TEST REPORT

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

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

MEASUREMENT AND TEST REPORT

For

Shenzhen Jiaomao Technology Co., Ltd.

Jiaomao,1003, Unit 1, Fucheng Digital Innovation Park, No. 15, Shijing Road, Fumin Community, Longhua District, Shenzhen

Model: JMMGW-mini, JMMGW-mini1, JMMGW-mini2

2022-10-09

This Report Concerns:	**Equipment Type:**
☒ Original Report	Mini Multi-Mode Gateway

Test Engineer:	Blue Hu/ Blue Hu
Report Number:	TH2209253-C01-R04
Test Date:	2022-09-22 to 2022-10-09
Reviewed By:	Neo Dong/ Neo Dong
Approved By:	Binglee/ Binglee
Prepared By:	**Shenzhen Tian Hai Test Technology Co., Ltd.** 125-126, No.66, Zhangge Road, Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong, China Tel: +86-755-86615100 Fax: +86-755-86615105

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of Shenzhen Tian Hai Test Technology Co.,Ltd.

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	**Shenzhen Jiaomao Technology Co., Ltd.**
Address:	Jiaomao,1003, Unit 1, Fucheng Digital Innovation Park, No. 15, Shijing Road, Fumin Community, Longhua District, Shenzhen
Manufacturer:	**Shenzhen Jiaomao Technology Co., Ltd.**
Address:	Jiaomao,1003, Unit 1, Fucheng Digital Innovation Park, No. 15, Shijing Road, Fumin Community, Longhua District, Shenzhen

General Description of E.U.T

EUT Description:	Mini Multi-Mode Gateway
Trade mark:	/
Model No.:	JMMGW-mini, JMMGW-mini1, JMMGW-mini2
Model Difference:	The circuit design of all models is the same, but the appearance and model are different.
Operation frequency:	2402MHz-2480MHz
Channel Numbers:	40 channels for BLE
Channel Separation:	2MHz for BLE
Antenna Type:	PCB Antenna
Antenna Gain:	0dBi
Rating:	DC 5V/1.0A power from adapter: Model: TPA-147C050100VU01 Input: AC 100-240V, 50/60Hz, 0.2A Output: DC 5V, 1.0A, 5.0W
Sample No.	TH2209185
Note:	All tests on model: JMMGW-mini
Test Mode:	Mode 1: TX Mode 2: RX
Note:	All test modes were tested, but we only recorded the worst case in this report.

Remark: * The test data gathered are from the production sample provided by the manufacturer.

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1.2 Test Standards

The following Declaration of Conformity report of EUT is prepared in accordance with

EN 55032:2015/A11:2020
Electromagnetic compatibility of multimedia equipment - Emission Requirements

EN 55035:2017/A11:2020
Electromagnetic compatibility of multimedia equipment - Immunity requirements

ETSI EN 301 489-1
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU

ETSI EN 301 489-17
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility

1.3 Test Methodology

All measurements contained in this report were conducted with EN 55032:2015/A11:2020, EN 55035:2017/A11:2020, ETSI EN 301 489-1 V2.2.3(2019-11) and ETSI EN 301 489-17 V2.1.1 (2019-03).

1.4 Measurement Uncertainty

Test	Parameters	Expanded uncertainty (Ulab)	Expanded uncertainty (Ucispr)
Conducted Emission	Level accuracy (9kHz to 150kHz) (150kHz to 30MHz)	±2.52 dB ±2.36 dB	±3.80 dB ±3.40 dB
Power disturbance	Level accuracy (30MHz to 300MHz)	±3.20dB	±4.50 dB
Electromagnetic Radiated Emission (3-loop)	Level accuracy (9kHz to 30MHz)	±3.10dB	N/A
Radiated emission	Level accuracy (30MHz to 1000MHz)	±5.78dB	±6.30dB
	Level accuracy (above 1000MHz)	±4.62dB	N/A
Mains Harmonic	Voltage	±1.80%	N/A
Voltage Fluctuations & Flicker	Voltage	±0.64%	N/A

(1) Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.
(2) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.
(3) The measurement uncertainty is not included in the test result.

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1.5 Measuring device and test equipment

The following test requirements were used during test:

Conducted Emission				☼
Kind of Equipment	**Manufacturer**	**Type**	**S/N**	**Calibrate until**
EMI Test Receiver	R&S	ESRP3	102242	2022-11-15
L.I.S.N	Schwarzbeck	NNLK 8128	5089	2022-11-15
8-Wire ISN CAT6	Schwarzbeck	NTFM 8158	231	2022-11-15
Pulse Limiter	Schwarzbeck	VTSD 9561-F	847	2022-11-15
Radiated Emission (3m)				☼
EMI Test Receiver	R&S	ESR7	102333	2022-11-15
MXA Signal Analyzer	Keysight	N9020A	MY50143107	2023-05-23
Bilog Antenna	Schwarzbeck	VULB 9168	01148	2022-11-20
Pre-Amplifier	Schwarzbeck	BBV 9718 B	00109	2022-11-16
Pre-Amplifier	Schwarzbeck	BBV 9743 B	00253	2022-11-15
Horn Antenna	Schwarzbeck	BBHA 9120	02379	2022-11-20
Harmonics & Flicker				☼
5kVA AC Power Source	AMETEK CTS	5001iX-CTS-400	2046A03237	2022-11-15
Signal Conditioning Unit	AMETEK CTS	PACS-1	2046A03238	2022-11-15
ESD				☼
ESD Simulator	TESEQ	NSG 437	1569	2022-11-20
RS				☼
Signal Generator	Agilent	M5181A	MY47420649	2023-09-06
Power Meter	Agilent	E4419B	GB43312510	2023-09-06
Bi-Log Antenna	Schwarzbeck	STLP 9128 E	3142	2023-09-10
Horn Antenna	Schwarzbeck	00270	00270	2023-09-10
Power Transmitter	KEYSIGHT	E9301A	MY41069009	2023-09-06
Power Transmitter	KEYSIGHT	E9301A	MY41069011	2023-09-06
EFT				☼
Burst Tester	3C test	EFT 500T	ES027000120015	2022-11-15
Coupling Clamp	3C test	CCC 100	CCC 20092269	2022-11-15
Surge				☼
Surge simulator	3C test	CWS 600CT	ES058000920005	2022-11-15
Three phases CDN	3C test	SPN 3832T	ES0911910	2022-11-15
CDN for unshielded symmetrical high-speed Telecom cable	3C test	CDN405T8A	ES064001220010	2022-11-15
CDN for Telecom cable	3C test	CDN405M40-5	ES1071910	2022-11-15
Radio-frequency,Continuous radiated disturbance (RS)				☼
Signal Generator	Agilent	M5181A	MY47420649	2023-09-06
Power Meter	Agilent	E4419B	GB43312510	2023-09-06
Bi-Log Antenna	Schwarzbeck	STLP 9128 E	3142	2023-09-10
Horn Antenna	Schwarzbeck	00270	00270	2023-09-10
Power Transmitter	KEYSIGHT	E9301A	MY41069009	2023-09-06
Power Transmitter	KEYSIGHT	E9301A	MY41069011	2023-09-06

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Radio-Frequency Continuous Conducted (CS)				☼
Conducted Immunity Test System	3C test	CST 1075	ES096000120008	2022-11-15
6dB Attenuator	3C test	DTC75-6	ES095000120006	2022-11-15
Single phase CDN	3C test	CDN M2M3	ES064002620007	2022-11-15
Three phases CDN	3C test	CDN M5-16	ES064003320004	2022-11-15
Calibration Set	3C test	CDN 100KIT	ES064002820016	2022-11-15
Calibration Set	3C test	EM CL100KIT	EM C20032816	2022-11-15
EM-Clamp	3C test	EM CL100	EM C20032811	2022-11-15
Voltage Dips and Interruptions				☼
Power failure simulator	3C test	PFS 2216SD	ES049001220003	2022-11-15

Note: ☼ Used ● Not Used

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2 - SUMMARY OF TEST RESULTS

Emission (EN 55032, EN 301 489-1 and EN 301 489-17)		
Standard	**Test Type**	**Result**
EN55032: 2015/A11:2020	Conducted Emission Test (0.15MHz~30MHz)	Pass
	Radiated Emission Test (30MHz~1GHz)	Pass
	Radiated Emission Test (1GHz ~ 6GHz)	Pass Note (2)
EN IEC 61000-3-2: 2019	Harmonic Current Emission	PASS
EN 61000-3-3: 2013/A1: 2019	Voltage Fluctuations & Flicker	PASS
Immunity (EN 55035, EN 301 489-1 and EN 301 489-17)		
Standard	**Test Type**	**Result**
EN 61000-4-2: 2009	Electrostatic discharge immunity test	Pass
EN IEC 61000-4-3:2020	Radiated, radio-frequency, electromagnetic field immunity test	Pass
EN 61000-4-4: 2012	Electrical fast transient / burst immunity test	Pass
EN 61000-4-5: 2014/A1: 2017	Surge immunity test	Pass
EN 61000-4-6: 2014	Conducted disturbances, induced by radio-frequency fields immunity test	N/A
EN 61000-4-8: 2012	Power frequency magnetic fied	N/A Note (4)
EN IEC 61000-4-11: 2020	Voltage dips, short interruptions and voltage variations immunity test	Pass

Note:
(1) "N/A" denotes test was not applicable in this Test Report.
(2) The EUT's max operating frequency is exceeds 108MHz, so the test will be performed.
(3) For equipment with a rated power of ≤75 W, other than lighting equipment, no limits are specified in this edition of the standard.
(4) Applicable only to EUT containing devices susceptible to magnetic fields, such as CRT monitors, Hall elements, electrodynamic microphones, magnetic field sensors, etc.

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3 - CONDUCTED EMISSION FROM THE AC MAINS POWER PORT

3.1 Limit

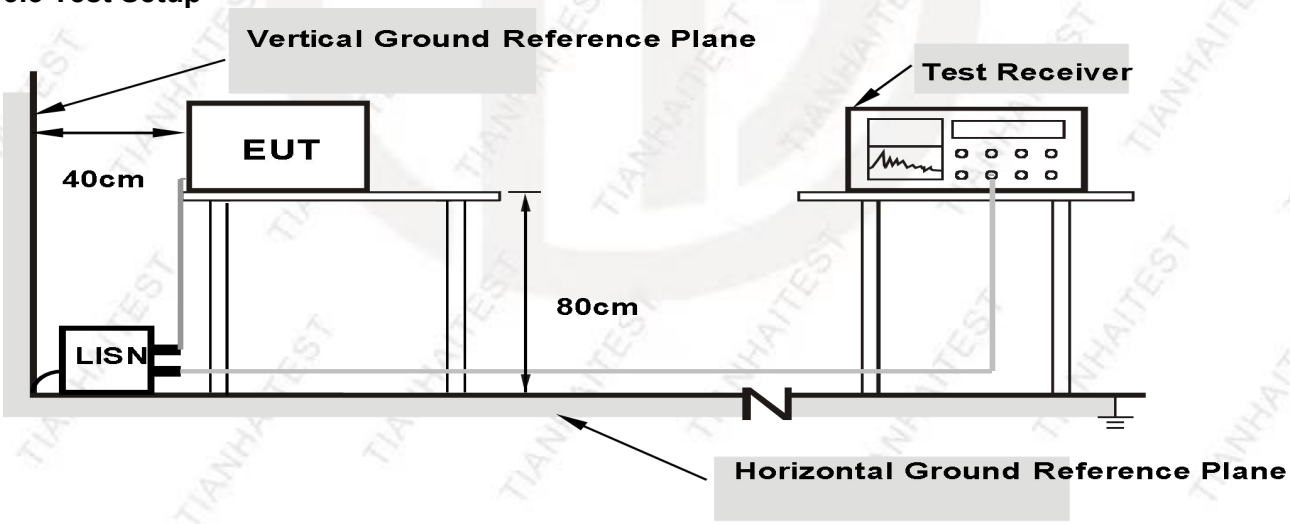
EN 55032				
Frequency (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Notes: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

3.2 Test Procedure

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.
Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.
Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

3.3 Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm

3.4 Test Results

Please refer to following:

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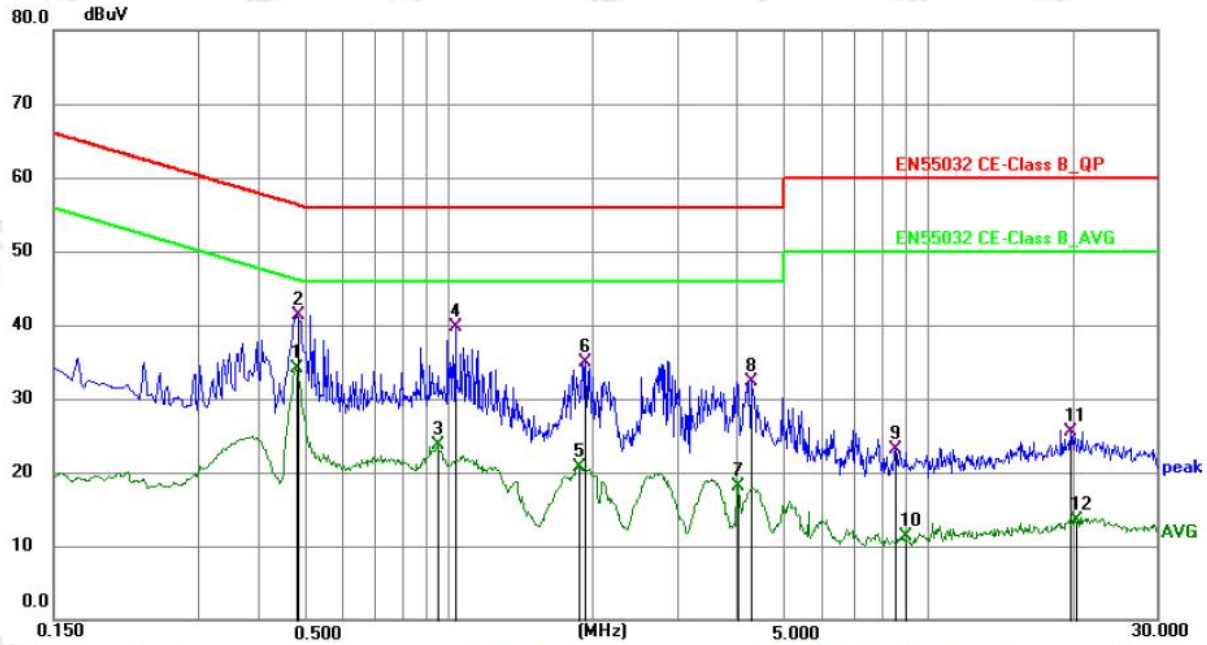
EUT	:	Mini Multi-Mode Gateway
M/N	:	JMMGW-mini
Operation Mode	:	Mode 1
Test Voltage	:	AC 230V/50Hz
Phase	:	L1

