



# FCC RF Test Report

**APPLICANT** : Xiaomi Communications Co., Ltd.  
**EQUIPMENT** : Mobile Phone  
**BRAND NAME** : Redmi  
**MODEL NAME** : 24090RA29G  
**FCC ID** : 2AFZZRA29G  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System  
**TEST DATE(S)** : Jul. 18, 2024 ~ Jul. 30, 2024

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia



Approved by: Jason Jia

**Sporton International Inc. (Kunshan)**

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300  
People's Republic of China**



# TABLE OF CONTENTS

**REVISION HISTORY..... 3**

**SUMMARY OF TEST RESULT ..... 4**

**1 GENERAL DESCRIPTION ..... 5**

    1.1 Applicant ..... 5

    1.2 Manufacturer ..... 5

    1.3 Product Feature of Equipment Under Test..... 5

    1.4 Product Specification of Equipment Under Test..... 5

    1.5 Modification of EUT ..... 6

    1.6 Testing Location ..... 6

    1.7 Test Software..... 6

    1.8 Applicable Standards..... 6

**2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST ..... 7**

    2.1 Carrier Frequency and Channel ..... 7

    2.2 Test Mode..... 8

    2.3 Connection Diagram of Test System..... 9

    2.4 Support Unit used in test configuration and system ..... 10

    2.5 EUT Operation Test Setup ..... 10

    2.6 Measurement Results Explanation Example..... 10

**3 TEST RESULT..... 11**

    3.1 6dB and 99% Bandwidth Measurement ..... 11

    3.2 Output Power Measurement..... 12

    3.3 Power Spectral Density Measurement ..... 15

    3.4 Conducted Band Edges and Spurious Emission Measurement ..... 16

    3.5 Radiated Band Edges and Spurious Emission Measurement ..... 17

    3.6 AC Conducted Emission Measurement..... 21

    3.7 Antenna Requirements ..... 23

**4 LIST OF MEASURING EQUIPMENT ..... 24**

**5 MEASUREMENT UNCERTAINTY ..... 25**

**APPENDIX A. CONDUCTED TEST RESULTS**

**APPENDIX B. AC CONDUCTED EMISSION TEST RESULT**

**APPENDIX C. RADIATED SPURIOUS EMISSION**

**APPENDIX D. DUTY CYCLE PLOTS**

**APPENDIX E. SETUP PHOTOGRAPHS**





### SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report Only	-
3.2	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.02 dB at 4904.00 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 15.07 dB at 15.146 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

**Conformity Assessment Condition:**

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
- The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty"

**Disclaimer:**

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.



# 1 General Description

## 1.1 Applicant

Xiaomi Communications Co., Ltd.

#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

## 1.2 Manufacturer

Xiaomi Communications Co., Ltd.

#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	Redmi
Model Name	24090RA29G
FCC ID	2AFZZRA29G
IMEI Code	Conducted: 861793070040843/861793070040850 Conduction: 861793070038664/861793070038672 Radiation: 861793070038607
HW Version	135300O16
SW Version	Xiaomi HyperOS 1.0
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to antenna	802.11b : 20.52 dBm (0.1127 W) 802.11g : 24.88 dBm (0.3076 W) 802.11n HT20 : 25.00 dBm (0.3162 W) 802.11ax HE20 : 24.66 dBm (0.2924 W)
99% Occupied Bandwidth	802.11b : 13.227 MHz 802.11g : 17.423 MHz 802.11n HT20 : 18.422 MHz 802.11ax HE20 : 19.261 MHz
Antenna Type / Gain	PIFA Antenna type with gain -1.6 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ax : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)

Note: 802.11ax support OFDMA full RU tone and partial RU tone, both full RU and partial RU-left (for low CH) and partial RU-right (for high CH) test output power, the full RU power > partial RU, therefore the full RU perform full, and partial RU verify PSD/RSE.



### 1.5 Modification of EUT

No modifications are made to the EUT during all test items.

### 1.6 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

<b>Test Firm</b>	Sporton International Inc. (Kunshan)		
<b>Test Site Location</b>	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	CO01-KS 03CH03-KS TH01-KS	CN1257	314309

### 1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	TH01-KS	Tonscend	JS1120-3 test system China_210602	3.3.10
2.	03CH03-KS	AUDIX	E3	210616
3.	CO01-KS	AUDIX	E3	6.2009-8-24

### 1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 15 Subpart C §15.247
- ♦ FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ♦ ANSI C63.10-2013

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



## 2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

### 2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437	-	-



## 2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11ax HE20	MCS0

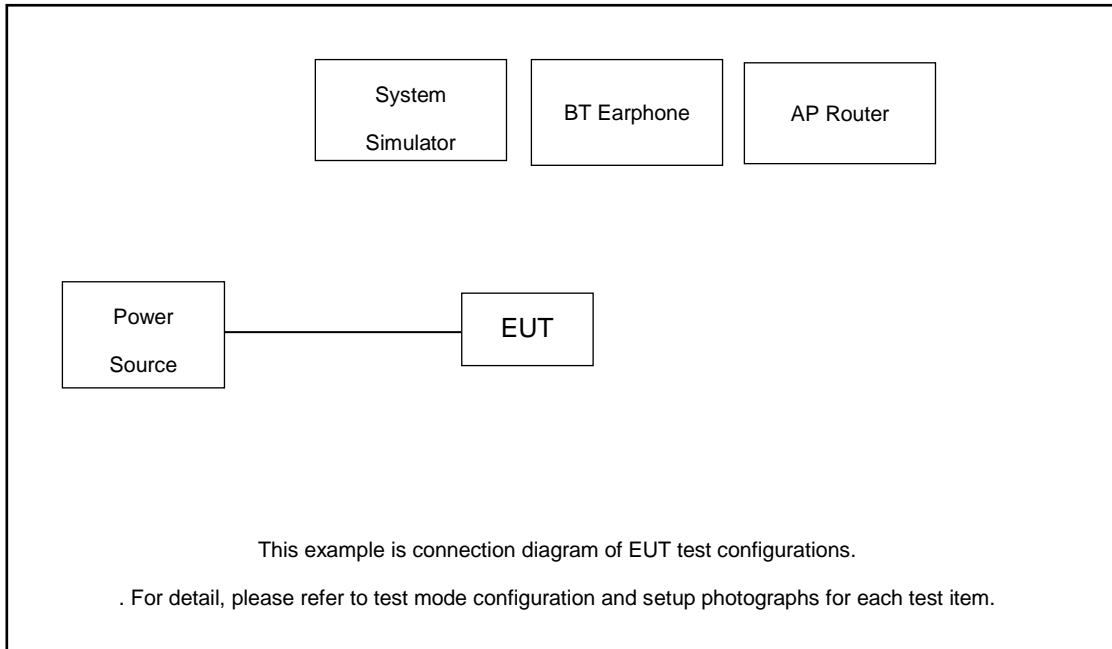
Test Cases	
<b>AC Conducted Emission</b>	Mode 1 :GSM 850 Idle + Bluetooth Link + WLAN Link (2.4G) + USB Cable 3 + Adapter 3
<b>Remark:</b> For Radiated Test Cases, The tests were performance with Adapter and USB Cable	

RSE Co-location
802.11ax HE20_Full RU_CH01_TX + LTE Band 48 Link

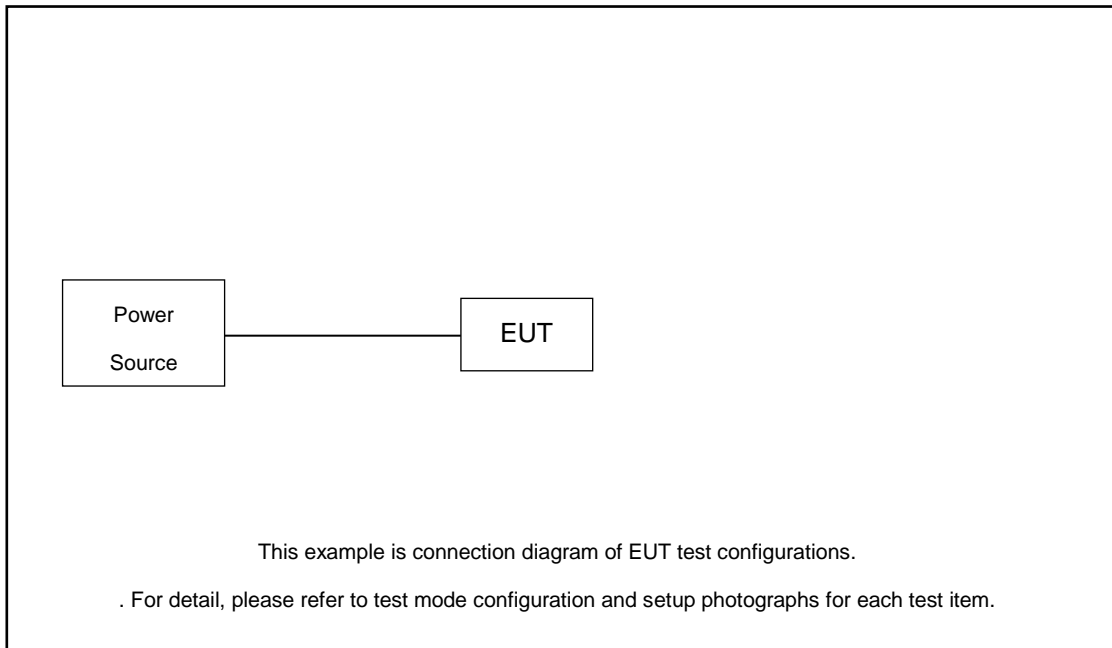


## 2.3 Connection Diagram of Test System

AC Conducted Emission:



Radiated Emission:



## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Lenovo	thinkplus-BH3	N/A	N/A	N/A
2.	LTE Base Station	Anritus	MT8821C	N/A	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
4.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m

## 2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

## 2.6 Measurement Results Explanation Example

### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 12.31 dB and 10dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 12.31 + 10 = 22.31 \text{ (dB)} \end{aligned}$$

### 3 Test Result

#### 3.1 6dB and 99% Bandwidth Measurement

##### 3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

##### 3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

##### 3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.8
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1%~5% of OBW and set the Video bandwidth (VBW)  $\geq 3 \times \text{RBW}$ .
6. Measure and record the results in the test report.

##### 3.1.4 Test Setup



##### 3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.

## 3.2 Output Power Measurement

### 3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

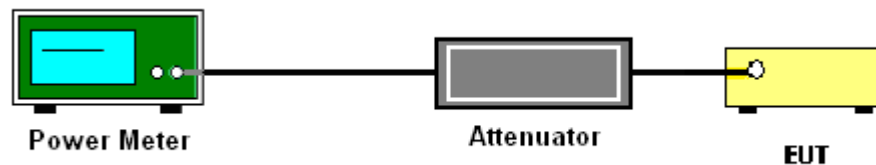
### 3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.1 Method AVGPM method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

### 3.2.4 Test Setup





3.2.5 Test Result of Peak Output Power

2.4GHz Band Single Antenna										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
					Ant6	Ant6	Ant6	Ant6	Ant6	
11b	1Mbps	1	1	2412	17.18	30.00	-1.60	15.58	36.00	Pass
11b	1Mbps	1	2	2417	18.09	30.00	-1.60	16.49	36.00	Pass
11b	1Mbps	1	6	2437	20.52	30.00	-1.60	18.92	36.00	Pass
11b	1Mbps	1	8	2447	18.33	30.00	-1.60	16.73	36.00	Pass
11b	1Mbps	1	9	2452	17.87	30.00	-1.60	16.27	36.00	Pass
11b	1Mbps	1	10	2457	17.26	30.00	-1.60	15.66	36.00	Pass
11b	1Mbps	1	11	2462	16.96	30.00	-1.60	15.36	36.00	Pass
11g	6Mbps	1	1	2412	24.50	30.00	-1.60	22.90	36.00	Pass
11g	6Mbps	1	6	2437	24.88	30.00	-1.60	23.28	36.00	Pass
11g	6Mbps	1	11	2462	24.40	30.00	-1.60	22.80	36.00	Pass
HT20	MCS0	1	1	2412	22.75	30.00	-1.60	21.15	36.00	Pass
HT20	MCS0	1	6	2437	25.00	30.00	-1.60	23.40	36.00	Pass
HT20	MCS0	1	11	2462	22.92	30.00	-1.60	21.32	36.00	Pass

2.4GHz Band Single Antenna											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
						Ant6	Ant6	Ant6	Ant6	Ant6	
HE20	MCS0	1	1	2412	Full	24.40	30.00	-1.60	22.80	36.00	Pass
HE20	MCS0	1	1	2412	26/0	15.76	30.00	-1.60	14.16	36.00	Pass
HE20	MCS0	1	1	2412	52/37	19.19	30.00	-1.60	17.59	36.00	Pass
HE20	MCS0	1	1	2412	106/53	21.84	30.00	-1.60	20.24	36.00	Pass
HE20	MCS0	1	6	2437	Full	24.66	30.00	-1.60	23.06	36.00	Pass
HE20	MCS0	1	6	2437	26/0	17.94	30.00	-1.60	16.34	36.00	Pass
HE20	MCS0	1	6	2437	52/37	21.18	30.00	-1.60	19.58	36.00	Pass
HE20	MCS0	1	6	2437	106/53	23.41	30.00	-1.60	21.81	36.00	Pass
HE20	MCS0	1	11	2462	Full	24.31	30.00	-1.60	22.71	36.00	Pass
HE20	MCS0	1	11	2462	26/8	16.94	30.00	-1.60	15.34	36.00	Pass
HE20	MCS0	1	11	2462	52/40	19.79	30.00	-1.60	18.19	36.00	Pass
HE20	MCS0	1	11	2462	106/54	22.63	30.00	-1.60	21.03	36.00	Pass



3.2.6 Test Result of Average Output Power (Reporting Only)

2.4GHz Band Single Antenna								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power with duty factor (dBm)	DG (dBi)	EIRP Power (dBm)
					Ant6	Ant6	Ant6	Ant6
11b	1Mbps	1	1	2412	0.00	14.92	-1.60	13.32
11b	1Mbps	1	2	2417	0.00	15.72	-1.60	14.12
11b	1Mbps	1	6	2437	0.00	18.06	-1.60	16.46
11b	1Mbps	1	8	2447	0.00	15.95	-1.60	14.35
11b	1Mbps	1	9	2452	0.00	15.53	-1.60	13.93
11b	1Mbps	1	10	2457	0.00	14.88	-1.60	13.28
11b	1Mbps	1	11	2462	0.00	14.56	-1.60	12.96
11g	6Mbps	1	1	2412	0.13	16.26	-1.60	14.66
11g	6Mbps	1	6	2437	0.13	17.62	-1.60	16.02
11g	6Mbps	1	11	2462	0.13	17.03	-1.60	15.43
HT20	MCS0	1	1	2412	0.14	15.30	-1.60	13.70
HT20	MCS0	1	6	2437	0.14	17.63	-1.60	16.03
HT20	MCS0	1	11	2462	0.14	15.39	-1.60	13.79

2.4GHz Band Single Antenna												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Duty Factor (dB)	Average Conducted Power with duty factor (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
						Ant6	Ant6	Ant6	Ant6	Ant6	Ant6	
HE20	MCS0	1	1	2412	Full	0.18	15.07	30.00	-1.60	13.47	36.00	Pass
HE20	MCS0	1	1	2412	26/0	0.04	6.22	30.00	-1.60	4.62	36.00	Pass
HE20	MCS0	1	1	2412	52/37	0.04	9.13	30.00	-1.60	7.53	36.00	Pass
HE20	MCS0	1	1	2412	106/53	0.08	12.33	30.00	-1.60	10.73	36.00	Pass
HE20	MCS0	1	6	2437	Full	0.18	16.71	30.00	-1.60	15.11	36.00	Pass
HE20	MCS0	1	6	2437	26/0	0.04	8.28	30.00	-1.60	6.68	36.00	Pass
HE20	MCS0	1	6	2437	52/37	0.04	11.40	30.00	-1.60	9.80	36.00	Pass
HE20	MCS0	1	6	2437	106/53	0.08	13.82	30.00	-1.60	12.22	36.00	Pass
HE20	MCS0	1	11	2462	Full	0.18	15.70	30.00	-1.60	14.10	36.00	Pass
HE20	MCS0	1	11	2462	26/8	0.04	7.67	30.00	-1.60	6.07	36.00	Pass
HE20	MCS0	1	11	2462	52/40	0.04	10.59	30.00	-1.60	8.99	36.00	Pass
HE20	MCS0	1	11	2462	106/54	0.08	13.02	30.00	-1.60	11.42	36.00	Pass

### 3.3 Power Spectral Density Measurement

#### 3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

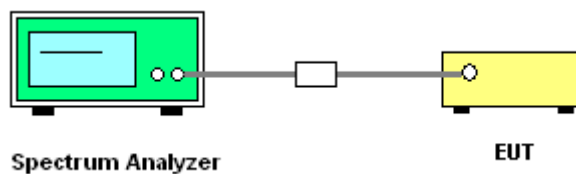
#### 3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

#### 3.3.3 Test Procedures

1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

#### 3.3.4 Test Setup



#### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

## 3.4 Conducted Band Edges and Spurious Emission Measurement

### 3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB relative to the maximum PSD level in 100 kHz by RF conducted measurement.

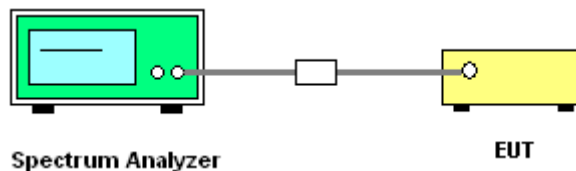
### 3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.11
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

### 3.4.4 Test Setup



### 3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Please refer to Appendix A.





### 3.5 Radiated Band Edges and Spurious Emission Measurement

#### 3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

#### 3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

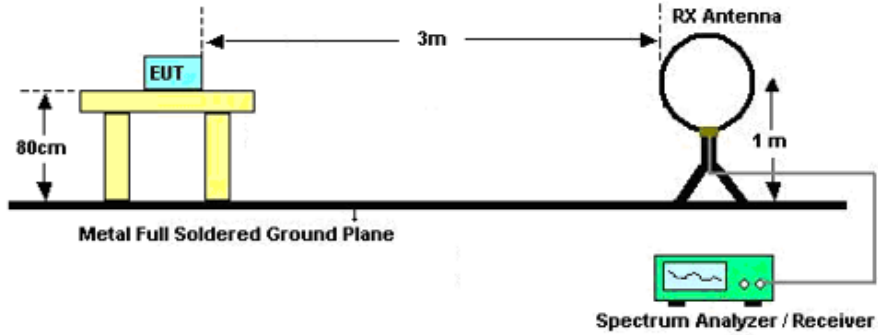


### 3.5.3 Test Procedures

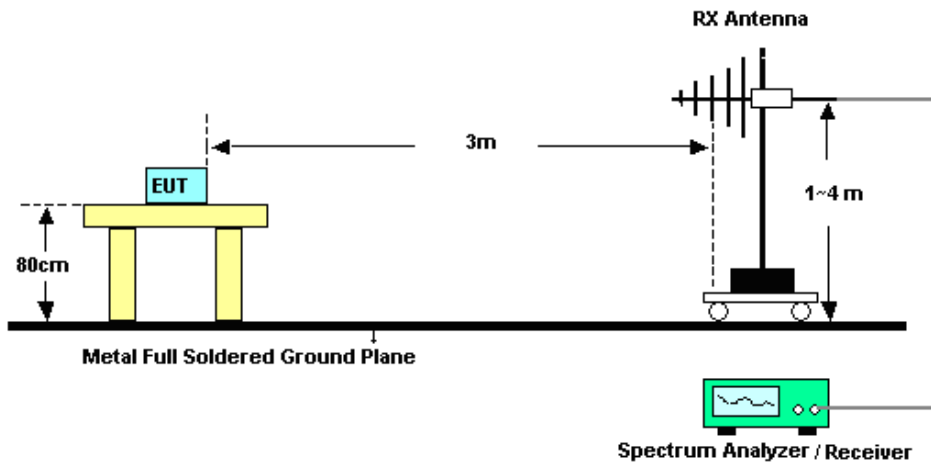
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1$  GHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f \geq 1$  GHz for peak measurement.  
For average measurement:
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW  $\geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### 3.5.4 Test Setup

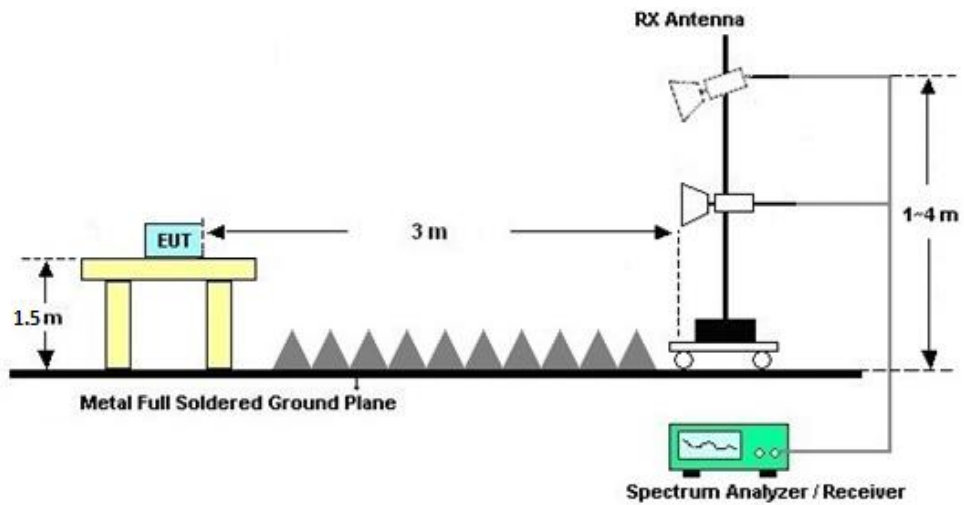
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





### **3.5.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)**

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### **3.5.6 Test Result of Radiated Spurious at Band Edges**

Please refer to Appendix C.

### **3.5.7 Duty Cycle**

Please refer to Appendix D.

### **3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)**

Please refer to Appendix C.



