TEST REPORT

Report No.:	8227EU122002W
Applicant:	Zhulu Electronic Technology (Shanghai) Co., Ltd
Address:	No.6395 Hutai Road, Baoshan District, Shanghai_Room 2480, Zone A, 2nd Floor, Shanghai, China
Product Name:	wireless headphones
Model No.:	B39 (refer to clause 2.4)
Trademark:	N/A
FCC ID:	2BDUD-B39
Test Standard(s):	47 CFR Part 15 Subpart C
Date of Receipt:	Mar. 20, 2024
Test Date:	Mar. 20, 2024 – Mar. 26, 2024
Date of Issue:	Apr. 23, 2024

ISSUED BY:

SHENZHEN EU TESTING LABORATORY LIMITED

SHENZHEN EU TESTING LABORATORY LIMITED APPROVED

Prepared by: **Reviewed and Approved by:**

Mikey Zhu/ Engineer

Sally Zhang/ Manager

Revision Record

Report Version	Issued Date	Description	Status
V0	Apr. 23, 2024	Original	Valid

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

Table of Contents

1 COVER PAGE 1
2 GENERAL INFORMATION 5
2.1 APPLICANT INFORMATION 5
2.2 MANUFACTURER INFORMATION 5
2.3 FACTORY INFORMATION 5
2.4 GENERAL DESCRIPTION OF E.U.T. 5
2.5 TECHNICAL INFORMATION OF E.U.T. 6
3 TEST SUMMARY 7
3.1 TEST STANDARD 7
3.2 TEST VERDICT 7
3.3 TEST LABORATORY 7
4 TEST CONFIGURATION 8
4.1 TEST ENVIRONMENT 8
4.2 TEST EQUIPMENT 8
4.3 DESCRIPTION OF SUPPORT UNIT 9
4.4 TEST MODE 9
4.5 MEASUREMENT UNCERTAINTY 9
4.6 DEVIATION FROM STANDARDS 10
4.7 ABNORMALITIES FROM STANDARD CONDITION 10
5 TEST ITEMS 11
5.1 ANTENNA REQUIREMENT 11
5.1.1 Test Requirement 11
5.1.2 Antenna Anti-Replacement Construction 11
5.1.3 Antenna Gain 11
5.2 CONDUCTED EMISSION AT AC POWER LINE 12
5.2.1 Test Requirement 12
5.2.2 Test Setup Diagram 12
5.2.3 Test Procedure 12
5.2.4 Test Data 12
5.3 OCCUPIED BANDWIDTH 15
5.3.1 Test Requirement 15
5.3.2 Test Setup Diagram 15
5.3.3 Test Procedure 16
5.3.4 Test Data 16
5.4 MAXIMUM CONDUCTED OUTPUT POWER 17
5.4.1 Test Requirement 17
5.4.2 Test Setup Diagram 17
5.4.3 Test Procedure 17
5.4.4 Test Data 18
5.5 CARRIER FREQUENCY SEPARATION 19
5.5.1 Test Requirement 19
5.5.2 Test Setup Diagram 19
5.5.3 Test Procedure 19
5.5.4 Test Data 20
5.6 NUMBER OF HOPPING FREQUENCIES 21
5.6.1 Test Requirement 21
5.6.2 Test Setup Diagram 21
5.6.3 Test Procedure 21
5.6.4 Test Data 22
5.7 TIME OF OCCUPANCY (DWELL TIME) 23

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.7.1 Test Requirement 23
5.7.2 Test Setup Diagram 23
5.7.3 Test Procedure 23
5.7.4 Test Data 24
5.8 EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS (CONDUCTED) 25
5.8.1 Test Requirement 25
5.8.2 Test Setup Diagram 25
5.8.3 Test Procedure 25
5.8.4 Test Data 26
5.9 BAND EDGE EMISSIONS (RESTRICTED FREQUENCY BANDS) 27
5.9.1 Test Requirement 27
5.9.2 Test Setup Diagram 28
5.9.3 Test Procedure 28
5.9.4 Test Data 28
5.10 RADIATED SPURIOUS EMISSION 32
5.10.1 Test Requirement 32
5.10.2 Test Setup Diagram 33
5.10.3 Test Procedure 34
5.10.4 Test Data 34
ANNEX A TEST SETUP PHOTOS 40
ANNEX B EXTERNAL PHOTOS 40
ANNEX C INTERNAL PHOTOS 40
ANNEX D TEST DATA 40

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

2 General Information

2.1 Applicant Information

Applicant	Zhulu Electronic Technology (Shanghai) Co., Ltd
Address	No.6395 Hutai Road, Baoshan District, Shanghai_Room 2480, Zone A, 2nd Floor, Shanghai, China

2.2 Manufacturer Information

Manufacturer	Zhulu Electronic Technology (Shanghai) Co., Ltd
Address	No.6395 Hutai Road, Baoshan District, Shanghai_Room 2480, Zone A, 2nd Floor, Shanghai, China

2.3 Factory Information

Factory	Zhulu Electronic Technology (Shanghai) Co., Ltd
Address	No.6395 Hutai Road, Baoshan District, Shanghai_Room 2480, Zone A, 2nd Floor, Shanghai, China

2.4 General Description of E.U.T.

Product Name	wireless headphones
Model No. Under Test	B39
List Model No.	HD200, P2961, VJ033, V33, MAX PRO, BT-3, M3, M5, M6, P47, Y08, V3, V5, V8, V9, STN28, STN28PRO, B39pro, LX8686, LX560, S3, B35, CXT01, K5, K6, M6PRO, ST89M, T14, S028, P30, P47M, Y08M, G58, G7100, H&S V660, H&S V860, H&S V960, H&S S5, H&S V3, H&S V5, H&S V8, H&S V9, H&S V5PRO, H&S V3PRO, H&S V12, H&S S8, H&S V560, H&S S3, H&S S7, H&S V530, H&S V10, H&S V500, H&S V930, H&S V11, H&S V630, H&S V760, H&S V730, H&S V830, SY20, V500
Description of Model differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in appearance and model name. (this information provided by the customer)
Rating(s)	Input: 5VDC Battery Capacity: 3.7VDC, 200mAh, 0.74Wh
Product Type	☐ Mobile ☒ Portable ☐ Fix Location
Test Sample No.	-1/1(Normal Sample)
Hardware Version	N/A
Software Version	N/A
Remark	For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.5 Technical Information of E.U.T.

Technology Used	Bluetooth (BDR+EDR)

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

Technology	**Bluetooth**
Operation Mode	☒ BDR ☒ EDR
Modulation Type	GFSK, π/4DQPSK, 8DPSK
Operating Frequency	2402-2480MHz
Transfer Rate	DH5: 1 Mbps 2DH5: 2 Mbps 3DH5: 3 Mbps
Number of Channel	79
Antenna Type	PCB Antenna
Antenna Gain(Peak)	-0.68 dBi

All channel was listed on the following table:

Channel Number	Freq. (MHz)	Channel Number	Freq. (MHz)	Channel Number	Freq. (MHz)	Channel Number	Freq. (MHz)
0	**2402**	21	2423	42	2444	63	2465
1	2403	22	2424	43	2445	64	2466
2	2404	23	2425	44	2446	65	2467
3	2405	24	2426	45	2447	66	2468
4	2406	25	2427	46	2448	67	2469
5	2407	26	2428	47	2449	68	2470
6	2408	27	2429	48	2450	69	2471
7	2409	28	2430	49	2451	70	2472
8	2410	29	2431	50	2452	71	2473
9	2411	30	2432	51	2453	72	2474
10	2412	31	2433	52	2454	73	2475
11	2413	32	2434	53	2455	74	2476
12	2414	33	2435	54	2456	75	2477
13	2415	34	2436	55	2457	76	2478
14	2416	35	2437	56	2458	77	2479
15	2417	36	2438	57	2459	**78**	**2480**
16	2418	37	2439	58	2460	-	-
17	2419	38	2440	59	2461	-	-
18	2420	**39**	**2441**	60	2462	-	-
19	2421	40	2442	61	2463	-	-
20	2422	41	2443	62	2464	-	-

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

3 Test Summary

3.1 Test Standard

The tests were performed according to following standards:

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Intentional radiators of radio frequency equipment
2	ANSI C63.10-2020	American National Standard for Testing Unlicensed Wireless Devices
3	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules

Remark:
Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the emission/immunity should be checked to ensure compliance has been maintained.

