TEST REPORT

of

RE Directive (2014/53/EU)
ETSI EN 300 328 v2.2.2

Product:	**Bluetooth 5.3 module**
Brand:	**Fanstel**
Model:	**BT840N; BT840NE**
Model Difference:	**Antenna. Please see page 6 for detail**
Applicant:	**Fanstel Corporation, Taipei**
Address:	**10F-10, No. 79, Sec. 1, Hsin Tai Wu Rd., Hsi-Chih, New Taipei City 221 Taiwan**

Test Performed by:

International Standards Laboratory Corp. LT Lab.
TEL: +886-3-263-8888 FAX: +886-3-263-8899
No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan

Report No.: **ISL-23LR0074E328**
Issue Date :**2023/09/11**

Testing Laboratory
0997

VERIFICATION OF COMPLIANCE

Applicant:	Fanstel Corporation, Taipei
Equipment Under Test:	Bluetooth 5.3 module
Brand Name:	Fanstel
Model Number:	BT840N; BT840NE
Model Different:	Antenna. Please see page 6 for detail
Date of Test:	2023/05/30 ~ 2023/09/11
Date of EUT Received:	2023/05/30

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
ETSI EN 300 328 V2.2.2	Compliance

The above equipment was tested by International Standards Laboratory Corp. for compliance with the requirements set forth in the European Standard ETSI EN 300 328 V2.2.2 under article 3.2 of RE Directive 2014/53/EU & The Radio Equipment Regulations 2017 of UK. The results of testing in this report apply to the product/system that was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties. The antenna specification is provided by the applicant, and ISL does not bear the relevant responsibility.

Test By:	Weitin Chen	***Date:***	2023/09/11
	Weitin Chen / Senior Engineer		
Prepared By:	Gigi yeh	***Date:***	2023/09/11
	Gigi Yeh / Senior Engineer		
Approved By:	Jerry Liu	***Date:***	2023/09/11
	Jerry Liu / Manager		

Version

Version No.	Date	Description
00	2023/09/11	Initial creation of document

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1. Description of Equipment under Test (EUT)

General Information	
Product Name:	Bluetooth 5.3 module
Brand Name:	Fanstel
Model Name:	BT840N; BT840NE
Model Difference:	Antenna. Please see table below for detail.
Temperature Range	-40°C to +105°C
Power Supply:	5Vdc
BLE Information	
Frequency Range:	2402 – 2480MHz
Max Output Power:	8.04dBm
Channel number:	40 channels
Modulation type:	GFSK
IEEE 802.15.4 (Thread, Zigbee) Information	
Frequency Range:	2405 – 2480MHz
Max Output Power:	9.57dBm
Channel number:	16 channels
Modulation type:	FSK

	Antenna Type	Brand	Model	Peak Gain	Frequency Range	Connector Type
1	Dipole	Fanstel	ANT000	0dBi	2400-2485 MHz	MMCX
2	PCB	Fanstel	F type	0.88dBi	2400-2485 MHz	MMCX

Model Summaries

module	BT840N	BT840NE
SoC	nRF52840	nRF52840
Size, mm	15x29.9x2.0	15x29.9x2.0
32M,32.768kHz crystals	Integrated	Integrated
DCDC inductors,VDD,VDDH	Integrated	Integrated
BT Antenna	PA+PCB	PA+PCB+u.FL
Operating temp.	-40oC to +85oC	-40oC to +85oC
Evaluation board	EV-BT840NE	EV-BT840NE

IEEE 802.15.4 (Thread, Zigbee) channels

Center Frequency (MHz)
2405MHz
2410MHz
2415MHz
2420MHz
2425MHz
2430MHz
2435MHz
2440MHz
2445MHz
2450MHz
2455MHz
2460MHz
2465MHz
2470MHz
2475MHz
2480MHz

This test report applies for Bluetooth BLE and IEEE 802.15.4 (Thread, Zigbee).

Remark: The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

2. Description of Test Modes

The EUT has been tested under Operating condition. To control the EUT for staying in continuous transmitting and receiving mode is programmed.

IEEE 802.15.4 (Thread, Zigbee): Lowest (2405MHz), Mid (2445MHz) and Highest (2480MHz) mode.

Normal test conditions :
Refer to section 5.1.1.2 of EN 300 328
Temperature : -20℃ to 55 ℃
Relative humidity: 20 % to 75 %

Normal Voltage: 5Vdc

Extreme test conditions :
Refer to section 5.1.1.3 of EN 300 328

Where tests at extreme temperatures are required, measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.

Extreme temperatures: -40°C ~ 105°C

3. General Description of Applied Standards

The EUT According to the Specifications, it must comply with the requirements of the following standards:

ETSI EN 300 328 V2.2.2 – Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band; Harmonized Standard for access to radio spectrum

4. Test Facility

International Standards Laboratory Corp.
<LT Lab.>
No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan

A fully anechoic chamber was used for the radiated spurious emissions test.

5. Block Diagram of Test Setup

5.1 EUT Configuration

Fig. 1 Configuration of Tested System

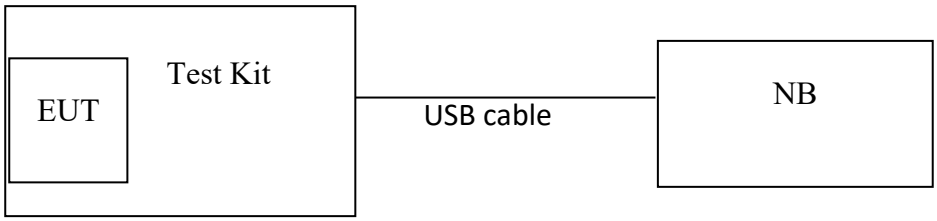


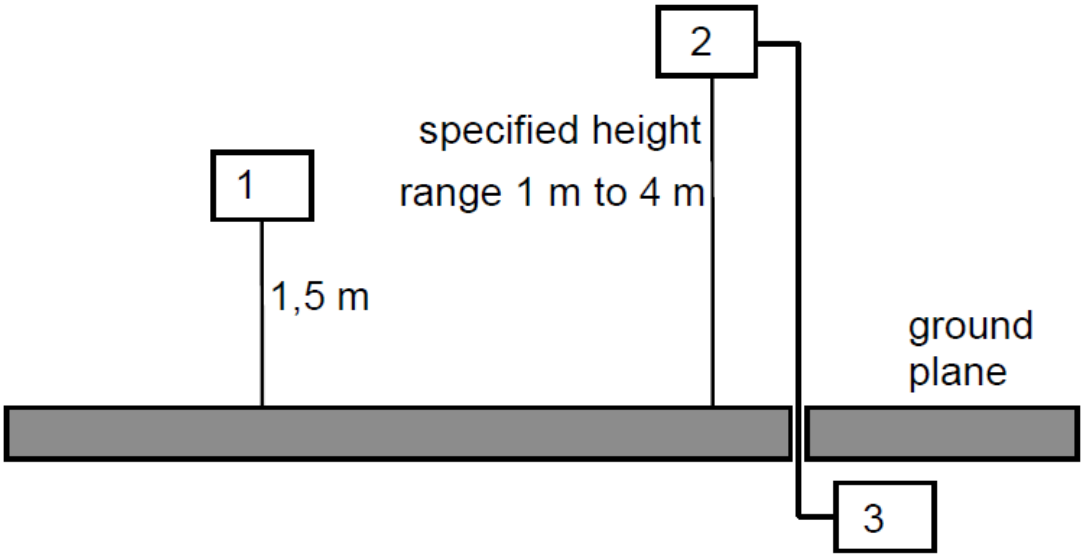
Table 1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	Notebook	Lenovo	X220i	N/A	N/A	Non-shielded
2	Test Kit	N/A	N/A	N/A	N/A	N/A

5.2 Test Setup for ERP/EIRP Measurement

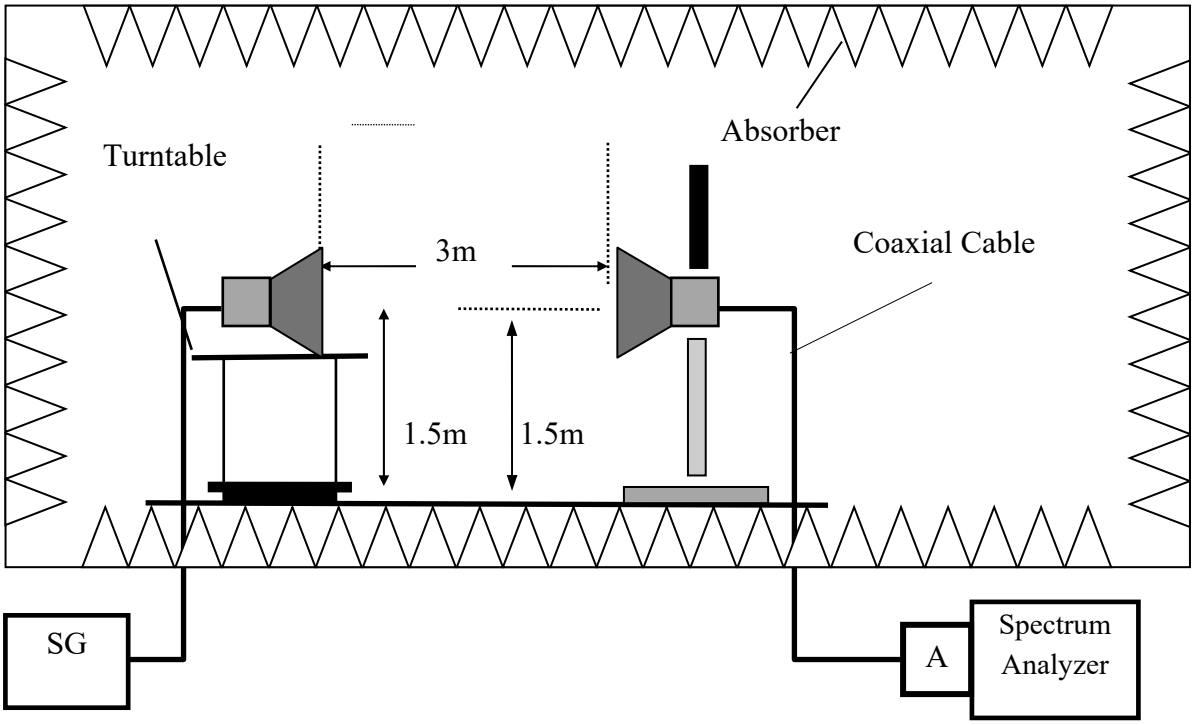
5.2.1 Step 1. Field Strength Measurement

