

**Laboratory** Keysight Technologies India Private Limited, The Millenia, Second Floor, Tower 'D', No. 1 & 2, Murphy Road, Ulsoor, Bangalore, Karnataka

**Accreditation Standard** ISO/IEC 17025: 2005

**Certificate Number** CC-2074

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**Validity** 02.01.2019 to 01.01.2021

**Last Amended on** -

*"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 ( $\pm$ )	Remarks
<b><u>ELECTRO-TECHNICAL CALIBRATION</u></b>				
<b>I.</b>	<b>SOURCE</b>			
1.	DC Voltage <sup>#</sup>	10 $\mu$ V to 1 mV 1 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.046 % to 0.065 % 0.065 % to 0.0014 % 0.0014 % to 0.0007 % 0.0007 % to 0.0004 % 0.0004 % to 0.0006 % 0.0006 % to 0.0008 %	Using Calibrator Fluke-5720A by Direct Method
2.	DC Current <sup>#</sup>	20 $\mu$ A to 2 mA 2 mA to 2 A 2 A to 10 A	0.04 % to 0.005 % 0.005 % to 0.07 % 0.07 % to 0.048 %	Using Calibrator Fluke-5720A and Amplifier Fluke- 5725A by Direct Method
3.	DC Resistance <sup>#</sup>	1 $\Omega$ to 10.9 $\Omega$ 10.9 $\Omega$ to 109 $\Omega$ 109 $\Omega$ to 10.9 k $\Omega$ 10.9 k $\Omega$ to 109 M $\Omega$ 109 M $\Omega$ to 1.090 G $\Omega$	0.70 % to 0.064 % 0.064 % to 0.0078 % 0.0078 % to 0.0035 % 0.0035 % to 0.062 % 0.062 % to 1.87 %	Using Calibrator Fluke-5522A by Direct Method
4.	Temperature Simulation <sup>#</sup>			
	J-Type Thermocouple	(-)100 $^{\circ}$ C to 1000 $^{\circ}$ C	0.18 $^{\circ}$ C to 0.26 $^{\circ}$ C	Using Calibrator Fluke- 5522A by ITS 90 Conversion Method
	K-Type Thermocouple	(-)100 $^{\circ}$ C to 1000 $^{\circ}$ C	0.22 $^{\circ}$ C to 0.45 $^{\circ}$ C	
5.	AC Resistance <sup>#</sup>	<b>10<math>\Omega</math>, 100<math>\Omega</math>, 1k<math>\Omega</math></b> 1 kHz, 100 kHz, 1 MHz, 2 MHz	0.1 % to 0.034 %	Using Four-Terminal Pair Standard Resistor Set; HP-42030A by Direct Method (Discrete Values)

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Convenor

**Avijit Das**  
Program Manager

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		<b>10k<math>\Omega</math>, 100k<math>\Omega</math></b> 1 kHz, 100 kHz, 1 MHz	0.034 % to 0.014 %	
6.	Oscilloscope <sup>#</sup> Voltage (Amplitude)	14 mV to 35 V (2 mV/Div to 5 V/Div)	0.005 % to 0.001 %	Using Calibrator Fluke-5720A by Direct Method
	Horizontal Delta Accuracy	1 ns to 5 s	0.0011 % to 0.005 %	Using Calibrator Fluke-5522A by Direct Method
	Bandwidth	20 MHz to 25 GHz	0.047 dB to 0.056 dB	Using Signal generator Agt- E8257D by Direct Method
7.	Capacitance <sup>#</sup>	<b>0.01 <math>\mu</math>F, 0.1<math>\mu</math>F, 1<math>\mu</math>F</b> 120 Hz, 1kHz, 10 kHz, 100 kHz	0.031% to 0.02 %	Using Standard Capacitor Set HP-16380A, 16380C by Direct Method (Discrete Values)
		<b>10 <math>\mu</math>F</b> 120 Hz, 1kHz, 10 kHz, 100 kHz	0.073 % to 0.012 %	
		<b>1 pF, 10 pF, 100 pF, 1000 pF</b> 1 kHz, 1MHz, 2 MHz 10 nF 300 nF 30 $\mu$ F 300 $\mu$ F 33 mF 110 mF	0.23 % to 0.040 % 1.44 % 0.41 % 0.58 % 0.64 % 1.62 % 1.52 %	Using Calibrator Fluke-5522A by Direct Method

