TEST REPORT

Applicant Name :	Thundercomm Technology Co., Ltd
Address :	Building 4, No. 99, Data Valley Middle Road, Xiantao District, Yubei District, Chongqing, China
Report Number :	SZNS211109-57647E-RF-00B
FCC ID:	2AOHHTURBOXC845SOM

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type:	Turbox-845
Model No.:	TurboX-C845-SOM
Multiple Model(s) No.:	N/A
Trade Mark:	N/A
Date Received:	2021/11/09
Date of Test:	2021/11/18~2022/01/09
Report Date:	2022/01/10

Test Result:	Pass*

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

Prepared and Checked By:

Black Ding
EMC Engineer

Approved By:

Candy Li
EMC Engineer

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Frequency Range	BLE: 2402-2480MHz Wi-Fi: 2412-2462MHz
Maximum Conducted Peak Output Power	BLE 1M: 6.51dBm, BLE 2M: 6.61dBm Wi-Fi: 16.87dBm(802.11b), 17.12dBm(802.11g) 18.9dBm(802.11n20), 18.2dBm(802.11n40)
Modulation Technique	BLE: GFSK Wi-Fi: DSSS, OFDM
Antenna Specification*	2.8dBi (provided by the applicant)
Voltage Range	DC 3.8V from I/O board
Sample serial number	SZNS211109-57647E-RF-S1 (Assigned by ATC)
Sample/EUT Status	Good condition

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF Frequency		$0.082*10^{-7}$
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Emissions, Radiated	9kHz - 30MHz	2.66dB
	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
	26.5GHz - 40GHz	4.72dB
Temperature		1℃
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISEDC), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40 mode, total 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	/	/
6	2437	/	/
7	2442	/	/

802.11b, 802.11g and 802.11n-HT20 mode was tested with Channel 1, 7 and 11.
802.11n-HT40 mode was tested with Channel 3, 7 and 9.

For BLE 1M&2M mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

EUT was tested with Channel 0, 19 and 39.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

"QRCT3.0"* software was used to test and power level as below:

Item	Mode	Data Rate	Power Level*
Wi-Fi	802.11 b	1Mbps	14
	802.11 g	6Mbps	13
	802.11 n20	MCS0	12
	802.11 n40	MCS0	12
BLE	BLE-1M	1Mbps	Default
	BLE-2M	2Mbps	Default

The worse-case data rates are determined to be as above for each mode based upon investigations by measuring the output power and PSD across all data rates, bandwidths and modulations.
For Wi-Fi function, the device supports SISO for all modes and MIMO for 802.11 n20/n40 modes, per pretest, the MIMO mode was the worst mode. And All the antenna ports have the same power level for SISO and MIMO modes.

Duty cycle

Test Result: Compliant. Please refer to the Appendix Wi-Fi and Appendix BLE.

Support Equipment List and Details

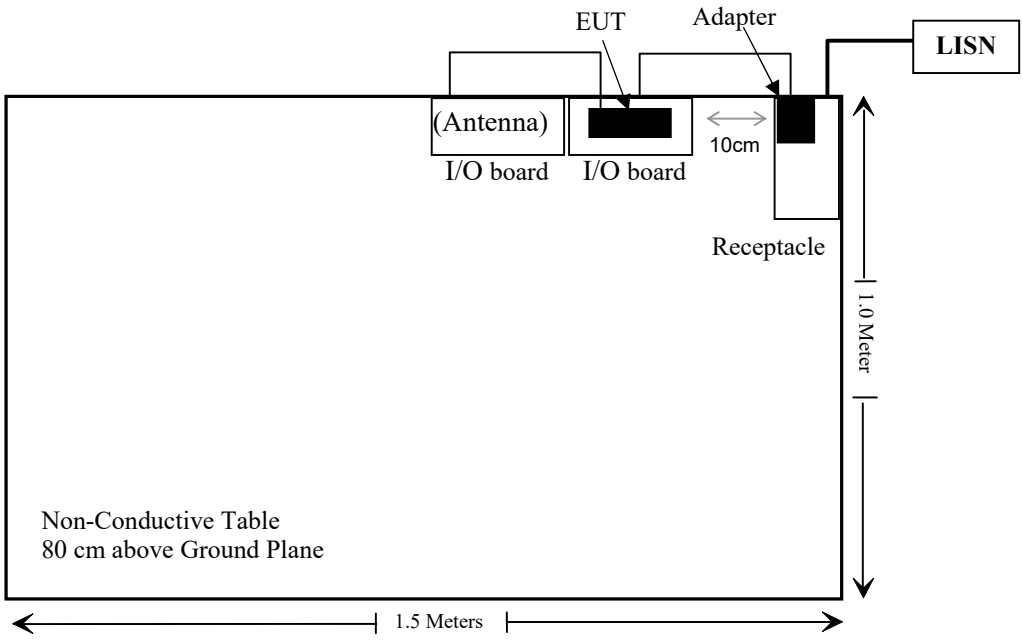
Manufacturer	Description	Model	Serial Number
Thundercomm Technology Co., Ltd	I/O board	Unknown	Unknown
SHENZHEN LIANYUNDA ELECTRONIC CO.,LTD	Adapter	LYD1202000B	E360964

External I/O Cable

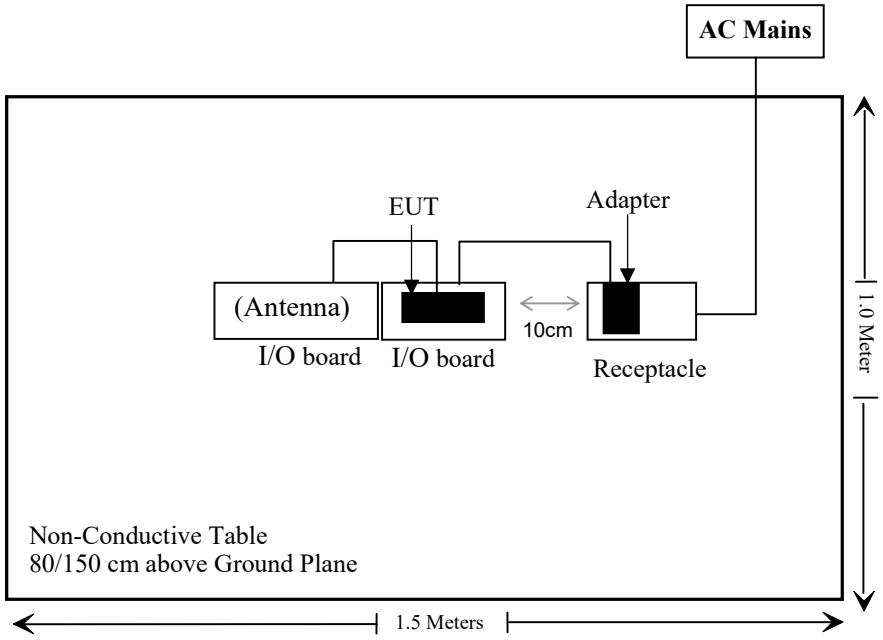
Cable Description	Length (m)	From Port	To
Un-shielded detachable DC cable	1.0	Adapter	EUT

Block Diagram of Test Setup

For conducted emission:



For Radation emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i), §2.1091	Maximum Permissible Exposure(MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth & Occupied Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde& Schwarz	EMI Test Receiver	ESCI	100784	2021/02/03	2022/02/02
R & S	L.I.S.N.	ENV216	101314	2020/12/25	2021/12/24
Anritsu Corp	50ΩCoaxial Switch	MP59B	6200506474	2020/12/25	2021/12/24
RF Coaxial Cable	N-2m	No.2	2020/12/25	2021/12/24	2021/12/24
Conducted Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test					
Rohde& Schwarz	Test Receiver	ESR	101817	2020/12/24	2021/12/23
Rohde&Schwarz	Spectrum Analyzer	FSV40	101495	2020/12/24	2021/12/23
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
A.H. Systems, inc.	Preamplifier	PAM-0118P	531	2021/11/09	2022/11/08
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/28	2021/11/27
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2020/12/25	2021/12/24
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2020/01/05	2023/01/04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Radiated Emission Test Software: e3 19821b (V9)					
Unknown	RF Coaxial Cable	N-1m	No.5	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-10m	No.7	2021/11/09	2022/11/08
Unknown	RF Coaxial Cable	N-2m	No.8	2021/11/09	2022/11/08
Wainwright	High Pass Filter	WHKX3.6/18 G-10SS	5	2020/12/25	2021/12/24

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2021/12/24	2022/12/23
Tonscend	RF Control Unit	JS0806-2	19G8060182	2021/07/06	2022/07/05

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Mode	Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	2.8	1.91	7.0	5.01	20	0.0019	1
Wi-Fi	2412-2462	2.8	1.91	19.0	79.43	20	0.0301	1

Note: 1. The tune up conducted power was declared by the applicant.
2. Bluetooth can not transmit at the same time with Wi-Fi.
3. The 2.4G Wi-Fi can not transmit at the same time with the 5G Wi-Fi.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has one PCB Antenna arrangement for BLE and two PCB antennas for Wi-Fi, which each uses a unique connector and all the antenna gain is 2.8 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

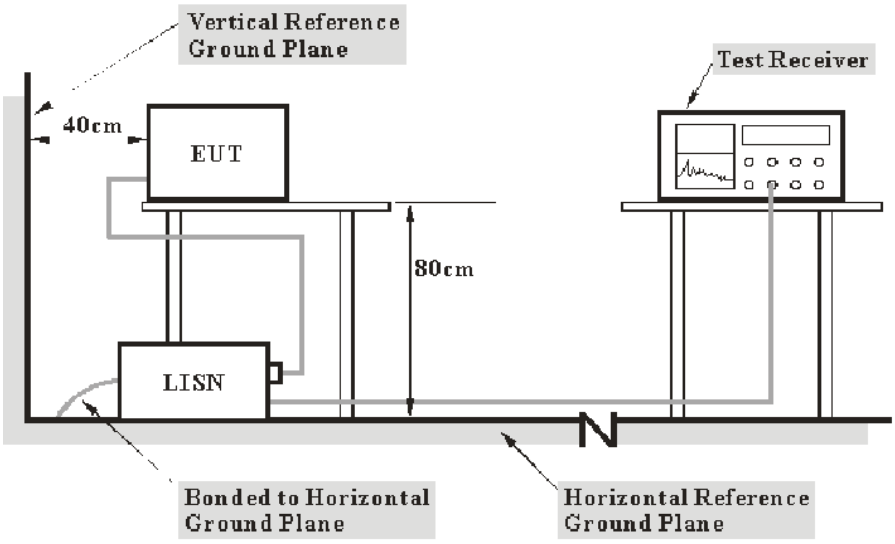
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Transd Factor & Margin Calculation

The Transd factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

Transd Factor = LISN VDF + Cable Loss

The "**Over limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over limit of -7 dB means the emission is 7 dB below the limit. The equation for calculation is as follows:

Over Limit = Level – Limit
Level = Read Level + Factor

Test Data

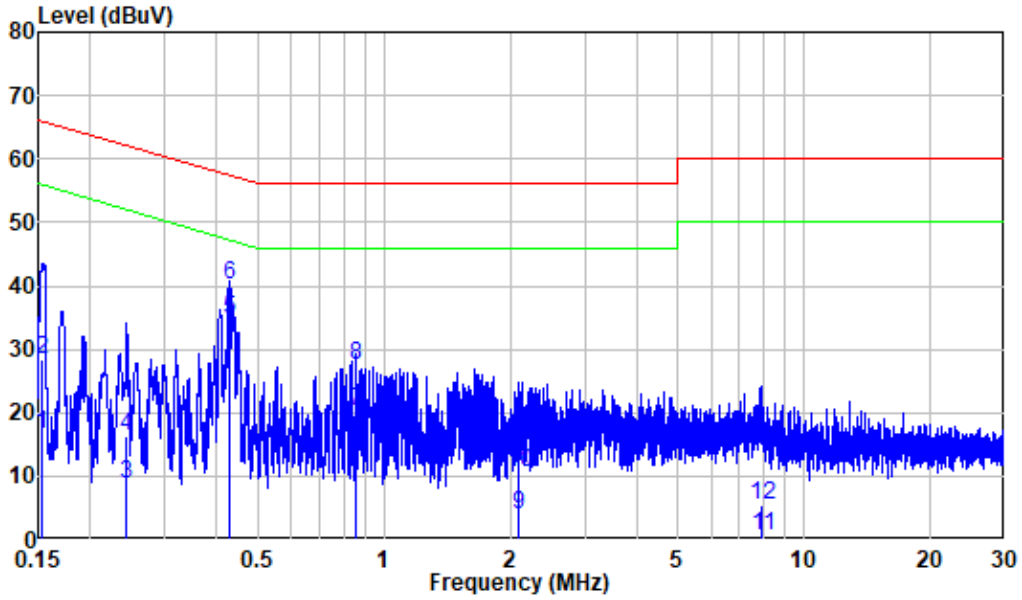
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	64 %
ATM Pressure:	101.0 kPa

The testing was performed by Bin Duan on 2021-11-25.

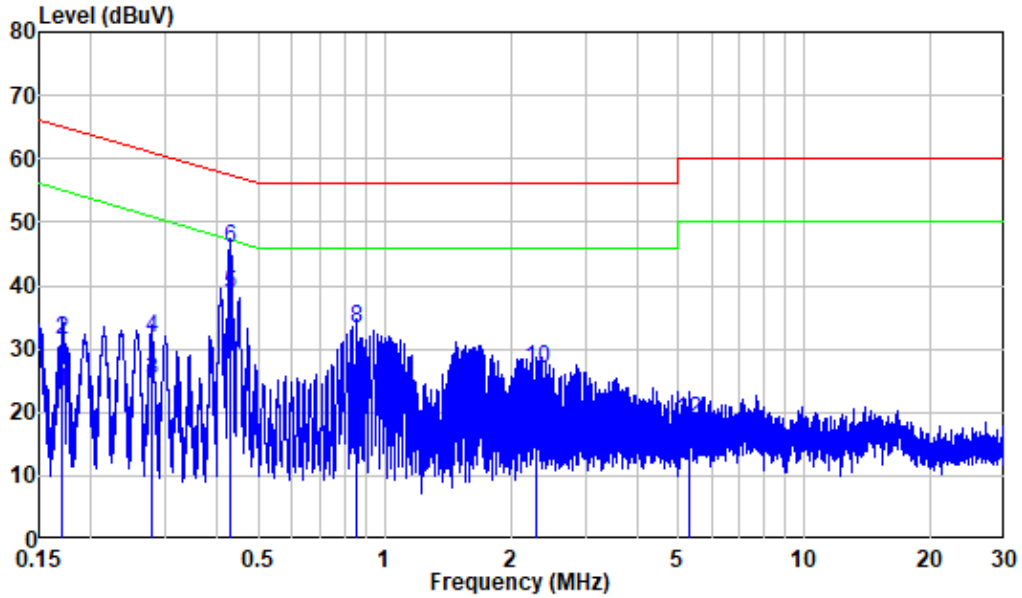
EUT operation mode: Transmitting (the worst case is 802.11G Mode, High channel)

AC 120V/60 Hz, Line



	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.154	9.89	6.85	16.74	55.79	-39.05	Average
2	0.154	9.89	18.55	28.44	65.79	-37.35	QP
3	0.243	9.80	-0.95	8.85	52.00	-43.15	Average
4	0.243	9.80	6.56	16.36	62.00	-45.64	QP
5	0.429	9.80	24.88	34.68	47.28	-12.60	Average
6	0.429	9.80	30.42	40.22	57.28	-17.06	QP
7	0.856	9.81	10.27	20.08	46.00	-25.92	Average
8	0.856	9.81	17.56	27.37	56.00	-28.63	QP
9	2.091	9.92	-6.07	3.85	46.00	-42.15	Average
10	2.091	9.92	0.68	10.60	56.00	-45.40	QP
11	7.951	10.08	-9.55	0.53	50.00	-49.47	Average
12	7.951	10.08	-4.71	5.37	60.00	-54.63	QP