OATS or SAR test Site

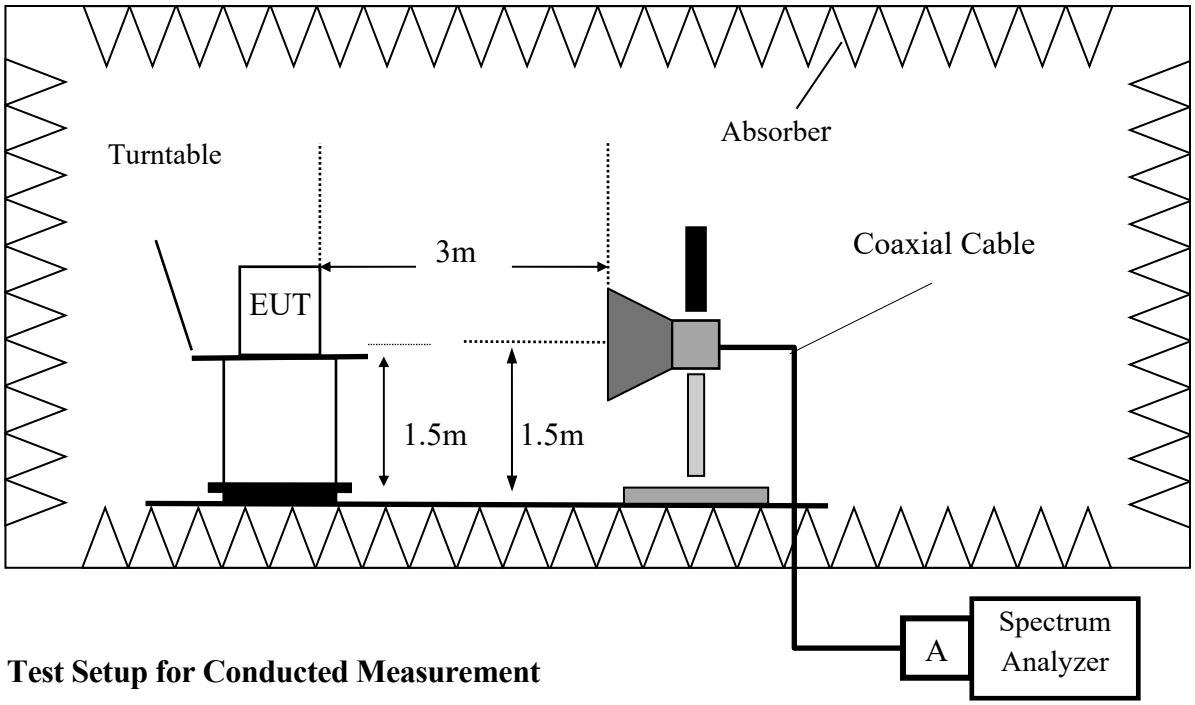


1) UUT
2) Measurement antenna
3) Measurement equipment

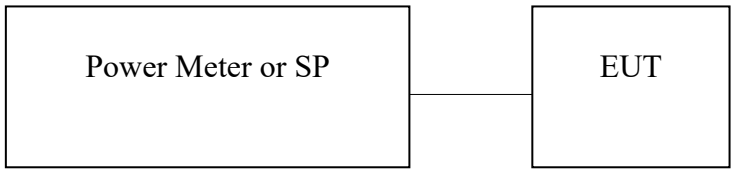
FAR Test Site



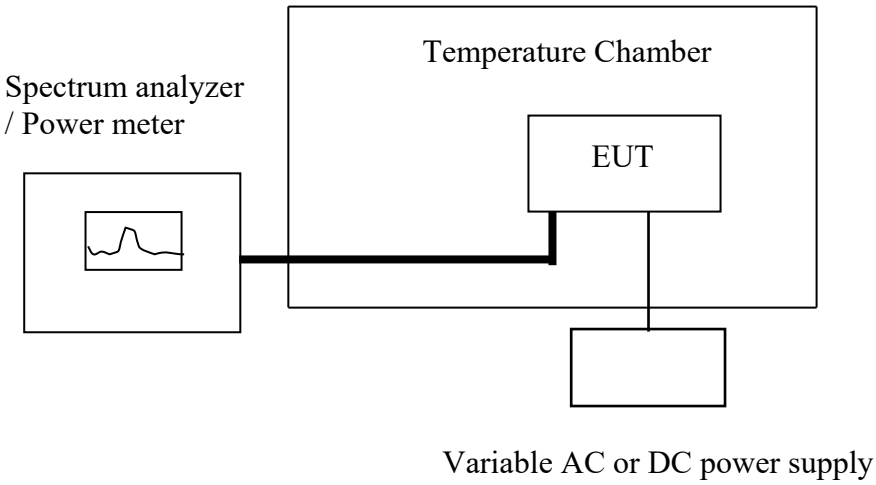
Step 2. SUBSTITUTION METHOD:



5.3 Test Setup for Conducted Measurement



5.4 Test Setup for Extreme test



5.5 Test Setup for verifying the adaptivity of an equipment

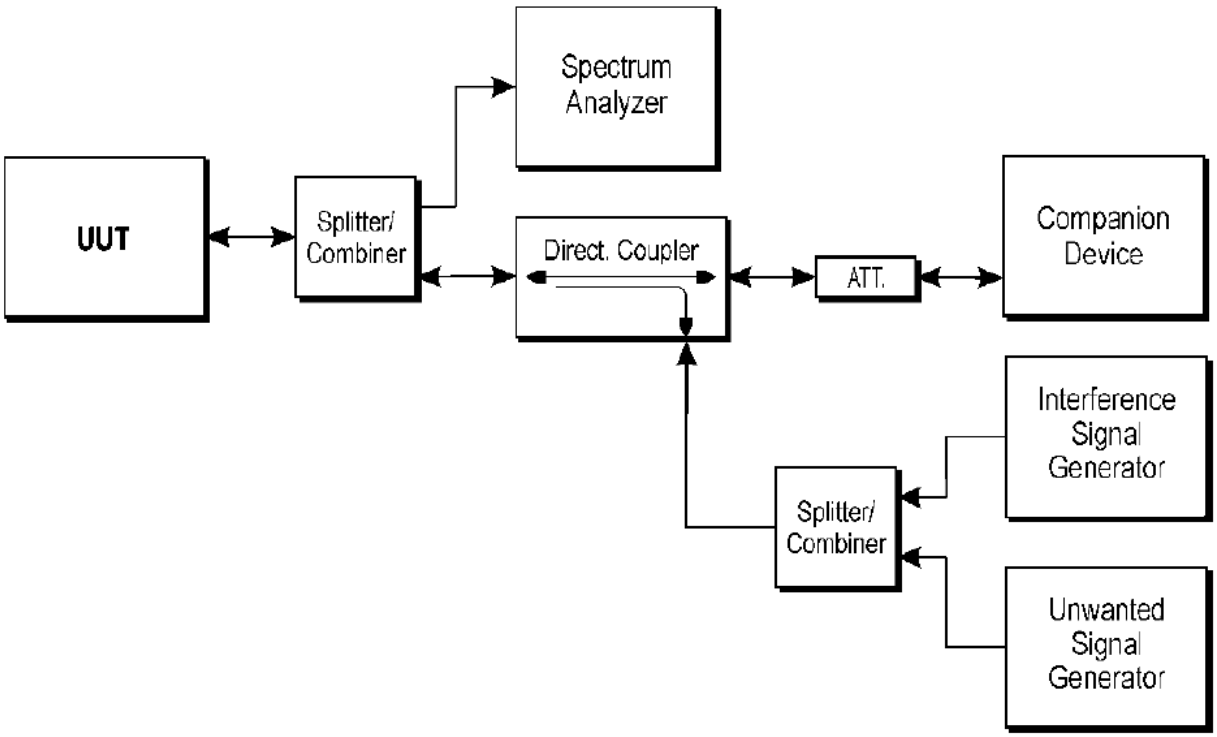


Figure 5: Test set-up for verifying the adaptivity of an equipment

5.6 Test Setup for verifying the receiver blocking of an equipment

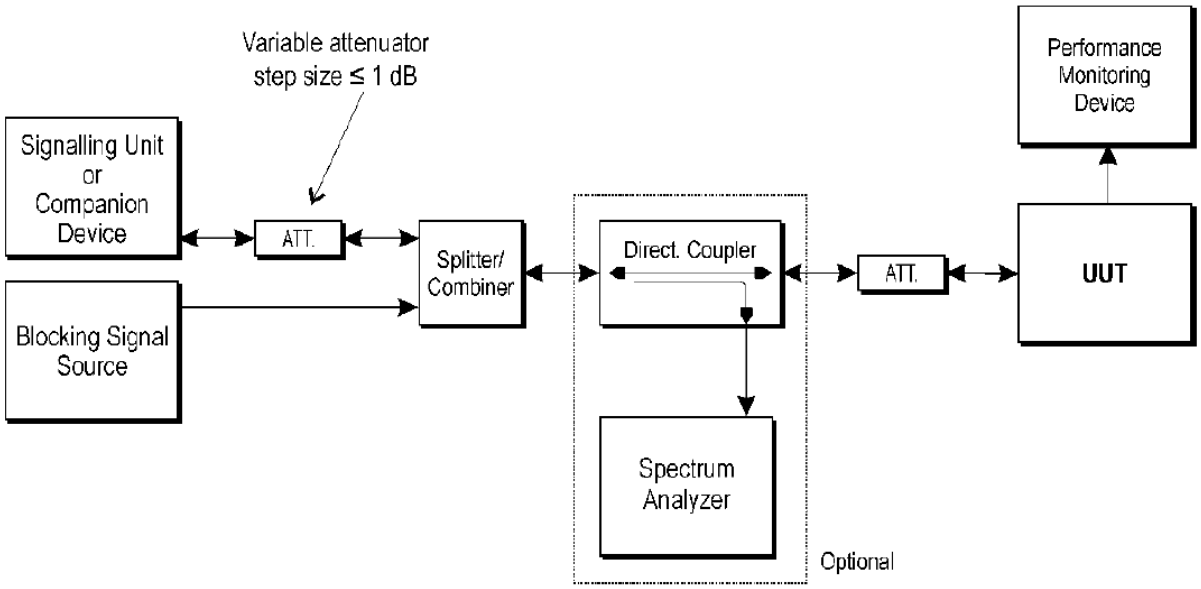


Figure 6: Test Set-up for receiver blocking

5.7 Measurement Equipment Used:

Location Conducted	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Chamber 16	Signal Analyzer (44GHz)	R&S	FSV3044	101463	02/07/2023	02/07/2024
Chamber 16	Loop Antenna	EM	EM-6879	271	10/05/2022	10/05/2023
Chamber 16	Bilog Antenna	Schwarzbeck	VULB9168 w 5dB Att.	9168-495	11/18/2022	11/18/2023
Chamber 16	Horn antenna (1GHz - 18GHz)	EM	EM-AH-10180	2011071401	11/25/2022	11/25/2023
Chamber 16	Horn antenna (18GHz-26GHz)	Com-power	AH-826	081001	11/24/2022	11/24/2023
Chamber 16	Horn antenna (26GHz - 40GHz)	Com-power	AH-640	100A	03/25/2023	03/25/2024
Chamber 16	Preamplifier (10MHz - 3GHz)	EM	EM330	060674	6/21/2023	6/21/2024
Chamber 16	Preamplifier (1GHz - 26GHz)	EM	EM01M26G	060559	6/20/2023	6/20/2024
Chamber 16	Preamplifier (26GHz - 40GHz)	MITEQ	JS4-26004000-27-5A	818471	05/04/2023	05/04/2024
Chamber 16	Cable 002 (1GHz-26.5GHz)	HUBER SUHNER	Sucoflex 104A	MY816/4A&MY277/4A&MY278/4A&MY818/4A	12/21/2022	12/21/2023
Chamber 16	Cable 001 (100kHz-1GHz)	HUBER SUHNER	Sucoflex 104A	1166 cable 001	12/21/2022	12/21/2023
Chamber 16	RF Cable (18GHz-40GHz)	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	11/23/2022	11/23/2023
Chamber 16	Signal Generator	Anritsu	MG3692A	20311	12/29/2022	12/29/2023
Chamber 16	Test Software	Audix	E3 Ver:6.120203a	N/A	N/A	N/A

