to 2.0 GHz	14 %	

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks
VOLTAGE REFLECTION COEFFICIENT	*5.0 MHz to 1.0 GHz*		50 ohm systems only
	0.00 to 0.05	0.011	
	0.05 to 0.1	0.015	
	0.1 to 0.2	0.028	
	0.2 to 0.7	0.089	
	0.7 to 1.0	0.12	
	1.0 GHz to 2.0 GHz		
	0.00 to 0.05	0.017	
	0.05 to 0.1	0.018	
	0.1 to 0.2	0.026	
	0.2 to 0.7	0.068	
	0.7 to 1.0	0.091	
	2.0 GHz to 5.0 GHz		
	0.00 to 0.05	0.021	
	0.05 to 0.1	0.034	
	0.1 to 0.2	0.065	
	0.2 to 0.7	0.22	
	0.7 to 1.0	0.32	
	5.0 GHz to 10 GHz		
	0.00 to 0.05	0.026	
	0.05 to 0.1	0.028	
	0.1 to 0.2	0.038	
	0.2 to 0.7	0.11	
	0.7 to 1.0	0.14	
	10 GHz to 15 GHz		
	0.00 to 0.05	0.033	
	0.05 to 0.1	0.035	
	0.1 to 0.2	0.042	
	0.2 to 0.7	0.093	
	0.7 to 1.0	0.13	
	15 GHz to 18 GHz		
	0.00 to 0.05	0.035	
	0.05 to 0.1	0.038	
	0.1 to 0.2	0.050	
	0.2 to 0.7	0.13	
	0.7 to 1.0	0.18	
RF ATTENUATION (Insertion loss method)	0 dB to 80 dB *10 kHz to 1.0 GHz*	0.37 dB	50 ohm systems only
	0 dB to 60 dB *1.0 GHz to 18 GHz*	0.39 dB	
	60 dB to 80 dB *1.0 GHz to 18 GHz*	1.0 dB	

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks
RF ATTENUATION (Substitution method)	0 dB to 80 dB *10 kHz to 1.0 GHz*	 0.32 dB	50 ohm systems only
	80 dB to 120 dB *10 kHz to 1.0 GHz*	 2.5 dB	
	0 dB to 25 dB *10 MHz to 50 MHz* *50 MHz to 1.0 GHz* *1.0 GHz to 5.0 GHz* *5.0 GHz to 10 GHz* *10 GHz to 15 GHz* *15 GHz to 18 GHz*	 0.060 dB 0.030 dB 0.040 dB 0.050 dB 0.060 dB 0.070 dB	
	25 dB to 60 dB *10 MHz to 50 MHz* *50 MHz to 1.0 GHz* *1.0 GHz to 5.0 GHz* *5.0 GHz to 10 GHz* *10 GHz to 15 GHz* *15 GHz to 18 GHz*	 0.040 dB 0.040 dB 0.040 dB 0.060 dB 0.080 dB 0.10 dB	
	60 dB To 70 dB *10MHz to 50MHz* *50MHz to 1.0 GHz* *1.0 GHz to 5.0 GHz* *5.0 GHz to 10 GHz* *10 GHz to 15 GHz* *15 GHz to 18 GHz*	 0.24 dB 0.24 dB 0.24 dB 0.24 dB 0.24 dB 0.25 dB	
FREQUENCY MODULATION	0 Hz to 40 kHz	2.6 % + 2.0 Hz	Carrier frequency range 250 kHz to 10 MHz; modulation frequency range 20 Hz to 10 kHz
	0 Hz to 400 kHz	1.6 % + 16 Hz	Carrier frequency range 10 MHz to 1.3 GHz; modulation frequency range 20 Hz to 200 kHz
	0 Hz to 300 kHz	6.0 % + 200 Hz	Carrier frequency range 1.3 GHz to 18 GHz; modulation frequency range 20 Hz to 100 kHz

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks
AMPLITUDE MODULATION			Ranges and uncertainties are shown in terms of modulation index
	0 to 0.05 0.05 to 0.3 0.3 to 0.5 0.5 to 0.9	4.3 % + 0.00020 3.1 % + 0.00020 2.8 % + 0.0020 2.6 % + 0.0020	Carrier frequency range 150 kHz to 10 MHz; modulation frequency range 20 Hz to 10 kHz.
	0 to 0.05 0.05 to 0.3 0.3 to 0.5 0.5 to 0.9	3.7 % + 0.00020 3.7 % + 0.00020 1.8 % + 0.0020 1.6 % + 0.0020	Carrier frequency range 10 MHz to 1.3 GHz; modulation frequency range 20 Hz to 100 kHz.
	0 to 0.05 0.05 to 0.3 0.3 to 0.5 0.5 to 0.9	5.6 % + 0.0020 4.8 % + 0.0020 4.6 % + 0.0050 4.6 % + 0.0050	Carrier frequency range 1.0 GHz to 18 GHz; modulation frequency range 200 Hz to 100 kHz.
PHASE MODULATION	0 radians to 400 radians	3.7 % + 0.0020 radians	Carrier frequency range 10 MHz to 1.3 GHz; modulation frequency range 20 Hz to 20 kHz
RF INTERMODULATION PRODUCTS	0 dB to - 80 dB *10 kHz to 110 MHz* *110 MHz to 18 GHz*	 0.94 dB 1.9 dB	
PULSE RISETIME AND FALLTIME	1.0 ns to 1.0 s	2.9 %	For the calibration of Waveform Generators
PULSE WIDTH	1.0 ns to 1.0 s	1.2 %	
VOLTAGE AMPLITUDE	0.1 kV to 6.6 kV	3.0 %	
ELECTROSTATIC VOLTAGE	0.1 kV to 30 kV	1.0 %	Fieldmeters for measuring charged surfaces
HIGH IMPEDANCE CONTACT VOLTAGE	0.1 kV to 30 kV	0.70 %	Electrostatic voltmeter and other high resistance voltmeters for measuring charged surfaces
ELECTROSTATIC DISCHARGE GENERATORS EN 61000-4-2:1995			
PULSE AMPLITUDE	0.1 kV to 30 kV	1.0 %	Contact voltmeter
PULSE AMPLITUDE	0.1 A to 30 A	2.8 %	ESD Target 1st peak
RISE TIME	100 ps to 1.0 s	3.7 %	ESD Target
FALL TIME AMPLITUDE	0.1 A to 30 A	3.8 %	ESD Target

