



EMC TEST REPORT

Product Name: 4G LTE Mobile Wi-Fi

Model Name: MF3, 4G180

Issued For : Shenzhen Tenda Technology Co.,Ltd

6-8 Floor, Tower E3, No.1001,Zhongshanyuan Road, Nanshan District, Shenzhen,518052 China.

Issued By : Shenzhen LGT Test Service Co., Ltd.

Room 205, Building 13, Zone B, Zhenxiong Industrial Park, No.177, Renmin West Road, Jinsha, Kengzi Street, Pingshan District, Shenzhen, Guangdong, China.

Report Number: LGT24A092EM01

Sample Received Date: Jan. 08, 2024

Date of Test: Jan. 08, 2024 ~ Jan. 24, 2024

Date of Issue: Feb. 02, 2024

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TABLE OF CONTENTS

1. TEST SUMMARY	5
1.1 TEST FACTORY	6
1.2 MEASUREMENT UNCERTAINTY	6
2. GENERAL INFORMATION	7
2.1 GENERAL DESCRIPTION OF THE EUT	7
2.2 DESCRIPTION OF THE TEST MODES	8
2.3 DESCRIPTION OF THE SUPPORT UNITS	8
2.4 MEASUREMENT INSTRUMENTS LIST	9
3. EMC EMISSION TEST	12
3.1 CONDUCTED EMISSION MEASUREMENT	12
3.2 RADIATED EMISSION MEASUREMENT	17
3.3 HARMONICS CURRENT	21
3.4 VOLTAGE FLUCTUATION AND FLICKERS	23
4. EMC IMMUNITY TEST	25
4.1 GENERAL PERFORMANCE CRITERIA	25
4.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)	28
4.3 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)	32
4.4 ELECTRICAL FAST TRANSIENT (EFT)	35
4.5 SURGE TESTING	39
4.6 CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)	42
4.7 VOLTAGE INTERRUPTION/DIPS TESTING (DIPS)	45
APPENDIX I - TEST SETUP	47



Revision History

Rev.	Issue Date	Report Number	Description of Revision
00	Jan. 24, 2024	LGT23L049EM01	Original Report
01	Jan. 24, 2024	LGT23L115EM01	Update applicant information/Brand name/Model name/manufacturer information/software version number to add WCDMA band 5 and LTE band 5/7/12/28/38/40 testing
02	Feb. 02, 2024	LGT24A092EM01	Update applicant information/manufacturer information brand name/model name/series model/ battery capacity/hardware version/software version/appearance/add LTE band 28B testing and delete LTE band 12.



TEST REPORT CERTIFICATION

Applicant: Shenzhen Tenda Technology Co.,Ltd
Address: 6-8 Floor, Tower E3, No.1001,Zhongshanyuan Road, Nanshan District, Shenzhen,518052 China.

Manufacture: Shenzhen Tenda Technology Co.,Ltd
Address: 6-8 Floor, Tower E3, No.1001,Zhongshanyuan Road, Nanshan District, Shenzhen,518052 China.

Product Name: 4G LTE Mobile Wi-Fi

Trademark: Tenda

Model Name: MF3, 4G180

Sample Status: Normal

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-17 V3.2.4 (2020-09) ETSI EN 301 489-52 V1.2.1 (2021-11)	PASS

Prepared by:

Terry Zhao

Terry Zhao
Engineer

Approved by:

Vita Li

Vita Li
Technical Director





1. TEST SUMMARY

Test procedures according to the technical standards:

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-17 V3.2.4 (2020-09)

ETSI EN 301 489-52 V1.2.1 (2021-11)

EMC Emission				
Standard	Test Item	Limit	Judgement	Remark
EN 55032:2015/A11:2020	Conducted Emission on AC And Telecom Port 150kHz to 30MHz	Class B	PASS	
	Radiated Emission 30MHz to 1000MHz	Class B	PASS	
	Radiated Emission 1GHz to 6GHz	Class B	PASS	NOTE (1)
EN IEC 61000-3-2:2019+A1:2021	Harmonic Current Emission	Class A	N/A	NOTE (2)
EN 61000-3-3:2013+A1:2019+A2: 2021	Voltage Fluctuations & Flicker	-----	PASS	
EMC Immunity				
Section	Test Item	Performance Criteria	Judgement	Remark
EN 61000-4-2:2009	Electrostatic discharges	B	PASS	
EN IEC 61000-4-3:2020	Continuous RF electromagnetic field disturbances	A	PASS	
EN 61000-4-4:2012	Electrical fast transients/burst	B	PASS	
EN 61000-4-5:2014/A1:2017	Surges	B	PASS	
EN 61000-4-6:2014+AC:2015	Continuous induced RF disturbances	A	PASS	
EN IEC 61000-4-11:2020	Voltage dips and interruptions	B / C / C	PASS	NOTE (3)

Note:

- (1) If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.
 If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.
 If the highest frequency of the internal sources of the EUT is between 500 MHz and 1GHz, the measurement shall only be made up to 5 GHz.
 If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times of the highest frequency or 6 GHz, whichever is less.
- (2) The power consumption of EUT is less than 75W and no Limits apply.
- (3) Voltage Dip: 100% reduction (0.5/1 cycle)– Performance Criteria B
 Voltage Dip: 40% reduction – Performance Criteria C
 Voltage Interruption: 100% Interruption – Performance Criteria C



1.1 TEST FACTORY

Company Name:	Shenzhen LGT Test Service Co., Ltd.
Address:	Room 205, Building 13, Zone B, Zhenxiong Industrial Park, No.177, Renmin West Road, Jinsha, Kengzi Street, Pingshan District, Shenzhen, Guangdong, China
Accreditation Certificate:	A2LA Certificate No.: 6727.01
	FCC Registration No.: 746540
	CAB ID: CN0136

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95** %.

Test Item	Measurement Frequency Range	Uncertainty
Conducted Emissions	0.009MHz ~ 0.15MHz	3.18
Conducted Emissions	0.15MHz ~ 30MHz	2.70
Radiated Emissions	9KHz ~ 30MHz	2.50
Radiated Emissions	30MHz ~ 1000MHz	4.40
Radiated Emissions	1GHz ~ 6 GHz	5.10
Radiated Emissions	6GHz ~ 18GHz	5.49

Note: The measurement uncertainty is not included in the test result.



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name:	4G LTE Mobile Wi-Fi	
Trademark:	Tenda	
Model Name:	MF3	
Series Model:	4G180	
Model Difference:	Only different in model name.	
Maximum Operating Frequency:	>108MHz	
Frequency Bands:	2.4G WLAN	802.11b/g/n/ax(20MHz): 2412~2472MHz 802.11n/ax(40MHz):2422~2462MHz
	WCDMA	WCDMA2100:1920-1980 MHz, 2110-2170 MHz WCDMA900: 880-915 MHz, 925-960 MHz WCDMA850: 824-849 MHz, 869-894 MHz
	LTE	FDD LTE Band 1: 1920-1980 MHz, 2110-2170 MHz FDD LTE Band 3: 1710-1785 MHz, 1805-1880 MHz FDD LTE Band 5: 824-849 MHz, 869-894 MHz FDD LTE Band 7: 2500-2570 MHz, 2620-2690 MHz FDD LTE Band 8: 880-915 MHz, 925-960 MHz FDD LTE Band 20: 832-862 MHz, 791-821 MHz FDD LTE Band 28A: 703-725.4 MHz, 773-803 MHz FDD LTE Band 28B: 718-748 MHz, 758-780.4 MHz TDD LTE Band 38: 2570-2620 MHz TDD LTE Band 40: 2300-2400 MHz TDD LTE Band 41: 2555-2655 MHz
Modulation Mode:	2.4G WLAN	802.11b(DSSS): CCK, DQPSK, DBPSK 802.11g(OFDM): BPSK, QPSK, 16-QAM, 64-QAM 802.11n(OFDM): BPSK, QPSK, 16-QAM, 64-QAM 802.11ax(OFDM,OFDMA): BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024QAM
	WCDMA	WCDMA: QPSK; HSDPA: QPSK/16QAM; HSUPA: BPSK
	LTE	QPSK/16QAM
Rating:	Input: 5V, 1A	
Battery:	Rated Voltage: 3.8V Capacity: 2100mAh 7.98Wh	
Hardware Version:	F231ZC _V2.0_OM26 _OM	
Software Version:	XFNJ _P42 _U05 _F231ZC _V2.0_OM26 _OM _GLOBAL18_M _POO5	



2.2 DESCRIPTION OF THE TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Test Mode	Description
Mode 1	Charging+Wi-Fi+WCDMA Link
Mode 2	Charging+Wi-Fi+LTE Link

Test For Conducted	
Final Test Mode	Description
Mode 1	Charging+Wi-Fi+WCDMA Link
Mode 2	Charging+Wi-Fi+LTE Link

For Radiated Test	
Final Test Mode	Description
Mode 1	Charging+Wi-Fi+WCDMA Link
Mode 2	Charging+Wi-Fi+LTE Link

For EMS Test	
Final Test Mode	Description
Mode 1	Charging+Wi-Fi+WCDMA Link
Mode 2	Charging+Wi-Fi+LTE Link

Note:

1. For conducted emission test, Only show the worst case in this report.
2. For radiated emission test, Only show the worst case in this report.

2.3 DESCRIPTION OF THE SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Accessories Equipment

Description	Manufacturer	Model	S/N	Rating

Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
Adapter	Tenpao	S005CAU05001 00	N/A	Input: 100-240V ~ 50/60Hz 0.2A Output: 5V, 1A
Mobile phone	SHARK	KSR-10	N/A	N/A
USB-A to USB-C Cable	UGREEN	US287	N/A	1m, shielded, without ferrite core

Note:

- (1) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (2) “YES” means “with core”; “NO” means “without core”.



2.4 MEASUREMENT INSTRUMENTS LIST

Conducted Emission					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
EMI Test Receiver	R&S	ESU8	100372	2023.04.13	2024.04.12
LISN	COM-POWER	LI-115	02032	2023.04.07	2024.04.06
LISN	SCHWARZBEC K	NNLK 8122	00160	2023.04.07	2024.04.06
Transient Limiter	CYBERTEK	EM5010A	E2250100049	2023.04.07	2024.04.06
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Testing Software	EMC-I_V1.4.0.3_SKET				
Radiated Emission					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
EMI Test Receiver	R&S	ESU8	100372	2023.04.10	2024.04.09
Spectrum Analyzer	Keysight	N9020A	MY50530994	2023.10.12	2024.10.10
Spectrum Analyzer	Keysight	N9010B	MY60242508	2023.04.10	2024.04.09
Active loop Antenna	ETS	6502	00049544	2022.06.02	2025.06.01
Bilog Antenna	SCHWARZBEC K	VULB 9168	01447	2022.12.12	2025.12.11
Horn Antenna	SCHWARZBEC K	3115	10SL0060	2022.06.02	2025.06.01
Pre-amplifier (9kHz-1GHz)	EMtrace	RP01A	02017	2023.04.07	2024.04.06
Pre-amplifier (1-26.5G)	Agilent	8449B	3008A4722	2023.04.07	2024.04.06
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Testing Software	EMC-I_V1.4.0.3_SKET				
Harmonic & Flick					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
Harmonic Voltage & Flicker	AMETEK	100-CTS-230	2229A00121	2023.10.12	2024.10.11
AC Power Source	AMETEK	3001iX-208-413	2236A00794	2023.10.12	2024.10.11
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Wireless Communications Test Set	R&S	CMW 500	137737	2023.04.13	2024.04.12
Electrostatic Discharge (ESD)					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
ESD TEST GENERATOR	PRIMA	ESD61002TA	PR230725090	2023.10.16	2024.10.15
Temperature & Humidity	SuWei	ST-W2318	N.A	2023.04.24	2024.04.23
Radio Frequency Electromagnetic Fields (RS)					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
Power Sensor	R&S	Z11	116655	2023.10.12	2024.10.11
Power Sensor	R&S	Z11	121896	2023.10.12	2024.10.11
Signal Generator	Agilent	N5181A	MY47070409	2023.10.12	2024.10.11
Power Amplifier	SKET	HAP_80M01G-2 50W	S202211402	2023.10.12	2024.10.11
Power Amplifier	SKET	HAP_010G060 G-80W	S202211403	2023.10.12	2024.10.11



