



CERTIFICATE *of* EXAMINATION



Certificate Validation

NOTIFIED BODY EU-TYPE EXAMINATION CERTIFICATE

BALU549-EU / 22 Dec 2022 / Rev A

Radio Equipment Directive (RED) 2014/53/EU

MiCOM Labs Inc., Notified Body Number 2280 declares, on the basis of the assessment of the tests and the technical documentation provided by the applicant that the following product complies with the essential requirements of the above noted Directive.

Product Name:
SwitchBot Hub 2

Approval Holder Name:
Woan Technology (Shenzhen) Co., Ltd.




Gordon Hurst, Product Certifier

This Certificate is Issued under the Authority of:
MiCOM Labs Inc., 575 Boulder Court, Pleasanton, California 94566, USA

Notified Body Number: 2280



Notified Body EU-Type Examination Certificate

BALU549-EU / 22 Dec 2022 / Rev A

for Radio Equipment Directive (RED) 2014/53/EU

Product Name:

SwitchBot Hub 2

Product Model Numbers: **W3202100, W3202101, W3202102, W3202103, W3202104, W3202105, W3202106**

Brand Name: **SwitchBot**

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

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

Standards

Group	Name
Article 3.1(a) Health & Safety	IEC 62368-1: 2018
	EN IEC 62368-1: 2020+A11: 2020
	EN IEC 62311: 2020
Article 3.1(b) Electromagnetic Compatibility	EN 301 489-1 V2.2.3
	EN 301 489-17 V3.2.4
	EN 55032: 2015+A1:2020
	EN 55035: 2017+A11:2020
	EN IEC 61000-3-2: 2019
	EN 61000-3-3: 2013+A1:2019
Article 3.2 Effective Use of Spectrum	EN 300 328 V2.2.2



Annex 1 to EU-Type Examination

EU-Type examination on the essential requirements
Article 3

Article 3.1 - a) Health and Safety	Assessed
Article 3.1 - b) Electromagnetic compatibility	Assessed
Article 3.2 - Effective use of radio spectrum	Assessed
Article 3.3 - a) interworks with Accessories/Chargers	Not Applicable
Article 3.3 - b) interworks with Radio Networks	Not Applicable
Article 3.3 - c) can connect to interfaces	Not Applicable
Article 3.3 - d) does not harm the network, misuse network resources	Not Applicable
Article 3.3 - e) privacy protections	Not Applicable
Article 3.3 - f) fraud protections	Not Applicable
Article 3.3 - g) emergency services access	Not Applicable
Article 3.3 - h) assist users with disabilities	Not Applicable
Article 3.3 - i) integrity of software	Not Applicable

Description of Apparatus

Company Name	Woan Technology (Shenzhen) Co., Ltd.
Certification No.	BALU549-EU
Issue Date / Rev	22 Dec 2022 / Rev A
Equipment Description	SwitchBot Hub 2



Notified Body EU-Type Examination Certificate

BALU549-EU / 22 Dec 2022 / Rev A

for Radio Equipment Directive (RED) 2014/53/EU

Emission Information

Technology	Frequency MHz		Emission Designator	RF Power		
	From	To		Max	Type	Field Strength
Bluetooth (BLE)	2402	2480	F1D	2.0dBm	EIRP	--
2.4G WIFI	2412	2472	G1D,D1D	19.8dBm	EIRP	--

Technical Construction File Details: (Documents Reviewed)

Technical Report(s):

Article 3.1(a) Health & Safety:

BL-SZ22B1240-701

BL-SZ22B1240-101

Article 3.1(b) Electromagnetic Compatibility:

BL-SZ22B1240-402

BL-SZ22B1240-401

Article 3.2 Effective Use of Spectrum:

BL-SZ22B1240-602

BL-SZ22B1240-601

Supporting Documentation:

Service Agreement

Agent Authorization

EU Application

EU Declaration of Conformity

Block Diagram

BOM or Parts List

External Photographs

Internal Photographs

Label and its Location

Operational Description

PCB Layout

Risk Assessment Report and other supporting documents (Radio)

Schematics

Test Setup - EU

User Manual

Declaration of Identity

Scope

This EU-Type Examination Certificate is given in respect of compliance of radio spectrum use Article 3 Paragraph 2 of the RED Directive 2014/53/EU. The scope of the evaluation and this certificate relates only to those items identified in 'Annex 1 to EU - Type Examination Certificate' for the specific product and Certificate number referenced above.

EU Type Examination was performed according to Module B: EU-type examination procedure per Annex III the Directive on the essential requirements in Article 3, for the specific product and Certificate Number referenced above.

This EU Type Examination Certificate is based upon the review of the Technical Documentation and supporting evidence for the adequacy of the technical design solution, it is only valid in conjunction with the attached Annexes. The scope of this statement relates to a single sample of the apparatus identified above and of the submitted documents only.

Annex 2 to EU-Type Examination Obligations of the Applicant

Ref RED 2014/53/EU Article 10 - Obligations of manufacturers

1. When placing their radio equipment on the market, manufacturers shall ensure that it has been designed and manufactured in accordance with the essential requirements set out in Article 3.
2. Manufacturers shall ensure that radio equipment shall be so constructed that it can be operated in at least one Member State without infringing applicable requirements on the use of radio spectrum.
3. Manufacturers shall draw up the technical documentation referred to in Article 21 and carry out the relevant conformity assessment procedure referred to in Article 17 or have it carried out. Where compliance of radio equipment with the applicable requirements has been demonstrated by that conformity assessment procedure, manufacturers shall draw up an EU declaration of conformity and affix the CE marking.
4. Manufacturers shall keep the technical documentation and the EU declaration of conformity for 10 years after the radio equipment has been placed on the market.
5. Manufacturers shall ensure that procedures are in place for series production to remain in conformity with this Directive. Changes in radio equipment design or characteristics and changes in the harmonised standards or in other technical specifications by reference to which conformity of radio equipment is declared shall be adequately taken into account.

When deemed appropriate with regard to the risks presented by radio equipment, manufacturers shall, to protect the health and safety of end-users, carry out sample testing of radio equipment made available on the market, investigate, and, if necessary, keep a register of complaints, of non-conforming radio equipment and radio equipment recalls, and shall keep distributors informed of any such monitoring.

6. Manufacturers shall ensure that radio equipment which they have placed on the market bears a type, batch or serial number or other element allowing its identification, or, where the size or nature of the radio equipment does not allow it, that the required information is provided on the packaging, or in a document accompanying the radio equipment.
7. Manufacturers shall indicate on the radio equipment their name, registered trade name or registered trade mark and the postal address at which they can be contacted or, where the size or nature of radio equipment does not allow it, on its packaging, or in a document accompanying the radio equipment. The address shall indicate a single point at which the manufacturer can be contacted. The contact details shall be in a language easily understood by end-users and market surveillance authorities.
8. Manufacturers shall ensure that the radio equipment is accompanied by instructions and safety information in a language which can be easily understood by consumers and other end-users, as determined by the Member State concerned. Instructions shall include the information required to use radio equipment in accordance with its intended use. Such information shall include, where applicable, a description of accessories and components, including software, which allow the radio equipment to operate as intended. Such instructions and safety information, as well as any labelling, shall be clear, understandable and intelligible.

The following information shall also be included in the case of radio equipment intentionally emitting radio waves:

- (a) frequency band(s) in which the radio equipment operates;
- (b) maximum radio-frequency power transmitted in the frequency band(s) in which the radio equipment operates.

9. Manufacturers shall ensure that each item of radio equipment is accompanied by a copy of the EU declaration of conformity or by a simplified EU declaration of conformity. Where a simplified EU declaration of conformity is provided, it shall contain the exact internet address where the full text of the EU declaration of conformity can be obtained.

10. In cases of restrictions on putting into service or of requirements for authorisation of use, information available on the packaging shall allow the identification of the Member States or the geographical area within a Member State where restrictions on putting into service or requirements for authorisation of use exist. Such information shall be completed in the instructions accompanying the radio equipment. The Commission may adopt implementing acts specifying how to present that information. Those implementing acts shall be adopted in accordance with the advisory procedure referred to in Article 45(2).



11. Manufacturers who consider or have reason to believe that radio equipment which they have placed on the market is not in conformity with this Directive shall immediately take the corrective measures necessary to bring that radio equipment into conformity, to withdraw it or recall it, if appropriate. Furthermore, where the radio equipment presents a risk, manufacturers shall immediately inform the competent national authorities of the Member States in which they made the radio equipment available on the market to that effect, giving details, in particular, of the noncompliance, of any corrective measures taken and of the results thereof.

12. Manufacturers shall, further to a reasoned request from a competent national authority, provide it with all the information and documentation in paper or electronic form necessary to demonstrate the conformity of the radio equipment with this Directive, in a language which can be easily understood by that authority. They shall cooperate with that authority, at its request, on any action taken to eliminate the risks posed by radio equipment which they have placed on the market.

Ref RED 2014/53/EU Article 11 - Authorised representatives

1. A manufacturer may, by a written mandate, appoint an authorised representative.

The obligations laid down in Article 10(1) and the obligation to draw up technical documentation laid down in Article 10(3) shall not form part of the authorised representative's mandate.

2. An authorised representative shall perform the tasks specified in the mandate received from the manufacturer. The mandate shall allow the authorised representative to do at least the following:

(a) keep the EU declaration of conformity and the technical documentation at the disposal of national market surveillance authorities for 10 years after the radio equipment has been placed on the market;

(b) further to a reasoned request from a competent national authority, provide that authority with all the information and documentation necessary to demonstrate the conformity of radio equipment;

(c) co-operate with the competent national authorities, at their request, on any action taken to eliminate the risks posed

Article 19 General principles of the CE marking

1. The CE marking shall be subject to the general principles set out in Article 30 of Regulation (EC) No 765/2008.

2. On account of the nature of radio equipment, the height of the CE marking affixed to radio equipment may be lower than 5 mm, provided that it remains visible and legible.

Article 20 Rules and conditions for affixing the CE marking and the identification number of the notified body

1. The CE marking shall be affixed visibly, legibly and indelibly to the radio equipment or to its data plate, unless that is not possible or not warranted on account of the nature of radio equipment. The CE marking shall also be affixed visibly and legibly to the packaging.

2. The CE marking shall be affixed before the radio equipment is placed on the market.

3. Member States shall build upon existing mechanisms to ensure correct application of the regime governing the CE marking and shall take appropriate action in the event of improper use of that marking.



UK TYPE EXAMINATION CERTIFICATE



Certificate Validation

APPROVED BODY UK-TYPE EXAMINATION CERTIFICATE

BALU549-UK / 22 Dec 2022 / Rev A

UK Radio Equipment Regulations (S.I. 2017 No. 1206)

MiCOM Labs Inc., Approved Body Number 2280 declares, on the basis of the assessment of the tests and the technical documentation provided by the applicant that the following product complies with the essential requirements of the above noted Regulations.

Product Name:
SwitchBot Hub 2

Approval Holder Name:
Woan Technology (Shenzhen) Co., Ltd.



UK CA


Gordon Hurst, Product Certifier

This Certificate is Issued under the Authority of:
MiCOM Labs Inc., 575 Boulder Court, Pleasanton, California 94566, USA

Approved Body Number: 2280



Approved Body UK-Type Examination Certificate

BALU549-UK / 22 Dec 2022 / Rev A

for UK Radio Equipment Regulations (S.I. 2017 No. 1206)

Product Name:

SwitchBot Hub 2

Product Model Numbers: **W3202100, W3202101, W3202102, W3202103, W3202104, W3202105, W3202106**

Brand Name: **SwitchBot**

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

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

Standards

Group	Name
Section 6(1)(a) Health & Safety	IEC 62368-1: 2018
	BS EN 62368-1: 2020+A11: 2020
	EN IEC 62311: 2020
Section 6(1)(b) Electromagnetic Compatibility	EN 301 489-1 V2.2.3
	EN 301 489-17 V3.2.4
	BS EN 55032: 2015+A1:2020
	BS EN 55035: 2017+A11:2020
	BS EN IEC 61000-3-2: 2019
	BS EN 61000-3-3: 2013+A1:2019
Section 6(2) Effective Use of Spectrum	EN 300 328 V2.2.2



Approved Body UK-Type Examination Certificate

BALU549-UK / 22 Dec 2022 / Rev A

for UK Radio Equipment Regulations (S.I. 2017 No. 1206)

Annex 1 to UK-Type Examination

UK-Type examination on the essential requirements Section 6

Section 6(1) - a) Health and Safety Assessed

Section 6(1) - b) Electromagnetic compatibility Assessed

Section 6(2) - Effective use of radio spectrum Assessed

Description of Apparatus

Company Name **Woan Technology (Shenzhen) Co., Ltd.**

Certification No. **BALU549-UK**

Issue Date / Rev **22 Dec 2022 / Rev A**

Equipment Description **SwitchBot Hub 2**

Emission Information

Technology	Frequency MHz		Emission Designator	RF Power		
	From	To		Max	Type	Field Strength
Bluetooth (BLE)	2402	2480	F1D	2.0dBm	EIRP	--
2.4G WIFI	2412	2472	G1D,D1D	19.8dBm	EIRP	--

Technical Construction File Details: (Documents Reviewed)

Technical Report(s):

Section 6(1)(a) Health & Safety:

BL-SZ22B1240-701

BL-SZ22B1240-101

Section 6(1)(b) Electromagnetic Compatibility:

BL-SZ22B1240-401

BL-SZ22B1240-402

Section 6(2) Effective Use of Spectrum:

BL-SZ22B1240-602

BL-SZ22B1240-601

Supporting Documentation:

Service Agreement

Agent Authorization

UK Application

UK Declaration of Conformity

Block Diagram

BOM or Parts List

External Photographs

Internal Photographs

Label and its Location

Operational Description

PCB Layout

Schematics

Test Setup - UK

UK Risk Assessment (Radio)

User Manual

Declaration of Identity

**Approved Body UK-Type Examination Certificate****BALU549-UK / 22 Dec 2022 / Rev A****for UK Radio Equipment Regulations (S.I. 2017 No. 1206)**

Scope

This UK-Type Examination Certificate is given in respect of compliance of the noted Radio Equipment per Section 6 Essential Requirements of UK Radio Equipment Regulations (SI 2017 No. 1206). The scope of the evaluation and this certificate relates only to those items identified in 'Annex 1 to UK-Type Examination Certificate' for the specific product and Certificate number referenced above.

UK Type Examination was performed according to Module B: UK-type examination procedure per Schedule 3 of the Regulation on the essential requirements in Section 6, for the specific product and Certificate Number referenced above.

This UK-Type Examination Certificate is based upon the review of the Technical Documentation and supporting evidence for the adequacy of the technical design solution, it is only valid in conjunction with the attached Annexes. The scope of this statement relates to a single sample of the apparatus identified above and of the submitted documents only.

The obligations of the following parties; Manufacturers, Importers, Distributors; are as defined in the UK Radio Equipment Regulations(SI 2017 / 1206) in conjunction with amendments in UK Statutory Instruments 2019 No. 696 Schedule 29.

<https://www.legislation.gov.uk/uksi/2017/1206/contents>

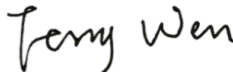
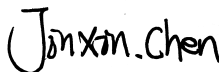
<https://www.legislation.gov.uk/uksi/2019/696/schedule/29>

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 Hub 2
Model Name: W3202100(refer to section 2.4)
Brand Name: SwitchBot
Test Standard: IEC 62368-1: 2018
EN IEC 62368-1: 2020+A11: 2020
BS EN IEC 62368-1:2020+A11:2020
Sample Arrival Date: Dec. 01, 2022
Test Date: Dec. 02, 2022 – Dec. 08, 2022
Date of Issue: Dec. 19, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Jinxin Chen**Checked by:** Terry Wen**Approved by:** Liao Jianming
(Technical Director)

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Dec. 19, 2022</u>	<u>Initial Issue</u>

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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 Factory Information

Factory	Woan Technology (Shenzhen) Co., Ltd.
Address	Building A2, Zhengfeng Industrial Area, No.610 Fengtang Boulevard, Fuhai Sub-district, Bao'an District, Shenzhen

2.4 General Description for Equipment under Test (EUT)

Equipment Type	SwitchBot Hub 2
Model Name Under Test	W3202100
Series Model Name	W3202101, W3202102, W3202103, W3202104, W3202105, W3202106
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name (this information provided by the customer).
Hardware Version	/
Software Version	/
Dimensions(Approx.)	/
Weight(Approx.)	59.4g

2.5 Ancillary Equipment

Ancillary Equipment 1	AC/DC ADAPTER	
	Brand Name	/
	Model No.	KA12C-0502000EU
	Rated Input	100-240V~ 50/60Hz 0.35A
	Rated Output	5.0V---2.0A Max 10.0W

2.6 Technical Information

Ratings	Input: 5.0Vdc, 2.0A, Class III (External Power supply by Adapter)
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	☐ _____ A; Installation location: ☐ building; ☐ equipment

building or equipment installation	☒ 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	40°C ☐ Outdoor: minimum °C
IP protection class	☒ IPX0 ☐ IPX4
Power Systems	☐ TN ☐ TT ☐ IT - ____ V _{L-L} ; ☐ dc mains ☒ not AC mains
Altitude during operation (m)	☐ 2000m or less ☒ 5000 m
Altitude of test laboratory (m)	☒ 2000m or less ☐ ____ m
Mass of equipment (kg)	☒ 59.4g
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	BS 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

Tests performed (name of test and test clause):

All applicable tests as described in Test Case and Measurement Sections were performed.

4	General requirements
5.2	Electrical energy source classifications
5.4.1.4, 6.3.2, 9.0, B.2.6	Maximum operating temperatures for materials, components and systems
6.2.2	Electrical power sources (PS) measurements for classification
6.2.3.2	Determination of Potential Ignition Sources (Resistive PIS)
6.3, 6.4	Simulated abnormal operating and single fault conditions
9.4.1	Equipment safeguards for thermal burn
B.2.5	Input tests
B.4	Simulated single fault conditions
F.3.9	Durability, legibility and permanence of markings
T.5	Steady force test, 250 N
T.6	Impact test
T.8	Stress relief test

Manufacturer specified the operating temperature range (without charging): 40°C.

Summary of compliance with National Differences:

List of countries addressed:

1. European group
2. Ireland and United Kingdom

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 class III SwitchBot Hub 2, the tested model is W3202100, used as Audio/video, information and communication technology equipment which indoor use only.
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. There are seven models in total, W3202100, W3202101, W3202102, W3202103, W3202104, W3202105, W3202106, all models are same with electrical parameters and internal circuit structure, but only differ in model name. All tests were conducted on model W3202100, to represent other models.
4. Circuit characteristics: Only secondary (SELV) circuit.
5. The product it to be powered by Adapter which were classified as ES1 and PS2/LPS circuits via Type-C port.
6. The specified Max. ambient temperature is +40°C.
7. The equipment was evaluated for a maximum operating altitude of 5000m.

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: Input circuit/port 5.0Vd.c.	Ordinary	N/A	N/A	N/A
ES1: All internal circuit 5.0Vd.c.	Ordinary	N/A	N/A	N/A
6	Electrically-caused fire			
Class and Energy Source (e.g. PS2: 100 Watt circuit)	Material part (e.g. Printed board)	Safeguards		
		B	1 st S	2 nd S
PS2:Input circuit/port	PCB	Comply with 6.3	V-1 or better	N/A
PS2:Input circuit/port	Enclosure	Comply with	HB or better	N/A

		6.3		
PS2:Input circuit/port	Combustible materials within equipment	Comply with 6.3	Comply with 6.4.5	N/A
7	Injury caused by hazardous substances			
Class and Energy Source (e.g. Ozone)	Body Part (e.g., Skilled)	Safeguards		
		B	S	R
N/A (no such sources)	N/A	N/A	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: Corner and edge are smooth	Ordinary	N/A	N/A	N/A
MS1: Mass of EUT	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
RS1:LED use as indicating lights of EUT	Ordinary	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	Digital Caliper	AIRUIZE	BZ-SFT-L228	2023/09/18	√
2	Heating Recorder	Agilent	BZ-SFT-L131	2023/01/04	√
3	High temperature test chamber	SHANGHAI JINGMI	BZ-SFT-L222	2023/01/04	√
4	Pull and push Tester	HANDPI	BZ-SFT-L045	2023/09/15	√
5	Digital Multimeter	Victor	BZ-SFT-L199	2023/09/15	√
6	Electronic Scale	ACS-3kg	BZ-SFT-L207	2023/01/04	√
7	Stop Watch	TF	BZ-SFT-L068	2023/05/24	√
8	Temperature and humidity meter	CEM	BZ-SFT-L197	2023/09/14	√
9	Tape Measure	DELI	BZ-SFT-L145	2023/09/18	√
10	Impact ball	/	BZ-KKX-L012	2023/06/06	√
11	DC power	ITECH	BZ-SFT-L143	2023/01/07	√

Clause	Requirement-Test	Result-Remark	Verdict

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 EN and/or national standards are used correctly within their ratings. Components not covered by EN 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.5)	P
4.4.3.3	Drop tests		N/A
4.4.3.4	Impact tests	(See Clause T.6)	P
4.4.3.5	Internal accessible safeguard tests		N/A
4.4.3.6	Glass impact tests		N/A
4.4.3.7	Glass fixation tests		N/A
	Glass impact test (1J)		N/A
	Push/pull test (10 N)		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
4.4.3.8	Thermoplastic material tests	(See Clause T.8)	P
4.4.3.9	Air comprising a safeguard		N/A
4.4.3.10	Accessibility, glass, safeguard effectiveness	After tests, no safeguard damaged	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		N/A
4.5.1	General	No such parts	N/A
4.5.2	No explosion during normal/abnormal operating condition		N/A
	No harm by explosion during single fault conditions		N/A
4.6	Fixing of conductors	Class III equipment	N/A
	Fix conductors not to defeat a safeguard		N/A
	Compliance is checked by test..... :		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 such battery used	N/A
4.8.2	Instructional safeguard..... :		N/A
4.8.3	Battery compartment door/cover construction		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

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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		P
4.10	Component requirements		N/A
4.10.1	Disconnect Device		N/A
4.10.2	Switches and relays		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..... :	Class III equipment	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	No such ringing signals within the EUT	N/A
5.2.2.7	Audio signals	No such Audio signals within the EUT	N/A
5.3	Protection against electrical energy sources		P
5.3.1	General Requirements for accessible parts to ordinary, instructed and skilled persons	See only 4.3 and 5.3 to 5.5 which applies to protection between the accessible parts and hazardous parts of other circuits.	P
5.3.1 a)	Accessible ES1/ES2 derived from ES2/ES3 circuits	Only ES1 circuit	P
5.3.1 b)	Skilled persons not unintentional contact ES3 bare conductors	Only ES1 circuit	N/A
5.3.2.1	Accessibility to electrical energy sources and safeguards	Only ES1 circuit can be accessed for this product.	P
	Accessibility to outdoor equipment bare parts		N/A
5.3.2.2	Contact requirements		N/A
	Test with test probe from Annex V		—

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Clause	Requirement-Test	Result-Remark	Verdict
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
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. Insulation are not required.	N/A
5.4.1.3	Material is non-hygroscopic		N/A
5.4.1.4	Maximum operating temperature for insulating materials..... :	(See appended table)	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		N/A
5.4.2.2	Procedure 1 for determining clearance		N/A
	Temporary overvoltage :		—

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Clause	Requirement-Test	Result-Remark	Verdict
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 :		—
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

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Clause	Requirement-Test	Result-Remark	Verdict
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
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 (M Ω)..... :		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

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Clause	Requirement-Test	Result-Remark	Verdict
	SPDs bridge separation between external circuit and earth		N/A
	Rated operating voltage U_{op} (V).....:		—
	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		N/A
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

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Clause	Requirement-Test	Result-Remark	Verdict
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
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

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Clause	Requirement-Test	Result-Remark	Verdict
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 connections		N/A
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..... :	PS (power source) classification determined by measuring the maximum power in Figures 34 and 35 for load and power source circuits.	P
6.2.3	Classification of potential ignition sources	See the following details.	P

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Clause	Requirement-Test	Result-Remark	Verdict
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)	P
6.3	Safeguards against fire under normal operating and abnormal operating conditions		P
6.3.1	No ignition and attainable temperature value less than 90 % defined by ISO 871 or less than 300 °C for unknown materials.....	(See appended table 5.4.1.4, 6.3.2, 9.0, B.2.6)	P
	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.....		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		P
6.4.5.2	Supplementary safeguards	Comply with compliance as follow Printed board: rated V-1 or better. Plastic enclosure: rated HB All other components: at least V-2 except for mounted on min. V-1 material or small parts of combustible material (with mass less than 4g).	P
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	See below.	N/A

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Clause	Requirement-Test	Result-Remark	Verdict
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	No fire enclosure required	N/A
6.4.8.3	Constructional requirements for a fire enclosure and a fire barrier	No fire enclosure required	N/A
6.4.8.3.1	Fire enclosure and fire barrier 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
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		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..... :	No such part.	N/A
6.5	Internal and external wiring		N/A
6.5.1	General requirements	No internal wire.	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	N/A
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

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Clause	Requirement-Test	Result-Remark	Verdict

	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		N/A

8	MECHANICALLY-CAUSED INJURY		P
8.2	Mechanical energy source classifications		P
8.3	Safeguards against mechanical energy sources		P
8.4	Safeguards against parts with sharp edges and corners		P
8.4.1	Safeguards	No sharp edges and corners:MS1 Weight< 7.0kg: MS1	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		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

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Clause	Requirement-Test	Result-Remark	Verdict
	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
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

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Clause	Requirement-Test	Result-Remark	Verdict
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
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

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Clause	Requirement-Test	Result-Remark	Verdict
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)..... :		—

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..... :		N/A

10	RADIATION		P
10.2	Radiation energy source classification		P
10.2.1	General classification	RS1	P
	Lasers..... :		—
	Lamps and lamp systems..... :	See 10.4	—
	Image projectors..... :		—

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Clause	Requirement-Test	Result-Remark	Verdict
	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 types)		P
10.4.1	General requirements	For LED indicator, Indicating LED considered as RS1, no safeguards required.	P
	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).....:		—
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

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Clause	Requirement-Test	Result-Remark	Verdict

	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
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..... :	(See Annex E)	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		N/A
B.3.1	General		N/A
B.3.2	Covering of ventilation openings	No ventilation openings.	N/A
	Instructional safeguard..... :		N/A
B.3.3	DC mains polarity test		N/A
B.3.4	Setting of voltage selector	No setting of voltage selector within	N/A

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Clause	Requirement-Test	Result-Remark	Verdict
		the EUT	
B.3.5	Maximum load at output terminals	No output terminals	N/A
B.3.6	Reverse battery polarity	No reverse battery polarity	N/A
B.3.7	Audio amplifier abnormal operating conditions	Not such equipment.	N/A
B.3.8	Safeguards functional during and after abnormal operating conditions..... :		N/A
B.4	Simulated single fault conditions		P
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 used	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		N/A
B.4.5	Short-circuit and interruption of electrodes in tubes and semiconductors	(See appended table B.3 &B.4)	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		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	No batteries used	N/A
C	UV RADIATION		N/A
C.1	Protection of materials in equipment from UV radiation		N/A
C.1.2	Requirements	No such UV generated from the equipment.	N/A
C.1.3	Test method		N/A
C.2	UV light conditioning test		N/A
C.2.1	Test apparatus..... :		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
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
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)..... :	No such equipment	—
	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		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

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Clause	Requirement-Test	Result-Remark	Verdict
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
F.3.3	Equipment rating markings	See below.	P
F.3.3.1	Equipment with direct connection to mains	Class III equipment	N/A
F.3.3.2	Equipment without direct connection to mains	Without direct connection to mains	P
F.3.3.3	Nature of the supply voltage.....	---	P
F.3.3.4	Rated voltage.....	5VDC	P
F.3.3.5	Rated frequency.....	DC supply	N/A
F.3.3.6	Rated current or rated power.....	2.0A	P
F.3.3.7	Equipment with multiple supply connections		N/A
F.3.4	Voltage setting device		N/A
F.3.5	Terminals and operating devices		N/A
F.3.5.1	Mains appliance outlet and socket-outlet markings		N/A
F.3.5.2	Switch position identification marking.....		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.....		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 equipment	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

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Clause	Requirement-Test	Result-Remark	Verdict
F.3.6.3	Functional earthing terminal marking..... :		N/A
F.3.7	Equipment IP rating marking..... :		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 following details.	P
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		N/A
	j) Permanently connected equipment not provided with all-pole mains switch		N/A
	k) Replaceable components or modules providing		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
	safeguard function		
	l) Equipment containing insulating liquid		N/A
	m) Installation instructions for outdoor equipment		N/A
F.5	Instructional safeguards		N/A
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		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		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

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Clause	Requirement-Test	Result-Remark	Verdict
G.3.5.1	Non-resettable devices suitably rated and marking provided		N/A
G.3.5.2	Single faults conditions..... :	(See appended table B.4)	N/A
G.4	Connectors		N/A
G.4.1	Spacings	Not directly connected to mains	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		N/A
G.5	Wound components		N/A
G.5.1	Wire insulation in wound components	No 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	No 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

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Clause	Requirement-Test	Result-Remark	Verdict
	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
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 used.	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		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	No Wire Insulation	N/A
G.6.2	Enamelled winding wire insulation		N/A
G.7	Mains supply cords		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
G.7.1	General requirements	No mains cord provided.	N/A
	Type..... :		—
G.7.2	Cross sectional area (mm ² or AWG)..... :		N/A
G.7.3	Cord anchorages and strain relief for non-detachable power supply cords		N/A
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, <i>D</i> (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

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Clause	Requirement-Test	Result-Remark	Verdict
G.9.1	Requirements	No IC current limiter provided within the equipment.	N/A
	IC limiter output current (max. 5A)..... :		—
	Manufacturers' defined drift :		—
G.9.2	Test Program		N/A
G.9.3	Compliance		N/A
G.10	Resistors		N/A
G.10.1	General	No such resistors	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	No such Capacitor and RC units	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	No such Optocouplers	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 the following details.	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		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

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Clause	Requirement-Test	Result-Remark	Verdict
	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
G.14	Coating on components terminals		N/A
G.14.1	Requirements :	No coating on component terminals considered to affect creepage or clearances.	N/A
G.15	Pressurized liquid filled components		N/A
G.15.1	Requirements	No such device provided within the equipment.	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

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Clause	Requirement-Test	Result-Remark	Verdict

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	Ringling signal		N/A
H.3.1.1	Frequency (Hz)		—
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		—
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

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Clause	Requirement-Test	Result-Remark	Verdict
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
	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		N/A
M.1	General requirements		N/A
M.2	Safety of batteries and their cells		N/A
M.2.1	Batteries and their cells comply with relevant IEC standards.....:	No batteries used	N/A
M.3	Protection circuits for batteries provided within the equipment		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
M.3.1	Requirements		N/A
M.3.2	Test method		N/A
	Overcharging of a rechargeable battery		N/A
	Excessive discharging		N/A
	Unintentional charging of a non-rechargeable battery		N/A
	Reverse charging of a rechargeable battery		N/A
M.3.3	Compliance		N/A
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		N/A
M.5.2	Test method and compliance		N/A
M.6	Safeguards against short-circuits		N/A
M.6.1	External and internal faults		N/A
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

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Clause	Requirement-Test	Result-Remark	Verdict
	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		N/A
	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)..... :		—

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Clause	Requirement-Test	Result-Remark	Verdict
P	SAFEGUARDS AGAINST CONDUCTIVE OBJECTS		N/A
P.1	General	No openings	N/A
P.2	Safeguards against entry or consequences of entry of a foreign object		N/A
P.2.1	General		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	No ES3 or PS3 circuit	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	No such equipment	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).....		—
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

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Clause	Requirement-Test	Result-Remark	Verdict
	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.....:	(See appended table Q.1)	N/A
	Current rating of overcurrent protective device (A):		N/A
Q.2	Test for external circuits – paired conductor cable		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
	- 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).....:		—

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Clause	Requirement-Test	Result-Remark	Verdict
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		N/A
T.3	Steady force test, 30 N		N/A
T.4	Steady force test, 100 N		N/A
T.5	Steady force test, 250 N	(See appended table T.5)	P
T.6	Enclosure impact test	(See appended table T.6)	P
	Fall test	(See appended table T.6)	P
	Swing test		N/A
T.7	Drop test		N/A
T.8	Stress relief test.....	(See appended table T.8)	P
T.9	Glass Impact Test.....		N/A
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

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Clause	Requirement-Test	Result-Remark	Verdict

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
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

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Clause	Requirement-Test	Result-Remark	Verdict
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

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Clause	Requirement-Test	Result-Remark	Verdict

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

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	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 <i>Replace 3.3.19 of IEC 62368-1 with the following definitions:</i>	N/A

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		N/A

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 $\text{Pa}^2 \text{ s}$. $E = \int_0^T p(t)^2 dt$		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. $SEL = 10 \lg \left(\frac{E}{E_0} \right) \text{ dB}$ Note 2 to entry: See B.4 of EN 50332-3:2017 for additional information.		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		

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Clause	Requirement-Test	Result-Remark	Verdict
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

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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

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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 $L_{Aeq,T}$, 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 $L_{Aeq,T}$) 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 $L_{Aeq,T}$) 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)		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
	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.		N/A
10.6.2.4	RS3 limits		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
	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		N/A

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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		N/A
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.		N/A
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		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
	(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 % <i>CSD</i> is reached, and at least at every 100 % further increase of <i>CSD</i>, 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 % <i>CSD</i> 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

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Clause	Requirement-Test	Result-Remark	Verdict
	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.		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 in the listening device (for example, built-in volume		N/A

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Clause	Requirement-Test	Result-Remark	Verdict
	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 <i>Measurements shall be made in accordance with EN 50332-2 as applicable.</i>		N/A
3	Modification to the whole document		
	Delete all the “country” notes in the reference document according to the following list:		P

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Clause	Requirement-Test	Result-Remark	Verdict

	<table><tr><td>0.2.1</td><td>Note 1 and 2</td><td>1</td><td>Note 4 and 5</td><td>3.3.8.1</td><td>Note 2</td></tr><tr><td>3.3.8.3</td><td>Note 1</td><td>4.1.15</td><td>Note</td><td>4.7.3</td><td>Note 1 and 2</td></tr><tr><td>5.2.2.2</td><td>Note</td><td>5.4.2.3.2.2 Table 12</td><td>Note c</td><td>5.4.2.3.2.4</td><td>Note 1 and 3</td></tr><tr><td>5.4.2.3.2.4 Table 13</td><td>Note 2</td><td>5.4.2.5</td><td>Note 2</td><td>5.4.5.1</td><td>Note</td></tr><tr><td>5.4.10.2.1</td><td>Note</td><td>5.4.10.2.2</td><td>Note</td><td>5.4.10.2.3</td><td>Note</td></tr><tr><td>5.5.2.1</td><td>Note</td><td>5.5.6</td><td>Note</td><td>5.6.4.2.1</td><td>Note 2 and 3 and 4</td></tr><tr><td>5.6.8</td><td>Note 2</td><td>5.7.6</td><td>Note</td><td>5.7.7.1</td><td>Note 1 and Note 2</td></tr><tr><td>8.5.4.2.3</td><td>Note</td><td>10.2.1 Table 39</td><td>Note 3 and 4 and 5</td><td>10.5.3</td><td>Note 2</td></tr><tr><td>~~10.6.4~~</td><td>Note 3</td><td>F.3.3.6</td><td>Note 3</td><td>Y.4.1</td><td>Note</td></tr><tr><td>Y.4.5</td><td>Note</td><td></td><td></td><td></td><td></td></tr></table>	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	~~10.6.4~~	Note 3	F.3.3.6	Note 3	Y.4.1	Note	Y.4.5	Note					
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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																																																								

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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

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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

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Clause	Requirement-Test		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

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Clause	Requirement-Test	Result-Remark	Verdict
	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

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Clause	Requirement-Test	Result-Remark	Verdict
	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. <i>Justification:</i> 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

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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

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Clause	Requirement-Test	Result-Remark	Verdict
	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 medföra risk för brand. För 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

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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 <i>Justification:</i> 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

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Clause	Requirement-Test	Result-Remark	Verdict
	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 mm² 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)		N/A
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

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Clause	Requirement-Test	Result-Remark	Verdict

	<i>Justification:</i> 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																																																					
	<table><tr><th rowspan="2">Type of flexible cord</th><th colspan="2">Code designations</th></tr><tr><th>IEC</th><th>CENELEC</th></tr><tr><td colspan="3">PVC insulated cords</td></tr><tr><td>Flat twin tinsel cord</td><td>60227 IEC 41</td><td>H03VH-Y</td></tr><tr><td>Light polyvinyl chloride sheathed flexible cord</td><td>60227 IEC 52</td><td>H03VV-F H03VVH2-F</td></tr><tr><td>Ordinary polyvinyl chloride sheathed flexible cord</td><td>60227 IEC 53</td><td>H05VV-F H05VVH2-F</td></tr><tr><td colspan="3">Rubber insulated cords</td></tr><tr><td>Braided cord</td><td>60245 IEC 51</td><td>H03RT-F</td></tr><tr><td>Ordinary tough rubber sheathed flexible cord</td><td>60245 IEC 53</td><td>H05RR-F</td></tr><tr><td>Ordinary polychloroprene sheathed flexible cord</td><td>60245 IEC 57</td><td>H05RN-F</td></tr><tr><td>Heavy polychloroprene sheathed flexible cord</td><td>60245 IEC 66</td><td>H07RN-F</td></tr><tr><td colspan="3">Cords having high flexibility</td></tr><tr><td>Rubber insulated and sheathed cord</td><td>60245 IEC 86</td><td>H03RR-H</td></tr><tr><td>Rubber insulated, crosslinked PVC sheathed cord</td><td>60245 IEC 87</td><td>H03RV4-H</td></tr><tr><td>Crosslinked PVC insulated and sheathed cord</td><td>60245 IEC 88</td><td>H03V4V4-H</td></tr><tr><td colspan="3">Cords insulated and sheathed with halogen-free thermoplastic compounds</td></tr><tr><td>Light halogen-free thermoplastic insulated and sheathed flexible cords</td><td></td><td>H03Z1Z1-F H03Z1Z1H2-F</td></tr><tr><td>Ordinary halogen-free thermoplastic insulated and sheathed flexible cords</td><td></td><td>H05Z1Z1-F H05Z1Z1H2-F</td></tr></table>		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	N/A
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Clause	Requirement-Test	Result-Remark	Verdict

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⁾	
5.0Vdc	External power supply by Adapter	Normal	5.09Vd.c	--	--	--	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)	

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Clause	Requirement-Test	Result-Remark	Verdict

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

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Clause	Requirement-Test	Result-Remark	Verdict

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 (V _{pk})	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				

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Clause	Requirement-Test	Result-Remark	Verdict

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. Power ¹⁾ (W)	Time (S)	PS class
5.0Vd.c (External Power supply)	Normal condition	--	--	--	--	PS2 ²⁾
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.						
2) The product is supplied by external USB power adapter output 5Vd.c, PS2 circuit assumed.						

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:					

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Clause	Requirement-Test	Result-Remark	Verdict

6.2.3.2	TABLE: Determination of resistive PIS			P
Location		Operating and fault condition	Dissipate power (W)	Arcing PIS? Yes / No
Input circuits/port		--	--	Yes
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:								

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Clause	Requirement-Test	Result-Remark	Verdict

5.4.1.4, 9.3, B.1.5, B.2.6	TABLE: Temperature measurements							P
Supply voltage (V)..... :			5.0Vd.c. (Power supply by Adapter)		--	--	—	
Ambient temperature during test T_{amb} (°C).. :			See below	See below	--	--	—	
Maximum measured temperature T of part/at:			T (°C)				Allowed T_{max} (°C)	
DC input			25.1	41.0	--	--	Ref.	
PCB near U5 (main board)			27.8	43.7	--	--	130	
PCB near U3 (main board)			26.9	42.8	--	--	130	
PCB near U4 (main board)			26.0	41.9	--	--	130	
PCB near U9 (main board)			26.4	42.4	--	--	130	
PCB near U10 (main board)			26.9	42.8	--	--	130	
PCB near Q13 (main board)			26.3	42.3	--	--	130	
Internal enclosure of top (main board)			24.9	40.8	--	--	Ref.	
Internal enclosure of bottom(main board)			24.3	40.2	--	--	Ref.	
Ambient			24.1	40.0	--	--	--	
Touch temperature:								
Outside enclosure of top (main board PCB)			24.4	25.4	--	--	77	
Outside enclosure of bottom(main board PCB)			23.9	24.8	--	--	77	
Display			25.1	26.1	--	--	48	
Ambient			24.1	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: The apparatus was submitted and evaluated for maximum manufacturer’s recommended ambient (T_{ma}) of 40°C.								
Note 2: The temperatures were measured under the worst box normal mode defined in clause B.2.1.								

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Clause	Requirement-Test	Result-Remark	Verdict

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
5.0	--	0.033	2.0	0.165	--	--	--	Max.normal working
Supplementary information:								

B.3, B.4		TABLE: Abnormal operating and fault condition tests					P
Ambient temperature T_{amb} (°C)..... :					See below		—
Power source for EUT: Manufacturer, model/type, outputrating :					--		—
Component No.	Condition	Supply voltage (V)	Test time	Fuse no.	Fuse current (A)	Observation	
Type C Port*	150% voltage	5.0*1.50=7.5V	10mins	--	--	Input current: 0.033A→0.001A Unit can't working. No damaged, No hazard.	
U9 pin3-4 (on main board)	S-C	5.0VDC	2hrs	--	--	Input current: 0.033A→0.076A. Unit normal working Temperature measurement: Outside enclosure of top (main board PCB): 26.0°C Outside enclosure of bottom(main board PCB): 24.4°C Display: 27.9°C Ambient: 23.3°C No high temperature, No damaged. No hazard.	
U2 pin3-8 (on main board)	S-C	5.0VDC	10mins	--	--	Input current: 0.033A . Unit normal working	

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Clause	Requirement-Test	Result-Remark	Verdict

						No high temperature, No damaged. No hazard.
U3 pinW1-AD2 (on main board)	S-C	5.0VDC	1hrs	--	--	Input current: 0.033A→0.423 A. Unit normal working Temperature measurement: Outside enclosure of top (main board PCB): 27.0°C Outside enclosure of bottom(main board PCB): 28.4°C Display: 29.8°C Ambient: 24.0°C No high temperature, No damaged. No hazard.
C43 (on main board)	S-C	5.0VDC	10mins	--	--	Input current: 0.033A→0A. Unit shutdown immediately Recoverable, no hazard.
D1 (on power board)	S-C	5.0VDC	10mins	--	--	Input current: 0.033A . Unit normal working No high temperature, No damaged. No hazard.

Supplementary information:

1)*Fault condition conducted according to requirements of IEC 62368-3.

M.3	TABLE: Protection circuits for batteries provided within the equipment		N/A
Is it possible to install the battery in a reverse polarity position?. :			—
Equipment Specification	Charging		
	Voltage (V)	Current (A)	
Manufacturer/type	Battery specification		
	Non-rechargeable batteries	Rechargeable batteries	

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Clause	Requirement-Test	Result-Remark	Verdict

	Discharging current (A)	Unintentional charging current (A)	Charging		Discharging current (A)	Reverse charging current (A)
			Voltage (V)	Current (A)		

Note: The tests of M.3.2 are applicable only when above appropriate data is not available.

Specified battery temperature (°C).....:

Component No.	Fault condition	Charge/discharge mode	Test time	Temp. (°C)	Current (A)	Voltage (V)	Observation

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.

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

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Clause	Requirement-Test	Result-Remark	Verdict

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
Enclosure(top)	Plastic	1.50	--	250	5	Enclosure remained intact, no crack/ opening developed. No insulation breakdown.
Enclosure (side)	Plastic	2.15	--	250	5	Enclosure remained intact, no crack/ opening developed. No insulation breakdown.
Enclosure(bottom)	Plastic	2.15	--	250	5	Enclosure remained intact, no crack/ opening developed. No insulation breakdown.

