



TEST REPORT



Report No. : RF-230796
Page 1 / 296

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■ FCC TEST REPORT

1. Client

- Name : MOVON Corporation
- Address : 140-28 Samsung Dong, Kangnam Ku, Seoul, South Korea

2. Sample Description

- Product item : Wi-Fi 6 and Bluetooth 5.x SOM
- Model name : WBT-MSB
- Manufacturer etc. : Movon Corporation

3. Date of test : 2023.12.15 ~ 2024.01.29

4. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

- Address : 473-21, Gayeo-ro, Yeosu-si, Gyeonggi-do, Korea

5. Test method used : Part 15 Subpart E 15.407

6. Test result : PASS

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This laboratory is not accredited for the test results marked *.
This test report is not related to KOLAS accreditation.

Affirmation	Tested by	Technical Manager
	Name : Gu-Bong, Kang (Signature)	Name : Yeong-Jun Cho (Signature)

[장구홍]2024/01/29

[조영준]2024/01/29

2024 . 01. 29.

KES Co., Ltd.

Accredited by KOLAS, Republic of KOREA



REPORT REVISION HISTORY

Date	Test Report No.	Revision History
2024.01.29	RF-230796	Initial

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Use of uncertainty of measurement for decisions on conformity (decision rule):

- ☒ No decision rule is specified by the standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty("simple acceptance" decision rule, previously known as "accuracy method").
- ☐ Other (to be specified, for example when required by the standard or client)



TABLE OF CONTENTS

1.	General information	4
1.1.	EUT description	4
1.2.	Test configuration.....	5
1.3.	Information about derivative model	5
1.4.	Accessory information	5
1.5.	Device modifications.....	5
1.6.	Sample calculation	6
1.7.	Measurement Uncertainty	6
1.8.	Worst case data rate.....	6
1.9.	Frequency/channel operations	7
2.	Summary of tests	9
3.	Test results	11
3.1.	26 dB bandwidth & 99% Occupied Bandwidth	11
3.2.	6 dB bandwidth	54
3.3.	Maximum conducted output power.....	63
3.4.	Power spectral density	72
3.5.	Frequency Stability	100
3.6.	Radiated restricted band and emissions	105
3.7.	AC conducted emissions	292
3.8.	Antenna Requirement.....	295
Appendix A.	Measurement equipment.....	296



1. General information

Applicant: MOVON Corporation
Applicant address: 140-28 Samsung Dong, Kangnam Ku, Seoul, South Korea
Test site: KES Co., Ltd.
Test site address: ☐ #3002, #3503, #3701, 40, Simin-daero365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Republic of Korea
☒ 473-21, Gayeo-ro, Yeosu-si, Gyeonggi-do, Korea
Test Facility: FCC Accreditation Designation No.: KR0100, Registration No.: 444148
FCC rule part(s): 15.407
FCC ID: TDU-WBT-MSB
Test device serial No.: ☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test: Wi-Fi 6 and Bluetooth 5.x SOM
Frequency range & Number of channels:
2 402 MHz ~ 2 480 MHz (BDR/EDR) : 79 ch
2 402 MHz ~ 2 480 MHz (LE 1 Mbps/LE 2 Mbps) : 40 ch
2 412 MHz ~ 2 462 MHz (802.11b/g/n_HT20/ax_HE20) : 11 ch
2 422 MHz ~ 2 452 MHz (802.11n_HT40/ax_HE40) : 7 ch
5 180 MHz ~ 5 240 MHz (802.11a/n_HT20/ac_VHT20/ax_HE20) : 4 ch
UNII-1 5 190 MHz ~ 5 230 MHz (802.11n_HT40/ac_VHT40/ax_HE40) : 2 ch
5 210 MHz (802.11ac_VHT80/ax_HE80) : 1 ch
5 260 MHz ~ 5 320 MHz (802.11a/n_HT20/ac_VHT20/ax_HE20) : 4 ch
UNII-2A 5 270 MHz ~ 5 310 MHz (802.11n_HT40/ac_VHT40/ax_HE40) : 2 ch
5 290 MHz (802.11ac_VHT80/ax_HE80) : 1 ch
5 500 MHz ~ 5 720 MHz (802.11a/n_HT20/ac_VHT20/ax_HE20) : 12 ch
UNII-2C 5 510 MHz ~ 5 710 MHz (802.11n_HT40/ac_VHT40/ax_HE40) : 6 ch
5 530 MHz ~ 5 690 MHz (802.11ac_VHT80/ax_HE80) : 3 ch
5 745 MHz ~ 5 825 MHz (802.11a/n_HT20/ac_VHT20/ax_HE20) : 5 ch
UNII-3 5 755 MHz ~ 5 795 MHz (802.11n_HT40/ac_VHT40/ax_HE40) : 2 ch
5 775 MHz (802.11ac_VHT80/ax_HE80) : 1 ch
Model: WBT-MSB
Modulation technique: GFSK, π /4DQPSK, 8DPSK, **DSSS**, **OFDM**
Antenna specification: 2.4 GHz band Chip Antenna // Peak gain: 0.01 dBi
5 GHz band Chip Antenna // Peak gain: -2.18 dBi
Power source: DC 3.3 V & DC 1.8 V
H/W version: V003
S/W version: V003

**1.2. Test configuration**

The **MOVON Corporation // Wi-Fi 6 and Bluetooth 5.x SOM // WBT-MSB // FCC ID: TDU-WBT-MSB** was tested according to the specification of EUT, the EUT must comply with following standards and KDB documents.

FCC Part 15.407
KDB 789033 D02 v02r01
ANSI C63.10-2013

1.3. Information about derivative model

N/A

1.4. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
-	-	-	-	-

1.5. Device modifications

N/A

**1.6. Sample calculation**

Where relevant, the following sample calculation is provided
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.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 1.36 + 10 = 11.36 \text{ (dB)}\end{aligned}$$

For Radiation test :

$$\text{Field strength level (dB}\mu\text{V/m)} = \text{Measured level (dB}\mu\text{V)} + \text{Antenna factor (dB)} + \text{Cable loss (dB)} - \text{Amplifier gain (dB)}$$

1.7. Measurement Uncertainty

Test Item		Uncertainty
Uncertainty for Conduction emission test		2.22 dB (SHIELD ROOM #6)
Uncertainty for Radiation emission test (include Fundamental emission)	Below 1 GHz	4.04 dB (SAC #6)
	Above 1 GHz	5.32 dB (SAC #5)
Note. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

1.8. Worst case data rate

1. Worst-case data rates were:

Mode	Data rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11ac VHT20	
802.11ax HE20	
802.11n HT40	
802.11ac VHT40	
802.11ax HE40	
802.11ac VHT80	
802.11ax HE80	



1.9. Frequency/channel operations

Ch.	Frequency (MHz)	Rate(Mbps)
00	2 402	BDR 1 Mbps, EDR 2 Mbps, EDR 3 Mbps
.	.	.
40	2 442	BDR 1 Mbps, EDR 2 Mbps, EDR 3 Mbps
.	.	.
78	2 480	BDR 1 Mbps, EDR 2 Mbps, EDR 3 Mbps

Ch.	Frequency (MHz)	Rate(Mbps)
00	2 402	LE 1 Mbps, LE 2 Mbps
.	.	.
20	2 442	LE 1 Mbps, LE 2 Mbps
.	.	.
39	2 480	LE 1 Mbps, LE 2 Mbps

Ch.	Frequency (MHz)	Mode
1	2 412	802.11b/g/n_HT20/ax_HE20
.	.	.
6	2 437	802.11b/g/n_HT20/ax_HE20
.	.	.
11	2 462	802.11b/g/n_HT20/ax_HE20

Ch.	Frequency (MHz)	Mode
3	2 422	802.11n_HT40/ax_HE40
.	.	.
6	2 437	802.11n_HT40/ax_HE40
.	.	.
9	2 452	802.11n_HT40/ax_HE40



