TEST REPORT

Applicant Name :	Invengo Information Technology Co., Ltd.
Address :	27th and 28th Floor,Hi-Tech Zone Union Tower, NO.63, Gaoxin South 10th Road, Nanshan District，Shenzhen,China
Report Number :	SZNS1220914-41680E-RF-00B
FCC ID:	TQ4-XC2908

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type:	Portable reader
Model No.:	XC2908
Multiple Model(s) No.:	XC2908-A,XC2908-B,XC2908-C,XC2908-D,XC2908-E, XC2908-F,XC2908-G,XC2908-H,XC2908-I,XC2908-J, XC2908-K,XC2908-L,XC2908-M,XC2908-N,XC2908-BM, XC-BM500,XC-RH500,AT908, XC2002,XC2005,XC9915
Trade Mark:	N/A
Date Received:	2022/09/14
Report Date:	2023/03/01

Test Result:	Pass*

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

Prepared and Checked By:

Andy Yu
EMC Engineer

Approved By:

Candy Li
EMC Engineer

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	SZNS1220914-41680E-RF-00B	Original Report	2023/03/01

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Portable reader
Tested Model	XC2908
Multiple Models	XC2908-A,XC2908-B,XC2908-C,XC2908-D,XC2908-E, XC2908-F,XC2908-G,XC2908-H,XC2908-I,XC2908-J, XC2908-K,XC2908-L,XC2908-M,XC2908-N,XC2908-BM, XC-BM500,XC-RH500,AT908, XC2002,XC2005,XC9915 (model difference see product declaration letter of similarity)
Frequency Range	BLE1/2M: 2402-2480MHz Wi-Fi: 2412-2462MHz
Maximum Conducted Peak Output Power	BLE 1M: -0.37dBm BLE 2M: -0.46dBm Wi-Fi: 18.49dBm(802.11b), 16.40dBm(802.11g), 16.38dBm(802.11n20), 15.96dBm(802.11n40)
Modulation Technique	BLE: GFSK Wi-Fi: DSSS, OFDM
Antenna Specification*	1.18dBi (provided by the applicant)
Voltage Range	3.7V from battery or DC 5V from adapter
Test Sample serial number	SZNS1220914-41680E-RF-S1 for Conducted and Radiated Emissions SZNS1220914-41680E-RF-S2 for RF Conducted Test (Assigned by ATC)
Sample/EUT Status	Good condition
Adapter information	Model: ICP20-050-3000B Input: AC 100-240V, 50/60Hz, 0.6A Output: DC 5.0V, 3.0A ,15.0W
Note: the series models are electrical identical, they may have slight difference in appearance, detail please refer to the DOS letter and External photo, the model XC2908 was selected to test.	

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.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
AC Line Conducted emission		2.72dB
Emissions, Radiated	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
Occupied Channel Bandwidth		5%
RF Frequency		$0.082*10^{-7}$
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB

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 2.4GHz Wi-Fi, 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, 6 and 11.
802.11n-HT40 mode was tested with Channel 3, 6 and 9.

For BLE 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

EUT was testing in an engineering mode and Power level which was provided by applicant is as below:

Mode	Data rate	Power Level*		
		Low channel	Middle channle	High channel
802.11b	1Mbps	Default	Default	Default
802.11g	6Mbps	Default	Default	Default
802.11n20	MCS0	Default	Default	Default
802.11n40	MCS0	Default	Default	Default
BLE 1M	1Mbps	Default	Default	Default
BLE 2M	2Mbps	Default	Default	Default

Duty cycle

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

Support Equipment List and Details

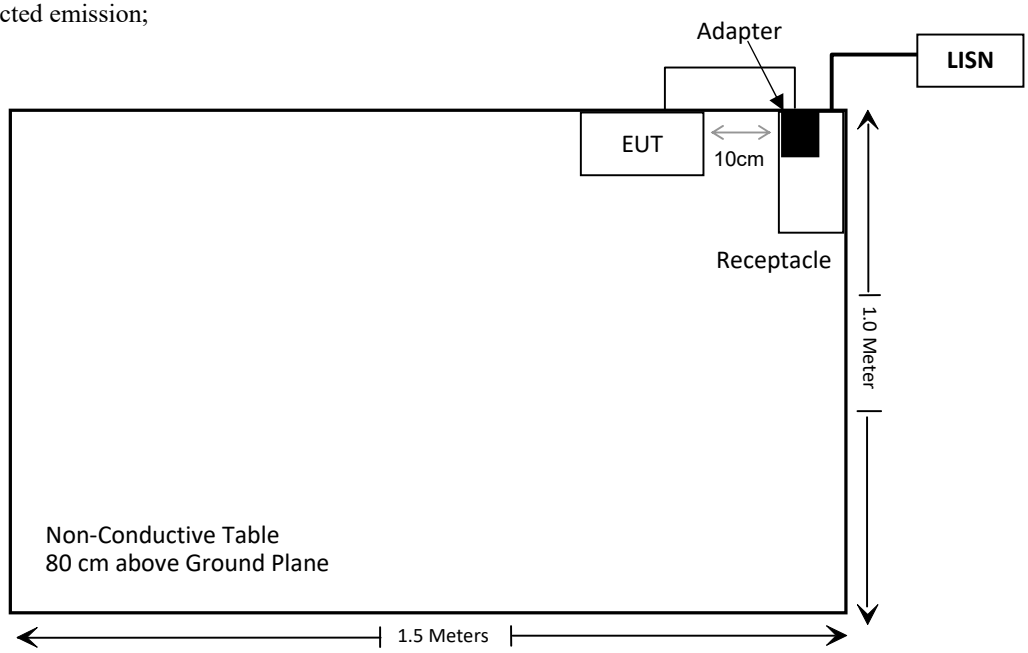
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

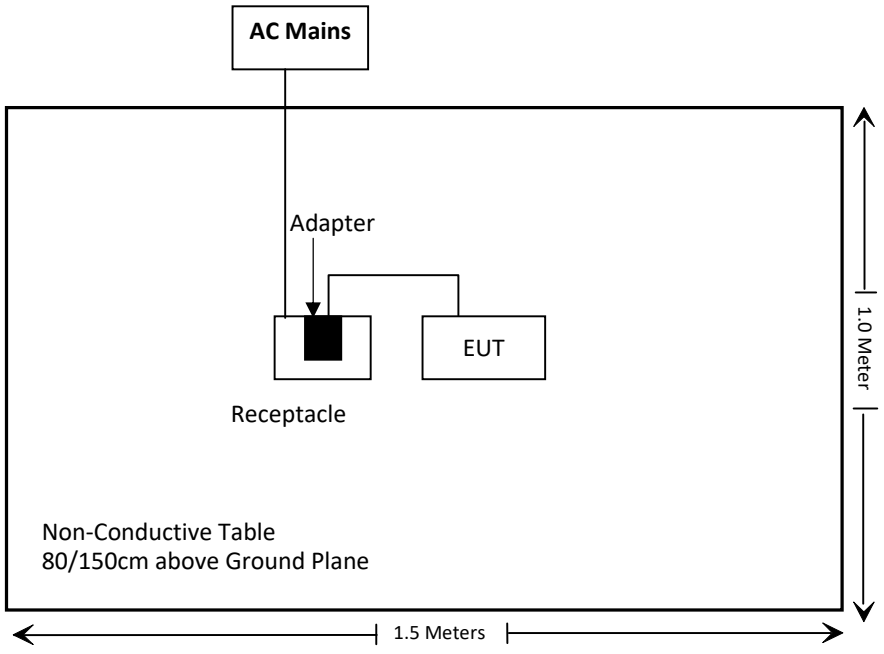
Cable Description	Length (m)	From Port	To
Un-shielded detachable DC cable	1.0	adapter	EUT

Block Diagram of Test Setup

For conducted emission;



For Radiated Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 1.1307 ,§2.1093	RF Exposure (SAR)	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	2021/12/13	2022/12/12
Rohde & Schwarz	L.I.S.N.	ENV216	101314	2021/12/13	2022/12/12
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2021/12/13	2022/12/12
Unknown	RF Coaxial Cable	No.17	N0350	2021/12/14	2022/12/13
Conducted Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2021/11/09	2022/11/08
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2021/11/11	2022/11/10
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
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	No.10	N050	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.15	N600	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.16	N650	2021/12/14	2022/12/13
Wainwright	High Pass Filter	WHKX3.6/18 G-10SS	5	2021/12/14	2022/12/13

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF conducted test					
Rohde&Schwarz	Spectrum Analyzer	FSV-40	101590	2022/01/19	2023/01/18
Tonscend	RF Control Unit	JS0806-2	19G8060182	2021/10/26	2022/10/25
Agilent	USB wideband power sensor	U2021XA	MY54250003	2022/6/27	2023/6/26
Unknown	RF Cable	Unknown	1	Each time	/
Rohde&Schwarz	Spectrum Analyzer	FSV-40	101948	2022/11/25	2023/11/24
WEINSCHEL	10dB Attenuator	5324	AU 3842	2022/11/25	2023/11/24

*** 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 §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliant, please refer to the SAR report: SZNS1220914-41680E-SA.

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 internal antenna which was permanently attached, and the maximum antenna gain is 1.18dBi, fulfill the requirement of this section. Please refer to the EUT photos.

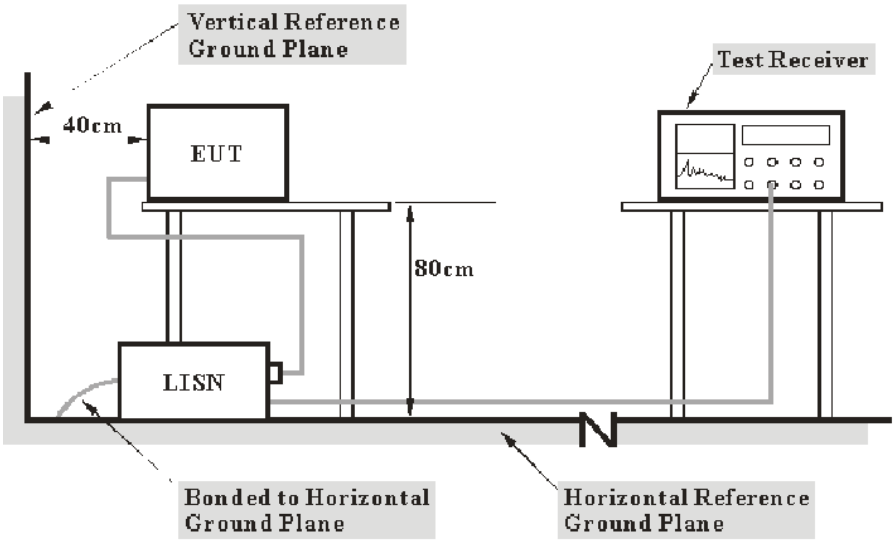
Result: Compliant.

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

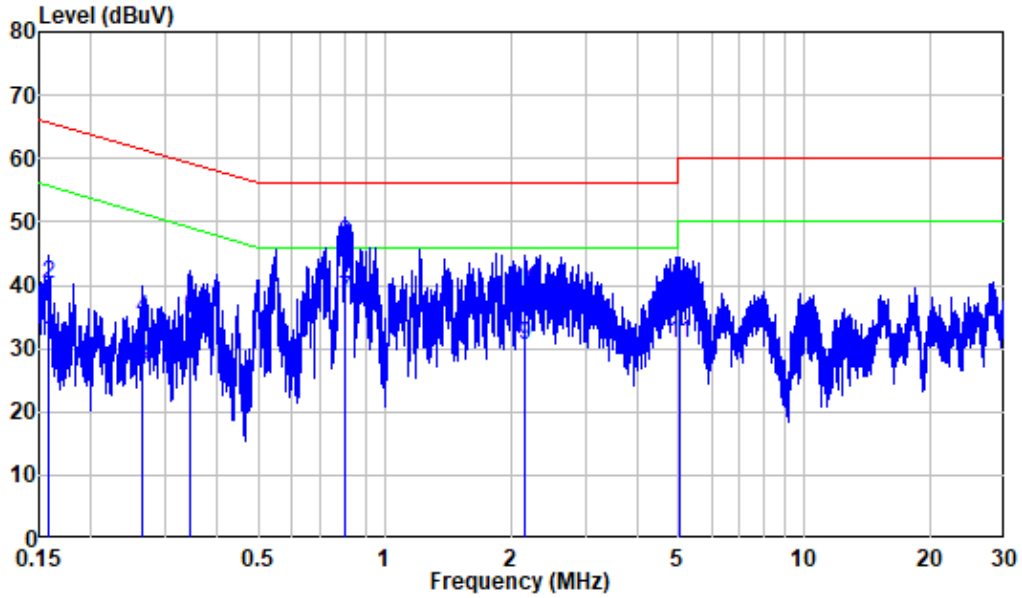
Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	40%
ATM Pressure:	101.0 kPa

The testing was performed by Jason Liu on 2022-10-21.

EUT operation mode: Transmitting (Worst case is 802.11n20, middle channel)

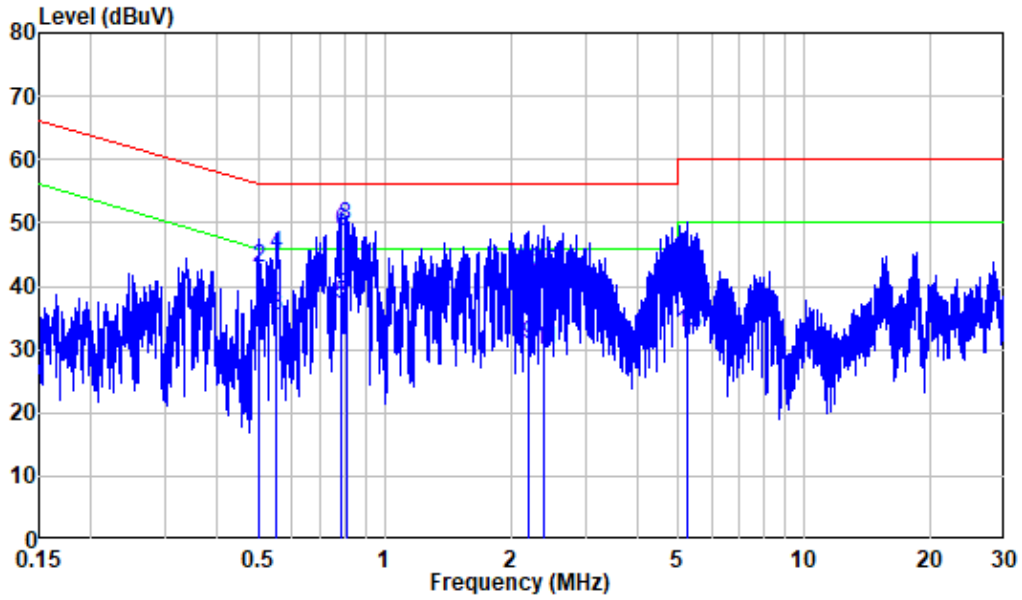
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : SZNS1220914-41680E-RF
Mode : 2.4G WIFI
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.158	9.80	21.21	31.01	55.58	-24.57	Average
2	0.158	9.80	30.48	40.28	65.58	-25.30	QP
3	0.264	9.80	17.49	27.29	51.31	-24.02	Average
4	0.264	9.80	24.86	34.66	61.31	-26.65	QP
5	0.344	9.80	17.62	27.42	49.11	-21.69	Average
6	0.344	9.80	25.23	35.03	59.11	-24.08	QP
7	0.802	9.81	27.98	37.79	46.00	-8.21	Average
8	0.802	9.81	36.62	46.43	56.00	-9.57	QP
9	2.155	9.82	20.72	30.54	46.00	-15.46	Average
10	2.155	9.82	29.00	38.82	56.00	-17.18	QP
11	5.048	9.85	20.83	30.68	50.00	-19.32	Average
12	5.048	9.85	29.08	38.93	60.00	-21.07	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral
Job No. : SZNS1220914-41680E-RF
Mode : 2.4G WIFI
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.499	9.80	22.92	32.72	46.02	-13.30	Average
2	0.499	9.80	33.19	42.99	56.02	-13.03	QP
3	0.554	9.81	25.59	35.40	46.00	-10.60	Average
4	0.554	9.81	35.32	45.13	56.00	-10.87	QP
5	0.784	9.81	27.33	37.14	46.00	-8.86	Average
6	0.784	9.81	38.93	48.74	56.00	-7.26	QP
7	0.808	9.81	28.45	38.26	46.00	-7.74	Average
8	0.808	9.81	39.67	49.48	56.00	-6.52	QP
9	2.191	9.82	20.95	30.77	46.00	-15.23	Average
10	2.191	9.82	32.59	42.41	56.00	-13.59	QP
11	2.399	9.82	20.03	29.85	46.00	-16.15	Average
12	2.399	9.82	32.13	41.95	56.00	-14.05	QP
13	5.246	9.90	22.57	32.47	50.00	-17.53	Average
14	5.246	9.90	33.10	43.00	60.00	-17.00	QP

