



FCC PART 15.247

TEST REPORT

For

MPS MAYORISTA DE COLOMBIA S.A.

Autop Bog Medellin Km2.5 Parque Emp. Tecnologico, Cota, Colombia

FCC ID: 2AHVR1100AS

Report Type: Original Report	Product Type: Tablet PC
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Report Date: 2020-12-28	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	TABLET PC
Tested Model	1100AS
Multiple Model	1100AS+, AS1100, AS1000+
Model Differences	Only model name is different.
Frequency Range	BLE: 2402-2480MHz Wi-Fi: 2412-2462MHz
Maximum Conducted Peak Output Power	BLE: 1.21dBm(LE 1M) Wi-Fi: 10.02dBm(802.11b), 13.97dBm(802.11g), 12.92dBm(802.11n-HT20)
Modulation Technique	BLE: GFSK Wi-Fi: DSSS, OFDM
Antenna Specification*	Internal Antenna: -3.5dBi(provided by the applicant)
Voltage Range	DC3.7V from battery or DC 5.0V from adapter
Date of Test	2020-12-17 to 2020-12-28
Sample serial number	RSZ201216802-RF-S1(Assigned by ATC, Shenzhen)
Received date	2020-12-17
Sample/EUT Status	Good condition
Adapter information	Model: JKX-777 INPUT: 100-240VAC, 50/60Hz, 0.5A max OUTPUT: 5V, 2000mA

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
AC Power Lines Conducted Emissions		±2.72dB
Emissions, Radiated	30MHz - 1GHz	±4.28dB
	1GHz- 18GHz	±4.98dB
	18GHz- 26.5GHz	±5.06dB

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 (ISED), the Registration Number is 5077A-2

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For 802.11b, 802.11g and 802.11n-HT20 mode, 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	/	/

For 802.11b, 802.11g, 802.11n-HT20, EUT was tested with Channel 1, 6 and 11.

For LE 1M mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	21	2444
...	...	...	...
...	...	...	...
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

Engineering mode and power level is default.

Duty cycle

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

Support Equipment List and Details

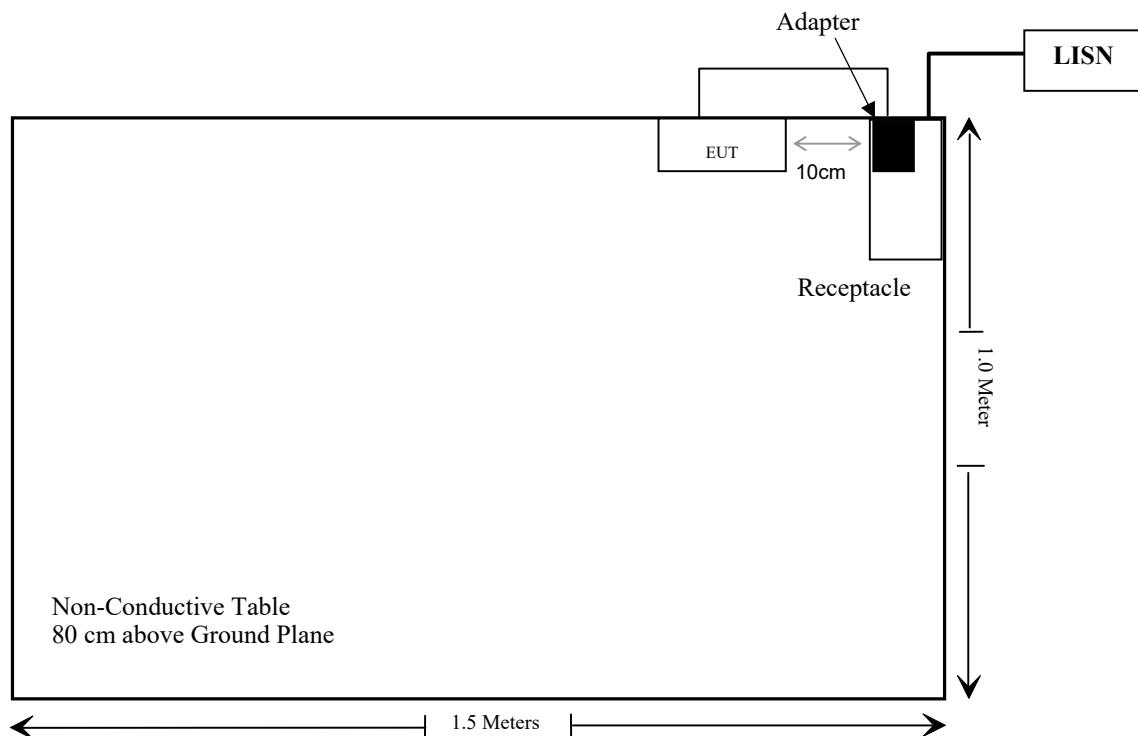
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-Shielding Detachable USB Cable	0.96	Adapter	EUT

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1)& §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth & Occupied Bandwidth	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/01/04	2021/01/03
Rohde & Schwarz	Open Switch and Control Unit	OSP120 +OSP -B157	101244 + 100866	2020/01/04	2021/01/03
Rohde & Schwarz	Test Receiver	ESPI	100396/003	2020/01/04	2021/01/03
Rohde & Schwarz	Test Receiver	ESCS30	100307	2020/01/04	2021/01/03
Schwarzbeck	L.I.S.N.	NLSK8126	8126431	2020/01/04	2021/01/03
Rohde & Schwarz	Pulse Limiter	ESH3-Z2	100815	2020/01/04	2021/01/03
Anritsu Corp	50Ω Coaxial Switch	MP59B	6200283936	2020/01/04	2021/01/03
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2021/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Rohde&Schwarz	Pre-Amplifier	CBLU1183540 -01	3791	2020/01/04	2021/01/03
Quinstar	Amplifier	QLW-184055 36-J0	15964001002	2020/11/28	2021/11/27
Rohde& Schwarz	Test Receiver	ESR	101817	2020/01/04	2021/01/03
Agilent	Pre-Amplifier	8447D	2944A10619	2020/01/04	2021/01/03
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2020/01/04	2021/01/03
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2020/01/05	2021/01/04

*** 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), §1.1307 (b) (1) & §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

1. $f(\text{GHz})$ is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

For worst case:

Mode	Frequency (MHz)	Maximum Tune-up power		Calculated Distance (mm)	Calculated Value	Threshold (1-g SAR)	SAR Test Exclusion
		(dBm)	(mW)				
BLE	2480	1.5	1.41	5	0.4	3.0	Yes
Wi-Fi	2462	9.5	8.91	5	2.8	3.0	Yes

Result: No Standalone SAR test is required

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 arrangement, which was permanently attached and the antenna gain is -3.5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

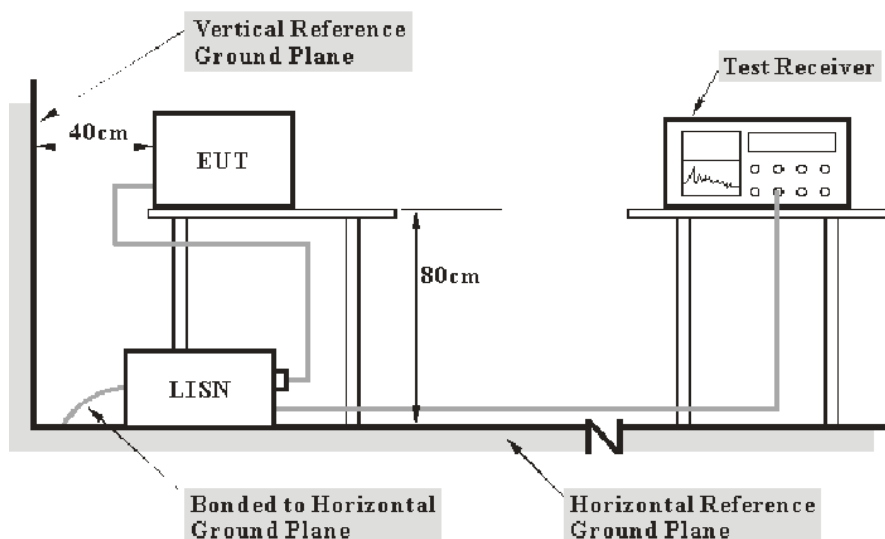
Result: Compliance.

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), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Transd Factor} = \text{LISN VDF} + \text{Cable Loss}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\begin{aligned}\text{Margin} &= \text{Limit} - \text{level} \\ \text{Level} &= \text{reading level} + \text{Transd Factor}\end{aligned}$$

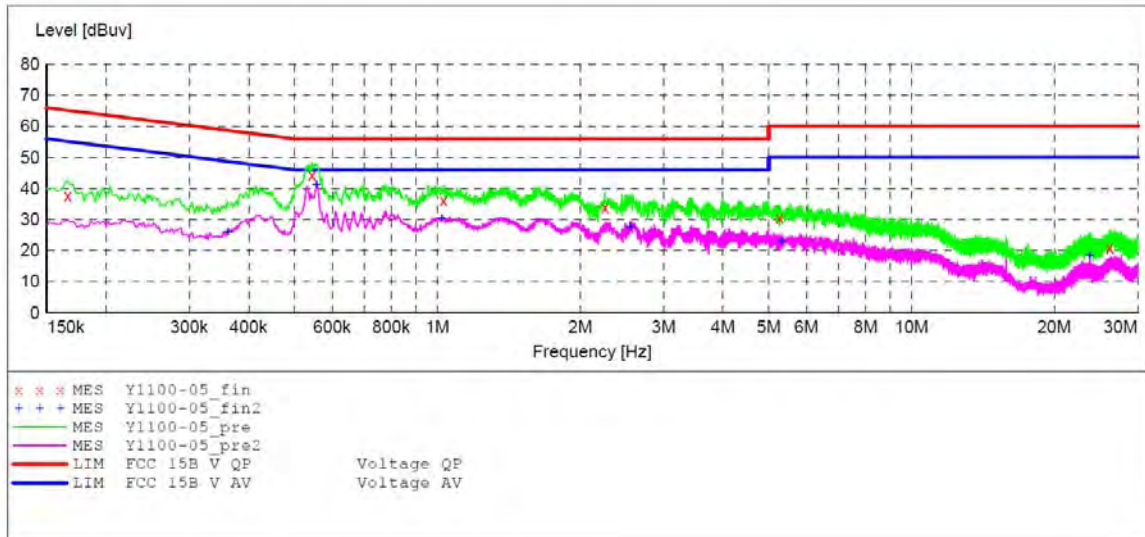
Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2020-12-28.

EUT operation mode: Transmitting

BLE:**AC 120V/60 Hz, Line****MEASUREMENT RESULT: "Y1100-05_fin"**

2020-12-28 11:13

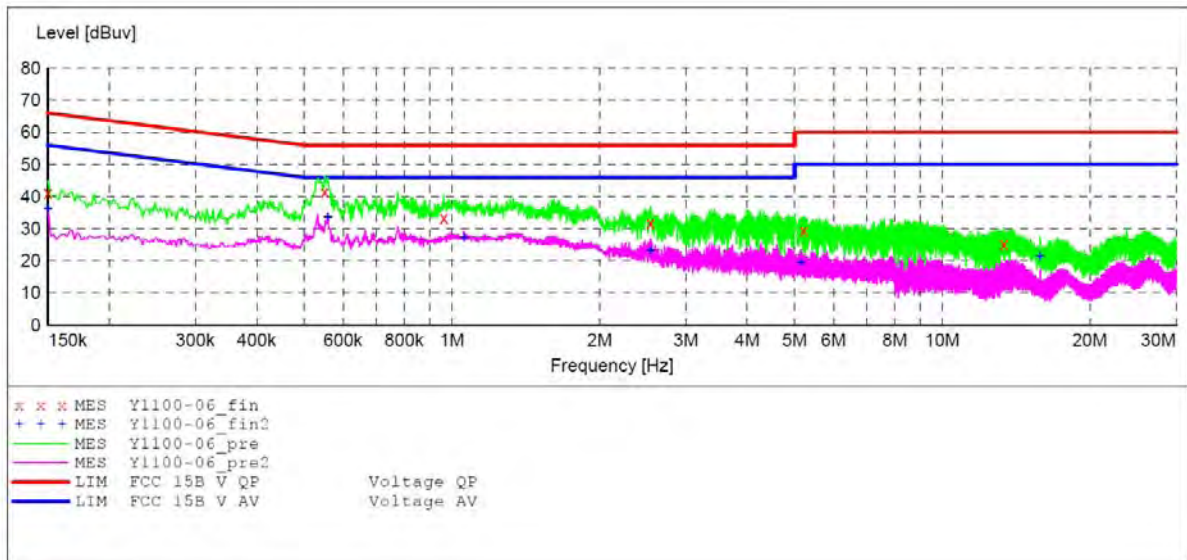
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.166000	37.70	10.8	65	27.3	QP	L1	GND
0.544000	44.20	11.0	56	11.8	QP	L1	GND
1.030000	36.00	11.1	56	20.0	QP	L1	GND
2.255000	33.80	11.3	56	22.2	QP	L1	GND
5.275000	30.40	11.4	60	29.6	QP	L1	GND
26.160000	20.90	11.8	60	39.1	QP	L1	GND

MEASUREMENT RESULT: "Y1100-05_fin2"

2020-12-28 11:13

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.362000	25.80	10.9	49	23.2	AV	L1	GND
0.556000	41.20	11.0	46	4.8	AV	L1	GND
1.022000	30.20	11.1	46	15.8	AV	L1	GND
2.550000	27.50	11.3	46	18.5	AV	L1	GND
5.315000	22.90	11.4	50	27.1	AV	L1	GND
23.745000	18.40	11.7	50	31.6	AV	L1	GND

AC 120V/60 Hz, Neutral

**MEASUREMENT RESULT: "Y1100-06_fin"**

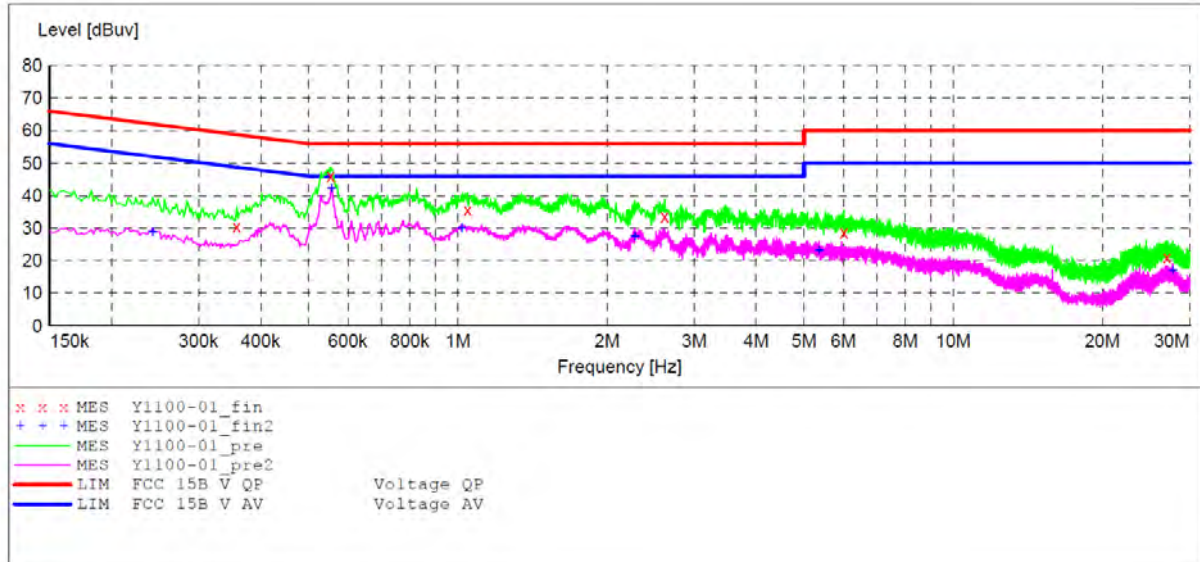
2020-12-28 11:16

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	41.10	10.8	66	24.9	QP	N	GND
0.550000	41.40	11.0	56	14.6	QP	N	GND
0.962000	33.40	11.1	56	22.6	QP	N	GND
2.540000	31.90	11.3	56	24.1	QP	N	GND
5.210000	29.40	11.4	60	30.6	QP	N	GND
13.360000	25.10	11.6	60	34.9	QP	N	GND

MEASUREMENT RESULT: "Y1100-06_fin2"

2020-12-28 11:16

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	36.10	10.8	56	19.9	AV	N	GND
0.558000	33.50	11.0	46	12.5	AV	N	GND
1.058000	27.30	11.1	46	18.7	AV	N	GND
2.540000	23.20	11.3	46	22.8	AV	N	GND
5.145000	19.40	11.4	50	30.6	AV	N	GND
15.830000	21.40	11.7	50	28.6	AV	N	GND

Wi-Fi:**AC 120V/60 Hz, Line****MEASUREMENT RESULT: "Y1100-01_fin"**

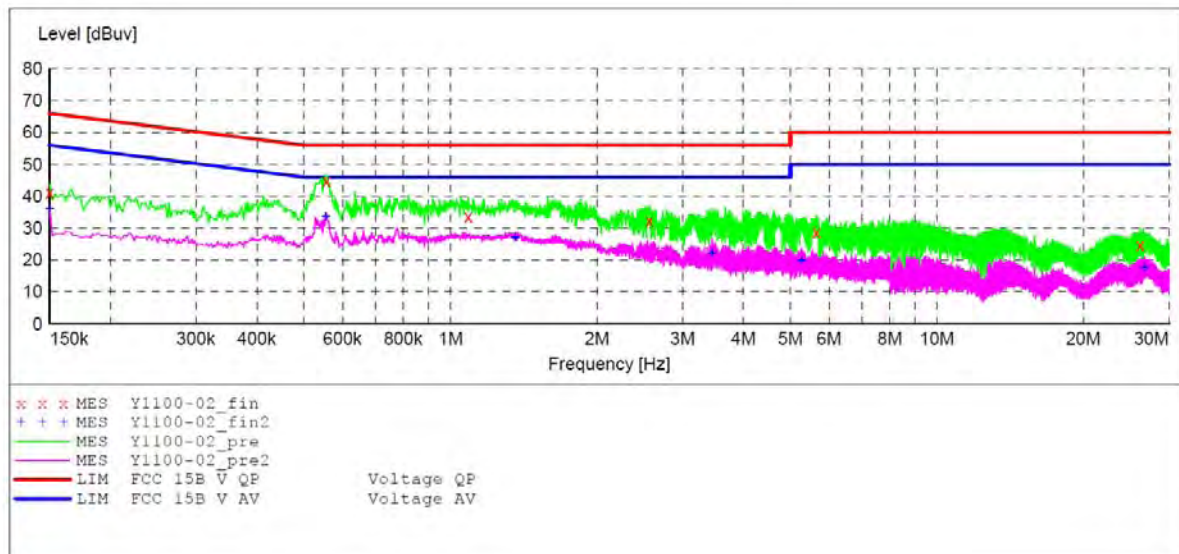
2020-12-28 11:04

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.358000	30.40	10.9	59	28.6	QP	L1	GND
0.554000	46.10	11.0	56	9.9	QP	L1	GND
1.046000	35.60	11.1	56	20.4	QP	L1	GND
2.615000	33.70	11.3	56	22.3	QP	L1	GND
6.015000	28.70	11.5	60	31.3	QP	L1	GND
27.000000	21.10	11.8	60	38.9	QP	L1	GND

MEASUREMENT RESULT: "Y1100-01_fin2"

2020-12-28 11:04

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.242000	28.80	10.9	52	23.2	AV	L1	GND
0.556000	42.20	11.0	46	3.8	AV	L1	GND
1.018000	30.10	11.1	46	15.9	AV	L1	GND
2.275000	27.40	11.3	46	18.6	AV	L1	GND
5.360000	23.10	11.5	50	26.9	AV	L1	GND
27.735000	16.90	11.8	50	33.1	AV	L1	GND

AC 120V/60 Hz, Neutral**MEASUREMENT RESULT: "Y1100-02_fin"**

2020-12-28 11:07

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	41.20	10.8	66	24.8	QP	N	GND
0.556000	44.70	11.0	56	11.3	QP	N	GND
1.088000	33.70	11.1	56	22.3	QP	N	GND
2.565000	32.30	11.3	56	23.7	QP	N	GND
5.650000	28.70	11.5	60	31.3	QP	N	GND
26.160000	24.50	11.8	60	35.5	QP	N	GND

MEASUREMENT RESULT: "Y1100-02_fin2"

2020-12-28 11:07

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	36.20	10.8	56	19.8	AV	N	GND
0.554000	33.70	11.0	46	12.3	AV	N	GND
1.358000	27.00	11.2	46	19.0	AV	N	GND
3.450000	22.00	11.4	46	24.0	AV	N	GND
5.265000	19.70	11.4	50	30.3	AV	N	GND
26.715000	17.40	11.8	50	32.6	AV	N	GND

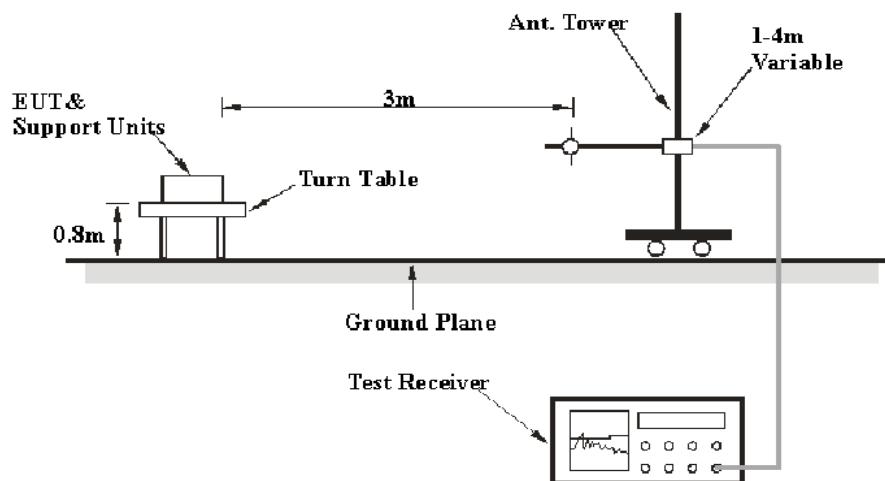
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

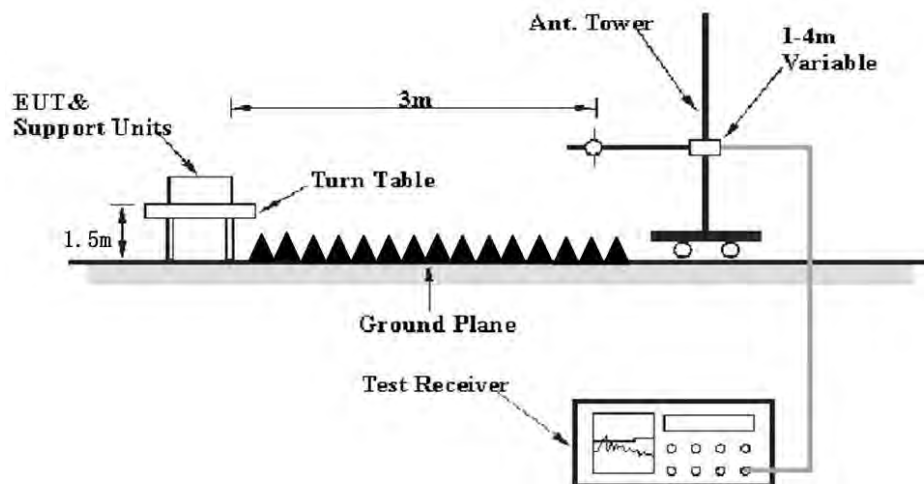
FCC §15.247 (d); §15.209; §15.205;

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 from the Meter Reading. The basic equation is as follows:

$$\text{Factor} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\begin{aligned} \text{Margin} &= \text{Result} - \text{Limit} \\ \text{Result} &= \text{Reading} + \text{Factor} \end{aligned}$$

Test Data

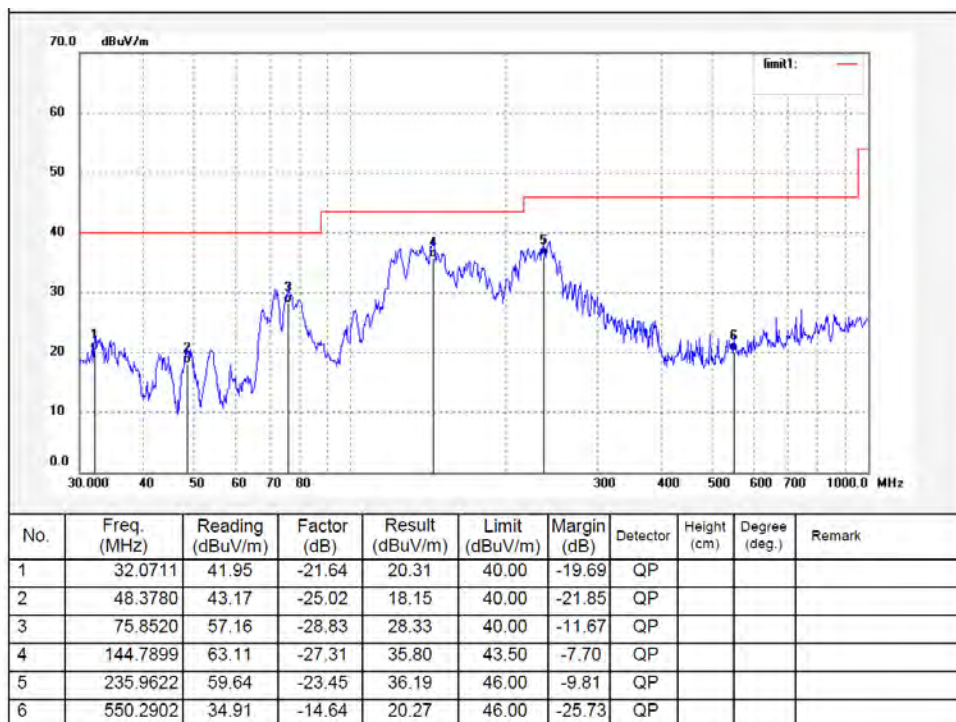
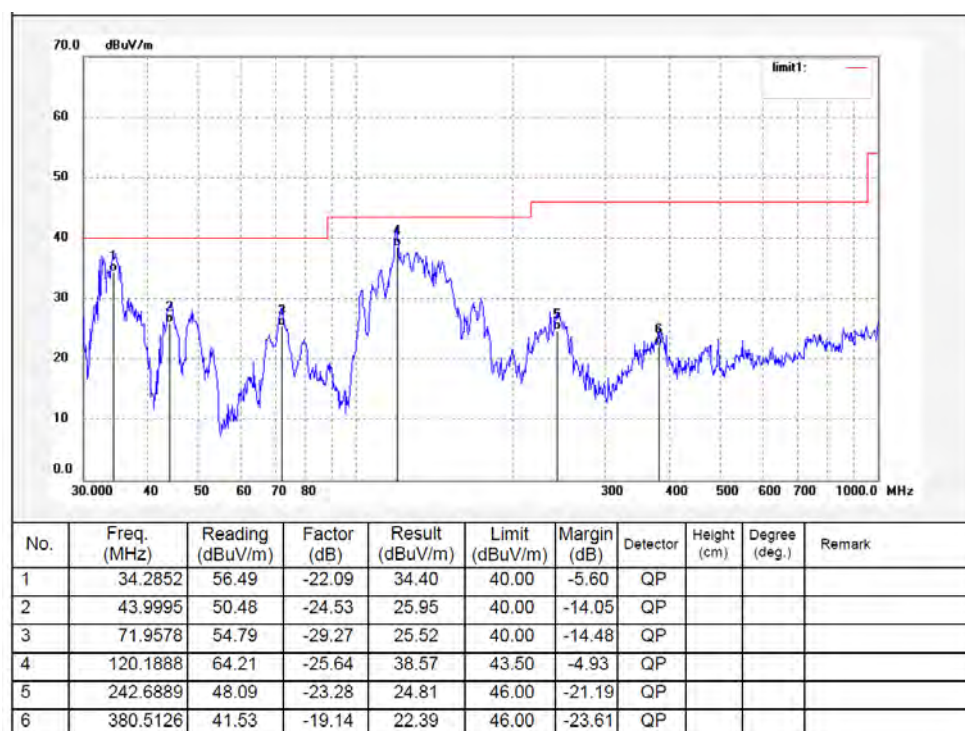
Environmental Conditions

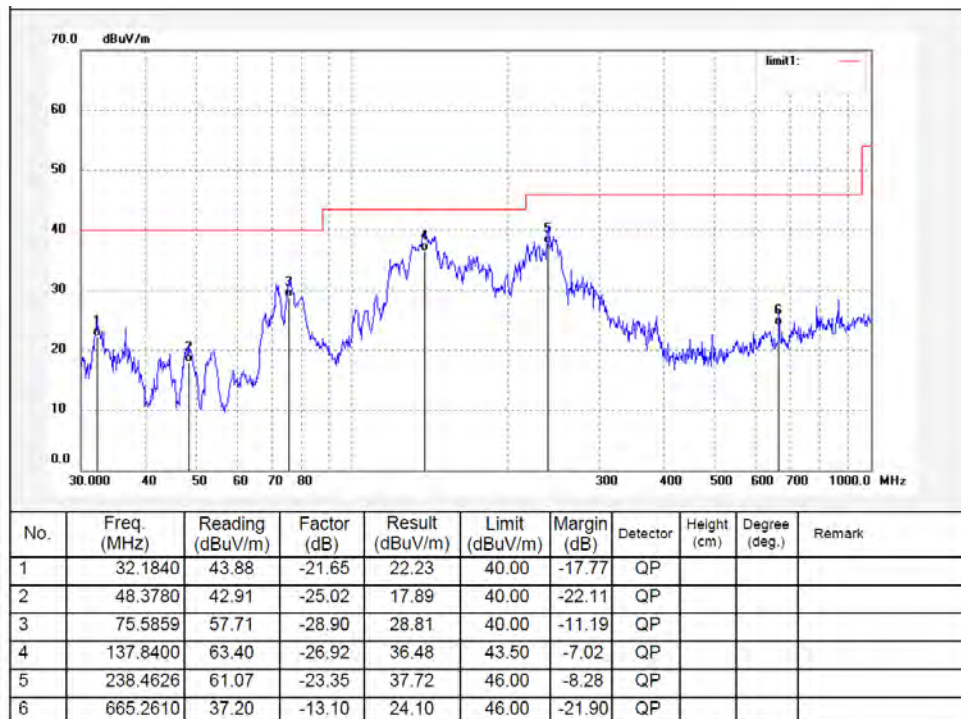
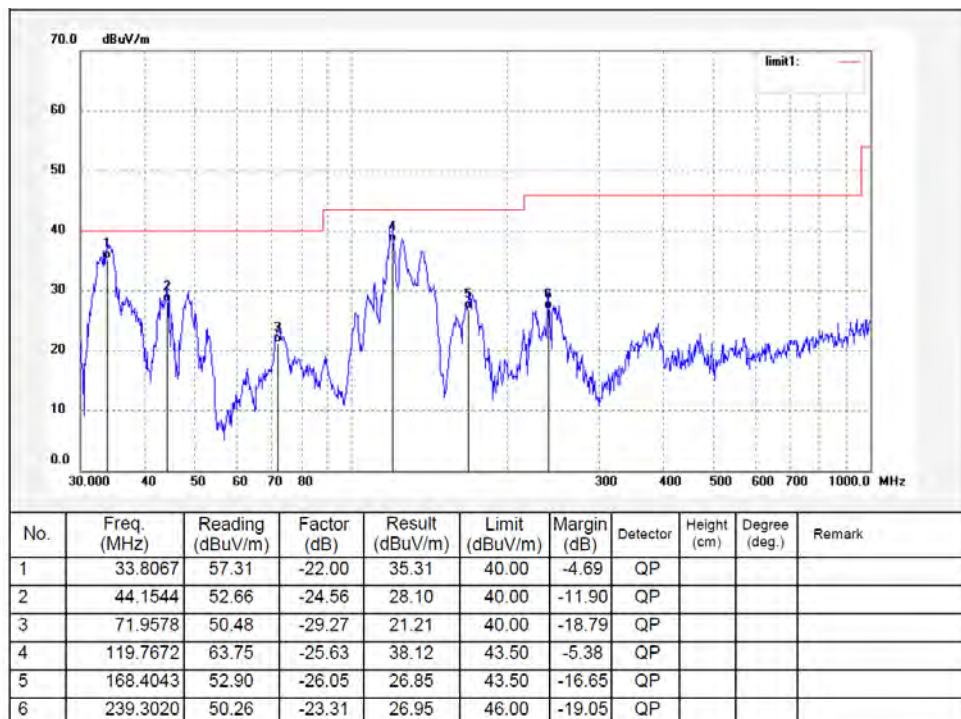
Temperature:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

