



FCC RF Test Report

APPLICANT : Motorola Mobility LLC
EQUIPMENT : Mobile Cellular Phone
BRAND NAME : Motorola
MODEL NAME : XT2331-1,XT2333-1
FCC ID : IHDT56AH6
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System
TEST DATE(S) : Aug. 29, 2022 ~ Oct. 27, 2022

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..... 6

 1.5 Modification of EUT 6

 1.6 Specification of Accessory..... 6

 1.7 Testing Location 7

 1.8 Test Software..... 8

 1.9 Applicable Standards..... 8

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST 9

 2.1 Carrier Frequency and Channel 9

 2.2 Test Mode 10

 2.3 Connection Diagram of Test System 11

 2.4 Support Unit used in test configuration and system 12

 2.5 EUT Operation Test Setup 12

 2.6 Measurement Results Explanation Example..... 12

3 TEST RESULT 13

 3.1 6dB Bandwidth Measurement 13

 3.2 Output Power Measurement..... 14

 3.3 Power Spectral Density Measurement 17

 3.4 Conducted Band Edges and Spurious Emission Measurement 18

 3.5 Radiated Band Edges and Spurious Emission Measurement 19

 3.6 AC Conducted Emission Measurement..... 23

 3.7 Antenna Requirements 25

4 LIST OF MEASURING EQUIPMENT 26

5 UNCERTAINTY OF EVALUATION 27

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



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR282501C	Rev. 01	Initial issue of report	Oct. 28, 2022



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 3.33 dB at 2389.56 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 4.19 dB at 0.154 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1 General Description

1.1 Applicant

Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2331-1,XT2333-1
FCC ID	IHDT56AH6
IMEI Code	Conducted: 355650970011873/355650970011881 Conduction: 354696570012499/354696570012507 Radiation: 355650970026350/355650970026368 for Sample 1 355650970023258/355650970023266 for Sample 1 355650970022953/355650970022961 for Sample 1 354696570018173/354696570018181 for Sample 3
HW Version	DVT2
SW Version	THA33.23
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are four types of EUT, the sample 1/2 model name is XT2331-1 and the sample 3/4 model name is XT2333-1, the differences could be referred to the XT2331-1,XT2333-1_Operational Description of Product Equality Declaration which is exhibit separately. According to the difference, we choose sample 1 to full test and the sample 3 is verified for the difference for RSE.



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 : 20.09 dBm (0.1021 W) 802.11g : 24.82 dBm (0.3034 W) 802.11n HT20 : 24.49 dBm (0.2812 W) 802.11n HT40 : 24.11 dBm (0.2576 W)
Antenna Type / Gain	IFA Antenna with gain -1.8 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Modification of EUT

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

1.6 Specification of Accessory

Accessories Information				
For XT2331-1				
AC Adapter 1(US)	Brand Name	Motorola(AOHAI)	Model Name	MC-101
AC Adapter 1(EU)	Brand Name	Motorola(AOHAI)	Model Name	MC-102
AC Adapter 1(UK)	Brand Name	Motorola(AOHAI)	Model Name	MC-103
AC Adapter 1(IN)	Brand Name	Motorola(AOHAI)	Model Name	MC-104
AC Adapter 1(AU)	Brand Name	Motorola(AOHAI)	Model Name	MC-105
AC Adapter 2(US)	Brand Name	Motorola(Chenyang)	Model Name	MC-101
AC Adapter 2(EU)	Brand Name	Motorola(Chenyang)	Model Name	MC-102
AC Adapter 2(UK)	Brand Name	Motorola(Chenyang)	Model Name	MC-103
AC Adapter 2(AU)	Brand Name	Motorola(Chenyang)	Model Name	MC-105
AC Adapter 3(US)	Brand Name	Motorola(Salcomp)	Model Name	MC-101
AC Adapter 3(EU)	Brand Name	Motorola(Salcomp)	Model Name	MC-102
AC Adapter 3(UK)	Brand Name	Motorola(Salcomp)	Model Name	MC-103
AC Adapter 3(AU)	Brand Name	Motorola(Salcomp)	Model Name	MC-105
AC Adapter 4(US)	Brand Name	Motorola(Salcomp)	Model Name	MC-201L
AC Adapter 4(EU)	Brand Name	Motorola(Salcomp)	Model Name	MC-202L
AC Adapter 4(AR)	Brand Name	Motorola(Salcomp)	Model Name	MC-206L
AC Adapter 4(BR)	Brand Name	Motorola(Salcomp)	Model Name	MC-207L
AC Adapter 4(CHILE)	Brand Name	Motorola(Salcomp)	Model Name	MC-209L
AC Adapter 5(US)	Brand Name	Motorola (AOHAI)	Model Name	MC-201L
AC Adapter 5(EU)	Brand Name	Motorola (AOHAI)	Model Name	MC-202L
AC Adapter 5(AR)	Brand Name	Motorola (AOHAI)	Model Name	MC-206L
AC Adapter 5(CHILE)	Brand Name	Motorola (AOHAI)	Model Name	MC-209L
AC Adapter 6(BR)	Brand Name	Motorola(Chenyang)	Model Name	MC-207
Battery 1	Brand Name	Motorola(SUNWODA)	Model Name	NH50
Battery 2	Brand Name	Motorola(ATL)	Model Name	NH50
Earphone 1	Brand Name	Motorola(Xinlide)	Model Name	MH202



Earphone 2	Brand Name	Motorola(Lianyun)	Model Name	MH202
USB Cable 1	Brand Name	Motorola(KingPower)	Model Name	K235-08073-H0
USB Cable 2	Brand Name	Motorola(Broad)	Model Name	HO0004
USB Cable 3	Brand Name	Motorola(KINGHOME)	Model Name	4G data cable
For XT2333-1				
AC Adapter 7(US)	Brand Name	Motorola (Salcomp)	Model Name	MC-331
AC Adapter 7(EU)	Brand Name	Motorola (Salcomp)	Model Name	MC-332
AC Adapter 7(UK)	Brand Name	Motorola (Salcomp)	Model Name	MC-333
AC Adapter 7(IN)	Brand Name	Motorola (Salcomp)	Model Name	MC-334
AC Adapter 7(AU)	Brand Name	Motorola (Salcomp)	Model Name	MC-335
AC Adapter 7(BR)	Brand Name	Motorola (Salcomp)	Model Name	MC-337
AC Adapter 7(CHILE)	Brand Name	Motorola (Salcomp)	Model Name	MC-339
AC Adapter 8(US)	Brand Name	Motorola(Chenyang)	Model Name	MC-331
AC Adapter 8(EU)	Brand Name	Motorola(Chenyang)	Model Name	MC-332
AC Adapter 8(AU)	Brand Name	Motorola(Chenyang)	Model Name	MC-335
AC Adapter 8(AR)	Brand Name	Motorola(Chenyang)	Model Name	MC-336
AC Adapter 8(BR)	Brand Name	Motorola(Chenyang)	Model Name	MC-337
AC Adapter 8(PRC)	Brand Name	Motorola(Chenyang)	Model Name	MC-338
AC Adapter 9(US)	Brand Name	Motorola(Acbel)	Model Name	MC-331
AC Adapter 9(EU)	Brand Name	Motorola(Acbel)	Model Name	MC-332
AC Adapter 9(UK)	Brand Name	Motorola(Acbel)	Model Name	MC-333
Battery 3	Brand Name	Motorola(ATL)	Model Name	PH50
Battery 4	Brand Name	Motorola(SUNWODA)	Model Name	PH50
USB Cable 4	Brand Name	Motorola(KingPower)	Model Name	K235-08074-H0
USB Cable 5	Brand Name	Motorola(Broad)	Model Name	HO0003
USB Cable 6	Brand Name	Motorola(KINGHOME)	Model Name	5G data cable

1.7 Testing Location

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

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	CO01-KS 03CH05-KS TH01-KS	CN1257	314309



1.8 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH05-KS	AUDIX	E3	6.2009-8-24
2.	CO01-KS	AUDIX	E3	6.2009-8-24

1.9 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
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ 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.

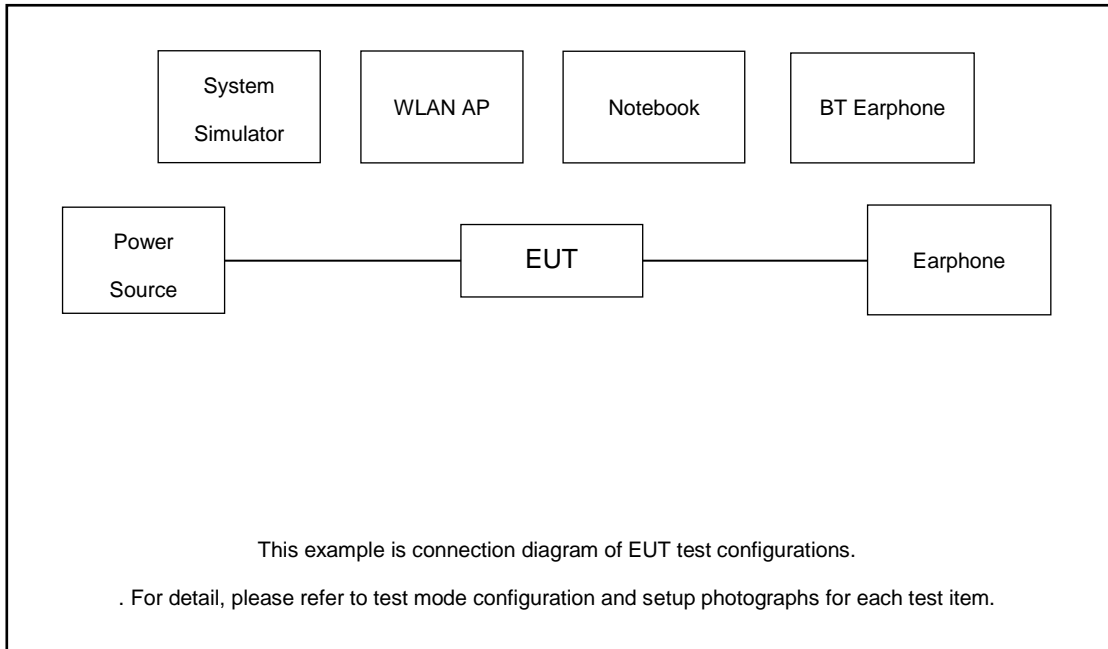
Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

Test Cases	
AC Conducted Emission	Mode 1 :GSM 850 Idle + Bluetooth Link + WLAN Link (2.4G) + Adaptor(8) +Earphone(1)+USB Cable(5)for Sample 3
Remark: For Radiated Test Cases, The tests were performance with Adapter 1, ,Earphone 1,and USB Cable 1 for sample 1	

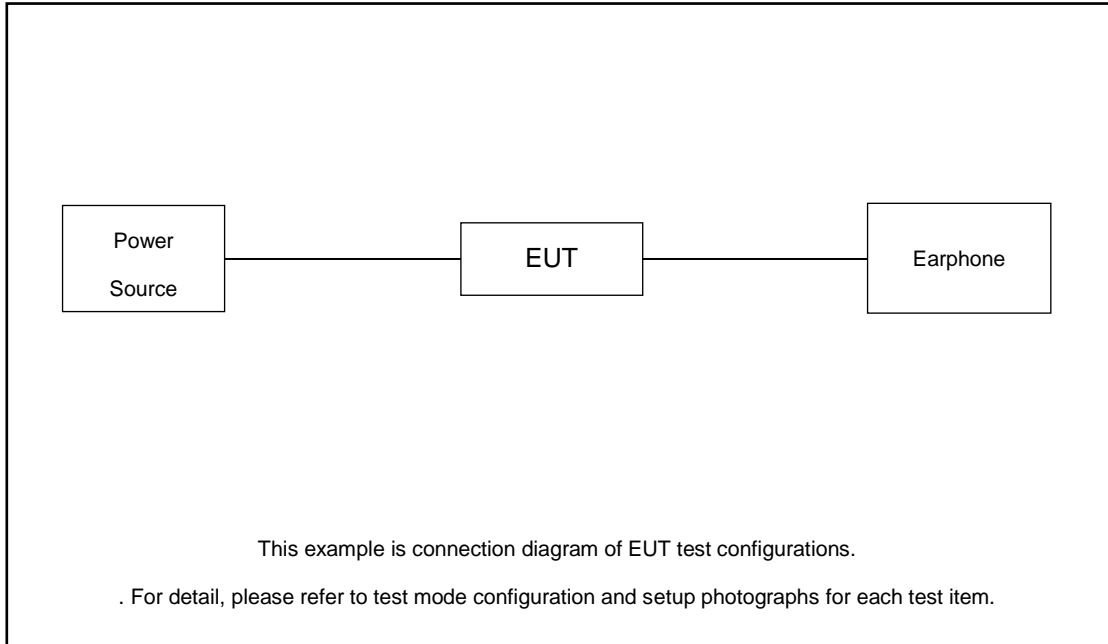
CO-location
WIFI 802.11n HT40 CH03 Tx + LTE Band 13 BW_5M Link

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.	LTE Base Station	Anritus	MT8820C	N/A	N/A	Unshielded, 1.8m
2.	WLAN AP	D-Link	DIR-655	KA21R655B1	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
4.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A
5.	SD Card	Kingston	8GB	N/A	N/A	N/A

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 2.95 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 2.95 + 10 = 12.95 (dB)

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB 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. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB 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.

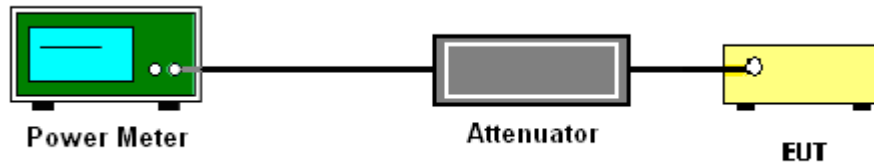
3.2.2 Measuring Instruments

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										
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
11b	1Mbps	1	1	2412	20.09	30.00	-1.80	18.29	36.00	Pass
11b	1Mbps	1	6	2437	19.65	30.00	-1.80	17.85	36.00	Pass
11b	1Mbps	1	11	2462	19.74	30.00	-1.80	17.94	36.00	Pass
11g	6Mbps	1	1	2412	22.85	30.00	-1.80	21.05	36.00	Pass
11g	6Mbps	1	2	2417	24.59	30.00	-1.80	22.79	36.00	Pass
11g	6Mbps	1	6	2437	24.82	30.00	-1.80	23.02	36.00	Pass
11g	6Mbps	1	11	2462	23.38	30.00	-1.80	21.58	36.00	Pass
HT20	MCS0	1	1	2412	22.20	30.00	-1.80	20.40	36.00	Pass
HT20	MCS0	1	2	2417	24.49	30.00	-1.80	22.69	36.00	Pass
HT20	MCS0	1	6	2437	24.34	30.00	-1.80	22.54	36.00	Pass
HT20	MCS0	1	11	2462	23.24	30.00	-1.80	21.44	36.00	Pass
HT40	MCS0	1	3	2422	21.37	30.00	-1.80	19.57	36.00	Pass
HT40	MCS0	1	6	2437	24.11	30.00	-1.80	22.31	36.00	Pass
HT40	MCS0	1	9	2452	22.25	30.00	-1.80	20.45	36.00	Pass



3.2.6 Test Result of Average Output Power (Reporting Only)

2.4GHz Band						
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.03	17.85
11b	1Mbps	1	6	2437	0.03	17.49
11b	1Mbps	1	11	2462	0.03	17.52
11g	6Mbps	1	1	2412	0.13	13.68
11g	6Mbps	1	2	2417	0.13	18.72
11g	6Mbps	1	6	2437	0.13	18.24
11g	6Mbps	1	11	2462	0.13	15.34
HT20	MCS0	1	1	2412	0.14	12.66
HT20	MCS0	1	2	2417	0.14	17.03
HT20	MCS0	1	6	2437	0.14	16.92
HT20	MCS0	1	11	2462	0.14	15.05
HT40	MCS0	1	3	2422	0.22	11.54
HT40	MCS0	1	6	2437	0.22	14.52
HT40	MCS0	1	9	2452	0.22	13.22

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.

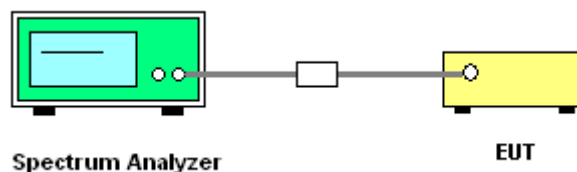
3.3.2 Measuring Instruments

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.