Supplementary information:

T.6, T.9	TABLE: Impact test	P

Location/Part	Material	Thickness (mm)	Height (mm)	Observation
Enclosure(top)	Plastic	1.50	1300	No damage, no hazard
Enclosure (side)	Plastic	2.15	1300	No damage, no hazard
Enclosure(bottom)	Plastic	2.15	1300	No damage, no hazard

Supplementary information:

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Clause	Requirement-Test	Result-Remark	Verdict

T.7	TABLE: Drop test					N/A
Location/Part		Material	Thickness (mm)	Height (mm)	Observation	
Supplementary information:						

T.8	TABLE: Stress relief test				P
Location/Part	Material	Thickness (mm)	Oven Temperature (°C)	Duration (h)	Observation
Enclosure	Plastic	--	70	7	No damage, no hazard
Supplementary information:					

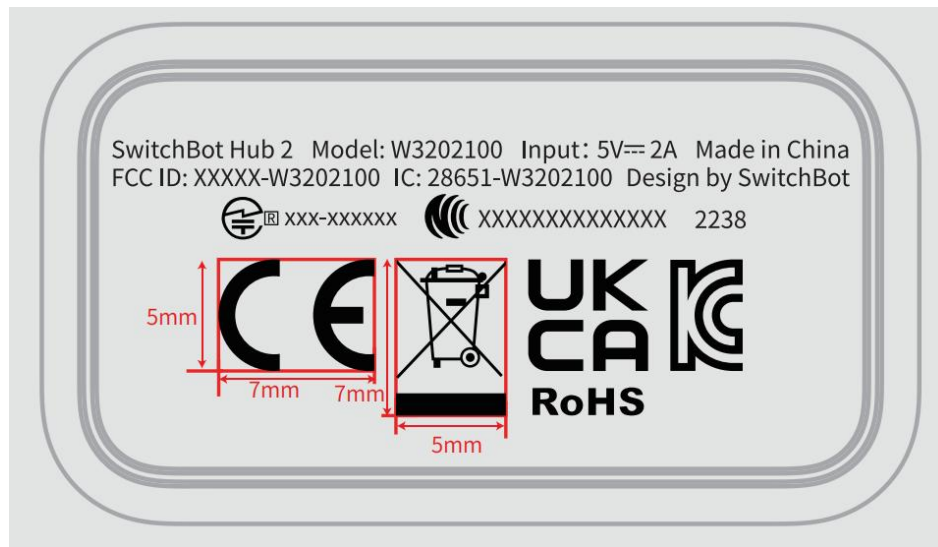
X	TABLE: Alternative method for determining minimum clearances distances			N/A
Clearance distanced between:	Peak of working voltage (V)	Required cl (mm)	Measured cl (mm)	
Supplementary information:				

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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⁾	
PCB	Shenzhen Keshijia Electronics Co., Ltd.	KSJ-A01	V-0, 130°C	UL 796 UL 94	UL E464917	
Alternative	Interchangeable	Interchangeable	V-1, 105°C	UL 796 UL 94	UL	
Plastic enclosure	ALENG PLASTICS LTD	AL2940, AL2950, AL2960, AL2970, AL2980, AL2990	V-0, 60°C, Min. thickness: 1.5mm	UL 746 UL 94	UL E529474	
Plastic enclosure	TORAY INDUSTRIES INC	920	HB, 60°C, Min. thickness: 1.5mm	UL 746 UL 94	UL E41797	
Alternative	Interchangeable	Interchangeable	HB, 60°C, Min. thickness: 1.5mm	UL 746 UL 94	UL	
Power Supply	Shenzhen Keyu Power Supply Technology Co.,Ltd.	KA12C-050200 0EU, KA12C-050200 0BS	Input:100-240V~50/ 60Hz, 0.35A; Output: 5VDC 2.0A Max 10W	IEC/EN 62368-1	CB by TUV SUD report No:65.210.19. 027.04	
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



Figure 1. Overall view



Figure 2. Overall view



Figure 3. Overall view



Figure 4. Overall view

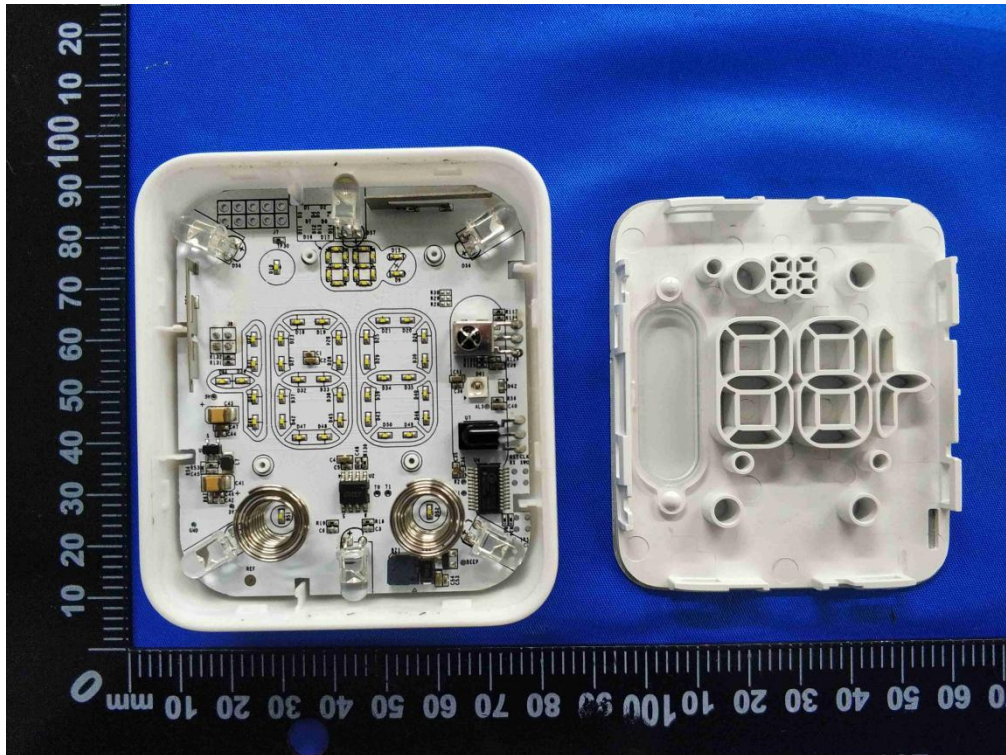


Figure 5. Internal view

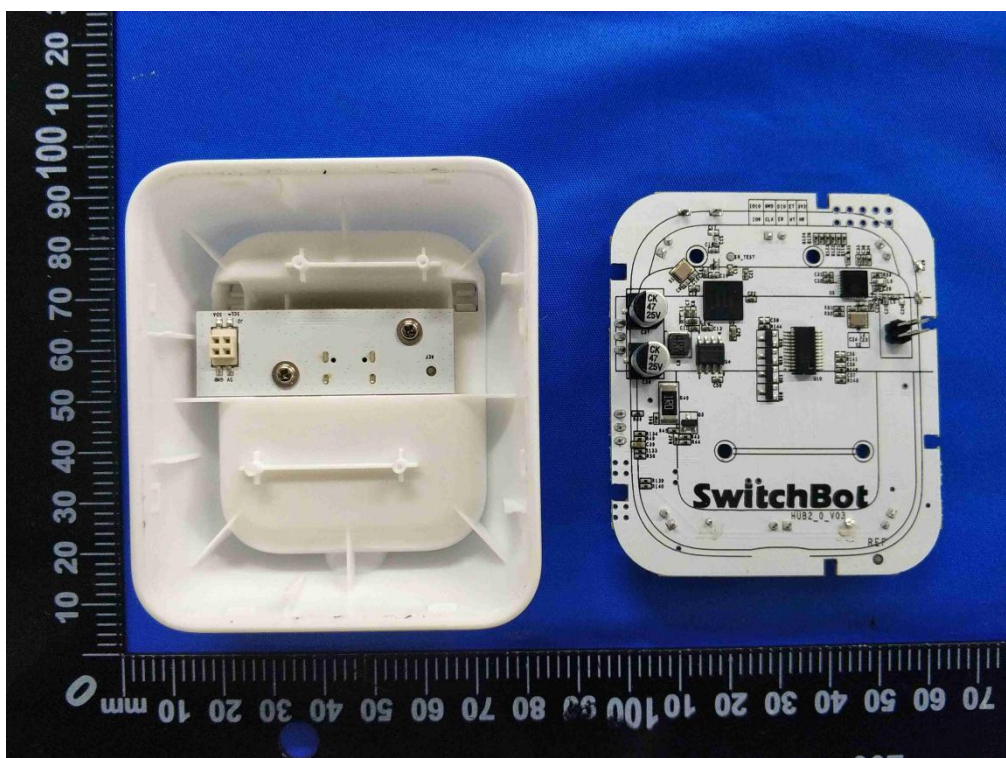


Figure 6. Internal view

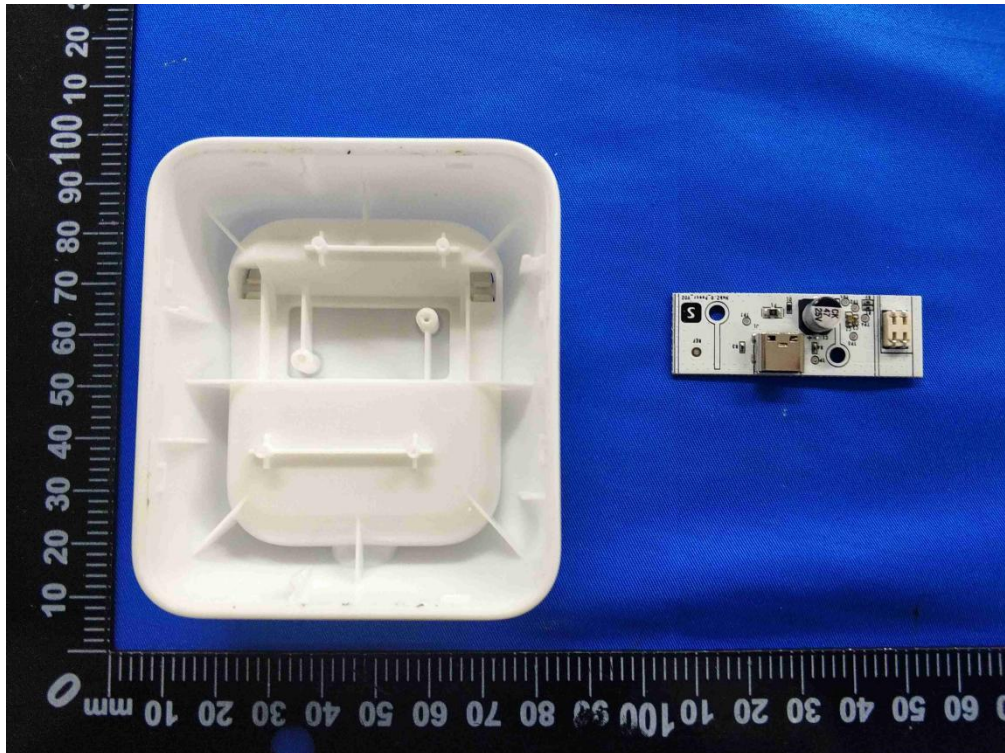


Figure 7. Internal view

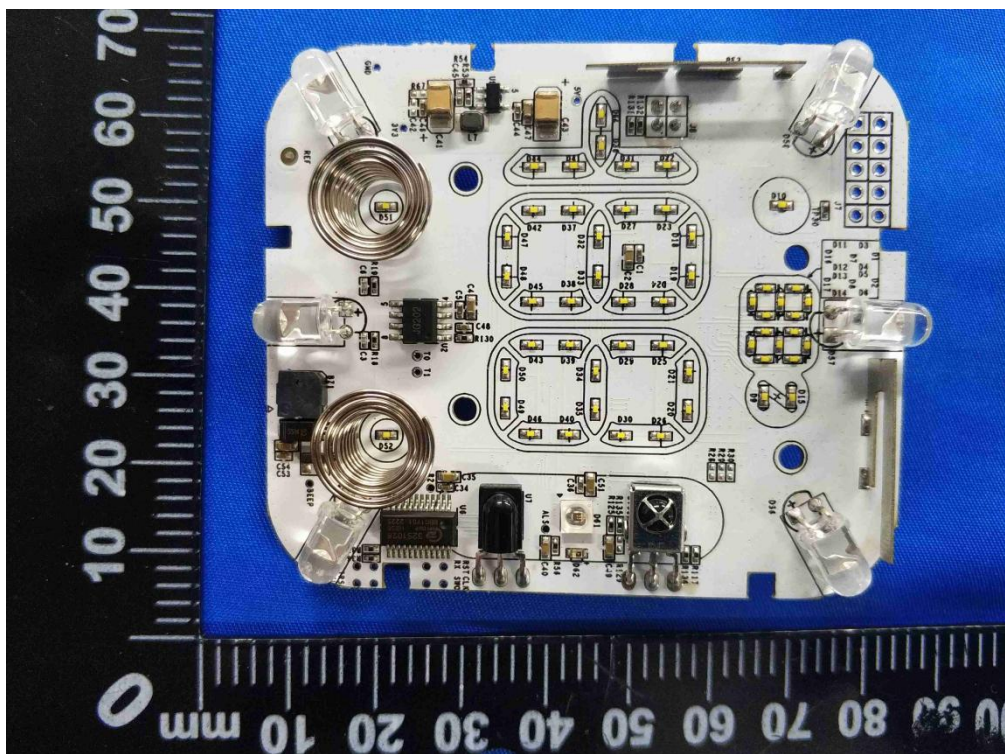


Figure 8. PCB view

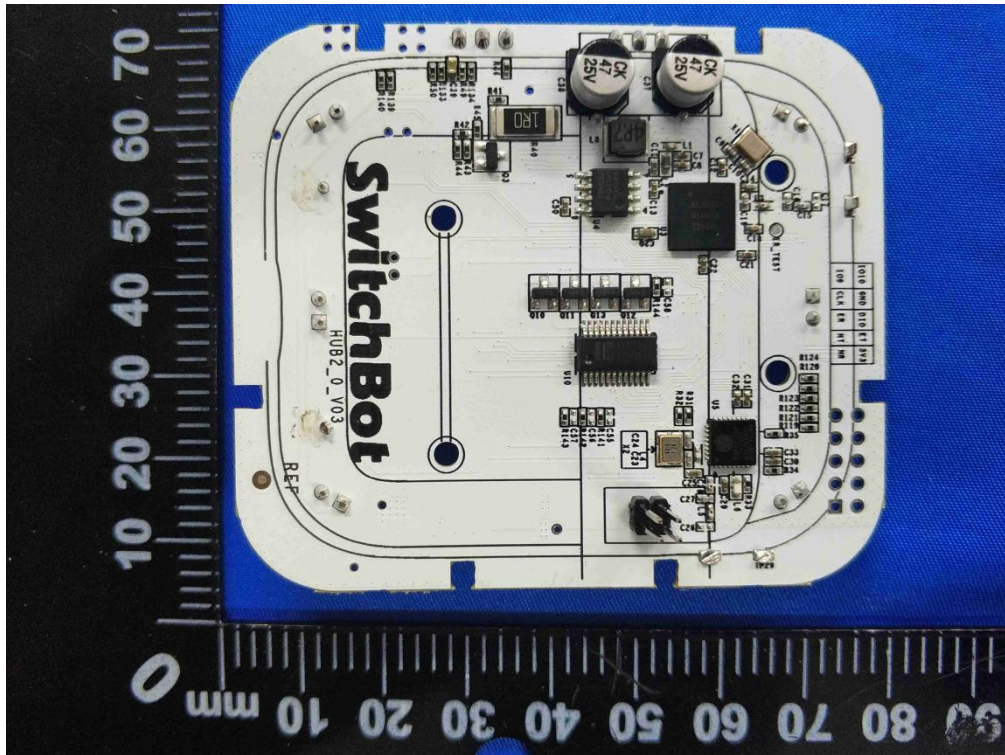


Figure 9. PCB view

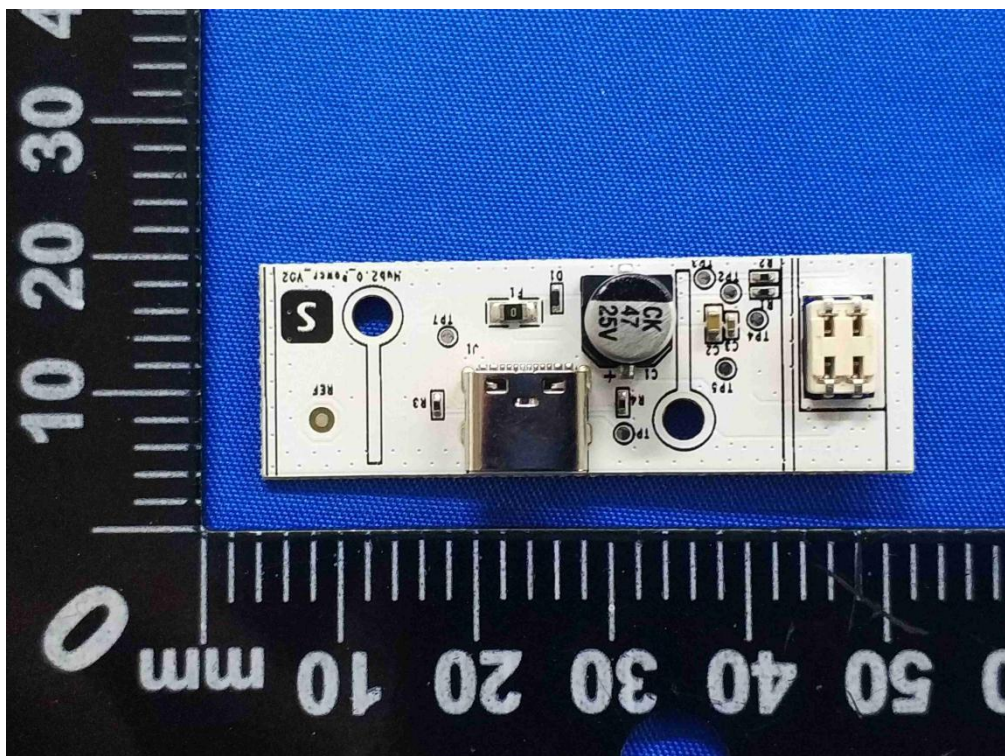


Figure 10. PCB view

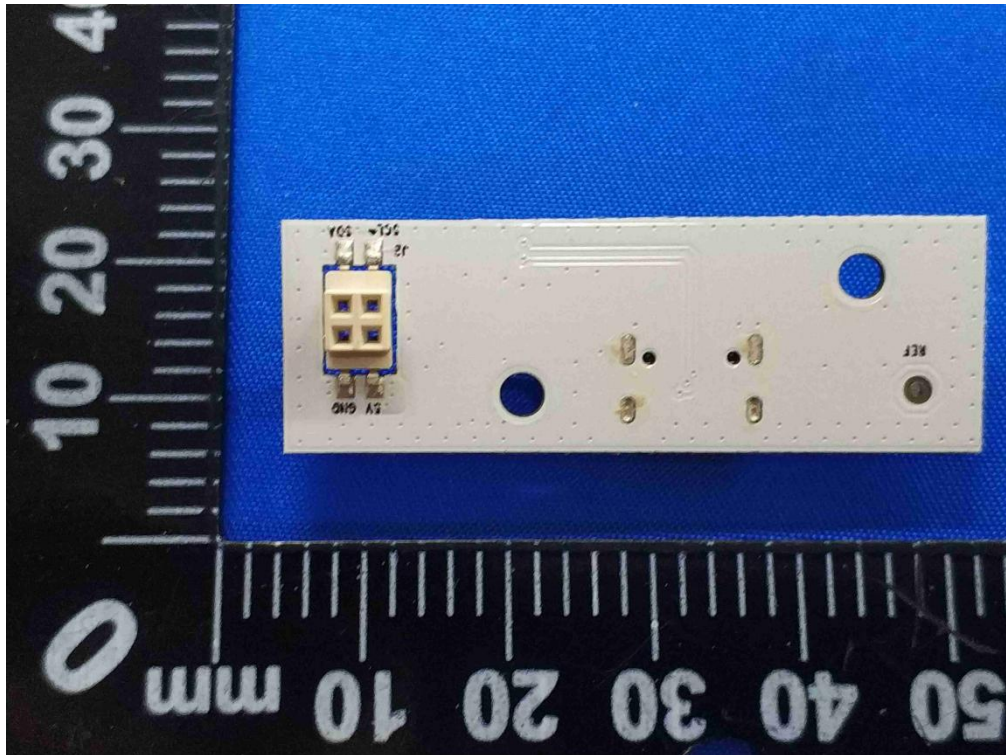


Figure 11. PCB view



Figure 12. Adapter view(model:KA12C-052000BS)



Figure 13. Adapter view(model:KA12C-052000EU)

Statement

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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 Hub 2
Model Name: W3202100
Brand Name: SwitchBot
Test Standard: ETSI EN 301 489-1 V2.2.3(2019-11)
Draft ETSI EN 301 489-17 V3.2.5 (2022-08)
Sample Arrival Date: Nov. 30, 2022
Test Date: Dec. 01, 2022 - Dec. 06, 2022
Date of Issue: Dec. 19, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Xiong Chong**Checked by:** Xia Long**Approved by:** Liao Jianming
(Technical Director)

Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Dec. 19, 2022</u>	<u>Initial Issue</u>

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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 Factory Information

Factory	Woan Technology (Shenzhen) Co., Ltd.
Address	Building A2, Zhengfeng Industrial Area, No.610 Fengtang Boulevard, Fuhai Sub-district, Bao'an District, Shenzhen

2.4 General Description for Equipment under Test (EUT)

EUT Name	SwitchBot Hub 2
Model Name Under Test	W3202100
Series Model Name	W3202101, W3202102, W3202103, W3202104, W3202105, W3202106
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name. (this information provided by the customer)
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Ancillary Equipment 1	Adapter (EU Plug)	
	Brand Name	N/A
	Model No.	KA12C-0502000EU
	Serial No.	N/A
	Rated Input	100-240V~, 0.35A, 50/60Hz
	Rated Output	5VDC 2A
Ancillary Equipment 2	Adapter (UK Plug)	
	Brand Name	N/A
	Model No.	KA12C-0502000BS
	Serial No.	N/A
	Rated Input	100-240V~, 0.35A, 50/60Hz
	Rated Output	5VDC 2A
Ancillary Equipment 3	Type-C Cable	
	Model No.	N/A
	Length (Approx.)	2.1 m

2.6 Technical Information

Network and Wireless connectivity		Bluetooth, WiFi
Interfaces present on the EUT	AC Ports	From mains to AC power adapter.
	DC Ports	From power supply to EUT, the DC port cable length is less than 3m.
	Signal/Control Ports	Type-C, which cable length is less than 3m.
	Wired Network Ports	No Wired Network ports.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

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

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
2	Draft ETSI EN 301 489-17 V3.2.5 (2022-08)	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. For undated references in this report, the cited version applies.

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	Verdict	Test Result	Remark
Emission					
1	EN 55032	Radiated Emission	Below 1 GHz	Pass	ANNEX A.1
			Above 1 GHz	Pass	--
2	EN 55032	Conducted Emission	AC Mains Port	Pass	ANNEX A.2
			DC Power Port	N/A	Note 2
			Wired Network Port	N/A	--
3	EN 61000-3-2	Harmonic Current Emissions	N/A	ANNEX A.3	Note 3
4	EN 61000-3-3	Voltage Fluctuations & Flicker	Pass	ANNEX A.4	--
Immunity					
5	EN 61000-4-2	Electrostatic Discharge Immunity	Pass	ANNEX A.5	--
6	EN 61000-4-3	Radiated RF Electromagnetic Field Immunity	Pass	ANNEX A.6	--
7	EN 61000-4-4	Electrical Fast Transient/Burst Immunity	AC Ports	Pass	ANNEX A.7
			DC Ports	N/A	--
			Signal Ports, Control Ports, Wired Network Port	N/A	Note 4
					Note 4
8	ISO 7637-2	Transients and Surges	N/A	ANNEX A.8	Note 5
9	EN 61000-4-5	Surge Immunity	AC Ports	Pass	ANNEX A.9
			Wired Network Port	N/A	--
10	EN 61000-4-6	Immunity to Conducted Disturbances Induced by RF Fields	AC Ports	Pass	ANNEX A.10
			DC Ports	N/A	Note 4
			Signal Ports, Control Ports, Wired Network Port	N/A	Note 4
					Note 4
11	EN 61000-4-11	Voltage Dips and Short Interruptions Immunity	Pass	ANNEX A.11	--
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: This test is applicable for radio equipment and ancillary equipment for fixed use that are intended to be connected to a local DC power network or to local battery with connecting cables longer than 3 m. Note 3: There is no need for Harmonics test to be performed on this product (rated power is less than 75 W) in accordance with EN 61000-3-2: 2014. For further details, please refer to Clause 7 of EN 61000-3-2: 2014 which states: “For the following categories of equipment, limits are not specified in this edition of the standard: - equipment with a rated power of 75 W or less, other than lighting equipment.” Note 4: This test is applicable for the cables may be longer than 3 m.					

Note 5: These tests are applicable to radio and ancillary equipment intended for vehicular use.

Note 6: These tests are applicable to wired network ports intended to be connected to outdoor cables and indoor cables (longer than 30 m).

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	3.22 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT3	3.66 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT5	4.10 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT6	4.58 dB
Radiated emissions (30 MHz-1 GHz)-10m	4.80 dB
Radiated emissions (30 MHz-1 GHz)-966#2	4.76 dB
Radiated emissions (30 MHz-1 GHz)-966#4	4.38 dB
Radiated emissions (1 GHz-18 GHz)-10m	4.72 dB
Radiated emissions (1 GHz-18 GHz)-966#2	4.88dB
Radiated emissions (1 GHz-18 GHz)-966#4	5.04 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments, Test Date and Test Engineer

Test items	Voltage	Temperature	Relative Humidity	Ambient Pressure	Test Date	Test Engineer
Radiated Emission	AC 230V/50Hz, AC 110V/60Hz	22.3℃	52%	101kPa	Dec. 01, 2022	Tian Shuo
Conducted Emission	AC 230V/50Hz, AC 110V/60Hz	21.9℃	59%	101kPa	Dec. 01, 2022	Tian Shuo
Voltage Fluctuations & Flicker	AC 230V/50Hz, AC 110V/60Hz	24.1℃	47%	101kPa	Dec. 05, 2022	Liu Chenfang
Electrostatic Discharge Immunity	AC 230V/50Hz, AC 110V/60Hz	24.5℃	44%	101kPa	Dec. 05, 2022	Liu Chenfang
Radiated RF Electromagnetic Field Immunity	AC 230V/50Hz, AC 110V/60Hz	23.0℃	54%	101kPa	Dec. 06, 2022	Yang Panxia
Electrical Fast Transient/Burst Immunity	AC 230V/50Hz, AC 110V/60Hz	24.1℃	47%	101kPa	Dec. 05, 2022	Liu Chenfang
Surge Immunity	AC 230V/50Hz, AC 110V/60Hz	24.1℃	47%	101kPa	Dec. 05, 2022	Liu Chenfang
Immunity to Conducted Disturbances Induced by RF Fields	AC 230V/50Hz, AC 110V/60Hz	23.0℃	54%	101kPa	Dec. 06, 2022	Yang Panxia
Voltage Dips and Short Interruptions Immunity	AC 230V/50Hz, AC 110V/60Hz	24.1℃	47%	101kPa	Dec. 05, 2022	Liu Chenfang

4.2 Test Equipment

Radiated Emission Test For Frequency Below 1 GHz (3m-966#4)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	Agilent	N9038A	MY53220118	2022.09.08	2023.09.07	☒
Amplifier (30-1GHz)	COM-MV	ZT30-1000M	B2017119082	2022.09.08	2023.09.07	☒
Test Antenna- Bi-Log	SCHWARZBECK	VULB 9163	9163-624	2021.08.20	2024.08.19	☒
Anechoic Chamber	ChangNing	9m*6m*6m	101	2020.03.16	2023.03.15	☒
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

Radiated Emission Test For Frequency Above 1 GHz (3m-966#4)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	Agilent	N9038A	MY53220118	2022.09.08	2023.09.07	☒
Amplifier (1-12GHz)	COM-MV	DLNAB- 1000-12000- 002	18080279	2022.09.08	2023.09.07	☒
Amplifier (0.8-21GHz)	Mini-Circuits	ZVA-213-S+	619201336	2022.09.08	2023.09.07	☐
Test Antenna- Horn	SCHWARZBECK	BBHA 9120D	1148	2022.04.12	2025.04.11	☒
Anechoic Chamber	ChangNing	9m*6m*6m	101	2020.03.16	2023.03.15	☒
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2022.09.09	2023.09.08	☒
LISN	SCHWARZBECK	NSLK 8127	8127-687	2022.06.01	2023.05.31	☒
ISN	TESEQ	ISN T800	34449	2021.11.24	2022.11.23	☐
ISN	TESEQ	ISN T8-Cat6	53561	2022.05.24	2023.05.23	☐
Shielded Room	YiHeng Electronic Co., Ltd	3.5m*3.1m*2. 8m	112	2022.02.19	2025.02.18	☒
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

Voltage Fluctuations & Flicker and Harmonic Current Emissions Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
HARMONICS, FLICKER&POWER ANALYSER	LAPLACE INSTRUMENTS	AC2000A	377954	2022.09.23	2023.09.22	☒
AC TESTING POWER SOURCE	EVERFINE	DPS1030	Y120984CJ7 331115	2022.01.08	2023.01.07	☒

Electrostatic Discharge Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
ESD Test System	EMTEST	DITO	P18332 22423	2022.05.09	2023.05.08	☒

Radiated RF Electromagnetic Field Immunity Test						
Description	Manufacturer	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	2022.01.08	2023.01.07	☒
Power Amplifier	OPHIR RF	5225F	1037	2022.02.16	2023.02.15	☒
Power Amplifier	OPHIR RF	5273F	1016	2022.02.16	2023.02.15	☒
Power Amplifier	RFLIGHT	NTWPAS-2560025	17043109	2022.02.16	2023.02.15	☒
Power Meter	R&S	NRP-Z11	117410/1176 93	2022.06.13	2023.06.12	☒
Field Strength Meter	Narda	EP602	611WX80276	2022.09.15	2023.09.14	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-977	2022.02.16	2025.02.15	☒
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	9120D-1148	2022.04.12	2025.04.11	☒
Mouth Simulator	B&K	4227	2423931	2022.09.21	2023.09.20	☐
Sound Calibrator	Hangzhou Aihua	AWA6022A	2023961	2022.10.21	2023.10.20	☐
Sound Level Meter	B&K	NL-20	00844023	2022.09.20	2023.09.19	☐
2CH Audio	B&K	2690-0S2	2421743	2022.10.21	2023.10.20	☐

Radiated RF Electromagnetic Field Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
Amplifier						
Ear Simulator	B&K	4192 -L-001	3038758	2022.01.12	2023.01.11	☐
Audio analyzer	R&S	UPL 16	100129	2022.01.08	2023.01.07	☐
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

Electrical Fast Transient/Burst Immunity & Surge Immunity Test & Voltage Dips and Short Interruptions Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
(EFT/ SURGE/ DIPS)Three-in-one Test System	HTEC	HCOMPACT7	190801	2022.05.09	2023.05.08	☒
DIPS coupling	HTEC	HV1P16T	190303	2022.05.09	2023.05.08	☒
EFT Clamp (Telecom Ports)	HTEC	H3C	N/A	2022.05.09	2023.05.08	☐
Surge Generator (10/700)	HTEC	HCOMB 70	143806	2022.05.09	2023.05.08	☐
SURGE coupling	HTEC	TCOMB-4	143807	2022.05.09	2023.05.08	☐

Immunity to Conducted Disturbances Induced by RF Fields						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
CONDUCTED DISTURBANCES TEST SYSTEM	SCHLODER	CDG 6000-75	126B1286	2022.05.10	2023.05.09	☒
CDN-M2+3	SCHLODER	CDN M2+M3-16	A2210276	2022.05.10	2023.05.09	☒
Injection Probe	FCC	F-120-8M	190119	2021.12.22	2022.12.21	☐
ISN	TESEQ	ISN T800	34449	2022.11.11	2023.11.10	☐
ISN	TESEQ	ISN T8-Cat6	53561	2022.05.24	2023.05.23	☐
Mouth Simulator	B&K	4227	2423931	2022.09.21	2023.09.20	☐
Sound Calibrator	Hangzhou Aihua	AWA6022A	2023961	2022.10.21	2023.10.20	☐
Sound Level Meter	B&K	NL-20	00844023	2022.09.20	2023.09.19	☐
2CH Audio Amplifier	B&K	2690-0S2	2421743	2022.09.21	2023.09.20	☐
Ear Simulator	B&K	4192 -L-001	3038758	2022.01.12	2023.01.11	☐
Audio analyzer	R&S	UPL 16	100129	2022.01.08	2023.01.07	☐
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

4.3 Test Enclosure list

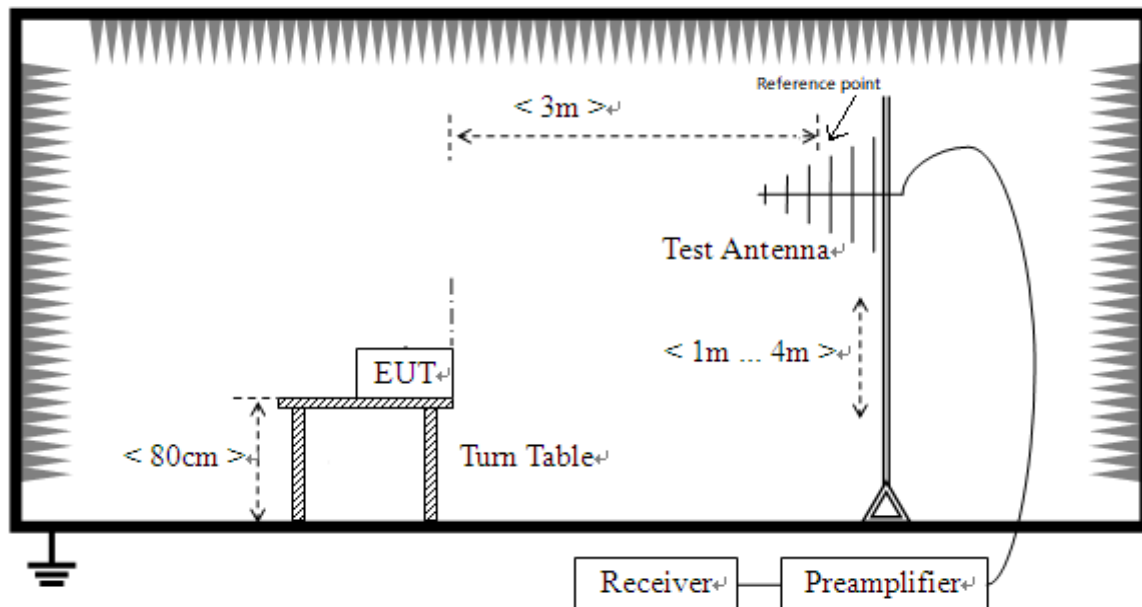
Description	Manufacturer	Model	Serial No.	Length	Description	Use
Router	HUAWEI	WS7000	N/A	N/A	N/A	☒
Mobile Phone	Xiaomi	MI 5X	N/A	N/A	N/A	☒

4.4 Test Configurations

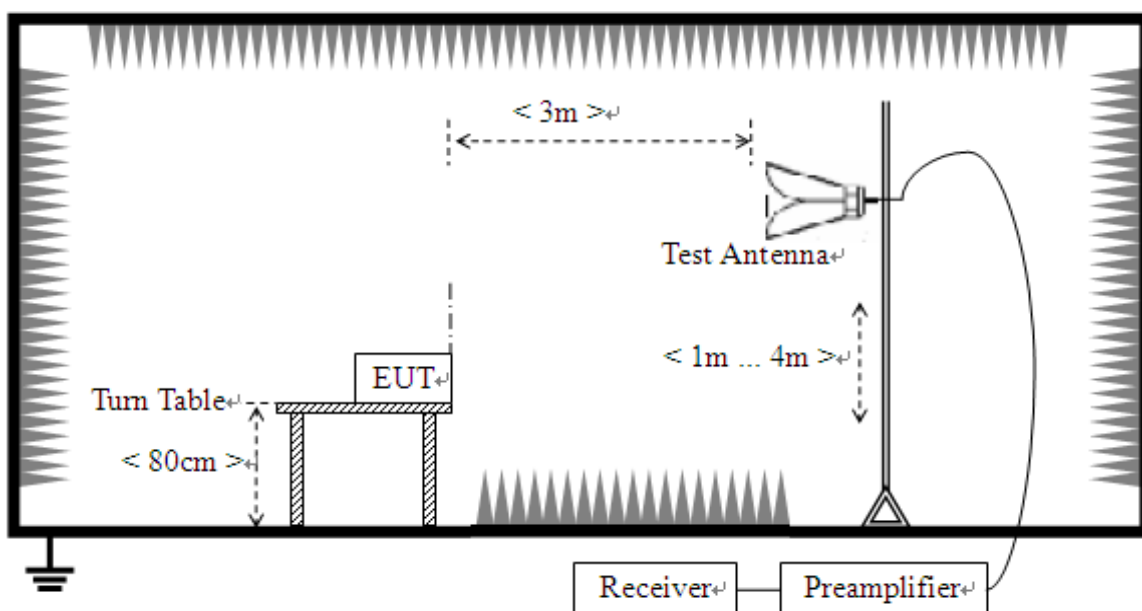
Test Configurations (TC) No.	Description
TC01	<u>The Working Test Mode</u> EUT + Type-C Cable + Adapter + Router + Mobile Phone + BT Link + WiFi Link

4.5 Test Setups

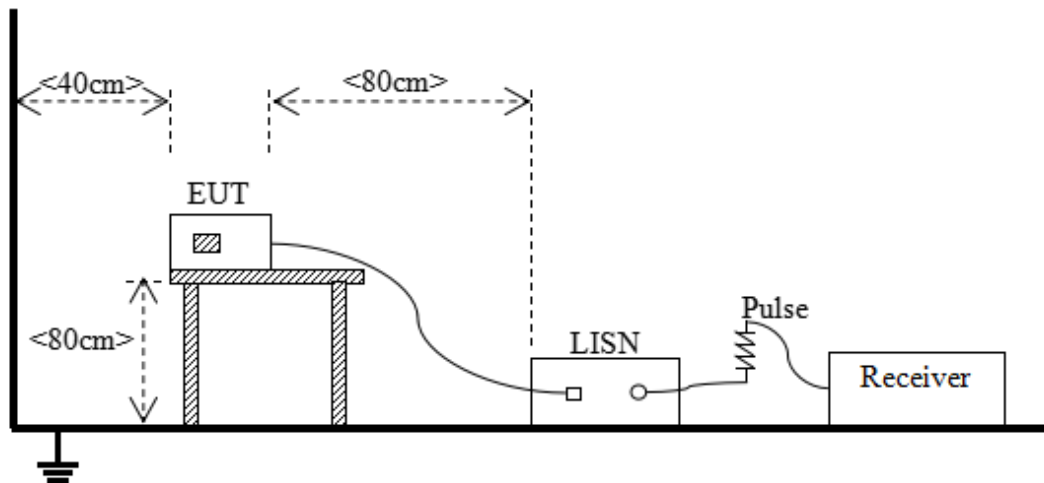
Test Setup 1



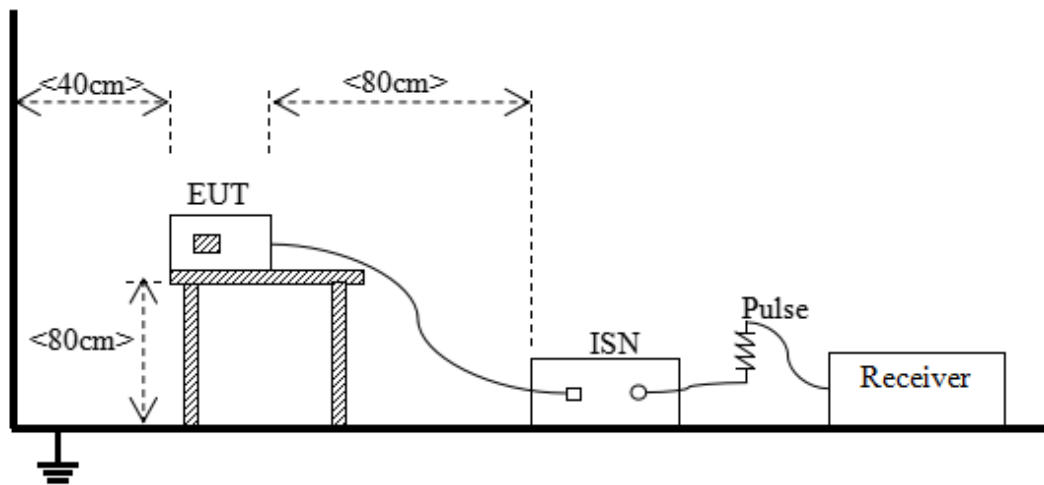
(For Radiated Emission Test (30 MHz-1 GHz))



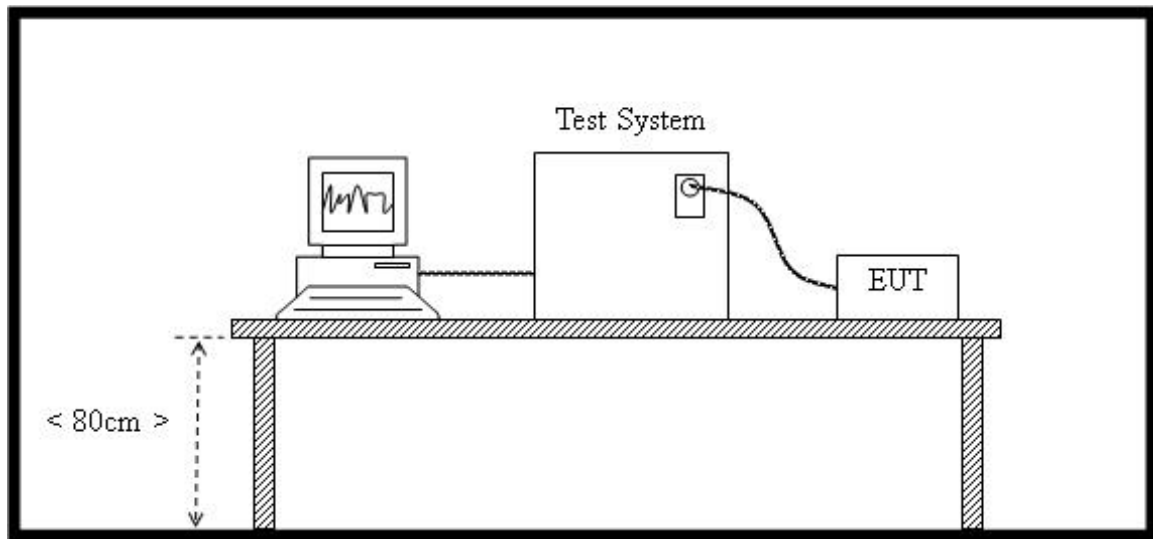
(For Radiated Emission Test (above 1 GHz))

Test Setup 2

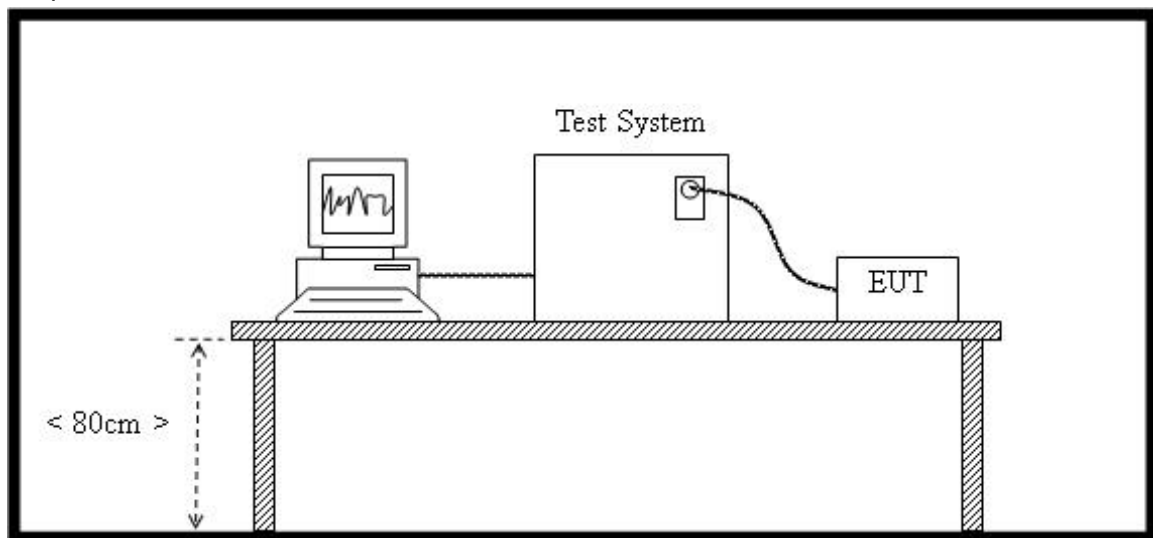
(For Conducted Emission at AC/DC Ports Test)

Test Setup 3

(For Conducted Emission for Wired Network Ports Test)

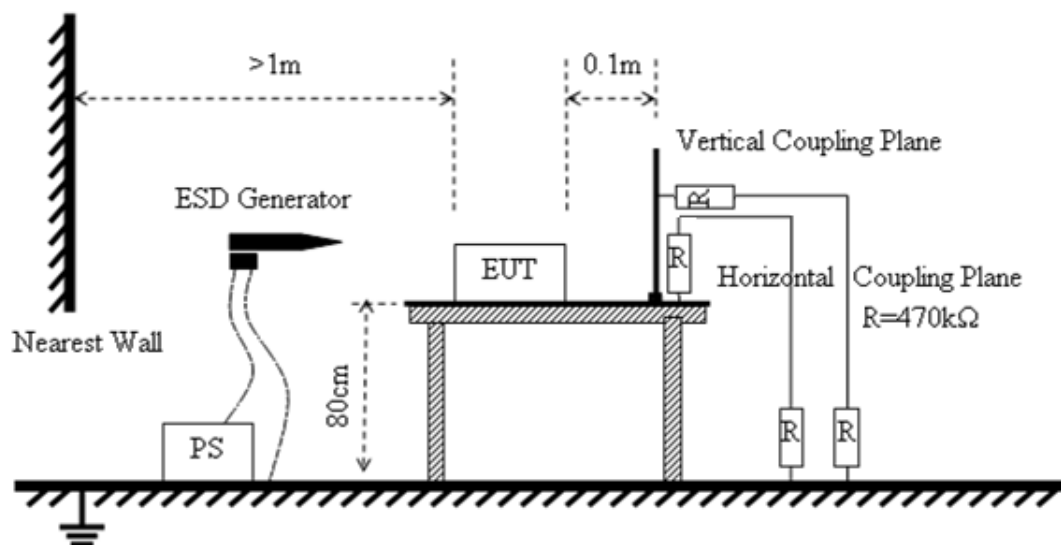
Test Setup 4

(For Harmonic Current Emissions Measurement Test)

Test Setup 5

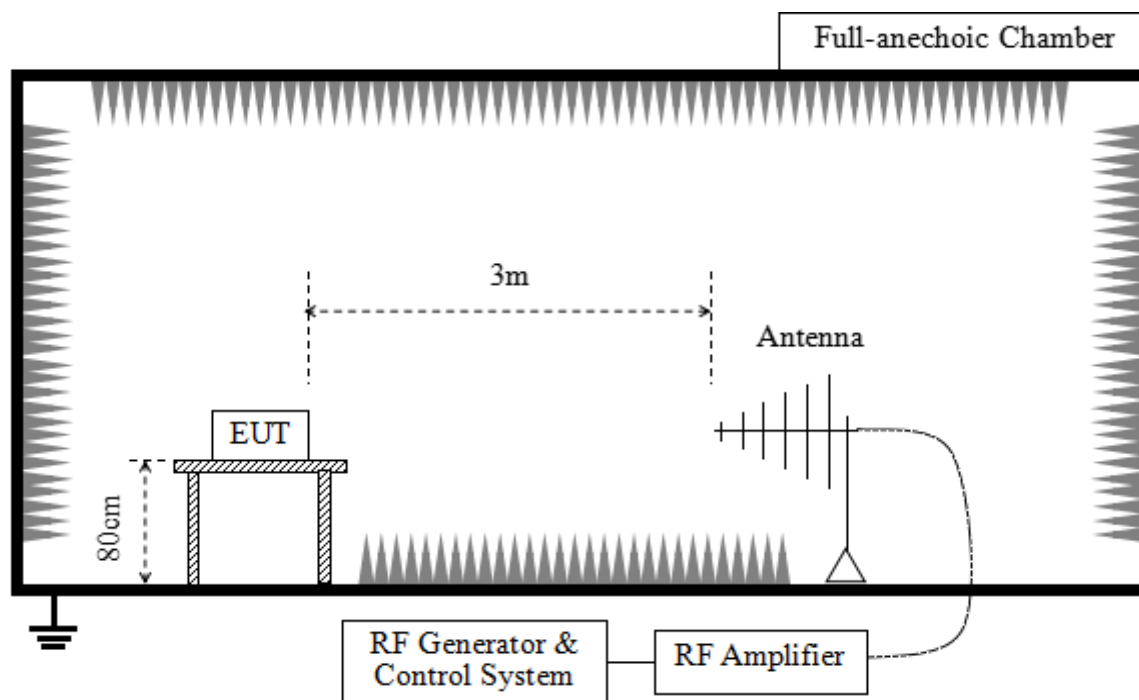
(For Voltage Fluctuations and Flicker Measurement Test)

Test Setup 6

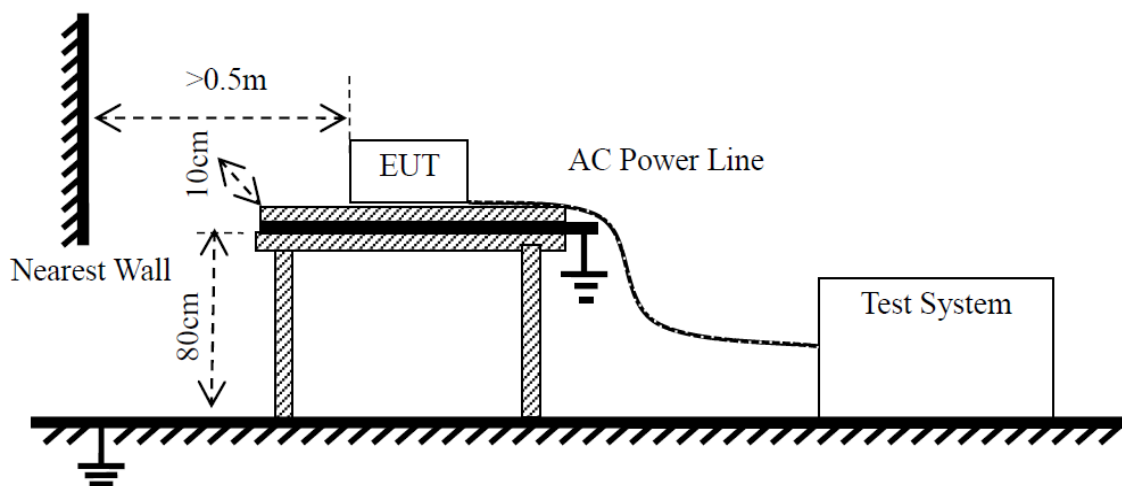


(For Electrostatic Discharge Immunity Test)

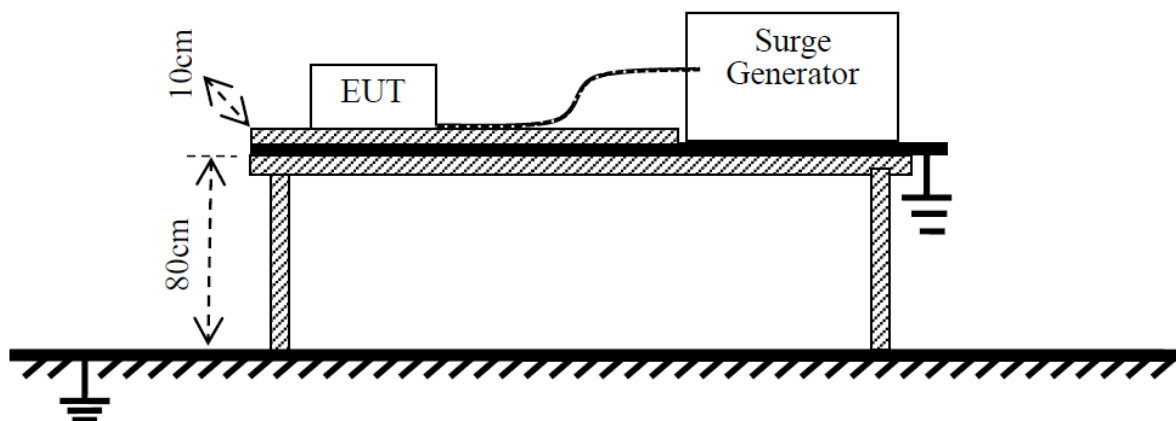
Test Setup 7



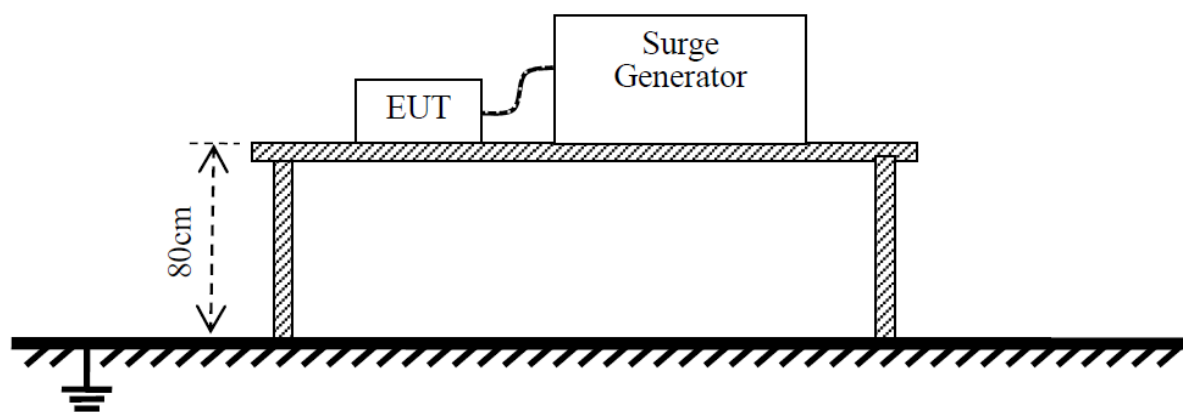
(For Radiated Immunity Test)

Test Setup 8

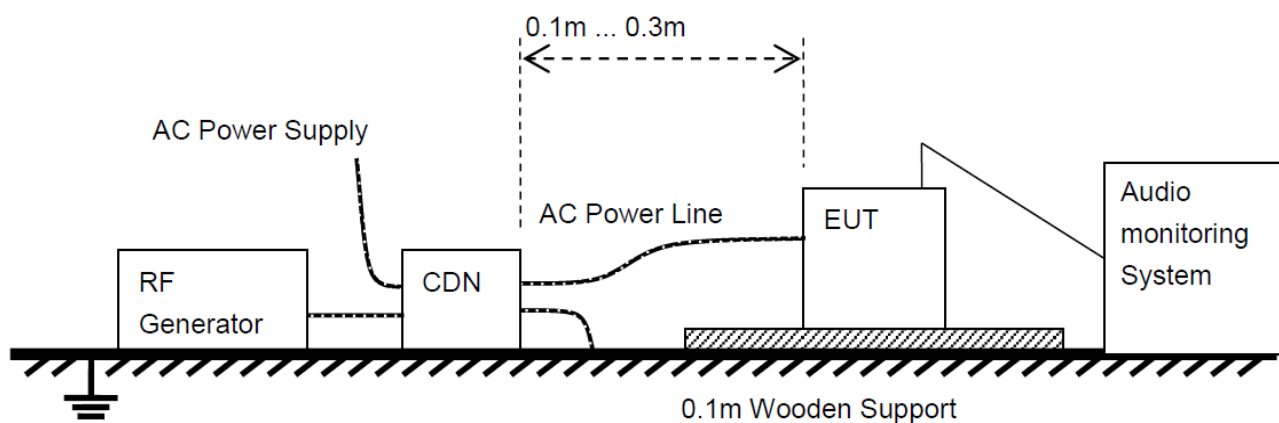
(For Electrical Fast Transient / Burst Immunity Test)

Test Setup 9

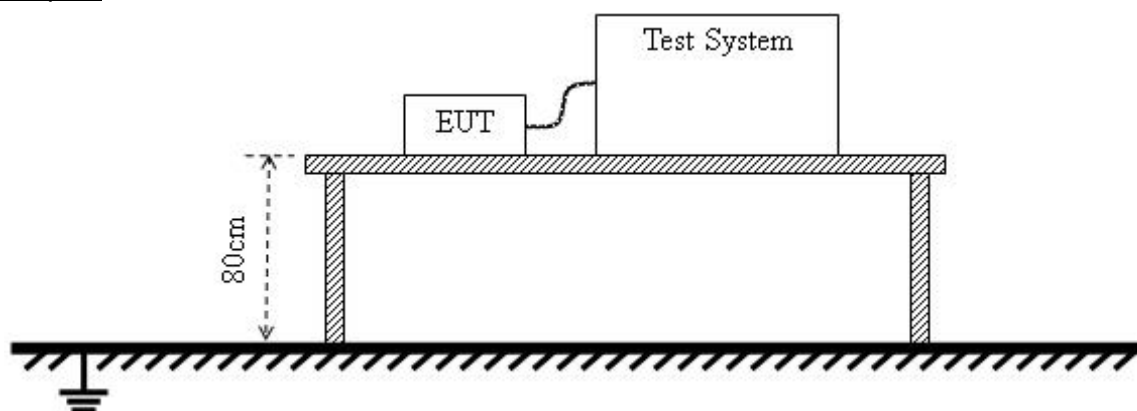
(Transients and Surges)

Test Setup 10

(For Surge Immunity Test)

Test Setup 11

(For Immunity to Conducted Disturbances Induced By RF Fields Test)

Test Setup 12

(For Voltage Dips and Short Interruptions Immunity Test)

4.6 Test Conditions

Test Case	Test Conditions	
Radiated Emission	Test Setup	Test Setup 1
	Test Configuration	TC01 ^{Note}
Conducted Emission	Test Setup	Test Setup 2
	Test Configuration	TC01 ^{Note}
Voltage Fluctuations & Flicker	Test Setup	Test Setup 5
	Test Configuration	TC01 ^{Note}
Electrostatic Discharge Immunity	Test Setup	Test Setup 6
	Test Configuration	TC01 ^{Note}
Radiated RF Electromagnetic Field Immunity	Test Setup	Test Setup 7
	Test Configuration	TC01 ^{Note}
Electrical Fast Transient/Burst Immunity	Test Setup	Test Setup 8
	Test Configuration	TC01 ^{Note}
Surge Immunity	Test Setup	Test Setup 10
	Test Configuration	TC01 ^{Note}
Immunity to Conducted Disturbances Induced by RF Fields	Test Setup	Test Setup 11
	Test Configuration	TC01 ^{Note}
Voltage Dips and Short Interruptions Immunity	Test Setup	Test Setup 12
	Test Configuration	TC01 ^{Note}
Note: Based on client request, all normal using modes of the normal function were tested, but only the worst test data of test mode is reported in this report. The Working Test Mode is the worst mode in this report.		

