



FCC RF Test Report

APPLICANT : Nauto
EQUIPMENT : In-vehicle camera
BRAND NAME : Nauto
MODEL NAME : N4
FCC ID : 2AKJ5-N4
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System
TEST DATE(S) : Mar. 28, 2024 ~ Apr. 12, 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**



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR3D2618C	Rev. 01	Initial issue of report	May 14, 2024



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	99% Bandwidth	-	Report Only	-
3.2	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	Conducted Band Edges	$\leq 20\text{dBc}$	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 3.14 dB at 2389.95 MHz
-	15.207	AC Conducted Emission	15.207(a)	Not Applicable	-
3.6	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Conformity Assessment Condition:

1. 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/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. 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

Nauto

1259 Reamwood Ave, Sunnyvale, CA 94089, USA

1.2 Manufacturer

Nauto

1259 Reamwood Ave, Sunnyvale, CA 94089, USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	In-vehicle camera
Brand Name	Nauto
Model Name	N4
FCC ID	2AKJ5-N4
SN Code	Conducted: N40HTV6E1000E5L Radiation: N40HTV6E10011BS
HW Version	V4
SW Version	NautoN4
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 : 19.54 dBm (0.0899 W) 802.11g : 23.10 dBm (0.2042 W) 802.11n HT20 : 22.63 dBm (0.1832 W) 802.11n HT40 : 22.32 dBm (0.1706 W) 802.11ax HE20 : 24.17 dBm (0.2612 W) 802.11ax HE40 : 22.63 dBm (0.1832 W)
99% Occupied Bandwidth	802.11b : 13.187 MHz 802.11g : 16.503 MHz 802.11n HT20 : 17.702 MHz 802.11n HT40 : 36.044 MHz 802.11ax HE20 : 18.941 MHz 802.11ax HE40 : 37.882 MHz
Antenna Type / Gain	monopole Antenna with gain -0.4 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:

- For 802.11n HT20/HT40 & 11ax HE20/HE40 mode, the RSE only test 11ax HE20/HE40 mode by referring to the high output power.
- 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/PSD > partial RU, therefore the full RU perform full test to cover partial RU except for Spurious and bandedge.

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.

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		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH05-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.	03CH05-KS	AUDIX	E3	210616

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:, 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	-	-

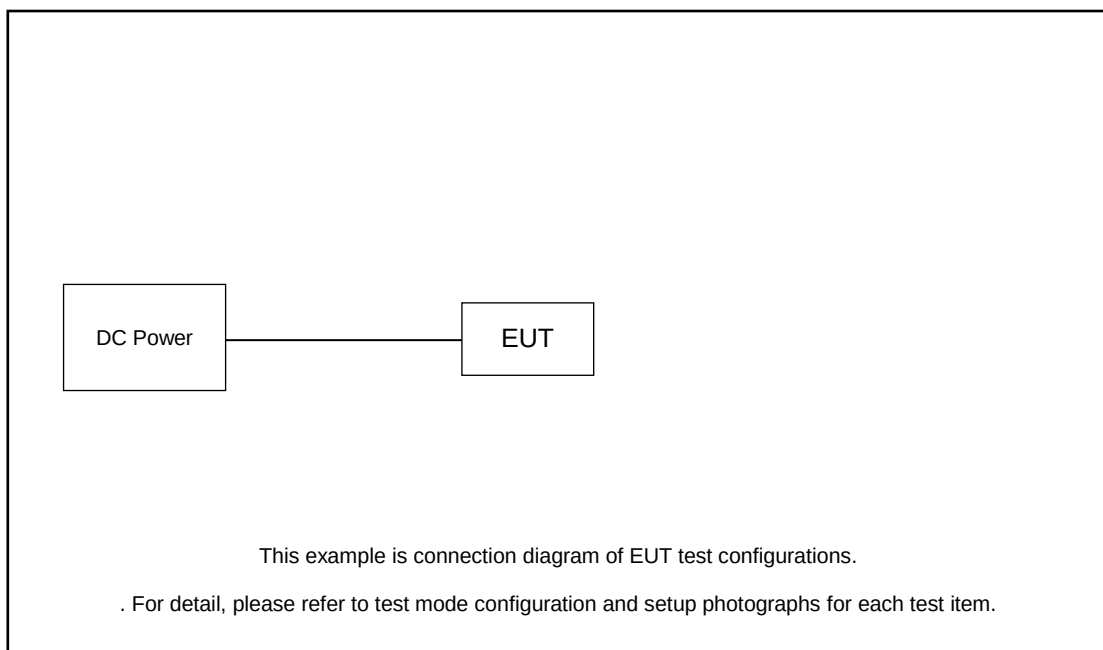
2.2 Test Mode

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
802.11ax HE20	MCS0
802.11ax HE40	MCS0

RSE Co-location
802.11ax HE40 CH03 2422 + LTE Band13 Link

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	DC Power	TIANNENG	A6-DZF-12V	N/A	N/A	NA



2.5 EUT Operation Test Setup

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

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 1.91 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 1.91 + 10 = 11.91 \text{ (dB)}\end{aligned}$$

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.

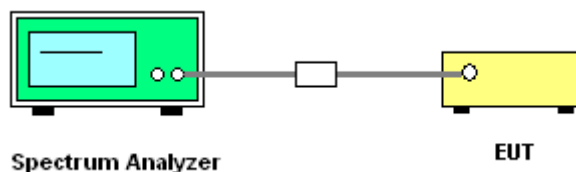
3.1.2 Measuring Instruments

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) = 3MHz.
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.

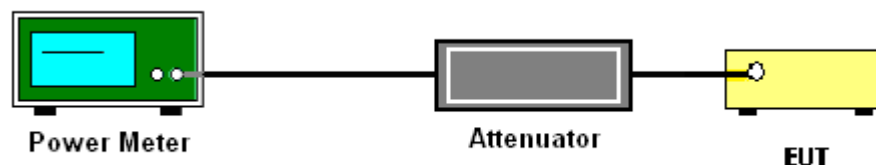
3.2.2 Measuring Instruments

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
11b	1Mbps	1	1	2412	19.54	30.00	-0.40	19.14	36.00	Pass
11b	1Mbps	1	6	2437	19.42	30.00	-0.40	19.02	36.00	Pass
11b	1Mbps	1	11	2462	19.27	30.00	-0.40	18.87	36.00	Pass
11g	6Mbps	1	1	2412	22.72	30.00	-0.40	22.32	36.00	Pass
11g	6Mbps	1	6	2437	22.87	30.00	-0.40	22.47	36.00	Pass
11g	6Mbps	1	11	2462	23.10	30.00	-0.40	22.70	36.00	Pass
HT20	MCS0	1	1	2412	21.82	30.00	-0.40	21.42	36.00	Pass
HT20	MCS0	1	6	2437	22.61	30.00	-0.40	22.21	36.00	Pass
HT20	MCS0	1	11	2462	22.63	30.00	-0.40	22.23	36.00	Pass
HT40	MCS0	1	3	2422	21.60	30.00	-0.40	21.20	36.00	Pass
HT40	MCS0	1	6	2437	22.32	30.00	-0.40	21.92	36.00	Pass
HT40	MCS0	1	9	2452	21.51	30.00	-0.40	21.11	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
HE20	MCS0	1	1	2412	Full	23.89	30.00	-0.40	23.49	36.00	Pass
HE20	MCS0	1	1	2412	26/0	18.62	30.00	-0.40	18.22	36.00	Pass
HE20	MCS0	1	1	2412	52/37	21.89	30.00	-0.40	21.49	36.00	Pass
HE20	MCS0	1	1	2412	106/53	23.76	30.00	-0.40	23.36	36.00	Pass
HE20	MCS0	1	6	2437	Full	24.17	30.00	-0.40	23.77	36.00	Pass
HE20	MCS0	1	6	2437	26/0	18.71	30.00	-0.40	18.31	36.00	Pass
HE20	MCS0	1	6	2437	52/37	21.86	30.00	-0.40	21.46	36.00	Pass
HE20	MCS0	1	6	2437	106/53	24.08	30.00	-0.40	23.68	36.00	Pass
HE20	MCS0	1	11	2462	Full	24.16	30.00	-0.40	23.76	36.00	Pass
HE20	MCS0	1	11	2462	26/8	19.82	30.00	-0.40	19.42	36.00	Pass
HE20	MCS0	1	11	2462	52/40	22.06	30.00	-0.40	21.66	36.00	Pass
HE20	MCS0	1	11	2462	106/54	24.02	30.00	-0.40	23.62	36.00	Pass
HE40	MCS0	1	3	2422	Full	21.82	30.00	-0.40	21.42	36.00	Pass
HE40	MCS0	1	6	2437	Full	22.63	30.00	-0.40	22.23	36.00	Pass
HE40	MCS0	1	9	2452	Full	21.75	30.00	-0.40	21.35	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)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail	Setting
11b	1Mbps	1	1	2412	0.00	17.01	30.00	-0.40	16.61	36.00	Pass	17.00
11b	1Mbps	1	6	2437	0.00	16.87	30.00	-0.40	16.47	36.00	Pass	17.00
11b	1Mbps	1	11	2462	0.00	16.85	30.00	-0.40	16.45	36.00	Pass	17.00
11g	6Mbps	1	1	2412	0.03	16.96	30.00	-0.40	16.56	36.00	Pass	17.00
11g	6Mbps	1	6	2437	0.03	16.76	30.00	-0.40	16.36	36.00	Pass	17.00
11g	6Mbps	1	11	2462	0.03	16.73	30.00	-0.40	16.33	36.00	Pass	17.00
HT20	MCS0	1	1	2412	0.00	16.03	30.00	-0.40	15.63	36.00	Pass	16.50
HT20	MCS0	1	6	2437	0.00	16.36	30.00	-0.40	15.96	36.00	Pass	17.00
HT20	MCS0	1	11	2462	0.00	16.41	30.00	-0.40	16.01	36.00	Pass	17.00
HT40	MCS0	1	3	2422	0.00	14.99	30.00	-0.40	14.59	36.00	Pass	15.00
HT40	MCS0	1	6	2437	0.00	16.02	30.00	-0.40	15.62	36.00	Pass	16.00
HT40	MCS0	1	9	2452	0.00	14.93	30.00	-0.40	14.53	36.00	Pass	15.00

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	Setting
HE20	MCS0	1	1	2412	Full	0.00	16.16	30.00	-0.40	15.76	36.00	Pass	16.50
HE20	MCS0	1	1	2412	26/0	0.00	7.74	30.00	-0.40	7.34	36.00	Pass	8.00
HE20	MCS0	1	1	2412	52/37	0.00	10.55	30.00	-0.40	10.15	36.00	Pass	11.00
HE20	MCS0	1	1	2412	106/53	0.00	13.08	30.00	-0.40	12.68	36.00	Pass	13.50
HE20	MCS0	1	6	2437	Full	0.00	16.44	30.00	-0.40	16.04	36.00	Pass	17.00
HE20	MCS0	1	6	2437	26/0	0.00	9.26	30.00	-0.40	8.86	36.00	Pass	8.50
HE20	MCS0	1	6	2437	52/37	0.00	11.83	30.00	-0.40	11.43	36.00	Pass	11.50
HE20	MCS0	1	6	2437	106/53	0.00	14.30	30.00	-0.40	13.90	36.00	Pass	14.00
HE20	MCS0	1	11	2462	Full	0.00	16.43	30.00	-0.40	16.03	36.00	Pass	17.00
HE20	MCS0	1	11	2462	26/8	0.00	9.18	30.00	-0.40	8.78	36.00	Pass	9.00
HE20	MCS0	1	11	2462	52/40	0.00	11.47	30.00	-0.40	11.07	36.00	Pass	11.50
HE20	MCS0	1	11	2462	106/54	0.00	13.84	30.00	-0.40	13.44	36.00	Pass	14.00
HE40	MCS0	1	3	2422	Full	0.00	15.02	30.00	-0.40	14.62	36.00	Pass	15.00
HE40	MCS0	1	6	2437	Full	0.00	16.03	30.00	-0.40	15.63	36.00	Pass	16.00
HE40	MCS0	1	9	2452	Full	0.00	15.03	30.00	-0.40	14.63	36.00	Pass	15.00

Note: the duty factor have been compensated to the final results.

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.

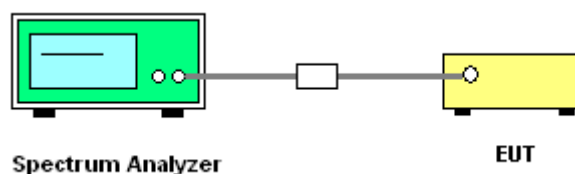
3.3.2 Measuring Instruments

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.

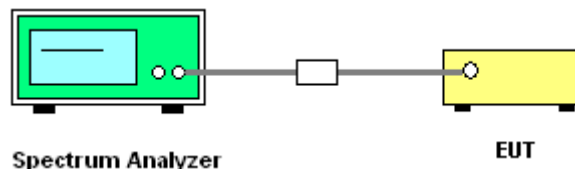
3.4.2 Measuring Instruments

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

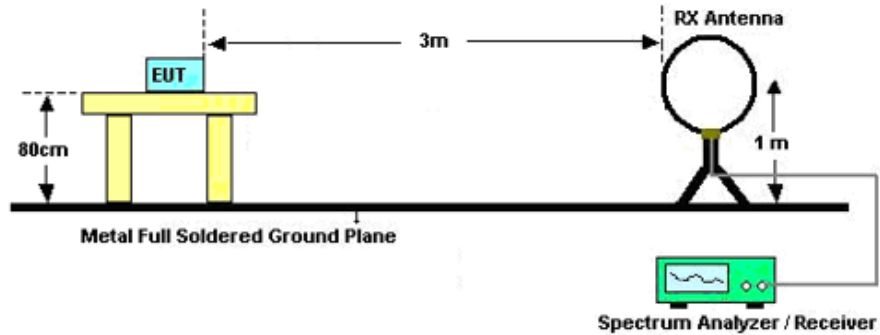
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better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

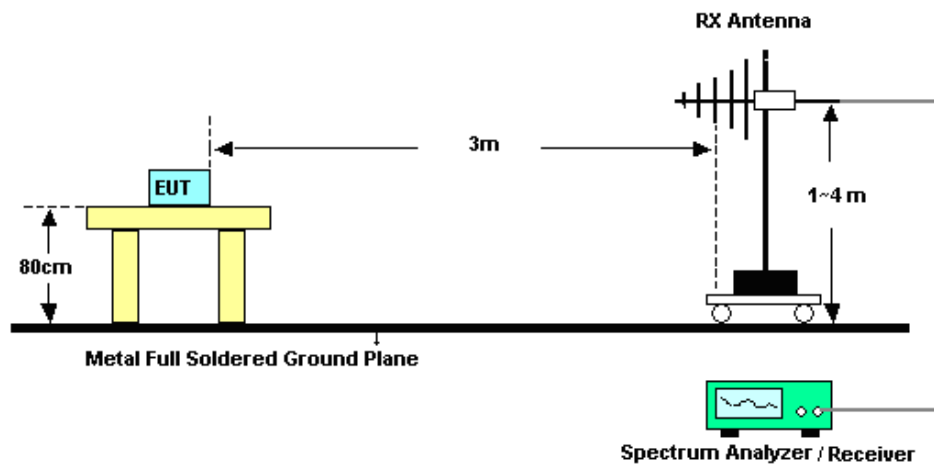
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

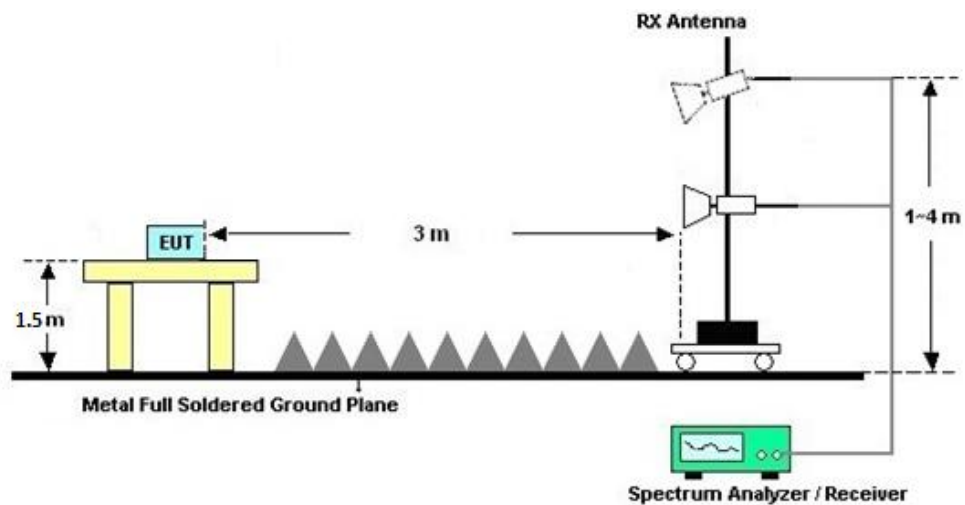
For radiated emissions below 30MHz



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 B.

3.5.7 Duty Cycle

Please refer to Appendix C.

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

Please refer to Appendix B.



3.6 Antenna Requirements

3.6.1 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.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 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. 10, 2023	Mar. 28, 2024~Apr. 12, 2024	Oct. 09, 2024	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Mar. 24, 2024	Mar. 28, 2024~Apr. 12, 2024	Mar. 23, 2025	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 10, 2023	Mar. 28, 2024~Apr. 12, 2024	Oct. 09, 2024	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Oct. 23, 2023	Mar. 28, 2024~Apr. 12, 2024	Oct. 22, 2024	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218642	1GHz~18GHz	Jan. 05, 2024	Mar. 28, 2024~Apr. 12, 2024	Jan. 04, 2025	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 05, 2024	Mar. 28, 2024~Apr. 12, 2024	Jan. 04, 2025	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	380826	9KHz-1GHz	Jul. 06, 2023	Mar. 28, 2024~Apr. 12, 2024	Jul. 05, 2024	Radiation (03CH05-KS)
Amplifier	EM	EM18G40GA	060852	18~40GHz	Jan. 05, 2024	Mar. 28, 2024~Apr. 12, 2024	Jan. 04, 2025	Radiation (03CH05-KS)
high gain Amplifier	EM	EM01G18GA	060839	1Ghz-18Ghz	Oct. 10, 2023	Mar. 28, 2024~Apr. 12, 2024	Oct. 09, 2024	Radiation (03CH05-KS)
Amplifier	EM	EM01G18GA	060833	1Ghz-18Ghz	Jan. 03, 2024	Mar. 28, 2024~Apr. 12, 2024	Jan. 02, 2025	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Mar. 28, 2024~Apr. 12, 2024	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Mar. 28, 2024~Apr. 12, 2024	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Mar. 28, 2024~Apr. 12, 2024	NCR	Radiation (03CH05-KS)
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 11, 2023	Mar. 31, 2024~Apr. 12, 2024	Oct. 10, 2024	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 02, 2024	Mar. 31, 2024~Apr. 12, 2024	Jan. 01, 2025	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 02, 2024	Mar. 31, 2024~Apr. 12, 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	± 2.26 dB
Occupied Channel Bandwidth	$\pm 0.1\%$
Conducted Power	± 0.46 dB
Conducted Power Spectral Density	± 0.88 dB
Frequency	± 0.4 Hz

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.30 dB
---	---------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	6.28 dB
---	---------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.88 dB
---	---------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.26 dB
---	---------

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



Appendix A. Conducted Test Results

Ambient Condition: 25 °C, 45 %RHTest Date: 2024.3.31~2024.4.12Test Engineer: Jiang Jun

