

TEST REPORT

Applicant Name : Feit Electric Company
Address : 4901 Gregg Road, Pico Rivera, California, United States
Report Number : SZ2220117-02412E-00A
FCC ID: SYW-PR38RGBWCA

Test Standard (s)

FCC PART 15.247

Sample Description

Product: LED Lamp
Trademark: FEIT
Tested Model: PAR38/RGBW/CA/AG (C)
Date Received: 2022-01-17
Date of Test: 2022-01-24 to 2022-02-15
Report Date: 2022-02-16

Test Result:	Pass*
--------------	-------

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

Prepared and Checked By:

Ting Lü

Ting Lü
EMC Engineer

Approved By:

Candy Li

Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

Shenzhen Accurate Technology Co., Ltd. is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk "★". Customer model name, addresses, names, trademarks etc. are not considered data.

This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

Shenzhen Accurate Technology Co., Ltd.

1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China
Tel: +86 755-26503290 Fax: +86 755-26503396 Web: www.atc-lab.com

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	6
EUT EXERCISE SOFTWARE	6
DUTY CYCLE	6
SUPPORT EQUIPMENT LIST AND DETAILS	7
EXTERNAL I/O CABLE.....	7
BLOCK DIAGRAM OF TEST SETUP	7
SUMMARY OF TEST RESULTS.....	9
TEST EQUIPMENT LIST	10
FCC §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)	11
FCC §15.203 - ANTENNA REQUIREMENT.....	12
APPLICABLE STANDARD	12
ANTENNA CONNECTOR CONSTRUCTION	12
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS	13
APPLICABLE STANDARD	13
EUT SETUP	13
EMI TEST RECEIVER SETUP.....	13
TEST PROCEDURE	13
TRANSD FACTOR & MARGIN CALCULATION.....	14
TEST DATA	14
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS.....	17
APPLICABLE STANDARD	17
EUT SETUP	17
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	18
TEST PROCEDURE	18
FACTOR & MARGIN CALCULATION	18
TEST DATA	18
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH.....	25
APPLICABLE STANDARD	25
TEST PROCEDURE	25
TEST DATA	25
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER.....	26
APPLICABLE STANDARD	26
TEST PROCEDURE	26
TEST DATA	26
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE.....	27
APPLICABLE STANDARD	27
TEST PROCEDURE	27
TEST DATA	27
FCC §15.247(e) - POWER SPECTRAL DENSITY	28

APPLICABLE STANDARD	28
TEST PROCEDURE	28
TEST DATA	28
APPENDIX Wi-Fi.....	29
APPENDIX A: 6dB EMISSION BANDWIDTH.....	29
APPENDIX B: OCCUPIED CHANNEL BANDWIDTH	36
APPENDIX C: MAXIMUM CONDUCTED OUTPUT PEAK POWER	43
APPENDIX D: POWER SPECTRAL DENSITY	44
APPENDIX E: BAND EDGE MEASUREMENTS.....	51
APPENDIX F: DUTY CYCLE	55

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

Product	LED Lamp
Tested Model	PAR38/RGBW/CA/AG (C)
Frequency Range	Wi-Fi: 2412-2462MHz
Maximum Conducted Peak Output Power	Wi-Fi: 17.41dBm(802.11b), 14.87dBm(802.11g), 13.97dBm(802.11n20), 13.94dBm(802.11n40)
Modulation Technique	Wi-Fi: DSSS, OFDM
Antenna Specification*	PCB Antenna: 2.5dBi(provided by the applicant)
Voltage Range	AC 120V/60Hz
Sample number	SZ2220117-02412E-RF-S1 (Assigned by ATC)
Sample/EUT Status	Good condition

Objective

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

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

Test Methodology

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

And KDB 558074 D01 15.247 Meas Guidance v05r02.

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

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF 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, 802.11n-HT20 and 802.11n-HT40 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.
802.11n-HT40 mode was tested with Channel 3, 6 and 9.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

“Wifi Test Tool v1.6.0 release”* software was used to test and power level as below:

Mode	Data rate	Power Level*		
		Low Channel	Middle Channel	High Channel
802.11b	1 Mbps	17	17	17
802.11g	6 Mbps	35	35	35
802.11n-HT20	MCS0	32	32	32
802.11n-HT40	MCS0	36	36	36

The worse-case data rates are determined to be as above for each mode based upon investigations by measuring the output power and PSD across all data rates, bandwidths and modulations.

Duty cycle

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

Support Equipment List and Details

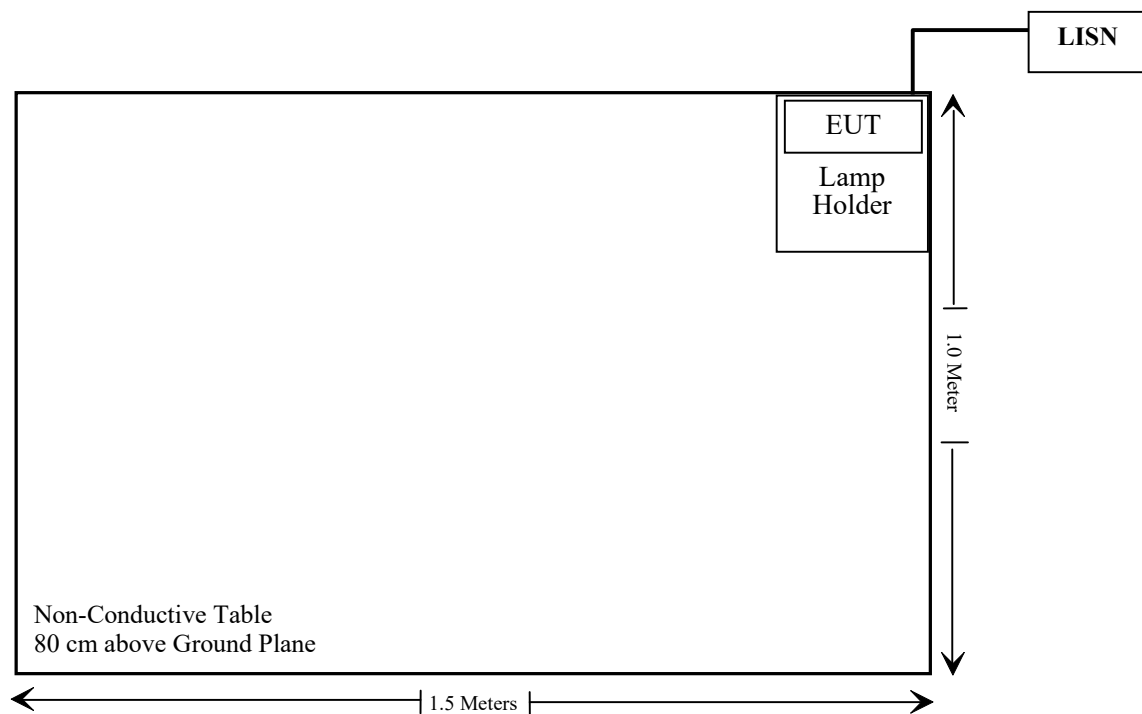
Manufacturer	Description	Model	Serial Number
De Li	Lamp Holder	DL-0027G	Unknown

External I/O Cable

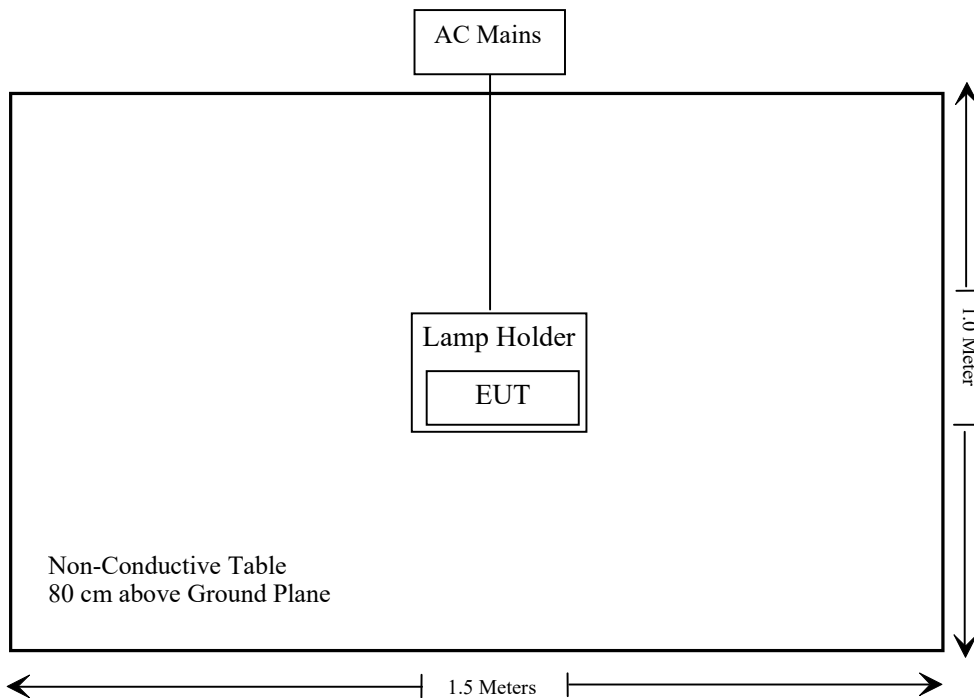
Cable Description	Length (m)	From Port	To
Unshielded Un-Detachable Power Cable	1.64	Lamp Holder	LISN

Block Diagram of Test Setup

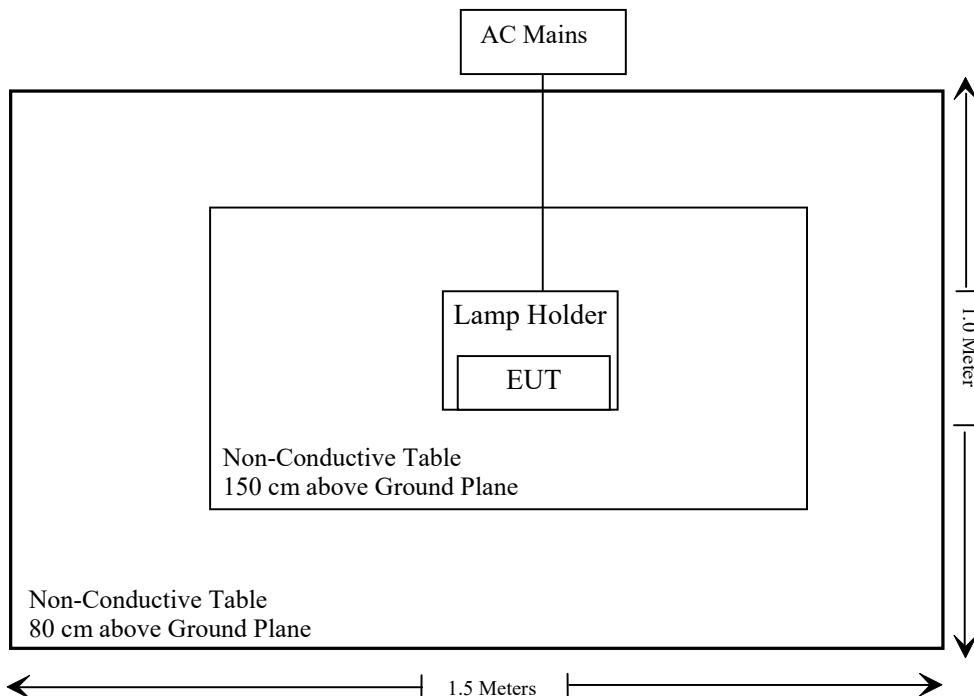
For conducted emission:



For Radiated emission:
Below 1GHz:



For radiated emission 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	EMI Test Receiver	ESCI	100784	2021/12/13	2022/12/12
Rohde & Schwarz	L.I.S.N.	ENV216	101314	2021/12/13	2022/12/12
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2021/12/13	2022/12/12
Unknown	RF Coaxial Cable	No.17	N0350	2021/12/14	2022/12/13
Conducted Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test					
Rohde & Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
Rohde & Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2021/11/09	2022/11/08
Quinstar	Amplifier	QLW-184055 36-J0	15964001002	2021/11/11	2022/11/10
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Wainwright	High Pass Filter	WHKX3.6/18 G-10SS	5	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.10	N050	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.15	N600	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.16	N650	2021/12/14	2022/12/13
Radiated Emission Test Software: e3 19821b (V9)					
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2021/12/13	2022/12/12
Rohde & Schwarz	Open Switch and Control Unit	OSP120 + OSP-B157	101244 + 100866	2021/12/13	2022/12/12
WEINSCHTEL	10dB Attenuator	5324	AU 3842	Each time	

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

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

Applicable Standard

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

Limits for General Population/Uncontrolled Exposure

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

f = frequency in MHz

* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

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

S = power density (in appropriate units, e.g. mW/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/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2412-2462	2.5	1.78	18	63.10	20	0.022	1

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

Result: Compliant.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

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

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has one internal PCB antenna used arrangement for Wi-Fi, which was permanently attached and the antenna gain is 2.5dBi, fulfill the requirement of this section. Please refer to the EUT photos.

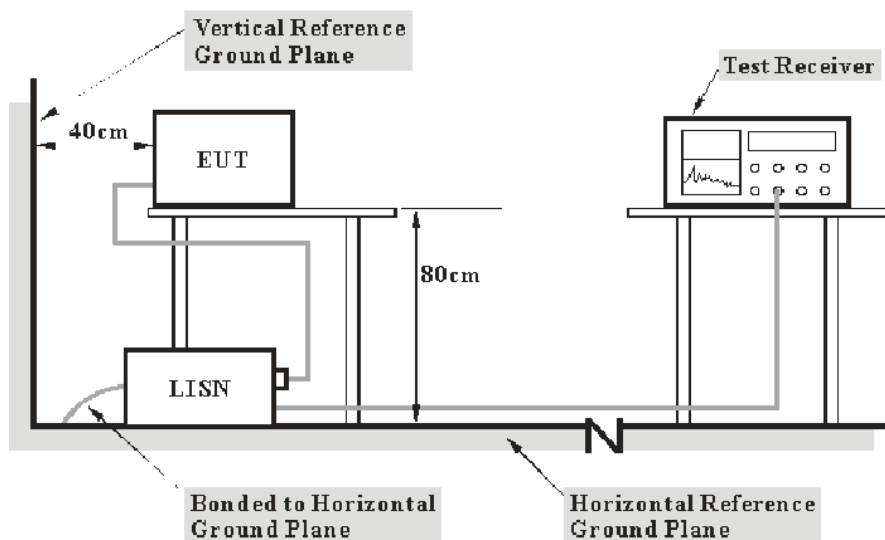
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

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

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

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

Test Procedure

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.

Factor & Margin Calculation

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

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

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

$$\begin{aligned}\text{Over Limit} &= \text{Level} - \text{Limit} \\ \text{Level} &= \text{Read Level} + \text{Factor}\end{aligned}$$

Test Data

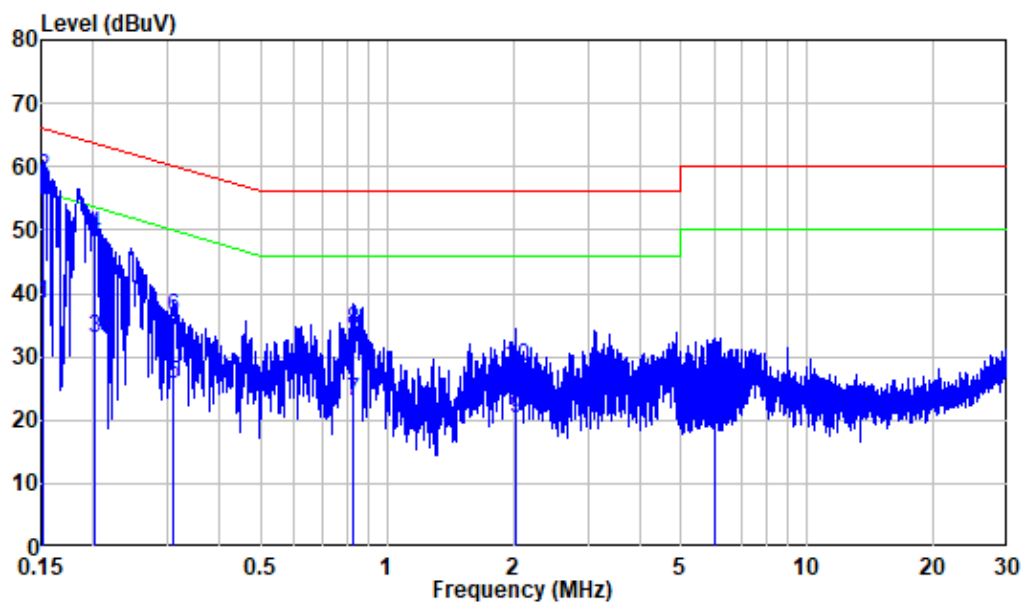
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	64 %
ATM Pressure:	101.0 kPa

The testing was performed by Bin Duan on 2022-02-15.