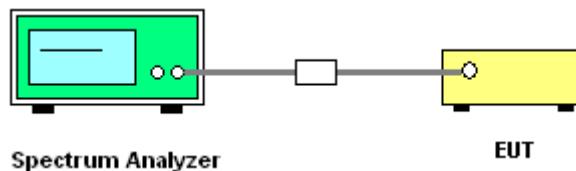
3.4.2 Measuring Instruments

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 11.13
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.

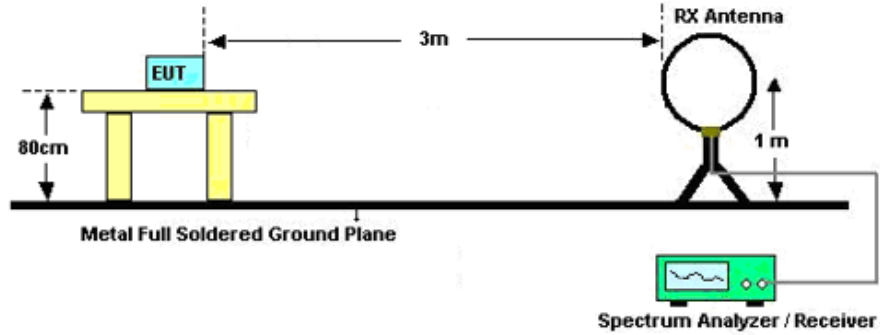


3.5.3 Test Procedures

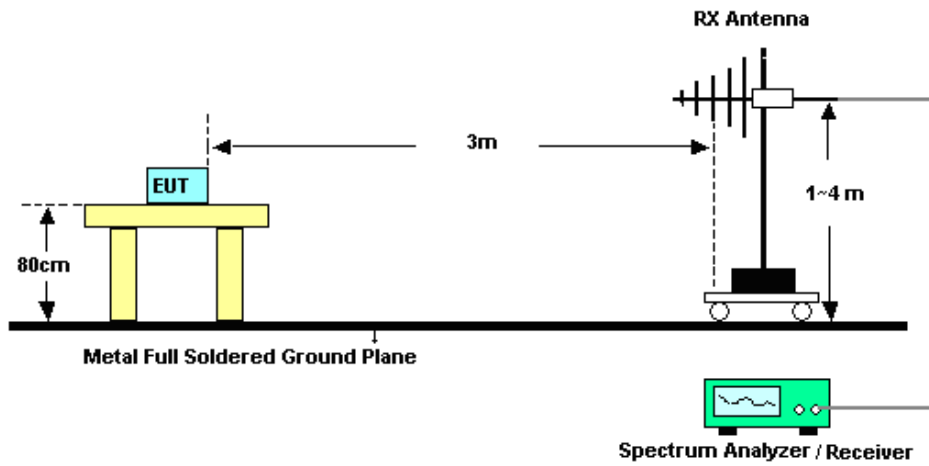
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better 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

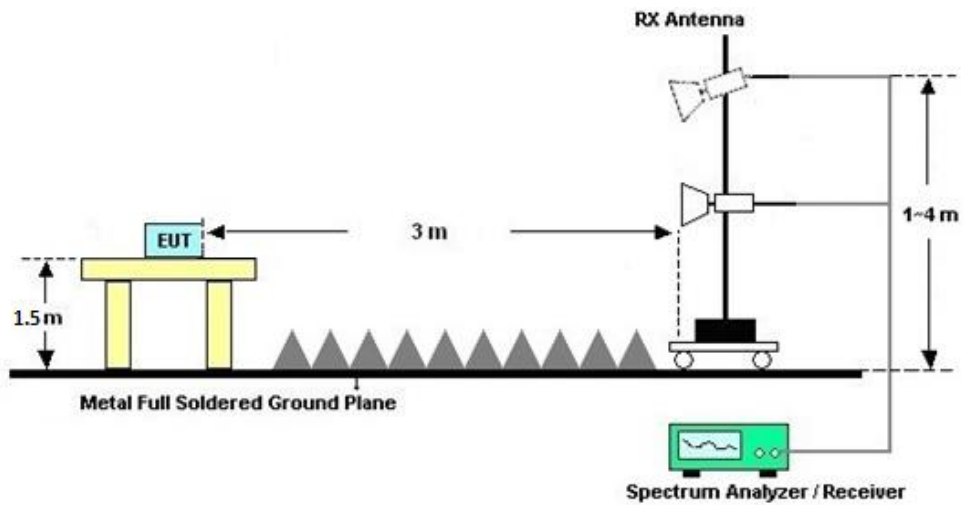
For radiated emissions below 30MHz



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 (dB μ V)	
	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.

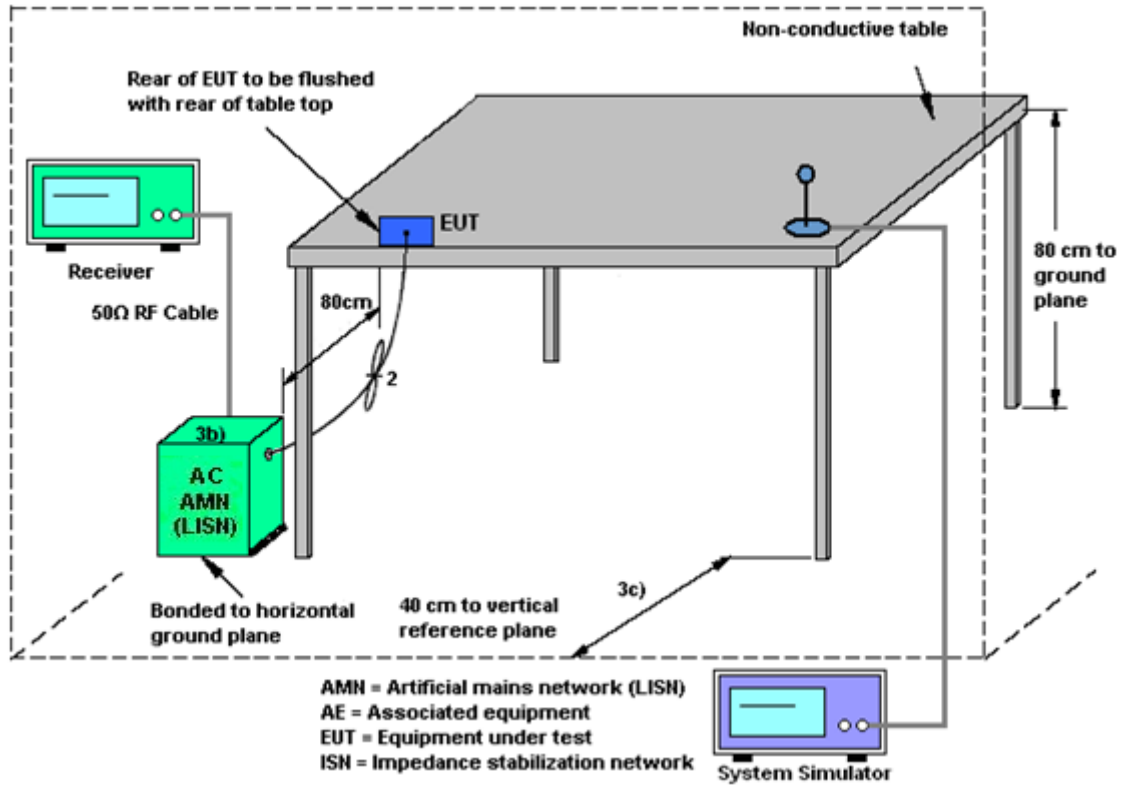
3.6.2 Measuring Instruments

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
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Apr. 12, 2022	Aug. 29, 2022~ Oct. 27, 2022	Apr. 11, 2023	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2022	Aug. 29, 2022~ Oct. 27, 2022	Jan. 04, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 05, 2022	Aug. 29, 2022~ Oct. 27, 2022	Jan. 04, 2023	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY564000 04	3Hz~8.5GHz;Max 30dBm	Oct. 13, 2022	Oct. 22, 2022	Oct. 12, 2023	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY551502 44	10Hz~44G,MAX 30dB	Mar. 24, 2022	Oct. 22, 2022	Mar. 23, 2023	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	Oct. 22, 2022	Oct. 15, 2023	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz~1GHz	May. 24, 2022	Oct. 22, 2022	May. 23, 2023	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 08, 2021	Oct. 22, 2022	Nov. 07, 2022	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Oct. 22, 2022	Jan. 04, 2023	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	380826	9KHz~1GHz	Jul. 11, 2022	Oct. 22, 2022	Jul. 10, 2023	Radiation (03CH05-KS)
Amplifier	MITEQ	EM18G40GG A	060728	18~40GHz	Jan. 05, 2022	Oct. 22, 2022	Jan. 04, 2023	Radiation (03CH05-KS)
high gain Amplifier	EM	EM01G18GA	060839	1Ghz~18Ghz	Oct. 12, 2022	Oct. 22, 2022	Oct. 11, 2023	Radiation (03CH05-KS)
Amplifier	EM	EM01G18GA	060833	1Ghz~18Ghz	Jan. 05, 2022	Oct. 22, 2022	Jan. 04, 2023	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	Oct. 22, 2022	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Oct. 22, 2022	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Oct. 22, 2022	NCR	Radiation (03CH05-KS)
EMI Receiver	R&S	ESC17	100768	9kHz~7GHz;	May. 24, 2022	Oct. 18, 2022	May. 23, 2023	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2022	Oct. 18, 2022	Oct. 12, 2023	Conduction (CO01-KS)
AC LISN	R&S	ENV216	100334	9kHz~30MHz	May. 24, 2022	Oct. 18, 2022	May. 23, 2023	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2022	Oct. 18, 2022	Oct. 11, 2023	Conduction (CO01-KS)

NCR: No Calibration Required



5 Uncertainty of Evaluation

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 Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0 dB
---	--------

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0 dB
---	--------

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0 dB
---	--------

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



Appendix A. Conducted Test Results



Ambient Condition: <u>25</u> °C, <u>45</u> %RH
According Standard: ■Part15C
Test Date: <u>2022.8.29~2022.10.27</u> Test Engineer: <u>Gene Wang</u>

