



FCC PART 15.247

TEST REPORT

For

Xiamen Goofoo Technology Co., Ltd.

No.88-3, North Tongji Road Xike County, Tong'an District, Xiamen, China

FCC ID: 2A24L-CUBE

Report Type: Original Report	Product Type: 3D Printer
Report Number: XMTN1211013-52461E-RF	
Report Date: 2021-10-21	
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GENERAL INFORMATION**Product Description for Equipment under Test (EUT)**

Product	3D Printer
Tested Model	Cube
Frequency Range	Wi-Fi: 2412-2462MHz
Maximum Conducted Peak Output Power	Wi-Fi: 802.11b: 10.80dBm, 802.11g: 16.84dBm, 802.11n-HT20: 17.88dBm
Modulation Technique	Wi-Fi: DSSS, OFDM
Antenna Specification*	Internal Antenna: 3.0dBi(provided by the applicant)
Voltage Range	DC 24V from adapter
Date of Test	2021-10-19 to 2021-10-20
Sample serial number	XMTN1211013-52461E-RF-S1 (Assigned by ATC)
Received date	2021-10-13
Sample/EUT Status	Good condition
Adapter information	Model: BYX3-2402000U Input: AC 100-240V, 50/60Hz, 1.0A Max Output: DC 24V, 2A

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
AC Power Lines Conducted Emissions		2.72dB
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, 802.11g and 802.11n-HT20 mode, total 11 channels are provided to testing:

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

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

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

“ESP_RF_Test”*Software was used to test and power level as below:

Item	Mode	Data Rate (Mbps)	Power Level*
2.4G Wi-Fi	802.11 b	1	40
	802.11 g	6	8
	802.11 n20	MCS0	8

Duty cycle

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

Support Equipment List and Details

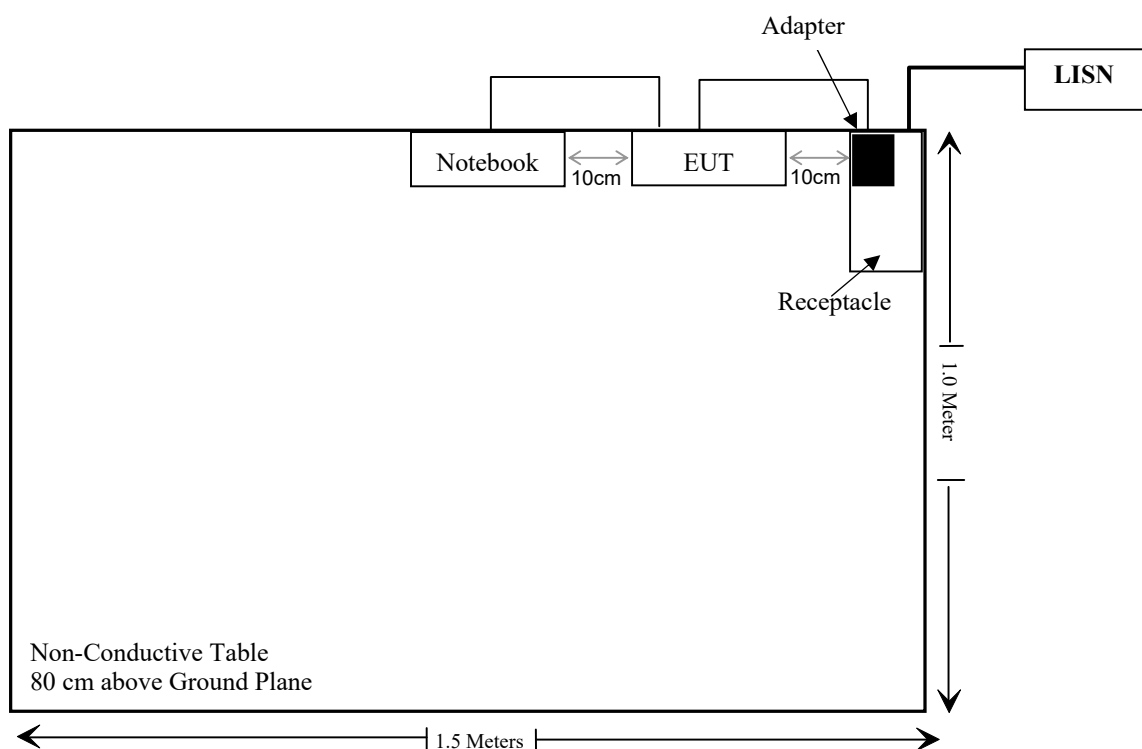
Manufacturer	Description	Model	Serial Number
LENOVO	Notebook	ThinkpadX240	PB-01UAM3 14/05

External I/O Cable

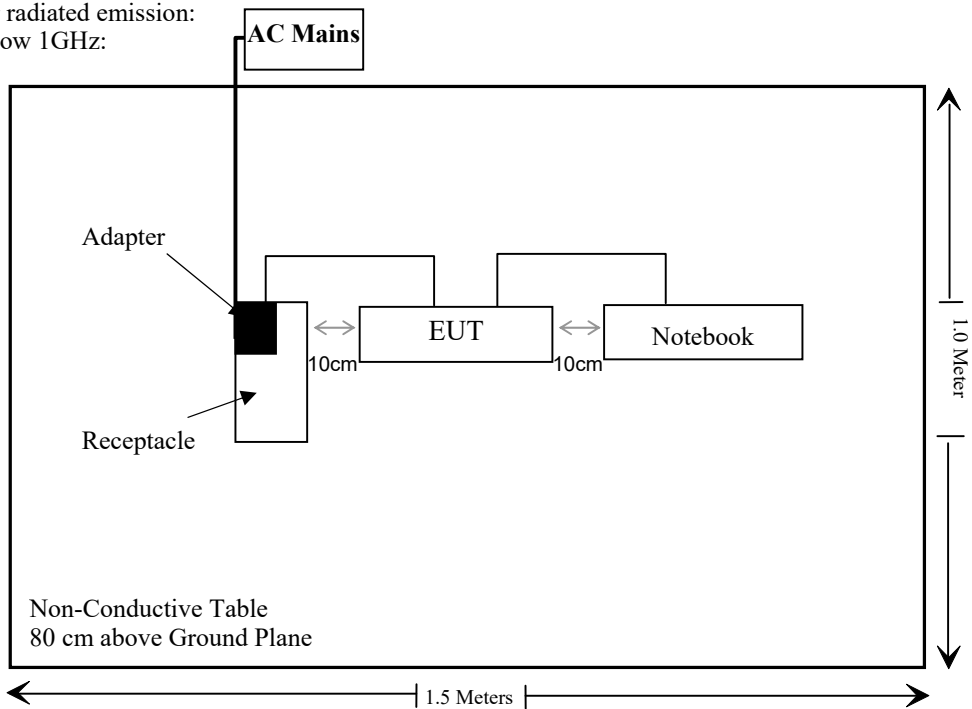
Cable Description	Length (m)	From Port	To
Unshielded Detachable DC Power Cable	1.5	Adapter	EUT
Unshielded Detachable USB Cable	0.8	Notebook	EUT

Block Diagram of Test Setup

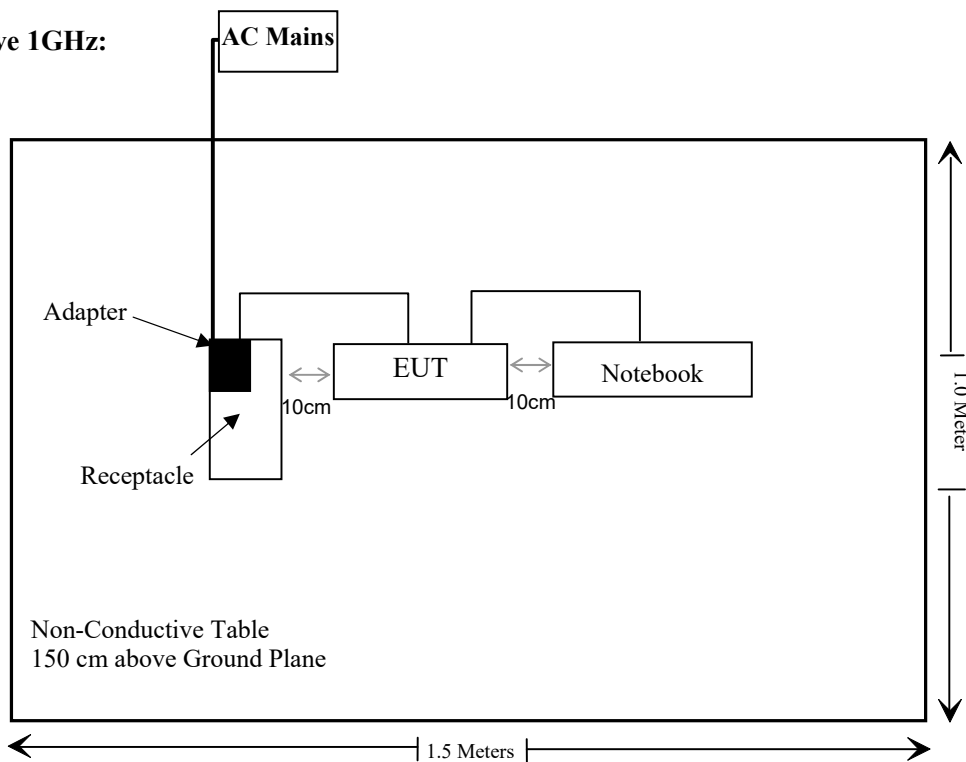
For conducted emission:



For radiated emission:
Below 1GHz:



Above 1GHz:



SUMMARY OF TEST RESULTS

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

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde& Schwarz	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
Conducted Emission Test Software: ES-K1 V1.71					
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	2021/07/08	2022/07/07
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Quinstar	Amplifier	QLW-1840553 6-J0	15964001002	2020/11/28	2021/11/27
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
Radiated Emission Test Software: EZ_EMC V 1.1.4.2					
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).

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

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

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm²)	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)

Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm²)	MPE Limit (mW/cm²)
	(dBi)	(numeric)	(dBm)	(mW)			
2412-2462	3.0	2.0	18.00	63.10	20	0.025	1

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 3.0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

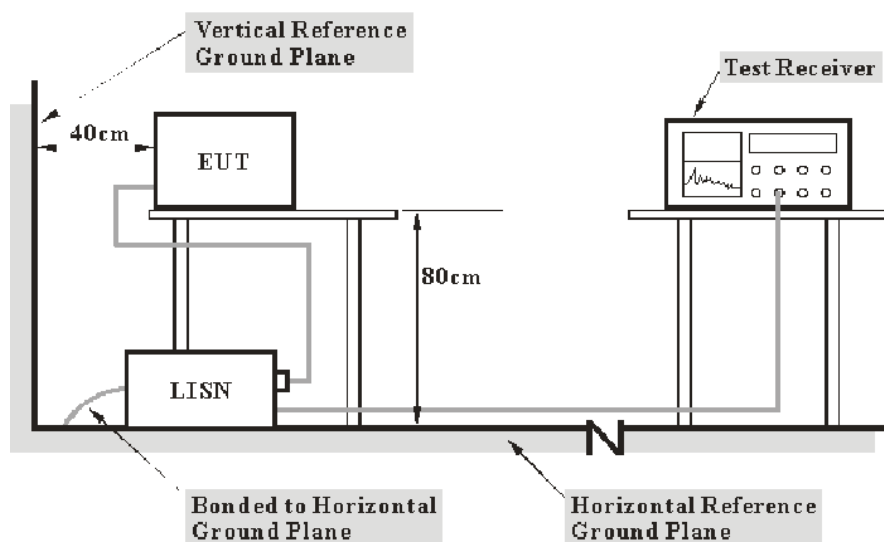
Result: Compliance.

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**

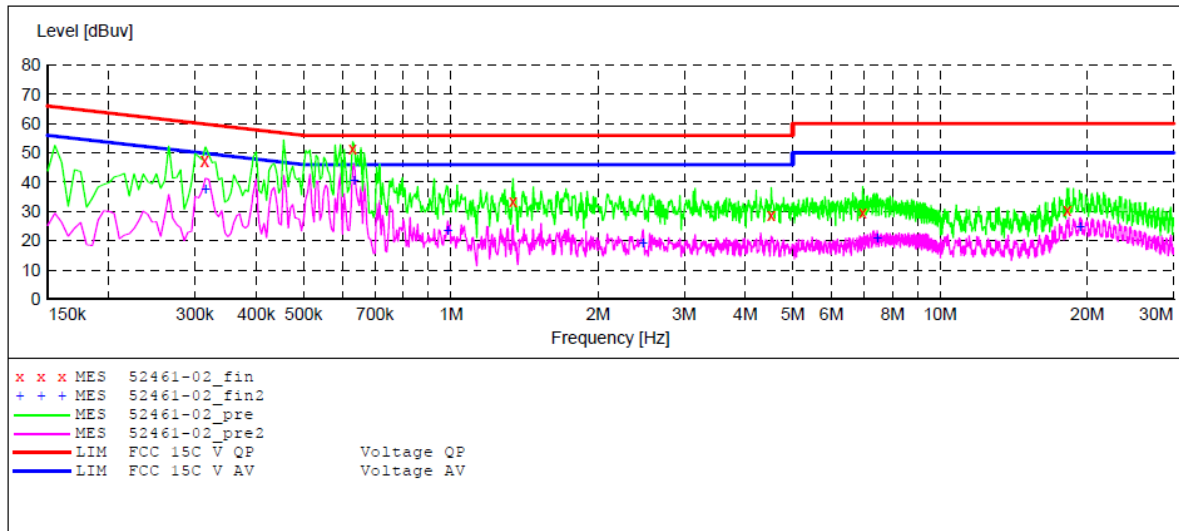
Temperature:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2021-10-20.

EUT operation mode: Transmitting

Wi-Fi: (Worst case is 802.11B mode, low Channel)

AC 120V/60 Hz, Line



MEASUREMENT RESULT: "52461-02_fin"

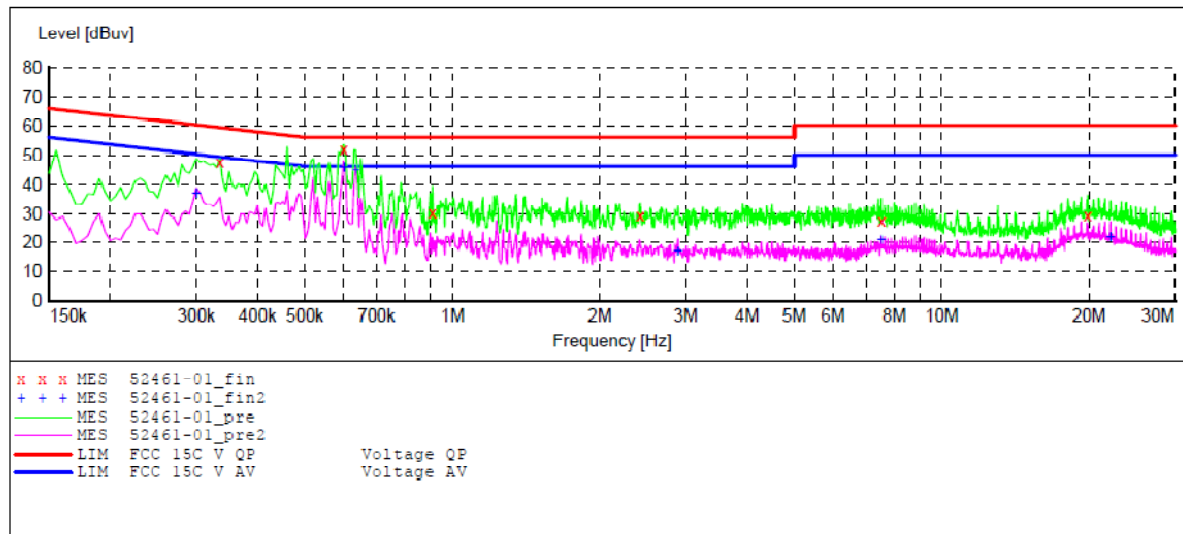
2021-10-20 14:13

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.315000	47.30	10.9	60	12.7	QP	L1	GND
0.630000	51.50	11.0	56	4.5	QP	L1	GND
1.340000	33.60	11.2	56	22.4	QP	L1	GND
4.520000	28.80	11.4	56	27.2	QP	L1	GND
6.950000	29.70	11.5	60	30.3	QP	L1	GND
18.200000	30.40	11.7	60	29.6	QP	L1	GND

MEASUREMENT RESULT: "52461-02_fin2"

