FCC TEST REPORT

Client Name	:	Seeed Technology Co., Ltd.
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road,Nanshan District, Shenzhen, China 518055
Product Name	:	WM1303 LoRaWAN Gateway Module(USB) - US915
Date	:	Jul. 22, 2021

Shenzhen Anbotek Compliance Laboratory Limited

Contents

TEST REPORT

Applicant	:	Seeed Technology Co., Ltd.
Manufacturer	:	Seeed Technology Co., Ltd.
Product Name	:	WM1303 LoRaWAN Gateway Module(USB) - US915
Model No.	:	WM1303-USB-US915
Trade Mark	:	Seeed Studio
Rating(s)	:	Input: DC 3.3V/420mA
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 Jun. 02, 2021

Date of Test Jun. 02~Jul. 20, 2021

Prepared by

(Ella Liang)

Approved & Authorized Signer

(Kingkong Jin)

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1. General Information

1.1. Client Information

Applicant	:	Seeed Technology Co., Ltd.
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road,Nanshan District, Shenzhen, China 518055
Manufacturer	:	Seeed Technology Co., Ltd.
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road,Nanshan District, Shenzhen, China 518055
Factory	:	Shenzhen Xinxian Technology Co; Limited
Address	:	F5, Building B17, Hengfeng Industrial City,No. 739 Zhoushi Rd, Baoan District, Shenzhen,Guangdong, P.R.C.

1.2. Description of Device (EUT)

Product Name	:	WM1303 LoRaWAN Gateway Module(USB) - US915	
Model No.	:	WM1303-USB-US915	
Trade Mark	:	Seeed Studio	
Test Power Supply	:	DC 3.3V by Debug board	
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)	
Product Description	:	Operation Frequency:	902~928MHz
		Number of Channel:	DTS: 16 Channels FHSS: 64 Channels
		Modulation Type:	LoRa Chirp Spread Spectrum
		Antenna Type:	Cylindrical antenna
		Antenna Gain(Peak):	2.6 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2) This report for FHSS only.			

1.3. Auxiliary Equipment Used During Test

Adapter	:	M/N: SAW12-050-2100UB Input: 100-240V~ 50/60Hz, 0.3A Output: DC 5V, 2100mA

1.4. Description of Test Modes

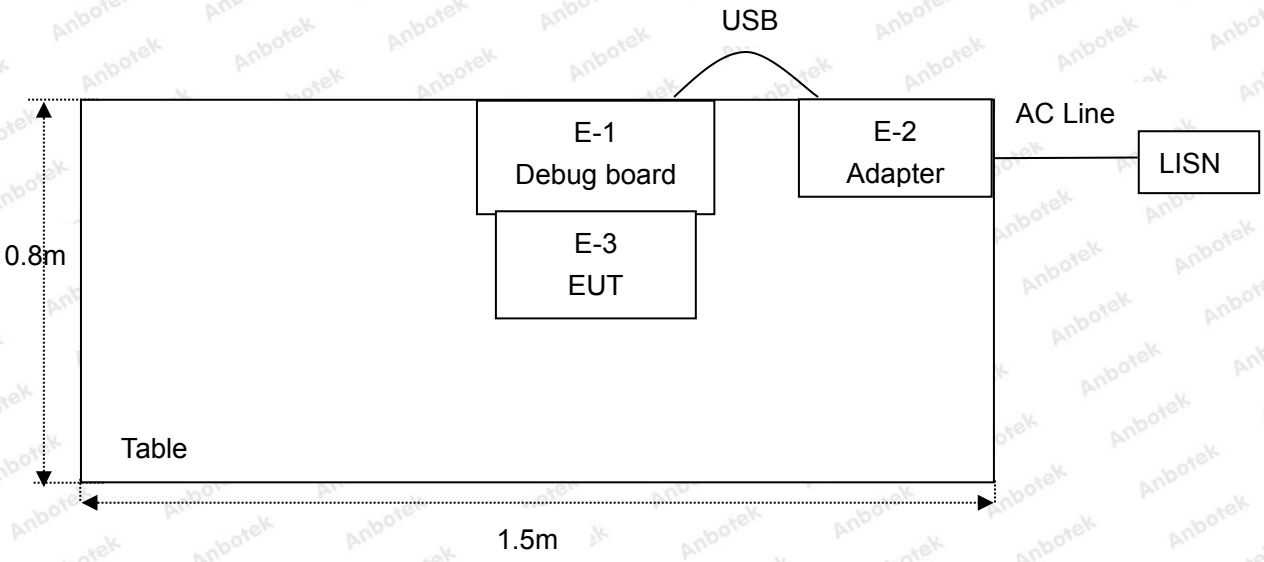
The system was configured for testing in testing mode, which was provided by manufacturer.
For LoRa mode, Detailed Frequency as below:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	902.3	23	906.7	45	911.1
2	902.5	24	906.9	46	911.3
3	902.7	25	907.1	47	911.5
4	902.9	26	907.3	48	911.7
5	903.1	27	907.5	49	911.9
6	903.3	28	907.7	50	912.1
7	903.5	29	907.9	51	912.3
8	903.7	30	908.1	52	912.5
9	903.9	31	908.3	53	912.7
10	904.1	32	908.5	54	912.9
11	904.3	33	908.7	55	913.1
12	904.5	34	908.9	56	913.3
13	904.7	35	909.1	57	913.5
14	904.9	36	909.3	58	913.7
15	905.1	37	909.5	59	913.9
16	905.3	38	909.7	60	914.1
17	905.5	39	909.9	61	914.3
18	905.7	40	910.1	62	914.5
19	905.9	41	910.3	63	914.7
20	906.1	42	910.5	64	914.9
21	906.3	43	910.7	-	-
22	906.5	44	910.9	-	-

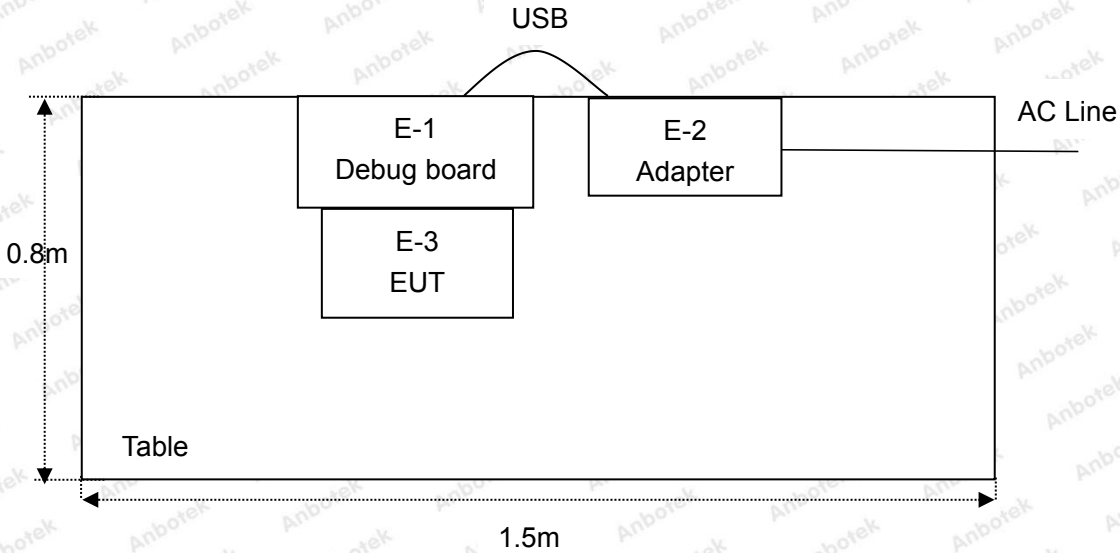
Note: 1. Note: EUT was tested with Channel 1, 32 and 64.