3.2 Test Verdict

No.	Description	FCC Part No.	Channel	Verdict	Remark
1	Antenna Requirement	15.203	N/A	Pass	Note [1]
2	Conducted Emission at AC Power Line	15.207	Low/Middle/High	Pass	--
3	Occupied Bandwidth	15.215(c)	Low/Middle/High	Pass	--
4	Maximum Conducted Output Power	15.247(b)(1)	Low/Middle/High	Pass	--
5	Carrier Frequency Separation	15.247(a)(1)	Hopping Mode	Pass	--
6	Number of Hopping Frequencies	15.247(a)(1) (iii)	Hopping Mode	Pass	--
7	Time of Occupancy (Dwell time)	15.247(a)(1)(iii)	Hopping Mode	Pass	--
8	Emission in non-restricted frequency bands (Conducted)	15.247(d)	Hopping Mode; Low/Middle/High	Pass	--
9	Band Edge Emissions (Restricted frequency bands)	15.209 15.247(d)	Low/High	Pass	--
10	Radiated Spurious Emission	15.209 15.247(d)	Low/Middle/High	Pass	--
Note [1]: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.					

3.3 Test Laboratory

Test Laboratory	Shenzhen EU Testing Laboratory Limited
Address	1/F, Bldg. B1, Fuqiao Fourth Industrial Area, Fuhai Street, Baoan District, Shenzhen, Guangdong, China
Designation Number	CN1368
Test Firm Registration Number	952583

4 Test Configuration

4.1 Test Environment

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

Relative Humidity	40% to 60%	
Atmospheric Pressure	90 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+15℃ to +35℃
Working Voltage of the EUT	NV (Normal Voltage)	3.7V

4.2 Test Equipment

Conducted Emission at AC power line					
Equipment	**Manufacturer**	**Model No**	**Serial No**	**Cal Date**	**Cal Due Date**
L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	EE-004	2024/01/09	2025/01/08
EMI Test Receiver	Rohde & Schwarz	ESCI	EE-005	2024/01/09	2025/01/08
Test Software	Farad	EZ-EMC	EE-014	N.C.R	N.C.R

Radiated Emission and RF Test					
Equipment	**Manufacturer**	**Model No**	**Serial No**	**Cal. Date**	**Cal. Due Date**
EMI Test Receiver	ROHDE & SCHWARZ	ESPI	EE-006	2024/01/09	2025/01/08
Bilog Broadband Antenna	SCHWARZBECK	VULB 9163	EE-007	2023/01/14	2026/01/09
Double Ridged Horn Antenna	A-INFOMW	LB-10180-NF	EE-008	2023/01/12	2026/01/09
Pre-amplifier	Agilent	8447D	EE-009	2024/01/09	2025/01/08
Pre-amplifier	Agilent	8449B	EE-010	2024/01/09	2025/01/08
MXA Signal Analyzer	Agilent	N9020A	EE-011	2024/01/09	2025/01/08
MXG RF Vector Signal Generator	Agilent	N5182A	EE-012	2024/01/09	2025/01/08
Test Software	Farad	EZ-EMC	EE-015	N.C.R	N.C.R
MIMO Power Measurement Module	TSTPASS	TSPS 2023R	EE-016	2023/05/17	2024/05/16
RF Test Software	TSTPASS	TS32893 V2.0	EE-017	N.C.R	N.C.R
Wideband Radio Communication Tester	ROHDE & SCHWARZ	CMW500	EE-402	2024/02/15	2025/02/14
Loop Antenna	TESEQ	HLA6121	EE-403	2024/02/15	2025/02/14
MXG RF Analog Signal Generator	Agilent	N5181A	EE-406	2024/02/15	2025/02/14
Power Meter	Anritsu	ML2495A	EE-416	2023/06/07	2024/06/06
Constant Temperature Humidity Chamber	Guangxin	GXP-401	ES-002	2023/07/31	2024/07/30

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

4.3 Description of Support Unit

No.	Title	Manufacturer	Model No.	Serial No.
1	Adapter	N/A	N/A	--
2	Mobile phone	Apple	iphone 13	--

4.4 Test Mode

No.	Test Modes	Description
TM1	TX-GFSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.
TM2	TX-GFSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with GFSK modulation.
TM3	TX-π/4DQPSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with π/4DQPSK modulation.
TM4	TX-π/4DQPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with π/4DQPSK modulation.
TM5	TX-8DPSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with 8DPSK modulation.
TM6	TX-8DPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with 8DPSK modulation.

4.5 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.

Test Item	Measurement Uncertainty
Conducted Emission	2.64 dB
Occupied Channel Bandwidth	2.8 %
RF output power, conducted	0.68 dB
Power Spectral Density, conducted	1.37 dB
Unwanted Emissions, conducted	1.84 dB
Radiated Emission (30MHz- 1GHz)	Ur = 2.70 dB (Horizontal)
	Ur = 2.70 dB (Vertical)
Radiated Emission (1GHz- 18GHz)	Ur = 3.50 dB (Horizontal)
	Ur = 3.50 dB (Vertical)
Radiated Emission (18GHz- 40GHz)	Ur = 5.15 dB (Horizontal)
	Ur = 5.24 dB (Vertical)
Temperature	0.8°C
Humidity	4%

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

4.6 Deviation from Standards

None.

4.7 Abnormalities from Standard Condition

None.

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5 Test Items

5.1 Antenna requirement

5.1.1 Test Requirement

Test Requirement	According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded. If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the product.	An embedded-in antenna design is used.

5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.2 Conducted Emission at AC Power Line

5.2.1 Test Requirement

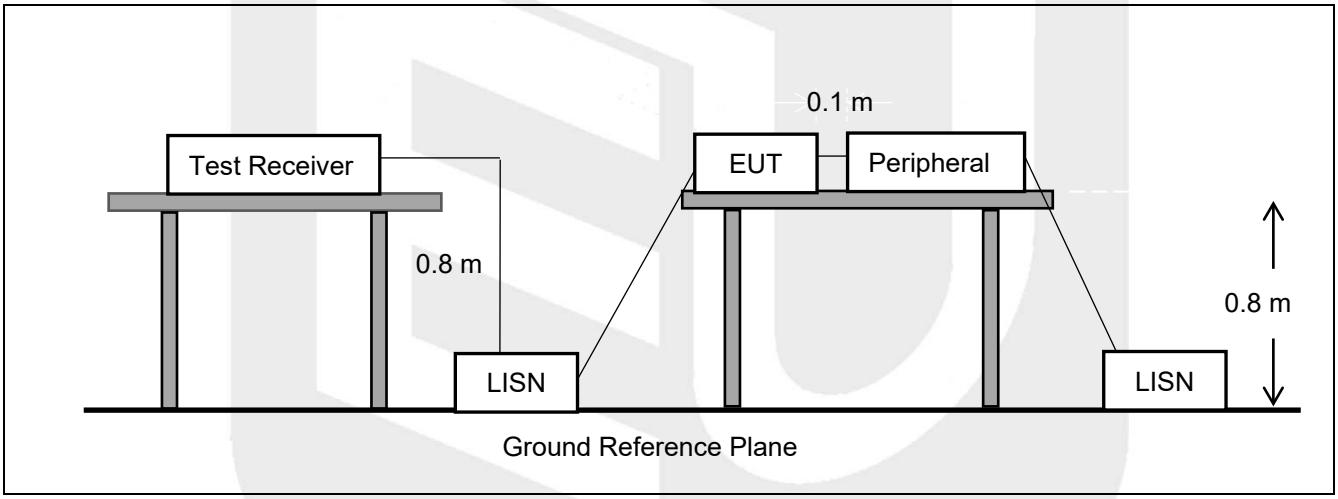
Test Requirement:	Except as shown in paragraphs (b)and (c)of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).
Test Limit	

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Test Method	Refer to ANSI C63.10-2020 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices.

