FCC Test Report

Applicant	:	**Shenzhen Radiomaster Co.,Ltd**
Address	:	**4F Yangtian Building, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China**
Product Name	:	**Bandit**
Report Date	:	**Nov. 11, 2024**

Shenzhen Anbotek Compliance Laboratory Limited

Contents

TEST REPORT

Applicant	:	Shenzhen Radiomaster Co.,Ltd
Manufacturer	:	Shenzhen Radiomaster Co.,Ltd
Product Name	:	Bandit
Model No.	:	Bandit
Trade Mark	:	Radiomaster
Rating(s)	:	Input: 6V~16.8V⎓

Test Standard(s)	**:**	**47 CFR Part 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 47 CFR Part 15.247 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. 21, 2023
Date of Test	Dec. 21, 2023~Jun. 07, 2024
Prepared by	(TuTu Hong)
Approved & Authorized Signer	(Kingkong Jin)

Revision History

Report Version	Description	Issued Date
R00	Original Issue.	Nov. 11, 2024

1. General Information

1.1. Client Information

Applicant	:	Shenzhen Radiomaster Co.,Ltd
Address	:	4F Yangtian Building, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China
Manufacturer	:	Shenzhen Radiomaster Co.,Ltd
Address	:	4F Yangtian Building, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China
Factory	:	Shenzhen Radiomaster Co.,Ltd
Address	:	4F Yangtian Building, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China

1.2. Description of Device (EUT)

Product Name	:	Bandit
Model No.	:	Bandit
Trade Mark	:	Radiomaster
Test Power Supply	:	DC 6V
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Adapter	:	N.A.
RF Specification		
Operation Frequency	:	903.5-926.9MHz
Number of Channel	:	51 Channels
Modulation Type	:	GFSK
Antenna Type	:	External antenna
Antenna Gain(Peak)	:	1.35dBi
Remark: 1) All of the RF specification are provided by customer. 2) 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)
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1.4. Description of Test Modes

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
01	903.5	11	908.18	21	912.86	31	917.54	41	922.22	51	926.9
02	903.968	12	908.648	22	913.328	32	918.008	42	922.688		
03	904.436	13	909.116	23	913.796	33	918.476	43	923.156		
04	904.904	14	909.584	24	914.264	34	918.944	44	923.624		
05	905.372	15	910.052	25	914.732	35	919.412	45	924.092		
06	905.84	16	910.52	26	915.2	36	919.88	46	924.56		
07	906.308	17	910.988	27	915.668	37	920.348	47	925.028		
08	906.776	18	911.456	28	916.136	38	920.816	48	925.496		
09	907.244	19	911.924	29	916.604	39	921.284	49	925.964		
10	907.712	20	912.392	30	917.072	40	921.752	50	926.432		

Note:

1 The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.

1.5. Description Of Test Setup

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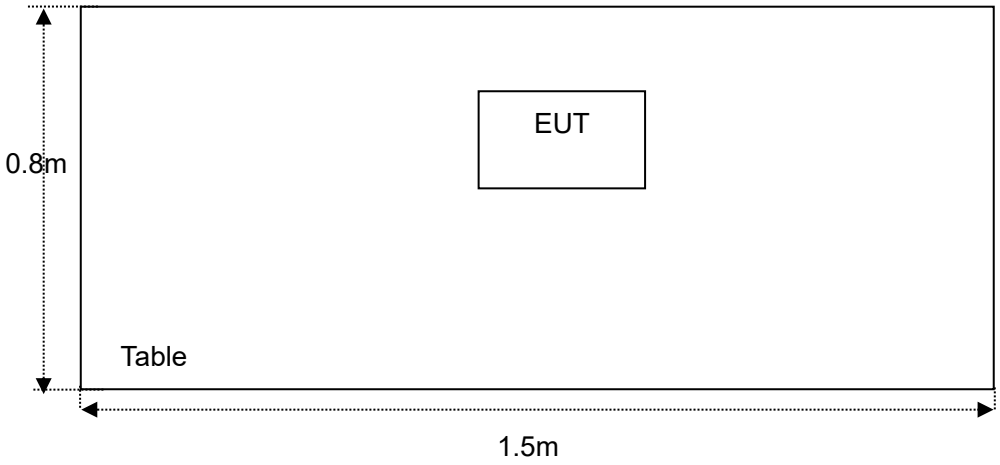


1.6. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Jan. 18, 2024	1 Year
2.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040DT001	Jan. 18, 2024	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 12, 2023	1 Year
4.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Jan. 23, 2024	1 Year
5.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 12, 2023	1 Year
6.	EMI Preamplifier	SKET Electronic	LNPA-0118G -45	SKET-PA-002	Jan. 17, 2024	1 Year
7.	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D	02555	Oct. 16, 2022	3 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	345	Oct. 23, 2022	3 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Oct. 12, 2023	1 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Oct. 12, 2023	1 Year
11.	Pre-amplifier	SONOMA	310N	186860	Jan. 17, 2024	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	MXA Spectrum Analysis	KEYSIGHT	N9020A	MY53280032	Oct. 12, 2023	1 Year
14.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 12, 2023	1 Year
15.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 12, 2023	1 Year
16.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 20, 2023	1 Year
17.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80 B	N/A	Oct. 16, 2023	1 Year
18.	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	104209	Oct. 12, 2023	1 Year

1.7. Measurement Uncertainty

Parameter	Uncertainty
Conducted emissions (AMN 150kHz~30MHz)	3.8dB
Occupied Bandwidth	925Hz
Conducted Output Power	0.76dB
Conducted Spurious Emission	1.24dB
Radiated spurious emissions (Below 30MHz)	3.53dB
Radiated spurious emissions (30MHz~1GHz)	Horizontal: 3.92dB; Vertical: 4.52dB
Radiated spurious emissions (above 1GHz)	1G-6GHz: 4.78dB; 6G-18GHz: 4.88dB 18G-40GHz: 5.68dB
The measurement uncertainty and decision risk evaluated according to AB/WI-RF-F-032. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

1.8. Description of Test Facility

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

FCC-Registration No.: 434132

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. 434132.

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.
Sogood Industrial Zone Laboratory & 1/F. of Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Subdistrict, Bao'an District, Shenzhen, Guangdong, China.

1.9.Disclaimer

1. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
2. The test report is invalid if there is any evidence and/or falsification.
3. The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
4. This document may not be altered or revised in any way unless done so by Anbotek and all revisions are duly noted in the revisions section.
5. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
6. The authenticity of the information provided by the customer is the responsibility of the customer and the laboratory is not responsible for its authenticity.