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 (dB μ V/m)	Quasi-Peak Limit (dB μ V/m)
30 - 230	50	40
230 - 1000	57	47

Frequency range (MHz)	Class A (at 3 m)		Class B (at 3 m)	
	Peak Limit (dB μ V/m)	Average Limit (dB μ V/m)	Peak Limit (dB μ V/m)	Average Limit (dB μ V/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 4.5 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 $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak for $f < 1$ GHz, peak & RMS Average for $f \geq 1$ GHz

Trace = max hold

5.1.1.4 Test Result

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 (dB μ V)	Average (dB μ V)	Quasi-peak (dB μ V)	Average (dB μ V)
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 (dB μ V)	Average (dB μ V)
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 (dB μ V)	Average (dB μ V)	Quasi-peak (dB μ V)	Average (dB μ V)
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 4.5 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 μ H 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 $\geq$ RBW

Sweep = 10ms

Detector function = peak & Average

Trace = max hold

5.1.2.4 Test Result

Please refer to ANNEX A.2.

5.1.3 Harmonic Current Emissions

5.1.3.1 Limit

Limits for Class A equipment				Limits for Class D equipment		
odd harmonic		Even harmonics		Harmonic order (n)	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
Harmonic order (n)	Maximum permissible harmonic current A	Harmonic order (n)	Maximum permissible harmonic current A			
3	2.30	2	1.08	3	3.4	2.30
5	1.14	4	0.43	5	1.9	1.14
7	0.77	6	0.30	7	1.0	0.77
9	0.40	8≤n≤40	0.23X8/n	9	0.5	0.40
11	0.33			11	0.35	0.33
13	0.21			15≤n≤39	3.85/n	0.15X15/n
15≤n≤39	0.15X15/n					

Note: For Class B equipment, the harmonics of the input current shall not exceed the values given in Table “limits for Class A equipment” multiplied by a factor of 1,5.

For the purpose of harmonic current limitation, equipment is classified as follows : (Note: Class C equipment requirement not include in this standard.)

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.

5.1.3.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 4. The photo of test setup please refer to ANNEX B.

5.1.3.3 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.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

5.1.4 Voltage Fluctuations and Flicker Measurement

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 4.5 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

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

Type	Description
Criterion A	The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
Criterion B	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
Criterion C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

5.2.1.2 Performance criteria (EN 301489-17)

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

About Bluetooth function Performance Criteria

Type	During test	After test
Criterion A	Shall operate as intended. May show degradation of performance (For example have noise or transmission short time interruption). Shall be no loss of Bluetooth function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (For example have noise or transmission short time interruption) Shall be no loss of Bluetooth function. Shall be no loss of stored data or user programmable functions.
Criterion B	May show loss of function (For example Bluetooth transmission interruption). May show degradation of performance (For example have noise or transmission short time interruption). No unintentional transmissions.	Bluetooth Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (For example have noise or transmission short time interruption). Shall be no loss of stored data or user programmable functions.
Criterion C	May be loss of function (For example Bluetooth transmission interruption).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (For example have noise or transmission short time interruption).

About WIFI function Performance Criteria

Type	During test	After test
Criterion A	Shall operate as intended. May show degradation of performance (For example have transmission short time interruption or a small amount of error in the transmission data). Shall be no loss of WIFI function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (For example have noise or transmission short time interruption or a small amount of error in the transmission data). Shall be no loss of WIFI function. Shall be no loss of stored data or user programmable functions.
Criterion B	May show loss of function (For example WIFI transmission interruption). May show degradation of performance (For example have transmission short time interruption or transmission data error). No unintentional transmissions.	WIFI Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (For example have noise or transmission short time interruption or or transmission data error). Shall be no loss of stored data or user programmable functions.
Criterion C	May be loss of function (For example WIFI transmission interruption or transmission data error).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (For example have transmission short time interruption or a small amount of error in the transmission data).

5.2.1.2.2 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.

5.2.1.2.3 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 Immunity

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: 2 kV; 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 4.5 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

Please refer to ANNEX A.5.

5.2.3 Radio Frequency Electromagnetic Field Immunity

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 4.5 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 was 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. The test is performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides, but only the worst side data is reported in this report.

5.2.3.4 Test Result

Please refer to ANNEX A.6.

5.2.4 Electrical Fast Transient / Burst Immunity

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
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 4.5 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 port.
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

Please refer to ANNEX A.7.

5.2.5 Transients and Surges

Specification	Value
Basic Standard	ISO 7637-2
Immunity test level	III
Voltage	12 V
Test pulse number	1, 2a, 2b, 3a / 3b,4
Repetition Rate	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 4.5 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

Please refer to ANNEX A.8.

5.2.6 Surge Immunity

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 μ s	Voltage: 1.2/50us, or 10/700 μ s 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 μ s 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 μ s 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 μ s pulse.

5.2.6.2 Test Setup

Please refer to 4.5 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

Please refer to ANNEX A.9.

5.2.7 Immunity to Conducted Disturbances Induced by RF Fields

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 Line; DC Power Line; Wired Network Line
Coupling Device	CDN-M2+3

5.2.7.2 Test Setup

Please refer to 4.5 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

Please refer to ANNEX A.10.

5.2.8 Voltage Dips and Short Interruptions Immunity

5.2.8.1 Test Specification

Specification	Value
Basic Standard	EN 61000-4-11
Voltage Dips	100% reduction: 10 ms; 100% reduction: 20 ms; 30% reduction: 500 ms
Voltage Interruptions	100% reduction: 5000 ms
Voltage Phase Angle	0°

5.2.8.2 Test Setup

Please refer to 4.5 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) 100% voltage dip of supplied voltage with duration of 10 ms; b) 100% voltage dip of supplied voltage with duration of 20 ms;c) 30% voltage dip 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.

100% voltage interruption 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

Please refer to ANNEX A.11.

ANNEX A TEST RESULTS

A.1 Radiated Emission

Note 1: The symbol of "--" in the table which means not application.

Note 2: 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.

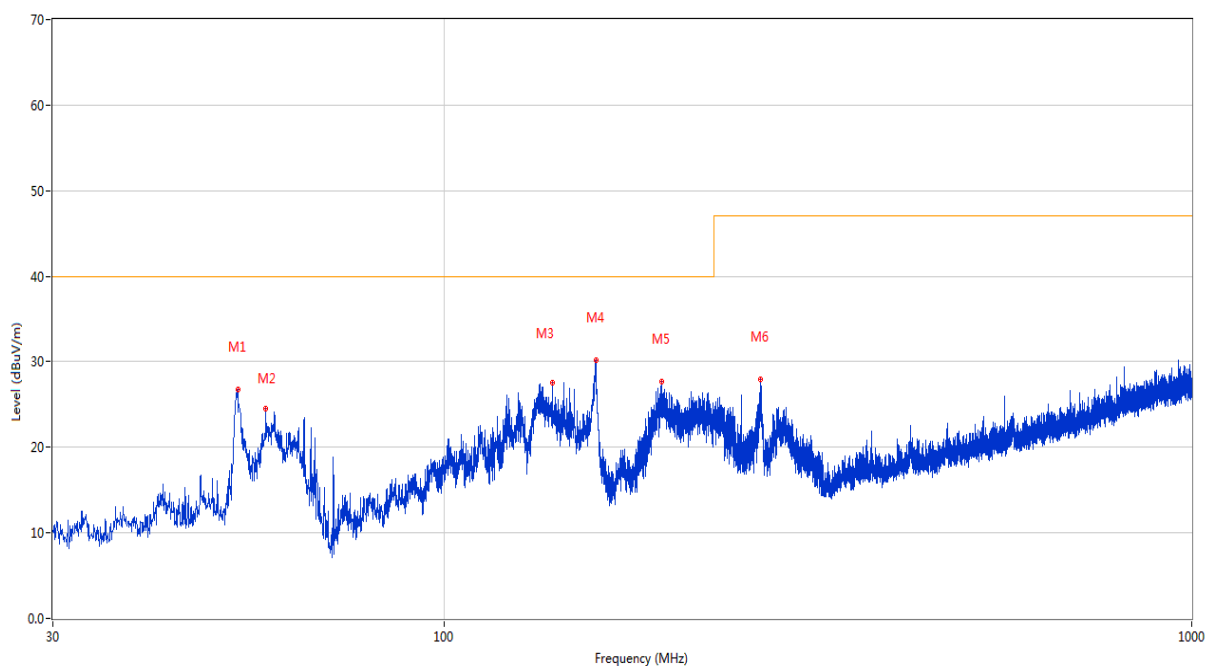
Note 3: The marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth or WiFi carrier frequencies.

Note 4: Two nominal voltages of 230 V (± 10 V) and 110 V (± 10 V), using a frequency of 50 Hz or 60 Hz, is normally sufficient for an EUT intended for worldwide use. Voltages and frequencies (such as a nominal 110 VAC, 50/60 Hz and 230 VAC, 50/60 Hz) for which the device is capable of operation. So, The configuration 110 VAC, 60 Hz and 230 VAC, 50 Hz were tested respectively, but only the worst configuration (110 VAC, 60 Hz) shown here.

Test Data and Plots (Below 1 GHz)

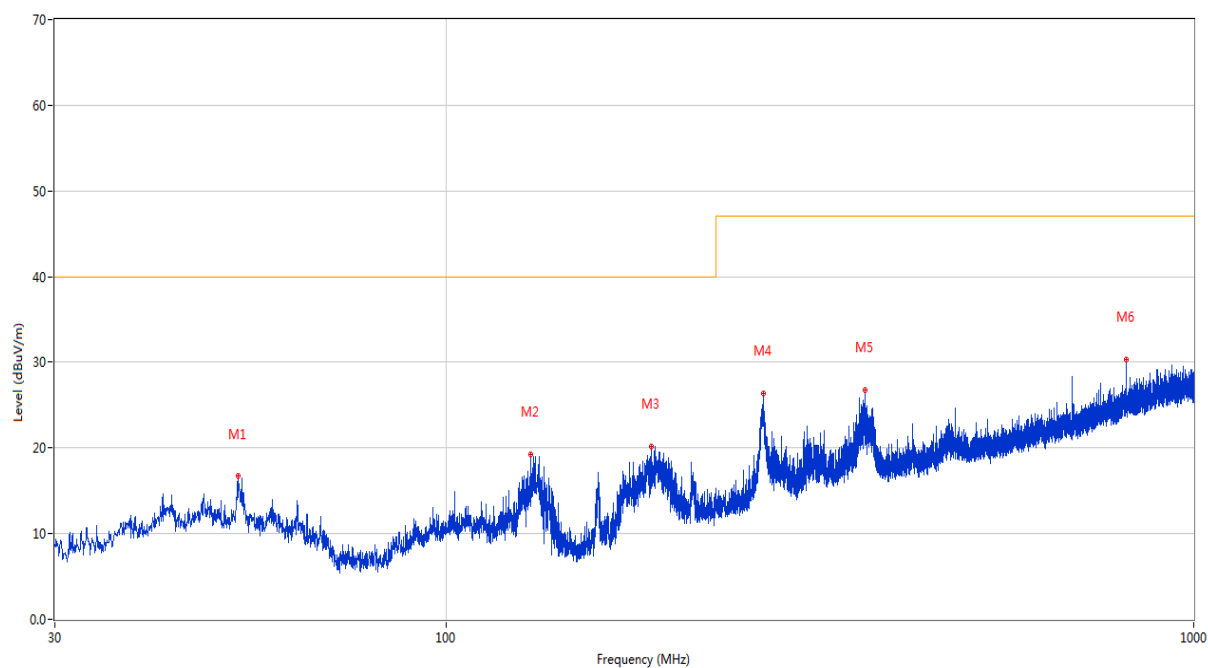
The Working Test Mode

A.1.1 Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	53.038	26.80	-23.00	40.0	13.20	Peak	80.00	100	Vertical	Pass
2	57.839	24.57	-24.11	40.0	15.43	Peak	219.80	100	Vertical	Pass
3	139.707	27.54	-27.63	40.0	12.46	Peak	337.40	100	Vertical	Pass
4	159.592	30.14	-27.41	40.0	9.86	Peak	98.40	100	Vertical	Pass
5	195.773	27.73	-24.32	40.0	12.27	Peak	70.80	100	Vertical	Pass
6	265.225	27.91	-22.17	47.0	19.09	Peak	45.60	100	Vertical	Pass

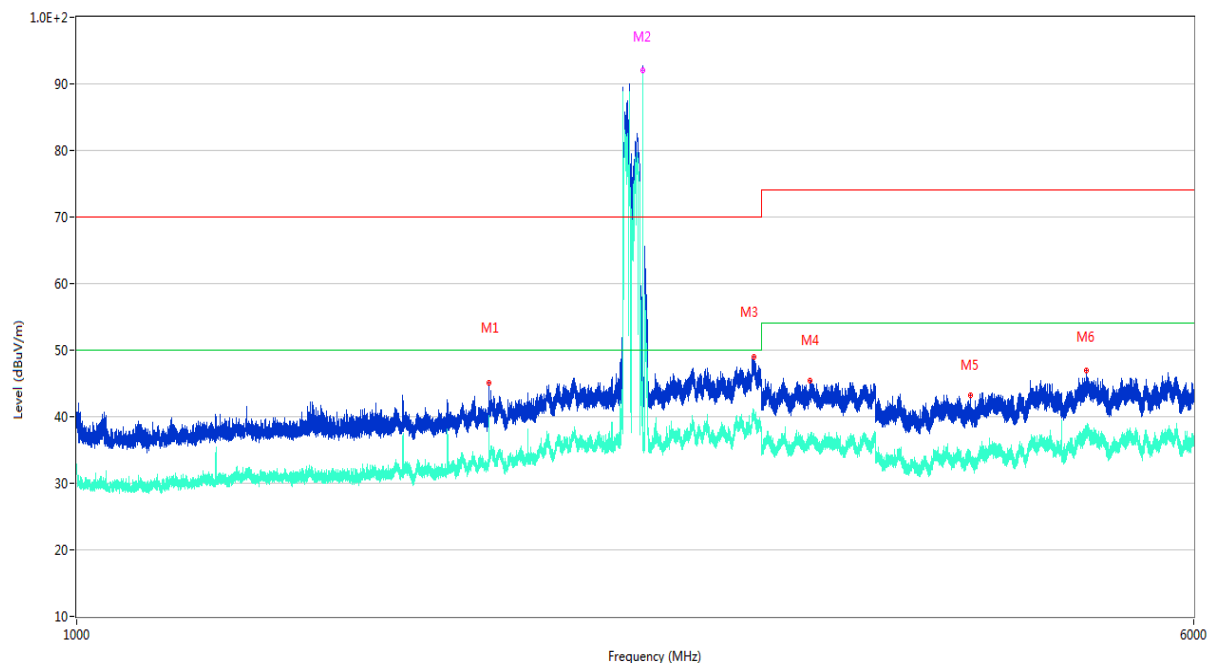
A.1.2 Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	52.746	16.68	-23.04	40.0	23.32	Peak	115.00	100	Horizontal	Pass
2	129.716	19.19	-27.05	40.0	20.81	Peak	350.80	200	Horizontal	Pass
3	188.449	20.16	-25.36	40.0	19.84	Peak	112.20	200	Horizontal	Pass
4	265.662	26.35	-22.17	47.0	20.65	Peak	293.80	100	Horizontal	Pass
5	363.195	26.81	-19.76	47.0	20.19	Peak	209.00	100	Horizontal	Pass
6	812.596	30.27	-11.12	47.0	16.73	Peak	149.10	100	Horizontal	Pass

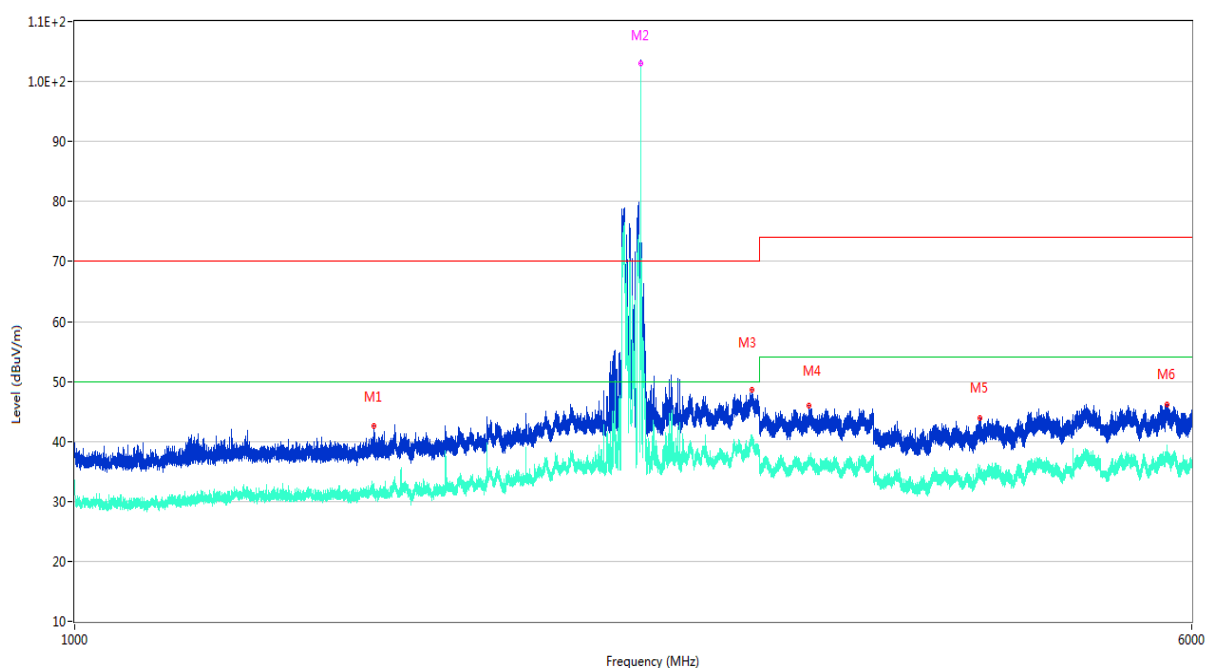
Test Data and Plots (Above 1 GHz)

A.1.3 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	1937.600	45.15	-12.93	70.0	24.85	Peak	191.90	100	Vertical	Pass
1**	1937.600	40.09	-12.93	50.0	9.91	AV	191.90	100	Vertical	Pass
2	2480.000	92.52	-9.75	70.0	-22.52	Peak	287.10	100	Vertical	N/A
2**	2480.000	92.06	-9.75	50.0	-42.06	AV	287.10	100	Vertical	N/A
3	2961.300	48.98	-4.86	70.0	21.02	Peak	129.90	100	Vertical	Pass
3**	2961.300	40.15	-4.86	50.0	9.85	AV	129.90	100	Vertical	Pass
4	3242.850	45.38	-7.71	74.0	28.62	Peak	0.70	100	Vertical	Pass
4**	3242.850	36.60	-7.71	54.0	17.40	AV	0.70	100	Vertical	Pass
5	4195.200	43.21	-4.84	74.0	30.79	Peak	39.60	100	Vertical	Pass
5**	4195.200	33.62	-4.84	54.0	20.38	AV	39.60	100	Vertical	Pass
6	5053.050	47.01	-3.20	74.0	26.99	Peak	186.80	100	Vertical	Pass
6**	5053.050	38.07	-3.20	54.0	15.93	AV	186.80	100	Vertical	Pass

A.1.4 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	1615.700	42.57	-14.91	70.0	27.43	Peak	307.60	100	Horizontal	Pass
1**	1615.700	31.29	-14.91	50.0	18.71	AV	307.60	100	Horizontal	Pass
2	2479.900	103.40	-9.76	70.0	-33.40	Peak	348.50	100	Horizontal	N/A
2**	2479.900	103.03	-9.76	50.0	-53.03	AV	348.50	100	Horizontal	N/A
3	2961.600	48.61	-4.88	70.0	21.39	Peak	299.00	100	Horizontal	Pass
3**	2961.600	39.62	-4.88	50.0	10.38	AV	299.00	100	Horizontal	Pass
4	3245.850	45.89	-7.64	74.0	28.11	Peak	40.20	100	Horizontal	Pass
4**	3245.850	37.23	-7.64	54.0	16.77	AV	40.20	100	Horizontal	Pass
5	4273.800	43.89	-4.71	74.0	30.11	Peak	171.20	100	Horizontal	Pass
5**	4273.800	34.62	-4.71	54.0	19.38	AV	171.20	100	Horizontal	Pass
6	5769.000	46.12	-2.76	74.0	27.88	Peak	40.20	100	Horizontal	Pass
6**	5769.000	37.38	-2.76	54.0	16.62	AV	40.20	100	Horizontal	Pass

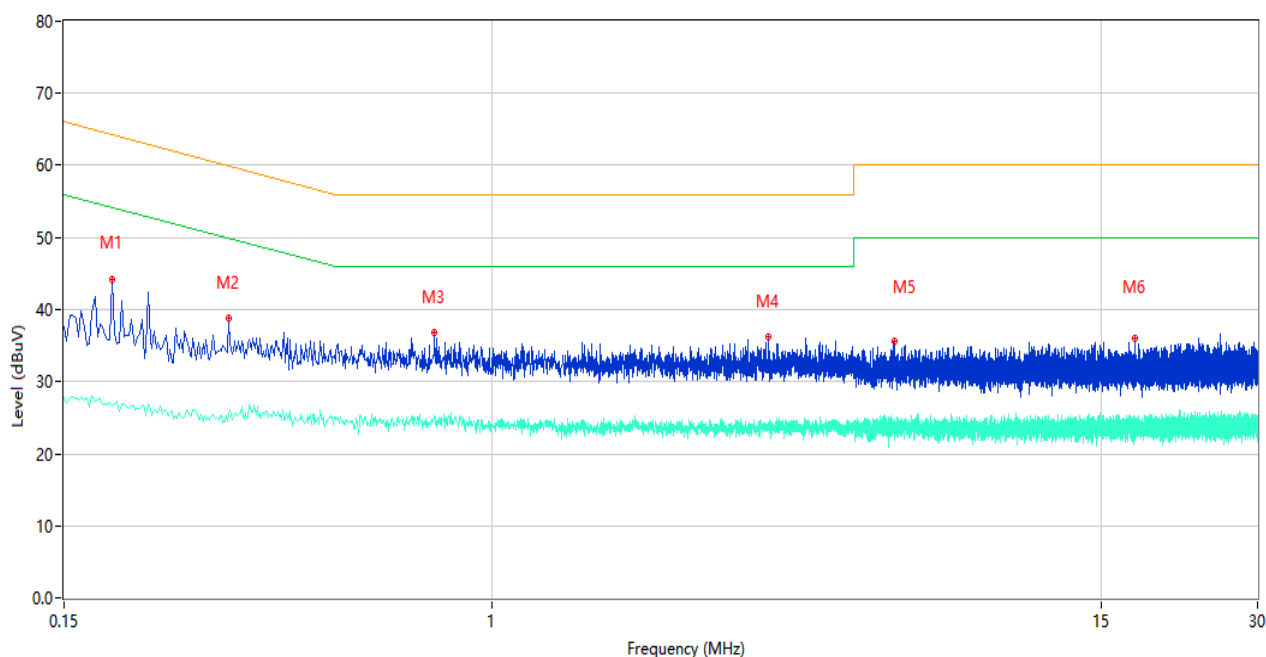
A.2 Conducted Emissions

Note: Two nominal voltages of 230 V (± 10 V) and 110 V (± 10 V), using a frequency of 50 Hz or 60 Hz, is normally sufficient for an EUT intended for worldwide use. Voltages and frequencies (such as a nominal 110 VAC, 50/60 Hz and 230 VAC, 50/60 Hz) for which the device is capable of operation. So, The configuration 110 VAC, 60 Hz and 230 VAC, 50 Hz were tested respectively, but only the worst configuration (230 VAC, 50 Hz) shown here.

Test Data and Plots

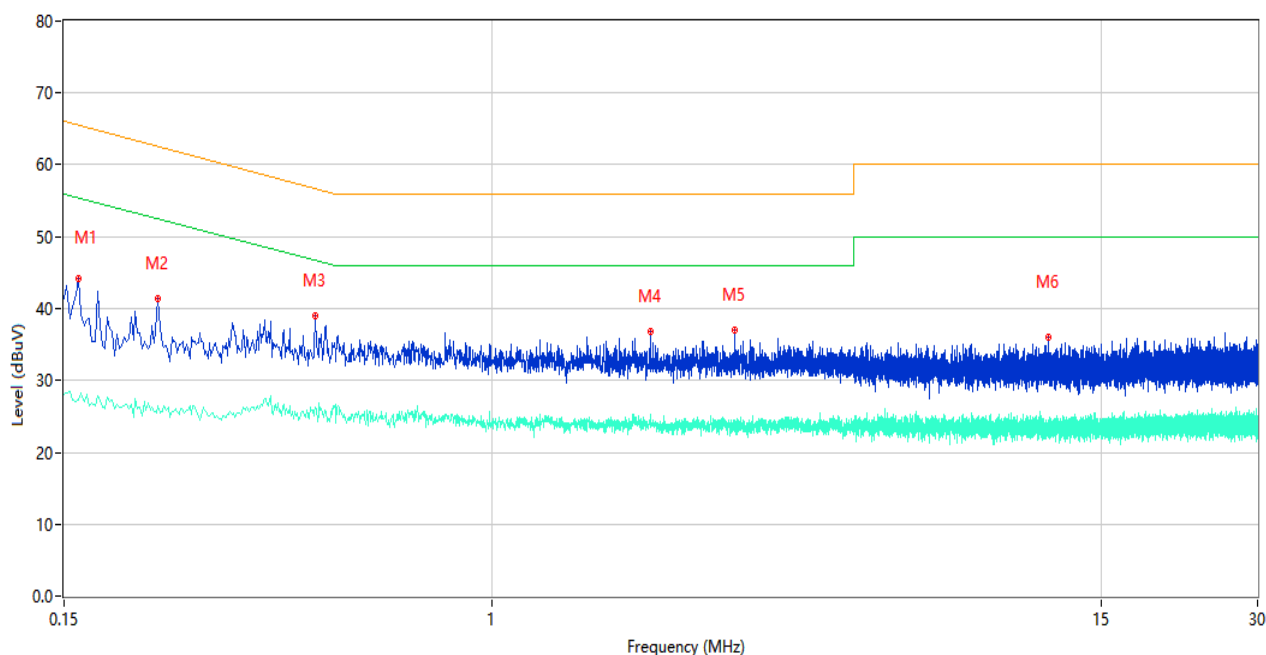
The Working Test Mode

A.2.1 L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.186	44.27	10.06	64.21	19.94	Peak	L	Pass
1**	0.186	26.60	10.06	54.21	27.61	AV	L	Pass
2	0.312	38.74	10.22	59.92	21.18	Peak	L	Pass
2**	0.312	25.34	10.22	49.92	24.58	AV	L	Pass
3	0.776	36.75	10.51	56.00	19.25	Peak	L	Pass
3**	0.776	25.31	10.51	46.00	20.69	AV	L	Pass
4	3.424	36.27	10.33	56.00	19.73	Peak	L	Pass
4**	3.424	23.89	10.33	46.00	22.11	AV	L	Pass
5	5.984	35.54	10.33	60.00	24.46	Peak	L	Pass
5**	5.984	24.44	10.33	50.00	25.56	AV	L	Pass
6	17.366	36.08	10.44	60.00	23.92	Peak	L	Pass
6**	17.366	24.50	10.44	50.00	25.50	AV	L	Pass

A.2.2 N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.160	44.15	10.08	65.46	21.31	Peak	N	Pass
1**	0.160	27.19	10.08	55.46	28.27	AV	N	Pass
2	0.228	41.38	10.03	62.52	21.14	Peak	N	Pass
2**	0.228	26.45	10.03	52.52	26.07	AV	N	Pass
3	0.458	39.03	10.22	56.73	17.70	Peak	N	Pass
3**	0.458	26.19	10.22	46.73	20.54	AV	N	Pass
4	2.024	36.82	10.45	56.00	19.18	Peak	N	Pass
4**	2.024	25.28	10.45	46.00	20.72	AV	N	Pass
5	2.938	37.04	10.22	56.00	18.96	Peak	N	Pass
5**	2.938	24.15	10.22	46.00	21.85	AV	N	Pass
6	11.884	36.05	10.59	60.00	23.95	Peak	N	Pass
6**	11.884	24.48	10.59	50.00	25.52	AV	N	Pass

A.3 Harmonic Current Emissions

Note: Not applicable.

A.4 Voltage Fluctuations and Flicker Measurement

Test Parameter	Limit	Measurement Value	Verdict
Pst	1.0	0.00	Pass
Plt	0.65	0.00	Pass
Tdt	0.5	0.00	Pass
dmax (%)	4%	-0.24%	Pass
dc (%)	3.3%	0.00%	Pass

A.5 Electrostatic Discharge Immunity

Test Points	Discharge Level (kV)	Discharge Mode	Number of Discharge	Verdict
HCP	±4	Contact	100	Pass
VCP	±4	Contact	100	Pass
Display Area	±2, ±4, ±8	Air	200	Pass
Type-C Port	±2, ±4, ±8	Air	60	Pass
Type-C Cable	±2, ±4, ±8	Air	60	Pass
Sensing Hole (Type-C Cable)	±2, ±4, ±8	Air	60	Pass
Shell and Crack	±2, ±4, ±8	Air	200	Pass

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

A.6 Radio Frequency Electromagnetic Field Immunity

Antenna Polarity	Frequency (MHz)	Side	Field Strength (V/m)	Verdict
Vertical	80 – 1000, 1000 – 3000, 3000 – 6000	Front	3	Pass
		Back	3	Pass
		Left	3	Pass
		Right	3	Pass
Horizontal	80 – 1000, 1000 – 3000, 3000 – 6000	Front	3	Pass
		Back	3	Pass
		Left	3	Pass
		Right	3	Pass

Note 1: The performance comply with the performance criteria in Criterion A.

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

A.7 Electrical Fast Transient / Burst Immunity

Test Point	Polarity	Test Level (kV)	Verdict
L-GND	+ / -	1	Pass
N-GND	+ / -	1	Pass
L+N-GND	+ / -	1	Pass

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

A.8 Transients and Surges

Note: Not applicable.

A.9 Surge Immunity

Coupling Line	Polarity	Voltage (kV)	Verdict
L-N	+ / -	1	Pass

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

A.10 Immunity to Conducted Disturbances Induced by RF Fields

Test Point	Frequency (MHz)	Field Strength (V rms)	Verdict
AC Port	0.15 - 80	3	Pass

Note 1: The performance comply with the performance criteria in Criterion A.

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

A.11 Voltage Dips and Short Interruptions Immunity

Test Mode	Voltage Reduction	Duration (ms)	Times	Interval (sec)	Verdict
Voltage Dips	100%	10	3	10	Pass
	100%	20	3	10	Pass
	30%	500	3	10	Pass
Voltage Interruptions	100%	5000	3	10	Pass

Note: The performance comply with the performance criteria in Voltage Dips 100% Voltage Reduction in Criterion B. Voltage Dips 30% Voltage Reduction and Voltage Interruptions performance in Criterion C.

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZT22B1240-AE-1.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZT22B1240-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZT22B1240-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.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
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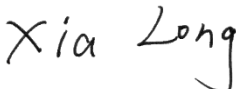
--END OF REPORT--

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 Hub 2
Model Name: W3202100
Brand Name: SwitchBot
Test Standard: EN 55032: 2015+A1:2020
EN 55035: 2017+A11:2020
EN IEC 61000-3-2: 2019
EN 61000-3-3: 2013+A1:2019
(refer section 3.1)
Sample Arrival Date: Nov. 30, 2022
Test Date: Dec. 01, 2022 - Dec. 08, 2022
Date of Issue: Dec. 19, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Xiong Chong**Checked by:** Xia Long**Approved by:** Liao Jianming
(Technical Director)

Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Dec. 19, 2022</u>	<u>Initial Issue</u>

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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 Factory Information

Factory	Woan Technology (Shenzhen) Co., Ltd.
Address	Building A2, Zhengfeng Industrial Area, No.610 Fengtang Boulevard, Fuhai Sub-district, Bao'an District, Shenzhen

2.4 General Description for Equipment under Test (EUT)

EUT Name	SwitchBot Hub 2
Model Name Under Test	W3202100
Series Model Name	W3202101, W3202102, W3202103, W3202104, W3202105, W3202106
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name. (this information provided by the customer)
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Ancillary Equipment 1	Adapter (EU Plug)	
	Brand Name	N/A
	Model No.	KA12C-0502000EU
	Serial No.	N/A
	Rated Input	100-240V~, 0.35A, 50/60Hz
	Rated Output	5VDC 2A
Ancillary Equipment 2	Adapter (UK Plug)	
	Brand Name	N/A
	Model No.	KA12C-0502000BS
	Serial No.	N/A
	Rated Input	100-240V~, 0.35A, 50/60Hz
	Rated Output	5VDC 2A
Ancillary Equipment 3	Type-C Cable	
	Model No.	N/A
	Length (Approx.)	2.1 m

2.6 Technical Information

Network and Wireless connectivity		Bluetooth, WiFi
Interfaces present on the EUT	AC Ports	From mains to AC power adapter.
	DC Ports	From power supply to EUT, the DC port cable length is less than 3m.
	I/O Ports	Type-C, which cable length is less than 3m.
	Telecom Ports	No Telecom Ports.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

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	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+A1:2019	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.
5	BS EN 55032: 2015+A1:2020	Electromagnetic compatibility of multimedia equipment — Emission requirements
6	BS EN 55035: 2017+A11:2020	Electromagnetic compatibility of multimedia equipment - Immunity requirements
7	BS EN IEC 61000-3-2: 2019	Electromagnetic compatibility (EMC) -- Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
8	BS EN 61000-3-3: 2013+A1:2019	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. For undated references in this report, the cited version applies.

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 (2005)	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test.
5	IEC 61000-4-6 (2008)	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	Result	Remark
Emission						
1	EN 55032	Radiated Emission	Below 1 GHz	Pass	ANNEX A.1	--
			Above 1 GHz	Pass		Note 1
2	EN 55032	Conducted Emission	Mains terminals	Pass	ANNEX A.2	--
			Asymmetric mode	N/A	ANNEX A.3	Note 2
			Differential voltage	N/A	ANNEX A.4	Note 3
3	EN 61000-3-2	Harmonic Current Emissions		N/A	ANNEX A.5	Note 4
4	EN 61000-3-3	Voltage Fluctuations & Flicker		Pass	ANNEX A.6	--
Immunity						
5	IEC 61000-4-2	Electrostatic Discharge Immunity		Pass	ANNEX A.7	--
6	IEC 61000-4-3	Radiated RF Electromagnetic Field Immunity		Pass	ANNEX A.8	--
7	IEC 61000-4-4	Electrical Fast Transient/Burst Immunity	AC Ports	Pass	ANNEX A.9	--
			DC Ports	N/A		--
			Analogue/ Digital data Ports	N/A		Note 5
8	IEC 61000-4-5	Surge Immunity	AC Ports	Pass	ANNEX A.10	Note 6
			DC Ports	N/A		Note 7
			Analogue/ Digital data Ports	N/A		Note 8
9	IEC 61000-4-6	Immunity to Conducted Disturbances Induced by RF Fields	AC Ports	Pass	ANNEX A.11	Note 9
			DC Ports	N/A		
			Analogue/ Digital data Ports	N/A		
10	IEC 61000-4-8	Power-frequency magnetic field		N/A	ANNEX A.12	Note 10
11	IEC 61000-4-11	Voltage Dips and Short Interruptions Immunity		Pass	ANNEX A.13	Note 11
12	EN 55035 (4.2.7)	Broadband impulsive conducted disturbances		N/A	ANNEX A.14	Note 12
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: For cables longer than 3 m only.						
Note 3: For Class B broadcasting receiver only.						
Note 4: There is no need for Harmonics test to be performed on this product (rated power is less than 75 W) in accordance with EN IEC 61000-3-2: 2019.						
For further details, please refer to Clause 7 of EN IEC 61000-3-2: 2019 which states:						
“For the following categories of equipment, limits are not specified in this edition of the standard:						
- equipment with a rated power of 75 W or less, other than lighting equipment.”						
For DC Ports and Analogue/ Digital data Ports, applicable only to ports which according to the manufacturer’s specification support cable lengths greater than 3 m.						

Note 5: The repetition frequency is 100 kHz for CPE, xDSL ports.

Note 6: The number of pulses applied shall be as follows:

- Five positive pulses line-to-neutral at 90° phase
- Five negative pulses line-to-neutral at 270° phase

The following additional pulses are required only if the EUT has an earth connection or if the EUT is earthed via any AE.

- Five positive pulses line-to-earth at 90° phase
- Five negative pulses line-to-earth at 270° phase
- Five negative pulses neutral-to-earth at 90° phase
- Five positive pulses neutral-to-earth at 270° phase

For multiple-phase systems where a neutral conductor is present, the test is applied (as defined above) to a single phase unless the other phases are connected to significantly different circuit arrangements.

For multiple-phase systems where a neutral conductor is not present, the test is applied as defined in the basic standard.

Note 7: Applicable only to ports which, according to the manufacturer's specification, may connect directly to outdoor cables.

Note 8: Surges are applicable to ports which satisfy all the following conditions:

- may connect directly to cables that leave the building structure.
- defined as an antenna port a wired network port or a broadcast receiver tuner port. Typical ports covered include xDSL, PSTN, CATV, antenna and similar. Excluded ports are LAN and similar.

Note 9: The level is 3V from 0.15 MHz to 10MHz, from 3V decrease to 1V when 10 MHz to 30 MHz with Logarithmic, and 1V from 30MHz to 80 MHz.

Note 10: 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.

Note 11: 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.

Note 12: Applicable only to CPE xDSL ports.

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	3.22 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT3	3.66 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT5	4.10 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT6	4.58 dB
Radiated emissions (30 MHz-1 GHz)-10m	4.80 dB
Radiated emissions (30 MHz-1 GHz)-966#2	4.76 dB
Radiated emissions (30 MHz-1 GHz)-966#4	4.38 dB
Radiated emissions (1 GHz-18 GHz)-10m	4.72 dB
Radiated emissions (1 GHz-18 GHz)-966#2	4.88dB
Radiated emissions (1 GHz-18 GHz)-966#4	5.04 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments, Test Date and Test Engineer

Test items	Voltage	Temperature	Relative Humidity	Ambient Pressure	Test Date	Test Engineer
Radiated Emission	AC 230V/50Hz, AC 110V/60Hz	22.3℃ 23.5℃	52% 54%	101kPa	Dec. 01, 2022 Dec. 08, 2022	Tian Shuo
Conducted Emission	AC 230V/50Hz, AC 110V/60Hz	21.9℃	59%	101kPa	Dec. 01, 2022	Tian Shuo
Voltage Fluctuations & Flicker	AC 230V/50Hz, AC 110V/60Hz	24.1℃	47%	101kPa	Dec. 05, 2022	Liu Chenfang
Electrostatic Discharge Immunity	AC 230V/50Hz, AC 110V/60Hz	24.5℃	44%	101kPa	Dec. 05, 2022	Liu Chenfang
Radiated RF Electromagnetic Field Immunity	AC 230V/50Hz, AC 110V/60Hz	23.0℃	54%	101kPa	Dec. 06, 2022	Yang Panxia
Electrical Fast Transient/Burst Immunity	AC 230V/50Hz, AC 110V/60Hz	24.1℃	47%	101kPa	Dec. 05, 2022	Liu Chenfang
Surge Immunity	AC 230V/50Hz, AC 110V/60Hz	24.1℃	47%	101kPa	Dec. 05, 2022	Liu Chenfang
Immunity to Conducted Disturbances Induced by RF Fields	AC 230V/50Hz, AC 110V/60Hz	23.0℃	54%	101kPa	Dec. 06, 2022	Yang Panxia
Voltage Dips and Short Interruptions Immunity	AC 230V/50Hz, AC 110V/60Hz	24.1℃	47%	101kPa	Dec. 05, 2022	Liu Chenfang

4.2 Test Equipment

Radiated Emission Test For Frequency Below 1 GHz (3m-966#4)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	Agilent	N9038A	MY53220118	2022.09.08	2023.09.07	☒
Amplifier (30-1GHz)	COM-MV	ZT30-1000M	B2017119082	2022.09.08	2023.09.07	☒
Test Antenna- Bi-Log	SCHWARZBECK	VULB 9163	9163-624	2021.08.20	2024.08.19	☒
Anechoic Chamber	ChangNing	9m*6m*6m	101	2020.03.16	2023.03.15	☒
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

Radiated Emission Test For Frequency Above 1 GHz (3m-966#4)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	Agilent	N9038A	MY53220118	2022.09.08	2023.09.07	☒
Amplifier (1-12GHz)	COM-MV	DLNAB- 1000-12000- 002	18080279	2022.09.08	2023.09.07	☒
Amplifier (0.8-21GHz)	Mini-Circuits	ZVA-213-S+	619201336	2022.09.08	2023.09.07	☐
Test Antenna- Horn	SCHWARZBECK	BBHA 9120D	1148	2022.04.12	2025.04.11	☒
Anechoic Chamber	ChangNing	9m*6m*6m	101	2020.03.16	2023.03.15	☒
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2022.09.09	2023.09.08	☒
LISN	SCHWARZBECK	NSLK 8127	8127-687	2022.06.01	2023.05.31	☒
ISN	TESEQ	ISN T800	34449	2021.11.24	2022.11.23	☐
ISN	TESEQ	ISN T8-Cat6	53561	2022.05.24	2023.05.23	☐
Shielded Room	YiHeng Electronic Co., Ltd	3.5m*3.1m*2. 8m	112	2022.02.19	2025.02.18	☒
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

Voltage Fluctuations & Flicker and Harmonic Current Emissions Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
HARMONICS, FLICKER&POWER ANALYSER	LAPLACE INSTRUMENTS	AC2000A	377954	2022.09.23	2023.09.22	☒
AC TESTING POWER SOURCE	EVERFINE	DPS1030	Y120984CJ7 331115	2022.01.08	2023.01.07	☒

Electrostatic Discharge Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
ESD Test System	EMTEST	DITO	P18332 22423	2022.05.09	2023.05.08	☒

Radiated RF Electromagnetic Field Immunity Test						
Description	Manufacturer	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	2022.01.08	2023.01.07	☒
Power Amplifier	OPHIR RF	5225F	1037	2022.02.16	2023.02.15	☒
Power Amplifier	OPHIR RF	5273F	1016	2022.02.16	2023.02.15	☒
Power Amplifier	RFLIGHT	NTWPAS-2560025	17043109	2022.02.16	2023.02.15	☒
Power Meter	R&S	NRP-Z11	117410/1176 93	2022.06.13	2023.06.12	☒
Field Strength Meter	Narda	EP602	611WX80276	2022.09.15	2023.09.14	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-977	2022.02.16	2025.02.15	☒
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	9120D-1148	2022.04.12	2025.04.11	☒
Mouth Simulator	B&K	4227	2423931	2022.09.21	2023.09.20	☐
Sound Calibrator	Hangzhou Aihua	AWA6022A	2023961	2022.10.21	2023.10.20	☐
Sound Level Meter	B&K	NL-20	00844023	2022.09.20	2023.09.19	☐
2CH Audio	B&K	2690-0S2	2421743	2022.10.21	2023.10.20	☐

Radiated RF Electromagnetic Field Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
Amplifier						
Ear Simulator	B&K	4192 -L-001	3038758	2022.01.12	2023.01.11	☐
Audio analyzer	R&S	UPL 16	100129	2022.01.08	2023.01.07	☐
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

Electrical Fast Transient/Burst Immunity & Surge Immunity Test & Voltage Dips and Short Interruptions Immunity Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
(EFT/ SURGE/ DIPS)Three-in-one Test System	HTEC	HCOMPACT7	190801	2022.05.09	2023.05.08	☒
DIPS coupling	HTEC	HV1P16T	190303	2022.05.09	2023.05.08	☒
EFT Clamp (Telecom Ports)	HTEC	H3C	N/A	2022.05.09	2023.05.08	☐
Surge Generator (10/700)	HTEC	HCOMB 70	143806	2022.05.09	2023.05.08	☐
SURGE coupling	HTEC	TCOMB-4	143807	2022.05.09	2023.05.08	☐

Immunity to Conducted Disturbances Induced by RF Fields						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
CONDUCTED DISTURBANCES TEST SYSTEM	SCHLODER	CDG 6000-75	126B1286	2022.05.10	2023.05.09	☒
CDN-M2+3	SCHLODER	CDN M2+M3-16	A2210276	2022.05.10	2023.05.09	☒
Injection Probe	FCC	F-120-8M	190119	2021.12.22	2022.12.21	☐
ISN	TESEQ	ISN T800	34449	2022.11.11	2023.11.10	☐
ISN	TESEQ	ISN T8-Cat6	53561	2022.05.24	2023.05.23	☐
Mouth Simulator	B&K	4227	2423931	2022.09.21	2023.09.20	☐
Sound Calibrator	Hangzhou Aihua	AWA6022A	2023961	2022.10.21	2023.10.20	☐
Sound Level Meter	B&K	NL-20	00844023	2022.09.20	2023.09.19	☐
2CH Audio Amplifier	B&K	2690-0S2	2421743	2022.09.21	2023.09.20	☐
Ear Simulator	B&K	4192 -L-001	3038758	2022.01.12	2023.01.11	☐
Audio analyzer	R&S	UPL 16	100129	2022.01.08	2023.01.07	☐
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

4.3 Test Enclosure list

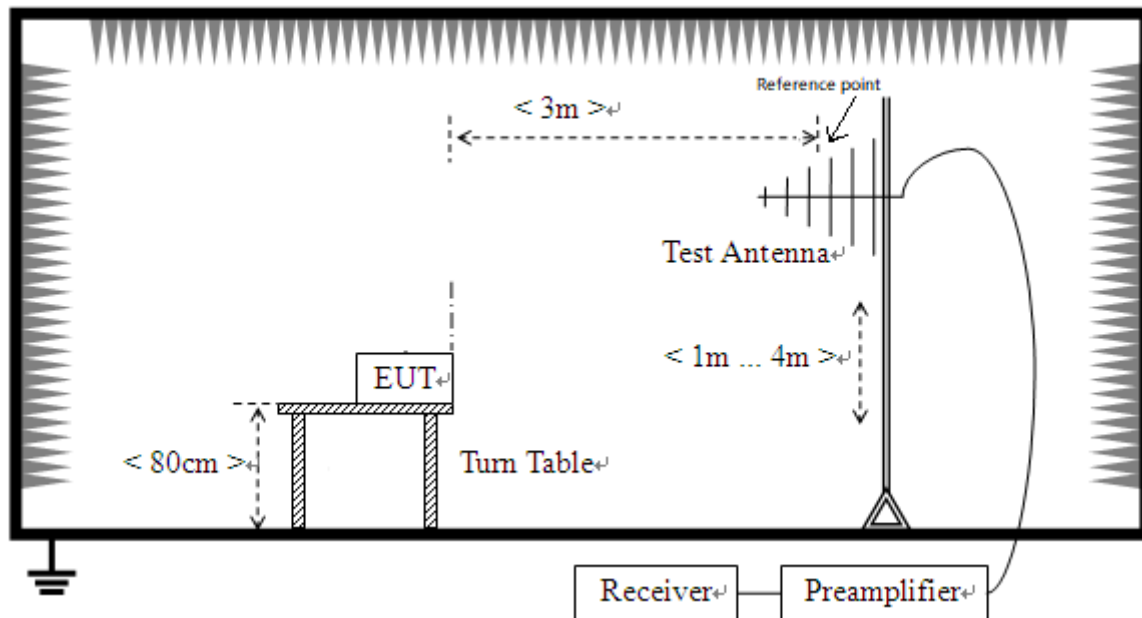
Note: Not applicable.