5.2.2 Test Setup Diagram



5.2.3 Test Procedure

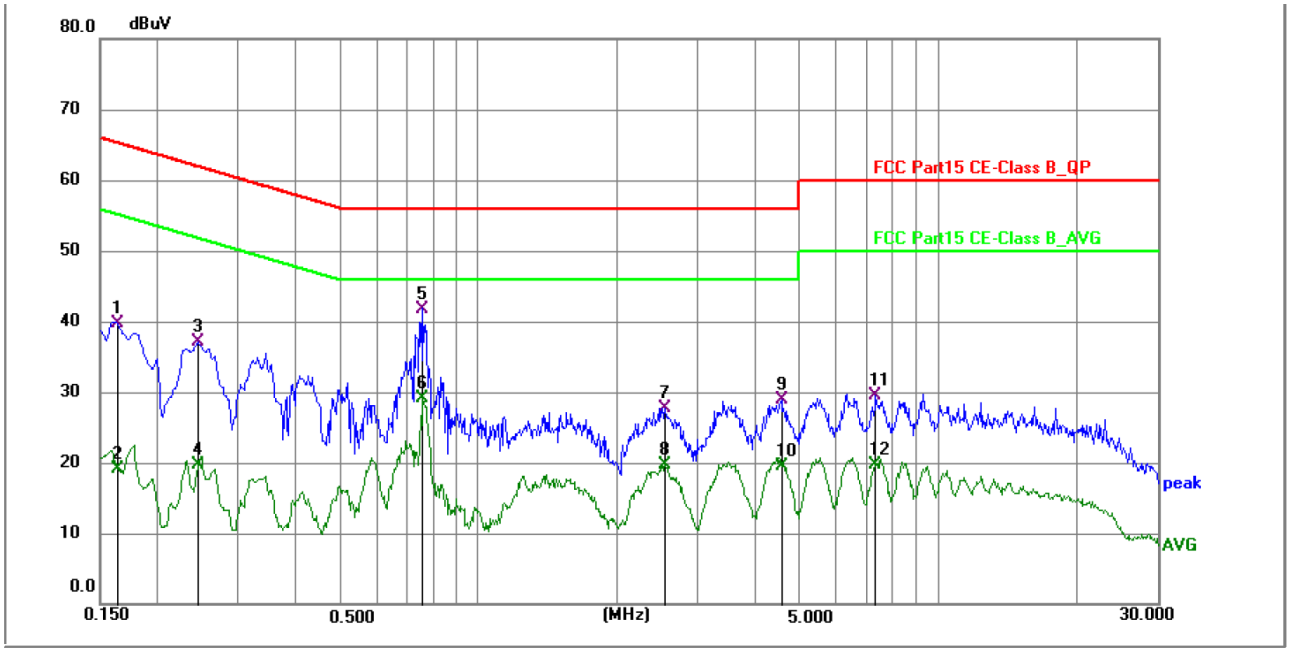
The EUT is put on the plane 0.8 m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network (L.I.S.N). This provided a 50ohm coupling impedance for the tested equipment. Both sides of AC line are investigated to find out the maximum conducted emission according to the test standard regulations during conducted emission measurement.
The bandwidth of the field strength meter (R&S Test Receiver ESCI) is set at 9kHz in 150kHz~30MHz.
The maximum conducted interference is searched using Peak (PK), if the emission levels 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. Refer to recorded points and plots below.
Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.2.4 Test Data

PASS.
Only the worst case data was showed in the report, please to see the following pages.

Conducted Emission Test Data

Test Site:	Shielded Room #1
Test Mode:	TM2/ CH Middle
Comments:	Live Line

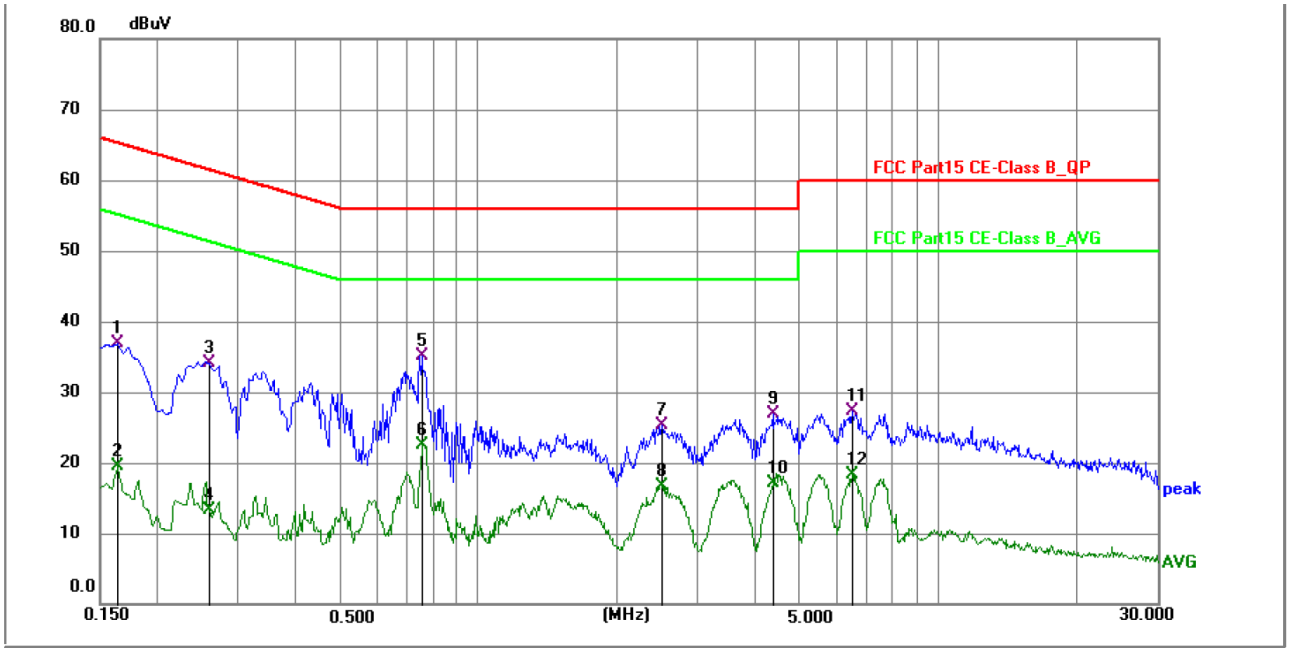


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1635	29.85	9.91	39.76	65.28	-25.52	QP	P	
2	0.1635	9.25	9.91	19.16	55.28	-36.12	AVG	P	
3	0.2445	27.22	9.92	37.14	61.94	-24.80	QP	P	
4	0.2445	9.86	9.92	19.78	51.94	-32.16	AVG	P	
5 *	0.7575	31.81	9.99	41.80	56.00	-14.20	QP	P	
6	0.7575	19.10	9.99	29.09	46.00	-16.91	AVG	P	
7	2.5440	17.79	10.00	27.79	56.00	-28.21	QP	P	
8	2.5440	9.71	10.00	19.71	46.00	-26.29	AVG	P	
9	4.5600	18.92	10.00	28.92	56.00	-27.08	QP	P	
10	4.5600	9.47	10.00	19.47	46.00	-26.53	AVG	P	
11	7.3185	19.53	10.00	29.53	60.00	-30.47	QP	P	
12	7.3185	9.71	10.00	19.71	50.00	-30.29	AVG	P	

Note: Level = Reading + Factor Margin = Level - Limit

Conducted Emission Test Data

Test Site:	Shielded Room #1
Test Mode:	TM2/ CH Middle
Comments:	Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1635	26.91	9.93	36.84	65.28	-28.44	QP	P	
2	0.1635	9.59	9.93	19.52	55.28	-35.76	AVG	P	
3	0.2580	24.22	9.95	34.17	61.50	-27.33	QP	P	
4	0.2580	3.30	9.95	13.25	51.50	-38.25	AVG	P	
5 *	0.7530	25.17	10.02	35.19	56.00	-20.81	QP	P	
6	0.7530	12.48	10.02	22.50	46.00	-23.50	AVG	P	
7	2.5080	15.28	10.02	25.30	56.00	-30.70	QP	P	
8	2.5080	6.63	10.02	16.65	46.00	-29.35	AVG	P	
9	4.3755	16.80	10.01	26.81	56.00	-29.19	QP	P	
10	4.3755	7.19	10.01	17.20	46.00	-28.80	AVG	P	
11	6.5085	17.18	10.03	27.21	60.00	-32.79	QP	P	
12	6.5085	8.18	10.03	18.21	50.00	-31.79	AVG	P	

Note: Level = Reading + Factor Margin = Level - Limit

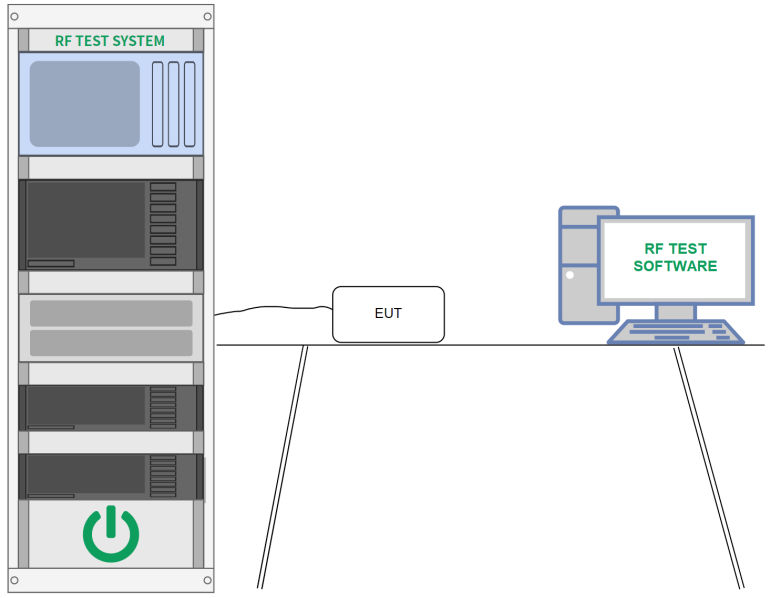
Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.3 Occupied Bandwidth

5.3.1 Test Requirement

Test Requirement	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Test Limit:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Test Method	ANSI C63.10-2020, section 6.9.2 Occupied bandwidth—relative measurement procedure

5.3.2 Test Setup Diagram



5.3.3 Test Procedure

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.
c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.
d) Steps a) through c) might require iteration to adjust within the specified tolerances.
e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "−xx dB down" requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the
reference value.
f) Set detection mode to peak and trace mode to max hold.
g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
h) Determine the "−xx dB down amplitude" using [(reference value) − xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.
i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).
j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "-xx dB down amplitude" determined in step h). If a marker is below this "−xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "-xx dB down amplitude" determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.
k)The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

5.3.4 Test Data

PASS.
Please refer to Annex D for details.