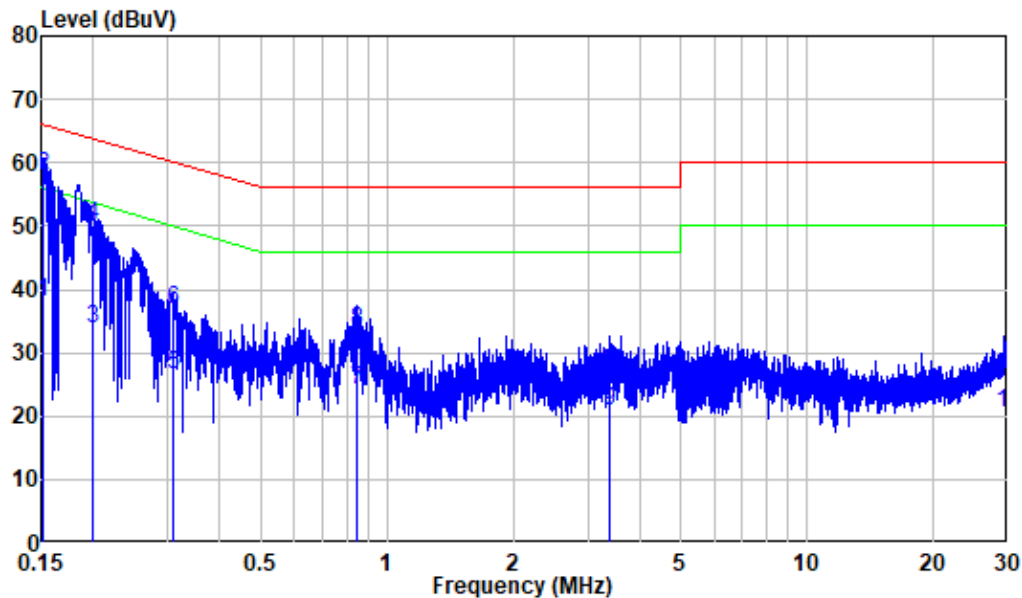
EUT operation mode: Transmitting (Worst case for 802.11B, middle channel)

AC 120V/60 Hz, Line



Site : Shielding Room
 Condition: Line
 Mode : Transmitting
 Model : PAR38/RGBW/CA/AG (C)
 Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.151	9.90	28.40	38.30	55.93	-17.63	Average
2	0.151	9.90	48.48	58.38	65.93	-7.55	QP
3	0.202	9.80	23.01	32.81	53.52	-20.71	Average
4	0.202	9.80	39.46	49.26	63.52	-14.26	QP
5	0.309	9.80	15.75	25.55	49.99	-24.44	Average
6	0.309	9.80	26.54	36.34	59.99	-23.65	QP
7	0.834	9.81	12.99	22.80	46.00	-23.20	Average
8	0.834	9.81	24.42	34.23	56.00	-21.77	QP
9	2.029	9.92	10.29	20.21	46.00	-25.79	Average
10	2.029	9.92	18.40	28.32	56.00	-27.68	QP
11	6.020	10.03	8.34	18.37	50.00	-31.63	Average
12	6.020	10.03	16.11	26.14	60.00	-33.86	QP

AC 120V/60 Hz, Neutral

Site : Shielding Room
 Condition: Neutral
 Mode : Transmitting
 Model : PAR38/RGBW/CA/AG (C)
 Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.152	9.80	28.15	37.95	55.87	-17.92	Average
2	0.152	9.80	48.09	57.89	65.87	-7.98	QP
3	0.200	9.80	24.15	33.95	53.62	-19.67	Average
4	0.200	9.80	40.23	50.03	63.62	-13.59	QP
5	0.308	9.80	16.74	26.54	50.03	-23.49	Average
6	0.308	9.80	27.07	36.87	60.03	-23.16	QP
7	0.843	9.81	14.27	24.08	46.00	-21.92	Average
8	0.843	9.81	23.68	33.49	56.00	-22.51	QP
9	3.375	9.83	11.05	20.88	46.00	-25.12	Average
10	3.375	9.83	17.11	26.94	56.00	-29.06	QP
11	29.960	10.20	10.32	20.52	50.00	-29.48	Average
12	29.960	10.20	15.26	25.46	60.00	-34.54	QP

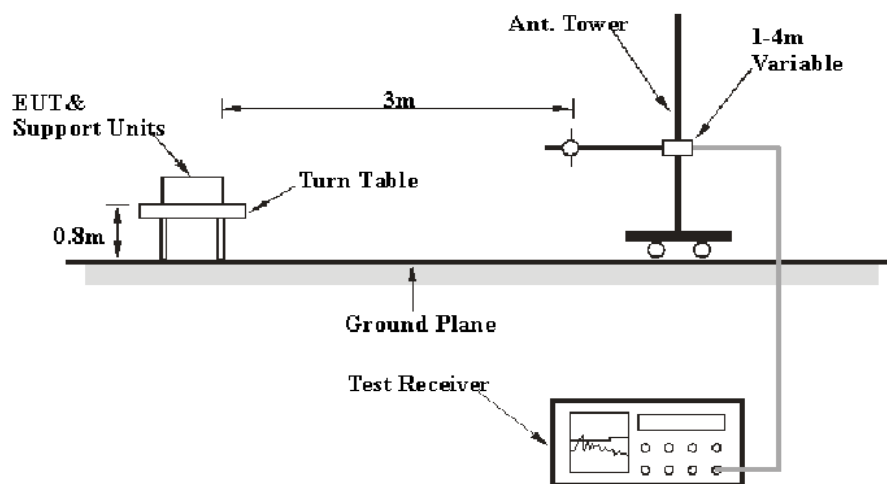
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

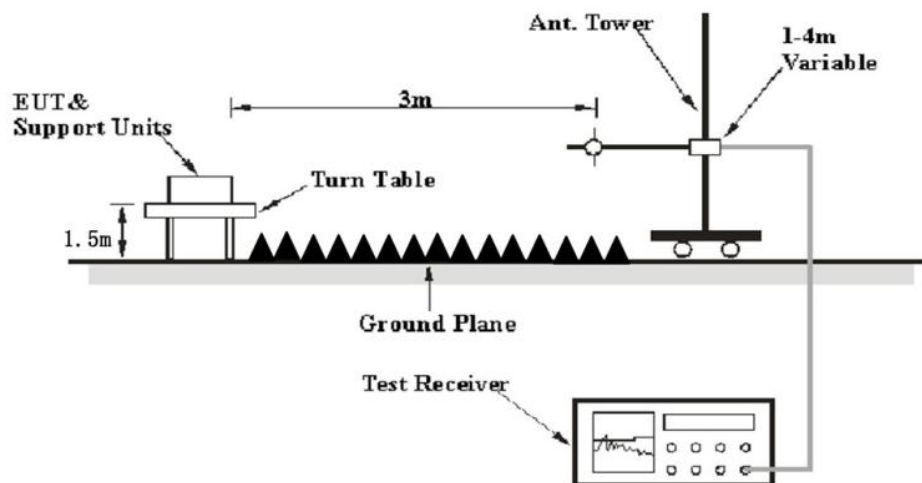
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



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

EMI Test Receiver & Spectrum Analyzer Setup

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

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

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

Note 2: when duty cycle is less than 98%

Test Procedure

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

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

Factor & Margin Calculation

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

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

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

$$\begin{aligned} \text{Over Limit/Margin} &= \text{Level} / \text{Corrected Amplitude} - \text{Limit} \\ \text{Level} / \text{Corrected Amplitude} &= \text{Read Level} + \text{Factor} \end{aligned}$$

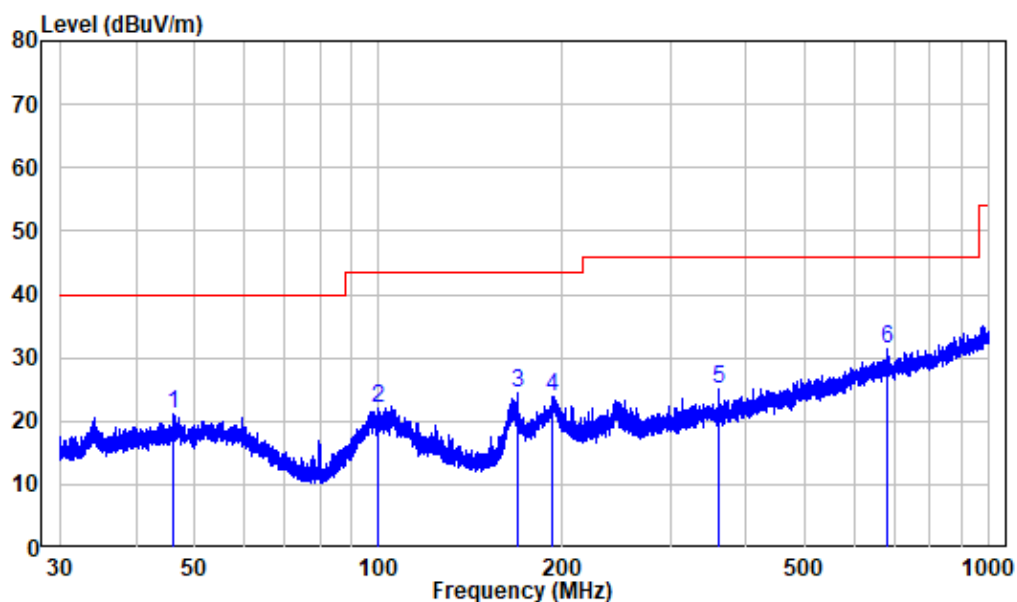
Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50-64 %
ATM Pressure:	101.0 kPa

The testing was performed by Chao Mo on 2022-01-24 for below 1GHz and 2022-02-15 for above 1GHz.

EUT operation mode: Transmitting (Scan with 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40, the worst case as below)

30MHz-1GHz: (Worst case for 802.11B, middle channel)**Horizontal:**

Site : chamber

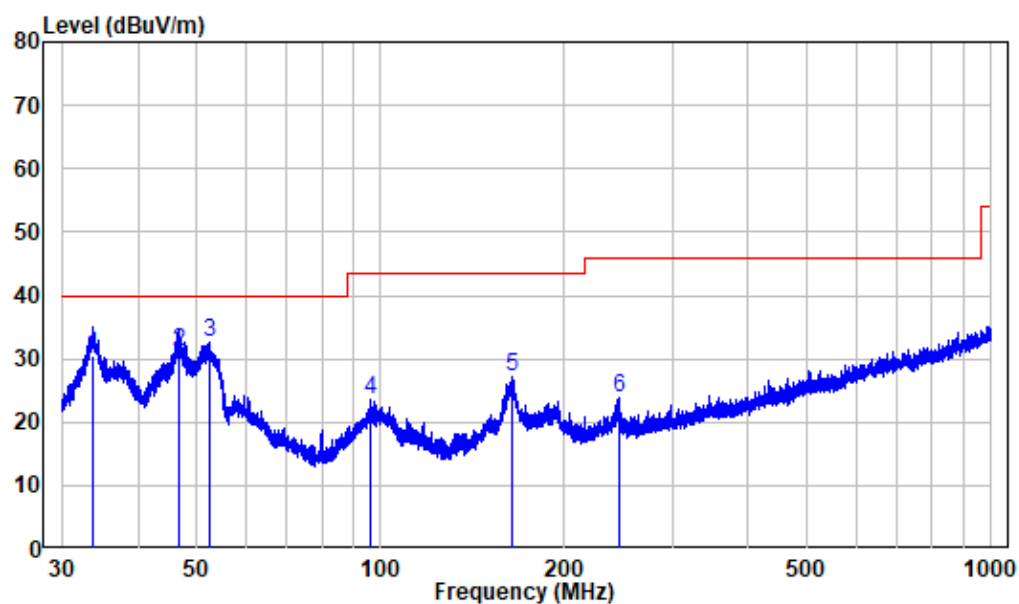
Condition: 3m Horizontal

Job No. : SZ2220117-02412E-RF

Test Mode: Transmitting

	Freq	Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	45.996	-9.99	31.08	21.09	40.00	-18.91	Peak
2	99.703	-11.86	34.03	22.17	43.50	-21.33	Peak
3	168.783	-13.70	38.08	24.38	43.50	-19.12	Peak
4	192.166	-11.26	35.25	23.99	43.50	-19.51	Peak
5	360.606	-7.67	32.77	25.10	46.00	-20.90	Peak
6	679.066	-1.52	32.84	31.32	46.00	-14.68	Peak

Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No. : SZ2220117-02412E-RF
 Test Mode: Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	33.725	-11.89	42.49	30.60	40.00	-9.40	QP
2	46.646	-10.00	41.20	31.20	40.00	-8.80	QP
3	52.368	-10.04	42.54	32.50	40.00	-7.50	Peak
4	96.436	-12.30	35.95	23.65	43.50	-19.85	Peak
5	164.474	-14.22	41.52	27.30	43.50	-16.20	Peak
6	245.305	-10.58	34.39	23.81	46.00	-22.19	Peak

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/QP/Ave		Height (m)	Polar (H/V)				
802.11B, Low Channel									
2310	50.21	PK	66	1.9	H	-7.23	42.98	74	-31.02
2310	50.17	PK	314	1.9	V	-7.23	42.94	74	-31.06
2390	50.96	PK	98	1.6	H	-7.21	43.75	74	-30.25
2390	51.03	PK	114	1.8	V	-7.21	43.82	74	-30.18
4824	47.85	PK	291	1.8	H	-3.53	44.32	74	-29.68
4824	48.8	PK	190	2.0	V	-3.53	45.27	74	-28.73
802.11B, Middle Channel									
4874	47.96	PK	214	2.0	H	-3.42	44.54	74	-29.46
4874	49.40	PK	344	1.2	V	-3.42	45.98	74	-28.02
11B, High Channel									
2483.5	53.52	PK	350	2.1	H	-7.2	46.32	74	-27.68
2483.5	52.75	PK	215	1.7	V	-7.2	45.55	74	-28.45
2500	52.09	PK	62	1.7	H	-7.18	44.91	74	-29.09
2500	51.91	PK	119	2.2	V	-7.18	44.73	74	-29.27
4924	47.43	PK	280	1.7	H	-3.16	44.27	74	-29.73
4924	48.52	PK	89	2.0	V	-3.16	45.36	74	-28.64
802.11G, Low Channel									
2310	49.97	PK	151	2.0	H	-7.23	42.74	74	-31.26
2310	50.07	PK	210	1.2	V	-7.23	42.84	74	-31.16
2390	50.8	PK	82	1.7	H	-7.21	43.59	74	-30.41
2390	50.76	PK	318	2.0	V	-7.21	43.55	74	-30.45
4824	47.29	PK	121	1.7	H	-3.53	43.76	74	-30.24
4824	48.08	PK	41	1.3	V	-3.53	44.55	74	-29.45
802.11G, Middle Channel									
4874	47.55	PK	214	2.0	H	-3.42	44.13	74	-29.87
4874	47.77	PK	344	1.2	V	-3.42	44.35	74	-29.65
802.11G, High Channel									
2483.5	53.79	PK	115	2.1	H	-7.2	46.59	74	-27.41
2483.5	53.22	PK	306	1.8	V	-7.2	46.02	74	-27.98
2500	51.74	PK	301	1.0	H	-7.18	44.56	74	-29.44
2500	51.79	PK	269	2.2	V	-7.18	44.61	74	-29.39
4924	47.07	PK	215	1.7	H	-3.16	43.91	74	-30.09
4924	47.37	PK	243	1.8	V	-3.16	44.21	74	-29.79
802.11N20, Low Channel									
2310	50.21	PK	59	1.0	H	-7.23	42.98	74	-31.02
2310	49.91	PK	353	1.0	V	-7.23	42.68	74	-31.32
2390	50.69	PK	122	1.6	H	-7.21	43.48	74	-30.52
2390	50.36	PK	150	1.3	V	-7.21	43.15	74	-30.85
4824	47.02	PK	343	1.5	H	-3.53	43.49	74	-30.51
4824	47.41	PK	251	1.2	V	-3.53	43.88	74	-30.12
802.11N20, Middle Channel									
4874	47.31	PK	214	2.0	H	-3.42	43.89	74	-30.11
4874	47.68	PK	344	1.2	V	-3.42	44.26	74	-29.74
802.11N20, High Channel									
2483.5	53.17	PK	263	1.6	H	-7.2	45.97	74	-28.03
2483.5	53.33	PK	75	2.0	V	-7.2	46.13	74	-27.87
2500	51.06	PK	190	2.0	H	-7.18	43.88	74	-30.12

2500	50.8	PK	30	1.9	V	-7.18	43.62	74	-30.38
4924	45.95	PK	168	1.6	H	-3.16	42.79	74	-31.21
4924	46.85	PK	143	1.6	V	-3.16	43.69	74	-30.31
802.11N40, Low Channel									
2310	50.21	PK	26	1.2	H	-7.23	42.98	74	-31.02
2310	50.65	PK	123	1.9	V	-7.23	43.42	74	-30.58
2390	50.77	PK	117	1.7	H	-7.21	43.56	74	-30.44
2390	50.98	PK	146	1.1	V	-7.21	43.77	74	-30.23
4844	47.43	PK	201	1.5	H	-3.54	43.89	74	-30.11
4844	47.19	PK	145	1.8	V	-3.54	43.65	74	-30.35
802.11N40, Middle Channel									
4874	47.21	PK	276	1.9	H	-3.42	43.79	74	-30.21
4874	48.01	PK	210	1.6	V	-3.42	44.59	74	-29.41
802.11N40, High Channel									
2483.5	48.1	PK	138	2.0	H	-3.26	44.84	74	-29.16
2483.5	47.39	PK	309	1.4	V	-3.26	44.13	74	-29.87
2500	45.91	PK	287	1.5	V	-3.26	42.65	74	-31.35
2500	46.29	PK	118	1.2	H	-3.16	43.13	74	-30.87
4904	45.95	PK	16	1.7	V	-3.16	42.79	74	-31.21
4904	48.1	PK	138	2.0	H	-3.26	44.84	74	-29.16

Note:

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

Corrected Amplitude = Corrected Factor + Reading

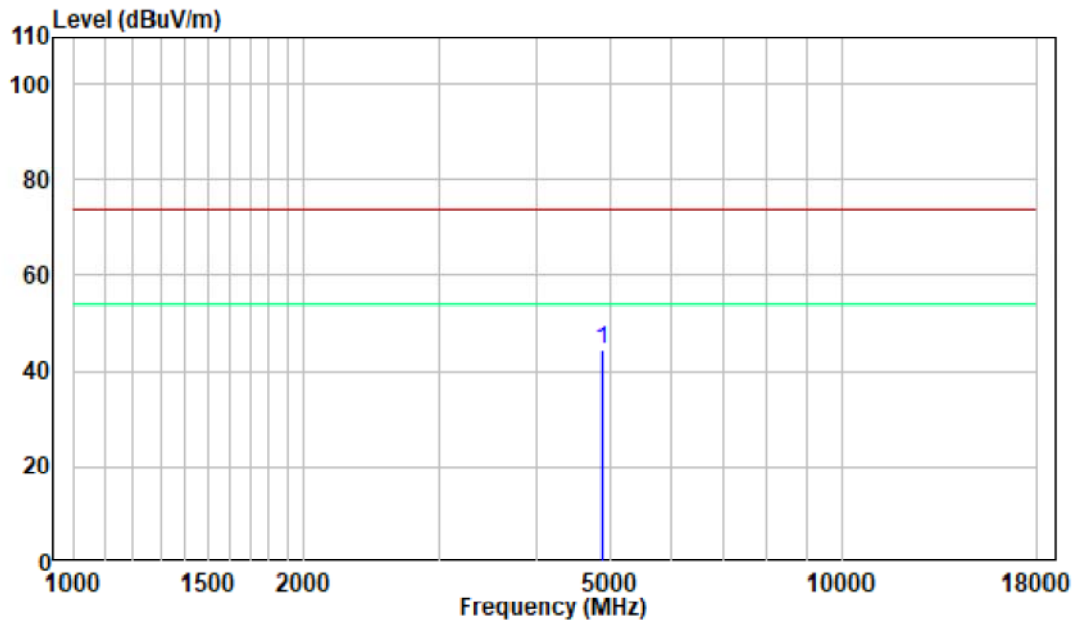
Margin = Corrected Amplitude- Limit

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

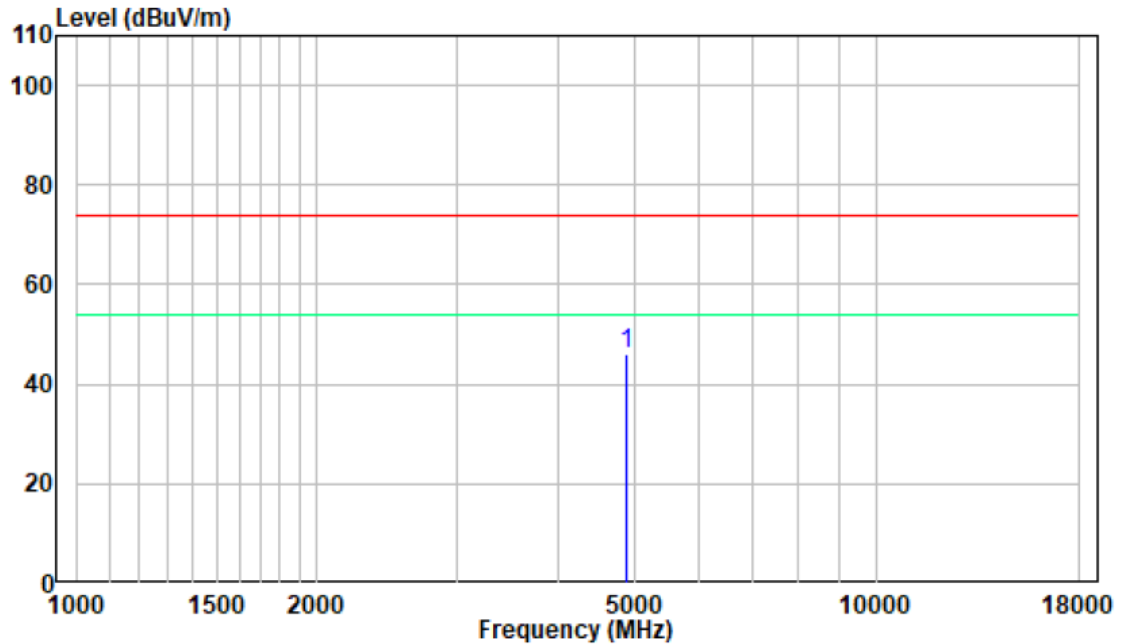
The test result of peak was 20dB below to the limit of peak, which can be compliant to the average limit, so just peak value was recorded.