UNII-1

Ch.	Frequency (MHz)
36	5 180
44	5 220
48	5 240

UNII-2A

Ch.	Frequency (MHz)
52	5 260
56	5 280
64	5 320

UNII-2C

Ch.	Frequency (MHz)
100	5 500
120	5 600
144	5 720

UNII-3

Ch.	Frequency (MHz)
149	5 745
157	5 785
165	5 825

802.11a/n_HT20/ac_VHT20/ax_HE20 mode

UNII-1

Ch.	Frequency (MHz)
38	5 190
46	5 230

UNII-2A

Ch.	Frequency (MHz)
54	5 270
62	5 310

UNII-2C

Ch.	Frequency (MHz)
102	5 510
118	5 590
142	5 710

UNII-3

Ch.	Frequency (MHz)
151	5 755
159	5 795

802.11n_HT40/ac_VHT40/ax_HE40 mode

UNII-1

Ch.	Frequency (MHz)
42	5 210

UNII-2A

Ch.	Frequency (MHz)
58	5 290

UNII-2C

Ch.	Frequency (MHz)
106	5 530
122	5 610
138	5 690

UNII-3

Ch.	Frequency (MHz)
155	5 775

802.11ac_VHT80/ax_HE80 mode



2. Summary of tests

Section in FCC Part 15	Parameter	Test results
15.407(a)	26 dB bandwidth & 99 % bandwidth	Pass
15.407(a)	6 dB bandwidth	Pass
15.407(a)	Maximum conducted output power	Pass
15.407(a)	Power spectral density	Pass
15.407(g)	Frequency stability	Pass
15.205, 15.209, 15.407(b)	Radiated restricted band and emission	Pass
15.207(a)	AC power line conducted emissions	Pass ^{Note.1}
15.203	Antenna Requirement	Pass

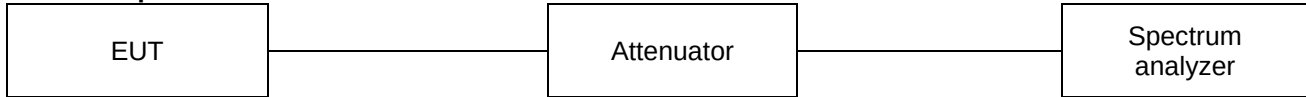
Note.

1. Because this product operates only when DC 3.3 V and DC 1.8 V are supplied simultaneously, the AC Conducted emissions test was performed once on the DC 3.3 V line and once on the DC 1.8 V line.
2. By the request of applicant, test is performed with power setting value below :

Mode	UNII-1		UNII-2A	
	Frequency (MHz)	Setting value	Frequency (MHz)	Setting value
802.11a (6 Mbps)	5 180 ~ 5 240	16	5 260 ~ 5 320	16
802.11n_HT20 (MCS0)		14		14
802.11ac_VHT20 (MCS0)		14		14
802.11ax_HE20 (MCS0)		13		13
802.11n_HT40 (MCS0)	5 190 ~ 5 230	14	5 270 ~ 5 310	14
802.11ac_VHT40 (MCS0)		12		12
802.11ax_HE40 (MCS0)		12		12
802.11ac_VHT80 (MCS0)	5 210	7	5 290	7
802.11ax_HE80 (MCS0)		7		7



Mode	UNII-2C		UNII-3	
	Frequency (Mhz)	Setting value	Frequency (Mhz)	Setting value
802.11a (6 Mbps)	5 500	16	5 745 ~ 5 825	16
	5 600	16		
	5 700	14		
	5 720	14		
802.11n_HT20 (MCS0)	5 500	14		14
	5 600	14		
	5 700	13		
	5 720	13		
802.11ac_VHT20 (MCS0)	5 500	14		14
	5 600	14		
	5 700	13		
	5 720	13		
802.11ax_HE20 (MCS0)	5 500	14		13
	5 600	14		
	5 700	13		
	5 720	13		
802.11n_HT40 (MCS0)	5 510	15	5 755 ~ 5 795	14
	5 670	14		
	5 710	14		
802.11ac_VHT40 (MCS0)	5 510	13		12
	5 670	12		
	5 710	12		
802.11ax_HE40 (MCS0)	5 510	13		12
	5 670	12		
	5 710	12		
802.11ac_VHT80 (MCS0)	5 530	8	5 775	7
	5 610	8		
	5 690	8		
802.11ax_HE80 (MCS0)	5 530	8		7
	5 610	8		
	5 690	8		

**3. Test results****3.1. 26 dB bandwidth & 99% Occupied Bandwidth****Test setup****Test procedure****26 dB bandwidth**

KDB 789033 D02 v02r01– Section C.1

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

99 % bandwidth

KDB 789033 D02 v02r01– Section D

1. Set span = 1.5 times to 5.0 times the OBW.
2. Set RBW = 1% to 5% of the OBW
3. Set the VBW > 3 x RBW.
4. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak bandwidth function of the instrument (if available).
5. Use the 99% power bandwidth function of the instrument (if available).
6. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Limit

N/A

**Test results**

Band	Frequency(MHz)	Mode	26 dB bandwidth(MHz)	99 % bandwidth(MHz)
UNII-1	5 180	802.11a (6 Mbps)	19.37	16.54
	5 220		19.63	16.49
	5 240		19.50	16.59
UNII-2A	5 260		19.57	16.46
	5 280		19.88	16.50
	5 320		19.70	16.60
UNII-2C	5 500		20.08	16.70
	5 600		20.19	16.73
	5 720		19.83	16.55
UNII-3	5 745		19.69	16.72
	5 785		19.77	16.81
	5 825		19.64	16.73
UNII-2C (Band-crossing channels)	5 720		15.11	N/A
UNII-1	5 180	802.11n_ HT20 (MCS0)	20.24	17.69
	5 220		20.13	17.68
	5 240		19.96	17.69
UNII-2A	5 260		20.17	17.64
	5 280		19.86	17.68
	5 320		19.92	17.70
UNII-2C	5 500		19.95	17.77
	5 600		20.29	17.74
	5 720		20.15	17.73
UNII-3	5 745		20.36	17.85
	5 785		20.19	17.76
	5 825		20.11	17.82
UNII-2C (Band-crossing channels)	5 720		15.25	N/A