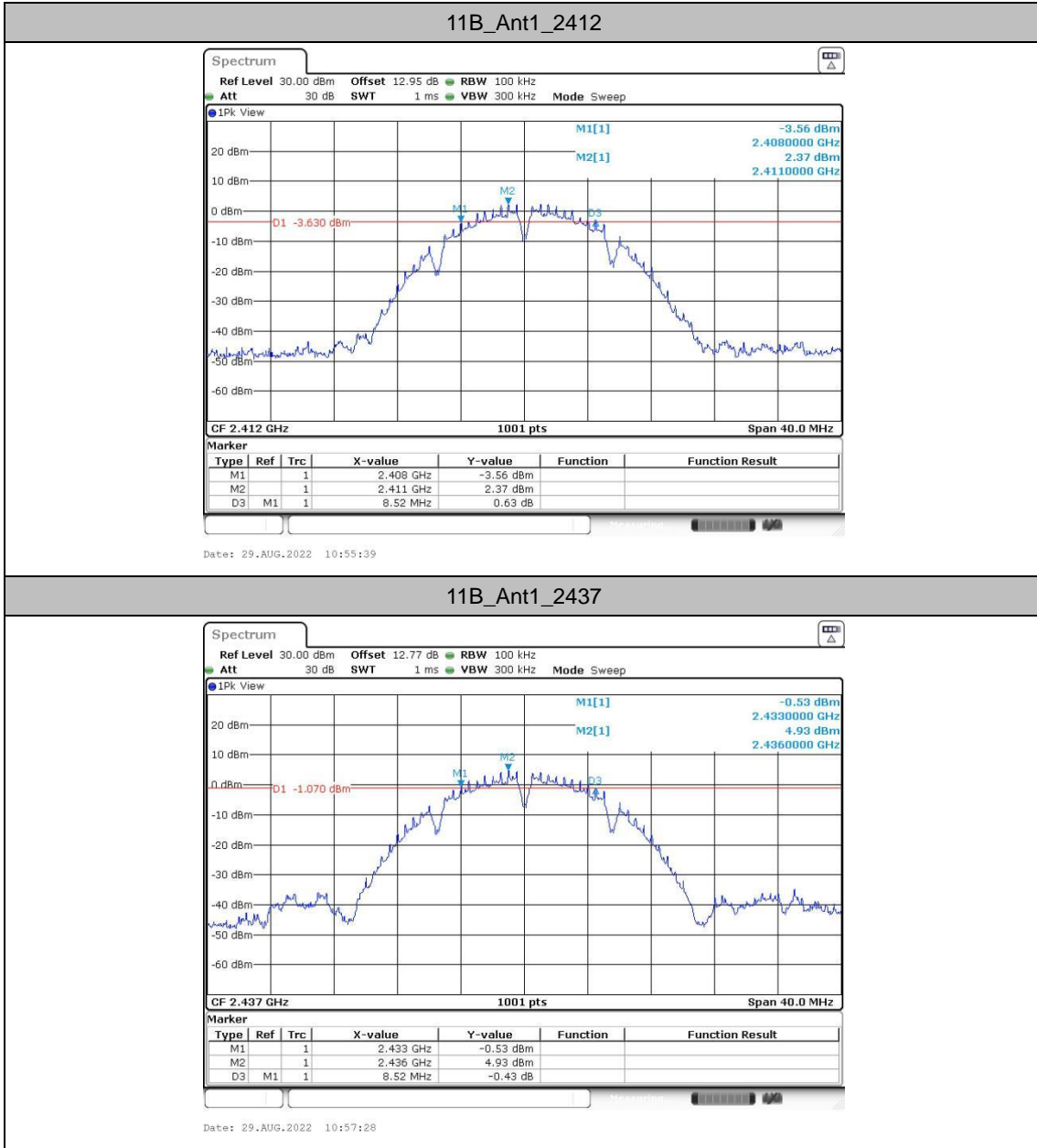
DTS Bandwidth

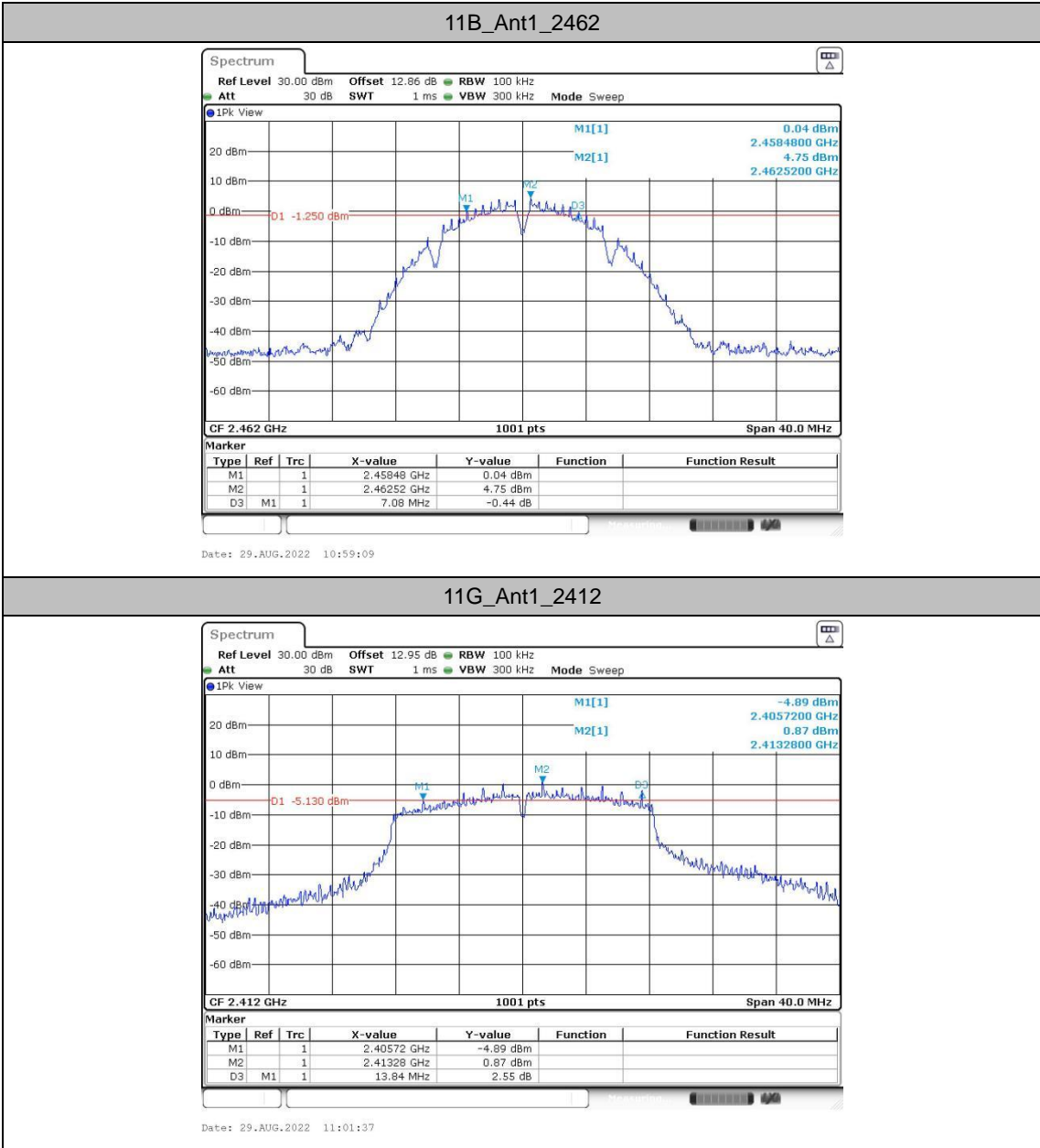
Test Result

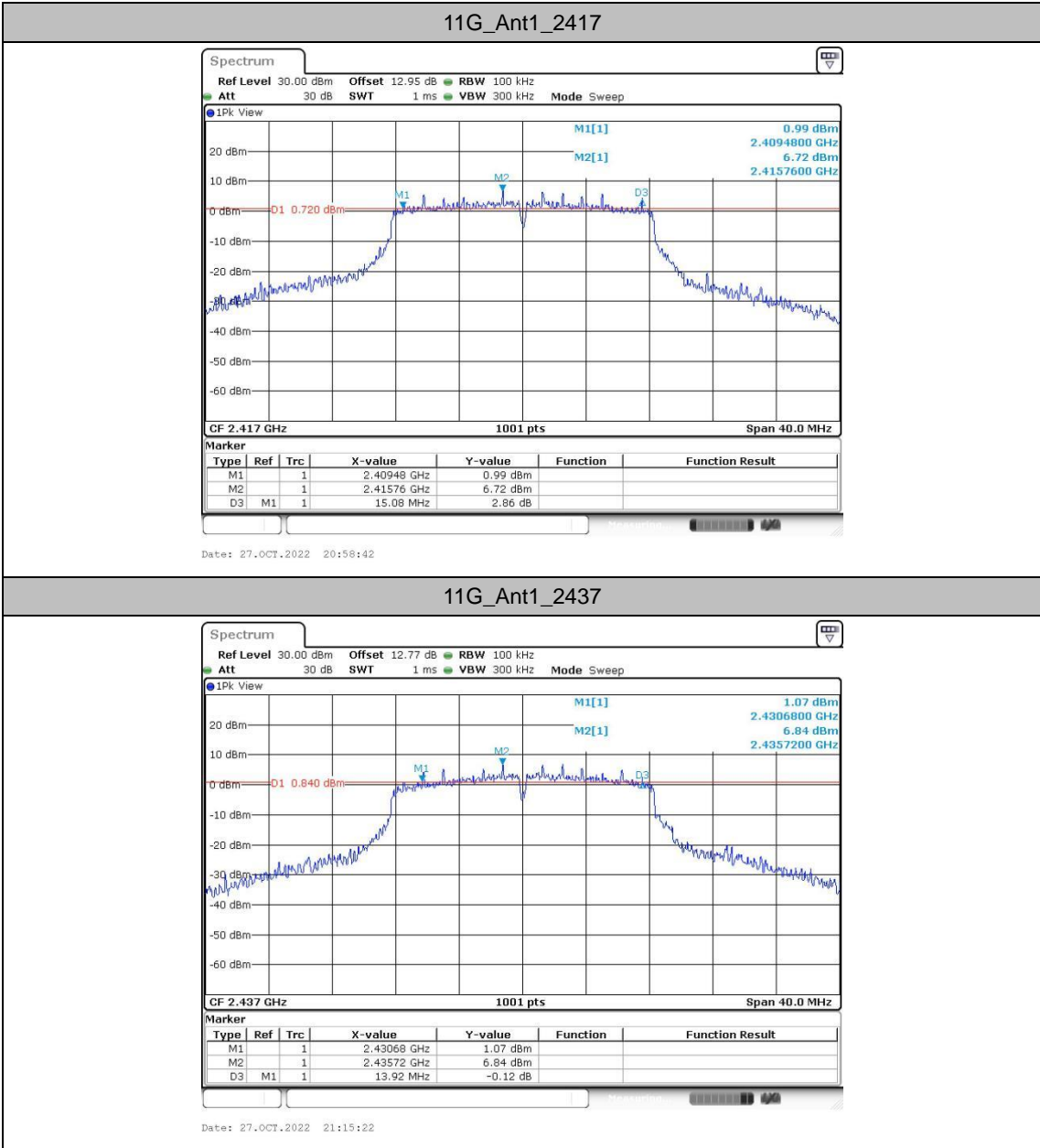
TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	8.52	2408.00	2416.52	0.5	PASS
		2437	8.52	2433.00	2441.52	0.5	PASS
		2462	7.08	2458.48	2465.56	0.5	PASS
11G	Ant1	2412	13.84	2405.72	2419.56	0.5	PASS
		2417	15.08	2409.48	2424.56	0.5	PASS
		2437	13.92	2430.68	2444.60	0.5	PASS
		2462	12.56	2454.48	2467.04	0.5	PASS
11N20SISO	Ant1	2412	13.84	2405.72	2419.56	0.5	PASS
		2417	15.56	2409.24	2424.80	0.5	PASS
		2437	15.08	2429.48	2444.56	0.5	PASS
		2462	13.84	2455.72	2469.56	0.5	PASS
11N40SISO	Ant1	2422	30.08	2406.96	2437.04	0.5	PASS
		2437	36.40	2418.84	2455.24	0.5	PASS
		2452	25.12	2444.48	2469.60	0.5	PASS

