TEST REPORT

Applicant:	Woan Technology (Shenzhen) Co., Ltd.
Address:	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100
Equipment Type:	SwitchBot Wallet Finder Card
Model Name:	W2500032 (refer to section 2.3)
Brand Name:	SwitchBot
Test Standard:	EN 55032:2015+A1:2020 EN 55035:2017+A11:2020 EN IEC 61000-3-2: 2019+A1:2021 EN 61000-3-3: 2013+A2:2021
Sample Arrival Date:	Apr. 17, 2024
Test Date:	Apr. 28, 2024 - May 06, 2024
Date of Issue:	May 24, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Liang Yongming

Yongming Liang

Checked by: Xia Long

Xia Long

Approved by: Liao Jianming (Technical Director)

Revision History

Version	Issue Date	Revisions Content
Rev. 01	May 24, 2024	Initial Issue

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100

2.2 Manufacturer Information

Manufacturer	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100

2.3 General Description for Equipment under Test (EUT)

EUT Name	SwitchBot Wallet Finder Card
Model Name Under Test	W2500032
Series Model Name	W2500031, W2500033, W2500034, W2500035
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name and combinations. (this information provided by the applicant)
Hardware Version	V02
Software Version	V01
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No.	CP114752B
	Serial No.	N/A
	Capacity	540 mAh
	Rated Voltage	3.0 V
	Limit Charge Voltage	N/A

2.5 Technical Information

Network and Wireless connectivity		Bluetooth, NFC
Interfaces present on the EUT	AC Ports	No AC Ports
	DC Ports	No DC Ports
	Analogue/ Digital data Ports	No Analogue/ Digital data Ports
Classification of equipment		Class B

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

The objective of the report is to perform testing according to following standards for CE marking:

No.	Identity	Document Title
1	EN 55032:2015+A1:2020	Electromagnetic compatibility of multimedia equipment - Emission requirements
2	EN 55035:2017+A11:2020	Electromagnetic compatibility of multimedia equipment - Immunity requirements
3	EN IEC 61000-3-2: 2019+A1:2021	Electromagnetic compatibility (EMC) -- Part 3-2: Limits -Limits for harmonic current emissions (equipment input current <= 16 A per phase)
4	EN 61000-3-3: 2013+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

3.2 Referenced Standards

The following referenced standards are necessary for the report.

No.	Identity	Document Title
1	IEC 61000-4-2:2008	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
2	IEC 61000-4-3:2006+A1:2007 +A2:2010	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test.
3	IEC 61000-4-4:2012	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
4	IEC 61000-4-5:2014	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
5	IEC 61000-4-6:2013	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
6	IEC 61000-4-8:2009	Electromagnetic compatibility (EMC) - Part 4- 8: Testing and measurement techniques - Power frequency magnetic field immunity test
7	IEC 61000-4-11:2004	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests

3.3 Verdict

No.	Base Standard	Description		Test Verdict	Remark
Emission					
1	EN 55032	Radiated Emission	Below 1 GHz	Pass	--
			Above 1 GHz	Pass	Note 1
2	EN 55032	Conducted Emission	AC Ports	N/A	Note 2
			Asymmetric Mode	N/A	Note 3
			Differential Voltage	N/A	Note 4
3	EN 61000-3-2	Harmonic Current Emissions		N/A	Note 2
4	EN 61000-3-3	Voltage Fluctuations & Flicker		N/A	Note 2
Immunity					
5	IEC 61000-4-2	Electrostatic Discharge		Pass	--
6	IEC 61000-4-3	Continuous RF Electromagnetic Field Disturbances		Pass	--
7	IEC 61000-4-4	Electrical Fast Transients/Burst	AC Ports	N/A	Note 2
			DC Ports	N/A	Note 5
			Analogue/ Digital Data Ports	N/A	Note 6
8	IEC 61000-4-5	Surges	AC Ports	N/A	Note 2
			DC Ports	N/A	Note 5
			Analogue/ Digital Data Ports	N/A	Note 6
9	IEC 61000-4-6	Continuous Induced RF Disturbances	AC Ports	N/A	Note 2
			DC Ports	N/A	Note 5
			Analogue/ Digital Data Ports	N/A	Note 6
10	IEC 61000-4-8	Power Frequency Magnetic Field		N/A	Note 7
11	IEC 61000-4-11	Voltage Dips and Voltage Interruptions		N/A	Note 2
12	EN 55035 (4.2.7)	Broadband Impulse Noise Disturbances		N/A	Note 8

Note 1: The highest frequency of the internal sources of the EUT is above 108 MHz, the measurement shall be made above 1 GHz.

Note 2: The EUT has no AC Ports.

Note 3: Only applicable to ports intended to connect to cables longer than 3 m and these ports belong to one of the following types:

- wired network ports;
- optical fibre ports with metallic shield or tension members;
- broadcast receiver tuner ports;
- antenna ports.

But the EUT has no above ports, so this test item is not applicable.

Note 4: Only apply to:

- TV broadcast receiver tuner ports with an accessible connector;
- RF modulator output ports ;

- FM broadcast receiver tuner ports with an accessible connector.

But the EUT has no above ports, so this test item is not applicable.

Note 5: The EUT has no DC Ports.

Note 6: The EUT has no Analogue/ Digital data Ports.

Note 7: Applicable only to equipment containing devices intrinsically susceptible to magnetic fields, such as CRT monitors, Hall effect elements electro-dynamic microphones magnetic field sensors or audio frequency transformers. This EUT not contain devices susceptible to magnetic fields, so this test item is not applicable.

Note 8: Applicable only to CPE xDSL ports.

The standard versions involved in this table are the same as those in Sections 3.1 and 3.2.

3.4 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)-AMN	3.2 dB
Radiated emissions (30 MHz-1 GHz)-966#2	4.4 dB
Radiated emissions (1 GHz-18 GHz)-966#2	5.0 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Enclosure List

Description	Manufacturer	Model	Serial No.	Length	Description	Use
Phone	HONOR	STF-AL00	N/A	N/A	N/A	☒
Control Switch	N/A	N/A	N/A	N/A	N/A	☒

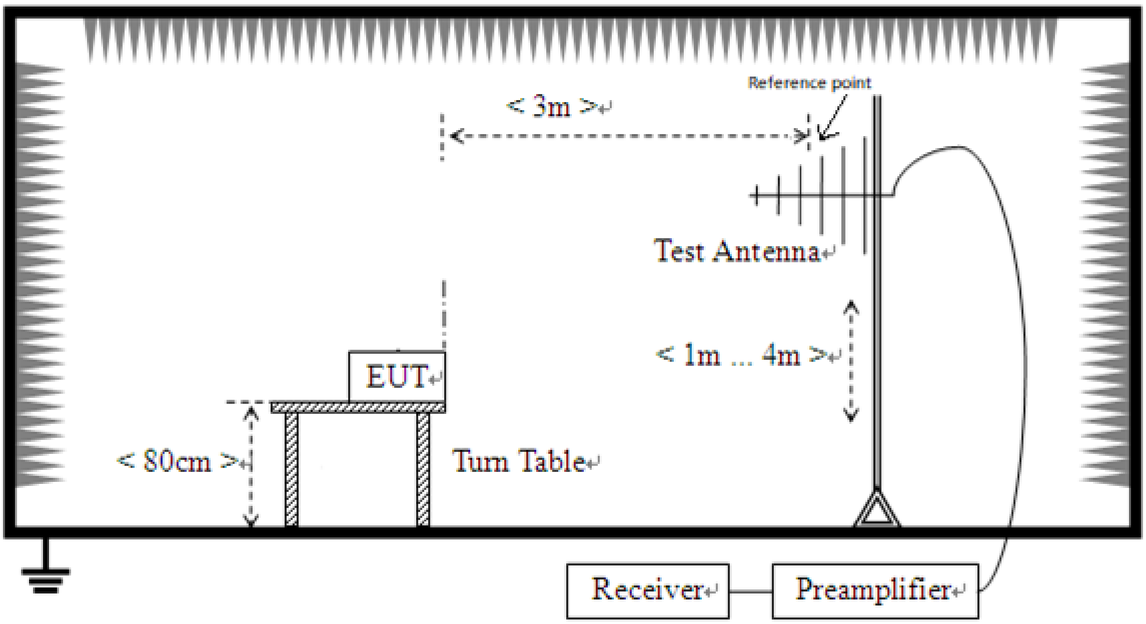
4.2 Test Configurations

All test modes of EUT are listed in the table below.

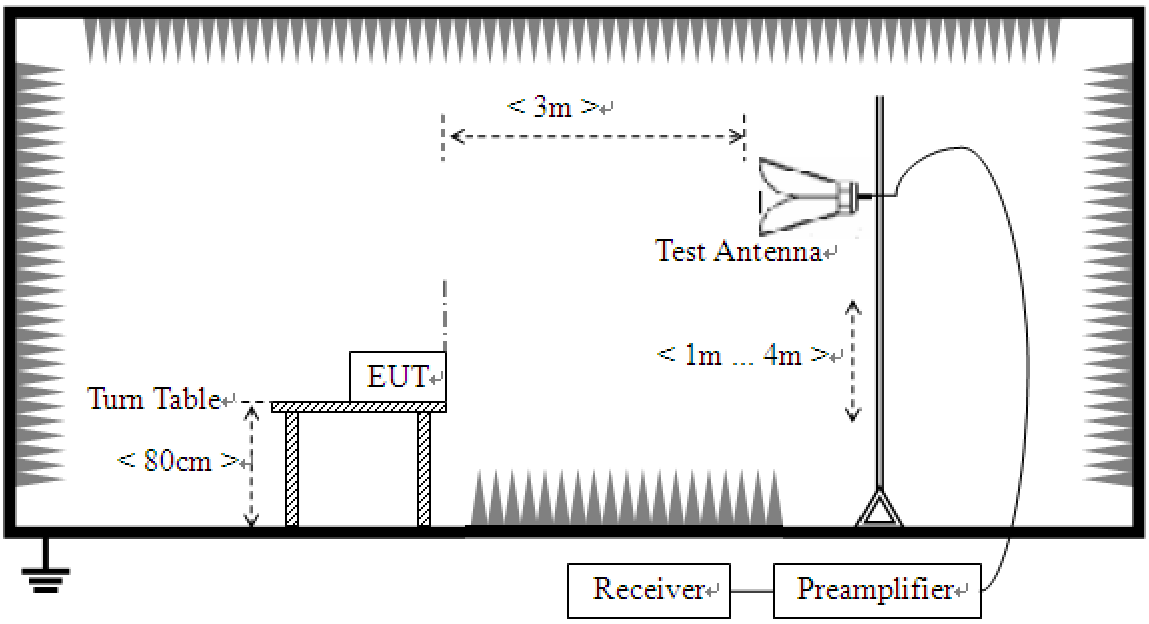
Test Mode Configuration	Description
Mode 1	The Working Test Mode EUT + Control Switch + Phone

4.3 Test Setups

Test Setup 1

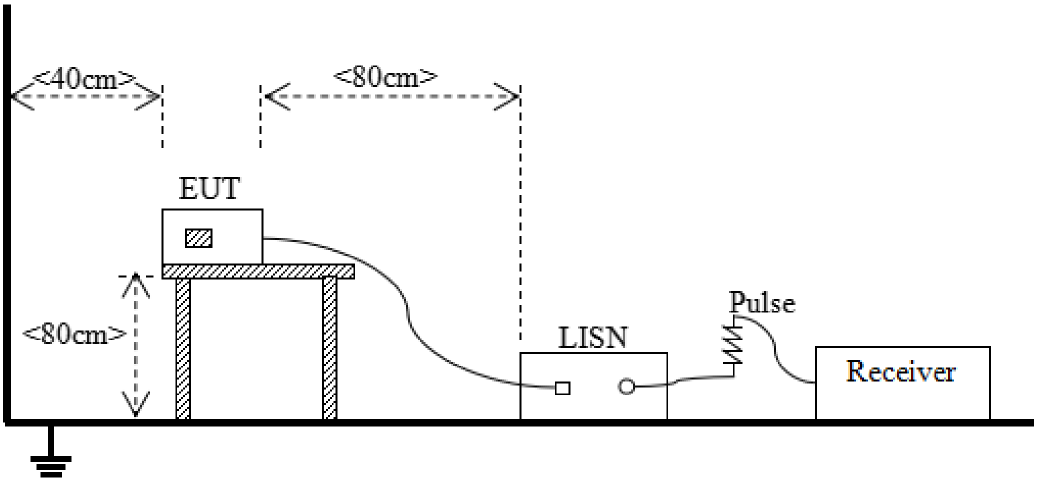


Radiated Emission (30 MHz-1 GHz)



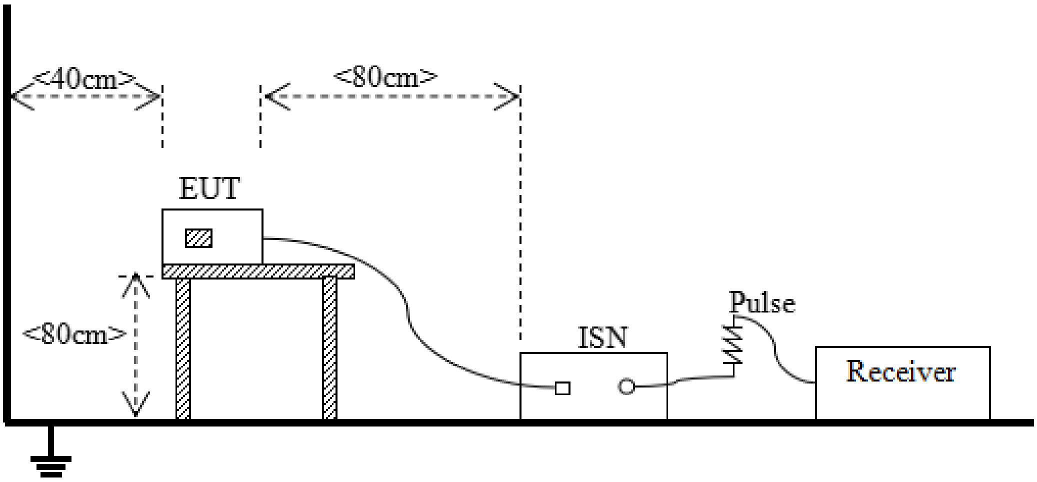
Radiated Emission (above 1 GHz)

Test Setup 2



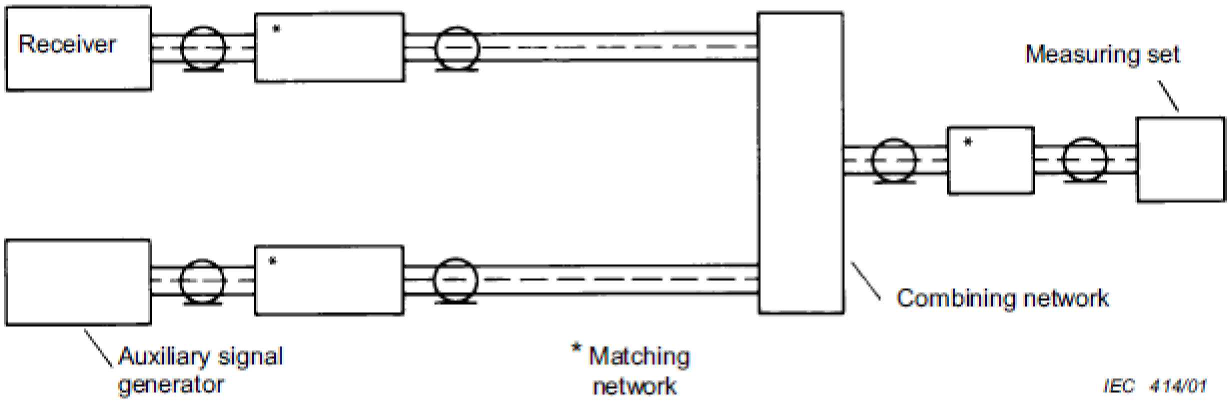
Conducted Emissions for AC mains power ports

Test Setup 3



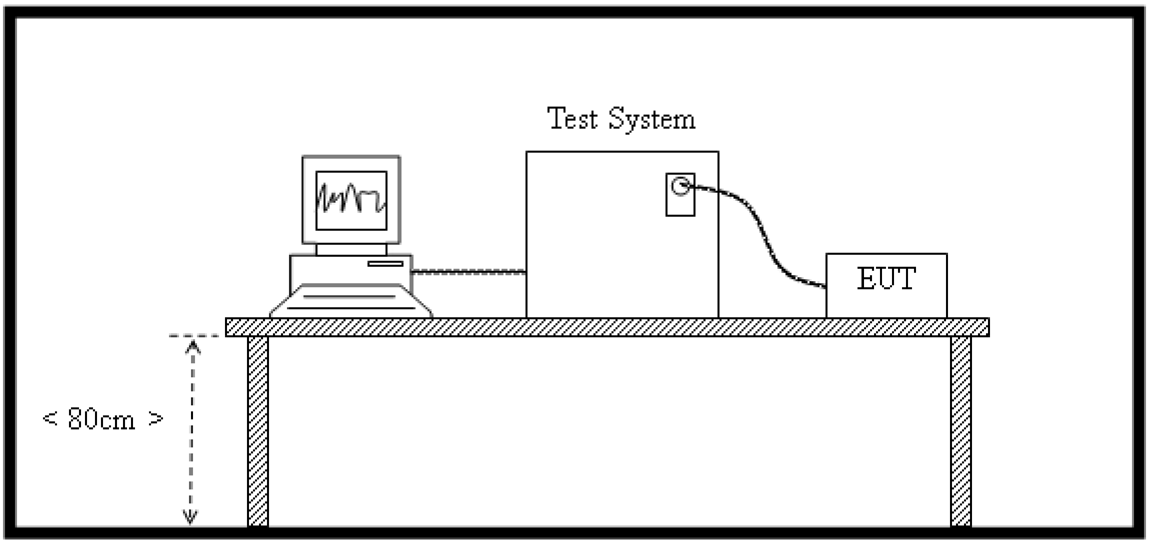
Conducted Emissions for asymmetric mode

Test Setup 4



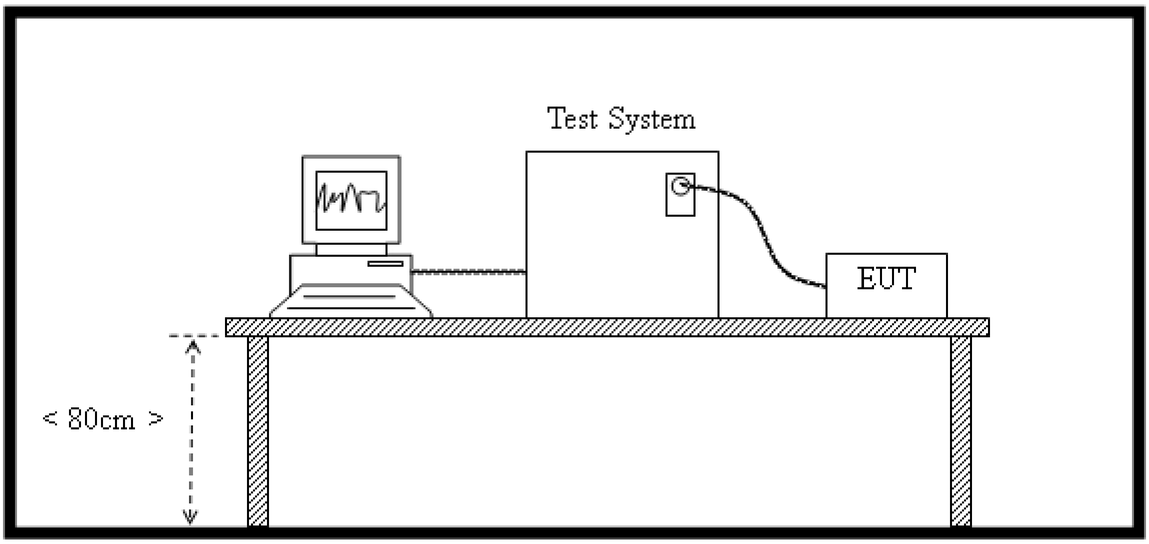
Conducted differential voltage emission (TV/FM broadcast receiver tuner ports)

Test Setup 5



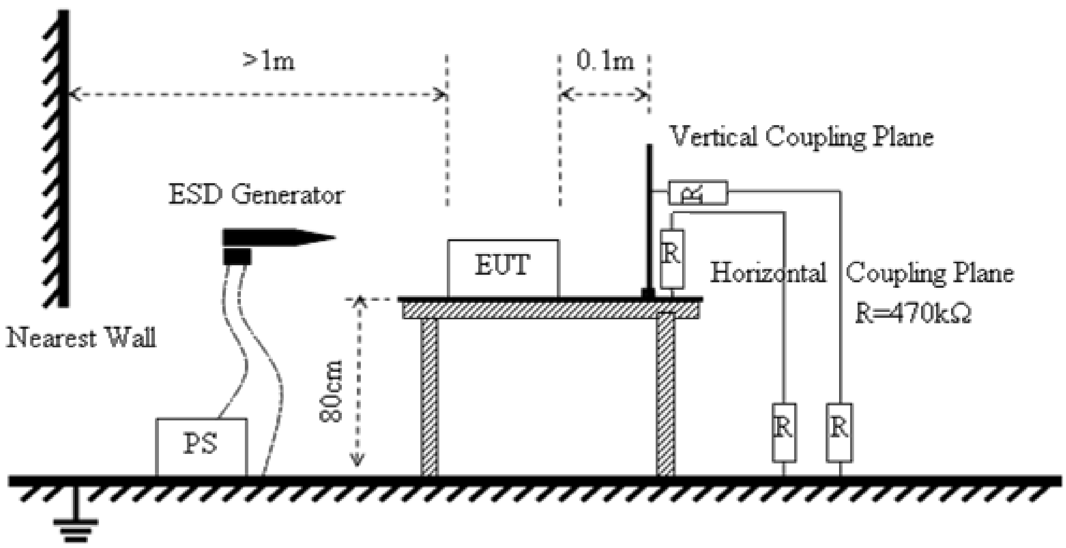
Harmonic Current Emissions

Test Setup 6



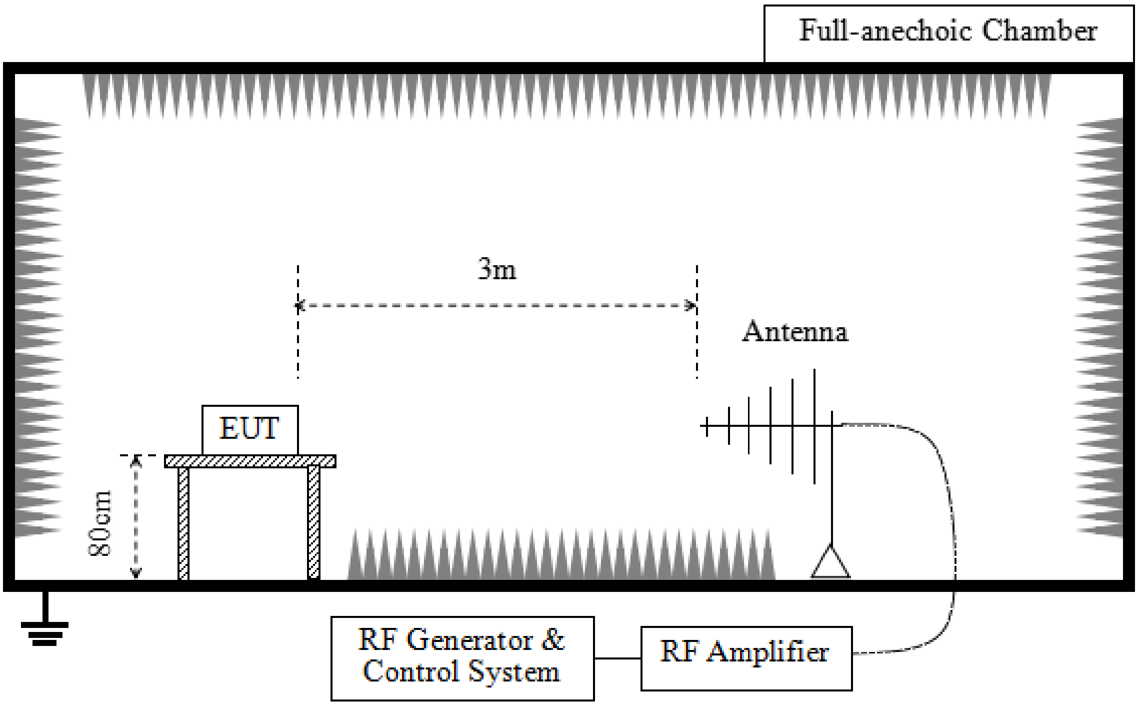
Voltage Fluctuations & Flicker

Test Setup 7



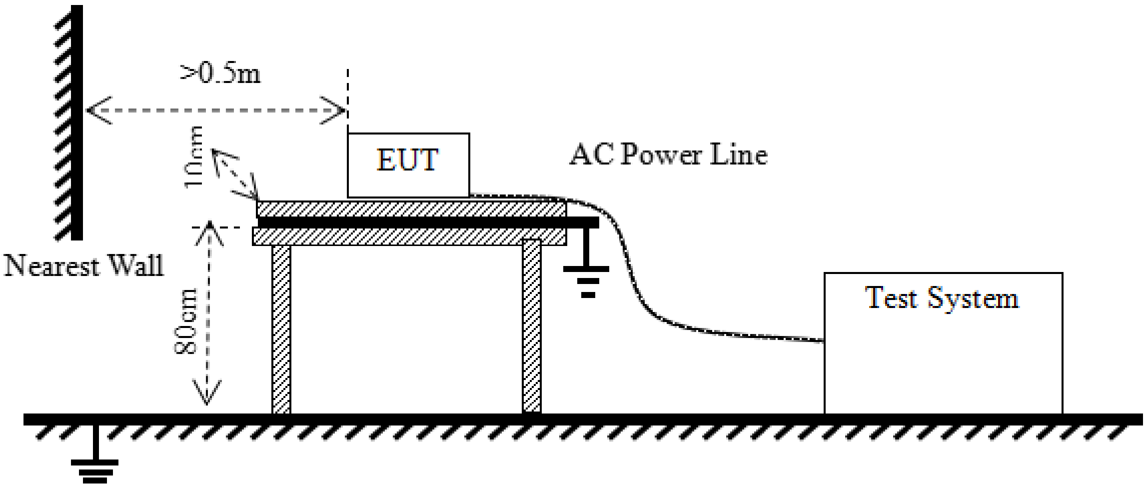
Electrostatic Discharge

Test Setup 8



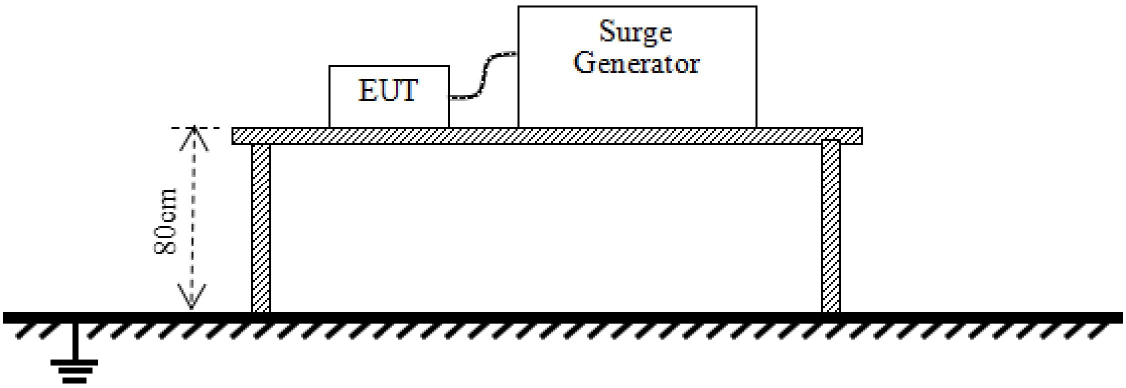
Continuous RF electromagnetic field disturbances

Test Setup 9



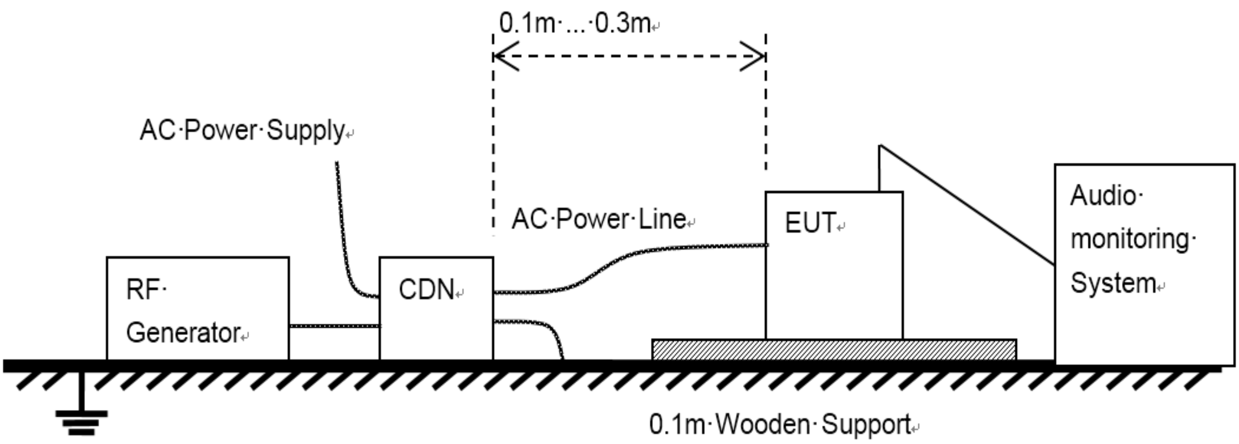
Electrical Fast Transients / Burst

Test Setup 10



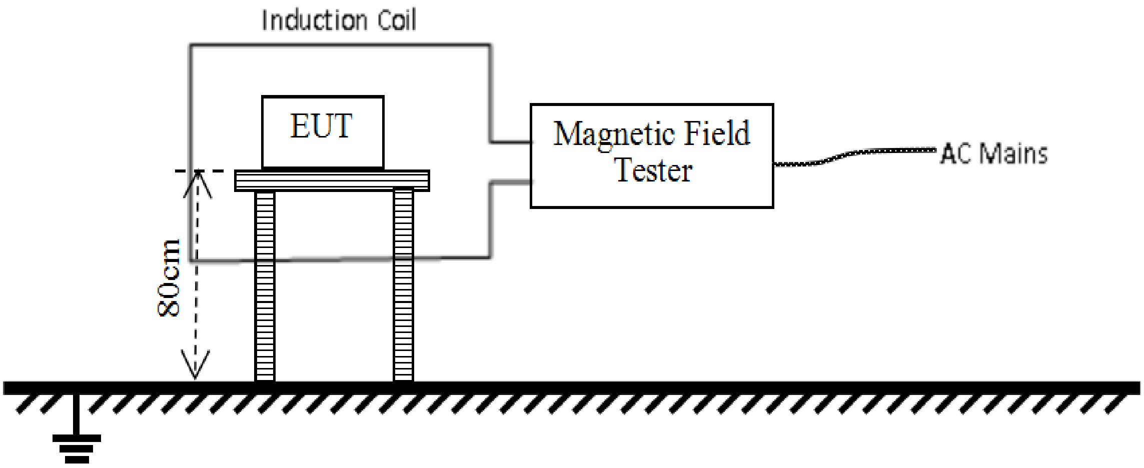
Surges

Test Setup 11



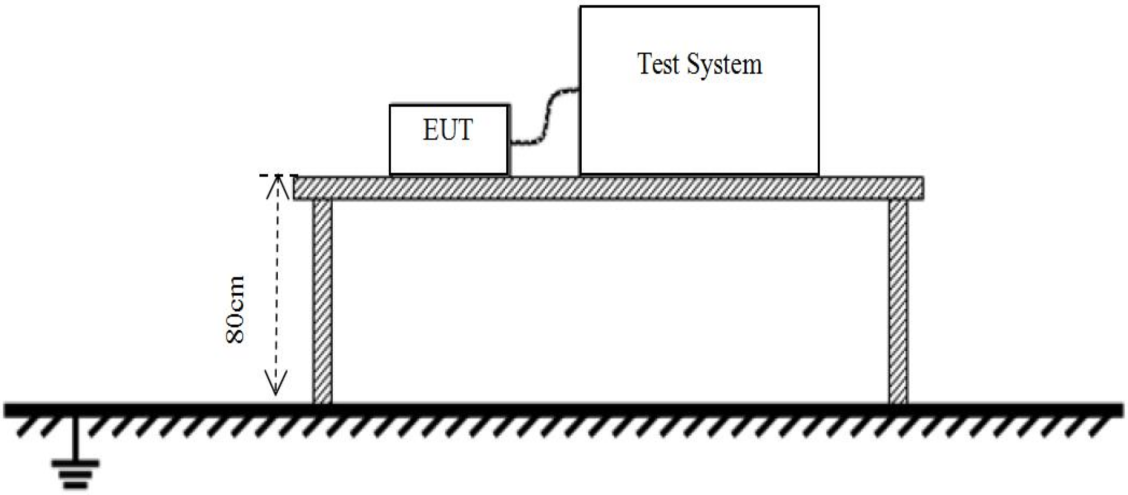
Continuous induced RF disturbances

Test Setup 12



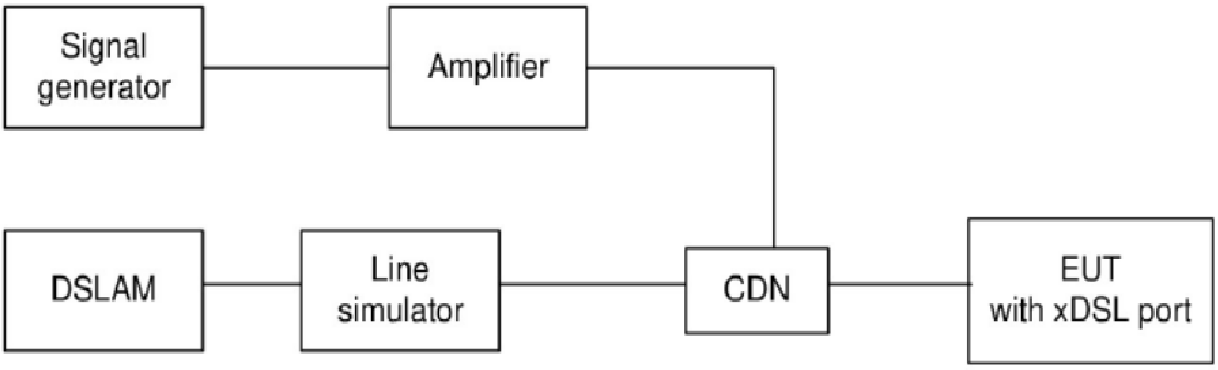
Power Frequency Magnetic Field

Test Setup 13



Voltage Dips and Voltage Interruptions

Test Setup 14



Broadband Impulse Noise Disturbances

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency range (MHz)	Class A (at 3 m)	Class B (at 3 m)
	Quasi-Peak Limit (dBμV/m)	Quasi-Peak Limit (dBμV/m)
30 - 230	50	40
230 - 1000	57	47

Frequency range (MHz)	Class A (at 3 m)		Class B (at 3 m)	
	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)
1000-6000	80	60	74	54

Requirements for radiated emissions from FM receivers

Frequency range (MHz)	Measurement		Quasi-Peak Limit (dBμV/m) Fundamental	Quasi-Peak Limit (dBμV/m) Harmonics	Quasi-Peak Limit (dBμV/m) Other
	Facility	Distance (m)			
30-230	OATS/SAC	10	50	42	30
230-300				42	37
300-1000				46	37
30-230	OATS/SAC	3	60	52	40
230-300				52	47
300-1000				56	47

NOTE:

1) The lower limit shall apply at the transition frequency.
2) Additional provisions may be required for cases where interference occurs.

5.1.1.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 1. The photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

1. An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

2. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz

VBW ≥ RBW

Sweep = auto

Detector function = peak for f <1 GHz, peak & RMS Average for f ≥ 1 GHz

Trace = max hold

5.1.1.4 Test Result and Test Equipment List

Please refer to ANNEX A.1.

5.1.2 Conducted Emissions for AC Ports

5.1.2.1 Limit

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dBμV)	Average (dBμV)	Quasi-peak (dBμV)	Average (dBμV)
0.15 - 0.50	79	66	66-56	56-46
0.50 - 5	73	60	56	46
5 - 30	73	60	60	50

NOTE:

1) The lower limit shall apply at the band edges.
2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 2. The photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

1. The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

2. Use the following spectrum analyzer settings:

RBW = 9 kHz

VBW ≥ RBW

Sweep = 10 ms

Detector function =peak & Average

Trace = max hold

5.1.2.4 Test Result and Test Equipment List

Please refer to ANNEX A.2.

5.1.3 Conducted Emissions for Asymmetric Mode

5.1.3.1 Limit

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dBμV)	Average (dBμV)	Quasi-peak (dBμV)	Average (dBμV)
0.15 - 0.50	97-87	84-74	84-74	74-64
0.50 - 30	87	74	74	64

NOTE:
1) The lower limit shall apply at the band edges.
2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.3.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 3. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

1. Measurement of common mode (asymmetric mode) current or voltage emissions at wired network ports for attachment of unscreened balanced pairs shall be performed with the wired network port connected by a cable to an AAN. The AAN shall define the common mode termination impedance seen by the wired network port during the emission measurements.

2. The voltage division factor shall be added to the measured voltage measured by the receiver directly at the voltage measurement port of the AAN and the result compared with the voltage limits as applicable.

3. Use the following spectrum analyzer settings:

RBW = 9 kHz

VBW ≥ RBW

Sweep = 10 ms

Detector function =peak & Average

Trace = max hold

5.1.3.4 Test Result and Test Equipment List

Please refer to ANNEX A.3.

5.1.4 Conducted Differential Voltage Emissions

5.1.4.1 Limit

Applicability	Frequency range (MHz)	Differential voltage limit @75Ω(dBμV)		
		Local Oscillator Fundamental	Local Oscillator Harmonics	Other
Television receivers; video recorders; PC TV broadcast receiver tuner cards; Digital audio receivers	30 to 950	46	46	46
	950 to 2150	54	54	46
Tuner units (not the LNB) for satellite signal reception	950 to 2150	54	54	46
FM audio receivers and PC tuner cards	30 to 300	54	50	46
	300 to 1000	54	52	46
FM car radios	30 to 300	66	59	46
	300 to 1000	66	52	46
RF modulator output ports connect to TV broadcast receiver tuner ports	30 to 950	76	46	46
	950 to 2150	N/A	54	46

5.1.4.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 4. The photo of test setup please refer to ANNEX B.

5.1.4.3 Test Procedure

1. The impedance as seen from the TV/FM broadcast receiver tuner port of the EUT shall be equal to the nominal antenna input impedance for which the port has been designed. The EUT shall be tuned to the wanted signal from the AE (signal generator). The emission level shall be measured across the relevant frequency range taking into account the attenuation between the EUT TV/FM broadcast receiver tuner port and the measurement device.

2. The RF modulator output port of the EUT is connected to the input of the measuring device by means of a coaxial cable and a matching network (if necessary). The characteristic impedance of the cable shall be equal to the nominal output impedance of the EUT. The EUT shall produce an RF carrier modulated by a video signal defined. The RF output level shall be obtained by adding the insertion loss of the matching network to the indication of the measuring device (tuned to the video carrier frequency and its harmonics).

3. Use the following spectrum analyzer settings:

RBW = 9 kHz

VBW ≥ RBW

Sweep = 10 ms

Detector function =peak & Average

Trace = max hold

5.1.4.4 Test Result and Test Equipment List

Please refer to ANNEX A.4.

5.1.5 Harmonic Current Emissions

5.1.5.1 Classification of equipment

Class A:
– balanced three-phase equipment;
– household appliances, excluding equipment identified as Class D;
– tools, excluding portable tools;
–dimmers for incandescent lamps;
– audio equipment.
Equipment not specified in one of the three other classes shall be considered as Class A equipment.
Class B:
– portable tools;
– arc welding equipment which is not professional equipment.
Class C:
– lighting equipment.
Class D:
Equipment having a specified power according to 6.2.2 less than or equal to 600 W, of the following types:
– personal computers and personal computer monitors;
– television receivers.
– refrigerators and freezers having one or more variable-speed drives to control compress or motor(s).

5.1.5.2 Limit

For the following two categories of equipment, limits are not specified in this document:
- lighting equipment with a rated power less than but not equal to 5 W;
- equipment with a rated power of 75 W or less, other than lighting equipment;

Limits of other equipment as follow:

Table 1–Limits for Class A equipment

Odd harmonic		Even harmonics	
Harmonic order n	Maximum permissible harmonic current A	Harmonic order n	Maximum permissible harmonic current A
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	8⩽n⩽40	0.23 x 8/n
11	0.33		
13	0.21		
15⩽n⩽39	0.15 x 15/n		

Table 2–Limits for Class C equipment [a]

Harmonic order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency %
2	2
3	27[b]
5	10
7	7
9	5
11⩽n⩽39 (odd harmonics only)	3
[a] For some Class C products, other emission limits apply (see 7.4). [b] he limit is determined based on the assumption of modern lighting technologies having power factors of 0,90 or higher.	

Table 3–Limits for Class D equipment

Harmonic order n	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13⩽n⩽39 (odd harmonics only)	3.85/n	See Table 1

5.1.5.3 Application of limit

Class A equipment: For Class A equipment, the harmonics of the input current shall not exceed the values given in Table 1.
Class B equipment: For Class B equipment, the harmonics of the input current shall not exceed the values given in Table 1 multiplied by a factor of 1,5.
Class C equipment: For Class C equipment, as follow:

a) Rated power > 25 W

For luminaires with incandescent lamps and built-in phase control dimming having a rated power greater than 25 W, the harmonics of the input current shall not exceed the limits given in Table 1.

For any other lighting equipment having a rated power greater than 25 W, the harmonics of the input current shall not exceed the relative limits given in Table 2. For those types that include means for control (e.g. dimming, colour), the harmonics of the input current shall not exceed the harmonic current values derived from the percentage limits given in Table 2 for the maximum active input power (P_{max})

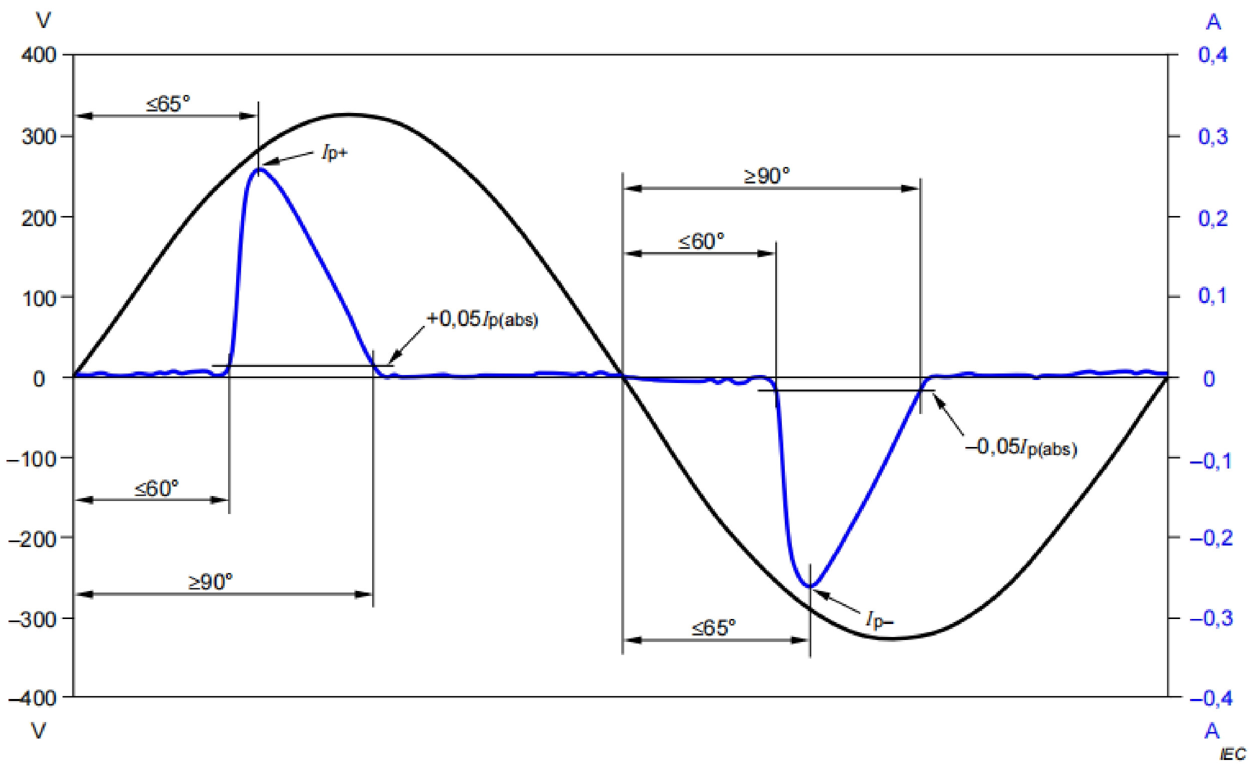
condition when tested in both following conditions:

– with the means for control set to obtain P_{max};

– with the means for control set to the position expected to produce the maximum total harmonic current (THC) within the active input power range [P_{min}, P_{max}], where

- P_{min} = 5 W, if $P_{max} \leq$ 50 W;
- P_{min} = 10 % of P_{max}, if 50 W < $P_{max} \leq$ 250 W;
- P_{min} = 25 W, if P_{max} > 250 W.

b) Rated power ⩾ 5 W and ⩽ 25 W



NOTE $I_{p(abs)}$ is the higher absolute value of I_{p+} and I_{p-}.

Lighting equipment having a rated power greater than or equal to 5 W and less than or equal to 25 W shall comply with one of the following three sets of requirements:

– the harmonic currents shall not exceed the power-related limits of Table 3, column 2;

– the third harmonic current, expressed as a percentage of the fundamental current, shall not exceed 86 % and the fifth harmonic current shall not exceed 61 %. In addition, the waveform of the input current shall be such that it reaches the 5 % current threshold before or at 60°, has its peak value before or at 65° and does not fall below the 5 % current threshold before 90°, referenced to any zero crossing of the fundamental supply voltage. The current threshold is 5 % of the highest absolute peak value that occurs in the measurement window, and the phase angle measurements are made on the cycle that includes this absolute peak value (see Figure 2). Components of current with frequencies above 9 kHz shall not influence this evaluation (a filter similar to the one described in 5.3 of IEC 61000-4-7:2002 and IEC 61000-4-7:2002/AMD1:2008 may be used);

– the THD shall not exceed 70 %. The third order harmonic current, expressed as a percentage of the fundamental current, shall not exceed 35 %, the fifth order current shall not exceed 25 %, the seventh order current shall not exceed 30 %, the ninth and eleventh order currents shall not exceed 20 % and the second order current shall not exceed 5 %.

If the lighting equipment includes means for control (e.g. dimming, colour), or is specified to drive multiple loads, then the measurement is made only at the control setting and at the load of the light sources that gives the maximum active input power.

NOTE The preceding requirement is based on the assumption that, for lighting equipment using control other than phase control, the THC decreases when the input power is reduced.

Class D equipment: For Class D equipment, the harmonics of the input current shall not exceed the values given in Table 3.

5.1.5.4 Test Setup

Please refer to 4.3 section description of test setup of test setup 5. The photo of test setup please refer to ANNEX B.

5.1.5.5 Test Procedure

1. The EUT is placed on the top of a wooden table 0.8m above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

2. 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 necessary for the EUT to be exercised.

5.1.5.6 Test Result and Test Equipment List

Please refer to ANNEX A.5.

5.1.6 Voltage Fluctuations & Flicker

5.1.6.1 Limit

Test Item	Limit	Note
Pst	1.0	Short-term flicker indicator
Plt	0.65	Long-term flicker indicator
Tdt	0.5	Maximum time that dt exceeds 3%
dmax (%)	4%	Maximum relative voltage change
dc (%)	3.3%	Relative steady-state voltage change

5.1.6.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 6. The photo of test setup please refer to ANNEX B.

5.1.6.3 Test Procedure

During the Flicker measurement, the measure time shall include that part of whole operation changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours. The test specifications refer the next table.

No.	Specification	Value
1	Test Frequency	50 Hz
2	Test Voltage	230 VAC
3	Waveform	Sine
4	Test Time	10 minutes for Pst; 2 hours for Plt

5.1.6.4 Test Result and Test Equipment List

Please refer to ANNEX A.6.

5.2 Immunity Tests

5.2.1 Test Performance Criteria for Immunity Test

5.2.1.1 General Performance Criteria

Type	Description
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

5.2.1.2 Performance Criteria for CPE containing xDSL ports

<table>
<tr><th>Type</th><th>Description</th></tr>
<tr><td>Criterion A</td><td>In the absence of impulsive noise:
The modem shall operate without retraining at its target noise margin with a bit rate value depending on the line attenuation and the stationary noise being present on the line. (The actual value will be between the minimum and maximum bit rate values programmed in the port).
With the impulsive noise applied:
The modem shall operate without retraining and without SES at the bit rate established prior to the application of the impulsive noise. No extra CRC errors shall occur due to the impulsive noise.</td></tr>
<tr><td>Criterion B</td><td>Modems shall withstand the application of the isolated impulsive noise events. The performance criteria defined in Table F.3 shall be applied.
Table F.3 – Performance criteria against impulse duration
<table>
<tr><th>Impulse duration
ms</th><th>Performance criteria</th></tr>
<tr><td>0,24</td><td>The application of the impulse shall not cause the xDSL link to lose synchronisation. No CRC errors are permitted.</td></tr>
<tr><td>10</td><td>The application of the 5 impulses shall result in less than 75 CRC errors and shall not cause the link to lose synchronisation.</td></tr>
<tr><td>300</td><td>The application of the impulse shall not cause the xDSL link to lose synchronisation.</td></tr>
</table></td></tr>
</table>

5.2.2 Electrostatic Discharge

5.2.2.1 Test Specification

Specification	Value
Discharge Impedance	330 Ohm / 150 pF
Discharge Voltage	Air Discharge: 2,4,8 kV Contact Discharge: 4 kV
Polarity	Positive / Negative
Number of Discharge	Minimum 20 times at each test point
Discharge Mode	Single discharge
Discharge Period	1 second minimum

5.2.2.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 7. The photo of test setup please refer to ANNEX B.

5.2.2.3 Test Procedure

1. Electrostatic discharges are applied only to those points and surfaces of the EUT that are accessible to users during normal operation.

2. The test is performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

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

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

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

6. Air discharges are 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 is removed from the EUT and re-triggered for a new single discharge. The test is repeated until all discharges were completed.

7. At least ten single discharges (in the most sensitive polarity) are applied to the Horizontal Coupling Plane at points on each side of the EUT. The ESD generator is positioned vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.

8. At least ten single discharges (in the most sensitive polarity) are applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m*0.5m) is placed vertically to and 0.1 meters from the EUT.

5.2.2.4 Test Result and Test Equipment List

Please refer to ANNEX A.7.

5.2.3 Continuous RF Electromagnetic Field Disturbances

5.2.3.1 Test Specification

Specification	Value
Frequency Range	80 MHz to 1000 MHz,1800/2600/3500/5000 (±1%) MHz
Field Strength	3 V/m (unmodulated, r.m.s)
Modulation	1 kHz 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	≤5 seconds

5.2.3.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 8. The photo of test setup please refer to ANNEX B.

5.2.3.3 Test Procedure

5.2.3.3.1 General test

1. The testing is performed in a fully anechoic chamber. The transmit antenna is located at a distance of 3 meters from the EUT.

2. The test signal is 80% amplitude modulated with a 1 kHz sine wave.

3. The frequency range is swept from 80 MHz to 1000 MHz and 1800/2600/3500/5000 (±1%) MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers. The rate of sweep does not exceed 1.5*10-3 decade/s. Where the frequency range is swept incrementally, the step size is 1% of fundamental.

4. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

5. The field strength level is 3 V/m.

6. When equipment can be used in different orientations (i .e. vertical or horizontal) all sides shall be exposed to the field during the test. When technically justified , some EUTs can be tested by exposing fewer faces to the generating antenna. In other cases , as determined for example by the type and size of EUT or the frequencies of test , more than four azimuths may need to be exposed,but only the worst side data is reported in this report.

7. For equipment with a primary function of telephony, additional spot frequency tests are required in follow three functions: a) Establish new communication. b) Maintain established communication. c) Terminate established communication.The additional spot frequencies are: 80 MHz; 120 MHz; 160 MHz; 230 MHz; 434 MHz; 460 MHz; 600 MHz; 863 MHz and 900 MHz (±1 %).

5.2.3.3.2 Audio output function test

Method of measurement:

1. The performance of the EUT shall be evaluated by measuring the level of the demodulated audio relative to the selected reference level.

2. For devices supporting the telephony function, direct (absolute) measurement of the level of demodulated audio is permitted, providing there is lossless coupling to the wire line or the earpiece.

3. Any losses within the measurement systems (for example the plastic tubing shown in Figure G.5) shall be taken into account.

4. For other devices, the levels of both the demodulated audio and a reference output from the EUT shall be measured so as to obtain a relative measurement.

5. The noise floor of the measurement system or ambient sounds shall not influence results.

6. The level of the demodulated audio signal shall be measured via a bandpass filter centred on the modulation frequency of the applied disturbance (typically 1 kHz). The 3 dB bandwidth of the filter (typically 100 Hz) should be selected with regard to the noise floor of the test system and the rejection of the harmonics of the disturbance modulating frequency.

Acoustic measurements:

1. Attention should be given to the acoustic characteristics of the measurement environment. To reduce the effect of reflections, acoustic absorption material may be necessary in the space around the transducer under test, such as the loudspeaker or the on-ear devices and the measuring microphone.

2. The manufacturer shall select a measurement test distance taking into account factors including but not limited to: EUT characteristics, reference level, ambient noise, and pass/fail criteria.

3. The ambient acoustic noise shall be at a sufficiently low level to avoid affecting the measurement result.

4. For on-ear measurements, the measurement transducer shall be coupled closely to the EUT electro-acoustic transducer limiting any loss of the demodulated signal by either:

- placing the transducer as close as possible to the earpiece; or,
- closely coupling a plastic or similar tube to the acoustic output to a remote mounted microphone. In

this case, the appropriate correction factor due to loss in the tube shall be applied.

5. The method using a remotely mounted microphone should be used during radiated immunity measurements. When the measurement transducer is placed within the applied field, it may be impacted by the applied disturbance and any shielding used to isolate the microphone may distort the applied field. Where this method is used, the impact of any shielding and any direct demodulation by the microphone shall be documented in the test report.

Processes (not applicable to direct measurements):

This method establishes an acoustic reference level using an SPL meter and microphone. During the test, the demodulated audio levels are measured, the interference ratio is then established.

1. Configure the measuring transducer to measure the level of acoustic output from the port under test, for example see Figure G.3 in EN 55035.

2. Configure the EUT in accordance with Clause G.5 in EN 55035.

3. Apply an appropriate input signal to the EUT so that a sine wave (tone) at the frequency that will be used to modulate the applied disturbance (typically 1 kHz) is generated from the port under test at a level equal to the acoustic reference level.

4. Record the resulting dB (SPL) level (or other appropriate dB unit) as the value of L0.

5. Change the input to the EUT so that the port under test is silent, or represents silence. This change shall not alter the terminating impedance at the EUT 's input.

6. Apply the RF disturbance to the applicable port of the EUT and record the resulting demodulated audio level in dB (SPL) (or other dB unit used in step d)) as the value of L1.

7. Ensure that non-linear processing does not impact the measurements.

8. Calculate the acoustic interference ratio using the following formula:

$$\text{Acoustic interference ratio} = L_1 - L_0$$

9. Compare the acoustic interference ratio with the relevant limit defined in Clause G.7 in EN 55035.

Repeat steps f) to i) for all required disturbance frequencies.

Equivalent procedures may be used provided they are described fully in the test report.

Audio output function Limits:

Limits for devices supporting telephony					
Type of immunity test	Frequency range (MHz)	Acoustic or electrical interference ratio	Equivalent direct measurement		
			dB(SPL)	Digital (dBm0)	Analogue (dBm)
Radiated	80 to 1 000	0 dB	75	-30	-30

The equivalent direct measurement values are presented to show the equivalency of the interference ratio in comparison to a direct measured value. These values may be used if the direct measurement method of the test is used.

The values within this table are aligned with CISPR 24, noting that the test levels are different between this document and CISPR 24.

For terminals connected to digital wired network ports (such as Ethernet, ISDN), measurements of the demodulated 1 kHz may be performed on a remote AE, ideally of the same design.

Limits for all other devices
The measured acoustic interference ratio and/or the measured electrical interference ratio during the test shall be –20 dB or better.

5.2.3.4 Test Result and Test Equipment List

Please refer to ANNEX A.8.

5.2.4 Electrical Fast Transients / Burst

5.2.4.1 Test Specification

Specification	Value
Test Voltage	AC Power Port: 1 kV.
	DC Power Ports, Analogue/ Digital data Ports: 0.5 kV.
Polarity	Positive / Negative
Impulse Frequency	5 kHz; 100 kHz for CPE xDSL ports only
Impulse Wave Shape	5/50 ns
Burst Duration	15 ms
Burst Period	300 ms
Test Duration	> 1 min

5.2.4.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 9. The photo of test setup please refer to ANNEX B.

5.2.4.3 Test Procedure

1. The EUT is tested with 1000 V discharges to the AC power input leads, and 500 V for DC Power Ports and Analogue/ Digital data Ports.

2. Both positive and negative polarity discharges are applied.

3. The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 m.

4. The duration time of each test sequential is 1min.

5. The transient / burst waveform is in accordance with IEC 61000-4-4, 5/50 ns.

5.2.4.4 Test Result and Test Equipment List

Please refer to ANNEX A.9.

5.2.5 Surges

5.2.5.1 Test Specification

Specification	Value		
Ports Class	AC Power Port	DC Power Port	Analogue/ Digital data Port
Waveform	Voltage: 1.2/50 μs; Current: 8/20 μs	Voltage: 1.2/50 μs; Current: 8/20 μs	Voltage: 10/700 μs
Test Voltage	line to ground 2 kV, line to line 1 kV	line to reference ground 0.5 kV	0.5 kV, 1 kV or 4 kV See note 1, 2, 3
Polarity	Positive / Negative		
Phase Angle	90°, 270°	N/A	N/A
Repetition Rate	60 seconds		
Times	5 times per condition		

Note 1: Port type: unshielded symmetrical Apply: lines to ground; Port type: coaxial or shielded Apply: shield to ground.
Note 2: The test level 1kV and 4kV should apply where primary protection is intended; The test level 1kV should apply where primary protection is not intended.
Note 3: The test level 0.5kV apply to coaxial or shielded

5.2.5.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 10. The photo of test setup please refer to ANNEX B.

5.2.5.3 Test Procedure

1. The EUT and the auxiliary equipment are placed on a table of 0.8 m heights above a metal ground reference plane. The size of ground plane is greater than 1m*1m and project beyond the EUT by at least 0.1 m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT is less than 2 meters (provided by the manufacturer).

2. The EUT is connected to the power mains through a coupling device that directly couples the surge interference signal. The surge noise is applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).

3. The surges are applied line to line and line(s) to earth. When testing line to earth the test voltage is applied successively between each of the lines and earth. Set up to the test level specified increased the test voltage. All lower levels including the selected test level are tested. The polarity of each surge level included positive and negative test pulses.

5.2.5.4 Test Result and Test Equipment List

Please refer to ANNEX A.10.

5.2.6 Continuous Induced RF Disturbances

5.2.6.1 Test Specification

Specification	Value
Frequency Range	0.15 MHz – 80 MHz
Voltage Level	1 V rms, 3 V rms (unmodulated, r.m.s)
Modulation	1 kHz sine wave, 80% AM
Frequency Step	1% of fundamental
Coupled Cable	AC Power Ports; DC Power Ports; Analogue/ Digital data Ports

5.2.6.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 11. The photo of test setup please refer to ANNEX B.

