



TEST REPORT

Reference No...... : WTF25F06167111W004
Applicant..... : Mid Ocean Brands B.V.
Address..... : Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan,
Kowloon, Hong Kong.
Manufacturer : 114276
Address..... : ---
Product Name..... : Solar hand crank radio torch
Model No...... : MO2746
Test specification..... : ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-9 V2.1.1 (2019-04)
Date of Receipt sample : 2025-07-24
Date of Test : 2025-07-24 to 2025-08-04
Date of Issue..... : 2025-08-15
Test Report Form No. : WEW-301489A-01B
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:

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1 Test Summary

Emission				
Test	Test Requirement	Test Method	Class / Severity	Result
Conducted Emissions	ETSI EN 301 489-9 V2.1.1	ETSI EN 301 489-1 V2.2.3 EN 55032	Table A.10 of EN 55032	N/A
Radiation Emission	ETSI EN 301 489-9 V2.1.1	ETSI EN 301 489-1 V2.2.3 EN 55032	Table A.4 and Table A.5 of EN 55032	Pass
Harmonic Current Emissions	ETSI EN 301 489-9 V2.1.1	ETSI EN 301 489-1 V2.2.3 EN IEC 61000-3-2	Clause 7 of EN IEC 61000-3-2	N/A
Voltage Fluctuations and Flicker	ETSI EN 301 489-9 V2.1.1	ETSI EN 301 489-1 V2.2.3 EN 61000-3-3	Clause 5 of EN 61000-3-3	N/A
Immunity				
Test	Test Requirement	Test Method	Class / Severity	Result
Electrostatic Discharge (ESD)	ETSI EN 301 489-9 V2.1.1	ETSI EN 301 489-1 V2.2.3 EN 61000-4-2	$\pm 2/\pm 4$ kV Contact $\pm 2/\pm 4/\pm 8$ kV Air	Pass
Radio frequency electromagnetic field (80 MHz to 6 000MHz)	ETSI EN 301 489-9 V2.1.1	ETSI EN 301 489-1 V2.2.3 EN 61000-4-3	3V/m, 80%, 1kHz, Amp. Mod.	Pass
Fast Transients Common Mode (EFT)	ETSI EN 301 489-9 V2.1.1	ETSI EN 301 489-1 V2.2.3 EN 61000-4-4	AC $\pm 0.5/1.0$ kV	N/A
Surge	ETSI EN 301 489-9 V2.1.1	ETSI EN 301 489-1 V2.2.3 EN 61000-4-5	± 1 kV D.M. $\dagger$ ± 2 kV C.M. $\ddagger$	N/A
RF common mode 0,15 MHz to 80 MHz (CS)	ETSI EN 301 489-9 V2.1.1	ETSI EN 301 489-1 V2.2.3 EN 61000-4-6	3Vrms(emf), 80%, 1kHz Amp. Mod.	N/A
Voltage Dips and Interruptions	ETSI EN 301 489-9 V2.1.1	ETSI EN 301 489-1 V2.2.3 EN 61000-4-11	0 % UT* for 0.5per 0 % UT* for 1per 70 % UT* for 25per 0 % UT* for 250per	N/A

Remark:

- Pass Test item meets the requirement
- Fail Test item does not meet the requirement
- N/A Test case does not apply to the test object
- A.M Amplitude Modulation
- $\dagger$ Differential Mode
- $\ddagger$ Common Mode
- * U_T is the nominal supply voltage



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3 General Information

3.1 General Description of E.U.T.

Product Name : Solar hand crank radio torch

Model No. : MO2746

Remark : ---

3.2 Details of E.U.T.

Technical Data : USB-C Input: DC 5V, 1A
USB-A Input: DC 5V, 0.5A, 2.5W
Battery: 3.7V, 1200mAh

3.3 Description of Support Units

The EUT has been tested as an independent unit. MO2746 is the test sample. The full tests were performed in the condition of battery 3.7V input.

3.4 Standards Applicable for Testing

The tests were performed according to following standards:

ETSI EN 301 489-1 V2.2.3 (2019-11) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility

ETSI EN 301 489-9 V2.1.1 (2019-04) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 9: Specific conditions for wireless microphones, similar Radio Frequency (RF) audio link equipment, cordless audio and in-ear monitoring devices; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

3.5 Test Facility

The test facility has a test site registered with the following organizations:

- **ISED – Registration No.: 21895**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Innovation, Science and Economic Development Canada (ISED). The acceptance letter from the ISED is maintained in our files. Registration ISED number: 21895.

- **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 820106.

- **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



3.6 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test items: ---

Lab information:---

3.7 Abnormalities from Standard Conditions

None.

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4 Equipment Used during Test

4.1 Equipment List

☐ Mains Terminal Disturbance Voltage 1#(Conducted Emission)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	EMI Test Receiver	R&S	ESR3	102423	2025-01-06	2026-01-05
2.	LISN	R&S	ENV216	101343	2025-01-06	2026-01-05
3.	Cable	HUBER+SUHNER	CBL2-NN-6M	223NN624	2025-01-06	2026-01-05
4.	Switch	CD	RSU-A4	RSUA4008	2025-01-06	2026-01-05
☐ Mains Terminal Disturbance Voltage 2#(Conducted Emission)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	EMI Test Receiver	R&S	ESCI	101178	2025-01-06	2026-01-05
2.	LISN	R&S	ENV216	101215	2025-01-07	2026-01-06
3.	Cable 22	Times Microwave Systems	LMR195UF-BMNM-5.00M	---	2025-01-08	2026-01-07
4.	Switch	ESE	RSU/M2	---	2025-01-06	2026-01-05
☐ Mains Terminal Disturbance Voltage 3#(Conducted Emission)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	EMI Test Receiver	R&S	ESR3	102842	2025-01-06	2026-01-05
2.	LISN	R&S	ENV216	101542	2025-01-06	2026-01-05
3.	Cable 12	YIHENG	LMR195UF-NMNM-2.5	---	2025-01-06	2026-01-05
4.	Manual RF Switch	Top Precision	SW-2	RSU0402	2025-01-06	2026-01-05
☒ Radiated Emission (30MHz to 1GHz) 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	3m Semi-anechoic Chamber	CHANGCHUANG	9m×6m×6m	---	2024-01-05	2027-01-04
2.	EMI Test Receiver	R&S	ESR7	101566	2025-01-06	2026-01-05
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB 9162	9162-117	2025-01-12	2026-01-11
4.	Cable 20	Times Microwave Systems	RG223-NMNM-10M	---	2025-01-06	2026-01-05
5.	Cable 21	Times Microwave Systems	RG223-NMNM-3M	---	2025-01-06	2026-01-05
☐ Radiated Emission (30MHz to 1GHz) 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	3m Semi-anechoic Chamber	YIHENG	9m×6m×6m	YH2021071801	2024-01-06	2027-01-05
2.	EMI Test Receiver	R&S	ESR7	102454	2025-01-06	2026-01-05
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB 9163	01418	2025-02-08	2026-02-07
4.	Cable 14	YIHENG	LMR240UF-NMSM-7.5	---	2025-01-06	2026-01-05



☐ Radiated Emission (1GHz to 6GHz) 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	3m Semi-anechoic Chamber	CHANGCHUANG	9m×6m×6m	-	2024-01-05	2027-01-04
2.	EMI Test Receiver	R&S	ESR7	101566	2025-01-06	2026-01-05
3.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	01561	2025-01-13	2026-01-12
4.	Coaxial Cable (above 1GHz)	Times-Microwave	CBL5-NN	-	2025-01-06	2026-01-05
5.	Preamplifier	Lunar E M	LNA1G18-40	20160501002	2025-01-06	2026-01-05
☐ Radiated Emission (1GHz to 6GHz) 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	3m Semi-anechoic Chamber	YIHENG	9m×6m×6m	YH2021071801	2024-01-06	2027-01-05
2.	EMI Test Receiver	R&S	ESR7	102454	2025-01-06	2026-01-05
3.	Broad-band Horn Antenna	SCHWARZBECK	BBHA9120D	02465	2025-01-13	2026-01-12
4.	Coaxial Cable (above 1GHz)	Times-Microwave Systems	SFT205-NMSM-7	-	2025-01-06	2026-01-05
5.	Preamplifier	Tonscend	TAP0118045	AP21J806168	2025-01-06	2026-01-05
☐ Harmonics and Flicker Measuring System						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	Harmonics and Flicker Measuring System	YUANFANG	HFM-3000	V200	2025-01-07	2026-01-06
☒ ESD						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	ESD Simulator	TESEQ	NSG437	521	2025-01-06	2026-01-05
☐ EFT & Voltage Dips and Interruptions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	EMS test system	TESEQ	NSG3040	1858	2025-01-06	2026-01-05
2.	Step transformer	TESEQ	INA6501	206	2025-01-06	2026-01-05
3.	Coupling clamp	TESEQ	CDN8014	31405	2025-01-07	2026-01-06
☐ Surge						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	Surge Simulator	TESEQ	NSG3060	1395	2025-01-06	2026-01-05
☐ Injected Currents						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	Conducted Immunity test system	TESEQ	NSG4070	45345	2025-01-06	2026-01-05
2.	CDN	TESEQ	CDN M016	31586	2025-01-07	2026-01-06
3.	EM Clamp	TESEQ	KEMZ801	32362	2025-01-06	2026-01-05
4.	6dB Attenuator	TESEQ	ATN6075	32122	2025-01-07	2026-01-06



☒ Radio-frequency electromagnetic fields						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1.	RF Power Amplifier	MICOTOP	MPA-80-1000-250	MPA2405139	2025-01-06	2026-01-05
2.	RF Power Amplifier	MICOTOP	MPA-1000-6000-100	MPA2405140	2025-01-06	2026-01-05
3.	Stacked double logarithmic periodic antenna	SCHWARZBECK	STLP9128E-SPECIAL	142	2025-01-15	2026-01-14
4.	Stacked double logarithmic periodic antenna	SCHWARZBECK	STLP 9149	476	2025-01-13	2026-01-12
5.	Analog signal generator	RS	SMB100A	105566	2025-01-06	2026-01-05
6.	Power meter	RS	NRP6A	101133	2025-01-06	2026-01-05
7.	Power meter	RS	NRP6A	101134	2025-01-06	2026-01-05

☐: Not Used

☒: Used

4.2 Software List

Description	Manufacturer	Model	Version
EMI Test Software (Conducted Emission 1#)	FARATRONIC	EZ-EMC	EMEC-3A1
EMI Test Software (Conducted Emission 2#)	FARATRONIC	EZ-CON	FARAD-3A1.1+
EMI Test Software (Conducted Emission 3#)	FARATRONIC	EZ-EMC	EMC-CON 3A1.1+
EMI Test Software (Radiated Emission 1#)	FARATRONIC	EZ-EMC	RA-03A1-2
EMI Test Software (Radiated Emission 2#)	FARATRONIC	EZ-EMC	RA-03A1-2
Harmonics and Flicker Test Software	YUANFANG	HFM-3000	V2.00.147
Radiated Immunity Test Software	Chinese EMC	EMS	V1.0.0.0

4.3 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Conducted Emission	150kHz~30MHz	±2.6dB	(1)
Radiated Emission	30MHz~1GHz	±4.5dB	(1)
Radiated Emission	1GHz~6GHz	±4.5dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



4.4 Special Accessories and Auxiliary Equipment

Item	Equipment	Technical Data	Manufacturer	Model No.	Serial No.
1.	/	/	/	/	/

4.5 Decision Rule

Compliance or non-compliance with a disturbance limit shall be determined in the following manner.

If U_{LAB} is less than or equal to U_{cispr} , then

- Compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{LAB} is greater than U_{cispr} , then

- Compliance is deemed to occur if no measured disturbance level, increased by $(U_{LAB} - U_{cispr})$, exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{LAB} - U_{cispr})$, exceeds the disturbance limit.

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5 EMC Requirements for Emissions

5.1 Radiated Emission

Test Requirement	ETSI EN 301 489-9
Test Method	ETSI EN 301 489-1, EN 55032, Class B
Frequency Range	30MHz to 1GHz
Class/Severity	Class B/ Table A.4 of EN 55032
Detector	Peak for pre-scan (120kHz Resolution Bandwidth Below 1GHz)

5.1.1 EUT Operation:

Operating Environment:

Temperature	22.4°C
Humidity	52.6%RH
Atmospheric Pressure	101.2kPa

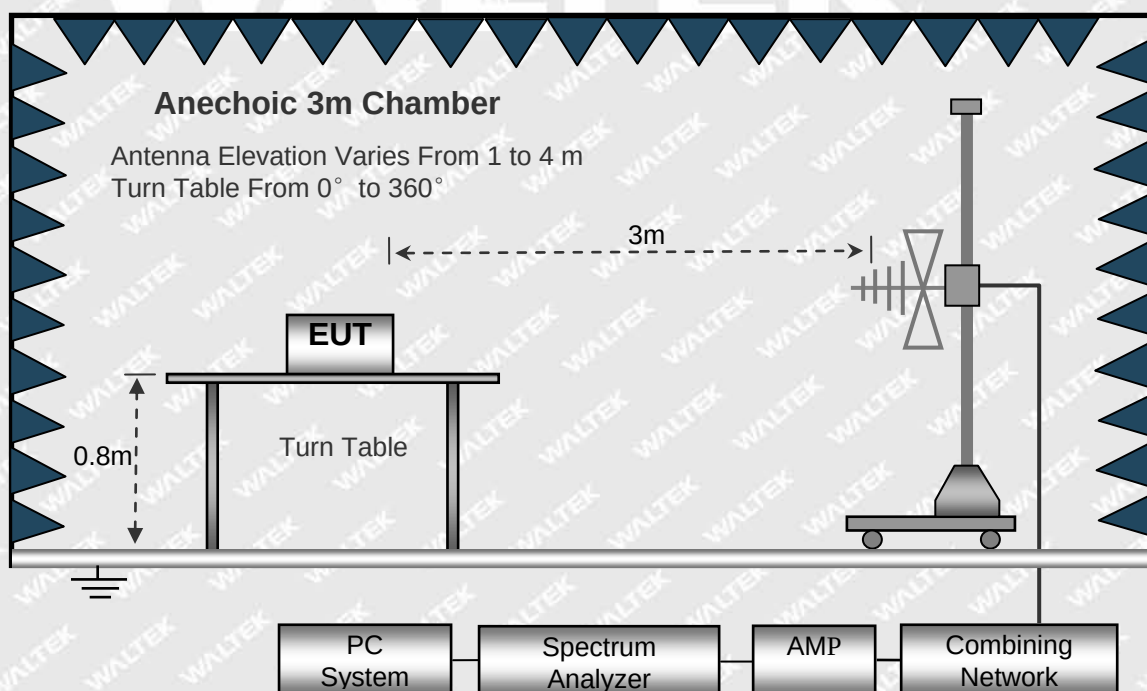
EUT Operation:

Input Voltage	Battery 3.7V
Operating Mode	AM mode; FM mode

5.1.2 Test Setup

The radiated emission tests were performed using the setup accordance with the EN 55032.

Frequency Range: Below 1 GHz





5.1.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Corr. Factor}$$

$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit.

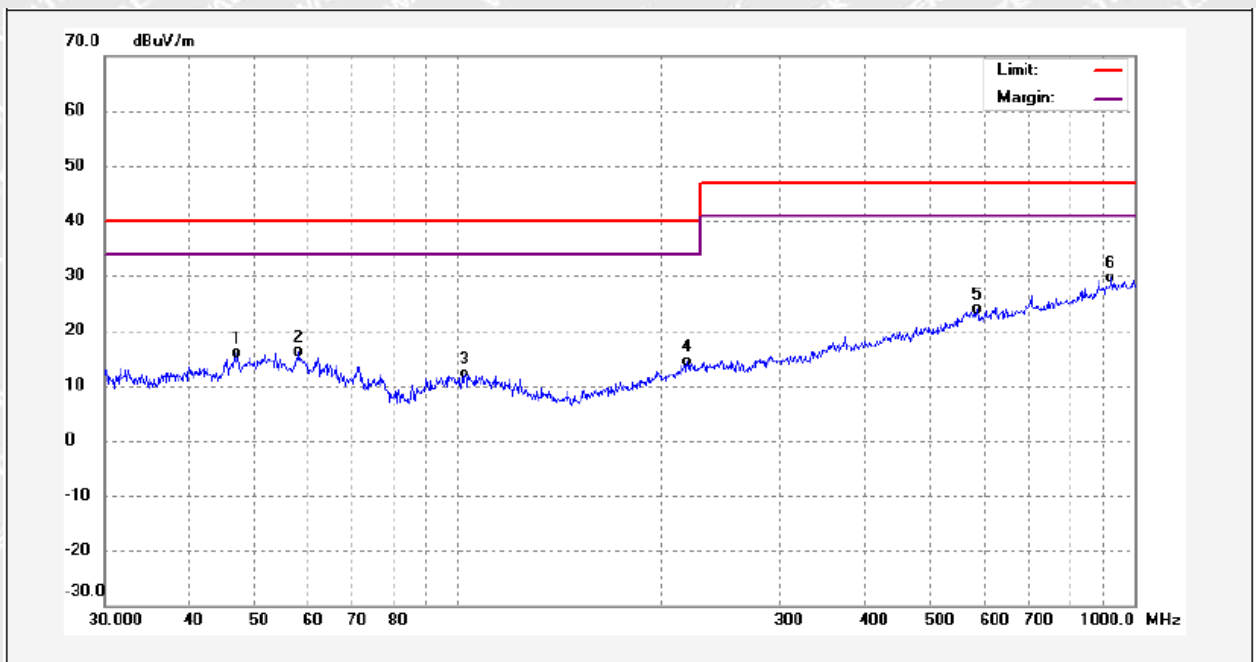
The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