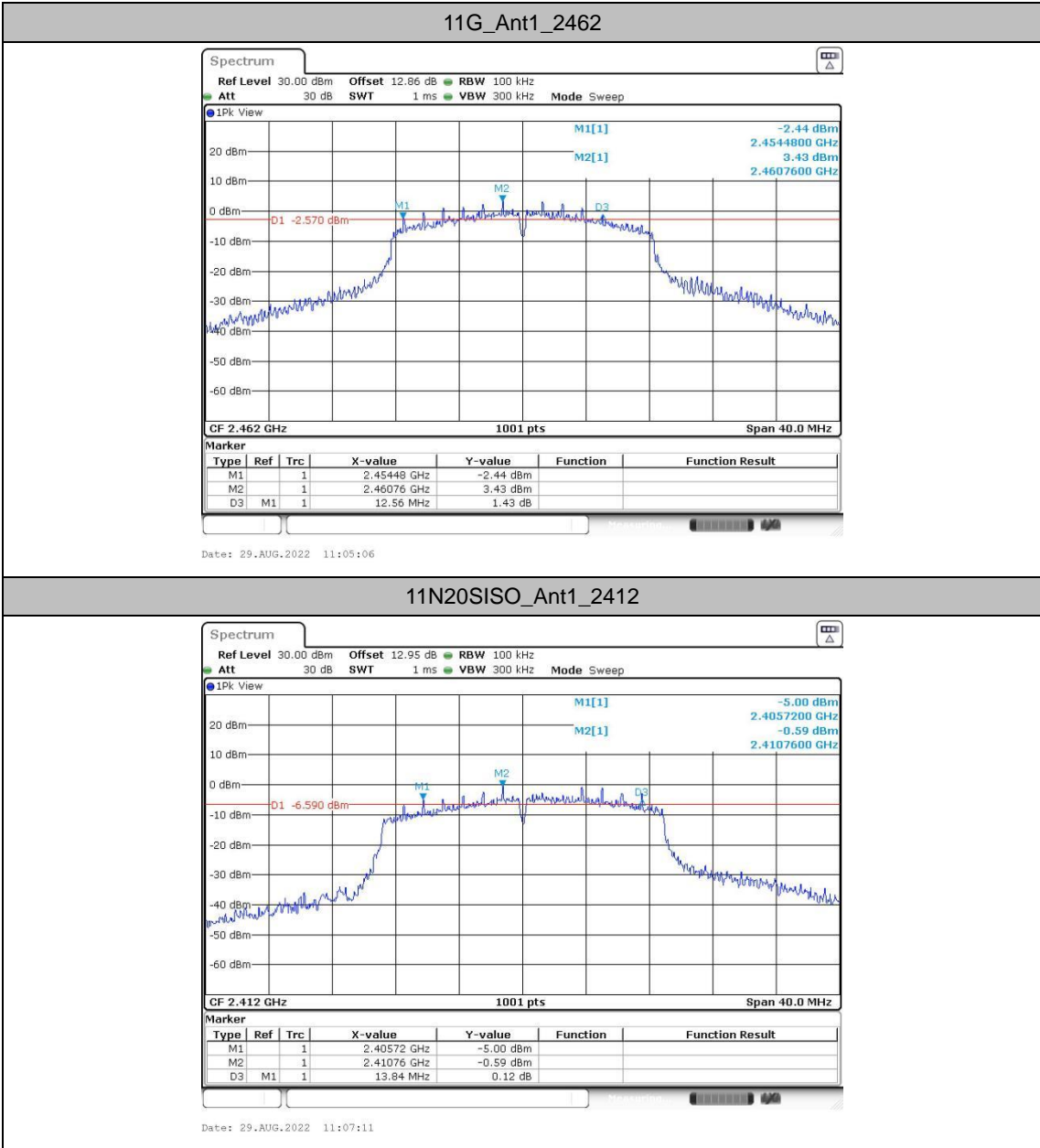


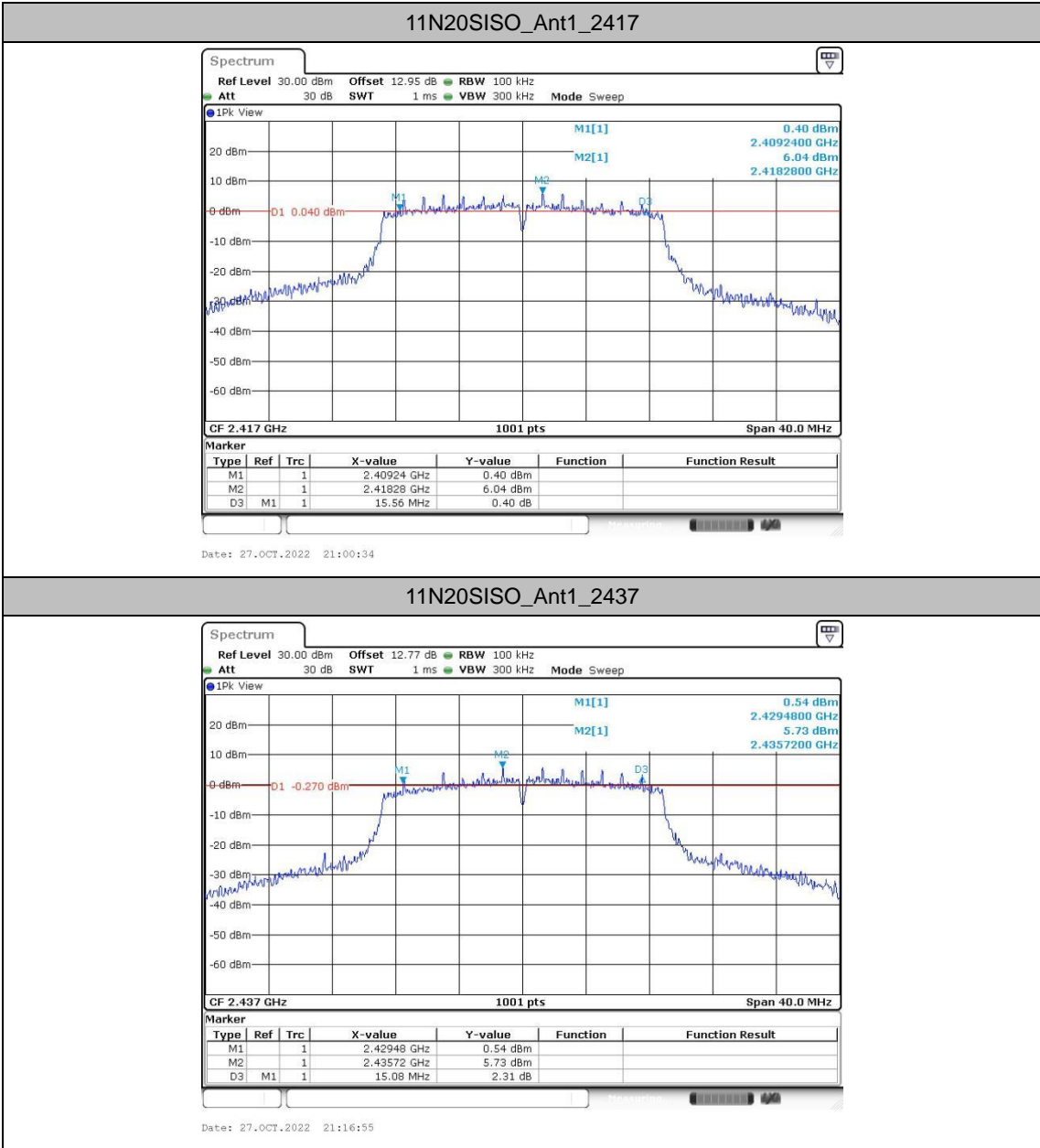
Test Graphs

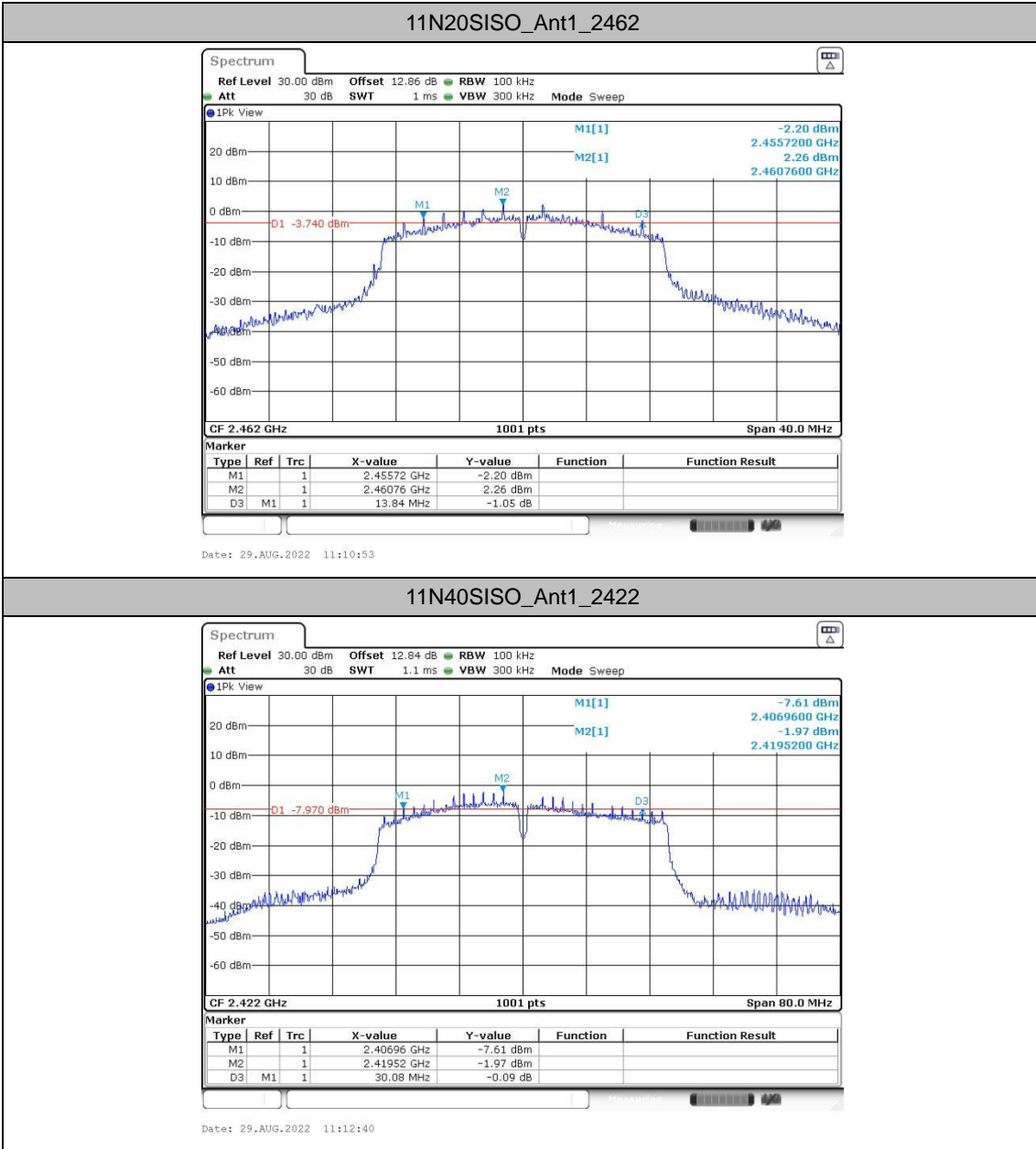


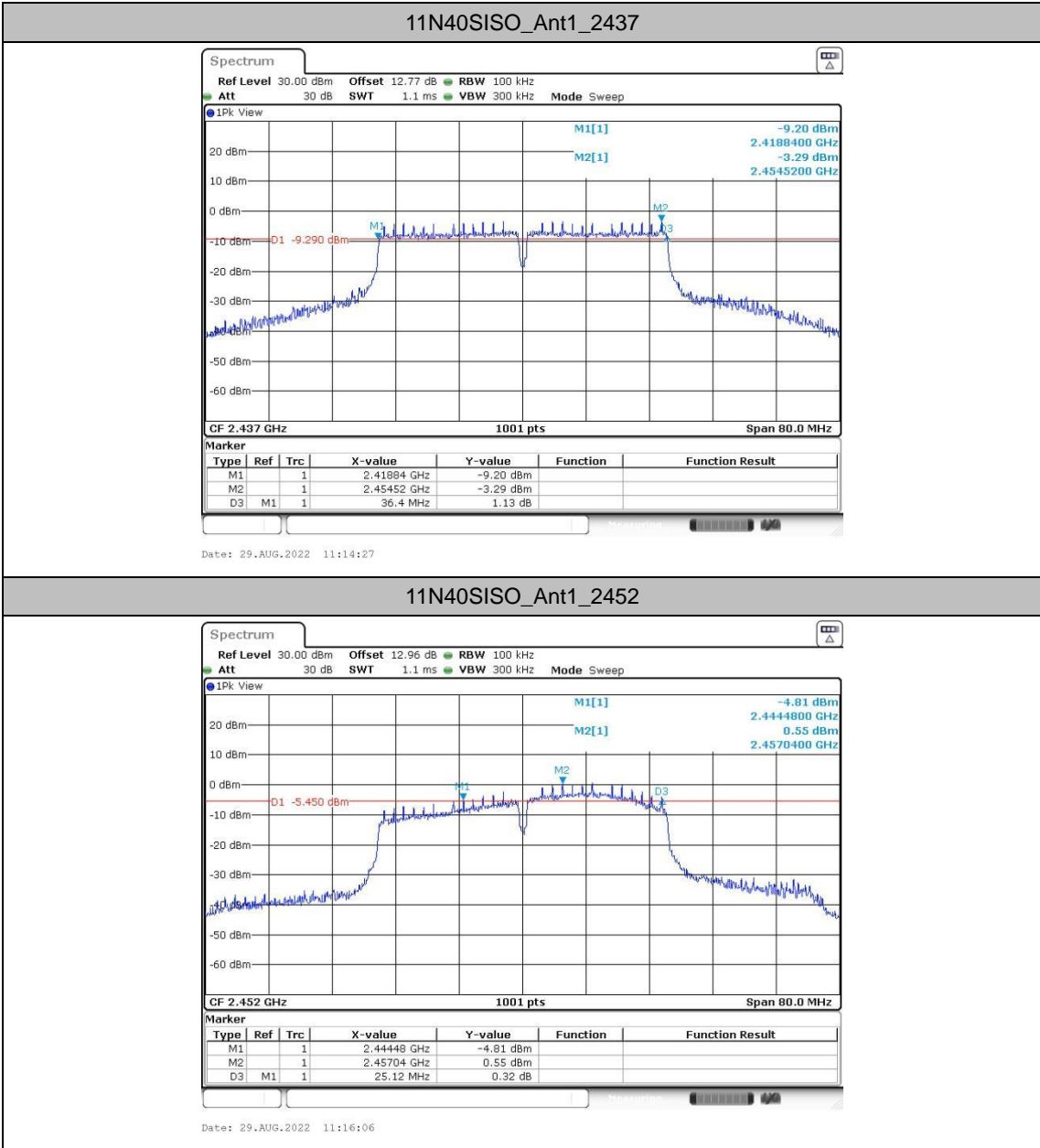

11G_Ant1_2412













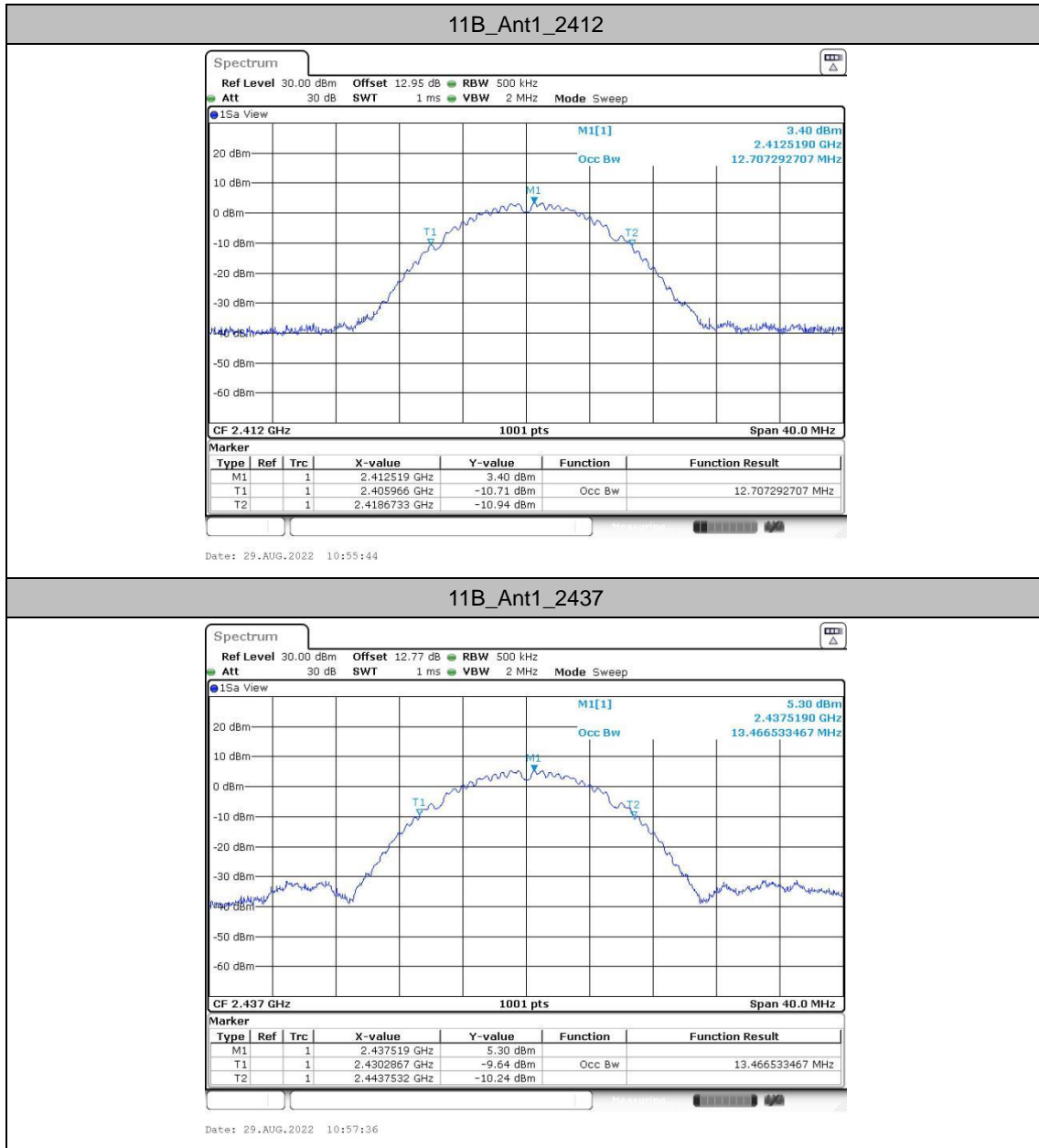
Occupied Channel Bandwidth

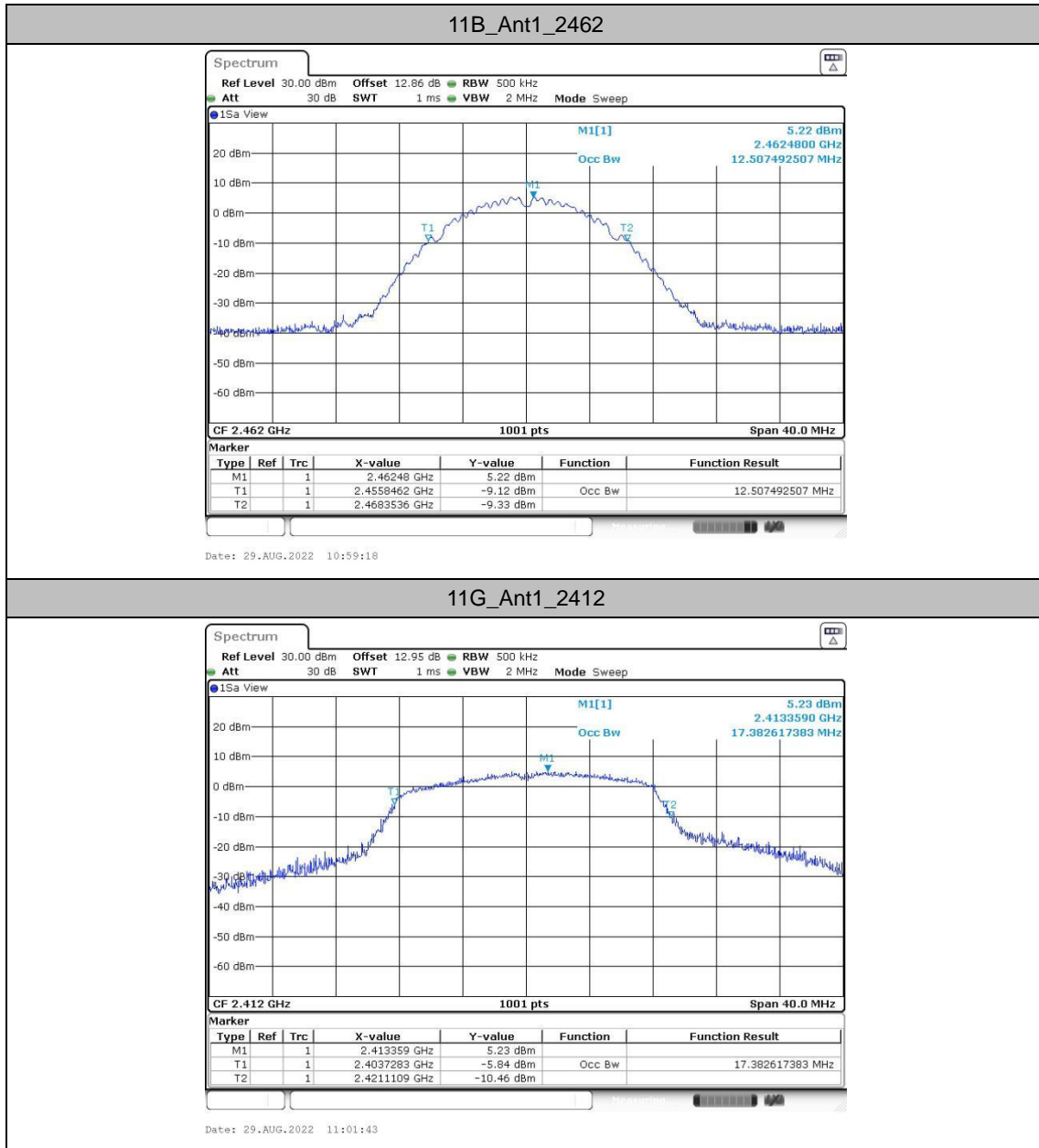
Test Result

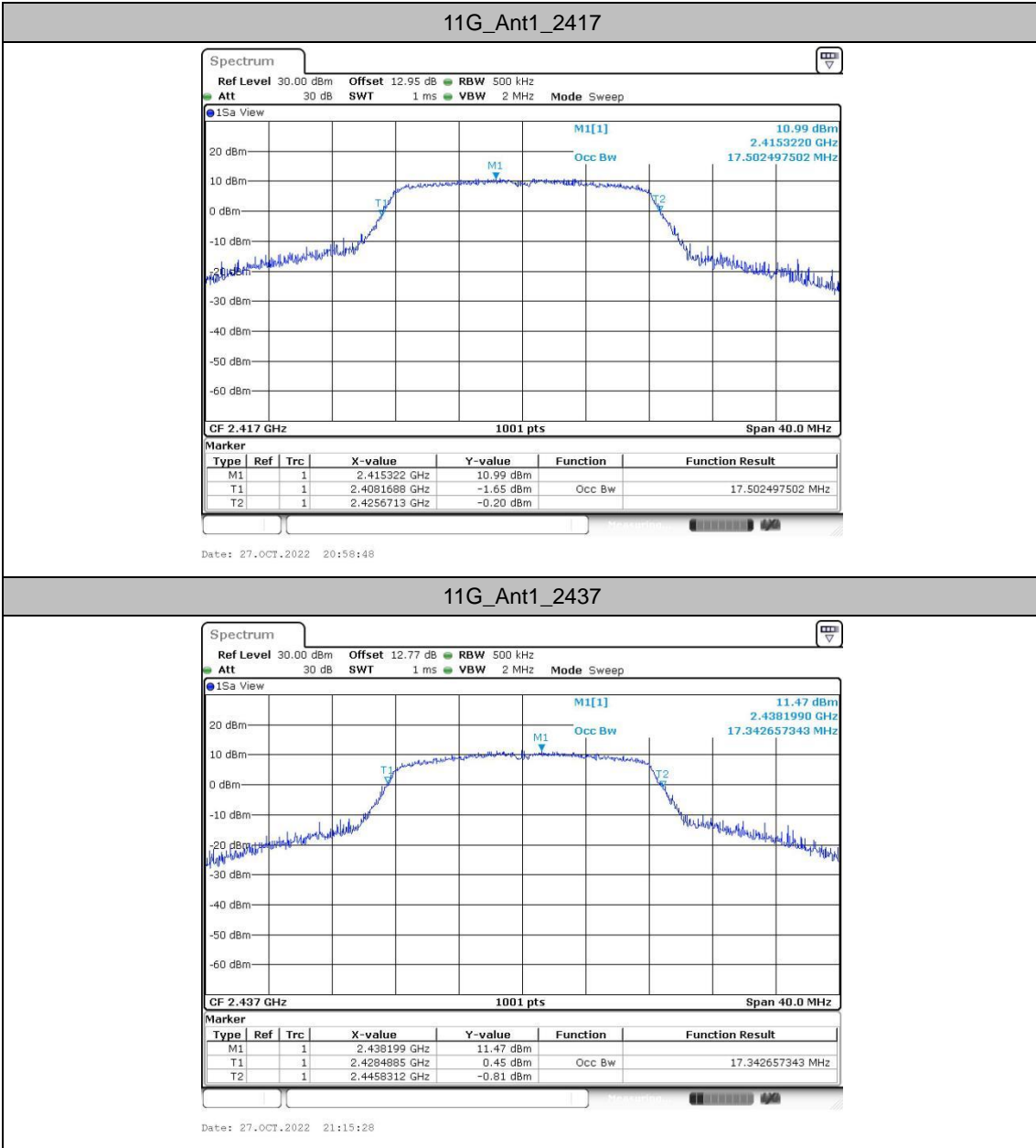
TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	12.707	2405.966	2418.673	---	---
		2437	13.467	2430.287	2443.753	---	---
		2462	12.507	2455.846	2468.354	---	---
11G	Ant1	2412	17.383	2403.728	2421.111	---	---
		2417	17.502	2408.1688	2425.6713	---	---
		2437	17.343	2428.4885	2445.8312	---	---
		2462	17.103	2453.449	2470.551	---	---
11N20SISO	Ant1	2412	18.062	2403.249	2421.311	---	---
		2417	18.422	2407.6893	2426.1109	---	---
		2437	18.222	2427.9690	2446.1908	---	---
		2462	17.822	2453.049	2470.871	---	---
11N40SISO	Ant1	2422	36.124	2404.018	2440.142	---	---
		2437	37.802	2418.379	2456.181	---	---
		2452	35.884	2434.418	2470.302	---	---