RS Test Antenna	SKET	STLP 9129 Plus	SK2022101200 6	N.A	N.A
audio analyzer	R&S	UPL	100689	2023.10.12	2024.10.11
Audio Breakthrough Shielding Box	SKET	SB_ABT/C35	N/A	2023.04.28	2024.04.27
1KHz Standard Source	SKET	MSC_ABT/C35	N/A	2023.04.28	2024.04.27
Audio conditioner	SKET	PM_ABT/C35	N/A	2023.04.28	2024.04.27
Mouth Simulator	SKET	AM_ABT/C35	N/A	2023.04.28	2024.04.27
Ear Simulator	SKET	AE_ABT/C35	N/A	2023.04.28	2024.04.27
Free field microphone	SKET	MP_ABT/C35	N/A	2023.04.28	2024.04.27
Testing Software	EMC-S_V2.1.2.28_SKET				
Radio Frequency Continuous Conducted (CS)					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
Conducted Radio-frequency Test System	PRIMA	CRF61006A	PR211281052	2023.04.28	2024.04.27
CDN	PRIMA	CRF-CDN-M216	PR220281070	2023.04.07	2024.04.06
CDN	PRIMA	CRF-CDN-M316	PR220281074	2023.04.07	2024.04.06
Attenuator	PRIMA	ATT-6DB-100	W2198770001	2023.04.07	2024.04.06
Electromagnetic Injection Clamp	ZHINAN	ZN23203	PR211281055	2023.04.07	2024.04.06
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
audio analyzer	R&S	UPL	100689	2023.10.12	2024.10.11
Audio Breakthrough Shielding Box	SKET	SB_ABT/C35	N/A	2023.04.28	2024.04.27
1KHz Standard Source	SKET	MSC_ABT/C35	N/A	2023.04.28	2024.04.27
Audio conditioner	SKET	PM_ABT/C35	N/A	2023.04.28	2024.04.27
Mouth Simulator	SKET	AM_ABT/C35	N/A	2023.04.28	2024.04.27
Ear Simulator	SKET	AE_ABT/C35	N/A	2023.04.28	2024.04.27
Free field microphone	SKET	MP_ABT/C35	N/A	2023.04.28	2024.04.27
Testing Software	EMC-S_V2.1.2.28_SKET				
Fast Transients Common Mode (EFT)					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
Fast Transient Burst Simulator	PRIMA	EFT61004TA	PR220243451	2023.04.13	2024.04.12
EFT CAPACITIVE COUPLING CLAMP	PRIMA	EFT-CLAMP	457	2023.04.13	2024.04.12
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Surge					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
Lightning Surge Generator (1.2us.50us)	PRIMA	SUG61005TAX	PR211155290	2023.04.07	2024.04.06
Lightning Surge Generator (10us.700us)	PRIMA	SUG10/700TA	PR211255516	2023.04.13	2024.04.12
Signal line decoupling network	PRIMA	DATA-CDN-8B	PR211255479	2023.10.12	2024.10.11
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Voltage Dips and Interruptions					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until



Cycle Sag Simulator	PRIMA	DRP61011TA	PR21126644	2023.04.13	2024.04.12
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
PFMF					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
Power Frequency Magnetic Field Generator	PRIMA	PFM61008TG	PR211281444	2023.04.13	2024.04.12
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION

(Frequency Range 150KHz-30MHz)

DC power input/output ports:

FREQUENCY (MHz)	Quasi-peak	Average
0.15 ~ 0.5	79.00	66.00
0.5 ~ 30	73.00	60.00

Note: According to EN 301489-3/-19 section 7.1.2 special conditions for EMC emission tests, the requirements of ETSI EN 301 489-1 [1], clause 8.3 shall be applied where the cable length exceeds 3 m or is connected to a vehicle power supply.

AC Power port used for power supply only:

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.5 ~ 5	73.00	60.00	56.00	46.00
5 ~ 30	73.00	60.00	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

Telecommunications/network Port

FREQUENCY (MHz)	Voltage limits Class A(dBuV)		Voltage limits Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	97 to 87	84 to 74	84 to 74	74 to 64
0.5 ~ 30	87	74	74	64

Note 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

Note 2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is $20 \log_{10} 150 / I = 44 \text{ dB}$).



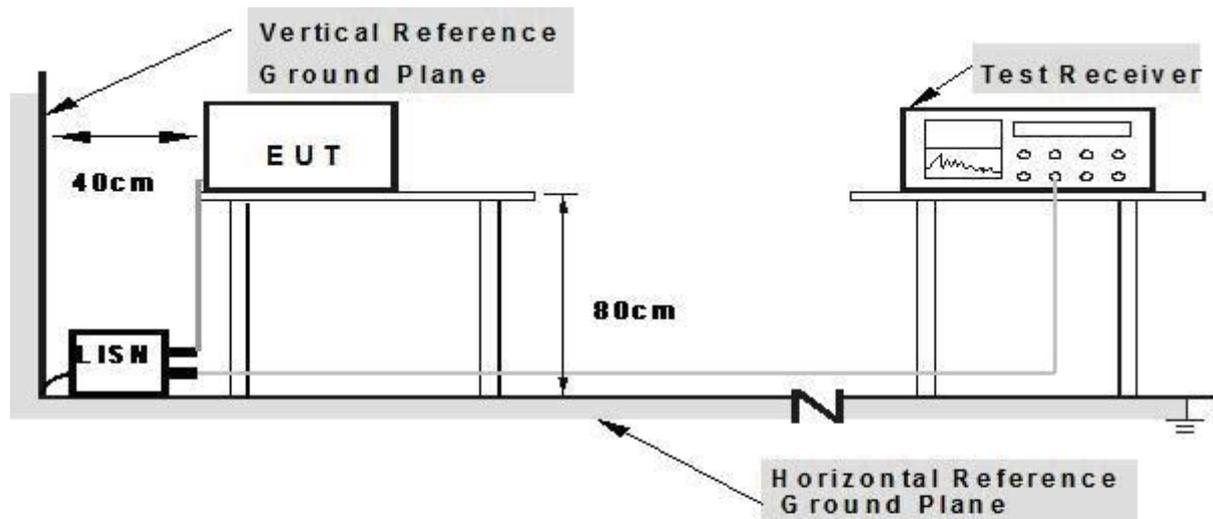
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

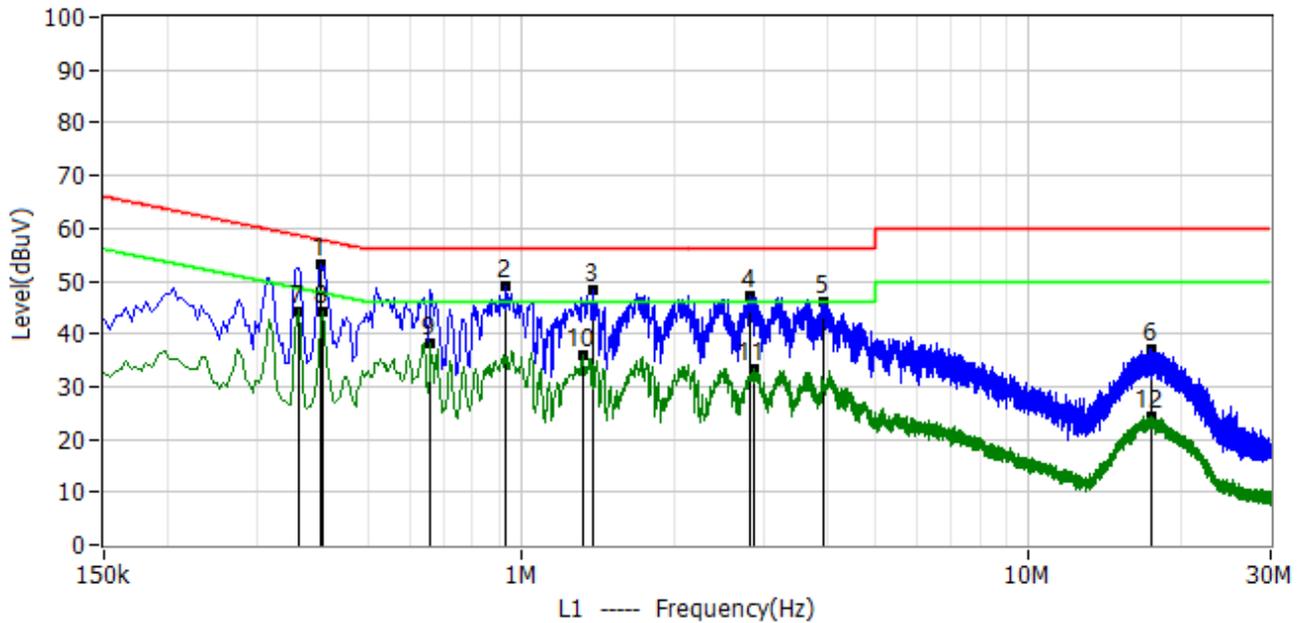
3.1.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 described unless otherwise a special operating condition is specified in the following during the testing.