Location Conducted	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Conducted	Power Meter	Anritsu	ML2495A	1116010	09/29/2022	09/29/2023
Conducted	Power Sensor	Anritsu	MA2411B	34NKF50	09/29/2022	09/29/2023
Conducted	Power Sensor	DARE	RPR3006W	13I00030SNO33	01/06/2023	01/06/2024
Conducted	Power Sensor	DARE	RPR3006W	13I00030SNO34	01/06/2023	01/06/2024
Conducted	Power Sensor	DARE	RPR3006W	14I00889SNO35	06/29/2022	06/29/2023
Conducted	Power Sensor	DARE	RPR3006W	14I00889SNO36	06/29/2022	06/29/2023
Conducted	Temperature Chamber	KSON	THS-B4H100	2287	05/20/2022	05/20/2023
Conducted	DC Power supply	ABM	8185D	N/A	01/04/2023	01/04/2024
Conducted	AC Power supply	EXTECH	CFC105W	NA	N/A	N/A
Conducted	Spectrum analyzer	Keysight	N9010A	MY56070257	09/28/2022	09/28/2023
Conducted	Test Software	DARE	Radiation Ver:2013.1.23	NA	NA	NA
Conducted	Universal Radio Comm. Tester	R&S	CMU200	111968	11/19/2022	11/19/2023
Conducted	Wideband Radio Comm. Tester	R&S	CMW500	1201.002K50108 793-JG	10/31/2022	10/31/2023
Conducted	BT Simulator	Agilent	N4010A	MY48100200	NA	NA
Conducted	Signal Generator	Agilent	E4438C	MY49071550	12/28/2022	12/28/2023
Conducted	Signal Generator	Keysight	N5182B	MY53052399	12/28/2022	12/28/2023
Conducted	Spectrum analyzer	Keysight	N9010A	MY56070257	09/28/2022	09/28/2023
Conducted (TS8997)	Wideband Radio Comm. Tester	R&S	CMW500	168811	09/22/2022	09/22/2023
Conducted (TS8997)	UP/DOWN converter	R&S	CMW-Z800A	100566	12/22/2022	12/22/2023
Conducted (TS8997)	Signal Generator	R&S	SMB100A	183701	01/18/2023	01/18/2024
Conducted (TS8997)	Vector Signal Generator	R&S	SMM100A	101908	11/23/2022	11/23/2023
Conducted (TS8997)	Signal analyzer 40GHz	R&S	FSV40	101884	09/22/2022	09/22/2023
Conducted (TS8997)	OSP150 extension unit CAM-BUS	R&S	OSP150	101107	09/21/2022	09/21/2023
Conducted (TS8997)	Test Software	R&S	EMC32 Ver:11.50.00	NA	NA	NA

6. Other Types of Wide Band Modulation Equipment

6.1 ETSI EN 300 328 SUB-CLAUSE 4.3.2.2 RF Output Power

This requirement applies to all types of equipment using wide band modulations other than FHSS.

6.1.1 Limit: Sub-Clause 4.3.2.2.3

For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm.

The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. See clause 5.3.1 m). For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.

This limit shall apply for any combination of power level and intended antenna assembly.

6.1.2 Test Procedure:

See Sub-Clause 5.4.2.1 of ETSI EN 300 328 for the test conditions
See Sub-Clause 5.4.2.2 of ETSI EN 300 328 for the test method

6.1.3 Test Result :

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

PCB Ant.

Mode	Frequency (MHz)	Temp.	Output Power e.i.r.p. (dBm)	Limit (dBm)	Results
BLE	2402	Normal	7.54	20	Pass
		Low	8.04	20	Pass
		High	7.53	20	Pass
	2442	Normal	5.62	20	Pass
		Low	6.12	20	Pass
		High	5.62	20	Pass
	2480	Normal	2.61	20	Pass
		Low	3.11	20	Pass
		High	2.61	20	Pass

Dipole Ant.

Mode	Frequency (MHz)	Temp.	Output Power e.i.r.p. (dBm)	Limit (dBm)	Results
BLE	2402	Normal	6.66	20	Pass
		Low	7.16	20	Pass
		High	6.65	20	Pass
	2442	Normal	4.74	20	Pass
		Low	5.24	20	Pass
		High	4.74	20	Pass
	2480	Normal	1.73	20	Pass
		Low	2.23	20	Pass
		High	1.73	20	Pass

PCB Ant.

Mode	Frequency (MHz)	Temp.	Output Power e.i.r.p. (dBm)	Limit (dBm)	Results
Zigbee	2405	Normal	9.07	20	Pass
		Low	9.57	20	Pass
		High	9.07	20	Pass
	2445	Normal	7.79	20	Pass
		Low	8.29	20	Pass
		High	7.79	20	Pass
	2480	Normal	6.56	20	Pass
		Low	7.06	20	Pass
		High	6.56	20	Pass

Dipole Ant.

Mode	Frequency (MHz)	Temp.	Output Power e.i.r.p. (dBm)	Limit (dBm)	Results
Zigbee	2405	Normal	8.19	20	Pass
		Low	8.69	20	Pass
		High	8.19	20	Pass
	2445	Normal	6.91	20	Pass
		Low	7.41	20	Pass
		High	6.91	20	Pass
	2480	Normal	5.68	20	Pass
		Low	6.18	20	Pass
		High	5.68	20	Pass

6.2 ETSI EN 300 328 SUB-CLAUSE 4.3.2.3 Power Spectral Density

This requirement applies to all types of equipment using wide band modulations other than FHSS.

6.1.1 Limit: Sub-Clause 4.3.2.3.3

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz.

6.2.1 Test Procedure:

See Sub-Clause 5.4.3.1 of ETSI EN 300 328 for the test conditions
See Sub-Clause 5.4.3.2 of ETSI EN 300 328 for the test method

6.2.2 Test Result:

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

PCB Ant.

Mode	Frequency (MHz)	PSD e.i.r.p. (dBm/MHz)	Limit (dBm/MHz)	Results
BLE	2402	8.66	10	Pass
	2442	6.67	10	Pass
	2480	3.79	10	Pass

Dipole Ant.

Mode	Frequency (MHz)	PSD e.i.r.p. (dBm/MHz)	Limit (dBm/MHz)	Results
BLE	2402	7.78	10	Pass
	2442	5.79	10	Pass
	2480	2.91	10	Pass

PCB Ant.

Mode	Frequency (MHz)	PSD e.i.r.p. (dBm/MHz)	Limit (dBm/MHz)	Results
Zigbee	2405	9.44	10	Pass
	2445	7.40	10	Pass
	2480	6.59	10	Pass

Dipole Ant.

Mode	Frequency (MHz)	PSD e.i.r.p. (dBm/MHz)	Limit (dBm/MHz)	Results
Zigbee	2405	8.56	10	Pass
	2445	6.52	10	Pass
	2480	5.71	10	Pass

6.3 ETSI EN 300 328 SUB-CLAUSE 4.3.2.7 Occupied Channel Bandwidth

This requirement applies to all types of equipment using wide band modulations other than FHSS.

6.3.1 Limit: Sub-Clause 4.3.2.7.3

The Occupied Channel Bandwidth shall fall completely within the band given in clause 1.

In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

6.3.2 Test Procedure:

See Sub-Clause 5.4.7.1 of ETSI EN 300 328 for the test conditions

See Sub-Clause 5.4.7.2 of ETSI EN 300 328 for conducted method.

6.3.3 Test Result :

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

BLE:

Test Mode: PCB Ant.

Occupied Channel Bandwidth		
	Channel Low	**Channel High**
Occupied Bandwidth (MHz)	1.07	1.09
Lowest/Highest Frequency (MHz)	2401.4724	2480.5550
Limit (Operating in the band)	2400~2483.5MHz	2400~2483.5MHz
Measurement Uncertainty	+/- 120kHz	

Test Mode: Dipole Ant.

Occupied Channel Bandwidth		
	Channel Low	**Channel High**
Occupied Bandwidth (MHz)	1.07	1.09
Lowest/Highest Frequency (MHz)	2401.4724	2480.5550
Limit (Operating in the band)	2400~2483.5MHz	2400~2483.5MHz
Measurement Uncertainty	+/- 120kHz	

Zigbee:

Test Mode: PCB Ant.

Occupied Channel Bandwidth		
	Channel Low	**Channel High**
Occupied Bandwidth (MHz)	2.08	2.09
Lowest/Highest Frequency (MHz)	2403.9500	2481.0550
Limit (Operating in the band)	2400~2483.5MHz	2400~2483.5MHz
Measurement Uncertainty	+/- 120kHz	

Test Mode: Dipole Ant.

Occupied Channel Bandwidth		
	Channel Low	**Channel High**
Occupied Bandwidth (MHz)	2.08	2.09
Lowest/Highest Frequency (MHz)	2403.9500	2481.0550
Limit (Operating in the band)	2400~2483.5MHz	2400~2483.5MHz
Measurement Uncertainty	+/- 120kHz	

6.4 ETSI EN 300 328 SUB-CLAUSE 4.3.2.8 Transmitter Unwanted Emissions in the out-of-band Domain

This requirement applies to all types of equipment using wide band modulations other than FHSS.

6.4.1 Limit: Sub-Clause 4.3.2.8.3

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 2.

Within the band specified in table 1, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.2.7.