4.4 Test Configurations

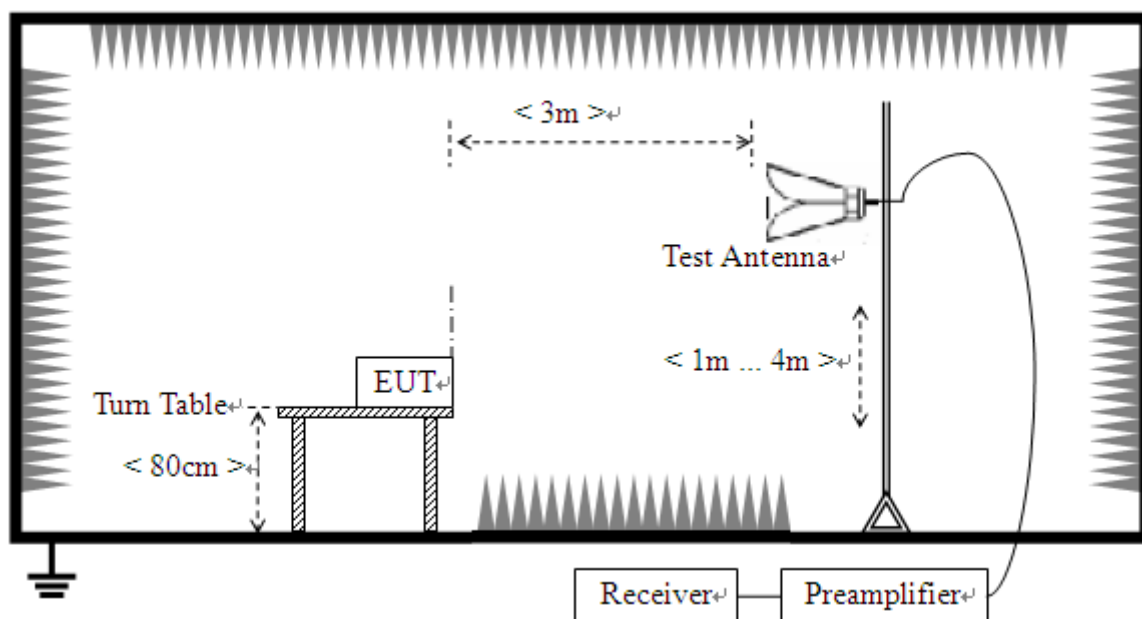
Test Configurations (TC) No.	Description
TC01	<u>The Working Test Mode</u> EUT + Type-C Cable + Adapter

4.5 Test Setups

Test Setup 1

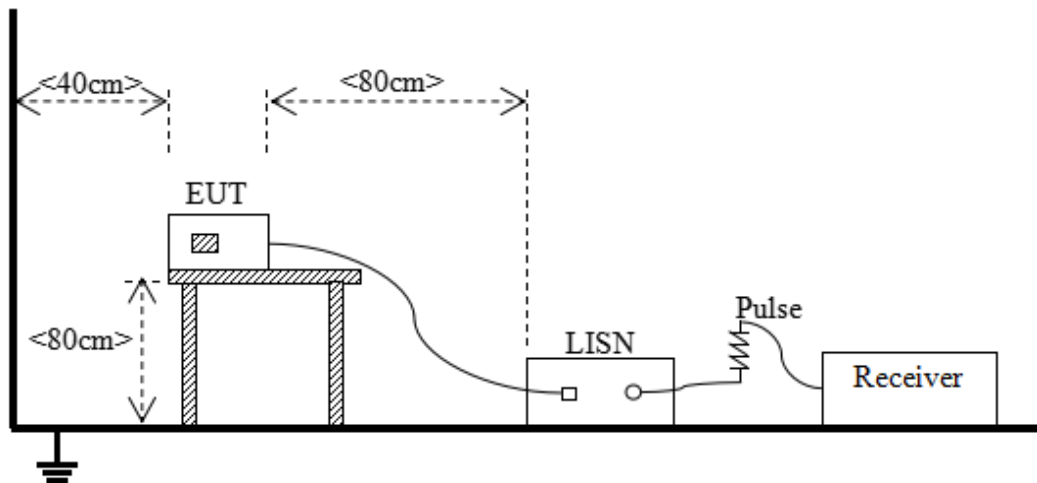


(For Radiated Emission Test (30 MHz-1 GHz))



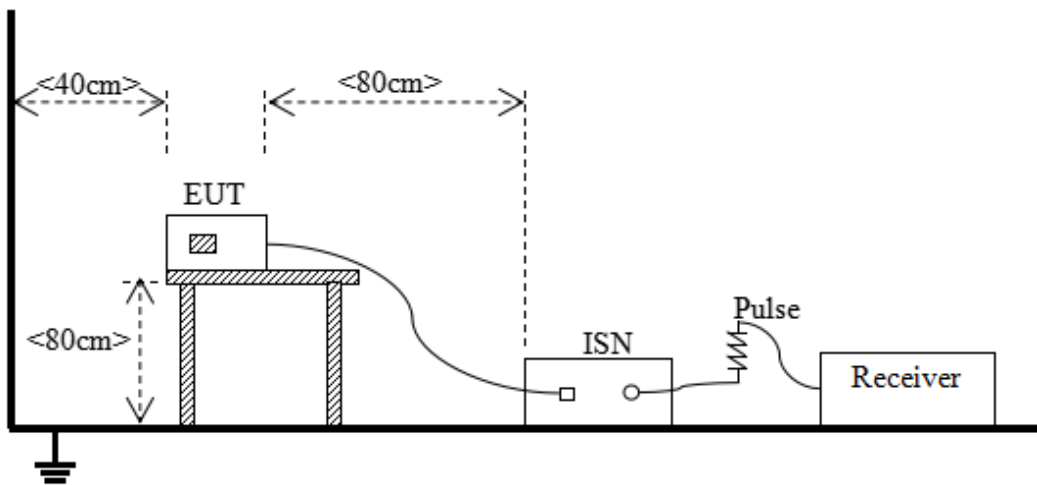
(For Radiated Emission Test (above 1 GHz))

Test Setup 2



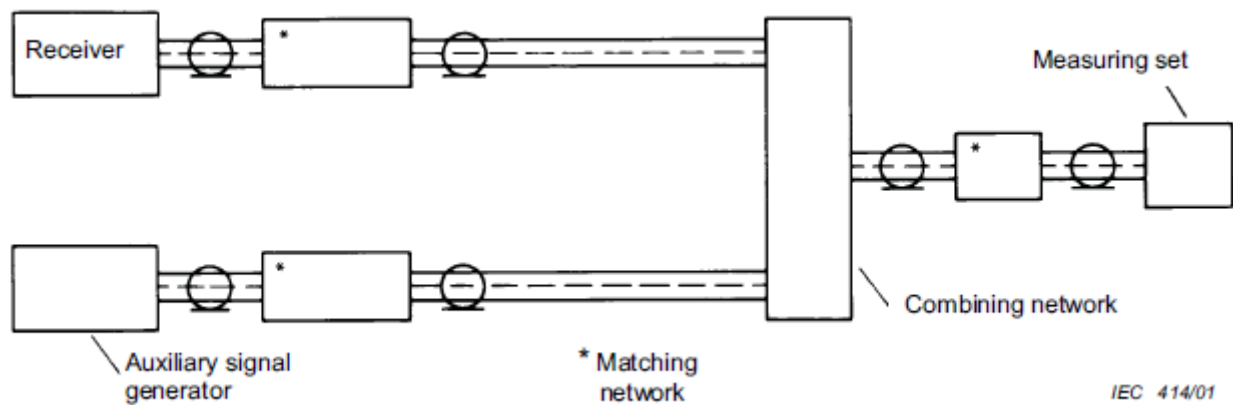
(For Conducted disturbance voltage at mains terminals Test)

Test Setup 3



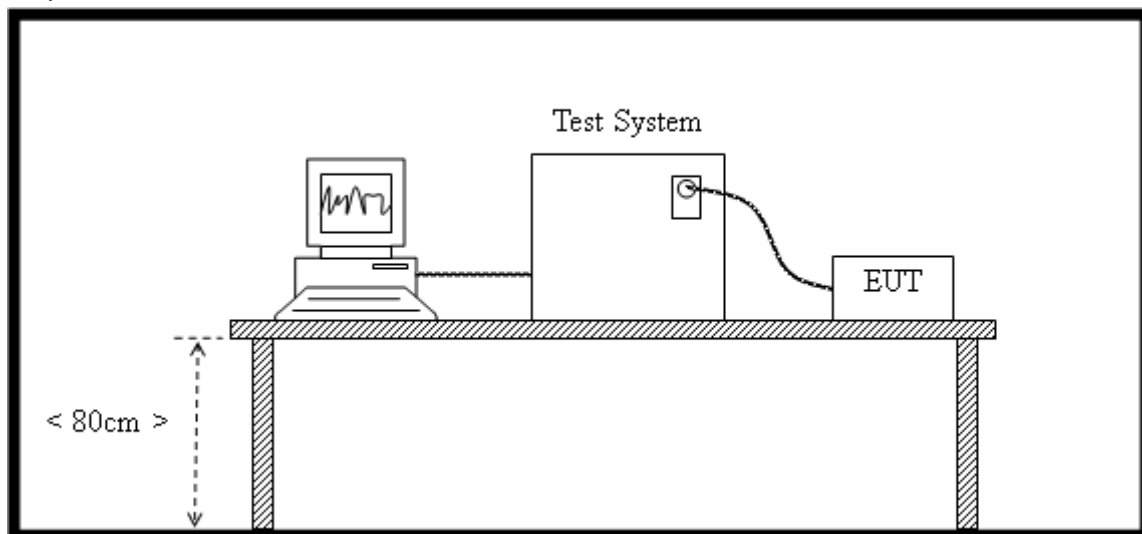
(For Conducted disturbance for asymmetric mode Test)

Test Setup 4



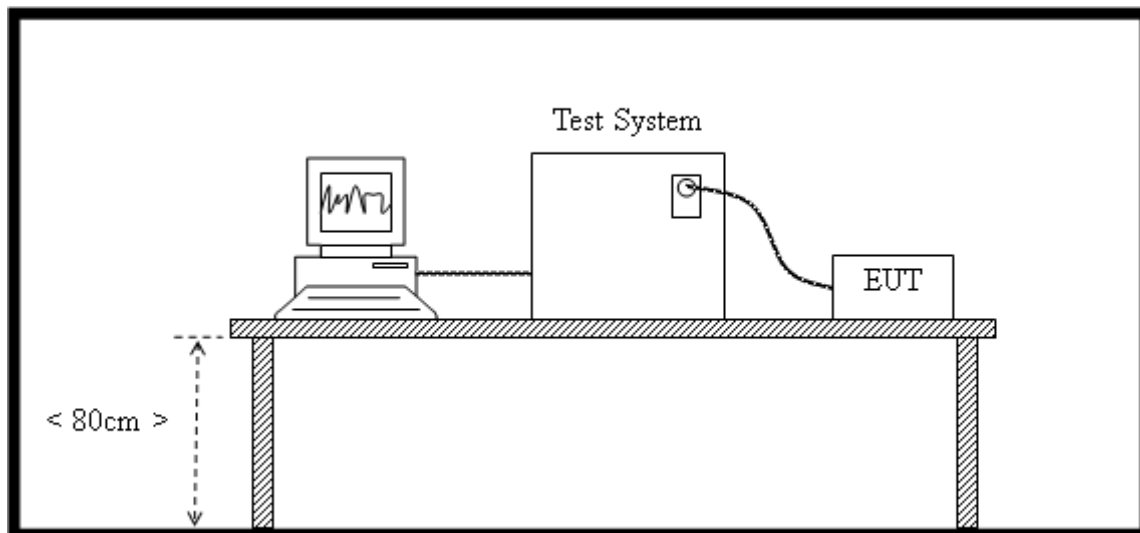
(For Conducted differential voltage emission (TV/FM broadcast receiver tuner ports))

Test Setup 5



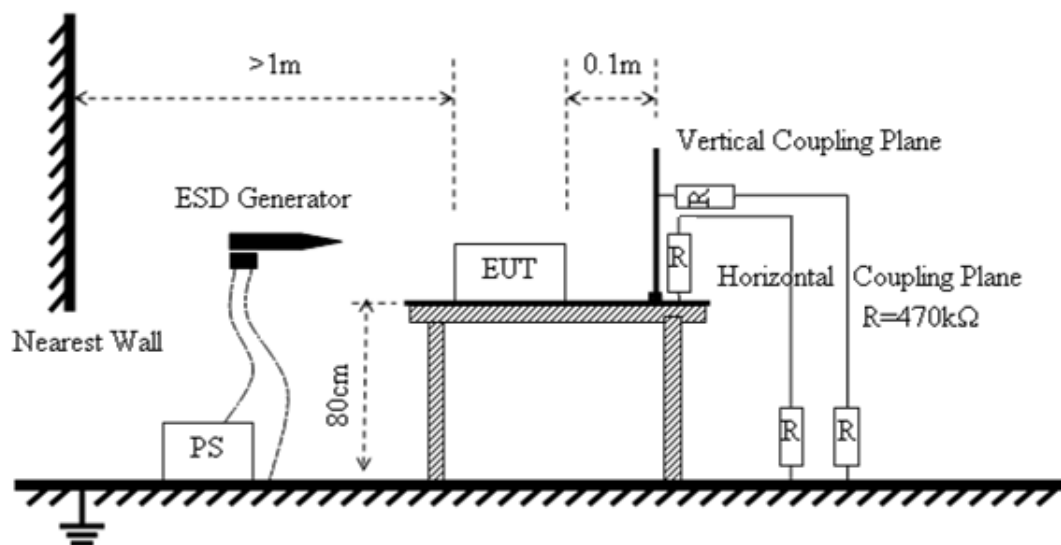
(For Harmonic Current Emissions Measurement Test)

Test Setup 6



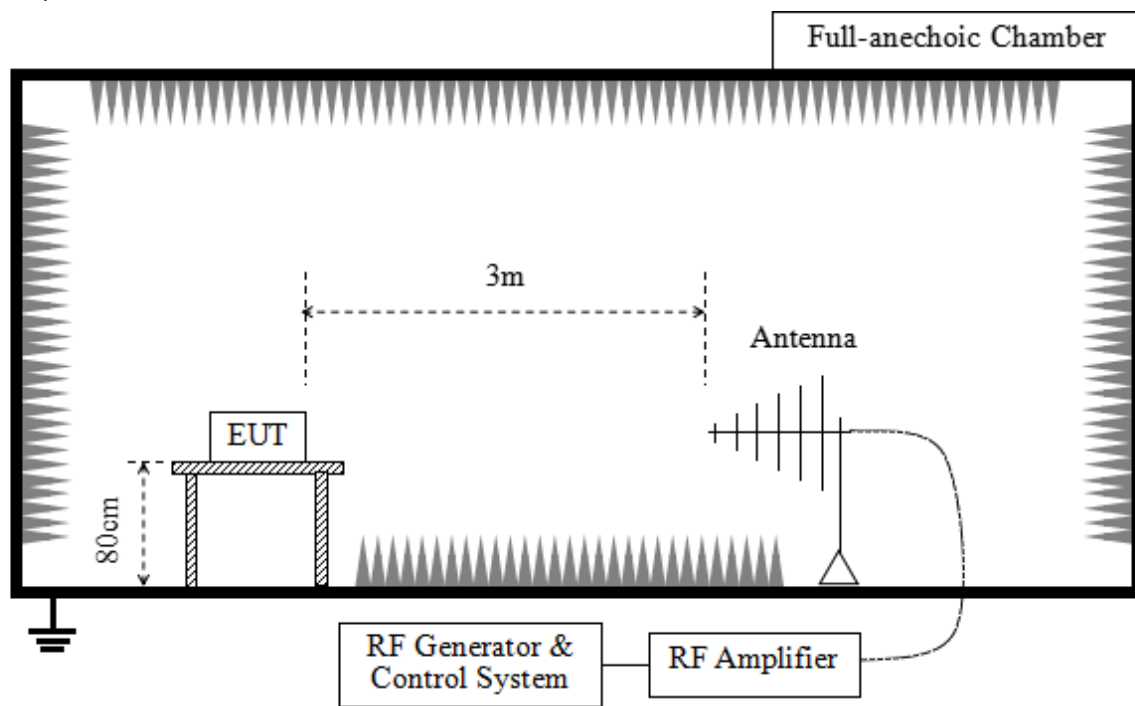
(For Voltage Fluctuations and Flicker Measurement Test)

Test Setup 7



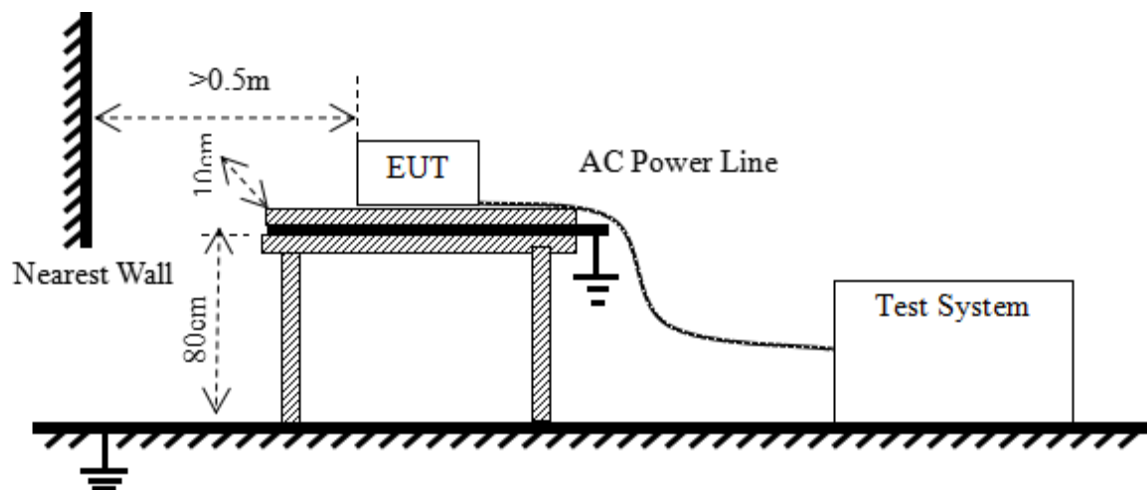
(For Electrostatic Discharge Immunity Test)

Test Setup 8



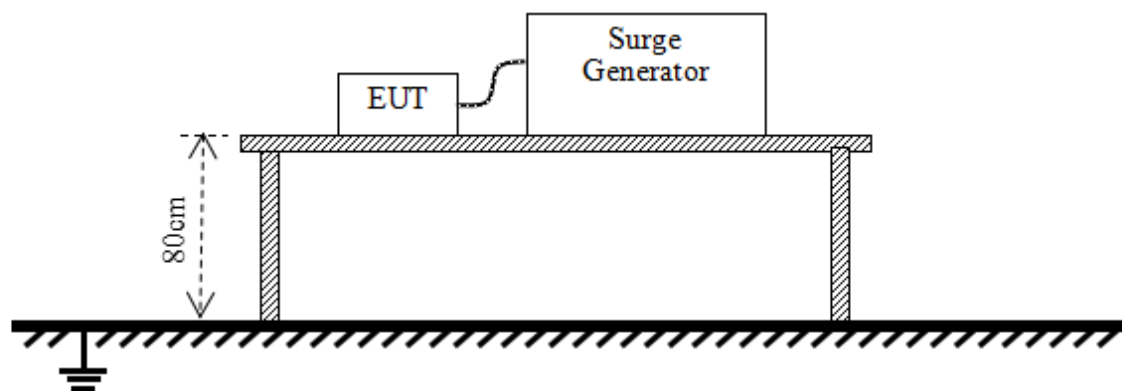
(For Radiated Immunity Test)

Test Setup 9



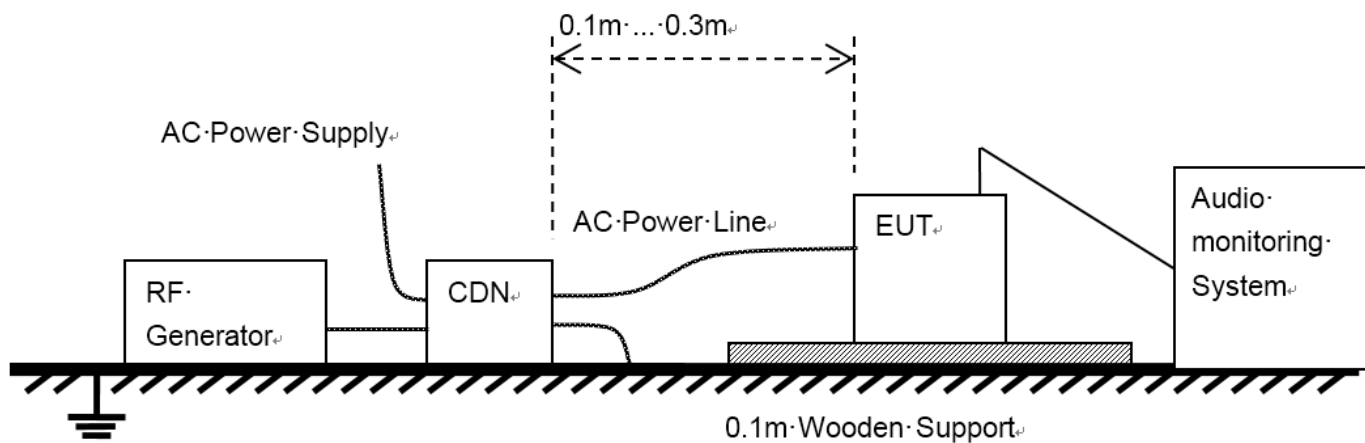
(For Electrical Fast Transient / Burst Immunity Test)

Test Setup 10

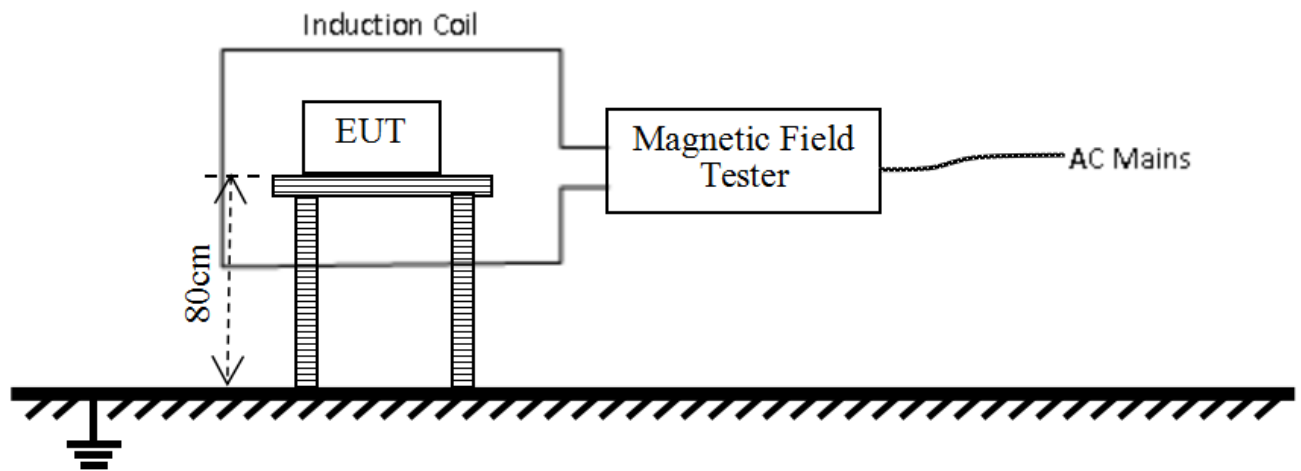


(For Surge Immunity Test)

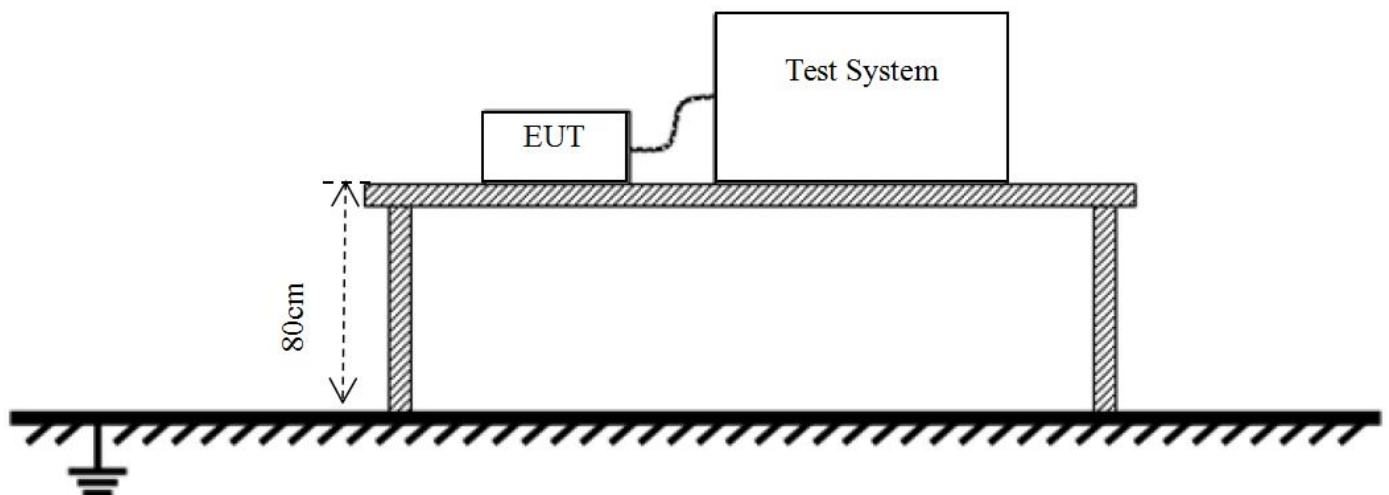
Test Setup 11



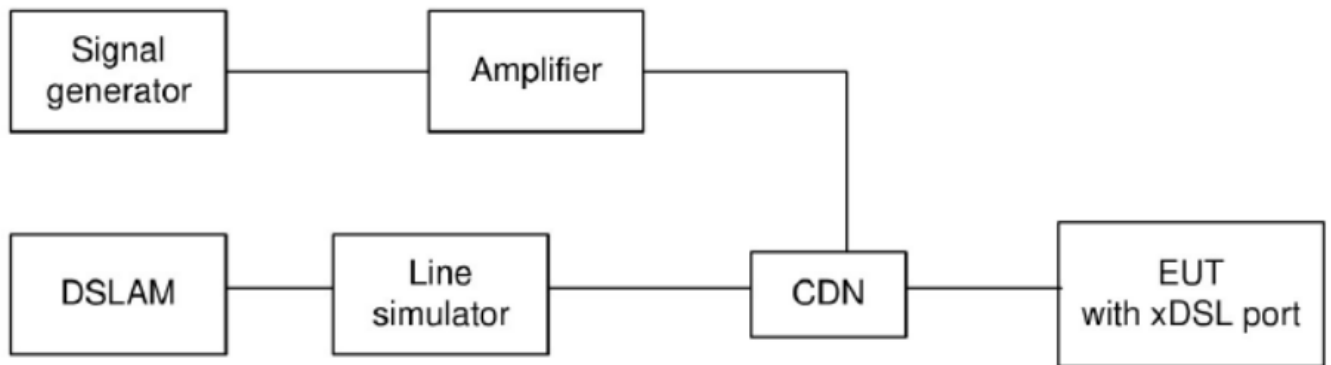
(For Immunity to Conducted Disturbances Induced By RF Fields Test)

Test Setup 12

(Power Frequency Magnetic Fields)

Test Setup 13

(For Voltage Dips and Short Interruptions Immunity Test)

Test Setup 14

(For Broadband Impulse Noise Disturbances Repetitive Immunity Test)

4.6 Test Conditions

Test Case	Test Conditions	
Radiated Emission	Test Setup	Test Setup 1
	Test Configuration	TC01 ^{Note}
Conducted disturbance voltage at mains terminals	Test Setup	Test Setup 2
	Test Configuration	TC01 ^{Note}
Voltage Fluctuations & Flicker	Test Setup	Test Setup 6
	Test Configuration	TC01 ^{Note}
Electrostatic Discharge Immunity	Test Setup	Test Setup 7
	Test Configuration	TC01 ^{Note}
Radiated RF Electromagnetic Field Immunity	Test Setup	Test Setup 8
	Test Configuration	TC01 ^{Note}
Electrical Fast Transient/Burst Immunity	Test Setup	Test Setup 9
	Test Configuration	TC01 ^{Note}
Surge Immunity	Test Setup	Test Setup 10
	Test Configuration	TC01 ^{Note}
Immunity to Conducted Disturbances Induced by RF Fields	Test Setup	Test Setup 11
	Test Configuration	TC01 ^{Note}
Voltage Dips and Short Interruptions Immunity	Test Setup	Test Setup 13
	Test Configuration	TC01 ^{Note}
Note: Based on client request, all normal using modes of the normal function were tested, but only the worst test data of test mode is reported in this report. The Working Test Mode is the worst mode in this report.		

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency range (MHz)	Class A (10 m)	Class A (3 m)	Class B (10 m)	Class B (3 m)
	Quasi-Peak Limit (dB μ V/m)		Quasi-Peak Limit (dB μ V/m)	
30 - 230	40	50	30	40
230 - 1000	47	57	37	47

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

Requirements for radiated emissions from FM receivers

Frequency range (MHz)	Measurement		Quasi-Peak Limit (dB μ V/m) Fundamental	Quasi-Peak Limit (dB μ V/m) Harmonics	Quasi-Peak Limit (dB μ V/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 4.5 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 $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak for $f < 1$ GHz, peak & RMS Average for $f \geq 1$ GHz

Trace = max hold

5.1.1.4 Test Result

Please refer to ANNEX A.1.

5.1.2 Conducted disturbance voltage at mains terminals

5.1.2.1 Test Limit

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dB μ V)	Average (dB μ V)	Quasi-peak (dB μ V)	Average (dB μ V)
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 4.5 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

The EUT is connected to the power mains through a LISN which provides 50 Ω /50 μ H 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.

Use the following spectrum analyzer settings:

RBW = 9 kHz

VBW $\geq$ RBW

Sweep = 10ms

Detector function = peak & Average

Trace = max hold

5.1.2.4 Test Result

Please refer to ANNEX A.2.

5.1.3 Conducted disturbance for asymmetric mode

5.1.3.1 Test Limit

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dB μ V)	Average (dB μ V)	Quasi-peak (dB μ V)	Average (dB μ V)
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 4.5 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

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.

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.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

5.1.4 Conducted differential voltage emission

5.1.4.1 Test Limit

Applicability	Frequency range (MHz)	Differential voltage limit @75Ω(dBuV)		
		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 4.5 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).

5.1.4.4 Test Result

Please refer to ANNEX A.4.

5.1.5 Harmonic Current Emissions

5.1.5.1 Limit

Limits for Class A equipment				Limits for Class D equipment		
odd harmonic		Even harmonics		Harmonic order (n)	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
Harmonic order (n)	Maximum permissible harmonic current A	Harmonic order (n)	Maximum permissible harmonic current A			
3	2.30	2	1.08	3	3.4	2.30
5	1.14	4	0.43	5	1.9	1.14
7	0.77	6	0.30	7	1.0	0.77
9	0.40	$8 \leq n \leq 40$	$0.23 \times 8/n$	9	0.5	0.40
11	0.33			11	0.35	0.33
13	0.21			$15 \leq n \leq 39$	$3.85/n$	$0.15 \times 15/n$
$15 \leq n \leq 39$	$0.15 \times 15/n$					

Note: For Class B equipment, the harmonics of the input current shall not exceed the values given in Table “limits for Class A equipment” multiplied by a factor of 1,5.

For the purpose of harmonic current limitation, equipment is classified as follows: (Note: Class C equipment requirement not include in this standard.)

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.

5.1.5.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 5. The photo of test setup please refer to ANNEX B.

5.1.5.3 Test Procedure

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.

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.

5.1.5.4 Test Result

Please refer to ANNEX A.5.

5.1.6 Voltage Fluctuations and Flicker Measurement

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 4.5 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

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

5.2.2 Performance Criteria for CPE containing xDSL ports

Type	Description								
Criterion A	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.								
Criterion B	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>	Impulse duration ms	Performance criteria	0,24	The application of the impulse shall not cause the xDSL link to lose synchronisation. No CRC errors are permitted.	10	The application of the 5 impulses shall result in less than 75 CRC errors and shall not cause the link to lose synchronisation.	300	The application of the impulse shall not cause the xDSL link to lose synchronisation.
Impulse duration ms	Performance criteria								
0,24	The application of the impulse shall not cause the xDSL link to lose synchronisation. No CRC errors are permitted.								
10	The application of the 5 impulses shall result in less than 75 CRC errors and shall not cause the link to lose synchronisation.								
300	The application of the impulse shall not cause the xDSL link to lose synchronisation.								

5.2.3 Electrostatic Discharge Immunity

5.2.3.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-2
Discharge Impedance	330 Ohm / 150 pF
Discharge Voltage	Air Discharge: 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

5.2.3.2 Test Setup

Please refer to 4.5 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

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.

5.2.3.4 Test Result

Please refer to ANNEX A.7.

5.2.4 Radio Frequency Electromagnetic Field Immunity

5.2.4.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-3
Frequency Range	80 MHz to 1000 MHz, 1800/2600/3500/5000 ($\pm 1\%$) MHz
Field Strength	1 V/m, 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

5.2.4.2 Test Setup

Please refer to 4.5 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 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 ($\pm 1\%$) 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. The test is performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides, but only the worst side data is reported in this report.

5.2.4.4 Test Result

Please refer to ANNEX A.8.

5.2.5 Electrical Fast Transient / Burst Immunity

5.2.5.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-4
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
Impulse Wave Shape	5/50 ns
Burst Duration	15 ms
Burst Period	300 ms
Test Duration	> 1 min

5.2.5.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 9. The photo of test setup please refer to ANNEX B.

5.2.5.3 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.

5.2.5.4 Test Result

Please refer to ANNEX A.9.

5.2.6 Surge Immunity

5.2.6.1 Test Specification

Specification	Value		
Ports class	AC Power Port	DC Power Port	Analogue/ Digital data Port
Basic Standard	IEC 61000-4-5		
Waveform	Voltage: 1.2/50 μ s; Current: 8/20 μ s	Voltage: 1.2/50 μ s; Current: 8/20 μ s	Voltage: 10/700 μ s
Test Voltage	line to ground 2 kV, line to line 1 kV	line to reference ground 0.5 kV	0.5KV, 1 kV or 4KV 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		

Note1: Port type: unshielded symmetrical Apply: lines to ground; Port type: coaxial or shielded Apply: shield to ground.

Note2: 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.

Note3: The test level 0.5kV apply to coaxial or shielded.

5.2.6.2 Test Setup

Please refer to 4.5 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 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).

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

Please refer to ANNEX A.10.

5.2.7 Immunity to Conducted Disturbances Induced by RF Fields

5.2.7.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-6
Frequency Range	0.15 MHz – 80 MHz
Field Strength	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 Line; DC Power Line; Analogue/ Digital data Line

5.2.7.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 11. The photo of test setup please refer to ANNEX B.

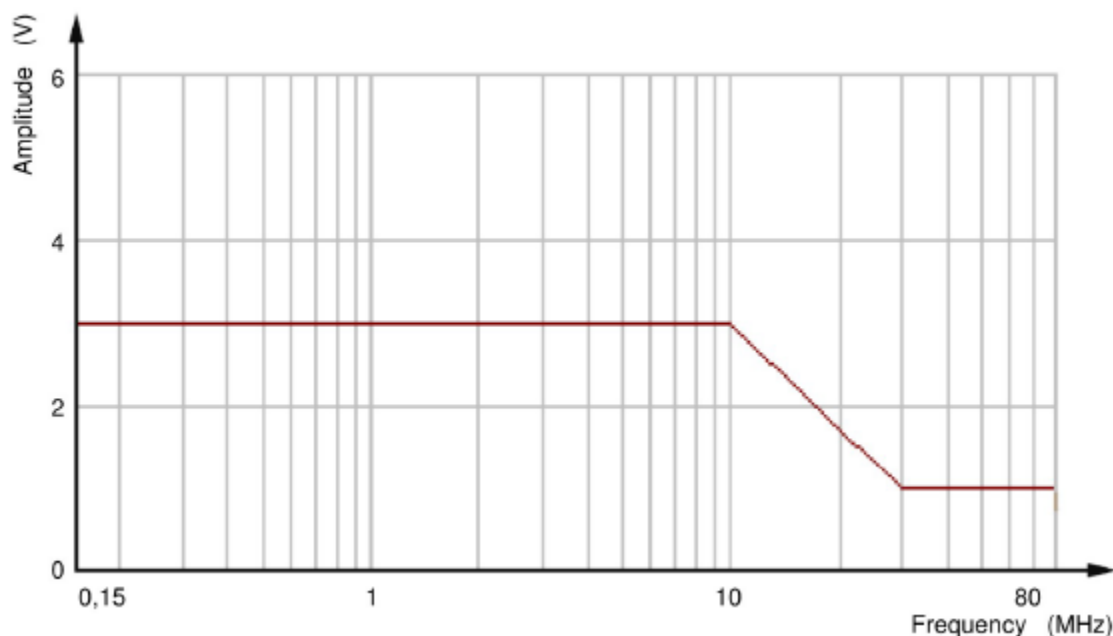
5.2.7.3 Test Procedure

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

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

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

The field strength level refer follow figure.



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.

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.

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

Please refer to ANNEX A.11.

5.2.8 Power Frequency Magnetic Fields Immunity

5.2.8.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-8
Field Frequency	50/60 Hz
Test Level	1 A/m
Test Duration	5 min

5.2.8.2 Test Setup

Please refer to 4.5 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 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.

5.2.8.4 Test Result

Please refer to ANNEX A.12.

5.2.9 Voltage Dips and Short Interruptions Immunity

5.2.9.1 Test Specification

Specification	Value
Basic Standard	IEC 61000-4-11
Voltage Dips	100% reduction: 10 ms; 30% reduction: 500 ms
Voltage Interruptions	100% reduction: 5000 ms
Voltage Phase Angle	0°, 90°, 270°

5.2.9.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 13. The photo of test setup please refer to ANNEX B.

5.2.9.3 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) 100% voltage dip of supplied voltage with duration of 10 ms; c) 30% voltage dip 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.

100% voltage interruption 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.

5.2.9.4 Test Result

Please refer to ANNEX A.13.

ANNEX A TEST RESULTS

A.1 Radiated Emission

Note 1: The symbol of “--” in the table which means not application.

Note 2: 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.

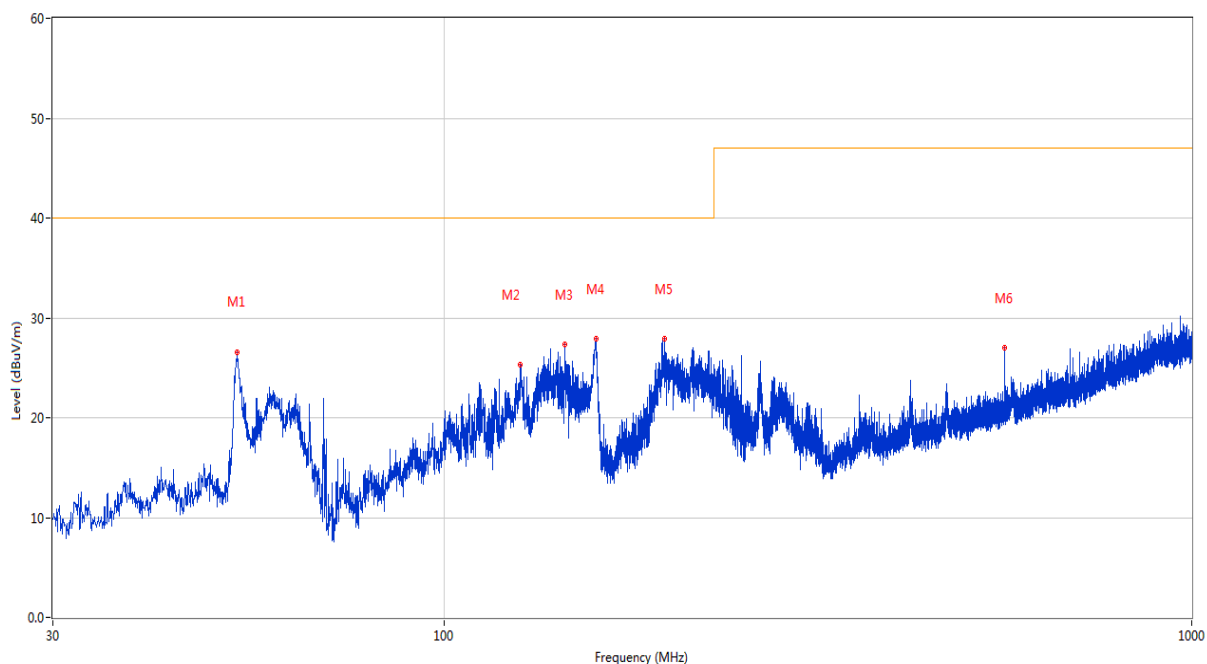
Note 3: When the EUT is on, it will automatically emit Bluetooth signal and cannot be turned off. So the marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth carrier frequencies. The marked spikes near 4854 MHz and 4924 MHz with circle should be ignored because they are harmonic frequencies of Bluetooth.

Note 4: Two nominal voltages of 230 V (± 10 V) and 110 V (± 10 V), using a frequency of 50 Hz or 60 Hz, is normally sufficient for an EUT intended for worldwide use. Voltages and frequencies (such as a nominal 110 VAC, 50/60 Hz and 230 VAC, 50/60 Hz) for which the device is capable of operation. So, The configuration 110 VAC, 60 Hz and 230 VAC, 50 Hz were tested respectively, but only the worst configuration (110 VAC, 60 Hz) shown here.

