Issue date: 24 March 2025
Valid Until: -

NO: SAMM 693

LABORATORY LOCATION/ CENTRAL OFFICE:	Radio & Frequency (RF) Laboratory, SIRIM Calibration Sdn. Bhd. Bangunan Utama, SIRIM Berhad 483, Mukim 6, Jalan Permatang Pauh, 13500 Permatang Pauh Seberang Prai, Pulau Pinang , 13500, PULAU PINANG MALAYSIA
ACCREDITED SINCE :	24 MARCH 2025
FIELD(S) OF CALIBRATION:	ELECTRICAL (DC & LOW FREQUENCY) ELECTRICAL (RF/MICROWAVE (50 ? SYSTEM))

This laboratory has demonstrated its technical competence to operate in accordance with MS ISO/IEC 17025:2017 (ISO/IEC 17025:2017).

This laboratory's fulfillment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations. The management system requirements in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001 (see Joint ISO-ILAC-IAF Communiqué dated April 2017).

*** The uncertainty covered by the CMC is expressed as the expanded uncertainty corresponding to a coverage probability of approximately 95 % and have a coverage factor of k=2 unless stated otherwise.**

CENTRAL LOCATION	Radio & Frequency (RF) Laboratory, SIRIM Calibration Sdn. Bhd. Bangunan Utama, SIRIM Berhad 483, Mukim 6, Jalan Permatang Pauh, 13500 Permatang Pauh Seberang Prai, Pulau Pinang , 13500, Pulau Pinang
FIELD(S) OF CALIBRATION :	ELECTRICAL, ELECTRICAL

SCOPE OF CALIBRATION : ELECTRICAL (DC & LOW FREQUENCY)

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Measuring Instrument Dc Voltage	0 to 330 mV 0 to 3.3 V 0 to 33 V 33 to 330 V 330 to 1000 V	(of reading) 7.5 µV 0.2 mV 0.8 mV 8 mV 74 mV	Generation using calibrator model Fluke 5500A

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Measuring Instrument Dc Resistance	 0 to 11 ? 11 to 33 ? 33 to 110 ? 110 to 330 ? 0.33 to 1.1 k ? 1.1 to 3.3 k ? 3.3 to 11 k ? 11 to 33 k ? 33 to 110 k ? 110 to 330 k ? 0.33 to 1.1 M ? 1.1 to 3.3 M ? 3.3 to 11 M ? 11 to 33 M ? 33 to 110 M ? 110 to 330 M ?	(of reading) 7 m ? 7 m ? 7 m ? 8 ? 0.2 ? 1 ? 0.7 ? 0.8 ? 11 ? 10 ? 0.1 k ? 0.2 k ? 0.7 k ? 12 k ? 17 k ? 67 k ?	Generation using calibrator model Fluke 5500A
Measuring Instrument Dc Current	0 to 3.3 mA 0 to 33 mA 0 to 330 mA 0 to 2.2 A 0 to 11 A	(of reading) 0.1 µA 2.1 µA 0.1 mA 1.2 mA 7.8 mA	Generation using calibrator model Fluke 5500A

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Measuring Instrument Ac Current	**0.03 to 0.33 mA** 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz **0.33 to 3.3 mA** 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz **3.3 to 33 mA** 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz **33 to 330 mA** 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz **0.33 to 2.2 A** 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz **2.2 to 11 A** 45 Hz to 65 Hz 65 Hz to 500 Hz 500 Hz to 1 kHz	0.3 µA 0.3 µA 0.3 µA 0.3 µA 0.3 µA 3 µA 3 µA 3 µA 3 µA 28 µA 28 µA 28 µA 28 µA 0.4 mA 0.4 mA 0.4 mA 0.4 mA 4 mA 4 mA 7 mA 12 mA 13 mA 14 mA	Generation using calibrator model Fluke 5500A

Instrument Calibrated/Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Measuring Instrument Ac Voltage	**1.0 to 33 mV** 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz **33 to 330 mV** 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz **0.33 to 3.3 V** 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz **3.3 to 33 V** 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz **33 to 330 V** 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz **330 to 1020 V** 45 Hz to 1 kH 1 kHz to 5 kHz	3.6 µV 43 µV 3.6 µV 5.7 µV 11 µV 26 µV 13 µV 77 µV 13 µV 18 µV 45 µV 110 µV 0.1 mV 0.1 mV 0.1 mV 0.2 mV 0.2 mV 1.1 mV 1.2 mV 1.1 mV 1.2 mV 2.1 mV 2.8 mV 17 mV 14 mV 14 mV 39 mV 52 mV	Generation using calibrator model Fluke 5500A

