



EMC TEST REPORT

Report No: FCS202604148E01

Issued for

Applicant:	Mid Ocean Brands B.V.
Address:	Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Product Name:	Wireless Speaker
Brand Name:	N/A
Model Name:	MO2378
Series Model:	N/A
Test Standard:	EN 55032:2015/A1:2020 EN 55035:2017/A11:2020 ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-17 V3.3.1 (2024-09) EN IEC 61000-3-2:2019+A2:2024 EN 61000-3-3:2013/A2:2021/AC:2022-01
Issued By: Dongguan Funas Testing Technology Co.,Ltd Add: Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan, China Tel: 769-27280901 Fax:769-27280901 http://www.fcs-lab.com E-mail: andy.yue@fcs-lab.com	

**TEST RESULT CERTIFICATION**

Applicant's Name.....: Mid Ocean Brands B.V.
Address.....: Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Manufacture's Name.....: Mid Ocean Brands B.V.
Address.....: Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.

Product Description

Product Name.....: Wireless Speaker
Brand Name: N/A
Model Name.....: MO2378
Series Model.....: N/A
Test Standards.....: EN 55032:2015/A1:2020
EN 55035:2017/A11:2020
ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.3.1 (2024-09)
EN IEC 61000-3-2:2019+A2:2024
EN 61000-3-3:2013/A2:2021/AC:2022-01

This device described above has been tested by FCS, and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of FCS, this document may be altered or revised by FCS, personal only, and shall be noted in the revision of the document.

Date of Test.....:

Date (s) of performance of tests.: Apr 14, 2026~Apr 23, 2026

Date of Issue.....: Apr 23, 2026

Test Result.....: **Pass**

Tested by

:

Ling xin.Peng

(Ling xin.Peng)

Reviewed by

:

Yolo.Su

(Yolo.Su)

Approved by

:

Jack Wang

(Jack Wang)



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 EUT	7
2.2 DESCRIPTION OF TEST MODES	8
2.3 DESCRIPTION OF TEST SETUP	8
2.4 MEASUREMENT INSTRUMENTS LIST	9
3. EMC EMISSION TEST	12
3.1 CONDUCTED EMISSION MEASUREMENT	12
3.2 RADIATED EMISSION MEASUREMENT	16
3.3 HARMONICS CURRENT	20
3.4 VOLTAGE FLUCTUATION AND FLICKERS	23
4. EMC IMMUNITY TEST	25
4.1 STANDARD COMPLIANCE/SERVIRITY LEVEL/CRITERIA	25
4.2 GENERAL PERFORMANCE CRITERIA	26
4.3 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)	27
4.4 ELECTRICAL FAST TRANSIENT (EFT)	30
4.5 SURGE TESTING	34
4.6 CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)	36
4.7 VOLTAGE INTERRUPTION/DIPS TESTING (DIPS)	39
4.8 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)	41
APPENDIX I- TEST SETUP	44

**Revision History**

Rev.	Issue Date	Report No.	Effect Page	Contents
00	Apr 23, 2026	FCS202604148E01	ALL	Initial Issue
Note: Format version of the report -V00				

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 V3.3.1 (2024-09)

EMC Emission				
Standard	Test Item	Limit	Judgment	Remark
ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-17 V3.3.1 (2024-09) EN 55032:2015/A1:2020	Conducted Emissions From The AC Mains Power Ports	Class B	PASS	
	Conducted Emissions From Asymmetric Mode	Class B	N/A	
	Conducted Differential Voltage Emissions	Class B	N/A	
	Radiated Emissions	Class B	PASS	
EN IEC 61000-3-2:2019+A2:2024	Harmonic Current Emission	Class A	N/A	
EN 61000-3-3:2013/A2:2021/AC:2022-01	Voltage Fluctuations & Flicker	-----	N/A	
EMC Immunity				
Section	Test Item	Performance Criteria	Judgment	Remark
EN 61000-4-2:2009	Electrostatic Discharge	Class B	PASS	
EN IEC 61000-4-3:2020	RF electromagnetic field	Class A	PASS	#
EN 61000-4-4:2012	Fast transients	Class B	N/A	
EN 61000-4-5:2014/A1:2017	Surges	Class B	N/A	
EN 61000-4-6:2014/AC:2015	Injected Current	Class A	N/A	
EN IEC 61000-4-11:2020/AC:2022-10	Volt. Interruptions Volt. Dips	B / C / C / C	N/A	

Note: “#” indicates the testing item(s) was(were) fulfilled by subcontracted lab.

1.1 TEST FACTORY

Company Name:	Dongguan Funas Testing Technology Co.,Ltd.
Address:	Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan, China,

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 %.

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
EACC01	ANSI	9KHz-150KHz	4.13	
		150 KHz ~ 30MHz	4.74	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
EACC02	ANSI	30MHz ~ 200MHz	5.2	
		200MHz ~ 1000MHz	5.2	
		1GHz ~ 6 GHz	4.66	

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	Wireless Speaker
Brand Name	N/A
Model Name	MO2378
Series Model	N/A
Model Difference	N/A
Power Rating:	Output power : 15W Max Input: DC 9V 3A, 5V 3A output: DC 5V 1A, 7.5V 1A, 9V 1.1A, 9V 1.67A
Battery	Rated Voltage: 3.7V Capacity: 1200mAh
Hardware version number	V1.0
Software version number	V1.0

2.2 DESCRIPTION OF TEST MODES

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

Pretest Mode	Description
Mode 1	Charging mode

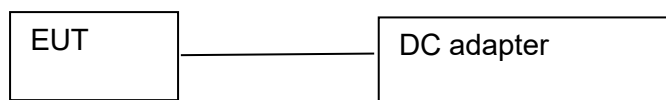
Note: The test modes were carried out for all operation modes(include link and idle).

The worst test mode for the final conducted data of EUT is Mode 2 and the worst test mode for radiation data is Mode 5, test data display.

2.3 DESCRIPTION OF TEST SETUP

System Diagram of Connections Between EUT and Simulators

Mode 1:



2.4 MEASUREMENT INSTRUMENTS LIST

2.4.1 CONDUCTED TEST SITE

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
EMI Test Receiver	R&S	ESCI	101427	2025.08.25	2026.08.24
LISN	R&S	ENV216	101242	2025.08.25	2026.08.24
LISN	ETS	3810/2NM	00023625	2025.08.25	2026.08.24
Absorbing Clamp	R&S	MDS-21	100668	2025.08.25	2026.08.24
CE Cable	N/A	C01	N/A	2025.08.25	2026.08.24
Temperature & Humidity	Mieo	HH660	N/A	2025.08.25	2026.08.24
Testing Software	EZ-EMC(Ver.STSLAB-03A1 CE)				

2.4.2 RADIATED TEST SITE

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
EMI Test Receiver	R&S	ESCI	101427	2025.08.25	2026.08.24
Bi-log Antenna	TESEQ	CBL6111D	34678	2025.08.25	2026.08.24
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1343	2025.08.25	2026.08.24
Pre-amplifier(1G-18G)	SKET	LNPA-01018G-45	SK2018080901	2025.08.25	2026.08.24
Pre-amplifier(0.1M-3GHz)	EM	EM330	060665	2025.08.25	2026.08.24
Spectrum Analyzer	Agilent	N9020A	MY49100060	2025.08.25	2026.08.24
RE Cable (9K-1G)	N/A	R01	N/A	2025.08.25	2026.08.24
RE Cable (1G-18G)	N/A	R02	N/A	2025.08.25	2026.08.24
Temperature & Humidity	Mieo	HH660	N/A	2025.08.25	2026.08.24
Testing Software	EZ-EMC(Ver.STSLAB-03A1 RE)				

2.4.3 HARMONICS AND FLICKER

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Harmonic Voltage & Flicker	LAPLACE	AC 2000A	311217	2025.08.25	2026.08.24
AC Power Source	MTONI	PHF-5010	631169	2025.08.25	2026.08.24
Universal Radio Communication Tester	R&S	CMW500	117239	2025.08.25	2026.08.24
Testing Software	HA-PC Link Version 3.03				

2.4.4ESD

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Electrostatic Discharge Simulator	KZKUSUI	KES4021	LB003568	2025.08.25	2026.08.24
Universal Radio Communication Tester	R&S	CMW500	117239	2025.08.25	2026.08.24
Temperature & Humidity	N/A	WS1066	N/A	2025.08.25	2026.08.24

2.4.5 SURGE, EFT/BURST, VOLTAGE INTERRUPTION/DIPS

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Surger Generator	HTEC	HCWG 10	152101	2025.08.25	2026.08.24
Surger Generator	HTEC	TC0MB4	152104	2025.08.25	2026.08.24
VOLTAGE DIPS & INTERRUPTIONS Generator	HTEC	HPFS 161P	143803	2025.08.25	2026.08.24
EFT/B Generator	HTEC	HEFT 51	143801	2025.08.25	2026.08.24
Universal Radio Communication Tester	R&S	CMW500	117239	2025.08.25	2026.08.24
Temperature & Humidity	Mieo	HH660	N/A	2025.08.25	2026.08.24