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8.	AC Current <sup>#</sup>	<b>10 <math>\mu</math>A to 200 <math>\mu</math>A</b> 10 Hz to 1 kHz 1 kHz to 10 kHz	0.023 % to 0.019 % 1.16 % to 0.019 %	Using Calibrator Fluke-5720A and Amplifier Fluke- 5725A by Direct Method
		<b>200 <math>\mu</math>A to 200 mA</b> 10 Hz to 1 kHz 1 kHz to 10 kHz	0.039 % to 0.016 % 0.17 % to 0.016 %	
		<b>200 mA to 2 A</b> 40 Hz to 1kHz 1kHz to 10 kHz	0.033% to 0.016 % 0.82 % to 0.016 %	
		<b>2A to 10A</b> 40 Hz to 1kHz 1 kHz to 10 kHz	0.07% to 0.033% 0.07% to 0.033%	
9.	AC Voltage <sup>#</sup>	<b>1 mV to 1 V</b> 10 Hz to 100 kHz 100 kHz to 1 MHz 1 MHz to 25 MHz	0.66 % to 0.018 % 2.71 % to 0.018 % 3.63 % to 0.025 %	Using Calibrator Fluke-5720A and Amplifier Fluke- 5725A by Direct Method
		<b>1 V to 3 V</b> 1 MHz to 25 MHz	1.27 % to 0.25 %	
		<b>1 V to 10 V</b> 10 Hz to 100 kHz 100 kHz to 1MHz	0.034 % to 0.018 % 0.25 % to 0.017 %	
		<b>10 V to 100 V</b> 10 Hz to 1 kHz 1 kHz to 100 kHz	0.037 % to 0.007 % 0.021 % to 0.007 %	
		<b>100 V to 700 V</b> 40 Hz to 100 kHz	0.038% to 0.0013%	

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
		<b>700 V to 1000 V</b> 40 Hz to 1 kHz	0.038 % to 0.009 %	
10.	Time and Frequency <sup>#</sup>			
	Frequency	5 MHz, 10 MHz	0.035 Hz	Using GPS Controlled Frequency Standard; Fluke- 910R by Direct Method (Discrete Values)
		1 Hz to 500 MHz 500 MHz to 45 GHz	12 $\mu$ Hz to 0.65 Hz 0.65 Hz to 2.45 Hz	Using Function Generator Agt-33250A and Signal generator Agt-E8257D by Direct Method
	Period	1ns to 50 ns 50 ns to 50 ms 50 ms to 5 s	0.015 ns to 0.025 ns 0.025 ns to 740 ns 740 ns to 58 $\mu$ s	Using Calibrator Fluke-5522A by Direct Method
	Rise and Fall Time	1kHz to 1MHz (200 to 300)ps 1MHz to 10 MHz (200 to 350)ps	11.72ps	Using Calibrator Fluke-5522A by Direct Method
11.	RF Power <sup>#</sup> (50 $\Omega$ Impedance)	<b>9 kHz to 10 MHz</b>		Using Function generator Agt-33250A and Signal generator Agt-E8257D by Direct and RF Tuned Method
		1nW(-60 dBm) to 20 mW(13 dBm)	3.5% to 6.48% (0.15 dB to 0.27dB)	
		<b>10 MHz to 30 MHz</b>		
		100 pW(-70 dBm) to 20 mW(13 dBm)	5% to 6.5% (0.21dB to 0.27dB)	
		<b>30 MHz to 45 GHz</b>		
		0.1pW(-100 dBm) to 20 mW(13 dBm)	7.5% to 21.2% (0.31dB to 0.84 dB)	