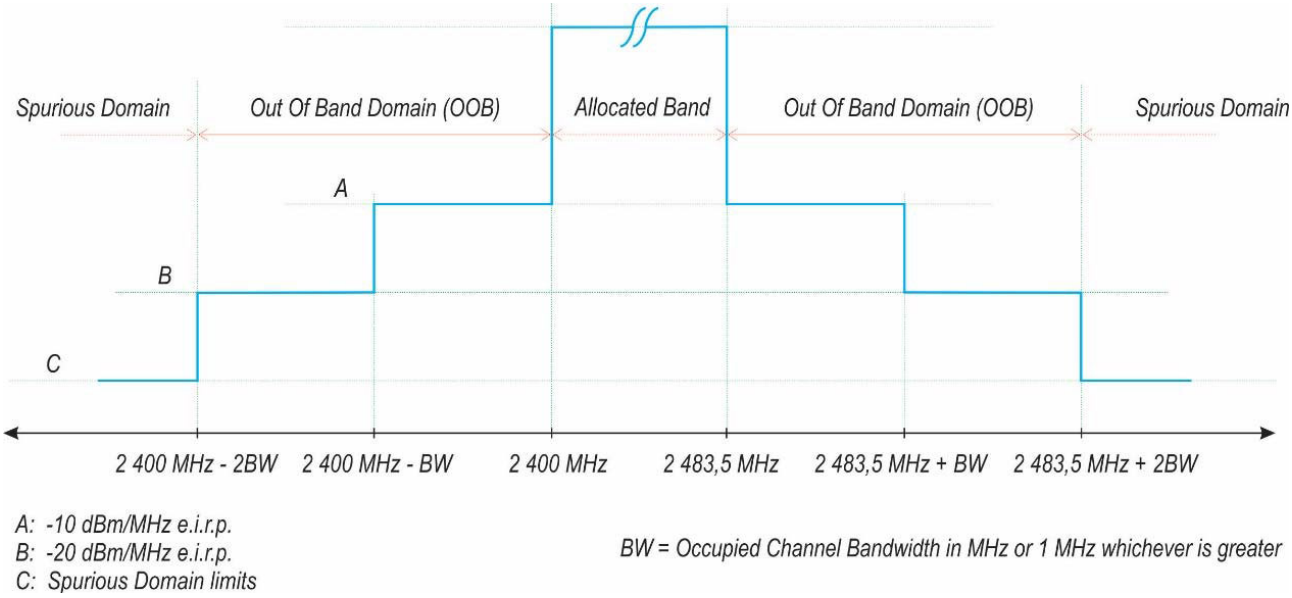


Figure 2: Transmit mask

6.4.2 Test Procedure:

Conducted test method

See Sub-Clause 5.4.8.1 of ETSI EN 300 328 for the test conditions

See Sub-Clause 5.4.8.2 of ETSI EN 300 328 for conducted method.

6.4.3 Test Result:

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

BLE:

Test Mode: PCB Ant.

Out of Band Domain Emission				
Test condition	2400-BW ~ 2400-2BW	2400 ~ 2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
2402MHz	-46.80	-32.91	-34.59	-45.67
2442MHz	-46.23	-33.88	-32.75	-46.58
2480MHz	-46.78	-33.17	-34.54	-46.94
Limit(dBm/MHz)	**-20**	**-10**	**-10**	**-20**

Test Mode: Dipole Ant.

Out of Band Domain Emission				
Test condition	2400-BW ~ 2400-2BW	2400 ~ 2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
2402MHz	-46.80	-32.91	-34.59	-45.67
2442MHz	-46.23	-33.88	-32.75	-46.58
2480MHz	-46.78	-33.17	-34.54	-46.94
Limit(dBm/MHz)	**-20**	**-10**	**-10**	**-20**

Zigbee:

Test Mode: PCB Ant.

Out of Band Domain Emission				
Test condition	2400-BW ~ 2400-2BW	2400 ~ 2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
2405MHz	-45.77	-31.49	-33.55	-45.46
2445MHz	-45.82	-31.94	-33.72	-45.92
2480MHz	-45.33	-31.78	-33.94	-45.99
Limit(dBm/MHz)	**-20**	**-10**	**-10**	**-20**

Test Mode: Dipole Ant.

Out of Band Domain Emission				
Test condition	2400-BW ~ 2400-2BW	2400 ~ 2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
2405MHz	-45.77	-31.49	-33.55	-45.46
2445MHz	-45.82	-31.94	-33.72	-45.92
2480MHz	-45.33	-31.78	-33.94	-45.99
Limit(dBm/MHz)	**-20**	**-10**	**-10**	**-20**

6.5 ETSI EN 300 328 SUB-CLAUSE 4.3.2.9 Transmitter Unwanted Emissions in the Spurious Domain

This requirement applies to all types of equipment using wide band modulations other than FHSS.

6.5.1 Limit: Sub-Clause 4.3.2.9.3

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 9.

In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Table 9: Transmitter limits for spurious emissions

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

6.5.2 Test Procedure:

See Sub-Clause 5.4.9.1 of ETSI EN 300 328 for the test conditions

See Sub-Clause 5.4.9.2 and 5.4.9.2.2 of ETSI EN 300 328 for Conducted Pre-Scan test method.

See Sub-Clause 5.4.9.2.2 of ETSI EN 300 328 for final Radiated test method.