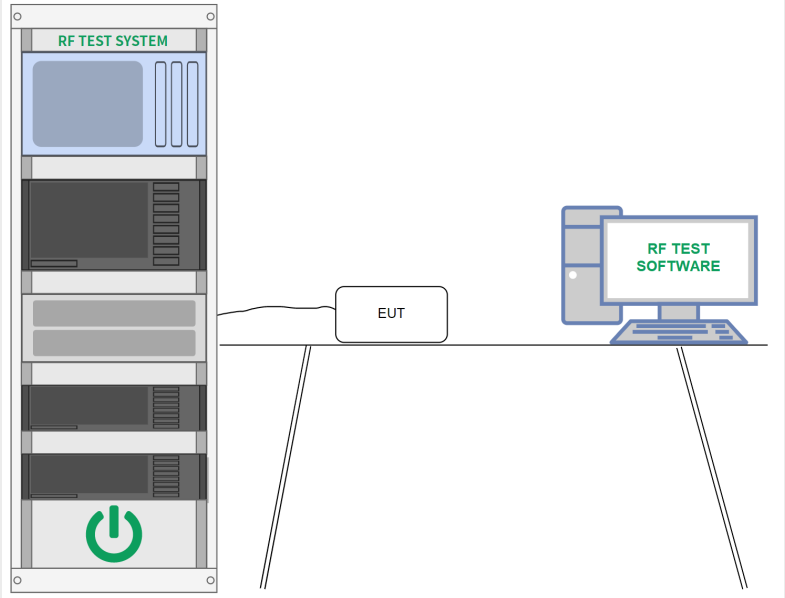
Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.4 Maximum Conducted Output Power

5.4.1 Test Requirement

Test Requirement	For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Test Limit:	For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Test Method	ANSI C63.10-2020, section 7.8.5 Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices

5.4.2 Test Setup Diagram



5.4.3 Test Procedure

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

a) Use the following spectrum analyzer settings:
1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
2) RBW > 20 dB bandwidth of the emission being measured.
3) VBW >= RBW.
4) Sweep: Auto.
5) Detector function: Peak.
6) Trace: Max hold.

b) Allow trace to stabilize.
c) Use the marker-to-peak function to set the marker to the peak of the emission.
d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

A plot of the test results and setup description shall be included in the test report. NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

5.4.4 Test Data

PASS.

Please refer to Annex D for details.

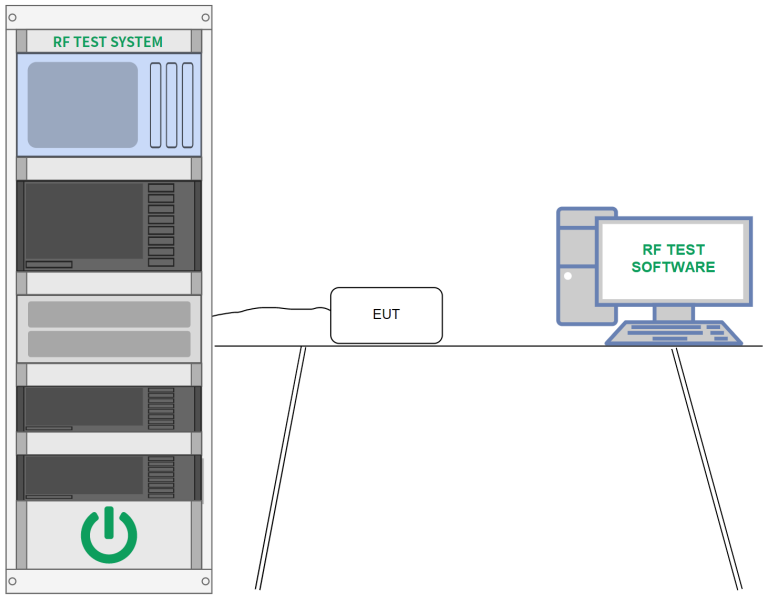
Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.5 Carrier Frequency Separation

5.5.1 Test Requirement

Test Requirement	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Test Limit:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Test Method	ANSI C63.10-2020, section 7.8.2 Carrier frequency separation

5.5.2 Test Setup Diagram



5.5.3 Test Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
a) Span: Wide enough to capture the peaks of two adjacent channels.
b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
c) Video (or average) bandwidth (VBW) ≥ RBW.
d) Sweep: Auto.
e) Detector function: Peak.
f) Trace: Max hold.
g) Allow the trace to stabilize.
Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

5.5.4 Test Data

PASS.

Please refer to Annex D for details.

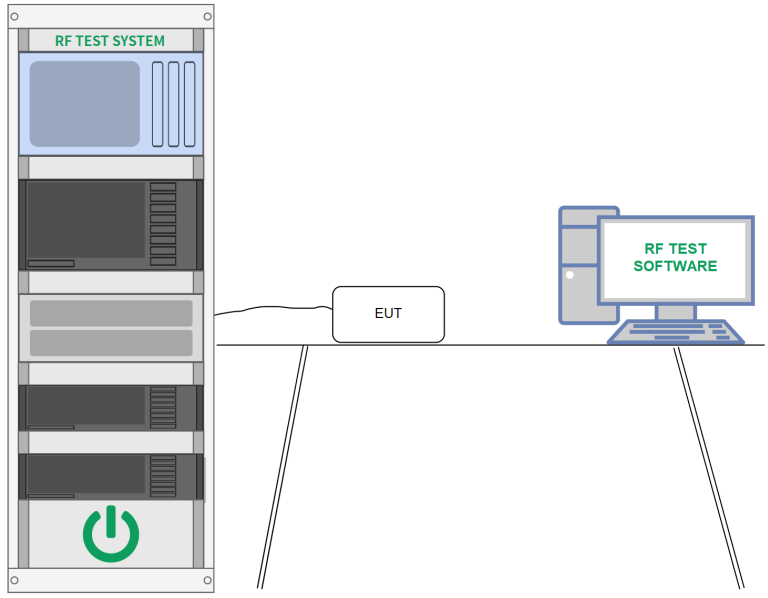
Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.6 Number of Hopping Frequencies

5.6.1 Test Requirement

Test Requirement	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied bythe number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Limit:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method	ANSI C63.10-2020, section 7.8.3 Number of hopping frequencies

5.6.2 Test Setup Diagram



5.6.3 Test Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
c) VBW ≥ RBW.
d) Sweep: Auto.
e) Detector function: Peak.
f) Trace: Max hold.
g) Allow the trace to stabilize.
It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

5.6.4 Test Data

PASS.

Please refer to Annex D for details.

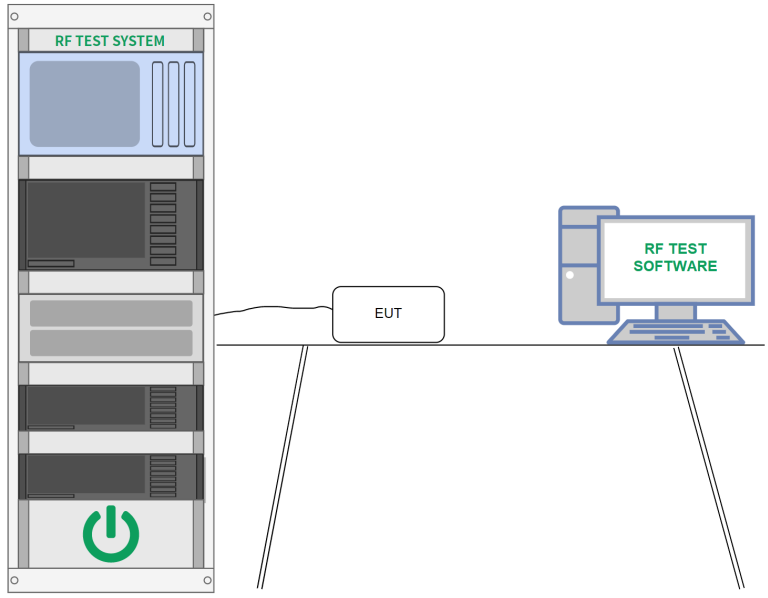
Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.7 Time of Occupancy (Dwell Time)

5.7.1 Test Requirement

Test Requirement	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Limit:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method	ANSI C63.10-2020, section 7.8.4 Time of occupancy (dwell time)

5.7.2 Test Setup Diagram



5.7.3 Test Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
a) Span: Zero span, centered on a hopping channel.
b) RBW shall be <= channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
d) Detector function: Peak.
e) Trace: Max hold.
Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) =
(number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.