The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2. Summary of Test Results

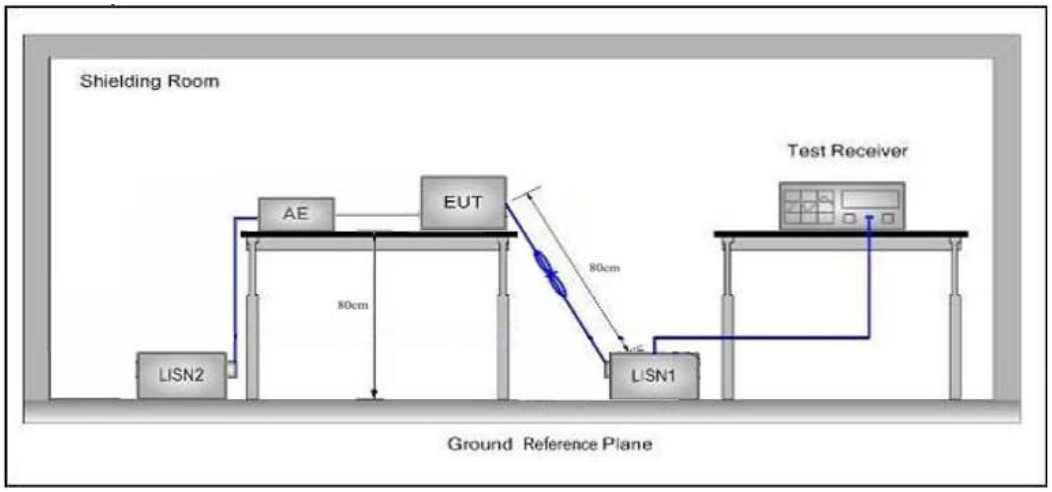
Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	N/A
15.205/15.209	Spurious Emission	PASS
15.247(b)(2)	Conducted Peak Output Power	PASS
15.247(a)(1)(i)	20dB Occupied Bandwidth	PASS
15.247(a)(1)	Carrier Frequencies Separation	PASS
15.247(a)(1)(i)	Hopping Channel Number	PASS
15.247(a)(1)(i), 15.247(f)	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

Not applicable.

The EUT is powered by DC 6V, so there is no need to conduct this test.

