FCC Test Report

Client Name	:	**Excelsecu Data Technology Co., Ltd.**
Client Address	:	**Unit 701-708, South 7/F, SDGI Building A, No.2 Kefeng Rd., Nanshan District, Shenzhen, Guangdong, 518057, China**
Product Name	:	**1D 2D Wireless Barcode Scanner**
Report Date	:	**Feb. 16, 2023**

Shenzhen Anbotek Compliance Laboratory Limited

Contents

1. General Information 6
1.1. Client Information 6
1.2. Description of Device (EUT) 6
1.3. Auxiliary Equipment Used During Test 7
1.4. Description of Test Configuration 7
1.5. Description Of Test Setup 8
1.6. Test Equipment List 9
1.7. Measurement Uncertainty 10
1.8. Description of Test Facility 10
2. Summary of Test Results 11
3. Conducted Emission Test 12
3.1. Test Standard and Limit 12
3.2. Test Setup 12
3.3. Test Procedure 12
3.4. Test Data 12
4. Radiation Spurious Emission and Band Edge 15
4.1. Test Standard and Limit 15
4.2. Test Setup 15
4.3. Test Procedure 16
4.4. Test Data 17
5. Maximum Peak Output Power Test 25
5.1. Test Standard and Limit 25
5.2. Test Setup 25
5.3. Test Procedure 25
5.4. Test Data 25
6. 20DB Occupy Bandwidth Test 26
6.1. Test Standard 26
6.2. Test Setup 26
6.3. Test Procedure 26
6.4. Test Data 26
7. Carrier Frequency Separation Test 27
7.1. Test Standard and Limit 27
7.2. Test Setup 27
7.3. Test Procedure 27
7.4. Test Data 27
8. Number of Hopping Channel Test 28
8.1. Test Standard and Limit 28

8.2. Test Setup 28
8.3. Test Procedure 28
8.4. Test Data 28
9. Dwell Time Test 29
9.1. Test Standard and Limit 29
9.2. Test Setup 29
9.3. Test Procedure 29
9.4. Test Data 29
10. 100kHz Bandwidth of Frequency Band Edge Requirement 30
10.1. Test Standard and Limit 30
10.2. Test Setup 30
10.3. Test Procedure 30
10.4. Test Data 30
11. Antenna Requirement 31
11.1. Test Standard and Requirement 31
11.2. Antenna Connected Construction 31
APPENDIX I -- TEST SETUP PHOTOGRAPH 32
APPENDIX II -- EXTERNAL PHOTOGRAPH 32
APPENDIX III -- INTERNAL PHOTOGRAPH 32

TEST REPORT

Applicant	:	Excelsecu Data Technology Co., Ltd.
Manufacturer	:	Excelsecu Data Technology Co., Ltd.
Product Name	:	1D 2D Wireless Barcode Scanner
Model No.	:	ESCS-W30
Trade Mark	:	excelsecu
Rating(s)	:	Input: 5V⎓ (with DC 3.7V, 2000mAh battery inside)
Test Standard(s)	**:**	**FCC Part15 Subpart C, Section 15.247**
Test Method(s)	**:**	**ANSI C63.10: 2020**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of receipt	Dec. 19, 2022
Date of Test	Dec. 19, 2022 ~ Jan. 16, 2023
Prepared by	Nian xiu Chen (Nianxiu Chen)
Approved & Authorized Signer	Kingkong Jin (Kingkong Jin)

Revision History

Report Version	Description	Issued Date
R00	Original Issue.	Feb. 16, 2023

1. General Information

1.1. Client Information

Applicant	:	Excelsecu Data Technology Co., Ltd.
Address	:	Unit 701-708, South 7/F, SDGI Building A, No.2 Kefeng Rd., Nanshan District, Shenzhen, Guangdong, 518057, China
Manufacturer	:	Excelsecu Data Technology Co., Ltd.
Address	:	Unit 701-708, South 7/F, SDGI Building A, No.2 Kefeng Rd., Nanshan District, Shenzhen, Guangdong, 518057, China
Factory	:	Shenzhen Excelsecu Data Technology Co., Ltd Baoan Branch
Address	:	1st to 3rd Floor, Building 28, Shancheng Industrial Zone, Shixin Community, Langxin Community, Shiyan Street, Baoan District, Shenzhen, P.R.China

1.2. Description of Device (EUT)

Product Name	:	1D 2D Wireless Barcode Scanner
Model No.	:	ESCS-W30
Trade Mark	:	excelsecu
Test Power Supply	:	AC 120V, 60Hz for adapter/ DC 3.7V battery inside
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Adapter	:	N/A
RF Specification		
Operation Mode	:	☐ DSSS ☒ FHSS
Operation Frequency	:	2402~2480 MHz
Number of Channel	:	79 Channels
Modulation Type	:	GFSK
Antenna Type	:	PCB antenna
Antenna Gain(Peak)	:	-0.24dBi (Provided by customer)
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.		

1.3. Auxiliary Equipment Used During Test

Description	Rating(s)
Adapter	Model: MDY-11-EX Input: 100-240V~50/60Hz, 0.7A Output: 5V⎓3A/ 9V⎓3A/ 12V⎓2.25A/ 20V⎓1.35A/ 11V⎓3A Max
Notebook	Manufacturer:HP Model: HP g14 Input: 19.5V/3.33A CMIIT ID:5CG50336XJ

