

FCC PART 15.247

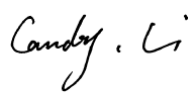
TEST REPORT

For

Shenzhen Jingwah Information Technology Co., Ltd.

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FCC ID: RBD-FAMILINK10

Report Type: Original Report	Product Type: Digital Photo Frame
Report Number: RSZ210317001-00B	
Report Date: 2021-04-06	
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TABLE OF CONTENTS

GENERAL INFORMATION	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
TEST METHODOLOGY	4
MEASUREMENT UNCERTAINTY	5
SYSTEM TEST CONFIGURATION	6
DESCRIPTION OF TEST CONFIGURATION	6
EQUIPMENT MODIFICATIONS	7
EUT EXERCISE SOFTWARE	7
DUTY CYCLE	7
SUPPORT EQUIPMENT LIST AND DETAILS	7
EXTERNAL I/O CABLE	7
BLOCK DIAGRAM OF TEST SETUP	8
SUMMARY OF TEST RESULTS	9
TEST EQUIPMENT LIST	10
§1.1307 (B) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)	11
APPLICABLE STANDARD	11
RESULT	11
FCC §15.203 - ANTENNA REQUIREMENT	13
APPLICABLE STANDARD	13
ANTENNA CONNECTOR CONSTRUCTION	13
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS	14
APPLICABLE STANDARD	14
EUT SETUP	14
EMI TEST RECEIVER SETUP	14
TEST PROCEDURE	14
TRANSD FACTOR & MARGIN CALCULATION	15
TEST DATA	15
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS	18
APPLICABLE STANDARD	18
EUT SETUP	18
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	19
TEST PROCEDURE	19
FACTOR & MARGIN CALCULATION	19
TEST DATA	19
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH	26
APPLICABLE STANDARD	26
TEST PROCEDURE	26
TEST DATA	26
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER	27
APPLICABLE STANDARD	27
TEST PROCEDURE	27
TEST DATA	27
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE	28

APPLICABLE STANDARD	28
TEST PROCEDURE	28
TEST DATA	28
FCC §15.247(e) - POWER SPECTRAL DENSITY	29
APPLICABLE STANDARD	29
TEST PROCEDURE	29
TEST DATA	29
APPENDIX Wi-Fi.....	30
APPENDIX A: 6DB EMISSION BANDWIDTH.....	30
APPENDIX B: OCCUPIED CHANNEL BANDWIDTH	34
APPENDIX C: MAXIMUM CONDUCTED OUTPUT POWER	38
APPENDIX D: POWER SPECTRAL DENSITY	39
APPENDIX E: BAND EDGE MEASUREMENTS.....	43
APPENDIX F: DUTY CYCLE	45
APPENDIX BLE.....	49
APPENDIX A: 6DB EMISSION BANDWIDTH.....	49
APPENDIX B: OCCUPIED CHANNEL BANDWIDTH	51
APPENDIX C: MAXIMUM CONDUCTED OUTPUT POWER	53
APPENDIX D: POWER SPECTRAL DENSITY	55
APPENDIX E: BAND EDGE MEASUREMENTS.....	57
APPENDIX F: DUTY CYCLE	58

GENERAL INFORMATION**Product Description for Equipment under Test (EUT)**

Product	Digital Photo Frame
Trade	FAMILINK
Tested Model	M1018FLK
Multiple Model	Familink AWS 10.1 inches 4G + WiFi Photo Diary
Model Differences	Refer to DOS letter.
Frequency Range	BLE: 2402-2480MHz Wi-Fi: 2412-2462MHz
Maximum Conducted Peak Output Power	BLE: 3.74dBm Wi-Fi: 16.63dBm(802.11b), 14.20dBm(802.11n-HT20),
Modulation Technique	BLE: GFSK Wi-Fi: DSSS, OFDM
Antenna Specification*	FPC Antenna: 1.53dBi(provided by the applicant)
Voltage Range	DC 5V from adapter
Date of Test	2021-03-21 to 2021-03-30
Sample serial number	RSZ210317001-RF-S1(Assigned by ATC)
Received date	2021-03-15
Sample/EUT Status	Good condition
Adapter information	Model: MKD-0503000H INPUT: 100-240V, 50/60Hz, 0.5A OUTPUT: 5V, 3000mA

Objective

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

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

Test Methodology

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

And KDB 558074 D01 15.247 Meas Guidance v05r02.

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

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF output power, conducted		±0.73dB
Unwanted Emission, conducted		±1.6dB
RF Frequency		±0.082*10 ⁻⁷
Emissions, Radiated	30MHz - 1GHz	±4.28dB
	1GHz- 18GHz	±4.98dB
	18GHz- 26.5GHz	±5.06dB
Temperature		±1 °C
Humidity		±6%
Supply voltages		±0.4%

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

Test Facility

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

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For 802.11b, 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	/	/

802.11 b / n20 was tested with Channel 1, 6 and 11.

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

BLE & WIFI test in the engineer mode during testing and power level as below:

	Mode	Data Rate (Mbps)	Power Level
WIFI	802.11 a	6	16
	802.11 n20	MCS0	16
BLE	1M	GFSK	Default

Duty cycle

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

Support Equipment List and Details

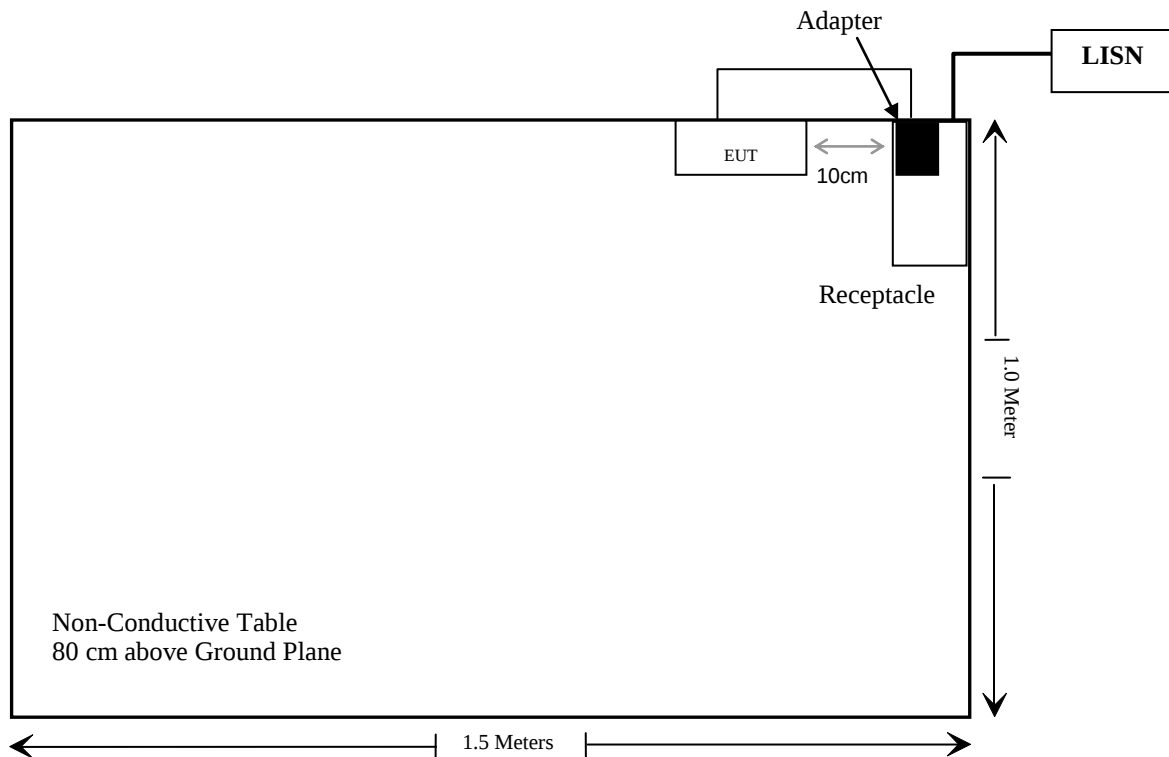
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
DC IN	1.5	Adapter	EUT

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1)& §2.1091	Maximum Permissible exposure (MPE)	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
Conducted Emissions Test					
Rohde& Schwarz	Test Receiver	ESPI3	100396	2020/12/24	2021/12/23
R & S	L.I.S.N.	ENV216	101314	2020/12/25	2021/12/24
Anritsu Corp	50Ω Coaxial Switch	MP59B	6200506474	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-2m	No.2	2020/12/25	2021/12/24
Radiated Emissions Test					
Rohde&Schwarz	Test Receiver	ESR	101817	2020/12/24	2021/12/23
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
A.H. Systems, inc.	Preamplifier	PAM-0118P	531	2020/07/08	2021/07/07
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2020/01/04	2023/01/03
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Unknown	RF Coaxial Cable	N-5m	No.3	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-5m	No.4	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-1m	No.5	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-1m	No.6	2020/12/25	2021/12/24
RF Conducted Test					
Rohde&Schwarz	Spectrum Analyzer	FSV40	101495	2020/12/24	2021/12/23
Rohde & Schwarz	Open Switch and Control Unit	OSP120 +OSP -B157	101244 + 100866	2020/12/24	2021/12/23

*** 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).

§1.1307 (B) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)**Applicable Standard**

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

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

f = frequency in MHz

* = Plane-wave equivalent power density

Result**Calculated Formulary:**

Predication of MPE limit at a given distance

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

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

For worst case:

Mode	Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BDR/EDR	2402-2480	1.53	1.42	1.0	1.26	20	0.0004	1
BLE	2402-2480	1.53	1.42	4.0	2.51	20	0.0007	1
2.4G Wi-Fi	2412-2462	1.53	1.42	17.0	50.12	20	0.0142	1
5.2G Wi-Fi	5180-5270	2.66	1.85	16.0	39.81	20	0.0146	1
5.8G Wi-Fi	5745-5825	2.66	1.85	10.5	11.22	20	0.0041	1
GSM 850	824-849	0.9	1.23	32	1584.89	20	0.3879	0.55
PCS 1900	1850-1910	2.39	1.73	28.5	707.95	20	0.2442	1
WCDMA B2	1850-1910	2.39	1.73	22	158.49	20	0.0547	1
WCDMA B5	824-849	0.9	1.23	23	199.53	20	0.0488	0.55
LTE B2	1850-1910	2.39	1.73	24	251.19	20	0.0866	1
LTE B4	1710-1755	0.93	1.24	24.5	281.84	20	0.0695	1
LTE B7	2500-2570	1.58	1.44	21.5	141.25	20	0.0404	1
LTE B12	699-716	0.88	1.22	25.5	354.81	20	0.0864	0.47
LTE B13	777-787	0.88	1.22	25.5	354.81	20	0.0784	0.52
LTE B17	704-716	0.88	1.22	25.5	354.81	20	0.0714	0.47
LTE B25	1850-1915	2.39	1.73	24	251.19	20	0.0655	1

Note 1: The tune up conducted power was declared by the applicant.

Note 2: Bluetooth or Wi-Fi function can transmit at the same time with the WWAN.

So the worst simultaneous transmitting consideration:

$$\text{The ratio} = \text{MPE}_{5.2\text{GWi-Fi}}/\text{limit} + \text{MPE}_{\text{GSM 850}}/\text{limit} = 0.0146/1.0 + 0.3879/0.55 = 0.72 < 1.0$$

So simultaneous exposure is not required.

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

Result: Compliance

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.

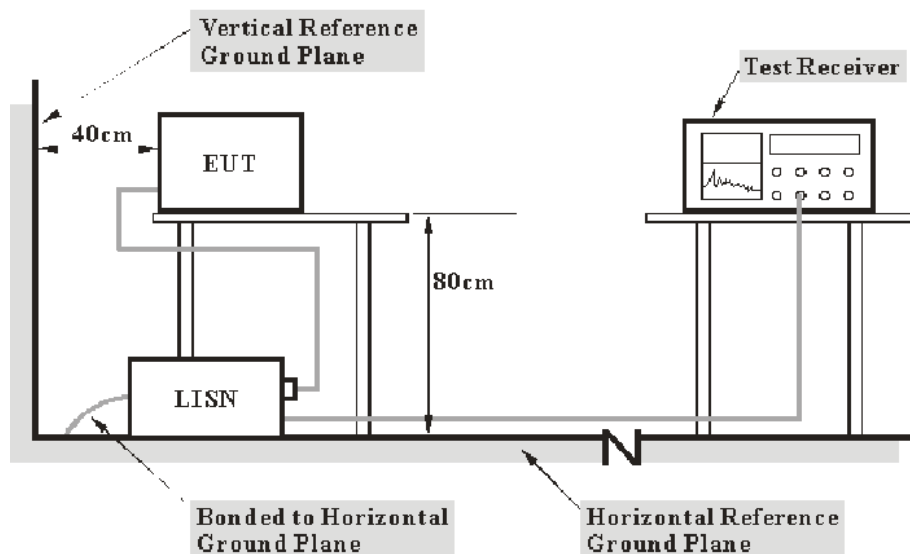
Antenna Connector Construction

The EUT has unique antenna connectors for BLE and Wi-Fi. The antenna gain is 1.53 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:

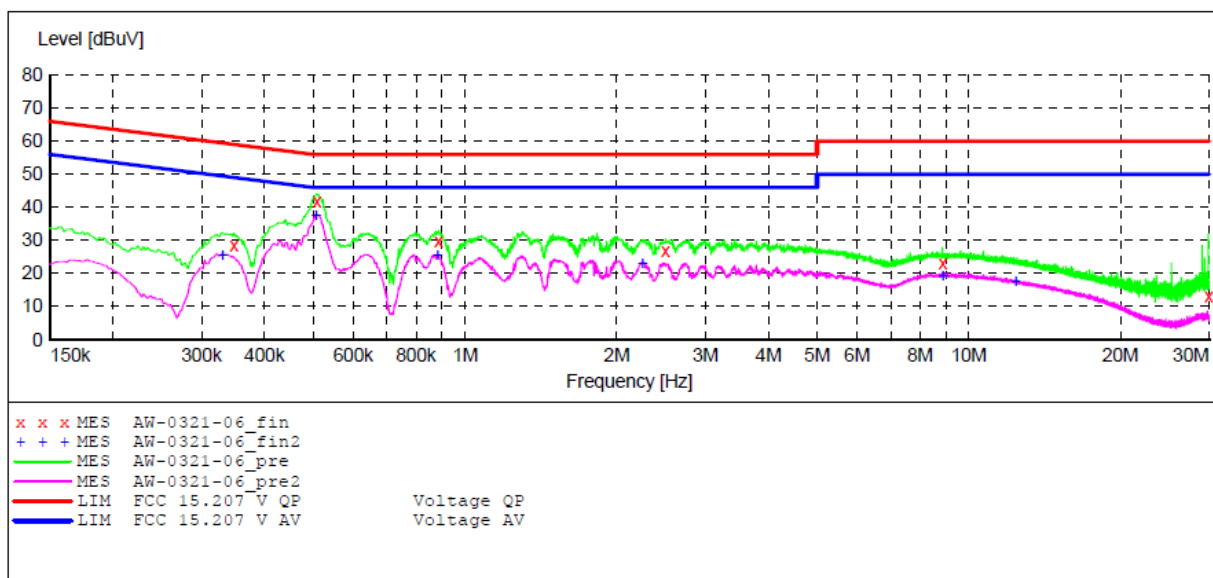
$$\begin{aligned}\text{Margin} &= \text{Limit} - \text{level} \\ \text{Level} &= \text{reading level} + \text{Transd Factor}\end{aligned}$$

Test Data**Environmental Conditions**

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

The testing was performed by Black Ding on 2021-03-21.

EUT operation mode: Transmitting (Worst case as below)

BLE:**AC 120V/60 Hz, Line****MEASUREMENT RESULT: "AW-0321-06_fin"**

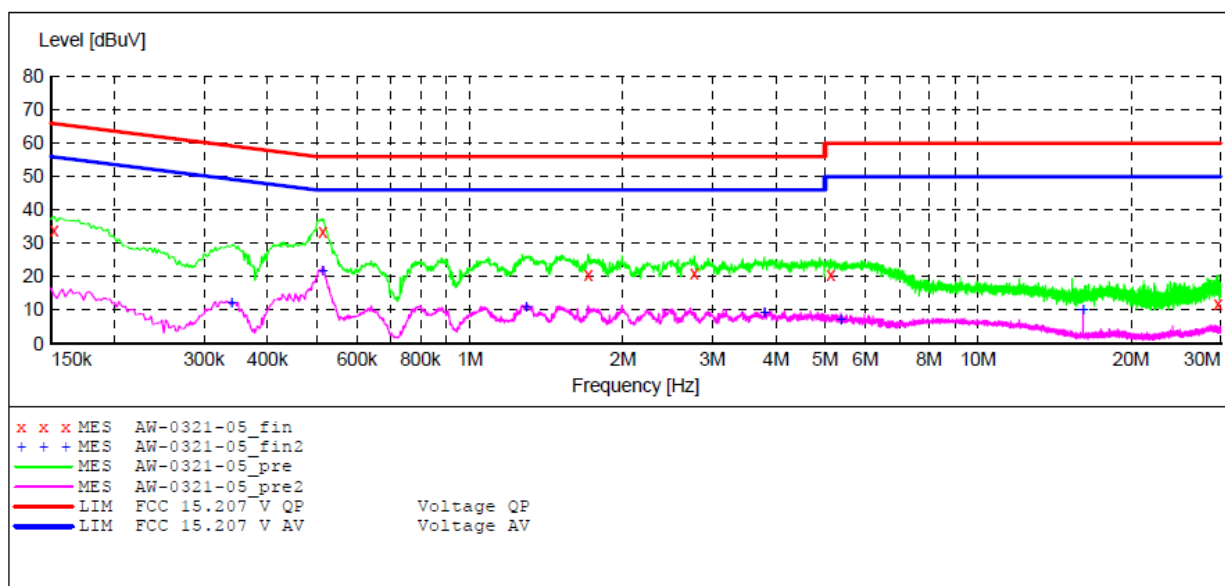
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Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.348000	28.60	10.9	59	30.4	QP	L1	GND
0.508000	41.60	11.0	56	14.4	QP	L1	GND
0.886000	29.60	11.1	56	26.4	QP	L1	GND
2.500000	27.00	11.3	56	29.0	QP	L1	GND
8.875000	23.20	11.5	60	36.8	QP	L1	GND
29.925000	12.90	11.8	60	47.1	QP	L1	GND

MEASUREMENT RESULT: "AW-0321-06_fin2"

2021-3-21 11:15

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.330000	25.70	10.9	50	23.3	AV	L1	GND
0.506000	37.70	11.0	46	8.3	AV	L1	GND
0.882000	25.60	11.1	46	20.4	AV	L1	GND
2.250000	23.20	11.3	46	22.8	AV	L1	GND
8.875000	19.40	11.5	50	30.6	AV	L1	GND
12.410000	17.50	11.6	50	32.5	AV	L1	GND

AC 120V/60 Hz, Neutral**MEASUREMENT RESULT: "AW-0321-05_fin"**

2021-3-21 11:05

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.152000	33.90	10.8	66	32.1	QP	N	GND
0.514000	33.50	11.0	56	22.5	QP	N	GND
1.710000	20.70	11.2	56	35.3	QP	N	GND
2.765000	20.90	11.3	56	35.1	QP	N	GND
5.130000	20.60	11.4	60	39.4	QP	N	GND
29.635000	12.00	11.8	60	48.0	QP	N	GND

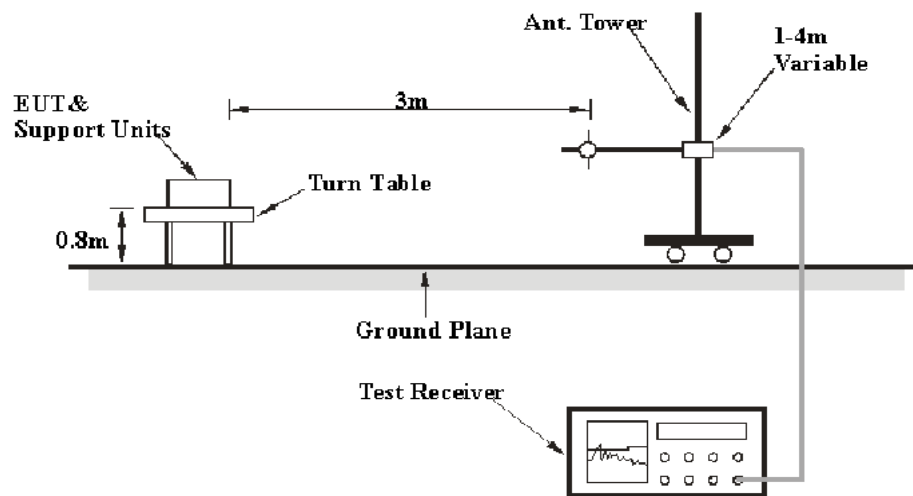
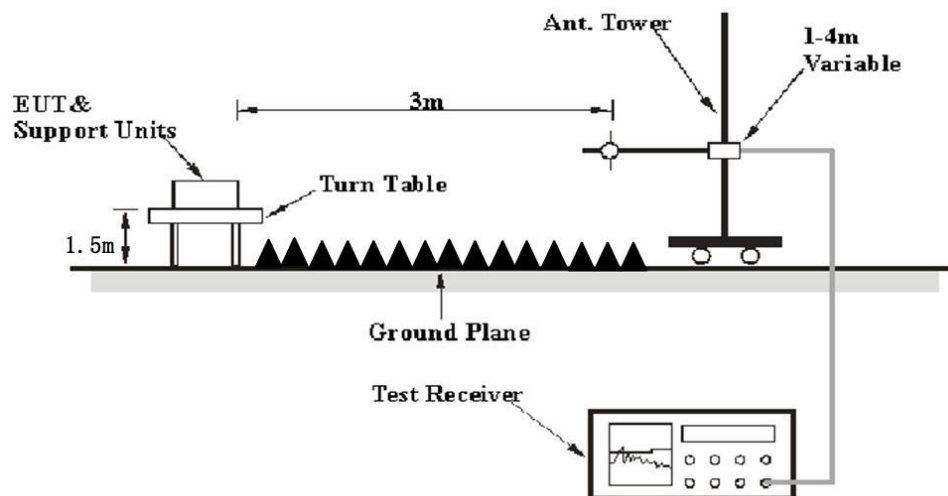
MEASUREMENT RESULT: "AW-0321-05_fin2"

