Shenzhen HTT Technology Co., Ltd.

Report No.: HTT202304169F02

TEST Report

Applicant:	GUANGZHOU ZHIFEI LIGHTING CO., LTD.
Address of Applicant:	3/F, Building 3, No.18, Keyuan Rd., Guangzhou Private Science and Technology Industry Park, Baiyun District, Guangzhou, Guangdong, 510080
Manufacturer :	GUANGZHOU ZHIFEI LIGHTING CO., LTD.
Address of Manufacturer :	3/F, Building 3, No.18, Keyuan Rd., Guangzhou Private Science and Technology Industry Park, Baiyun District, Guangzhou, Guangdong, 510080

Equipment Under Test (EUT)

Product Name:	Portable luminaires
Model No.:	T1001
Series model:	F1013, F1014, F1015, F1016, F1017, F1018, F1019, F1053, F1054, F1055, F1060, F1061, T1005, T1006, T1012, T1013, T1014, T1015, D1005, D1006, D1007
Trade Mark:	CHIPHY
FCC ID:	2BA7G-T1001
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	Apr.10,2023
Date of Test:	Apr.10,2023~Apr.14,2023
Date of report issued:	Apr.14,2023
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

1. Version

Version No.	Date	Description
00	*Apr.14,2023*	*Original*

Tested/ Prepared By Heber He ***Date:*** ***Apr.14,2023***

Project Engineer

Check By: Bruce Zhu ***Date:*** ***Apr.14,2023***

Reviewer

Approved By : Kevin Yang ***Date:*** ***Apr.14,2023***

Authorized Signature

2. Contents

Page

3. Test Summary

Test Item	Section	Result
Antenna requirement	FCC part 15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	FCC part 15.207	Pass
Conducted Peak Output Power	FCC part 15.247 (b)(3)	Pass
6dB Bandwidth	FCC part 15.247 (a)(2)	Pass
Power Spectral Density	FCC part 15.247 (e)	Pass
Band Edge	FCC part 15.247(d)	Pass
Spurious Emission	FCC part 15.205/15.209	Pass

Remark: Test according to ANSI C63.10:2013 and RSS-Gen

Pass: The EUT complies with the essential requirements in the standard.

Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.45 dB	(1)
Radiated Emission	1~6GHz	3.54 dB	(1)
Radiated Emission	6~40GHz	5.38 dB	(1)
Conducted Disturbance	0.15~30MHz	2.66 dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

4. General Information

4.1. General Description of EUT

Product Name:	Portable luminaires
Model No.:	T1001
Series model:	F1013, F1014, F1015, F1016, F1017, F1018, F1019, F1053, F1054, F1055, F1060, F1061, T1005, T1006, T1012, T1013, T1014, T1015, D1005, D1006, D1007
Test sample(s) ID:	HTT202304169-1(Engineer sample) HTT202304169-2(Normal sample)
Operation frequency	2412~2462 MHz
Channel numbers:	802.11b/802.11g /802.11n(HT20): 11 802.11n(HT40):7
Channel separation:	5MHz
Modulation technology:	802.11b: Direct Sequence Spread Spectrum (DSSS) 802.11g/802.11n(H20)/802.11n(HT40): Orthogonal Frequency Division Multiplexing (OFDM)
Antenna Type:	PCB Antenna
Antenna gain:	2.21 dBi
Power supply:	DC 5.0V

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	Frequency (MHz)	
	802.11b/802.11g/802.11n(HT20)	802.11n(HT40)
Lowest channel	2412MHz	2422MHz
Middle channel	2437MHz	2437MHz
Highest channel	2462MHz	2452MHz

4.2. Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
Remark: During the test, the dutycycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Pre-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

Mode	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)
Data rate	1Mbps	6Mbps	6.5Mbps	13Mbps

4.3. Description of Support Units

None.

4.4. Deviation from Standards

None.

4.5. Abnormalities from Standard Conditions

None.

4.6. Test Facility

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

FCC-Registration No.: 779513 Designation Number: CN1319
Shenzhen HTT Technology Co.,Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.
A2LA-Lab Cert. No.: 6435.01
Shenzhen HTT Technology Co.,Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.
The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

4.7. Test Location

All tests were performed at:

Shenzhen HTT Technology Co.,Ltd.
1F, Building B, Huafeng International Robotics Industrial Park, Hangcheng Road,Nanchang Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
Tel: 0755-23595200
Fax: 0755-23595201

4.8. Additional Instructions

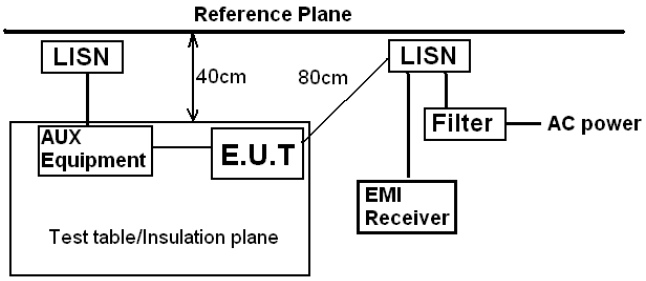
Test Software	Special AT test command provided by manufacturer to Keep the EUT in continuously transmitting mode and hopping mode
Power level setup	Default

5. Test Instruments list

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	Shenzhen C.R.T technology co., LTD	9*6*6	HTT-E028	Aug. 10 2020	Aug. 09 2024
2	Control Room	Shenzhen C.R.T technology co., LTD	4.8*3.5*3.0	HTT-E030	Aug. 10 2020	Aug. 09 2024
3	EMI Test Receiver	Rohde&Schwar	ESCI7	HTT-E022	May 23 2022	May 22 2023
4	Spectrum Analyzer	Rohde&Schwar	FSP	HTT-E037	May 23 2022	May 22 2023
5	Coaxial Cable	ZDecl	ZT26-NJ-NJ-0.6M	HTT-E018	May 23 2022	May 22 2023
6	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-2M	HTT-E019	May 23 2022	May 22 2023
7	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-0.6M	HTT-E020	May 23 2022	May 22 2023
8	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-8.5M	HTT-E021	May 23 2022	May 22 2023
9	Composite logarithmic antenna	Schwarzbeck	VULB 9168	HTT-E017	May 23 2022	May 22 2023
10	Horn Antenna	Schwarzbeck	BBHA9120D	HTT-E016	May 23 2022	May 22 2023
11	Loop Antenna	Zhinan	ZN30900C	HTT-E039	May 23 2022	May 22 2023
12	Horn Antenna	Beijing Hangwei Dayang	OBH100400	HTT-E040	May 23 2022	May 22 2023
13	low frequency Amplifier	Sonoma Instrument	310	HTT-E015	May 23 2022	May 22 2023
14	high-frequency Amplifier	HP	8449B	HTT-E014	May 23 2022	May 22 2023
15	Variable frequency power supply	Shenzhen Anbiao Instrument Co., Ltd	ANB-10VA	HTT-082	May 23 2022	May 22 2023
16	EMI Test Receiver	Rohde & Schwarz	ESCS30	HTT-E004	May 23 2022	May 22 2023
17	Artificial Mains	Rohde & Schwarz	ESH3-Z5	HTT-E006	May 23 2022	May 22 2023
18	Artificial Mains	Rohde & Schwarz	ENV-216	HTT-E038	May 23 2022	May 22 2023
19	Cable Line	Robinson	Z302S-NJ-BNCJ-1.5M	HTT-E001	May 23 2022	May 22 2023
20	Attenuator	Robinson	6810.17A	HTT-E007	May 23 2022	May 22 2023
21	Variable frequency power supply	Shenzhen Yanghong Electric Co., Ltd	YF-650（5KVA）	HTT-E032	May 23 2022	May 22 2023
22	Control Room	Shenzhen C.R.T technology co., LTD	8*4*3.5	HTT-E029	May 23 2022	May 22 2023
23	DC power supply	Agilent	E3632A	HTT-E023	May 23 2022	May 22 2023
24	EMI Test Receiver	Agilent	N9020A	HTT-E024	May 23 2022	May 22 2023
25	Analog signal generator	Agilent	N5181A	HTT-E025	May 23 2022	May 22 2023
26	Vector signal generator	Agilent	N5182A	HTT-E026	May 23 2022	May 22 2023
27	Power sensor	Keysight	U2021XA	HTT-E027	May 23 2022	May 22 2023
28	Temperature and humidity meter	Shenzhen Anbiao Instrument Co., Ltd	TH10R	HTT-074	May 23 2022	May 22 2023
29	Radiated Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
30	Conducted Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
31	RF Test Software	panshanrf	TST	N/A	N/A	N/A