2021-10-20 14:13

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.315000	37.70	10.9	50	12.3	AV	L1	GND
0.635000	40.80	11.0	46	5.2	AV	L1	GND
0.985000	23.80	11.1	46	22.2	AV	L1	GND
2.470000	19.10	11.3	46	26.9	AV	L1	GND
7.440000	20.90	11.5	50	29.1	AV	L1	GND
19.375000	24.80	11.7	50	25.2	AV	L1	GND

AC 120V/60 Hz, Neutral**MEASUREMENT RESULT: "52461-01_fin"**

2021-10-20 14:11

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.335000	47.20	10.9	59	11.8	QP	N	GND
0.600000	52.10	11.0	56	3.9	QP	N	GND
0.910000	30.30	11.1	56	25.7	QP	N	GND
2.420000	29.50	11.3	56	26.5	QP	N	GND
7.530000	27.40	11.5	60	32.6	QP	N	GND
19.875000	29.10	11.7	60	30.9	QP	N	GND

MEASUREMENT RESULT: "52461-01_fin2"

2021-10-20 14:11

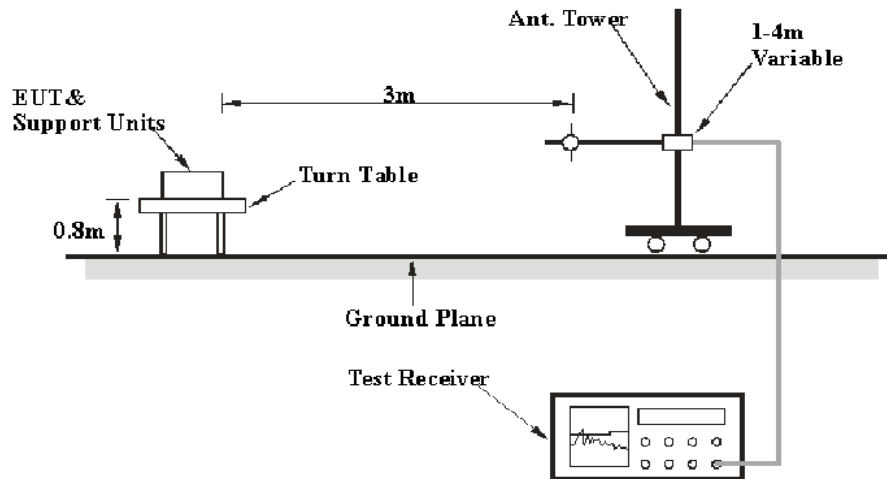
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.300000	37.00	10.9	50	13.0	AV	N	GND
0.600000	45.90	11.0	46	0.1	AV	N	GND
0.630000	44.90	11.2	46	1.1	AV	N	GND
2.890000	17.10	11.3	46	28.9	AV	N	GND
8.830000	18.60	11.5	50	31.4	AV	N	GND
22.100000	22.10	11.7	50	27.9	AV	N	GND

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

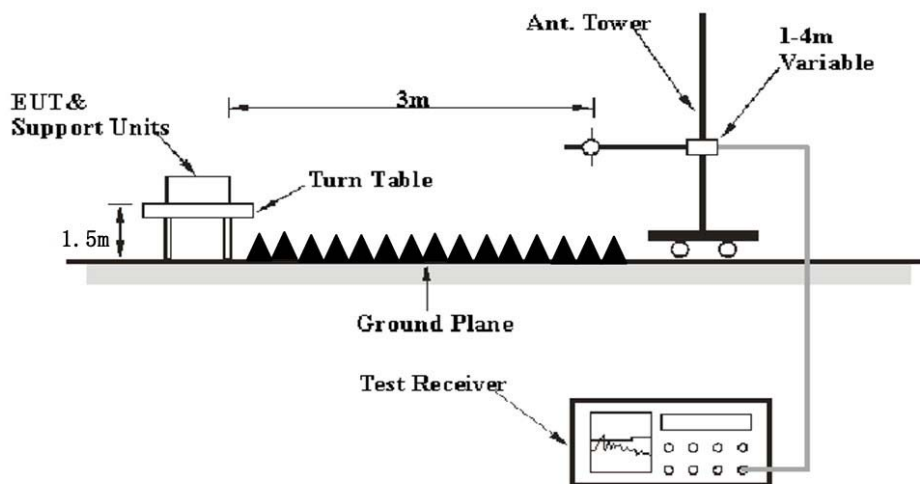
FCC §15.247 (d); §15.209; §15.205;

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 Corrected Amplitude 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:

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

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:

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

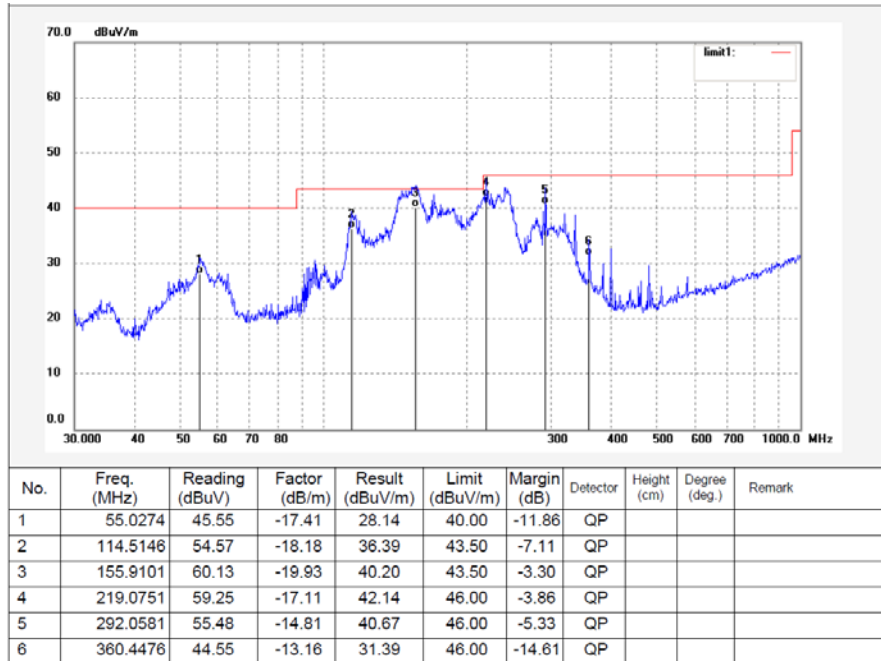
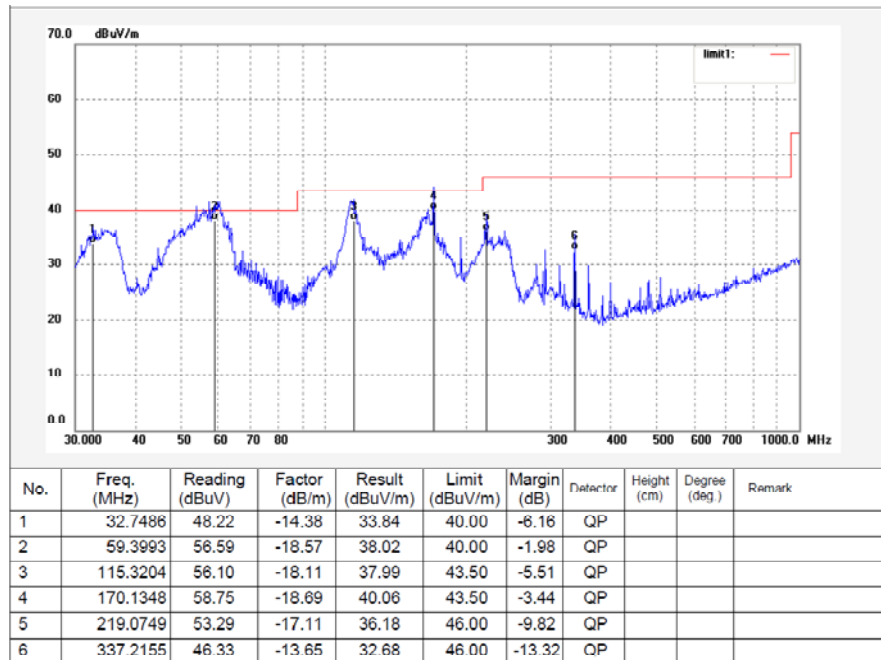
Test Data

Environmental Conditions

Temperature:	18-19 °C
Relative Humidity:	44 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2021-10-20 for below 1GHz and 2021-10-19 for above 1GHz.

EUT operation mode: Transmitting

30MHz-1GHz: (Worst case is 802.11B mode, low Channel)**Horizontal****Vertical**

1-25 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/AV		Height (m)	Polar (H/V)				
802.11B, Low Channel									
2310	51.61	PK	344	1.8	H	-6.84	44.77	74	-29.23
2310	50.97	PK	307	1.8	V	-6.84	44.13	74	-29.87
2390	55.69	PK	0	1.4	H	-6.44	49.25	74	-24.75
2390	57.22	PK	236	1.4	V	-6.44	50.78	74	-23.22
4824	54.58	PK	62	1.6	H	2.87	57.45	74	-16.55
4824	50.61	AV	62	1.6	H	2.87	53.48	54	-0.52
4824	53.45	PK	341	2.2	V	2.87	56.32	74	-17.68
4824	50.22	AV	341	2.2	V	2.87	53.09	54	-0.91
802.11B, Middle Channel									
4874	58.22	PK	36	1.1	H	3.01	61.23	74	-12.77
4874	50.2	AV	36	1.1	H	3.01	53.21	54	-0.79
4874	57.63	PK	317	1.9	V	3.01	60.64	74	-13.36
4874	49.66	AV	317	1.9	V	3.01	52.67	54	-1.33
802.11B, High Channel									
2483.5	51.98	PK	82	1.1	H	-5.96	46.02	74	-27.98
2483.5	52.14	PK	83	1.2	V	-5.96	46.18	74	-27.82
2500	53.2	PK	217	2.4	H	-5.88	47.32	74	-26.68
2500	52.57	PK	36	1.1	V	-5.88	46.69	74	-27.31
4924	57.29	PK	217	2.4	H	3.17	60.46	74	-13.54
4924	49.93	AV	217	2.4	H	3.17	53.1	54	-0.9
4924	54.26	PK	36	1.1	V	3.17	57.43	74	-16.57
4924	48.04	AV	36	1.1	V	3.17	51.21	54	-2.79
802.11G, Low Channel									
2310	59.22	PK	13	2.1	H	-6.84	52.38	74	-21.62
2310	59.51	PK	154	1.4	V	-6.84	52.67	74	-21.33
2390	73.93	PK	324	2.2	H	-6.44	67.49	74	-6.51
2390	55.94	AV	324	2.2	H	-6.44	49.5	54	-4.5
2390	74.13	PK	80	1.7	V	-6.44	67.69	74	-6.31
2390	56.31	AV	80	1.7	V	-6.44	49.87	54	-4.13
4824	59.52	PK	252	2.3	H	2.87	62.39	74	-11.61
4824	48.05	AV	252	2.3	H	2.87	50.92	54	-3.08
4824	57.34	PK	68	2.2	V	2.87	60.21	74	-13.79
4824	46.75	AV	68	2.2	V	2.87	49.62	54	-4.38
7236	56.63	PK	158	1.8	H	7.71	64.34	74	-9.66
7236	42.52	AV	158	1.8	H	7.71	50.23	54	-3.77
7236	56.24	PK	213	2.2	V	7.71	63.95	74	-10.05
7236	41.36	AV	213	2.2	V	7.71	49.07	54	-4.93
802.11G, Middle Channel									
4874	58.4	PK	213	2.2	H	3.01	61.41	74	-12.59
4874	47.08	AV	213	2.2	H	3.01	50.09	54	-3.91
4874	56.42	PK	165	2.1	V	3.01	59.43	74	-14.57
4874	46.43	AV	165	2.1	V	3.01	49.44	54	-4.56
7311	55.46	PK	343	2.4	H	8.23	63.69	74	-10.31
7311	41.83	AV	343	2.4	H	8.23	50.06	54	-3.94
7311	55.15	PK	180	2.2	V	8.23	63.38	74	-10.62

7311	39.91	AV	180	2.2	V	8.23	48.14	54	-5.86
802.11G, High Channel									
2483.5	75.13	PK	113	1.9	H	-5.96	69.17	74	-4.83
2483.5	55.67	AV	113	1.9	H	-5.96	49.71	54	-4.29
2483.5	70.76	PK	297	1.7	V	-5.96	64.8	74	-9.2
2483.5	51.52	AV	297	1.7	V	-5.96	45.56	54	-8.44
2500	59.82	PK	29	1	H	-5.88	53.94	74	-20.06
2500	58.42	PK	206	1.2	V	-5.88	52.54	74	-21.46
4924	58.26	PK	7	2.2	H	3.17	61.43	74	-12.57
4924	46.84	AV	7	2.2	H	3.17	50.01	54	-3.99
4924	56.56	PK	317	2.3	V	3.17	59.73	74	-14.27
4924	46.34	AV	317	2.3	V	3.17	49.51	54	-4.49
7386	54.75	PK	265	1.3	H	8.75	63.5	74	-10.5
7386	41.03	AV	265	1.3	H	8.75	49.78	54	-4.22
7386	54.84	PK	68	2.5	V	8.75	63.59	74	-10.41
7386	40.11	AV	68	2.5	V	8.75	48.86	54	-5.14
802.11N20, Low Channel									
2310	60.04	PK	327	1.1	H	-6.84	53.2	74	-20.8
2310	59.38	PK	100	2.3	V	-6.84	52.54	74	-21.46
2390	74.92	PK	129	2.3	H	-6.44	68.48	74	-5.52
2390	57.12	AV	129	2.3	H	-6.44	50.68	54	-3.32
2390	75.49	PK	17	1.5	V	-6.44	69.05	74	-4.95
2390	56.83	AV	17	1.5	V	-6.44	50.39	54	-3.61
4824	60.45	PK	109	1.8	H	2.87	63.32	74	-10.68
4824	47.85	AV	109	1.8	H	2.87	50.72	54	-3.28
4824	58.67	PK	8	2.4	V	2.87	61.54	74	-12.46
4824	47.62	AV	8	2.4	V	2.87	50.49	54	-3.51
7236	55.13	PK	75	2.4	H	7.71	62.84	74	-11.16
7236	41.08	AV	75	2.4	H	7.71	48.79	54	-5.21
7236	54.75	PK	129	1.7	V	7.71	62.46	74	-11.54
7236	41.25	AV	129	1.7	V	7.71	48.96	54	-5.04
802.11N20, Middle Channel									
4874	60.05	PK	129	1.7	H	3.01	63.06	74	-10.94
4874	46.95	AV	129	1.7	H	3.01	49.96	54	-4.04
4874	58.04	PK	285	1.1	V	3.01	61.05	74	-12.95
4874	47.15	AV	285	1.1	V	3.01	50.16	54	-3.84
7311	54.07	PK	59	1.2	H	8.23	62.3	74	-11.7
7311	40.26	AV	59	1.2	H	8.23	48.49	54	-5.51
7311	53.29	PK	273	1.2	V	8.23	61.52	74	-12.48
7311	40.36	AV	273	1.2	V	8.23	48.59	54	-5.41
802.11N20, High Channel									
2483.5	78.11	PK	244	1.4	H	-5.96	72.15	74	-1.85
2483.5	57.63	AV	244	1.4	H	-5.96	51.67	54	-2.33
2483.5	73.34	PK	196	1.2	V	-5.96	67.38	74	-6.62
2483.5	53.46	AV	196	1.2	V	-5.96	47.5	54	-6.5
2500	62.9	PK	166	1	H	-5.88	57.02	74	-16.98
2500	42.83	AV	166	1	H	-5.88	36.95	54	-17.05
2500	59.86	PK	116	1.7	V	-5.88	53.98	74	-20.02
4924	59.47	PK	137	1.5	H	3.17	62.64	74	-11.36
4924	47.3	AV	137	1.5	H	3.17	50.47	54	-3.53
4924	57.55	PK	342	1.8	V	3.17	60.72	74	-13.28
4924	46.92	AV	342	1.8	V	3.17	50.09	54	-3.91
7386	54.02	PK	351	1.2	H	8.75	62.77	74	-11.23

7386	40.03	AV	351	1.2	H	8.75	48.78	54	-5.22
7386	52.94	PK	94	2	V	8.75	61.69	74	-12.31
7386	39.61	AV	94	2	V	8.75	48.36	54	-5.64

Note:

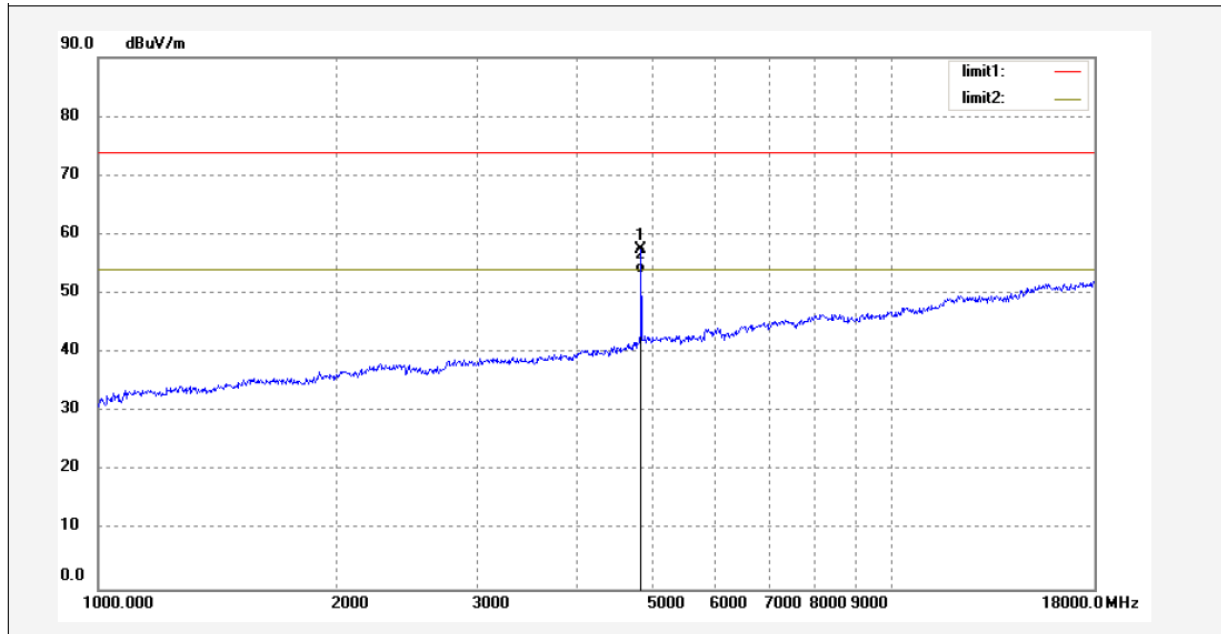
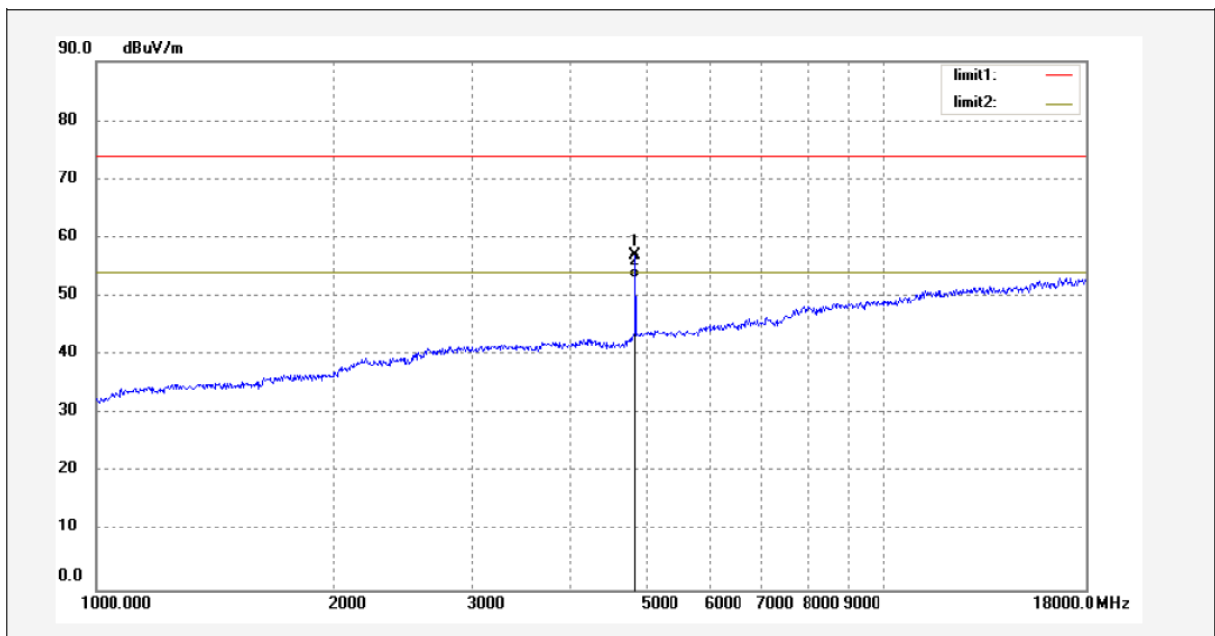
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Factor + Reading

Margin = Corrected Amplitude - Limit

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

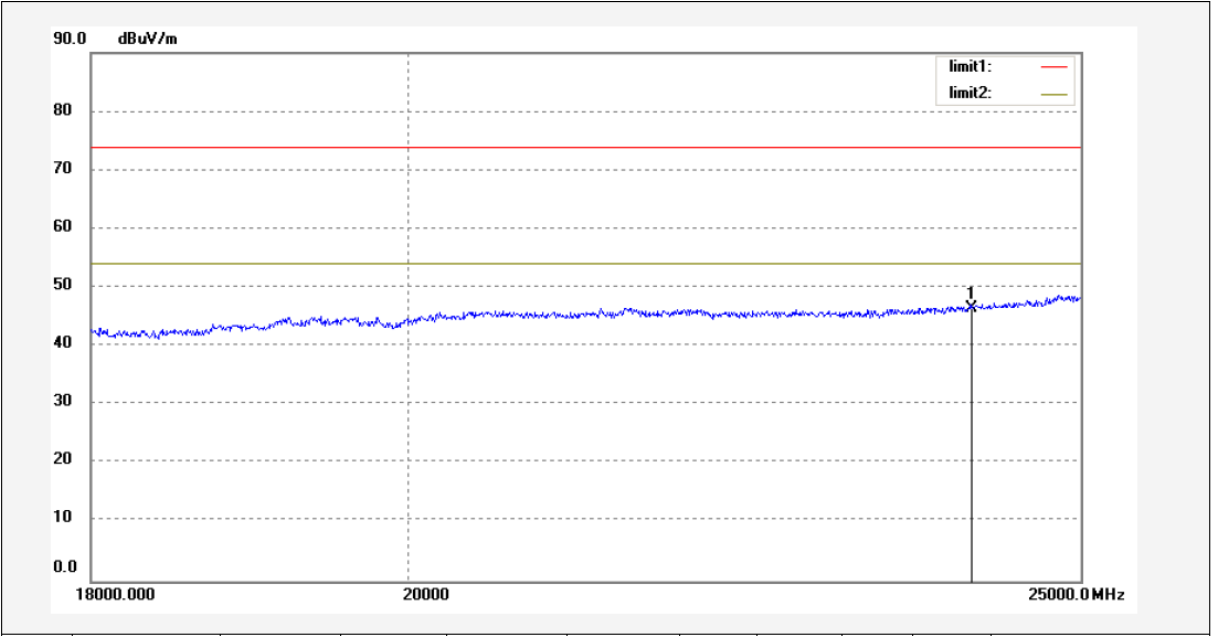
The test result of peak was less than the limit of average, so just peak values were recorded.

1 - 18 GHz:**Pre-scan Plots:****802.11 b Low Channel
Horizontal****Vertical**

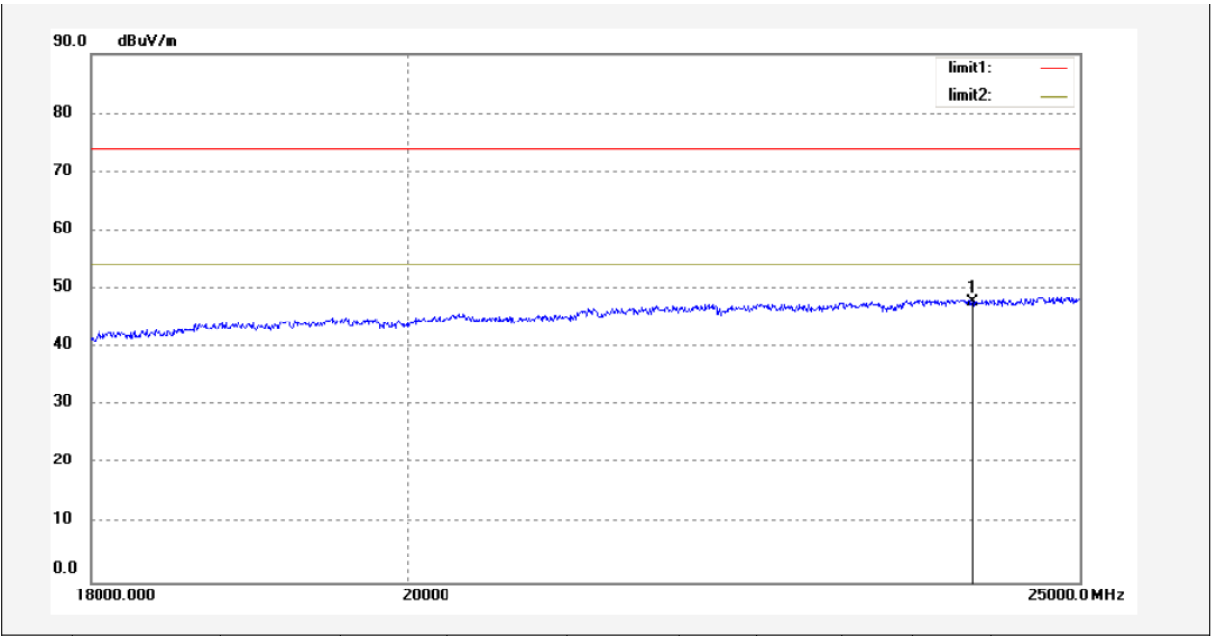
18 - 25GHz:

Pre-scan Plots:

802.11 b Low Channel
Horizontal



Vertical



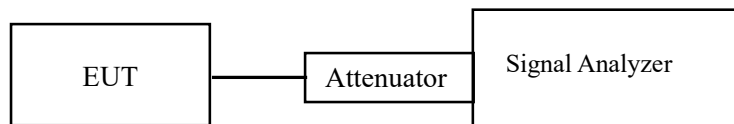
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

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 Fan Yang on 2021-10-19.

EUT operation mode: Transmitting

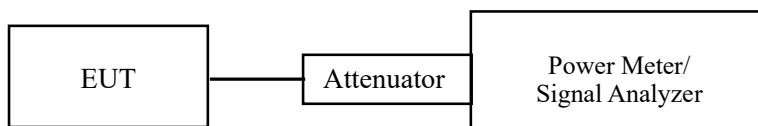
Test Result: Compliant. Please refer to the Appendix Wi-Fi.

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 Fan Yang on 2021-10-19.

EUT operation mode: Transmitting

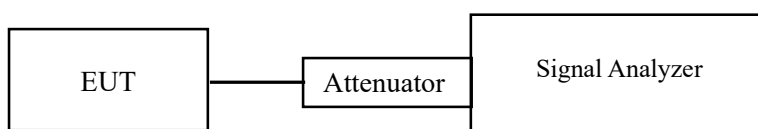
Test Result: Compliant. Please refer to the Appendix Wi-Fi.

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 2021-10-19

EUT operation mode: Transmitting

Test Result: Compliant.

Conducted Band Edge Result:

Please refer to the Appendix Wi-Fi.

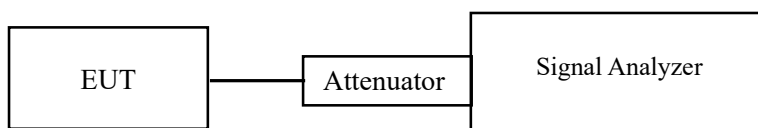
FCC §15.247(e) - POWER SPECTRAL DENSITY

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 2021-10-19.

EUT operation mode: Transmitting

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

Appendix A: 6dB Emission Bandwidth

TestMode	Antenna	Channel [MHz]	DTS BW [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	10.080	0.5	PASS
		2437	10.160	0.5	PASS
		2462	10.120	0.5	PASS
11G	Ant1	2412	15.920	0.5	PASS
		2437	15.920	0.5	PASS
		2462	15.920	0.5	PASS
11N20SISO	Ant1	2412	16.160	0.5	PASS
		2437	16.160	0.5	PASS
		2462	15.920	0.5	PASS

11B_Ant1_2412MHz

Spectrum

Ref Level 30.00 dBm Offset 12.88 dB RBW 100 kHz
 Att 30 dB SWT 94.8 μ s VBW 300 kHz Mode Auto FFT
 Count 100/100