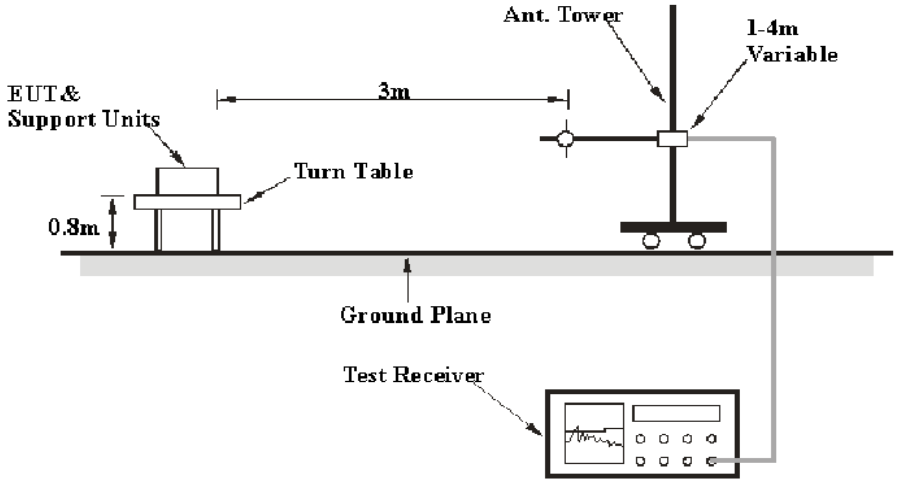
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

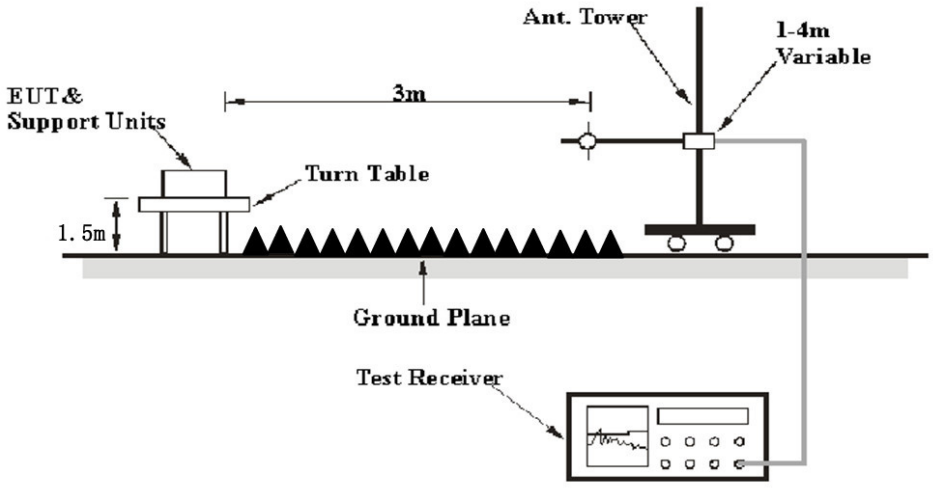
FCC §15.247 (d); §15.209; §15.205;

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:	24℃
Relative Humidity:	58%
ATM Pressure:	101.0~101.2 kPa

The testing was performed by Level Li on 2022-10-24 for below 1GHz, Jimi on 2022-10-21 for above 1GHz

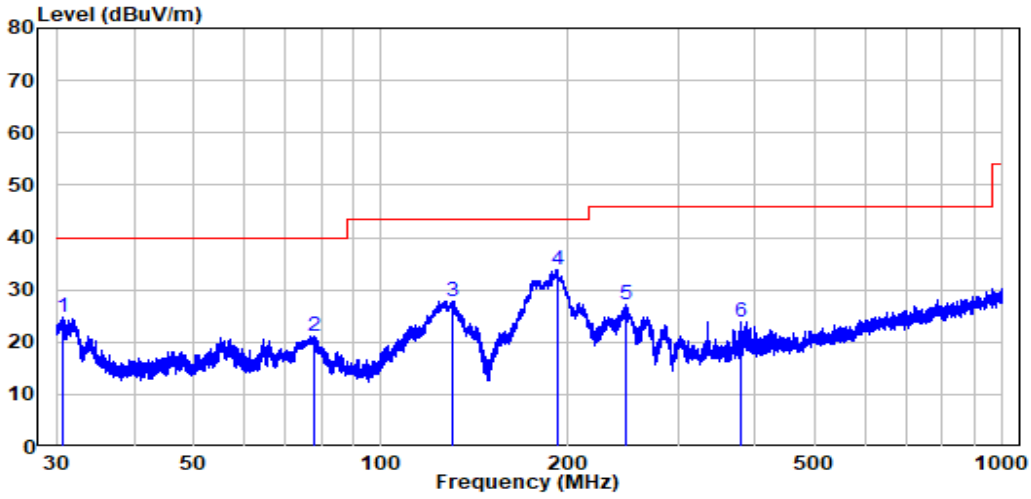
EUT operation mode: Transmitting

Note: Pre-scan in the X, Y and Z axes of orientation, the worst case X-axis of orientation was recorded

30MHz-1GHz: *(Worst case is 802.11n20, middle channel)*

Note: When the test result of Peak was less than the limit of QP, just the peak value was recorded.

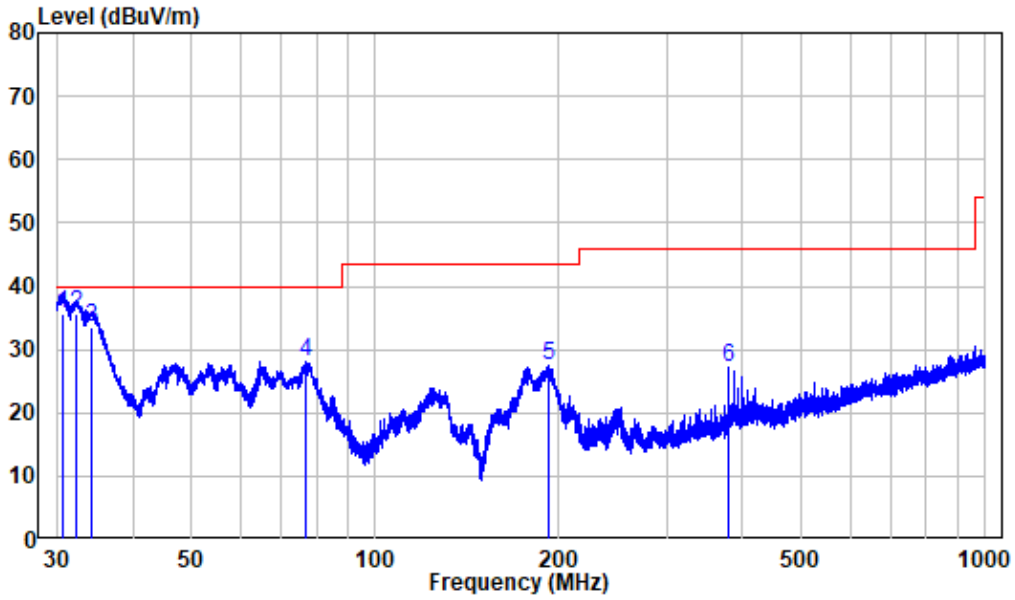
Horizontal:



Site : chamber
Condition: 3m HORIZONTAL
Job No. : SZNS1220914-41680E-RF
Test Mode: 2.4G WIFI Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.638	-12.33	37.16	24.83	40.00	-15.17	Peak
2	78.242	-16.62	37.75	21.13	40.00	-18.87	Peak
3	130.322	-14.90	42.79	27.89	43.50	-15.61	Peak
4	191.829	-11.28	45.04	33.76	43.50	-9.74	Peak
5	248.117	-10.68	37.75	27.07	46.00	-18.93	Peak
6	379.914	-7.14	31.05	23.91	46.00	-22.09	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : SZNS1220914-41680E-RF
Test Mode: 2.4G WIFI Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.826	-12.31	48.00	35.69	40.00	-4.31	QP
2	32.321	-12.12	47.88	35.76	40.00	-4.24	QP
3	34.261	-11.77	45.29	33.52	40.00	-6.48	QP
4	76.882	-16.50	44.69	28.19	40.00	-11.81	Peak
5	192.166	-11.26	38.73	27.47	43.50	-16.03	Peak
6	380.247	-7.14	34.23	27.09	46.00	-18.91	Peak

1-25 GHz:

BLE 1M:

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/Ave		Height (m)	Polar (H/V)				
BLE 1M, Low Channel									
2310	44.49	PK	66	1.2	H	-7.23	37.26	74	-36.74
2310	44.72	PK	30	1.2	V	-7.23	37.49	74	-36.51
2390	44.19	PK	4	1.2	H	-7.21	36.98	74	-37.02
2390	44.35	PK	168	1.7	V	-7.21	37.14	74	-36.86
4804	45.1	PK	135	1.8	H	-3.52	41.58	74	-32.42
4804	46.29	PK	252	1.1	V	-3.52	42.77	74	-31.23
BLE 1M, Middle Channel									
4880	43.95	PK	223	1.7	H	-3.38	40.57	74	-33.43
4880	44.23	PK	62	2.1	V	-3.38	40.85	74	-33.15
BLE 1M, High Channel									
2483.5	45.61	PK	3	2.2	H	-7.2	38.41	74	-35.59
2483.5	44.53	PK	215	2.1	V	-7.2	37.33	74	-36.67
2500	45.05	PK	316	1.7	H	-7.18	37.87	74	-36.13
2500	44.53	PK	102	1.3	V	-7.18	37.35	74	-36.65
4960	44.77	PK	237	1.9	H	-3.01	41.76	74	-32.24
4960	44.17	PK	98	2.0	V	-3.01	41.16	74	-32.84

BLE 2M:

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/Ave		Height (m)	Polar (H/V)				
BLE 2M, Low Channel									
2310	44.05	PK	66	1.2	H	-7.23	36.82	74	-37.18
2310	44.56	PK	30	1.2	V	-7.23	37.33	74	-36.67
2390	44.71	PK	4	1.2	H	-7.21	37.5	74	-36.5
2390	44.51	PK	168	1.7	V	-7.21	37.3	74	-36.7
4804	45.37	PK	135	1.8	H	-3.52	41.85	74	-32.15
4804	44.4	PK	252	1.1	V	-3.52	40.88	74	-33.12
BLE 2M, Middle Channel									
4880	44.83	PK	223	1.7	H	-3.38	41.45	74	-32.55
4880	44.49	PK	62	2.1	V	-3.38	41.11	74	-32.89
BLE 2M, High Channel									
2483.5	45.26	PK	3	2.2	H	-7.2	38.06	74	-35.94
2483.5	45.6	PK	215	2.1	V	-7.2	38.4	74	-35.6
2500	44.8	PK	316	1.7	H	-7.18	37.62	74	-36.38
2500	44.42	PK	102	1.3	V	-7.18	37.24	74	-36.76
4960	43.85	PK	237	1.9	H	-3.01	40.84	74	-33.16
4960	43.91	PK	98	2.0	V	-3.01	40.9	74	-33.1

Wi-Fi:

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/Ave		Height (m)	Polar (H/V)				
802.11b, Low Channel									
2310	44.03	PK	66	1.2	H	-7.23	36.80	74	-37.20
2310	43.31	PK	30	1.2	V	-7.23	36.08	74	-37.92
2390	47.13	PK	4	1.2	H	-7.21	39.92	74	-34.08
2390	44.76	PK	135	1.8	V	-7.21	37.55	74	-36.45
4824	45.89	PK	226	1.1	H	-3.53	42.36	74	-31.64
4824	45.19	PK	62	2.1	V	-3.53	41.66	74	-32.34
802.11 b, Middle Channel									
4874	45.84	PK	215	2.1	H	-3.42	42.42	74	-31.58
4874	44.11	PK	102	1.3	V	-3.42	40.69	74	-33.31
11 b, High Channel									
2483.5	48.33	PK	98	2.0	H	-7.2	41.13	74	-32.87
2483.5	47.19	PK	192	1.8	V	-7.2	39.99	74	-34.01
2500	46.78	PK	262	1.6	H	-7.18	39.60	74	-34.40
2500	46.09	PK	4	1.2	V	-7.18	38.91	74	-35.09
4924	45.98	PK	298	1.6	H	-3.16	42.82	74	-31.18
4924	45.13	PK	25	1.7	V	-3.16	41.97	74	-32.03
802.11g, Low Channel									
2310	44.87	PK	357	2.1	H	-7.23	37.64	74	-36.36
2310	44.52	PK	30	1.1	V	-7.23	37.29	74	-36.71
2390	66.94	PK	42	2.0	H	-7.21	59.73	74	-14.27
2390	45.66	AVG	42	2.0	H	-7.21	38.45	54	-15.55
2390	55.75	PK	51	2.1	V	-7.21	48.54	74	-25.46
4824	45.91	PK	132	1.1	H	-3.53	42.38	74	-31.62
4824	45.03	PK	317	1.1	V	-3.53	41.50	74	-32.50
802.11 g, Middle Channel									
4874	44.33	PK	236	1.6	H	-3.42	40.91	74	-33.09
4874	45.06	PK	246	1.5	V	-3.42	41.64	74	-32.36
802.11 g, High Channel									
2483.5	62.35	PK	237	2.0	H	-7.2	55.15	74	-18.85
2483.5	45.56	AVG	237	2.0	H	-7.2	38.36	54	-15.64
2483.5	56.31	PK	137	2.0	V	-7.2	49.11	74	-24.89
2500	48.3	PK	318	1.4	H	-7.18	41.12	74	-32.88
2500	47	PK	318	1.4	V	-7.18	39.82	74	-34.18
4924	44.25	PK	347	1.3	H	-3.16	41.09	74	-32.91
4924	44.7	PK	143	1.3	V	-3.16	41.54	74	-32.46

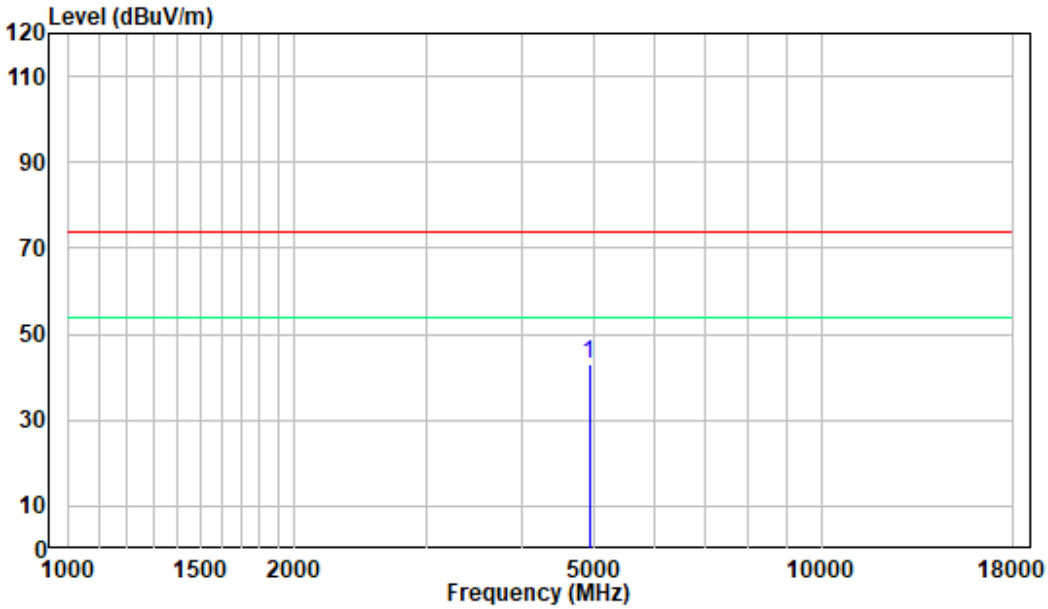
Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/Ave		Height (m)	Polar (H/V)				
802.11N20, Low Channel									
2310	43.43	PK	301	2.0	H	-7.23	36.20	74	-37.80
2310	44.26	PK	89	1.1	V	-7.23	37.03	74	-36.97
2390	57.58	PK	327	1.2	H	-7.21	50.37	74	-23.63
2390	60.29	PK	164	1.9	V	-7.21	53.08	74	-20.92
4824	45.4	PK	246	1.6	H	-3.53	41.87	74	-32.13
4824	45.38	PK	347	2.0	V	-3.53	41.85	74	-32.15
802.11N20, Middle Channel									
4874	43.82	PK	48	2.0	H	-3.42	40.40	74	-33.60
4874	44.53	PK	299	2.0	V	-3.42	41.11	74	-32.89
802.11N20, High Channel									
2483.5	65.67	PK	299	2.0	H	-7.2	58.47	74	-15.53
2483.5	48.97	AVG	299	2.0	H	-7.2	41.77	54	-12.23
2483.5	60.15	PK	292	1.7	V	-7.2	52.95	74	-21.05
2500	47.68	PK	26	2.1	H	-7.18	40.50	74	-33.50
2500	46.53	PK	26	2.1	V	-7.18	39.35	74	-34.65
4924	44.58	PK	184	1.6	H	-3.16	41.42	74	-32.58
4924	44.08	PK	354	1.6	V	-3.16	40.92	74	-33.08
802.11N40, Low Channel									
2310	43.9	PK	331	1.9	H	-7.23	36.67	74	-37.33
2310	44.43	PK	93	2.1	V	-7.23	37.20	74	-36.80
2390	67.04	PK	331	1.9	H	-7.21	59.83	74	-14.17
2390	51.28	AVG	331	1.9	H	-7.21	44.07	54	-9.93
2390	55.97	PK	84	1.8	V	-7.21	48.76	74	-25.24
4844	45.01	PK	58	1.8	H	-3.54	41.47	74	-32.53
4844	46.03	PK	254	1.5	V	-3.54	42.49	74	-31.51
802.11N40, Middle Channel									
4874	45.28	PK	306	2.1	H	-3.42	41.86	74	-32.14
4874	44.13	PK	219	1.5	V	-3.42	40.71	74	-33.29
802.11N40, High Channel									
2483.5	63.63	PK	341	1.3	H	-3.26	60.37	74	-13.63
2483.5	49.98	AVG	341	1.3	H	-3.26	46.72	54	-7.28
2483.5	61.7	PK	143	1.0	V	-3.26	58.44	74	-15.56
2483.5	42.18	AVG	143	1.0	V	-3.26	38.92	54	-15.08
2500	50.84	PK	128	2.1	H	-3.26	47.58	74	-26.42
2500	47.4	PK	336	1.2	V	-3.26	44.14	74	-29.86
4904	44.33	PK	100	1.5	H	-3.16	41.17	74	-32.83
4904	44.44	PK	49	1.1	V	-3.16	41.28	74	-32.72

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Corrected. Amplitude - Limit
The other spurious emission which is in the noise floor level was not recorded.
The test result of peak was less than the limit of average, so just peak value were recorded.