5.2.6.3 Test Procedure

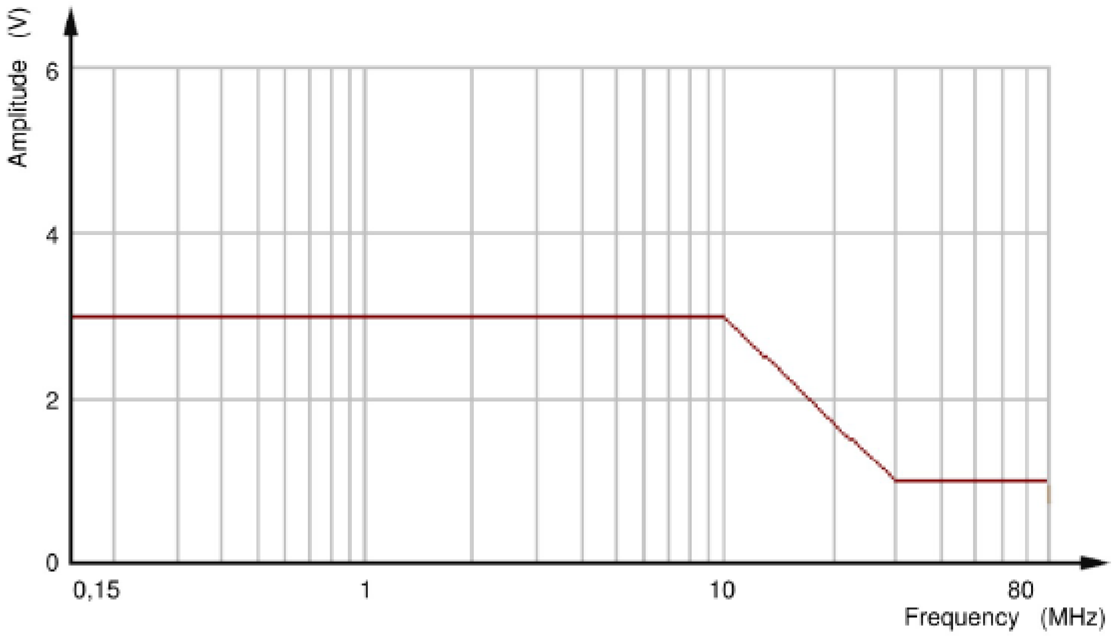
5.2.6.3.1 General test

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

2. 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.

3. The test signal is 80% amplitude modulated with a 1 kHz sine wave.

4. The field strength level refer follow figure.



5. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80% amplitude. The sweep rate shall not exceed 1.5*10-3 decades/s. The step size shall not exceed 1% of the start and thereafter 1% of the preceding

frequency value where the frequency is swept incrementally.

6. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequencies and harmonics or frequencies of dominant interest, shall be analyzed separately.

7. Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.

8. For equipment with a primary function of telephony, additional spot frequency tests are required in follow three functions: a) Establish new communication. b) Maintain established communication. c) Terminate established communication. The additional spot frequencies are: 0.2 MHz; 1 MHz; 7.1 MHz; 13.56 MHz; 21 MHz; 27.12 MHz and 40.68 MHz (±1 %).

5.2.6.3.2 Audio output function test

Method of measurement:

1. The performance of the EUT shall be evaluated by measuring the level of the demodulated audio relative to the selected reference level.

2. For devices supporting the telephony function, direct (absolute) measurement of the level of demodulated audio is permitted, providing there is lossless coupling to the wire line or the earpiece.

3. Any losses within the measurement systems (for example the plastic tubing shown in Figure G.5) shall be taken into account.

4. For other devices, the levels of both the demodulated audio and a reference output from the EUT shall be measured so as to obtain a relative measurement.

5. The noise floor of the measurement system or ambient sounds shall not influence results.

6. The level of the demodulated audio signal shall be measured via a bandpass filter centred on the modulation frequency of the applied disturbance (typically 1 kHz). The 3 dB bandwidth of the filter (typically 100 Hz) should be selected with regard to the noise floor of the test system and the rejection of the harmonics of the disturbance modulating frequency.

Acoustic measurements:

1. Attention should be given to the acoustic characteristics of the measurement environment. To reduce the effect of reflections, acoustic absorption material may be necessary in the space around the transducer under test, such as the loudspeaker or the on-ear devices and the measuring microphone.

2. The manufacturer shall select a measurement test distance taking into account factors including but not limited to: EUT characteristics, reference level, ambient noise, and pass/fail criteria.

3. The ambient acoustic noise shall be at a sufficiently low level to avoid affecting the measurement result.

4. For on-ear measurements, the measurement transducer shall be coupled closely to the EUT electro-acoustic transducer limiting any loss of the demodulated signal by either:

- placing the transducer as close as possible to the earpiece; or,

• closely coupling a plastic or similar tube to the acoustic output to a remote mounted microphone. In this case, the appropriate correction factor due to loss in the tube shall be applied.

5. The method using a remotely mounted microphone should be used during radiated immunity measurements. When the measurement transducer is placed within the applied field, it may be impacted by the applied disturbance and any shielding used to isolate the microphone may distort the applied field. Where this method is used, the impact of any shielding and any direct demodulation by the microphone shall be documented in the test report.

Processes (not applicable to direct measurements):

This method establishes an acoustic reference level using an SPL meter and microphone. During the test, the demodulated audio levels are measured, the interference ratio is then established.

3. Configure the measuring transducer to measure the level of acoustic output from the port under test, for example see Figure G.3 in EN 55035.

4. Configure the EUT in accordance with Clause G.5 in EN 55035.

3. Apply an appropriate input signal to the EUT so that a sine wave (tone) at the frequency that will be used to modulate the applied disturbance (typically 1 kHz) is generated from the port under test at a level equal to the acoustic reference level.

4. Record the resulting dB (SPL) level (or other appropriate dB unit) as the value of L0.

5. Change the input to the EUT so that the port under test is silent, or represents silence. This change shall not alter the terminating impedance at the EUT 's input.

6. Apply the RF disturbance to the applicable port of the EUT and record the resulting demodulated audio level in dB (SPL) (or other dB unit used in step d)) as the value of L1.

7. Ensure that non-linear processing does not impact the measurements.

8. Calculate the acoustic interference ratio using the following formula:

$$\text{Acoustic interference ratio} = L_1 - L_0$$

9. Compare the acoustic interference ratio with the relevant limit defined in Clause G.7 in EN 55035.

Repeat steps f) to i) for all required disturbance frequencies.

Equivalent procedures may be used provided they are described fully in the test report.

Audio output function Limits:

Limits for devices supporting telephony					
Type of immunity test	Frequency range (MHz)	Acoustic or electrical interference ratio	Equivalent direct measurement		
			dB(SPL)	Digital (dBm0)	Analogue (dBm)
Conducted [a]	0.15 to 30	–20 dB	55	-50	-50
	30 to 80	–10 dB	65	-40	-40

[a] At the step in the frequency range, the lower limit shall be applied.

The equivalent direct measurement values are presented to show the equivalency of the interference ratio in comparison to a direct measured value. These values may be used if the direct measurement method of the test is used.

The values within this table are aligned with CISPR 24, noting that the test levels are different between this document and CISPR 24.

For terminals connected to digital wired network ports (such as Ethernet, ISDN), measurements of the demodulated 1 kHz may be performed on a remote AE, ideally of the same design.

Limits for all other devices
The measured acoustic interference ratio and/or the measured electrical interference ratio during the test shall be –20 dB or better.

5.2.6.4 Test Result and Test Equipment List

Please refer to ANNEX A.11.

5.2.7 Power Frequency Magnetic Fields

5.2.7.1 Test Specification

Specification	Value
Field Frequency	50 Hz or 60 Hz
Test Level	1 A/m
Test Duration	5 min

5.2.7.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 12. The photo of test setup please refer to ANNEX B.

5.2.7.3 Test Procedure

The EUT shall be subjected to the test magnetic field by using the induction coil of standard dimensions (1m*1m) and shown in Section 15.1. The induction coil shall then be rotated by 90°in order to expose the EUT to the test field with different orientations.

5.2.7.4 Test Result and Test Equipment List

Please refer to ANNEX A.12.

5.2.8 Voltage Dips and Voltage Interruptions

5.2.8.1 Test Specification

Specification	Value
Voltage Dips	0% Residual: 10 ms; 70% Residual: 500 ms
Voltage Interruptions	0% Residual: 5000 ms
Voltage Phase Angle	0°, 90°, 270°

5.2.8.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 13. The photo of test setup please refer to ANNEX B.

5.2.8.3 Test Procedure

1. The power cord is used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.

2. The EUT is tested for a) 0% voltage residual of supplied voltage with duration of 10 ms; b) 70% voltage residual of supplied voltage with duration of 500 ms. Both of the dips tests are carried out for a sequence of three voltage dips with intervals of 10 seconds.

3. 0% voltage residual of supplied voltage with duration of 5000 ms is followed, which is a sequence of three voltage interruptions with intervals of 10 seconds.

Changes to occur at 0-degree crossover point of the voltage waveform. If the EUT does not demonstrate compliance when tested with 0 degree switching. the test shall be repeated with the switching occurring at both 90 degrees and 270 degrees. If EUT satisfies these alternative requirements, then it fulfils the requirements. This condition shall be recorded in the test report.

5.2.8.4 Test Result and Test Equipment List

Please refer to ANNEX A.13.

5.2.9 Broadband Impulsive Conducted Disturbances

5.2.9.1 Test Specification

Type	Repetitive	Isolated
Specification	Value	Value
Impulse Frequency	0.15 MHz – 30 MHz	0.15 MHz – 30 MHz
Voltage Level	107 dBμV, 36 dBμV, 30 dBμV	110 dBμV
Burst duration	0.7 ms	0.24 ms, 10 ms, 300 ms
Burst period	8.3 ms (for 60 Hz), 10 ms (for 50 Hz)	/
Coupled Cable	Only CPE xDSL Ports	

5.2.9.2 Test Setup

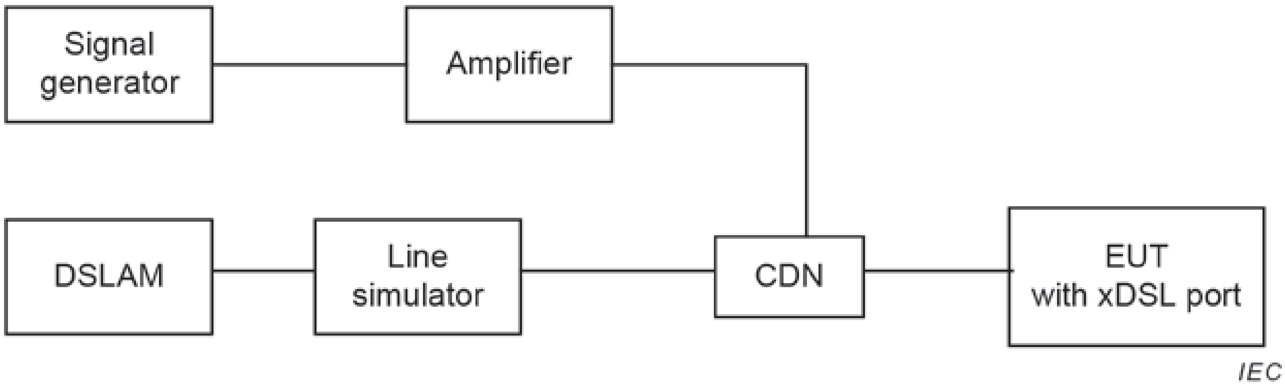
Please refer to 4.3 section description of test setup of test setup 14. The photo of test setup please refer to ANNEX B.

5.2.9.3 Test Procedure

1. Repetitive noise impulses and isolated noise impulses are applied to xDSL ports of the EUT. The requirements for the test level, burst duration and burst period for the two tests are given in follow Table.

Environmental phenomenon	Test specification		Units
Broadband impulse noise disturbances, repetitive	Impulse frequency Test level	0,15 to 0,5 107	MHz dBμV
		0,5 to 10 107 to 36	MHz dBμV
		10 to 30 36 to 30	MHz dBμV
	Burst duration Burst period	0.70 8.3 (for 60 Hz) 10 (for 50 Hz)	ms ms ms
Broadband impulse noise disturbances, isolated	Impulse frequency Test Level	0.15 to 30 110	MHz dBμV
	Burst duration	0.24 10 300	ms ms ms

2. This test procedure is based upon the CDN method defined in IEC 61000-4-6:2008, but with the signal generator replaced by a generator capable of producing bursts of white noise. See follow Figure.



3. The white noise burst should be derived from a longer sequence pseudo-random near-Gaussian white noise generator that may be band-limited to the highest frequency used by the xDSL technology or 30 MHz, whichever is the lowest. This may be generated from an arbitrary waveform source. The length of the sequence from which the noise bursts are generated shall be at least 128 K samples.

4. The amplifier and CDN used shall have a uniform frequency response that does not change by more than 3 dB over the frequency range that extends from 150 kHz to the highest frequency used by the xDSL technology or 30 MHz, whichever is the lowest. It is recommended that the CDN should have an LCL of at least 60 dB over the relevant frequency range. Equipment that satisfies the performance criteria when tested using a CDN with a lower LCL value shall be deemed to meet the requirements.

NOTE 1 A CDN with an LCL of less than 60 dB is more likely to cause failures due to the differential mode signal generated by the lower LCL value of the CDN.

5. The LCL of the CDN shall be measured in accordance with CISPR 16-1-2:2014.

6. The ratio of the peak value to the rms value of the signal at the CDN input port shall be at least 4,0.

7. A level setting procedure similar to that in IEC 61000-4-6:2008 shall be used. The specified test level is established using a spectrum analyser in peak detection mode with a resolution bandwidth of 10 kHz, and a video bandwidth of less than or equal to 10 Hz. The EUT port of the coupling device is connected in common mode through a 150 Ω to 50 Ω adapter to a spectrum analyser having a 50 Ω input impedance.

8. The test generator shall be adjusted to give the level specified in table clause 2.2 at the EUT port of the coupling device, using the setup shown in Figure 8c of the basic standard IEC 61000-4-6:2008.

9. For the repetitive impulse test the disturbance shall be applied for a period of at least 2 min for each port under test.

10. For the isolated impulse test a minimum of 5 isolated impulses shall be applied with an interval of at least 60 s between successive impulses.

NOTE 2 The relationship between the measured level (M) in dBμV and the test level (T) in dBμV as defined in table clause 2.2 or 2.3 is given by:

$$M = T - 27{,}6 \text{ dB}$$

where:

$$27{,}6\ \text{dB} = A_1 + A_2 + A_3$$

A1 = 9,6 dB (150 Ω to 50 Ω converter loss)

A2 = 6 dB (e.m.f. correction, 50 Ω termination of signal generator output)

A3 = 12 dB for the averaging caused by the video bandwidth reduction

NOTE 3 For xDSL lines the test levels were derived from a spectral power density (dBm/Hz) of -43 dBm/Hz where:

$$\text{Test level (dB}(\mu\text{V})) = \text{Spectral power density (dBm/Hz)} + 150\ \text{dB}$$

where:

$$150\ \text{dB} = A_1 + A_2 + A_3$$

A1 = 40 dB (10 kHz bandwidth factor)

A2 = –10 dB (mW to V conversion for 100 Ω impedance)

A3 = 120 dB (V to µV conversion)

5.2.9.4 Test Result and Test Equipment List

Please refer to ANNEX A.14.

ANNEX A TEST RESULTS AND TEST EQUIPMENT LIST

A.1 Radiated Emission

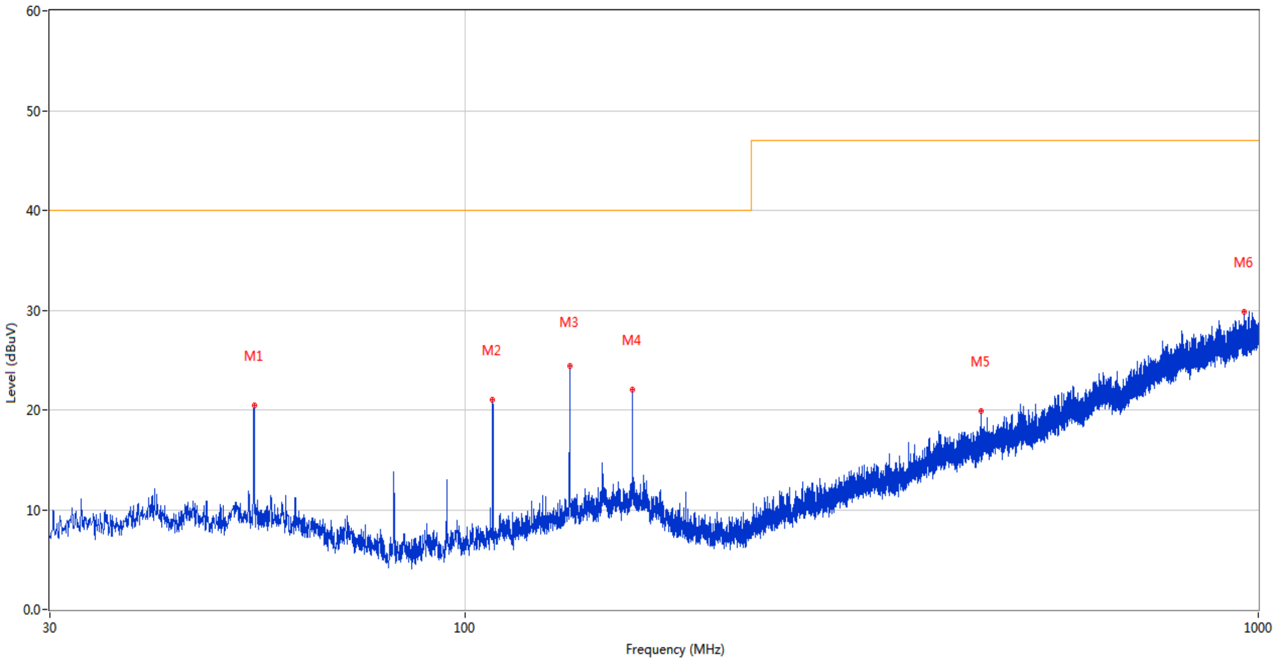
Note 1: Measurements shall be made with a quasi-peak measuring receiver in the frequency range 30 MHz to 1000 MHz. To reduce the testing time, a peak measuring receiver may be used instead of a quasi-peak measuring receiver. In case of dispute, measurement with a quasi-peak measuring receiver will take precedence.

Note 2: In order to achieve the normal operation function of the EUT, it is necessary to connect with the auxiliary Bluetooth Headset via Bluetooth. So the marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth carrier frequencies.

Sample No.	S04	Temperature	22.1℃
Humidity	59%RH	Pressure	101kPa
Test Engineer	Gong Baihua	Test Date	2024.04.28

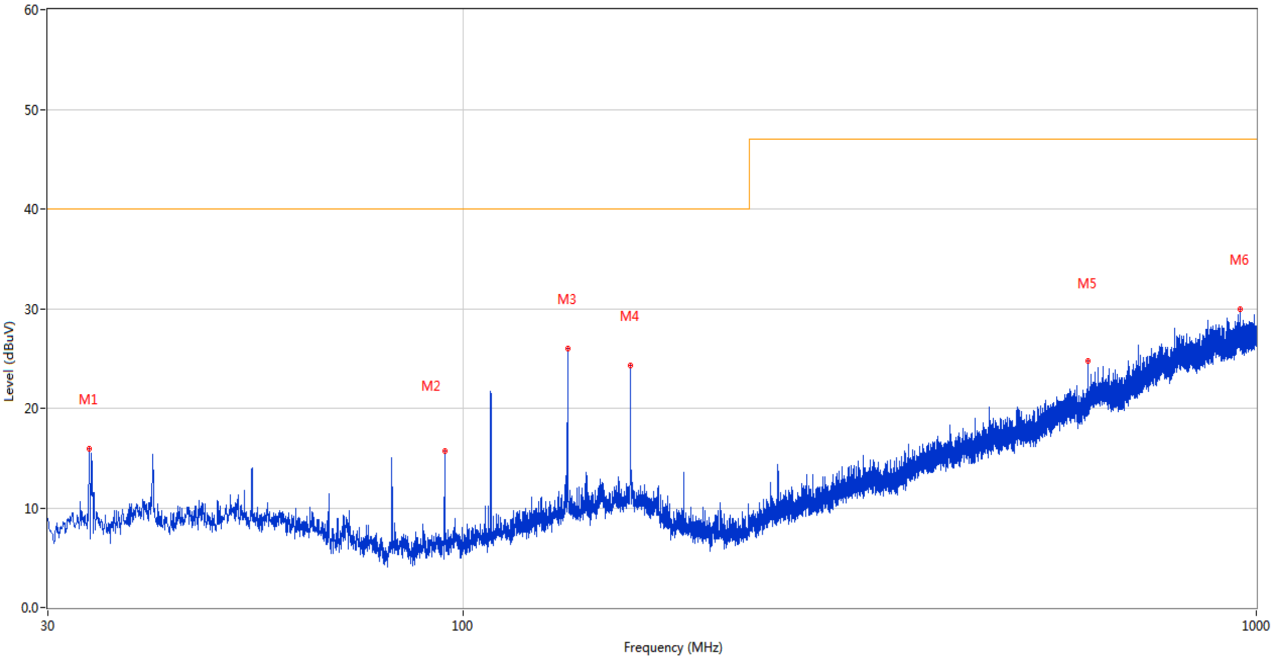
Test Mode 1

1) Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	54.250	20.45	-26.97	40.0	19.55	Peak	72.00	200	Vertical	Pass
2	108.473	20.98	-29.12	40.0	19.02	Peak	33.00	100	Vertical	Pass
3	135.584	24.38	-26.35	40.0	15.62	Peak	0.00	100	Vertical	Pass
4	162.696	22.00	-25.28	40.0	18.00	Peak	0.00	100	Vertical	Pass
5	447.730	19.86	-20.14	47.0	27.14	Peak	360.00	200	Vertical	Pass
6	959.114	29.81	-10.29	47.0	17.19	Peak	198.00	100	Vertical	Pass

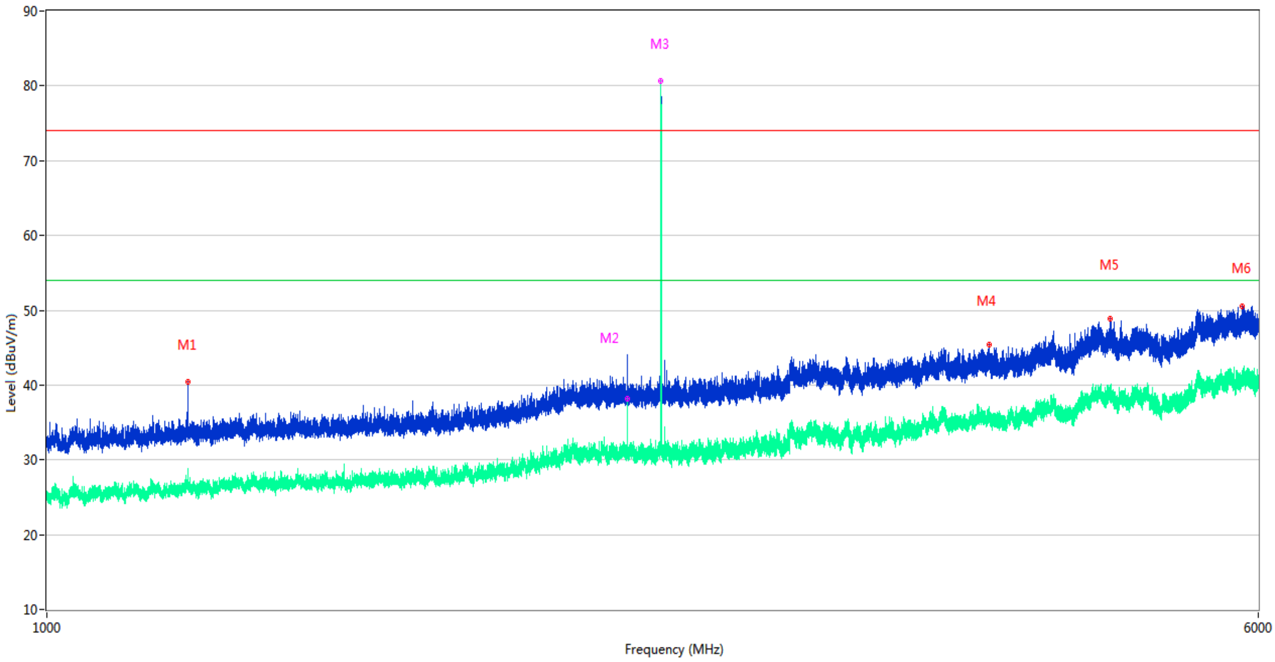
2) Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	33.783	15.93	-27.64	40.0	24.07	Peak	332.00	100	Horizontal	Pass
2	94.893	15.75	-30.06	40.0	24.25	Peak	190.00	200	Horizontal	Pass
3	135.584	25.99	-26.35	40.0	14.01	Peak	75.00	200	Horizontal	Pass
4	162.696	24.30	-25.28	40.0	15.70	Peak	88.00	200	Horizontal	Pass
5	614.134	24.79	-16.03	47.0	22.21	Peak	22.00	200	Horizontal	Pass
6	954.313	29.93	-10.00	47.0	17.07	Peak	42.00	100	Horizontal	Pass

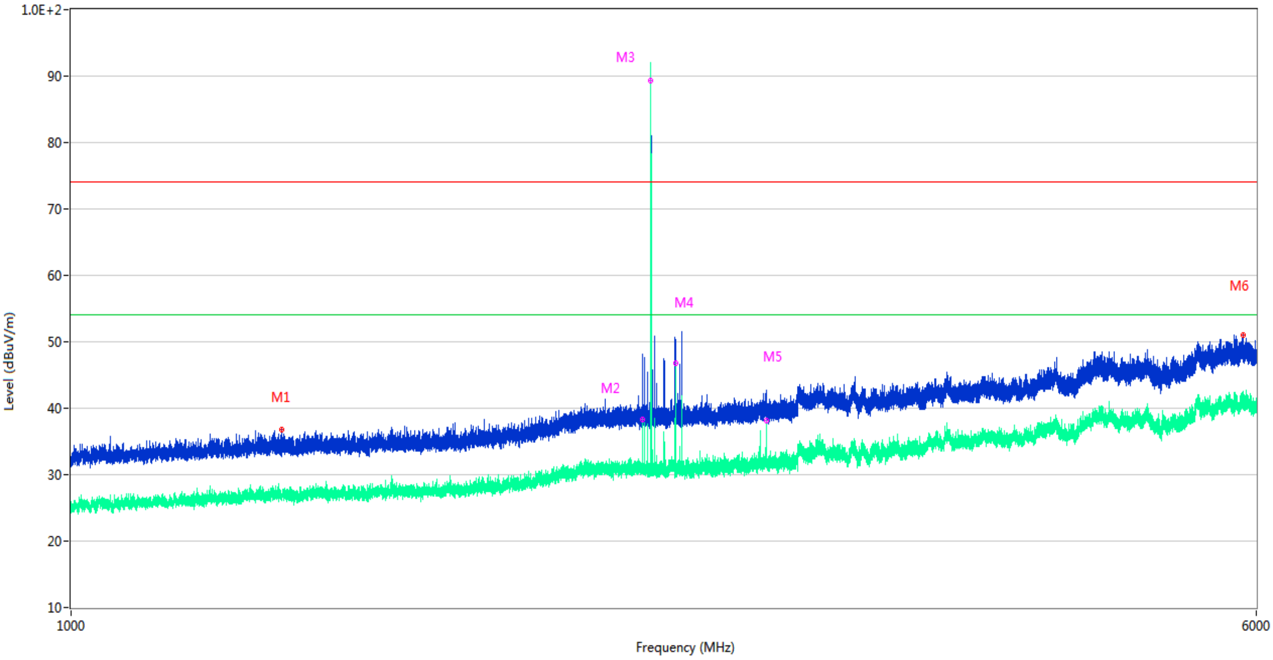
Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency Below 1 GHz						
EMI Receiver	Keysight	N9038A	MY55330120	2023.09.05	2024.09.04	☒
Amplifier (30MHz-1GHz)	COM-MV	ZT30-1000M	B2017119081	2023.12.05	2024.12.04	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-00867	2022.04.12	2025.04.11	☒
Anechoic Chamber（#2）	YiHeng	9m*6m*6m	142	2021.08.19	2024.08.18	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

3) Test Antenna Vertical, 1 GHz – 6 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1232.100	40.36	-16.39	74.0	33.64	Peak	187.00	100	Vertical	Pass
1**	1232.100	26.70	-16.39	54.0	27.30	AV	187.00	100	Vertical	Pass
2	2359.600	38.44	-11.46	74.0	35.56	Peak	0.00	100	Vertical	Pass
2**	2359.600	38.19	-11.46	54.0	15.81	AV	0.00	100	Vertical	Pass
3	2480.200	80.97	-10.96	74.0	-6.97	Peak	194.00	100	Vertical	N/A
3**	2480.200	80.69	-10.96	54.0	-26.69	AV	194.00	100	Vertical	N/A
4	4030.350	45.35	-6.26	74.0	28.65	Peak	255.00	100	Vertical	Pass
4**	4030.350	35.54	-6.26	54.0	18.46	AV	255.00	100	Vertical	Pass
5	4816.050	48.92	-3.12	74.0	25.08	Peak	96.00	100	Vertical	Pass
5**	4816.050	38.45	-3.12	54.0	15.55	AV	96.00	100	Vertical	Pass
6	5855.850	50.58	0.61	74.0	23.42	Peak	0.00	100	Vertical	Pass
6**	5855.850	40.44	0.61	54.0	13.56	AV	0.00	100	Vertical	Pass

4) Test Antenna Horizontal, 1 GHz – 6 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1374.100	36.75	-16.35	74.0	37.25	Peak	7.00	100	Horizontal	Pass
1**	1374.100	26.74	-16.35	54.0	27.26	AV	7.00	100	Horizontal	Pass
2	2373.500	40.67	-11.12	74.0	33.33	Peak	156.00	100	Horizontal	Pass
2**	2373.500	38.33	-11.12	54.0	15.67	AV	156.00	100	Horizontal	Pass
3	2402.600	90.81	-11.66	74.0	-16.81	Peak	350.00	100	Horizontal	N/A
3**	2402.600	89.38	-11.66	54.0	-35.38	AV	350.00	100	Horizontal	N/A
4	2492.900	39.20	-11.07	74.0	34.80	Peak	92.00	100	Horizontal	Pass
4**	2492.900	46.83	-11.07	54.0	7.17	AV	92.00	100	Horizontal	Pass
5	2863.000	39.14	-9.49	74.0	34.86	Peak	185.00	100	Horizontal	Pass
5**	2863.000	38.08	-9.49	54.0	15.92	AV	185.00	100	Horizontal	Pass
6	5885.550	50.96	0.19	74.0	23.04	Peak	177.00	100	Horizontal	Pass
6**	5885.550	41.43	0.19	54.0	12.57	AV	177.00	100	Horizontal	Pass

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency Above 1 GHz						
EMI Receiver	Keysight	N9038A	MY55330120	2023.09.05	2024.09.04	☒
Amplifier (1-12GHz)	Advanced Microwave	WLA652A	1740103	2023.12.05	2024.12.04	☒
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	01917	2022.06.09	2025.06.08	☒
Anechoic Chamber（#2）	YiHeng	9m*6m*6m	142	2021.08.19	2024.08.18	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

A.2 Conducted Emission for AC Mains Power Ports

Note: Not applicable.

A.3 Conducted Emission for Asymmetric Mode

Note: Not applicable.

A.4 Conducted Differential Voltage Emission

Note: Not applicable.

A.5 Harmonic Current Emissions

Note: Not applicable.

A.6 Voltage Fluctuations and Flicker

Note: Not applicable.

A.7 Electrostatic Discharge

Sample No.	S04	Temperature	21.5℃
Humidity	47%RH	Pressure	101kPa
Test Engineer	Chen Yuwei	Test Date	2024.05.06

Test Mode	Discharge Type	Test Position	Test Level (kV)	Discharge Times	Result
Mode 1	Air	Key	±2,±4,±8	60	Pass
		Fuselage and Crevices	±2,±4,±8	300	Pass
	Contact	HCP	±4	100	Pass
		VCP	±4	100	Pass
		Ostiole	±4	20	Pass

Note: The performance comply with the performance criteria in Criterion B.

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
ESD Test System	EMTEST	DITO	P1833222423	2023.08.04	2024.08.03	☒

A.8 Continuous RF Electromagnetic Field Disturbances

Sample No.	S04	Temperature	25.3℃
Humidity	52%RH	Pressure	101kPa
Test Engineer	Xiao Tangqi	Test Date	2024.05.06

Test Mode	Test Fre. (MHz)	Test Level (V/m)	Antenna Polarity	Step (MHz)	Dwell Time (s)	Test Position	Result
Mode 1	80 - 1000	3	Horizontal	1%	3	Front; Back; Left; Right; Top; Bottom	Pass
	80 - 1000	3	Vertical	1%	3	Front; Back; Left; Right; Top; Bottom	Pass
	1800, 2600, 3500, 5000	3	Horizontal	1%	3	Front; Back; Left; Right; Top; Bottom	Pass
	1800, 2600, 3500, 5000	3	Vertical	1%	3	Front; Back; Left; Right; Top; Bottom	Pass

Note: The performance comply with the performance criteria in Criterion A.

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Anechoic Chamber	ChangNing	7m*4m*3m	103	2022.10.28	2025.10.27	☒
Signal Generator	Agilent	N5181A	MY50141752	2023.12.05	2024.12.04	☒
Power Amplifier	OPHIR RF	5225F	1037	2023.12.27	2024.12.26	☒
Power Amplifier	OPHIR RF	5273F	1016	2023.12.27	2024.12.26	☒
Power Amplifier	RFLIGHT	NTWPAS-25 60025	17043109	2023.12.27	2024.12.26	☒
Power Meter	R&S	NRP-Z11	117410/117693	2023.06.12	2024.06.11	☒
Field Strength Meter	Narda	EP 602	611WX80276	2023.09.12	2024.09.11	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-977	2022.02.16	2025.02.15	☒
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	1148	2022.04.12	2025.04.11	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

A.9 Electrical Fast Transients/Burst

Note: Not applicable.

A.10 Surges

Note: Not applicable.

A.11 Continuous induced RF Disturbances

Note: Not applicable.

A.12 Power Frequency Magnetic Fields Immunity

Note: Not applicable.

A.13 Voltage Dips and Voltage Interruptions

Note: Not applicable.

A.14 Broadband Impulsive Conducted Disturbances

Note: Not applicable.

ANNEX B TEST SETUP PHOTOS

Please refer the document BL-SZ2440809-AE-2.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2440809-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2440809-AI.PDF”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
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4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the “inspection and testing dedicated stamp” or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--

TEST REPORT

Applicant:	Woan Technology (Shenzhen) Co., Ltd.
Address:	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100
Equipment Type:	SwitchBot Wallet Finder Card
Model Name:	W2500032 (refer to section 2.3)
Brand Name:	SwitchBot
Test Standard:	ETSI EN 300 330 V2.1.1 (2017-02)
Sample Arrival Date:	Apr. 17, 2024
Test Date:	Apr. 28, 2024 - May 01, 2024
Date of Issue:	May 24, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Liang Yongming

Yongming Liang

Checked by: Xia Long

Xia Long

Approved by: Liao Jianming (Technical Director)

Jm Liao

Revision History

Version	Issue Date	Revisions Content
Rev. 01	May 24, 2024	Initial Issue

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100

2.2 Manufacturer Information

Manufacturer	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100

2.3 General Description for Equipment under Test (EUT)

EUT Name	SwitchBot Wallet Finder Card
Model Name Under Test	W2500032
Series Model Name	W2500031, W2500033, W2500034, W2500035
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name and combinations. (this information provided by the applicant)
Hardware Version	V02
Software Version	V01
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	Bluetooth, NFC

The requirement for the following technical information of the EUT was tested in this report:

Modulation Type	ASK
Frequency Range	13.56 MHz
Product Class	1
Receiver Categorization	3
Number of channel	1
Tested Channel	1
Antenna Type	FPC Antenna
About the Product	The equipment is SwitchBot Wallet Finder Card, intended for used with information technology equipment. Only NFC was tested in this report.

Note: The above EUT information in section 2.3 and 2.4 was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

The EUT has been tested according to ETSI EN 300 330 V2.1.1 (2017-02).

No.	Identity	Document Title
1	ETSI EN 300 330 V2.1.1 (2017-02)	Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

3.2 Verdict

Report Section	Standard Rule	Description	Result
Transmitter requirements			
5.1.1	4.3.1	Permitted range of operating frequencies	Pass
5.1.2	4.3.2	Operating frequency ranges	Pass
5.1.3	4.3.3	Modulation bandwidth	Pass
5.1.4	4.3.4	Transmitter H-field requirements (only applies to product class 1 and class 2)	Pass
--	4.3.5	Transmitter RF carrier current (only applies to product class 3)	N/A
--	4.3.6	Transmitter radiated E-field (only applies to product class 4)	N/A
--	4.3.7	Transmitter conducted spurious emissions (only applies to product class 3 and their power or current level in an artificial antenna)	N/A
5.1.5	4.3.8	Transmitter radiated spurious domain emission limits < 30 MHz	Pass
5.1.6	4.3.9	Transmitter radiated spurious domain emission limits > 30 MHz	Pass
--	4.3.10	Transmitter Frequency stability (only applies to channelized systems where channel limits are defined)	N/A
Receiver requirements			
5.2.1	4.4.2	Receiver spurious emissions	Pass
--	4.4.3	Adjacent channel selectivity (only for channelized systems in the 27 MHz range)	N/A
--	4.4.4	Receiver blocking or desensitization (only applicable for channelized systems where channel definitions are used.)	N/A

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Radiated spurious emissions-966#2	4.7 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

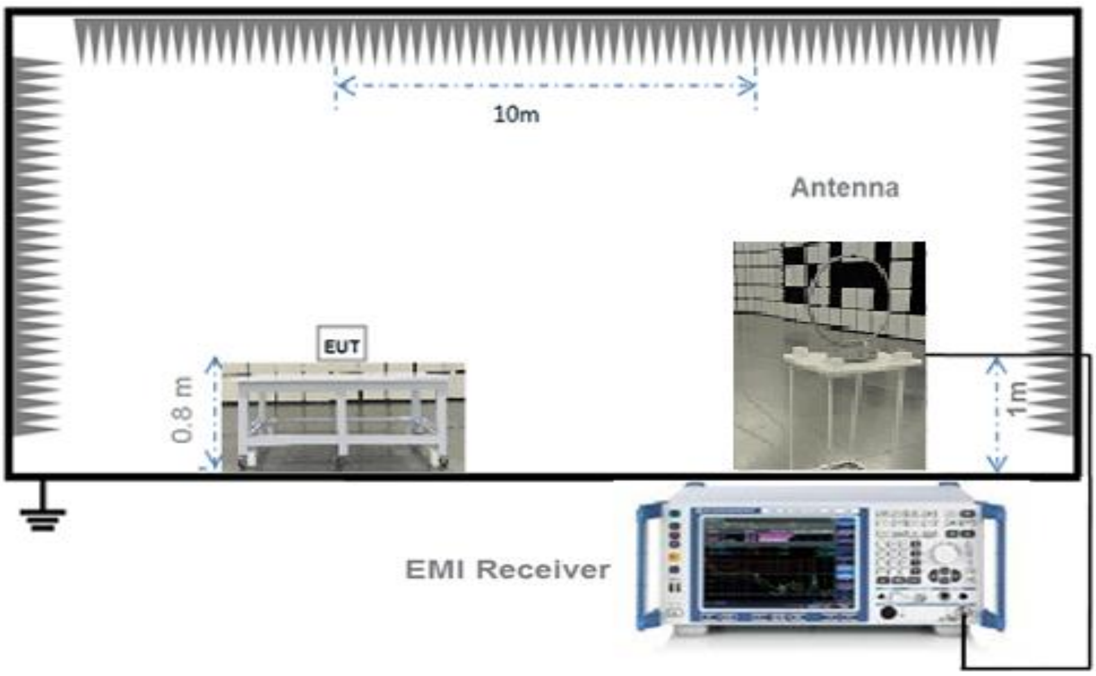
During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	30% to 60%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+22℃ to +25℃
	LT (Low Temperature)	0℃
	HT (High Temperature)	+35℃
Working Voltage of the EUT	NV (Normal Voltage)	3.87 V
	LV (Low Voltage)	3.60 V
	HV (High Voltage)	4.45 V

4.2 Test Setups

Test Setup 1

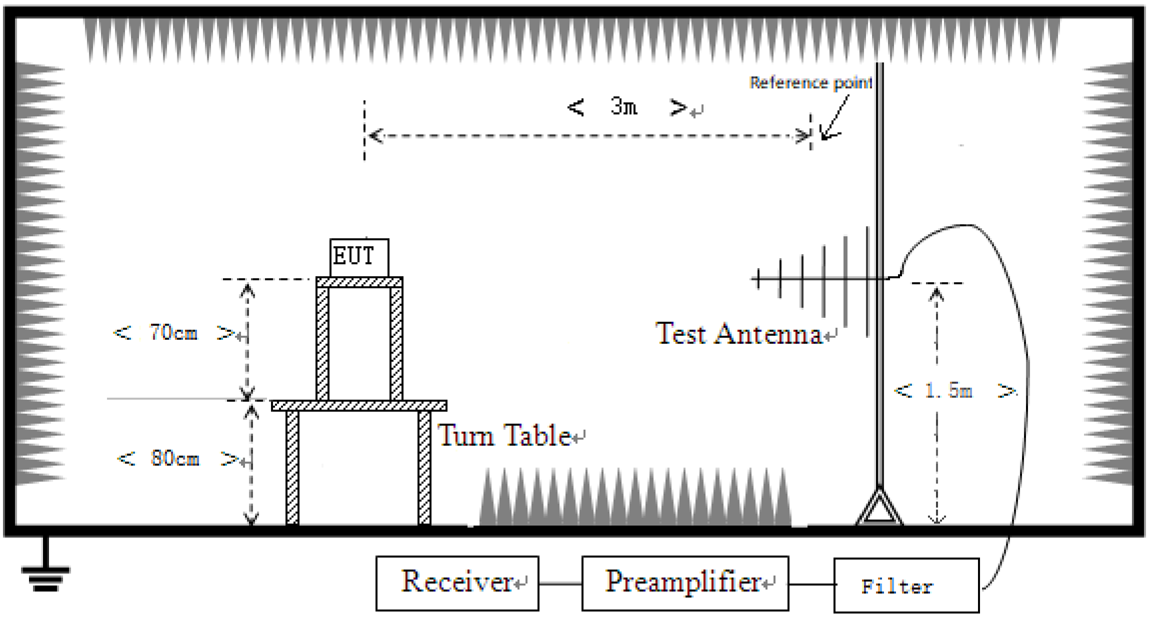
Radiated Test (Below 30 MHz)



(Diagram 1)

Test Setup 2

Radiated Test (30 MHz-1 GHz)



(Diagram 2)

4.3 Receiver categorization

Technologies	Receiver spurious emission	Adjacent channel selectivity	Blocking or desensitization
tagging systems	yes	no (note 2)	no (note 1)
systems in the 27 MHz range	yes	yes	yes
all others	yes	no (note 2)	yes
NOTE 1: Blocking or desensitization not needed because of the physical co-location of RX to TX in tagging systems where the RX and TX operate simultaneously. The TX signal is used for the RX baseband mixing. The TX signal at the RX input is about 90 dB above the receiver sensitivity or tagging signal level the receiver (see ETSI TR 103 059 [i.9], figure 8). Furthermore given the very short communication ranges for most applications (e.g. NFC, RFID), a given interference blocking signal will have to be about 90 dB higher as the transmitter signal at the transceiver antenna, which is unlikely to happen. NOTE 2: This requirement can only be required where a frequency plan with standard channel spacing is consistently used, for example in the 27 MHz band.			

4.4 Product classes

Product Class	Description of transmitter	Antenna to be tested	Frequency range	Loop antenna area	Length of antenna (= maximum dimension of the antenna)	Customization of antenna design allowed	Transmitter carrier output limits	Spurious emissions limits
1	Inductive loop coil transmitter	Integral antenna (antenna type 1) or dedicated antenna supplied with the equipment (antenna type 2); (see note 1)	9 kHz to 30 MHz	< 30 m^2	< λ/4 (75 metres/f where f is in MHz) or < 30 m, whichever is shorter	No	H-field at 10 m (see clause 4.3.4.3)	H-field at 10 m (see clauses 4.3.8.3 and 4.3.9.3)
2	Inductive loop coil transmitter	Two representative antennas supplied with the equipment (see note 2)	9 kHz to 30 MHz	< 30 m^2 (see note 3)	< λ/4 (75 metres/f where f is in MHz) or < 30 m, whichever is shorter	Yes (see note 3)	H-field at 10 m (see clause 4.3.4.3)	H-field at 10 m (see clauses 4.3.8.3 and 4.3.9.3)
3	Customized, large size loop antennas only	Test without an antenna by using an artificial antenna	9 kHz to 135 kHz	> 30 m^2	n.a.	Yes	Current in artificial antenna (see note 4 and clauses 4.3.4.3 and 4.3.6.3)	Current in artificial antenna (see note 4 and clauses 4.3.7.3 and 4.3.19.3)
4	E-field transmitter	Each type of antenna to be used	9 kHz to 30 MHz	n.a.	n.a.	n.a.	H-field at 10 m (see clause 4.3.6.3)	H-field at 10 m (see clauses 4.3.8.3 and 4.3.9.3)

NOTE 1: Where a manufacturer provides a range of standard antennas, the equipment will be tested as Product Class 1 equipment, with the antenna(s) attached. The measurements shall be repeated for each antenna.
NOTE 2: The two antennas shall meet the manufacturer's design rules published in the equipment manual and shall have maximum and minimum loop areas respectively. Both antennas shall have the maximum magnetic dipole moment as declared by the manufacturer.
NOTE 3: Customization is only allowed according to the manufacturer's antenna design rules published in the equipment manual.
NOTE 4: ON-site measurements may be required.

4.5 Measuring receiver

Frequency	Detector type	Measurement receiver bandwidth	Spectrum analyzer bandwidth
9 kHz≤f<150 kHz	Quasi Peak	200 Hz	300 Hz
150 kHz≤f<30 MHz	Quasi Peak	9 kHz	10 kHz
30 MHz≤f<1 GHz	Quasi Peak	120 kHz	100 kHz
NOTE: For the measurement of the ranges 6,765 MHz ≤ f ≤ 6,795 MHz and 11,810 MHz ≤ f ≤ 15,310 MHz, the measurement bandwidth has to be 200 Hz respectively 300 Hz.			

4.6 Short Range Devices within the 9 kHz to 30 MHz permitted frequency bands

	Frequency Bands/frequencies	Applications
Transmit and Receive	9 kHz to 90 kHz	Inductive devices, Generic use
Transmit and Receive	90 kHz to 119 kHz	Inductive devices, Generic use
Transmit and Receive	119 kHz to 140 kHz	Inductive devices, Generic use
Transmit and Receive	140 kHz to 148,5 kHz	Inductive devices, Generic use
Transmit and Receive	148,5 kHz to 5 MHz	Inductive devices, Generic use
Transmit and Receive	400 kHz to 600 kHz	RFID only
Transmit and Receive	5 MHz to 30 MHz	Inductive devices, Generic use
Transmit and Receive	3 155 kHz to 3 400 kHz	Inductive devices, Generic use
Transmit and Receive	984 kHz to 7 484 kHz (Note 3, Centre frequency is 4 234 kHz)	Inductive devices, Railway applications
Transmit and Receive	4 516 kHz	Inductive devices, Railway applications
Transmit and Receive	6 765 kHz to 6 795 kHz	Inductive devices, Generic use
Transmit and Receive	7 400 kHz to 8 800 kHz	Inductive devices, Generic use
Transmit and Receive	10 200 kHz to 11,000 MHz	Inductive devices, Generic use
Transmit and Receive	11,810 MHz to 15,310 MHz (Centre frequency is 13,56 MHz)	RFID only
Transmit and Receive	12,5 MHz to 20 MHz	Inductive devices, Wireless healthcare
Transmit and Receive	13,553 MHz to 13,567 MHz	Inductive devices, Generic use
Transmit and Receive	26,957 MHz to 27,283 MHz	Inductive devices, Generic use
Transmit and Receive	27,090 MHz to 27,100 MHz	Inductive devices, Railway applications
NOTE 1: In addition, it should be noted that other frequency bands may be available in a country within the frequency range 9 kHz to 30 MHz. NOTE 2: On non-harmonised parameters, national administrations may impose certain conditions such as the type of modulation, frequency, channel/frequency separations, maximum transmitter radiated power, duty cycle, and the inclusion of an automatic transmitter shut-off facility, as a condition for the issue of an Individual Rights for use of spectrum or General Authorization, or as a condition for use under "licence exemption" as it is in most cases for Short Range Devices. NOTE 3: Transmitting only on receipt of a Balise/Eurobalise tele-powering signal from a train.		

5 Test Type and Test Results

5.1 Transmitter Parameters

5.1.1 Permitted range of operating frequencies

5.1.1.1 Limit

The permitted range of operating frequencies for intentional emissions shall be entirely within the frequency bands in the table of section 4.6.

5.1.1.2 Test Setup

The section 4.2 (Diagram 1) test setup was used for this test. The photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

The permitted range of operating frequencies is the frequency range over which the equipment is authorized to operate.

If more than one modulation scheme can be generated by the EUT, then for each modulation scheme and one typical set of modulation parameters the maximum and minimum frequencies shall be measured and recorded separately.

5.1.1.4 Test Result and Test Equipment List

Please refer to ANNEX A.1.

5.1.2 Operating frequency ranges

5.1.2.1 Limit

The operating frequency ranges for intentional emissions shall be entirely within the frequency bands in table of section 4.6.

5.1.2.2 Test Setup

The section 4.2 (Diagram 1) test setup was used for this test. The photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The operating frequency range (OFR) is the frequency range over which the EUT is transmitting. The operating frequency range of the EUT is determined by the lowest (f_L) and highest frequency (f_H) as occupied by the power envelope. With the centre frequency of the OFR as: $f_C = (f_H+f_L)/2$. An EUT could have more than one operating frequency range.

5.1.2.4 Test Result and Test Equipment List

Please refer to ANNEX A.2.

5.1.3 Modulation bandwidth

5.1.3.1 Limit

The modulation bandwidth shall be within the assigned frequency band or ±7,5 % of the carrier frequency whichever is the smallest. For RFID and EAS Systems, the modulation bandwidth shall be within the transmitter emission boundary of figures I.1, I.2, I.3 and I.4. For further information, see CEPT/ERC/REC 70-03 [i.1] or ERC/ECC/CEPT Decisions as implemented through National Radio Interfaces (NRI) and additional NRI as relevant.

5.1.3.2 Test Setup

The section 4.2 (Diagram 1) test setup was used for this test. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

The transmitter shall be connected to an artificial antenna or if the transmitter has an integral antenna a test fixture shall be used. The RF output of the equipment shall be connected to a spectrum analyzer via a 50 Ω variable attenuator.
The transmitter shall be operated at the nominal carrier power or field strength measured under normal test conditions.
The measurements shall be made during normal and extreme test conditions. During extreme test conditions, both extreme temperature and voltage apply simultaneously.

5.1.3.4 Test Result and Test Equipment List

Please refer to ANNEX A.3.

5.1.4 Transmitter radiated H-field

5.1.4.1 Limit

The frequency ranges and limits shown in flow table.

H-field limits at 10 m

Frequency range (MHz)	H-field strength limit (H_f) dBμA/m at 10 m or specified in mW e.r.p.
0,009 ≤ f < 0,090	72 descending 3 dB/oct above 0,03 MHz or according to note 1 (see note 5)
0,09 ≤ f < 0,119	42
0,119 ≤ f < 0,135	66 descending 3 dB/oct above 0,119 MHz or according to note 1 (see notes 3 and 5)
0,135 ≤ f < 0,140	42
0,140 ≤ f < 0,1485	37,7
0,1485 ≤ f < 30	-5 (see note 4)
0,315 ≤ f < 0,600	-5
3,155≤ f < 3,400	13,5
4,234	9 (see note 9)
4,516	7
7,400 ≤ f < 8,800	9
10,2 ≤ f < 11,00	9
12,5 ≤ f ≤ 20	-7
6,765 ≤ f ≤ 6,795	42 (see notes 3 and 7)
26,957 ≤ f ≤ 27,283	42 (see note 3)
13,410 ≤ f ≤13,553, 13,567 ≤ f ≤ 13,710	9 (see note 6)
13,110 ≤ f ≤ 13,410, 13,710 ≤ f ≤ 14,010	-3,5 (see note 6)
12,660 ≤ f ≤ 13,110, 14,010 ≤ f ≤ 14,460	-10 (see note 6)
11,810 ≤ f ≤ 12,660, 14,460 ≤ f ≤ 15,310	-16 (see note 6)
13,460 ≤ f ≤ 13,553, 13,567 ≤ f ≤ 13,660	27 (see note 6)
13,360 ≤ f ≤ 13,460, 13,660 ≤ f ≤ 13,760	Linear transition from 27 to -3,5 (see note 6)
13,110 ≤ f ≤ 13,360, 13,760 ≤ f ≤ 14,010	-3,5 (see note 6)
12,660 ≤ f ≤ 13,110, 14,010 ≤ f ≤ 14,460	-5 (see note 6)
13,553 ≤ f ≤ 13,567	42 (see note 3) or 60 (see notes 2 and 3)
27,095	42
26,995, 27,045, 27,095, 27,145, 27,195 (see note 8)	100 mW

NOTE 1: For the frequency ranges 9 kHz to 135 kHz, the following additional restrictions apply to limits above 42 dBμA/m:
- for loop coil antennas with an area ≥ 0,16 m^2 this table and table B.1 with the antenna limitations apply;
- for loop coil antennas with an area between 0,05 m^2 and 0,16 m^2 table B.1 applies with a correction factor. The limit is: table value + 10 × log (area/0,16 m^2);
- for loop coil antennas with an area < 0,05 m^2 the limit is 10 dB below table B.1.

NOTE 2: For RFID (incl. NFC) and EAS applications only.
NOTE 3: Spectrum mask limit, see annex I.
NOTE 4: For further information see annex G.
NOTE 5: Limit is 42 dBμA/m for the following spot frequencies: 60 kHz ± 250 Hz, 66,6 kHz ± 750 Hz, 75 kHz ± 250 Hz, 77,5 kHz ± 250 Hz, and 129,1 kHz ± 500 Hz.
NOTE 6: Only in conjunction with spectrum mask, see annex I.
NOTE 7: The frequency range 6,765 MHz - 6,795 MHz is not a harmonised ISM frequency band according article 5.138 of the ITU Radio Regulations [i.13].
NOTE 8: Center frequencies for channelized systems by using ≤ 10 kHz bandwidth.
NOTE 9: The limit is valid in the range 984 kHz - 7 484 kHz for Transmitting only on receipt of a Balise/Eurobalise tele-powering signal from a train.

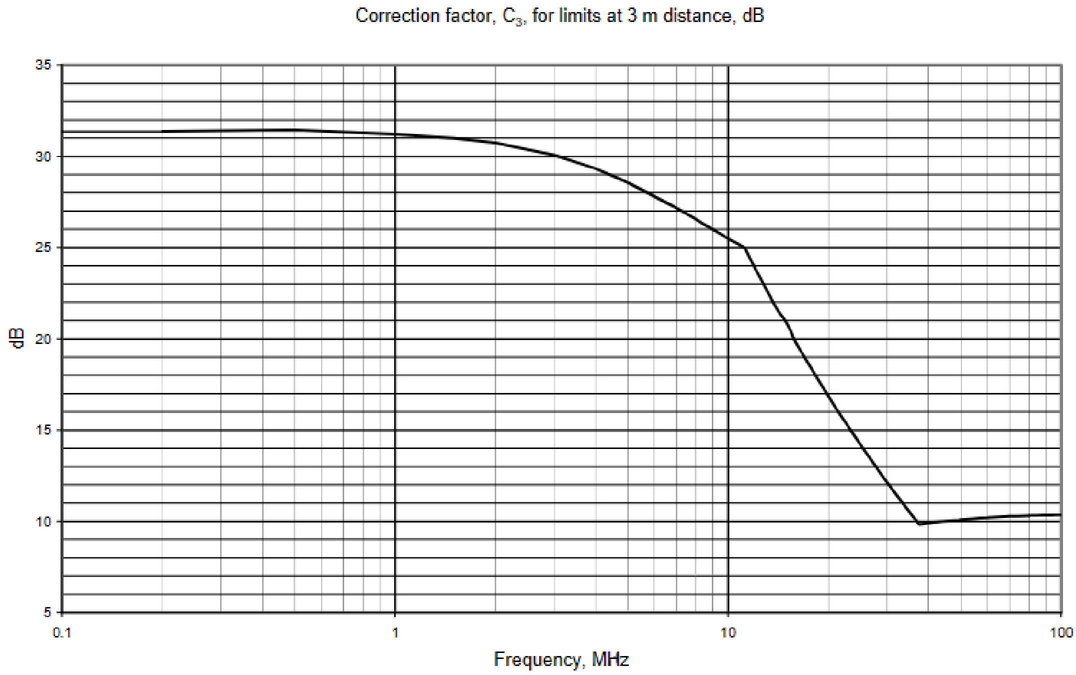
The H-field limit in dBμA/m at 3 m, H_{3m}, is determined by the following equation:

$$H_{3m} = H_{10m} + C_3$$

where:

H_{10m} is the H-field limit in dBμA/m at 10 m distance according to the present document; and

C_3 is a conversion factor in dB determined from follow figure.



5.1.4.2 Test Setup

The section 4.2 (Diagram 1) test setup was used for this test. The photo of test setup please refer to ANNEX B.

5.1.4.3 Test Procedure

The conformance tests for Transmitter radiated H-field shall be as defined in clause 6.2.4 of the present document. Conformance shall be established under test conditions to be declared by the manufacturer according to clause 4.1. The interpretation of the results for the measurements uncertainty shall be as given in clause 5.13.

5.1.4.4 Test Result and Test Equipment List

Please refer to ANNEX A.4.

5.1.5 Transmitter radiated spurious domain emission limits < 30 MHz

5.1.5.1 Limit

Limits for transmitters spurious emissions in the range from 9 kHz to 30 MHz

Limits for measurements at 10 m distance:

State	Frequency 9 kHz≤ f <10MHz	Frequency 10 MHz≤ f <30 MHz
Transmit	27 dBμA/m at 9 kHz descending 3 dB/oct	-3.5 dBμA/m
Standby	5.5 dBμA/m at 9 kHz descending 3 dB/oct	-25 dBμA/m

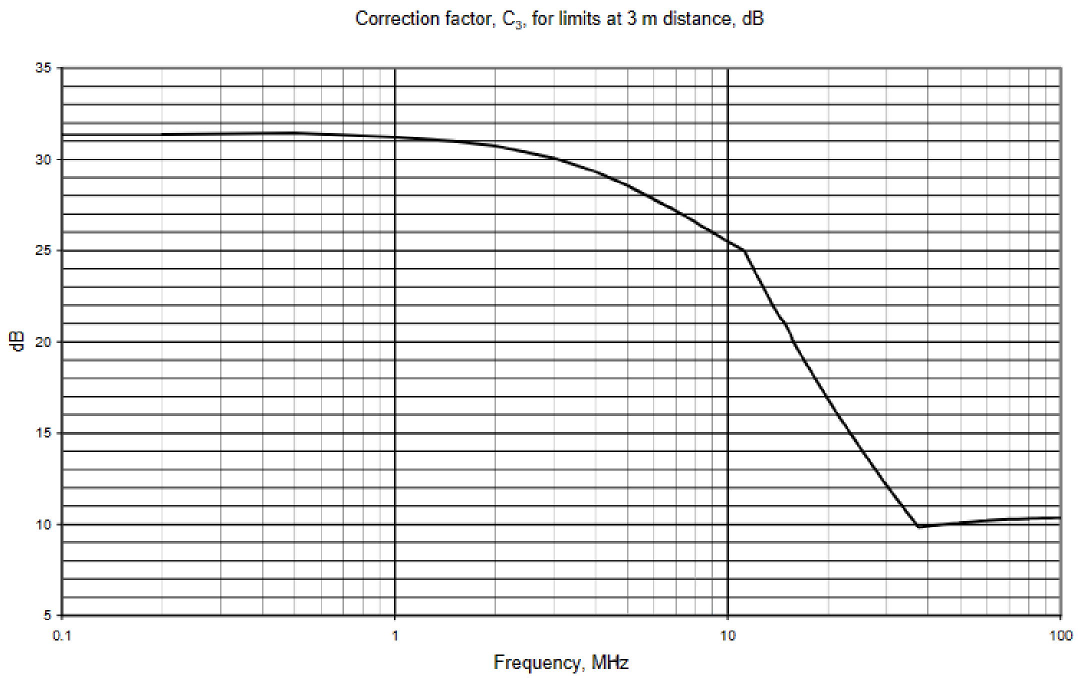
The H-field limit in dBμA/m at 3 m, H_{3m}, is determined by the following equation:

$$H_{3m} = H_{10m} + C_3$$

where:

H_{10m} is the H-field limit in dBμA/m at 10 m distance according to the present document; and

C_3 is a conversion factor in dB determined from follow figure.