1.6. Description Of Test Setup

CE



RE



1.7. 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. 26, 2020	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 26, 2020	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 26, 2020	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 26, 2020	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 26, 2020	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Oct. 26, 2020	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 02, 2020	2 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 02, 2020	2 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 02, 2020	2 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Nov. 02, 2020	2 Year
11.	Pre-amplifier	SONOMA	310N	186860	Oct. 26, 2020	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Oct. 26, 2020	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Oct. 26, 2020	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Oct. 26, 2020	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 26, 2020	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 26, 2020	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 26, 2020	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 26, 2020	1 Year

1.8. Measurement Uncertainty

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

1.9. 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, September 30, 2020.

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, September 30, 2020.

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

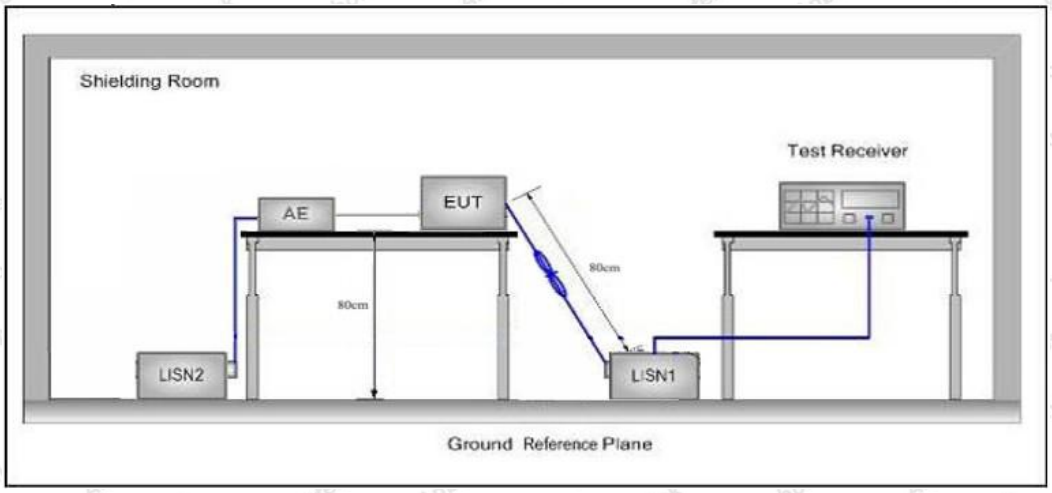
Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.247(b)(2)	Conducted Peak Output Power	PASS
15.247(a)(1)(i)	20dB Occupied Bandwidth	PASS
15.247(a)(1)	Carrier Frequencies Separation	PASS
15.247(a)(1)(i)	Hopping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

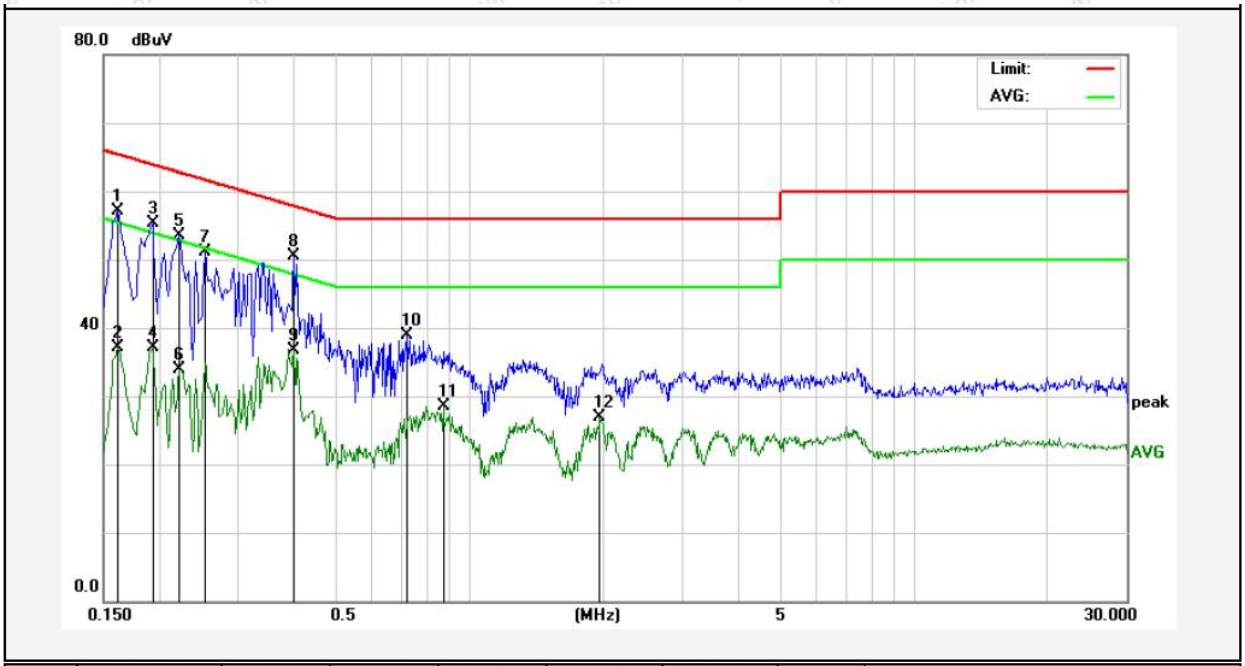
3.4. Test Data

During the test, pre-scan all the modes, and found CH01 (TX) which is the worst case, only the worst case is recorded in the report.

Please to see the following pages.

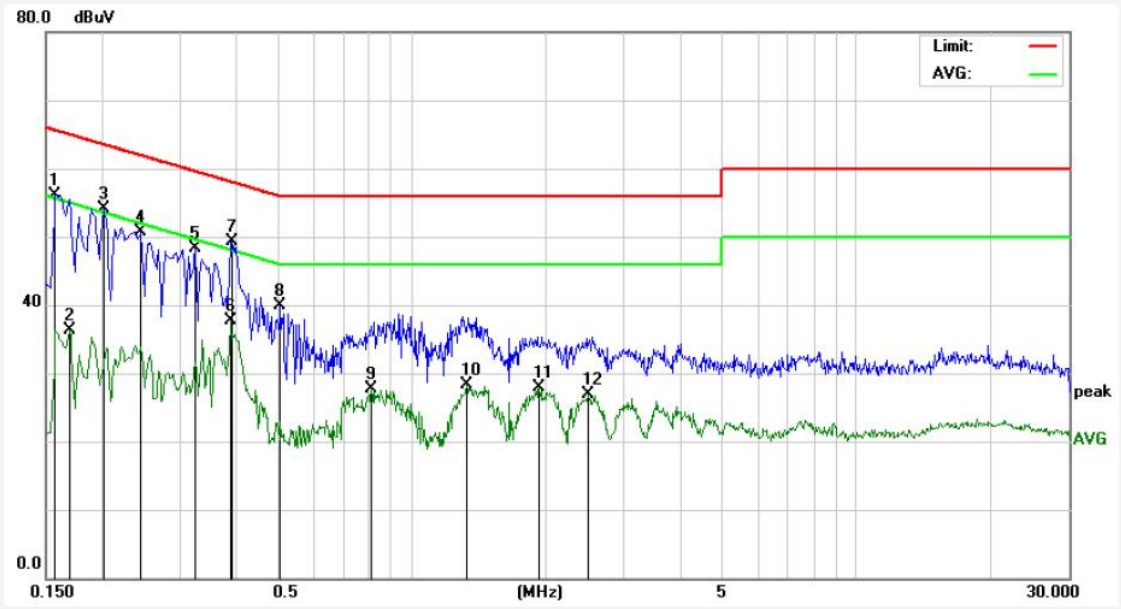
Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: CH01
Test Specification: AC 120V, 60Hz
Comment: Live Line
Tem.: 22.4℃ Hum.: 53%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1620	37.12	19.90	57.02	65.36	-8.34	QP	
2	0.1620	17.23	19.90	37.13	55.36	-18.23	AVG	
3	0.1940	35.45	19.90	55.35	63.86	-8.51	QP	
4	0.1940	17.21	19.90	37.11	53.86	-16.75	AVG	
5	0.2220	33.52	19.90	53.42	62.74	-9.32	QP	
6	0.2220	14.03	19.90	33.93	52.74	-18.81	AVG	
7	0.2540	31.28	19.89	51.17	61.62	-10.45	QP	
8	0.4020	30.63	19.94	50.57	57.81	-7.24	QP	
9	0.4020	16.71	19.94	36.65	47.81	-11.16	AVG	
10	0.7260	18.82	20.05	38.87	56.00	-17.13	QP	
11	0.8740	8.47	20.09	28.56	46.00	-17.44	AVG	
12	1.9620	6.74	20.14	26.88	46.00	-19.12	AVG	