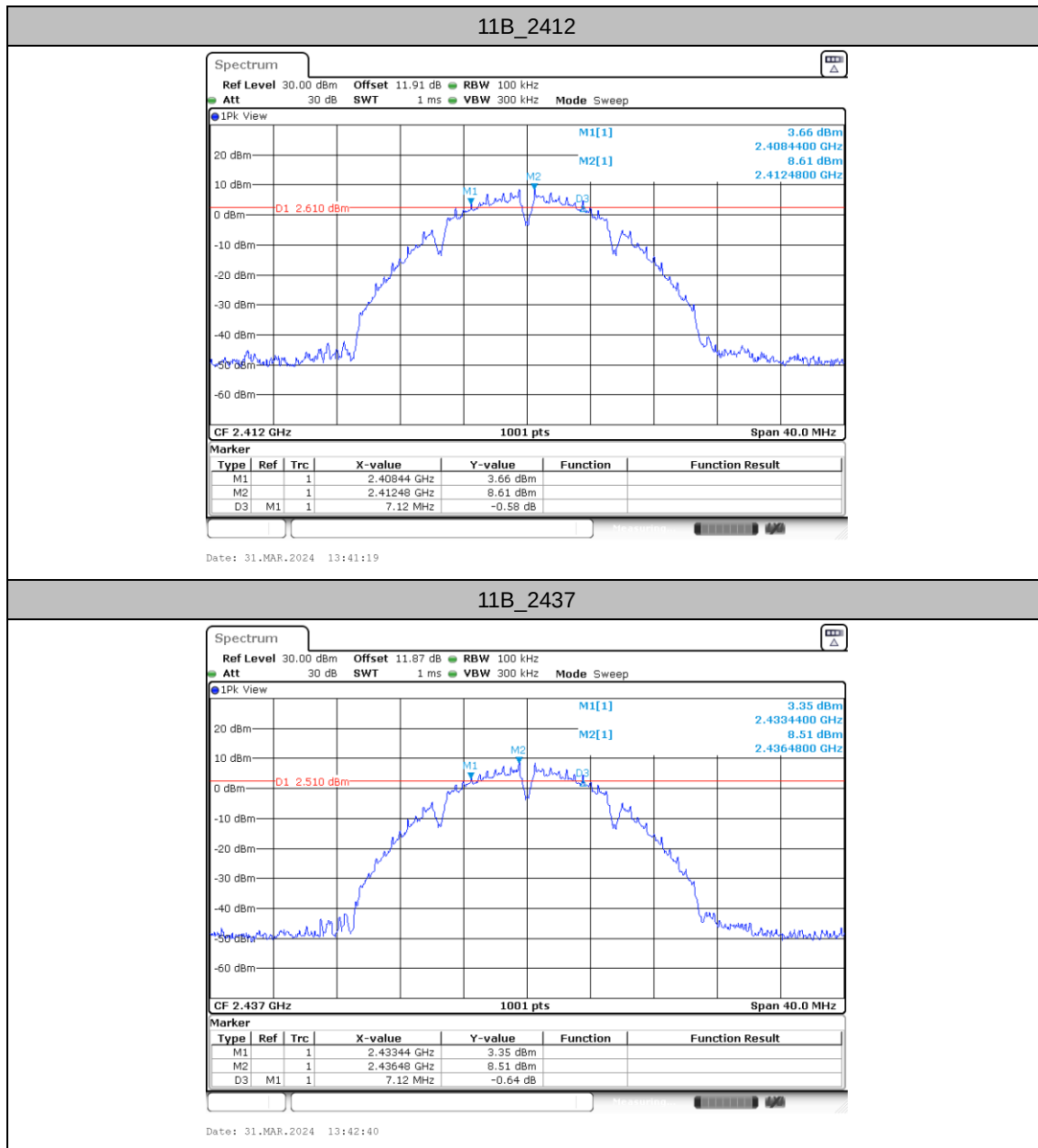
DTS Bandwidth

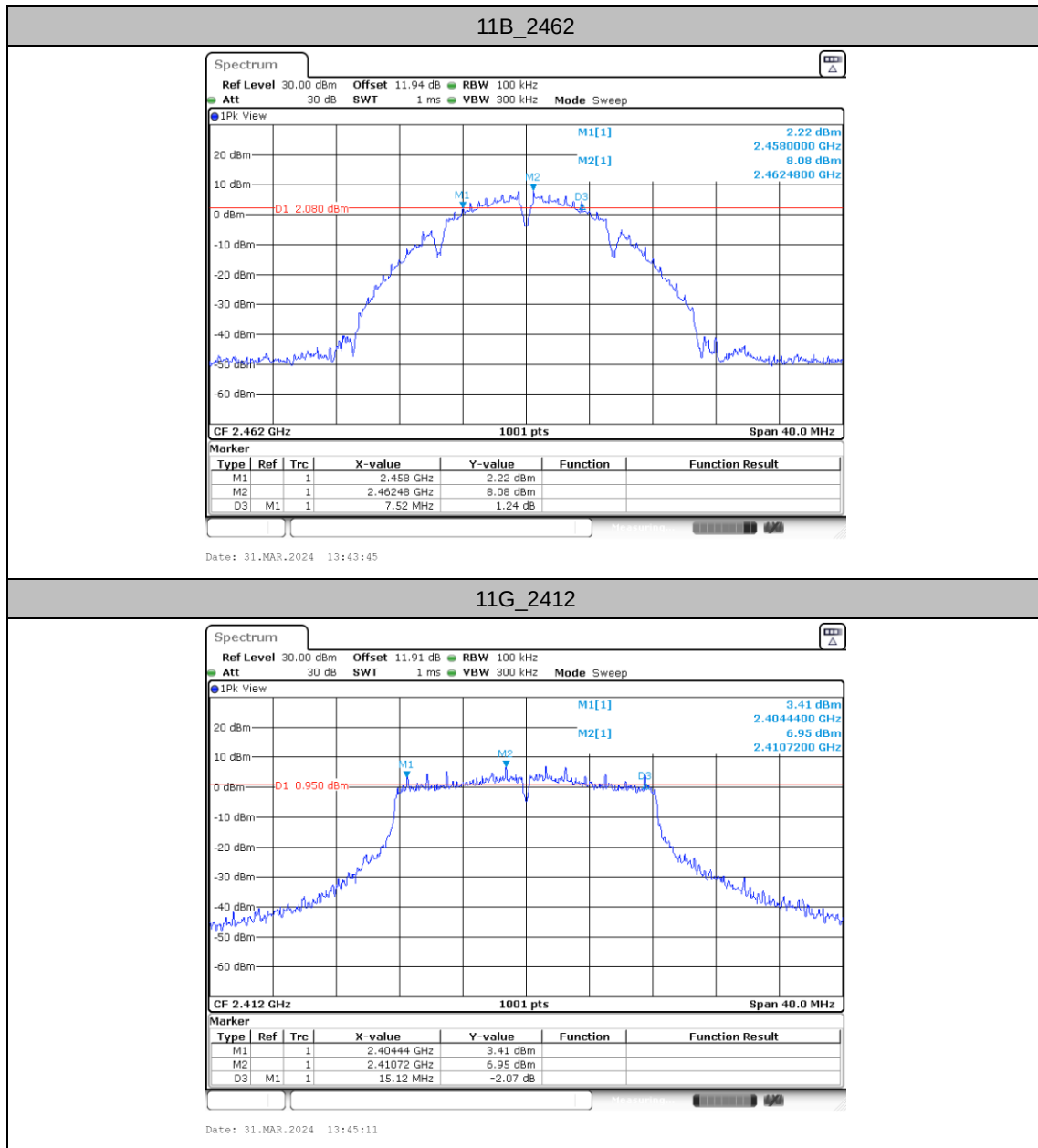
Test Result

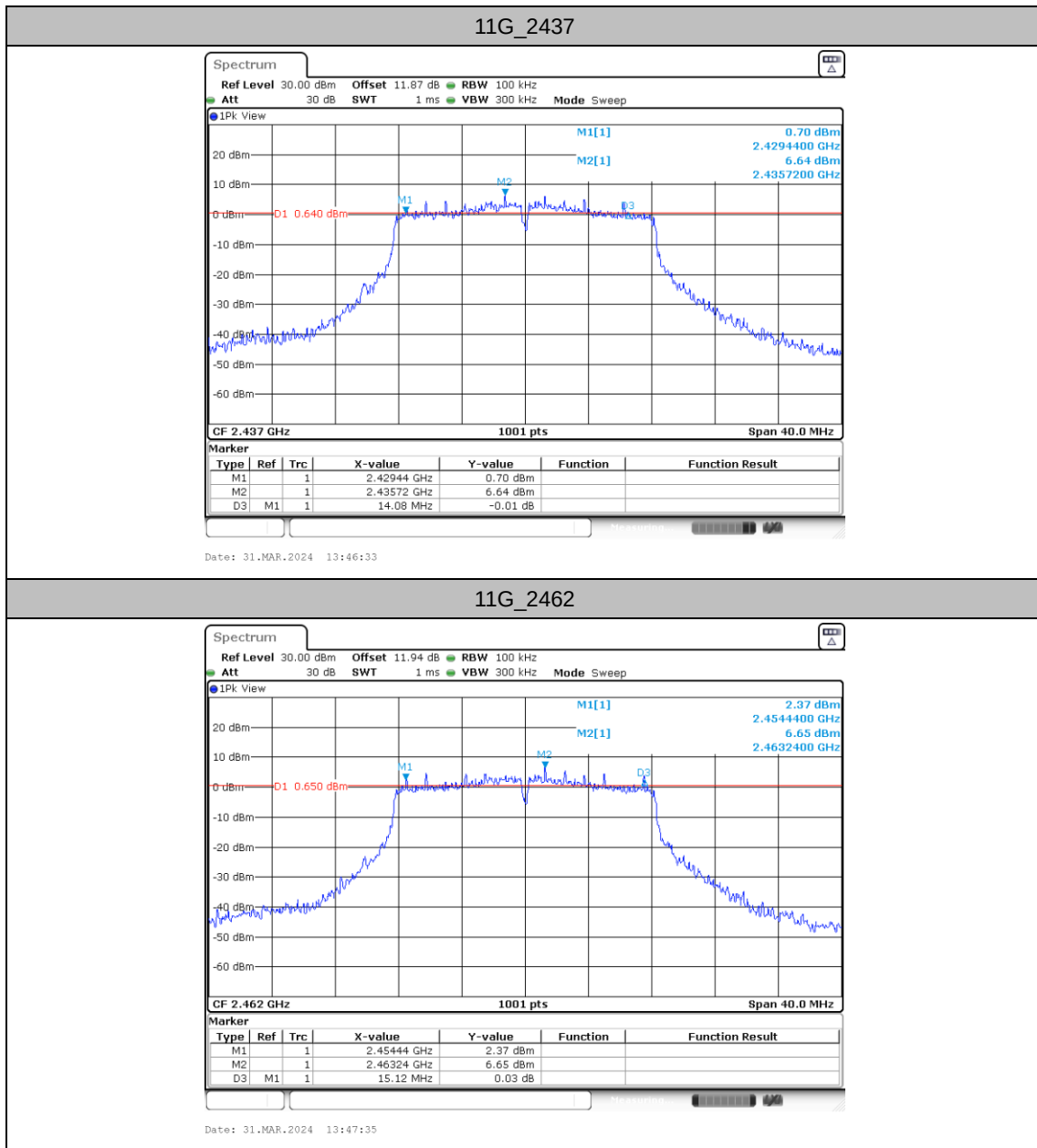
TestMode	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	2412	7.12	2408.44	2415.56	0.5	PASS
	2437	7.12	2433.44	2440.56	0.5	PASS
	2462	7.52	2458.00	2465.52	0.5	PASS
11G	2412	15.12	2404.44	2419.56	0.5	PASS
	2437	14.08	2429.44	2443.52	0.5	PASS
	2462	15.12	2454.44	2469.56	0.5	PASS
11N20SISO	2412	13.84	2405.72	2419.56	0.5	PASS
	2437	12.80	2430.48	2443.28	0.5	PASS
	2462	17.16	2453.24	2470.40	0.5	PASS
11N40SISO	2422	35.12	2404.48	2439.60	0.5	PASS
	2437	35.04	2419.48	2454.52	0.5	PASS
	2452	35.28	2434.24	2469.52	0.5	PASS
11AX20SISO	2412	17.00	2402.84	2419.84	0.5	PASS
	2437	17.16	2428.92	2446.08	0.5	PASS
	2462	15.64	2453.92	2469.56	0.5	PASS
11AX40SISO	2422	35.20	2404.32	2439.52	0.5	PASS
	2437	35.44	2419.08	2454.52	0.5	PASS
	2452	35.44	2434.08	2469.52	0.5	PASS