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
		<b>45 GHz to 50 GHz</b> 1pW(-90dBm) to 20 mW(13 dBm)	16.9 % to 21.3 % (0.68 dB to 0.84 dB)	
12.	RF Attenuation <sup>#</sup> (50 $\Omega$ Impedance)	<b>300 kHz to 18 GHz</b> 1dB to 11dB 10 dB to 90 dB <b>18 GHz to 26.5 GHz</b> 10 dB to 50 dB <b>26.5GHz to 50GHz</b> 10 dB to 50 dB	0.065 dB to 0.2 dB 0.13 dB to 0.56 dB 0.16 dB to 0.28 dB 0.22 dB to 0.48 dB	Using Step Attenuator Agt-8494B(0-11dB), Agt- 8496B(0-110dB) and Co-axial fixed attenuator Agt-8490D, Agt-8493C Using Direct Method
13.	Calibration Factor <sup>#</sup>	9 kHz to 18 GHz 18 GHz to 26.5 GHz 26.5 GHz to 50 GHz	2.9 % to 4.7 % 4.7 % to 4.8 % 4.8 % to 5.8 %	Using Signal generator Agt- E8257D and Power Sensors Agt-E9304A, 8487A
II.	<b>MEASURE</b>			
1.	DC Voltage <sup>#</sup>	1 mV to 1 V 1 V to 100 V 100 V to 1000 V	0.06 % to 0.0005 % 0.0005 % to 0.0007 % 0.0007 % to 0.0008 %	Using 8.5 Digit Multimeter Agilent 3458A by Direct Method
2.	DC Current <sup>#</sup>	100 nA to 1 $\mu$ A 1 $\mu$ A to 100 $\mu$ A 100 $\mu$ A to 100 mA 100 mA to 1 A 1 A to 100 A	0.06 % to 0.008 % 0.008 % to 0.004 % 0.004 % to 0.007 % 0.007 % to 0.014 % 0.014 % to 0.035 %	Using 8.5 Digit Multimeter Agilent 3458A by Direct Method and VI Method
3.	DC Resistance <sup>#</sup>	1 $\Omega$ to 100 $\Omega$ 100 $\Omega$ to 100 k $\Omega$ 100 k $\Omega$ to 10 M $\Omega$ 10 M $\Omega$ to 100 M $\Omega$ 100 M $\Omega$ to 1G $\Omega$	0.009 % to 0.002 % 0.002 % 0.002 % to 0.008 % 0.008 % to 0.060 % 0.060 % to 0.07 %	Using 8.5 Digit Multimeter Agilent 3458A by Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
4.	AC Voltage <sup>#</sup>	10 mV to 700 V 40 Hz to 1 kHz	0.08 % to 0.046 %	Using 8.5 Digit Multimeter Agilent 3458A by Direct Method
		10 mV to 10 V 1 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz	0.6 % to 0.11 % 1.45 % to 0.36 % 1.45 % to 0.36 %	
		10 V 10 Hz to 1 kHz	0.012 %	
		10 V to 100 V 1 kHz to 100 kHz	0.11 % to 0.25 %	
		100 V to 700 V 1 kHz to 20 kHz	0.07 % to 0.025 %	
5.	AC Current <sup>#</sup>	40 Hz to 1kHz 10 $\mu$ A to 100 $\mu$ A 100 $\mu$ A to 10 mA 10 mA to 1 A	0.053 % to 0.11 % 0.21 % to 0.06 % 0.21 % to 0.06 %	Using 8.5 Digit Multimeter Agilent 3458A by Direct Method
6.	Reflection <sup>#</sup> Co-efficient/ VSWR (50 $\Omega$ Impedance)	9 kHz to 50 GHz   $\Gamma$  : 0.002 to 0.33	$\Delta$   $\Gamma$  : 0.0012 to 0.025	Using Network Analyzer Agt- E5071C, Agt N5245A, Type-N Verification Kit Agt- 85055A and 2.4mm Verification Kit Agt- 85057B by Direct Method
7.	RF Power <sup>#</sup> (50 $\Omega$ Impedance)	9 kHz to 10 MHz 1nW(-60 dBm) to 20 mW(13 dBm)	3.52 % to 4.9 % (0.15 dB to 0.21dB)	Using Power Meter Agt- E4419B, Power Sensors Agt- E9304A, Agt-