6.5.3 Test Result:

Test Mode: BLE mode, TX CH Low, PCB Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	85.97	-50.79	1.00	-49.79	-36.00	-13.79	VERTICAL
2	193.48	-61.44	2.23	-59.21	-54.00	-5.21	VERTICAL
3	507.43	-70.49	8.95	-61.54	-54.00	-7.54	VERTICAL
4	617.10	-72.81	10.73	-62.08	-54.00	-8.08	VERTICAL
5	745.26	-74.61	13.73	-60.88	-36.00	-24.88	VERTICAL
6	817.42	-73.18	13.83	-59.35	-36.00	-23.35	VERTICAL
7	4804.00	-70.63	17.44	-53.19	-30.00	-23.19	VERTICAL
8	6488.00	-69.36	20.84	-48.52	-30.00	-18.52	VERTICAL
1	87.23	-51.10	0.37	-50.73	-36.00	-14.73	HORIZONTAL
2	194.44	-55.76	1.70	-54.06	-54.00	-0.06	HORIZONTAL
3	598.98	-72.93	11.10	-61.83	-54.00	-7.83	HORIZONTAL
4	668.15	-73.08	11.93	-61.15	-54.00	-7.15	HORIZONTAL
5	742.46	-75.34	13.94	-61.40	-36.00	-25.40	HORIZONTAL
6	816.73	-75.62	14.39	-61.23	-36.00	-25.23	HORIZONTAL
7	4804.00	-70.80	17.44	-53.36	-30.00	-23.36	HORIZONTAL
8	6341.00	-69.22	20.56	-48.66	-30.00	-18.66	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: BLE mode, TX CH High, PCB Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	87.11	-45.56	1.00	-44.56	-36.00	-8.56	VERTICAL
2	194.75	-60.77	2.23	-58.54	-54.00	-4.54	VERTICAL
3	483.78	-70.37	8.99	-61.38	-54.00	-7.38	VERTICAL
4	594.86	-70.14	9.94	-60.20	-54.00	-6.20	VERTICAL
5	744.45	-76.55	13.74	-62.81	-36.00	-26.81	VERTICAL
6	818.17	-73.74	13.83	-59.91	-36.00	-23.91	VERTICAL
7	4884.00	-69.62	17.66	-51.96	-30.00	-21.96	VERTICAL
8	6327.00	-69.01	20.54	-48.47	-30.00	-18.47	VERTICAL
1	86.66	-47.82	0.37	-47.45	-36.00	-11.45	HORIZONTAL
2	194.94	-55.92	1.70	-54.22	-54.00	-0.22	HORIZONTAL
3	597.70	-75.03	11.10	-63.93	-54.00	-9.93	HORIZONTAL
4	669.00	-75.59	11.93	-63.66	-54.00	-9.66	HORIZONTAL
5	745.81	-77.49	14.04	-63.45	-36.00	-27.45	HORIZONTAL
6	819.54	-73.86	14.44	-59.42	-36.00	-23.42	HORIZONTAL
7	4884.00	-70.63	17.66	-52.97	-30.00	-22.97	HORIZONTAL
8	6453.00	-69.75	20.77	-48.98	-30.00	-18.98	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: BLE mode, TX CH Low, Dipole Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	85.73	-50.99	1.00	-49.99	-36.00	-13.99	VERTICAL
2	192.74	-61.96	2.23	-59.73	-54.00	-5.73	VERTICAL
3	506.92	-72.00	8.95	-63.05	-54.00	-9.05	VERTICAL
4	617.37	-73.48	10.73	-62.75	-54.00	-8.75	VERTICAL
5	745.20	-76.53	13.73	-62.80	-36.00	-26.80	VERTICAL
6	815.65	-73.91	13.83	-60.08	-36.00	-24.08	VERTICAL
7	4960.00	-70.97	17.87	-53.10	-30.00	-23.10	VERTICAL
8	6327.00	-69.01	20.54	-48.47	-30.00	-18.47	VERTICAL
1	85.86	-51.19	0.37	-50.82	-36.00	-14.82	HORIZONTAL
2	194.78	-56.64	1.70	-54.94	-54.00	-0.94	HORIZONTAL
3	598.86	-73.53	11.10	-62.43	-54.00	-8.43	HORIZONTAL
4	668.11	-73.57	11.93	-61.64	-54.00	-7.64	HORIZONTAL
5	743.52	-73.88	13.94	-59.94	-36.00	-23.94	HORIZONTAL
6	817.01	-75.70	14.39	-61.31	-36.00	-25.31	HORIZONTAL
7	4960.00	-70.31	17.87	-52.44	-30.00	-22.44	HORIZONTAL
8	6453.00	-69.75	20.77	-48.98	-30.00	-18.98	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: BLE mode, TX CH High, Dipole Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	86.62	-46.48	1.00	-45.48	-36.00	-9.48	VERTICAL
2	194.60	-60.04	2.23	-57.81	-54.00	-3.81	VERTICAL
3	482.78	-70.46	8.99	-61.47	-54.00	-7.47	VERTICAL
4	594.67	-70.57	9.94	-60.63	-54.00	-6.63	VERTICAL
5	743.25	-76.23	13.74	-62.49	-36.00	-26.49	VERTICAL
6	816.98	-73.47	13.83	-59.64	-36.00	-23.64	VERTICAL
7	4804.00	-69.68	17.44	-52.24	-30.00	-22.24	VERTICAL
8	6488.00	-69.36	20.84	-48.52	-30.00	-18.52	VERTICAL
1	85.96	-48.49	0.37	-48.12	-36.00	-12.12	HORIZONTAL
2	194.57	-56.59	1.70	-54.89	-54.00	-0.89	HORIZONTAL
3	596.56	-76.11	11.10	-65.01	-54.00	-11.01	HORIZONTAL
4	667.57	-76.02	11.93	-64.09	-54.00	-10.09	HORIZONTAL
5	744.64	-76.69	14.04	-62.65	-36.00	-26.65	HORIZONTAL
6	818.64	-74.31	14.44	-59.87	-36.00	-23.87	HORIZONTAL
7	4804.00	-70.09	17.44	-52.65	-30.00	-22.65	HORIZONTAL
8	6341.00	-69.22	20.56	-48.66	-30.00	-18.66	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: Zigbee mode, TX CH Low, PCB Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	86.43	-51.30	1.00	-50.30	-36.00	-14.30	VERTICAL
2	193.62	-61.85	2.23	-59.62	-54.00	-5.62	VERTICAL
3	508.26	-71.36	8.95	-62.41	-54.00	-8.41	VERTICAL
4	617.40	-73.32	10.73	-62.59	-54.00	-8.59	VERTICAL
5	746.12	-73.94	13.73	-60.21	-36.00	-24.21	VERTICAL
6	817.83	-73.97	13.83	-60.14	-36.00	-24.14	VERTICAL
7	4,810.00	-71.42	17.44	-53.98	-30.00	-23.98	VERTICAL
8	6,488.43	-70.28	20.84	-49.44	-30.00	-19.44	VERTICAL
1	87.28	-51.94	0.37	-51.57	-36.00	-15.57	HORIZONTAL
2	194.77	-56.07	1.70	-54.37	-54.00	-0.37	HORIZONTAL
3	599.46	-73.00	11.10	-61.90	-54.00	-7.90	HORIZONTAL
4	668.91	-73.14	11.93	-61.21	-54.00	-7.21	HORIZONTAL
5	742.83	-74.62	13.94	-60.68	-36.00	-24.68	HORIZONTAL
6	817.36	-76.21	14.39	-61.82	-36.00	-25.82	HORIZONTAL
7	4,810.00	-71.51	17.44	-54.07	-30.00	-24.07	HORIZONTAL
8	6,341.28	-70.21	20.56	-49.65	-30.00	-19.65	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: Zigbee mode, TX CH High, PCB Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	87.66	-45.88	1.00	-44.88	-36.00	-8.88	VERTICAL
2	195.55	-61.39	2.23	-59.16	-54.00	-5.16	VERTICAL
3	484.35	-71.19	8.99	-62.20	-54.00	-8.20	VERTICAL
4	595.35	-70.71	9.94	-60.77	-54.00	-6.77	VERTICAL
5	744.89	-75.60	13.74	-61.86	-36.00	-25.86	VERTICAL
6	818.80	-73.80	13.83	-59.97	-36.00	-23.97	VERTICAL
7	4,960.00	-71.17	17.87	-53.30	-30.00	-23.30	VERTICAL
8	6,327.24	-69.42	20.54	-48.88	-30.00	-18.88	VERTICAL
1	87.08	-47.90	0.37	-47.53	-36.00	-11.53	HORIZONTAL
2	195.49	-56.72	1.70	-55.02	-54.00	-1.02	HORIZONTAL
3	598.12	-75.15	11.10	-64.05	-54.00	-10.05	HORIZONTAL
4	669.15	-76.36	11.93	-64.43	-54.00	-10.43	HORIZONTAL
5	745.95	-77.19	14.04	-63.15	-36.00	-27.15	HORIZONTAL
6	820.28	-74.53	14.44	-60.09	-36.00	-24.09	HORIZONTAL
7	4,960.00	-70.49	17.87	-52.62	-30.00	-22.62	HORIZONTAL
8	6,453.59	-70.49	20.77	-49.72	-30.00	-19.72	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: Zigbee mode, TX CH Low, Dipole Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	85.98	-51.56	1.00	-50.56	-36.00	-14.56	VERTICAL
2	193.68	-62.90	2.23	-60.67	-54.00	-6.67	VERTICAL
3	507.87	-72.28	8.95	-63.33	-54.00	-9.33	VERTICAL
4	617.60	-74.08	10.73	-63.35	-54.00	-9.35	VERTICAL
5	745.87	-76.01	13.73	-62.28	-36.00	-26.28	VERTICAL
6	815.90	-74.03	13.83	-60.20	-36.00	-24.20	VERTICAL
7	4,810.00	-70.36	17.44	-52.92	-30.00	-22.92	VERTICAL
8	6,488.30	-70.26	20.84	-49.42	-30.00	-19.42	VERTICAL
1	85.98	-52.16	0.37	-51.79	-36.00	-15.79	HORIZONTAL
2	194.95	-56.83	1.70	-55.13	-54.00	-1.13	HORIZONTAL
3	599.74	-74.03	11.10	-62.93	-54.00	-8.93	HORIZONTAL
4	668.44	-73.63	11.93	-61.70	-54.00	-7.70	HORIZONTAL
5	743.64	-73.27	13.94	-59.33	-36.00	-23.33	HORIZONTAL
6	817.79	-76.21	14.39	-61.82	-36.00	-25.82	HORIZONTAL
7	4,810.00	-70.24	17.44	-52.80	-30.00	-22.80	HORIZONTAL
8	6,341.82	-69.35	20.56	-48.79	-30.00	-18.79	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: Zigbee mode, TX CH High, Dipole Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	87.13	-47.44	1.00	-46.44	-36.00	-10.44	VERTICAL
2	194.89	-60.39	2.23	-58.16	-54.00	-4.16	VERTICAL
3	483.15	-71.20	8.99	-62.21	-54.00	-8.21	VERTICAL
4	595.57	-70.69	9.94	-60.75	-54.00	-6.75	VERTICAL
5	743.30	-75.32	13.74	-61.58	-36.00	-25.58	VERTICAL
6	817.53	-73.82	13.83	-59.99	-36.00	-23.99	VERTICAL
7	4,960.00	-71.08	17.87	-53.21	-30.00	-23.21	VERTICAL
8	6,327.64	-69.10	20.54	-48.56	-30.00	-18.56	VERTICAL
1	86.84	-49.10	0.37	-48.73	-36.00	-12.73	HORIZONTAL
2	194.60	-57.33	1.70	-55.63	-54.00	-1.63	HORIZONTAL
3	596.67	-77.05	11.10	-65.95	-54.00	-11.95	HORIZONTAL
4	668.23	-76.12	11.93	-64.19	-54.00	-10.19	HORIZONTAL
5	744.64	-76.09	14.04	-62.05	-36.00	-26.05	HORIZONTAL
6	819.63	-74.84	14.44	-60.40	-36.00	-24.40	HORIZONTAL
7	4,960.00	-70.71	17.87	-52.84	-30.00	-22.84	HORIZONTAL
8	6,453.07	-69.85	20.77	-49.08	-30.00	-19.08	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

6.6 ETSI EN 300 328 SUB-CLAUSE 4.3.2.10 Receiver Spurious Emissions

This requirement applies to all types of equipment using wide band modulations other than FHSS.

6.6.1 Limit: Sub-Clause 4.3.2.10.3

The spurious emissions of the receiver shall not exceed the values given in table 10.

For emissions radiated by the cabinet or emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Table 10: Spurious emission limits for receivers

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

6.6.2 Test Procedure:

See Sub-Clause 5.4.10.1 of ETSI EN 300 328 for the test conditions

See Sub-Clause 5.4.10.2.2 of ETSI EN 300 328 for final Radiated test method.