3.1.5 TEST RESULTS

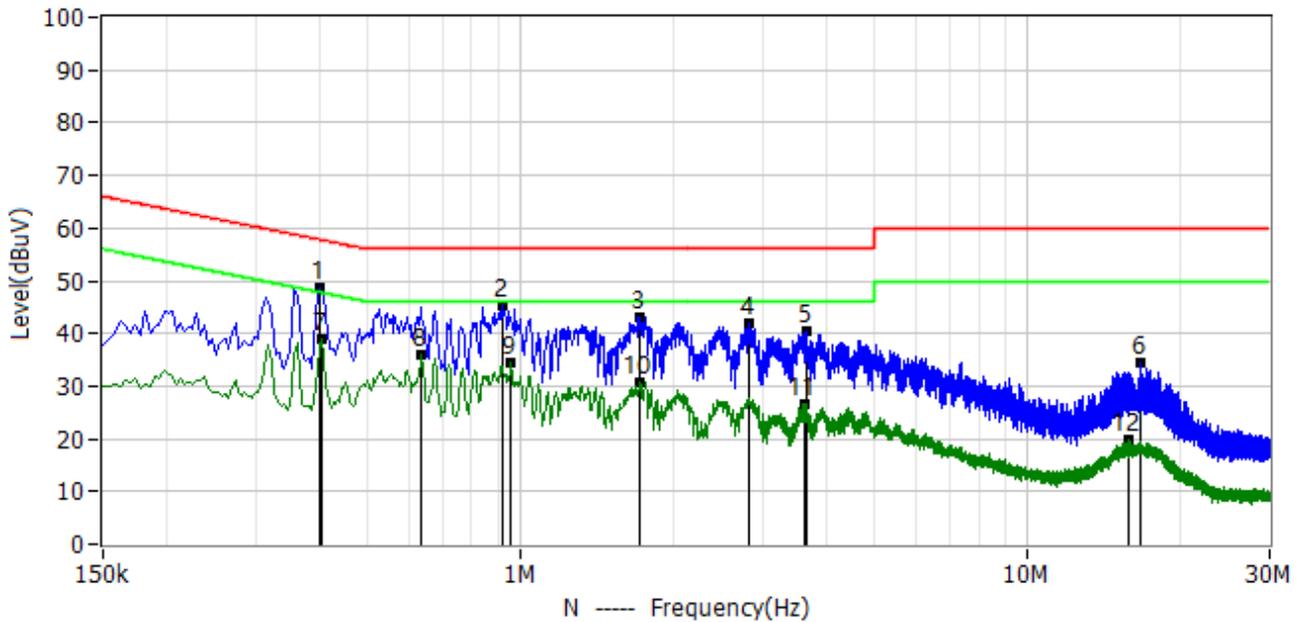
Project: LGT24A092	Test Engineer: LiuH
EUT: 4G LTE Mobile Wi-Fi	Temperature: 21.9℃
M/N: MF3	Humidity: 55%RH
Test Voltage: AC 230V/50Hz	Test Data: 2023-12-30
Test Mode: Charging+Wi-Fi+LTE Link	
Note:	



No.	Frequency MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Detector	Polar
1*	0.402	42.88	10.49	53.37	57.81	-4.45	QP	L1
2*	0.930	38.39	10.51	48.90	56.00	-7.10	QP	L1
3*	1.386	37.88	10.60	48.48	56.00	-7.52	QP	L1
4*	2.810	36.35	10.74	47.09	56.00	-8.91	QP	L1
5*	3.934	35.18	10.77	45.95	56.00	-10.05	QP	L1
6*	17.446	26.15	11.10	37.25	60.00	-22.75	QP	L1
7*	0.362	33.89	10.49	44.38	48.68	-4.30	AV	L1
8*	0.406	33.53	10.49	44.02	47.73	-3.71	AV	L1
9*	0.662	27.84	10.50	38.34	46.00	-7.66	AV	L1
10*	1.322	25.38	10.58	35.96	46.00	-10.04	AV	L1
11*	2.878	22.52	10.74	33.26	46.00	-12.74	AV	L1
12*	17.450	13.36	11.10	24.46	50.00	-25.54	AV	L1



Project: LGT24A092	Test Engineer: LiuH
EUT: 4G LTE Mobile Wi-Fi	Temperature: 21.9°C
M/N: MF3	Humidity: 55%RH
Test Voltage: AC 230V/50Hz	Test Data: 2023-12-30
Test Mode: Charging+Wi-Fi+LTE Link	
Note:	



No.	Frequency MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Detector	Polar
1*	0.402	38.23	10.49	48.72	57.81	-9.09	QP	N
2*	0.918	34.66	10.51	45.17	56.00	-10.83	QP	N
3*	1.722	32.44	10.66	43.10	56.00	-12.90	QP	N
4*	2.826	31.38	10.74	42.12	56.00	-13.88	QP	N
5*	3.666	29.70	10.77	40.47	56.00	-15.53	QP	N
6*	16.686	23.28	11.14	34.42	60.00	-25.58	QP	N
7*	0.406	28.53	10.49	39.02	47.73	-8.71	AV	N
8*	0.638	25.31	10.50	35.81	46.00	-10.19	AV	N
9*	0.958	23.85	10.51	34.36	46.00	-11.64	AV	N
10*	1.722	20.10	10.66	30.76	46.00	-15.24	AV	N
11*	3.634	15.92	10.77	26.69	46.00	-19.31	AV	N
12*	15.874	8.77	11.11	19.88	50.00	-30.12	AV	N



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF THE RADIATED EMISSION MEASUREMENT (Below 1000MHz)

FREQUENCY (MHz)	Class A		Class B	
	At 10m	At 3m	At 10m	At 3m
	dBuV/m	dBuV/m	dBuV/m	dBuV/m
30 ~ 230	40	50	30	40
230 ~ 1000	47	57	37	47

3.2.2 LIMITS OF THE RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (at 3m) dBuV/m		Class B (at 3m) dBuV/m	
	Peak	AVG	Peak	AVG
1000 ~ 3000	76	56	70	50
3000 ~ 6000	80	60	74	54

Notes:

- (1) The limit for radiated test was performed in the following: CISPR 32.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m) = 20log Emission level (uV/m).
- (4) For EN 301489-52 section 7.2.2 special conditions for EMC emission tests, according to typical of intended use of radio equipment, ancillary equipment can also be measured in combination with the radio equipment under test. When the ancillary equipment is measured in combination with the radio equipment, radiated emissions from the transmitter/transceiver shall be ignored, but recorded in the test report.

3.2.3 TEST PROCEDURE

- a. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. EUT as the center to the edge of the auxiliary device, the distance from the maximum edge to the center of the antenna is 3 meter.
- c. The height of antenna is varied from 1 meter to 4 meter above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meter and the rotatable table was turned from 0 degrees to 360 degree to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.2.4 TEST SETUP

(A) Radiated Emission Test Setup Frequency Below 1 GHz

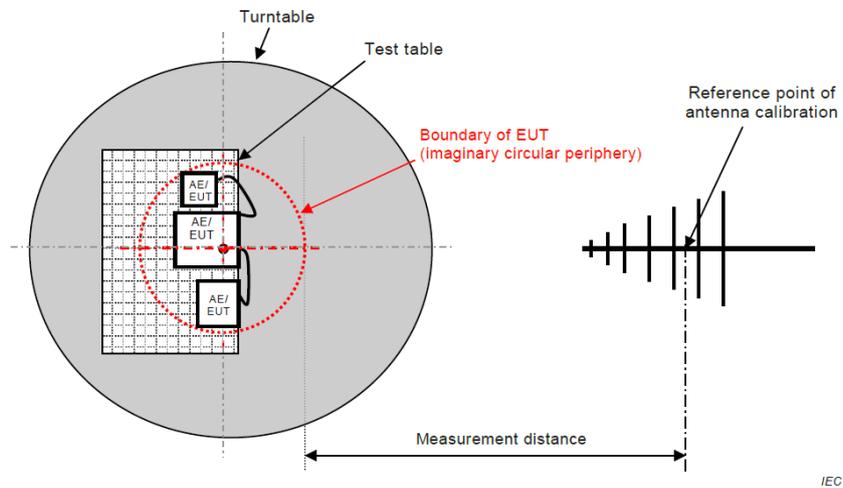


Figure C.1 – Measurement distance

(B) Radiated Emission Test Setup Frequency Above 1GHz

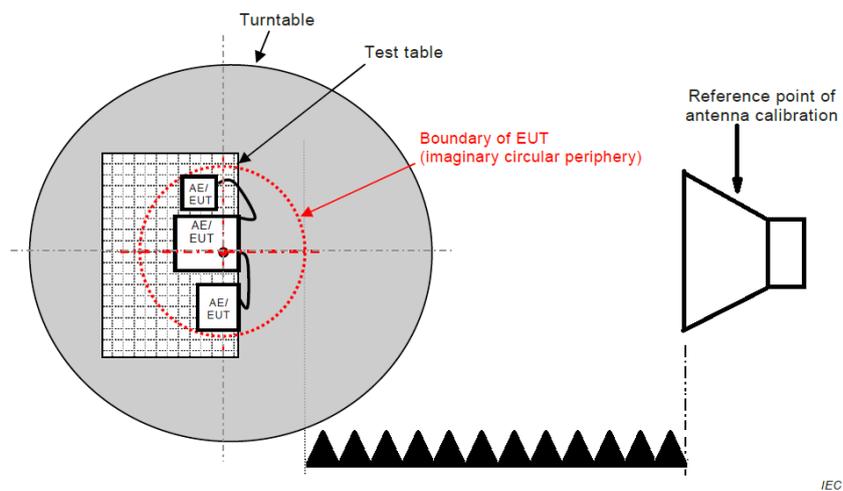


Figure C.1 – Measurement distance

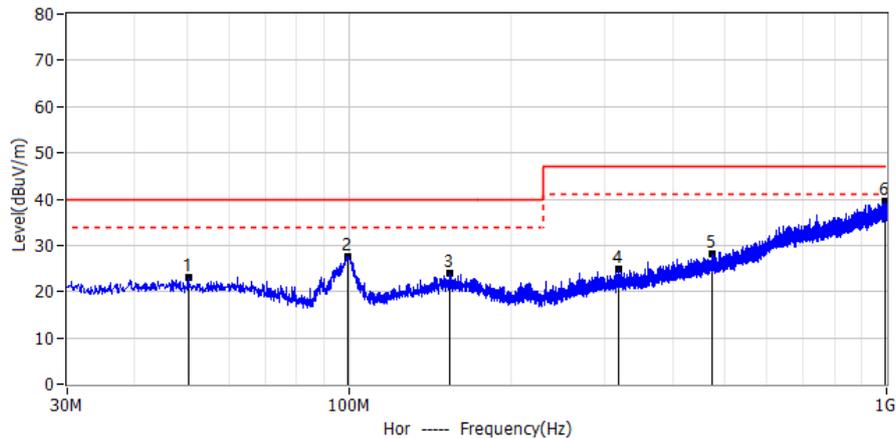
3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 described unless otherwise a special operating condition is specified in the following during the testing.

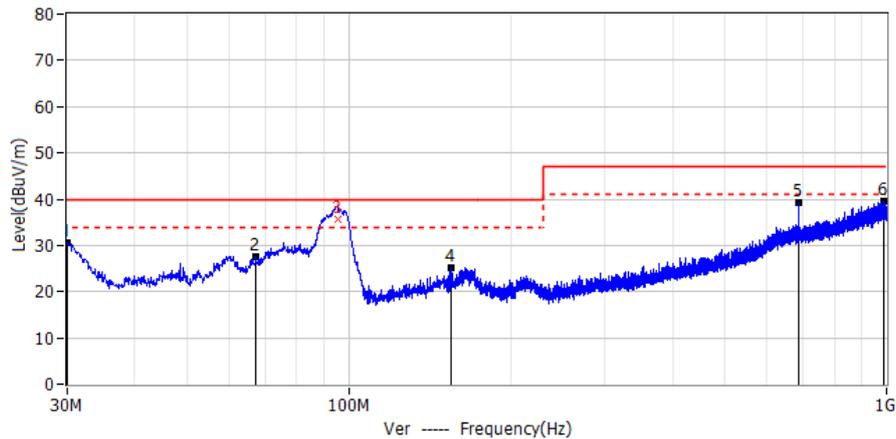


3.2.6 TEST RESULTS (30 - 1000 MHz)

Project: LGT24A092	Test Engineer: Xiangdong Ma
EUT: 4G LTE Mobile Wi-Fi	Temperature: 22°C
M/N: MF3	Humidity: 55%RH
Test Voltage: Battery	Test Data: 2024-01-09
Test Mode: Charging+Wi-Fi+LTE Link	
Note:	



No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	50.370	3.87	19.33	23.20	40.00	-16.80	QP	Hor
2*	99.719	11.92	15.60	27.52	40.00	-12.48	QP	Hor
3*	154.160	3.92	19.93	23.85	40.00	-16.15	QP	Hor
4*	318.090	4.53	20.48	25.01	47.00	-21.99	QP	Hor
5*	474.624	3.66	24.46	28.12	47.00	-18.88	QP	Hor
6*	991.149	5.14	34.53	39.67	47.00	-7.33	QP	Hor