Test Graphs

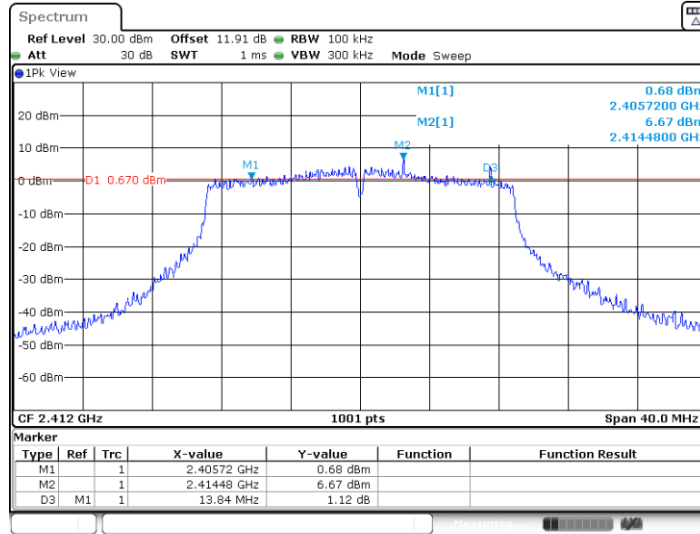






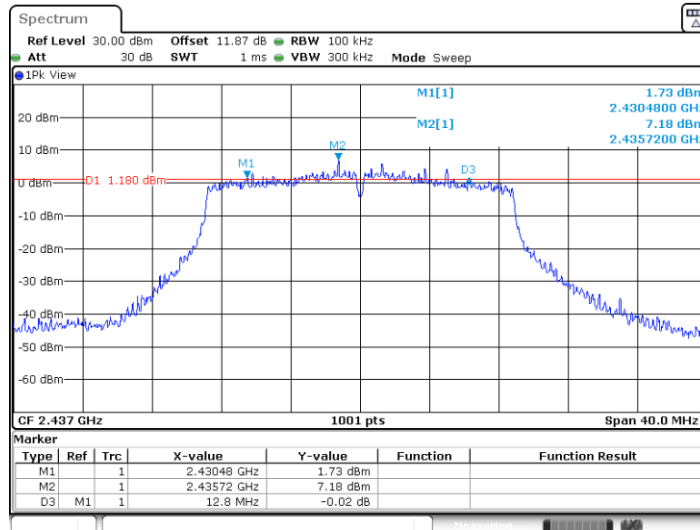


11N20SISO_2412

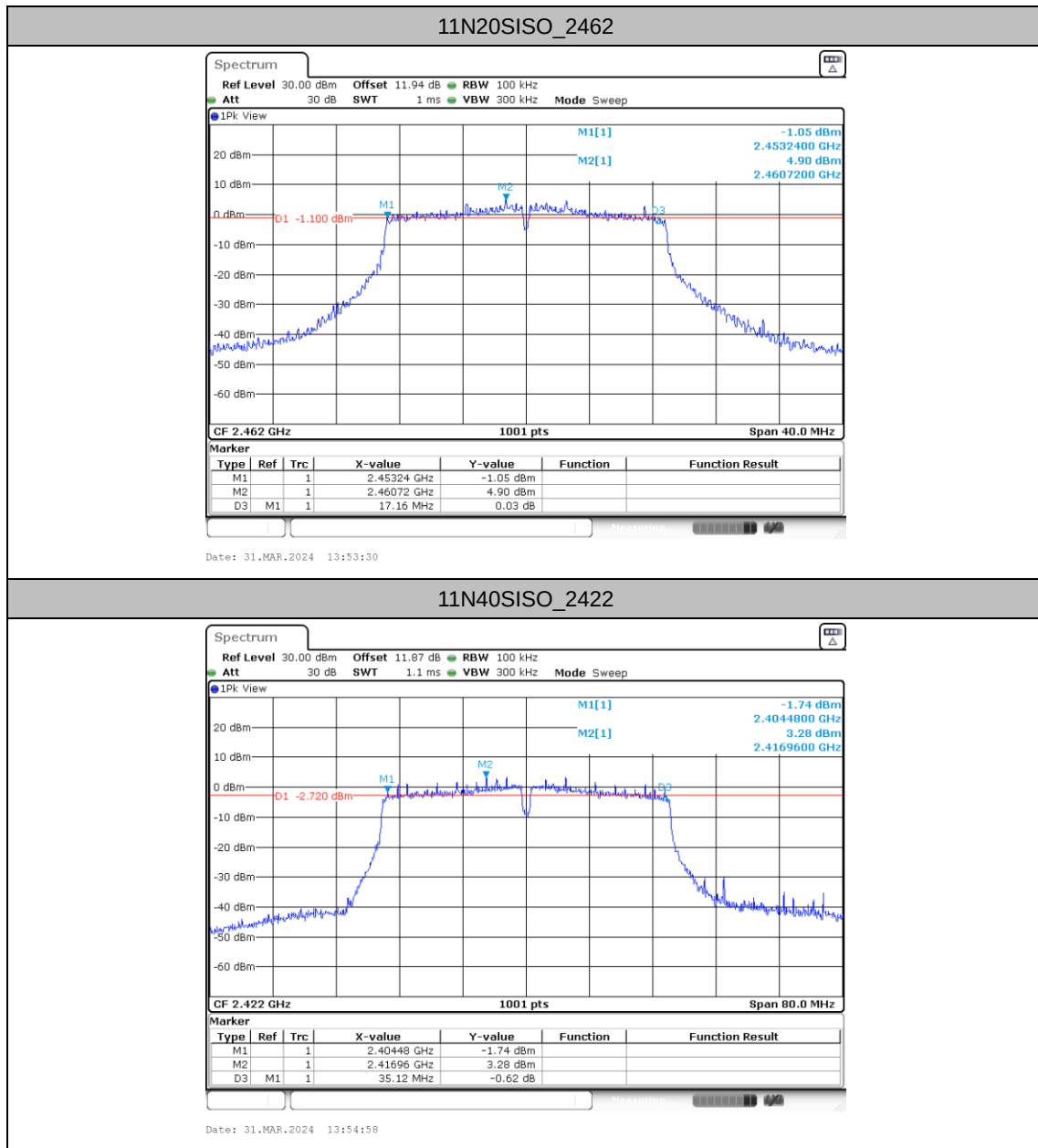


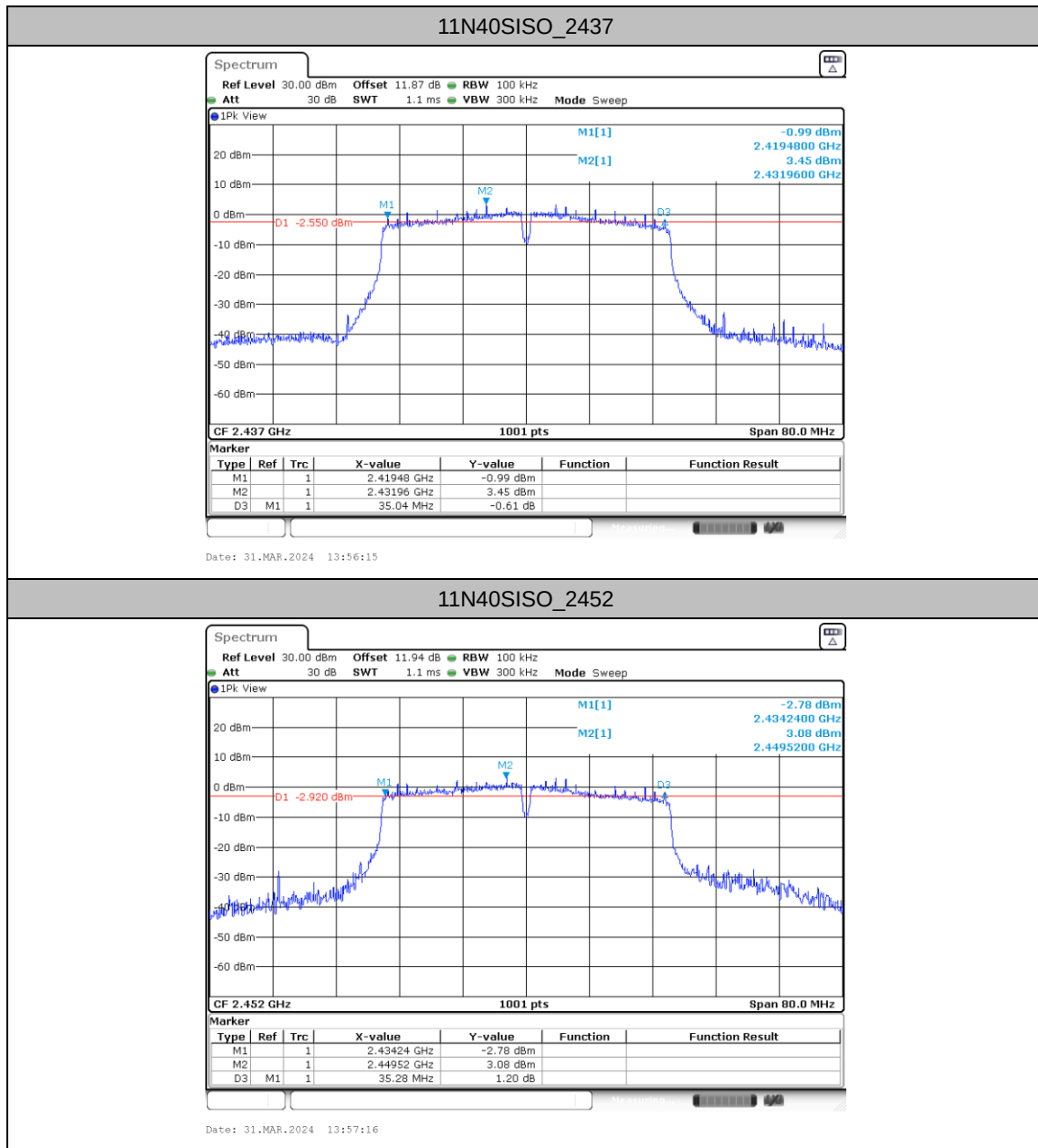
Date: 31.MAR.2024 13:50:26

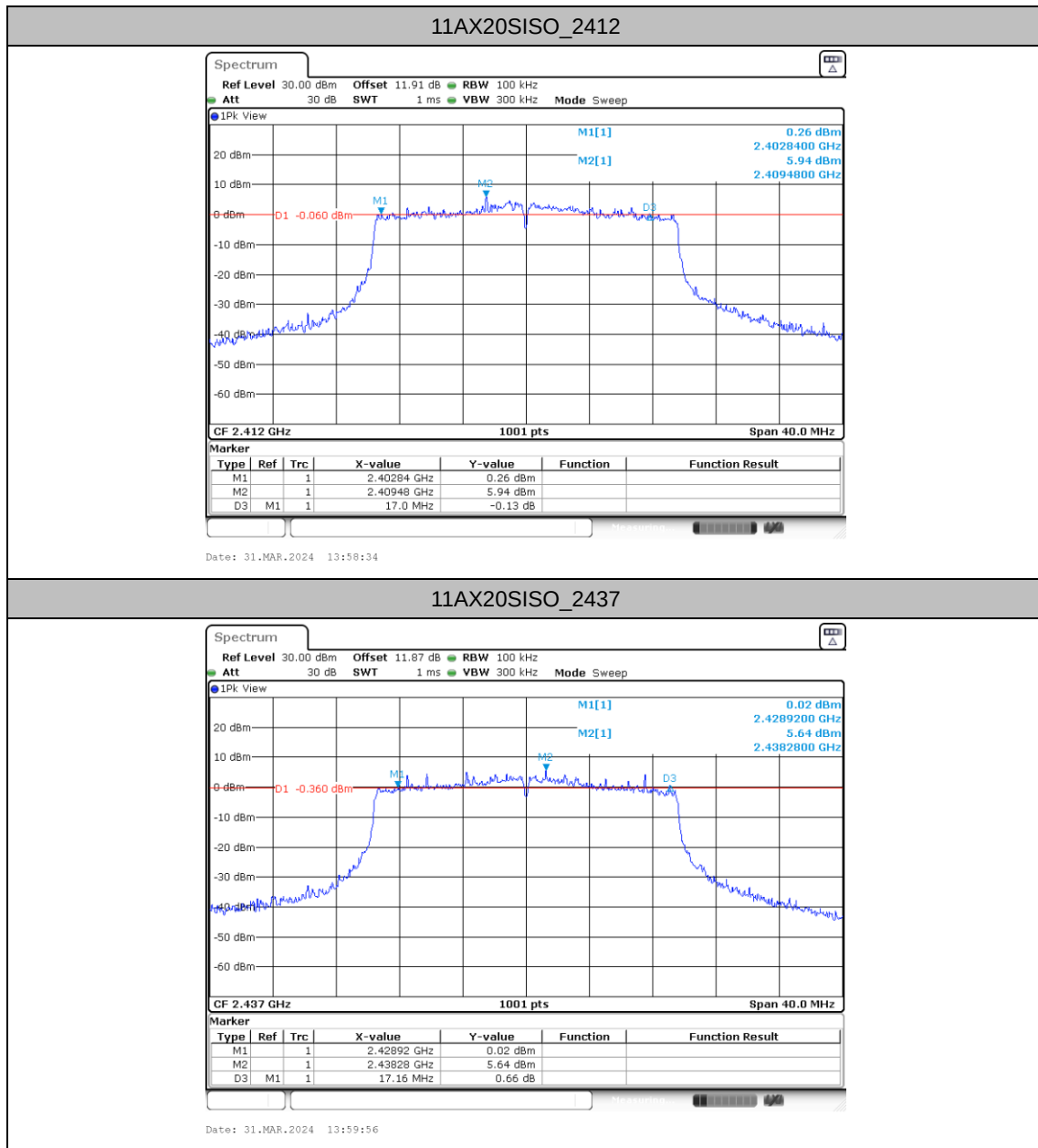
11N20SISO_2437

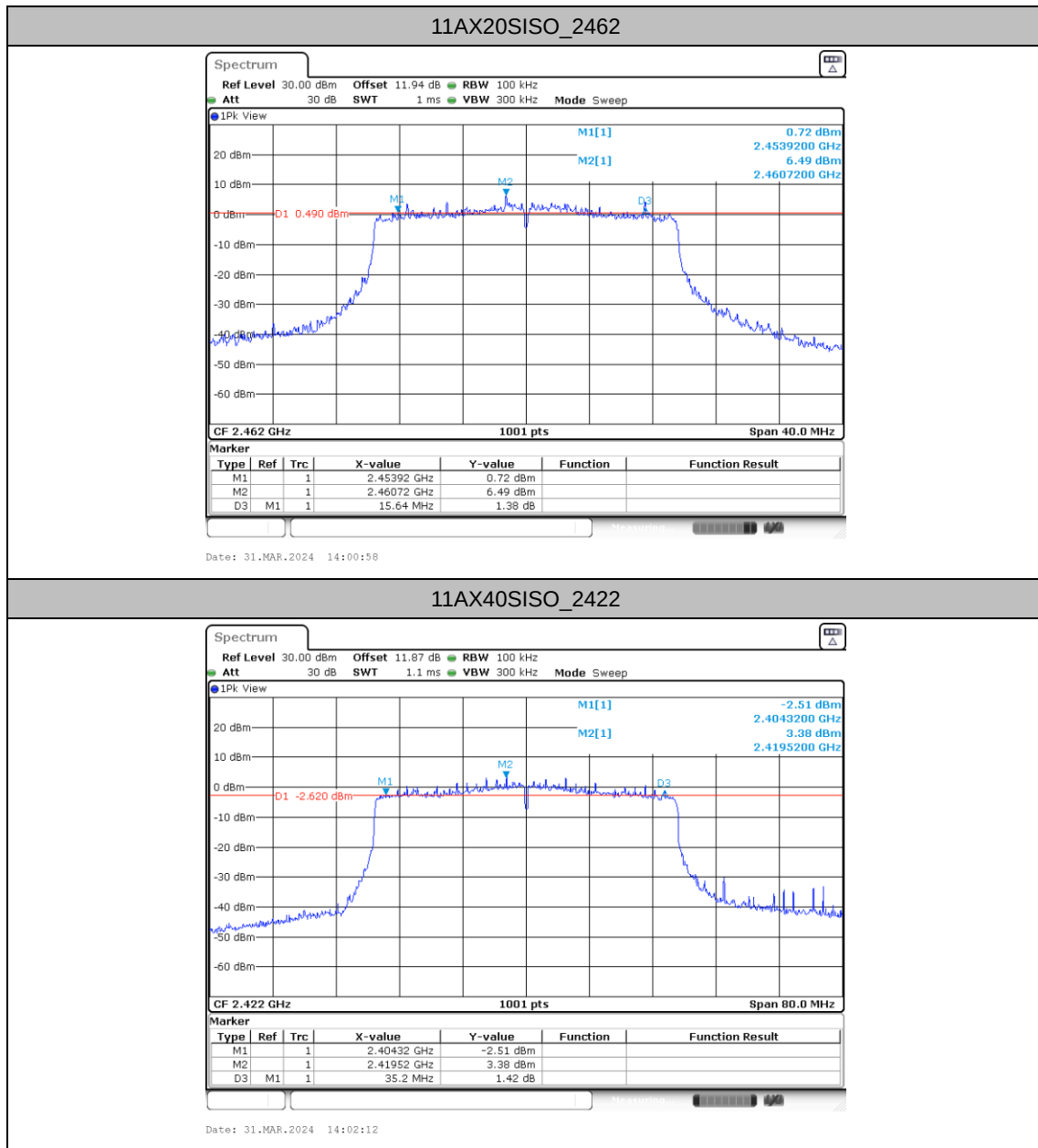


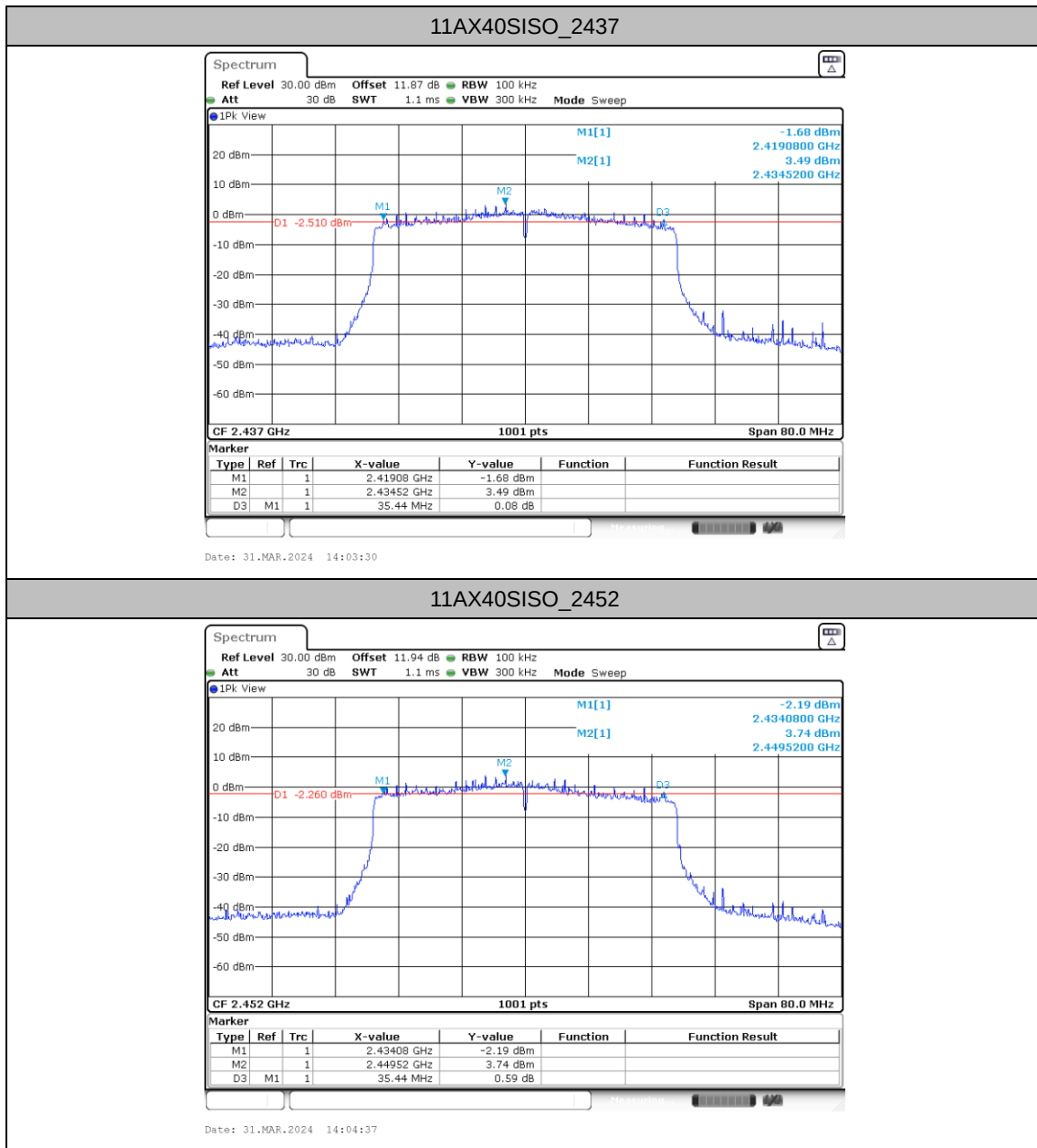
Date: 31.MAR.2024 13:51:47













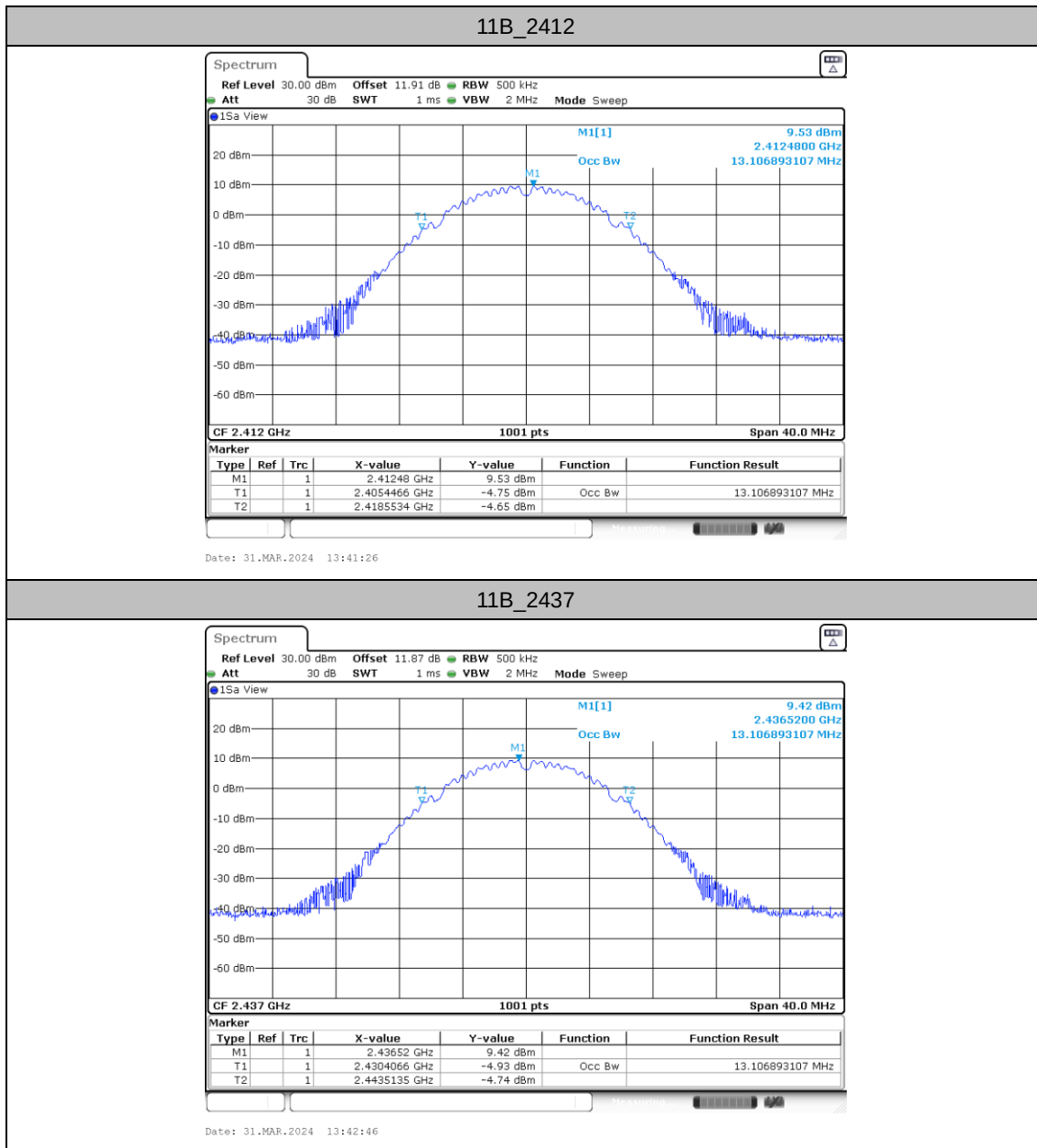
Occupied Channel Bandwidth

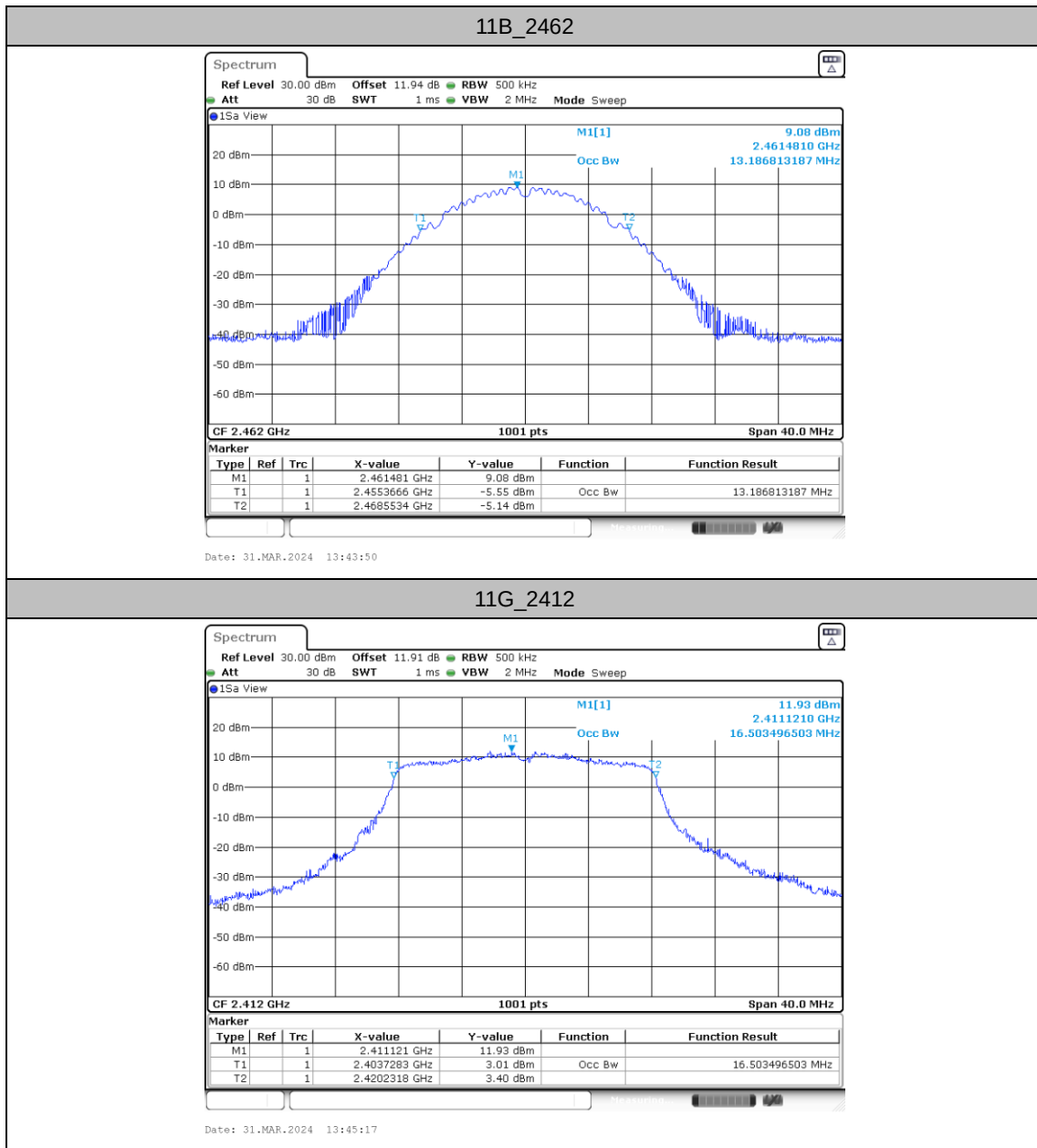
Test Result

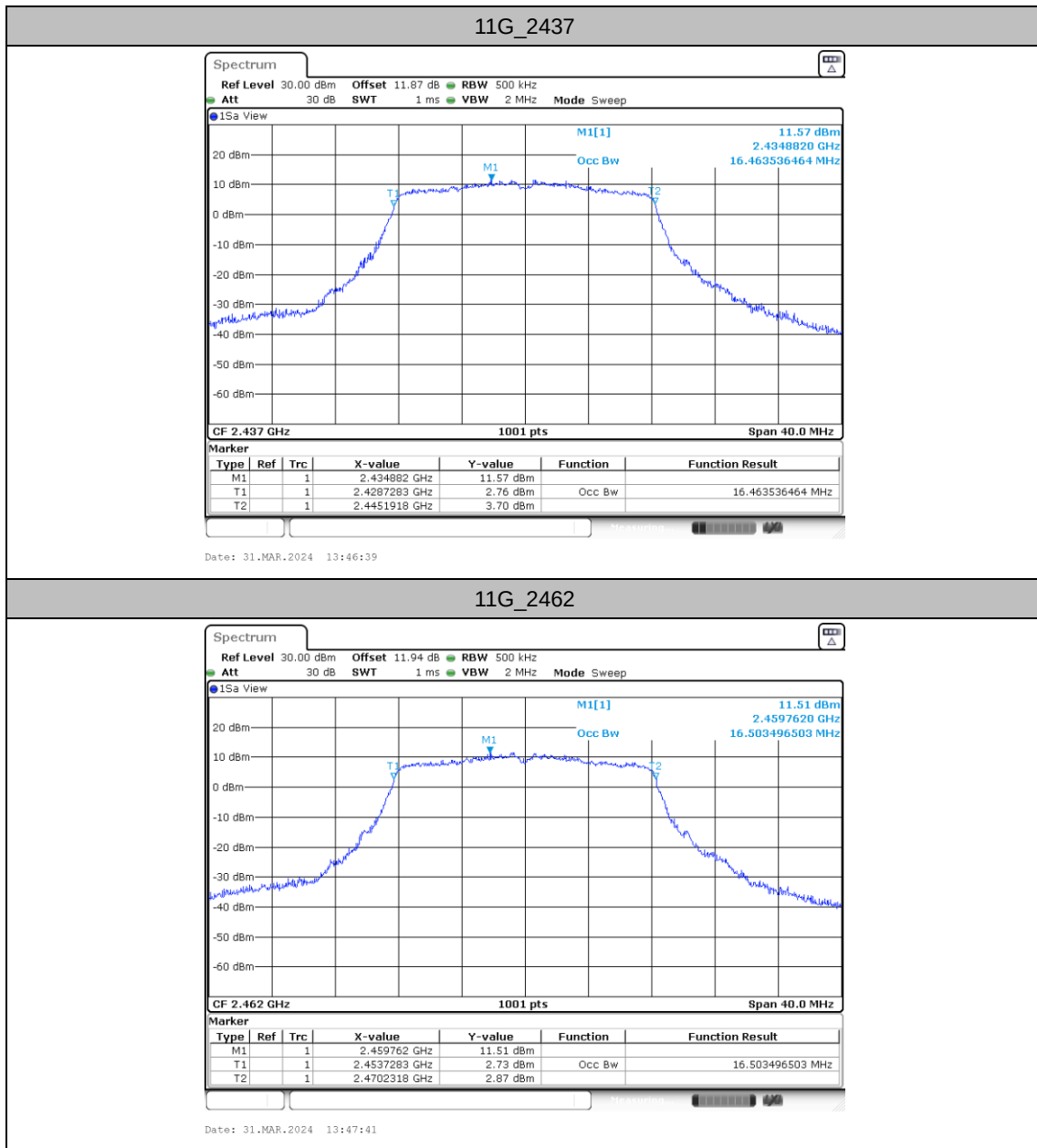
TestMode	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]
11B	2412	13.107	2405.4466	2418.5534
	2437	13.107	2430.4066	2443.5135
	2462	13.187	2455.3666	2468.5534
11G	2412	16.503	2403.7283	2420.2318
	2437	16.464	2428.7283	2445.1918
	2462	16.503	2453.7283	2470.2318
11N20SISO	2412	17.662	2403.1688	2420.8312
	2437	17.622	2428.1688	2445.7912
	2462	17.702	2453.1289	2470.8312
11N40SISO	2422	36.044	2403.9381	2439.9820
	2437	35.884	2419.0180	2454.9021
	2452	35.964	2433.9381	2469.9021
11AX20SISO	2412	18.901	2402.5295	2421.4306
	2437	18.901	2427.5295	2446.4306
	2462	18.941	2452.4895	2471.4306
11AX40SISO	2422	37.882	2403.0589	2440.9411
	2437	37.562	2418.1389	2455.7013
	2452	37.722	2433.0589	2470.7812