5.1.5.2 Test Setup

The section 4.2 (Diagram 1) test setup was used for this test. The photo of test setup please refer to ANNEX B.

5.1.5.3 Test Procedure

The conformance tests for transmitter radiated spurious domain emission limits < 30 MHz shall be as defined in clause 6.2.8 of the present document. Conformance shall be established under test conditions to be declared by the manufacturer according to clause 4.1. The interpretation of the results for the measurements uncertainty shall be as given in clause 5.13.

5.1.5.4 Test Result and Test Equipment List

Please refer to ANNEX A.5.

5.1.6 Transmitter radiated spurious domain emission limits > 30 MHz

5.1.6.1 Limit

Limits for transmitters spurious emissions in the range from 30 MHz to 1000 MHz

The power of any radiated emission shall not exceed the values as below.

State	47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequency between 30 MHz to 1000 MHz
Operating	4 nW	250 nW
Standby	2 nW	2 nW

Note 1: The test limit has been transformed to the limit at 3m.

5.1.6.2 Test Setup

The section 4.2 (Diagram 2) test setup was used for this test. The photo of test setup please refer to ANNEX B.

5.1.6.3 Test Procedure

The conformance tests for transmitter radiated spurious domain emission limits > 30 MHz shall be as defined in clause 6.2.9 of the present document. Conformance shall be established under test conditions to be declared by the manufacturer according to clause 4.1. The interpretation of the results for the measurements uncertainty shall be as given in clause 5.13.

5.1.6.4 Test Result and Test Equipment List

Please refer to ANNEX A.6.

5.2 Receiver Parameters

5.2.1 Receiver Spurious Emissions

5.2.1.1 Limits for transmitters spurious emissions in the range from 9 kHz to 30 MHz

Limits for measurements at 10 m distance:

Frequency 9 kHz≤ f <10MHz	Frequency 10 MHz≤ f <30MHz
5.5dBμA/m at 9kHz descending 3 dB/oct	-25 dBμA/m

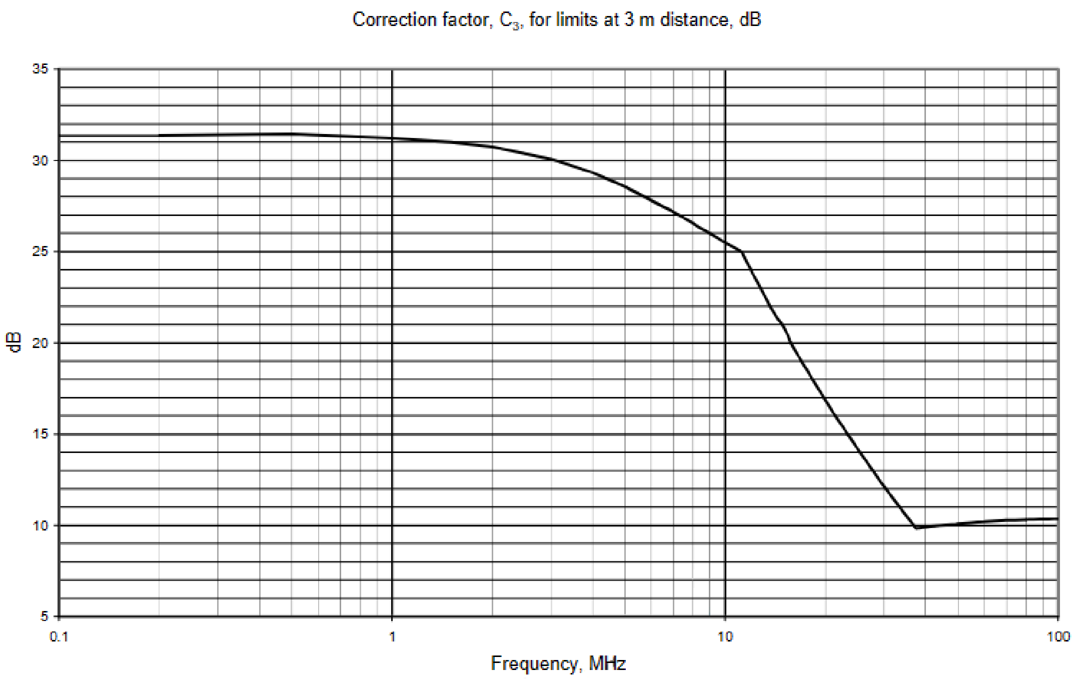
The H-field limit in dBμA/m at 3 m, H_{3m}, is determined by the following equation:

$$H_{3m} = H_{10m} + C_3$$

where:

H_{10m} is the H-field limit in dBμA/m at 10 m distance according to the present document; and

C_3 is a conversion factor in dB determined from follow figure.



5.2.1.2 Limits for transmitters spurious emissions in the range from 30 MHz to 1000 MHz

The measured values shall not exceed 2 nW.

5.2.1.3 Test Setup

See 4.2 (Diagram 1 and 2) for test setup for the radiated test. The photo of test setup please refer to ANNEX B.

5.2.1.4 Test Procedure

The measurements of the radiated spurious emissions were made on an anechoic chamber. The spurious emissions produced by the equipment were measured at the distance of 10m for below 30MHz, but the measure distance is 3m for above 30MHz. The spurious emissions are measured with a shielded loop antenna connected to a measurement receiver.

5.2.1.5 Test Result and Test Equipment List

Please refer to ANNEX A.7.

ANNEX A TEST RESULT

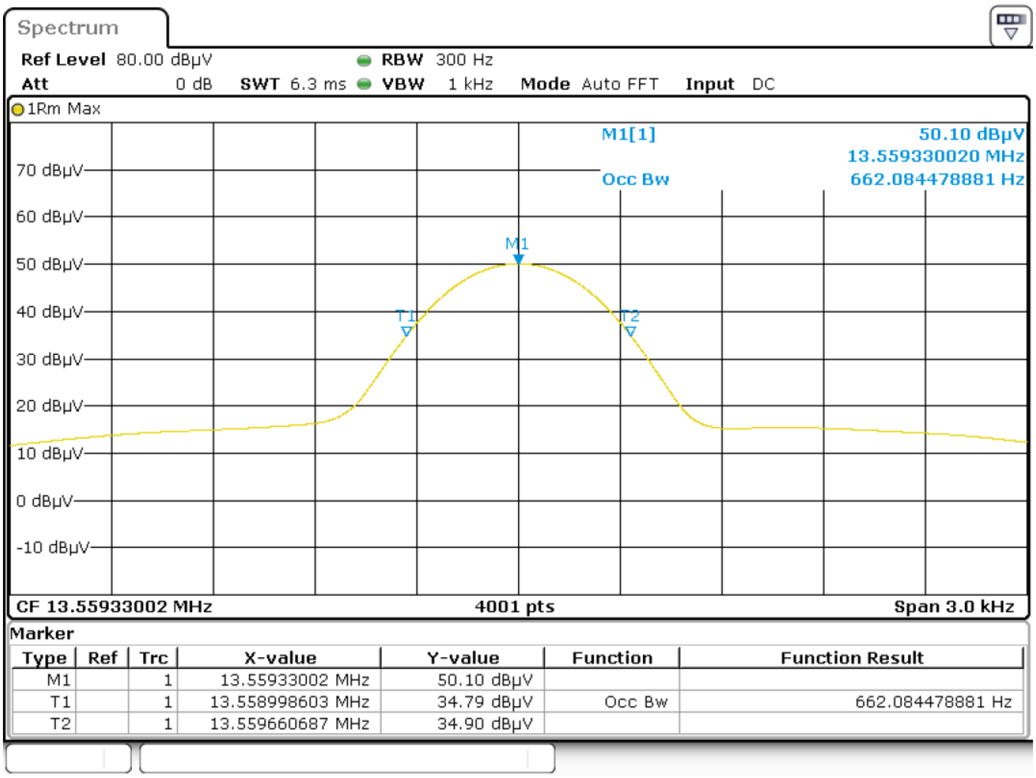
A.1 Permitted range of operating frequencies

Sample No.	S04	Temperature	23.4℃
Humidity	52%RH	Pressure	101kPa
Test Engineer	Xi Zifeng	Test Date	2024.05.01

Test Data

Test Method	Modulation	Test Conditions		operating frequencies (kHz)	limit
☒ Radiated ☐ Conducted	☒ ON ☐ OFF	NT	NV	13559.3300	13553 kHz to 13567 kHz
Test Result				Pass	

Test Plot



Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2023.09.05	2024.09.04	☒
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2024.01.23	2027.01.22	☒
Anechoic Chamber（10m）	EMC TECHNOLOGY LTD	20.1m*11.6m*7.35m	130	2021.08.15	2024.08.14	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

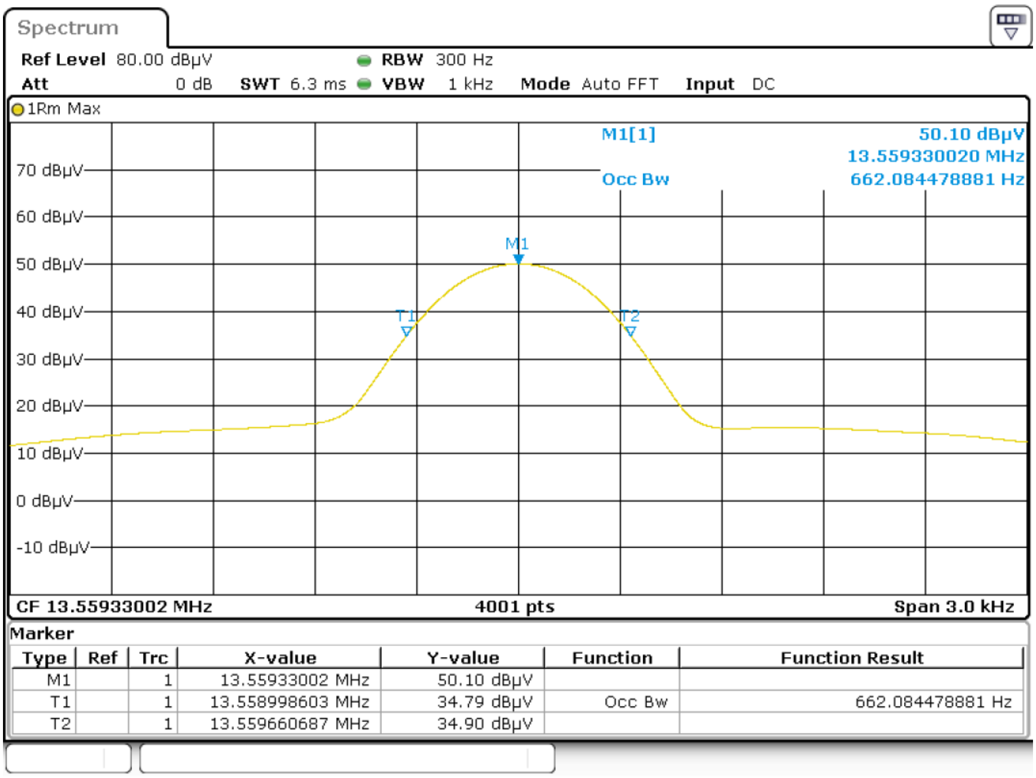
A.2 Operating frequency ranges

Sample No.	S04	Temperature	23.4℃
Humidity	52%RH	Pressure	101kPa
Test Engineer	Xi Zifeng	Test Date	2024.05.01

Test Data

Test Conditions		Frequency band			
		Measured (kHz)			Limit
		Low frequency	High frequency	Fc	
NT	NV	13558.99860	13559.66069	13559.32965	13553 kHz to 13567 kHz
Test Result		Pass			

Test Plot



Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2023.09.05	2024.09.04	☒
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2024.01.23	2027.01.22	☒
Anechoic Chamber（10m）	EMC TECHNOLOGY LTD	20.1m*11.6m*7.35m	130	2021.08.15	2024.08.14	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

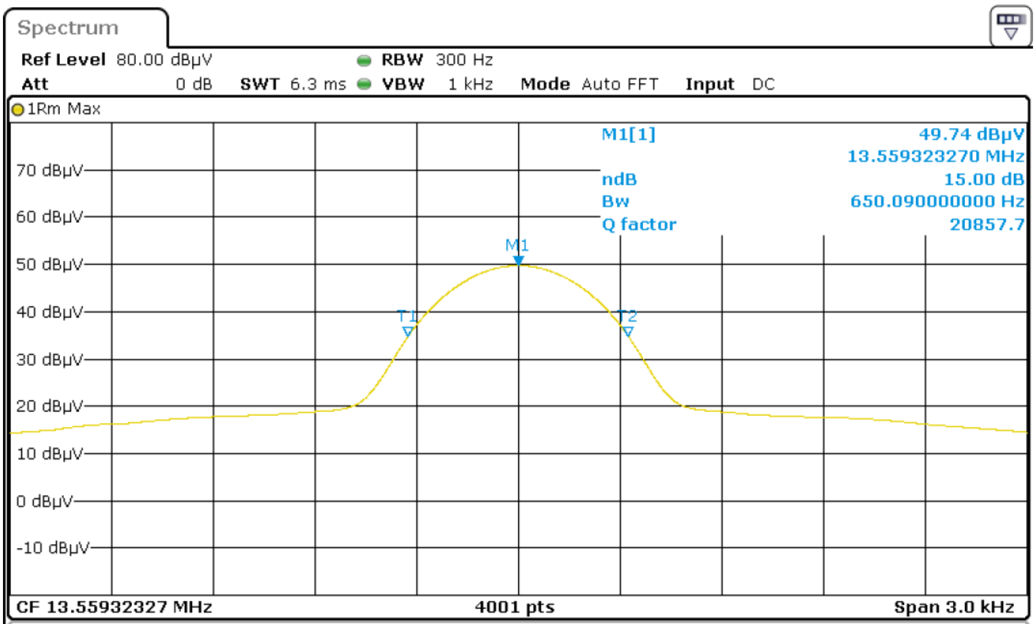
A.3 Modulation bandwidth

Sample No.	S04	Temperature	23.4℃
Humidity	52%RH	Pressure	101kPa
Test Engineer	Xi Zifeng	Test Date	2024.05.01

Test Data

Test Conditions		Frequency band		
		Measured (kHz)		Limit
		Low frequency	High frequency	
NT	NV	13558.99710	13559.64719	13553 kHz to 13567 kHz
Test Result		Pass		

Test Plot



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	13.55932327 MHz	49.74 dBµV	ndB down	650.09 Hz
T1		1	13.5589971 MHz	34.75 dBµV	ndB	15.00 dB
T2		1	13.55964719 MHz	34.76 dBµV	Q factor	20858

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2023.09.05	2024.09.04	☒
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2024.01.23	2027.01.22	☒
Anechoic Chamber（10m）	EMC TECHNOLOGY LTD	20.1m*11.6m*7.35m	130	2021.08.15	2024.08.14	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

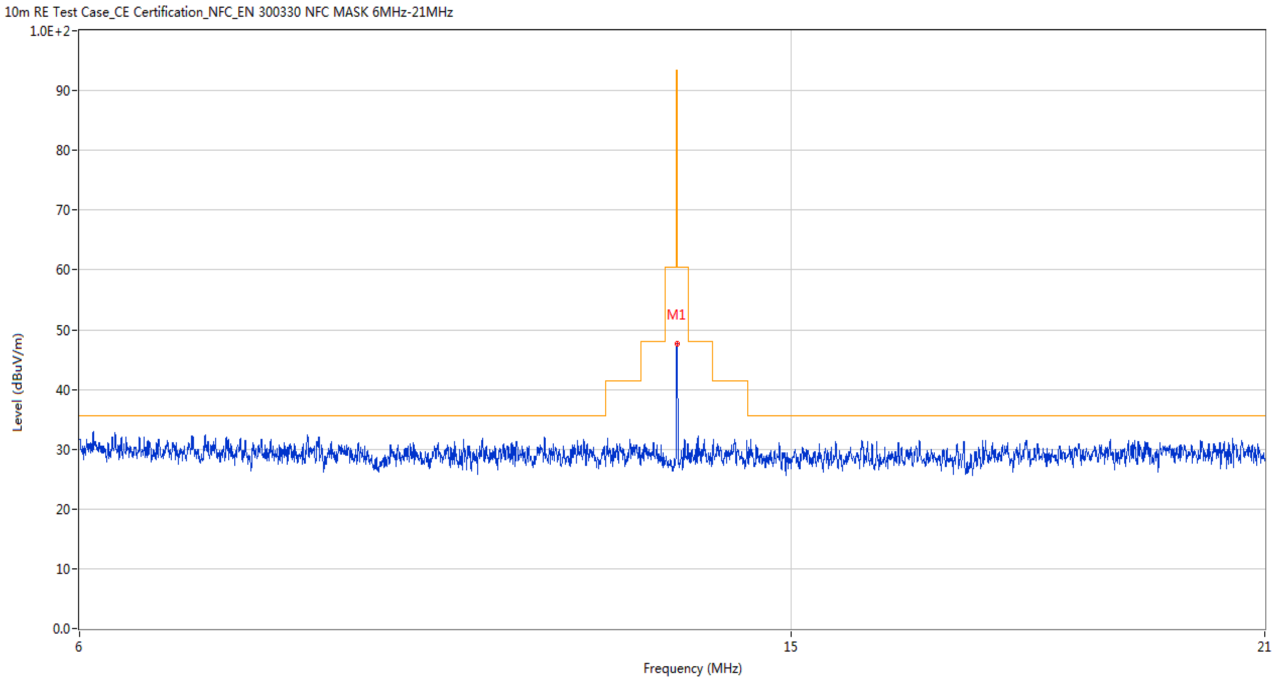
A.4 Transmitter radiated H-field

Sample No.	S04	Temperature	23.4℃
Humidity	52%RH	Pressure	101kPa
Test Engineer	Xi Zifeng	Test Date	2024.05.01

Test Data and Plot

Field Strength of Fundamental Emissions Value						
Frequency (MHz)	Field Strength @10m (dBμV/m)	Field Strength @10m (dBμA/m)	Limit @10m (dBμA/m)	Margin @10m (dB)	Antenna	Verdict
13.560	47.57	-3.93	42	45.93	Horizontal	Pass

OPERATING ANT-H



Note: For measuring equipment calibrated in dBμV/m, the reading should be reduced by 51.5 dB to be converted to dBμA/m.

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2023.09.05	2024.09.04	☒
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2024.01.23	2027.01.22	☒
Anechoic Chamber（10m）	EMC TECHNOLOGY LTD	20.1m*11.6m*7.35m	130	2021.08.15	2024.08.14	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

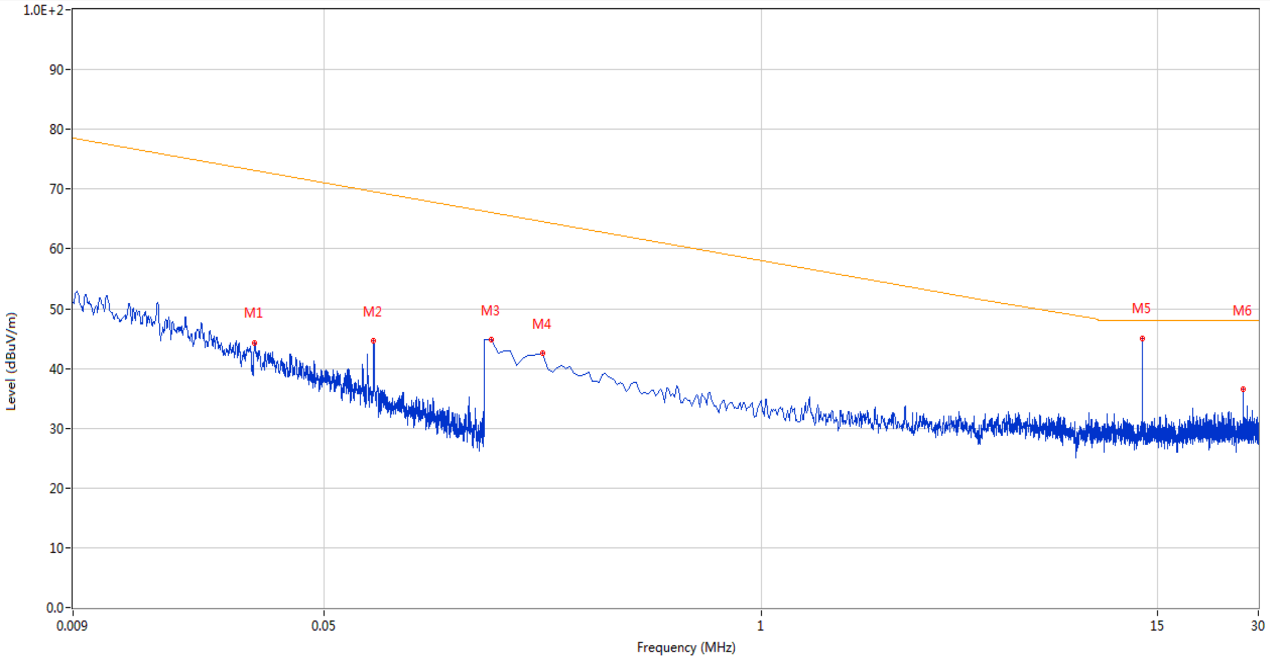
A.5 Transmitter radiated spurious domain emission limits < 30 MHz

Transmitters spurious emissions in the range from 9 kHz to 30 MHz

Sample No.	S04	Temperature	24.1℃
Humidity	63%RH	Pressure	101kPa
Test Engineer	Xi Zifeng	Test Date	2024.04.30

Test Data and Plot

OPERATING ANT-H

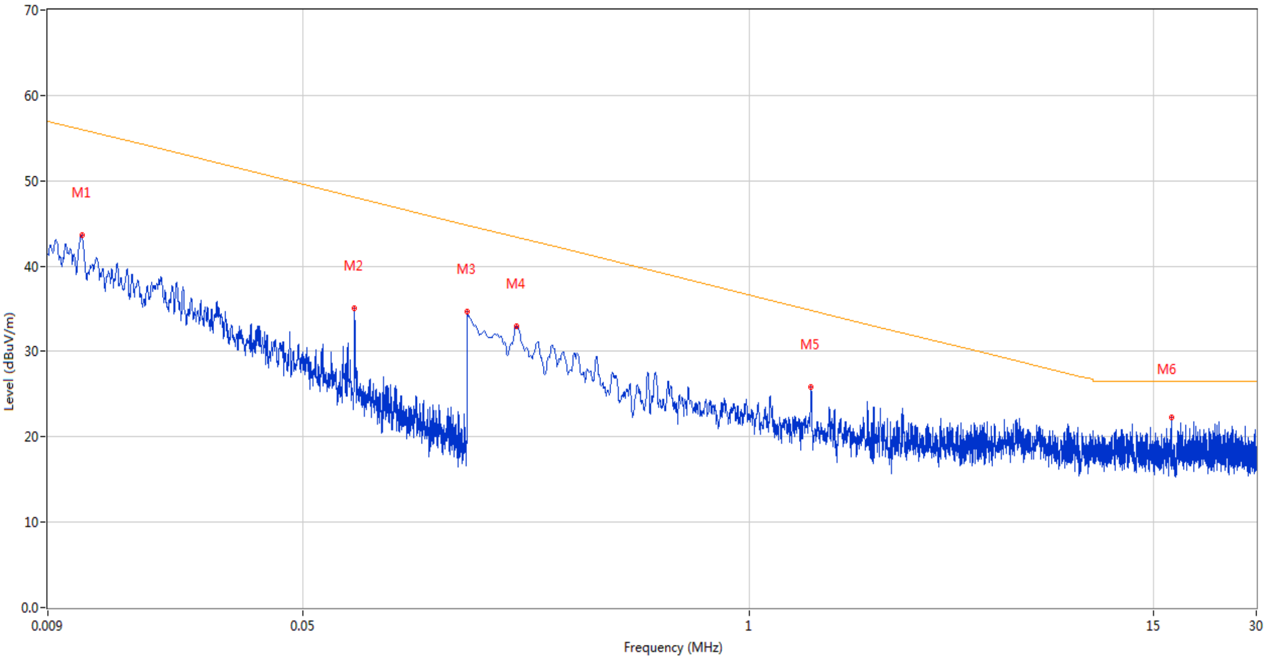


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.031	44.19	20.20	73.1	28.91	Peak	323.00	100	Horizontal	Pass
2	0.070	44.60	20.17	69.6	25.00	Peak	258.00	100	Horizontal	Pass
3	0.157	44.77	20.10	66.1	21.33	Peak	29.00	100	Horizontal	Pass
4	0.225	42.55	20.12	64.6	22.05	Peak	67.00	100	Horizontal	Pass
5	13.560	45.09	20.86	48.0	2.91	Peak	199.00	100	Horizontal	N/A
6	27.119	37.24	21.22	48.0	10.76	Peak	237.00	100	Horizontal	Pass

Note 1: This frequency which near 13.56 MHz with circle should be ignored because they are NFC carrier frequencies.

Note 2: For measuring equipment calibrated in dBμV, the reading should be reduced by 51.5 dB to be converted to dBμA/m.

STANDBY ANT-H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.011	43.63	10.55	56.0	12.37	Peak	307.00	100	Horizontal	Pass
2	0.071	35.11	10.55	48.1	12.99	Peak	177.00	100	Horizontal	Pass
3	0.150	19.27	10.36	44.8	25.53	Peak	129.00	100	Horizontal	Pass
4	0.209	32.92	10.26	43.4	10.48	Peak	351.00	100	Horizontal	Pass
5	1.510	25.82	10.00	34.8	8.98	Peak	129.00	100	Horizontal	Pass
6	16.944	22.30	10.16	26.5	4.20	Peak	236.00	100	Horizontal	Pass

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency 9kHz-30MHz						
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2023.09.05	2024.09.04	☒
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2024.01.23	2027.01.22	☒
Anechoic Chamber（10m）	EMC TECHNOLOGY LTD	20.1m*11.6m*7.35m	130	2021.08.15	2024.08.14	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

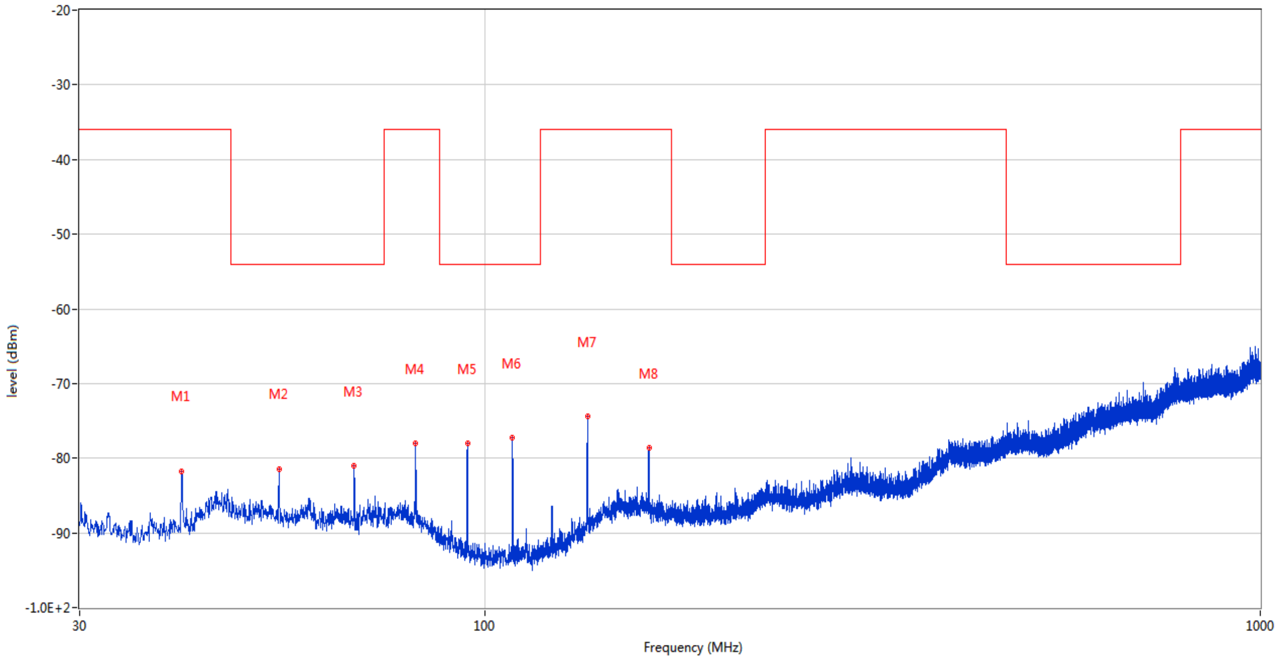
A.6 Transmitter radiated spurious domain emission limits > 30 MHz

Transmitter spurious emissions in the range from 30 MHz to 1 GHz

Sample No.	S04	Temperature	22.1℃
Humidity	59%RH	Pressure	101kPa
Test Engineer	Gong Baihua	Test Date	2024.04.28

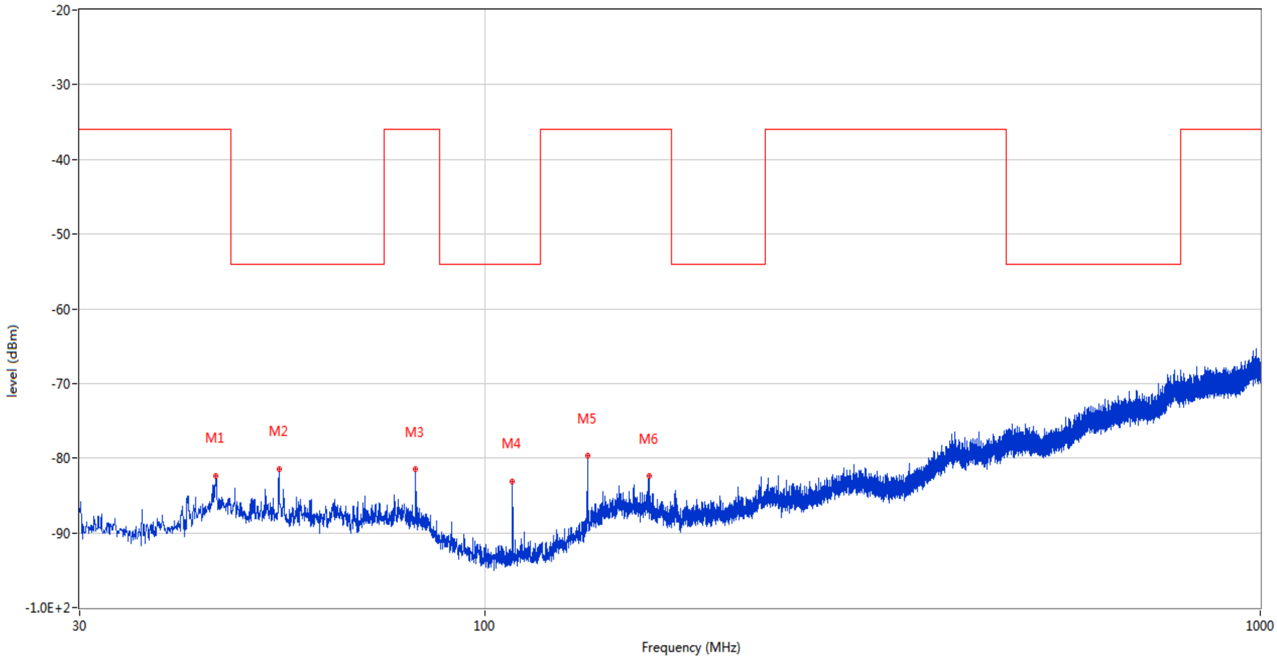
Test Data and Plots

OPERATING ANT-H



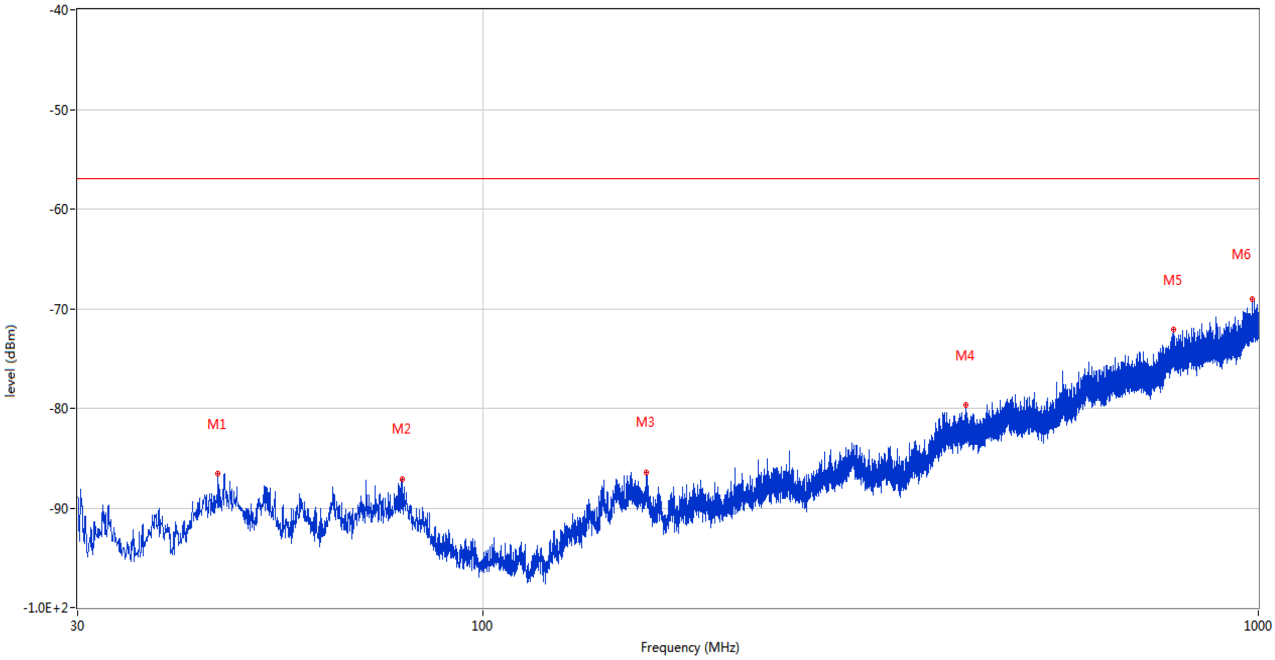
Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
40.621	-81.76	-17.59	-36.0	45.76	220.00	Horizontal	Horizontal	Pass
54.250	-81.51	-16.15	-54.0	27.51	305.00	Horizontal	Horizontal	Pass
67.782	-82.26	-16.76	-54.0	28.26	282.00	Horizontal	Horizontal	Pass
81.362	-78.07	-16.98	-36.0	42.07	220.00	Horizontal	Horizontal	Pass
94.941	-78.02	-21.62	-54.0	24.02	220.00	Horizontal	Horizontal	Pass
108.473	-77.27	-22.14	-54.0	23.27	220.00	Horizontal	Horizontal	Pass
135.584	-74.33	-17.90	-36.0	38.33	220.00	Horizontal	Horizontal	Pass
162.696	-78.64	-15.72	-36.0	42.64	62.00	Horizontal	Horizontal	Pass

OPERATING ANT-V



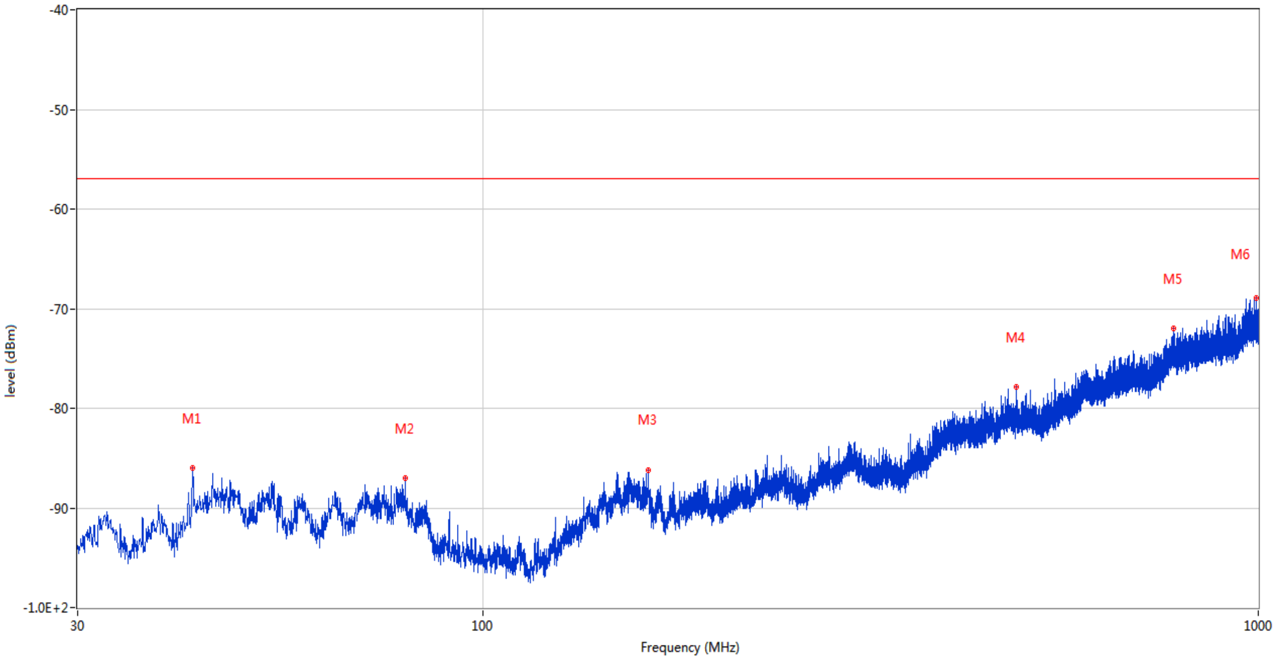
Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
44.986	-82.30	-14.79	-36.0	46.30	195.00	Vertical	Vertical	Pass
54.250	-81.42	-16.15	-54.0	27.42	260.00	Vertical	Vertical	Pass
81.362	-81.49	-16.98	-36.0	45.49	260.00	Vertical	Vertical	Pass
108.473	-83.06	-22.14	-54.0	29.06	342.00	Vertical	Vertical	Pass
135.584	-79.67	-17.90	-36.0	43.67	299.00	Vertical	Vertical	Pass
162.696	-82.39	-15.72	-36.0	46.39	16.00	Vertical	Vertical	Pass

STANDBY ANT-H



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
45.520	-86.55	-14.82	-57.0	29.55	360.00	Horizontal	Horizontal	Pass
78.597	-87.08	-16.46	-57.0	30.08	351.00	Horizontal	Horizontal	Pass
162.454	-86.41	-15.70	-57.0	29.41	28.00	Horizontal	Horizontal	Pass
419.018	-79.65	-8.89	-57.0	22.65	79.00	Horizontal	Horizontal	Pass
778.064	-72.04	-0.70	-57.0	15.04	246.00	Horizontal	Horizontal	Pass
981.327	-69.08	2.15	-57.0	12.08	98.00	Horizontal	Horizontal	Pass

STANDBY ANT-V



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
42.222	-85.98	-16.62	-57.0	28.98	0.00	Vertical	Horizontal	Pass
79.373	-86.99	-16.44	-57.0	29.99	117.00	Vertical	Horizontal	Pass
163.472	-86.17	-15.78	-57.0	29.17	257.00	Vertical	Horizontal	Pass
486.967	-77.84	-7.39	-57.0	20.84	197.00	Vertical	Horizontal	Pass
778.355	-72.03	-0.71	-57.0	15.03	324.00	Vertical	Horizontal	Pass
993.598	-68.98	2.17	-57.0	11.98	327.00	Vertical	Horizontal	Pass

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency 30MHz-1GHz						
EMI Receiver	Keysight	N9038A	MY55330120	2023.09.05	2024.09.04	☒
Amplifier (30MHz-1GHz)	COM-MV	ZT30-1000M	B2017119081	2023.12.05	2024.12.04	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-00867	2022.04.12	2025.04.11	☒
Anechoic Chamber（#2）	YiHeng	9m*6m*6m	142	2021.08.19	2024.08.18	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

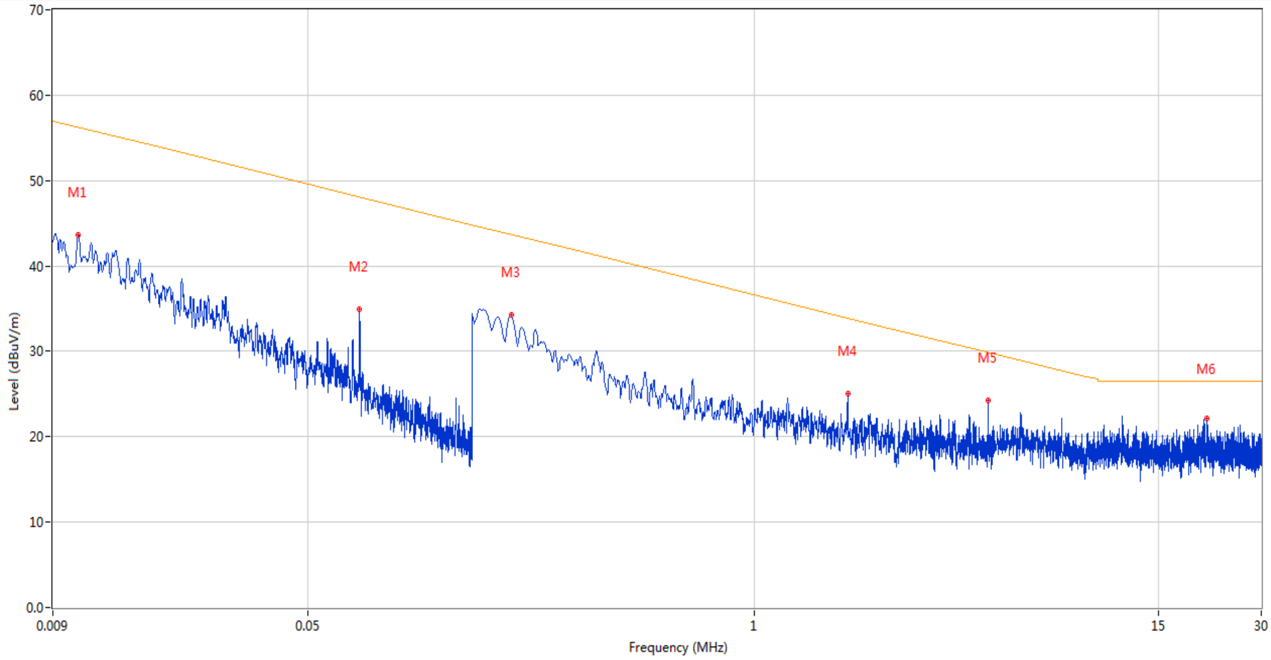
A.7 Receiver spurious emissions

Receiver spurious emissions in the range from 9 kHz to 30 MHz

Sample No.	S04	Temperature	24.1℃
Humidity	63%RH	Pressure	101kPa
Test Engineer	Xi Zifeng	Test Date	2024.04.30

Test Data and Plot

RX ANT-H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.011	43.60	10.54	56.3	12.70	Peak	156.00	100	Horizontal	Pass
2	0.071	34.91	10.55	48.1	13.19	Peak	286.00	100	Horizontal	Pass
3	0.195	34.30	10.27	43.7	9.40	Peak	279.00	100	Horizontal	Pass
4	1.871	24.99	10.00	33.9	8.91	Peak	144.00	100	Horizontal	Pass
5	4.801	24.24	10.00	29.8	5.56	Peak	318.00	100	Horizontal	Pass
6	20.794	22.20	10.18	26.5	4.30	Peak	104.00	100	Horizontal	Pass

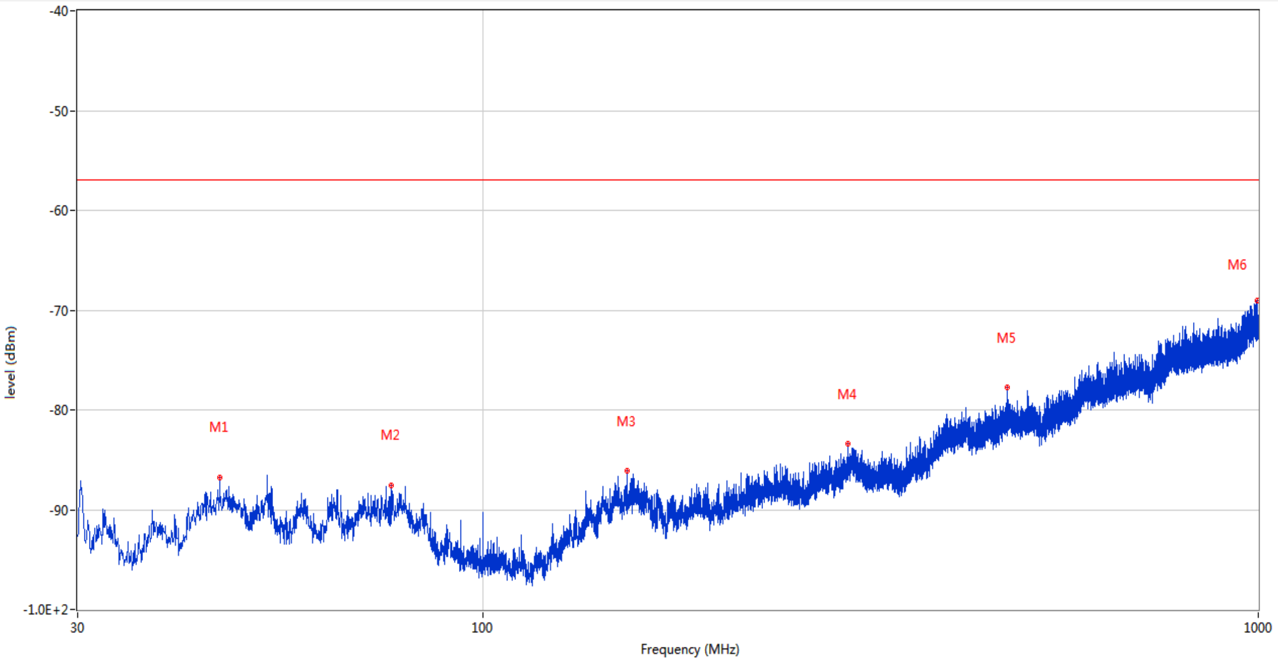
Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency 9kHz-30MHz						
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2023.09.05	2024.09.04	☒
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2024.01.23	2027.01.22	☒
Anechoic Chamber（10m）	EMC TECHNOLOGY LTD	20.1m*11.6m*7.35m	130	2021.08.15	2024.08.14	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

Receiver spurious emissions in the range from 30 MHz to 1 GHz

Sample No.	S04	Temperature	22.1℃
Humidity	59%RH	Pressure	101kPa
Test Engineer	Gong Baihua	Test Date	2024.04.28

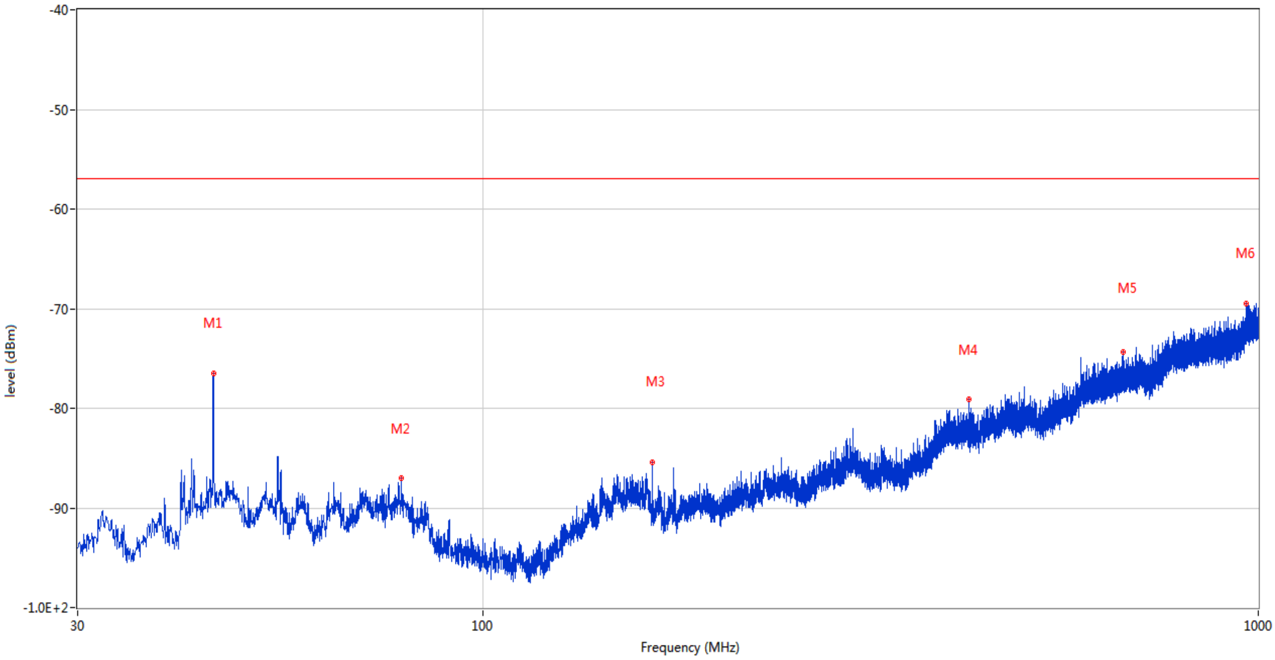
Test Data and Plots

RX ANT-H



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
45.763	-86.73	-14.84	-57.0	29.73	353.00	Horizontal	Horizontal	Pass
76.172	-87.52	-16.50	-57.0	30.52	193.00	Horizontal	Horizontal	Pass
153.335	-86.13	-15.33	-57.0	29.13	88.00	Horizontal	Horizontal	Pass
295.877	-83.43	-12.15	-57.0	26.43	157.00	Horizontal	Horizontal	Pass
474.211	-77.79	-7.40	-57.0	20.79	333.00	Horizontal	Horizontal	Pass
997.526	-69.03	2.11	-57.0	12.03	200.00	Horizontal	Horizontal	Pass

RX ANT-V



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
44.889	-76.46	-14.87	-57.0	19.46	41.00	Vertical	Horizontal	Pass
78.500	-87.02	-16.46	-57.0	30.02	134.00	Vertical	Horizontal	Pass
165.218	-85.39	-15.91	-57.0	28.39	113.00	Vertical	Horizontal	Pass
423.481	-79.14	-8.94	-57.0	22.14	118.00	Vertical	Horizontal	Pass
668.696	-74.34	-3.28	-57.0	17.34	149.00	Vertical	Horizontal	Pass
964.692	-69.49	1.81	-57.0	12.49	259.00	Vertical	Horizontal	Pass

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency 30MHz-1GHz						
EMI Receiver	Keysight	N9038A	MY55330120	2023.09.05	2024.09.04	☒
Amplifier (30MHz-1GHz)	COM-MV	ZT30-1000M	B2017119081	2023.12.05	2024.12.04	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-00867	2022.04.12	2025.04.11	☒
Anechoic Chamber（#2）	YiHeng	9m*6m*6m	142	2021.08.19	2024.08.18	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2440809-AE-3.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2440809-AW-1.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2440809-AI-1.PDF”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
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4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the “inspection and testing dedicated stamp” or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--

TEST REPORT

Applicant:	Woan Technology (Shenzhen) Co., Ltd.
Address:	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100
Equipment Type:	SwitchBot Wallet Finder Card
Model Name:	W2500032 (refer to section 2.3)
Brand Name:	SwitchBot
Test Standard:	ETSI EN 300 328 V2.2.2 (2019-07)
Sample Arrival Date:	Apr. 16, 2024
Test Date:	Apr. 18, 2024 - Apr. 26, 2024
Date of Issue:	May 24, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

CERTIFICATION CONSULTING • SOLUTION • SERVICE BALUN

Tested by: Julie Zhu

Julie Zhu

Checked by: Ye Hongji

Approved by: Liao Jianming

(Technical Director)

Revision History

Version	Issue Date	Revisions
Rev. 01	May 24, 2024	Initial Issue

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100

2.2 Manufacturer Information

Manufacturer	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100

2.3 General Description for Equipment under Test (EUT)

EUT Name	SwitchBot Wallet Finder Card
Model Name Under Test	W2500032
Series Model Name	W2500031, W2500033, W2500034, W2500035
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name and combinations. (this information provided by the applicant)
Hardware Version	V02
Software Version	V01
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

EUT Type	Stand-alone equipment
Network and Wireless connectivity	Bluetooth (BLE), NFC

The requirement for the following tech/nical information of the EUT was tested in this report:

Modulation Technology	Bluetooth Low Energy: Wide band modulations other than FHSS
Modulation Type	Bluetooth Low Energy: GFSK
Transfer Rate	BLE: 1 Mbps BLE: 2 Mbps
Frequency Range	The frequency range used is 2402 MHz – 2480 MHz; The frequency block is 2400 MHz to 2483.5 MHz.
Number of channel	Bluetooth Low Energy: 40 (at intervals of 2 MHz) Note 1
Tested Channel	Bluetooth Low Energy: 1 Mbps: 0 (2402 MHz), 19 (2440 MHz), 39 (2480 MHz) 2 Mbps: 1 (2404 MHz), 19 (2440 MHz), 38 (2478 MHz)
Nominal Channel Bandwidth	1 MHz, 2 MHz
Antenna Type	PCB Antenna
Antenna Gain	0.23 dBi (In test items related to antenna gain, the final results reflect this figure. This value is provided by the applicant.)
Beamforming Gain	N/A
Adaptive or Non-Adaptive	Adaptive
LBT Based	Non-LBT
The Max RF Output power	Bluetooth Low Energy: 3.7 dBm
Receiver Category	Bluetooth Low Energy: 2
Note 1: 2 Mbps does not support Channel 0, Channel 12, and Channel 39.	

Description	Modulation Type (BLE)	Transfer Rate (BLE)
Transmitter Parameters		
RF output power	GFSK	1 Mbps, 2 Mbps
Power Spectral Density	GFSK	1 Mbps, 2 Mbps
Duty Cycle, Tx-sequence, Tx-gap	N/A	N/A
Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	N/A	N/A
Hopping Frequency Separation	N/A	N/A
Medium Utilization (MU) factor	N/A	N/A
Adaptivity	--	N/A
Occupied Channel Bandwidth	GFSK	1 Mbps, 2 Mbps
Transmitter unwanted emissions in the out-of-band domain	GFSK	1 Mbps, 2 Mbps
Transmitter unwanted emissions in the spurious domain	GFSK	1 Mbps, 2 Mbps
Receiver Parameters		
Receiver spurious emissions	GFSK	1 Mbps, 2 Mbps
Receiver Blocking	GFSK	1 Mbps
Other Parameters		
Geo-location capability	N/A	N/A

3 SUMMARY OF TEST RESULTS

The EUT has been tested according to ETSI EN 300 328 V2.2.2 (2019-07).