### 3.6 AC Conducted Emission Measurement

#### 3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

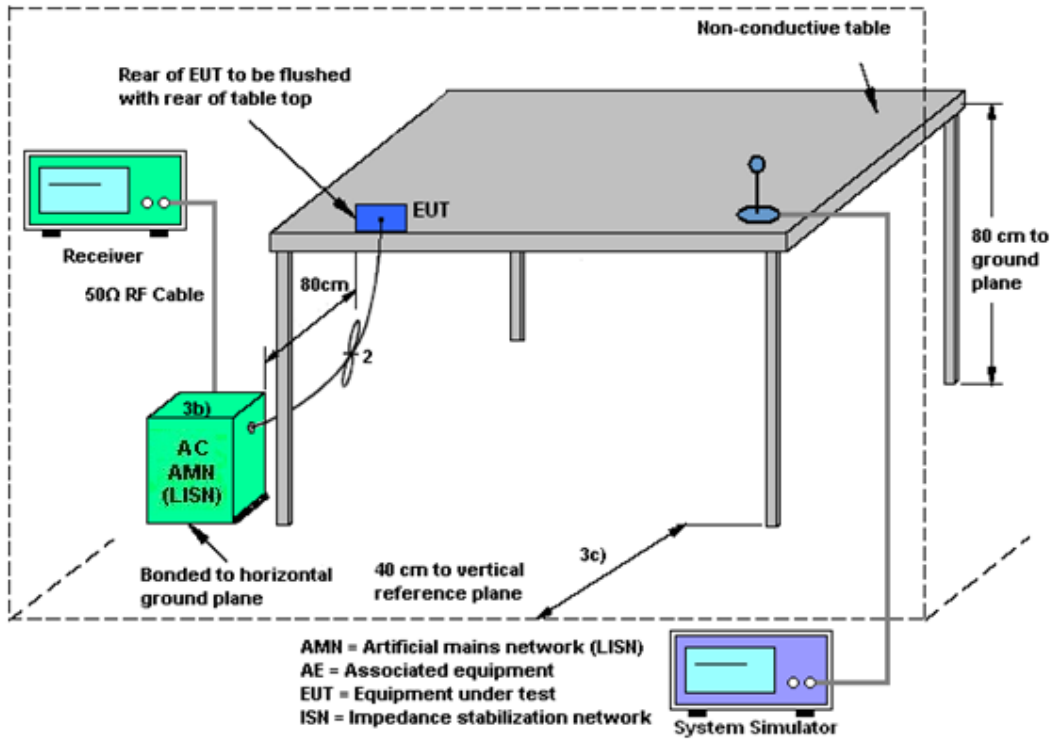
#### 3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

#### 3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.

### 3.6.4 Test Setup



### 3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



## **3.7 Antenna Requirements**

### **3.7.1 Standard Applicable**

If directional gain of transmitting Antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

### **3.7.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **3.7.3 Antenna Gain**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 11, 2023	Jul. 18, 2024~Jul. 23, 2024	Oct. 10, 2024	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55370528	10Hz~44GHz	Oct. 11, 2023	Jul. 18, 2024~Jul. 23, 2024	Oct. 10, 2024	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2E	101125	9kHz~30MHz	Sep. 11, 2023	Jul. 18, 2024~Jul. 23, 2024	Sep. 10, 2024	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	23182	30MHz~1GHz	Dec. 06, 2023	Jul. 18, 2024~Jul. 23, 2024	Dec. 05, 2024	Radiation (03CH03-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 23, 2023	Jul. 18, 2024~Jul. 23, 2024	Oct. 22, 2024	Radiation (03CH03-KS)
SHF-EHF Horn	com-power	AH-840	101115	18GHz~40GHz	Oct. 15, 2023	Jul. 18, 2024~Jul. 23, 2024	Oct. 14, 2024	Radiation (03CH03-KS)
Amplifier	SONOMA	310N	413740	30MHz~1000MHz	Jan. 03, 2024	Jul. 18, 2024~Jul. 23, 2024	Jan. 02, 2025	Radiation (03CH03-KS)
Amplifier	EM	EM18G40GA	060851	18~40GHz	Jan. 03, 2024	Jul. 18, 2024~Jul. 23, 2024	Jan. 02, 2025	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2082394	1Ghz~18Ghz	Jan. 03, 2024	Jul. 18, 2024~Jul. 23, 2024	Jan. 02, 2025	Radiation (03CH03-KS)
Amplifier	Keysight	83017A	MY53270319	1GHz~26.5GHz	Oct. 11, 2023	Jul. 18, 2024~Jul. 23, 2024	Oct. 10, 2024	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jul. 18, 2024~Jul. 23, 2024	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jul. 18, 2024~Jul. 23, 2024	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jul. 18, 2024~Jul. 23, 2024	NCR	Radiation (03CH03-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr 18, 2024	Jul. 28, 2024	Apr 17, 2025	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 11, 2023	Jul. 28, 2024	Oct. 10, 2024	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	Apr 18, 2024	Jul. 28, 2024	Apr 17, 2025	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000811	AC 0V~300V, 45Hz~1000Hz	Oct. 11, 2023	Jul. 28, 2024	Oct. 10, 2024	Conduction (CO01-KS)
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 11, 2023	Jul. 19, 2024~Jul. 30, 2024	Oct. 10, 2024	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 02, 2024	Jul. 19, 2024~Jul. 30, 2024	Jan. 01, 2025	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 02, 2024	Jul. 19, 2024~Jul. 30, 2024	Jan. 01, 2025	Conducted (TH01-KS)

NCR: No Calibration Required





## 5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

### Uncertainty of Conducted Measurement

Conducted Spurious Emission & Bandedge	±2.22 dB
Occupied Channel Bandwidth	±0.1%
Conducted Power	±0.50 dB
Conducted Power Spectral Density	±0.90 dB
Frequency	0.04ppm

### Uncertainty of AC Conducted Emission Measurement (0.15 MHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.84 dB
---	---------

### Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.30 dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.08 dB
---	---------

### Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.18 dB
---	---------

### Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.22 dB
---	---------

----- THE END -----



## Appendix A. Conducted Test Results



Ambient Condition: <u>25</u> °C, <u>45</u> %RH	
Test Date: <u>2024/7/19~2024/7/30</u>	Test Engineer: <u>albert shi</u>

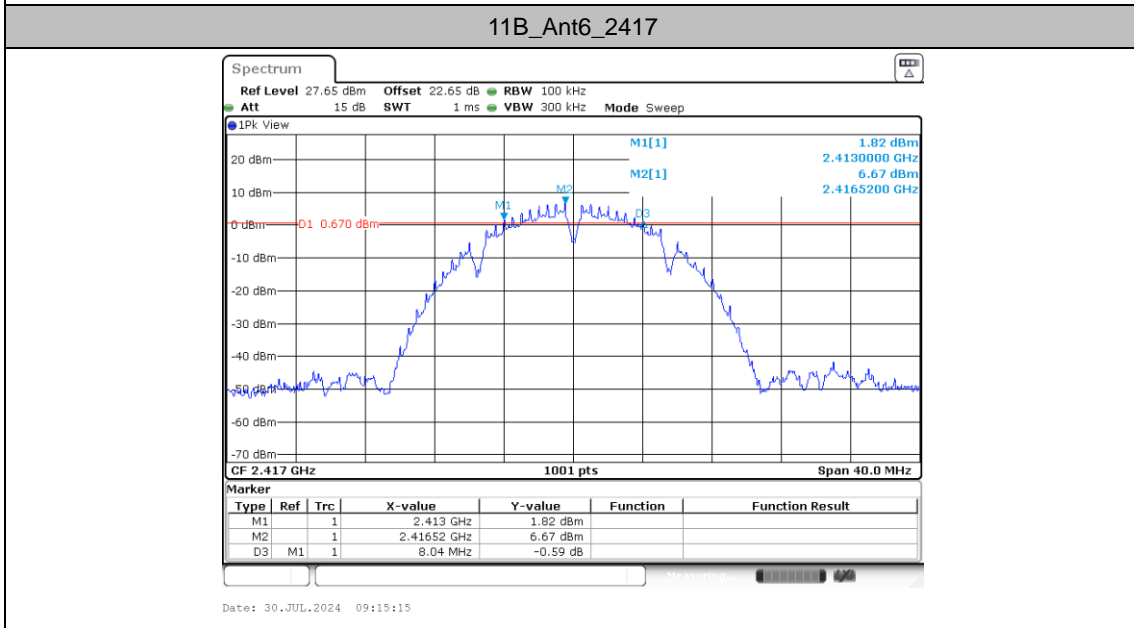
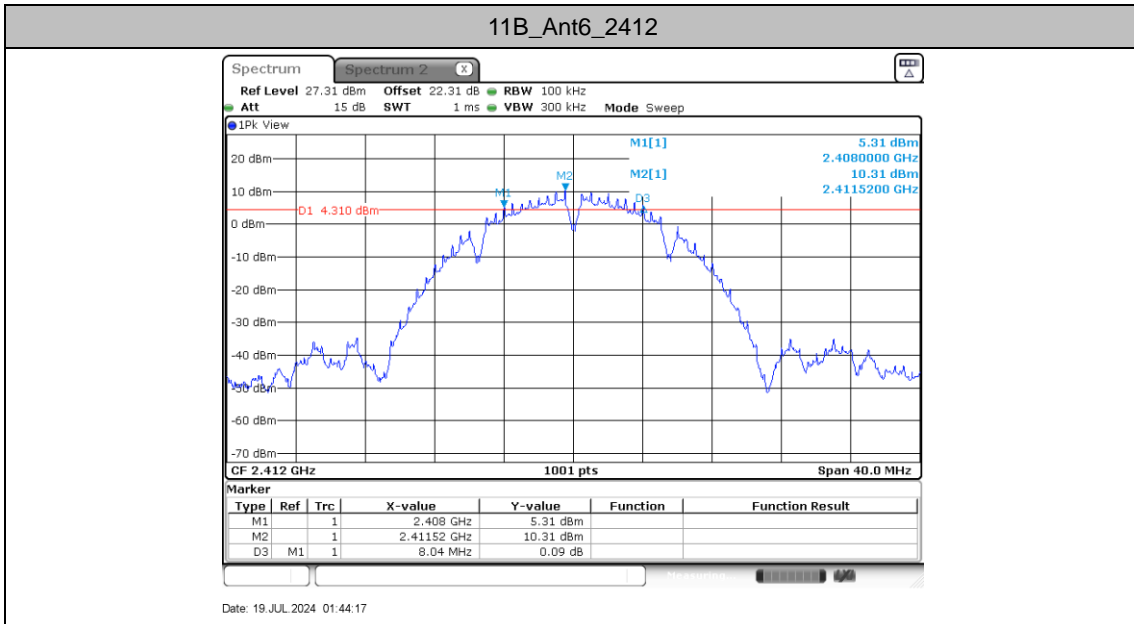
### DTS Bandwidth

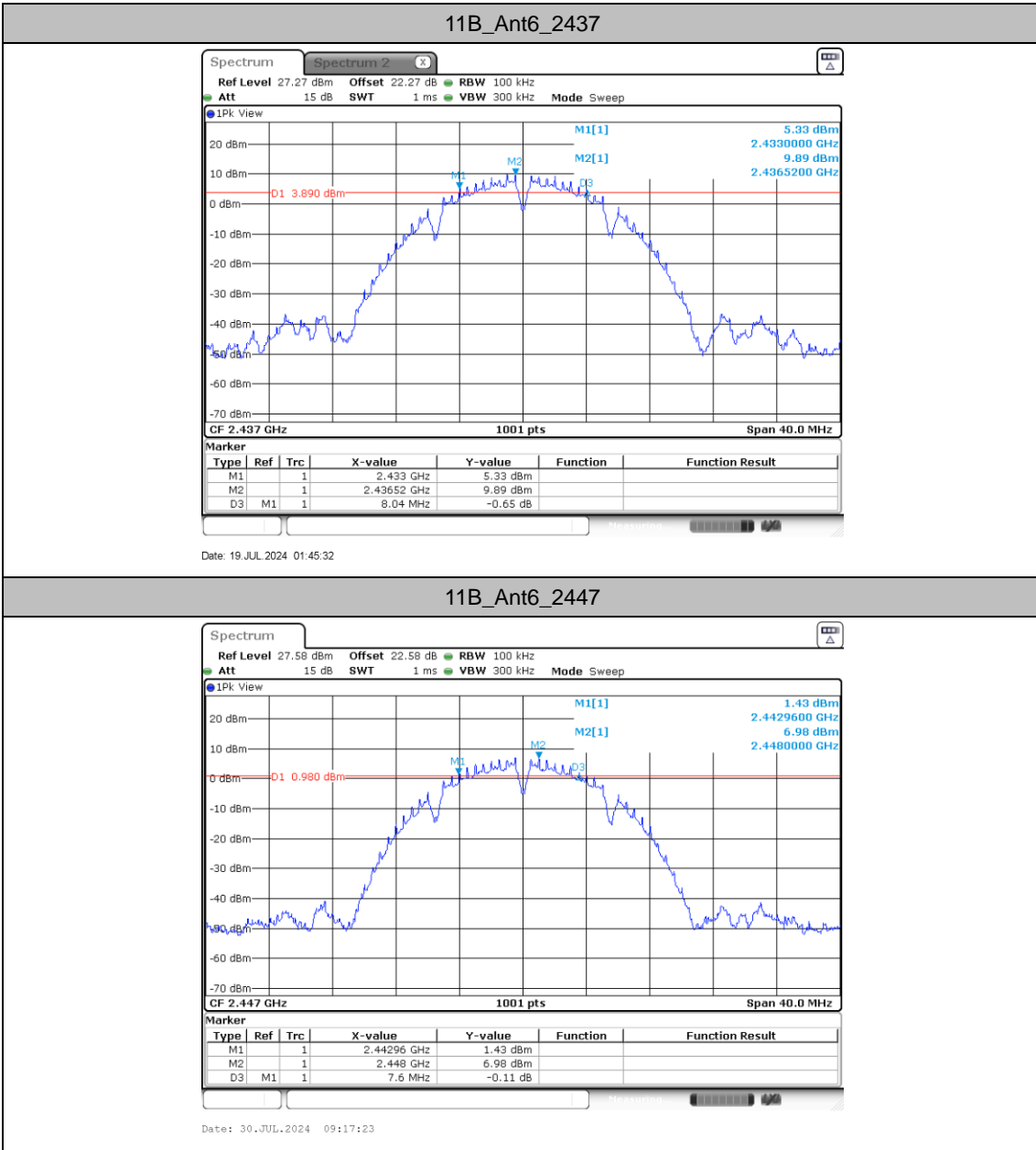
#### Test Result

TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant6	2412	8.04	2408.00	2416.04	0.5	PASS
		2417	8.04	2413.00	2421.04	0.5	PASS
		2437	8.04	2433.00	2441.04	0.5	PASS
		2447	7.60	2442.96	2450.56	0.5	PASS
		2452	8.08	2447.96	2456.04	0.5	PASS
		2457	8.08	2452.96	2461.04	0.5	PASS
		2462	8.04	2458.00	2466.04	0.5	PASS
11G	Ant6	2412	15.96	2404.20	2420.16	0.5	PASS
		2437	15.72	2429.44	2445.16	0.5	PASS
		2462	16.32	2453.84	2470.16	0.5	PASS
11N20SISO	Ant6	2412	16.92	2403.84	2420.76	0.5	PASS
		2437	16.52	2428.88	2445.40	0.5	PASS
		2462	17.16	2453.24	2470.40	0.5	PASS
11AX20SISO	Ant6	2412	18.72	2402.80	2421.52	0.5	PASS
		2437	18.56	2427.88	2446.44	0.5	PASS
		2462	18.72	2452.56	2471.28	0.5	PASS



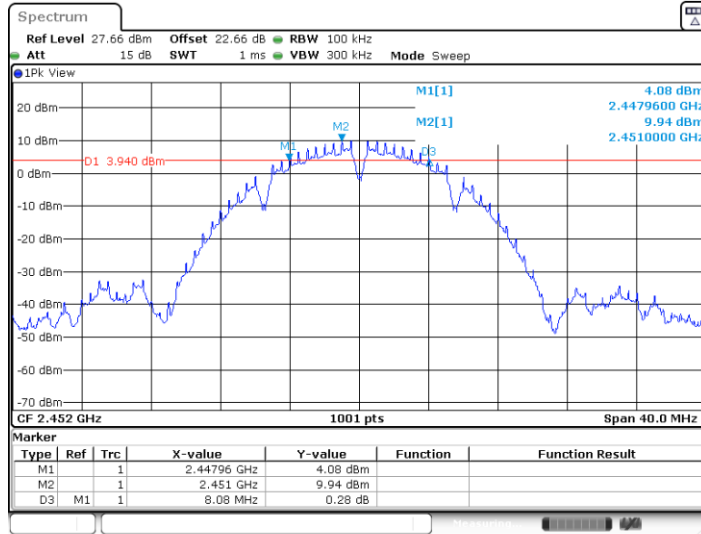
Test Graphs





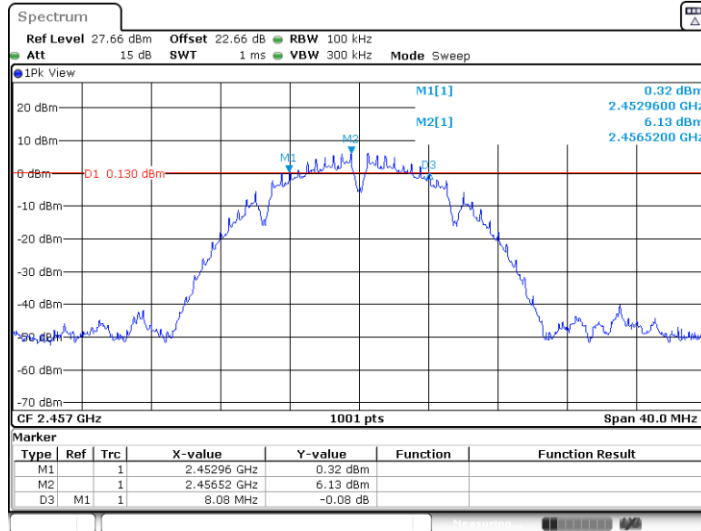


11B\_Ant6\_2452

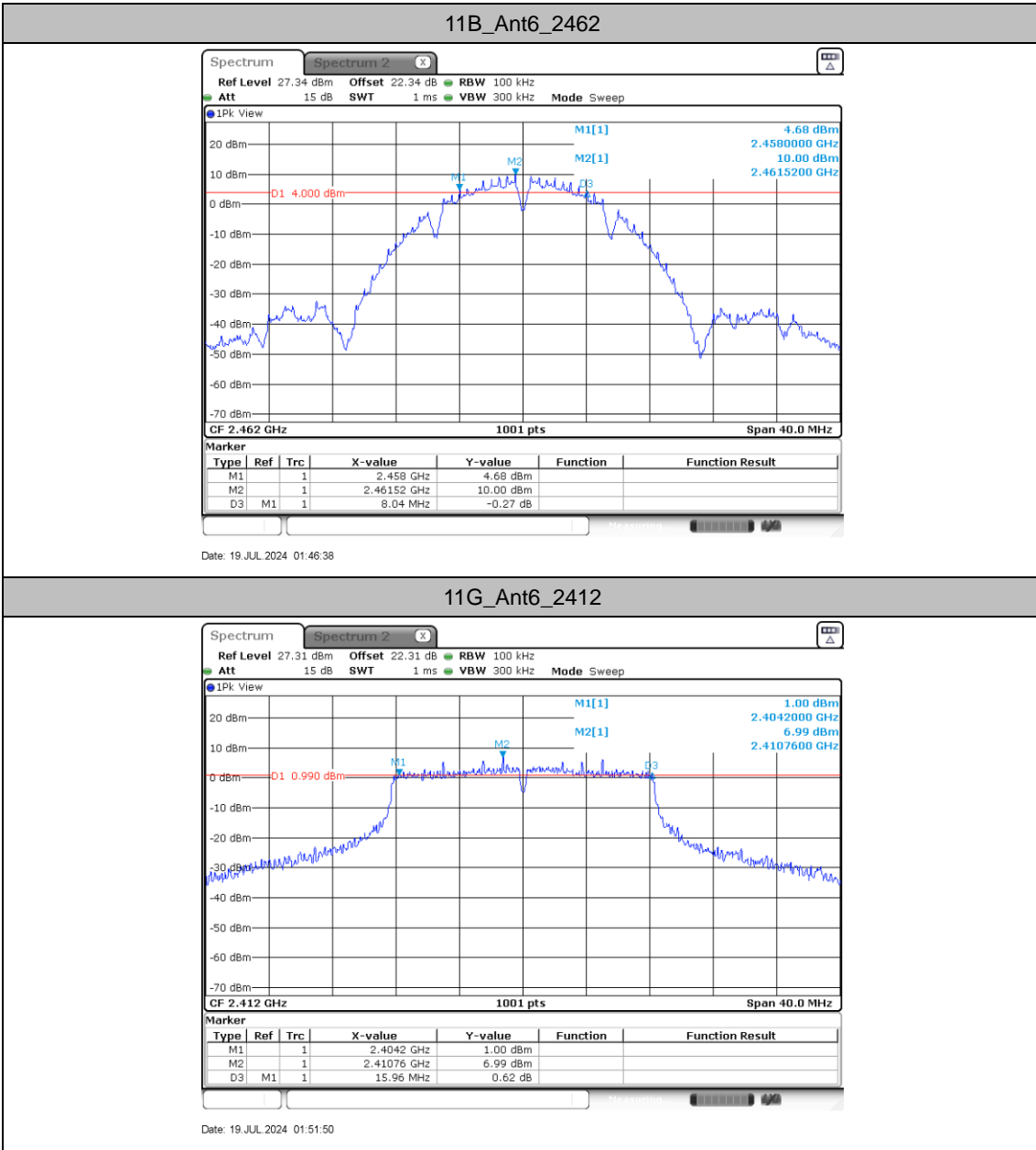


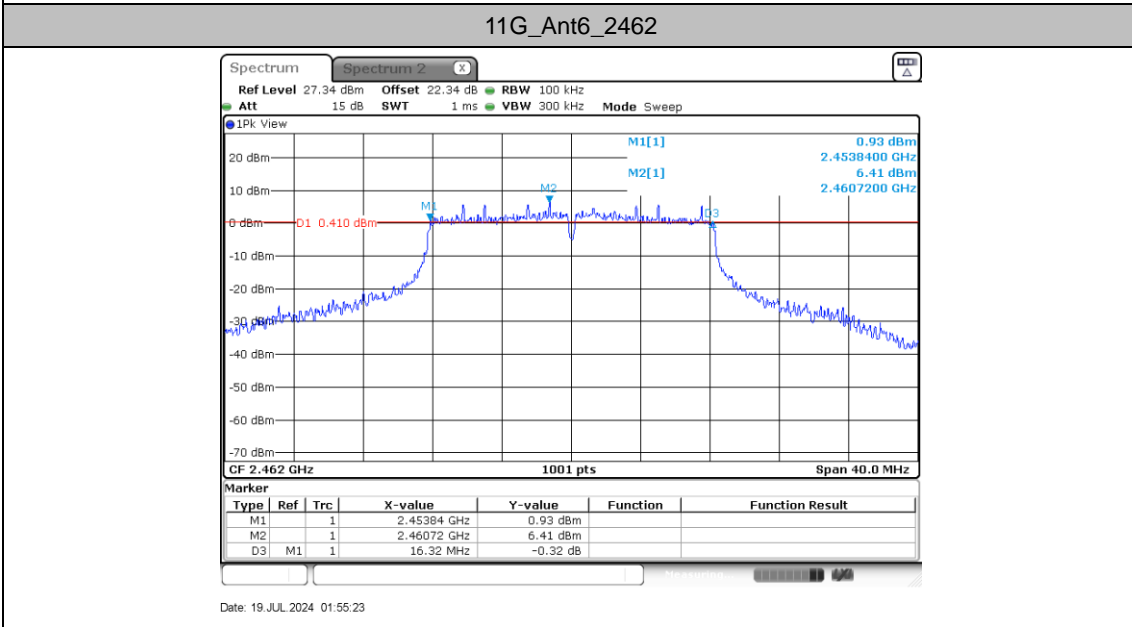
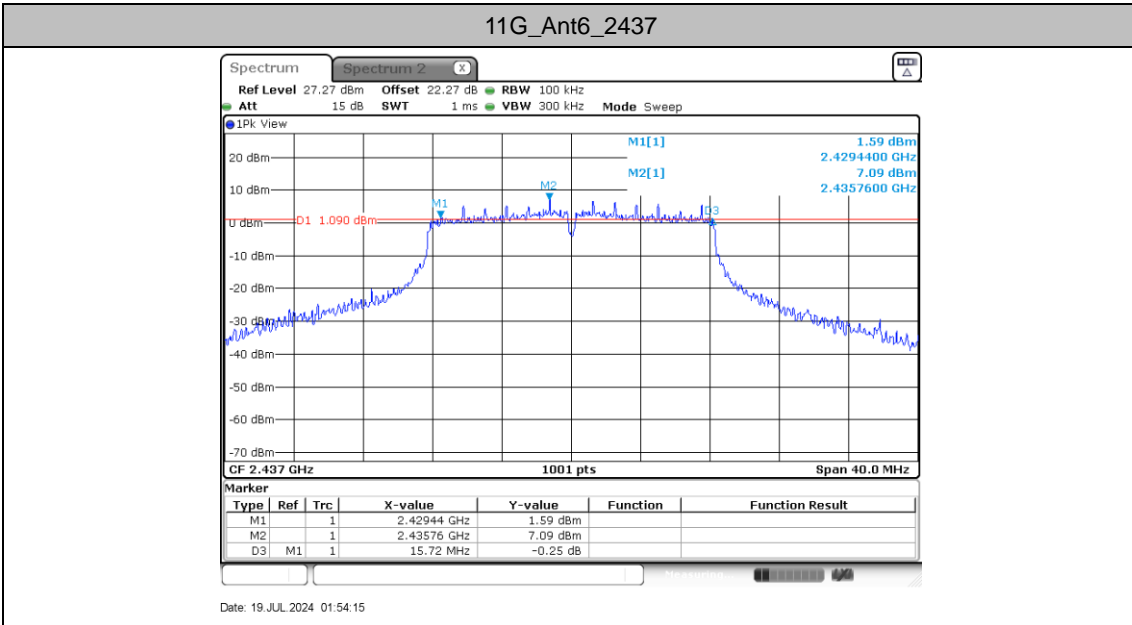
Date: 30.JUL.2024 09:22:48