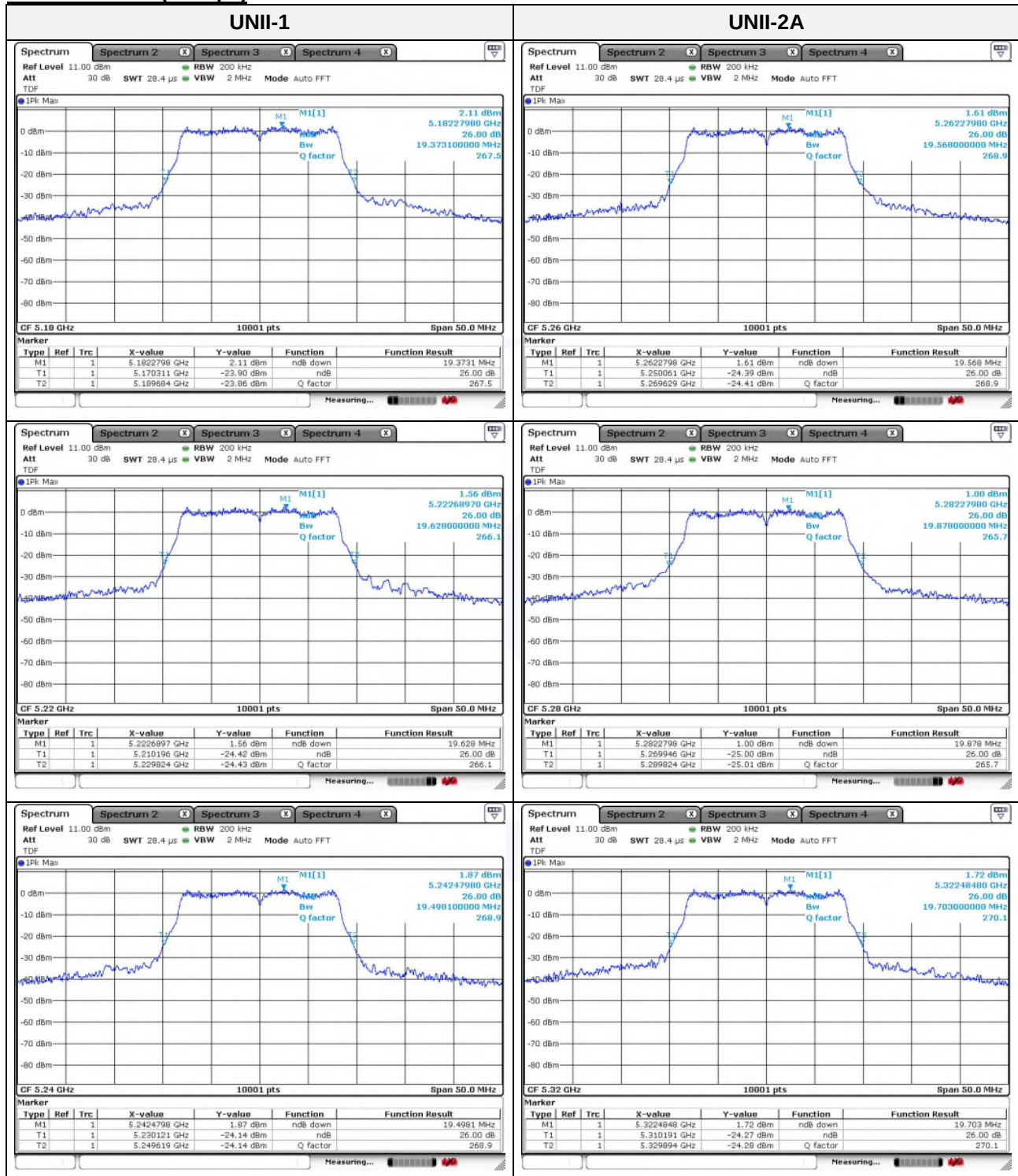
Band	Frequency(MHz)	Mode	26 dB bandwidth(MHz)	99 % bandwidth(MHz)
UNII-1	5 180	802.11ac_VHT20 (MCS0)	20.00	17.71
	5 220		19.94	17.76
	5 240		20.01	17.71
UNII-2A	5 260		20.77	17.76
	5 280		19.95	17.77
	5 320		20.01	17.71
UNII-2C	5 500		20.23	17.79
	5 600		20.25	17.80
	5 720		19.99	17.78
UNII-3	5 745		20.32	17.83
	5 785		20.23	17.82
	5 825		19.92	17.77
UNII-2C (Band-crossing channels)	5 720		15.27	N/A
UNII-1	5 180	802.11ax_HE20 (MCS0)	19.28	16.54
	5 220		19.12	16.53
	5 240		19.38	16.48
UNII-2A	5 260		19.06	16.54
	5 280		19.11	16.58
	5 320		19.17	16.48
UNII-2C	5 500		20.11	16.58
	5 600		19.80	16.53
	5 720		19.51	16.61
UNII-3	5 745		19.38	16.64
	5 785		19.34	16.53
	5 825		19.34	16.55
UNII-2C (Band-crossing channels)	5 720		14.98	N/A

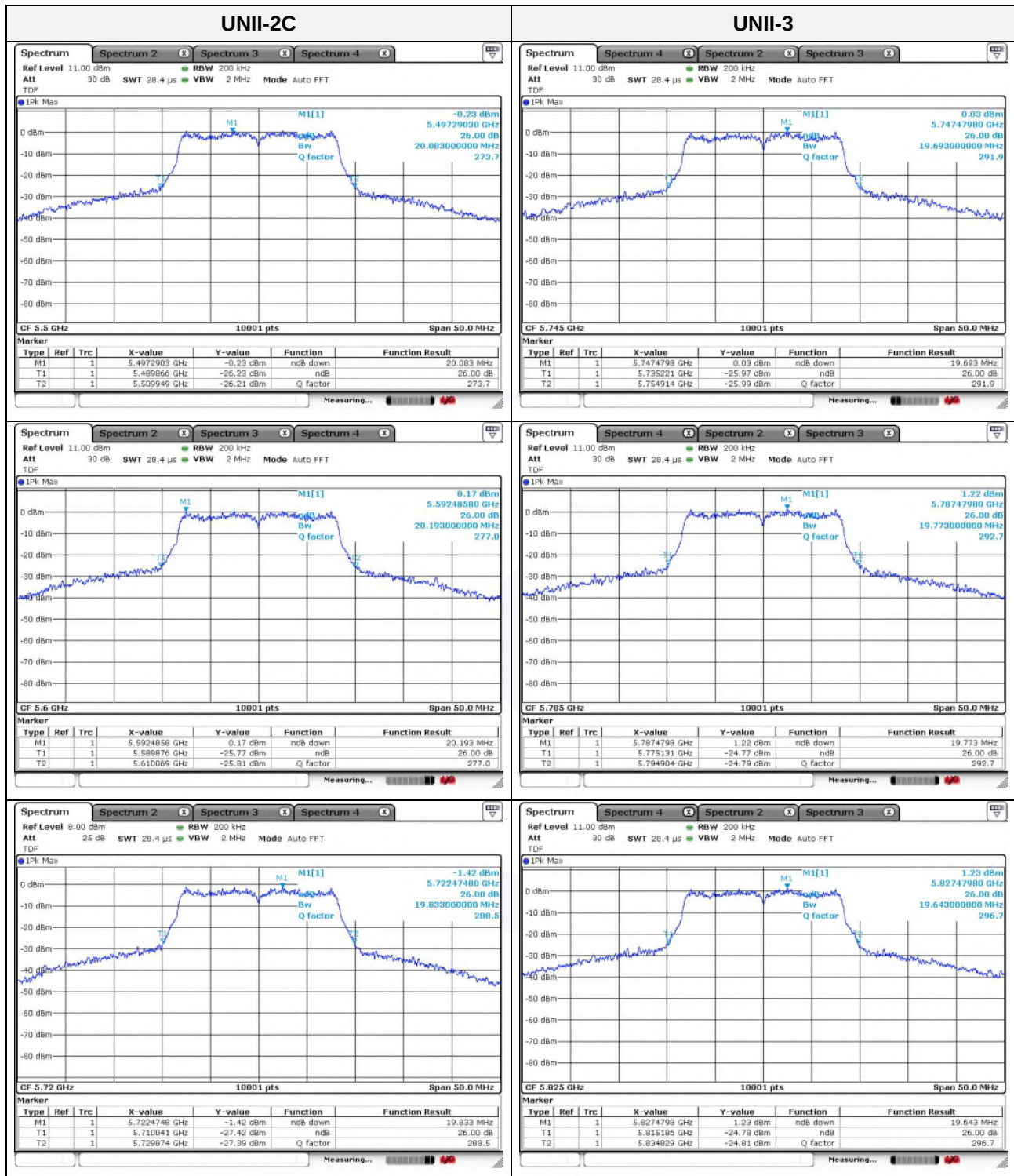


Band	Frequency(MHz)	Mode	26 dB bandwidth(MHz)	99 % bandwidth(MHz)
UNII-1	5 190	802.11n_ HT40 (MCS0)	40.42	36.20
	5 230		40.49	36.50
UNII-2A	5 270		40.97	36.40
	5 310		40.72	36.22
UNII-2C	5 510		40.63	36.53
	5 590		41.26	36.75
	5 710		41.04	36.31
UNII-3	5 755		41.05	36.64
	5 795		40.45	36.65
UNII-2C (Band-crossing channels)	5 710		35.53	N/A
UNII-1	5 190	802.11ac_ VHT40 (MCS0)	40.20	36.20
	5 230		40.47	36.57
UNII-2A	5 270		40.56	36.30
	5 310		40.24	36.21
UNII-2C	5 510		41.07	36.37
	5 590		41.12	36.35
	5 710		40.53	36.31
UNII-3	5 755		41.00	36.55
	5 795		40.59	36.62
UNII-2C (Band-crossing channels)	5 710		35.33	N/A
UNII-1	5 190	802.11ax_ HE40 (MCS0)	40.36	37.74
	5 230		40.13	37.75
UNII-2A	5 270		40.37	37.60
	5 310		40.11	37.53
UNII-2C	5 510		40.21	37.81
	5 590		40.36	37.74
	5 710		40.75	37.62
UNII-3	5 755		40.75	38.06
	5 795		40.34	37.97
UNII-2C (Band-crossing channels)	5 710		35.65	N/A