1.4. Description of Test Configuration

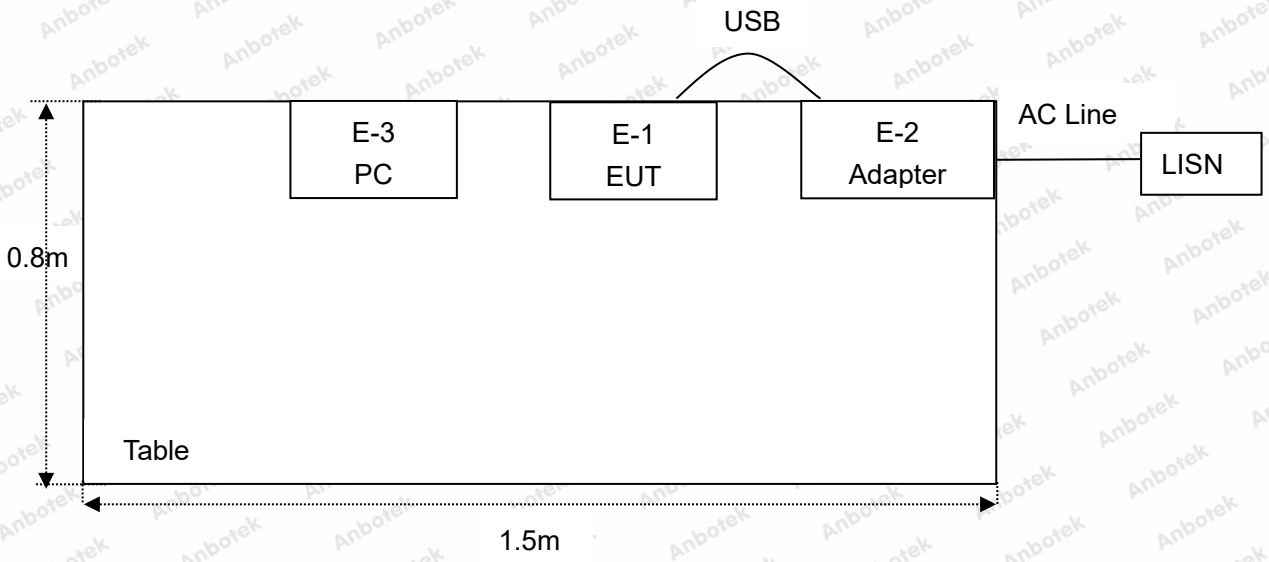
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
01	**2402**	18	2419	35	2436	52	2453	69	2470
02	2403	19	2420	36	2437	53	2454	70	2471
03	2404	20	2421	37	2438	54	2455	71	2472
04	2405	21	2422	38	2439	55	2456	72	2473
05	2406	22	2423	39	2440	56	2457	73	2474
06	2407	23	2424	**40**	**2441**	57	2458	74	2475
07	2408	24	2425	41	2442	58	2459	75	2476
08	2409	25	2426	42	2443	59	2460	76	2477
09	2410	26	2427	43	2444	60	2461	77	2478
10	2411	27	2428	44	2445	61	2462	78	2479
11	2412	28	2429	45	2446	62	2463	**79**	**2480**
12	2413	29	2430	46	2447	63	2464		
13	2414	30	2431	47	2448	64	2465		
14	2415	31	2432	48	2449	65	2466		
15	2416	32	2433	49	2450	66	2467		
16	2417	33	2434	50	2451	67	2468		
17	2418	34	2435	51	2452	68	2469		

Note:

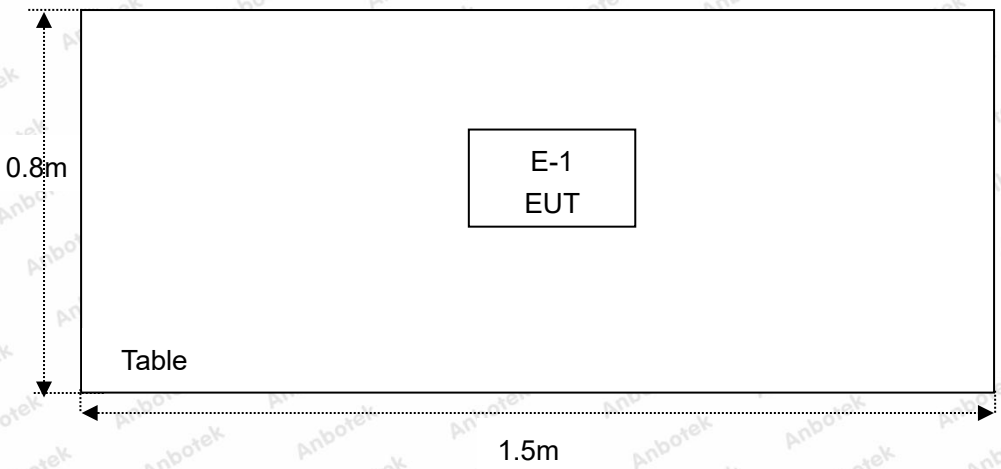
1. The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.
2. EUT was tested with channel 01, 40 and 79.

1.5. Description Of Test Setup

CE



RE



1.6. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Oct. 23, 2022	1 Year
2.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040DT001	Jul. 05, 2022	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 13, 2022	1 Year
4.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 23, 2022	1 Year
5.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2022	1 Year
6.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 13, 2022	1 Year
7.	EMI Preamplifier	SKET Electronic	LNPA-0118G-45	SKET-PA-002	Oct. 13, 2022	1 Year
8.	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D	02555	Oct. 16, 2022	3 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 23, 2022	1 Year
10.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Oct. 23, 2022	1 Year
11.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Oct. 23, 2022	1 Year
12.	Pre-amplifier	SONOMA	310N	186860	Oct. 23, 2022	1 Year
13.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
14.	MXA Spectrum Analysis	KEYSIGHT	N9020A	MY53280032	Oct. 13, 2022	1 Year
15.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 13, 2022	1 Year
16.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 13, 2022	1 Year
17.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 22, 2022	1 Year
18.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Oct. 19, 2022	1 Year

1.7. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 3.9 dB (Horizontal)
		Ur = 3.8 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB

1.8. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

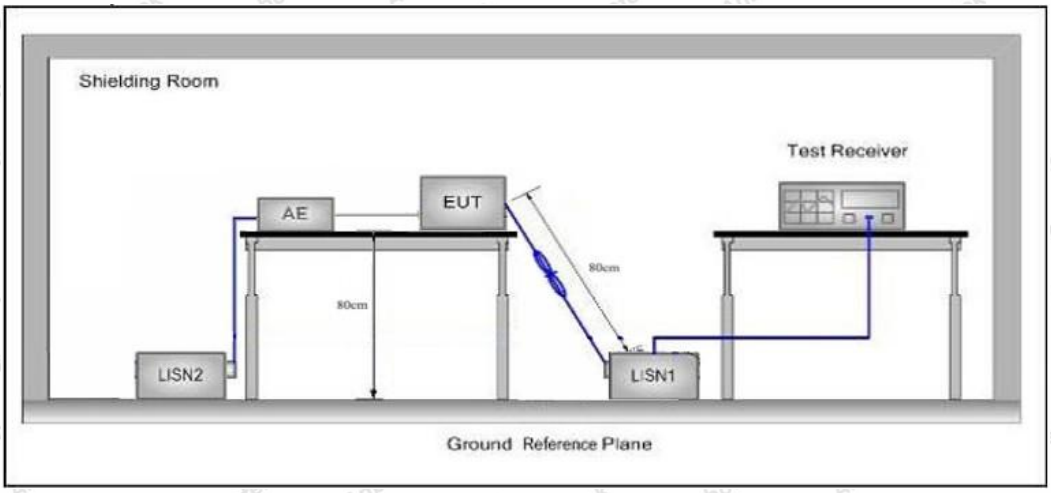
Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.247(b)(1)	Conducted Peak Output Power	PASS
15.247(a)(1)	20dB Occupied Bandwidth	PASS
15.247(a)(1)	Carrier Frequencies Separation	PASS
15.247(a)(1)(iii)	Number of Hopping Channel	PASS
15.247(a)(1)(iii)	Dwell Time	PASS
15.247(d)	Band Edge	PASS
Remark: “N/A” is an abbreviation for Not Applicable.		