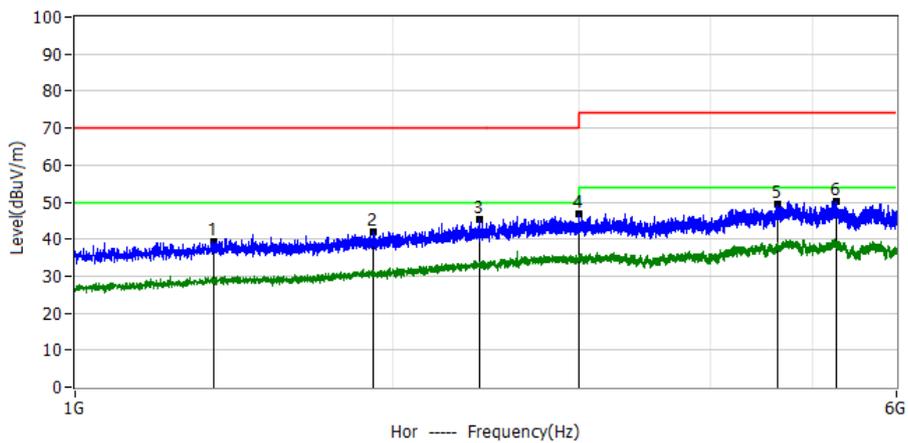


No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	30.000	12.51	18.20	30.71	40.00	-9.29	QP	Ver
2*	67.224	9.47	18.19	27.66	40.00	-12.34	QP	Ver
3	95.818	20.16	15.40	35.56	40.00	-4.44	QP	Ver
4*	155.494	5.19	19.91	25.10	40.00	-14.90	QP	Ver
5*	687.539	9.46	29.69	39.15	47.00	-7.85	QP	Ver
6*	985.935	5.14	34.51	39.65	47.00	-7.35	QP	Ver

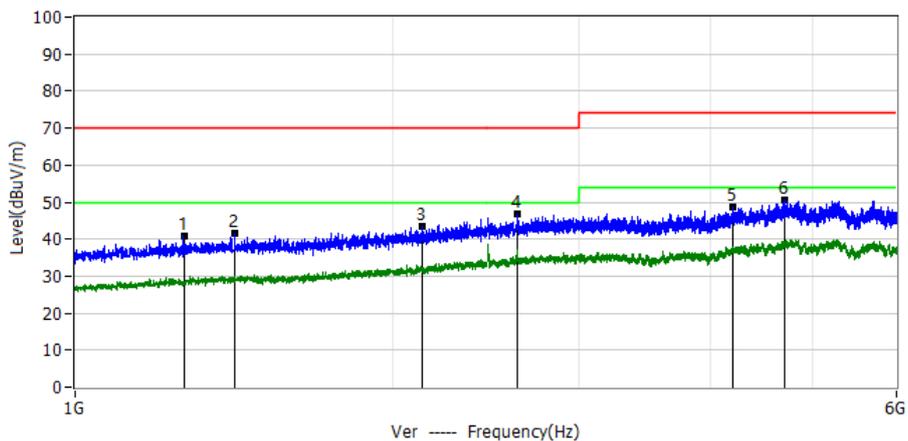


3.2.7 TEST RESULT (1000 - 6000MHz)

Project: LGT24A092	Test Engineer: Xiangdong Ma
EUT: 4G LTE Mobile Wi-Fi	Temperature: 22°C
M/N: MF3	Humidity: 55.5%RH
Test Voltage: AC 230V/50Hz	Test Data: 2023-12-31
Test Mode: Charging+Wi-Fi+LTE Link	
Note:	



No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1.351GHz	61.20	-21.77	39.43	70.00	-30.57	PK	Hor
2*	1.914GHz	58.89	-17.10	41.79	70.00	-28.21	PK	Hor
3*	2.417GHz	57.36	-11.86	45.50	70.00	-24.50	PK	Hor
4*	2.997GHz	55.14	-8.36	46.78	70.00	-23.22	PK	Hor
5*	4.627GHz	55.11	-5.85	49.26	74.00	-24.74	PK	Hor
6*	5.268GHz	57.15	-7.00	50.15	74.00	-23.85	PK	Hor



No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1.267GHz	63.21	-22.44	40.77	70.00	-29.23	PK	Ver
2*	1.418GHz	62.80	-21.29	41.51	70.00	-28.49	PK	Ver
3*	2.131GHz	58.31	-14.85	43.46	70.00	-26.54	PK	Ver
4*	2.624GHz	57.12	-10.33	46.79	70.00	-23.21	PK	Ver
5*	4.199GHz	55.83	-7.03	48.80	74.00	-25.20	PK	Ver
6*	4.704GHz	56.47	-5.91	50.56	74.00	-23.44	PK	Ver



3.3 HARMONICS CURRENT

3.3.1 LIMITS OF THE HARMONICS CURRENT

IEC 555-2					
Table - I			Table - II		
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)
Non Portable Tools or TV Receivers	Odd Harmonics		TV Receivers	Odd Harmonics	
	3	2.30		3	0.80
	5	1.14		5	0.60
	7	0.77		7	0.45
	9	0.40		9	0.30
	11	0.33		11	0.17
	13	0.21		13	0.12
	15 ≤ n ≤ 39	0.15 · 15/n		15 ≤ n ≤ 39	0.10 · 15/n
	Even Harmonics			Even Harmonics	
	2	1.08		2	0.30
4	0.43	4	0.15		
8	0.30				
8 ≤ n ≤ 40	0.23 · 8/n	DC	0.05		

EN 61000-3-2/IEC 61000-3-2					
Equipment Category	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in A)	(mA/w)
Class A	Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required	Class D	3	2.30	3.4
			5	1.14	1.9
			7	0.77	1.0
			9	0.40	0.5
			11	0.33	0.35
			13 ≤ n ≤ 39	see Table I	3.85/n
only odd harmonics required					

3.3.2 TEST PROCEDURE

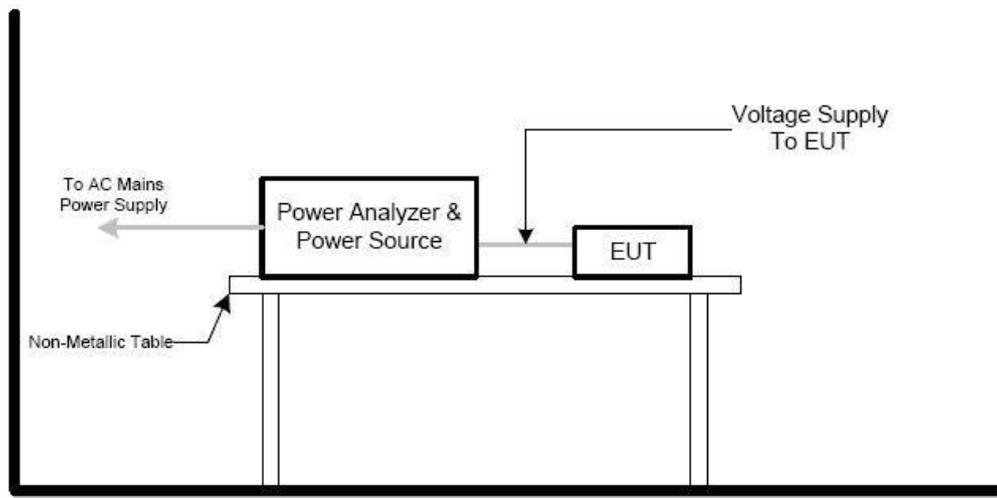
- The EUT was placed on the top of a wooden table 0.8 meter above the ground and operated to produce the maximum harmonic components under normal operating conditions.
- The classification of EUT is according to section 5 of EN IEC 61000-3-2. The EUT is classified as follows:
 - Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
 - Class B: Portable tools. Portable tools; Arc welding equipment which is not professional equipment.
 - Class C: Lighting equipment.
 - Class D: Equipment having a specified power less than or equal to 600W of the following types: Personal computers and personal computer monitors and television receivers.
- The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.



3.3.3 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** described unless otherwise a special operating condition is specified in the following during the testing.

3.3.4 TEST SETUP



3.3.5 TEST RESULTS

N/A. This part is applicable to the power input terminals of equipment intended to be connected to 220/380 V, 230/400 V and 240/415 V systems operating at 50 Hz or 60 Hz. Requirements and limits for other cases are not yet specified.



3.4 VOLTAGE FLUCTUATION AND FLICKERS

3.4.1 LIMITS OF THE VOLTAGE FLUCTUATION AND FLICKERS

Tests	Measurement Value	Limit	Descriptions
	IEC555-3	IEC/EN 61000-3-3	
P_{st}	$\leq 1.0, T_p= 10 \text{ min.}$	$\leq 1.0, T_p= 10 \text{ min.}$	Short Term Flicker Indicator
P_{lt}	N/A	$\leq 0.65, T_p=2 \text{ hr.}$	Long Term Flicker Indicator
$T_{dt(s)}$	$\leq 3\%$	$\leq 3.3\%$	Relative Steady-State V-Chang
$d_{max}(\%)$	$\leq 4\%$	$\leq 4\%$	Maximum Relative V-Chang
$d_c(\%)$	N/A	$\leq 3.3\%$ for $> 500\text{ms}$	Relative V-change Characteristic

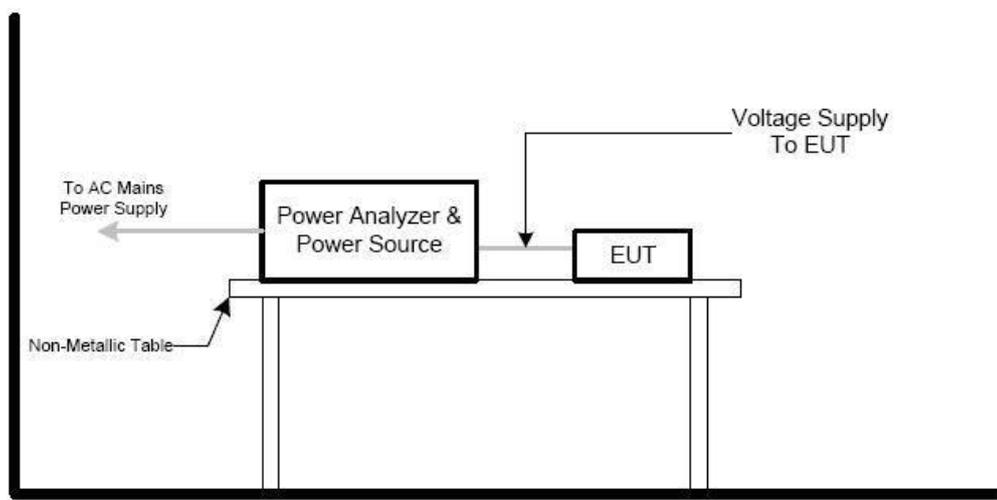
3.4.2 TEST PROCEDURE

- a. Fluctuation and Flickers Test:
Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.
- b. All types of voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

3.4.3 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** described unless otherwise a special operating condition is specified in the following during the testing.