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

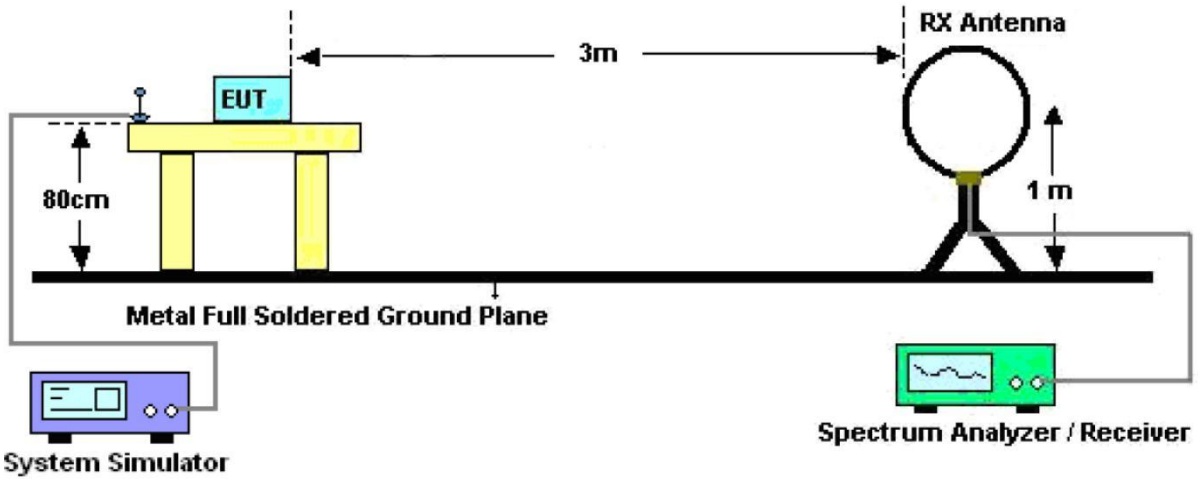


Figure 1. Below 30MHz

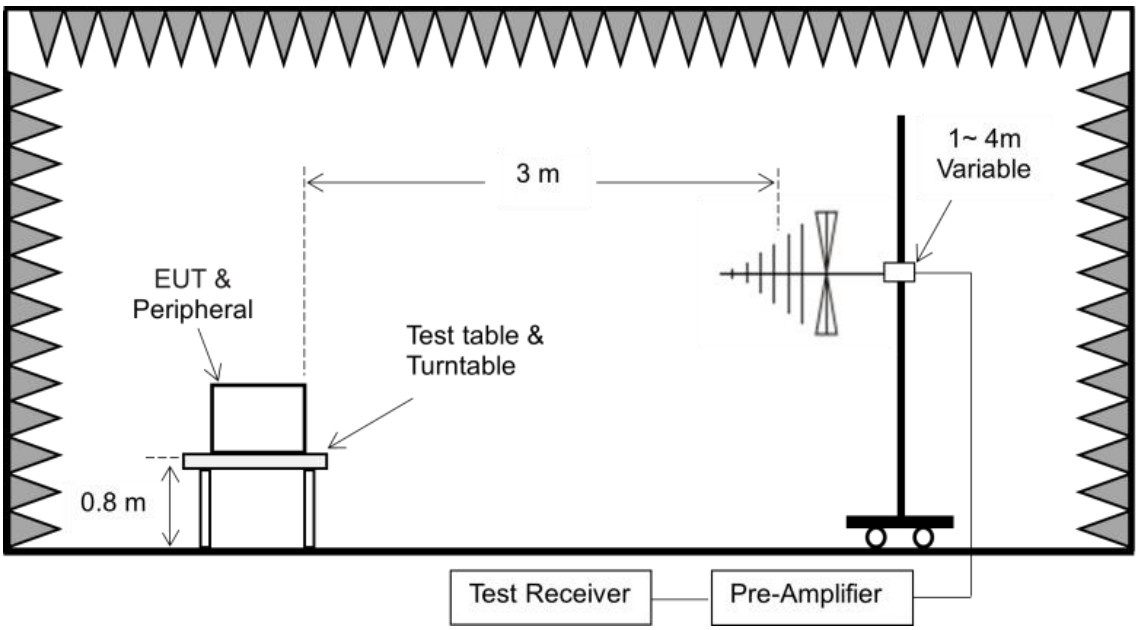


Figure 2. 30MHz to 1GHz

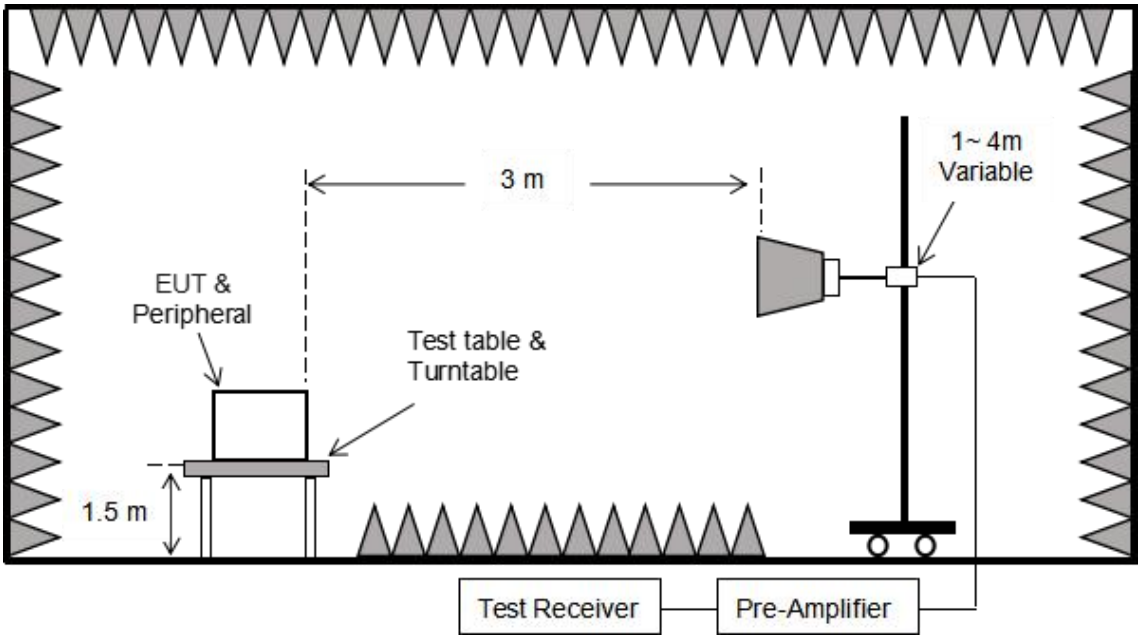


Figure 3. Above 1 GHz

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 = 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.

4.4. Test Data

PASS

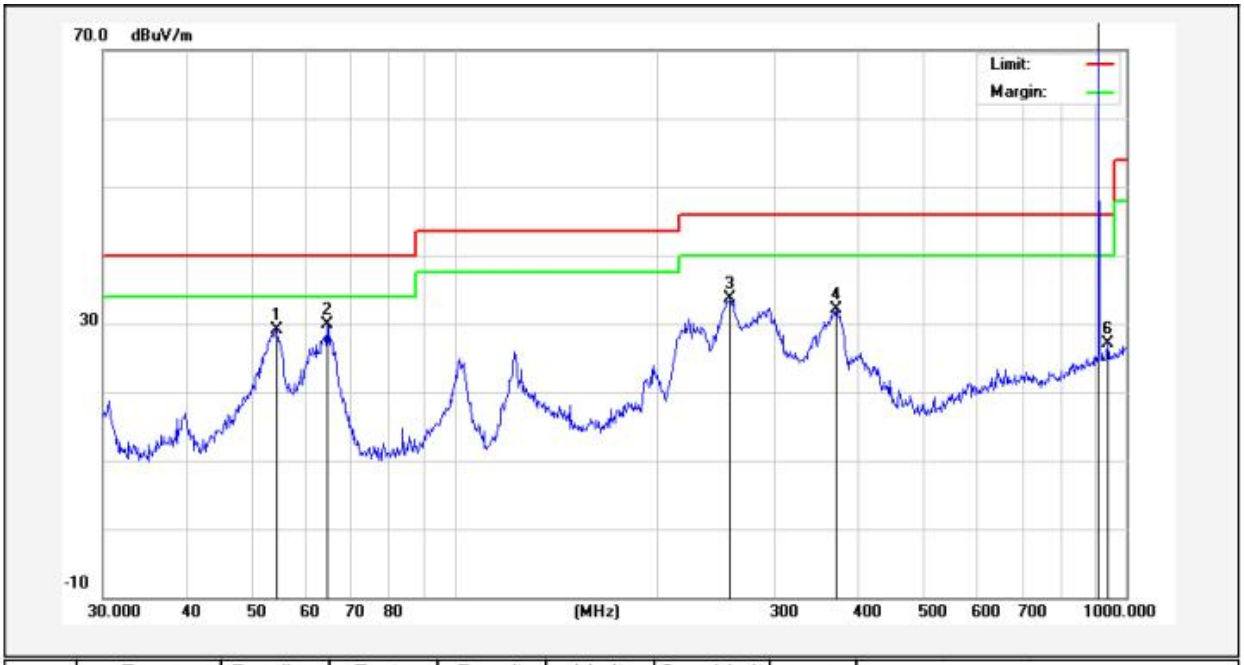
During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

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:	High CH (926.9MHz)
Power Source:	DC 6V
Polarization:	Vertical
Temp.(℃)/Hum.(%RH):	23.5℃/49%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector			
1	54.4515	46.55	-17.42	29.13	40.00	-10.87	QP			
2	64.6594	49.13	-19.19	29.94	40.00	-10.06	QP			
3	257.4221	51.46	-17.69	33.77	46.00	-12.23	QP			
4	369.4045	46.87	-14.78	32.09	46.00	-13.91	QP			
5	903.5001	130.78	-6.11	124.67	/	/	peak			
6	938.8324	32.81	-5.77	27.04	46.00	-18.96	QP			

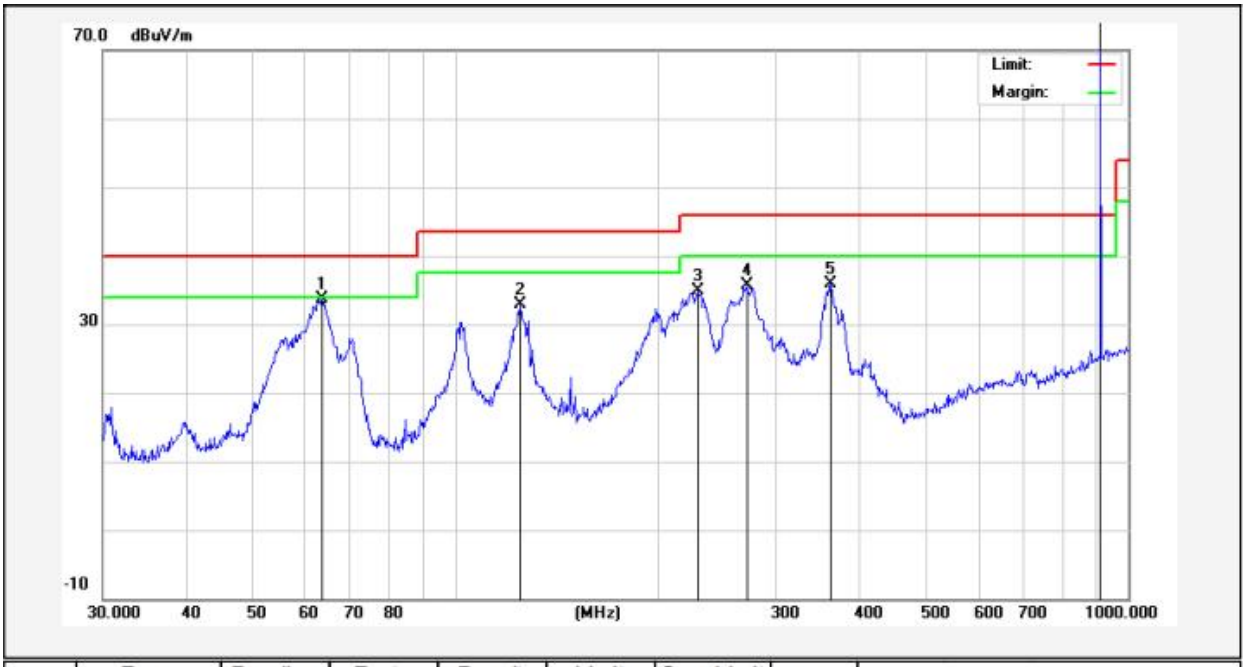
Test Results (30~1000MHz)