5.1.4 Test Result

AM mode

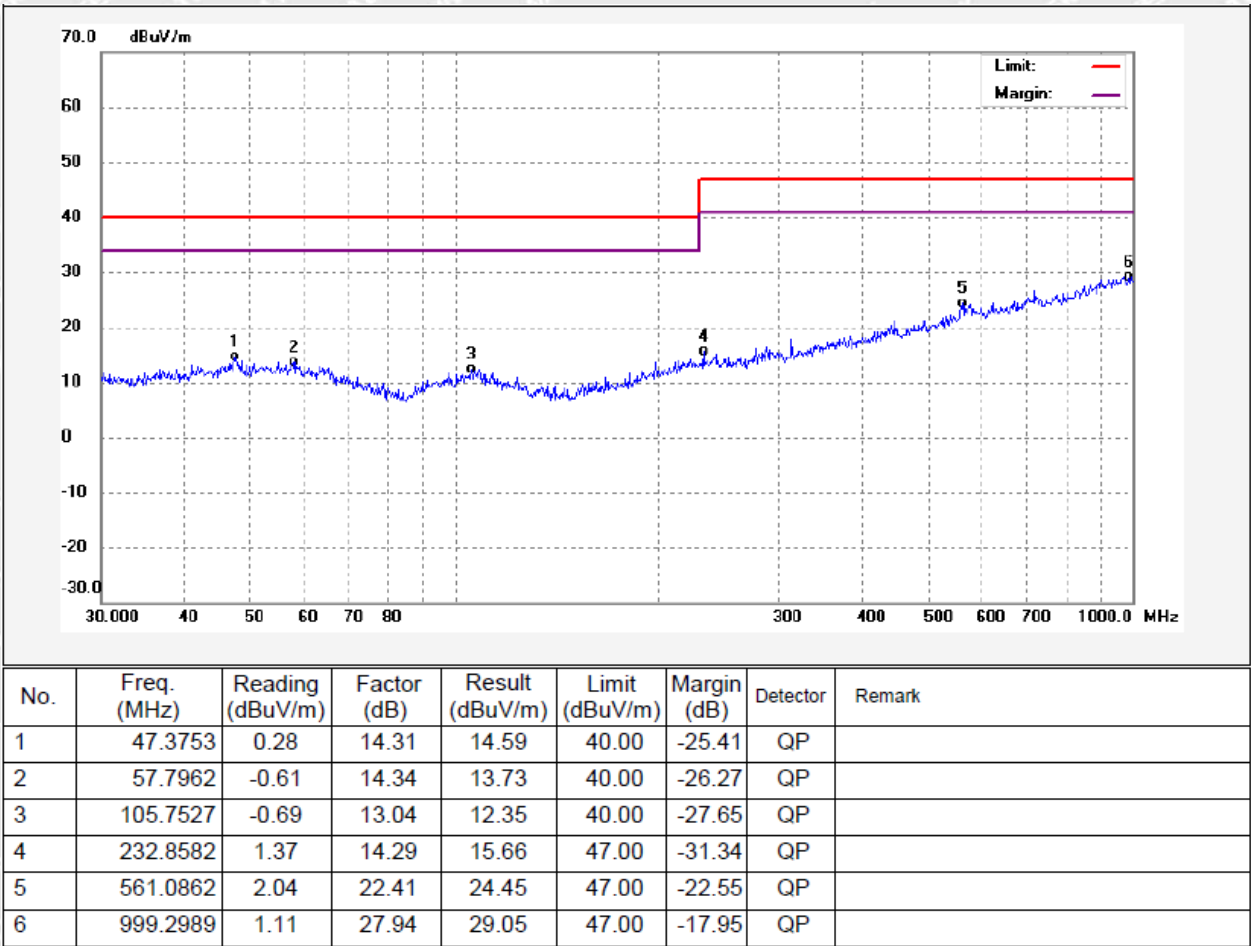
Antenna Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	47.2095	1.54	14.26	15.80	40.00	-24.20	QP	
2	58.2643	1.90	14.26	16.16	40.00	-23.84	QP	
3	102.4315	-0.50	12.67	12.17	40.00	-27.83	QP	
4	218.3085	0.20	14.24	14.44	40.00	-25.56	QP	
5	585.4050	1.33	22.57	23.90	47.00	-23.10	QP	
6	923.1629	2.25	27.33	29.58	47.00	-17.42	QP	



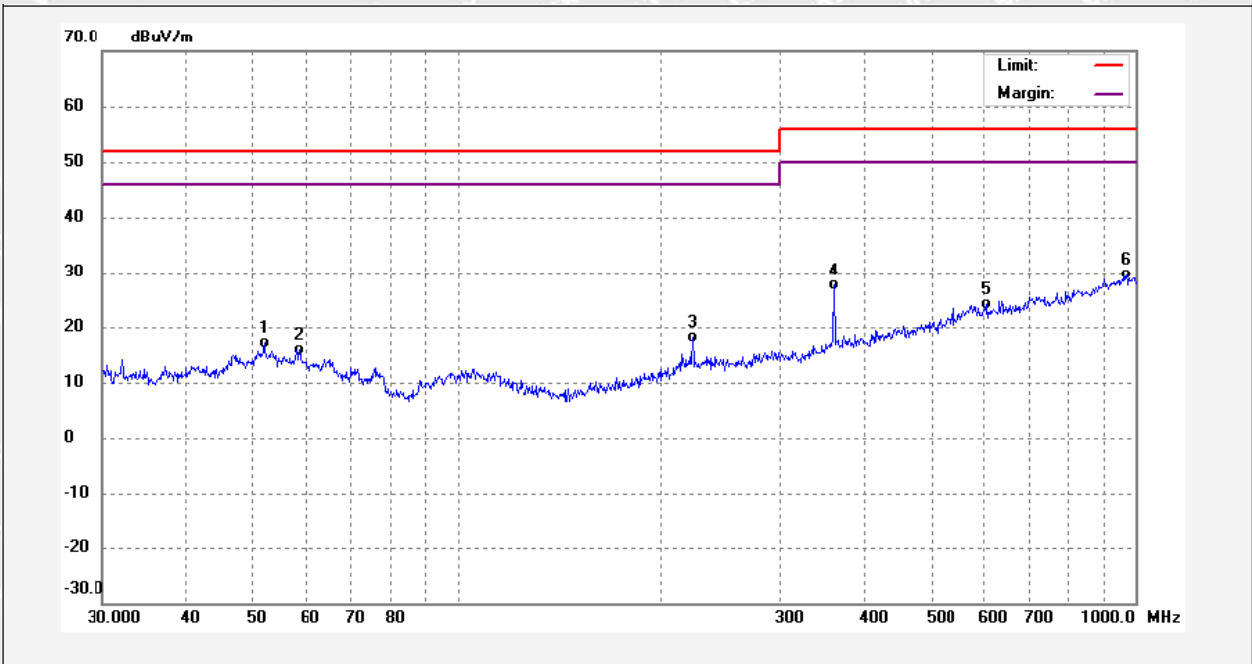
Antenna Polarization: Horizontal



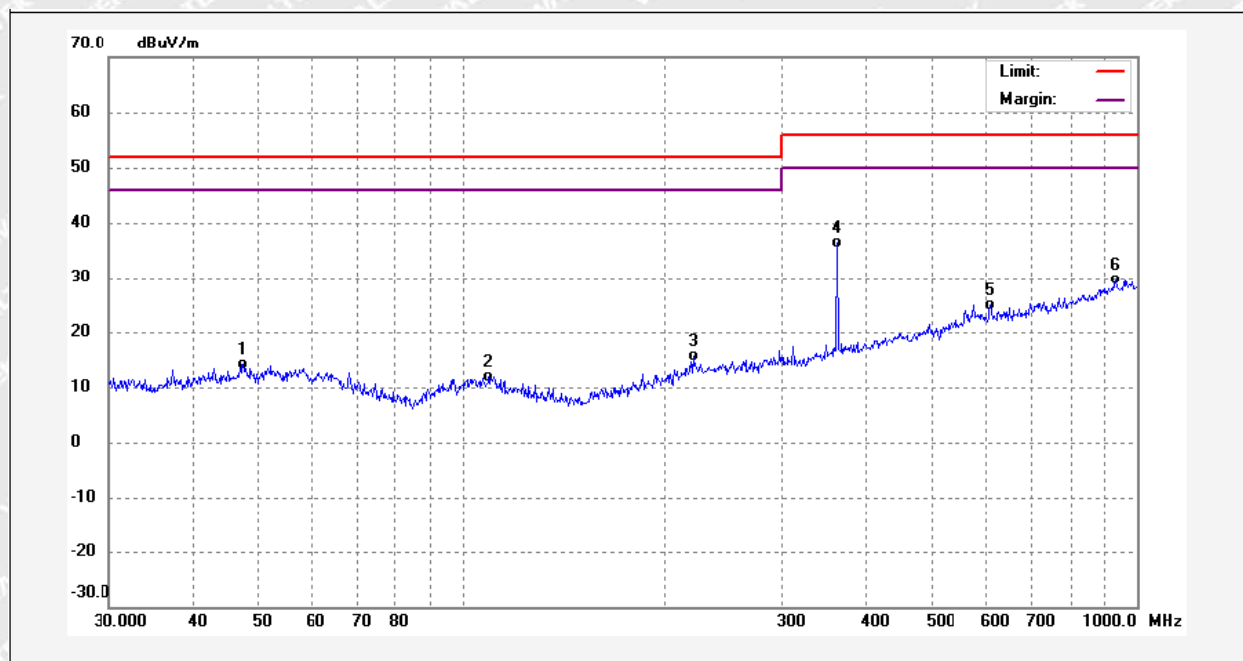


FM mode

Antenna Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	51.9340	2.70	14.36	17.06	52.00	-34.94	QP	
2	58.6126	1.79	14.19	15.98	52.00	-36.02	QP	
3	222.7158	3.67	14.34	18.01	52.00	-33.99	QP	
4	360.3214	9.81	17.81	27.62	56.00	-28.38	QP	
5	605.6592	1.58	22.55	24.13	56.00	-31.87	QP	
6	970.9745	1.99	27.76	29.75	56.00	-26.25	QP	

**Antenna Polarization: Horizontal**

No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	47.3421	-0.19	14.29	14.10	52.00	-37.90	QP	
2	109.5268	-0.85	12.76	11.91	52.00	-40.09	QP	
3	220.3079	1.37	14.29	15.66	52.00	-36.34	QP	
4	360.3214	18.51	17.81	36.32	56.00	-19.68	QP	
5	608.6398	2.40	22.52	24.92	56.00	-31.08	QP	
6	930.6384	2.08	27.48	29.56	56.00	-26.44	QP	



6 EMC Requirement for Immunity

6.1 Performance Criteria

6.1.1 General performance criteria

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

6.1.2 Performance table

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 critical stored data.
B	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data.

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6.2 Electrostatic Discharge(ESD)

Test Requirement	ETSI EN 301 489-9
Test Method	ETSI EN 301 489-1, EN 61000-4-2
Discharge Impedance	330 Ω / 150 pF
Discharge Voltage	Air Discharge: +/-2,4,8 KV Contact Discharge: +/-2,4 kV HCP & VCP: +/-2,4 kV
Polarity	Positive & Negative
Discharge Repeat Times	At Least 20 times at each test point
Discharge Mode	Single Discharge
Discharge Period	1 second minimum

6.2.1 E.U.T. Operation

Operating Environment:

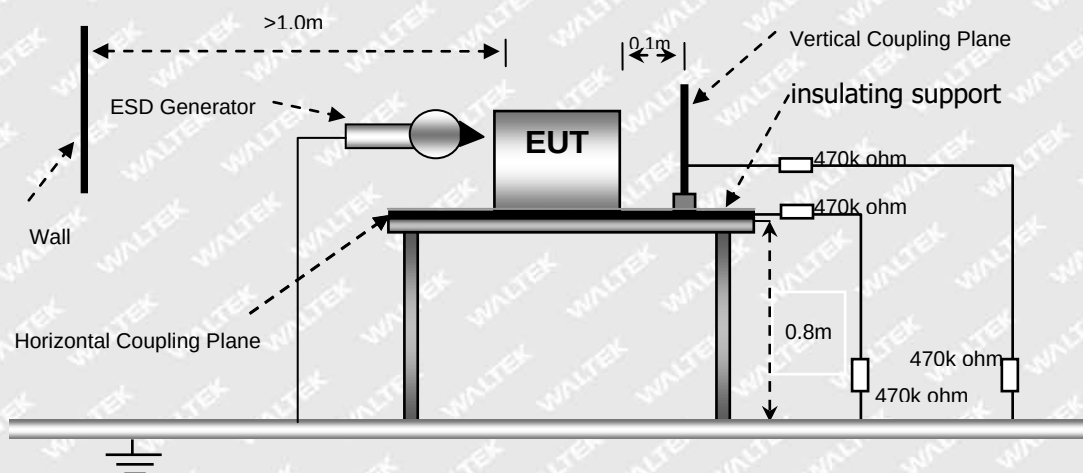
Temperature	21.6°C
Humidity	55.3%RH
Atmospheric Pressure	100.2kPa

EUT Operation:

Input Voltage	Battery 3.7V
Operating Mode	AM mode; FM mode

6.2.2 Block Diagram of Setup

The ESD test was performed in accordance with the EN 61000-4-2.





6.2.3 Test Result

Direct Discharge			Performance Criteria	
Discharge Level (kV)	Performance Criterion	Test Point	Contact Discharge	Air Discharge
$\pm 2 / \pm 4 / \pm 8$	B	1	N/A	Pass*
$\pm 2 / \pm 4$	B	2	Pass*	N/A

Remark:

Test points 1. All Exposed Surface & Seams; 2. All metallic part

* During the test no deviation was detected to the selected operation mode(s)

Indirect Discharge			Performance Criteria	
Discharge Level (kV)	Performance Criterion	Test Point	Horizontal Coupling	Vertical Coupling
$\pm 2 / \pm 4$	B	1	Pass*	Pass*

Remark:

Test points 1. All sides

* During the test no deviation was detected to the selected operation mode(s)

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6.3 RF Electromagnetic Field (80MHz to 6 000MHz) (RS)

Test Requirement : ETSI EN 301 489-9
Test Method : ETSI EN 301 489-1, EN 61000-4-3
Face of EUT : Front, Back, Left, Right
Frequency Range : 80MHz to 6 000MHz
Test Level : 3V/m
Modulation : 80%, 1kHz Amplitude Modulation.
Antenna polarisation : Horizontal& Vertical

6.3.1 E.U.T. Operation

Operating Environment:

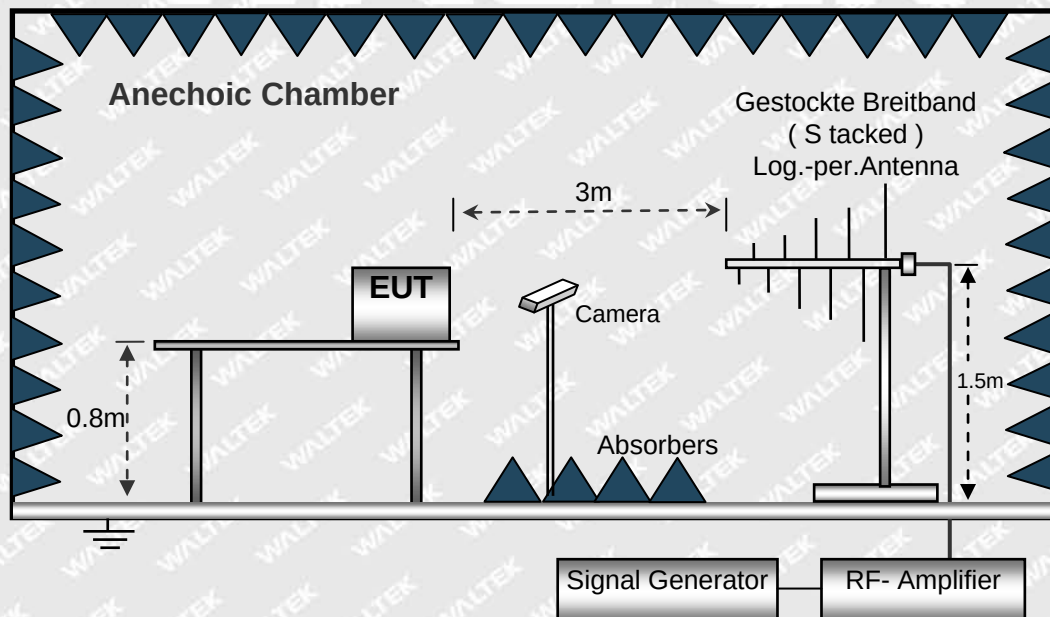
Temperature : 21.6°C
Humidity : 55.3%RH
Atmospheric Pressure : 100.2kPa

EUT Operation:

Input Voltage : Battery 3.7V
Operating Mode : AM mode; FM mode

6.3.2 Block Diagram of Setup

The Radiated Immunity test was performed in accordance with the EN 61000-4-3.