AC 120V/60 Hz, Neutral



	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.170	9.94	13.21	23.15	54.95	-31.80	Average
2	0.170	9.94	21.35	31.29	64.95	-33.66	QP
3	0.278	9.96	15.09	25.05	50.87	-25.82	Average
4	0.278	9.96	21.80	31.76	60.87	-29.11	QP
5	0.428	9.92	28.87	38.79	47.29	-8.50	Average
6	0.428	9.92	36.04	45.96	57.29	-11.33	QP
7	0.857	9.91	13.89	23.80	46.00	-22.20	Average
8	0.857	9.91	23.36	33.27	56.00	-22.73	QP
9	2.289	9.94	10.22	20.16	46.00	-25.84	Average
10	2.289	9.94	17.01	26.95	56.00	-29.05	QP
11	5.287	10.05	1.59	11.64	50.00	-38.36	Average
12	5.287	10.05	8.52	18.57	60.00	-41.43	QP

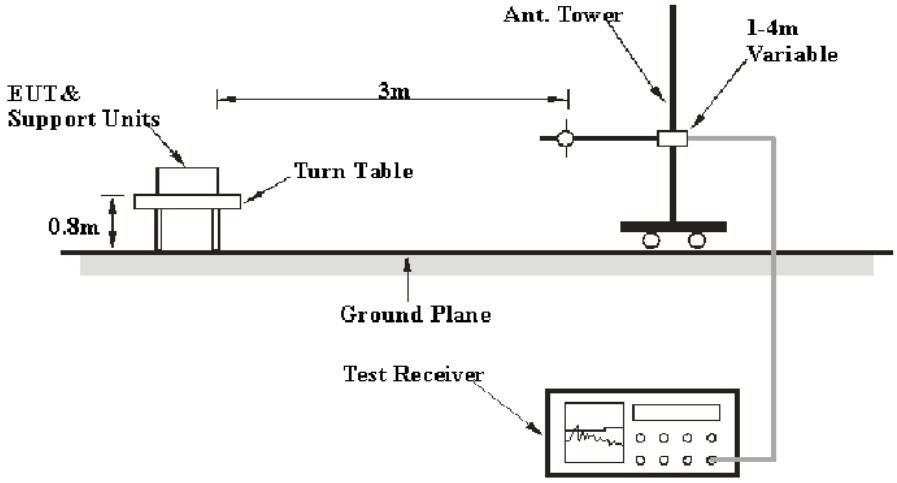
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

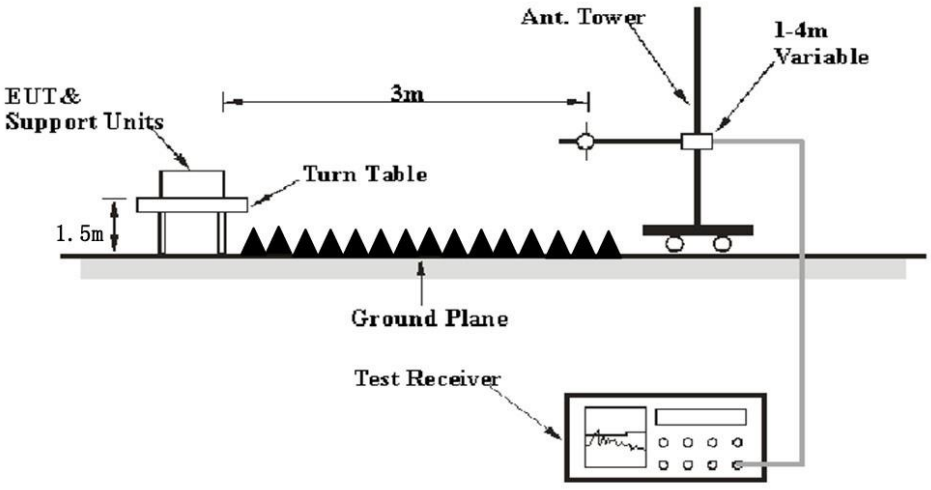
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Average
	1MHz	＞1/T Note 2	/	Average

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Factor & Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit/Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

Over Limit/Margin = Level / Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

Test Data

Environmental Conditions

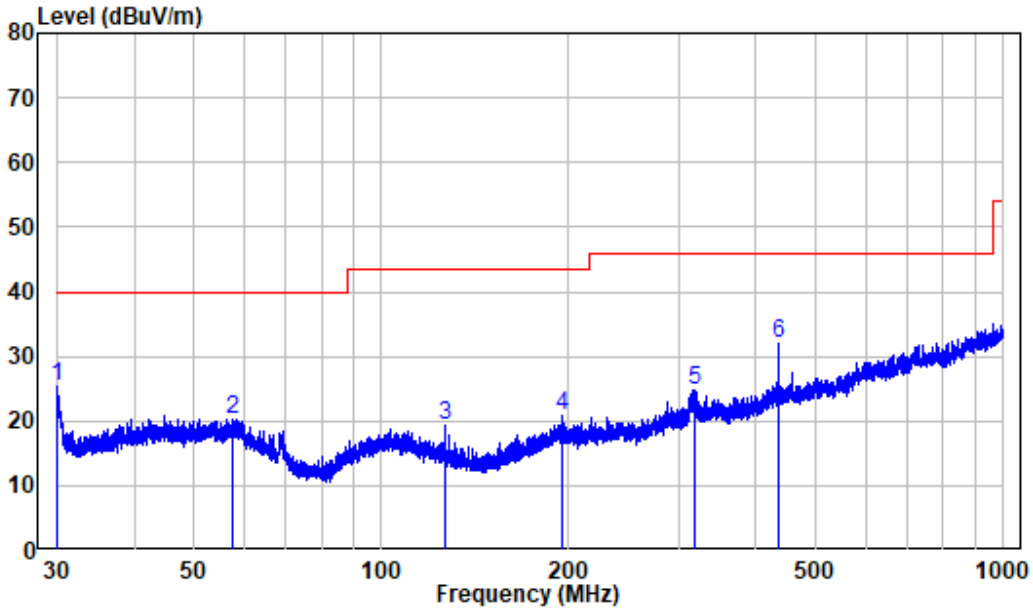
Temperature:	25 ℃
Relative Humidity:	64 %
ATM Pressure:	101.0 kPa

The testing was performed by Bin Deng on 2021-11-25 for below 1GHz and Chao Mo on 2021-11-25 for above 1GHz.

EUT operation mode: Transmitting(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

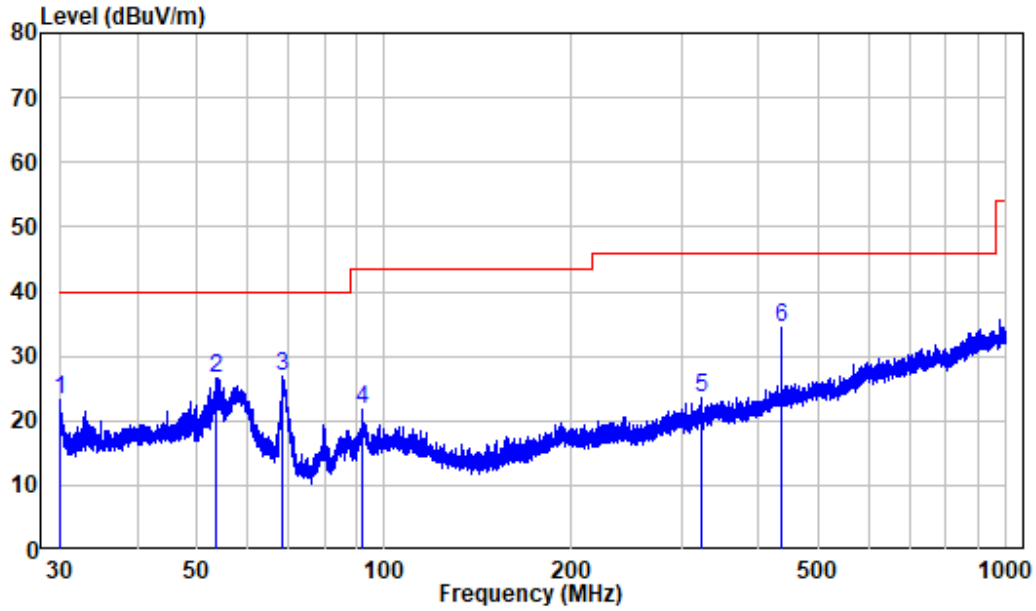
30MHz-1GHz: *(the worst case is 802.11G Mode, High channel)*

Horizontal



	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.00	-12.32	37.77	25.45	40.00	-14.55	Peak
2	57.75	-9.89	30.19	20.30	40.00	-19.70	Peak
3	126.72	-14.43	33.77	19.34	43.50	-24.16	Peak
4	194.79	-11.30	32.00	20.70	43.50	-22.80	Peak
5	319.94	-8.20	32.88	24.68	46.00	-21.32	Peak
6	434.07	-5.38	37.31	31.93	46.00	-14.07	Peak

Vertical



	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.00	-12.32	35.50	23.18	40.00	-16.82	Peak
2	53.76	-10.22	36.78	26.56	40.00	-13.44	Peak
3	68.72	-14.15	40.92	26.77	40.00	-13.23	Peak
4	92.22	-13.32	35.17	21.85	43.50	-21.65	Peak
5	323.75	-8.08	31.54	23.46	46.00	-22.54	Peak
6	434.07	-5.38	39.71	34.33	46.00	-11.67	Peak

1-25 GHz:

BLE 1M:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
	Reading (dBm)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel									
2310	67.44	PK	26	2	H	-7.24	60.20	74	-13.80
2310	54.85	Ave.	26	2	H	-7.24	47.61	54	-6.39
2390	68.44	PK	309	1.8	H	-7.22	61.22	74	-12.78
2390	55.88	Ave.	309	1.8	H	-7.22	48.66	54	-5.34
2310	67.56	PK	117	1.5	V	-7.24	60.32	74	-13.68
2310	54.87	Ave.	117	1.5	V	-7.24	47.63	54	-6.37
2390	68.63	PK	341	2.3	V	-7.22	61.41	74	-12.59
2390	55.94	Ave.	341	2.3	V	-7.22	48.72	54	-5.28
4804	54.38	PK	39	1.5	H	-3.51	50.87	74	-23.13
4804	54.55	PK	241	1.1	V	-3.51	51.04	74	-22.96
Middle Channel									
4880	55	PK	65	1.9	H	-3.38	51.62	74	-22.38
4880	55.15	PK	321	1.2	V	-3.38	51.77	74	-22.23
High Channel									
2483.5	69.51	PK	237	2.3	H	-7.2	62.31	74	-11.69
2483.5	56.59	Ave.	237	2.3	H	-7.2	49.39	54	-4.61
2500	68.95	PK	95	1.6	H	-7.18	61.77	74	-12.23
2500	56.08	Ave.	95	1.6	H	-7.18	48.9	54	-5.1
2483.5	70.01	PK	115	1.1	V	-7.2	62.81	74	-11.19
2483.5	56.78	Ave.	115	1.1	V	-7.2	49.58	54	-4.42
2500	69.17	PK	306	1.5	V	-7.18	61.99	74	-12.01
2500	56.13	Ave.	306	1.5	V	-7.18	48.95	54	-5.05
4960	54.72	PK	324	2.2	H	-3.01	51.71	74	-22.29
4960	55.18	PK	16	2	V	-3.01	52.17	74	-21.83

BLE 2M:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
	Reading (dBm)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel									
2310	67.80	PK	60	1.4	H	-7.24	60.56	74	-13.44
2310	55.15	Ave.	60	1.4	H	-7.24	47.91	54	-6.09
2390	68.57	PK	332	1.9	H	-7.22	61.35	74	-12.65
2390	56.38	Ave.	332	1.9	H	-7.22	49.16	54	-4.84
2310	67.96	PK	40	1.6	V	-7.24	60.72	74	-13.28
2310	55.22	Ave.	40	1.6	V	-7.24	47.98	54	-6.02
2390	68.84	PK	343	1.7	V	-7.22	61.62	74	-12.38
2390	56.45	Ave.	343	1.7	V	-7.22	49.23	54	-4.77
4804	54.47	PK	84	1.8	H	-3.51	50.96	74	-23.04
4804	55.12	PK	43	2.1	V	-3.51	51.61	74	-22.39
Middle Channel									
4880	55.4	PK	164	2.4	H	-3.38	52.02	74	-21.98
4880	55.41	PK	103	2	V	-3.38	52.03	74	-21.97
High Channel									
2483.5	70.08	PK	241	1.6	H	-7.2	62.88	74	-11.12
2483.5	57.01	Ave.	241	1.6	H	-7.2	49.81	54	-4.19
2500	69.15	PK	33	1.7	H	-7.18	61.97	74	-12.03
2500	56.37	Ave.	33	1.7	H	-7.18	49.19	54	-4.81
2483.5	70.57	PK	45	2	V	-7.2	63.37	74	-10.63
2483.5	57.22	Ave.	45	2	V	-7.2	50.02	54	-3.98
2500	69.18	PK	289	2.3	V	-7.18	62	74	-12
2500	56.39	Ave.	289	2.3	V	-7.18	49.21	54	-4.79
4960	54.66	PK	284	1.8	H	-3.01	51.65	74	-22.35
4960	55.24	PK	252	2	V	-3.01	52.23	74	-21.77

Wi-Fi: (worst case as below)

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
802.11B, Antenna 1									
Low Channel									
2310	68.11	PK	97	1.7	H	-7.24	60.87	74	-13.13
2310	53.44	Ave.	97	1.7	H	-7.24	46.20	54	-7.80
2390	68.66	PK	4	1.7	H	-7.22	61.44	74	-12.56
2390	54.62	Ave.	4	1.7	H	-7.22	47.40	54	-6.60
2310	67.84	PK	42	1.4	V	-7.24	60.60	74	-13.40
2310	53.40	Ave.	42	1.4	V	-7.24	46.16	54	-7.84
2390	68.48	PK	62	1.3	V	-7.22	61.26	74	-12.74
2390	54.47	Ave.	62	1.3	V	-7.22	47.25	54	-6.75
4824	56.26	PK	146	1.8	H	-3.53	52.73	74	-21.27
4824	55.13	PK	311	2.2	V	-3.53	51.60	74	-22.40
Middle Channel									
4884	55.18	PK	29	1	H	-3.38	51.8	74	-22.20
4884	54.86	PK	138	1.7	V	-3.38	51.48	74	-22.52
High Channel									
2483.5	69.77	PK	181	2.1	H	-7.2	62.57	74	-11.43
2483.5	55.42	Ave.	181	2.1	H	-7.2	48.22	54	-5.78
2500	69.16	PK	122	2.1	H	-7.18	61.98	74	-12.02
2500	54.74	Ave.	122	2.1	H	-7.18	47.56	54	-6.44
2483.5	69.53	PK	180	1.4	V	-7.2	62.33	74	-11.67
2483.5	54.81	Ave.	180	1.4	V	-7.2	47.61	54	-6.39
2500	69.07	PK	324	1.6	V	-7.18	61.89	74	-12.11
2500	54.68	Ave.	324	1.6	V	-7.18	47.5	54	-6.5
4924	58.24	PK	126	1.5	H	-3.16	55.08	74	-18.92
4924	52.77	Ave.	126	1.5	H	-3.16	49.61	54	-4.39
4924	55.57	PK	136	1.6	V	-3.16	52.41	74	-21.59

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
802.11G, Antenna 1									
Low Channel									
2310	68.12	PK	309	1.3	H	-7.24	60.88	74	-13.12
2310	54.36	Ave.	309	1.3	H	-7.24	47.12	54	-6.88
2390	69.66	PK	224	1.8	H	-7.22	62.44	74	-11.56
2390	57.05	Ave.	224	1.8	H	-7.22	49.83	54	-4.17
2310	68.06	PK	16	1.2	V	-7.24	60.82	74	-13.18
2310	54.33	Ave.	16	1.2	V	-7.24	47.09	54	-6.91
2390	69.21	PK	6	1.1	V	-7.22	61.99	74	-12.01
2390	56.73	Ave.	6	1.1	V	-7.22	49.51	54	-4.49
4824	55.22	PK	169	2.4	H	-3.53	51.69	74	-22.31
4824	54.65	PK	38	1.7	V	-3.53	51.12	74	-22.88
Middle Channel									
4884	54.92	PK	141	1.3	H	-3.38	51.54	74	-22.46
4884	54.8	PK	274	2.2	V	-3.38	51.42	74	-22.58
High Channel									
2483.5	71.11	PK	243	1.9	H	-7.2	63.91	74	-10.09
2483.5	57.18	Ave.	243	1.9	H	-7.2	49.98	54	-4.02
2500	69.59	PK	1	2.1	H	-7.18	62.41	74	-11.59
2500	54.75	Ave.	1	2.1	H	-7.18	47.57	54	-6.43
2483.5	70.71	PK	319	1.3	V	-7.2	63.51	74	-10.49
2483.5	56.27	Ave.	319	1.3	V	-7.2	49.07	54	-4.93
2500	69.42	PK	153	2.1	V	-7.18	62.24	74	-11.76
2500	54.63	Ave.	153	2.1	V	-7.18	47.45	54	-6.55
4924	56.65	PK	3	1.7	H	-3.16	53.49	74	-20.51
4924	54.64	PK	161	1.8	V	-3.16	51.48	74	-22.52