Test Data and Plots (Below 1 GHz)

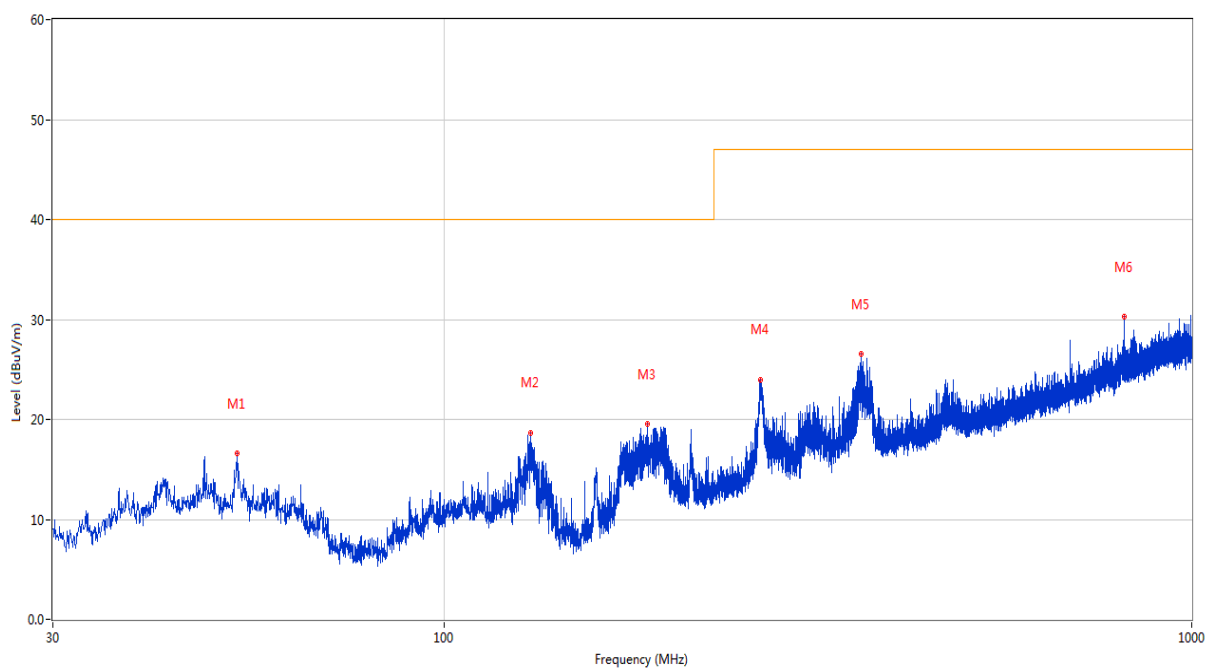
The Working Test Mode

A.1.1 Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	52.892	26.60	-23.02	40.0	13.40	Peak	72.50	100	Vertical	Pass
2	126.660	25.36	-26.85	40.0	14.64	Peak	321.80	100	Vertical	Pass
3	145.236	27.33	-27.57	40.0	12.67	Peak	360.00	100	Vertical	Pass
4	159.834	27.91	-27.38	40.0	12.09	Peak	163.50	100	Vertical	Pass
5	197.180	27.92	-24.24	40.0	12.08	Peak	134.90	100	Vertical	Pass
6	562.530	27.02	-15.40	47.0	19.98	Peak	242.40	200	Vertical	Pass

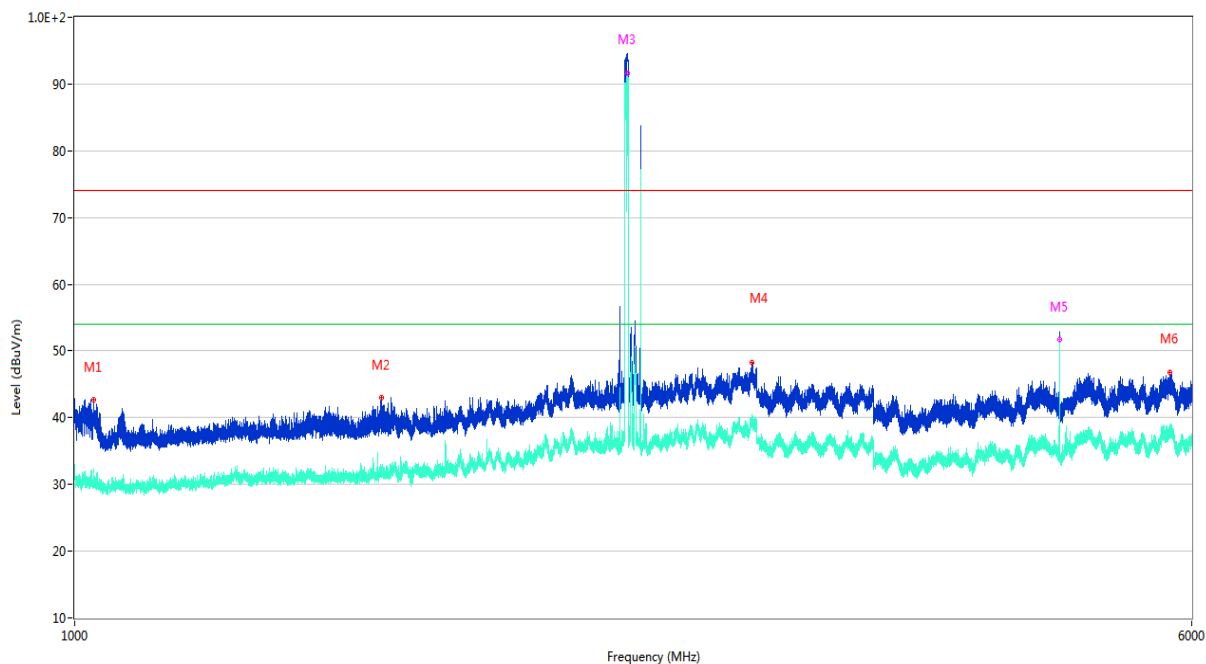
A.1.2 Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	52.843	16.56	-23.03	40.0	23.44	Peak	160.80	100	Horizontal	Pass
2	130.492	18.68	-27.10	40.0	21.32	Peak	182.60	200	Horizontal	Pass
3	187.140	19.56	-25.45	40.0	20.44	Peak	250.90	200	Horizontal	Pass
4	264.837	23.94	-22.17	47.0	23.06	Peak	281.80	100	Horizontal	Pass
5	361.934	26.56	-20.02	47.0	20.44	Peak	217.30	100	Horizontal	Pass
6	812.596	30.24	-11.12	47.0	16.76	Peak	143.60	100	Horizontal	Pass

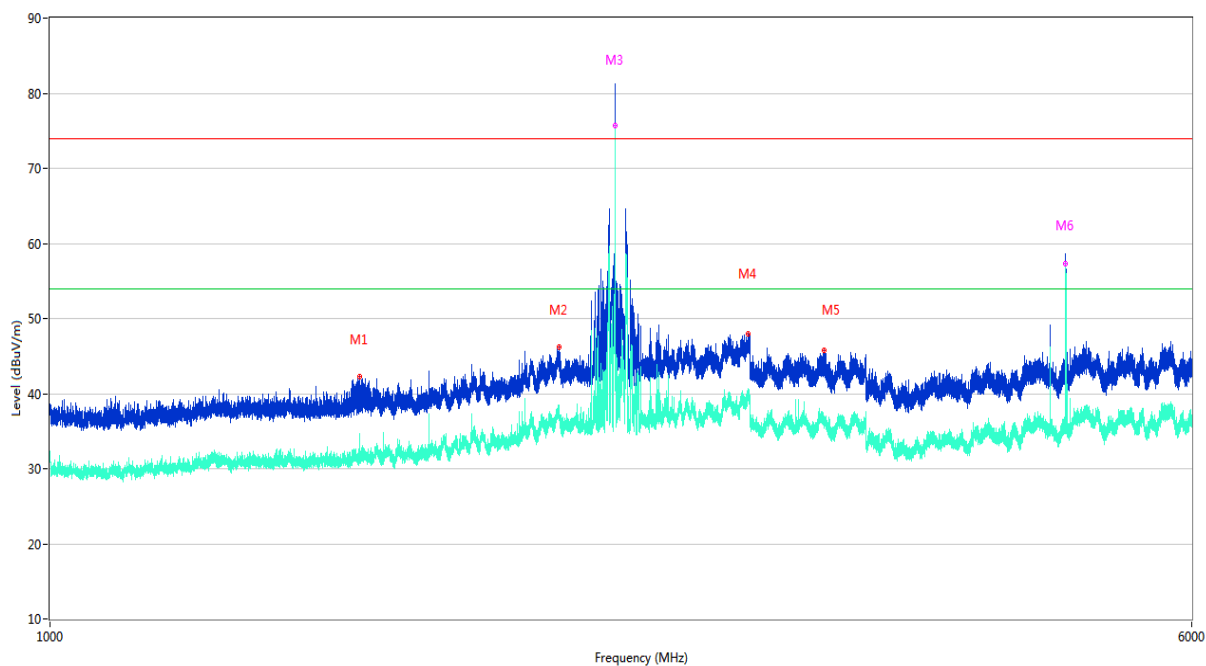
Test Data and Plots (Above 1 GHz)

A.1.3 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	1031.100	42.66	-15.85	74.0	31.34	Peak	215.80	100	Vertical	Pass
1**	1031.100	30.65	-15.85	54.0	23.35	AV	215.80	100	Vertical	Pass
2	1636.300	43.03	-15.21	74.0	30.97	Peak	4.40	100	Vertical	Pass
2**	1636.300	31.21	-15.21	54.0	22.79	AV	4.40	100	Vertical	Pass
3	2426.000	94.42	-9.60	74.0	-20.42	Peak	138.30	100	Vertical	N/A
3**	2426.000	91.65	-9.60	54.0	-37.65	AV	138.30	100	Vertical	N/A
4	2962.600	48.33	-4.98	74.0	25.67	Peak	333.60	100	Vertical	Pass
4**	2962.600	39.26	-4.98	54.0	14.74	AV	333.60	100	Vertical	Pass
5	4854.150	52.53	-3.54	74.0	21.47	Peak	316.90	100	Vertical	N/A
5**	4854.150	51.64	-3.54	54.0	2.36	AV	316.90	100	Vertical	N/A
6	5794.350	46.83	-2.77	74.0	27.17	Peak	316.90	100	Vertical	Pass
6**	5794.350	38.16	-2.77	54.0	15.84	AV	316.90	100	Vertical	Pass

A.1.4 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	1625.100	42.23	-15.26	74.0	31.77	Peak	309.50	100	Horizontal	Pass
1**	1625.100	34.70	-15.26	54.0	19.30	AV	309.50	100	Horizontal	Pass
2	2223.000	46.14	-8.45	74.0	27.86	Peak	297.50	100	Horizontal	Pass
2**	2223.000	37.07	-8.45	54.0	16.93	AV	297.50	100	Horizontal	Pass
3	2427.500	80.64	-9.45	74.0	-6.64	Peak	18.40	100	Horizontal	N/A
3**	2427.500	75.72	-9.45	54.0	-21.72	AV	18.40	100	Horizontal	N/A
4	2990.200	48.02	-5.12	74.0	25.98	Peak	120.40	100	Horizontal	Pass
4**	2990.200	39.52	-5.12	54.0	14.48	AV	120.40	100	Horizontal	Pass
5	3368.100	45.74	-8.11	74.0	28.26	Peak	49.10	100	Horizontal	Pass
5**	3368.100	35.89	-8.11	54.0	18.11	AV	49.10	100	Horizontal	Pass
6	4924.350	58.19	-4.09	74.0	15.81	Peak	245.00	100	Horizontal	N/A
6**	4924.350	57.35	-4.09	54.0	-3.35	AV	245.00	100	Horizontal	N/A

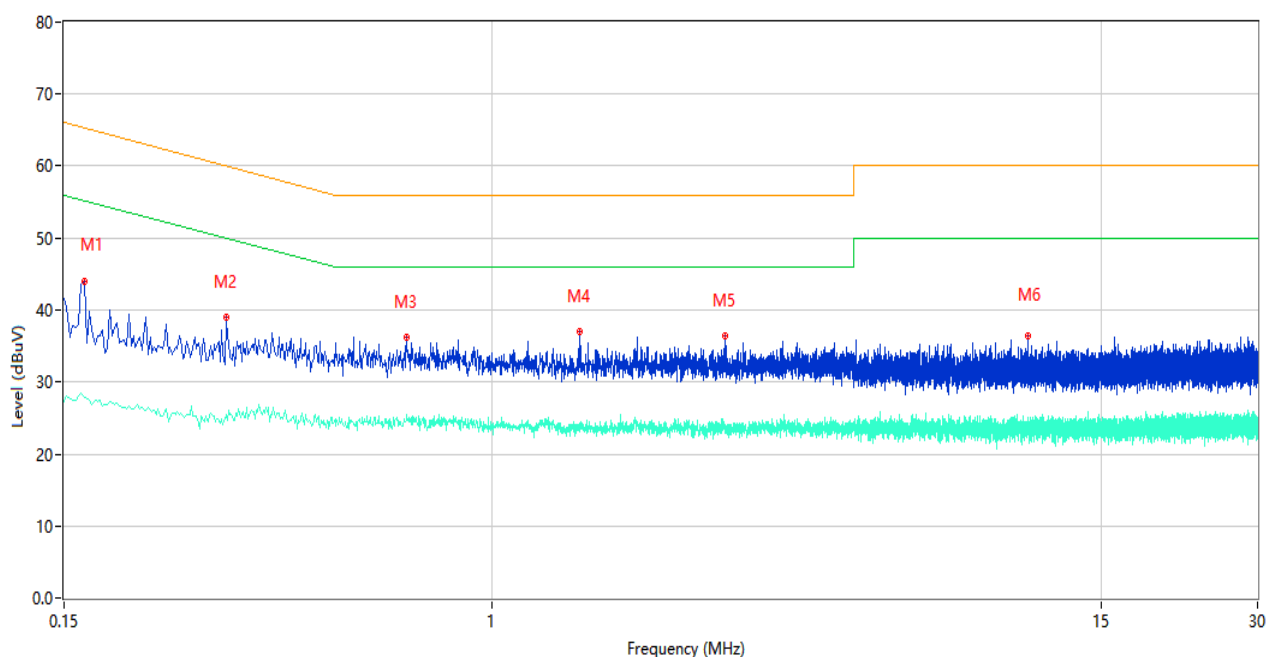
A.2 Conducted disturbance voltage at mains terminals Test

Note: Two nominal voltages of 230 V (± 10 V) and 110 V (± 10 V), using a frequency of 50 Hz or 60 Hz, is normally sufficient for an EUT intended for worldwide use. Voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 230 VAC, 50/60 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 230 VAC, 50 Hz were tested respectively, but only the worst configuration (230 VAC, 50 Hz) shown here.

Test Data and Plots

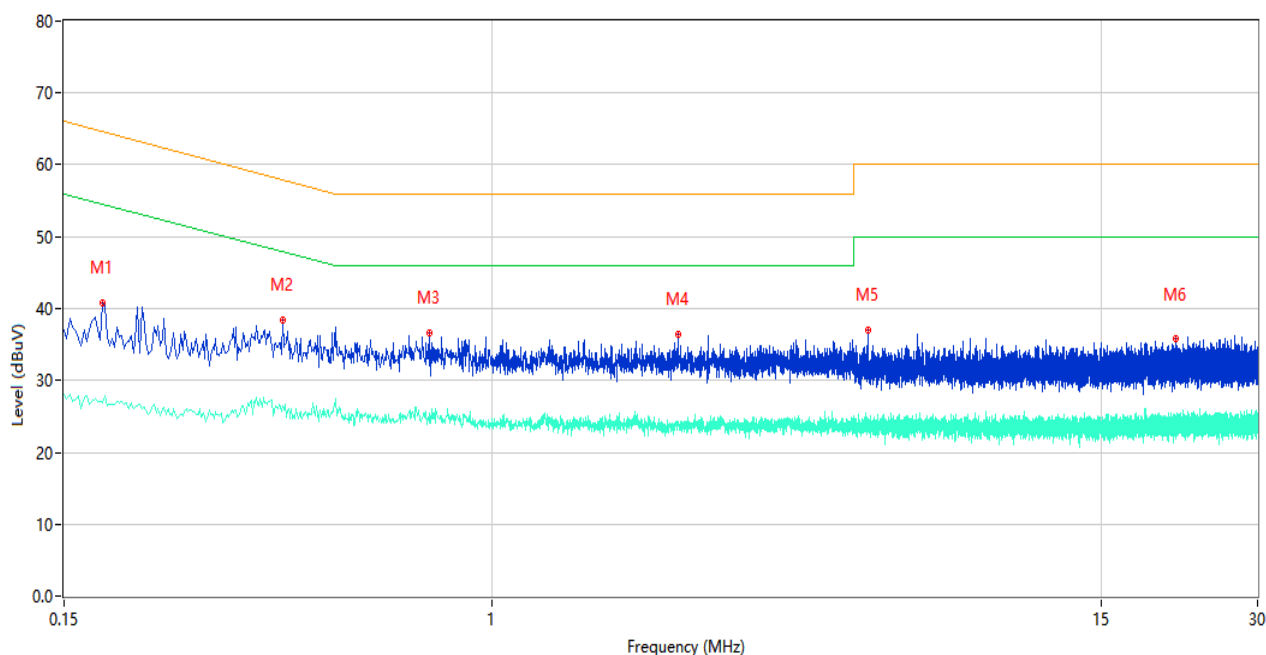
The Working Test Mode

A.2.1 L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.164	44.01	10.08	65.26	21.25	Peak	L	Pass
1**	0.164	27.82	10.08	55.26	27.44	AV	L	Pass
2	0.308	39.08	10.14	60.02	20.94	Peak	L	Pass
2**	0.308	25.44	10.14	50.02	24.58	AV	L	Pass
3	0.686	36.12	10.70	56.00	19.88	Peak	L	Pass
3**	0.686	24.62	10.70	46.00	21.38	AV	L	Pass
4	1.482	36.93	10.30	56.00	19.07	Peak	L	Pass
4**	1.482	24.10	10.30	46.00	21.90	AV	L	Pass
5	2.816	36.50	10.21	56.00	19.50	Peak	L	Pass
5**	2.816	24.02	10.21	46.00	21.98	AV	L	Pass
6	10.848	36.40	10.36	60.00	23.60	Peak	L	Pass
6**	10.848	24.51	10.36	50.00	25.49	AV	L	Pass

A.2.2 N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.178	40.77	10.07	64.58	23.81	Peak	N	Pass
1**	0.178	26.90	10.07	54.58	27.68	AV	N	Pass
2	0.396	38.43	10.78	57.94	19.51	Peak	N	Pass
2**	0.396	26.53	10.78	47.94	21.41	AV	N	Pass
3	0.758	36.58	10.39	56.00	19.42	Peak	N	Pass
3**	0.758	23.99	10.39	46.00	22.01	AV	N	Pass
4	2.290	36.48	10.39	56.00	19.52	Peak	N	Pass
4**	2.290	23.95	10.39	46.00	22.05	AV	N	Pass
5	5.320	36.95	10.28	60.00	23.05	Peak	N	Pass
5**	5.320	23.42	10.28	50.00	26.58	AV	N	Pass
6	20.870	35.78	10.47	60.00	24.22	Peak	N	Pass
6**	20.870	24.27	10.47	50.00	25.73	AV	N	Pass

A.3 Conducted disturbance 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 & Flicker

Test Parameter	Limit	Measurement Value	Verdict
Pst	1.0	0.00	Pass
Plt	0.65	0.00	Pass
Tdt	0.5	0.00	Pass
dmax (%)	4%	-0.21%	Pass
dc (%)	3.3%	0.00%	Pass

A.7 Electrostatic Discharge Immunity

Test Points	Discharge Level (kV)	Discharge Mode	Number of Discharge	Verdict
HCP	±4	Contact	100	Pass
VCP	±4	Contact	100	Pass
Display Area	±2, ±4, ±8	Air	200	Pass
Type-C Port	±2, ±4, ±8	Air	60	Pass
Type-C Cable	±2, ±4, ±8	Air	60	Pass
Sensing Hole (Type-C Cable)	±2, ±4, ±8	Air	60	Pass
Shell and Crack	±2, ±4, ±8	Air	200	Pass

Note: Performance of the all modes comply with the performance criteria in Criterion B.

A.8 Radio Frequency Electromagnetic Field Immunity

Antenna Polarity	Frequency (MHz)	Side	Field Strength (V/m)	Verdict
Vertical	80 – 1000, 1800, 2600, 3500, 5000	Front	3	Pass
		Back	3	Pass
		Left	3	Pass
		Right	3	Pass
Horizontal	80 – 1000, 1800, 2600, 3500, 5000	Front	3	Pass
		Back	3	Pass
		Left	3	Pass
		Right	3	Pass

Note: Performance of the all modes comply with the performance criteria in Criterion A.

A.9 Electrical Fast Transient/Burst Immunity

Test Data (AC Power Port)

Test Point	Polarity	Test Level (kV)	Verdict
L - GND	+ / -	1	Pass
N - GND	+ / -	1	Pass
L+N - GND	+ / -	1	Pass

Note: Performance of the all modes comply with the performance criteria in Criterion B.

A.10 Surge Immunity

Test Data (AC Power Port)

Coupling Line	phase	Polarity	Times	Voltage (kV)	Verdict
L-N	90°	+	5	1	Pass
L-N	270°	-	5	1	Pass

Note: Performance of the all modes comply with the performance criteria in Criterion B.

A.11 Immunity to Conducted Disturbances Induced by RF Fields

Test Data (AC Power Port)

Test Point	Frequency (MHz)	Field Strength (V rms)	Verdict
AC Port	0.15 - 10	3	Pass
AC Port	10 - 30	3 - 1 ^{Note1}	Pass
AC Port	30 - 80	1	Pass

Note 1: The detailed description of level refer to the figure on 5.2.7.

Note 2: Performance of the all modes comply with the performance criteria in Criterion A.

A.12 Power Frequency Magnetic Fields Immunity

Note: Not applicable.

A.13 Voltage Dips and Short Interruptions Immunity

Test Mode	Voltage Reduction	Duration (ms)	Times	Interval (sec)	Verdict
Voltage Dips	100%	10	3	10	Pass
	30%	500	3	10	Pass
Voltage Interruptions	100%	5000	3	10	Pass

Note: Voltage Dips 100% Voltage Reduction performance of the all modes comply with the performance criteria in Criterion B. Voltage Dips 30% Voltage Reduction and Voltage Interruptions performance of the all modes comply with the performance criteria in Criterion C.

A.14 Broadband impulsive conducted disturbances

Note: Not applicable.

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ22B1240-AE-2.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ22B1240-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ22B1240-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.
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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 Hub 2
Model Name: W3202100
Brand Name: SwitchBot
Test Standard: ETSI EN 300 328 V2.2.2 (2019-07)
Sample Arrival Date: Dec. 02, 2022
Test Date: Dec. 05, 2022 - Dec. 13, 2022
Date of Issue: Dec. 19, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Chen Huiming**Checked by:** Ye Hongji**Approved by:** Liao Jianming
(Technical Director)

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Dec. 19, 2022</u>	<u>Initial Issue</u>

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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 Factory Information

Factory	Woan Technology (Shenzhen) Co., Ltd.
Address	Building A2, Zhengfeng Industrial Area, No.610 Fengtang Boulevard, Fuhai Sub-district, Bao'an District, Shenzhen

2.4 General Description for Equipment under Test (EUT)

EUT Name	SwitchBot Hub 2
Model Name Under Test	W3202100
Series Model Name	W3202101, W3202102, W3202103, W3202104, W3202105, W3202106
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name. (this information provided by the customer)
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Technical Information

EUT Type	Stand-alone equipment
Network and Wireless connectivity	Bluetooth (BLE) 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20)

The requirement for the following technical 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
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)
Tested Channel	Bluetooth Low Energy: 0 (2402 MHz), 19 (2440 MHz), 39 (2480 MHz)
Nominal Channel Bandwidth	1 MHz
Antenna Type	IFA Antenna
Antenna Gain	3.66 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	Non-Adaptive
LBT Based	Non-LBT
The Max RF Output power	Bluetooth Low Energy: 2.0 dBm
Receiver Category	Bluetooth Low Energy: 2

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

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	--	ANNEX A.4	--	Note ⁵
5.1.5	4.3.1.5	Hopping Frequency Separation	--	ANNEX A.5	--	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	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	41% to 58%	
Atmospheric Pressure	98 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+20.6°C to +22.8°C
	LT (Low Temperature)	-20°C
	HT (High Temperature)	+40°C
Working Voltage of the EUT	NV (Normal Voltage)	3.3 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2022.05.19	2023.05.18
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	260592	2022.02.09	2023.02.08
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2022.05.19	2023.05.18
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2022.05.19	2023.05.18
Signaling Unit	ROHDE&SCHWARZ	CMW270	100607	2022.05.19	2023.05.18
Temperature Chamber	AHK	NTH64-40A	1310	2022.01.05	2023.01.04
Spectrum Analyzer	KEYSIGHT	N9020A	MY52510065	2022.09.06	2023.09.05
Signaling Unit	ROHDE&SCHWARZ	CMW500	171150	2022.06.29	2023.06.28
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	00884	2021.03.08	2024.03.07
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	01631	2022.02.03	2025.02.02
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2021.09.04	2024.09.03

4.3 Test Software List

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

4.4 Measurement Uncertainty

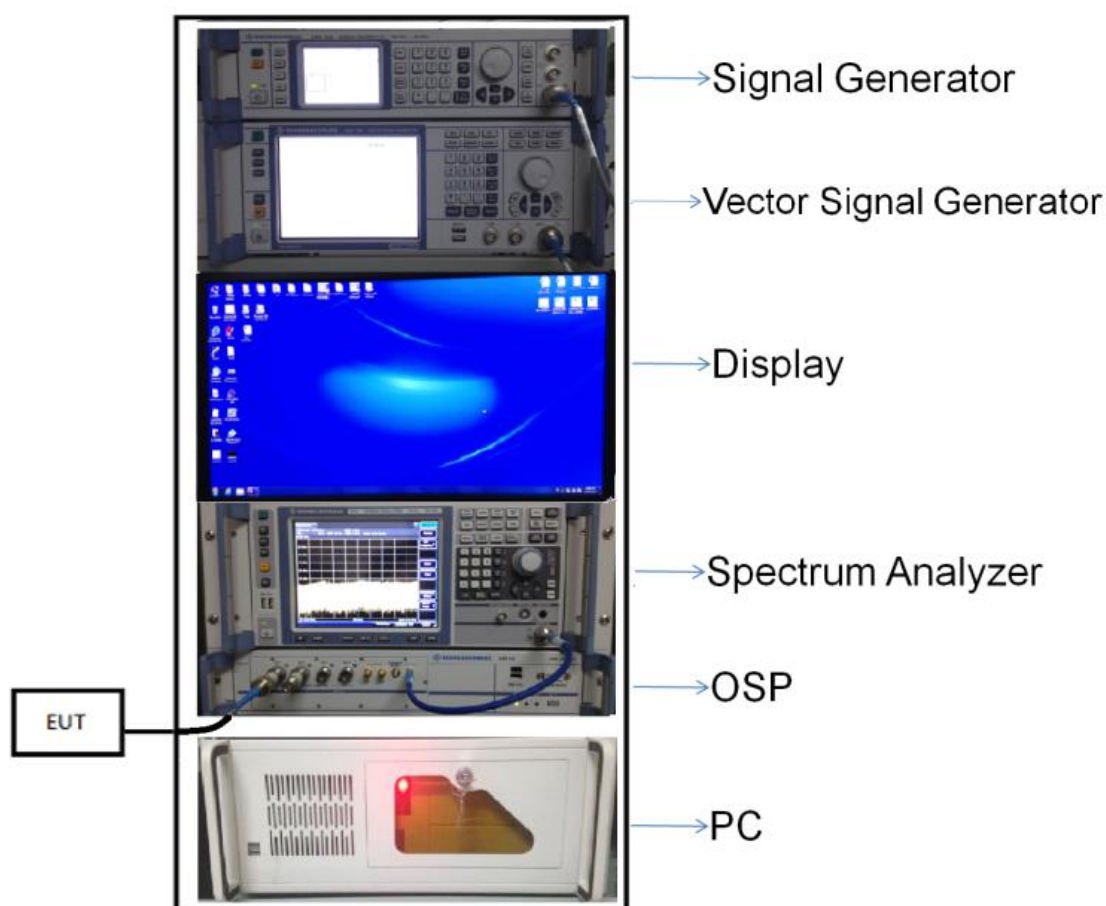
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

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	0.82 °C
Humidity	4.1 %

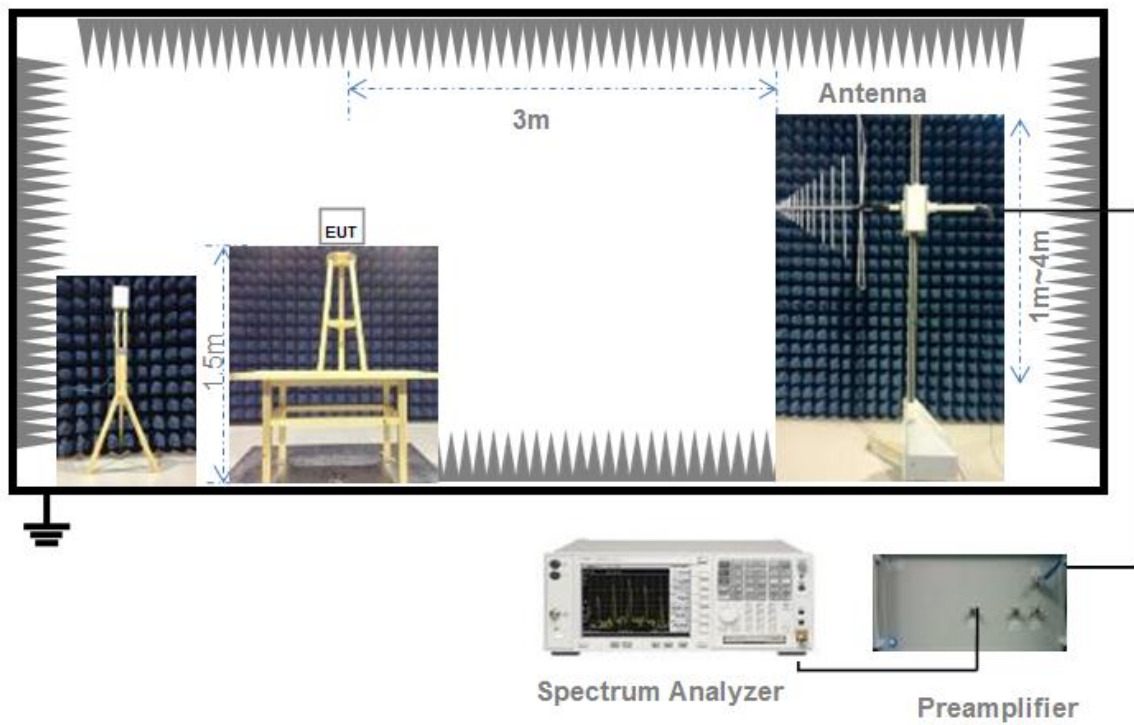
4.5 Description of Test Setup

4.5.1 For Conducted Test

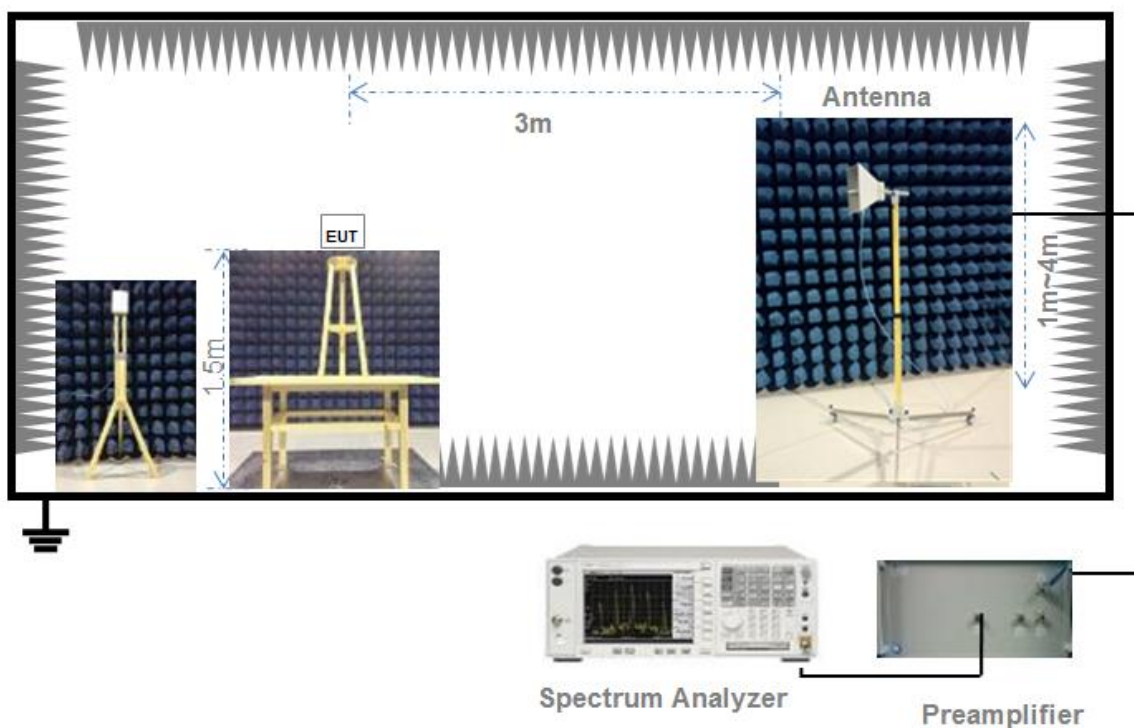


(Diagram 1)

4.5.2 For Radiated Test

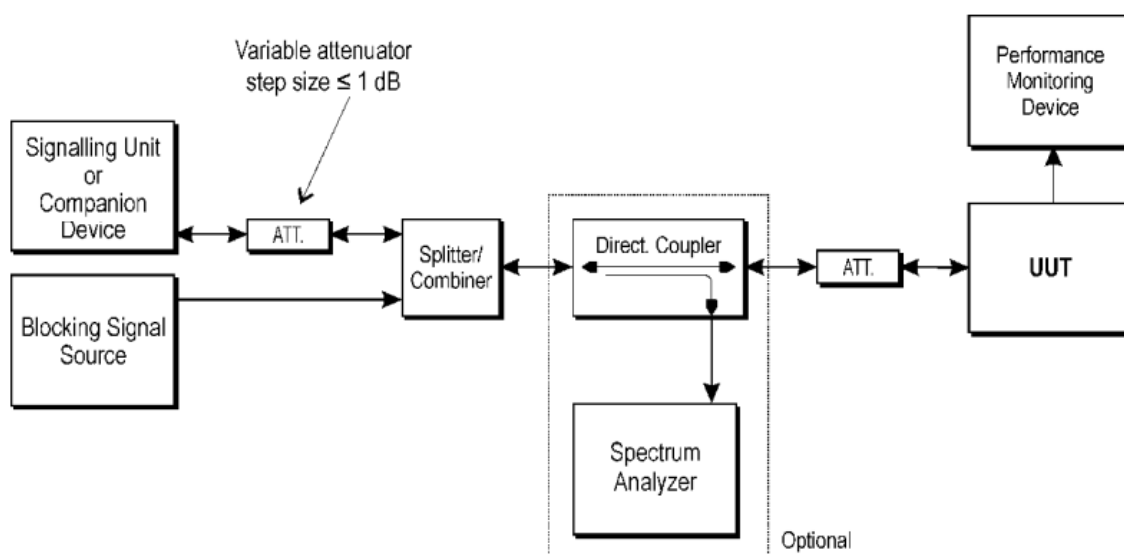


(Diagram 2)



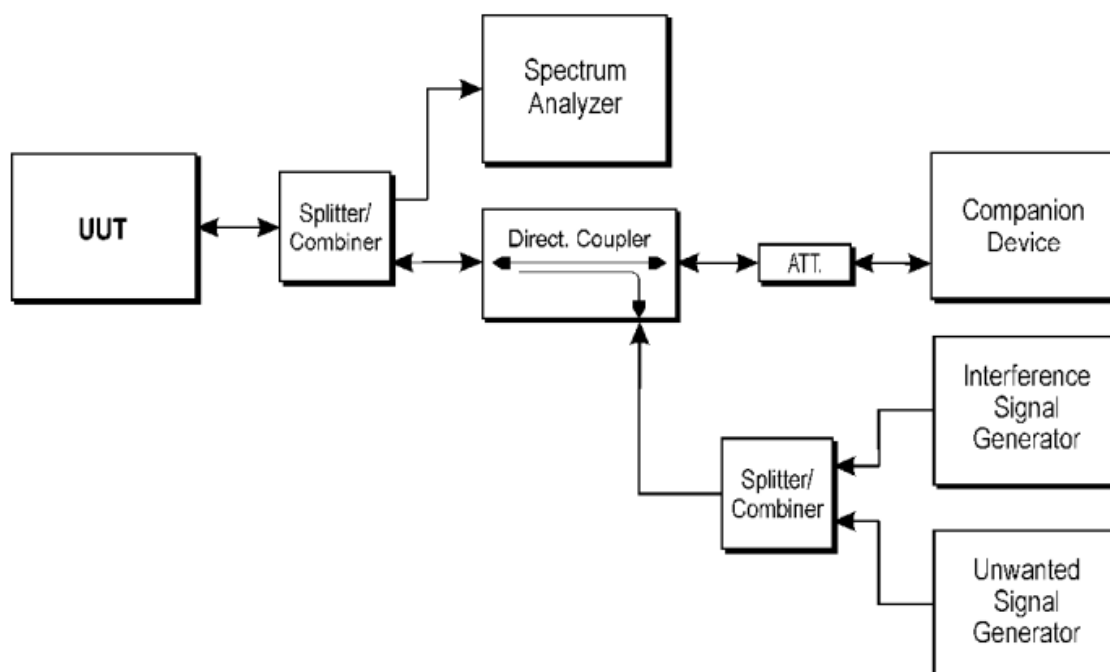
(Diagram 3)

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 $((1 / U) \times 25 \%)$ 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: $TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW} / P_{out})$ (P_{out} 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

Requirement	Operational Mode			
	Non-LBT based Detect and Avoid	LBT based Detect and Avoid		
		Frame Based Equipment	Load Based Equipment (CCA using 'energy detect')	Load Based Equipment (CCA not using any of the mechanisms referenced as note 2)
Minimum Clear Channel Assessment (CCA) Time	NA	18 us (see note 1)	(see note 2)	18 us (see note 1)
Maximum Channel Occupancy (COT) Time	40 ms	1 ms to 10 ms	(see note 2)	13 ms
Minimum Idle Period	5% of COT	5% of COT	(see note 2)	NA
Extended CCA check	NA	NA	(see note 2)	a random duration in the range between 18 μs and at least 160 μs
Short Control Signalling Transmissions	Maximum duty cycle of 10 % within an observation period of 50 ms (see note 3)			
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.				

Interference threshold level:

Maximum transmit power (P_H) EIRP dBm	Threshold level (TL) (see notes 1 and 2)
20	-70 dBm / MHz
NOTE 1: $TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW} / P_{out})$ (P_{out} 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.		

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 MHz 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.

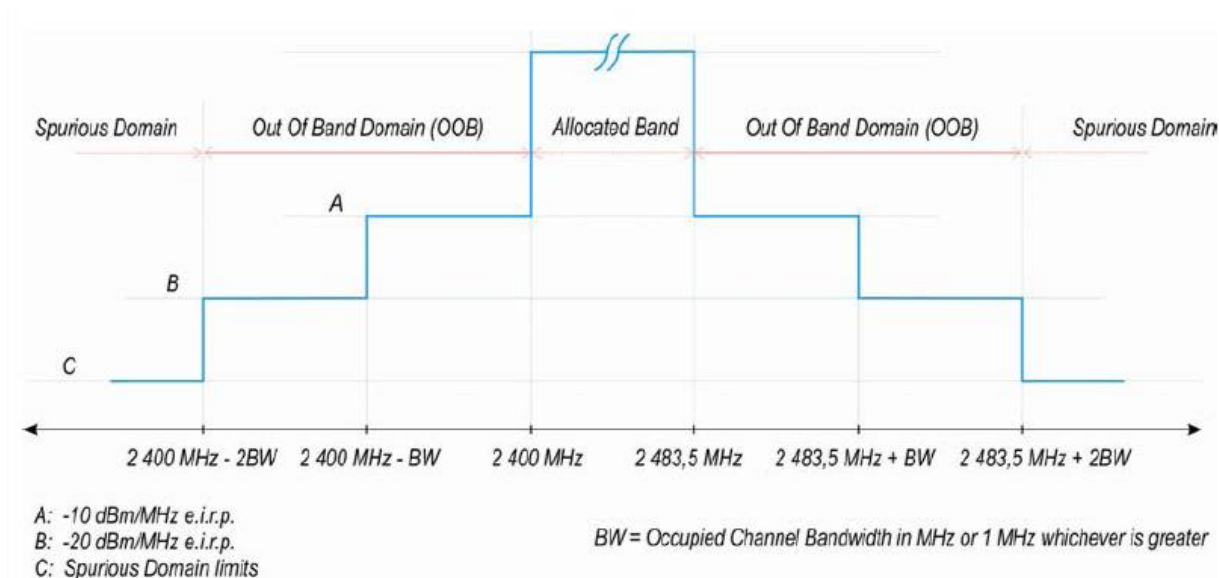


Figure 1: Transmit mask

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 + $10 \times \log_{10}(\text{OCBW})$) or -68 dBm whichever is less (see note 2)	2 380	-34	CW
	2 504	-34	CW
(-139 dBm + $10 \times \log_{10}(\text{OCBW})$) 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 + $10 \times \log_{10}(\text{OCBW})$ + 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 $P_{\min} + 26$ 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.

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 + $10 \times \log_{10}(\text{OCBW})$ + 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 $P_{\min} + 30$ 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 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

Note: EIRP Power = Conducted Power + Antenna Gain

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	2.0	1.9	1.5
		LT	1.9	1.8	1.6
		HT	2.0	1.8	1.6
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
2.0	0.000	0.108	0.108	0.517
2.0	0.625	0.733	0.108	0.517
2.0	1.250	1.358	0.108	0.517
2.0	1.875	1.983	0.108	0.517
2.0	2.500	2.608	0.108	0.517
2.0	3.125	3.233	0.108	0.517
2.0	3.750	3.858	0.108	0.517
2.0	4.375	4.483	0.108	0.517
2.0	5.000	5.108	0.108	0.517
2.0	5.625	5.733	0.108	0.517
2.0	6.250	6.358	0.108	0.517
2.0	6.875	6.983	0.108	0.517
2.0	7.500	7.608	0.108	0.517
2.0	8.125	8.233	0.108	0.517
2.0	8.750	8.858	0.108	0.517
2.0	9.375	9.483	0.108	0.517
2.0	10.000	10.108	0.108	0.517
2.0	10.625	10.733	0.108	0.517
2.0	11.250	11.358	0.108	0.517
2.0	11.875	11.983	0.108	0.517
2.0	12.500	12.608	0.108	0.517
2.0	13.125	13.233	0.108	0.517
2.0	13.750	13.858	0.108	0.517
2.0	14.375	14.483	0.108	0.517
2.0	15.000	15.108	0.108	0.517
2.0	15.625	15.733	0.108	0.517
2.0	16.250	16.358	0.108	0.517
2.0	16.875	16.983	0.108	0.517
2.0	17.500	17.608	0.108	0.517
2.0	18.125	18.233	0.108	0.517
2.0	18.750	18.858	0.108	0.517
2.0	19.375	19.483	0.108	0.517
2.0	20.000	20.108	0.108	0.517
2.0	20.625	20.733	0.108	0.517

GFSK (BLE 1Mbps): Middle Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
1.9	0.000	0.108	0.108	0.517
1.9	0.625	0.733	0.108	0.517
1.9	1.250	1.358	0.108	0.517
1.9	1.875	1.983	0.108	0.517
1.9	2.500	2.608	0.108	0.517
1.9	3.125	3.233	0.108	0.517
1.9	3.750	3.858	0.108	0.517
1.9	4.375	4.483	0.108	0.517
1.9	5.000	5.108	0.108	0.517
1.9	5.625	5.733	0.108	0.517
1.9	6.250	6.358	0.108	0.517
1.9	6.875	6.983	0.108	0.517
1.9	7.500	7.608	0.108	0.517
1.9	8.125	8.233	0.108	0.517
1.9	8.750	8.858	0.108	0.517
1.9	9.375	9.483	0.108	0.517
1.9	10.000	10.108	0.108	0.517
1.9	10.625	10.733	0.108	0.517
1.9	11.250	11.358	0.108	0.517
1.9	11.875	11.983	0.108	0.517
1.9	12.500	12.608	0.108	0.517
1.9	13.125	13.233	0.108	0.517
1.9	13.750	13.858	0.108	0.517
1.9	14.375	14.483	0.108	0.517
1.9	15.000	15.108	0.108	0.517
1.9	15.625	15.733	0.108	0.517
1.9	16.250	16.358	0.108	0.517
1.9	16.875	16.983	0.108	0.517
1.9	17.500	17.608	0.108	0.517
1.9	18.125	18.233	0.108	0.517
1.9	18.750	18.858	0.108	0.517
1.9	19.375	19.483	0.108	0.517
1.9	20.000	20.108	0.108	0.517
1.9	20.625	20.733	0.108	0.517

GFSK (BLE 1Mbps): High Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
1.6	0.000	0.107	0.107	0.518
1.6	0.625	0.732	0.107	0.518
1.6	1.250	1.357	0.107	0.518
1.6	1.875	1.982	0.107	0.518
1.6	2.500	2.607	0.107	0.518
1.6	3.125	3.232	0.107	0.518
1.6	3.750	3.857	0.107	0.518
1.6	4.375	4.482	0.107	0.518
1.6	5.000	5.107	0.107	0.518
1.6	5.625	5.732	0.107	0.518
1.6	6.250	6.357	0.107	0.518
1.6	6.875	6.982	0.107	0.518
1.6	7.500	7.607	0.107	0.518
1.6	8.125	8.232	0.107	0.518
1.6	8.750	8.857	0.107	0.518
1.6	9.375	9.482	0.107	0.518
1.6	10.000	10.107	0.107	0.518
1.6	10.625	10.732	0.107	0.518
1.6	11.250	11.357	0.107	0.518
1.6	11.875	11.982	0.107	0.518
1.6	12.500	12.607	0.107	0.518
1.6	13.125	13.232	0.107	0.518
1.6	13.750	13.857	0.107	0.518
1.6	14.375	14.482	0.107	0.518
1.6	15.000	15.107	0.107	0.518
1.6	15.625	15.732	0.107	0.518
1.6	16.250	16.357	0.107	0.518
1.6	16.875	16.982	0.107	0.518
1.6	17.500	17.607	0.107	0.518
1.6	18.125	18.232	0.107	0.518
1.6	18.750	18.857	0.107	0.518
1.6	19.375	19.482	0.107	0.518
1.6	20.000	20.107	0.107	0.518
1.6	20.625	20.732	0.107	0.518

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	2.0	1.8
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

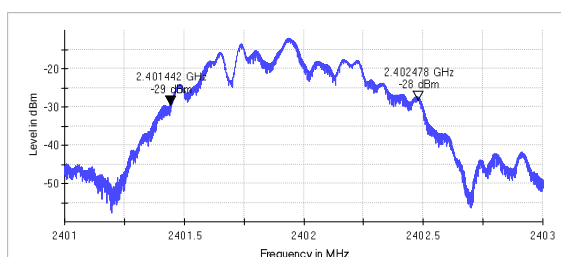
Centre Frequency	The centre frequency of the channel under test
RBW	~ 1 % of the span without going below 1 %
VBW	3 × RBW
Span	2 × Nominal Channel Bandwidth
Detector mode	RMS
Trace mode	Max Hold
Sweep time	Auto
Test Method	☐ Radiated ☒ Conducted

Test Data

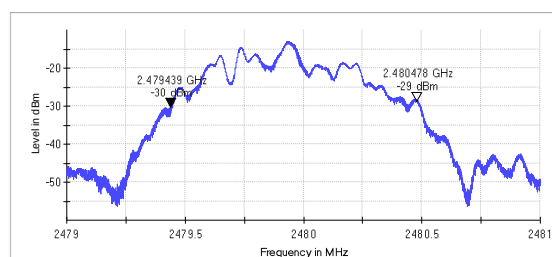
Test Data							
Test Conditions		Test Mode	DUT Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Lower Band Edge (MHz)	Upper Band Edge (MHz)	Limit (MHz)
Temperature	Voltage						
NT	NV	GFSK (BLE 1Mbps)	2402	1.036371	2401.441570	2402.477940	Within The Band
			2480	1.039120	2479.439070	2480.478190	2400 MHz to 2483.5 MHz
Test Verdict		Pass					

Test Plots

GFSK (BLE 1Mbps): Low Channel



GFSK (BLE 1Mbps): High Channel



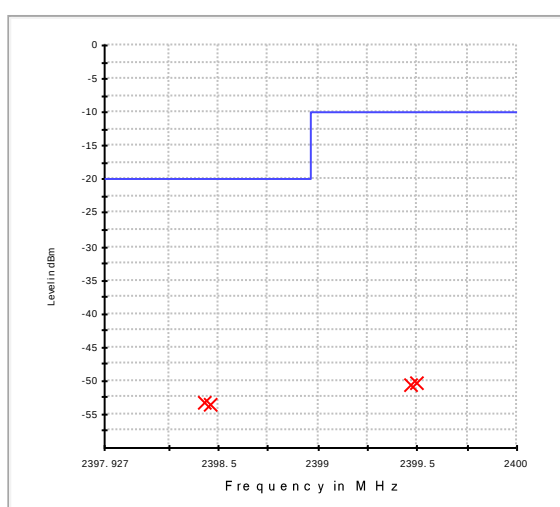
A.9 Transmitter unwanted emissions in the out-of-band domain

Test Data

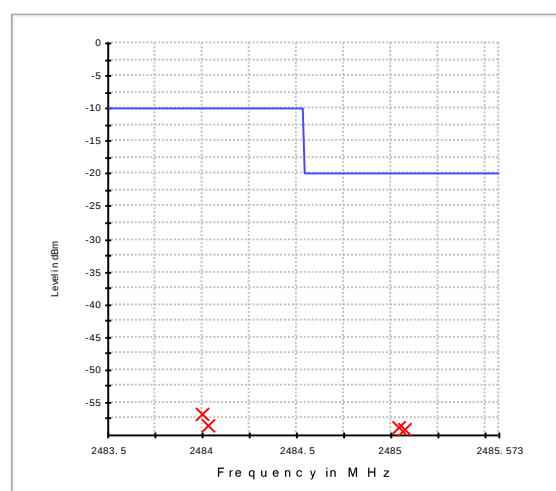
Test Method	Test Conditions		Test Mode	Frequency (MHz)	OOB Emission Worst level(dBm/MHz)	Limit(dBm/ MHz)
	Temperature	Voltage				
	NT	NV				
	NT	NV	GFSK (BLE 1Mbps)	2402	-50.3	-10,-20
				2480	-54.7	-10,-20
Test Verdict			Pass			

Test Plots

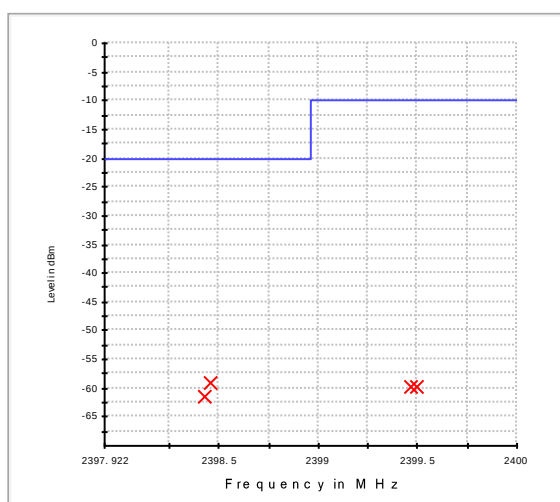
GFSK (BLE 1Mbps): Low frequency (Part 1)



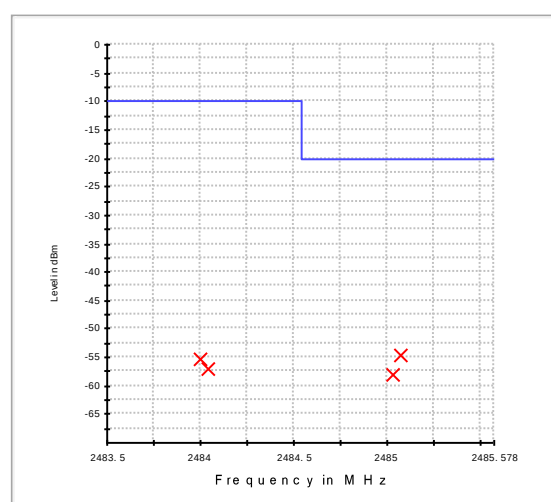
GFSK (BLE1Mbps): Low frequency (Part 2)



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



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



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.

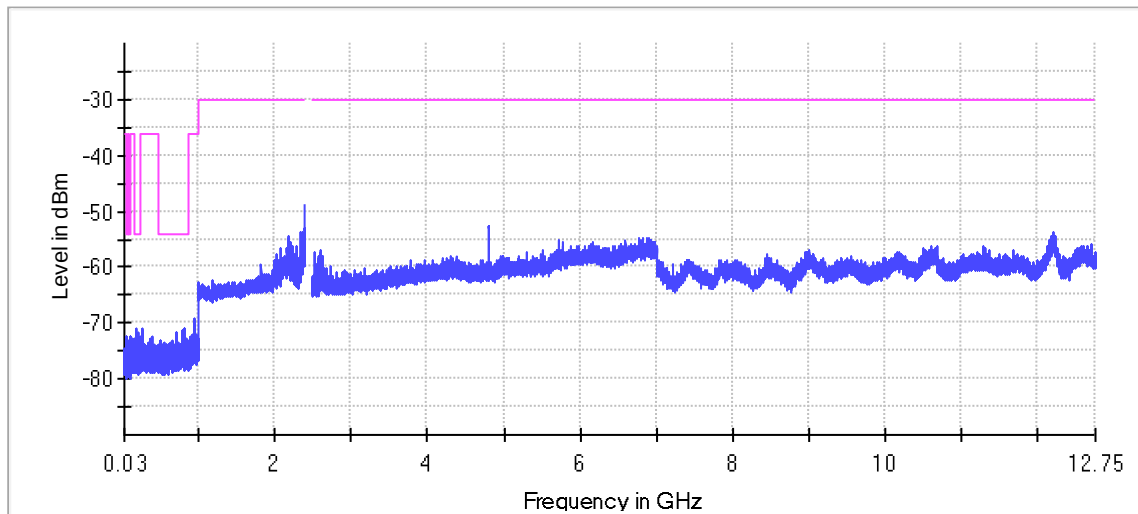
Note 3: The cabinet radiated test data is tested in the normal working mode of the product.