5.7.4 Test Data

PASS.

Please refer to Annex D for details.

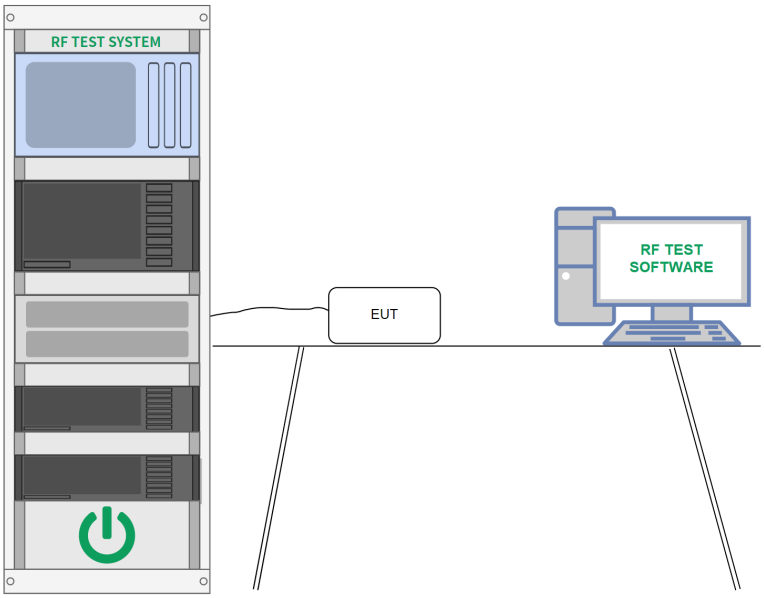
Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.8 Emissions in Non-restricted Frequency Bands (Conducted)

5.8.1 Test Requirement

Test Requirement	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Test Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Test Method	ANSI C63.10-2020 Section 11.11 Emission in non-restricted frequency bands

5.8.2 Test Setup Diagram



5.8.3 Test Procedure

Conducted spurious emissions shall be measured for the transmit frequency and at the maximum transmit powers.
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several

plots are required to cover this entire span. RBW = 100 kHz VBW = 300 kHz Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize

5.8.4 Test Data

PASS.

Please refer to Annex D for details.

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.9 Band Edge Emissions (Restricted frequency bands)

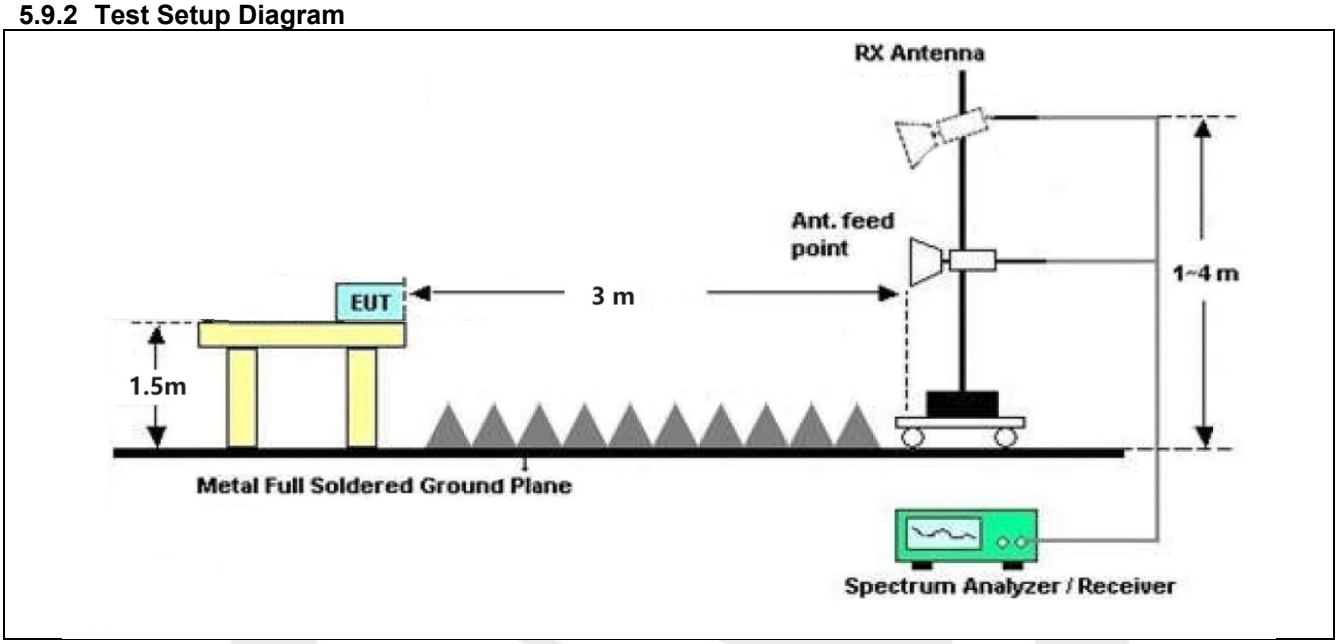
5.9.1 Test Requirement

<table>
<tr><td>Test Requirement</td><td>In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).</td></tr>
<tr><td>Test Limit</td><td>
<table>
<tr><th>Frequency (MHz)</th><th>Field strength (microvolts/meter)</th><th>Measurement distance (meters)</th></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

Restricted frequency bands:
<table>
<tr><th>MHz</th><th>MHz</th><th>MHz</th><th>GHz</th></tr>
<tr><td>0.090-0.110</td><td>16.42-16.423</td><td>399.9-410</td><td>4.5-5.15</td></tr>
<tr><td>0.495-0.505</td><td>16.69475-16.69525</td><td>608-614</td><td>5.35-5.46</td></tr>
<tr><td>2.1735-2.1905</td><td>16.80425-16.80475</td><td>960-1240</td><td>7.25-7.75</td></tr>
<tr><td>4.125-4.128</td><td>25.5-25.67</td><td>1300-1427</td><td>8.025-8.5</td></tr>
<tr><td>4.17725-4.17775</td><td>37.5-38.25</td><td>1435-1626.5</td><td>9.0-9.2</td></tr>
<tr><td>4.20725-4.20775</td><td>73-74.6</td><td>1645.5-1646.5</td><td>9.3-9.5</td></tr>
<tr><td>6.215-6.218</td><td>74.8-75.2</td><td>1660-1710</td><td>10.6-12.7</td></tr>
<tr><td>6.26775-6.26825</td><td>108-121.94</td><td>1718.8-1722.2</td><td>13.25-13.4</td></tr>
<tr><td>6.31175-6.31225</td><td>123-138</td><td>2200-2300</td><td>14.47-14.5</td></tr>
<tr><td>8.291-8.294</td><td>149.9-150.05</td><td>2310-2390</td><td>15.35-16.2</td></tr>
<tr><td>8.362-8.366</td><td>156.52475-156.52525</td><td>2483.5-2500</td><td>17.7-21.4</td></tr>
<tr><td>8.37625-8.38675</td><td>156.7-156.9</td><td>2690-2900</td><td>22.01-23.12</td></tr>
<tr><td>8.41425-8.41475</td><td>162.0125-167.17</td><td>3260-3267</td><td>23.6-24.0</td></tr>
<tr><td>12.29-12.293</td><td>167.72-173.2</td><td>3332-3339</td><td>31.2-31.8</td></tr>
<tr><td>12.51975-12.52025</td><td>240-285</td><td>3345.8-3358</td><td>36.43-36.5</td></tr>
<tr><td>12.57675-12.57725</td><td>322-335.4</td><td>3600-4400</td><td></td></tr>
<tr><td>13.36-13.41</td><td></td><td></td><td></td></tr>
</table>
Note:
1) Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].
2) In the emission tables above, the tighter limit applies at the band edges.
3) For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
4) For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).
</td></tr>
<tr><td>Test Method</td><td>ANSI C63.10-2020 section 6.6.4</td></tr>
</table>

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.9.2 Test Setup Diagram



5.9.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.
The power of the EUT transmitting frequency should be ignored.
All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.
Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold.