11B\_Ant6\_2457

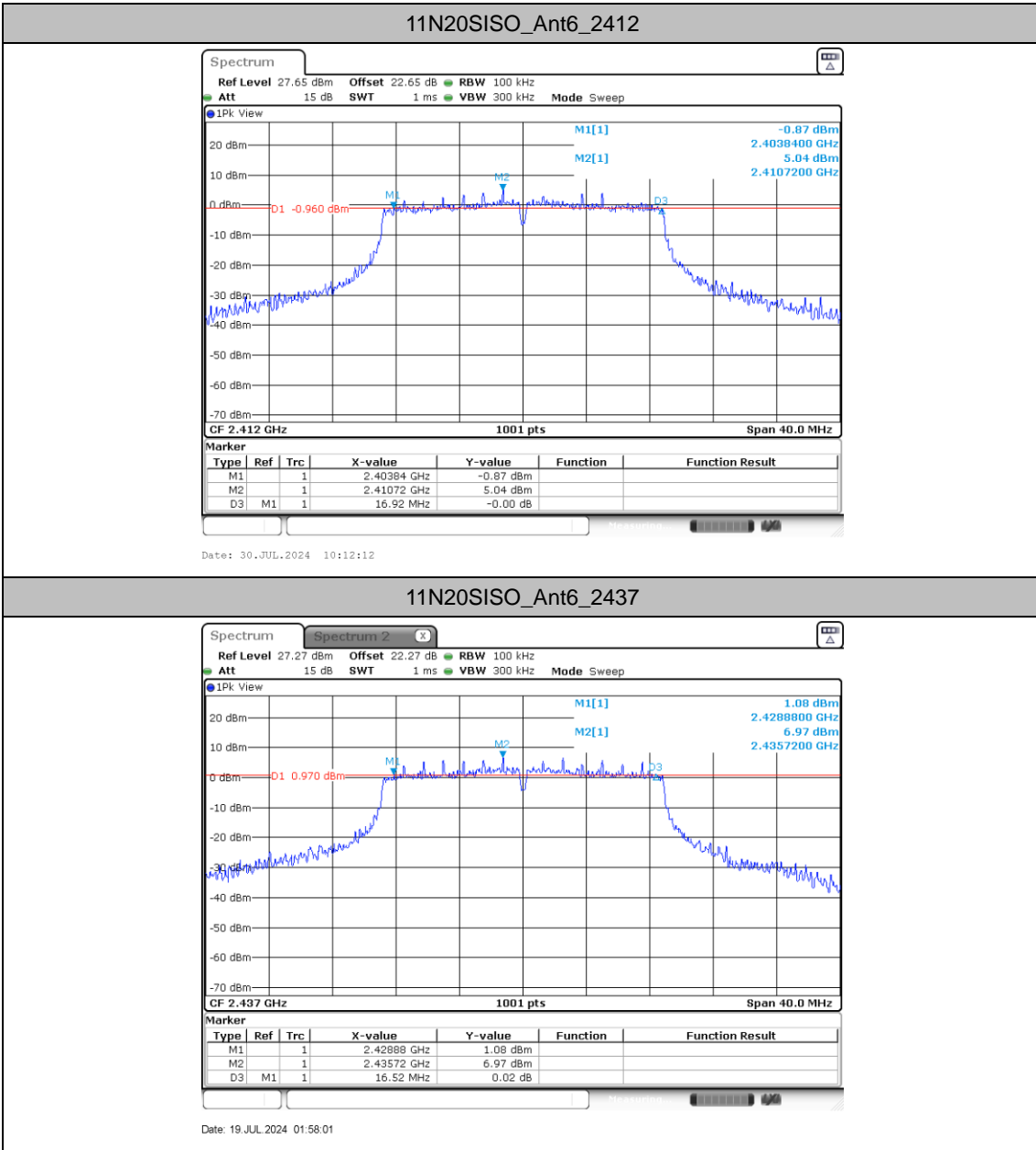


Date: 30.JUL.2024 09:24:56



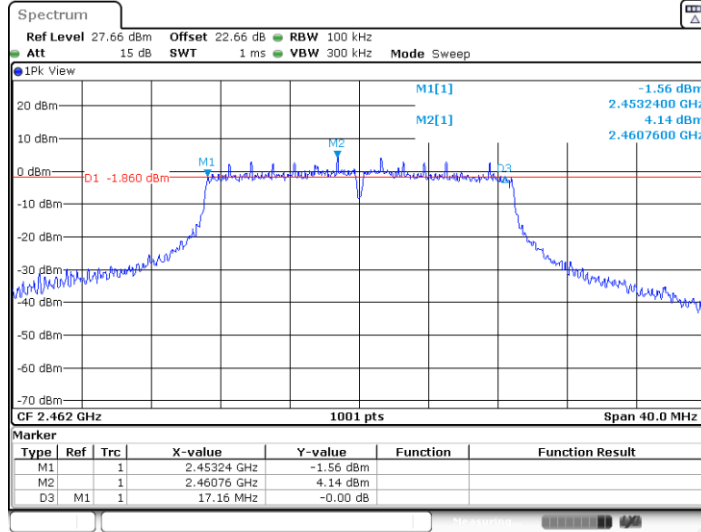






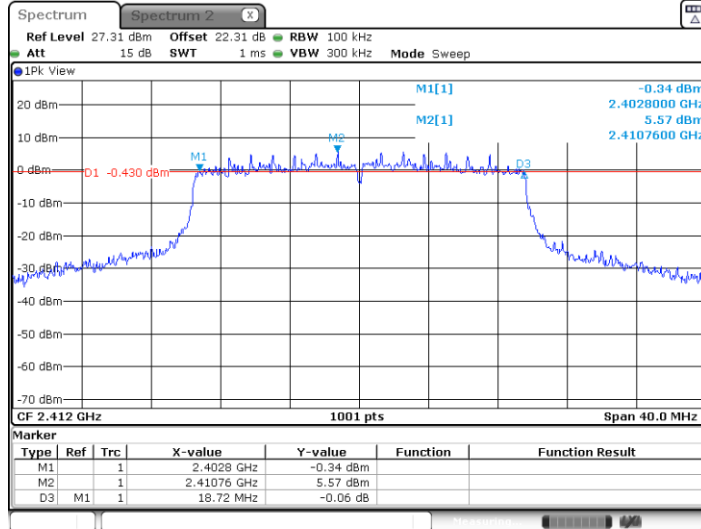


11N20SISO\_Ant6\_2462

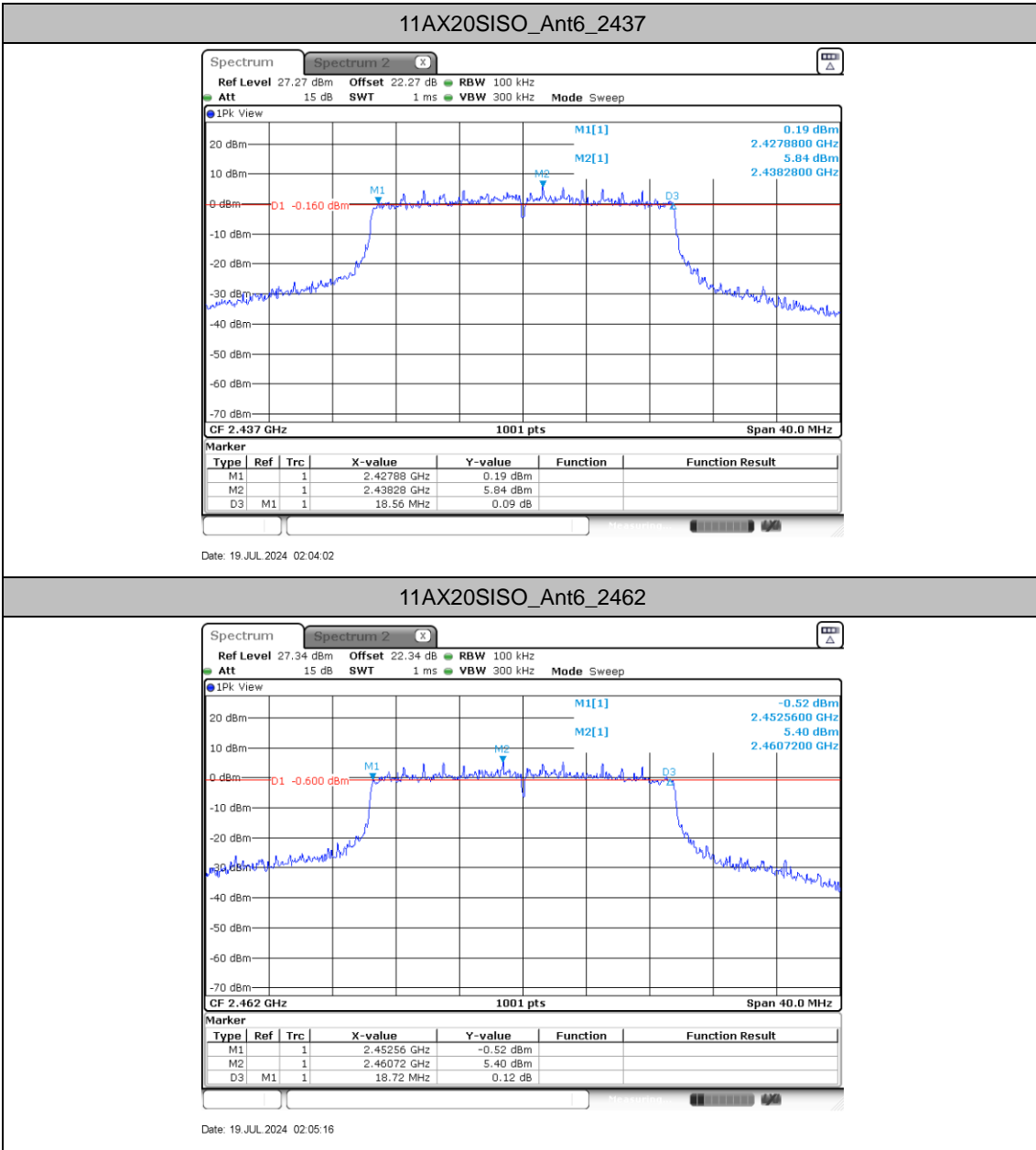


Date: 30.JUL.2024 10:14:05

11AX20SISO\_Ant6\_2412



Date: 19.JUL.2024 02:01:45





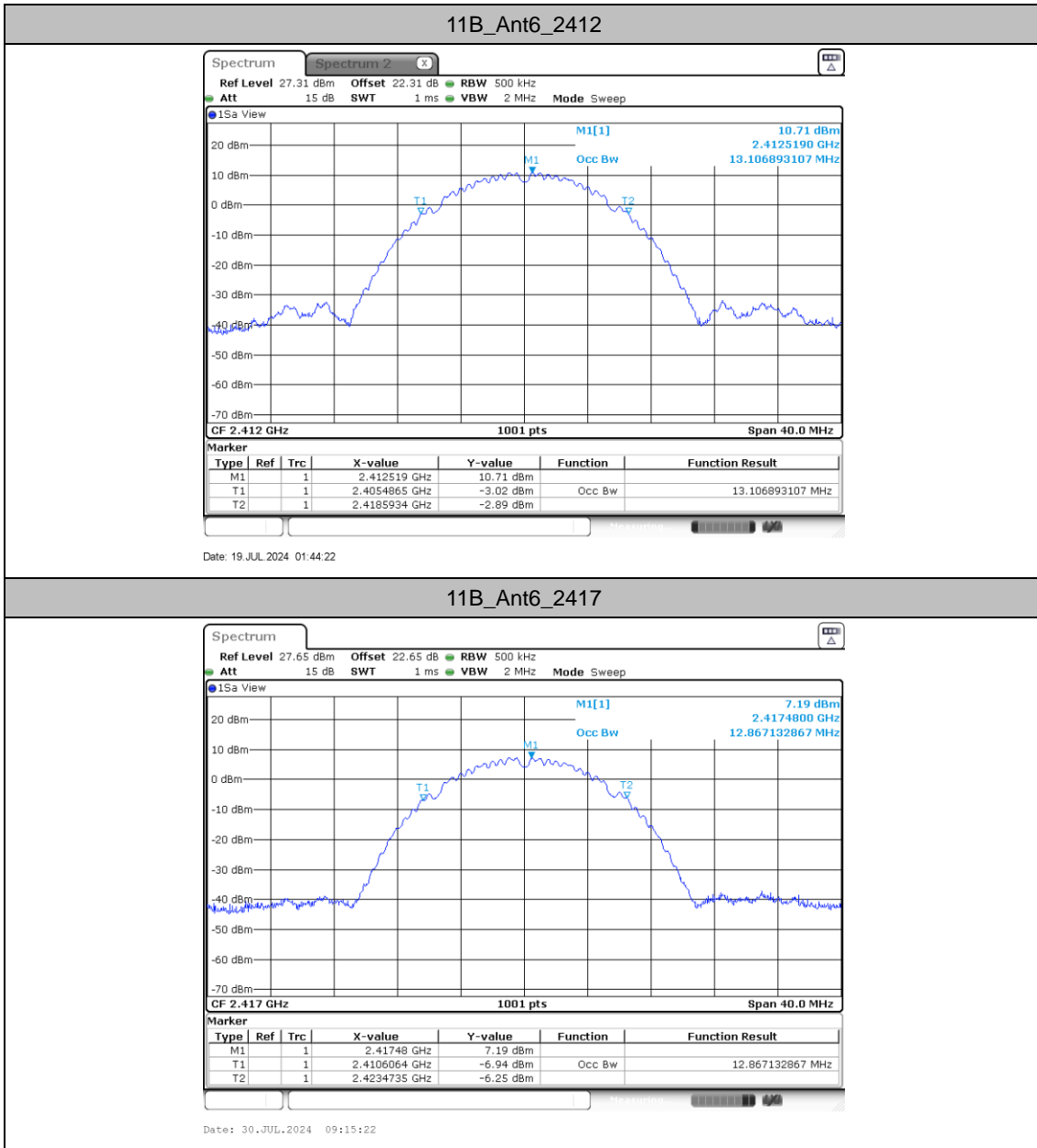
### Occupied Channel Bandwidth

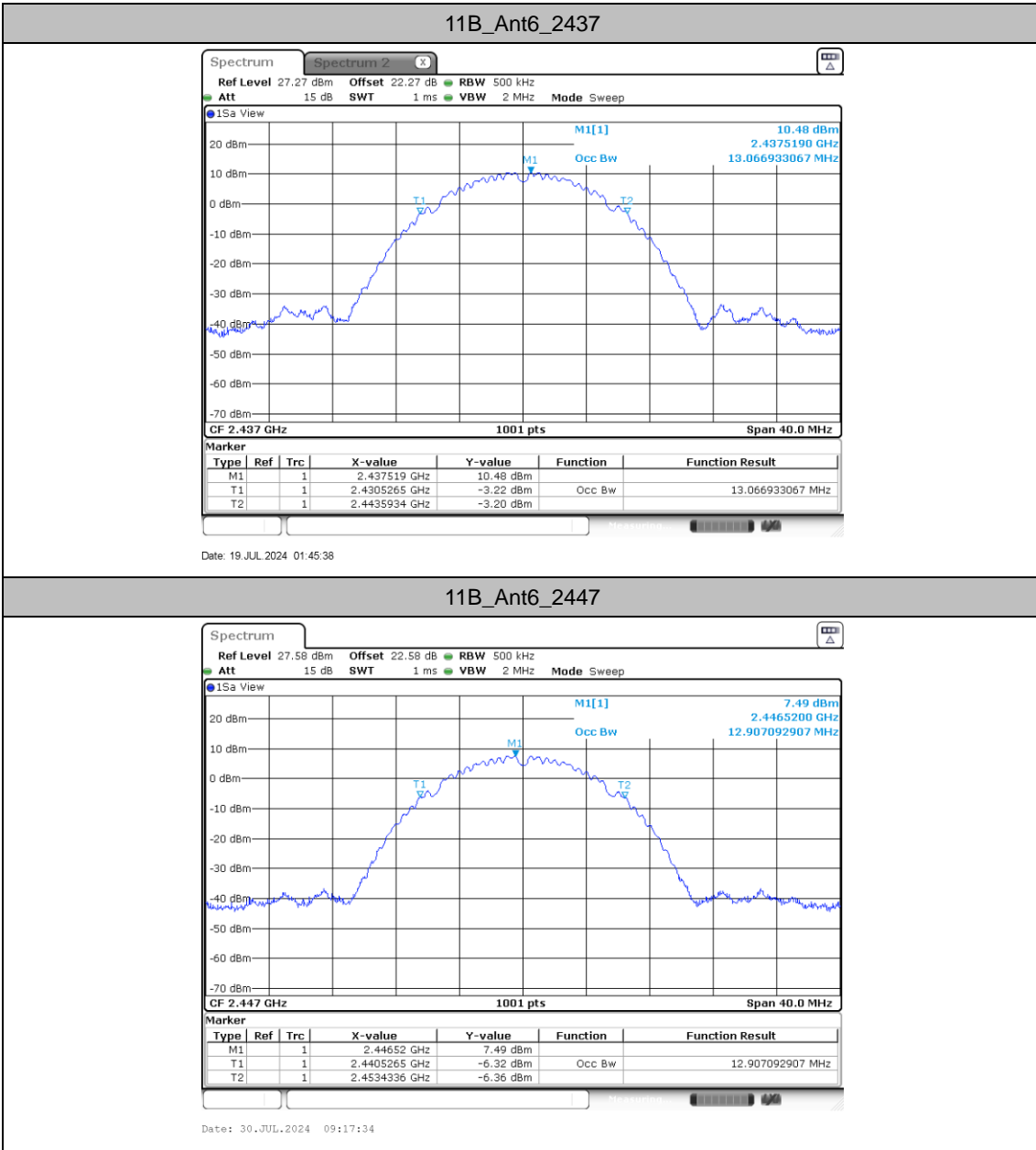
#### Test Result

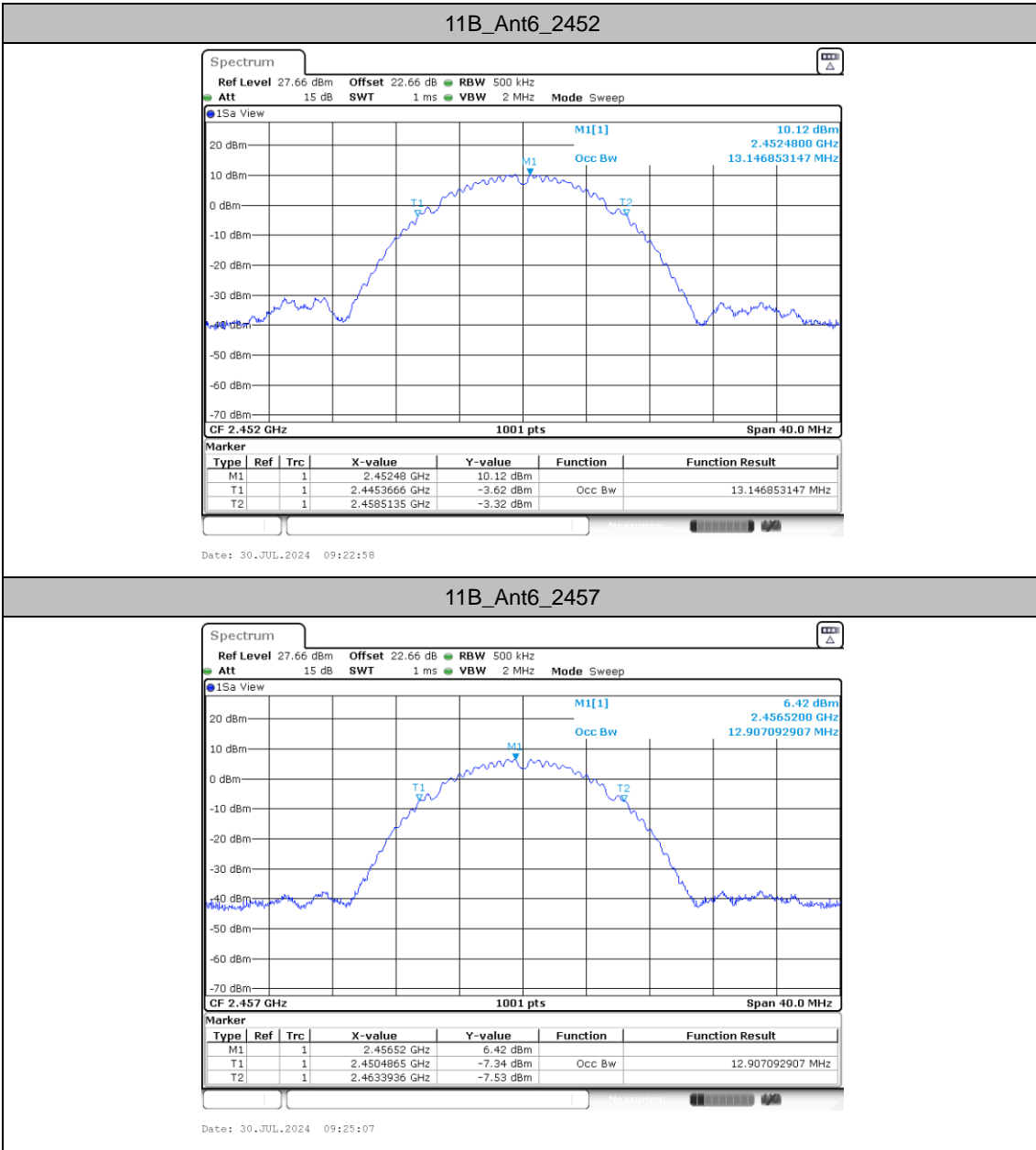
TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]
11B	Ant6	2412	13.107	2405.4865	2418.5934
		2417	12.867	2410.6064	2423.4735
		2437	13.067	2430.5265	2443.5934
		2447	12.907	2440.5265	2453.4336
		2452	13.147	2445.3666	2458.5135
		2457	12.907	2450.4865	2463.3936
		2462	13.227	2455.3666	2468.5934
11G	Ant6	2412	17.423	2403.3287	2420.7512
		2437	17.263	2428.3686	2445.6314
		2462	17.343	2453.3287	2470.6713
11N20SISO	Ant6	2412	18.382	2402.8492	2421.2308
		2437	18.422	2427.7692	2446.1908
		2462	18.382	2452.7692	2471.1508
11AX20SISO	Ant6	2412	19.261	2402.4096	2421.6703
		2437	19.181	2427.4096	2446.5904
		2462	19.261	2452.3696	2471.6304