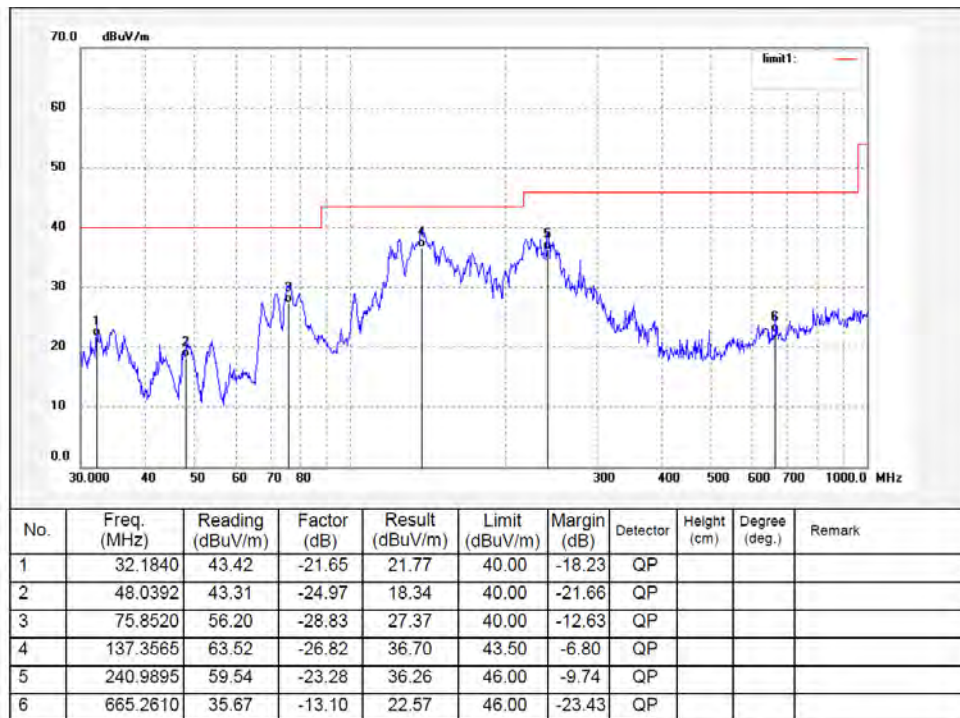
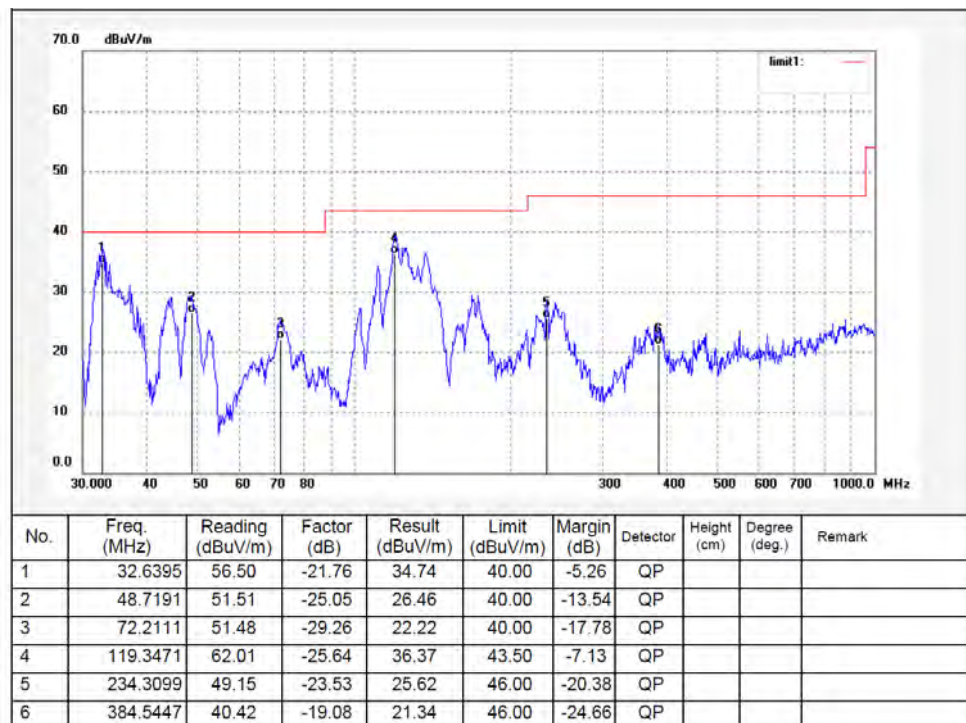
The testing was performed by Fan Yang on 2020-12-24 for below 1GHz and Fan Yang on 2020-12-21 for above 1GHz.

EUT operation mode: Transmitting

18~25GHz: The test values lower than the limits of 20dB or in the noise floor level, the test data were not recorded in the report.

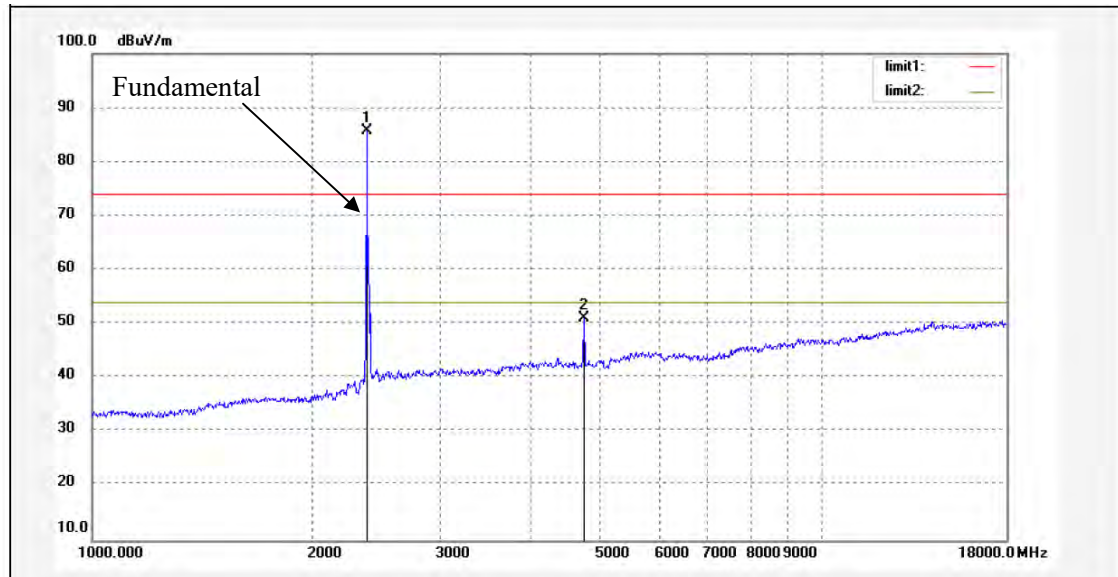
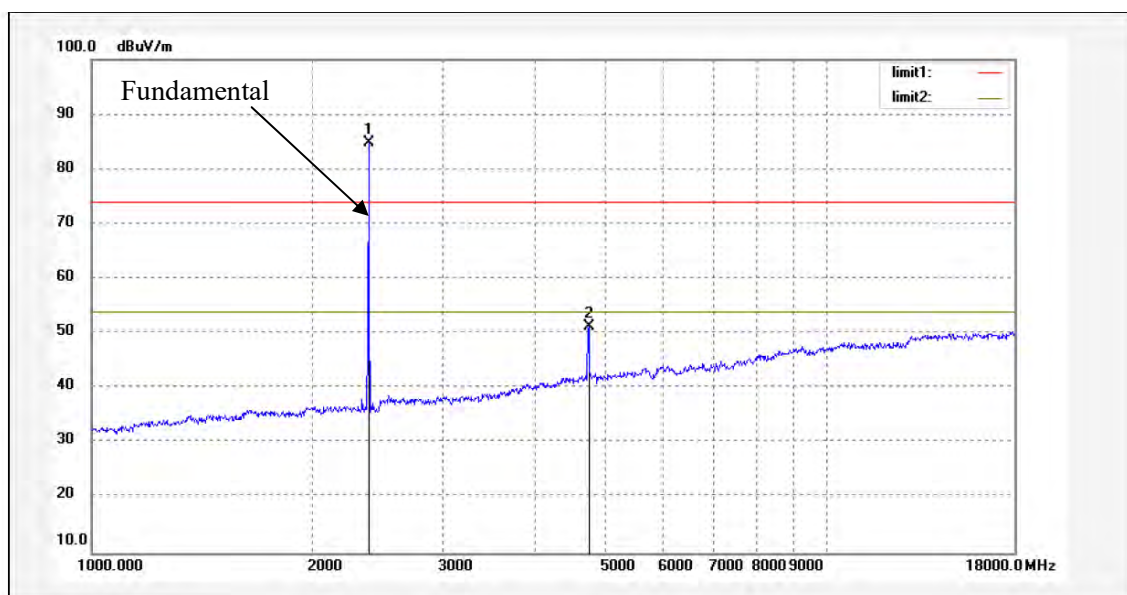
BLE:**30 MHz~1 GHz:****TX 2402MHz:****Horizontal****Vertical**

TX 2440MHz:**Horizontal****Vertical**

TX 2480MHz:**Horizontal****Vertical**

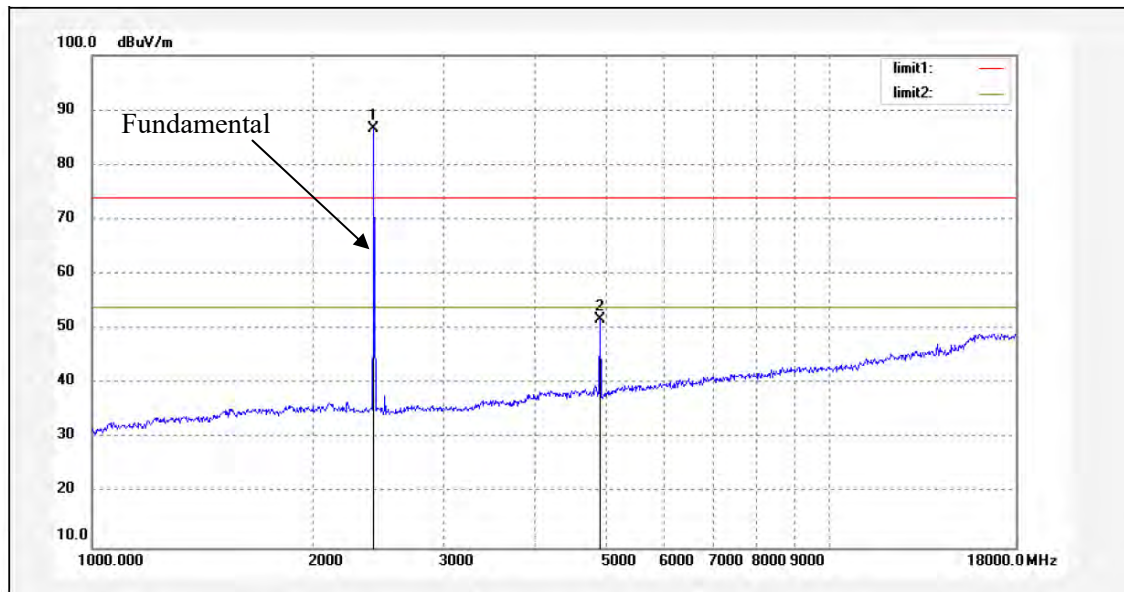
Above 1 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2402 MHz)									
4804	53.44	PK	56	1.2	H	3.15	56.59	74	17.41
4804	42.12	Ave.	56	1.2	H	3.15	45.27	54	8.73
4804	51.37	PK	15	1.7	V	3.15	54.52	74	19.48
4804	41.36	Ave.	15	1.7	V	3.15	44.51	54	9.49
Middle Channel (2440MHz)									
4880	52.16	PK	217	1.3	H	4.06	56.22	74	17.78
4880	40.15	Ave.	217	1.3	H	4.06	44.21	54	9.79
4880	53.97	PK	306	1.1	V	4.06	58.03	74	15.97
4880	43.44	Ave.	306	1.1	V	4.06	47.5	54	6.5
High Channel (2480 MHz)									
4960	53.45	PK	161	1.6	H	4.69	58.14	74	15.86
4960	41.71	Ave.	161	1.6	H	4.69	46.4	54	7.6
4960	52.74	PK	222	1.6	V	4.69	57.43	74	16.57
4960	41.71	Ave.	222	1.6	V	4.69	46.4	54	7.6

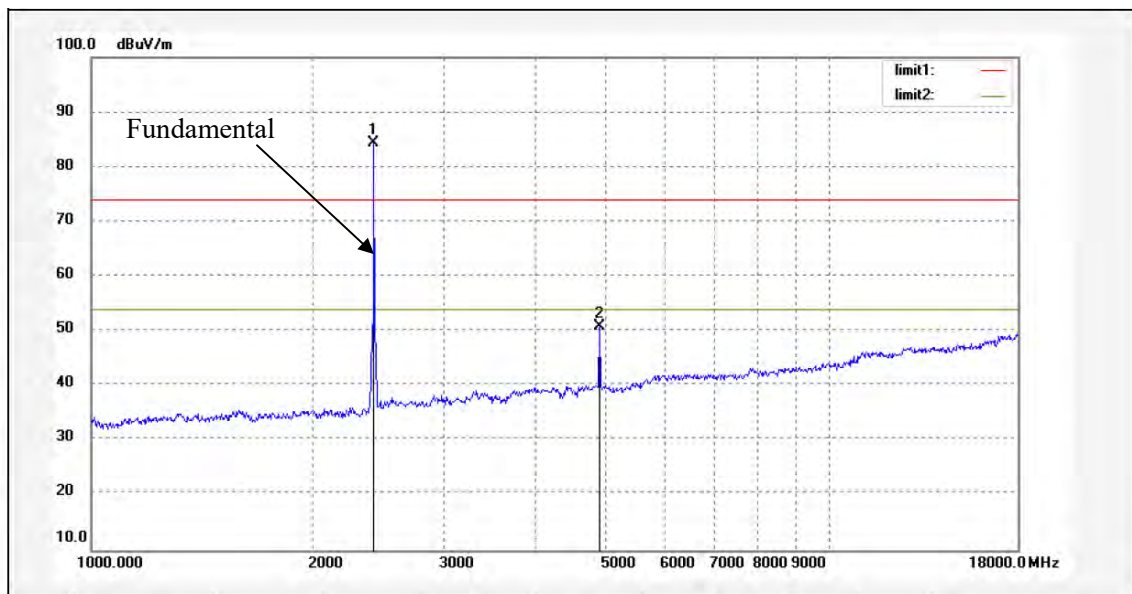
Pre-scan plots:**TX 2402MHz:****Horizontal****Vertical**

TX 2440MHz:

Horizontal

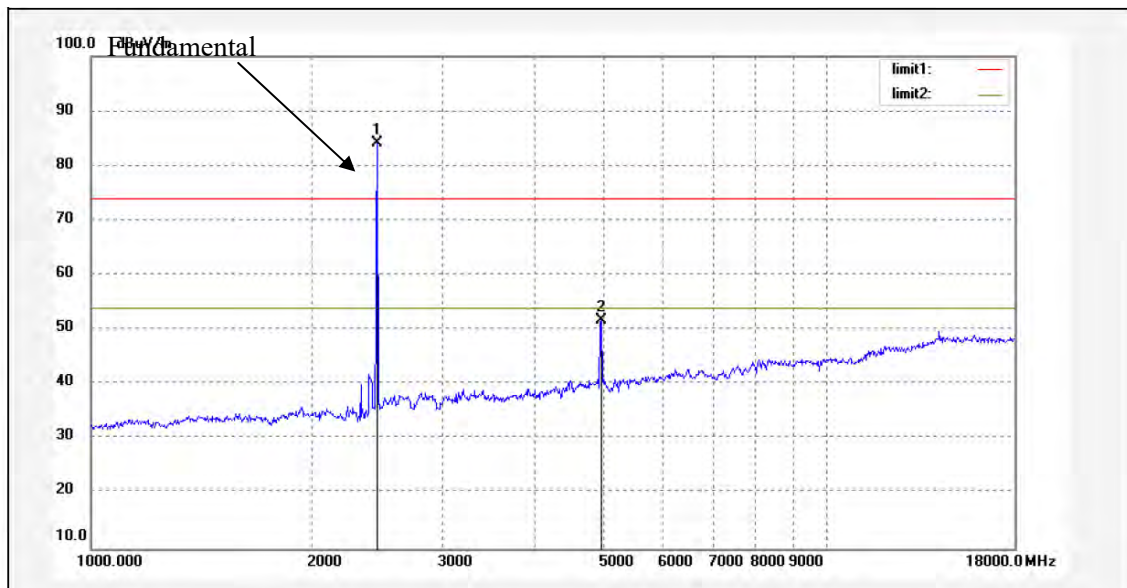


Vertical

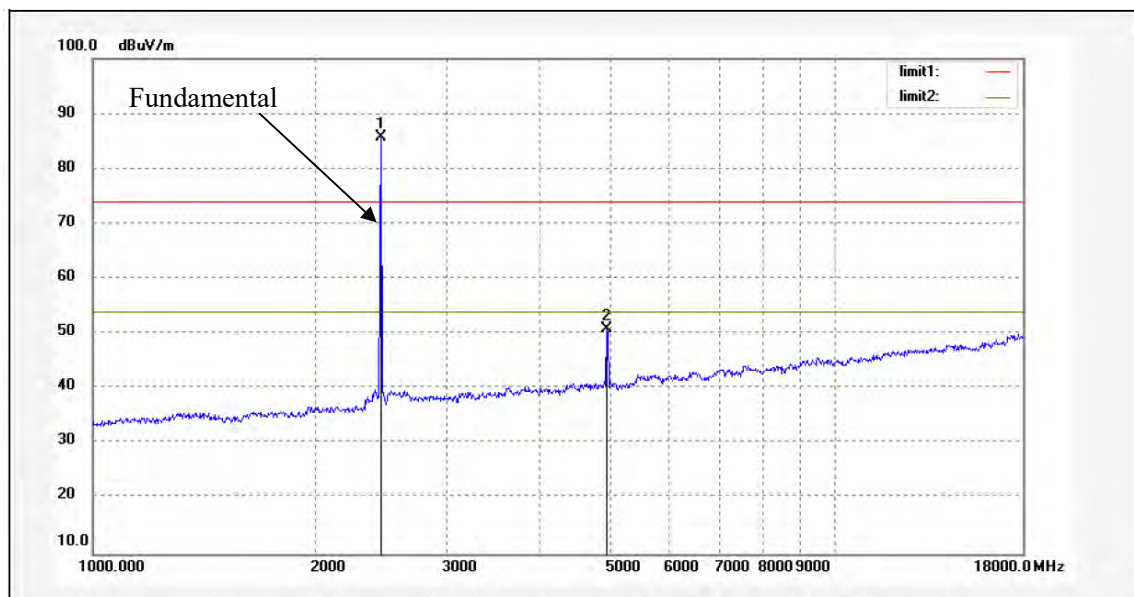


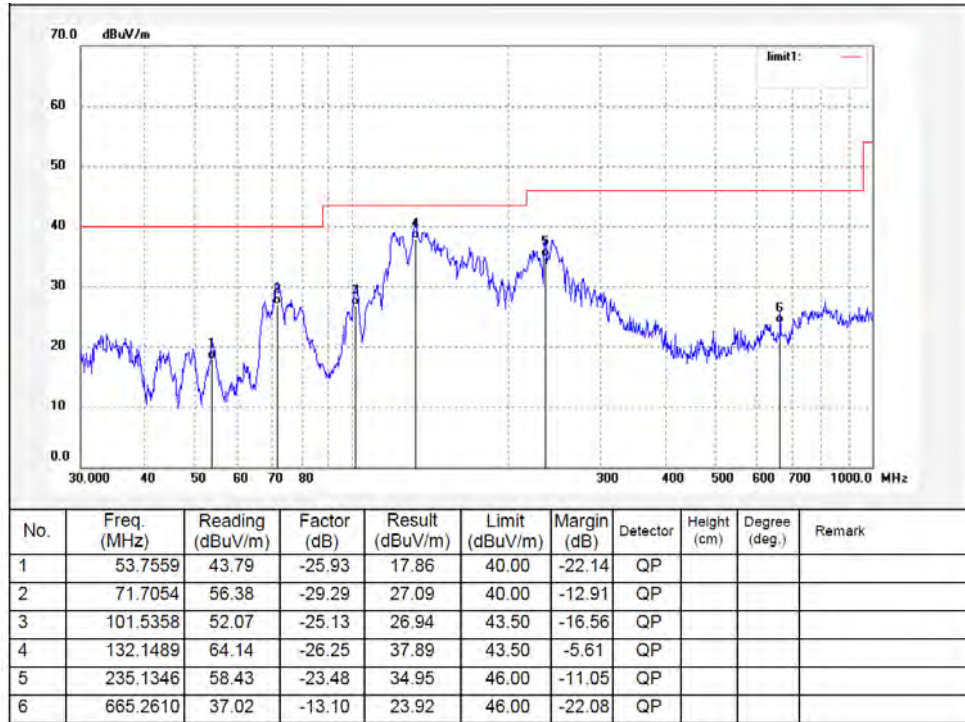
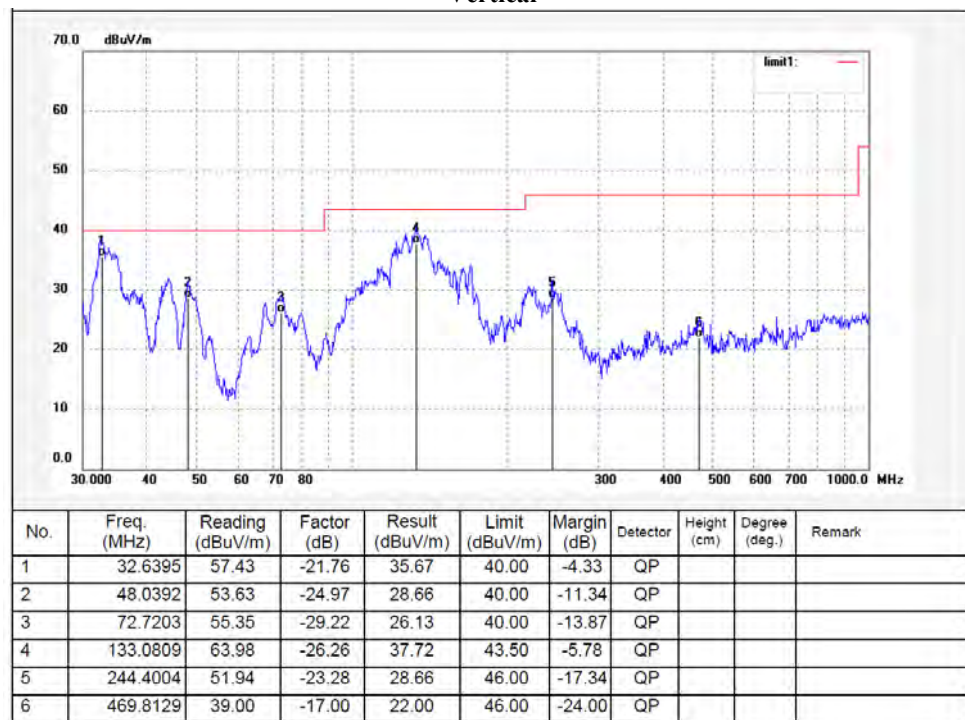
TX 2480MHz:

Horizontal



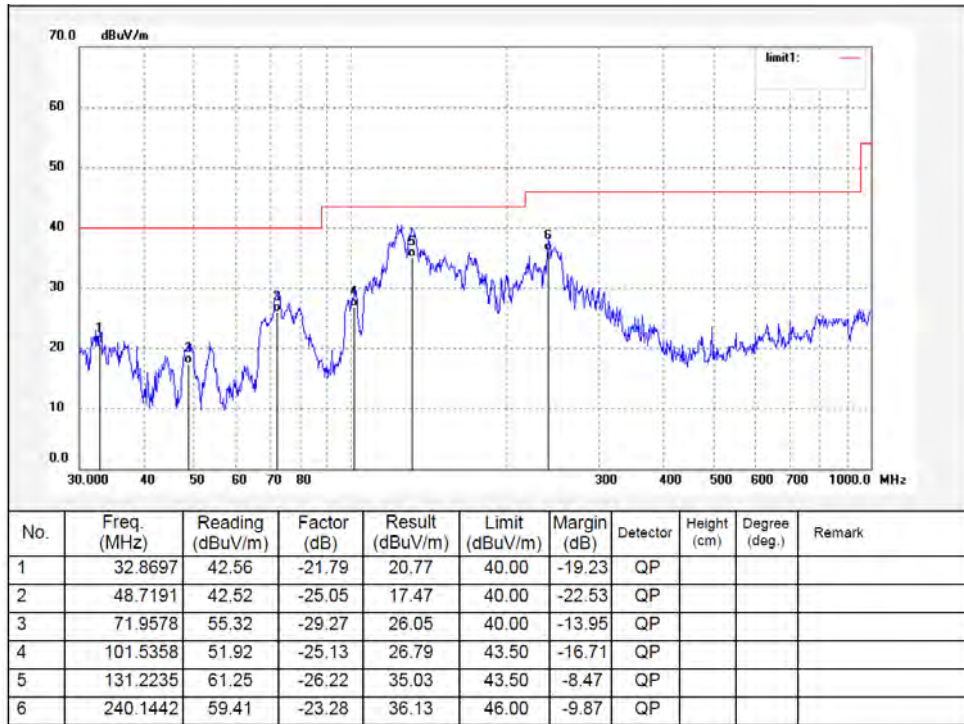
Vertical



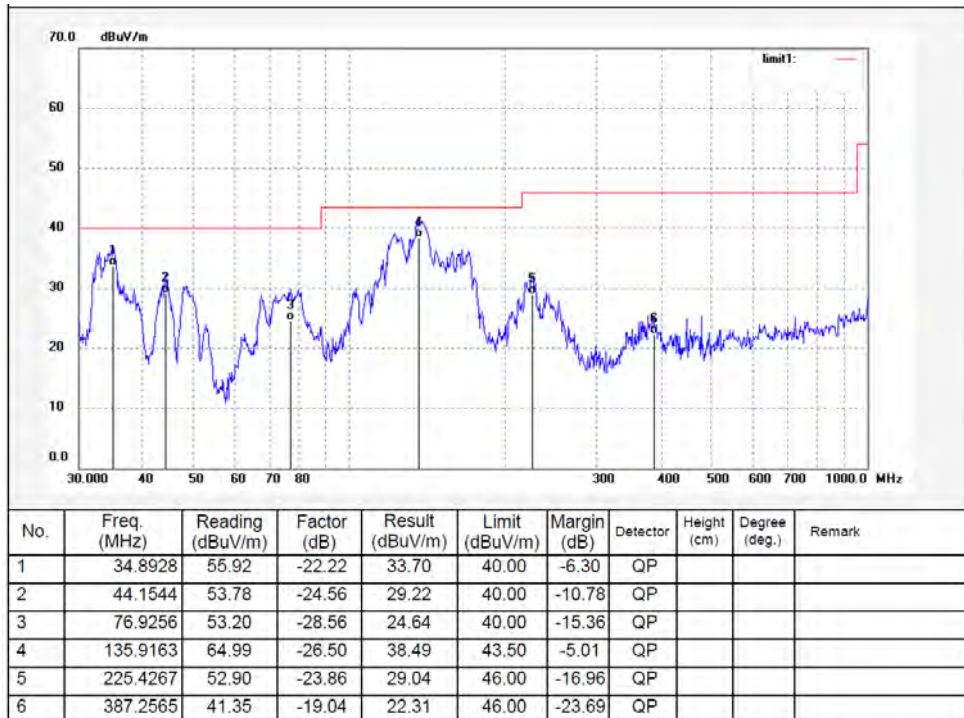
Wi-Fi:**30 MHz~1 GHz: (worst case at 802.11b mode)****TX Chanel 1:****Horizontal****Vertical**

TX Chanel 6:

Horizontal

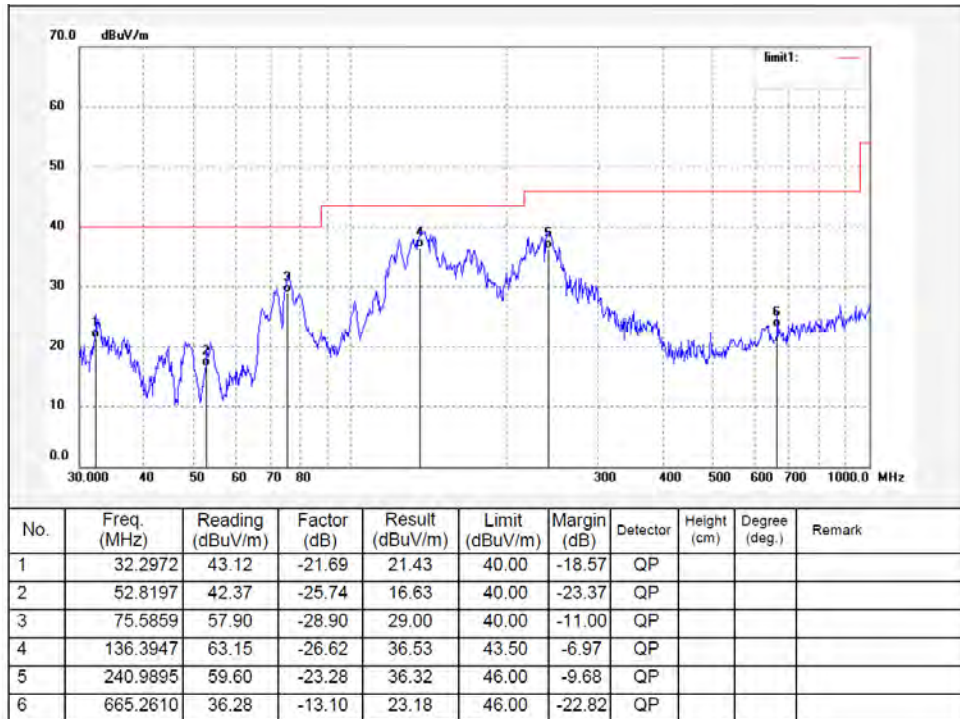


Vertical

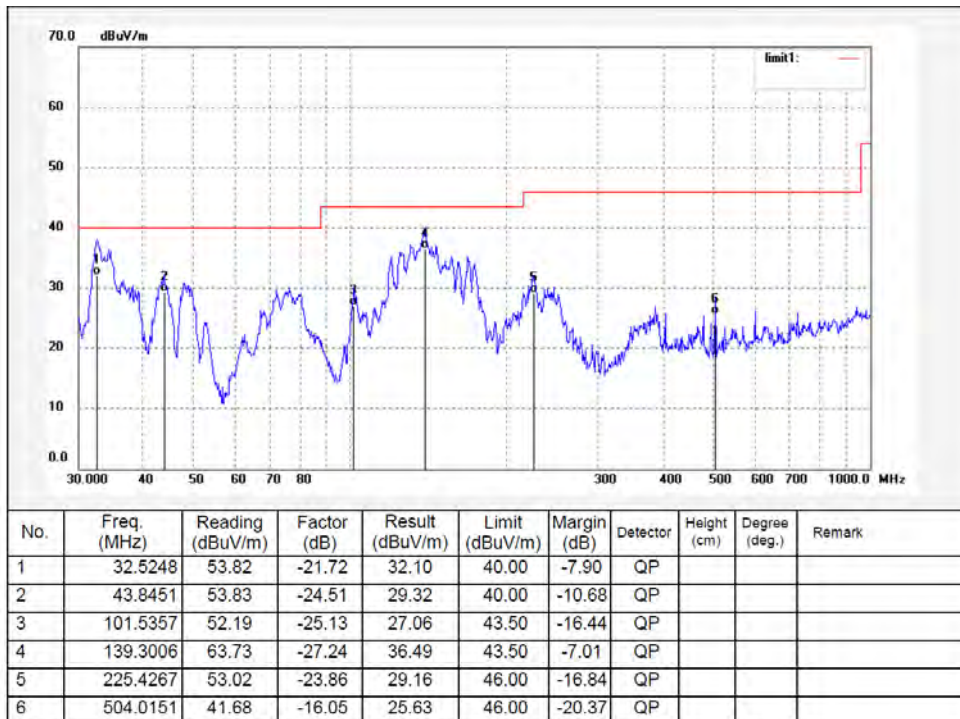


TX Chanel 11:

Horizontal



Vertical



Above 1 GHz:

802.11b

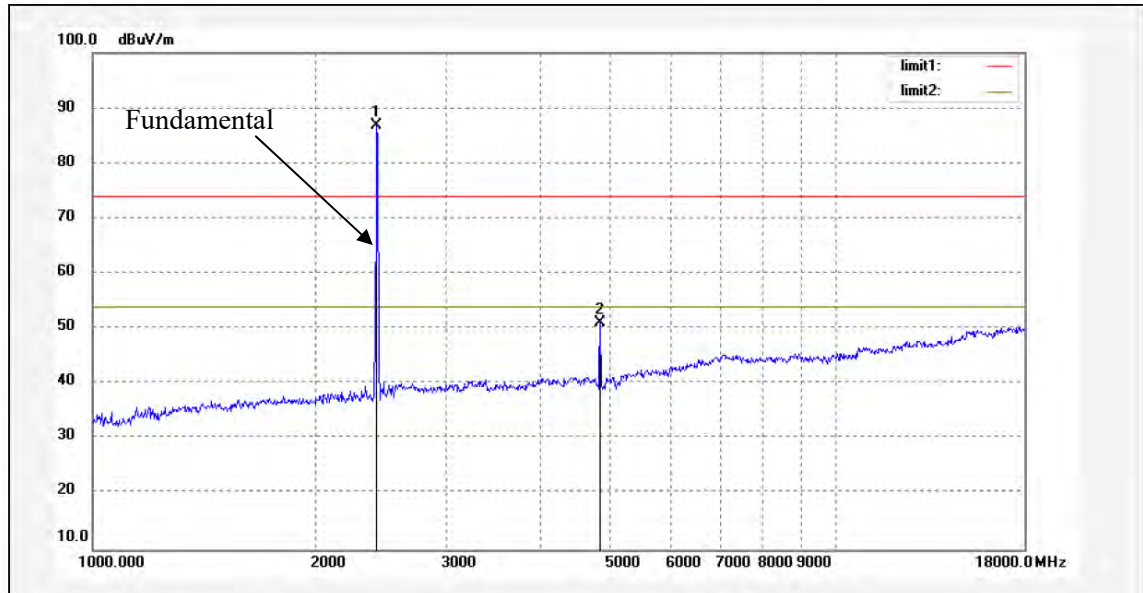
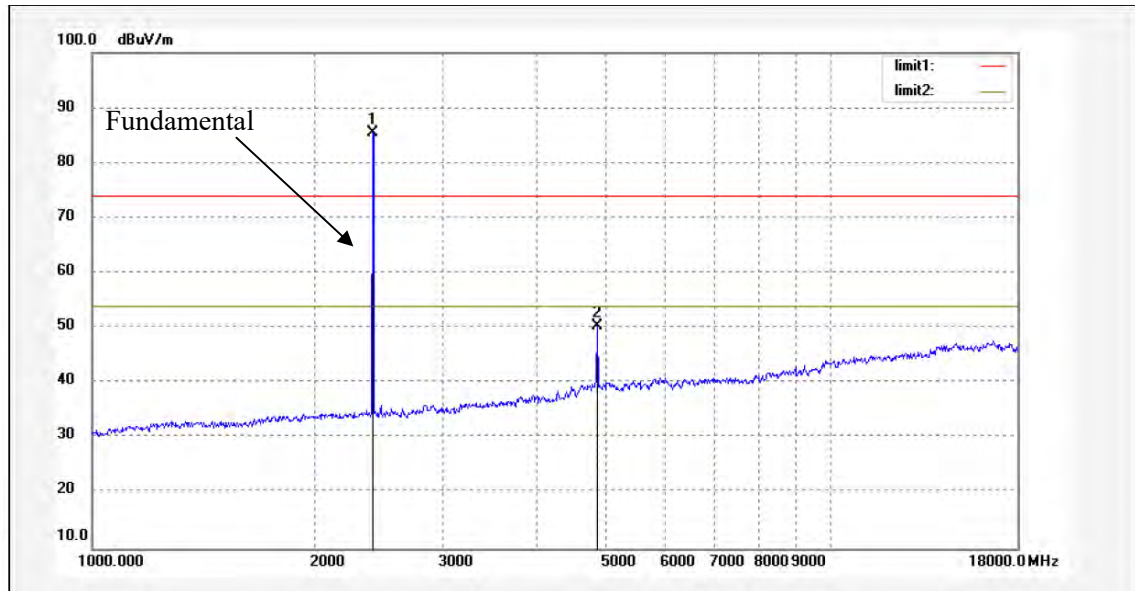
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2412 MHz)									
4824	52.68	PK	256	2.1	H	3.15	55.83	74	18.17
4824	42.28	Ave.	256	2.1	H	3.15	45.43	54	8.57
4824	53.37	PK	333	1.2	V	3.15	56.52	74	17.48
4824	42.96	Ave.	333	1.2	V	3.15	46.11	54	7.89
Middle Channel (2437 MHz)									
4874	54.76	PK	176	1.1	H	4.06	58.82	74	15.18
4874	43.62	Ave.	176	1.1	H	4.06	47.68	54	6.32
4874	52.69	PK	194	1.3	V	4.06	56.75	74	17.25
4874	42.83	Ave.	194	1.3	V	4.06	46.89	54	7.11
High Channel (2462 MHz)									
4944	51.78	PK	157	1.5	H	4.69	56.47	74	17.53
4944	42.18	Ave.	157	1.5	H	4.69	46.87	54	7.13
4944	49.67	PK	211	1.9	V	4.69	54.36	74	19.64
4944	40.52	Ave.	211	1.9	V	4.69	45.21	54	8.79

802.11g:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2412 MHz)									
4824	52.26	PK	24	1.8	H	3.15	55.41	74	18.59
4824	38.47	Ave.	24	1.8	H	3.15	41.62	54	12.38
4824	53.37	PK	169	1.8	V	3.15	56.52	74	17.48
4824	40.18	Ave.	169	1.8	V	3.15	43.33	54	10.67
Middle Channel (2437 MHz)									
4874	54.21	PK	108	1.9	H	4.06	58.27	74	15.73
4874	40.92	Ave.	108	1.9	H	4.06	44.98	54	9.02
4874	53.01	PK	298	1.6	V	4.06	57.07	74	16.93
4874	39.62	Ave.	298	1.6	V	4.06	43.68	54	10.32
High Channel (2462 MHz)									
4944	52.11	PK	94	1.3	H	4.69	56.8	74	17.2
4944	39.02	Ave.	94	1.3	H	4.69	43.71	54	10.29
4944	49.48	PK	28	1.8	V	4.69	54.17	74	19.83
4944	37.10	Ave.	28	1.8	V	4.69	41.79	54	12.21

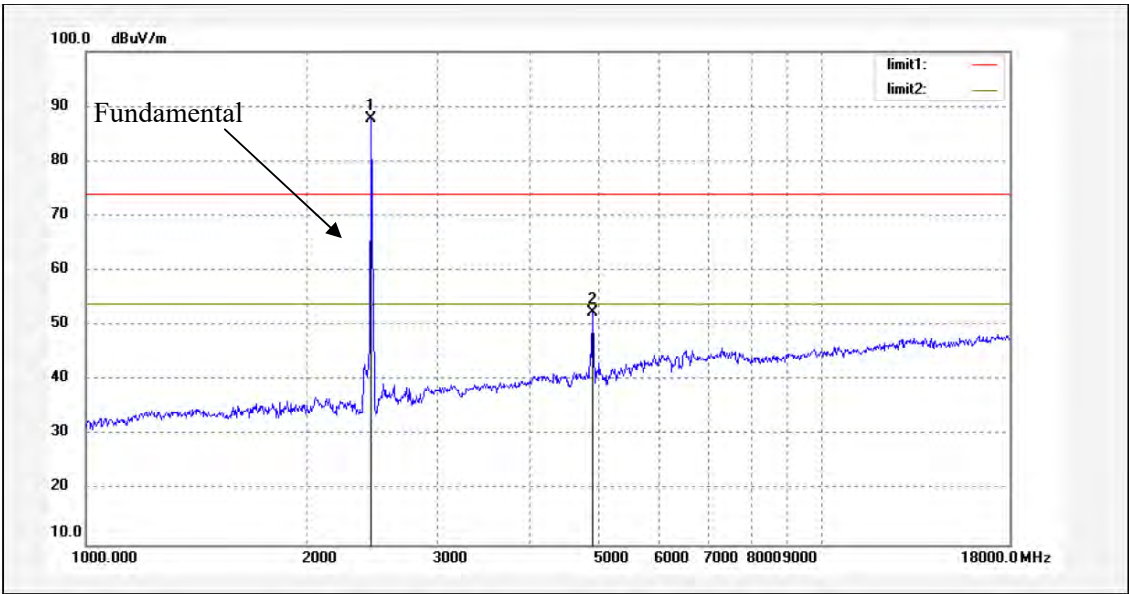
802.11n20:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2412 MHz)									
4824	52.46	PK	267	1.5	H	3.15	55.61	74	18.39
4824	38.59	Ave.	267	1.5	H	3.15	41.74	54	12.26
4824	53.10	PK	240	1.3	V	3.15	56.25	74	17.75
4824	39.98	Ave.	240	1.3	V	3.15	43.13	54	10.87
Middle Channel (2437 MHz)									
4874	54.36	PK	286	1.4	H	4.06	58.42	74	15.58
4874	40.45	Ave.	286	1.4	H	4.06	44.51	54	9.49
4874	52.34	PK	127	1.3	V	4.06	56.4	74	17.6
4874	39.01	Ave.	127	1.3	V	4.06	43.07	54	10.93
High Channel (2462 MHz)									
4944	51.90	PK	303	1.7	H	4.69	56.59	74	17.41
4944	38.59	Ave.	303	1.7	H	4.69	43.28	54	10.72
4944	49.35	PK	126	1.5	V	4.69	54.04	74	19.96
4944	37.06	Ave.	126	1.5	V	4.69	41.75	54	12.25

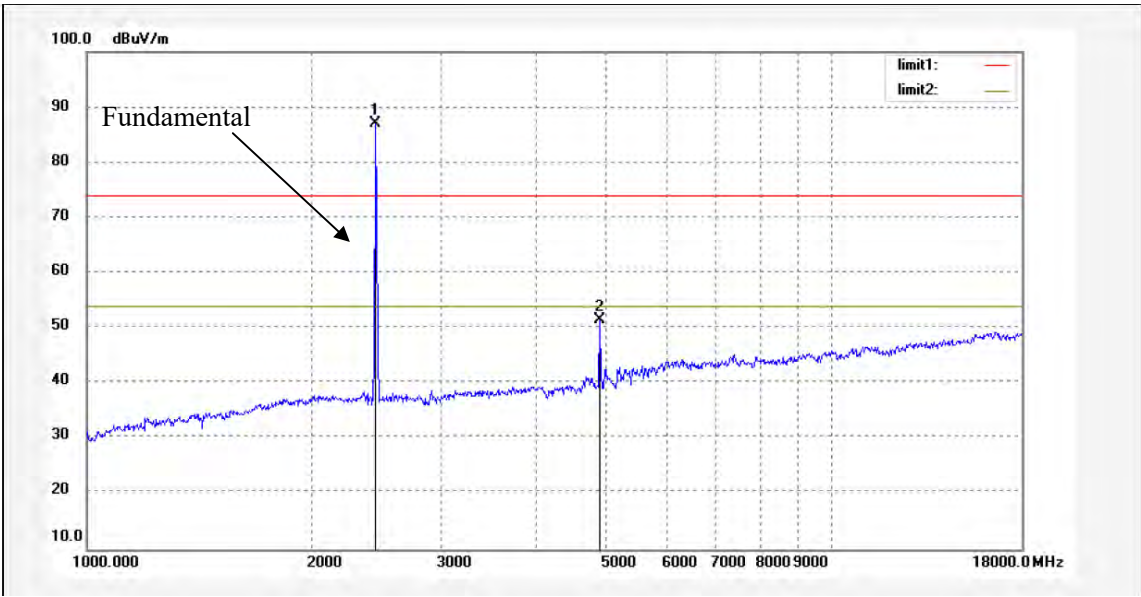
Pre-scan plots:**802.11b****TX Chanel 1:****Horizontal****Vertical**

TX Chanel 6:

Horizontal

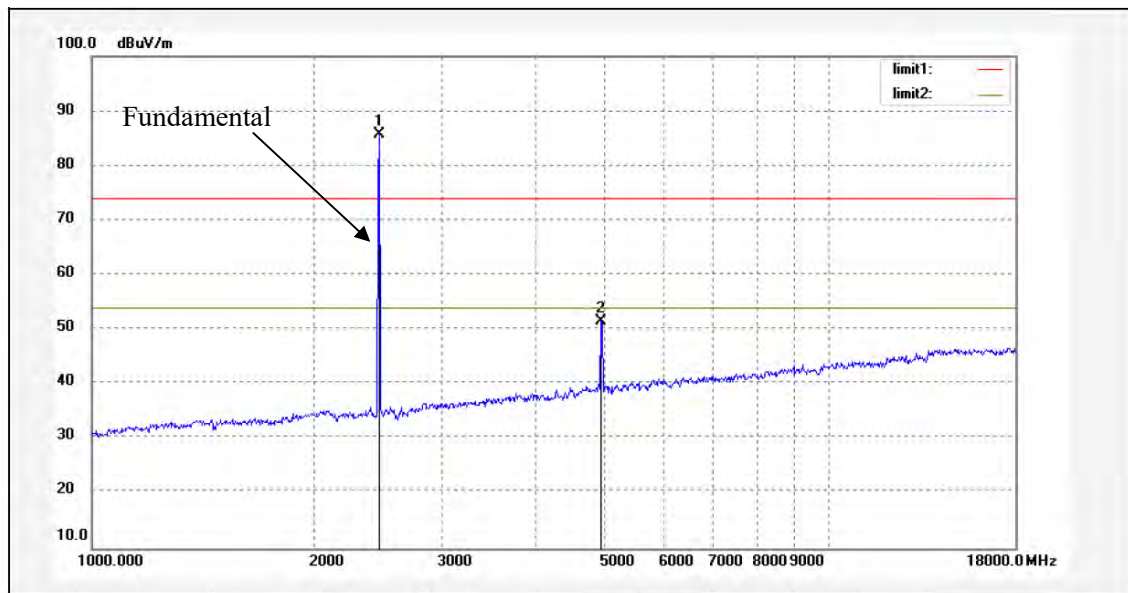


Vertical

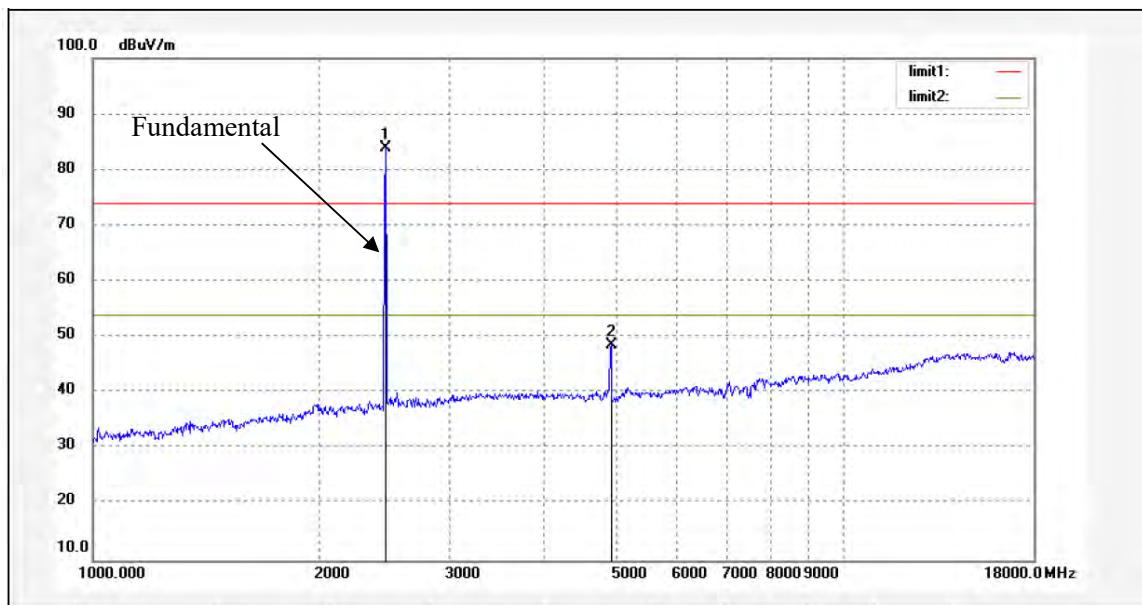


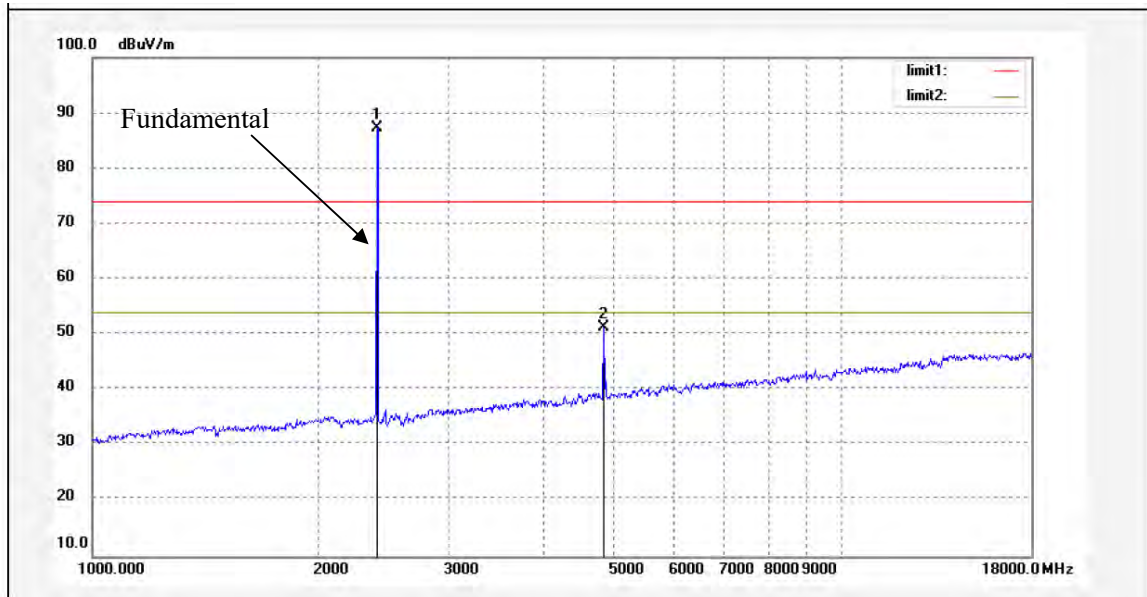
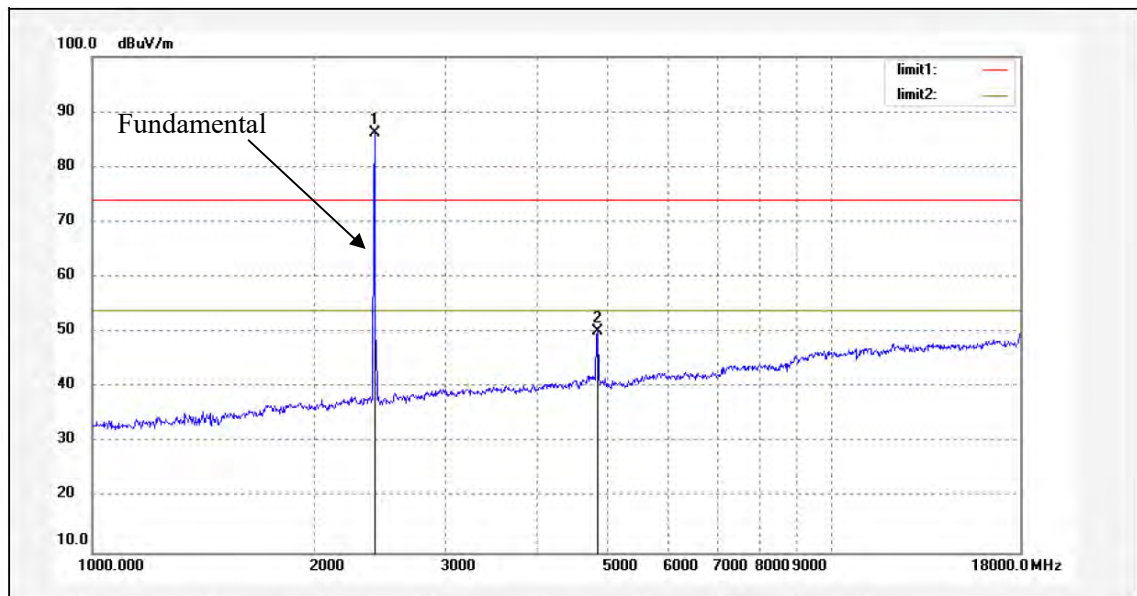
TX Chanel 11:

Horizontal



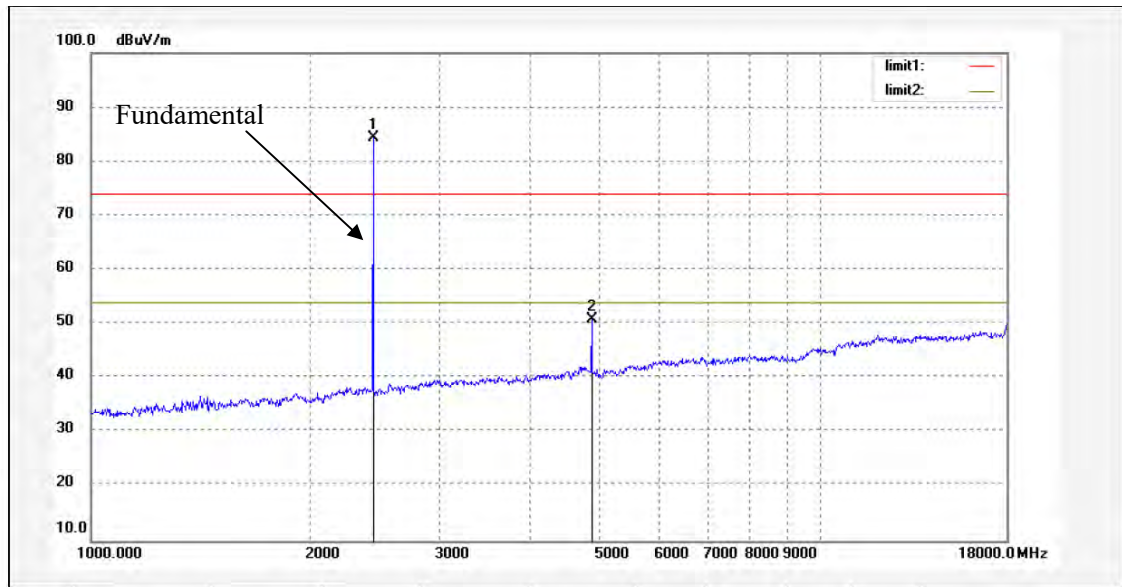
Vertical



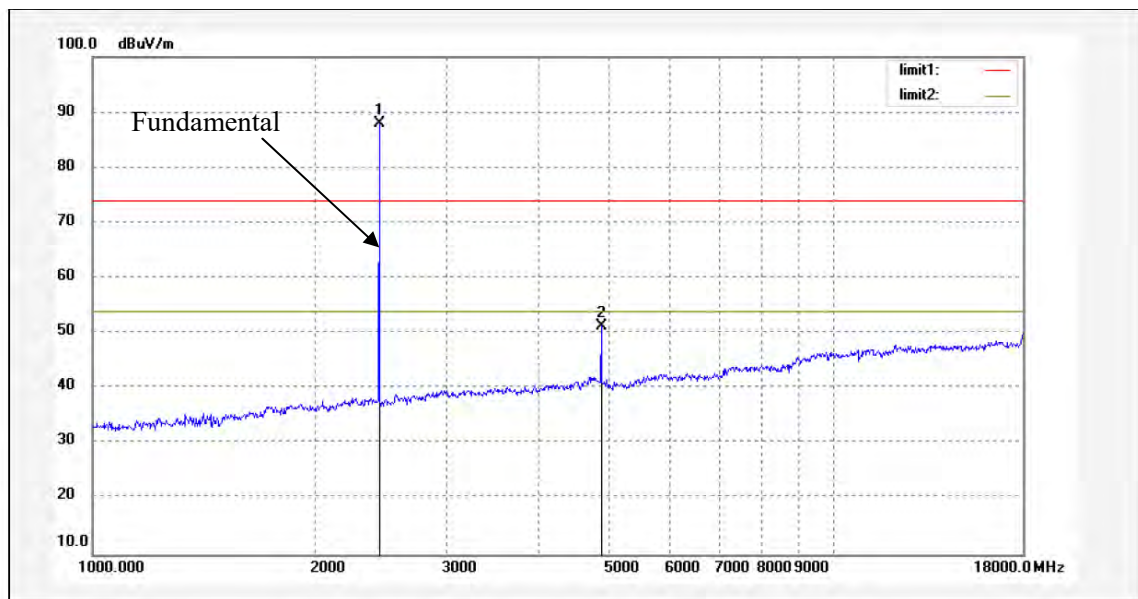
**802.11g
TX Chanel 1:****Horizontal****Vertical**

TX Chanel 6:

Horizontal

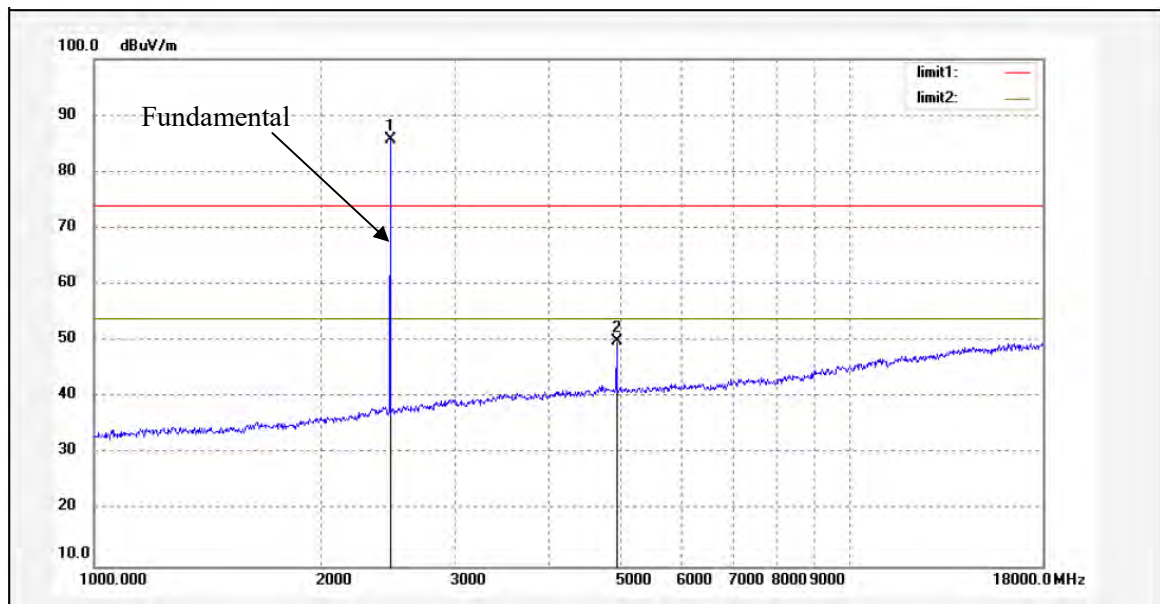


Vertical

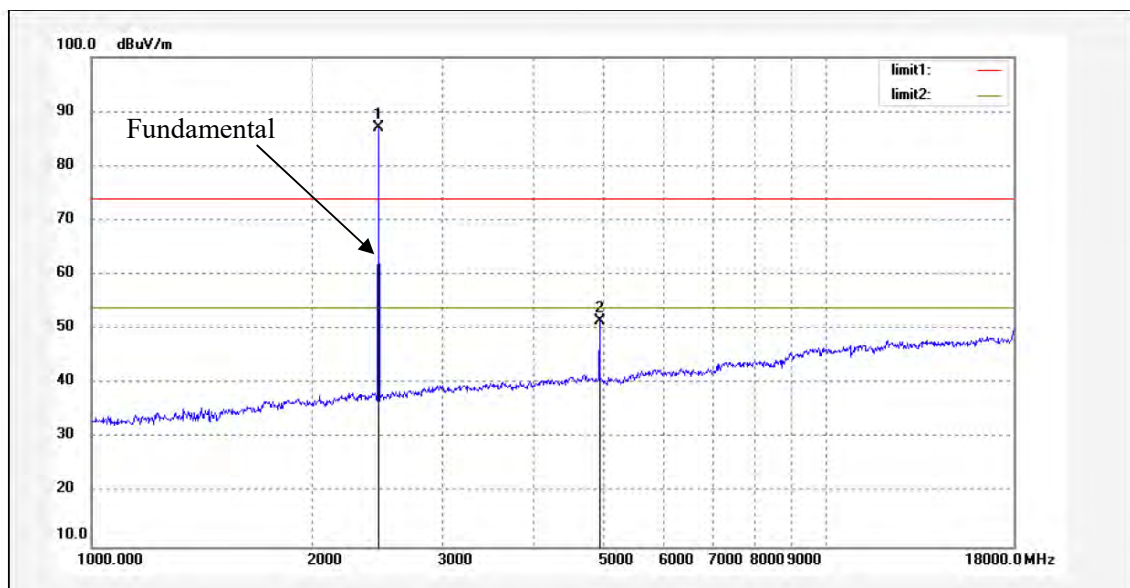


TX Chanel 11:

Horizontal

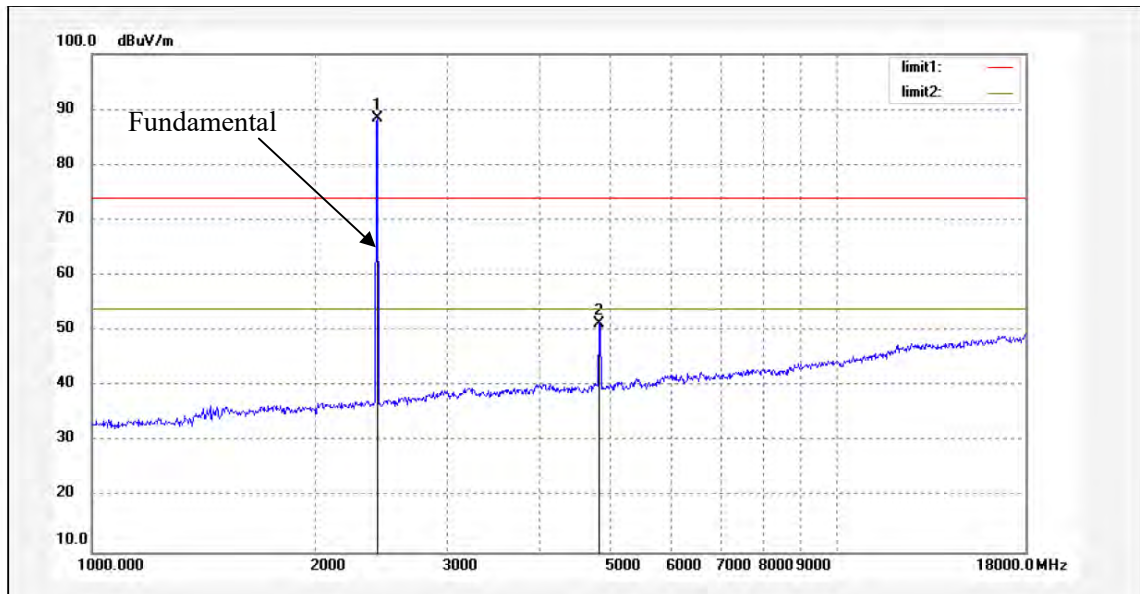


Vertical

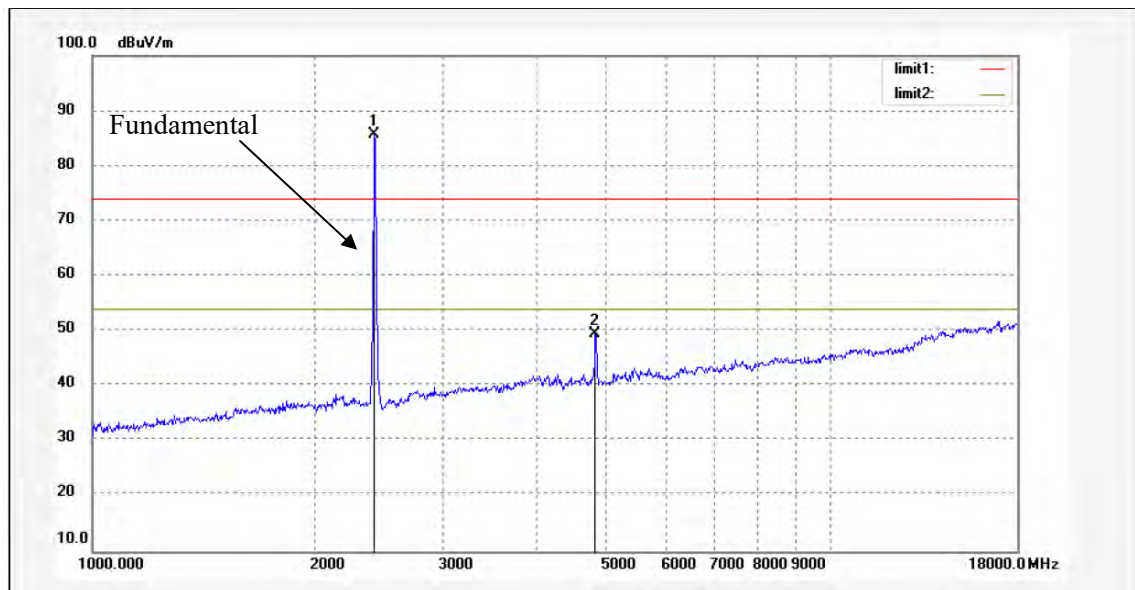


802.11n20
TX Chanel 1:

Horizontal

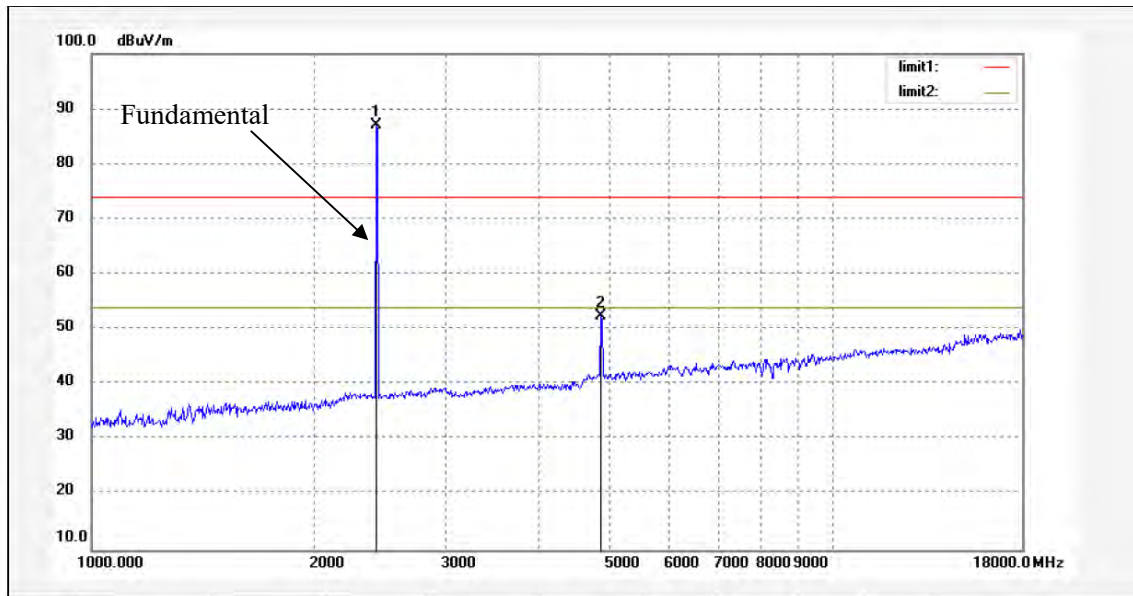


Vertical

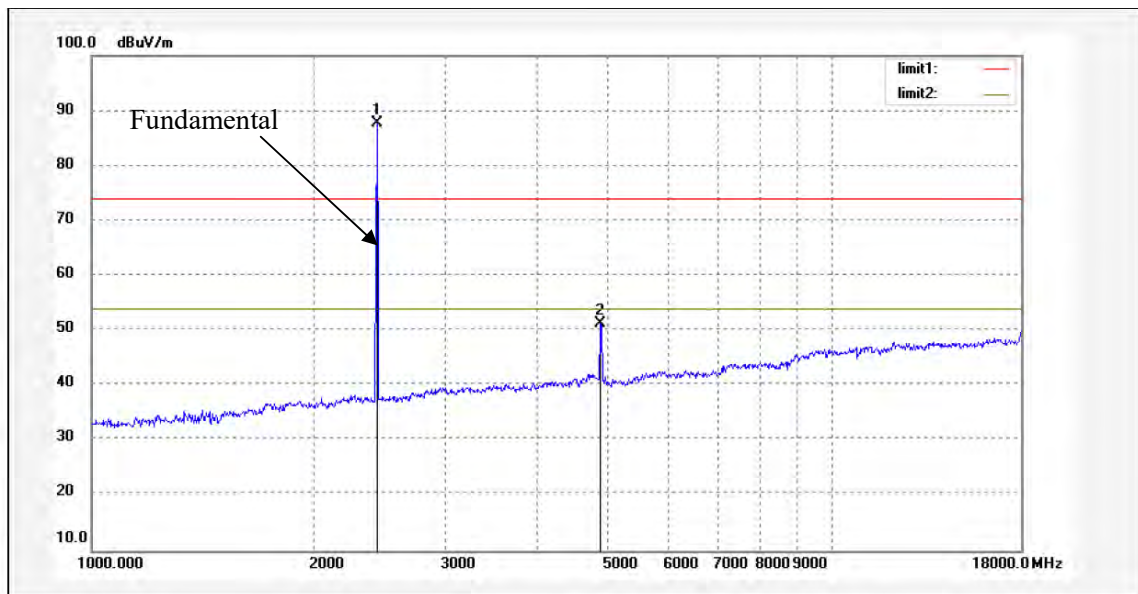


TX Chanel 6:

Horizontal

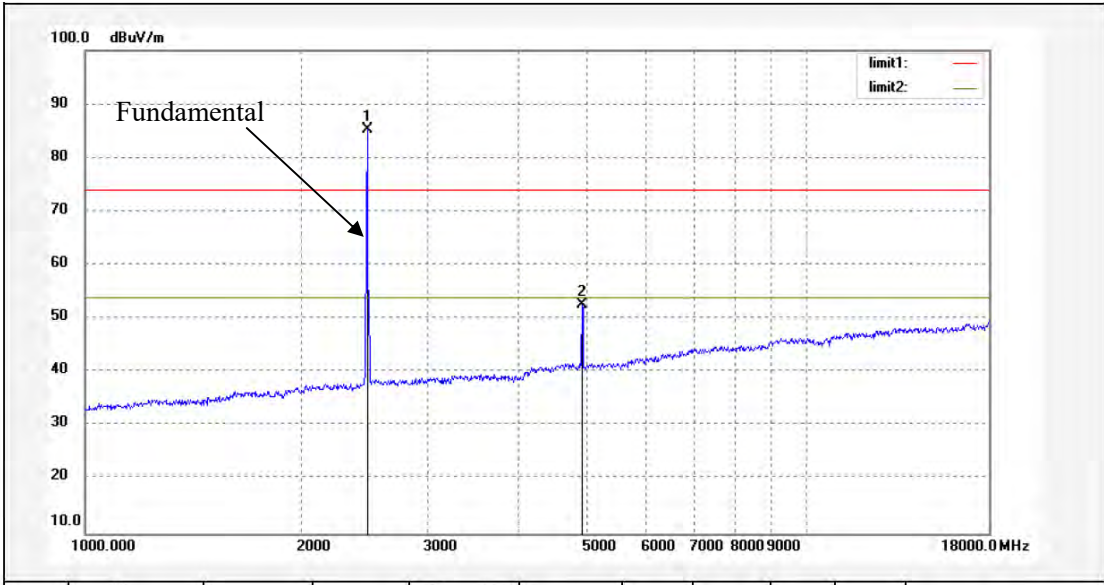


Vertical

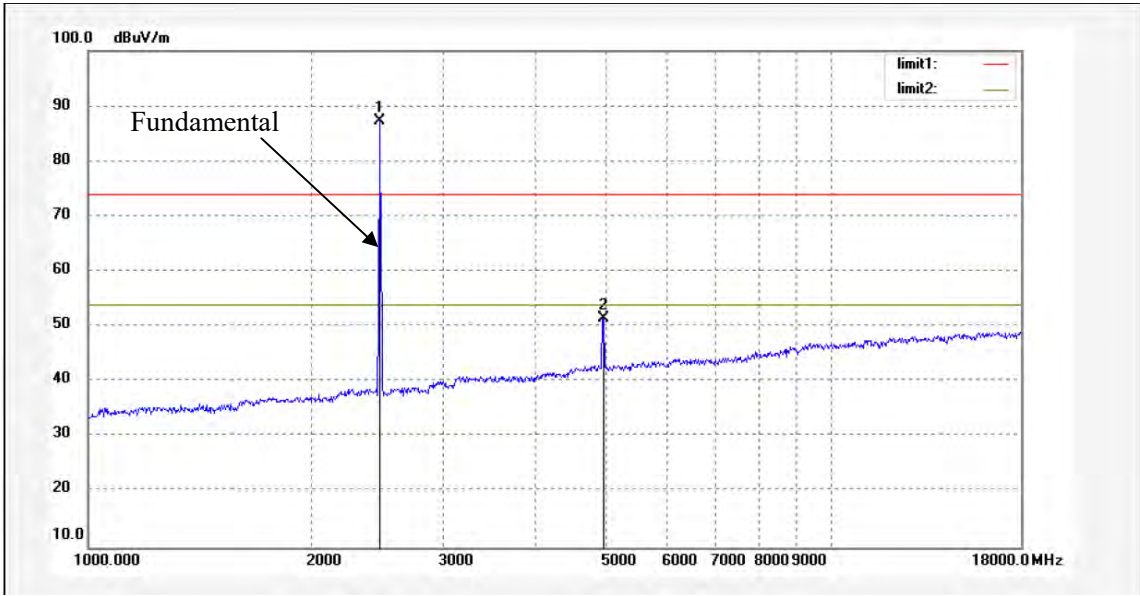


TX Chanel 11:

Horizontal



Vertical



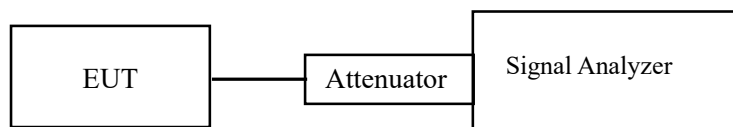
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

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:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2020-12-21.

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

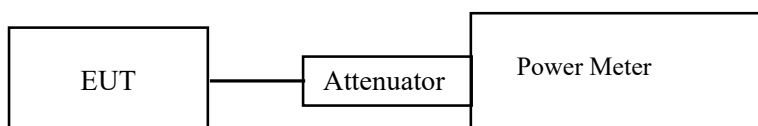
Applicable Standard

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:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Test engineer on 2020-12-26.

EUT operation mode: Transmitting

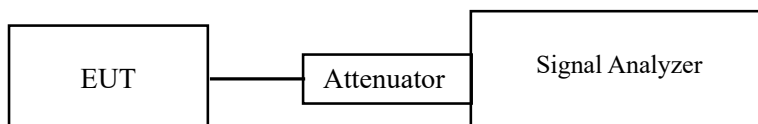
Test Result: Compliant. Please refer to the Appendix Wi-Fi and Appendix BLE.

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:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

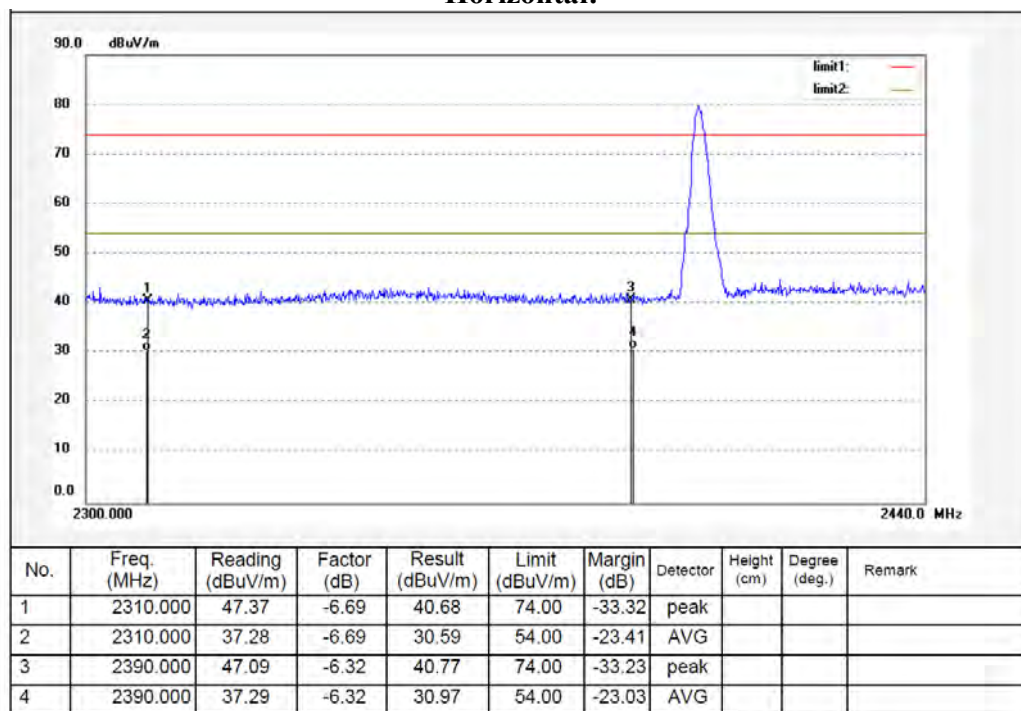
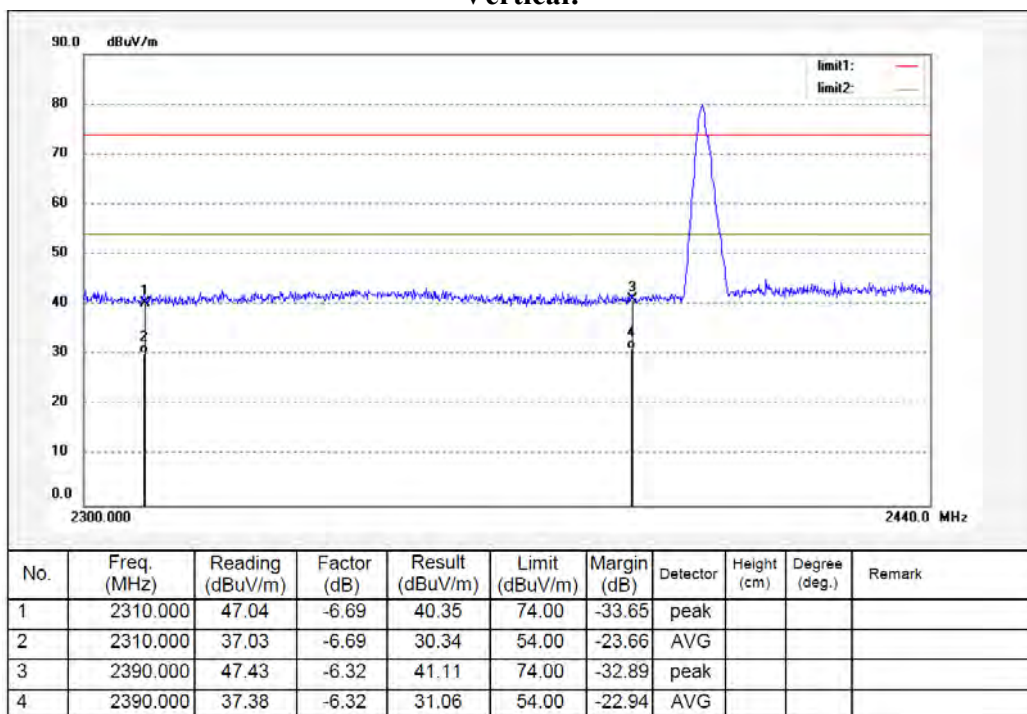
The testing was performed by Fan Yang on 2020-12-28.

EUT operation mode: Transmitting

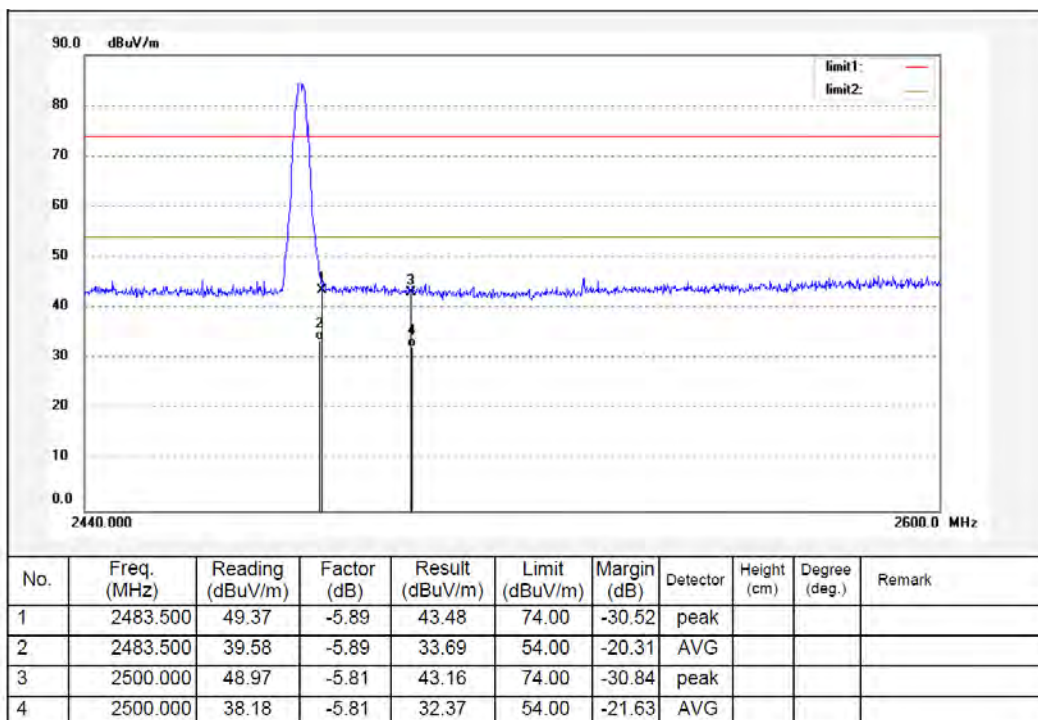
Test Result: Compliant.

Conducted Band Edge Result:

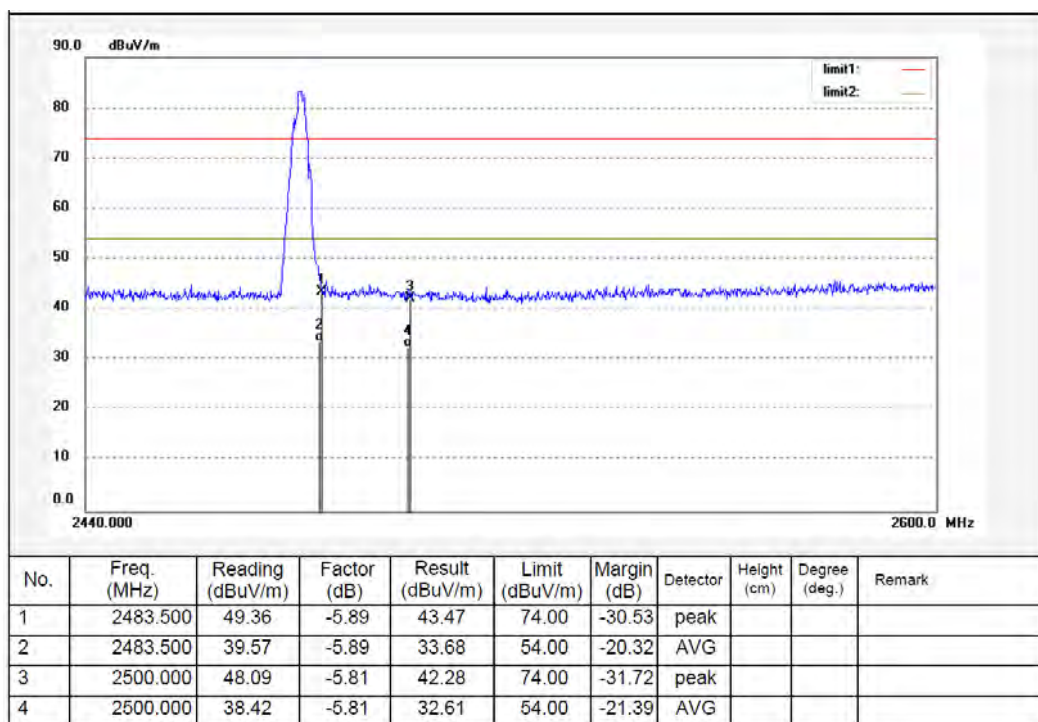
Please refer to the Appendix Wi-Fi and Appendix BLE.

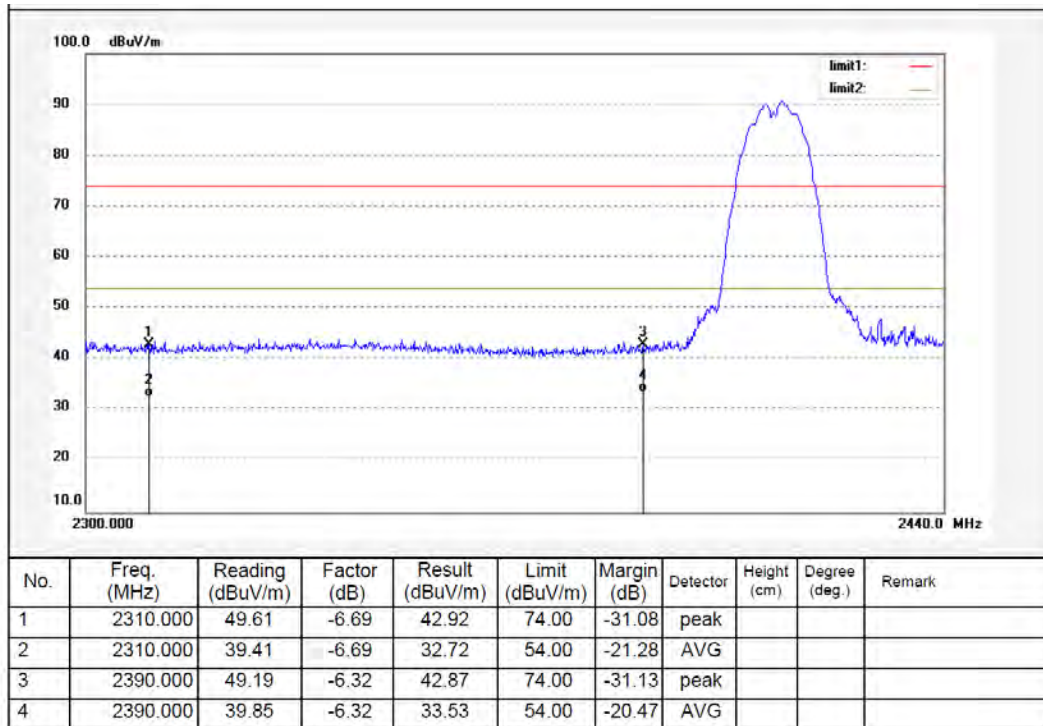
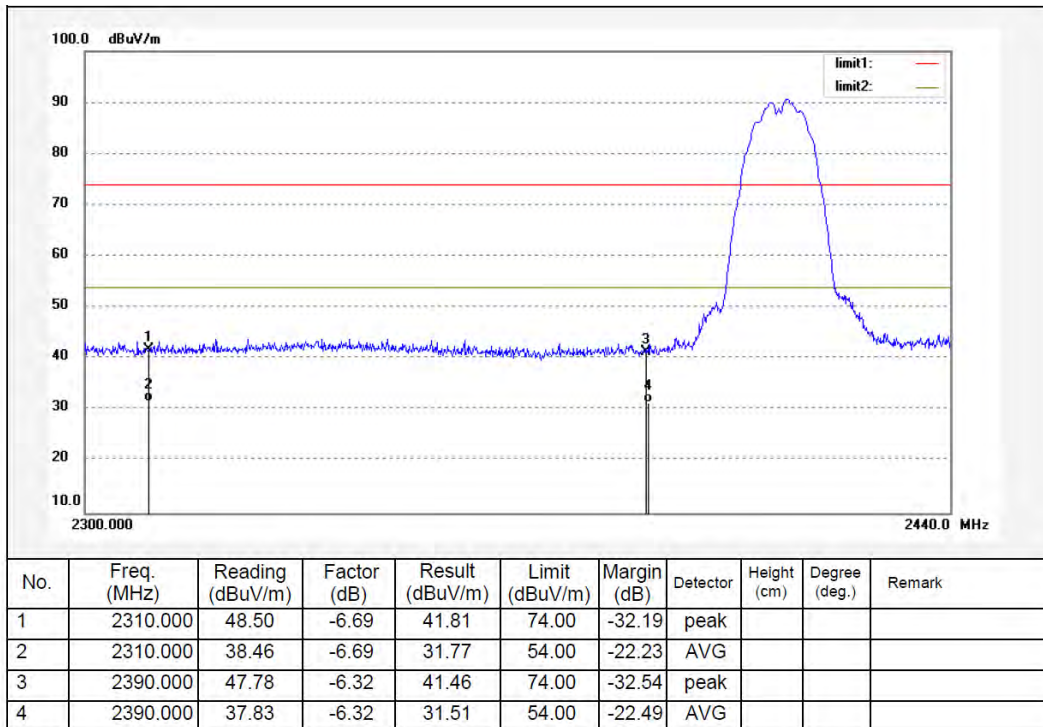
Radiated Band Edge Result:**BLE:****GFSK 2402MHz:****Horizontal:****Vertical:**

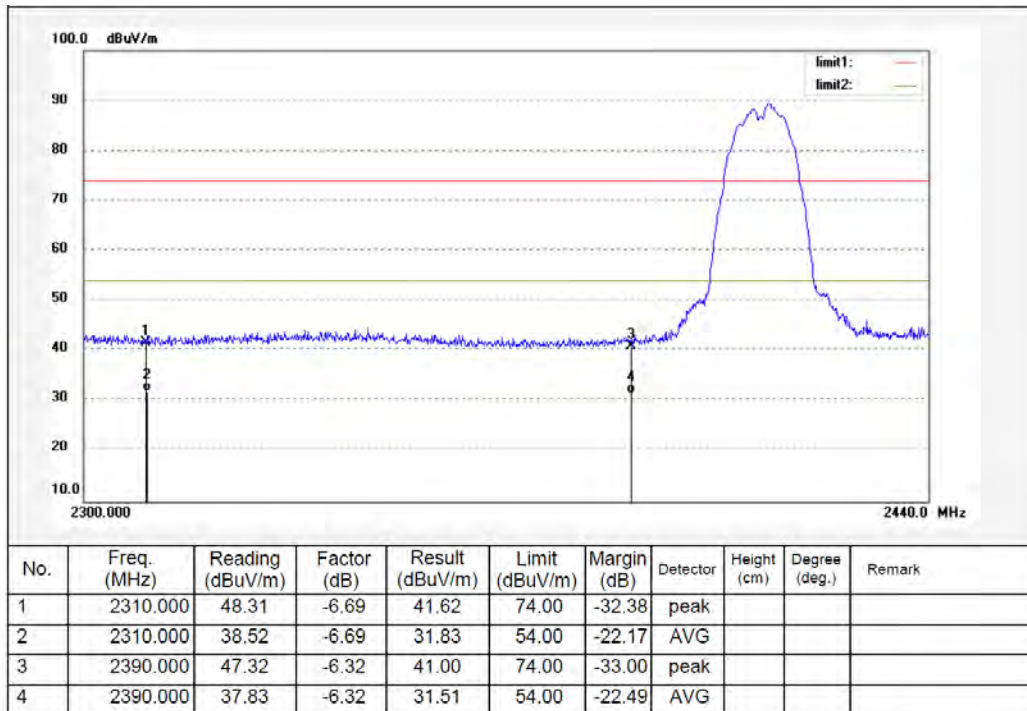
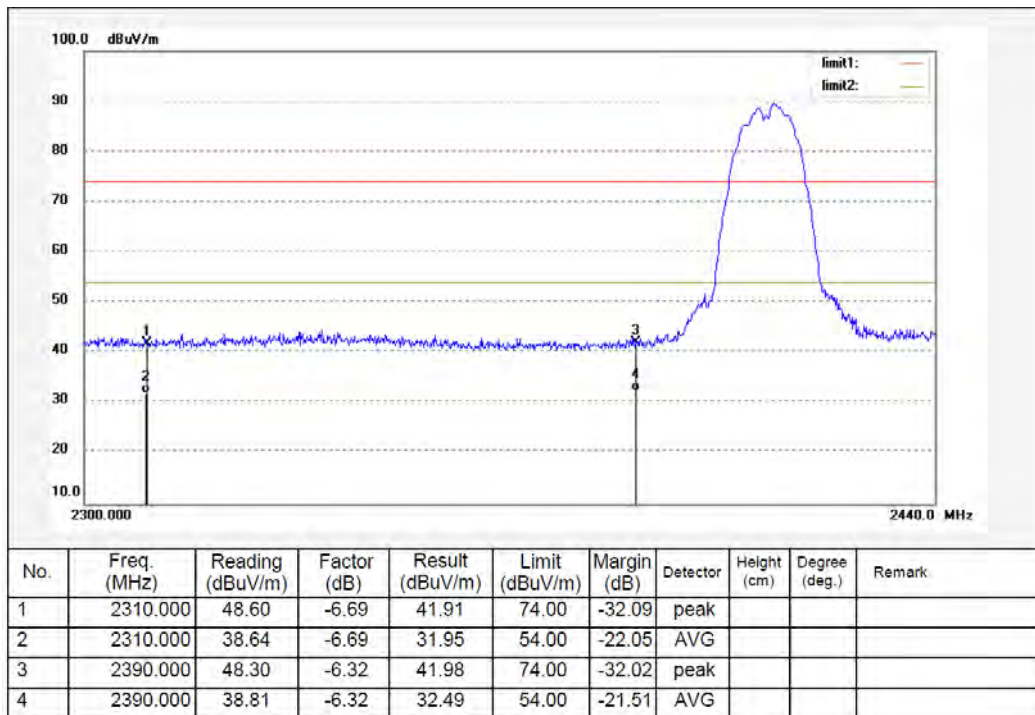
**GFSK 2480MHz:
Horizontal:**