1-18 GHz:
Pre-scan plots:

802.11B Middle Channel
Horizontal

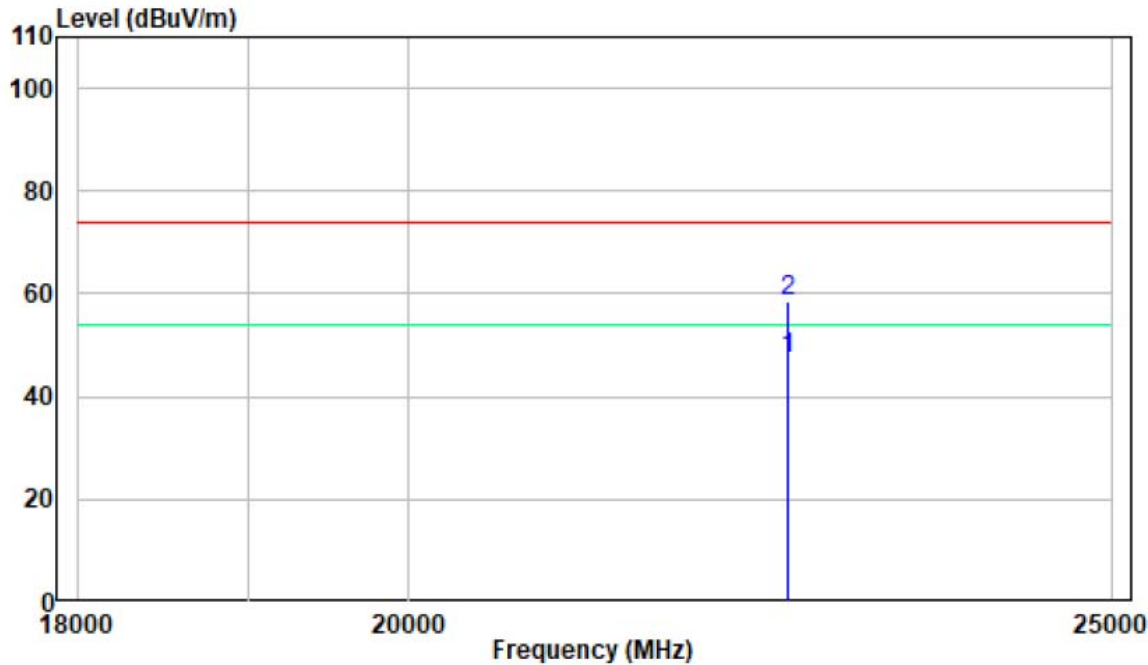


Vertical

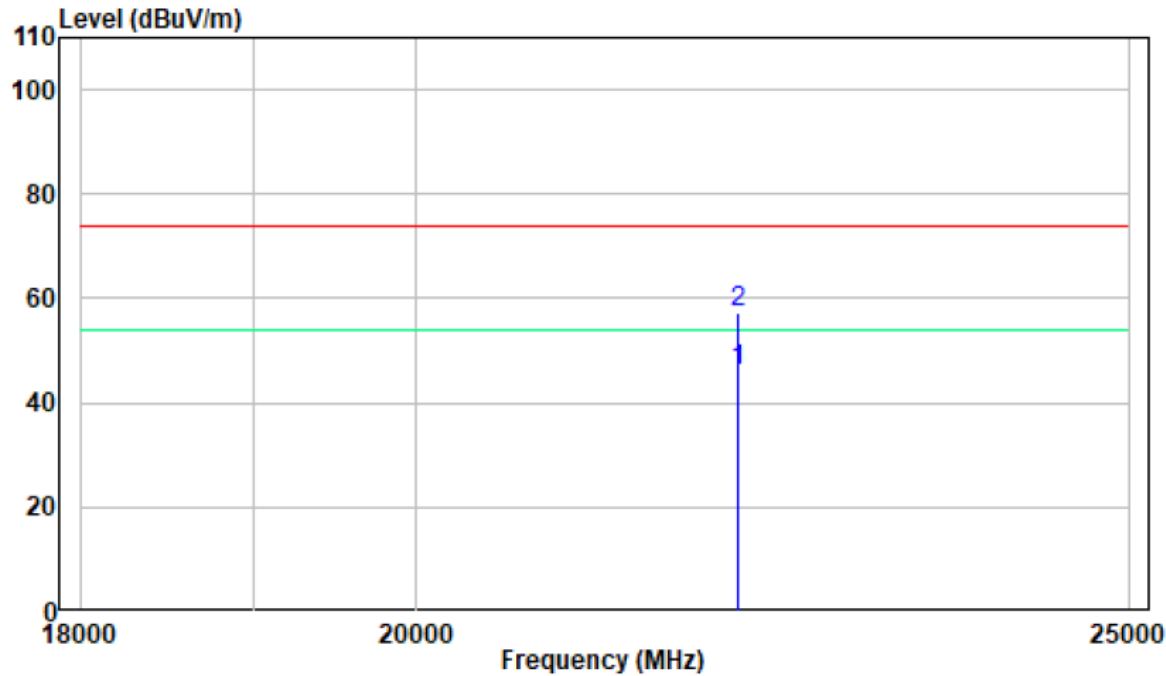


18 -25GHz:
Pre-scan plots:

802.11B Middle Channel
Horizontal



Vertical



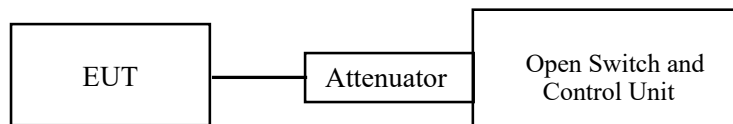
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

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 Paul Liu on 2022-01-24

EUT operation mode: Transmitting

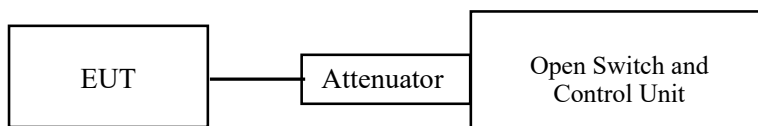
Test Result: Compliant. Please refer to the Appendix Wi-Fi.

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 Paul Liu on 2022-01-24

EUT operation mode: Transmitting

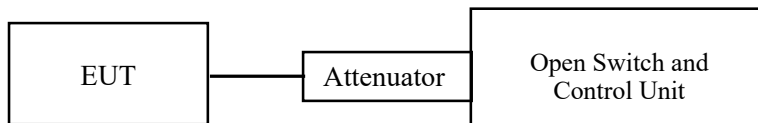
Test Result: Compliant. Please refer to the Appendix Wi-Fi.

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 Paul Liu on 2022-01-24.

EUT operation mode: Transmitting

Test Result: Compliant.

Conducted Band Edge Result:

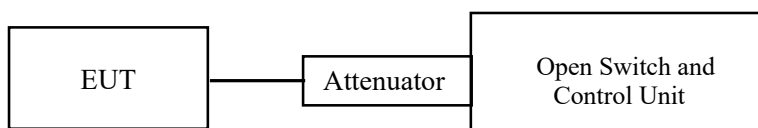
Please refer to the Appendix Wi-Fi.

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 Paul Liu on 2022-01-25

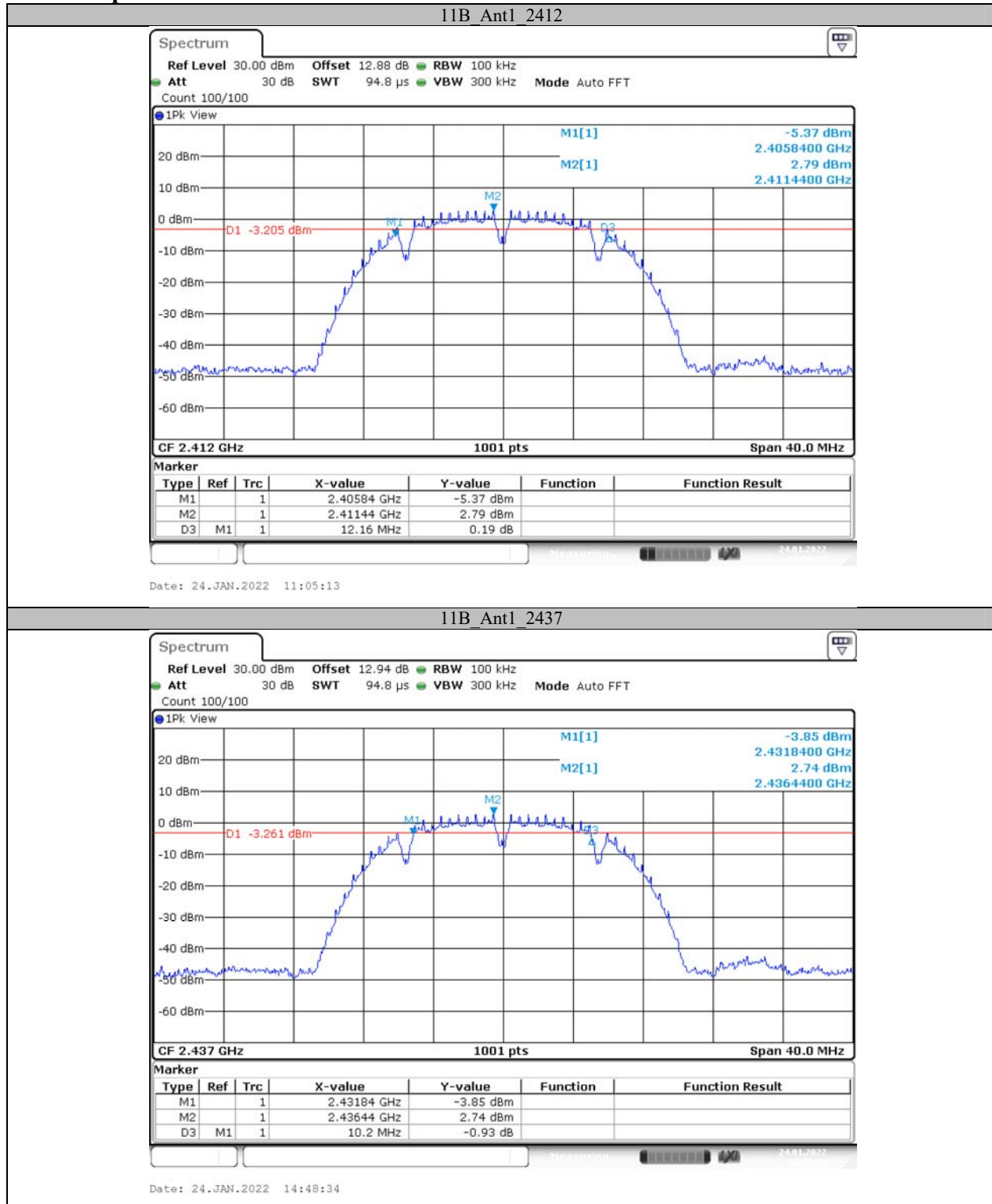
EUT operation mode: Transmitting

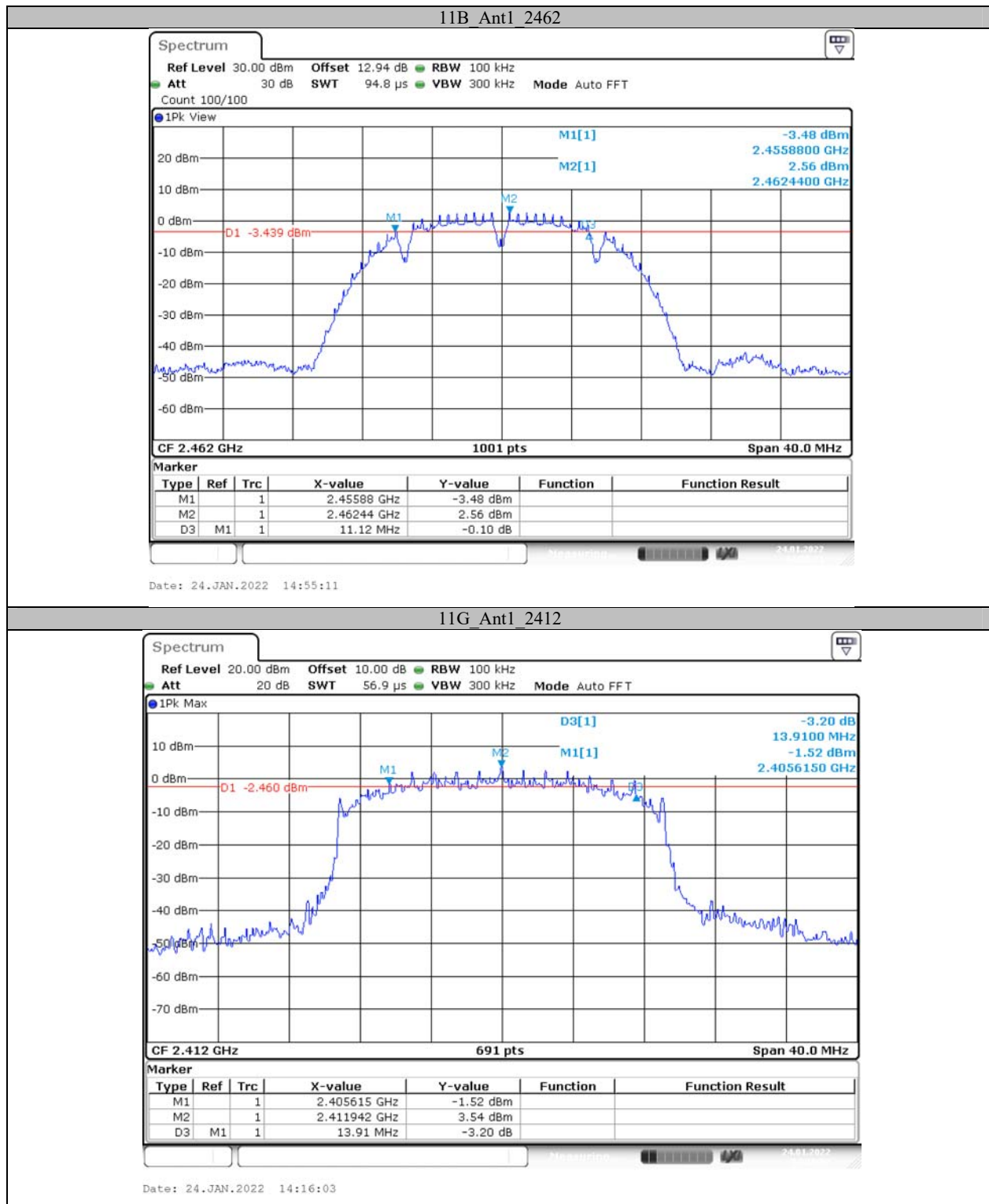
Test Result: Compliant. Please refer to the Appendix Wi-Fi.

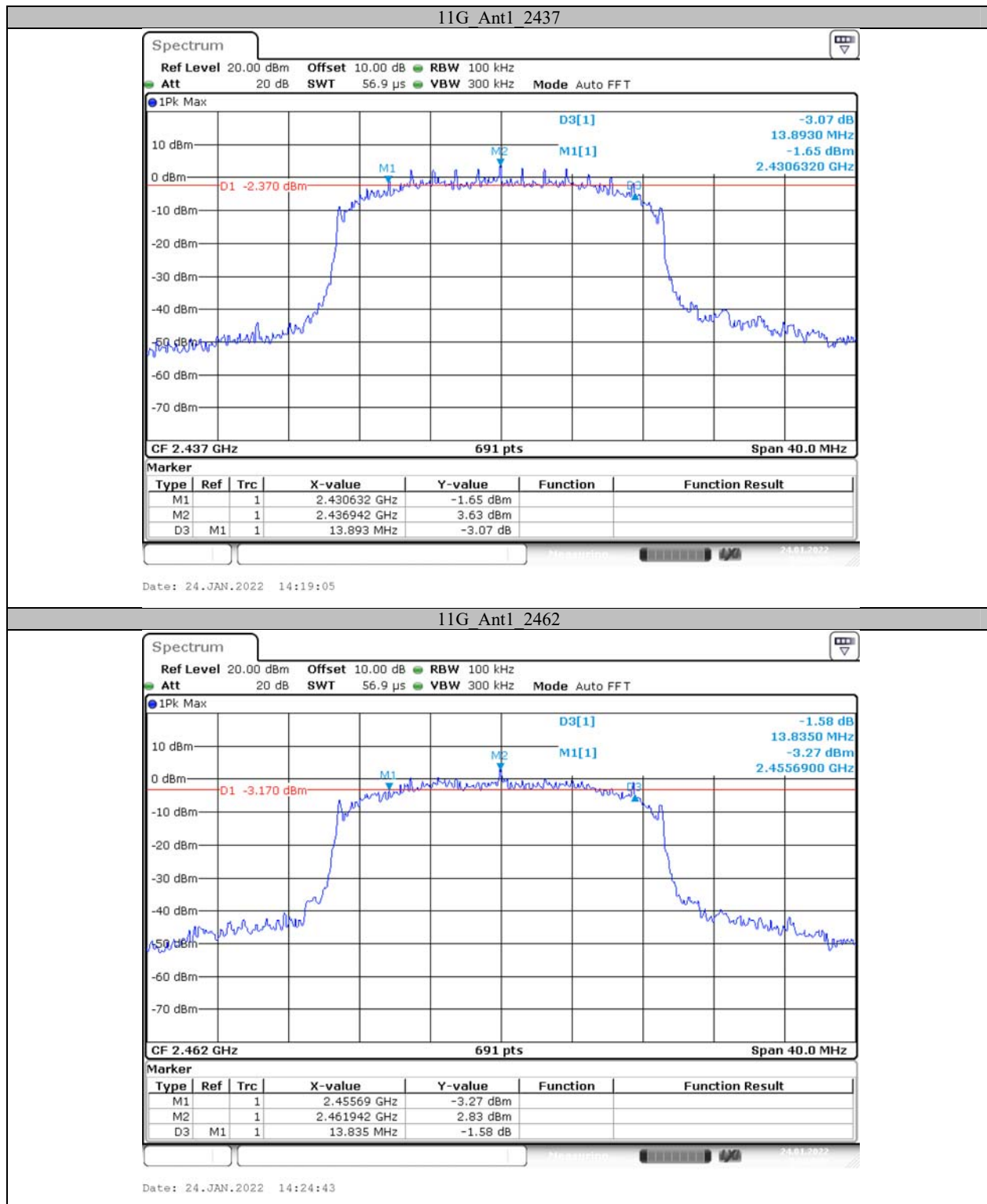
APPENDIX Wi-Fi**Appendix A: 6dB Emission Bandwidth****Test Result**