3.4.4 TEST SETUP





3.4.5 TEST RESULTS

Flicker Test Summary per IEC61000-3-3:2013/AMD1:2017 (Run time)

EUT: 4G LTE Mobile Wi-Fi
Test category: All parameters (European limits)
Test date: 2024/1/10
Test duration (min): 10
Comment: M613
Customer: LGT23L115

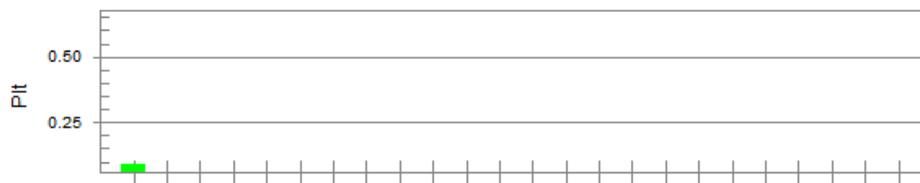
Tested by: Cheng li
Test Margin: 100
E636nd time: 9:20:39
Data file name: F-000638.cts_data

Test Result: Pass

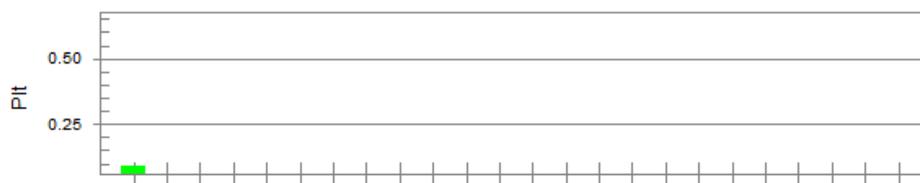
Status: Test Completed

Pst_i and limit line

European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 229.96

Highest dt (%):

T-max (mS): 0

Highest dc (%): 0.00

Highest dmax (%): 0.00

Highest Pst (10 min. period): 0.209

Highest Plt (2 hr. period): 0.090

Test limit (%):

Test limit (mS): 500.0 Pass

Test limit (%): 3.30 Pass

Test limit (%): 4.00 Pass

Test limit: 1.000 Pass

Test limit: 0.650 Pass



4. EMC IMMUNITY TEST

4.1 GENERAL PERFORMANCE CRITERIA

4.1.1 PERFORMANCE CRITERIA (ETSI EN 301 489-17)

According to **ETSI EN 301 489-17** standard, the general performance criteria are as follows:

Criteria	During the test	After the test
A	Shall operate as intended. (See note). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of critical stored data.
B	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data.

NOTE: Operate as intended during the test allows a level of degradation in accordance with clause 6.2.2.

Minimum performance level

For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %. For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment.

Performance for Performance criteria for Continuous phenomena

The performance criteria A shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur during the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur during the test.

Performance criteria for Transient phenomena

The performance criteria B shall apply, except for voltage dips greater than or equal to 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur as a result of the application of the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur as a result of the application of the test.



4.1.2 PERFORMANCE CRITERIA

According to **ETSI EN 301 489-52** standard, the general performance criteria are as follows:

GSM and voice call
Performance criteria for Continuous phenomena applied to Transmitters (CT) With a link established, during the test, the uplink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check). NOTE: When there is a high-level background noise present, the filter bandwidth may be reduced down to a minimum of 40 Hz. In idle mode, the transmitter shall not operate unintentionally. At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or critical stored data, and the communication link shall have been maintained.
Performance criteria for Continuous phenomena applied to Receivers (CR) During the test, the RXQUAL of the downlink shall not exceed the value of three, measured during each individual exposure in the test sequence. In the case of narrow band responses, the procedure in clause 4.4.1 shall be followed. During the test, the downlink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check). NOTE: When there is a high-level background noise present, the filter bandwidth may be reduced down to a minimum of 40 Hz. At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or critical stored data, and the communication link shall have been maintained.



UTRA

In the data transfer mode, the performance criteria can be one of the following:

- if the BER (as referred in clause 5.3.1 of ETSI TS 134 109 [4]) is used, it shall not exceed 0,001 during the test sequence;
- if the BLER (as referred in ETSI TS 134 109 [4]) is used, it shall not exceed 0,01 during the test sequence.

The BLER calculation shall be based on evaluating the CRC on each transport block. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.2.1 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

E-UTRA, E-UTRA with LAA, inband or guard band NB-IoT, Standalone NB-IoT

In data transfer mode, the data throughput of the EUT shall not fall below 95 % of the maximum data throughput.

Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.2.2 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

NR

In data transfer mode, the data throughput of the EUT shall not fall below 95 % of the maximum data throughput.

Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.3 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

Performance criteria for Transient phenomena

At the conclusion of each exposure of the transient phenomena, the EUT shall operate without loss of the communication link.

At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended without loss of user control functions or critical stored data.

In addition where the EUT supports idle mode it should be verified that the transmitter shall not unintentionally operate when transient phenomena are applied.

4.1.3 GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of **2.2** or **2.3** unless otherwise a special operating condition is specified in the following during the testing.



4.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

4.2.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance:	B
Discharge Voltage:	Air Discharge: 2KV/4KV/8KV (Direct) Contact Discharge: 4KV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: at least 10 times on each point Contact Discharge: at least 10 times on each point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum
Special conditions:	For EN 301489-52 section 7.3.2 special conditions, When applying direct discharge to a portable or handheld battery powered EUT with a display screen, it may not be possible to observe the screen for a given EUT orientation. If observation of the screen is necessary during the test, the EUT may be mounted vertically using non-metallic supports as specified in the last paragraph of clause 4.2.1 of EN 55035

4.2.2 TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manners:

- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation
The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

The time interval between two successive single discharges was at least 1 second.

The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meter from the EUT.

Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

Vertical Coupling Plane (VCP):

The coupling plane of dimensions 0.5m x 0.5m, is placed parallel to and positioned at a distance 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge.

Horizontal Coupling Plane (HCP):

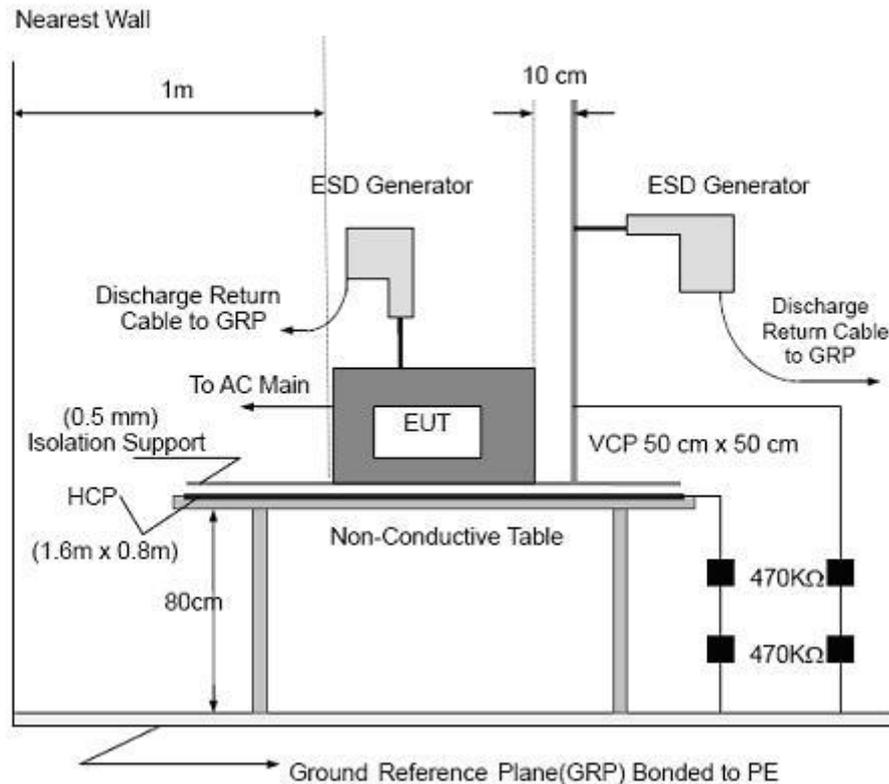
The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge.



- b. Air discharges at insulation surfaces of the EUT.
It was at least ten single discharges with positive and negative at the same selected point.

4.2.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meter high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940kΩ total impedance. The equipment under test was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 0.8-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP was consisted of a sheet of aluminum that is at least 0.25mm thick, and extended at least 0.5 meter from the EUT on all sides.



4.2.4 TEST RESULT

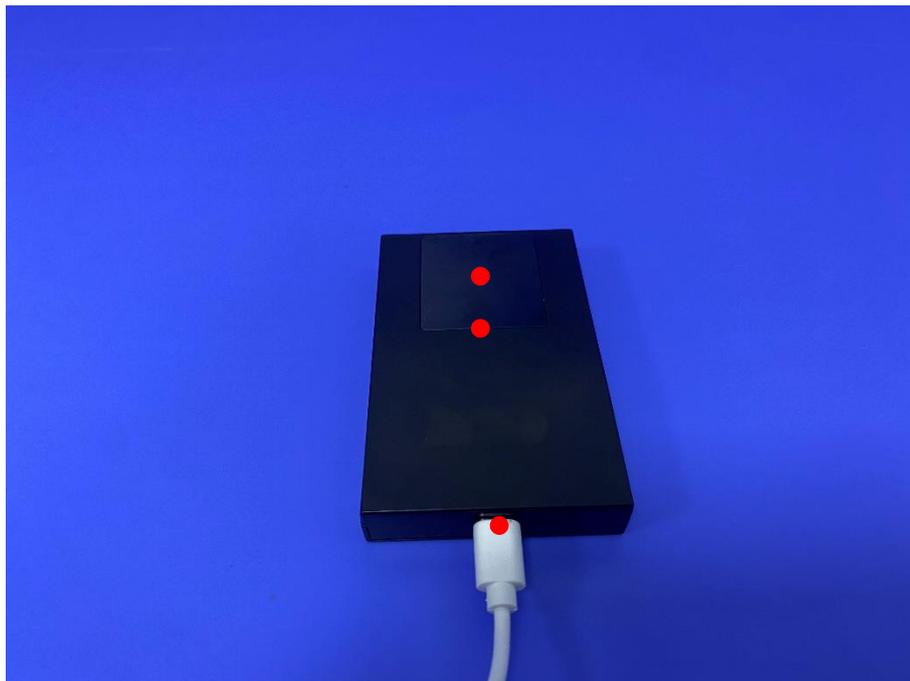
Temperature:	23.1°C	Relative Humidity:	43%
Pressure:	1017.8hPa	Test Date:	2024.01.10

Discharge times	Contact discharge: minimum 10 times (+/--respectively) at each point Air discharge: minimum 10 times (+/- respectively) at each point					
Discharge Level/KV	Polarity	Test Points	Contact Discharge	Air Discharge	Criterion	Test Result
2,4	+/-	HCP/VCP	A	N/A	B	Pass
2,4	+/-	Green Dot	N/A	N/A	B	N/A
2,4,8	+/-	Red Dot	N/A	A	B	Pass

Note 1: EUT operate as intended during the test Normal performance within limits specified by the manufacturer, request or purchaser.
 Note 2: ● Red Dot_Air Discharged, ● Green Dot_Contact Discharged



The Photo for Discharge Points of EUT





4.3 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

4.3.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-3
Required Performance:	A
Frequency Range:	80 MHz - 6000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5 s.
Special conditions:	For EN 301489-3 section 7.2.2 special conditions, Where the EUT is subject to EMC Immunity testing under a Harmonised Standard of a Directive other than the Directive 2014/53/EU [i.2] then the modulating signal frequency specified in that Harmonised Standard may be used. If this alternative modulating frequency is used, then the applicable Directive, Harmonised Standard & modulating frequency shall be noted in the test report.

4.3.2 TEST PROCEDURE

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.