Test Mode: High CH (926.9MHz)

Power Source: DC 6V

Polarization: Horizontal

Temp.(℃)/Hum.(%RH): 23.5℃/49%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector			
1	63.5356	52.57	-18.79	33.78	40.00	-6.22	QP			
2	125.0066	56.14	-23.22	32.92	43.50	-10.58	QP			
3	229.2931	56.74	-21.85	34.89	46.00	-11.11	QP			
4	271.3245	55.35	-19.64	35.71	46.00	-10.29	QP			
5	361.7139	51.95	-16.03	35.92	46.00	-10.08	QP			
6	903.5001	130.88	-6.11	124.77	/	/	peak			

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
1807.00	27.30	15.27	42.57	74.00	-31.43	Vertical
2710.50	28.53	18.09	46.62	74.00	-27.38	Vertical
3614.00	29.32	23.76	53.08	74.00	-20.92	Vertical
4517.50	*			74.00		Vertical
5421.00	*			74.00		Vertical
1807.00	27.71	15.27	42.98	74.00	-31.02	Horizontal
2710.50	28.45	18.09	46.54	74.00	-27.46	Horizontal
3614.00	28.36	23.76	52.12	74.00	-21.88	Horizontal
4517.50	*			74.00		Horizontal
5421.00	*			74.00		Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
1807.00	16.68	15.27	31.95	54.00	-22.05	Vertical
2710.50	17.56	18.09	35.65	54.00	-18.35	Vertical
3614.00	18.34	23.76	42.10	54.00	-11.90	Vertical
4517.50	*			54.00		Vertical
5421.00	*			54.00		Vertical
1807.00	16.06	15.27	31.33	54.00	-22.67	Horizontal
2710.50	17.51	18.09	35.60	54.00	-18.40	Horizontal
3614.00	17.67	23.76	41.43	54.00	-12.57	Horizontal
4517.50	*			54.00		Horizontal
5421.00	*			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
1829.46	27.32	15.42	42.74	74.00	-31.26	Vertical
2744.20	28.38	18.02	46.40	74.00	-27.60	Vertical
3658.93	28.33	23.80	52.13	74.00	-21.87	Vertical
4573.66	*			74.00		Vertical
5488.39	*			74.00		Vertical
1829.46	27.41	15.42	42.83	74.00	-31.17	Horizontal
2744.20	28.44	18.02	46.46	74.00	-27.54	Horizontal
3658.93	28.06	23.80	51.86	74.00	-22.14	Horizontal
4573.66	*			74.00		Horizontal
5488.39	*			74.00		Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
1829.46	16.41	15.42	31.83	54.00	-22.17	Vertical
2744.20	17.66	18.02	35.68	54.00	-18.32	Vertical
3658.93	18.20	23.80	42.00	54.00	-12.00	Vertical
4573.66	*			54.00		Vertical
5488.39	*			54.00		Vertical
1829.46	15.97	15.42	31.39	54.00	-22.61	Horizontal
2744.20	17.07	18.02	35.09	54.00	-18.91	Horizontal
3658.93	18.18	23.80	41.98	54.00	-12.02	Horizontal
4573.66	*			54.00		Horizontal
5488.39	*			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
1853.80	27.59	15.58	43.17	74.00	-30.83	Vertical
2780.70	28.39	17.93	46.32	74.00	-27.68	Vertical
3707.60	28.88	23.83	52.71	74.00	-21.29	Vertical
4634.50	*			74.00		Vertical
5561.40	*			74.00		Vertical
1853.80	27.48	15.58	43.06	74.00	-30.94	Horizontal
2780.70	28.47	17.93	46.40	74.00	-27.60	Horizontal
3707.60	28.74	23.83	52.57	74.00	-21.43	Horizontal
4634.50	*			74.00		Horizontal
5561.40	*			74.00		Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
1853.80	17.53	15.58	33.11	54.00	-20.89	Vertical
2780.70	18.67	17.93	36.60	54.00	-17.40	Vertical
3707.60	18.75	23.83	42.58	54.00	-11.42	Vertical
4634.50	*			54.00		Vertical
5561.40	*			54.00		Vertical
1853.80	17.41	15.58	32.99	54.00	-21.01	Horizontal
2780.70	18.44	17.93	36.37	54.00	-17.63	Horizontal
3707.60	18.08	23.83	41.91	54.00	-12.09	Horizontal
4634.50	*			54.00		Horizontal
5561.40	*			54.00		Horizontal

Remark:

1. Result =Reading + Factor

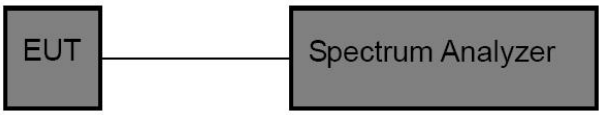
2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

5. Maximum Peak Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(2)
Test Limit	For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

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

Test Item	:	Max. peak output power	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 6V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

Test Channel	Peak Power output (dBm)	Limit (dBm)	Results
Low	29.469	30.00	PASS
Middle	29.677	30.00	PASS
High	29.860	30.00	PASS