Test Site: 1# Shielded Room
Operating Condition: CH01
Test Specification: AC 120V, 60Hz
Comment: Neutral Line
Tem.: 22.4℃ Hum.: 53%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1580	36.30	19.90	56.20	65.56	-9.36	QP	
2	0.1700	16.46	19.90	36.36	54.96	-18.60	AVG	
3	0.2020	34.12	19.90	54.02	63.52	-9.50	QP	
4	0.2460	30.83	19.89	50.72	61.89	-11.17	QP	
5	0.3260	28.41	19.90	48.31	59.55	-11.24	QP	
6	0.3899	17.68	19.93	37.61	48.06	-10.45	AVG	
7	0.3940	29.47	19.93	49.40	57.98	-8.58	QP	
8	0.5060	19.97	19.98	39.95	56.00	-16.05	QP	
9	0.8100	7.73	20.07	27.80	46.00	-18.20	AVG	
10	1.3260	8.20	20.13	28.33	46.00	-17.67	AVG	
11	1.9380	7.69	20.14	27.83	46.00	-18.17	AVG	
12	2.4900	6.66	20.15	26.81	46.00	-19.19	AVG	

Note: The EUT received input Voltage DC 3.3V from Debug board, and the Debug board received AC 120V/60Hz from Adapter.

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

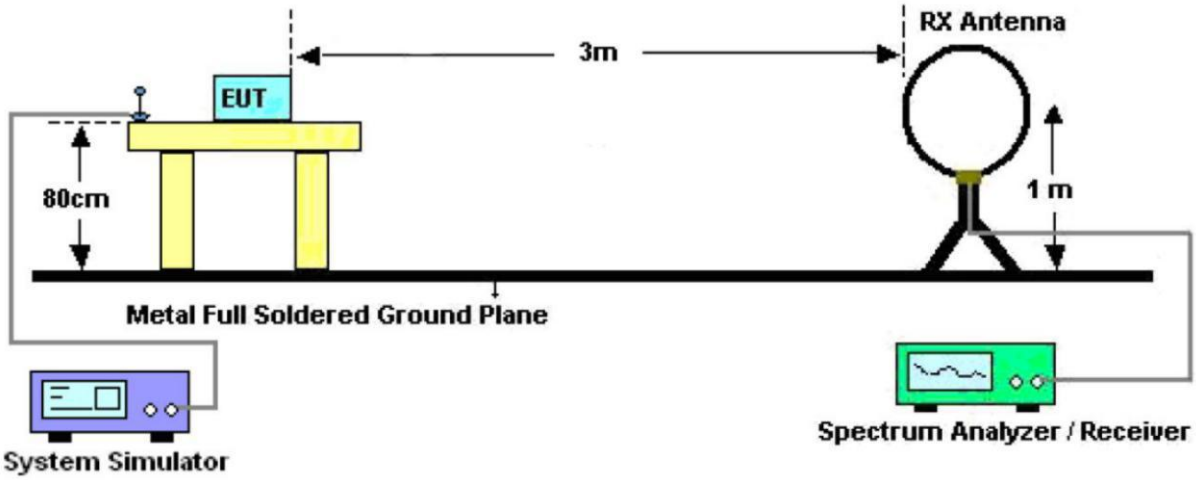


Figure 1. Below 30MHz

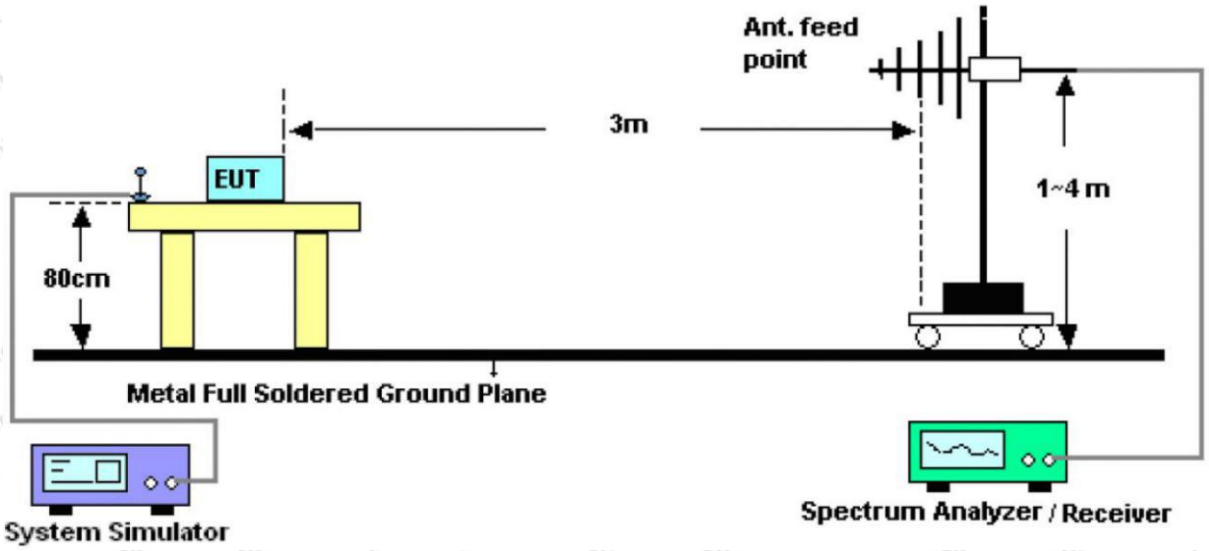


Figure 2. 30MHz to 1GHz

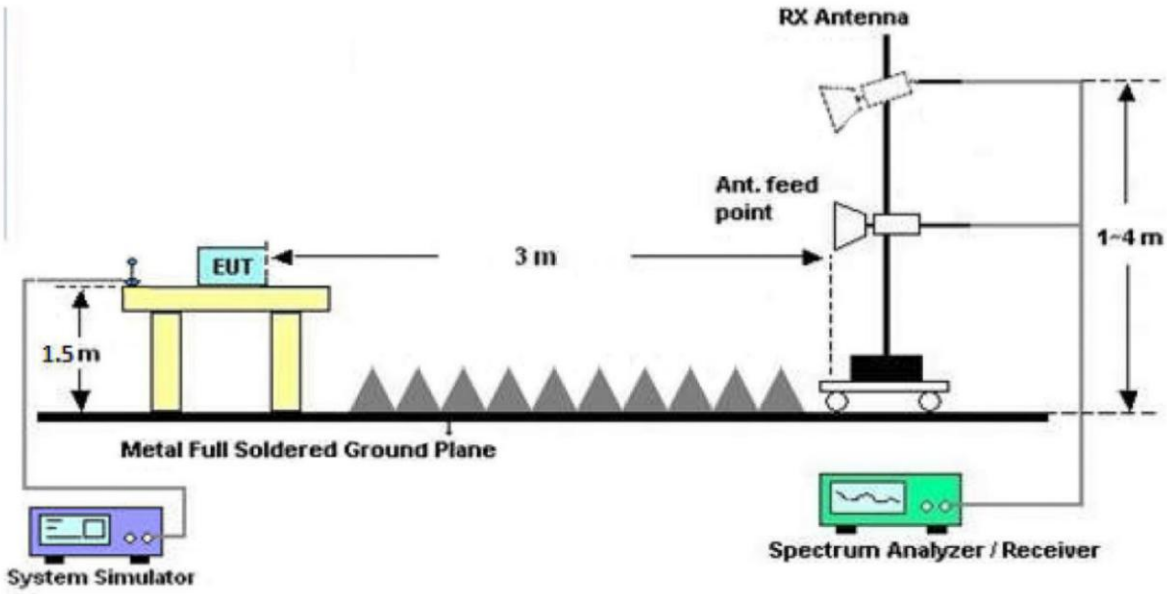


Figure 3. Above 1 GHz

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.

