

FCC/ISED - TEST REPORTReport Number : **68.950.22.0675.01** Date of Issue: **August 18, 2022**

Model : MDZ-28-AA

Product Type : Xiaomi Box 4K

Applicant : Beijing Xiaomi Electronics Co., Ltd

Address : Room 802, 8F, Building 5, No.15, Kechuang Ten Street, Beijing

: Economic & Technological Development Zone Beijing China 100085

: REPUBLIC OF CHINA

Manufacturer : Beijing Xiaomi Electronics Co., Ltd

Address : Room 802, 8F, Building 5, No.15, Kechuang Ten Street, Beijing

: Economic & Technological Development Zone Beijing China 100085

Test Result : **n Positive o Negative**Total pages including
Appendices: **76**

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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Checkpoint Road 2, Nanshan District
Shenzhen 518052
P.R. China

Telephone: 86 755 8828 6998

Fax: 86 755 8288 5299

FCC Registration No.: 514049

No.:

ISED test site number: 10320A

3 Description of the Equipment Under Test

Description of the Equipment Under Test	
Product:	Xiaomi Box 4K
Model no/HVIN/PMN:	MDZ-28-AA
FVIN:	R104
FCC ID:	2AIMRMITVMDZ28AA
IC:	25940-MITVMDZ28AA
Options and accessories:	Adapter, HDMI Cable
Rating:	5.2VDC, 2.1A(Supplied by AC/DC Adapter) Adapter information: Model: AD-0100520210US-1 Input: 100-240V~50/60Hz, 0.3A Output: 5.2VDC, 2.1A, 10.92W
RF transmission frequency:	Bluetooth BR+EDR: 2402-2480MHz Bluetooth LE: 2402-2480MHz Wi-Fi 2.4G: 2412-2462MHz Wi-Fi 5G: 5150MHz~5350MHz; Wi-Fi 5G: 5470MHz – 5725MHz Wi-Fi 5G: 5725MHz – 5850MHz. Note: until further notice, device subject to this section shall not be capable of transmitting in the band 5600-5650MHz. This restriction is for the protection of Environment Canada's weather radars operating in this band.
Antenna Type:	Integrated Antenna
Antenna Gain:	Bluetooth: 0.5dBi Wi-Fi 2.4G Ant 1: 0.5dBi, Ant 2: 0.5dBi Wi-Fi 5G Ant 1: 2dBi, Ant 2: 2dBi
Description of the EUT	The EUT is a Xiaomi Box 4K with Bluetooth, 2.4GHz Wi-Fi and 5GHz Wi-Fi function. Bluetooth TX and RX range is 2402-2480MHz, Wi-Fi TX and RX is 2412-2462MHz, 5150MHz~5350MHz; 5470MHz – 5725MHz, 5725MHz – 5850MHz.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2020 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5, Amendment 2, February 2021	General Requirements and Information for the Certification of Radio Apparatus
RSS-247 Issue 2 February 2017	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB558074 D01 v05r02 DTS Measurement Guidance and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements			
FCC Part 15 Subpart C/RSS-247 Issue 2/RSS-Gen Issue 5			
Test Condition		Test Result	Test Site
RSS-GEN 8.8	Conducted emission AC power port	Pass	Site 1
RSS-247 5.4(d)	Conducted output power	Pass	Site 1
RSS-247 5.4(d)	Equivalent Isotropic Radiated Power	Pass	Site 1
RSS-247 5.2(b)	Power spectral density	Pass	Site 1
RSS-247 5.2(a) & RSS-GEN 6.7	6dB bandwidth	Pass	Site 1
RSS-247 5.1(b)	20dB Occupied bandwidth	N/A	--
RSS-GEN 6.7	99% Occupied Bandwidth	Pass	Site 1
RSS-247 5.1(b)	Carrier frequency separation	N/A	--
RSS-247 5.1(d)	Number of hopping frequencies	N/A	--
RSS-247 5.1(d)	Dwell Time	N/A	--
RSS-247 5.5	Spurious RF conducted emissions	Pass	Site 1
RSS-247 5.5	Band edge	Pass	Site 1
RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	Pass	Site 1
RSS-Gen 6.8	Antenna requirement	Pass See note 2	--

Note 1: N/A=Not Applicable.

Note 2: The EUT uses an Integrated antenna, which gain is 0.5dBi. It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AIMRMITVMDZ28AA, IC: 25940-MITVMDZ28AA Complies with Section 15.205, 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules. and RSS-247 issue 2 and RSS-Gen issue 5 rules.

This report is for the 2.4GHz Wi-Fi.

SUMMARY:

All tests according to the regulations cited on page 5 were

n - Performed

o - **Not** Performed

The Equipment Under Test

n - **Fulfills** the general approval requirements.

o - **Does not** fulfill the general approval requirements.

Sample Received Date: July 6, 2022

Testing Start Date: July 6, 2022

Testing End Date: August 3, 2022

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch.

Reviewed by:

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Tested by:



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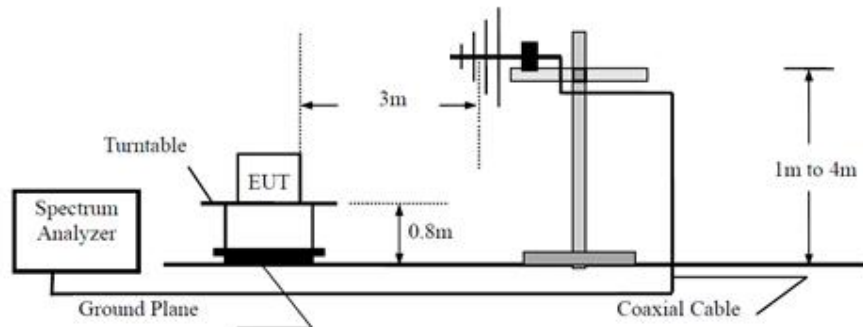