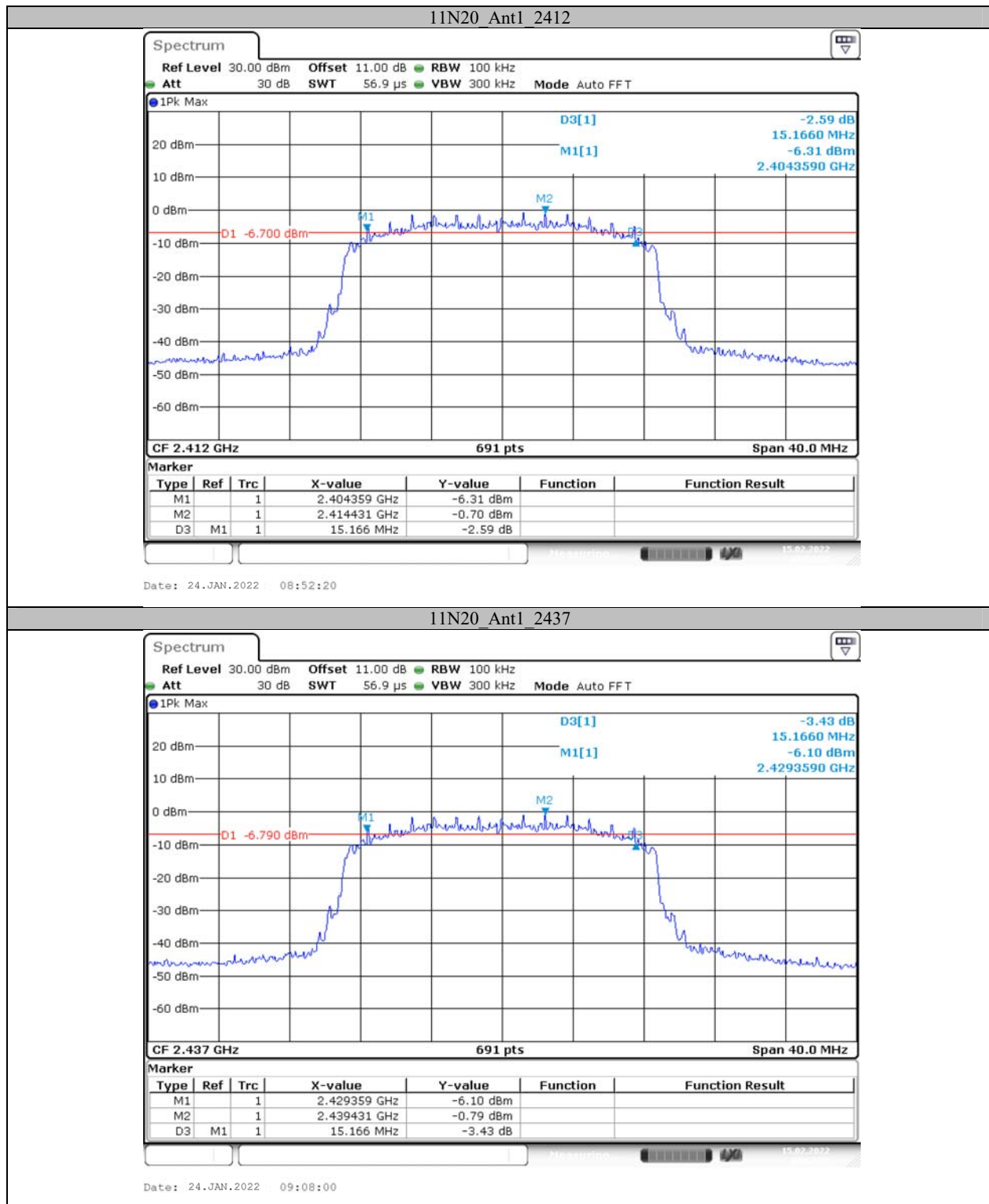
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	12.160	2405.840	2418.000	0.5	PASS
		2437	10.200	2431.840	2442.040	0.5	PASS
		2462	11.120	2455.880	2467.000	0.5	PASS
11G	Ant1	2412	13.910	2405.615	2411.942	0.5	PASS
		2437	13.893	2430.632	2436.942	0.5	PASS
		2462	13.835	2455.690	2461.942	0.5	PASS
11N20SISO	Ant1	2412	15.166	2404.359	2414.431	0.5	PASS
		2437	15.166	2429.359	2439.431	0.5	PASS
		2462	15.166	2454.359	2464.431	0.5	PASS
11N40SISO	Ant1	2422	33.920	2405.600	2439.520	0.5	PASS
		2437	34.000	2420.600	2454.600	0.5	PASS
		2452	33.920	2435.600	2469.520	0.5	PASS