During the test, pre-scan all the modes, and found the CH01 (TX) 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.

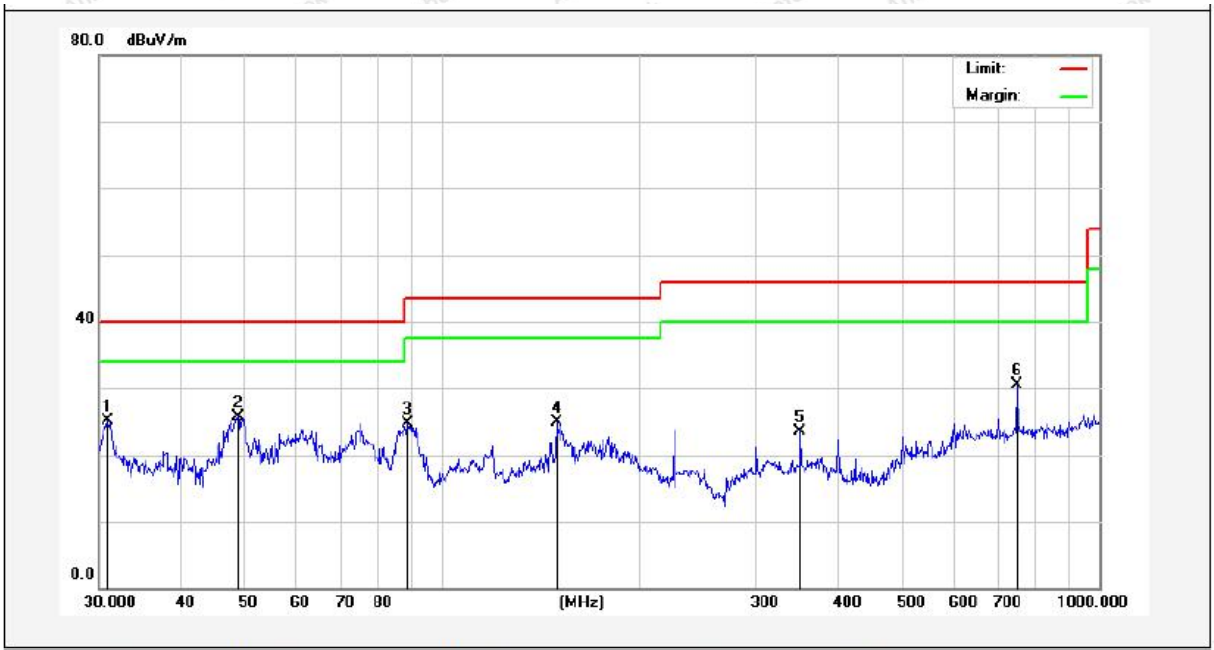
Test Results (30~1000MHz)

Test Mode: CH01

Power Source: AC 120V, 60Hz

Polarization: Vertical

Temp.(℃)/Hum.(%RH): 22℃/52%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	30.8535	42.11	-17.04	25.07	40.00	-14.93	peak			
2	48.8429	40.33	-14.67	25.66	40.00	-14.34	peak			
3	88.6524	40.83	-16.05	24.78	43.50	-18.72	peak			
4	149.4857	44.87	-19.91	24.96	43.50	-18.54	peak			
5	350.4768	35.58	-11.99	23.59	46.00	-22.41	peak			
6	750.1082	35.70	-5.22	30.48	46.00	-15.52	peak			

Address: 1/F., Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.
Tel:(86) 755-26066440 Fax: (86) 755-26014772 Email: service@anbotek.com
Hotline 400-003-0500 www.anbotek.com

Test Mode: CH01

Power Source: AC 120V, 60Hz

Polarization: Horizontal

Temp.(℃)/Hum.(%RH): 22℃/52%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	31.0704	34.61	-19.09	15.52	40.00	-24.48	peak			
2	74.9191	43.43	-20.48	22.95	40.00	-17.05	peak			
3	175.0365	47.52	-21.07	26.45	43.50	-17.05	peak			
4	344.3854	36.04	-13.14	22.90	46.00	-23.10	peak			
5	446.4141	35.25	-12.12	23.13	46.00	-22.87	peak			
6	663.4728	33.73	-6.60	27.13	46.00	-18.87	peak			

Note: The EUT received input Voltage DC 3.3V from Debug board, and the Debug board received AC 120V/60Hz from Adapter.

Test Results (1GHz-25GHz)

Test Mode: CH01					Test channel: Lowest				
Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Det. Mode
1804.6000	H	42.99	7.39	28.73	26.31	52.80	74	-21.20	PK
1804.6000	H	34.26	7.39	28.73	26.31	44.07	54	-9.93	AV
2706.9000	H	42.85	8.10	29.71	27.01	53.65	74	-20.35	PK
2706.9000	H	33.54	8.10	29.71	27.01	44.34	54	-9.66	AV
3609.2000	H	--	--	--	--	--	--	--	PK
3609.2000	H	--	--	--	--	--	--	--	AV
1804.6000	V	42.52	7.39	28.73	26.31	52.33	74	-21.67	PK
1804.6000	V	35.67	7.39	28.73	26.31	45.48	54	-8.52	AV
2706.9000	V	42.66	8.10	29.71	27.01	53.46	74	-20.54	PK
2706.9000	V	33.36	8.10	29.71	27.01	44.16	54	-9.84	AV
3609.2000	V	--	--	--	--	--	--	--	PK
3609.2000	V	--	--	--	--	--	--	--	AV

Test Mode: CH32					Test channel: Middle				
Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Det. Mode
1817.0000	H	46.21	7.41	28.72	26.31	56.03	74	-17.97	PK
1817.0000	H	36.84	7.41	28.72	26.31	46.66	54	-7.34	AV
2725.5000	H	46.60	8.11	29.71	27.01	57.41	74	-16.59	PK
2725.5000	H	35.15	8.11	29.71	27.01	45.96	54	-8.04	AV
3634.0000	H	--	--	--	--	--	--	--	PK
3634.0000	H	--	--	--	--	--	--	--	AV
1817.0000	V	46.92	7.41	28.72	26.31	56.74	74	-17.26	PK
1817.0000	V	35.96	7.41	28.72	26.31	45.78	54	-8.22	AV
2725.5000	V	46.39	8.11	29.71	27.01	57.20	74	-16.80	PK
2725.5000	V	34.80	8.11	29.71	27.01	45.61	54	-8.39	AV
3634.0000	V	--	--	--	--	--	--	--	PK
3634.0000	V	--	--	--	--	--	--	--	AV

Test Mode: CH64						Test channel: High			
Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Det. Mode
1829.8000	H	46.60	7.43	28.69	26.31	56.41	74	-17.59	PK
1829.8000	H	35.97	7.43	28.69	26.31	45.78	54	-8.22	AV
2744.7000	H	45.93	8.15	29.84	27.01	56.91	74	-17.09	PK
2744.7000	H	35.53	8.15	29.84	27.01	46.51	54	-7.49	AV
3659.6000	H	--	--	--	--	--	--	--	PK
3659.6000	H	--	--	--	--	--	--	--	AV
1829.8000	V	48.06	7.43	28.69	26.31	57.87	74	-16.13	PK
1829.8000	V	35.29	7.43	28.69	26.31	45.10	54	-8.90	AV
2744.7000	V	47.00	8.15	29.84	27.01	57.98	74	-16.02	PK
2744.7000	V	35.85	8.15	29.84	27.01	46.83	54	-7.17	AV
3659.6000	V	--	--	--	--	--	--	--	PK
3659.6000	V	--	--	--	--	--	--	--	AV

Remark:

1. Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier 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:

Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Det.
902.0000	42.92	22.45	4.48	31.33	38.52	46.00	-7.48	H	QP
928.0000	39.51	22.59	4.54	31.35	35.29	46.00	-10.71	H	QP
902.0000	44.07	22.45	4.48	31.33	39.67	46.00	-6.33	V	QP
928.0000	39.35	22.59	4.54	31.35	35.13	46.00	-10.87	V	QP