Carry Cai
Test Engineer

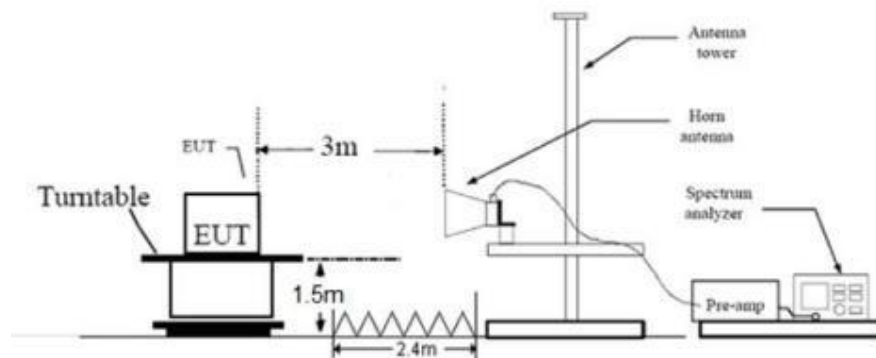
7 Test Setups

7.1 Radiated test setups

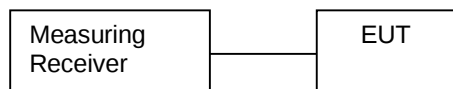
Below 1GHz



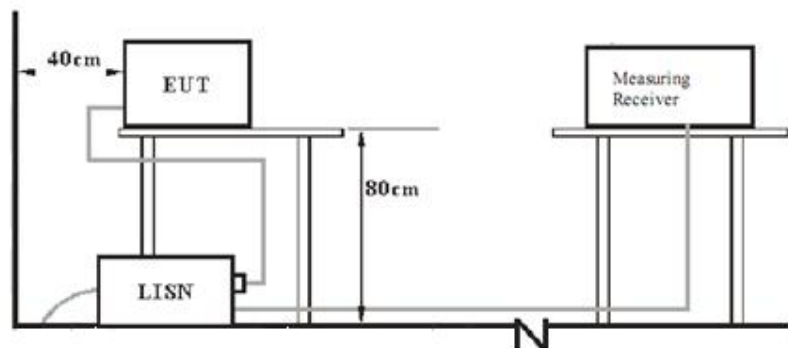
Above 1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Computer	Lenovo	--	--

Through pre-scan all kind of modulation and all kind of rates, find the 1Mbps of rate is the worst case of 802.11b; the 6Mbps of rate is the worst case of 802.11g; the Mcs0 of rate is the worst case of 802.11N20, the Mcs0 of rate is the worst case of 802.11 N40. only the worst case transmitter rate data mode in recorded in the report.

9 Technical Requirement

9.1 Conducted emission AC power port

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

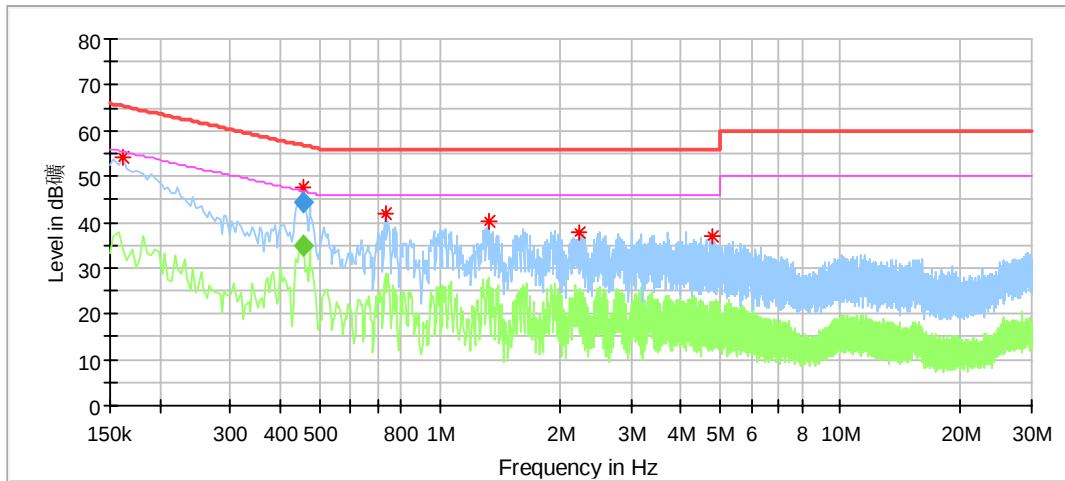
conducted emissions limit as below:

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Remark: “*” Decreasing linearly with logarithm of the frequency

Conducted Emission

Product Type : Xiaomi Box 4K
 M/N : MDZ-28-AA
 Operating Condition : Normal working with transmitting
 Test specification : Live
 Comment : AC 120V/60Hz



Critical Freqs

Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB/m)
0.162000	54.09	---	65.36	11.27	L1	9.26
0.453500	47.42	---	56.73	9.31	L1	9.20
0.730000	41.69	---	56.00	14.31	L1	9.20
1.322000	40.06	---	56.00	15.94	L1	9.21
2.230000	37.90	---	56.00	18.10	L1	9.23
4.798000	36.74	---	56.00	19.26	L1	9.30

Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB/m)
0.453500	---	34.77	46.81	12.04	L1	9.20
0.453500	44.51	---	56.81	12.30	L1	9.20

Remark:

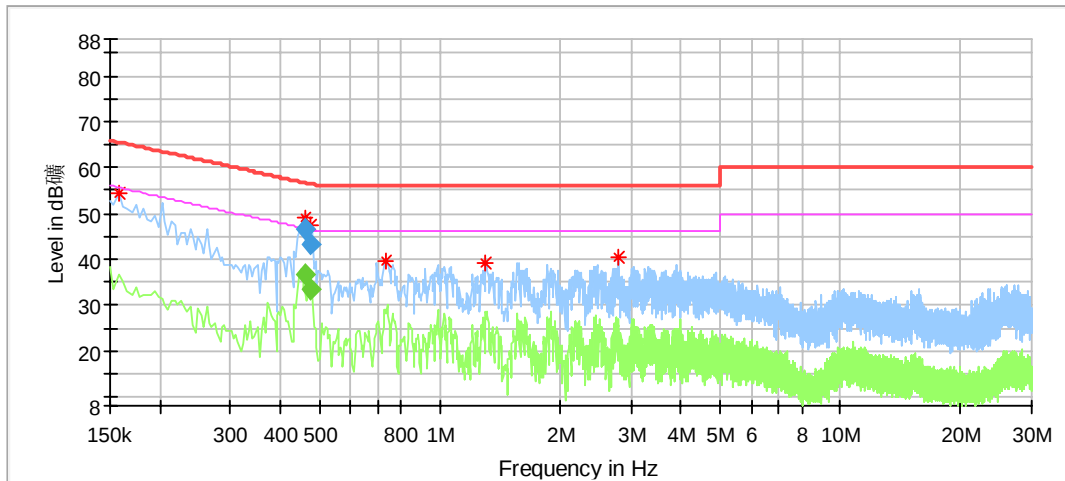
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Xiaomi Box 4K
 M/N : MDZ-28-AA
 Operating Condition : Normal working with transmitting
 Test specification : Neutral
 Comment : AC 120V/60Hz



Critical Freqs

Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB/m)
0.158000	54.48	---	65.57	11.09	N	9.40
0.458500	48.96	---	56.80	7.84	N	9.39
0.473500	47.53	---	56.37	8.85	N	9.39
0.730000	39.66	---	56.00	16.34	N	9.39
1.302000	38.98	---	56.00	17.02	N	9.41
2.806000	40.45	---	56.00	15.55	N	9.44

Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB/m)
0.458500	---	36.85	46.72	9.87	N	9.39
0.458500	46.42	---	56.72	10.30	N	9.39
0.473500	---	33.50	46.45	12.95	N	9.39
0.473500	43.37	---	56.45	13.08	N	9.39

Remark:

Level=Reading Level + Correction Factor

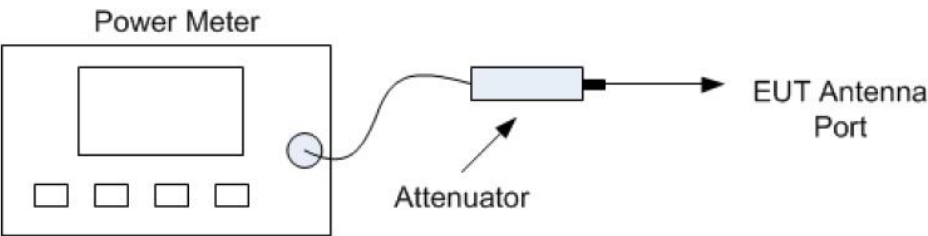
Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

9.2 Conducted peak output power

Test Method

- 1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
- 2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
- 3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- 4) Measure the peak power of the transmitter. This measurement is a peak over both the ON and OFF periods of the transmitter.