Low Channel

Mid Channel

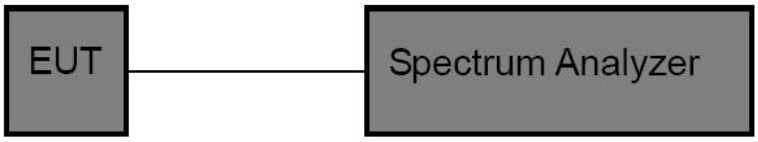
High Channel

6. 20DB Occupy Bandwidth Test

6.1. Test Standard

Test Standard	FCC Part15 C Section 15.247 (a)(1)(i)
Limit	Less than 250KHz

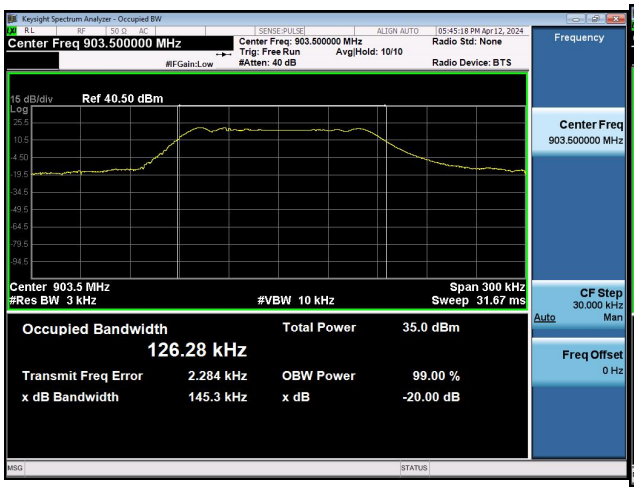
6.2. Test Setup



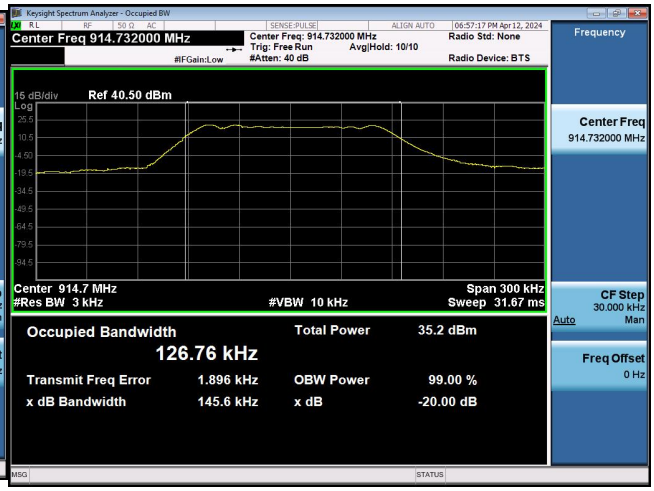
6.3. Test Data

Test Item	:	20dB BW	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 6V	Temperature	:	23.6℃
Test Result	:	PASS	Humidity	:	53 %

Test Channel	Bandwidth (kHz)	Limit (kHz)	Results
Low	145.3	≤250	PASS
Middle	145.6	≤250	PASS
High	146.1	≤250	PASS



Low Channel



Mid Channel

High Channel

6.4. Test Procedure

Using the following spectrum analyzer settings:

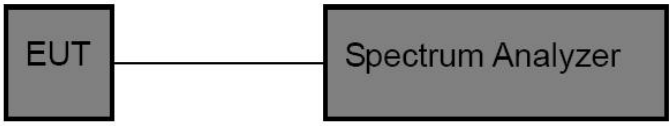
1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW ≥1% of the 20 dB bandwidth.
3. Set the VBW ≥RBW.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

7. Carrier Frequency Separation Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	> 25 kHz or the 20 dB bandwidth whichever is greater.

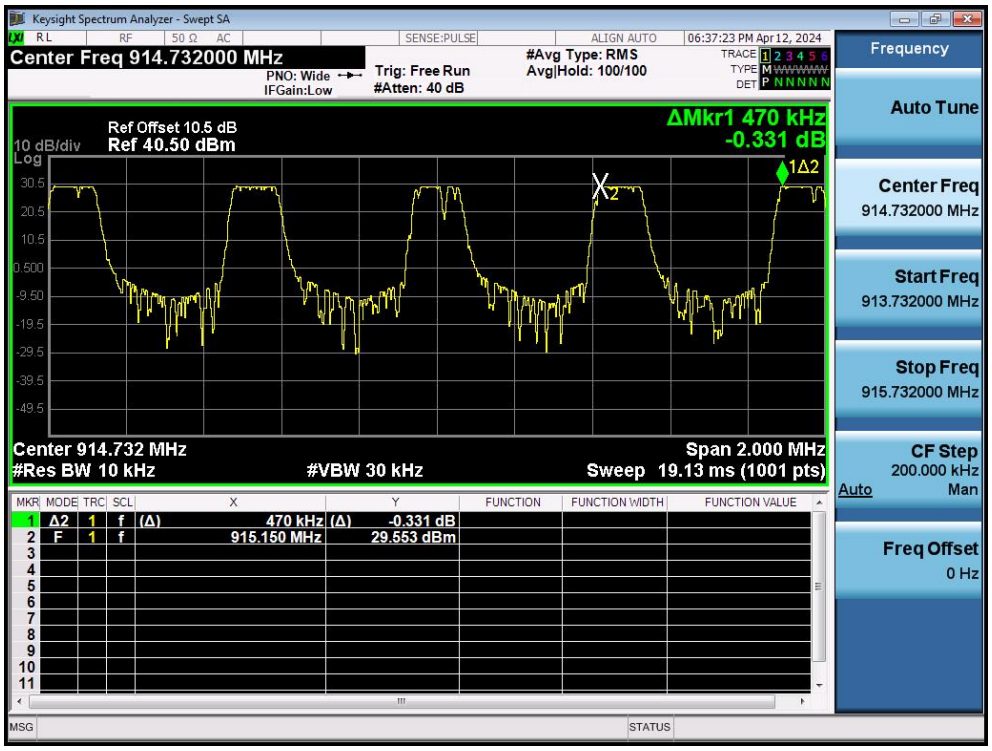
7.2. Test Setup



7.3. 7.4. Test Data

Test Item	:	Frequency Separation	Test Mode	:	Hopping
Test Voltage	:	DC 6V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

Mode	Frequency (MHz)	Separation Read Value (kHz)	Limit (kHz)	Result
Hopping	915.15	470	146.1	PASS



Hopping

7.4. Test Procedure

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

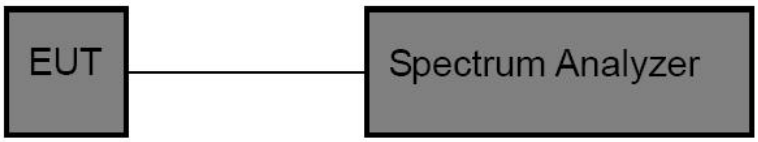
1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW =approximately 30% of the channel spacing.
3. Set the VBW ≥ RBW.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

8. Number of Hopping Channel Test

8.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247(a)(1)(i)
Test Limit	≥ 50 channels for 20 dB bandwidth less than 250KHz ≥ 25 channels for 20 dB bandwidth greater than 250KHz