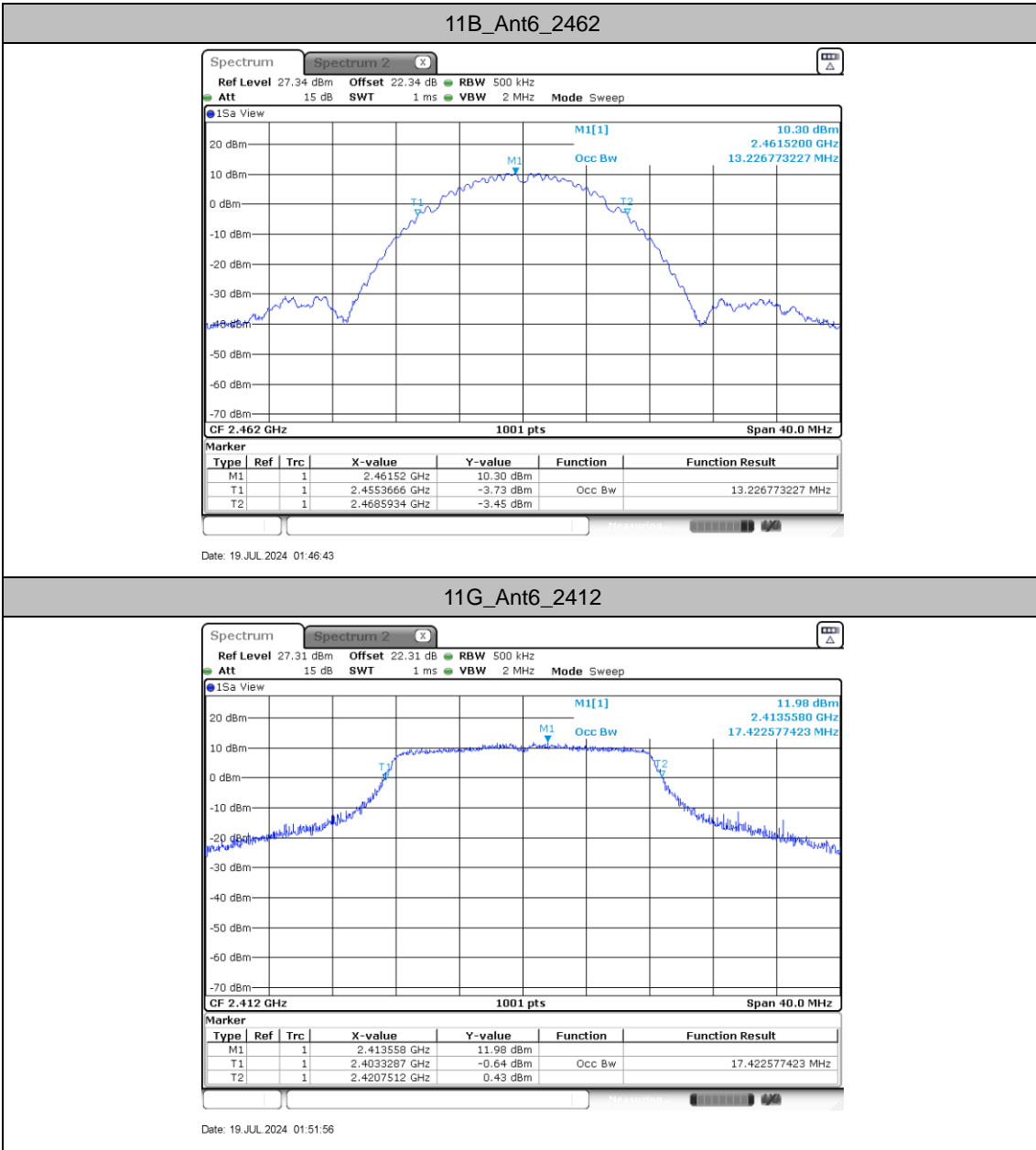
Test Graphs



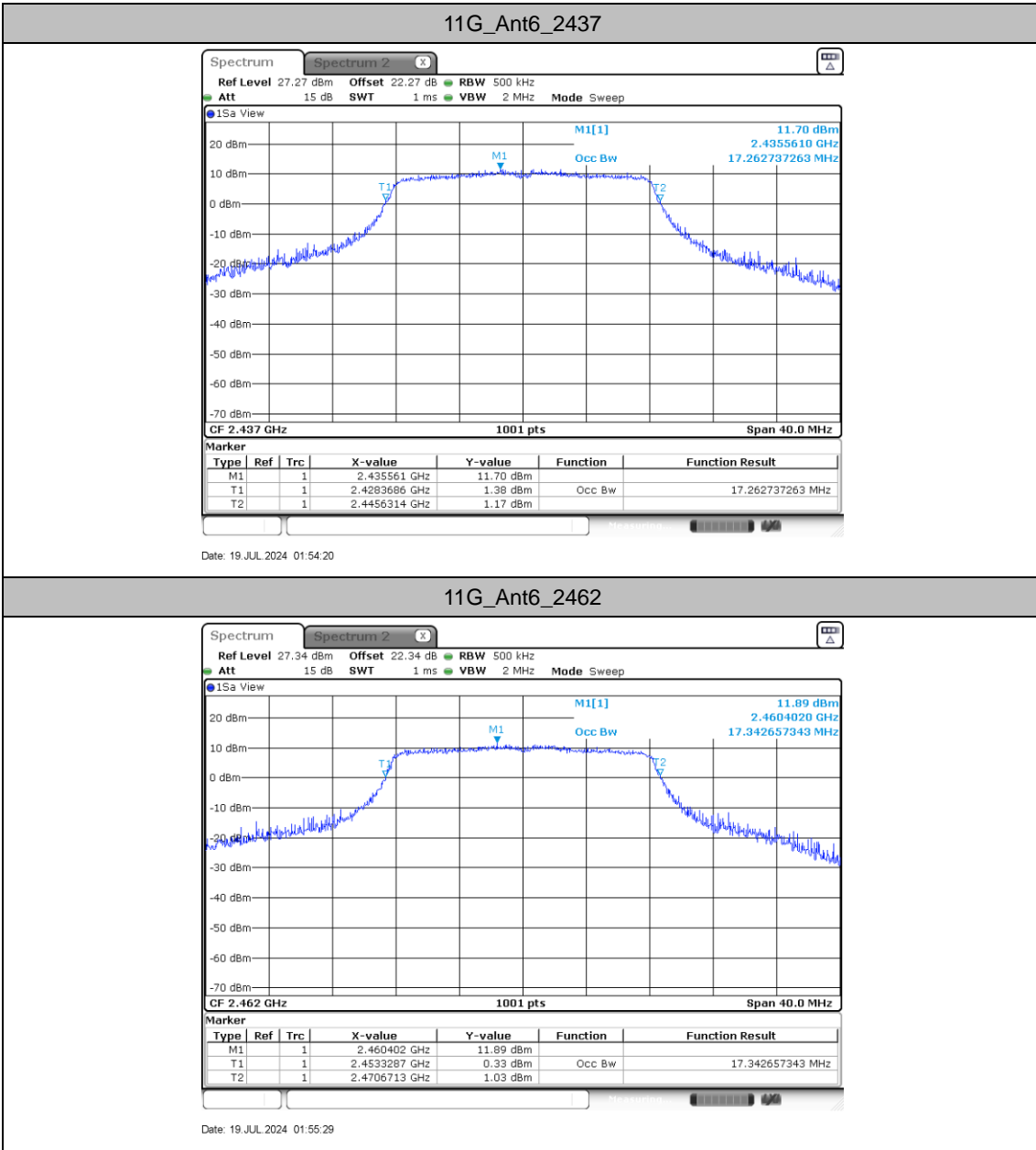


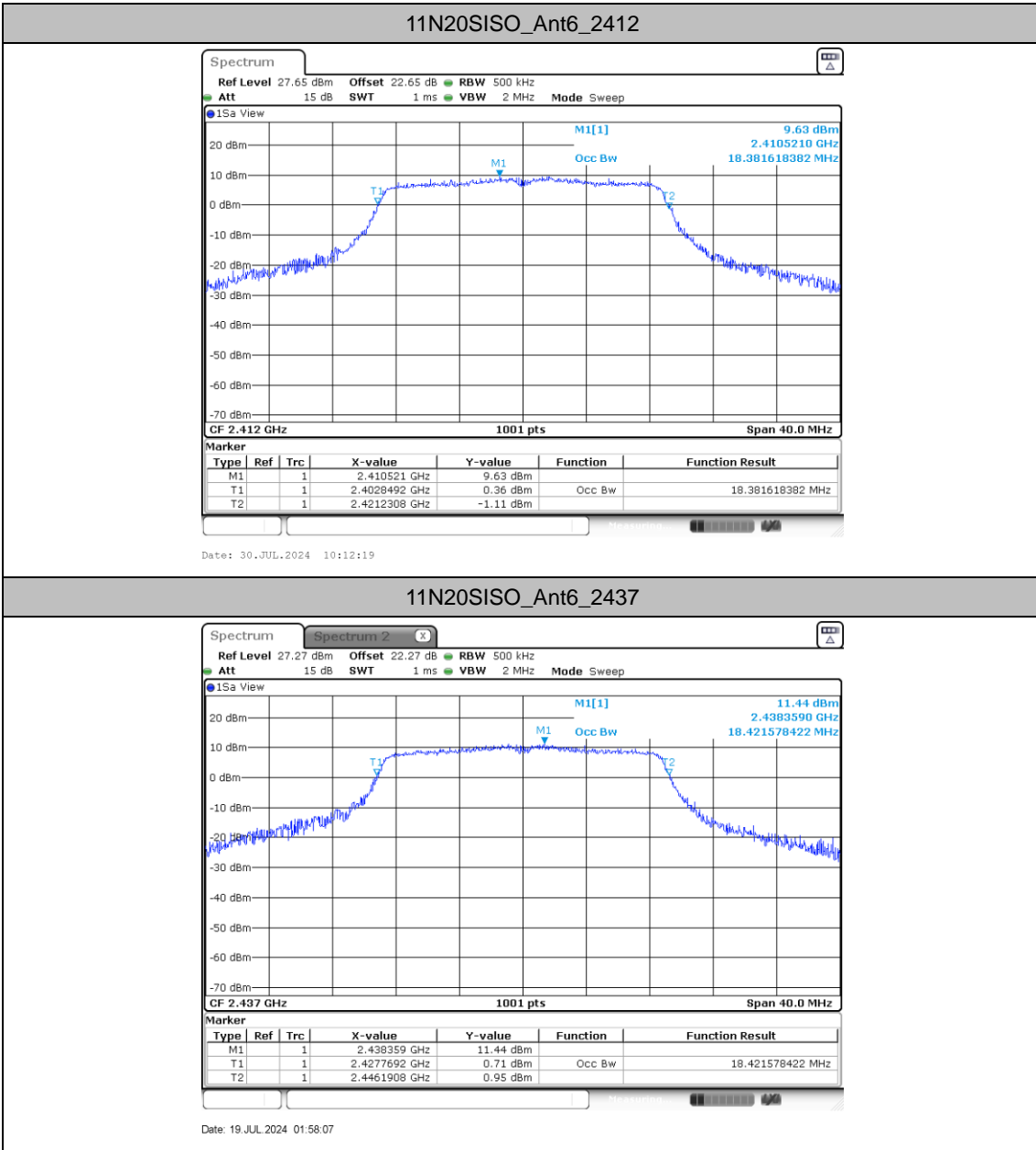


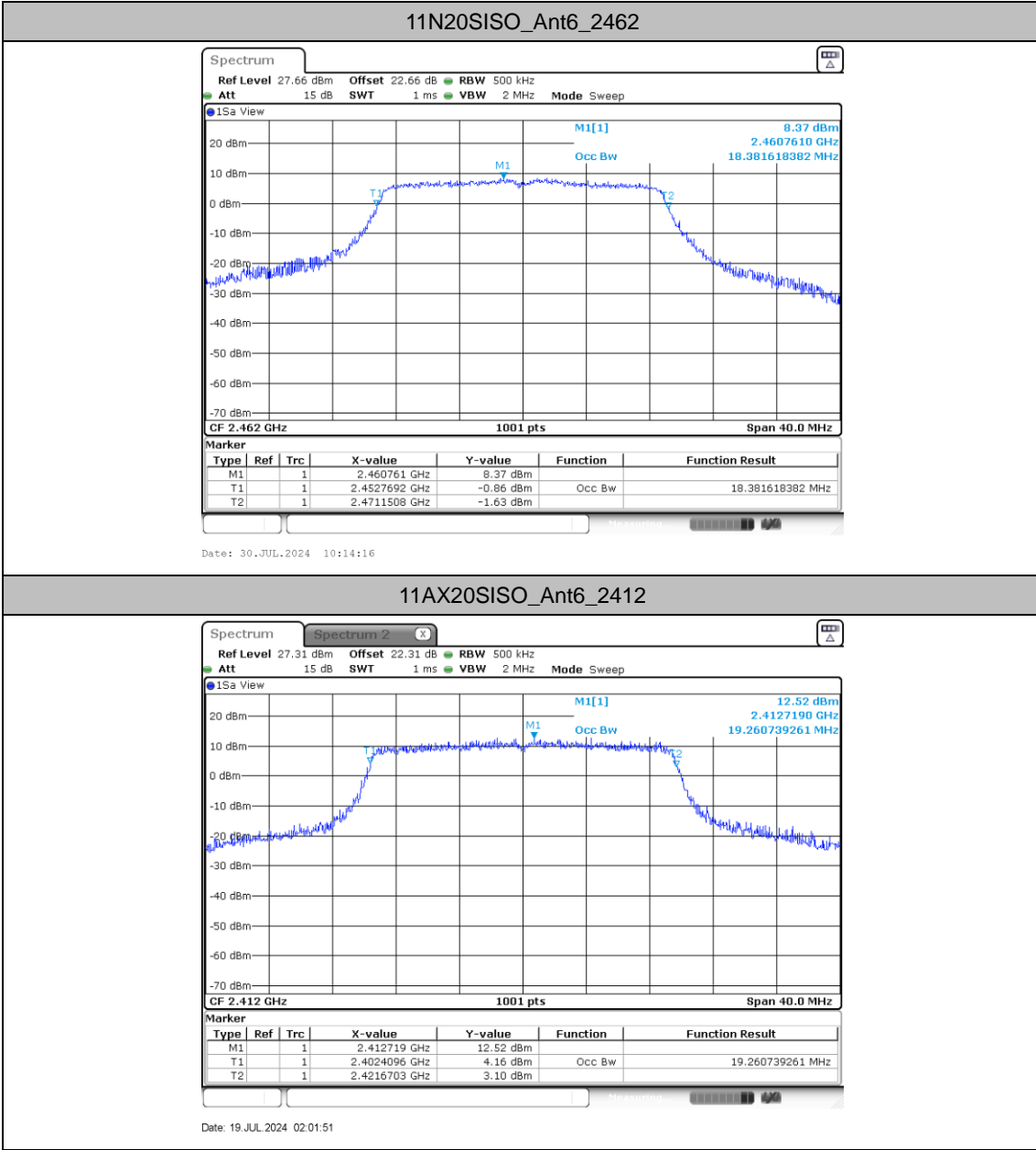
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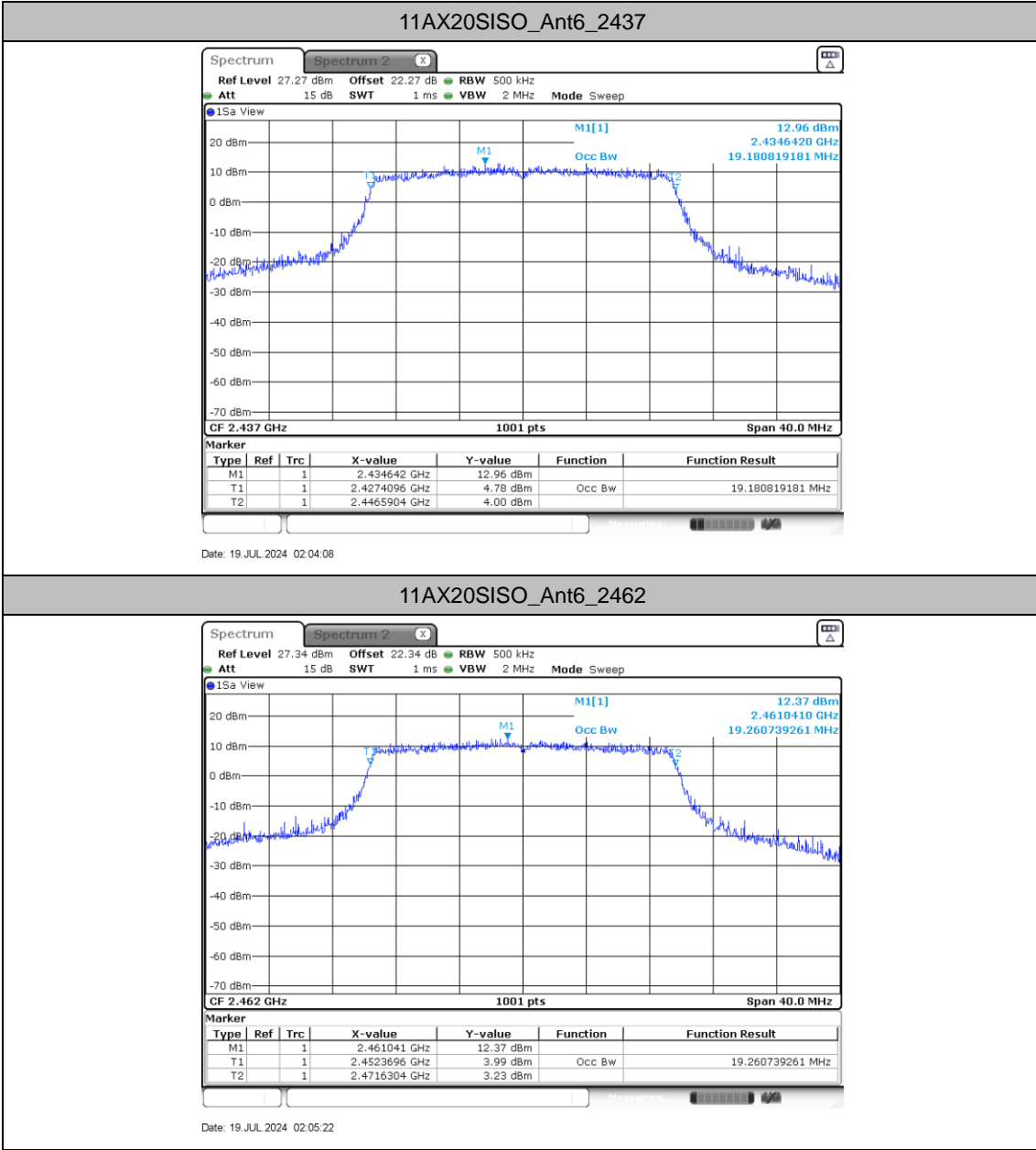














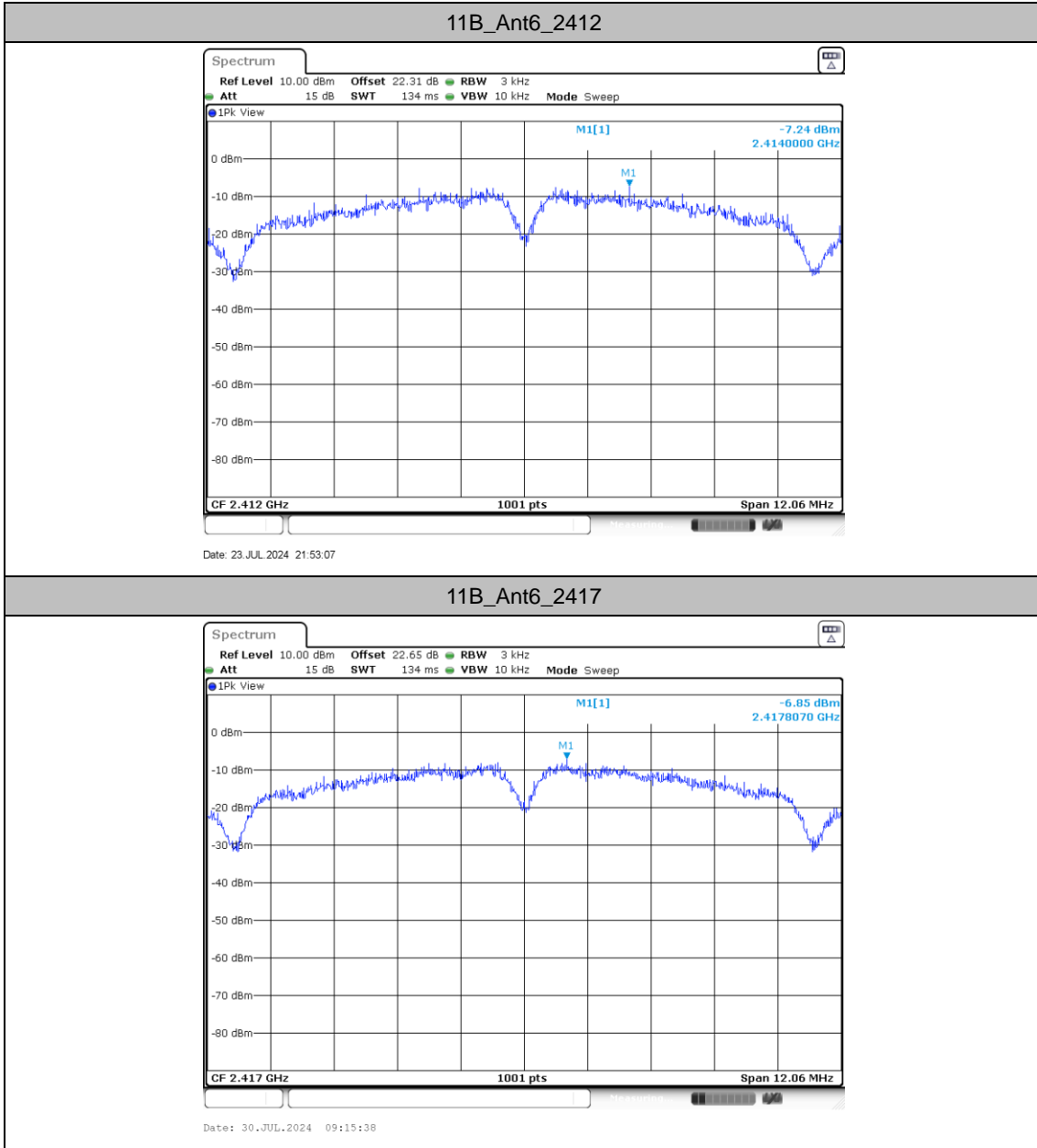
### Maximum power spectral density

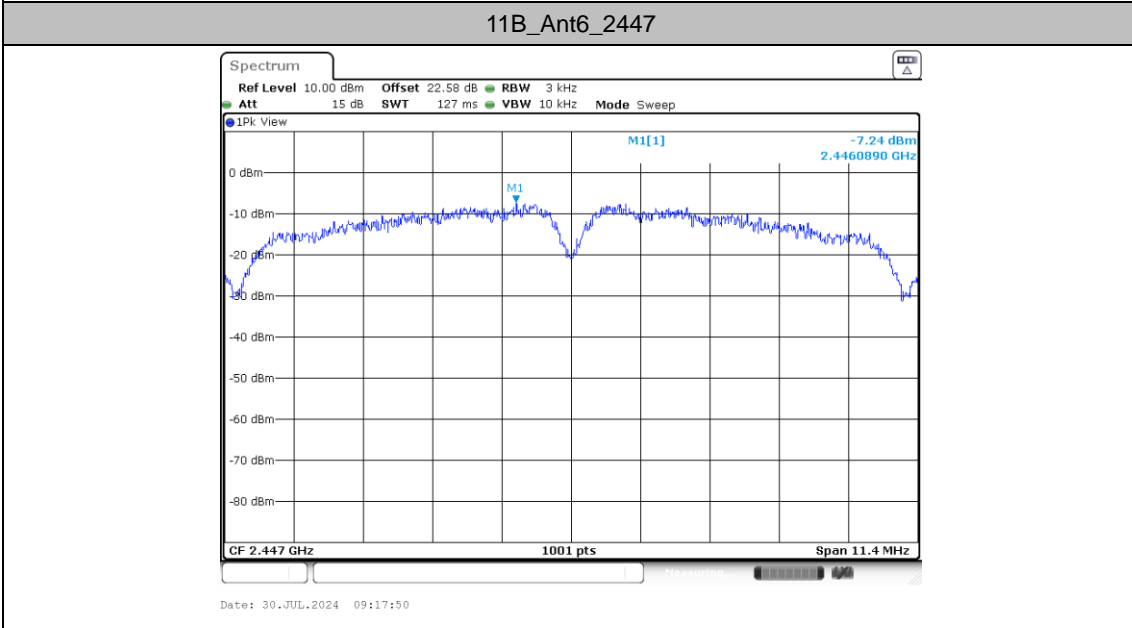
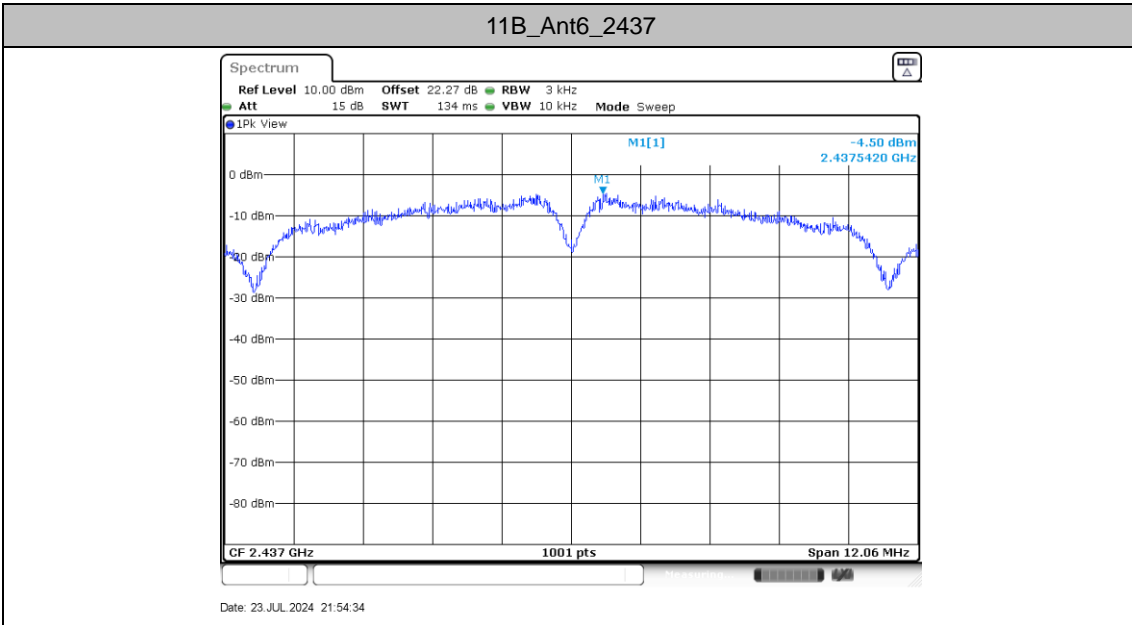
#### Test Result