6. Test results and Measurement Data

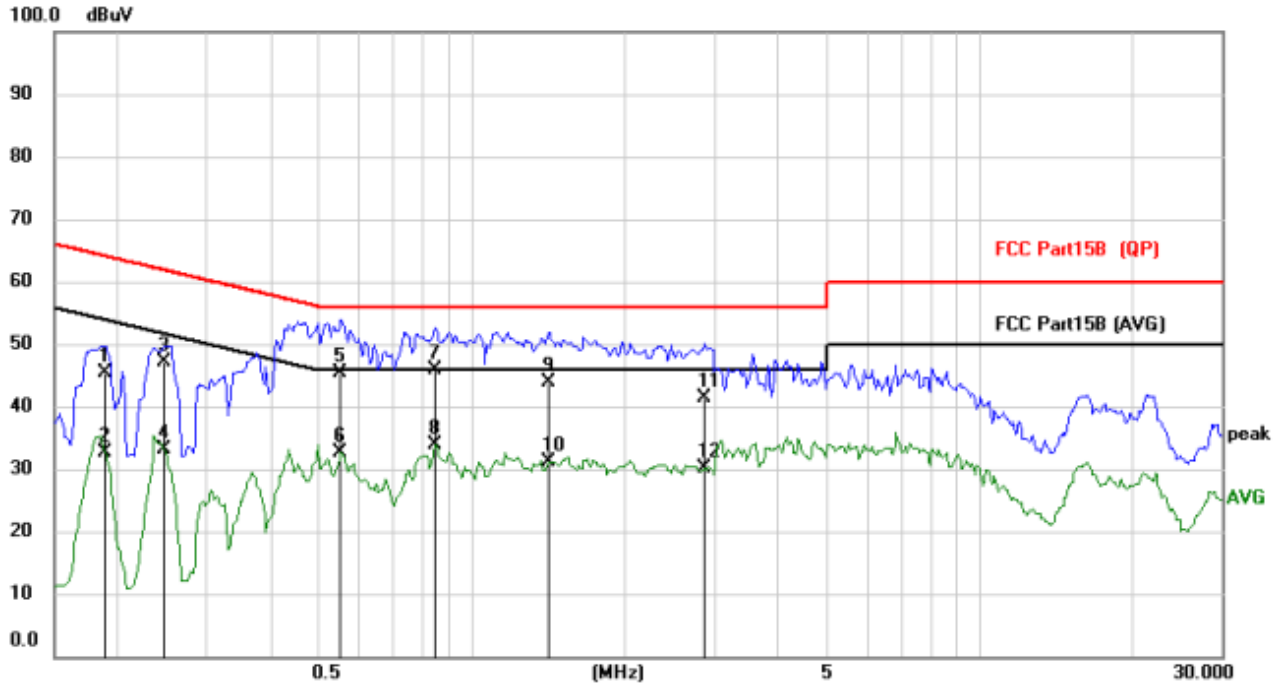
6.1. Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	Frequency range (MHz) / Limit (dBuV): Quasi-peak / Average 0.15-0.5: 66 to 56* / 56 to 46* 0.5-5: 56 / 46 5-30: 60 / 50 * Decreases with the logarithm of the frequency.
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test environment:	Temp.: 25 °C / Humid.: 52% / Press.: 1012mbar
Test voltage:	AC 120V, 60Hz
Test results:	Pass

Remark: Both high and low voltages have been tested to show only the worst low voltage test data.

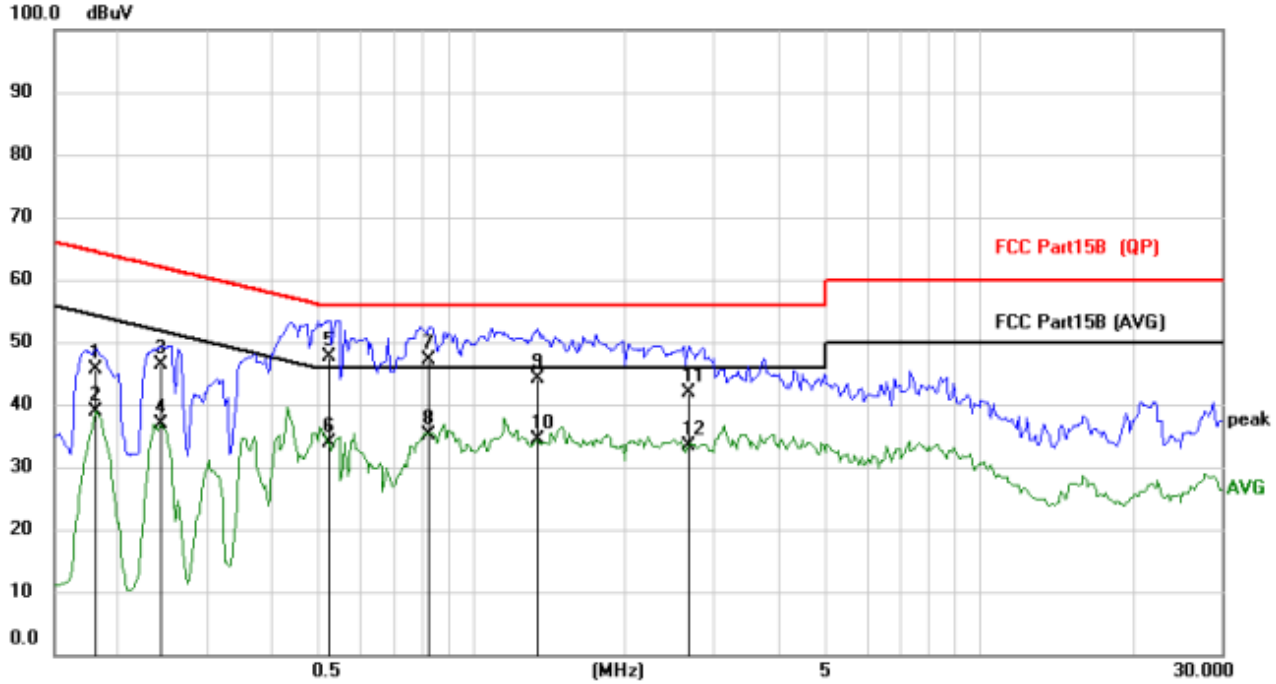
Measurement data:

Line:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1890	34.94	10.39	45.33	64.08	-18.75	QP
2		0.1890	22.25	10.39	32.64	54.08	-21.44	AVG
3		0.2475	36.81	10.40	47.21	61.84	-14.63	QP
4		0.2475	22.74	10.40	33.14	51.84	-18.70	AVG
5		0.5517	34.97	10.52	45.49	56.00	-10.51	QP
6		0.5517	22.12	10.52	32.64	46.00	-13.36	AVG
7	*	0.8481	35.10	10.82	45.92	56.00	-10.08	QP
8		0.8481	22.96	10.82	33.78	46.00	-12.22	AVG
9		1.4175	32.89	10.87	43.76	56.00	-12.24	QP
10		1.4175	20.18	10.87	31.05	46.00	-14.95	AVG
11		2.8761	30.56	10.84	41.40	56.00	-14.60	QP
12		2.8761	19.30	10.84	30.14	46.00	-15.86	AVG

Neutral:

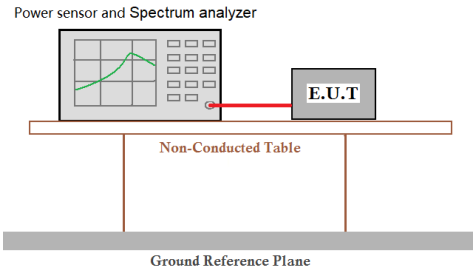


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1812	35.32	10.23	45.55	64.43	-18.88	QP
2		0.1812	28.63	10.23	38.86	54.43	-15.57	AVG
3		0.2436	36.11	10.22	46.33	61.97	-15.64	QP
4		0.2436	26.62	10.22	36.84	51.97	-15.13	AVG
5	*	0.5205	37.22	10.38	47.60	56.00	-8.40	QP
6		0.5205	23.62	10.38	34.00	46.00	-12.00	AVG
7		0.8208	36.41	10.71	47.12	56.00	-8.88	QP
8		0.8208	24.43	10.71	35.14	46.00	-10.86	AVG
9		1.3473	33.30	10.81	44.11	56.00	-11.89	QP
10		1.3473	23.52	10.81	34.33	46.00	-11.67	AVG
11		2.6655	31.13	10.84	41.97	56.00	-14.03	QP
12		2.6655	22.56	10.84	33.40	46.00	-12.60	AVG

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Los

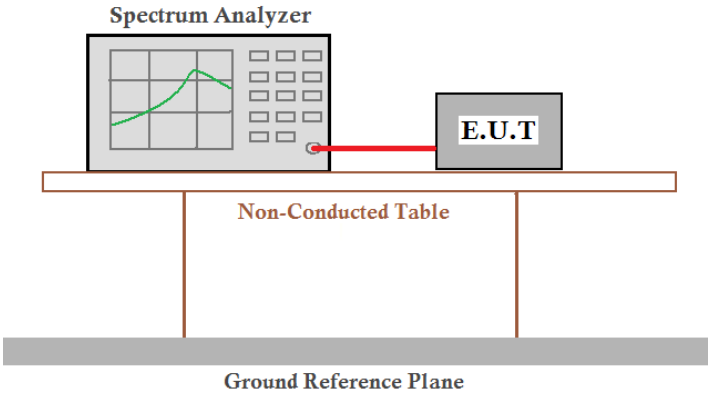
6.2. Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)					
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02					
Limit:	30dBm					
Test setup:						
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test results:	Pass					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

Measurement Data

Test CH	Peak Output Power (dBm)				Limit(dBm)	Result
	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)		
Lowest	8.98	11.31	11.34	10.92	30.00	Pass
Middle	8.03	11.61	11.64	11.24		
Highest	7.37	11.03	11.07	11.23		