2021-3-21 11:05

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.340000	12.30	10.9	49	36.7	AV	N	GND
0.514000	21.90	11.0	46	24.1	AV	N	GND
1.292000	11.20	11.2	46	34.8	AV	N	GND
3.800000	9.20	11.4	46	36.8	AV	N	GND
5.375000	7.30	11.5	50	42.7	AV	N	GND
16.090000	10.10	11.7	50	39.9	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

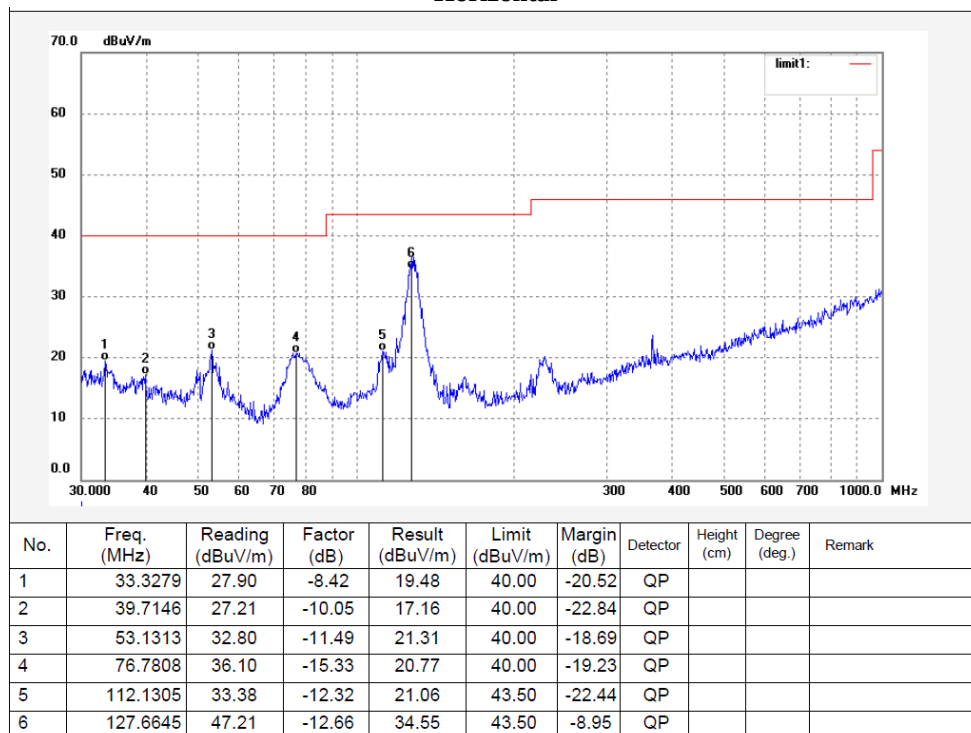
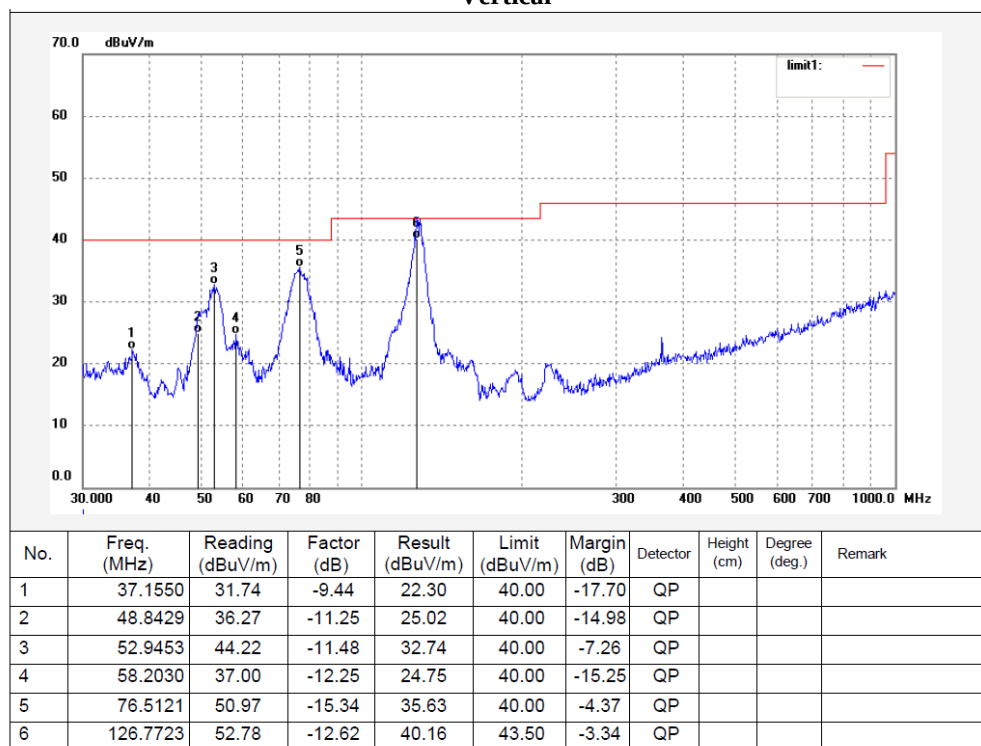
Environmental Conditions

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

The testing was performed by Black Ding on 2021-03-29 to 2021-03-30.

EUT operation mode: Transmitting

Note: 18~25GHz : The test values lower than 20dBm of the limits, the test data were not recorded in the report.

BLE:**30 MHz~1 GHz:****TX 2402MHz (worst case):****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)				
BLE, Low Channel									
2310.00	50.44	PK	326	1.70	H	-6.84	43.60	74.00	30.40
2310.00	50.45	PK	49	1.70	V	-6.84	43.61	74.00	30.39
2390.00	50.21	PK	175	1.40	H	-6.44	43.77	74.00	30.23
2390.00	50.26	PK	232	1.60	V	-6.44	43.82	74.00	30.18
4804.00	42.57	PK	148	1.50	H	2.81	45.38	74.00	28.62
4804.00	42.04	PK	119	1.90	V	2.81	44.85	74.00	29.15
BLE, Middle Channel									
4880.00	42.42	PK	235	1.50	H	3.04	45.46	74.00	28.54
4880.00	42.07	PK	143	1.70	V	3.04	45.11	74.00	28.89
BLE, High Channel									
2483.50	50.55	PK	132	1.60	H	-5.96	44.59	74.00	29.41
2483.50	50.43	PK	152	1.70	V	-5.96	44.47	74.00	29.53
2500.00	50.63	PK	124	1.80	H	-5.88	44.75	74.00	29.25
2500.00	50.37	PK	68	1.50	V	-5.88	44.49	74.00	29.51
4960.00	42.06	PK	97	1.50	H	3.29	45.35	74.00	28.65
4960.00	41.85	PK	213	1.40	V	3.29	45.14	74.00	28.86

Note:

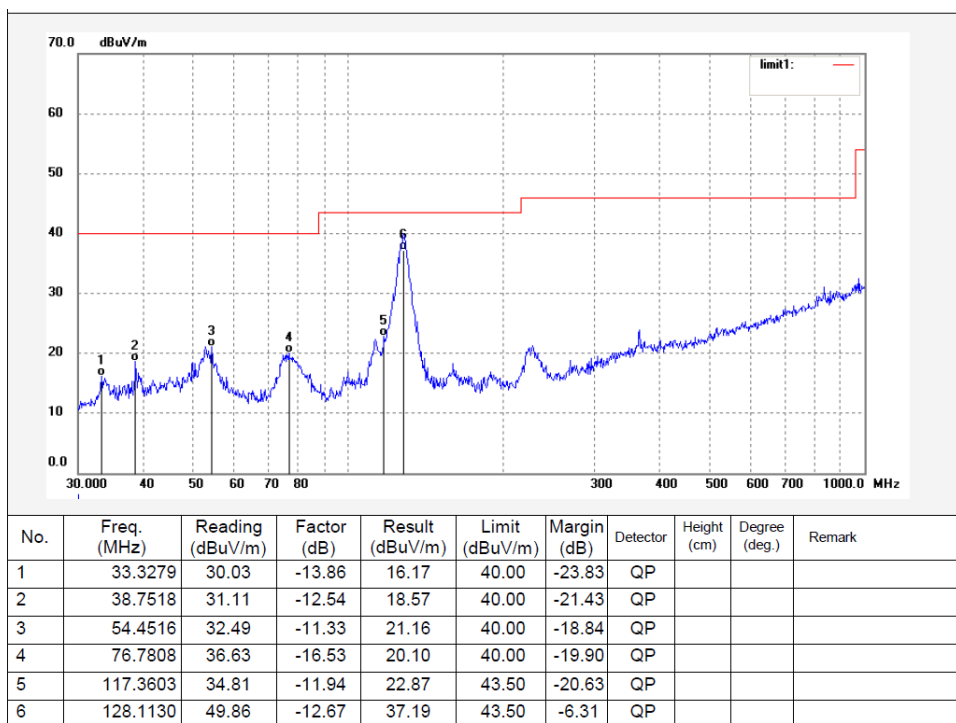
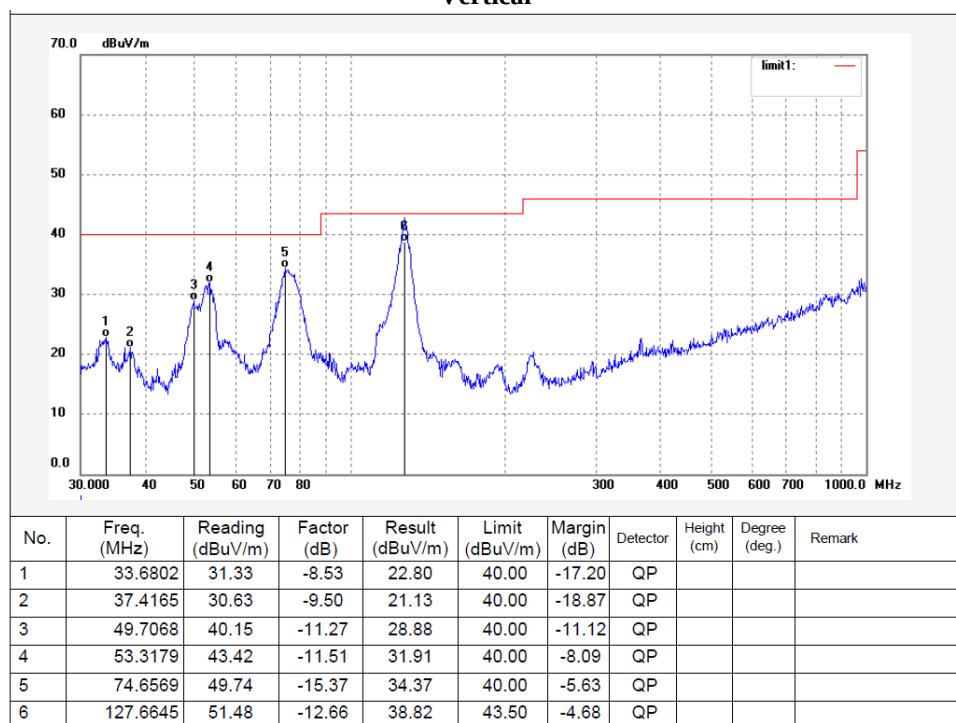
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

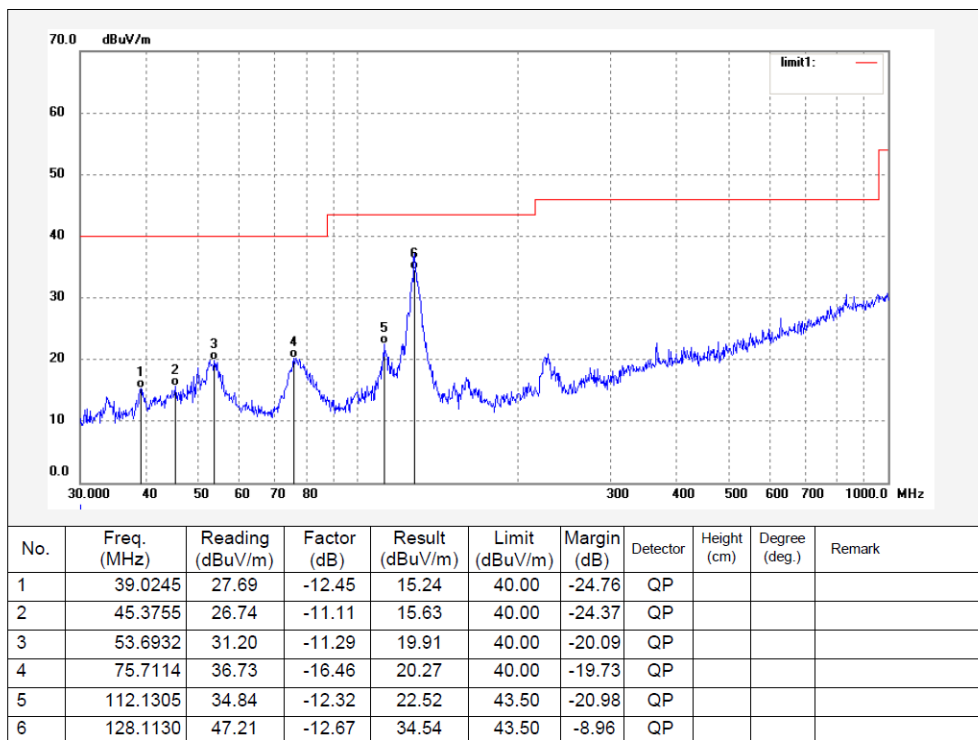
The other spurious emission which is in the noise floor level was not recorded.

The test result of peak was less than the limit of average, so just peak values were recorded.

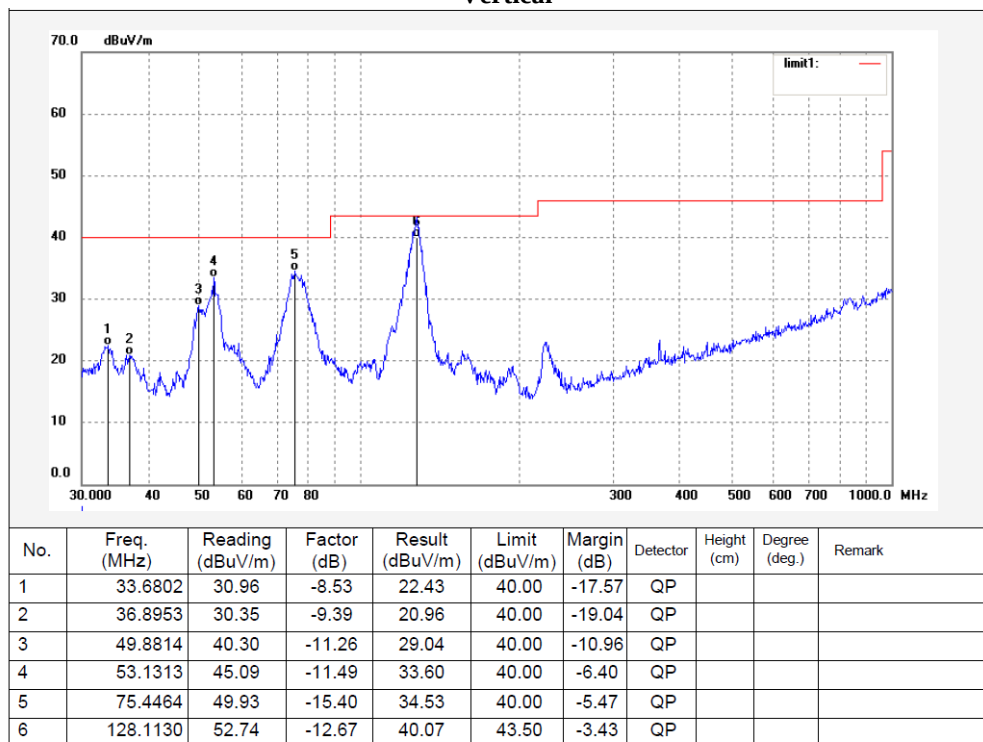
Wi-Fi:**30 MHz~1 GHz: (worst case at 802.11b mode)****TX 2412MHz:****Horizontal****Vertical**

TX 2462MHz:

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		Heigh t (m)	Polar (H/V)				
11B, Low Channel									
2310.00	51.65	PK	248	1.50	H	-6.84	44.81	74.00	29.19
2310.00	52.06	PK	329	1.50	V	-6.84	45.22	74.00	28.78
2390.00	51.96	PK	107	1.60	H	-6.44	45.52	74.00	28.48
2390.00	51.37	PK	66	1.70	V	-6.44	44.93	74.00	29.07
4824.00	44.38	PK	21	1.60	H	2.87	47.25	74.00	26.75
4824.00	43.66	PK	132	1.80	V	2.87	46.53	74.00	27.47
11B, Middle Channel									
4874.00	45.26	PK	184	1.80	H	3.01	48.27	74.00	25.73
4874.00	44.78	PK	259	1.60	V	3.01	47.79	74.00	26.21
11B, High Channel									
2483.50	50.92	PK	141	1.70	H	-5.96	44.96	74.00	29.04
2483.50	50.95	PK	275	1.60	V	-5.96	44.99	74.00	29.01
2500.00	50.90	PK	331	1.50	H	-5.88	45.02	74.00	28.98
2500.00	50.92	PK	246	1.70	V	-5.88	45.04	74.00	28.96
4924.00	46.12	PK	357	1.60	H	3.17	49.29	74.00	24.71
4924.00	45.57	PK	24	2.10	V	3.17	48.74	74.00	25.26
11 N20, Low Channel									
2310.00	52.09	PK	136	1.60	H	-6.84	45.25	74.00	28.75
2310.00	52.28	PK	202	1.90	V	-6.84	45.44	74.00	28.56
2390.00	51.97	PK	105	1.80	H	-6.44	45.53	74.00	28.47
2390.00	51.66	PK	39	1.70	V	-6.44	45.22	74.00	28.78
4824.00	43.35	PK	214	2.10	H	2.87	46.22	74.00	27.78
4824.00	42.78	PK	233	1.60	V	2.87	45.65	74.00	28.35
11 N20, Middle Channel									
4874.00	41.99	PK	107	1.60	H	3.01	45.00	74.00	29.00
4874.00	42.06	PK	125	1.70	V	3.01	45.07	74.00	28.93
11 N20, High Channel									
2483.50	51.36	PK	148	1.50	H	-5.96	45.40	74.00	28.60
2483.50	51.47	PK	159	1.60	V	-5.96	45.51	74.00	28.49
2500.00	51.89	PK	238	1.90	H	-5.88	46.01	74.00	27.99
2500.00	51.67	PK	227	1.80	V	-5.88	45.79	74.00	27.21
4924.00	43.37	PK	129	2.00	H	3.17	46.54	74.00	27.48
4924.00	42.74	PK	163	1.50	V	3.17	45.91	74.00	28.09

Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

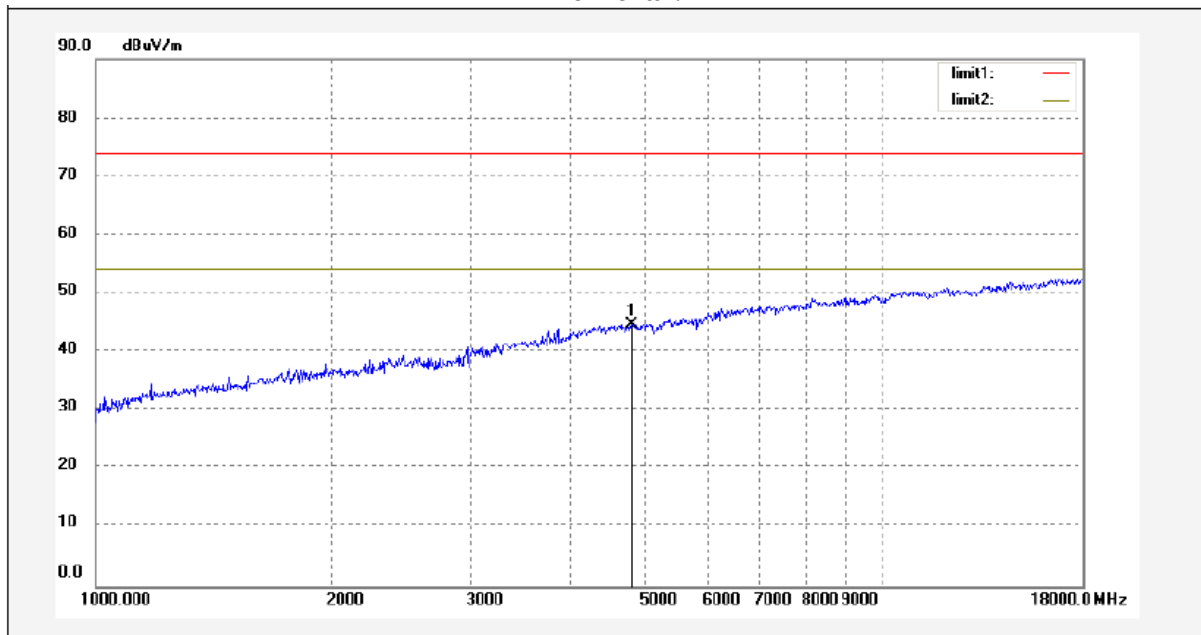
Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

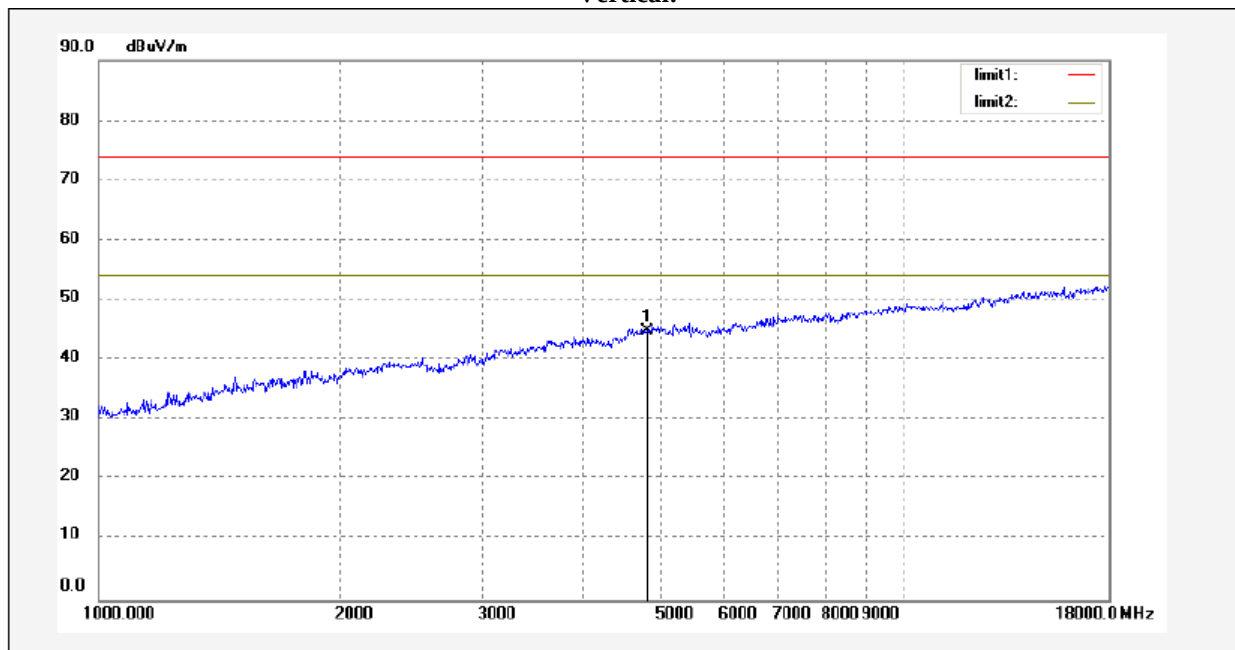
The other spurious emission which is 20dB to the limit was not recorded.