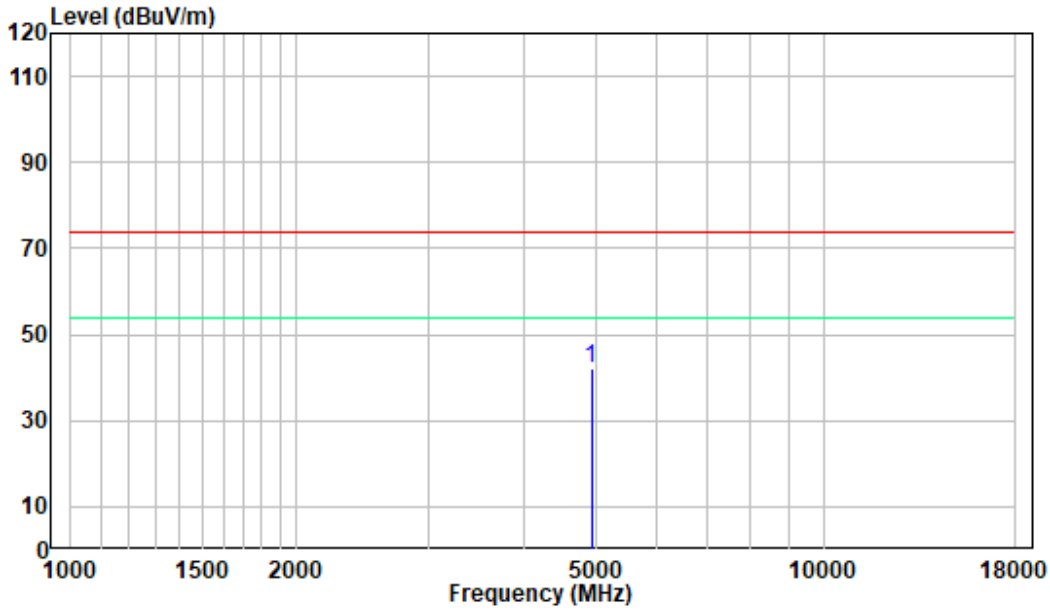
1-18 GHz:

Pre-scan for 802.11 b, high channel

Horizontal



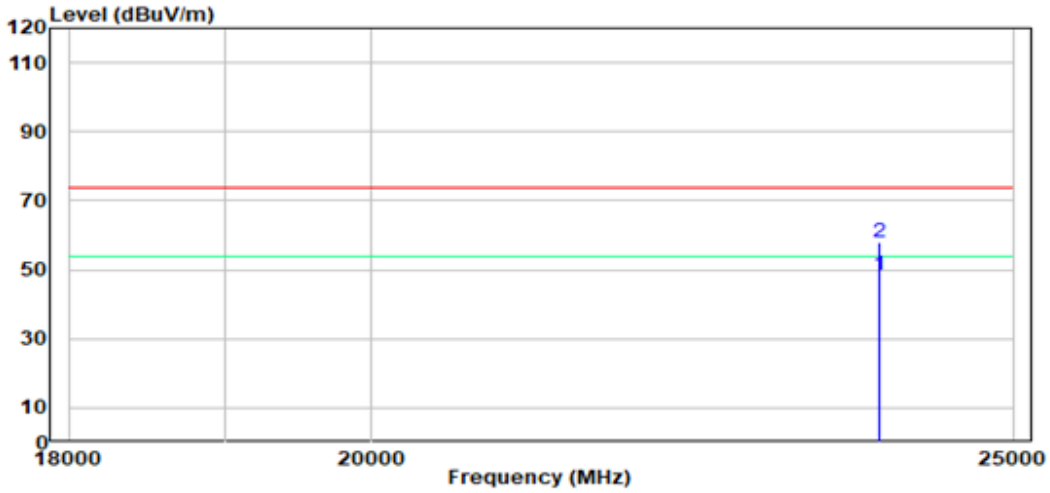
Vertical



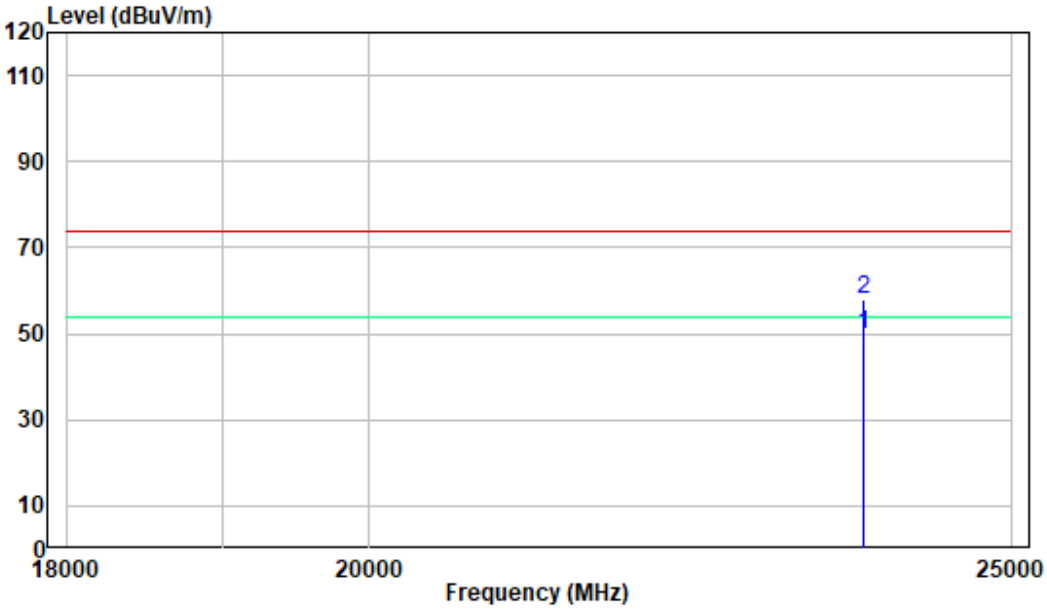
18 -25GHz:

Pre-scan for 802.11 b, high channel

Horizontal



Vertical



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

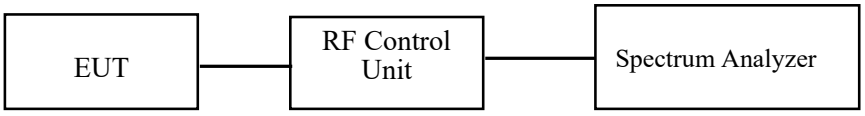
Applicable Standard

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

Test Method: ANSI C63.10-2013 Clause 11.8.1 & Clause 6.9.3

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:	27.5℃
Relative Humidity:	62%
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2022-10-14.

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.

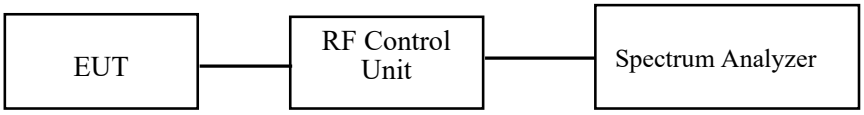
Test Procedure

For BLE:

Test Method: ANSI C63.10-2013 Clause 11.9.1.1

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW $\geqslant$ DTS bandwidth.
b) Set VBW $\geqslant$ [3 $\times$ RBW].
c) Set span $\geqslant$ [3 $\times$ RBW].
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

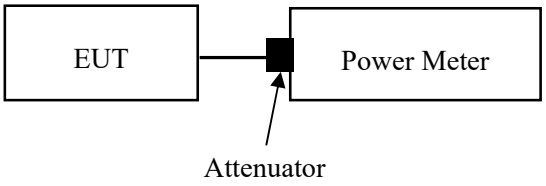


For Wi-Fi:

Test Method: ANSI C63.10-2013 Clause 11.9.2.3.2

Method AVGPM-G is a measurement using a gated RF average power meter.

Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.



Test Data

Environmental Conditions

Temperature:	27.5℃
Relative Humidity:	62%
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2022-10-14.

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

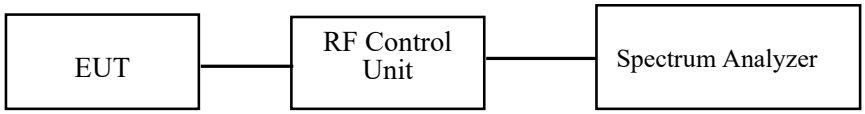
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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

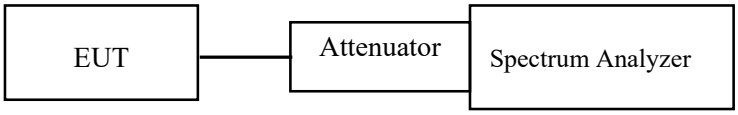
Test Method: ANSI C63.10-2013 Clause 11.11

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.

For BLE:



For Wi-Fi:



Test Data

Environmental Conditions

Temperature:	27.5℃
Relative Humidity:	62%
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2022-10-14 and 2023-03-01.

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

Test Method: ANSI C63.10-2013 Clause 11.10.2

If maximum peak conducted output power was measured, then the peak PSD procedure (method PKPSD) shall be used. If maximum conducted output power was measured, then one of the average PSD procedures shall be used.

For PKPSD measurement, according to ANSI C63.10-2013 section 11.10.2

Method PKPSD:

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

For AVGPSD measurement, according to ANSI C63.10-2013 section 11.10.3 or section 11.10.5

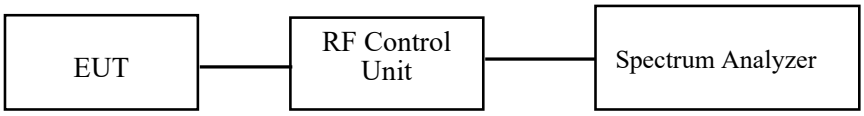
Methord AVGPSD-1: For the EUT transmits continuously (or with a Duty cycle ⩾ 98%)

a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set VBW ≥ [3 × RBW].
e) Detector = power averaging (rms) or sample detector (when rms not available).
f) Ensure that the number of measurement points in the sweep ≥ [2 × span / RBW].
g) Sweep time = auto couple.
h) Employ trace averaging (rms) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.
j) If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

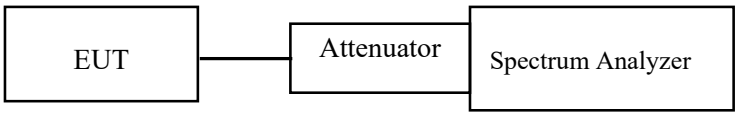
Methord AVGPSD-2: For the EUT transmits with a Duty cycle < 98% but with constant duty cycle during the measurement duration

a) Measure the duty cycle (D) of the transmitter output signal as described in 11.6 of ANSI C63.10-2013.
b) Set instrument center frequency to DTS channel center frequency.
c) Set span to at least 1.5 times the OBW.
d) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
e) Set VBW ≥ [3 × RBW].
f) Detector = power averaging (rms) or sample detector (when rms not available).
g) Ensure that the number of measurement points in the sweep ≥ [2 × span / RBW].
h) Sweep time = auto couple.
i) Do not use sweep triggering; allow sweep to "free run."
j) Employ trace averaging (rms) mode over a minimum of 100 traces.
k) Use the peak marker function to determine the maximum amplitude level.
l) Add [10 log (1 / D)], where D is the duty cycle measured in step a), to the measured PSD to compute the average PSD during the actual transmission time.
m) If measured value exceeds requirement specified by regulatory agency, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced)

For BLE:



For Wi-Fi:



Test Data

Environmental Conditions

Temperature:	27.5℃
Relative Humidity:	62%
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2022-10-14 and 2023-03-01.

EUT operation mode: Transmitting

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

APPENDIX Wi-Fi

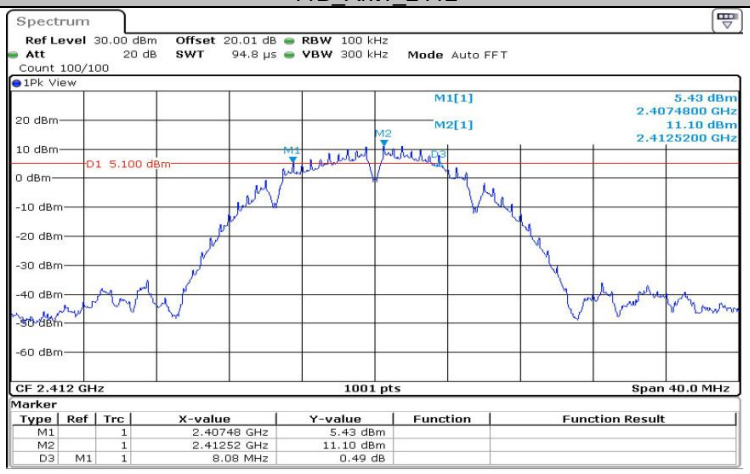
Appendix A: DTS Bandwidth

Test Result

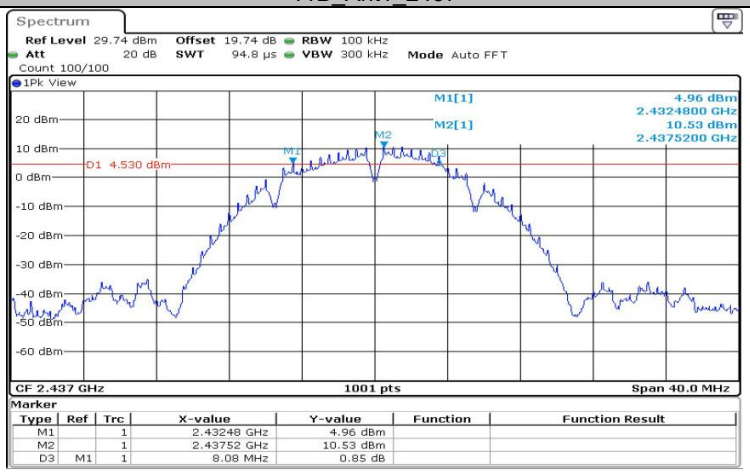
Test Mode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	8.08	2407.48	2415.56	0.5	PASS
		2437	8.08	2432.48	2440.56	0.5	PASS
		2462	7.08	2458.48	2465.56	0.5	PASS
11G	Ant1	2412	15.12	2404.44	2419.56	0.5	PASS
		2437	15.12	2429.44	2444.56	0.5	PASS
		2462	15.12	2454.44	2469.56	0.5	PASS
11N20SISO	Ant1	2412	15.12	2404.44	2419.56	0.5	PASS
		2437	15.12	2429.44	2444.56	0.5	PASS
		2462	15.44	2454.12	2469.56	0.5	PASS
11N40SISO	Ant1	2422	35.12	2404.48	2439.60	0.5	PASS
		2437	35.12	2419.48	2454.60	0.5	PASS
		2452	35.12	2434.48	2469.60	0.5	PASS