6.3. Channel Bandwidth

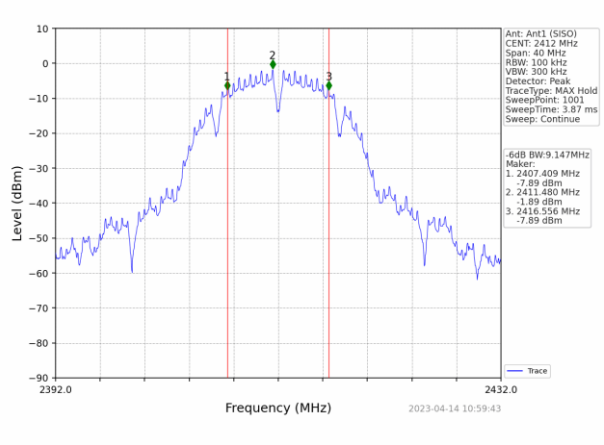
Test Requirement:	FCC Part15 C Section 15.247 (a)(2)					
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02					
Limit:	>500KHz					
Test setup:						
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test results:	Pass					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

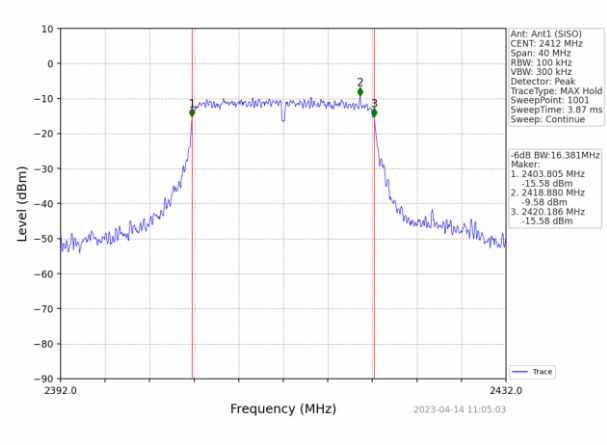
Measurement Data

Test CH	Channel Bandwidth (MHz)				Limit(KHz)	Result
	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)		
Lowest	9.147	16.381	16.966	31.990	>500	Pass
Middle	9.152	16.363	16.928	31.655		
Highest	9.152	16.375	16.903	31.662		

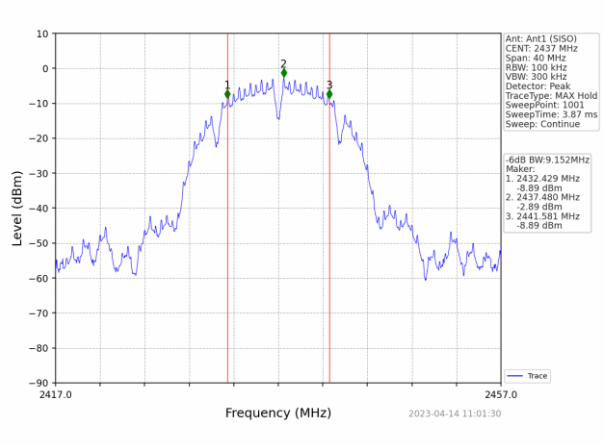
Test plot as follows:

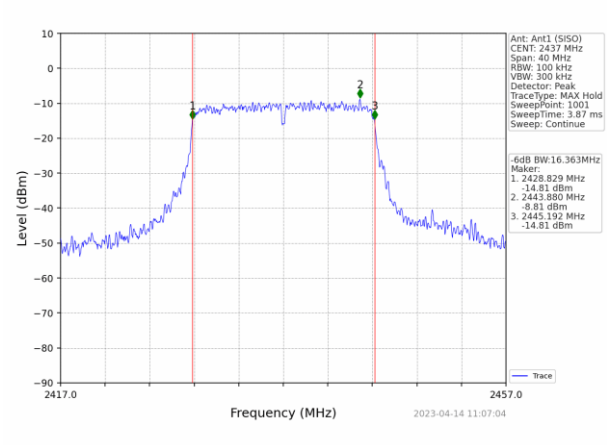
802.11b		802.11g	



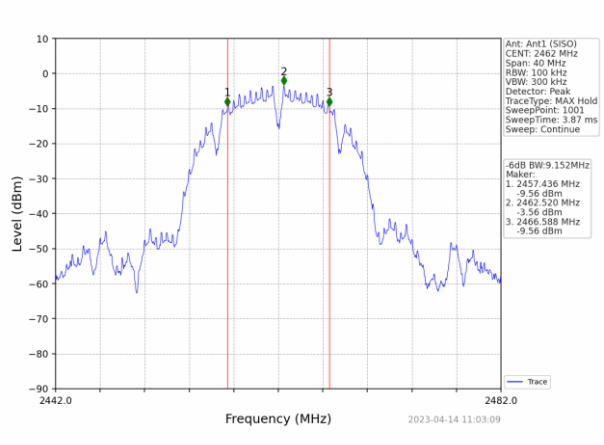


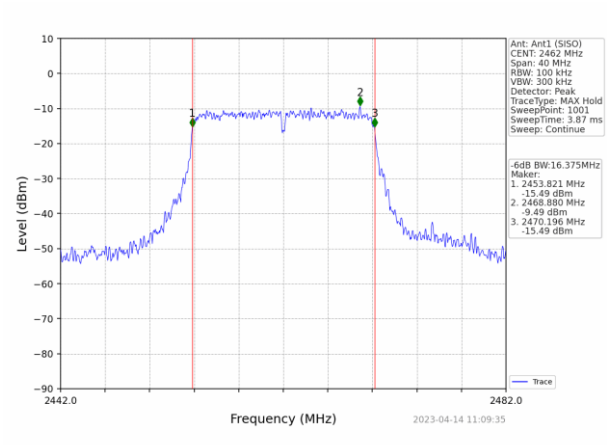
Lowest channel





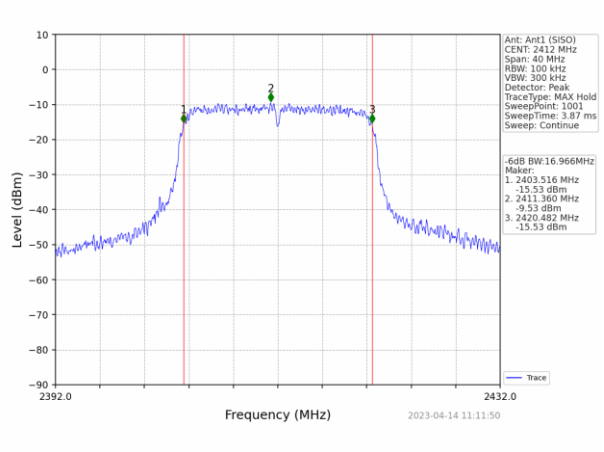
Middle channel

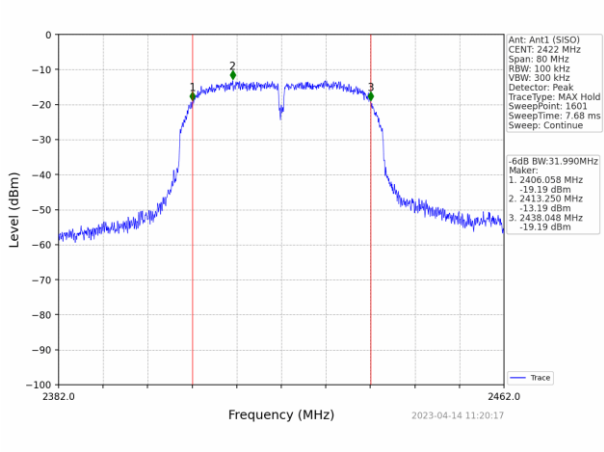




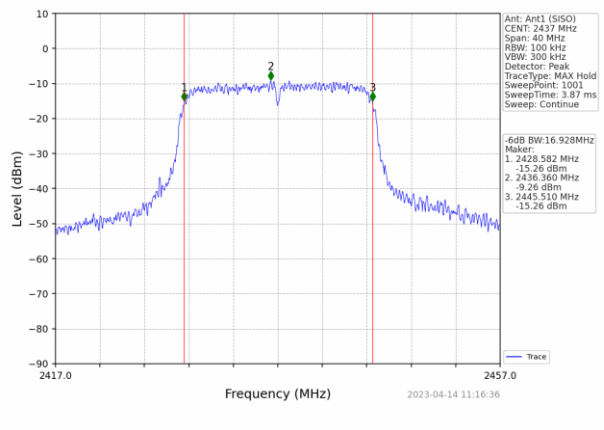
Highest channel

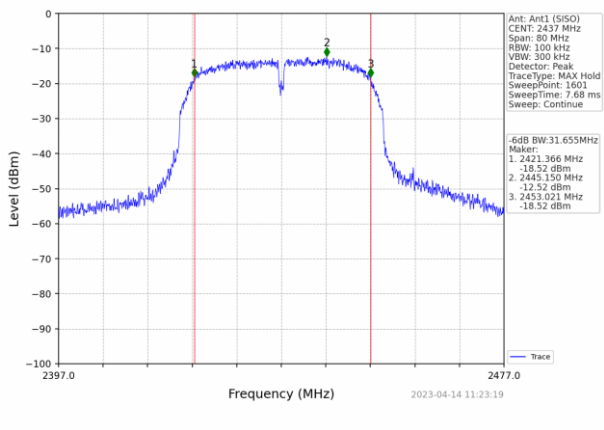
802.11n(HT20)		802.11n(HT40)	