3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequency.			

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10: 2020 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

PASS

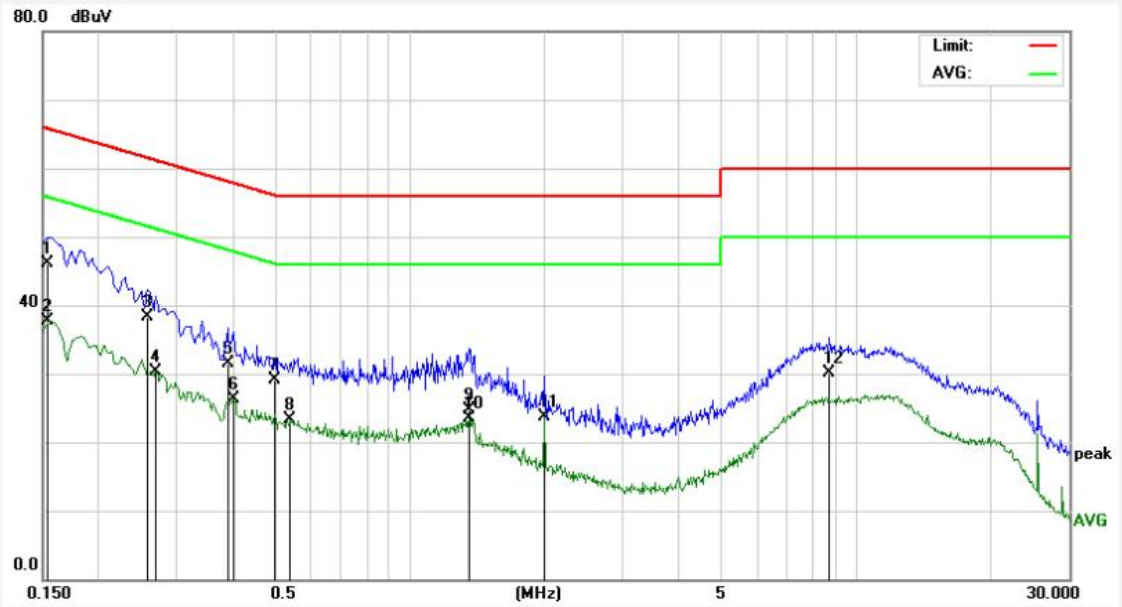
During the test, pre-scan all modes, only the worst case is recorded in the report.

AC conducted emission pre-test at both at AC 120V/60Hz and AC 240V/60Hz modes, recorded worst case AC 120V/60Hz.

Please to see the following pages.

Conducted Emission Test Data

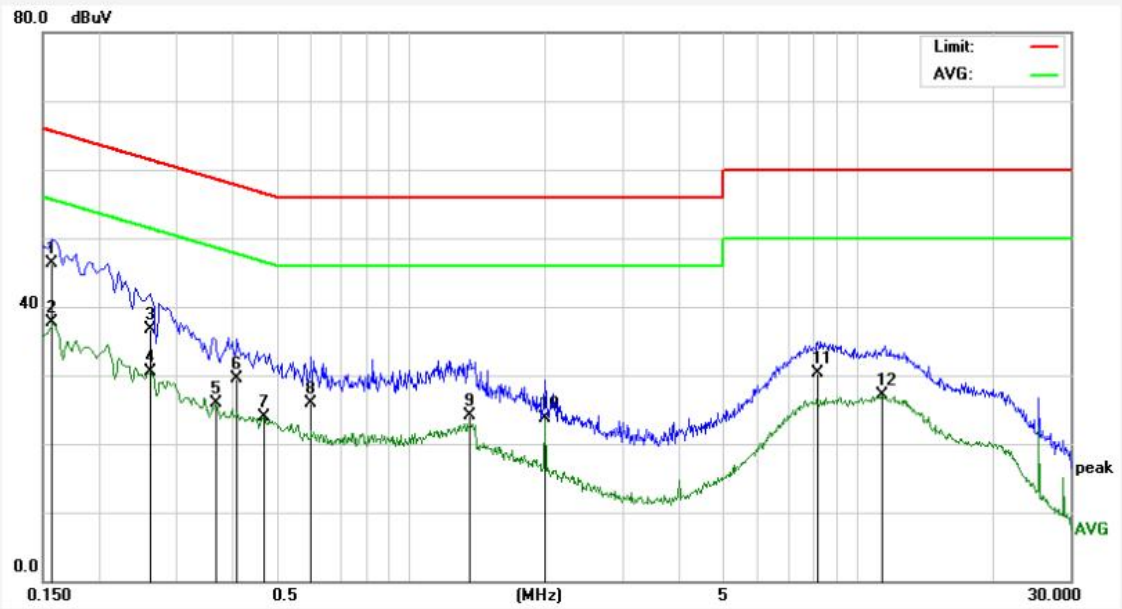
Test Site: 1# Shielded Room
Operating Condition: Low CH (2402MHz)
Test Specification: AC 120V, 60Hz for adapter
Comment: Live Line
Temp.(℃)/Hum.(%RH): 22.4℃/47%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1539	36.31	9.83	46.14	65.78	-19.64	QP	
2	0.1539	27.81	9.83	37.64	55.78	-18.14	AVG	
3	0.2580	28.42	9.83	38.25	61.49	-23.24	QP	
4	0.2700	20.54	9.83	30.37	51.12	-20.75	AVG	
5	0.3899	21.64	9.81	31.45	58.06	-26.61	QP	
6	0.4020	16.43	9.81	26.24	47.81	-21.57	AVG	
7	0.4980	19.22	9.85	29.07	56.03	-26.96	QP	
8	0.5380	13.50	9.85	23.35	46.00	-22.65	AVG	
9	1.3580	14.92	9.84	24.76	56.00	-31.24	QP	
10	1.3580	13.63	9.84	23.47	46.00	-22.53	AVG	
11	2.0020	13.83	9.83	23.66	46.00	-22.34	AVG	
12	8.7020	20.14	9.93	30.07	60.00	-29.93	QP	