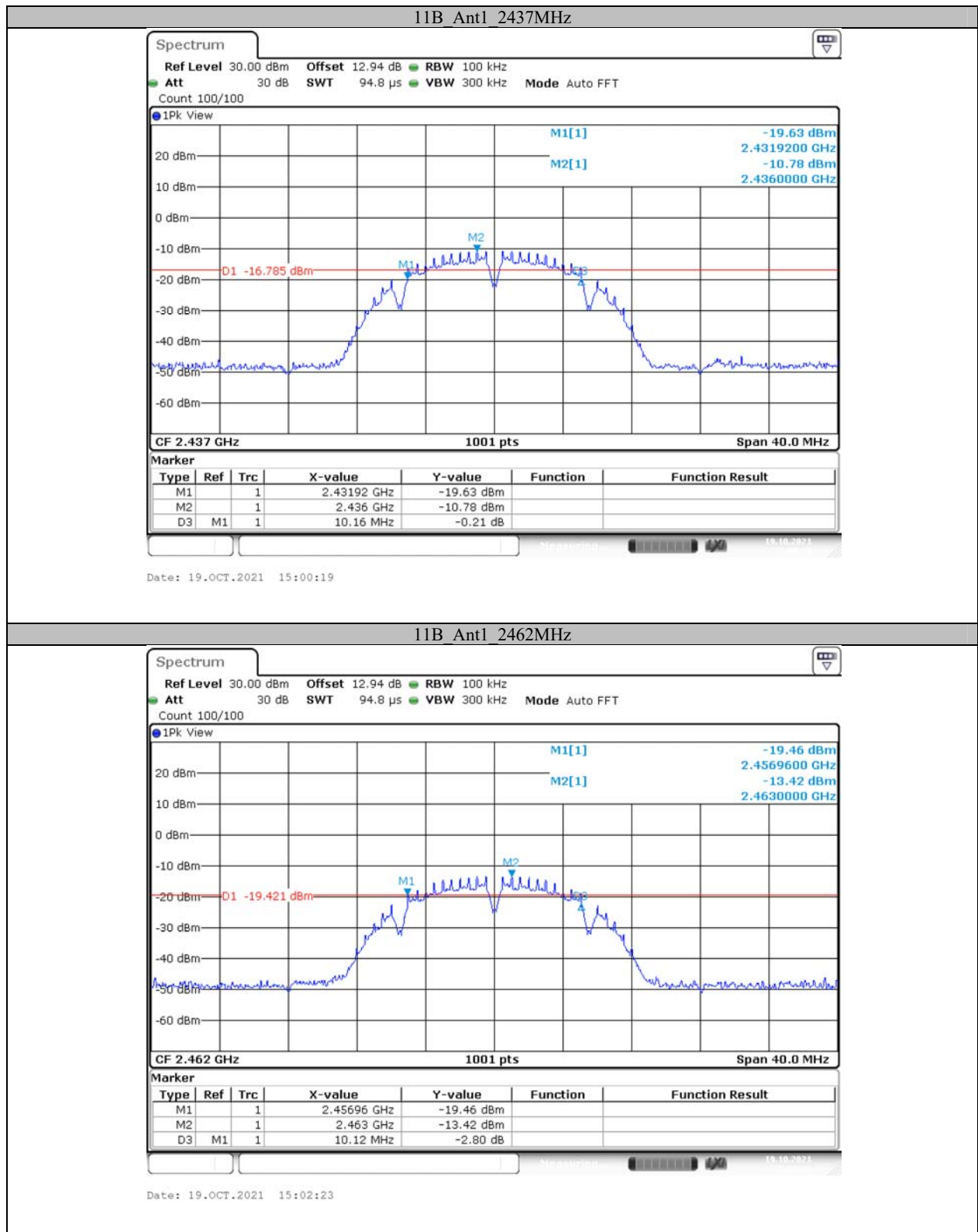
● 1Pk View

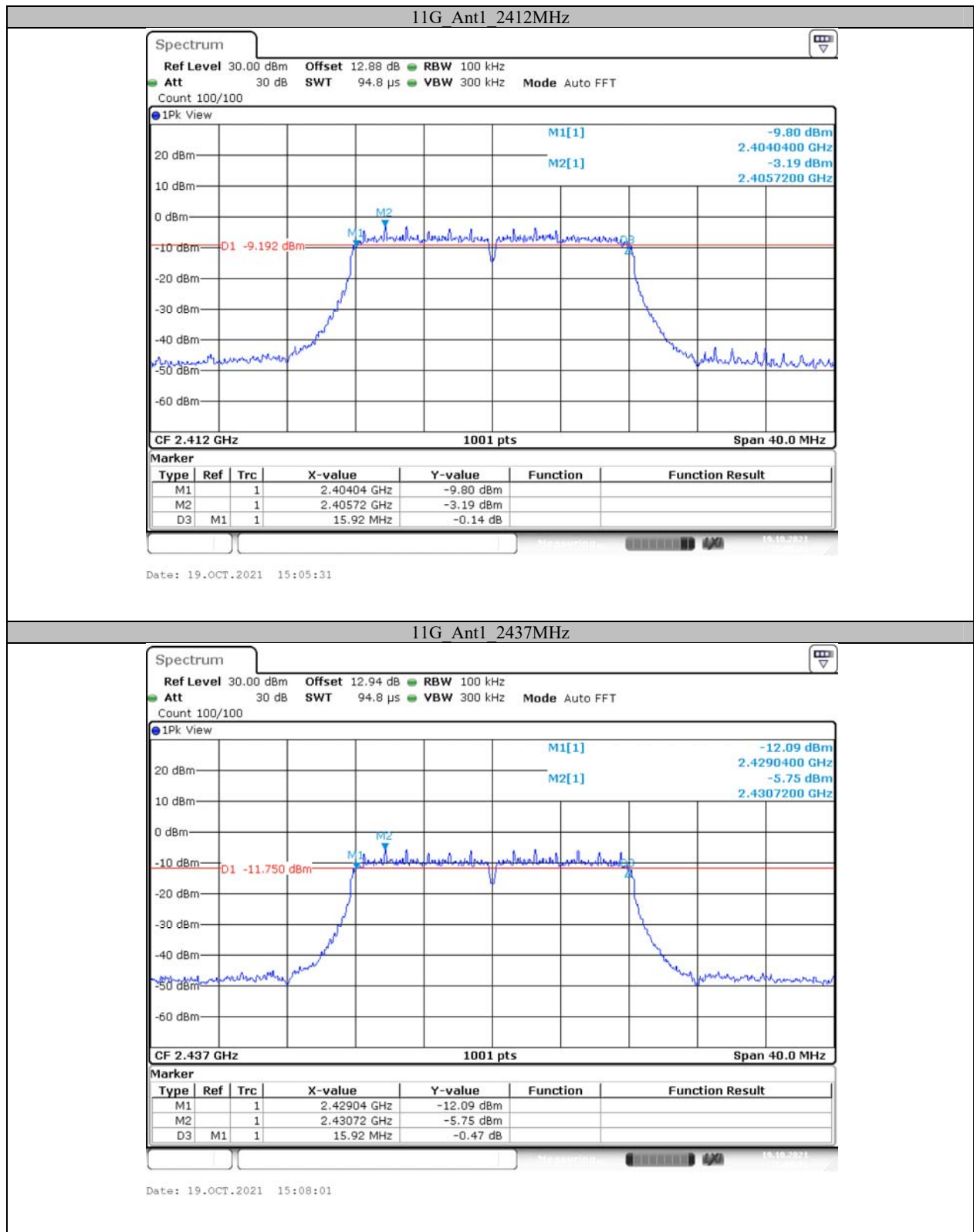
CF 2.412 GHz 1001 pts Span 40.0 MHz

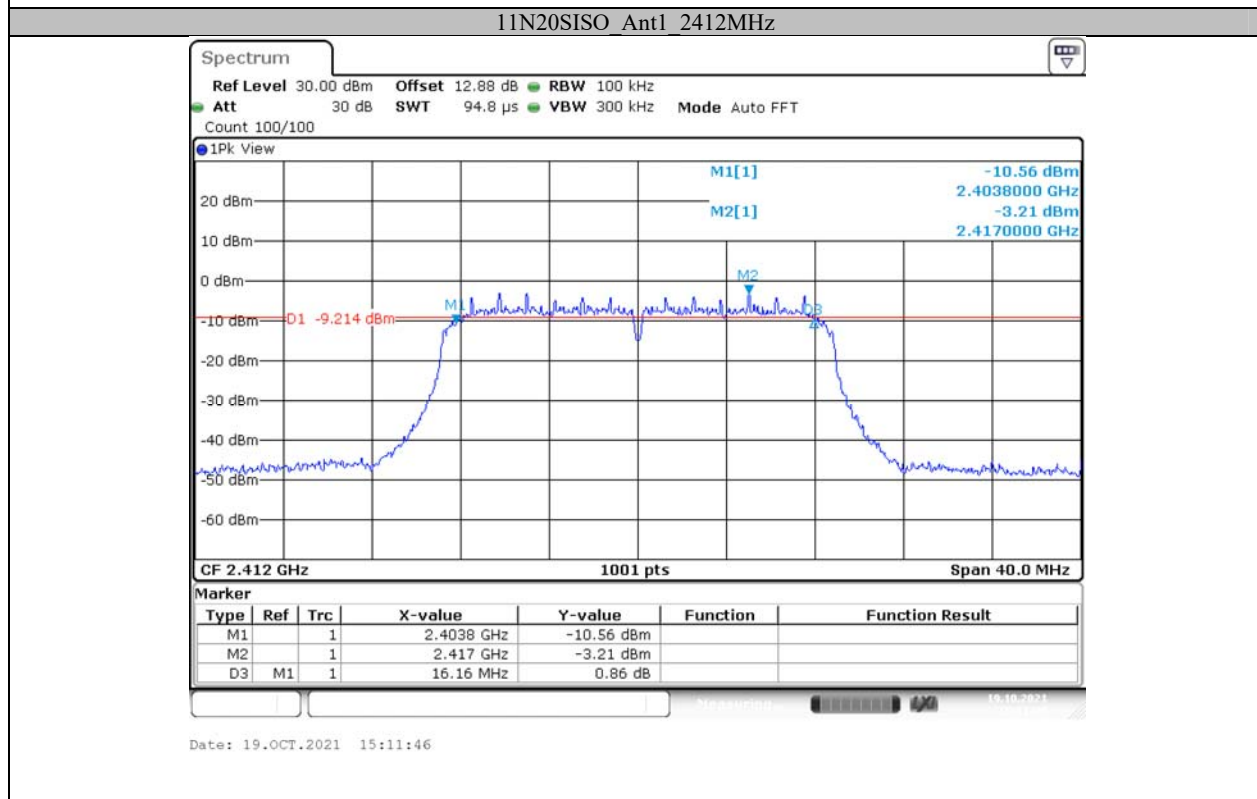
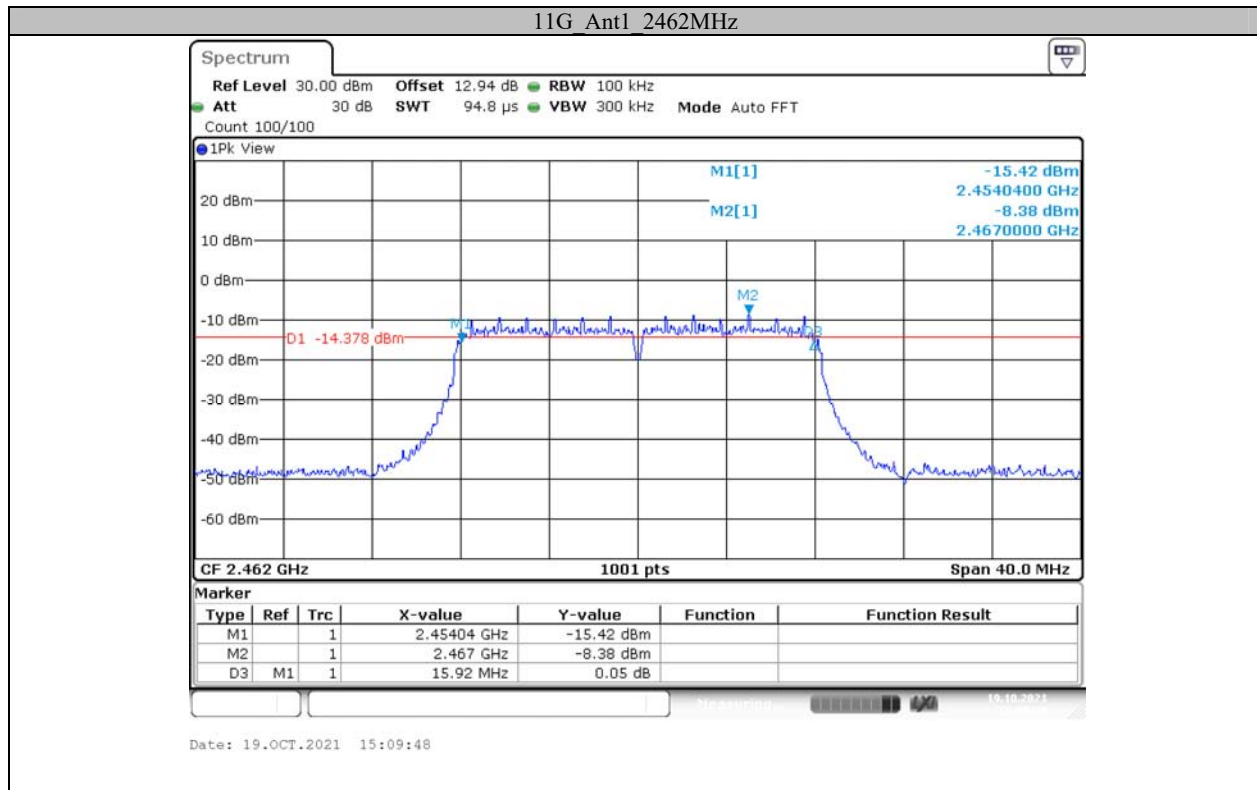
Marker

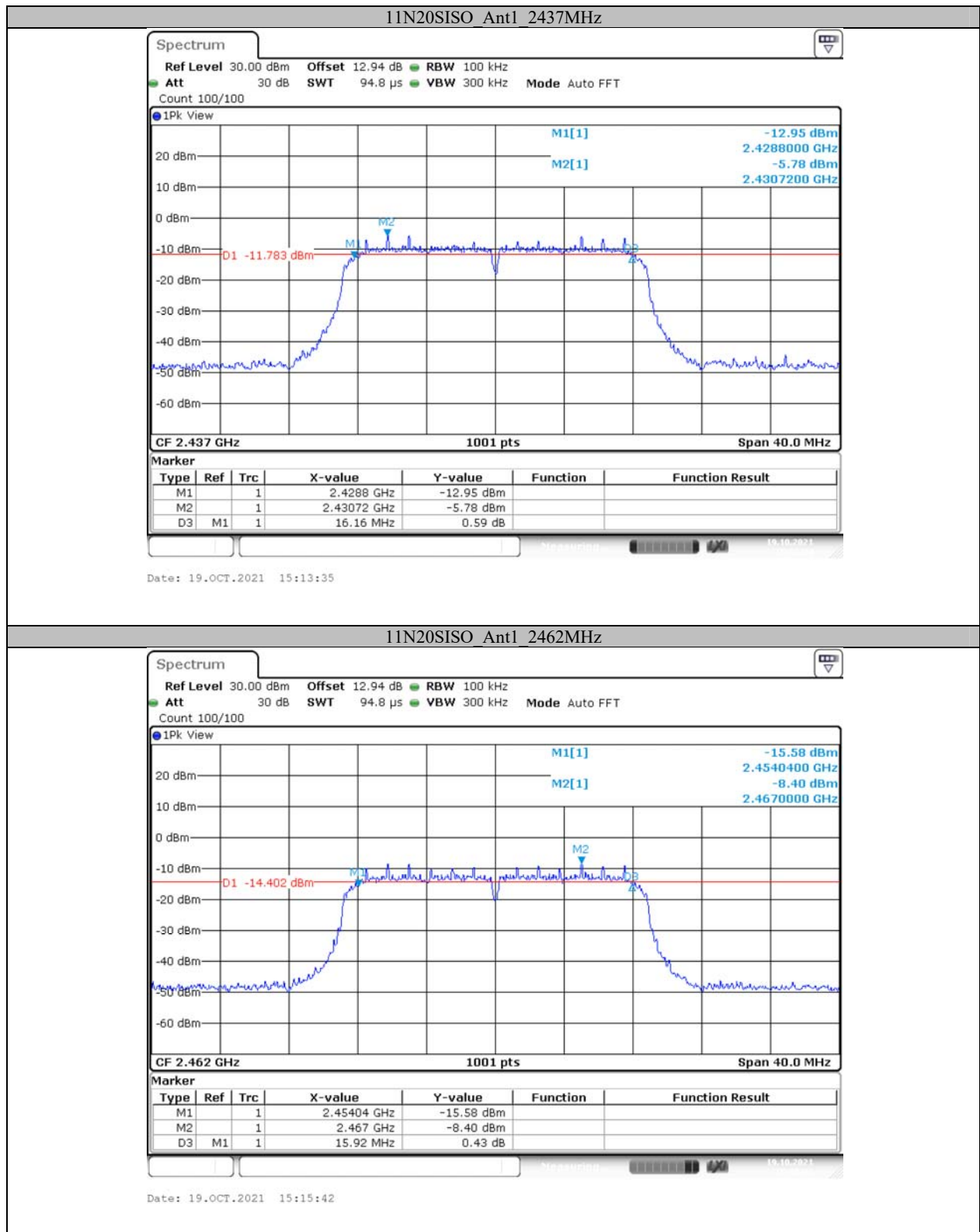
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40696 GHz	-14.01 dBm		
M2		1	2.41252 GHz	-7.95 dBm		
D3	M1	1	10.08 MHz	-0.30 dB		