The test result of peak was less than the limit of average, so just peak values were recorded.

**Pre-scan for Peak
802.11 b Middle Channel
Horizontal:**



Vertical:



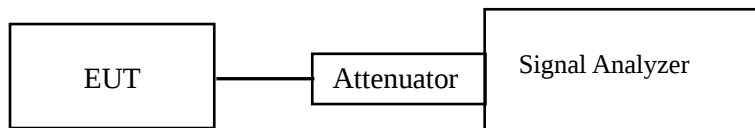
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

Applicable Standard

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

Test Procedure

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



Test Data

Environmental Conditions

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

The testing was performed by Black Ding on 2021-03-29.

EUT operation mode: Transmitting

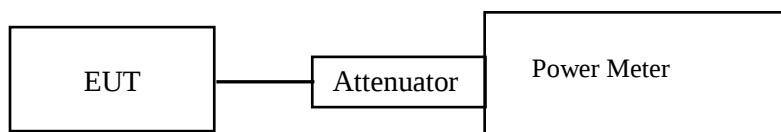
Test Result: Compliant. Please refer to the Appendix Wi-Fi and Appendix BLE.

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 Black Ding on 2021-03-29.

EUT operation mode: Transmitting

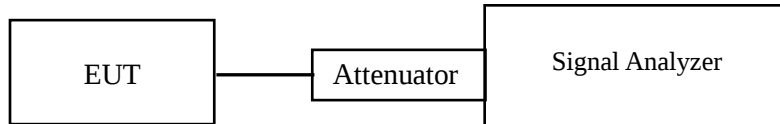
Test Result: Compliant. Please refer to the Appendix Wi-Fi and Appendix BLE.

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 Black Ding on 2021-03-29.

EUT operation mode: Transmitting

Test Result: Compliant.

Conducted Band Edge Result:

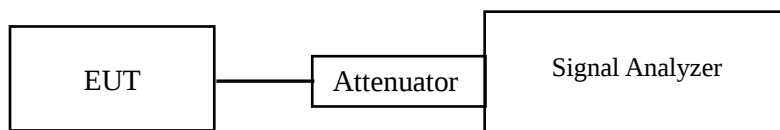
Please refer to the Appendix Wi-Fi and Appendix BLE.

FCC §15.247(e) - POWER SPECTRAL DENSITY**Applicable Standard**

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

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$.
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 Black Ding on 2021-03-29.

EUT operation mode: Transmitting

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

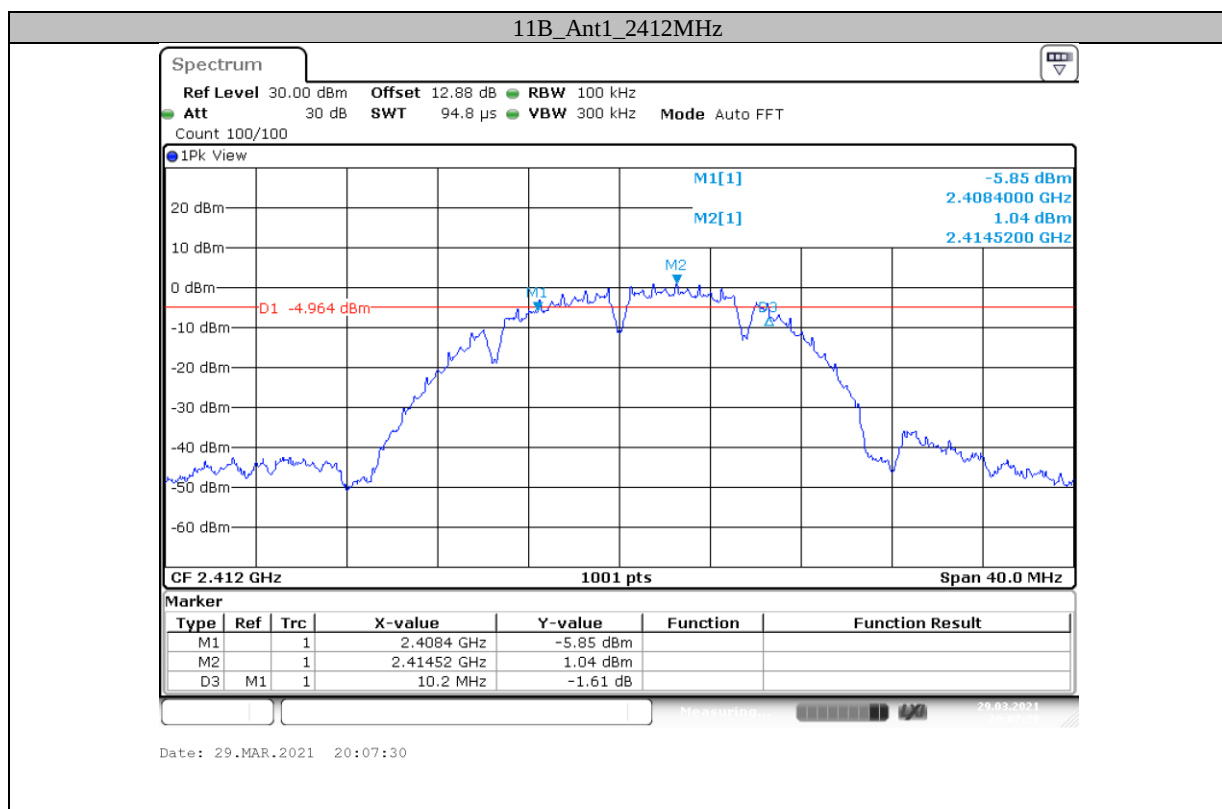
APPENDIX Wi-Fi

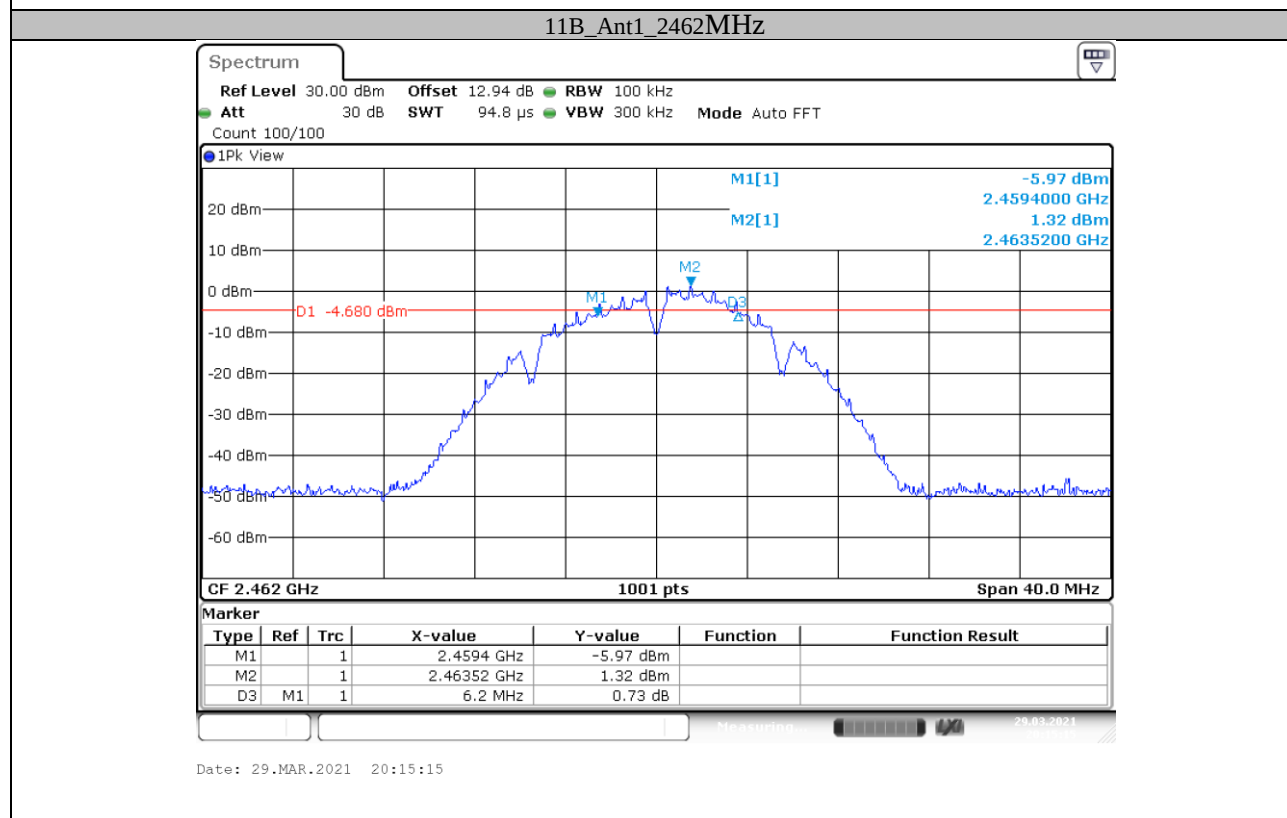
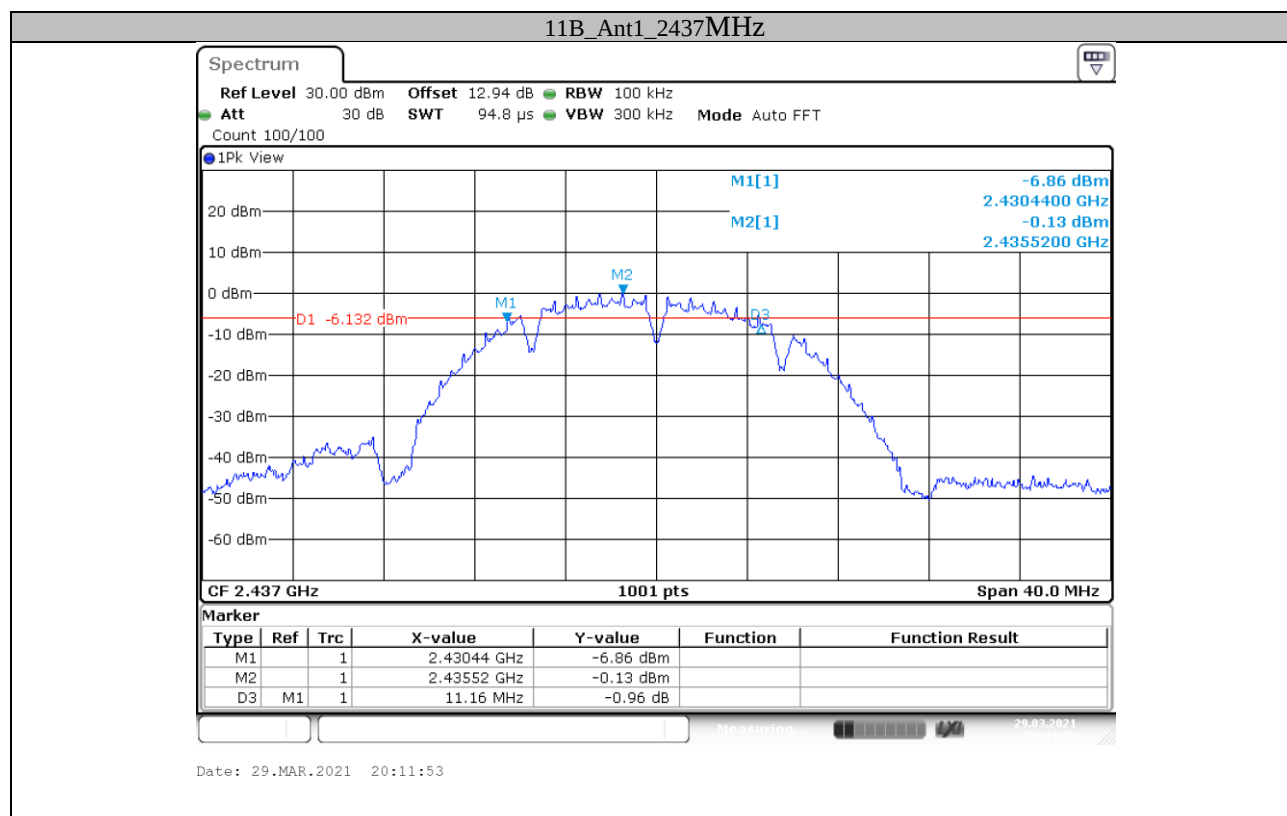
Appendix A: 6dB Emission Bandwidth

Test Result

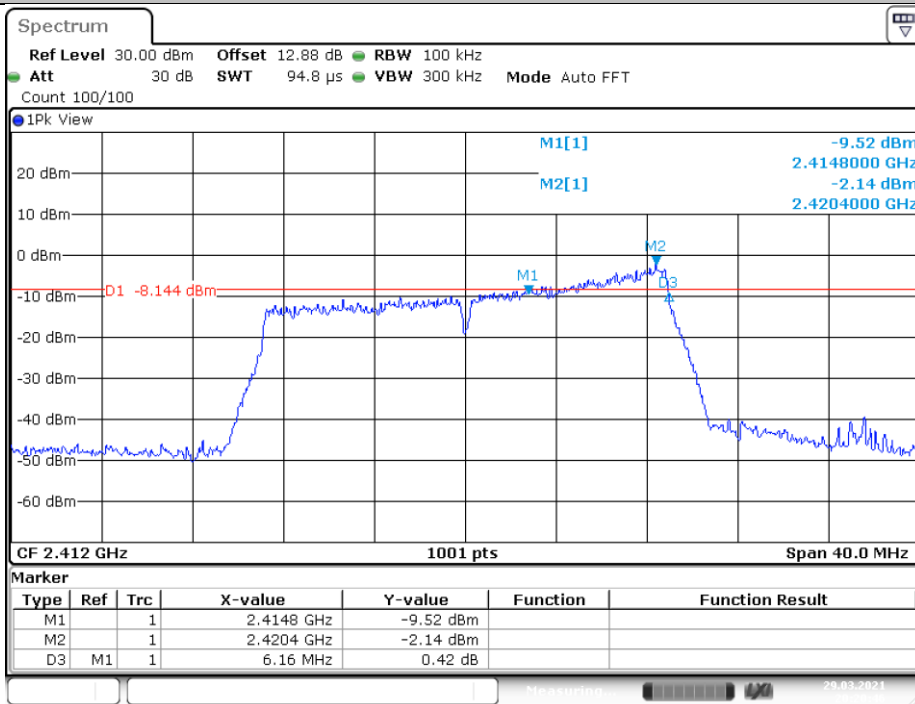
TestMode	Antenna	Channel	DTS BW [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	10.200	0.5	PASS
		2437	11.160	0.5	PASS
		2462	6.200	0.5	PASS
11N20SISO	Ant1	2412	6.160	0.5	PASS
		2437	8.360	0.5	PASS
		2462	10.480	0.5	PASS