6.3.3 Test Result

Frequency	Face of EUT	Antenna polarisation	Test Level	Step Size	Dwell Time	Performance Criterion	Result
80MHz to 1000MHz	Front, Back, Left, Right	Horizontal	3V/m	1%	1s	A	Pass*
80MHz to 1000MHz	Front, Back, Left, Right	Vertical	3V/m	1%	1s	A	Pass*
1000MHz to 6000MHz	Front, Back, Left, Right	Horizontal	3V/m	1%	1s	A	Pass*
1000MHz to 6000MHz	Front, Back, Left, Right	Vertical	3V/m	1%	1s	A	Pass*

Remark:

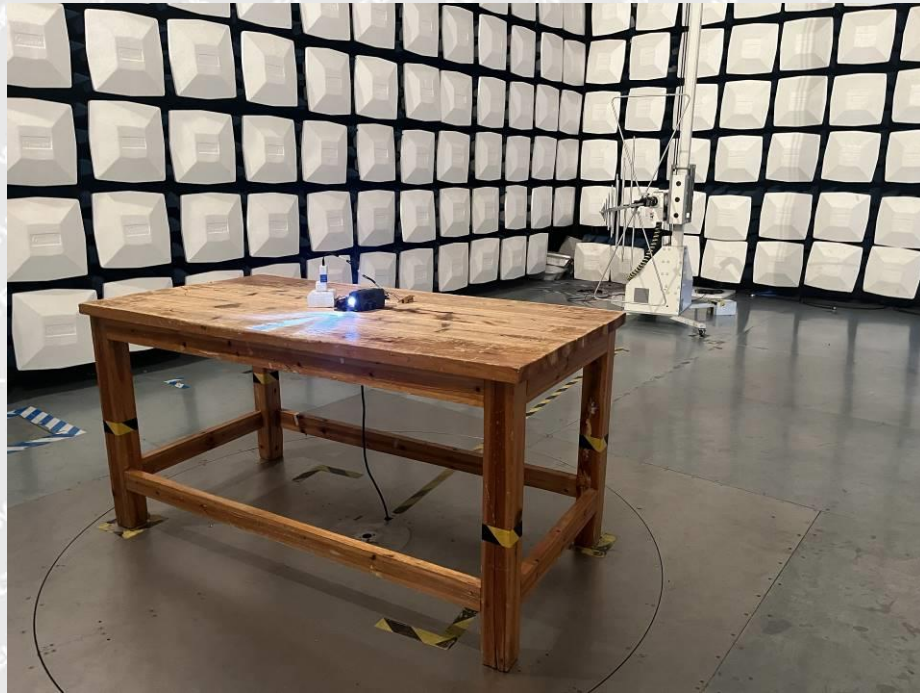
* During the test no deviation was detected to the selected operation mode(s)

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7 Photographs - Test Setup

7.1 Photograph - Radiated Emissions Test Setup

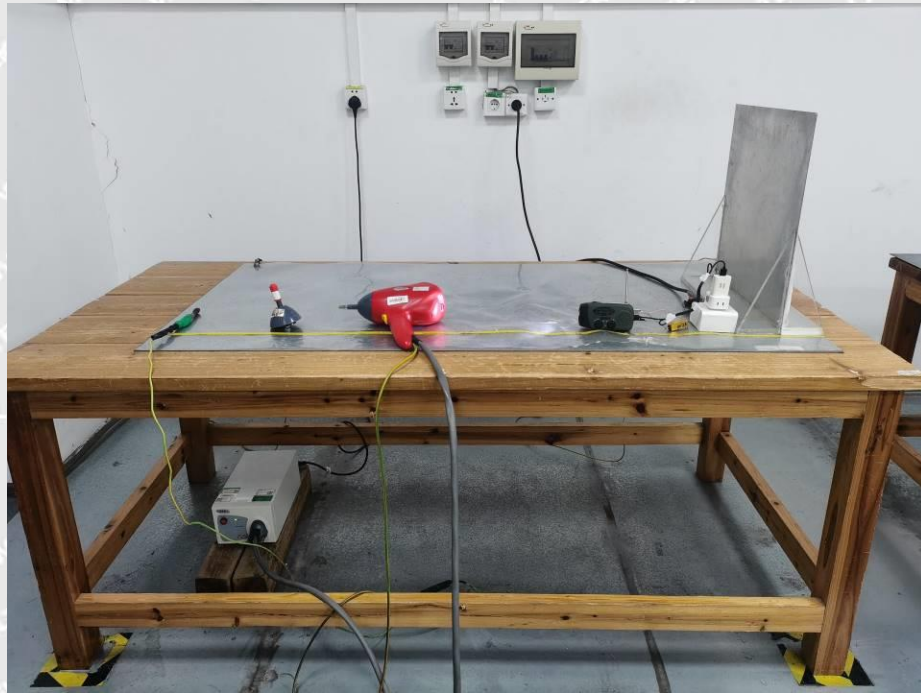


7.2 Photograph - RF Electromagnetic Field Test Setup





7.3 Photograph - ESD Test Setup



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8 Photographs – EUT Constructional Details

Please refer to “ANNEX” (Reference No. WTF25F06167111W).

=====End of Report=====

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国际互认
检测
TESTING
CNAS L6478



TEST REPORT

Reference No...... : WTF25F06167111W001
Applicant..... : Mid Ocean Brands B.V.
Address..... : Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan,
Kowloon, Hong Kong.
Manufacturer : 114276
Address..... : ---
Product Name..... : Solar hand crank radio torch
Model No...... : MO2746
Test specification..... : EN IEC 55015:2019+A11:2020
EN IEC 61547:2023
EN 55032:2015+A11:2020+A1:2020
EN 55035:2017+A11:2020
Date of Receipt sample : 2025-07-24
Date of Test : 2025-07-24 to 2025-07-25
Date of Issue..... : 2025-08-15
Test Report Form No...... : WEL-55015A-01A
Test Result..... : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:

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Tested by:

Roy Hong

Approved by:

Danny Zhou



1 Test Summary

EMISSION				
Test Item	Test Standard		Class / Severity	Result
Conducted Disturbance for Wired Network Port, 9kHz to 30MHz	EN IEC 55015:2019+A11:2020 EN 55032:2015+A11:2020+A1:2020		Clause 4.3.1 Table A.10	Pass
Conducted Disturbance for Local Wired Port,150kHz to 30MHz	EN IEC 55015:2019+A11:2020		Clause 4.4	N/A
Radiated Electromagnetic Disturbance, 9kHz to 30MHz	EN IEC 55015:2019+A11:2020		Clause 4.5.2	Pass
Radiated Disturbance, 30MHz to 1000MHz	EN IEC 55015:2019+A11:2020 EN 55032:2015+A11:2020+A1:2020		Clause 4.5.3 Table A.4	Pass
Radiation Emission, 1GHz to 6GHz	EN 55032:2015+A11:2020+A1:2020		Table A.5	N/A ^{a)}
IMMUNITY (EN IEC 61547:2023, EN 55035:2017+A11:2020)				
Test Item	Test Method	Class / Severity	Performance Criteria	Result
Electrostatic Discharge(ESD)	IEC 61000-4-2:2008	±4 kV Contact ±8 kV Air	B	Pass
Radio-Frequency Electromagnetic Fields	IEC 61000-4-3: 2006+A1+A2	3V/m, 80%, 1kHz, Amp. Mod.	A	Pass
Electrical Fast Transients (EFT)	IEC 61000-4-4:2012	AC ±1.0kV DC ±0.5kV	B	Pass
Surge	IEC 61000-4-5:2005	±1Kv D.M.† ±2Kv C.M.‡	C	Pass
Injected Currents, 0.15MHz to 80MHz	IEC 61000-4-6:2008	3~1Vr.m.s.(emf), 80%, 1kHz Amp. Mod.	A	Pass
Power-Frequency Magnetic Field	IEC 61000-4-8:2009	3A/m	A	N/A
Voltage Dips	IEC 61000-4-11:2004	< 5 % U _T * for 0.5per	B	Pass
		70 % U _T * for 10/25/30per	C	
Voltage Interruptions		< 5 % U _T * for 250/300per	C	

Remark:

Pass Test item meets the requirement

Fail Test item does not meet the requirement

N/A Test case does not apply to the test object

A.M Amplitude Modulation

† Differential Mode

‡ Common Mode

* U_T is the nominal supply voltage

^{a)} Since the highest frequency of the internal sources of the EUT is less than 108MHz, According to EN 55032, the measurement shall only be made up to 1GHz.



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3 General Information

3.1 General Description of E.U.T.

Product Name : Solar hand crank radio torch

Model No. : MO2746

Remark : ---

3.2 Details of E.U.T.

Technical Data : USB-C Input: DC 5V, 1A
USB-A Input: DC 5V, 0.5A, 2.5W
Battery: 3.7V, 1200mAh

3.3 Description of Support Units

The EUT has been tested as an independent unit. MO2746 is the test sample. The DV, LOOP and RE tests were performed in the condition of AC 240V/50Hz input. The other tests were performed in the condition of AC 230V/50Hz input. The tests under AC input condition were performed with the AC adapter specified by the laboratory. The LOOP, RE, ESD and RS tests were performed in the additional condition of battery 3.7V input.

3.4 Standards Applicable for Testing

The tests were performed according to following standards:

EN IEC 55015:2019 +A11:2020	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
EN IEC 61547:2023	Equipment for general lighting purposes - EMC immunity requirements
EN 55032:2015+A11:2020 +A1:2020	Electromagnetic compatibility of multimedia equipment — Emission Requirements
EN 55035:2017+A11:2020	Electromagnetic compatibility of multimedia equipment - Immunity requirements
EN IEC 61000-3-2:2019 +A1:2021+A2:2024	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase).
EN 61000-3-3:2013 +A1:2019+A2:2021	Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.



3.5 Test Facility

The test facility has a test site registered with the following organizations:

- **ISED – Registration No.: 21895**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Innovation, Science and Economic Development Canada (ISED). The acceptance letter from the ISED is maintained in our files. Registration ISED number: 21895.

- **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 820106, August 16, 2018

- **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

3.6 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test items: ---

Lab information: ---

3.7 Abnormalities from Standard Conditions

None.



4 Equipment Used during Test

☐ Mains Terminal Disturbance Voltage (Conducted Emission) 1#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	EMI Test Receiver	R&S	ESR3	102423	Valid
2.	LISN	R&S	ENV216	101343	Valid
3.	Cable	HUBER+SUHNER	CBL2-NN-6M	223NN624	Valid
4.	Switch	CD	RSU-A4	RSUA4008	Valid
☒ Mains Terminal Disturbance Voltage (Conducted Emission) 2#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	EMI Test Receiver	R&S	ESCI	101178	Valid
2.	LISN	R&S	ENV216	101215	Valid
3.	Cable 22	Times Microwave Systems	LMR195UF-BMNM-5.00M	---	Valid
4.	Switch	ESE	RSU/M2	---	Valid
☐ Mains Terminal Disturbance Voltage (Conducted Emission) 3#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	EMI Test Receiver	R&S	ESR3	102842	Valid
2.	LISN	R&S	ENV216	101542	Valid
3.	Cable 12	YIHENG	LMR195UF-NMNM-2.5	---	Valid
4.	Manual RF Switch	Top Precision	SW-2	RSU0402	Valid
☒ Radiated Electromagnetic Disturbance (9kHz to 30MHz) 1#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	EMI Test Receiver	R&S	ESCI	101178	Valid
2.	Three Loops Antenna	SCHWARZBECK	HXYZ9170	000222	Valid
☐ Radiated Electromagnetic Disturbance (9kHz to 30MHz) 2#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	EMI Test Receiver	R&S	ESR3	102842	Valid
2.	Three Loops Antenna	SCHWARZBECK	HXYZ 9170	9170-367	Valid
☒ Radiated Emission (30MHz to 1GHz) 1#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	3m Semi-anechoic Chamber	CHANGCHUANG	9m×6m×6m	---	Valid
2.	EMI Test Receiver	R&S	ESR7	101566	Valid
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB 9162	9162-117	Valid
4.	Cable 20	Times Microwave Systems	RG223-NMNM-10M	---	Valid
5.	Cable 21	Times Microwave Systems	RG223-NMNM-3M	---	Valid



☐ Radiated Emission (30MHz to 1GHz) 2#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	3m Semi-anechoic Chamber	YIHENG	9m×6m×6m	YH2021071801	Valid
2.	EMI Test Receiver	R&S	ESR7	102454	Valid
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB 9163	01418	Valid
4.	Cable 14	YIHENG	LMR240UF-NMSM-7.5	---	Valid
☐ Radiated Emission (1GHz to 6GHz) 1#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	3m Semi-anechoic Chamber	CHANGCHUANG	9m×6m×6m	-	Valid
2.	EMI Test Receiver	R&S	ESR7	101566	Valid
3.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	01561	Valid
4.	Coaxial Cable (above 1GHz)	Times-Microwave	CBL5-NN	-	Valid
5.	Preamplifier	Lunar E M	LNA1G18-40	20160501002	Valid
☐ Radiated Emission (1GHz to 6GHz) 2#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	3m Semi-anechoic Chamber	CHANGCHUANG	9m×6m×6m	-	Valid
2.	EMI Test Receiver	R&S	ESR7	101566	Valid
3.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	01561	Valid
4.	Coaxial Cable (above 1GHz)	Times-Microwave	CBL5-NN	-	Valid
5.	Preamplifier	Lunar E M	LNA1G18-40	20160501002	Valid
☒ ESD					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	ESD Simulator	TESEQ	NSG437	521	Valid
☒ EFT & Voltage Dips and Interruptions					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	EMS test system	TESEQ	NSG3040	1858	Valid
2.	Step transformer	TESEQ	INA6501	206	Valid
3.	Coupling clamp	TESEQ	CDN8014	31405	Valid
☒ Surge					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	Surge Simulator	TESEQ	NSG3060	1395	Valid
☒ Injected Currents					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	Conducted Immunity test system	TESEQ	NSG4070	45345	Valid



2.	CDN	TESEQ	CDN M016	31586	Valid
3.	EM Clamp	TESEQ	KEMZ801	32362	Valid
4.	6dB Attenuator	TESEQ	ATN6075	32122	Valid

☒ **Radio-frequency Electromagnetic Fields**

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	RF Power Amplifier	MICOTOP	MPA-80-1000-250	MPA2405139	Valid
2.	RF Power Amplifier	MICOTOP	MPA-1000-6000-100	MPA2405140	Valid
3.	Stacked double logarithmic periodic antenna	SCHWARZBECK	STLP9128E-SPECIAL	142	Valid
4.	Stacked double logarithmic periodic antenna	SCHWARZBECK	STLP 9149	476	Valid
5.	Analog signal generator	RS	SMB100A	105566	Valid
6.	Power meter	RS	NRP6A	101133	Valid
7.	Power meter	RS	NRP6A	101134	Valid

☐: Not Used

☒: Used

4.1 Software List

Description	Manufacturer	Model	Version
EMI Test Software (Conducted Disturbance 1#)	FARATRONIC	EZ-EMC	EMEC-3A1
EMI Test Software (Conducted Disturbance 2#)	FARATRONIC	EZ-CON	FARAD-3A1.1+
EMI Test Software (Conducted Disturbance 3#)	FARATRONIC	EZ-EMC	EMC-CON 3A1.1+
EMI Test Software (LOOP 1#)	FARATRONIC	EZ-CON	FARAD-3A1.1+
EMI Test Software (LOOP 2#)	FARATRONIC	EZ-EMC	EMC-CON 3A1.1+
EMI Test Software (Radiated Disturbance 1#)	FARATRONIC	EZ-EMC	RA-03A1-2
EMI Test Software (Radiated Disturbance 2#)	FARATRONIC	EZ-EMC	RA-03A1-2
Radiated Immunity Test Software	Chinese EMC	EMS	V1.0.0.0



4.2 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Conducted Emission	9kHz~150kHz	$\pm 2.6\text{dB}$	(1)
Conducted Emission	150kHz~30MHz	$\pm 2.6\text{dB}$	(1)
Radiated Electromagnetic Disturbance	9kHz~30MHz	$\pm 3.0\text{dB}$	(1)
Radiated Disturbance	30MHz~1GHz	$\pm 4.5\text{dB}$	(1)
Radiated Disturbance	1GHz~6GHz	$\pm 4.5\text{dB}$	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

4.3 Special Accessories and Auxiliary Equipment

Item	Equipment	Technical Data	Manufacturer	Model No.
1.	AC Adapter	Input: AC 100-240V~, 50/60Hz, 0.5A Output: DC 5V, 2A or DC 9V, 2A	HUAWEI	HW-090200CH0

4.4 Decision Rule

Compliance or non-compliance with a disturbance limit shall be determined in the following manner.

If U_{LAB} is less than or equal to U_{CISPR1} then

- Compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{LAB} is greater than U_{CISPR1} then

- Compliance is deemed to occur if no measured disturbance level, increased by $(U_{\text{LAB}} - U_{\text{CISPR1}})$, exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{\text{LAB}} - U_{\text{CISPR1}})$, exceeds the disturbance limit.



5 Emission Test Results

5.1 Conducted Disturbance for Wired Network Port

Test Requirement	: EN IEC 55015 Clause 4.3.1, EN 55032 Annex A.3
Test Method	: EN IEC 55015 Clause 8.3, EN 55032 Annex A.3
Test Result	: Pass
Frequency Range	: 9kHz to 30MHz of EN IEC 55015; 150kHz to 30MHz of EN 55032
Class/Severity	: Table 1 of EN IEC 55015, Table A.10 of EN 55032

5.1.1 E.U.T. Operation

Operating Environment:

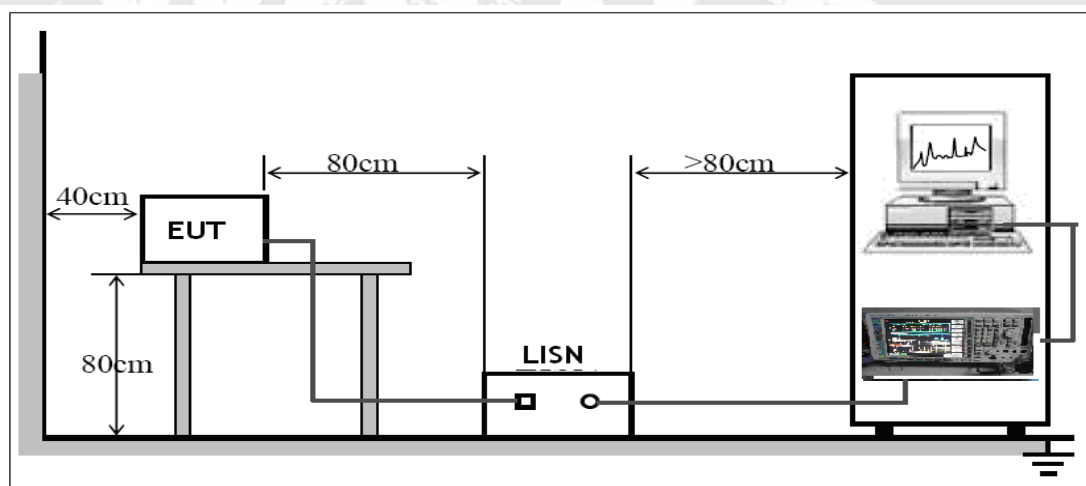
Temperature	: 20.8°C
Humidity	: 49.3%RH
Atmospheric Pressure	: 101.2kPa

EUT Operation:

Input Voltage	: AC 240V/50Hz
Operating Mode	: Charging + lighting + USB output +FM mode

5.1.2 Block Diagram of Test Setup

The Conducted Disturbance for Wired Network Port tests were performed in accordance with the EN IEC 55015 and EN 55032.



5.1.3 Measurement Data

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.