Test Graphs

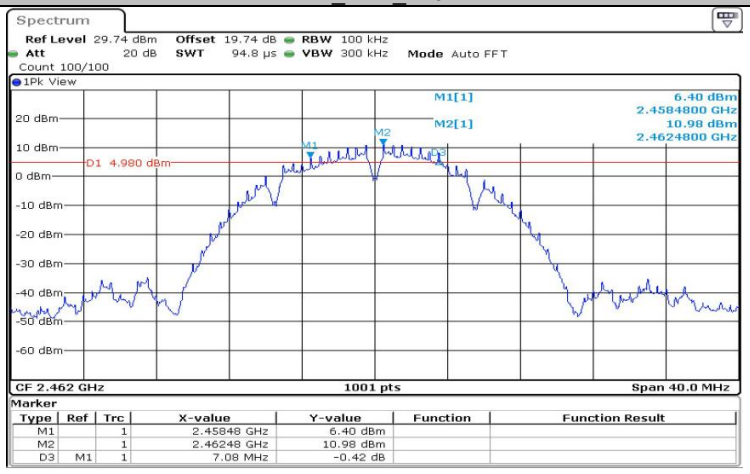
11B_Ant1_2412



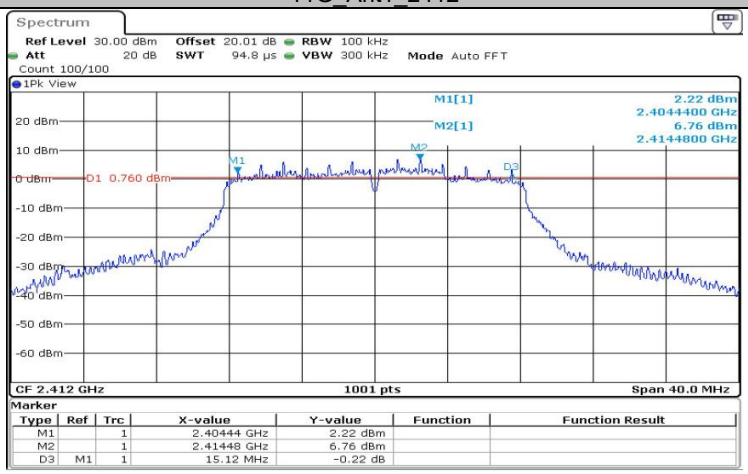
11B_Ant1_2437



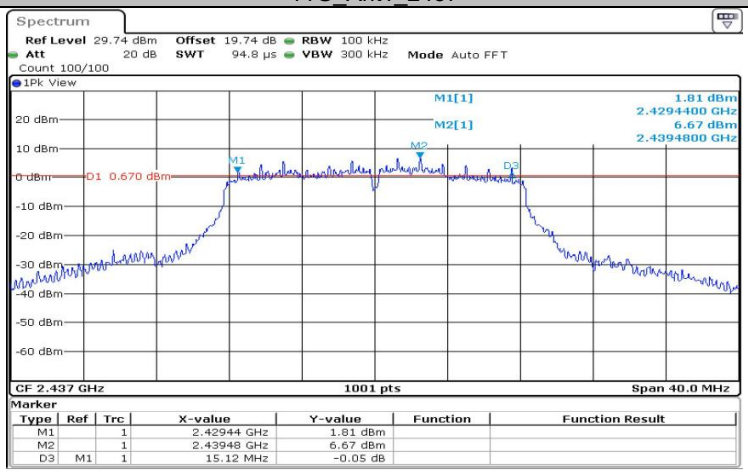
11B_Ant1_2462



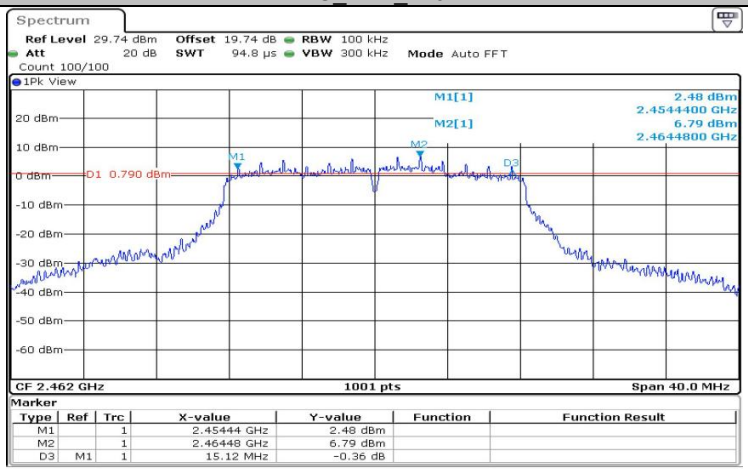
11G_Ant1_2412



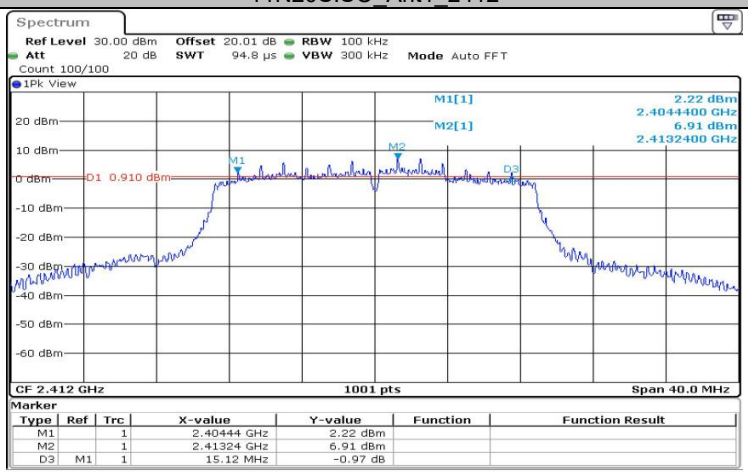
11G_Ant1_2437



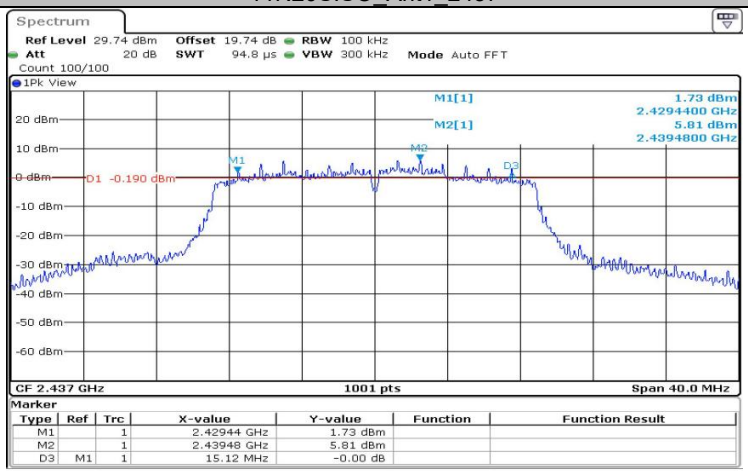
11G_Ant1_2462



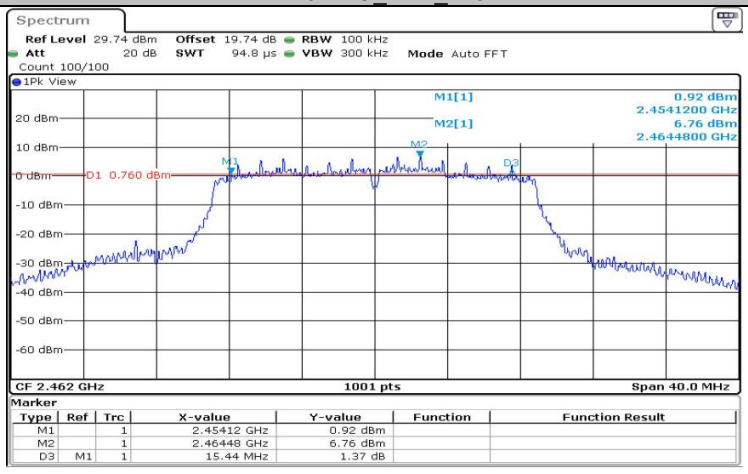
11N20SISO_Ant1_2412



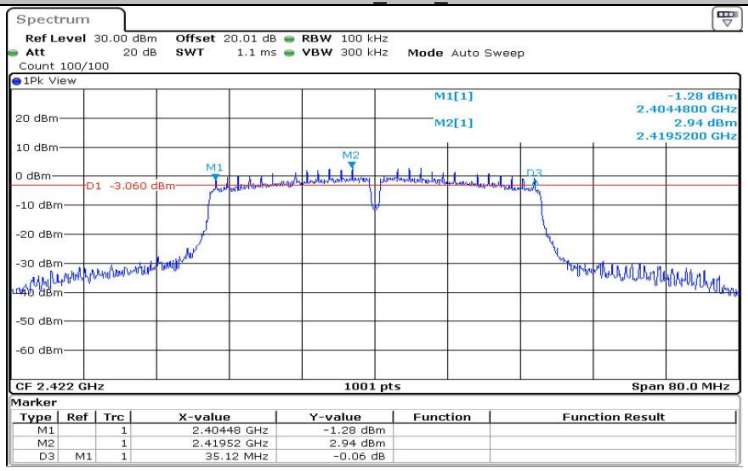
11N20SISO_Ant1_2437



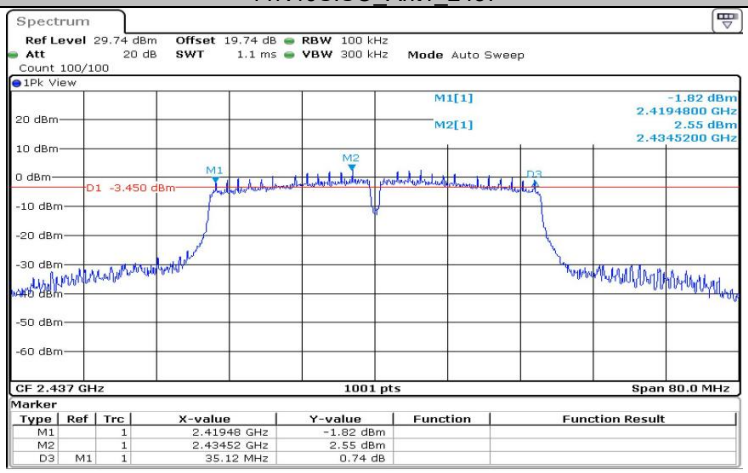
11N20SISO_Ant1_2462



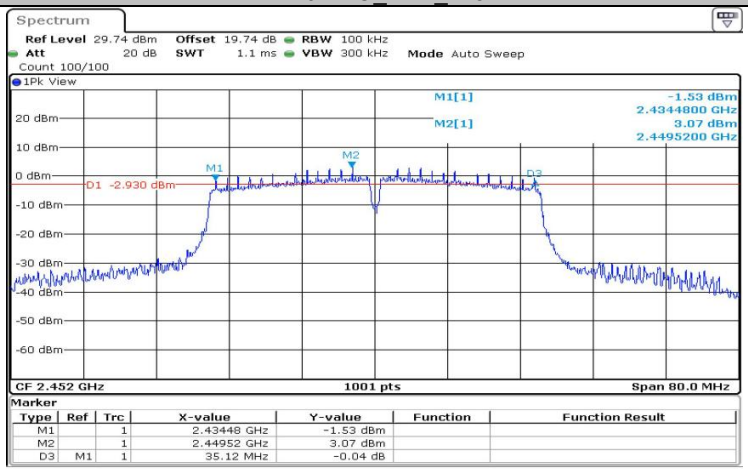
11N40SISO_Ant1_2422



11N40SISO_Ant1_2437



11N40SISO_Ant1_2452



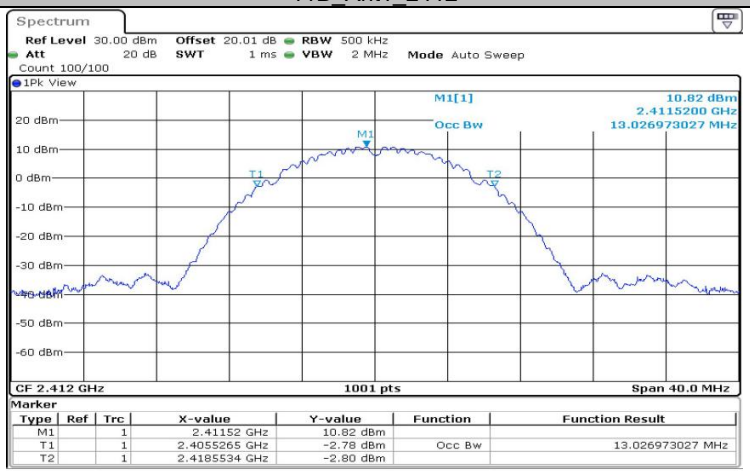
Appendix B: Occupied Channel Bandwidth

Test Result

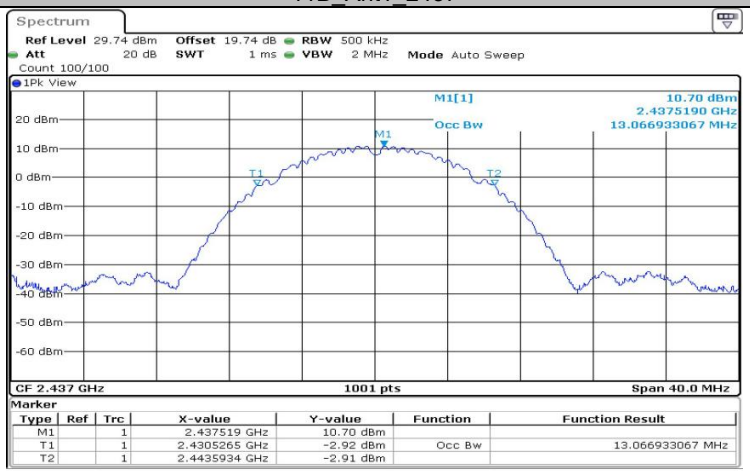
Test Mode	Antenna	Channel Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	13.027	2405.526	2418.553	---	---
		2437	13.067	2430.526	2443.593	---	---
		2462	13.067	2455.487	2468.553	---	---
11G	Ant1	2412	17.343	2403.329	2420.671	---	---
		2437	17.343	2428.329	2445.671	---	---
		2462	17.343	2453.329	2470.671	---	---
11N20SISO	Ant1	2412	18.302	2402.849	2421.151	---	---
		2437	18.342	2427.849	2446.191	---	---
		2462	18.302	2452.849	2471.151	---	---
11N40SISO	Ant1	2422	36.843	2403.698	2440.541	---	---
		2437	36.843	2418.698	2455.541	---	---
		2452	36.683	2433.778	2470.462	---	---