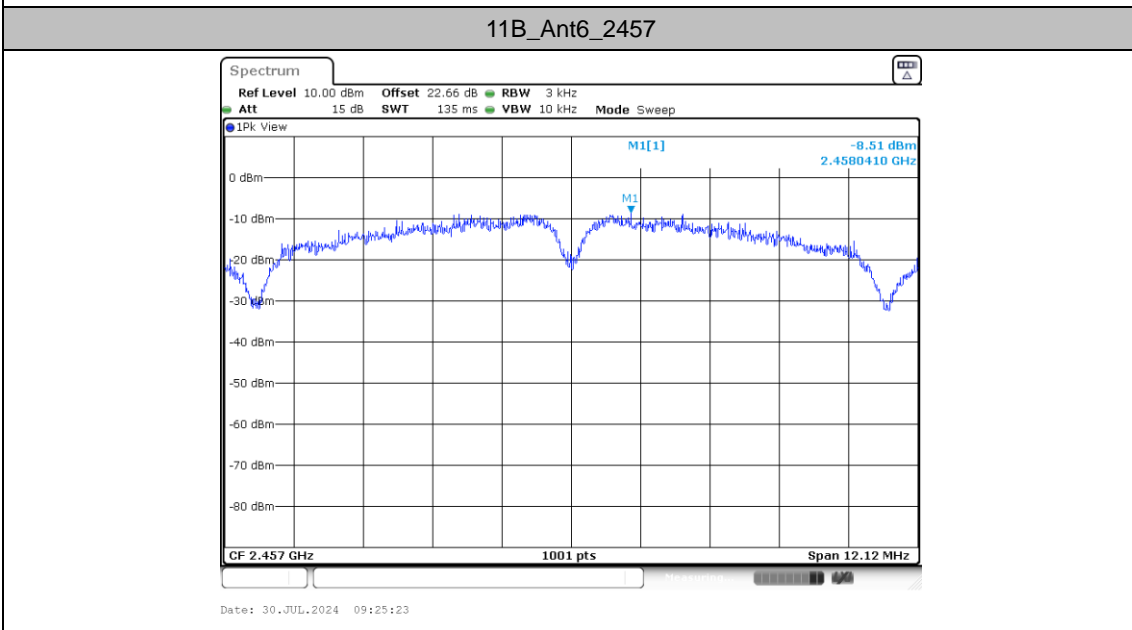
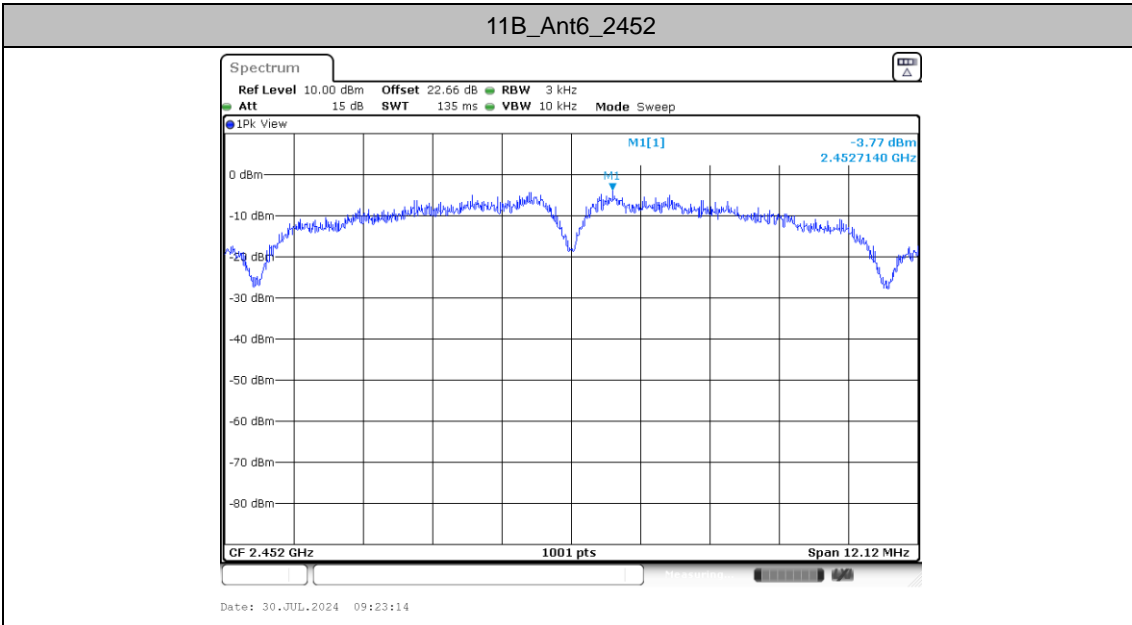
TestMode	Antenna	Freq(MHz)	Result [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
11B	Ant6	2412	-7.24	≤8.00	PASS
		2417	-6.85	≤8.00	PASS
		2437	-4.5	≤8.00	PASS
		2447	-7.24	≤8.00	PASS
		2452	-3.77	≤8.00	PASS
		2457	-8.51	≤8.00	PASS
		2462	-7.64	≤8.00	PASS
11G	Ant6	2412	-7.83	≤8.00	PASS
		2437	-6.86	≤8.00	PASS
		2462	-7.22	≤8.00	PASS
11N20SISO	Ant6	2412	-8.37	≤8.00	PASS
		2437	-6.86	≤8.00	PASS
		2462	-10.20	≤8.00	PASS
11AX20SISO	Ant6	2412	-10.89	≤8.00	PASS
		2437	-9.6	≤8.00	PASS
		2462	-10	≤8.00	PASS



### Test Graphs



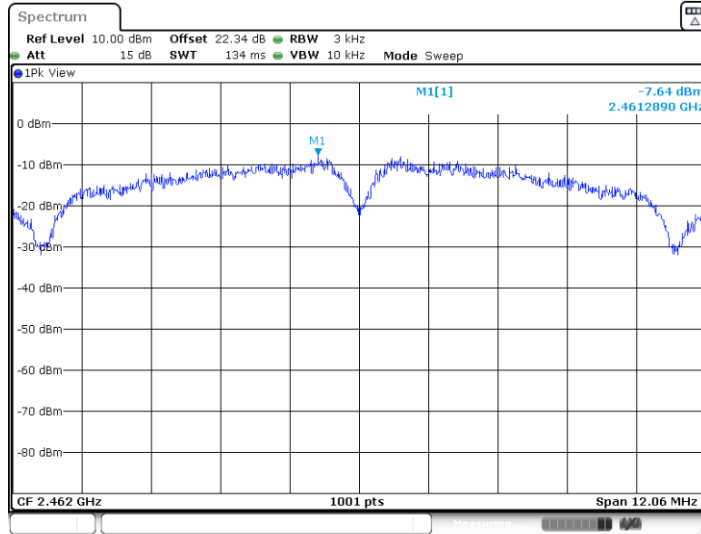






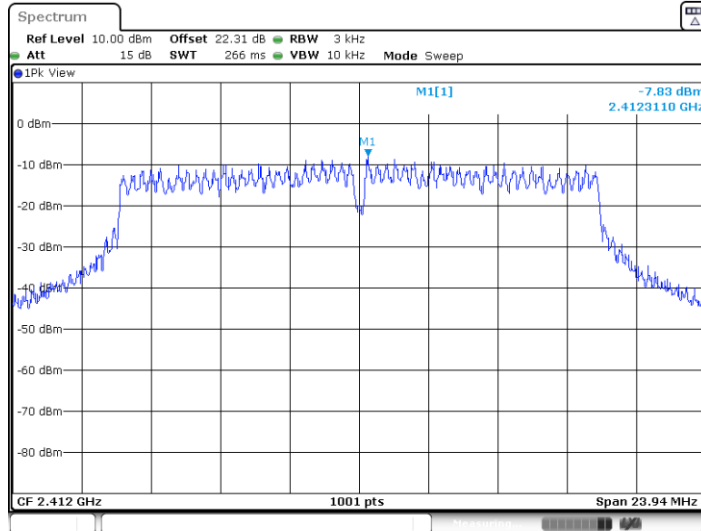


11B\_Ant6\_2462

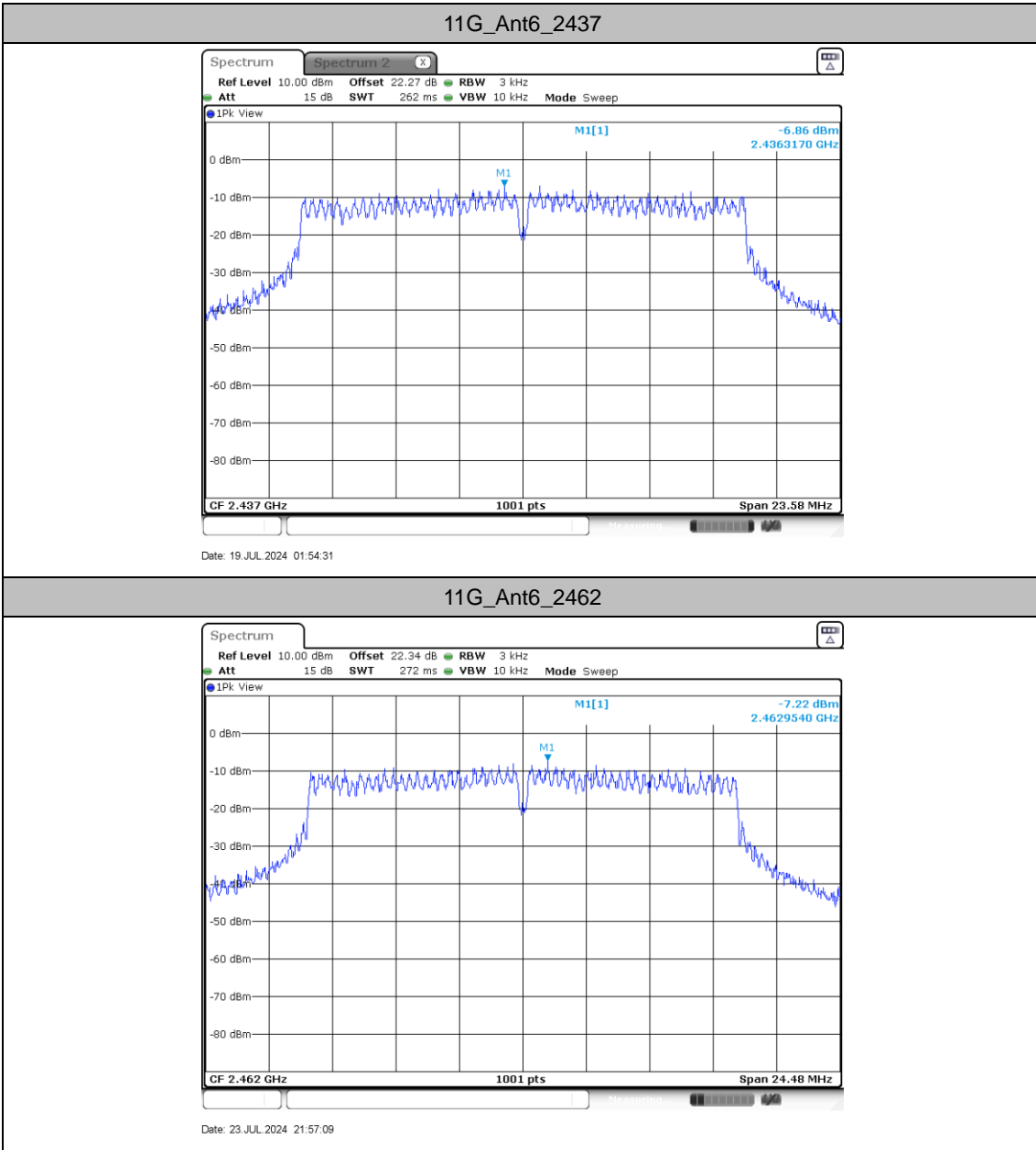


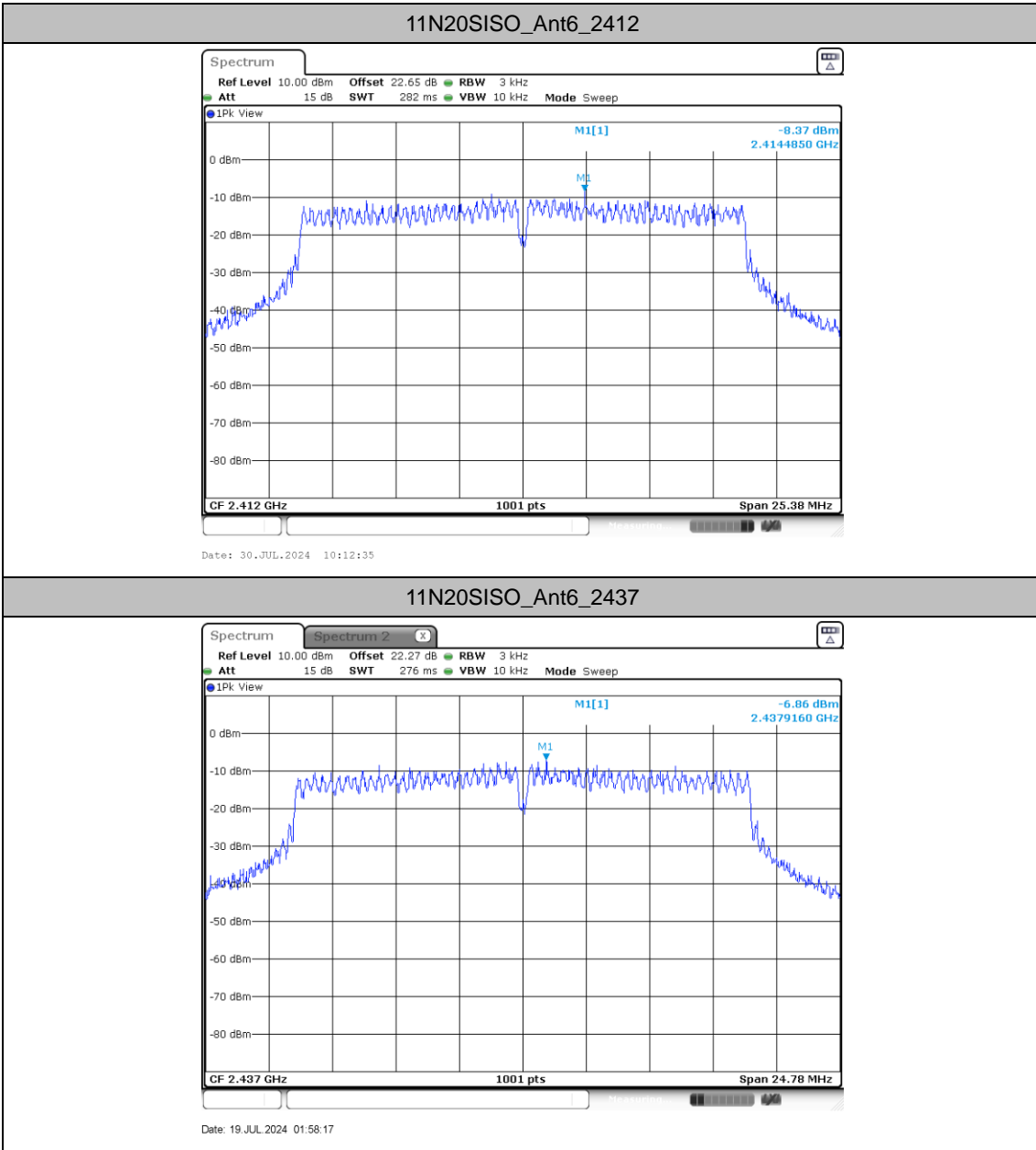
Date: 23 JUL 2024 21:55:23

11G\_Ant6\_2412



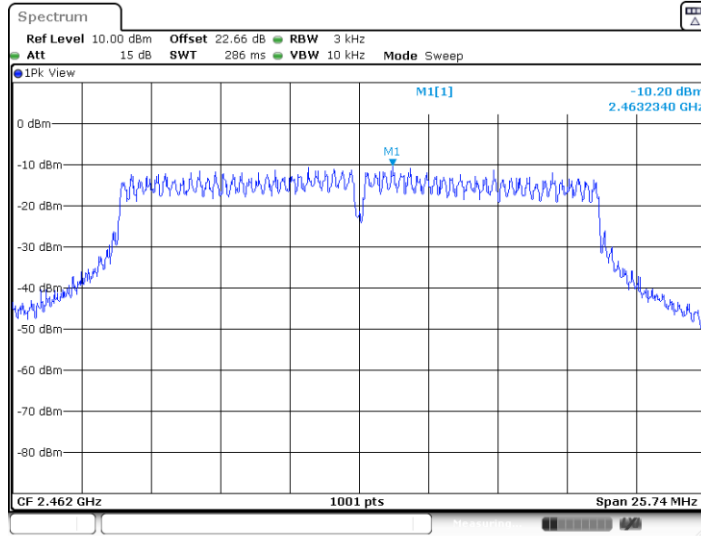
Date: 23 JUL 2024 21:56:02



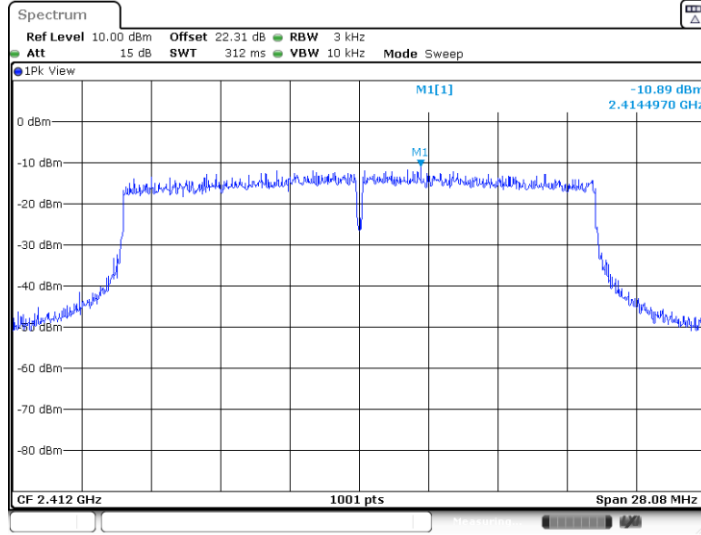


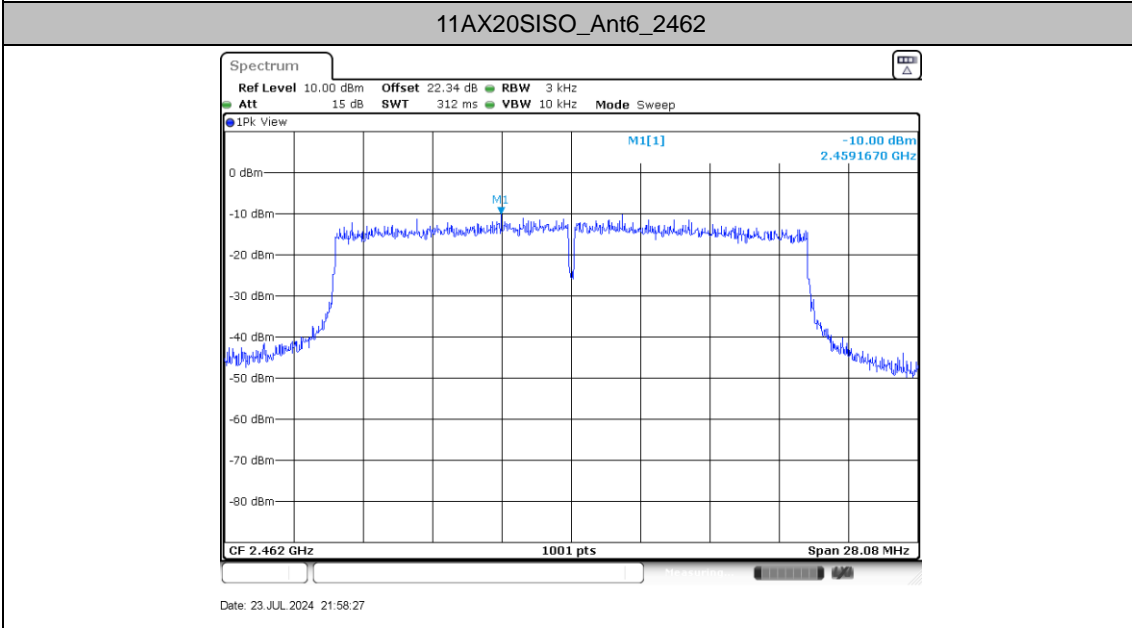
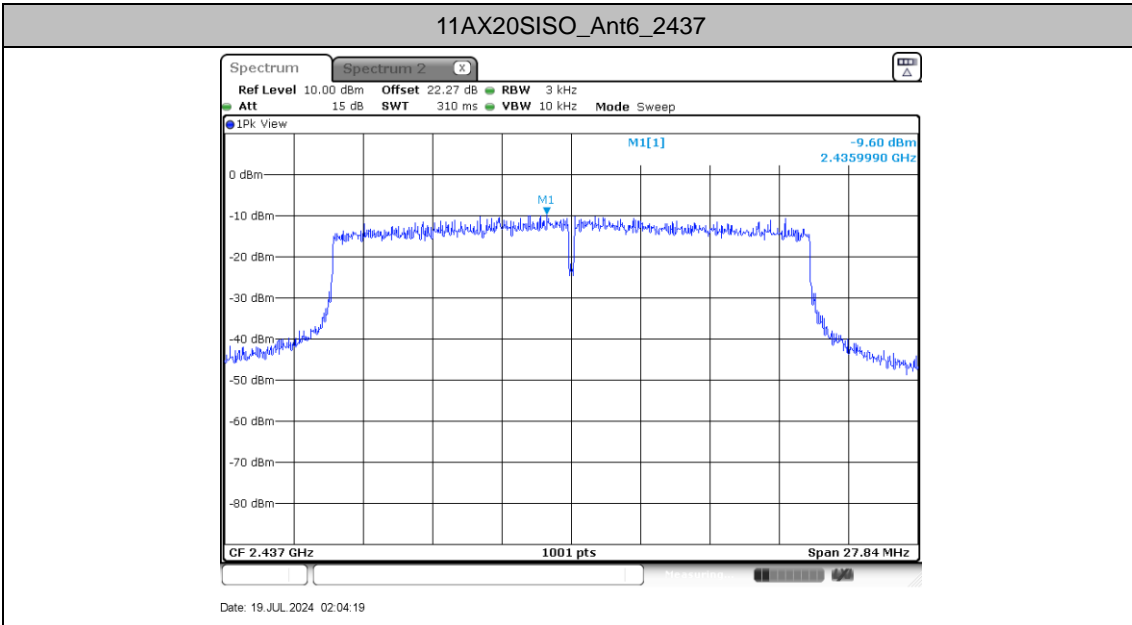