Conducted Emission Test Data

Test Site:	1# Shielded Room
Operating Condition:	Low CH (2402MHz)
Test Specification:	AC 120V, 60Hz for adapter
Comment:	Neutral Line
Temp.(℃)/Hum.(%RH):	22.4℃/47%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1580	36.44	9.83	46.27	65.56	-19.29	QP	
2	0.1580	27.83	9.83	37.66	55.56	-17.90	AVG	
3	0.2620	26.84	9.83	36.67	61.36	-24.69	QP	
4	0.2620	20.76	9.83	30.59	51.36	-20.77	AVG	
5	0.3660	16.06	9.82	25.88	48.59	-22.71	AVG	
6	0.4100	19.63	9.81	29.44	57.65	-28.21	QP	
7	0.4700	14.02	9.84	23.86	46.51	-22.65	AVG	
8	0.5980	16.05	9.86	25.91	56.00	-30.09	QP	
9	1.3540	14.26	9.84	24.10	56.00	-31.90	QP	
10	2.0020	13.90	9.83	23.73	46.00	-22.27	AVG	
11	8.1540	20.42	9.91	30.33	60.00	-29.67	QP	
12	11.3220	17.08	10.03	27.11	50.00	-22.89	AVG	

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:
(1)The lower limit shall apply at the transition frequency.
(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