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
		<b>10MHz to 30MHz</b> 100 pW(-70 dBm) to 20 mW(13 dBm)	4.5 % to 6 % (0.19 dB to 0.25 dB)	8481D, Agt- 8487A by Direct Method
		<b>30MHz to 45GHz</b> 0.1pW(-100 dBm) to 20 mW(13 dBm)	10.6 % to 21 % (0.44 dB to 0.83 dB)	Using Spectrum Analyzer Agt-E4448A, Power Meter Agt-N1912A, Sensor Module Agt-N5532B by RF Tuned Method
		<b>45 GHz to 50 GHz</b> 1 pW(-90 dBm) to 20 mW (13 dBm)	17.28 % to 21 % (0.69 dB to 0.83 dB)	
8.	RF Attenuation <sup>#</sup> (50Ω Impedance)	<b>300 kHz to 18 GHz</b> 1dB to 90 dB	0.065 dB to 0.12 dB	Using Power Meter Agt- E4419B, Power Sensors Agt- E9304A, Agt-8485A, Agt- 8485D, Agt-8487D, Agt- 8487A by Direct Method
		<b>18 GHz to 26.5 GHz</b> 10 dB to 50 dB	0.11 dB to 0.18 dB	
		<b>26.5 GHz to 50 GHz</b> 10 dB to 50 dB	0.18 dB to 0.28 dB	
9.	Modulation <sup>#</sup>			Using Measuring Receiver Agt-N5531S by Direct Method
	AM Modulation <sup>#</sup>			
	Carrier Frequency	10 MHz to 1.3 GHz	2.44 %	
	Modulation Rate	50 Hz to 50 kHz		
	Modulation Depth	5 % to 98 %		
	FM Modulation <sup>#</sup>			
	Carrier Frequency	10 MHz to 1.3 GHz	2.53 %	
Modulation Rate	50 Hz to 200 kHz			
	Modulation Deviation	250 Hz to 400 kHz		
10.	Time and Frequency <sup>#</sup>			Using Frequency Counter Agt-53131A, Agt-53152A by Direct Method
	Frequency	9 kHz to 500 MHz 500 MHz to 45 GHz	0.12 Hz to 2.7 Hz 2.7 Hz to 3.75 Hz	

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	Time Interval	10 ns to 100 ns 100 ns to 1 $\mu$ s 1 $\mu$ s to 10 $\mu$ s	2.9 ns	Using Frequency Counter Agt-53131A by Direct Method
<b>MOBILE FACILITY</b>				
<b>I. SOURCE</b>				
1.	DC Voltage	10 $\mu$ V to 1 mV 1 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.046 % to 0.065 % 0.065 % to 0.0014 % 0.0014 % to 0.0007 % 0.0007 % to 0.0004 % 0.0004 % to 0.0006 % 0.0006 % to 0.0008 %	Using Calibrator Fluke-5720A by Direct Method
2.	DC Current	20 $\mu$ A to 2 mA 2 mA to 2 A 2 A to 10 A	0.04 % to 0.005 % 0.005 % to 0.07 % 0.07 % to 0.048 %	Using Calibrator Fluke-5720A and Amplifier Fluke- 5725A by Direct Method
3.	DC Resistance	1 $\Omega$ to 10.9 $\Omega$ 10.9 $\Omega$ to 109 $\Omega$ 109 $\Omega$ to 10.9 k $\Omega$ 10.9 k $\Omega$ to 109 M $\Omega$ 109 M $\Omega$ to 1.090 G $\Omega$	0.70 % to 0.064 % 0.064 % to 0.0078 % 0.0078 % to 0.0035 % 0.0035 % to 0.062 % 0.062 % to 1.87 %	Using Calibrator Fluke-5522A by Direct Method
4.	Temperature Simulation			Using Calibrator Fluke-5522A by ITS 90 Conversion Method
	J-Type Thermocouple	(-)100 $^{\circ}$ C to 1000 $^{\circ}$ C	0.18 $^{\circ}$ C to 0.26 $^{\circ}$ C	
	K-Type Thermocouple	(-)100 $^{\circ}$ C to 1000 $^{\circ}$ C	0.22 $^{\circ}$ C to 0.45 $^{\circ}$ C	