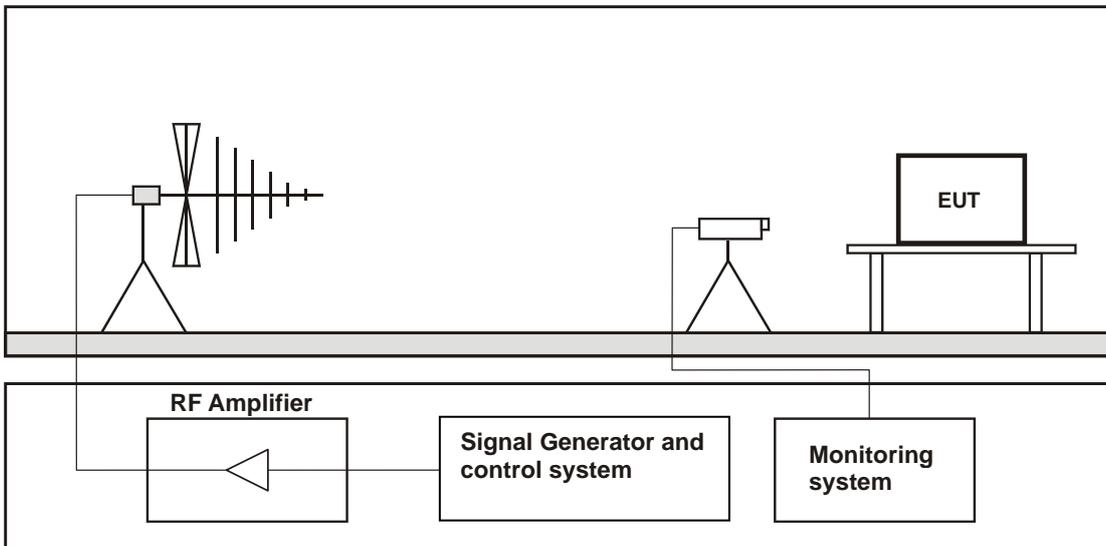
The testing distance from antenna to the EUT was 3 meters.

The other conditions required in the following manners:

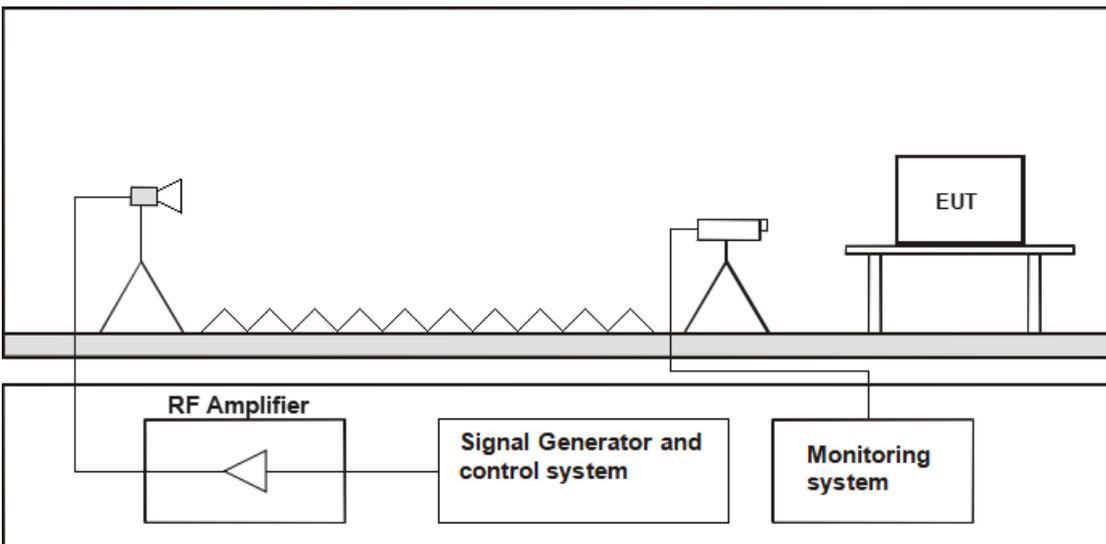
- a. The frequency range is swept from 80 MHz to 6000 MHz with the signal 80% amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- b. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- c. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.3.3 TEST SETUP

(A) RS Test Set-Up Frequency Below 1GHz



(B) RS Test Set-Up Frequency Above 1GHz



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive table 0.8 meter in height. The system under test was connected to the power and signal wire according to the relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive wood support 0.1 meter in height. The system under test was connected to the power and signal wire according to the relevant installation instructions.



4.3.4 TEST RESULTS

Temperature:	23.1°C	Relative Humidity:	43%
Test Power:	AC 230V/50Hz	Test Date:	2024.01.10

Frequency Range (MHz)	Antenna polarity	Modulation	EUT position	Criterion	Result
80MHz-1000MHz	Horizontal Vertical	3 V/m 1KHz, 80% AM	Front	A	A
			Rear	A	A
			Left	A	A
			Right	A	A
1000MHz-6000MHz	Horizontal Vertical	3 V/m 1KHz, 80% AM	Front	A	A
			Rear	A	A
			Left	A	A
			Right	A	A

Note: EUT operate as intended during the test Normal performance within limits specified by the manufacturer, request or purchaser.

Mode	BER	Result
WCDMA 2100	< 0.001	PASS
WCDMA 900	< 0.001	PASS
WCDMA 850	< 0.001	PASS
Mode	Throughput	Result
LTE Band1	> 95%	PASS
LTE Band3	> 95%	PASS
LTE Band5	> 95%	PASS
LTE Band7	> 95%	PASS
LTE Band8	> 95%	PASS
LTE Band12	> 95%	PASS
LTE Band20	> 95%	PASS
LTE Band28	> 95%	PASS
LTE Band38	> 95%	PASS
LTE Band40	> 95%	PASS
LTE Band41	> 95%	PASS

Note: For channelized equipment the exclusion band shall extend 250% of the channel width either side of the transmitter centre frequency.

Mode	PER	Result
2.4GWIFI	Less than 10%	PASS



4.4 ELECTRICAL FAST TRANSIENT (EFT)

4.4.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-4
Required Performance:	B
Test Voltage:	Power Line: 1 KV Signal/Control Line: 0.5 KV
Polarity:	Positive & Negative
Impulse Frequency:	5kHz
Impulse Wave shape:	5/50ns
Burst Duration:	15ms
Burst Period:	300ms
Test Duration:	Not less than 1 min
Special conditions:	According to EN 301489-3 section 7.2.2 special conditions, The requirements of ETSI EN 301 489-1 [1], clauses 9.4.1 and 9.4.2 shall be applied with the exception of clause 7.4 of EN 61000-4-4 [4].

4.4.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter & 0.1 meter above a metal ground plane measured 1m*1m min.

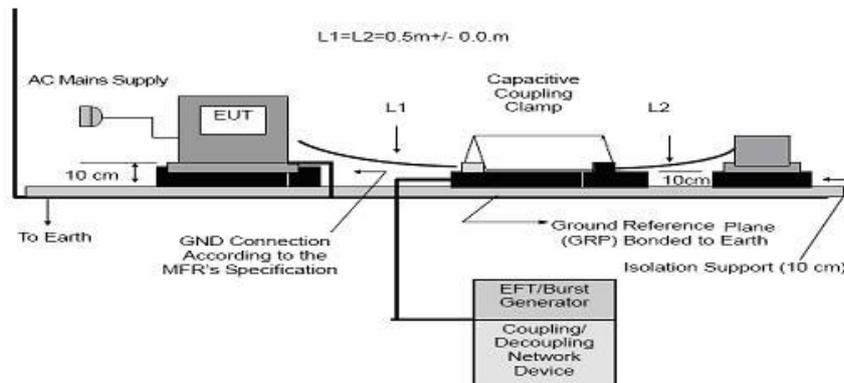
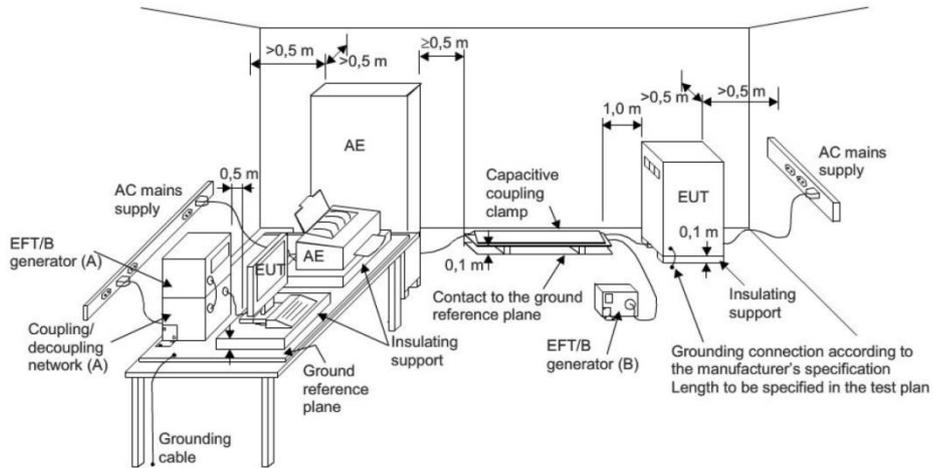
The ground reference plane shall be a metallic sheet (copper or aluminum) of 0.25 mm minimum thickness; other metallic materials may be used, but they shall have at least 0.65 mm minimum thickness.

The other conditions required in the following manners:

- The length of power cord between the coupling device and the EUT should not exceed 1 meter.
- Both positive and negative polarity discharges were applied.
- The duration time of each test sequential was 1 minutes.



4.4.3 TEST SETUP





Note:

TABLE-TOP EQUIPMENT

- a. Table-top equipment and equipment normally mounted on ceilings or walls as well as built-in equipment shall be tested with the EUT located (0.1 ± 0.01) m above the ground reference plane.
- b. Testing of large table-top equipment or multiple systems can be performed on the floor; maintaining the same distances as for the test setup of table-top equipment.
- c. The test generator and the coupling/decoupling network shall be bonded to the ground reference plane.
- d. The ground reference plane shall be a metallic sheet (copper or aluminum) of 0.25mm minimum thickness; other metallic materials may be used, but they shall have at least 0.65 mm minimum thickness.
- e. The minimum size of the ground reference plane is 0.8m x 1m. The actual size depends on the dimension of the EUT.
- f. The ground reference plane shall project beyond the EUT by at least 0.1m on all sides.
- g. The ground reference plane shall be connected to the earth (PE) for safety reasons.
- h. The EUT shall be arranged and connected to satisfy its functional requirements according to the equipment installation specifications.
- i. The minimum distance between the EUT and all other conductive structures (including the generator, AE and the walls of a shielded room), except the ground reference plane, shall be more than 0.5m.
- j. All cables to the EUT shall be placed on the insulation support 0.1m above the ground reference plane. Cables not subject to electrical fast transients shall be routed as far as possible from the cable under test to minimize the coupling between the cables.
- k. The EUT shall be connected to the earth system in accordance with the manufacturer's installation specifications; no additional earth connections are allowed.
- l. The connection impedance of the coupling/decoupling network earth cables to the ground reference plane and all connectors shall provide a low inductance.
- m. Either a direct coupling network or a capacitive clamp shall be used for the application of the test voltages. The test voltages shall be coupled to all of the EUT ports in turn including those between two units of equipment involved in the test, unless the length of the interconnecting cable makes it impossible to test.