4.2. Test Setup

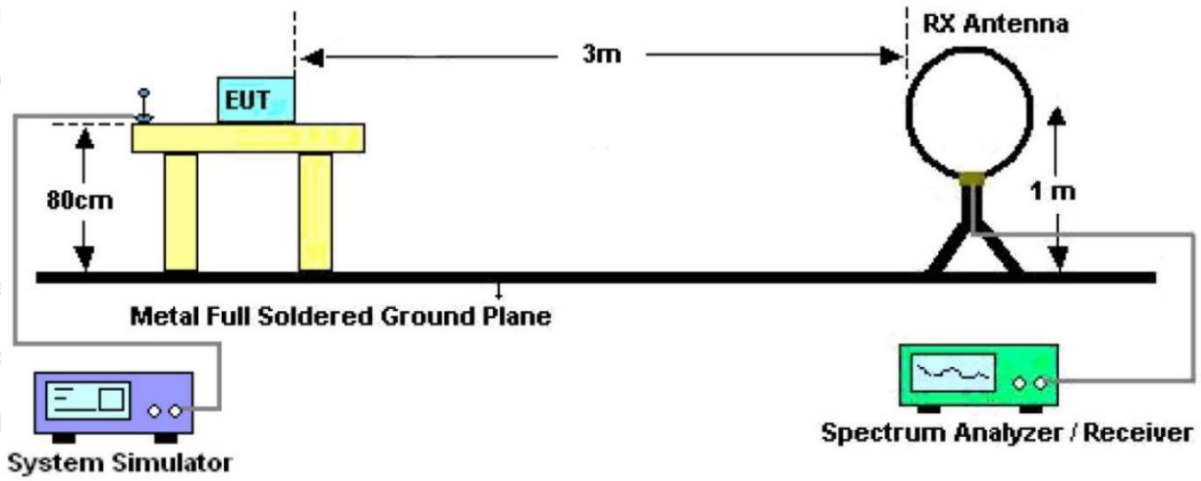


Figure 1. Below 30MHz

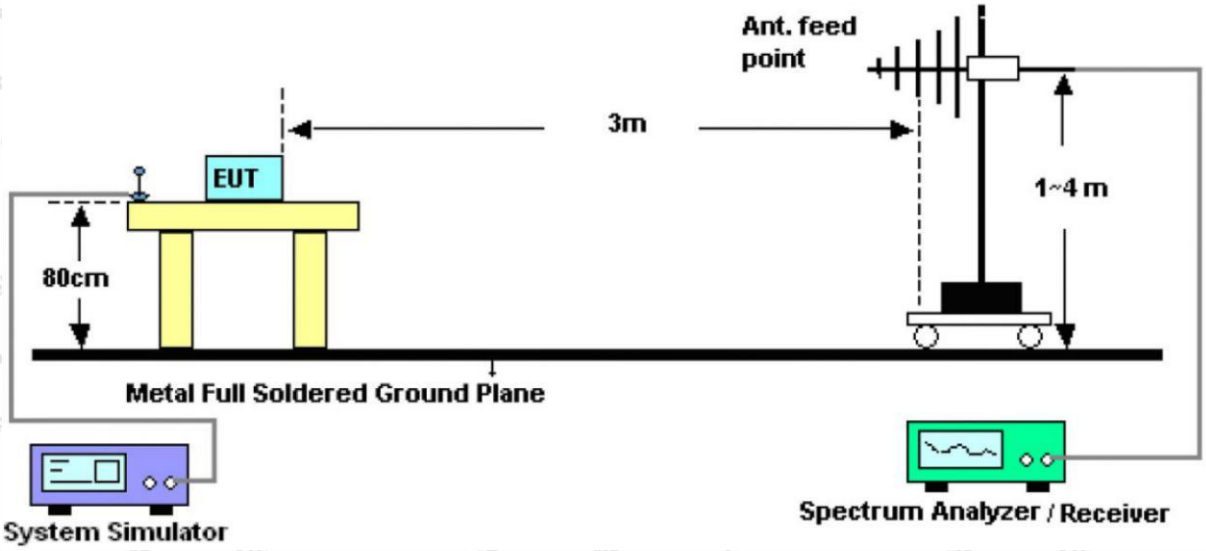


Figure 2. 30MHz to 1GHz

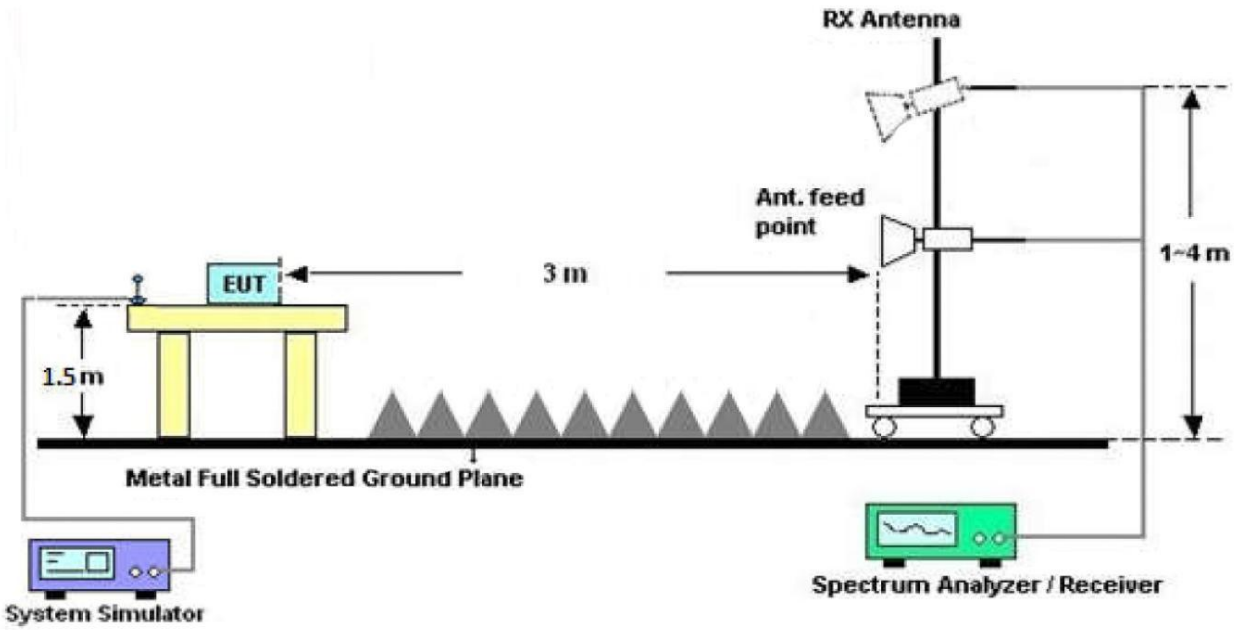


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

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 = 120kHz, 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.

For average measurement: use duty cycle correction factor method (DCCF)

Average level = Peak level + DCCF

4.4. Test Data

PASS

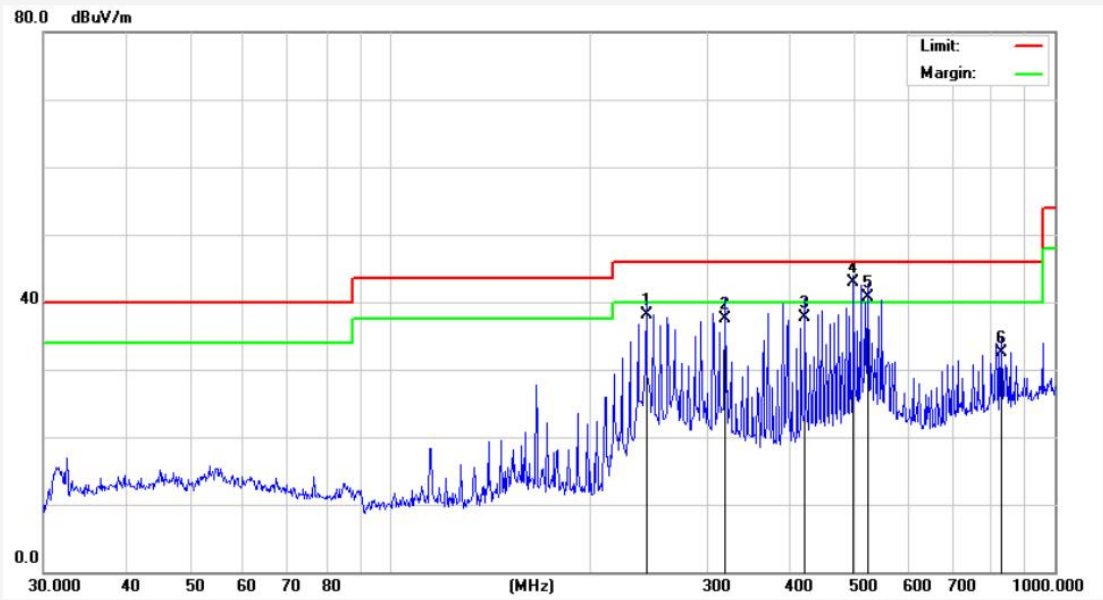
During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

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

During the test, pre-scan all modes, only the worst case is recorded in the report.

Test Results (30~1000MHz)

Test Mode:	Low CH (2402MHz)
Power Source:	DC 3.7V battery inside
Polarization:	Horizontal
Temp.(℃)/Hum.(%RH):	23.5℃/50%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	242.5252	59.72	-21.62	38.10	46.00	-7.90	QP			
2	318.8170	54.32	-16.72	37.60	46.00	-8.40	QP			
3	420.5803	53.55	-15.86	37.69	46.00	-8.31	QP			
4	497.6764	56.76	-13.84	42.92	46.00	-3.08	QP			
5	522.7179	53.58	-12.86	40.72	46.00	-5.28	QP			
6	830.4002	40.40	-7.80	32.60	46.00	-13.40	QP			

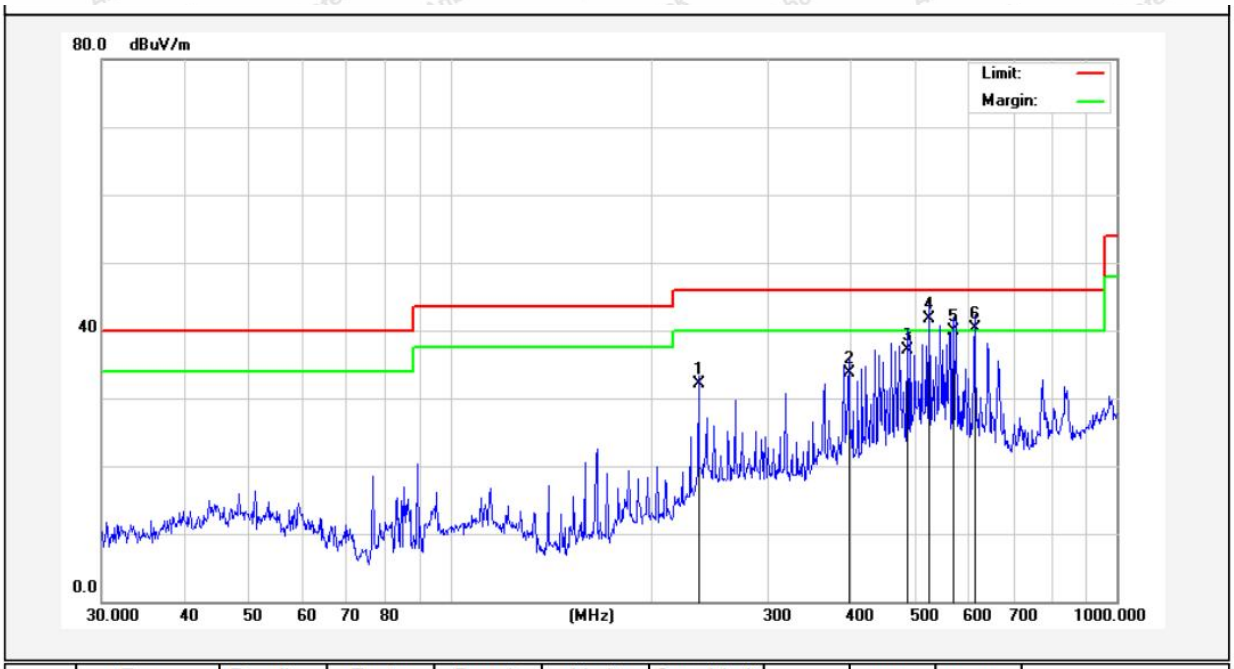
Test Results (30~1000MHz)