Power meter conducted test setup

Limits

Frequency Range MHz	conducted peak output power limit W	conducted peak output power limit dBm	Limit dBm
2400-2483.5	≤1	30	≤30

Frequency Range MHz	EIRP W	EIRP dBm	Limit dBm
2400-2483.5	≤4	36	≤39

Test result as below table

802.11b modulation Test Result

Frequency (MHz)	Conducted Peak Output Power Ant1 (dBm)	Conducted Peak Output Power Ant2 (dBm)	Antenna Gain (dBi)	EIRP Ant1 (dBm)	EIRP Ant2 (dBm)	Result
Low channel 2412MHz	14.0	13.7	0.5	14.5	14.2	Pass
Middle channel 2437MHz	14.2	13.8	0.5	14.7	14.3	Pass
High channel 2462MHz	14.2	13.9	0.5	14.7	14.4	Pass

802.11g modulation Test Result

Frequency (MHz)	Conducted Peak Output Power Ant1 (dBm)	Conducted Peak Output Power Ant2 (dBm)	Antenna Gain (dBi)	EIRP Ant1 (dBm)	EIRP Ant2 (dBm)	Result
Low channel 2412MHz	12.9	12.7	0.5	13.4	13.2	Pass
Middle channel 2437MHz	13.1	12.8	0.5	13.6	13.3	Pass
High channel 2462MHz	13.1	12.9	0.5	13.6	13.4	Pass

802.11n20 modulation Test Result

Frequency (MHz)	Conducted Peak Output Power Ant1 (dBm)	Conducted Peak Output Power Ant2 (dBm)	Total Conducted Peak output power(dBm)	Antenna Gain (dBi)	EIRP Ant1 (dBm)	EIRP Ant2 (dBm)	Total EIRP (dBm)	Result
Low channel 2412MHz	13.3	13.3	16.31	0.5	13.8	13.8	16.81	Pass
Middle channel 2437MHz	13.1	12.9	16.01	0.5	13.6	13.5	16.56	Pass
High channel 2462MHz	13.4	13.3	16.36	0.5	13.9	13.8	16.86	Pass

802.11n40 modulation Test Result

Frequency (MHz)	Conducted Peak Output Power Ant1 (dBm)	Conducted Peak Output Power Ant2 (dBm)	Total Conducted Peak output power(dBm)	Antenna Gain (dBi)	EIRP Ant1 (dBm)	EIRP Ant2 (dBm)	Total EIRP (dBm)	Result
Low channel 2422MHz	13.1	13.2	16.16	0.5	13.6	13.7	16.66	Pass
Middle channel 2437MHz	13.3	13.2	16.26	0.5	13.8	13.7	16.76	Pass
High channel 2452MHz	13.5	13.4	16.46	0.5	14.0	13.9	16.96	Pass

9.3 6dB bandwidth & 99%OBW

Test Method

1. Connect EUT test port to spectrum analyzer.
2. Use the following spectrum analyzer settings:
Set RBW ³ 1% of the 99% bandwidth, VBW ³ RBW.
Sweep = auto, Detector function = peak, Trace = max hold
3. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
4. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]

≥ 500

802.11b modulation Test Result

Frequency (MHz)	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
Low channel 2412MHz	9.120	13.427	Pass
Middle channel 2437MHz	9.120	13.467	Pass
High channel 2462MHz	9.160	13.506	Pass

802.11g modulation Test Result

Frequency (MHz)	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
Low channel 2412MHz	15.200	17.223	Pass
Middle channel 2437MHz	15.200	17.223	Pass
High channel 2462MHz	15.200	17.223	Pass

802.11n-HT20 modulation Test Result

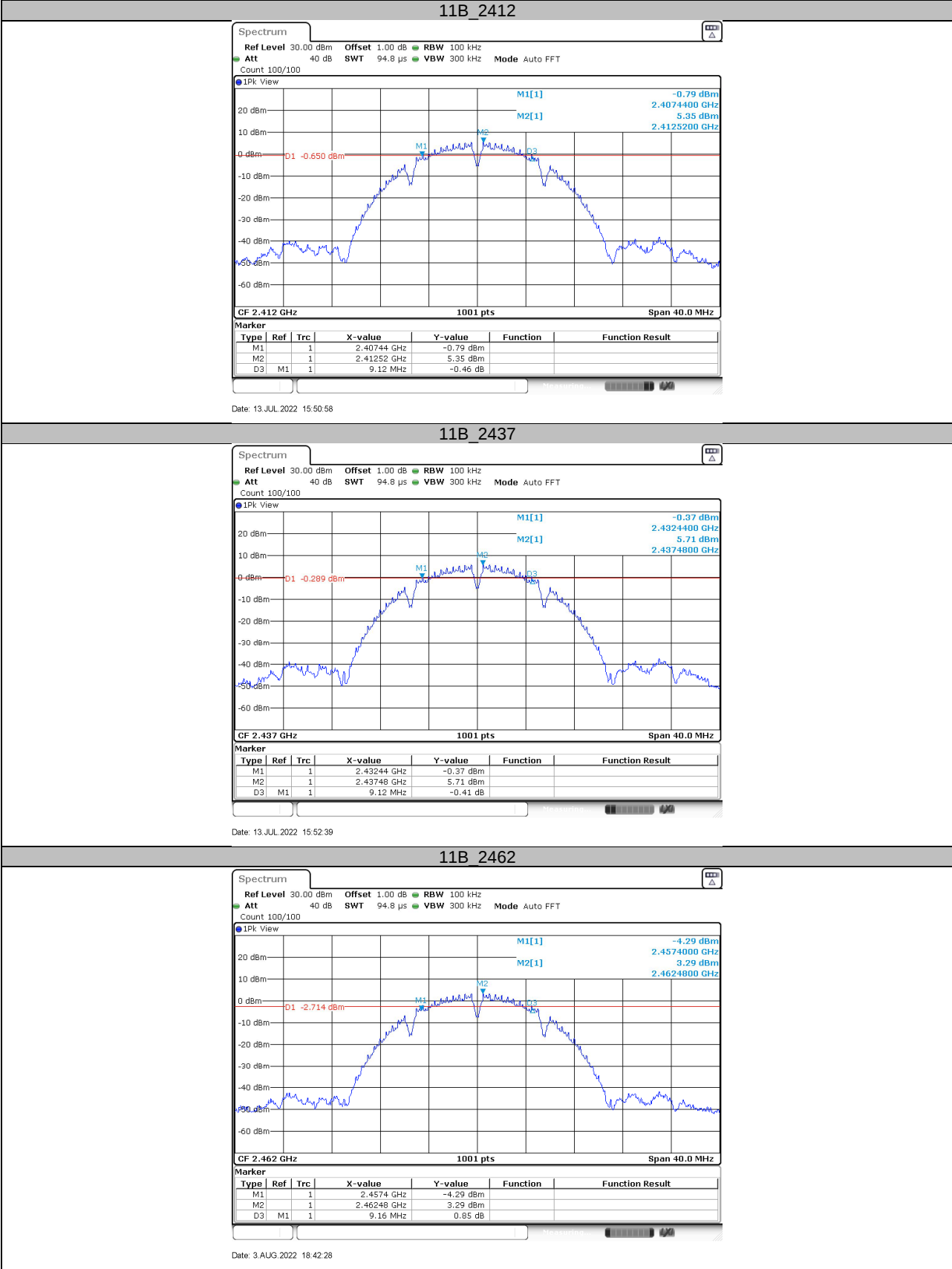
Frequency (MHz)	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
Low channel 2412MHz	15.200	17.982	Pass
Middle channel 2437MHz	15.200	17.982	Pass
High channel 2462MHz	15.200	17.982	Pass