5.9.4 Test Data

PASS.
Please refer to the following pages.

Band-edge Emissions (Radiated)

Test Mode: GFSK					CH Low: 2402 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
H	2310.00	45.52	-2.81	42.71	74.00	-31.29	PK	PASS
H	2390.00	49.59	-2.69	46.90	74.00	-27.10	PK	PASS
H	**2400.00	63.84	-2.68	61.16	74.00	-12.84	PK	PASS
V	2310.00	44.73	-2.81	41.92	74.00	-32.08	PK	PASS
V	2390.00	46.47	-2.69	43.78	74.00	-30.22	PK	PASS
V	**2400.00	63.32	-2.68	60.64	74.00	-13.36	PK	PASS
H	2310.00	32.79	-2.81	29.98	54.00	-24.02	AV	PASS
H	2390.00	36.65	-2.69	33.96	54.00	-20.04	AV	PASS
H	**2400.00	49.58	-2.68	46.90	54.00	-7.10	AV	PASS
V	2310.00	33.95	-2.81	31.14	54.00	-22.86	AV	PASS
V	2390.00	37.18	-2.69	34.49	54.00	-19.51	AV	PASS
V	**2400.00	50.63	-2.68	47.95	54.00	-6.05	AV	PASS

Test Mode: GFSK					CH High: 2480 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
H	**2483.50	47.57	-2.56	45.01	74.00	-28.99	PK	PASS
H	2500.00	52.94	-2.54	50.40	74.00	-23.60	PK	PASS
V	**2483.50	47.55	-2.56	44.99	74.00	-29.01	PK	PASS
V	2500.00	52.93	-2.54	50.39	74.00	-23.61	PK	PASS
H	**2483.50	39.29	-2.56	36.73	54.00	-17.27	AV	PASS
H	2500.00	43.01	-2.54	40.47	54.00	-13.53	AV	PASS
V	**2483.50	40.12	-2.56	37.56	54.00	-16.44	AV	PASS
V	2500.00	40.90	-2.54	38.36	54.00	-15.64	AV	PASS

Remark:
1. Emission Level = Reading + Factor, Margin= Emission Level – Limit.

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

Band Edge Emissions (Restricted frequency bands):

Test Mode: π/4DQPSK					CH Low: 2402 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
H	2310.00	46.32	-2.81	43.51	74.00	-30.49	PK	PASS
H	2390.00	46.55	-2.69	43.86	74.00	-30.14	PK	PASS
H	**2400.00	62.43	-2.68	59.75	74.00	-14.25	PK	PASS
V	2310.00	46.59	-2.81	43.78	74.00	-30.22	PK	PASS
V	2390.00	46.68	-2.69	43.99	74.00	-30.01	PK	PASS
V	**2400.00	63.16	-2.68	60.48	74.00	-13.52	PK	PASS
H	2310.00	36.11	-2.81	33.30	54.00	-20.70	AV	PASS
H	2390.00	37.70	-2.69	35.01	54.00	-18.99	AV	PASS
H	**2400.00	48.95	-2.68	46.27	54.00	-7.73	AV	PASS
V	2310.00	33.83	-2.81	31.02	54.00	-22.98	AV	PASS
V	2390.00	38.10	-2.69	35.41	54.00	-18.59	AV	PASS
V	**2400.00	49.42	-2.68	46.74	54.00	-7.26	AV	PASS

Test Mode: π/4DQPSK					CH High: 2480 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
H	**2483.50	49.62	-2.56	47.06	74.00	-26.94	PK	PASS
H	2500.00	52.17	-2.54	49.63	74.00	-24.37	PK	PASS
V	**2483.50	49.84	-2.56	47.28	74.00	-26.72	PK	PASS
V	2500.00	49.77	-2.54	47.23	74.00	-26.77	PK	PASS
H	**2483.50	38.93	-2.56	36.37	54.00	-17.63	AV	PASS
H	2500.00	42.98	-2.54	40.44	54.00	-13.56	AV	PASS
V	**2483.50	39.95	-2.56	37.39	54.00	-16.61	AV	PASS
V	2500.00	42.12	-2.54	39.58	54.00	-14.42	AV	PASS

Remark:
1. Emission Level = Reading + Factor, Margin= Emission Level – Limit.

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

Band Edge Emissions (Restricted frequency bands):

Test Mode: 8DPSK					CH Low: 2402 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
H	2310.00	45.18	-2.81	42.37	74.00	-31.63	PK	PASS
H	2390.00	46.57	-2.69	43.88	74.00	-30.12	PK	PASS
H	**2400.00	62.27	-2.68	59.59	74.00	-14.41	PK	PASS
V	2310.00	43.59	-2.81	40.78	74.00	-33.22	PK	PASS
V	2390.00	48.25	-2.69	45.56	74.00	-28.44	PK	PASS
V	**2400.00	61.93	-2.68	59.25	74.00	-14.75	PK	PASS
H	2310.00	33.98	-2.81	31.17	54.00	-22.83	AV	PASS
H	2390.00	35.37	-2.69	32.68	54.00	-21.32	AV	PASS
H	**2400.00	47.36	-2.68	44.68	54.00	-9.32	AV	PASS
V	2310.00	32.84	-2.81	30.03	54.00	-23.97	AV	PASS
V	2390.00	38.57	-2.69	35.88	54.00	-18.12	AV	PASS
V	**2400.00	50.38	-2.68	47.70	54.00	-6.30	AV	PASS

Test Mode: 8DPSK					CH High: 2480 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
H	**2483.50	50.45	-2.56	47.89	74.00	-26.11	PK	PASS
H	2500.00	49.73	-2.54	47.19	74.00	-26.81	PK	PASS
V	**2483.50	47.57	-2.56	45.01	74.00	-28.99	PK	PASS
V	2500.00	49.53	-2.54	46.99	74.00	-27.01	PK	PASS
H	**2483.50	38.76	-2.56	36.20	54.00	-17.80	AV	PASS
H	2500.00	40.85	-2.54	38.31	54.00	-15.69	AV	PASS
V	**2483.50	36.98	-2.56	34.42	54.00	-19.58	AV	PASS
V	2500.00	41.89	-2.54	39.35	54.00	-14.65	AV	PASS

Remark:
1. Emission Level = Reading + Factor, Margin= Emission Level – Limit.

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.10 Radiated Spurious Emission

5.10.1 Test Requirement

<table>
<tr><td>Test Requirement</td><td>In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).</td></tr>
<tr><td>Test Limit</td><td>
<table>
<tr><th>Frequency (MHz)</th><th>Field strength (microvolts/meter)</th><th>Measurement distance (meters)</th></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
Note:
1) Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].
2) In the emission tables above, the tighter limit applies at the band edges.
3) For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
4) For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).
</td></tr>
<tr><td>Test Method</td><td>ANSI C63.10-2020 section 6.6.4
Radiated emissions tests</td></tr>
</table>