5.1.4 Corrected Amplitude & Margin Calculation

The Corrected factor is calculated by adding LISN VDF(Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Measurement} = \text{Reading Level} + \text{Correct Factor}$$

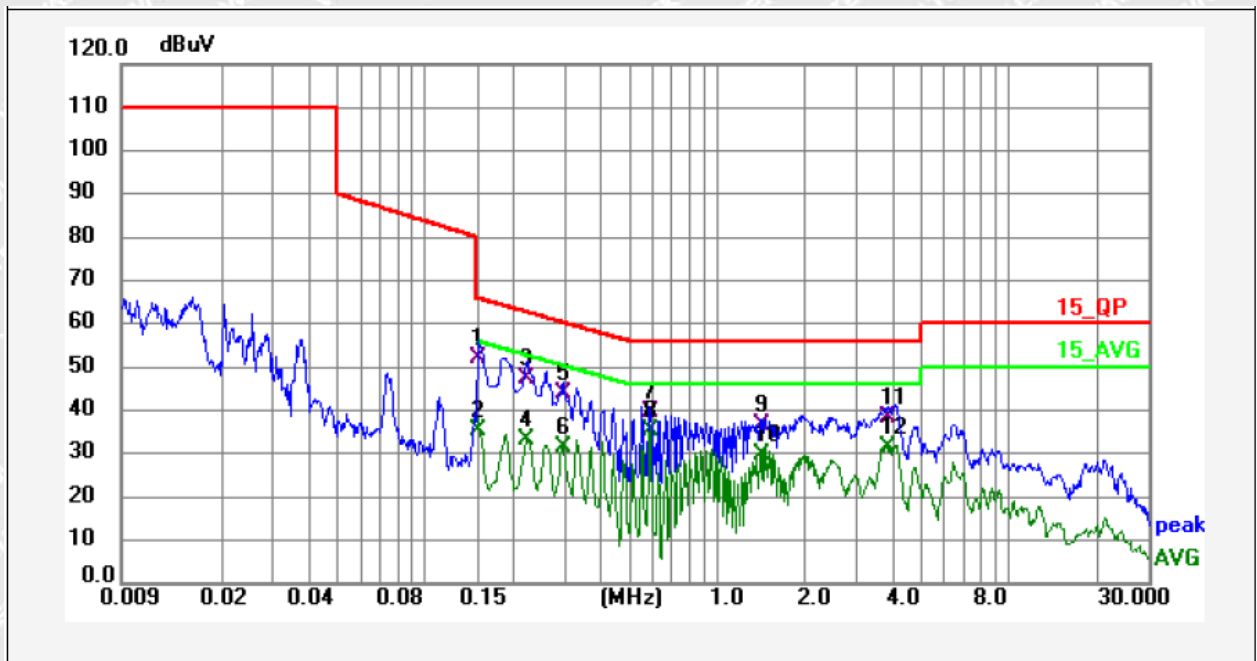
$$\text{Correct Factor} = \text{LISN VDF} + \text{Cable Loss}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Measurement} - \text{Limit}$$

5.1.5 Conducted Disturbance for Wired Network Port Test Data

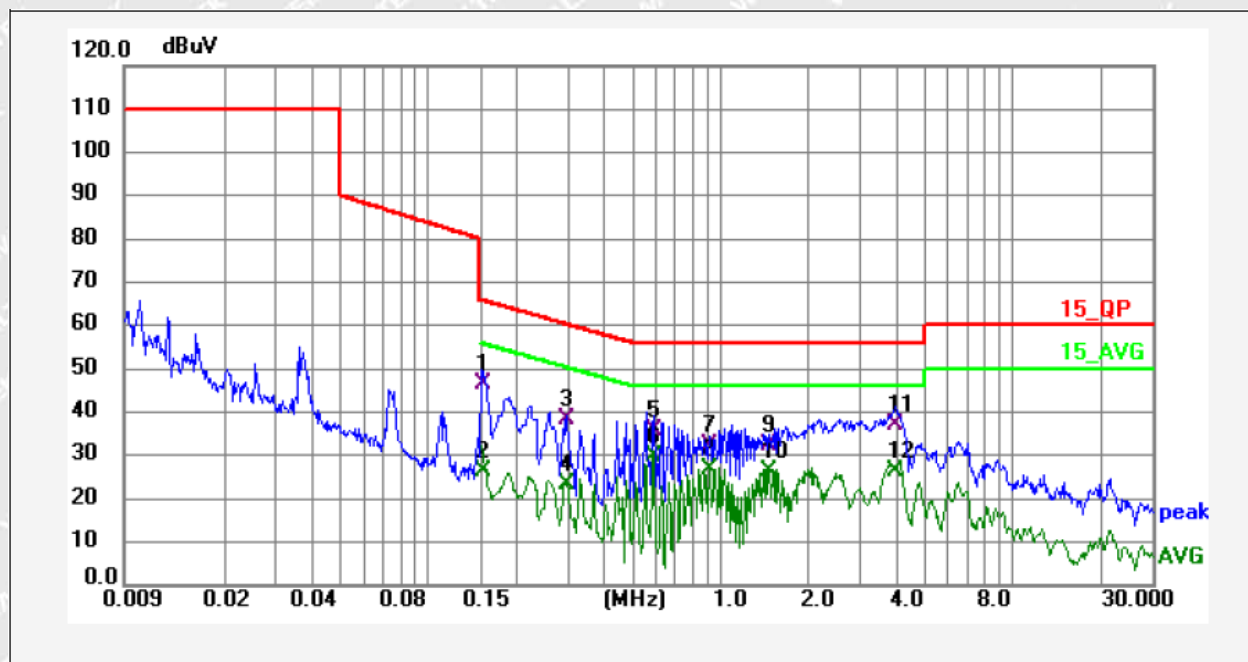
Live Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Remark
1	0.151	42.44	9.61	52.05	65.94	-13.89	QP	
2	0.151	25.96	9.61	35.57	55.94	-20.37	AVG	
3	0.222	37.90	9.61	47.51	62.74	-15.23	QP	
4	0.222	23.73	9.61	33.34	52.74	-19.40	AVG	
5	0.294	34.19	9.61	43.80	60.41	-16.61	QP	
6	0.294	21.89	9.61	31.50	50.41	-18.91	AVG	
7	0.587	29.82	9.65	39.47	56.00	-16.53	QP	
8	0.587	25.90	9.65	35.55	46.00	-10.45	AVG	
9	1.428	26.73	9.71	36.44	56.00	-19.56	QP	
10	1.428	19.90	9.71	29.61	46.00	-16.39	AVG	
11	3.840	28.43	9.83	38.26	56.00	-17.74	QP	
12	3.840	21.49	9.83	31.32	46.00	-14.68	AVG	



Neutral Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Remark
1	0.154	36.83	9.52	46.35	65.79	-19.44	QP	
2	0.154	17.04	9.52	26.56	55.79	-29.23	AVG	
3	0.294	28.61	9.54	38.15	60.41	-22.26	QP	
4	0.294	13.72	9.54	23.26	50.41	-27.15	AVG	
5	0.591	26.17	9.58	35.75	56.00	-20.25	QP	
6	0.591	20.42	9.58	30.00	46.00	-16.00	AVG	
7	0.915	22.58	9.60	32.18	56.00	-23.82	QP	
8	0.915	17.00	9.60	26.60	46.00	-19.40	AVG	
9	1.468	22.80	9.63	32.43	56.00	-23.57	QP	
10	1.468	16.69	9.63	26.32	46.00	-19.68	AVG	
11	3.979	27.25	9.75	37.00	56.00	-19.00	QP	
12	3.979	16.45	9.75	26.20	46.00	-19.80	AVG	



5.2 Radiated Electromagnetic Disturbance, 9kHz to 30MHz

Test Requirement : EN IEC 55015 Clause 4.5.2

Test Method : EN IEC 55015 Clause 9.3.2

Test Result : Pass

Frequency Range : 9kHz to 30MHz

Class/Severity : Table 8 of EN IEC 55015

5.2.1 E.U.T. Operation

Operating Environment:

Temperature : 20.8°C

Humidity : 49.3%RH

Barometric Pressure : 101.2kPa

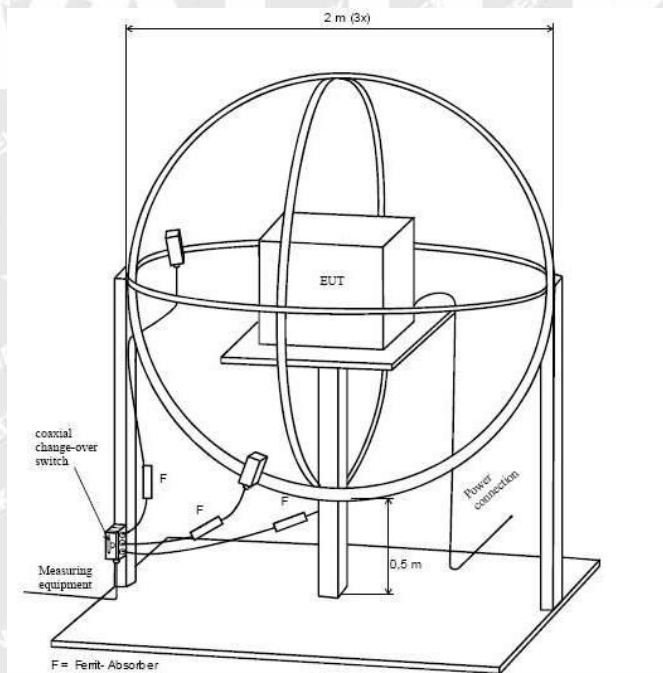
EUT Operation:

Input Voltage : AC 240V/50Hz for mode 1; Battery 3.7V for mode 2

Operating Mode : Mode 1: Charging + lighting mode
Mode2: USB output + lighting mode

5.2.2 Block Diagram of Test Setup

The Radiated Electromagnetic Disturbance (9kHz to 30MHz) test was performed in accordance with the EN IEC 55015.



5.2.3 Measurement Data

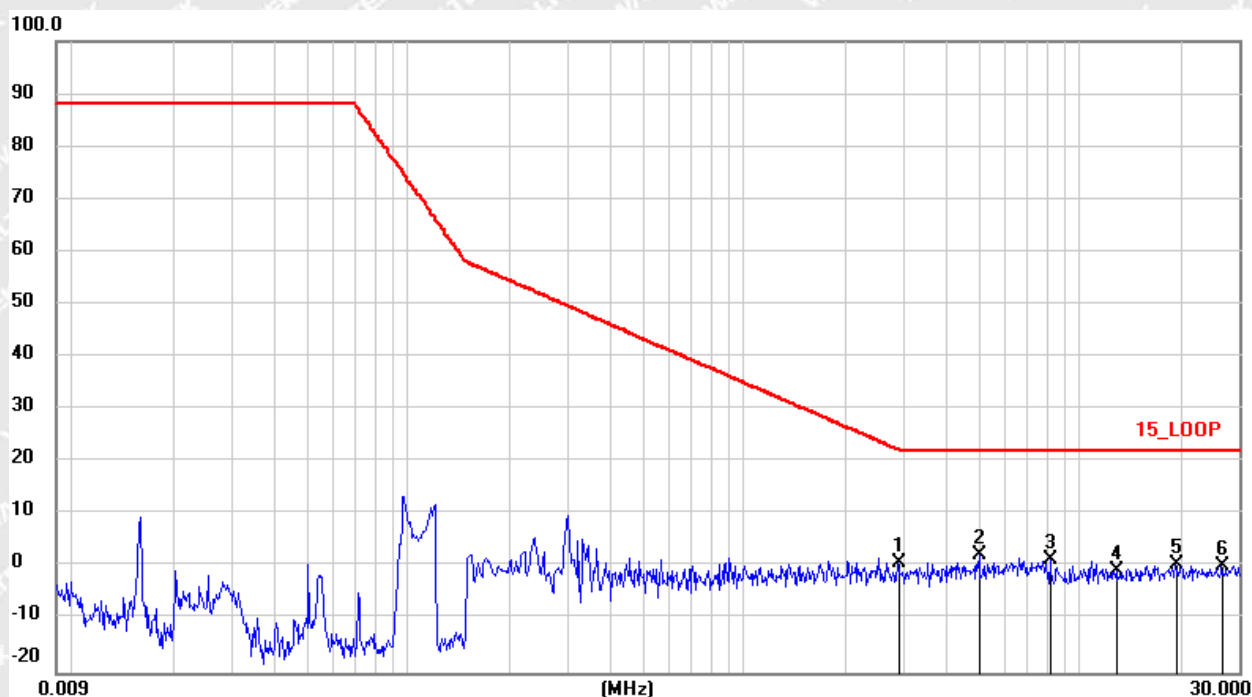
According to the data in section 5.2.4, the EUT complied with the EN IEC 55015 standards. The maximised peak emissions from the EUT was scanned and measured for three loops. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.



5.2.4 Radiated Electromagnetic Disturbance Test Data, 9kHz to 30MHz

Charging + lighting mode

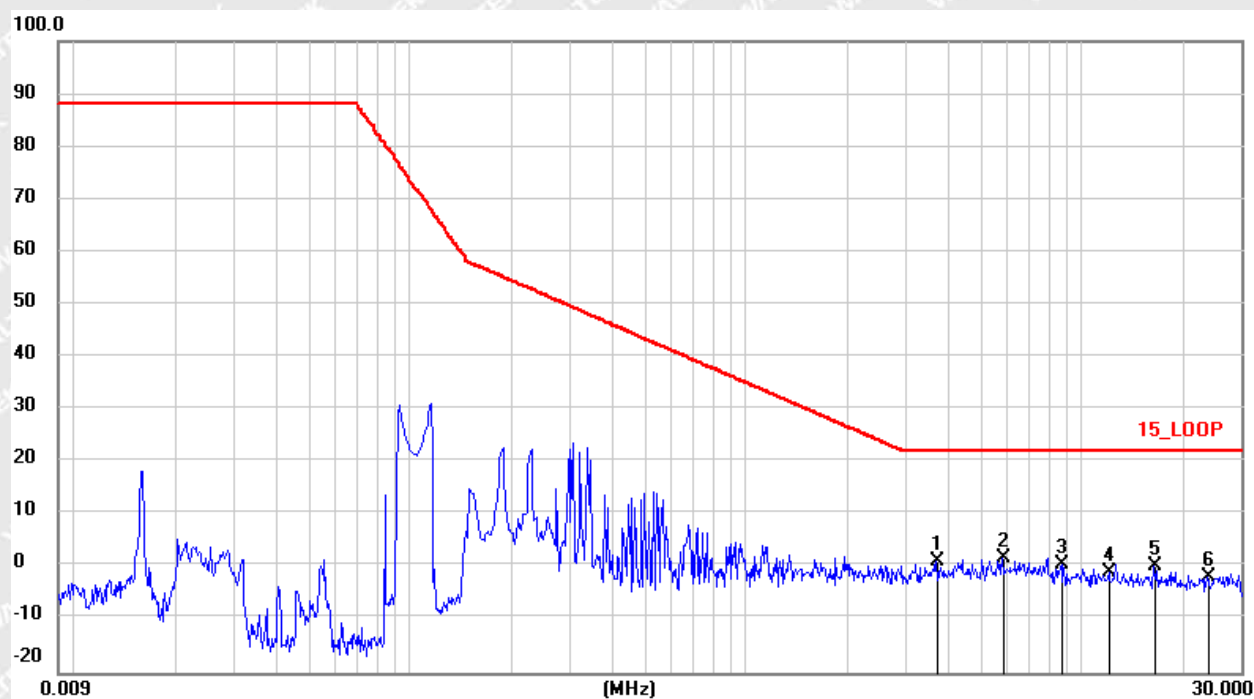
Loop X



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
		MHz	Level	Factor	ment			Detector	Comment
				dB			dB		
1		2.8780	-0.37	1.23	0.86	22.50	-21.64	QP	
2	*	5.0460	0.99	1.28	2.27	22.00	-19.73	QP	
3		8.2340	-0.07	1.45	1.38	22.00	-20.62	QP	
4		12.9900	-2.09	1.54	-0.55	22.00	-22.55	QP	
5		19.5100	-0.64	1.28	0.64	22.00	-21.36	QP	
6		26.6540	-0.60	0.71	0.11	22.00	-21.89	QP	