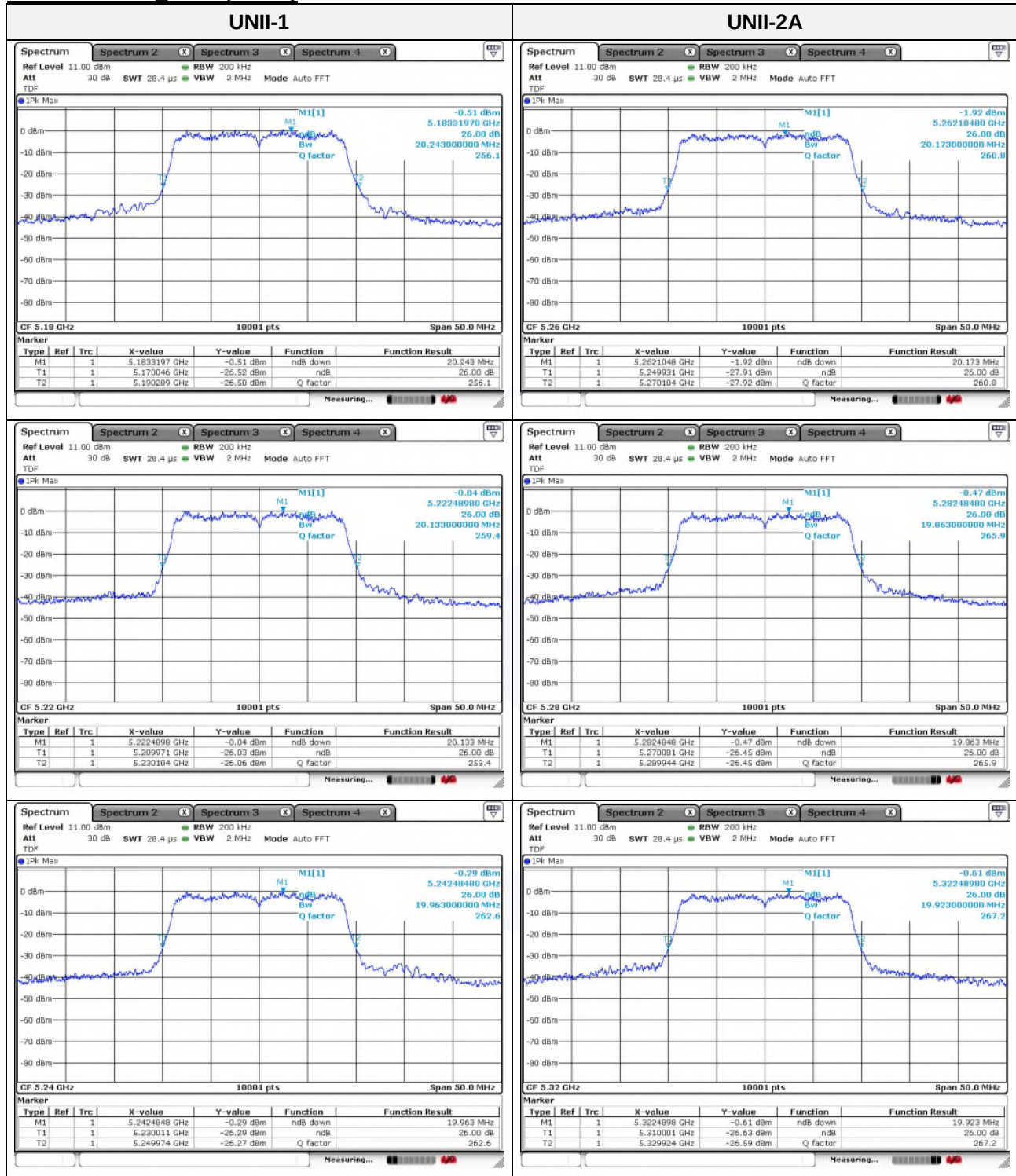
Band	Frequency(MHz)	Mode	26 dB bandwidth(MHz)	99 % bandwidth(MHz)
UNII-1	5 210	802.11ac_VHT80 (MCS0)	81.63	76.13
UNII-2A	5 290		81.85	76.41
UNII-2C	5 530		81.49	76.15
	5 610		81.75	76.77
	5 690		81.53	75.97
UNII-3	5 775		82.39	76.07
UNII-2C (Band-crossing channels)	5 690		75.96	N/A
UNII-1	5 210	802.11ax_HE80 (MCS0)	80.71	77.73
UNII-2A	5 290		80.83	77.65
UNII-2C	5 530		80.61	77.71
	5 610		80.35	77.81
	5 690		80.41	77.75
UNII-3	5 775		80.79	77.55
UNII-2C (Band-crossing channels)	5 690		75.50	N/A

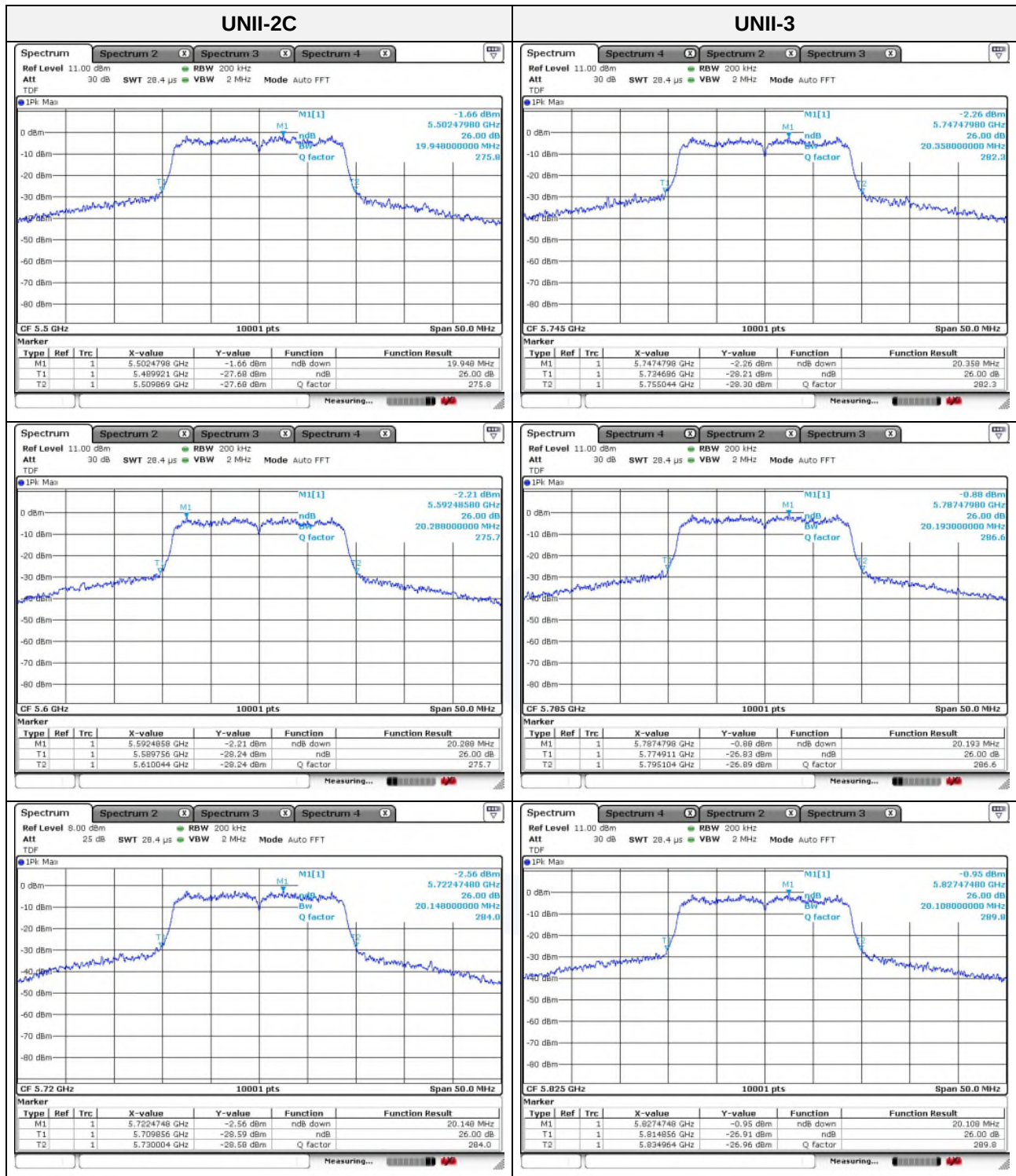
**26 dB bandwidth****Mode : 802.11a (6 Mbps)**