Temperature (°C) : 22.8 Relative Humidity (%) : 49 Atmospheric Pressure(mbar) : 1015



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1 *	0.4785	23.75	10.31	34.06	46.37	-12.31	AVG	P
2	0.4830	31.06	10.31	41.37	56.29	-14.92	QP	P
3	0.9510	13.23	10.40	23.63	46.00	-22.37	AVG	P
4	1.0365	29.22	10.39	39.61	56.00	-16.39	QP	P
5	1.8735	10.29	10.45	20.74	46.00	-25.26	AVG	P
6	1.9365	24.42	10.46	34.88	56.00	-21.12	QP	P
7	4.0065	7.66	10.45	18.11	46.00	-27.89	AVG	P
8	4.2810	21.91	10.43	32.34	56.00	-23.66	QP	P
9	8.5820	12.55	10.51	23.06	60.00	-36.94	QP	P
10	8.9870	0.76	10.52	11.28	50.00	-38.72	AVG	P
11	19.8550	14.57	10.91	25.48	60.00	-34.52	QP	P
12	20.2870	2.65	10.91	13.56	50.00	-36.44	AVG	P

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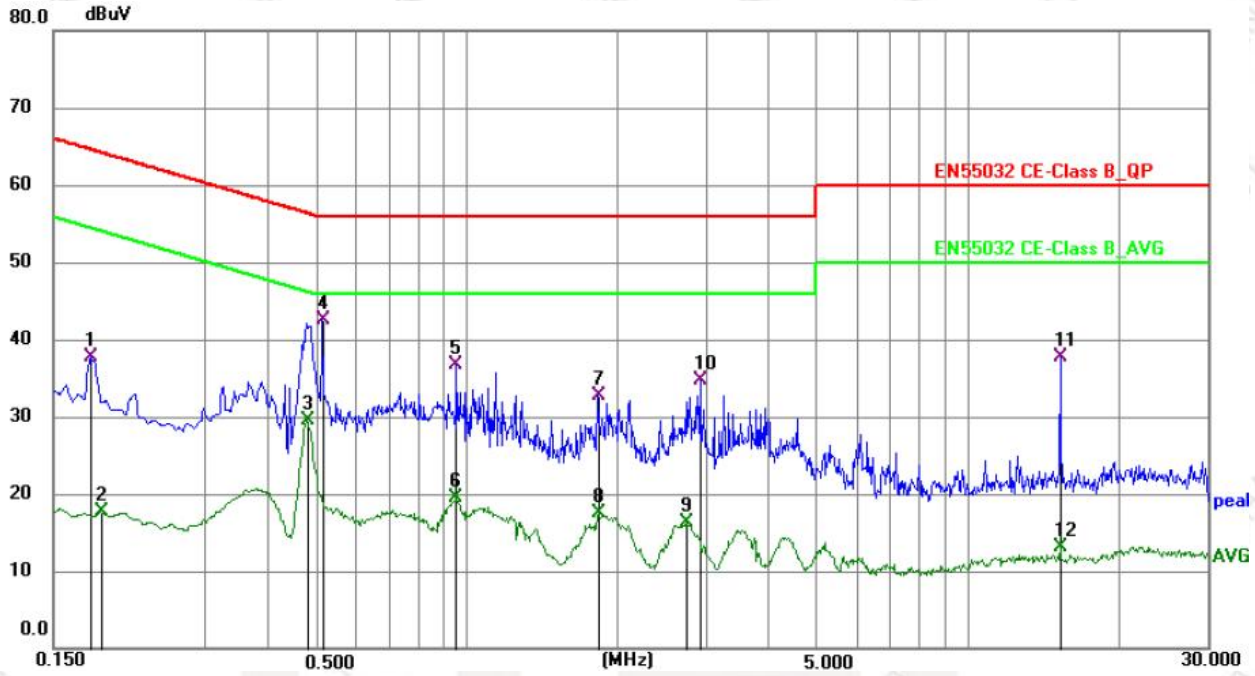
EUT	:	Mini Multi-Mode Gateway
M/N	:	JMMGW-mini
Operation Mode	:	Mode 1
Test Voltage	:	AC 230V/50Hz
Phase	:	N

Temperature (°C) : 22.8 Relative Humidity (%) : 49 Atmospheric Pressure(mbar) : 1015



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1770	27.39	10.22	37.61	64.63	-27.02	QP	P
2	0.1860	7.53	10.21	17.74	54.21	-36.47	AVG	P
3	0.4785	19.20	10.32	29.52	46.37	-16.85	AVG	P
4 *	0.5144	32.14	10.33	42.47	56.00	-13.53	QP	P
5	0.9555	26.24	10.41	36.65	56.00	-19.35	QP	P
6	0.9555	9.14	10.41	19.55	46.00	-26.45	AVG	P
7	1.8195	22.26	10.52	32.78	56.00	-23.22	QP	P
8	1.8375	6.93	10.52	17.45	46.00	-28.55	AVG	P
9	2.7375	5.89	10.45	16.34	46.00	-29.66	AVG	P
10	2.9219	24.17	10.46	34.63	56.00	-21.37	QP	P
11	15.2785	27.01	10.72	37.73	60.00	-22.27	QP	P
12	15.2785	2.42	10.72	13.14	50.00	-36.86	AVG	P

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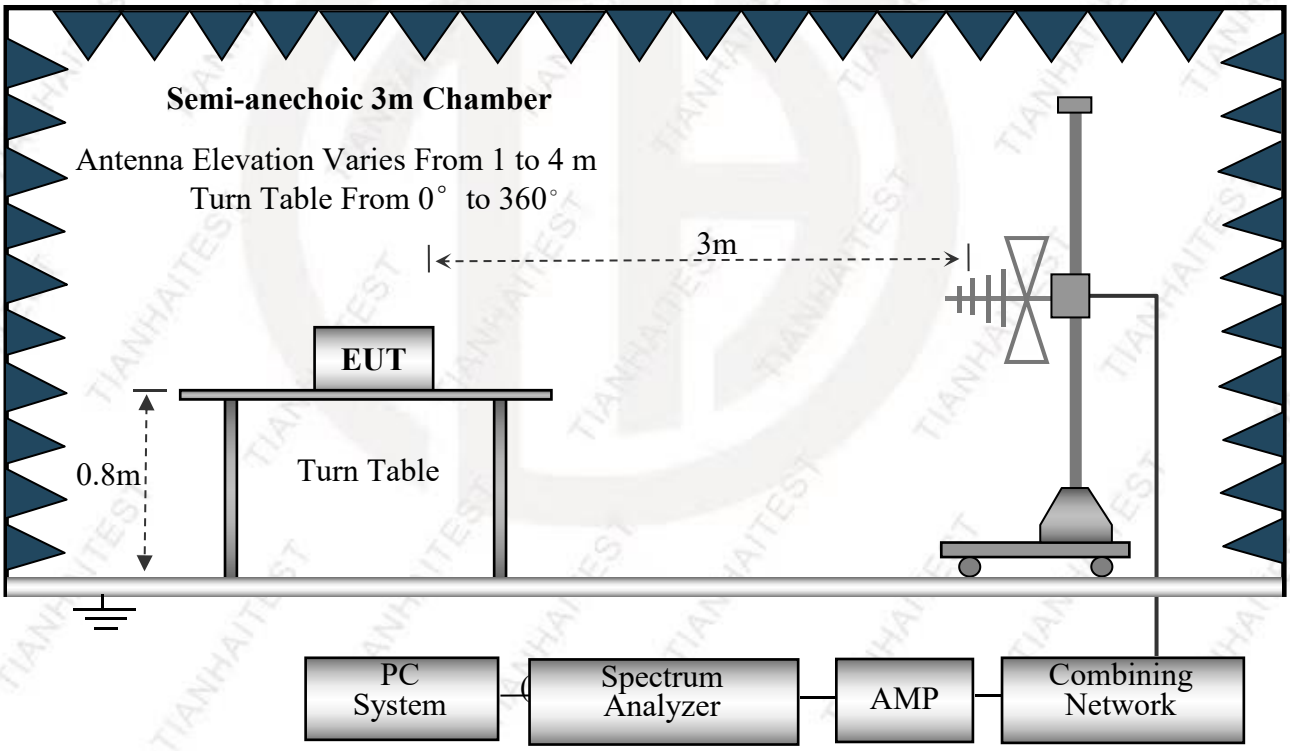
4 - RADIATED DISTURBANCES

4.1 Limit

EN 55032		
Below 1GHz		
Frequency (MHz)	Class A (at 3m)	Class B (at 3m)
	Quasi-Peak dBuV/m	Quasi-Peak dBuV/m
30 – 230	50	40
230 – 1000	57	47
Above 1GHz		
Frequency MHz	Field Strengths Limits dB(μV)/m	Detector
1000～3000	70	Peak
1000～3000	50	Average
3000～6000	74	Peak
3000～6000	54	Average

4.2 Test Setup



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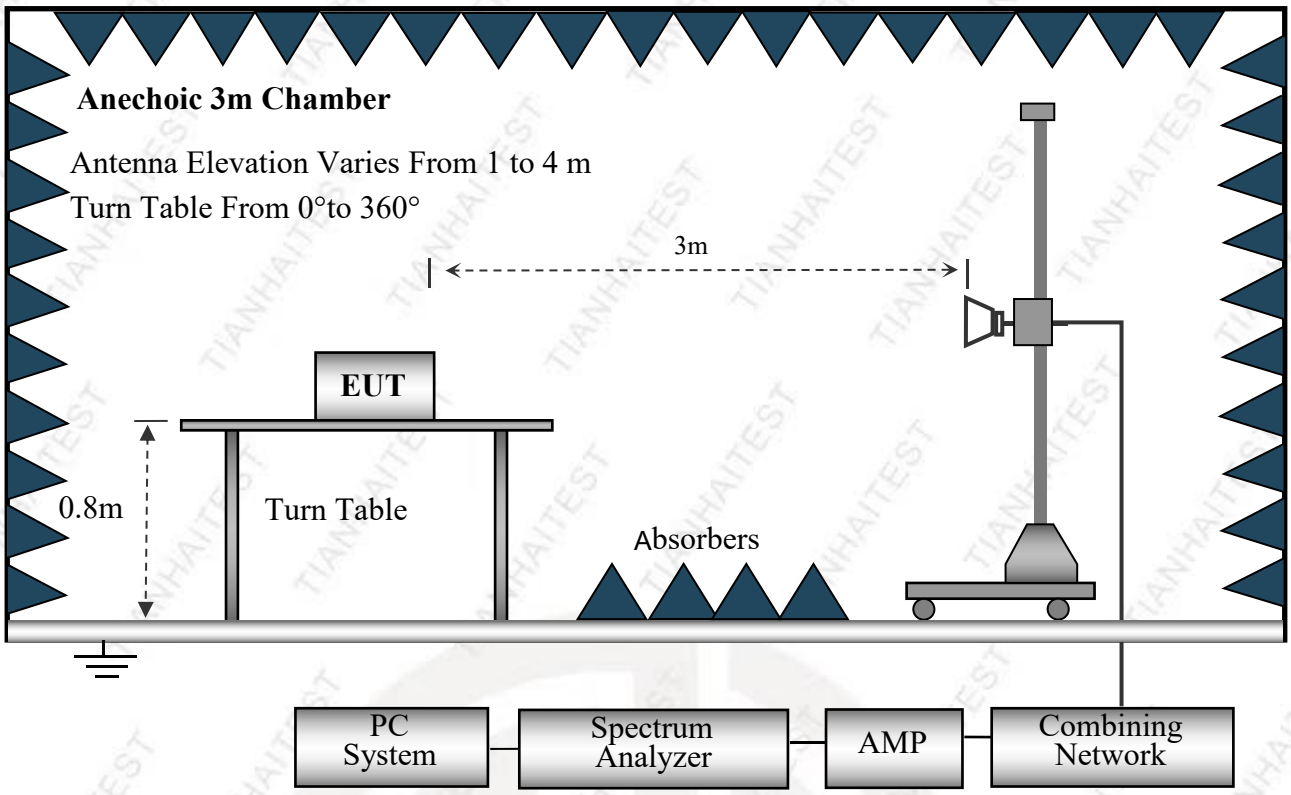

4.3 Test Procedure

a. The EUT was placed on the top of a rotating table 0.8 meters 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. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from 1 meter to 4 meters 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 meters and the rotatable table was turned from 0 degrees to 360 degrees 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. The test receiver/spectrum was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

4.4 Test Result

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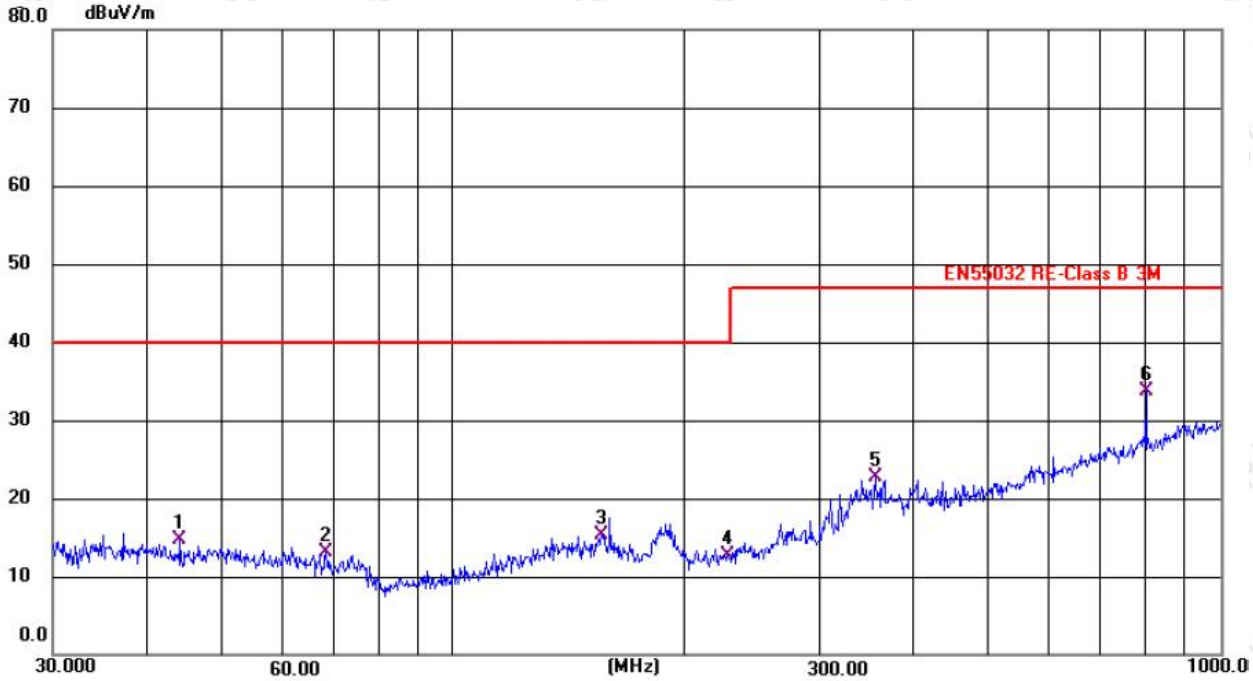
Below 1GHz Data