Test Graphs



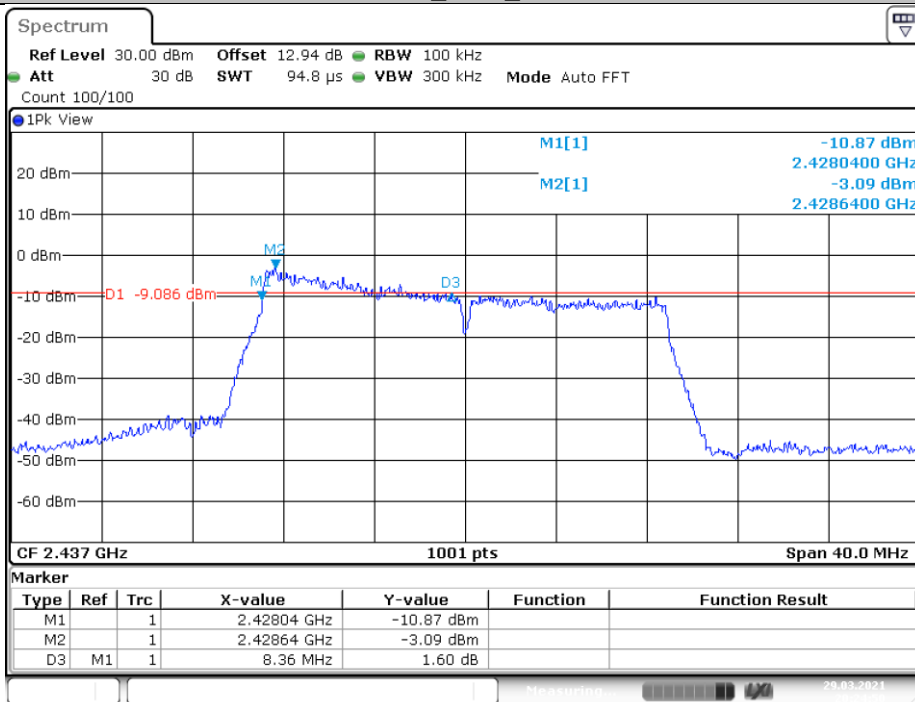


11N20SISO_Ant1_2412MHz

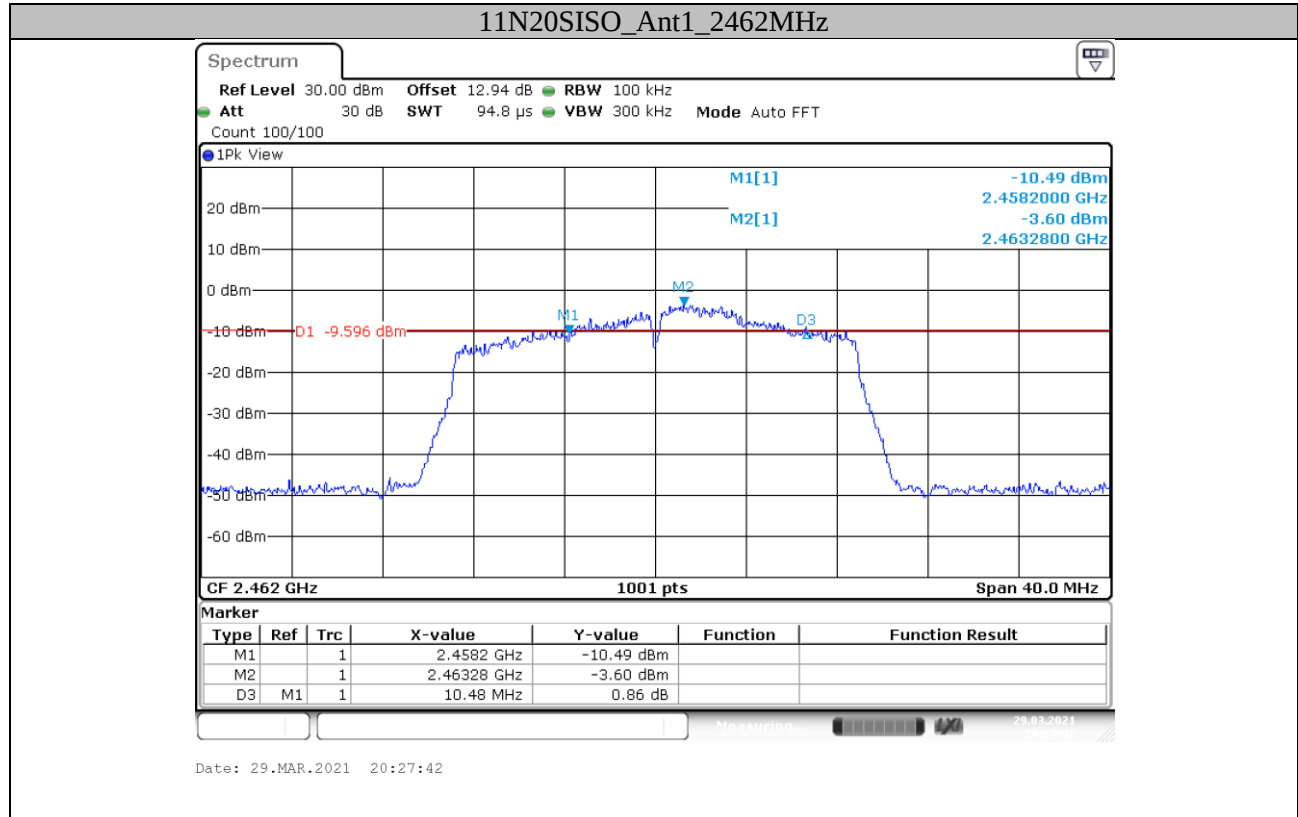


Date: 29.MAR.2021 20:20:46

11N20SISO_Ant1_2437MHz



Date: 29.MAR.2021 20:24:50

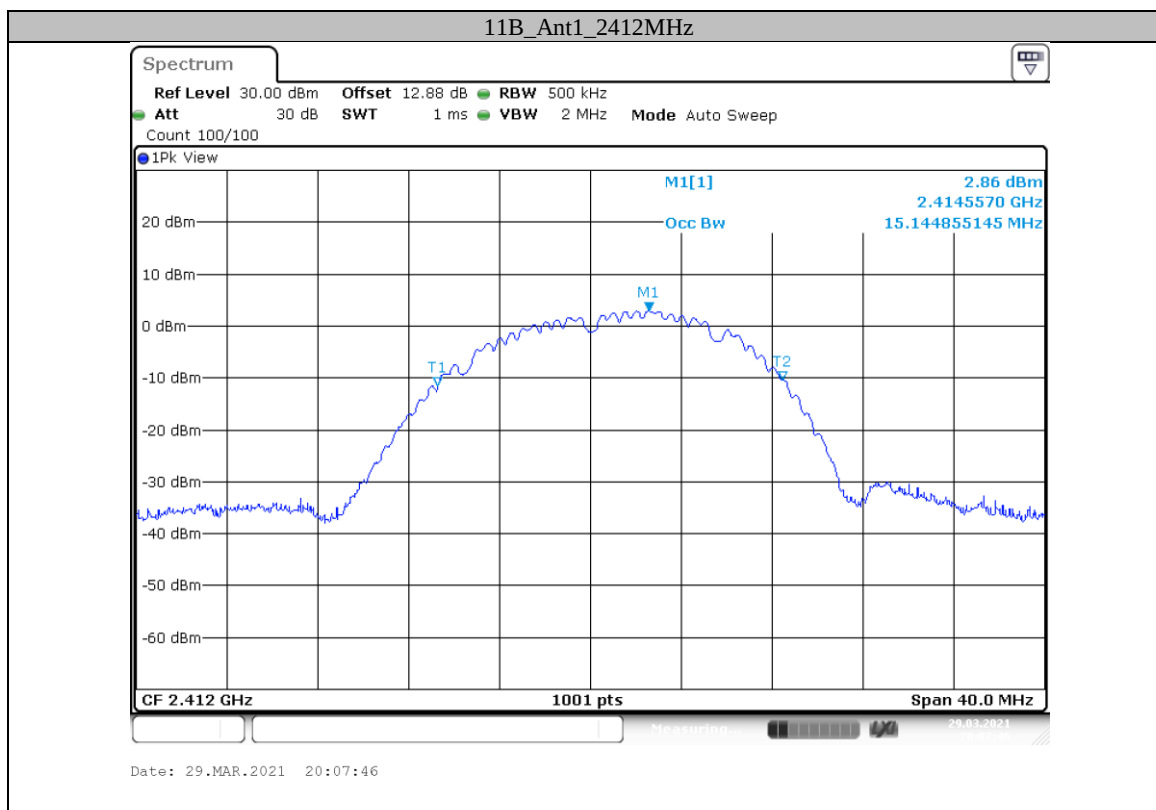


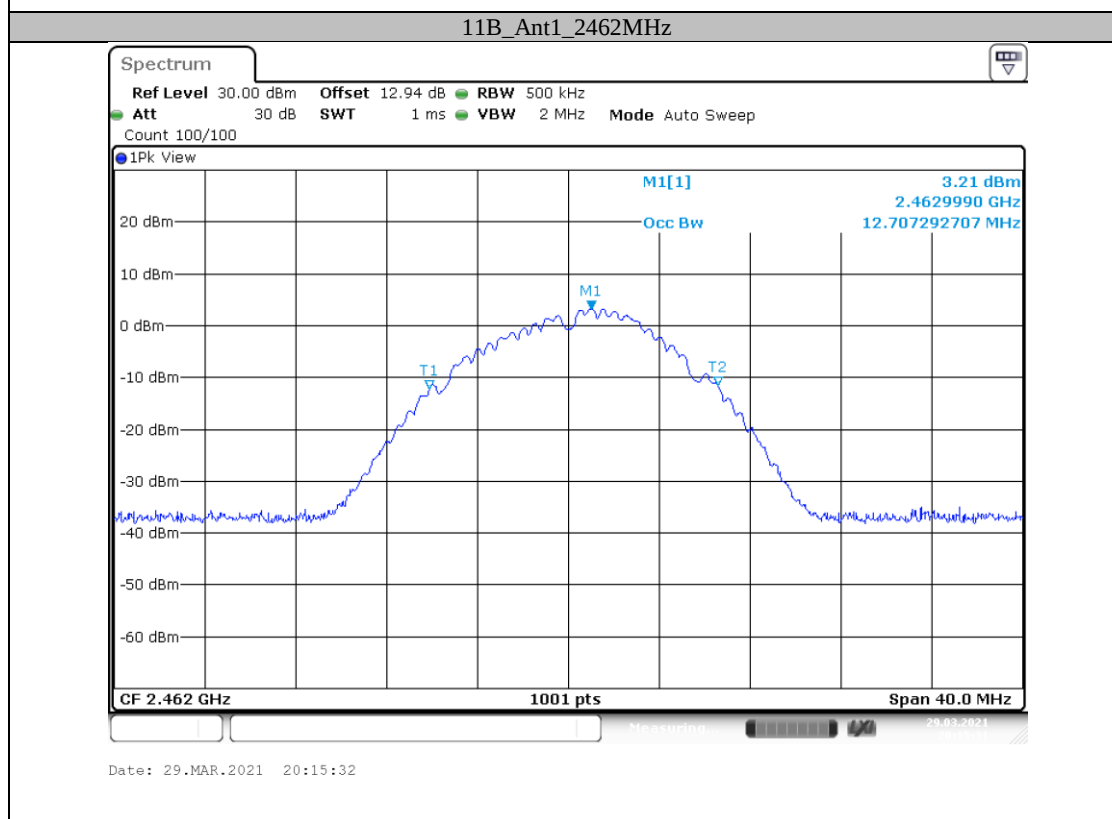
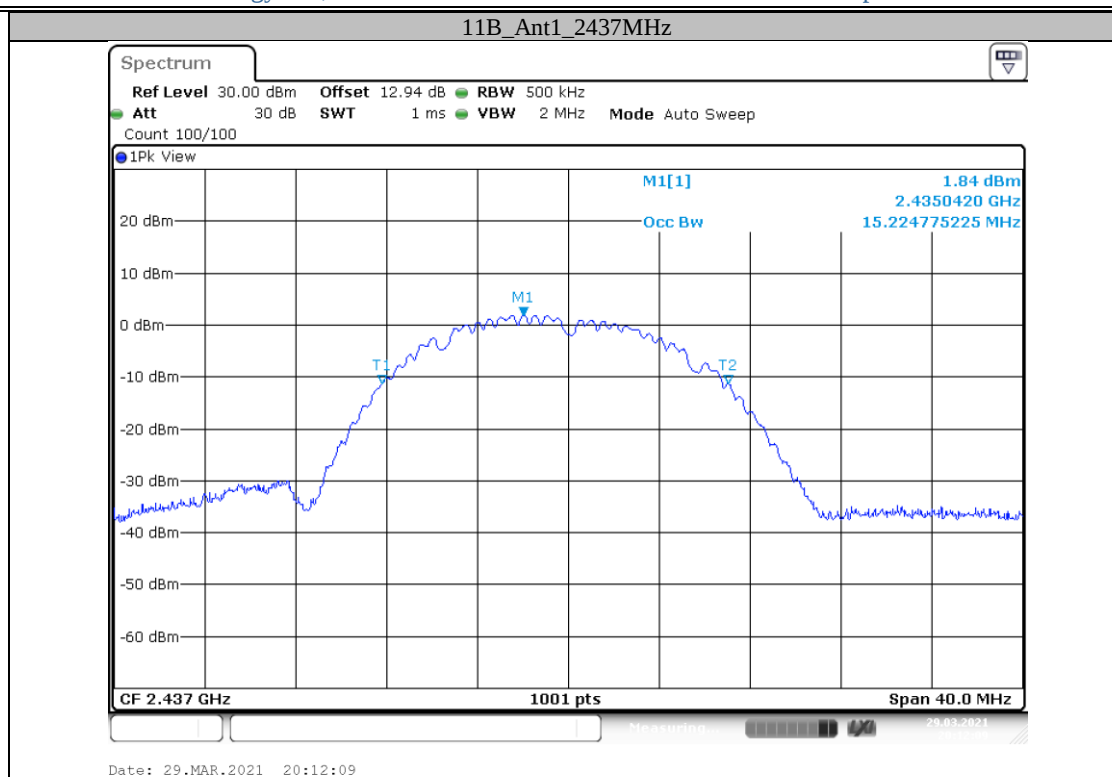
Appendix B: Occupied Channel Bandwidth

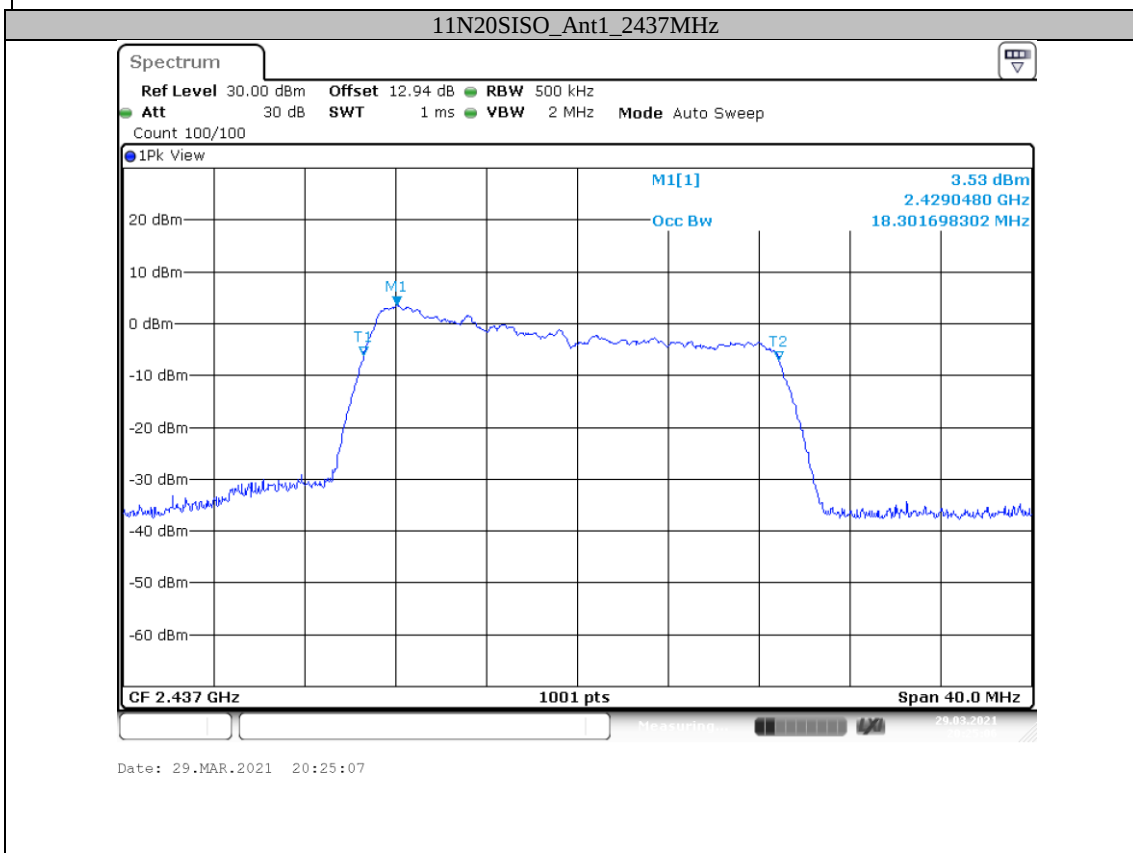
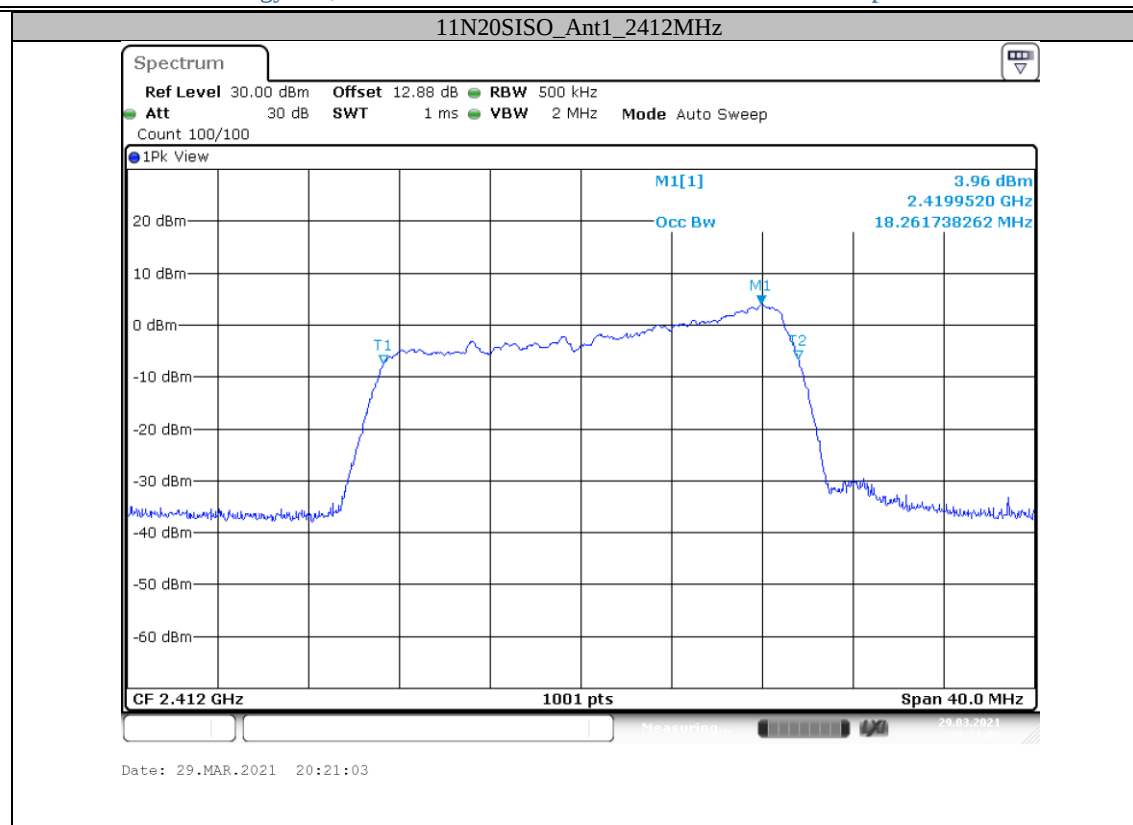
Test Result

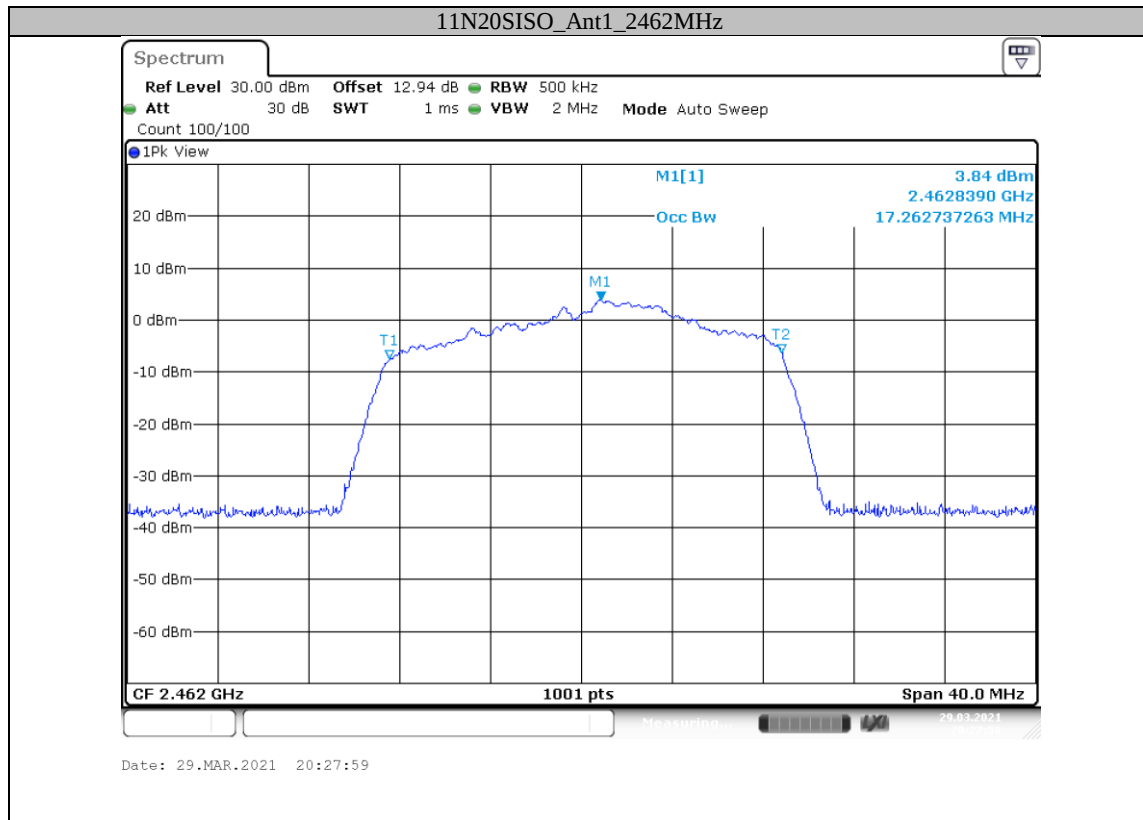
TestMode	Antenna	Channel[MHz]	OCB [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	15.145	---	PASS
		2437	15.225	---	PASS
		2462	12.707	---	PASS
11N20SISO	Ant1	2412	18.262	---	PASS
		2437	18.302	---	PASS
		2462	17.263	---	PASS