Remark:

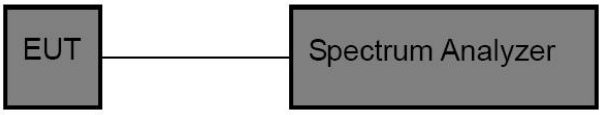
1. Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

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 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



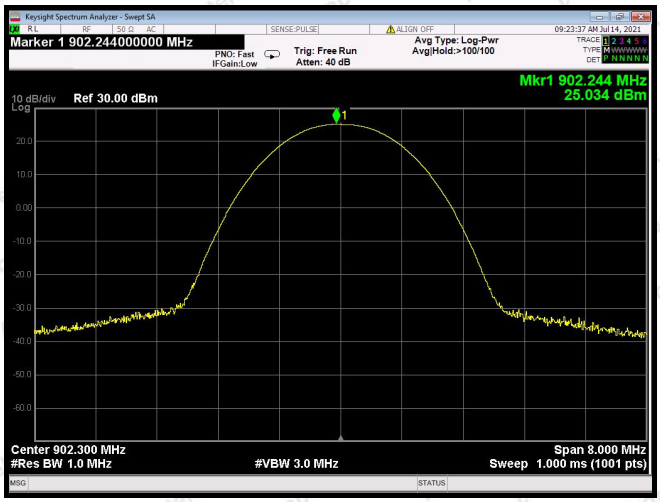
5.3. Test Procedure

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

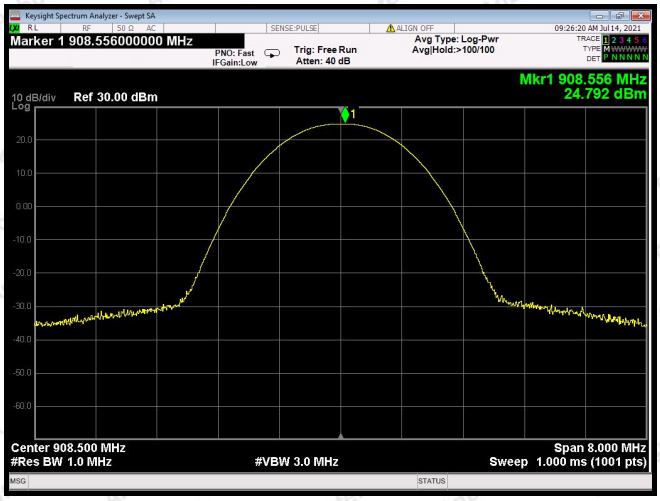
5.4. Test Data

Test Item	:	Max. peak output power	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 3.3V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

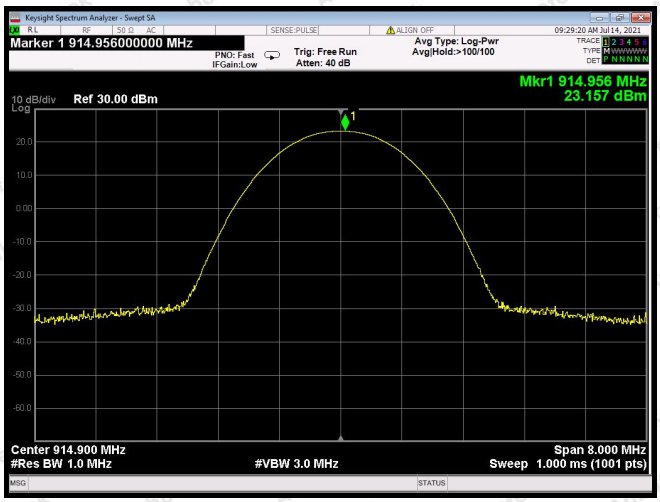
Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
902.3	25.034	30.00	PASS
908.5	24.792	30.00	PASS
914.9	23.157	30.00	PASS



CH: Low



CH: Middle



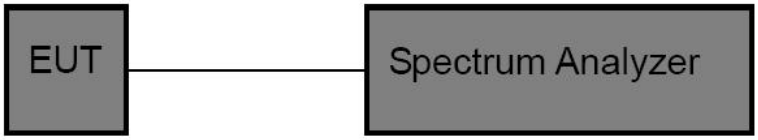
CH: High

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 Procedure

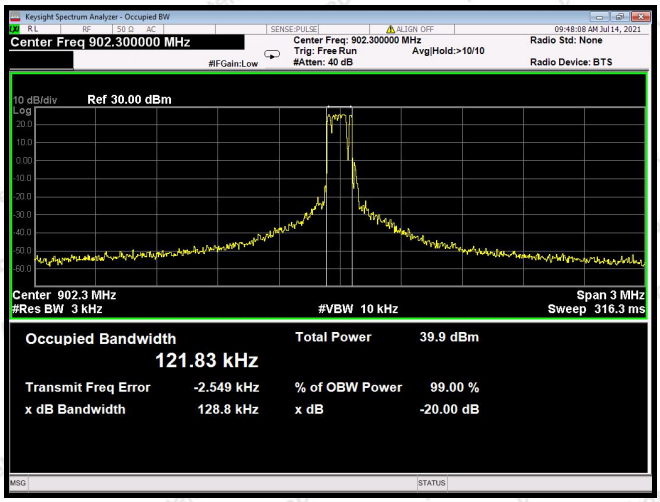
Using the following spectrum analyzer settings:

1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW = 3 kHz.
3. Set the VBW = 10 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

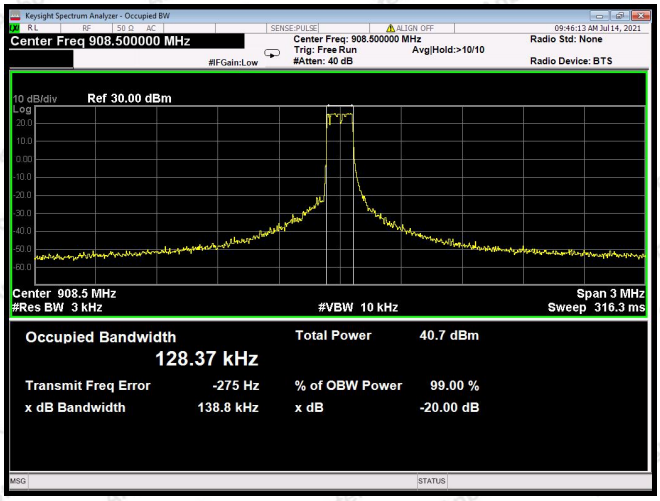
6.4. Test Data

Test Item	:	20dB BW	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 3.3V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

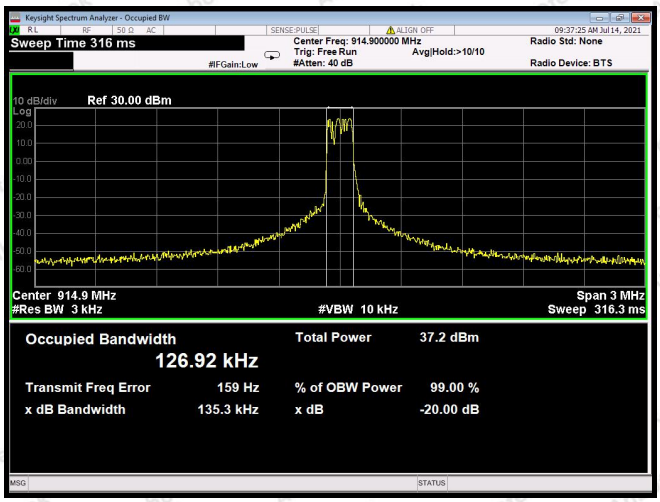
Channel	Frequency(MHz)	20dB Down BW(kHz)	Limit(KHz)	Results
Low	902.3	128.8	≤250	PASS
Middle	908.5	138.8	≤250	PASS
High	914.9	135.3	≤250	PASS