Date: 19.OCT.2021 14:57:44







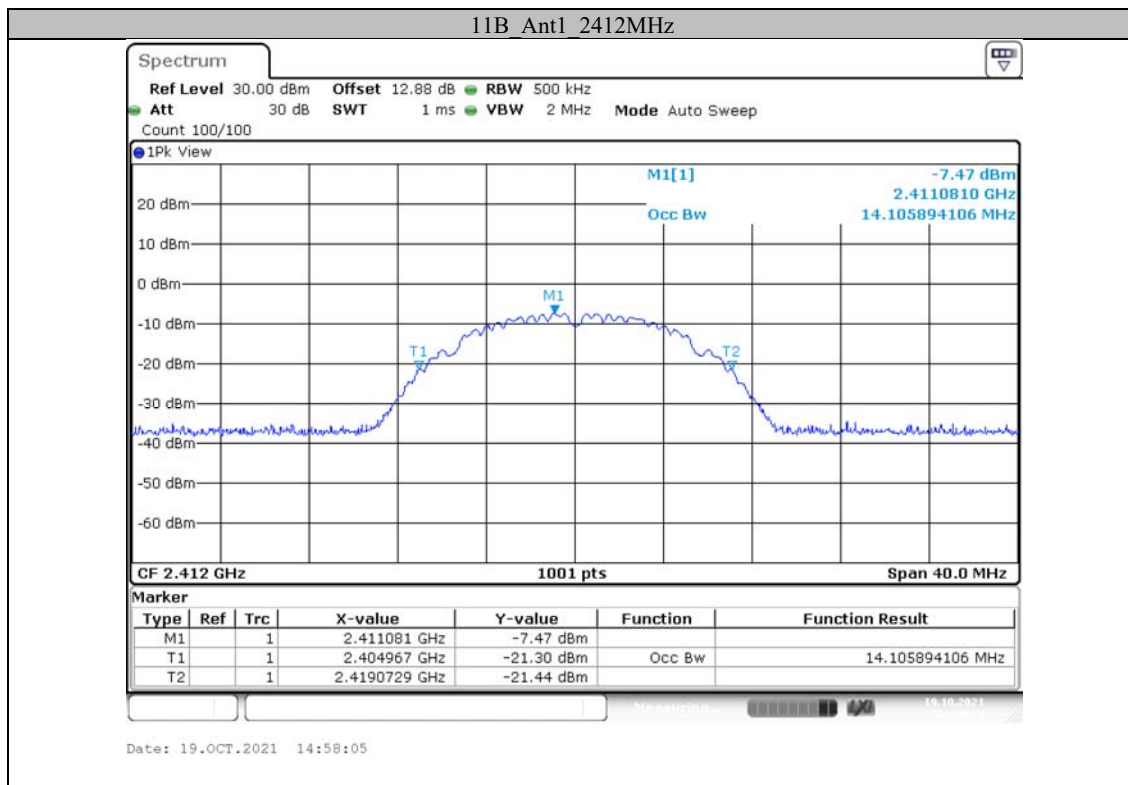


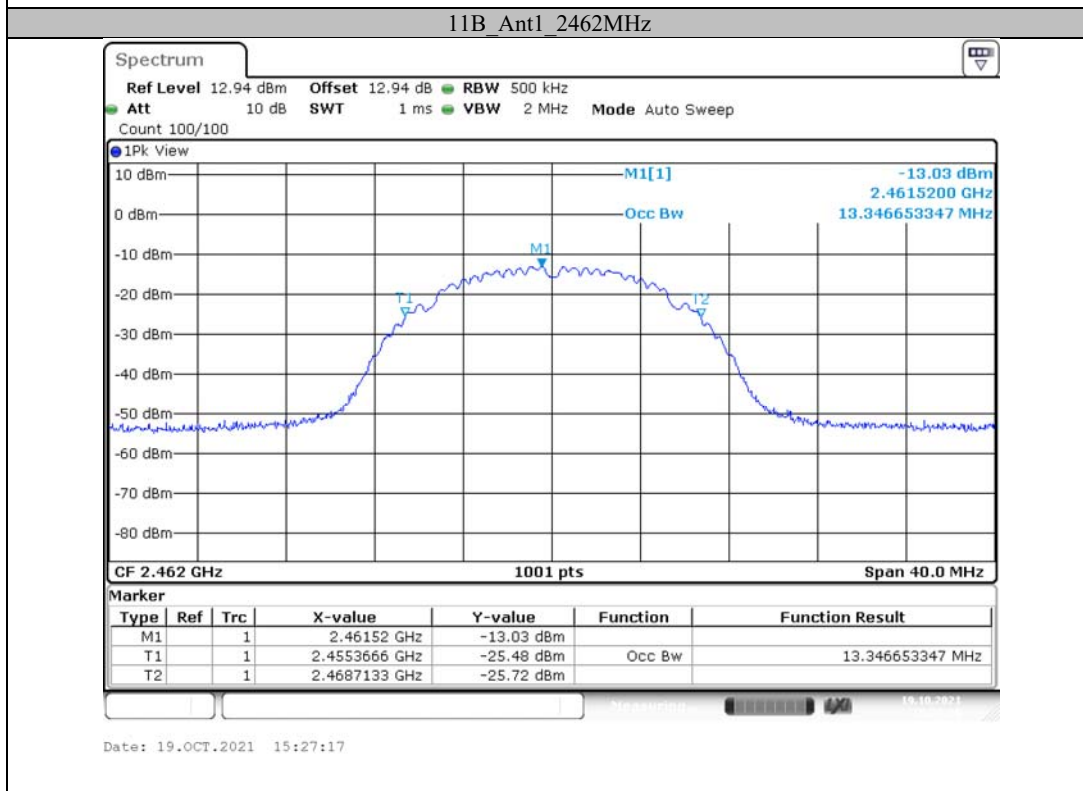
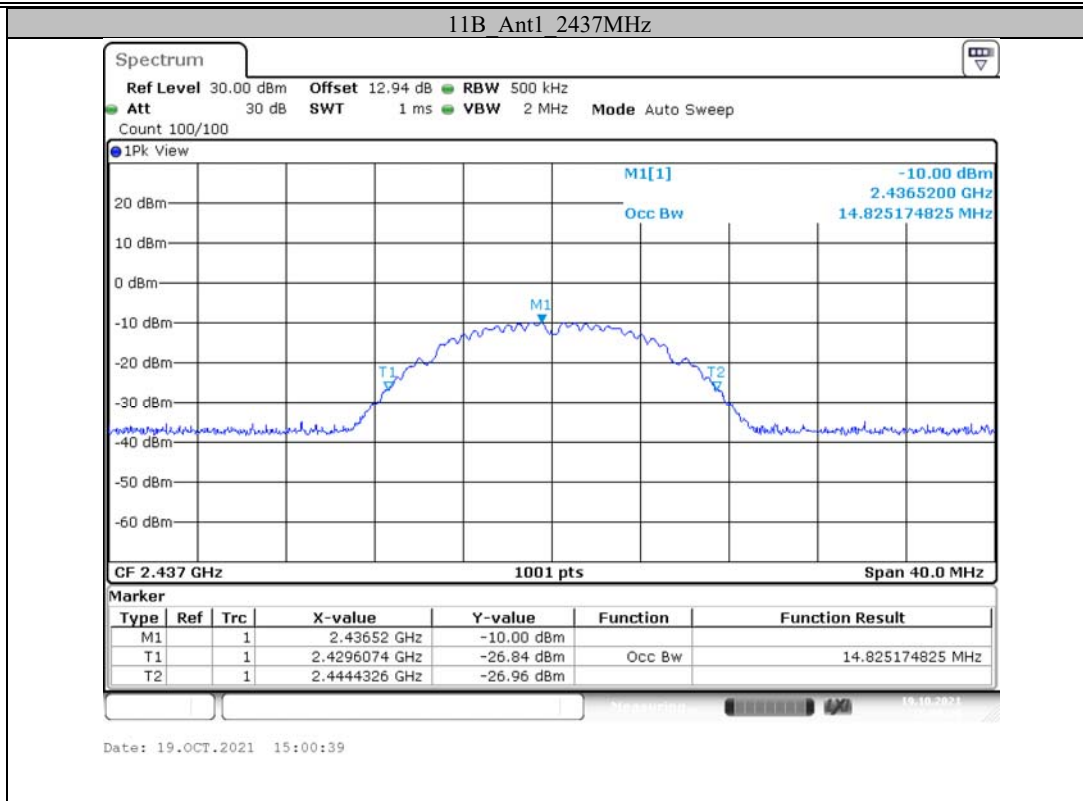
Appendix B: Occupied Channel Bandwidth

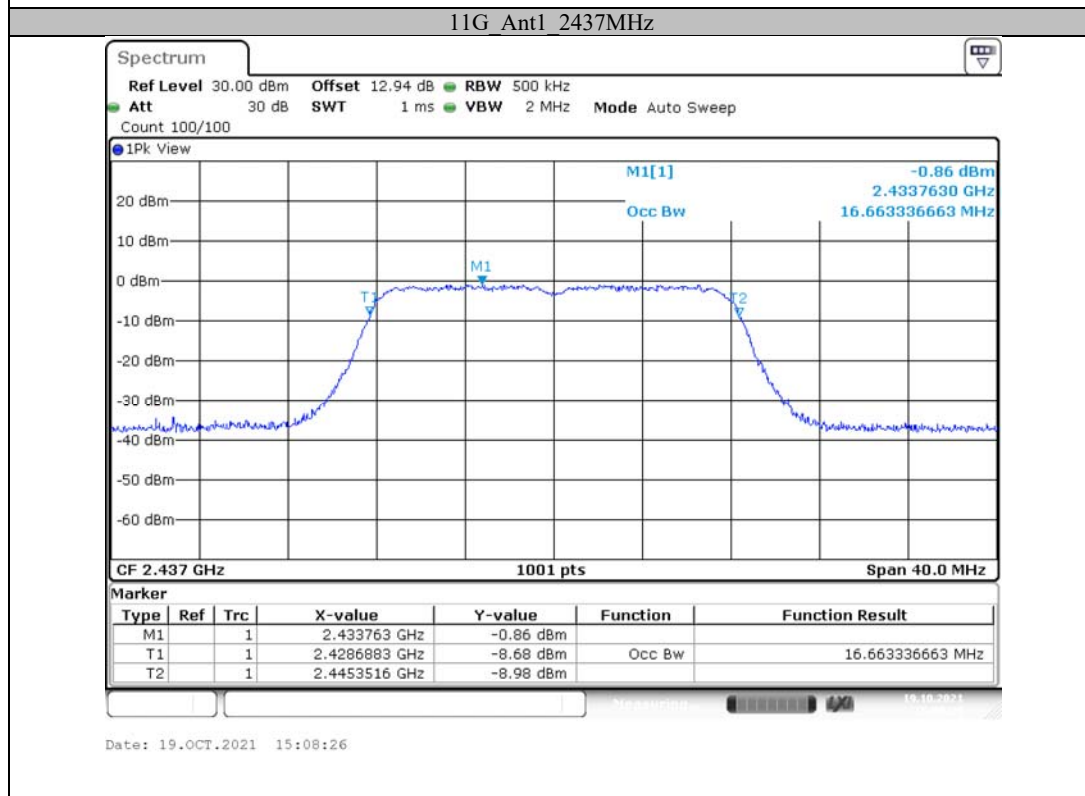
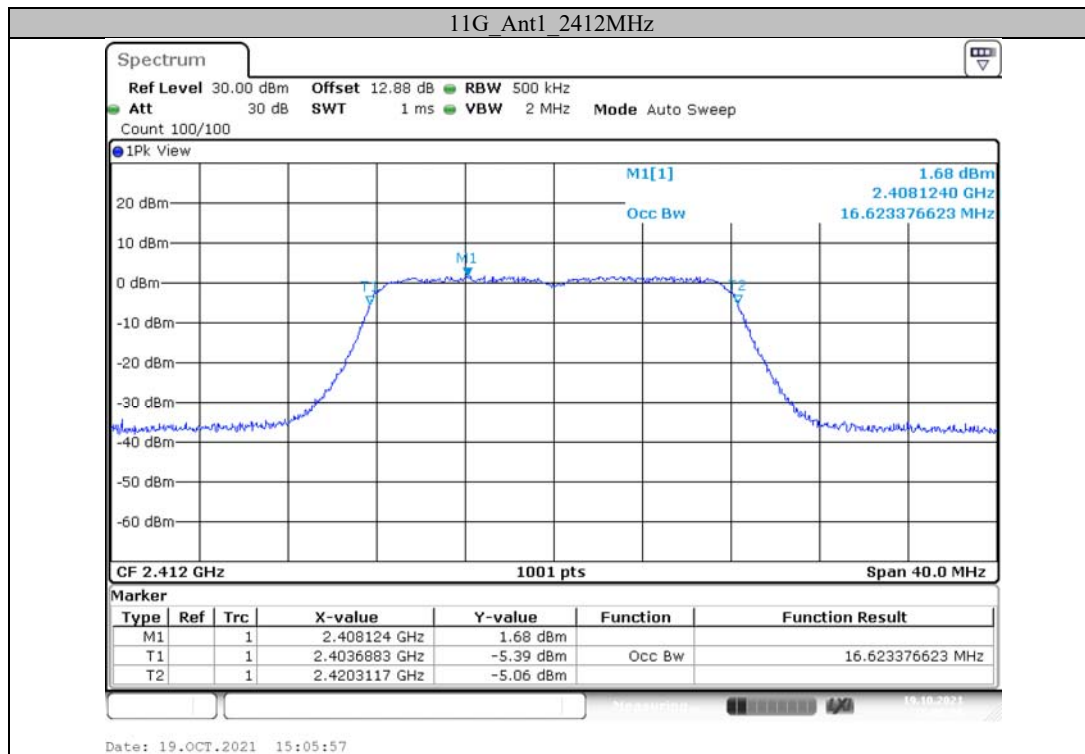
Test Result

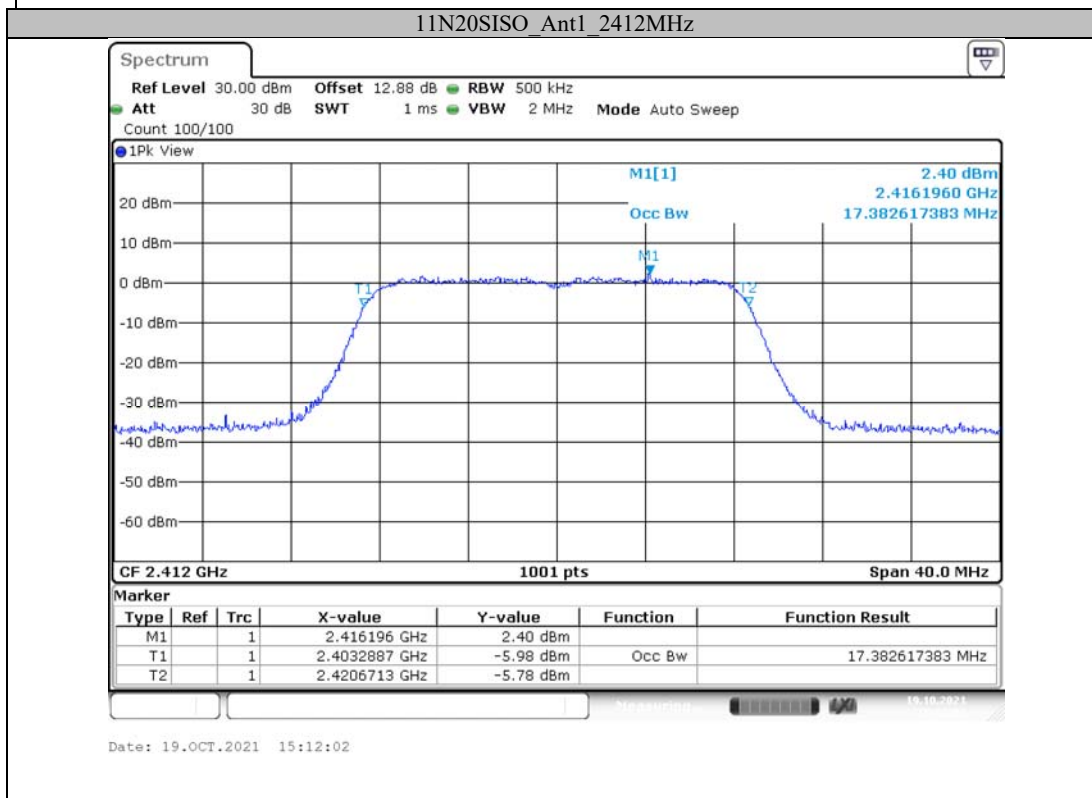
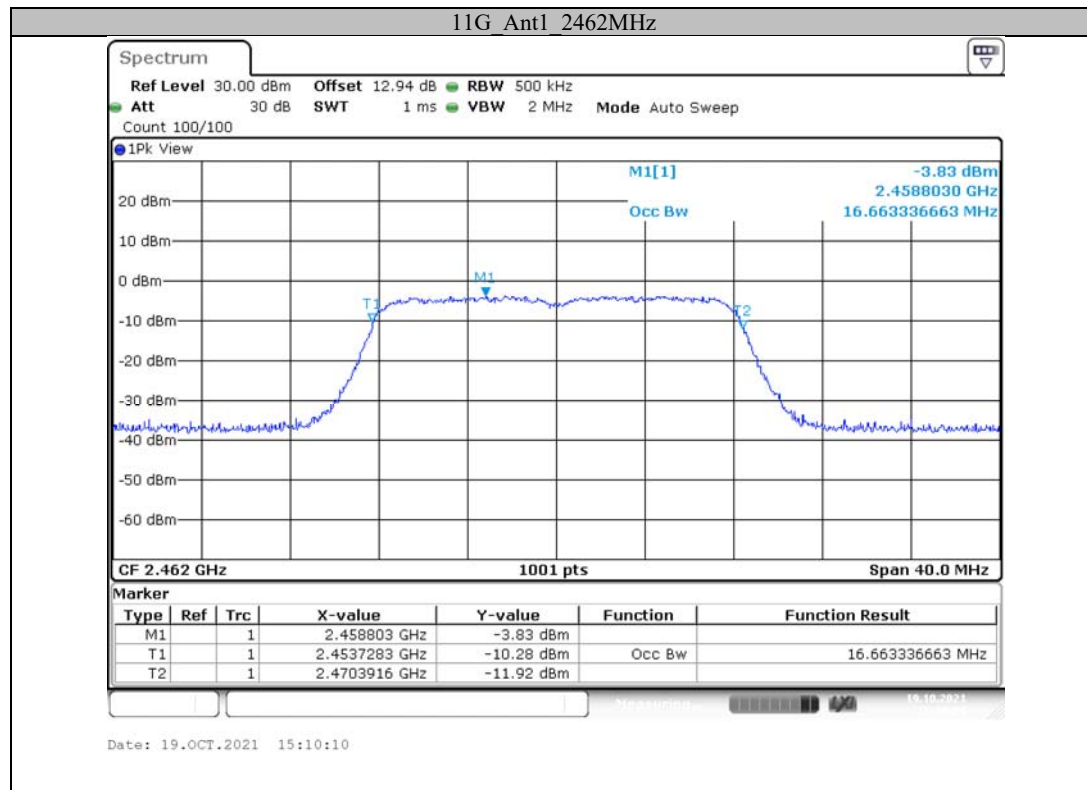
TestMode	Antenna	Channel[MHz]	OCB [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	14.106	---	PASS
		2437	14.825	---	PASS
		2462	13.347	---	PASS
11G	Ant1	2412	16.623	---	PASS
		2437	16.663	---	PASS
		2462	16.663	---	PASS
11N20SISO	Ant1	2412	17.383	---	PASS
		2437	17.383	---	PASS
		2462	17.423	---	PASS