2.4.7 INJECTION CURRENT

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
CS	SCHLODER	CDG-6000-25	126A1280/2014	2025.08.25	2026.08.24
CDN	Frankonia	CDN-M2+3	A2210275/2014	2025.08.25	2026.08.24
EM Clamp	SCHLODER	EMCL-20	132A1283	2025.08.25	2026.08.24
Attenuator	Nemtest	ATT-6DB-100	A100W224	2025.08.25	2026.08.24
Audio Power Amplifier	B&K	2716-C-001	2610976	2025.08.25	2026.08.24
Mouth Simulator	B&K	4227	2630621	2025.08.25	2026.08.24
Sound Calibrator	B&K	4231	2637486	2025.08.25	2026.08.24
1/2" Pressure-field Microphone	B&K	4192	2641678	2025.08.25	2026.08.24
Ear Simulator for Telephonometry	B&K	4185	2553612	2025.08.25	2026.08.24
Telephone Test Head	B&K	4185	2631728	2025.08.25	2026.08.24
Universal Radio Communication Tester	R&S	CMU200	111764	2025.08.25	2026.08.24
Audio Analyzer	R&S	UPV	100419	2025.08.25	2026.08.24
Universal Radio Communication Tester	R&S	CMW500	117239	2025.08.25	2026.08.24

2.4.8 RS

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
RF Relay matrix tsj	TSJ	RFM-S621	04261	2025.08.25	2026.08.24
Power meter	Agilent	E4419B	MY45102079	2025.08.25	2026.08.24
Power Sensor	Agilent	8481A	MY41097696	2025.08.25	2026.08.24
Power Sensor	Agilent	8481A	MY41097697	2025.08.25	2026.08.24
Signal Generator	Agilent	N5182A	MY46240556	2025.08.25	2026.08.24
Power Amplifier	MICOTOP	MPA-80-1000-250	1711488	2025.08.25	2026.08.24
Power Amplifier	MICOTOP	MPA-1000-3000-75	MPA1706275	2025.08.25	2026.08.24
Logarithmic-periodic Antenna	Schwarzbeck	VULP9118E	820	2025.08.25	2026.08.24
Microwave Horn Antenna	Schwarzbeck	BBHA 9120LF	F01008	2025.08.25	2026.08.24
Universal Radio Communication Tester	R&S	CMU200	111764	2025.08.25	2026.08.24
Universal Radio Communication Tester	R&S	CMW500	117239	2025.08.25	2026.08.24
Audio Analyzer	R&S	UPV	100419	2025.08.25	2026.08.24
Power Amplifier	MICOTOP	MPA-3000-6000-50	1711489	2025.08.25	2026.08.24
Testing Software	EMC-S V1.2.0.90				

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 REQUIREMENTS FOR CONDUCTED EMISSIONS FROM THE AC MAINS POWER PORTS OF THE CLASS A EQUIPMENT

FREQUENCY (MHz)	Coupling device	Detector type / bandwidth	Class A limits dB(μ V)
0.15 - 0.5	AMN	Quasi Peak / 9 kHz	79
0.50 - 30			73
0.15 - 0.5	AMN	Average / 9 kHz	66
0.50 - 30			60

3.1.2 REQUIREMENTS FOR CONDUCTED EMISSIONS FROM THE AC MAINS POWER PORTS OF THE CLASS B EQUIPMENT

FREQUENCY (MHz)	Coupling device	Detector type / bandwidth	Class B limits dB(μ V)
0.15 - 0.5	AMN	Quasi Peak / 9 kHz	66 - 56*
0.50 - 5			56
5 - 30			60
0.15 - 0.5	AMN	Average / 9 kHz	56 - 46*
0.50 - 5			46
5 - 30			50

Note:

- C. The tighter limit applies at the band edges.
- D. The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

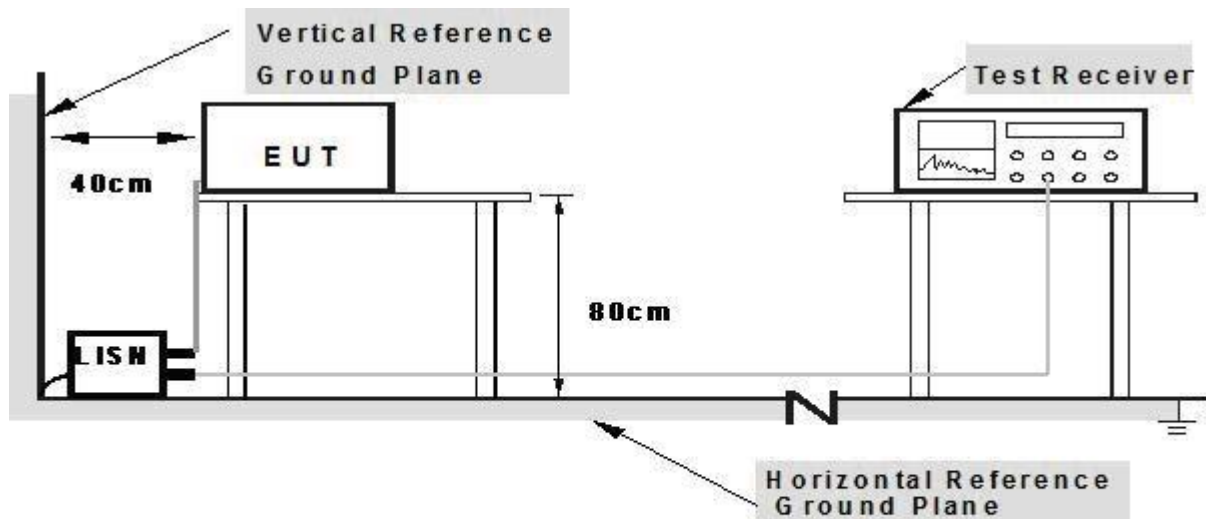
The following table is the setting of the receiver

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

3.1.3 TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- 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.
- 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.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

• 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

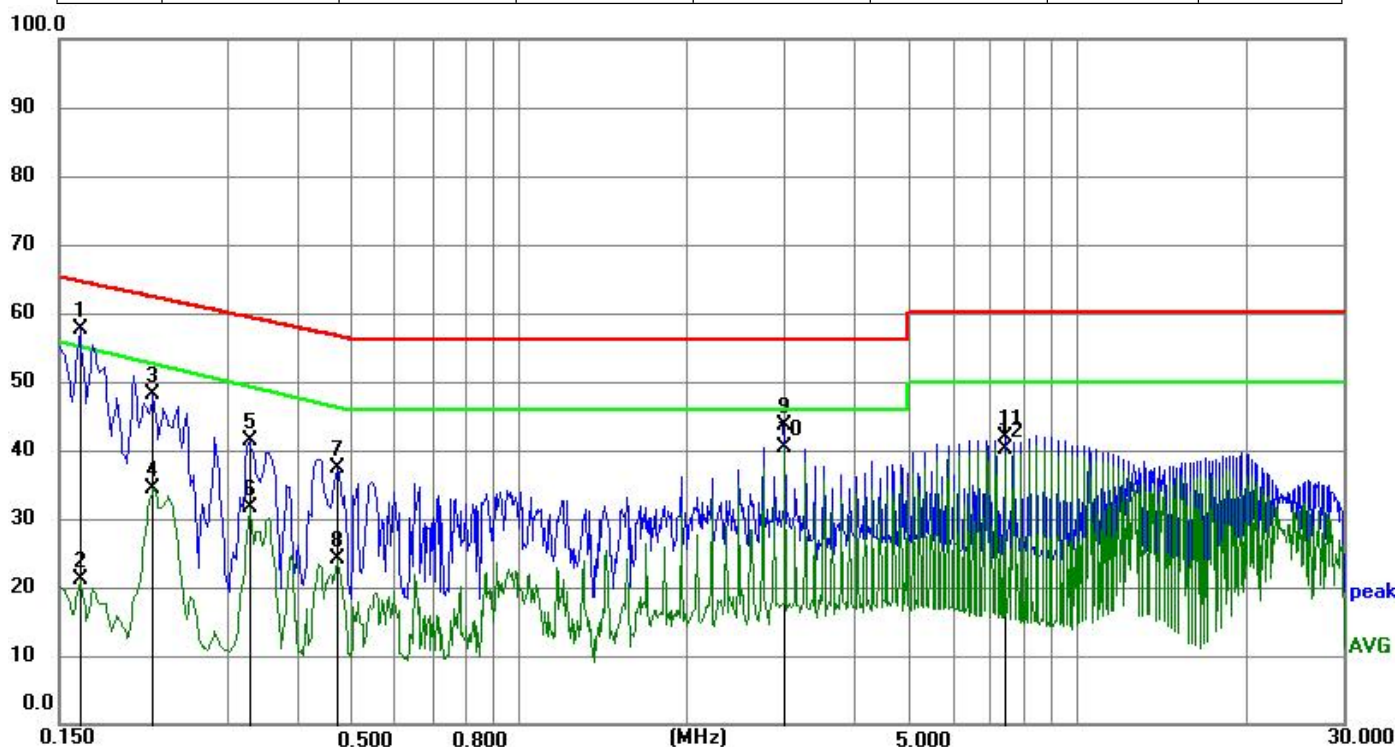
3.1.4 EUT OPERATING CONDITIONS

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

3.1.5 TEST RESULTS

Temperature:	25.3℃	Relative Humidity:	62%
Phase:	L	Test Mode:	Mode 1
Test Voltage:	DC 9V		