8.2. Test Setup



8.3. Test Procedure

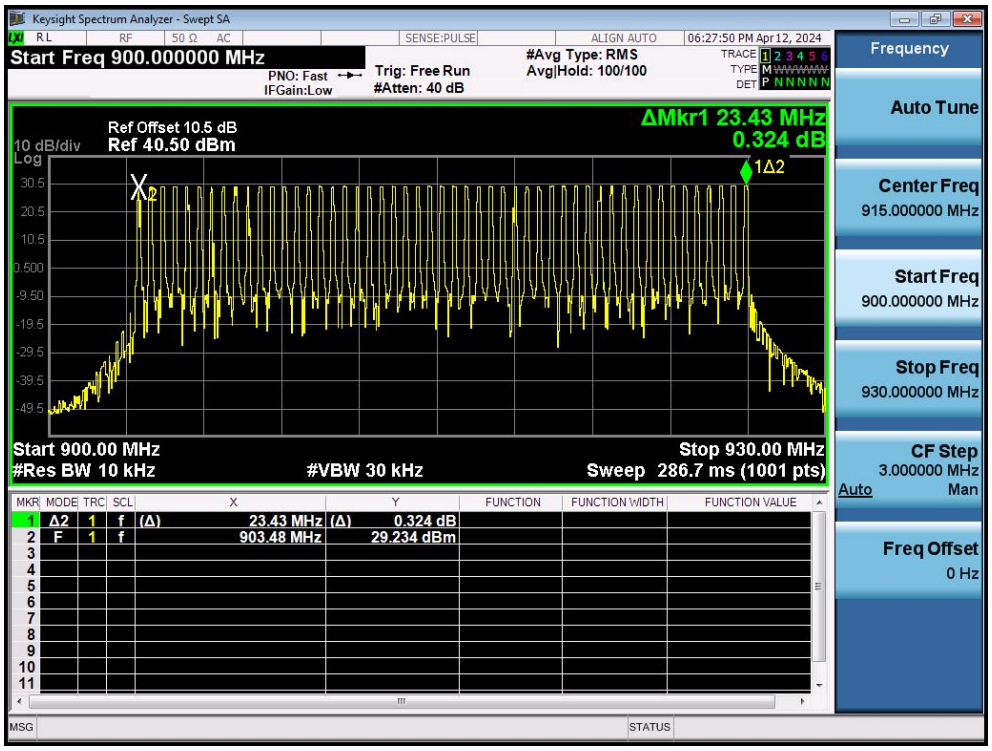
The EUT must have its hopping function enabled. Using the following spectrum analyzer setting:

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

Test Item	:	Number of Hopping Frequency	Test Mode	:	Hopping
Test Voltage	:	DC 6V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel
902-928MHz	51	≥ 50


Keysight Spectrum Analyzer - Swept SA
Start Freq 900.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
06:27:50 PM Apr 12, 2024
Ref Offset 10.5 dB
10 dB/div
Log
Ref 40.50 dBm
ΔMkr1 23.43 MHz
0.324 dB
Start 900.00 MHz
#Res BW 10 kHz
#VBW 30 kHz
Stop 930.00 MHz
Sweep 286.7 ms (1001 pts)
1 Δ2 1 f (Δ) 23.43 MHz (Δ) 0.324 dB
2 F 1 f 903.48 MHz 29.234 dBm
Frequency
Auto Tune
Center Freq
915.000000 MHz
Start Freq
900.000000 MHz
Stop Freq
930.000000 MHz
CF Step
3.000000 MHz
Auto
Man
Freq Offset
0 Hz

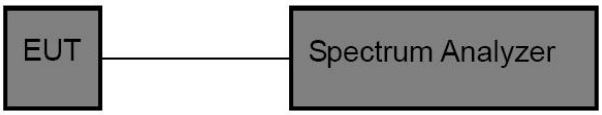
Hopping

9. Dwell Time Test

9.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247(a)(1)(i), 15.247(f)
Test Limit	15.247(a)(1)(i): if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. 15.247(f): For the purposes of this section, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques. The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4

9.2. Test Setup



9.3. Test Procedure

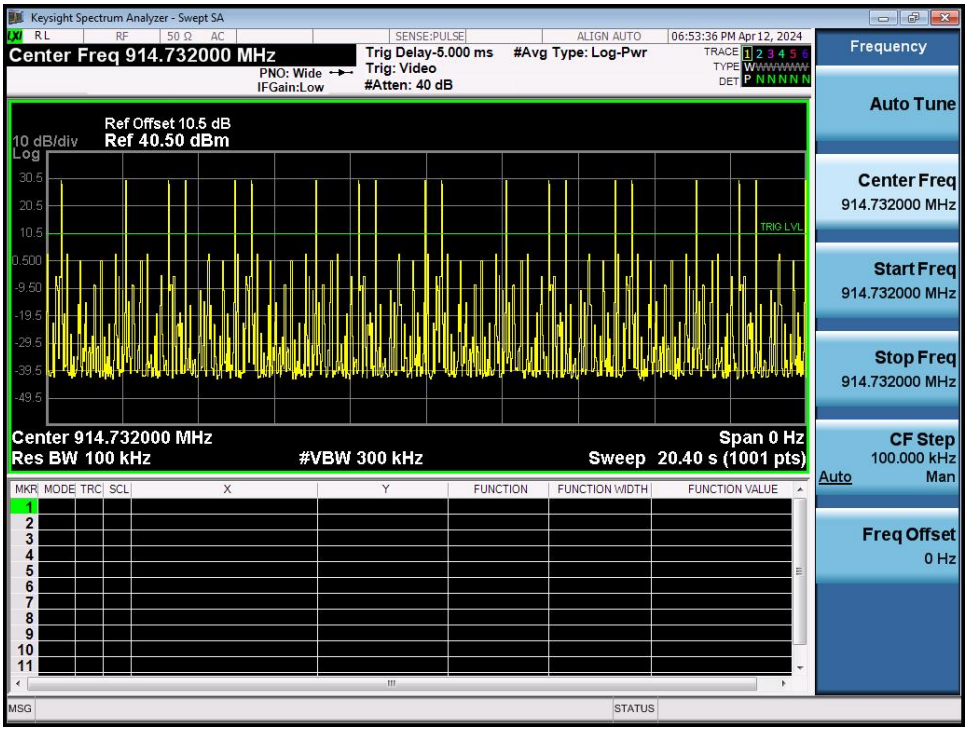
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