Test Mode: Low CH (2402MHz)

Power Source: DC 3.7V battery inside

Polarization: Vertical

Temp.(℃)/Hum.(%RH): 23.5℃/50%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	235.8163	50.63	-18.43	32.20	46.00	-13.80	QP			
2	396.2414	48.28	-14.48	33.80	46.00	-12.20	QP			
3	485.6093	49.76	-12.63	37.13	46.00	-8.87	QP			
4	522.7179	53.72	-12.02	41.70	46.00	-4.30	QP			
5	568.6127	51.21	-11.31	39.90	46.00	-6.10	QP			
6	612.0642	50.90	-10.55	40.35	46.00	-5.65	QP			

Test Results (1GHz-25GHz)

Test channel: Lowest						
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	28.35	15.27	43.62	74.00	-30.38	Vertical
7206.00	29.54	18.09	47.63	74.00	-26.37	Vertical
9608.00	30.58	23.76	54.34	74.00	-19.67	Vertical
12010.00	*			74.00		Vertical
14412.00	*			74.00		Vertical
4804.00	28.74	15.27	44.01	74.00	-29.99	Horizontal
7206.00	29.43	18.09	47.52	74.00	-26.48	Horizontal
9608.00	28.91	23.76	52.67	74.00	-21.33	Horizontal
12010.00	*			74.00		Horizontal
14412.00	*			74.00		Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4804.00	17.73	15.27	33.00	54.00	-21.00	Vertical
7206.00	18.57	18.09	36.66	54.00	-17.34	Vertical
9608.00	19.60	23.76	43.36	54.00	-10.65	Vertical
12010.00	*			54.00		Vertical
14412.00	*			54.00		Vertical
4804.00	17.09	15.27	32.36	54.00	-21.64	Horizontal
7206.00	18.49	18.09	36.58	54.00	-17.42	Horizontal
9608.00	18.22	23.76	41.98	54.00	-12.02	Horizontal
12010.00	*			54.00		Horizontal
14412.00	*			54.00		Horizontal

Test Results (1GHz-25GHz)

Test channel: Middle						
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4882.00	28.37	15.42	43.79	74.00	-30.21	Vertical
7323.00	29.39	18.02	47.41	74.00	-26.59	Vertical
9764.00	29.59	23.80	53.39	74.00	-20.62	Vertical
12205.00	*			74.00		Vertical
14646.00	*			74.00		Vertical
4882.00	28.44	15.42	43.86	74.00	-30.14	Horizontal
7323.00	29.42	18.02	47.44	74.00	-26.56	Horizontal
9764.00	28.61	23.80	52.41	74.00	-21.59	Horizontal
12205.00	*			74.00		Horizontal
14646.00	*			74.00		Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4882.00	17.46	15.42	32.88	54.00	-21.12	Vertical
7323.00	18.67	18.02	36.69	54.00	-17.31	Vertical
9764.00	19.46	23.80	43.26	54.00	-10.75	Vertical
12205.00	*			54.00		Vertical
14646.00	*			54.00		Vertical
4882.00	17.00	15.42	32.42	54.00	-21.58	Horizontal
7323.00	18.05	18.02	36.07	54.00	-17.93	Horizontal
9764.00	18.73	23.80	42.53	54.00	-11.47	Horizontal
12205.00	*			54.00		Horizontal
14646.00	*			54.00		Horizontal

Test Results (1GHz-25GHz)

Test channel: Highest						
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	28.64	15.58	44.22	74.00	-29.78	Vertical
7440.00	29.40	17.93	47.33	74.00	-26.67	Vertical
9920.00	30.14	23.83	53.97	74.00	-20.04	Vertical
12400.00	*			74.00		Vertical
14880.00	*			74.00		Vertical
4960.00	28.51	15.58	44.09	74.00	-29.91	Horizontal
7440.00	29.45	17.93	47.38	74.00	-26.62	Horizontal
9920.00	29.29	23.83	53.12	74.00	-20.88	Horizontal
12400.00	*			74.00		Horizontal
14880.00	*			74.00		Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4960.00	18.58	15.58	34.16	54.00	-19.84	Vertical
7440.00	19.68	17.93	37.61	54.00	-16.39	Vertical
9920.00	20.01	23.83	43.84	54.00	-10.17	Vertical
12400.00	*			54.00		Vertical
14880.00	*			54.00		Vertical
4960.00	18.44	15.58	34.02	54.00	-19.98	Horizontal
7440.00	19.42	17.93	37.35	54.00	-16.65	Horizontal
9920.00	18.63	23.83	42.46	54.00	-11.54	Horizontal
12400.00	*			54.00		Horizontal
14880.00	*			54.00		Horizontal

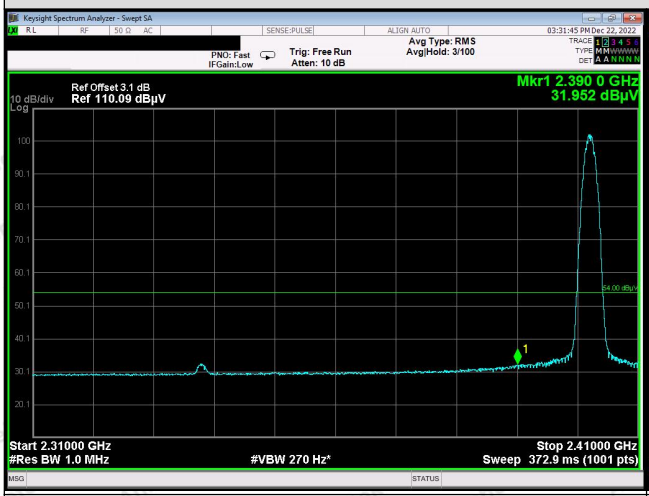
Remark:

1. Result =Reading + Factor

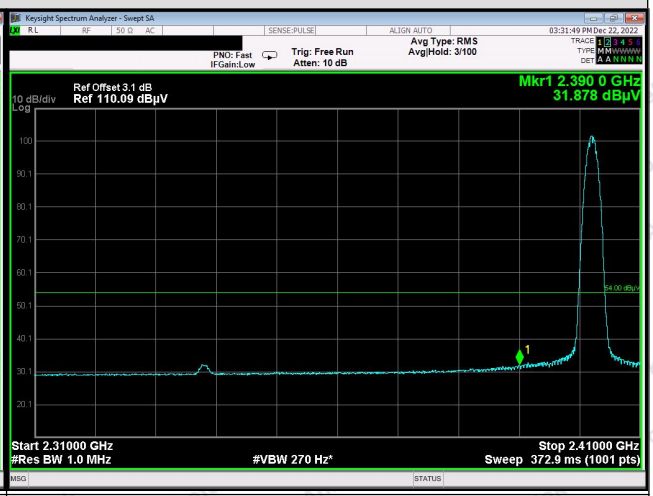
2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Radiated Band Edge:

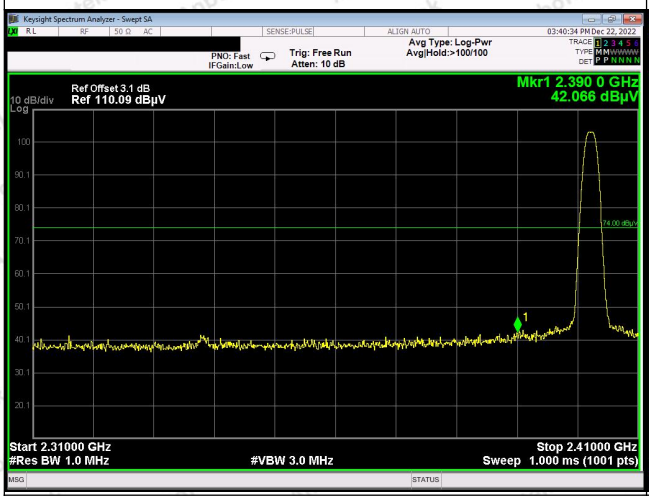
Test Mode: Lowest



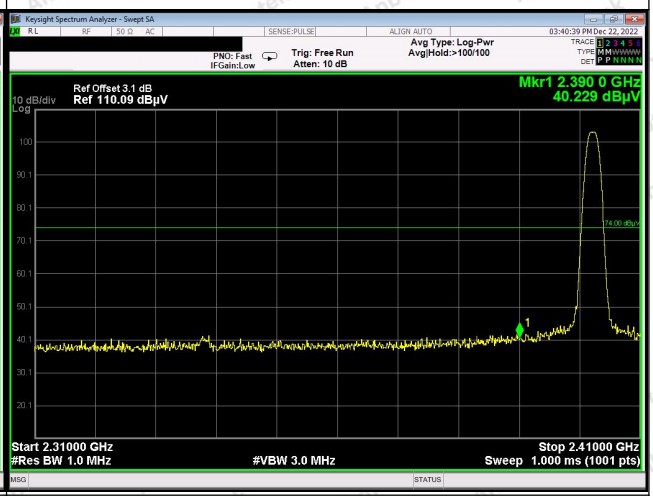
Average Value(Vertical)



Average Value(Horizontal)

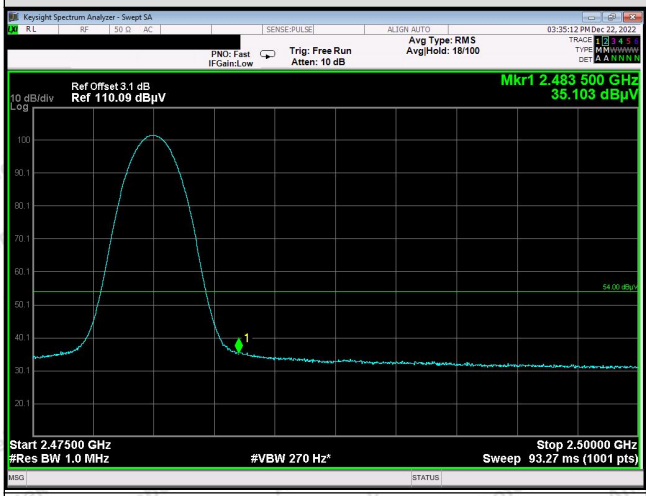


Peak Value(Vertical)

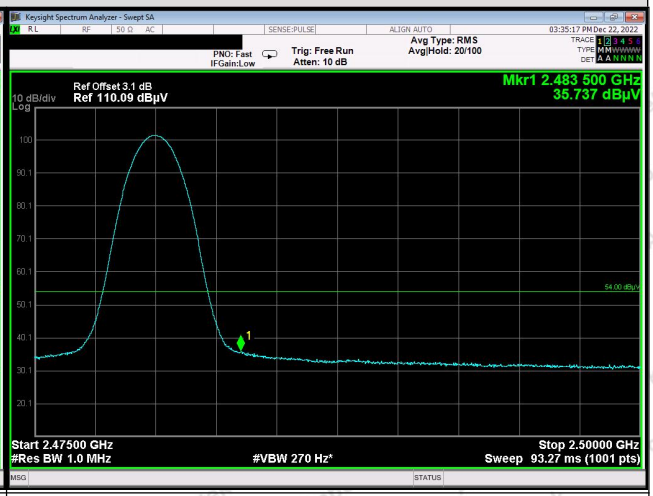


Peak Value(Horizontal)