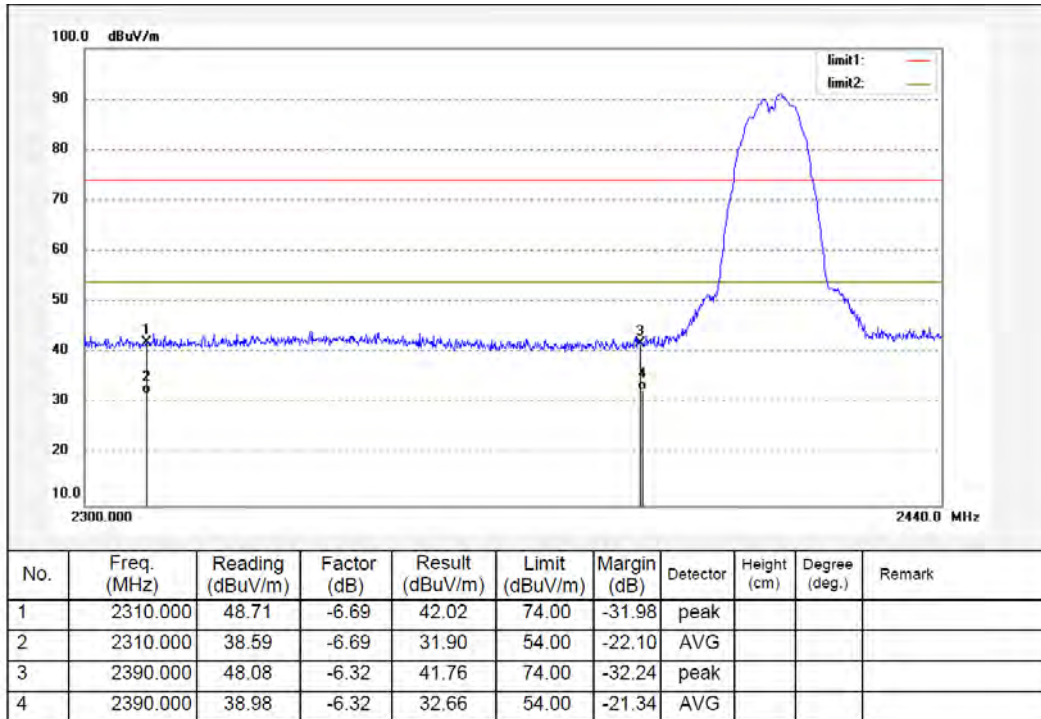
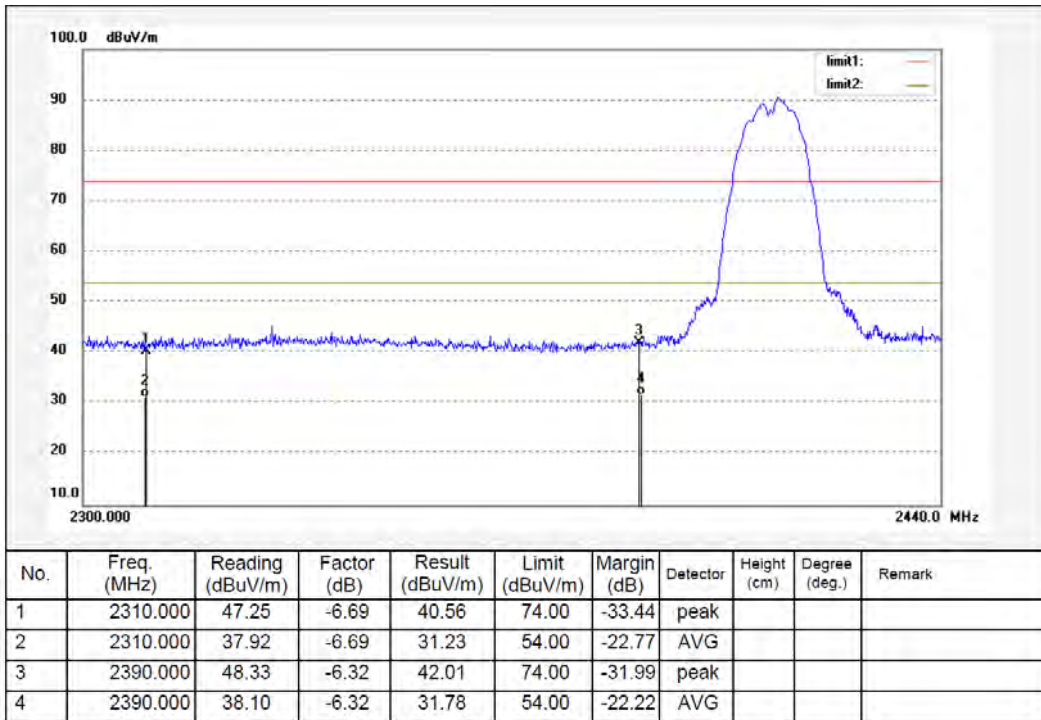


Vertical:

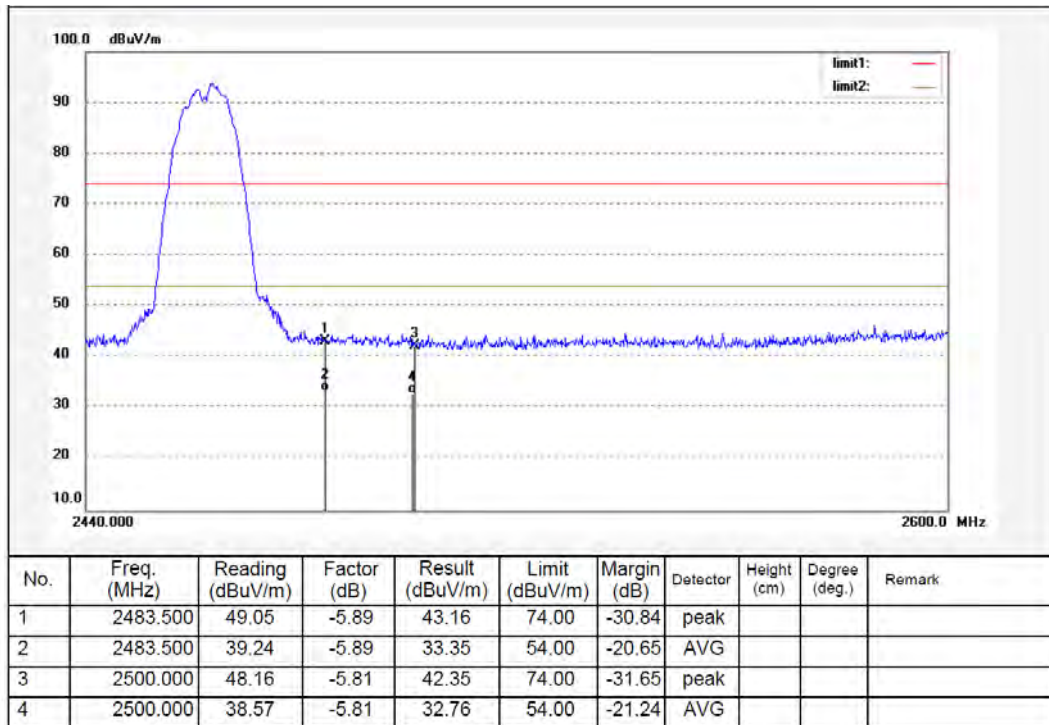


Wi-Fi:**TX Chanel 1 (802.11b):
Horizontal:****Vertical:**

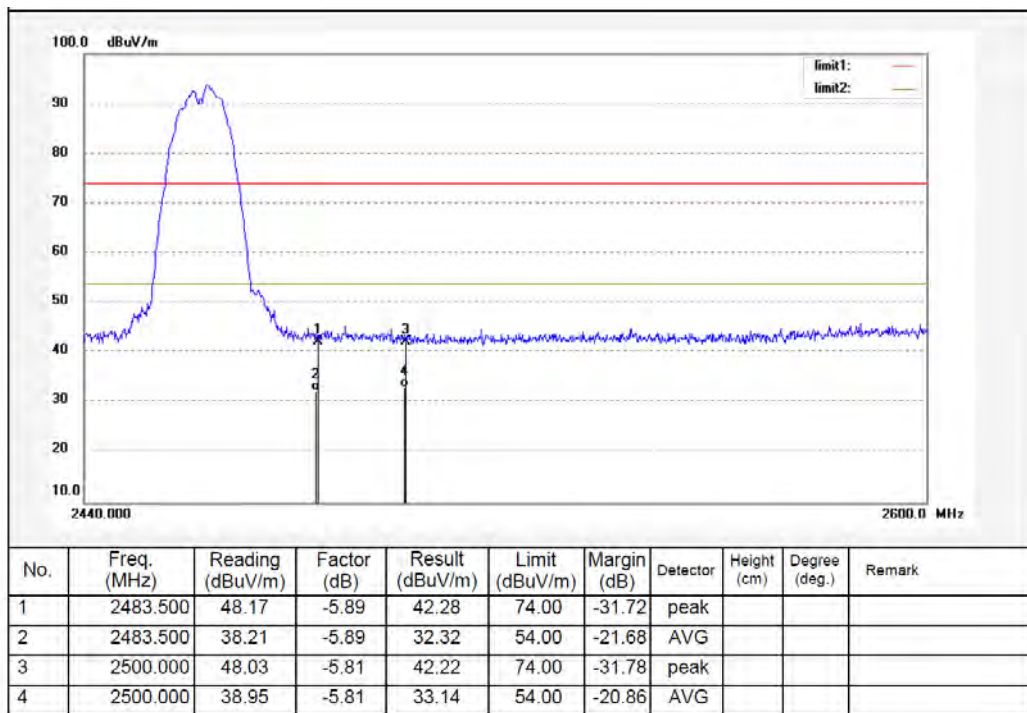
**TX Chanel 1 (802.11g):
Horizontal:****Vertical:**

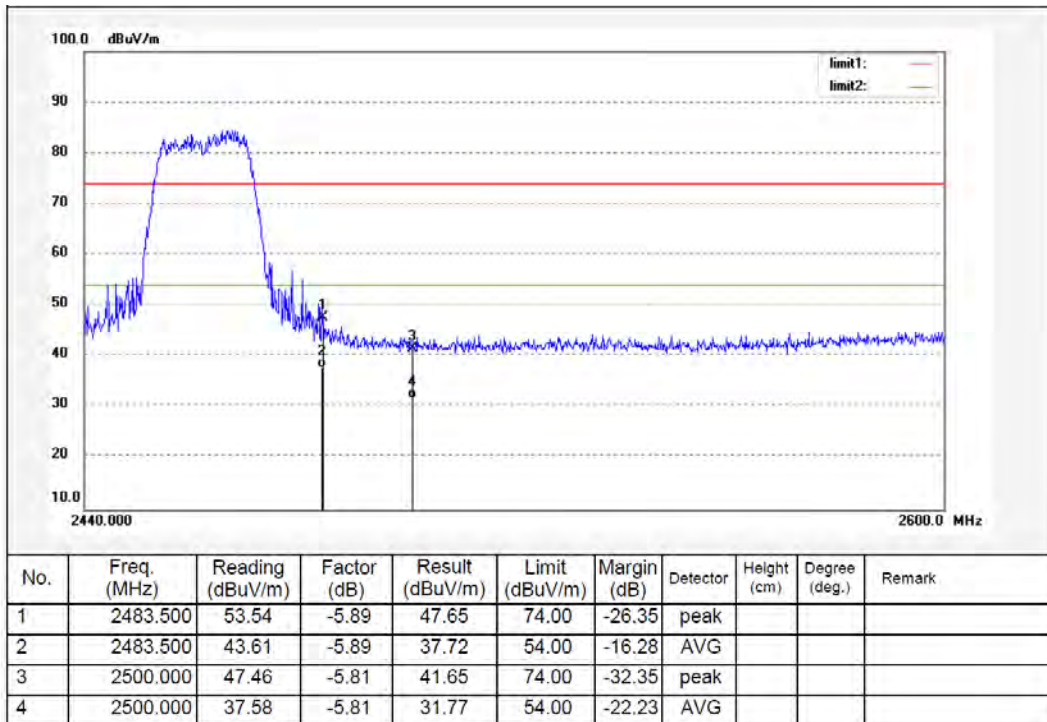
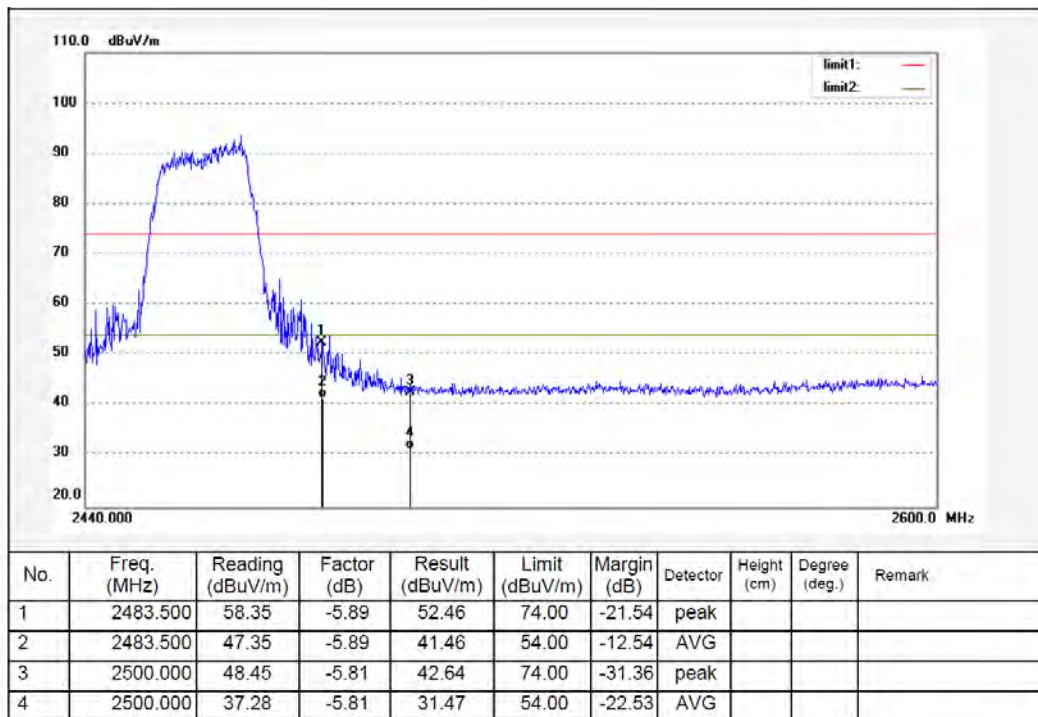
**TX Chanel 1 (802.11n20):
Horizontal:****Vertical:**

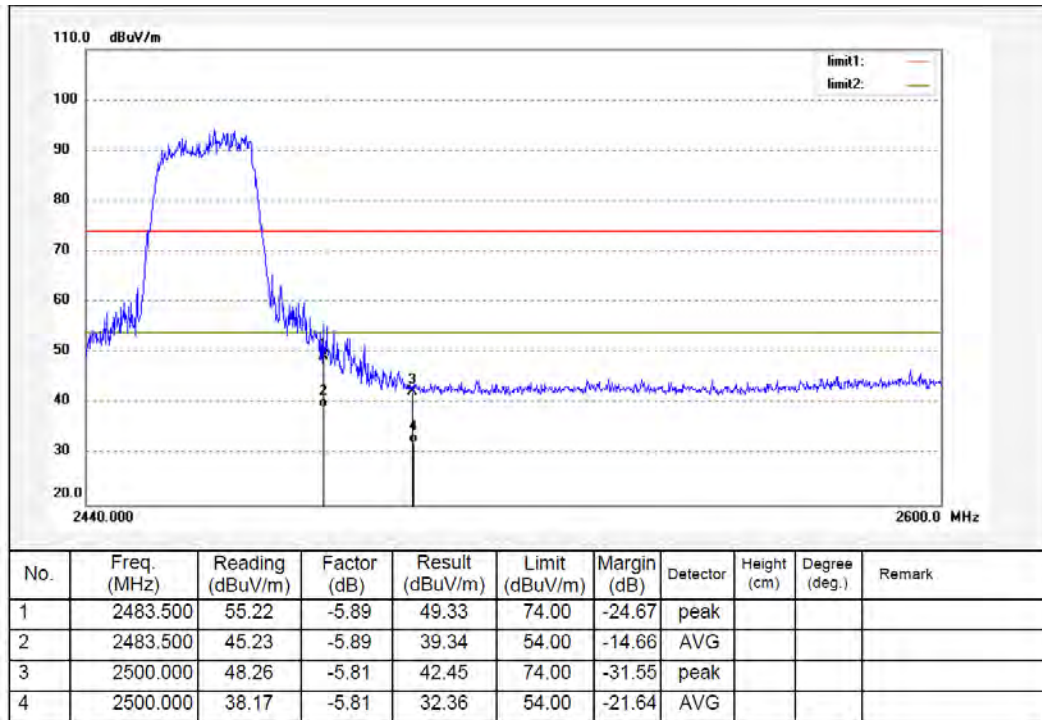
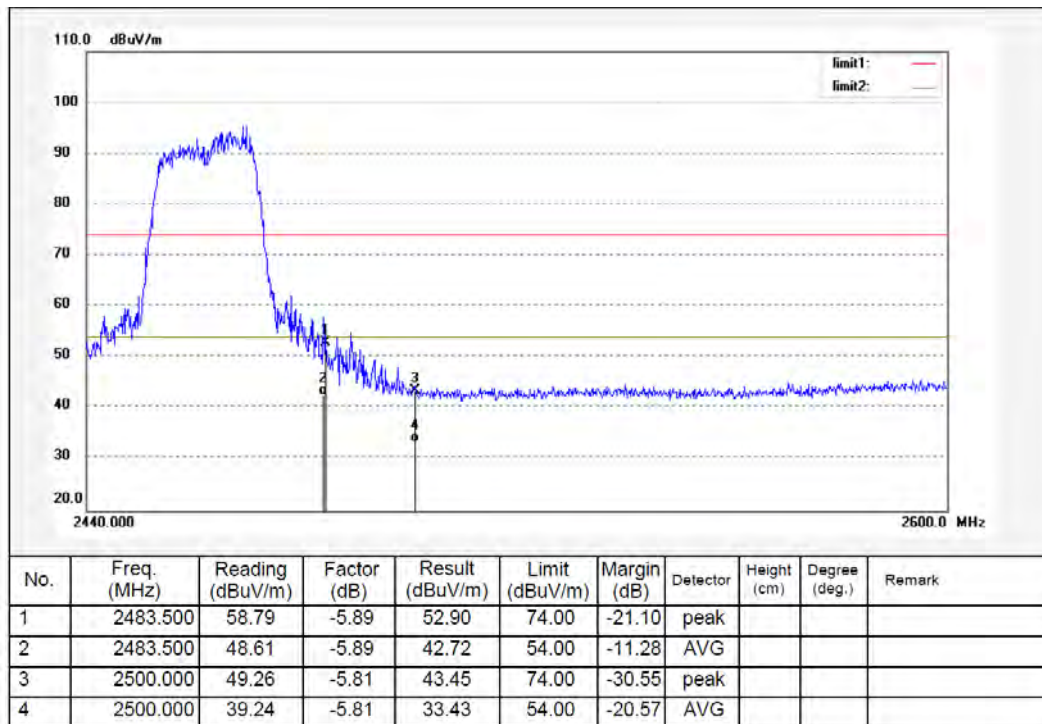
TX Chanel 11 (802.11b):
Horizontal:



Vertical:



**TX Chanel 11 (802.11g):
Horizontal:****Vertical:**

**TX Chanel 11 (802.11n20):
Horizontal:****Vertical:**

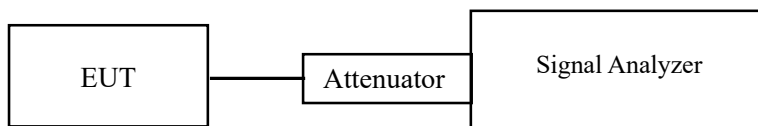
FCC §15.247(e) - POWER SPECTRAL DENSITY

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: $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$.
3. Set the VBW $\geq 3 \times \text{RBW}$.
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:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2020-12-21.

EUT operation mode: Transmitting

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

APPENDIX Wi-Fi

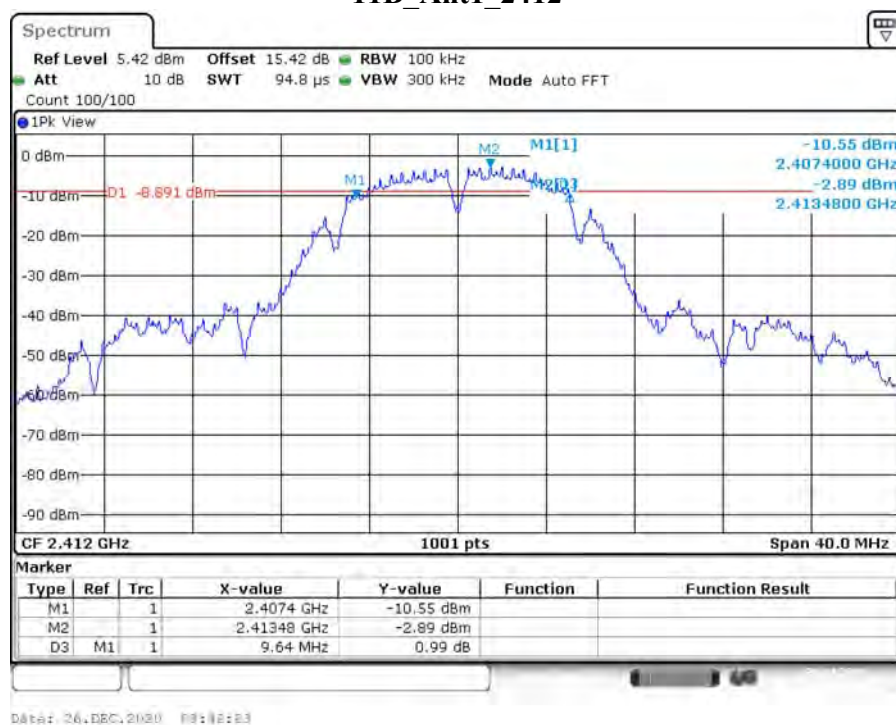
Appendix A: 6dB Emission Bandwidth

Test Result

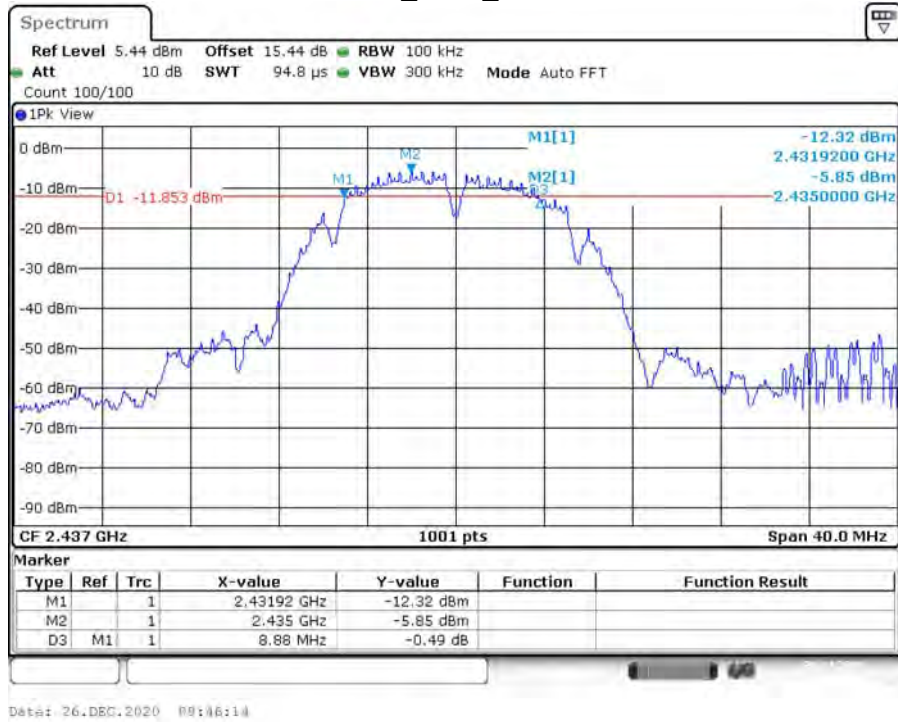
Test Mode	Antenna	Channel	DTS BW [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	9.640	0.5	PASS
		2437	8.880	0.5	PASS
		2462	8.880	0.5	PASS
11G	Ant1	2412	16.200	0.5	PASS
		2437	15.800	0.5	PASS
		2462	15.800	0.5	PASS
11N20SISO	Ant1	2412	17.400	0.5	PASS
		2437	16.400	0.5	PASS
		2462	16.400	0.5	PASS