FLOOR-STANDING EQUIPMENT

When using the coupling clamp, the minimum distance between the coupling plates and all other conductive surfaces (including the generator), except the ground reference plane beneath the coupling clamp and beneath the EUT, shall be at least 0.5m.

The distance between any coupling devices and the EUT shall be ($0.5 - 0/+0.1$) m for tabletop equipment testing, and (1.0 ± 0.1) m for floor standing equipment, unless otherwise specified in product standards. When it is not physically possible to apply the distances mentioned above, other distances can be used and shall be recorded in the test report.

The cable between the EUT and the coupling device, if detachable, shall be as short as possible to comply with the requirements of this clause. If the manufacturer provides a cable exceeding the distance between the coupling device and the point of entry of the EUT, the excess length of this cable shall be bundled and situated at a distance of 0.1m above the ground reference plane. When a capacitive clamp is used as a coupling device, the excess cable length shall be bundled at the AE side. Parts of the EUT with interconnecting cables of a length less than 3m, which are not tested, shall be placed on the insulating support. The parts of the EUT shall have a distance of 0.5m between them. Excess cable length shall be bundled.



4.4.4 TEST RESULTS

Temperature:	23.1°C	Relative Humidity:	43%
Test Power:	AC 230V/50Hz	Test Date:	2024.01.10

Coupling Line		Test level (kV)								Performance Criterion	Result
		0.5		1		2		4			
		+	-	+	-	+	-	+	-		
I/O AC power ports	L	/	/	A	A	/	/	/	/	B	PASS
	N	/	/	A	A	/	/	/	/		PASS
	PE	/	/	/	/	/	/	/	/		N/A
	L+N	/	/	A	A	/	/	/	/		PASS
	L+PE	/	/	/	/	/	/	/	/		N/A
	N+PE	/	/	/	/	/	/	/	/		N/A
	L+N+PE	/	/	/	/	/	/	/	/		N/A
I/O DC Power ports		/	/	/	/	/	/	/	/	B	N/A
analogue/digital data ports		/	/	/	/	/	/	/	/	B	N/A
Note: 1. EUT operate as intended during the test Normal performance within limits specified by the manufacturer, request or purchaser 2. B: EUT There is abnormal sound in the headphones during the test, which will automatically resume after the test.											



4.5 SURGE TESTING

4.5.1 TEST SPECIFICATION

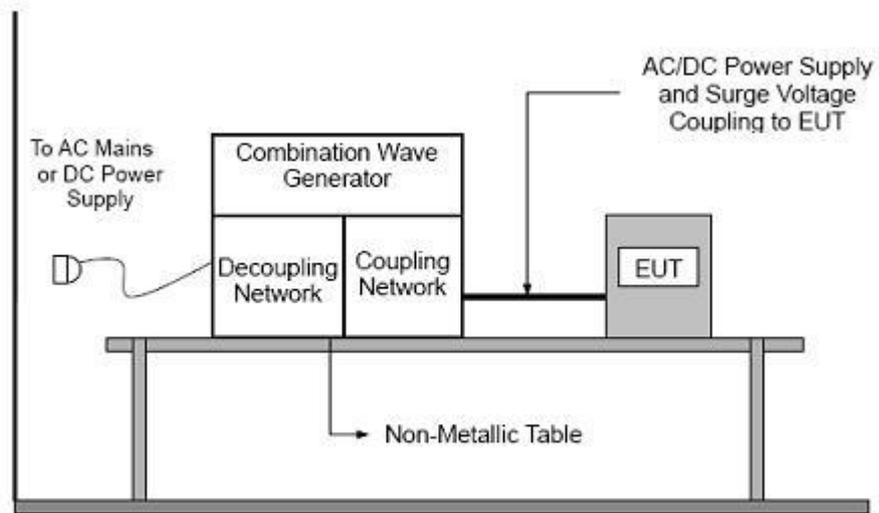
Basic Standard:	IEC/EN 61000-4-5
Required Performance:	B
Wave-Shape:	Combination Wave 1.2/50us Open Circuit Voltage
Test Voltage:	Power line ~ line to line: 1 KV line to ground: 2KV Telecommunication line: 1 KV
Surge Input/Output:	L-N, L-PE, N-PE
Generator Source:	(L-N)2 ohm between networks
Impedance:	(L-PE, N-PE)12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	90°/270°
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

4.5.2 TEST PROCEDURE

- a. For EUT power supply:
The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2meter in length (or shorter).
- b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:
The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meter in length (or shorter).
- c. For test applied to unshielded symmetrically operated interconnection/telecommunication lines of EUT.
The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrester was not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meter in length.



4.5.3 TEST SETUP





4.5.4 TEST RESULTS

Temperature:	23.1 °C	Relative Humidity:	43%
Test Power:	AC 230V/50Hz	Test Date:	2024.01.10

Coupling Line			Test level								Criterion	Result
			0.5 kV		1 kV		2 kV		4 kV			
			+	-	+	-	+	-	+	-		
Input AC power ports	L-N	0°	/	/	/	/	/	/	/	/	B	N/A
		90°	A	/	A	/	/	/	/	/		PASS
		180°	/	/	/	/	/	/	/	/		N/A
		270°	/	A	/	A	/	/	/	/		PASS
	L-PE	0°	/	/	/	/	/	/	/	/		N/A
		90°	/	/	/	/	/	/	/	/		N/A
		180°	/	/	/	/	/	/	/	/		N/A
		270°	/	/	/	/	/	/	/	/		N/A
	N-PE	0°	/	/	/	/	/	/	/	/		N/A
		90°	/	/	/	/	/	/	/	/		N/A
		180°	/	/	/	/	/	/	/	/		N/A
		270°	/	/	/	/	/	/	/	/		N/A
Input DC power ports			/	/	/	/	/	/	/	/		N/A
Analogue/digital data ports	lines to PE	unshielded symmetrical	/	/	/	/	/	/	/	/	B	N/A
			/	/	/	/	/	/	/	N/A		
			/	/	/	/	/	/	/	N/A		
			/	/	/	/	/	/	/	N/A		
Analogue/digital data ports	lines to PE	coaxial or shielded	/	/	/	/	/	/	/	B	N/A	
			/	/	/	/	/	/	/		N/A	
			/	/	/	/	/	/	/		N/A	
Note: EUT operate as intended during the test Normal performance within limits specified by the manufacturer, request or purchaser.												



4.6 CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

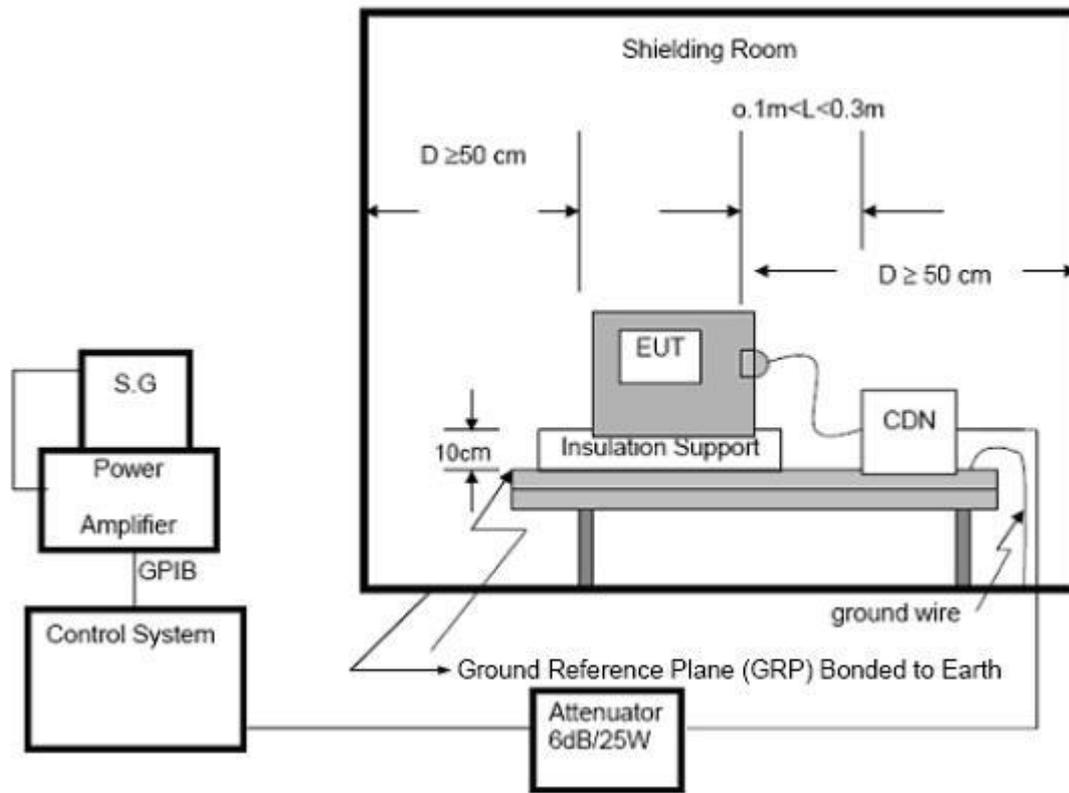
4.6.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-6
Required Performance:	A
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3Vr.m.s.
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Dwell Time:	The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5 s.
Special conditions:	According to EN 301489-3 section 7.2.2 special conditions, Where the EUT is subject to EMC Immunity testing under a Harmonised Standard of a Directive other than the Directive 2014/53/EU [i.2] then the modulating signal frequency specified in that Harmonised Standard may be used. If this alternative modulating frequency is used, then the applicable Directive, Harmonised Standard & modulating frequency shall be noted in the test report.

4.6.2 TEST PROCEDURE

- a. The EUT shall be tested within its intended operating and climatic conditions.
- b. An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.
- c. One of the CDNs not used for injection was terminated with 50Ω, providing only one return path. All other CDNs were coupled as decoupling networks.
- d. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. Where the frequency is swept incrementally, the step size shall not exceed 1% of the preceding frequency value.
- e. The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5 s. The sensitive frequencies (e.g. clock frequencies) shall be analyzed separately.
- f. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

4.6.3 TEST SETUP



NOTE:

FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meter height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meter and 0.3 meter from the projected geometry of the EUT on the ground reference plane.



4.6.4 TEST RESULTS

Temperature:	23.1°C	Relative Humidity:	43%
Test Power:	AC 230V/50Hz	Test Date:	2024.01.10

Frequency Step:	1%		Dwell Time:	2000 ms	
Test Ports (Mode)	Freq. Range MHz	Field Strength	Perform. Criteria	Results	Result
Input / Output AC Power Port	0.15~80	3V r.m.s.	A	A	PASS
Input / Output DC Power Port	0.15~80	3V r.m.s.	A	N/A	N/A
Analogue/digital data ports	0.15~80	3V r.m.s.	A	N/A	N/A

Note: EUT operate as intended during the test Normal performance within limits specified by the manufacturer, request or purchaser.

Mode	BER	Result
WCDMA 2100	< 0.001	PASS
WCDMA 900	< 0.001	PASS
WCDMA 850	< 0.001	PASS
Mode	Throughput	Result
LTE Band1	> 95%	PASS
LTE Band3	> 95%	PASS
LTE Band5	> 95%	PASS
LTE Band7	> 95%	PASS
LTE Band8	> 95%	PASS
LTE Band12	> 95%	PASS
LTE Band20	> 95%	PASS
LTE Band28	> 95%	PASS
LTE Band38	> 95%	PASS
LTE Band40	> 95%	PASS
LTE Band41	> 95%	PASS

Note: For channelized equipment the exclusion band shall extend 250% of the channel width either side of the transmitter centre frequency.