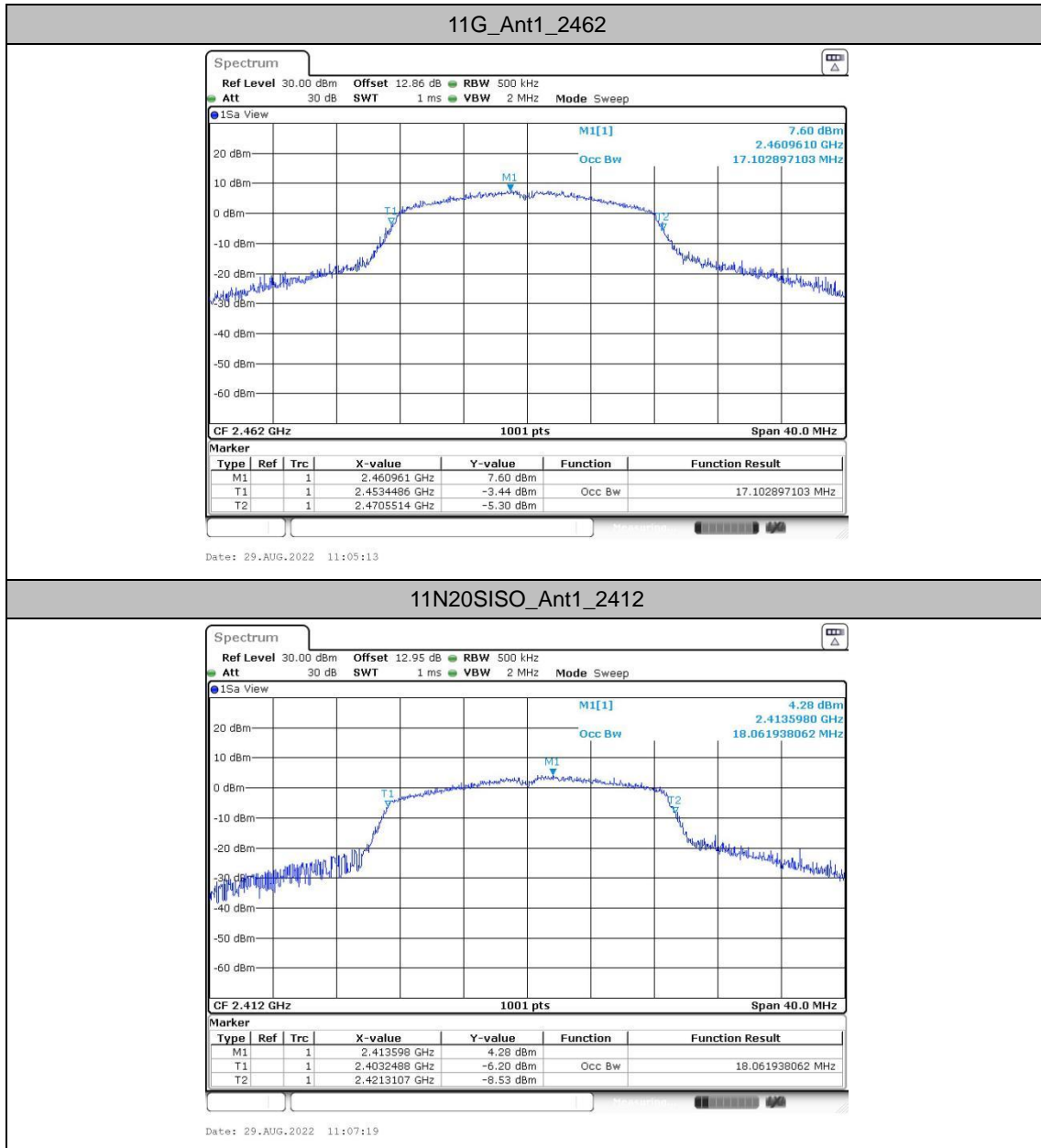


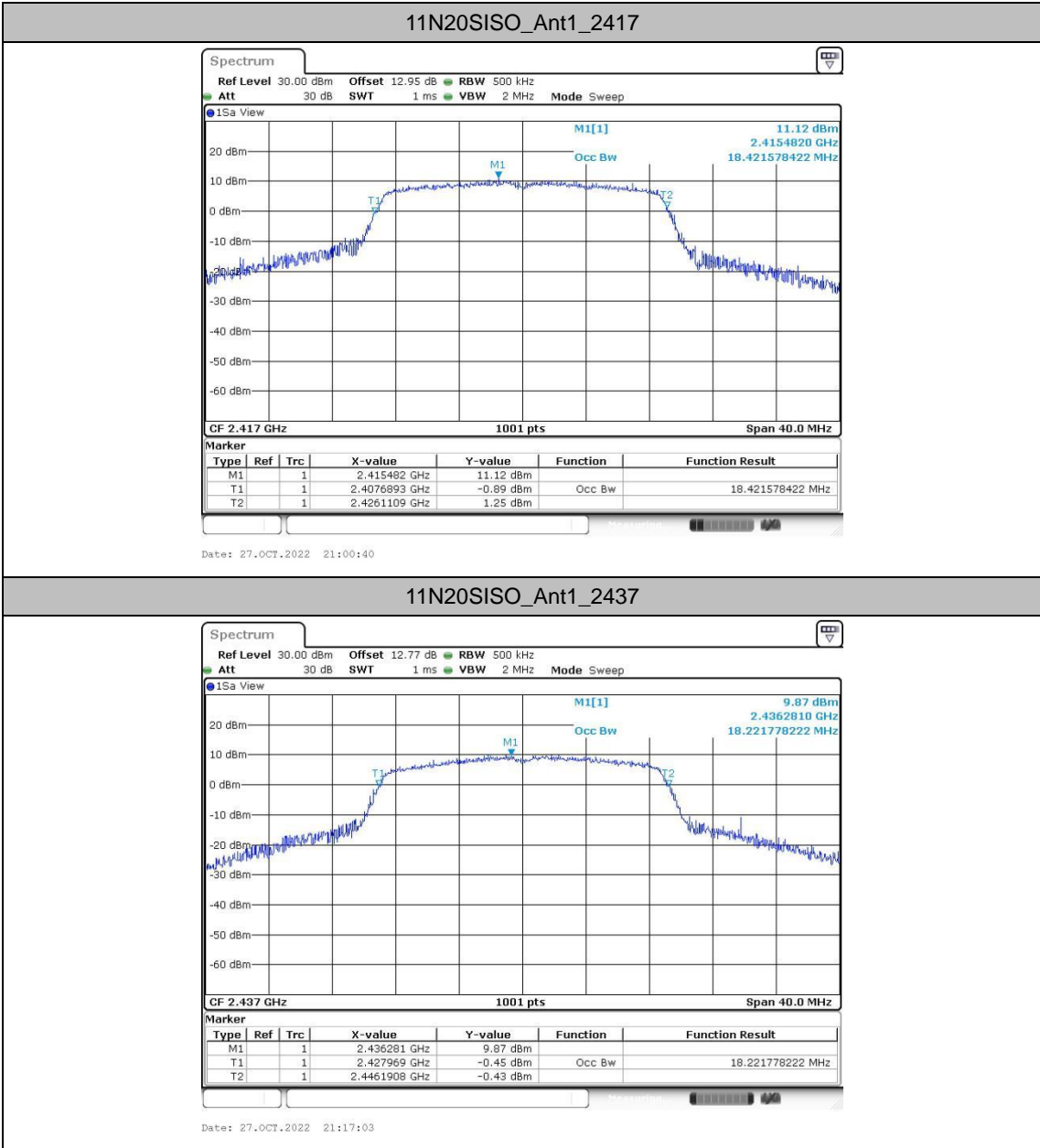
Test Graphs

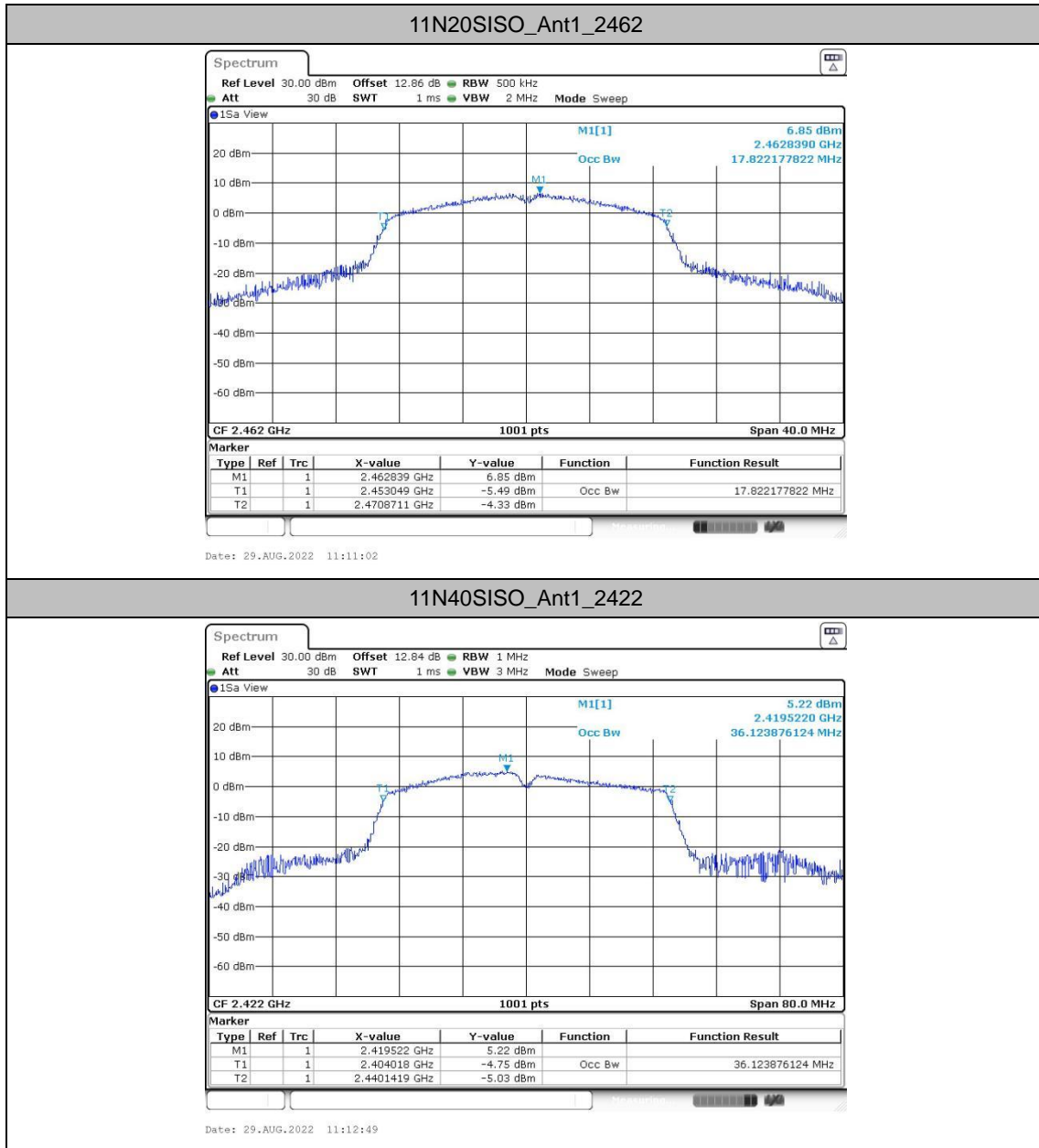






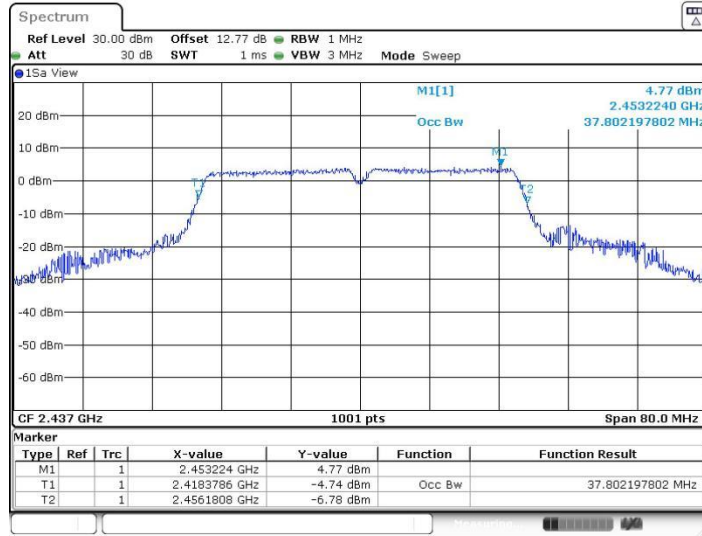






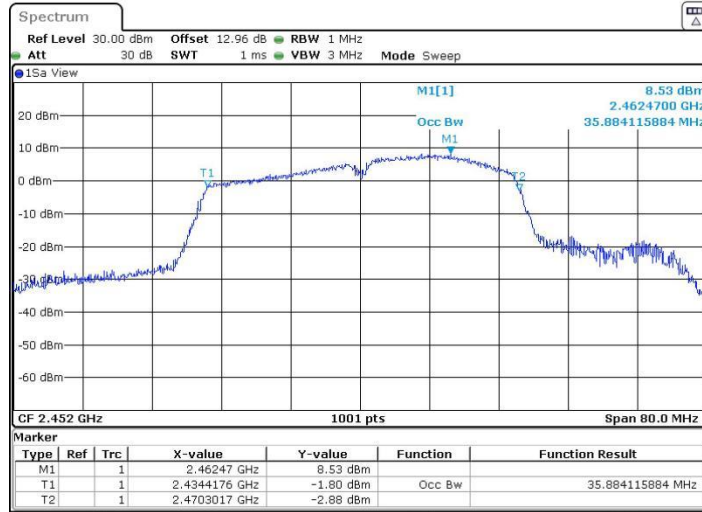


11N40SISO_Ant1_2437



Date: 29.AUG.2022 11:14:36

11N40SISO_Ant1_2452



Date: 29.AUG.2022 11:16:14



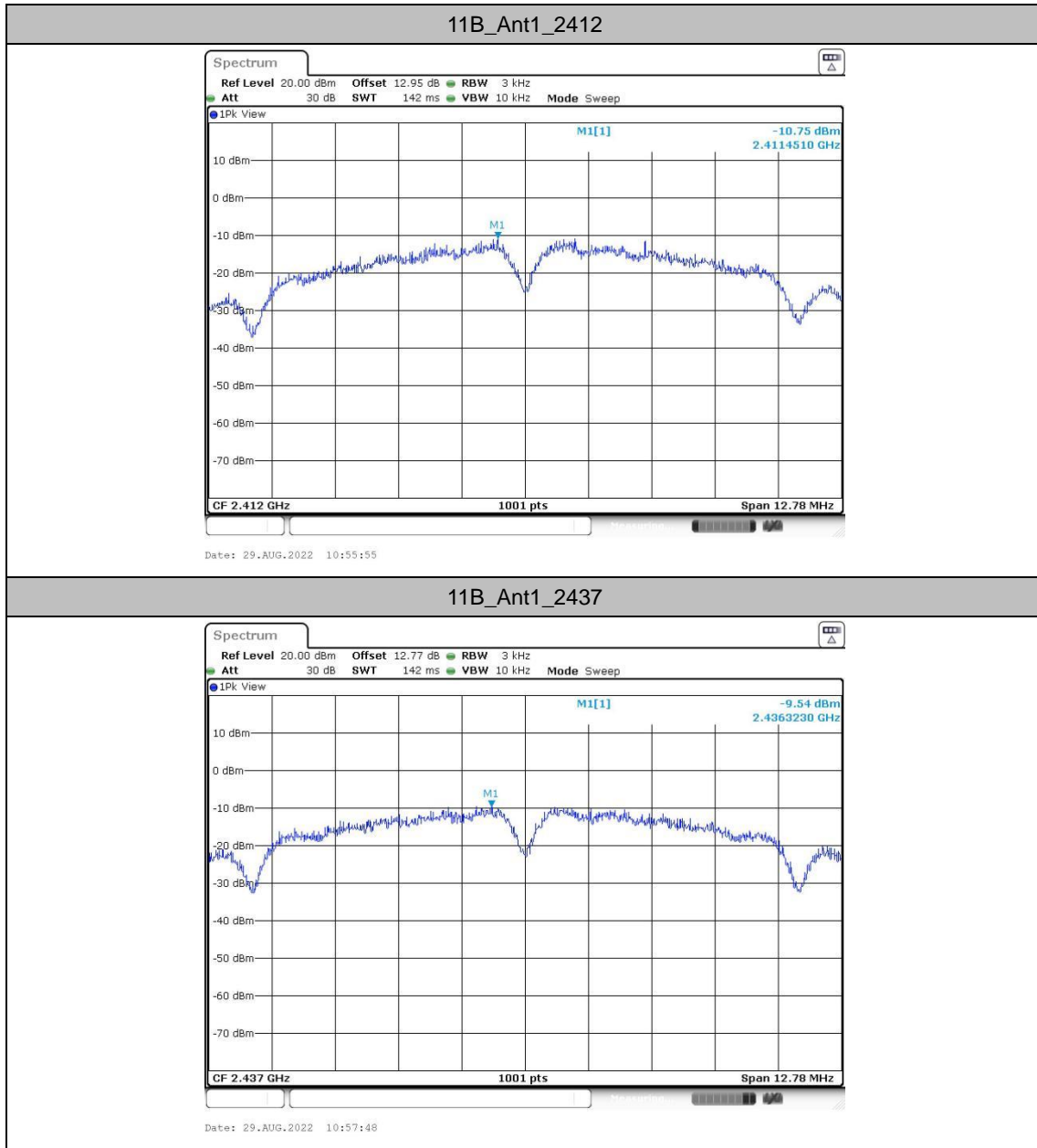
Maximum power spectral density

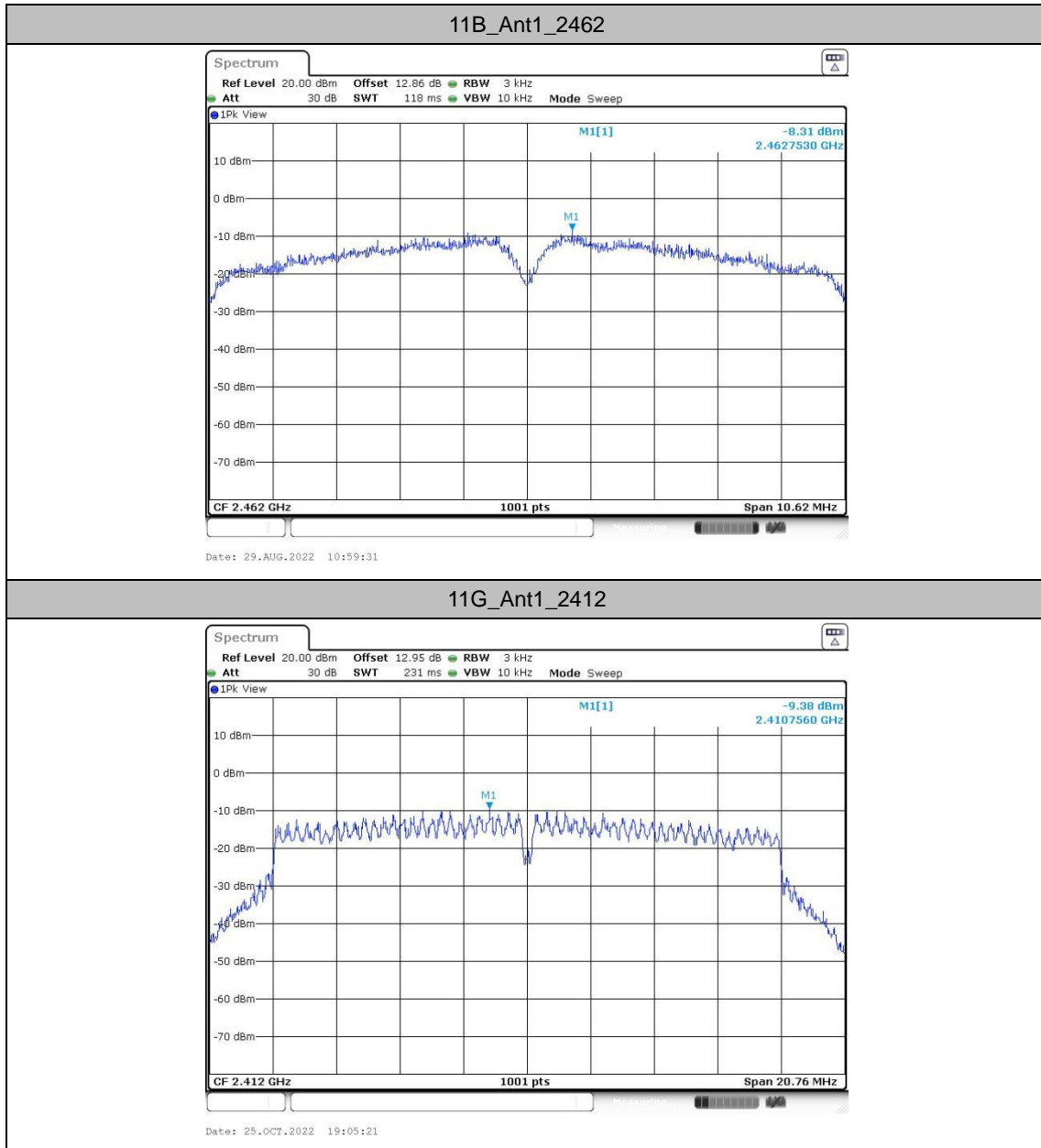
Test Result

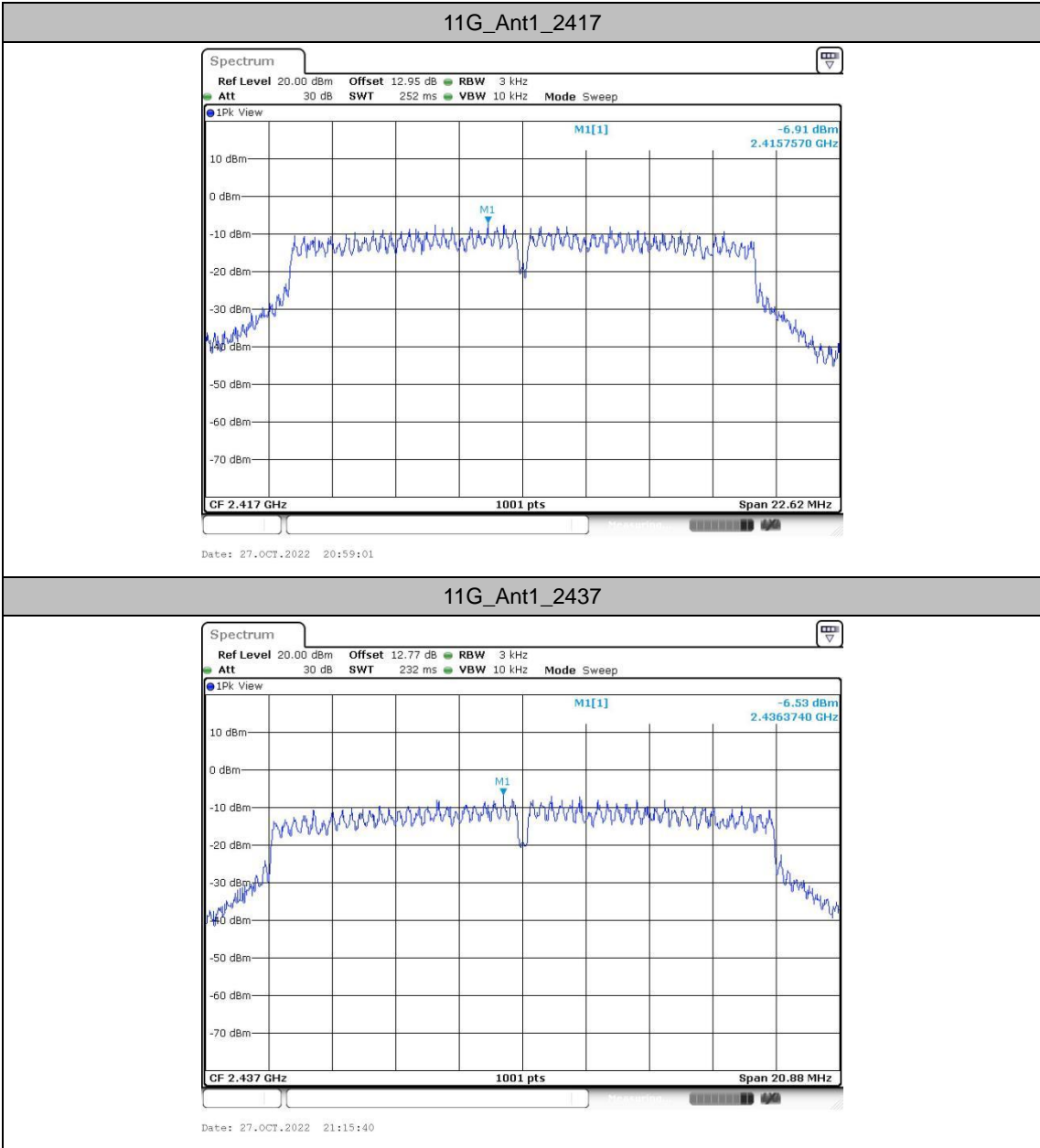
TestMode	Antenna	Frequency[MHz]	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-10.75	≤8.00	PASS
		2437	-9.54	≤8.00	PASS
		2462	-8.31	≤8.00	PASS
11G	Ant1	2412	-9.38	≤8.00	PASS
		2417	-6.91	≤8.00	PASS
		2437	-6.53	≤8.00	PASS
		2462	-8.98	≤8.00	PASS
11N20SISO	Ant1	2412	-11.86	≤8.00	PASS
		2417	-7.48	≤8.00	PASS
		2437	-8.11	≤8.00	PASS
		2462	-9.56	≤8.00	PASS
11N40SISO	Ant1	2422	-16.08	≤8.00	PASS
		2437	-11.75	≤8.00	PASS
		2452	-12.94	≤8.00	PASS