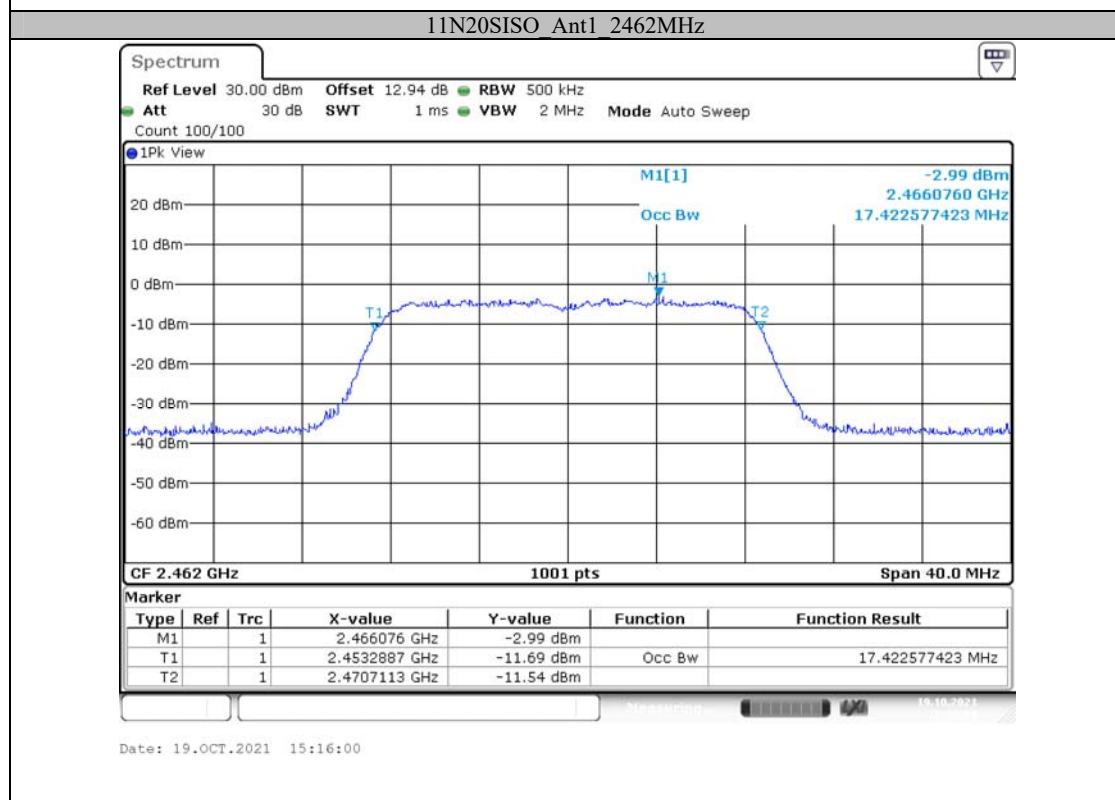
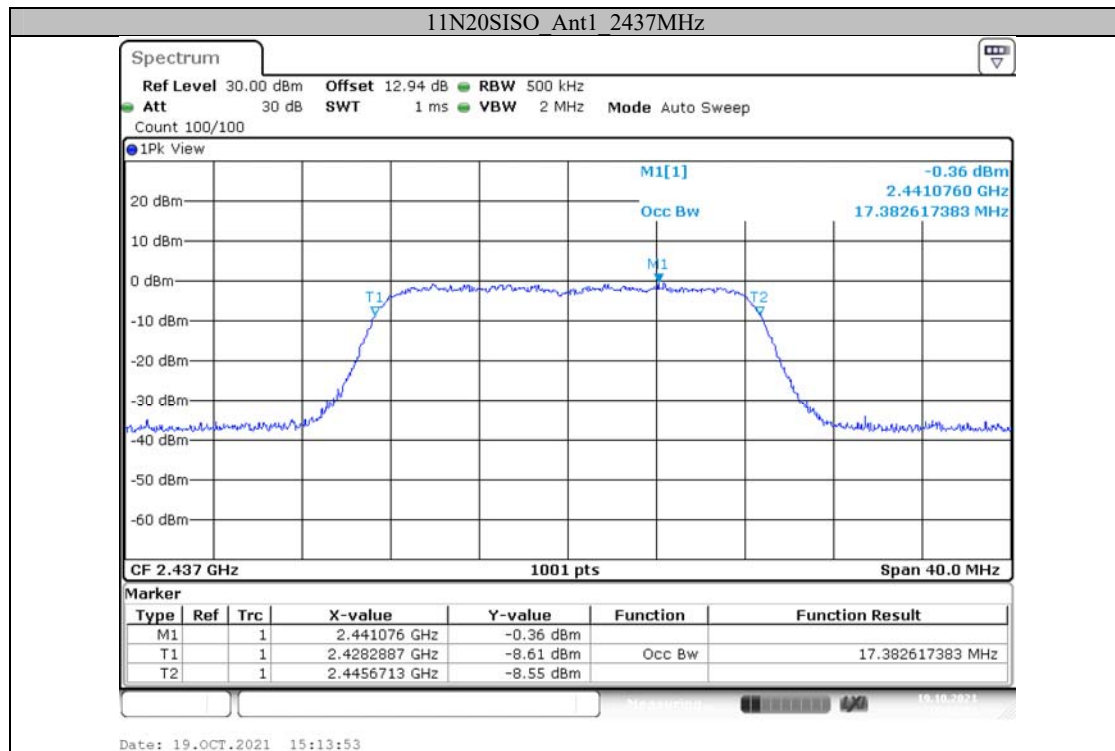
Test Graphs









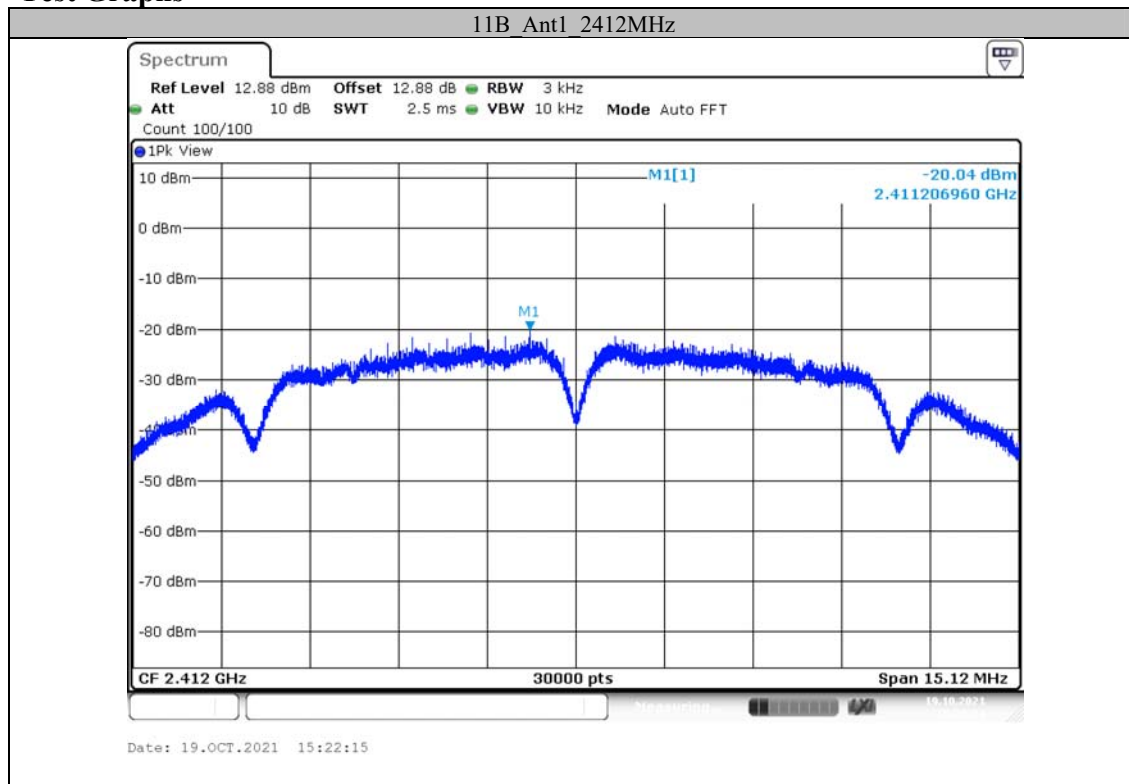


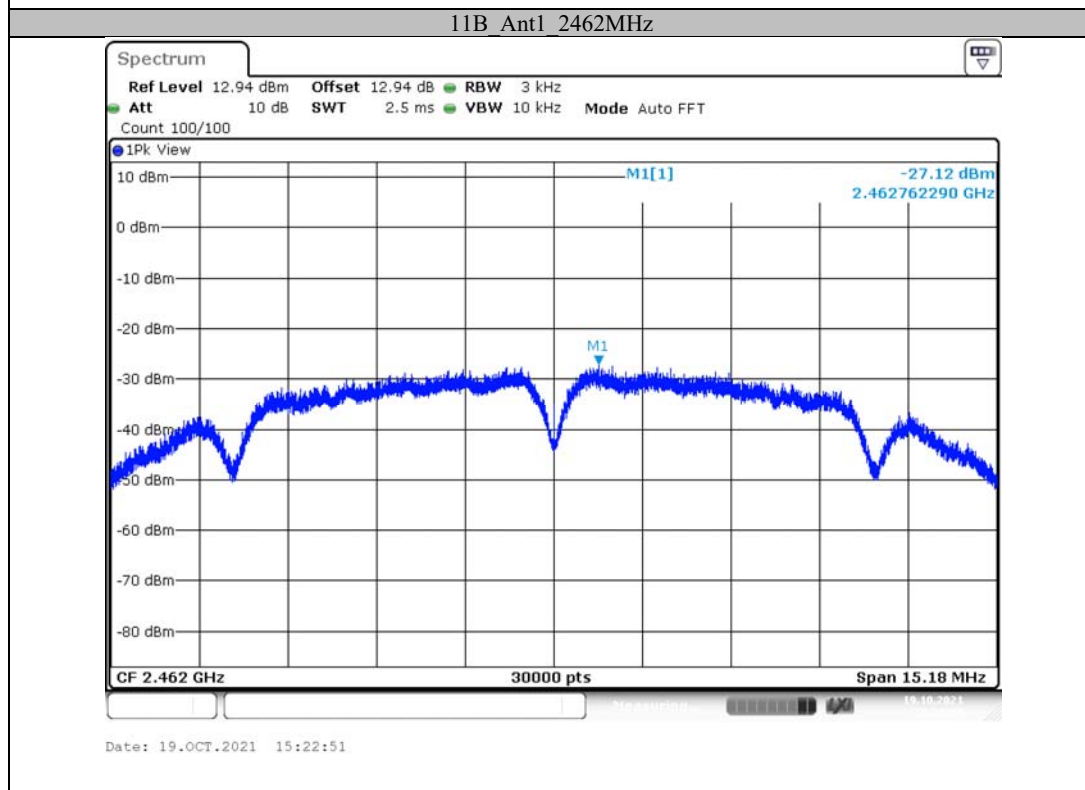
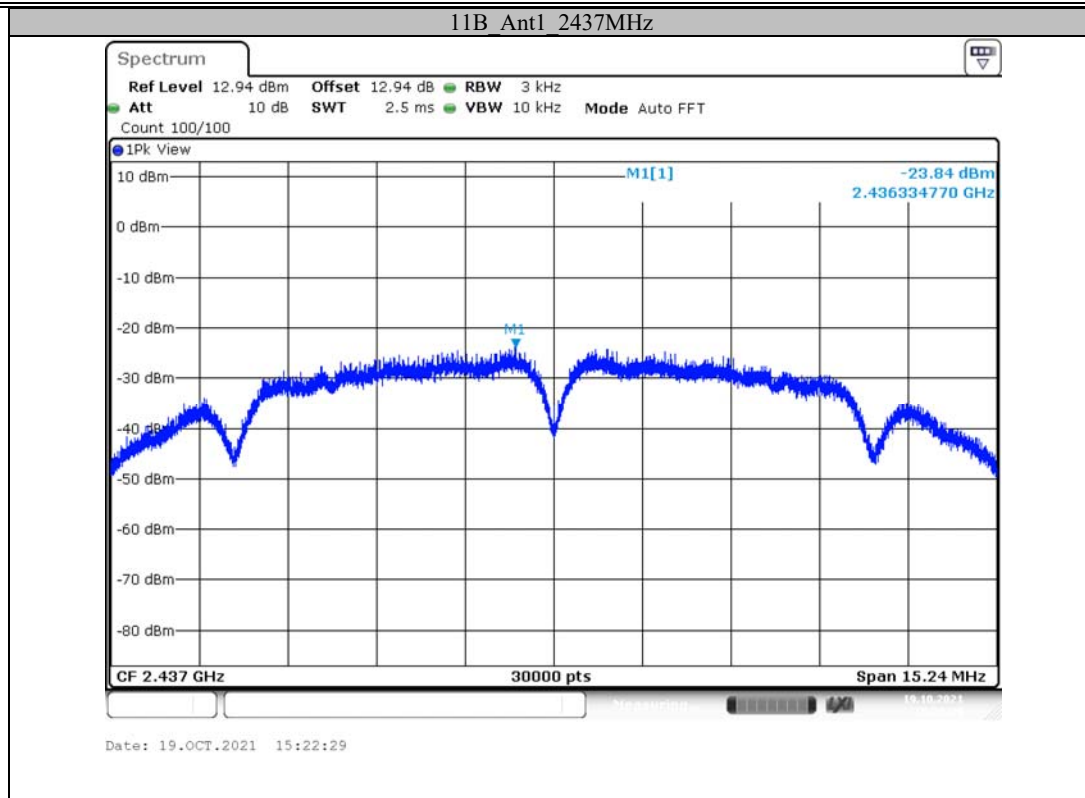
Appendix C: Maximum conducted Peak output power**Test Result**