6.6.3 Test Result:

Test Mode: BLE mode, RX CH Low, PCB Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	38.15	-65.10	6.41	-59.69	-57.00	-1.69	VERTICAL
2	87.11	-58.93	1.00	-57.93	-57.00	-0.93	VERTICAL
3	341.71	-63.36	5.18	-58.18	-57.00	-1.18	VERTICAL
4	604.73	-70.65	10.19	-60.46	-57.00	-3.46	VERTICAL
5	747.03	-77.41	13.73	-63.68	-57.00	-6.68	VERTICAL
6	821.32	-73.65	13.92	-59.73	-57.00	-2.73	VERTICAL
7	1,996.30	-63.95	4.60	-59.35	-47.00	-12.35	VERTICAL
8	5,405.15	-71.64	17.59	-54.05	-47.00	-7.05	VERTICAL
1	39.40	-67.62	9.65	-57.97	-57.00	-0.97	HORIZONTAL
2	114.28	-59.30	1.29	-58.01	-57.00	-1.01	HORIZONTAL
3	221.75	-60.50	2.41	-58.09	-57.00	-1.09	HORIZONTAL
4	339.71	-63.46	4.81	-58.65	-57.00	-1.65	HORIZONTAL
5	744.79	-76.32	14.04	-62.28	-36.00	-26.28	HORIZONTAL
6	819.50	-75.19	14.44	-60.75	-36.00	-24.75	HORIZONTAL
7	1,485.66	-64.66	2.28	-62.38	-47.00	-15.38	HORIZONTAL
8	5,264.50	-71.65	16.82	-54.83	-47.00	-7.83	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: BLE mode, RX CH High, PCB Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	89.12	-58.83	1.00	-57.83	-57.00	-0.83	VERTICAL
2	220.97	-59.95	2.73	-57.22	-57.00	-0.22	VERTICAL
3	341.52	-62.40	5.18	-57.22	-57.00	-0.22	VERTICAL
4	743.94	-75.99	13.74	-62.25	-57.00	-5.25	VERTICAL
5	820.72	-73.01	13.92	-59.09	-57.00	-2.09	VERTICAL
6	950.74	-75.52	17.65	-57.87	-57.00	-0.87	VERTICAL
7	1,975.10	-64.79	4.50	-60.29	-47.00	-13.29	VERTICAL
8	4,942.54	-70.64	16.32	-54.32	-47.00	-7.32	VERTICAL
1	197.53	-59.17	1.70	-57.47	-57.00	-0.47	HORIZONTAL
2	251.77	-61.74	4.38	-57.36	-57.00	-0.36	HORIZONTAL
3	523.45	-70.90	9.08	-61.82	-57.00	-4.82	HORIZONTAL
4	668.78	-74.42	11.93	-62.49	-57.00	-5.49	HORIZONTAL
5	746.17	-74.78	14.04	-60.74	-57.00	-3.74	HORIZONTAL
6	820.00	-73.38	14.44	-58.94	-57.00	-1.94	HORIZONTAL
7	4,605.57	-69.40	14.95	-54.45	-47.00	-7.45	HORIZONTAL
8	6,531.18	-71.72	23.84	-47.88	-47.00	-0.88	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: BLE mode, RX CH Low, Dipole Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	38.19	-64.69	6.41	-58.28	-57.00	-1.28	VERTICAL
2	86.85	-58.89	1.00	-57.89	-57.00	-0.89	VERTICAL
3	340.97	-62.46	5.18	-57.28	-57.00	-0.28	VERTICAL
4	605.14	-72.40	10.19	-62.21	-57.00	-5.21	VERTICAL
5	746.09	-77.48	13.73	-63.75	-57.00	-6.75	VERTICAL
6	821.27	-75.59	13.92	-61.67	-57.00	-4.67	VERTICAL
7	1,997.44	-61.86	4.60	-57.26	-47.00	-10.26	VERTICAL
8	5,405.62	-70.65	17.59	-53.06	-47.00	-6.06	VERTICAL
1	35.17	-67.91	9.65	-58.26	-57.00	-1.26	HORIZONTAL
2	111.93	-59.12	1.29	-57.83	-57.00	-0.83	HORIZONTAL
3	221.49	-59.59	2.41	-57.18	-57.00	-0.18	HORIZONTAL
4	339.17	-62.39	4.81	-57.58	-57.00	-0.58	HORIZONTAL
5	596.95	-75.55	11.08	-64.47	-57.00	-7.47	HORIZONTAL
6	743.93	-76.18	13.94	-62.24	-57.00	-5.24	HORIZONTAL
7	1,484.04	-63.51	2.28	-61.23	-47.00	-14.23	HORIZONTAL
8	5,264.94	-70.67	16.82	-53.85	-47.00	-6.85	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: BLE mode, RX CH High, Dipole Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	87.85	-58.40	1.00	-57.40	-57.00	-0.40	VERTICAL
2	218.04	-60.58	2.73	-57.85	-57.00	-0.85	VERTICAL
3	340.22	-64.00	5.18	-58.82	-57.00	-1.82	VERTICAL
4	743.02	-76.87	13.74	-63.13	-57.00	-6.13	VERTICAL
5	819.63	-73.32	13.92	-59.40	-57.00	-2.40	VERTICAL
6	951.29	-75.29	17.65	-57.64	-57.00	-0.64	VERTICAL
7	1,974.52	-64.34	4.50	-59.84	-47.00	-12.84	VERTICAL
8	4,942.65	-70.24	16.32	-53.92	-47.00	-6.92	VERTICAL
1	194.13	-58.77	1.70	-57.07	-57.00	-0.07	HORIZONTAL
2	247.74	-61.68	4.38	-57.30	-57.00	-0.30	HORIZONTAL
3	522.51	-71.16	9.08	-62.08	-57.00	-5.08	HORIZONTAL
4	669.06	-77.30	11.93	-65.37	-57.00	-8.37	HORIZONTAL
5	746.72	-75.28	14.04	-61.24	-57.00	-4.24	HORIZONTAL
6	820.01	-76.46	14.44	-62.02	-57.00	-5.02	HORIZONTAL
7	4,606.73	-70.64	14.95	-55.69	-47.00	-8.69	HORIZONTAL
8	6,532.52	-71.19	23.84	-47.35	-47.00	-0.35	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: Zigbee mode, RX CH Low, PCB Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	38.22	-65.17	6.41	-58.76	-57.00	-1.76	VERTICAL
2	87.90	-58.93	1.00	-57.93	-57.00	-0.93	VERTICAL
3	342.31	-64.04	5.18	-58.86	-57.00	-1.86	VERTICAL
4	605.28	-71.03	10.19	-60.84	-57.00	-3.84	VERTICAL
5	747.26	-76.42	13.73	-62.69	-57.00	-5.69	VERTICAL
6	821.46	-73.86	13.92	-59.94	-57.00	-2.94	VERTICAL
7	1,996.34	-64.04	4.60	-59.44	-47.00	-12.44	VERTICAL
8	5,406.12	-71.66	17.59	-54.07	-47.00	-7.07	VERTICAL
1	39.91	-68.09	9.65	-58.44	-57.00	-1.44	HORIZONTAL
2	115.19	-59.79	1.29	-58.50	-57.00	-1.50	HORIZONTAL
3	222.53	-61.07	2.41	-58.66	-57.00	-1.66	HORIZONTAL
4	340.31	-64.13	4.81	-59.32	-57.00	-2.32	HORIZONTAL
5	745.47	-75.89	14.04	-61.85	-36.00	-25.85	HORIZONTAL
6	819.91	-75.93	14.44	-61.49	-36.00	-25.49	HORIZONTAL
7	1,486.09	-65.06	2.28	-62.78	-47.00	-15.78	HORIZONTAL
8	5,264.76	-72.44	16.82	-55.62	-47.00	-8.62	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: Zigbee mode, RX CH High, PCB Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	89.32	-59.53	1.00	-58.53	-57.00	-1.53	VERTICAL
2	221.55	-60.42	2.73	-57.69	-57.00	-0.69	VERTICAL
3	342.18	-62.85	5.18	-57.67	-57.00	-0.67	VERTICAL
4	744.71	-76.66	13.74	-62.92	-57.00	-5.92	VERTICAL
5	820.95	-72.35	13.92	-58.43	-57.00	-1.43	VERTICAL
6	951.56	-75.93	17.65	-58.28	-57.00	-1.28	VERTICAL
7	1,975.54	-65.57	4.50	-61.07	-47.00	-14.07	VERTICAL
8	4,943.28	-71.33	16.32	-55.01	-47.00	-8.01	VERTICAL
1	197.74	-59.21	1.70	-57.51	-57.00	-0.51	HORIZONTAL
2	252.66	-61.79	4.38	-57.41	-57.00	-0.41	HORIZONTAL
3	523.49	-70.96	9.08	-61.88	-57.00	-4.88	HORIZONTAL
4	669.13	-74.44	11.93	-62.51	-57.00	-5.51	HORIZONTAL
5	746.68	-74.30	14.04	-60.26	-57.00	-3.26	HORIZONTAL
6	820.48	-73.87	14.44	-59.43	-57.00	-2.43	HORIZONTAL
7	4,605.58	-69.69	14.95	-54.74	-47.00	-7.74	HORIZONTAL
8	6,531.93	-71.87	23.84	-48.03	-47.00	-1.03	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: Zigbee mode, RX CH Low, Dipole Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	39.15	-64.60	6.41	-58.19	-57.00	-1.19	VERTICAL
2	87.26	-59.12	1.00	-58.12	-57.00	-1.12	VERTICAL
3	341.34	-63.42	5.18	-58.24	-57.00	-1.24	VERTICAL
4	605.45	-73.09	10.19	-62.90	-57.00	-5.90	VERTICAL
5	746.74	-76.66	13.73	-62.93	-57.00	-5.93	VERTICAL
6	821.49	-75.71	13.92	-61.79	-57.00	-4.79	VERTICAL
7	1,997.79	-62.78	4.60	-58.18	-47.00	-11.18	VERTICAL
8	5,405.97	-70.79	17.59	-53.20	-47.00	-6.20	VERTICAL
1	35.80	-67.57	9.65	-57.92	-57.00	-0.92	HORIZONTAL
2	112.72	-59.63	1.29	-58.34	-57.00	-1.34	HORIZONTAL
3	221.70	-60.12	2.41	-57.71	-57.00	-0.71	HORIZONTAL
4	339.78	-62.92	4.81	-58.11	-57.00	-1.11	HORIZONTAL
5	597.33	-75.30	11.08	-64.22	-57.00	-7.22	HORIZONTAL
6	744.08	-76.22	13.94	-62.28	-57.00	-5.28	HORIZONTAL
7	1,484.93	-63.74	2.28	-61.46	-47.00	-14.46	HORIZONTAL
8	5,264.96	-70.97	16.82	-54.15	-47.00	-7.15	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

Test Mode: Zigbee mode, RX CH High, Dipole Ant.

Ambient temperature: 20℃ Relative humidity: 66% Test Date: 2023/09/05

No	Freq MHz	Reading dBm	Aux dB	Level dBm	Limit dBm	Margin dB	Pol V/H
1	88.27	-58.62	1.00	-57.62	-57.00	-0.62	VERTICAL
2	218.19	-61.54	2.73	-58.81	-57.00	-1.81	VERTICAL
3	341.02	-64.23	5.18	-59.05	-57.00	-2.05	VERTICAL
4	743.50	-77.32	13.74	-63.58	-57.00	-6.58	VERTICAL
5	820.22	-73.31	13.92	-59.39	-57.00	-2.39	VERTICAL
6	951.97	-75.76	17.65	-58.11	-57.00	-1.11	VERTICAL
7	1,975.07	-64.50	4.50	-60.00	-47.00	-13.00	VERTICAL
8	4,943.61	-70.62	16.32	-54.30	-47.00	-7.30	VERTICAL
1	195.03	-58.96	1.70	-57.26	-57.00	-0.26	HORIZONTAL
2	247.87	-62.54	4.38	-58.16	-57.00	-1.16	HORIZONTAL
3	522.61	-72.07	9.08	-62.99	-57.00	-5.99	HORIZONTAL
4	669.88	-78.28	11.93	-66.35	-57.00	-9.35	HORIZONTAL
5	746.97	-74.66	14.04	-60.62	-57.00	-3.62	HORIZONTAL
6	820.23	-77.24	14.44	-62.80	-57.00	-5.80	HORIZONTAL
7	4,607.47	-70.72	14.95	-55.77	-47.00	-8.77	HORIZONTAL
8	6,533.16	-71.38	23.84	-47.54	-47.00	-0.54	HORIZONTAL

Measurement uncertainty	30MHz - 80MHz: 5.04dB
	80MHz -1000MHz: 3.76dB
	1GHz - 26GHz: 4.45dB

Remark:

1. The emission behaviors belong to narrowband spurious emission.
2. Remark " --- " means that the emission level is too low to be measured
3. Aux: Field strength to EIRP correction factor
4. Level (dBm) = Reading (dBm) + Aux (dB)
5. Measurement Range upto 12.75GHz.

6.7 ETSI EN 300 328 SUB-CLAUSE 4.3.2.11 Receiver Blocking

This requirement applies to all receiver categories below.

Receiver categories

Receiver category 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.

Receiver category 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.

Receiver category 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.

6.7.1 Limit: Sub-Clause 4.3.2.11.3

While maintaining the minimum performance criteria as defined in clause 4.3.2.11.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided table 11, table 12 or table 13.

Table 11: Receiver Blocking parameters 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)	2380 2504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2300 2330 2360 2524 2584		

NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 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.

Table 12: Receiver Blocking parameters receiver category 2 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2380 2504 2300 2584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Table 13: Receiver Blocking parameters receiver category 3 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2380 2504 2300 2584	-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 the test may be performed using a wanted signal up to Pmin + 30 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

6.7.2 Test Procedure:

See Sub-Clause 5.4.11.1 of ETSI EN 300 328 for the test conditions

See Sub-Clause 5.4.11.2 of ETSI EN 300 328 for conducted method.

6.7.3 Test Result:

Dipole Ant.