No.	Identity	Document Title
1	ETSI EN 300 328 V2.2.2 (2019-07)	Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

Test items and the results are as follows:

Report Section	Standard Rule	Description	Channel (BLE)	Test Result	Verdict	Remark
Transmitter Parameters						
5.1.1	4.3.1.2 4.3.2.2	RF output power	Low/Middle/High	ANNEX A.1	Pass	--
5.1.2	4.3.2.3	Power Spectral Density	Low/Middle/High	ANNEX A.2	Pass	Note [4]
5.1.3	4.3.1.3 4.3.2.4	Duty Cycle, Tx-sequence, Tx-gap	N/A	ANNEX A.3	N/A	Note [2], Note [7]
5.1.4	4.3.1.4	Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	N/A	ANNEX A.4	N/A	Note [5]
5.1.5	4.3.1.5	Hopping Frequency Separation	N/A	ANNEX A.5	N/A	Note [5]
5.1.6	4.3.1.6 4.3.2.5	Medium Utilization (MU) factor	N/A	ANNEX A.6	N/A	Note [2], Note [7]
5.1.7	4.3.1.7 4.3.2.6	Adaptivity	N/A	ANNEX A.7	N/A	Note [2], Note [3]
5.1.8	4.3.1.8 4.3.2.7	Occupied Channel Bandwidth	Low/High	ANNEX A.8	Pass	--
5.1.9	4.3.1.9 4.3.2.8	Transmitter unwanted emissions in the out-of-band domain	Low/High	ANNEX A.9	Pass	--
5.1.10	4.3.1.10 4.3.2.9	Transmitter unwanted emissions in the spurious domain	Low/High	ANNEX A.10	Pass	--
Receiver Parameters						
5.2.1	4.2.3.2	Receiver categories	--	--	--	--
5.2.2	4.3.1.11 4.3.2.10	Receiver spurious emissions	Low/High	ANNEX A.11	Pass	--
5.2.3	4.3.1.12 4.3.2.11	Receiver Blocking	Low/High	ANNEX A.12	Pass	--
Other Parameters						

5.3.1	4.3.1.13 4.3.2.12	Geo-location capability	N/A	N/A	N/A	Note [6]

Note [1]: This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.
Note [2]: This test doesn't apply for the EUT which has the RF Output power is less than 10 dBm e.i.r.p.
Note [3]: This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode.
Note [4]: This requirement apply to the equipment is using wide band modulations other than FHSS.
Note [5]: This requirement apply to the equipment is using FHSS.
Note [6]: This requirement does not apply to devices that do not support Geo-location capability.
Note [7]: These requirements apply to non-adaptive frequency hopping equipment or to adaptive frequency hopping equipment operating in a non-adaptive mode.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	58% to 68%	
Atmospheric Pressure	98 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+21.9℃ to +23.1℃
	LT (Low Temperature)	-10.0℃
	HT (High Temperature)	+45.0℃
Working Voltage of the EUT	NV (Normal Voltage)	3.0 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101544	2023.12.27	2024.12.26
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	260592	2023.12.27	2024.12.26
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2023.05.16	2024.05.15
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2023.05.16	2024.05.15
Signaling Unit	ROHDE&SCHWARZ	CMW270	100607	2023.05.16	2024.05.15
Temperature Chamber	AHK	NTH64-40A	1310	2023.12.05	2024.12.04
Spectrum Analyzer	KEYSIGHT	N9020A	MY50531259	2023.09.05	2024.09.04
Signaling Unit	ROHDE&SCHWARZ	CMW500	171150	2023.06.19	2024.06.18
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	01415	2024.01.19	2025.01.18
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	02460	2021.05.20	2024.05.19
Anechoic Chamber	RAINFORD	9m*6m*6m	140	2022.02.19	2024.08.15
Amplifier	COM-MV	ZT30-1000M	07210897	2023.09.05	2024.09.04
Amplifier	COM-MV	LSCX_LNA1-12G-01	7210214	2023.09.05	2024.09.04
Amplifier	COM-MV	XKu_LNA7-18G-01	7210209	2023.09.05	2024.09.04

4.3 Test Software List

Description	Manufacturer	Software Version	Serial No.
TS8997 EMC32	ROHDE&SCHWARZ	V10.01.00	N/A
BL410E	BALUN	V22.930	N/A

4.4 Measurement Uncertainty

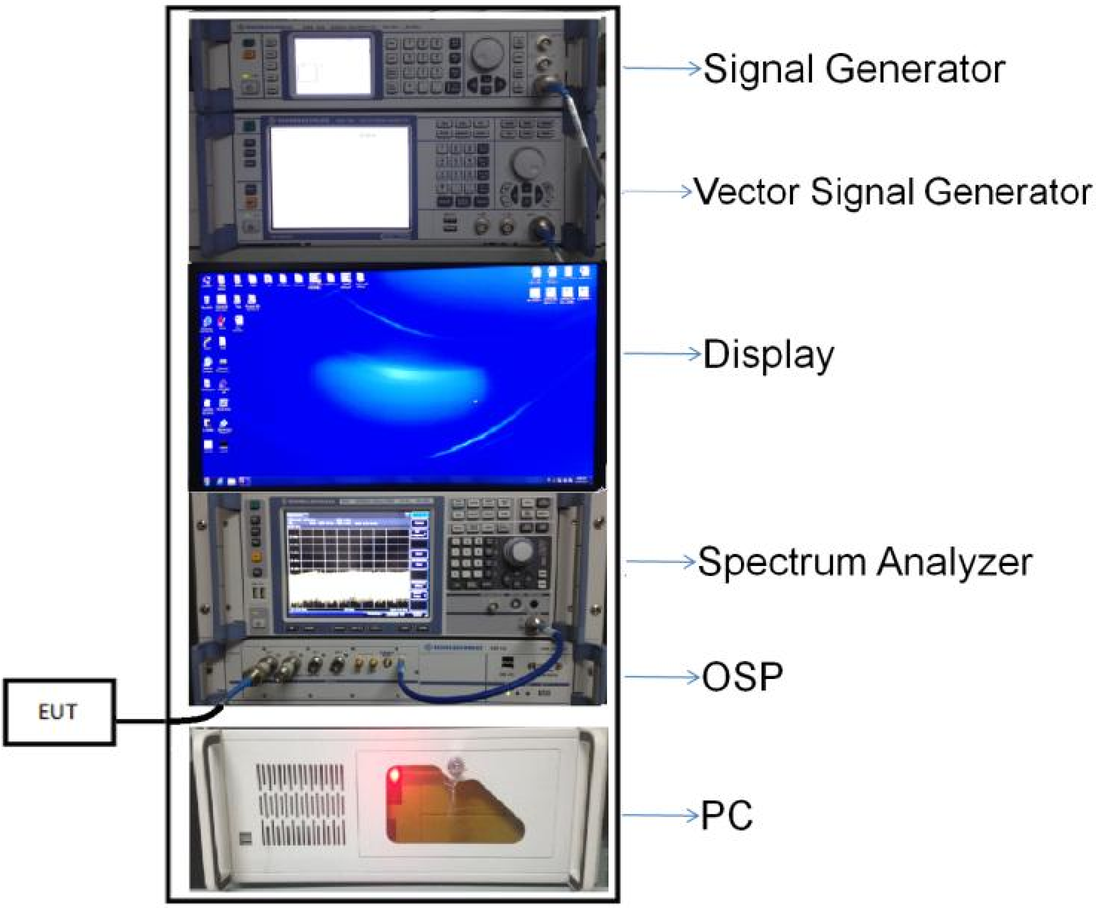
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

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

Parameters	Uncertainty
Occupied Channel Bandwidth	3.6 %
RF output power, conducted	0.66 dB
Power Spectral Density, conducted	0.90 dB
Unwanted Emissions, conducted	1.78 dB
All emissions, radiated	5.36 dB
Temperature	0.8 °C
Humidity	4 %

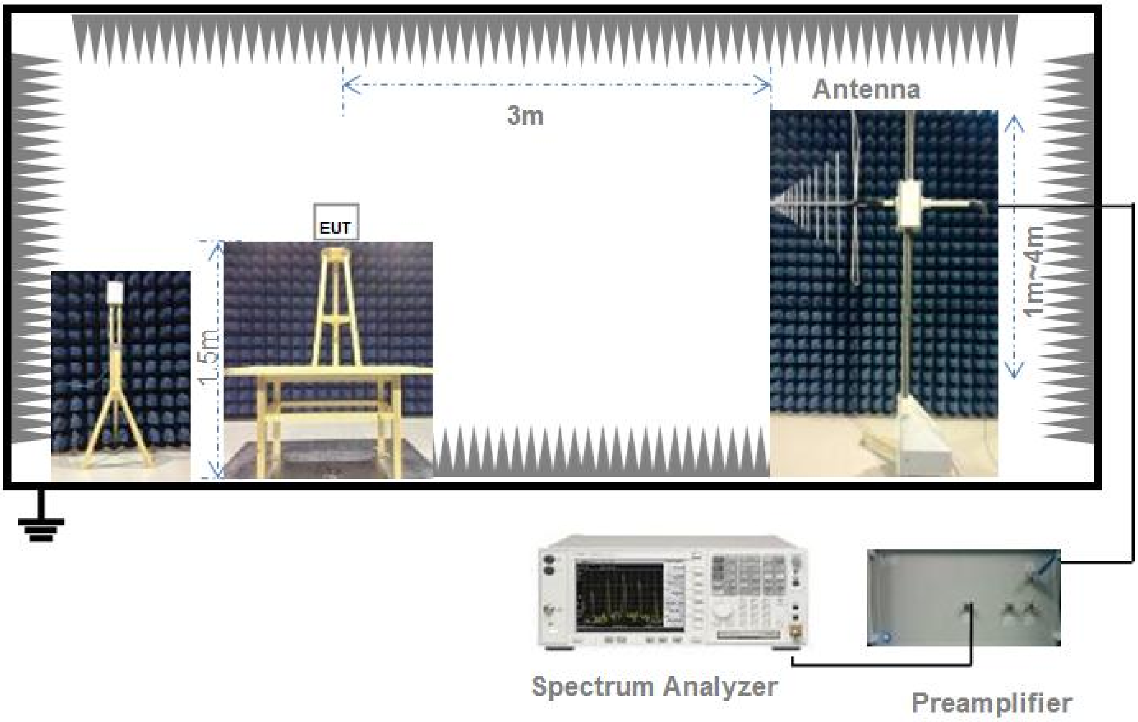
4.5 Description of Test Setup

4.5.1 For Conducted Test

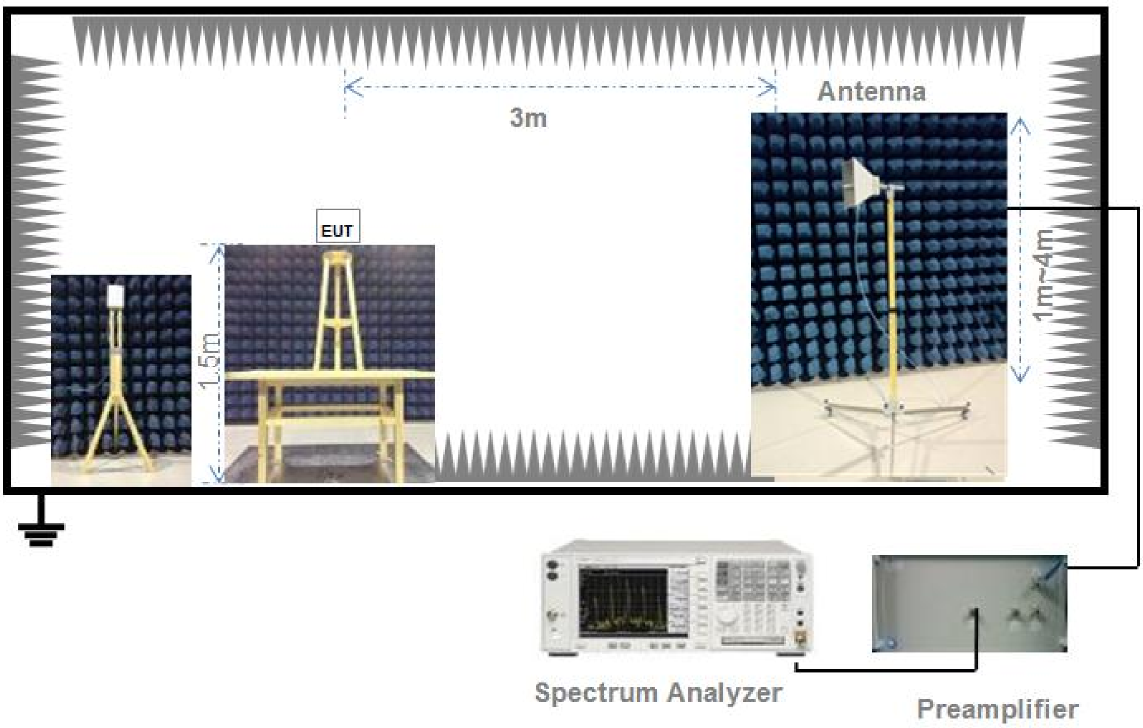


(Diagram 1)

4.5.2 For Radiated Test

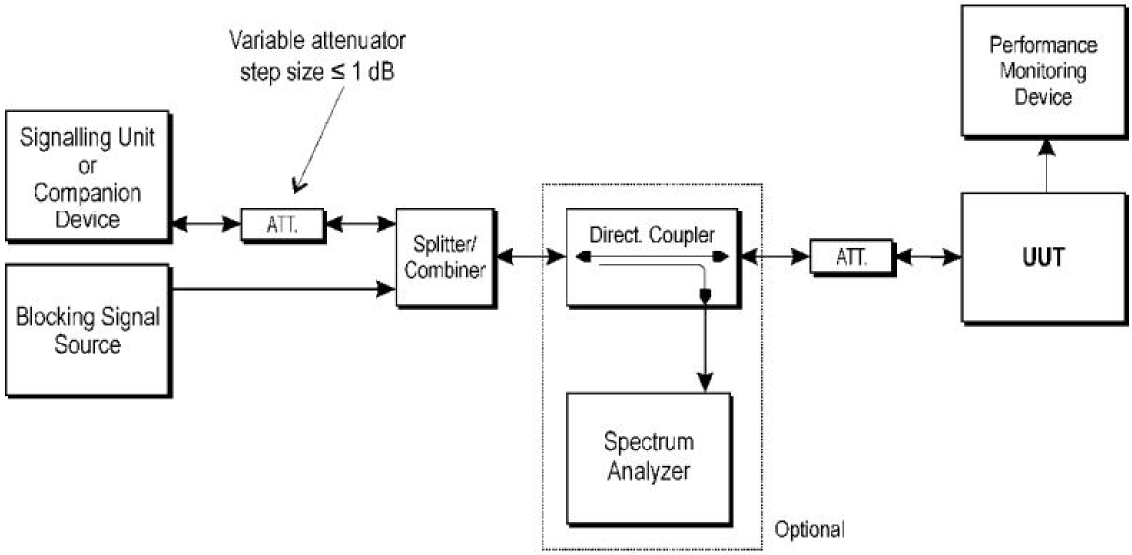


(Diagram 2)



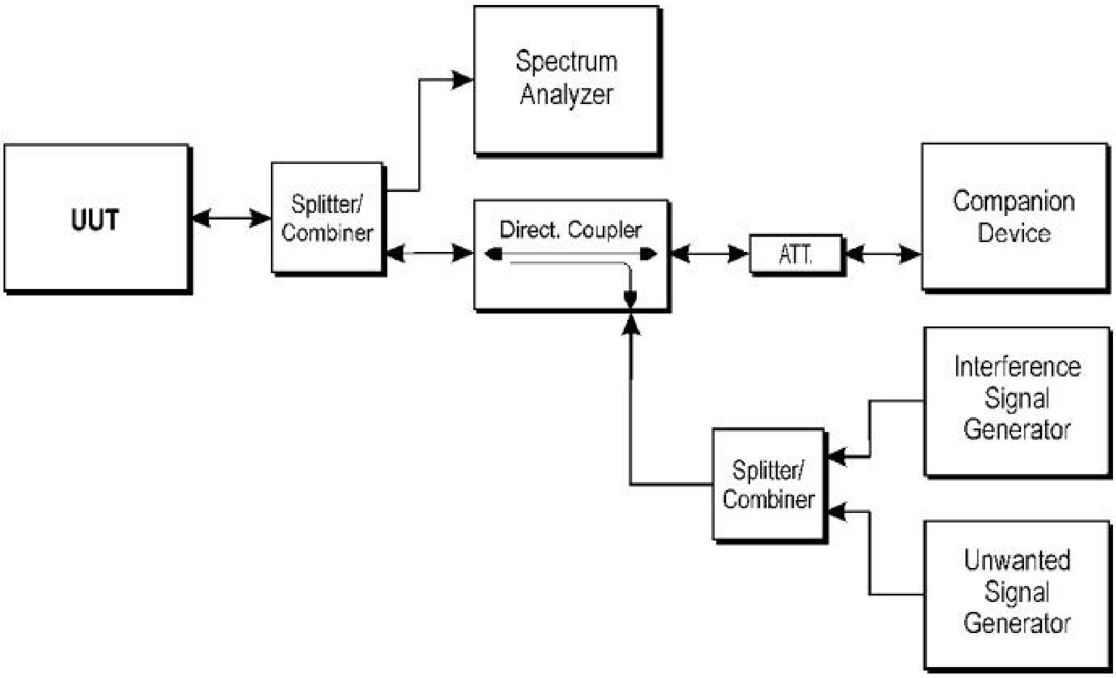
(Diagram 3)

4.5.3 For Receiver Blocking Test



(Diagram 4)

4.5.4 For Adaptivity Test



(Diagram 5)

5 Test Type and Test Results

5.1 Transmitter Parameters

5.1.1 RF output power

5.1.1.1 Limit

The maximum RF output power shall be equal to or less than 20 dBm.

5.1.1.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

5.1.1.4 Test Result

Please refer to ANNEX A.1.

5.1.2 Power Spectral Density

5.1.2.1 Limit

The maximum Power Spectral Density for non-FHSS equipment is 10 dBm per MHz.

5.1.2.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.3.2.

5.1.2.4 Test Result

Please refer to ANNEX A.2.

5.1.3 Duty Cycle, Tx-sequence, Tx-gap

5.1.3.1 Limit

The Duty Cycle shall be equal to or less than the maximum value declared by the manufacturer.

The Tx-sequence time shall be equal to or less than 10 ms.

The minimum Tx-gap time following a Tx-sequence shall be equal to the duration of that proceeding Tx-sequence with a minimum of 3,5 ms.

5.1.3.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

5.1.4 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

5.1.4.1 Limit

The Accumulated Transmit Time on any hopping frequency shall not be greater than 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used.

The hopping sequence(s) shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:

Option 1: Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.

Option 2: The occupation probability for each frequency shall be between ((1 / U) × 25 %) and 77 % where U is the number of hopping frequencies in use.

5.1.4.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.4.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.4.2.

5.1.4.4 Test Result

Please refer to ANNEX A.4.

5.1.5 Hopping Frequency Separation

5.1.5.1 Limit

For adaptive frequency hopping systems, the minimum Hopping Frequency Separation shall be 100 kHz.

5.1.5.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.5.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.5.2.

5.1.5.4 Test Result

Please refer to ANNEX A.5.

5.1.6 Medium Utilization (MU) factor

5.1.6.1 Limit

The maximum Medium Utilization factor for non-adaptive equipment shall be 10 %.

5.1.6.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.6.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

5.1.6.4 Test Result

Please refer to ANNEX A.6.

5.1.7 Adaptivity

5.1.7.1 Limit

Adaptive Frequency Hopping

Requirement	Operational Mode	
	Non-LBT based Detect and Avoid	LBT based Detect and Avoid
Minimum Clear Channel Assessment (CCA) Time	NA	18 us (see note 1)
Maximum Channel Occupancy (COT) Time	40 ms	60 ms
Minimum Idle Period	5% of COT	5% of COT
Extended CCA check	NA	NA
Short Control Signalling Transmissions	Maximum duty cycle of 10 % within an observation period of 50 ms (see note 2)	
NOTE 1: The CCA time used by the equipment shall be declared by the supplier. NOTE 2: Adaptive equipment may or may not have Short Control Signalling Transmissions. NOTE 3: The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3, step 1 and step 2. NOTE 4: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.		

Interference threshold level:

Maximum transmit power (P_H) EIRP dBm	Threshold level (TL) (see notes 1 and 2)
20	-70 dBm / MHz
NOTE 1: TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.). NOTE 2: Transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna).	

Unwanted Signal parameters

Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483.5 MHz. See clause 5.4.6.1. NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz. NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

Adaptive equipment using modulations other than FHSS

<table>
<tr><th rowspan="3">Requirement</th><th colspan="4">Operational Mode</th></tr>
<tr><th rowspan="2">Non-LBT based Detect and Avoid</th><th colspan="3">LBT based Detect and Avoid</th></tr>
<tr><th>Frame Based Equipment</th><th>Load Based Equipment (CCA using 'energy detect')</th><th>Load Based Equipment (CCA not using any of the mechanisms referenced as note 2)</th></tr>
<tr><td>Minimum Clear Channel Assessment (CCA) Time</td><td>NA</td><td>18 us (see note 1)</td><td>(see note 2)</td><td>18 us (see note 1)</td></tr>
<tr><td>Maximum Channel Occupancy (COT) Time</td><td>40 ms</td><td>1 ms to 10 ms</td><td>(see note 2)</td><td>13 ms</td></tr>
<tr><td>Minimum Idle Period</td><td>5% of COT</td><td>5% of COT</td><td>(see note 2)</td><td>NA</td></tr>
<tr><td>Extended CCA check</td><td>NA</td><td>NA</td><td>(see note 2)</td><td>a random duration in the range between 18 μs and at least 160 μs</td></tr>
<tr><td>Short Control Signalling Transmissions</td><td colspan="4">Maximum duty cycle of 10 % within an observation period of 50 ms (see note 3)</td></tr>
<tr><td colspan="5">NOTE 1: The CCA time used by the equipment shall be declared by the supplier.
NOTE 2: Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect, as described in IEEE 802.11™-2012 [i.3] clause 9, clause 10, clause 16, clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8.
NOTE 3: Adaptive equipment may or may not have Short Control Signalling Transmissions.
NOTE 4: The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3, step 1 and step 2.
NOTE 5: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.</td></tr>
</table>

Interference threshold level:

<table>
<tr><th>Maximum transmit power (P_H)
EIRP dBm</th><th>Threshold level (TL)
(see notes 1 and 2)</th></tr>
<tr><td>20</td><td>-70 dBm / MHz</td></tr>
<tr><td colspan="2">NOTE 1: TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.).
NOTE 2: transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna).</td></tr>
</table>

Unwanted Signal parameters

Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483.5 MHz. See clause 5.4.6.1. NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz. NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

5.1.7.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.7.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.6.2.

5.1.7.4 Test Result

Please refer to ANNEX A.7.

5.1.8 Occupied Channel Bandwidth

5.1.8.1 Limit

The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band 2400 MHz to 2483.5 MHz.

In addition, for non-adaptive FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth for every occupied hopping frequency shall be equal to or less than 5 MHz.

In addition, for non-adaptive non-FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth shall be equal to or less than 20 MHz.

5.1.8.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.8.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.7.2.

5.1.8.4 Test Result

Please refer to ANNEX A.8.

5.1.9 Transmitter unwanted emissions in the out-of-band domain

5.1.9.1 Limit

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 1.

Note: Within the 2400 M Hz to 2483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.1.8.

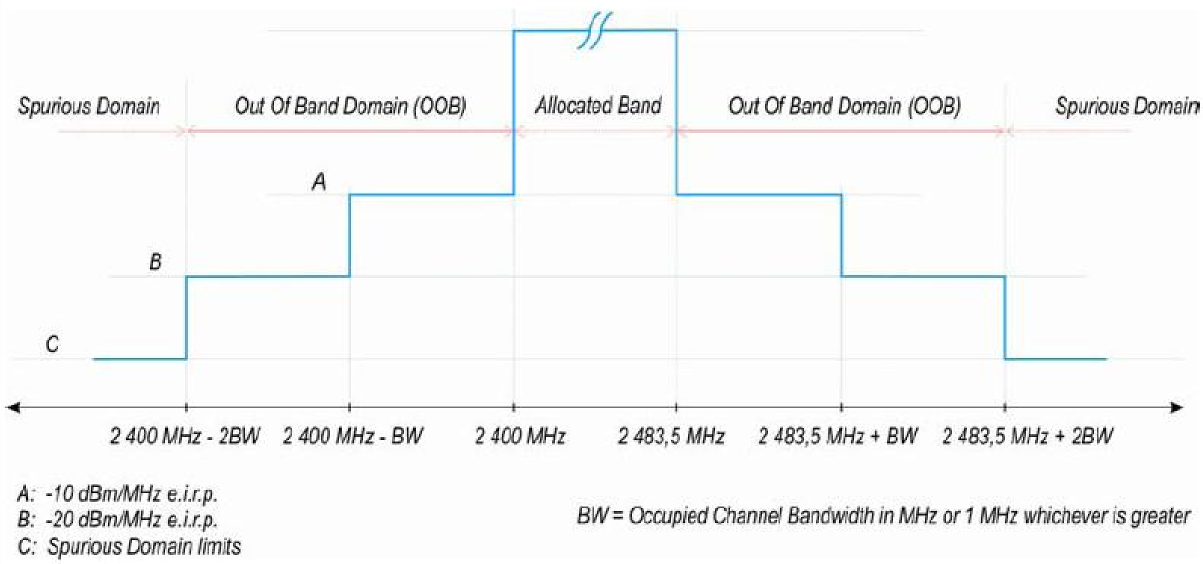


Figure 1: Transmit mask

5.1.9.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.9.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.8.2.

5.1.9.4 Test Result

Please refer to ANNEX A.9.

5.1.10 Transmitter unwanted emissions in the spurious domain

5.1.10.1 Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values in following tables:

Frequency range	Maximum power (dBm)	Bandwidth
30 MHz to 47 MHz	-36	100 kHz
47 MHz to 74 MHz	-54	100 kHz
74 MHz to 87.5 MHz	-36	100 kHz
87.5 MHz to 118 MHz	-54	100 kHz
118 MHz to 174 MHz	-36	100 kHz
174 MHz to 230 MHz	-54	100 kHz
230 MHz to 470 MHz	-36	100 kHz
470 MHz to 694 MHz	-54	100 kHz
694 MHz to 1 GHz	-36	100 kHz
1 GHz to 12.75 GHz	-30	1 MHz

5.1.10.2 Test Setup

The section 4.5.1 and 4.5.2 (Diagram 1, 2, 3) for test setup description. The photo of test setup please refer to ANNEX B.

5.1.10.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.9.2.

5.1.10.4 Test Result

Please refer to ANNEX A.10.

5.2 Receiver Parameters

5.2.1 Receiver categories

There have three different receiver categories for which different receiver requirements and/or corresponding limits apply.

Receiver Category

Receiver Category	Definition
Category 1	Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p.
Category 2	Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment and non-adaptive with a maximum RF output power of 10 dBm e.i.r.p.
Category 3	Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment and non-adaptive with a maximum RF output power of 0 dBm e.i.r.p.

5.2.2 Receiver Spurious Emissions

5.2.2.1 Limit

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode.

The spurious emissions of the transmitter shall not exceed the values in following tables for the EUT in this report.

Frequency range	Maximum power (dBm)	Bandwidth
30 MHz to 1 GHz	-57	100 KHz
1 GHz to 12.75 GHz	-47	1 MHz

5.2.2.2 Test Setup

The section 4.5.1 (Diagram 1) for test setup description. The photo of test setup please refer to ANNEX B.

5.2.2.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.10.2.

5.2.2.4 Test Result

Please refer to ANNEX A.11.

5.2.3 Receiver Blocking

5.2.3.1 Limit

While maintaining the minimum performance criteria as defined in clause 4.3.1.12.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in next table.

Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency(MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380	-34	CW
	2 504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300	-34	CW
	2 330	-34	CW
	2 360	-34	CW
	2 524	-34	CW
	2 584	-34	CW
	2 674	-34	CW

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. P_{min} is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 20 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Receiver Category 2 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380	-34	CW
	2 504	-34	CW
	2 300	-34	CW
	2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Receiver Category 3 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency(MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380	-34	CW
	2 504	-34	CW
	2 300	-34	CW
	2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 30 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Categorization

Receiver category	Definition
1	Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment.
2	Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment.
3	Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment.

5.2.3.2 Test Setup

See the section 4.5.3 (Diagram 4) for test setup description. The photo of test setup please refer to ANNEX B.

5.2.3.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.11.2.

5.2.3.4 Test Result

Please refer to ANNEX A.12.

5.3 Other Parameters

5.3.1 Geo-location capability

5.3.1.1 Requirements

The geographical location determined by the equipment as defined in following section (5.3.1.2) shall not be accessible to the user.

5.3.1.2 Definition

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

5.3.1.3 Test Result

Note: Not applicable.

ANNEX A TEST RESULT

A.1 RF output power

Test Data

Modulation Mode			GFSK (BLE 1Mbps)		
Limit			20 dBm		
Test Result					
Test Method	Test Conditions		Transmitter Power Level (dBm)		
☐ Radiated ☒ Conducted	Voltage	Temperature	Low Channel	Middle Channel	High Channel
			EIRP	EIRP	EIRP
	NV	NT	3.7	3.4	3.1
		LT	3.4	3.0	2.9
		HT	3.7	3.0	2.9
Test Verdict			Pass		

Modulation Mode			GFSK (BLE 2Mbps)		
Limit			20 dBm		
Test Result					
Test Method	Test Conditions		Transmitter Power Level (dBm)		
☐ Radiated ☒ Conducted	Voltage	Temperature	Low Channel	Middle Channel	High Channel
			EIRP	EIRP	EIRP
	NV	NT	3.7	3.5	3.2
		LT	3.4	3.4	3.3
		HT	3.6	3.5	2.8
Test Verdict			Pass		

Bursts Power List

GFSK (BLE 1Mbps): Low Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
3.7	0.000	0.419	0.419	0.206
3.7	0.625	1.044	0.419	0.206
3.7	1.250	1.669	0.419	0.206
3.7	1.875	2.294	0.419	0.206
3.7	2.500	2.919	0.419	0.206
3.7	3.125	3.544	0.419	0.206
3.7	3.750	4.169	0.419	0.206
3.7	4.375	4.794	0.419	0.206
3.7	5.000	5.419	0.419	0.206
3.7	5.625	6.044	0.419	0.206
3.7	6.250	6.669	0.419	0.206
3.7	6.875	7.294	0.419	0.206
3.7	7.500	7.919	0.419	0.206
3.7	8.125	8.544	0.419	0.206
3.7	8.750	9.169	0.419	0.206
3.7	9.375	9.794	0.419	0.206
3.7	10.000	10.419	0.419	0.206
3.7	10.625	11.044	0.419	0.206
3.7	11.250	11.669	0.419	0.206
3.7	11.875	12.294	0.419	0.206
3.7	12.500	12.919	0.419	0.206
3.7	13.125	13.544	0.419	0.206
3.7	13.750	14.169	0.419	0.206
3.7	14.375	14.794	0.419	0.206
3.7	15.000	15.419	0.419	0.206
3.7	15.625	16.044	0.419	0.206
3.7	16.250	16.669	0.419	0.206
3.7	16.875	17.294	0.419	0.206
3.7	17.500	17.919	0.419	0.206
3.7	18.125	18.544	0.419	0.206
3.7	18.750	19.169	0.419	0.206
3.7	19.375	19.794	0.419	0.206
3.7	20.000	20.419	0.419	0.206
3.7	20.625	21.044	0.419	0.206

GFSK (BLE 1Mbps): Middle Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
3.4	0.000	0.419	0.419	0.206
3.4	0.625	1.044	0.419	0.206
3.4	1.250	1.669	0.419	0.206
3.4	1.875	2.294	0.419	0.206
3.4	2.500	2.919	0.419	0.206
3.4	3.125	3.544	0.419	0.206
3.4	3.750	4.169	0.419	0.206
3.4	4.375	4.794	0.419	0.206
3.4	5.000	5.419	0.419	0.206
3.4	5.625	6.044	0.419	0.206
3.4	6.250	6.669	0.419	0.206
3.4	6.875	7.294	0.419	0.206
3.4	7.500	7.919	0.419	0.206
3.4	8.125	8.544	0.419	0.206
3.4	8.750	9.169	0.419	0.206
3.4	9.375	9.794	0.419	0.206
3.4	10.000	10.419	0.419	0.206
3.4	10.625	11.044	0.419	0.205
3.4	11.249	11.669	0.420	0.206
3.4	11.875	12.294	0.419	0.206
3.4	12.500	12.919	0.419	0.206
3.4	13.125	13.544	0.419	0.206
3.4	13.750	14.169	0.419	0.205
3.4	14.374	14.794	0.420	0.206
3.4	15.000	15.419	0.419	0.206
3.4	15.625	16.044	0.419	0.205
3.4	16.249	16.669	0.420	0.206
3.4	16.875	17.294	0.419	0.205
3.4	17.499	17.919	0.420	0.205
3.4	18.124	18.544	0.420	0.205
3.4	18.749	19.169	0.420	0.205
3.4	19.374	19.794	0.420	0.205
3.4	19.999	20.419	0.420	0.205
3.4	20.624	21.044	0.420	0.205

GFSK (BLE 1Mbps): High Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
3.1	0.000	0.420	0.420	0.205
3.1	0.625	1.045	0.420	0.205
3.1	1.250	1.670	0.420	0.205
3.1	1.875	2.295	0.420	0.205
3.1	2.500	2.920	0.420	0.205
3.1	3.125	3.545	0.420	0.205
3.1	3.750	4.170	0.420	0.205
3.1	4.375	4.795	0.420	0.205
3.1	5.000	5.420	0.420	0.205
3.1	5.625	6.045	0.420	0.205
3.1	6.250	6.670	0.420	0.205
3.1	6.875	7.295	0.420	0.205
3.1	7.500	7.920	0.420	0.205
3.1	8.125	8.545	0.420	0.205
3.1	8.750	9.170	0.420	0.205
3.1	9.375	9.795	0.420	0.205
3.1	10.000	10.420	0.420	0.205
3.1	10.625	11.045	0.420	0.205
3.1	11.250	11.670	0.420	0.205
3.1	11.875	12.295	0.420	0.205
3.1	12.500	12.920	0.420	0.205
3.1	13.125	13.545	0.420	0.205
3.1	13.750	14.170	0.420	0.205
3.1	14.375	14.795	0.420	0.205
3.1	15.000	15.420	0.420	0.205
3.1	15.625	16.045	0.420	0.205
3.1	16.250	16.670	0.420	0.205
3.1	16.875	17.295	0.420	0.205
3.1	17.500	17.919	0.419	0.206
3.1	18.125	18.545	0.420	0.205
3.1	18.750	19.169	0.419	0.206
3.1	19.375	19.795	0.420	0.205
3.1	20.000	20.419	0.419	0.206
3.1	20.625	21.045	0.420	0.205

GFSK (BLE 2Mbps): Low Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
3.7	0.000	0.236	0.236	0.389
3.7	0.625	0.861	0.236	0.389
3.7	1.250	1.486	0.236	0.389
3.7	1.875	2.111	0.236	0.389
3.7	2.500	2.736	0.236	0.389
3.7	3.125	3.361	0.236	0.389
3.7	3.750	3.986	0.236	0.389
3.7	4.375	4.611	0.236	0.389
3.7	5.000	5.236	0.236	0.389
3.7	5.625	5.861	0.236	0.389
3.7	6.250	6.486	0.236	0.389
3.7	6.875	7.111	0.236	0.389
3.7	7.500	7.736	0.236	0.389
3.7	8.125	8.361	0.236	0.389
3.7	8.750	8.986	0.236	0.389
3.7	9.375	9.611	0.236	0.389
3.7	10.000	10.236	0.236	0.389
3.7	10.625	10.861	0.236	0.389
3.7	11.250	11.486	0.236	0.389
3.7	11.875	12.111	0.236	0.389
3.7	12.500	12.736	0.236	0.389
3.7	13.125	13.361	0.236	0.389
3.7	13.750	13.986	0.236	0.389
3.7	14.375	14.611	0.236	0.389
3.7	15.000	15.236	0.236	0.389
3.7	15.625	15.861	0.236	0.389
3.7	16.250	16.486	0.236	0.389
3.7	16.875	17.111	0.236	0.389
3.7	17.500	17.736	0.236	0.389
3.7	18.125	18.361	0.236	0.389
3.7	18.750	18.986	0.236	0.389
3.7	19.375	19.611	0.236	0.389
3.7	20.000	20.236	0.236	0.389
3.7	20.625	20.861	0.236	0.389

GFSK (BLE 2Mbps): Middle Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
3.5	0.000	0.235	0.235	0.390
3.5	0.625	0.860	0.235	0.390
3.5	1.250	1.485	0.235	0.390
3.5	1.875	2.110	0.235	0.390
3.5	2.500	2.735	0.235	0.390
3.5	3.125	3.360	0.235	0.390
3.5	3.750	3.985	0.235	0.390
3.5	4.375	4.610	0.235	0.390
3.5	5.000	5.235	0.235	0.390
3.5	5.625	5.860	0.235	0.390
3.5	6.250	6.485	0.235	0.390
3.5	6.875	7.110	0.235	0.390
3.5	7.500	7.735	0.235	0.390
3.5	8.125	8.360	0.235	0.390
3.5	8.750	8.985	0.235	0.390
3.5	9.375	9.610	0.235	0.390
3.5	10.000	10.235	0.235	0.390
3.5	10.625	10.860	0.235	0.390
3.5	11.250	11.485	0.235	0.390
3.5	11.875	12.110	0.235	0.390
3.5	12.500	12.735	0.235	0.390
3.5	13.125	13.360	0.235	0.390
3.5	13.750	13.985	0.235	0.390
3.5	14.375	14.610	0.235	0.390
3.5	15.000	15.235	0.235	0.390
3.5	15.625	15.860	0.235	0.390
3.5	16.250	16.485	0.235	0.390
3.5	16.875	17.110	0.235	0.390
3.5	17.500	17.735	0.235	0.390
3.5	18.125	18.360	0.235	0.390
3.5	18.750	18.985	0.235	0.390
3.5	19.375	19.610	0.235	0.390
3.5	20.000	20.235	0.235	0.390
3.5	20.625	20.860	0.235	0.390

GFSK (BLE 2Mbps): High Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
3.3	0.000	0.236	0.236	0.389
3.3	0.625	0.861	0.236	0.389
3.3	1.250	1.486	0.236	0.389
3.3	1.875	2.111	0.236	0.389
3.3	2.500	2.736	0.236	0.389
3.3	3.125	3.361	0.236	0.389
3.3	3.750	3.986	0.236	0.389
3.3	4.375	4.611	0.236	0.389
3.3	5.000	5.236	0.236	0.389
3.3	5.625	5.861	0.236	0.389
3.3	6.250	6.486	0.236	0.389
3.3	6.875	7.111	0.236	0.389
3.3	7.500	7.736	0.236	0.389
3.3	8.125	8.361	0.236	0.389
3.3	8.750	8.986	0.236	0.389
3.3	9.375	9.611	0.236	0.389
3.3	10.000	10.236	0.236	0.389
3.3	10.625	10.861	0.236	0.389
3.3	11.250	11.486	0.236	0.389
3.3	11.875	12.111	0.236	0.389
3.3	12.500	12.736	0.236	0.389
3.3	13.125	13.361	0.236	0.389
3.3	13.750	13.986	0.236	0.389
3.3	14.375	14.611	0.236	0.389
3.3	15.000	15.236	0.236	0.389
3.3	15.625	15.861	0.236	0.389
3.3	16.250	16.486	0.236	0.389
3.3	16.875	17.111	0.236	0.389
3.3	17.500	17.736	0.236	0.389
3.3	18.125	18.361	0.236	0.389
3.3	18.750	18.986	0.236	0.389
3.3	19.375	19.611	0.236	0.389
3.3	20.000	20.236	0.236	0.389
3.3	20.625	20.861	0.236	0.389

A.2 Power spectral density

Measuring Parameter

Frequency Range		
2400 MHz to 2483.5 MHz	RBW (MHz)	10 kHz
	VBW (MHz)	30 kHz
	Sweep points	8351
	Detector mode	RMS
	Trace mode	Max Hold
	Sweep time	Auto

Test Data

Note: The Power density is EIRP Power density, which is contain antenna gain.

Modulation Mode			GFSK (BLE 1Mbps)		
Limit			10 dBm/MHz		
Test Result					
Test Method	Test Conditions		Power density (dBm/MHz)		
☐ Radiated ☒ Conducted	Temperature	Voltage	Low Channel	Middle Channel	High Channel
			Power Spectral density	Power Spectral density	Power Spectral density
	NT	NV	3.7	3.4	3.1
Test Verdict			Pass		

Modulation Mode			GFSK (BLE 2Mbps)		
Limit			10 dBm/MHz		
Test Result					
Test Method	Test Conditions		Power density (dBm/MHz)		
☐ Radiated ☒ Conducted	Temperature	Voltage	Low Channel	Middle Channel	High Channel
			Power Spectral density	Power Spectral density	Power Spectral density
	NT	NV	2.7	2.6	2.3
Test Verdict			Pass		

A.3 Duty Cycle, Tx-sequence, Tx-gap

Note: The maximum value of Duty Cycle declared by the supplier.

Test Data

Duty Cycle (%)	Limit Duty Cycle (%)[Note1]	Number of Bursts	Minimum Tx-On (ms)	Maximum Tx-On (ms)	Minimum Tx-Off (ms)	Maximum Tx-Off (ms)	Measurement Time (ms)	Comment
--	--	--	--	--	--	--	--	--

Note: Not applicable.

A.4 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

Note: Not applicable.

A.5 Hopping Frequency Separation

Note: Not applicable.

A.6 Medium Utilization (MU) factor

Medium Utilization (MU) (%)	Limit Medium Utilization (MU) (%)	Verdict
--	10	--

Note: Not applicable.

A.7 Adaptivity

Note: Not applicable.

A.8 Occupied Channel Bandwidth

Measuring Parameter

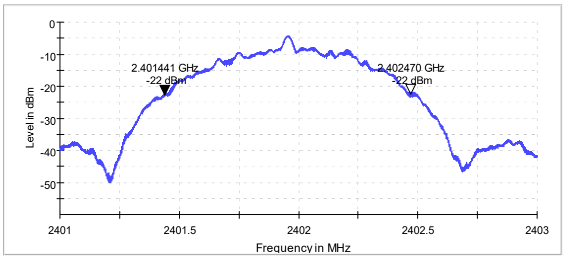
Centre Frequency	The centre frequency of the channel under test
RBW	~ 1 % of the span without going below 1 %
VBW	3 × RBW
Span	2 × Nominal Channel Bandwidth
Detector mode	RMS
Trace mode	Max Hold
Sweep time	Auto
Test Method	☐ Radiated ☒ Conducted

Test Data

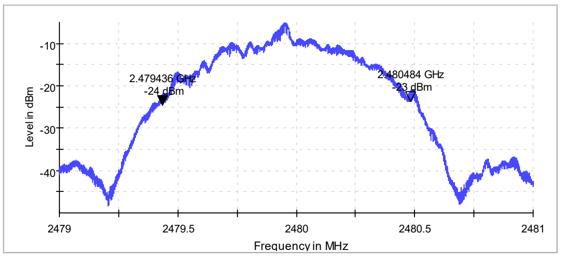
Test Conditions		Test Mode	DUT Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Lower Band Edge (MHz)	Upper Band Edge (MHz)	Limit (MHz)
Temperature	Voltage						
NT	NV	GFSK (BLE 1Mbps)	2402	1.028871	2401.44132	2402.470191	Within The Band 2400 MHz to 2483.5 MHz
			2480	1.048119	2479.436321	2480.48444	
		GFSK (BLE 2Mbps)	2404	2.068241	2402.934633	2405.002874	
			2478	2.085239	2476.915636	2479.000875	
Test Verdict		Pass					

Test Plots

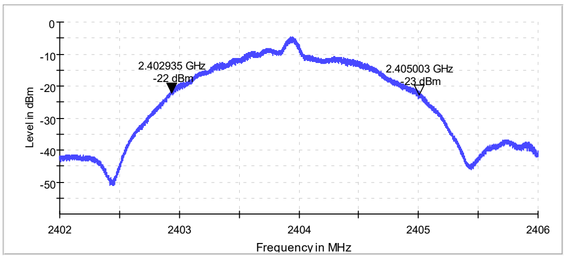
GFSK (BLE 1Mbps): Low Channel



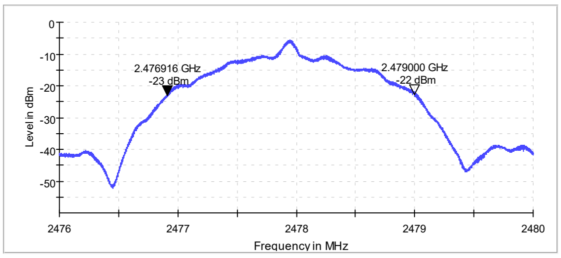
GFSK (BLE 1Mbps): High Channel



GFSK (BLE 2Mbps): Low Channel



GFSK (BLE 2Mbps): High Channel



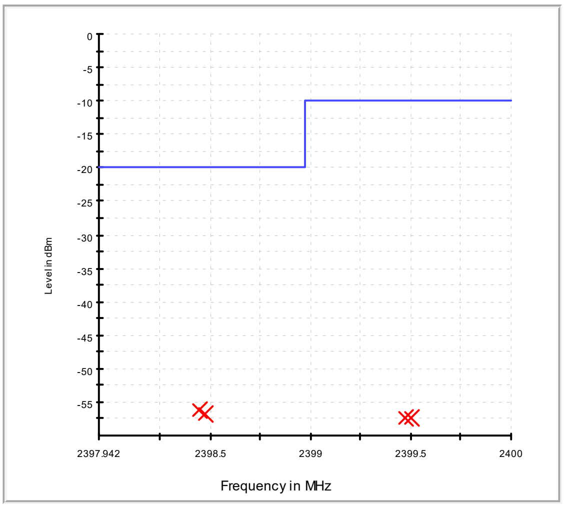
A.9 Transmitter unwanted emissions in the out-of-band domain

Test Data

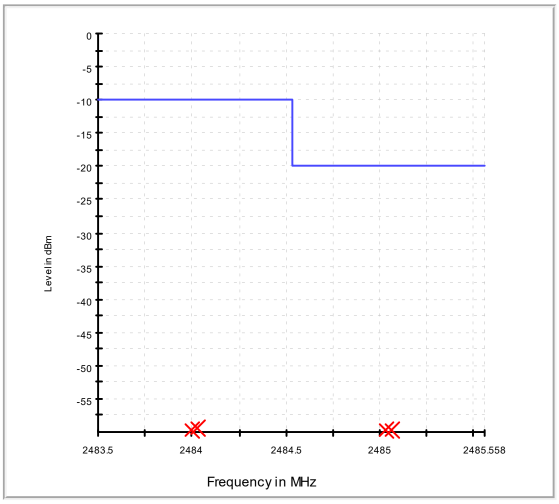
Test Method	Test Conditions		Test Mode	Frequency (MHz)	OOB Emission Worst level (dBm/MHz)	Limit (dBm/MHz)
	Temperature	Voltage				
☐ Radiated ☒ Conducted	NT	NV	GFSK (BLE 1Mbps)	2402	-56.3	-10,-20
				2480	-59.1	-10,-20
			GFSK (BLE 2Mbps)	2404	-59.3	-10,-20
				2478	-58.5	-10,-20
Test Verdict			Pass			

Test Plots

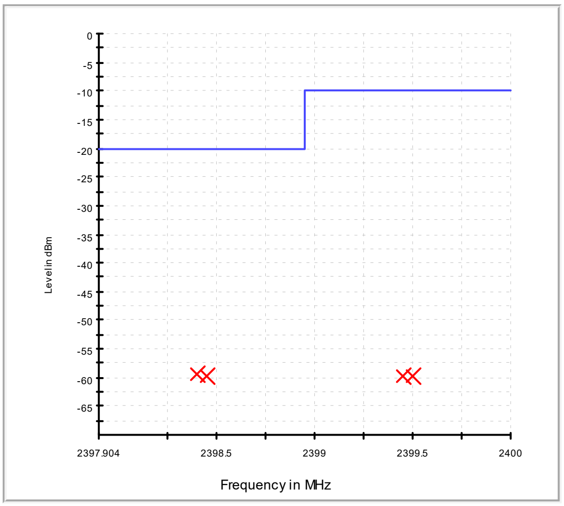
GFSK (BLE 1Mbps): Low frequency (Part 1)



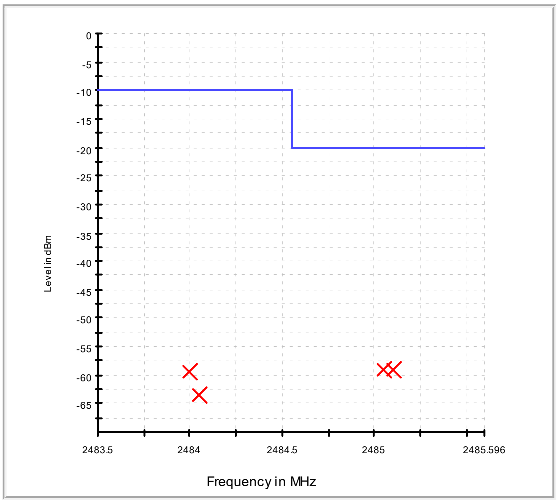
GFSK (BLE1Mbps): Low frequency (Part 2)



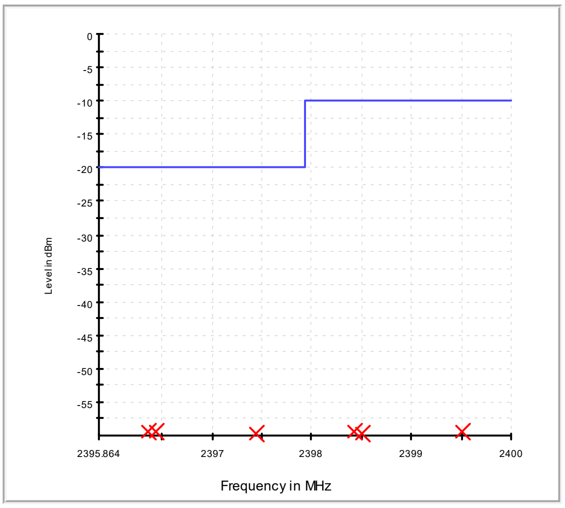
GFSK (BLE 1Mbps): High frequency (Part 1)



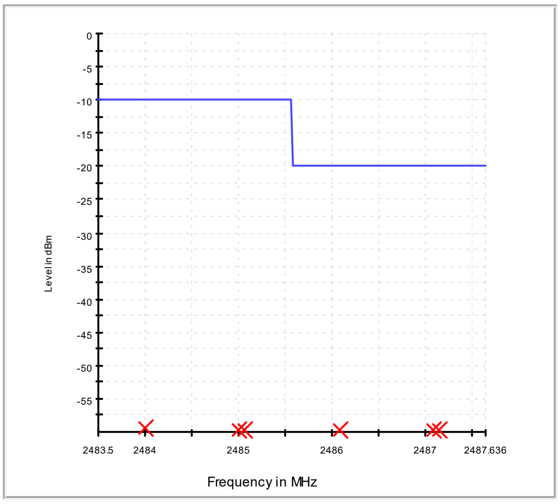
GFSK (BLE 1Mbps): High frequency (Part 2)



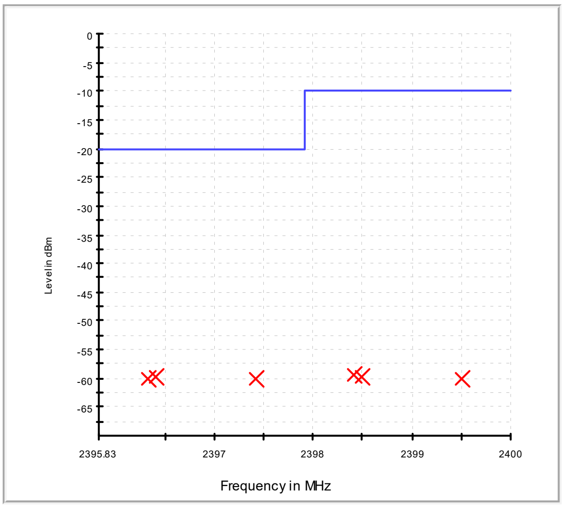
GFSK (BLE 2Mbps): Low frequency (Part 1)



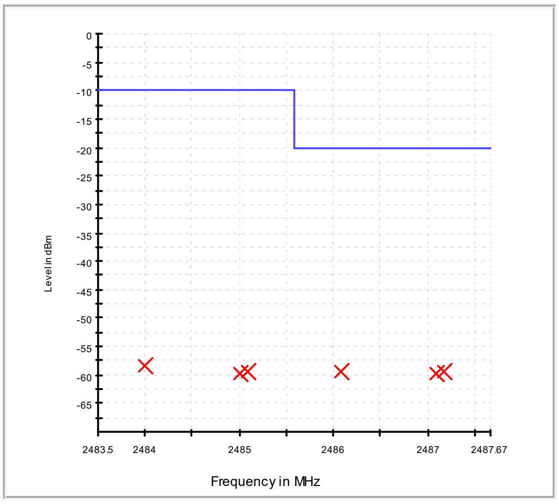
GFSK (BLE 2Mbps): Low frequency (Part 2)



GFSK (BLE 2Mbps): High frequency (Part 1)



GFSK (BLE 2Mbps): High frequency (Part 2)



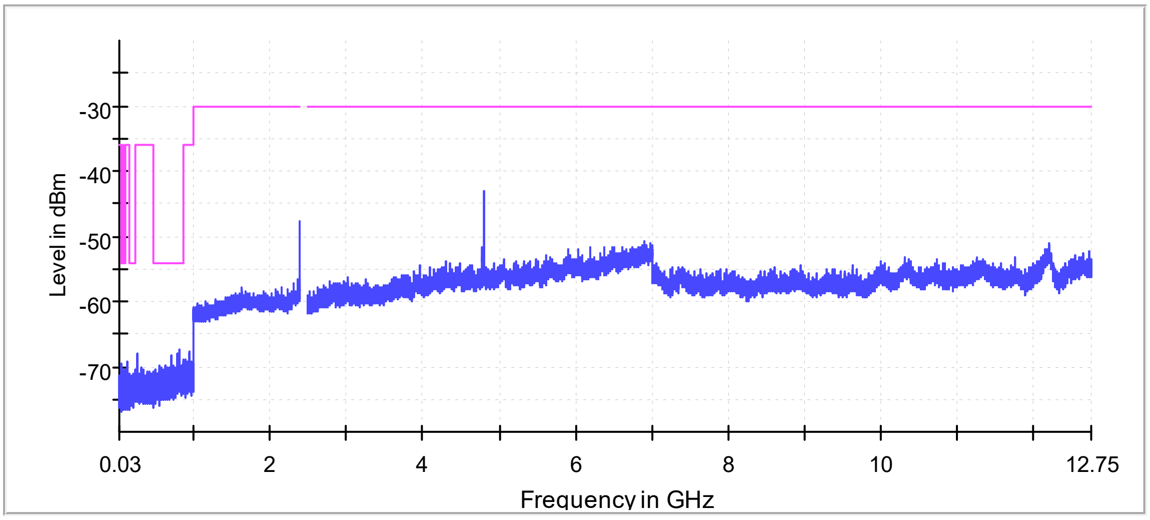
A.10 Transmitter unwanted emissions in the spurious domain

Note 1: The test method choose the conducted method. Which power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation).
Note 2: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.
Note 3: The cabinet radiated test data is tested in the normal working mode of the product.
Measuring Parameter

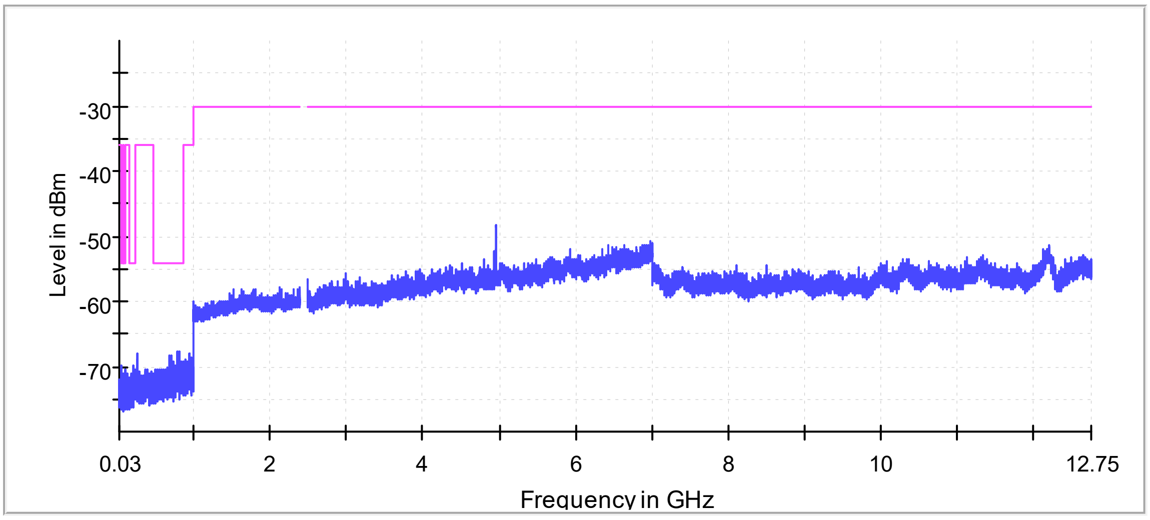
Frequency Range		
30 MHz to 1 000 MHz	RBW (MHz)	100 kHz
	VBW (MHz)	300 kHz
	Sweep points	19400
	Detector mode	Peak
	Trace mode	Max Hold
1 GHz to 12,75 GHz	RBW (MHz)	1 MHz
	VBW (MHz)	3 MHz
	Sweep points	23500
	Detector mode	Peak
	Trace mode	Max Hold

Conducted Test Data

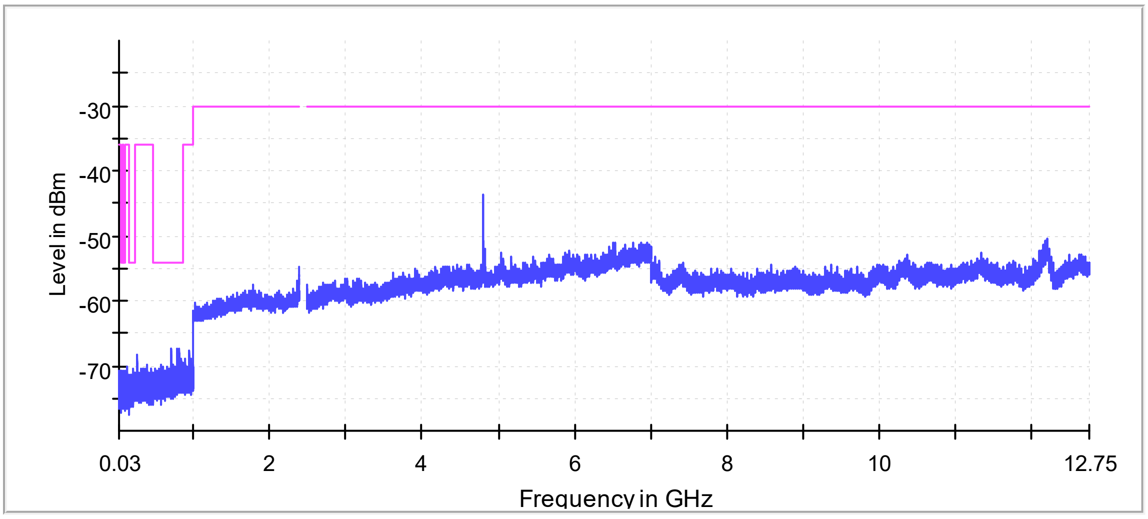
GFSK (BLE 1Mbps) Low Frequency



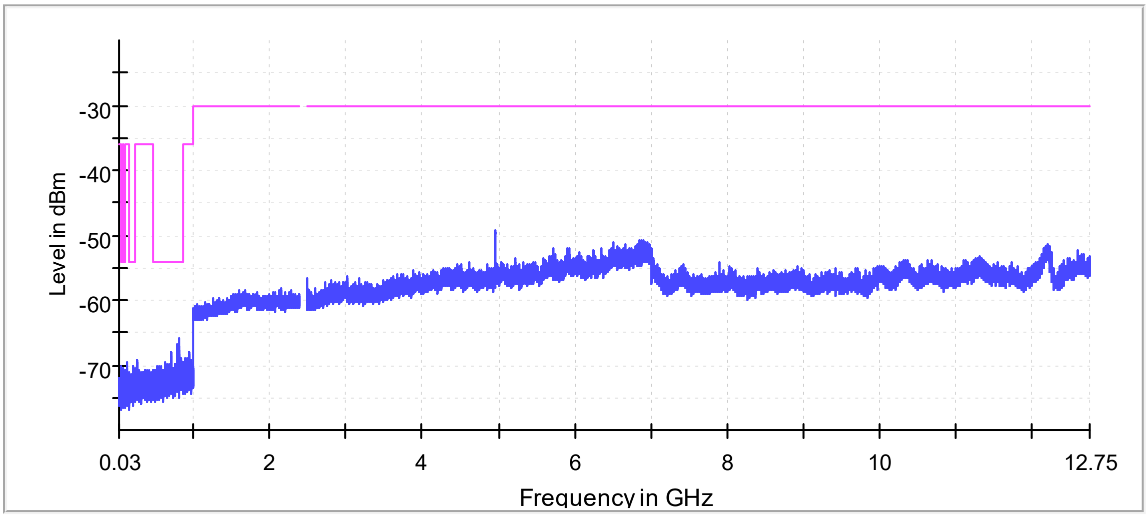
GFSK (BLE 1Mbps) High Frequency



GFSK (BLE 2Mbps) Low Frequency

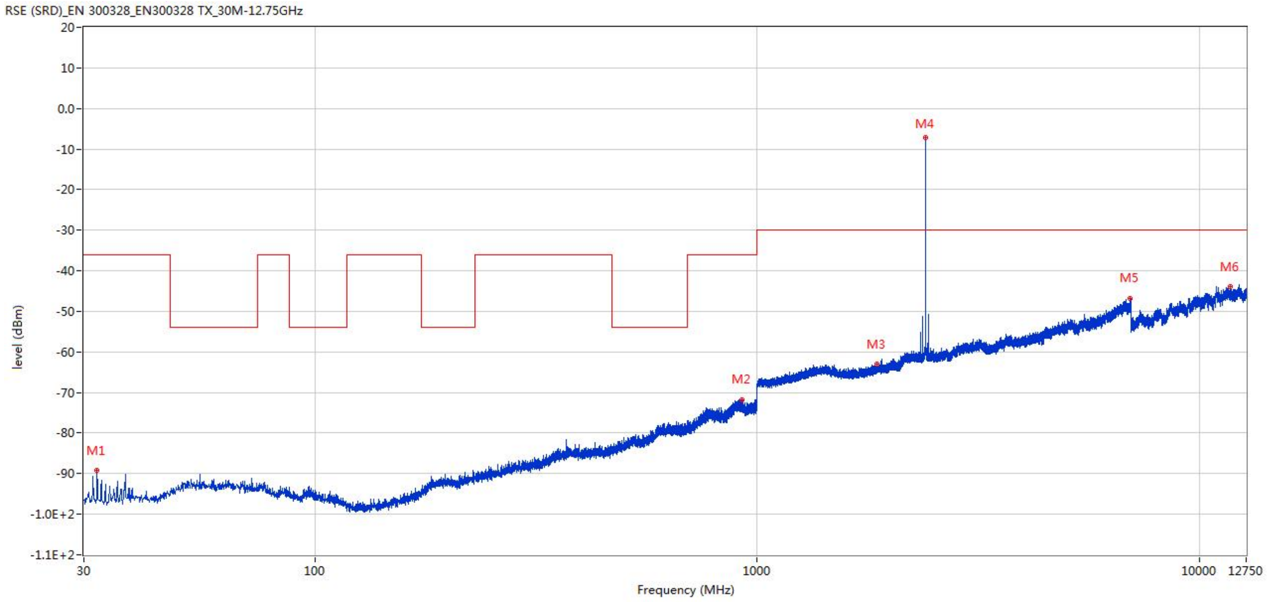


GFSK (BLE 2Mbps) High Frequency



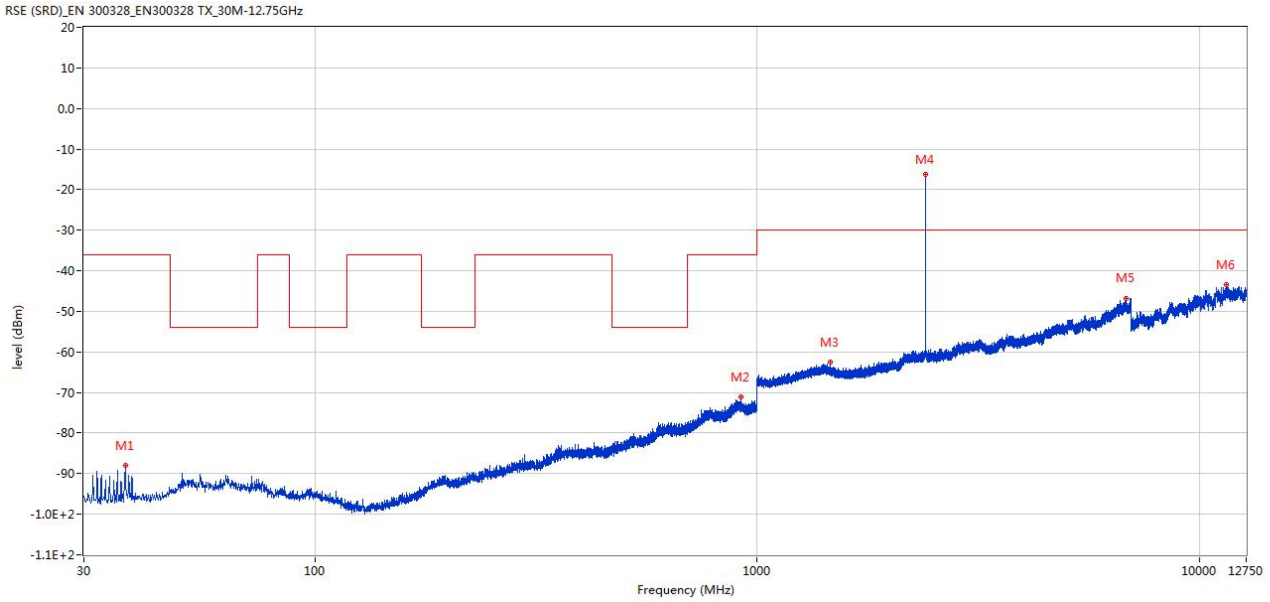
Cabinet Radiated Test Data

30 MHz to 12.75 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
32.134	-89.24	-20.18	-36.0	53.24	20.00	Horizontal	Horizontal	Pass
923.370	-71.70	3.50	-36.0	35.70	109.00	Horizontal	Horizontal	Pass
1861.400	-62.98	-4.01	-30.0	32.98	184.00	Horizontal	Horizontal	Pass
2401.900	-7.11	1.02	-30.0	-22.89	117.00	Horizontal	Horizontal	N/A
6976.200	-46.80	15.42	-30.0	16.80	167.00	Horizontal	Horizontal	Pass
11763.875	-43.97	19.45	-30.0	13.97	310.00	Horizontal	Horizontal	Pass