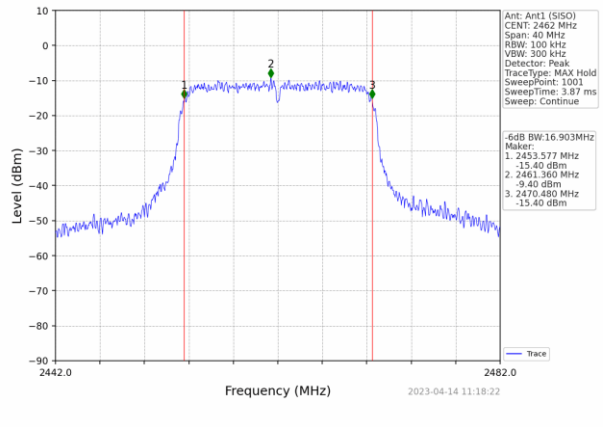


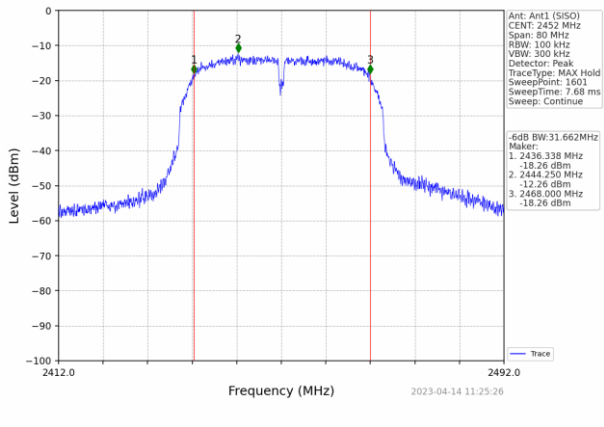
Lowest channel





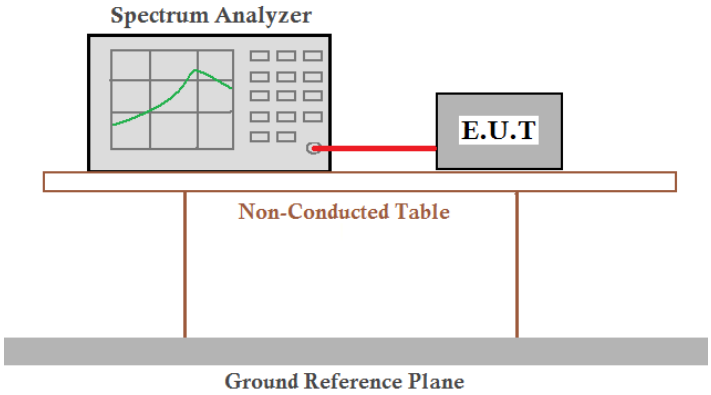
Middle channel





Highest channel

6.4. Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e)					
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02					
Limit:	8dBm/3kHz					
Test setup:						
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test results:	Pass					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

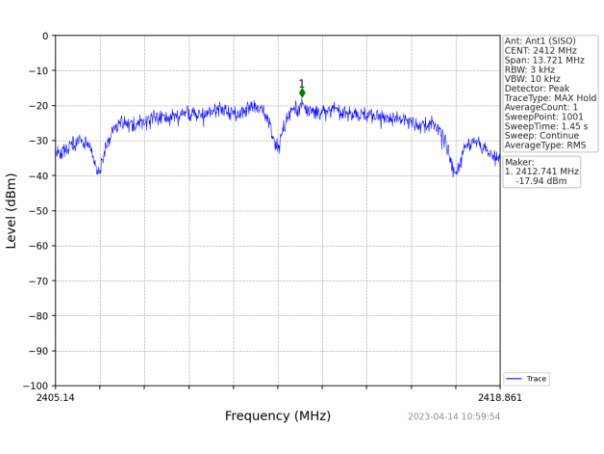
Measurement Data

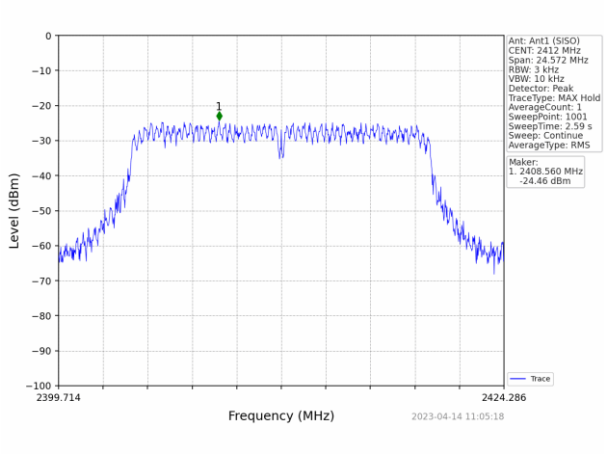
Test CH	Power Spectral Density (dBm/3kHz)				Limit (dBm/3kHz)	Result
	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)		
Lowest	-17.94	-24.46	-24.14	-25.42	8.00	Pass
Middle	-18.74	-24.21	-24.08	-24.53		
Highest	-19.86	-24.89	-24.47	-25.56		

Remark: We have tested all mode at high, middle and low channel, and recorded worst case at middle

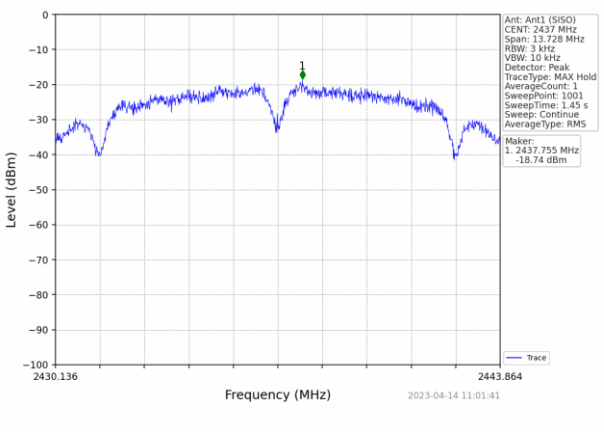
Test plot as follows:

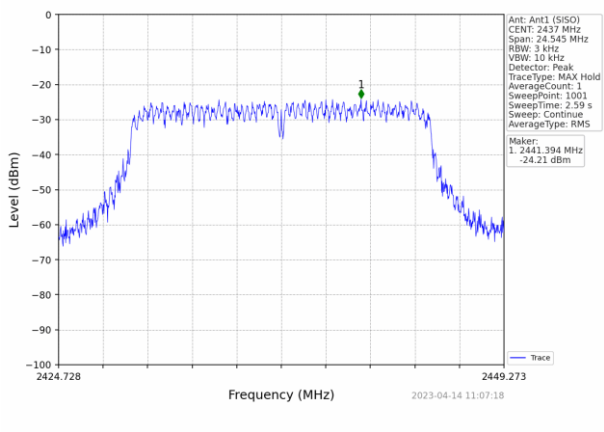
802.11b		802.11b	



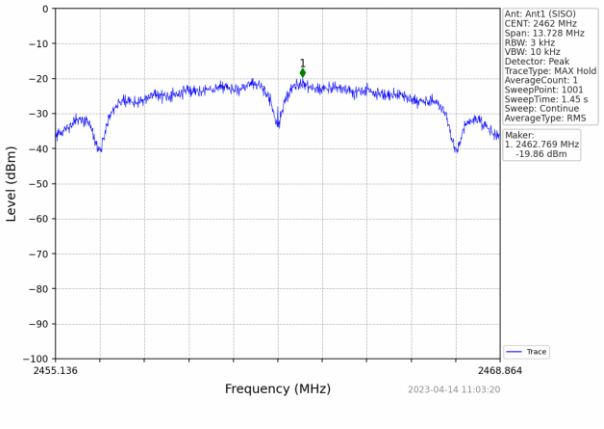


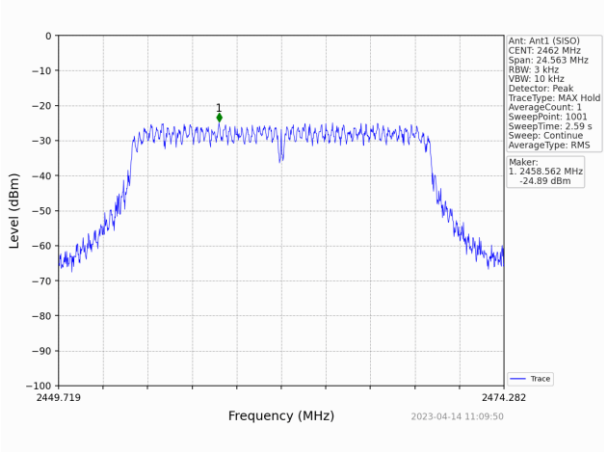
Lowest channel





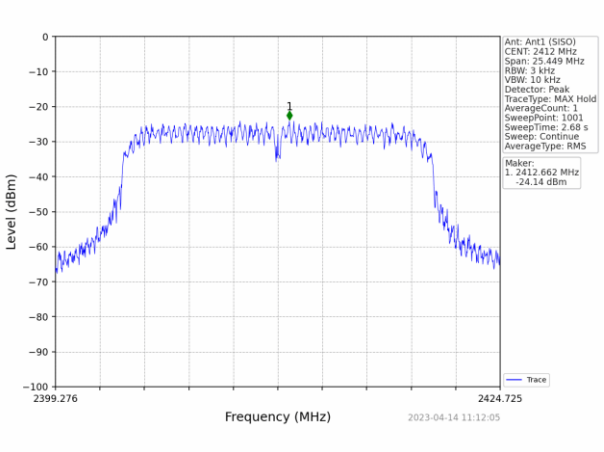
Middle channel

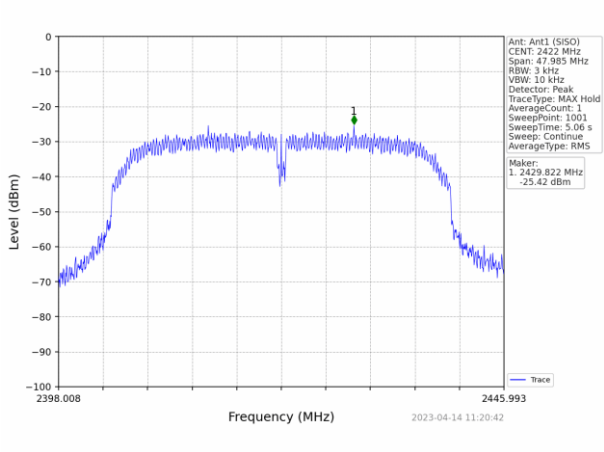




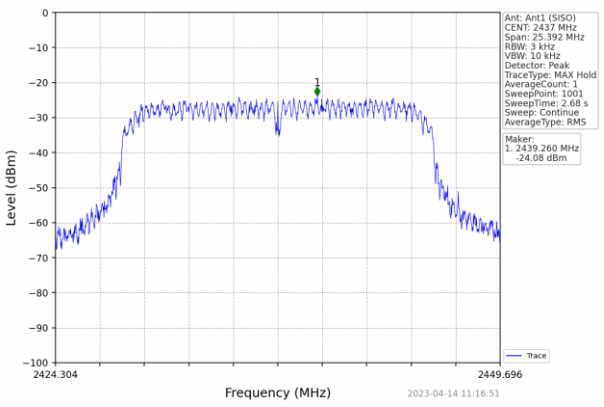
Highest channel

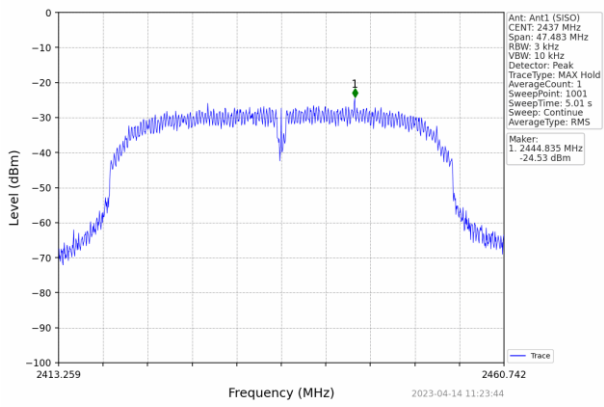
802.11n(HT20)		802.11n(HT40)	



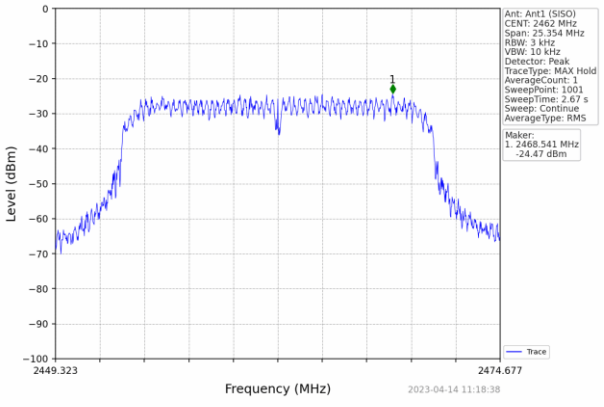


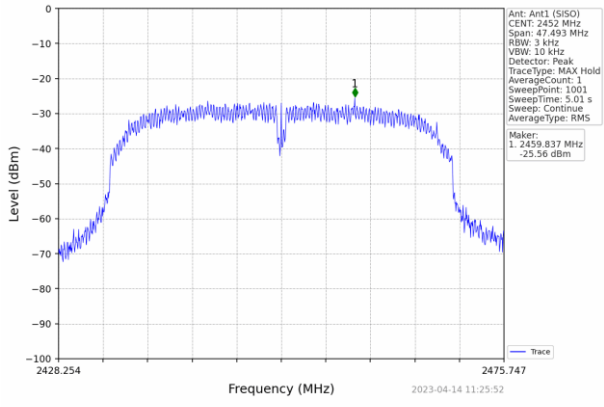
Lowest channel





Middle channel

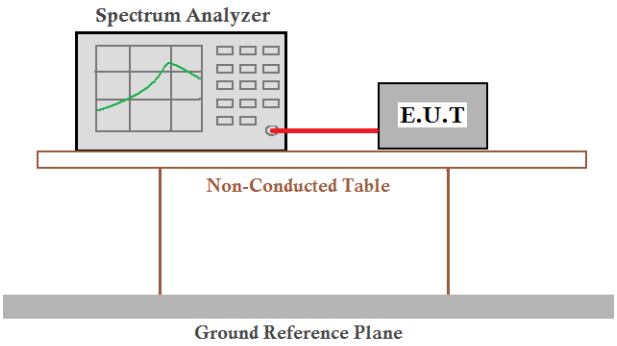




Highest channel

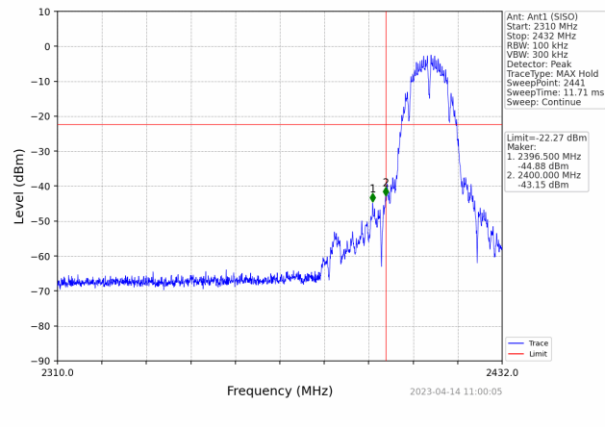
6.5. Band Edge

6.5.1. Conducted Emission Method

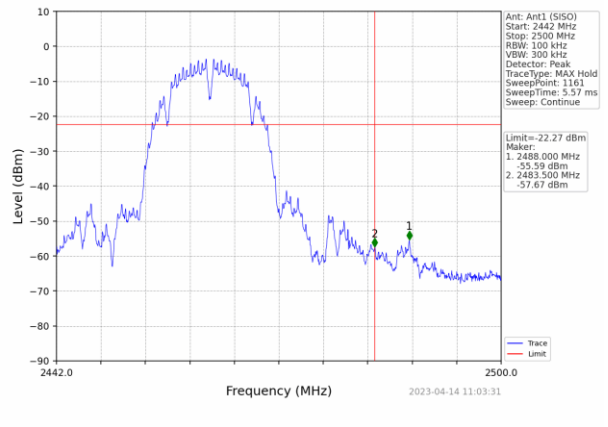
Test Requirement:	FCC Part15 C Section 15.247 (d)					
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02					
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.					
Test setup:						
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test results:	Pass					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

Test plot as follows:

Test mode:	802.11b

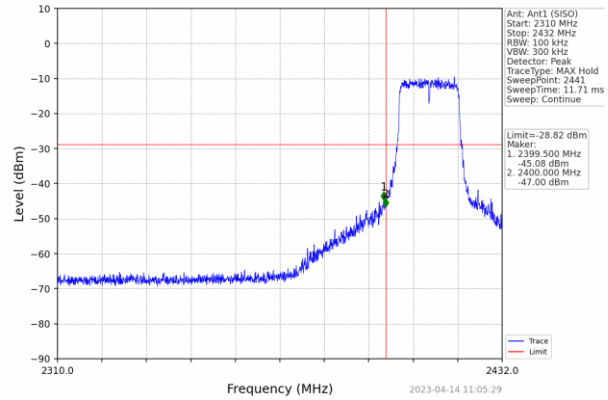


Lowest channel

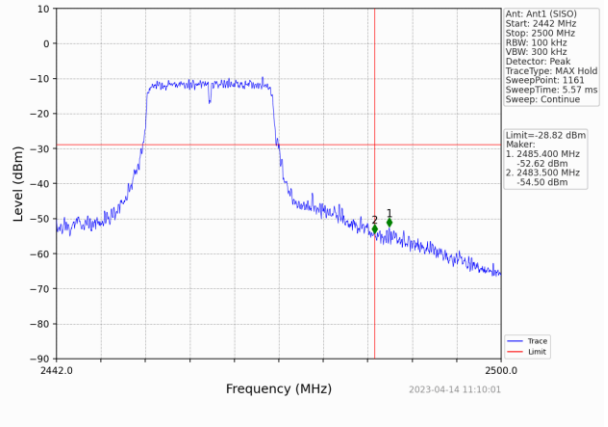


Highest channel

Test mode:	802.11g

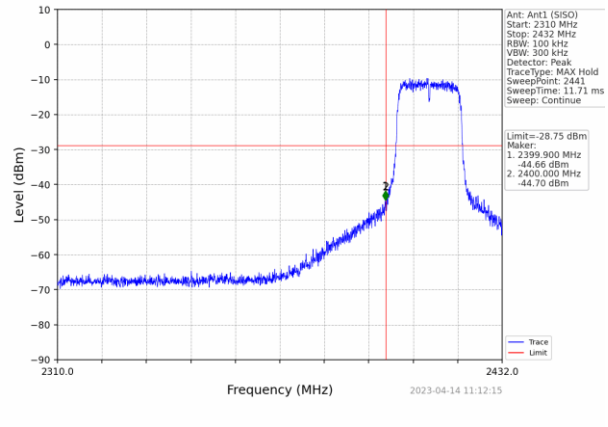


Lowest channel

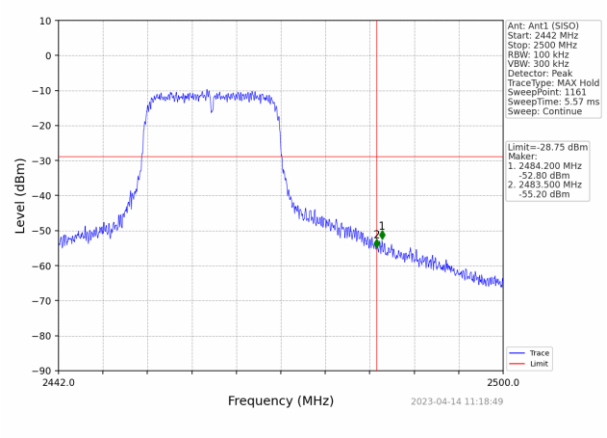


Highest channel

Test mode:	802.11n(HT20)