The receiver blocking setup (conducted) shown in section Test & System Description was used to measure receiver blocking signal. The signaling Unit is a CMW500.The packet error rate (PER) is measured with the CMW500. The blocking signal is emulated by the Signal generator SMB100B. Antenna gain and insertion loss are taken into account.
The declared antenna gain is 0 dBi

Configuration	99% Occupied bandwidth (MHz)	Wanted signal mean power from companion device (dBm)	PER (%) Without blocking signal	Blocking signal(MHz)	Blocking Frequency Offset (MHz)	Blocking signal Power (dBm)	PER (%) With Blocking signal	Verdict
		without blocking signal		with blocking signal				
BLE channel 1 2402MHz	1.07	-65	0.4	2380	0	-32.5	7.9	PASS
			0.3	2300	0	-32.5	7.7	PASS
		without blocking signal		with blocking signal				
BLE channel 39 2480MHz	1.09	-65	0.3	2504	0	-32.5	8.3	PASS
			0.4	2584	0	-32.5	7.6	PASS

Note: The wanted signal mean power from the companion device and the blocking signal power level values are compensated with the declared antenna gain on table above

PCB Ant.

The receiver blocking setup (conducted) shown in section Test & System Description was used to measure receiver blocking signal. The signaling Unit is a CMW500.The packet error rate (PER) is measured with the CMW500. The blocking signal is emulated by the Signal generator SMB100B. Antenna gain and insertion loss are taken into account.

The declared antenna gain is 0 dBi

Configuration	99% Occupied bandwidth (MHz)	Wanted signal mean power from companion device (dBm)	PER (%) Without blocking signal	Blocking signal(MHz)	Blocking Frequency Offset (MHz)	Blocking signal Power (dBm)	PER (%) With Blocking signal	Verdict
		without blocking signal		with blocking signal				
BLE channel 1 2402MHz	1.07	-65	0.4	2380	0	-32.5	7.9	PASS
			0.3	2300	0	-32.5	7.7	PASS
		without blocking signal		with blocking signal				
BLE channel 39 2480MHz	1.09	-65	0.3	2504	0	-32.5	8.3	PASS
			0.4	2584	0	-32.5	7.6	PASS

Note: The wanted signal mean power from the companion device and the blocking signal power level values are compensated with the declared antenna gain on table above

Dipole Ant.

The receiver blocking setup (conducted) shown in section Test & System Description was used to measure receiver blocking signal. The signaling Unit is a CMW500.The packet error rate (PER) is measured with the CMW500. The blocking signal is emulated by the Signal generator SMB100B. Antenna gain and insertion loss are taken into account.

The declared antenna gain is 0 dBi

Configuration	99% Occupied bandwidth (MHz)	Wanted signal mean power from companion device (dBm)	PER (%) Without blocking signal	Blocking signal(MHz)	Blocking Frequency Offset (MHz)	Blocking signal Power (dBm)	PER (%) With Blocking signal	Verdict
		without blocking signal		**with blocking signal**				
Zigbee channel 1 2405MHz	1.07	-65	0.4	2380	0	-32.4	8.1	PASS
			0.3	2300	0	-32.5	7.9	PASS
		without blocking signal		**with blocking signal**				
Zigbee channel 39 2480MHz	1.09	-65	0.3	2504	0	-32.5	7.7	PASS
			0.4	2584	0	-32.5	7.6	PASS

Note: The wanted signal mean power from the companion device and the blocking signal power level values are compensated with the declared antenna gain on table above

PCB Ant.

The receiver blocking setup (conducted) shown in section Test & System Description was used to measure receiver blocking signal. The signaling Unit is a CMW500.The packet error rate (PER) is measured with the CMW500. The blocking signal is emulated by the Signal generator SMB100B. Antenna gain and insertion loss are taken into account.

The declared antenna gain is 0 dBi

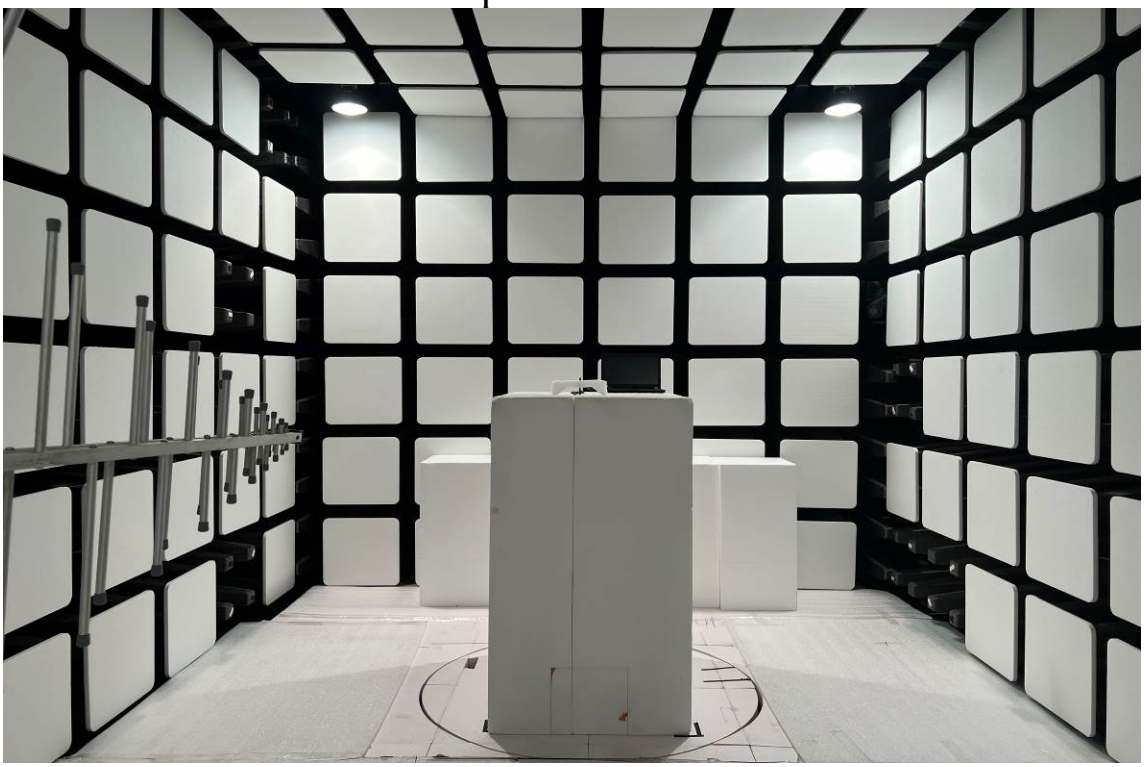
Configuration	99% Occupied bandwidth (MHz)	Wanted signal mean power from companion device (dBm)	PER (%) Without blocking signal	Blocking signal(MHz)	Blocking Frequency Offset (MHz)	Blocking signal Power (dBm)	PER (%) With Blocking signal	Verdict
		without blocking signal		with blocking signal				
Zigbee channel 1 2405MHz	1.07	-65	0.4	2380	0	-32.4	8.1	PASS
			0.3	2300	0	-32.5	7.9	PASS
		without blocking signal		with blocking signal				
Zigbee channel 39 2480MHz	1.09	-65	0.3	2504	0	-32.5	7.7	PASS
			0.4	2584	0	-32.5	7.6	PASS

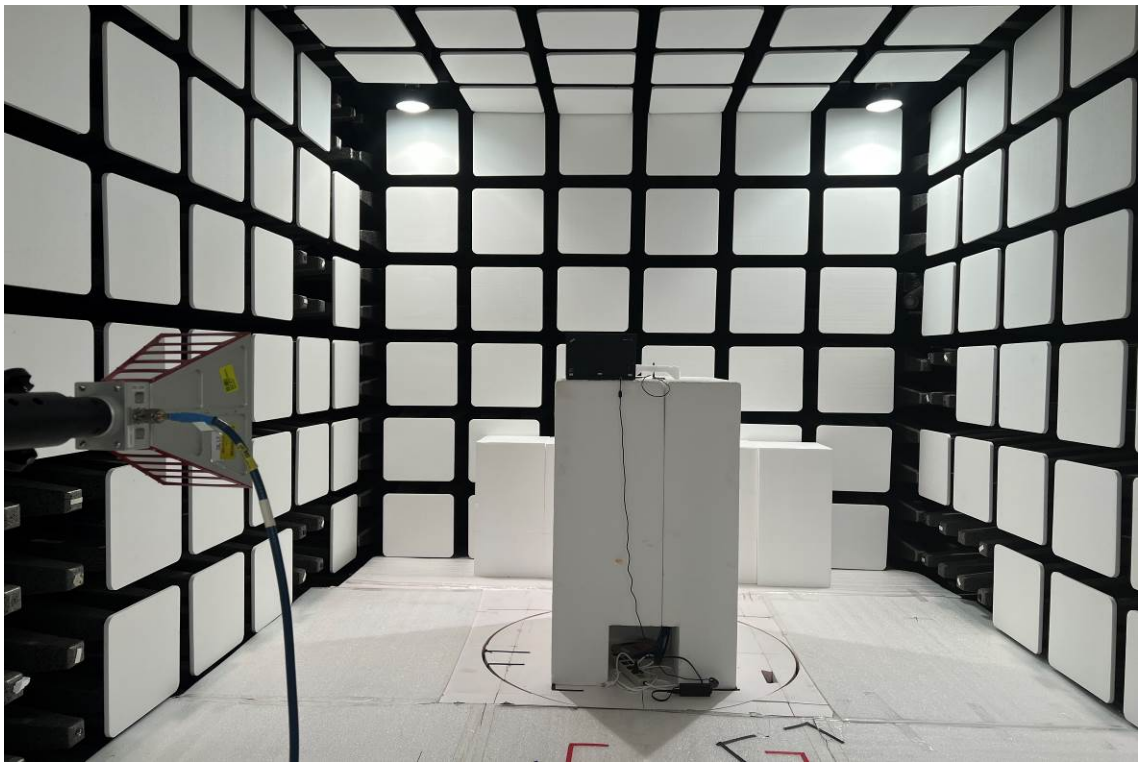
Note: The wanted signal mean power from the companion device and the blocking signal power level values are compensated with the declared antenna gain on table above