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
802.11N20, 2TX									
Low Channel									
2310	68.24	PK	248	1.2	H	-7.24	61.00	74	-13.00
2310	54.35	Ave.	248	1.2	H	-7.24	47.11	54	-6.89
2390	69.84	PK	112	1.6	H	-7.22	62.62	74	-11.38
2390	56.67	Ave.	112	1.6	H	-7.22	49.45	54	-4.55
2310	68.13	PK	356	1.7	V	-7.24	60.89	74	-13.11
2310	54.32	Ave.	356	1.7	V	-7.24	47.08	54	-6.92
2390	69.47	PK	132	2	V	-7.22	62.25	74	-11.75
2390	56.38	Ave.	132	2	V	-7.22	49.16	54	-4.84
4824	55.29	PK	2	2	H	-3.53	51.76	74	-22.24
4824	54.84	PK	187	1.2	V	-3.53	51.31	74	-22.69
Middle Channel									
4884	55	PK	191	2.4	H	-3.38	51.62	74	-22.38
4884	54.86	PK	36	1.5	V	-3.38	51.48	74	-22.52
High Channel									
2483.5	71.68	PK	175	1.8	H	-7.2	64.48	74	-9.52
2483.5	57.47	Ave.	175	1.8	H	-7.2	50.27	54	-3.73
2500	69.85	PK	280	2	H	-7.18	62.67	74	-11.33
2500	54.76	Ave.	280	2	H	-7.18	47.58	54	-6.42
2483.5	71.79	PK	317	1.6	V	-7.2	64.59	74	-9.41
2483.5	56.98	Ave.	317	1.6	V	-7.2	49.78	54	-4.22
2500	69.63	PK	295	1.5	V	-7.18	62.45	74	-11.55
2500	54.75	Ave.	295	1.5	V	-7.18	47.57	54	-6.43
4924	56.57	PK	3	1.5	H	-3.16	53.41	74	-20.59
4924	54.59	PK	16	2.4	V	-3.16	51.43	74	-22.57

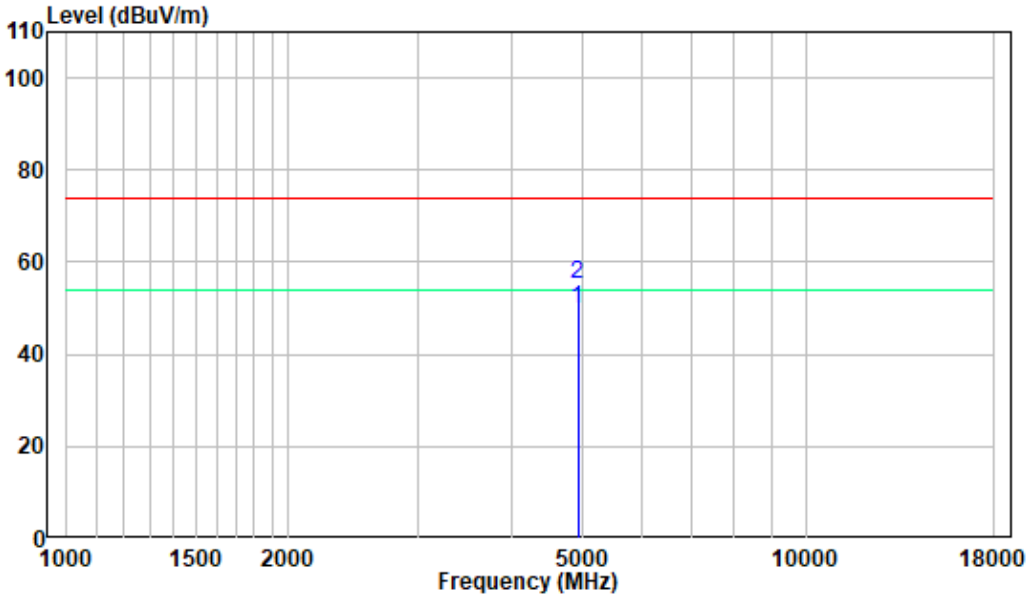
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
802.11N40, 2TX									
Low Channel									
2310	69.66	PK	52	1.5	H	-7.24	62.42	74	-11.58
2310	55.63	Ave.	52	1.5	H	-7.24	48.39	54	-5.61
2390	72.44	PK	223	1	H	-7.22	65.22	74	-8.78
2390	58.07	Ave.	223	1	H	-7.22	50.85	54	-3.15
2310	69.43	PK	101	2.2	V	-7.24	62.19	74	-11.81
2310	55.40	Ave.	101	2.2	V	-7.24	48.16	54	-5.84
2390	69.96	PK	59	1.2	V	-7.22	62.74	74	-11.26
2390	55.35	Ave.	59	1.2	V	-7.22	48.13	54	-5.87
4844	55.11	PK	82	1.3	H	-3.54	51.57	74	-22.43
4844	54.47	PK	36	2	V	-3.54	50.93	74	-23.07
Middle Channel									
4884	55.55	PK	12	1.9	H	-3.38	52.17	74	-21.83
4884	54.68	PK	356	2.3	V	-3.38	51.3	74	-22.7
High Channel									
2483.5	72.28	PK	169	1.2	H	-7.2	65.08	74	-8.92
2483.5	58.02	Ave.	169	1.2	H	-7.2	50.82	54	-3.18
2500	69.95	PK	19	2.5	H	-7.18	62.77	74	-11.23
2500	55.76	Ave.	19	2.5	H	-7.18	48.58	54	-5.42
2483.5	70.96	PK	329	2.4	V	-7.2	63.76	74	-10.24
2483.5	56.81	Ave.	329	2.4	V	-7.2	49.61	54	-4.39
2500	69.89	PK	317	1.2	V	-7.18	62.71	74	-11.29
2500	55.74	Ave.	317	1.2	V	-7.18	48.56	54	-5.44
4904	55.78	PK	60	1.8	H	-3.26	52.52	74	-21.48
4904	55.07	PK	241	1.9	V	-3.26	51.81	74	-22.19

Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Absolute Level (Corrected Amplitude) = Factor + Reading
Margin = Absolute Level (Corrected Amplitude) – Limit
The other spurious emission which is in the noise floor level was not recorded.
The test result of peak was 20dB below to the limit of peak, which can be compliant to the average limit, so just peak value was recorded.

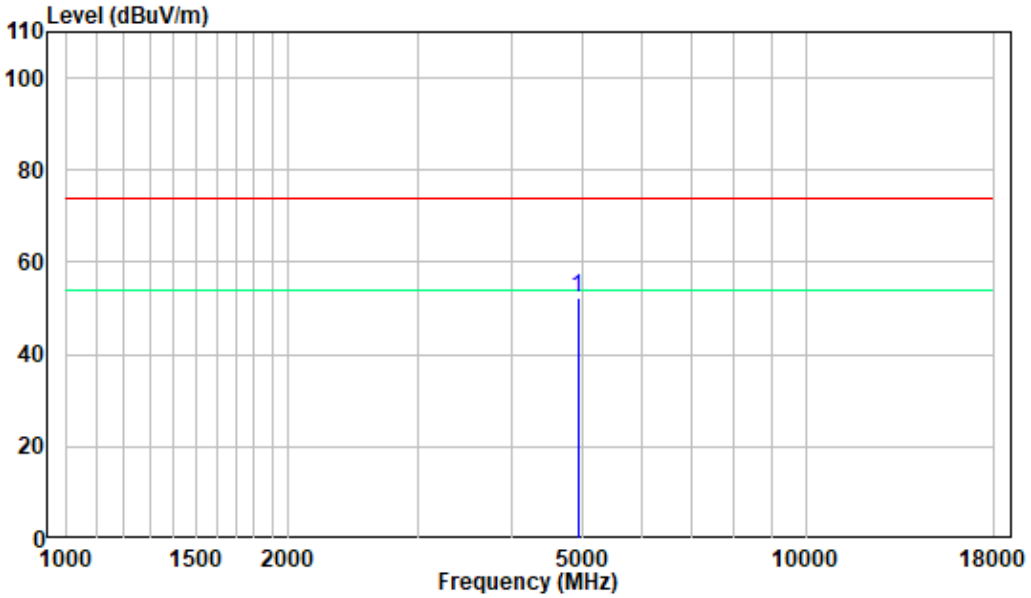
1-18 GHz:

Pre-scan plots:

802.11 b High Channel
Horizontal



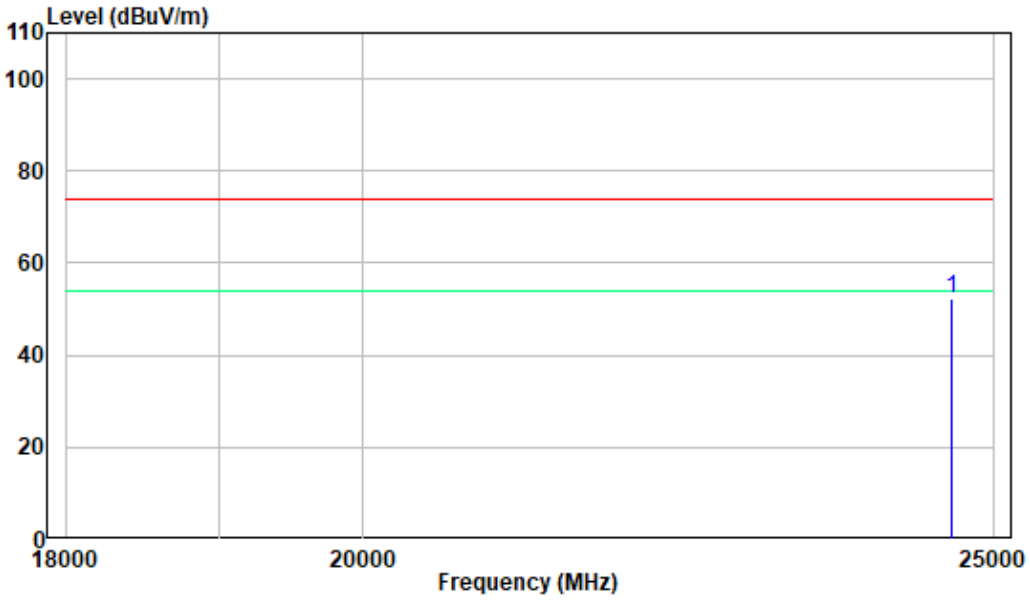
Vertical



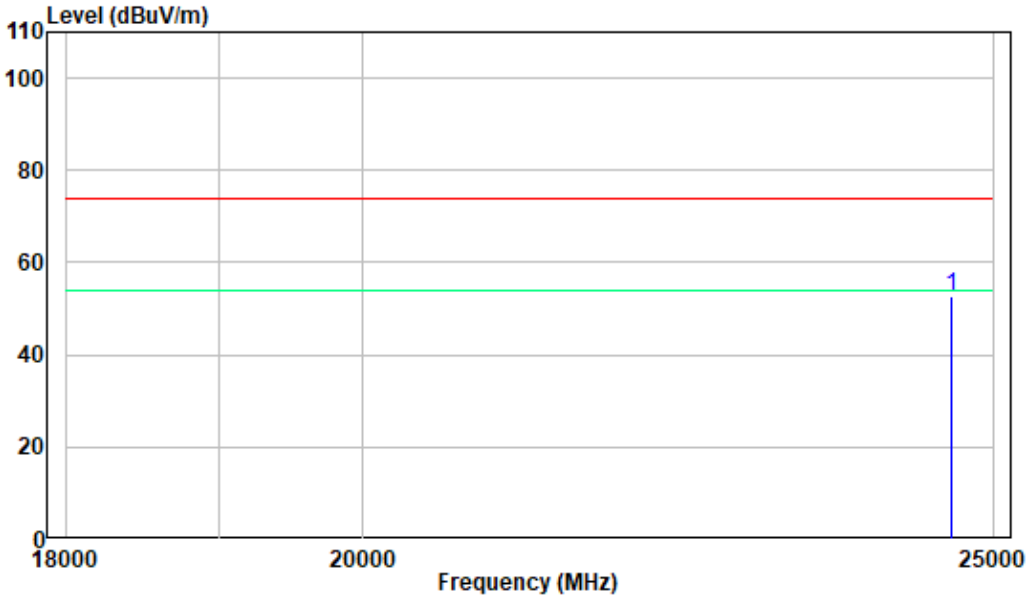
18 -25GHz:

Pre-scan plots:

802.11 b High Channel
Horizontal



Vertical



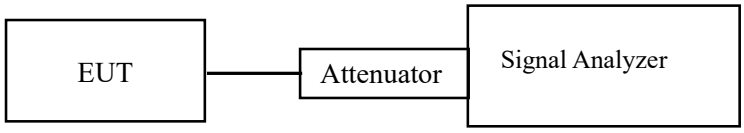
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Data

Environmental Conditions

Temperature:	21~23 ℃
Relative Humidity:	62 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Ding from 2021-11-18 to 2021-12-01.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix Wi-Fi and Appendix BLE.

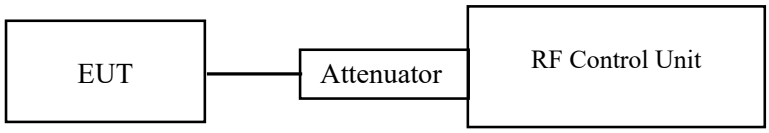
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	21~23 ℃
Relative Humidity:	62 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Ding from 2021-11-18 to 2022-01-09.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix Wi-Fi and Appendix BLE.

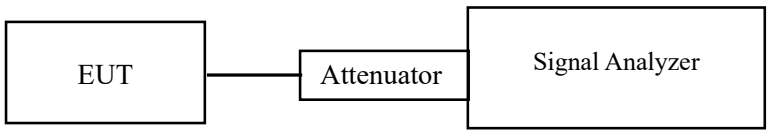
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	62 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Ding on 2021-12-19.

EUT operation mode: Transmitting

Test Result: Compliant.

Conducted Band Edge Result:

Please refer to the Appendix Wi-Fi and Appendix BLE.

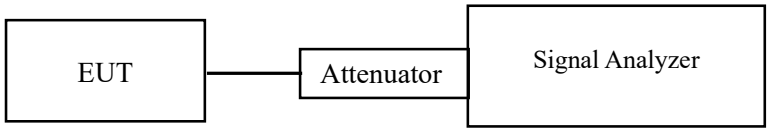
FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test Data

Environmental Conditions

Temperature:	21~23 ℃
Relative Humidity:	62 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Ding from 2021-11-18 to 2022-01-09.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix Wi-Fi and Appendix BLE.

APPENDIX Wi-Fi

Appendix A: DTS Bandwidth

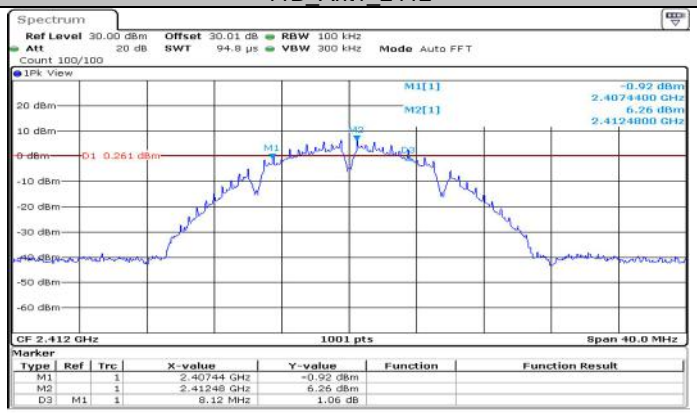
Test Result

Test Mode	Antenna	Channel	DTS BW [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	8.120	0.5	PASS
	Ant1	2442	8.160	0.5	PASS
	Ant1	2462	8.120	0.5	PASS
11G	Ant1	2412	15.760	0.5	PASS
	Ant1	2442	15.800	0.5	PASS
	Ant1	2462	15.800	0.5	PASS
11N20MIMO	Ant1	2412	16.600	0.5	PASS
	Ant1	2442	15.160	0.5	PASS
	Ant1	2462	16.000	0.5	PASS
11N40MIMO	Ant1	2422	35.200	0.5	PASS
	Ant1	2442	35.840	0.5	PASS
	Ant1	2452	34.000	0.5	PASS

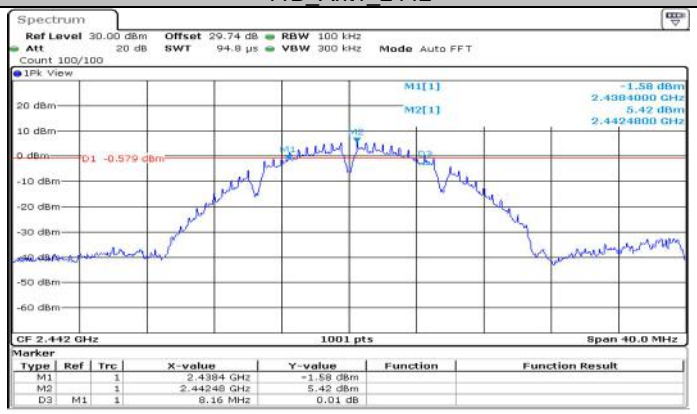
Note: Antenna 1 was tested and recorded.