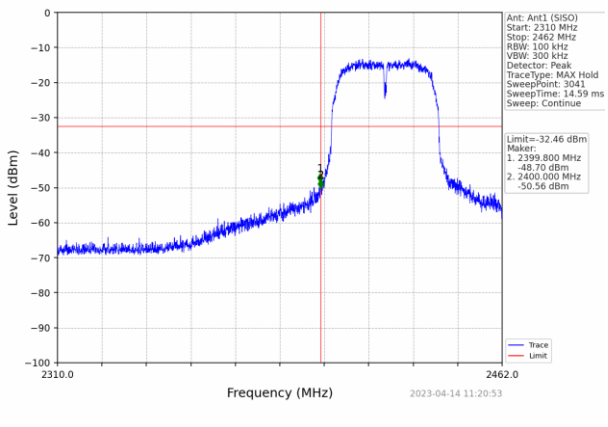


Lowest channel

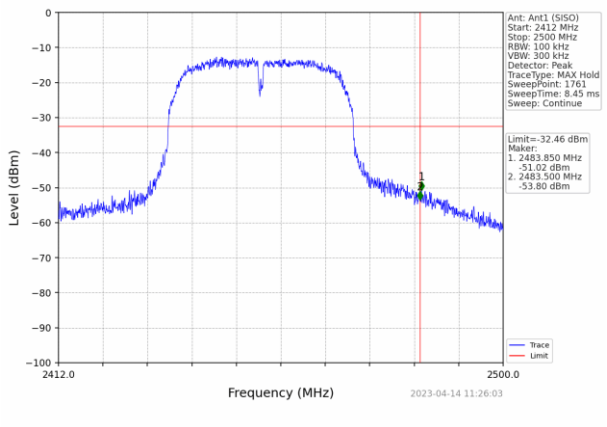


Highest channel

Test mode:	802.11n(HT40)



Lowest channel



Highest channel

6.5.2. Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.
Test site:	Measurement Distance: 3m

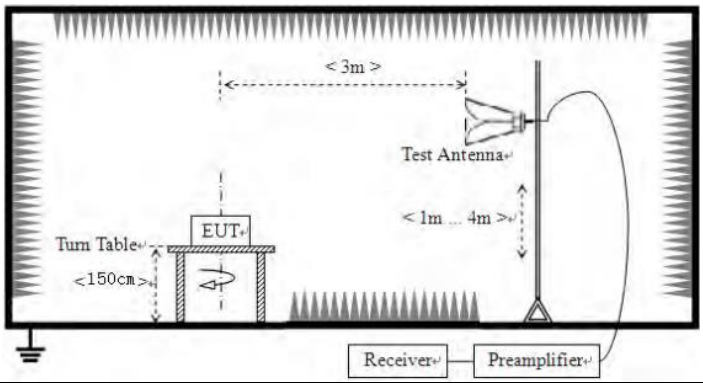
Receiver setup:

Frequency	Detector	RBW	VBW	Remark
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
Above 1GHz	54.00	Average Value
	74.00	Peak Value

Test setup:



Test Procedure:

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test results:	Pass					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

Measurement Data

Remark: During the test, pre-scan the 802.11b/802.11g/802.11n (H20)/802.11n (H40) modulation, and found the 802.11b modulation which it is worse case.

Test mode:	802.11b	Test channel:	Lowest

Horizontal (Worst case)

Frequency	Meter Reading	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	61.52	26.20	5.72	33.30	60.14	74.00	-13.86	peak
2390	45.30	26.20	5.72	33.30	43.92	54.00	-10.08	AVG

Vertical:

Frequency	Meter Reading	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	60.53	26.20	5.72	33.30	59.15	74.00	-14.85	peak
2390	45.68	26.20	5.72	33.30	44.30	54.00	-9.70	AVG

Test mode:	802.11b	Test channel:	Highest

Horizontal (Worst case)

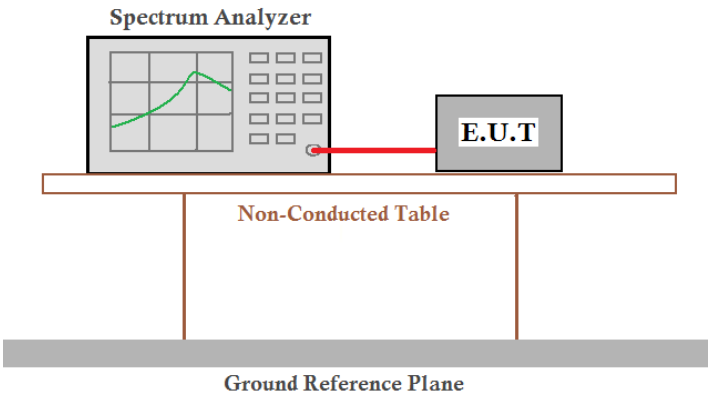
Frequency	Meter Reading	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	57.48	28.60	6.97	32.70	60.35	74.00	-13.65	peak
2483.5	43.55	28.60	6.97	32.70	46.42	54.00	-7.58	AVG

Vertical:

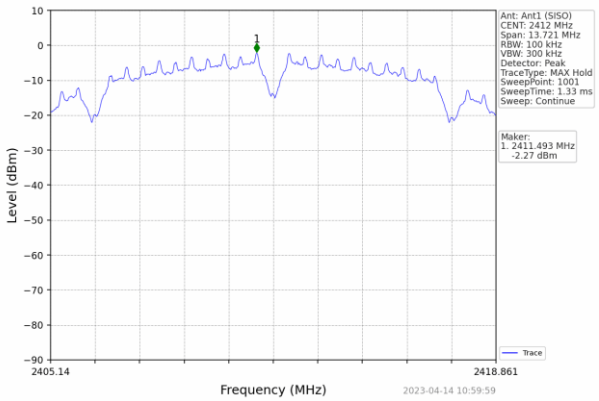
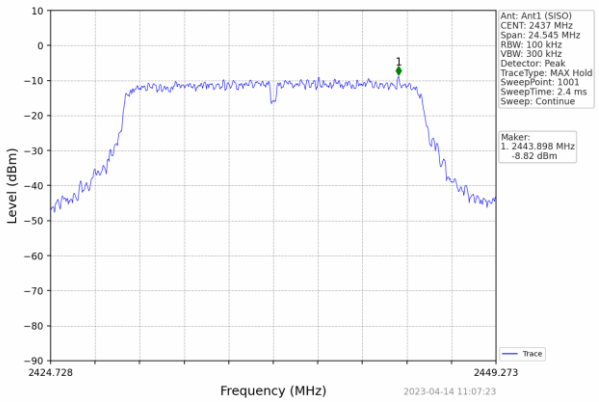
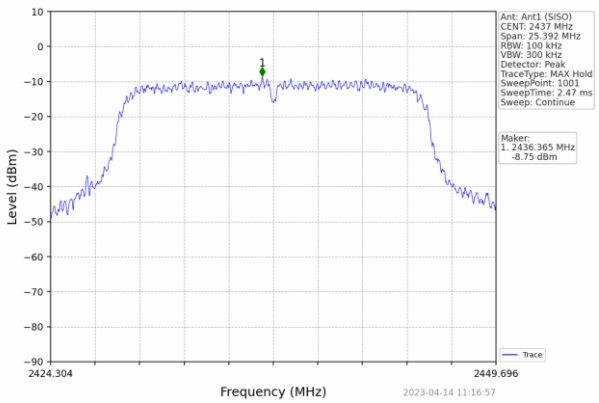
Frequency	Meter Reading	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.82	28.60	6.97	32.70	59.69	74.00	-14.31	peak
2483.5	42.69	28.60	6.97	32.70	45.56	54.00	-8.44	AVG

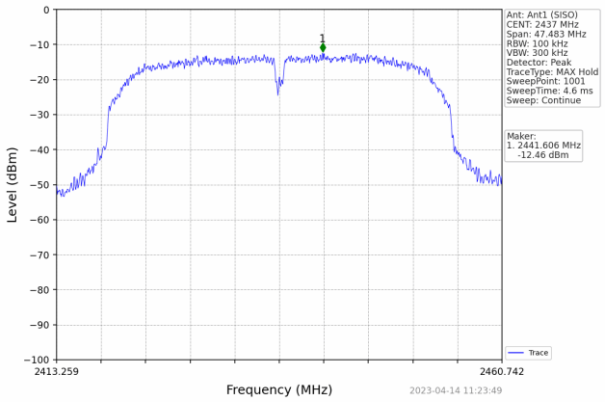
6.6. Spurious Emission

6.6.1. Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)					
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02					
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.					
Test setup:						
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test results:	Pass					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

Measurement Data:

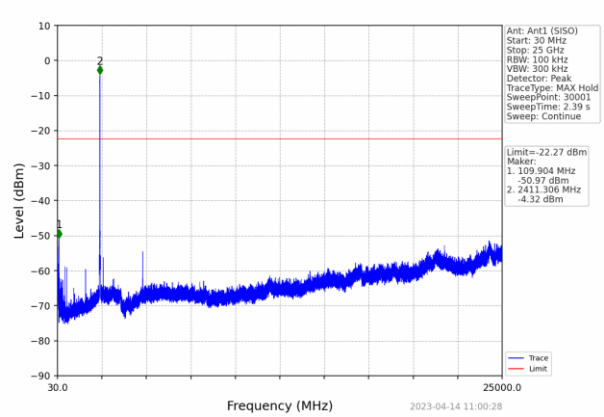
Reference

802.11b

802.11g

802.11n(HT20)

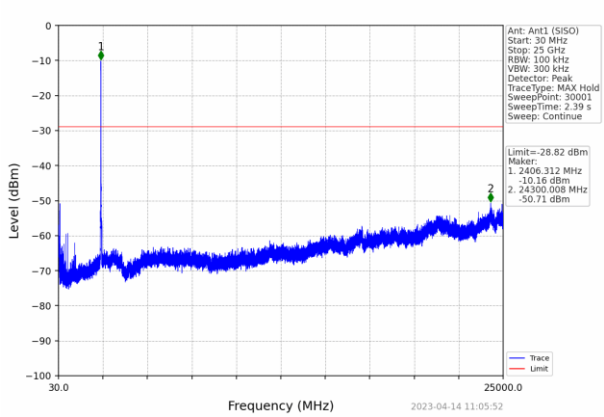

Ant: Ant1 (SISO)
CENT: 2437 MHz
Span: 47.483 MHz
RBW: 100 kHz
VBW: 300 kHz
Detector: Peak
TraceType: MAX Hold
SweepPoint: 1001
SweepTime: 4.6 ms
Sweep: Continue
Maker:
1. 2441.606 MHz
-12.46 dBm
Trace
Level (dBm)
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
2413.259
2460.742
Frequency (MHz)
2023-04-14 11:23:49

802.11n(HT40)

802.11b	802.11g

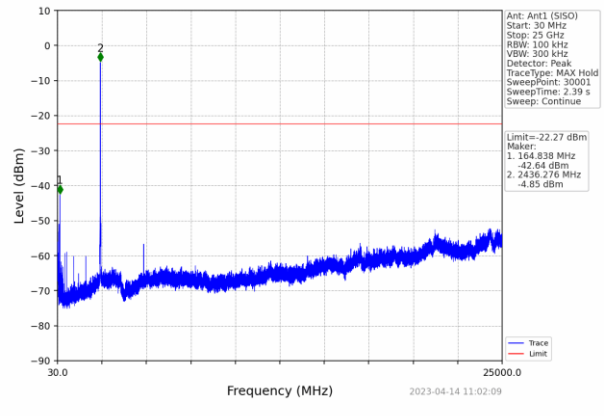
Lowest channel

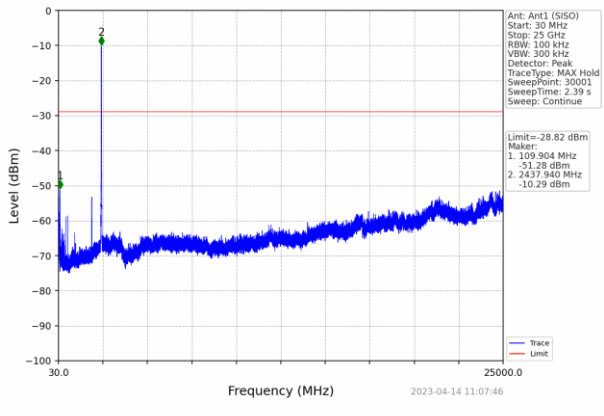




30MHz~25GHz

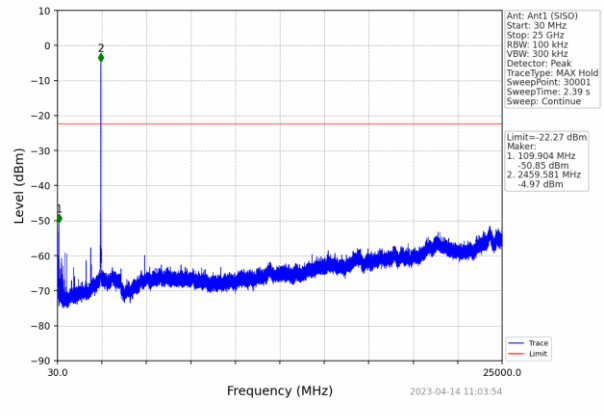
Middle channel

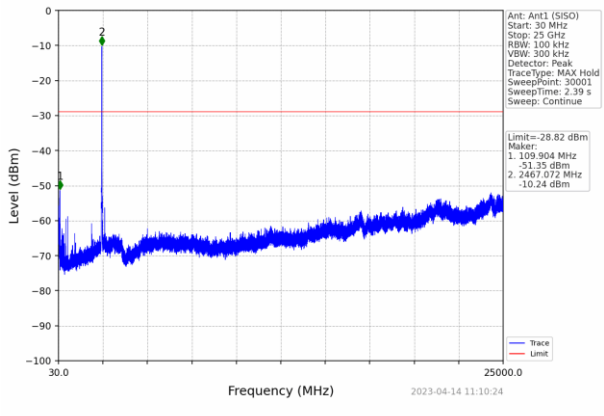




30MHz~25GHz

Highest channel

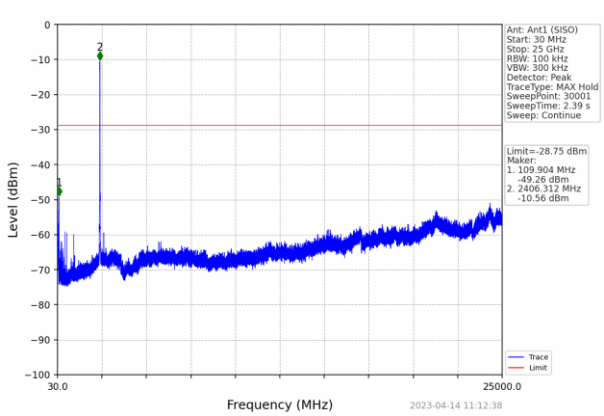


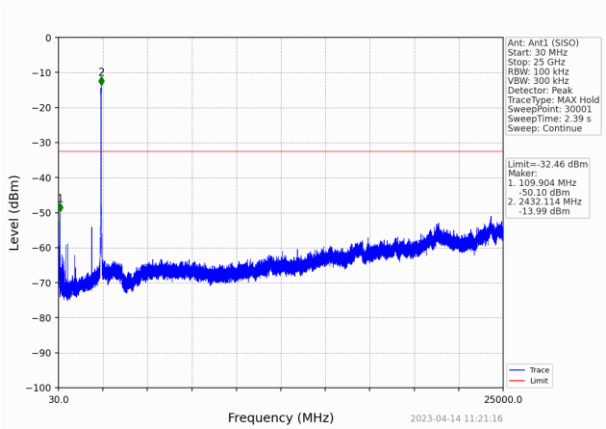


30MHz~25GHz

802.11n(HT20)	802.11n(HT40)