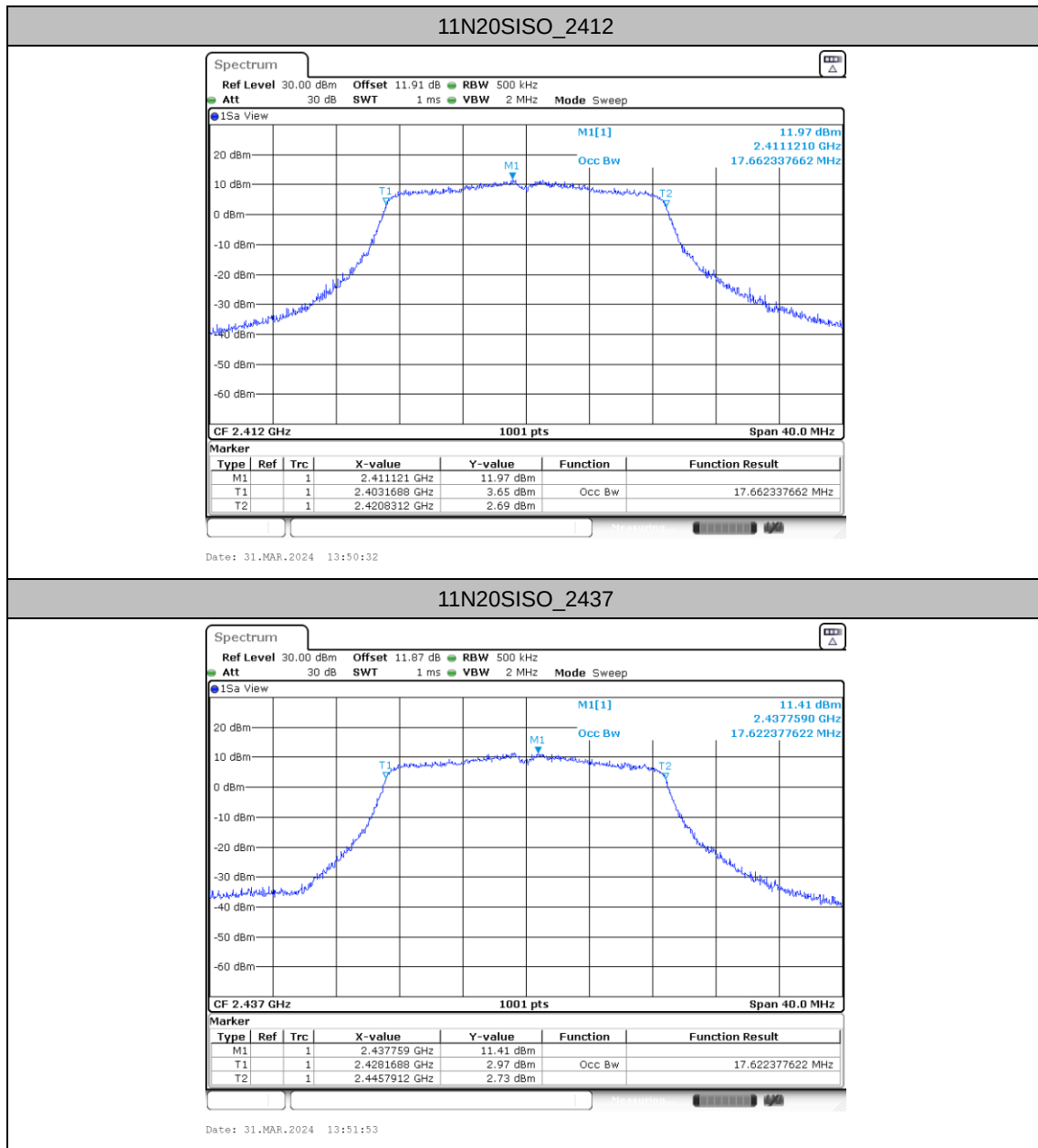


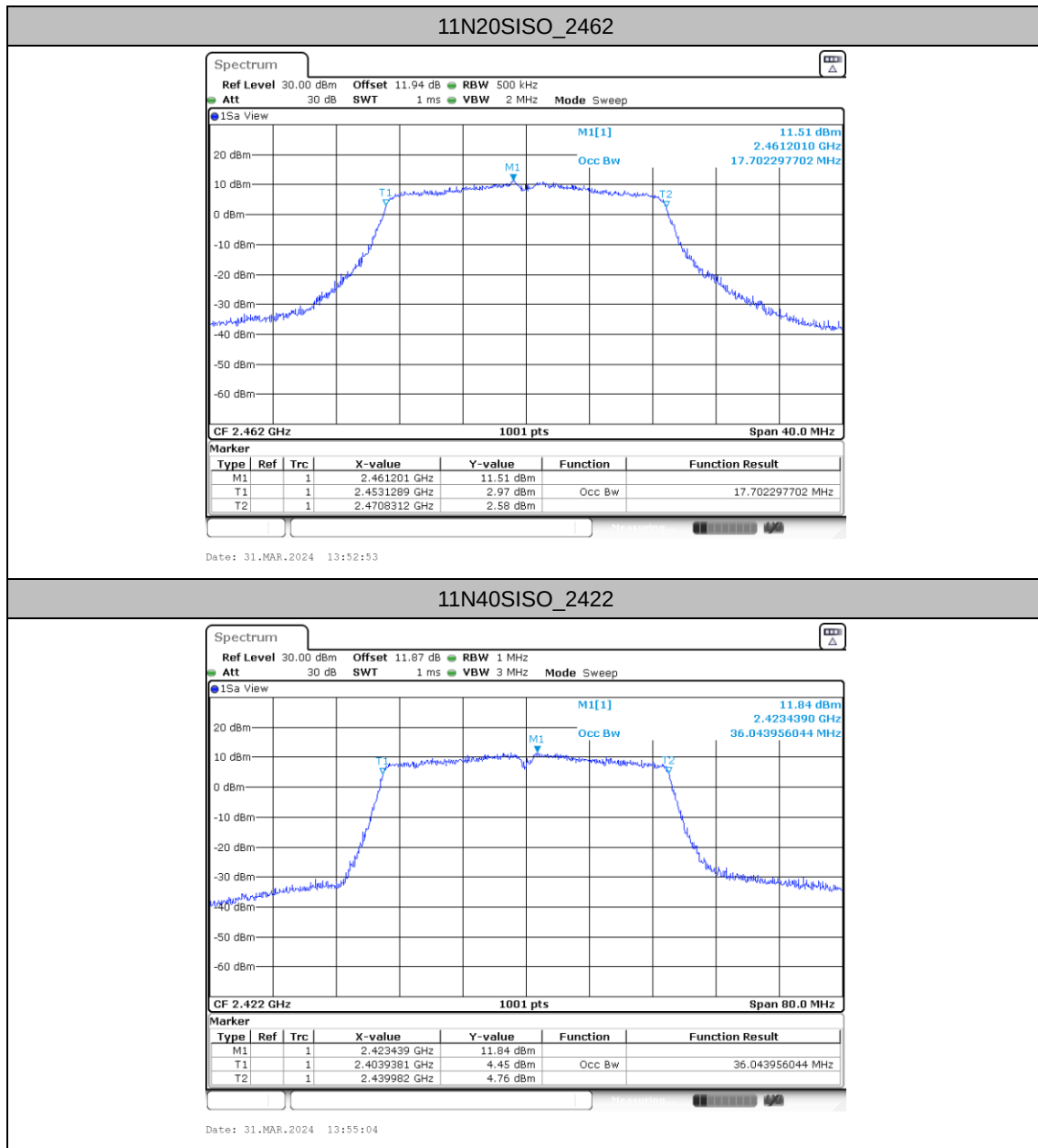
Test Graphs

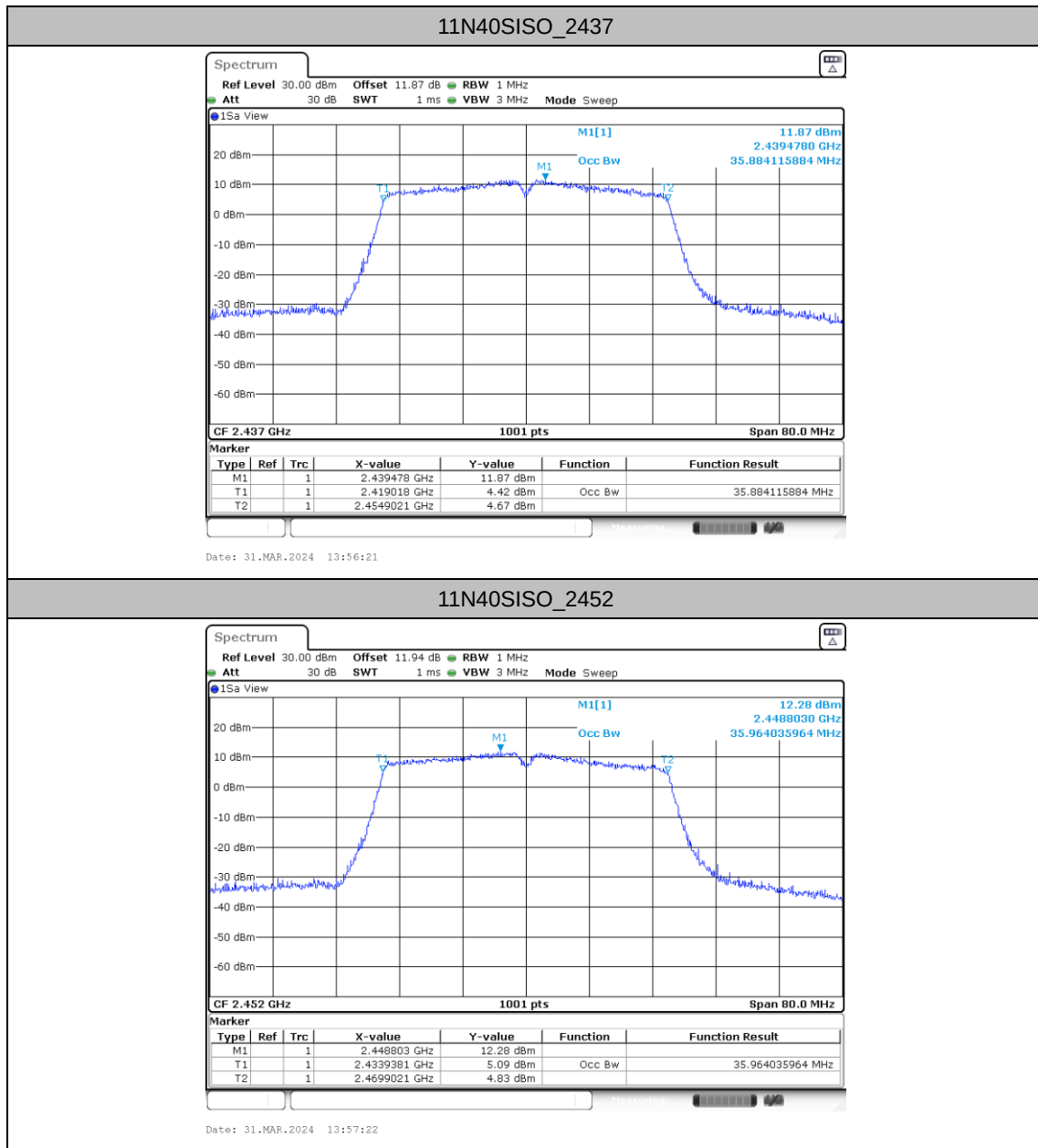


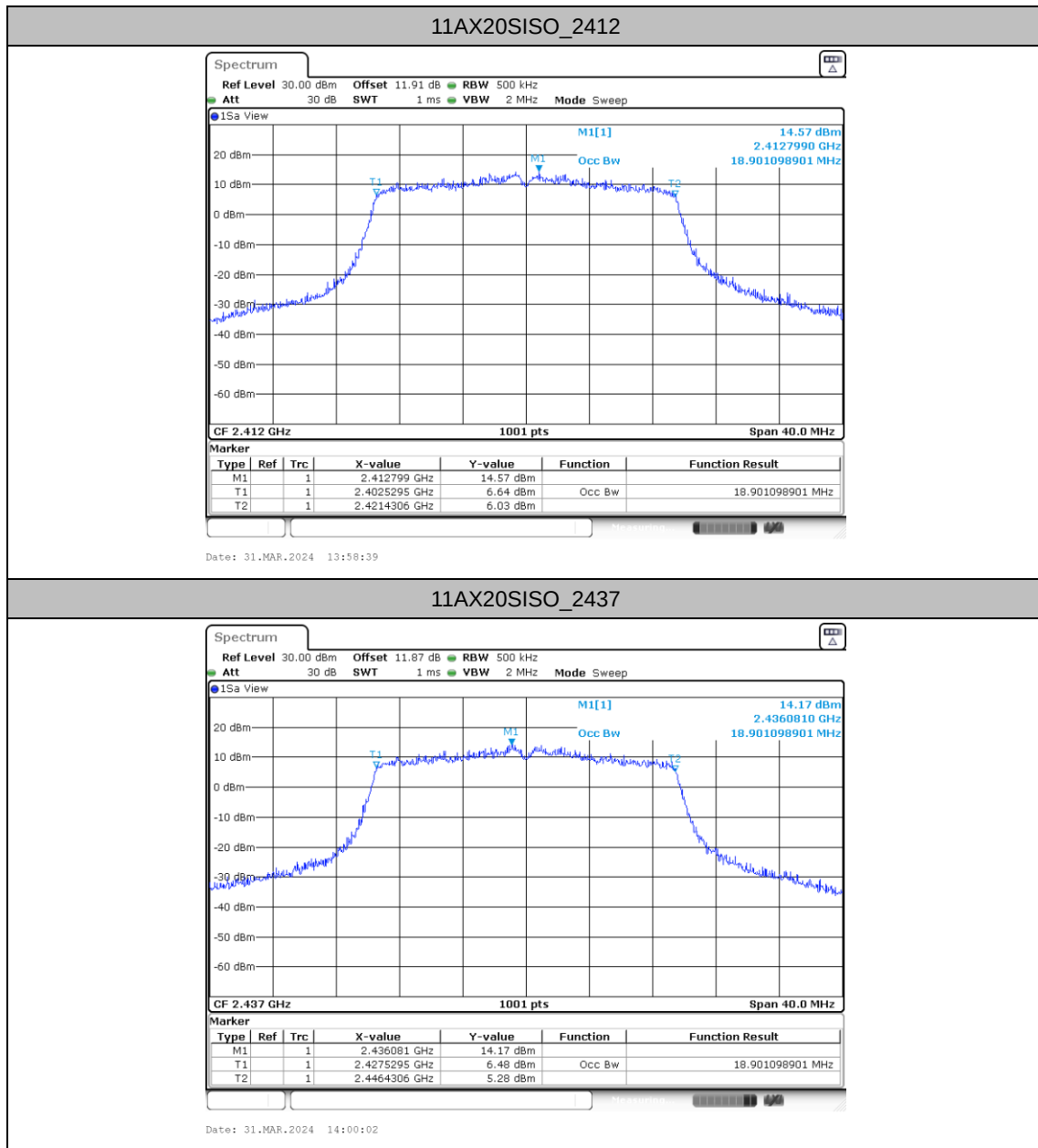


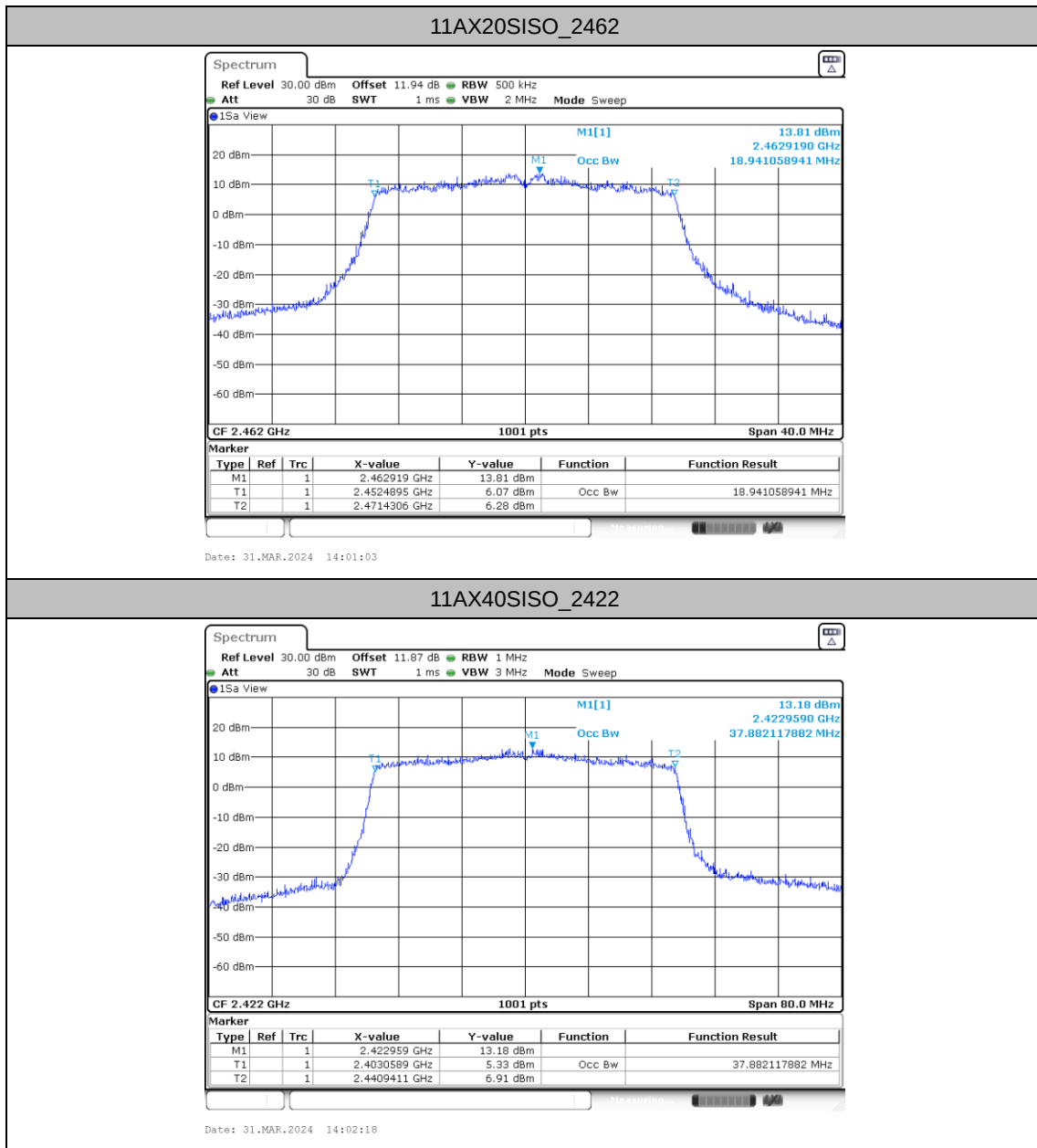


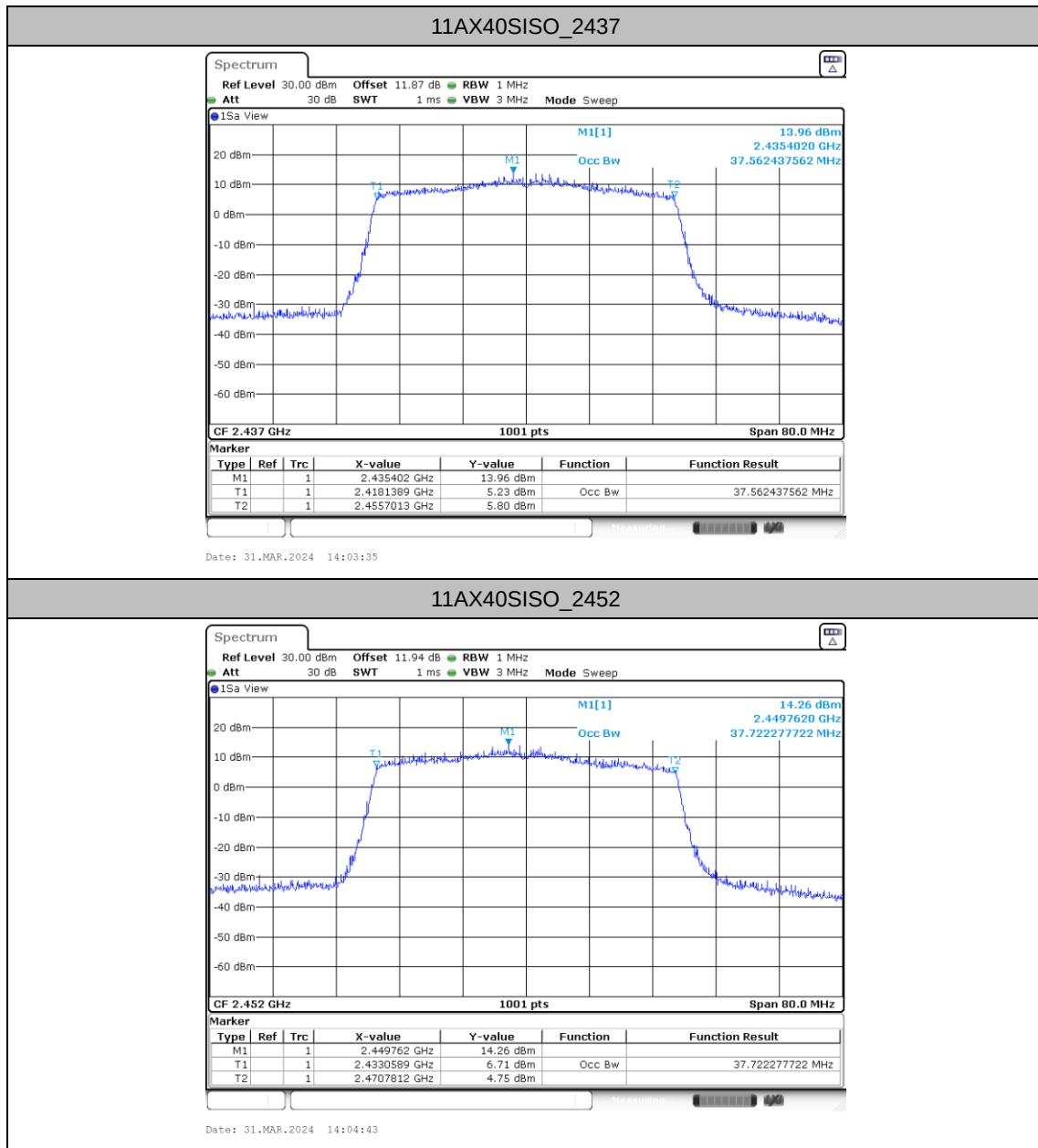












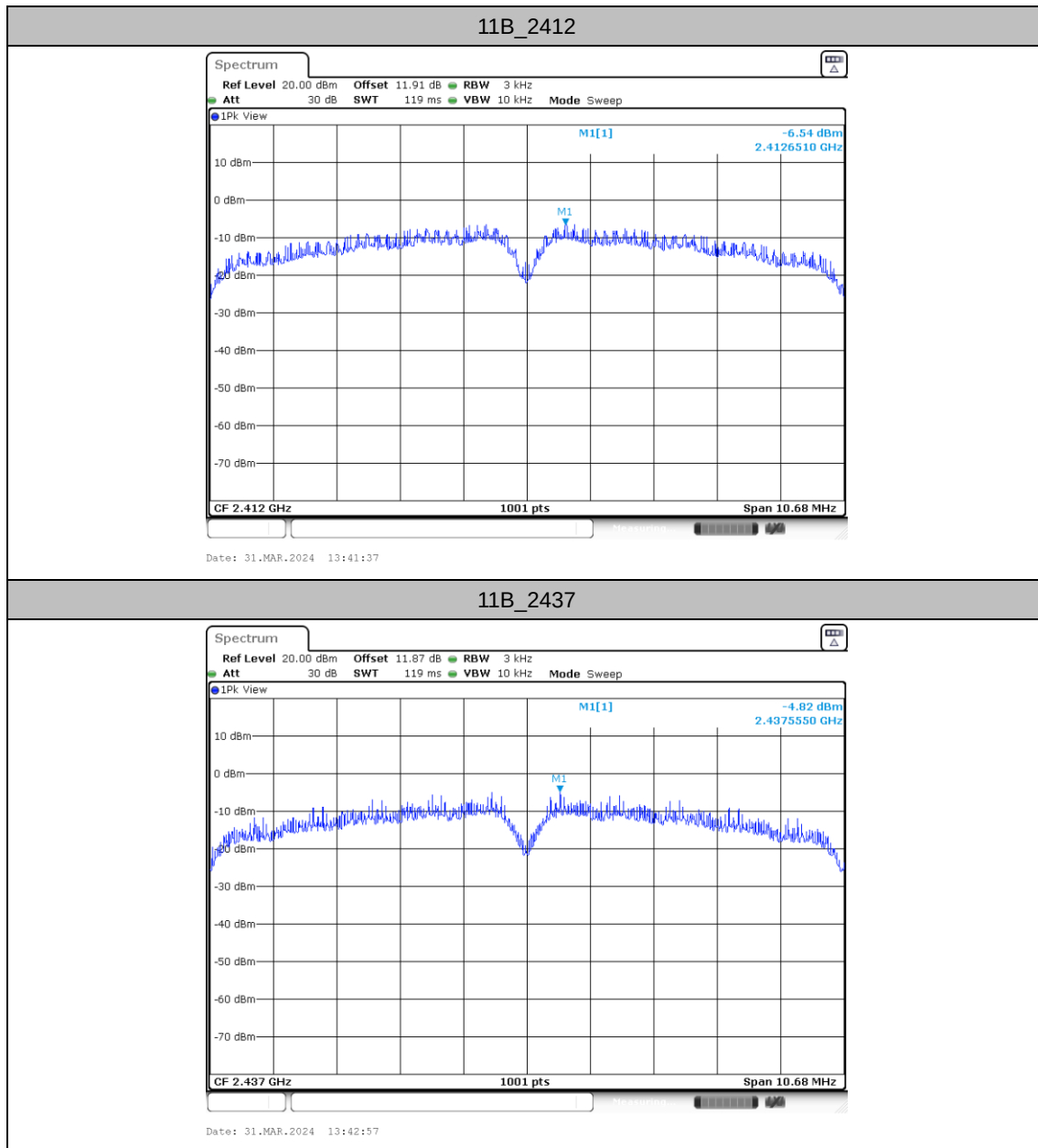
Maximum power spectral density

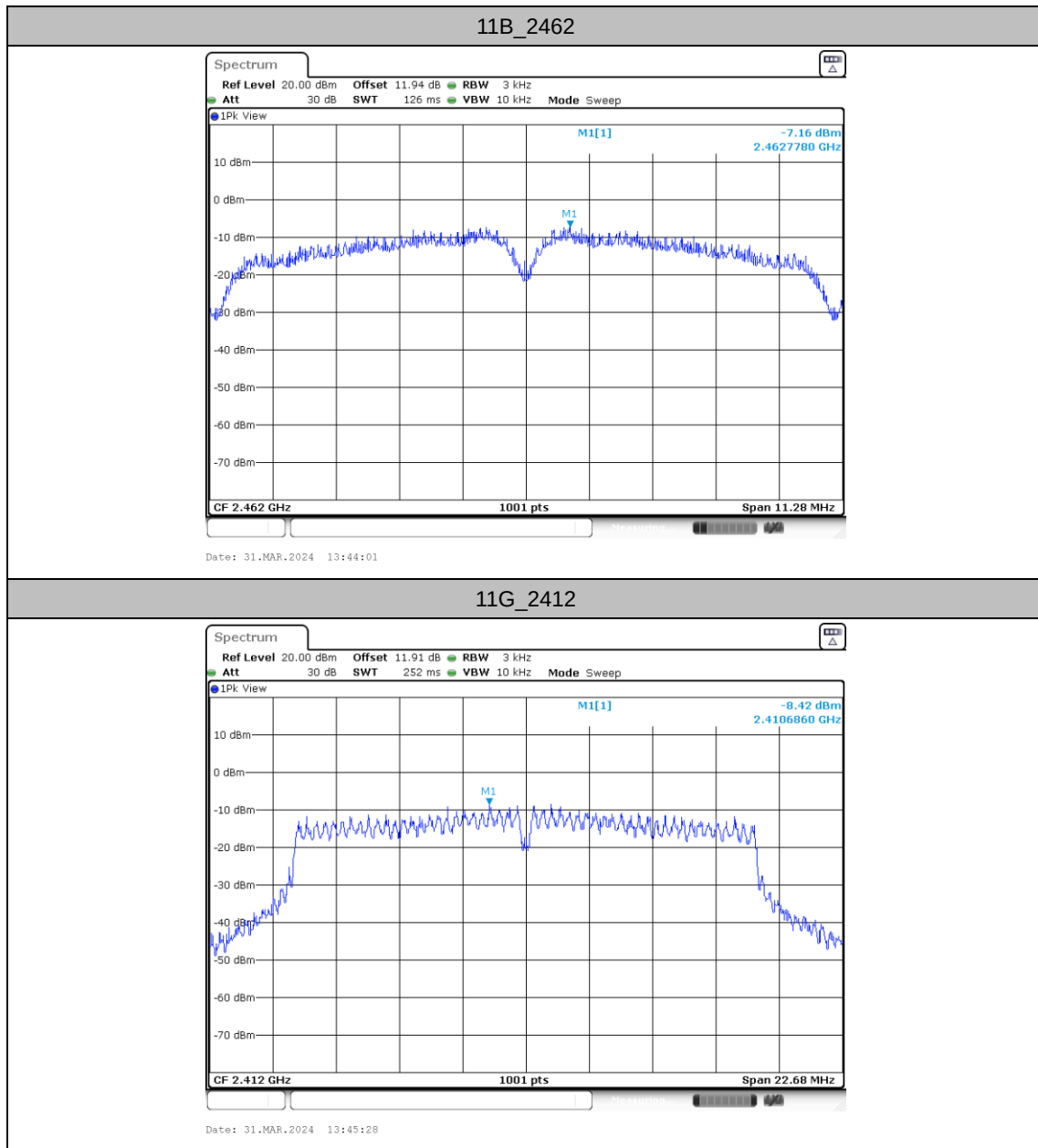
Test Result

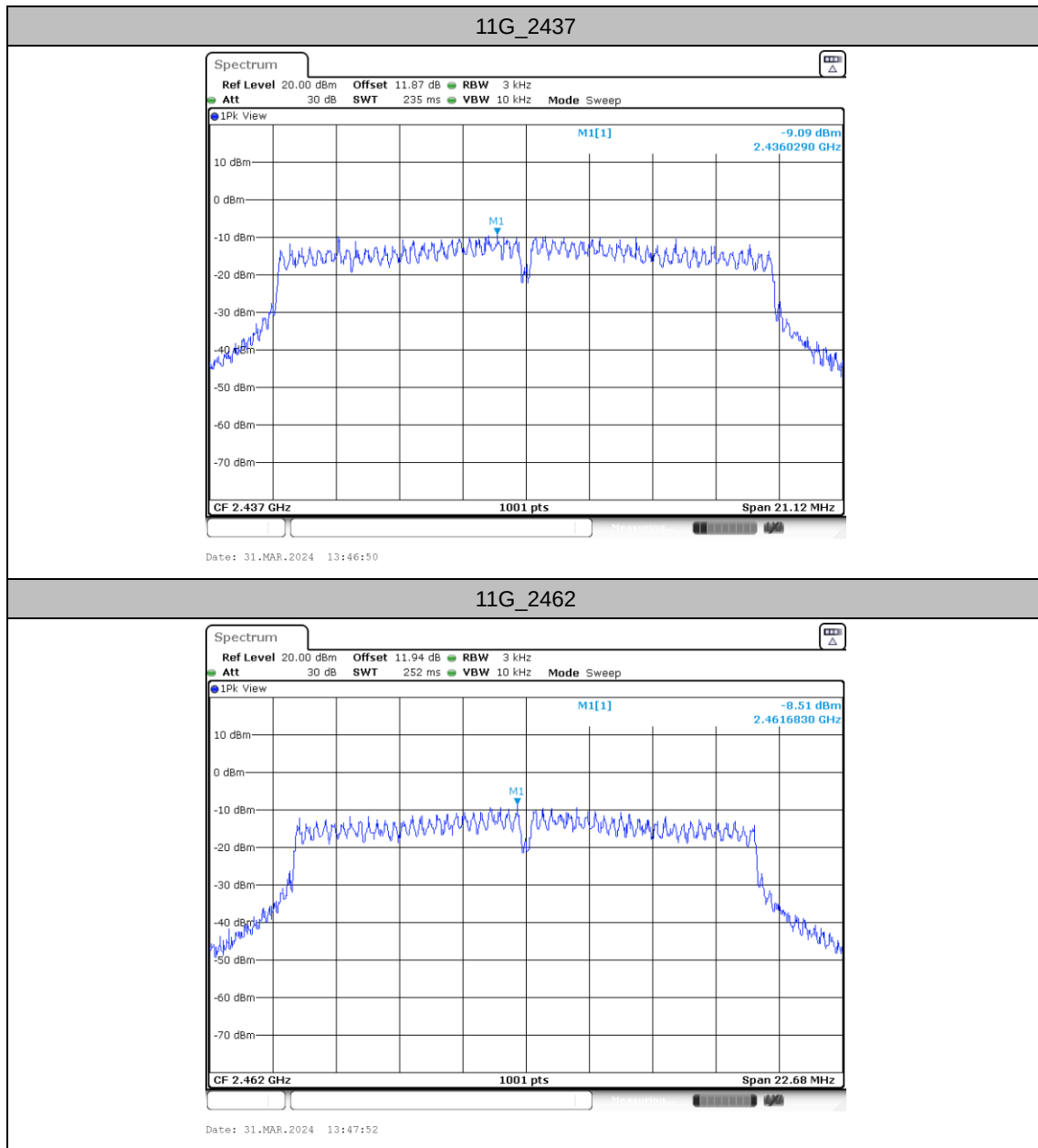
TestMode	Freq(MHz)	Result [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
11B	2412	-6.54	≤8.00	PASS
	2437	-4.82	≤8.00	PASS
	2462	-7.16	≤8.00	PASS
11G	2412	-8.42	≤8.00	PASS
	2437	-9.09	≤8.00	PASS
	2462	-8.51	≤8.00	PASS
11N20SISO	2412	-8.63	≤8.00	PASS
	2437	-8	≤8.00	PASS
	2462	-9.11	≤8.00	PASS
11N40SISO	2422	-12.1	≤8.00	PASS
	2437	-10.94	≤8.00	PASS
	2452	-11.92	≤8.00	PASS
11AX20SISO	2412	-9.25	≤8.00	PASS
	2437	-8.76	≤8.00	PASS
	2462	-7.95	≤8.00	PASS
11AX40SISO	2422	-12.82	≤8.00	PASS
	2437	-11.15	≤8.00	PASS
	2452	-11.73	≤8.00	PASS