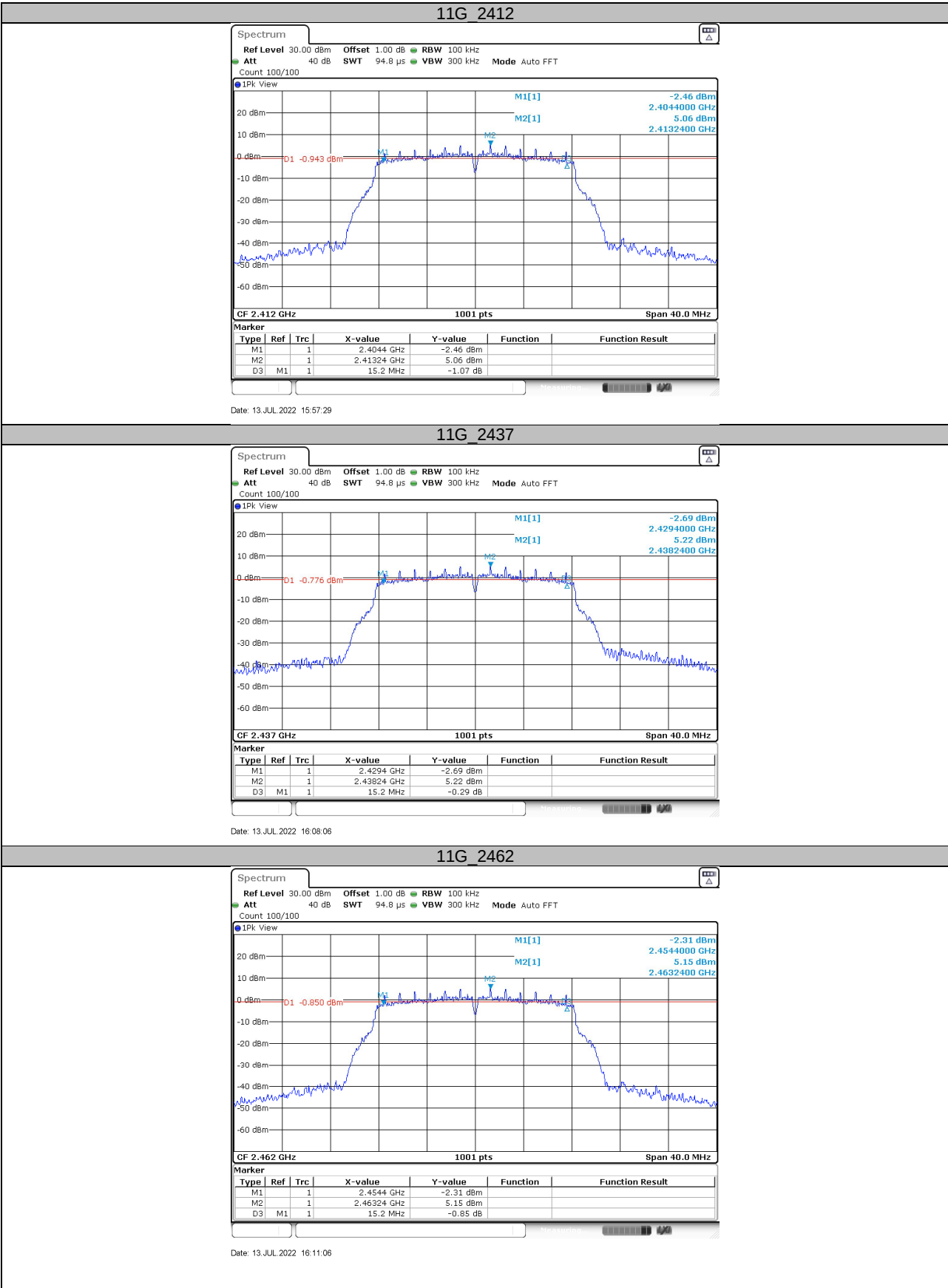
802.11n-HT40 modulation Test Result

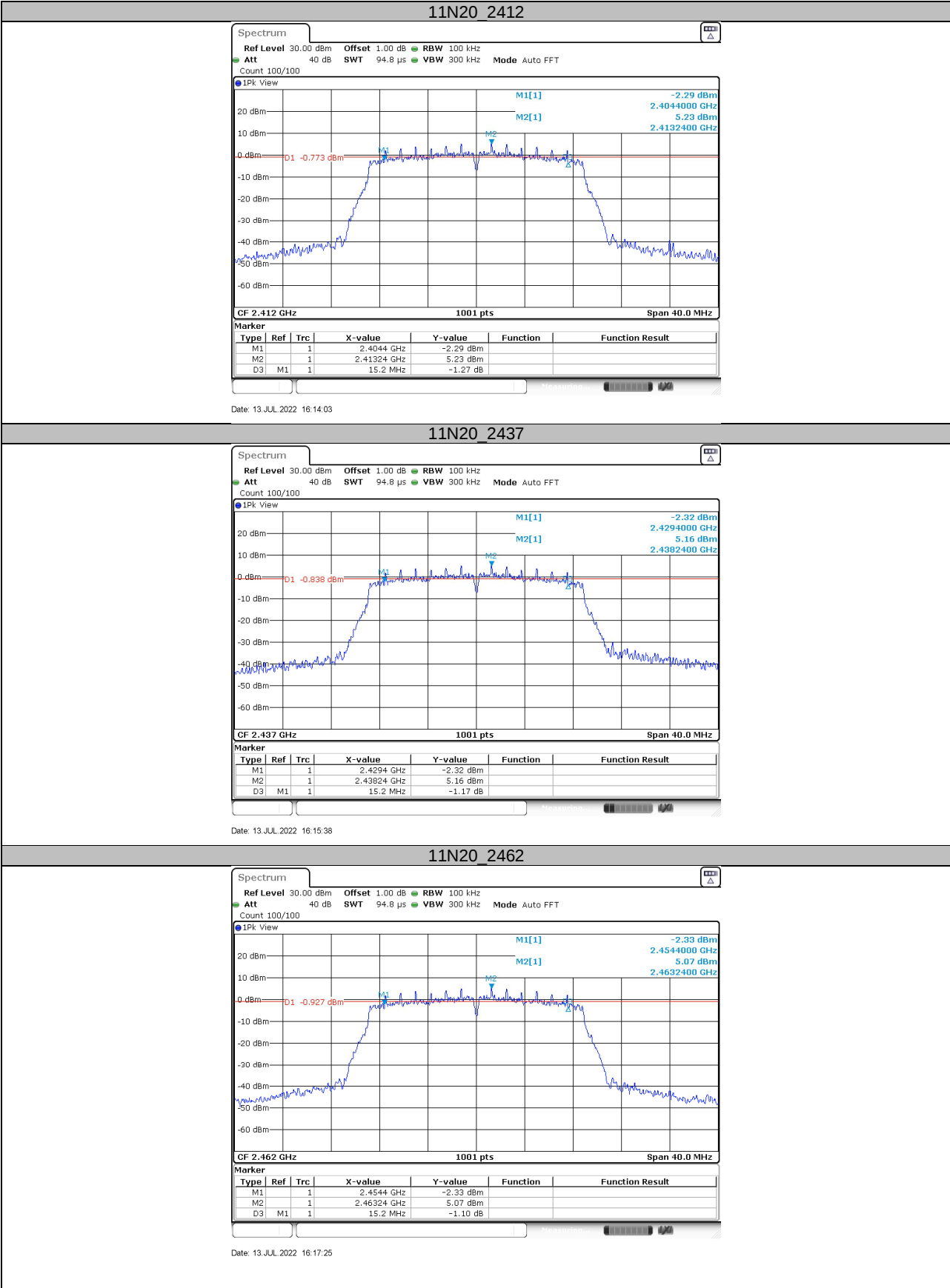
Frequency (MHz)	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
Low channel 2422MHz	35.280	36.284	Pass