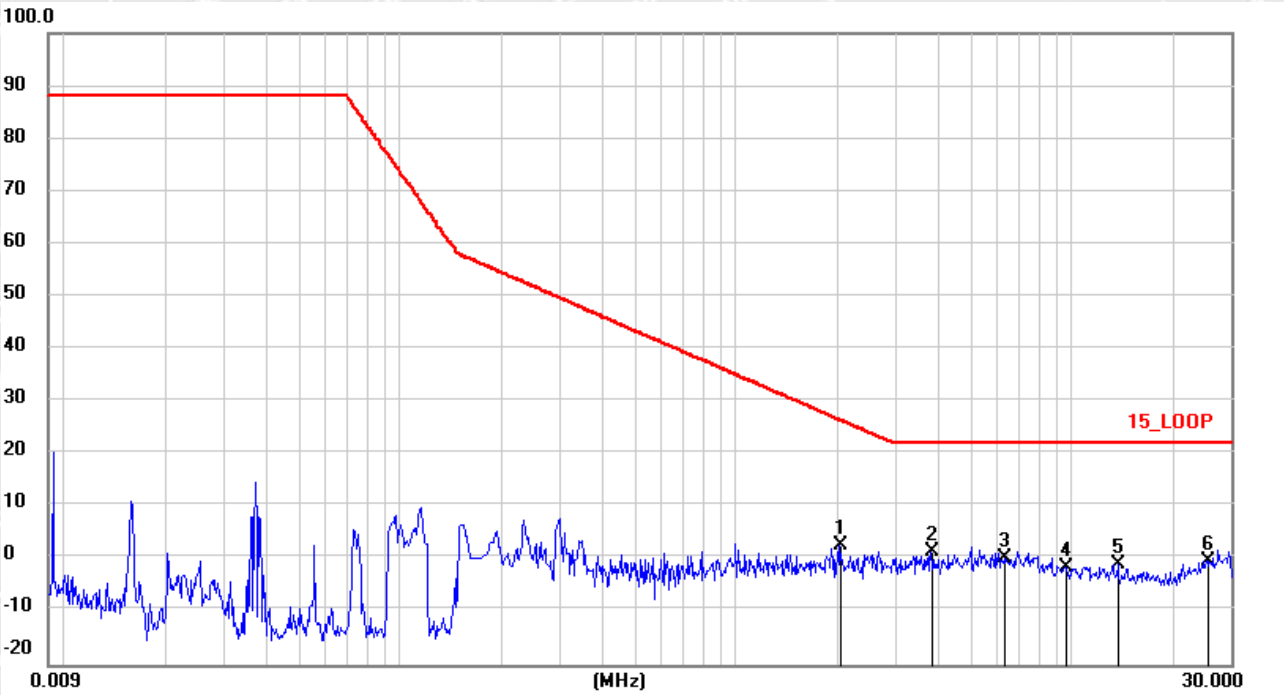
Loop Y



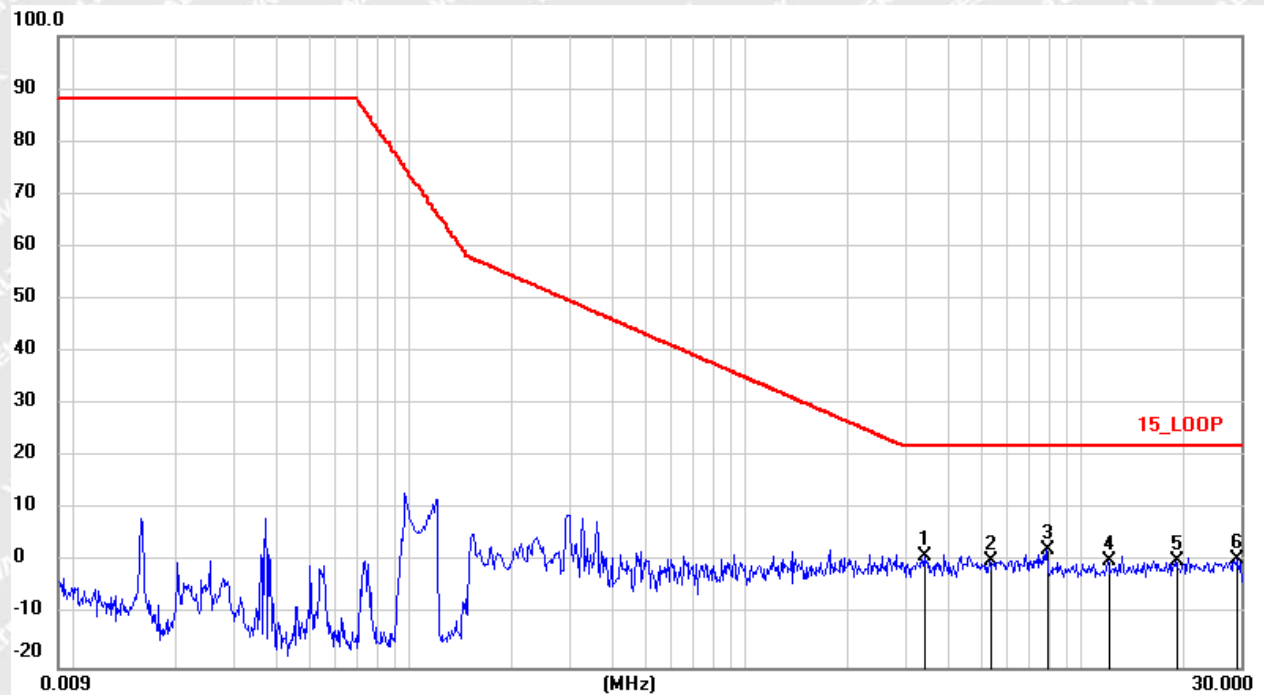
No.	Mk.	Freq. MHz	Reading Level	Correct Factor dB	Measure- ment	Limit	Over dB	Detector	Comment
1		3.7020	0.01	1.26	1.27	22.00	-20.73	QP	
2	*	5.8340	0.43	1.38	1.81	22.00	-20.19	QP	
3		8.7700	-0.67	1.27	0.60	22.00	-21.40	QP	
4		12.1020	-1.88	0.94	-0.94	22.00	-22.94	QP	
5		16.5780	0.18	0.05	0.23	22.00	-21.77	QP	
6		23.7580	-0.96	-1.02	-1.98	22.00	-23.98	QP	



Loop Z



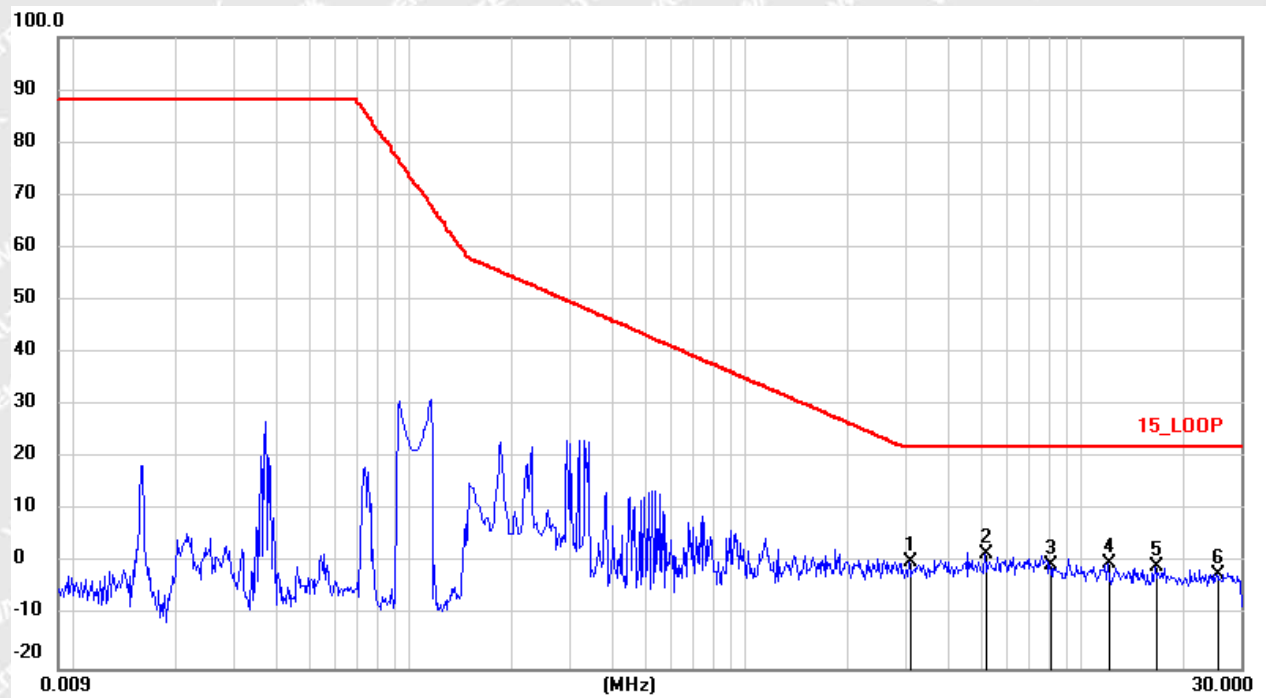
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
		MHz	Level	Factor	ment			Detector	Comment
				dB			dB		
1		2.0540	1.27	1.30	2.57	26.55	-23.98	QP	
2	*	3.8300	0.28	1.17	1.45	22.00	-20.55	QP	
3		6.3460	-1.11	1.28	0.17	22.00	-21.83	QP	
4		9.7020	-2.81	1.16	-1.65	22.00	-23.65	QP	
5		13.8660	-1.12	0.19	-0.93	22.00	-22.93	QP	
6		25.3380	-0.65	0.35	-0.30	22.00	-22.30	QP	

**USB output + lighting mode****Loop X**

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz		dB			dB	Detector	Comment
1		3.4340	-0.10	1.24	1.14	22.00	-20.86	QP	
2		5.3460	-1.00	1.29	0.29	22.00	-21.71	QP	
3	*	7.8820	0.85	1.41	2.26	22.00	-19.74	QP	
4		12.0580	-1.38	1.57	0.19	22.00	-21.81	QP	
5		19.3380	-1.14	1.28	0.14	22.00	-21.86	QP	
6		29.0900	-0.10	0.51	0.41	22.00	-21.59	QP	



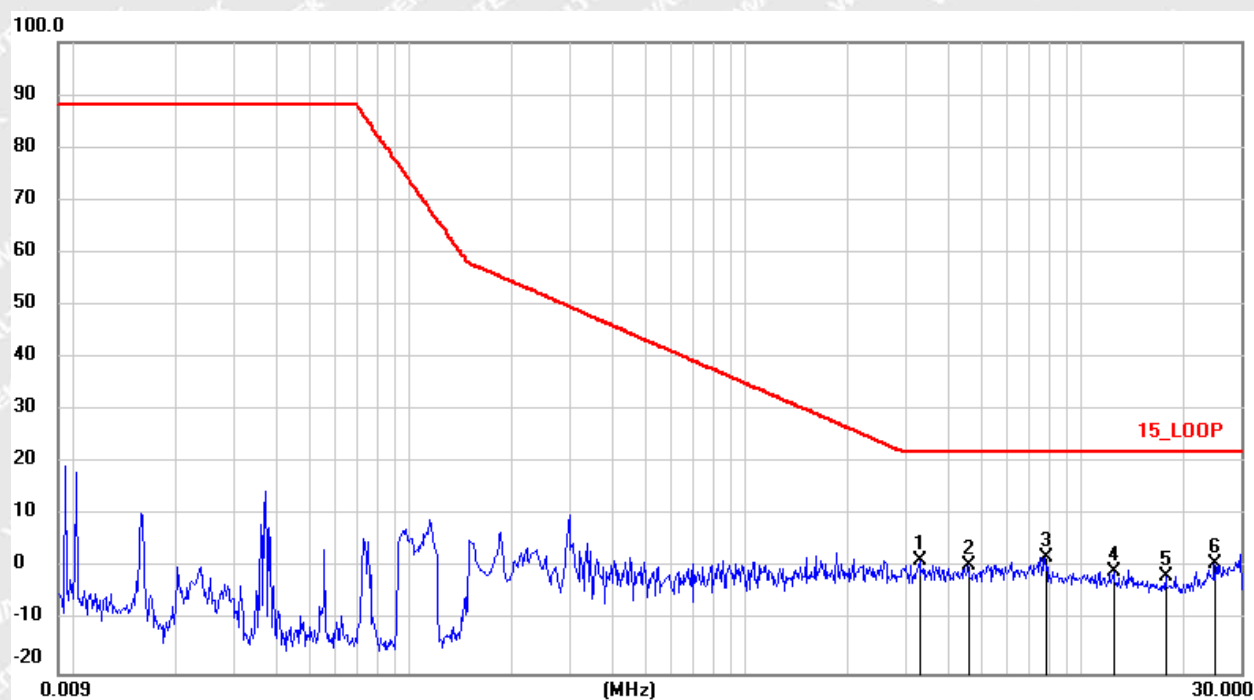
Loop Y



No.	Mk.	Freq. MHz	Reading Level dB	Correct Factor dB	Measure- ment	Limit	Over dB	Detector	Comment
1		3.0940	-0.91	1.29	0.38	22.00	-21.62	QP	
2	*	5.2020	0.37	1.34	1.71	22.00	-20.29	QP	
3		8.1220	-1.51	1.23	-0.28	22.00	-22.28	QP	
4		12.0460	-1.13	0.94	-0.19	22.00	-22.19	QP	
5		16.6700	-0.73	0.03	-0.70	22.00	-22.70	QP	
6		25.4700	-0.89	-1.20	-2.09	22.00	-24.09	QP	



Loop Z



No.	Mk.	Freq. MHz	Reading Level	Correct Factor dB	Measure- ment	Limit	Over dB	Detector	Comment
1		3.3260	0.20	1.21	1.41	22.00	-20.59	QP	
2		4.6340	-0.71	1.20	0.49	22.00	-21.51	QP	
3	*	7.8220	0.69	1.23	1.92	22.00	-20.08	QP	
4		12.5260	-1.20	0.52	-0.68	22.00	-22.68	QP	
5		17.9780	-0.69	-0.83	-1.52	22.00	-23.52	QP	
6		25.0459	0.47	0.26	0.73	22.00	-21.27	QP	



5.3 Radiated Disturbance, 30MHz to 1000MHz

Test Requirement	: EN IEC 55015 Clause 4.5.3, EN 55032 Annex A.2
Test Method	: EN IEC 55015 Clause 9.3.4, EN 55032 Annex A.2
Test Result	: Pass
Frequency Range	: 30MHz to 1000MHz
Class/Severity	: Table 10 of EN IEC 55015, Table A.4 of EN 55032 (Class B)

5.3.1 E.U.T. Operation

Operating Environment:

Temperature	: 22.4°C
Humidity	: 52.6%RH
Atmospheric Pressure	: 101.2kPa

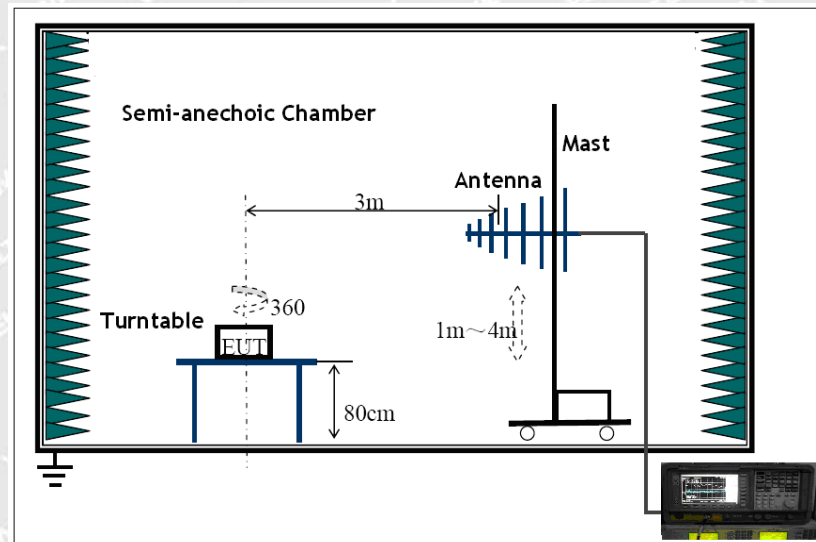
EUT Operation:

Input Voltage	: AC 240V/50Hz for mode 1 and mode 2; Battery 3.7V for mode 3 and mode 4
---------------------	---

Operating Mode	: Mode 1: Charging + lighting mode Mode 2: Charging + FM mode Mode 3: USB output + lighting mode Mode 4: FM mode with battery operated
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5.3.2 Block Diagram of Test Setup

The Radiated Disturbance test was performed in the 3m Semi- Anechoic Chamber test site and accordance with CISPR16-2-3.



5.3.3 Measurement Data

The maximised peak emissions from the EUT was scanned and measured for Horizontal & Vertical polarisation. Quasi-peak measurements were performed if peak emissions were within 6dB of the limit line.



5.3.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Corr. Factor}$$

$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit.

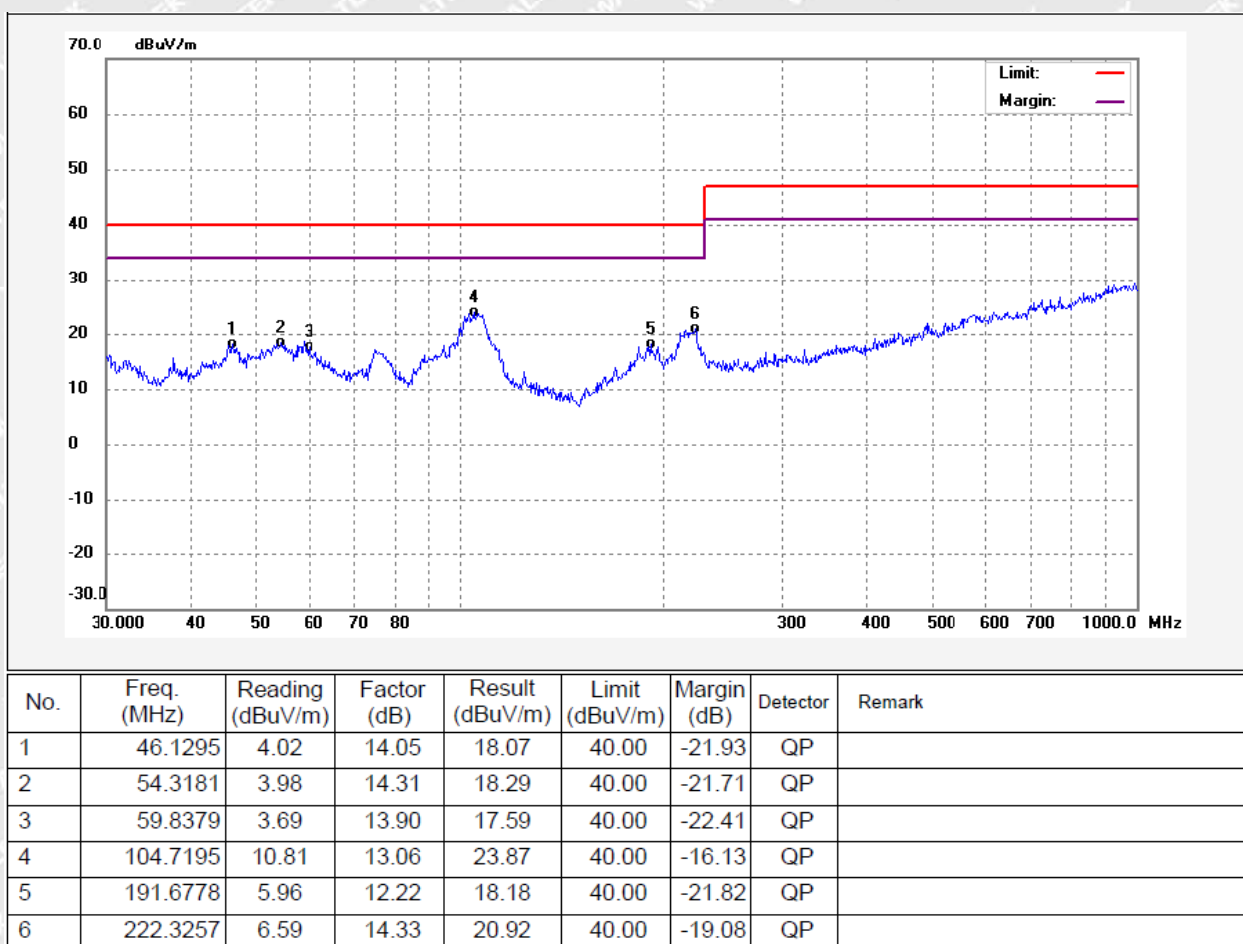
The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