Measuring Parameter

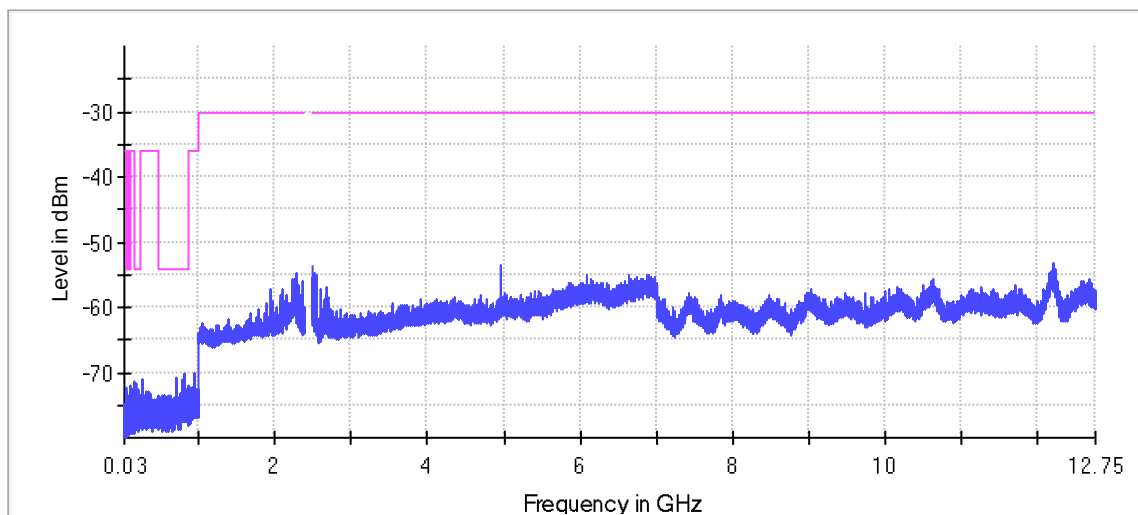
Frequency Range		
30 MHz to 1 000 MHz	RBW (MHz)	100 kHz
	VBW (MHz)	300 kHz
	Sweep points	19400
	Detector mode	Peak
	Trace mode	Max Hold
1 GHz to 12,75 GHz	RBW (MHz)	1 MHz
	VBW (MHz)	3 MHz
	Sweep points	23500
	Detector mode	Peak
	Trace mode	Max Hold

Conducted Test Data

GFSK (BLE 1Mbps) Low Frequency



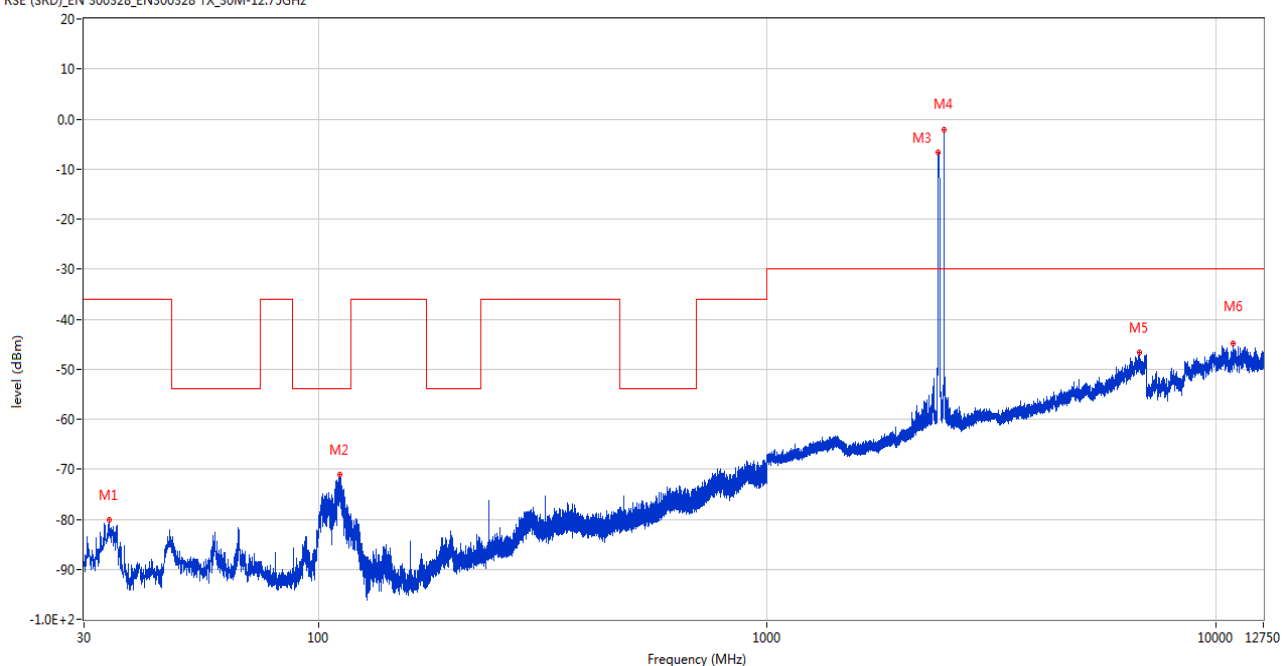
GFSK (BLE 1Mbps) High Frequency



Cabinet Radiated Test Data

30 MHz to 12.75 GHz, ANT H

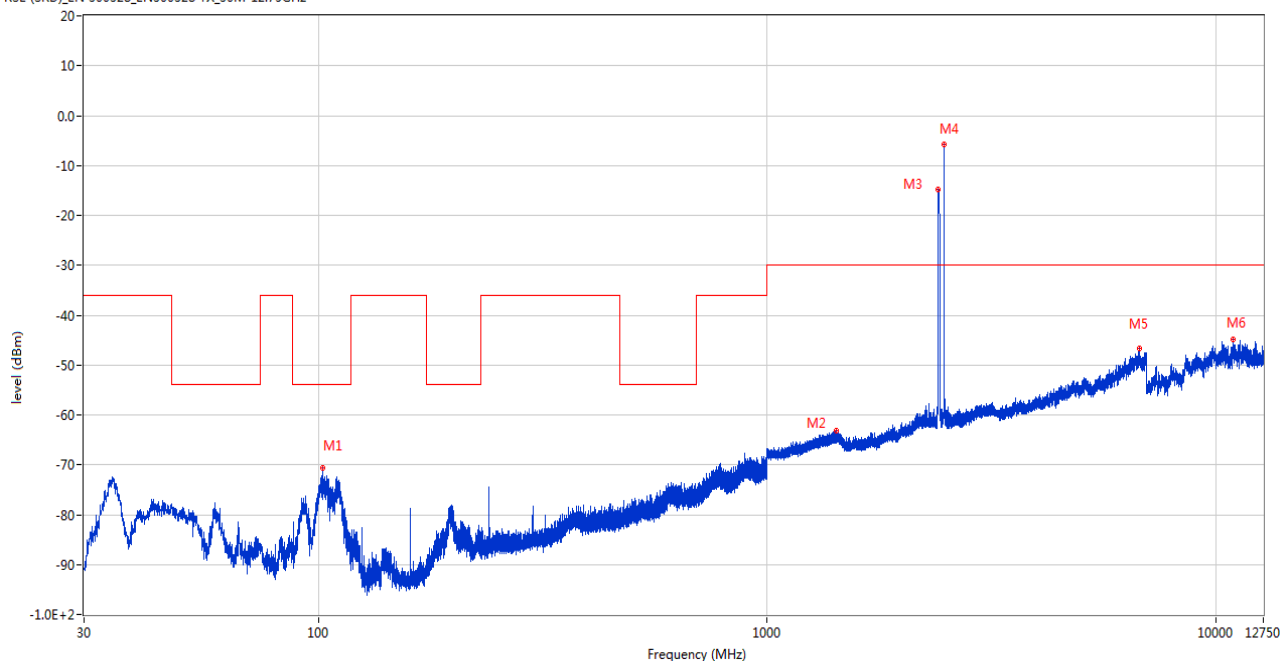
RSE (SRD)_EN 300328_EN300328 TX_30M-12.75GHz



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
34.074	-80.16	-20.09	-36.0	44.16	348.00	Horizontal	Horizontal	Pass
111.335	-71.11	-19.87	-54.0	17.11	235.00	Horizontal	Horizontal	Pass
2406.500	-6.67	-1.02	-30.0	-23.33	356.00	Horizontal	Horizontal	N/A
2479.700	-2.04	-1.41	-30.0	-27.96	328.00	Horizontal	Horizontal	N/A
6737.600	-46.67	15.87	-30.0	16.67	321.00	Horizontal	Horizontal	Pass
10928.687	-44.91	18.76	-30.0	14.91	178.00	Horizontal	Horizontal	Pass

30 MHz to 12.75 GHz, ANT V

RSE (SRD)_EN 300328_EN300328 TX_30M-12.75GHz



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
102.265	-70.67	-19.28	-54.0	16.67	51.00	Vertical	Horizontal	Pass
1427.900	-63.27	-4.37	-30.0	33.27	323.00	Vertical	Horizontal	Pass
2406.700	-14.76	-1.05	-30.0	-15.24	21.00	Vertical	Horizontal	N/A
2479.800	-5.76	-1.41	-30.0	-24.24	294.00	Vertical	Horizontal	N/A
6738.600	-46.58	15.76	-30.0	16.58	121.00	Vertical	Horizontal	Pass
10925.237	-44.95	18.84	-30.0	14.95	107.00	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.

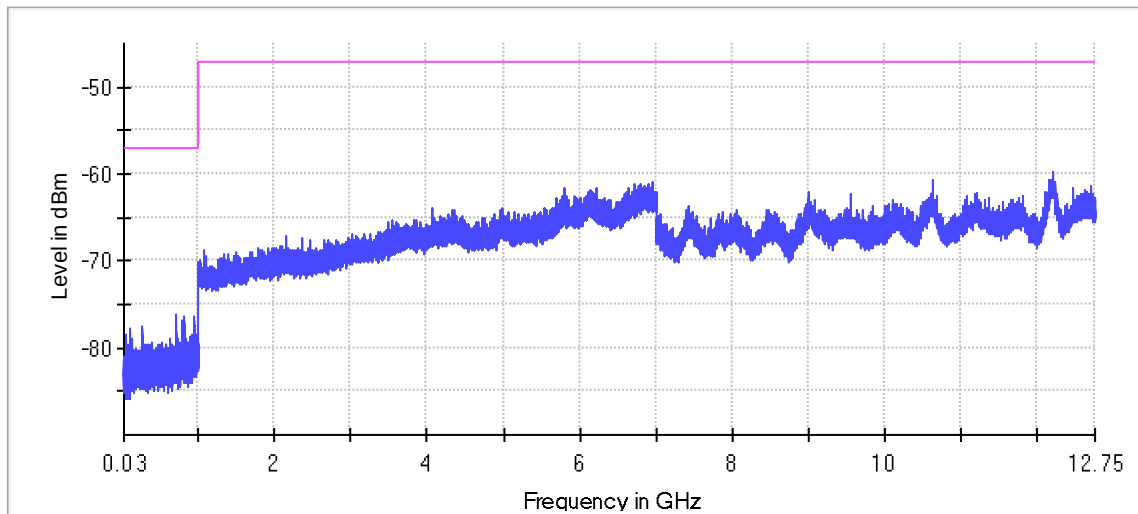
Note 3: The cabinet radiated test data is tested in the normal working mode of the product.

Measuring Parameter

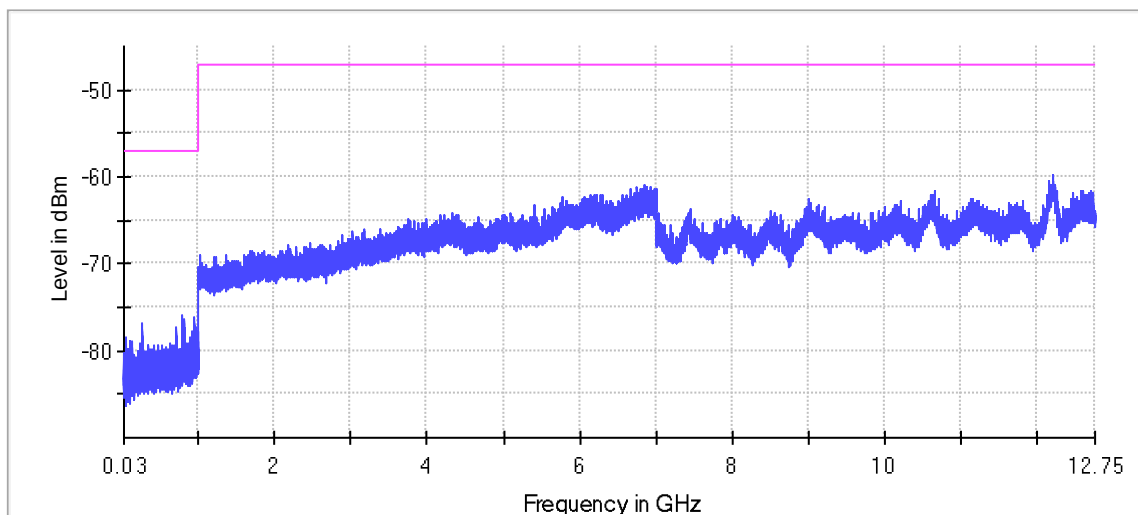
Frequency Range		
30 MHz to 1 000 MHz	RBW (MHz)	100 kHz
	VBW (MHz)	300 kHz
	Sweep points	19400
	Detector mode	Peak
	Trace mode	Max Hold
1 GHz to 12,75 GHz	RBW (MHz)	1 MHz
	VBW (MHz)	3 MHz
	Sweep points	23500
	Detector mode	Peak
	Trace mode	Max Hold

Conducted Test Data

GFSK (BLE 1Mbps) Low Frequency



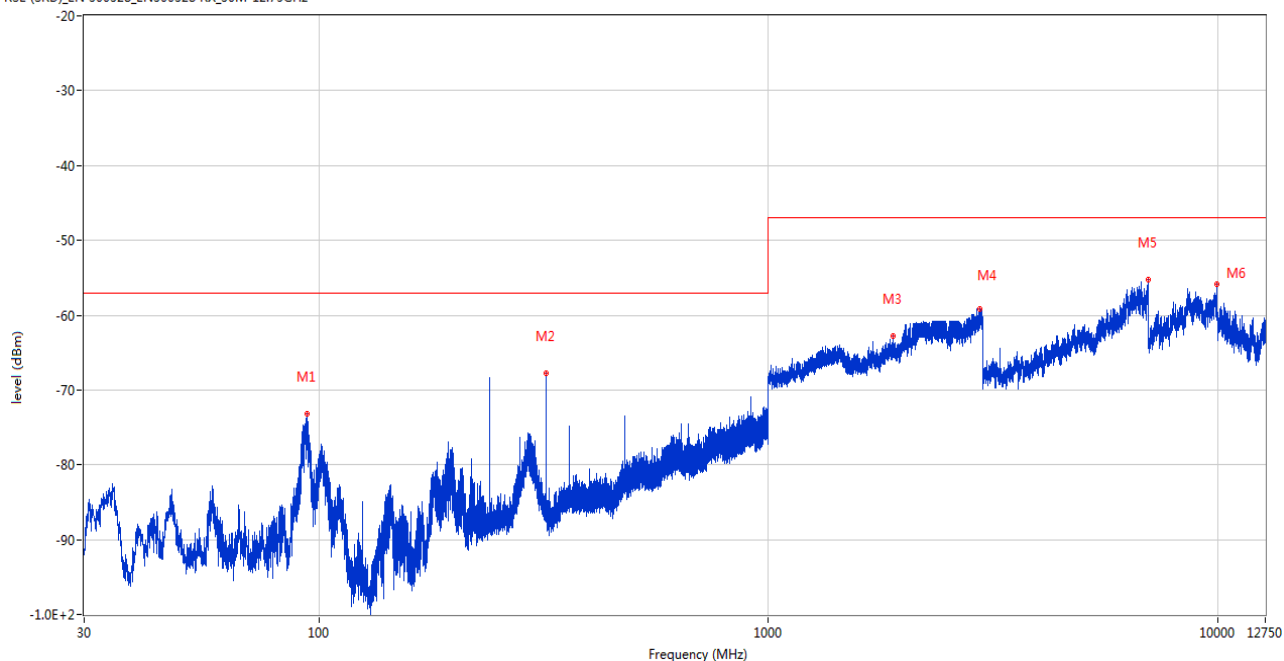
GFSK (BLE 1Mbps) High Frequency



Cabinet Radiated Test Data

30 MHz to 12.75 GHz, ANT H

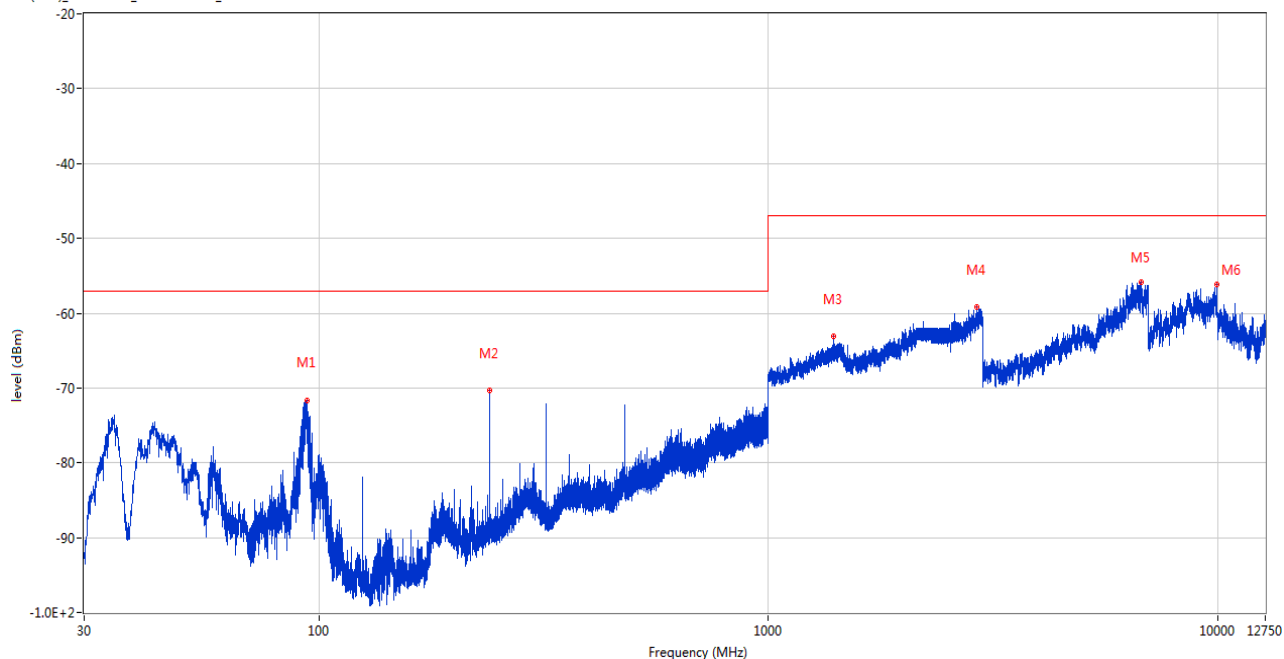
RSE (SRD)_EN 300328_EN300328 RX_30M-12.75GHz



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
94.165	-73.20	-19.17	-57.0	16.20	217.00	Horizontal	Horizontal	Pass
319.982	-67.79	-11.23	-57.0	10.79	209.00	Horizontal	Horizontal	Pass
1891.800	-62.83	-4.14	-47.0	15.83	91.00	Horizontal	Horizontal	Pass
2946.800	-59.19	1.37	-47.0	12.19	302.00	Horizontal	Horizontal	Pass
6992.800	-55.26	6.42	-47.0	8.26	187.00	Horizontal	Horizontal	Pass
9951.475	-55.91	6.88	-47.0	8.91	46.00	Horizontal	Horizontal	Pass

30 MHz to 12.75 GHz, ANT V

RSE (SRD)_EN 300328_EN300328 RX_30M-12.75GHz



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
93.971	-71.62	-19.16	-57.0	14.62	173.00	Vertical	Horizontal	Pass
240.005	-70.39	-13.75	-57.0	13.39	261.00	Vertical	Horizontal	Pass
1396.600	-63.10	-4.57	-47.0	16.10	210.00	Vertical	Horizontal	Pass
2911.200	-59.24	2.31	-47.0	12.24	297.00	Vertical	Horizontal	Pass
6741.000	-55.85	7.00	-47.0	8.85	4.00	Vertical	Horizontal	Pass
9951.188	-56.13	6.89	-47.0	9.13	227.00	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)	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%	0.07%	≤10%	Pass
	2 504	-34	0.00%	0.07%		
	2 300	-34	0.00%	0.00%		
	2 584	-34	0.07%	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

Channel

☒ Single
☐ Sweep

Channel

0

Payload model

Constant carrier

Payload length

1 bytes

Packets received

1499

Start test

High Channel

Channel

☒ Single
☐ Sweep

Channel

39

Payload model

Constant carrier

Payload length

1 bytes

Packets received

1499

Start test

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ22B1240-AR.pdf”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ22B1240-AW.pdf”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ22B1240-AI.pdf”.

ANNEX E INFORMATIVE

Application form for testing please refer to the document “BL-SZ22B1240-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 Hub 2
Model Name: W3202100
Brand Name: SwitchBot
Test Standard: ETSI EN 300 328 V2.2.2 (2019-07)
Sample Arrival Date: Dec. 02, 2022
Test Date: Dec. 05, 2022 - Dec. 13, 2022
Date of Issue: Dec. 19, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Chen Huiming**Checked by:** Ye Hongji**Approved by:** Liao Jianming
(Technical Director)

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Dec. 19, 2022</u>	<u>Initial Issue</u>

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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 Factory Information

Factory	Woan Technology (Shenzhen) Co., Ltd.
Address	Building A2, Zhengfeng Industrial Area, No.610 Fengtang Boulevard, Fuhai Sub-district, Bao'an District, Shenzhen

2.4 General Description for Equipment under Test (EUT)

EUT Name	SwitchBot Hub 2
Model Name Under Test	W3202100
Series Model Name	W3202101, W3202102, W3202103, W3202104, W3202105, W3202106
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name. (this information provided by the customer)
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Technical Information

EUT Type	Stand-alone equipment
Network and Wireless connectivity	Bluetooth (BLE) 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20)

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

Frequency Range	802.11b/g/n (20 MHz): 2.412 GHz - 2.472 GHz $f_c = 2412 \text{ MHz} + (N-1)*5 \text{ MHz}$, where - f_c = "Operating Frequency" in MHz, - N = "Channel Number" with the range from 1 to 13. The frequency block is 2.4GHz-2.4835GHz
Modulation Type	DSSS, OFDM
Equipment Type (LBT / non- LBT)	LBT based Detect and Avoid
Adaptive or non-adaptive	Adaptive
LBT Based	Yes (Load Based)
Antenna System (eg., MIMO, Smart Antenna)	N/A
Categorization as Correlated or Completely Uncorrelated	N/A
Antenna Type	IFA Antenna
Antenna Gain	3.2 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
The Max RF Output power	19.8 dBm
Receiver Category	1

Modulation technology	Modulation Type	Transfer Rate (Mbps)(Single RF path)
DSSS (802.11b)	DBPSK	1
	DQPSK	2
	CCK	5.5/11
OFDM (802.11g)	BPSK	6/9
	QPSK	12/18
	16QAM	24/36
	64QAM	48/54
OFDM (802.11n -20 MHz)	BPSK	6.5/7.2
	QPSK	13/19.5/14.4/21.7
	16QAM	26/39/28.9/43.3
	64QAM	52/58.5/65/57.8/65/72.2

Note: Preliminary tests were performed in different data rate in above table to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel
RF output power	11b/11g/11n20	1/6/6.5 Mbps	1/7/13
Power Spectral Density	11b/11g/11n20	1/6/6.5 Mbps	1/7/13
Adaptivity (adaptive equipment using modulations other than FHSS)	11b/11g/11n20	1/6/6.5 Mbps	1/13
Occupied Channel Bandwidth	11b/11g/11n20	1/6/6.5 Mbps	1/13
Transmitter unwanted emissions in the out-of-band domain	11b/11g/11n20	1/6/6.5 Mbps	1/13
Transmitter unwanted emissions in the spurious domain	11b/11g/11n20	1/6/6.5 Mbps	1/13
Receiver spurious emissions	11b/11g/11n20	1/6/6.5 Mbps	1/13
Receiver Blocking	11b	1 Mbps	1/13

Mode	Channel	Channel Number	Frequency (MHz)
802.11b	HIGH/MIDDLE/LOW(H/M/L)	13/7/1	2472/2442/2412
802.11g	HIGH/MIDDLE/LOW(H/M/L)	13/7/1	2472/2442/2412
802.11n20	HIGH/MIDDLE/LOW(H/M/L)	13/7/1	2472/2442/2412

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	Test Result	Verdict	Remark
Transmitter Parameters						
5.1.1	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	--
5.1.3	4.3.2.4	Duty Cycle, Tx-sequence, Tx-gap	--	ANNEX A.3	N/A	Note ¹ , Note ²
5.1.4	4.3.2.5	Medium Utilization (MU) factor	--	ANNEX A.4	N/A	Note ¹ , Note ²
5.1.5	4.3.2.6	Adaptivity (adaptive equipment using modulations other than FHSS)	Low/ High	ANNEX A.5	Pass	Note ² , Note ³
5.1.6	4.3.2.7	Occupied Channel Bandwidth	Low/ High	ANNEX A.6	Pass	--
5.1.7	4.3.2.8	Transmitter unwanted emissions in the out-of-band domain	Low/ High	ANNEX A.7	Pass	--
5.1.8	4.3.2.9	Transmitter unwanted emissions in the spurious domain	Low/ High	ANNEX A.8	Pass	--
Receiver Parameters						
5.2.1	4.2.3.2	Receiver categories	--	--	--	--
5.2.2	4.3.2.10	Receiver spurious emissions	Low/ High	ANNEX A.9	Pass	--
5.2.3	4.3.2.11	Receiver Blocking	Low/ High	ANNEX A.10	Pass	--
Other Parameters						
5.3.1	4.3.2.12	Geo-location capability	--	--	N/A	Note ⁴
Note ¹: This requirement apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is using wide band modulations other than FHSS. Note ²: This requirement do not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where 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 does not apply to devices that do not support Geo-location capability.						

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

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

Relative Humidity	41% to 58%	
Atmospheric Pressure	98 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+20.6°C to +22.8°C
	LT (Low Temperature)	-20°C
	HT (High Temperature)	+40°C
Working Voltage of the EUT	NV (Normal Voltage)	3.3 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2022.05.19	2023.05.18
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	260592	2022.02.09	2023.02.08
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2022.05.19	2023.05.18
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2022.05.19	2023.05.18
Signaling Unit	ROHDE&SCHWARZ	CMW270	100607	2022.05.19	2023.05.18
Temperature Chamber	AHK	NTH64-40A	1310	2022.01.05	2023.01.04
Spectrum Analyzer	KEYSIGHT	N9020A	MY52510065	2022.09.06	2023.09.05
Signaling Unit	ROHDE&SCHWARZ	CMW500	171150	2022.06.29	2023.06.28
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	00884	2021.03.08	2024.03.07
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	01631	2022.02.03	2025.02.02
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2021.09.04	2024.09.03

4.3 Test Software List

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

4.4 Measurement Uncertainty

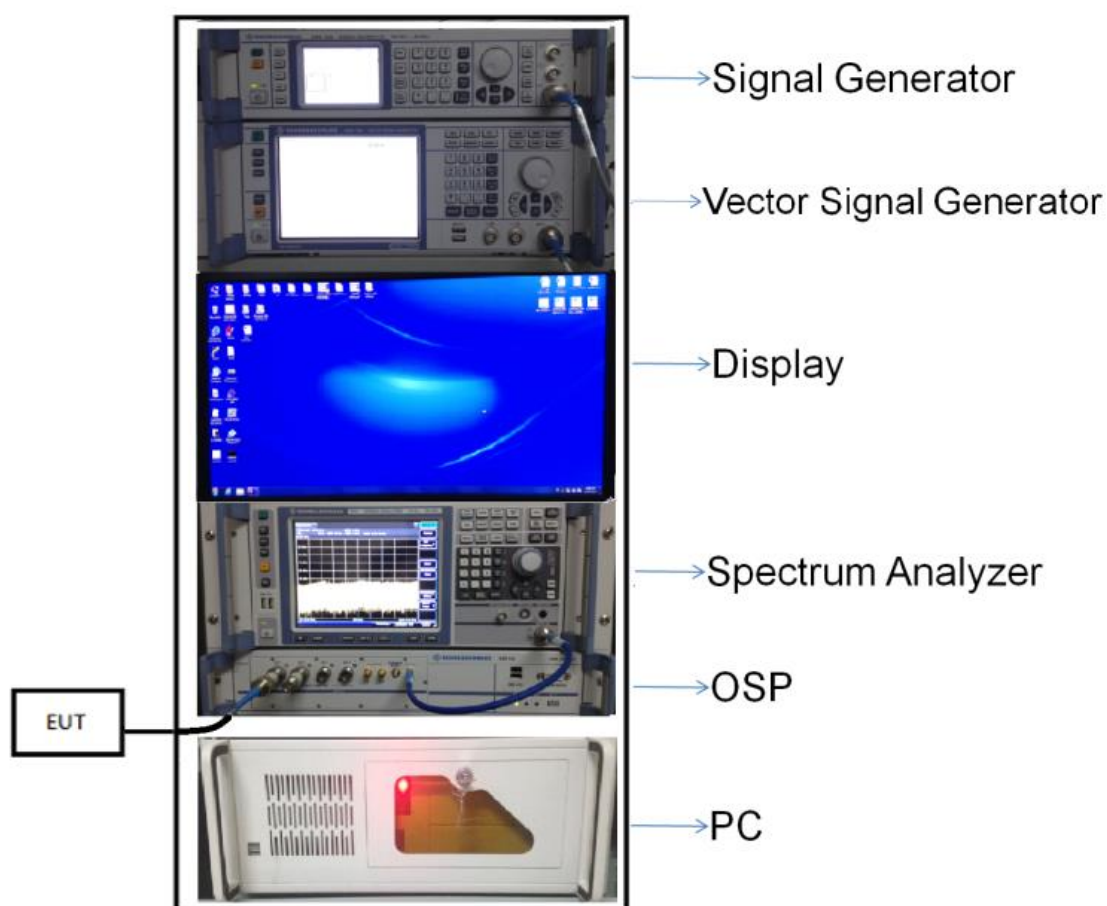
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

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	0.82 °C
Humidity	4.1 %

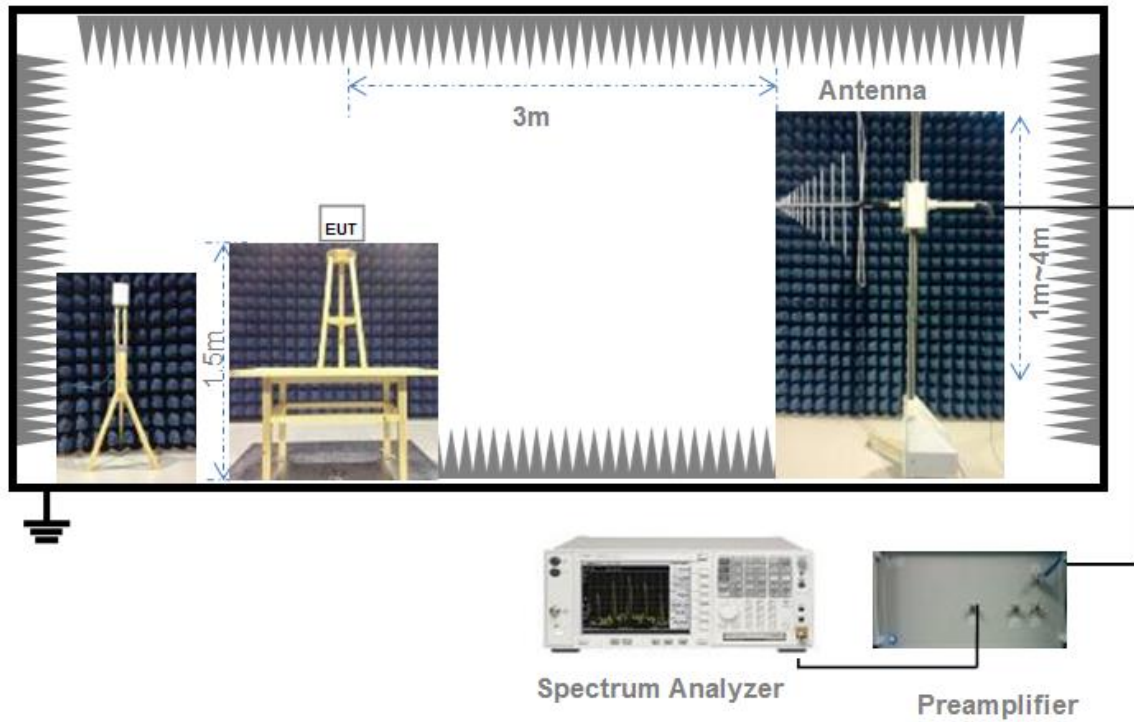
4.5 Description of Test Setup

4.5.1 For Conducted Test

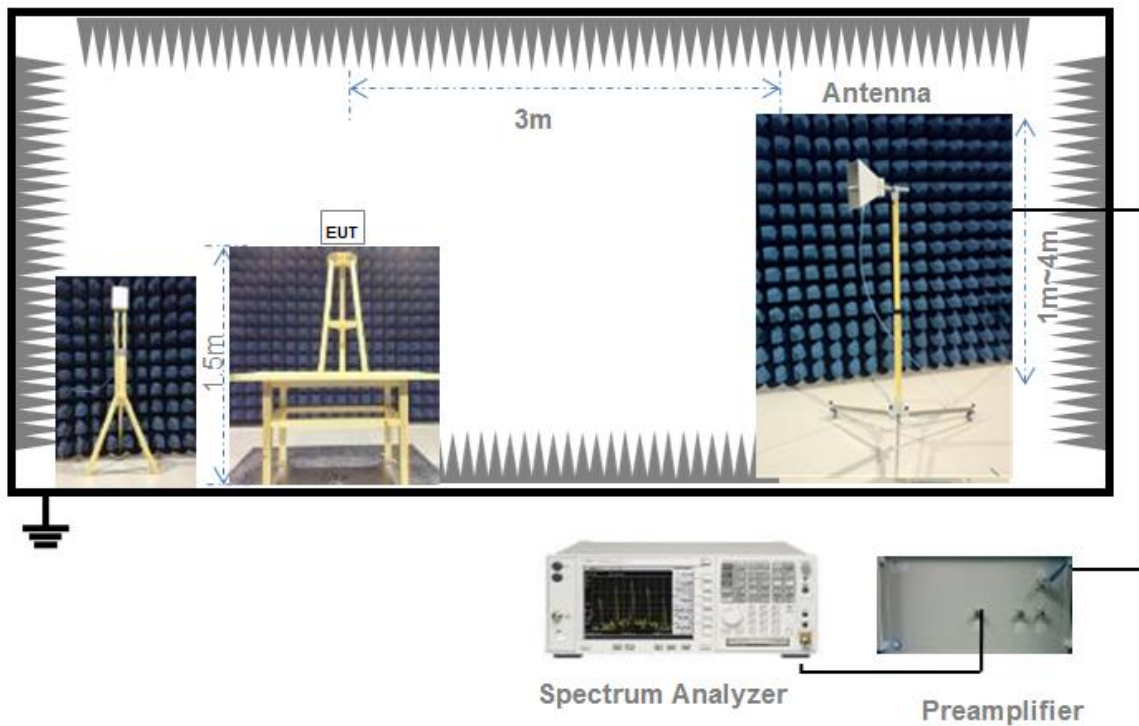


(Diagram 1)

4.5.2 For Radiated Test

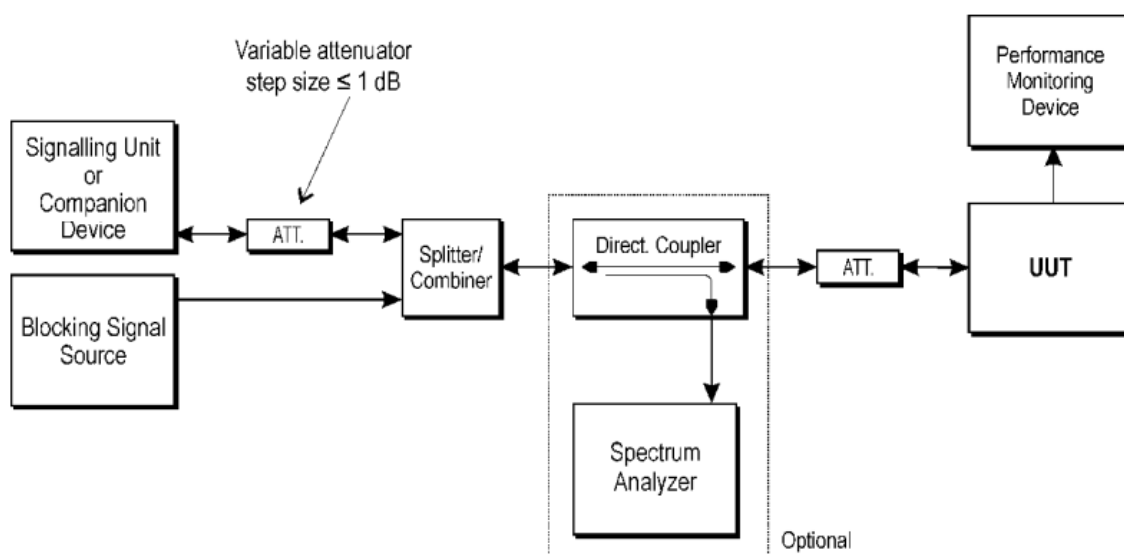


(Diagram 2)



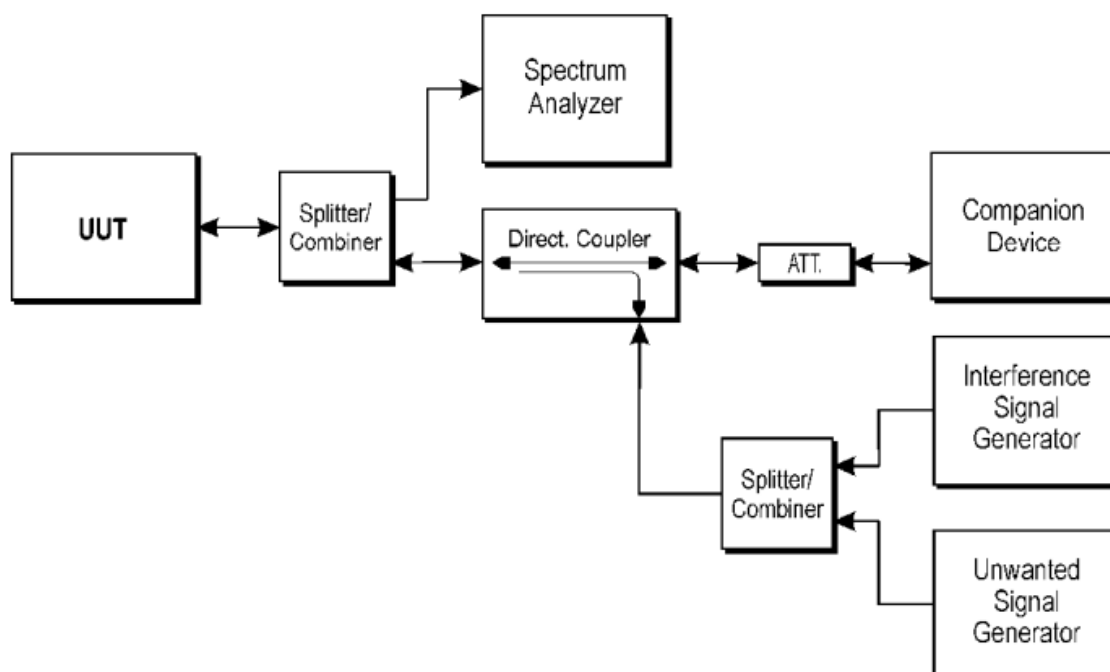
(Diagram 3)

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 RF output power for non-FHSS equipment 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

Non-FHSS equipment shall comply with the following:

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.

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 Medium Utilization (MU) factor

5.1.4.1 Limit

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

5.1.4.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test.

5.1.4.3 Test Procedure

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

5.1.4.4 Test Procedure

Please refer to ANNEX A.4.

5.1.5 Adaptivity (adaptive equipment using modulations other than FHSS)

5.1.5.1 Limit

Requirement	Operational Mode			
	Non-LBT based Detect and Avoid	LBT based Detect and Avoid		
		Frame Based Equipment	Load Based Equipment (CCA using 'energy detect')	Load Based Equipment (CCA not using any of the mechanisms referenced as note 2)
Minimum Clear Channel Assessment (CCA) Time	NA	18 us (see note 1)	(see note 2)	18 us (see note 1)
Maximum Channel Occupancy (COT) Time	40 ms	1 ms to 10 ms	(see note 2)	13 ms
Minimum Idle Period	5% of COT	5% of COT	(see note 2)	NA
Extended CCA check	NA	NA	(see note 2)	a random duration in the range between 18 μs and at least 160 μs
Short Control Signalling Transmissions	Maximum duty cycle of 10 % within an observation period of 50 ms (see note 3)			
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.				

Interference threshold level:

Maximum transmit power (P_H) EIRP dBm	Threshold level (TL)
20	-70 dBm / MHz
NOTE 1: $TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW} / P_{out})$ (P_{out} 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 1)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2400 MHz to 2442 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.		

5.1.5.2 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 5.4.6.2.

5.1.5.4 Test Result

Please refer to ANNEX A.5.

5.1.6 Occupied Channel Bandwidth

5.1.6.1 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 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.

5.1.6.2 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 5.4.7.2.

5.1.6.4 Test Result

Please refer to ANNEX A.6.

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

5.1.7.1 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 2 400 MHz to 2 483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in §2.4 in this report.

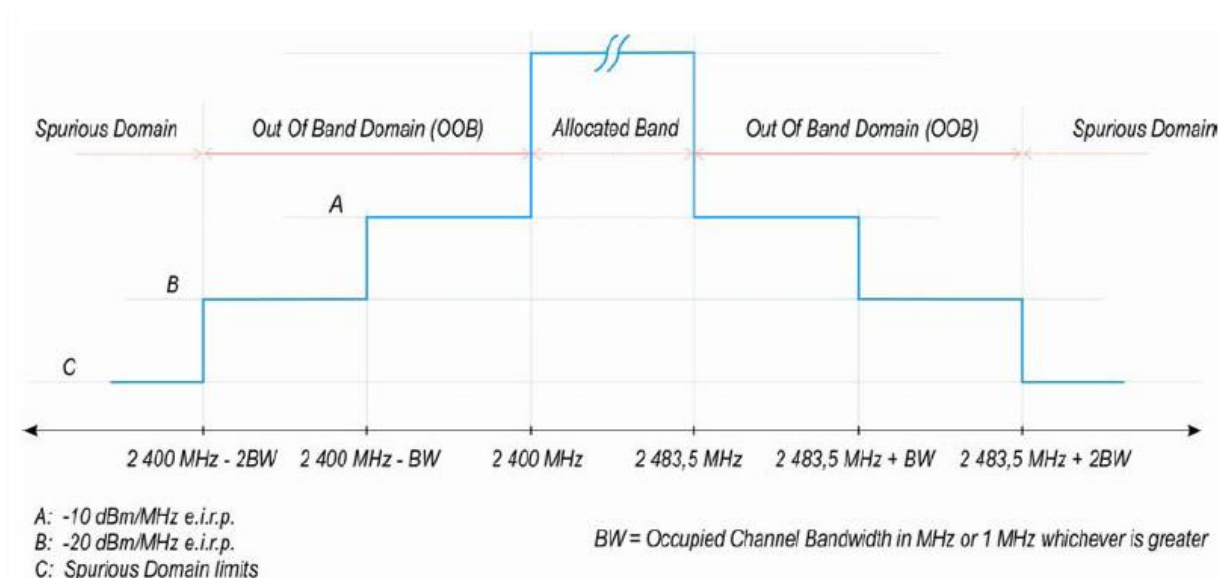


Figure 1: Transmit mask

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 5.4.8.2.

5.1.7.4 Test Result

Please refer to ANNEX A.7.

5.1.8 Transmitter unwanted emissions in the spurious domain

5.1.8.1 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

5.1.8.2 Test Setup

See 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.

5.1.8.3 Test Procedure

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

5.1.8.4 Test Result

Please refer to ANNEX A.8.

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

See 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.9.

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 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 + $10 \times \log_{10}(\text{OCBW})$ + 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 $P_{\min} + 26$ 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.

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 + $10 \times \log_{10}(\text{OCBW})$ + 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 $P_{\min} + 30$ 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 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.

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.10.

5.3 Other Parameters

5.3.1 Geo-location capability

5.3.1.1 Requirements

The geographical location determined by the non-FHSS equipment as defined in clause 4.3.2.12.2 shall not be accessible to the user in a way that would allow the user to alter it.