11N20SISO\_Ant6\_2462



11AX20SISO\_Ant6\_2412







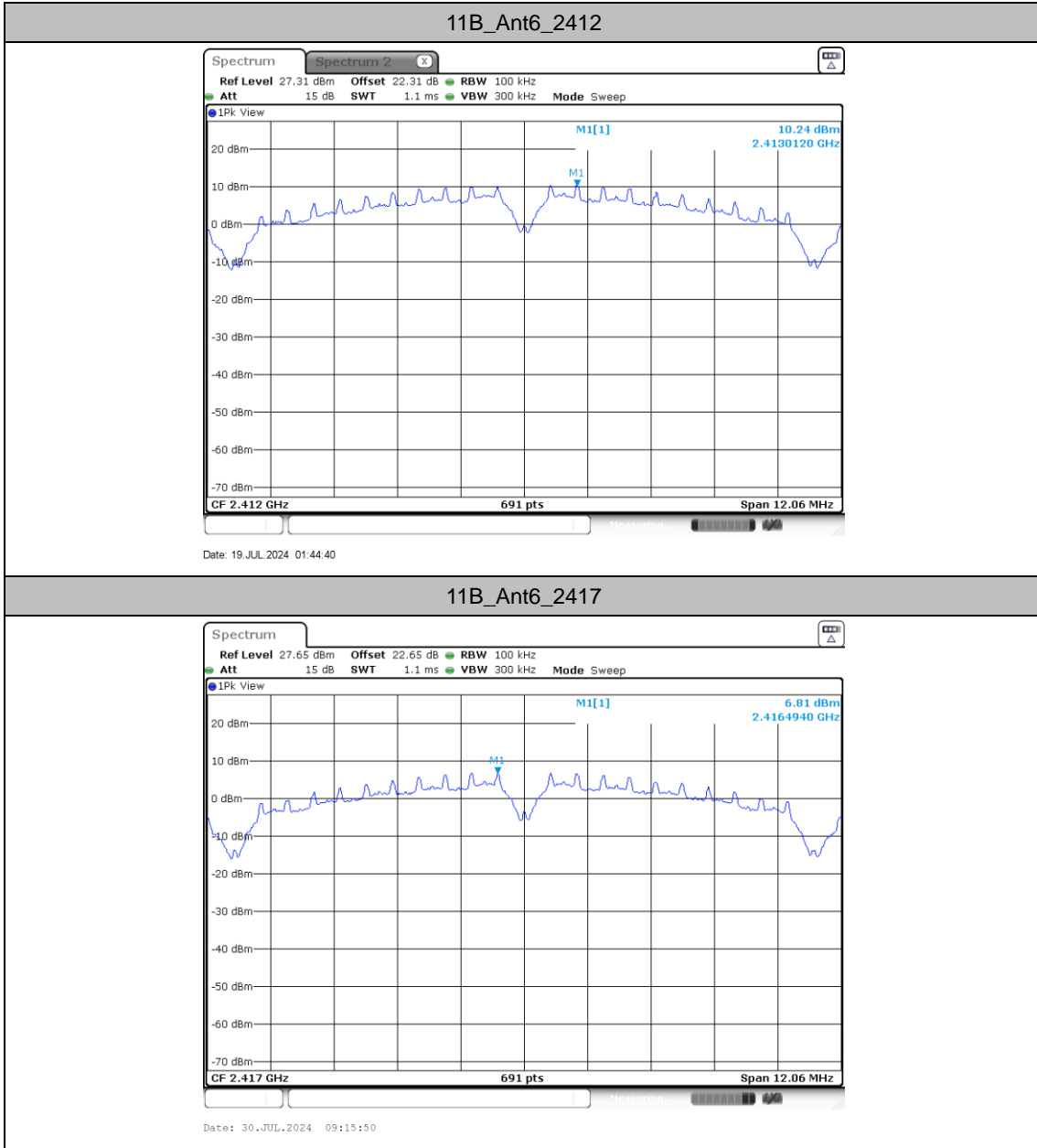
## Reference level measurement

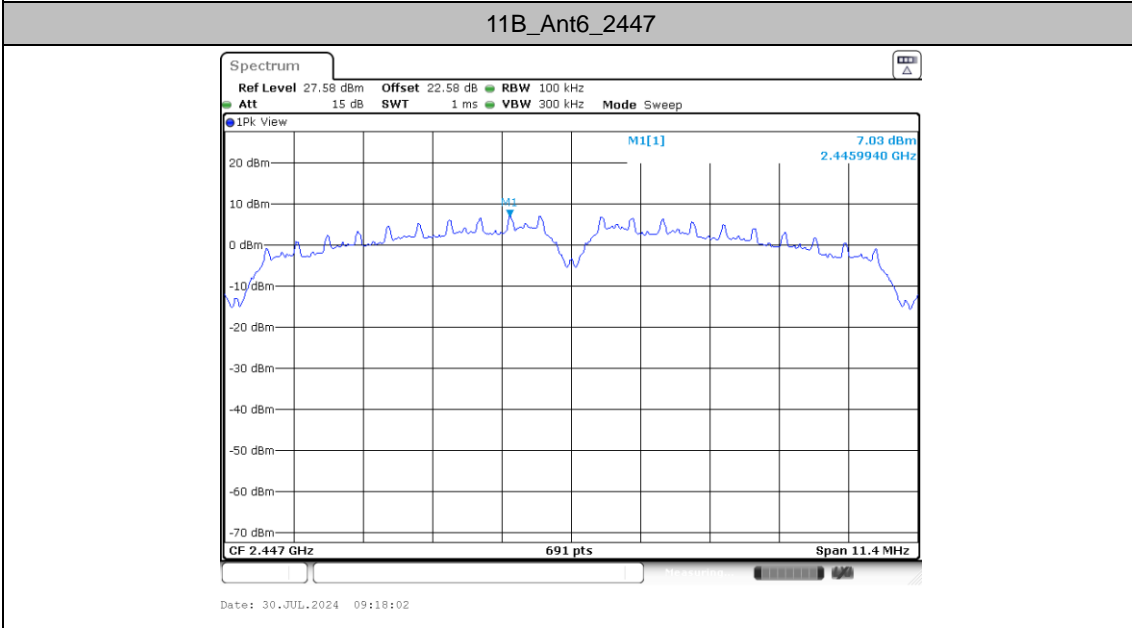
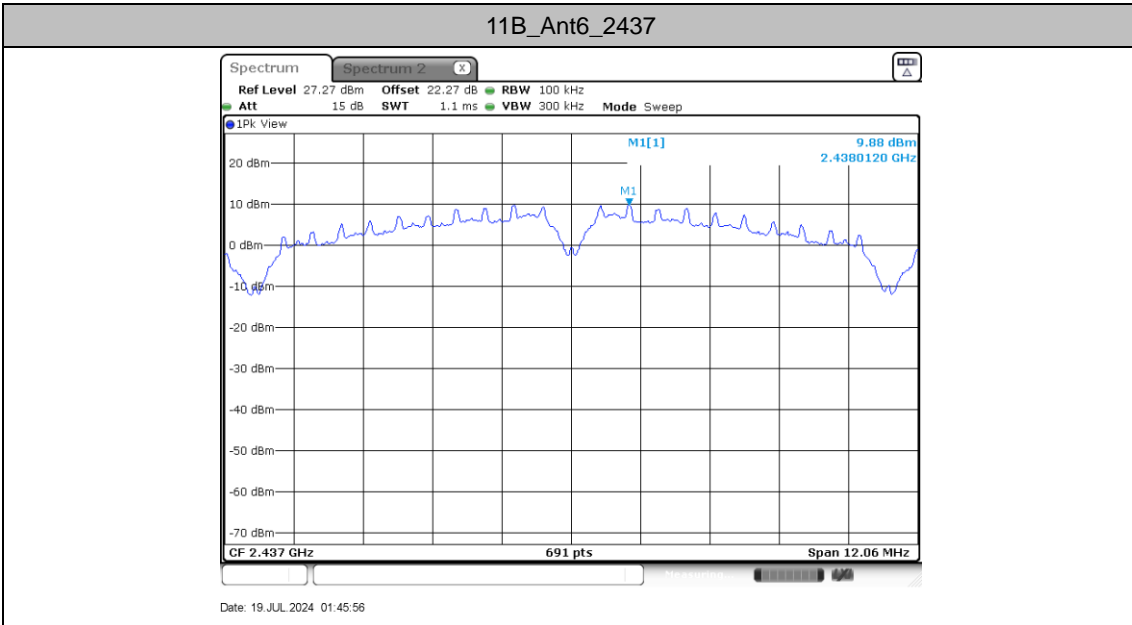
### Test Result

TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm/100KHz]
11B	Ant6	2412	2413.01	10.24
		2417	2416.49	6.81
		2437	2438.01	9.88
		2447	2445.99	7.03
		2452	2452.49	9.68
		2457	2456.49	6.14
		2462	2462.51	9.80
11G	Ant6	2412	2410.75	6.98
		2437	2435.74	6.96
		2462	2463.28	6.50
11N20SISO	Ant6	2412	2413.25	4.88
		2437	2435.75	6.94
		2462	2464.50	3.59
11AX20SISO	Ant6	2412	2410.74	5.82
		2437	2439.50	5.47
		2462	2463.26	5.40

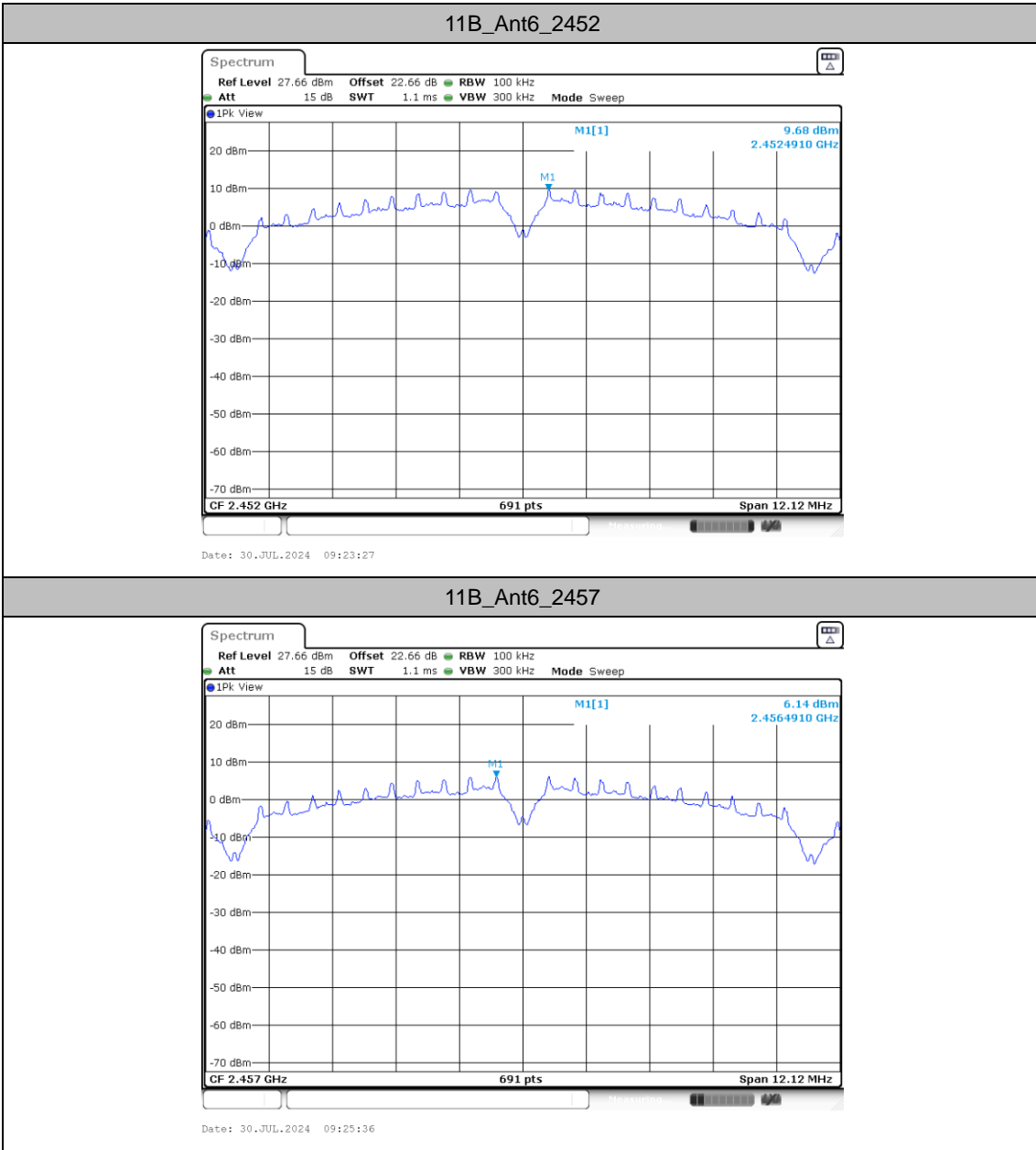


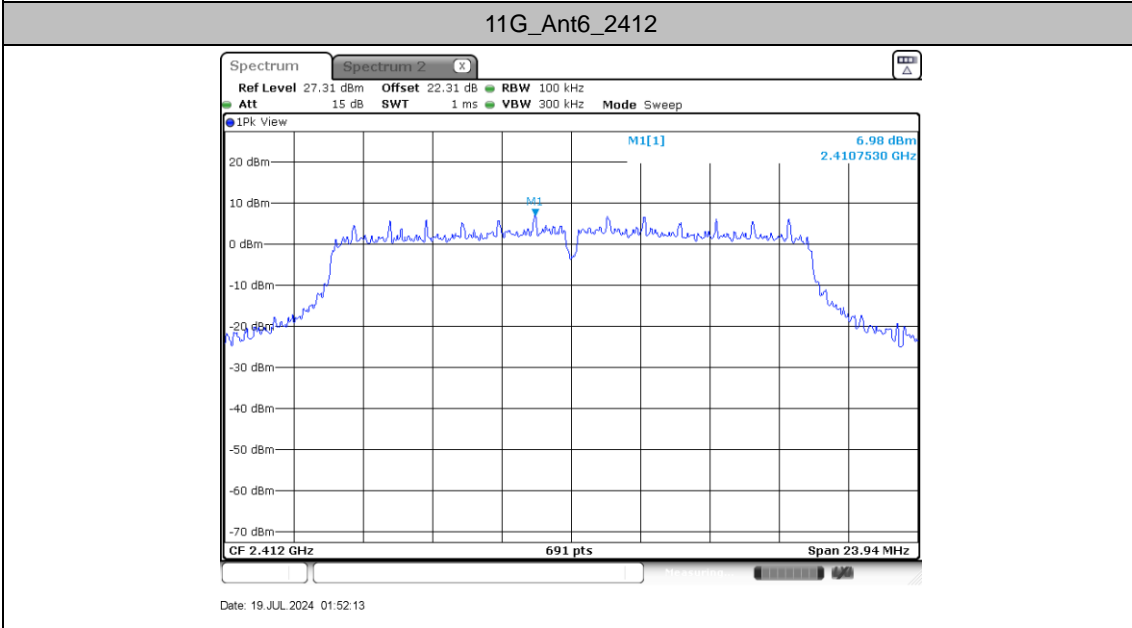
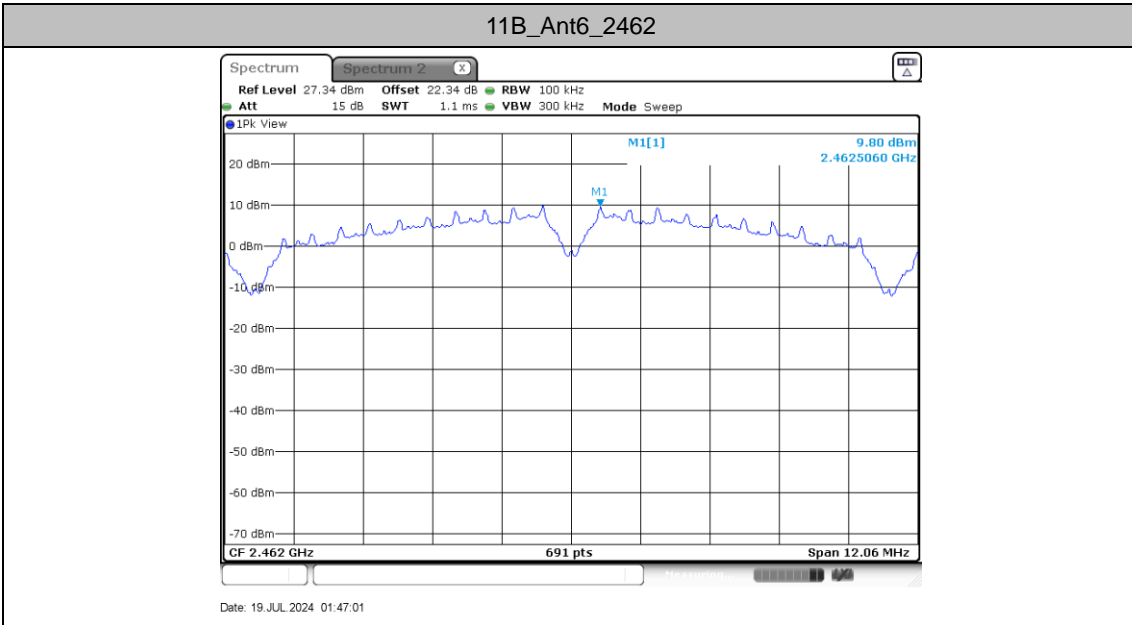
### Test Graphs

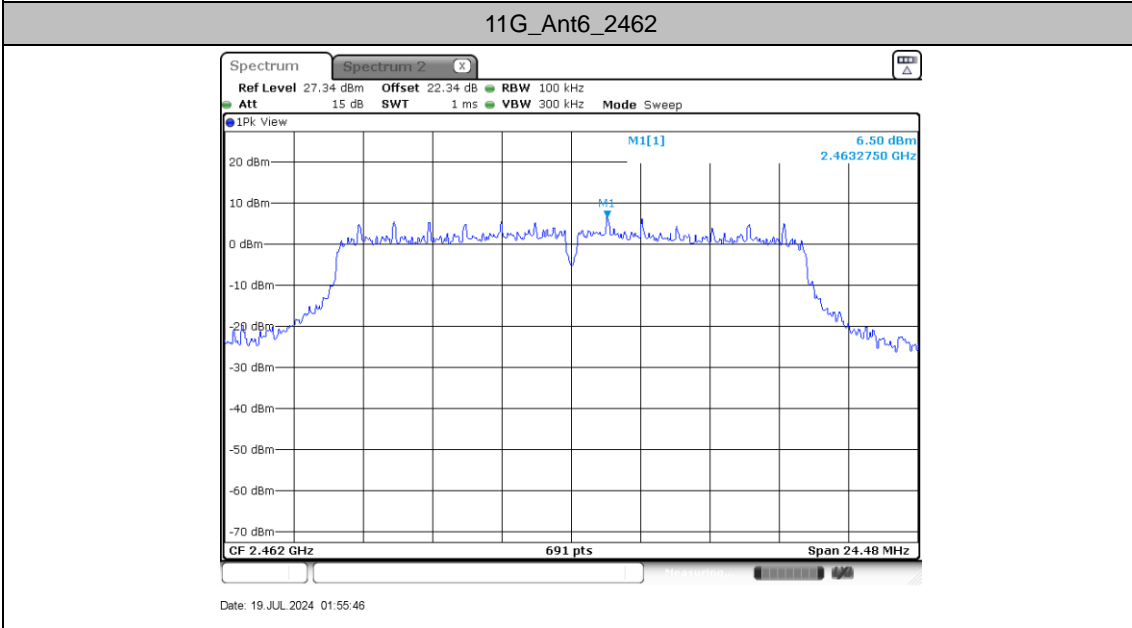
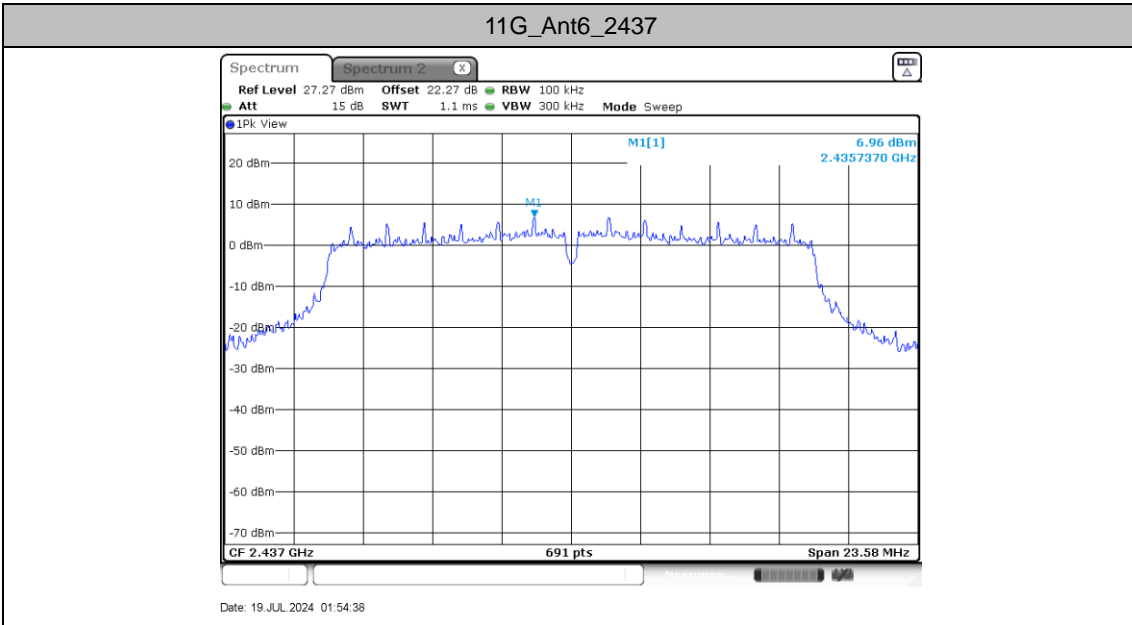






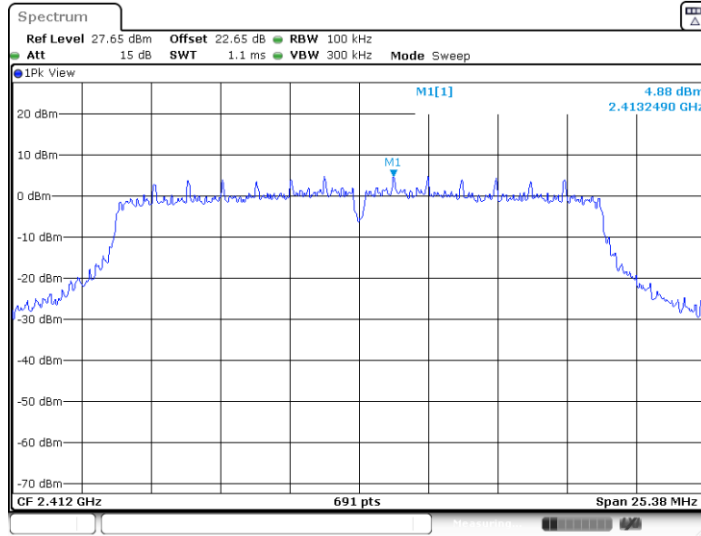






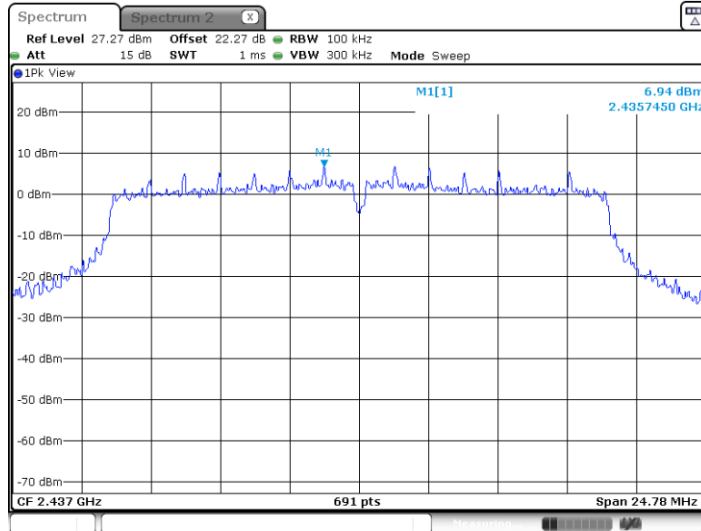


11N20SISO\_Ant6\_2412



Date: 30.JUL.2024 10:12:47

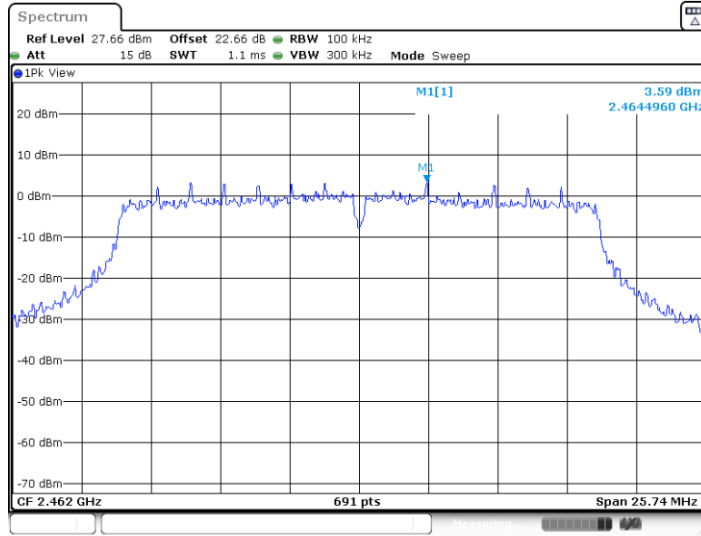
11N20SISO\_Ant6\_2437



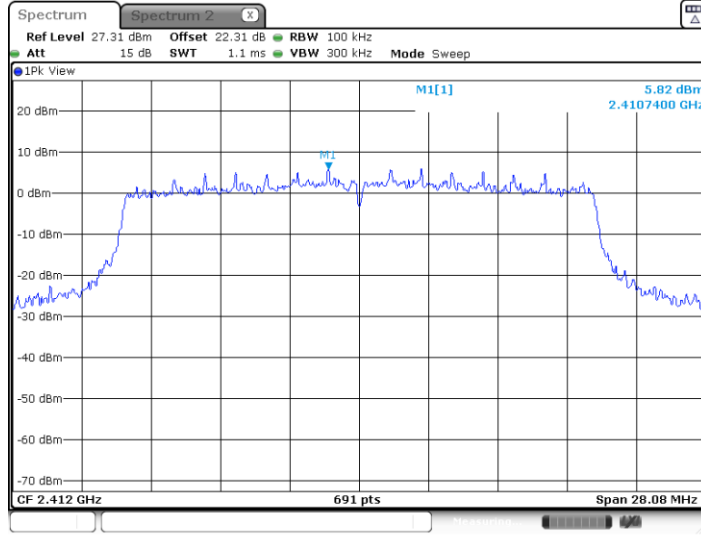
Date: 19.JUL.2024 01:58:25

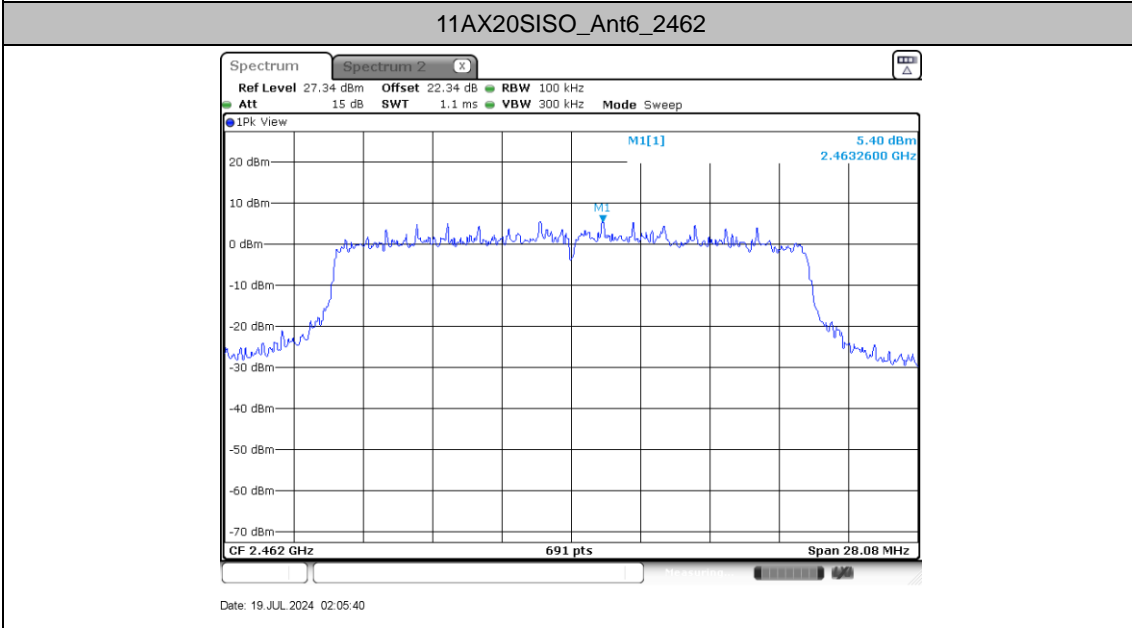
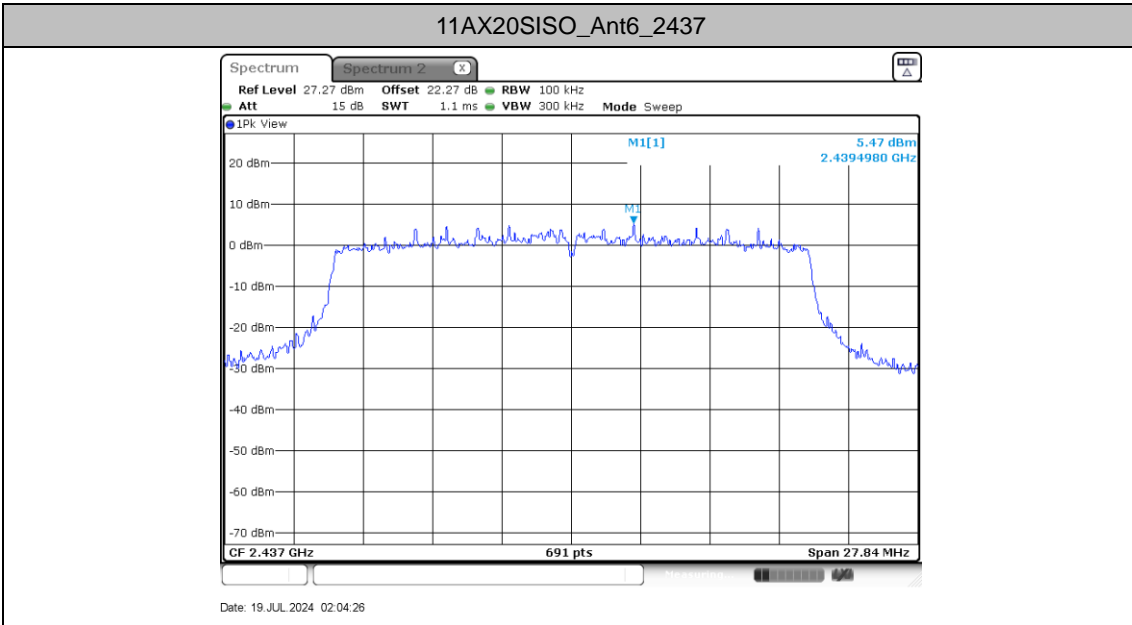