5.3.5 Radiated Disturbance Test Data

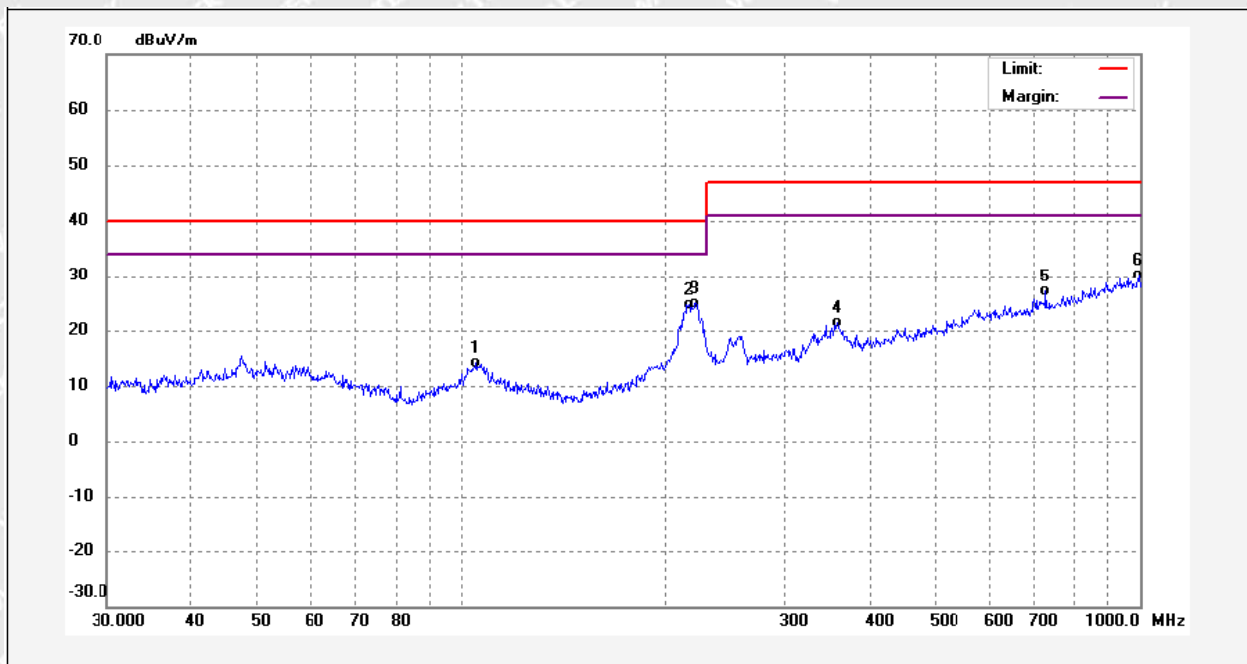
Charging +lighting mode

Vertical Polarization





Horizontal Polarization

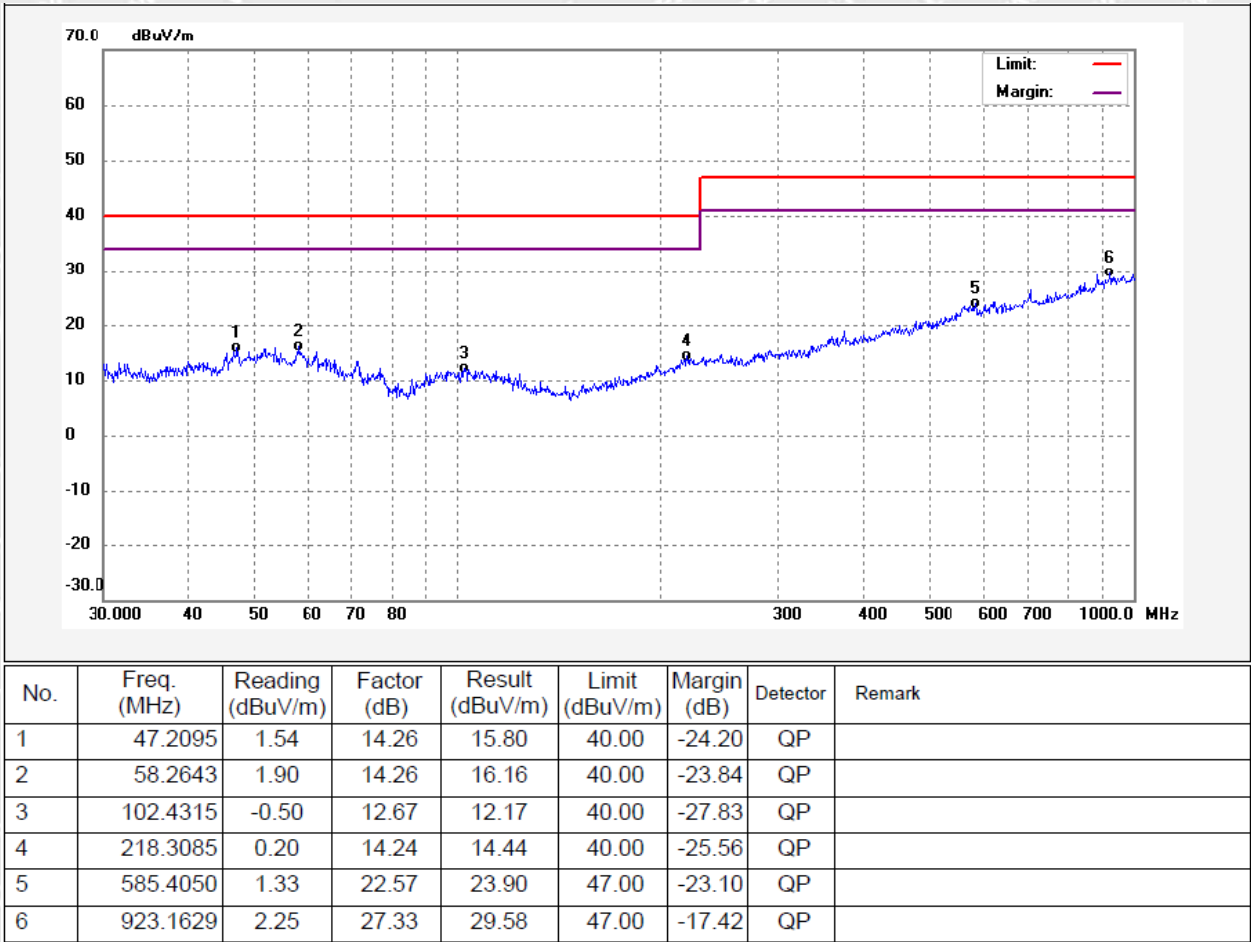


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	105.1979	0.93	13.08	14.01	40.00	-25.99	QP	
2	216.6308	10.37	14.20	24.57	40.00	-15.43	QP	
3	221.1593	10.62	14.30	24.92	40.00	-15.08	QP	
4	358.8084	3.53	17.73	21.26	47.00	-25.74	QP	
5	728.0806	2.87	24.28	27.15	47.00	-19.85	QP	
6	998.5984	2.21	27.94	30.15	47.00	-16.85	QP	



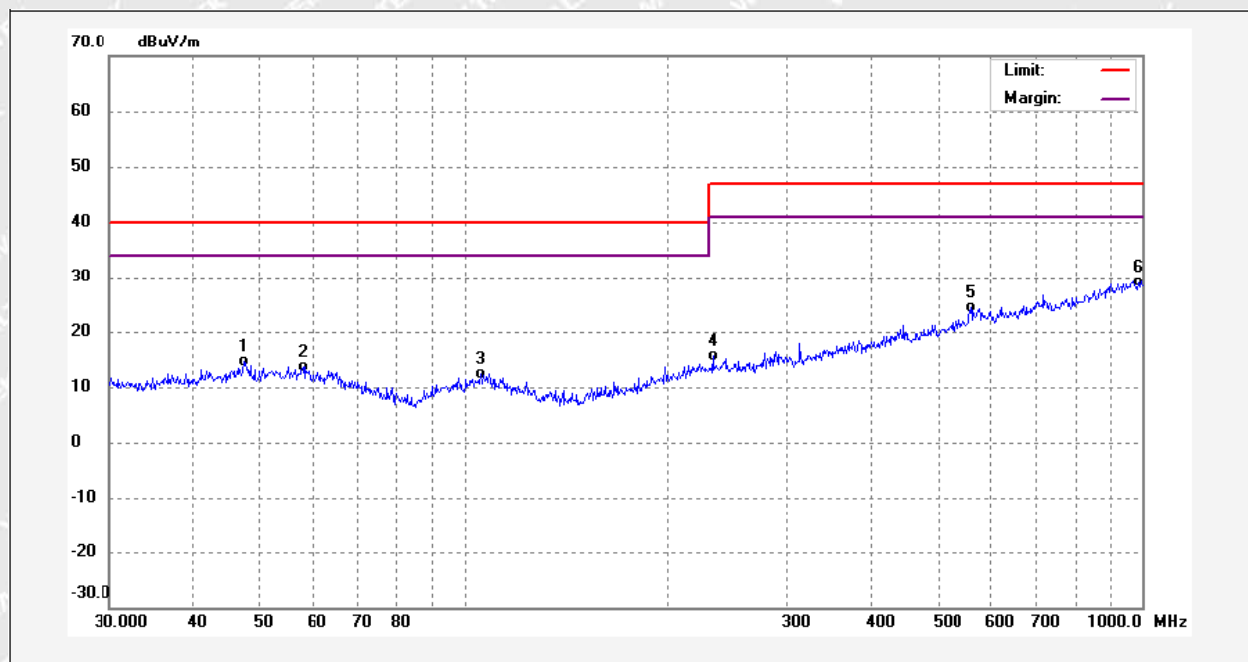
USB output + lighting mode

Vertical Polarization





Horizontal Polarization

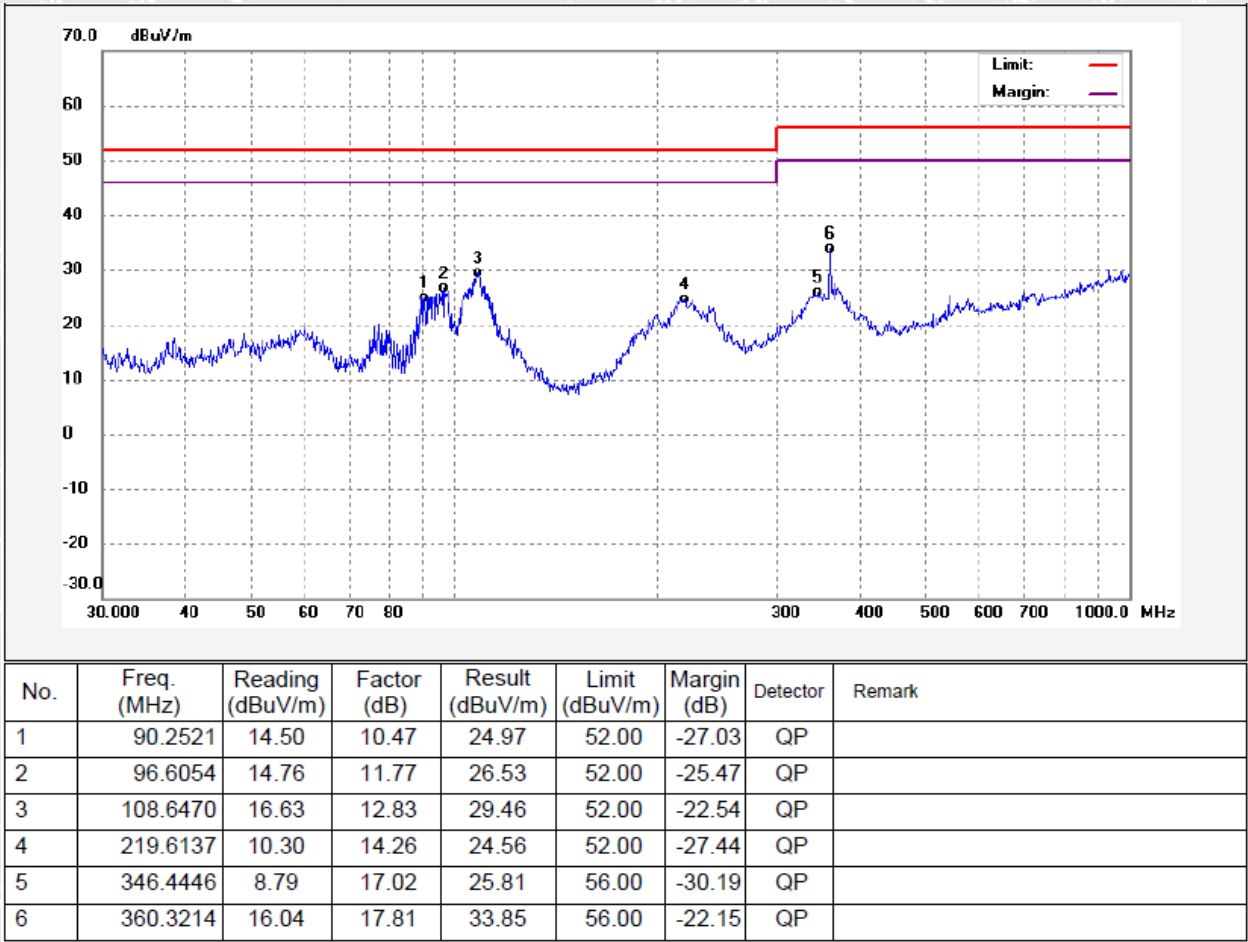


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	47.3753	0.28	14.31	14.59	40.00	-25.41	QP	
2	57.7962	-0.61	14.34	13.73	40.00	-26.27	QP	
3	105.7527	-0.69	13.04	12.35	40.00	-27.65	QP	
4	232.8582	1.37	14.29	15.66	47.00	-31.34	QP	
5	561.0862	2.04	22.41	24.45	47.00	-22.55	QP	
6	999.2989	1.11	27.94	29.05	47.00	-17.95	QP	