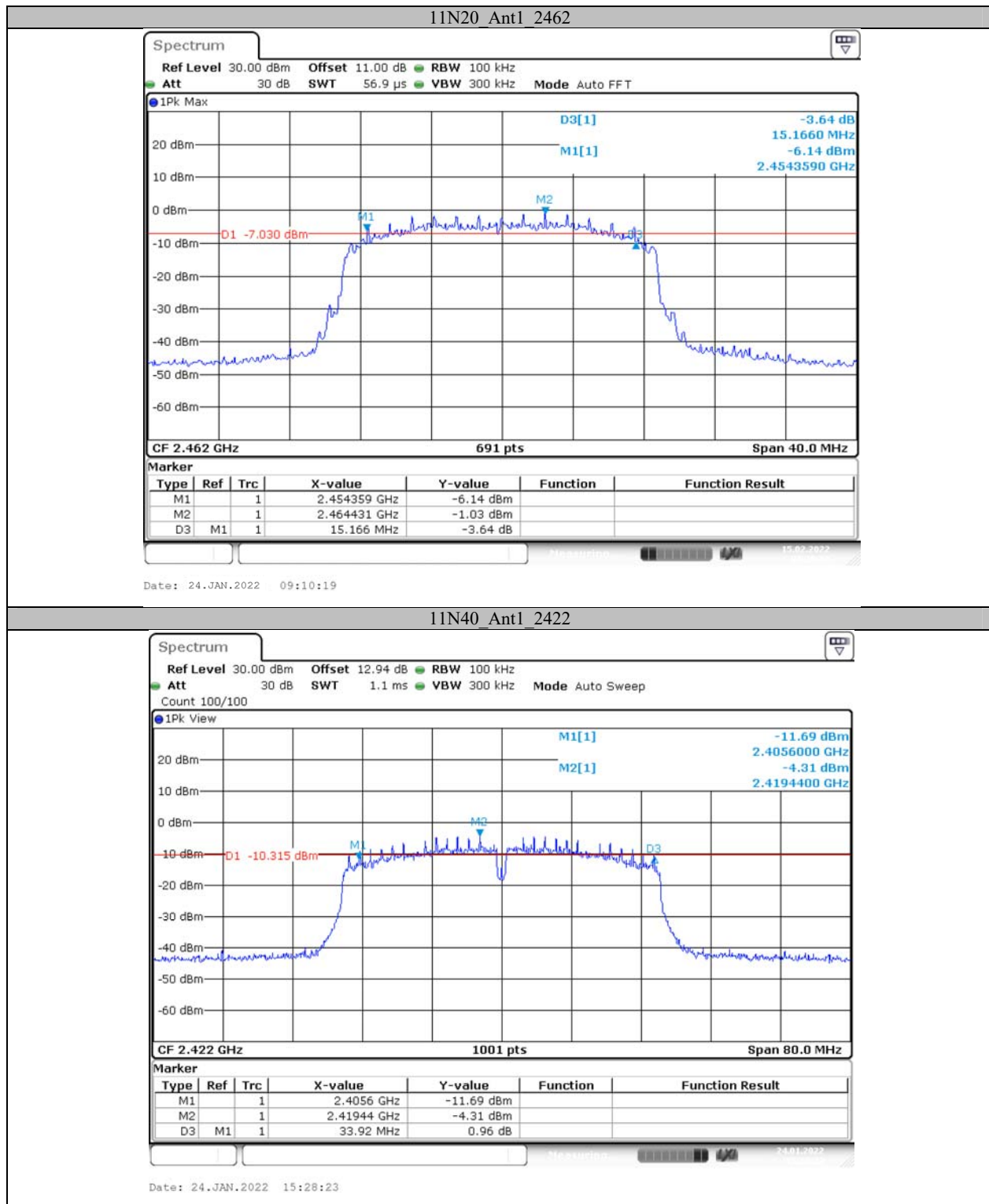
Test Graphs

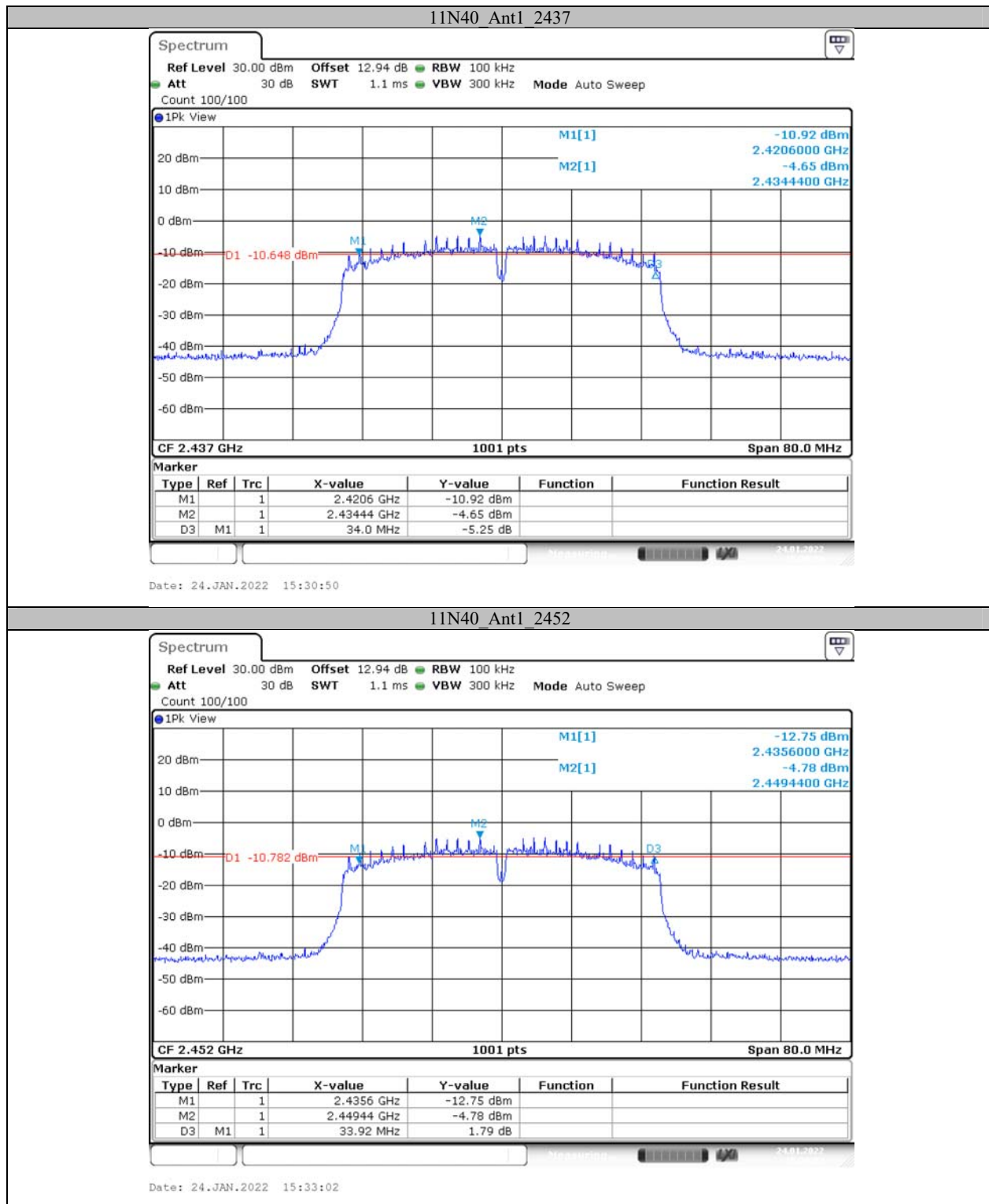








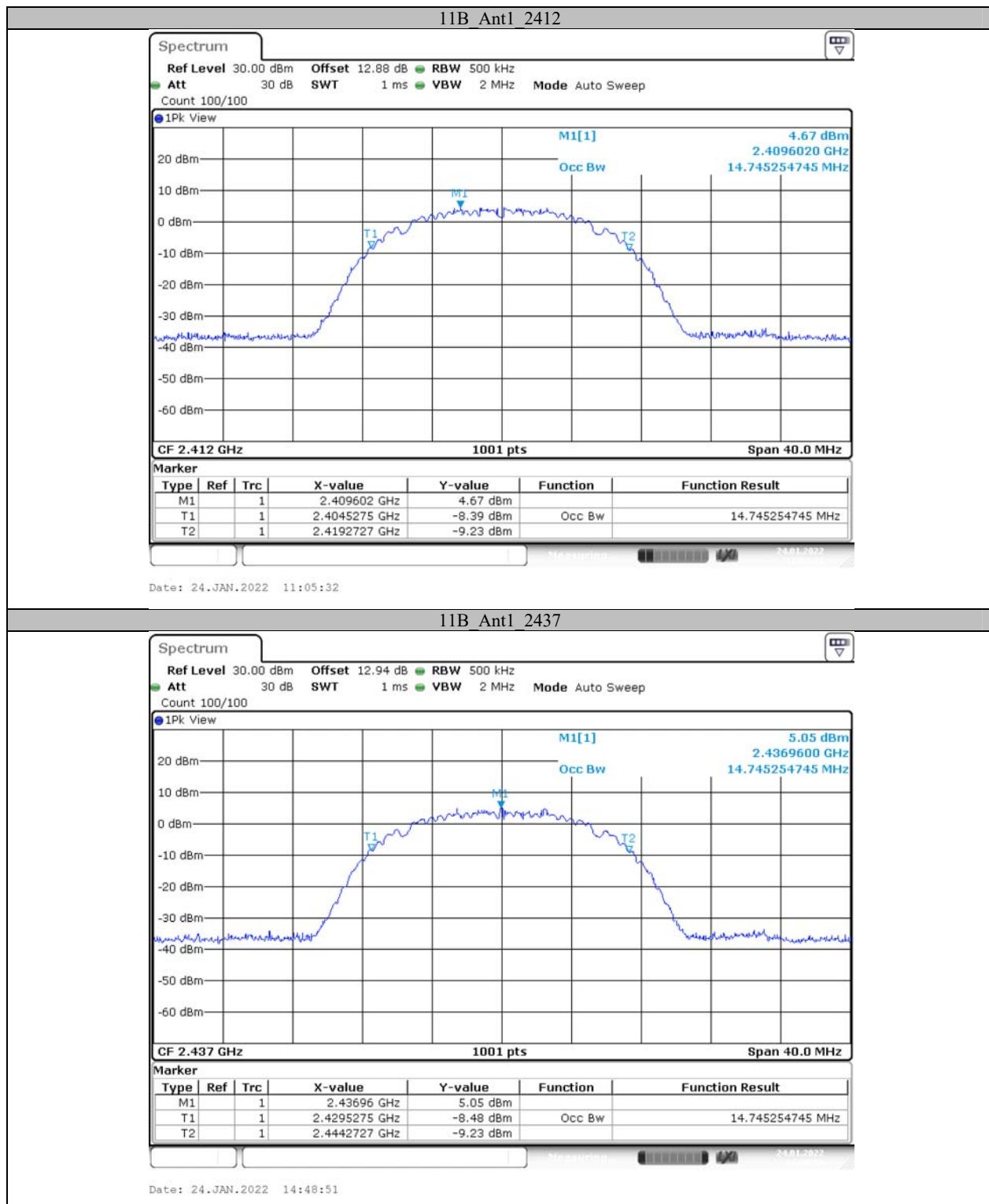


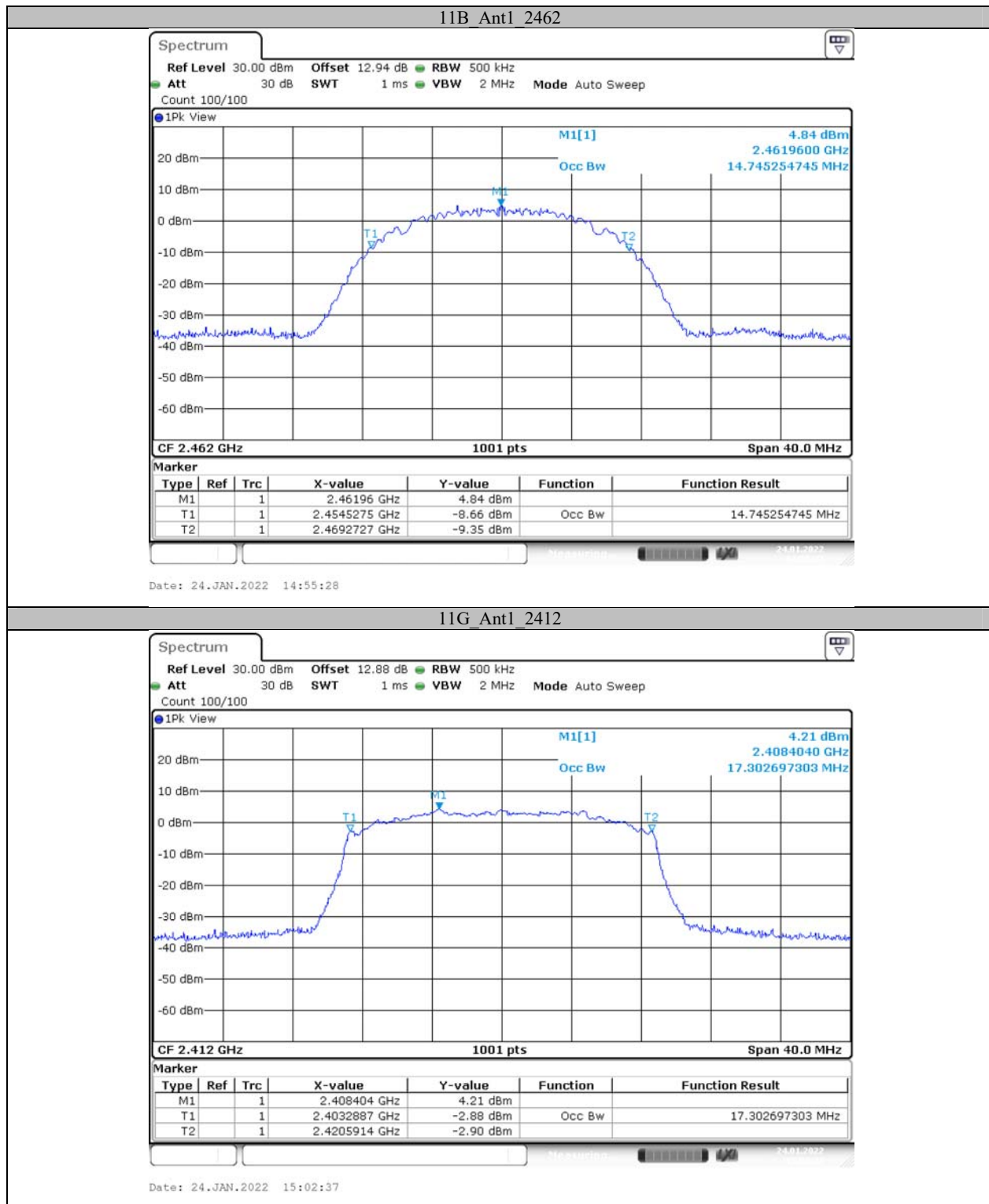


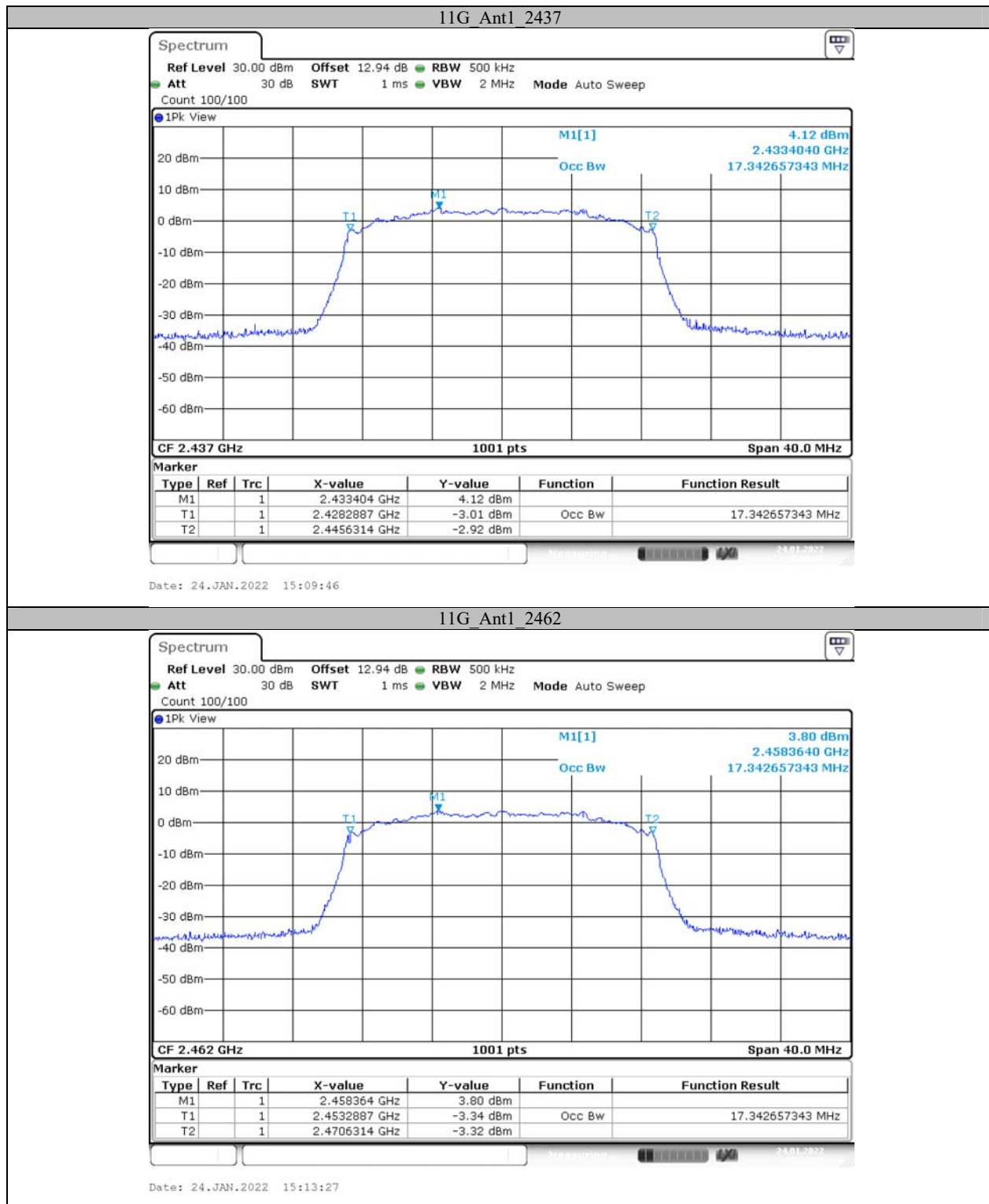
Appendix B: Occupied Channel Bandwidth**Test Result**

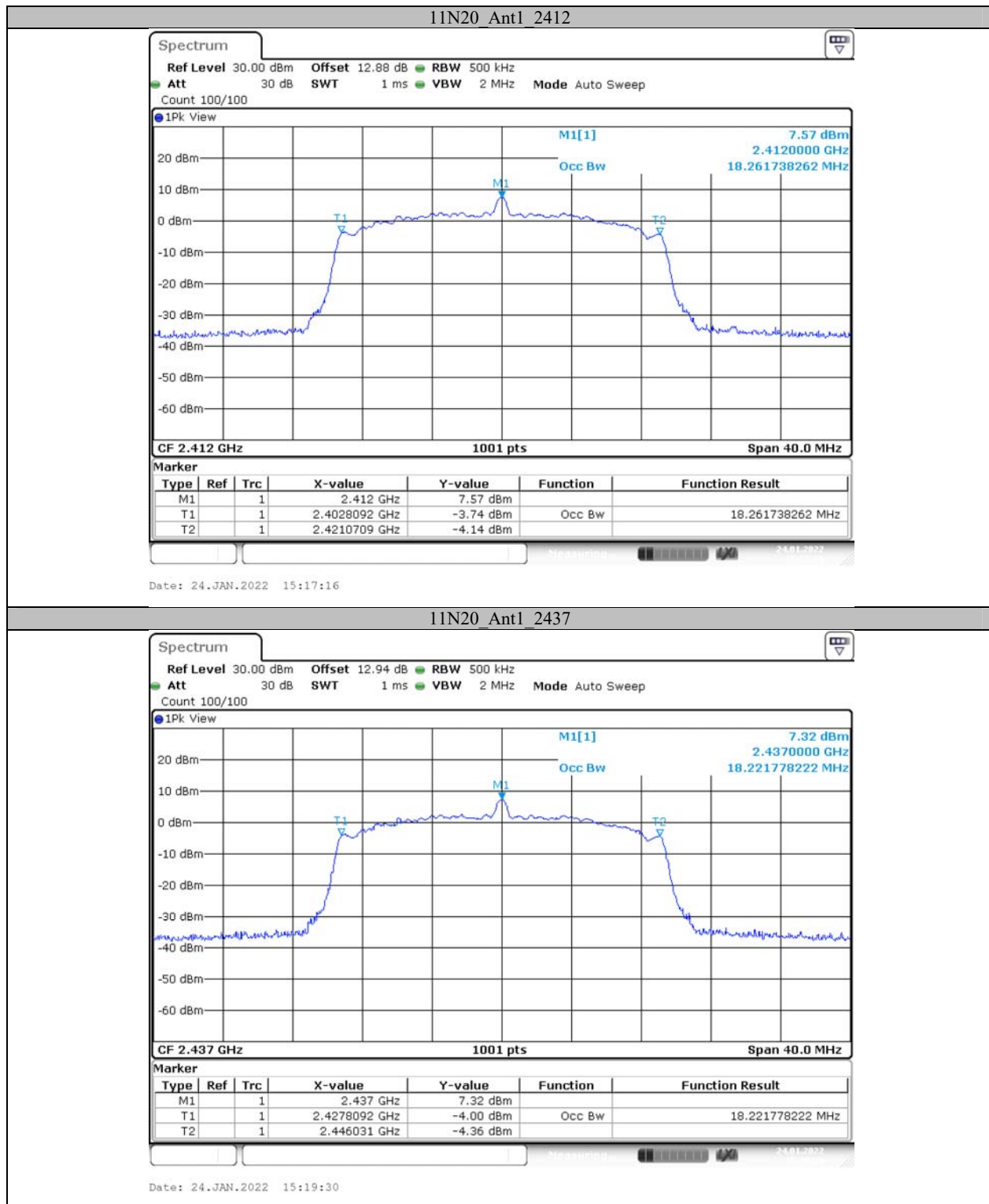
TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	14.745	2404.527	2419.273	---	PASS
		2437	14.745	2429.527	2444.273	---	PASS
		2462	14.745	2454.527	2469.273	---	PASS
11G	Ant1	2412	17.303	2403.289	2420.591	---	PASS
		2437	17.343	2428.289	2445.631	---	PASS
		2462	17.343	2453.289	2470.631	---	PASS
11N20SISO	Ant1	2412	18.262	2402.809	2421.071	---	PASS
		2437	18.222	2427.809	2446.031	---	PASS
		2462	18.222	2452.809	2471.031	---	PASS
11N40SISO	Ant1	2422	35.564	2404.178	2439.742	---	PASS
		2437	35.644	2419.178	2454.822	---	PASS
		2452	35.644	2434.178	2469.822	---	PASS

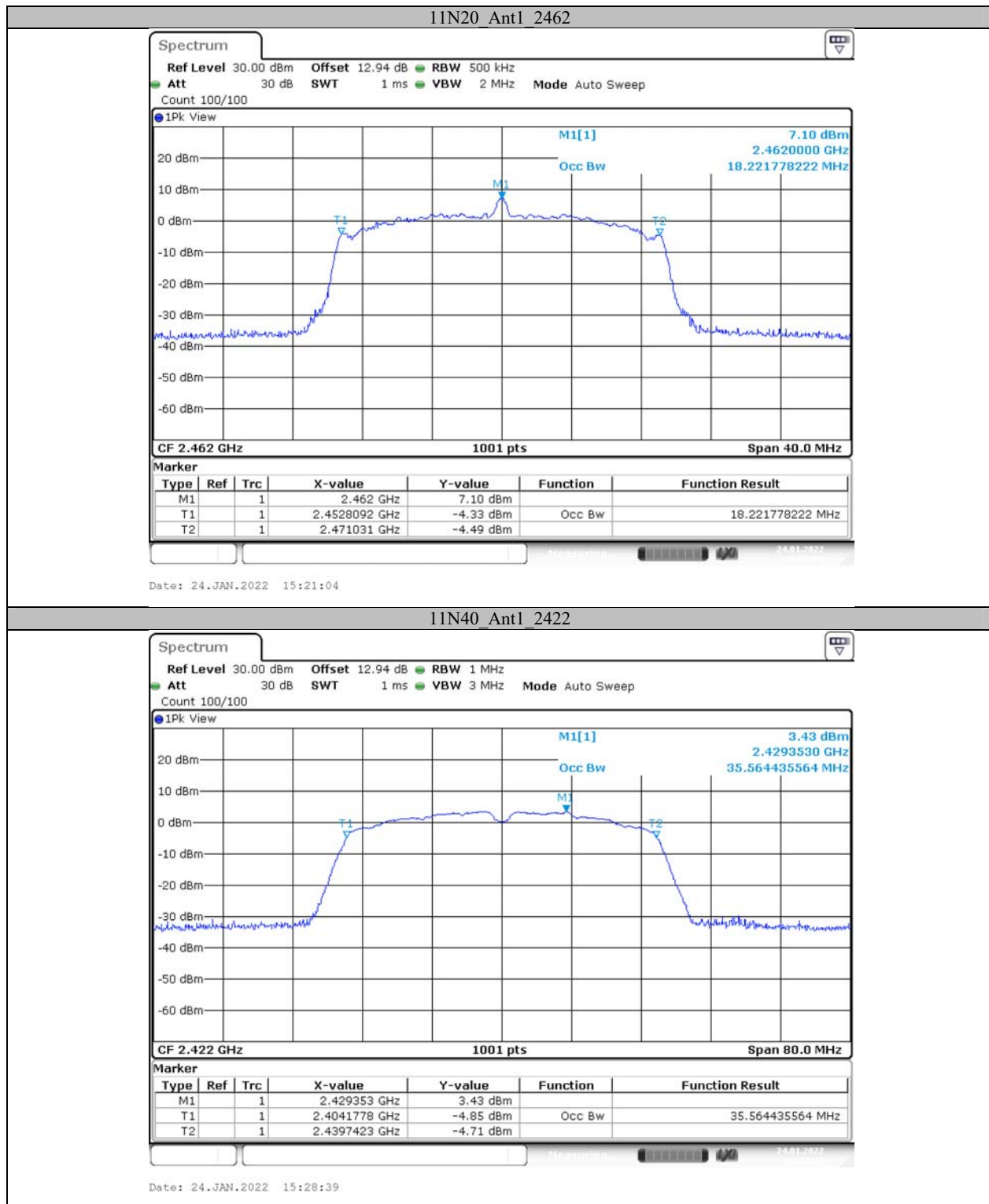
Test Graphs

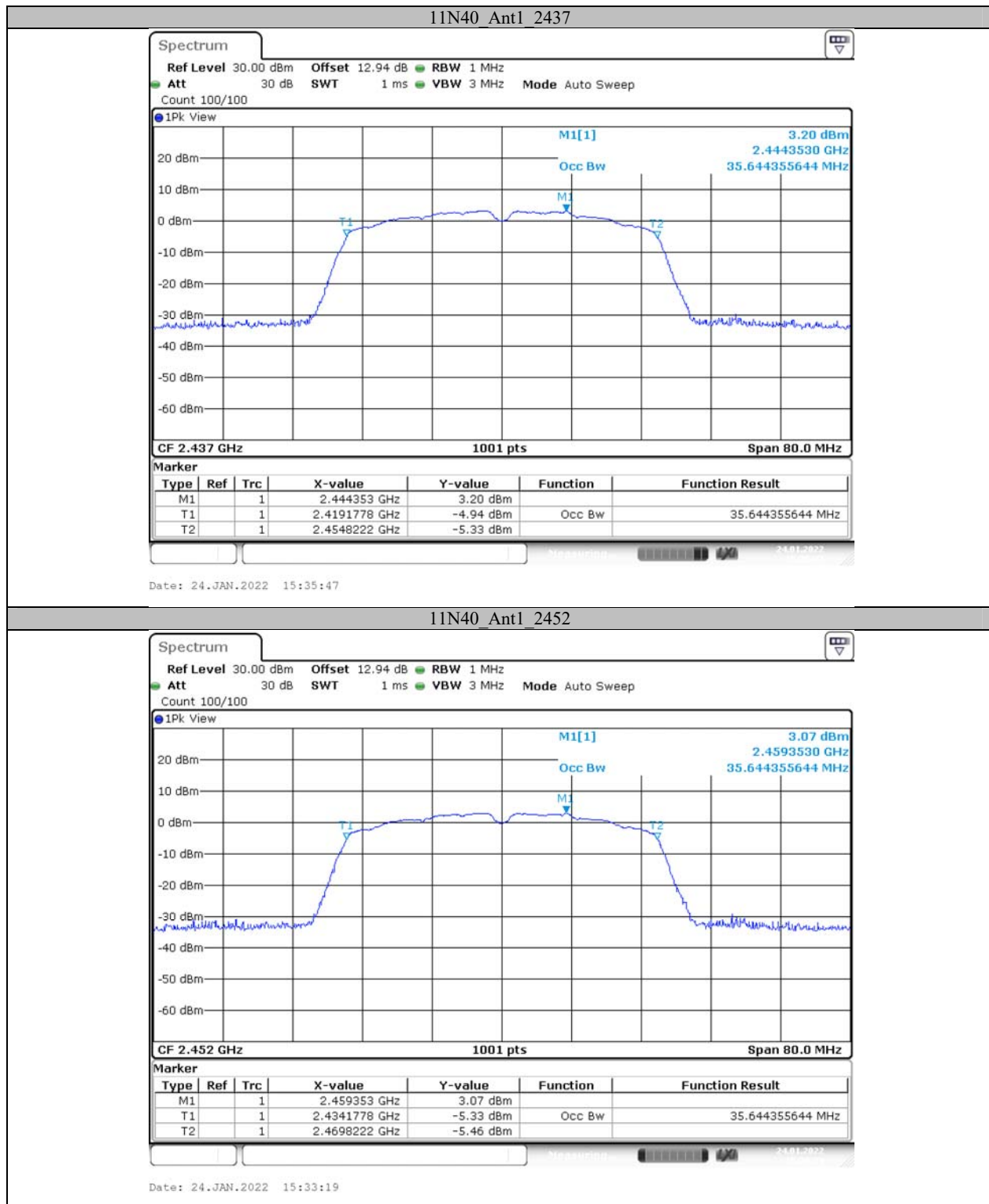












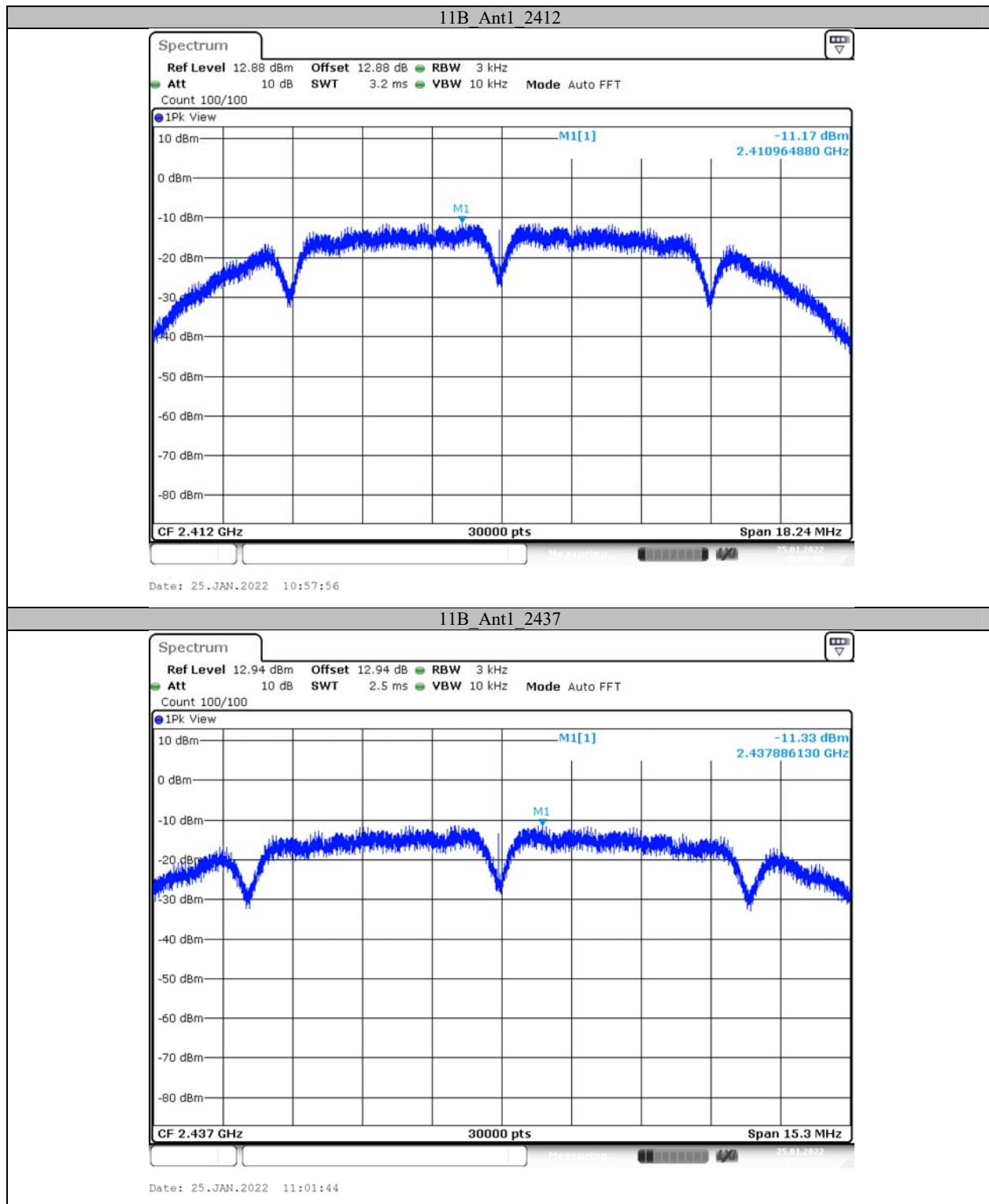
Test Graphs**Appendix C: Maximum Conducted Output Peak Power****Test Result**