Test Graphs

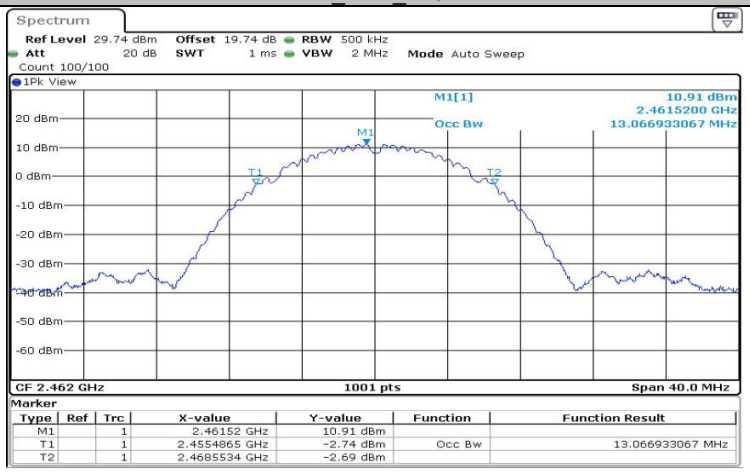
11B_Ant1_2412



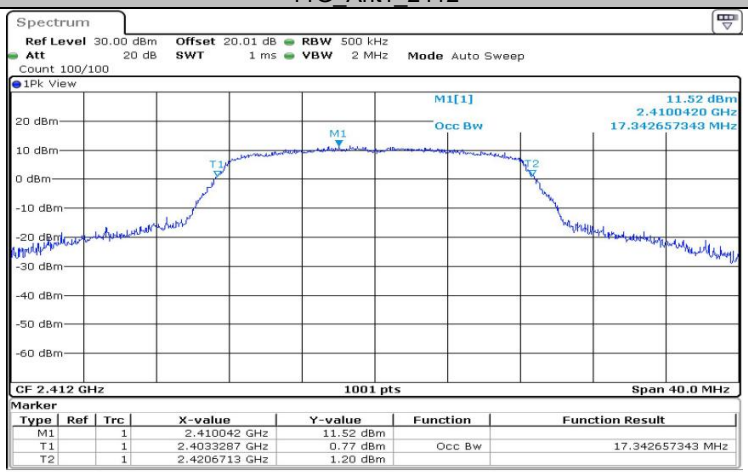
11B_Ant1_2437



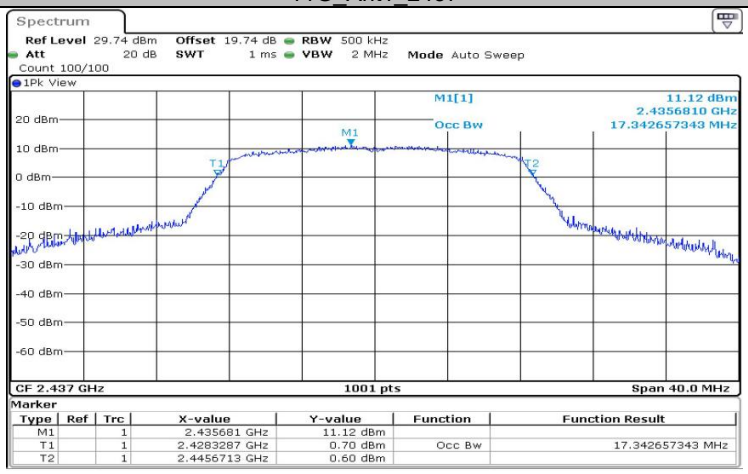
11B_Ant1_2462



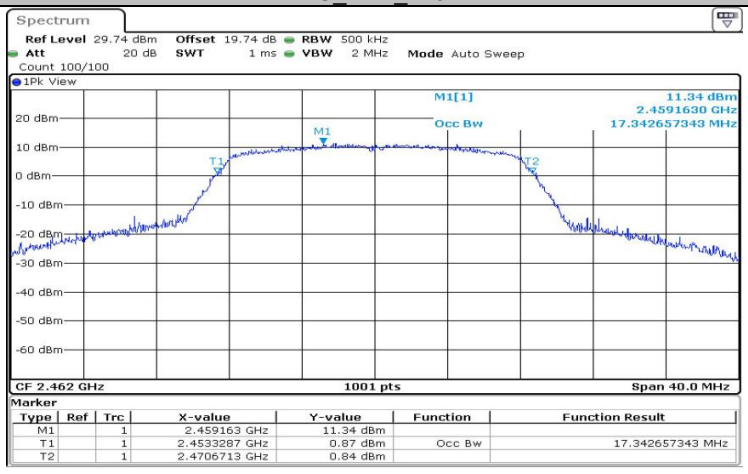
11G_Ant1_2412



11G_Ant1_2437

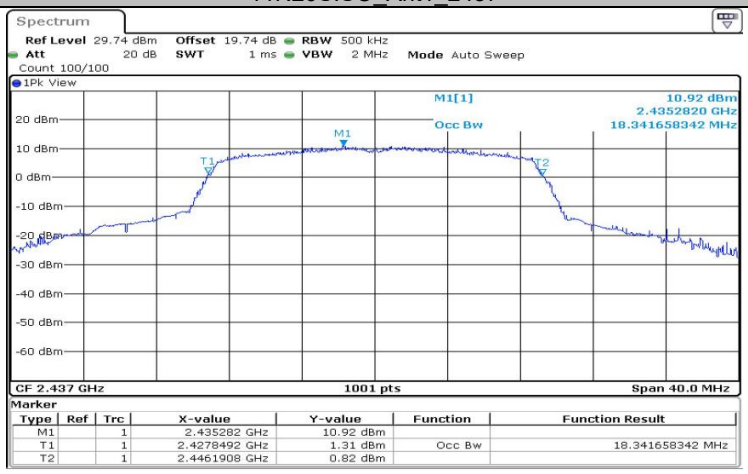


11G_Ant1_2462

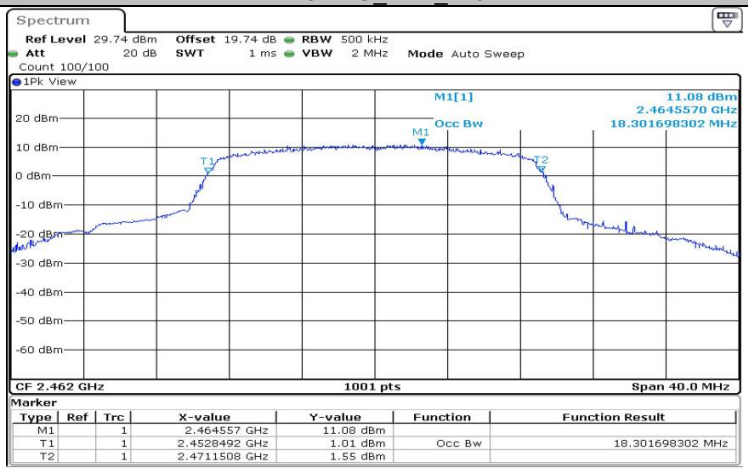


11N20SISO_Ant1_2412

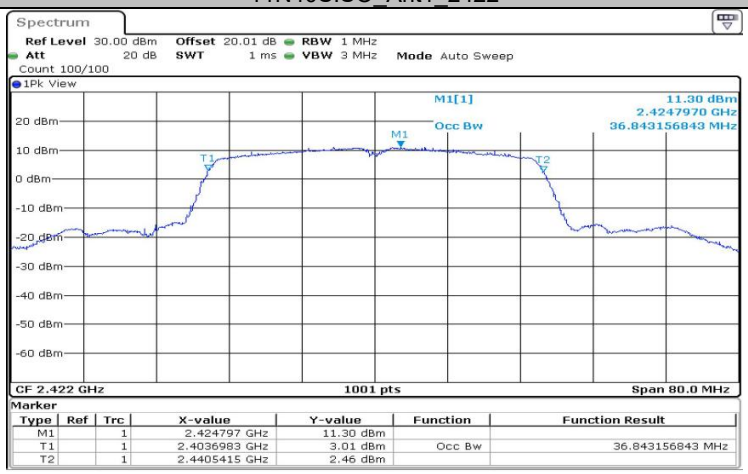
11N20SISO_Ant1_2437



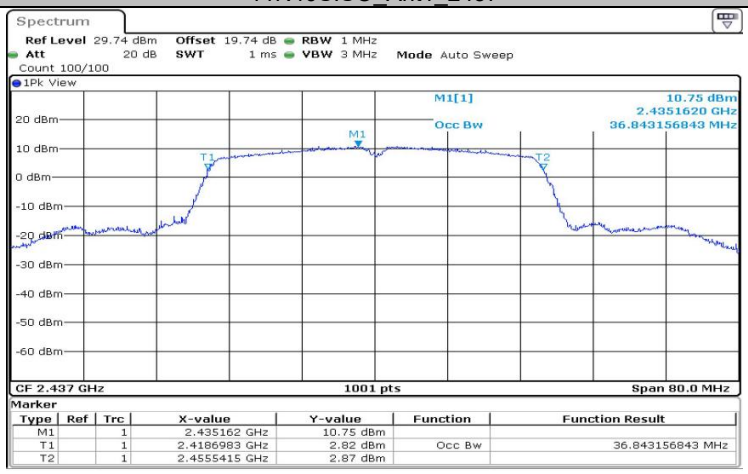
11N20SISO_Ant1_2462



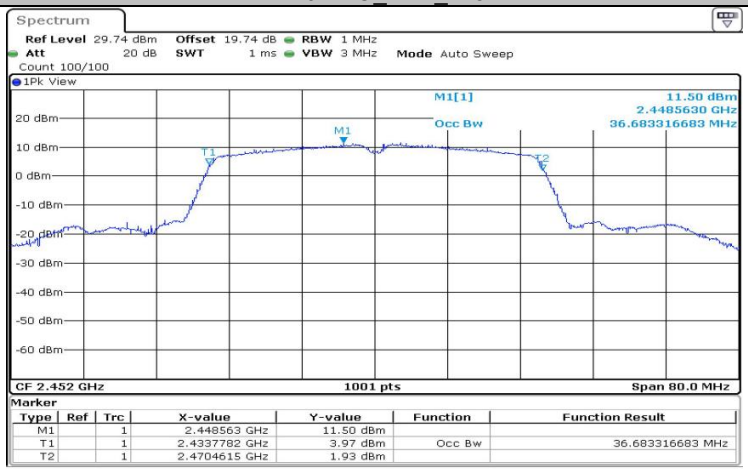
11N40SISO_Ant1_2422



11N40SISO_Ant1_2437



11N40SISO_Ant1_2452



Appendix C: Maximum conducted output power

Test Result (Average)

Test Mode	Antenna	Frequency[MHz]	Average Power[dBm]	Conducted Limit[dBm]	Verdict
11B	Ant1	2412	18.35	≤30.00	PASS
		2437	17.50	≤30.00	PASS
		2462	18.49	≤30.00	PASS
11G	Ant1	2412	15.28	≤30.00	PASS
		2437	16.40	≤30.00	PASS
		2462	15.42	≤30.00	PASS
11N20SISO	Ant1	2412	16.33	≤30.00	PASS
		2437	16.38	≤30.00	PASS
		2462	16.17	≤30.00	PASS
11N40SISO	Ant1	2422	15.96	≤30.00	PASS
		2437	15.86	≤30.00	PASS
		2452	15.75	≤30.00	PASS

Appendix D: Maximum power spectral density

Test Result

Test Mode	Antenna	Frequency[MHz]	Measured [dBm/10kHz]	Duty cycle factor [dB]	PSD[dBm/10kHz]	Limit[dBm/3kHz]
11B	Ant1	2412	-7.91	/	-7.91	≤8.00
		2437	-7.73	/	-7.73	≤8.00
		2462	-7.28	/	-7.28	≤8.00
11G	Ant1	2412	-11.66	0.12	-11.54	≤8.00
		2437	-11.95	0.12	-11.83	≤8.00
		2462	-11.55	0.12	-11.43	≤8.00
11N20SISO	Ant1	2412	-12.01	0.16	-11.85	≤8.00
		2437	-12.10	0.16	-11.94	≤8.00
		2462	-11.96	0.16	-11.80	≤8.00
11N40SISO	Ant1	2422	-14.74	0.26	-14.48	≤8.00
		2437	-15.06	0.26	-14.80	≤8.00
		2452	-15.03	0.26	-14.77	≤8.00

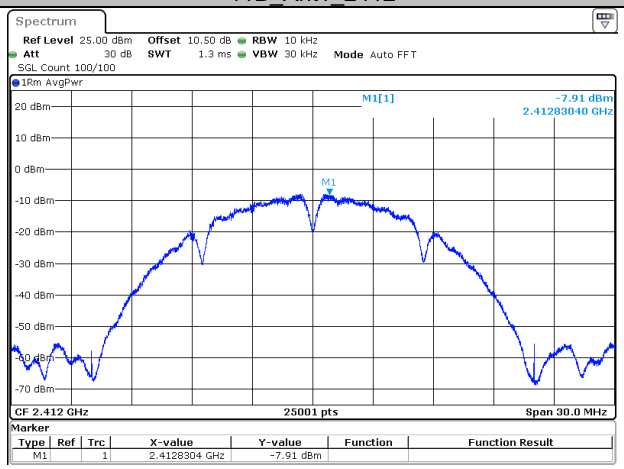
Note: PSD=measured level + duty cycle factor

The duty cycle factor please refer Appendix F

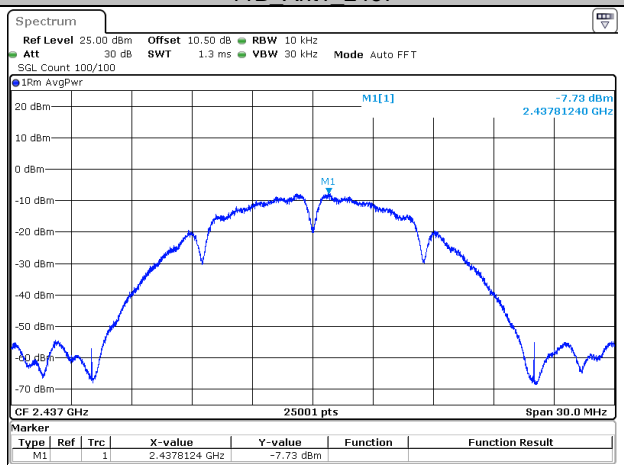
Only when the duty cycle less than 98%, the duty cycle factor applied.