30 MHz to 12.75 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
37.178	-88.09	-19.71	-36.0	52.09	293.00	Vertical	Horizontal	Pass
917.841	-71.09	3.69	-36.0	35.09	360.00	Vertical	Horizontal	Pass
1458.800	-62.60	-4.54	-30.0	32.60	71.00	Vertical	Horizontal	Pass
2402.000	-15.76	1.03	-30.0	-14.34	45.00	Vertical	Horizontal	N/A
6806.400	-46.85	15.48	-30.0	16.85	138.00	Vertical	Horizontal	Pass
11501.674	-43.52	18.70	-30.0	13.52	331.00	Vertical	Horizontal	Pass

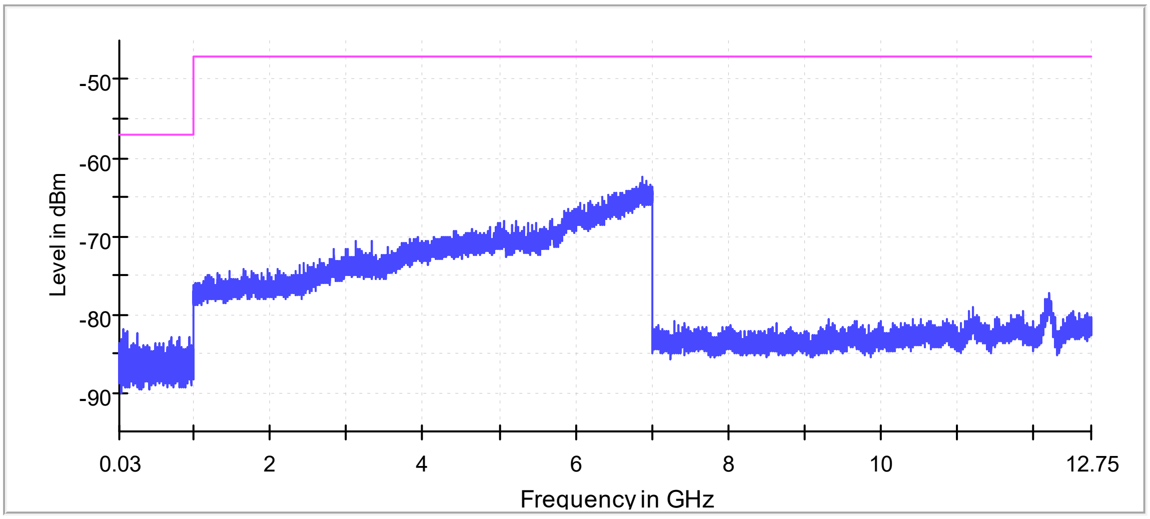
A.11 Receiver Spurious Emissions

Note 1: The test method choose the conducted method. Which power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation).
Note 2: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.
Note 3: The cabinet radiated test data is tested in the normal working mode of the product.
Measuring Parameter

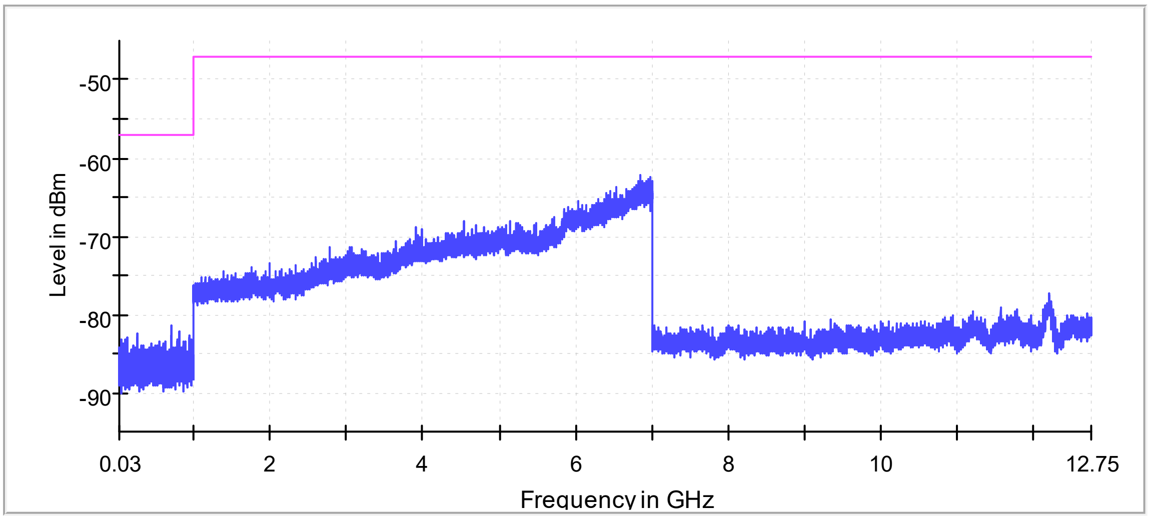
Frequency Range		
30 MHz to 1 000 MHz	RBW (MHz)	100 kHz
	VBW (MHz)	300 kHz
	Sweep points	19400
	Detector mode	Peak
	Trace mode	Max Hold
1 GHz to 12,75 GHz	RBW (MHz)	1 MHz
	VBW (MHz)	3 MHz
	Sweep points	23500
	Detector mode	Peak
	Trace mode	Max Hold

Conducted Test Data

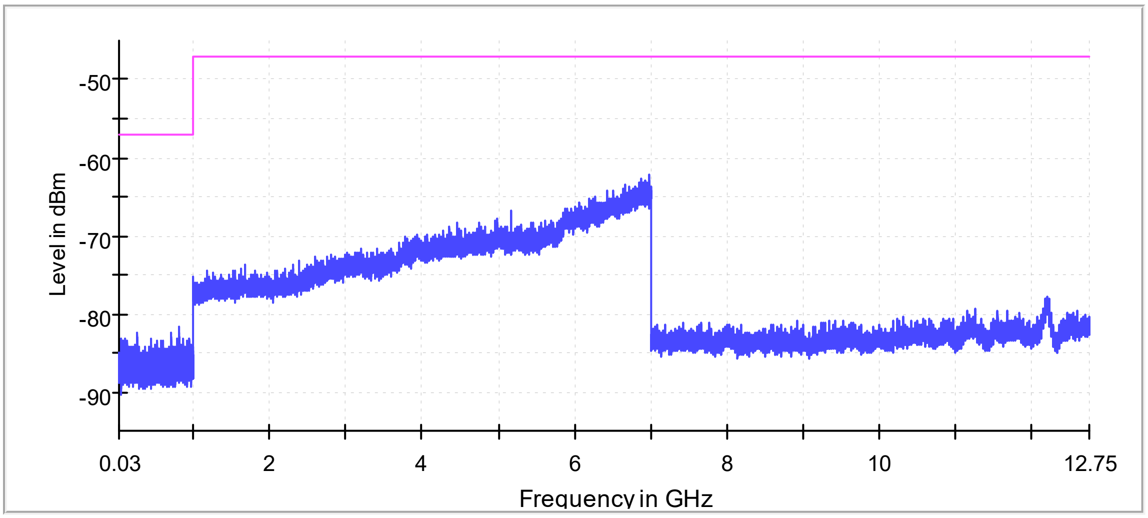
GFSK (BLE 1Mbps) Low Frequency



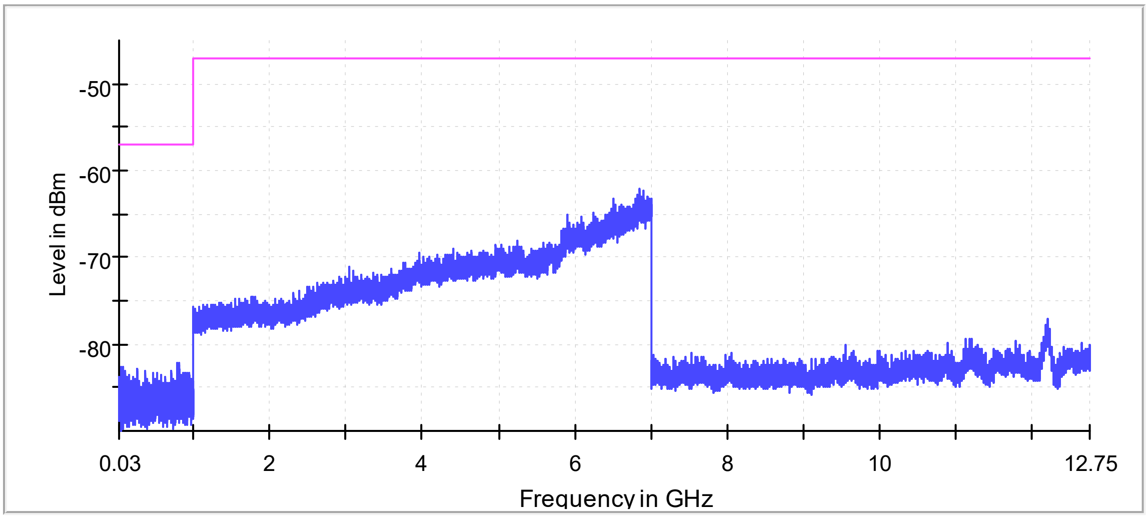
GFSK (BLE 1Mbps) High Frequency



GFSK (BLE 2Mbps) Low Frequency

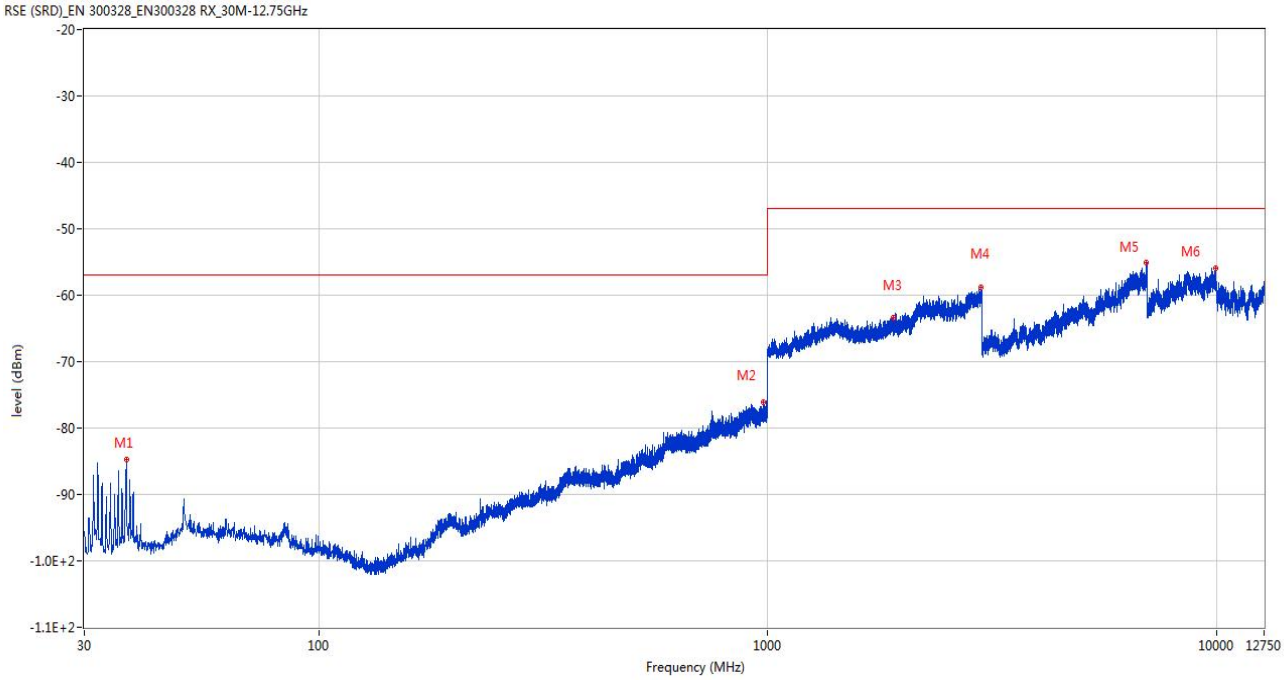


GFSK (BLE 2Mbps) High Frequency



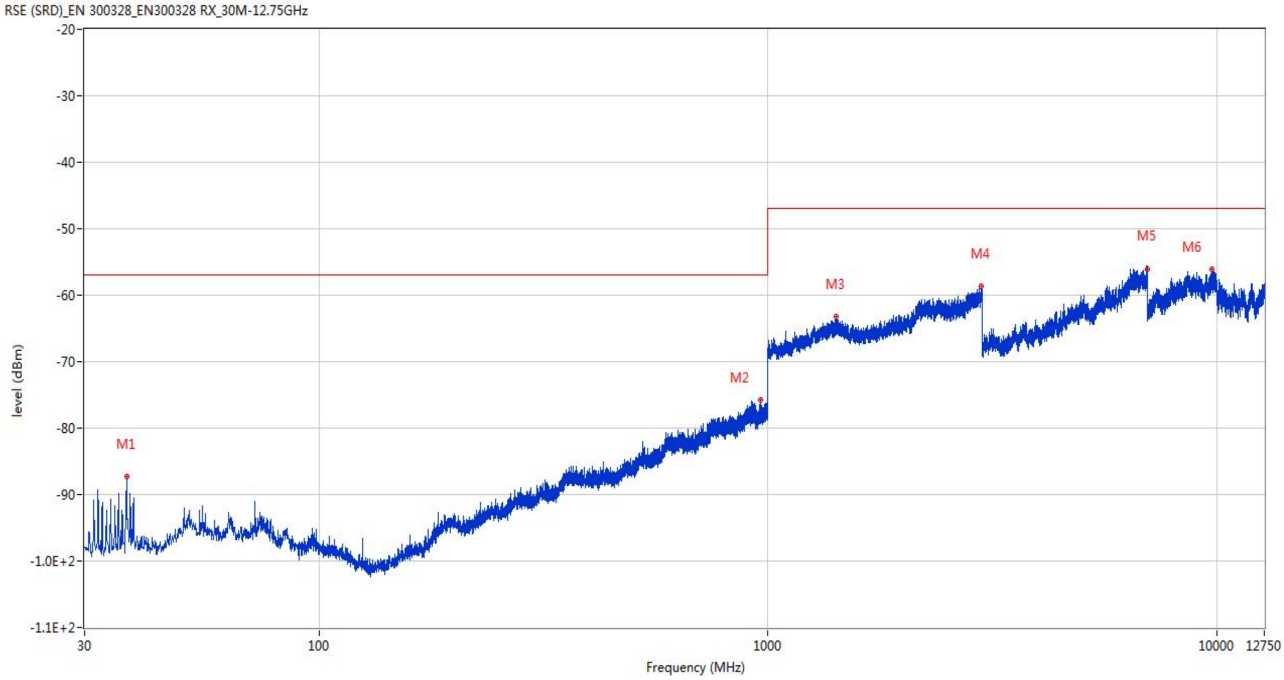
Cabinet Radiated Test Data

30 MHz to 12.75 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
37.178	-84.67	-19.71	-57.0	27.67	225.00	Horizontal	Horizontal	Pass
978.854	-76.14	3.58	-57.0	19.14	160.00	Horizontal	Horizontal	Pass
1899.900	-63.43	-3.91	-47.0	16.43	290.00	Horizontal	Horizontal	Pass
2991.600	-58.80	1.50	-47.0	11.80	111.00	Horizontal	Horizontal	Pass
6974.400	-55.13	6.57	-47.0	8.13	353.00	Horizontal	Horizontal	Pass
9940.838	-55.97	6.69	-47.0	8.97	264.00	Horizontal	Horizontal	Pass

30 MHz to 12.75 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
37.178	-87.34	-19.71	-57.0	30.34	258.00	Vertical	Horizontal	Pass
963.916	-75.78	3.06	-57.0	18.78	120.00	Vertical	Horizontal	Pass
1419.000	-63.25	-4.37	-47.0	16.25	23.00	Vertical	Horizontal	Pass
2990.800	-58.69	1.65	-47.0	11.69	223.00	Vertical	Horizontal	Pass
7000.000	-56.09	6.91	-47.0	9.09	118.00	Vertical	Horizontal	Pass
9759.713	-56.08	7.43	-47.0	9.08	77.00	Vertical	Horizontal	Pass

A.12 Receiver Blocking

For Bluetooth Low Energy

Note 1: The combination of the smallest channel bandwidth and the lowest data rate was reported.

Note 2: Blocking signal levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels corrected by the actual antenna assembly gain.

Note 3: During the Blocking test, the number of packets sent by the system is 1500.

Test Data

Receiver Category 2 equipment

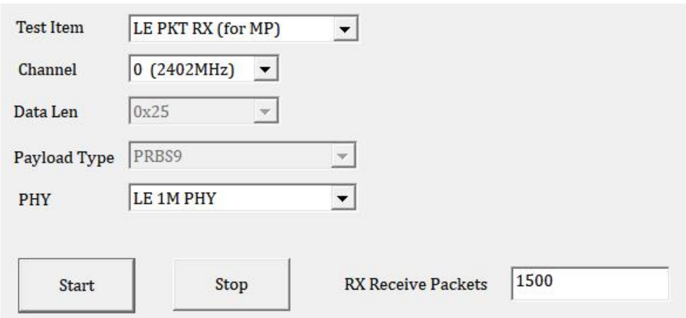
Wanted signal mean power from companion device (dBm)	Blocking signal Frequency (MHz)	Blocking signal power (dBm) (see note 2)	PER Result		Limit	Verdict
			Low channel	High channel		
(-139 dBm + 10 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less	2 380	-34	0.00%	0.00%	≦10%	Pass
	2 504	-34	0.00%	0.00%		
	2 300	-34	0.00%	0.00%		
	2 584	-34	0.00%	0.00%		

Test Plot (PER)

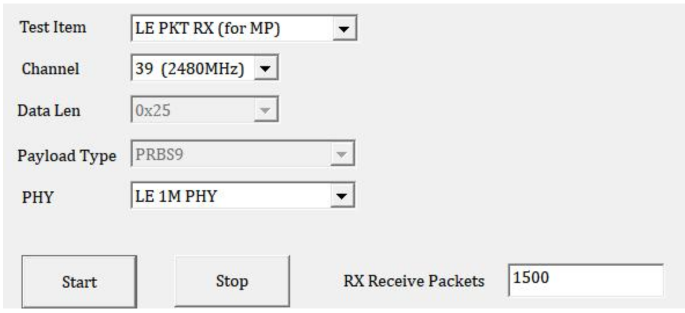
Note: All the configuration were tested, but only the worst PER Plot were reported in this report.

For Bluetooth Low Energy

Low Channel



High Channel



ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2440809-AR.pdf”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2440809-AW.pdf”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2440809-AI.pdf”.

ANNEX E EUT DECLARATION TECHNOLOGY TYPE

Application form for testing please refer to the document “BL-SZ2440809-AM.pdf”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the “inspection and testing dedicated stamp” or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--

TEST REPORT

Applicant:	Woan Technology (Shenzhen) Co., Ltd.
Address:	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100
Equipment Type:	SwitchBot Wallet Finder Card
Model Name:	W2500032 (refer to section 2.3)
Brand Name:	SwitchBot
Test Standard:	EN 62479: 2010 (refer to section 3.1)
Sample Arrival Date:	Apr. 16, 2024
Test Date:	Apr. 18, 2024 - Apr. 26, 2024
Date of Issue:	May 24, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Xiong Lining

Checked by: Xu Rui

Approved by: Tolan Tu

(Testing Director)

Xiong Li Ning

Xu Rui

Tolan Tu

Revision History

Version	Issue Date	Revisions Content
Rev. 01	May 24, 2024	Initial Issue

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100

2.2 Manufacturer Information

Manufacturer	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100

2.3 General Description for Equipment under Test (EUT)

EUT Name	SwitchBot Wallet Finder Card
Model Name Under Test	W2500032
Series Model Name	W2500031, W2500033, W2500034, W2500035
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name and combinations. (this information provided by the applicant)
Hardware Version	V02
Software Version	V01
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	Bluetooth (BLE)

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	Bluetooth	
Frequency Range	Bluetooth	2400 ~ 2483.5 MHz
Antenna Type	Bluetooth	PCB Antenna
Exposure Category	General Population/Uncontrolled Exposure	
EUT Type	Portable Device	

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	EN 62479:2010	Assessment of the compliance of low-power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)
2	EN 50663:2017	Assessment of the compliance of low-power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)

3.2 Limit Standards

No.	Identity	Document Title
1	1999/519/EC	Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

4 DEVICE CATEGORY AND LEVELS LIMITS

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the following limits.

For frequency range 10 MHz to 10 GHz

The basic restriction at frequencies between 10 MHz and 100 GHz is on localized SAR in the head. Any device with output power below 20 mW cannot produce an exposure exceeding this restriction under the most pessimistic exposure conditions. The basic restriction is 2 W/kg so any unit which supplies less than 20 mW (=2/100W) from its antenna port, averaged over 6 minutes, will meet the basic restriction.

For frequency range 10 GHz to 300 GHz

The most conservative assumption is that all the transmitted power is absorbed within the specified area, therefore any device which supplies less than 20 mW will meet the basic restriction. The average time is equal to 68/f-1.05 minutes (where f is in GHz) In the frequency range 10 GHz to 300 GHz, the basic restriction is 10 Wm-2 averaged over any 20 cm2 of exposed area with a spatial maximum of 200 Wm-2 averaged over 1 cm2

Criteria A: All electromagnetic fields

If the average power emitted by apparatus operating in the frequency range 10 MHz – 300GHz is less that or equal to 20 mW and the transmitting peak power is less than 20W then the apparatus is deemed to comply with the basic restrictions without testing. Averaging time is 6 minutes in the frequency range 10 MHz to 10 GHz. The average time is equal to 68/f-1.05 minutes (where f is in GHz) in the frequency range 10 GHz to 300 GHz.
If the total supply power or the input power to the circuitry producing the greatest emissions in the device is less than or equal to 20 mW then it is assumed that the emitted power is less than 20 mW.

Criteria B: Pulse modulated electromagnetic fields with pulse duration less than 30 microseconds

For pulses of duration less than 30 microseconds at frequencies between 300 MHz and 10 GHz, there is also a basic restriction on Specific energy absorption (SA). This is 2mJ kg-1 in any 10g of tissue in the head. For most pulses, the SAR restriction will be more stringent, but for pulses with a repetition frequency of less than 100 Hz, the SA restriction will predominate. For devices producing pulses with repetition rates below 100 Hz, the average power should be less than 20 x prf mW (pulse repetition frequency, prf in Hz).

5 ASSESSMENT RESULT

5.1 Output Power

Mode	Bluetooth
EIRP (dBm)	3.70
EIRP (mW)	2.34
Limit (mW)	20.00
Note: This report listed the maximal case EIRP power value, please refer to BL-SZ2440809-601 report for more details.	

5.2 Conclusion

Note: The EIRP Power of Bluetooth which are below the exempt condition, 20mW specified in EN62479: 2010. RF exposure assessment has been performed below to prove that this unit will not generate the harmful EM emission above the reference level as specified in EC Council Recommendation (1999/519/EC).

This EUT is deemed to comply with the reference level limits by Council Recommendation 1999/519/EC, therefore the basic restrictions are compliant with human exposure limits.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the “inspection and testing dedicated stamp” or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--

BLE

In accordance with ETSI EN 300 328, clause 5.4.1, the following information is provided by the manufacturer.

a) The type of modulation used by the equipment:

☐FHSS

☒other forms of modulation

b) In case of FHSS modulation:

In case of non-Adaptive Frequency Hopping equipment:

The number of Hopping Frequencies:________

In case of Adaptive Frequency Hopping Equipment:

The maximum number of Hopping Frequencies:________

The minimum number of Hopping Frequencies:________

The (average) Dwell Time:________ms

c) Adaptive / non-adaptive equipment:

☐non-adaptive Equipment

☒adaptive Equipment without the possibility to switch to a non-adaptive mode

☐adaptive Equipment which can also operate in a non-adaptive mode

d) In case of adaptive equipment:

The maximum Channel Occupancy Time implemented by the equipment: ___0.420___ms

☐The equipment has implemented an LBT mechanism

In case of equipment using modulation different from FHSS:

☐The equipment is Frame Based equipment

☐The equipment is Load Based equipment

☐The equipment can switch dynamically between Frame Based and Load Based equipment

The CCA time implemented by the equipment: ______μs

☒The equipment has implemented a DAA mechanism

☐The equipment can operate in more than one adaptive mode

e) In case of non-adaptive Equipment:

The maximum RF Output Power (e.i.r.p.): _______dBm

The maximum (corresponding) Duty Cycle: _______%

Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):

____

____

____

f) The worst case operational mode for each of the following tests:

The worst case	
Test item	**operational mode**
RF Output Power	GFSK
Power Spectral Density	GFSK
Duty cycle, Tx-Sequence, Tx-gap	N/A
Adaptivity & Receiver Blocking	GFSK
Nominal Channel Bandwidth	GFSK
Transmitter unwanted emissions in the OOB domain	GFSK
Transmitter unwanted emissions in the spurious domain	GFSK
Receiver spurious emissions	GFSK

g) The different transmit operating modes (tick all that apply):

☒Operating mode 1: Single Antenna Equipment

☒Equipment with only one antenna

☐Equipment with two diversity antennas but only one antenna active at any moment in time

☐Smart Antenna Systems with two or more antennas, but operating in a (legacy) mode where only one antenna is used (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)

☐Operating mode 2: Smart Antenna Systems - Multiple Antennas without beamforming

☐Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)

☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1

☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2

NOTE 1: Add more lines if more channel bandwidths are supported.

☐Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming

☐Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)

☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1

☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2

NOTE 2: Add more lines if more channel bandwidths are supported.

h) In case of Smart Antenna Systems:

The number of Receive chains: _______

The number of Transmit chains: _______

☐symmetrical power distribution

☐asymmetrical power distribution

In case of beamforming, the maximum (additional) beamforming gain:_____ dB

NOTE: The additional beam forming gain does not include the basic gain of a single antenna.

i) Operating Frequency Range(s) of the equipment:

Operating Frequency Range 1: 2400 MHz to 2483.5 MHz

Operating Frequency Range 2: N/A MHz to N/A MHz

NOTE: Add more lines if more Frequency Ranges are supported.

j) Nominal Channel Bandwidth(s):

Nominal Channel Bandwidth 1:___1___ MHz

Nominal Channel Bandwidth 2:___2___ MHz

NOTE: Add more lines if more channel bandwidths are supported.

k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):

☒Stand-alone

☐Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)

☐Plug-in radio device (Equipment intended for a variety of host systems)

☐Other ______________________________

l) The normal and the extreme operating conditions that apply to the equipment:

Normal operating conditions (if applicable):

Operating temperature: __15~35__ ° C

Other (please specify if applicable): ___N/A___

Extreme operating conditions:

Operating temperature range: Minimum: ___-10.0___ ° C Maximum ___45.0___ ° C

Other (please specify if applicable): ___N/A___ Minimum: ___N/A___ Maximum ___N/A___

Details provided are for the:

☒stand-alone equipment

☐combined (or host) equipment

☐test jig

m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p. levels:

Antenna Type:

☒Integral Antenna (information to be provided in case of conducted measurements)

Antenna Gain: ___0.23___ dBi

If applicable, additional beamforming gain (excluding basic antenna gain): ___N/A___ dB

☐Temporary RF connector provided

☐No temporary RF connector provided

☐Dedicated Antennas (equipment with antenna connector)

☐Single power level with corresponding antenna(s)

☐Multiple power settings and corresponding antenna(s)

Number of different Power Levels: ....

Power Level 1: ______dBm

Power Level 2: ______dBm

Power Level 3: ______dBm

NOTE 1: Add more lines in case the equipment has more power levels.

NOTE 2: These power levels are conducted power levels (at antenna connector).

For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable

Power Level 1: _______dBm

Number of antenna assemblies provided for this power level: _______

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE 3: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 2: _______ dBm

Number of antenna assemblies provided for this power level: ....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE 4: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 3: _______ dBm

Number of antenna assemblies provided for this power level: ....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE 5: Add more rows in case more antenna assemblies are supported for this power level.

n) The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:

Details provided are for the:

☒stand-alone equipment

☐combined (or host) equipment

Supply Voltage

☐AC mains State AC voltage _______V

☒DC State DC voltage __2.8____ V

In case of DC, indicate the type of power source

☐Internal Power Supply
☐External Power Supply or AC/DC adapter
☒Battery
☐Other: ___________

o) Describe the test modes available which can facilitate testing:

The DUT uses the RFTestTool software to enter the test mode to complete the test.

p) The equipment type (e.g. Bluetooth®, WIFI: IEEE 802.11™ [i.3], IEEE 802.15.4™ [i.4], proprietary, etc.):

Bluetooth®

q) If applicable, the statistical analysis referred to in clause 5.4.1 q)

(to be provided as separate attachment)

r) If applicable, the statistical analysis referred to in clause 5.4.1 r)

(to be provided as separate attachment)

s) Geo-location capability supported by the equipment:

☐Yes

☐The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user

☒No

t) Describe the minimum performance criteria that apply to the equipment (see clause 4.3.1.12.3 or clause 4.3.2.11.3):

The minimum performance criterion shall be a PER less than or equal to 10 %.

--BLANK BELOW--

Shenzhen BALUN Technology Co., Ltd.
Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, ShenZhen, GuangDong Province, P. R. China 518055.

VERIFICATION OF CONFORMITY

Certificate No.:	BL-SZ2440809D01
Applicant:	Woan Technology (Shenzhen) Co., Ltd.
Address:	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R.China, 518100
Manufacturer:	Woan Technology (Shenzhen) Co., Ltd.
Address:	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R.China, 518100
Product:	SwitchBot Wallet Finder Card
Brand name:	SwitchBot
Model name:	W2500032, W2500031, W2500033, W2500034, W2500035

The submitted sample of the above product has been tested according with following standards. Standard(s) used for showing compliance with the essential requirements in the **RED directive 2014/53/EU**:

Essential requirements	**Standards:**	**Report No.:**
Safety (Article 3.1 a)	IEC 62368-1: 2018 EN IEC 62368-1: 2020+A11: 2020	BL-SZ2440809-101
EMC (Article 3.1 b)	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.3.2 (2023-01) Draft ETSI EN 301 489-17 V3.2.6 (2023-06) EN 55032:2015+A1:2020 EN 55035:2017+A11:2020 EN IEC 61000-3-2: 2019+A1:2021 EN 61000-3-3: 2013+A2:2021	BL-SZ2440809-401 BL-SZ2440809-402
Radio (Article 3.2)	ETSI EN 300 330 V2.1.1 (2017-02) ETSI EN 300 328 V2.2.2 (2019-07)	BL-SZ2440809-403 BL-SZ2440809-601
Health (Article 3.1 a)	EN 62479:2010 EN 50663:2017	BL-SZ2440809-701

Liao Jianming
(Technical Director)
Date of Issue: May 30, 2024

TEST REPORT

Applicant:	Woan Technology (Shenzhen) Co., Ltd.
Address:	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100
Equipment Type:	SwitchBot Wallet Finder Card
Model Name:	W2500032 (refer to section 2.3)
Brand Name:	SwitchBot
Test Standard:	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.3.2 (2023-01) Draft ETSI EN 301 489-17 V3.2.6 (2023-06)
Sample Arrival Date:	Apr. 17, 2024
Test Date:	Apr. 28, 2024 - May 06, 2024
Date of Issue:	May 24, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Liang Yongming

Yongming Liang

Checked by: Xia Long

Xia Long

Approved by: Liao Jianming (Technical Director)

Jm Liao

Revision History

Version	Issue Date	Revisions Content
Rev. 01	May 24, 2024	Initial Issue

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100

2.2 Manufacturer Information

Manufacturer	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100

2.3 General Description for Equipment under Test (EUT)

EUT Name	SwitchBot Wallet Finder Card
Model Name Under Test	W2500032
Series Model Name	W2500031, W2500033, W2500034, W2500035
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name and combinations. (this information provided by the applicant)
Hardware Version	V02
Software Version	V01
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No.	CP114752B
	Serial No.	N/A
	Capacity	540 mAh
	Rated Voltage	3.0 V
	Limit Charge Voltage	N/A

2.5 Technical Information

<table>
<tr><td colspan="2">Network and Wireless connectivity</td><td>Bluetooth, NFC</td></tr>
<tr><td rowspan="4">Interfaces present on the EUT</td><td>AC Ports</td><td>No AC Ports</td></tr>
<tr><td>DC Ports</td><td>No DC Ports</td></tr>
<tr><td>Signal/Control Ports</td><td>No Signal/Control Ports</td></tr>
<tr><td>Wired Network Ports</td><td>No Wired Network Ports.</td></tr>
<tr><td colspan="2">Classification of equipment</td><td>Class B</td></tr>
</table>

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

The objective of the report is to perform testing according to following standards for CE marking:

No.	Identity	Document Title
1	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
2	ETSI EN 301 489-3 V2.3.2 (2023-01)	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz; Harmonised Standard for ElectroMagnetic Compatibility
3	Draft ETSI EN 301 489-17 V3.2.6 (2023-06)	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband and Wideband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility

3.2 Referenced Standards

The following referenced standards are necessary for the report.

No.	Identity	Document Title
1	CENELEC EN 55032 (2015)	Electromagnetic compatibility of multimedia equipment - Emission Requirements.
2	CENELEC EN 61000-3-2 (2014)	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤16 A per phase)
3	CENELEC EN 61000-3-3 (2013)	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.
4	CENELEC EN 61000-4-2 (2009)	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test.
5	CENELEC EN 61000-4-3 (2006), A1 (2008) and A2 (2010)	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test.
6	CENELEC EN 61000-4-4 (2012)	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test.
7	CENELEC EN 61000-4-5 (2014): + A1 (2017)	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test.
8	CENELEC EN 61000-4-6 (2014)	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.
9	CENELEC EN 61000-4-11 (2004)	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests.
10	ISO 7637-2 (2004)	Road vehicles - Electrical disturbances from conduction and coupling - Part 2: Electrical transient conduction along supply lines only.

3.3 Verdict

No.	Base Standard	Description		Test Verdict	Remark
Emission					
1	EN 55032	Radiated Emission	Below 1 GHz	Pass	--
			Above 1 GHz	Pass	Note 1
2	EN 55032	Conducted Emission	AC Mains Ports	N/A	Note 2
			DC Power Ports	N/A	Note 3
			Wired Network Ports	N/A	Note 4
3	EN 61000-3-2	Harmonic Current Emissions		N/A	Note 2
4	EN 61000-3-3	Voltage Fluctuations & Flicker		N/A	Note 2
Immunity					
5	EN 61000-4-2	Electrostatic Discharge		Pass	--
6	EN 61000-4-3	Radio Frequency Electromagnetic Field		Pass	--
7	EN 61000-4-4	Fast Transients Common Mode	AC Ports	N/A	Note 2
			DC Ports	N/A	Note 3
			Signal Ports, Control Ports	N/A	Note 5
			Wired Network Ports	N/A	Note 4
8	ISO 7637-2	Transients and Surges		N/A	Note 6
9	EN 61000-4-5	Surges	AC Ports	N/A	Note 2
			Wired Network Ports	N/A	Note 4
10	EN 61000-4-6	Radio Frequency Common Mode	AC Ports	N/A	Note 2
			DC Ports	N/A	Note 3
			Signal Ports, Control Ports	N/A	Note 5
			Wired Network Ports	N/A	Note 4
11	EN 61000-4-11	Voltage Dips and Interruptions		N/A	Note 2

Note 1: The highest frequency of the internal sources of the EUT is above 108 MHz, the measurement shall be made above 1 GHz.
Note 2: The EUT has no AC Ports.
Note 3: The EUT has no DC Ports.
Note 4: The EUT has no Wired Network Ports.
Note 5: The EUT has no Signal Ports, Control Ports.
Note 6: Only applicable for equipment is connected to vehicle power supply.
The standard versions involved in this table are the same as those in Sections 3.2.

3.4 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)-AMN	3.2 dB
Radiated emissions (30 MHz-1 GHz)-966#2	4.4 dB
Radiated emissions (1 GHz-18 GHz)-966#2	5.0 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Enclosure List

Description	Manufacturer	Model	Serial No.	Length	Description	Use
Phone	HONOR	STF-AL00	N/A	N/A	N/A	☒
Control Switch	N/A	N/A	N/A	N/A	N/A	☒
Wireless Communications Test Set	R&S	CMW500	102318	N/A	Cal. Due 2024.05.15	☒

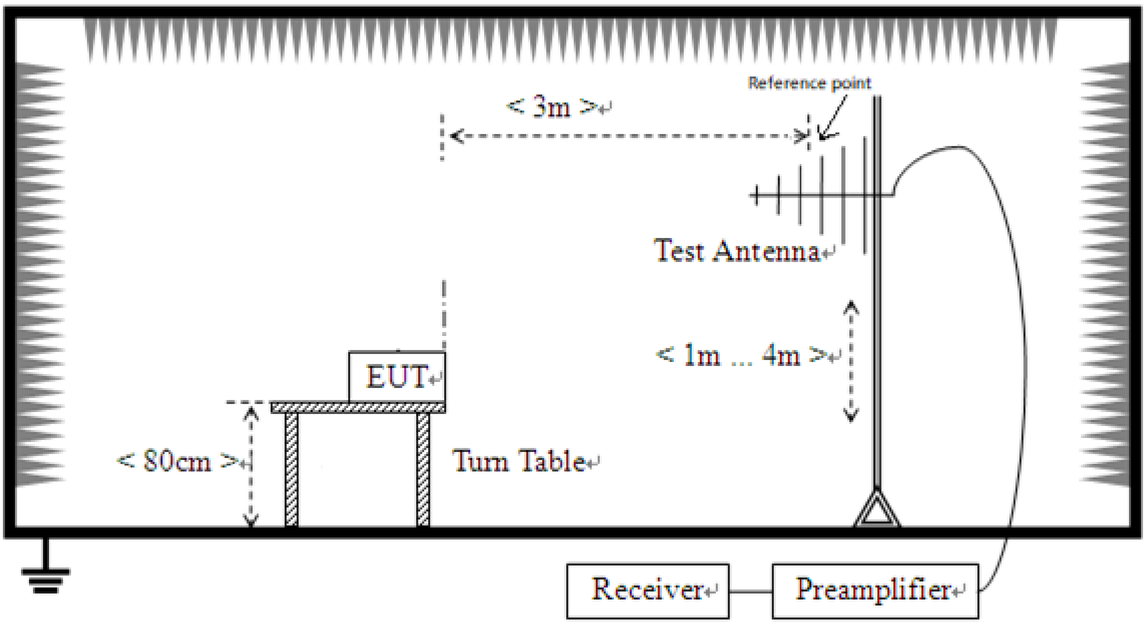
4.2 Test Configurations

All test modes of EUT are listed in the table below.

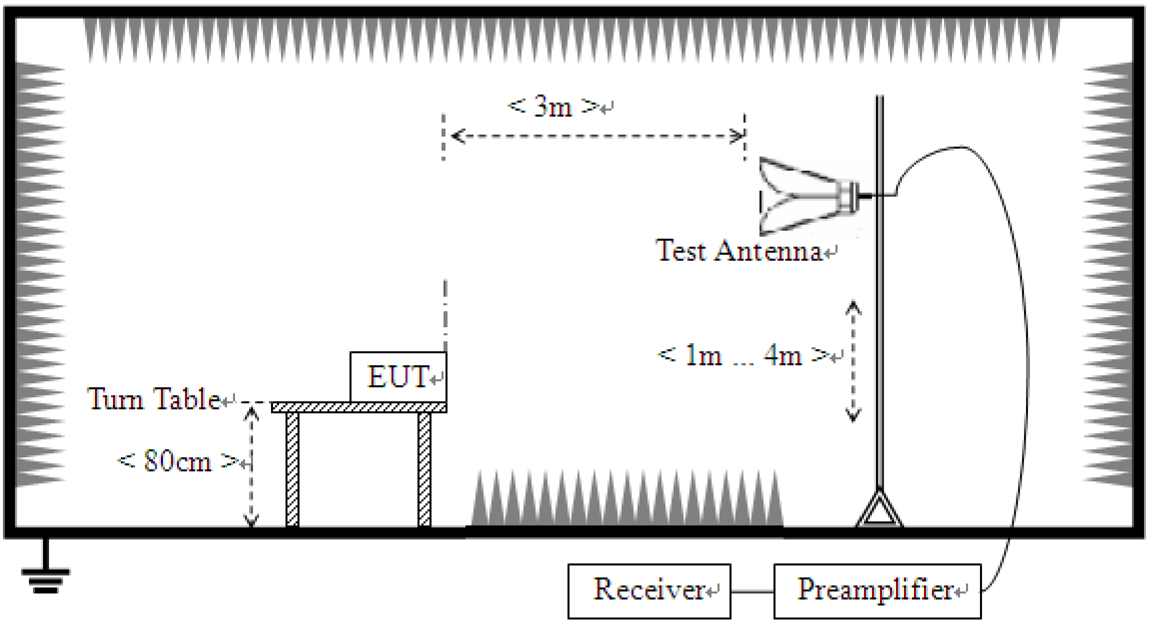
Test Mode Configuration	Description
Mode 1	The Working Test Mode EUT + Control Switch + Phone

4.3 Test Setups

Test Setup 1

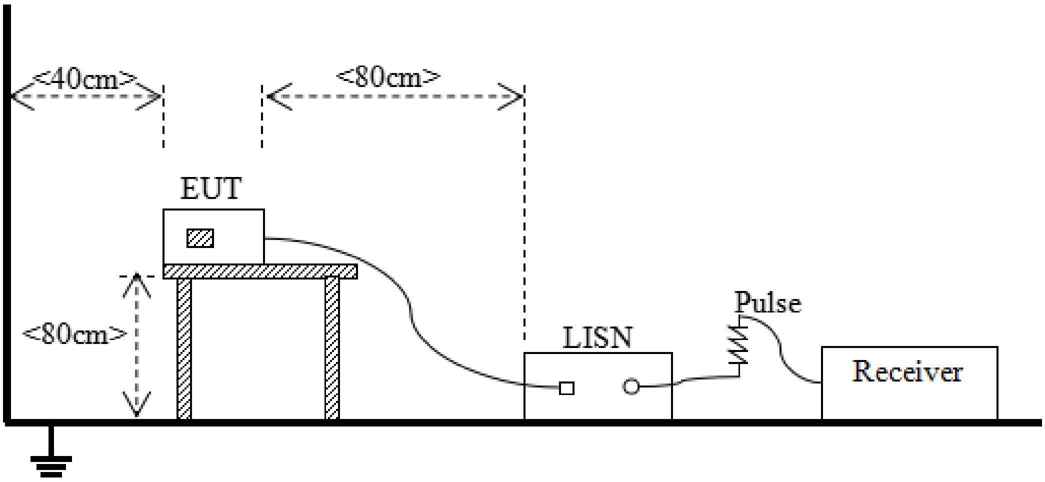


Radiated Emission (30 MHz-1 GHz)



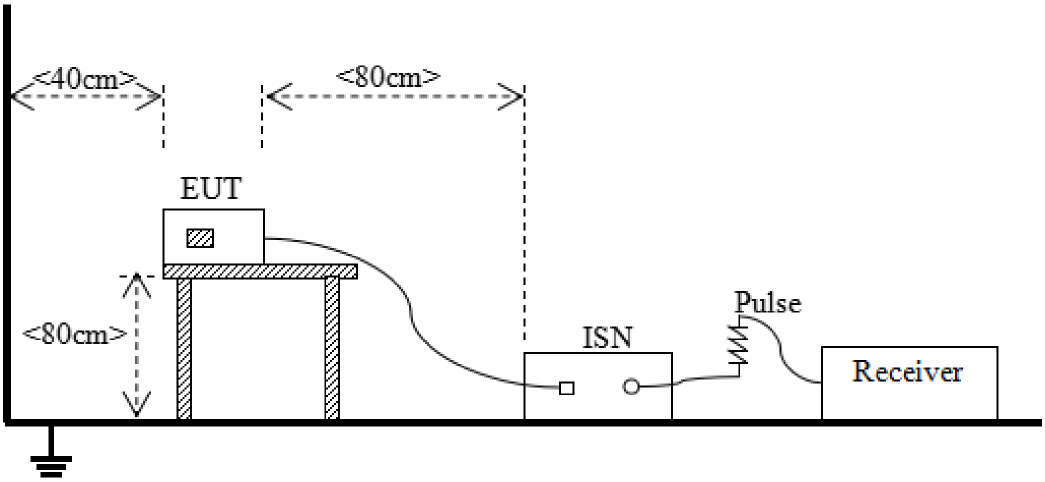
Radiated Emission (above 1 GHz)

Test Setup 2



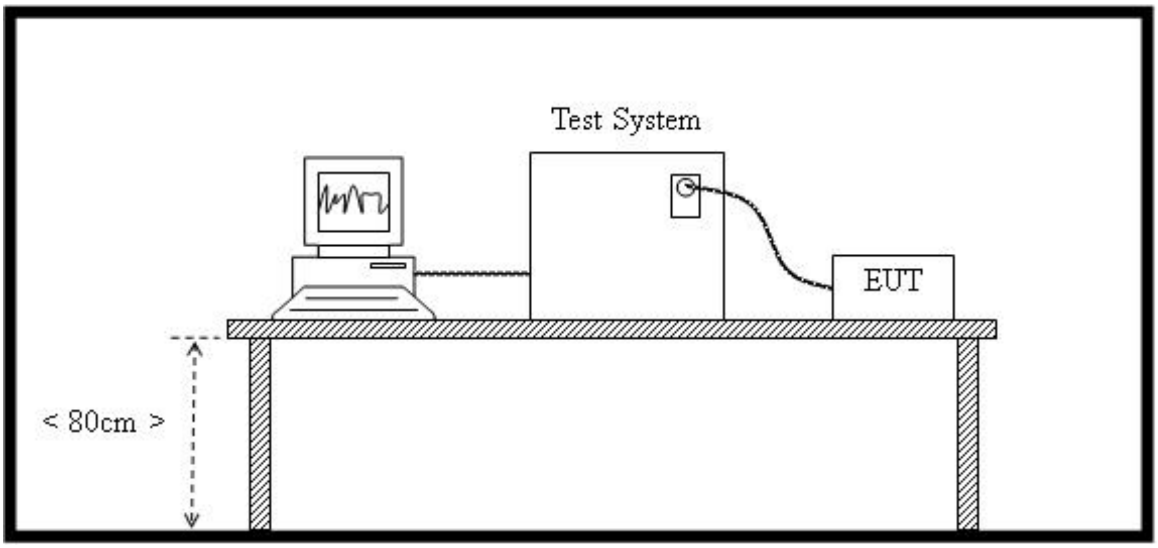
Conducted Emission for AC/DC Ports

Test Setup 3



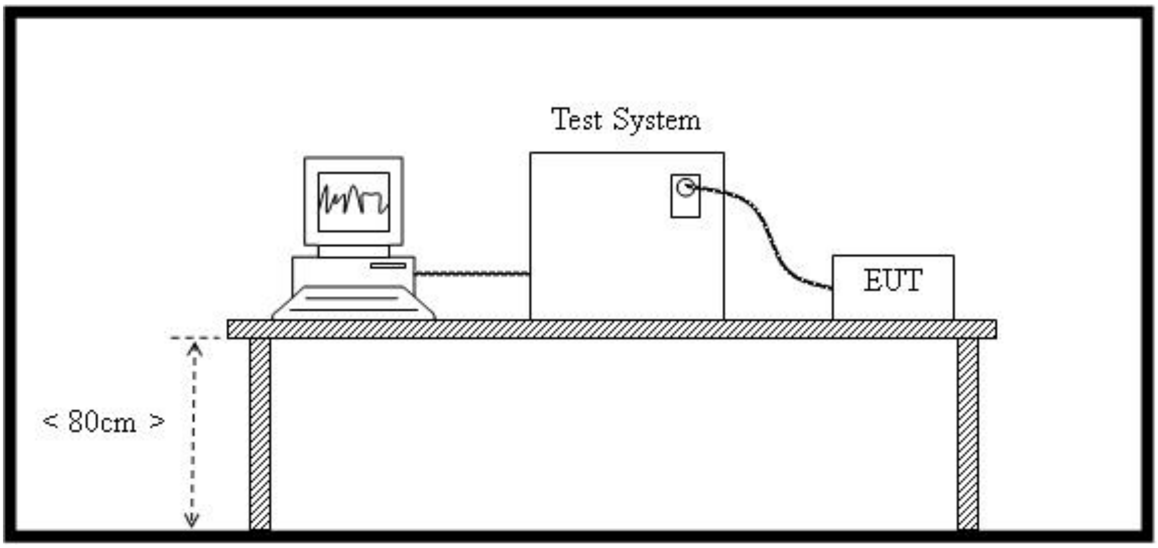
Conducted Emission for Wired Network Ports

Test Setup 4



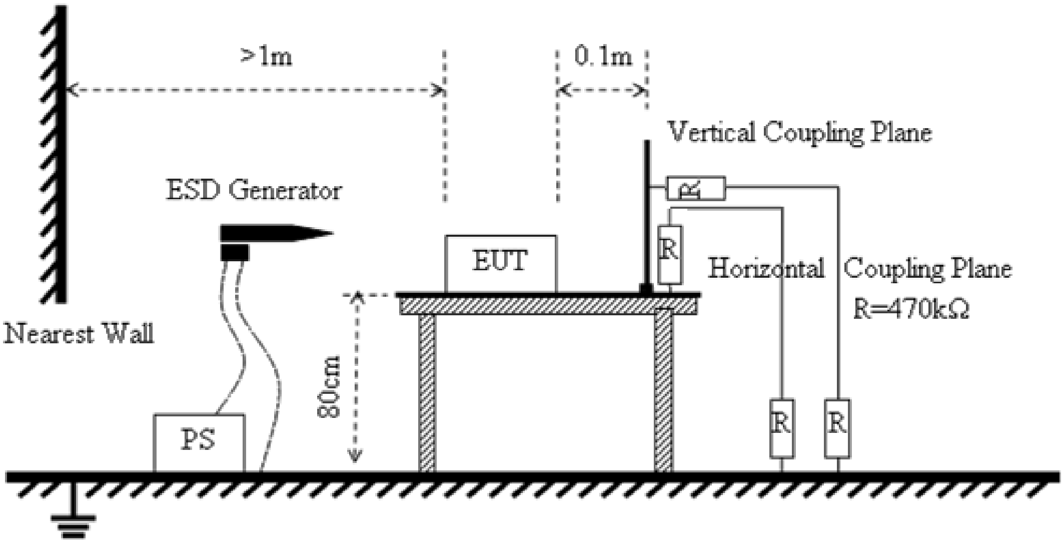
Harmonic Current Emissions

Test Setup 5



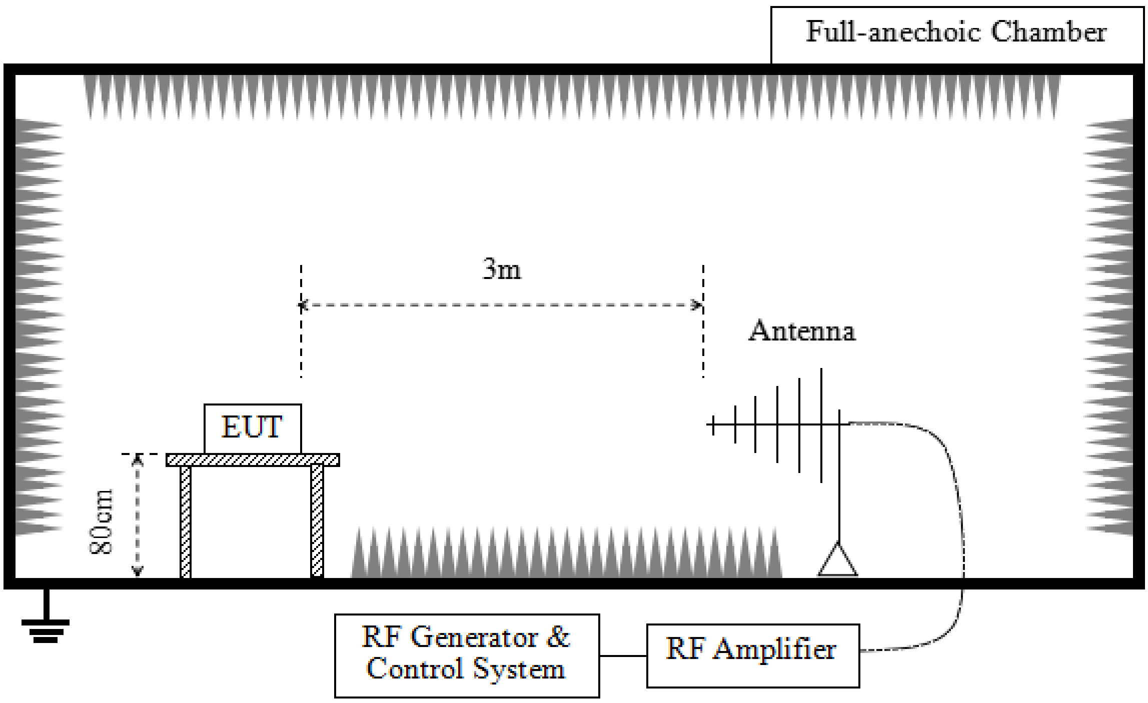
Voltage Fluctuations and Flicker

Test Setup 6



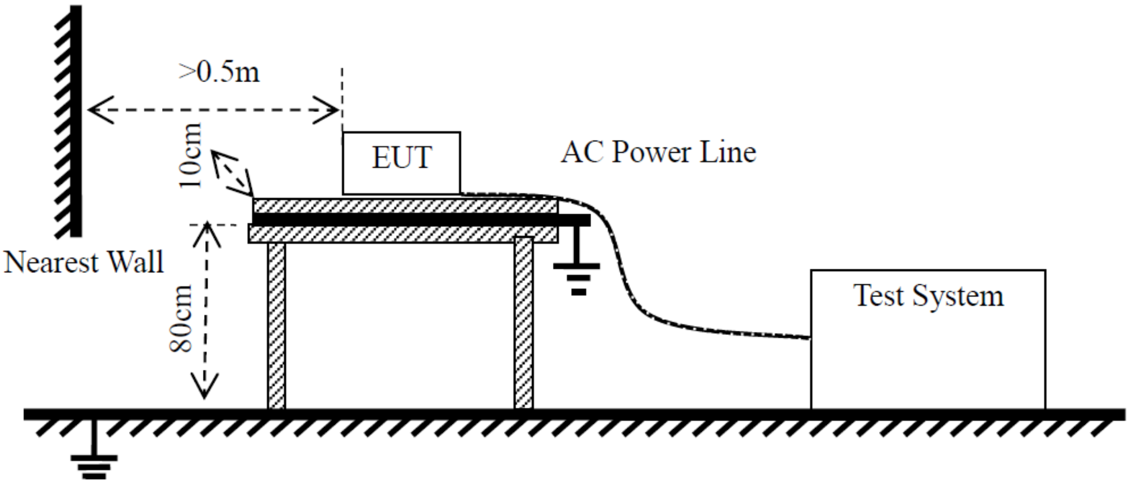
Electrostatic Discharge

Test Setup 7



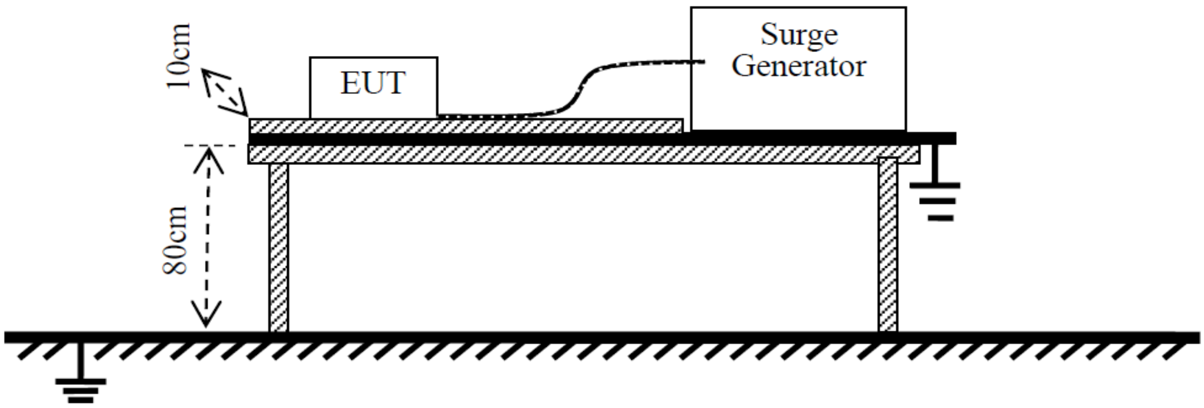
Radio Frequency Electromagnetic Field

Test Setup 8



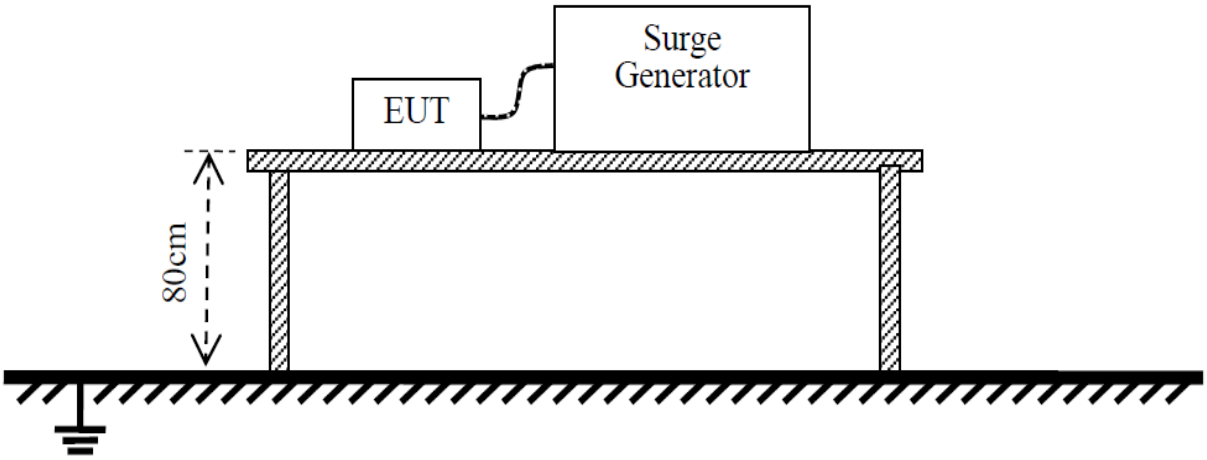
Fast Transients Common Mode

Test Setup 9



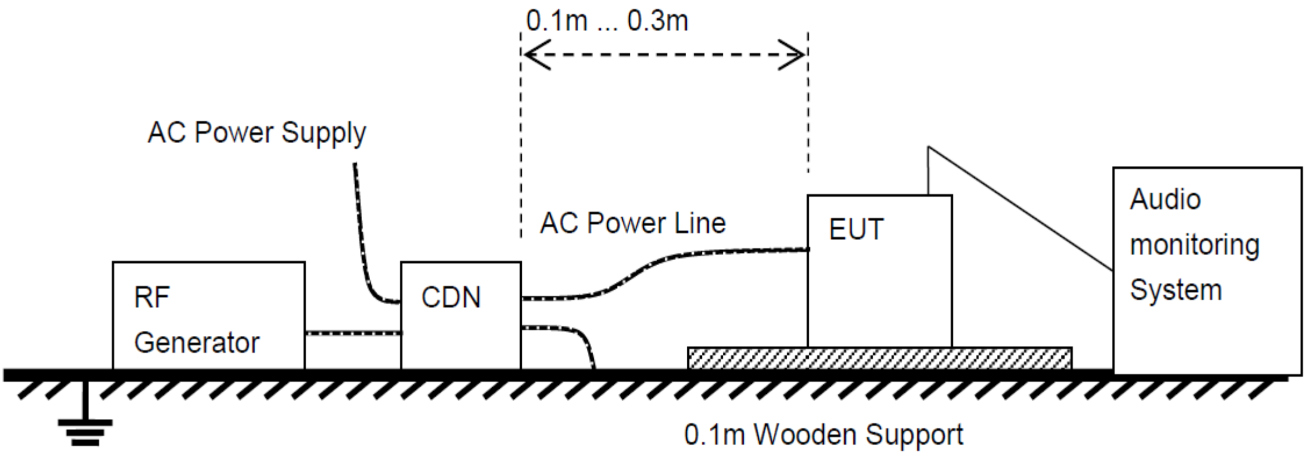
Transients and Surges

Test Setup 10



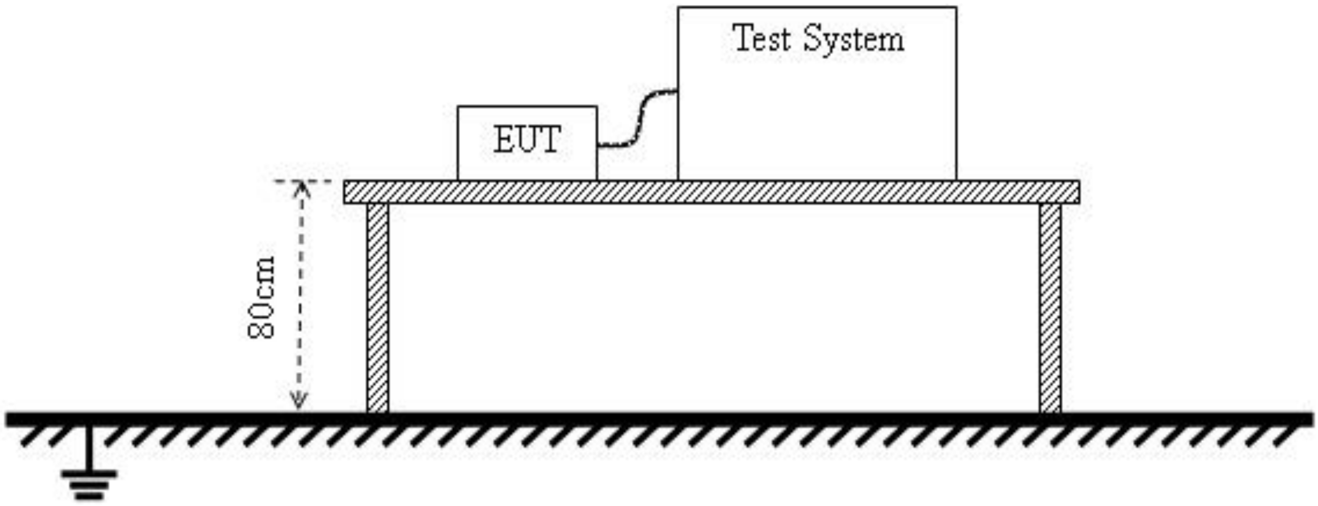
Surges

Test Setup 11



Radio Frequency Common Mode

Test Setup 12



Voltage Dips and Interruptions

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency range (MHz)	Class A (at 3 m)	Class B (at 3 m)
	Quasi-Peak Limit (dBμV/m)	Quasi-Peak Limit (dBμV/m)
30 - 230	50	40
230 - 1000	57	47

Frequency range (MHz)	Class A (at 3 m)		Class B (at 3 m)	
	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)
1000-3000	76	56	70	50
3000-6000	80	60	74	54

NOTE:

1) The lower limit shall apply at the transition frequency.
2) Additional provisions may be required for cases where interference occurs.