EUT : Mini Multi-Mode Gateway
M/N : JMMGW-mini
Operation Mode : Mode 1
Test Voltage : AC 230V/50Hz
Polarizations : Horizontal
Temperature (°C) : 21.7 Relative Humidity (%) : 48 Atmospheric Pressure(mbar) : 1015



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	43.9658	29.34	-14.70	14.64	40.00	-25.36	QP
2	68.2710	30.44	-17.29	13.15	40.00	-26.85	QP
3	156.4578	30.79	-15.49	15.30	40.00	-24.70	QP
4	228.0902	29.59	-16.95	12.64	40.00	-27.36	QP
5	355.4273	35.95	-13.28	22.67	47.00	-24.33	QP
6 *	800.3817	37.26	-3.65	33.61	47.00	-13.39	QP

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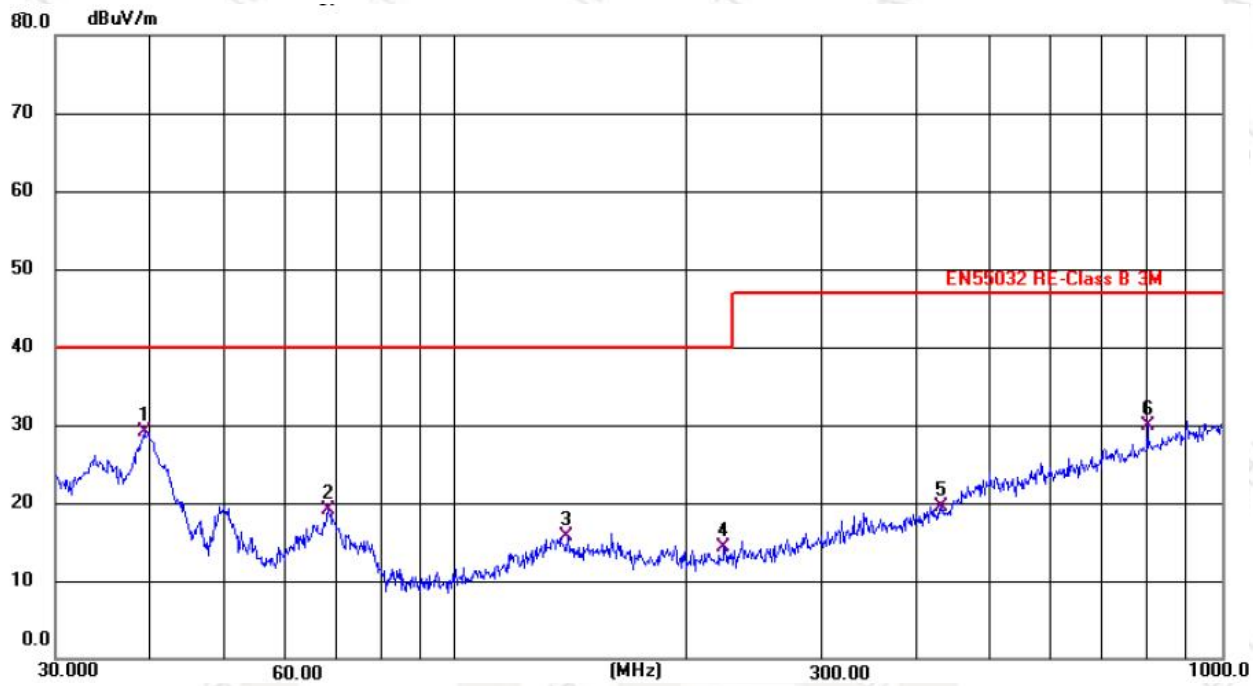
Below 1GHz Data

EUT : Mini Multi-Mode Gateway
M/N : JMMGW-mini
Operation Mode : Mode 1
Test Voltage : AC 230V/50Hz
Polarizations : Vertical
Temperature (°C) : 21.7 Relative Humidity (%) : 48 Atmospheric Pressure(mbar) : 1015



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	39.2991	43.82	-14.78	29.04	40.00	-10.96	QP
2	68.2710	36.24	-17.16	19.08	40.00	-20.92	QP
3	140.0961	31.39	-15.71	15.68	40.00	-24.32	QP
4	224.1260	31.72	-17.45	14.27	40.00	-25.73	QP
5	430.2765	30.84	-11.40	19.44	47.00	-27.56	QP
6	800.3817	34.06	-4.15	29.91	47.00	-17.09	QP

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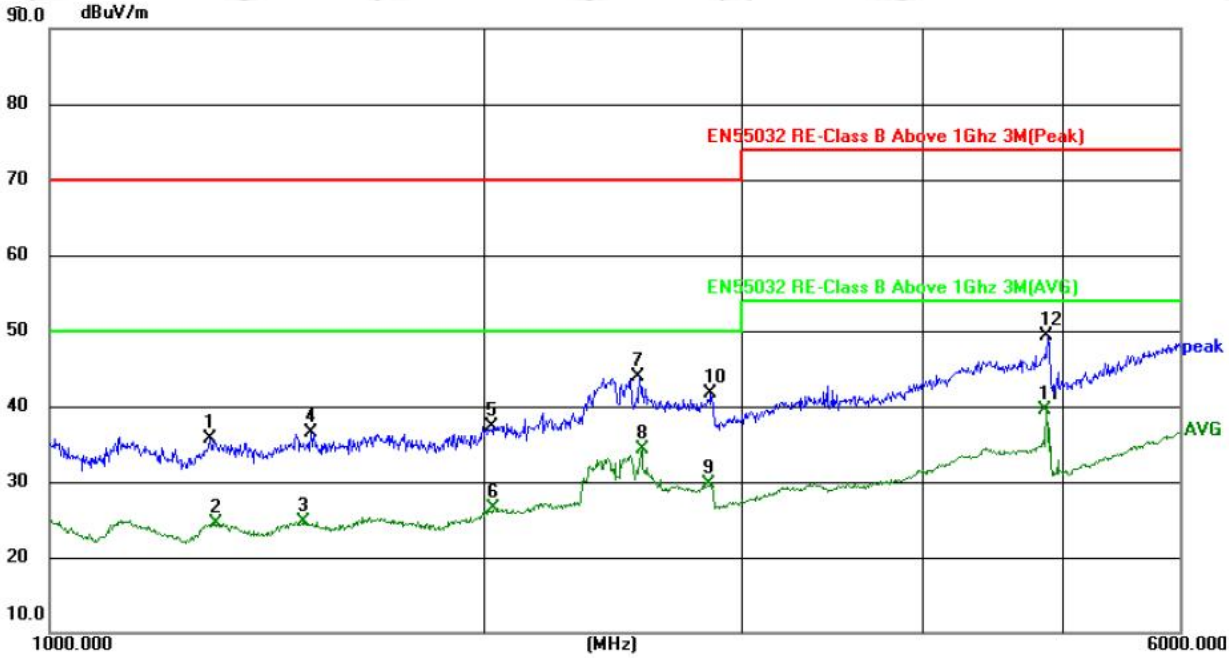
Above 1GHz Data

EUT	:	Mini Multi-Mode Gateway
M/N	:	JMMGW-mini
Operation Mode	:	Mode 1
Test Voltage	:	AC 230V/50Hz
Polarizations	:	Horizontal

Temperature (°C) : 22.2 Relative Humidity (%) : 50 Atmospheric Pressure(mbar) : 1015



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1292.039	42.98	-7.37	35.61	70.00	-34.39	peak
2	1304.834	31.87	-7.30	24.57	50.00	-25.43	AVG
3	1493.846	31.02	-6.30	24.72	50.00	-25.28	AVG
4	1515.413	42.81	-6.23	36.58	70.00	-33.42	peak
5	2022.150	41.25	-4.00	37.25	70.00	-32.75	peak
6	2027.592	30.52	-3.98	26.54	50.00	-23.46	AVG
7	2552.543	46.72	-2.76	43.96	70.00	-26.04	peak
8	2559.413	37.04	-2.75	34.29	50.00	-15.71	AVG
9	2855.009	32.06	-2.27	29.79	50.00	-20.21	AVG
10	2857.568	43.98	-2.27	41.71	70.00	-28.29	peak
11 *	4869.637	36.36	3.23	39.59	54.00	-14.41	AVG
12	4874.002	46.05	3.24	49.29	74.00	-24.71	peak

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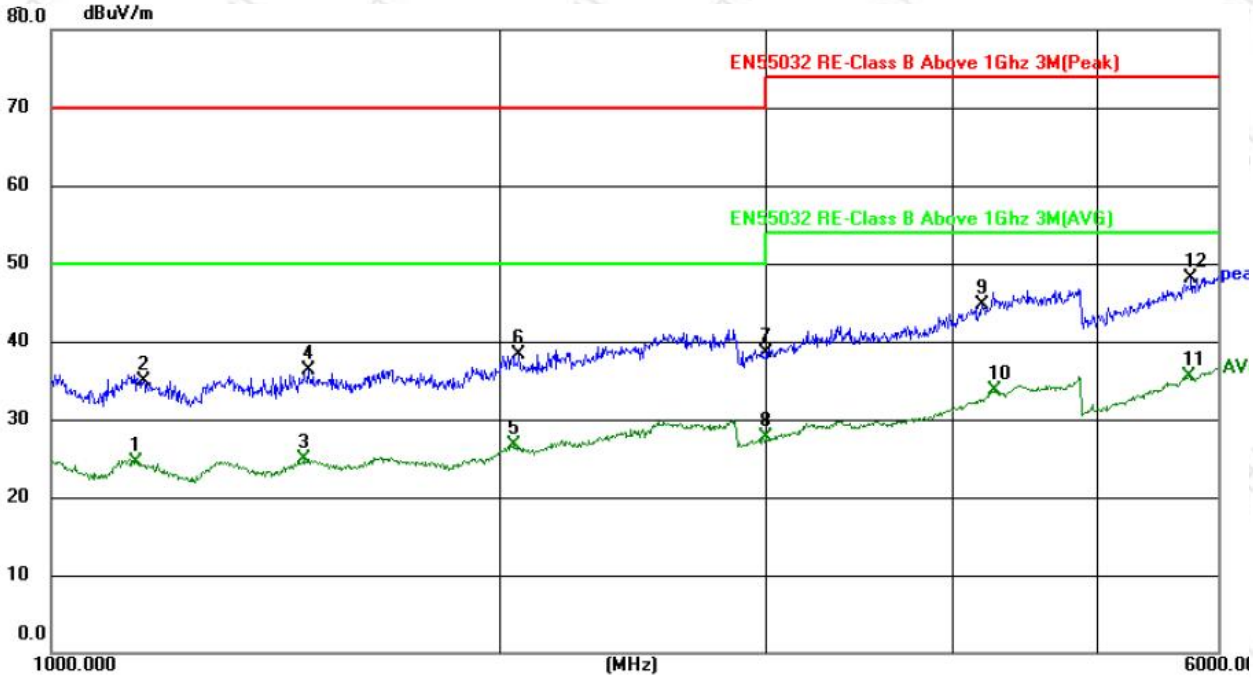
Above 1GHz Data

EUT : Mini Multi-Mode Gateway
M/N : JMMGW-mini
Operation Mode : Mode 1
Test Voltage : AC 230V/50Hz
Polarizations : Vertical
Temperature (°C) : 22.2 Relative Humidity (%) : 50 Atmospheric Pressure(mbar) : 1015



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1139.738	31.37	-6.77	24.60	50.00	-25.40	AVG
2	1154.123	41.66	-6.71	34.95	70.00	-35.05	peak
3	1475.227	30.08	-5.15	24.93	50.00	-25.07	AVG
4	1485.838	41.50	-5.10	36.40	70.00	-33.60	peak
5	2038.521	29.17	-2.54	26.63	50.00	-23.37	AVG
6	2055.024	40.79	-2.48	38.31	70.00	-31.69	peak
7	3001.897	37.83	0.66	38.49	74.00	-35.51	peak
8	3001.897	27.02	0.66	27.68	54.00	-26.32	AVG
9	4189.208	40.64	3.99	44.63	74.00	-29.37	peak
10	4261.126	29.53	4.09	33.62	54.00	-20.38	AVG
11 *	5747.456	28.50	7.04	35.54	54.00	-18.46	AVG
12	5768.089	40.91	7.13	48.04	74.00	-25.96	peak

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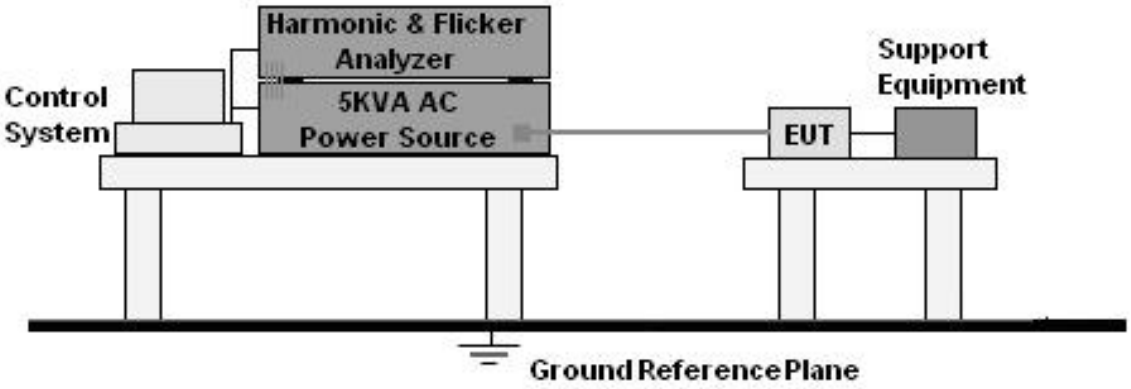
5 - HARMONIC CURRENT EMISSION

5.1 Test Standard

ETSI 301 489-1 / (EN IEC 61000-3-2)

5.2 Test Setup



5.3 Test Procedure

The power cord of the EUT is connected to the output of the test system. Turn on the power of the EUT and use the test system to test the harmonic current level.