Test Graphs

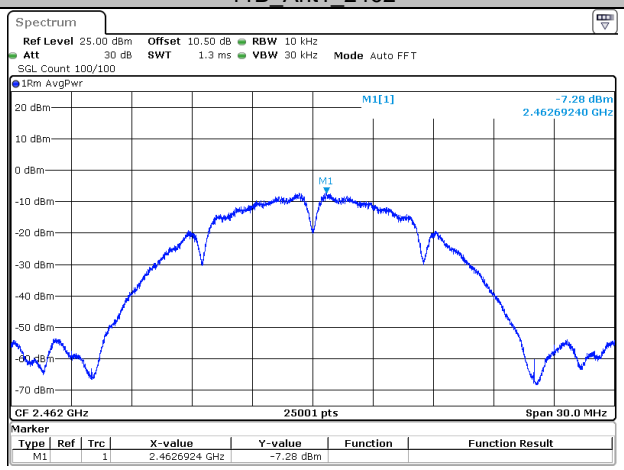
11B_Ant1_2412



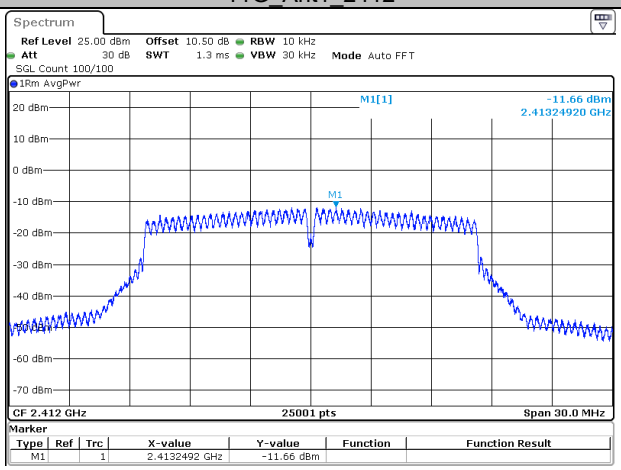
11B_Ant1_2437



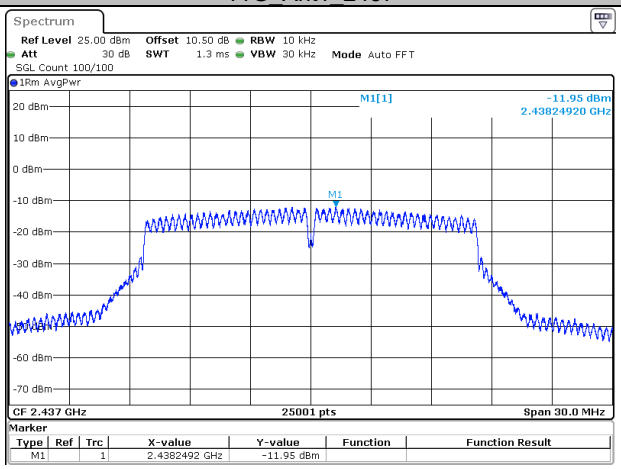
11B_Ant1_2462



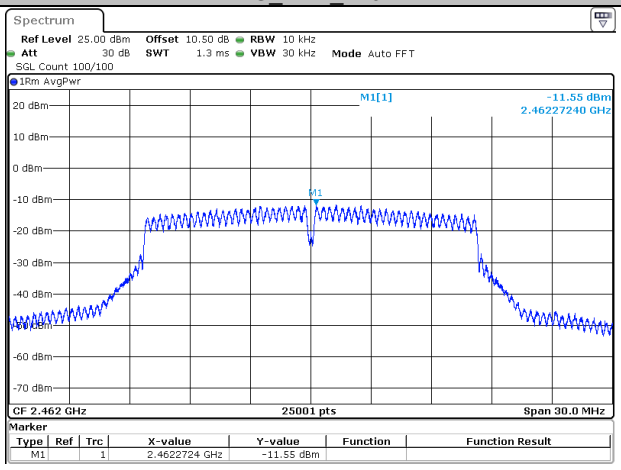
11G_Ant1_2412



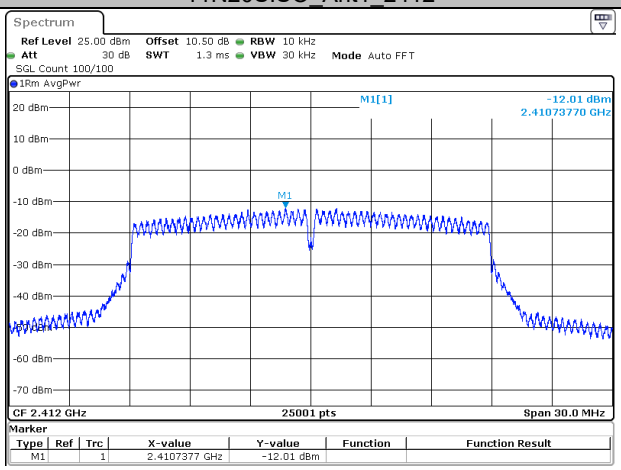
11G_Ant1_2437



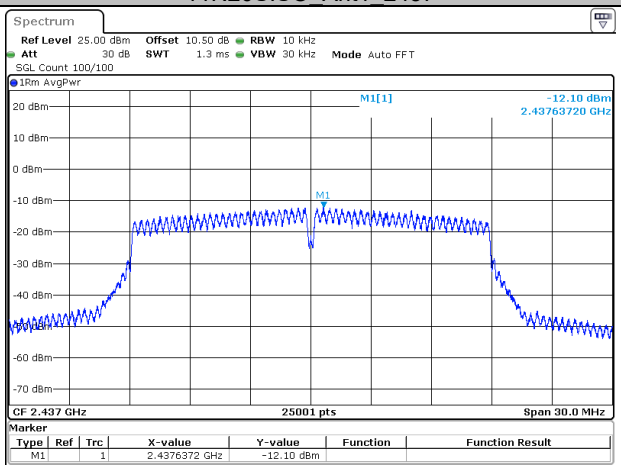
11G_Ant1_2462



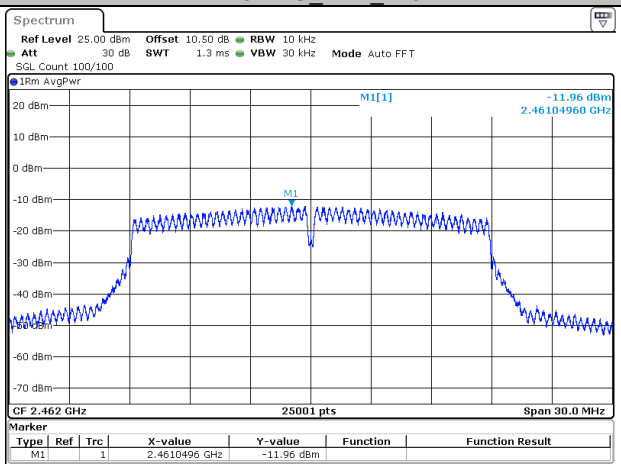
11N20SISO_Ant1_2412



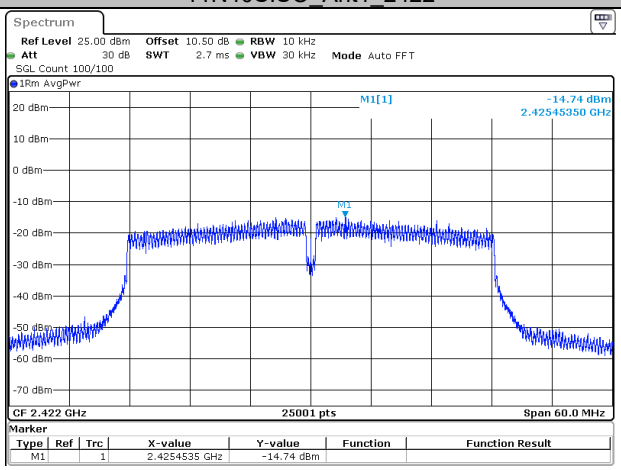
11N20SISO_Ant1_2437



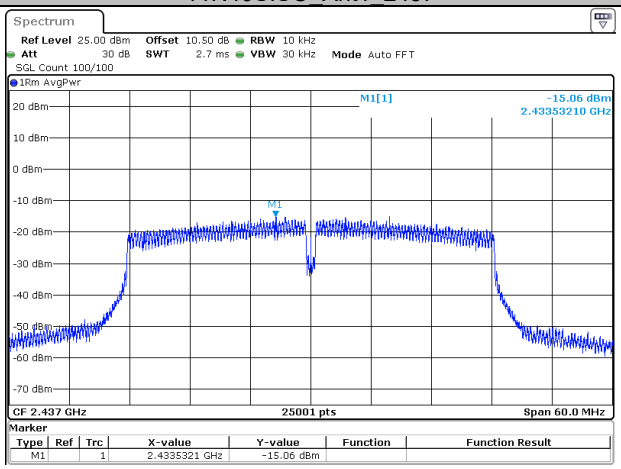
11N20SISO_Ant1_2462



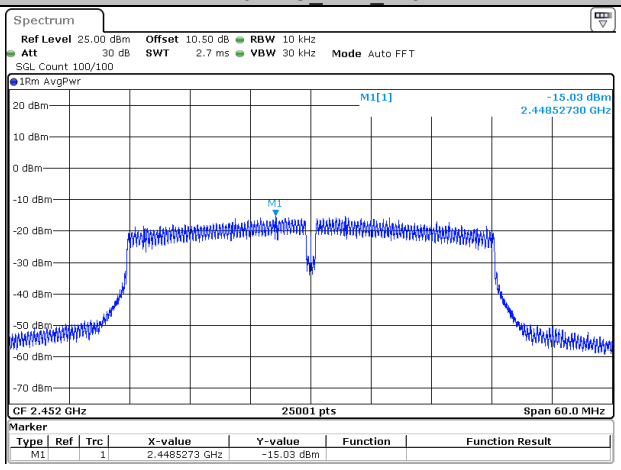
11N40SISO_Ant1_2422



11N40SISO_Ant1_2437



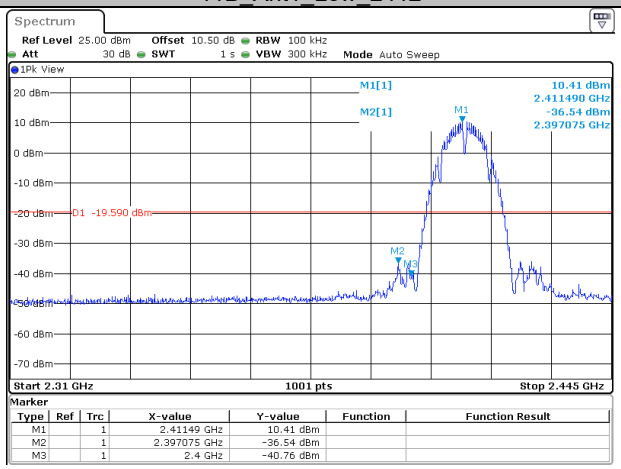
11N40SISO_Ant1_2452



Appendix E: Band edge measurements

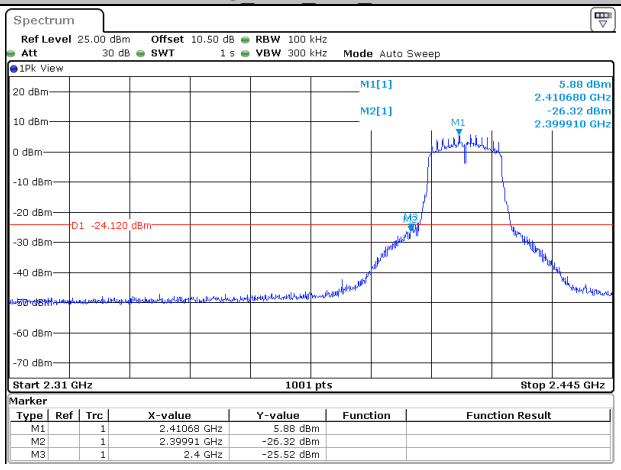
Test Graphs

11B_Ant1_Low_2412

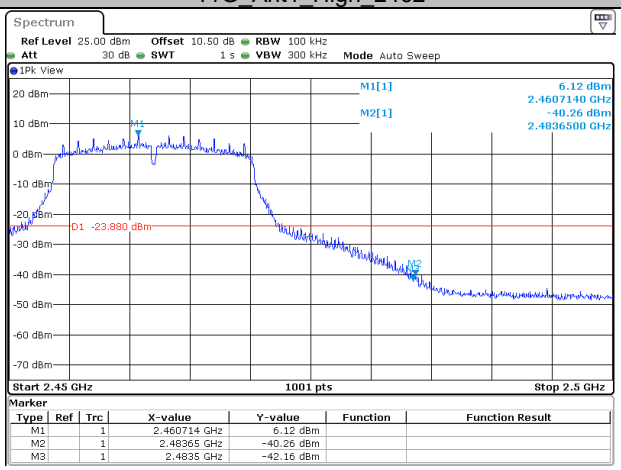


11B_Ant1_High_2462

11G_Ant1_Low_2412



11G_Ant1_High_2462

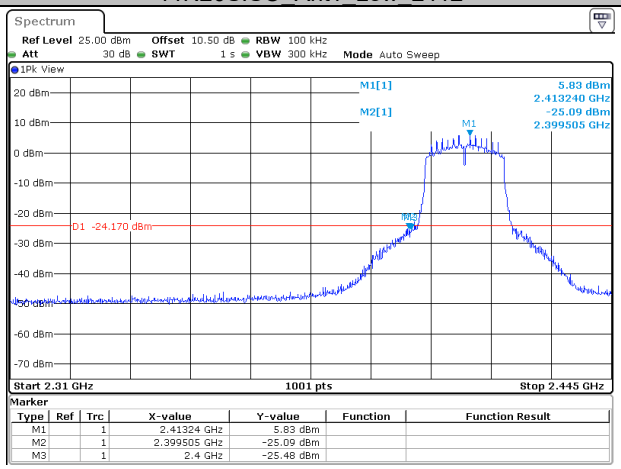


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.460714 GHz	6.12 dBm		
M2		1	2.48365 GHz	-40.26 dBm		
M3		1	2.4835 GHz	-42.16 dBm		

Date: 1.MAR.2023 19:07:46

11N20SISO_Ant1_Low_2412

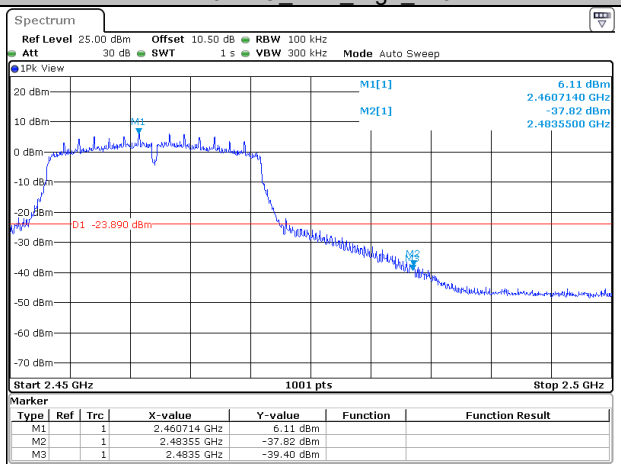


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41324 GHz	5.83 dBm		
M2		1	2.399505 GHz	-25.09 dBm		
M3		1	2.4 GHz	-25.48 dBm		

Date: 1.MAR.2023 19:09:01

11N20SISO_Ant1_High_2462

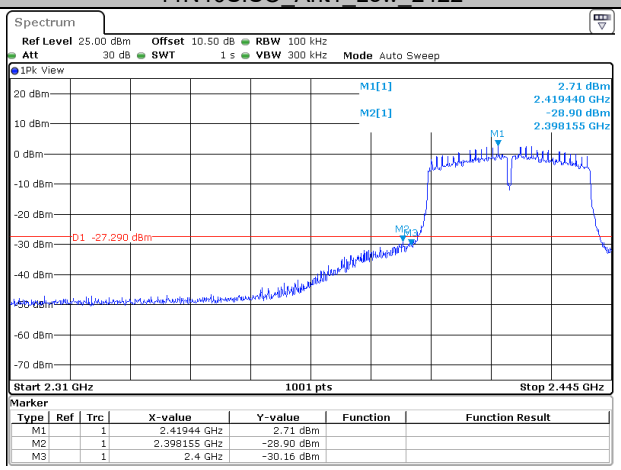


Marker

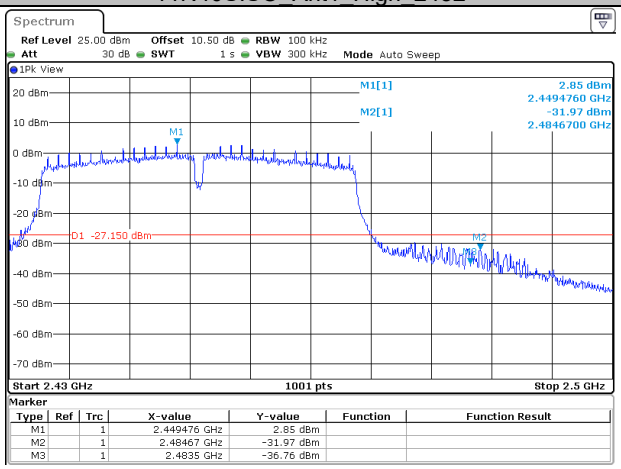
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.460714 GHz	6.11 dBm		
M2		1	2.48355 GHz	-37.82 dBm		
M3		1	2.4835 GHz	-39.40 dBm		

Date: 1.MAR.2023 19:11:10

11N40SISO_Ant1_Low_2422



11N40SISO_Ant1_High_2452



Appendix F: Duty Cycle

Test Result

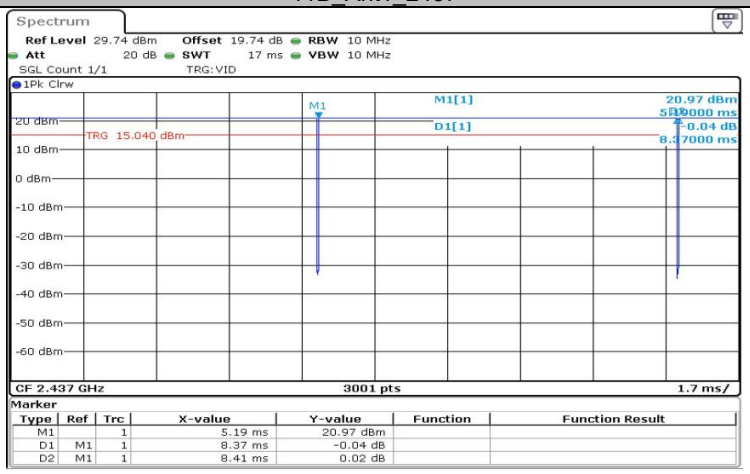
Test Mode	Antenna	Frequency[MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]	1/T Minimum VBW[kHz]
11B	Ant1	2437	8.37	8.41	99.52	/	/
11G	Ant1	2437	1.40	1.44	97.22	0.12	0.714
11N20SISO	Ant1	2437	1.30	1.35	96.30	0.16	0.769
11N40SISO	Ant1	2437	0.65	0.69	94.20	0.26	1.538

Note: duty cycle factor=10*log10(1/duty cycle)

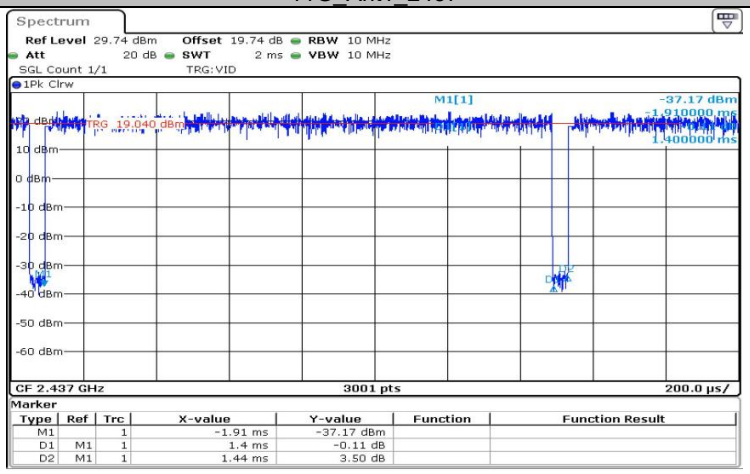
Only when the duty cycle less than 98%, the duty cycle factor and 1/T was used for test.

Test Graphs

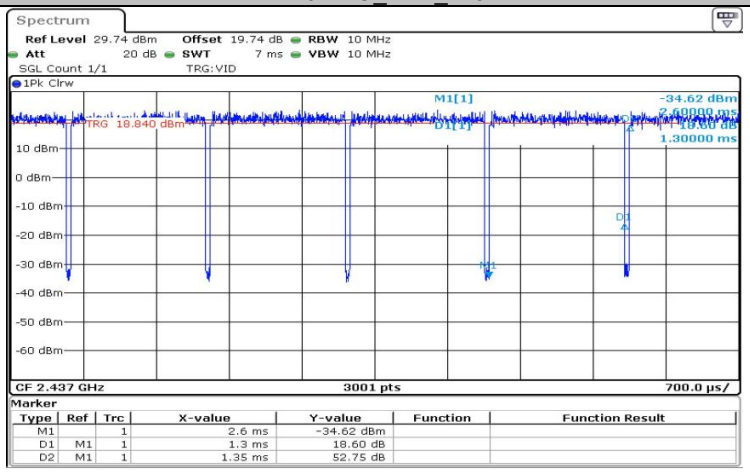
11B_Ant1_2437



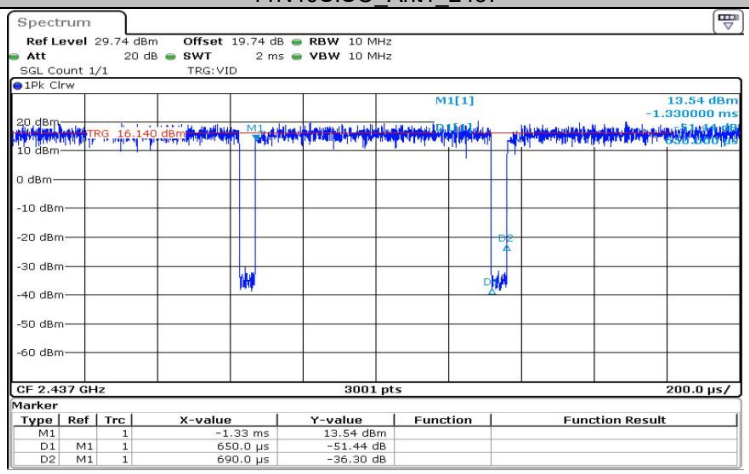
11G_Ant1_2437



11N20SISO_Ant1_2437



11N40SISO_Ant1_2437



APPENDIX BLE

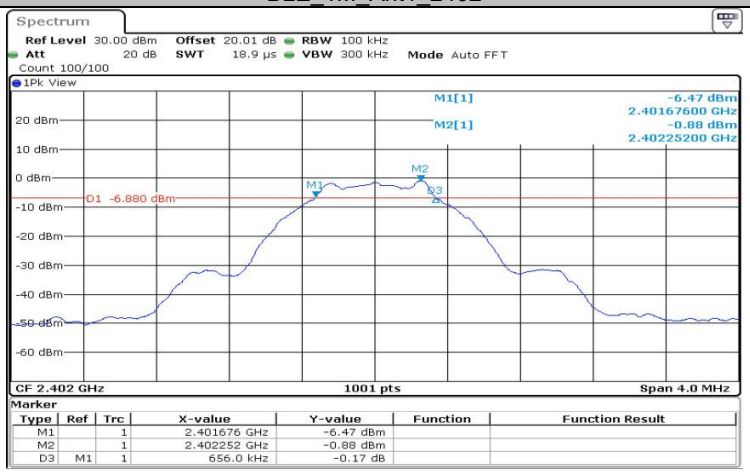
Appendix A: DTS Bandwidth

Test Result

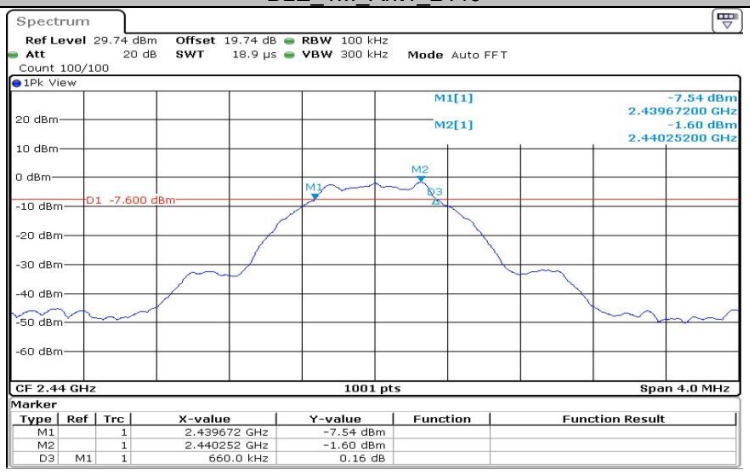
Test Mode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.66	2401.68	2402.33	0.5	PASS
		2440	0.66	2439.67	2440.33	0.5	PASS
		2480	0.66	2479.67	2480.33	0.5	PASS
BLE_2M	Ant1	2402	1.16	2401.43	2402.58	0.5	PASS
		2440	1.16	2439.43	2440.58	0.5	PASS
		2480	1.16	2479.43	2480.58	0.5	PASS