Test Graphs

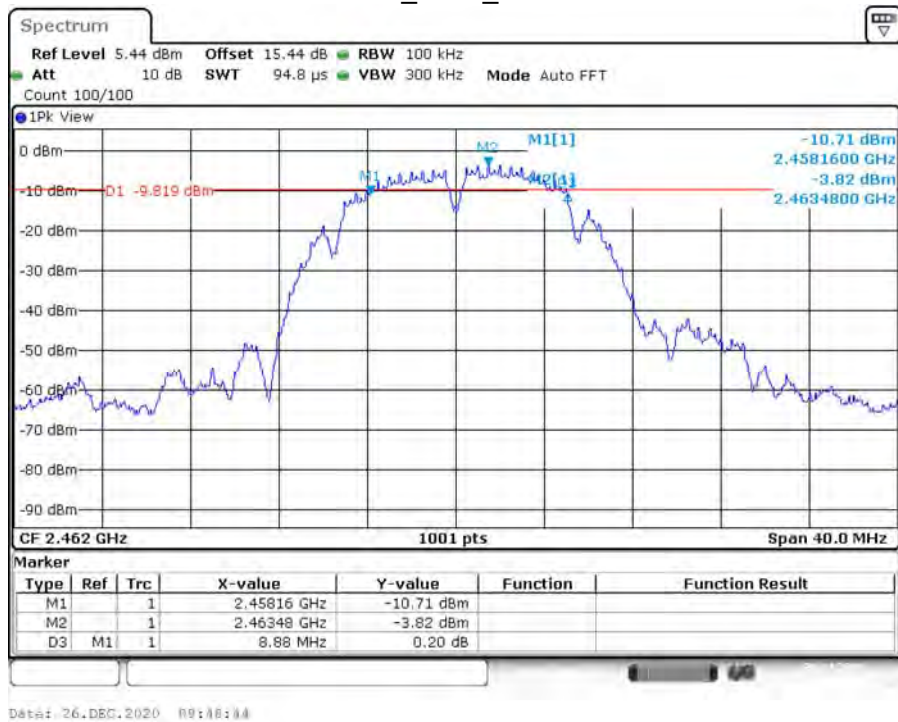
11B_Ant1_2412



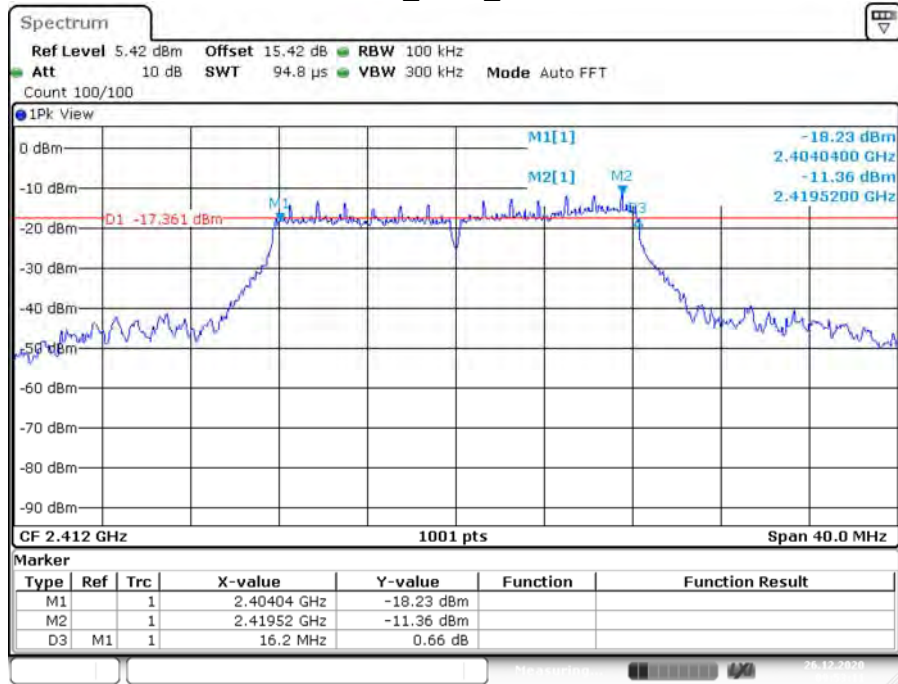
11B_Ant1_2437



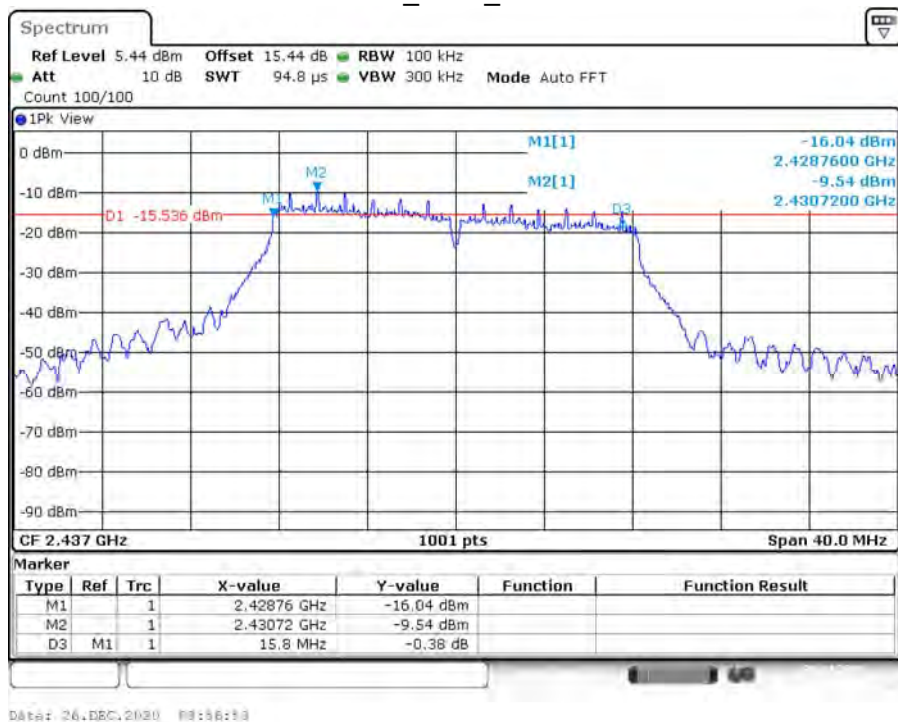
11B_Ant1_2462



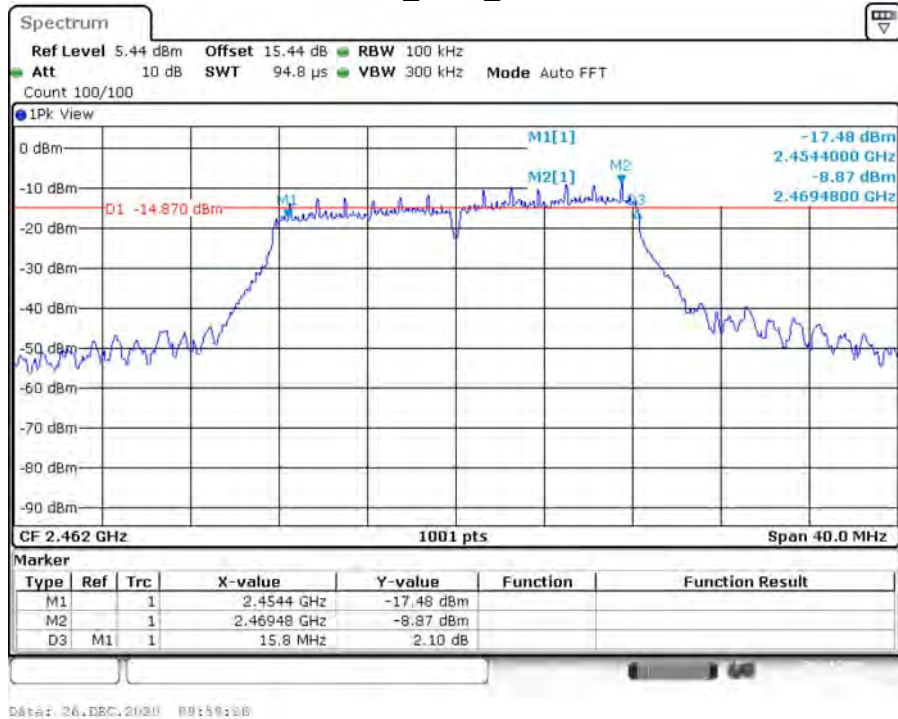
11G_Ant1_2412



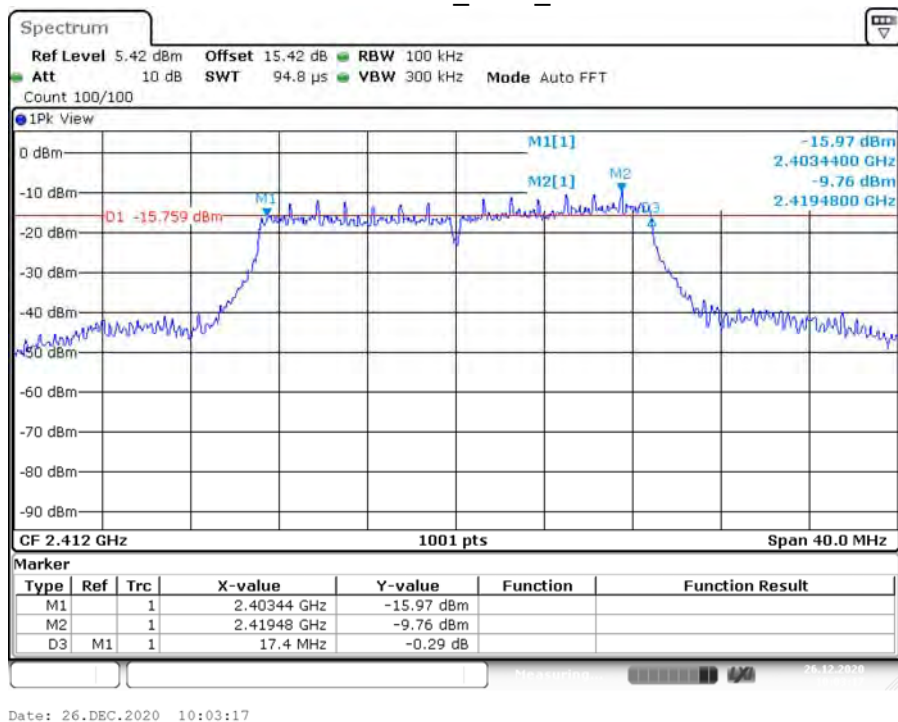
11G_Ant1_2437



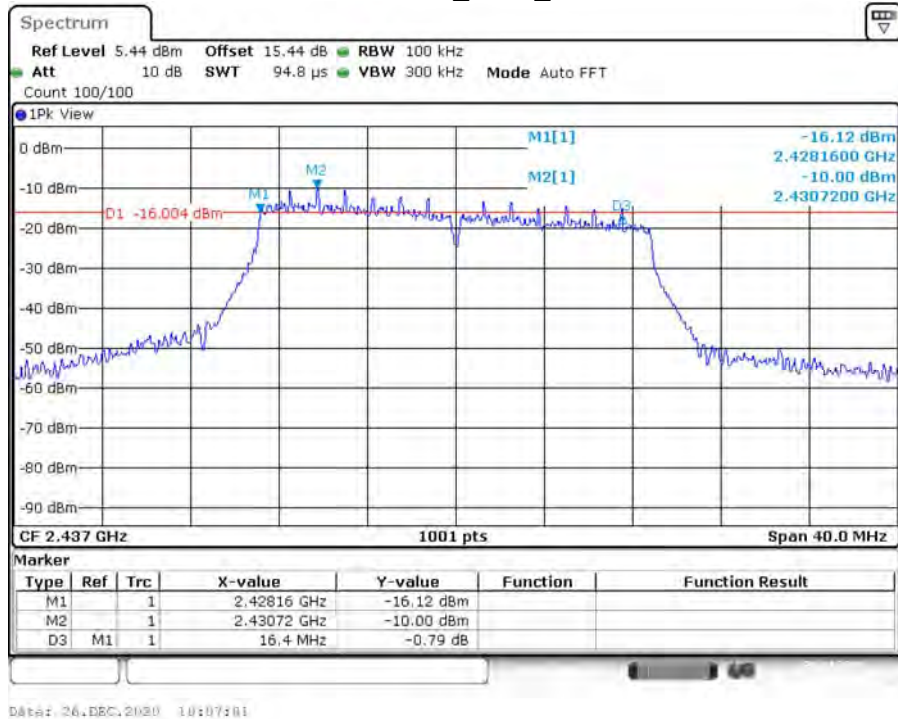
11G_Ant1_2462



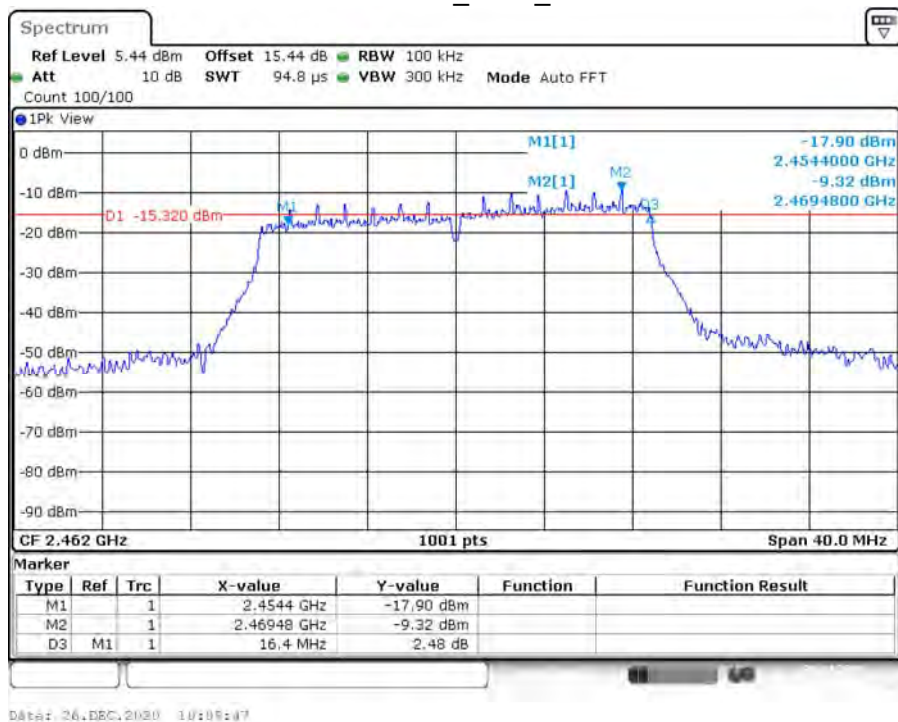
11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462



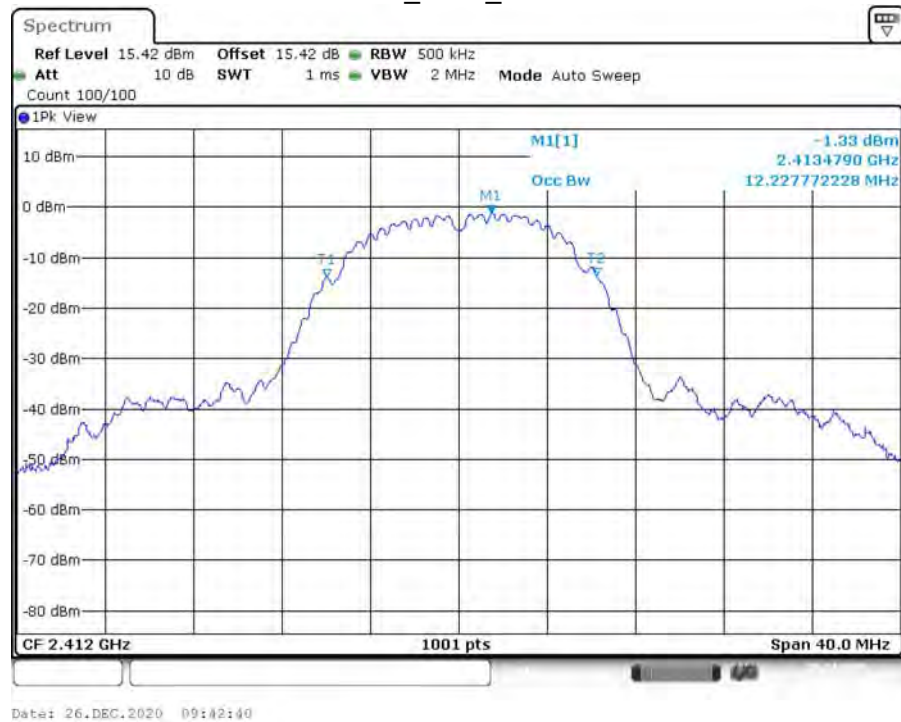
Appendix B: Occupied Channel Bandwidth

Test Result

Test Mode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	12.228	---	PASS
		2437	11.708	---	PASS
		2462	11.668	---	PASS
11G	Ant1	2412	18.701	---	PASS
		2437	17.782	---	PASS
		2462	17.822	---	PASS
11N20SISO	Ant1	2412	19.141	---	PASS
		2437	18.422	---	PASS
		2462	18.462	---	PASS

Test Graphs

11B_Ant1_2412



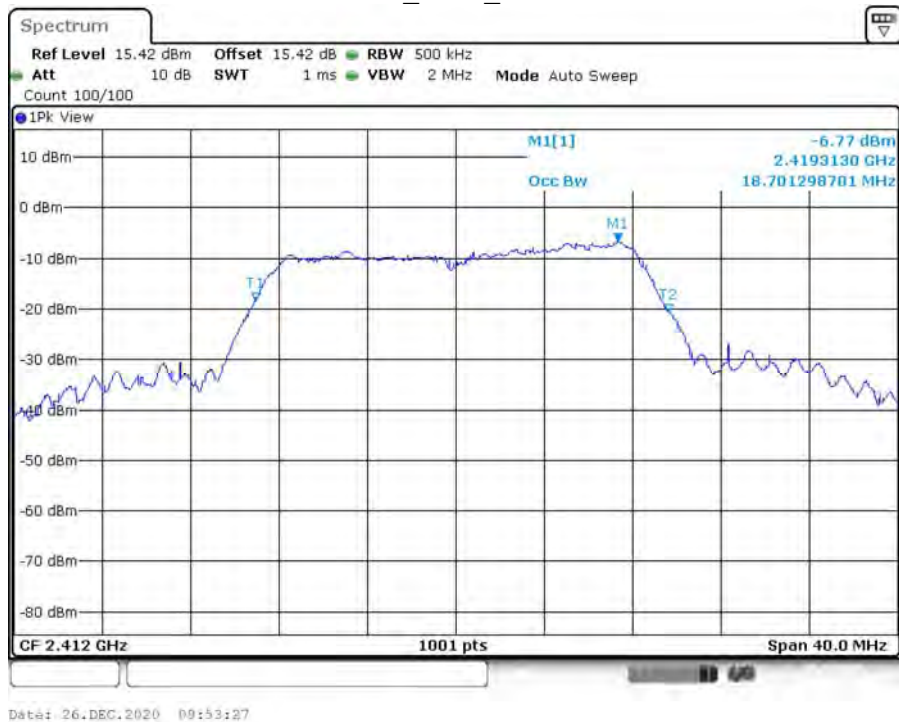
11B_Ant1_2437



11B_Ant1_2462



11G_Ant1_2412



11G_Ant1_2437



11G_Ant1_2462



11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462



Appendix C: Maximum conducted output power**Test Result**

Test Mode	Antenna	Channel	Peak Power Result [dBm]	Average Power Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	9.55	7.69	<=30	PASS
		2437	10.02	7.73	<=30	PASS
		2462	9.85	7.47	<=30	PASS
11G	Ant1	2412	13.97	9.15	<=30	PASS
		2437	13.81	8.94	<=30	PASS
		2462	13.68	8.80	<=30	PASS
11N20SISO	Ant1	2412	12.92	8.56	<=30	PASS
		2437	12.48	8.23	<=30	PASS
		2462	12.27	8.38	<=30	PASS

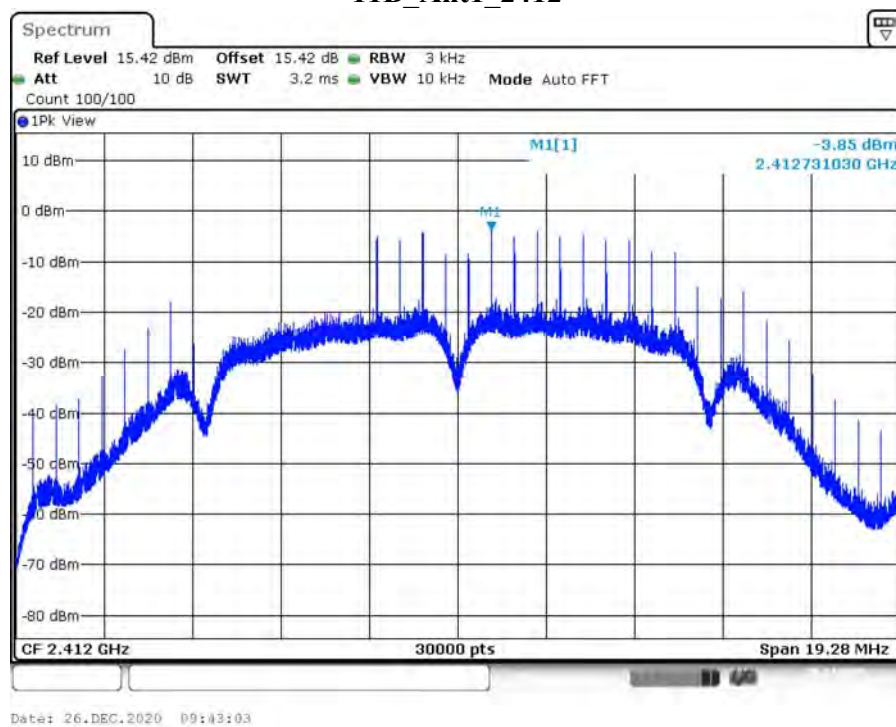
Appendix D: Power spectral density

Test Result

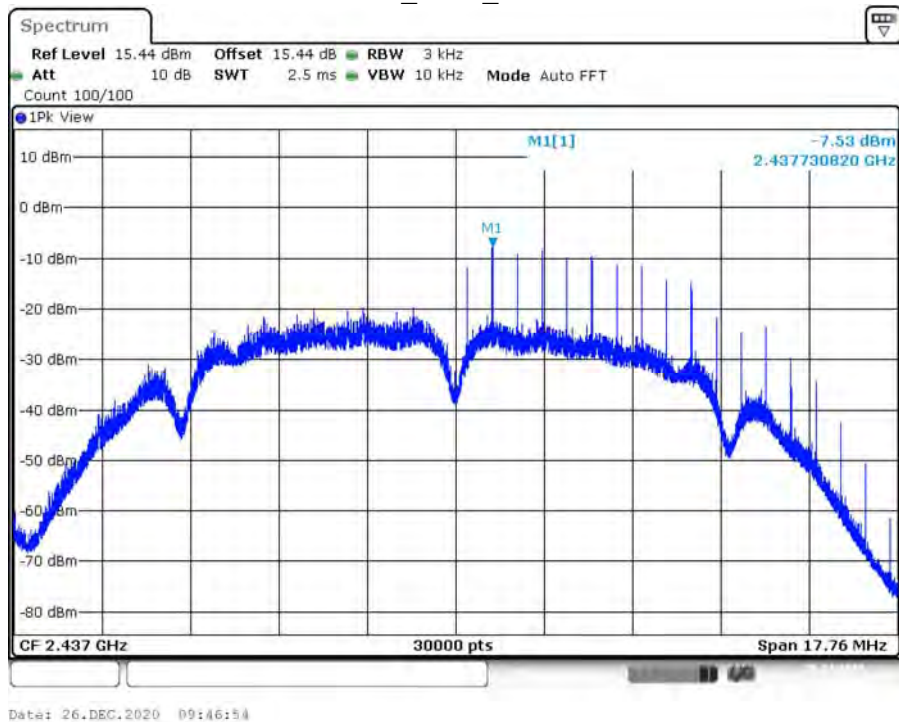
TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-3.85	<=8	PASS
		2437	-7.53	<=8	PASS
		2462	-4.92	<=8	PASS
11G	Ant1	2412	-26.29	<=8	PASS
		2437	-25.28	<=8	PASS
		2462	-23.3	<=8	PASS
11N20SISO	Ant1	2412	-25.02	<=8	PASS
		2437	-25.38	<=8	PASS
		2462	-23.8	<=8	PASS