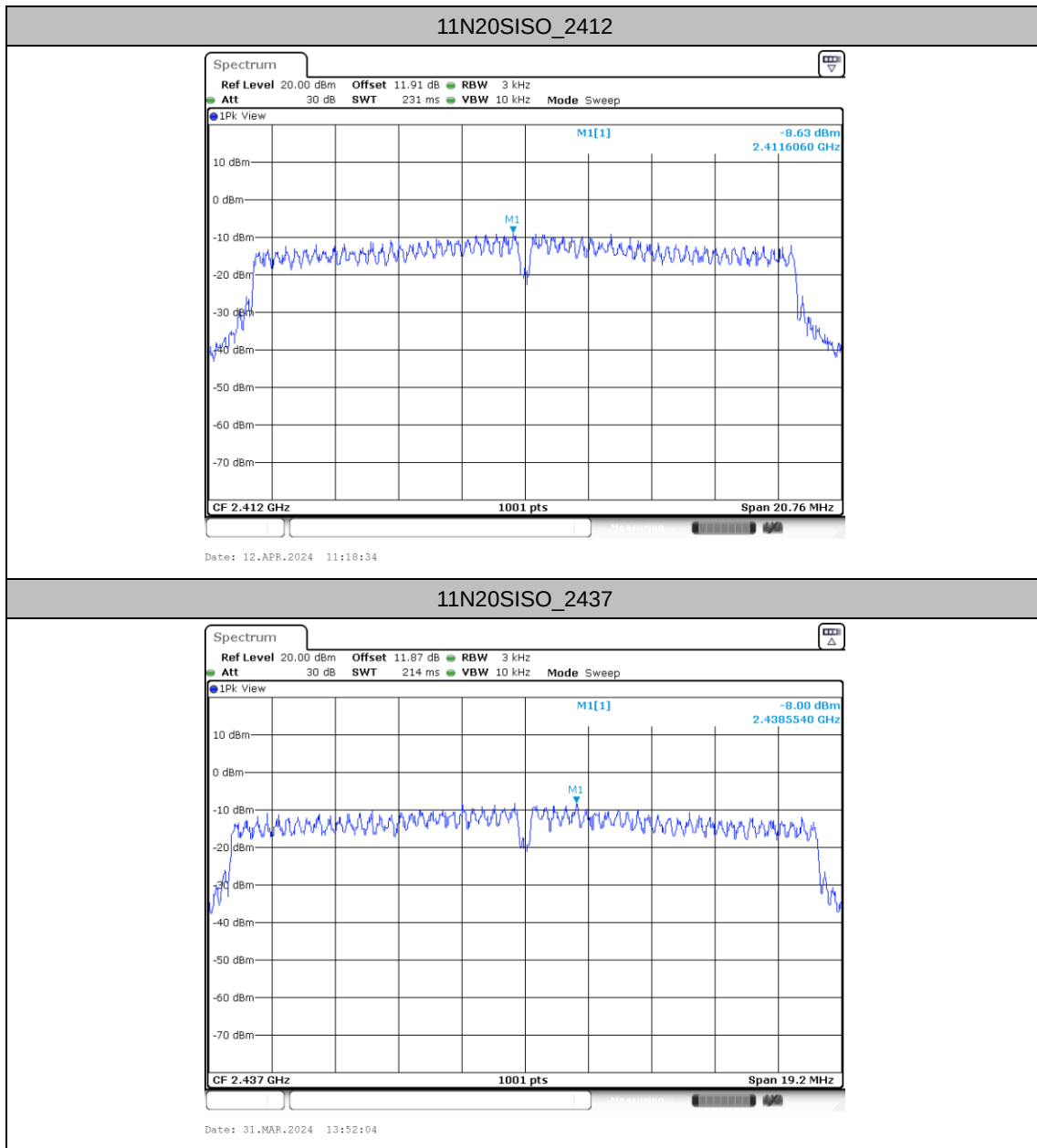


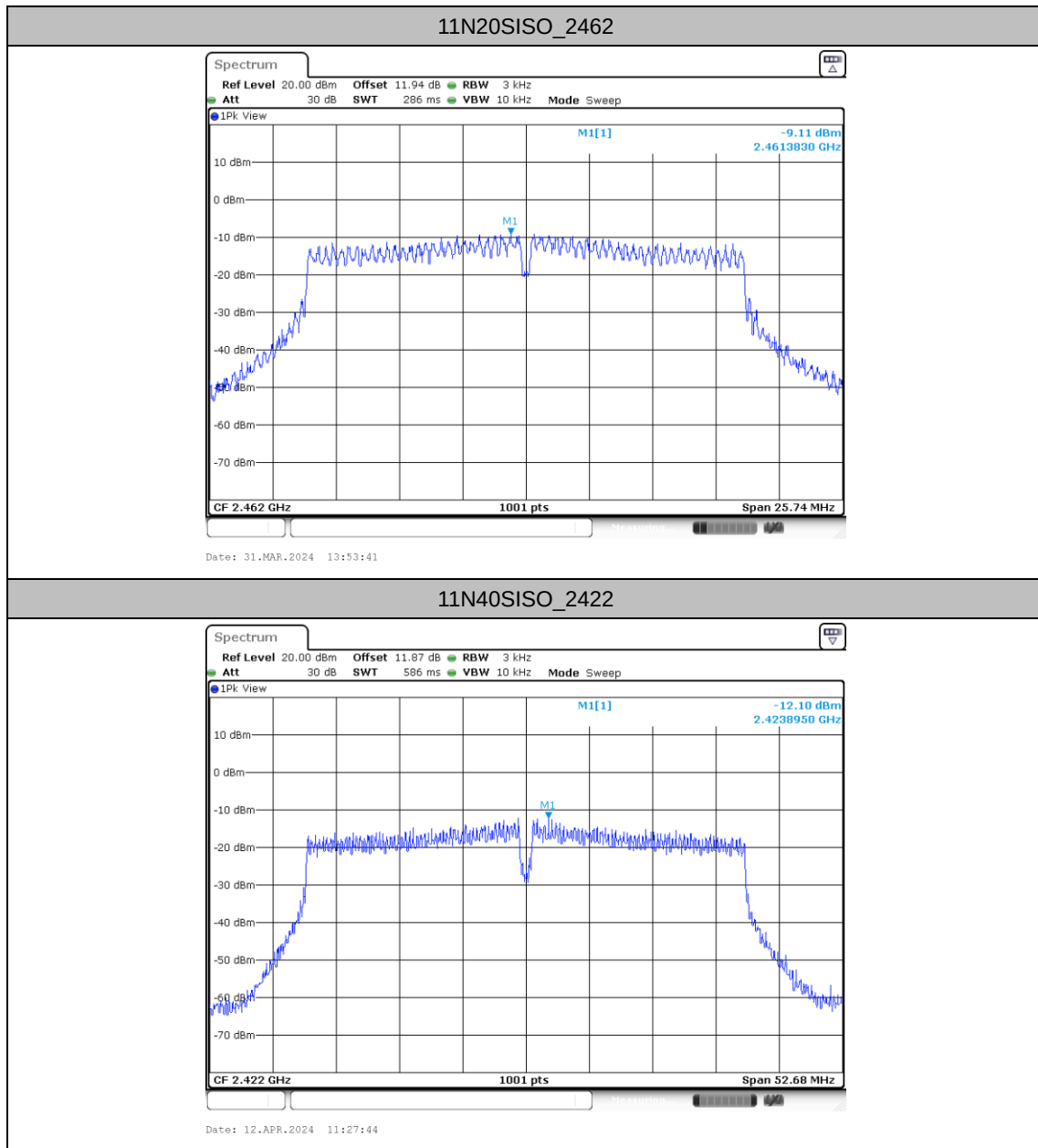
Test Graphs

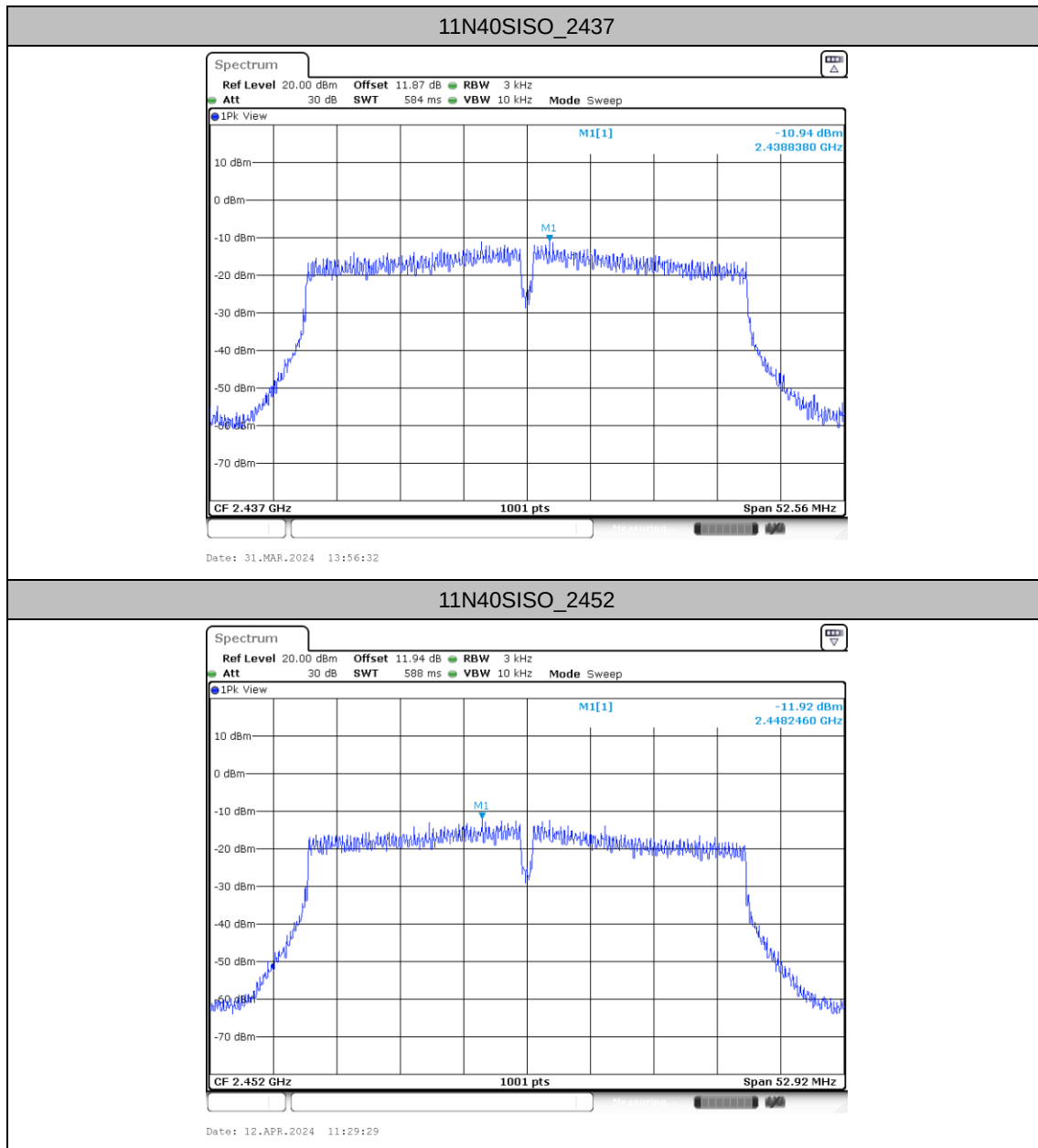


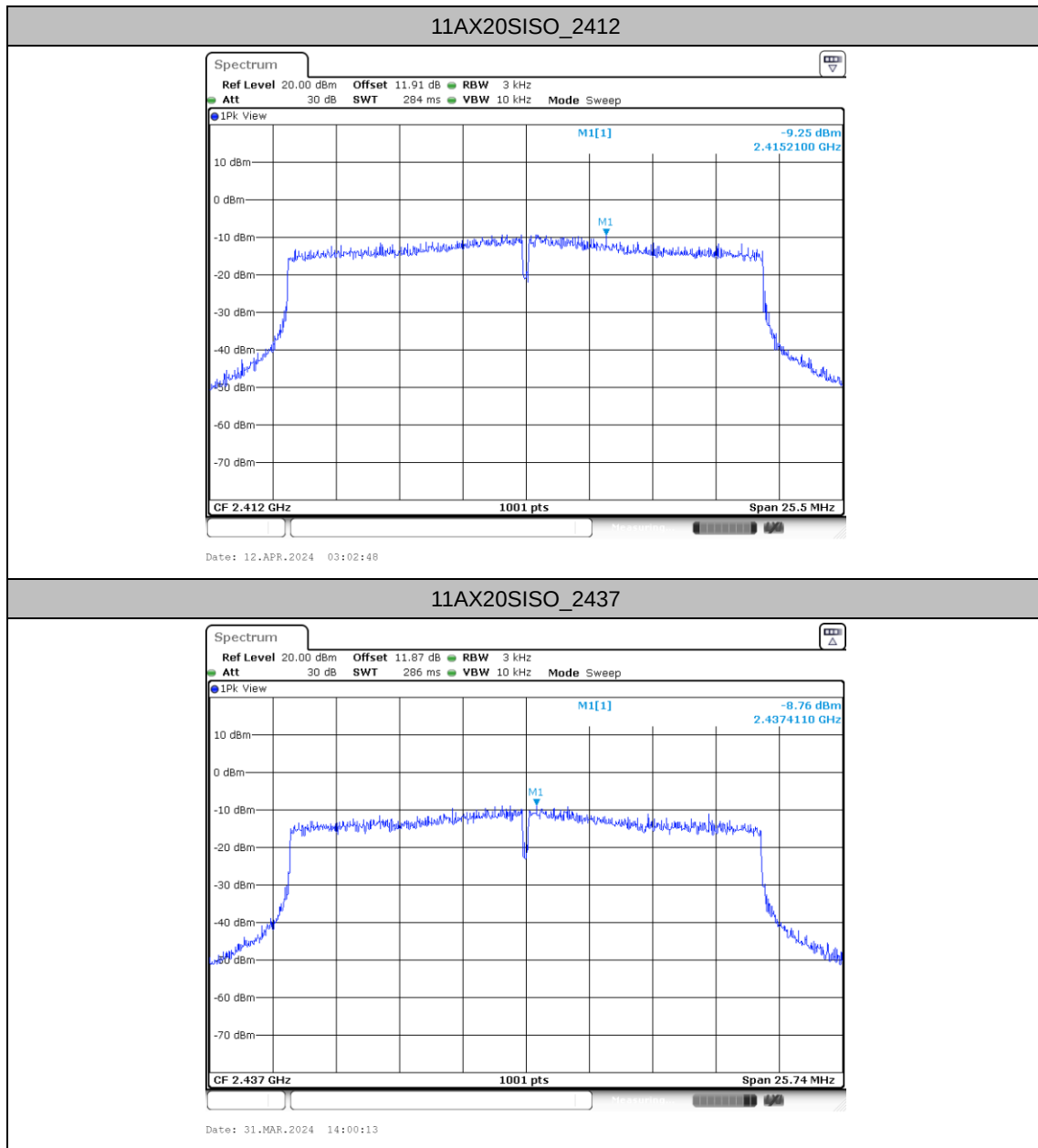


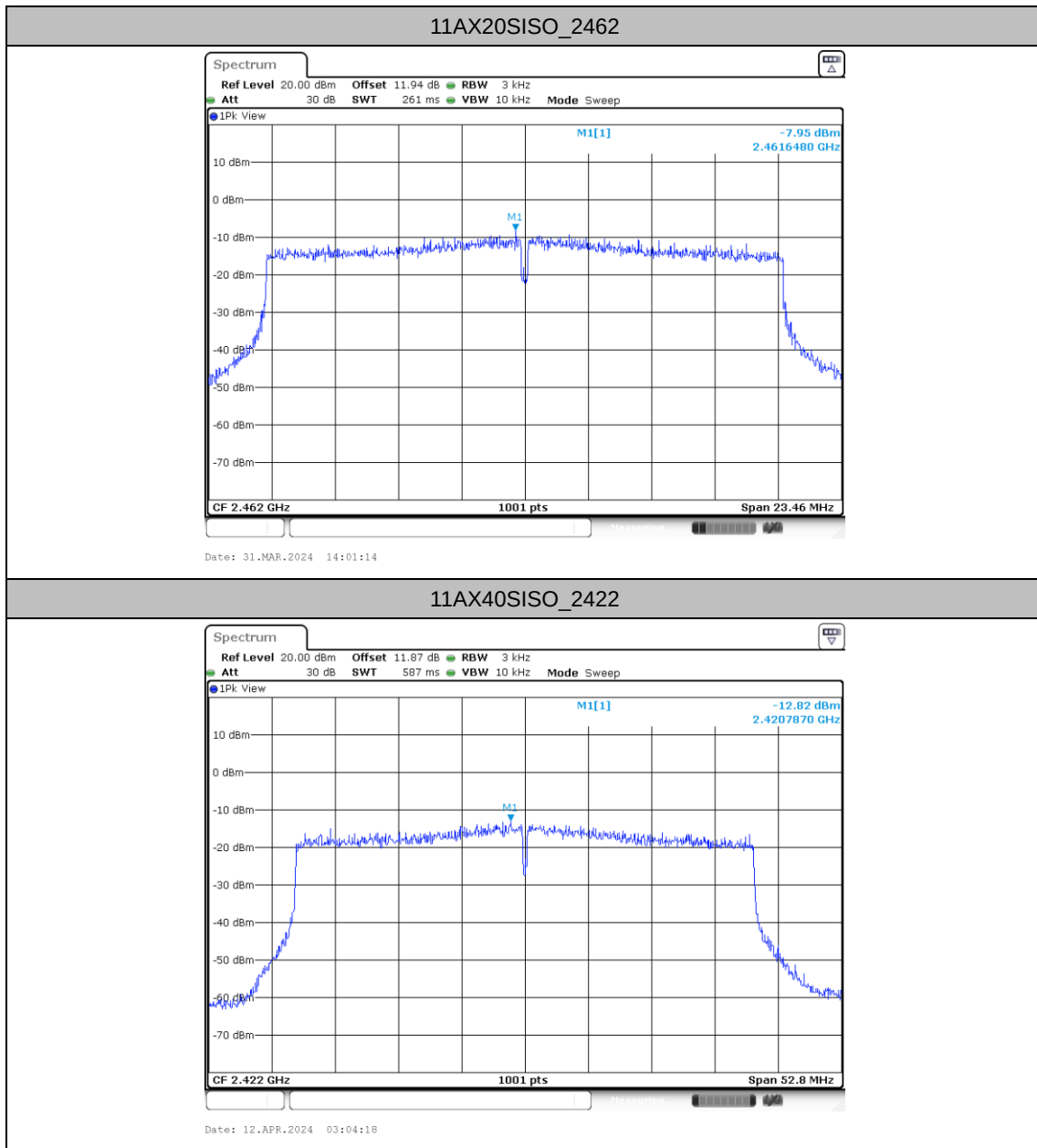


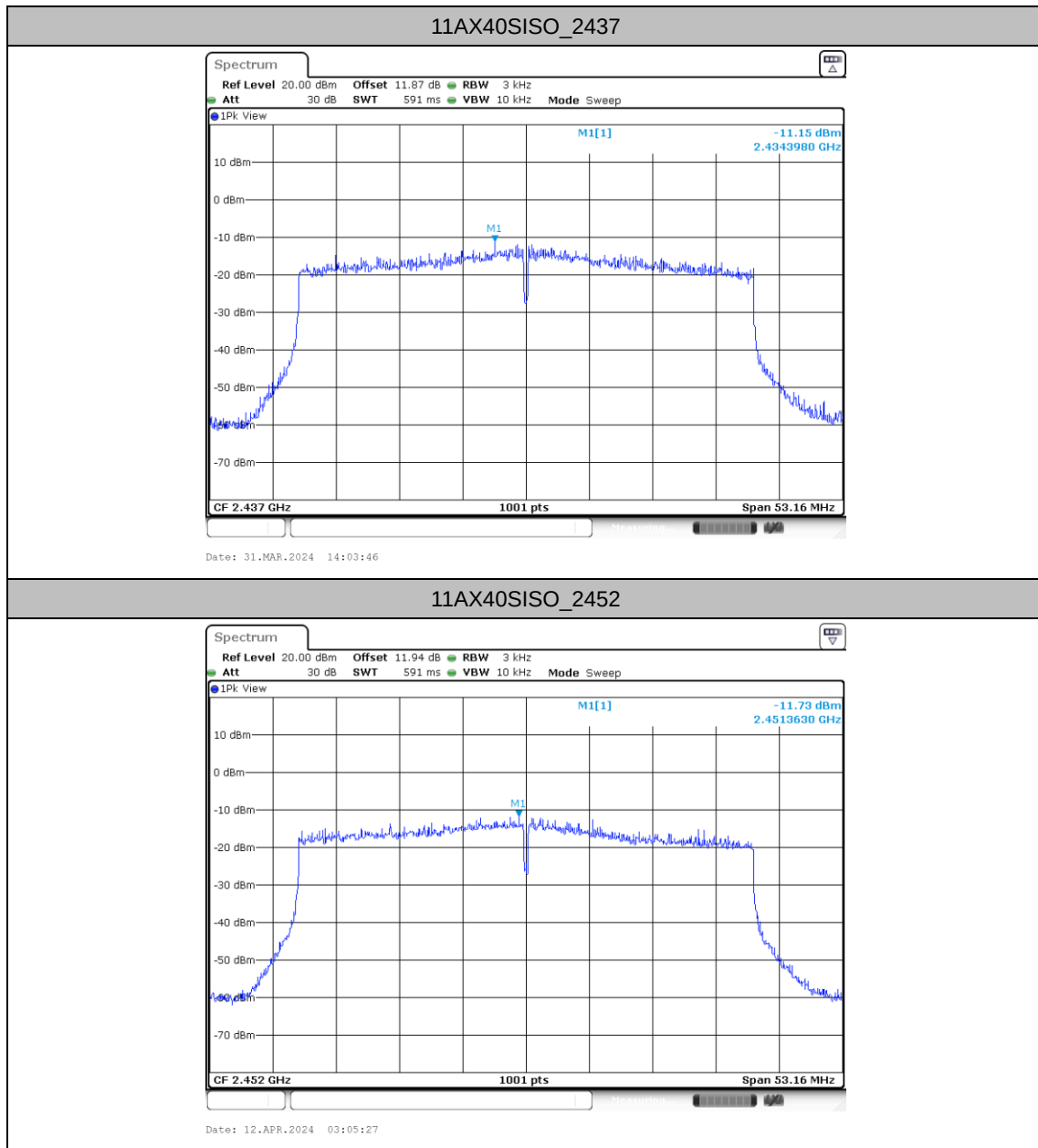












**Reference level measurement (100K PSD)****Test Result**

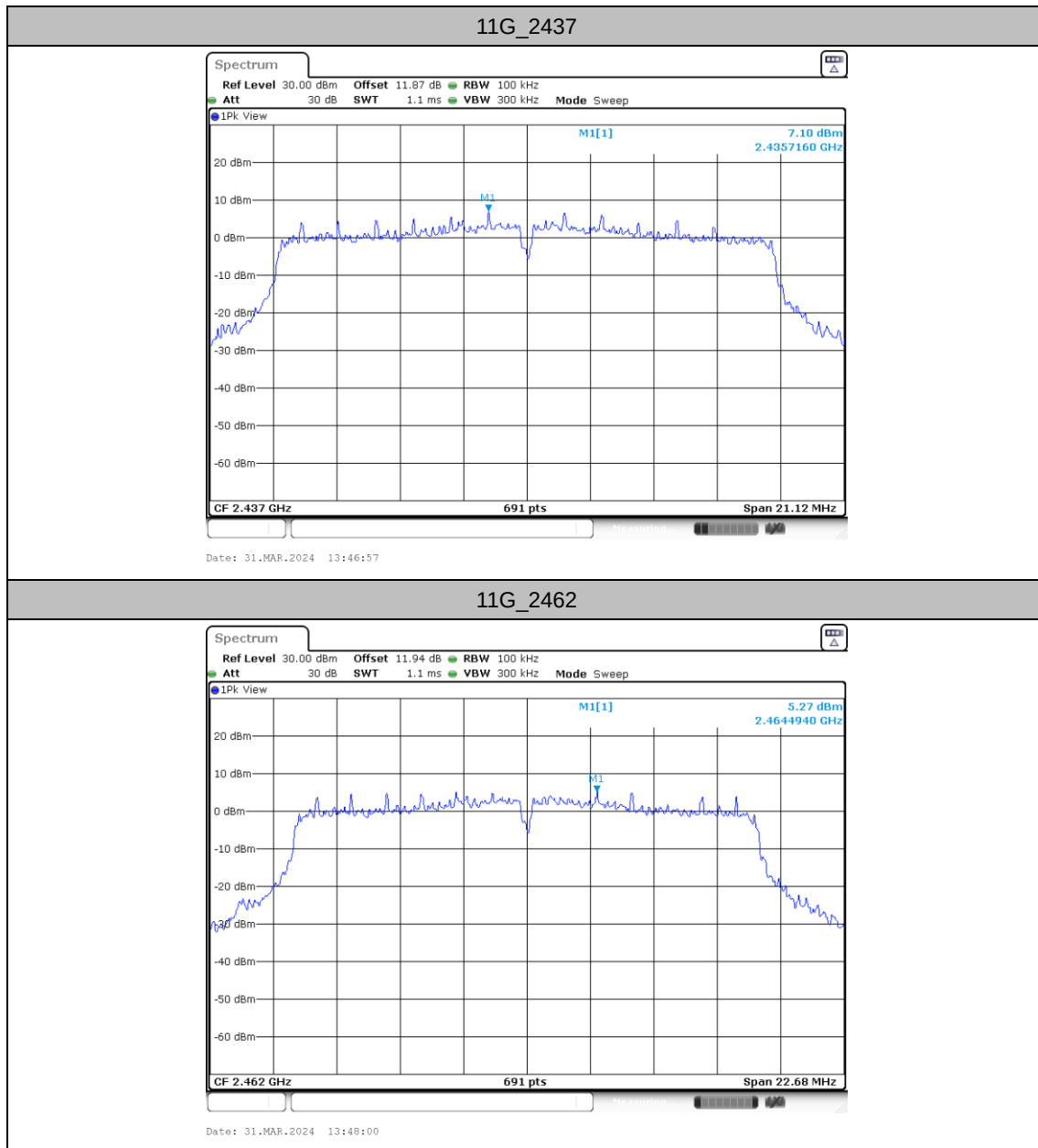
TestMode	Freq(MHz)	Max.Point[MHz]	Result[dBm/100KHz]
11B	2412	2412.48	8.48
	2437	2436.48	8.43
	2462	2461.46	7.94
11G	2412	2410.72	7.22
	2437	2435.72	7.10
	2462	2464.49	5.27
11N20SISO	2412	2408.25	5.00
	2437	2435.72	7.07
	2462	2461.37	4.18
11N40SISO	2422	2425.74	3.39
	2437	2431.98	3.36
	2452	2447.02	3.91
11AX20SISO	2412	2414.51	6.69
	2437	2435.73	7.07
	2462	2464.51	5.25
11AX40SISO	2422	2419.48	3.22
	2437	2440.77	3.30
	2452	2447.00	3.74