Test Graphs

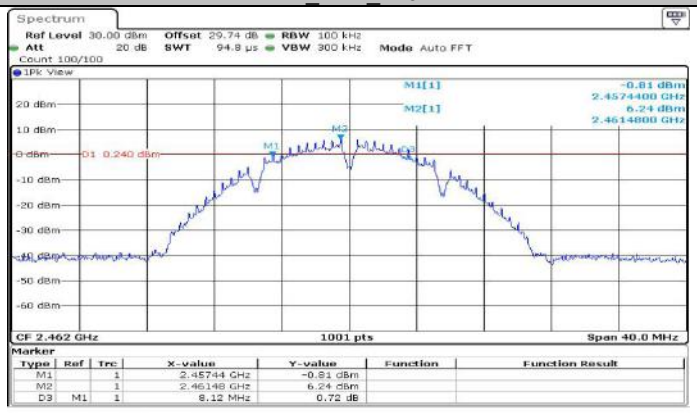
11B_Ant1_2412



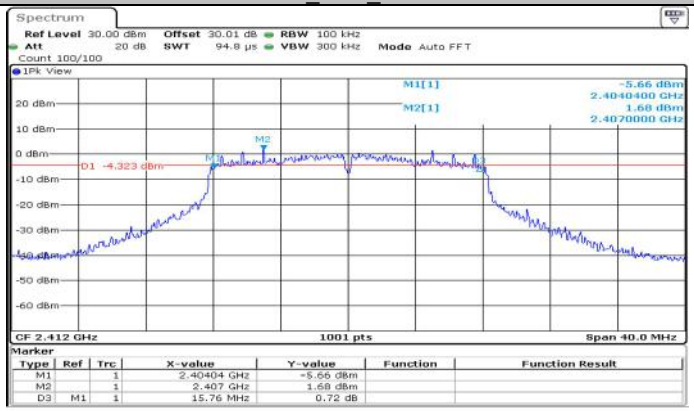
11B_Ant1_2442



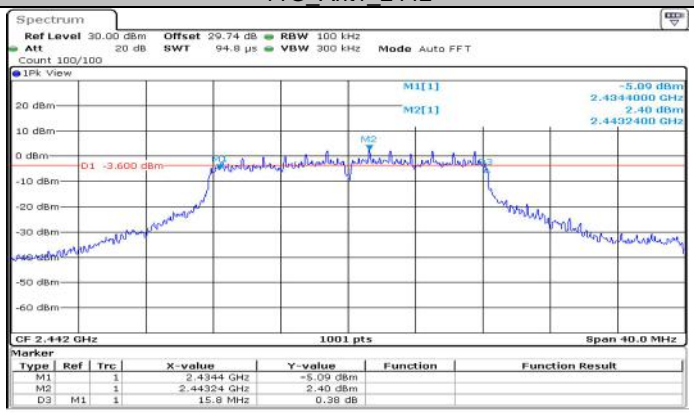
11B_Ant1_2462



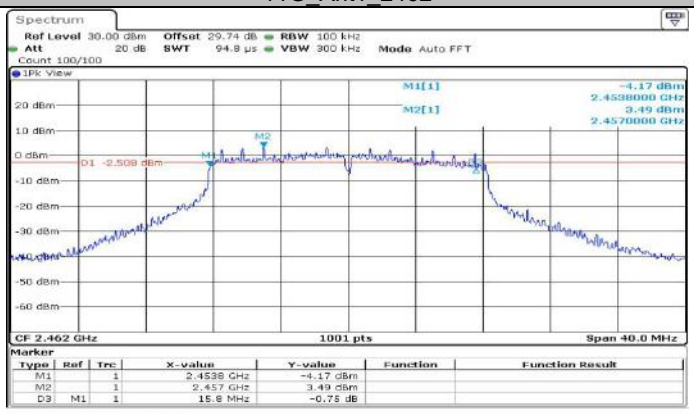
11G_Ant1_2412



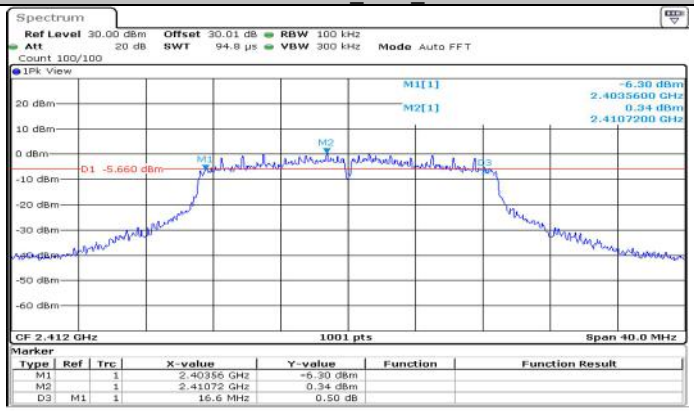
11G_Ant1_2442



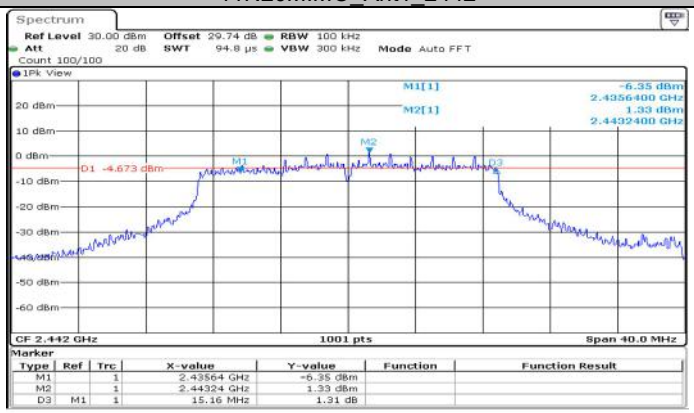
11G_Ant1_2462



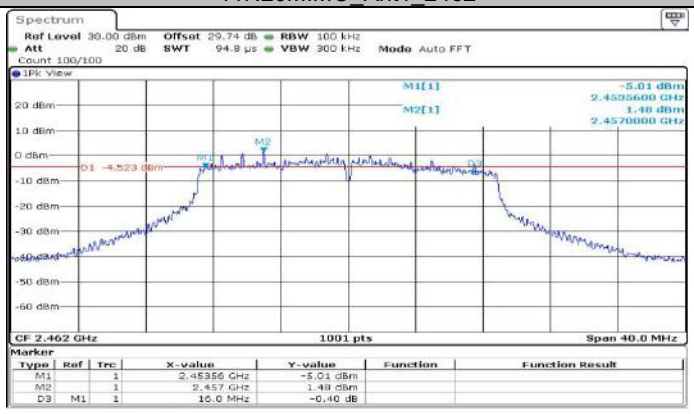
11N20MIMO_Ant1_2412



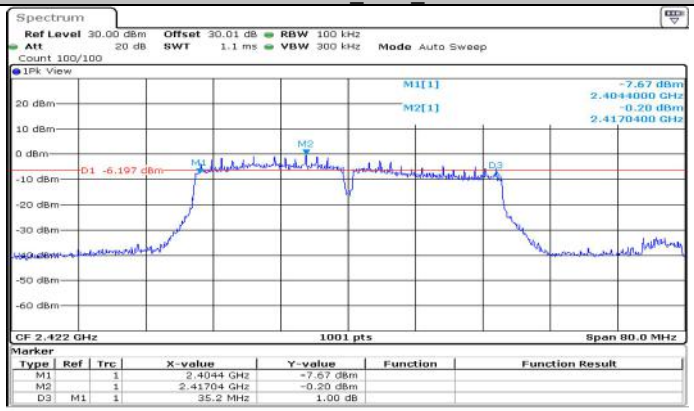
11N20MIMO_Ant1_2442



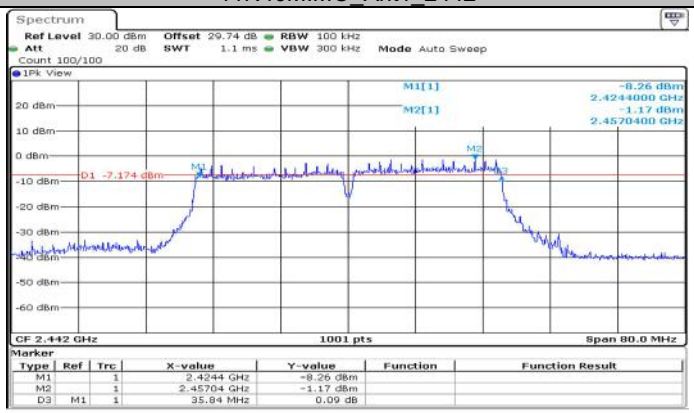
11N20MIMO_Ant1_2462



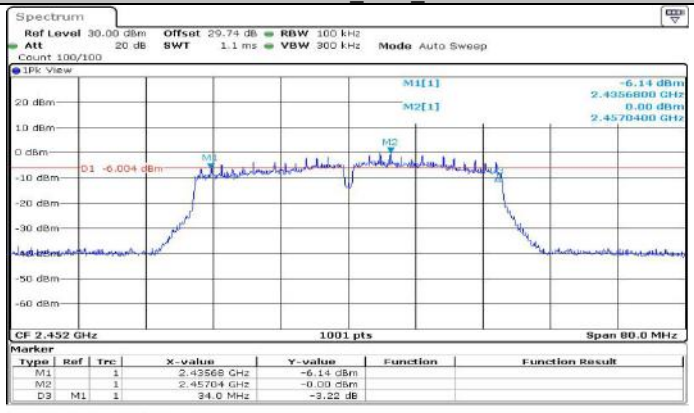
11N40MIMO_Ant1_2422



11N40MIMO_Ant1_2442



11N40MIMO_Ant1_2452



Appendix B: Occupied Channel Bandwidth

Test Result

Test Mode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	13.506	---	PASS
	Ant1	2442	14.226	---	PASS
	Ant1	2462	13.586	---	PASS
11G	Ant1	2412	16.863	---	PASS
	Ant1	2442	17.582	---	PASS
	Ant1	2462	17.023	---	PASS
11N20MIMO	Ant1	2412	17.942	---	PASS
	Ant1	2442	18.701	---	PASS
	Ant1	2462	18.102	---	PASS
11N40MIMO	Ant1	2422	36.444	---	PASS
	Ant1	2442	36.843	---	PASS
	Ant1	2452	36.204	---	PASS

Note: Antenna 1 was test and recorded.

Test Graphs

11B_Ant1_2412

11B_Ant1_2442

11B_Ant1_2462

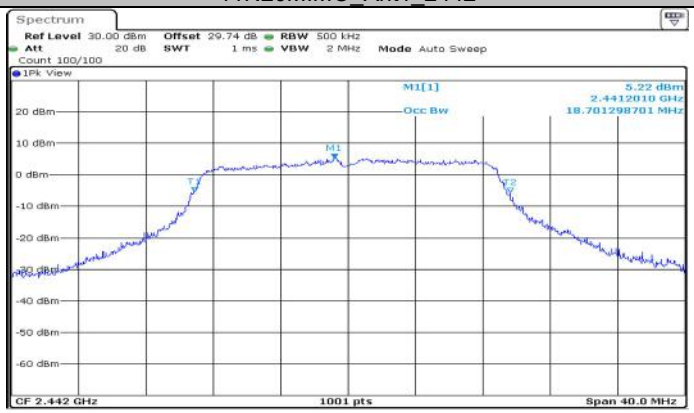
11G_Ant1_2412

11G_Ant1_2442

11G_Ant1_2462

11N20MIMO_Ant1_2412

11N20MIMO_Ant1_2442



11N20MIMO_Ant1_2462

11N40MIMO_Ant1_2422

11N40MIMO_Ant1_2442

11N40MIMO_Ant1_2452

Appendix C: Maximum conducted peak output power

Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	2412	16.17	≤30	PASS
	Ant2	2412	16.38	≤30	PASS
	Ant1	2442	16.10	≤30	PASS
	Ant2	2442	16.87	≤30	PASS
	Ant1	2462	16.44	≤30	PASS
	Ant2	2462	16.76	≤30	PASS
11G	Ant1	2412	16.57	≤30	PASS
	Ant2	2412	17.10	≤30	PASS
	Ant1	2442	16.03	≤30	PASS
	Ant2	2442	16.87	≤30	PASS
	Ant1	2462	16.82	≤30	PASS
	Ant2	2462	17.12	≤30	PASS
11N20MIMO	Ant1	2412	15.81	≤30	PASS
	Ant2	2412	15.84	≤30	PASS
	total	2412	18.8	≤30	PASS
	Ant1	2442	15.44	≤30	PASS
	Ant2	2442	16.26	≤30	PASS
	total	2442	18.9	≤30	PASS
	Ant1	2462	15.52	≤30	PASS
	Ant2	2462	15.99	≤30	PASS
	total	2462	18.8	≤30	PASS
11N40MIMO	Ant1	2422	14.59	≤30	PASS
	Ant2	2422	15.24	≤30	PASS
	total	2422	17.9	≤30	PASS
	Ant1	2442	14.86	≤30	PASS
	Ant2	2442	15.25	≤30	PASS
	total	2442	18.1	≤30	PASS
	Ant1	2452	14.69	≤30	PASS
	Ant2	2452	15.63	≤30	PASS
	total	2452	18.2	≤30	PASS

Note 1: The maximum antenna gain is 2.8 dBi. The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:

Array Gain = 0dB (i.e., no array gain) For $N_{ANT} \leq 4$;

So: Directional gain=2.8dBi <6dBi.