Middle channel 2437MHz	35.280	36.124	Pass
High channel 2452MHz	35.280	36.204	Pass

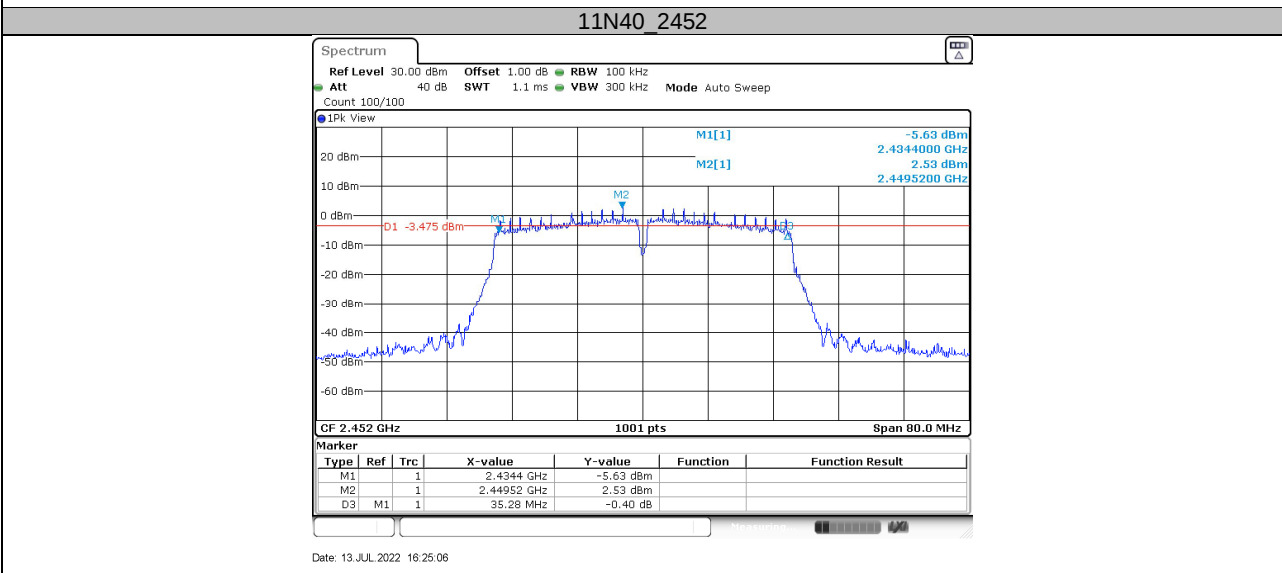
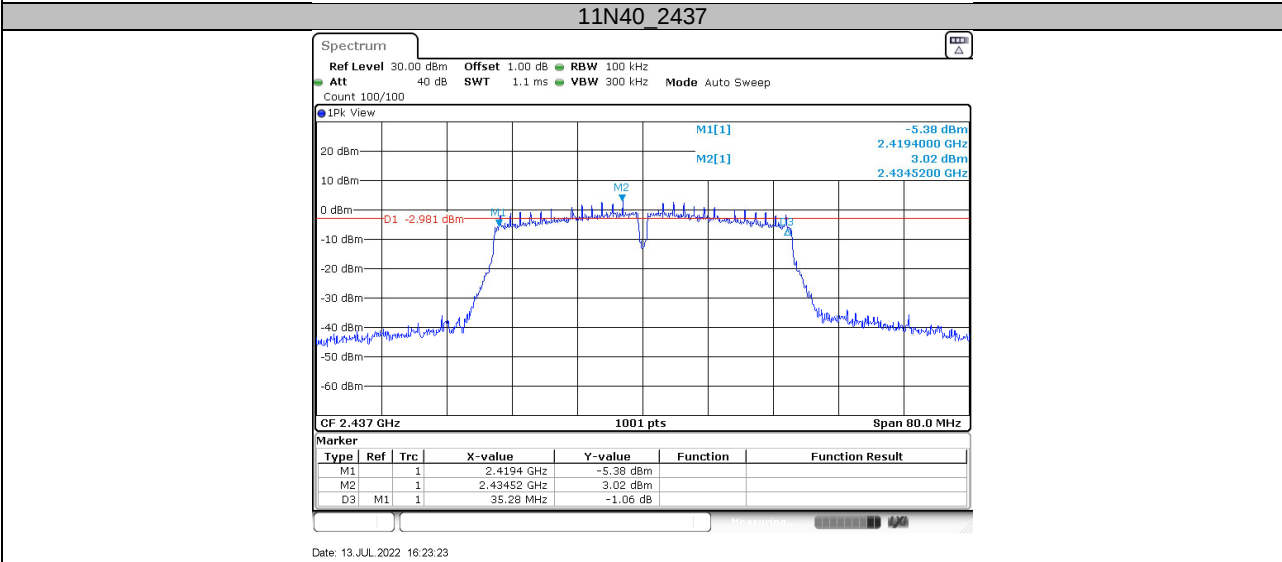
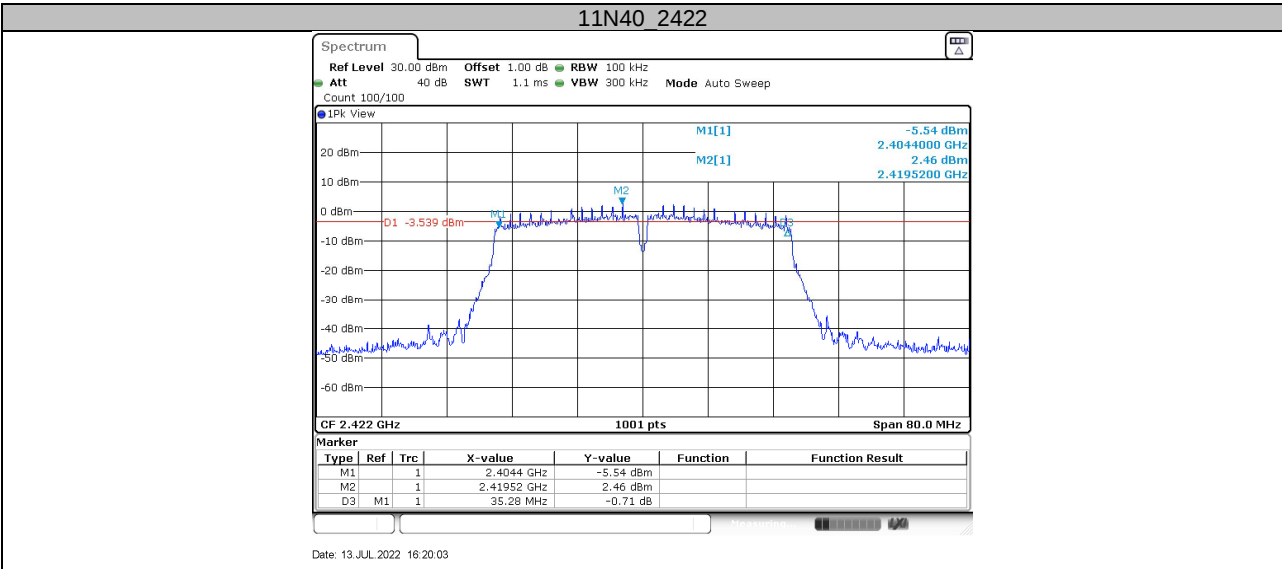