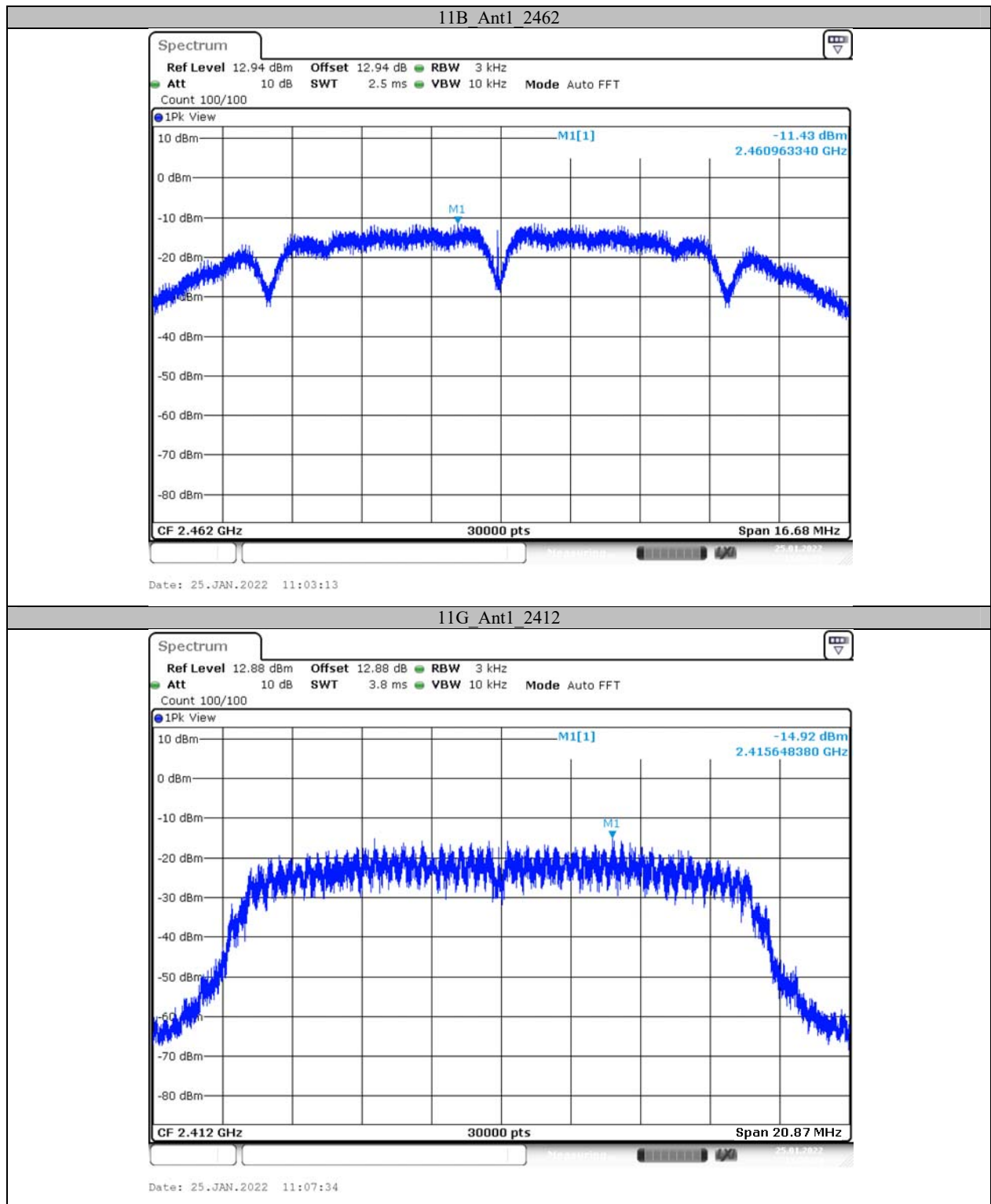
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	2412	17.36	<=30	PASS
		2437	17.41	<=30	PASS
		2462	16.38	<=30	PASS
11G	Ant1	2412	14.87	<=30	PASS
		2437	14.57	<=30	PASS
		2462	14.82	<=30	PASS
11N20SISO	Ant1	2412	13.97	<=30	PASS
		2437	13.87	<=30	PASS
		2462	13.32	<=30	PASS
11N40SISO	Ant1	2422	13.94	<=30	PASS
		2437	13.67	<=30	PASS
		2452	13.80	<=30	PASS

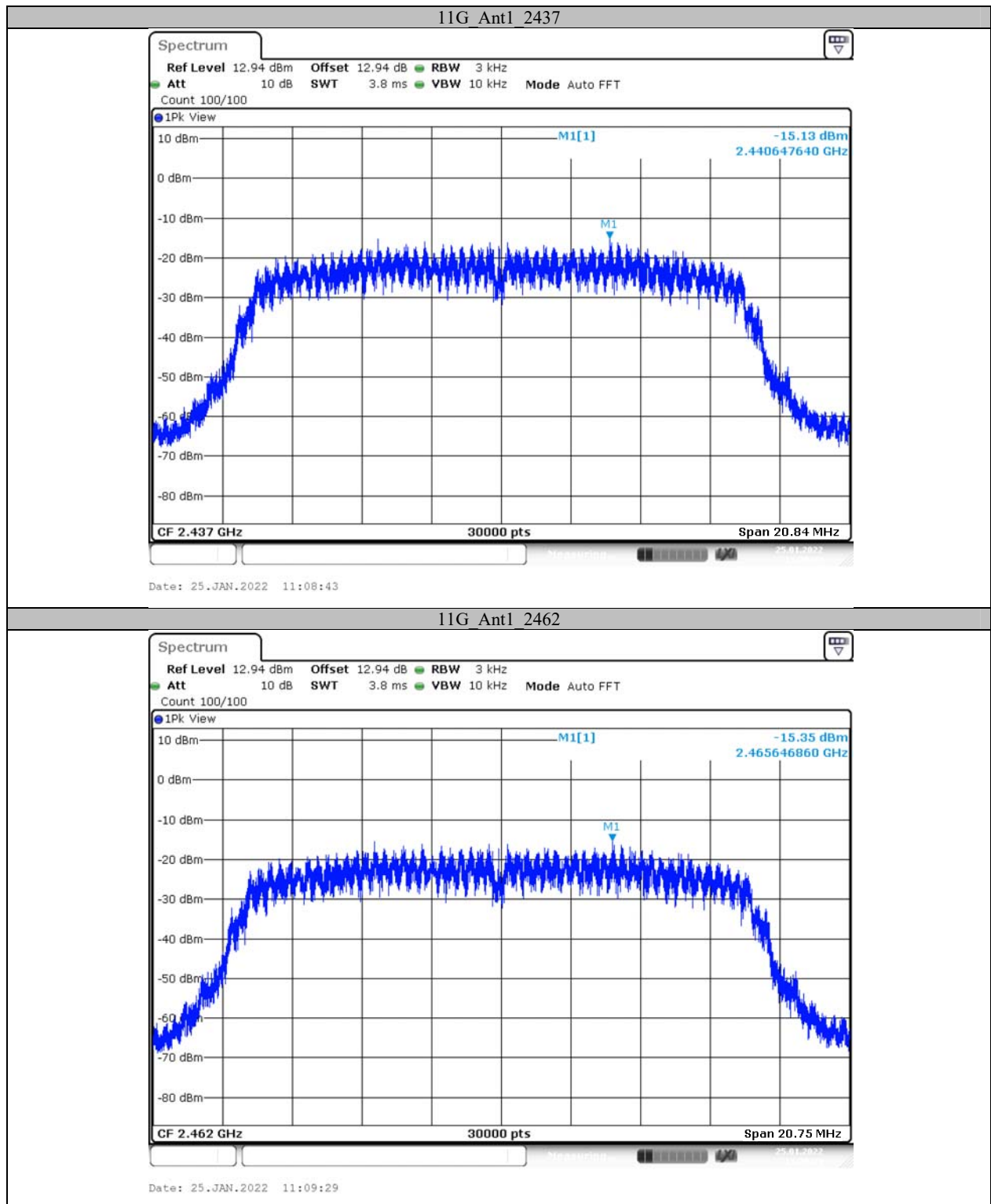
Appendix D: Power spectral density**Test Result**

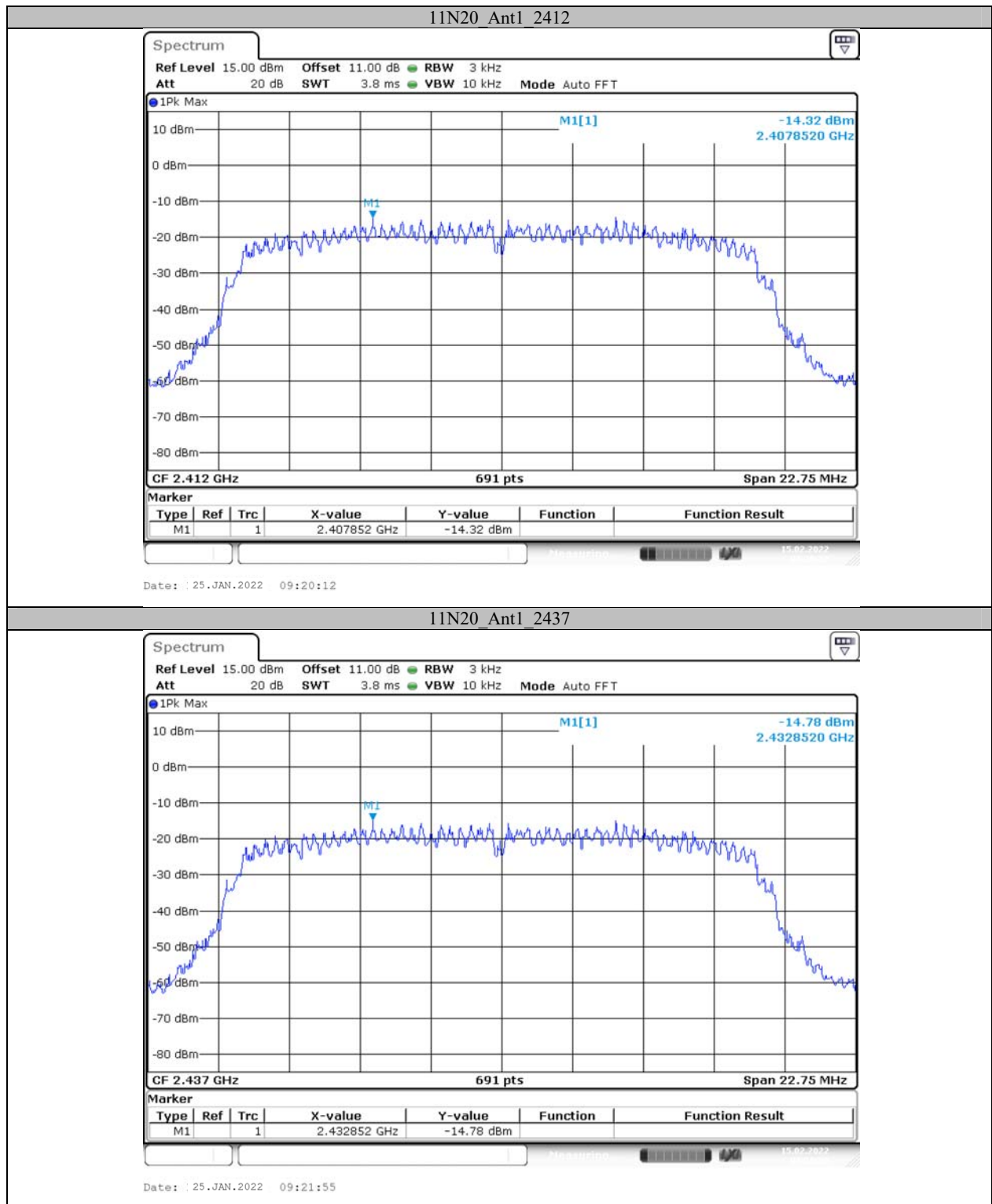
TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-11.17	<=8	PASS
		2437	-11.33	<=8	PASS
		2462	-11.43	<=8	PASS
11G	Ant1	2412	-14.92	<=8	PASS
		2437	-15.13	<=8	PASS
		2462	-15.35	<=8	PASS
11N20SISO	Ant1	2412	-14.32	<=8	PASS
		2437	-14.78	<=8	PASS
		2462	-15.00	<=8	PASS
11N40SISO	Ant1	2422	-18.70	<=8	PASS
		2437	-19.11	<=8	PASS
		2452	-19.18	<=8	PASS