Appendix D: Maximum power spectral density

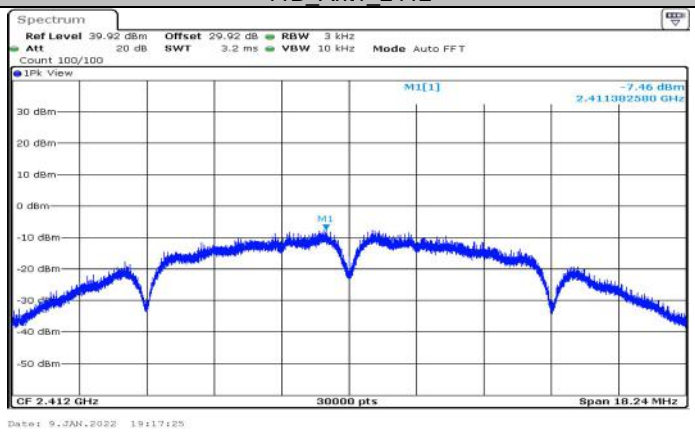
Test Result

TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-7.46	≤8	PASS
	Ant2	2412	-7.23	≤8	PASS
	Ant1	2442	-7.74	≤8	PASS
	Ant2	2442	-7.62	≤8	PASS
	Ant1	2462	-7.96	≤8	PASS
	Ant2	2462	-7.36	≤8	PASS
11G	Ant1	2412	-11.59	≤8	PASS
	Ant2	2412	-10.26	≤8	PASS
	Ant1	2442	-12.22	≤8	PASS
	Ant2	2442	-11.47	≤8	PASS
	Ant1	2462	-12.02	≤8	PASS
	Ant2	2462	-10.34	≤8	PASS
11N20MIMO	Ant1	2412	-12.64	≤8	PASS
	Ant2	2412	-12.04	≤8	PASS
	total	2412	-9.32	≤8	PASS
	Ant1	2442	-13.24	≤8	PASS
	Ant2	2442	-13.20	≤8	PASS
	total	2442	-10.21	≤8	PASS
	Ant1	2462	-12.89	≤8	PASS
	Ant2	2462	-12.68	≤8	PASS
	total	2462	-9.77	≤8	PASS
11N40MIMO	Ant1	2422	-16.11	≤8	PASS
	Ant2	2422	-15.00	≤8	PASS
	total	2422	-12.51	≤8	PASS
	Ant1	2442	-16.23	≤8	PASS
	Ant2	2442	-15.99	≤8	PASS
	total	2442	-13.10	≤8	PASS
	Ant1	2452	-16.00	≤8	PASS
	Ant2	2452	-14.02	≤8	PASS
	total	2452	-11.89	≤8	PASS

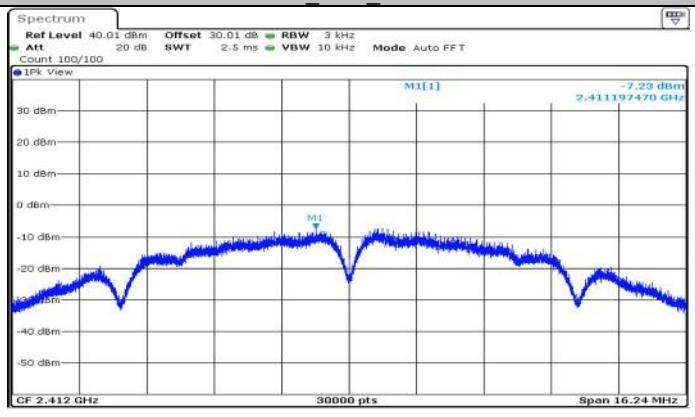
Note 1: The maximum antenna gain is 2.8 dBi. The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:
Array Gain = 10 $\log(N_{ANT}/N_{ss})$dB
Directional gain=G_{ANT} + Array Gain =2.8+10*log(2/1)=5.81dBi<6dBi.

Test Graphs

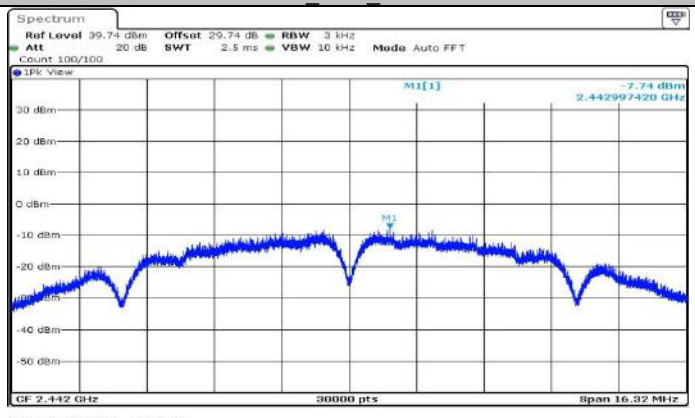
11B_Ant1_2412



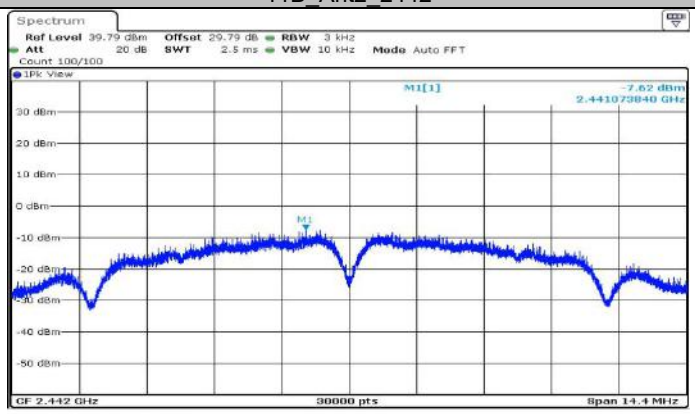
11B_Ant2_2412



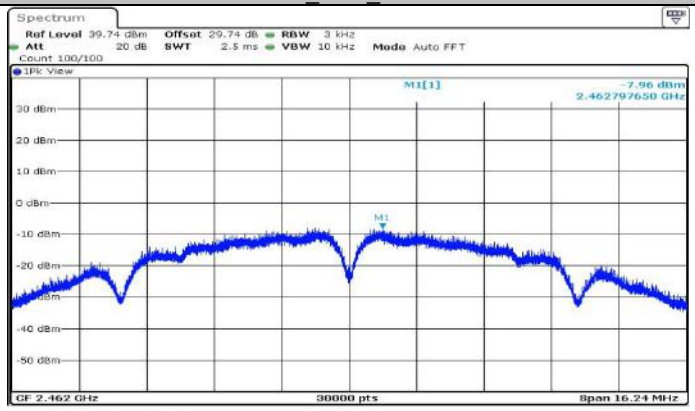
11B_Ant1_2442



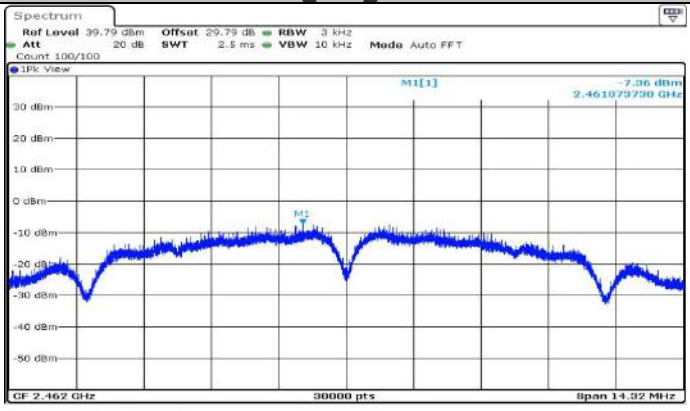
11B_Ant2_2442



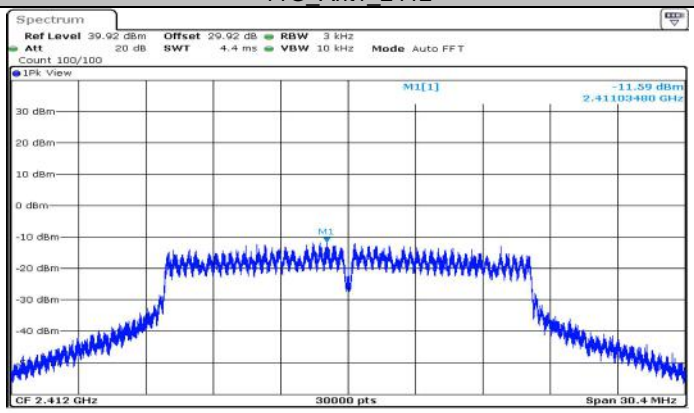
11B_Ant1_2462



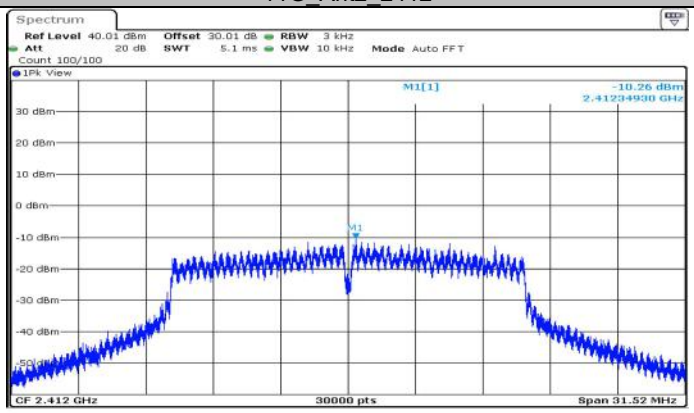
11B_Ant2_2462



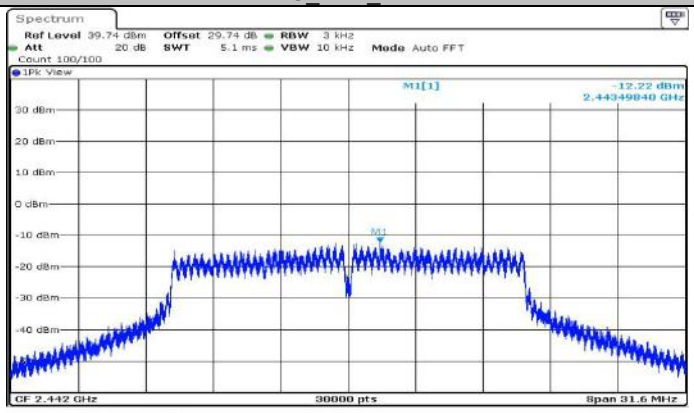
11G_Ant1_2412

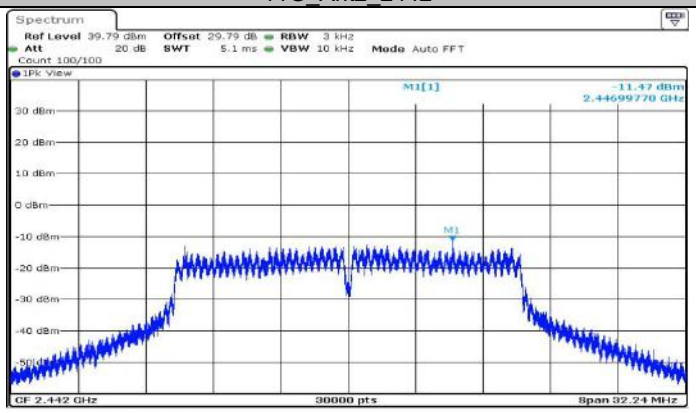
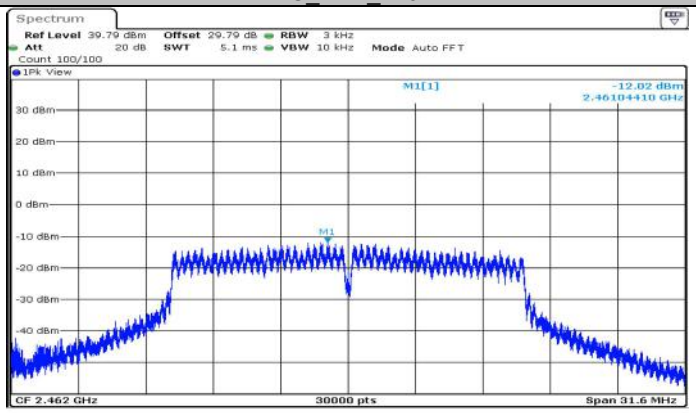
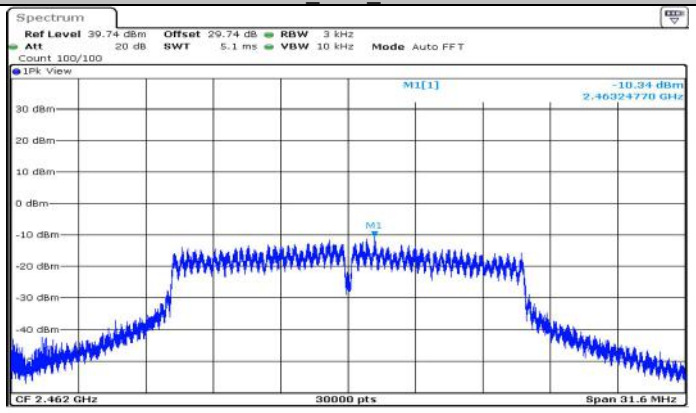


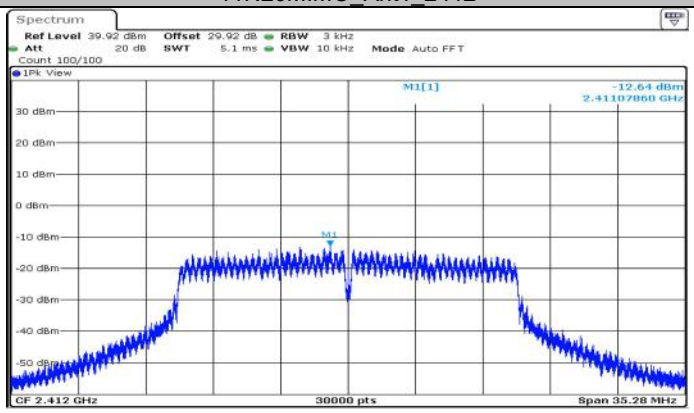
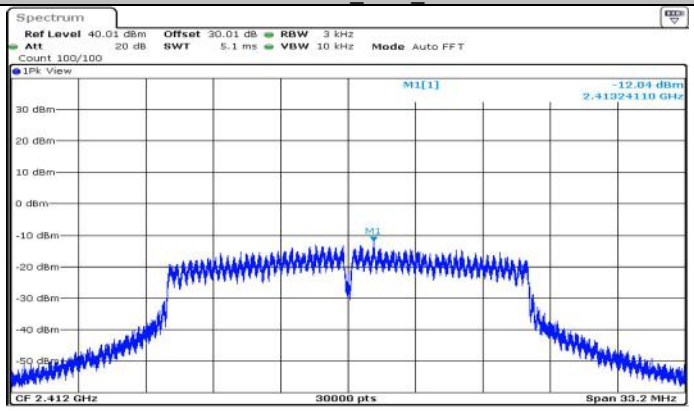
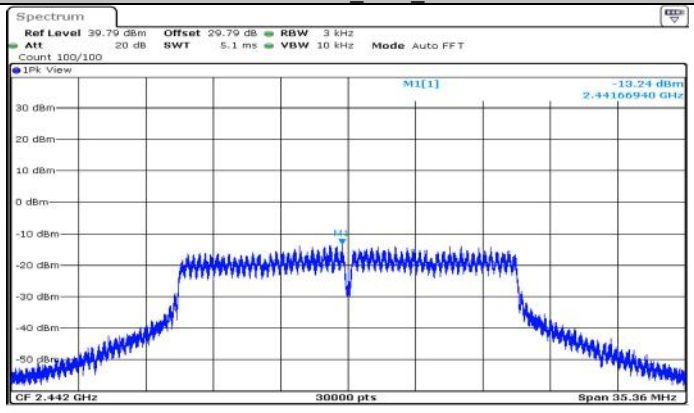
11G_Ant2_2412

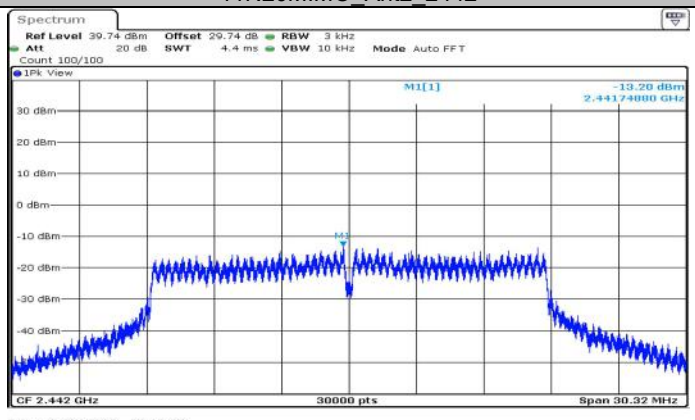
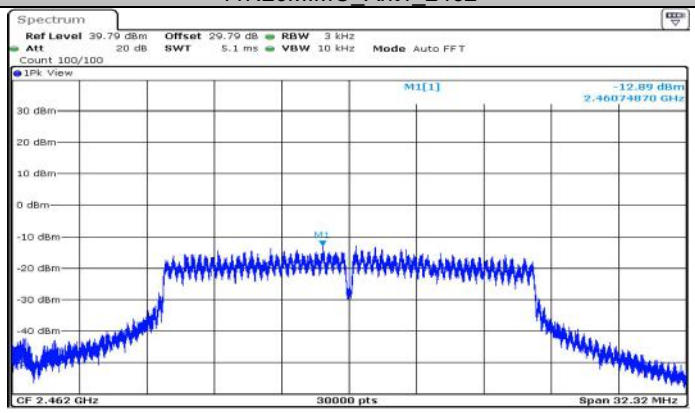
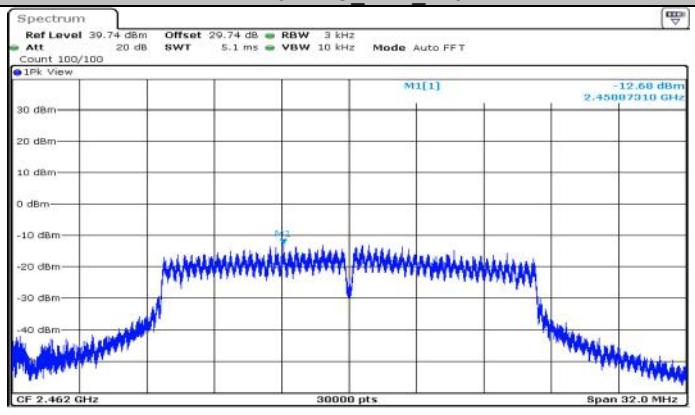