CH: Low



CH: Middle



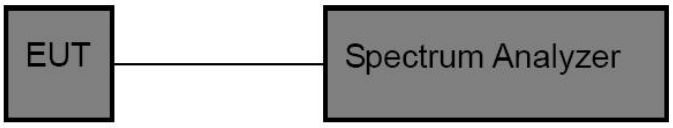
CH: High

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. Test Procedure

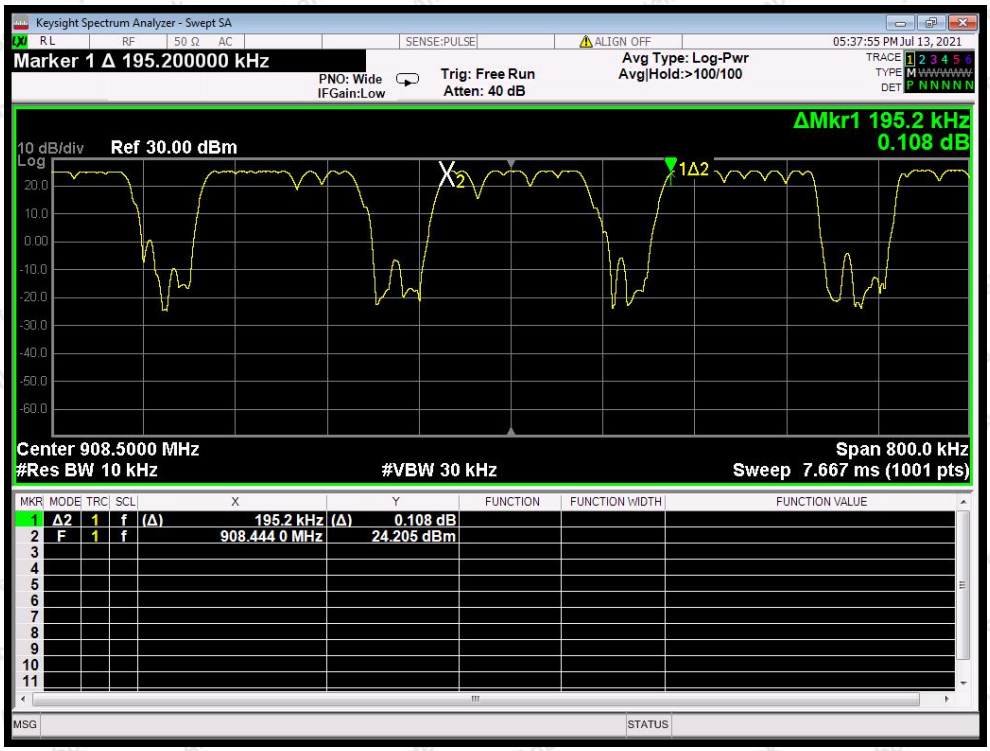
The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW = 10 kHz.
3. Set the VBW = 30 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

7.4. Test Data

Test Item	:	Frequency Separation	Test Mode	:	Hopping
Test Voltage	:	DC 3.3V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

Mode	Frequency (MHz)	Separation Read Value (kHz)	Limit (kHz)	Result
Hopping	908.5	195.2	138.8	PASS



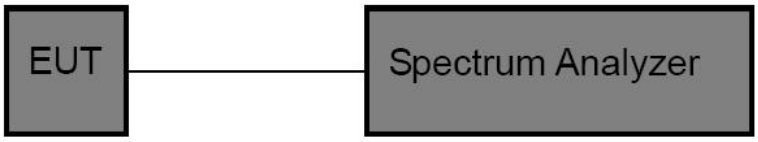
Hopping

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 = 100kHz.
3. Set the VBW = 300kHz.
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 3.3V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel
902-928MHz	64	≥ 50

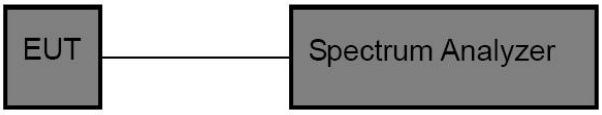
Hopping

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

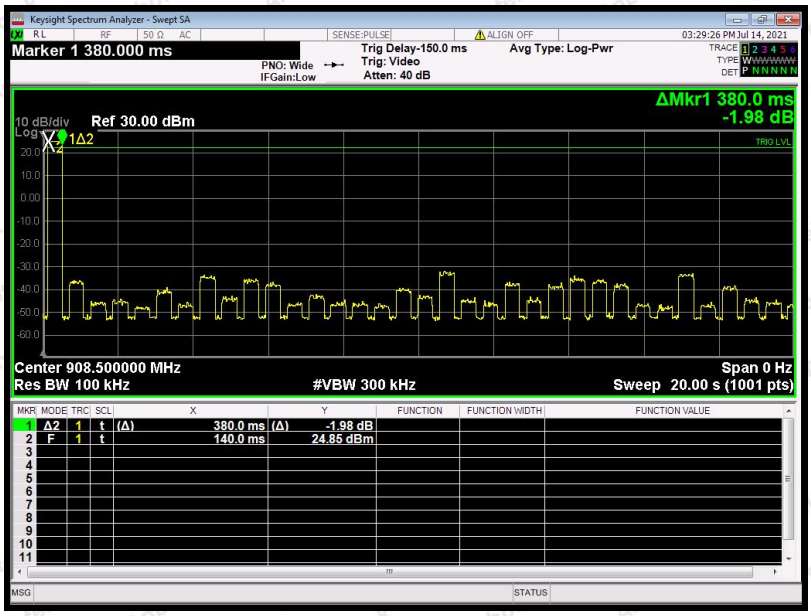
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

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 = max hold.
7. Allow trace to fully stabilize.

9.4. Test Data

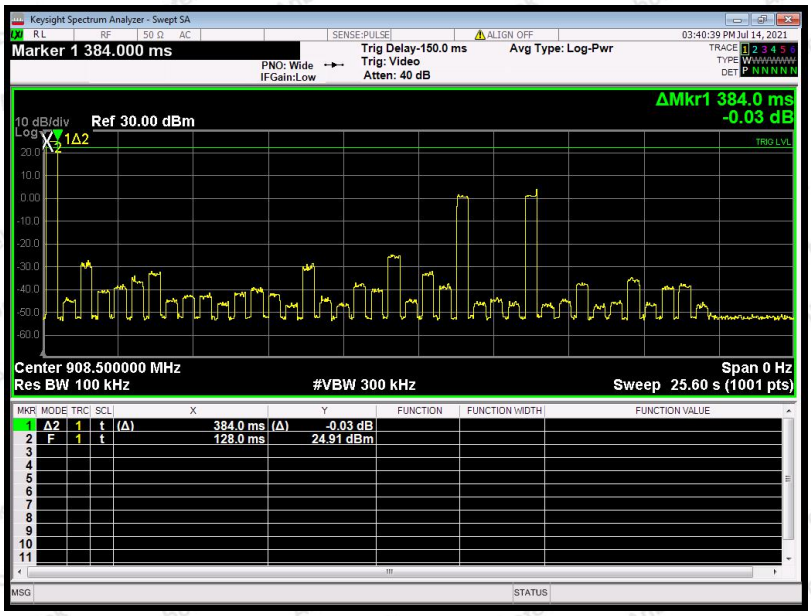
Test Item	:	Time of Occupancy	Test Mode	:	Hopping
Test Voltage	:	DC 3.3V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

Requirement	Pulse width (ms)	Observe Period(s)	Dwell time (ms)	Limit (s)	Result
15.247(a)(1)(i)	380.00	20.00	380.00	0.40	PASS



Hopping

Requirement	Pulse width (ms)	Observe Period(s)	Dwell time (ms)	Limit (s)	Result
15.247(f)	384.	25.60	384.0	0.40	PASS