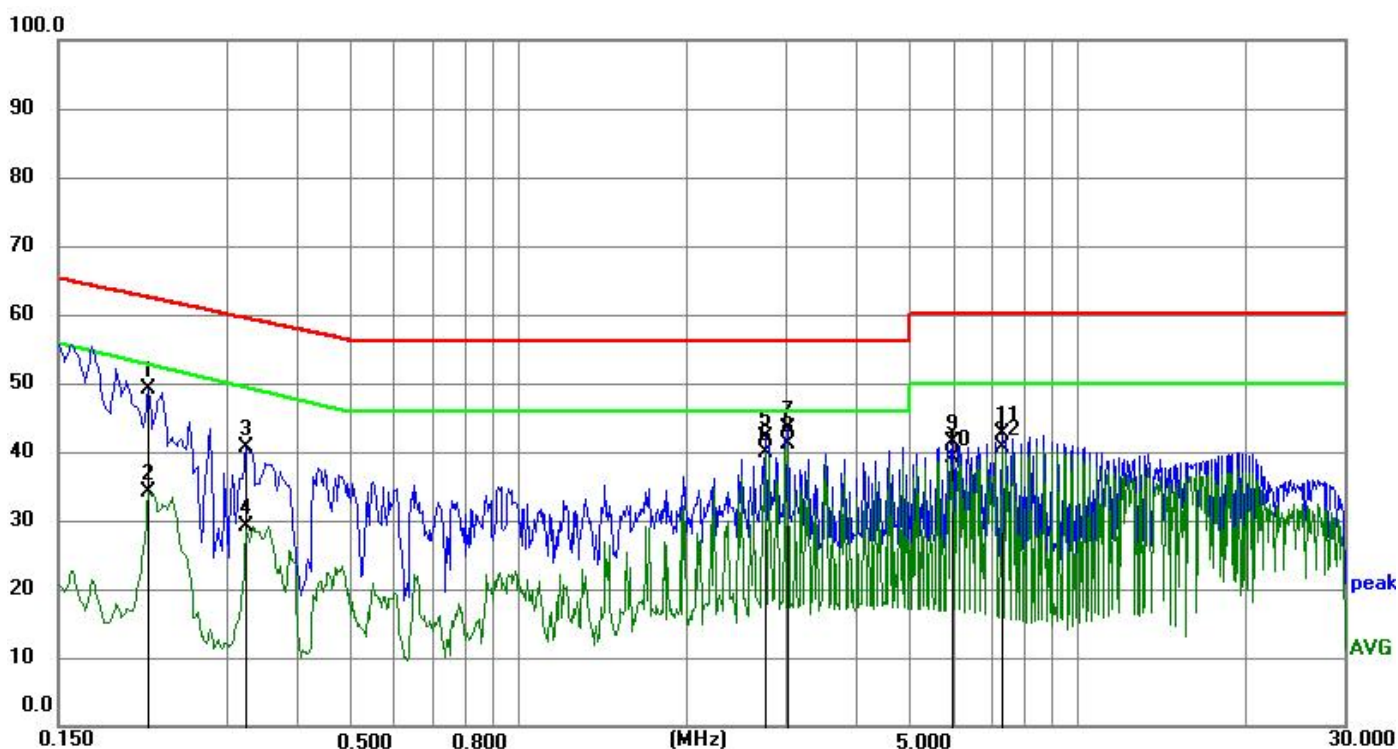
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1635	47.48	10.12	57.60	64.36	6.76	QP
2	0.1635	11.10	10.12	21.22	55.28	34.06	AVG
3	0.2220	37.96	10.07	48.03	62.07	14.04	QP
4	0.2220	24.37	10.07	34.44	52.74	18.30	AVG
5	0.3300	31.25	10.02	41.27	59.11	17.84	QP
6	0.3300	21.53	10.02	31.55	49.45	17.90	AVG
7	0.4740	27.41	10.02	37.43	56.40	18.97	QP
8	0.4740	14.13	10.02	24.15	46.44	22.29	AVG
9	3.0030	33.61	9.94	43.55	56.00	12.45	QP
10	3.0030	30.49	9.94	40.43	46.00	5.57	AVG
11	7.4355	32.04	9.83	41.87	60.00	18.13	QP
12	7.4355	30.20	9.83	40.03	50.00	9.97	AVG



Remark: All readings are Quasi-Peak and Average values.

Temperature:	25.3℃	Relative Humidity:	62%
Phase:	N	Test Mode:	Mode 1
Test Voltage:	DC 9V		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2175	39.13	10.05	49.18	62.22	13.04	QP
2	0.2175	23.96	10.05	34.01	52.91	18.90	AVG
3	0.3255	30.69	10.03	40.72	59.21	18.49	QP
4	0.3255	19.15	10.03	29.18	49.57	20.39	AVG
5	2.7690	32.26	9.94	42.20	56.00	13.80	QP
6	2.7690	30.01	9.94	39.95	46.00	6.05	AVG
7	3.0345	33.32	9.94	43.26	56.00	12.74	QP
8	3.0345	31.18	9.94	41.12	46.00	4.88	AVG
9	5.9865	31.46	9.86	41.32	60.00	18.68	QP
10	5.9865	29.36	9.86	39.22	50.00	10.78	AVG
11	7.3500	32.85	9.83	42.68	60.00	17.32	QP
12	7.3500	30.77	9.83	40.60	50.00	9.40	AVG



Remark: All readings are Quasi-Peak and Average values.

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF 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 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 according to CISPR 32.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

3.2.3 TEST PROCEDURE

- e. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- f. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- g. The height of the equipment shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- h. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured, above 1G Average detector mode will be instead.
- i. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP(AV) Limits and then no additional QP Mode measurement performed.
- j. For the actual test configuration, please refer to the related Item –EUT TestPhotos.