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

5.10.2Test Setup Diagram

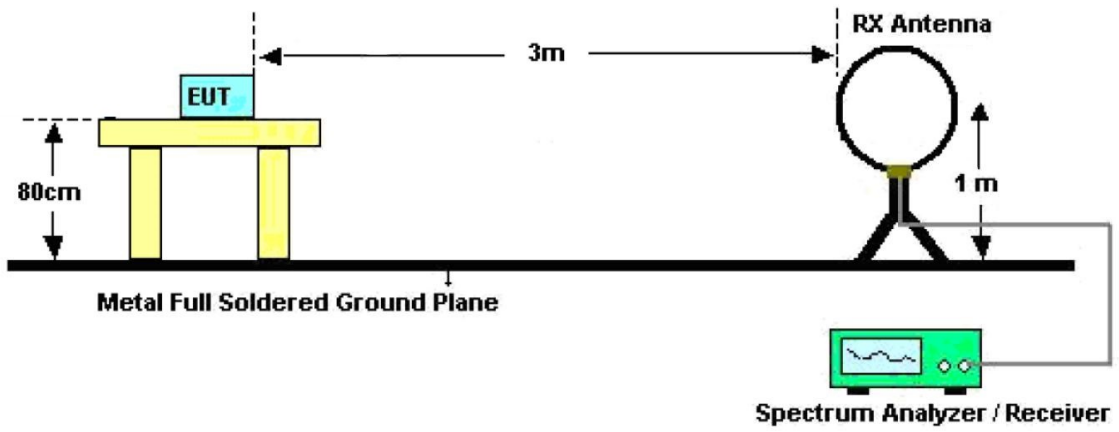


Figure 1. Below 30MHz

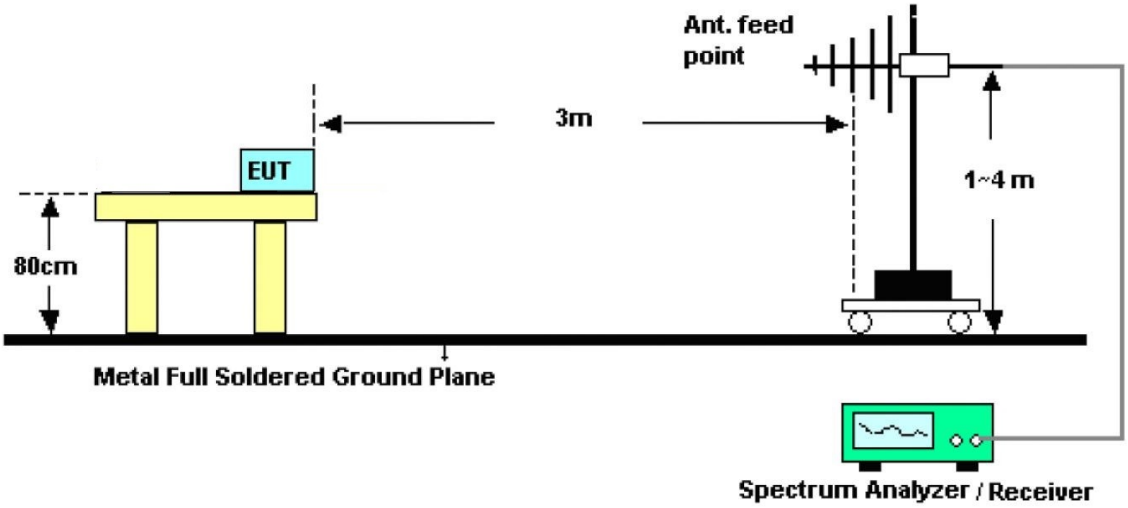


Figure 2. 30MHz to 1GHz

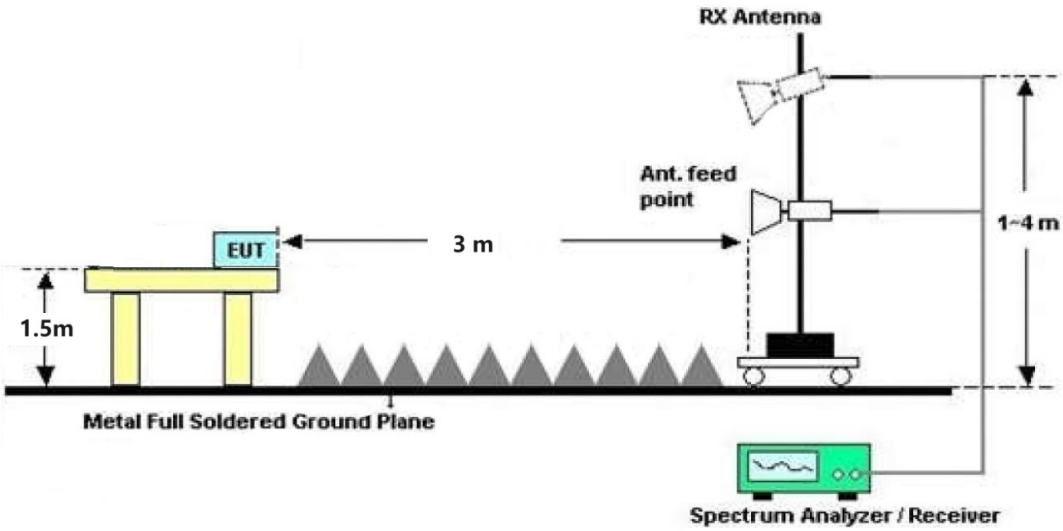


Figure 3. Above 1 GHz

5.10.3Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power.
Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.
The power of the EUT transmitting frequency should be ignored.
All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.
Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured
For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:
RBW = 100kHz, VBW =300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz, Set the spectrum analyzer as:
RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.
RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

5.10.4Test Data

PASS.

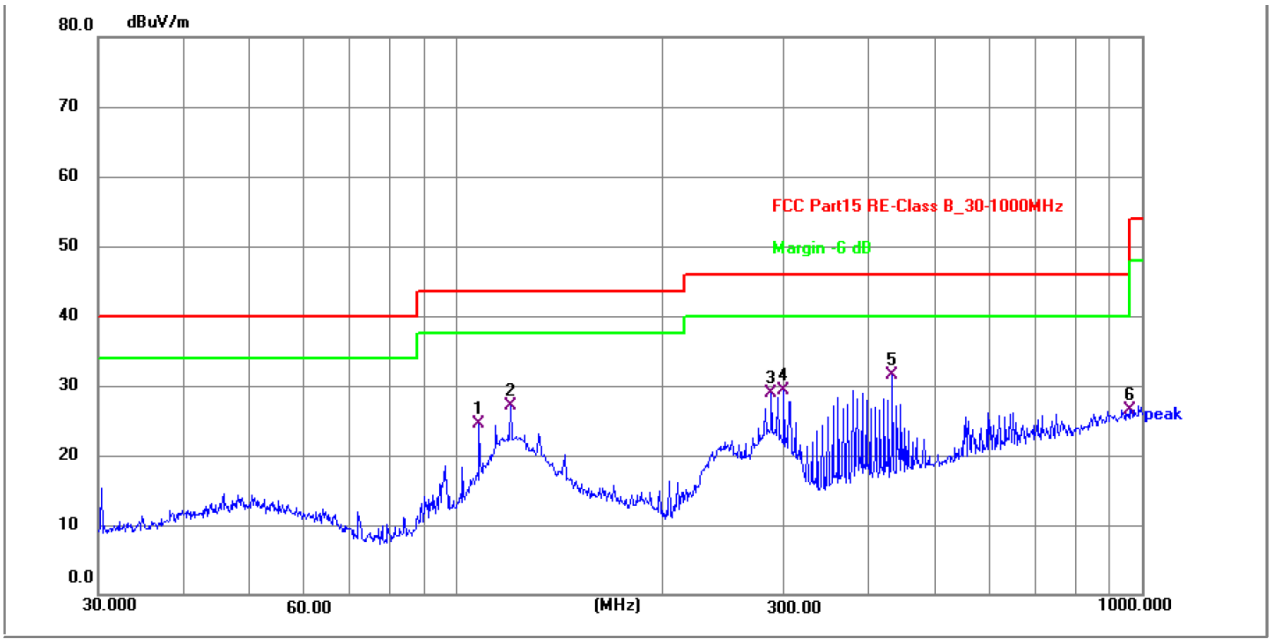
During the test, pre-scan the GFSK, π/4QPSK, 8DPSK modulation, and found the GFSK modulation Middle channel(TX Only) which is the worst case, only the worst case is recorded in the report.

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

Radiated Emission Test Data (30-1000MHz)

Test Site:	**966 Chamber #1**	**Polarization:**	**Horizontal**
Distance:	**3m**	**Test Mode:**	**TM1/ CH Middle**



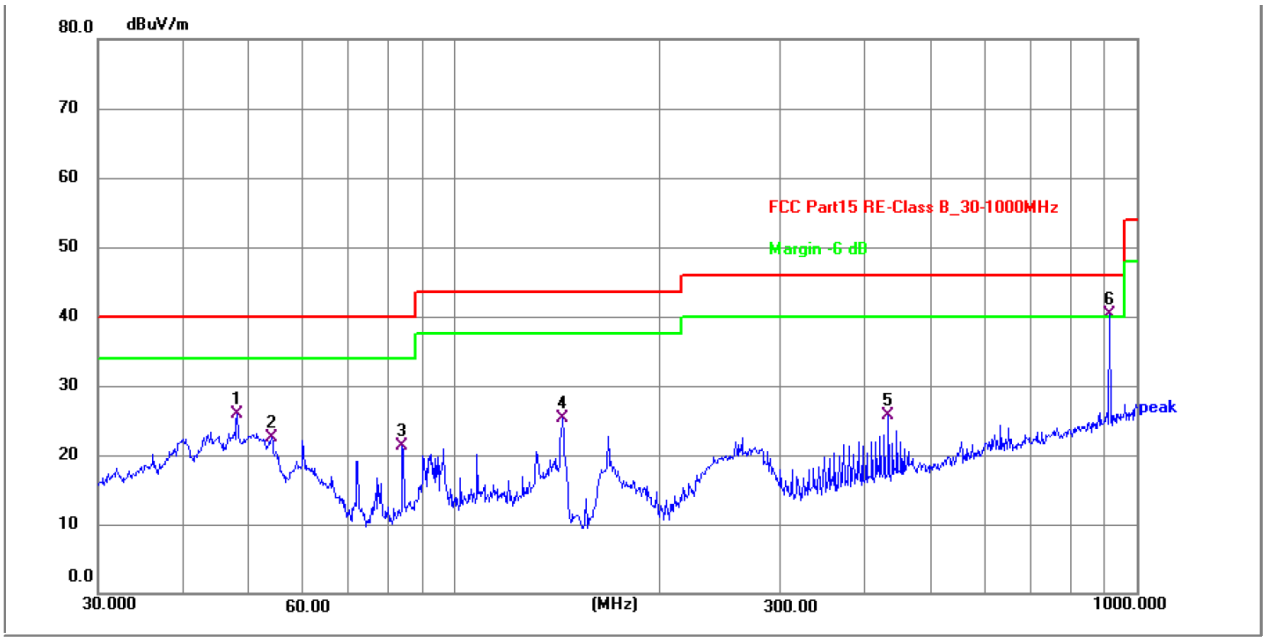
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	107.8877	40.39	-15.83	24.56	43.50	-18.94	QP	P	
2	119.8556	43.66	-16.55	27.11	43.50	-16.39	QP	P	
3	287.9904	41.13	-12.28	28.85	46.00	-17.15	QP	P	
4	300.3672	41.18	-11.96	29.22	46.00	-16.78	QP	P	
5 *	432.5456	41.07	-9.64	31.43	46.00	-14.57	QP	P	
6	958.7943	27.84	-1.28	26.56	46.00	-19.44	QP	P	