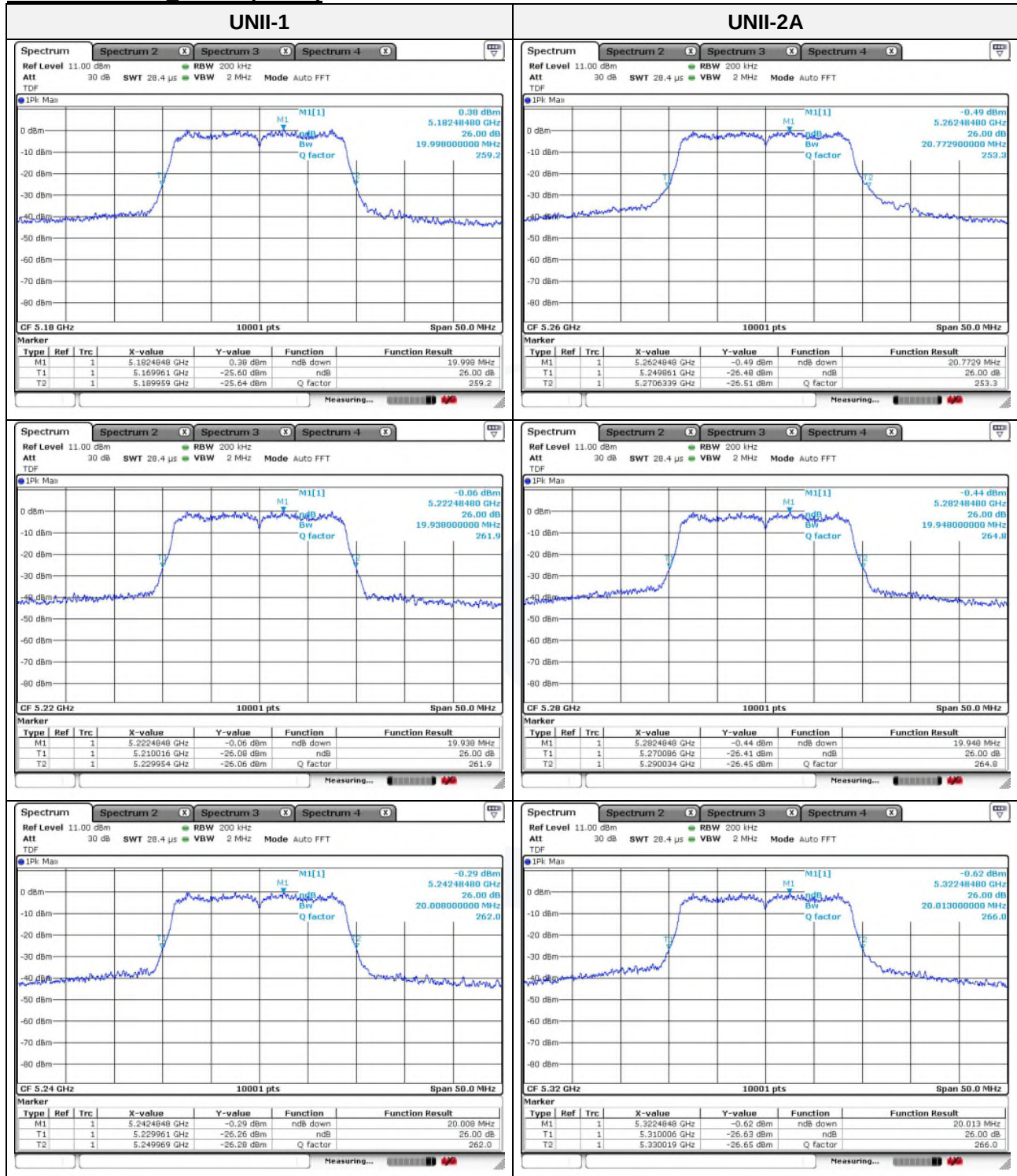
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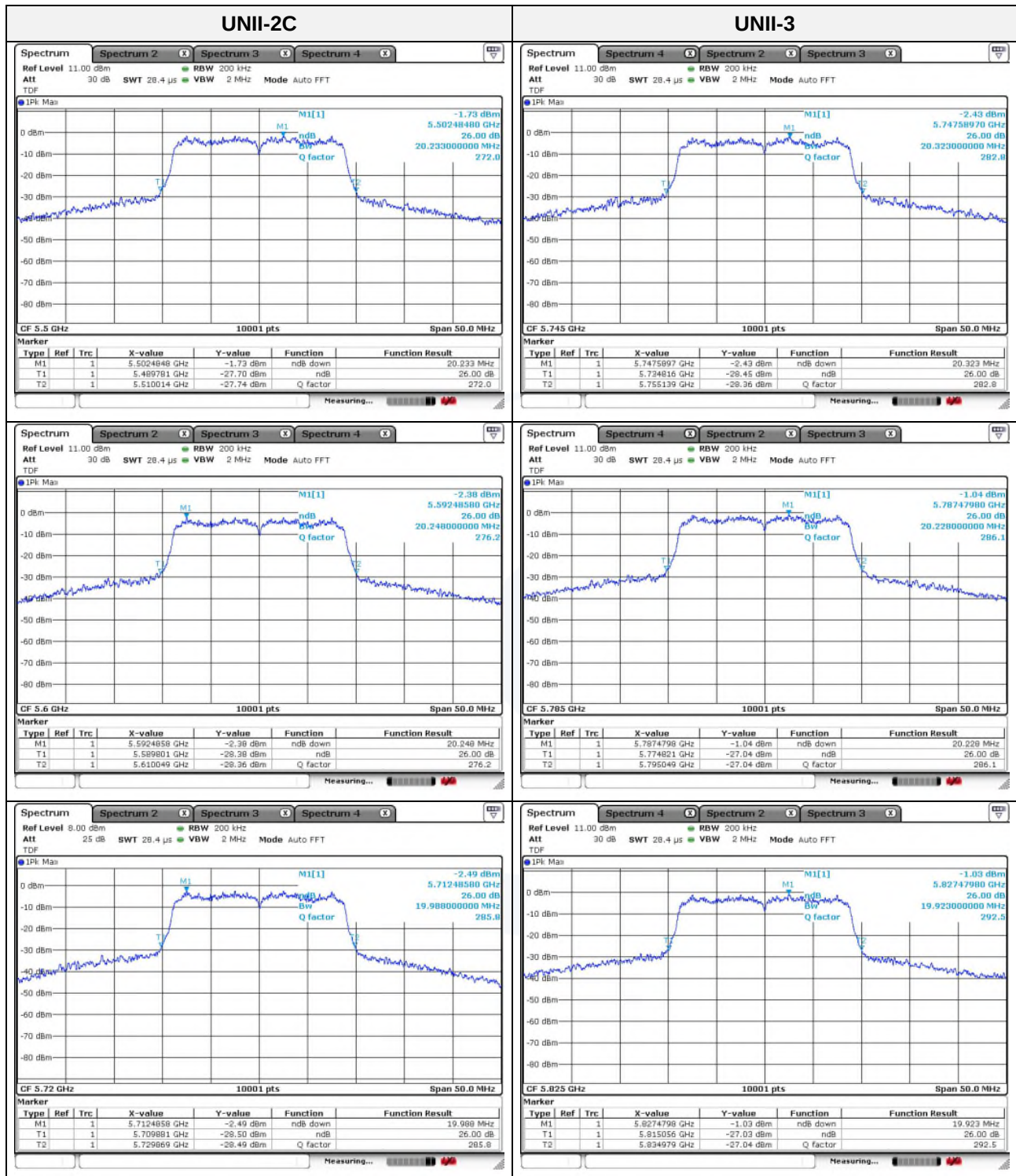