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks
ELECTROSTATIC DISCHARGE GENERATORS (cont'd)			
EN 61000-4-2:1995			
FALL TIME	100 ps to 1.0 s	3.7 %	ESD Target
EN 61000-4-2:2009			
PULSE AMPLITUDE	0.1 kV to 30 kV	1.0 %	Contact voltmeter
PULSE AMPLITUDE	0.1 A to 50 A	5.9 %	ESD Target 1st peak
RISE TIME	200 ps to 1.0 s	100 ps	ESD Target
FALL TIME AMPLITUDE	0.1 A to 50 A	5.9 %	ESD Target
FALL TIME	200 ps to 1.0 s	100 ps	ESD Target
Voltage amplitude	0.5 kV to 4.4 kV	2.9 %	
BURST TRANSIENT GENERATOR CHARACTERISTICS			
Risetime and falltime	1 ns to 1.0 s	1.7 %	For the calibration of Electrical Fast Transient generators and CDN's to 61000-4-4
Pulse width	0.6 ns to 1.0 ms	1.2 %	
Repetition rate	1 ns to 100 s	0.03 %	
Frequency	1 Hz to 1 GHz	0.3 %	
Voltage amplitude	0.25 kV to 6.6 kV	3.0 %	
SURGE PULSE CHARACTERISTICS			
Risetime and falltime Pulse width Repetition rate Phase angle Voltage amplitude Current amplitude	0.1 μs to 1.0 s 0.6 μs to 1.0 ms 1.0 s to 100 s 0° to 360° 0.25 kV to 6.6 kV 0.2 kA to 3.3 kA	2.3 % 1.5 % 0.03 % 1.3° 2.6 % 2.9 %	For the calibration of Surge generators to 61000-4-5
RF IMPEDANCE	5.0 Ω to 60 Ω *9.0 kHz to 30 MHz*	4.6 %	For impedance calibration of line impedance stabilisation networks (LISNs)
IMPULSE GENERATOR MEASUREMENTS	50 dBμV to 110 dBμV *9.0 kHz to 30 MHz* *30 MHz to 300 MHz* *300 MHz to 1.0 GHz*	 0.7 dB 1.0 dB 1.5 dB	

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IMPULSE GENERATION			
Absolute and relative amplitude	50 dBμV to 110 dBμV *9.0 kHz to 150 kHz*	 0.25 dB	
Absolute amplitude	50 dBμV to 110 dBμV *150 kHz to 30 MHz* *30 MHz to 300 MHz* *300 MHz to 1.0 GHz*	 0.80 dB 1.1 dB 1.6 dB	
Relative amplitude	50 dBμV to 110 dBμV *150 kHz to 30 MHz* *30 MHz to 300 MHz* *300 MHz to 1.0 GHz*	 0.50 dB 0.60 dB 0.90 dB	
Voltage Dips, Short Interruptions Voltage Variations Generators			
Dip RMS Voltage	1 V to 400 V	2.3 %	
Voltage Variations	1 V to 400 V	3.5 %	
Interruptions Overshoot Voltage	25 % to 100 %	3.5 %	
Transition rise and fall time	1.0 us to 1.0 s	3.0 %	
Phase Angle	0° to 360°	11°	
Damped Oscillatory Generator			
Voltage	1.0 V to 6.6 kV	2.7 %	
Ringwave Current	1.0 A to 3.3 kA	2.9 %	
Oscillatory Wave Current	1.0 A to 150 A	4.4 %	
Rise time	1.0 ns to 1.0 s	3.0 %	
Frequency	1 Hz to 1 GHz	2.3 %	
Repetition Rate	1.0 us to 1.0 s	2.3 %	
Duration	10 ns to 10 s	2.3 %	
Period	1.0 ns to 1.0 s	1.0 %	
Phase	0° to 360°	11°	
ANTENNA MEASUREMENTS			
Monopole Antenna **Antenna Factor**	20 Hz to 30 MHz 30 MHz to 100 MHz	1.4 dB/m 1.6 dB/m	Equivalent capacitance method
Antenna Factor & Apparent Gain			Best capability using the three antenna method or by comparison with similar antennas using the standard antenna method
Biconical and Broad Band Dipoles	20 MHz to 300 MHz 300 MHz to 1.0 GHz	1.2 dB 1.2 dB	Measurement distance 10 m, 3 .0 m and 1.0 m
Log Periodic	80 MHz to 18.0 GHz	1.2 dB	Measurement distances 3.0 m and 1.0 m; calculated results for 10 m and for Free Space

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks
ANTENNA MEASUREMENTS (cont)			
Bilog and hybrid antennas	20 MHz to 18.0 GHz	1.4 dB	Measurement distances 3.0 m and 1.0 m; calculated results for 10 m and for Free Space
Horn Antennas	200 MHz to 1.0 GHz 1.0 GHz to 18.0 GHz	1.5 dB 1.2 dB	Horn measurement at 3.0 m and 1.0 m
END			