Test Graphs







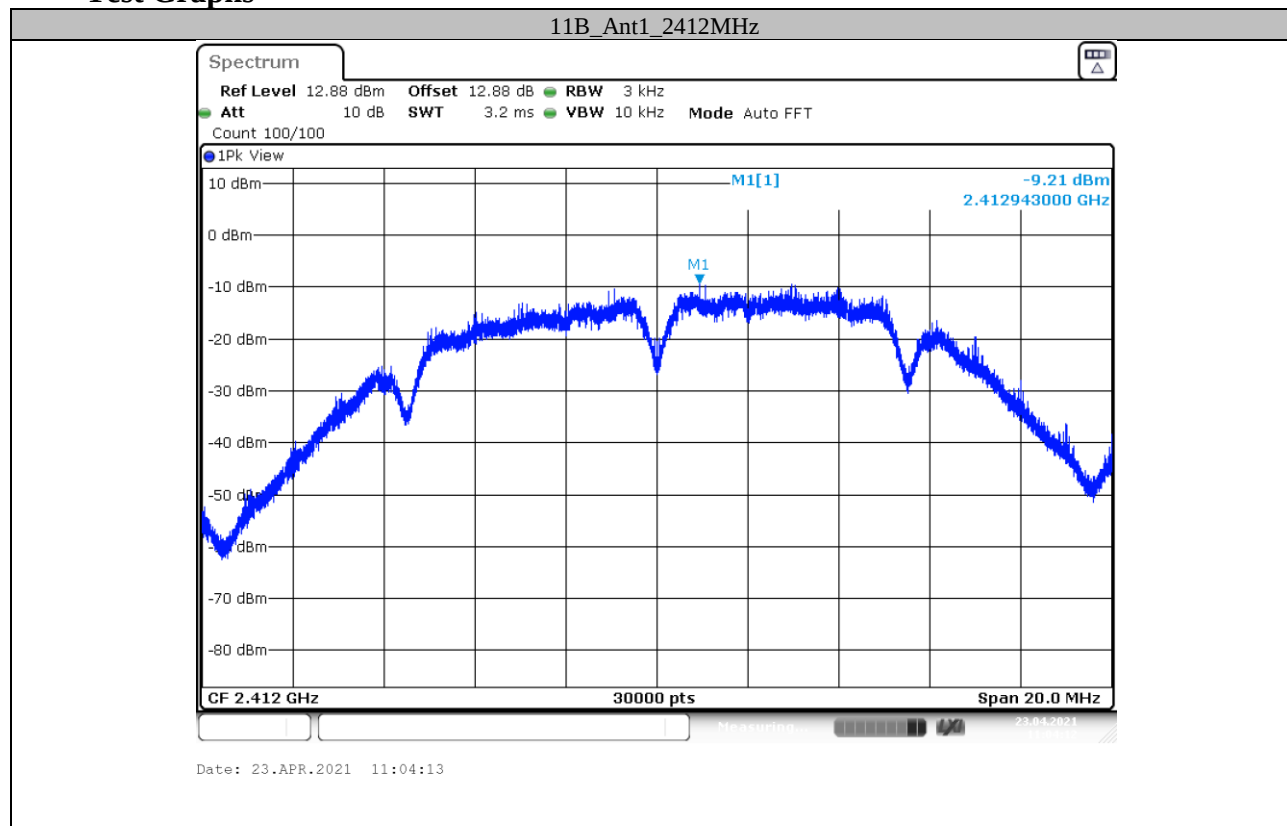


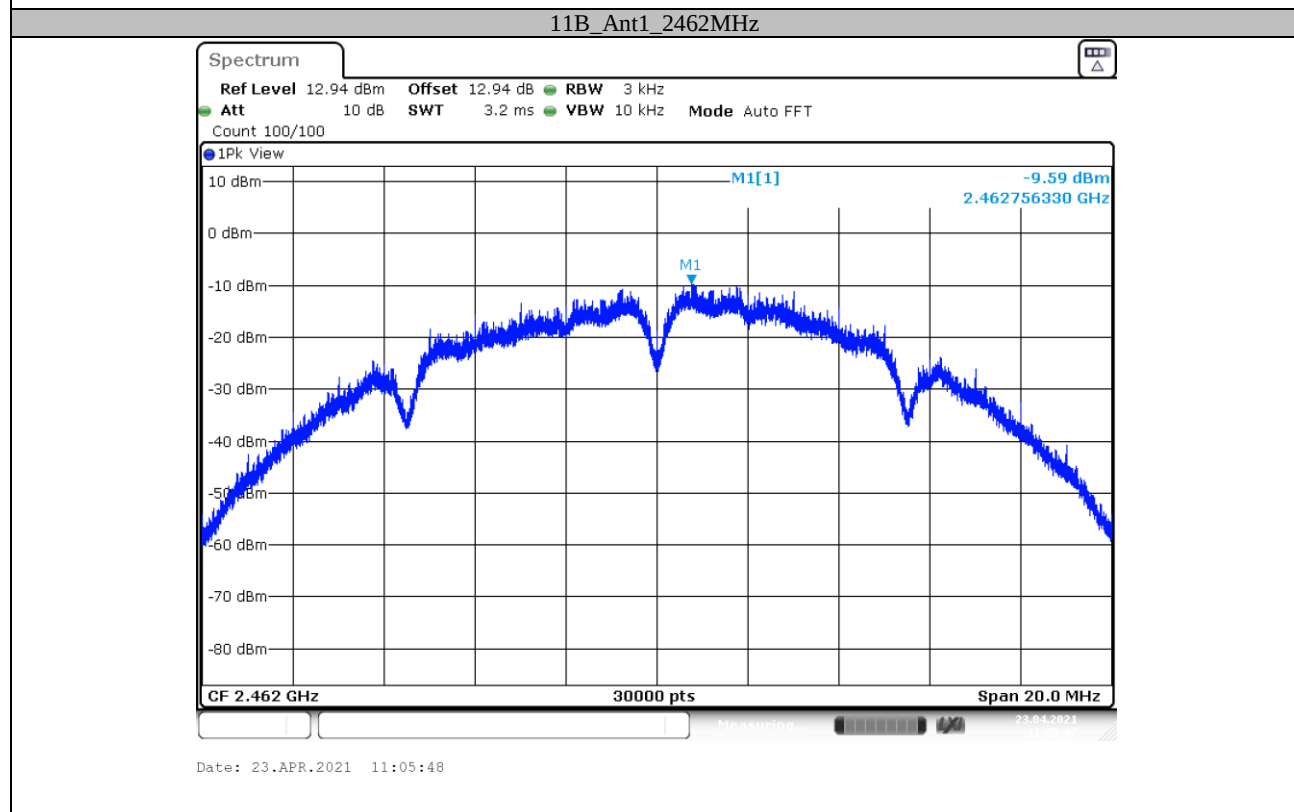
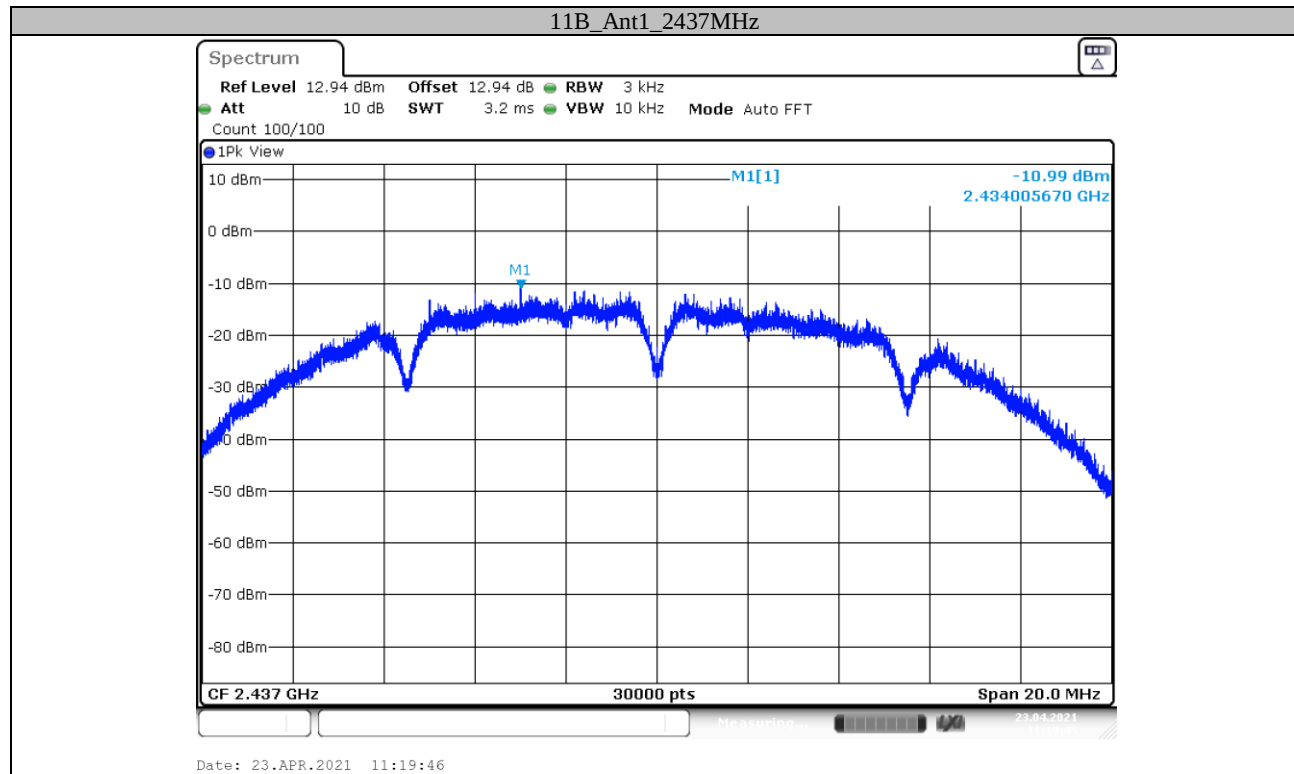
Appendix C: Maximum conducted output power**Test Result**

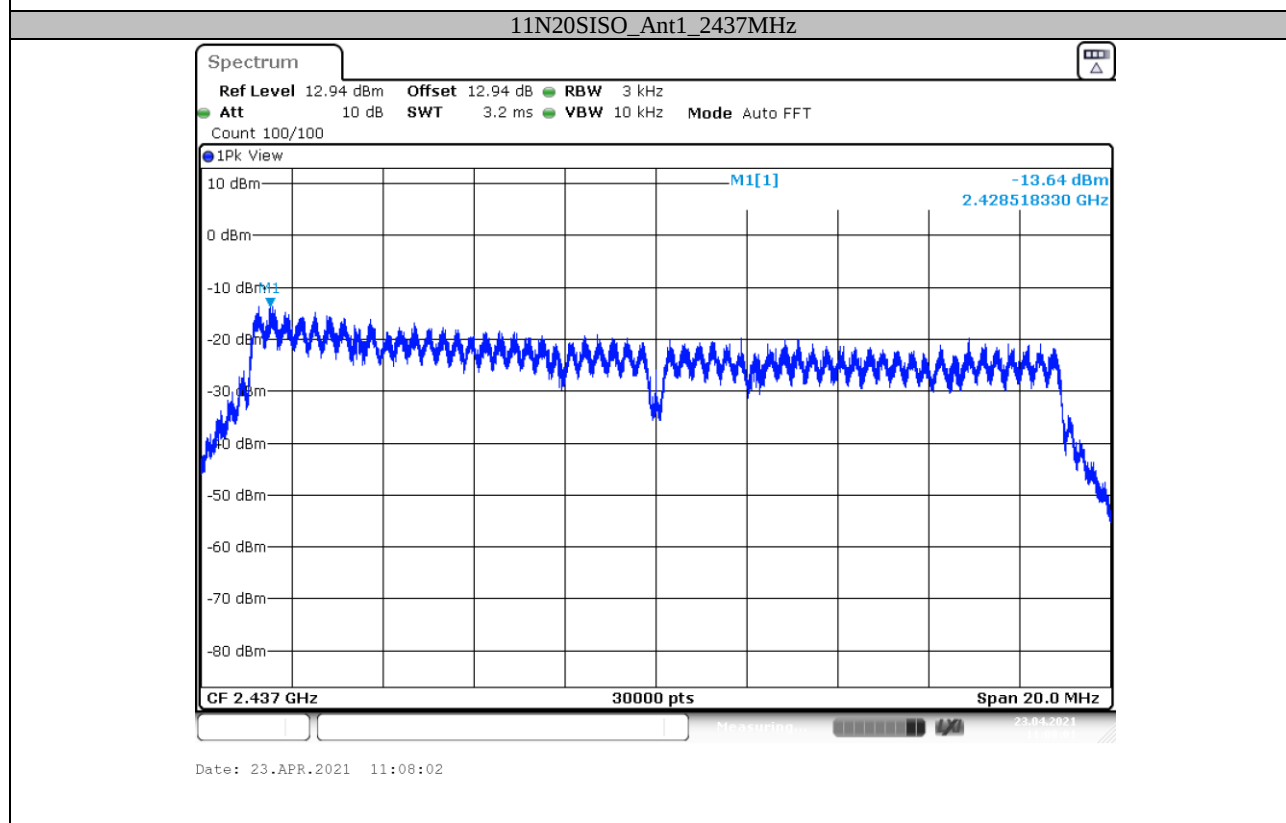
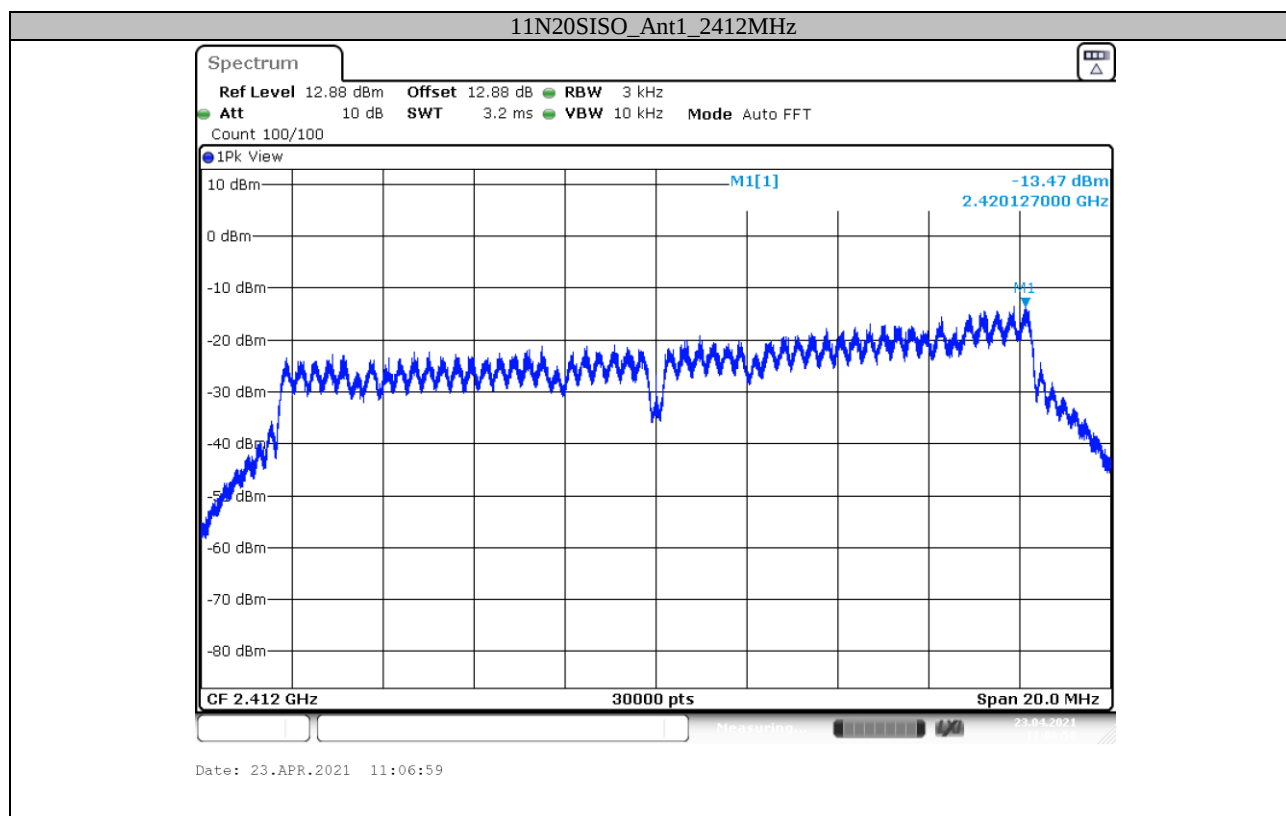
Test Mode	Antenna	Channel [MHz]	Peak Power Result [dBm]	Average Power Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	16.37	15.22	<=30	PASS
		2437	15.53	14.38	<=30	PASS
		2462	16.63	15.41	<=30	PASS
11N20SISO	Ant1	2412	12.74	11.66	<=30	PASS
		2437	13.58	12.45	<=30	PASS
		2462	14.20	13.02	<=30	PASS

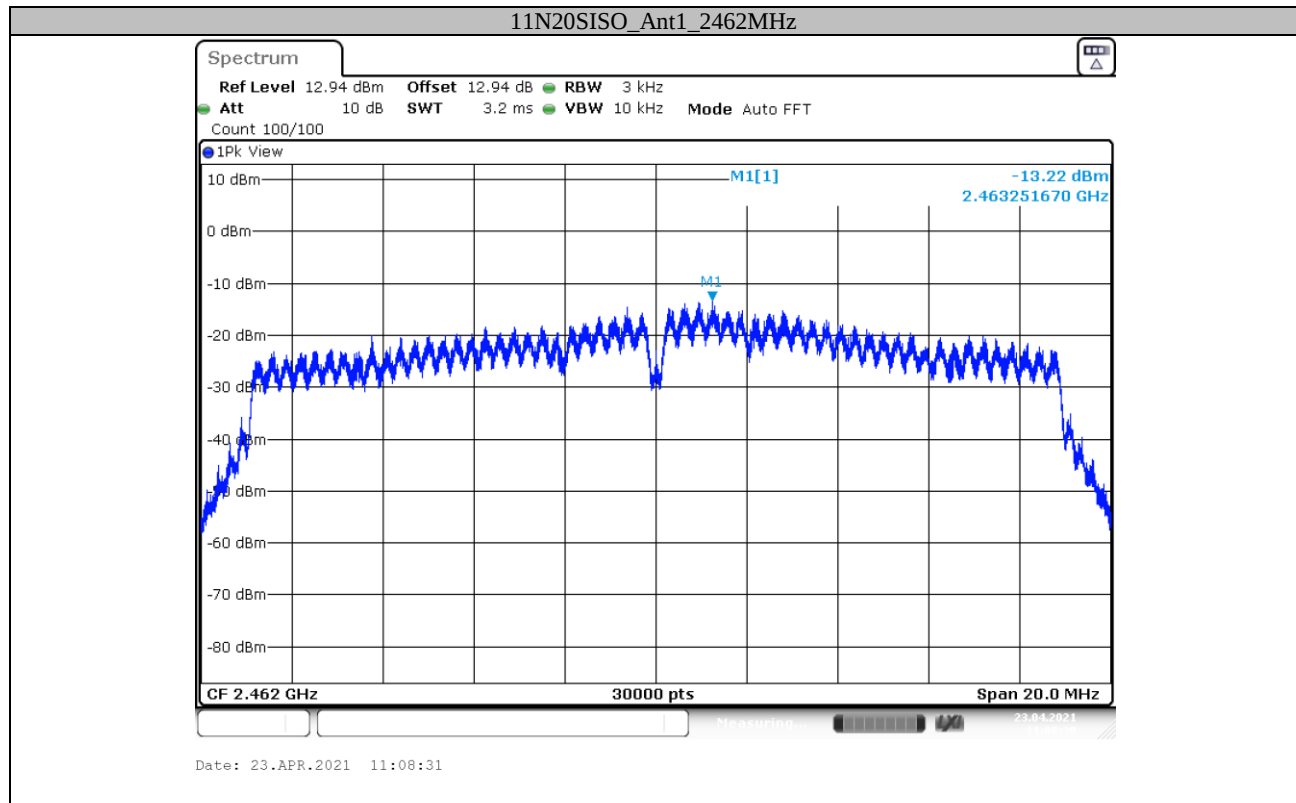
Appendix D: Power spectral density**Test Result**

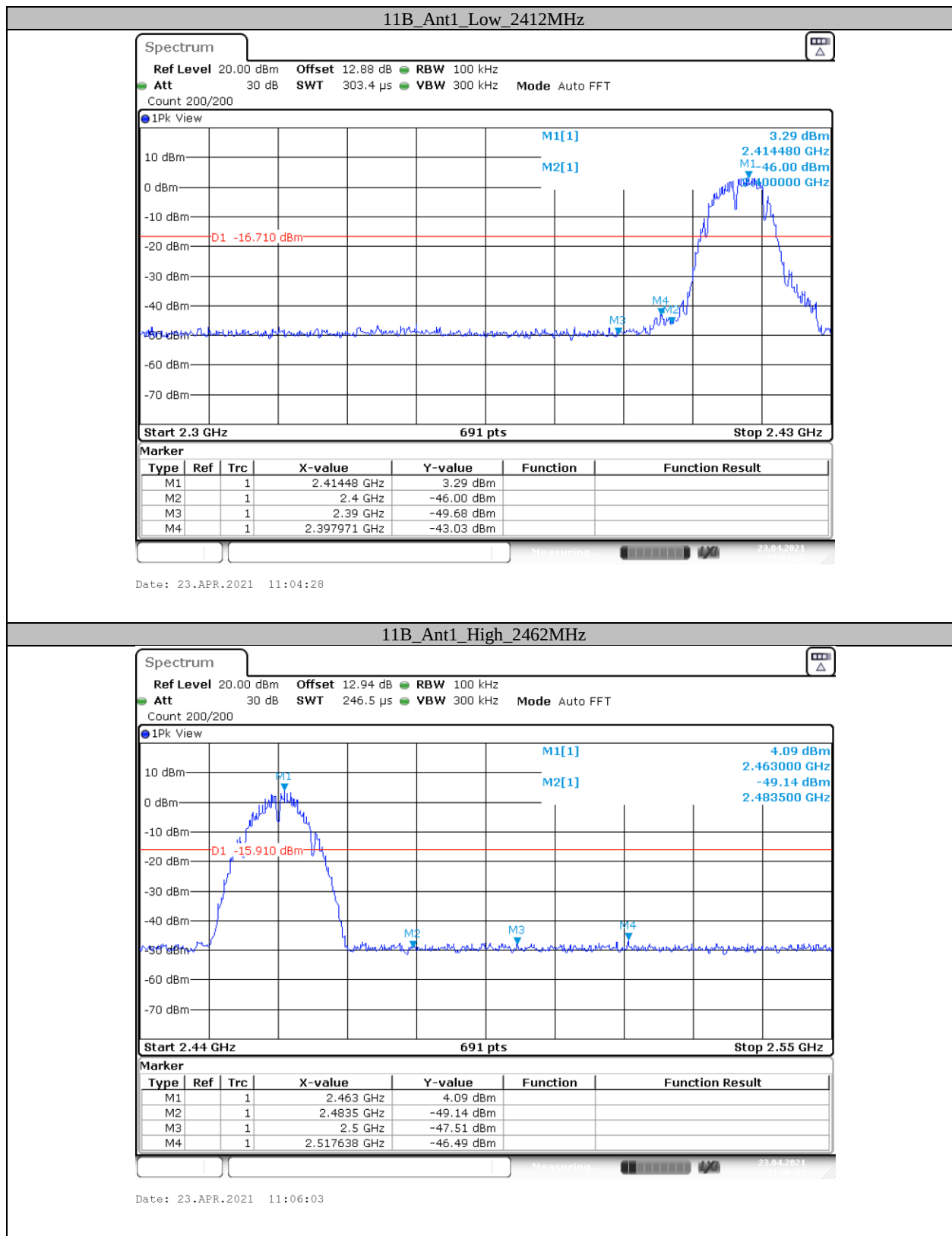
TestMode	Antenna	Channel[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-9.21	<=8	PASS
		2437	-10.99	<=8	PASS
		2462	-9.59	<=8	PASS
11N20SISO	Ant1	2412	-13.47	<=8	PASS
		2437	-13.64	<=8	PASS
		2462	-13.22	<=8	PASS