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

Note 1: EIRP Power = Conducted Power + Antenna Gain

Modulation Mode			802.11b		
Limit			20 dBm		
Test Result					
Test Method	Test Conditions		EIRP (dBm)		
☐ Radiated ☒ Conducted	Voltage	Temperature	Low Channel	Middle Channel	High Channel
			EIRP	EIRP	EIRP
	NV	NT	18.1	18.2	18.0
		LT	18.1	18.0	17.6
		HT	18.0	18.1	17.8
Test Verdict			Pass		

Modulation Mode			802.11g		
Limit			20 dBm		
Test Result					
Test Method	Test Conditions		EIRP (dBm)		
☐ Radiated ☒ Conducted	Voltage	Temperature	Low Channel	Middle Channel	High Channel
			EIRP	EIRP	EIRP
	NV	NT	19.4	19.7	19.5
		LT	19.4	19.8	19.5
		HT	19.6	19.6	19.5
Test Verdict			Pass		

Modulation Mode			802.11n(20 MHz)		
Limit			20 dBm		
Test Result					
Test Method	Test Conditions		EIRP (dBm)		
☐ Radiated ☒ Conducted	Voltage	Temperature	Low Channel	Middle Channel	High Channel
			EIRP	EIRP	EIRP
	NV	NT	19.4	19.6	19.5
		LT	19.4	19.5	19.6
		HT	19.2	19.3	19.6
Test Verdict			Pass		

Bursts Power List

802.11b: Low Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
18.1	0.000	32.953	32.953	0.018
17.9	32.971	65.924	32.953	0.019
17.9	65.943	98.895	32.952	0.019
18.1	98.914	131.867	32.953	0.018
18.1	131.885	164.838	32.953	0.018
17.9	164.856	197.809	32.953	0.019
17.9	197.828	230.780	32.952	0.019
18.1	230.799	263.752	32.953	0.018
18.1	263.770	296.723	32.953	0.018
17.9	296.741	329.694	32.953	0.019
17.9	329.713	362.665	32.952	0.019
18.1	362.684	395.637	32.953	0.018
18.1	395.655	428.608	32.953	0.018
18.0	428.626	461.579	32.953	0.019
17.9	461.598	494.550	32.952	0.019
18.0	494.569	527.522	32.953	0.018
18.1	527.540	560.493	32.953	0.018
18.0	560.511	593.464	32.953	0.018
17.9	593.482	626.435	32.953	0.019
18.0	626.454	659.407	32.953	0.018
18.1	659.425	692.378	32.953	0.018
18.0	692.396	725.349	32.953	0.018
17.9	725.367	758.320	32.953	0.019
18.0	758.339	791.292	32.953	0.018
18.1	791.310	824.263	32.953	0.018
18.0	824.281	857.234	32.953	0.018
17.9	857.252	890.205	32.953	0.019
18.0	890.224	923.177	32.953	0.018
18.1	923.195	956.148	32.953	0.018

802.11b: Middle Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
18.2	0.000	32.953	32.953	0.018
18.2	32.971	65.924	32.953	0.018
18.1	65.942	98.895	32.953	0.018
18.0	98.913	131.866	32.953	0.019
18.1	131.885	164.837	32.952	0.019
18.2	164.856	197.809	32.953	0.018
18.2	197.827	230.780	32.953	0.018
18.0	230.798	263.751	32.953	0.019
18.1	263.770	296.722	32.952	0.019
18.2	296.741	329.694	32.953	0.018
18.2	329.712	362.665	32.953	0.018
18.1	362.683	395.636	32.953	0.018
18.0	395.654	428.607	32.953	0.019
18.1	428.626	461.578	32.952	0.019
18.2	461.597	494.550	32.953	0.018
18.2	494.568	527.521	32.953	0.018
18.1	527.539	560.492	32.953	0.019
18.1	560.511	593.463	32.952	0.019
18.2	593.482	626.435	32.953	0.018
18.2	626.453	659.406	32.953	0.018
18.1	659.424	692.377	32.953	0.018
18.0	692.395	725.348	32.953	0.019
18.1	725.367	758.319	32.952	0.019
18.2	758.338	791.291	32.953	0.018
18.2	791.309	824.262	32.953	0.018
18.1	824.280	857.233	32.953	0.019
18.0	857.252	890.204	32.952	0.019
18.1	890.223	923.176	32.953	0.018
18.2	923.194	956.147	32.953	0.018

802.11b: High Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
18.0	0.000	32.953	32.953	0.018
18.0	32.971	65.924	32.953	0.018
17.8	65.942	98.895	32.953	0.019
17.9	98.914	131.866	32.952	0.019
18.0	131.885	164.838	32.953	0.018
18.0	164.856	197.809	32.953	0.018
17.9	197.827	230.780	32.953	0.019
17.8	230.799	263.751	32.952	0.019
17.9	263.770	296.723	32.953	0.018
18.0	296.741	329.694	32.953	0.018
17.9	329.712	362.665	32.953	0.018
17.8	362.683	395.636	32.953	0.019
17.9	395.655	428.608	32.953	0.018
18.0	428.626	461.579	32.953	0.018
17.9	461.597	494.550	32.953	0.018
17.8	494.568	527.521	32.953	0.019
17.9	527.540	560.492	32.952	0.019
18.0	560.511	593.464	32.953	0.018
17.9	593.482	626.435	32.953	0.018
17.8	626.453	659.406	32.953	0.019
17.9	659.425	692.377	32.952	0.019
18.0	692.396	725.349	32.953	0.018
18.0	725.367	758.320	32.953	0.018
17.8	758.338	791.291	32.953	0.019
17.8	791.310	824.262	32.952	0.019
17.9	824.281	857.234	32.953	0.018
18.0	857.252	890.205	32.953	0.018
17.9	890.223	923.176	32.953	0.018
17.8	923.194	956.147	32.953	0.019

802.11g: Low Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
19.6	0.000	5.486	5.486	0.024
19.6	5.510	10.996	5.486	0.024
19.6	11.020	16.505	5.485	0.025
19.6	16.530	22.015	5.485	0.025
19.6	22.040	27.525	5.485	0.025
19.6	27.550	33.035	5.485	0.025
19.6	33.060	38.545	5.485	0.025
19.6	38.570	44.055	5.485	0.024
19.6	44.079	49.565	5.486	0.024
19.6	49.589	55.075	5.486	0.024
19.6	55.099	60.584	5.485	0.025
19.6	60.609	66.094	5.485	0.025
19.6	66.119	71.604	5.485	0.025
19.6	71.629	77.114	5.485	0.025
19.6	77.139	82.624	5.485	0.025
19.6	82.649	88.134	5.485	0.024
19.6	88.158	93.644	5.486	0.024
19.6	93.668	99.154	5.486	0.024
19.6	99.178	104.663	5.485	0.025
19.6	104.688	110.173	5.485	0.025
19.6	110.198	115.683	5.485	0.025
19.6	115.708	121.193	5.485	0.025
19.6	121.218	126.703	5.485	0.025
19.6	126.728	132.213	5.485	0.024
19.6	132.237	137.723	5.486	0.024
19.6	137.747	143.233	5.486	0.024
19.6	143.257	148.742	5.485	0.025
19.6	148.767	154.252	5.485	0.025
19.6	154.277	159.762	5.485	0.025
19.6	159.787	165.272	5.485	0.025
19.6	165.297	170.782	5.485	0.025
19.6	170.807	176.292	5.485	0.024
19.6	176.316	181.802	5.486	0.024
19.6	181.826	187.312	5.486	0.024

802.11g: Middle Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
19.8	0.000	5.485	5.485	0.025
19.8	5.510	10.995	5.485	0.025
19.8	11.020	16.505	5.485	0.025
19.8	16.530	22.015	5.485	0.025
19.8	22.040	27.525	5.485	0.025
19.8	27.550	33.035	5.485	0.024
19.8	33.059	38.545	5.486	0.024
19.8	38.569	44.055	5.486	0.024
19.8	44.079	49.564	5.485	0.025
19.8	49.589	55.074	5.485	0.025
19.8	55.099	60.584	5.485	0.025
19.8	60.609	66.094	5.485	0.025
19.8	66.119	71.604	5.485	0.025
19.8	71.629	77.114	5.485	0.024
19.8	77.138	82.624	5.486	0.024
19.8	82.648	88.133	5.485	0.025
19.8	88.158	93.643	5.485	0.025
19.8	93.668	99.153	5.485	0.025
19.8	99.178	104.663	5.485	0.025
19.8	104.688	110.173	5.485	0.025
19.8	110.198	115.683	5.485	0.024
19.8	115.707	121.193	5.486	0.024
19.8	121.217	126.703	5.486	0.024
19.8	126.727	132.212	5.485	0.025
19.8	132.237	137.722	5.485	0.025
19.8	137.747	143.232	5.485	0.025
19.8	143.257	148.742	5.485	0.025
19.8	148.767	154.252	5.485	0.025
19.8	154.277	159.762	5.485	0.024
19.8	159.786	165.272	5.486	0.024
19.8	165.296	170.781	5.485	0.025
19.8	170.806	176.291	5.485	0.025
19.8	176.316	181.801	5.485	0.025
19.8	181.826	187.311	5.485	0.025

802.11g: High Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
19.5	0.000	5.485	5.485	0.025
19.5	5.510	10.995	5.485	0.025
19.5	11.020	16.505	5.485	0.025
19.5	16.530	22.015	5.485	0.025
19.4	22.040	27.525	5.485	0.024
19.5	27.549	33.035	5.486	0.024
19.5	33.059	38.545	5.486	0.024
19.5	38.569	44.054	5.485	0.025
19.5	44.079	49.564	5.485	0.025
19.5	49.589	55.074	5.485	0.025
19.5	55.099	60.584	5.485	0.025
19.5	60.609	66.094	5.485	0.025
19.4	66.119	71.604	5.485	0.024
19.5	71.628	77.114	5.486	0.024
19.5	77.138	82.624	5.486	0.024
19.5	82.648	88.133	5.485	0.025
19.5	88.158	93.643	5.485	0.025
19.5	93.668	99.153	5.485	0.025
19.5	99.178	104.663	5.485	0.025
19.5	104.688	110.173	5.485	0.025
19.4	110.198	115.683	5.485	0.024
19.5	115.707	121.193	5.486	0.024
19.5	121.217	126.703	5.486	0.024
19.5	126.727	132.212	5.485	0.025
19.5	132.237	137.722	5.485	0.025
19.5	137.747	143.232	5.485	0.025
19.5	143.257	148.742	5.485	0.025
19.5	148.767	154.252	5.485	0.025
19.4	154.277	159.762	5.485	0.024
19.5	159.786	165.272	5.486	0.024
19.5	165.296	170.782	5.486	0.024
19.5	170.806	176.291	5.485	0.025
19.5	176.316	181.801	5.485	0.025
19.5	181.826	187.311	5.485	0.025

802.11n(20 MHz): Low Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
19.4	0.000	5.081	5.081	0.025
19.4	5.106	10.187	5.081	0.025
19.4	10.212	15.293	5.081	0.025
19.4	15.318	20.399	5.081	0.024
19.4	20.423	25.505	5.082	0.024
19.4	25.529	30.610	5.081	0.025
19.4	30.635	35.716	5.081	0.025
19.4	35.741	40.822	5.081	0.025
19.4	40.847	45.928	5.081	0.025
19.4	45.953	51.034	5.081	0.025
19.4	51.059	56.140	5.081	0.025
19.4	56.165	61.246	5.081	0.024
19.4	61.270	66.352	5.082	0.024
19.4	66.376	71.457	5.081	0.025
19.4	71.482	76.563	5.081	0.025
19.4	76.588	81.669	5.081	0.025
19.4	81.694	86.775	5.081	0.025
19.4	86.800	91.881	5.081	0.025
19.4	91.906	96.987	5.081	0.025
19.4	97.012	102.093	5.081	0.024
19.4	102.117	107.199	5.082	0.024
19.4	107.223	112.304	5.081	0.025
19.4	112.329	117.410	5.081	0.025
19.4	117.435	122.516	5.081	0.025
19.4	122.541	127.622	5.081	0.025
19.4	127.647	132.728	5.081	0.025
19.4	132.753	137.834	5.081	0.025
19.4	137.859	142.940	5.081	0.024
19.4	142.964	148.046	5.082	0.024
19.3	148.070	153.151	5.081	0.025
19.4	153.176	158.257	5.081	0.025
19.4	158.282	163.363	5.081	0.025
19.4	163.388	168.469	5.081	0.025
19.4	168.494	173.575	5.081	0.025

802.11n(20 MHz): Middle Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
19.5	0.000	5.081	5.081	0.024
19.5	5.105	10.186	5.081	0.025
19.5	10.211	15.292	5.081	0.025
19.5	15.317	20.398	5.081	0.025
19.6	20.423	25.504	5.081	0.025
19.5	25.529	30.610	5.081	0.025
19.5	30.635	35.716	5.081	0.025
19.5	35.741	40.822	5.081	0.025
19.5	40.847	45.928	5.081	0.024
19.5	45.952	51.033	5.081	0.025
19.5	51.058	56.139	5.081	0.025
19.5	56.164	61.245	5.081	0.025
19.5	61.270	66.351	5.081	0.025
19.5	66.376	71.457	5.081	0.025
19.5	71.482	76.563	5.081	0.025
19.5	76.588	81.669	5.081	0.025
19.5	81.694	86.775	5.081	0.024
19.5	86.799	91.880	5.081	0.025
19.5	91.905	96.986	5.081	0.025
19.5	97.011	102.092	5.081	0.025
19.5	102.117	107.198	5.081	0.025
19.6	107.223	112.304	5.081	0.025
19.5	112.329	117.410	5.081	0.025
19.5	117.435	122.516	5.081	0.025
19.5	122.541	127.622	5.081	0.024
19.5	127.646	132.727	5.081	0.025
19.5	132.752	137.833	5.081	0.025
19.5	137.858	142.939	5.081	0.025
19.5	142.964	148.045	5.081	0.025
19.5	148.070	153.151	5.081	0.025
19.5	153.176	158.257	5.081	0.025
19.5	158.282	163.363	5.081	0.025
19.5	163.388	168.469	5.081	0.024
19.5	168.493	173.574	5.081	0.025

802.11n(20 MHz): High Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
19.6	0.000	5.081	5.081	0.025
19.6	5.106	10.187	5.081	0.025
19.6	10.212	15.293	5.081	0.025
19.6	15.318	20.399	5.081	0.025
19.6	20.424	25.505	5.081	0.025
19.6	25.530	30.611	5.081	0.025
19.6	30.636	35.717	5.081	0.025
19.6	35.742	40.823	5.081	0.024
19.6	40.847	45.928	5.081	0.025
19.6	45.953	51.034	5.081	0.025
19.6	51.059	56.140	5.081	0.025
19.6	56.165	61.246	5.081	0.025
19.6	61.271	66.352	5.081	0.025
19.6	66.377	71.458	5.081	0.025
19.6	71.483	76.564	5.081	0.025
19.6	76.589	81.670	5.081	0.024
19.6	81.694	86.776	5.082	0.024
19.6	86.800	91.881	5.081	0.025
19.6	91.906	96.987	5.081	0.025
19.6	97.012	102.093	5.081	0.025
19.6	102.118	107.199	5.081	0.025
19.6	107.224	112.305	5.081	0.025
19.6	112.330	117.411	5.081	0.025
19.6	117.436	122.517	5.081	0.025
19.6	122.542	127.623	5.081	0.024
19.5	127.647	132.728	5.081	0.025
19.5	132.753	137.834	5.081	0.025
19.5	137.859	142.940	5.081	0.025
19.6	142.965	148.046	5.081	0.025
19.6	148.071	153.152	5.081	0.025
19.6	153.177	158.258	5.081	0.025
19.6	158.283	163.364	5.081	0.025
19.6	163.389	168.470	5.081	0.024
19.6	168.494	173.576	5.082	0.024

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	100s

Test Data

Note 1: The Power density is EIRP Power density, which is contain antenna gain

Modulation Mode			802.11b		
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	9.8	9.9	9.7
Test Verdict			Pass		

Modulation Mode			802.11g		
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	7.7	8.0
Test Verdict			Pass		

Modulation Mode			802.11n(20 MHz)		
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	7.4	7.5
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
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Note: Not applicable.

A.4 Medium Utilization (MU) factor

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

Note: Not applicable.

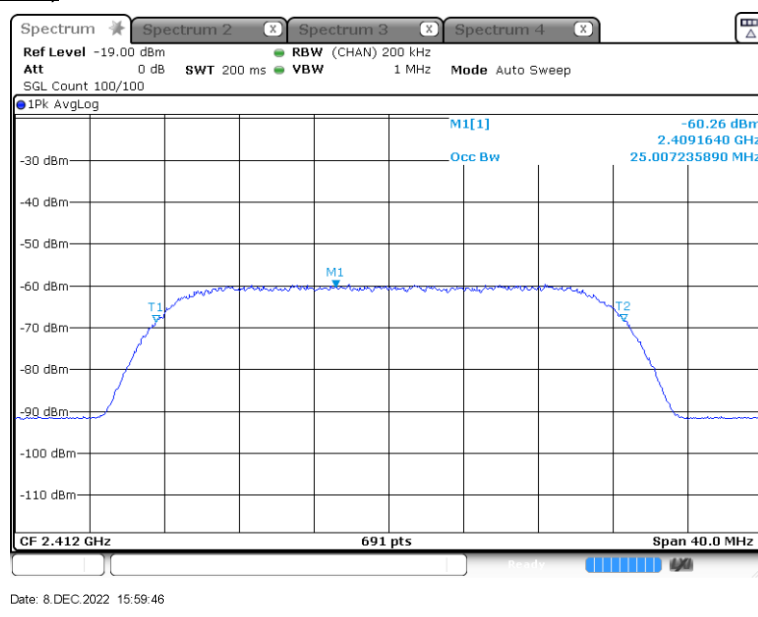
A.5 Adaptivity (adaptive equipment using modulations other than FHSS)

Test Method and Interference threshold level

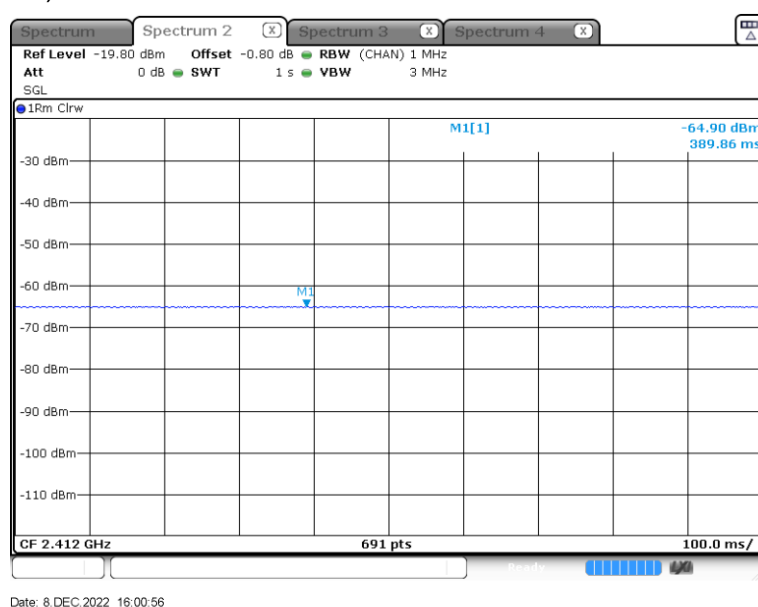
Test Method	Interference threshold level
☐ Radiated ☒ Conducted	The 802.11b low channel EIRP is 18.1 dBm and antenna gain is 3.2 dBi. Threshold level= $-70 \text{ dBm/MHz} + G + 10 \times \log_{10} (100 \text{ mW} / P_{\text{out}}) = -64.90 \text{ dBm/MHz}$. The interference signal level to the UUT is -64.90 dBm/MHz

Test plot

99% Bandwidth (802.11b)



Threshold level (802.11b)



Test DataTest step 1

Test	Test Result							
Temperature	Voltage	Test Mode	Frequency (MHz)	COT (ms)	Limit (ms)	CCA Time (μs)	Idle Period (ms)	Limit (μs)
NT	NV	802.11b	2412	8.85	13	44	0.04	18
			2472	8.85	13	45	0.05	18
		802.11g	2412	8.85	13	36	0.04	18
			2472	1.47	13	52	0.05	18
		802.11n (20 MHz)	2412	1.47	13	34	0.03	18
			2472	1.47	13	34	0.03	18
Note: Wanted signal mean power from companion device is -50 dBm/MHz.								
Test Verdict	Pass							

Test step 2

Note: The least monitoring time during the adaptivity test is 60s, please refer to the test plot as shown below.

Test step 2_2nd

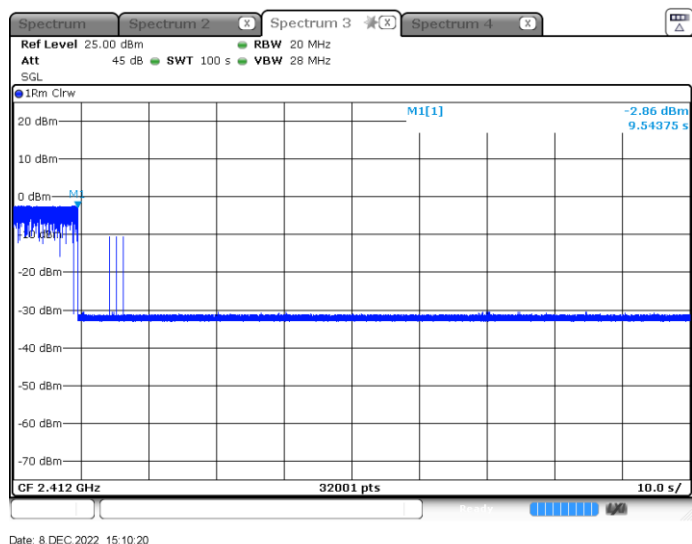
Temperature	Voltage	Test Mode	Frequency (MHz)	Number of Bursts	Short Signalling (%)	Limit (%)
NT	NV	802.11b	2412	2	3.4784	10
			2472	0	0	10
		802.11g	2412	0	0	10
			2472	0	0	10
		802.11n (20 MHz)	2412	0	0	10
			2472	0	0	10

The step 3

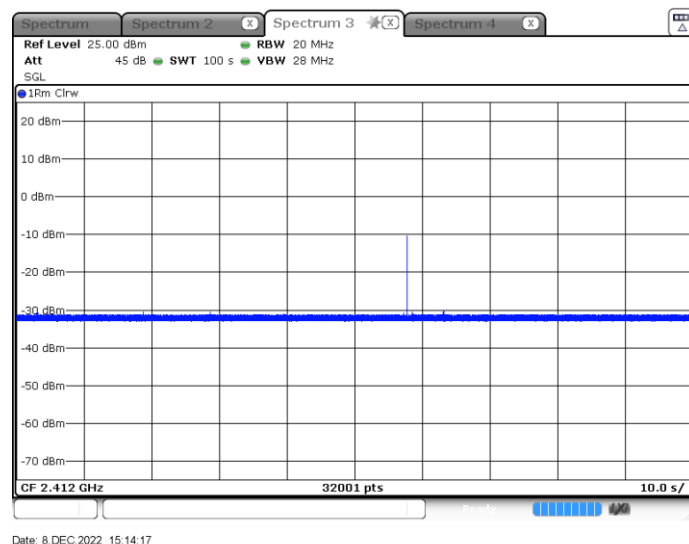
Note: The least monitoring time during the blocking test is 60s, please refer to the test plot as shown below.

Test Plots

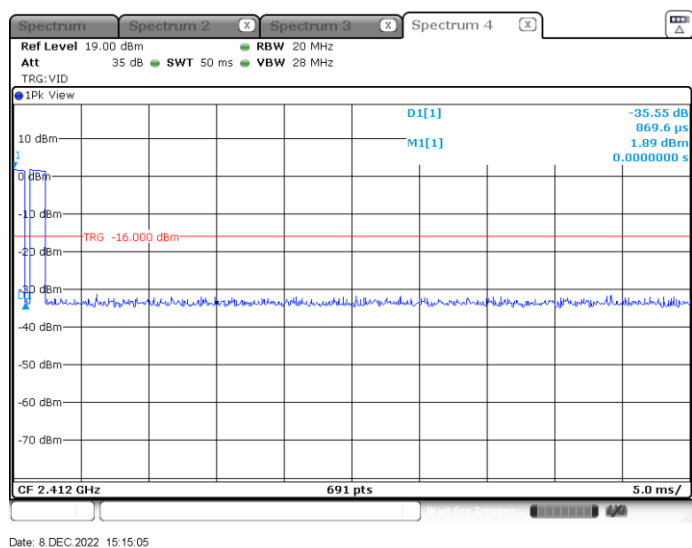
802.11b: Low Channel Step 2 Interferer on / Blocker off



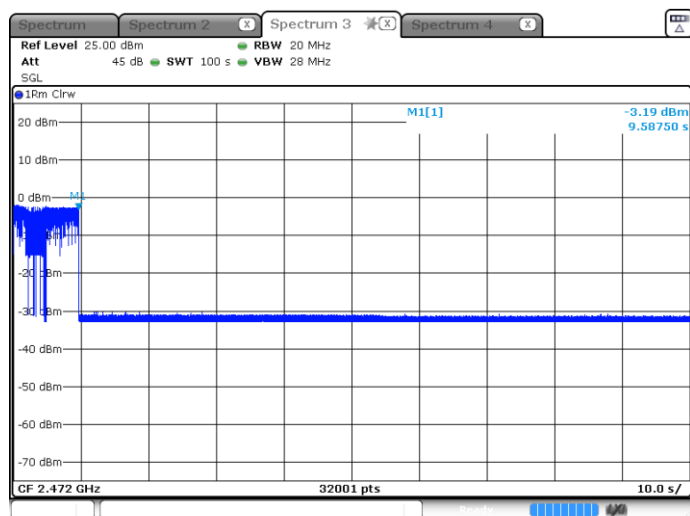
802.11b: Low Channel Step 3 Interferer on / Blocker on



802.11b: High Channel Short Signalling

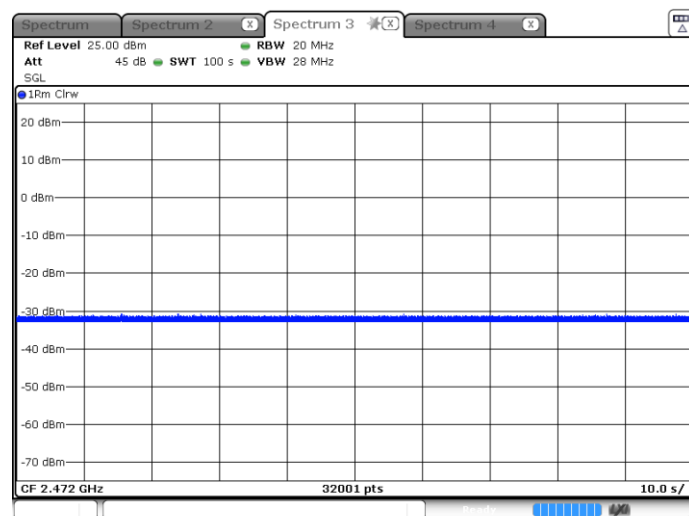


802.11b: High Channel Step 2 Interferer on / Blocker off



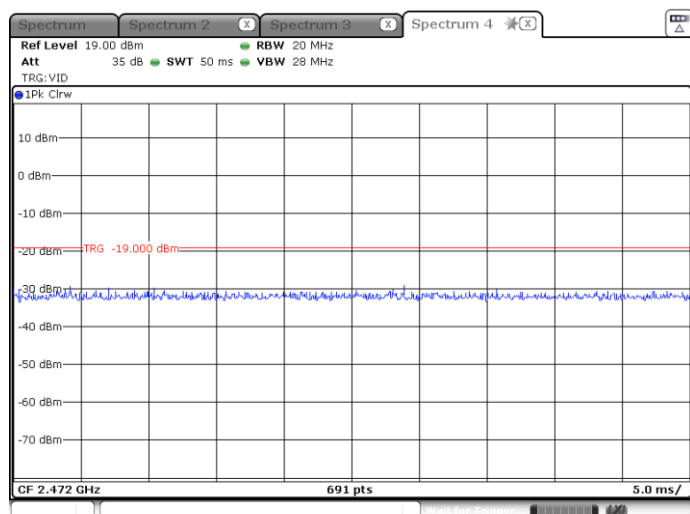
Date: 8 DEC. 2022 15:43:48

802.11b: High Channel Step 3 Interferer on / Blocker on



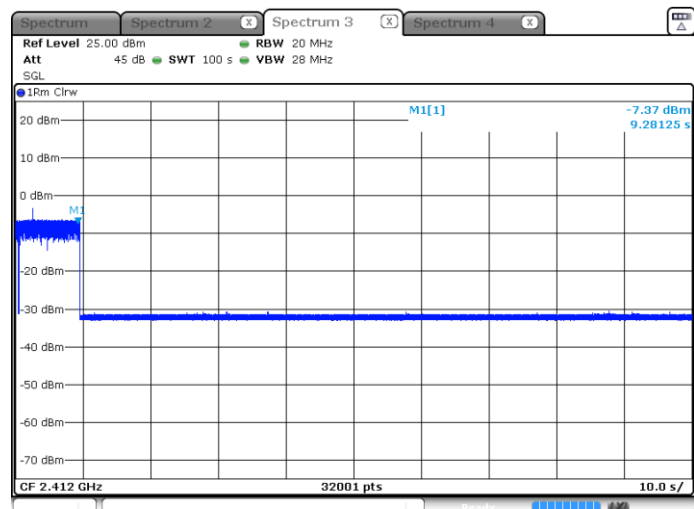
Date: 8 DEC. 2022 15:45:41

802.11b: High Channel Short Signalling



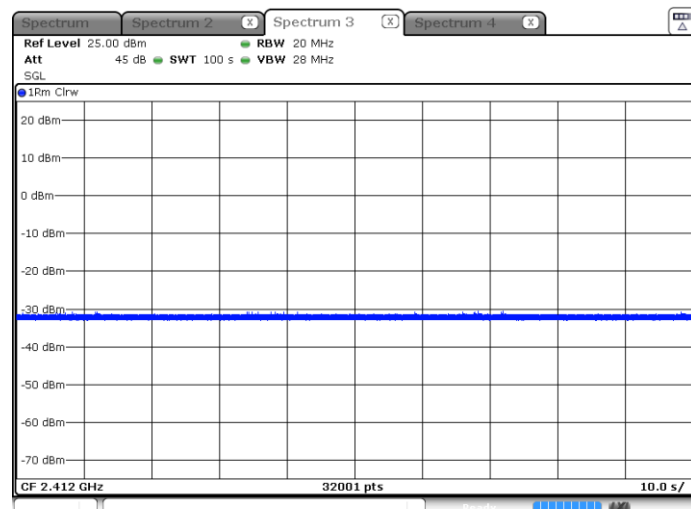
Date: 8 DEC. 2022 15:45:58

802.11g: Low Channel Step 2 Interferer on / Blocker off



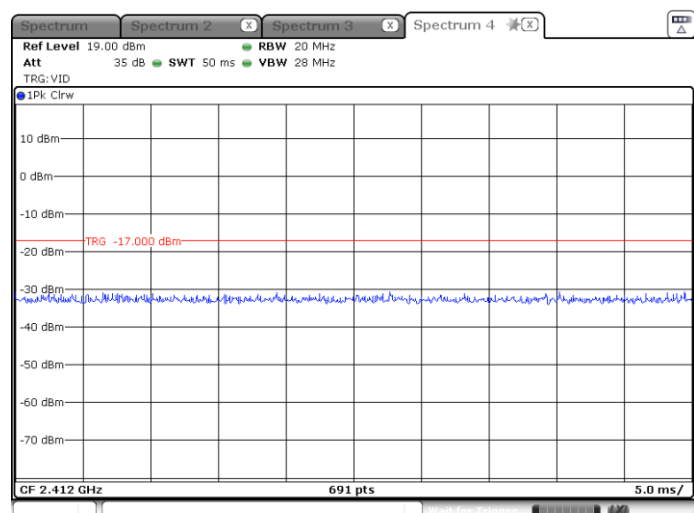
Date: 8 DEC.2022 15:21:12

802.11g: Low Channel Step 3 Interferer on / Blocker on



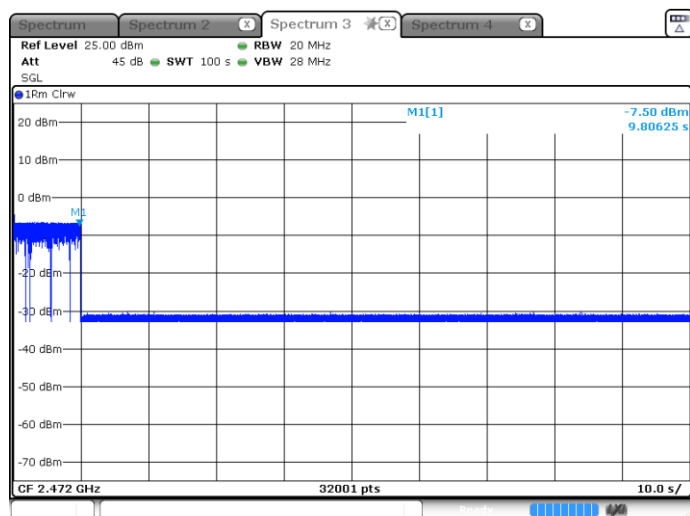
Date: 8 DEC.2022 15:23:44

802.11g: Low Channel Short Signalling



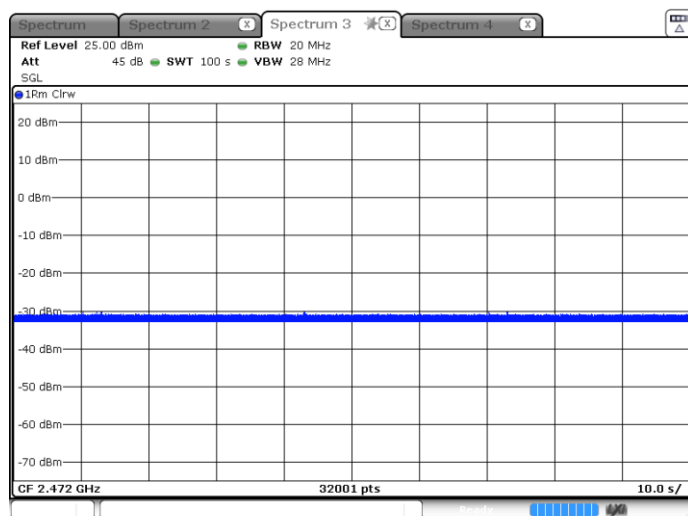
Date: 8 DEC.2022 15:24:12

802.11g: High Channel Step 2 Interferer on / Blocker off



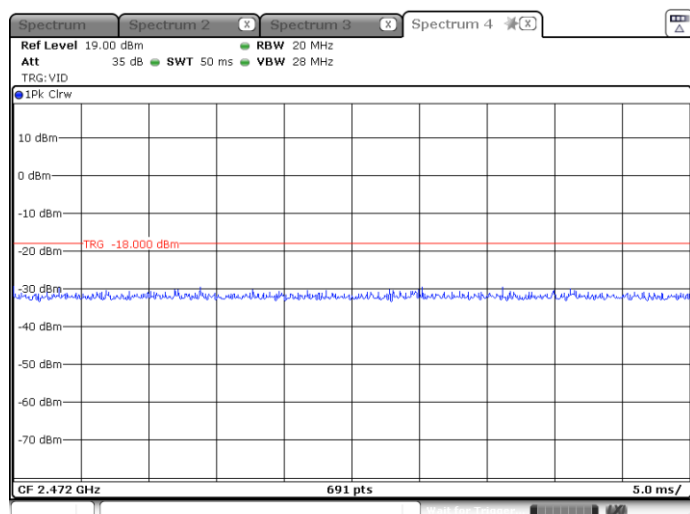
Date: 8 DEC. 2022 15:39:02

802.11g: High Channel Step 3 Interferer on / Blocker on



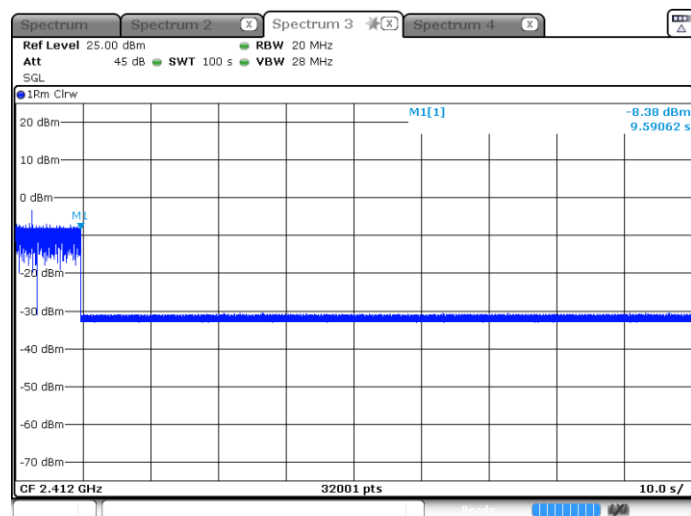
Date: 8 DEC. 2022 15:40:54

802.11g: High Channel Short Signalling

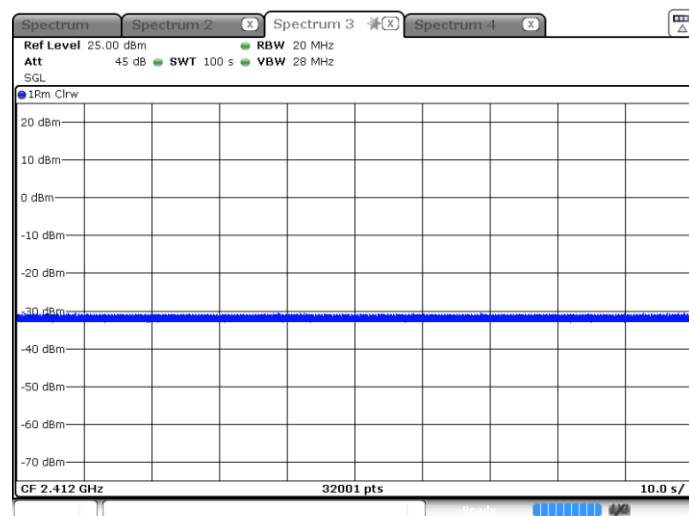


Date: 8 DEC. 2022 15:41:13

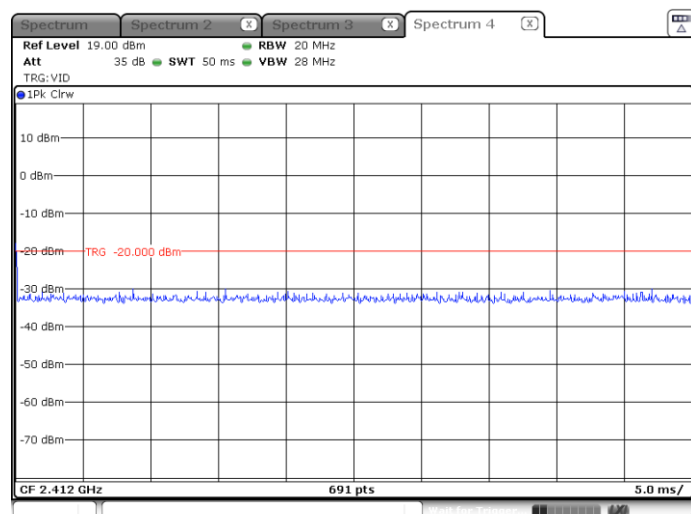
802.11n(20 MHz): Low Channel Step 2 Interferer on / Blocker off



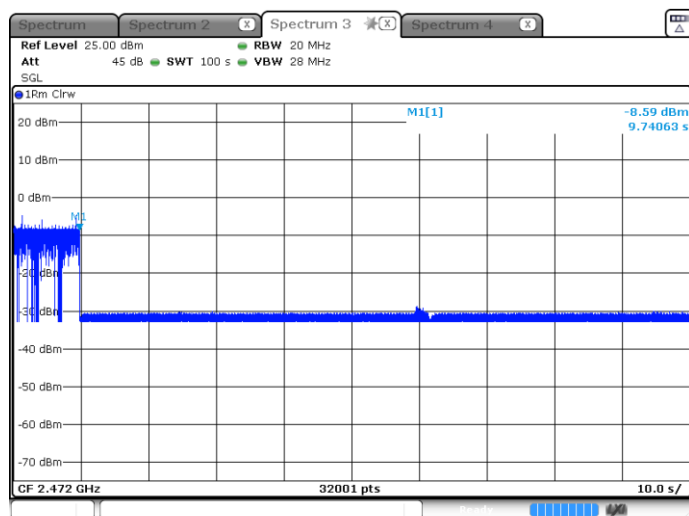
802.11n(20 MHz): Low Channel Step 3 Interferer on / Blocker on



802.11n(20 MHz): Low Channel Short Signalling

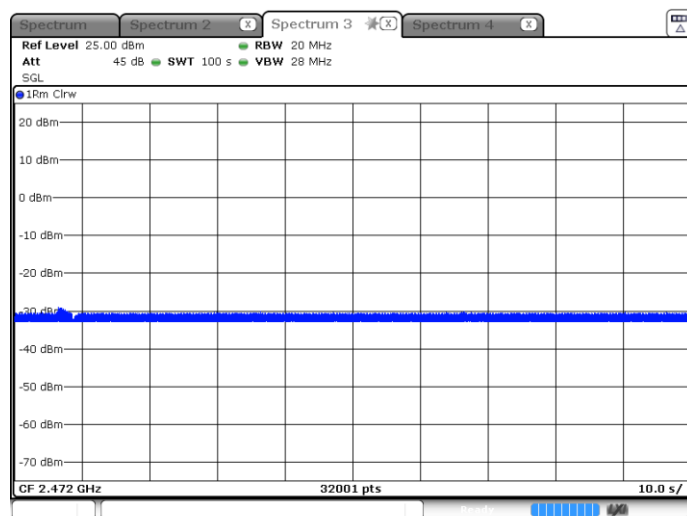


802.11n(20 MHz): High Channel Step 2 Interferer on / Blocker off



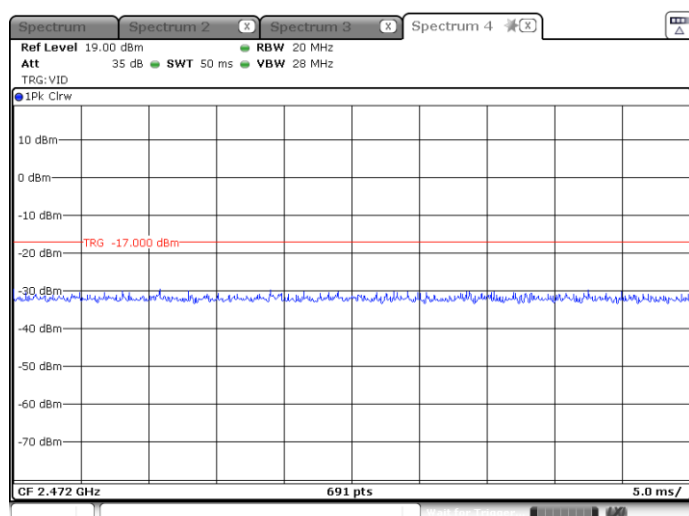
Date: 8 DEC. 2022 15:32:08

802.11n(20 MHz): High Channel Step 3 Interferer on / Blocker on



Date: 8 DEC. 2022 15:34:03

802.11n(20 MHz): High Channel Short Signalling



Date: 8 DEC. 2022 15:34:26

A.6 Occupied Channel Bandwidth

Measuring Parameter

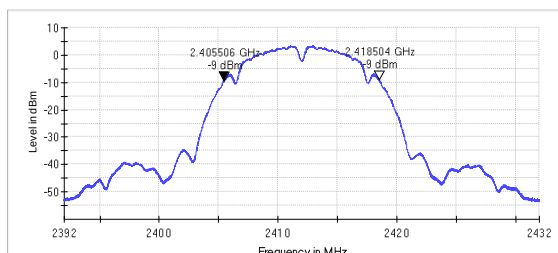
Centre Frequency	The centre frequency of the channel under test
RBW (MHz)	1 MHz
VBW (MHz)	3 MHz
Span (MHz)	40 MHz (for 20 MHz channel), 80 MHz (for 40 MHz channel)
Detector mode	RMS
Trace mode	Max Hold
Sweep time	Auto
Test Method	☐ Radiated ☒ Conducted

Test Data

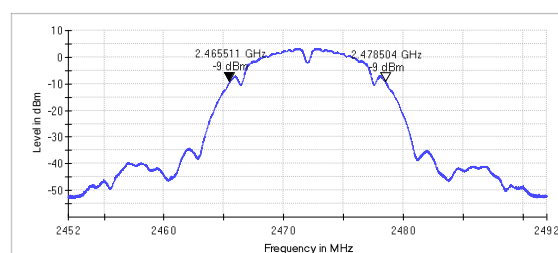
Test Conditions		Test Mode	DUT Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Lower Band Edge (MHz)	Upper Band Edge (MHz)	Limit (MHz)
Temperature	Voltage						
NT	NV	802.11b	2412	12.998375	2405.505812	2418.504187	Within
			2472	12.993376	2465.510811	2478.504187	The Band
		802.11g	2412	16.782902	2403.601050	2420.383952	2400
			2472	16.787902	2463.596051	2480.383952	MHz to
		802.11n (20 MHz)	2412	17.972753	2403.011124	2420.983877	2483.5
			2472	17.977753	2463.006124	2480.983877	MHz
Test Verdict		Pass					

Test Plots

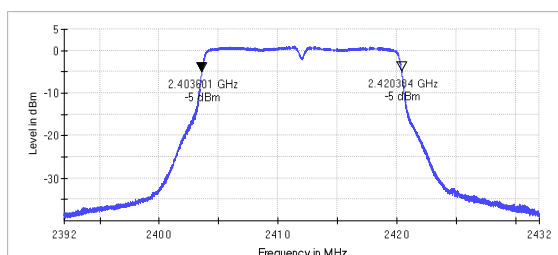
802.11b: Low Channel



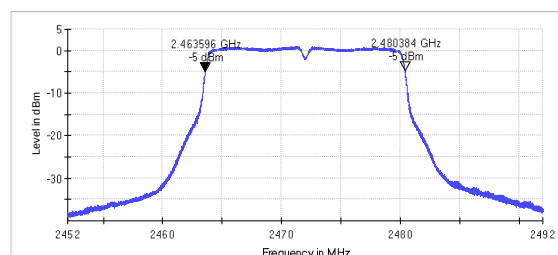
802.11b: High Channel



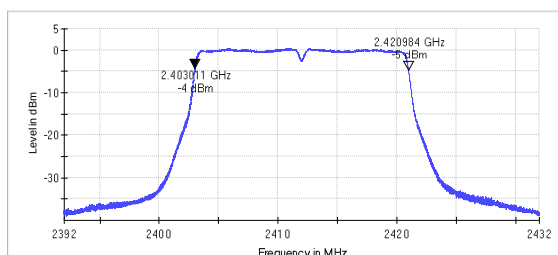
802.11g: Low Channel



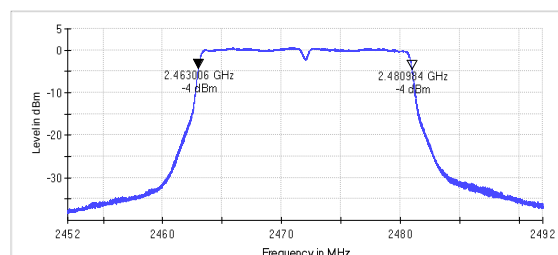
802.11g: High Channel



802.11n(20 MHz): Low Channel



802.11n(20 MHz): High Channel



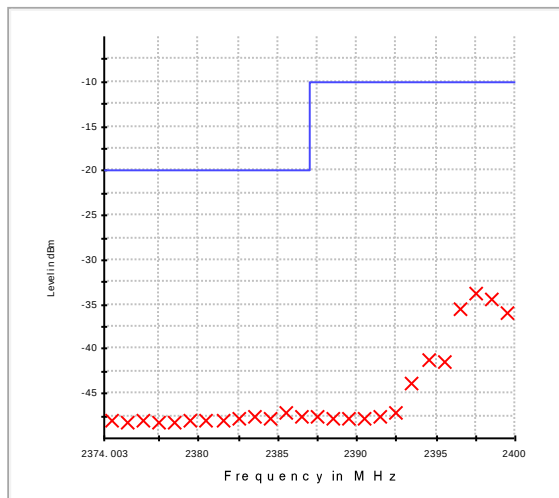
A.7 Transmitter unwanted emissions in the out-of-band domain

Test Data

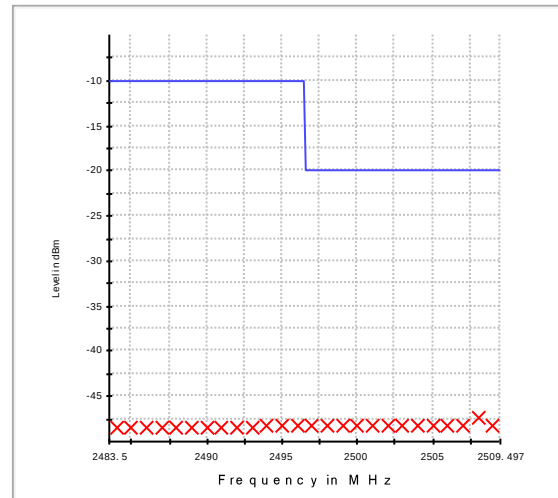
Test Method	Test Conditions		Test Mode	Frequency (MHz)	OOB Emission Worst level(dBm/MHz)	Limit(dBm /MHz)
	Temperature	Voltage				
☐ Radiated ☒ Conducted	NV	NT	802.11b	2412	-33.7	-10,-20
				2472	-35.3	-10,-20
			802.11g	2412	-28.2	-10,-20
				2472	-25.0	-10,-20
			802.11n (20 MHz)	2412	-28.5	-10,-20
				2472	-24.6	-10,-20
Test Verdict			Pass			

Test Plots

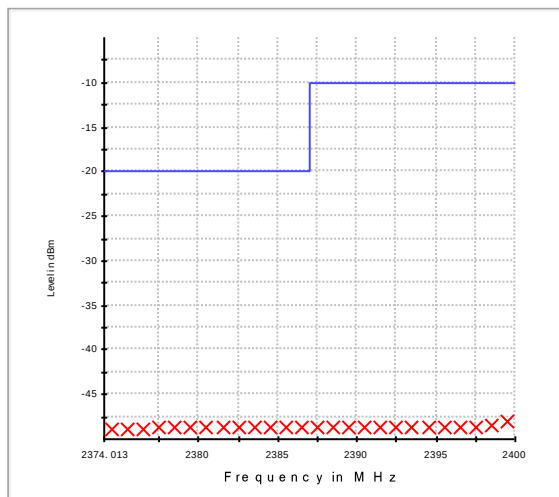
802.11b: Low frequency (Part 1)



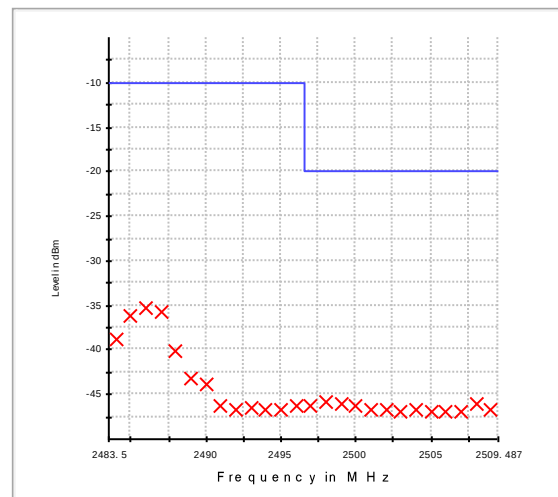
802.11b: Low frequency (Part 2)



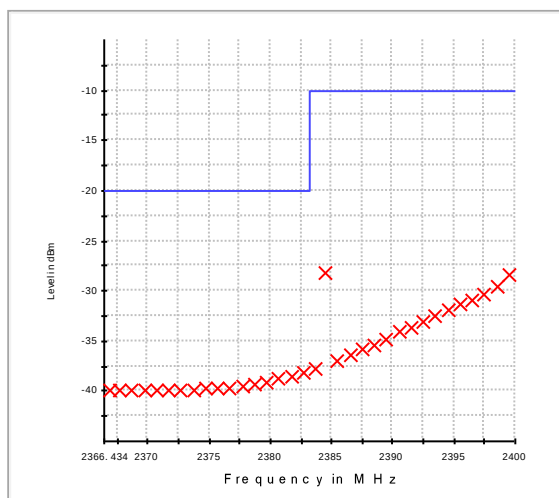
802.11b: High frequency (Part 1)



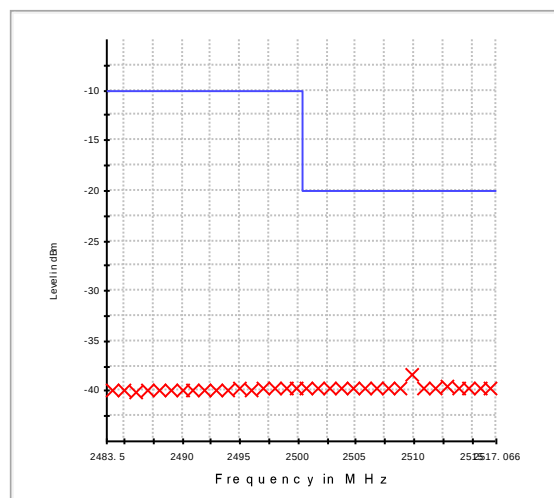
802.11b: High frequency (Part 2)



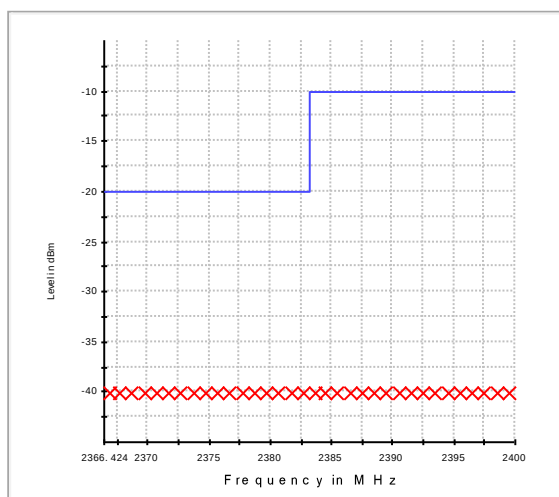
802.11g: Low frequency (Part 1)



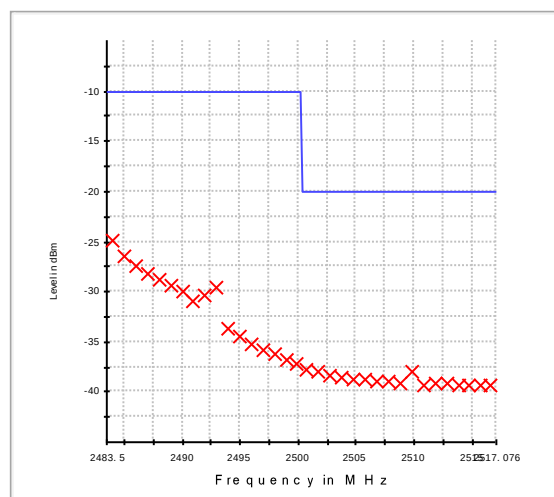
802.11g: Low frequency (Part 2)



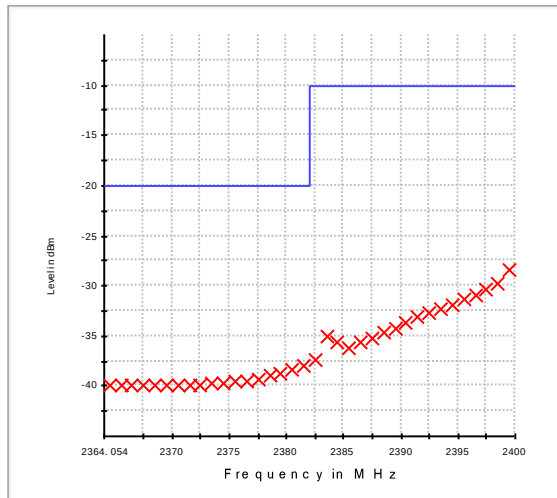
802.11g: High frequency (Part 1)



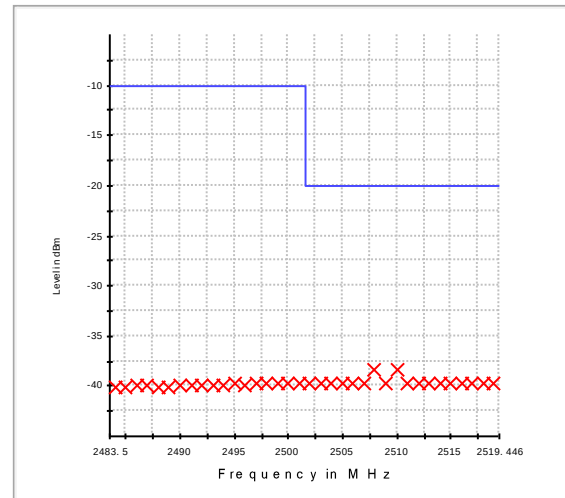
802.11g: High frequency (Part 2)



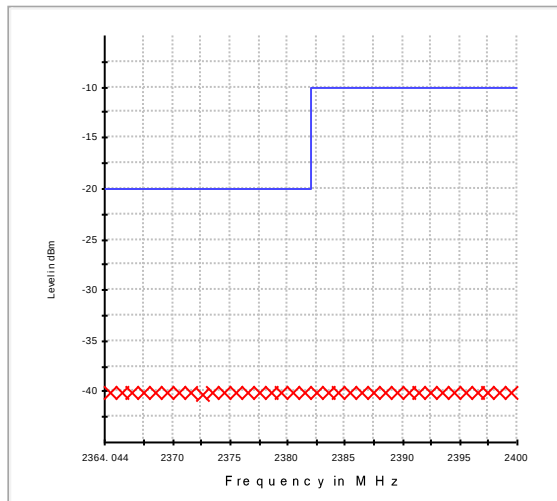
802.11n(20 MHz): Low frequency (Part 1)



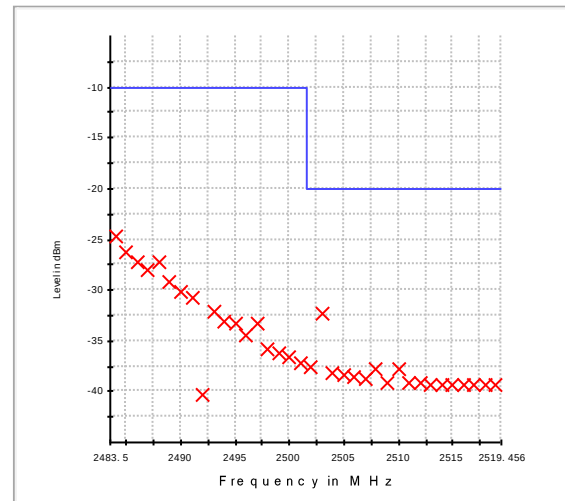
802.11n(20 MHz): Low frequency (Part 2)



802.11n(20 MHz): High frequency (Part 1)



802.11n(20 MHz): High frequency (Part 2)



A.8 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.