5.4 Operating Condition of EUT

Standard used:	EN/IEC 61000-3-2 A14 (2006) Quasi-stationary - Equipment class A
Observation time:	150s
E. U. T	Mini Multi-Mode Gateway
M/N	JMMGW-mini
Operation Mode	Mode 1

5.5 Test Result

Pass

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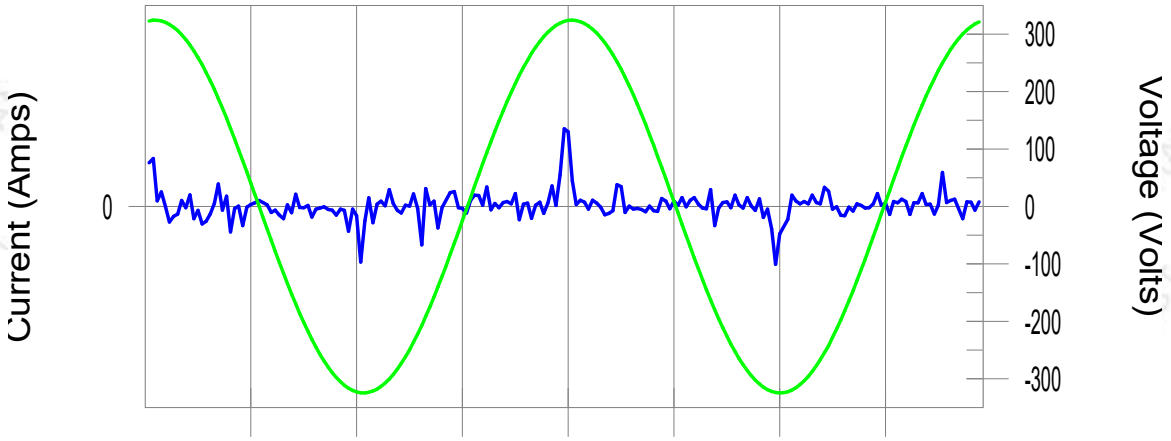
Harmonics – Class-A per Ed. 5.0 (2018)(Run time)

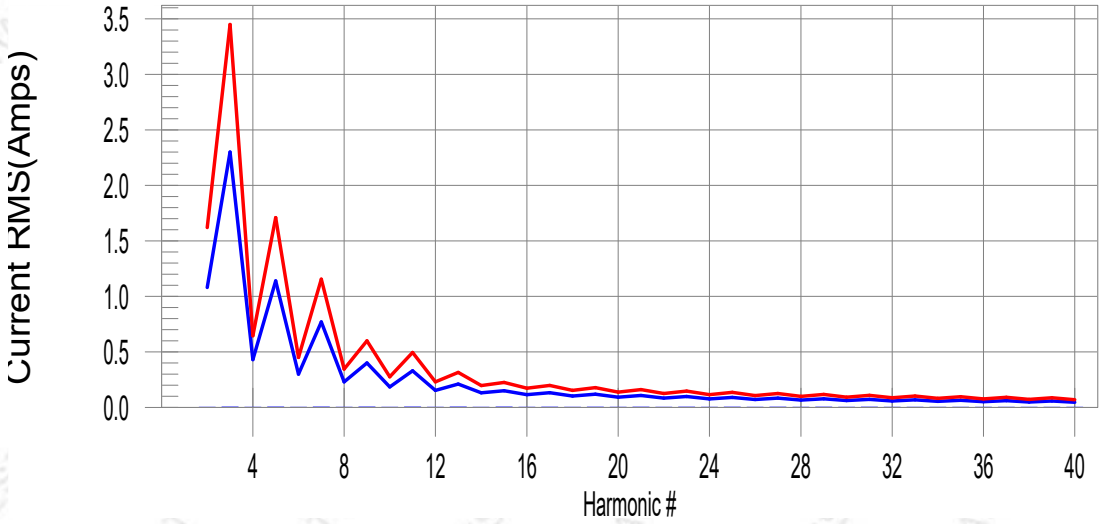
EUT: Mini Multi-Mode Gateway **Tested by: Rich**
Test category: Class-A per Ed. 5.0 (2018) (European limits) **Test Margin: 100**
Test date: 2022/9/28 **Start time: 11:01:32** **End time: 11:04:14**
Test duration (min): 2.5 **Data file name: H-000482.cts_data**
Comment: JMMGW-mini
Customer: Shenzhen Jiaomao Technology Co., Ltd.

Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class A limit line **European Limits**



Test result: Pass **Worst harmonics H0-0.0% of 150% limit, H0-0% of 100% limit**

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Current Test Result Summary (Run time)

EUT: Mini Multi-Mode Gateway **Tested by: Rich**
Test category: Class-A per Ed. 5.0 (2018) (European limits) **Test Margin: 100**
Test date: 2022/9/28 **Start time: 11:01:32** **End time: 11:04:14**
Test duration (min): 2.5 **Data file name: H-000482.cts_data**
Comment: JMMGW-mini
Customer: Shenzhen Jiaomao Technology Co., Ltd.

Test Result: Pass **Source qualification: Normal**
THC(A): 0.008 **I-THD(%): 253.5** **POHC(A): 0.004** **POHC Limit(A): 0.251**

Highest parameter values during test:

V_RMS (Volts):	229.58	Frequency(Hz):	50.00
I_Peak (Amps):	0.128	I_RMS (Amps):	0.014
I_Fund (Amps):	0.003	Crest Factor:	10.115
Power (Watts):	0.7	Power Factor:	0.266

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	N/A	0.001	1.620	N/A	Pass
3	0.003	2.300	N/A	0.004	3.450	N/A	Pass
4	0.001	0.430	N/A	0.001	0.645	N/A	Pass
5	0.002	1.140	N/A	0.003	1.710	N/A	Pass
6	0.000	0.300	N/A	0.001	0.450	N/A	Pass
7	0.002	0.770	N/A	0.003	1.155	N/A	Pass
8	0.000	0.230	N/A	0.000	0.345	N/A	Pass
9	0.002	0.400	N/A	0.003	0.600	N/A	Pass
10	0.000	0.184	N/A	0.000	0.276	N/A	Pass
11	0.002	0.330	N/A	0.002	0.495	N/A	Pass
12	0.000	0.153	N/A	0.000	0.230	N/A	Pass
13	0.002	0.210	N/A	0.003	0.315	N/A	Pass
14	0.000	0.131	N/A	0.000	0.197	N/A	Pass
15	0.002	0.150	N/A	0.002	0.225	N/A	Pass
16	0.000	0.115	N/A	0.000	0.173	N/A	Pass
17	0.002	0.132	N/A	0.002	0.198	N/A	Pass
18	0.000	0.102	N/A	0.000	0.153	N/A	Pass
19	0.002	0.118	N/A	0.002	0.178	N/A	Pass
20	0.000	0.092	N/A	0.000	0.138	N/A	Pass
21	0.002	0.107	N/A	0.002	0.161	N/A	Pass
22	0.000	0.084	N/A	0.000	0.125	N/A	Pass
23	0.002	0.098	N/A	0.002	0.147	N/A	Pass
24	0.000	0.077	N/A	0.000	0.115	N/A	Pass
25	0.002	0.090	N/A	0.002	0.135	N/A	Pass
26	0.000	0.071	N/A	0.000	0.107	N/A	Pass
27	0.001	0.083	N/A	0.002	0.125	N/A	Pass
28	0.000	0.066	N/A	0.000	0.099	N/A	Pass
29	0.001	0.078	N/A	0.001	0.116	N/A	Pass
30	0.000	0.061	N/A	0.000	0.092	N/A	Pass
31	0.001	0.073	N/A	0.001	0.109	N/A	Pass
32	0.000	0.058	N/A	0.001	0.086	N/A	Pass
33	0.001	0.068	N/A	0.001	0.102	N/A	Pass
34	0.000	0.054	N/A	0.000	0.081	N/A	Pass
35	0.001	0.064	N/A	0.001	0.096	N/A	Pass
36	0.000	0.051	N/A	0.000	0.077	N/A	Pass
37	0.001	0.061	N/A	0.001	0.091	N/A	Pass
38	0.000	0.048	N/A	0.000	0.073	N/A	Pass
39	0.001	0.058	N/A	0.001	0.087	N/A	Pass
40	0.000	0.046	N/A	0.000	0.069	N/A	Pass

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Voltage Source Verification Data (Run time)

EUT: Mini Multi-Mode Gateway **Tested by: Rich**
Test category: Class-A per Ed. 5.0 (2018) (European limits) **Test Margin: 100**
Test date: 2022/9/28 **Start time: 11:01:32** **End time: 11:04:14**
Test duration (min): 2.5 **Data file name: H-000482.cts_data**
Comment: JMMGW-mini
Customer: Shenzhen Jiaomao Technology Co., Ltd.

Test Result: Pass **Source qualification: Normal**

Highest parameter values during test:

Voltage (Vrms):	229.58	Frequency(Hz):	50.00
I_Peak (Amps):	0.128	I_RMS (Amps):	0.014
I_Fund (Amps):	0.003	Crest Factor:	10.115
Power (Watts):	0.7	Power Factor:	0.266

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.087	0.459	18.88	OK
3	0.475	2.066	22.98	OK
4	0.062	0.459	13.45	OK
5	0.033	0.918	3.58	OK
6	0.028	0.459	6.11	OK
7	0.038	0.689	5.47	OK
8	0.016	0.459	3.44	OK
9	0.014	0.459	3.11	OK
10	0.015	0.459	3.27	OK
11	0.010	0.230	4.21	OK
12	0.014	0.230	6.26	OK
13	0.011	0.230	4.74	OK
14	0.009	0.229	4.02	OK
15	0.010	0.230	4.29	OK
16	0.007	0.229	2.97	OK
17	0.008	0.230	3.34	OK
18	0.008	0.229	3.41	OK
19	0.010	0.230	4.17	OK
20	0.011	0.230	4.86	OK
21	0.009	0.230	3.73	OK
22	0.007	0.230	2.88	OK
23	0.008	0.230	3.45	OK
24	0.007	0.230	2.93	OK
25	0.008	0.229	3.37	OK
26	0.006	0.230	2.82	OK
27	0.008	0.230	3.30	OK
28	0.007	0.230	2.88	OK
29	0.008	0.229	3.48	OK
30	0.006	0.230	2.80	OK
31	0.007	0.229	3.17	OK
32	0.007	0.230	2.98	OK
33	0.006	0.230	2.64	OK
34	0.007	0.230	2.85	OK
35	0.007	0.230	3.22	OK
36	0.006	0.229	2.40	OK
37	0.008	0.230	3.42	OK
38	0.006	0.229	2.71	OK
39	0.008	0.230	3.50	OK
40	0.008	0.230	3.66	OK

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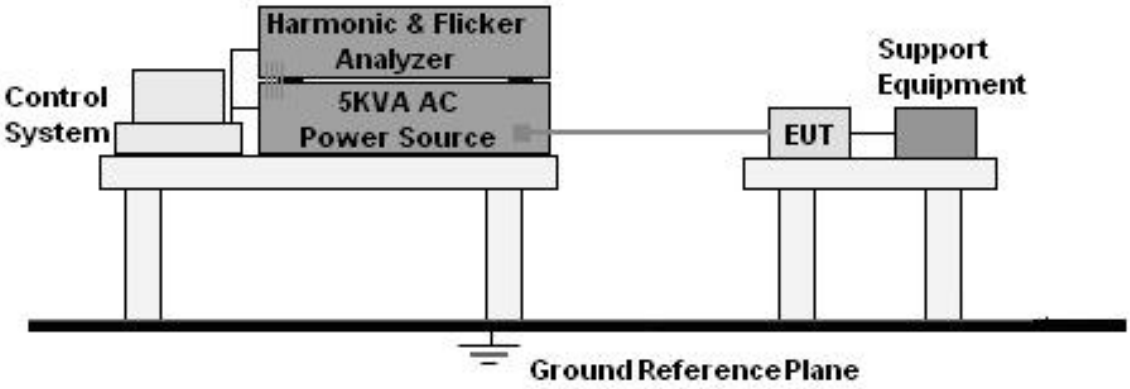
6 - VOLTAGE FLUCTUATIONS & FLICKER

6.1 Limit

ETSI 301 489-1 / (EN 61000-3-3)	
Test Items	Limit
Pst	1.0
dc	3.3%
Tmax	4.0%
dt	Not exceed 3.3% for 500ms

6.2 Test Setup



6.3 Test Procedure

a. The Product was placed on the top of a non-conductive table above the ground and operated to produce the most unfavorable sequence of voltage changes under normal Test Modes.
b. During the flick test, the measure time shall include that part of whole operation cycle in which the Product procedure the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

6.4 Test Result

Pass

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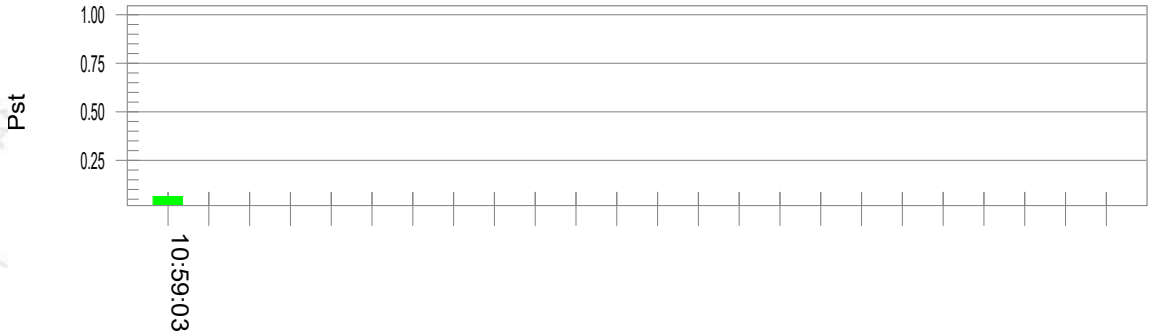
Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

EUT: Mini Multi-Mode Gateway **Tested by: Rich**
Test category: All parameters (European limits) **Test Margin: 100**
Test date: 2022/9/28 **Start time: 10:48:42** **End time: 10:59:09**
Test duration (min): 10 **Data file name: F-000481.cts_data**
Comment: JMMGW-mini
Customer: Shenzhen Jiaomao Technology Co., Ltd.