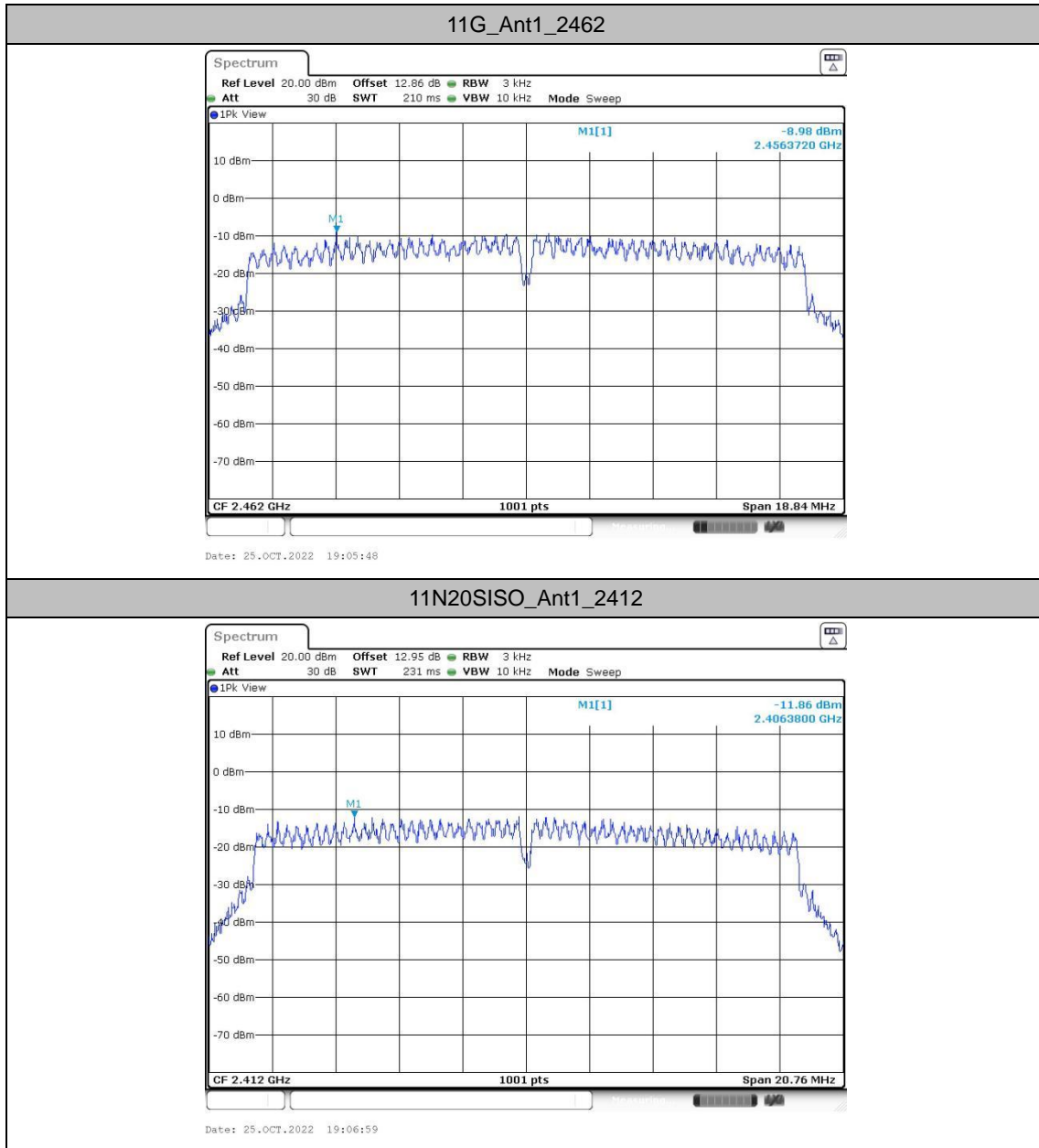


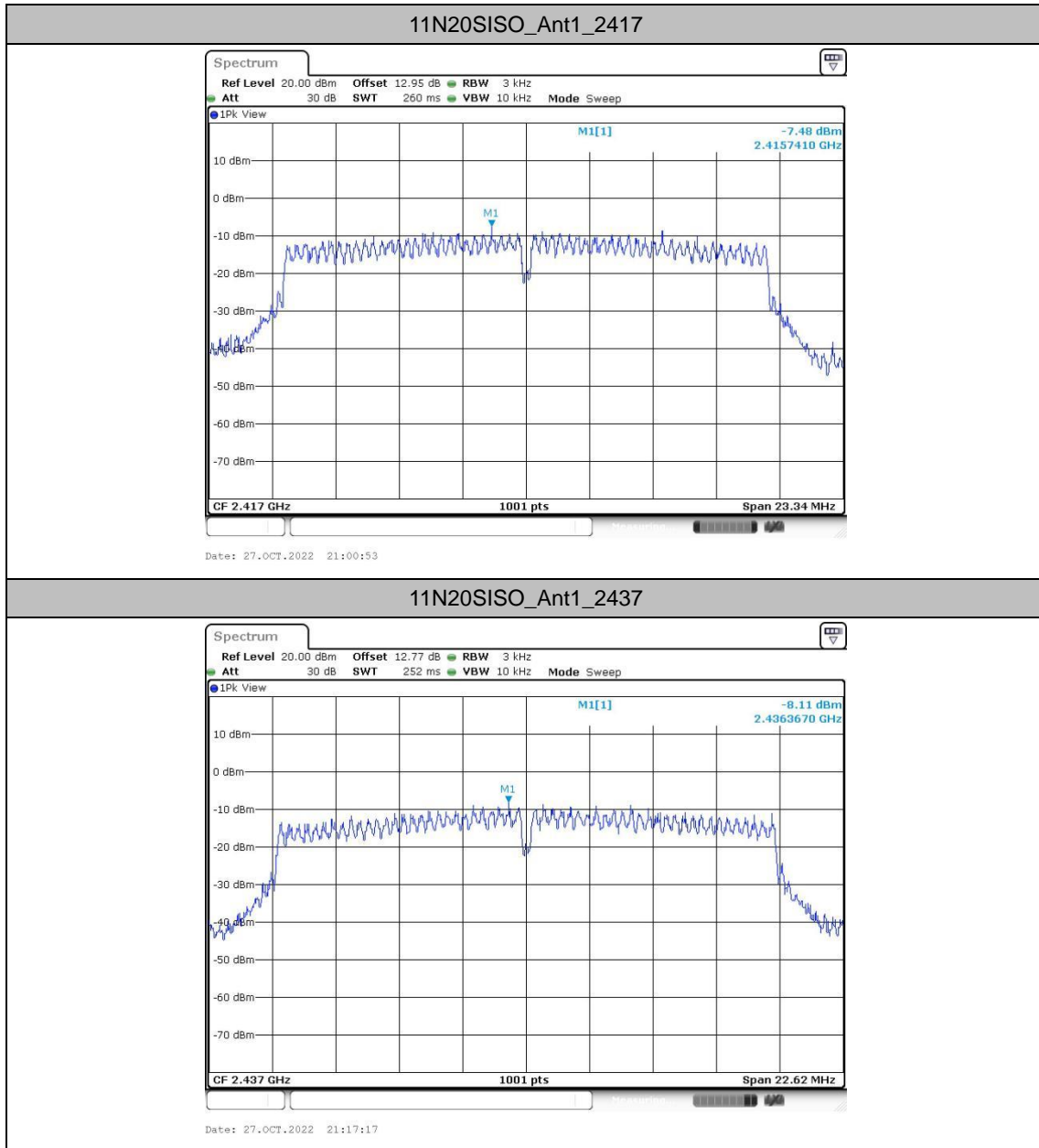
Test Graphs





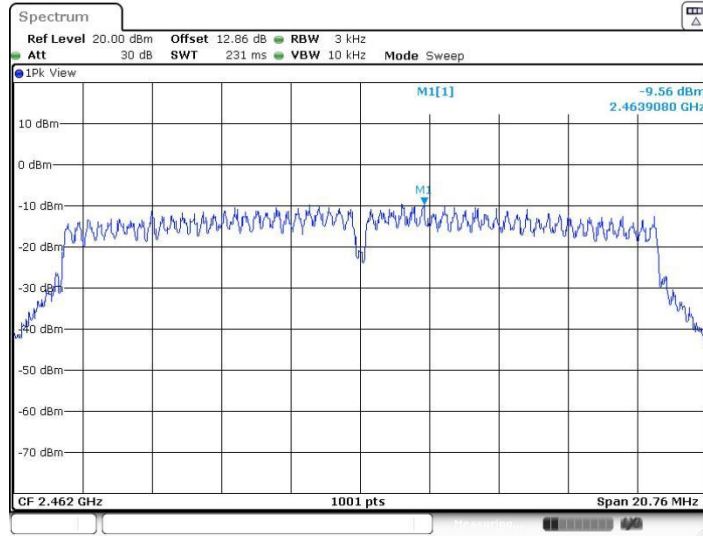






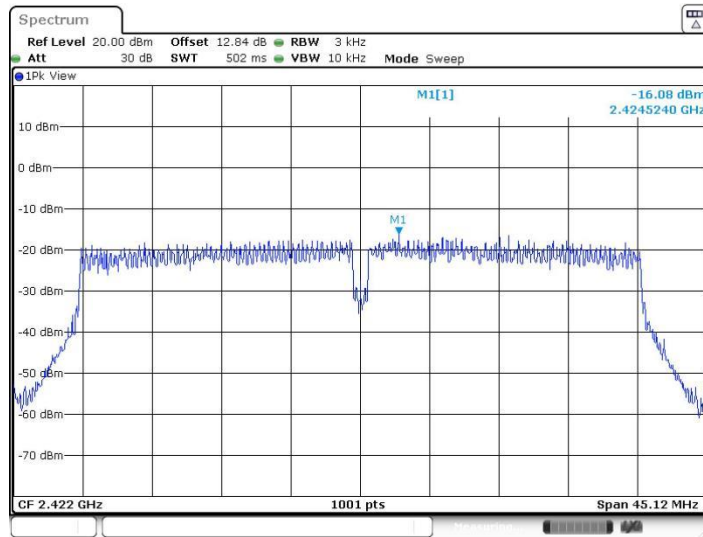


11N20SISO_Ant1_2462

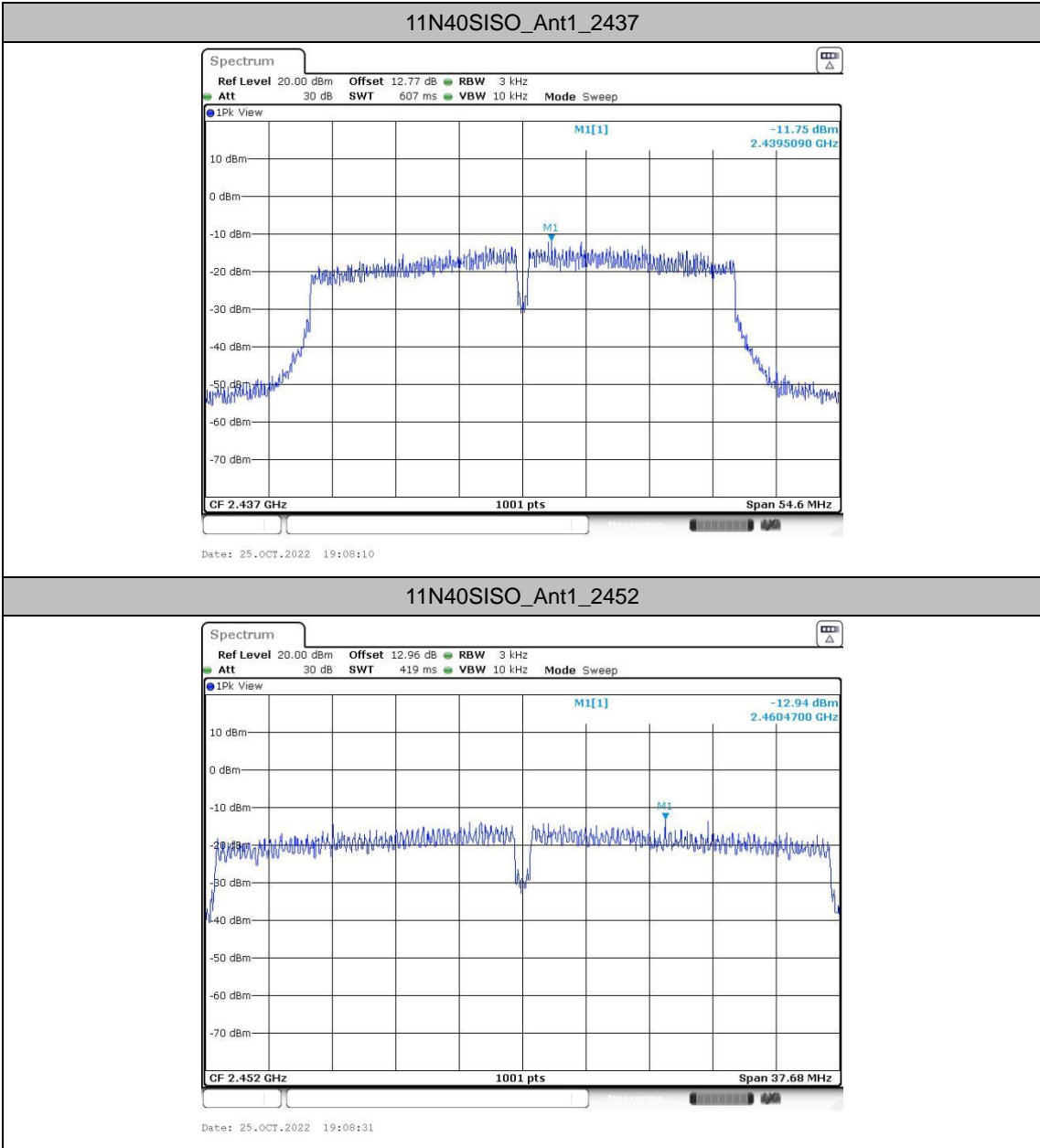


Date: 25.OCT.2022 19:07:20

11N40SISO_Ant1_2422



Date: 25.OCT.2022 19:07:46





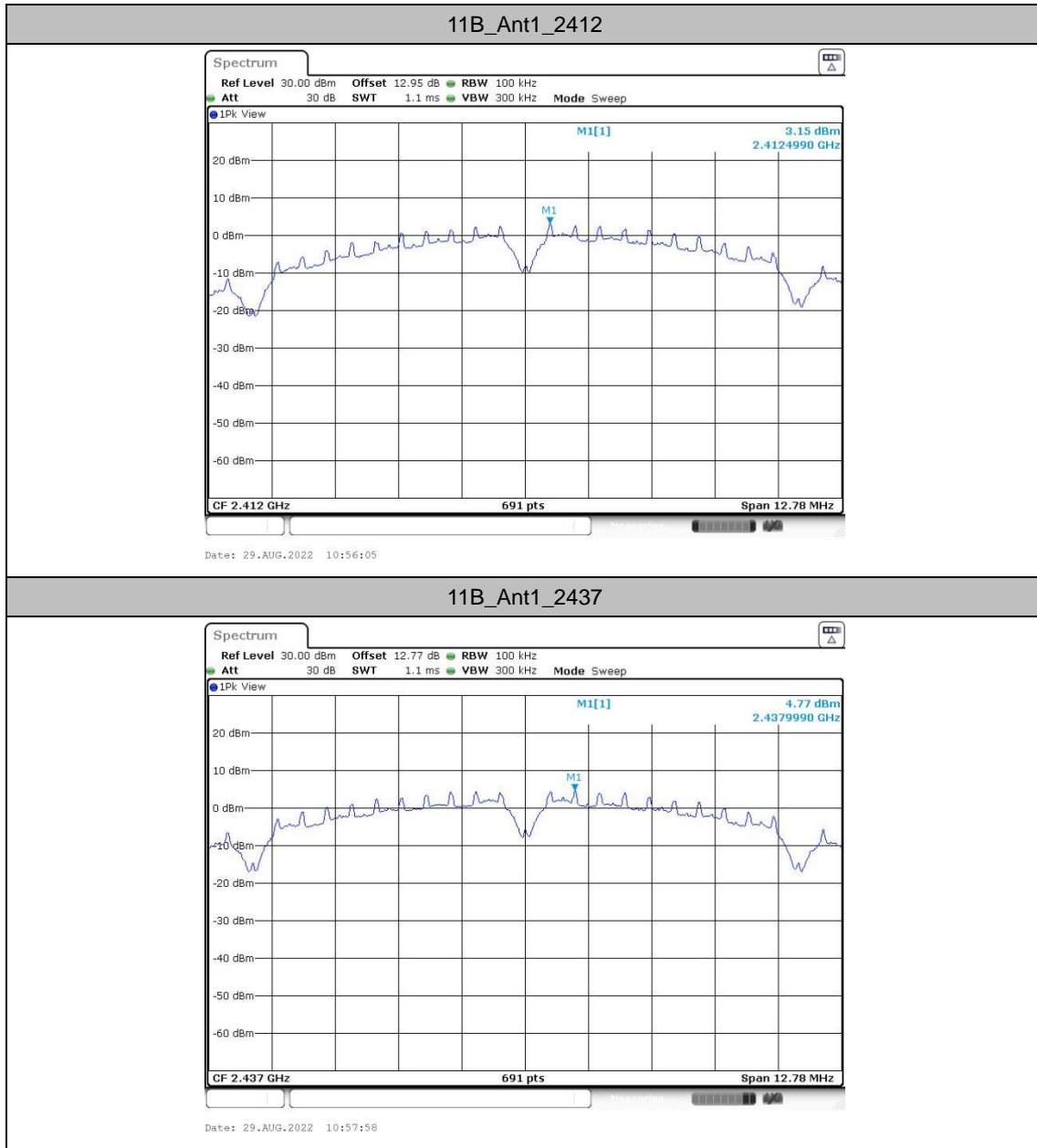
Reference level measurement

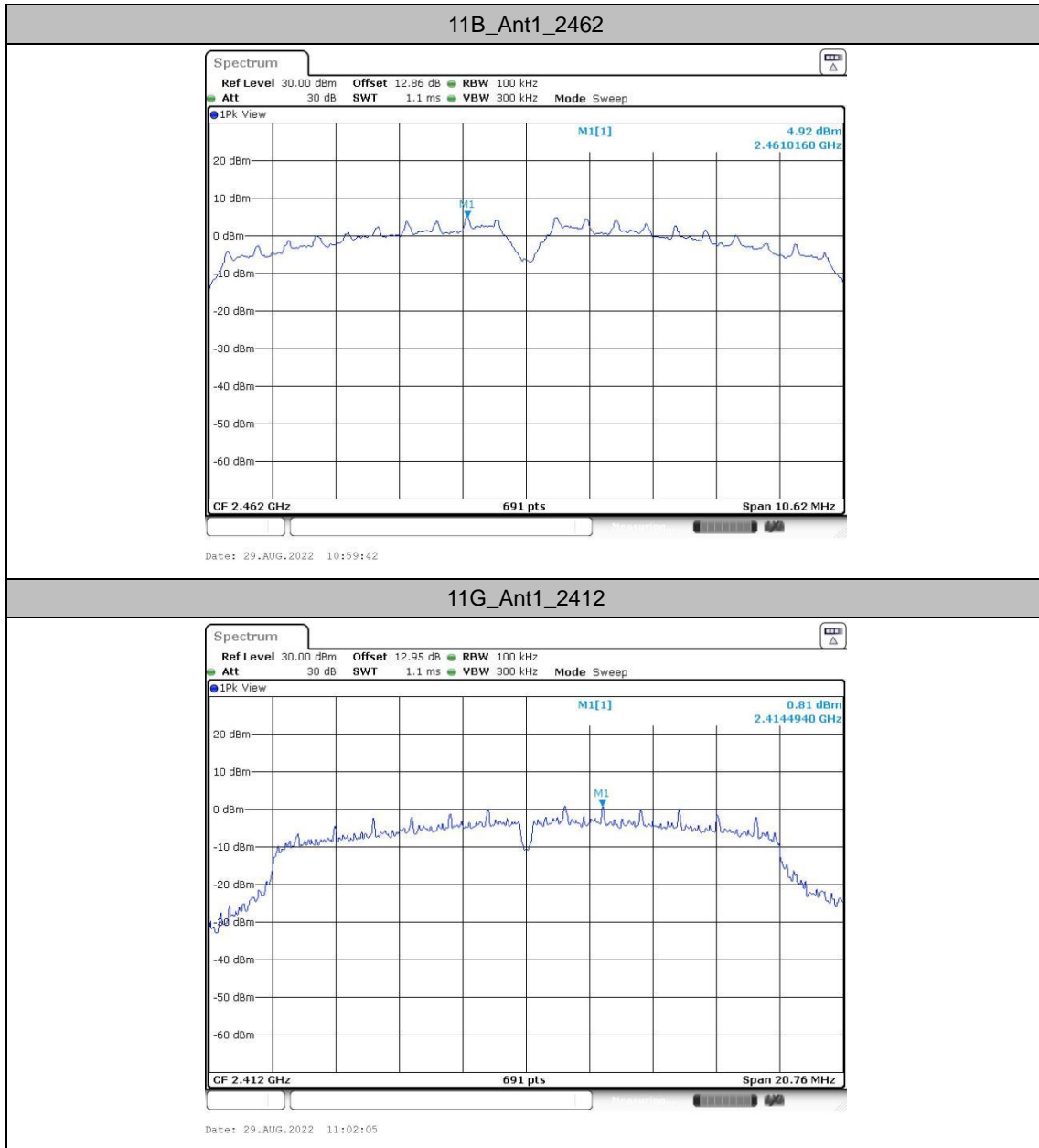
Test Result

TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm/100KHz]
11B	Ant1	2412	2412.50	3.15
		2437	2438.00	4.77
		2462	2461.02	4.92
11G	Ant1	2412	2414.49	0.81
		2417	2419.52	6.17
		2437	2435.73	6.78
		2462	2463.25	3.19
11N20SISO	Ant1	2412	2414.49	-0.09
		2417	2415.75	6.07
		2437	2438.28	5.68
		2462	2463.26	2.28
11N40SISO	Ant1	2422	2416.97	-2.46
		2437	2454.54	-3.25
		2452	2457.02	0.51