5.1.1.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 1. The photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by antenna with 2 orthogonal polarities.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz

VBW ≥ RBW

Sweep = auto

Detector function = peak for f <1 GHz, peak & RMS Average for f ≥ 1 GHz

Trace = max hold

5.1.1.4 Test Result and Test Equipment List

Please refer to ANNEX A.1.

5.1.2 Conducted Emission

5.1.2.1 Test Limit

AC Port

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dBμV)	Average (dBμV)	Quasi-peak (dBμV)	Average (dBμV)
0.15 - 0.50	79	66	66-56	56-46
0.50 - 5	73	60	56	46
5 - 30	73	60	60	50

DC Port

Frequency range (MHz)	Quasi-peak (dBμV)	Average (dBμV)
0.15 - 0.50	79	66
0.50 - 30	73	60

NOTE:

1) The lower limit shall apply at the band edges.
2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

Wired Network Port

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dBμV)	Average (dBμV)	Quasi-peak (dBμV)	Average (dBμV)
0.15 - 0.50	97-87	84-74	84-74	74-64
0.50 - 30	87	74	74	64

NOTE:

1) The lower limit shall apply at the band edges.
2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 2 or/and setup 3. The photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

Measurement of common mode (asymmetric mode)voltage emissions at wired network ports for attachment of unscreened balanced pairs shall be performed with the wired network port connected by a cable to an AAN. The AAN shall define the common mode termination impedance seen by the wired network port during the emission measurements.
The voltage division factor shall be added to the measured voltage measured by the receiver directly at the voltage measurement port of the AAN and the result compared with the voltage limits as applicable.

Use the following spectrum analyzer settings:

RBW = 9 kHz

VBW ≥ RBW

Sweep = 10 ms

Detector function =peak & Average

Trace = max hold

5.1.2.4 Test Result and Test Equipment List

Please refer to ANNEX A.2.

5.1.3 Harmonic Current Emissions

5.1.3.1 Classification of equipment

Class A:
– balanced three-phase equipment;
– household appliances, excluding equipment identified as Class D;
– tools, excluding portable tools;
–dimmers for incandescent lamps;
– audio equipment.
Equipment not specified in one of the three other classes shall be considered as Class A equipment.
Class B:
– portable tools;
– arc welding equipment which is not professional equipment.
Class C:
– lighting equipment.
Class D:
Equipment having a specified power according to 6.2.2 less than or equal to 600 W, of the following types:
– personal computers and personal computer monitors;
– television receivers.
– refrigerators and freezers having one or more variable-speed drives to control compress or motor(s).

5.1.3.2 Limit

For the following four categories of equipment, limits are not specified in this document:
– equipment with a rated power of 75 W or less, other than lighting equipment;
– professional equipment with a total rated power greater than 1kW;
– symmetrically controlled heating elements with a rated power less than or equal to 200 W;
– independent dimmers for incandescent lamps with a rated power less than or equal to 1 kW.
Limits of other equipment as follow:

Table 1–Limits for Class A equipment

Odd harmonic		Even harmonics	
Harmonic order n	Maximum permissible harmonic current A	Harmonic order n	Maximum permissible harmonic current A
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	8≤n≤40	0.23 x 8/n
11	0.33		
13	0.21		
15≤n≤39	0.15 x 15/n		

Table 2–Limits for Class C equipment

Harmonic order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency %
2	2
3	$30 \cdot \lambda$[a]
5	10
7	7
9	5
11≤n≤39 (odd harmonics only)	3
[a] λ is the circuit power factor.	

Table 3–Limits for Class D equipment

Harmonic order n	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13≤n≤39 (odd harmonics only)	3.85/n	See Table 1

5.1.3.3 Application of limit

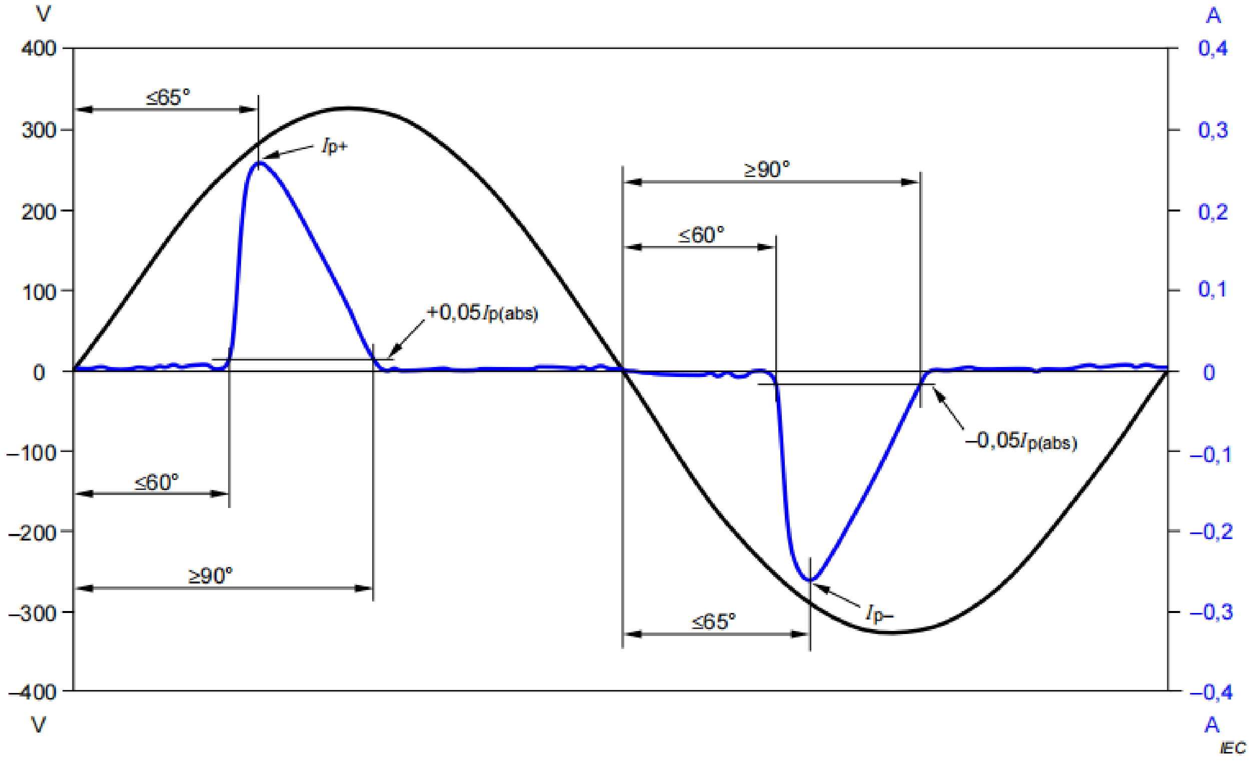
Class A equipment: For Class A equipment, the harmonics of the input current shall not exceed the values given in Table 1.
Class B equipment: For Class B equipment, the harmonics of the input current shall not exceed the values given in Table 1 multiplied by a factor of 1,5.
Class C equipment: For Class C equipment, as follow:

a) Active input power > 25 W

For lighting equipment having an active input power greater than 25 W,the harmonic currents shall not exceed the relative limits given in Table 2.
However, the limits given in Table 1 apply to incandescent lighting equipment that has built-in dimmers or consists of dimmers built in an enclosure.
For discharge lighting equipment that has built-in dimmers or consists of independent dimmers or dimmers built in an enclosure, the following conditions apply:

- the harmonic current values for the maximum load condition derived from the percentage limits given in Table 2 shall not be exceeded;
- in any dimming position,the harmonic current shall not exceed the value of current allowed in the maximum load condition;
- the equipment shall be tested according to the conditions given in Clause C.5(see the last paragraph of C.5.3).

b) Rated power ≤ 25 W



NOTE $I_{p(abs)}$ is the higher absolute value of I_{p+} and I_{p-}.

Discharge lighting equipment having an active input power smaller than or equal to 25 W shall comply with one of the following two sets of requirements:

-the harmonic currents shall not exceed the power-related limits of Table 3,column 2,or:-the third harmonic current, expressed as a percentage of the fundamental current, shall not exceed 86% and the fifth harmonic current shall not exceed 61%.Also,the waveform of the input current shall be such that it reaches the 5% current threshold before or at 60°,has its peak value before or at 65°and does not fall below the 5% current threshold before 90°, referenced to any zero crossing of the fundamental supply voltage. The current threshold is 5 % of the highest absolute peak value that occurs in the measurement window, and the phase angle measurements are made on the cycle that includes this absolute peak value. See above figure.

If the discharge lighting equipment has a built-in dimming device, measurement is made only in the full load condition.

Class D equipment: For Class D equipment, the harmonics of the input current shall not exceed the values given in Table 3.

5.1.3.4 Test Setup

Please refer to 4.3 section description of test setup of test setup 4. The photo of test setup please refer to ANNEX B.

5.1.3.5 Test Procedure

The EUT is placed on the top of a wooden table 0.8 m above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

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 necessary for the EUT to be exercised.

5.1.3.6 Test Result and Test Equipment List

Please refer to ANNEX A.3.

5.1.4 Voltage Fluctuations and Flicker

5.1.4.1 Limit

Test Item	Limit	Note
Pst	1.0	Short-term flicker indicator
Plt	0.65	Long-term flicker indicator
Tdt	0.5	Maximum time that dt exceeds 3%
dmax (%)	4%	Maximum relative voltage change
dc (%)	3.3%	Relative steady-state voltage change

5.1.4.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 5. The photo of test setup please refer to ANNEX B.

5.1.4.3 Test Procedure

During the Flicker measurement, the measure time shall include that part of whole operation changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours. The test specifications refer the next table.

No.	Specification	Value
1	Test Frequency	50 Hz
2	Test Voltage	230 VAC
3	Waveform	Sine
4	Test Time	10 minutes for Pst; 2 hours for Plt

5.1.4.4 Test Result and Test Equipment List

Please refer to ANNEX A.4.

5.2 Immunity Tests

5.2.1 Test Performance Criteria for Immunity Test

5.2.1.1 Performance Criteria (EN 301489-1)

5.2.1.1.1 General Performance Criteria

Performance criteria for continuous phenomena

During the test, the equipment shall:

• continue to operate as intended;

• not unintentionally transmit;

• not unintentionally change its operating state;

• not unintentionally change critical stored data.

Performance criteria for transient phenomena

For all ports and transient phenomena with the exception described below, the following applies:

• The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data.

• After application of the transient phenomena, the equipment shall operate as intended.

For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:

• For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

• For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

Note: For a 70 % residual voltage dip and voltage interruption tests in the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) , above Performance criteria for transient phenomena is not applicable. The following criteria are used to replace it:

• volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator.

• no unintentional responses shall occur at the end of the test, when the voltage is restored to nominal.

• in the event of loss of function(s) or in the event of loss of user stored data, this fact shall be recorded.

5.2.1.2 Performance criteria (EN 301489-3)

5.2.1.2.1 General Performance Criteria

The performance criteria are used to make an assessment whether a radio equipment passes or fails immunity tests.

Only the performance criteria specified in the present document or in ETSI EN 301 489-1 [1] where referenced shall apply.

The provisions of ETSI EN 301 489-1 [1], clause 6, shall apply together with the following.

Continuous and non-continuous operation	Operating modes
Latency is the time delay between the initiation and the completion of operation of the EUT. Correct functioning requires completing the relevant operation within the maximum latency time. Where the maximum latency is specified in the applicable harmonised radio standard (in the wanted performance criterion, or an acknowledge requirement), that value shall be used. Where this is not the case, then the maximum latency is that required by the intended use of the EUT.	Where the EUT has more than one mode of operation (see clause 4.4.1), an unplanned transition from one mode to another is considered as an unintentional response. The EUT shall be tested in all modes to confirm there are no such unintentional responses.

5.2.1.3 Performance criteria (EN 301489-17)

5.2.1.3.1 General Performance Criteria

Type	During test	After test
Criterion 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.
Criterion 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.
Criterion C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data
NOTE: For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to10 %. For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment.		

5.2.1.3.2 Performance criteria for Continuous phenomena

The performance criteria A shall apply.

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

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

5.2.1.3.3 Performance criteria for Transient phenomena

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

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

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

5.2.2 Electrostatic Discharge

5.2.2.1 Test Specification

Specification	Value
Basic Standard	EN 61000-4-2
Discharge Impedance	330 Ohm / 150 pF
Discharge Voltage	Air Discharge: 2 kV; 4 kV; 8 kV; Contact Discharge: 4 kV
Polarity	Positive / Negative
Number of Discharge	Minimum 20 times at each test point
Discharge Mode	Single discharge
Discharge Period	1 second minimum

5.2.2.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 6. The photo of test setup please refer to ANNEX B.

5.2.2.3 Test Procedure

1. Electrostatic discharges are applied only to those points and surfaces of the EUT that are accessible to users during normal operation.

2. The test is performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

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

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

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

6. Air discharges are 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 is removed from the EUT and re-triggered for a new single discharge. The test is repeated until all discharges were completed.

7. At least ten single discharges (in the most sensitive polarity) are applied to the Horizontal Coupling Plane at points on each side of the EUT. The ESD generator is positioned vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.

8. At least ten single discharges (in the most sensitive polarity) are applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5 m*0.5 m) is placed vertically to and 0.1 meters from the EUT.

5.2.2.4 Test Result and Test Equipment List

Please refer to ANNEX A.5.

5.2.3 Radio Frequency Electromagnetic Field

5.2.3.1 Test Specification

Specification	Value
Basic Standard	EN 61000-4-3
Frequency Range	80 MHz to 6000 MHz
Field Strength	3 V/m (unmodulated, r.m.s)
Modulation	1 kHz 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	3 seconds

5.2.3.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 7. The photo of test setup please refer to ANNEX B.

5.2.3.3 Test Procedure

PER Test:

Before testing, we should set the base station(CMW500) to the mode that needs to be tested, such as Bluetooth or WIFI, then set EUT to the corresponding mode and connect to Base station. Adjust the base station interface to the PER interface, and observe the PER value on the base station interface by adding interference signal during the test.

The test procedure is in accordance with EN 61000-4-3.

1. The testing is performed in a fully anechoic chamber. The transmit antenna is located at a distance of 3 meters from the EUT.

2. The test signal is 80% amplitude modulated with a 1 kHz sine wave.

3. The frequency range is swept from 80 MHz to 6000 MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers. The rate of sweep does not exceed 1.5*10-3 decade/s. Where the frequency range is swept incrementally, the step size is 1% of fundamental.

4. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

5. The field strength level is 3 V/m.

6. When equipment can be used in different orientations (i .e. vertical or horizontal) all sides shall be exposed to the field during the test. When technically justified , some EUTs can be tested by exposing fewer faces to the generating antenna. In other cases , as determined for example by the type and size of EUT or the frequencies of test , more than four azimuths may need to be exposed,but only the worst side data is reported in this report.

5.2.3.4 Test Result and Test Equipment List

Please refer to ANNEX A.6.

5.2.4 Fast Transients Common Mode

5.2.4.1 Test Specification

Specification	Value
Basic Standard	EN 61000-4-4
Test Voltage	AC Power Port: 1 kV.
	DC Power Ports,Signal Ports,Control Ports, Wired Network Ports: 0.5 kV.
Polarity	Positive / Negative
Impulse Frequency	5 kHz; 100 kHz only for xDSL wired network port
Impulse Wave Shape	5/50 ns
Burst Duration	15 ms
Burst Period	300 ms
Test Duration	> 1 min

5.2.4.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 8. The photo of test setup please refer to ANNEX B.

5.2.4.3 Test Procedure

1. The EUT is tested with 1000 V discharges to the AC power input leads, and 500 V for wired network ports/ control ports/ DC power ports.

2. Both positive and negative polarity discharges are applied.

3. The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1m.

4. The duration time of each test sequential is 1min.

5. The transient / burst waveform is in accordance with IEC 61000-4-4, 5/50 ns.

5.2.4.4 Test Result and Test Equipment List

Please refer to ANNEX A.7.

5.2.5 Transients and Surges

Specification	Value
Basic Standard	ISO 7637-2
Immunity Test Level	III
Voltage	DC 12 V/24V
Test Pulse Number	1, 2a, 2b, 3a, 3b, 4
Test Times	For the purpose of EMC testing it is sufficient to apply pulses 1, 2a, 2b and 4, 10 times each, and apply the test pulses 3a and 3b for 20 minutes each.

5.2.5.1 Test Setup

Please refer to 4.3 section description of test setup of test setup 9. The photo of test setup please refer to ANNEX B.

5.2.5.2 Test Procedure

1. The immunity of ESA representative of its type shall be tested by the method(s) according to ISO 7637-2: 2011.

2. For test pulses 3a and 3b, the leads between the terminals of the test pulse generator and the DUT shall be laid out in a straight parallel line at a height of (500+10 mm) above the ground plane and shall have a length of (0,5 ± 0,1) m.

3. Please refer to Annex B for the photographs of the Test Configuration.

5.2.5.3 Test Result and Test Equipment List

Please refer to ANNEX A.8.

5.2.6 Surges

5.2.6.1 Test Specification

AC Power Port and Wired Network Port

Specification	Value	
Ports class	AC Power Port	Wired Network Port
Basic Standard	EN 61000-4-5	
Waveform	Voltage: 1.2/50 μs	Voltage:1.2/50us,or 10/700 μs See Note 2,3,4
Test Voltage	line to ground 2 kV, line to line 1 kV; line to ground 1 kV, line to line 0.5 kV(Note 1)	0.5 kV,or 1 kV See Note 2,3,4
Polarity	Positive / Negative	
Phase Angle	0°, 90°, 180°, 270°	N/A
Repetition Rate	60 seconds	
Times	5 times per condition	

Note 1: The test level for AC mains ports, in telecommunications centres.
Note 2: The test level for wired network ports, intended to be connected to indoor cables (longer than 30 m) shall be 0,5 kV (applied line to ground, or shield to ground).The test generator shall provide the 1,2/50 μs pulse.
Note 3: The test level for symmetrically operated, wired network ports, intended to be directly connected to wired network ports via outdoor cables, shall be 1 kV (applied lines to ground).The test generator shall provide the 10/700 μs pulse.
Note 4: The test level for non-symmetrically operated wired network ports, intended to be directly connected to wired network ports via outdoor cables, shall be 1 kV (applied line to ground, or shield to ground) and 0,5 kV (applied line to line).The test generator shall provide the 1,2/50 μs pulse.

5.2.6.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 10. The photo of test setup please refer to ANNEX B.

5.2.6.3 Test Procedure

The EUT and the auxiliary equipment are placed on a table of 0.8 m heights above a metal ground reference plane. The size of ground plane is greater than 1 m*1 m and project beyond the EUT by at least 0.1 m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT is less than 2 meters (provided by the manufacturer).
The EUT is connected to the power mains through a coupling device that directly couples the surge interference signal. The surge noise is applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).
The surges are applied line to line and line(s) to earth. When testing line to earth the test voltage is applied successively between each of the lines and earth. Set up to the test level specified increased the test voltage. All lower levels including the selected test level are tested. The polarity of each surge level included positive and negative test pulses.

5.2.6.4 Test Result and Test Equipment List

Please refer to ANNEX A.9.

5.2.7 Radio Frequency Common Mode

5.2.7.1 Test Specification

Specification	Value
Basic Standard	EN 61000-4-6
Frequency Range	0.15 MHz – 80 MHz
Field Strength	3 V rms (unmodulated, r.m.s)
Modulation	1 kHz sine wave, 80% AM
Frequency Step	1% of fundamental
Coupled Cable	AC Power Port; DC Power Port; Wired Network Port

5.2.7.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 11. The photo of test setup please refer to ANNEX B.

5.2.7.3 Test Procedure

PER Test:

Before testing, we should set the base station(CMW500) to the mode that needs to be tested, such as Bluetooth or WIFI, then set EUT to the corresponding mode and connect to Base station. Adjust the base station interface to the PER interface, and observe the PER value on the base station interface by adding interference signal during the test.

The test procedure was in accordance with EN 61000-4-6.

1. The EUT shall be tested within its intended operating and climatic conditions.
2. 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.
3. The test signal is 80% amplitude modulated with a 1 kHz sine wave.
4. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80% amplitude. The sweep rate shall not exceed 1.5*10-3 decades/s. The step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value where the frequency is swept incrementally.
5. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequencies and harmonics or frequencies of dominant interest, shall be analyzed separately.
6. Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.

5.2.7.4 Test Result and Test Equipment List

Please refer to ANNEX A.10.

5.2.8 Voltage Dips and Interruptions

5.2.8.1 Test Specification

Specification	Value
Basic Standard	EN 61000-4-11
Voltage Dips	0% Residual: 10 ms; 0% Residual: 20 ms; 70% Residual: 500 ms
Voltage Interruptions	0% Residual: 5000 ms
Voltage Phase Angle	0°

5.2.8.2 Test Setup

Please refer to 4.3 section description of test setup of test setup 12. The photo of test setup please refer to ANNEX B.

5.2.8.3 Test Procedure

The power cord is used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.

The EUT is tested for a) 0% voltage residual of supplied voltage with duration of 10 ms; b) 0% voltage residual of supplied voltage with duration of 20 ms;c) 70% voltage residual of supplied voltage and duration 500 ms. Both of the dip tests are carried out for a sequence of three voltage dips with intervals of 10 seconds.

0% voltage residual of supplied voltage with duration of 5000 ms is followed, which is a sequence of three voltage interruptions with intervals of 10 seconds.

Voltage reductions occur at 0 degrees crossover point of the voltage waveform. The performance of the EUT is checked after the voltage dip or interruption.

5.2.8.4 Test Result and Test Equipment List

Please refer to ANNEX A.11.

ANNEX A TEST RESULTS

A.1 Radiated Emission

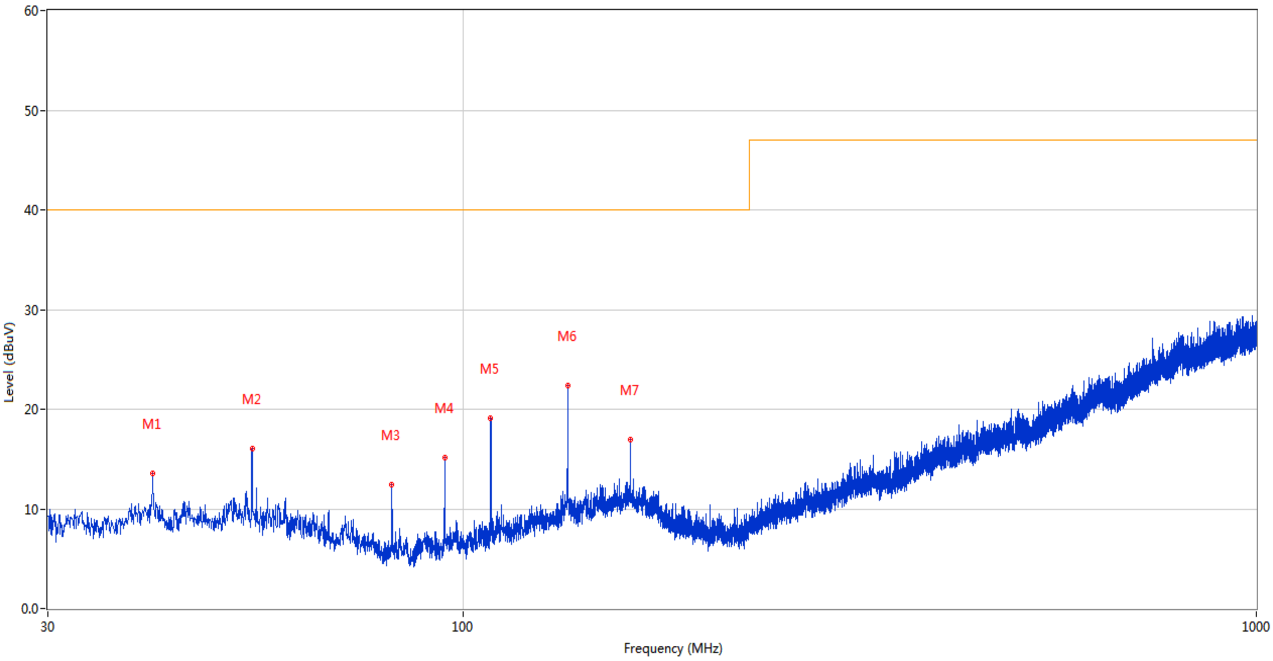
Note 1: Measurements shall be made with a quasi-peak measuring receiver in the frequency range 30 MHz to 1000 MHz. To reduce the testing time, a peak measuring receiver may be used instead of a quasi-peak measuring receiver. In case of dispute, measurement with a quasi-peak measuring receiver will take precedence.

Note 2: The marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth carrier frequencies.

Sample No.	S04	Temperature	22.1℃
Humidity	59%RH	Pressure	101kPa
Test Engineer	Gong Baihua	Test Date	2024.04.28

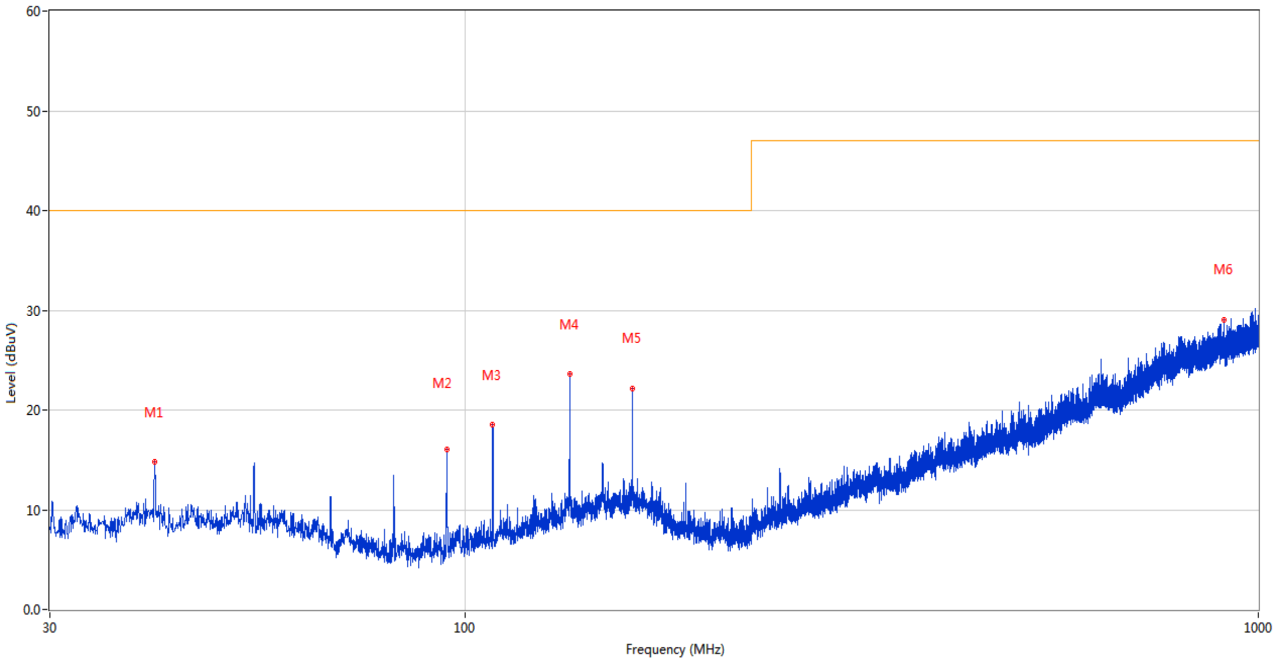
Test Mode 1

1) Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	40.670	13.53	-26.09	40.0	26.47	Peak	216.00	100	Vertical	Pass
2	54.250	16.06	-26.97	40.0	23.94	Peak	214.00	100	Vertical	Pass
3	81.362	12.38	-30.28	40.0	27.62	Peak	194.00	200	Vertical	Pass
4	94.893	15.13	-30.06	40.0	24.87	Peak	315.00	100	Vertical	Pass
5	108.473	19.11	-29.12	40.0	20.89	Peak	313.00	100	Vertical	Pass
6	135.584	22.32	-26.35	40.0	17.68	Peak	315.00	100	Vertical	Pass
7	162.696	16.93	-25.28	40.0	23.07	Peak	194.00	200	Vertical	Pass

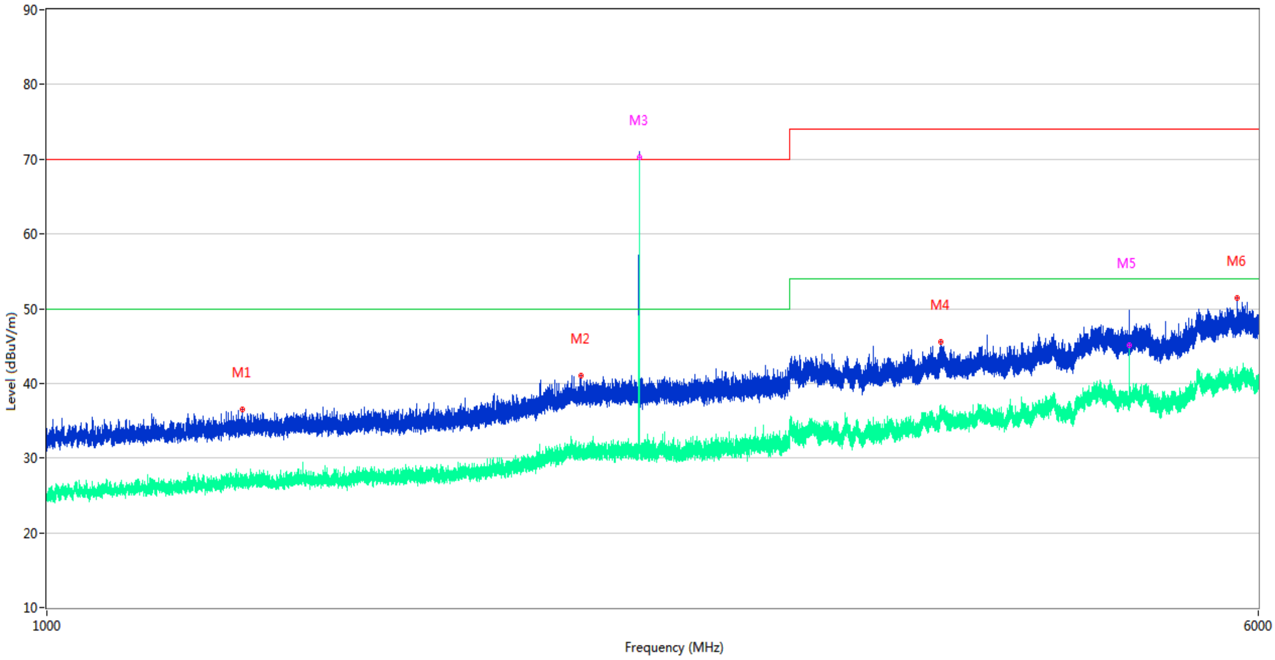
2) Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	40.670	14.77	-26.09	40.0	25.23	Peak	171.00	200	Horizontal	Pass
2	94.941	16.06	-30.01	40.0	23.94	Peak	235.00	200	Horizontal	Pass
3	108.473	18.51	-29.12	40.0	21.49	Peak	229.00	200	Horizontal	Pass
4	135.584	23.64	-26.35	40.0	16.36	Peak	104.00	100	Horizontal	Pass
5	162.745	22.20	-25.28	40.0	17.80	Peak	88.00	100	Horizontal	Pass
6	905.328	28.99	-10.97	47.0	18.01	Peak	69.00	100	Horizontal	Pass

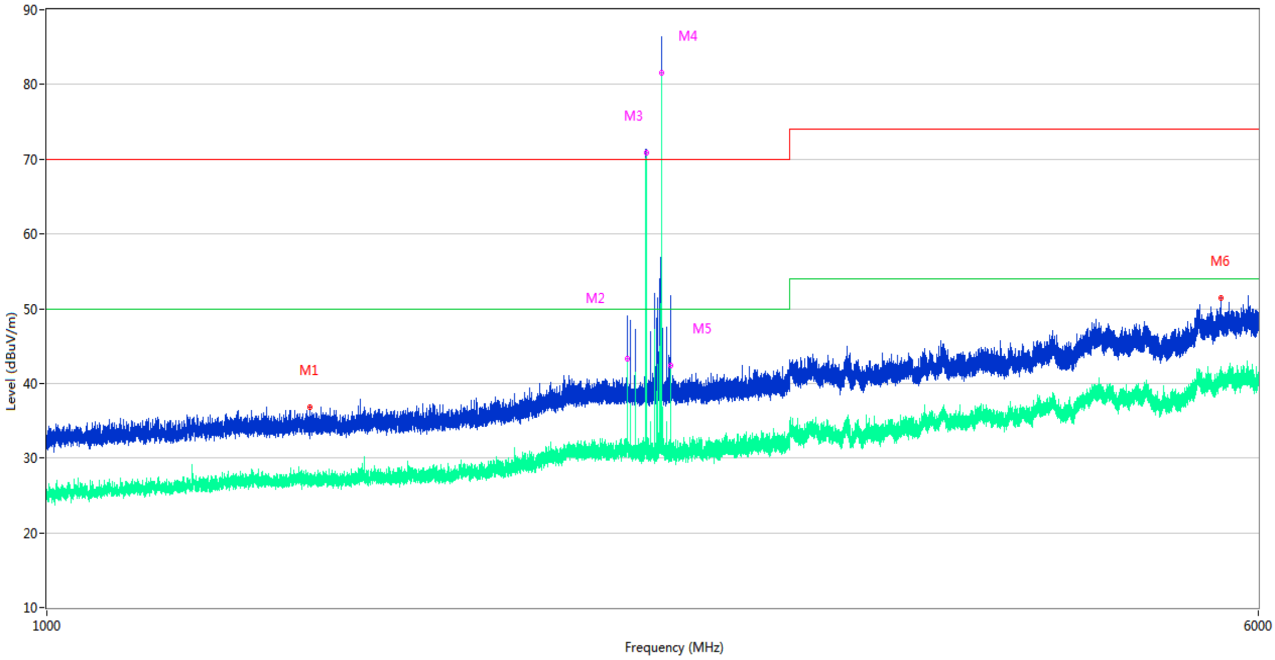
Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency Below 1 GHz						
EMI Receiver	Keysight	N9038A	MY55330120	2023.09.05	2024.09.04	☒
Amplifier (30MHz-1GHz)	COM-MV	ZT30-1000M	B2017119081	2023.12.05	2024.12.04	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-00867	2022.04.12	2025.04.11	☒
Anechoic Chamber（#2）	YiHeng	9m*6m*6m	142	2021.08.19	2024.08.18	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

3) Test Antenna Vertical, 1 GHz – 6 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1336.300	36.48	-16.02	70.0	33.52	Peak	31.00	100	Vertical	Pass
1**	1336.300	26.90	-16.02	50.0	23.10	AV	31.00	100	Vertical	Pass
2	2202.100	41.00	-12.28	70.0	29.00	Peak	52.00	100	Vertical	Pass
2**	2202.100	30.49	-12.28	50.0	19.51	AV	52.00	100	Vertical	Pass
3	2402.000	70.73	-11.64	70.0	-0.73	Peak	31.00	100	Vertical	N/A
3**	2402.000	70.20	-11.64	50.0	-20.20	AV	31.00	100	Vertical	N/A
4	3753.450	45.48	-5.97	74.0	28.52	Peak	43.00	100	Vertical	Pass
4**	3753.450	35.37	-5.97	54.0	18.63	AV	43.00	100	Vertical	Pass
5	4959.600	47.99	-3.40	74.0	26.01	Peak	9.00	100	Vertical	N/A
5**	4959.600	45.09	-3.40	54.0	8.91	AV	9.00	100	Vertical	N/A
6	5818.650	51.36	-0.29	74.0	22.64	Peak	297.00	100	Vertical	Pass
6**	5818.650	40.91	-0.29	54.0	13.09	AV	297.00	100	Vertical	Pass

4) Test Antenna Horizontal, 1 GHz – 6 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1475.300	36.82	-16.60	70.0	33.18	Peak	285.00	100	Horizontal	Pass
1**	1475.300	27.37	-16.60	50.0	22.63	AV	285.00	100	Horizontal	Pass
2	2358.900	45.78	-11.43	70.0	24.22	Peak	15.00	100	Horizontal	Pass
2**	2358.900	43.32	-11.43	50.0	6.68	AV	15.00	100	Horizontal	Pass
3	2426.200	71.34	-11.49	70.0	-1.34	Peak	268.00	100	Horizontal	N/A
3**	2426.200	70.80	-11.49	50.0	-20.80	AV	268.00	100	Horizontal	N/A
4	2481.200	84.84	-11.03	70.0	-14.84	Peak	90.00	100	Horizontal	N/A
4**	2481.200	81.50	-11.03	50.0	-31.50	AV	90.00	100	Horizontal	N/A
5	2516.900	38.90	-11.10	70.0	31.10	Peak	0.00	100	Horizontal	Pass
5**	2516.900	42.32	-11.10	50.0	7.68	AV	0.00	100	Horizontal	Pass
6	5678.700	51.39	-0.91	74.0	22.61	Peak	280.00	100	Horizontal	Pass
6**	5678.700	40.95	-0.91	54.0	13.05	AV	280.00	100	Horizontal	Pass

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency Above 1 GHz						
EMI Receiver	Keysight	N9038A	MY55330120	2023.09.05	2024.09.04	☒
Amplifier (1-12GHz)	Advanced Microwave	WLA652A	1740103	2023.12.05	2024.12.04	☒
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	01917	2022.06.09	2025.06.08	☒
Anechoic Chamber（#2）	YiHeng	9m*6m*6m	142	2021.08.19	2024.08.18	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

A.2 Conducted Emissions

Note: Not applicable.

A.3 Harmonic Current Emissions

Note: Not applicable.

A.4 Voltage Fluctuations & Flicker

Note: Not applicable.

A.5 Electrostatic Discharge

Sample No.	S04	Temperature	21.5℃
Humidity	47%RH	Pressure	101kPa
Test Engineer	Chen Yuwei	Test Date	2024.05.06

Test Mode	Discharge Type	Test Position	Test Level (kV)	Discharge Times	Result
Mode 1	Air	Key	±2,±4,±8	60	Pass
		Fuselage and Crevices	±2,±4,±8	300	Pass
	Contact	HCP	±4	100	Pass
		VCP	±4	100	Pass
		Ostiole	±4	20	Pass

Note: The performance comply with Performance criteria for Transient phenomena.

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
ESD Test System	EMTEST	DITO	P1833222423	2023.08.04	2024.08.03	☒

A.6 Radio Frequency Electromagnetic Field

Sample No.	S04	Temperature	25.3℃
Humidity	52%RH	Pressure	101kPa
Test Engineer	Xiao Tangqi	Test Date	2024.05.06

Test Mode	Test Fre. (MHz)	Test Level (V/m)	Antenna Polarity	Step (MHz)	Dwell Time (s)	Test Position	Result
Mode 1	80 - 1000	3	Horizontal	1%	3	Front; Back; Left; Right; Top; Bottom	Pass
	80 - 1000	3	Vertical	1%	3	Front; Back; Left; Right; Top; Bottom	Pass
	1000 - 6000	3	Horizontal	1%	3	Front; Back; Left; Right; Top; Bottom	Pass
	1000 - 6000	3	Vertical	1%	3	Front; Back; Left; Right; Top; Bottom	Pass

Note 1: The performance comply with Performance criteria for Continuous phenomena.

Note 2: During the test, the PER of Bluetooth are less than 10%.

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Anechoic Chamber	ChangNing	7m*4m*3m	103	2022.10.28	2025.10.27	☒
Signal Generator	Agilent	N5181A	MY50141752	2023.12.05	2024.12.04	☒
Power Amplifier	OPHIR RF	5225F	1037	2023.12.27	2024.12.26	☒
Power Amplifier	OPHIR RF	5273F	1016	2023.12.27	2024.12.26	☒
Power Amplifier	RFLIGHT	NTWPAS-2560025	17043109	2023.12.27	2024.12.26	☒
Power Meter	R&S	NRP-Z11	117410/117693	2023.06.12	2024.06.11	☒
Field Strength Meter	Narda	EP 602	611WX80276	2023.09.12	2024.09.11	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-977	2022.02.16	2025.02.15	☒
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	1148	2022.04.12	2025.04.11	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

A.7 Fast Transients Common Mode

Note: Not applicable.

A.8 Transients and Surges

Note: Not applicable.

A.9 Surges

Note: Not applicable.

A.10 Radio Frequency Common Mode

Note: Not applicable.

A.11 Voltage Dips and Interruptions

Note: Not applicable.

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2440809-AE-1.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2440809-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2440809-AI.PDF”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
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5. The test data and results are only valid for the tested samples provided by the customer.
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7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--

TEST REPORT

Applicant:	Woan Technology (Shenzhen) Co., Ltd.
Address:	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R.China, 518100
Equipment Type:	SwitchBot Wallet Finder Card
Model Name:	W2500032
Brand Name:	SwitchBot
Test Standard:	IEC 62368-1: 2018 EN IEC 62368-1: 2020+A11: 2020
Sample Arrival Date:	May 08, 2024
Test Date:	May 08, 2024 - May 15, 2024
Date of Issue:	May 28, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

CERTIFICATION • CONSULTING • SOLUTION • SERVICE BALUN

Tested by: Junfeng Xie **Checked by:** Terry Wen **Approved by:** Liao Jianming (Technical Director)

Junfeng Xie Terry Wen Jm Liao

Revision History

Version	Issue Date	Revisions
Rev. 01	May 28, 2024	Initial Issue

TABLE OF CONTENTS

1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province
Description	All measurement facilities used to collect the measurement data are located at Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R.China, 518100

2.2 Manufacturer Information

Manufacturer	Woan Technology (Shenzhen) Co., Ltd.
Address	Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R.China, 518100

2.3 General Description for Equipment under Test (EUT)

Equipment Type	SwitchBot Wallet Finder Card
Model Name Under Test	W2500032
Series Model Name	W2500031, W2500033, W2500034, W2500035
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structu re, but only differ in model name and combinations. (this information provided by the applicant)
Hardware Version	V02
Software Version	V01
Dimensions(Approx.)	/
Weight(Approx.)	13.4g

2.4 Ancillary Equipment

Ancillary Equipment 1	Lithium Manganese Cell	
	Brand Name	SwitchBot
	Model No.	CP114752B
	Serial No.	N/A
	Capacitance	540mAh
	Rated Voltage	3.0V
	Limited Voltage	N/A
	Manufacturer	GN Energy Technology Co.,Ltd
Note 1:		

2.5 Technical Information

The requirement for the following technical information of the EUT was tested in this report:

Ratings	Input: / Internal battery rated capacity: 540mAh, nominal voltage: 3.0Vd.c., Class III.
Product group	☒ end product ☐ built-in component
Classification of use by	☒ Ordinary person ☐ Instructed person ☐ Skilled person ☒ Children likely to be present
Supply Connection	☐ AC Mains ☐ DC Mains ☒ External Circuit - not Mains connected - ☒ ES1 ☐ ES2 ☐ ES3
Supply % Tolerance	☐ +10%/-10% ☐ +20%/-15% ☐ +____%/ -_____% ☒ None
Supply Connection – Type	☐ pluggable equipment type A - ☐ non-detachable supply cord ☐ appliance coupler ☐ direct plug-in ☐ mating connector ☐ pluggable equipment type B - ☐ non-detachable supply cord ☐ appliance coupler ☐ permanent connection ☐ mating connector ☒ other: Not directly connect to mains
Considered current rating of protective device as part of building or equipment installation	☐ ______ A; Installation location: ☐ building; ☐ equipment ☒ N/A
Equipment mobility	☐ movable ☒ hand-held ☒ transportable ☐ direct plug-in ☐ stationary ☐ for building-in ☐ wall/ceiling-mounted ☐ SRME/rack-mounted ☐ other:
Over voltage category (OVC)	☐ OVC I ☐ OVC II ☐ OVC III ☐ OVC IV ☒ other: Not directly connect to mains
Class of equipment	☐ Class I ☐ Class II ☒ Class III ☐ Not classified ☐ other
Access location	☒ N/A ☐ restricted access area

	☐ outdoor location☐
Pollution degree (PD)	☐ PD 1 ☒ PD 2 ☐ PD 3
Manufacturer's specified maximum operating ambient	45°C ☐ Outdoor: minimum °C
IP protection class	☒ IPX0 ☐ IPX67
Power Systems	☐ TN ☐ TT ☐ IT - ____ V L-L; ☐ dc mains ☒ not AC mains
Altitude during operation (m)	☒ 2000m or less ☐ ______ m
Altitude of test laboratory (m)	☒ 2000m or less ☐ _______ m
Mass of equipment (kg)	☒ 13.4g
Note: The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.	

3 SUMMARY OF TEST

3.1 Test Standards

No.	Identity	Document Title
1	IEC 62368-1:2018	Audio/video, information and communication technology equipment –Part 1: Safety requirements
2	EN IEC 62368-1:2020+A11:2020	Audio/video, information and communication technology equipment –Part 1: Safety requirements

3.2 Possible test box verdict

Possible test box verdicts:
-test box does not apply to the test object. : N/A -test object does meet the requirement........: P(Pass) -test object does not meet the requirement..: F(Fail)

3.3 Test item

<table>
<tr>
<td>
Tests performed (name of test and test clause):
All applicable tests as described in Test Case and Measurement Sections were performed.
<table>
<tr><td>4</td><td>General requirements</td></tr>
<tr><td>5.2.2.2, 5.7.2.2</td><td>Classification of Steady-state Electrical Energy Sources</td></tr>
<tr><td>5.4.1.4, 6.3.2, 9.0, B.2.6</td><td>Maximum operating temperatures for materials, components and systems</td></tr>
<tr><td>6.2.2</td><td>Electrical power sources (PS) measurements for classification</td></tr>
<tr><td>6.3, 6.4</td><td>Simulated abnormal operating and single fault conditions</td></tr>
<tr><td>9.4.1</td><td>Equipment safeguards for thermal burn</td></tr>
<tr><td>Annex B.2.5</td><td>Input tests</td></tr>
<tr><td>Annex B.3</td><td>Simulated Abnormal operating condition tests</td></tr>
<tr><td>Annex B.4</td><td>Simulated single fault conditions</td></tr>
<tr><td>Annex F.3.9</td><td>Durability, legibility and permanence of markings</td></tr>
<tr><td>Annex M</td><td>Batteries</td></tr>
<tr><td>Annex T.4</td><td>Steady force test, 100 N</td></tr>
<tr><td>Annex T.7</td><td>Drop test</td></tr>
<tr><td>Annex T.8</td><td>Stress relief test</td></tr>
</table>
Note :
1. Max. ambient temperature 45°C.
2. For temperature test the thermocouples method used, regarding fault condition test simulated faults applied.
3. EUT passed all the tests.
</td>
<td>
Summary of compliance with National Differences:
List of countries addressed:
1. European group
</td>
</tr>
</table>

3.4 General information

GENERAL REMARKS:
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report.
GENERAL PRODUCT INFORMATION:
1.The equipment is a SwitchBot Wallet Finder Card, model W2500032, Series Model (W2500031, W2500033, W2500034, W2500035). The equipment is considered as Class III equipment. 2.Instructions and equipment marking related to safety is applied in the language that is acceptable in the country in which the equipment is to be sold. 3.It is powered by a built-in, non-rechargeable lithium-manganese battery, as detailed in Table 4.1.2. (ES1 and PS1 have been identified, see Table 4.1.2 for details).

OVERVIEW OF ENERGY SOURCES AND SAFEGUARDS				
Clause	**Possible Hazard**			
5	Electrically-caused injury			
Class and Energy Source (e.g. ES3: Primary circuit)	Body Part (e.g. Ordinary)	Safeguards		
		B	S	R
ES1: +3.0Vdc output of battery cell "-" and "+"	Ordinary	N/A	N/A	N/A
6	Electrically-caused fire			
Class and Energy Source (e.g. PS2: 100Watt circuit)	Material part (e.g. Printed board)	Safeguards		
		B	1st S	2nd S
PS1: <15W circuit (Internal circuit/Output of battery cell)	battery cell	Comply with 6.3	N/A	N/A
7	Injury caused by hazardous substances			
Class and Energy Source (e.g. Ozone)	Body Part (e.g., Skilled)	Safeguards		
		B	S	R
Lithium Battery	Ordinary	Complied with Annex M	N/A	N/A
8	Mechanically-caused injury			
Class and Energy Source (e.g. MS3: Plastic fan blades)	Body Part (e.g. Ordinary)	Safeguards		
		B	S	R
MS1: Edges and corners	Ordinary	N/A	N/A	N/A
MS1: Mass of the unit	Ordinary	N/A	N/A	N/A
9	Thermal burn			
Class and Energy Source (e.g. TS1: Keyboard caps)	Body Part (e.g., Ordinary)	Safeguards		
		B	S	R
TS1: Accessible parts	Ordinary	N/A	N/A	N/A
10	Radiation			
Class and Energy Source (e.g. RS1: PMP sound output)	Body Part (e.g., Ordinary)	Safeguards		
		B	S	R
N/A	N/A	N/A	N/A	N/A

Supplementary Information: “B” – Basic Safeguard; “S” – Supplementary Safeguard; “R” – Reinforced Safeguard

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

Temperature (°C)	15°C to 35°C
Relative Humidity (%)	35% to 75%
Atmospheric Pressure (kPa)	100kPa to 102kPa

4.2 Test Equipment List

No.	Equipment name	Manufacture	Serial No.	Calibration Due Date	Usage
1	Electronic Scale	WUXINHENG	BZ-SFT-L207	2024/09/11	√
2	Digital Multimeter	Fluke	BZ-SFT-L247	2025/04/16	√
3	Stop Watch	TF	BZ-SFT-L068	2025/05/14	√
4	DC electronic load	UNI-T	BZ-SFT-L239	2024/07/18	√
5	Heating Recorder	Toprie	BZ-SFT-L311	2025/04/20	√
6	Pull and push Tester	HANDPI	BZ-SFT-L045	2024/09/28	√
7	Tape Measure	DELI	BZ-SFT-L145	2024/09/15	√
8	Caliper Meter	CHENGLIANG	BZ-SFT-L317	2025/05/07	√
9	Drop test wood board	BALUN	BZ-SFT-L059	/	√

5 TEST RESULTS

4	**GENERAL REQUIREMENTS**		P
4.1.1	Acceptance of materials, components and subassemblies	See appended table 4.1.2	P
4.1.2	Use of components	Components which are certified to IEC and/or national standards are used correctly within their ratings. Components not covered by IEC standards are tested under the conditions present in the equipment. See also Annex G	P
4.1.3	Equipment design and construction	Evaluation of safeguards regarding limiting the outputs to fulfill ES1 and protection in regard to risk of spread of fire, mechanical and thermal burn injury considered.	P
4.1.4	Specified ambient temperature for outdoor use (°C) ....:		N/A
4.1.5	Constructions and components not specifically covered		N/A
4.1.8	Liquids and liquid filled components (LFC)		N/A
4.1.15	Markings and instructions	(See Annex F)	P
4.4.3	Safeguard robustness		P
4.4.3.1	General		P
4.4.3.2	Steady force tests	(See Clause T.4)	P
4.4.3.3	Drop tests	(See Clause T.7)	P
4.4.3.4	Impact tests		N/A
4.4.3.5	Internal accessible safeguard tests	No such enclosure and barrier	N/A
4.4.3.6	Glass impact tests	No Glass	N/A
4.4.3.7	Glass fixation tests	No Glass	N/A
	Glass impact test (1J)		N/A
	Push/pull test (10 N)		N/A

IEC 62368-1			
Clause	Requirement-Test	Result-Remark	Verdict
4.4.3.8	Thermoplastic material tests	(See Annex T.8)	P
4.4.3.9	Air comprising a safeguard	Considered, but no such barrier or enclosure provided	N/A
4.4.3.10	Accessibility, glass, safeguard effectiveness	All safeguards remain effective	P
4.4.4	Displacement of a safeguard by an insulating liquid		N/A
4.4.5	Safety interlocks	(See Annex K)	N/A
4.5	**Explosion**		P
4.5.1	General	(See Annex M for batteries)	P
4.5.2	No explosion during normal/abnormal operating condition	(See Clause B.2, B.3)	P
	No harm by explosion during single fault conditions	(See Clause B.4)	P
4.6	**Fixing of conductors**	Class III equipment	N/A
	Fix conductors not to defeat a safeguard		N/A
	Compliance is checked by test.................................:	(See Clause T.2)	N/A
4.7	**Equipment for direct insertion into mains socket–outlets**		N/A
4.7.2	Mains plug part complies with relevant standard... :	The EUT is not for direct insertion into mains socket outlets, class III equipment	N/A
4.7.3	Torque (Nm).. :		N/A
4.8	**Equipment containing coin/button cell batteries**		N/A
4.8.1	General	No coin/button cell batteries used.	N/A
4.8.2	Instructional safeguard... :		N/A
4.8.3	Battery compartment door/cover construction	No such battery compartment	N/A
	Open torque test		N/A
4.8.4.2	Stress relief test		N/A
4.8.4.3	Battery replacement test		N/A
4.8.4.4	Drop test		N/A
4.8.4.5	Impact test		N/A
4.8.4.6	Crush test		N/A
4.8.5	Compliance		N/A
	30N force test with test probe		N/A

Clause	Requirement-Test	Result-Remark	Verdict
	20N force test with test hook		N/A
4.9	**Likelihood of fire or shock due to entry of conductive object**		N/A
4.10	**Component requirements**		N/A
4.10.1	Disconnect Device	(See Annex L)	N/A
4.10.2	Switches and relays	(See Annex G)	N/A

5	**ELECTRICALLY-CAUSED INJURY**		P
5.2	**Classification and limits of electrical energy sources**		P
5.2.2	ES1, ES2 and ES3 limits	ES1	P
5.2.2.2	Steady-state voltage and current limits..................... :	(See appended table 5.2)	P
5.2.2.3	Capacitance limits... :	(See appended table 5.2)	N/A
5.2.2.4	Single pulse limits..:	No such single pulses generated in the EUT or applied to it.	N/A
5.2.2.5	Limits for repetitive pulses...:	No such repetitive pulses within the EUT	N/A
5.2.2.6	Ringing signals	(See Annex H)	N/A
5.2.2.7	Audio signals	(See Clause E.1)	N/A
5.3	**Protection against electrical energy sources**		P
5.3.1	General Requirements for accessible parts to ordinary, instructed and skilled persons	Only ES1 circuit can be accessible	P
5.3.1 a)	Accessible ES1/ES2 derived from ES2/ES3 circuits		P
5.3.1 b)	Skilled persons not unintentional contact ES3 bare conductors		N/A
5.3.2.1	Accessibility to electrical energy sources and safeguards		N/A
	Accessibility to outdoor equipment bare parts		N/A
5.3.2.2	Contact requirements		N/A
	Test with test probe from Annex V		—
5.3.2.2 a)	Air gap – electric strength test potential (V).............. :	(See appended table 5.4.9)	N/A
5.3.2.2 b)	Air gap – distance (mm) .... :		N/A
5.3.2.3	Compliance		N/A

IEC 62368-1			
Clause	Requirement-Test	Result-Remark	Verdict
5.3.2.4	Terminals for connecting stripped wire		N/A
5.4	**Insulation materials and requirements**		P
5.4.1.2	Properties of insulating material	All circuits or parts are considered as ES1. Insulations are not required.	N/A
5.4.1.3	Material is non-hygroscopic	No such material	N/A
5.4.1.4	Maximum operating temperature for insulating materials..:	(See appended table 5.4.1.4)	P
5.4.1.5	Pollution degrees..:	2	—
5.4.1.5.2	Test for pollution degree 1 environment and for an insulating compound	Pollution degree 2 is applied. No insulating compound applied (however see 5.5.4).	N/A
5.4.1.5.3	Thermal cycling test	See above	N/A
5.4.1.6	Insulation in transformers with varying dimensions	No such transformer within the EUT	N/A
5.4.1.7	Insulation in circuits generating starting pulses	No such starting pulses within the EUT	N/A
5.4.1.8	Determination of working voltage..............................:		N/A
5.4.1.9	Insulating surfaces		N/A
5.4.1.10	Thermoplastic parts on which conductive metallic parts are directly mounted		N/A
5.4.1.10.2	Vicat test...:		N/A
5.4.1.10.3	Ball pressure test..:		N/A
5.4.2	Clearances		N/A
5.4.2.1	General requirements		N/A
	Clearances in circuits connected to AC Mains, Alternative method	(See Annex X)	N/A
5.4.2.2	Procedure 1 for determining clearance		N/A
	Temporary overvoltage ....:		—
5.4.2.3	Procedure 2 for determining clearance		N/A
5.4.2.3.2.2	a.c. mains transient voltage.......................................:		—
5.4.2.3.2.3	d.c. mains transient voltage ....:		—