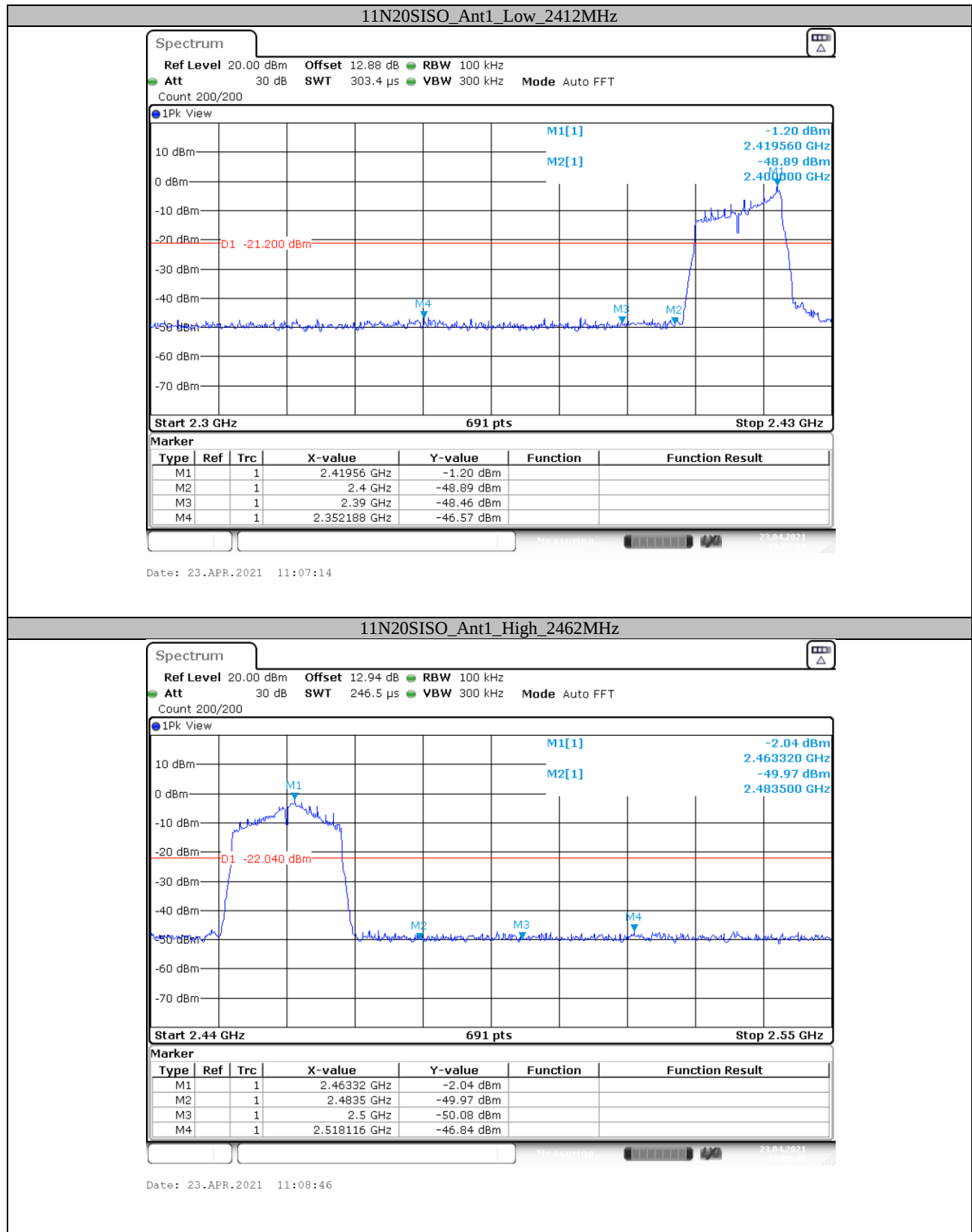
Test Graphs







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

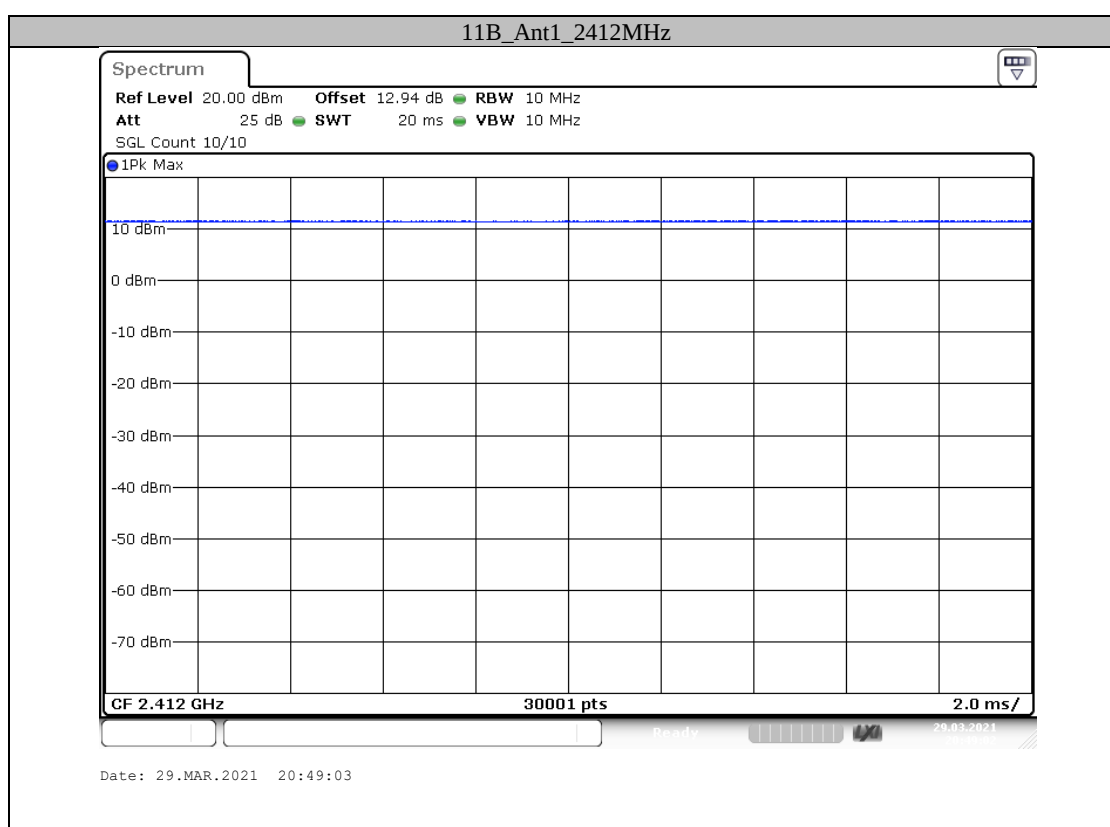


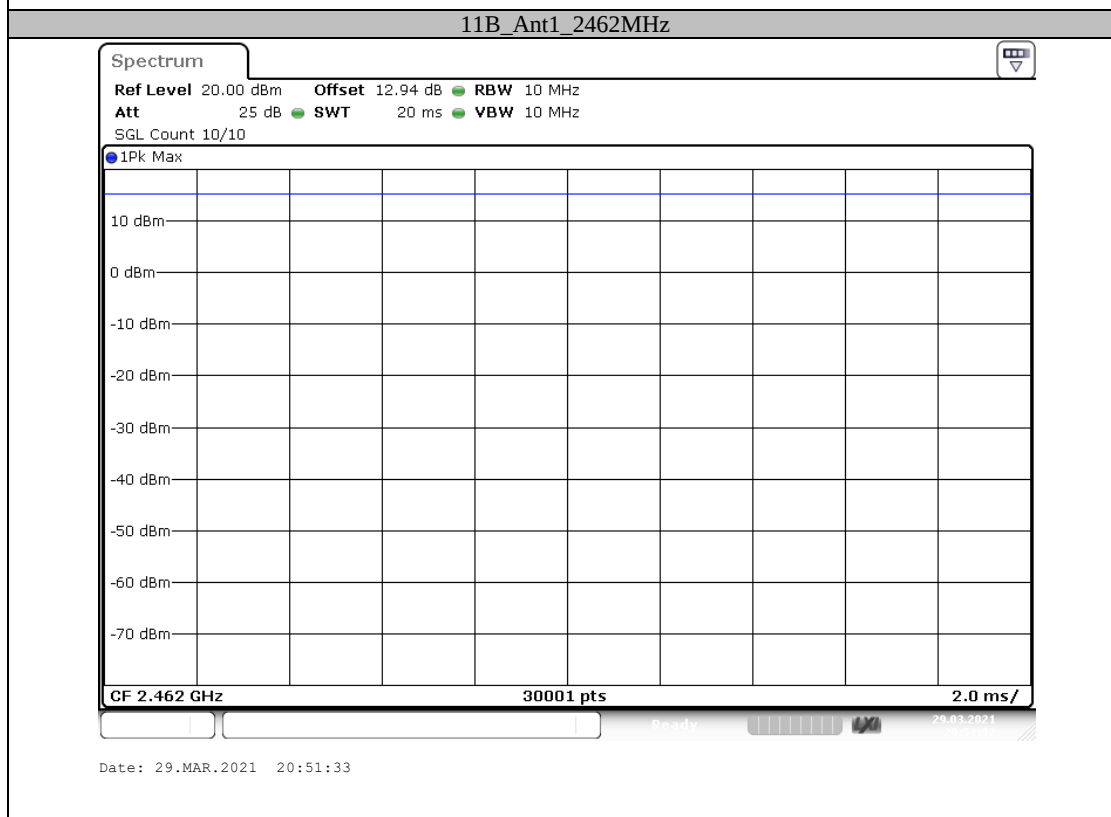
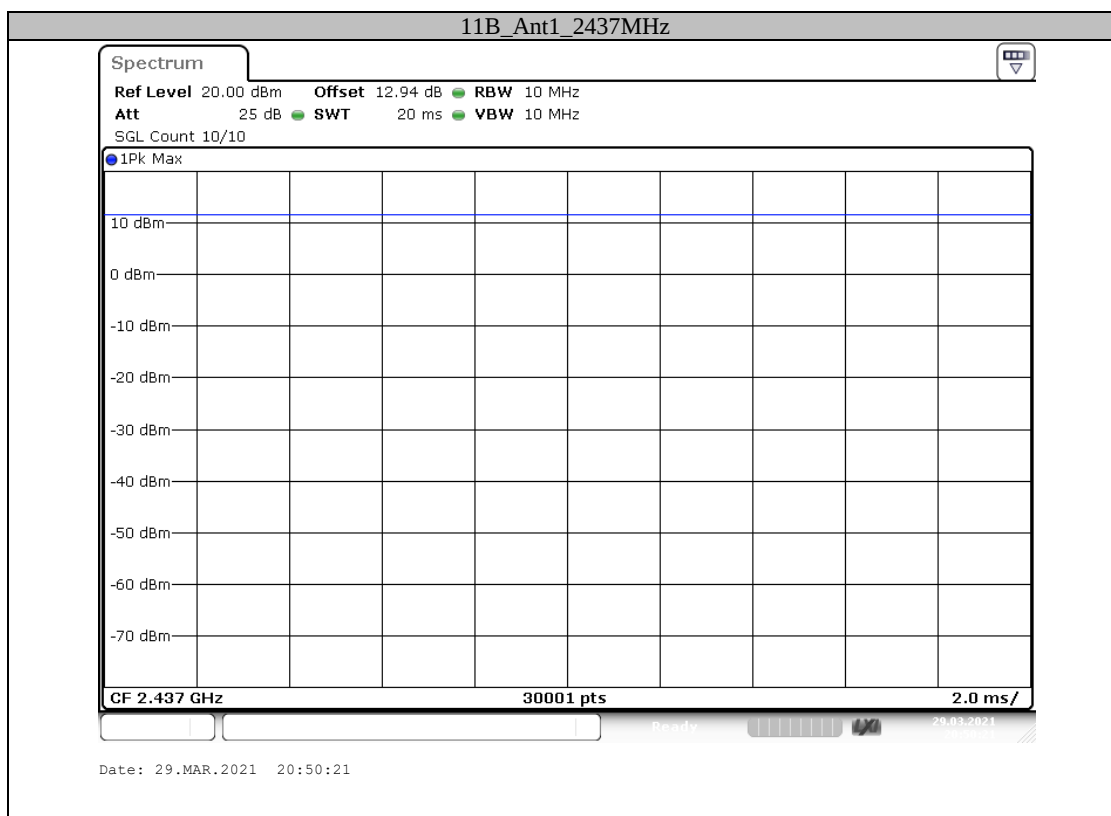
Appendix F: Duty Cycle

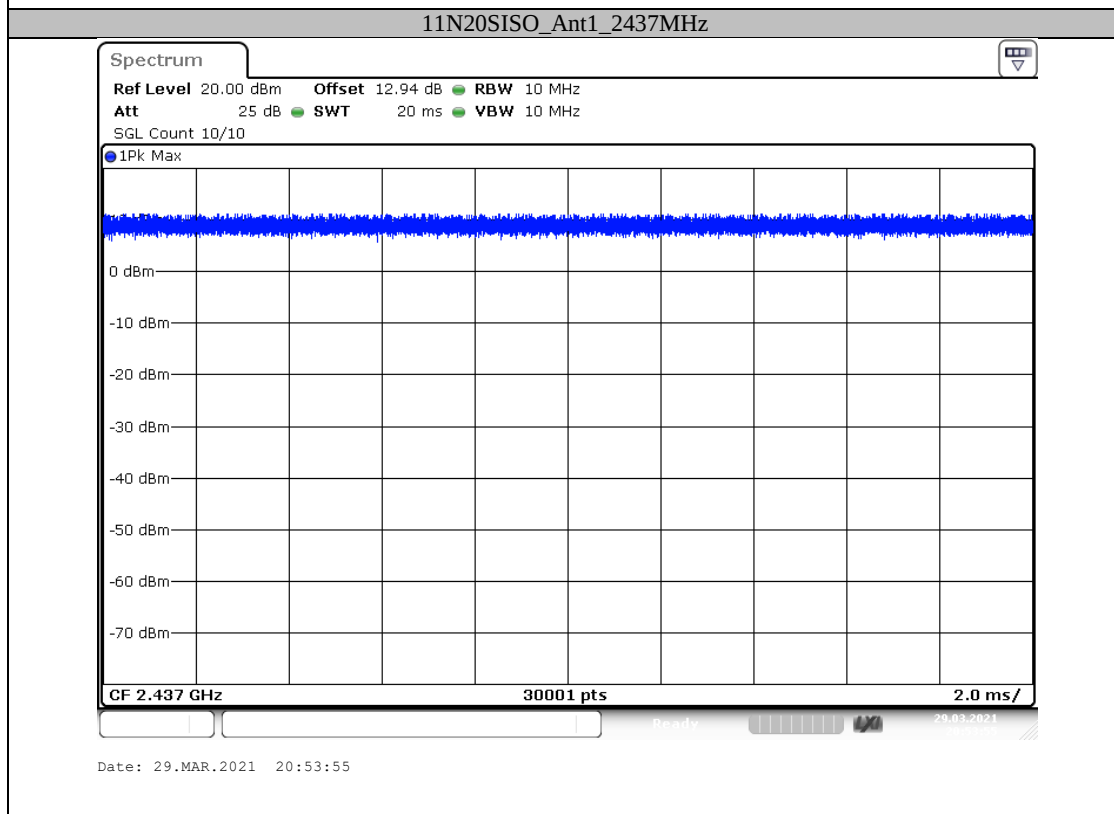
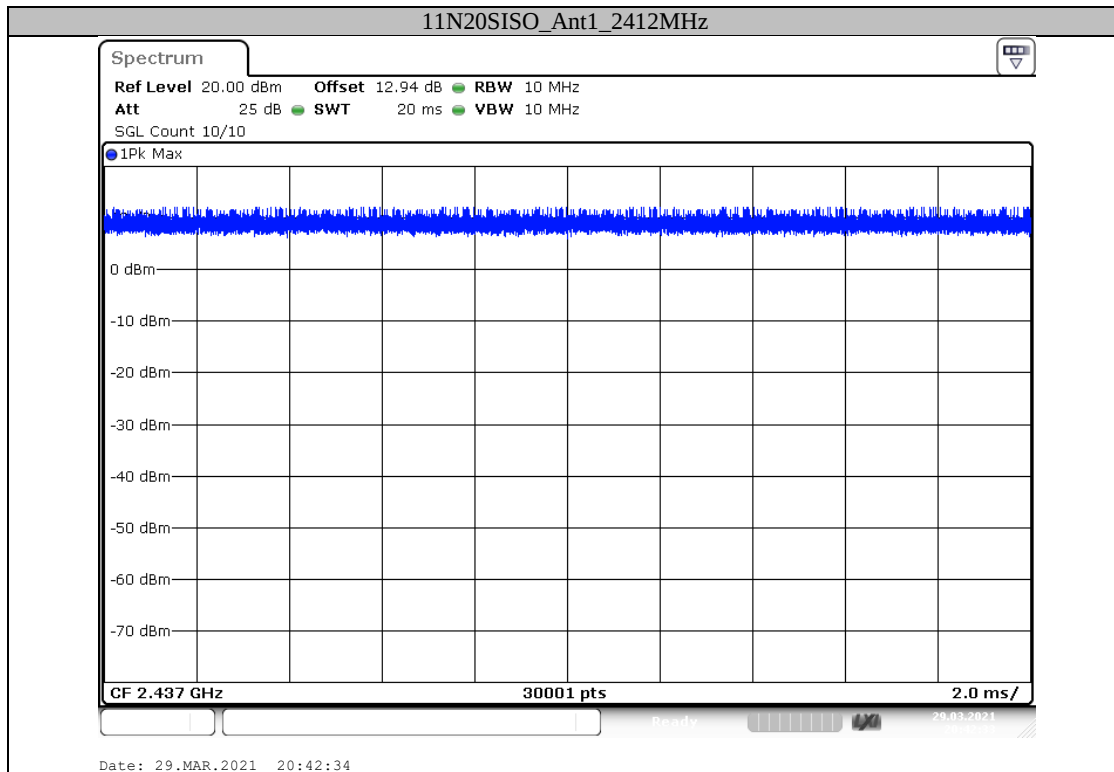
Test Result

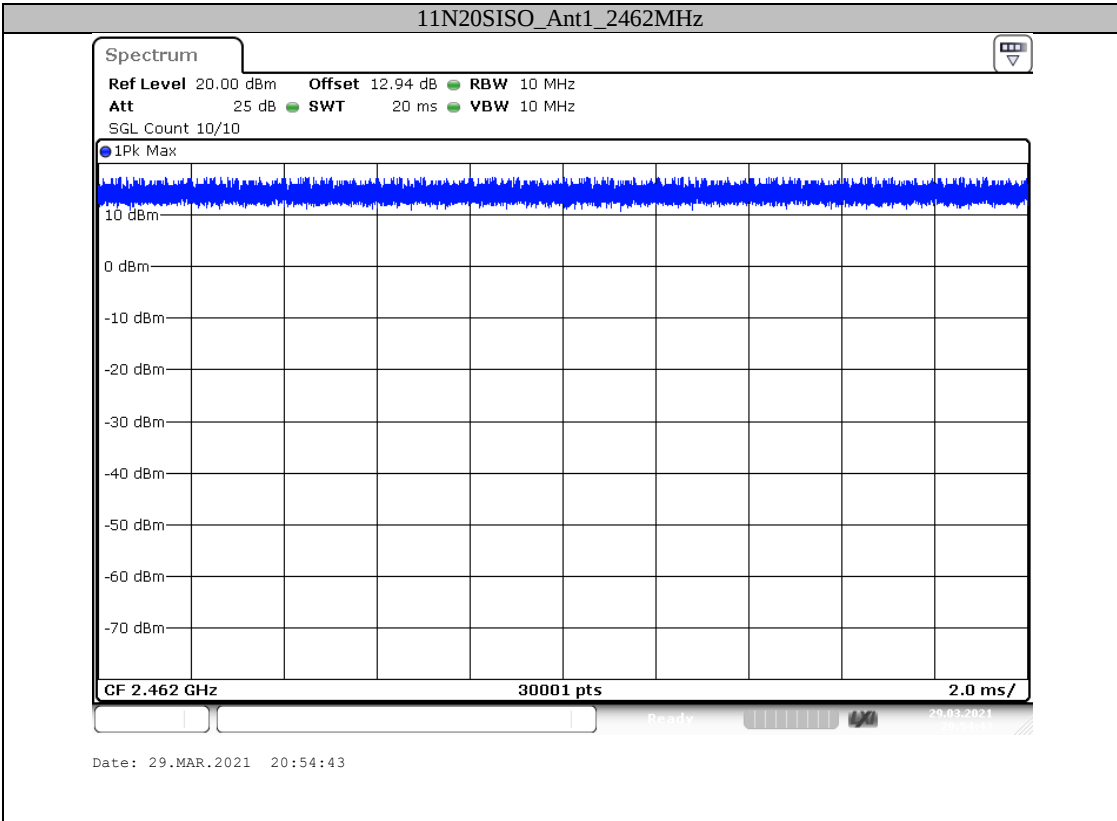
TestMode	Antenna	Channel [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	Ant1	2412	20.00	20.00	100.00
		2437	20.00	20.00	100.00
		2462	20.00	20.00	100.00
		2462	20.00	20.00	100.00
11N20SISO	Ant1	2412	20.00	20.00	100.00
		2437	20.00	20.00	100.00
		2462	20.00	20.00	100.00