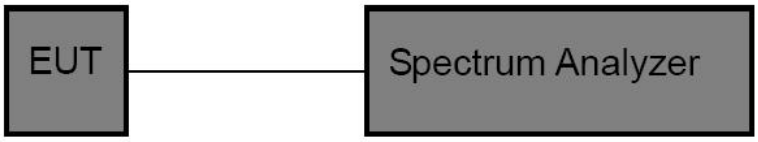
Hopping

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



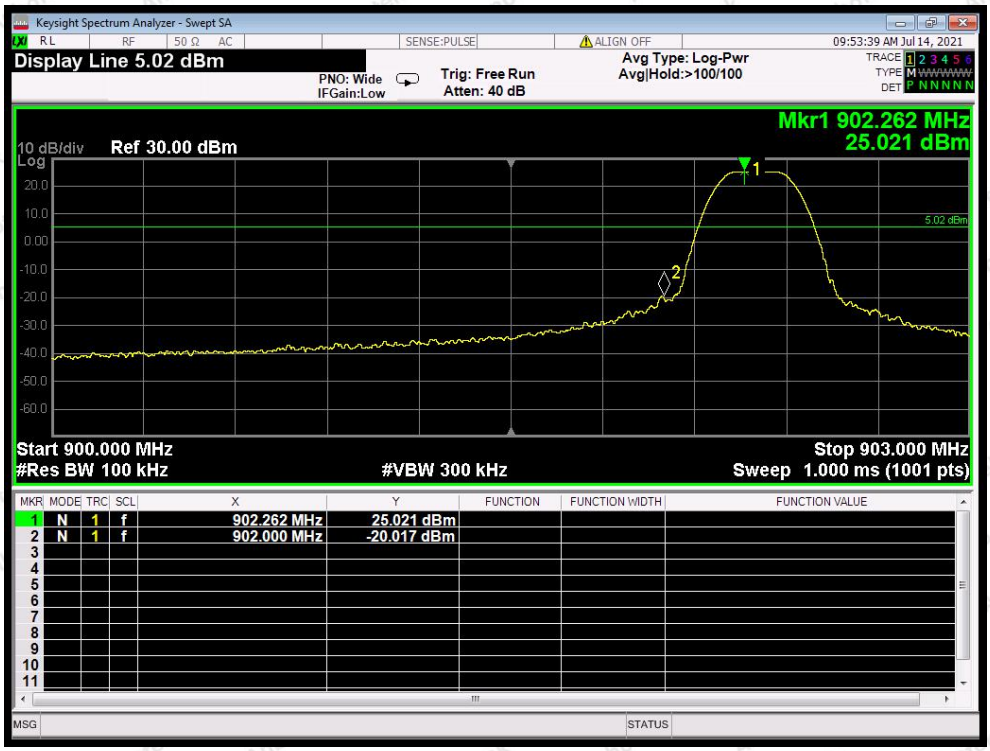
10.3. Test Procedure

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

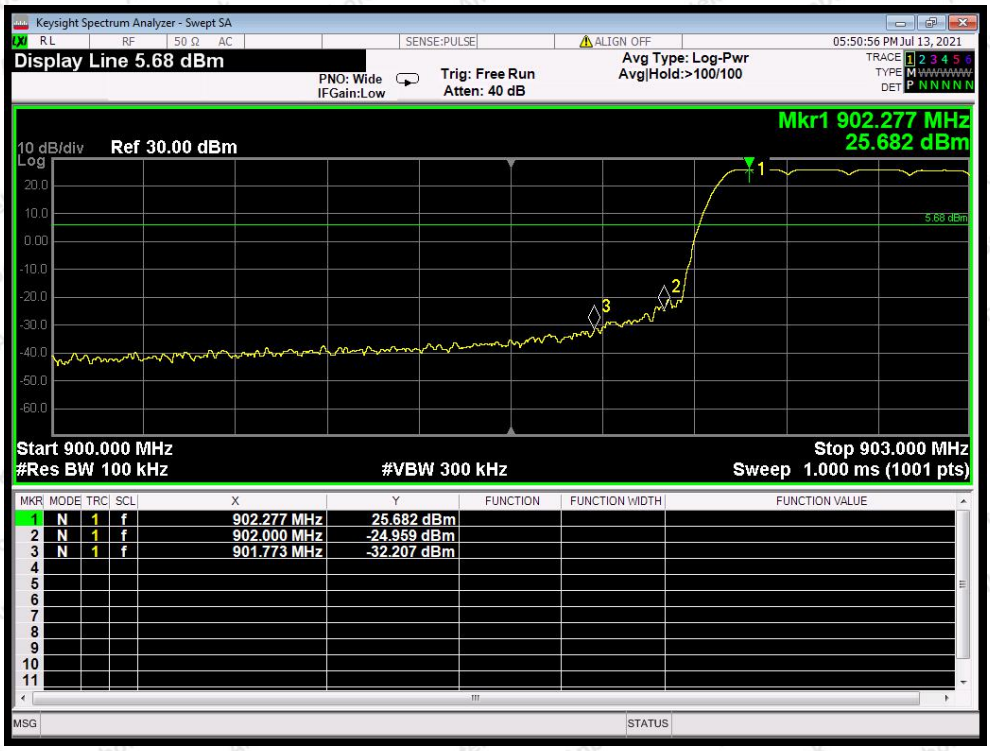
1. Set the RBW = 100kHz.
2. Set the VBW = 300kHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

10.4. Test Data

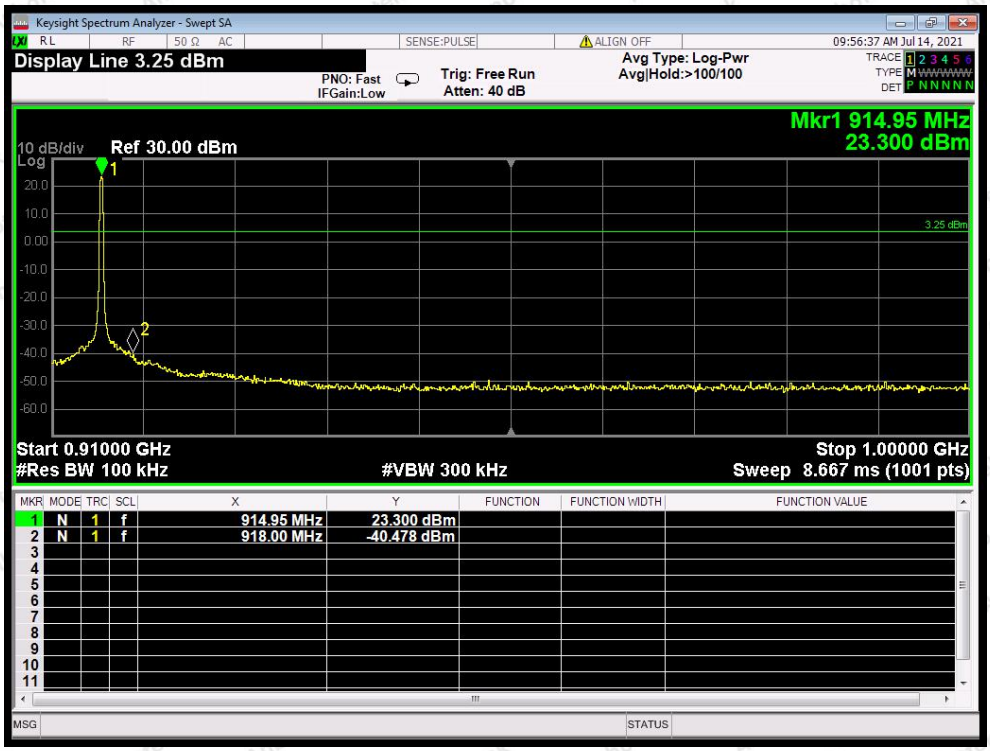
Test Item	:	Band edge	Test Mode	:	CH Low, CH High
Test Voltage	:	DC 3.3V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %