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Clause	Requirement-Test	Result-Remark	Verdict
5.4.2.3.2.4	External circuit transient voltage................................:		—
5.4.2.3.2.5	Transient voltage determined by measurement.......:		—
5.4.2.4	Determining the adequacy of a clearance using an electric strength test ....:	(See appended table 5.4.2)	N/A
5.4.2.5	Multiplication factors for clearances and test voltages ....:		N/A
5.4.2.6	Clearance measurement...:	(See appended table 5.4.2)	N/A
5.4.3	Creepage distances		N/A
5.4.3.1	General		N/A
5.4.3.3	Material group..:		—
5.4.3.4	Creepage distances measurement...........................:	(See appended table 5.4.3)	N/A
5.4.4	Solid insulation		N/A
5.4.4.1	General requirements		N/A
5.4.4.2	Minimum distance through insulation ....:	(See appended table 5.4.4.2)	N/A
5.4.4.3	Insulating compound forming solid insulation		N/A
5.4.4.4	Solid insulation in semiconductor devices		N/A
5.4.4.5	Insulating compound forming cemented joints		N/A
5.4.4.6	Thin sheet material		N/A
5.4.4.6.1	General requirements		N/A
5.4.4.6.2	Separable thin sheet material		N/A
	Number of layers (pcs) ....:		N/A
5.4.4.6.3	Non-separable thin sheet material		N/A
	Number of layers (pcs) ....:		N/A
5.4.4.6.4	Standard test procedure for non-separable thin sheet material...:	(See appended table 5.4.9)	N/A
5.4.4.6.5	Mandrel test		N/A
5.4.4.7	Solid insulation in wound components		N/A
5.4.4.9	Solid insulation at frequencies >30 kHz, E_P, K_R, d, V_{PW} (V)..:	(See appended Table 5.4.4.9)	N/A
	Alternative by electric strength test, tested voltage (V), K_R..:	(See appended Tables 5.4.4.9 and 5.4.9)	N/A

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Clause	Requirement-Test	Result-Remark	Verdict
5.4.5	Antenna terminal insulation		N/A
5.4.5.1	General		N/A
5.4.5.2	Voltage surge test		N/A
5.4.5.3	Insulation resistance (MΩ).. :		N/A
	Electric strength test..:	(See appended table 5.4.9)	N/A
5.4.6	Insulation of internal wire as part of supplementary safeguard		N/A
5.4.7	Tests for semiconductor components and for cemented joints		N/A
5.4.8	Humidity conditioning		N/A
	Relative humidity (%), temperature (°C), duration (h)... :		—
5.4.9	Electric strength test		N/A
5.4.9.1	Test procedure for type test of solid insulation....... :	(See appended table 5.4.9)	N/A
5.4.9.2	Test procedure for routine test		N/A
5.4.10	Safeguards against transient voltages from external circuits		N/A
5.4.10.1	Parts and circuits separated from external circuits		N/A
5.4.10.2	Test methods		N/A
5.4.10.2.1	General		N/A
5.4.10.2.2	Impulse test.. :	(See appended table 5.4.9)	N/A
5.4.10.2.3	Steady-state test..:	(See appended table 5.4.9)	N/A
5.4.10.3	Verification for insulation breakdown for impulse test.. :		N/A
5.4.11	Separation between external circuits and earth		N/A
5.4.11.1	Exceptions to separation between external circuits and earth		N/A
5.4.11.2	Requirements		N/A
	SPDs bridge separation between external circuit and earth		N/A
	Rated operating voltage U_{op} (V).................................:		—

Clause	Requirement-Test	Result-Remark	Verdict
	Nominal voltage U_{peak} (V)..:		—
	Max increase due to variation ΔU_{sp} .... :		—
	Max increase due to ageing ΔU_{sa} .... :		—
5.4.11.3	Test method and compliance...................................:	(See appended table 5.4.9)	N/A
5.4.12	Insulating liquid		N/A
5.4.12.1	General requirements		N/A
5.4.12.2	Electric strength of an insulating liquid....................:	(See appended table 5.4.9)	N/A
5.4.12.3	Compatibility of an insulating liquid..........................:	(See appended table 5.4.9)	N/A
5.4.12.4	Container for insulating liquid.................................. :		N/A
5.5	**Components as safeguards**		—
5.5.1	General		N/A
5.5.2	Capacitors and RC units		N/A
5.5.2.1	General requirement		N/A
5.5.2.2	Safeguards against capacitor discharge after disconnection of a connector...................................:	(See appended table 5.5.2.2)	N/A
5.5.3	Transformers		N/A
5.5.4	Optocouplers	(See sub-clause 5.4 or Clause G.12)	N/A
5.5.5	Relays	(See sub-clause 5.4)	N/A
5.5.6	Resistors	(See Clause G.10)	N/A
5.5.7	SPDs	(See Clause G.8)	N/A
5.5.8	Insulation between the mains and an external circuit consisting of a coaxial cable..........................:		N/A
5.5.9	Safeguards for socket-outlets in outdoor equipment		N/A
	RCD rated residual operating current (mA).............:		—
5.6	**Protective conductor**		N/A
5.6.2	Requirement for protective conductors		N/A
5.6	**Protective conductor**		N/A
5.6.2	Requirement for protective conductors		N/A
5.6.2.1	General requirements		N/A
5.6.2.2	Colour of insulation		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
5.6.3	Requirement for protective earthing conductors		N/A
	Protective earthing conductor size (mm^2) .... :		—
	Protective earthing conductor serving as a reinforced safeguard		N/A
	Protective earthing conductor serving as a double safeguard		N/A
5.6.4	Requirements for protective bonding conductors		N/A
5.6.4.1	Protective bonding conductors		N/A
	Protective bonding conductor size (mm^2)................. :		—
5.6.4.2	Protective current rating (A)....................................... :		N/A
5.6.5	Terminals for protective conductors		N/A
5.6.5.1	Terminal size for connecting protective earthing conductors (mm)... :		N/A
	Terminal size for connecting protective bonding conductors (mm)..:		N/A
5.6.5.2	Corrosion		N/A
5.6.6	Resistance of the protective bonding system		N/A
5.6.6.1	Requirements		N/A
5.6.6.2	Test Method..:	(See appended table 5.6.6)	N/A
5.6.6.3	Resistance (Ω) or voltage drop.................................:	(See appended table 5.6.6)	N/A
5.6.7	Reliable connection of a protective earthing conductor		N/A
5.6.8	Functional earthing		N/A
	Conductor size (mm^2)... :		N/A
	Class II with functional earthing marking .... :		N/A
	Appliance inlet cl & cr (mm)...................................... :		N/A
5.7	**Prospective touch voltage, touch current and protective conductor current**		N/A
5.7.2	Measuring devices and networks		N/A
5.7.2.1	Measurement of touch current		N/A
5.7.2.2	Measurement of voltage		N/A
5.7.3	Equipment set-up, supply connections and earth		N/A

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Clause	Requirement-Test	Result-Remark	Verdict

	connections		
5.7.4	Unearthed accessible parts...................................... :	(See appended table 5.7.4)	N/A
5.7.5	Earthed accessible conductive parts.......................:	(See appended table 5.7.5)	N/A
5.7.6	Requirements when touch current exceeds ES2 limits		N/A
	Protective conductor current (mA)........................... :		N/A
	Instructional Safeguard..:		N/A
5.7.7	Prospective touch voltage and touch current associated with external circuits		N/A
5.7.7.1	Touch current from coaxial cables		N/A
5.7.7.2	Prospective touch voltage and touch current associated with paired conductor cables		N/A
5.7.8	Summation of touch currents from external circuits		N/A
	a) Equipment connected to earthed external circuits, current (mA).. :		N/A
	b) Equipment connected to unearthed external circuits, current (mA).. :		N/A
5.8	**Backfeed safeguard in battery backed up supplies**		N/A
	Mains terminal ES... :	(See appended table 5.8)	N/A
	Air gap (mm).. :		N/A

6	**ELECTRICALLY- CAUSED FIRE**		P
6.2	**Classification of PS and PIS**		P
6.2.2	Power source circuit classifications............................:	(See appended table 6.2.2)	P
6.2.3	Classification of potential ignition sources	PS classification determined by measuring the maximum power in figures 34 and 35 for load and power source circuits	P
6.2.3.1	Arcing PIS ....:	(See appended table 6.2.3.1)	N/A
6.2.3.2	Resistive PIS ....:	(See appended table 6.2.3.2)	N/A
6.3	**Safeguards against fire under normal operating and abnormal operating conditions**		P
6.3.1	No ignition and attainable temperature value less	(See appended table 5.4.1.4, 6.3.2,	P

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	than 90 % defined by ISO 871 or less than 300 °C for unknown materials...:	9.0, B.2.6)	
	Combustible materials outside fire enclosure...........:	No combustible materials outside fire enclosure	N/A
6.4	**Safeguards against fire under single fault conditions**		P
6.4.1	Safeguard method	Method by control of fire spread applied.	P
6.4.2	Reduction of the likelihood of ignition under single fault conditions in PS1 circuits		N/A
6.4.3	Reduction of the likelihood of ignition under single fault conditions in PS2 and PS3 circuits		N/A
6.4.3.1	Supplementary safeguards		N/A
6.4.3.2	Single Fault Conditions...:	(See appended table B.4)	N/A
	Special conditions for temperature limited by fuse		N/A
6.4.4	Control of fire spread in PS1 circuits		P
6.4.5	Control of fire spread in PS2 circuits		N/A
6.4.5.2	Supplementary safeguards	Only PS1, no supplementary safeguard required.	N/A
6.4.6	Control of fire spread in PS3 circuits		N/A
6.4.7	Separation of combustible materials from a PIS		N/A
6.4.7.2	Separation by distance		N/A
6.4.7.3	Separation by a fire barrier	No specific barrier provided.	N/A
6.4.8	Fire enclosures and fire barriers		N/A
6.4.8.2	Fire enclosure and fire barrier material properties		N/A
6.4.8.2.1	Requirements for a fire barrier		N/A
6.4.8.2.2	Requirements for a fire enclosure		N/A
6.4.8.3	Constructional requirements for a fire enclosure and a fire barrier	See below	N/A
6.4.8.3.1	Fire enclosure and fire barrier openings	No openings	N/A
6.4.8.3.2	Fire barrier dimensions		N/A
6.4.8.3.3	Top openings and properties		N/A
	Openings dimensions (mm).....................................:		N/A

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6.4.8.3.4	Bottom openings and properties		N/A
	Openings dimensions (mm)......................................:		N/A
	Flammability tests for the bottom of a fire enclosure	(See Clause S.3)	N/A
	Instructional Safeguard...:		N/A
6.4.8.3.5	Side openings and properties		N/A
	Openings dimensions (mm)......................................:		N/A
6.4.8.3.6	Integrity of a fire enclosure, condition met: a), b) or c)...:		N/A
6.4.8.4	Separation of a PIS from a fire enclosure and a fire barrier distance (mm) or flammability rating...........:		N/A
6.4.9	Flammability of insulating liquid................................:		N/A
6.5	**Internal and external wiring**		N/A
6.5.1	General requirements		N/A
6.5.2	Requirements for interconnection to building wiring ....:		N/A
6.5.3	Internal wiring size (mm^2) for socket-outlets........... :		N/A
6.6	**Safeguards against fire due to the connection to additional equipment**		N/A

7	**INJURY CAUSED BY HAZARDOUS SUBSTANCES**		P
7.2	**Reduction of exposure to hazardous substances**		N/A
7.3	**Ozone exposure**		N/A
7.4	**Use of personal safeguards or personal protective equipment (PPE)**		N/A
	Personal safeguards and instructions...................... :		—
7.5	**Use of instructional safeguards and instructions**		N/A
	Instructional safeguard (ISO 7010)...........................:		—
7.6	**Batteries and their protection circuits**		P

8	**MECHANICALLY-CAUSED INJURY**		P
8.2	**Mechanical energy source classifications**		P
8.3	**Safeguards against mechanical energy sources**		P

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Clause	Requirement-Test	Result-Remark	Verdict

8.4	**Safeguards against parts with sharp edges and corners**		P
8.4.1	Safeguards	MS1: No sharp edges or corners. MS1: Mass less than 1 kg.	P
	Instructional Safeguard...:		N/A
8.4.2	Sharp edges or corners	Edges and corners of the enclosure are rounded, and is considered as MS1.	P
8.5	**Safeguards against moving parts**		N/A
8.5.1	Fingers, jewellery, clothing, hair, etc., contact with MS2 or MS3 parts	Only internal DC vibration motor used.	N/A
	MS2 or MS3 part required to be accessible for the function of the equipment		N/A
	Moving MS3 parts only accessible to skilled person		N/A
8.5.2	Instructional safeguard... :		N/A
8.5.4	Special categories of equipment containing moving parts		N/A
8.5.4.1	General		N/A
8.5.4.2	Equipment containing work cells with MS3 parts		N/A
8.5.4.2.1	Protection of persons in the work cell		N/A
8.5.4.2.2	Access protection override		N/A
8.5.4.2.2.1	Override system		N/A
8.5.4.2.2.2	Visual indicator		N/A
8.5.4.2.3	Emergency stop system		N/A
	Maximum stopping distance from the point of activation (m)... :		N/A
	Space between end point and nearest fixed mechanical part (mm).. :		N/A
8.5.4.2.4	Endurance requirements		N/A
	Mechanical system subjected to 100 000 cycles of operation		N/A
	- Mechanical function check and visual inspection		N/A
	- Cable assembly..:		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
8.5.4.3	Equipment having electromechanical device for destruction of media		N/A
8.5.4.3.1	Equipment safeguards		N/A
8.5.4.3.2	Instructional safeguards against moving parts......... :		N/A
8.5.4.3.3	Disconnection from the supply		N/A
8.5.4.3.4	Cut type and test force (N)... :		N/A
8.5.4.3.5	Compliance		N/A
8.5.5	High pressure lamps		N/A
	Explosion test...:		N/A
8.5.5.3	Glass particles dimensions (mm).............................. :		N/A
8.6	**Stability of equipment**		N/A
8.6.1	General	Classification MS1 according to table 35, line 5 and no stability requirements.	N/A
	Instructional safeguard... :		N/A
8.6.2	Static stability		N/A
8.6.2.2	Static stability test..:		N/A
8.6.2.3	Downward force test		N/A
8.6.3	Relocation stability		N/A
	Wheels diameter (mm)... :		—
	Tilt test		N/A
8.6.4	Glass slide test		N/A
8.6.5	Horizontal force test... :		N/A
8.7	**Equipment mounted to wall, ceiling or other structure**		N/A
8.7.1	Mount means type...:		N/A
8.7.2	Test methods		N/A
	Test 1, additional downwards force (N).................... :		N/A
	Test 2, number of attachment points and test force (N)..:		N/A
	Test 3 Nominal diameter (mm) and applied torque (Nm).. :		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
8.8	**Handles strength**		N/A
8.8.1	General		N/A
8.8.2	Handle strength test		N/A
	Number of handles...:		—
	Force applied (N)...:		—
8.9	**Wheels or casters attachment requirements**		N/A
8.9.2	Pull test		N/A
8.10	**Carts, stands and similar carriers**		N/A
8.10.1	General		N/A
8.10.2	Marking and instructions...:		N/A
8.10.3	Cart, stand or carrier loading test		N/A
	Loading force applied (N)...:		N/A
8.10.4	Cart, stand or carrier impact test		N/A
8.10.5	Mechanical stability		N/A
	Force applied (N)...:		—
8.10.6	Thermoplastic temperature stability		N/A
8.11	**Mounting means for slide-rail mounted equipment (SRME)**		N/A
8.11.1	General		N/A
8.11.2	Requirements for slide rails		N/A
	Instructional Safeguard..:		N/A
8.11.3	Mechanical strength test		N/A
8.11.3.1	Downward force test, force (N) applied.....................:		N/A
8.11.3.2	Lateral push force test		N/A
8.11.3.3	Integrity of slide rail end stops		N/A
8.11.4	Compliance		N/A
8.12	**Telescoping or rod antennas**		N/A
	Button/ball diameter (mm)..:		—

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Clause	Requirement-Test	Result-Remark	Verdict

9	**THERMAL BURN INJURY**		P
9.2	**Thermal energy source classifications**		P
9.3	**Touch temperature limits**		P
9.3.1	Touch temperatures of accessible parts.................. :	(See appended table)	P
9.3.2	Test method and compliance		P
9.4	**Safeguards against thermal energy sources**		P
9.5	**Requirements for safeguards**		P
9.5.1	Equipment safeguard	Enclosure provided to limit the transfer of thermal energy of internal parts under normal operating conditions and abnormal operating conditions.	P
9.5.2	Instructional safeguard... :		N/A
9.6	**Requirements for wireless power transmitters**		N/A
9.6.1	General		N/A
9.6.2	Specification of the foreign objects		N/A
9.6.3	Test method and compliance.....................................:	(See appended table 9.6)	N/A

10	**RADIATION**		N/A
10.2	**Radiation energy source classification**		N/A
10.2.1	General classification		N/A
	Lasers...:		—
	Lamps and lamp systems..:		—
	Image projectors.. :		—
	X-Ray..:		—
	Personal music player..:		—
10.3	**Safeguards against laser radiation**		N/A
	The standard(s) equipment containing laser(s) comply...:		N/A
10.4	**Safeguards against optical radiation from lamps and lamp systems (including LED**		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
	types)		
10.4.1	General requirements		N/A
	Instructional safeguard provided for accessible radiation level needs to exceed		N/A
	Risk group marking and location...............................:		N/A
	Information for safe operation and installation		N/A
10.4.2	Requirements for enclosures		N/A
	UV radiation exposure...:	(See Annex C)	N/A
10.4.3	Instructional safeguard... :		N/A
10.5	**Safeguards against X-radiation**		N/A
10.5.1	Requirements		N/A
	Instructional safeguard for skilled persons.............:		—
10.5.3	Maximum radiation (pA/kg)......................................:	(See appended tables B.3 & B.4)	—
10.6	**Safeguards against acoustic energy sources**		N/A
10.6.1	General		N/A
10.6.2	Classification		N/A
	Acoustic output $L_{Aeq,T}$, dB(A).....................................:		N/A
	Unweighted RMS output voltage (mV).....................:		N/A
	Digital output signal (dBFS)....................................... :		N/A
10.6.3	Requirements for dose-based systems		N/A
10.6.3.1	General requirements		N/A
10.6.3.2	Dose-based warning and automatic decrease		N/A
10.6.3.3	Exposure-based warning and requirements		N/A
	30 s integrated exposure level (MEL30)...................:		N/A
	Warning for MEL ≥ 100 dB(A)....................................:		N/A
10.6.4	Measurement methods		N/A
10.6.5	Protection of persons		N/A
	Instructional safeguards.. :		N/A
10.6.6	Requirements for listening devices (headphones, earphones, etc.)		N/A

Clause	Requirement-Test	Result-Remark	Verdict
10.6.6.1	Corded listening devices with analogue input		N/A
	Listening device input voltage (mV)........................:		N/A
10.6.6.2	Corded listening devices with digital input		N/A
	Max. acoustic output $L_{Aeq,T}$, dB(A)............................:		N/A
10.6.6.3	Cordless listening devices		N/A
	Max. acoustic output $L_{Aeq,T}$, dB(A)............................:		N/A

B	**NORMAL OPERATING CONDITION TESTS, ABNORMAL OPERATING CONDITION TESTS AND SINGLE FAULT CONDITION TESTS**		P
B.1	**General**		P
B.1.5	Temperature measurement conditions	(See appended table B.1.5)	P
B.2	**Normal operating conditions**		P
B.2.1	General requirements.. :	(See Test Item Particulars and appended test tables)	P
	Audio Amplifiers and equipment with audio amplifiers..:		N/A
B.2.3	Supply voltage and tolerances		N/A
B.2.5	Input test... :	(See appended table B.2.5)	P
B.3	**Simulated abnormal operating conditions**		P
B.3.1	General	(See appended table B.3)	P
B.3.2	Covering of ventilation openings	No ventilation openings	N/A
	Instructional safeguard... :		N/A
B.3.3	DC mains polarity test	No connected to DC mains	N/A
B.3.4	Setting of voltage selector	No voltage selector	N/A
B.3.5	Maximum load at output terminals	No output terminals	N/A
B.3.6	Reverse battery polarity	Not possible to reverse the battery polarity.	N/A
B.3.7	Audio amplifier abnormal operating conditions		N/A
B.3.8	Safeguards functional during and after abnormal operating conditions... :	All safeguards remain effective. (See appended table B.3)	P
B.4	**Simulated single fault conditions**		P

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Clause	Requirement-Test	Result-Remark	Verdict
B.4.1	General		P
B.4.2	Temperature controlling device	No such device used.	N/A
B.4.3	Blocked motor test	No motor	N/A
B.4.4	Functional insulation	See the following details.	P
B.4.4.1	Short circuit of clearances for functional insulation	(See appended table B.3 &B.4)	P
B.4.4.2	Short circuit of creepage distances for functional insulation	(See appended table B.3 &B.4)	P
B.4.4.3	Short circuit of functional insulation on coated printed boards	No coated PCB used	N/A
B.4.5	Short-circuit and interruption of electrodes in tubes and semiconductors		P
B.4.6	Short circuit or disconnection of passive components	(See appended table B.3 &B.4)	P
B.4.7	Continuous operation of components	The EUT is continuous operating type and no such components intended for short time operation or intermittent operation	N/A
B.4.8	Compliance during and after single fault conditions ....:	(See appended table B.4)	P
B.4.9	Battery charging and discharging under single fault conditions	(See Annex M)	P
C	**UV RADIATION**		N/A
C.1	**Protection of materials in equipment from UV radiation**		N/A
C.1.2	Requirements		N/A
C.1.3	Test method		N/A
C.2	**UV light conditioning test**		N/A
C.2.1	Test apparatus.. :		N/A
C.2.2	Mounting of test samples		N/A
C.2.3	Carbon-arc light-exposure test		N/A
C.2.4	Xenon-arc light-exposure test		N/A
D	**TEST GENERATORS**		N/A
D.1	**Impulse test generators**		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
D.2	**Antenna interface test generator**		N/A
D.3	**Electronic pulse generator**		N/A
E	**TEST CONDITIONS FOR EQUIPMENT CONTAINING AUDIO AMPLIFIERS**		N/A
E.1	**Electrical energy source classification for audio signals**		N/A
	Maximum non-clipped output power (W)................. :		—
	Rated load impedance (Ω) .... :		—
	Open-circuit output voltage (V)..................................:		—
	Instructional safeguard... :		—
E.2	**Audio amplifier normal operating conditions**		N/A
	Audio signal source type... :		—
	Audio output power (W)...:		—
	Audio output voltage (V)...:		—
	Rated load impedance (Ω) .... :		—
	Requirements for temperature measurement	(See Table B.1.5)	N/A
E.3	Audio amplifier abnormal operating conditions		N/A
F	**EQUIPMENT MARKINGS, INSTRUCTIONS, AND INSTRUCTIONAL SAFEGUARDS**		P
F.1	**General**		P
	Language .... :	English	—
F.2	**Letter symbols and graphical symbols**		P
F.2.1	Letter symbols according to IEC60027-1	Letter symbols for quantities and units comply with IEC 60227-1	P
F.2.2	Graphic symbols according to IEC, ISO or manufacturer specific	Graphic symbols are complied with IEC 60417, ISO 3864-2, ISO 7000 or ISO 7010	P
F.3	**Equipment markings**		P
F.3.1	Equipment marking locations	Equipment marking is located on the enclosure surface and is easily visible.	P
F.3.2	Equipment identification markings	See the following details.	P
F.3.2.1	Manufacturer identification .... :	See copy of marking plate	P
F.3.2.2	Model identification ....:	See copy of marking plate	P

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Clause	Requirement-Test	Result-Remark	Verdict
F.3.3	Equipment rating markings	See the following details.	P
F.3.3.1	Equipment with direct connection to mains	Class III equipment	P
F.3.3.2	Equipment without direct connection to mains	Without direct connection to mains, no need rating markings.	P
F.3.3.3	Nature of the supply voltage......................................:	DC supply	N/A
F.3.3.4	Rated voltage...:		N/A
F.3.3.5	Rated frequency...:	DC supply	N/A
F.3.3.6	Rated current or rated power.....................................:		N/A
F.3.3.7	Equipment with multiple supply connections	No multiple supply connection.	N/A
F.3.4	Voltage setting device	No such device.	N/A
F.3.5	Terminals and operating devices		N/A
F.3.5.1	Mains appliance outlet and socket-outlet markings ....:	No mains appliance outlet.	N/A
F.3.5.2	Switch position identification marking.......................:	Not such switch.	N/A
F.3.5.3	Replacement fuse identification and rating markings...:		N/A
	Instructional safeguards for neutral fuse..................:		N/A
F.3.5.4	Replacement battery identification marking............:	No such battery	N/A
F.3.5.5	Neutral conductor terminal		N/A
F.3.5.6	Terminal marking location		N/A
F.3.6	Equipment markings related to equipment classification		N/A
F.3.6.1	Class I equipment	Class III	N/A
F.3.6.1.1	Protective earthing conductor terminal.....................:		N/A
F.3.6.1.2	Protective bonding conductor terminals ....:		N/A
F.3.6.2	Equipment class marking..:		N/A
F.3.6.3	Functional earthing terminal marking.......................:		N/A
F.3.7	Equipment IP rating marking.....................................:	IPX0	N/A
F.3.8	External power supply output marking.....................:		N/A
F.3.9	Durability, legibility and permanence of marking	Marking is considered to be legible and easily discernible. See also the	P

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Clause	Requirement-Test	Result-Remark	Verdict

		following details.	
F.3.10	Test for permanence of markings	The label was subjected to the permanence of marking test. The label was rubbed with cloth soaked with water for 15 sec. And then again for 15 sec. With the cloth soaked with petroleum spirit. After this test there was no damage to the label. The marking on the label did not fade. There was no curling and lifting of the label edge. After each test, the marking remained legible.	P
F.4	**Instructions**		P
	a) Information prior to installation and initial use	Provided in user manual.	P
	b) Equipment for use in locations where children not likely to be present		N/A
	c) Instructions for installation and interconnection	Instruction in user manual.	P
	d) Equipment intended for use only in restricted access area	Not used in restricted access area.	N/A
	e) Equipment intended to be fastened in place	Equipment is not intended to be fastened in place.	N/A
	f) Instructions for audio equipment terminals		N/A
	g) Protective earthing used as a safeguard	Class III equipment.	N/A
	h) Protective conductor current exceeding ES2 limits	Class III equipment.	N/A
	i) Graphic symbols used on equipment		P
	j) Permanently connected equipment not provided with all-pole mains switch		N/A
	k) Replaceable components or modules providing safeguard function		N/A
	l) Equipment containing insulating liquid		N/A
	m) Installation instructions for outdoor equipment		N/A
F.5	Instructional safeguards		P

G	**COMPONENTS**		P
G.1	**Switches**		N/A
G.1.1	General	No switch	N/A
G.1.2	Ratings, endurance, spacing, maximum load		N/A
G.1.3	Test method and compliance		N/A
G.2	**Relays**		N/A
G.2.1	Requirements	No relay	N/A
G.2.2	Overload test		N/A
G.2.3	Relay controlling connectors supplying power to other equipment		N/A
G.2.4	Test method and compliance		N/A
G.3	**Protective devices**		N/A
G.3.1	Thermal cut-offs		N/A
	Thermal cut-outs separately approved according to IEC 60730 with conditions indicated in a) & b)		N/A
	Thermal cut-outs tested as part of the equipment as indicated in c)		N/A
G.3.1.2	Test method and compliance		N/A
G.3.2	Thermal links		N/A
G.3.2.1	a) Thermal links tested separately according to IEC 60691 with specifics		N/A
	b) Thermal links tested as part of the equipment		N/A
G.3.2.2	Test method and compliance		N/A
G.3.3	PTC thermistors	Considered NTC on EUT	N/A
G.3.4	Overcurrent protection devices		N/A
G.3.5	Safeguards components not mentioned in G.3.1 to G.3.4		N/A
G.3.5.1	Non-resettable devices suitably rated and marking provided	No such component.	N/A
G.3.5.2	Single faults conditions...:	(See appended table B.4)	N/A
G.4	**Connectors**		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
G.4.1	Spacings		N/A
G.4.2	Mains connector configuration..................................:		N/A
G.4.3	Plug is shaped that insertion into mains socket-outlets or appliance coupler is unlikely	No such connector. Only USB for connection for charging.	N/A
G.5	**Wound components**		N/A
G.5.1	Wire insulation in wound components		N/A
G.5.1.2	Protection against mechanical stress		N/A
G.5.2	Endurance test		N/A
G.5.2.1	General test requirements		N/A
G.5.2.2	Heat run test		N/A
	Test time (days per cycle).. :		—
	Test temperature (°C).. :		—
G.5.2.3	Wound components supplied from the mains		N/A
G.5.2.4	No insulation breakdown		N/A
G.5.3	Transformers		N/A
G.5.3.1	Compliance method.. :		N/A
	Position...:		N/A
	Method of protection... :		N/A
G.5.3.2	Insulation		N/A
	Protection from displacement of windings............... :		—
G.5.3.3	Transformer overload tests		N/A
G.5.3.3.1	Test conditions		N/A
G.5.3.3.2	Winding temperatures		N/A
G.5.3.3.3	Winding temperatures - alternative test method		N/A
G.5.3.4	Transformers using FIW		N/A
G.5.3.4.1	General		N/A
	FIW wire nominal diameter...................................... :		—
G.5.3.4.2	Transformers with basic insulation only		N/A
G.5.3.4.3	Transformers with double insulation or reinforced insulation... :		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
G.5.3.4.4	Transformers with FIW wound on metal or ferrite core		N/A
G.5.3.4.5	Thermal cycling test and compliance		N/A
G.5.3.4.6	Partial discharge test		N/A
G.5.3.4.7	Routine test		N/A
G.5.4	Motors	No motors	N/A
G.5.4.1	General requirements		N/A
G.5.4.2	Motor overload test conditions		N/A
G.5.4.3	Running overload test		N/A
G.5.4.4.2	Locked-rotor overload test		N/A
	Test duration (days) .... :		—
G.5.4.5	Running overload test for DC motors		N/A
G.5.4.5.2	Tested in the unit		N/A
G.5.4.5.3	Alternative method		N/A
G.5.4.6	Locked-rotor overload test for DC motors		N/A
G.5.4.6.2	Tested in the unit	Alternative method used.	N/A
	Maximum Temperature ....:		N/A
G.5.4.6.3	Alternative method		N/A
G.5.4.7	Motors with capacitors		N/A
G.5.4.8	Three-phase motors		N/A
G.5.4.9	Series motors		N/A
	Operating voltage .... :		—
G.6	**Wire Insulation**		N/A
G.6.1	General		N/A
G.6.2	Enamelled winding wire insulation		N/A
G.7	**Mains supply cords**		N/A
G.7.1	General requirements		N/A
	Type...:		—
G.7.2	Cross sectional area (mm^2 or AWG)........................ :		N/A
G.7.3	Cord anchorages and strain relief for		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
	non-detachable power supply cords		
G.7.3.2	Cord strain relief		N/A
G.7.3.2.1	Requirements		N/A
	Strain relief test force (N)... :		N/A
G.7.3.2.2	Strain relief mechanism failure		N/A
G.7.3.2.3	Cord sheath or jacket position, distance (mm)....... :		N/A
G.7.3.2.4	Strain relief and cord anchorage material		N/A
G.7.4	Cord Entry		N/A
G.7.5	Non-detachable cord bend protection		N/A
G.7.5.1	Requirements		N/A
G.7.5.2	Test method and compliance		N/A
	Overall diameter or minor overall dimension, *D* (mm)..:		—
	Radius of curvature after test (mm).........................:		—
G.7.6	Supply wiring space		N/A
G.7.6.1	General requirements		N/A
G.7.6.2	Stranded wire		N/A
G.7.6.2.1	Requirements		N/A
G.7.6.2.2	Test with 8 mm strand		N/A
G.8	**Varistors**		N/A
G.8.1	General requirements		N/A
G.8.2	Safeguards against fire		N/A
G.8.2.1	General		N/A
G.8.2.2	Varistor overload test		N/A
G.8.2.3	Temporary overvoltage test		N/A
G.9	**Integrated circuit (IC) current limiters**		N/A
G.9.1	Requirements		N/A
	IC limiter output current (max. 5A)...........................:		—
	Manufacturers' defined drift .... :		—
G.9.2	Test Program		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
G.9.3	Compliance		N/A
G.10	**Resistors**		N/A
G.10.1	General		N/A
G.10.2	Conditioning		N/A
G.10.3	Resistor test		N/A
G.10.4	Voltage surge test		N/A
G.10.5	Impulse test		N/A
G.10.6	Overload test		N/A
G.11	**Capacitors and RC units**		N/A
G.11.1	General requirements		N/A
G.11.2	Conditioning of capacitors and RC units		N/A
G.11.3	Rules for selecting capacitors		N/A
G.12	**Optocouplers**		N/A
	Optocouplers comply with IEC 60747-5-5 with specifics		N/A
	Type test voltage $V_{ini,a}$..:		—
	Routine test voltage, $V_{ini, b}$.. :		—
G.13	**Printed boards**		P
G.13.1	General requirements	See follow	P
G.13.2	Uncoated printed boards	Only need to comply with functional insulation, see Annex B.4.4	P
G.13.3	Coated printed boards	No used	N/A
G.13.4	Insulation between conductors on the same inner surface		N/A
G.13.5	Insulation between conductors on different surfaces		N/A
	Distance through insulation.......................................:		N/A
	Number of insulation layers (pcs) .... :		—
G.13.6	Tests on coated printed boards		N/A
G.13.6.1	Sample preparation and preliminary inspection		N/A
G.13.6.2	Test method and compliance		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
G.14	**Coating on components terminals**		N/A
G.14.1	Requirements ....:	(See Clause G.13)	N/A
G.15	**Pressurized liquid filled components**		N/A
G.15.1	Requirements		N/A
G.15.2	Test methods and compliance		N/A
G.15.2.1	Hydrostatic pressure test		N/A
G.15.2.2	Creep resistance test		N/A
G.15.2.3	Tubing and fittings compatibility test		N/A
G.15.2.4	Vibration test		N/A
G.15.2.5	Thermal cycling test		N/A
G.15.2.6	Force test		N/A
G.15.3	Compliance		N/A
G.16	**IC including capacitor discharge function (ICX)**		N/A
G.16.1	Condition for fault tested is not required		N/A
	ICX with associated circuitry tested in equipment		N/A
	ICX tested separately		N/A
G.16.2	Tests		N/A
	Smallest capacitance and smallest resistance specified by ICX manufacturer for impulse test......:		—
	Mains voltage that impulses to be superimposed on ....:		—
	Largest capacitance and smallest resistance for ICX tested by itself for 10000 cycles test.................:		—
G.16.3	Capacitor discharge test...:		N/A
H	**CRITERIA FOR TELEPHONE RINGING SIGNALS**		N/A
H.1	**General**		N/A
H.2	**Method A**		N/A
H.3	**Method B**		N/A
H.3.1	Ringing signal		N/A
H.3.1.1	Frequency (Hz) ....:		—

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Clause	Requirement-Test	Result-Remark	Verdict

H.3.1.2	Voltage (V) ....:		—
H.3.1.3	Cadence; time (s) and voltage (V) ....:		—
H.3.1.4	Single fault current (mA):..:		—
H.3.2	Tripping device and monitoring voltage		N/A
H.3.2.1	Conditions for use of a tripping device or a monitoring voltage		N/A
H.3.2.2	Tripping device		N/A
H.3.2.3	Monitoring voltage (V)..:		N/A
J	**INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION**		N/A
J.1	**General**		N/A
	Winding wire insulation...:		—
	Solid round winding wire, diameter (mm)................:		N/A
	Solid square and rectangular (flatwise bending) winding wire, cross-sectional area (mm^2)...............:		N/A
J.2/J.3	Tests and Manufacturing	(See separate test report)	—
K	**SAFETY INTERLOCKS**		N/A
K.1	**General requirements**		N/A
	Instructional safeguard... :		N/A
K.2	**Components of safety interlock safeguard mechanism**		N/A
K.3	**Inadvertent change of operating mode**		N/A
K.4	**Interlock safeguard override**		N/A
K.5	**Fail-safe**		N/A
K.5.1	Under single fault condition		N/A
K.6	**Mechanically operated safety interlocks**		N/A
K.6.1	Endurance requirement		N/A
K.6.2	Test method and compliance....................................:		N/A
K.7	**Interlock circuit isolation**		N/A
K.7.1	Separation distance for contact gaps & interlock circuit elements		N/A
	In circuit connected to mains, separation distance for contact gaps (mm)...:		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
	In circuit isolated from mains, separation distance for contact gaps (mm)...:		N/A
	Electric strength test before and after the test of K.7.2...:	(See appended table 5.4.9)	N/A
K.7.2	Overload test, Current (A)..:		N/A
K.7.3	Endurance test		N/A
K.7.4	Electric strength test		N/A
L	**DISCONNECT DEVICES**		N/A
L.1	**General requirements**		N/A
L.2	**Permanently connected equipment**		N/A
L.3	**Parts that remain energized**		N/A
L.4	**Single-phase equipment**		N/A
L.5	**Three-phase equipment**		N/A
L.6	**Switches as disconnect devices**		N/A
L.7	**Plugs as disconnect devices**		N/A
L.8	**Multiple power sources**		N/A
	Instructional safeguard...:		N/A
M	**EQUIPMENT CONTAINING BATTERIES AND THEIR PROTECTION CIRCUITS**		P
M.1	**General requirements**		P
M.2	**Safety of batteries and their cells**		P
M.2.1	Batteries and their cells comply with relevant IEC standards..:	The cells comply with IEC 60086-4. (See appended table 4.1.2)	P
M.3	**Protection circuits for batteries provided within the equipment**	Safeguards considered during charging and discharging cycles as determined for expected and foreseeable use according to the user instructions.	P
M.3.1	Requirements		P
M.3.2	Test method		P
	Overcharging of a rechargeable battery		N/A
	Excessive discharging	(See appended table Annex M)	P

Clause	Requirement-Test	Result-Remark	Verdict
	Unintentional charging of a non-rechargeable battery		N/A
	Reverse charging of a rechargeable battery	Because of the limitation of structure, Reverse charging is impossible.	N/A
M.3.3	Compliance	No chemical leakage, no spillage of liquid, no explosion of the battery, no emission of flame or expulsion of molten metal.	P
M.4	**Additional safeguards for equipment containing a portable secondary lithium battery**		N/A
M.4.1	General		N/A
M.4.2	Charging safeguards		N/A
M.4.2.1	Requirements		N/A
M.4.2.2	Compliance..:		N/A
M.4.3	Fire enclosure...:		N/A
M.4.4	Drop test of equipment containing a secondary lithium battery		N/A
M.4.4.2	Preparation and procedure for the drop test		N/A
M.4.4.3	Drop, Voltage on reference and dropped batteries (V); voltage difference during 24 h period (%): .....:		N/A
M.4.4.4	Check of the charge/discharge function		N/A
M.4.4.5	Charge / discharge cycle test		N/A
M.4.4.6	Compliance		N/A
M.5	**Risk of burn due to short-circuit during carrying**		N/A
M.5.1	Requirement	No bare part of battery can be exposed during use. The battery is assembled inside the unit.	N/A
M.5.2	Test method and compliance		N/A
M.6	**Safeguards against short-circuits**		P
M.6.1	External and internal faults	The battery complied with IEC 60086-4 which is considered the	P

Clause	Requirement-Test	Result-Remark	Verdict
		internal fault tests. No such explosion or fire likely to result from short circuits.	
M.6.2	Compliance		N/A
M.7	**Risk of explosion from lead acid and NiCd batteries**		N/A
M.7.1	Ventilation preventing explosive gas concentration		N/A
	Calculated hydrogen generation rate...................... :		N/A
M.7.2	Test method and compliance		N/A
	Minimum air flow rate, Q (m^3/h)................................:		N/A
M.7.3	Ventilation tests		N/A
M.7.3.1	General		N/A
M.7.3.2	Ventilation test – alternative 1		N/A
	Hydrogen gas concentration (%)..............................:		N/A
M.7.3.3	Ventilation test – alternative 2		N/A
	Obtained hydrogen generation rate.........................:		N/A
M.7.3.4	Ventilation test – alternative 3		N/A
	Hydrogen gas concentration (%)..............................:		N/A
M.7.4	Marking..:		N/A
M.8	**Protection against internal ignition from external spark sources of batteries with aqueous electrolyte**		N/A
M.8.1	General		N/A
M.8.2	Test method		N/A
M.8.2.1	General		N/A
M.8.2.2	Estimation of hypothetical volume V_Z (m^3/s)........... :		—
M.8.2.3	Correction factors.. :		—
M.8.2.4	Calculation of distance d (mm) ....:		—
M.9	**Preventing electrolyte spillage**		N/A
M.9.1	Protection from electrolyte spillage		N/A
M.9.2	Tray for preventing electrolyte spillage		N/A
M.10	Instructions to prevent reasonably foreseeable misuse	Provided the instructions include battery charging, storage and	P

Clause	Requirement-Test	Result-Remark	Verdict
		transportation, and disposal and recycling.	
	Instructional safeguard... :		N/A
N	**ELECTROCHEMICAL POTENTIALS**		N/A
	Material(s) used... :		—
O	**MEASUREMENT OF CREEPAGE DISTANCES AND CLEARANCES**		N/A
	Value of *X* (mm)... :		—
P	**SAFEGUARDS AGAINST CONDUCTIVE OBJECTS**		N/A
P.1	**General**		N/A
P.2	**Safeguards against entry or consequences of entry of a foreign object**		N/A
P.2.1	General	No openings.	N/A
P.2.2	Safeguards against entry of a foreign object		N/A
	Location and Dimensions (mm) ....:		—
P.2.3	Safeguards against the consequences of entry of a foreign object		N/A
P.2.3.1	Safeguard requirements		N/A
	The ES3 and PS3 keep-out volume in Figure P.3 not applicable to transportable equipment		N/A
	Transportable equipment with metalized plastic parts... :		N/A
P.2.3.2	Consequence of entry test....................................... :		N/A
P.3	**Safeguards against spillage of internal liquids**		N/A
P.3.1	General		N/A
P.3.2	Determination of spillage consequences		N/A
P.3.3	Spillage safeguards		N/A
P.3.4	Compliance		N/A
P.4	**Metallized coatings and adhesives securing parts**		N/A
P.4.1	General		N/A
P.4.2	Tests		N/A
	Conditioning, T_C (°C)...:		—
	Duration (weeks)..:		—

Clause	Requirement-Test	Result-Remark	Verdict
Q	**CIRCUITS INTENDED FOR INTERCONNECTION WITH BUILDING WIRING**		N/A
Q.1	**Limited power sources**		N/A
Q.1.1	Requirements		N/A
	a) Inherently limited output		N/A
	b) Impedance limited output		N/A
	c) Regulating network limited output		N/A
	d) Overcurrent protective device limited output		N/A
	e) IC current limiter complying with G.9		N/A
Q.1.2	Test method and compliance....................................:		N/A
	Current rating of overcurrent protective device (A) ....:		N/A
Q.2	**Test for external circuits – paired conductor cable**	Not connect to external circuits	N/A
	Maximum output current (A) ....:		N/A
	Current limiting method..:		—
R	**LIMITED SHORT CIRCUIT TEST**		N/A
R.1	**General**		N/A
R.2	**Test setup**		N/A
	Overcurrent protective device for test......................:		—
R.3	**Test method**		N/A
	Cord/cable used for test..:		—
R.4	**Compliance**		N/A
S	**TESTS FOR RESISTANCE TO HEAT AND FIRE**		N/A
S.1	**Flammability test for fire enclosures and fire barrier materials of equipment where the steady state power does not exceed 4 000 W**		N/A
	Samples, material...:		—
	Wall thickness (mm)...:		—
	Conditioning (°C)..:		—
	Test flame according to IEC 60695-11-5 with conditions as set out		N/A
	- Material not consumed completely		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
	- Material extinguishes within 30s		N/A
	- No burning of layer or wrapping tissue		N/A
S.2	**Flammability test for fire enclosure and fire barrier integrity**		N/A
	Samples, material..:		—
	Wall thickness (mm)..:		—
	Conditioning (°C).. :		—
S.3	**Flammability test for the bottom of a fire enclosure**		N/A
S.3.1	Mounting of samples		N/A
S.3.2	Test method and compliance		N/A
	Mounting of samples ....:		—
	Wall thickness (mm)..:		—
S.4	**Flammability classification of materials**		N/A
S.5	**Flammability test for fire enclosure materials of equipment with a steady state power exceeding 4 000 W**		N/A
	Samples, material..:		—
	Wall thickness (mm)..:		—
	Conditioning (°C).. :		—
T	**MECHANICAL STRENGTH TESTS**		P
T.1	**General**		P
T.2	**Steady force test, 10 N ....:**	(See appended table T.2)	N/A
T.3	**Steady force test, 30 N ....:**	(See appended table T.3)	N/A
T.4	**Steady force test, 100 N ....:**	(See appended table T.4)	P
T.5	**Steady force test, 250 N ....:**	(See appended table T.5)	N/A
T.6	**Enclosure impact test**	(See appended table T.6)	N/A
	Fall test		N/A
	Swing test		N/A
T.7	**Drop test ....:**	(See appended table T.7)	P
T.8	**Stress relief test...:**	(See appended table T.8)	P
T.9	**Glass Impact Test...:**	(See appended table T.9)	N/A

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Clause	Requirement-Test	Result-Remark	Verdict

T.10	**Glass fragmentation test**		N/A
	Number of particles counted.......................................:		N/A
T.11	**Test for telescoping or rod antennas**		N/A
	Torque value (Nm) ....:		N/A
U	**MECHANICAL STRENGTH OF CATHODE RAY TUBES (CRT) AND PROTECTION AGAINST THE EFFECTS OF IMPLOSION**		N/A
U.1	**General**		N/A
	Instructional safeguard :		N/A
U.2	**Test method and compliance for non-intrinsically protected CRTs**		N/A
U.3	**Protective screen**		N/A
V	**DETERMINATION OF ACCESSIBLE PARTS**		N/A
V.1	**Accessible parts of equipment**		N/A
V.1.1	General		N/A
V.1.2	Surfaces and openings tested with jointed test probes		N/A
V.1.3	Openings tested with straight unjointed test probes		N/A
V.1.4	Plugs, jacks, connectors tested with blunt probe		N/A
V.1.5	Slot openings tested with wedge probe		N/A
V.1.6	Terminals tested with rigid test wire		N/A
V.2	**Accessible part criterion**		N/A
X	**ALTERNATIVE METHOD FOR DETERMINING CLEARANCES FOR INSULATION IN CIRCUITS CONNECTED TO AN AC MAINS NOT EXCEEDING 420 V PEAK (300 V RMS)**		N/A
	Clearance...:	(See appended table X)	N/A
Y	**CONSTRUCTION REQUIREMENTS FOR OUTDOOR ENCLOSURES**		N/A
Y.1	**General**		N/A
Y.2	**Resistance to UV radiation**		N/A
Y.3	**Resistance to corrosion**		N/A
Y.3	**Resistance to corrosion**		N/A
Y.3.1	Metallic parts of outdoor enclosures are resistant to effects of water-borne contaminants by..................:		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
Y.3.2	Test apparatus		N/A
Y.3.3	Water – saturated sulphur dioxide atmosphere		N/A
Y.3.4	Test procedure..:		N/A
Y.3.5	Compliance		N/A
Y.4	**Gaskets**		N/A
Y.4.1	General		N/A
Y.4.2	Gasket tests		N/A
Y.4.3	Tensile strength and elongation tests		N/A
	Alternative test methods...:		N/A
Y.4.4	Compression test		N/A
Y.4.5	Oil resistance		N/A
Y.4.6	Securing means	(See Annex P.4)	N/A
Y.5	**Protection of equipment within an outdoor enclosure**		N/A
Y.5.1	General		N/A
Y.5.2	Protection from moisture		N/A
	Relevant tests of IEC 60529 or Y.5.3......................:		N/A
Y.5.3	Water spray test		N/A
Y.5.4	Protection from plants and vermin		N/A
Y.5.5	Protection from excessive dust		N/A
Y.5.5.1	General		N/A
Y.5.5.2	IP5X equipment		N/A
Y.5.5.3	IP6X equipment		N/A
Y.6	**Mechanical strength of enclosures**		N/A
Y.6.1	General		N/A
Y.6.2	Impact test...:	(See Table T.6)	N/A

ATTACHMENT TO TEST REPORT IEC 62368-1 EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES (Audio/video, information and communication technology equipment Part 1: Safety requirements)	
Differences according to..................:	EN IEC 62368-1:2020+A11:2020
Attachment Form No........................ :	EU_GD_IEC62368_1E
Attachment Originator......................:	UL(Demko)
Master Attachment............................:	2021-02-04

	CENELEC COMMON MODIFICATIONS (EN)	P
	Clause numbers in the cells that are shaded light grey are clause references in EN IEC 62368-1:2020+A11:2020. All other clause numbers in that column, except for those in the paragraph below, refers to IEC 62368-1:2018. Clauses, subclauses, notes, tables, figures and Annexes which are additional to those in IEC 62368-1:2018 are prefixed "Z".	P
	Add the following Annexes: Annex ZA (normative) Normative references to international publications with their corresponding European publications Annex ZB (normative) Special national conditions Annex ZC (informative) A-deviations Annex ZD (informative) IEC and CENELEC code designations for flexible cords	P
1	**Modification to Clause 3 .**	
3.3.19	**Sound exposure** *Replace 3.3.19 of IEC 62368-1 with the following definitions:*	P

3.3.19.1	**momentary exposure level, MEL** metric for estimating 1 s sound exposure level from the HD 483-1 S2 test signal applied to both channels, based on EN 50332-1:2013, 4.2. Note 1 to entry: MEL is measured as A-weighted levels in dB. Note 2 to entry: See B.3 of EN 50332-3:2017 for additional	Considered.	N/A

IEC 62368-1			
Clause	Requirement-Test	Result-Remark	Verdict
	information.		
3.3.19.3	**sound exposure, *E*** A-weighted sound pressure (*p*) squared and integrated over a stated period of time, *T* Note 1 to entry: The SI unit is Pa^2 s. $E = \int_0^T p(t)^2 \, dt$	Considered.	N/A
3.3.19.4	**sound exposure level, *SEL*** logarithmic measure of sound exposure relative to a reference value, E_0, typically the 1 kHz threshold of hearing in humans. Note 1 to entry: *SEL* is measured as A-weighted levels in dB. $SEL = 10 \lg \left(\frac{E}{E_0} \right)$ dB Note 2 to entry: See B.4 of EN 50332-3:2017 for additional information.	Considered.	N/A
3.3.19.5	**digital signal level relative to full scale, dBFS** levels reported in dBFS are always r.m.s. Full scale level, 0 dBFS, is the level of a dc-free 997-Hz sine wave whose undithered positive peak value is positive digital full scale, leaving the code corresponding to negative digital full scale unused Note 1 to entry: It is invalid to use dBFS for non-r.m.s. levels. Because the definition of full scale is based on a sine wave, the level of signals with a crest factor lower than that of a sine wave may exceed 0 dBFS. In particular, square wave signals may reach +3,01 dBFS.		N/A
2	**Modification to Clause 10**		

10.6	**Safeguards against acoustic energy sources** Replace 10.6 of IEC 62368-1 with the following:		N/A
10.6.1.1	**Introduction** **Safeguard** requirements for protection against long-term exposure to excessive sound pressure levels from personal music players closely coupled to the ear are specified below. Requirements for earphones and headphones intended for use with personal music players are also covered. A personal music player is a portable equipment intended for use by an **ordinary person**, that: – is designed to allow the user to listen to audio or audiovisual content / material; and – uses a listening device, such as headphones or earphones that can be worn in or on or around the ears; and – has a player that can be body worn (of a size suitable to be carried in a clothing pocket) and is intended for the user to walk around with while in continuous use (for example, on a street, in a subway, at an airport, etc.). EXAMPLES Portable CD players, MP3 audio players, mobile phones with MP3 type features, PDAs or similar equipment. Personal music players shall comply with the requirements of either 10.6.2 or 10.6.3. NOTE 1 Protection against acoustic energy sources from telecom applications is referenced to ITU-T P.360. NOTE 2 It is the intention of the Committee to allow the alternative methods for now, but to only use the dose measurement method as given in 10.6.5 in future. Therefore, manufacturers are encouraged to implement 10.6.5 as soon as possible. Listening devices sold separately shall comply with the requirements of 10.6.6.		N/A

Clause	Requirement-Test	Result-Remark	Verdict
	These requirements are valid for music or video mode only. The requirements do not apply to: – professional equipment; NOTE 3 Professional equipment is equipment sold through special sales channels. All products sold through normal electronics stores are considered not to be professional equipment. – hearing aid equipment and other devices for assistive listening; – the following type of analogue personal music players: • long distance radio receiver (for example, a multiband radio receiver or world band radio receiver, an AM radio receiver), and • cassette player/recorder; NOTE 4 This exemption has been allowed because this technology is falling out of use and it is expected that within a few years it will no longer exist. This exemption will not be extended to other technologies. – a player while connected to an external amplifier that does not allow the user to walk around while in use. For equipment that is clearly designed or intended primarily for use by children, the limits of the relevant toy standards may apply. The relevant requirements are given in EN 71-1:2011, 4.20 and the related tests methods and measurement distances apply.		
10.6.1.2	**Non-ionizing radiation from radio frequencies in the range 0 to 300 GHz** The amount of non-ionizing radiation is regulated by European Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic		N/A

Clause	Requirement-Test	Result-Remark	Verdict
	fields (0 Hz to 300 GHz). For intentional radiators, ICNIRP guidelines should be taken into account for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz). For hand-held and body mounted devices, attention is drawn to EN 50360 and EN 50566.		
10.6.2	**Classification of devices without the capacity to estimate sound dose**		N/A
10.6.2.1	**General** This standard is transitioning from short-term based (30 s) requirements to long-term based (40 hour) requirements. These clauses remain in effect only for devices that do not comply with sound dose estimation as stipulated in EN 50332-3. For classifying the acoustic output $L_{\text{Aeq},T}$, measurements are based on the A-weighted equivalent sound pressure level over a 30 s period. For music where the average sound pressure (long term $L_{\text{Aeq},T}$) measured over the duration of the song is lower than the average produced by the programme simulation noise, measurements may be done over the duration of the complete song. In this case, T becomes the duration of the song. NOTE Classical music, acoustic music and broadcast typically has an average sound pressure (long term $L_{\text{Aeq},T}$) which is much lower than the average programme simulation noise. Therefore, if the player is capable to analyse the content and compare it with the programme simulation noise, the warning does not need to be given as long as the average sound pressure of the song does not exceed the required limit. For example, if the player is set with the programme simulation noise to 85 dB, but the average music level of the song is only 65 dB, there is no need to give a warning or ask an acknowledgement as long as the average sound level of the song is not above the basic limit of 85 dB.		N/A
10.6.2.2	**RS1 limits (to be superseded, see 10.6.3.2)**	RS2	N/A

	RS1 is a class 1 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or where the combination of player and listening device is known by other means such as setting or automatic detection, the $L_{Aeq,T}$ acoustic output shall be ≤ 85 dB when playing the fixed “programme simulation noise” described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output voltage shall be ≤ 27 mV (analogue interface) or -25 dBFS (digital interface) when playing the fixed “programme simulation noise” described in EN 50332-1. – The RS1 limits will be updated for all devices as per 10.6.3.2.		
10.6.2.3	**RS2 limits (to be superseded, see 10.6.3.3)** RS2 is a class 2 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or when the combination of player and listening device is known by other means such as setting or automatic 130 detection, the $L_{Aeq,T}$ acoustic output shall be ≤ 100 dB(A) when playing the fixed “programme simulation noise” as described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output voltage shall be ≤ 150 mV (analogue interface) or -10 dBFS (digital interface) when playing the fixed “programme simulation noise” as described in EN 50332-1.	Considered. See main report.	N/A
10.6.2.4	**RS3 limits**		N/A

	RS3 is a class 3 acoustic energy source that exceeds RS2 limits.		
10.6.3	**Classification of devices (new)**		N/A
10.6.3.1	**General** Previous limits (10.6.2) created abundant false negative and false positive PMP sound level warnings. New limits, compliant with The Commission Decision of 23 June 2009, are given below.		N/A
10.6.3.2	**RS1 limits (new)** RS1 is a class 1 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or where the combination of player and listening device is known by other means such as setting or automatic detection, the $L_{Aeq,T}$ acoustic output shall be ≤ 80 dB when playing the fixed “programme simulation noise” described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output voltage shall be ≤ 15 mV (analogue interface) or -30 dBFS (digital interface) when playing the fixed “programme simulation noise” described in EN 50332-1.		N/A
10.6.3.3	**RS2 limits (new)** RS2 is a class 2 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or where the combination of player and listening device is known by other means such as setting or automatic detection, the weekly sound	Must be checked when market to the country.	P

Clause	Requirement-Test	Result-Remark	Verdict
	exposure level, as described in EN 50332-3, shall be ≤ 80 dB when playing the fixed "programme simulation noise" described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output level, integrated over one week, as described in EN50332-3, shall be ≤ 15 mV (analogue interface) or -30 dBFS (digital interface) when playing the fixed “programme simulation noise” described in EN 50332-1.		
10.6.4	**Requirements for maximum sound exposure**		P
10.6.4.1	**Measurement methods** All volume controls shall be turned to maximum during tests. Measurements shall be made in accordance with EN 50332-1 or EN 50332-2 as applicable.	Considered. See separate acoustic test report.	P
10.6.4.2	**Protection of persons** Except as given below, protection requirements for parts **accessible** to **ordinary persons**, **instructed persons** and **skilled persons** are given in 4.3. NOTE 1 Volume control is not considered a **safeguard.** Between RS2 and an **ordinary person**, the **basic safeguard** may be replaced by an **instructional safeguard** in accordance with Clause F.5, except that the **instructional safeguard** shall be placed on the equipment, or on the packaging, or in the instruction manual. Alternatively, the **instructional safeguard** may be given through the equipment display during use. The elements of the **instructional safeguard** shall be as follows: – element 1a: the symbol , IEC 60417-6044	See main report.	P

	(2011-01) – element 2: “High sound pressure” or equivalent wording – element 3: “Hearing damage risk” or equivalent wording – element 4: “Do not listen at high volume levels for long periods.” or equivalent wording An **equipment safeguard** shall prevent exposure of an **ordinary person** to an RS2 source without intentional physical action from the **ordinary person** and shall automatically return to an output level not exceeding what is specified for an RS1 source when the power is switched off. The equipment shall provide a means to actively inform the user of the increased sound level when the equipment is operated with an output exceeding RS1. Any means used shall be acknowledged by the user before activating a mode of operation which allows for an output exceeding RS1. The acknowledgement does not need to be repeated more than once every 20 h of cumulative listening time. NOTE 2 Examples of means include visual or audible signals. Action from the user is always needed. NOTE 3 The 20 h listening time is the accumulative listening time, independent of how often and how long the personal music player has been switched off. A **skilled person** shall not be unintentionally exposed to RS3.		
10.6.5	**Requirements for dose-based systems**		N/A
10.6.5.1	**General requirements** Personal music players shall give the warnings as provided below when tested according to EN 50332-3, using the limits from this clause.		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
	The manufacturer may offer optional settings to allow the users to modify when and how they wish to receive the notifications and warnings to promote a better user experience without defeating the safeguards. This allows the users to be informed in a method that best meets their physical capabilities and device usage needs. If such optional settings are offered, an administrator (for example, parental restrictions, business/educational administrators, etc.) shall be able to lock any optional settings into a specific configuration. The personal music player shall be supplied with easy to understand explanation to the user of the dose management system, the risks involved, and how to use the system safely. The user shall be made aware that other sources may significantly contribute to their sound exposure, for example work, transportation, concerts, clubs, cinema, car races, etc.		
10.6.5.2	**Dose-based warning and requirements** When a dose of 100 % *CSD* is reached, and at least at every 100 % further increase of *CSD*, the device shall warn the user and require an acknowledgement. In case the user does not acknowledge, the output level shall automatically decrease to compliance with class RS1. The warning shall at least clearly indicate that listening above 100 % *CSD* leads to the risk of hearing damage or loss.		N/A
10.6.5.3	**Exposure-based requirements** With only dose-based requirements, cause and effect could be far separated in time, defying the purpose of educating users about safe listening practice. In addition to dose-based requirements, a PMP shall therefore also put a limit to the short-term sound level a user can listen at. The exposure-based limiter (EL) shall automatically		N/A

	reduce the sound level not to exceed 100 dB(A) or 150 mV integrated over the past 180 s, based on methodology defined in EN 50332-3. The EL settling time (time from starting level reduction to reaching target output) shall be 10 s or faster. Test of EL functionality is conducted according to EN 50332-3, using the limits from this clause. For equipment provided as a package (player with its listening device), the level integrated over 180 s shall be 100 dB or lower. For equipment provided with a standardized connector, the unweighted level integrated over 180 s shall be no more than 150 mV for an analogue interface and no more than -10 dBFS for a digital interface. NOTE In case the source is known not to be music (or test signal), the EL may be disabled.		