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):	**229.93**			
T-max (mS):	**0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.00**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.064**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.028**	**Test limit:**	**0.650**	**Pass**

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7 - GENERAL PERFORMANCE CRITERIA FOR IMMUNITY TEST

EN 55035 General Performance Criteria	
Criterion A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below aperformance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
	For audio output device: The measured acoustic interference ratio and/or the measured electrical interference during the test shall be -20dB or better(see note1)
Criterion B	During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test. After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criterion C	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

EN 301 489-17 Performance criteria		
Criteria	During test	After 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 stored data.
B	May show 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 a and b. (a) For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %. (b) 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.		

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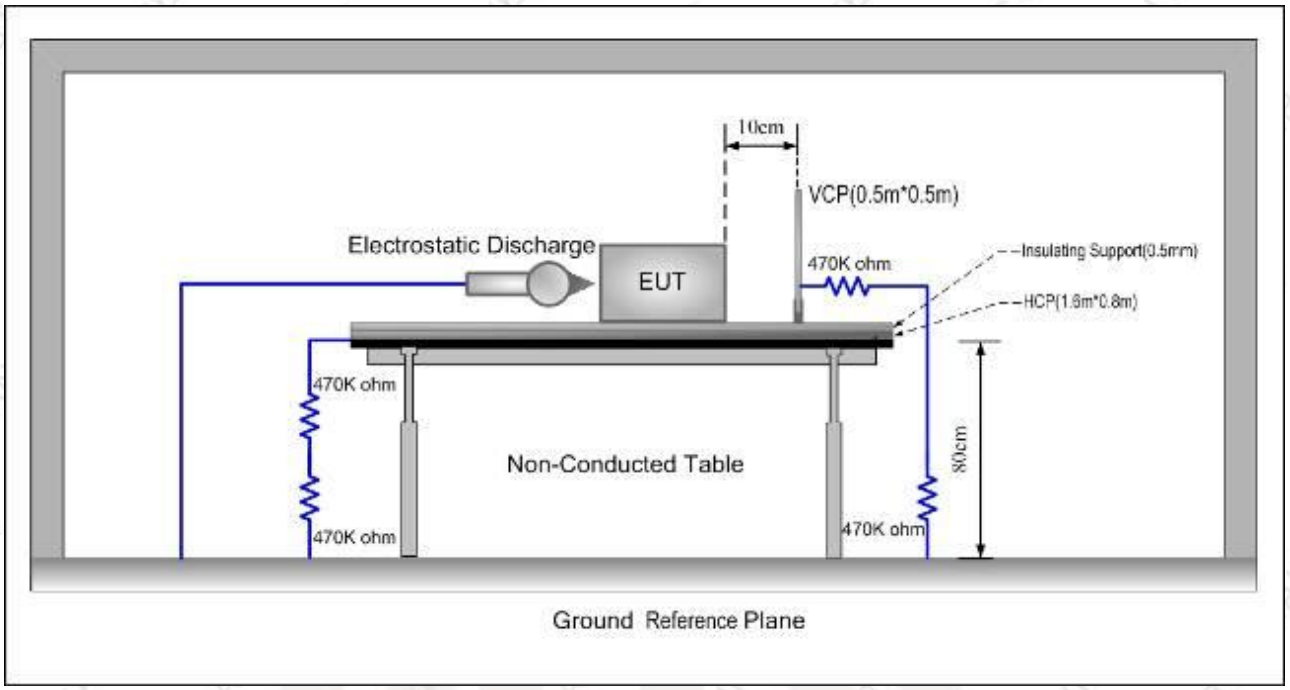
8 - ELECTROSTATIC DISCHARGE IMMUNITY TEST

8.1 Test Setup



8.2 Test Standard

EN 55035, ETSI EN 301 489-17, EN 61000-4-2

8.3 Severity Levels and Performance Criterion

Severity Level: 3 / Air Discharge: ±8kV
Level: 2 / Contact Discharge: ±4kV
Performance criterion: B

8.4 Test Procedure

Air Discharge:
This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 20 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Contact Discharge:
All the procedure shall be same as Air Discharge. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

Indirect discharge for horizontal coupling plane:
At least 25 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

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Indirect discharge for vertical coupling plane:
At least 25 singles discharge (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m×0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

8.5 Test Result

Please refer to following:

Electrostatic Discharge Test Data

EUT : Mini Multi-Mode Gateway
M/N : JMMGW-mini
Operation Mode : Mode 1, Mode2
Test Voltage : AC 230V/50Hz, AC 230V/50Hz
Temperature (°C) : 23.2 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015

Discharge Method	Discharge Position	Test Level /±kV	Remark	Result (Pass/Fail)
Contact Discharge	Mini USB port	2, 4	A	Pass
	Indirect Discharge HCP	2, 4	A	Pass
	Indirect Discharge VCP	2, 4	A	Pass
	Insulating Surfaces, Indicator light	2, 4, 8	A	Pass
Air Discharge	Mini USB port	2, 4	A	Pass

Note:
No obvious change of function was found after the test.

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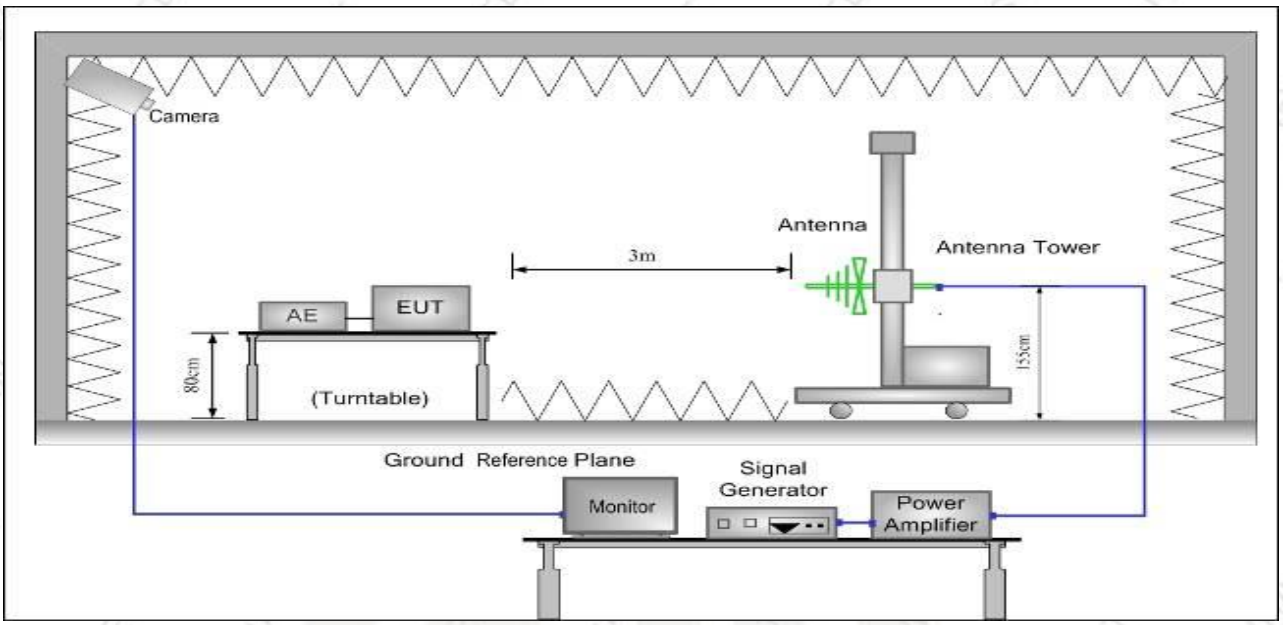
9 - RF FIELD STRENGTH SUSCEPTIBILITY TEST

9.1 Test Setup



9.2 Test Standard

EN 55035, ETSI EN 301 489-17, EN IEC 61000-4-3

9.3 Severity Levels and Performance Criterion

Severity Level 2, 3V/m
Performance criterion: B

9.4 Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. EUT is set 3 meter away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually.
All the scanning conditions are as follows:

Condition of Test	Remarks
Fielded Strength	3 V/m (Severity Level 2)
Radiated Signal	Modulated
Scanning Frequency	80 – 6000 MHz
Dwell time of radiated	0.0015 decade/s
Waiting Time	1 Sec.

9.5 Test Result

Please refer to following:

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EN 55035 R/S Test Data

EUT : Mini Multi-Mode Gateway
M/N : JMMGW-mini
Operation Mode : Mode 1, Mode 2
Test Voltage : AC 230V/50Hz, AC 230V/50Hz
Temperature (°C) : 24.8 Relative Humidity (%) : 55 Atmospheric Pressure(mbar) : 1015

Frequency Range	Field Strength (V/m)	Position	Polarization of Antenna	Result (Pass/Fail)
80 - 1000MHz	3	Front, Right, Back, Left	Horizontal	Pass
80 - 1000MHz	3	Front, Right, Back, Left	Vertical	Pass
1800MHz	3	Front, Right, Back, Left	Horizontal	Pass
1800MHz	3	Front, Right, Back, Left	Vertical	Pass
2600MHz	3	Front, Right, Back, Left	Horizontal	Pass
2600MHz	3	Front, Right, Back, Left	Vertical	Pass
3500MHz	3	Front, Right, Back, Left	Horizontal	Pass
3500MHz	3	Front, Right, Back, Left	Vertical	Pass
5000MHz	3	Front, Right, Back, Left	Horizontal	Pass
5000MHz	3	Front, Right, Back, Left	Vertical	Pass

Note:
No loss of function was observed.

ETSI EN 301 489-17 R/S Test Data

EUT : Mini Multi-Mode Gateway
M/N : JMMGW-mini
Operation Mode : Mode 1, Mode 2
Test Voltage : AC 230V/50Hz, AC 230V/50Hz
Temperature (°C) : 24.8 Relative Humidity (%) : 55 Atmospheric Pressure(mbar) : 1015

Frequency Range	Field Strength (V/m)	Position	Polarization of Antenna	Result (Pass/Fail)
80 - 6000MHz	3	Front, Right, Back, Left	Horizontal	Pass
80 - 6000MHz	3	Front, Right, Back, Left	Vertical	Pass

Note:
No loss of function was observed.

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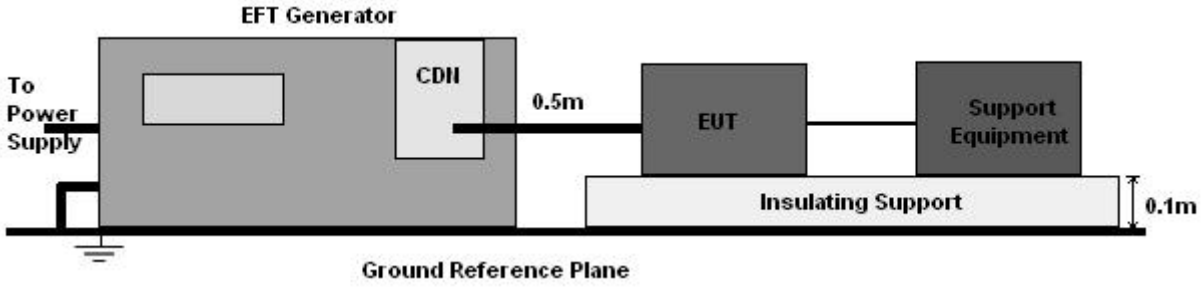
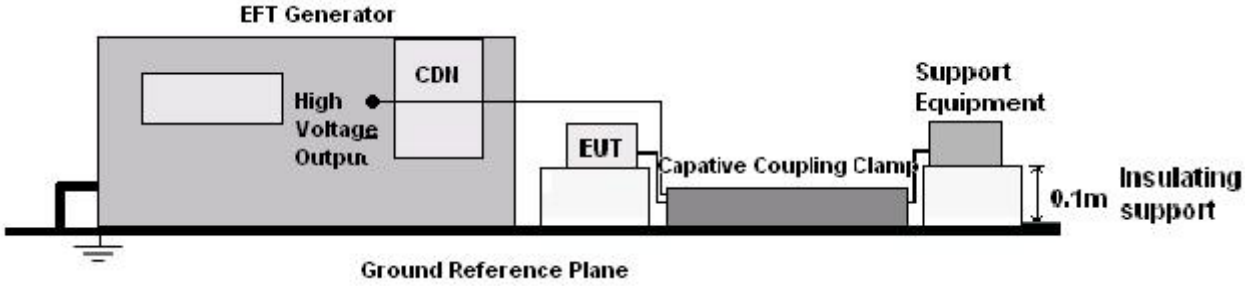
10 - ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

10.1 Test Setup



For input a.c. / d.c. power port



For signal lines and control lines

10.2 Test Standard

EN 55035, ETSI EN 301 489-17, EN 61000-4-4

10.3 Severity Levels and Performance Criterion

Severity Level 2 at 1kV, Pulse Rise time & Duration: 5 ns / 50 ns
Performance criterion: B

10.4 Test Procedure

EUT shall be placed 0.8m high above the ground reference plane which is a min.1m*1m metallic sheet with 0.65mm minimum thickness. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m
For input and output AC power ports:
The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 minutes.

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10.5 Test Result

EFT Test Data

EUT : Mini Multi-Mode Gateway
M/N : JMMGW-mini
Operation Mode : Mode 1, Mode 2
Test Voltage : AC 230V/50Hz
Temperature (°C) : 21.2 Relative Humidity (%) : 50 Atmospheric Pressure(mbar) : 1015

Conductor	Test Level /kV	Remark	Result (Pass/Fail)
L	±1kV	B	Pass
N	±1kV	B	Pass
L - N	±1kV	B	Pass

Note:
No loss of function was observed.