3.2.4 TEST SETUP

(A) Radiated Emission Test Setup Frequency Below 1 GHz

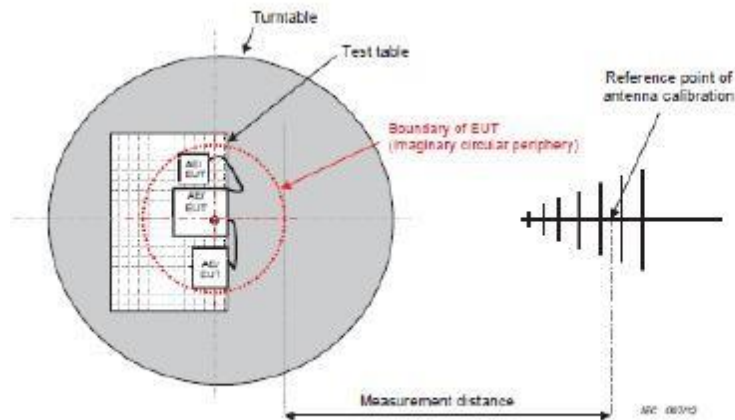


Figure C.1 – Measurement distance

(B) Radiated Emission Test Setup Frequency Above 1GHz

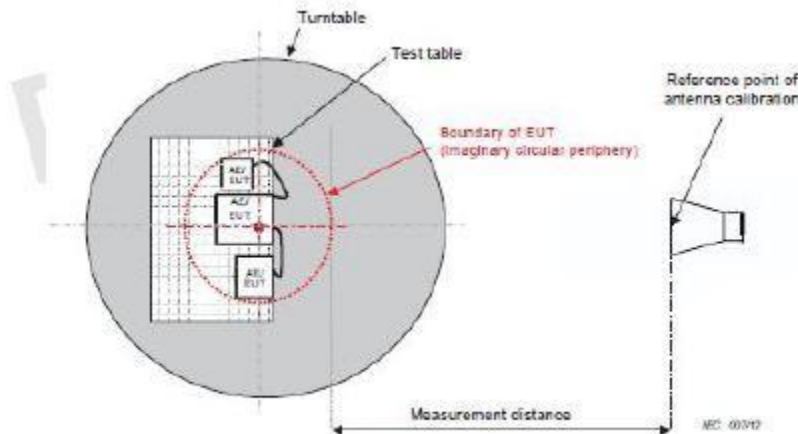


Figure C.1 – Measurement distance

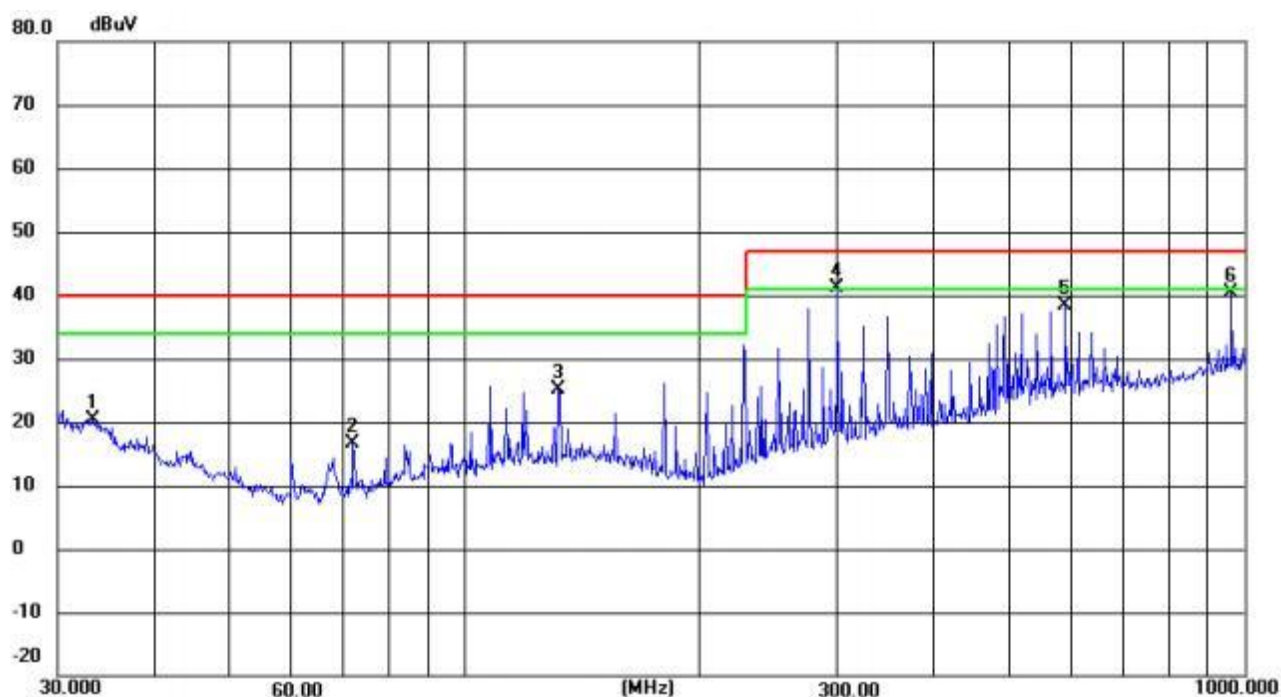
3.2.5 EUT OPERATING CONDITIONS

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

3.2.6 TEST RESULTS(30 - 1000 MHz)

Temperature:	22.1℃	Relative Humidity:	56%
Phase:	Horizontal	Test Mode:	Mode 1

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	33.3278	29.89	-9.42	20.47	40.00	-19.53	QP
2	71.8320	36.31	-19.60	16.71	40.00	-23.29	QP
3	131.7577	57.30	-32.15	25.15	40.00	-14.85	QP
4	300.3672	73.09	-31.90	41.19	47.00	-5.81	QP
5	588.9050	69.50	-31.15	38.35	47.00	-8.65	QP
6	962.1622	70.92	-30.64	40.28	47.00	-6.72	QP

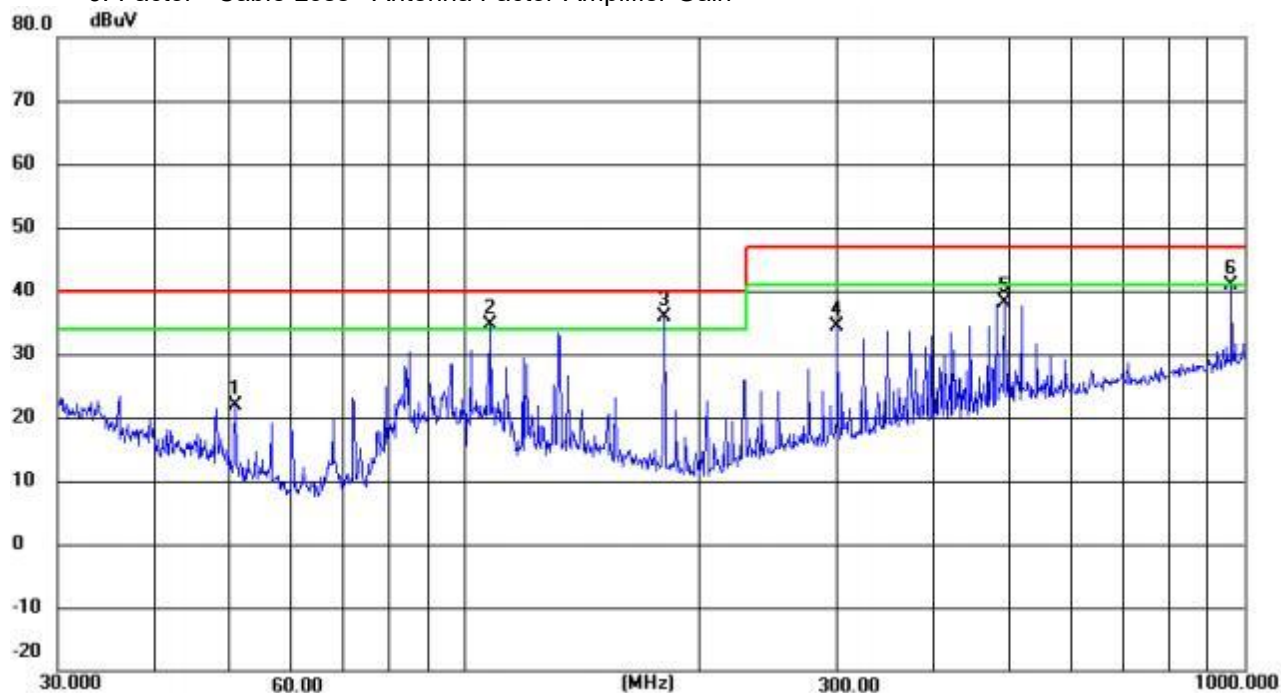


Temperature:	22.1℃	Relative Humidity:	56%
Phase:	Vertical	Test Mode:	Mode 1

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	50.7637	40.08	-18.08	22.00	40.00	-18.00	QP
2	107.8877	66.87	-32.19	34.68	40.00	-5.32	QP
3	180.0165	67.84	-32.08	35.76	40.00	-4.24	QP
4	300.3672	66.34	-31.90	34.44	47.00	-12.56	QP
5	492.4685	69.45	-31.32	38.13	47.00	-8.87	QP
6	962.1623	71.46	-30.64	40.82	47.00	-6.18	QP

Remark:

1. All readings are Quasi-Peak.
2. Margin = Result (Result = Reading + Factor) – Limit
3. Factor= Cable Loss +Antenna Factor-Amplifier Gain



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

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.

b. The classification of EUT is according to section 5 of EN 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.

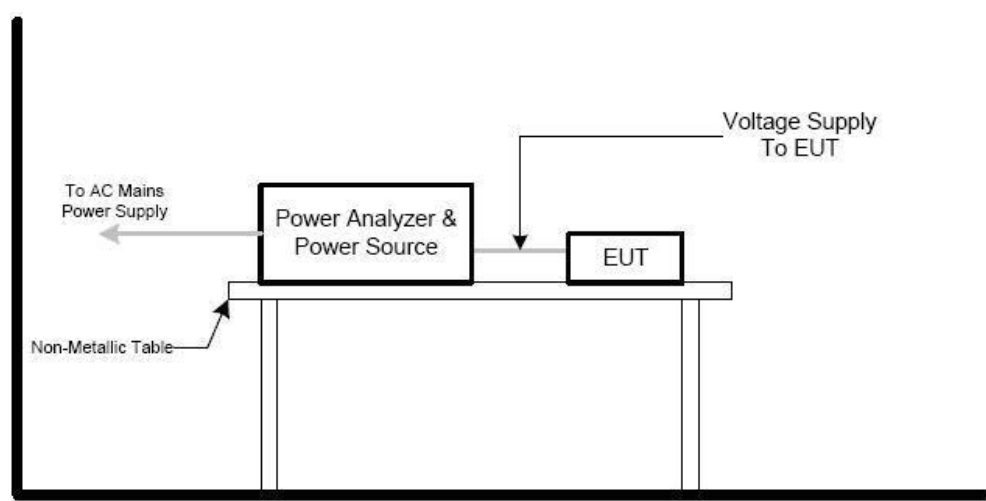
Class D: Equipment having a specified power less than or equal to 600W of the following types: Personal computers and personal computer monitors and television receivers.

c. 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 Unless otherwise a special operating condition is specified in the following during the testing.