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5.	AC Resistance	<b>10 <math>\Omega</math>, 100 <math>\Omega</math>, 1 k<math>\Omega</math></b> 1kHz, 100kHz, 1MHz, 2MHz	0.1 % to 0.034 %	Using Four-Terminal Pair Standard Resistor Set; HP-42030A by Direct Method; (Discrete Values)	
		<b>10 k<math>\Omega</math>, 100 k<math>\Omega</math></b> 1kHz, 100kHz, 1MHz	0.034 % to 0.014 %		
6.	Oscilloscope				
	Voltage (Amplitude)	14 mV to 35 V (2 mV/Div to 5 V/Div)	0.005 % to 0.001 %	Using Calibrator Fluke-5720A by Direct Method	
	Horizontal Delta Accuracy	1ns to 5 s	0.0011 % to 0.005 %	Using Calibrator Fluke-5522A by Direct Method	
	Bandwidth	20 MHz to 25 GHz	0.047 dB to 0.056 dB	Using Signal generator-Agt E8257D by Direct Method	
7.	Capacitance	<b>0.01<math>\mu</math>F, 0.1<math>\mu</math>F, 1<math>\mu</math>F</b> 120 Hz, 1kHz, 10 kHz, 100 kHz	0.031 % to 0.02 %	Using Standard Capacitor Set HP-16380A, 16380C by Direct Method (Discrete Values)	
		<b>10 <math>\mu</math>F</b> 120 Hz, 1kHz, 10 kHz, 100 kHz	0.073 % to 0.012 %		
		<b>1pF, 10 pF, 100 pF, 1000 pF</b> 1 kHz, 1MHz, 2MHz	0.23 % to 0.040 %		
			10 nF	1.44 %	Using Calibrator Fluke-5522A by Direct Method
			300 nF	0.41 %	
			30 $\mu$ F	0.58 %	
			300 $\mu$ F	0.64 %	
			33 mF	1.62 %	
			110 mF	1.52 %	

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
8.	AC Current	10 $\mu$ A to 200 $\mu$ A		Using Calibrator Fluke-5720A and Amplifier Fluke- 5725A by Direct Method
		10 Hz to 1 kHz	0.023 % to 0.019 %	
		1 kHz to 10 kHz	1.16 % to 0.019 %	
		<b>200 <math>\mu</math>A to 200 mA</b>		
		10 Hz to 1 kHz	0.039 % to 0.016 %	
		1 kHz to 10 kHz	0.17 % to 0.016 %	
		<b>200 mA to 2 A</b>		
		40 Hz to 1 kHz	0.033 % to 0.016 %	
		1 kHz to 10 kHz	0.82 % to 0.016 %	
		<b>2 A to 10 A</b>		
40 Hz to 1 kHz	0.07% to 0.033%			
1 kHz to 10 kHz	0.07% to 0.033%			
9.	AC Voltage	<b>1mV to 1V</b>		Using Calibrator Fluke-5720A and Amplifier Fluke- 5725A by Direct Method
		10 Hz to 100 kHz	0.66% to 0.018%	
		100 kHz to 1MHz	2.71% to 0.018%	
		<b>1 V to 10 V</b>		
		10 Hz to 100 kHz	0.034% to 0.018%	
		100 kHz to 1MHz	0.25% to 0.017%	
		<b>10 V to 100 V</b>		
		10 Hz to 1kHz	0.037% to 0.007%	
		1kHz to 100 kHz	0.021% to 0.007%	
		<b>100 V to 700 V</b>		
40 Hz to 100 kHz	0.038% to 0.0013%			
<b>700 V to 1000 V</b>				
40 Hz to 1kHz	0.038% to 0.009%			
10.	Frequency	5 MHz, 10 MHz	0.035 Hz	Using GPS Controlled Frequency Standard; Fluke- 910R by Direct Method (Discrete Values)

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
		1 Hz to 500 MHz 500 MHz to 45 GHz	12 $\mu$ Hz to 0.65 Hz 0.65 Hz to 2.45 Hz	Using Function Generator Agt- 33250A and Signal generator Agt- E8257D by Direct Method
11.	RF Power (50 $\Omega$ Impedance)	<b>10 MHz to 50 MHz</b> 100 pW(-70 dBm) to 20 mW(13 dBm)	7.5% to 21 % (0.31dB to 0.83 dB)	Using Signal generator Agt- E8257D by Direct Method
12.	RF Attenuation (50 $\Omega$ Impedance)	<b>300 kHz to 18 GHz</b> 1dB to 11dB 10 dB to 90 dB	0.065 dB to 0.2 dB 0.13 dB to 0.56 dB	Using Step Attenuator Agt-8494B(0-11dB), Agt-8496B(0-110dB) by Direct Method

\* Measurement Capability is expressed as an uncertainty ( $\pm$ ) at a confidence probability of 95%

# 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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