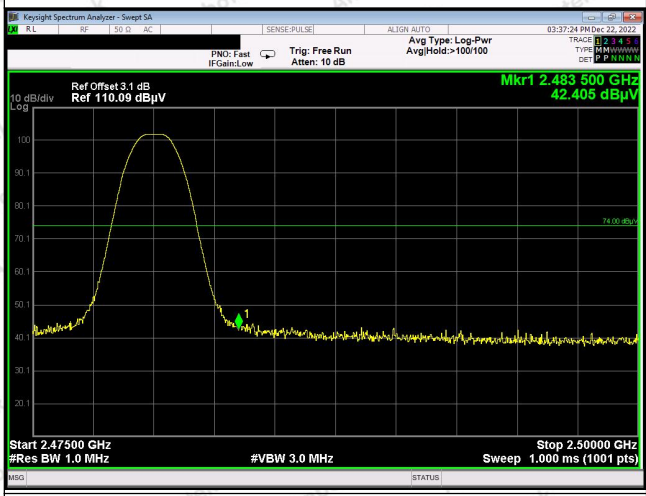
Test Mode: Highest



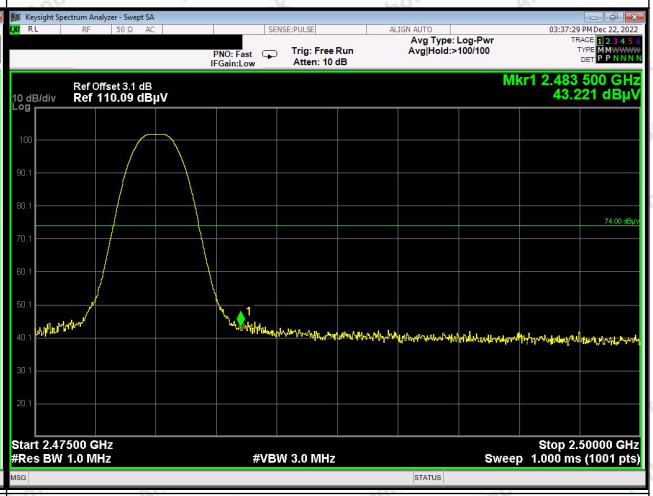
Average Value(Vertical)



Average Value(Horizontal)



Peak Value(Vertical)



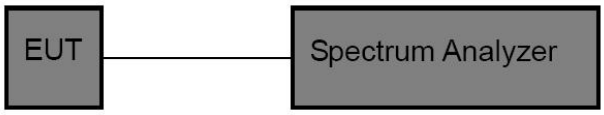
Peak Value(Horizontal)

5. Maximum Peak Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(1)
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.

5.2. Test Setup



5.3. Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above,
2. Spectrum Setting:
   RBW > the 20 dB bandwidth of the emission being measured
   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold

5.4. Test Data

Pass

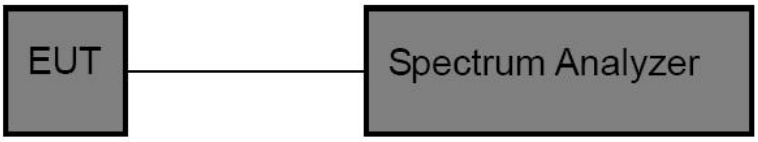
Please refer to Appendix C of the Appendix Test Data.

6. 20DB Occupy Bandwidth Test

6.1. Test Standard

Test Standard	FCC Part15 C Section 15.247 (a)(1)

6.2. Test Setup



6.3. Test Procedure

Using the following spectrum analyzer settings:

1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW ≥1% of the 20 dB bandwidth.
3. Set the VBW ≥RBW
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

6.4. Test Data

Pass

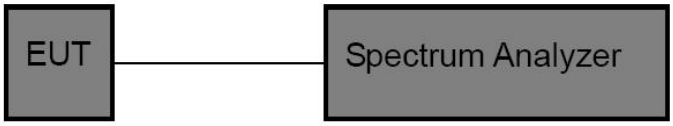
Please refer to Appendix A of the Appendix Test Data.

7. Carrier Frequency Separation Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W.

7.2. Test Setup



7.3. Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW =approximately 30% of the channel spacing.
3. Set the VBW ≥ RBW.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

7.4. Test Data

Pass

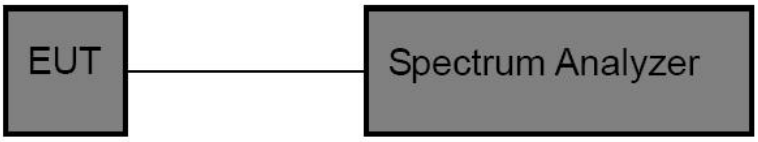
Please refer to Appendix D of the Appendix Test Data.

8. Number of Hopping Channel Test

8.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Limit	>15 channels

8.2. Test Setup



8.3. Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer setting:

1. Span= the frequency band of operation
2. Set the RBW = less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. Set the VBW ≥ RBW.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

8.4. Test Data

Pass

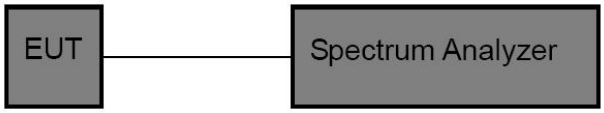
Please refer to Appendix F of the Appendix Test Data.

9. Dwell Time Test

9.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Limit	0.4 s

9.2. Test Setup



9.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span= zero span, centered on a hopping channel
2. Set the RBW = 1 MHz.
3. Set the VBW ≥ RBW.
4. Sweep time = as necessary to capture the entire dwell time per hopping channel.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

9.4. Test Data

Pass

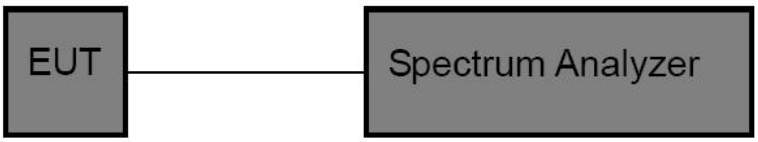
Please refer to Appendix E of the Appendix Test Data.

10. 100kHz Bandwidth of Frequency Band Edge Requirement

10.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (d)
Test Limit	In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, 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).

10.2. Test Setup



10.3. Test Procedure

The EUT must have its hopping/Non-hopping function enabled. Using the following spectrum analyzer setting:

1. Set the RBW = 100kHz.
2. Set the VBW = 300kHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

10.4. Test Data

Pass

Please refer to Appendix G & Appendix H of the Appendix Test Data.

11. Antenna Requirement

11.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /247(c)
Requirement	1) 15.203 requirement: 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, 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. 2) 15.247(c) (1)(i) requirement: Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

11.2. Antenna Connected Construction

The antenna is PCB Antenna which permanently attached, and the best case gain of the antenna is -0.24dBi. It complies with the standard requirement.

APPENDIX I -- TEST SETUP PHOTOGRAPH

Please refer to separated files Appendix I -- Test Setup Photograph

APPENDIX II -- EXTERNAL PHOTOGRAPH

Please refer to separated files Appendix II -- External Photograph

APPENDIX III -- INTERNAL PHOTOGRAPH

Please refer to separated files Appendix III -- Internal Photograph

---------- End of Report ----------