11N20SISO\_Ant6\_2462



11AX20SISO\_Ant6\_2412







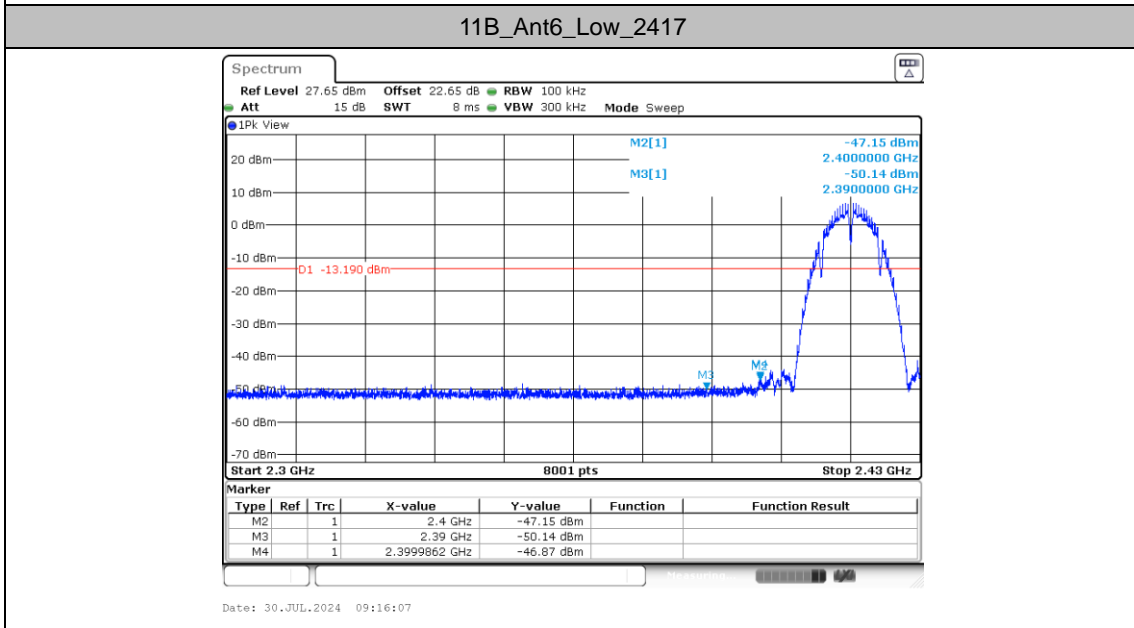
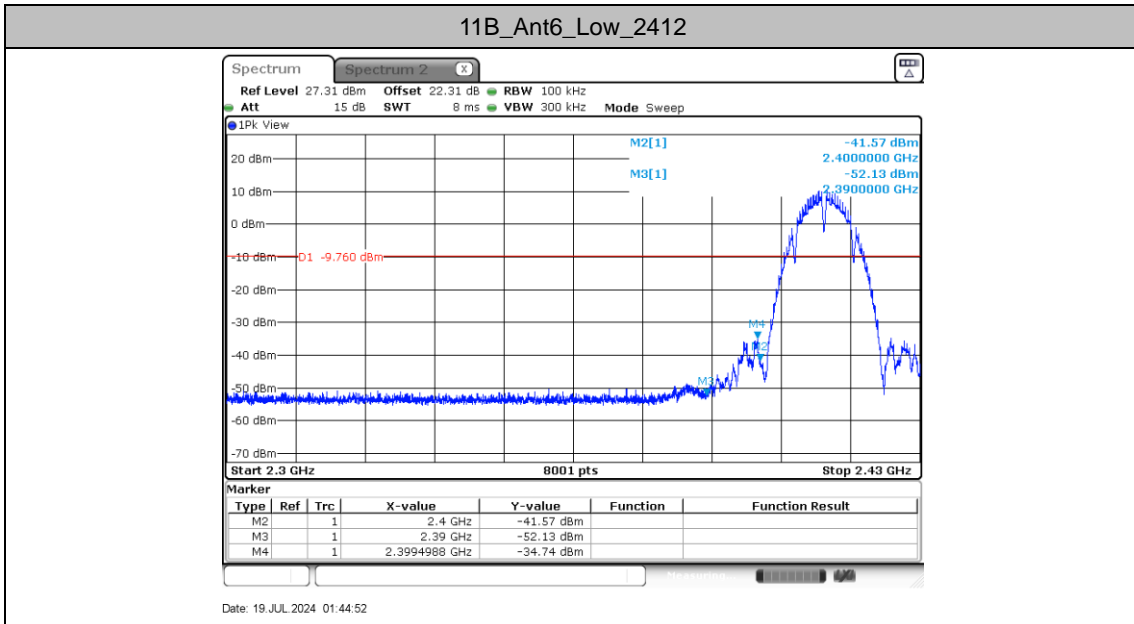
### Band edge measurements

#### Test Result

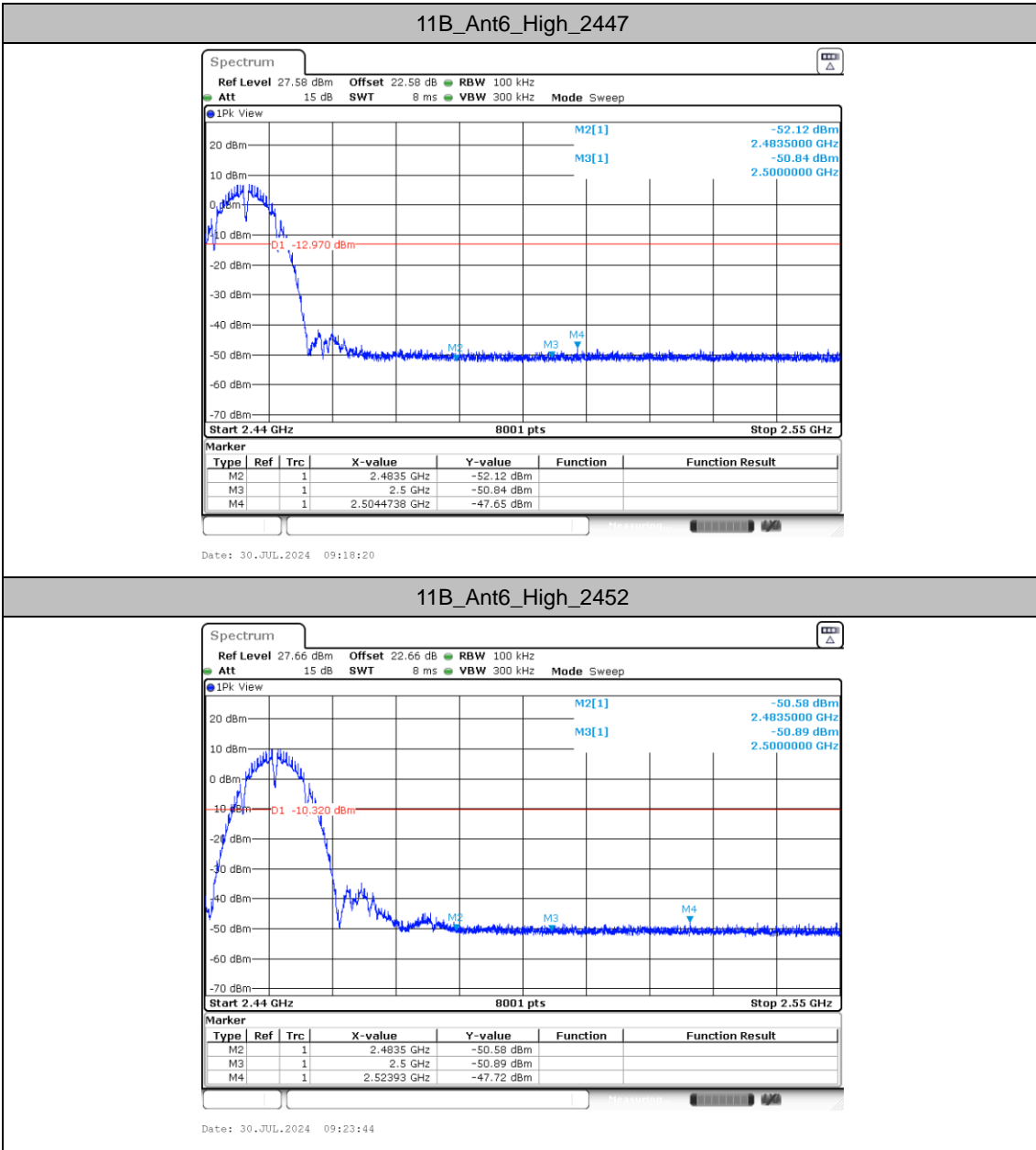
TestMode	Antenna	ChName	Freq(MHz)	RefLevel[dBm /100KHz]	Result[dBm /100KHz]	Limit[dBm /100KHz]	Verdict
11B	Ant6	Low	2412	10.24	-34.74	≤-9.76	PASS
			2417	6.81	-46.87	≤-13.19	PASS
		High	2447	7.03	-47.65	≤-12.97	PASS
			2452	9.68	-47.72	≤-10.32	PASS
			2457	6.14	-47.86	≤-13.86	PASS
			2462	9.80	-48.21	≤-10.2	PASS
11G	Ant6	Low	2412	6.98	-21.92	≤-13.02	PASS
		High	2462	6.50	-38.63	≤-13.5	PASS
11N20SISO	Ant6	Low	2412	4.88	-25.29	≤-15.12	PASS
		High	2462	3.59	-42.79	≤-16.41	PASS
11AX20SISO	Ant6	Low	2412	5.82	-22.09	≤-14.18	PASS
		High	2462	5.40	-38.27	≤-14.6	PASS