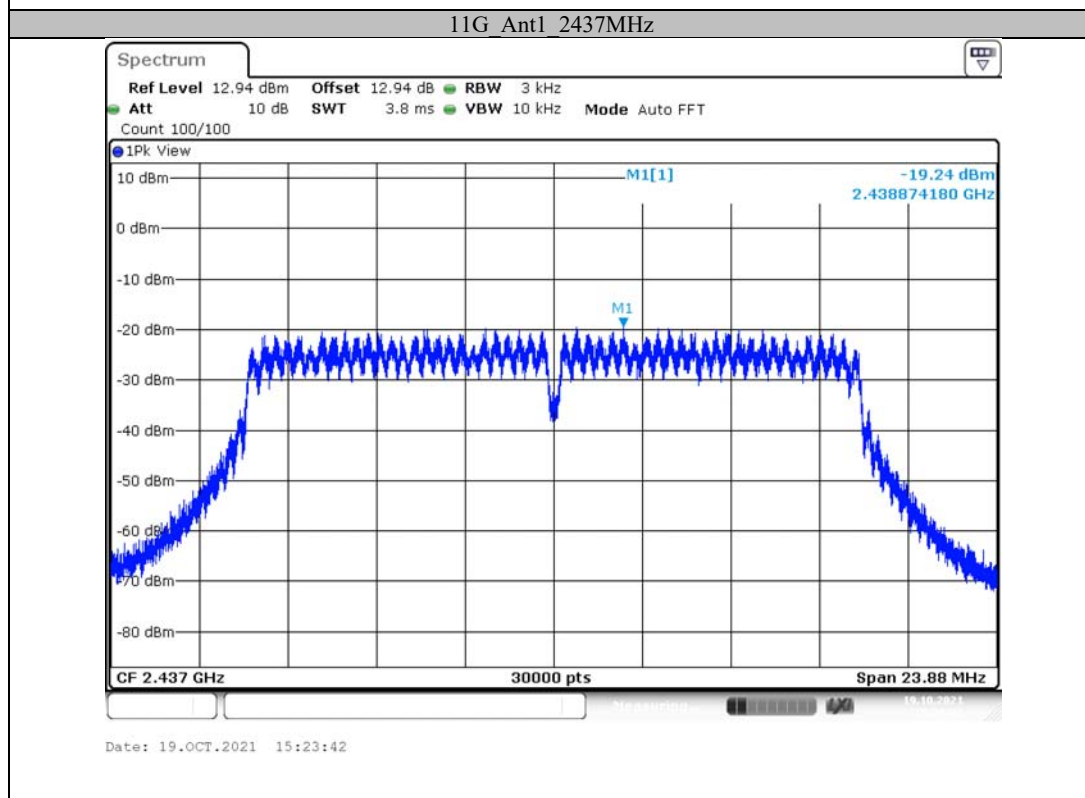
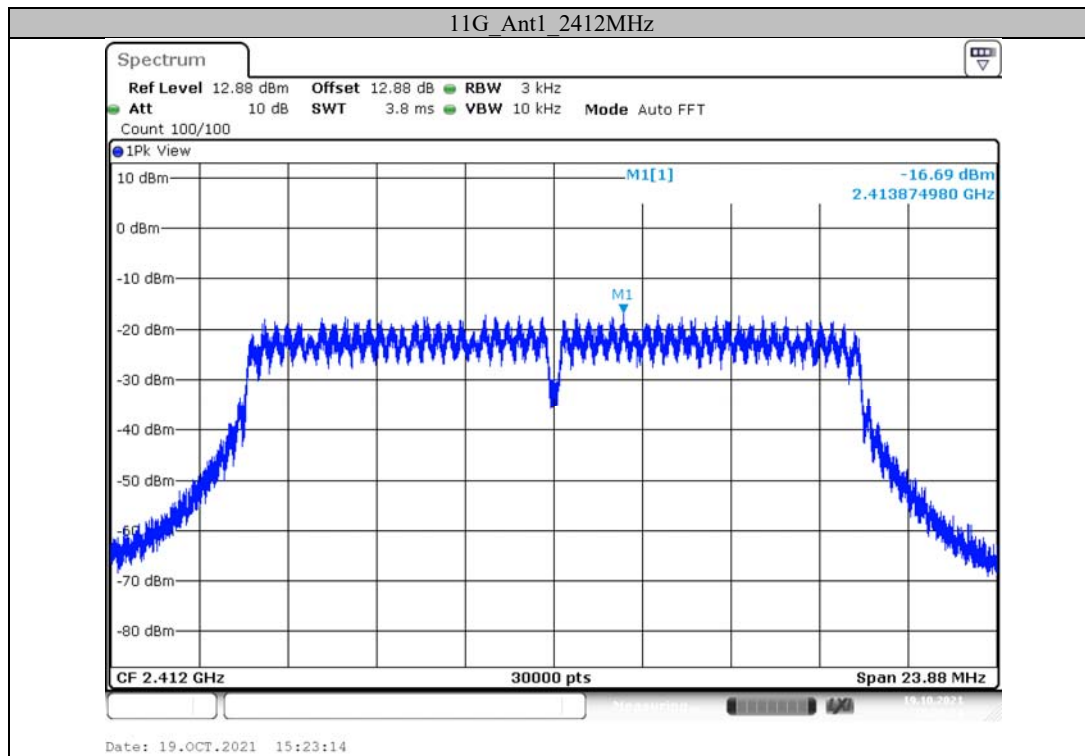
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	2412	10.80	<=30	PASS
		2437	9.09	<=30	PASS
		2462	7.66	<=30	PASS
11G	Ant1	2412	16.84	<=30	PASS
		2437	14.38	<=30	PASS
		2462	12.40	<=30	PASS
11N20SISO	Ant1	2412	17.88	<=30	PASS
		2437	15.91	<=30	PASS
		2462	13.23	<=30	PASS

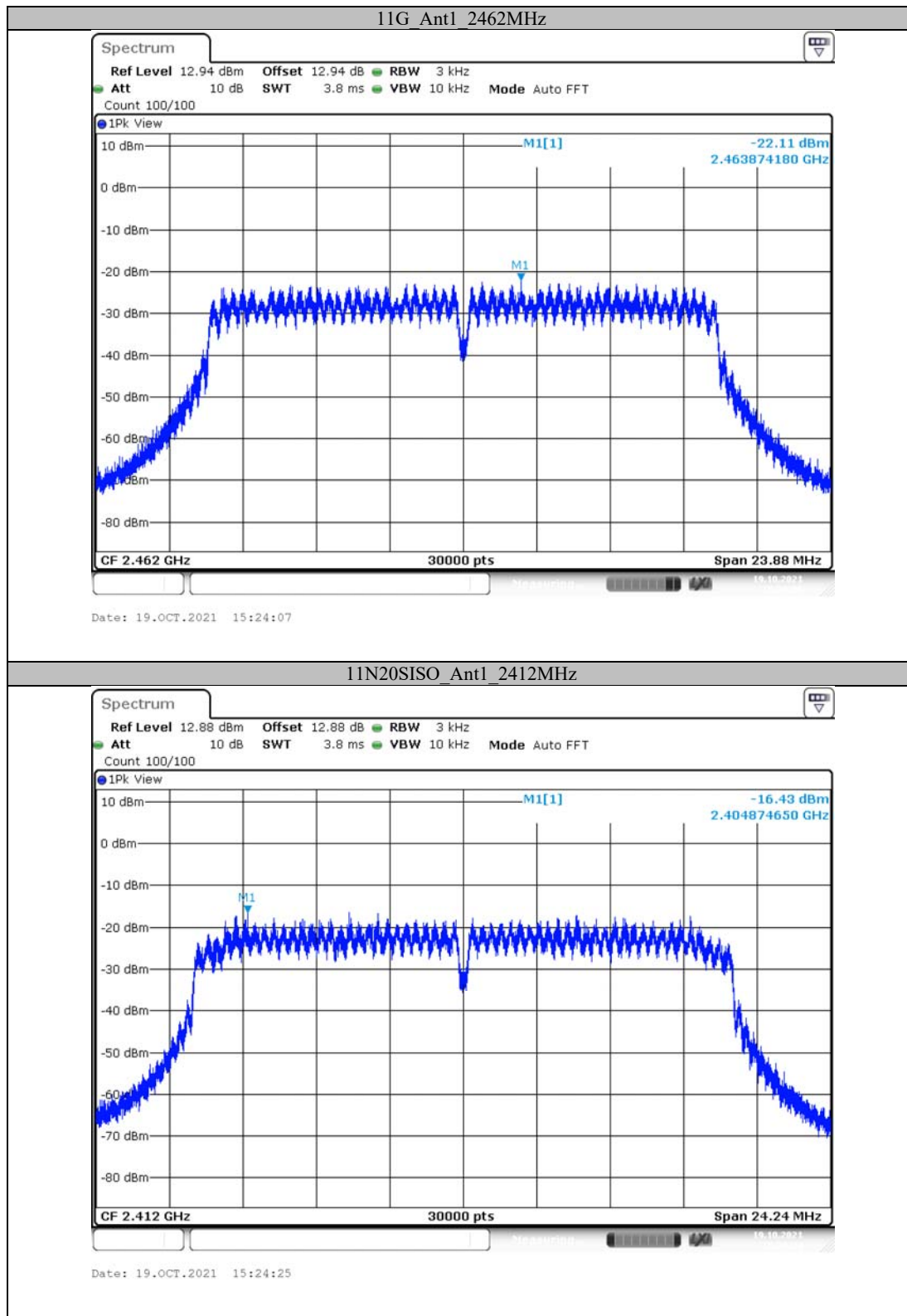
Appendix D: Power spectral density**Test Result**

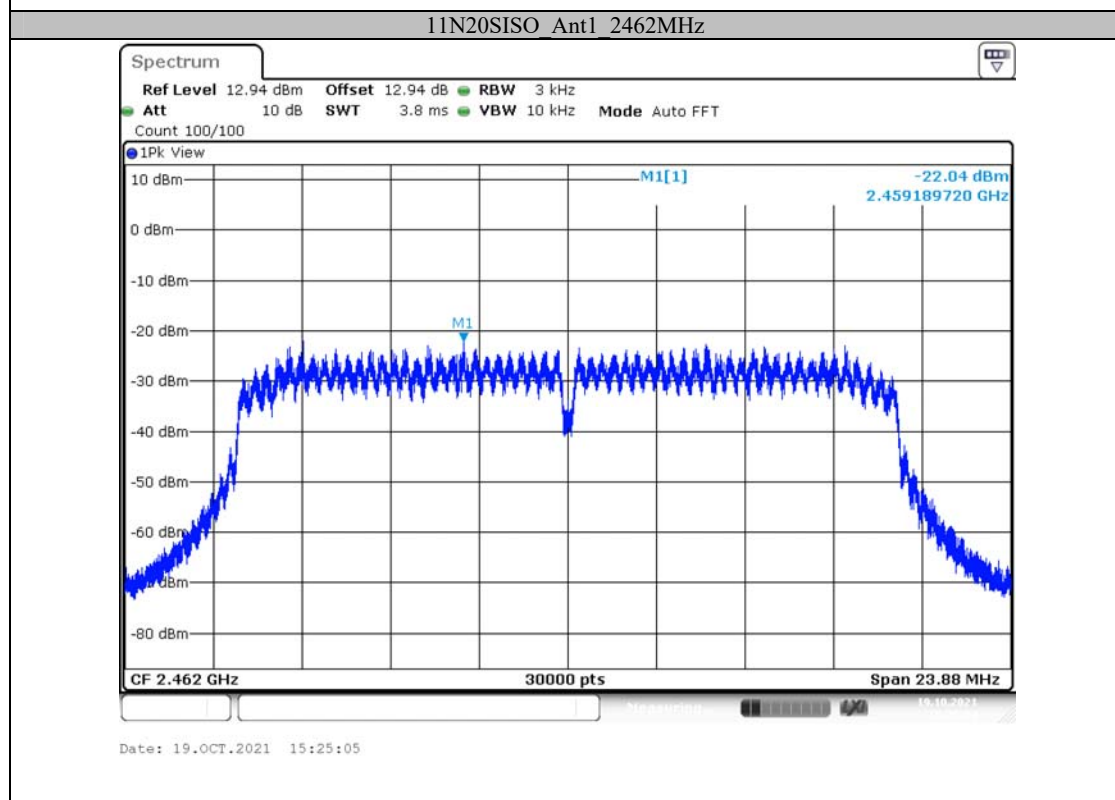
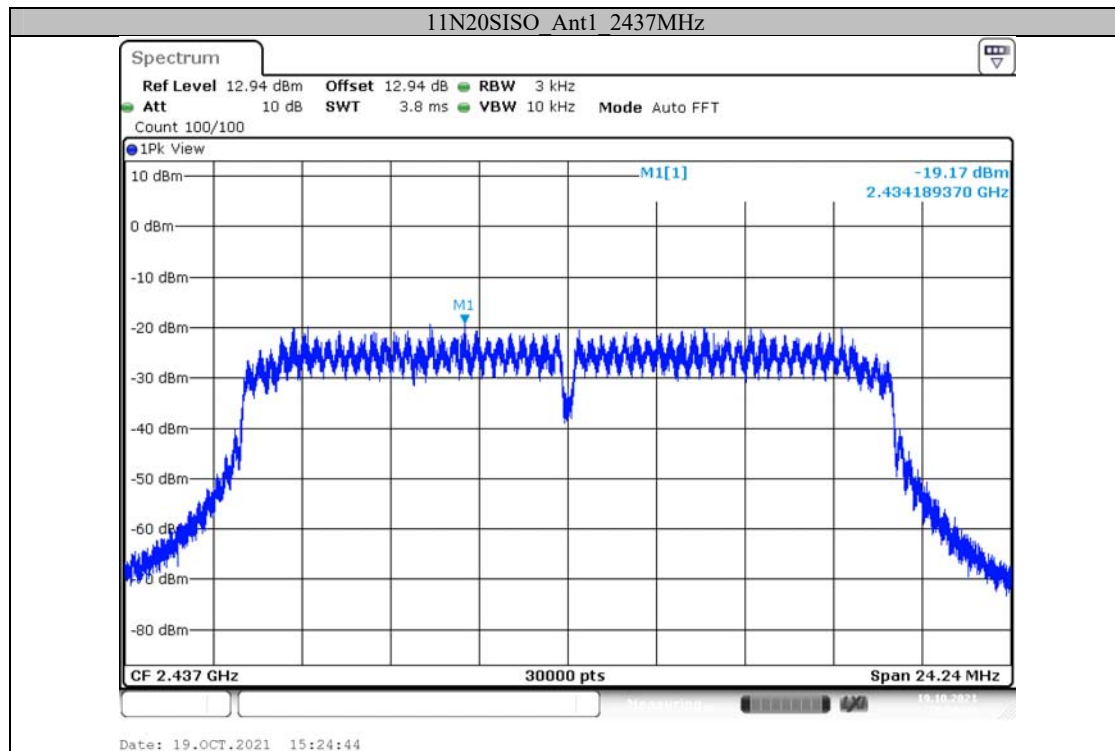
TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-20.04	<=8	PASS
		2437	-23.84	<=8	PASS
		2462	-27.12	<=8	PASS
11G	Ant1	2412	-16.69	<=8	PASS
		2437	-19.24	<=8	PASS
		2462	-22.11	<=8	PASS
11N20SISO	Ant1	2412	-16.43	<=8	PASS
		2437	-19.17	<=8	PASS
		2462	-22.04	<=8	PASS