3.3.4 TEST SETUP



3.3.5 TEST RESULTS

Temperature:	26°C	Relative Humidity:	45%
Test Voltage:	N/A		

Note: 1) N/A - denotes test is not applicable in this test report.

3.4 VOLTAGE FLUCTUATION AND FLICKERS

3.4.2 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	$\leq 3.3\% \text{ for } > 500\text{ms}$	Relative V-change Characteristic

3.4.3 TEST PROCEDURE

a. Fluctuation and Flickers Test:

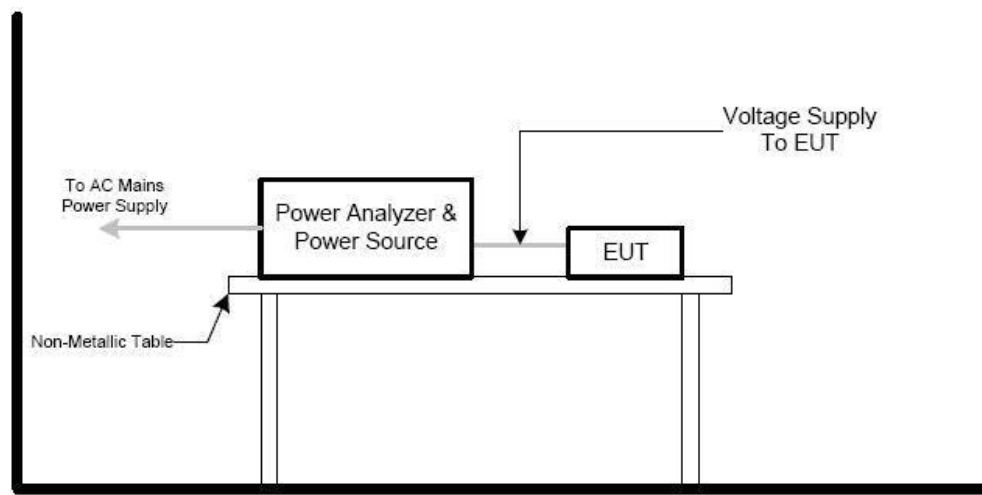
Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

b. All types of voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

3.4.5 EUT OPERATING CONDITIONS

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

3.4.6 TEST SETUP



3.4.7 TEST RESULTS

Temperature:	23.9 °C	Relative Humidity:	54%
Test Voltage:	N/A		

Note: 1) N/A - denotes test is not applicable in this test report.

4. EMC IMMUNITY TEST

4.1 STANDARD COMPLIANCE/SERVRITY LEVEL/CRITERIA

Tests Standard No.	TEST SPECIFICATION	Test Mode Test Ports	Perform. Criteria
1. ESD IEC/EN 61000-4-2	8KV air discharge 4KV contact discharge	Direct Mode	B
	4KV HCP discharge 4KV VCP discharge	Indirect Mode	B
2. RS IEC/EN 61000-4-3	80 MHz - 1000 MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz, 1000Hz, 80%, AM modulated	Enclosure	A
3. EFT/Burst IEC/EN 61000-4-4	5/50ns Tr/Th 5KHz Repetition Freq.	Power Supply Port	B
	5/50ns Tr/Th 5KHz Repetition Freq.	CTL/Signal Data Line Port	B
4. Surges IEC/EN 61000-4-5	1.2/50(8/20) Tr/Th us	L-N	B
	1.2/50(8/20) Tr/Th us	L-PE N-PE	B
5. Injected Current IEC/EN 61000-4-6	0.15 MHz to 80 MHz, 1000Hz 80% , AM Modulated 150Ω source impedance	CTL/Signal Port	A
	0.15 MHz to 80 MHz, 1000Hz 80% , AM Modulated 150Ω source impedance	AC Power Port	A
	0.15 MHz to 80 MHz, 1000Hz 80% , AM Modulated 150Ω source impedance	DC Power Port	A
6. Volt. Interruptions Volt. Dips IEC/EN 61000-4-11	Voltage dip 100%	AC Power Port	B
	Voltage dip 30%		C
	Interruption 100%		C

4.2 GENERAL PERFORMANCE CRITERIA

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

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 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 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 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.

4.2.1 GENERAL PERFORMANCE CRITERIA TEST SETUP

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

4.3 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

4.3.1 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: 2KV/4KV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 200 times in total 20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

4.3.2 TEST PROCEDURE

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

- 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 meters 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.

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

Diagram illustrating the test setup for ESD immunity testing. The setup includes a Non-Conductive Table (1.6m x 0.8m) with a height of 80cm. The table is supported by HCP (0.5 mm) Isolation Supports. The EUT (Equipment Under Test) is placed on the table, connected to the AC Main. Two ESD Generators are positioned 10 cm from the table surface, each with a Discharge Return Cable to GRP. A VCP (50 cm x 50 cm) is also shown. The setup is grounded to a Ground Reference Plane (GRP) Bonded to PE.

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 meters from the EUT on all sides.

4.3.4 TEST RESULTS

Temperature:	23.9℃	Relative Humidity:	56%
Pressure:	1020.1hPa	Test Voltage:	DC 9V
Test Mode:	Mode 1		

Discharge Level	Polarity	Test Points	Contact Discharge	Air Discharge	Criterion	Test Result
4	+/-	VCP/HCP	NOTE	N/A	B	PASS
2,4	+/-	Green Dot	Note	N/A	B	PASS
2,4,8	+/-	Red Dot	N/A	NOTE	B	PASS

Note: The EUT function was correct during the test.
 Red Dot —Air Discharged
 Green Dot —Contact Discharged

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 DC network power port:0.5KV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave shape :	5/50 ns
Burst Duration:	15ms
Burst Period:	300ms
Test Duration:	Not less than 1 min.

4.4.2 TEST PROCEDURE

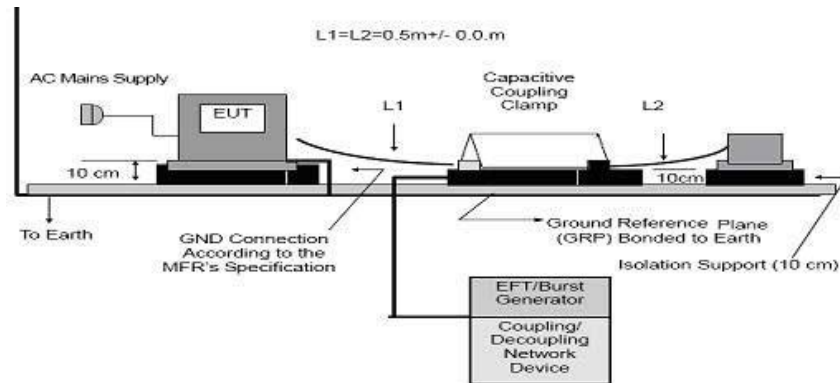
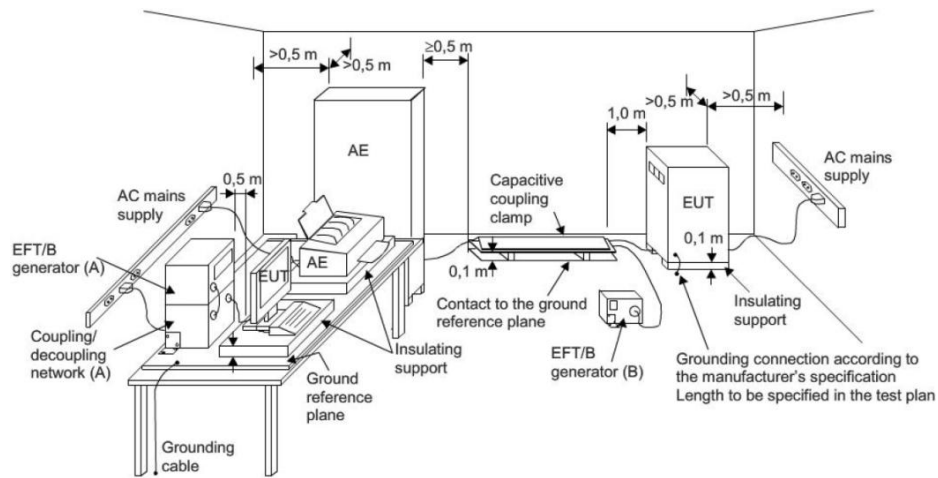
The EUT and support equipment, are placed on a table that is 0.8 meter&0.1 meter above a metal ground plane measured 1m*1m min .

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 condition need as following manners:

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

4.4.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

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. 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.

The test generator and the coupling/decoupling network shall be bonded to the ground reference plane.

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 minimum size of the ground reference plane is 0.8 m x 1 m. The actual size depends on the dimensions of the EUT.

The ground reference plane shall project beyond the EUT by at least 0.1 m on all sides.

The ground reference plane shall be connected to the earth (PE) for safety reasons.

The EUT shall be arranged and connected to satisfy its functional requirements, according to the equipment installation specifications.

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 0.5 m.

All cables to the EUT shall be placed on the insulation support 0.1 m 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.