Test Graphs

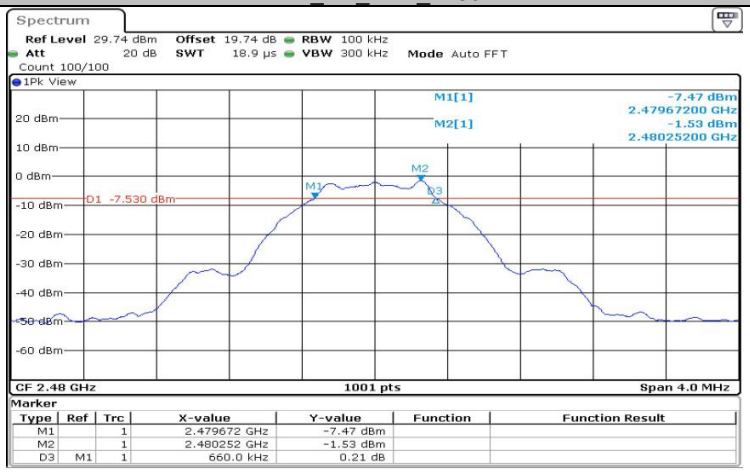
BLE_1M_Ant1_2402



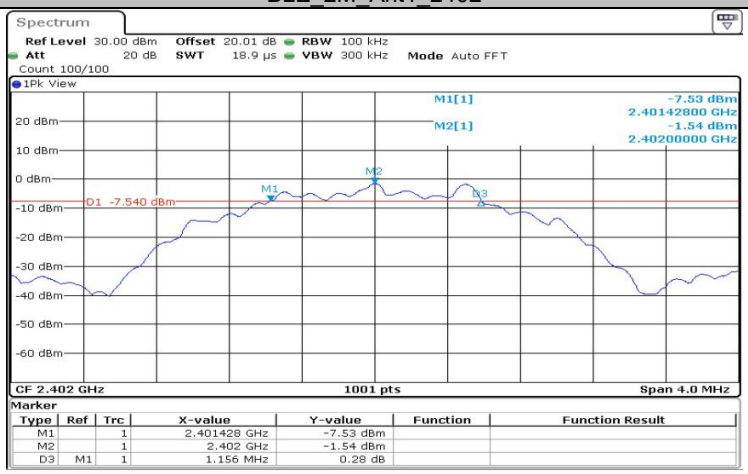
BLE_1M_Ant1_2440



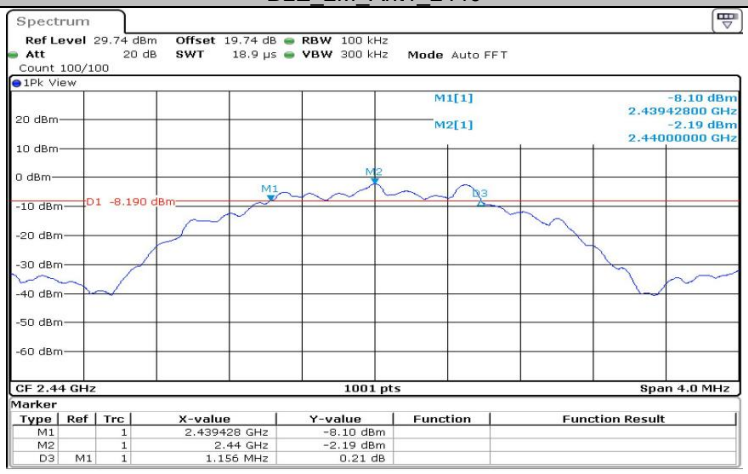
BLE_1M_Ant1_2480



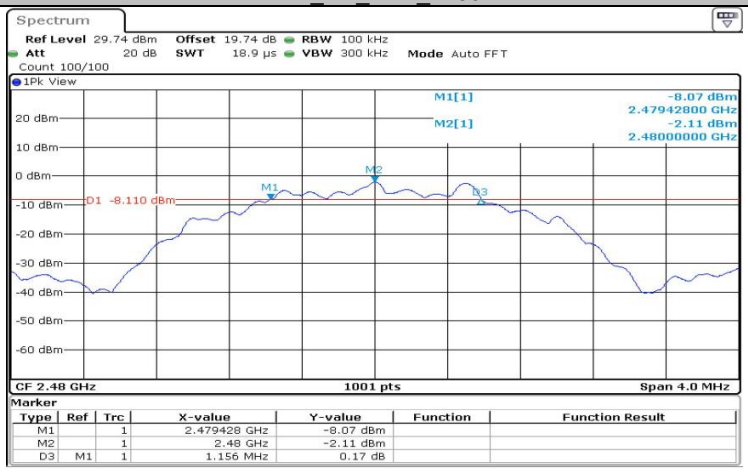
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



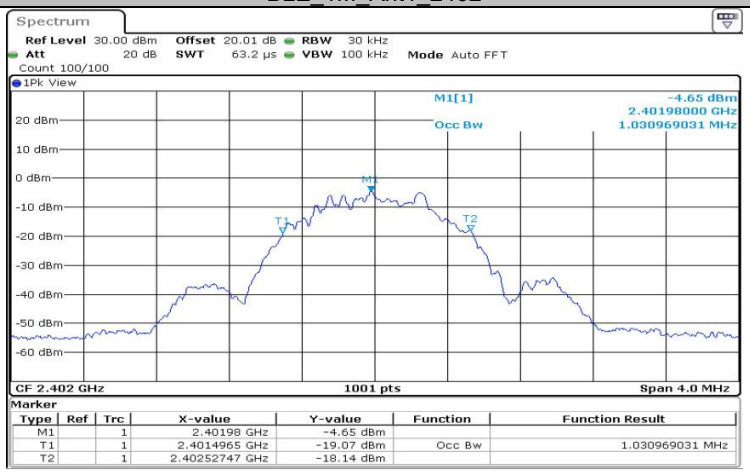
Appendix B: Occupied Channel Bandwidth

Test Result

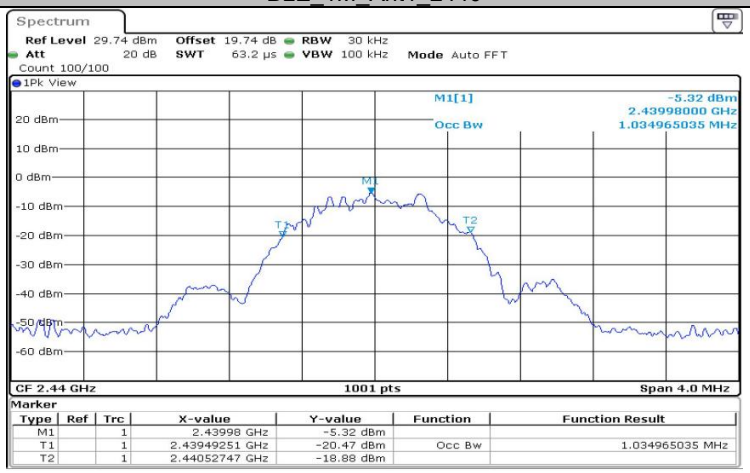
Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.031	2401.497	2402.527	---	---
		2440	1.035	2439.493	2440.527	---	---
		2480	1.035	2479.493	2480.527	---	---
BLE_2M	Ant1	2402	2.066	2400.989	2403.055	---	---
		2440	2.066	2438.985	2441.051	---	---
		2480	2.066	2478.985	2481.051	---	---

Test Graphs

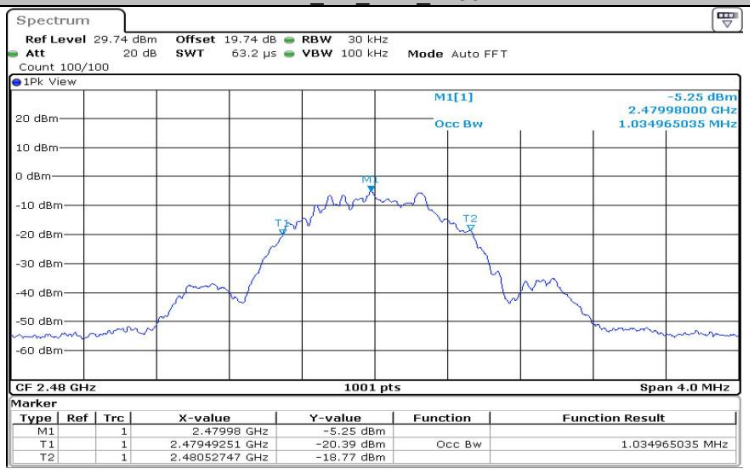
BLE_1M_Ant1_2402



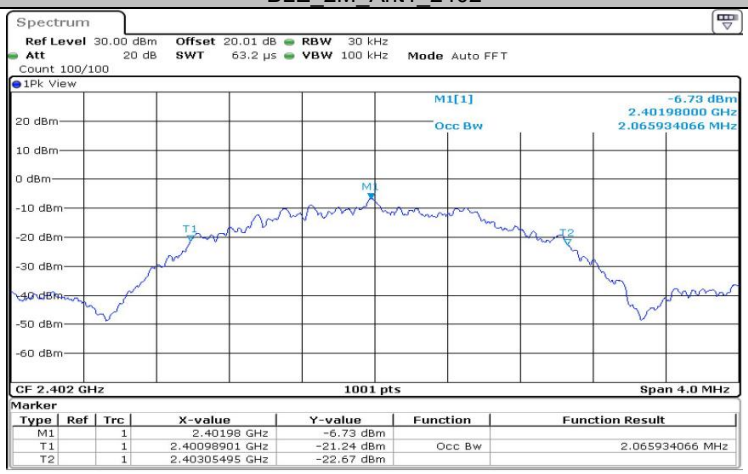
BLE_1M_Ant1_2440



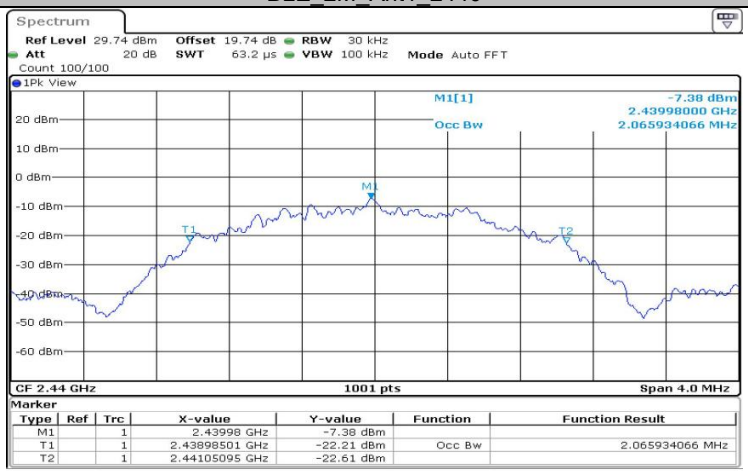
BLE_1M_Ant1_2480



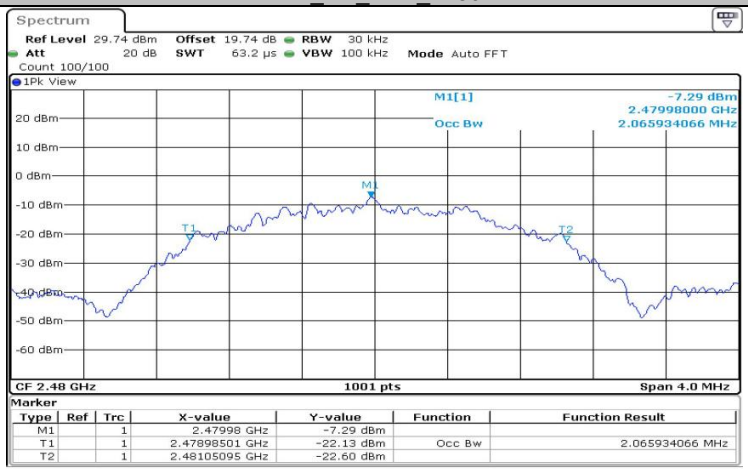
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



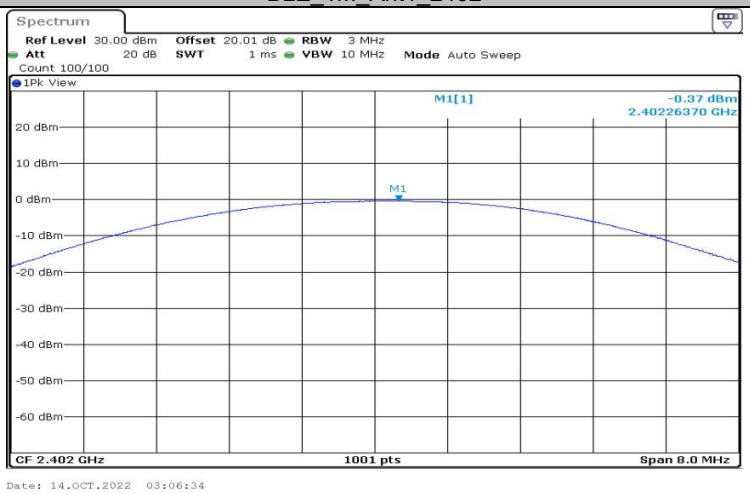
Appendix C: Maximum conducted output power

Test Result Peak

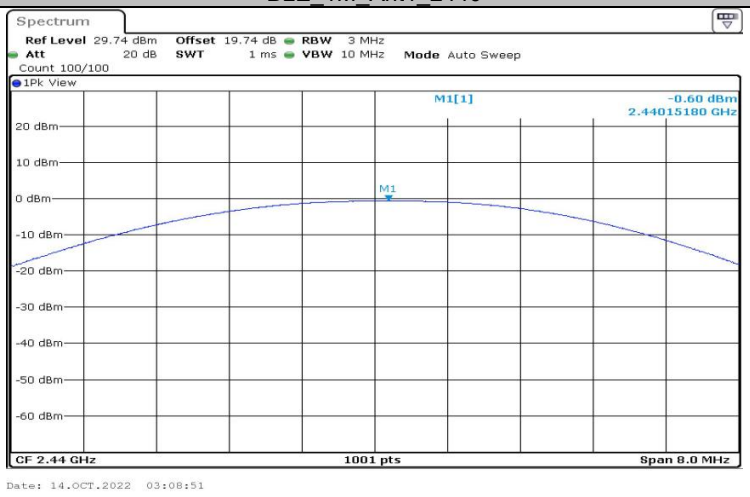
Test Mode	Antenna	Frequency[MHz]	Conducted Peak Power[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-0.37	≤30	PASS
		2440	-0.60	≤30	PASS
		2480	-0.64	≤30	PASS
BLE_2M	Ant1	2402	-0.46	≤30	PASS
		2440	-0.58	≤30	PASS
		2480	-0.69	≤30	PASS

Test Graphs Peak

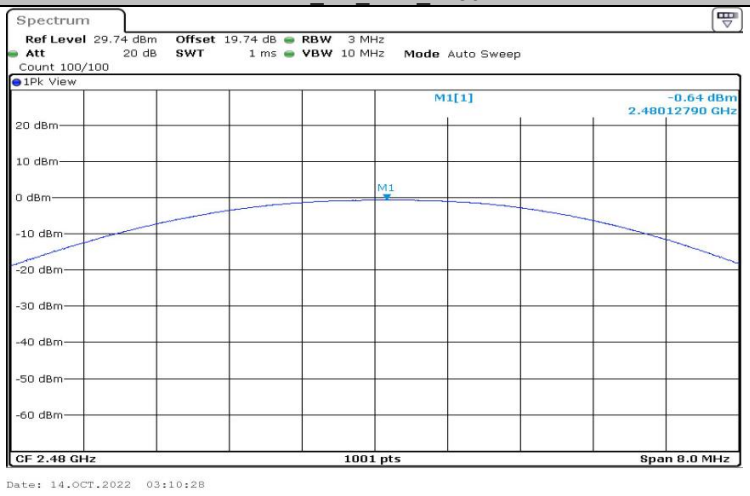
BLE_1M_Ant1_2402



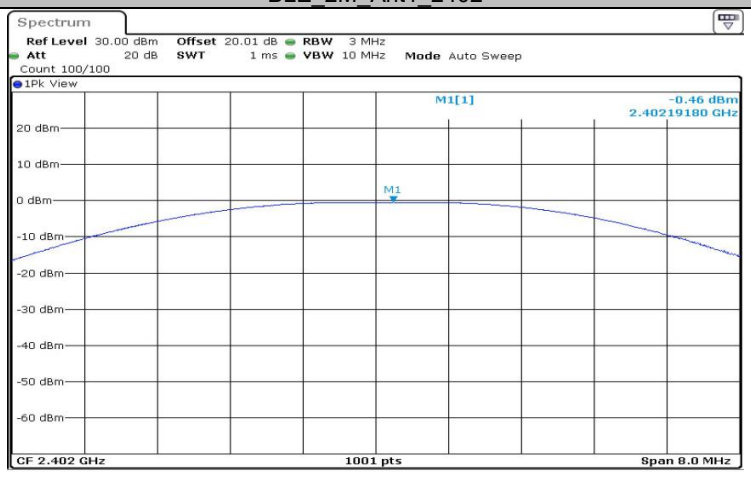
BLE_1M_Ant1_2440



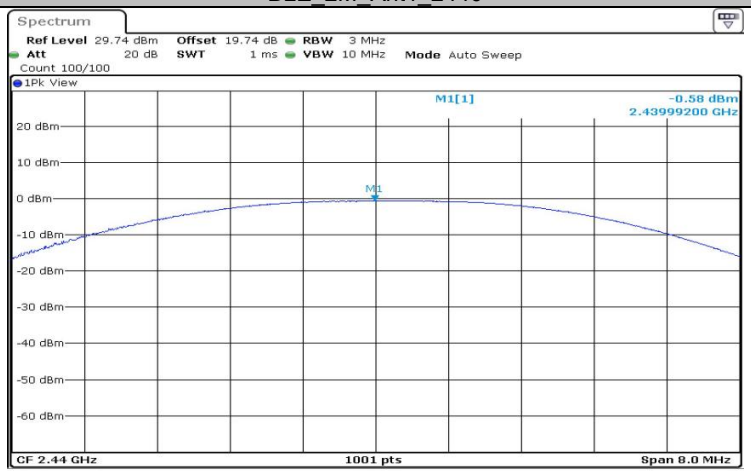
BLE_1M_Ant1_2480



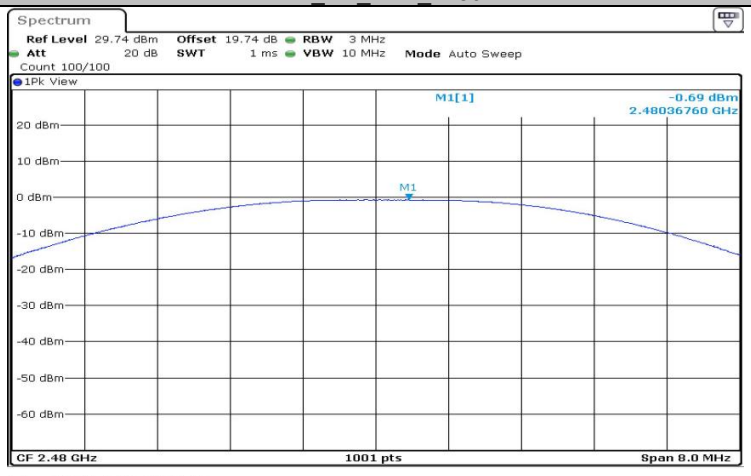
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