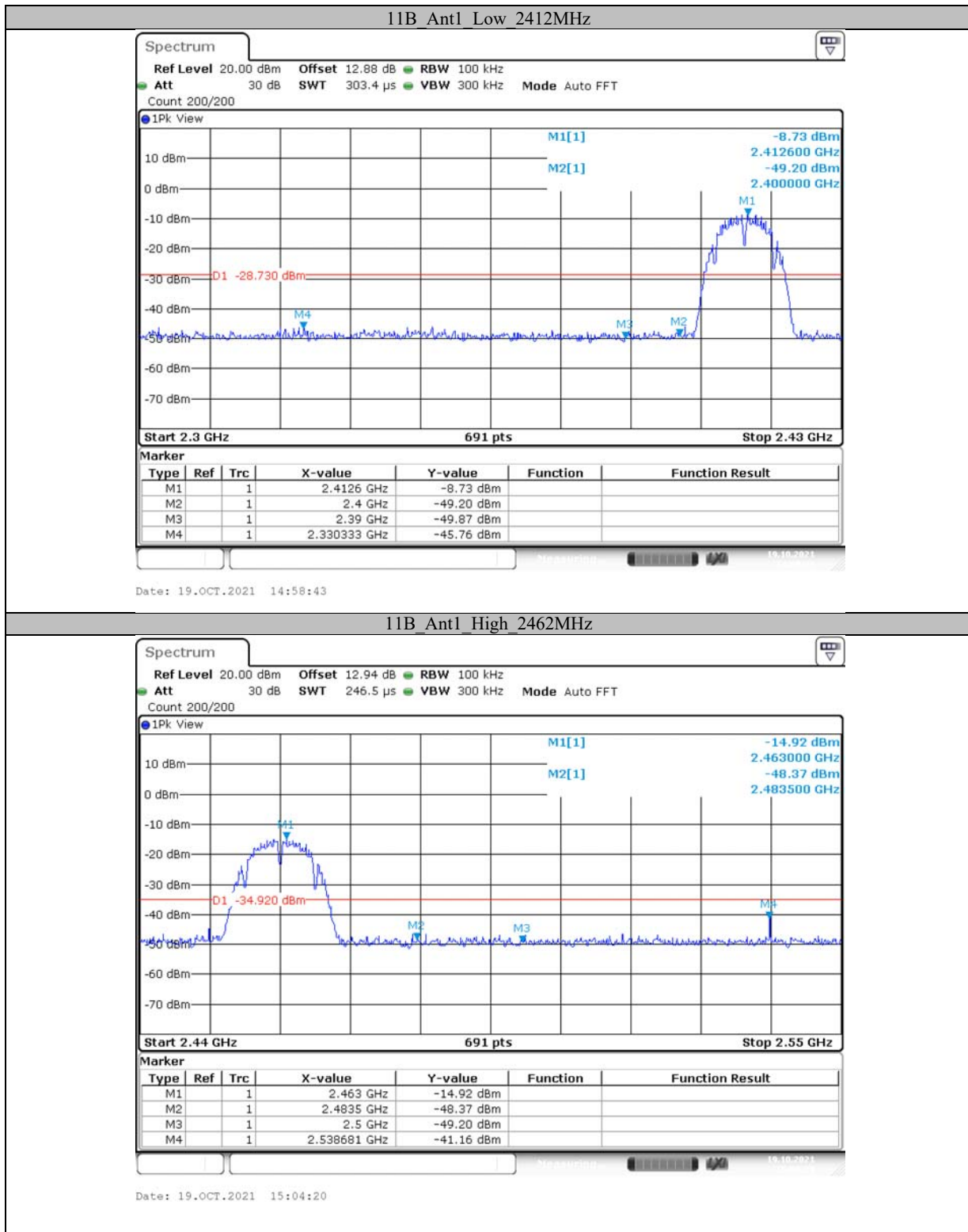
Test Graphs

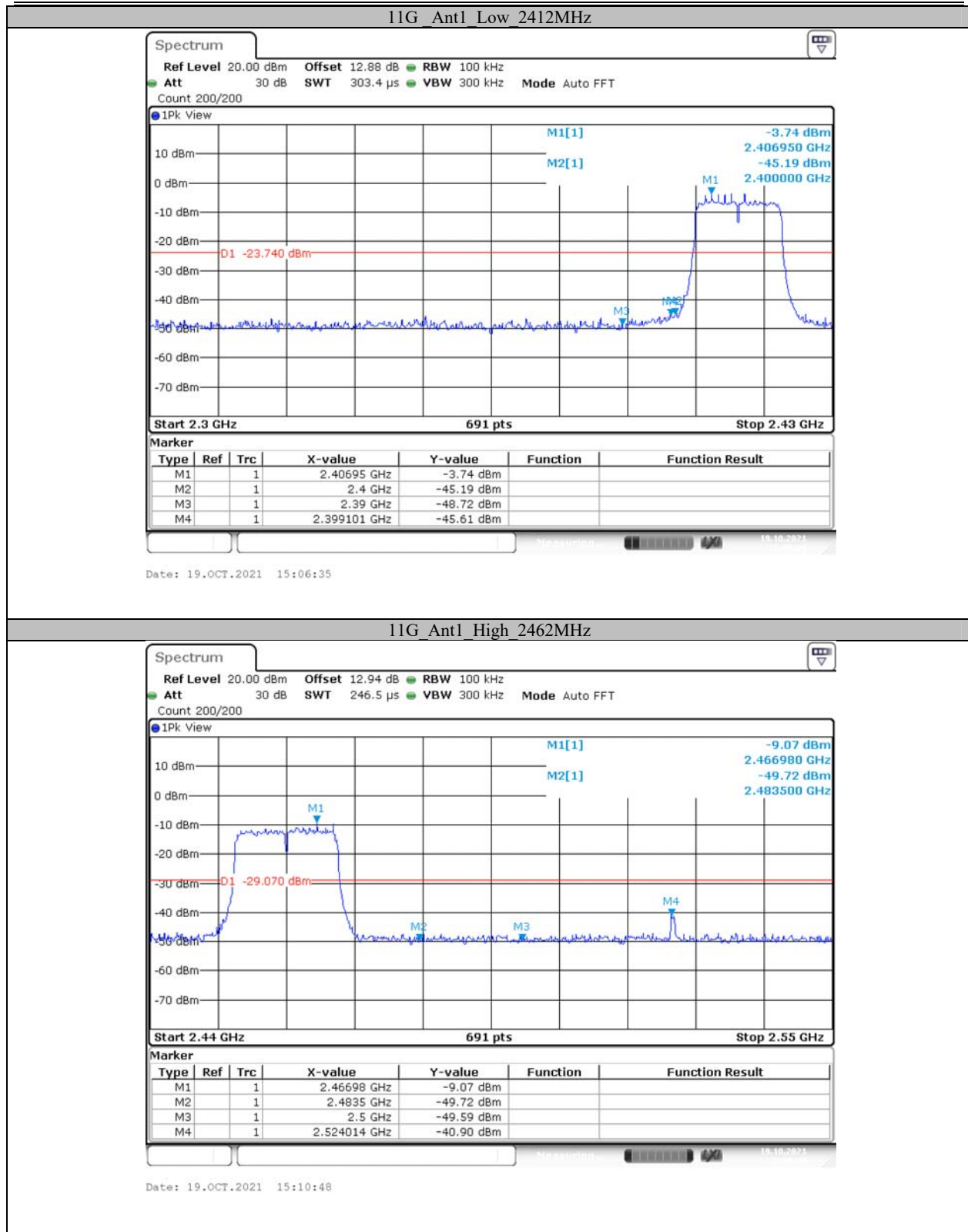


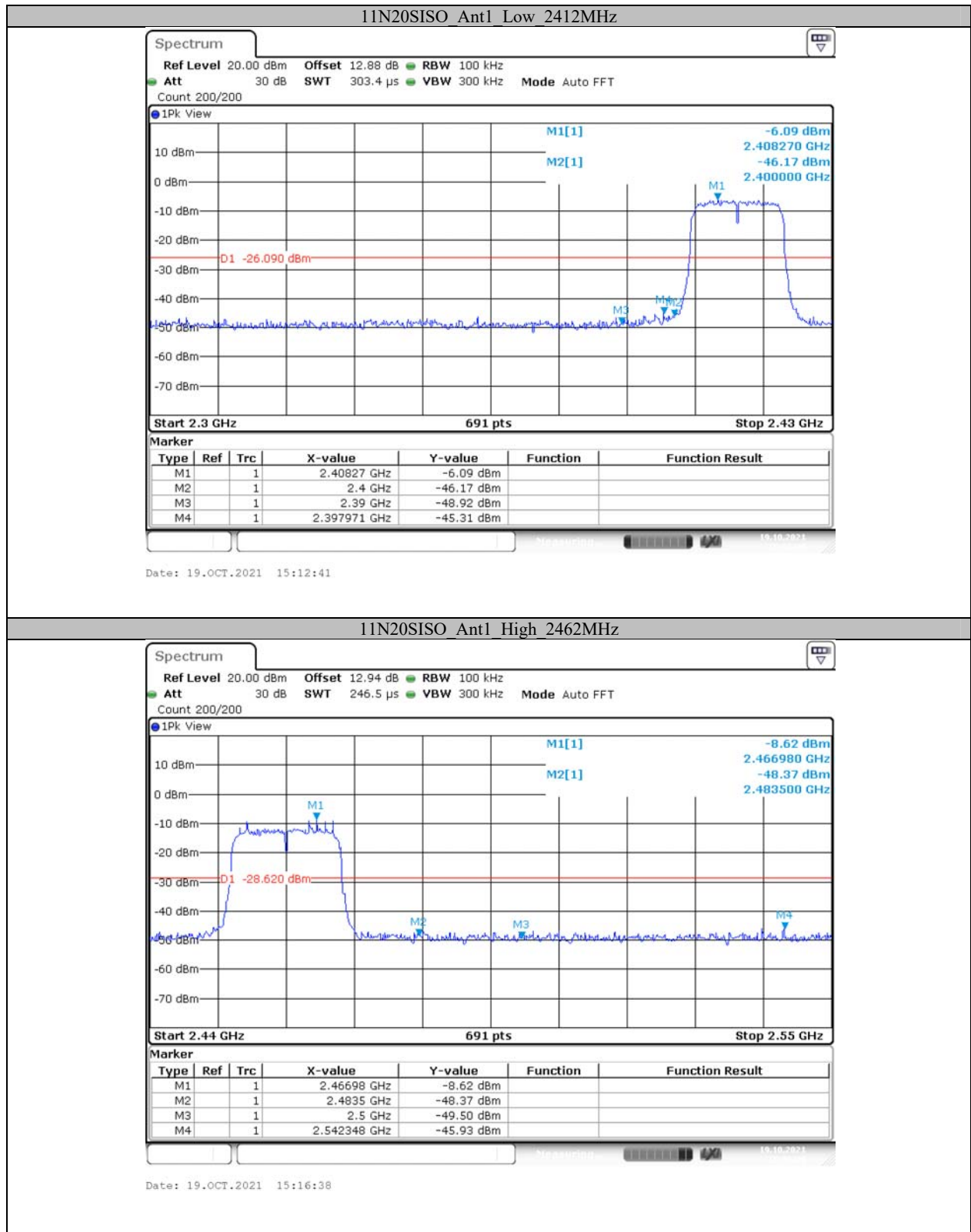






Appendix E: Band edge measurements**Test Graphs**



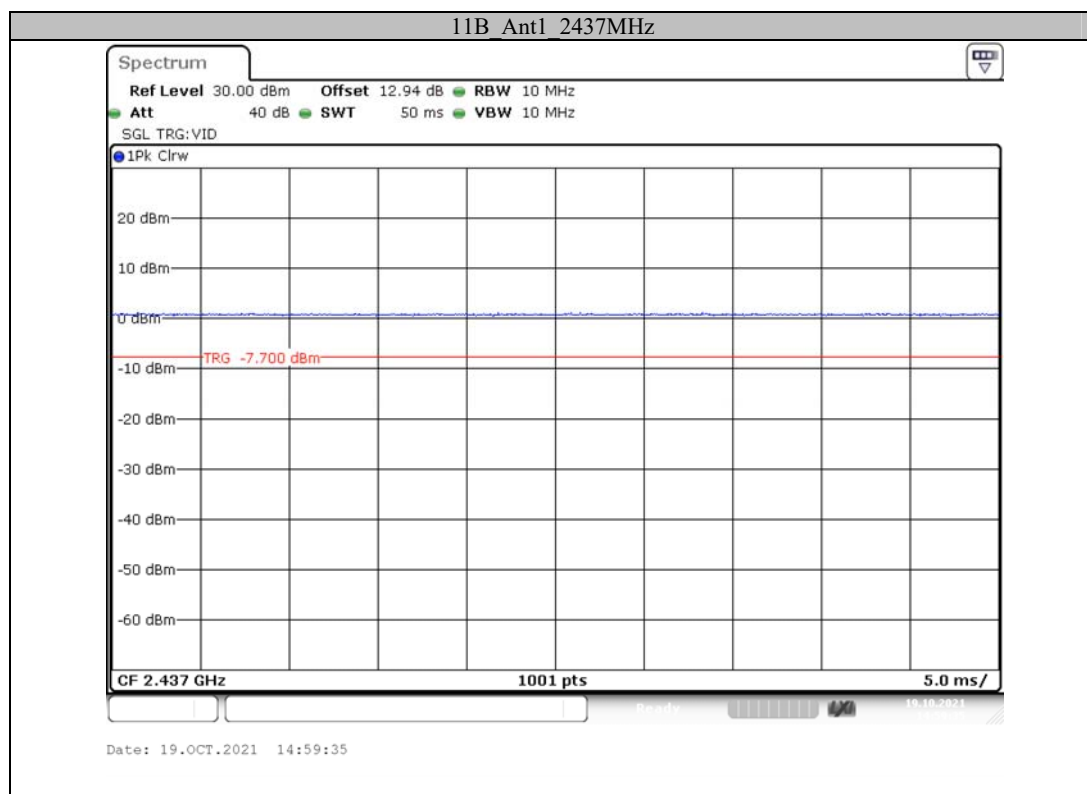


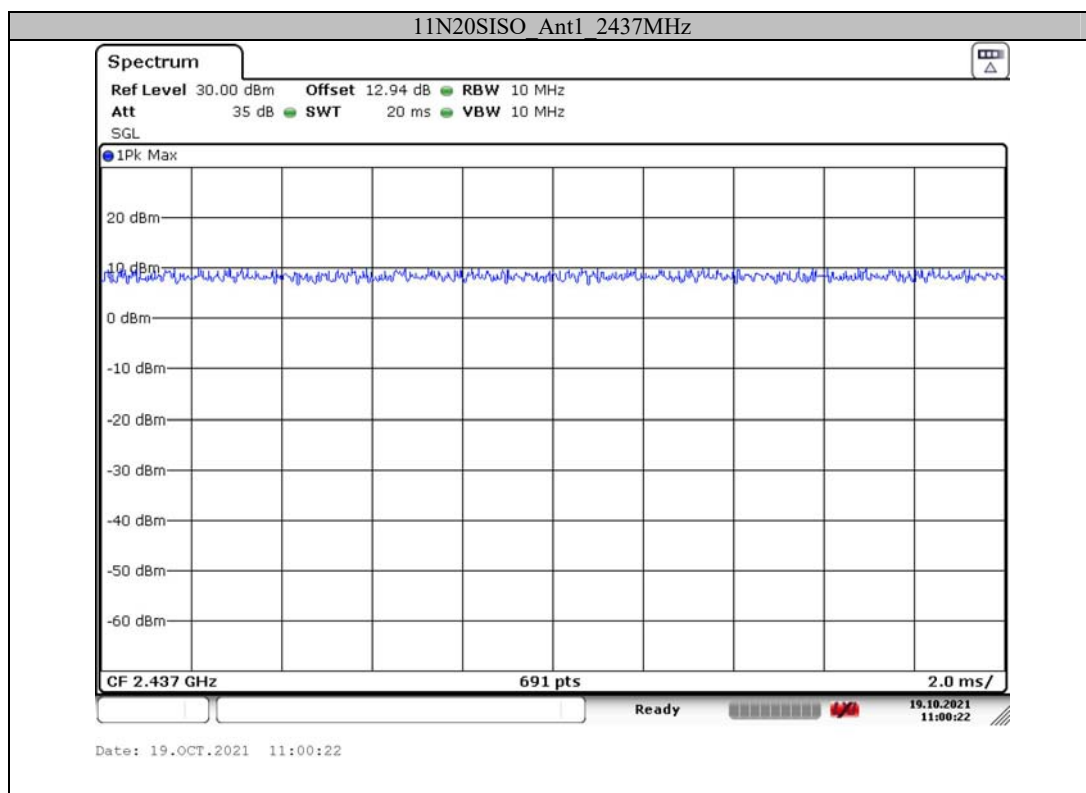
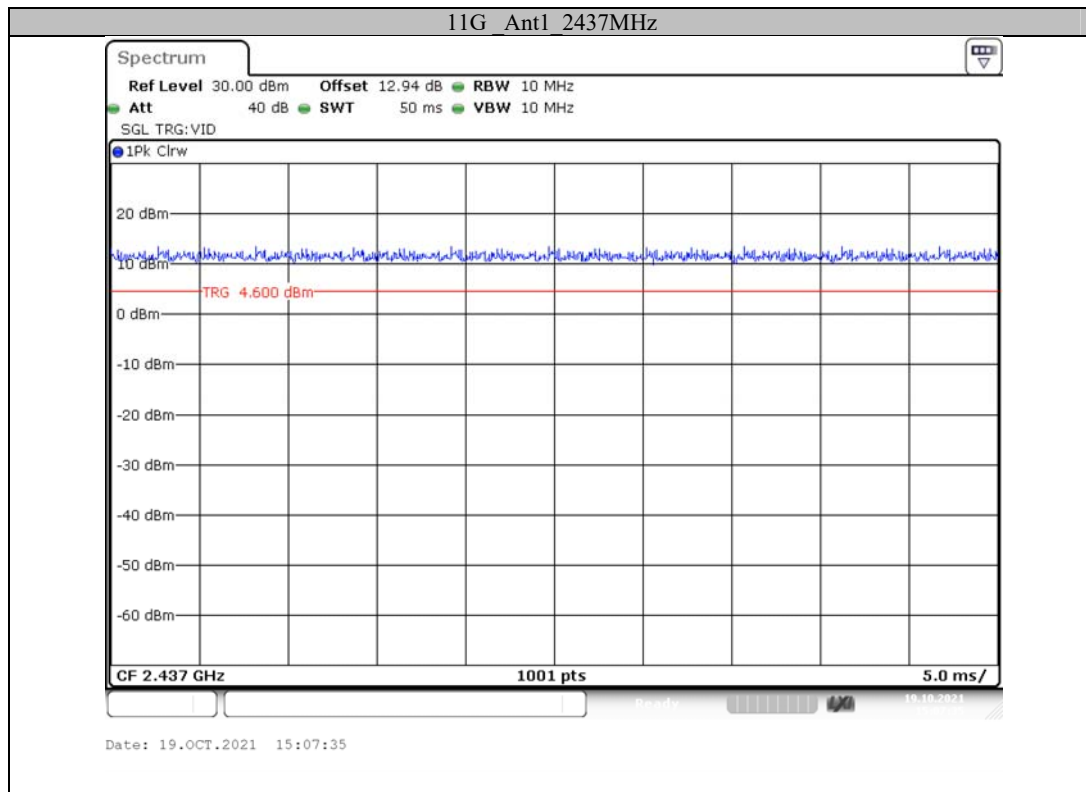
Appendix F: Duty Cycle

Test Result

TestMode	Antenna	Channel [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	Ant1	2437	50.00	50.00	100.00
11G	Ant1	2437	50.00	50.00	100.00
11N20SISO	Ant1	2437	50.00	50.00	100.00

Test Graphs





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