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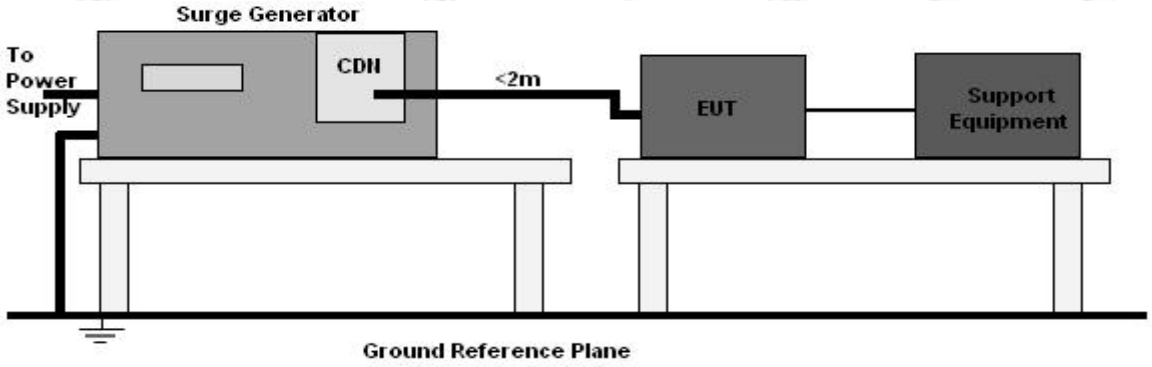
11 - SURGE IMMUNITY TEST

11.1 Test Setup



11.2 Test Standard

EN 55035, ETSI EN 301 489-17, EN 61000-4-5

11.3 Severity Levels and Performance Criterion

Severity Level: Line to Line, Level 2 at 1KV;
Severity Level: Line to Earth, Level 3 at 2KV.
Performance criterion: B

11.4 Test Procedure

1) Set up the EUT and test generator as shown on section 11.1
2) For line to line coupling mode, provide a 1KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.
3) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
4) Different phase angles are done individually.
5) Repeat procedure 2) to 4) except the open-circuit test voltage change from 1KV to 2KV for line to earth coupling mode test.
6) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

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11.5 Test Result

Surge Test Data

EUT : Mini Multi-Mode Gateway
M/N : JMMGW-mini
Operation Mode : Mode 1, Mode 2
Test Voltage : AC 230V/50Hz
Temperature (°C) : 21.2 Relative Humidity (%) : 50 Atmospheric Pressure(mbar) : 1015

Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (kV)	Result (Pass/Fail)
L-N	±	0°	10	1.0	Pass
	±	90°	10	1.0	Pass
	±	180°	10	1.0	Pass
	±	270°	10	1.0	Pass
L - PE	/	/	/	/	/
	/	/	/	/	/
	/	/	/	/	/
	/	/	/	/	/
N - PE	/	/	/	/	/
	/	/	/	/	/
	/	/	/	/	/
	/	/	/	/	/
Signal Line	±	/	/	/	/

Note:
No loss of function was observed.

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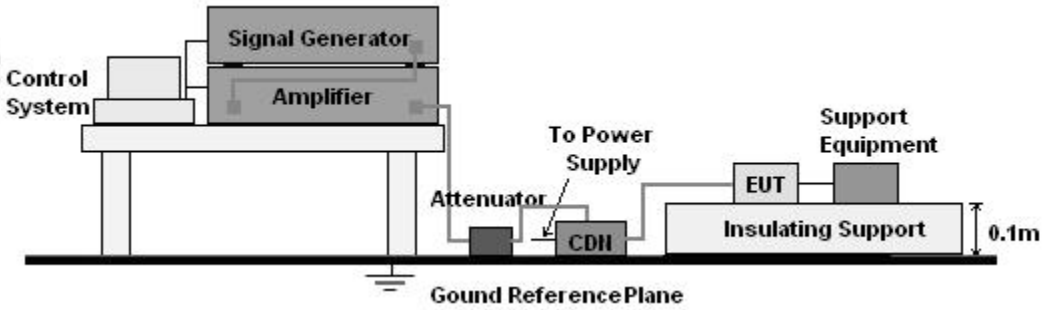
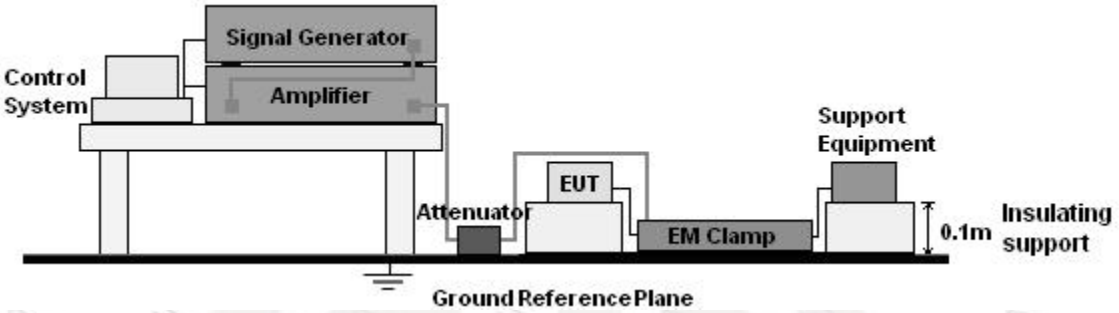
12 - INJECTED CURRENTS SUSCEPTIBILITY TEST

12.1 Test Setup



For input a.c. / d.c. power port



For signal lines and control lines

12.2 Test Standard

EN 55035, ETSI EN 301 489-17, EN 61000-4-6

12.3 Severity Levels and Performance Criterion

Severity Level 2: 3V (rms), 150KHz - 80MHz
Performance criterion: A

12.4 Test Procedure

1) Set up the EUT, CDN and test generator as shown on section 12.1
2) Let EUT work in test mode and measure.
3) The EUT and supporting equipments are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane at above 0.1-0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
4) The disturbance signal described below is injected to EUT through CDN.
5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
6) The frequency range is swept from 150KHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave
7) The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
8) Recording the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

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12.5 Test Result

Please refer to following:

EN 55035 CS Test Data

EUT : Laptop
M/N : R40
Operation Mode : Mode 1
Test Voltage : DC 5V from Adapter
Temperature (°C) : 25 Relative Humidity (%) : 54 Atmospheric Pressure(mbar) : 1015

Frequency Range	Injected Position	Test Level (r.m.s.)	Result (Pass/Fail)
0.15 - 10MHz	AC Mains	3	Pass
10 - 30MHz		3 - 1	Pass
30 - 80MHz		1	Pass
Note: No loss of function was observed.			

ETSI EN 301 489-17 CS Test Data

EUT : Laptop
M/N : R40
Operation Mode : Mode 1
Test Voltage : DC 3.7V from Battery
Polarizations : Vertical
Temperature (°C) : 21.2 Relative Humidity (%) : 50 Atmospheric Pressure(mbar) : 1015

Frequency Range	Injected Position	Test Level (r.m.s.)	Result (Pass/Fail)
0.15 - 10MHz	AC Line	3	Pass
10 - 30MHz		3 - 1	Pass
30 - 80MHz		1	Pass
0.15 - 10MHz	Signal Line	/	/
10 - 30MHz		/	/
30 - 80MHz		/	/
Note: No loss of function was observed.			

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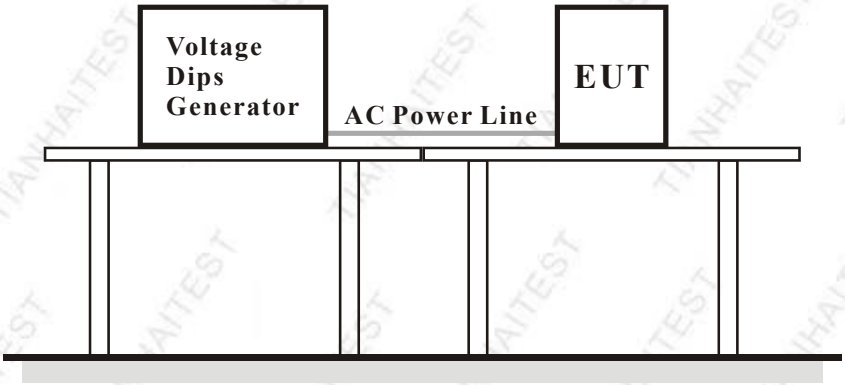
13 - VOLTAGE DIPS AND INTERRUPTIONS TEST

13.1 Test Setup



13.2 Test Standard

EN 55035, ETSI EN 301 489-17, EN IEC 61000-4-11

13.3 Severity Levels and Performance Criterion

Input and Output AC Power Ports.
Voltage Dips.
Voltage Interruptions.

Environmental Phenomena	Test Specification	Units	Performance Criterion
Voltage Dips	100 0.5	% Reduction period	B
	100 1	% Reduction period	B
	30 25	% Reduction period	C
Voltage Interruptions	100 250	% Reduction period	C

13.4 Test Procedure

1) Set up the EUT and test generator as shown on section 14.1
2) The interruption is introduced at selected phase angles with specified duration. There is a 3mins minimum interval between each test event.
3) After each test a full functional check is performed before the next test.
4) Repeat procedures 2 & 3 for voltage dips, only the level and duration is changed.
5) Record any degradation of performance.

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13.5 Test Result

Please refer to following:

Voltage Dips & Short Interruptions Test Data

EUT : Laptop
M/N : R40
Operation Mode : Mode 1
Test Voltage : DC 5V from Adapter
Temperature (°C) : 21.2 Relative Humidity (%) : 50 Atmospheric Pressure(mbar) : 1015

Test Level %UT	Voltage Dips %UT	Duration (in period) 50Hz/60Hz	Phase Angle	Performance Criterion	Result (Pass/Fail)
0	100	0.5P	0°- 360°	B	Pass
0	100	1P	0°-360°	B	Pass
70	30	25P	0°-360°	B	Pass
0	100	250	0°	C	Pass

Note:
Means EUT Shut down, lost function. It should be recoverable by operator.

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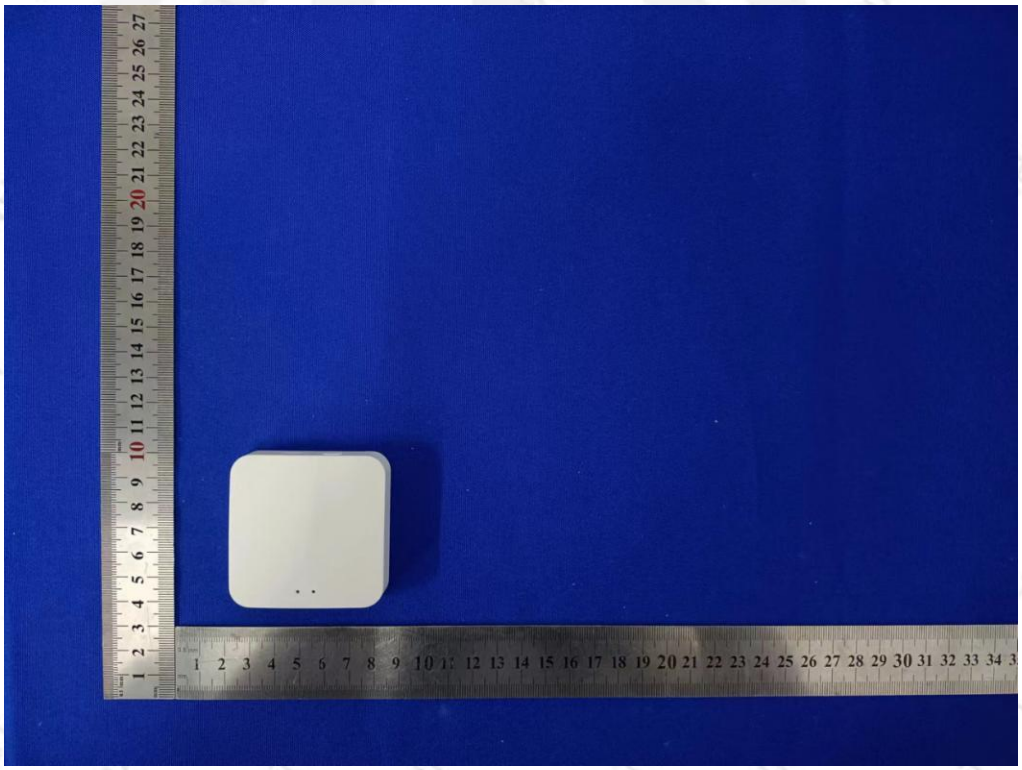
APPENDIX A - EUT PHOTOGRAPHS



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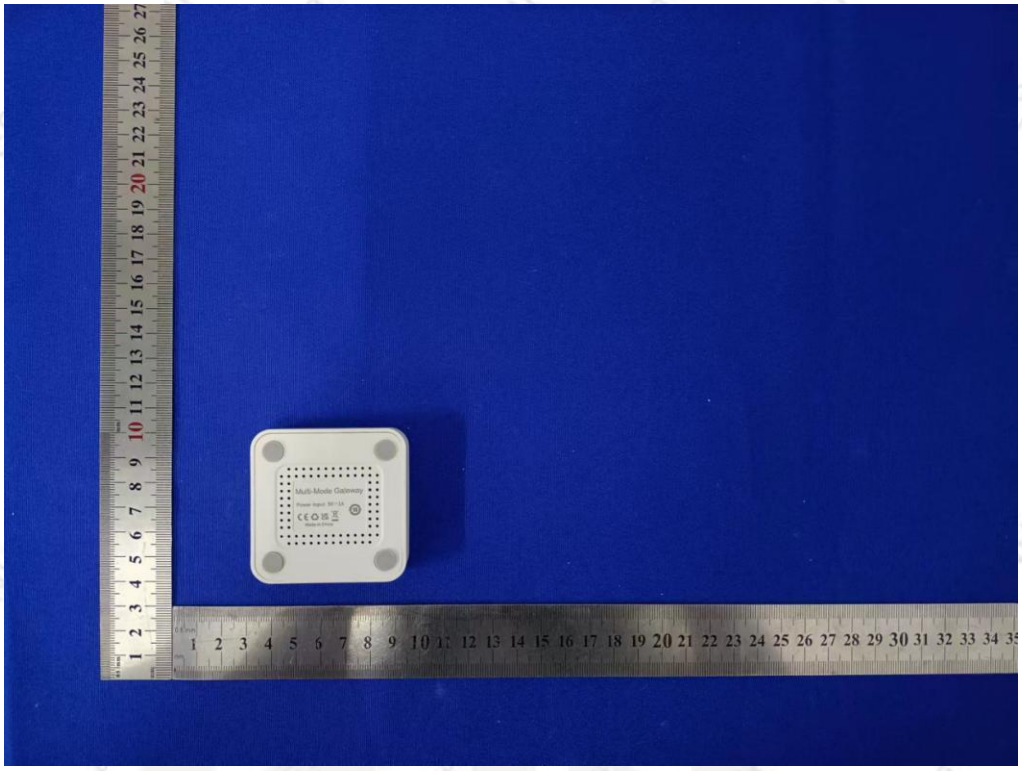