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Sourcing/generating Instrument Dc Voltage	 100 mV + 100 µV to + 100 mV - 100 mV to - 100 µV 1 V + 100 mV to 1 V -1 V to -100 mV 10 V + 1 V to + 10 V - 10 V to -1 V 100 V + 10 V to +100 V -100 V to -10 V 1000 V + 100 V to + 1000 V - 1000 V to -100 V	(of reading) 1.8 µV 1.8 µV 9 µV 9 µV 0.1 mV 0.1 mV 1 mV 1 mV 12 mV 12 mV	HP3458A
Sourcing/generating Instrument Dc Resistance	10 ? 100 ? 1 k ? 10 k ? 100 k ? 1 M ? 10 M ? 100 M ?	0.3 m ? 2.0 m ? 15 m ? 0.1 ? 1.6 ? 23 ? 0.5 k? 13 k?	HP3458A

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Sourcing/generating Instrument Dc Current	 100 µA +10 µA to +100 µA -100 µA to – 10 µA 1 mA +100 µA to +1 mA -1 mA to -100 µA 10 mA +1 mA to +10 mA -10 mA to -1 mA 100 mA +10 mA to +100 mA -100 mA to -10 mA 1 A +100 mA to + 1 A -1 A to -100 mA	(of reading) 16 nA 16 nA 69 nA 69 nA 0.7 µA 0.7 µA 7.8 µA 7.8 µA 0.1 mA 0.1 mA	HP 3458A
Sourcing/generating Instrument Ac Voltage	10 mV range 0 mV to 10 mV 100 mV range 10 mV to 100 mV 1 V range 100 mV to 1 V 10 V range 1 V to 10 V 100 V range 10 V to 100 V 1000 V range 100 V to 700 V (See Matrix A)	(See Matrix A)	HP 3458A
High Current Generating Dc Current	1 A to 10 A	0.03 A	HP 6060B / 6050A w/ 60503A module

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Oscilloscope Vertical Deflection Dc Signal	0 V to ± 6.6 V (50 ? Load) 0 V to ± 130 V (1 M? Load)	(of reading) 1 mV/V + 0.04 mV 0.5 mV/V + 0.04 mV	Generating using Oscillosco pe Calibrator Fluke 5820A & E8257D
Oscilloscope Vertical Deflection Square Wave Signal	±1 mVp-p to ± 6.6 Vp-p (50 ? Load) ±1 mVp-p to 130 Vp-p (1 M? Load)	1.0 mVp-p/Vp-p +0.04 mV 0.5 mVp-p/Vp-p + 0.04 mV	
Oscilloscope Horizontal Deflection Time Markers (50 Ohm Load)	2 ns/div to 20 ms/div 50 ms/div to 5 s/div	2.5 us/s 2.2 ms/s	
Oscilloscope Rise Time	<= 300ps	0.3 ns	
Oscilloscope Bandwidth Amplitude	50 kHz to 600 MHz 600 MHz to 2100 MHz	17 mVp-p 23 mVp-p	
Audio Analyzer	Frequency 20 Hz to 150 kHz Amplitude 1 mV to 300 V	0.006 kHz 0.11 V	Fluke 5500A
	Residual Distortion (-99 to 0 dB) 20 Hz to 20 kHz 20 kHz to 100 kHz	 1 dB 1 dB	8903B

SCOPE OF CALIBRATION : ELECTRICAL (RF/MICROWAVE (50 ? SYSTEM))

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Measuring Instrument Dc Voltage	0 to 330 mV 0 to 3.3 V 0 to 33 V 33 to 330 V 330 to 1000 V	(of reading) 7.5 µV 0.2 mV 0.8 mV 8 mV 74 mV	Generation using calibrator model Fluke 5500A

Issue date: 24 March 2025
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Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Measuring Instrument Dc Resistance	 0 to 11 ? 11 to 33 ? 33 to 110 ? 110 to 330 ? 0.33 to 1.1 k ? 1.1 to 3.3 k ? 3.3 to 11 k ? 11 to 33 k ? 33 to 110 k ? 110 to 330 k ? 0.33 to 1.1 M ? 1.1 to 3.3 M ? 3.3 to 11 M ? 11 to 33 M ? 33 to 110 M ? 110 to 330 M ?	(of reading) 7 m ? 7 m ? 7 m ? 8 ? 0.2 ? 1 ? 0.7 ? 0.8 ? 11 ? 10 ? 0.1 k ? 0.2 k ? 0.7 k ? 12 k ? 17 k ? 67 k ?	Generation using calibrator model Fluke 5500A
Measuring Instrument Dc Current	0 to 3.3 mA 0 to 33 mA 0 to 330 mA 0 to 2.2 A 0 to 11 A	(of reading) 0.1 µA 2.1 µA 0.1 mA 1.2 mA 7.8 mA	Generation using calibrator model Fluke 5500A