Test Graphs

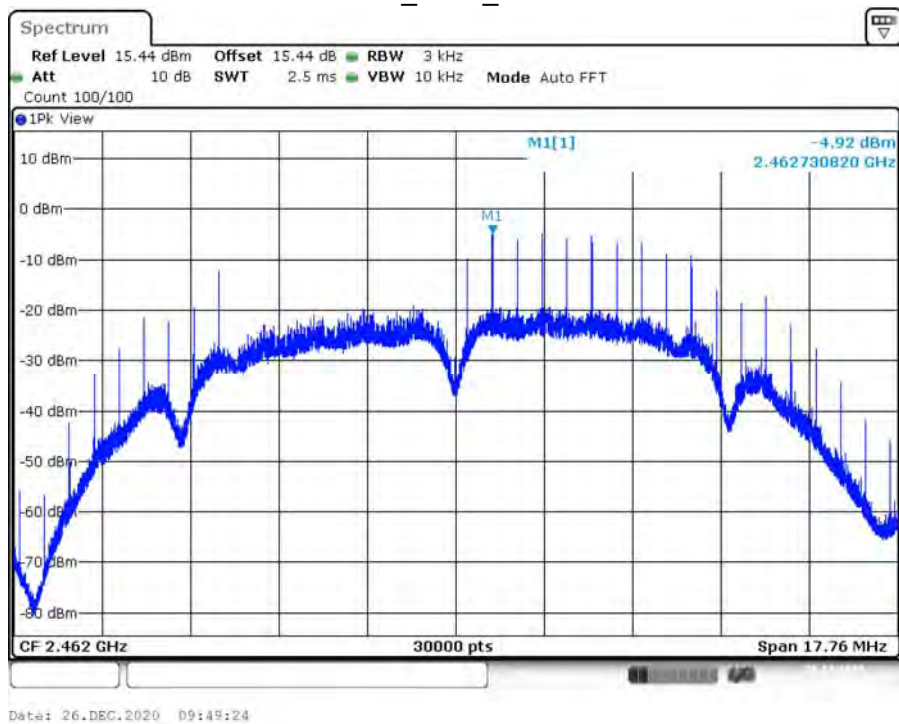
11B_Ant1_2412



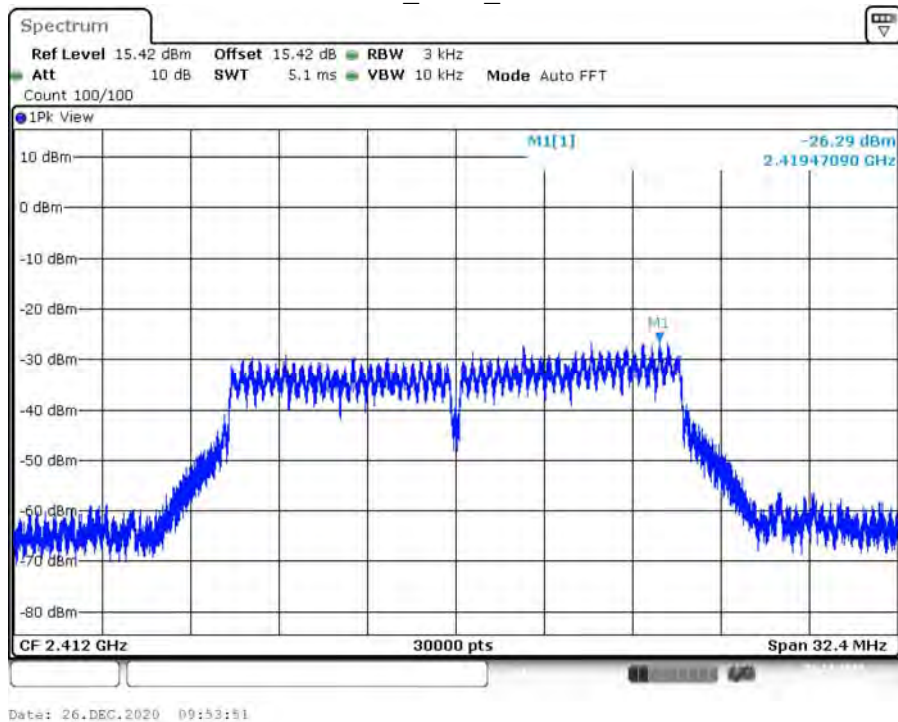
11B_Ant1_2437



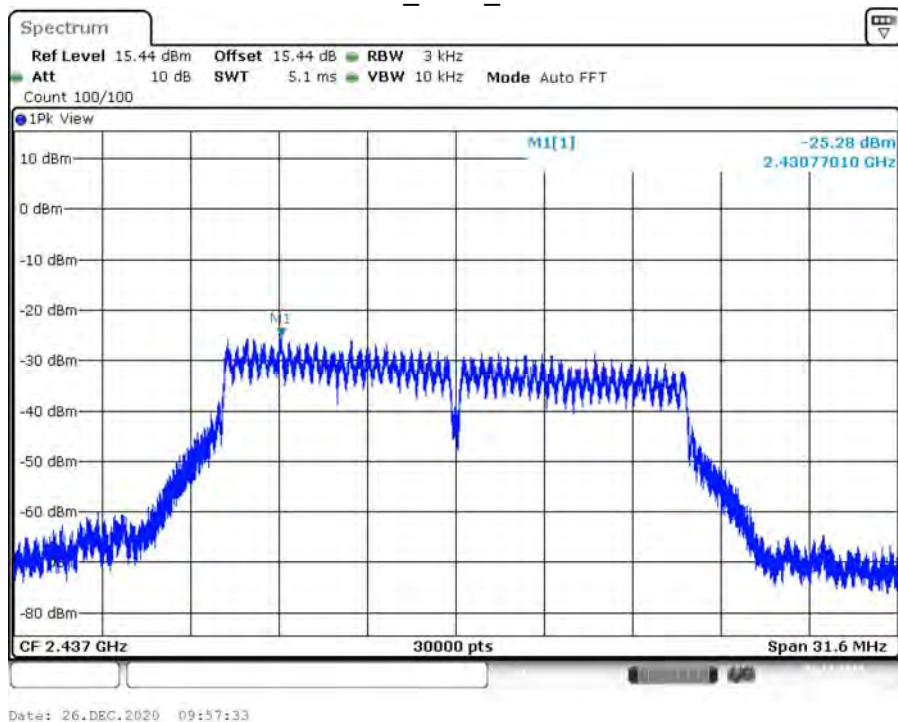
11B_Ant1_2462



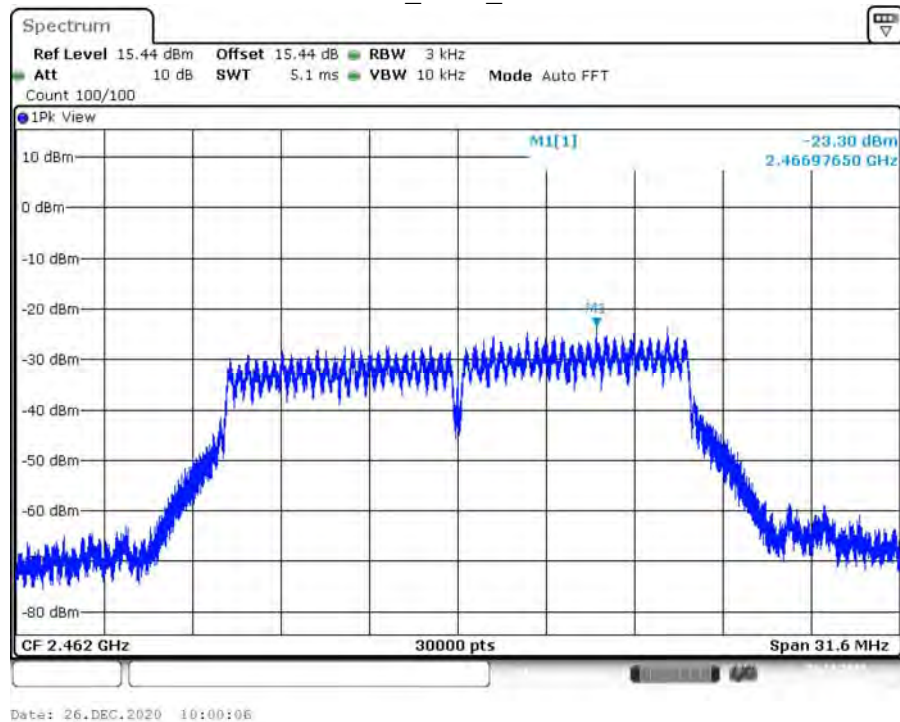
11G_Ant1_2412



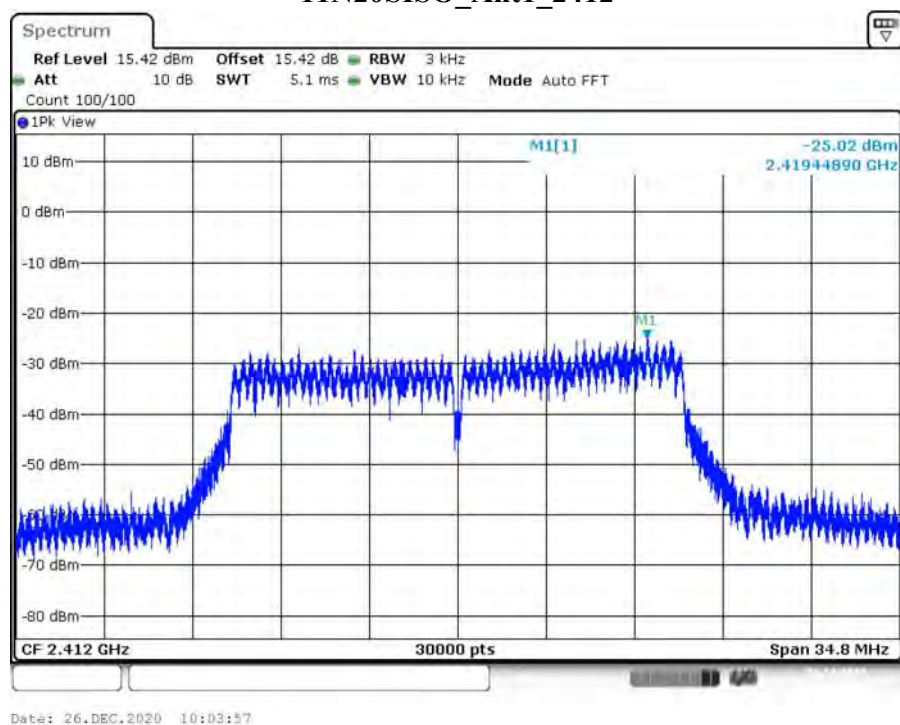
11G_Ant1_2437



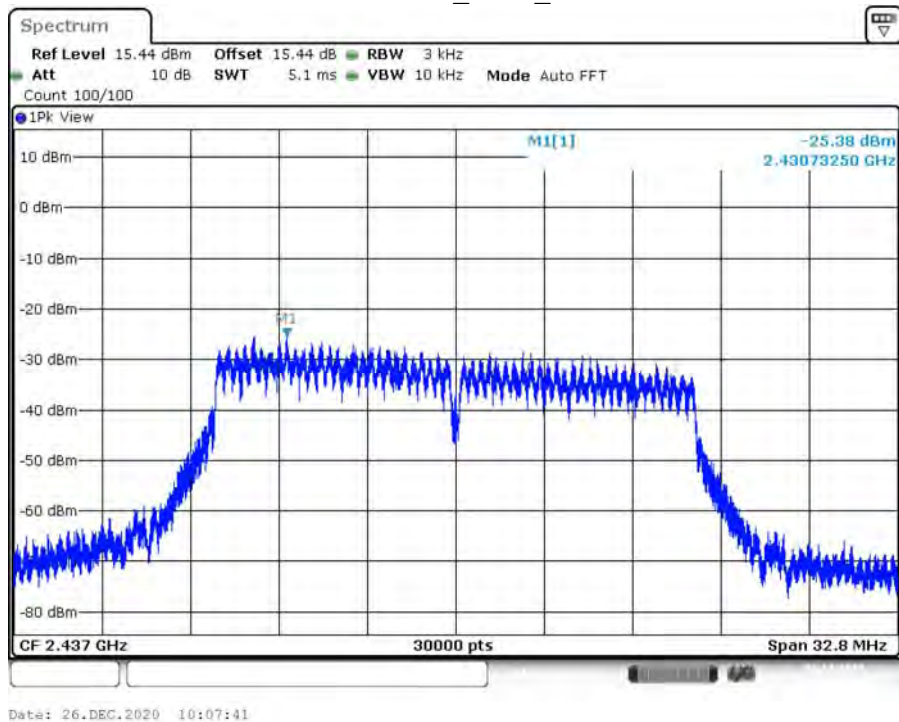
11G_Ant1_2462



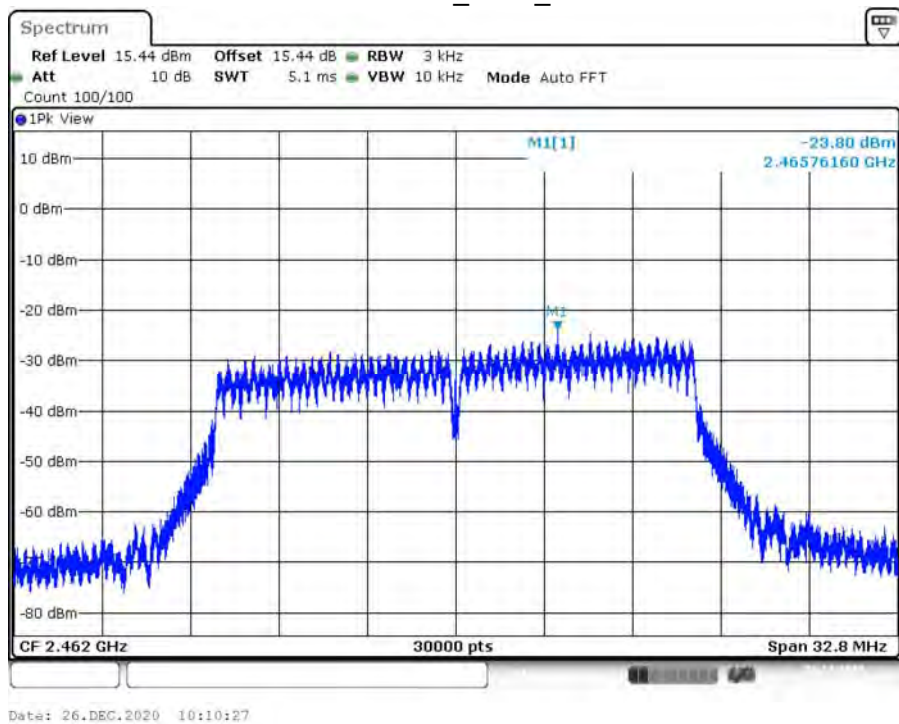
11N20SISO_Ant1_2412

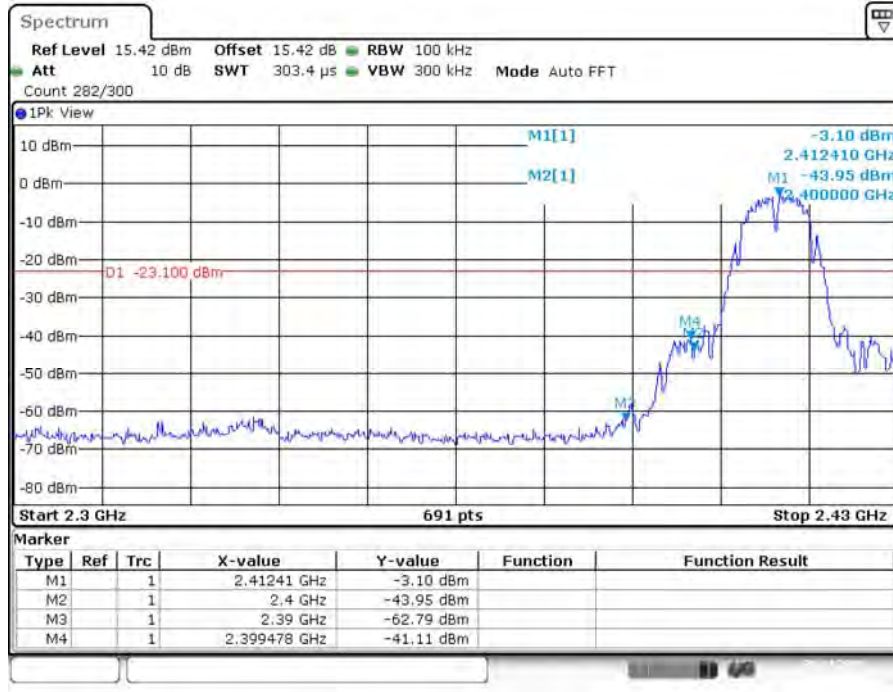
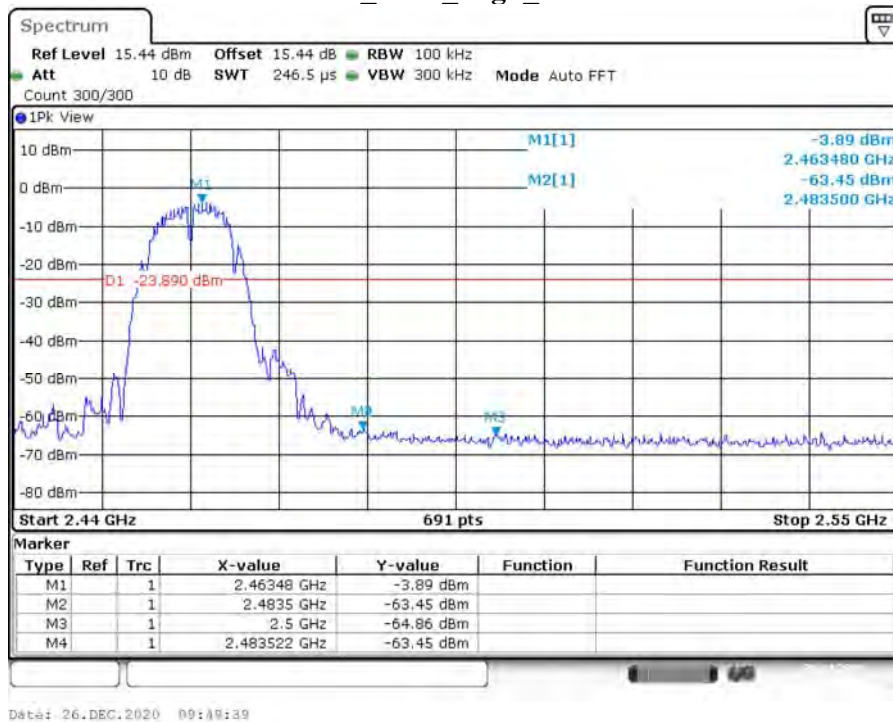


11N20SISO_Ant1_2437

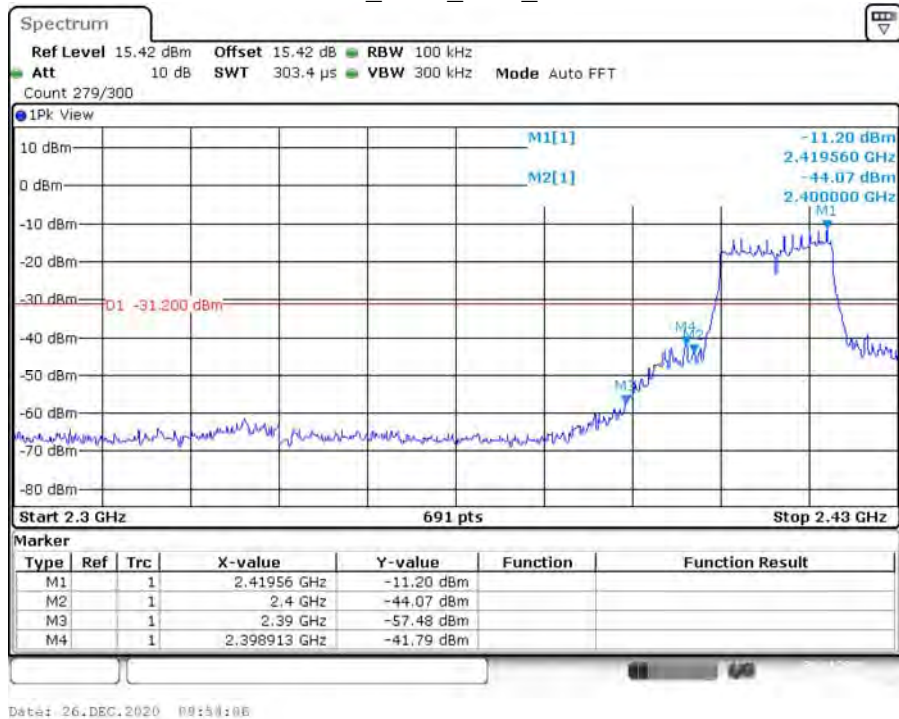


11N20SISO_Ant1_2462

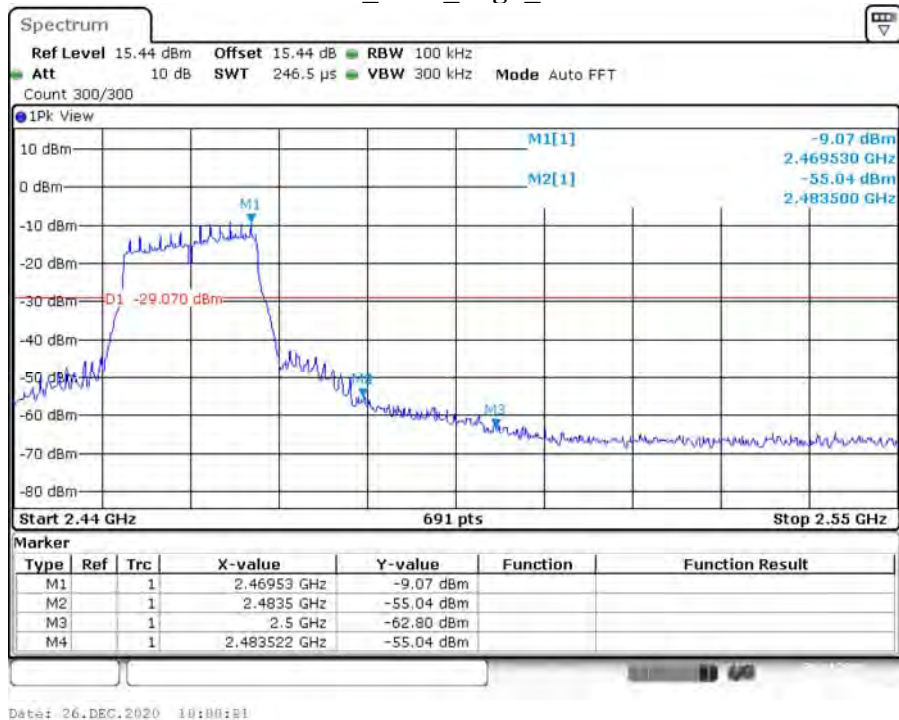


Appendix E: Band edge measurements**Test Graphs****11B_Ant1_Low_2412****11B_Ant1_High_2462**

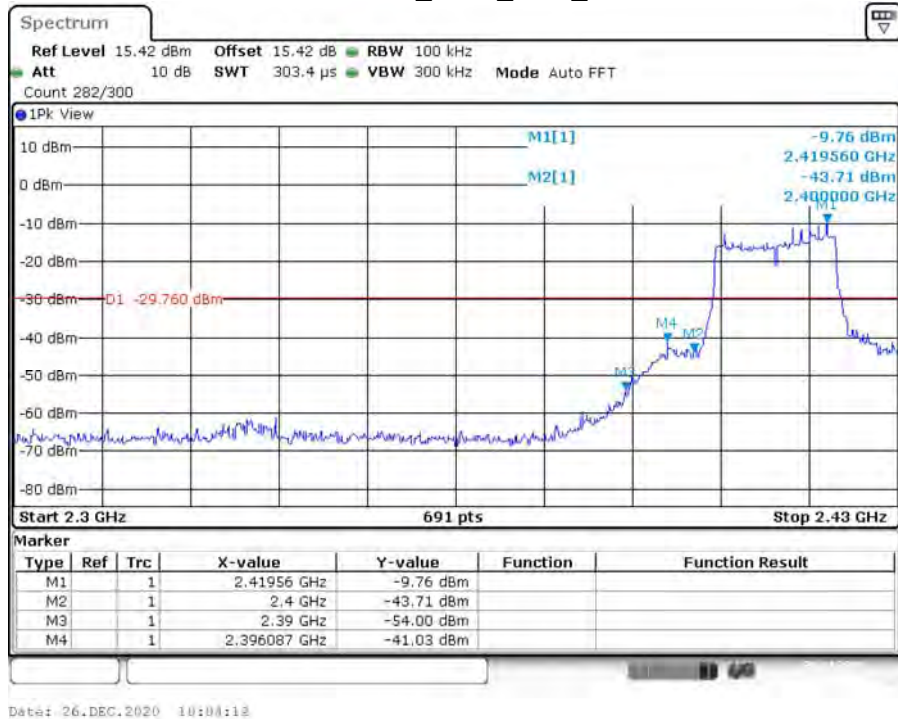
11G_Ant1_Low_2412



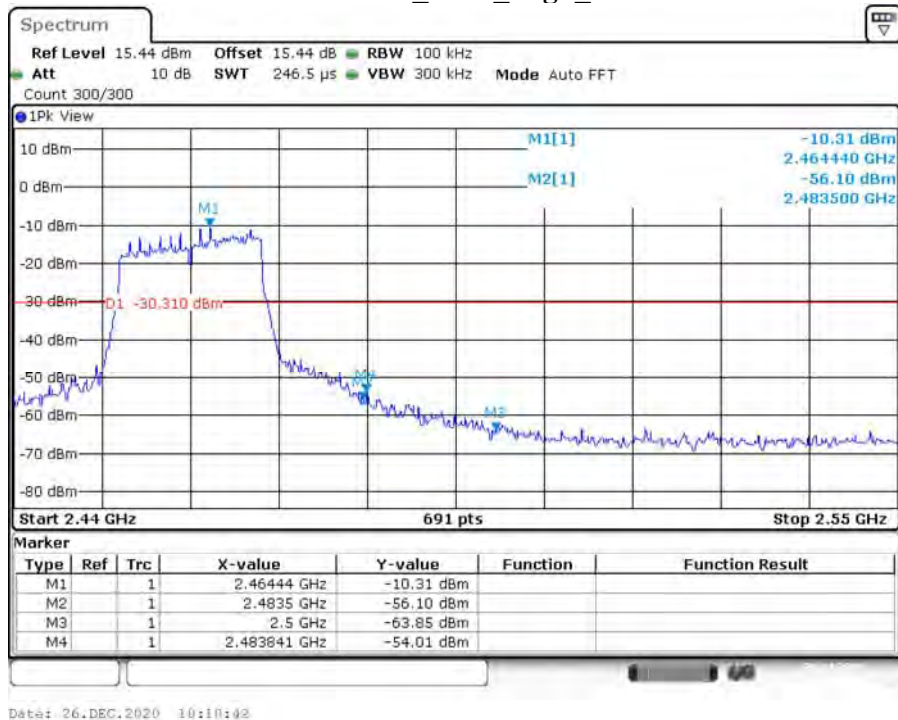
11G_Ant1_High_2462



11N20SISO_Ant1_Low_2412



11N20SISO_Ant1_High_2462



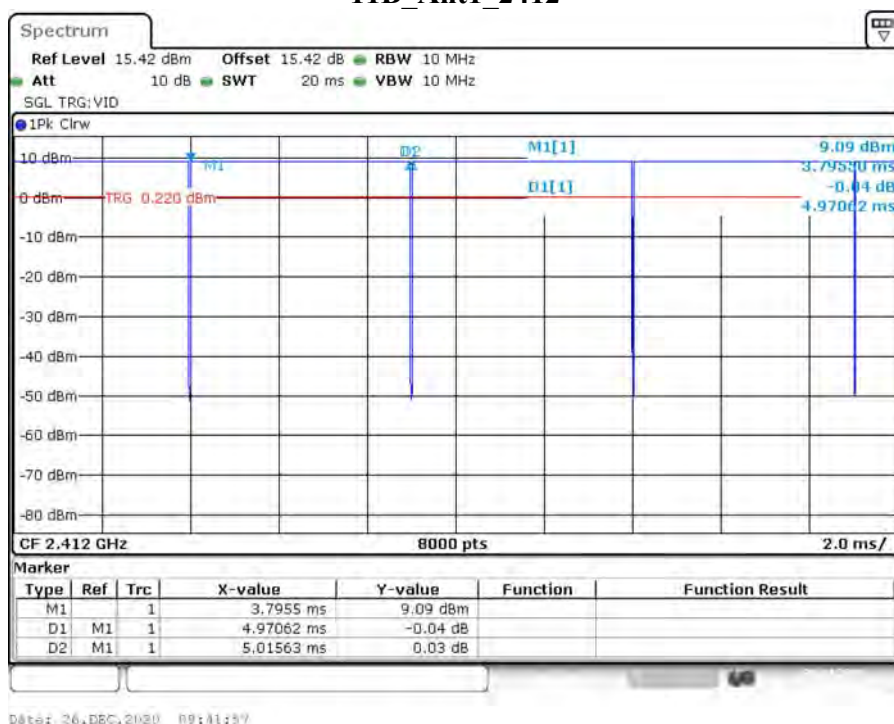
Appendix F: Duty Cycle

Test Result

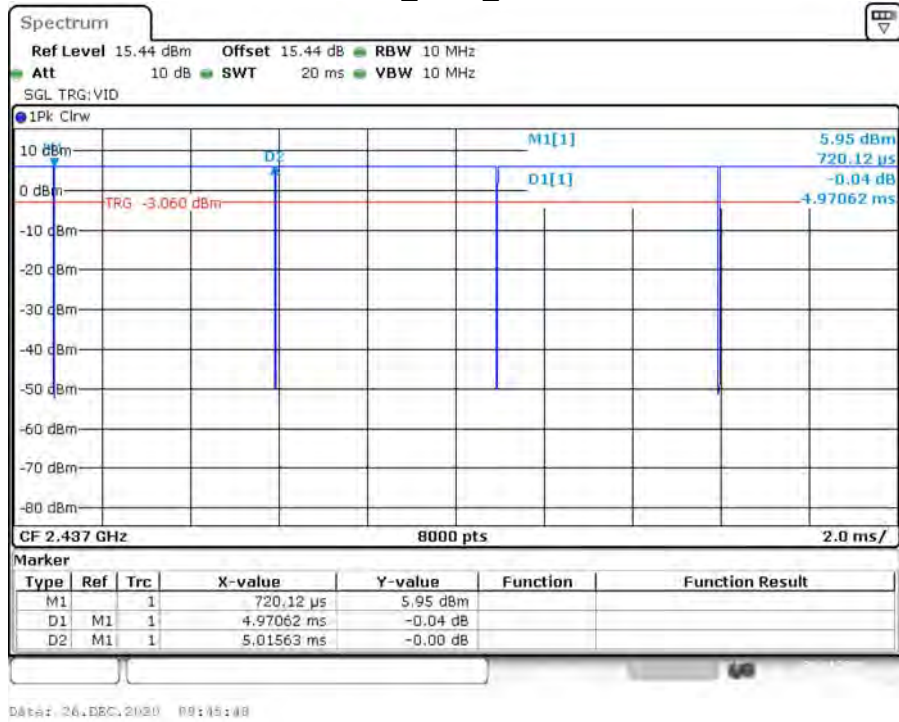
Test Mode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	Ant1	2412	4.97	5.02	99.10
		2437	4.97	5.02	99.10
		2462	4.97	5.02	99.15
11G	Ant1	2412	0.82	0.85	95.75
		2437	0.82	0.85	95.61
		2462	0.82	0.87	93.69
11N20SISO	Ant1	2412	0.77	0.81	95.52
		2437	0.77	0.81	95.52
		2462	0.77	0.81	95.52

Test Graphs

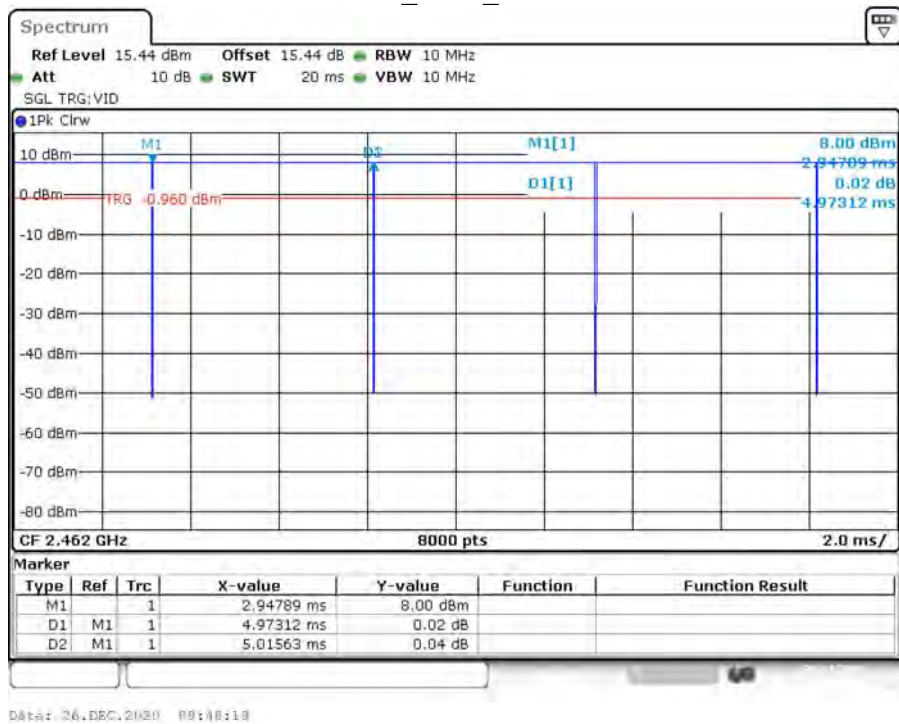
11B_Ant1_2412



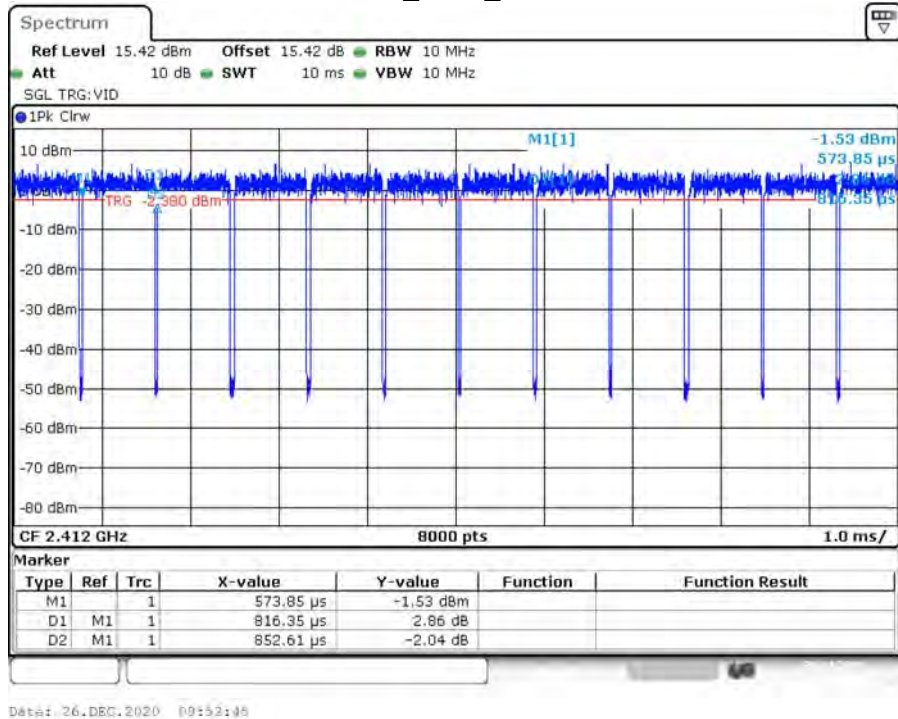
11B_Ant1_2437



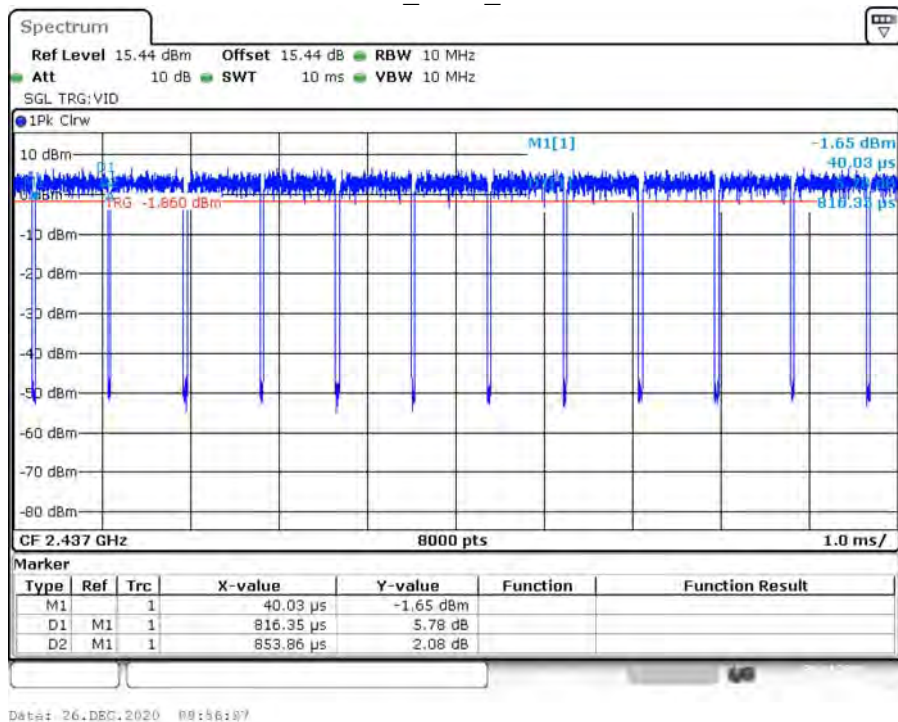
11B_Ant1_2462



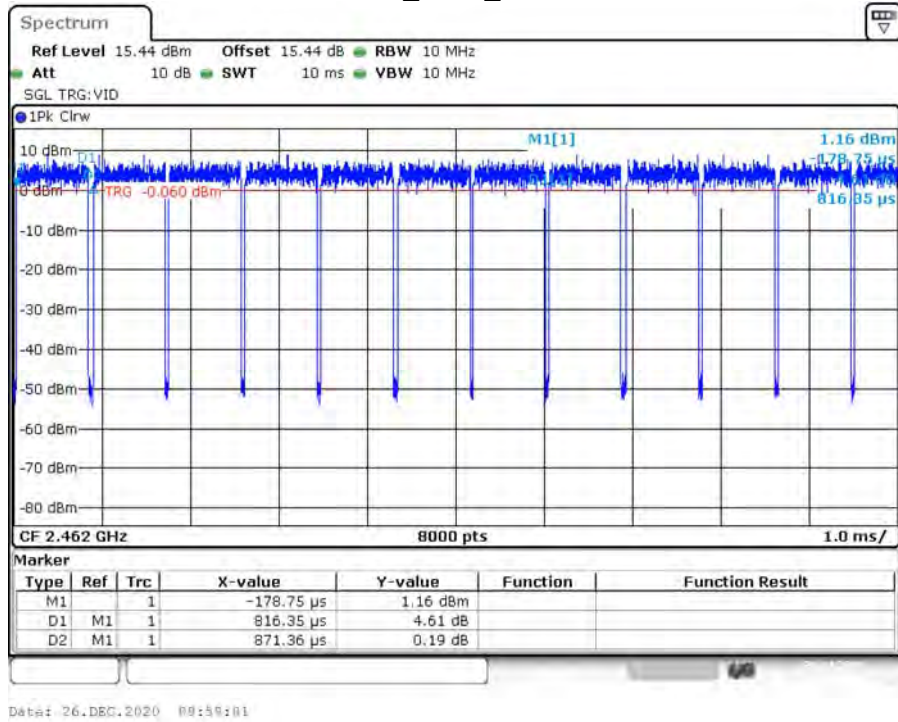
11G_Ant1_2412



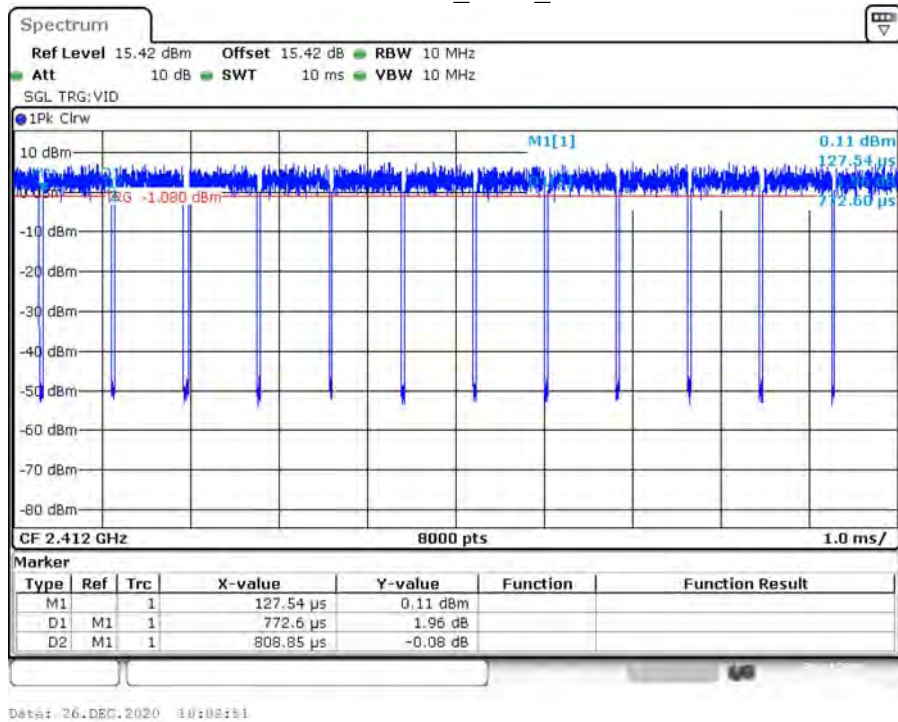
11G_Ant1_2437



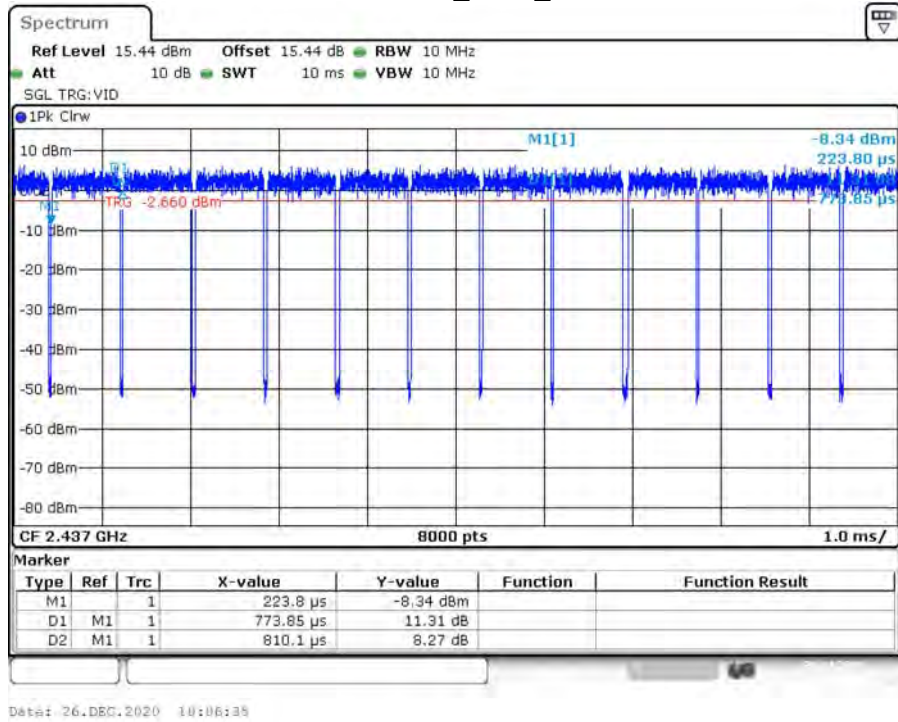
11G_Ant1_2462



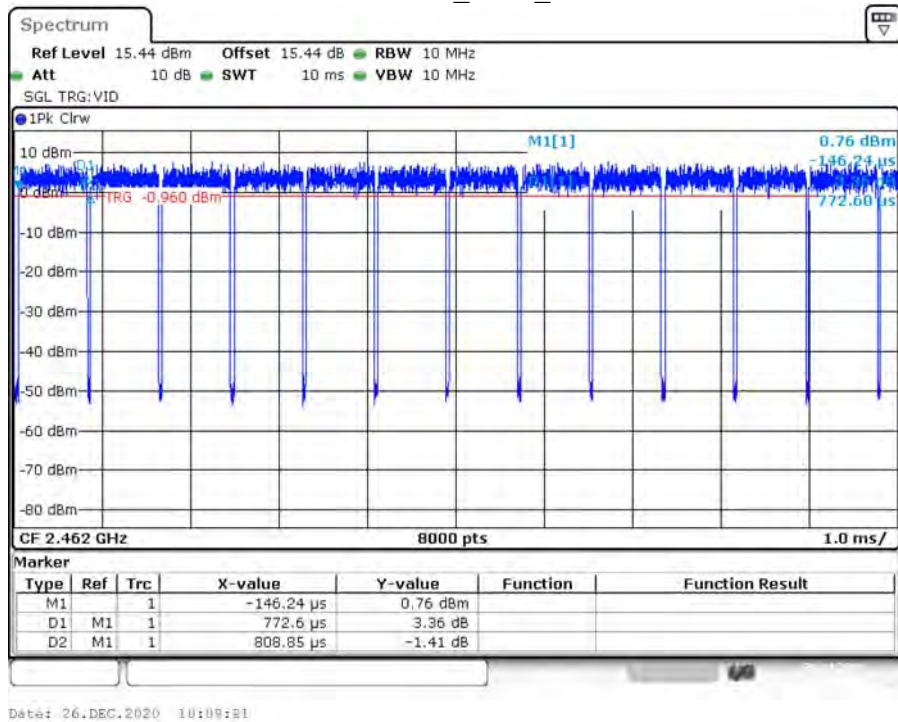
11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462