6 dB Bandwidth



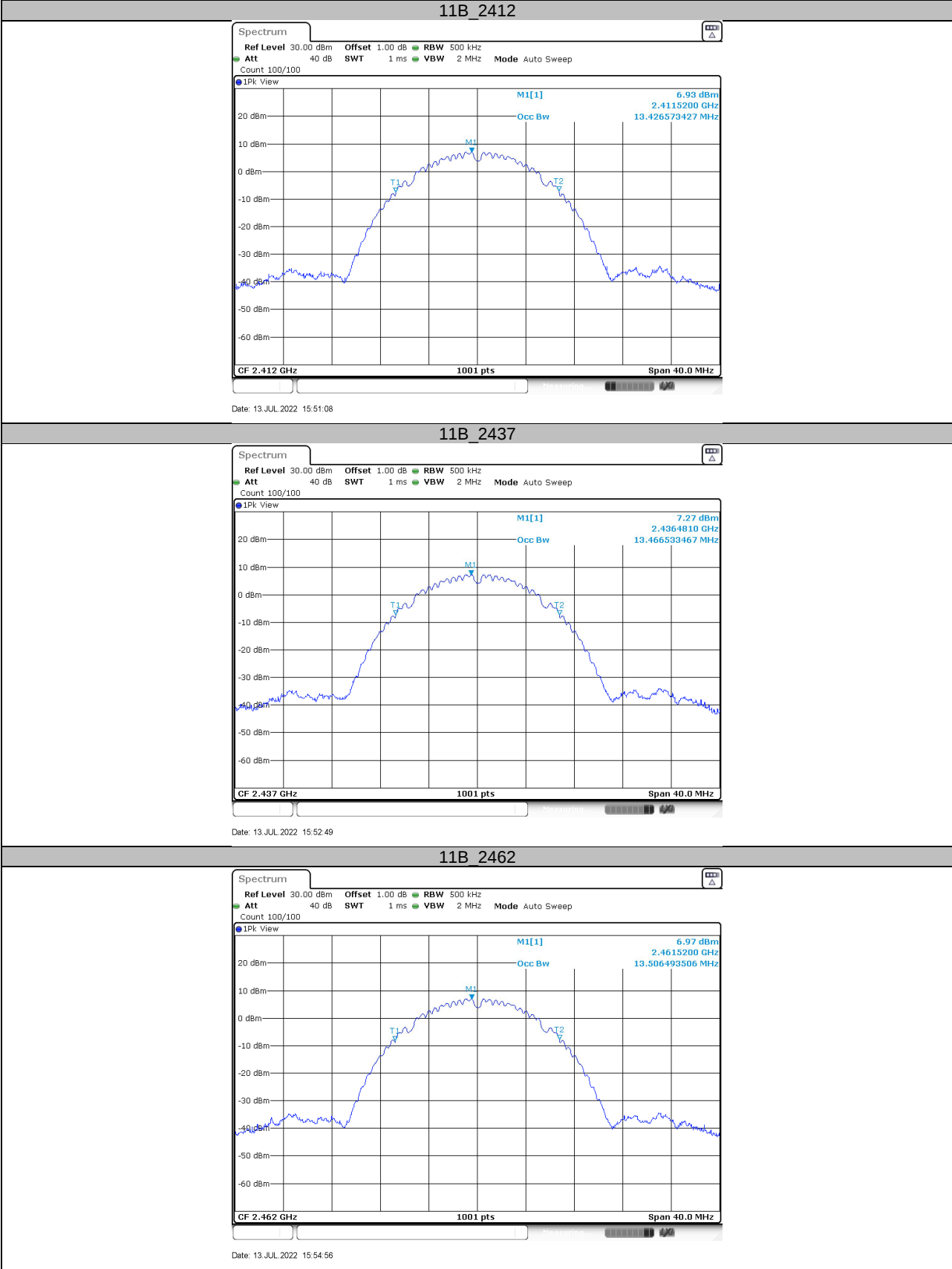


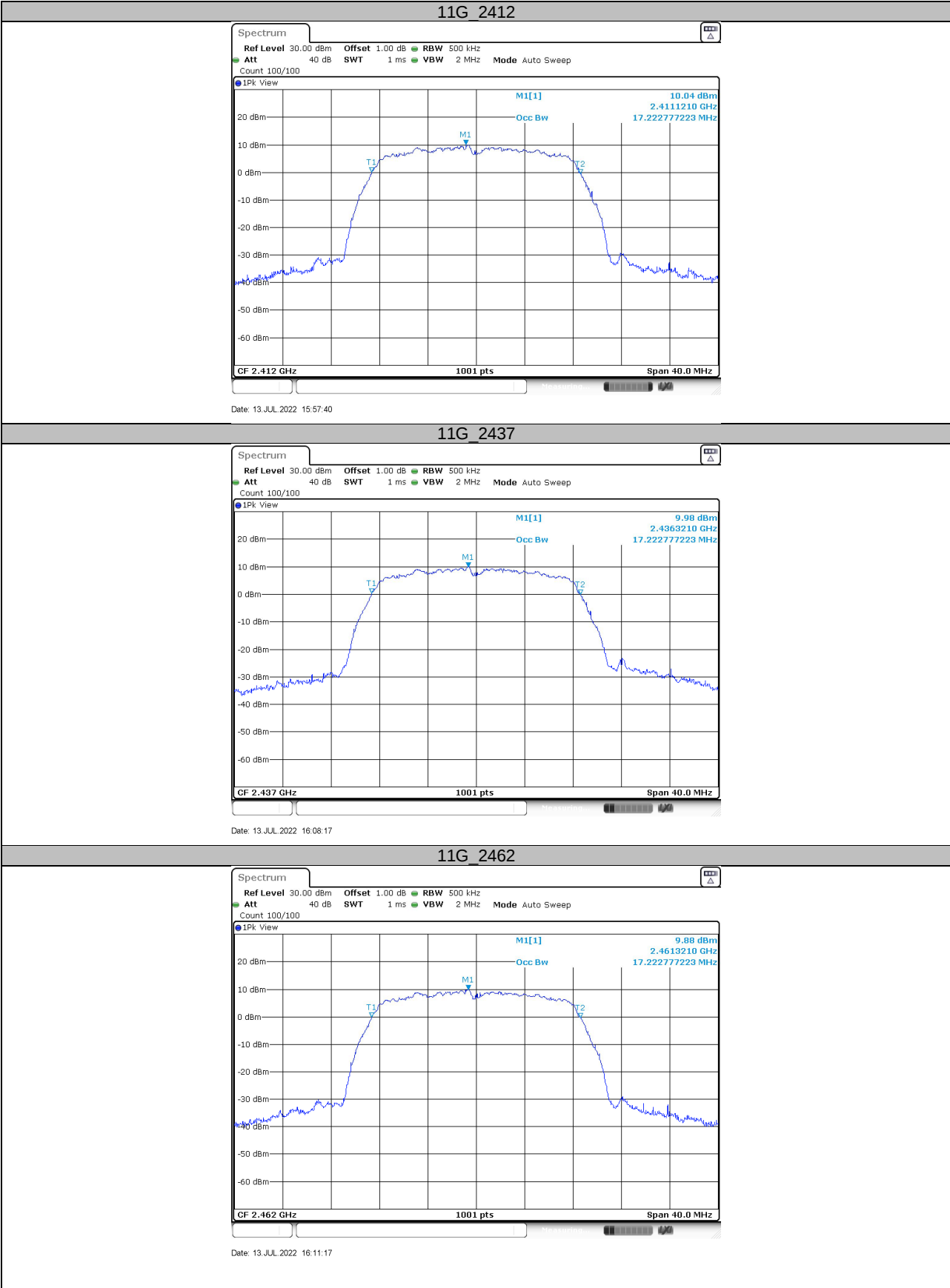


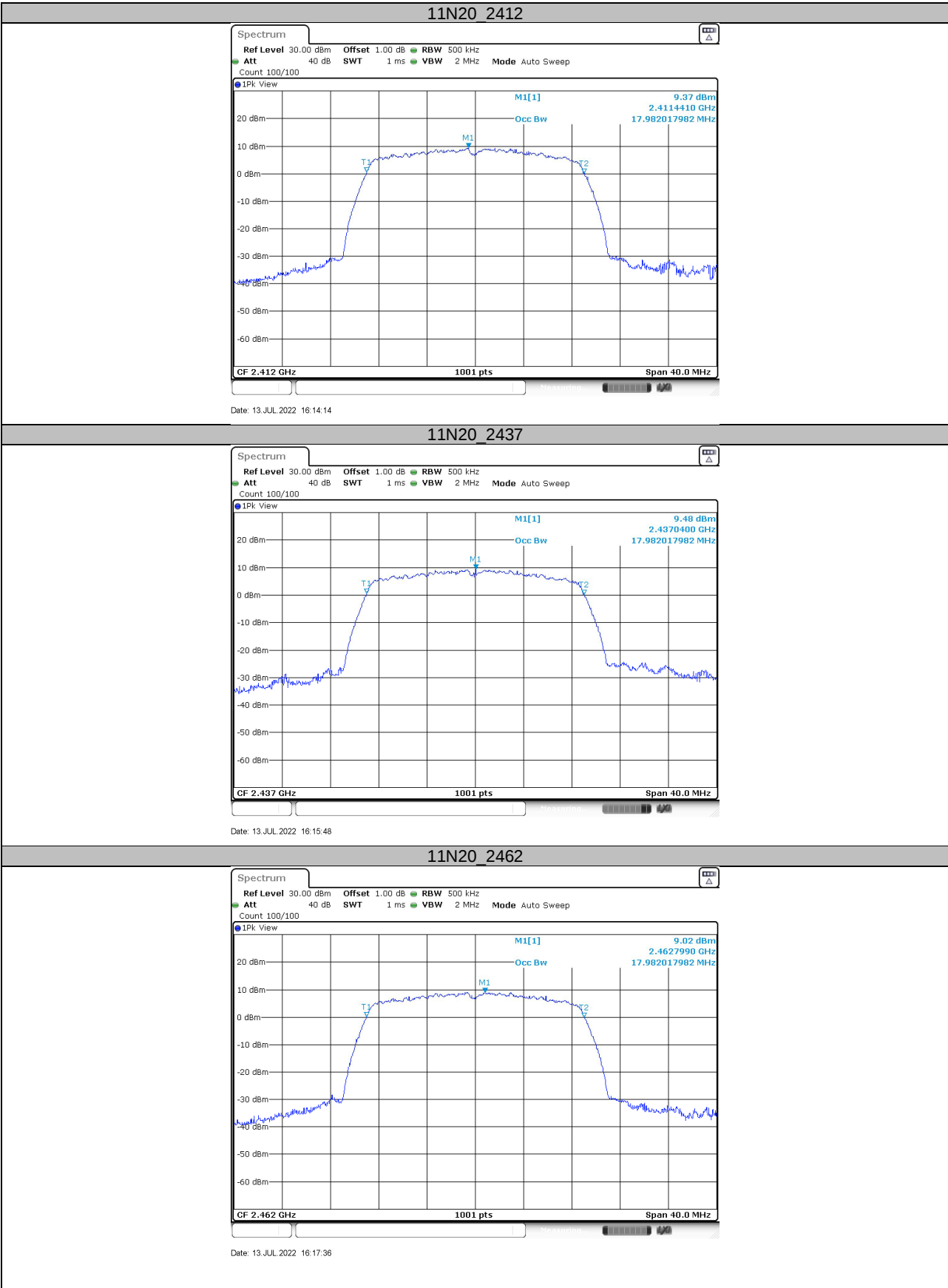


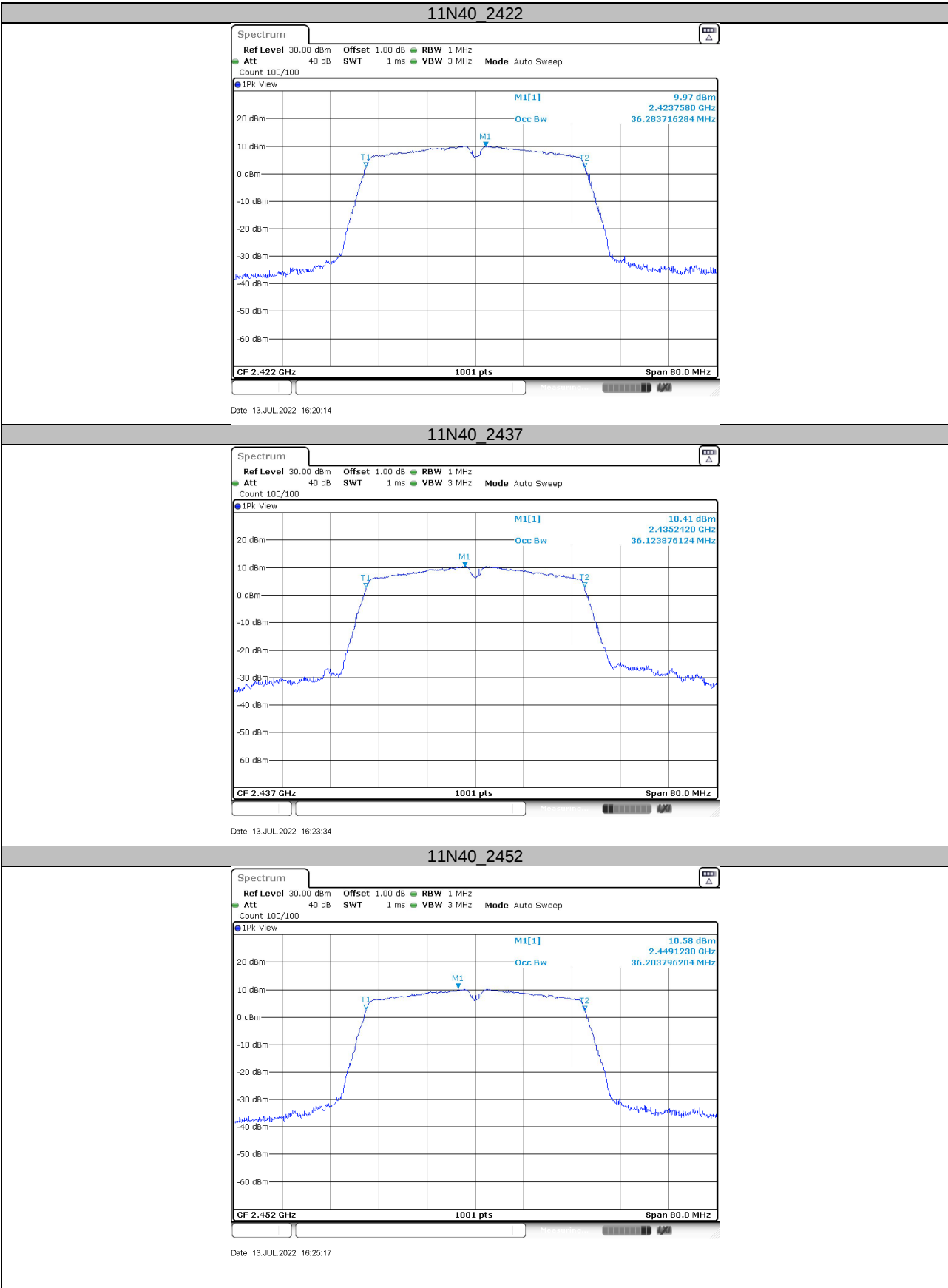


99% dB Bandwidth









9.4 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW $\geq$ 3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm/3kHz]
 ≤ 8

TestMode	Antenna	Channel(MHz)	Result(dBm/3kHz)	Limit(dBm/3kHz)	Verdict
11B	Ant1	2412	2.4	≤ 8	PASS