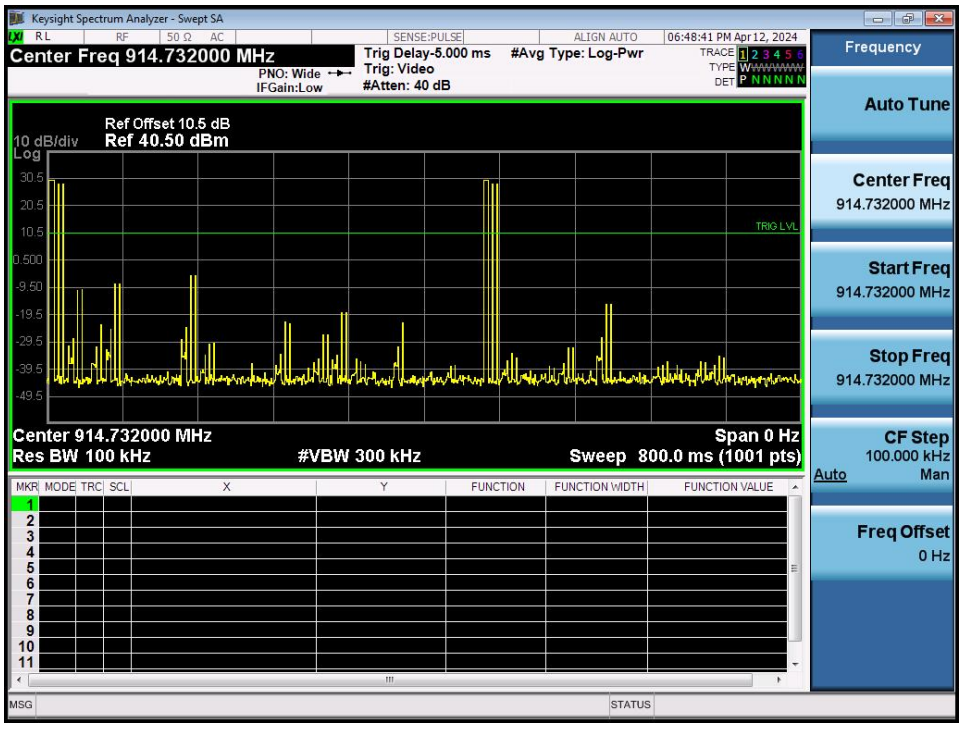
1. Span= zero span, centered on a hopping channel
2. Set the RBW = 100 KHz.
3. Set the VBW = 300 KHz.
4. Sweep time = as necessary to capture the entire dwell time per hopping channel.
5. Detector function = peak.
6. Trace mode = clear write.

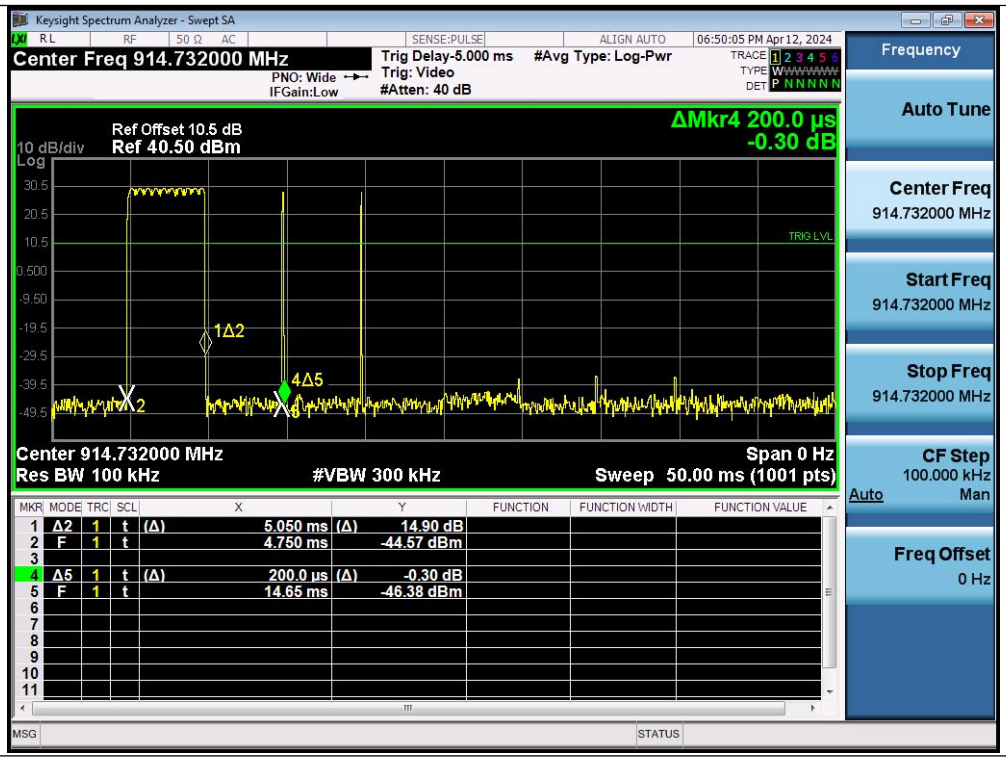
9.4. Test Data

Test Item	:	Time of Occupancy	Test Mode	:	Hopping
Test Voltage	:	DC 6V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

Requirement	Observe Period(s)	Dwell time (ms)	Limit (s)	Result
15.247(a)(1)(i)	20.00	103.55	0.40	PASS






Keysight Spectrum Analyzer - Swept SA
Center Freq 914.732000 MHz
PNO: Wide
IFGain:Low
Trig Delay-5.000 ms
Trig: Video
#Avg Type: Log-Pwr
#Atten: 40 dB
06:50:05 PM Apr 12, 2024
Ref Offset 10.5 dB
10 dB/div
Ref 40.50 dBm
ΔMkr4 200.0 µs
-0.30 dB
TRIG LVL
1Δ2
4Δ5
Center 914.732000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 50.00 ms (1001 pts)
1 Δ2 1 t (Δ) 5.050 ms (Δ) 14.90 dB
2 F 1 t 4.750 ms -44.57 dBm
4 Δ5 1 t (Δ) 200.0 µs (Δ) -0.30 dB
5 F 1 t 14.65 ms -46.38 dBm
Frequency
Auto Tune
Center Freq
914.732000 MHz
Start Freq
914.732000 MHz
Stop Freq
914.732000 MHz
CF Step
100.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

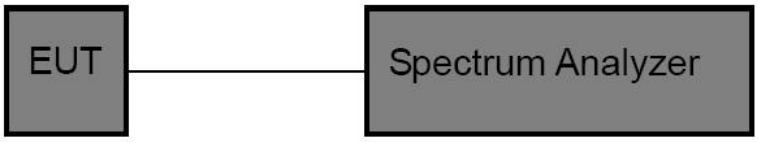
Hopping

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

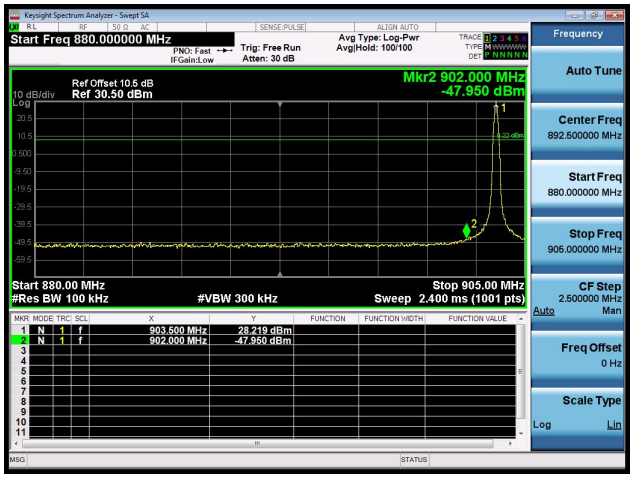
The EUT must have its hopping/Non-hopping function enabled. Using the following spectrum analyzer setting:

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.