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Measuring Instrument Ac Current	**0.03 to 0.33 mA** 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz **0.33 to 3.3 mA** 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz **3.3 to 33 mA** 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz **33 to 330 mA** 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz **0.33 to 2.2 A** 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz **2.2 to 11 A** 45 Hz to 65 Hz 65 Hz to 500 Hz 500 Hz to 1 kHz	0.3 µA 0.3 µA 0.3 µA 0.3 µA 0.3 µA 3 µA 3 µA 3 µA 3 µA 28 µA 28 µA 28 µA 28 µA 0.4 mA 0.4 mA 0.4 mA 0.4 mA 4 mA 4 mA 7 mA 12 mA 13 mA 14 mA	Generation using calibrator model Fluke 5500A

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Measuring Instrument Ac Voltage	**1.0 to 33 mV** 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz **33 to 330 mV** 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz **0.33 to 3.3 V** 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz **3.3 to 33 V** 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz **33 to 330 V** 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz **330 to 1020 V** 45 Hz to 1 kH 1 kHz to 5 kHz	3.6 µV 43 µV 3.6 µV 5.7 µV 11 µV 26 µV 13 µV 77 µV 13 µV 18 µV 45 µV 110 µV 0.1 mV 0.1 mV 0.1 mV 0.2 mV 0.2 mV 1.1 mV 1.2 mV 1.1 mV 1.2 mV 2.1 mV 2.8 mV 17 mV 14 mV 14 mV 39 mV 52 mV	Generation using calibrator model Fluke 5500A

Issue date: 24 March 2025
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NO: SAMM 693

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Sourcing/generating Instrument Dc Voltage	 100 mV + 100 µV to + 100 mV - 100 mV to - 100 µV 1 V + 100 mV to 1 V -1 V to -100 mV 10 V + 1 V to + 10 V - 10 V to -1 V 100 V + 10 V to +100 V -100 V to -10 V 1000 V + 100 V to + 1000 V - 1000 V to -100 V	(of reading) 1.8 µV 1.8 µV 9 µV 9 µV 0.1 mV 0.1 mV 1 mV 1 mV 12 mV 12 mV	HP3458A
Sourcing/generating Instrument Dc Resistance	10 ? 100 ? 1 k ? 10 k ? 100 k ? 1 M ? 10 M ? 100 M ?	0.3 m ? 2.0 m ? 15 m ? 0.1 ? 1.6 ? 23 ? 0.5 k? 13 k?	HP3458A

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Sourcing/generating Instrument Dc Current	 100 µA +10 µA to +100 µA -100 µA to – 10 µA 1 mA +100 µA to +1 mA -1 mA to -100 µA 10 mA +1 mA to +10 mA -10 mA to -1 mA 100 mA +10 mA to +100 mA -100 mA to -10 mA 1 A +100 mA to + 1 A -1 A to -100 mA	(of reading) 16 nA 16 nA 69 nA 69 nA 0.7 µA 0.7 µA 7.8 µA 7.8 µA 0.1 mA 0.1 mA	HP 3458A
Sourcing/generating Instrument Ac Voltage	10 mV range 0 mV to 10 mV 100 mV range 10 mV to 100 mV 1 V range 100 mV to 1 V 10 V range 1 V to 10 V 100 V range 10 V to 100 V 1000 V range 100 V to 700 V (See Matrix A)	(See Matrix A)	HP 3458A
High Current Generating Dc Current	1 A to 10 A	0.03 A	HP 6060B / 6050A w/ 60503A module

Instrument Calibrated/Measurement Parameter	**Range**	**Calibration and Measurement Capability Expressed as an Uncertainty (±)***	**Remarks**
Oscilloscope Vertical Deflection Dc Signal	0 V to ± 6.6 V (50 ? Load) 0 V to ± 130 V (1 M? Load)	(of reading) 1 mV/V + 0.04 mV 0.5 mV/V + 0.04 mV	Generating using Oscillosco pe Calibrator Fluke 5820A & E8257D
Oscilloscope Vertical Deflection Square Wave Signal	±1 mVp-p to ± 6.6 Vp-p (50 ? Load) ±1 mVp-p to 130 Vp-p (1 M? Load)	1.0 mVp-p/Vp-p +0.04 mV 0.5 mVp-p/Vp-p + 0.04 mV	
Oscilloscope Horizontal Deflection Time Markers (50 Ohm Load)	2 ns/div to 20 ms/div 50 ms/div to 5 s/div	2.5 us/s 2.2 ms/s	
Oscilloscope Rise Time	<= 300ps	0.3 ns	
Oscilloscope Bandwidth Amplitude	50 kHz to 600 MHz 600 MHz to 2100 MHz	17 mVp-p 23 mVp-p	
Audio Analyzer	Frequency 20 Hz to 150 kHz Amplitude 1 mV to 300 V	0.006 kHz 0.11 V	Fluke 5500A
	Residual Distortion (-99 to 0 dB) 20 Hz to 20 kHz 20 kHz to 100 kHz	 1 dB 1 dB	8903B