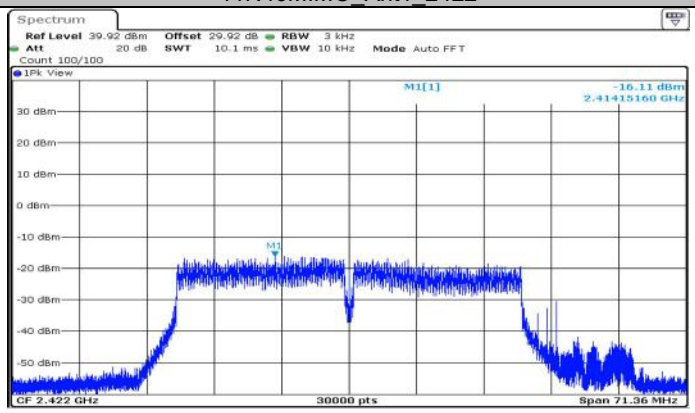
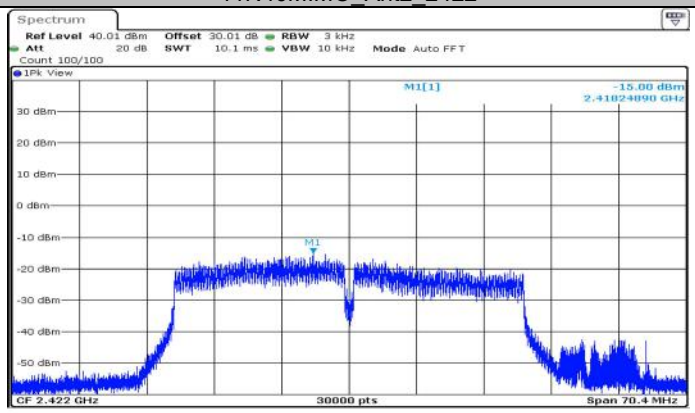
11G_Ant1_2442



11G_Ant2_2442

11G_Ant1_2462

11G_Ant2_2462


11N20MIMO_Ant1_2412

11N20MIMO_Ant2_2412

11N20MIMO_Ant1_2442


11N20MIMO_Ant2_2442

11N20MIMO_Ant1_2462

11N20MIMO_Ant2_2462


11N40MIMO_Ant1_2422

11N40MIMO_Ant2_2422

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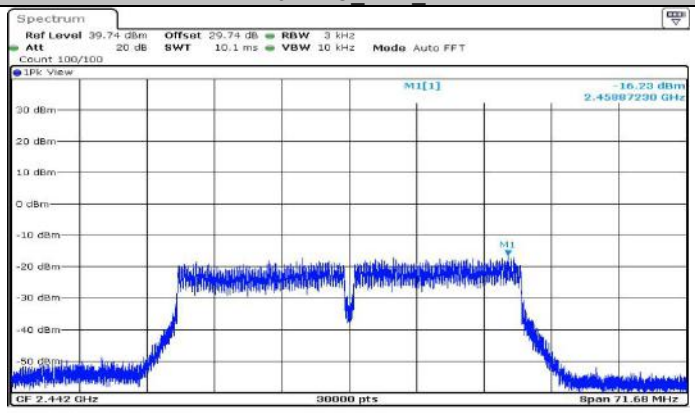
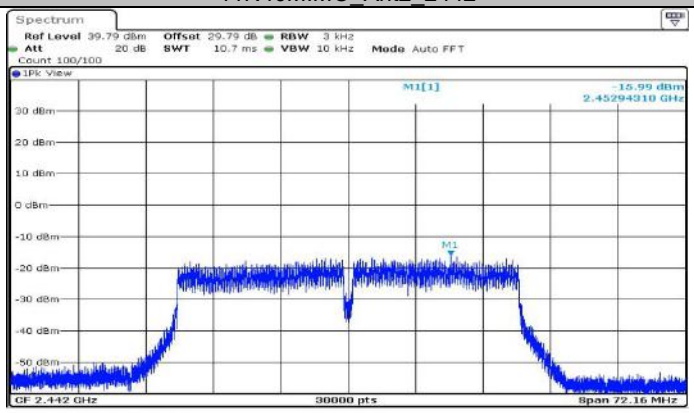
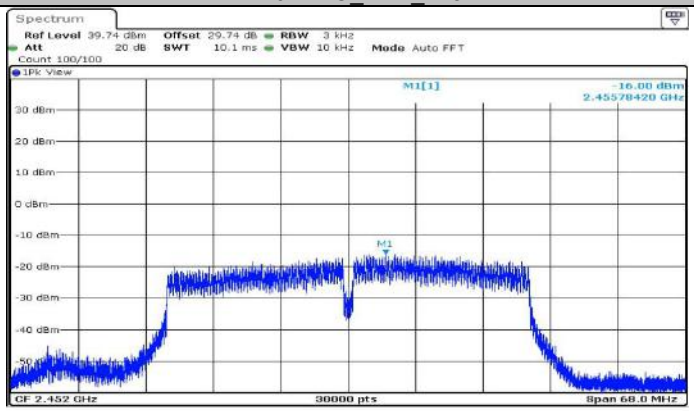
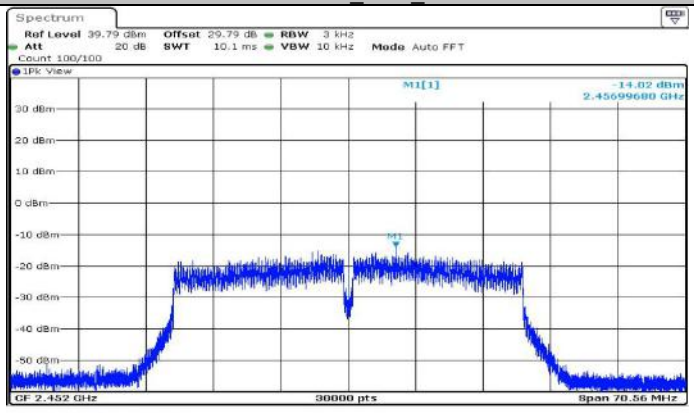
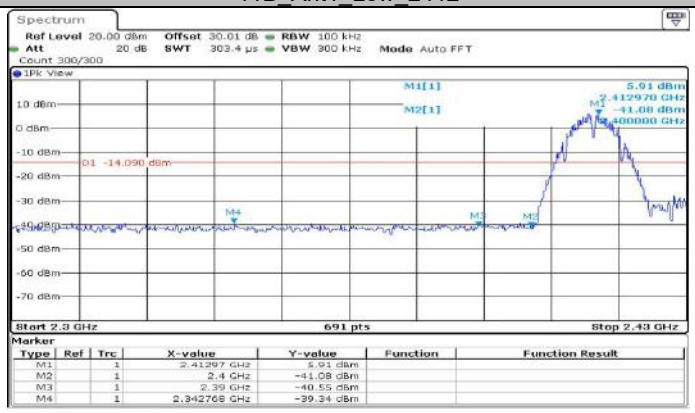