Test Graphs









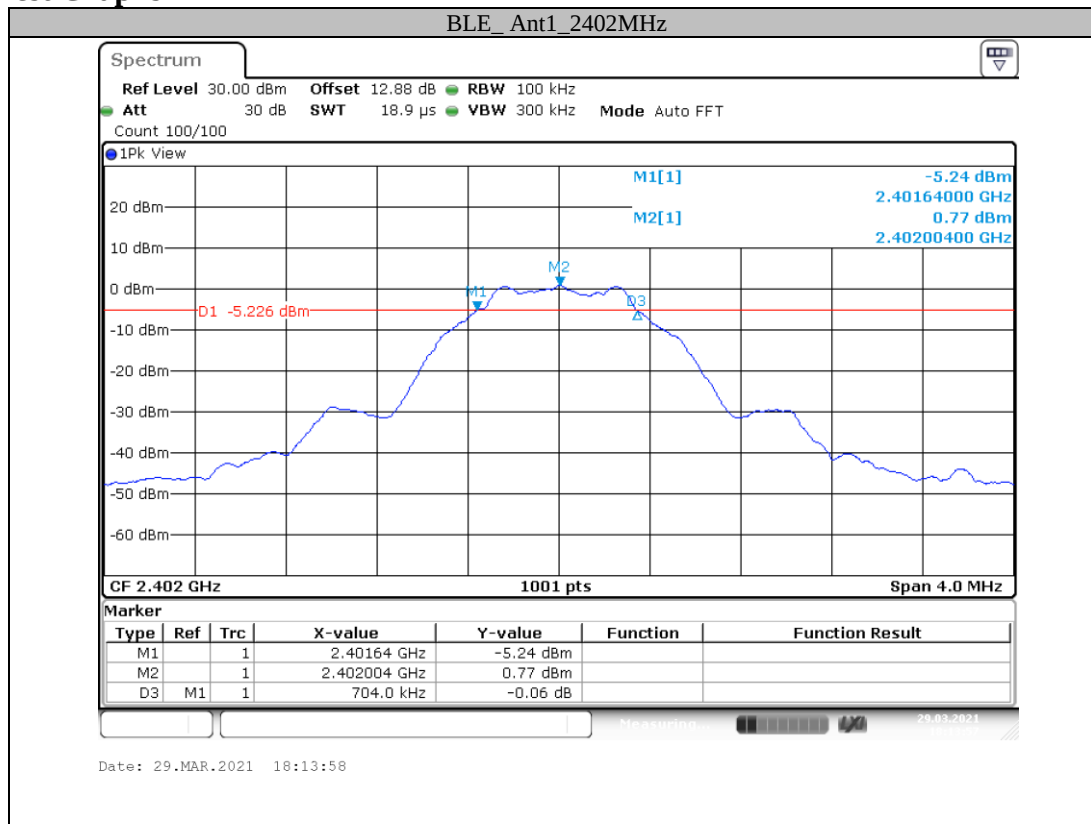
APPENDIX BLE

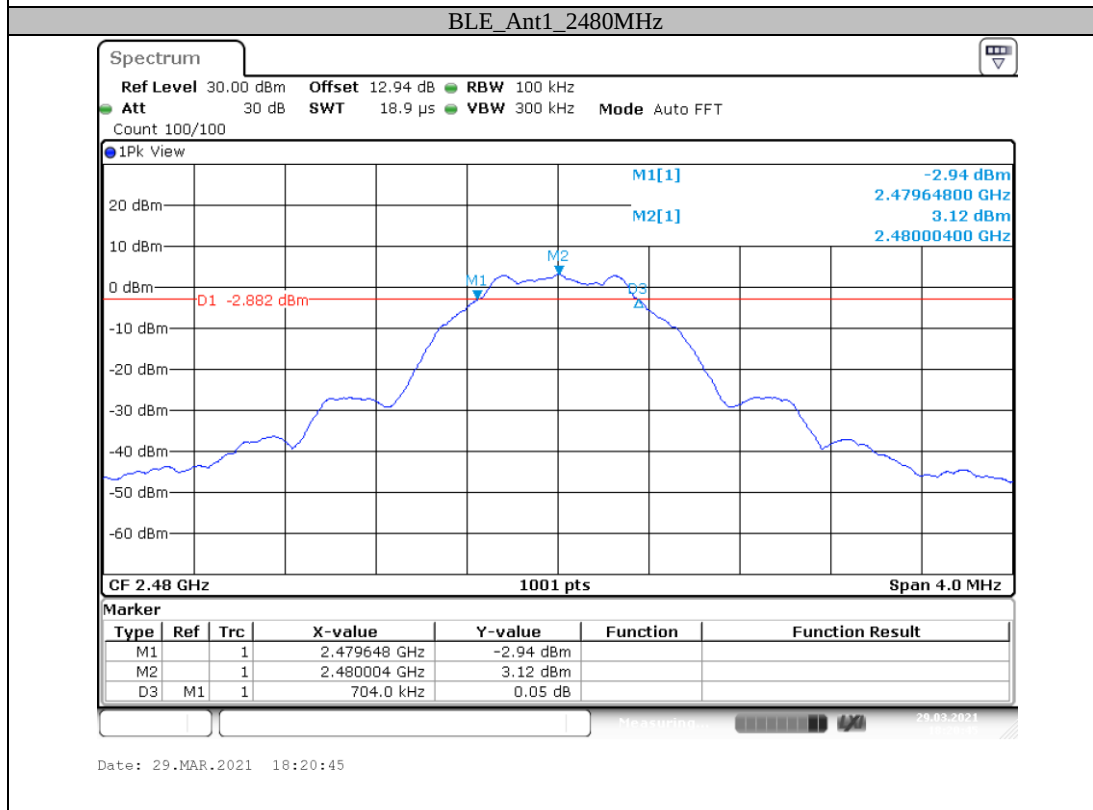
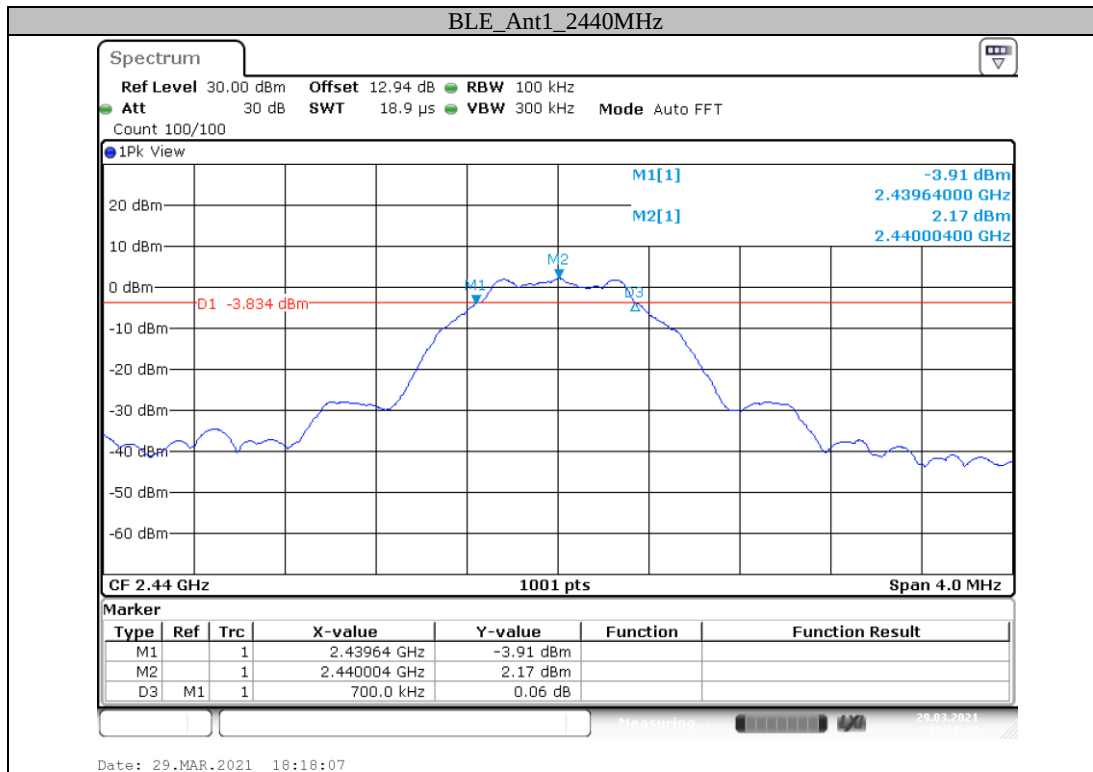
Appendix A: 6dB Emission Bandwidth

Test Result

Test Mode	Antenna	Channel [MHz]	DTS BW [MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.704	0.5	PASS
		2440	0.700	0.5	PASS
		2480	0.704	0.5	PASS

Test Graphs



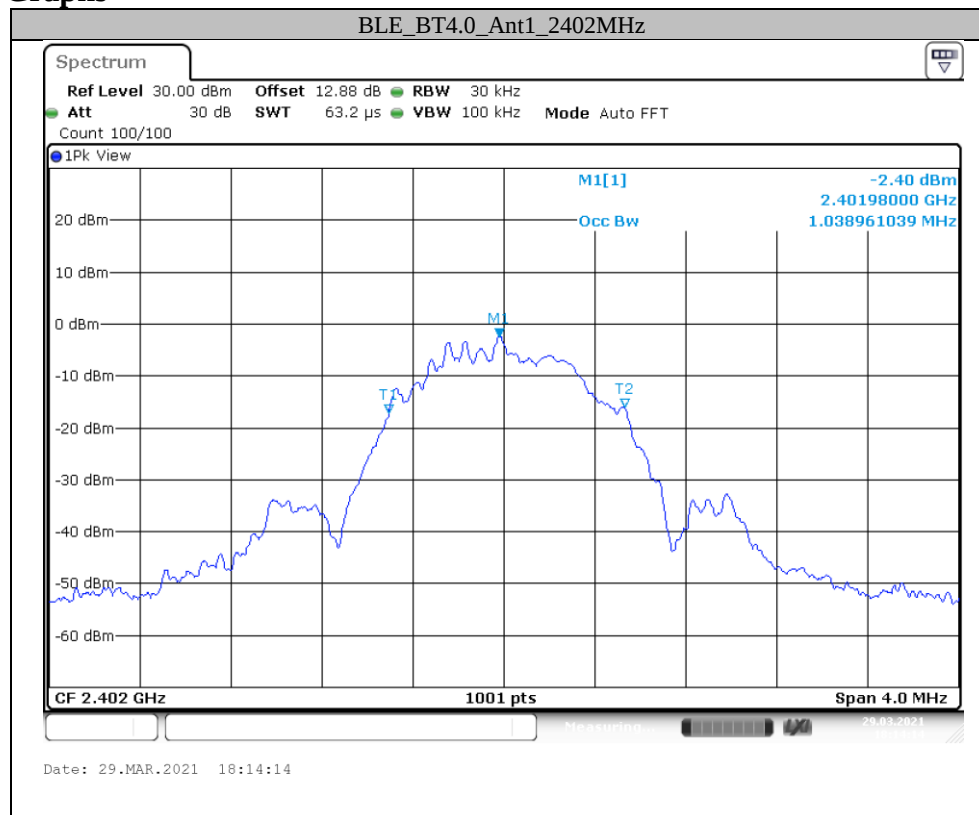


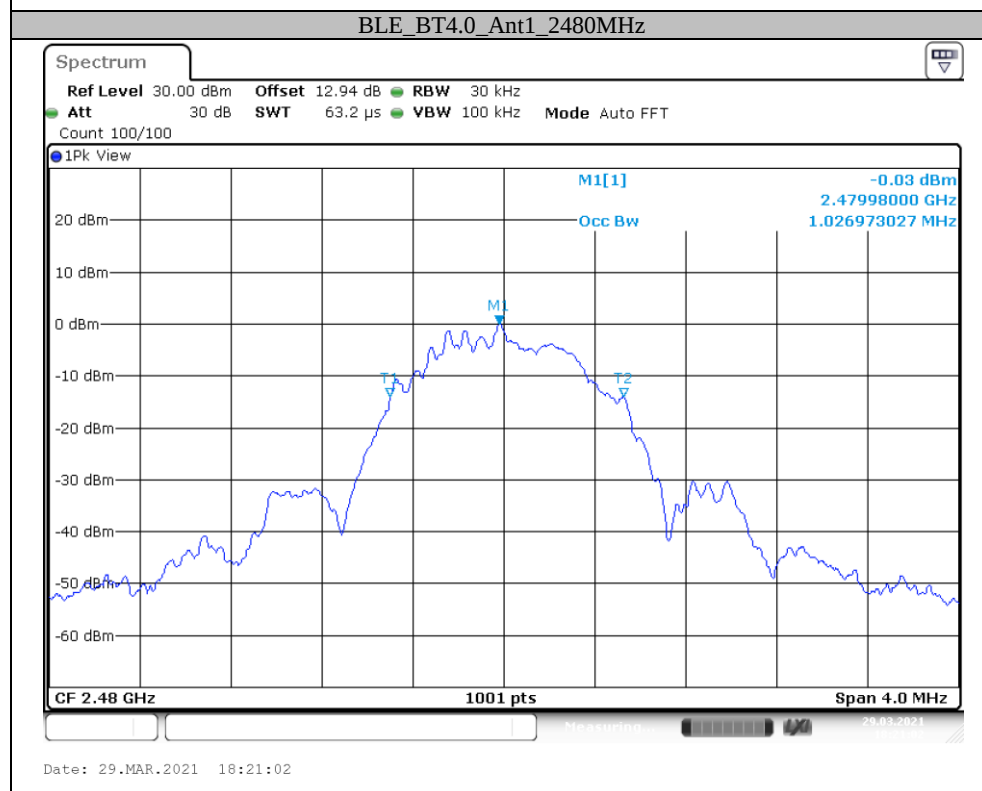
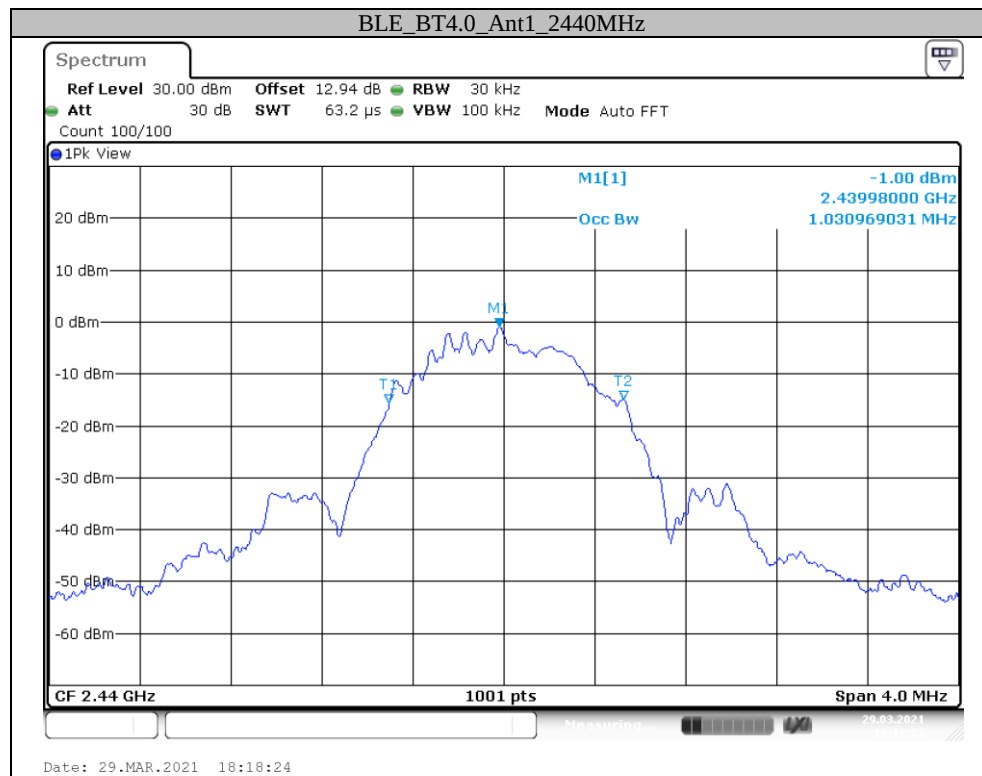
Appendix B: Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Channel [MHz]	OCB [MHz]	Limit[dBm]	Verdict
BLE_BT4.0	Ant1	2402	1.039	---	PASS
		2440	1.031	---	PASS
		2480	1.027	---	PASS

Test Graphs



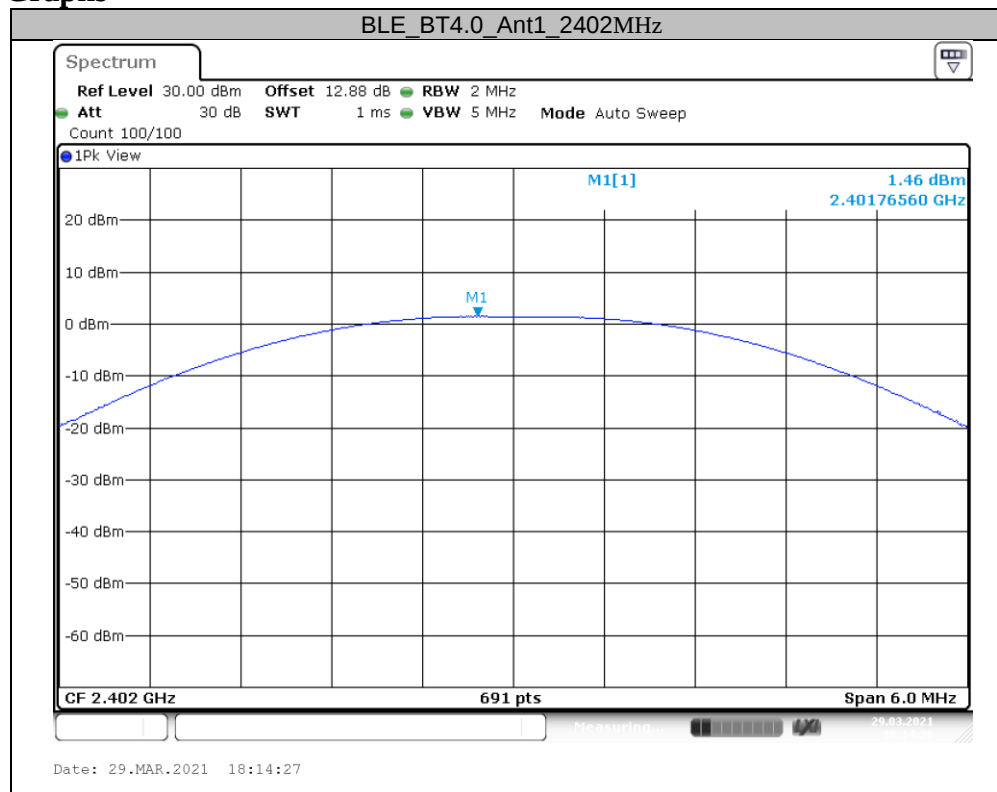


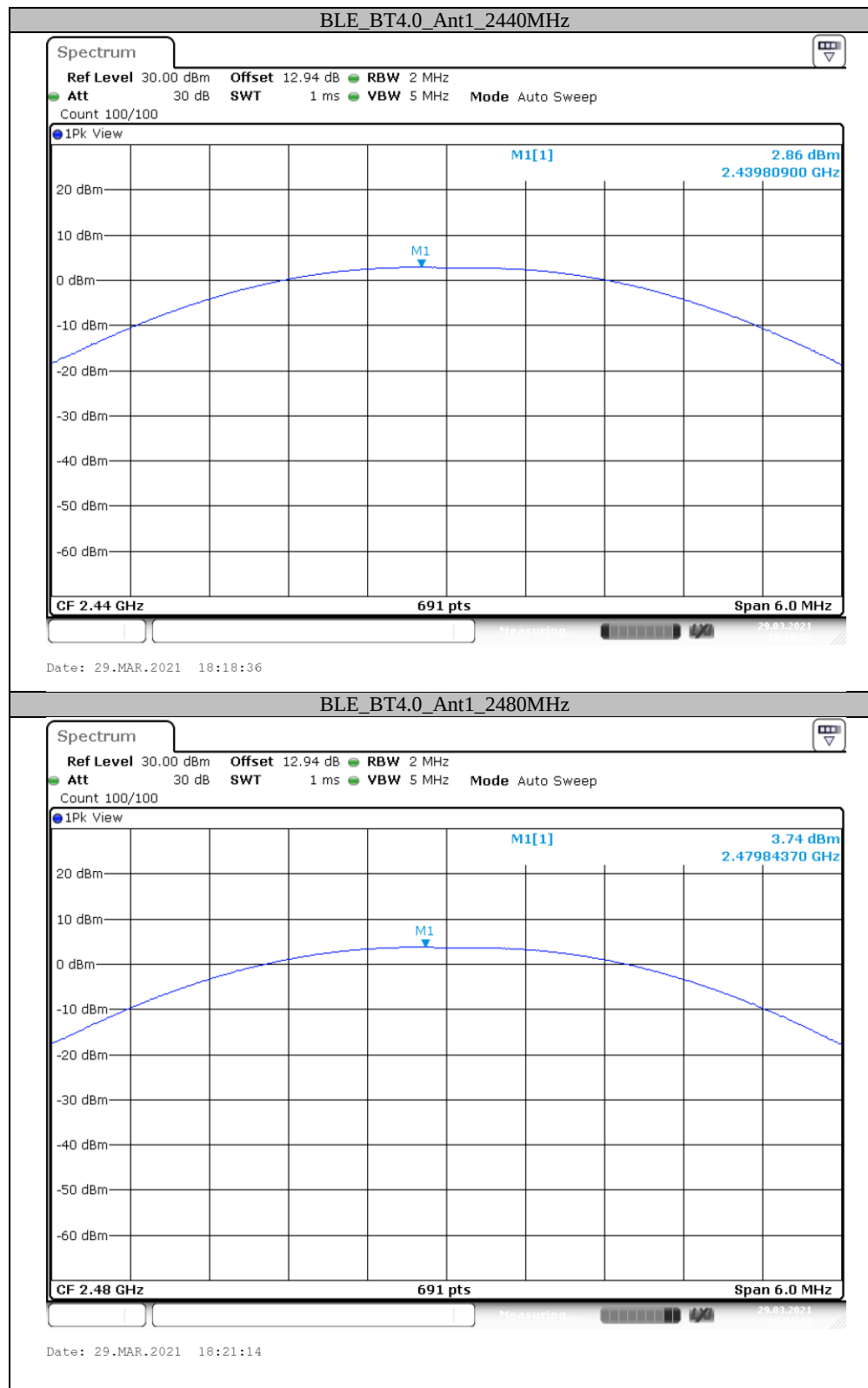
Appendix C: Maximum conducted output power

Test Result

Test Mode	Antenna	Channel [MHz]	Result[dBm]	Limit[dBm]	Verdict
BLE_BT4.0	Ant1	2402	1.46	<=30	PASS
		2440	2.86	<=30	PASS
		2480	3.74	<=30	PASS