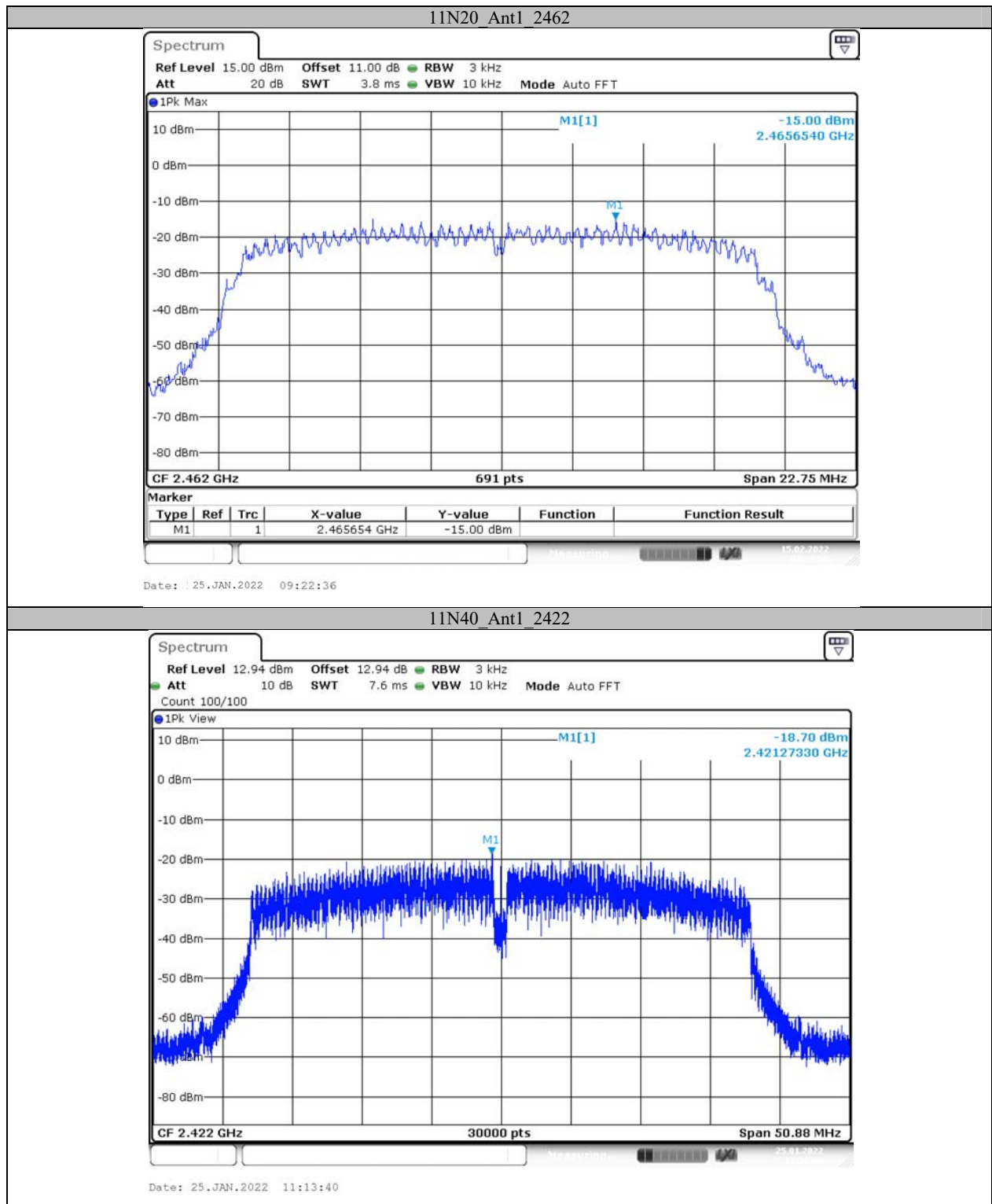
Test Graphs

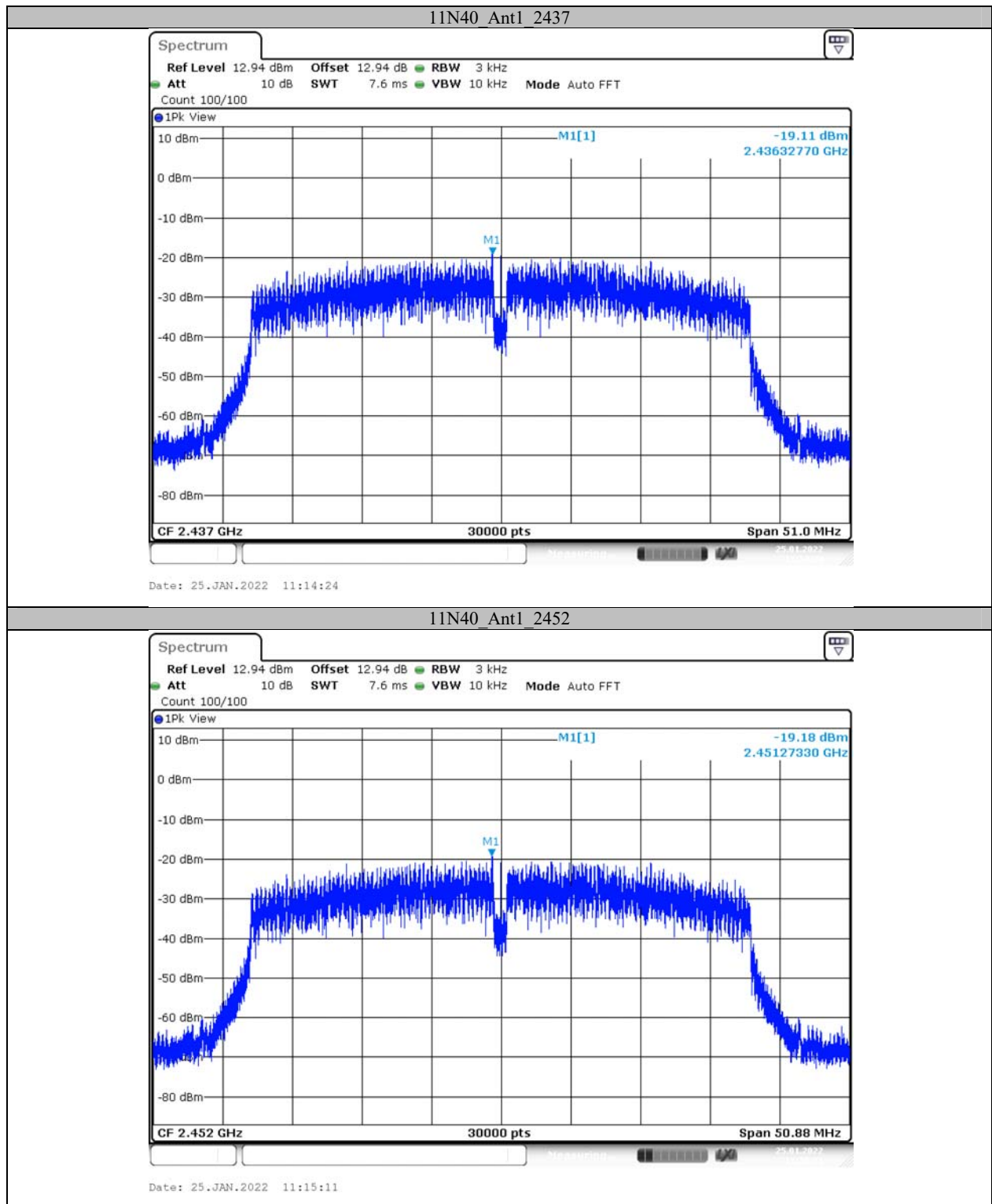






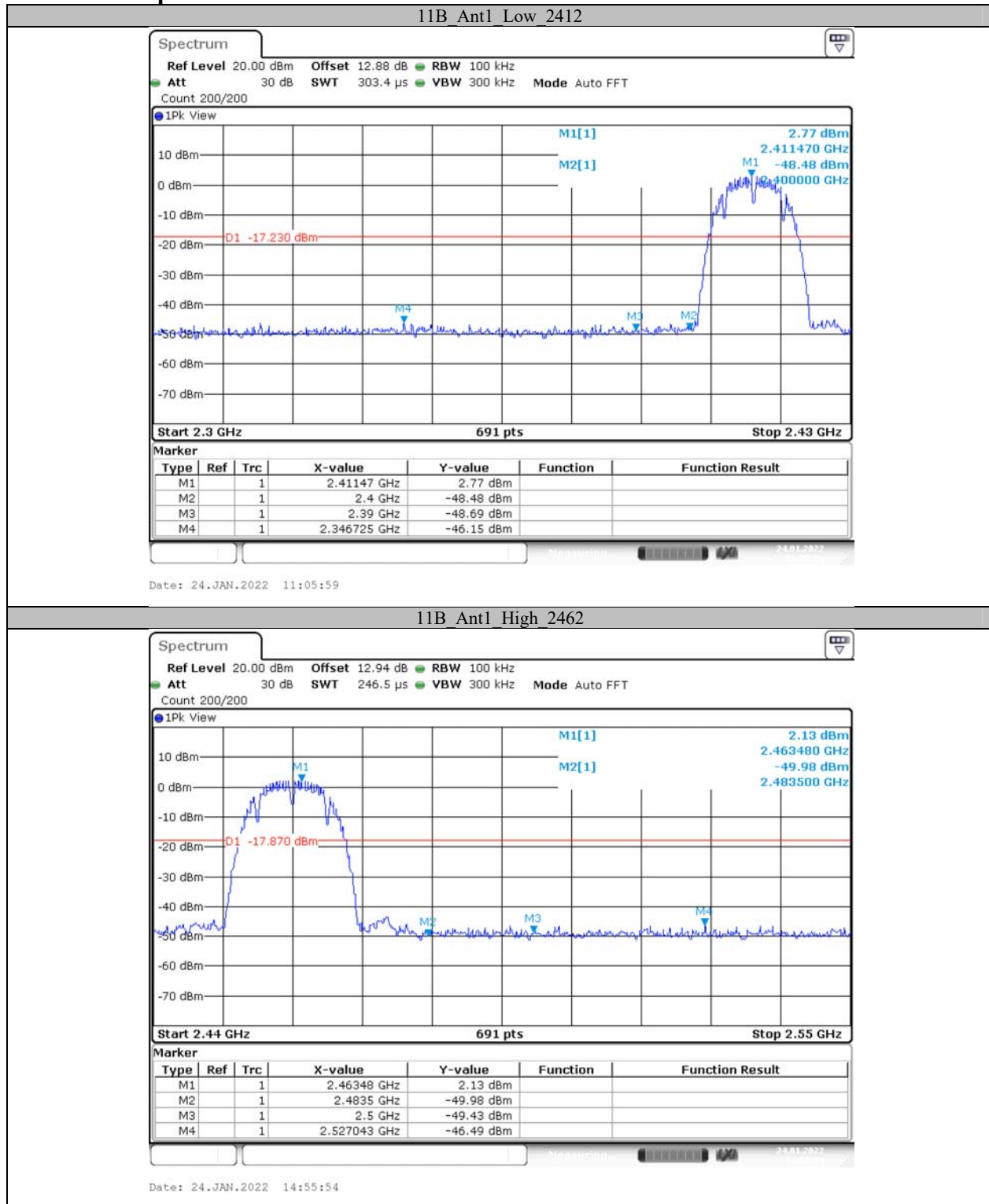


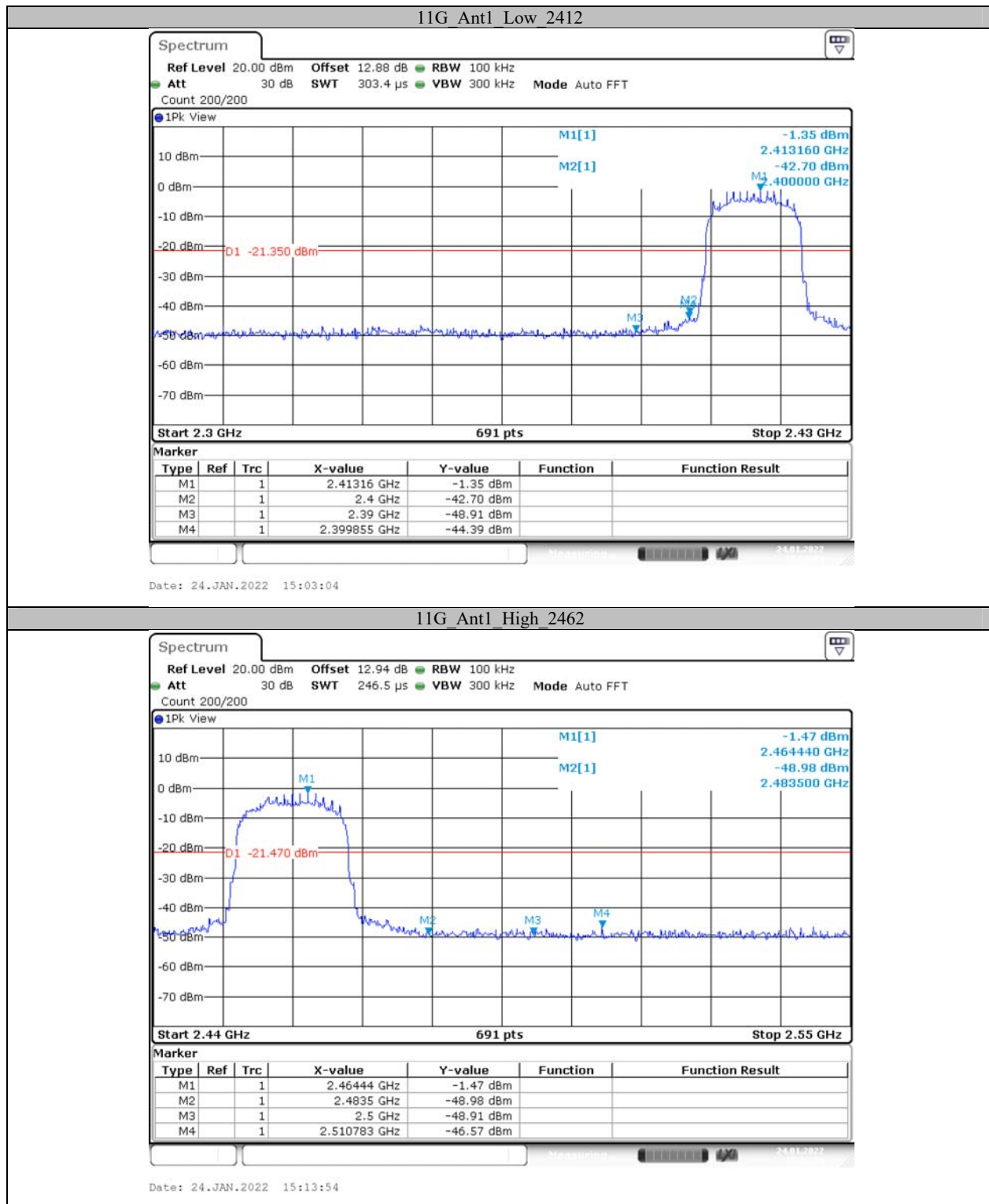


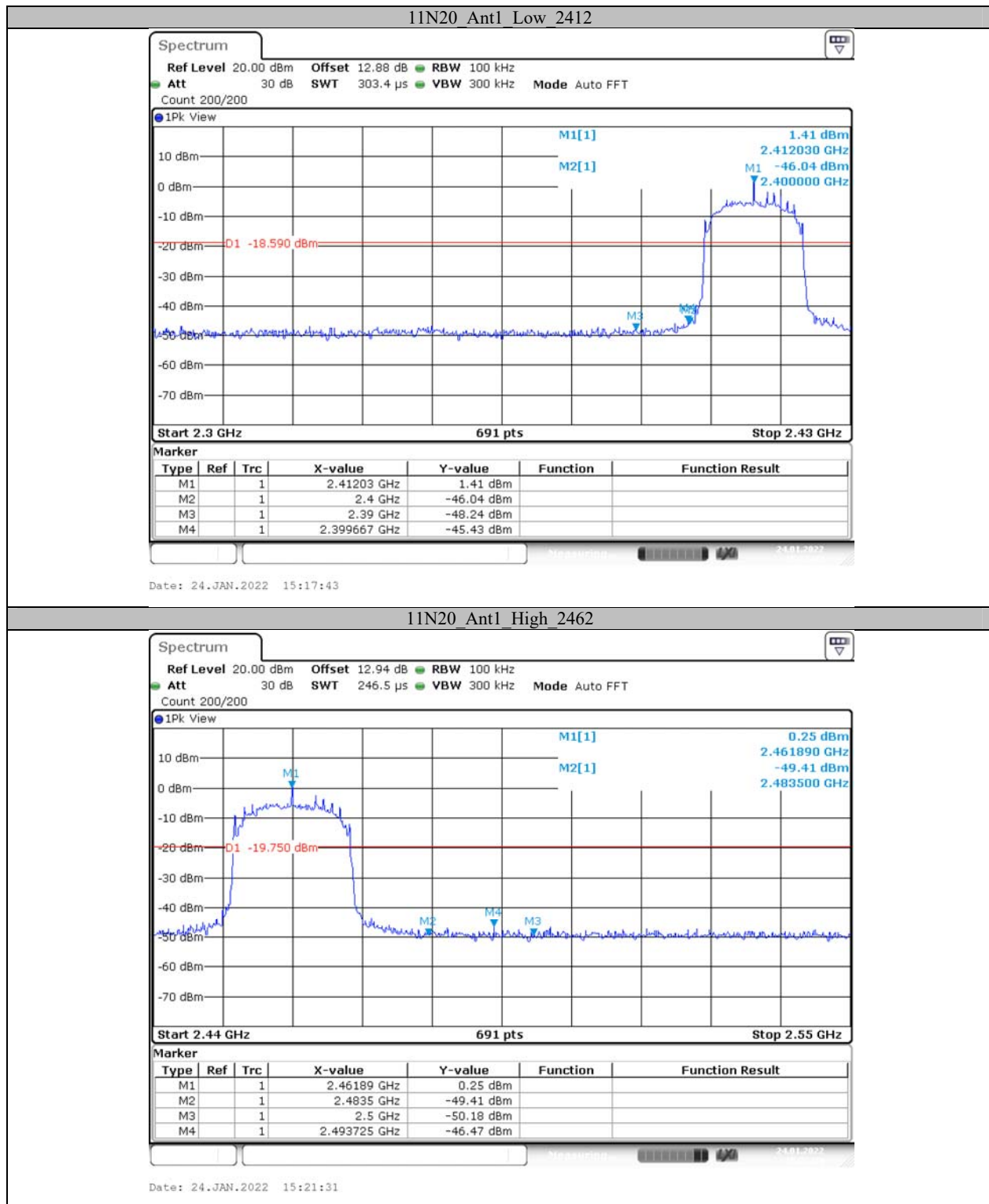


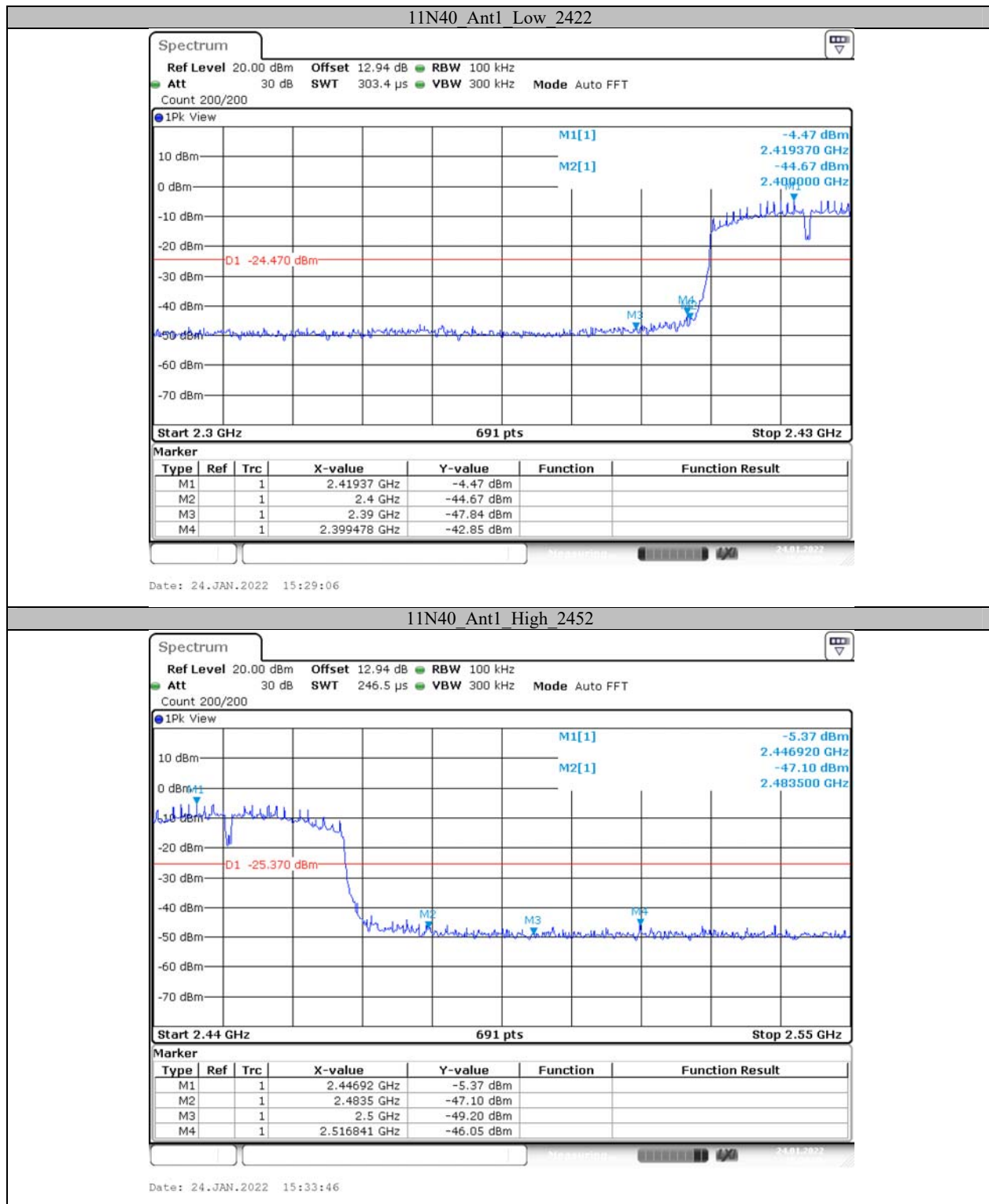
Appendix E: Band edge measurements

Test Graphs





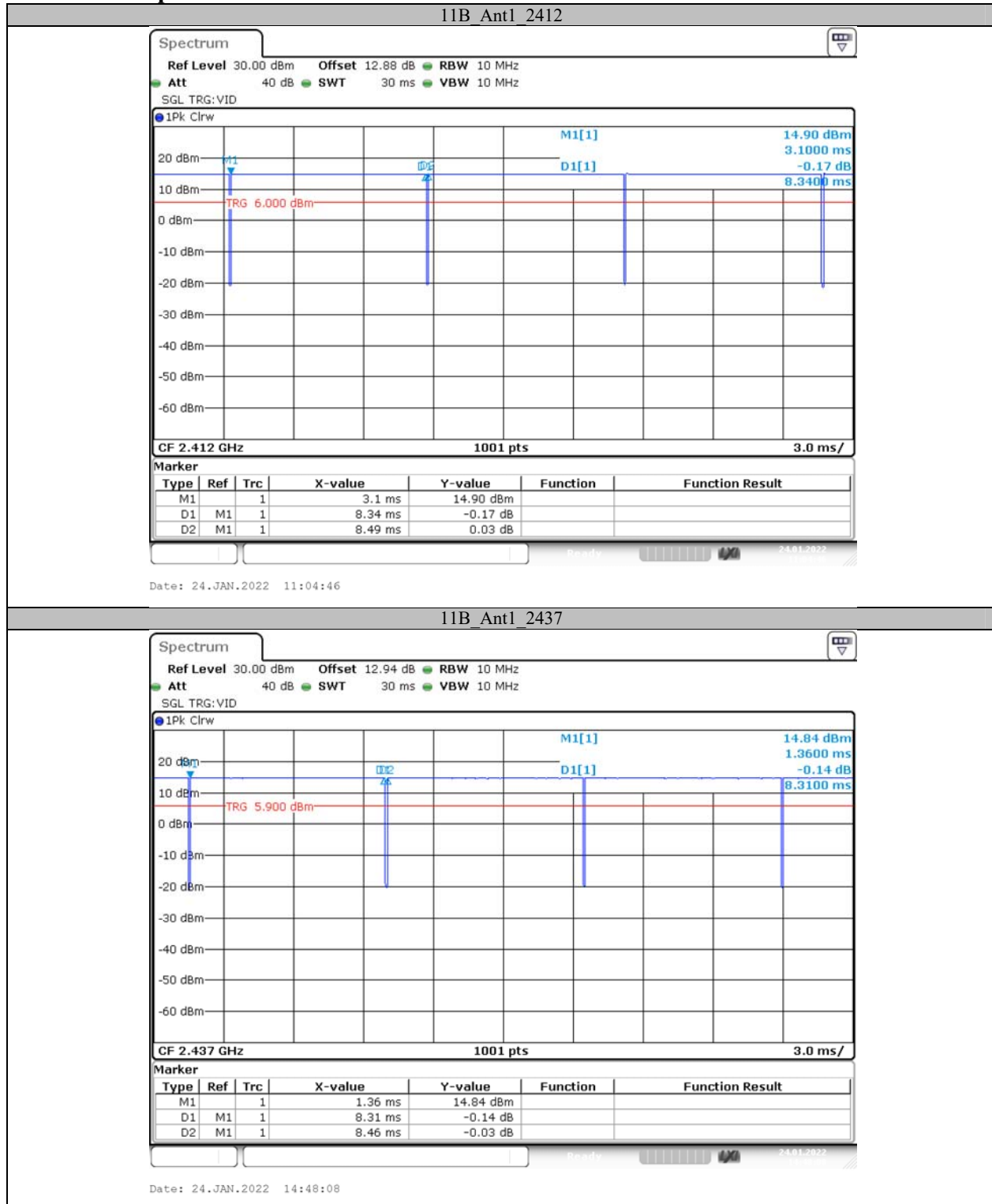


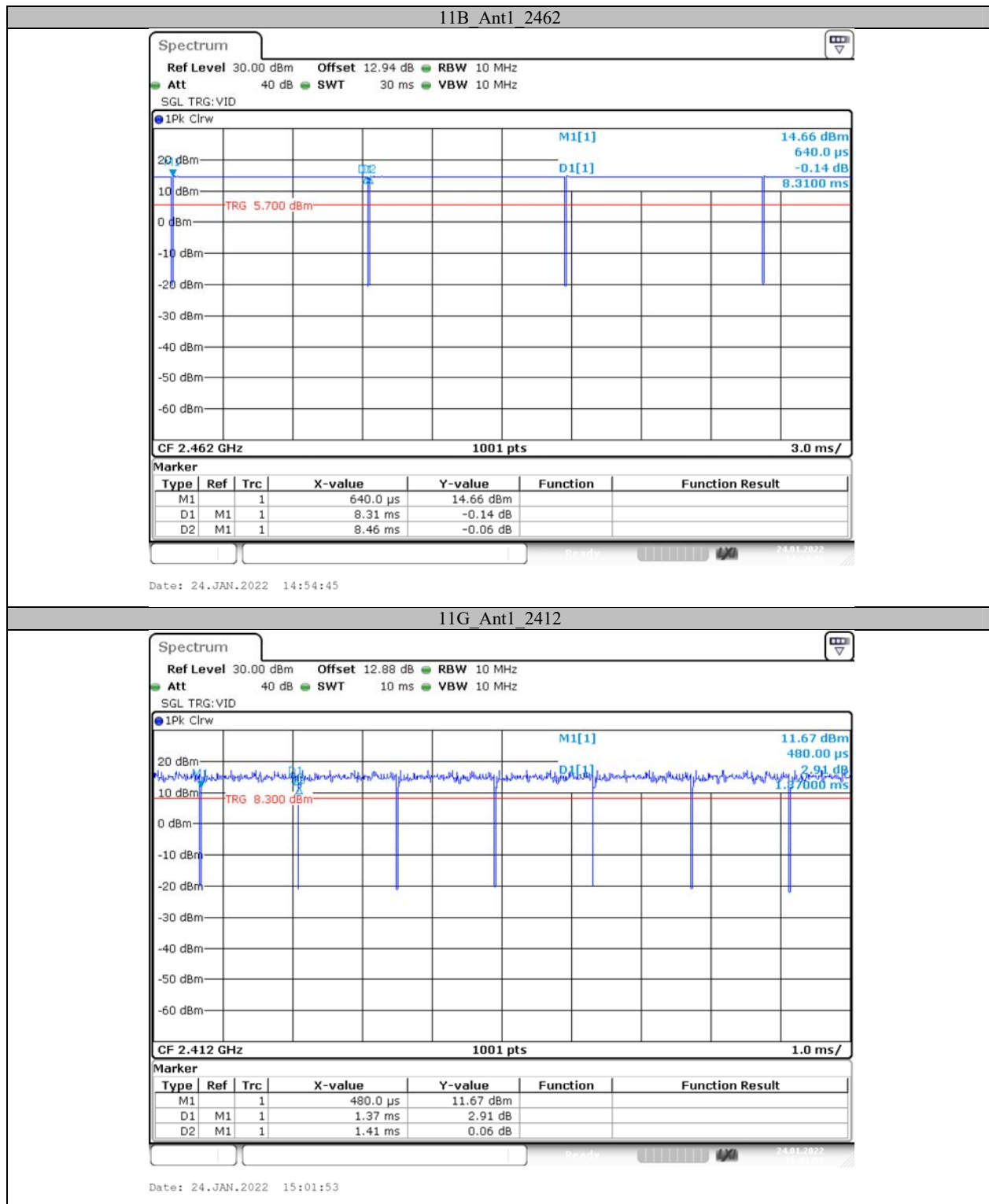


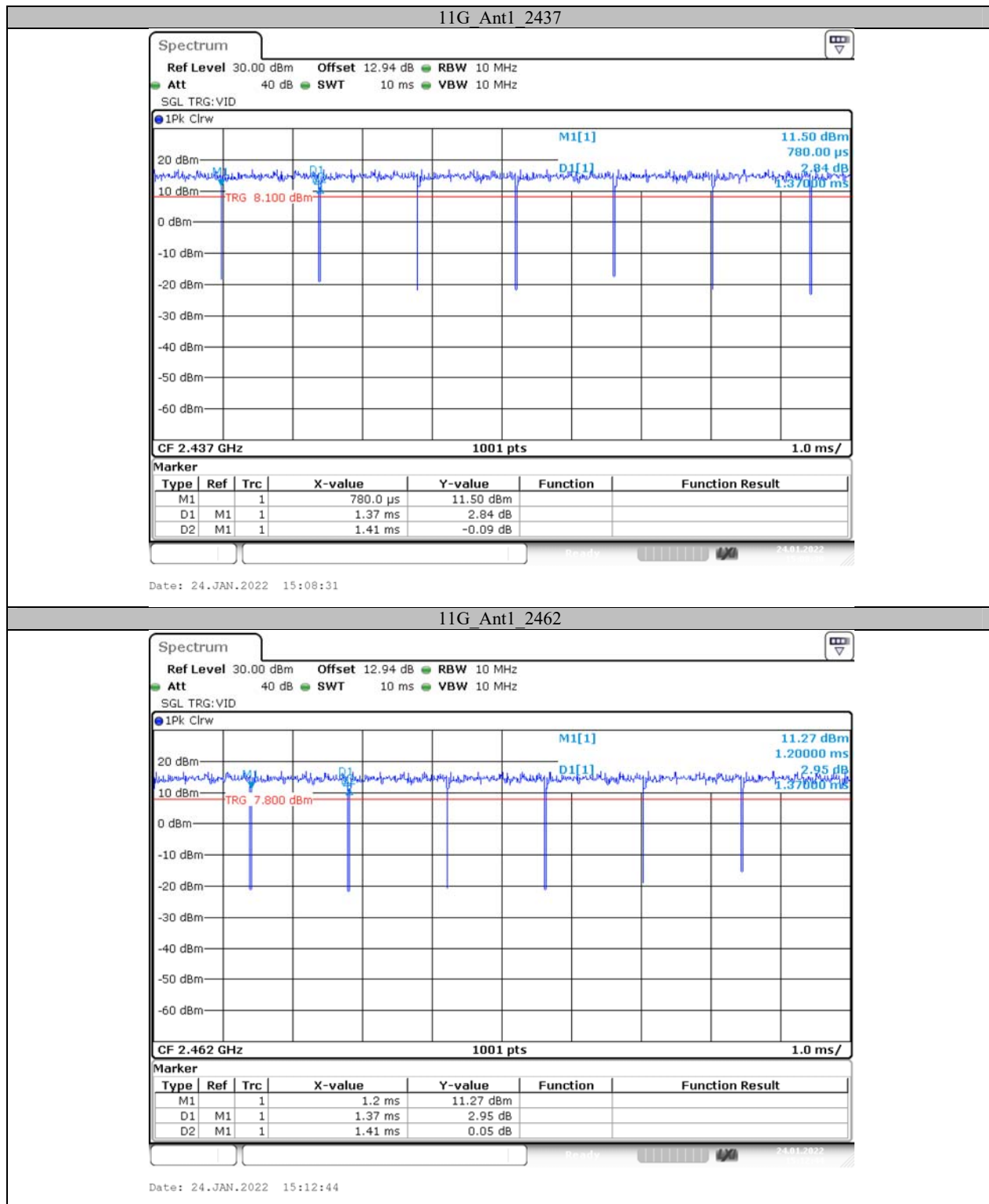
Appendix F: Duty Cycle**Test Result**

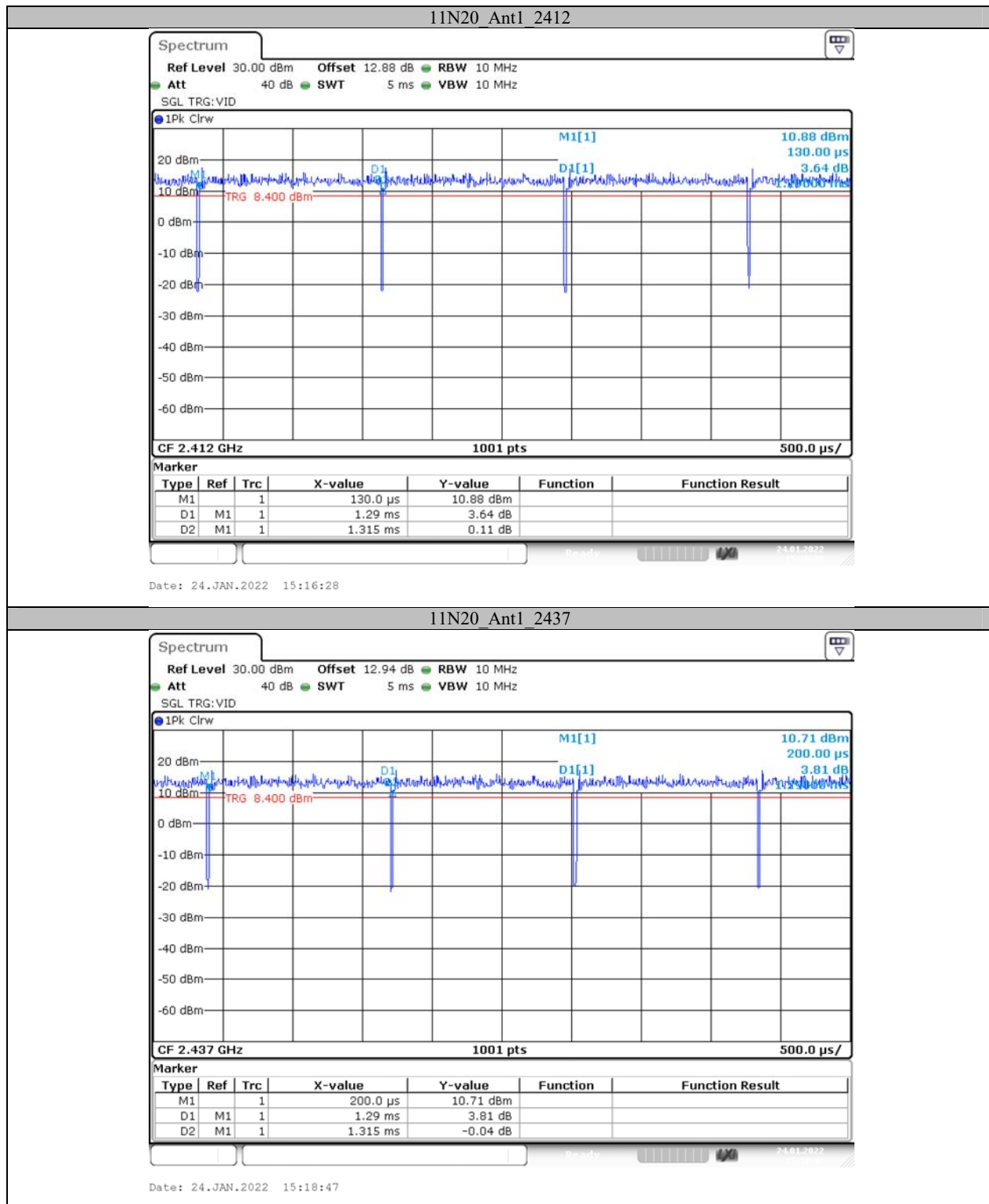
TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	Ant1	2412	8.34	8.49	98.23
		2437	8.31	8.46	98.23
		2462	8.31	8.46	98.23
11G	Ant1	2412	1.37	1.41	97.16
		2437	1.37	1.41	97.16
		2462	1.37	1.41	97.16
11N20SISO	Ant1	2412	1.29	1.32	98.10
		2437	1.29	1.32	98.10
		2462	1.29	1.32	98.10
11N40SISO	Ant1	2422	50.00	50.00	100.00
		2437	50.00	50.00	100.00
		2452	50.00	50.00	100.00

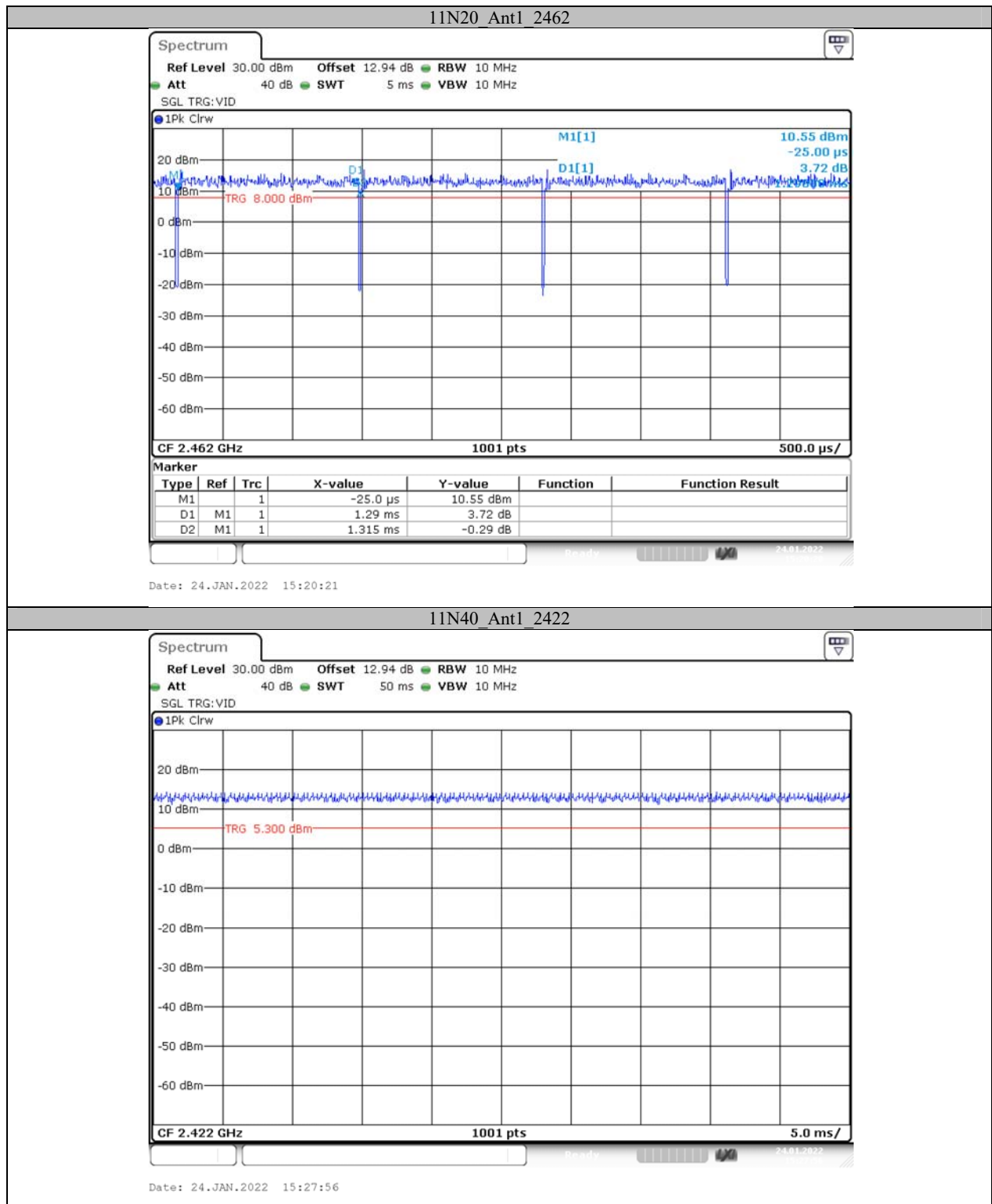
Test Graphs

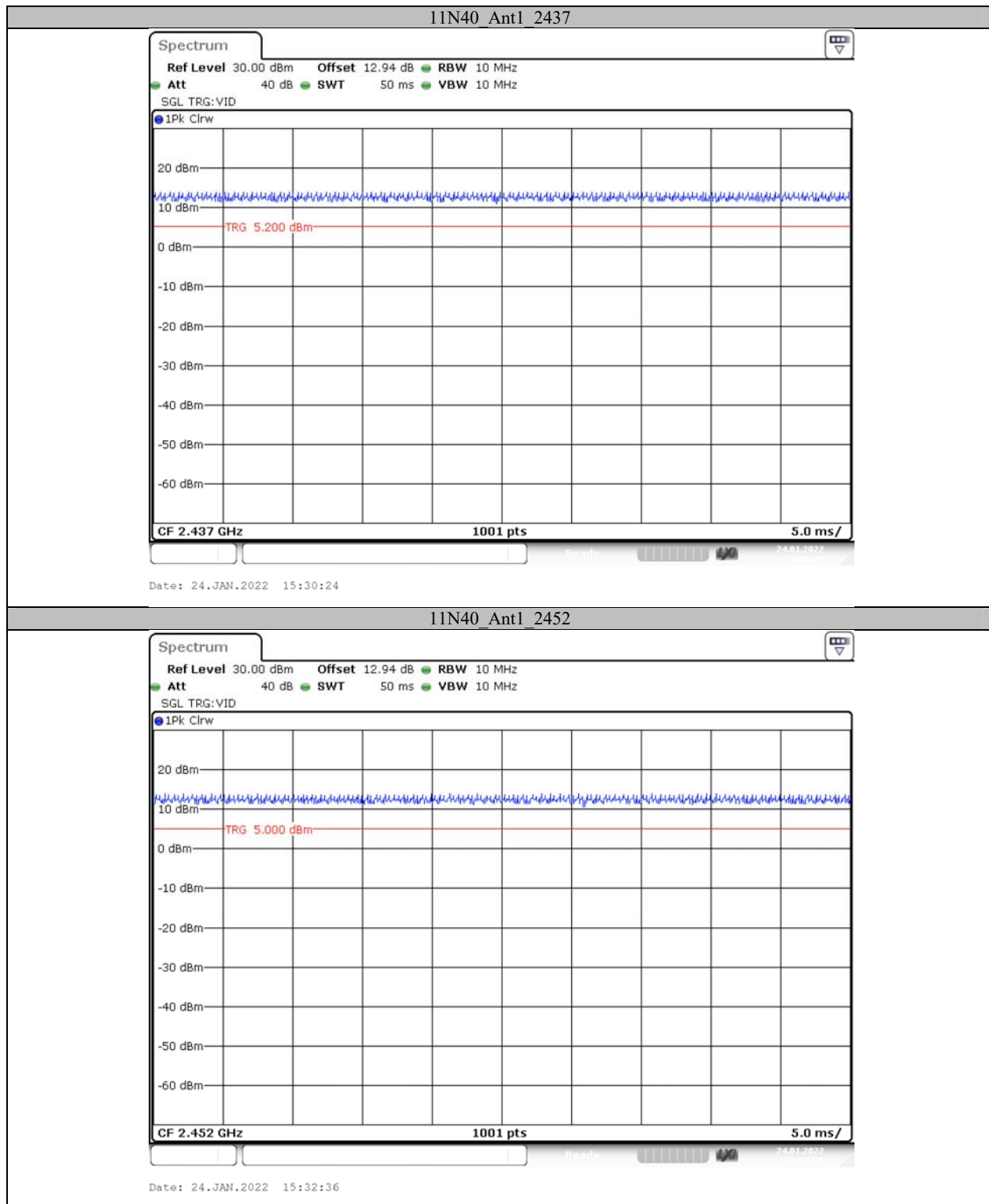












***** END OF REPORT *****