11N40MIMO_Ant2_2442

11N40MIMO_Ant1_2452

11N40MIMO_Ant2_2452


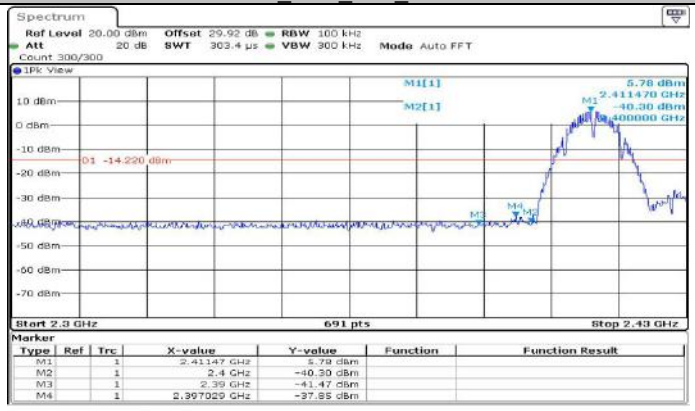
Appendix E:Band edge measurements

Test Graphs

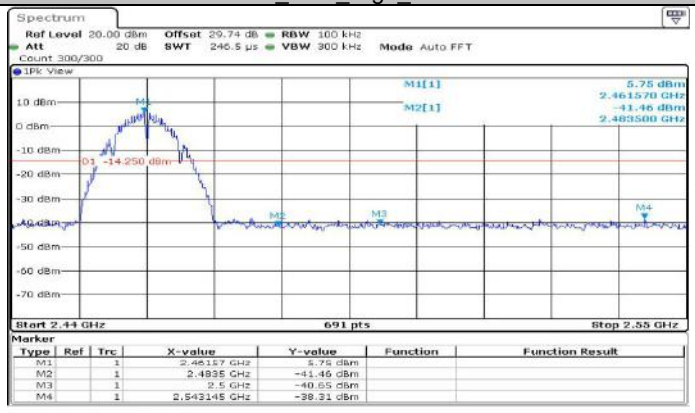
11B_Ant1_Low_2412



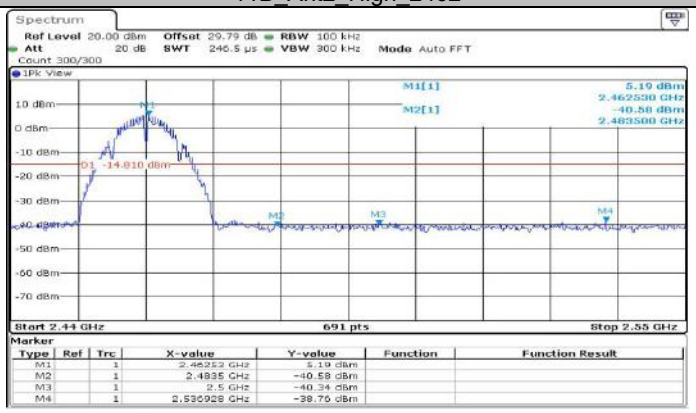
11B_Ant2_Low_2412



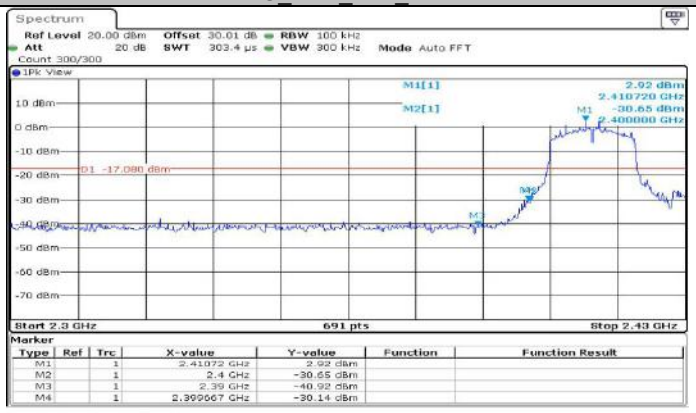
11B_Ant1_High_2462



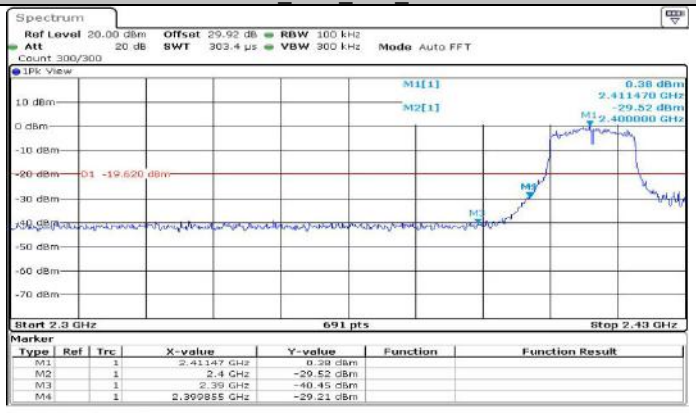
11B_Ant2_High_2462



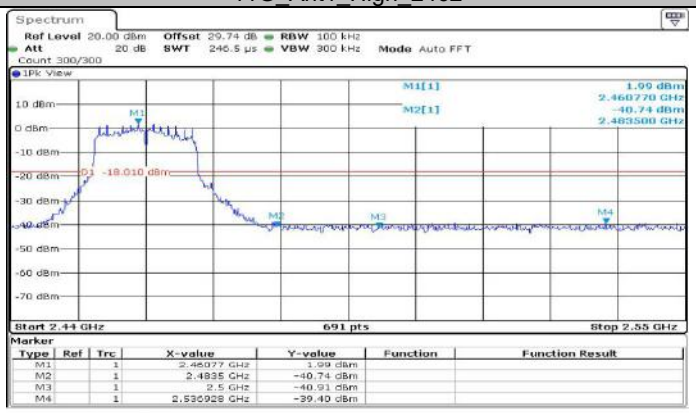
11G_Ant1_Low_2412



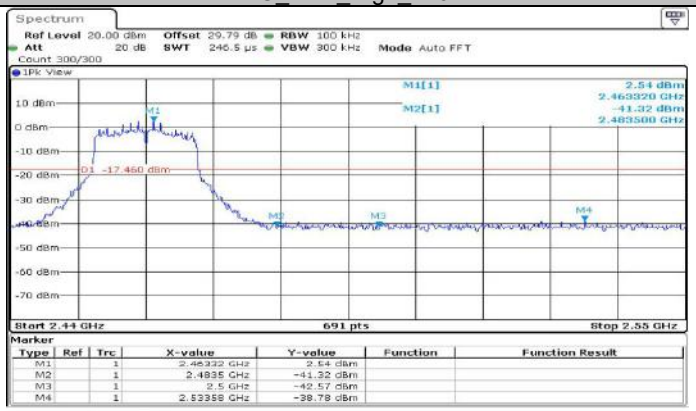
11G_Ant2_Low_2412



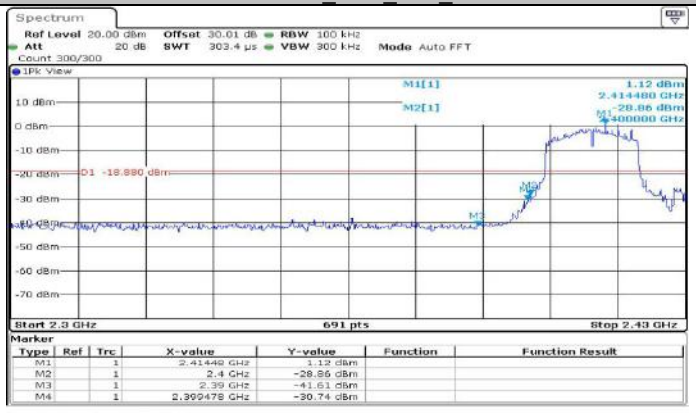
11G_Ant1_High_2462



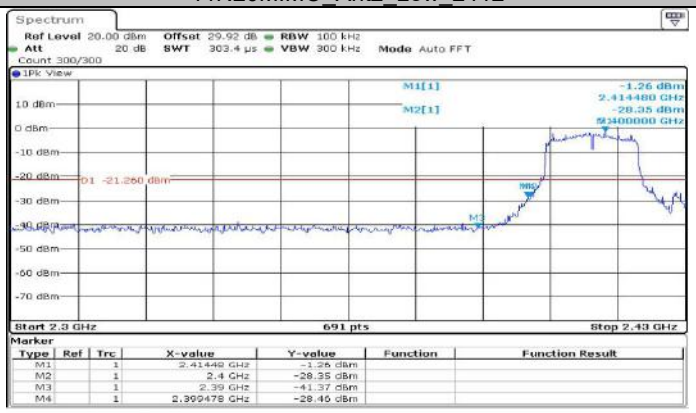
11G_Ant2_High_2462



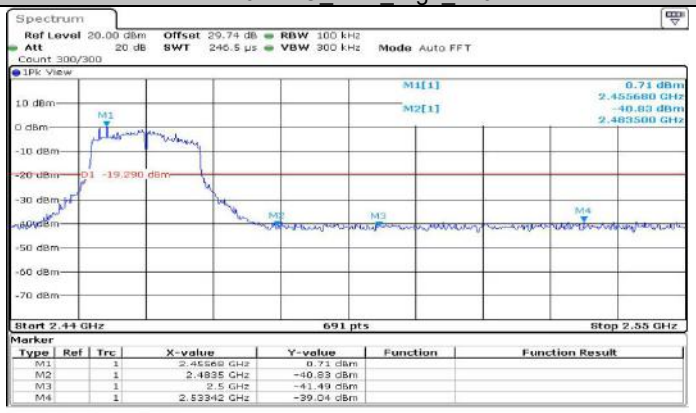
11N20MIMO_Ant1_Low_2412



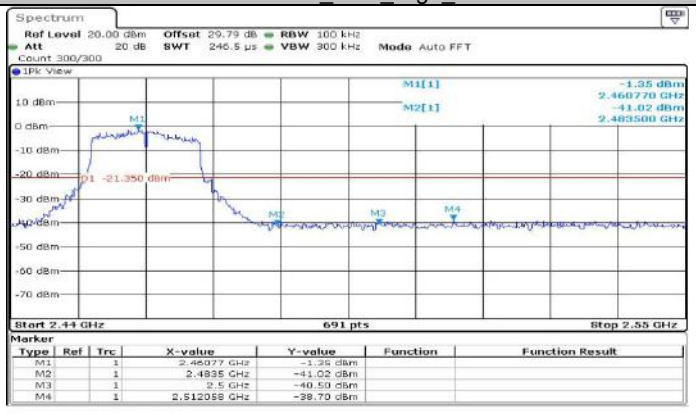
11N20MIMO_Ant2_Low_2412



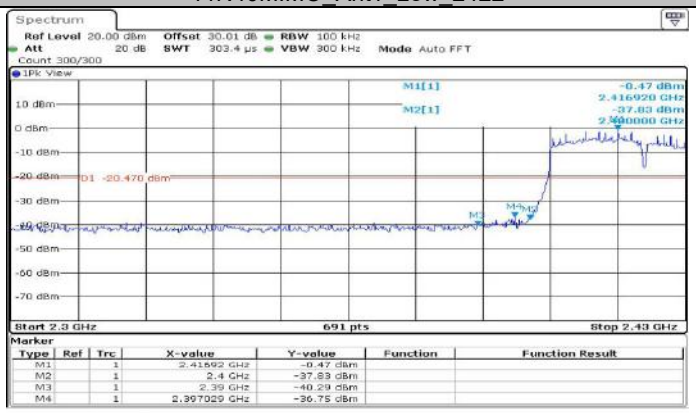
11N20MIMO_Ant1_High_2462



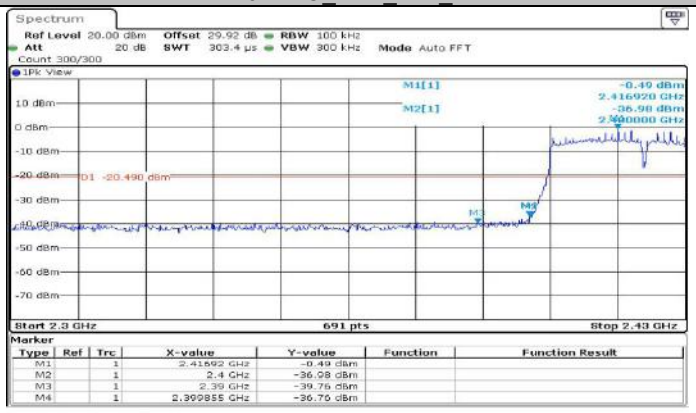
11N20MIMO_Ant2_High_2462



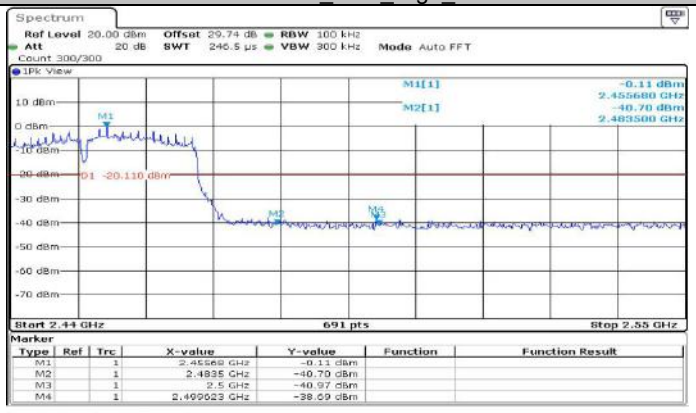
11N40MIMO_Ant1_Low_2422



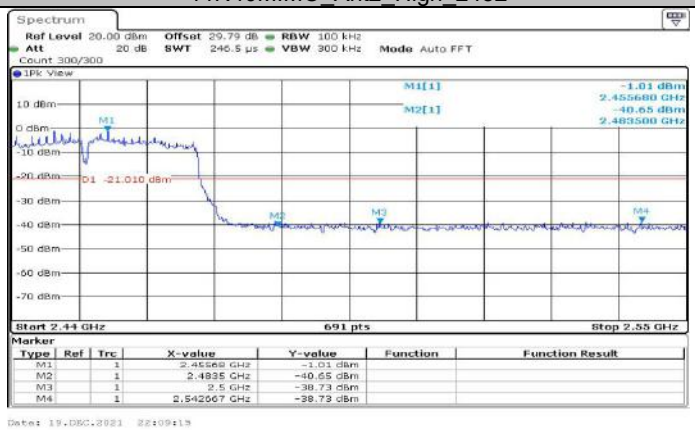
11N40MIMO_Ant2_Low_2422



11N40MIMO_Ant1_High_2452



11N40MIMO_Ant2_High_2452



Appendix F: Duty Cycle

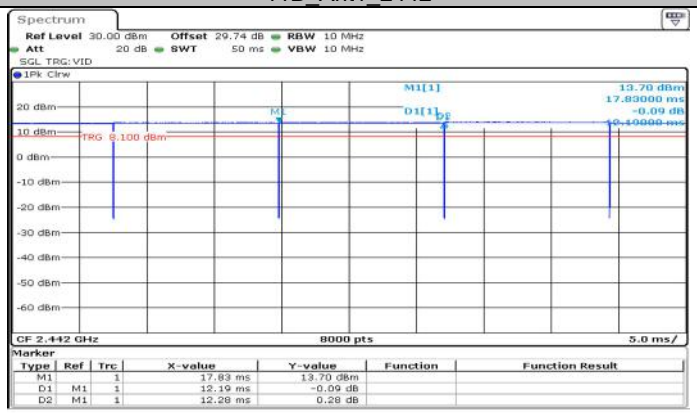
Test Result

Test Mode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	Ant1	2442	12.19	12.28	99.27
11G	Ant1	2442	2.02	2.05	98.54
11N20MIMO	Ant1	2442	4.94	4.98	99.20
11N40MIMO	Ant1	2442	2.39	2.44	97.95

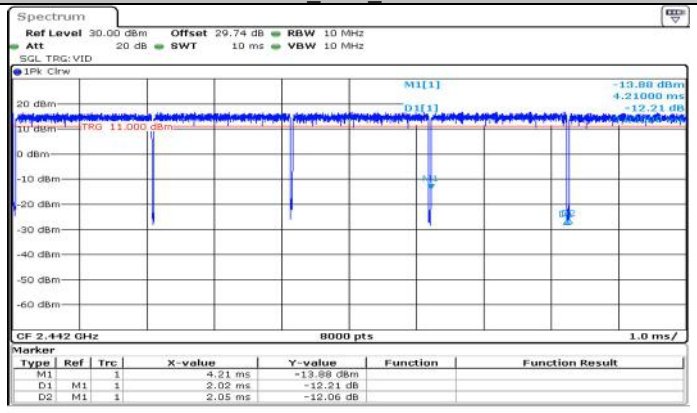
Note: Antenna 1 was test and recorded.

Test Graphs

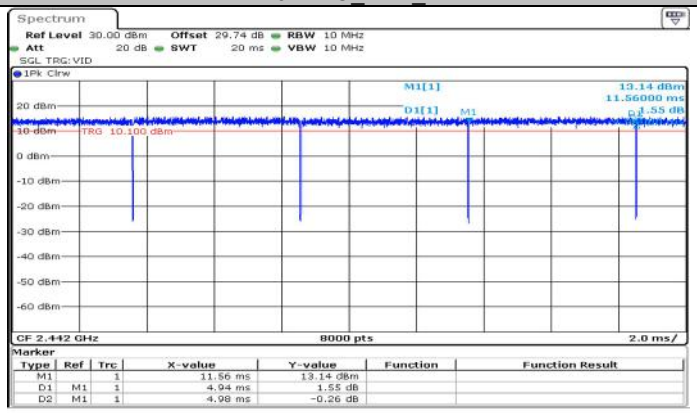
11B_Ant1_2442



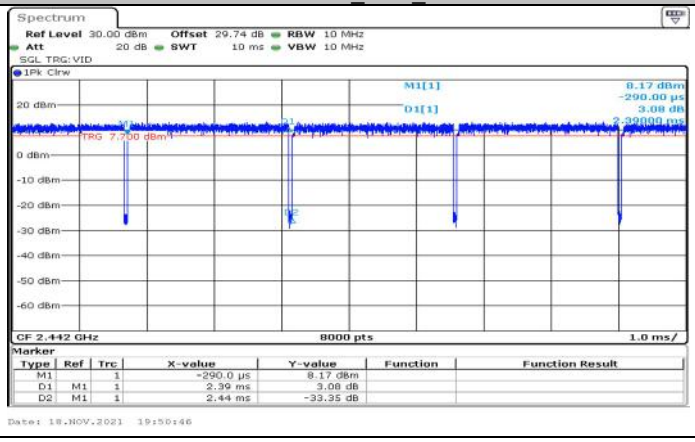
11G_Ant1_2442



11N20MIMO_Ant1_2442



11N40MIMO_Ant1_2442



APPENDIX BLE

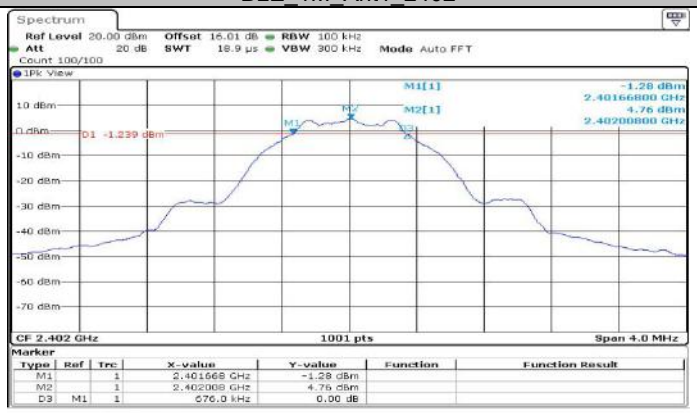
AppendixA: DTS Bandwidth

Test Result

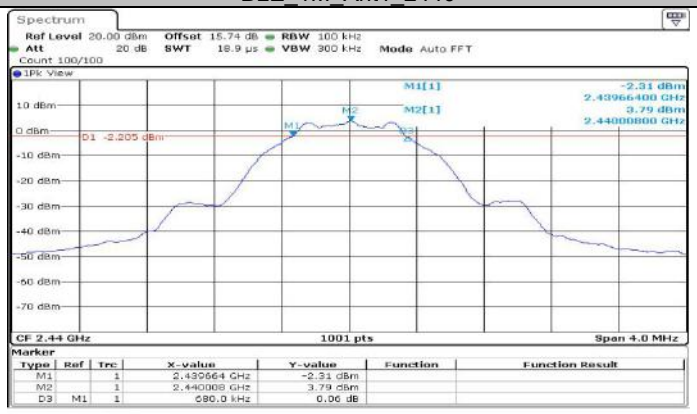
Test Mode	Antenna	Channel	DTS BW [MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.676	0.5	PASS
		2440	0.680	0.5	PASS
		2480	0.672	0.5	PASS
BLE_2M	Ant1	2402	1.144	0.5	PASS
		2440	1.148	0.5	PASS
		2480	1.144	0.5	PASS

Test Graphs

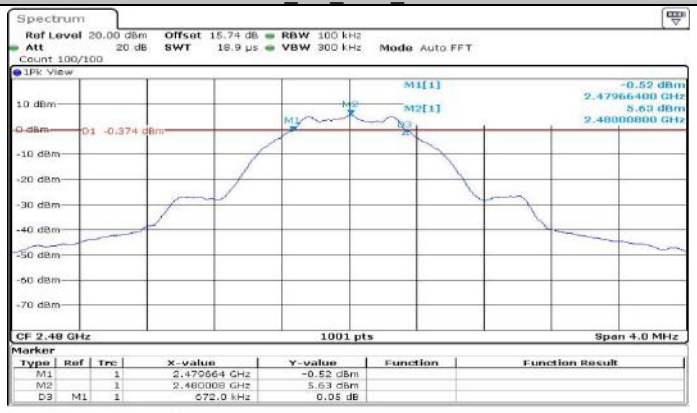
BLE_1M_Ant1_2402



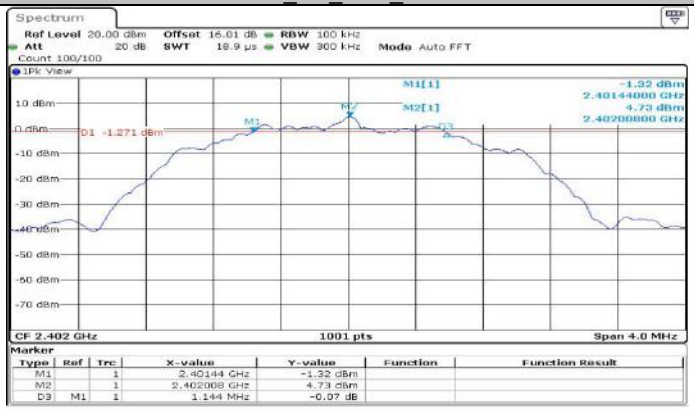
BLE_1M_Ant1_2440



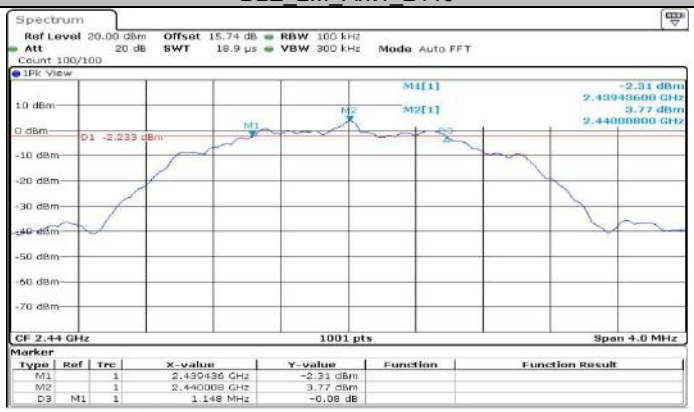
BLE_1M_Ant1_2480



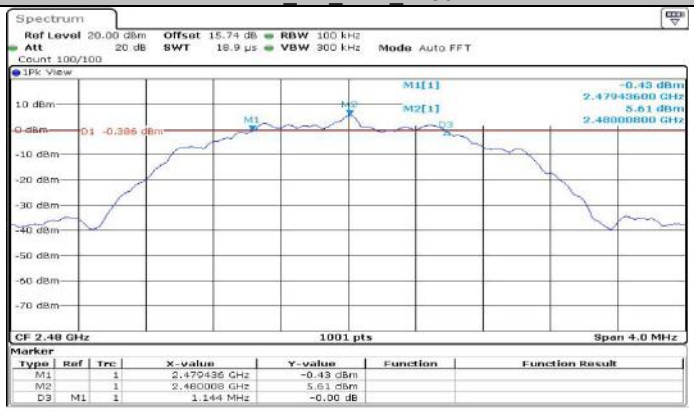
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