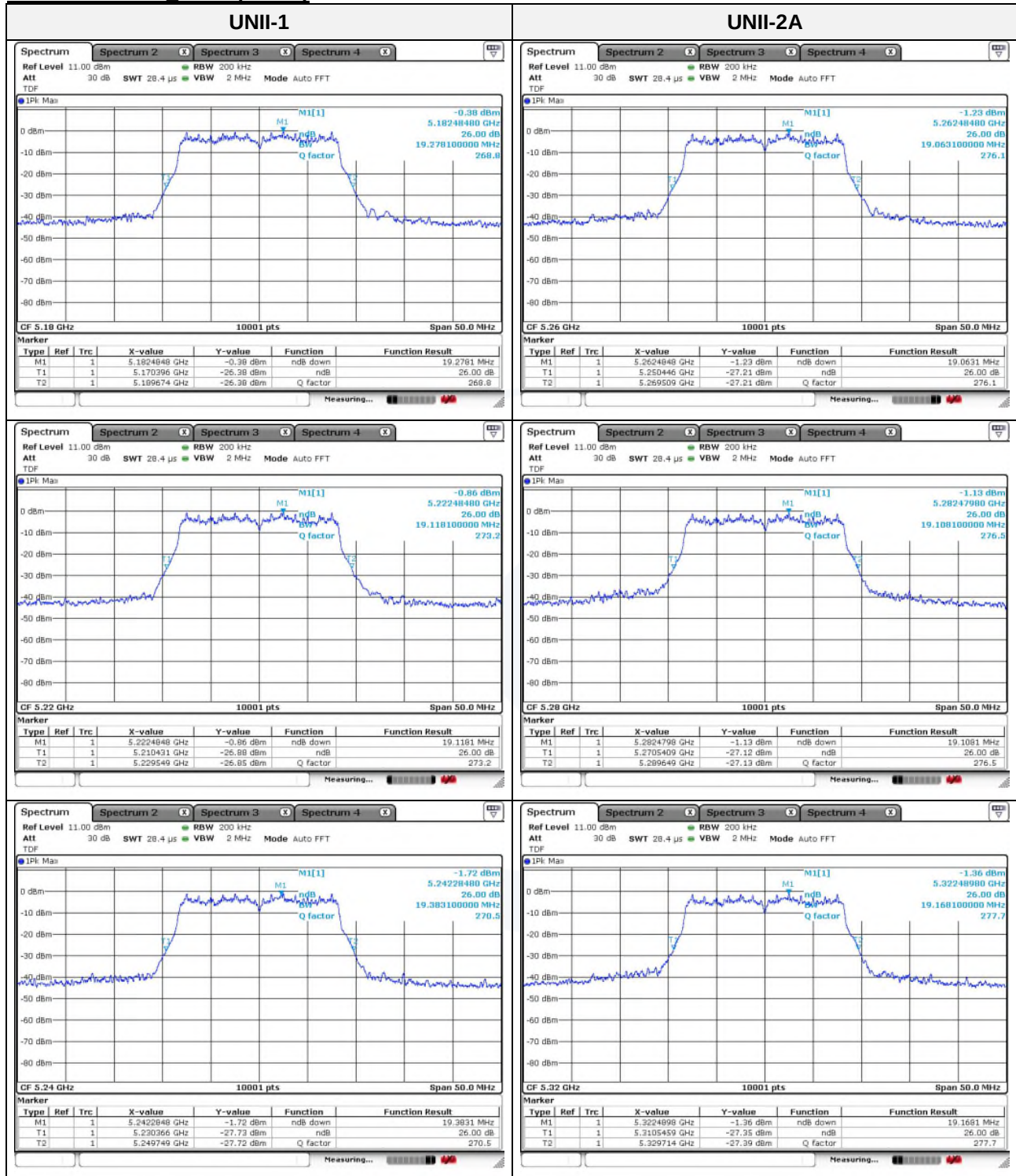
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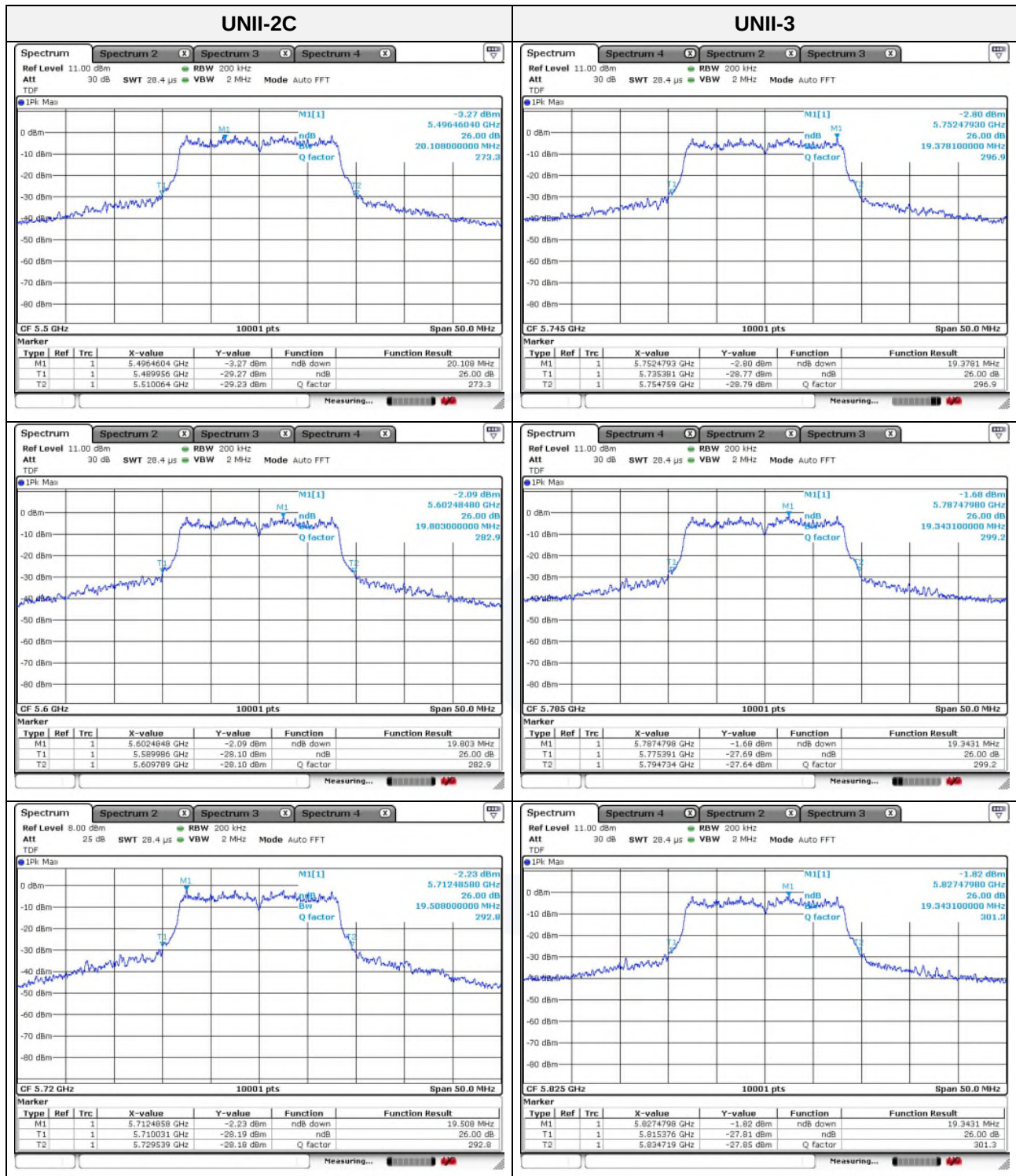