	Ant2	2412	2.1	≤ 8	PASS
	Ant1	2437	0.43	≤ 8	PASS
	Ant2	2437	2.56	≤ 8	PASS
	Ant1	2462	2.48	≤ 8	PASS
	Ant2	2462	-0.02	≤ 8	PASS
11G	Ant1	2412	2.73	≤ 8	PASS
	Ant2	2412	-1.02	≤ 8	PASS
	Ant1	2437	4.95	≤ 8	PASS
	Ant2	2437	2.96	≤ 8	PASS
	Ant1	2462	2.92	≤ 8	PASS
	Ant2	2462	-0.03	≤ 8	PASS

TestMode	Antenna	Channel(MHz)	Result(dBm/3kHz)	Limit(dBm/3kHz)	Verdict
11N20MIMO	Ant1	2412	-13.24	≤ 8	PASS
	Ant2	2412	-12.56	≤ 8	PASS
	total	2412	-9.88	≤ 8	PASS
	Ant1	2437	-12.18	≤ 8	PASS
	Ant2	2437	-14	≤ 8	PASS
	total	2437	-9.99	≤ 8	PASS
	Ant1	2462	-13.31	≤ 8	PASS
	Ant2	2462	-13.29	≤ 8	PASS
11N40MIMO	total	2462	-10.29	≤ 8	PASS
	Ant1	2422	-15.73	≤ 8	PASS
	Ant2	2422	-15.7	≤ 8	PASS
	total	2422	-12.70	≤ 8	PASS
	Ant1	2437	-16.18	≤ 8	PASS
	Ant2	2437	-16.06	≤ 8	PASS
	total	2437	-13.11	≤ 8	PASS
	Ant1	2452	-16.34	≤ 8	PASS
	Ant2	2452	-16.44	≤ 8	PASS
	total	2452	-13.38	≤ 8	PASS