The EUT shall be connected to the earth system in accordance with the manufacturer's installation specifications; no additional earth connections are allowed.

The connection impedance of the coupling/decoupling network earth cables to the ground reference plane and all connectors shall provide a low inductance.

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 0.5 m.

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 0.1 m 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 3 m, which are not tested, shall be placed on the insulating support. The parts of the EUT shall have a distance of 0.5 m between them. Excess cable length shall be bundled.

4.4.4 TEST RESULTS

Temperature:	23.9℃	Relative Humidity:	54%
Test Voltage:	N/A	Test Mode:	N/A

Note: 1) N/A - denotes test is not applicable in this test report.

4.5 SURGE TESTING

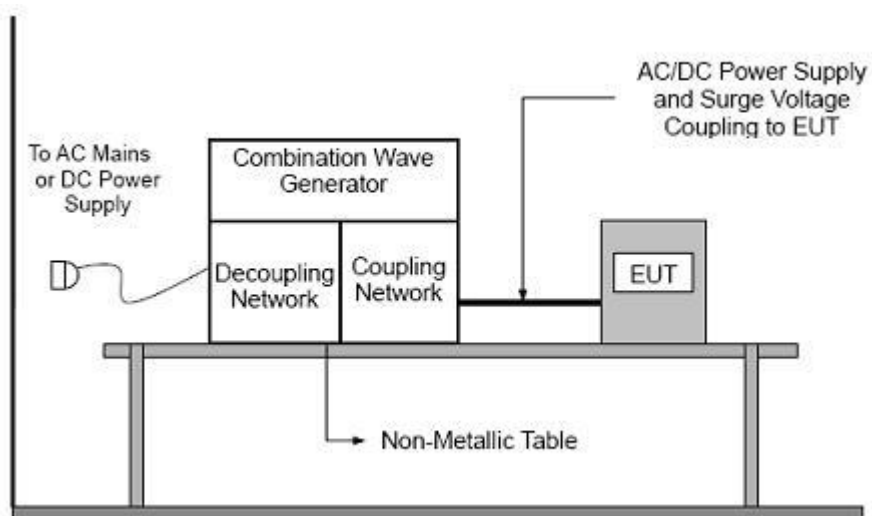
4.5.1 TEST SPECIFICATION

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: 0.5KV DC network power port: 0.5KV
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:	0°/90°/180°/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:
- b. 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 2 meters in length (or shorter).
- c. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:
- d. 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 meters in length (or shorter).

4.5.3 TEST SETUP



4.5.4 TEST RESULTS

Temperature:	23.9°C	Relative Humidity:	54%
Test Voltage:	N/A	Test Mode:	N/A

Note: 1) N/A - denotes test is not applicable in this test report.

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:	0.15 MHz - 80 MHz, 3V.
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Dwell Time:	1.5×10^{-3} decade/s

4.6.2 TEST PROCEDURE

The EUT shall be tested within its intended operating and climatic conditions.

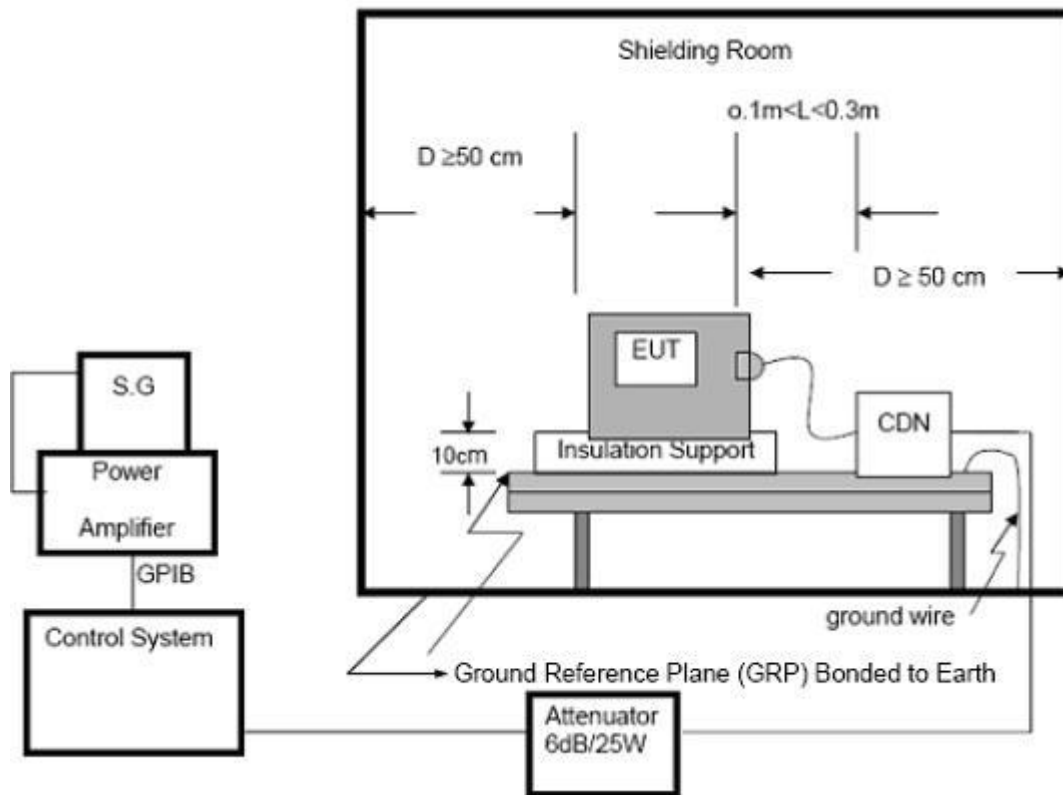
The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was 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 was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5×10^{-3} decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency (ies) and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts were 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 meters 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 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

4.6.4 TEST RESULTS

Temperature:	23.9°C	Relative Humidity:	54%
Test Voltage:	N/A	Test Mode:	N/A

Note: 1) N/A - denotes test is not applicable in this test report.

4.7 VOLTAGE INTERRUPTION/DIPS TESTING (DIPS)

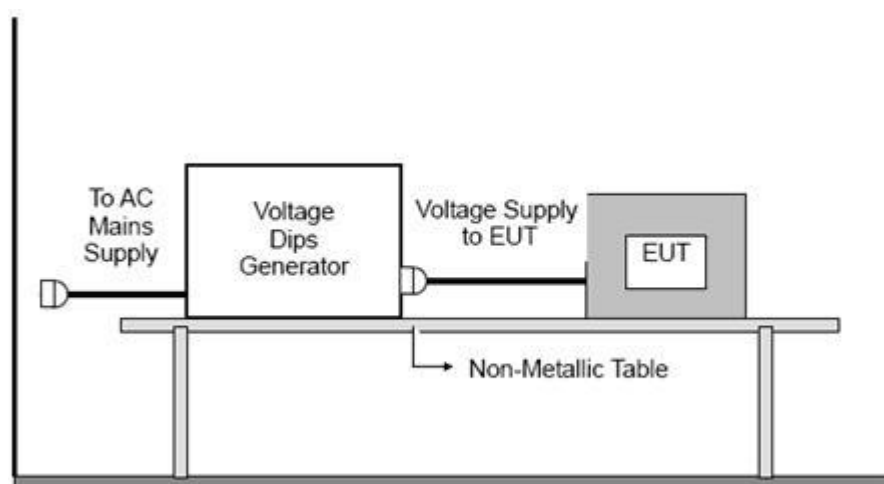
4.7.1 TEST SPECIFICATION

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 three test events in sequence
Interval between Event:	Minimum ten 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:	23.9°C	Relative Humidity:	54%
Test Voltage:	N/A	Test Mode:	N/A

Note: 1) N/A - denotes test is not applicable in this test report.