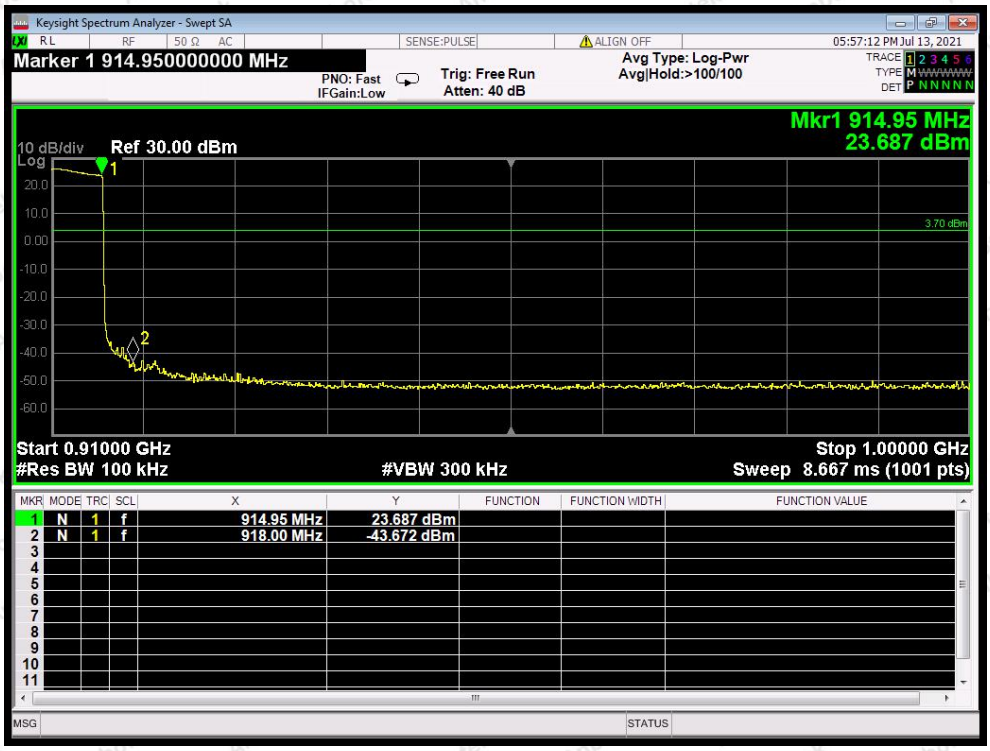
For Low channel Non-Hopping Mode



For Low channel Hopping Mode

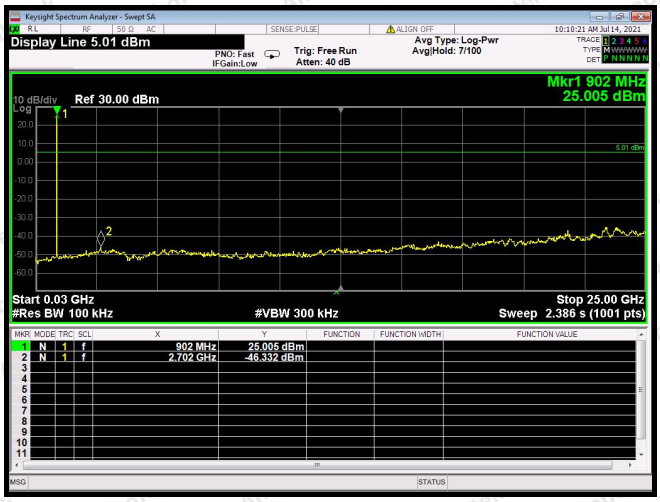


For High channel Non-Hopping Mode

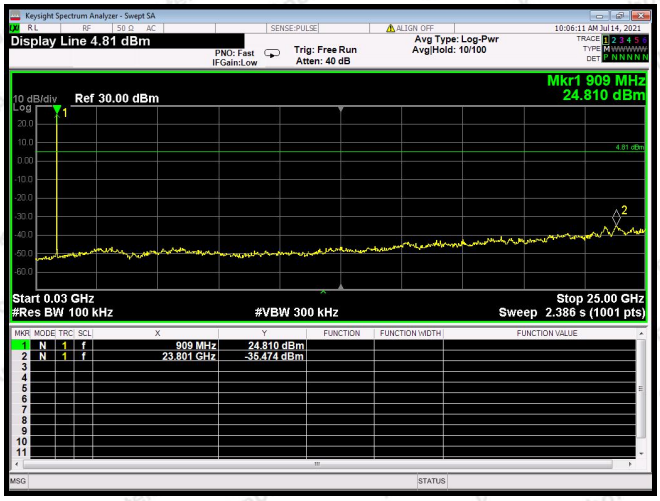


For High channel Hopping Mode

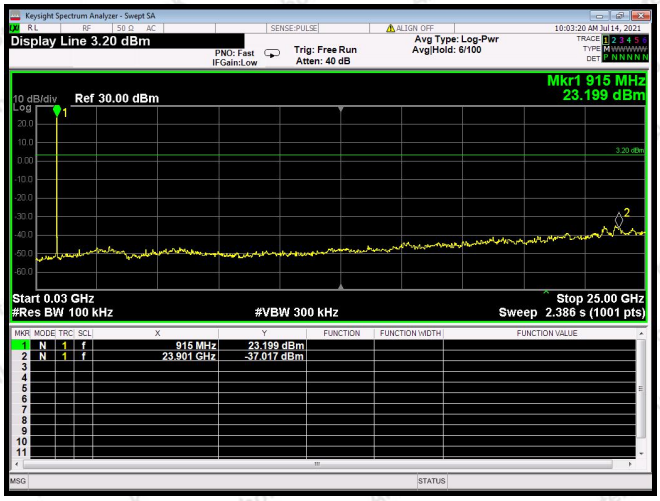
Conducted Emission Method



CH: Low



CH: Middle



CH: High

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.

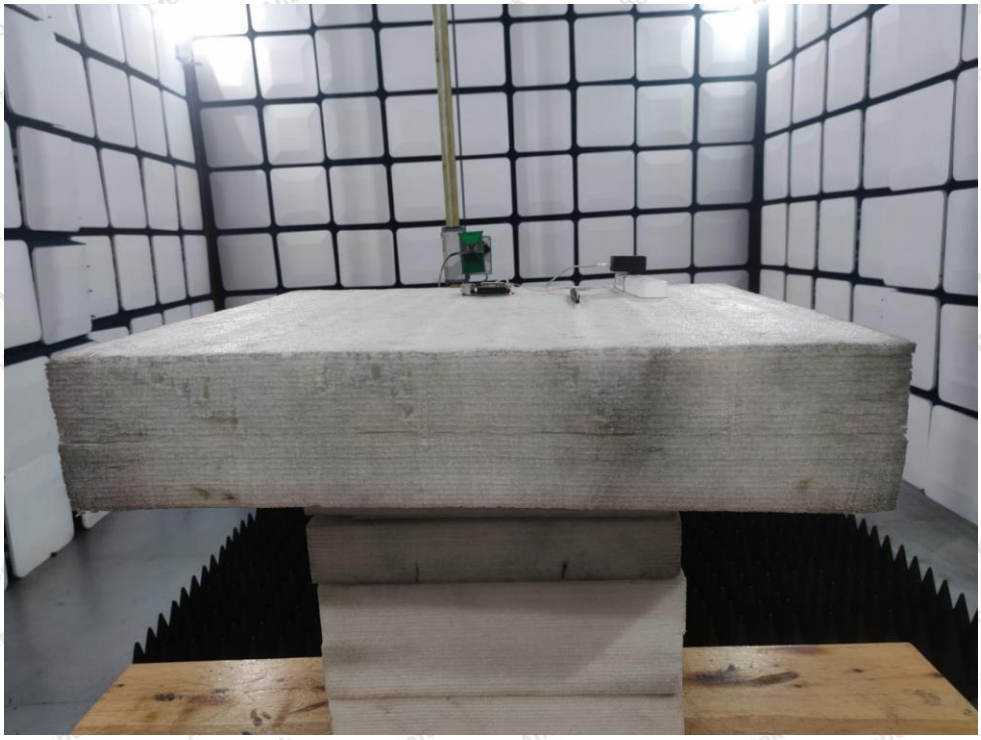
11.2. Antenna Connected Construction

The antenna is Cylindrical antenna which permanently attached, and the best case gain of the antenna is 2.6dBi. It complies with the standard requirement.

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Measurement

Photo of Radiation Emission Test



APPENDIX II -- EXTERNAL PHOTOGRAPH

Reference to the test report 18220WC10125101.

APPENDIX III -- INTERNAL PHOTOGRAPH

Reference to the test report 18220WC10125101

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