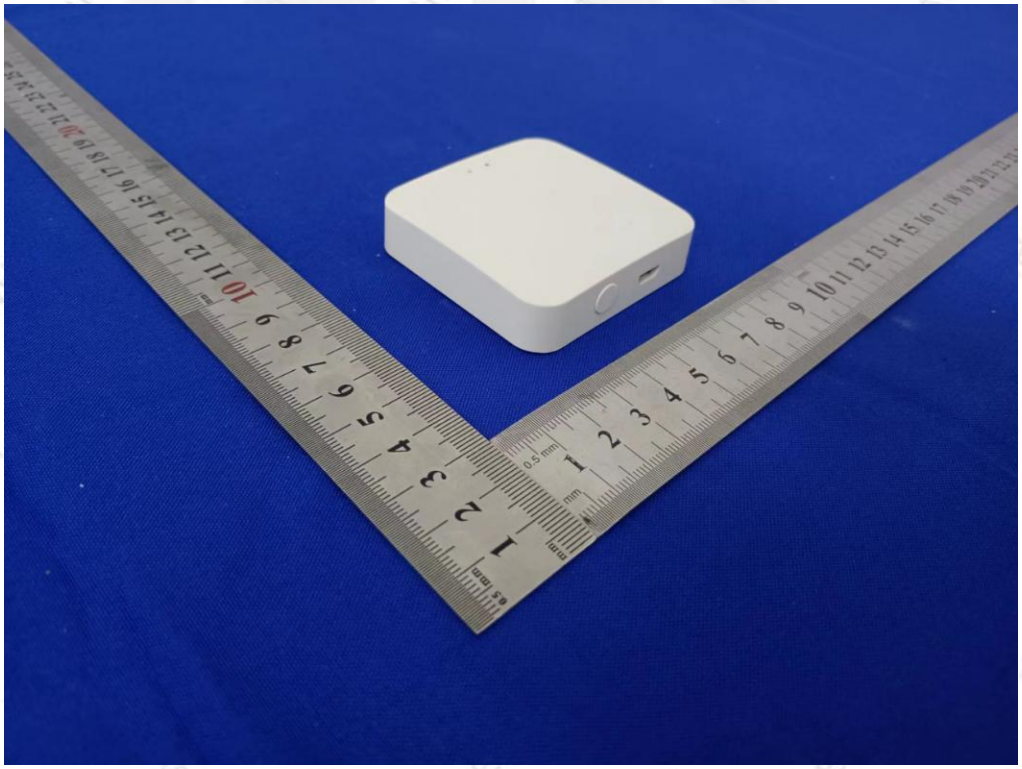

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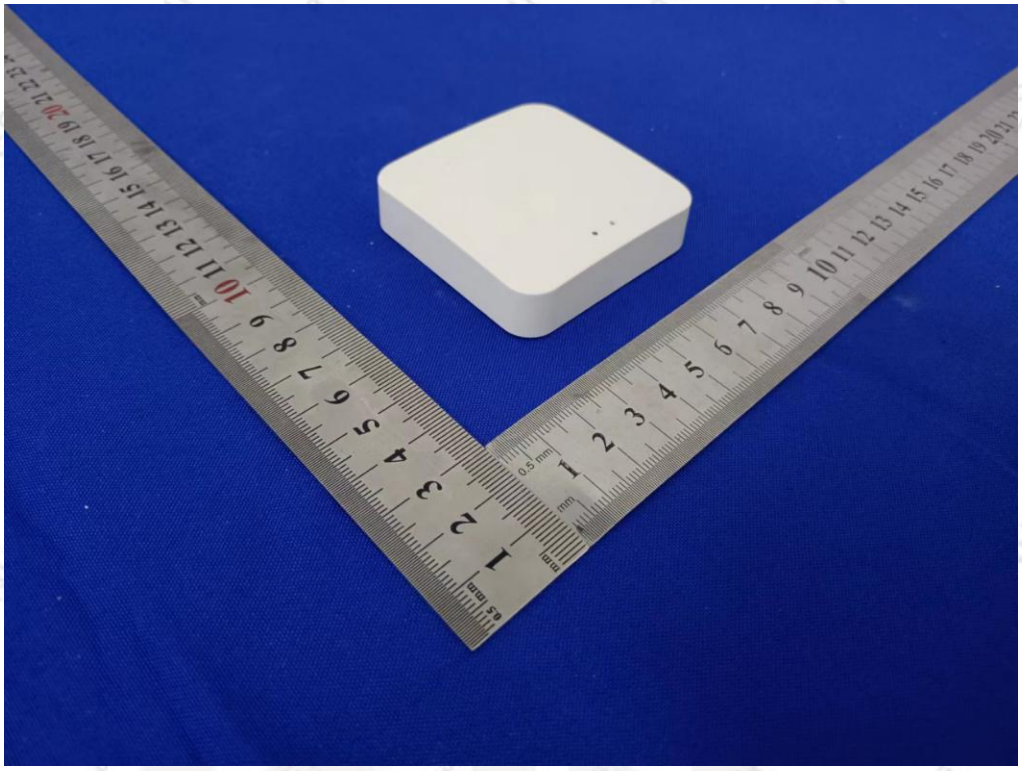

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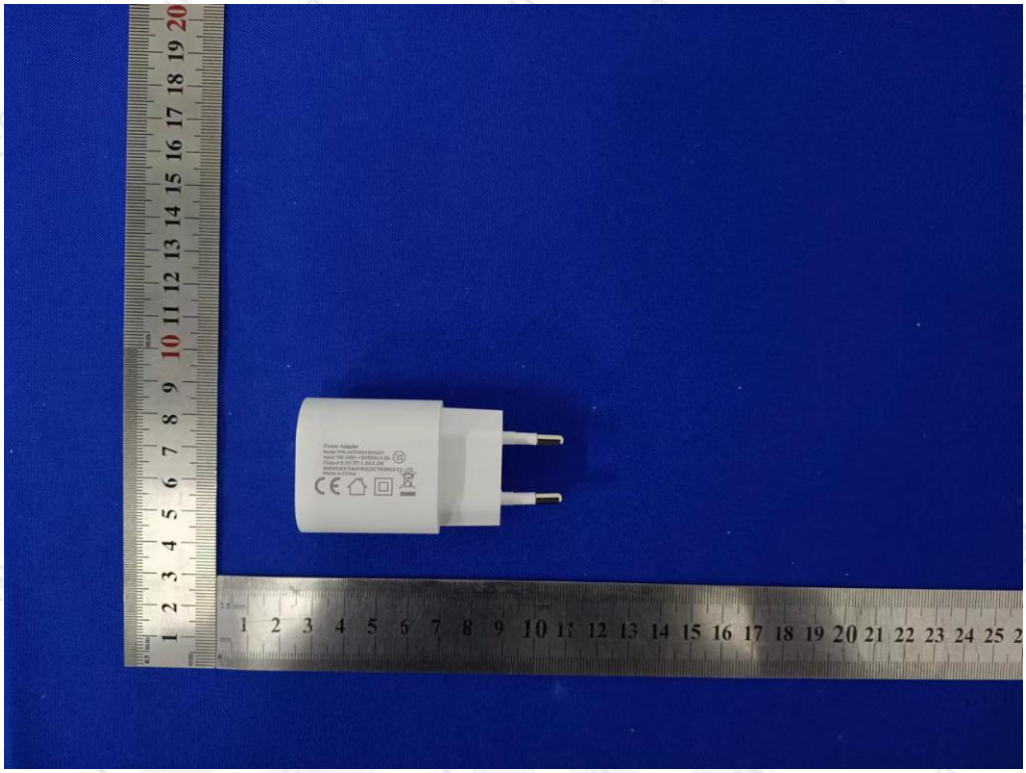

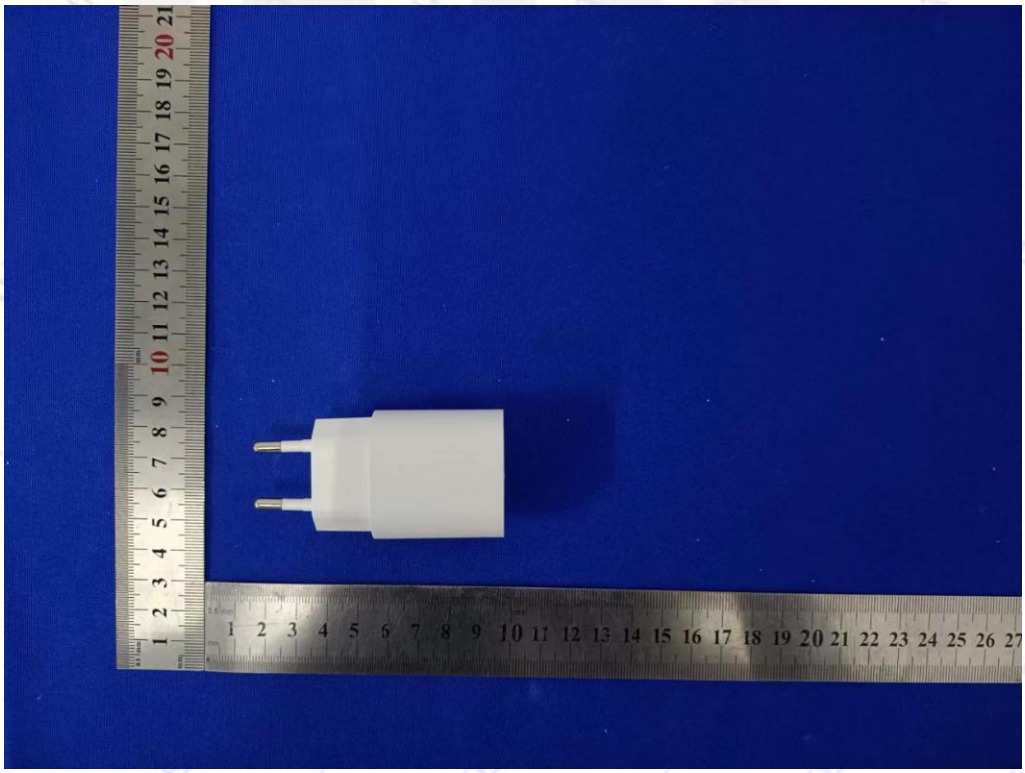

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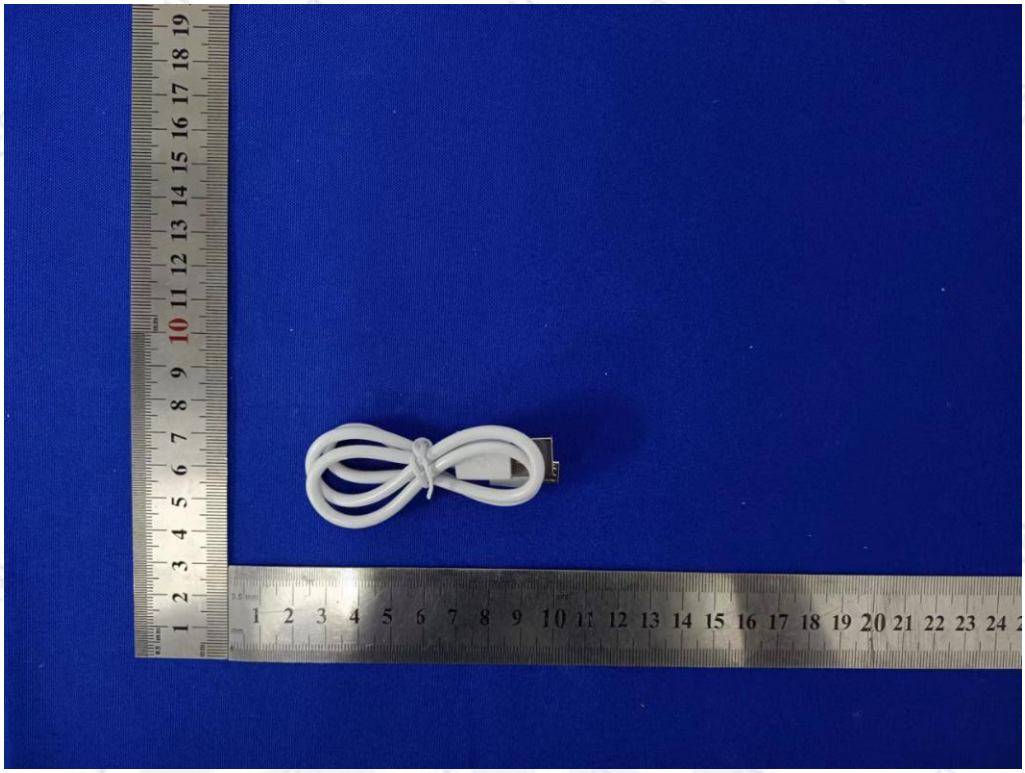