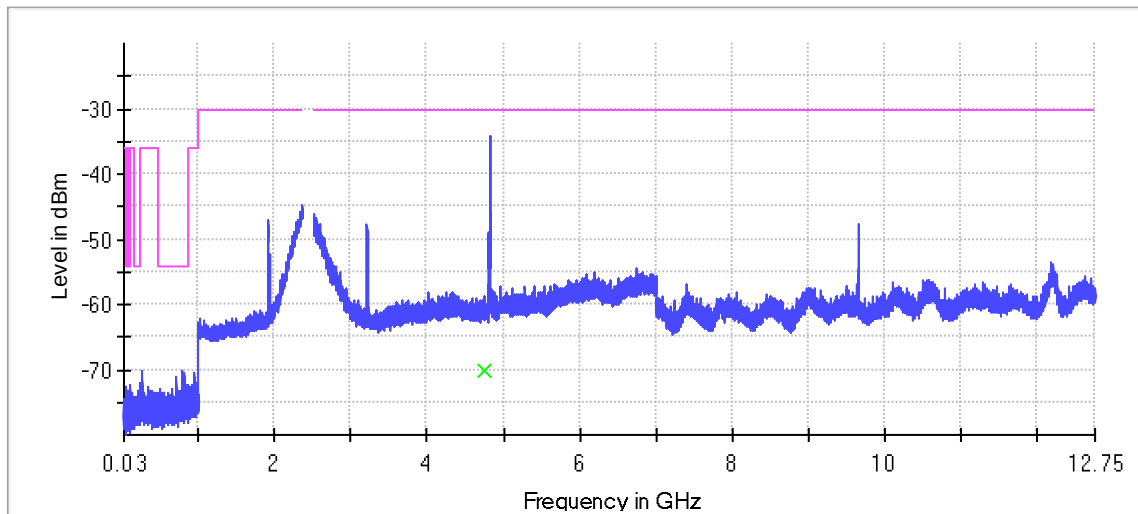
Note 3: The cabinet radiated test data is tested in the normal working mode of the product.

Measuring Parameter

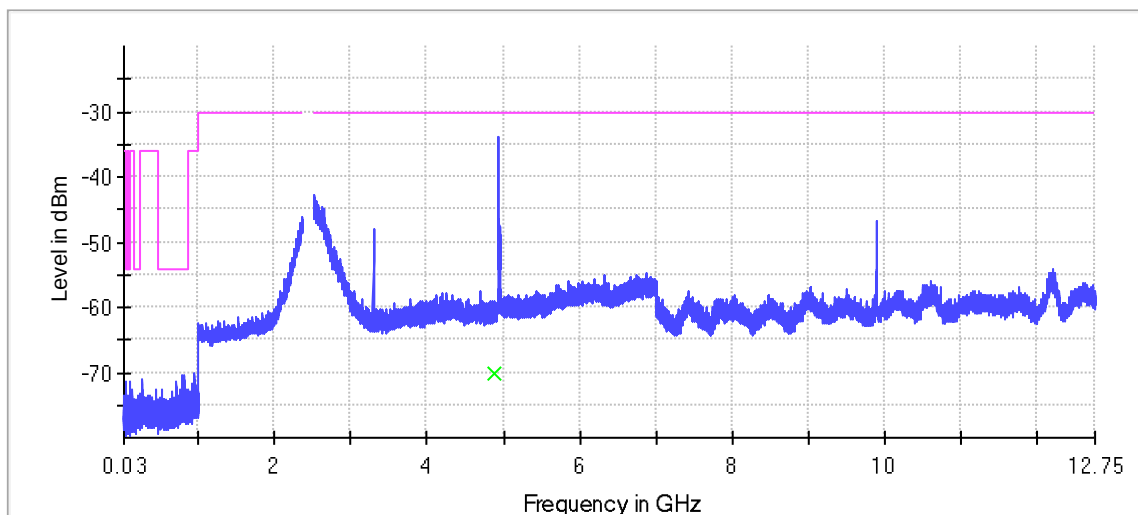
Frequency Range		
30 MHz to 1 000 MHz	RBW (MHz)	100 kHz
	VBW (MHz)	300 kHz
	Sweep points	9970
	Detector mode	Peak
	Trace mode	Max Hold
1 GHz to 12,75 GHz	RBW (MHz)	1 MHz
	VBW (MHz)	3 MHz
	Sweep points	11750
	Detector mode	Peak
	Trace mode	Max Hold

Conducted Test Data

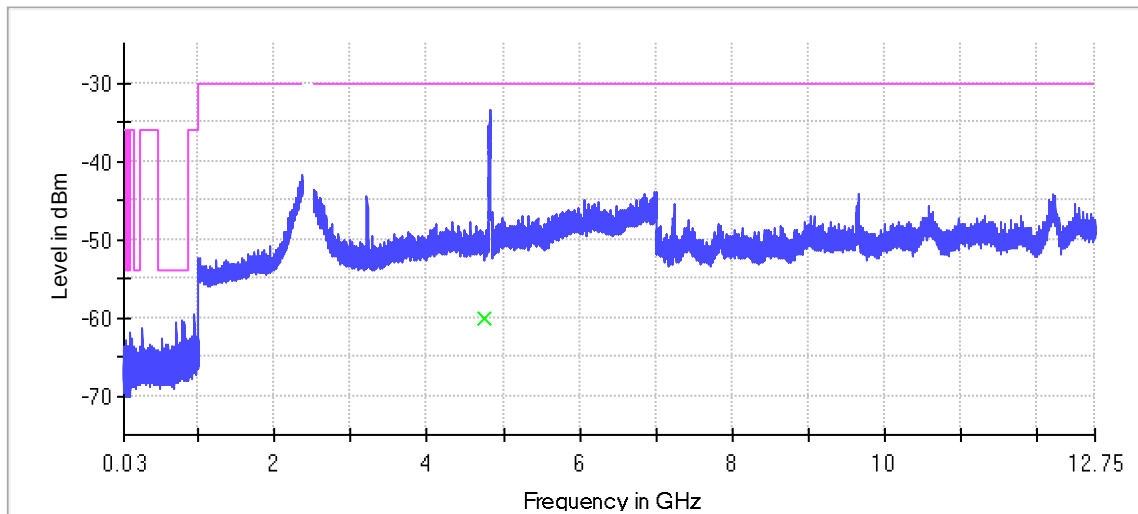
802.11b Low Frequency



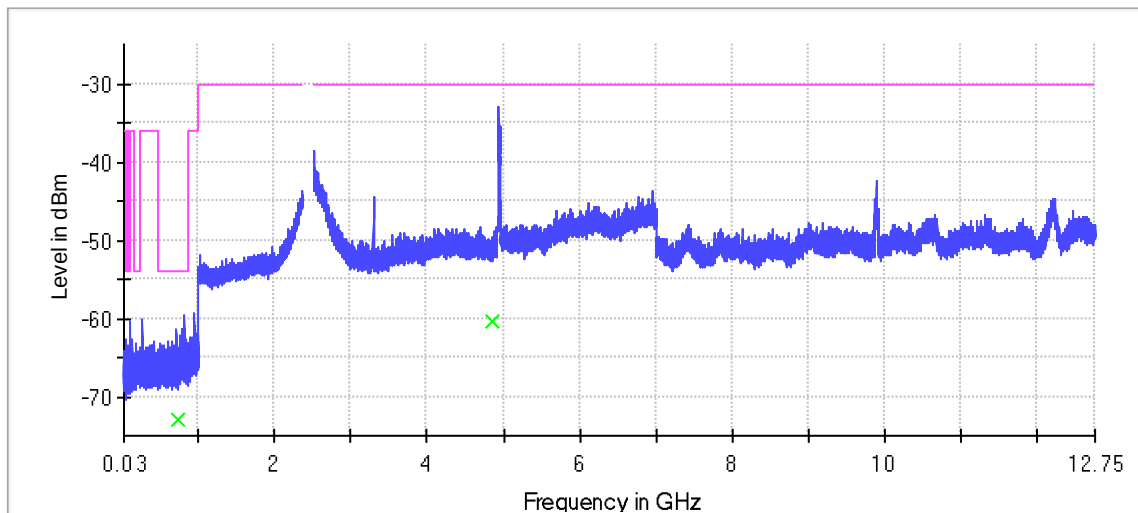
802.11b High Frequency



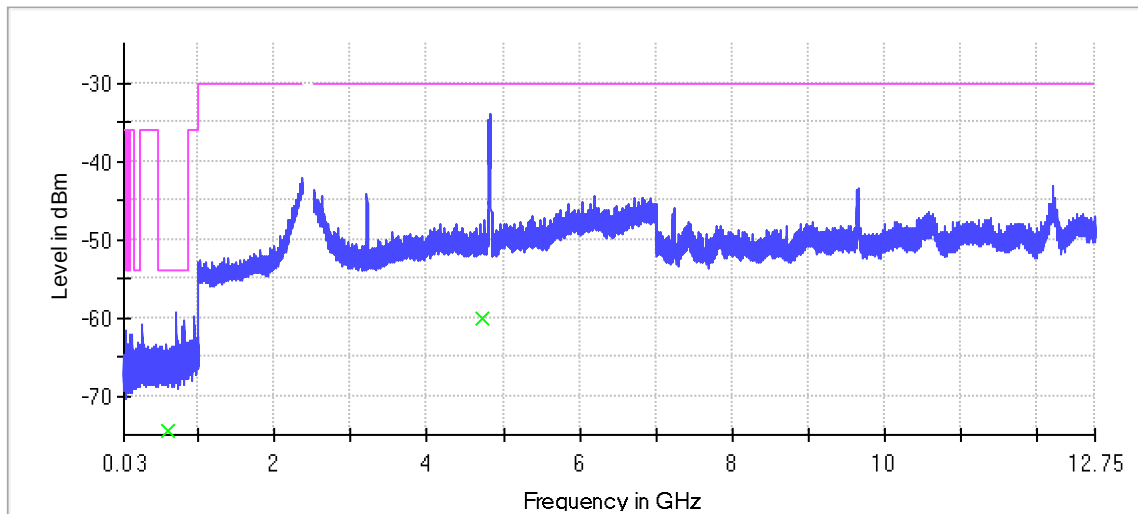
802.11g Low Frequency



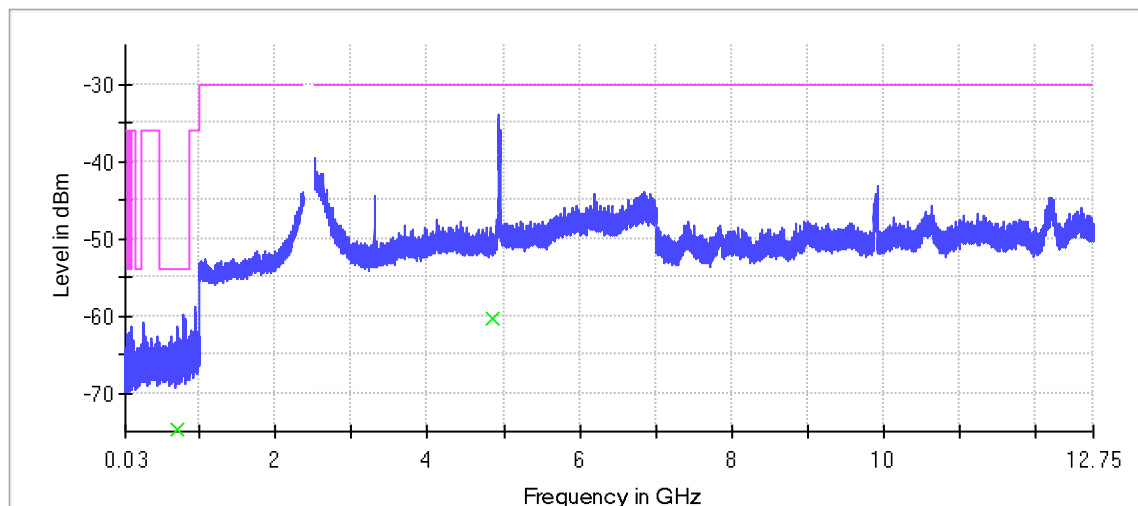
802.11g High Frequency



802.11n20 Low Frequency



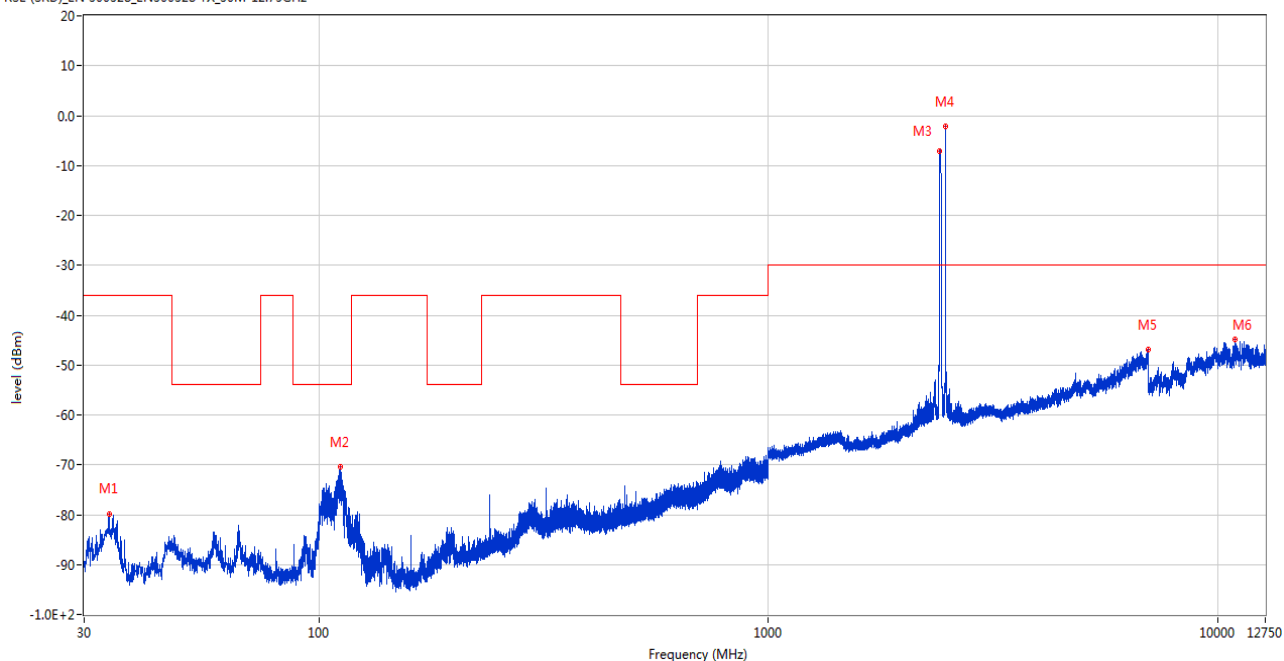
802.11n20 High Frequency



Cabinet Radiation Test Data

30 MHz to 12.75 GHz, ANT H

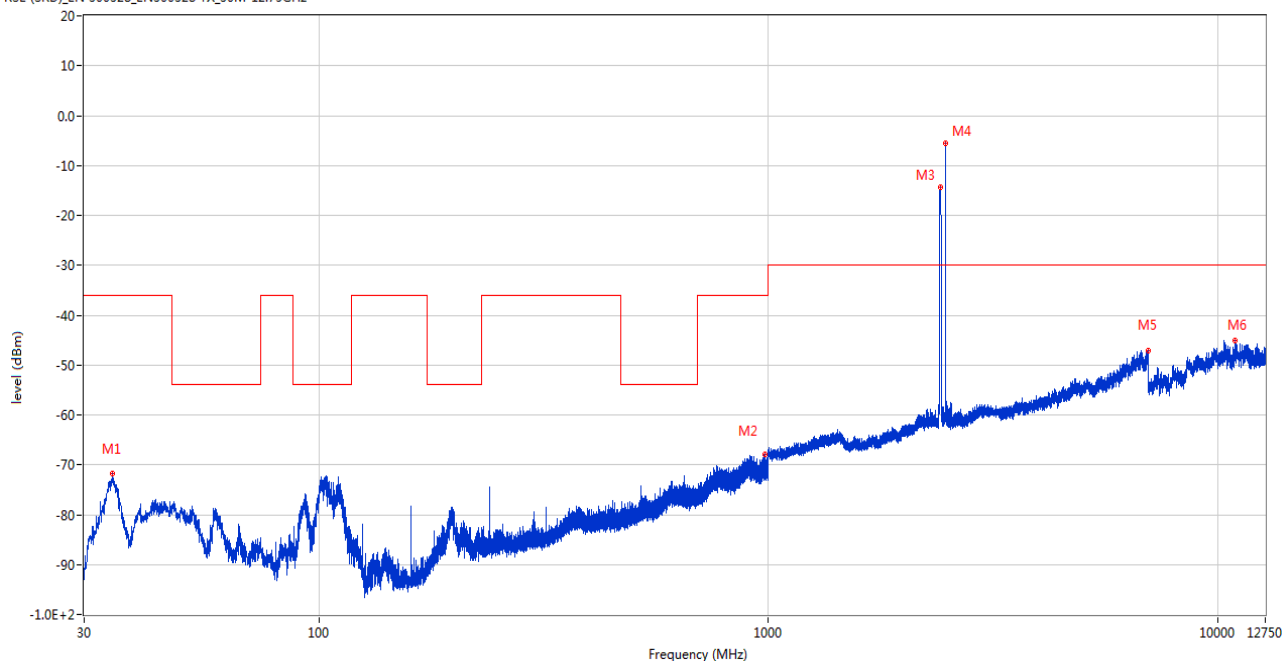
RSE (SRD)_EN 300328_EN300328 TX_30M-12.75GHz



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
34.074	-79.80	-20.09	-36.0	43.80	263.00	Horizontal	Horizontal	Pass
111.529	-70.29	-19.93	-54.0	16.29	219.00	Horizontal	Horizontal	Pass
2405.600	-7.16	-0.93	-30.0	-22.84	353.00	Horizontal	Horizontal	N/A
2479.800	-2.20	-1.41	-30.0	-27.80	325.00	Horizontal	Horizontal	N/A
6995.400	-46.94	15.18	-30.0	16.94	140.00	Horizontal	Horizontal	Pass
10936.162	-44.96	18.56	-30.0	14.96	159.00	Horizontal	Horizontal	Pass

30 MHz to 12.75 GHz, ANT V

RSE (SRD)_EN 300328_EN300328 TX_30M-12.75GHz



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
34.753	-71.82	-20.14	-36.0	35.82	233.00	Vertical	Horizontal	Pass
983.655	-67.86	3.21	-36.0	31.86	70.00	Vertical	Horizontal	Pass
2414.300	-14.36	-0.66	-30.0	-15.64	24.00	Vertical	Horizontal	N/A
2480.000	-5.50	-1.40	-30.0	-24.50	304.00	Vertical	Horizontal	N/A
6983.200	-47.03	15.43	-30.0	17.03	94.00	Vertical	Horizontal	Pass
10919.487	-44.98	18.97	-30.0	14.98	326.00	Vertical	Horizontal	Pass

A.9 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.

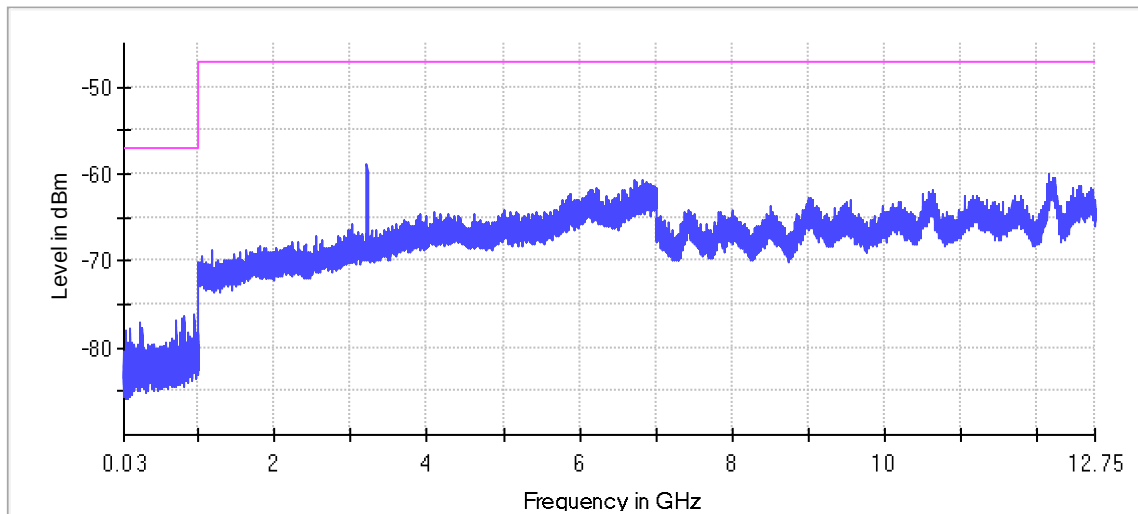
Note 3: The cabinet radiated test data is tested in the normal working mode of the product.

Measuring Parameter

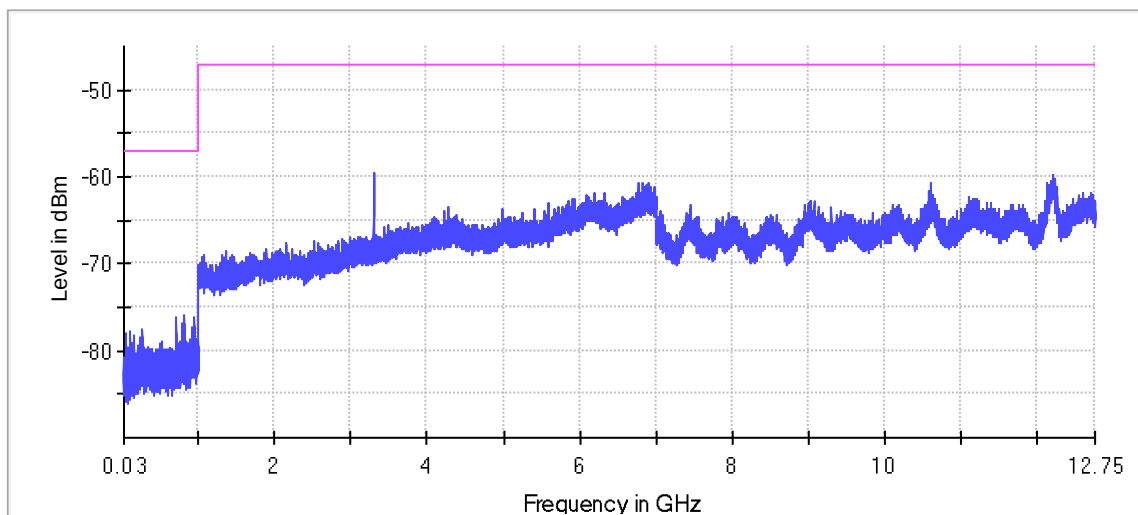
Frequency Range		
30 MHz to 1 000 MHz	RBW (MHz)	100 kHz
	VBW (MHz)	300 kHz
	Sweep points	9970
	Detector mode	Peak
	Trace mode	Max Hold
1 GHz to 12,75 GHz	RBW (MHz)	1 MHz
	VBW (MHz)	3 MHz
	Sweep points	11750
	Detector mode	Peak
	Trace mode	Max Hold

Conducted Test Data

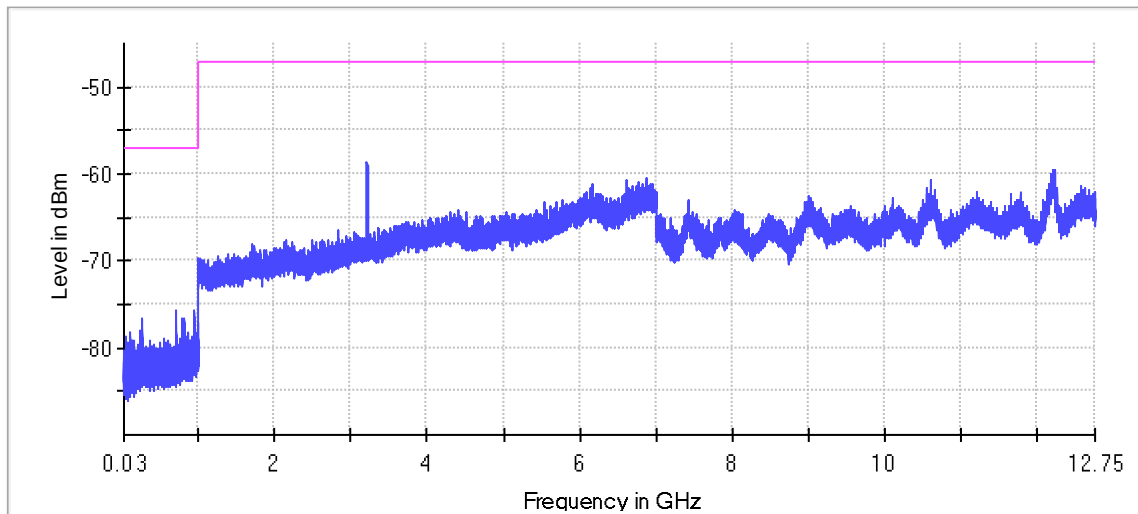
802.11b Low Frequency



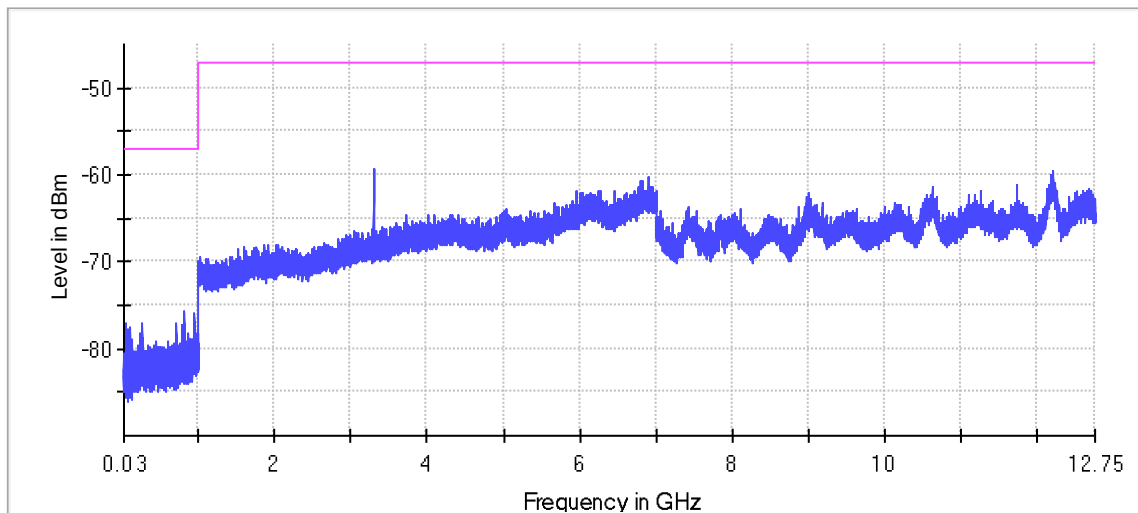
802.11b High Frequency



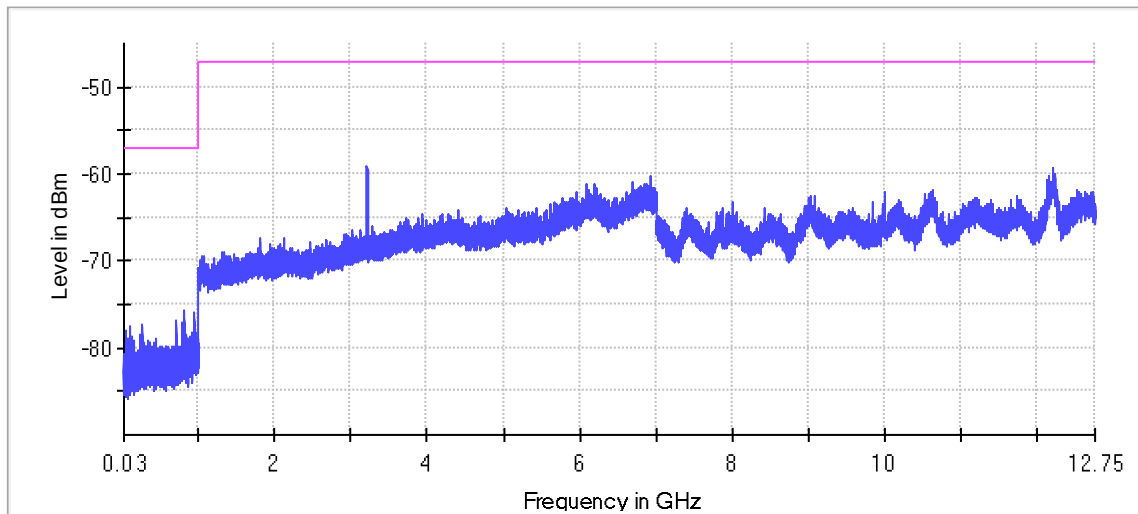
802.11g Low Frequency



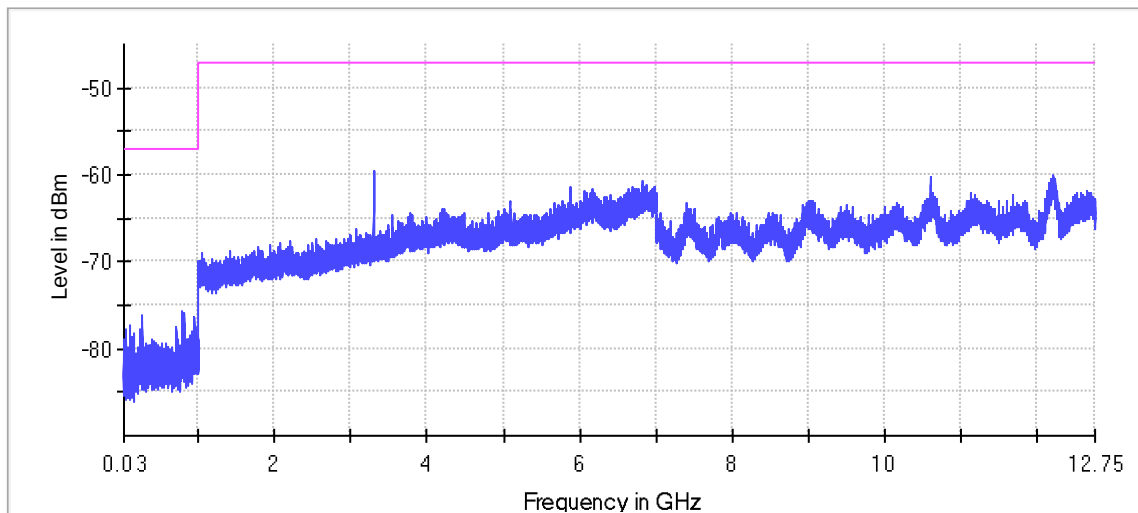
802.11g High Frequency



802.11n20 Low Frequency



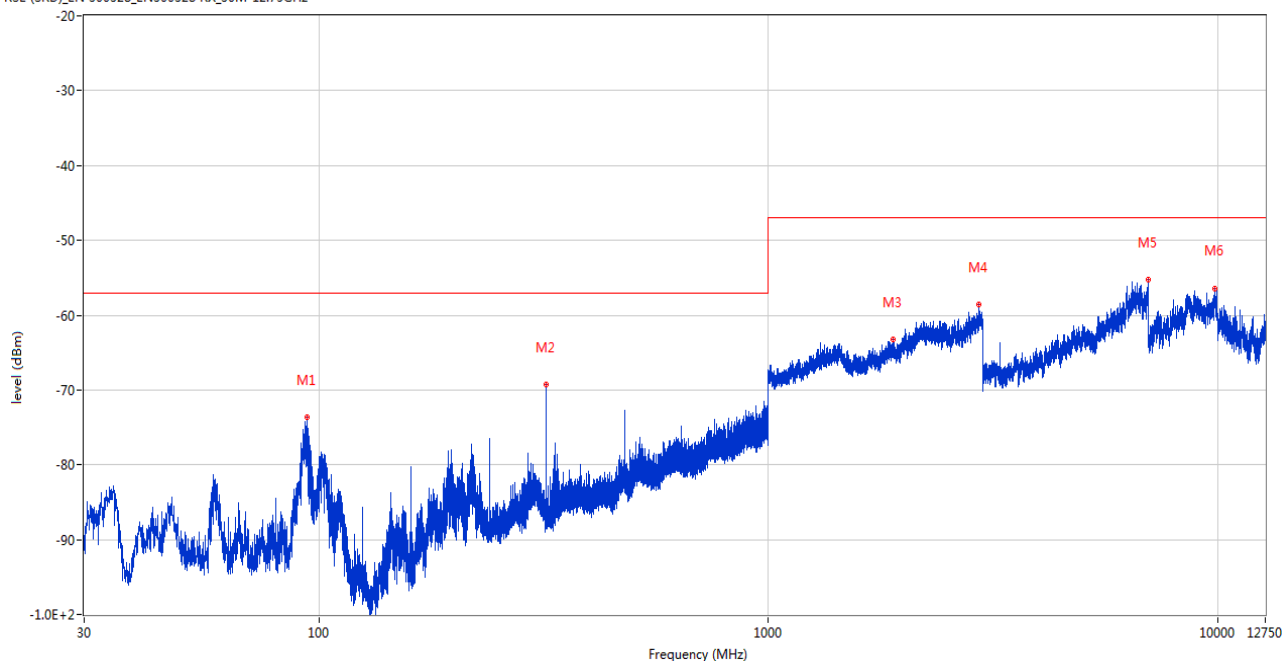
802.11n20 High Frequency



Cabinet Radiation Test Data

30 MHz to 12.75 GHz, ANT H

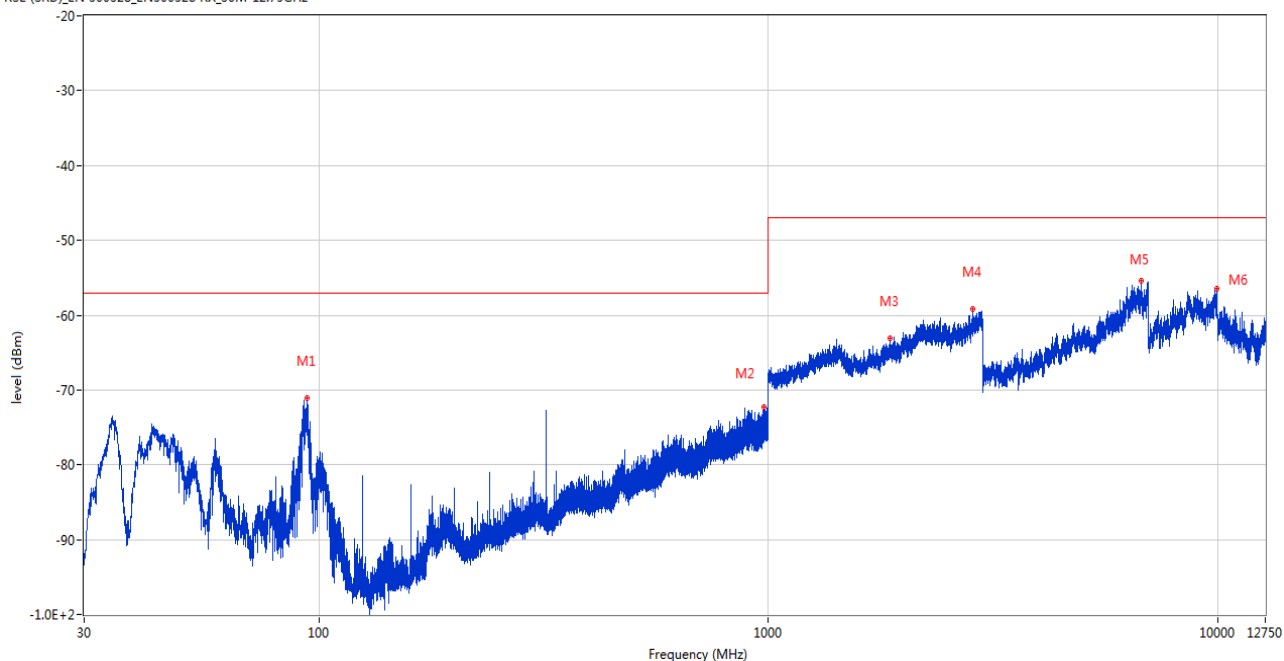
RSE (SRD)_EN 300328_EN300328 RX_30M-12.75GHz



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
94.020	-73.62	-19.16	-57.0	16.62	182.00	Horizontal	Horizontal	Pass
319.982	-69.24	-11.23	-57.0	12.24	204.00	Horizontal	Horizontal	Pass
1889.800	-63.20	-4.41	-47.0	16.20	315.00	Horizontal	Horizontal	Pass
2942.900	-58.58	1.79	-47.0	11.58	250.00	Horizontal	Horizontal	Pass
6997.000	-55.26	6.72	-47.0	8.26	263.00	Horizontal	Horizontal	Pass
9870.401	-56.39	6.63	-47.0	9.39	99.00	Horizontal	Horizontal	Pass

30 MHz to 12.75 GHz, ANT V

RSE (SRD)_EN 300328_EN300328 RX_30M-12.75GHz



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
93.826	-71.08	-19.15	-57.0	14.08	152.00	Vertical	Horizontal	Pass
977.641	-72.31	3.34	-57.0	15.31	306.00	Vertical	Horizontal	Pass
1868.100	-63.06	-4.52	-47.0	16.06	97.00	Vertical	Horizontal	Pass
2855.300	-59.19	0.83	-47.0	12.19	235.00	Vertical	Horizontal	Pass
6736.400	-55.44	7.24	-47.0	8.44	161.00	Vertical	Horizontal	Pass
9946.299	-56.49	6.84	-47.0	9.49	93.00	Vertical	Horizontal	Pass

A.10 Receiver Blocking

Test Data

Note 1: 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 2: During the Blocking test, the number of packets sent by the system is 1000.

802.11b:

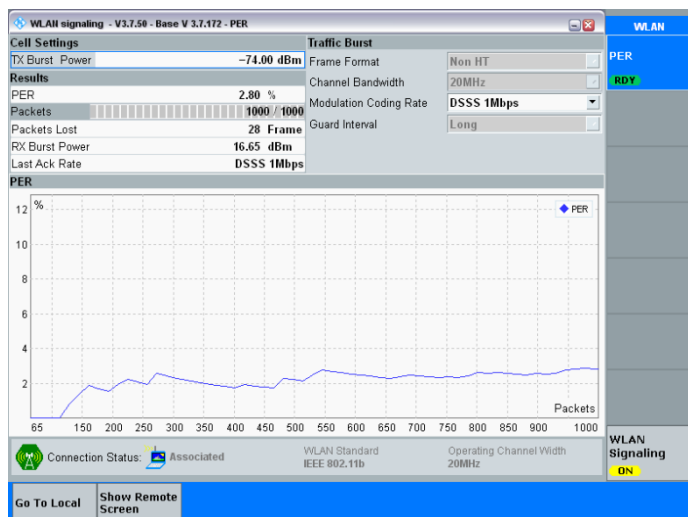
Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal Frequency (MHz)	Blocking signal power (dBm) (see note 1)	PER Result		Limit	Verdict
			Low channel	High channel		
(-133 dBm + $10 \times \log_{10}(\text{OCBW})$) or -68 dBm whichever is less	2 380	-34	0.40%	0.00%	$\leq 10\%$	Pass
	2 504	-34	0.50%	0.00%		
(-139 dBm + $10 \times \log_{10}(\text{OCBW})$) or -74 dBm whichever is less	2 300	-34	0.00%	0.00%		
	2 330	-34	0.00%	1.40%		
	2 360	-34	0.60%	0.10%		
	2 524	-34	2.80%	2.40%		
	2 584	-34	0.20%	0.20%		
	2 674	-34	0.00%	2.90%		

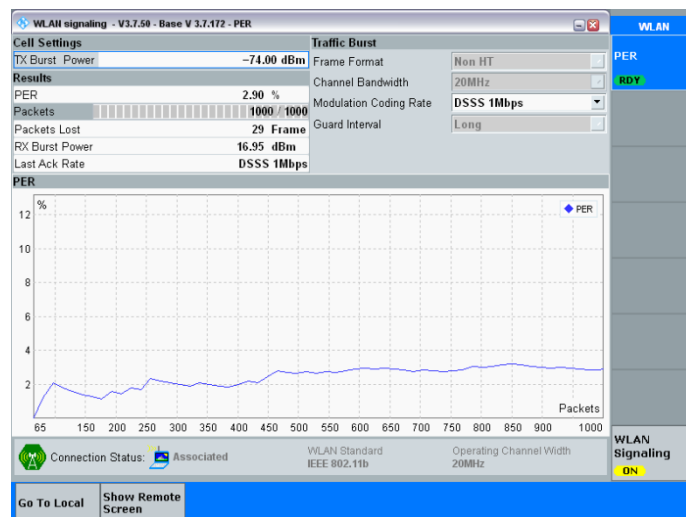
Test Plot (PER)

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

802.11b: Low Channel



802.11b: High Channel



ANNEX B TEST SETUP PHOTOS

Please refer to the document “BL-SZ22B1240-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer to the document “BL-SZ22B1240-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer to the document “BL-SZ22B1240-AI.PDF”.

ANNEX E INFORMATIVE

Application form for testing please refer to the document “BL-SZ22B1240-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 Hub 2
Model Name: W3202100
Brand Name: SwitchBot
Test Standard: EN IEC 62311: 2020
Sample Arrival Date: Dec. 02, 2022
Test Date: Dec. 05, 2022 - Dec. 13, 2022
Date of Issue: Dec. 19, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Chen Huiming**Checked by:** Xu Rui**Approved by:** Wei Yanquan
(Chief Engineer)

Revision History

<u>Version</u>	<u>Issue Date</u>	<u>Revisions Content</u>
<u>Rev. 01</u>	<u>Dec. 19, 2022</u>	<u>Initial Issue</u>

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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 Factory Information

Factory	Woan Technology (Shenzhen) Co., Ltd.
Address	Building A2, Zhengfeng Industrial Area, No.610 Fengtang Boulevard, Fuhai Sub-district, Bao'an District, Shenzhen

2.4 General Description for Equipment under Test (EUT)

EUT Name	SwitchBot Hub 2
Model Name Under Test	W3202100
Series Model Name	W3202101, W3202102, W3202103, W3202104, W3202105, W3202106
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name. (this information provided by the customer)
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Note: Not applicable.

2.6 Technical Information

Network and Wireless connectivity	Bluetooth (BLE) 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20)

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

Operating Mode	2.4G WLAN, Bluetooth	
Frequency Range	802.11b/g	2400 ~ 2483.5 MHz
	802.11n(HT20)	2400 ~2483.5 MHz
	Bluetooth	2400 ~ 2483.5 MHz
Antenna Type	WLAN	IFA
	Bluetooth	IFA
Exposure Category	General Population/Uncontrolled Exposure	
EUT Stage	Mobile Device	

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	EN IEC 62311: 2020	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

4 DEVICE CATEGORY AND LEVELS LIMITS

The field calculation does not take into account the antenna size, which is assumed to be a point source. An ideal isotropic antenna is used as a reference to compare the performance of practical antennas: P watts is radiated, from a point, uniformly over the surface of sphere of radius r . The POINTING VECTOR gives the power density:

Assumed use distance from EUT to Human, **20 cm** separation distance warning is required. In this section, the power density at 20 cm location is calculated to examine if it is lower than the limit.

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = power density

P = output power (W)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Separation distance between radiator and human body (m)

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.

Compliance criteria

The electronic and electrotechnical apparatus shall comply with the basic restriction as specified in Annex II of Council Recommendation 1999/519/EC.

1999/519/EC Limit

Reference levels for electric, magnetic and electromagnetic fields
(0 Hz to 300 GHz, unperturbed rms values)

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density S_{eq} (W/m ²)
0-1 Hz	—	$3,2 \times 10^4$	4×10^4	—
1-8 Hz	10 000	$3,2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
8-25 Hz	10 000	$4\,000/f$	$5\,000/f$	—
0,025-0,8 kHz	$250/f$	$4/f$	$5/f$	—
0,8-3 kHz	$250/f$	5	6,25	—
3-150 kHz	87	5	6,25	—
0,15-1 MHz	87	$0,73/f$	$0,92/f$	—
1-10 MHz	$87/f^{1/2}$	$0,73/f$	$0,92/f$	—
10-400 MHz	28	0,073	0,092	2
400-2 000 MHz	$1,375\ f^{1/2}$	$0,0037\ f^{1/2}$	$0,0046\ f^{1/2}$	$f/200$
2-300 GHz	61	0,16	0,20	10

5 ASSESSMENT RESULT

5.1 Output Power

Mode	Bluetooth	WLAN
EIRP (dBm)	2.00	19.80
Note: This report listed the maximal case power value, please refer to BL-SZ22B1240-601 & BL-SZ22B1240-602 report for more details.		

5.2 Assessment Result

Mode	EIRP(dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (W/m ²)	Limit of Power Density (W/m ²)	S/Slimit	Verdict
Bluetooth	2.00	3.66	20	0.003	10.000	0.0003	Pass
WLAN	19.80	3.20	20	0.190	10.000	0.0190	Pass

Collocated Power Density Calculation

Evolution mode	Frequency(MHz)	S/Slimit	Σ (S/Slimit)	Verdict
Bluetooth	2480	0.0003	0.0193	Pass
WLAN	2472	0.0190		Pass

Note:

- Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power Density limit)], for Bluetooth +WLAN.
- Both of the 2.4GHz can transmit simultaneously, the formula of calculated the Power Density is $CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$
 CPD = Calculation power density
 LPD = Limit of power density
- The worst-case situation is 0.0193, which is less than "1". This confirmed that the device comply with Council Recommendation 199-519-EC Power Density limit.
- More power list please refer to RF test report.

5.3 Conclusion

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.
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--END OF REPORT--