Note: Level = Reading + Factor **Margin = Level - Limit**

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

Radiated Emission Test Data (30-1000MHz)

Test Site:	**966 Chamber #1**	**Polarization:**	**Vertical**
Distance:	**3m**	**Test Mode:**	**TM1/ CH Middle**



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	47.9940	40.13	-14.15	25.98	40.00	-14.02	QP	P	
2	53.8818	36.87	-14.38	22.49	40.00	-17.51	QP	P	
3	83.8156	40.13	-18.80	21.33	40.00	-18.67	QP	P	
4	143.8295	43.39	-18.02	25.37	43.50	-18.13	QP	P	
5	432.5457	35.34	-9.64	25.70	46.00	-20.30	QP	P	
6 *	912.8620	42.35	-2.11	40.24	46.00	-5.76	QP	P	

Note: Level = Reading + Factor **Margin = Level - Limit**

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

Radiated Spurious Emission (1GHz-25GHz)

Test Mode: GFSK					CH Low: 2402 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
V	4804.76	40.47	4.68	45.15	74.00	-28.85	PK	PASS
V	7206.89	35.94	9.84	45.78	74.00	-28.23	PK	PASS
V	9608.04	29.90	13.17	43.07	74.00	-30.94	PK	PASS
V	12010.53	*	*	*	74.00	*	PK	PASS
V	14412.02	*	*	*	74.00	*	PK	PASS
V	16814.83	*	*	*	74.00	*	PK	PASS
H	4804.19	42.47	4.68	47.15	74.00	-26.86	PK	PASS
H	7206.76	33.30	9.84	43.14	74.00	-30.87	PK	PASS
H	9608.95	28.27	13.17	41.44	74.00	-32.56	PK	PASS
H	12010.30	*	*	*	74.00	*	PK	PASS
H	14412.12	*	*	*	74.00	*	PK	PASS
H	16814.68	*	*	*	74.00	*	PK	PASS
V	4804.40	31.21	4.68	35.89	54.00	-18.11	AV	PASS
V	7206.08	23.88	9.84	33.72	54.00	-20.28	AV	PASS
V	9608.22	19.70	13.17	32.87	54.00	-21.13	AV	PASS
V	12010.91	*	*	*	54.00	*	AV	PASS
V	14412.85	*	*	*	54.00	*	AV	PASS
V	16814.09	*	*	*	54.00	*	AV	PASS
H	4804.12	30.40	4.68	35.08	54.00	-18.92	AV	PASS
H	7206.76	24.84	9.84	34.68	54.00	-19.32	AV	PASS
H	9608.95	19.15	13.17	32.32	54.00	-21.68	AV	PASS
H	12010.30	*	*	*	54.00	*	AV	PASS
H	14412.12	*	*	*	54.00	*	AV	PASS
H	16814.68	*	*	*	54.00	*	AV	PASS

Remark:
1. Emission Level = Reading + Factor, Margin= Emission Level – Limit.
2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

Radiated Spurious Emission (1GHz-25GHz)

Test Mode: GFSK					CH Middle: 2441 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
V	4882.26	40.69	4.92	45.61	74.00	-28.39	PK	PASS
V	7323.20	35.46	9.83	45.29	74.00	-28.72	PK	PASS
V	9764.19	28.11	13.22	41.33	74.00	-32.67	PK	PASS
V	12205.33	*	*	*	74.00	*	PK	PASS
V	14646.48	*	*	*	74.00	*	PK	PASS
V	17087.25	*	*	*	74.00	*	PK	PASS
H	4882.91	41.58	4.92	46.50	74.00	-27.50	PK	PASS
H	7323.87	33.09	9.83	42.92	74.00	-31.09	PK	PASS
H	9764.96	28.66	13.22	41.88	74.00	-32.13	PK	PASS
H	12205.00	*	*	*	74.00	*	PK	PASS
H	14646.08	*	*	*	74.00	*	PK	PASS
H	17087.26	*	*	*	74.00	*	PK	PASS
V	4882.93	31.89	4.92	36.81	54.00	-17.19	AV	PASS
V	7323.14	23.40	9.83	33.23	54.00	-20.77	AV	PASS
V	9764.55	18.67	13.22	31.89	54.00	-22.12	AV	PASS
V	12205.03	*	*	*	54.00	*	AV	PASS
V	14646.07	*	*	*	54.00	*	AV	PASS
V	17087.49	*	*	*	54.00	*	AV	PASS
H	4882.91	31.71	4.92	36.63	54.00	-17.37	AV	PASS
H	7323.87	24.24	9.83	34.07	54.00	-19.94	AV	PASS
H	9764.96	17.09	13.22	30.31	54.00	-23.70	AV	PASS
H	12205.00	*	*	*	54.00	*	AV	PASS
H	14646.08	*	*	*	54.00	*	AV	PASS
H	17087.26	*	*	*	54.00	*	AV	PASS

Remark:
1. Emission Level = Reading + Factor, Margin= Emission Level – Limit.
2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

Radiated Spurious Emission (1GHz-25GHz)

Test Mode: GFSK					CH High: 2480 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
V	4960.23	41.47	5.17	46.64	74.00	-27.37	PK	PASS
V	7440.18	35.28	9.83	45.11	74.00	-28.90	PK	PASS
V	9920.91	29.49	13.27	42.76	74.00	-31.25	PK	PASS
V	12400.92	*	*	*	74.00	*	PK	PASS
V	14880.88	*	*	*	74.00	*	PK	PASS
V	17360.06	*	*	*	74.00	*	PK	PASS
H	4960.12	41.57	5.17	46.74	74.00	-27.27	PK	PASS
H	7440.85	34.11	9.83	43.94	74.00	-30.06	PK	PASS
H	9920.99	30.41	13.27	43.68	74.00	-30.32	PK	PASS
H	12400.11	*	*	*	74.00	*	PK	PASS
H	14880.44	*	*	*	74.00	*	PK	PASS
H	17360.29	*	*	*	74.00	*	PK	PASS
V	4960.52	32.59	5.17	37.76	54.00	-16.24	AV	PASS
V	7440.34	24.02	9.83	33.85	54.00	-20.16	AV	PASS
V	9920.88	19.59	13.27	32.86	54.00	-21.15	AV	PASS
V	12400.07	*	*	*	54.00	*	AV	PASS
V	14880.66	*	*	*	54.00	*	AV	PASS
V	17360.48	*	*	*	54.00	*	AV	PASS
H	4960.12	32.27	5.17	37.44	54.00	-16.56	AV	PASS
H	7440.85	22.78	9.83	32.61	54.00	-21.39	AV	PASS
H	9920.99	18.39	13.27	31.66	54.00	-22.35	AV	PASS
H	12400.11	*	*	*	54.00	*	AV	PASS
H	14880.44	*	*	*	54.00	*	AV	PASS
H	17360.29	*	*	*	54.00	*	AV	PASS

Remark:
1. Emission Level = Reading + Factor, Margin= Emission Level – Limit.
2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

ANNEX A TEST SETUP PHOTOS

Please refer to the document “8227EU122002W-AA.PDF”

ANNEX B EXTERNAL PHOTOS

Please refer to the document “8227EU122002W-AB.PDF”

ANNEX C INTERNAL PHOTOS

Please refer to the document “8227EU122002W-AC.PDF”

ANNEX D TEST DATA

Please refer to the document “8227EU122002W-AD.PDF”

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com

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 ---

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Website: www.eu-test.com
Tel: (86)-755-2357-9714 Email: Service@eu-test.com