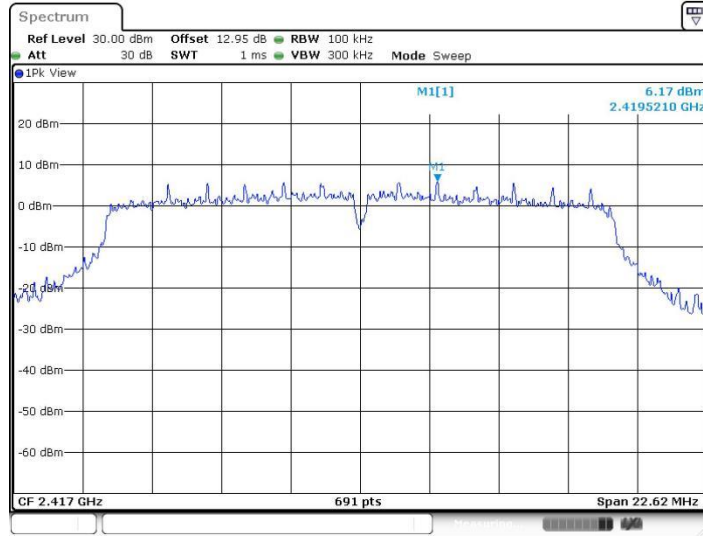
Test Graphs





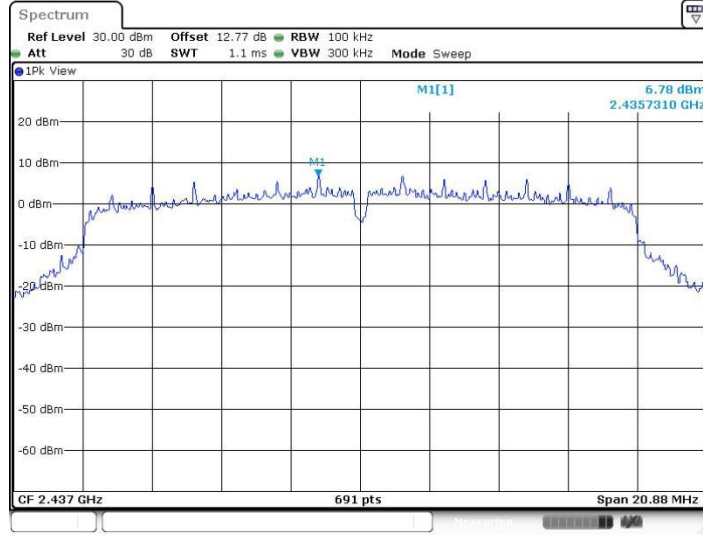


11G_Ant1_2417



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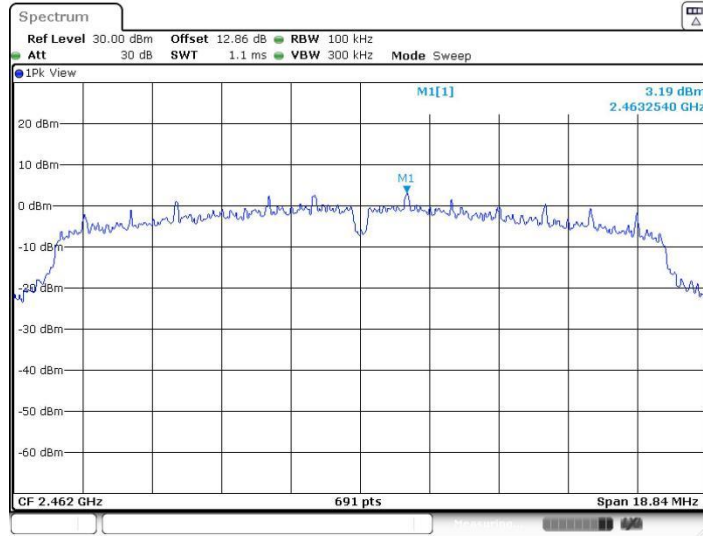
11G_Ant1_2437



Date: 27.OCT.2022 21:15:51

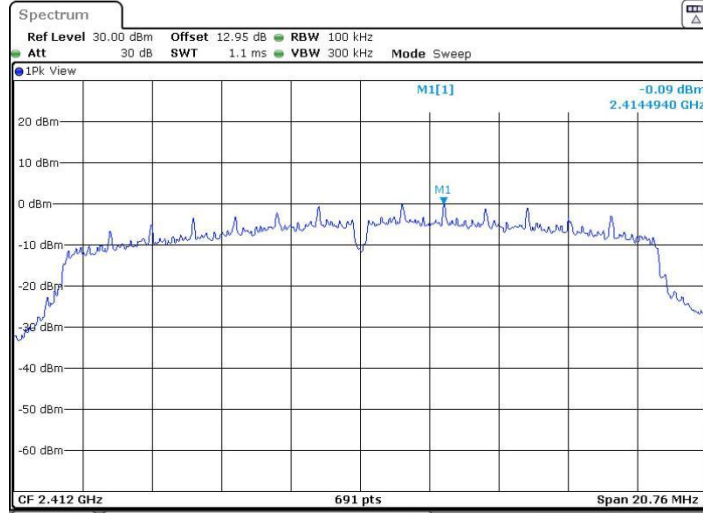


11G_Ant1_2462

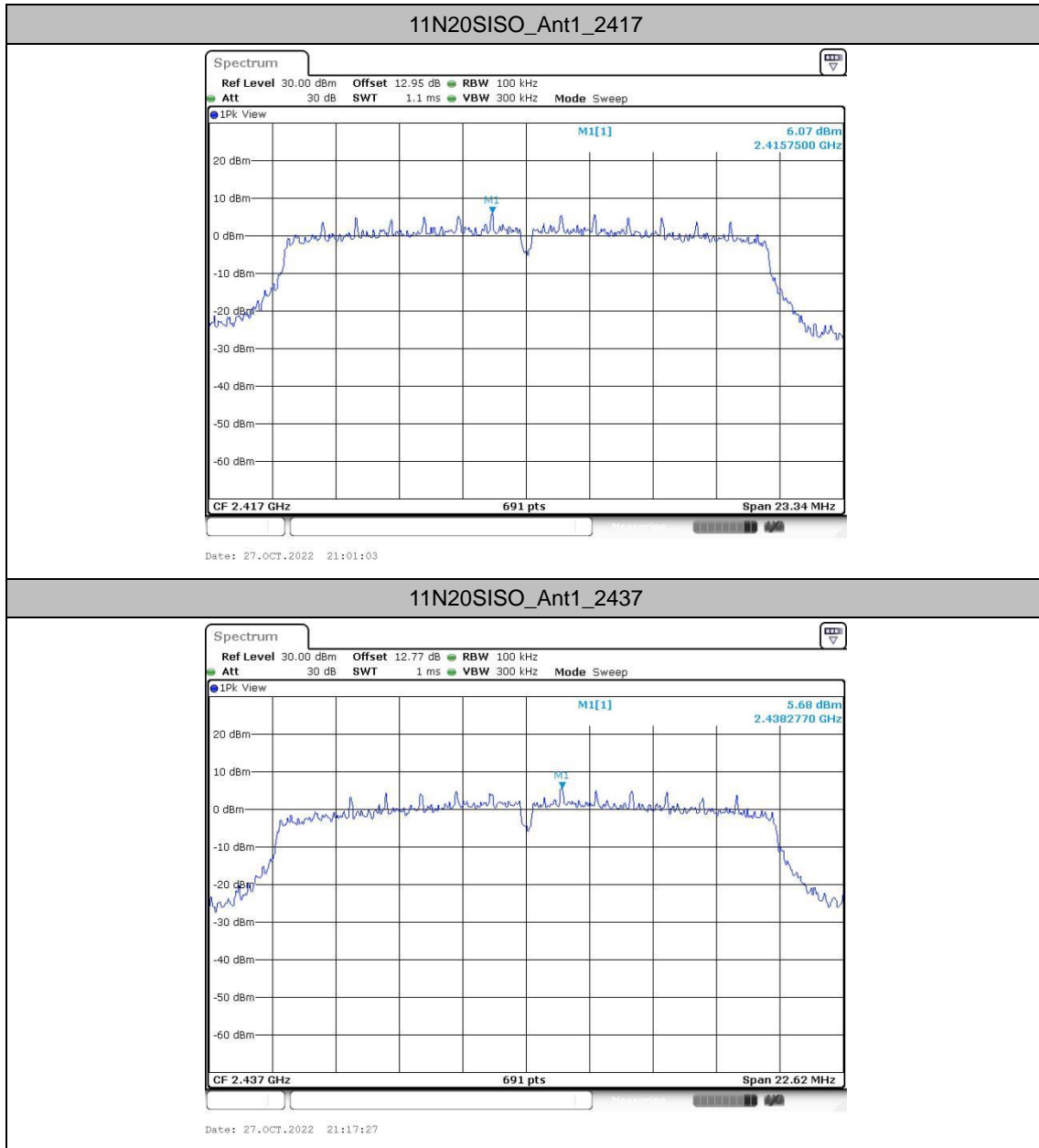


Date: 29.AUG.2022 11:05:34

11N20SISO_Ant1_2412

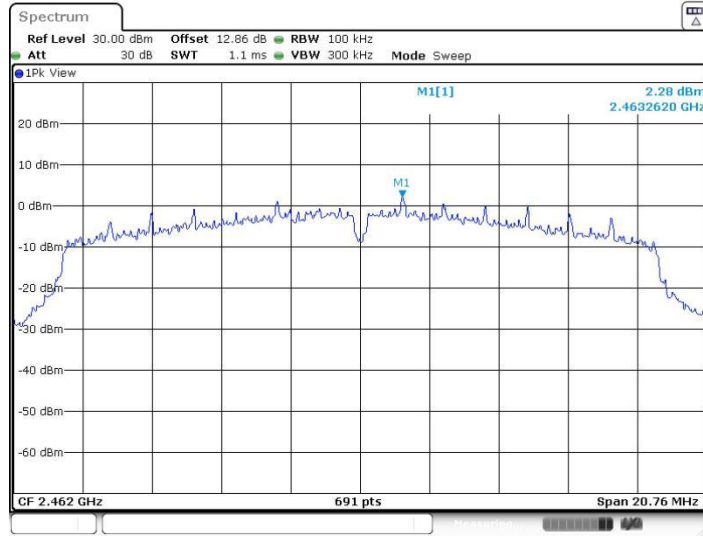


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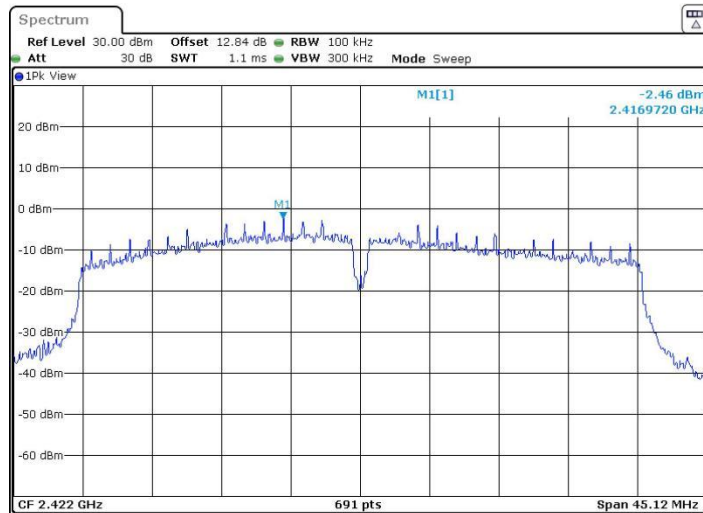


11N20SISO_Ant1_2462

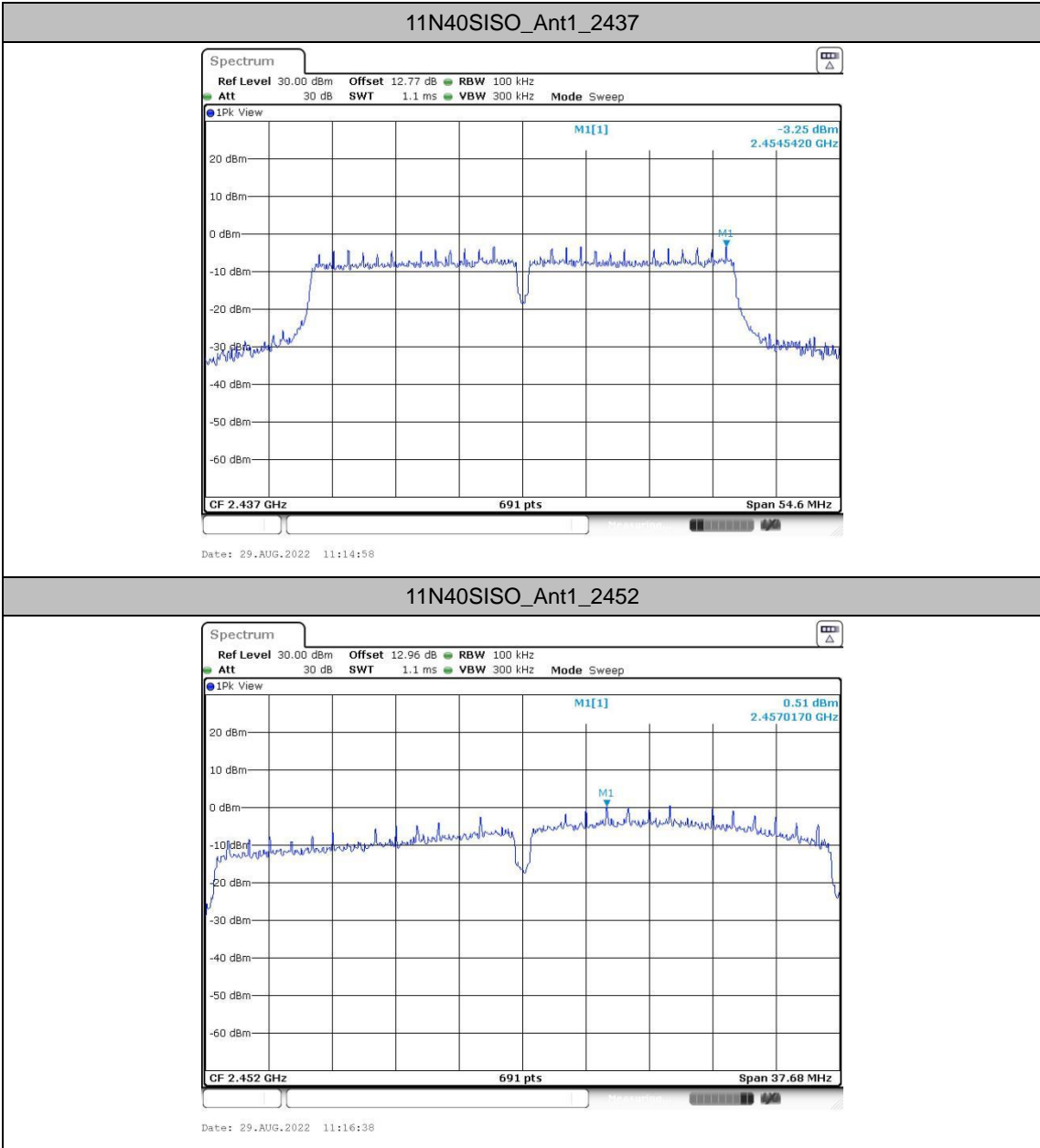


Date: 29.AUG.2022 11:11:25

11N40SISO_Ant1_2422



Date: 29.AUG.2022 11:13:11





Band edge measurements

Test Result

TestMode	Antenna	Channel Name	Freq(MHz)	RefLevel[dBm/100KHz]	Result[dBm/100KHz]	Limit[dBm/100KHz]	Verdict
11B	Ant1	Low	2412	3.15	-43.41	≤-16.85	PASS
		High	2462	4.92	-43.61	≤-15.08	PASS
11G	Ant1	Low	2412	0.81	-32.68	≤-19.19	PASS
			2417	6.17	-27.21	≤-13.83	PASS
		High	2462	3.19	-35.39	≤-16.81	PASS
11N20SISO	Ant1	Low	2412	-0.09	-34.6	≤-20.09	PASS
			2417	6.07	-26.7	≤-13.93	PASS
		High	2462	2.28	-36.95	≤-17.72	PASS
11N40SISO	Ant1	Low	2422	-2.46	-33.55	≤-22.46	PASS
		High	2452	0.51	-31.73	≤-19.49	PASS