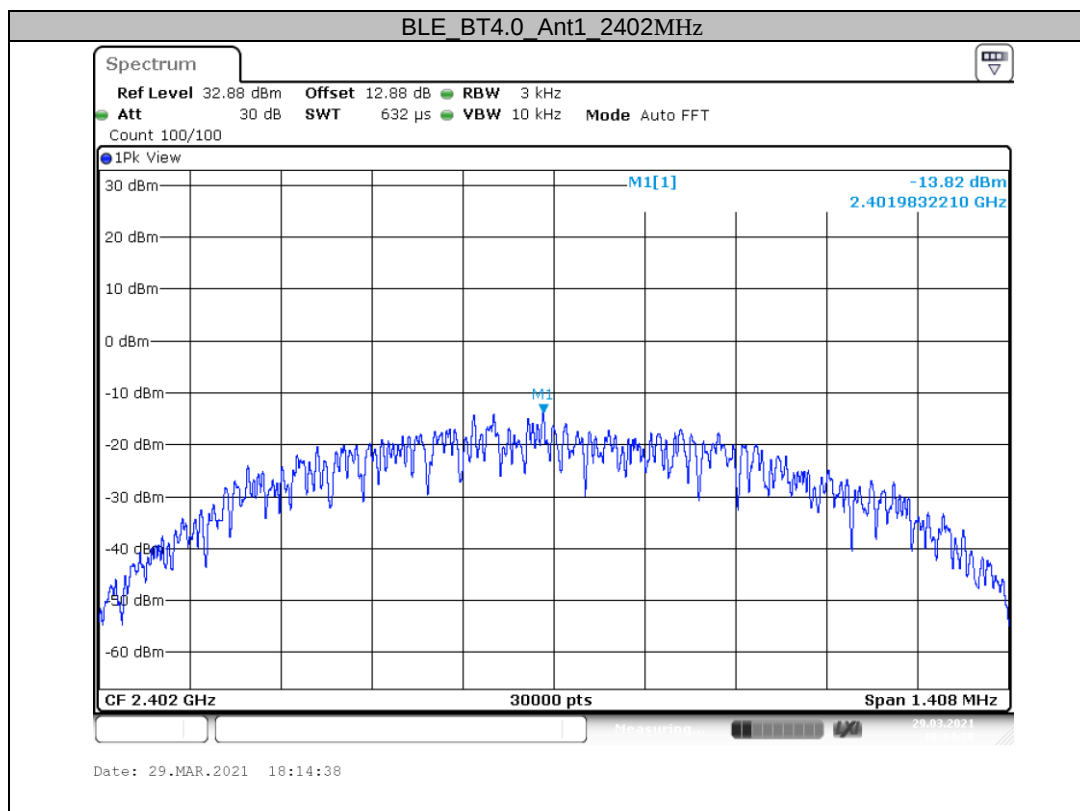
Test Graphs

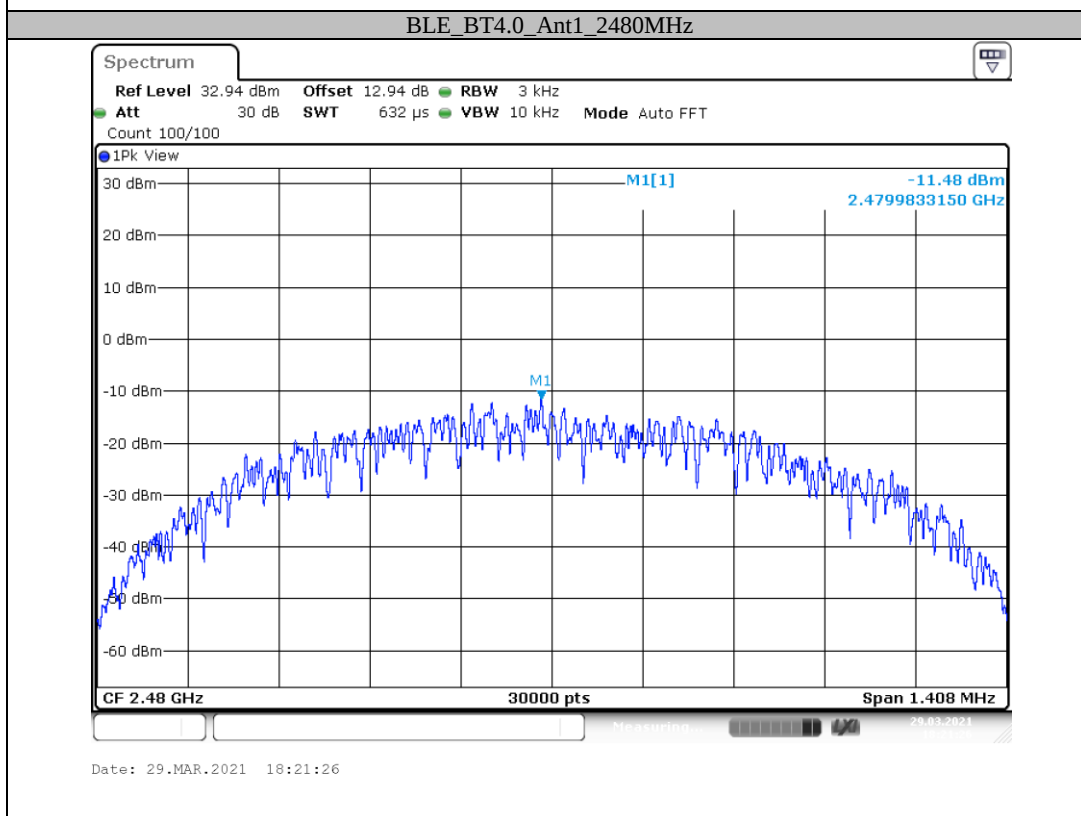
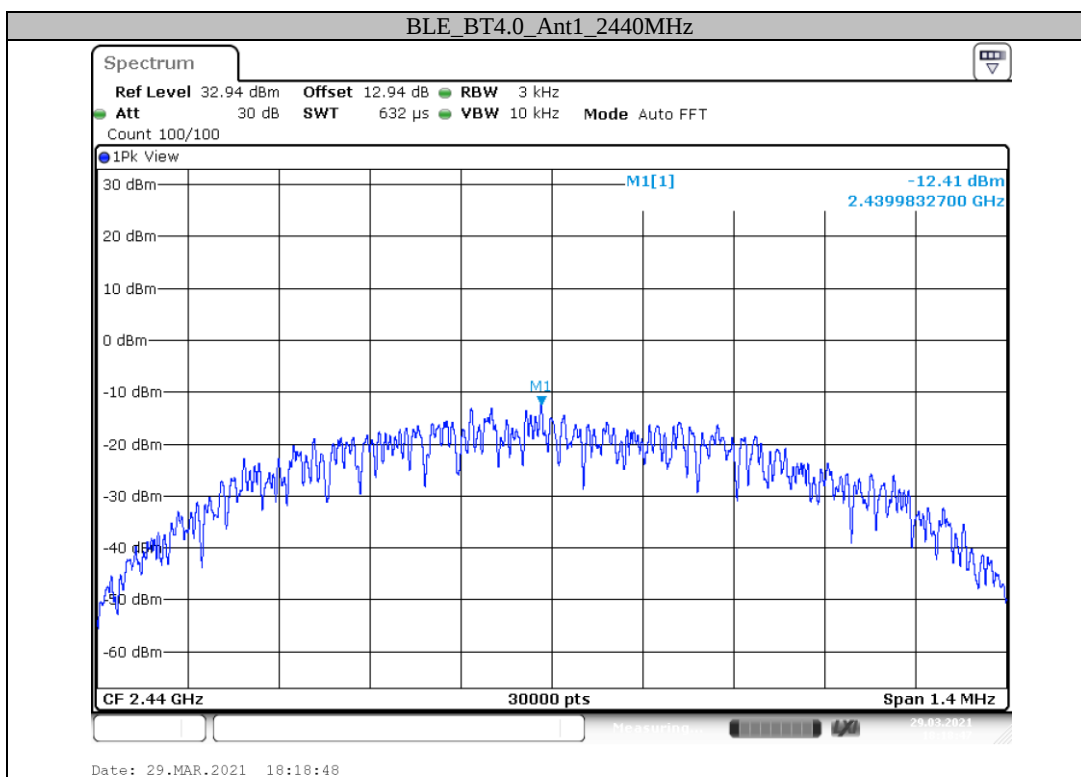




Appendix D: Power spectral density**Test Result**

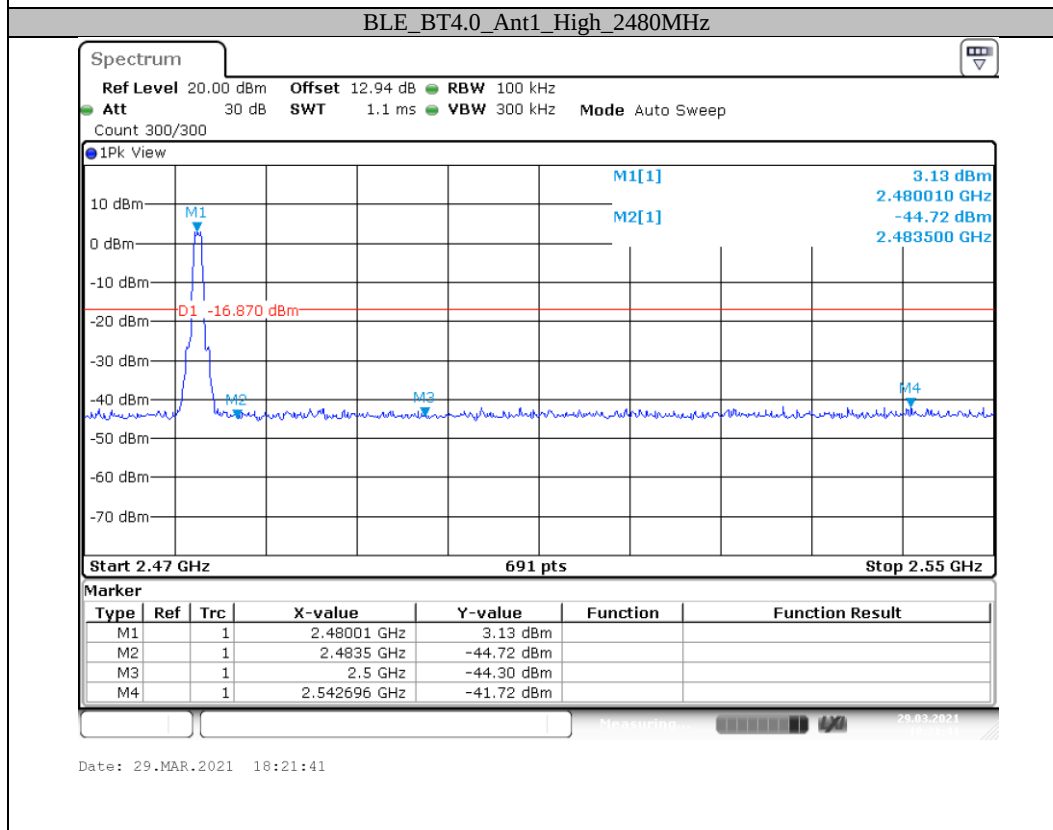
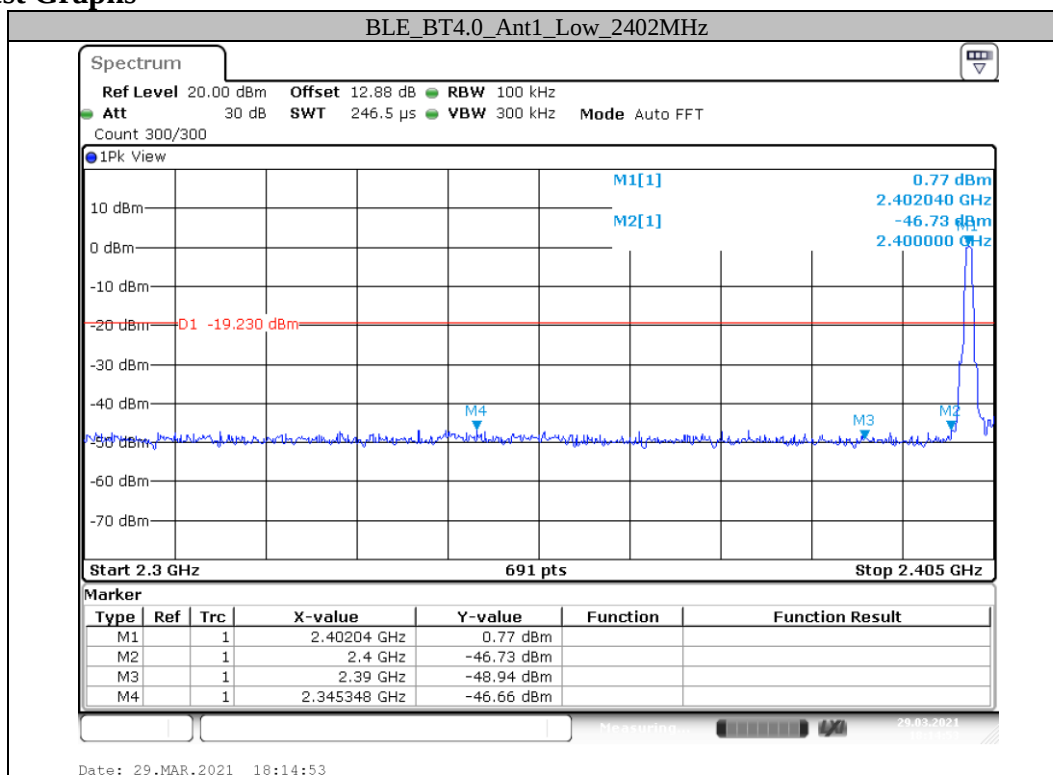
Test Mode	Antenna	Channel[MHz]	Result[dBm/3-10kHz]	Limit[dBm/3kHz]	Verdict
BLE_BT4.0	Ant1	2402	-13.82	<=8	PASS
		2440	-12.41	<=8	PASS
		2480	-11.48	<=8	PASS

Test Graphs



Appendix E: Band edge measurements

Test Graphs

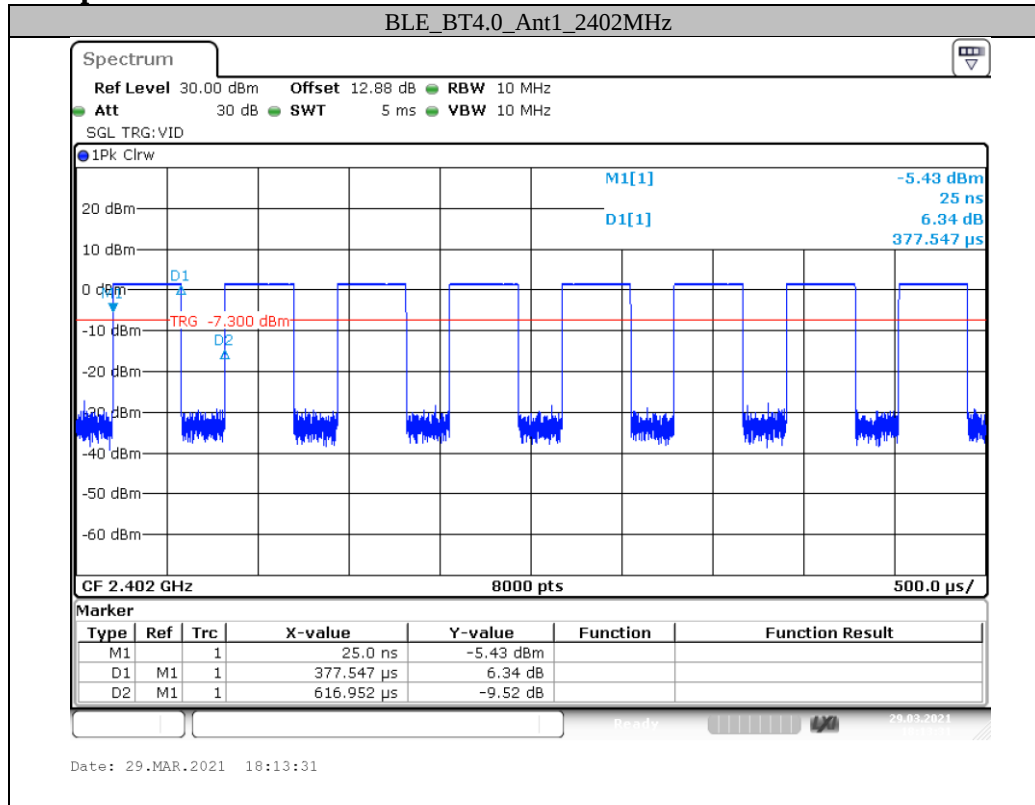


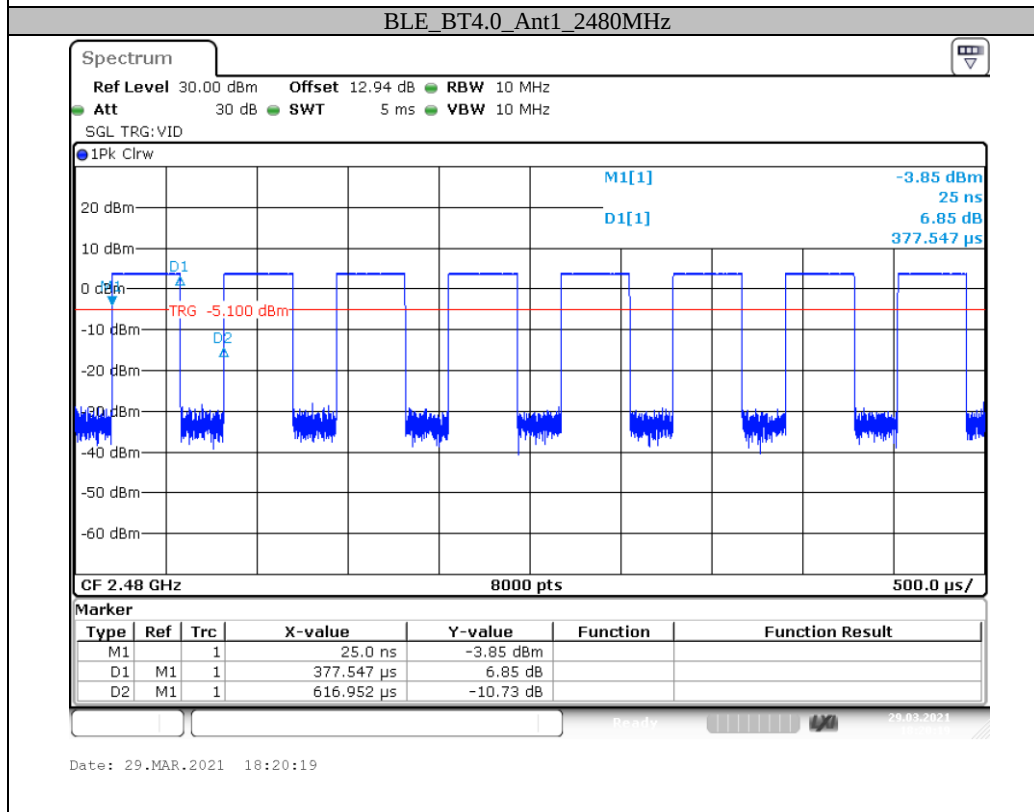
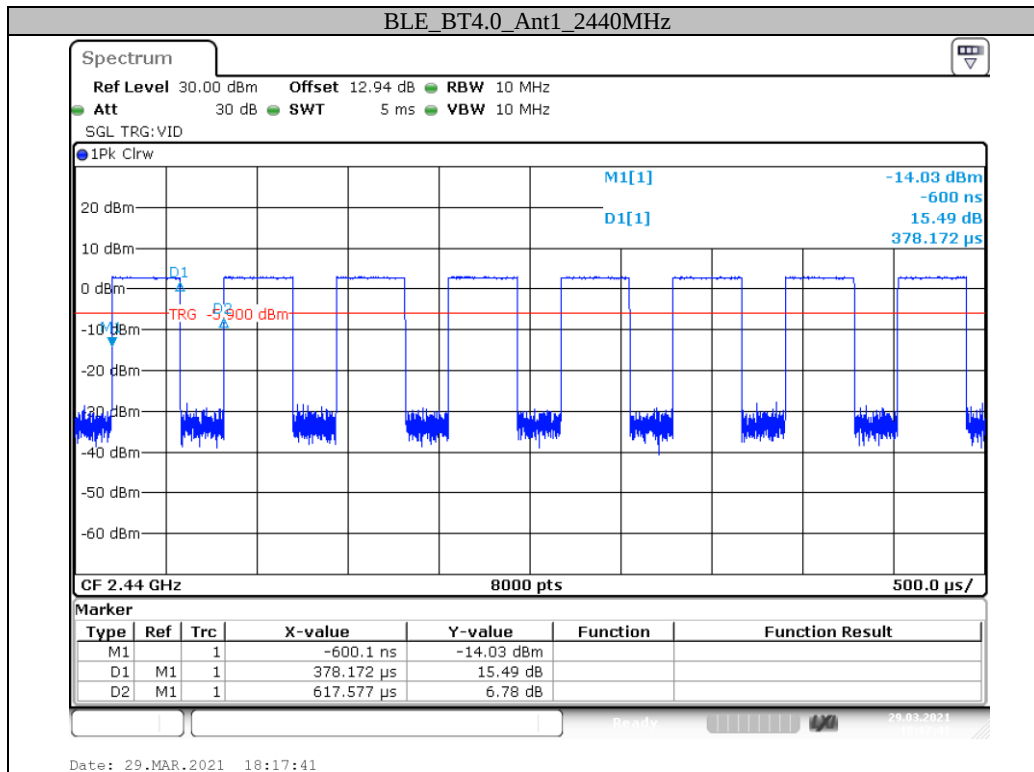
Appendix F: Duty Cycle

Test Result

Test Mode	Antenna	Channel [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
BLE_BT4.0	Ant1	2402	0.38	0.62	61.20
		2440	0.38	0.62	61.23
		2480	0.38	0.62	61.20

Test Graphs





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