SCOPE OF CALIBRATION : ELECTRICAL (DC & LOW FREQUENCY)

Instrument Calibrated/Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Rf Measuring Equipment	Time Base	(of reading)	Fluke 910R. (GPS-disciplined.)
Frequency Counter	10 MHz	0.1 mHz	
	Frequency Range	0.8 mHz	HP 3325A/B HP 8642A/B HP 83620A
	100 Hz to 60 MHz	0.8 mHz	
	0.1 MHz to 2.1 GHz	0.8 Hz	E8257D (GPS-disciplined.)
	10 MHz to 20 GHz	0.8 Hz	
	250 kHz to 40 GHz		
Modulation Analyzer	Frequency	0.8 Hz	HP8642A/B
	150kHz to 1.3GHz		
	Power Level	0.06 dBm	HP 11683A
	-25 dBm to 20 dBm		
	(3 µW to 100 mW)		
	FM, Flatness	0.1 kHz	HP 11715A
	20 Hz to 100 kHz rates	0.5 kHz	
	100 kHz to 200 kHz rates		
	AM, Flatness	0.05 kHz	HP 11715A
	50 Hz to 50 kHz	0.25 kHz	
	20 Hz to 100 kHz		
	Distortion	1 dB	HP 8903B
	Audio Distortion		
	-70 dB minimum		
Rf Power Meter	Power Level	0.06 dBm	HP 11683A
	-25 dBm to 20 dBm		
	(3 µW to 100 mW)		
Network Analyzer	Frequency	(of reading)	E4448A
	9 kHz to 26.5 GHz	0.18 Hz	
	Power Level		
	0 dBm to +20 dBm	0.31 dB	
	9 kHz to 2 GHz	0.57 dB	
	>2 GHz to 8 GHz	0.60 dB	
	>8 GHz to 13.5 GHz	0.67 dB	
	>13.5 GHz to 26.5 GHz		
		0.30 dB	
	0 dBm to -30 dBm	0.57 dB	
	9 kHz to 2 GHz	0.60 dB	
	>2 GHz to 8 GHz	0.64 dB	
	>8 GHz to 13.5 GHz		
	>13.5 GHz to 26.5 GHz		

Issue date: 24 March 2025
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Rf Power Sensor	Power Level	(of reading)	Calibration Factor in a
100 Khz To 4.2 Ghz	-30 dBm to +20 dBm		50 ? system, Type-N(m) 50 ? Calibrated
	100 kHz to 300 kHz	(%)	at 1 mW input power,
	300 kHz to 1 MHz	1	referenced to 50 MHz
	3 MHz to 30 MHz	1	at 1 mW
	100 MHz to 3.5 GHz	1	
	3.7 GHz to 4.2 GHz	1	
		1	
Rf Power Sensor	Power Level		
10 Mhz To 18 Ghz	-30 dBm to +20 dBm		
		2	
	10 MHz to 300 MHz	2	
	300 MHz to 1.5 GHz	2	
	1.5 GHz to 8 GHz	2	
	8 GHz to 13 GHz	2	
	13 GHz to 18 GHz		
Rf Power Sensor	Power Level		
100 Khz To 4.0 Ghz	-10 dBm to +35 dBm		
		1	
	100 kHz to 500 kHz	1	
	500 kHz to 10 MHz	1	
	10 MHz to 50 MHz	1	
	50 MHz to 2 GHz	1	
	2 GHz to 4 GHz		
Spectrum Analyzer	Frequency Range	0.16 Hz	HP 83620A HP
	10 MHz to 20 GHz	0.18 Hz	83630A E8257D
	10 MHz to 26.5 GHz	0.18 Hz	(GPS-disciplined)
	250 kHz to 40 GHz		
	Resolution Bandwidth	1 MHz	
	1 kHz to 3 MHz		
	Reference Level	1 dB	E8257D
	Freq.: 250 kHz to 40 GHz		
	-90 dBm to 0 dBm		
Rf Generating Equipment	150 kHz to 1300 MHz	3.0 x 10-5 Hz	HP 8902A w/ 11722A
Signal Generator	1 Hz to 12 GHz	3.0 x 10-5 Hz	HP 53132A E4448A
Frequency	9 kHz to 50 GHz	3.0 x 10-5 Hz	(GPSdisciplined)
Rf Generating Equipment	150 kHz to 10 MHz	4 % of reading	HP 8902A w/ 11722A
Amplitude Modulation (am)			
depth: 10 % To 90 %	10 MHz to 1300 MHz	4 % of reading	
rate: 50hz To 10 Khz			
Rate: 50hz To 100khz			