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

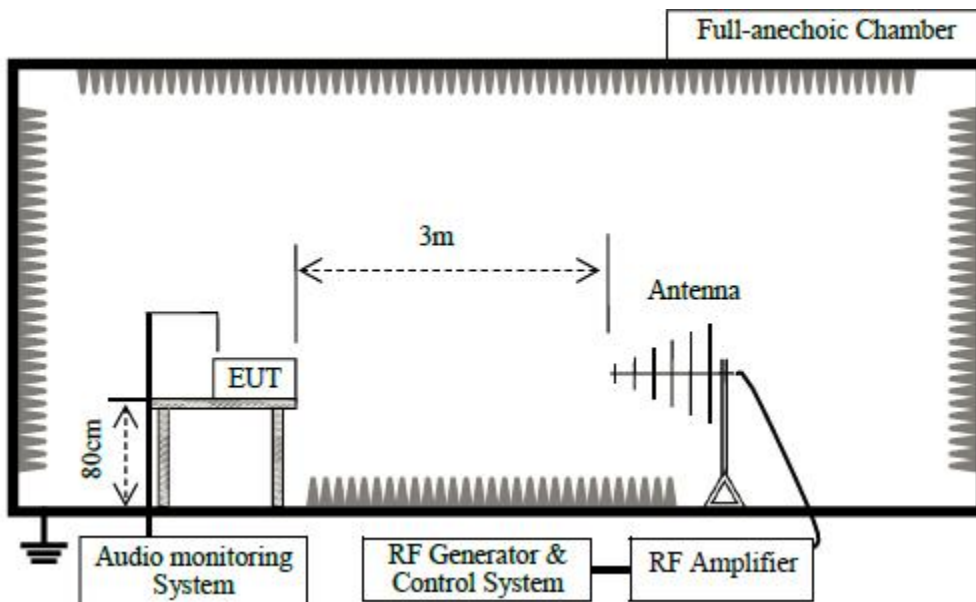
4.8.1 TEST SPECIFICATION

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:	1.5×10^{-3} decade/s

4.8.2 TEST PROCEDURE

- The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- The frequency range is swept from 80 MHz to 1000 MHz, 1800 MHz, 2600 MHz, 3500 MHz, 5000 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 preceding frequency value.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.8.3 TEST SETUP



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 meters in height. The system under test was connected to the power and signal wire according to 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 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

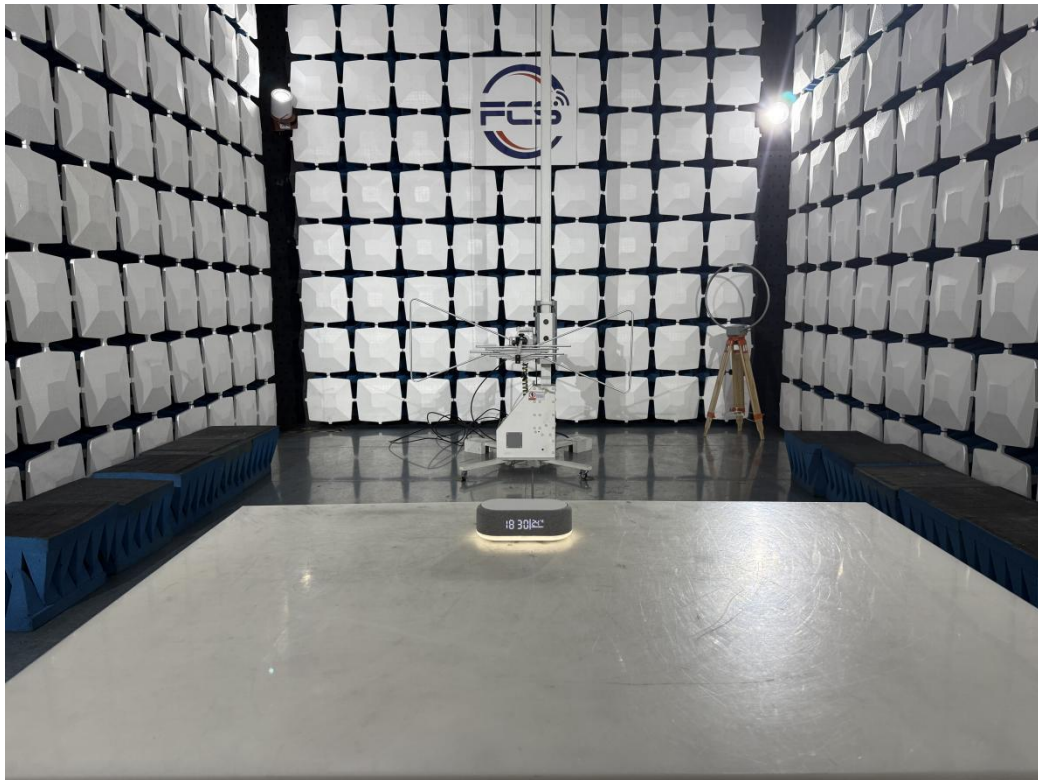
4.8.4TEST RESULTS

Temperature:	23.9℃	Relative Humidity:	54%
Test Voltage:	DC 9V	Test Mode:	Mode 1

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Observation	Perform. Criteria	Results	Judgment
80-6000	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	CT,CR	A	A	PASS
			Rear				
			Left				
			Right				