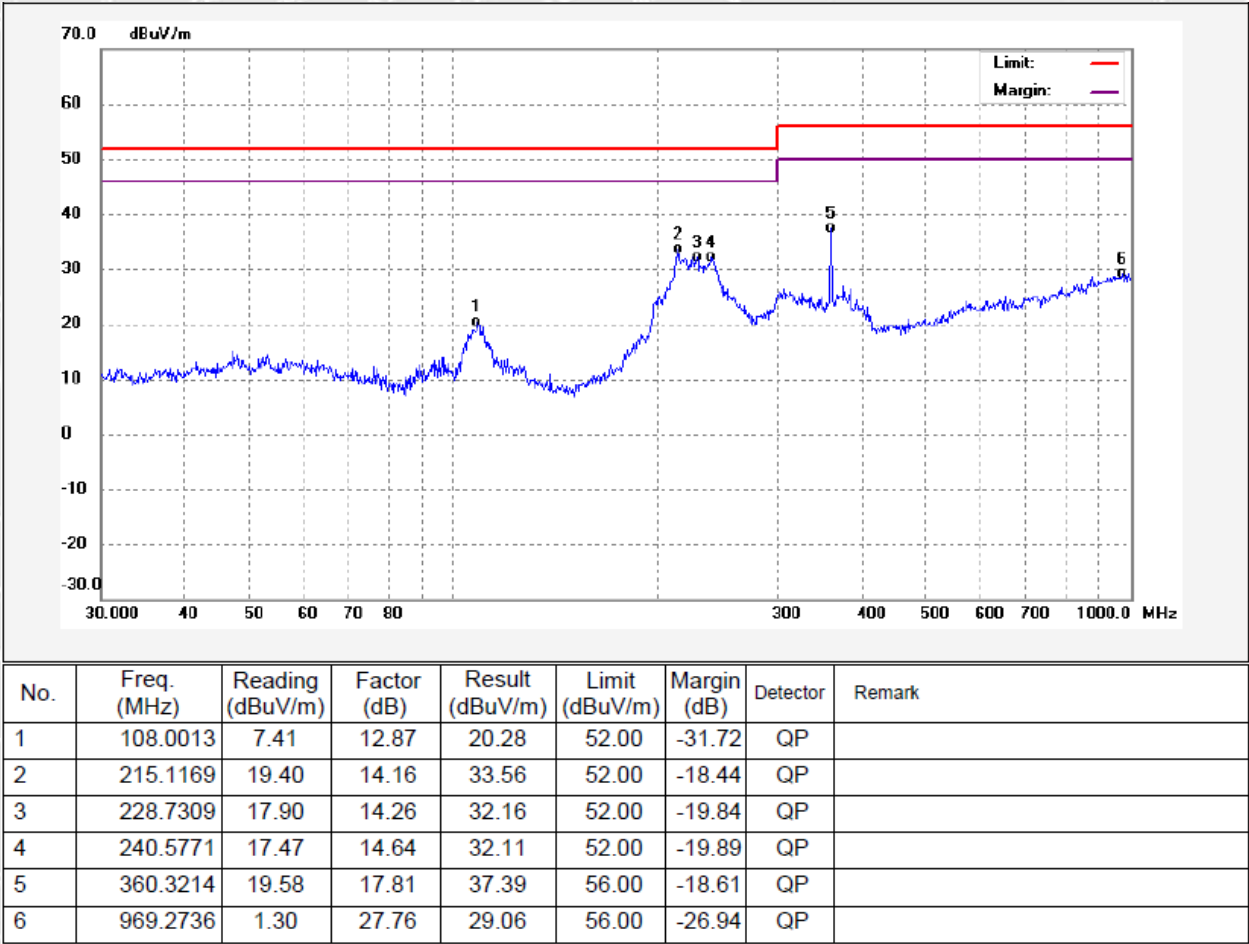
Charging + FM mode

Vertical Polarization





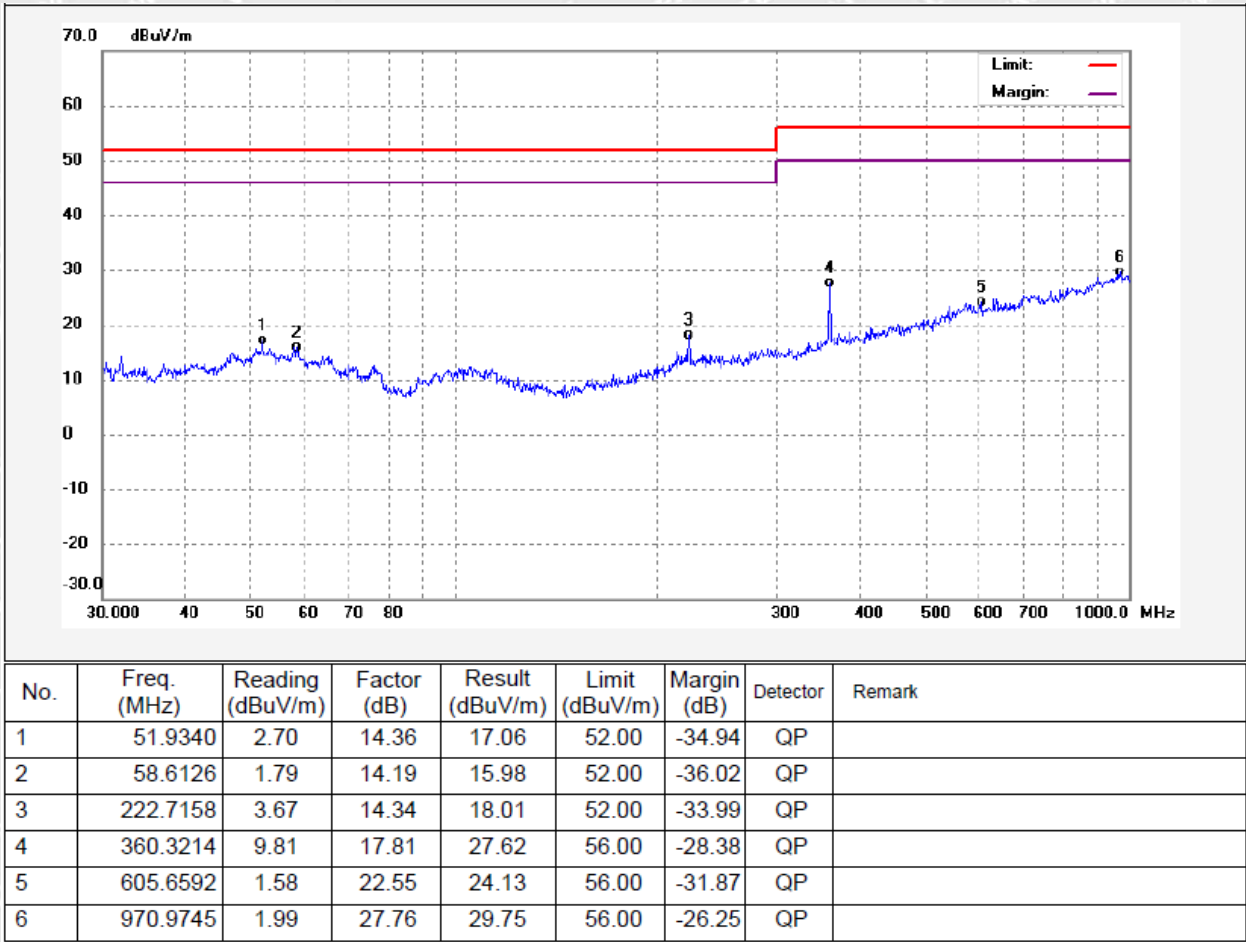
Horizontal Polarization





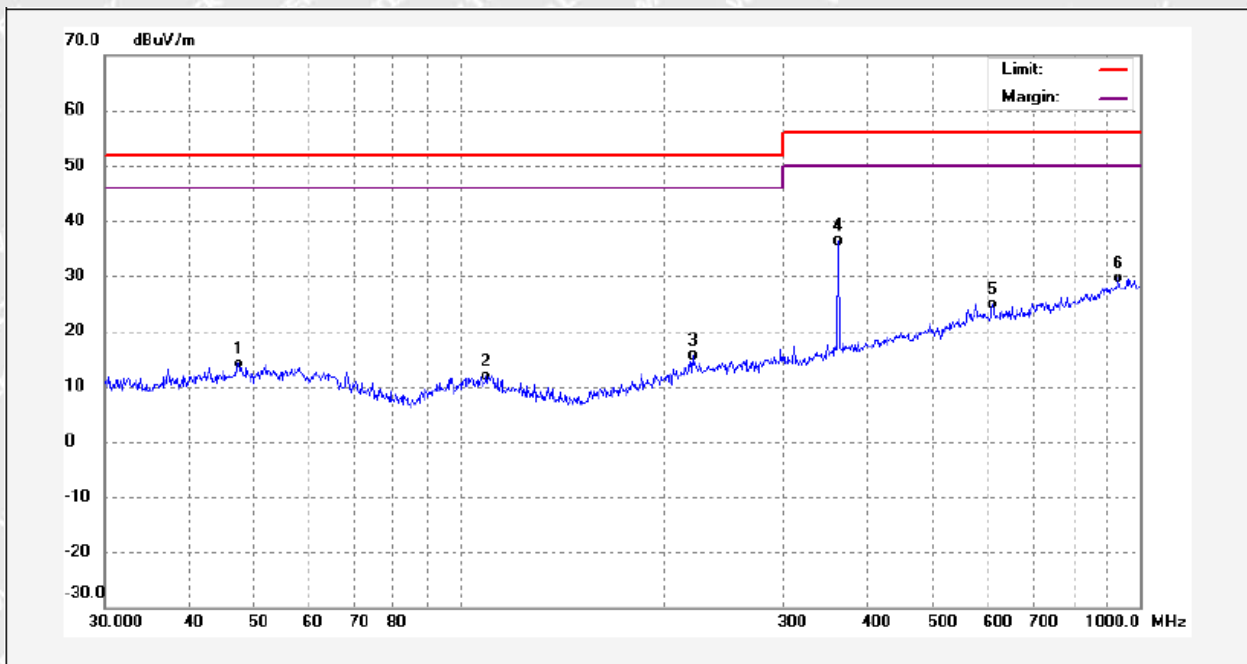
FM mode with battery operated

Vertical Polarization





Horizontal Polarization



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	47.3421	-0.19	14.29	14.10	52.00	-37.90	QP	
2	109.5268	-0.85	12.76	11.91	52.00	-40.09	QP	
3	220.3079	1.37	14.29	15.66	52.00	-36.34	QP	
4	360.3214	18.51	17.81	36.32	56.00	-19.68	QP	
5	608.6398	2.40	22.52	24.92	56.00	-31.08	QP	
6	930.6384	2.08	27.48	29.56	56.00	-26.44	QP	



6 Immunity Test Results

6.1 Performance Criteria

Performance criterion A: During the test, no change of the luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.

Performance criterion B: During the test, the luminous intensity may change to any value. After the test, the luminous intensity shall be restored to its initial value within 1 min. Regulating controls need not function during the test, but after the test, the mode of the control shall be the same as before the test provided that during the test no mode changing commands were given.

Performance criterion C: During and after the test, any change of the luminous intensity is allowed and the lamp(s) may be extinguished. After the test, within 30 min, all functions shall return to normal, if necessary by temporary interruption of the mains supply and/or operating the regulating control.

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6.2 Electrostatic Discharge (ESD)

Test Requirement	: EN 55035, EN IEC 61547
Test Method	: IEC 61000-4-2
Test Result	: Pass
Discharge Impedance	: 330Ω / 150pF
Discharge Voltage	: Air Discharge: ±8kV Contact Discharge: ±4kV HCP & VCP: ±4kV
Polarity	: Positive & Negative
Number of Discharge	: Minimum 10 times at each test point
Discharge Mode	: Single Discharge
Discharge Period	: 1 second minimum

6.2.1 E.U.T. Operation

Operating Environment:

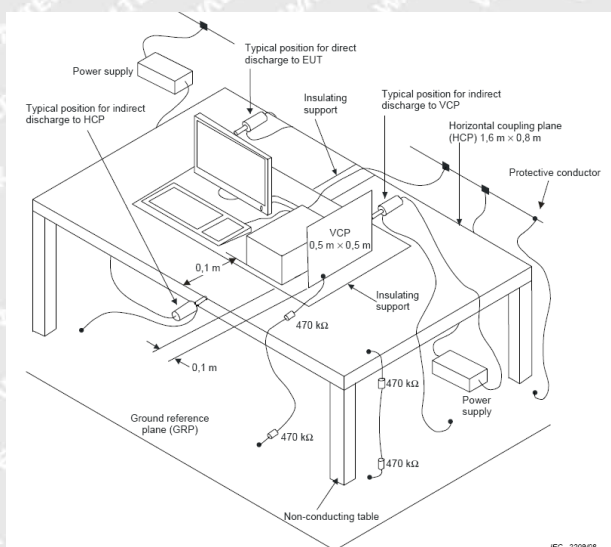
Temperature	: 21.6°C
Humidity	: 55.3%RH
Barometric Pressure	: 100.2kPa

EUT Operation:

Input Voltage	: AC 230V/50Hz; Battery 3.7V
Operating Mode	: On mode

6.2.2 Block Diagram of Setup

The ESD test was performed in accordance with the IEC 61000-4-2.





6.2.3 Direct Discharge Test Results

Observations:

Test points:

1. All Exposed Surface & Seams;
2. All metallic part

Direct Discharge			Test Results	
Applied Voltage (kV)	Performance Criterion	Test Point	Contact Discharge	Air Discharge
±8	B	1	N/A	Pass*
±4	B	2	Pass*	N/A

Remark:

- * During the test no deviation was detected to the selected operation mode(s)

6.2.4 Indirect Discharge Test Results

Observations:

Test points:

1. All sides.

Indirect Discharge			Test Results	
Applied Voltage (kV)	Performance Criterion	Test Point	Horizontal Coupling	Vertical Coupling
±4	B	1	Pass*	Pass*

Remark:

- * During the test no deviation was detected to the selected operation mode(s)



6.3 Radio-Frequency Electromagnetic Fields

Test Requirement	:	EN 55035, EN IEC 61547
Test Method	:	IEC 61000-4-3
Test Result	:	Pass
Frequency Range	:	80MHz to 1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz
Test level	:	3V/m
Modulation	:	80%, 1kHz Amplitude Modulation.
Face of EUT	:	Front, Back, Left, Right
Antenna polarisation	:	Horizontal & Vertical
Test Distance	:	3m

6.3.1 E.U.T. Operation

Operating Environment:

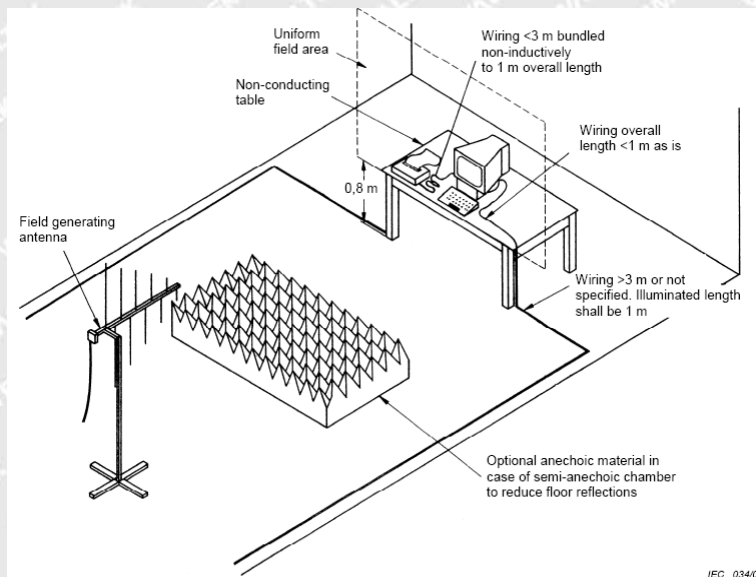
Temperature	:	21.6°C
Humidity	:	55.3%RH
Barometric Pressure	:	100.2kPa

EUT Operation:

Input Voltage	:	AC 230V/50Hz; Battery 3.7V
Operating Mode	:	On mode

6.3.2 Block Diagram of Setup

The Radio-Frequency Electromagnetic Fields Immunity test was performed in accordance with the IEC 61000-4-3.





6.3.3 Test Results

Frequency	Face of EUT	Antenna polarisation	Test Level	Step Size	Dwell Time	Performance Criterion	Result
80 to 1000MHz	Front, Back, Left, Right	Horizontal	3V/m	1%	1s	A	Pass*
80 to 1000MHz	Front, Back, Left, Right	Vertical	3V/m	1%	1s	A	Pass*
1800MHz	Front, Back, Left, Right	Horizontal	3V/m	1%	1s	A	Pass*
1800MHz	Front, Back, Left, Right	Vertical	3V/m	1%	1s	A	Pass*
2600MHz	Front, Back, Left, Right	Horizontal	3V/m	1%	1s	A	Pass*
2600MHz	Front, Back, Left, Right	Vertical	3V/m	1%	1s	A	Pass*
3500MHz	Front, Back, Left, Right	Horizontal	3V/m	1%	1s	A	Pass*
3500MHz	Front, Back, Left, Right	Vertical	3V/m	1%	1s	A	Pass*
5000MHz	Front, Back, Left, Right	Horizontal	3V/m	1%	1s	A	Pass*
5000MHz	Front, Back, Left, Right	Vertical	3V/m	1%	1s	A	Pass*

Remark:

- * During the test no deviation was detected to the selected operation mode(s)



6.4 Electrical Fast Transients (EFT)

Test Requirement.....	: EN 55035, EN IEC 61547
Test Method	: IEC 61000-4-4
Test Result	: Pass
Test Level	: 1.0kV on AC Mains
Polarity	: Positive & Negative
Repetition Frequency....	: 5kHz
Burst Duration	: 300ms
Test Duration	: 2 minutes per level & polarity

6.4.1 E.U.T. Operation

Operating Environment:

Temperature.....	: 21.6°C
Humidity	: 55.3%RH
Barometric Pressure	: 100.2kPa

EUT Operation:

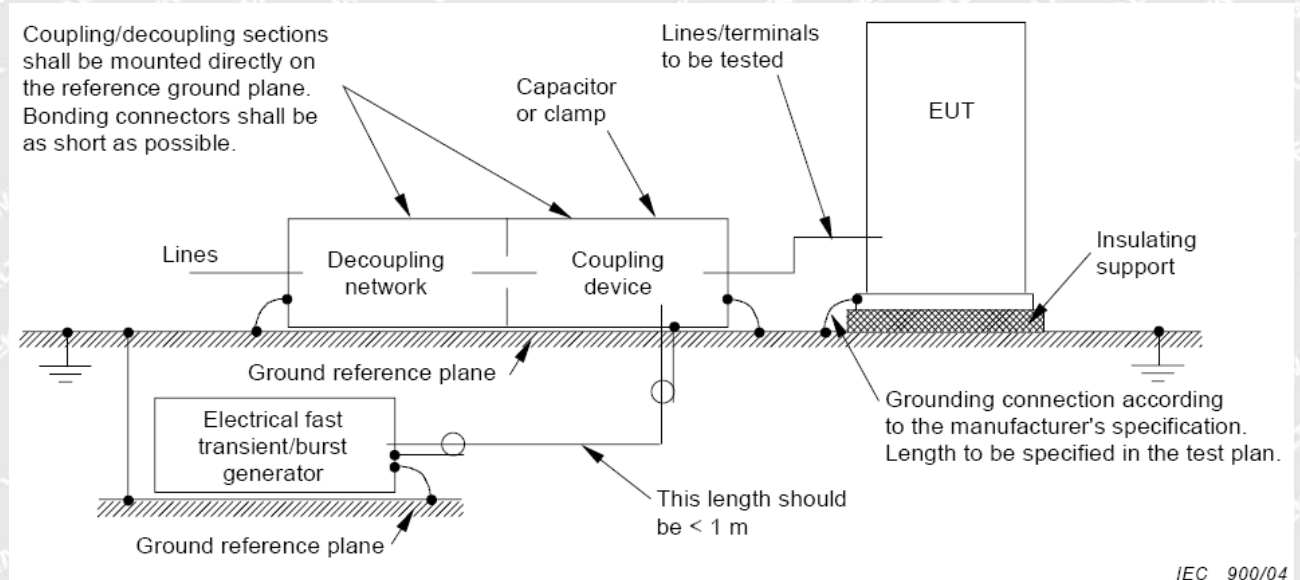
Input Voltage.....	: AC 230V/50Hz
Operating Mode	: On mode

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6.4.2 Block Diagram of Setup

The Electrical Fast Transients Immunity test was performed in accordance with the IEC 61000-4-4.



6.4.3 Test Results

Test Port	Test Level(kV)	Performance Criterion	Result
Line-Neutral	± 1.0	B	Pass*

Remark:

* During the test no deviation was detected to the selected operation mode(s)



6.5 Surge

Test Requirement	:	EN 55035, EN IEC 61547
Test Method	:	IEC 61000-4-5
Test Result	:	Pass
Test level	:	Table 10 of EN IEC 61547
Interval	:	60s between each surge
No. of surges	:	5 positive at 90°, 5 negative at 270°.

6.5.1 E.U.T. Operation

Operating Environment:

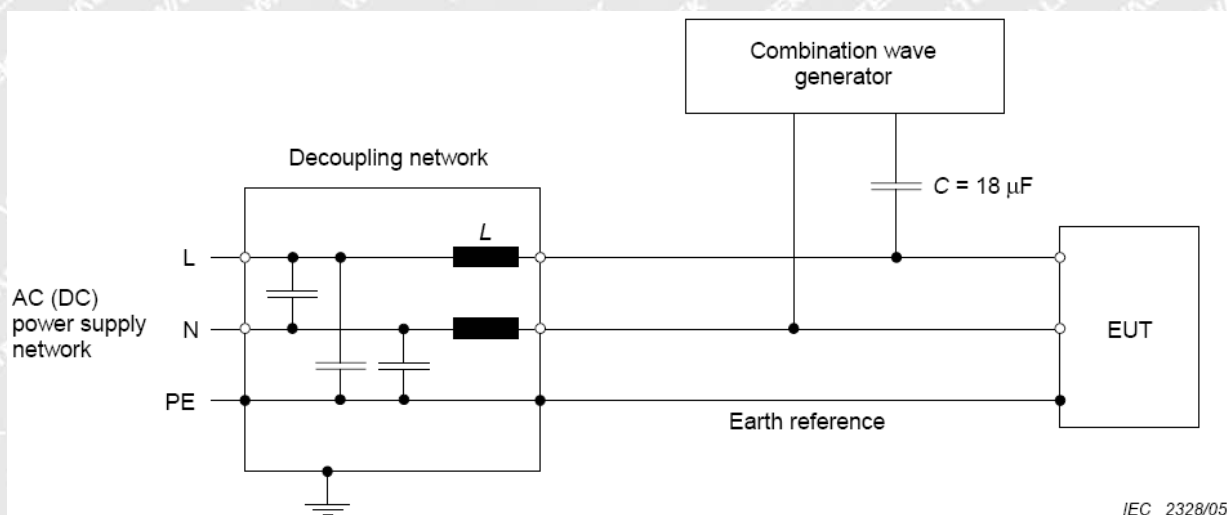
Temperature	:	21.6°C
Humidity	:	55.3%RH
Barometric Pressure	:	100.2kPa

EUT Operation:

Input Voltage	:	AC 230V/50Hz
Operating Mode	:	On mode

6.5.2 Block Diagram of Setup

The Surge Immunity test was performed in accordance with the IEC 61000-4-5.