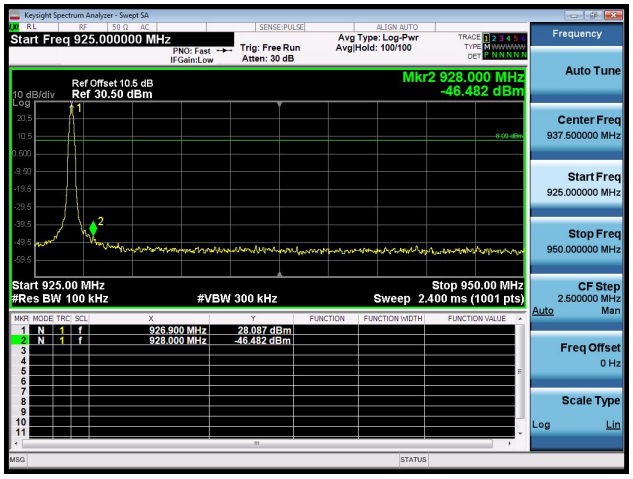
10.4. Test Data

Test Item	:	Band edge	Test Mode	:	CH Low, CH High
Test Voltage	:	DC 6V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

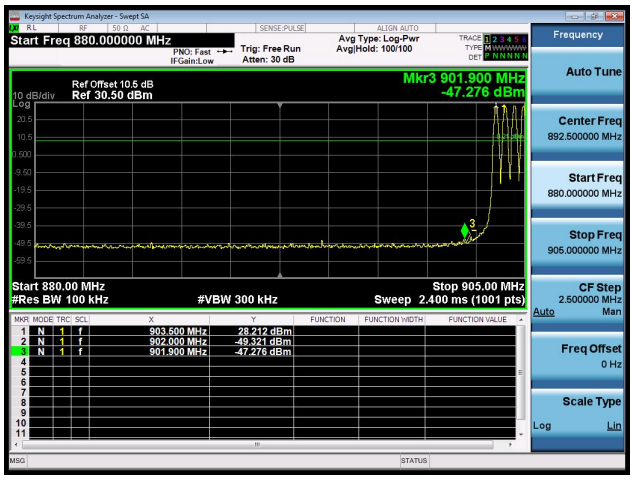
Band edge measurements



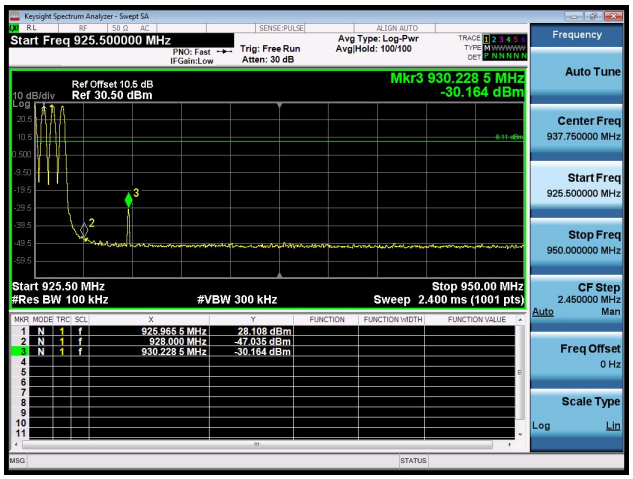
For Low channel Non-Hopping Mode



For High channel Non-Hopping Mode

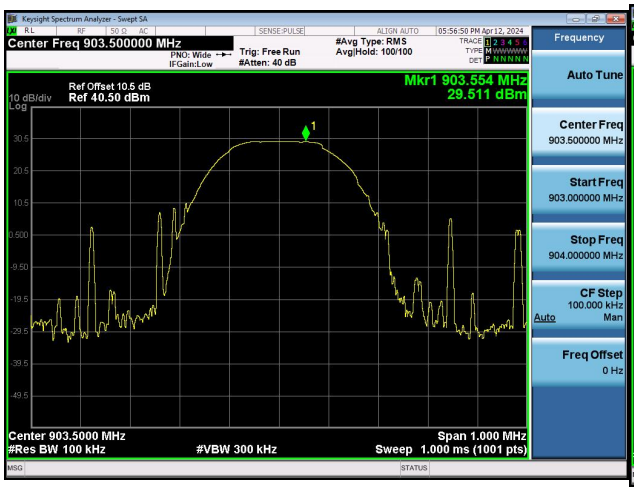


For Low channel Hopping Mode

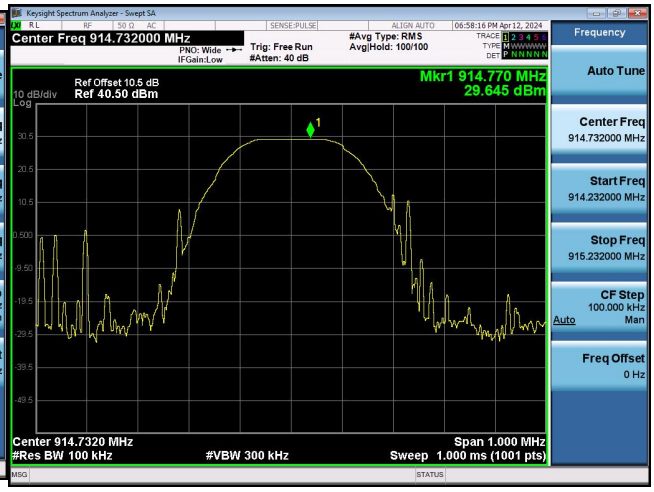


For High channel Hopping Mode

Conducted Emission Method



Low Channel



Mid Channel

High Channel

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 External antenna which permanently attached, and the best case gain of the antenna is 1.35dBi. It complies with the standard requirement.

APPENDIX I -- TEST SETUP PHOTOGRAPH

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

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 ----------