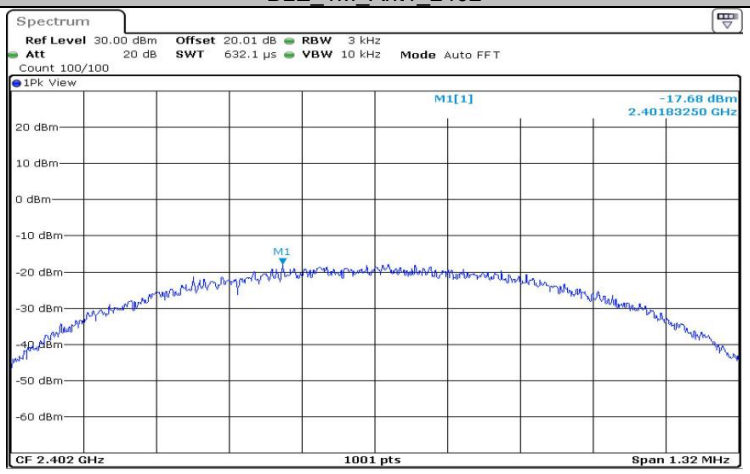
Appendix D: Maximum power spectral density

Test Result

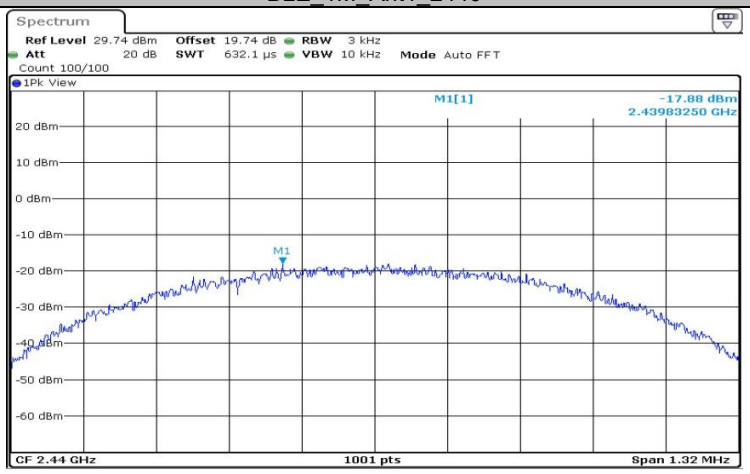
Test Mode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-17.68	≤8.00	PASS
		2440	-17.88	≤8.00	PASS
		2480	-17.94	≤8.00	PASS
BLE_2M	Ant1	2402	-19.88	≤8.00	PASS
		2440	-20.09	≤8.00	PASS
		2480	-20.09	≤8.00	PASS

Test Graphs

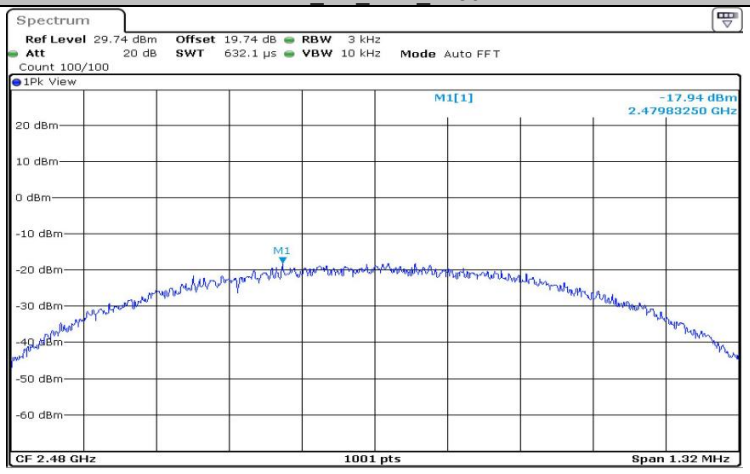
BLE_1M_Ant1_2402



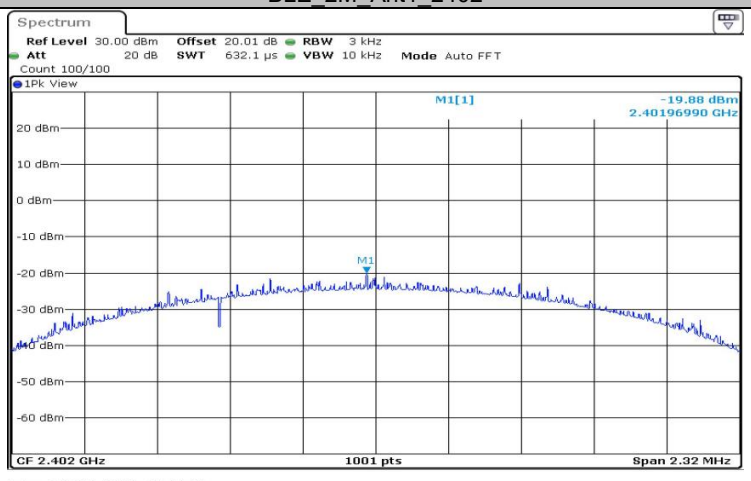
BLE_1M_Ant1_2440



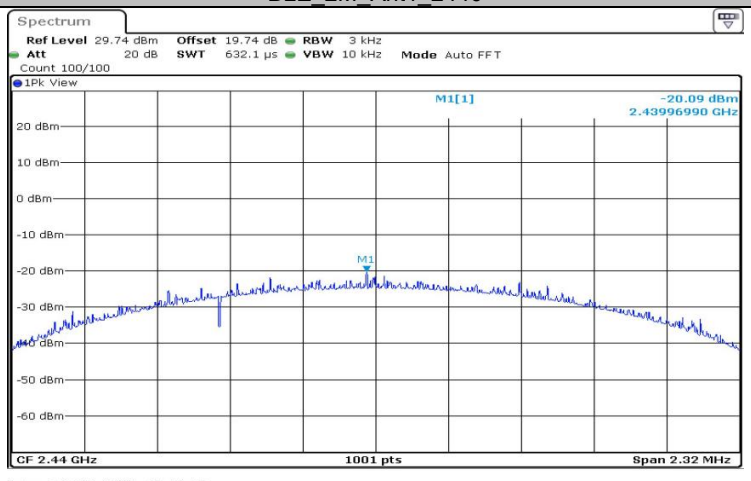
BLE_1M_Ant1_2480



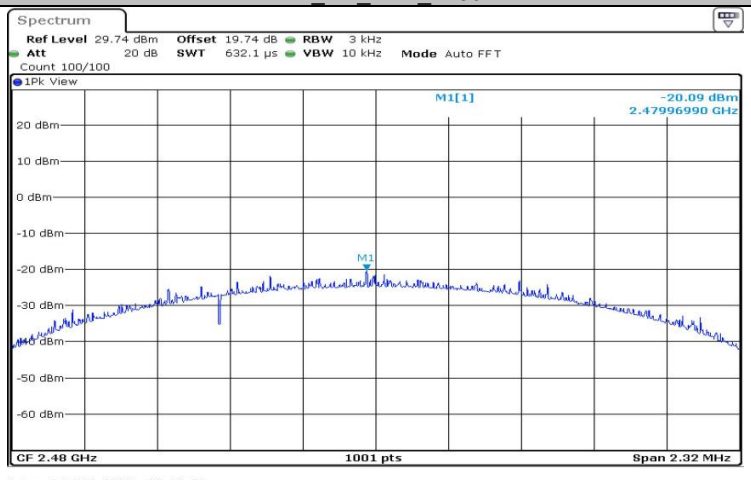
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



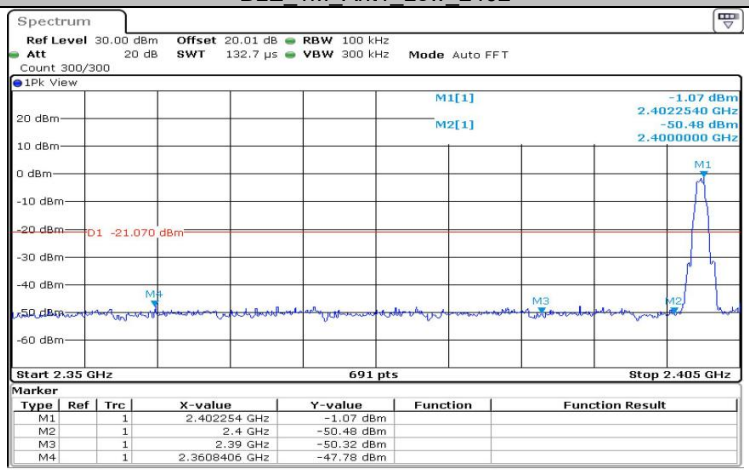
BLE_2M_Ant1_2480



Appendix E: Band edge measurements

Test Graphs

BLE_1M_Ant1_Low_2402

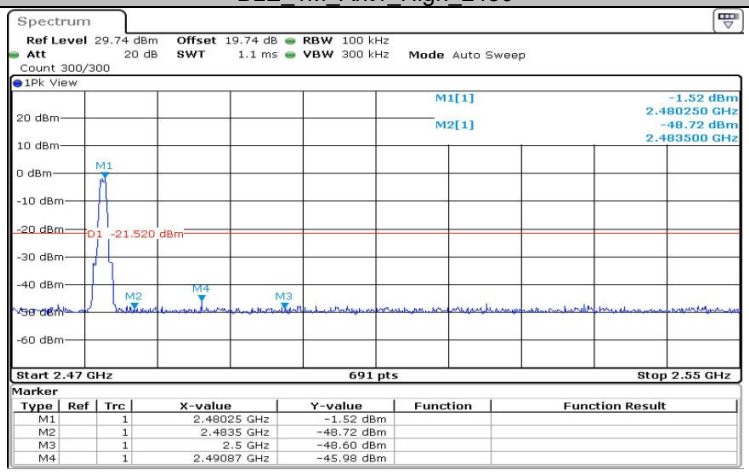


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402254 GHz	-1.07 dBm		
M2		1	2.4 GHz	-50.48 dBm		
M3		1	2.39 GHz	-50.32 dBm		
M4		1	2.3608406 GHz	-47.78 dBm		

Date: 14.OCT.2022 03:06:48

BLE_1M_Ant1_High_2480

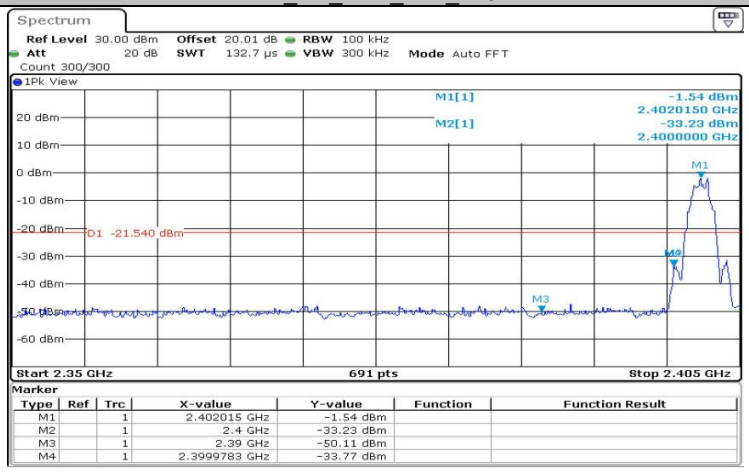


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48025 GHz	-1.52 dBm		
M2		1	2.4835 GHz	-48.72 dBm		
M3		1	2.5 GHz	-48.60 dBm		
M4		1	2.49087 GHz	-45.98 dBm		

Date: 14.OCT.2022 03:10:42

BLE_2M_Ant1_Low_2402

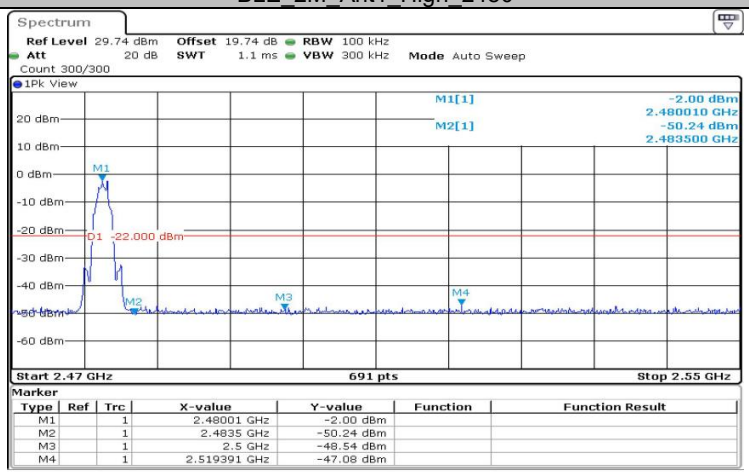


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402015 GHz	-1.54 dBm		
M2		1	2.4 GHz	-33.23 dBm		
M3		1	2.39 GHz	-50.11 dBm		
M4		1	2.3999783 GHz	-33.77 dBm		

Date: 14.OCT.2022 03:11:53

BLE_2M_Ant1_High_2480



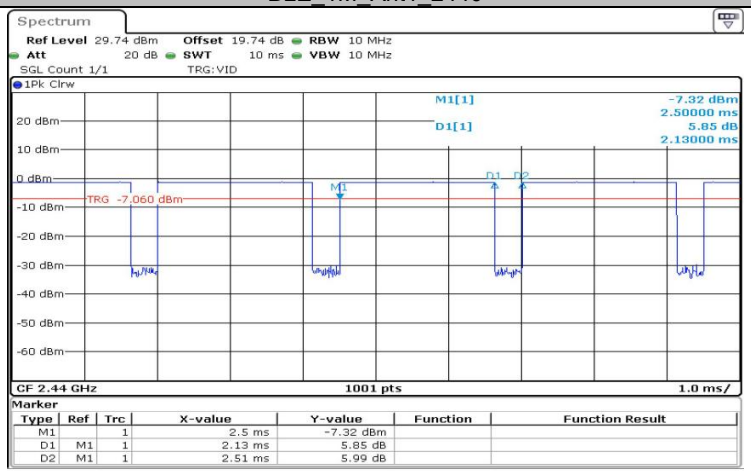
Appendix F: Duty Cycle

Test Result

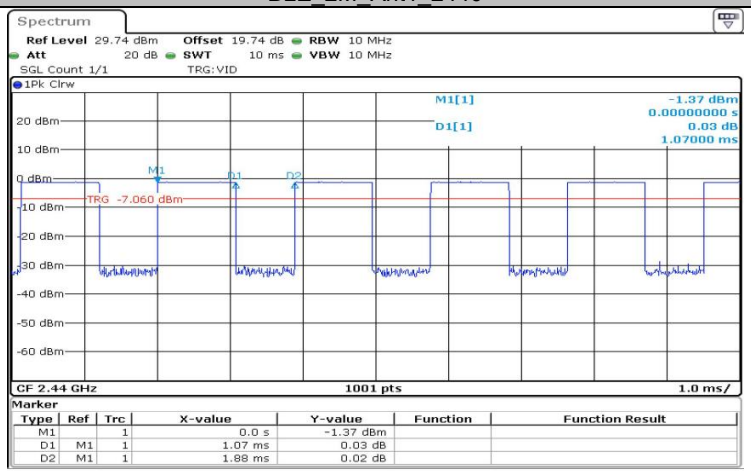
Test Mode	Antenna	Frequency[MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]	1/T Minimum VBW[kHz]
BLE_1M	Ant1	2440	2.13	2.51	84.86	0.71	0.469
BLE_2M	Ant1	2440	1.07	1.88	56.91	2.45	0.935

Test Graphs

BLE_1M_Ant1_2440



BLE_2M_Ant1_2440



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