Mode	PER	Result
2.4GWIFI	Less than 10%	PASS



4.7 VOLTAGE INTERRUPTION/DIPS TESTING (DIPS)

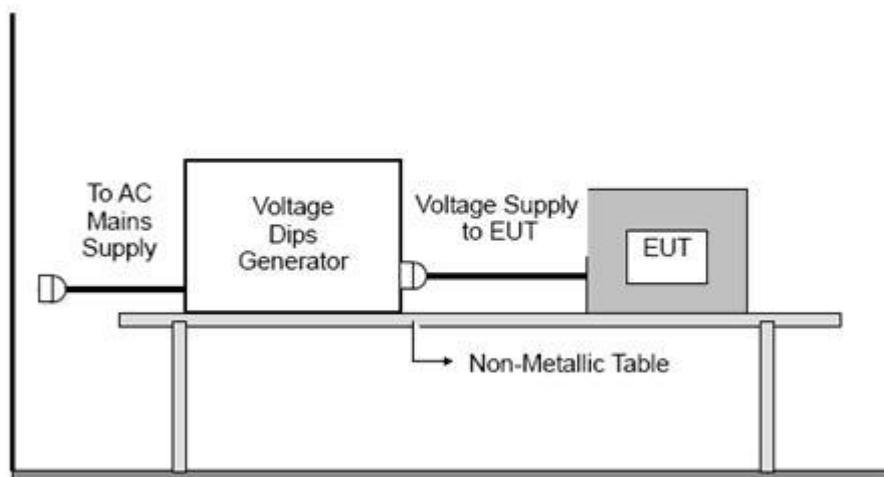
4.7.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-11
Required Performance:	B (For 100% Voltage Dips, 0.5 Cycle) B (For 100% Voltage Dips, 1 Cycle) C (For 30% Voltage Dips, 25 Cycles) C (For 100% Voltage Interruptions, 250 Cycles)
Test Duration Time:	Minimum 3 test events in sequence
Interval between Event:	Minimum 10 seconds
Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°/360°
Test Cycle:	3 times

4.7.2 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

4.7.3 TEST SETUP





4.7.4 TEST RESULTS

Temperature:	23.1°C	Relative Humidity:	43%
Test Power:	AC 230V/50Hz	Test Date:	2024.01.10

Interruption & Dips	Duration (T)	Perform Criteria	Results	Judgment
Voltage dip 70%	25	C	A	PASS
Voltage dip 0%	0.5	B	A	PASS
Voltage dip 0%	1	B	A	PASS
Interruption 0%	250	C	B	PASS

Note: The charge is interrupted during the test, and will be automatically restored during the test.

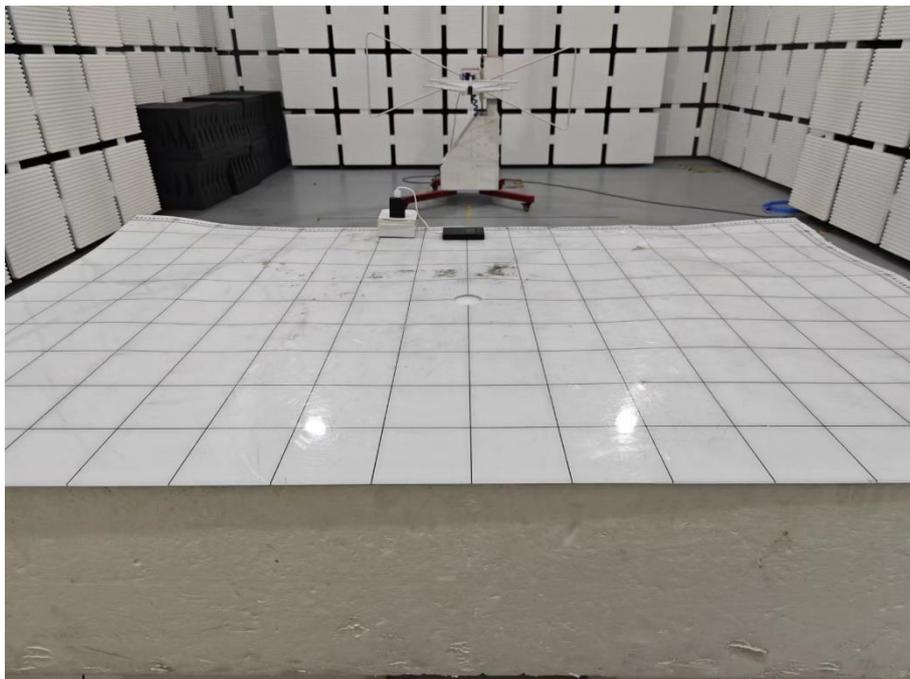


APPENDIX I - TEST SETUP

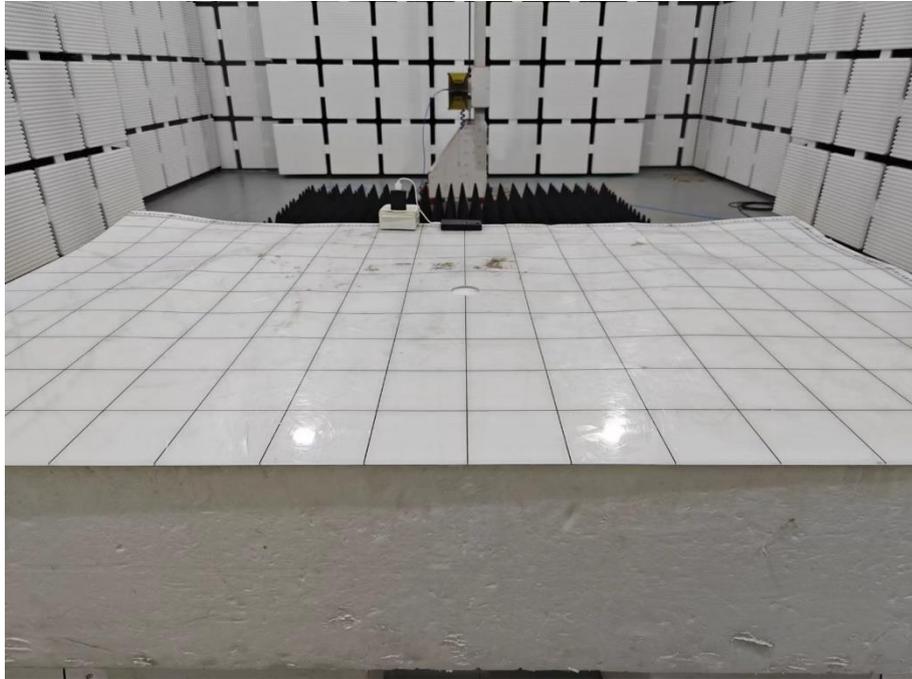
Set-up for Conducted Emission on AC Mains (CE)



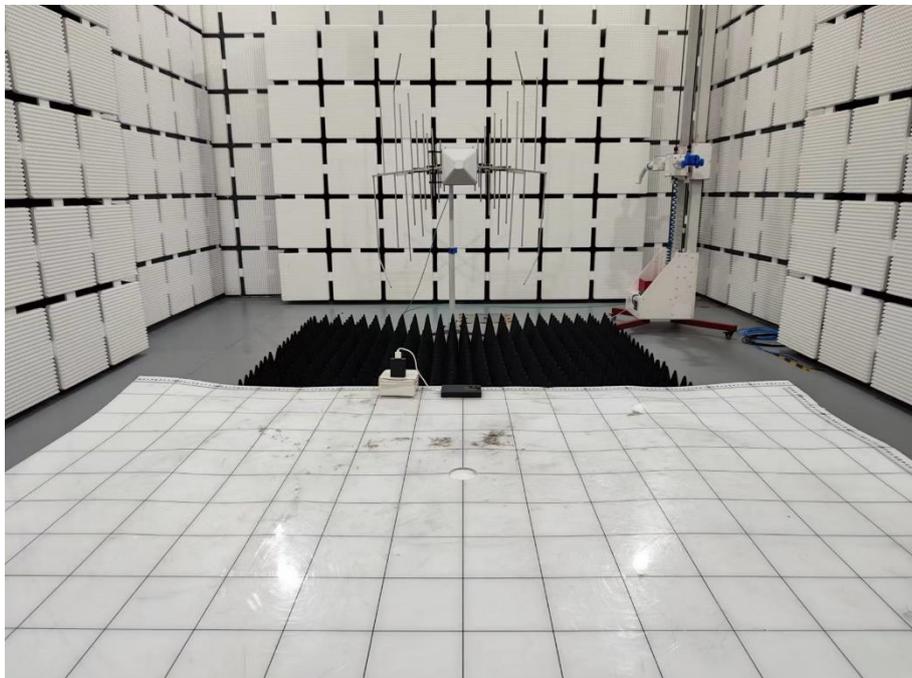
Set-up for Radiated Emission (RE), Below 1GHz



Set-up for Radiated Emission (RE), Above 1GHz

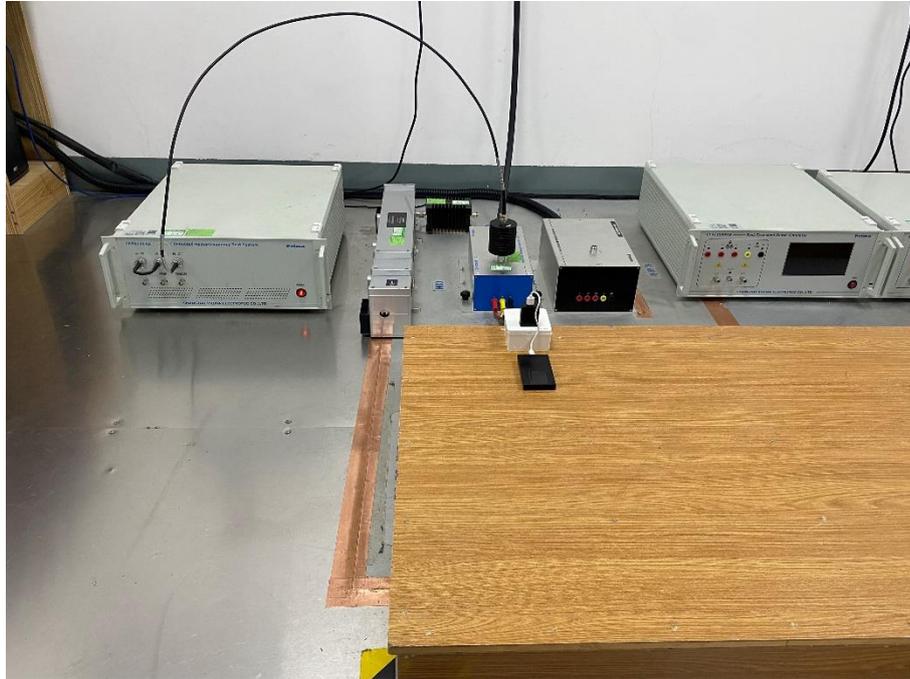


Set-up for Radio Frequency Electromagnetic Fields (RS)





Set-up for Radio Frequency Continuous Conducted (CS)



Set-up for Electrostatic Discharges (ESD)





Set-up for Electrical Fast Transients (EFT)



Set-up for Surge



Set-up for Voltage Dips and Interruptions



Set-up for Harmonic Current & Voltage Fluctuations and Flicker (HF)



※※※※※END OF THE REPORT※※※※※