10.6.6	**Requirements for listening devices (headphones, earphones, etc.)**		N/A
10.6.6.1	**Corded listening devices with analogue input** With 94 dB L_{Aeq} acoustic pressure output of the listening device, and with the volume and sound settings in the listening device (for example, built-in volume level control, additional sound features like equalization, etc.) set to the combination of positions that maximize the measured acoustic output, the input voltage of the listening device when playing the fixed "programme simulation noise" as described in EN 50332-1 shall be ≥ 75 mV. NOTE The values of 94 dB and 75 mV correspond with 85 dB and 27 mV or 100 dB and 150 mV.	See separated test report	N/A
10.6.6.2	**Corded listening devices with digital input** With any playing device playing the fixed "programme simulation noise" described in EN 50332-1, and with the volume and sound settings		N/A

Clause	Requirement-Test	Result-Remark	Verdict
	in the listening device (for example, built-in volume level control, additional sound features like equalization, etc.) set to the combination of positions that maximize the measured acoustic output, the $L_{Aeq,T}$ acoustic output of the listening device shall be ≤ 100 dB with an input signal of -10 dBFS.		
10.6.6.3	**Cordless listening devices** In cordless mode, – with any playing and transmitting device playing the fixed programme simulation noise described in EN 50332-1; and – respecting the cordless transmission standards, where an air interface standard exists that specifies the equivalent acoustic level; and – with volume and sound settings in the receiving device (for example, built-in volume level control, additional sound features like equalization, etc.) set to the combination of positions that maximize the measured acoustic output for the above mentioned programme simulation noise, the $L_{Aeq,T}$ acoustic output of the listening device shall be ≤ 100 dB with an input signal of -10 dBFS.		N/A
10.6.6.4	**Measurement method** *Measurements shall be made in accordance with EN 50332-2 as applicable.*		N/A
3	**Modification to the whole document**		
	Delete all the “country” notes in the reference document according to the following list:		P

Clause	Requirement-Test	Result-Remark	Verdict

0.2.1	Note 1 and 2	1	Note 4 and 5	3.3.8.1	Note 2
3.3.8.3	Note 1	4.1.15	Note	4.7.3	Note 1 and 2
5.2.2.2	Note	5.4.2.3.2.2 Table 12	Note c	5.4.2.3.2.4	Note 1 and 3
5.4.2.3.2.4 Table 13	Note 2	5.4.2.5	Note 2	5.4.5.1	Note
5.4.10.2.1	Note	5.4.10.2.2	Note	5.4.10.2.3	Note
5.5.2.1	Note	5.5.6	Note	5.6.4.2.1	Note 2 and 3 and 4
5.6.8	Note 2	5.7.6	Note	5.7.7.1	Note 1 and Note 2
8.5.4.2.3	Note	10.2.1 Table 39	Note 3 and 4 and 5	10.5.3	Note 2
~~10.6.1~~	Note 3	F.3.3.6	Note 3	Y.4.1	Note
Y.4.5	Note				

4	**Modification to Clause 1**		P
1	***Add*** *the following note:* *NOTE Z1 The use of certain substances in electrical and electronic equipment is restricted within the EU: see Directive 2011/65/EU.*		P
5	**Modification to 4.Z1**		
4.Z1	***Add*** *the following new subclause after 4.9:* To protect against excessive current, short-circuits and earth faults in circuits connected to an a.c. **mains**, protective devices shall be included either as integral parts of the equipment or as parts of the building installation, subject to the following, a), b) and c): a) except as detailed in b) and c), protective devices necessary to comply with the requirements of B.3.1 and B.4 shall be included as parts of the equipment; b) for components in series with the mains input to the equipment such as the supply cord, appliance		N/A

Clause	Requirement-Test	Result-Remark	Verdict
	coupler, r.f.i. filter and switch, short-circuit and earth fault protection may be provided by protective devices in the building installation; c) it is permitted for **pluggable equipment type B** or **permanently connected equipment**, to rely on dedicated overcurrent and short-circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instructions. If reliance is placed on protection in the building installation, the installation instructions shall so state, except that for **pluggable equipment type A** the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet.		
6	**Modification to 5.4.2.3.2.4**		
5.4.2.3.2.4	***Add** the following to the end of this subclause:* The requirement for interconnection with **external circuit** is in addition given in EN 50491-3:2009.		N/A
7	**Modification to 10.2.1**		
10.2.1	Add the following to c) and d) in table 39: For additional requirements, see 10.5.1.		N/A
8	**Modification to 10.5.1**		
10.5.1	***Add** the following after the first paragraph:* For RS 1 compliance is checked by measurement under the following conditions: In addition to the normal operating conditions, all controls adjustable from the outside by hand, by any object such as a tool or a coin, and those internal adjustments or pre-sets which are not locked in a reliable manner, are adjusted so as to give maximum radiation whilst maintaining an intelligible picture for 1 h, at the end of which the measurement is made.		N/A

Clause	Requirement-Test	Result-Remark	Verdict
	NOTE Z1 Soldered joints and paint lockings are examples of adequate locking. The dose-rate is determined by means of a radiation monitor with an effective area of 10 cm², at any point 10 cm from the outer surface of the apparatus. Moreover, the measurement shall be made under fault conditions causing an increase of the high voltage, provided an intelligible picture is maintained for 1 h, at the end of which the measurement is made. For RS1, the dose-rate shall not exceed 1 μSv/h taking account of the background level. NOTE Z2 These values appear in Directive 96/29/Euratom of 13 May 1996.		
9	**Modification to G.7.1**		
G.7.1	***Add** the following note:* NOTE Z1 The harmonized code designations corresponding to the IEC cord types are given in Annex ZD.		N/A

10	**Modification to Bibliography**	
	Add the following notes for the standards indicated:	P

Clause	Requirement-Test	Result-Remark	Verdict
	IEC 60130-9 NOTE Harmonized as EN 60130-9. IEC 60269-2 NOTE Harmonized as HD 60269-2. IEC 60309-1 NOTE Harmonized as EN 60309-1. IEC 60364 NOTE some parts harmonized in HD 384/HD 60364 series. IEC 60601-2-4 NOTE Harmonized as EN 60601-2-4. IEC 60664-5 NOTE Harmonized as EN 60664-5. IEC 61032:1997 NOTE Harmonized as EN 61032:1998 (not modified). IEC 61508-1 NOTE Harmonized as EN 61508-1. IEC 61558-2-1 NOTE Harmonized as EN 61558-2-1. IEC 61558-2-4 NOTE Harmonized as EN 61558-2-4. IEC 61558-2-6 NOTE Harmonized as EN 61558-2-6. IEC 61643-1 NOTE Harmonized as EN 61643-1. IEC 61643-21 NOTE Harmonized as EN 61643-21. IEC 61643-311 NOTE Harmonized as EN 61643-311. IEC 61643-321 NOTE Harmonized as EN 61643-321. IEC 61643-331 NOTE Harmonized as EN 61643-331.		
11	**ADDITION OF AnnexES**		
ZB	**Annex ZB, SPECIAL NATIONAL CONDITIONS (EN)**		P
4.1.15	**Denmark, Finland, Norway** and **Sweden** To the end of the subclause the following is added: **Class I pluggable equipment type A** intended for connection to other equipment or a network shall, if safety relies on connection to reliable earthing or if surge suppressors are connected between the network terminals and **accessible** parts, have a marking stating that the equipment shall be connected to an earthed **mains** socket-outlet. The marking text in the applicable countries shall be as follows: In **Denmark**: “Apparatets stikprop skal tilsluttes en stikkontakt med jord som giver forbindelse til stikproppens jord.” In **Finland**: "Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan" In **Norway**: “Apparatet må tilkoples jordet stikkontakt” In **Sweden**: “Apparaten skall anslutas till jordat uttag”		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
4.7.3	**United Kingdom** To the end of the subclause the following is added: The torque test is performed using a socket-outlet complying with BS 1363, and the plug part shall be assessed to the relevant clauses of BS 1363. Also see Annex G.4.2 of this Annex		N/A
5.2.2.2	**Denmark** After the 2nd paragraph add the following: A warning (marking safeguard) for high touch current is required if the touch current exceeds the limits of 3,5 mA a.c. or 10 mA d.c.		N/A
5.4.11.1 and Annex G	**Finland and Sweden** To the end of the subclause the following is added: For separation of the telecommunication network from earth the following is applicable: If this insulation is solid, including insulation forming part of a component, it shall at least consist of either • two layers of thin sheet material, each of which shall pass the electric strength test below, or • one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. If this insulation forms part of a semiconductor component (e.g. an optocoupler), there is no distance through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that clearances and creepage distances do not exist, if the		N/A

	component passes the electric strength test in accordance with the compliance clause below and in addition • passes the tests and inspection criteria of 5.4.8 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 5.4.9 shall be performed using 1,5 kV), and • is subject to routine testing for electric strength during manufacturing, using a test voltage of 1,5 kV. It is permitted to bridge this insulation with a capacitor complying with EN 60384-14:2005, subclass Y2. A capacitor classified Y3 according to EN 60384-14:2005, may bridge this insulation under the following conditions: • the insulation requirements are satisfied by having a capacitor classified Y3 as defined by EN 60384-14, which in addition to the Y3 testing, is tested with an impulse test of 2,5 kV defined in 5.4.11; • the additional testing shall be performed on all the test specimens as described in EN 60384-14; the impulse test of 2,5 kV is to be performed before the endurance test in EN 60384-14, in the sequence of tests as described in EN 60384-14.		
5.5.2.1	**Norway** After the 3rd paragraph the following is added: Due to the IT power system used, capacitors are required to be rated for the applicable line-to-line		N/A

	voltage (230 V).		
5.5.6	**Finland, Norway** and **Sweden** To the end of the subclause the following is added: Resistors used as **basic safeguard** or bridging **basic insulation** in **class I pluggable equipment type A** shall comply with G.10.1 and the test of G.10.2.		N/A
5.6.1	**Denmark** **Add** to the end of the subclause Due to many existing installations where the socket-outlets can be protected with fuses with higher rating than the rating of the socket-outlets the protection for pluggable equipment type A shall be an integral part of the equipment. *Justification:* In Denmark an existing 13 A socket outlet can be protected by a 20 A fuse.		N/A
5.6.4.2.1	**Ireland and United Kingdom** After the indent for **pluggable equipment type A**, the following is added: – the **protective current rating** is taken to be 13 A, this being the largest rating of fuse used in the **mains** plug.		N/A
5.6.4.2.1	**France** After the indent for **pluggable equipment type A**, the following is added: – in certain cases, the **protective current rating** of the circuit supplied from the mains is taken as 20 A instead of 16 A.		N/A
5.6.5.1	To the second paragraph the following is added: The range of conductor sizes of flexible cords to be accepted by terminals for equipment with a rated current over 10 A and up to and including		N/A

Clause	Requirement-Test	Result-Remark	Verdict
	13 A is: 1,25 mm^2 to 1,5 mm^2 in cross-sectional area.		
5.6.8	**Norway** To the end of the subclause the following is added: Equipment connected with an earthed mains plug is classified as **class I equipment**. See the Norway marking requirement in 4.1.15. The symbol IEC 60417-6092, as specified in F.3.6.2, is accepted.		N/A
5.7.6	**Denmark** To the end of the subclause the following is added: The installation instruction shall be affixed to the equipment if the **protective conductor current** exceeds the limits of 3,5 mA a.c. or 10 mA d.c.		N/A
5.7.6.2	**Denmark** To the end of the subclause the following is added: The warning (marking safeguard) for high touch current is required if the touch current or the protective current exceed the limits of 3,5 mA .		N/A
5.7.7.1	**Norway and Sweden** To the end of the subclause the following is added: The screen of the television distribution system is normally not earthed at the entrance of the building and there is normally no equipotential bonding system within the building. Therefore the protective earthing of the building installation needs to be isolated from the screen of a cable distribution system. It is however accepted to provide the insulation external to the equipment by an adapter or an interconnection cable with galvanic isolator, which may be provided by a retailer, for example.		N/A

	The user manual shall then have the following or similar information in Norwegian and Swedish language respectively, depending on in what country the equipment is intended to be used in: “Apparatus connected to the protective earthing of the building installation through the mains connection or through other apparatus with a connection to protective earthing – and to a television distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a television distribution system therefore has to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11)” NOTE In Norway, due to regulation for CATV-installations, and in Sweden, a galvanic isolator shall provide electrical insulation below 5 MHz. The insulation shall withstand a dielectric strength of 1,5 kV r.m.s., 50 Hz or 60 Hz, for 1 min. Translation to Norwegian (the Swedish text will also be accepted in Norway): “Apparater som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplet utstyr – og er tilkoplet et koaksialbasert kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkopling av apparater til kabel-TV nett installeres en galvanisk isolator mellom apparatet og kabel-TV nettet.” Translation to Swedish: ”Apparater som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medfőra risk főr brand. Főr att undvika detta skall vid anslutning av apparaten till kabel-TV nät galvanisk isolator finnas mellan		

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Clause	Requirement-Test	Result-Remark	Verdict
	apparaten och kabel-TV nätet.”.		
8.5.4.2.3	**United Kingdom** Add the following after the 2nd dash bullet in 3rd paragraph: An emergency stop system complying with the requirements of IEC 60204-1 and ISO 13850 is required where there is a risk of personal injury.		N/A
B.3.1 and B.4	**Ireland and United Kingdom** The following is applicable: To protect against excessive currents and short-circuits in the primary circuit of **direct plug-in equipment**, tests according to Annexes B.3.1 and B.4 shall be conducted using an external miniature circuit breaker complying with EN 60898-1, Type B, rated 32A. If the equipment does not pass these tests, suitable protective devices shall be included as an integral part of the **direct plug-in equipment**, until the requirements of Annexes B.3.1 and B.4 are met		N/A
G.4.2	**Denmark** To the end of the subclause the following is added: Supply cords of single phase appliances having a rated current not exceeding 13 A shall be provided with a plug according to DS 60884-2-D1:2011. CLASS I EQUIPMENT provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with standard sheet DK 2-1a or DK 2-5a. If a single-phase equipment having a RATED		N/A

IEC 62368-1			
Clause	Requirement-Test	Result-Remark	Verdict
	CURRENT exceeding 13 A or if a polyphase equipment is provided with a supply cord with a plug, this plug shall be in accordance with the standard sheets DK 6-1a in DS 60884-2-D1 or EN 60309-2. Mains socket outlets intended for providing power to Class II apparatus with a rated current of 2,5 A shall be in accordance DS 60884-2-D1:2011 standard sheet DKA 1-4a. Other current rating socket outlets shall be in compliance with Standard Sheet DKA 1-3a or DKA 1-1c. Mains socket-outlets with earth shall be in compliance with DS 60884-2-D1:2011 Standard Sheet DK 1-3a, DK 1-1c, DK1-1d, DK 1-5a or DK 1-7a *Justification:* Heavy Current Regulations, Section 6c		
G.4.2	**United Kingdom** To the end of the subclause the following is added: The plug part of direct plug-in equipment shall be assessed to BS 1363: Part 1, 12.1, 12.2, 12.3, 12.9, 12.11, 12.12, 12.13, 12.16, and 12.17, except that the test of 12.17 is performed at not less than 125 °C. Where the metal earth pin is replaced by an Insulated Shutter Opening Device (ISOD), the requirements of clauses 22.2 and 23 also apply.		N/A
G.7.1	**United Kingdom** To the first paragraph the following is added: Equipment which is fitted with a flexible cable or cord and is designed to be connected to a mains		N/A

	socket conforming to BS 1363 by means of that flexible cable or cord shall be fitted with a 'standard plug' in accordance with the Plugs and Sockets etc. (Safety) Regulations 1994, Statutory Instrument 1994 No. 1768, unless exempted by those regulations. NOTE "Standard plug" is defined in SI 1768:1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.		
G.7.1	**Ireland** To the first paragraph the following is added: Apparatus which is fitted with a flexible cable or cord shall be provided with a plug in accordance with Statutory Instrument 525: 1997, "13 A Plugs and Conversion Adapters for Domestic Use Regulations: 1997. S.I. 525 provides for the recognition of a standard of another Member State which is equivalent to the relevant Irish Standard		N/A
G.7.2	**Ireland and United Kingdom** To the first paragraph the following is added: A power supply cord with a conductor of 1,25 mm^2 is allowed for equipment which is rated over 10 A and up to and including 13 A.		N/A
ZC	**Annex ZC, NATIONAL DEVIATIONS (EN)**		
10.5.2	**Germany** The following requirement applies: For the operation of any cathode ray tube intended for the display of visual images operating at an acceleration voltage exceeding 40 kV, authorization is required, or application of type approval (Bauartzulassung) and marking.		N/A

	Justification: German ministerial decree against ionizing radiation (Röntgenverordnung), in force since 2002-07-01, implementing the European Directive 96/29/EURATOM. **NOTE** Contact address: Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig, Tel.: Int+49-531-592-6320, Internet: http://www.ptb.de		
ZD	**IEC and CENELEC CODE DESIGNATIONS FOR FLEXIBLE CORDS (EN)**		
			N/A

Type of flexible cord	Code designations	
	IEC	CENELEC
PVC insulated cords		
Flat twin tinsel cord	60227 IEC 41	H03VH-Y
Light polyvinyl chloride sheathed flexible cord	60227 IEC 52	H03VV-F H03VVH2-F
Ordinary polyvinyl chloride sheathed flexible cord	60227 IEC 53	H05VV-F H05VVH2-F
Rubber insulated cords		
Braided cord	60245 IEC 51	H03RT-F
Ordinary tough rubber sheathed flexible cord	60245 IEC 53	H05RR-F
Ordinary polychloroprene sheathed flexible cord	60245 IEC 57	H05RN-F
Heavy polychloroprene sheathed flexible cord	60245 IEC 66	H07RN-F
Cords having high flexibility		
Rubber insulated and sheathed cord	60245 IEC 86	H03RR-H
Rubber insulated, crosslinked PVC sheathed cord	60245 IEC 87	H03RV4-H
Crosslinked PVC insulated and sheathed cord	60245 IEC 88	H03V4V4-H
Cords insulated and sheathed with halogen-free thermoplastic compounds		
Light halogen-free thermoplastic insulated and sheathed flexible cords		H03Z1Z1-F H03Z1Z1H2-F
Ordinary halogen-free thermoplastic insulated and sheathed flexible cords		H05Z1Z1-F H05Z1Z1H2-F

5.2	TABLE: Classification of electrical energy sources						P
Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters				ES Class
			U (V)	I (mA)	Type[1)]	Additional Info [2)]	
3.0Vd.c.	Battery output	Normal	2.98Vd.c.	--	--	DC	ES1
Supplementary information:							
1) Type: Steady state (SS), Capacitance (CP), Single pulse (SP), Repetitive pulses (RP), etc. 2) Additional Info: Frequency, Pulse duration, Pulse off time, Capacitance value, etc.							

5.4.1.8	TABLE: Working voltage measurement				N/A
Location	RMS voltage (V)	Peak voltage (V)	Frequency (Hz)	Comments	
--	--	--	--	--	
--	--	--	--	--	
Supplementary information:					

5.4.1.10.2	TABLE: Vicat softening temperature of thermoplastics			N/A
Method.. :		ISO 306 / B50		—
Object/ Part No./Material	Manufacturer/trademark	Thickness (mm)	T softening (°C)	
--	--	--	--	
--	--	--	--	
Supplementary information:				

5.4.1.10.3	TABLE: Ball pressure test of thermoplastics				N/A
Allowed impression diameter (mm).. :		≤ 2 mm			—
Object/Part No./Material	Manufacturer/trademark	Thickness (mm)	Test temperature (°C)	Impression diameter (mm)	
--	--	--	--	--	
--	--	--	--	--	

Supplementary information:

5.4.2, 5.4.3	TABLE: Minimum Clearances/Creepage distance							N/A
Clearance (cl) and creepage distance (cr) at/of/between:	U_p (V)	U_{rms} (V)	Freq 1) (Hz)	Required cl (mm)	cl (mm)	E.S. 2) (V)	Required cr (mm)	cr (mm)
--	--	--	--	--	--	--	--	--
Supplementary information:								
1) Only for frequency above 30 kHz 2) Complete Electric Strength voltage (E.S. (V) when 5.4.2.4 applied)								

5.4.4.2	TABLE: Minimum distance through insulation			N/A
Distance through insulation (DTI) at/of	Peak voltage (V)	Insulation	Required DTI (mm)	Measured DTI (mm)
--	--	--	--	--
Supplementary information:				

5.4.4.9	TABLE: Solid insulation at frequencies >30 kHz					N/A
Insulation material	E_P	Frequency (kHz)	K_R	Thickness d (mm)	Insulation	V_{PW} (Vpk)
--	--	--	--	--	--	--
Supplementary information:						

5.4.9	TABLE: Electric strength tests		N/A
Test voltage applied between:	Voltage shape (Surge, Impulse, AC, DC, etc.)	Test voltage (V)	Breakdown Yes / No
--	--	--	--
--	--	--	--

Supplementary information:

5.5.2.2	TABLE: Stored discharge on capacitors				N/A
Location	Supply voltage (V)	Operating and fault condition 1)	Switch position	Measured voltage (Vpk)	ES Class
--	--	--	--	--	--
Supplementary information:					
X-capacitors installed for testing: [ ] bleeding resistor rating: [ ] ICX: 1) Normal operating condition (e.g., normal operation, or open fuse), SC= short circuit, OC= open circuit					

5.6.6	TABLE: Resistance of protective conductors and terminations			N/A
Location	Test current (A)	Duration (min)	Voltage drop (V)	Resistance (Ω)
--	--	--	--	--
Supplementary information:				

5.7.4	TABLE: Unearthed accessible parts					N/A
Location	Operating and fault conditions	Supply Voltage (V)	Parameters			ES class
			Voltage (V_{rms} or V_{pk})	Current (A_{rms} or A_{pk})	Freq. (Hz)	
--	--	--	--	--	--	--
Supplementary information:						
Abbreviation: SC= short circuit; OC= open circuit						

5.7.5	TABLE: Earthed accessible conductive part	N/A
Supply voltage (V)..............................:		—
Phase(s) .... :	[ ] Single Phase; [ ] Three Phase: [ ] Delta [ ] Wye	
Power Distribution System ....:	[ ] TN [ ]TT [ ] IT	

Location	Fault Condition No in IEC 60990 clause 6.2.2	Touch current (mA)	Comment
--	--	--	--
Supplementary Information:			

5.8	TABLE: Backfeed safeguard in battery backed up supplies					N/A
Location	Supply voltage (V)	Operating and fault condition	Time (s)	Open-circuit voltage (V)	Touch current (A)	ES Class
--	--	--	--	--	--	--
Supplementary information:						
Abbreviation: SC= short circuit, OC= open circuit						

6.2.2	TABLE: Power source circuit classifications					P
Location	Operating and fault condition	Voltage (V)	Current (A)	Max. Power1) (W)	Time (S)	PS class
Output of battery cell	Normal condition	2.27	3.80	8.62	3	PS1
Supplementary information:						
Abbreviation: SC= short circuit; OC= open circuit 1) Measured after 3 s for PS1 and measured after 5 s for PS2 and PS3.						

6.2.3.1	TABLE: Determination of Arcing PIS			N/A
Location	Open circuit voltage after 3 s (Vpk)	Measured r.m.s current (A)	Calculated value	Arcing PIS? Yes / No
--	--	--	--	--
Supplementary information:				

6.2.3.2	TABLE: Determination of resistive PIS		N/A
Location	Operating and fault condition	Dissipate power (W)	Arcing PIS? Yes / No
--	--	--	--

Supplementary information:
Abbreviation: SC= short circuit; OC= open circuit

8.5.5	TABLE: High pressure lamp			N/A
Lamp manufacturer	Lamp type	Explosion method	Longest axis of glass particle (mm)	Particle found beyond 1 m Yes / No
--	--	--	--	--
Supplementary information:				

9.6	TABLE: Temperature measurements for wireless power transmitters							N/A
Supply voltage (V)..:								—
Max. transmit power of transmitter (W)........... :								—
Foreign objects	w/o receiver and direct contact		with receiver and direct contact		with receiver and at distance of 2 mm		with receiver and at distance of 5 mm	
	Object (°C)	Ambient (°C)	Object (°C)	Ambient (°C)	Object (°C)	Ambient (°C)	Object (°C)	Ambient (°C)
--	--	--	--	--	--	--	--	--
Supplementary information:								

5.4.1.4, 9.3, B.1.5, B.2.6	TABLE: Temperature measurements						P
Supply voltage (V)..:	3.0Vd.c. Note 4		--		--		—
Ambient temperature during test T_{amb} (°C)......:	See below	See below	See below	See below	See below	See below	—
Maximum measured temperature T of part/at:	T (°C)						Allowed T_{max} (°C)
PCB near U1	27.1	48.5	--	--	--	--	130
PCB near U5	26.6	48.0	--	--	--	--	130

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Clause	Requirement-Test	Result-Remark	Verdict

PCB near U6	26.8	48.2	--	--	--	--	130
Battery surface	25.6	47.0	--	--	--	--	130
Plastic housing inside near U1	25.2	46.6	--	--	--	--	Ref.
Plastic housing inside near battery	24.9	46.3	--	--	--	--	Ref.
Ambient	23.6	45.0	--	--	--	--	--
Touch Temperatures							
button	24.2	25.6	--	--	--	--	48
Plastic housing outside near U1	24.6	26.0	--	--	--	--	48
Plastic housing outside near battery	24.4	25.8	--	--	--	--	48
Ambient	23.6	25.0	--	--	--	--	--

Temperature T of winding:	t_1 (°C)	R_1 (Ω)	t_2 (°C)	R_2 (Ω)	T (°C)	Allowed T_{max} (°C)	Insulation class

Supplementary information:

Supplementary information: * Temperature limit for TS1 of accessible enclosure according to Table 38.

Note 1: Tma should be considered as directed by applicable requirement.

Note 2: Tma is not included in assessment of Touch Temperatures (Clause 9).

Note 3: The maximum ambient temperature specified by manufacturer is 45°C.

Note 4: The equipment normal operating.

Note 5: All values for T(C) are re-calculated from Tamb respectively.

B.2.5	**TABLE: Input test**							P
U (V)	Hz	I (A)	I rated (A)	P (W)	P rated (W)	Fuse No	I fuse (A)	Condition/status
3.0Vd.c. (Fully charged battery)	--	0.031	0.1	0.93	--	--	--	Normal operating

Supplementary information:

Note: Use the empty battery when charging, and use the full battery when Discharging.

B.3, B.4	**TABLE: Abnormal operating and fault condition tests**					P
Ambient temperature T_{amb} (°C).. :				See follow		—
Power source for EUT: Manufacturer, model/type, outputrating....:				--		—
Component No.	Condition	Supply voltage (V)	Test time	Fuse no.	Fuse current (A)	Observation
Battery P+ to P-	S-C	3.0VDC	10mins	--	--	Battery Discharging current: 0.031A→0A Unit shutdown, No damaged, No hazard.
U4 Pin 2-8	S-C	3.0VDC	10mins	--	--	Battery Discharging current: 0.031A→0A Unit shutdown, No damaged, No hazard.
U1 Pin 9-32	S-C	3.0VDC	10mins	--	--	Battery Discharging current: 0.031A→0.027A Unit normally operating, No damaged, No hazard.
U6 Pin 1-2	S-C	3.0VDC	10mins	--	--	Battery Discharging current: 0.031A→0A Unit shutdown, No damaged, No hazard.
Supplementary information:						
#) Fault condition conducted according to requirements of IEC 62368-3. 1) During single fault operating condition test, the output voltage did not increase by more than 3V or 10% which one is higher of its rated output voltage under normal operating condition (For USB outlet). 2) S-C: Short-circuited; O-C: Open-circuited; O-L: Overloaded; OVC=Overcharge. The test result shown all safeguards remained effective and didn’t lead to a single fault condition during abnormal operating condition; In addition all safeguards complied with applicable requirements in this standard after restoration of normal operating conditions.						

M.3	**TABLE: Protection circuits for batteries provided within the equipment**		P
Is it possible to install the battery in a reverse polarity position?.......:		Impossible	—
Equipment Specification	Charging		
	Voltage (V)	Current (A)	
	--	--	
Manufacturer/type	Battery specification		

	Non-rechargeable batteries		Rechargeable batteries			
	Discharging current (A)	Unintentional charging current (A)	Charging		Discharging current (A)	Reverse charging current (A)
			Voltage (V)	Current (A)		
CP114752B	0.1	--	--	--	--	--
Note: The tests of M.3.2 are applicable only when above appropriate data is not available.						

Specified battery temperature (ºC)..:	--	

Component No.	Fault condition	Charge/ discharge mode	Test time	Temp. (ºC)	Current (A) 2)	Voltage (V)	Observation
Normal	--	Discharge	2h	Battery surface: 25.6 Ambient: 23.6	0.031	2.98	NL, NS, NE, NF
U4 Pin 2-8	SC	Discharge	--	--	0	2.98	NL, NS, NE, NF
U1 Pin 9-32	SC	Discharge	2h	Battery surface:25.1 Ambient: 23.3	0.027	2.98	NL, NS, NE, NF
U6 Pin 1-2	SC	Discharge	--	--	0	2.98	NL, NS, NE, NF
Supplementary information:							
Abbreviation: SC= short circuit; OC= open circuit NL= no chemical leakage; NS= no spillage of liquid; NE= no explosion; NF= no emission of flame or expulsion of molten metal. 1) The rechargeable Li-ion battery/cells cannot be reversed due to the design of enclosure.							

M.4.2	**TABLE: Charging safeguards for equipment containing a secondary lithium battery**					N/A
Maximum specified charging voltage (V)... :			--			—
Maximum specified charging current (A) ....:			--			—
Highest specified charging temperature (°C) ....:			--			
Lowest specified charging temperature (°C) ....:			--			
Battery manufacturer/type	Operating and fault condition	Measurement			Observation	
		Charging voltage (V)	Charging current (A)	Temp. (°C)		
Supplementary information:						
Abbreviation: SC= short circuit; OC= open circuit; MSCV= maximum specified charging voltage; MSCC= maximum specified charging current; HSCT= highest specified charging temperature; LSCT= lowest specified charging temperature						

Q.1	**TABLE: Circuits intended for interconnection with building wiring (LPS)**						N/A
Output Circuit	Condition	U_{oc} (V)	Time (s)	I_{sc} (A)		S (VA)	
				Meas.	Limit	Meas.	Limit
--	--	--	--	--	--	--	--
Supplementary Information:							

T.2, T.3, T.4, T.5	**TABLE: Steady force test**					P
Location/Part	Material	Thickness (mm)	Probe	Force (N)	Test Duration (s)	Observation
Top enclosure	Plastic	0.62	--	100	5	Enclosure remained intact, no crack/ opening developed. No insulation breakdown.
Bottom enclosure	Plastic	0.62	--	100	5	Enclosure remained intact, no

						crack/ opening developed. No insulation breakdown.
Supplementary information:						

T.6, T.9	TABLE: Impact test			N/A
Location/Part	Material	Thickness (mm)	Height (mm)	Observation
--	--	--	--	--
Supplementary information:				

T.7	TABLE: Drop test			P
Location/Part	Material	Thickness (mm)	Height (mm)	Observation
Top enclosure	Plastic	0.62	1000	No damage, no hazard
Bottom enclosure	Plastic	0.62	1000	No damage, no hazard
Supplementary information:				

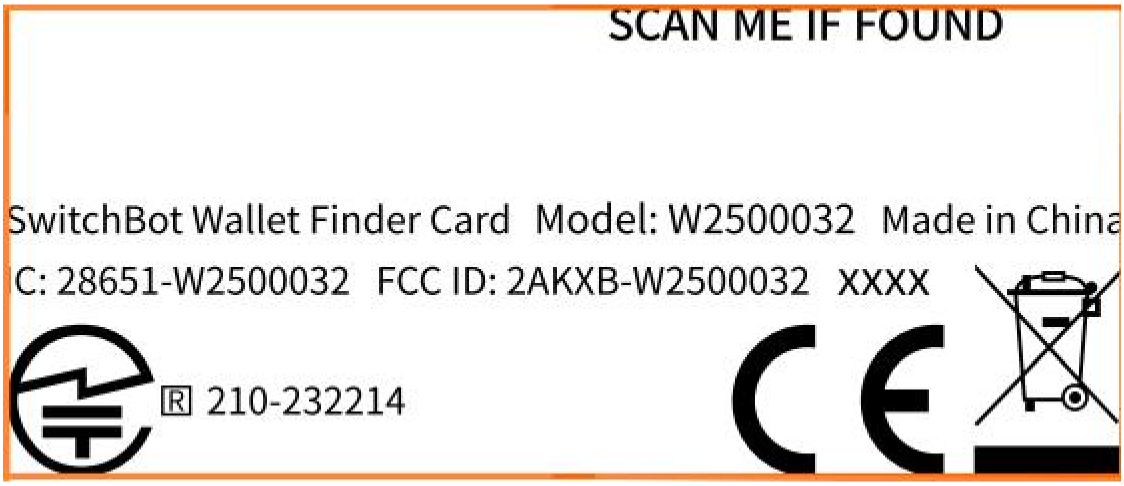
T.8	TABLE: Stress relief test				P
Location/Part	Material	Thickness (mm)	Oven Temperature (°C)	Duration (h)	Observation
Whole EUT	Plastic	0.62	70	7	No risk of shrinkage or distortion on material.
Supplementary information:					

X	**TABLE: Alternative method for determining minimum clearances distances**		N/A
Clearance distanced between:	Peak of working voltage (V)	Required cl (mm)	Measured cl (mm)
--	--	--	--
Supplementary information:			

IEC 62368-1			
Clause	Requirement-Test	Result-Remark	Verdict

4.1.2	**TABLE: Critical components information**				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity[1)]
Plastic enclosure	Covestro Deutschland AG [PC Resins]	6555 + (z)(f2)	V-2, Minimum thickness:0.62mm	UL 94 UL 746	UL E41613
Alternate	Interchangeable	Interchangeable	Min.HB, 80°C	UL 94 UL 746	UL
PCB	Jiangyin Junchi New Material Technology Co.,LTD	TD-R	V-0, 105°C	UL 94 UL 796	UL E519891
Alternate	Interchangeable	Interchangeable	Min.V-1, 105°C	UL 94 UL 796	UL
Non-rechargeable lithium-manganes e batteries	GN Energy Technology Co.,Ltd	CP114752B	3,0Vdc, 540mAh	IEC 60086-4	Tested by Shenzhen NCT Testing Technology Co.,Ltd. Report.no.: NCT23048136X1 5-1
Supplementary information:					
1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

6 Product Marking Label



Label of main unit

7 PHOTO DOCUMENT

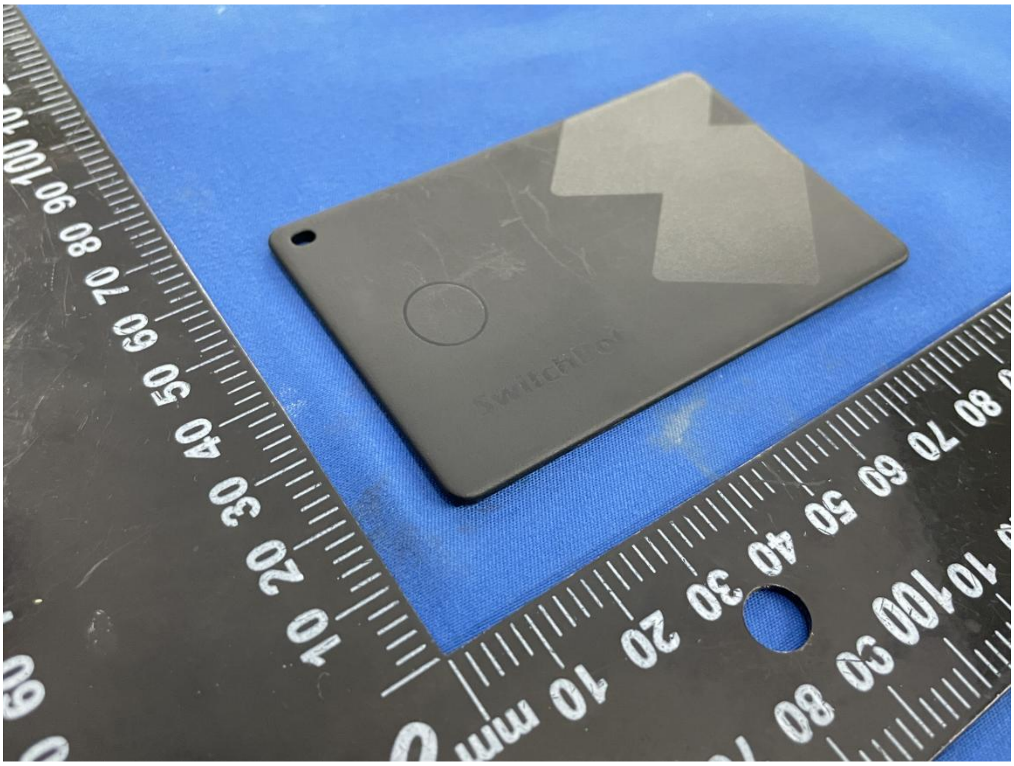


Photo 1: Overall view

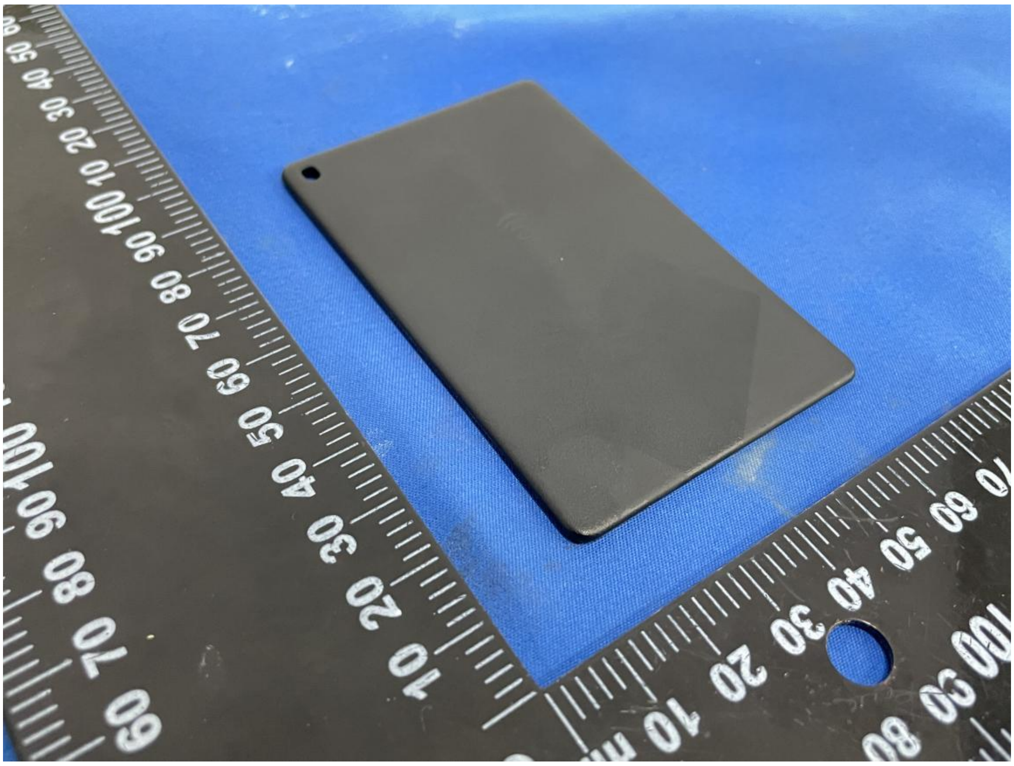


Photo 2: Overall view

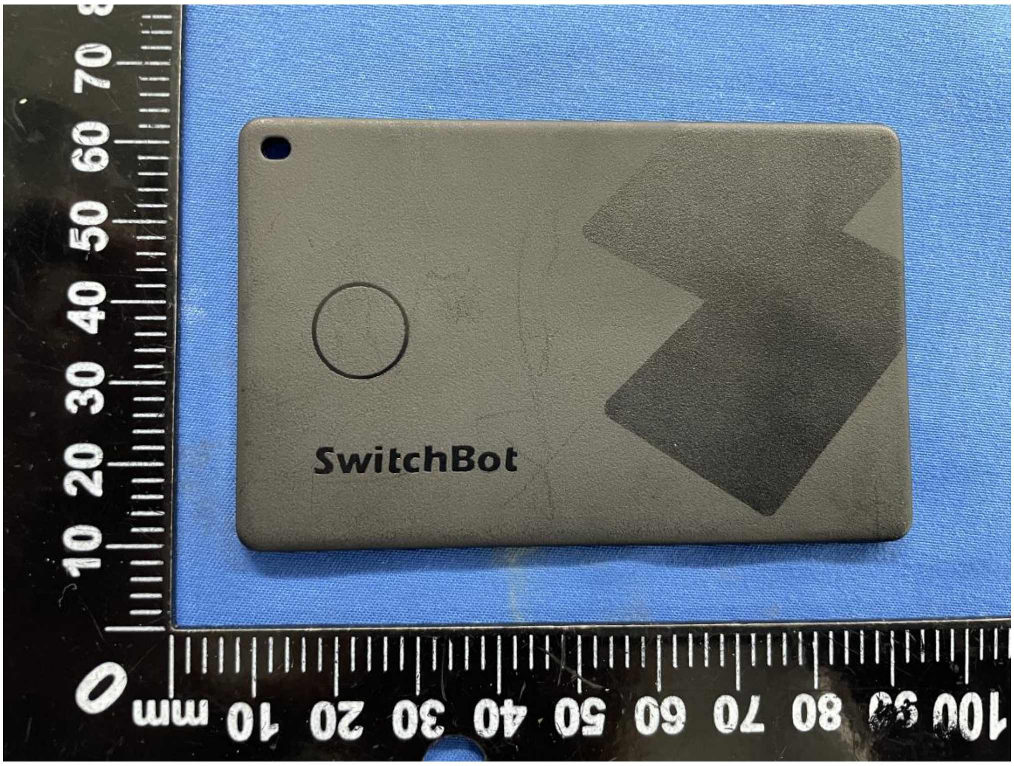


Photo 3: Overall view

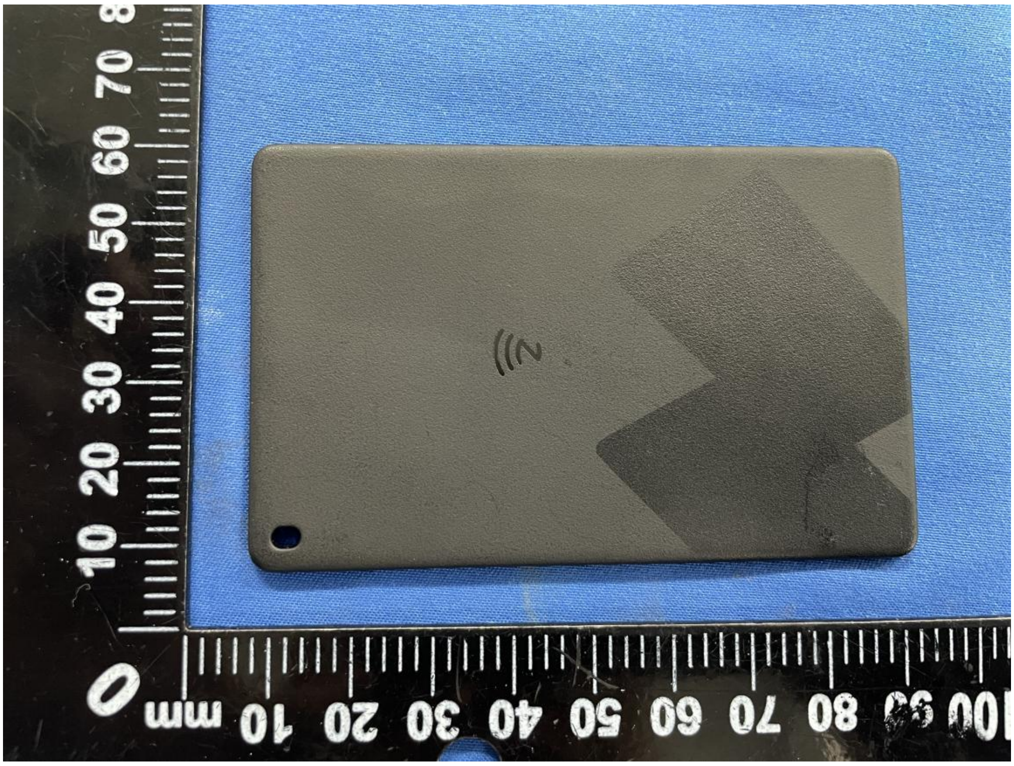


Photo 4: Overall view

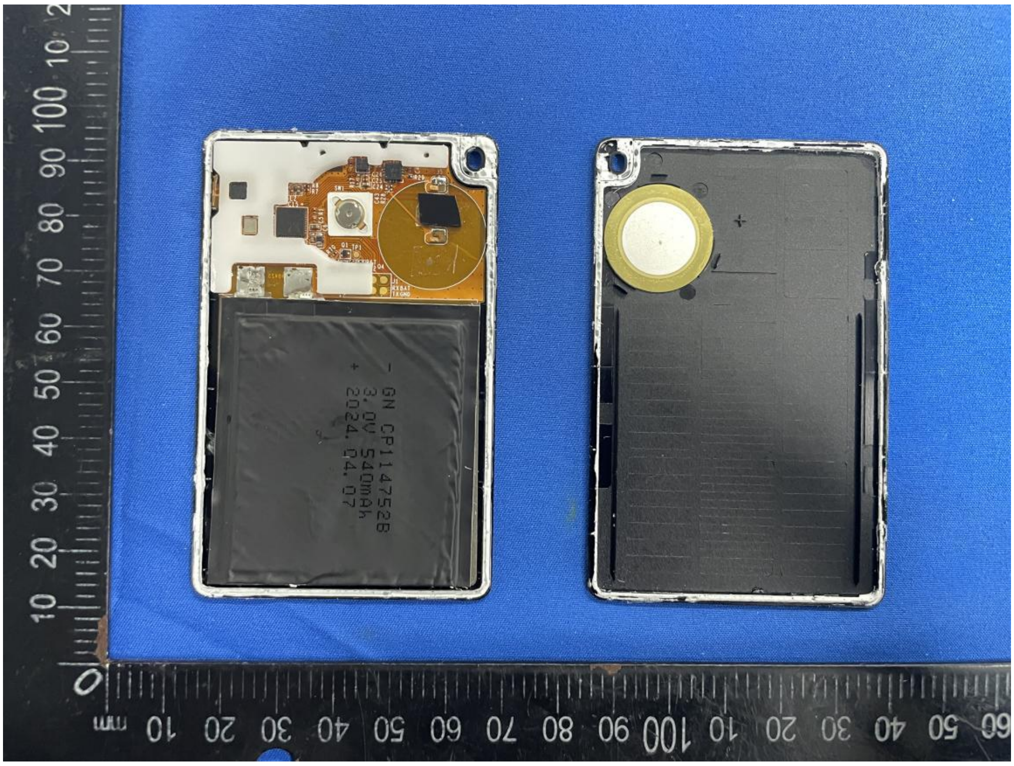


Photo 5: Internal view

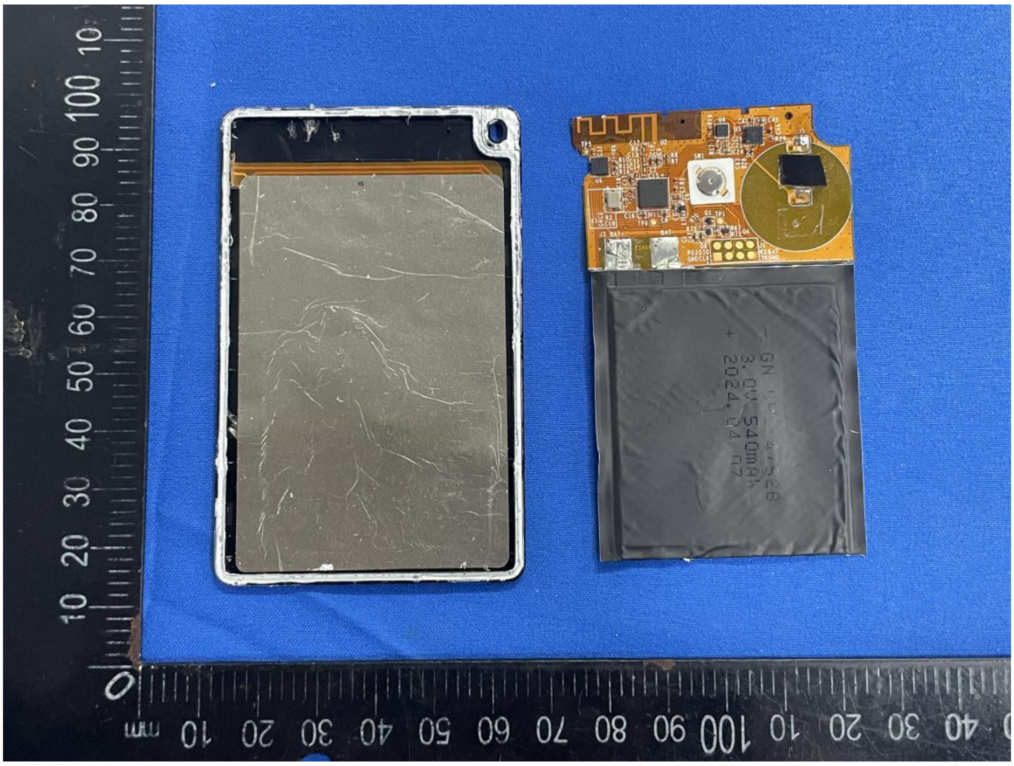


Photo 6: Internal view

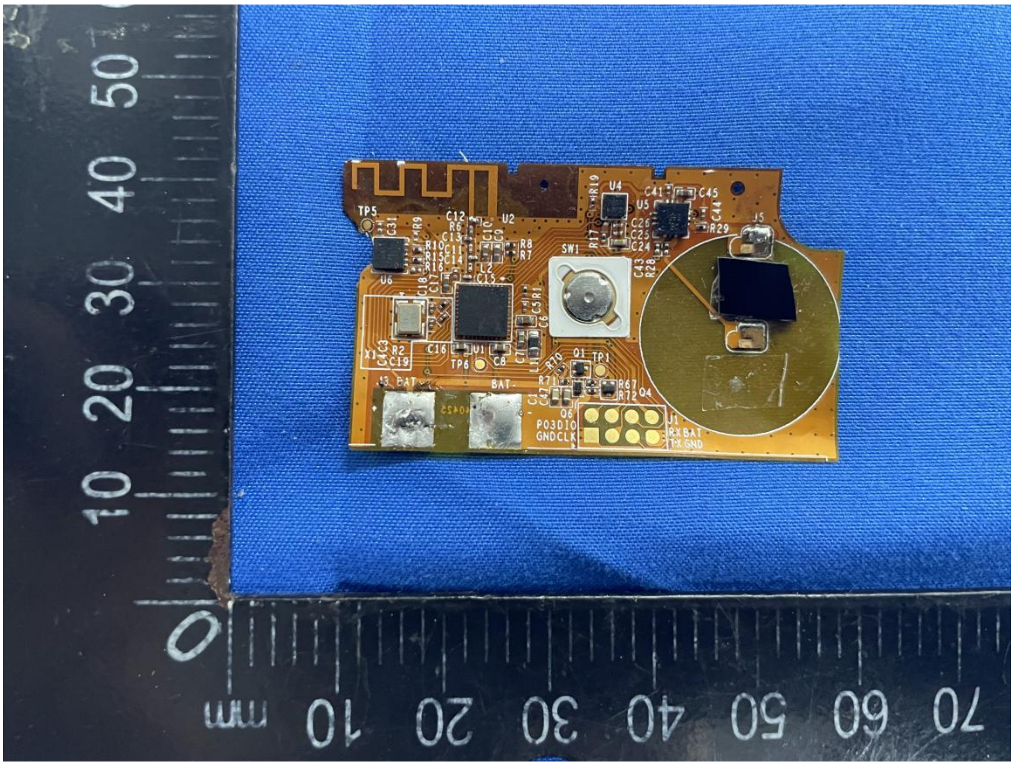


Photo 7: PCB view

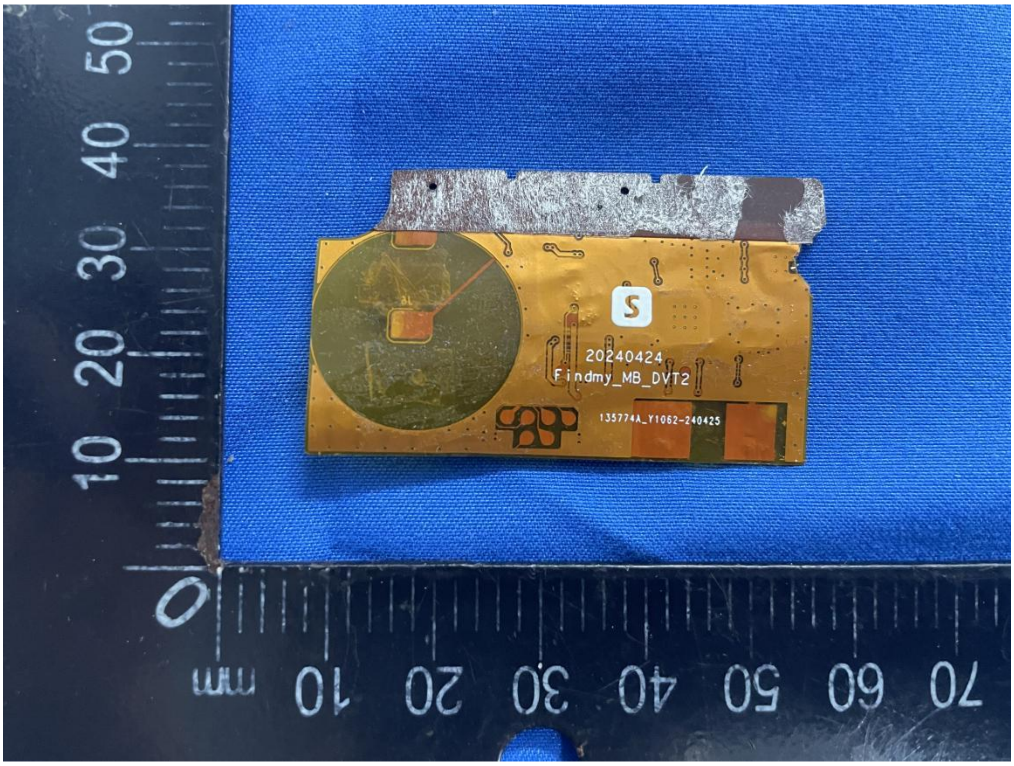


Photo 8: PCB view

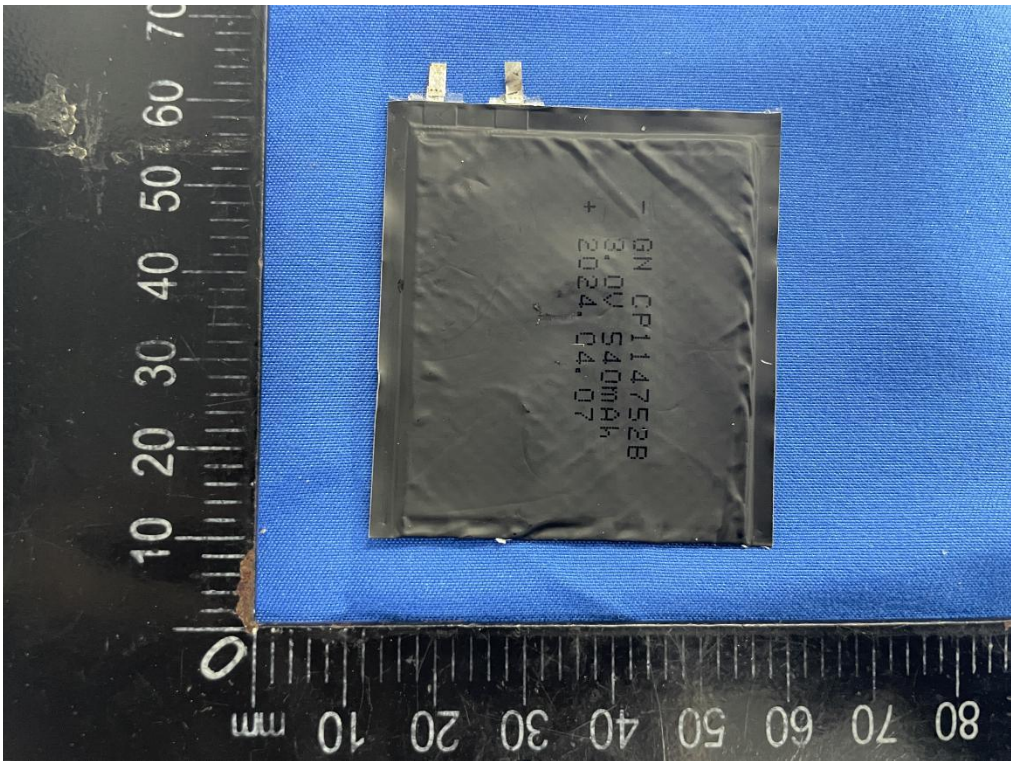


Photo 9: Battery view

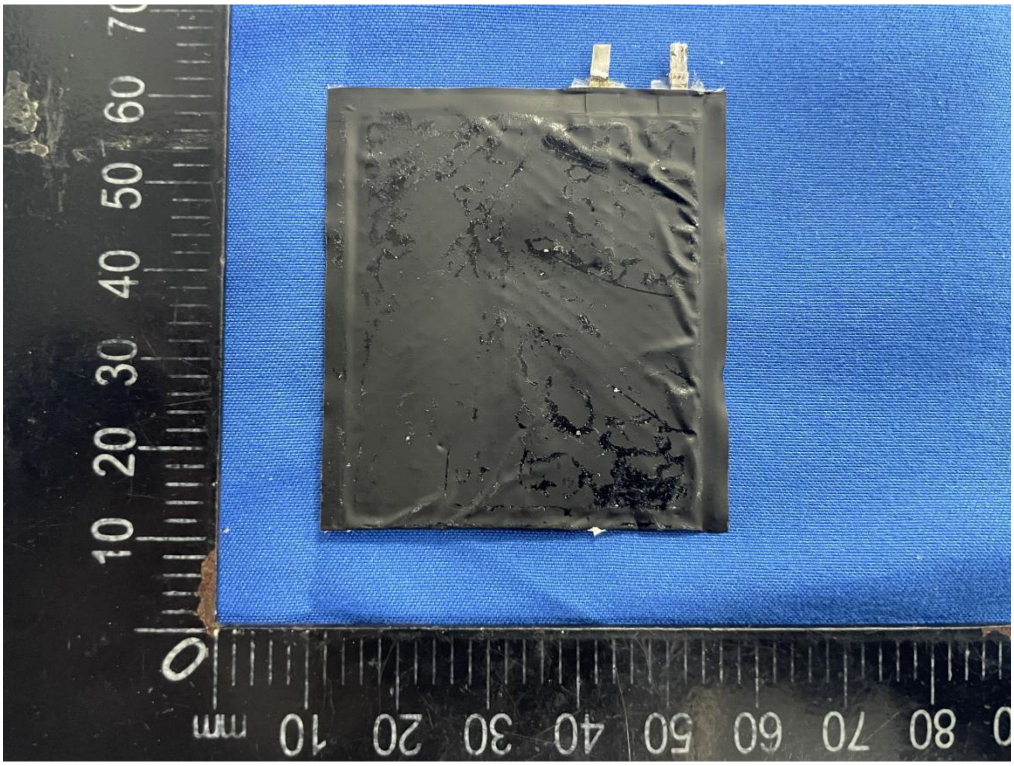


Photo 10: Battery view

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
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4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the “inspection and testing dedicated stamp” or test report stamp.
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7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--