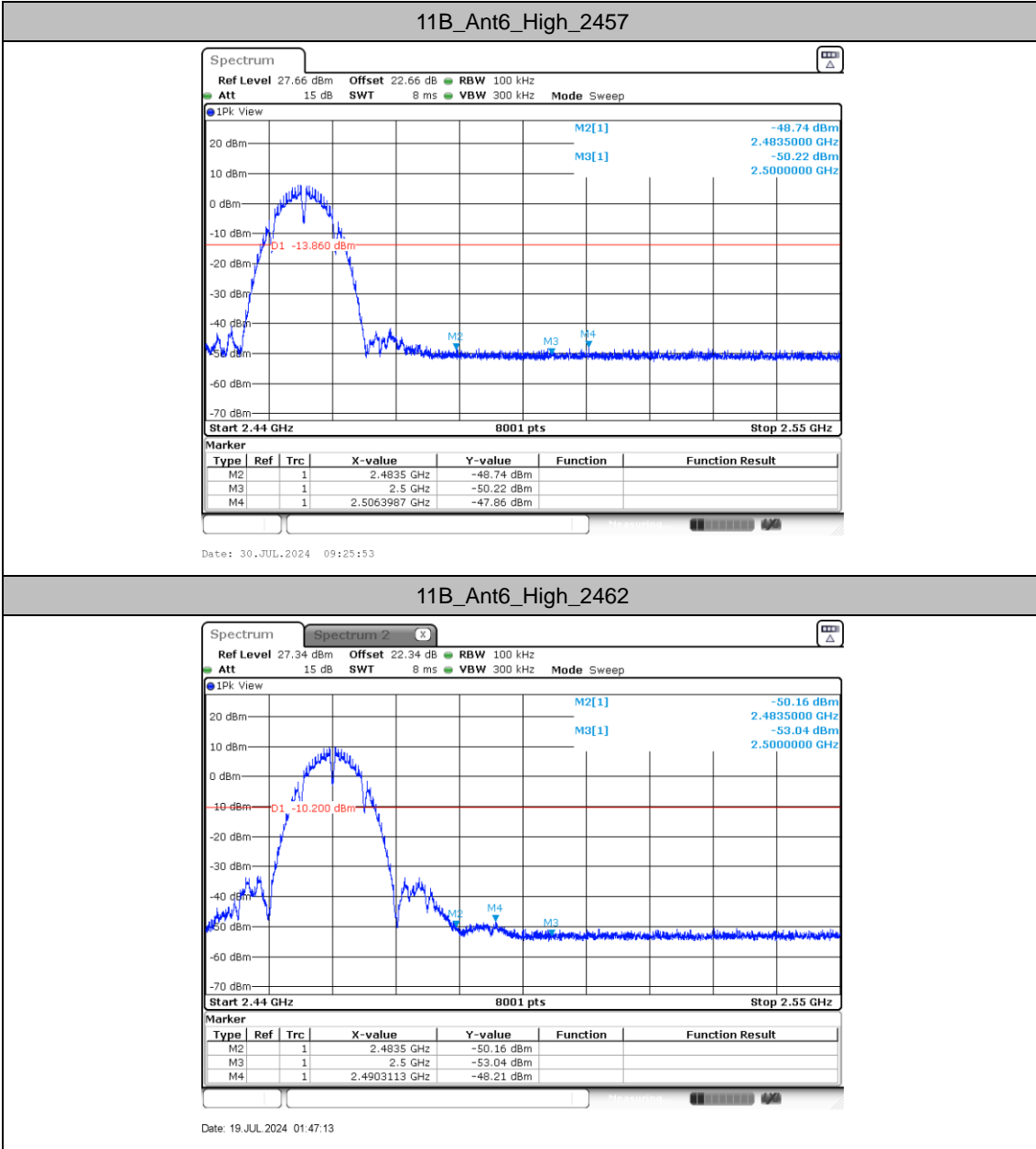


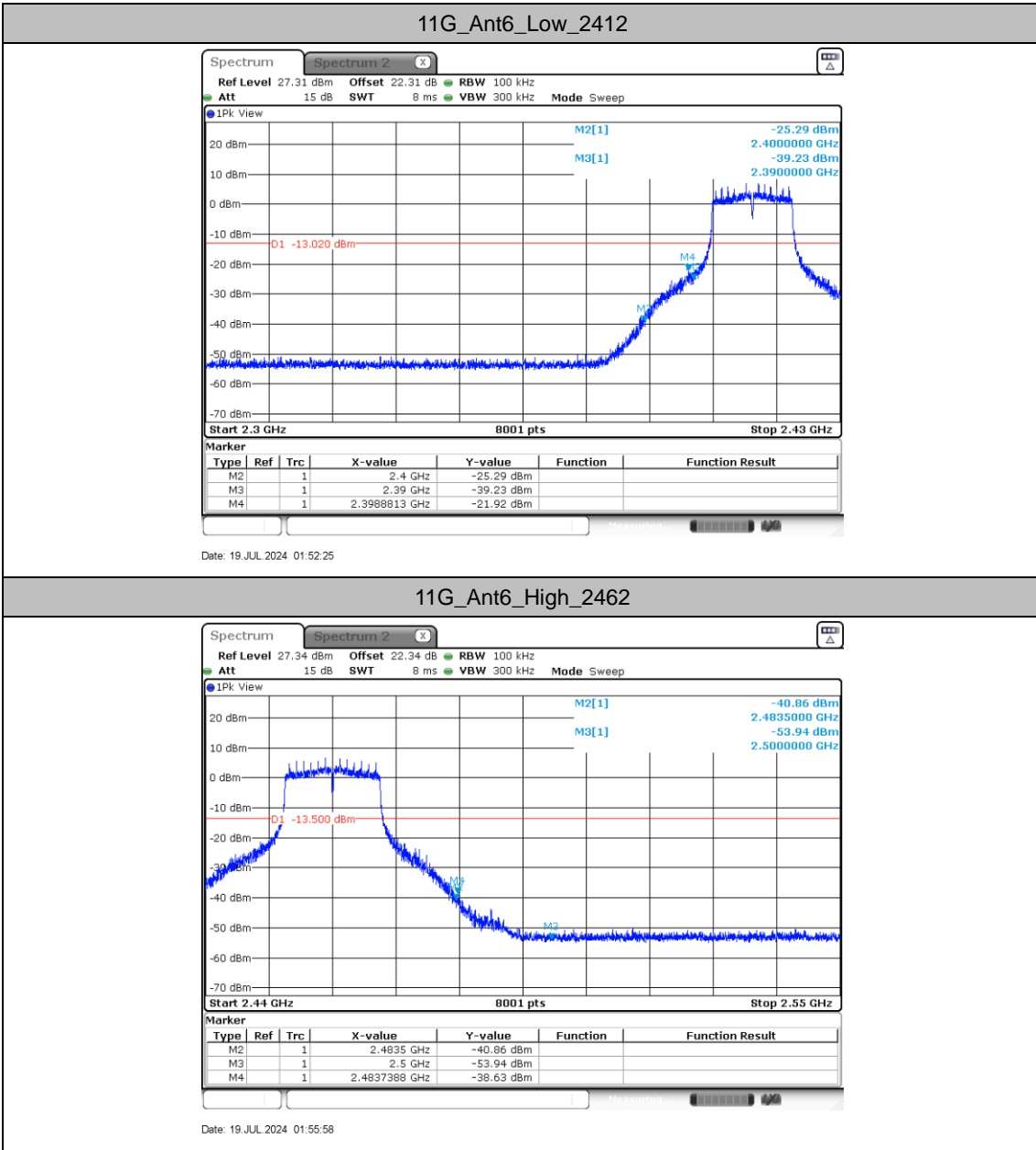
Test Graphs

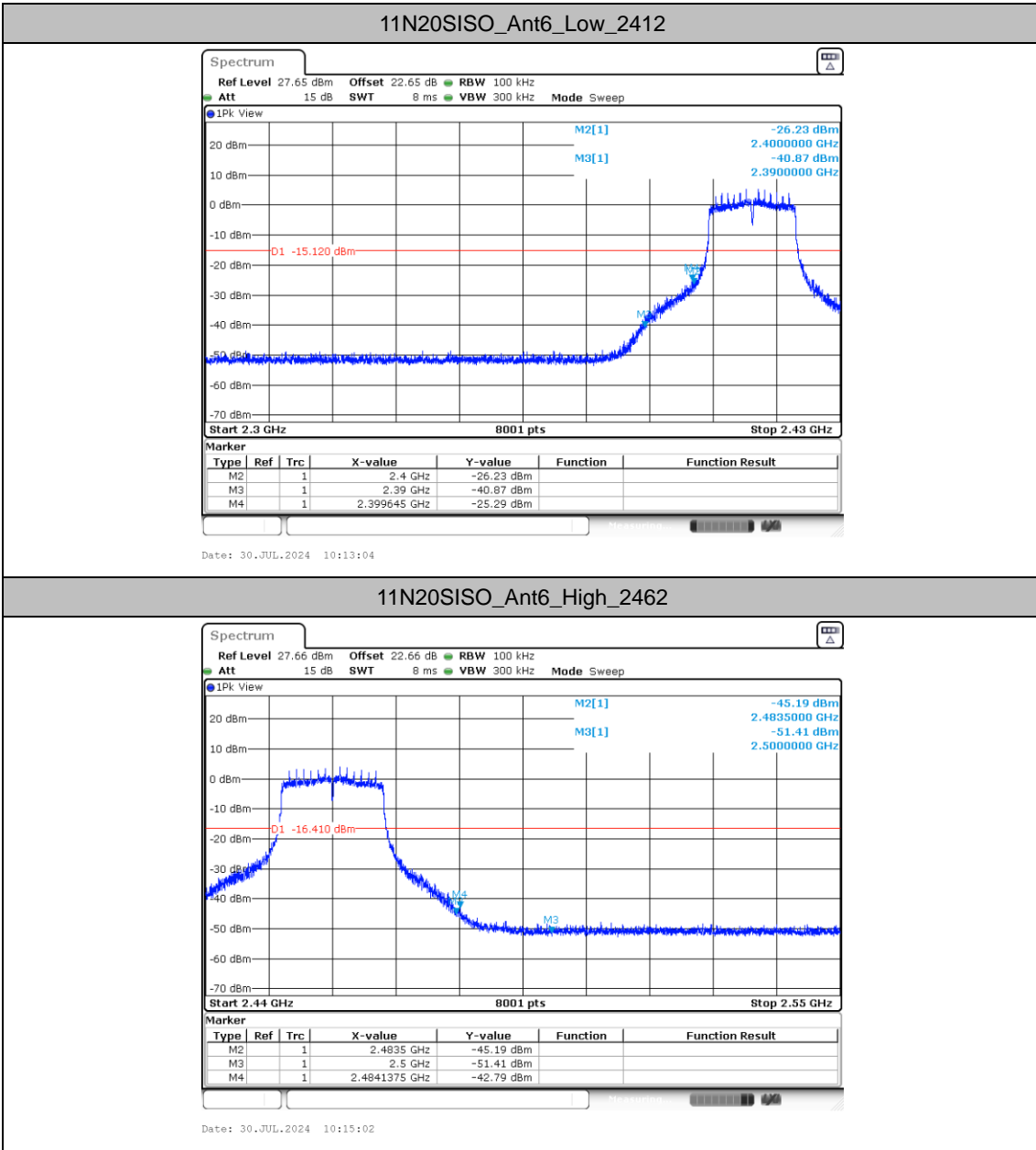






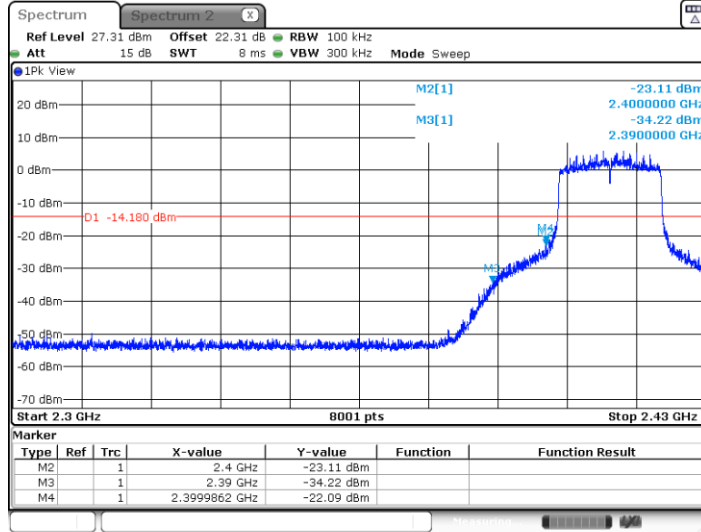






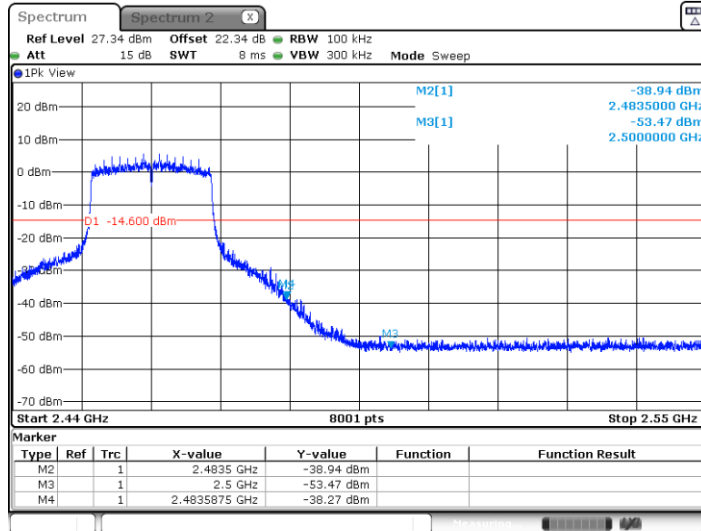


11AX20SISO\_Ant6\_Low\_2412



Date: 19 JUL 2024 02:02:21

11AX20SISO\_Ant6\_High\_2462



Date: 19 JUL 2024 02:05:52



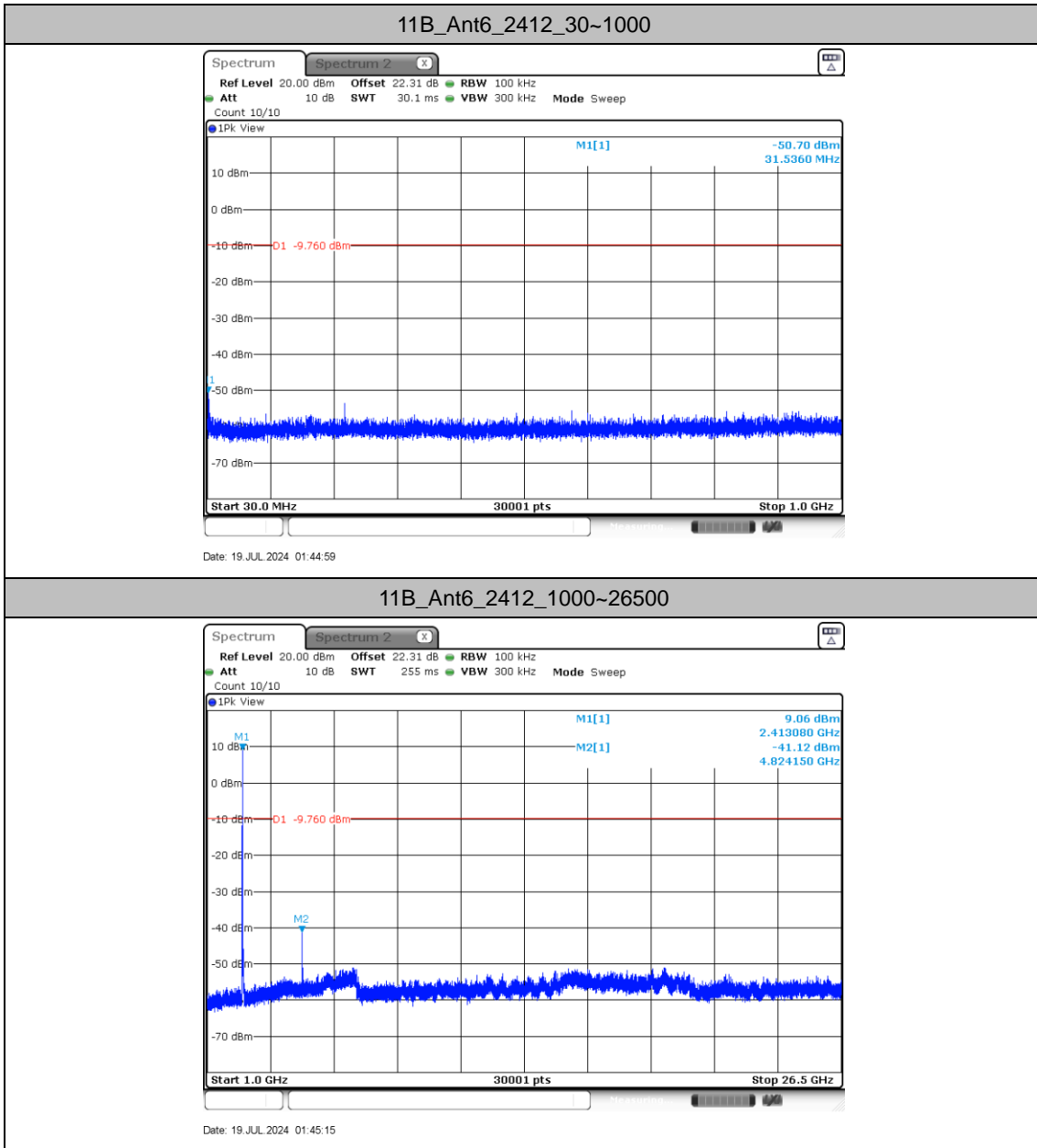
### Conducted Spurious Emission

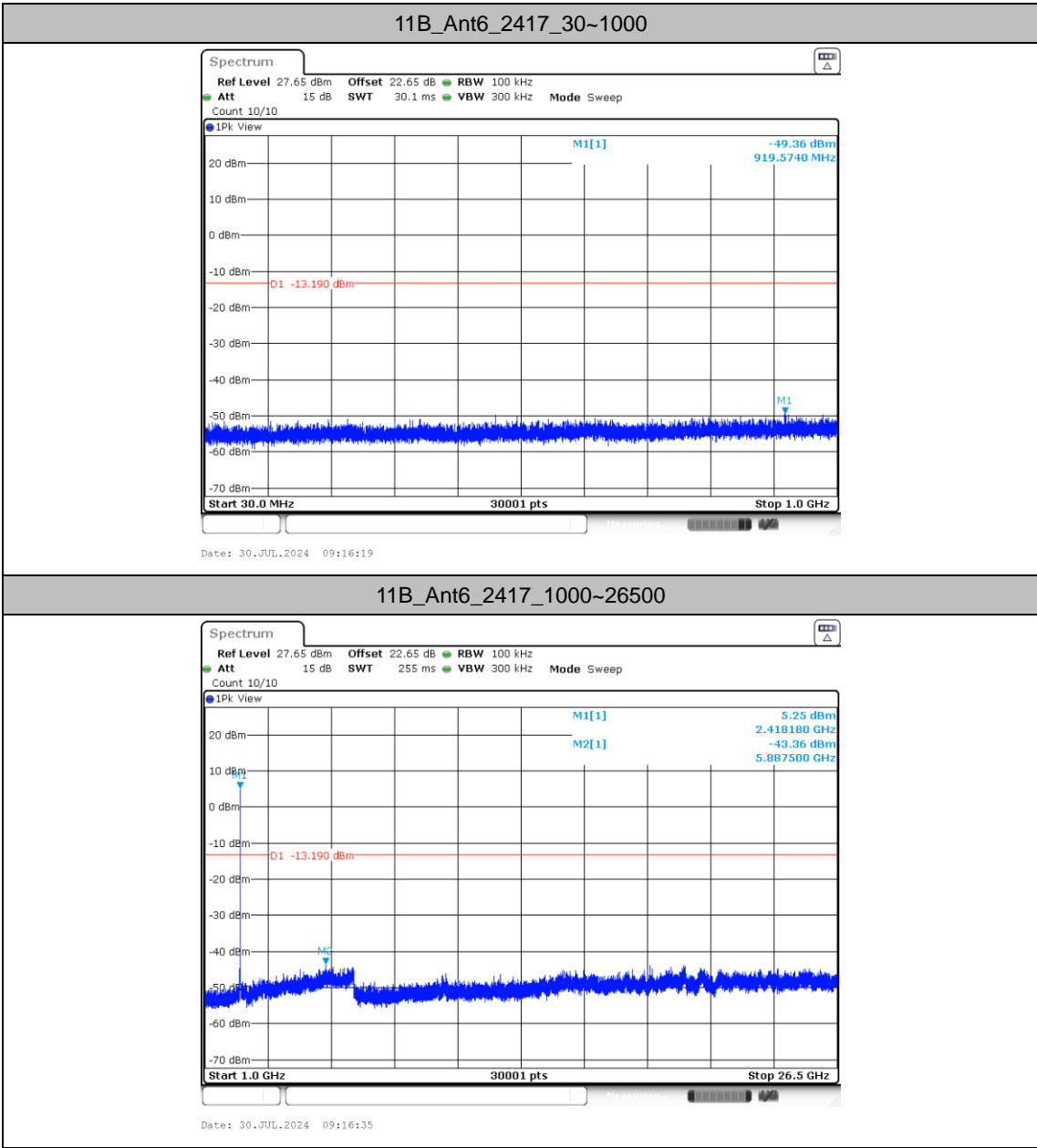
#### Test Result

TestMode	Antenna	Freq(MHz)	FreqRange [Mhz]	RefLevel [dBm/100KHz]	Result [dBm/100KHz]	Limit [dBm/100KHz]	Verdict
11B	Ant6	2412	30~1000	10.24	-50.7	≤-9.76	PASS
			1000~26500	10.24	-41.12	≤-9.76	PASS
		2417	30~1000	6.81	-49.36	≤-13.19	PASS
			1000~26500	6.81	-43.36	≤-13.19	PASS
		2437	30~1000	9.88	-53.82	≤-10.12	PASS
			1000~26500	9.88	-43.78	≤-10.12	PASS
		2447	30~1000	7.03	-49.16	≤-12.97	PASS
			1000~26500	7.03	-43.7	≤-12.97	PASS
		2452	30~1000	9.68	-49.41	≤-10.32	PASS
			1000~26500	9.68	-42.66	≤-10.32	PASS
		2457	30~1000	6.14	-49.22	≤-13.86	PASS
			1000~26500	6.14	-43.59	≤-13.86	PASS
		2462	30~1000	9.80	-53.69	≤-10.2	PASS
			1000~26500	9.80	-41.41	≤-10.2	PASS
11G	Ant6	2412	30~1000	6.98	-52.46	≤-13.02	PASS
			1000~26500	6.98	-50.19	≤-13.02	PASS
		2437	30~1000	6.96	-54.04	≤-13.04	PASS
			1000~26500	6.96	-50.68	≤-13.04	PASS
2462	30~1000	6.50	-49.79	≤-13.5	PASS		
	1000~26500	6.50	-50.3	≤-13.5	PASS		
11N20SISO	Ant6	2412	30~1000	4.88	-49.48	≤-15.12	PASS
			1000~26500	4.88	-43.56	≤-15.12	PASS
		2437	30~1000	6.94	-50.73	≤-13.06	PASS
			1000~26500	6.94	-49.83	≤-13.06	PASS
2462	30~1000	3.59	-49.02	≤-16.41	PASS		
	1000~26500	3.59	-43.66	≤-16.41	PASS		
11AX20SISO	Ant6	2412	30~1000	5.82	-50.91	≤-14.18	PASS
			1000~26500	5.82	-50.64	≤-14.18	PASS
		2437	30~1000	5.47	-53.53	≤-14.53	PASS
			1000~26500	5.47	-50.16	≤-14.53	PASS
		2462	30~1000	5.40	-53.54	≤-14.6	PASS
			1000~26500	5.40	-50.89	≤-14.6	PASS



### Test Graphs

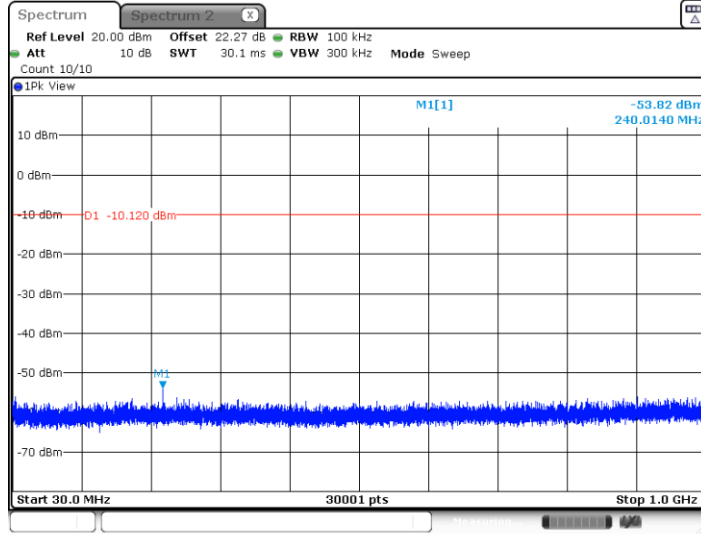






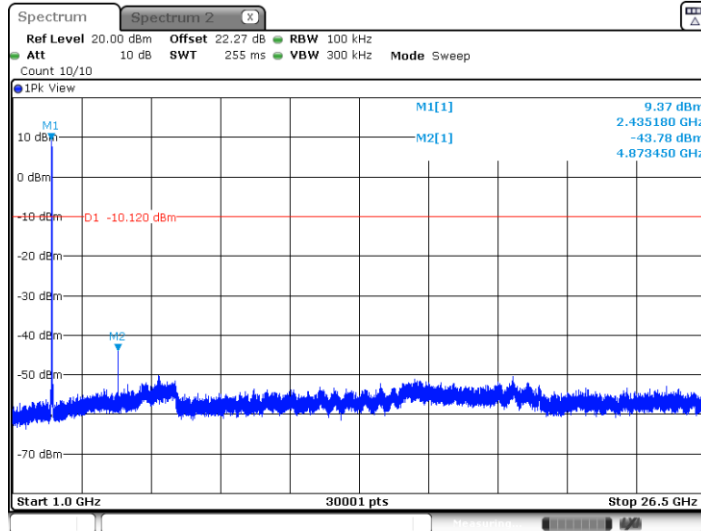


11B\_Ant6\_2437\_30~1000



Date: 19 JUL 2024 01:46:02

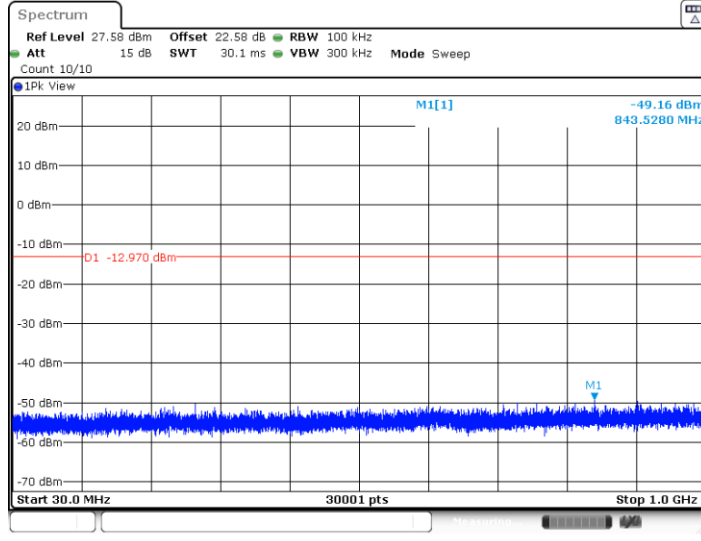
11B\_Ant6\_2437\_1000~26500



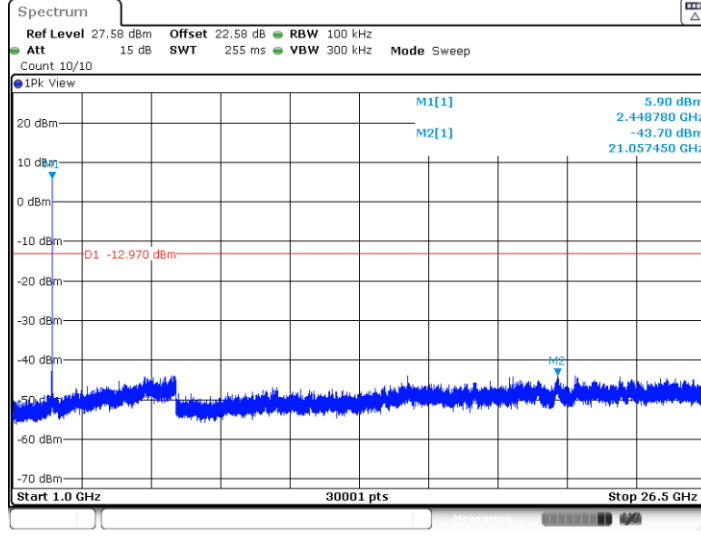
Date: 19 JUL 2024 01:46:18



11B\_Ant6\_2447\_30~1000

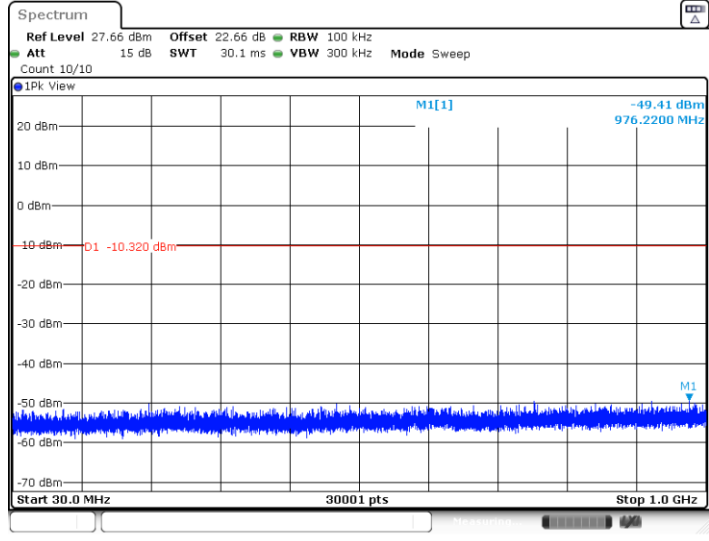


11B\_Ant6\_2447\_1000~26500

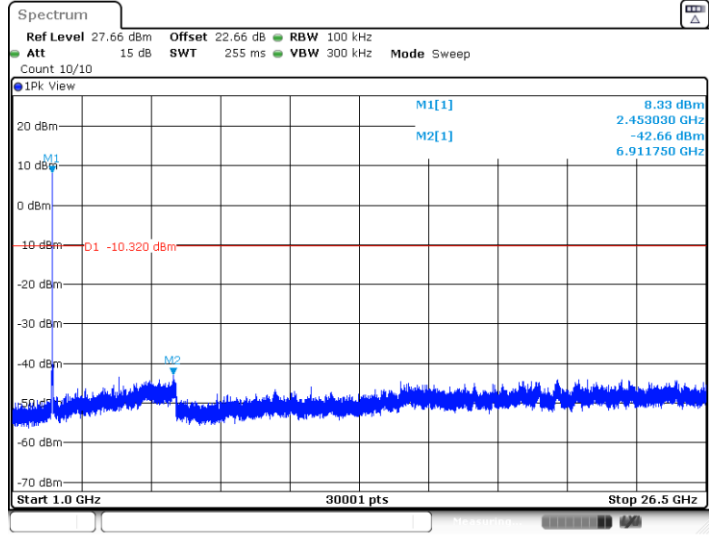




11B\_Ant6\_2452\_30~1000

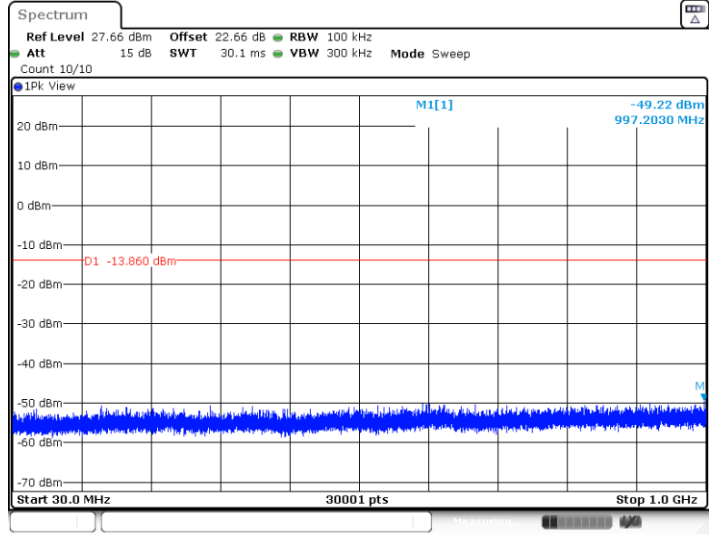


11B\_Ant6\_2452\_1000~26500



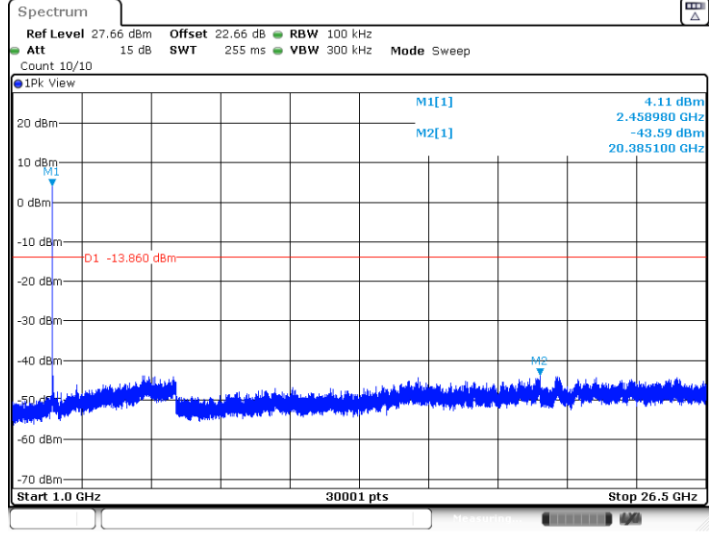


11B\_Ant6\_2457\_30~1000



Date: 30.JUL.2024 09:26:05

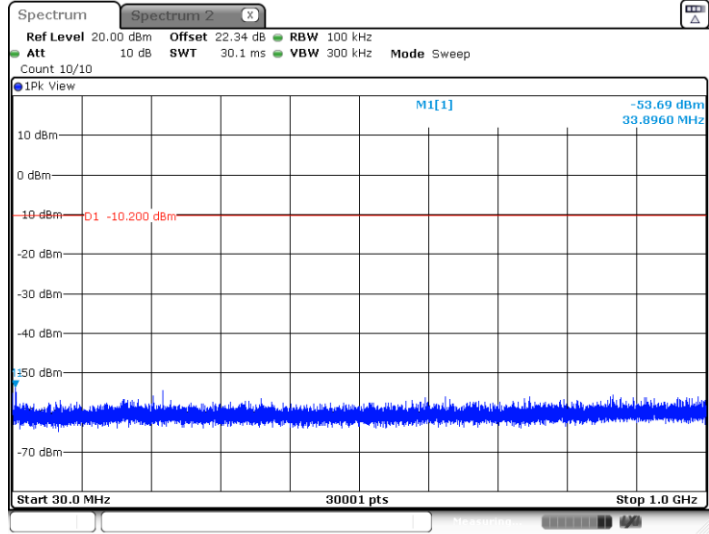
11B\_Ant6\_2457\_1000~26500



Date: 30.JUL.2024 09:26:20

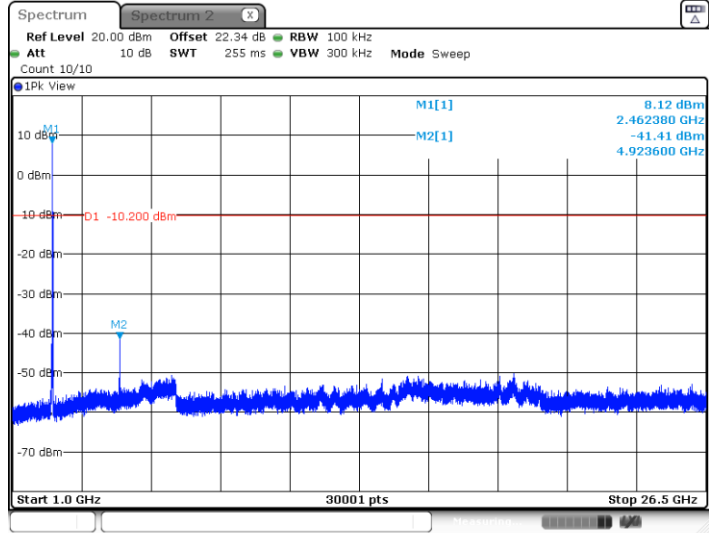


11B\_Ant6\_2462\_30~1000



Date: 19 JUL 2024 01:47:20

11B\_Ant6\_2462\_1000~26500



Date: 19 JUL 2024 01:47:35