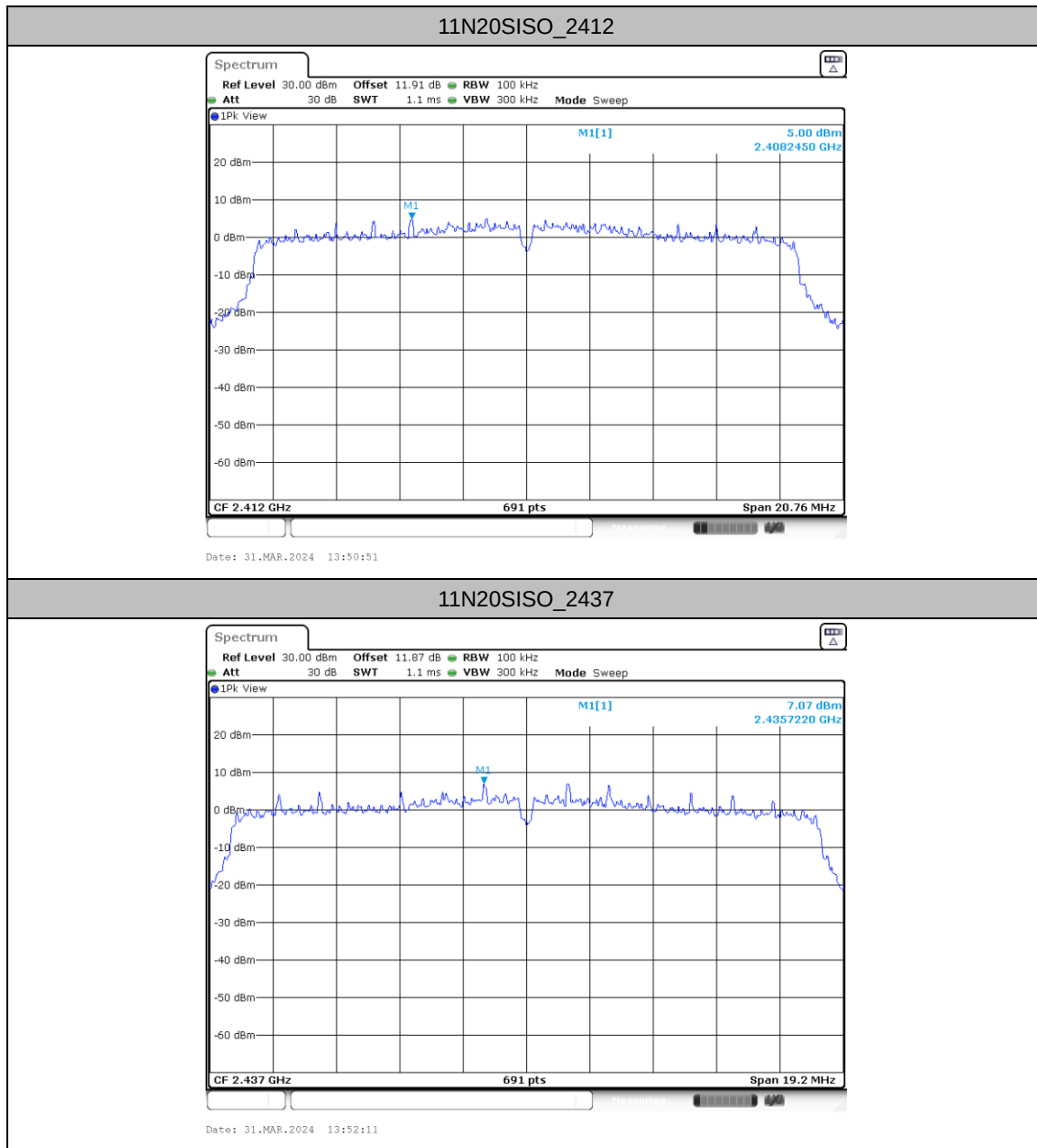


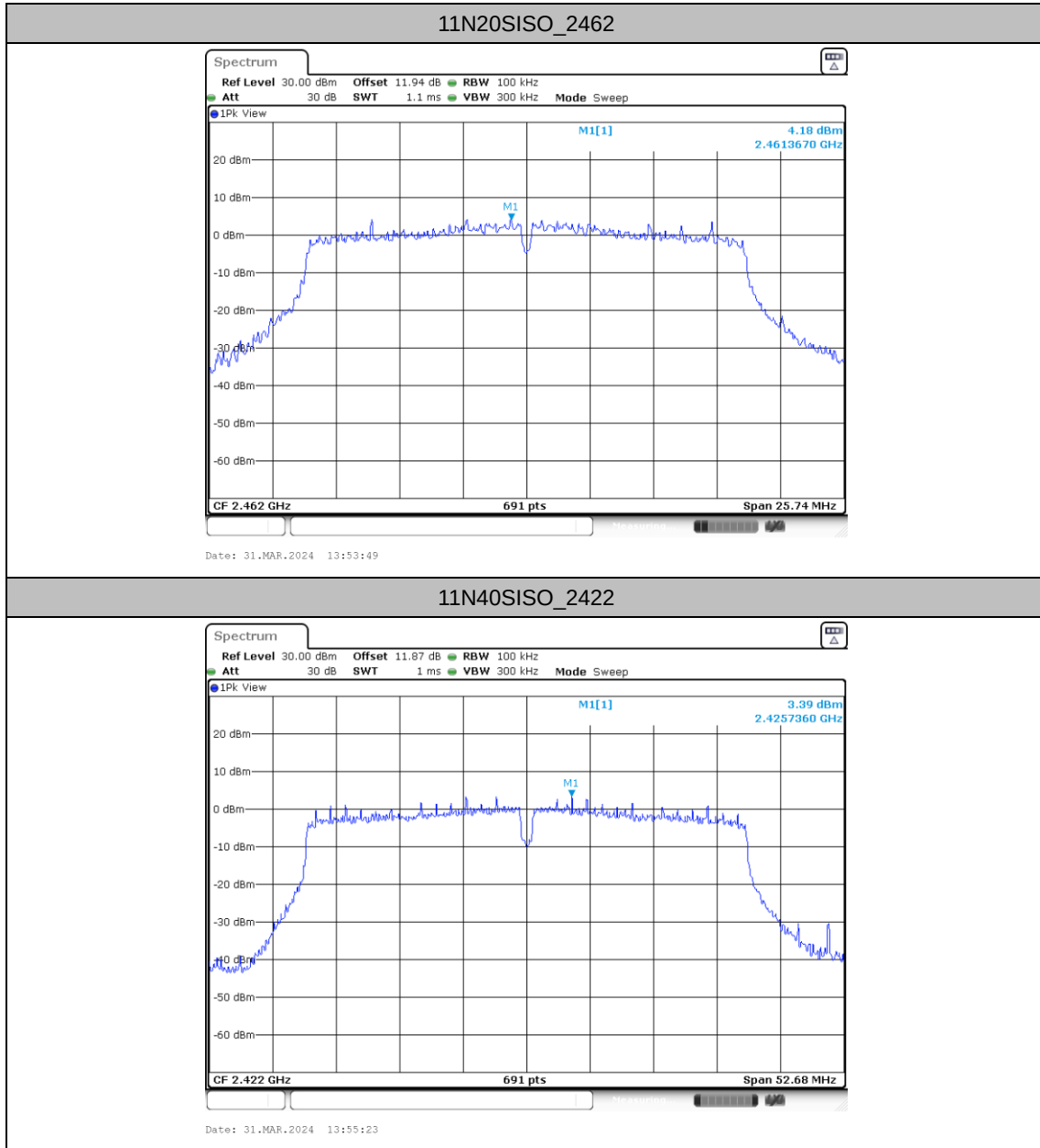
Test Graphs

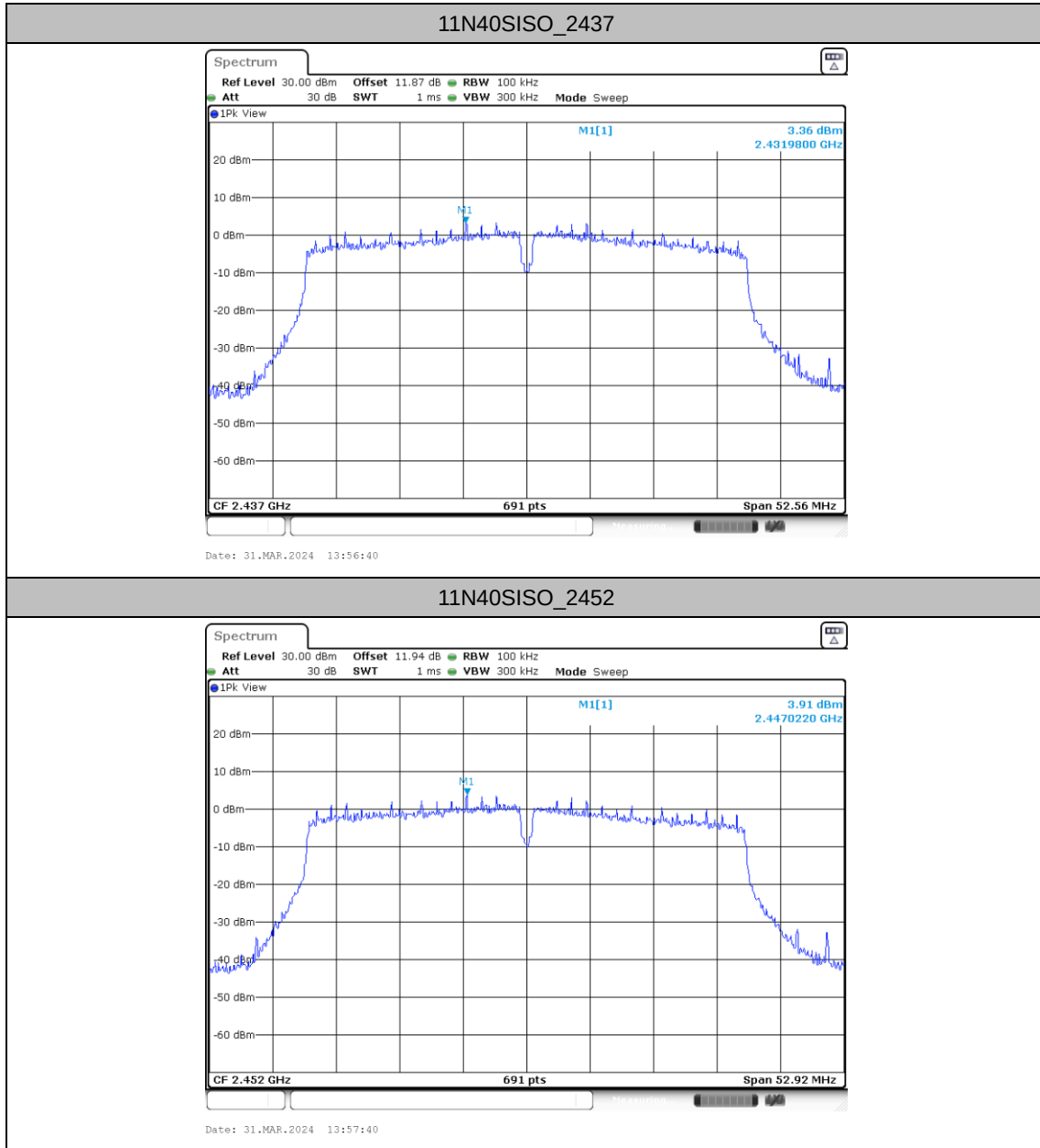


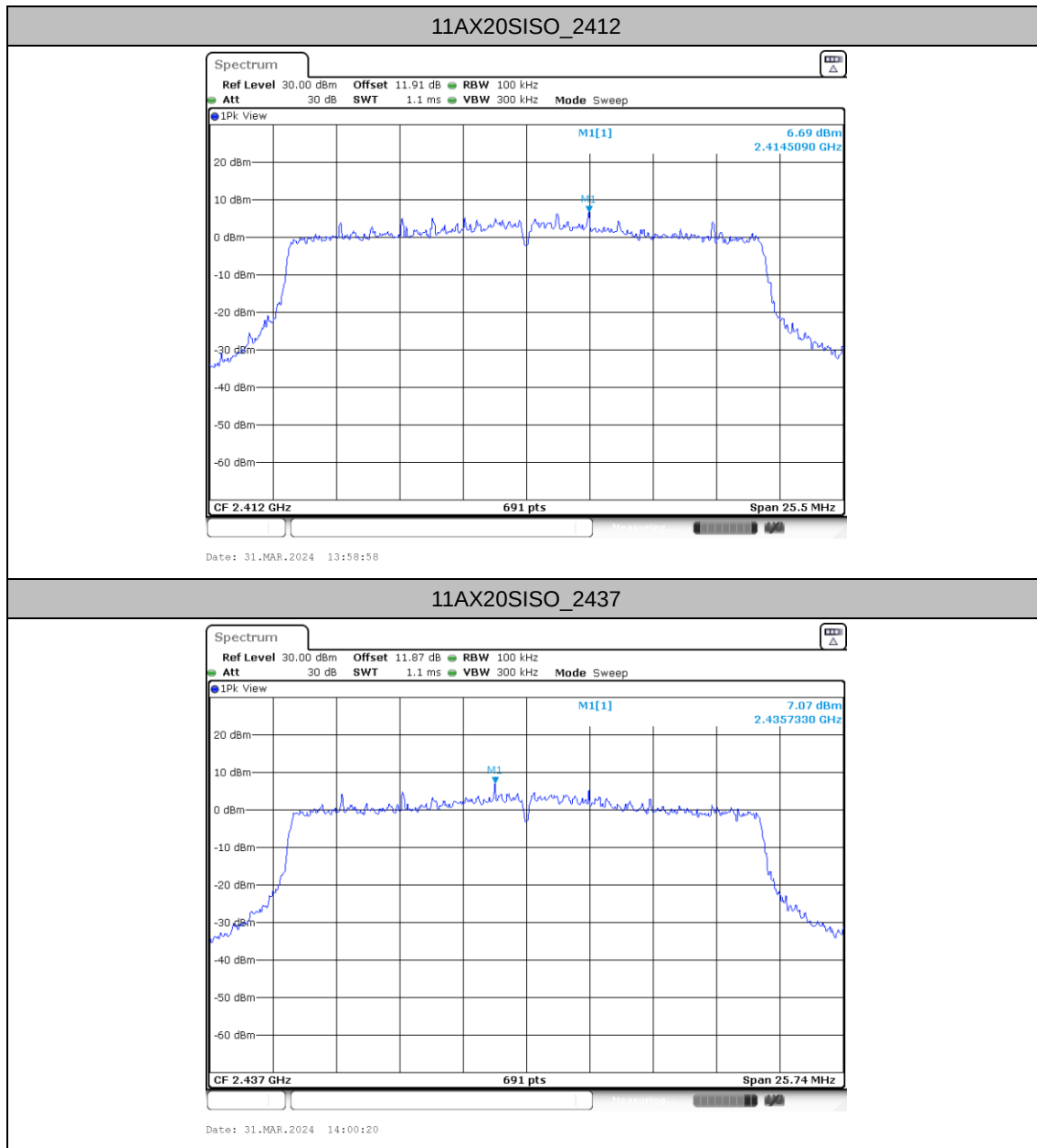


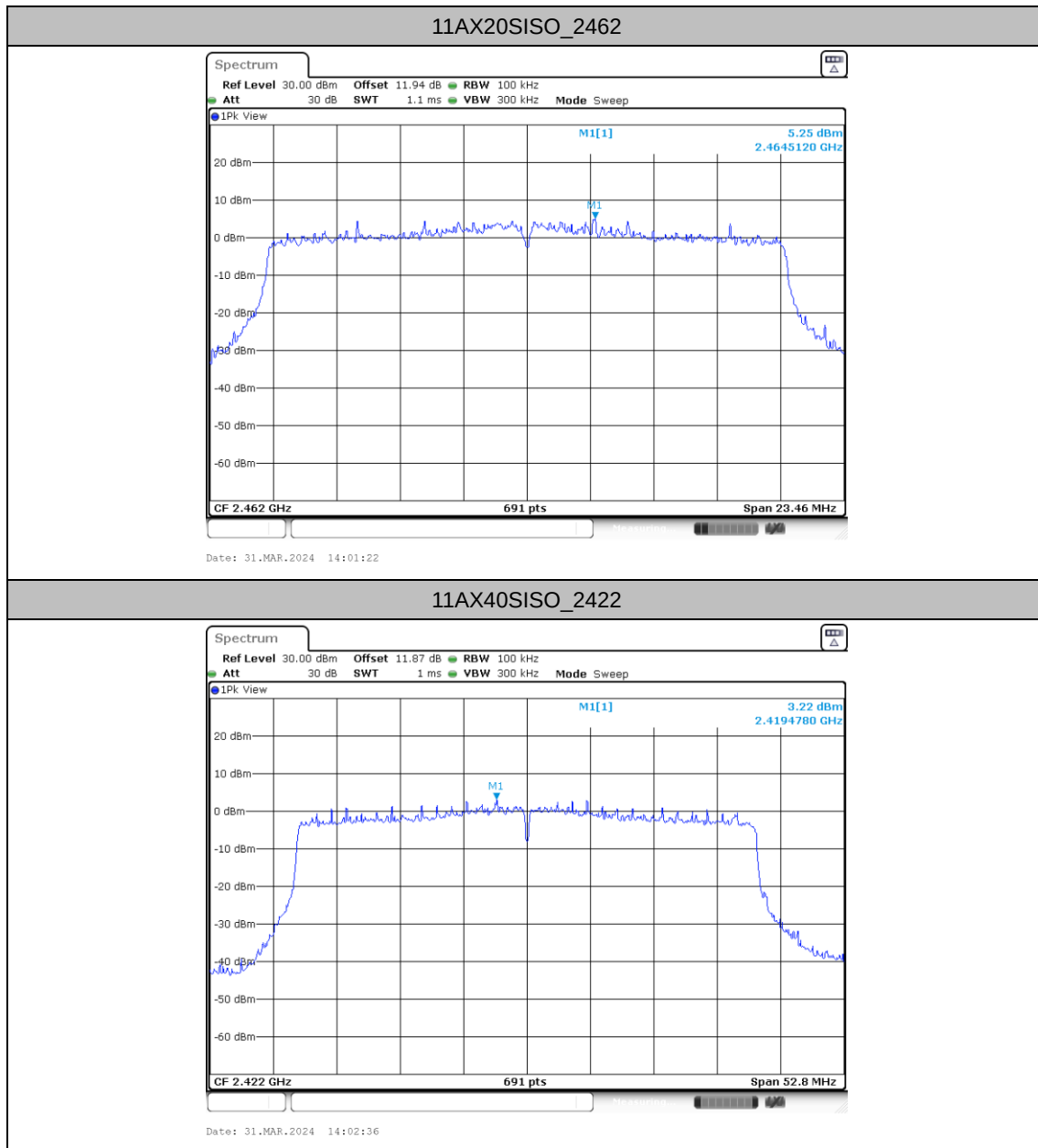


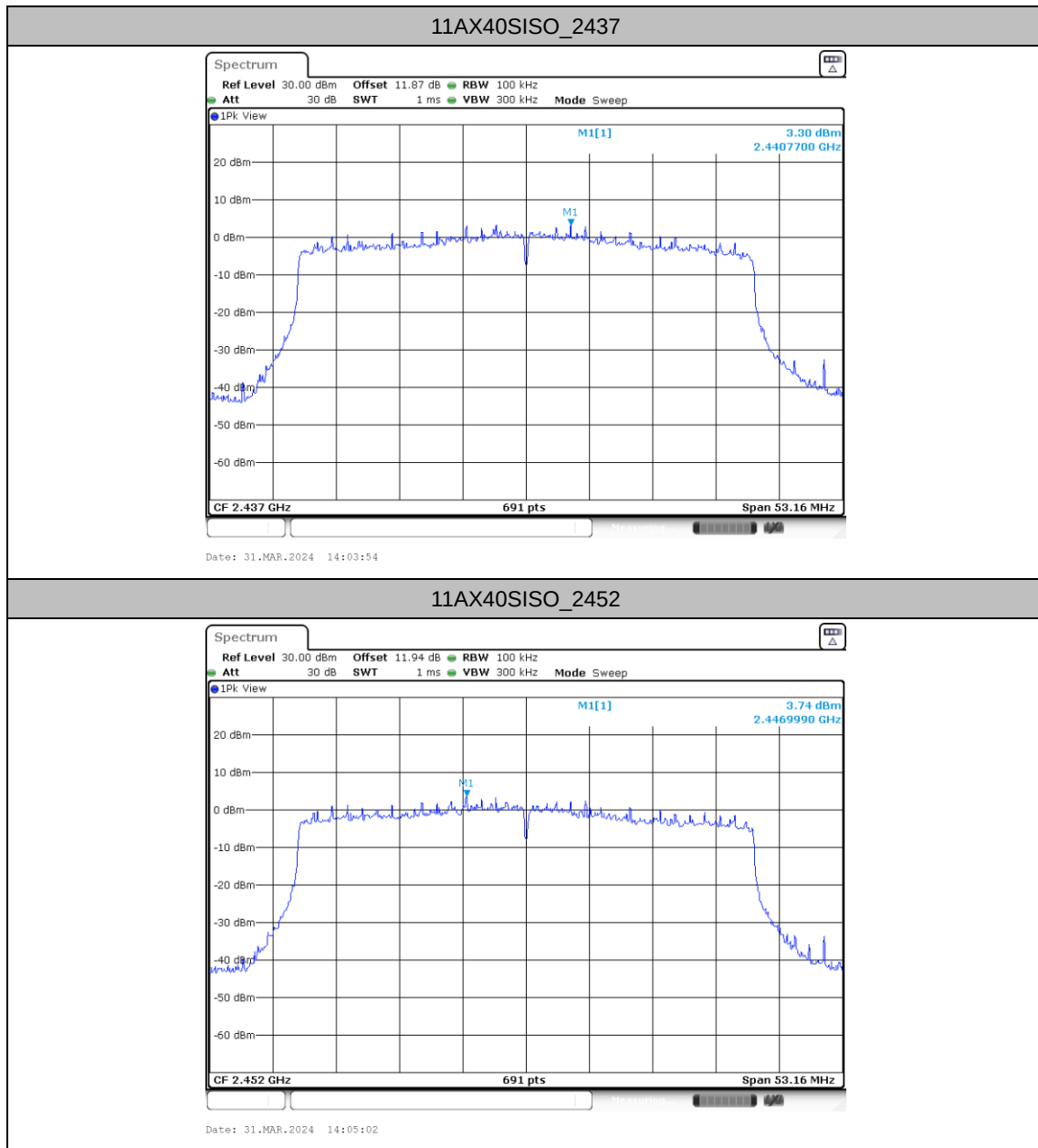












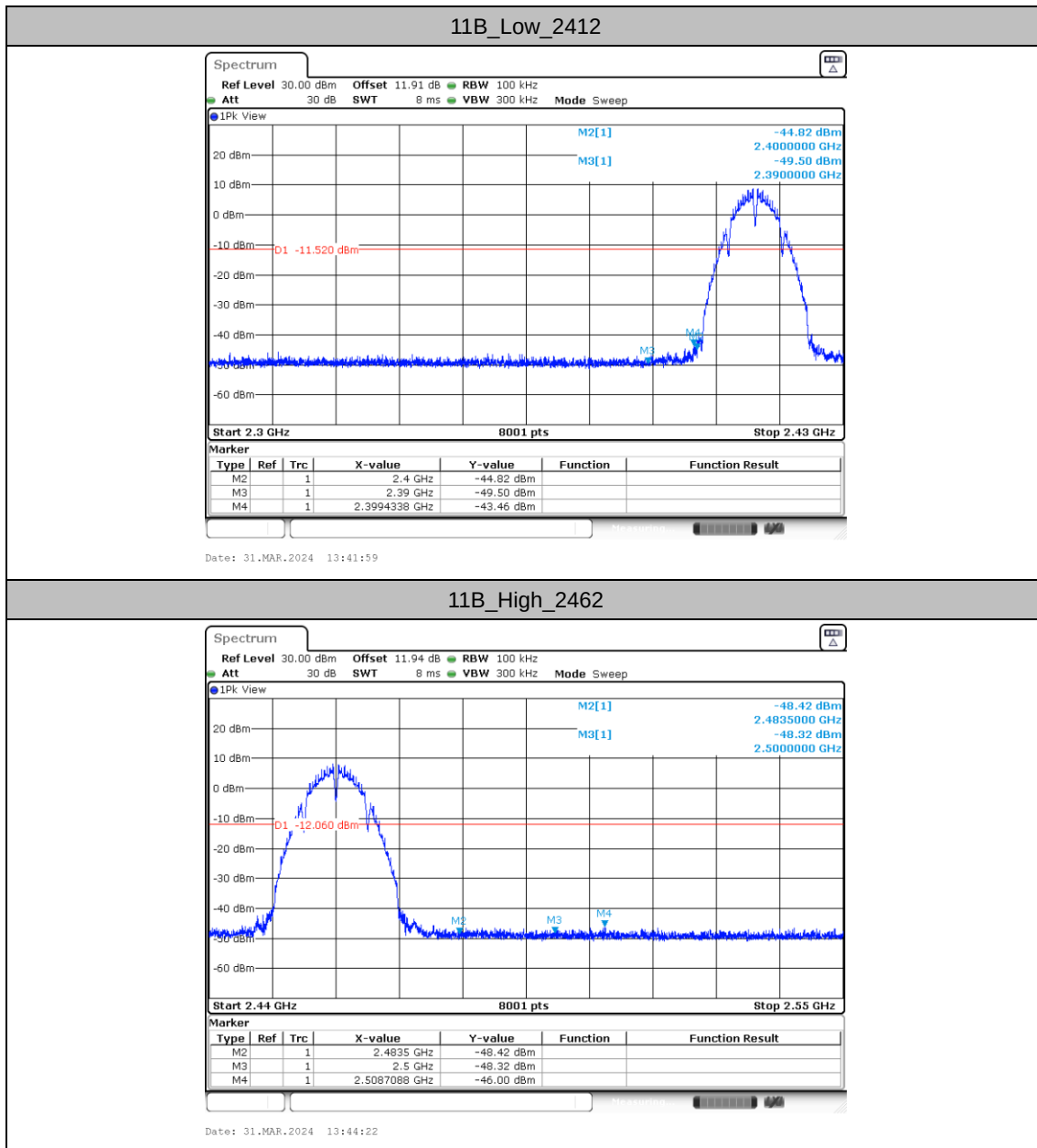
Band edge measurements

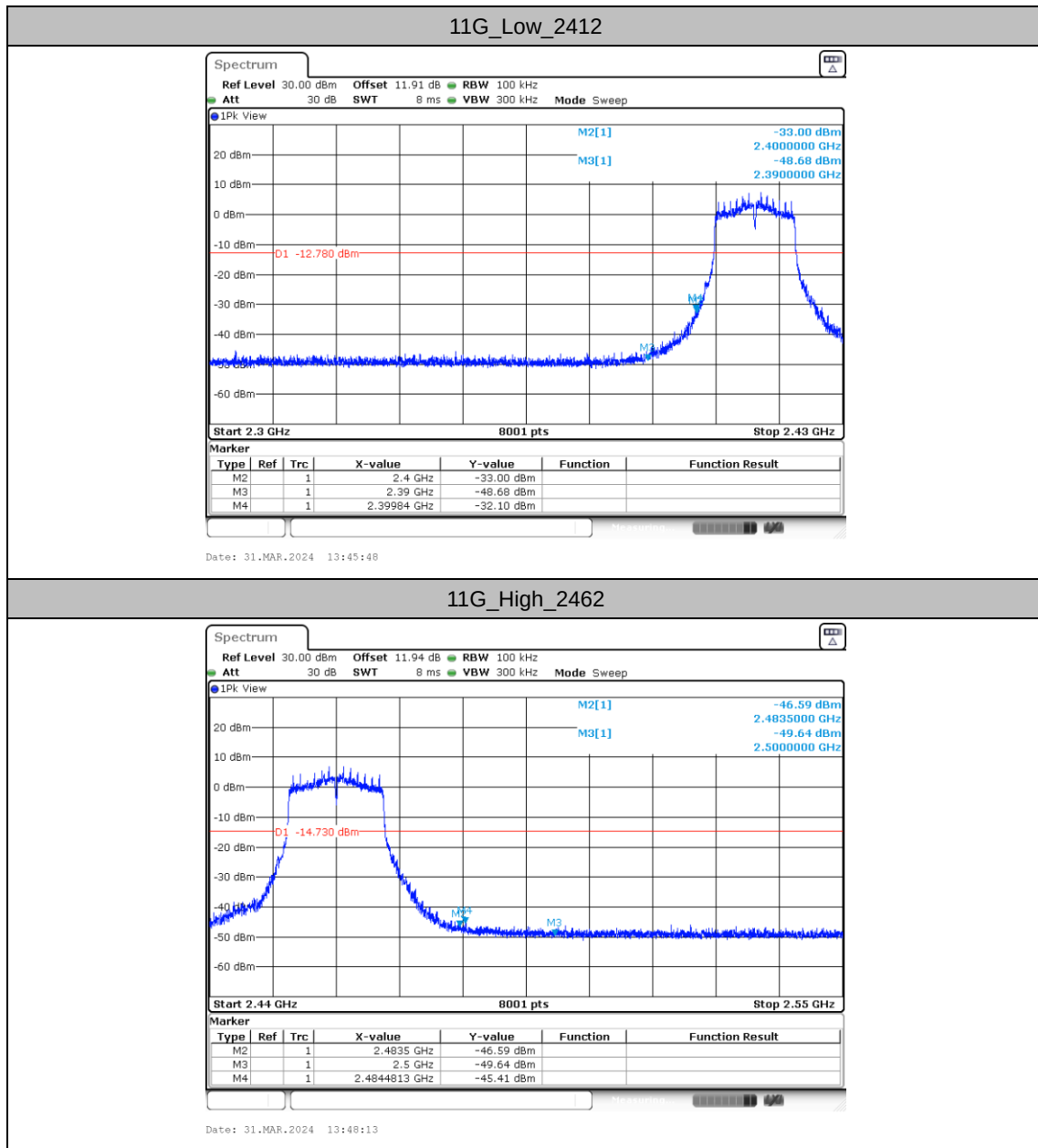
Test Result

TestMode	ChName	Freq(MHz)	RefLevel[dBm /100KHz]	Result[dBm /100KHz]	Limit[dBm /100KHz]	Verdict
11B	Low	2412	8.48	-43.46	≤-11.52	PASS
	High	2462	7.94	-46	≤-12.06	PASS
11G	Low	2412	7.22	-32.1	≤-12.78	PASS
	High	2462	5.27	-45.41	≤-14.73	PASS
11N20SISO	Low	2412	5.00	-31.86	≤-15	PASS
	High	2462	4.18	-44.62	≤-15.82	PASS
11N40SISO	Low	2422	3.39	-37.01	≤-16.61	PASS
	High	2452	3.91	-39.29	≤-16.09	PASS
11AX20SISO	Low	2412	6.69	-31.82	≤-13.31	PASS
	High	2462	5.25	-44.59	≤-14.75	PASS
11AX40SISO	Low	2422	3.22	-37.39	≤-16.78	PASS
	High	2452	3.74	-38.45	≤-16.26	PASS



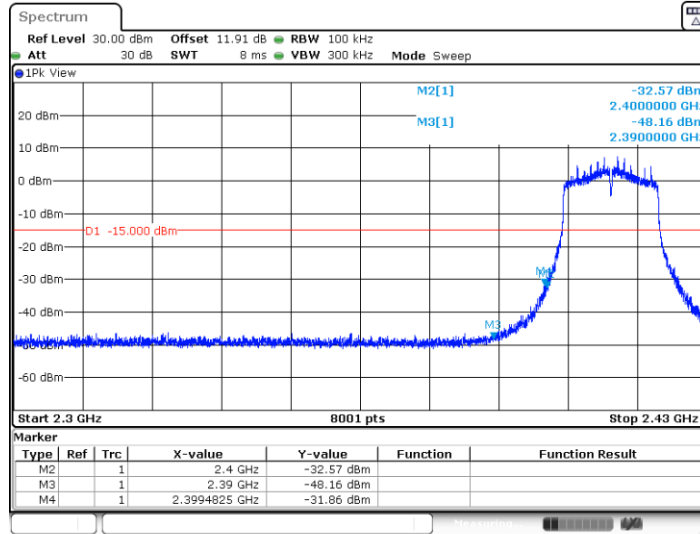
Test Graphs



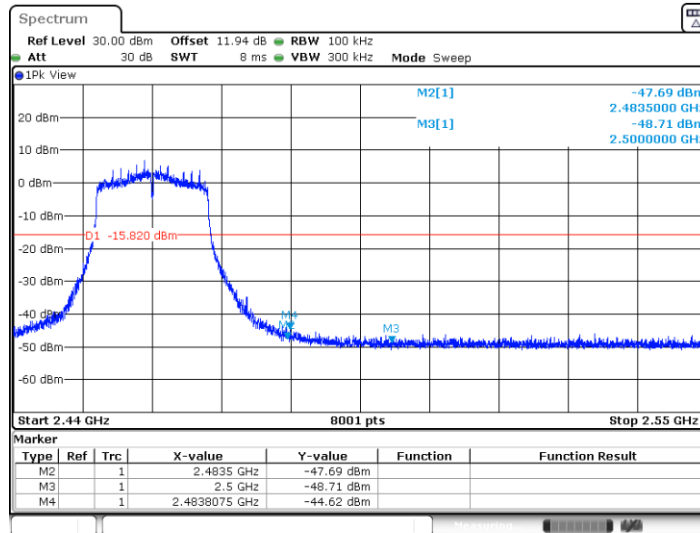


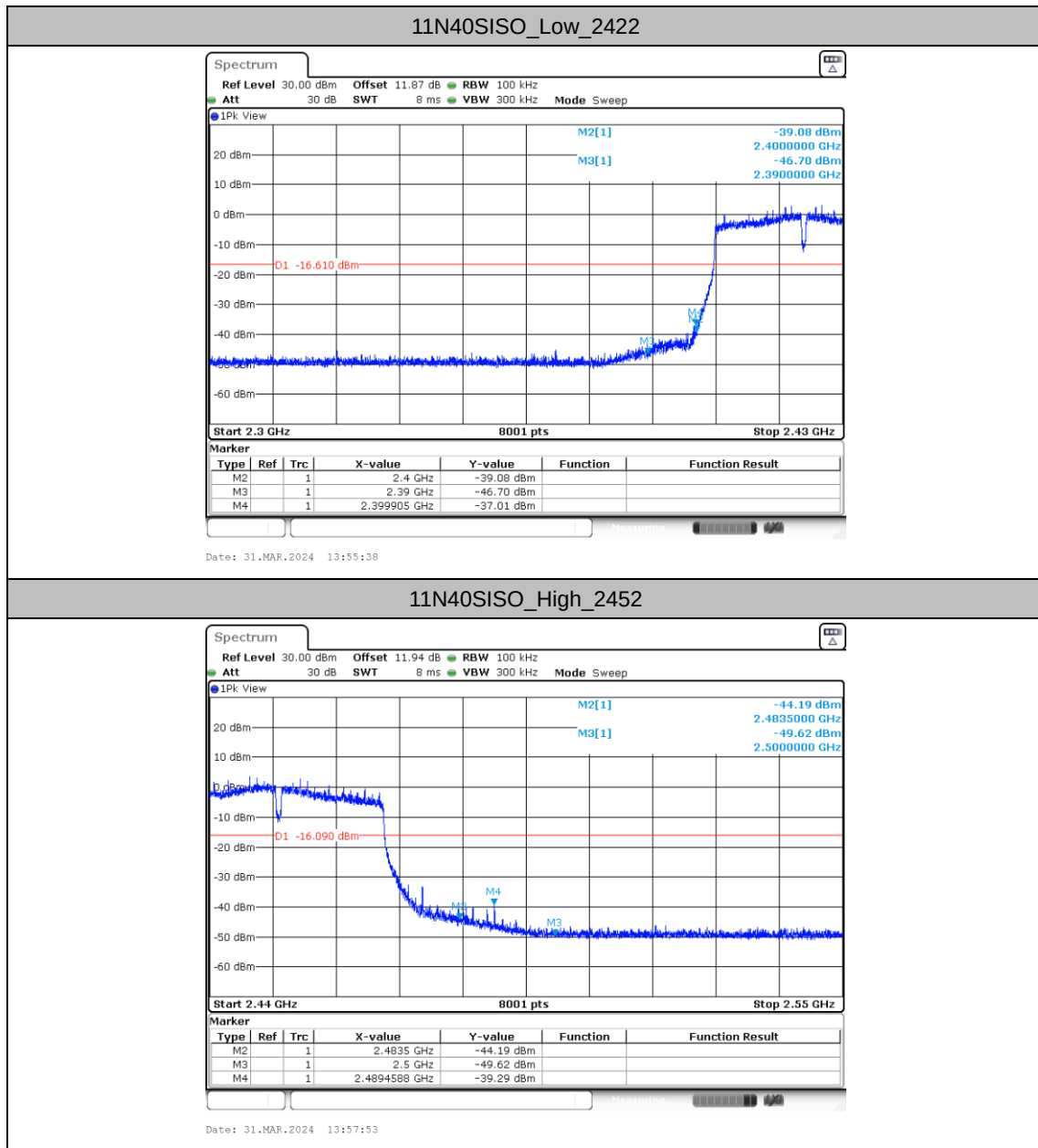


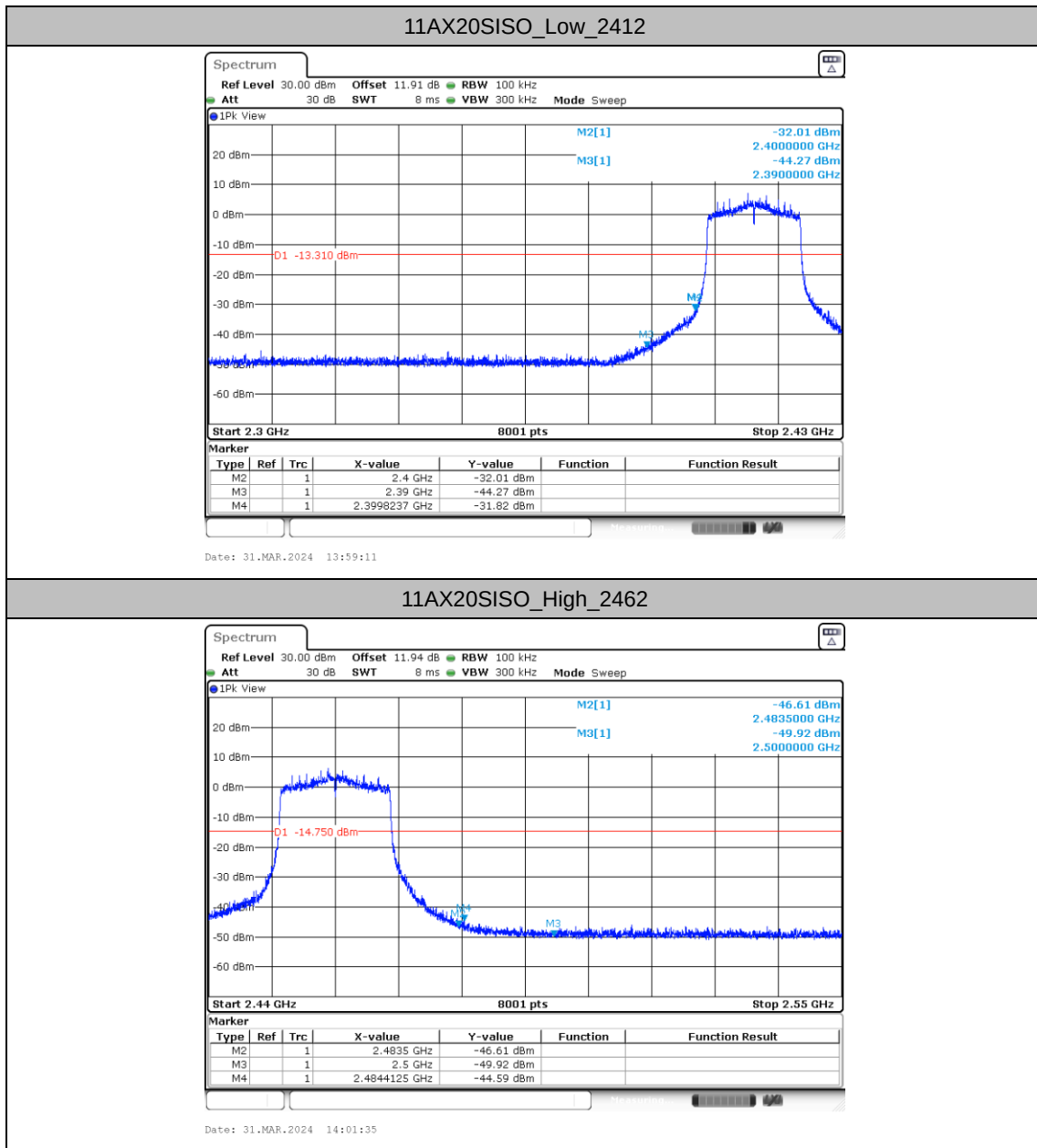
11N20SISO_Low_2412

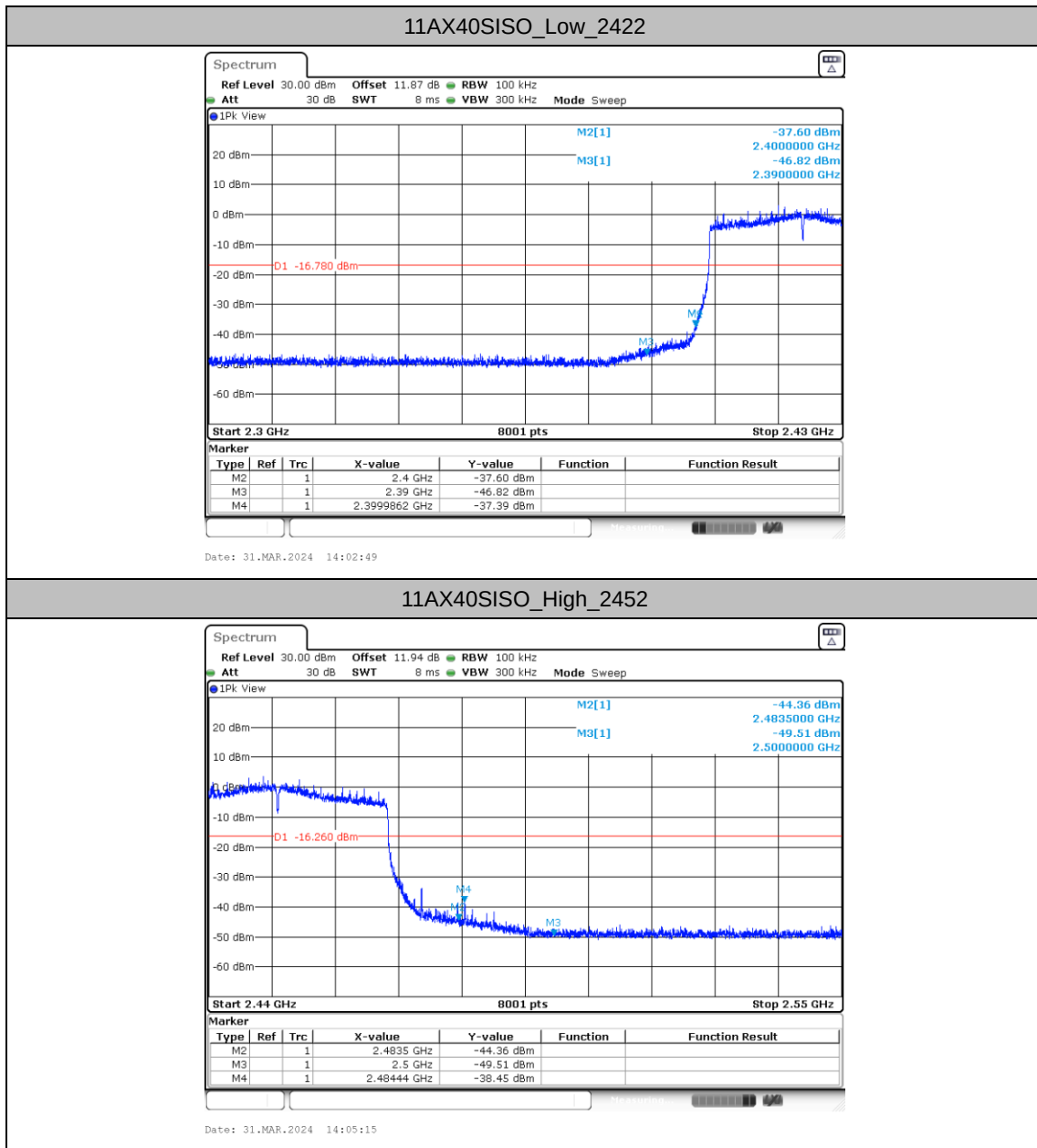


11N20SISO_High_2462











Conducted Spurious Emission

Test Result

TestMode	Freq(MHz)	FreqRange [Mhz]	RefLevel [dBm/100KHz]	Result [dBm/100KHz]	Limit [dBm/100KHz]	Verdict
11B	2412	30~1000	8.48	-52.23	≤-11.52	PASS