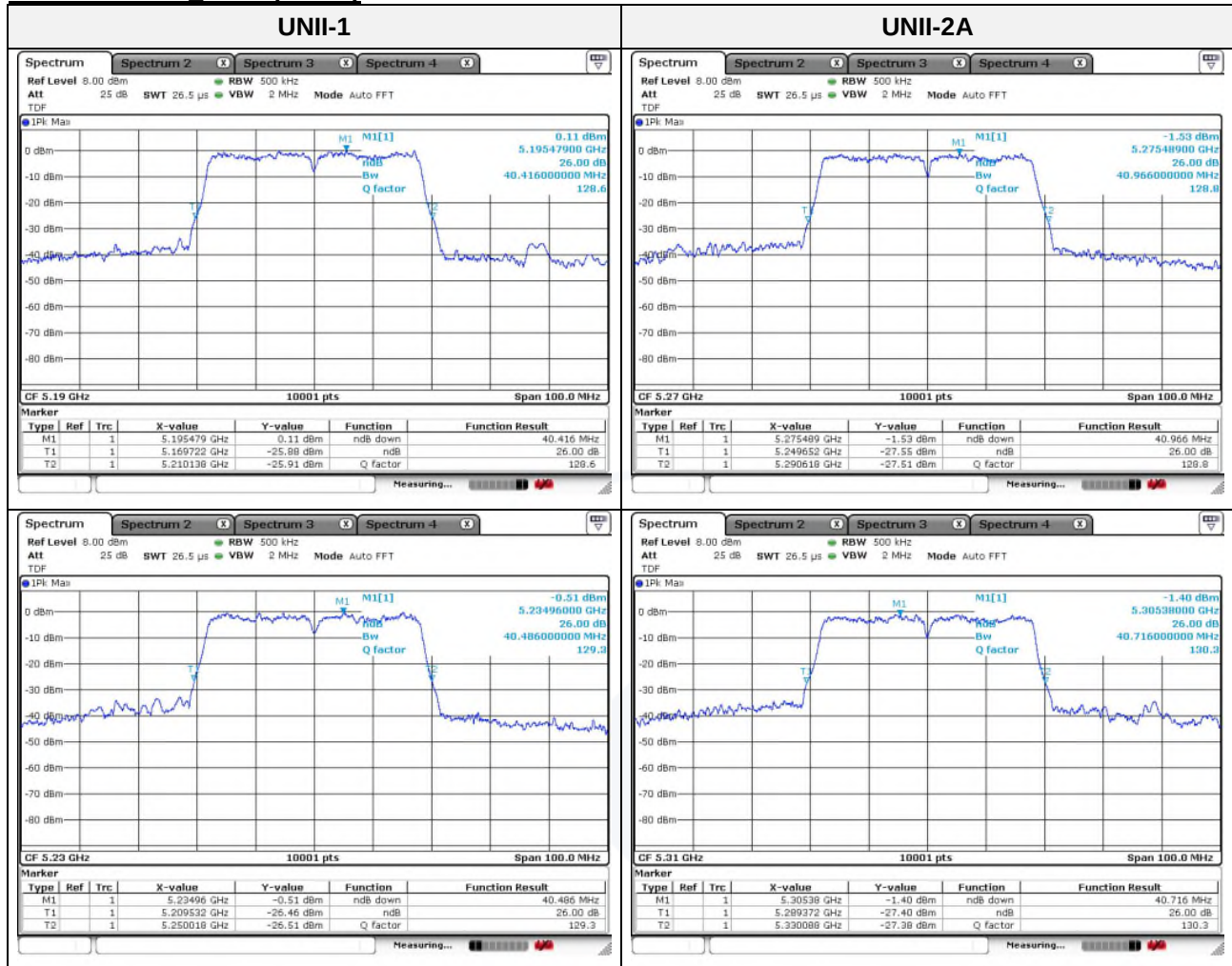
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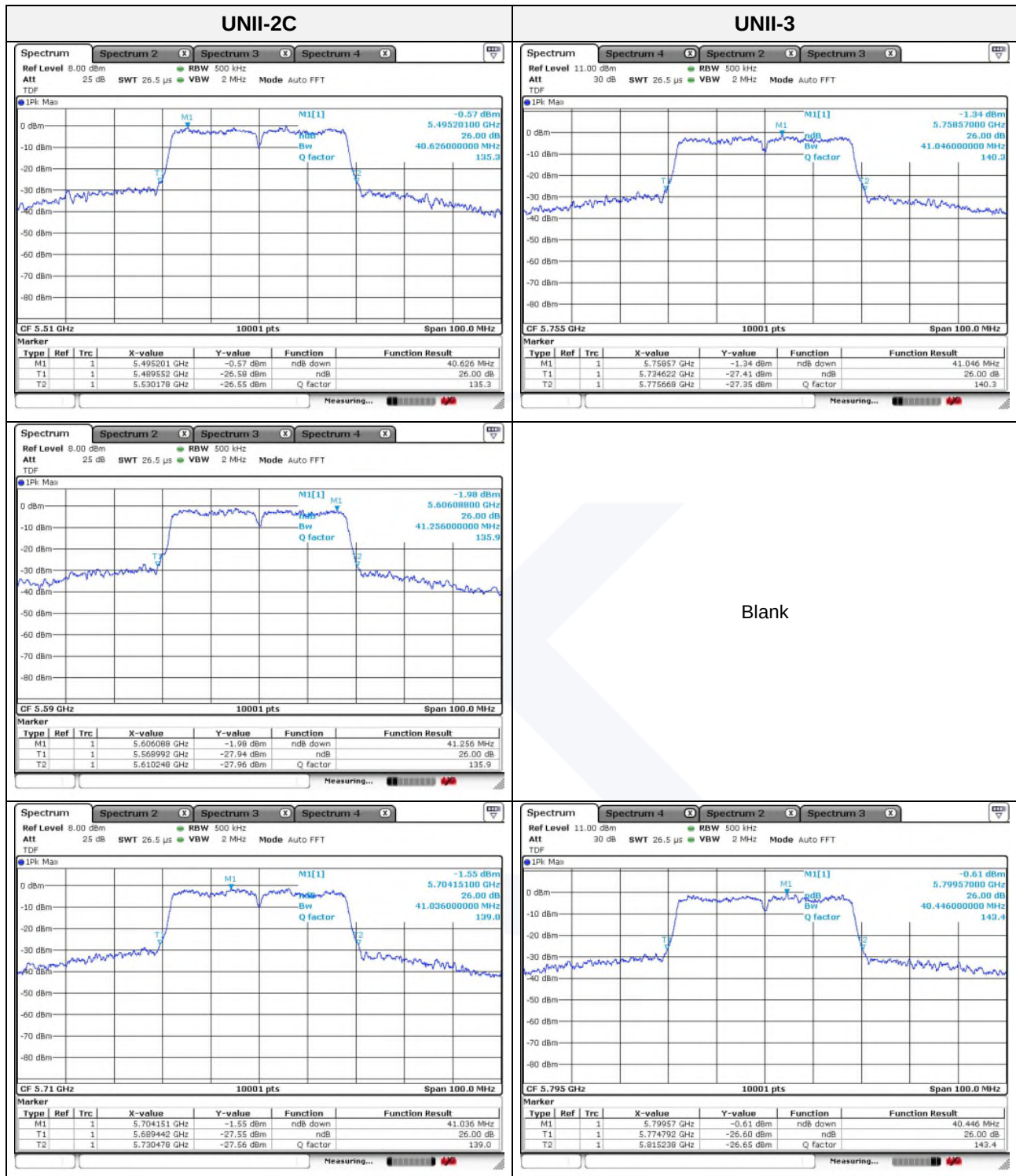