Appendix B: Occupied Channel Bandwidth

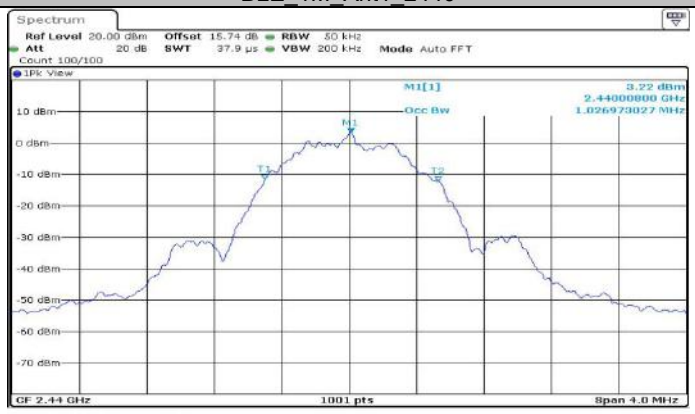
Test Result

Test Mode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.027	---	PASS
		2440	1.027	---	PASS
		2480	1.031	---	PASS
BLE_2M	Ant1	2402	2.042	---	PASS
		2440	2.042	---	PASS
		2480	2.046	---	PASS

Test Graphs

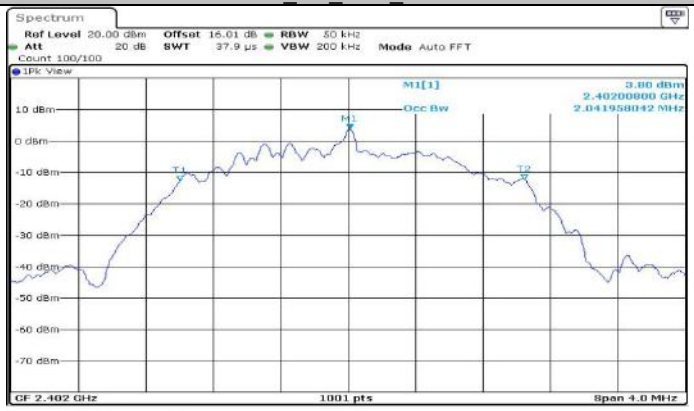
BLE_1M_Ant1_2402

BLE_1M_Ant1_2440

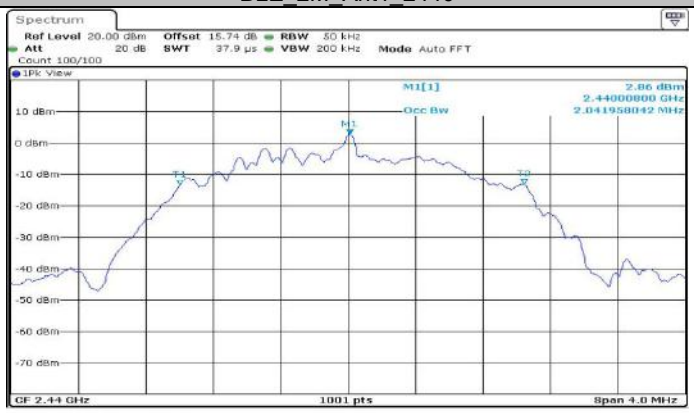


BLE_1M_Ant1_2480

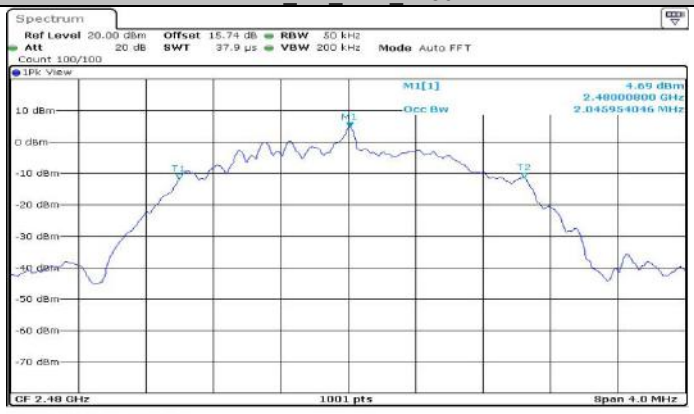
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



Appendix C: Maximum conducted Peak output power

Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	5.41	≤30	PASS
		2440	4.78	≤30	PASS
		2480	6.51	≤30	PASS
BLE_2M	Ant1	2402	5.41	≤30	PASS
		2440	4.82	≤30	PASS
		2480	6.61	≤30	PASS

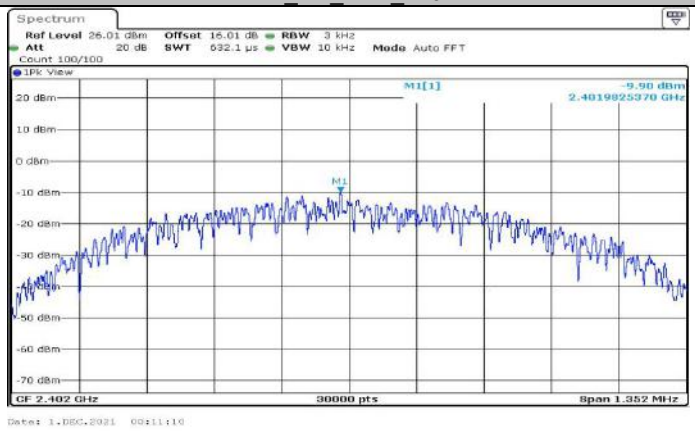
Appendix D: Maximum power spectral density

Test Result

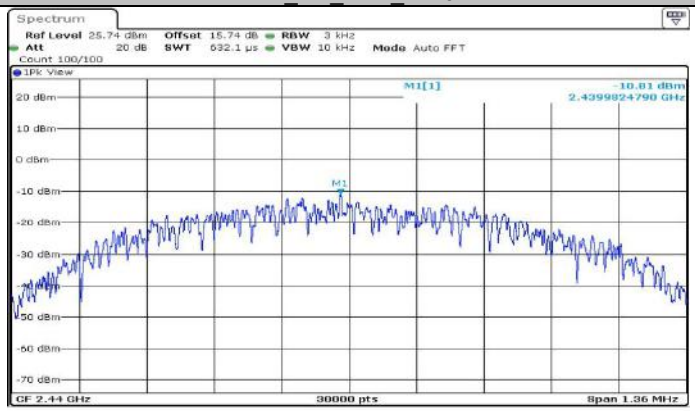
Test Mode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-9.9	≤8	PASS
		2440	-10.81	≤8	PASS
		2480	-9.01	≤8	PASS
BLE_2M	Ant1	2402	-13.49	≤8	PASS
		2440	-14.38	≤8	PASS
		2480	-12.63	≤8	PASS

Test Graphs

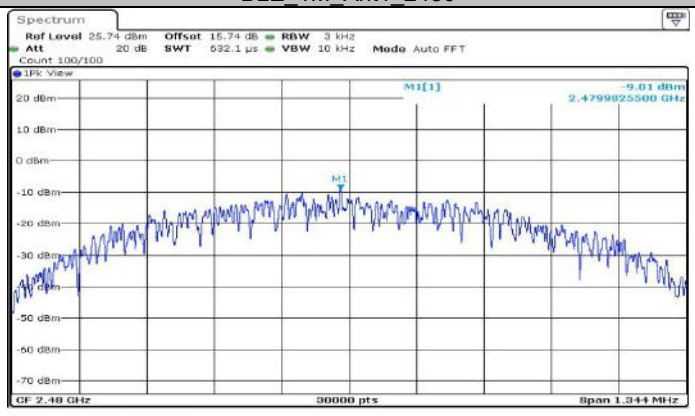
BLE_1M_Ant1_2402



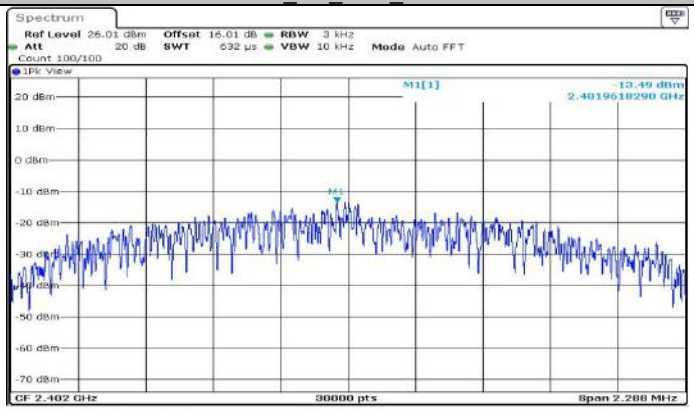
BLE_1M_Ant1_2440



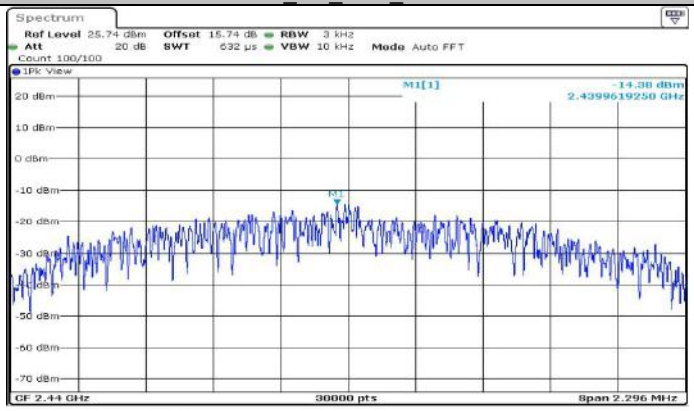
BLE_1M_Ant1_2480



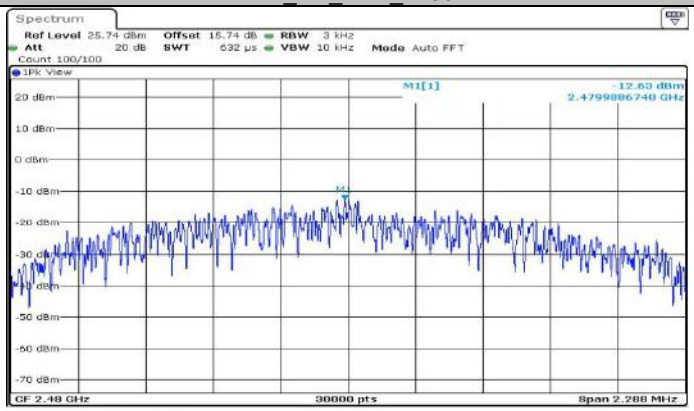
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



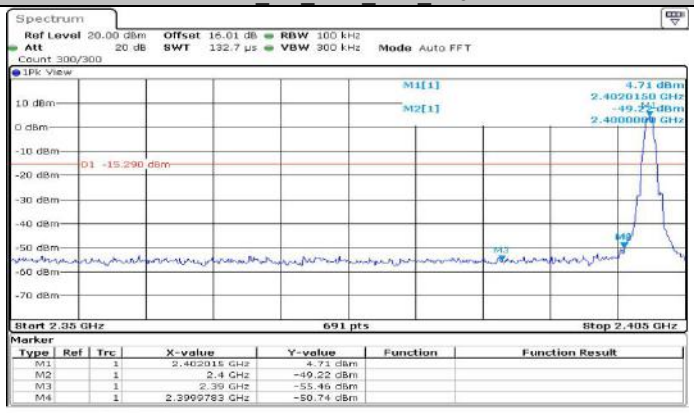
BLE_2M_Ant1_2480



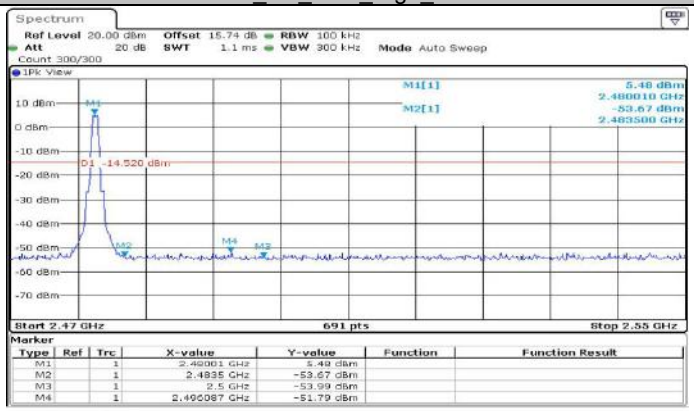
Appendix E:Band edge measurements

Test Graphs

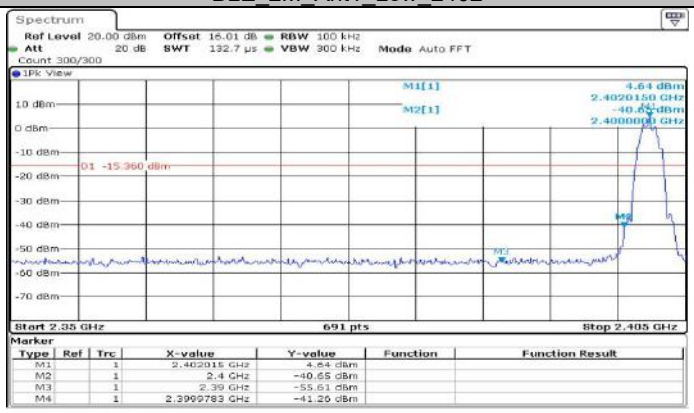
BLE_1M_Ant1_Low_2402



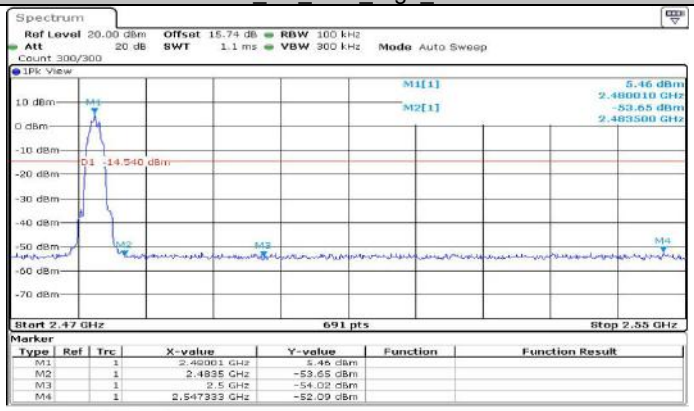
BLE_1M_Ant1_High_2480



BLE_2M_Ant1_Low_2402



BLE_2M_Ant1_High_2480



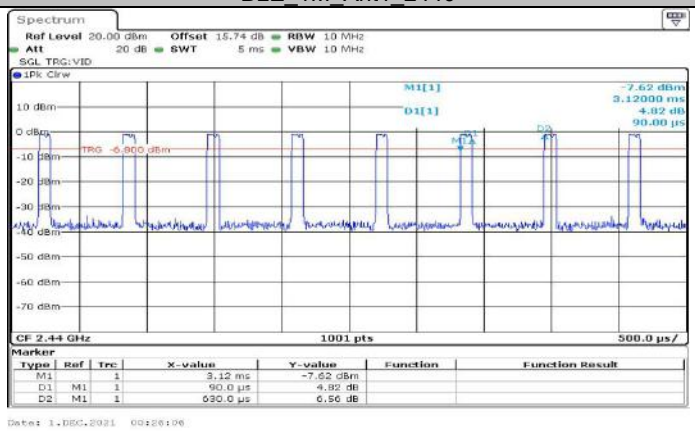
Appendix F: Duty Cycle

Test Result

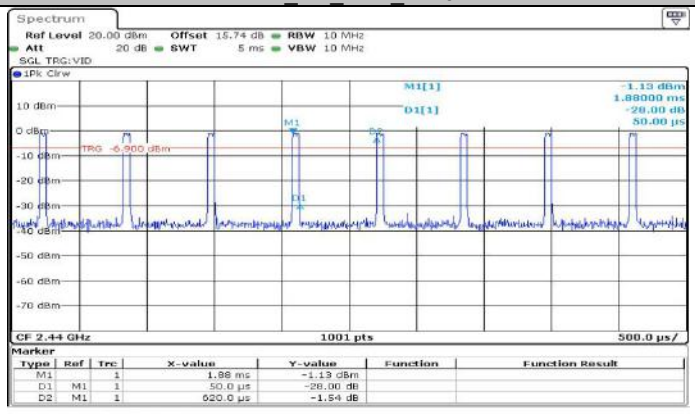
Test Mode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
BLE_1M	Ant1	2440	0.09	0.63	14.29
BLE_2M	Ant1	2440	0.05	0.62	8.06

Test Graphs

BLE_1M_Ant1_2440



BLE_2M_Ant1_2440



******* END OF REPORT *******