Note: "A" stand for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

APPENDIX I- TEST SETUP RE



CE



ESD



PHOTO 1



PHOTO 2

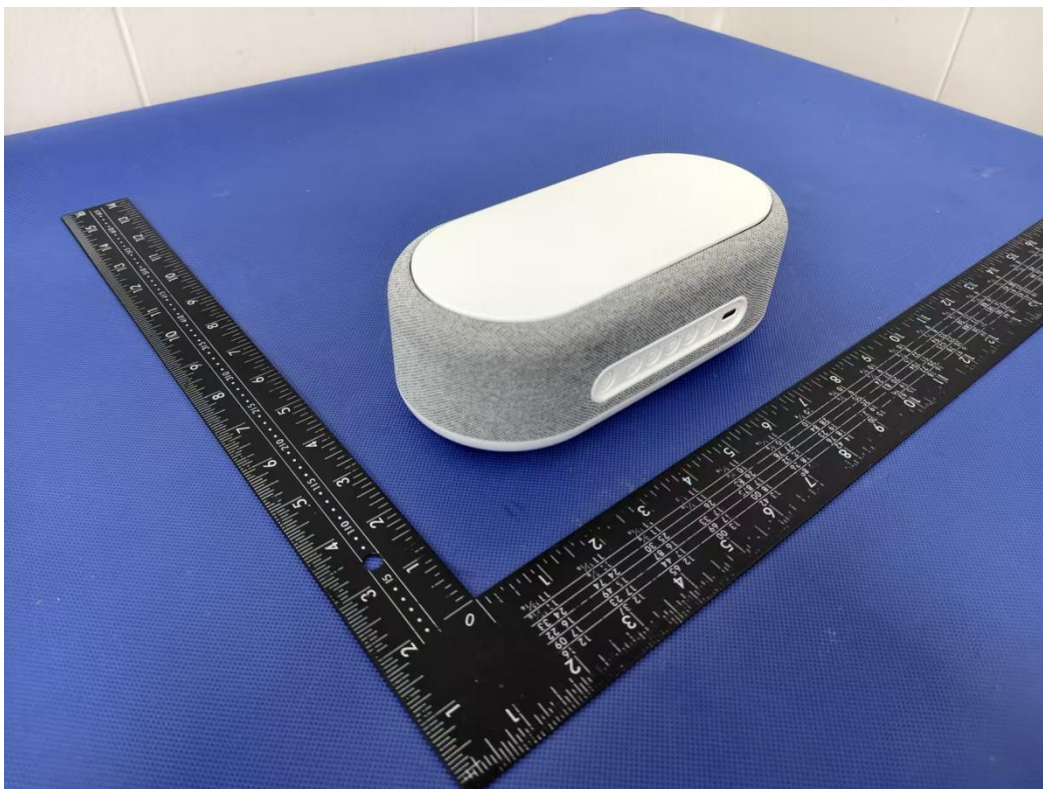


PHOTO 3

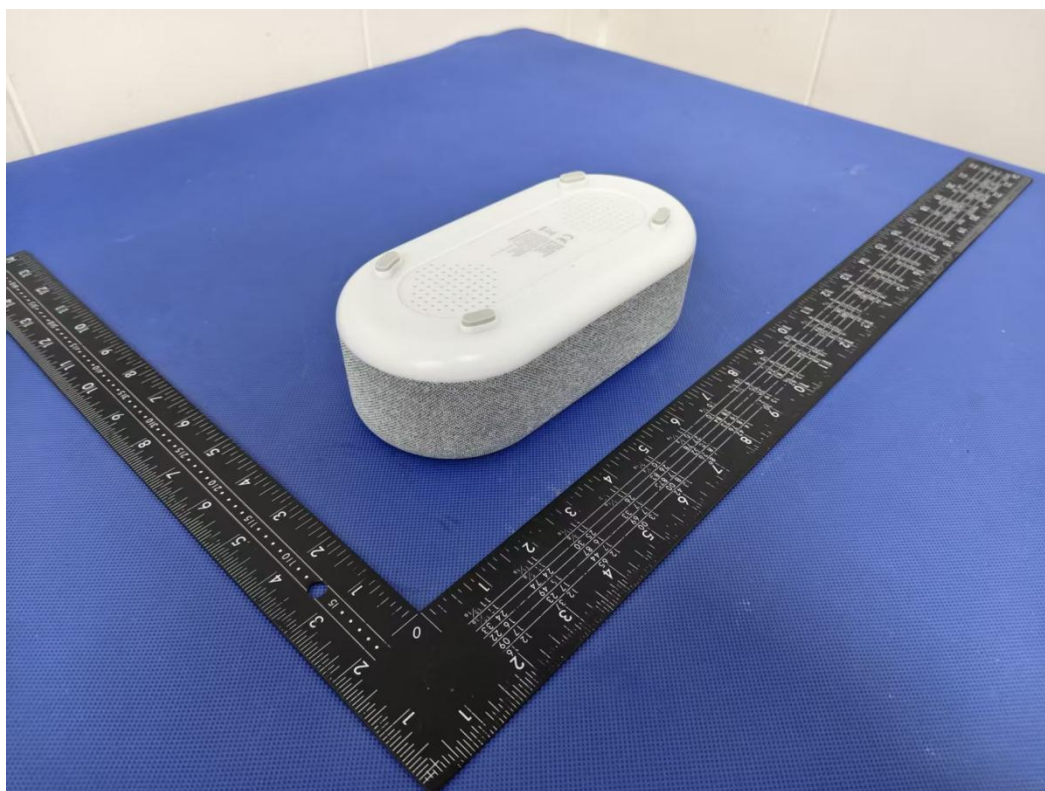


PHOTO 4



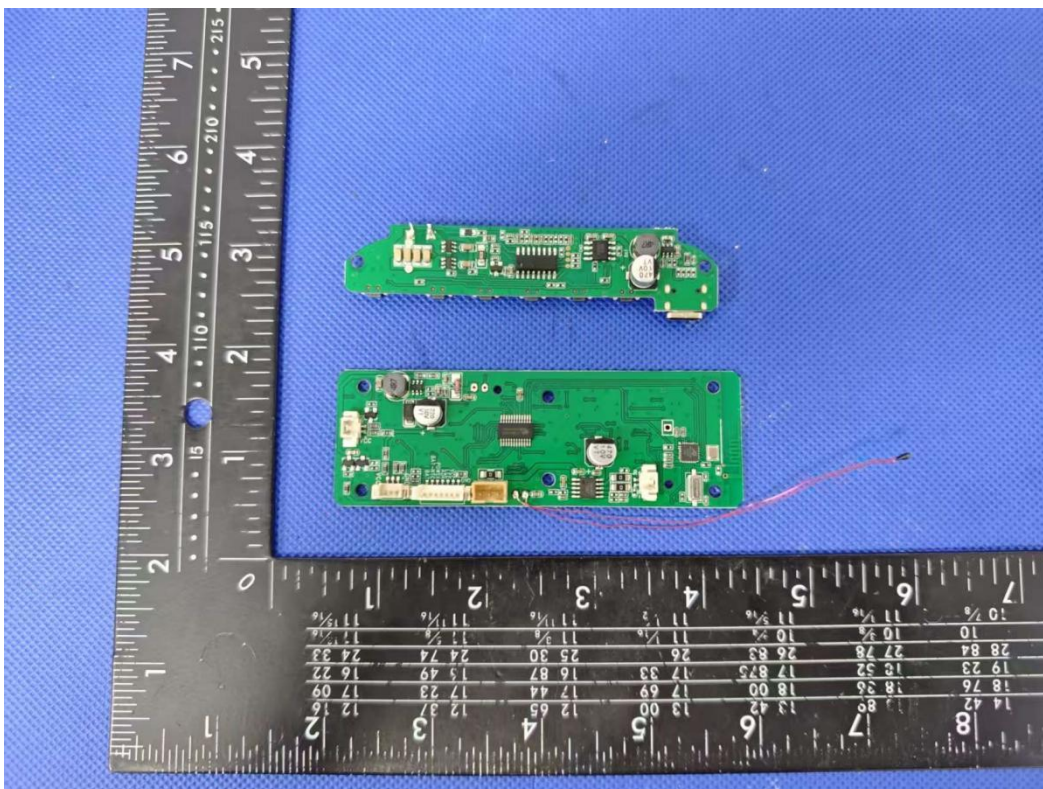
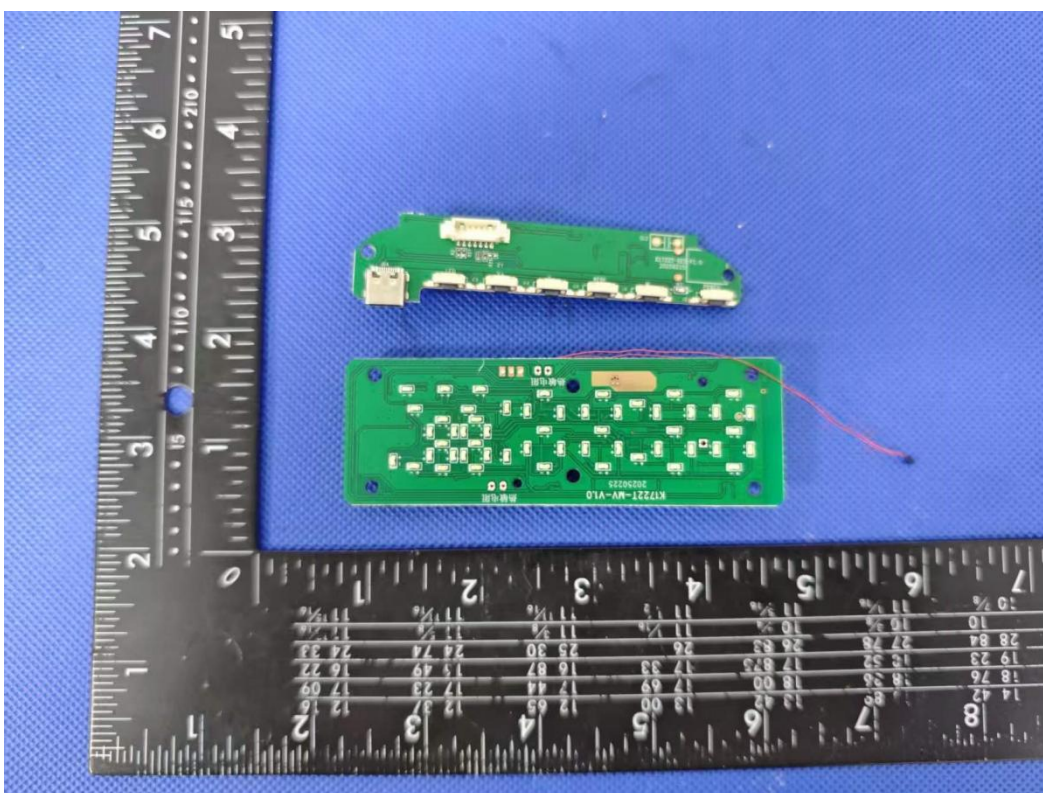
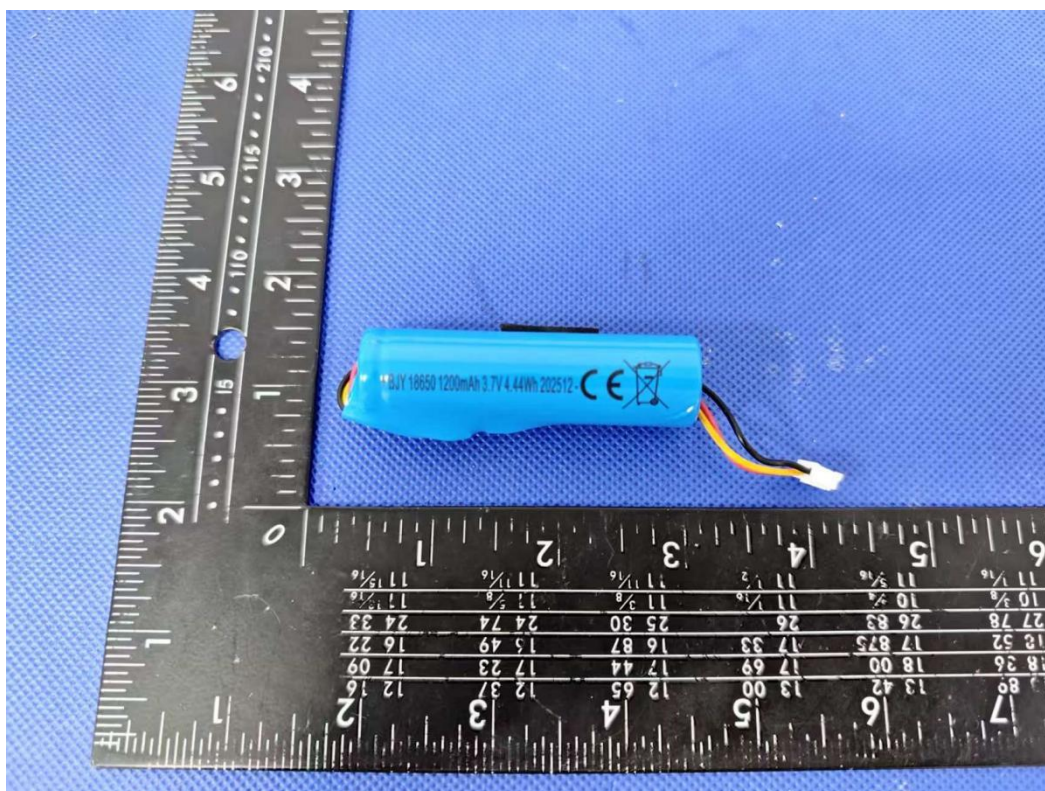
PHOTO 5

PHOTO 6


PHOTO 7



*****END OF THE REPORT*****