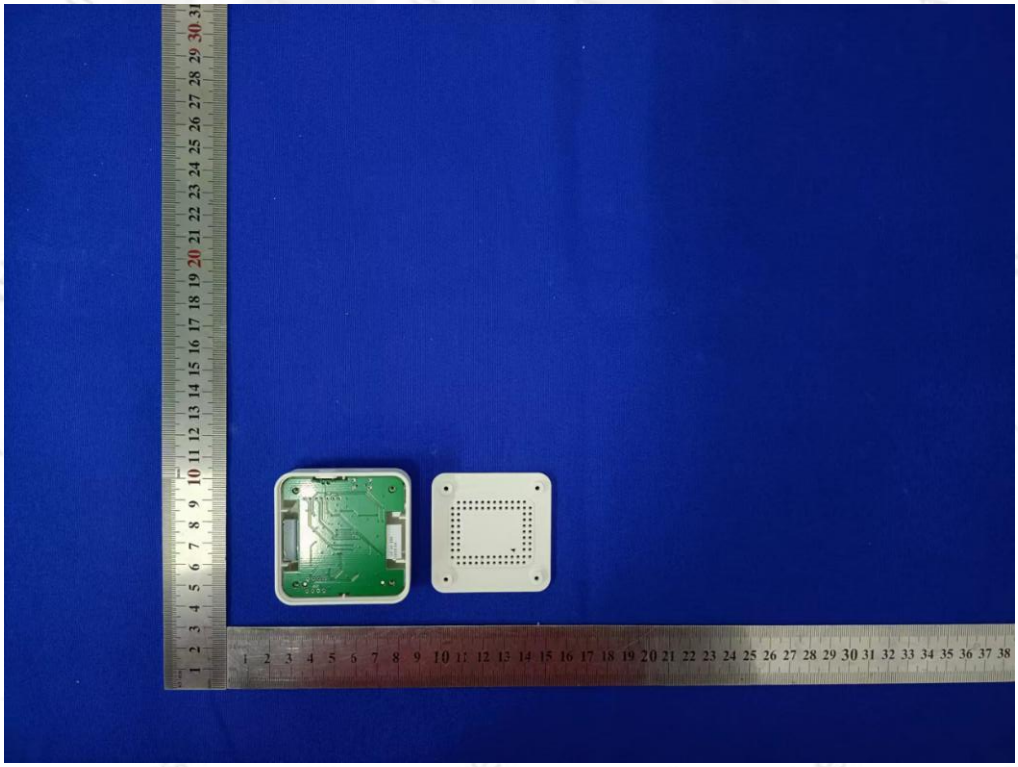

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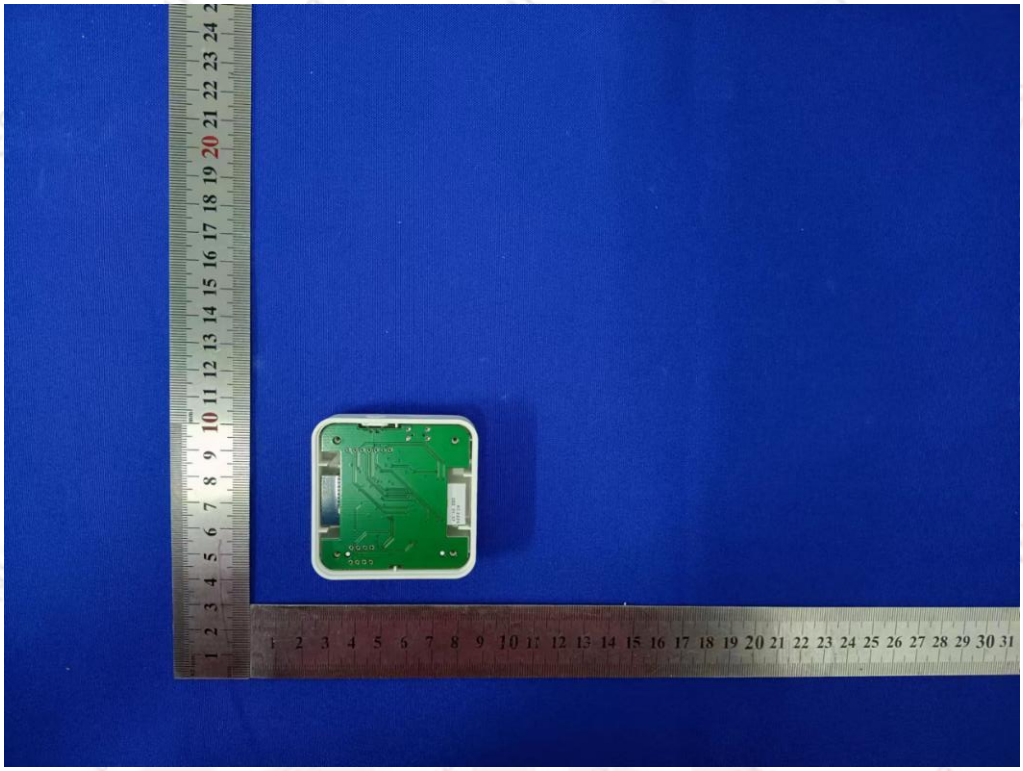

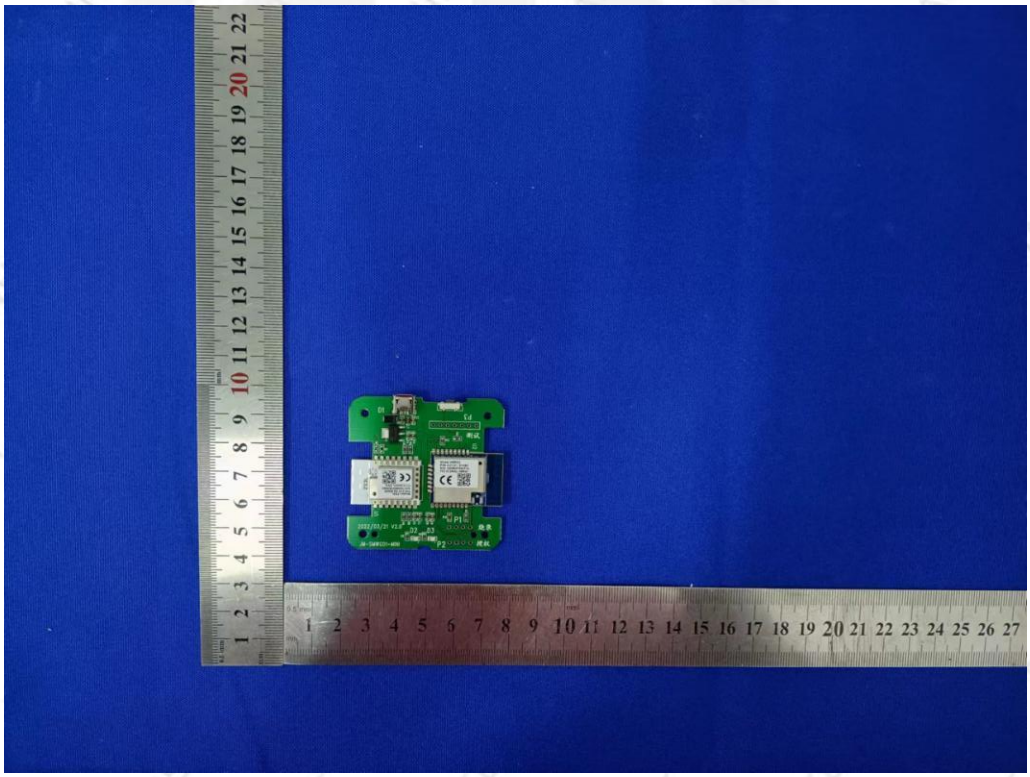

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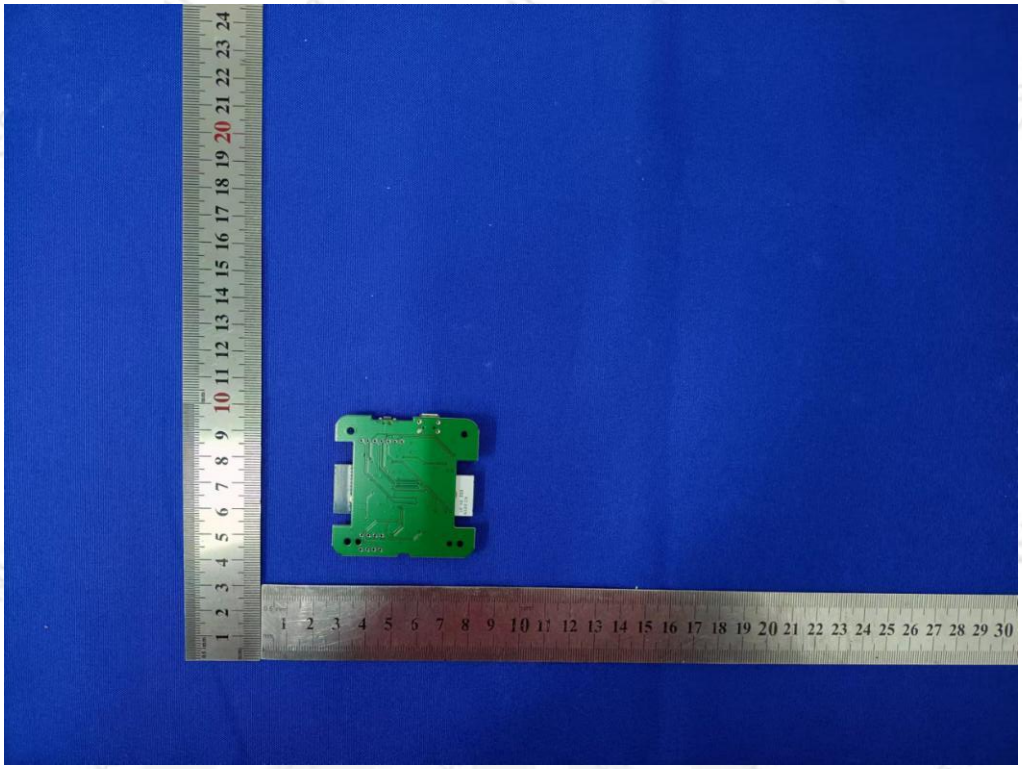

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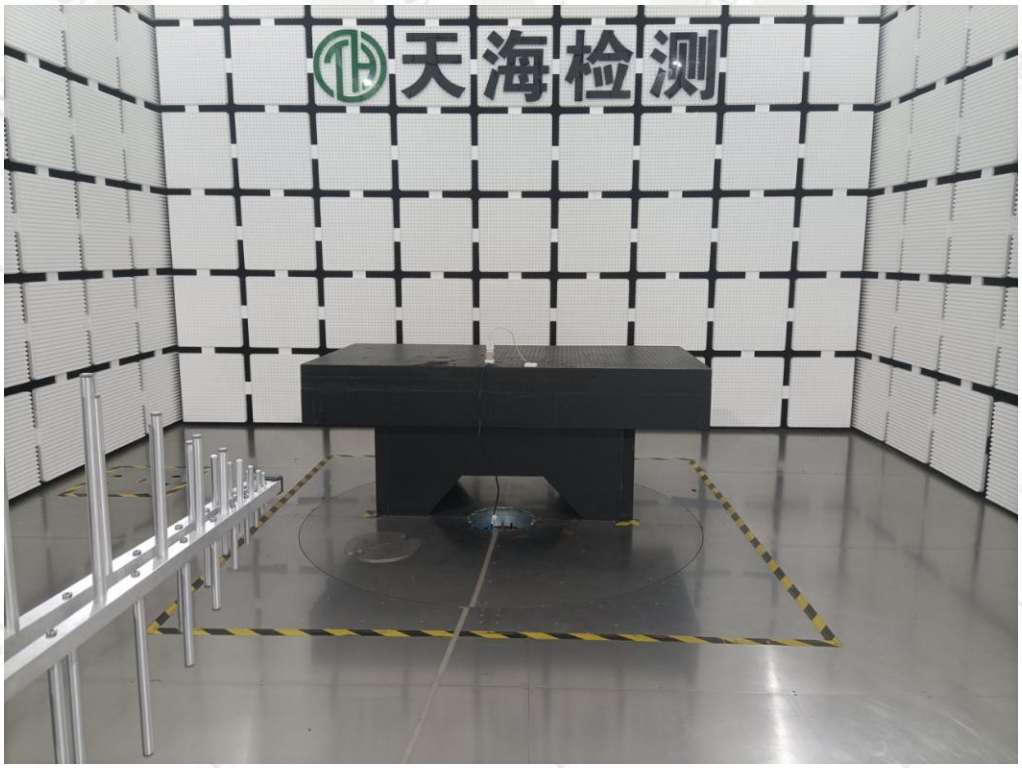
APPENDIX B - TEST SETUP PHOTOGRAPHS

Photograph 1: Set-up for Conducted Emission

Photograph 2: Set-up for Radiation Emission (Below 1GHz)



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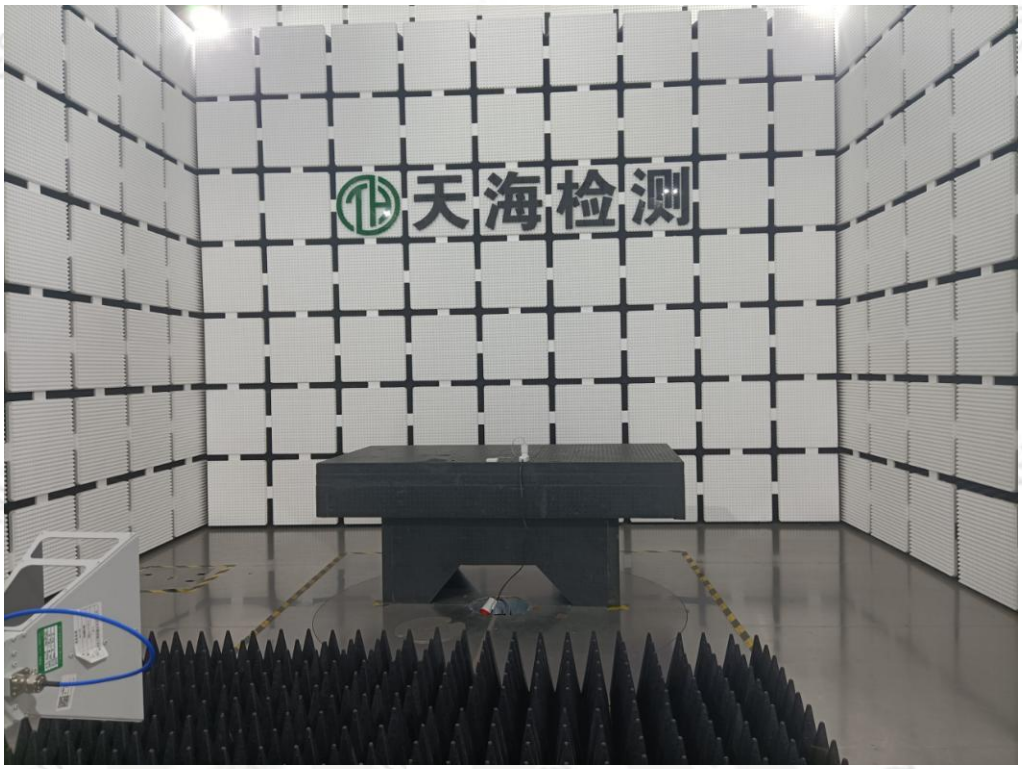
Photograph 3: Set-up for Radiation Emission (Above 1GHz)



Photograph 4: Set-up for Electrostatic Discharges

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Photograph 5: Set-up for RF field strength sensitivity test

Photograph 6: Set-up for Electrical Fast Transient / Burst

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Photograph 7: Set-up for Surge

Photograph 8: Set-up for Conducted disturbances, induced by radio-frequency fields

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Photograph 9: Set-up for Voltage Dips and Interruption

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