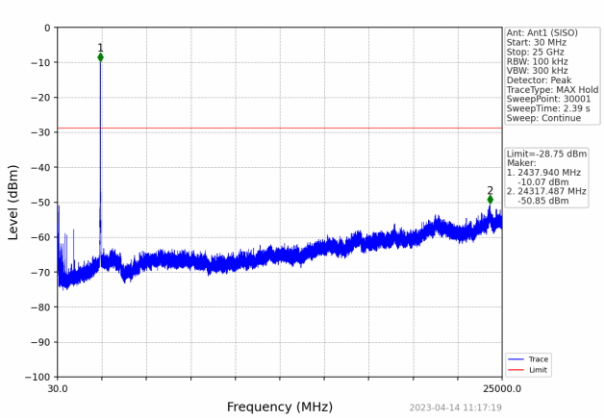
Lowest channel

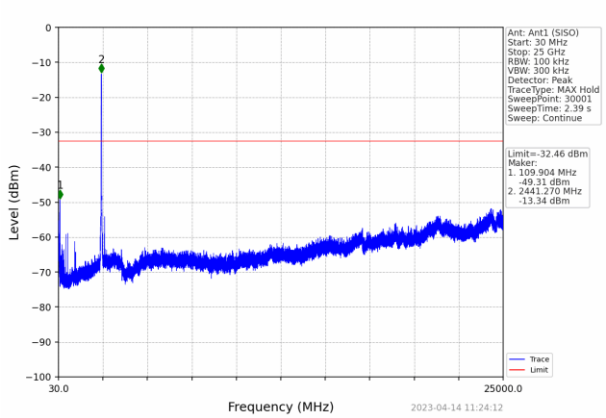




30MHz~25GHz

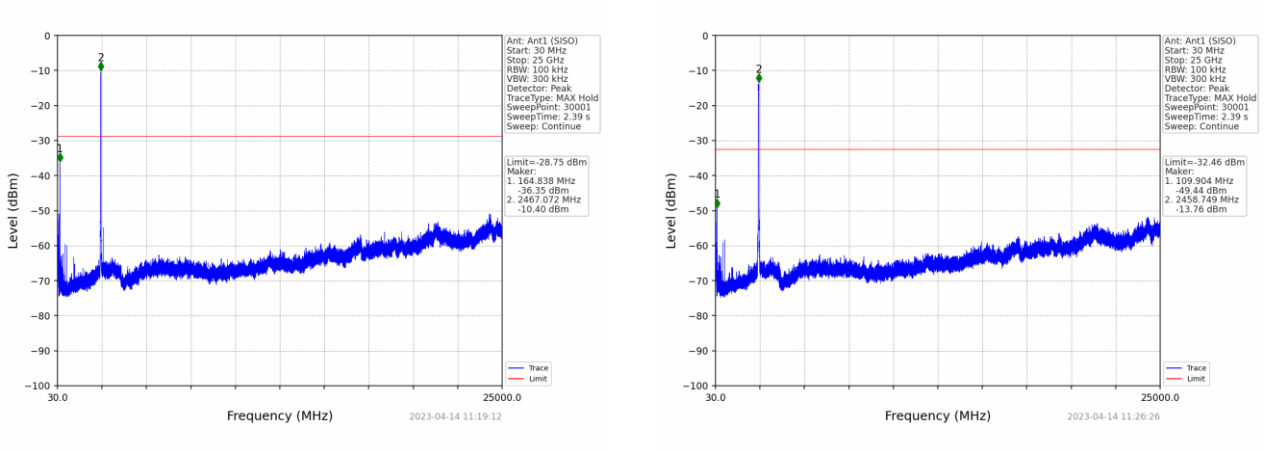
Middle channel





30MHz~25GHz

Highest channel



30MHz~25GHz

6.6.2. Radiated Emission Method

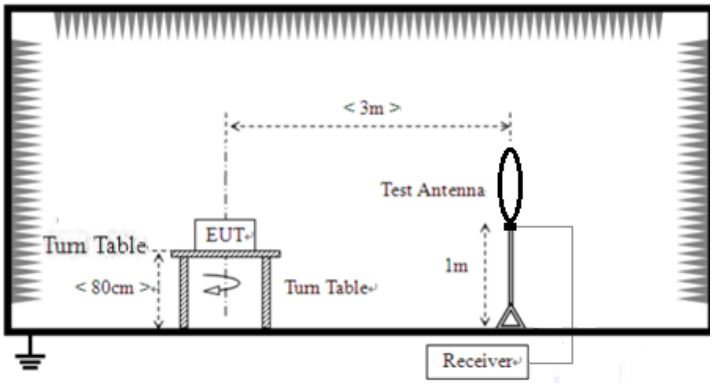
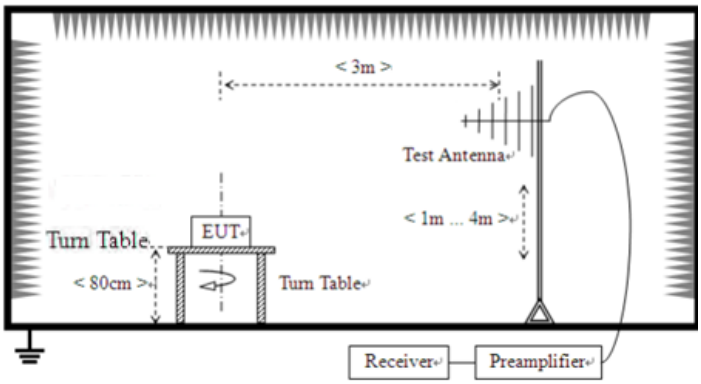
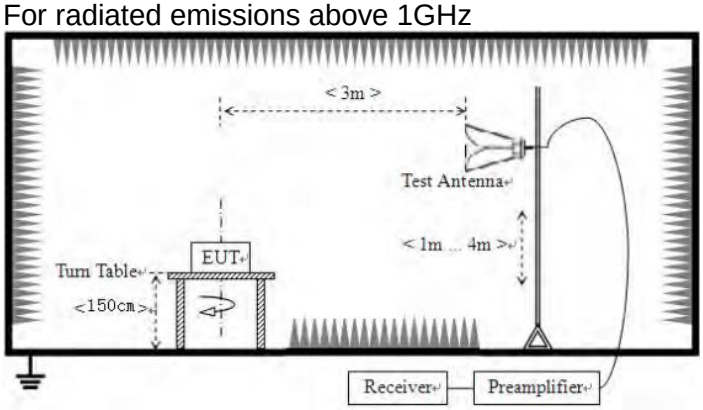
Test Requirement:	FCC Part15 C Section 15.209
Test Method:	ANSI C63.10:2013
Test Frequency Range:	9kHz to 25GHz
Test site:	Measurement Distance: 3m

Receiver setup:

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

Frequency	Limit (uV/m)	Value	Measurement Distance
0.009MHz-0.490MHz	2400/F(KHz)	QP	300m
0.490MHz-1.705MHz	24000/F(KHz)	QP	30m
1.705MHz-30MHz	30	QP	30m
30MHz-88MHz	100	QP	3m
88MHz-216MHz	150	QP	
216MHz-960MHz	200	QP	
960MHz-1GHz	500	QP	
Above 1GHz	500	Average	
	5000	Peak	

Test setup:	For radiated emissions from 9kHz to 30MHz  For radiated emissions from 30MHz to1GHz  For radiated emissions above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the

	measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Remarks:
1.Only the worst case Main Antenna test data.
2.Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

Measurement data:

■ **9kHz~30MHz**

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

■ **Below 1GHz**

Pre-scan all test modes, found worst case at 802.11b 2437MHz, and so only show the test result of 802.11b 2437MHz

Horizontal

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dB/m	dB	Detector
1	*	32.6340	46.08	-18.32	27.76	40.00	-12.24	QP
2		39.0245	45.11	-17.56	27.55	40.00	-12.45	QP
3		46.9947	44.22	-17.20	27.02	40.00	-12.98	QP
4		59.4405	44.34	-18.07	26.27	40.00	-13.73	QP
5		91.8161	44.35	-21.73	22.62	43.50	-20.88	QP
6		202.1005	39.33	-20.86	18.47	43.50	-25.03	QP

Final Level =Receiver Read level + Correct Factor

Vertical

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dB/m	dB	Detector
1	*	38.6160	53.49	-17.62	35.87	40.00	-4.13	QP
2		47.3253	50.90	-17.31	33.59	40.00	-6.41	QP
3		58.4074	50.22	-17.98	32.24	40.00	-7.76	QP
4		69.3568	52.05	-19.85	32.20	40.00	-7.80	QP
5		95.0930	58.41	-21.40	37.01	43.50	-6.49	QP
6		129.9225	51.16	-19.04	32.12	43.50	-11.38	QP

Final Level =Receiver Read level + Correct Factor

■ **Above 1-25GHz**

Note: During the test, pre-scan the 802.11b/802.11g/802.11n (H20)/802.11n (H40) modulation, and found the 802.11b modulation which it is worse case.

802.11b:Lowest

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824	51.68	31.40	8.18	31.50	59.76	74.00	-14.24	peak
4824	37.05	31.40	8.18	31.50	45.13	54.00	-8.87	AVG
7236	45.33	35.80	10.83	31.40	60.56	74.00	-13.44	peak
7236	28.74	35.80	10.83	31.40	43.97	54.00	-10.03	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824	51.36	31.40	8.18	31.50	59.44	74.00	-14.56	peak
4824	36.59	31.40	8.18	31.50	44.67	54.00	-9.33	AVG
7236	44.62	35.80	10.83	31.40	59.85	74.00	-14.15	peak
7236	28.67	35.80	10.83	31.40	43.90	54.00	-10.10	AVG
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---	---			---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

802.11b:Middle

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874	51.69	31.40	9.17	32.10	60.16	74.00	-13.84	peak
4874	36.80	31.40	9.17	32.10	45.27	54.00	-8.73	AVG
7311	43.96	35.80	10.83	31.40	59.19	74.00	-14.81	peak
7311	30.07	35.80	10.83	31.40	45.30	54.00	-8.70	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874	51.47	31.40	9.17	32.10	59.94	74.00	-14.06	peak
4874	35.45	31.40	9.17	32.10	43.92	54.00	-10.08	AVG
7311	42.88	35.80	10.83	31.40	58.11	74.00	-15.89	peak
7311	29.31	35.80	10.83	31.40	44.54	54.00	-9.46	AVG
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---	---			---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

802.11b:Highest

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924	50.12	31.40	9.17	32.10	58.59	74	-15.41	peak
4924	34.71	31.40	9.17	32.10	43.18	54	-10.82	AVG
7386	43.96	35.80	10.83	31.40	59.19	74	-14.81	peak
7386	28.68	35.80	10.83	31.40	43.91	54	-10.09	AVG
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---	---			---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924	50.35	31.40	9.17	32.10	58.82	74	-15.18	peak
4924	34.55	31.40	9.17	32.10	43.02	54	-10.98	AVG
7386	44.62	35.80	10.83	31.40	59.85	74	-14.15	peak
7386	29.78	35.80	10.83	31.40	45.01	54	-8.99	AVG
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---	---			---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

Remark：
(1) Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(2) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed.

6.7. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):

(i) 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 6dBi.

Antenna Connected Construction

The maximum gain of antenna was 2.21 dBi.

Remark:The antenna gain is provided by the customer , if the data provided by the customer is not accurate, Shenzhen HTT Technology Co.,Ltd. does not assume any responsibility.

7. Test Setup Photo

Reference to the **appendix I** for details.

8. EUT Constructional Details

Reference to the **appendix II** for details.

------End------