		1000~26500	8.48	-48.17	≤-11.52	PASS
	2437	30~1000	8.43	-55.83	≤-11.57	PASS
		1000~26500	8.43	-48.58	≤-11.57	PASS
	2462	30~1000	7.94	-54.7	≤-12.06	PASS
		1000~26500	7.94	-48.68	≤-12.06	PASS
11G	2412	30~1000	7.22	-55.69	≤-12.78	PASS
		1000~26500	7.22	-48.81	≤-12.78	PASS
	2437	30~1000	7.10	-55.56	≤-12.9	PASS
		1000~26500	7.10	-48.08	≤-12.9	PASS
	2462	30~1000	5.27	-55.5	≤-14.73	PASS
		1000~26500	5.27	-47.57	≤-14.73	PASS
11N20SISO	2412	30~1000	5.00	-55.89	≤-15	PASS
		1000~26500	5.00	-48.11	≤-15	PASS
	2437	30~1000	7.07	-55.72	≤-12.93	PASS
		1000~26500	7.07	-48.67	≤-12.93	PASS
	2462	30~1000	4.18	-55.12	≤-15.82	PASS
		1000~26500	4.18	-48.7	≤-15.82	PASS
11N40SISO	2422	30~1000	3.39	-56.23	≤-16.61	PASS
		1000~26500	3.39	-48.7	≤-16.61	PASS
	2437	30~1000	3.36	-56.02	≤-16.64	PASS
		1000~26500	3.36	-47.5	≤-16.64	PASS
	2452	30~1000	3.91	-55.42	≤-16.09	PASS
		1000~26500	3.91	-48.67	≤-16.09	PASS
11AX20SISO	2412	30~1000	6.69	-55.78	≤-13.31	PASS
		1000~26500	6.69	-48.45	≤-13.31	PASS
	2437	30~1000	7.07	-55.85	≤-12.93	PASS
		1000~26500	7.07	-48.93	≤-12.93	PASS
	2462	30~1000	5.25	-55.86	≤-14.75	PASS
		1000~26500	5.25	-48.96	≤-14.75	PASS
11AX40SISO	2422	30~1000	3.22	-55.57	≤-16.78	PASS
		1000~26500	3.22	-48.13	≤-16.78	PASS
	2437	30~1000	3.30	-51.79	≤-16.7	PASS
		1000~26500	3.30	-47.41	≤-16.7	PASS
	2452	30~1000	3.74	-55.42	≤-16.26	PASS
		1000~26500	3.74	-48.76	≤-16.26	PASS



Test Graphs