APPENDIX BLE

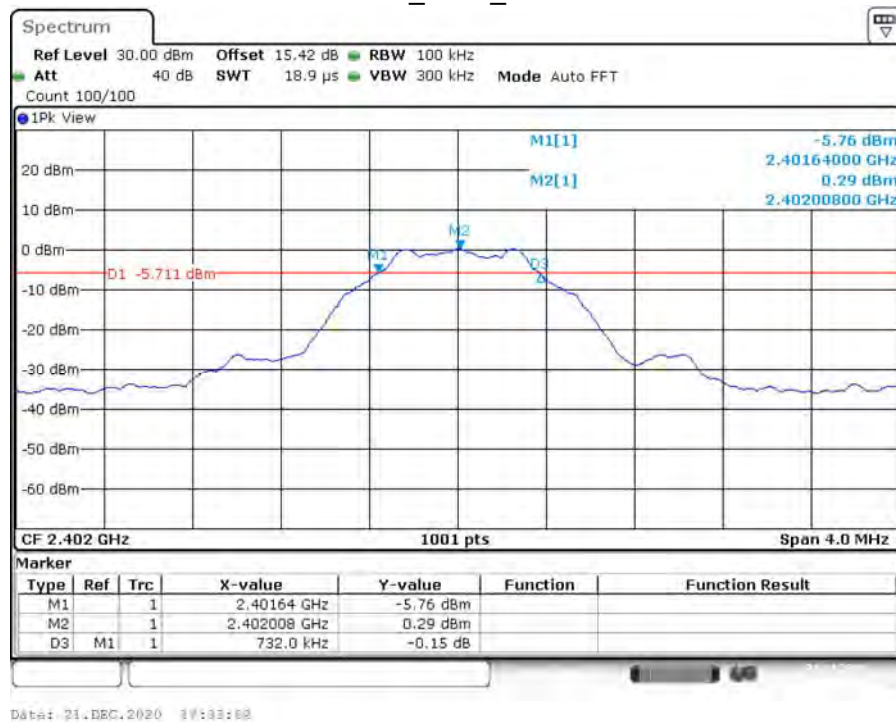
Appendix A: 6dB Emission Bandwidth

Test Result

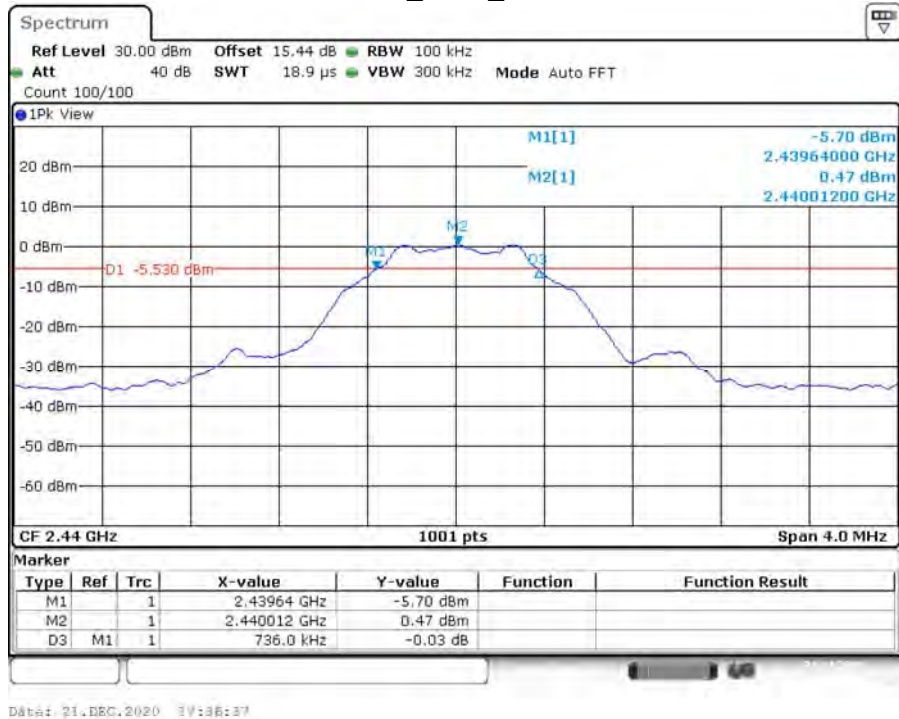
Test Mode	Antenna	Channel	DTS BW [MHz]	Limit[MHz]	Verdict
BLE	Ant1	2402	0.732	0.5	PASS
		2440	0.736	0.5	PASS
		2480	0.736	0.5	PASS

Test Graphs

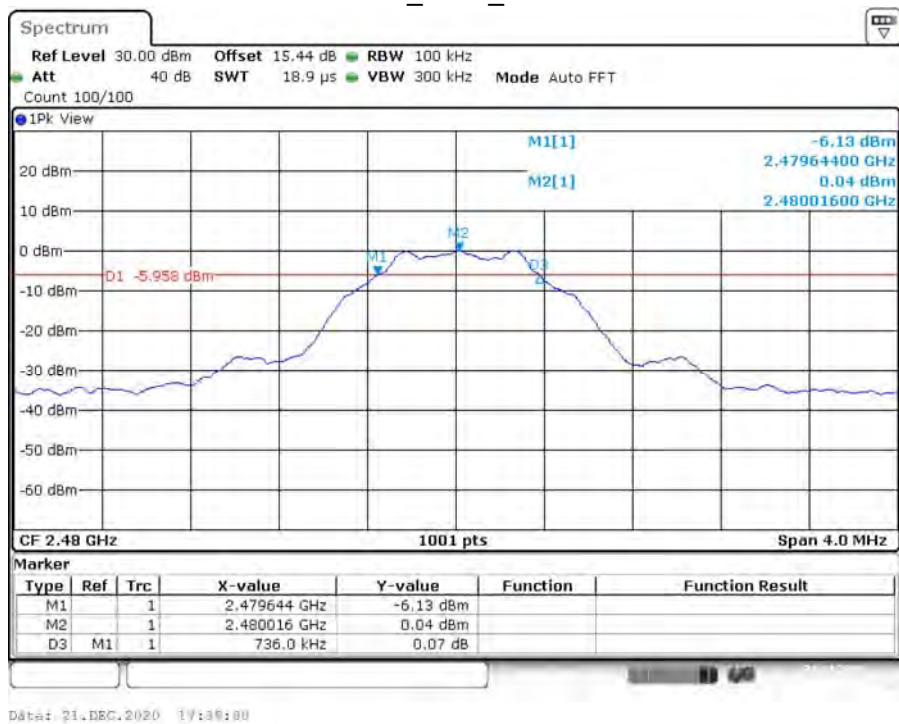
BLE_Ant1_2402



BLE_Ant1_2440



BLE_Ant1_2480



Appendix B: Occupied Channel Bandwidth

Test Result

Test Mode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
BLE	Ant1	2402	1.055	---	PASS
		2440	1.055	---	PASS
		2480	1.055	---	PASS

Test Graphs

BLE_Ant1_2402



BLE_Ant1_2440

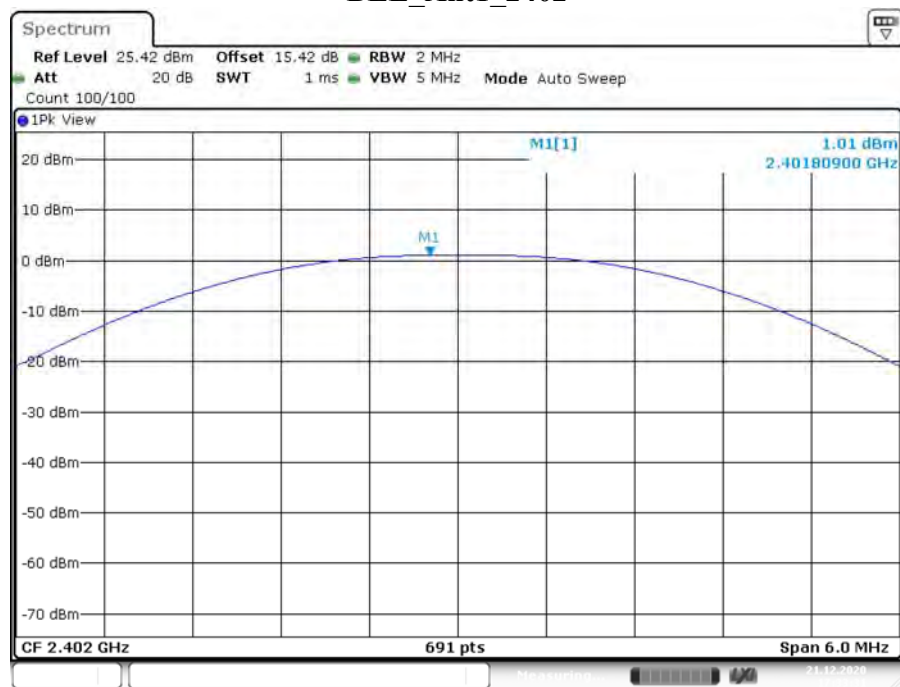


BLE_Ant1_2480



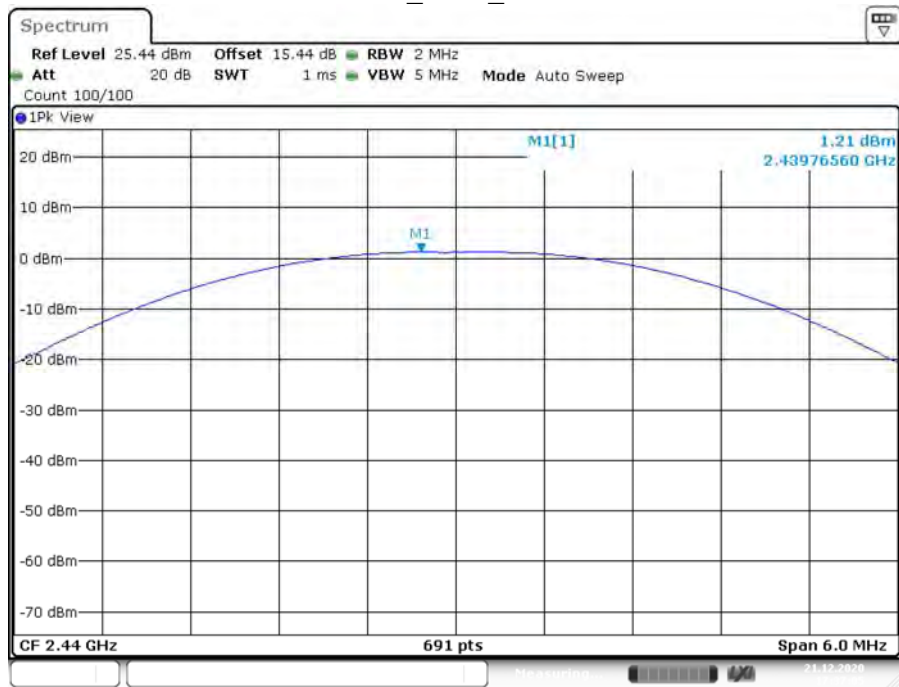
Appendix C: Maximum conducted output power**Test Result**

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE	Ant1	2402	1.01	<=30	PASS
		2440	1.21	<=30	PASS
		2480	0.8	<=30	PASS

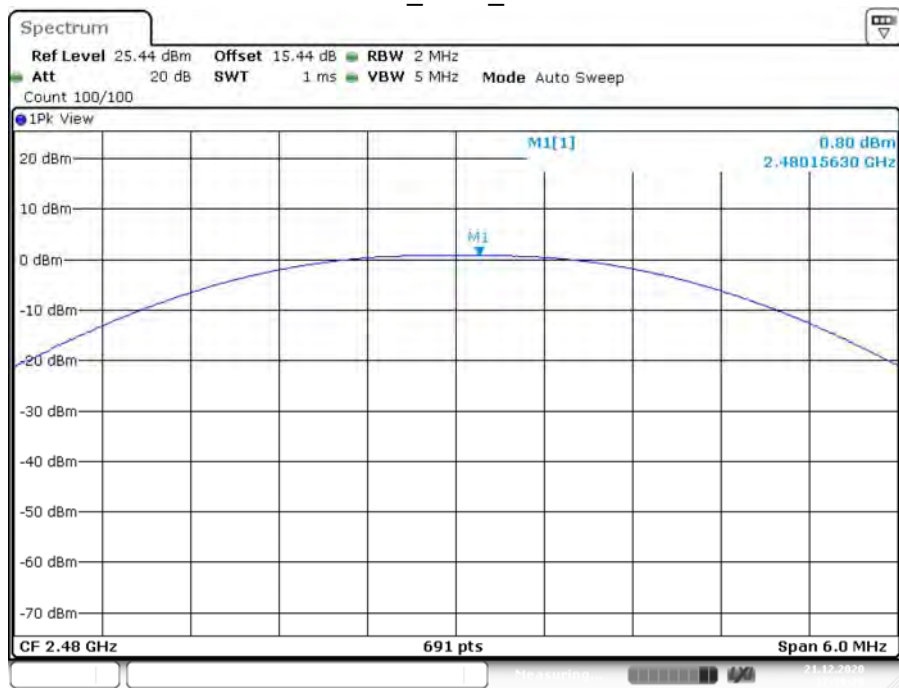
Test Graphs**BLE_Ant1_2402**

Date: 21.DEC.2020 17:33:31

BLE_Ant1_2440



BLE_Ant1_2480



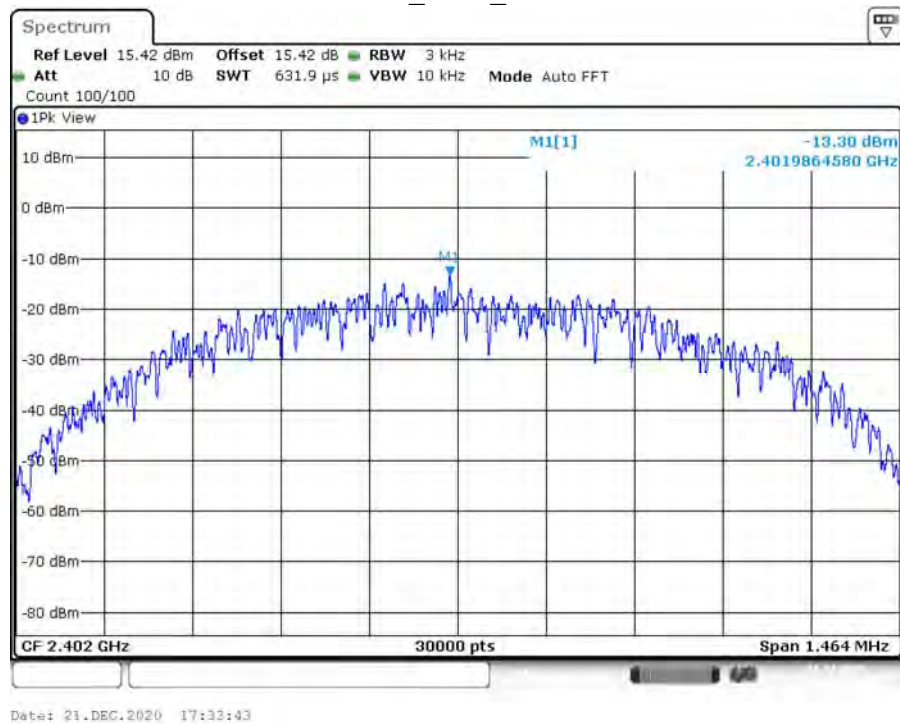
Appendix D: Power spectral density

Test Result

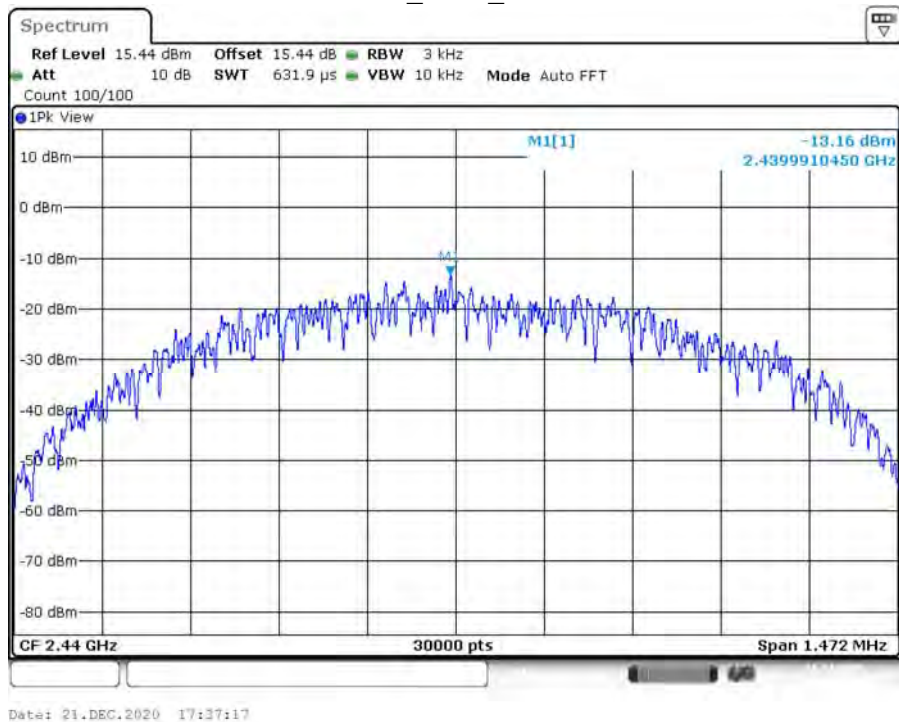
Test Mode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE	Ant1	2402	-13.3	≤ 8	PASS
		2440	-13.16	≤ 8	PASS
		2480	-13.51	≤ 8	PASS

Test Graphs

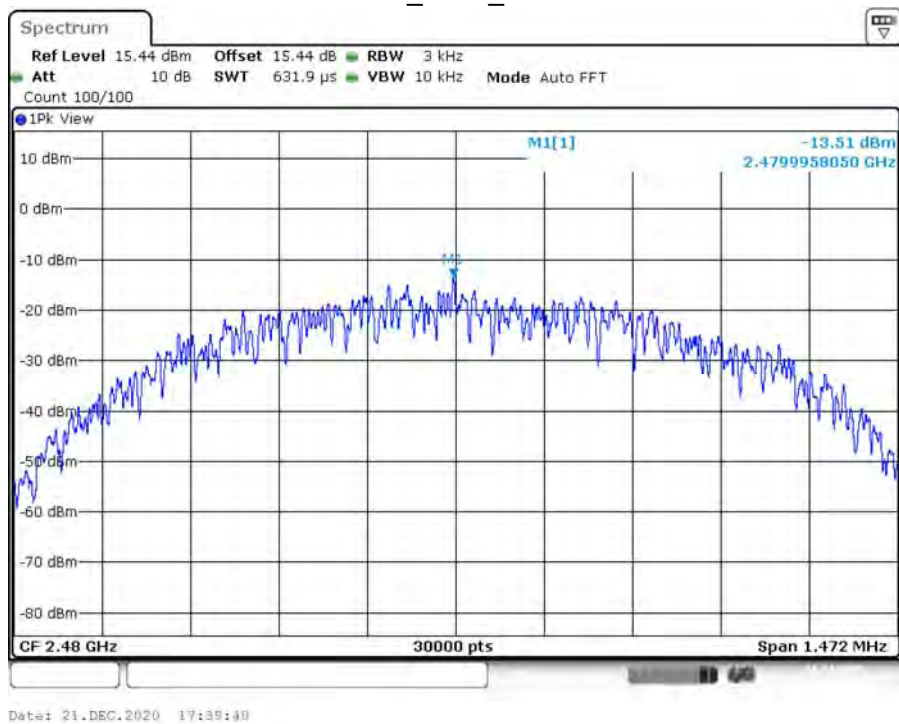
BLE_Ant1_2402

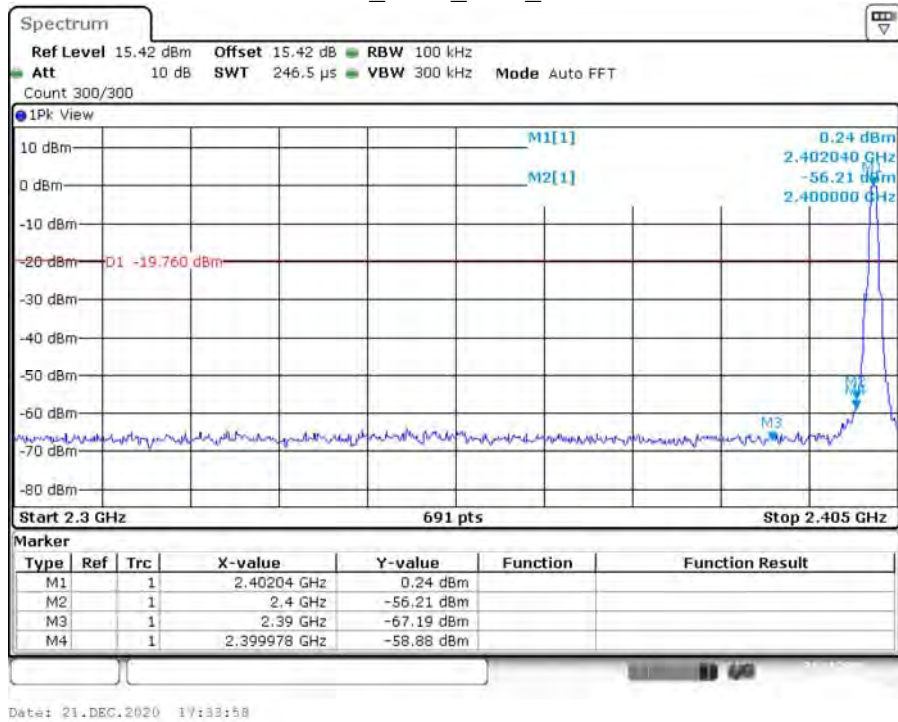
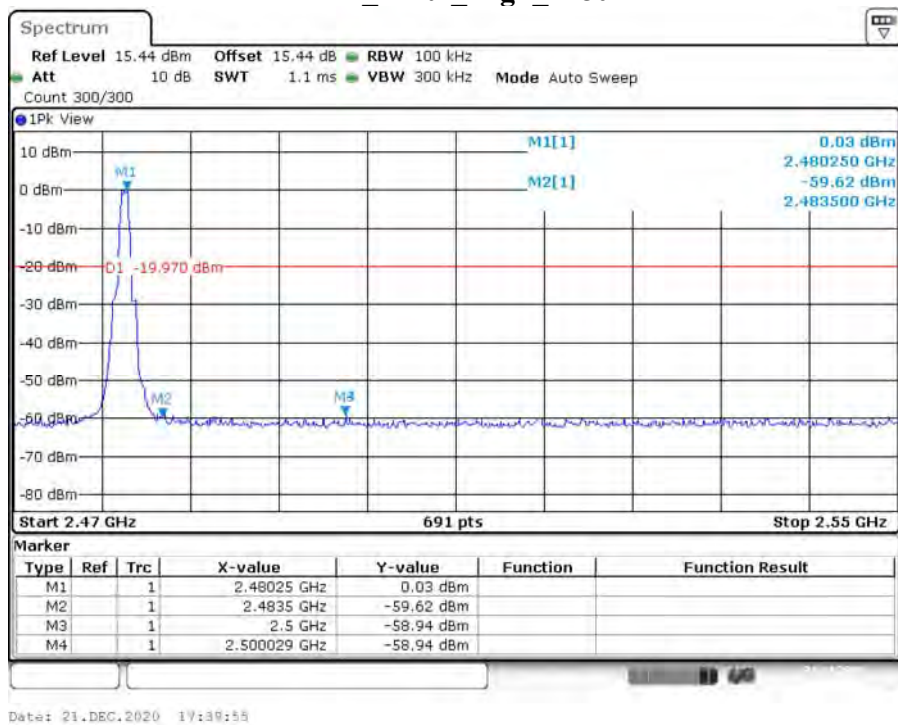


BLE_Ant1_2440



BLE_Ant1_2480



Appendix E: Band edge measurements**Test Graphs****BLE_Ant1_Low_2402****BLE_Ant1_High_2480**

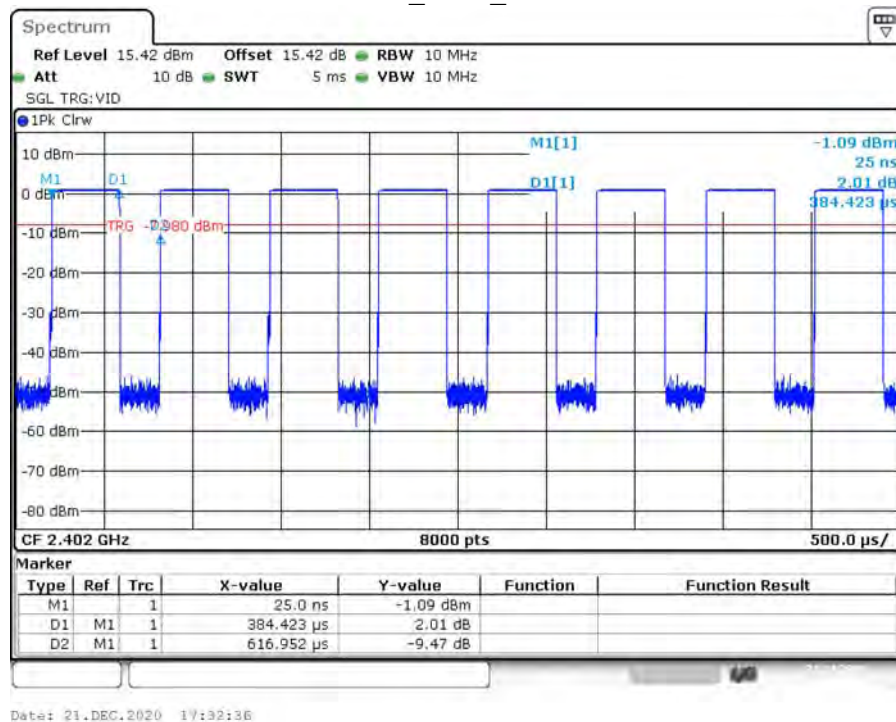
Appendix F: Duty Cycle

Test Result

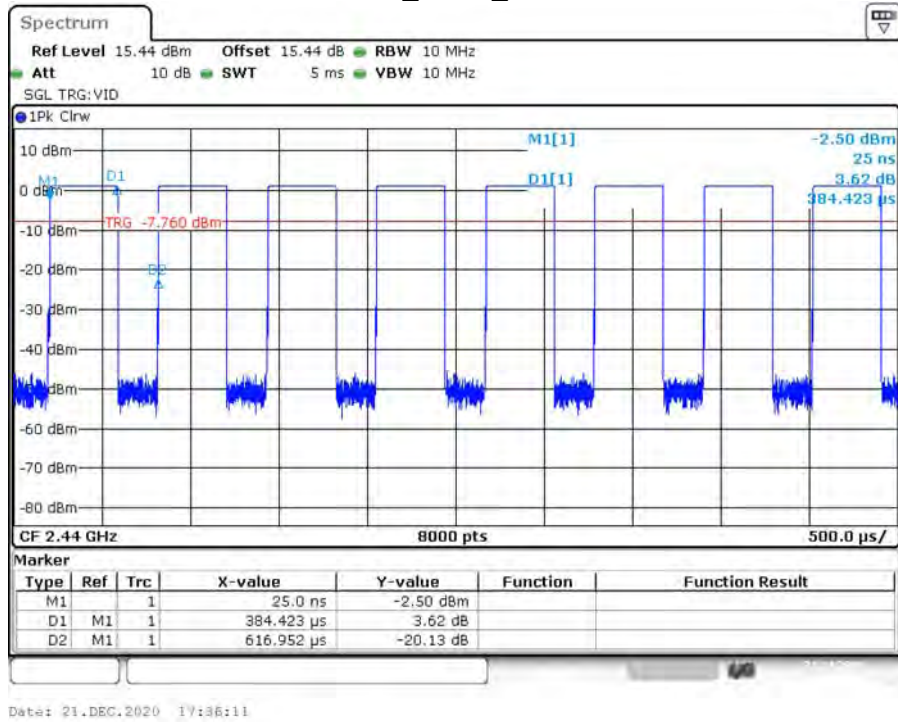
Test Mode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
BLE	Ant1	2402	0.38	0.62	62.31
		2440	0.38	0.62	62.31
		2480	0.38	0.62	62.25

Test Graphs

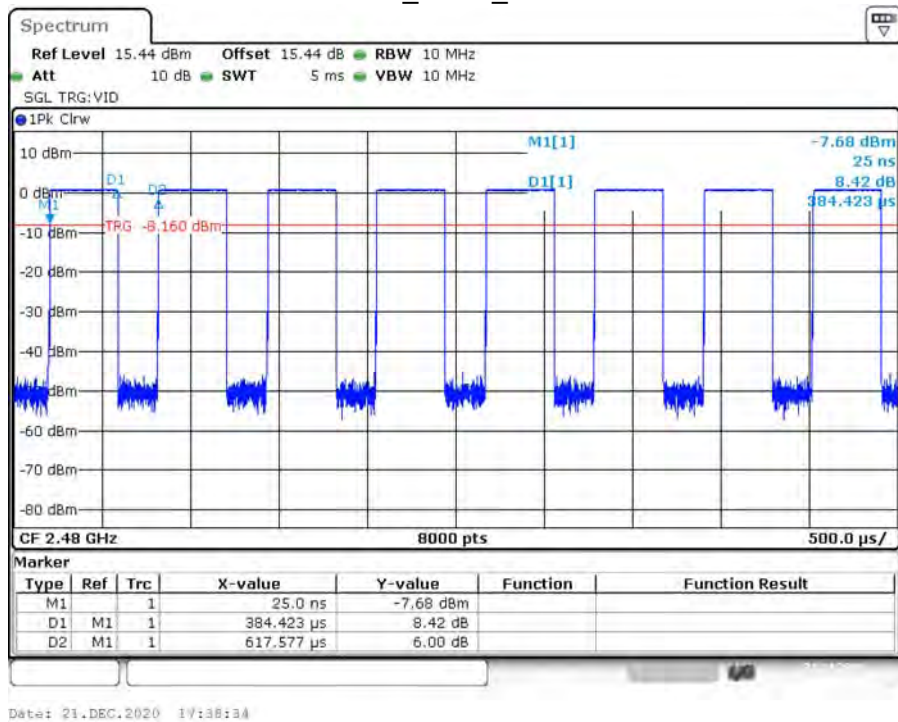
BLE_Ant1_2402



BLE_Ant1_2440



BLE_Ant1_2480



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