APPENDIX 1

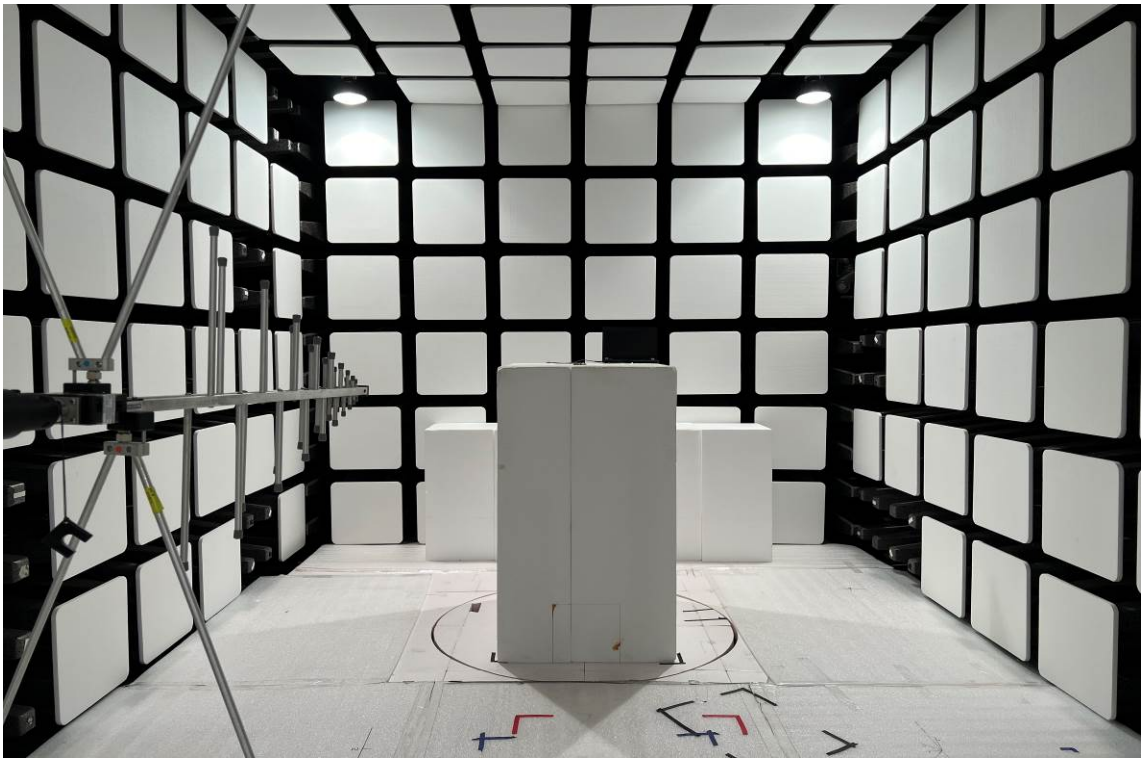
PHOTOGRAPHS OF SET UP

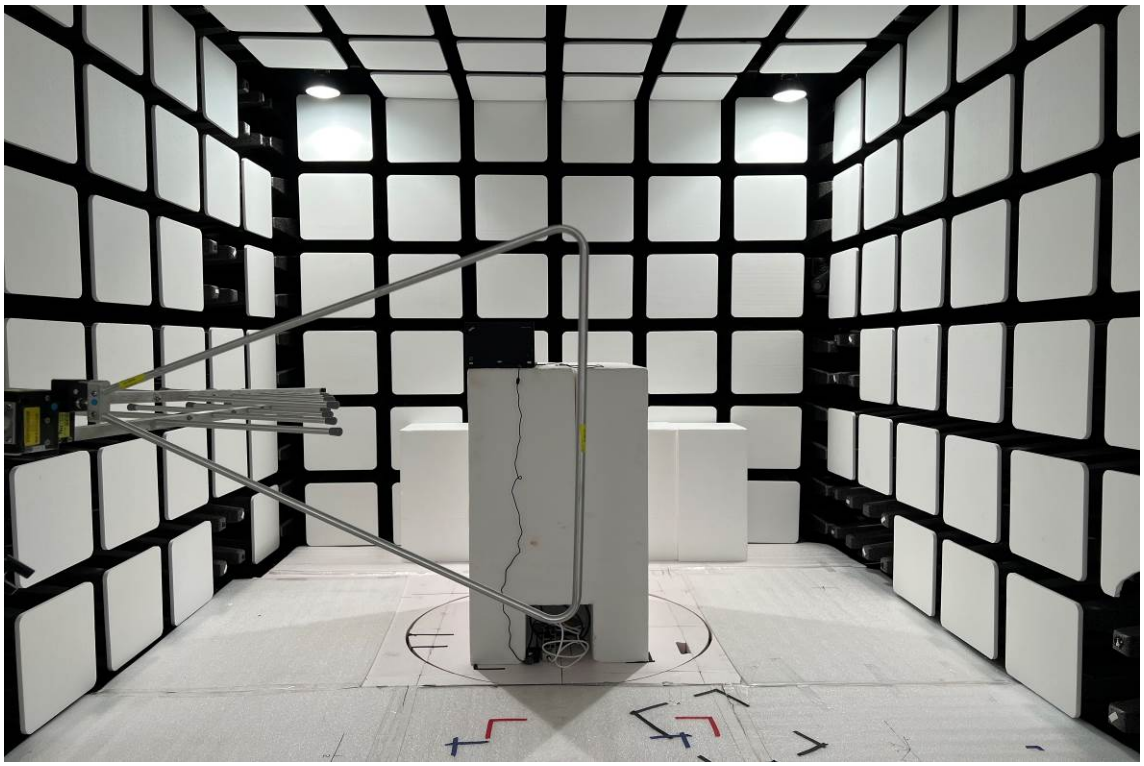
Dipole Antenna

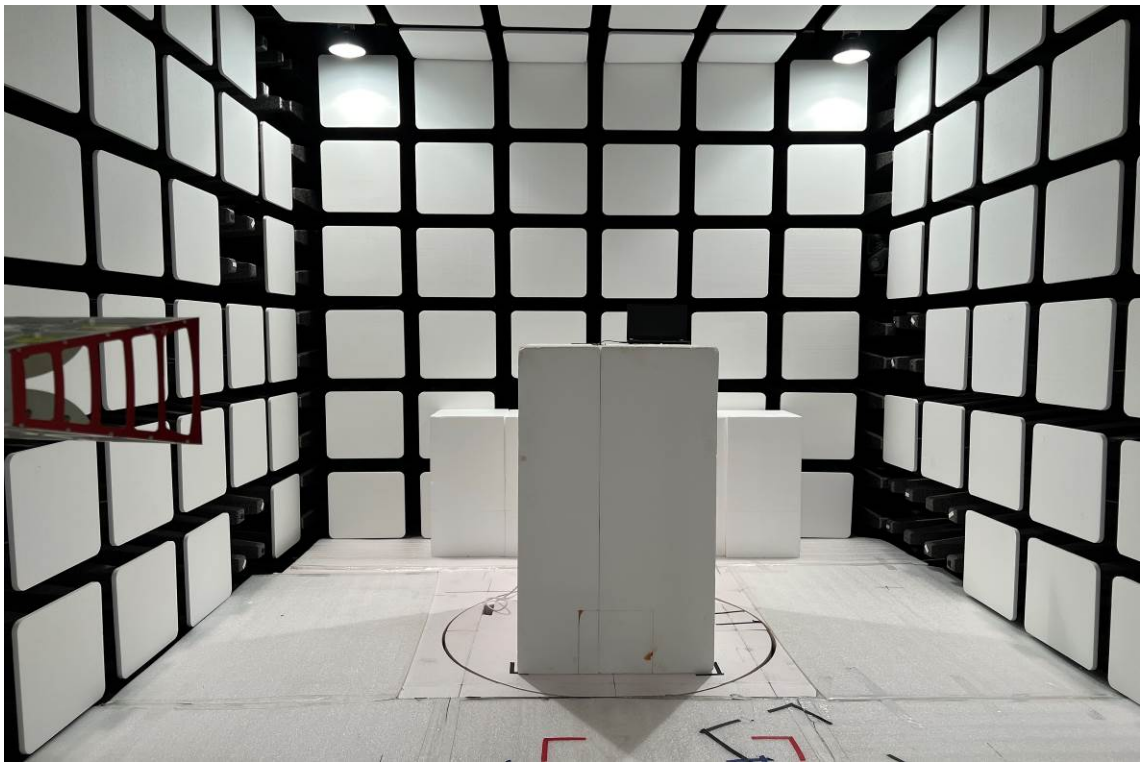


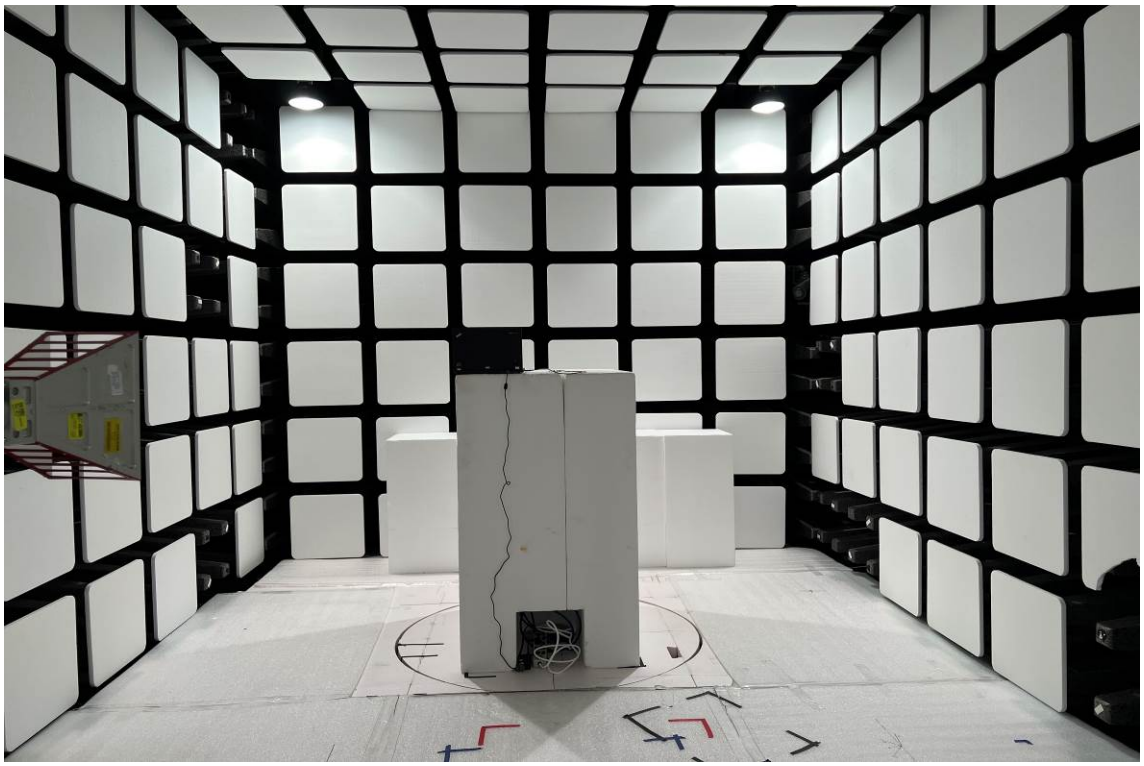


PCB Antenna









APPENDIX 2

PHOTOGRAPHS OF EUT

Please refer to the file ISL-23LR0074P