6.5.3 Test Results

Test Port	Applied Voltage (kV)	Performance criterion	Result
Between Phase And Phase	± 1	C	N/A
Between Live And Neutral	± 0.5	C	Pass*
Between Live And Earth	± 2	C	N/A
Between Neutral And Earth	± 2	C	N/A

Remark:

- * During the test no deviation was detected to the selected operation mode(s)

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6.6 Injected Currents Immunity, 0.15MHz to 80MHz

Test Requirement	: EN 55035, EN IEC 61547
Test Method	: IEC 61000-4-6
Test Result	: Pass
Frequency Range	: 0.15MHz to 80MHz
Test level	: 3V r.m.s. (unmodulated emf into 150 Ω)
Modulation	: 80%, 1kHz Amplitude Modulation.

6.6.1 E.U.T. Operation

Operating Environment:

Temperature	: 21.6°C
Humidity	: 55.7%RH
Barometric Pressure	: 100.2kPa

EUT Operation:

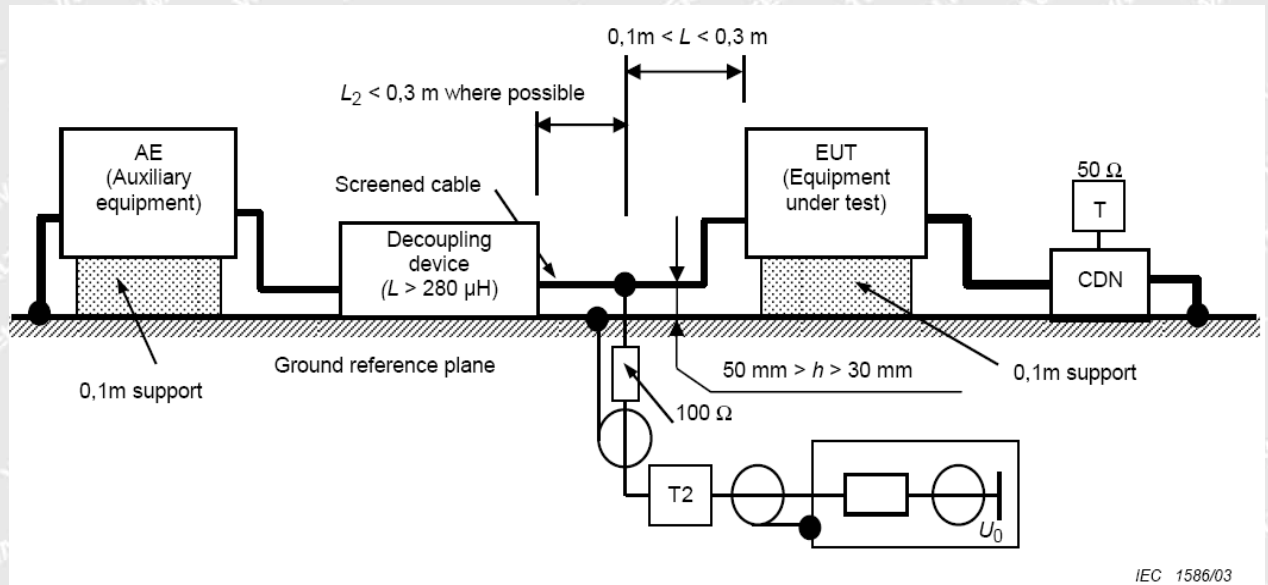
Input Voltage	: AC 230V/50Hz
Operating Mode	: On mode

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6.6.2 Block Diagram of Setup

The Injected Currents Immunity test was performed in accordance with the IEC 61000-4-6.



6.6.3 Test Results

Frequency	Line	Test Level	Modulation	Step Size	Dwell Time	Performance Criterion	Result
0.15MHz to 10MHz	2 Wire AC Supply Cables	3Vr.m.s.	80%, 1kHz Amp. Mod.	1%	1s	A	Pass*
10MHz to 30MHz	2 Wire AC Supply Cables	3 to 1 Vr.m.s.	80%, 1kHz Amp. Mod.	1%	1s	A	Pass*
30MHz to 80MHz	2 Wire AC Supply Cables	1Vr.m.s.	80%, 1kHz Amp. Mod.	1%	1s	A	Pass*

Remark:

- * During the test no deviation was detected to the selected operation mode(s)



6.7 Voltage Dips and Interruptions

Test Requirement	: EN 55035, EN IEC 61547
Test Method	: IEC 61000-4-11
Test Result	: Pass
Test Level(Voltage reduction)	: >90% & 30 % of Induction
No. of Dips / Interruptions	: 1 per Level at 20ms intervals

6.7.1 E.U.T. Operation

Operating Environment:

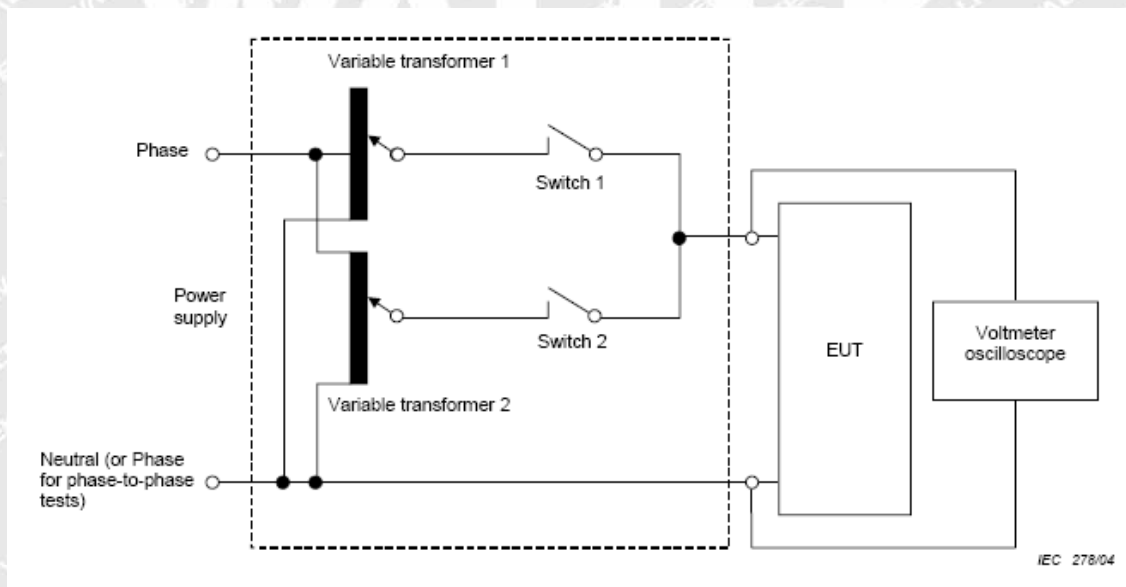
Temperature	: 21.6°C
Humidity	: 55.7%RH
Barometric Pressure	: 100.2kPa

EUT Operation:

Input Voltage	: AC 230V/50Hz
Operating Mode	: On mode

6.7.2 Block Diagram of Setup

The Voltage Dips and Interruptions Immunity test was performed in accordance with the IEC 61000-4-11.





6.7.3 Test Results

Test Item	Test Level in %U _T	Performance criterion	50Hz		60Hz	
			Duration	Result	Duration	Result
Voltage Dips	< 5	B	0.5	Pass*	0.5	Pass*
	70	C	10/25	Pass*	30	Pass*
Voltage Interruptions	< 5	C	250	Pass**	300	Pass**

Remark:

* During the test no deviation was detected to the selected operation mode(s)

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7 Photographs – Test Setup

7.1 Photograph – Conducted Disturbance Test Setup

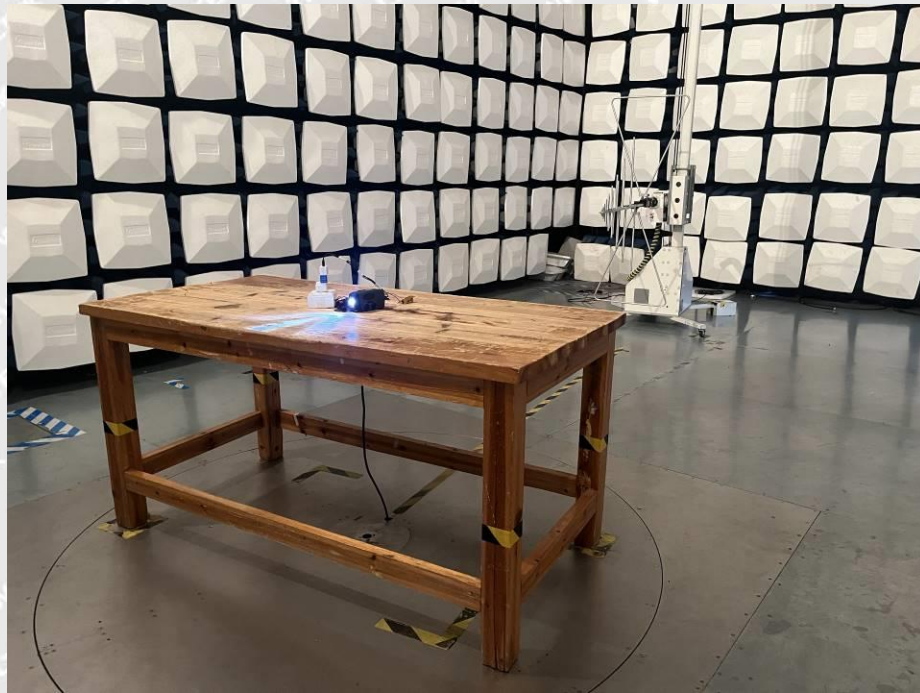


7.2 Photograph – Radiated Electromagnetic Disturbance Test Setup

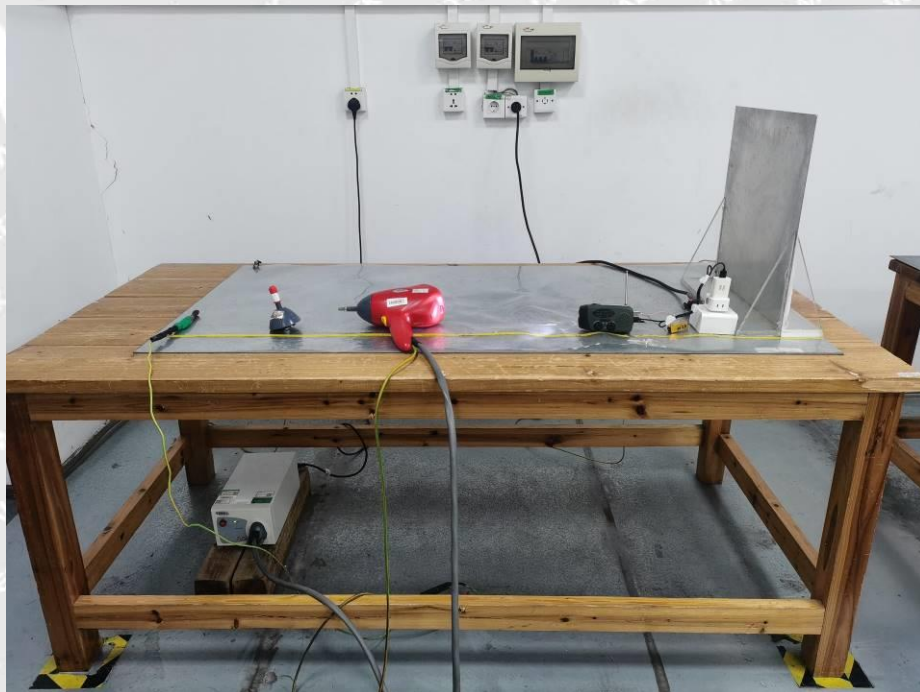




7.3 Photograph – Radiated Disturbance Test Setup, 30MHz to 1000MHz



7.4 Photograph – ESD Immunity Test Setup

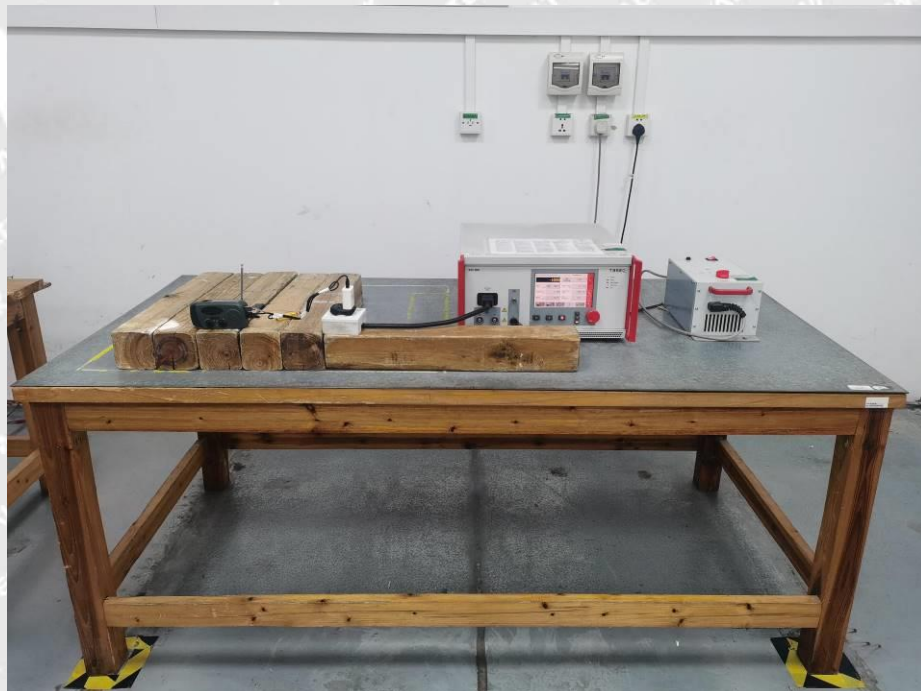




7.5 Photograph – Radio-Frequency Electromagnetic Fields Immunity Test Setup

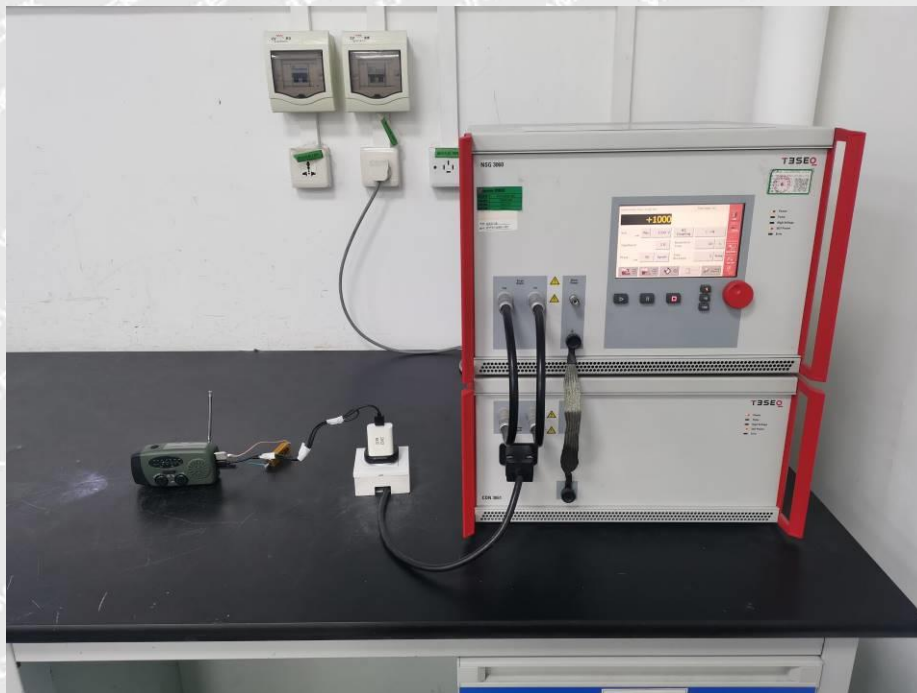


7.6 Photograph – EFT Immunity Test Setup

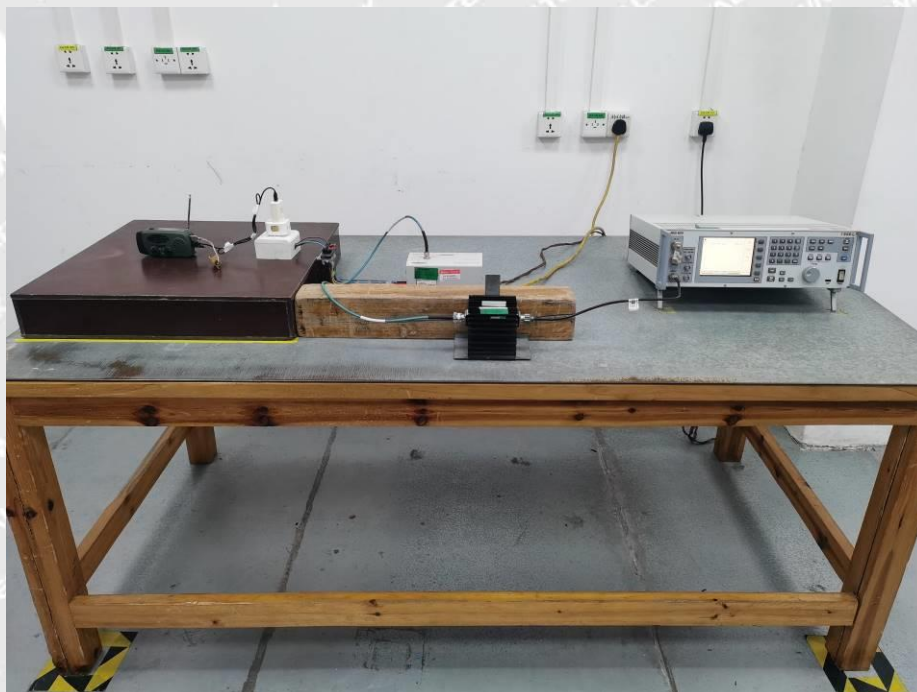




7.7 Photograph – Surge Immunity Test Setup



7.8 Photograph – Injected Currents Immunity Test Setup





7.9 Photograph – Voltage Dips and Interruptions Immunity Test Setup



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8 Photographs – EUT Constructional Details

Please refer to “ANNEX” (Reference No. WTF25F06167111W).

===== End of Report =====

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