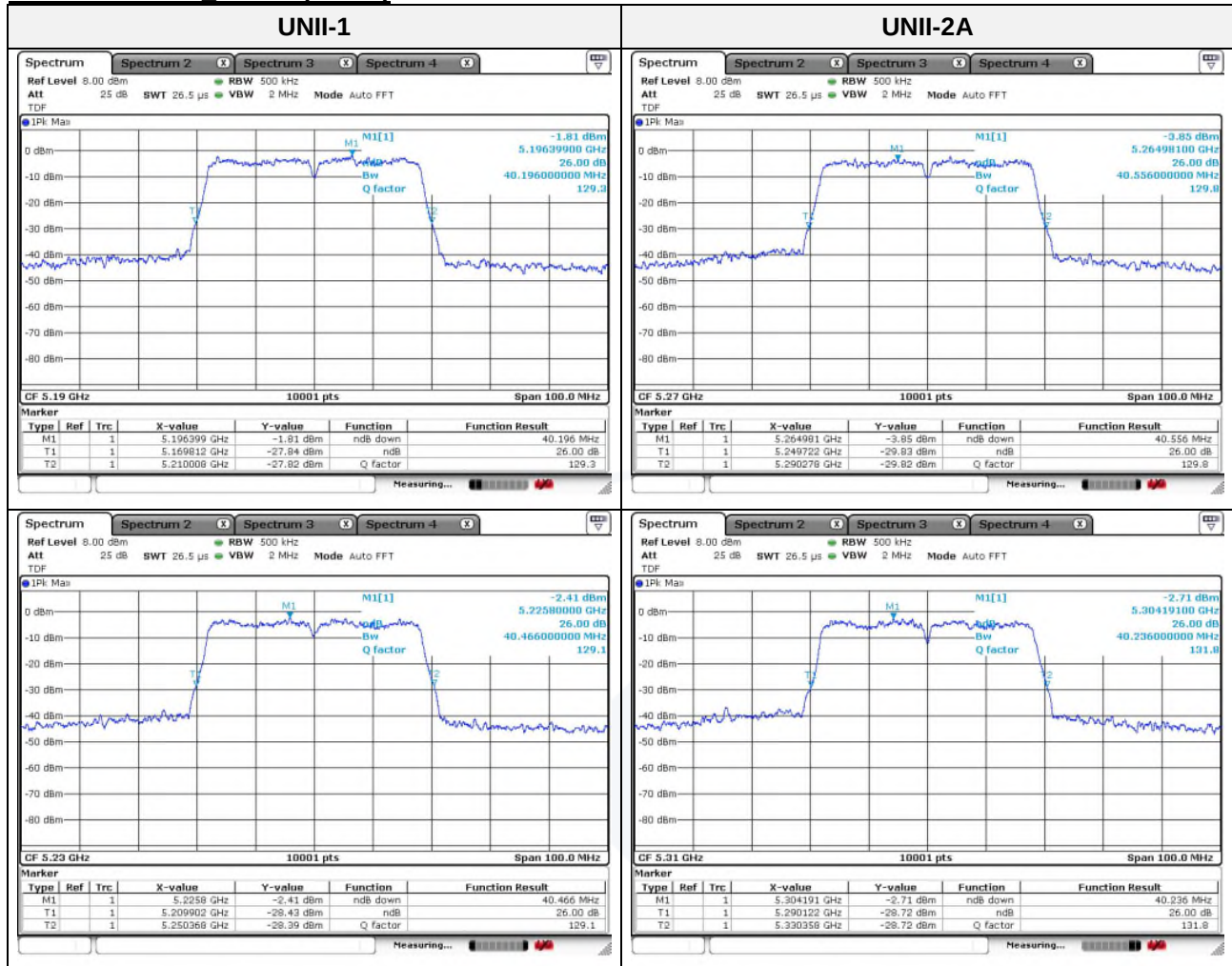
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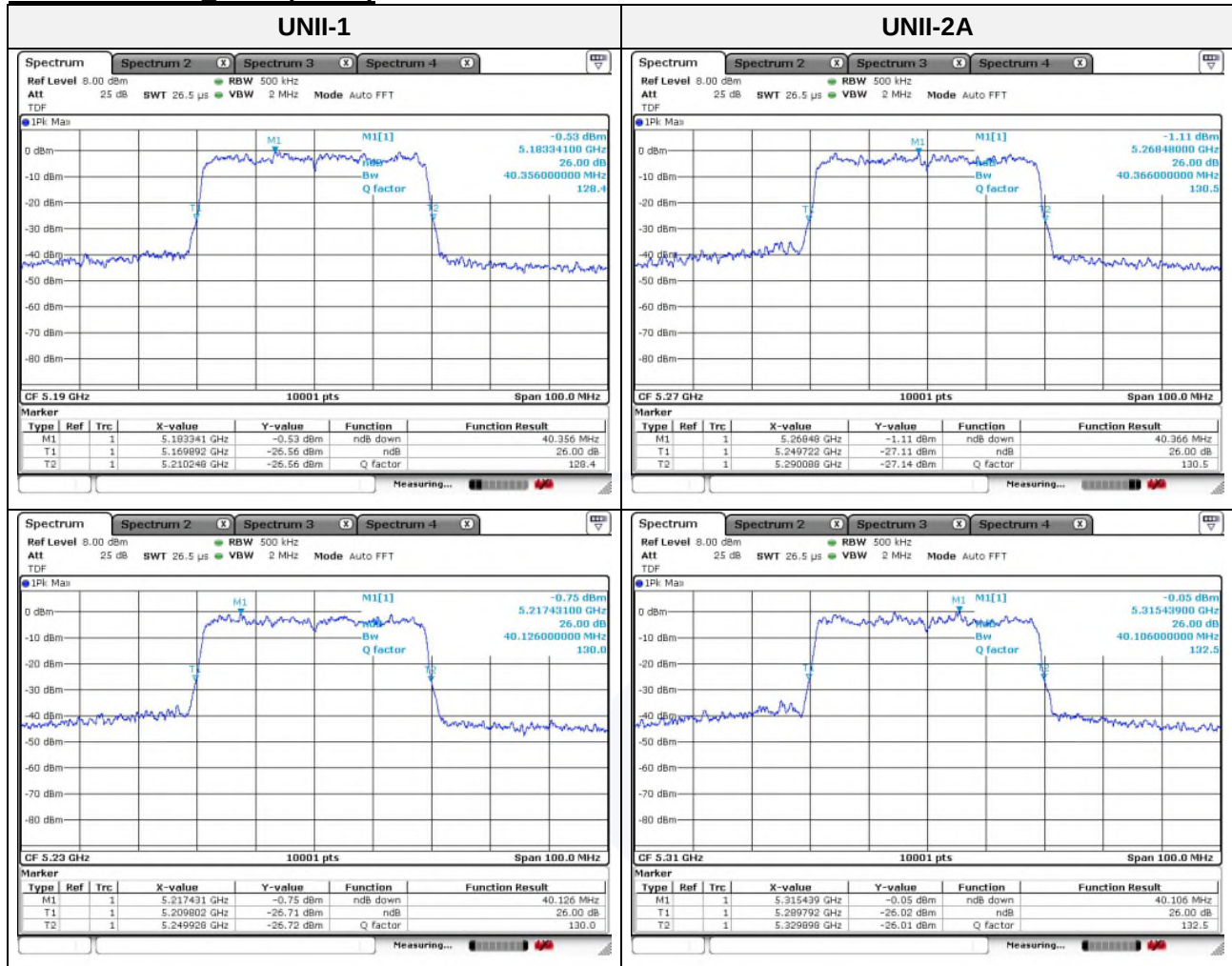
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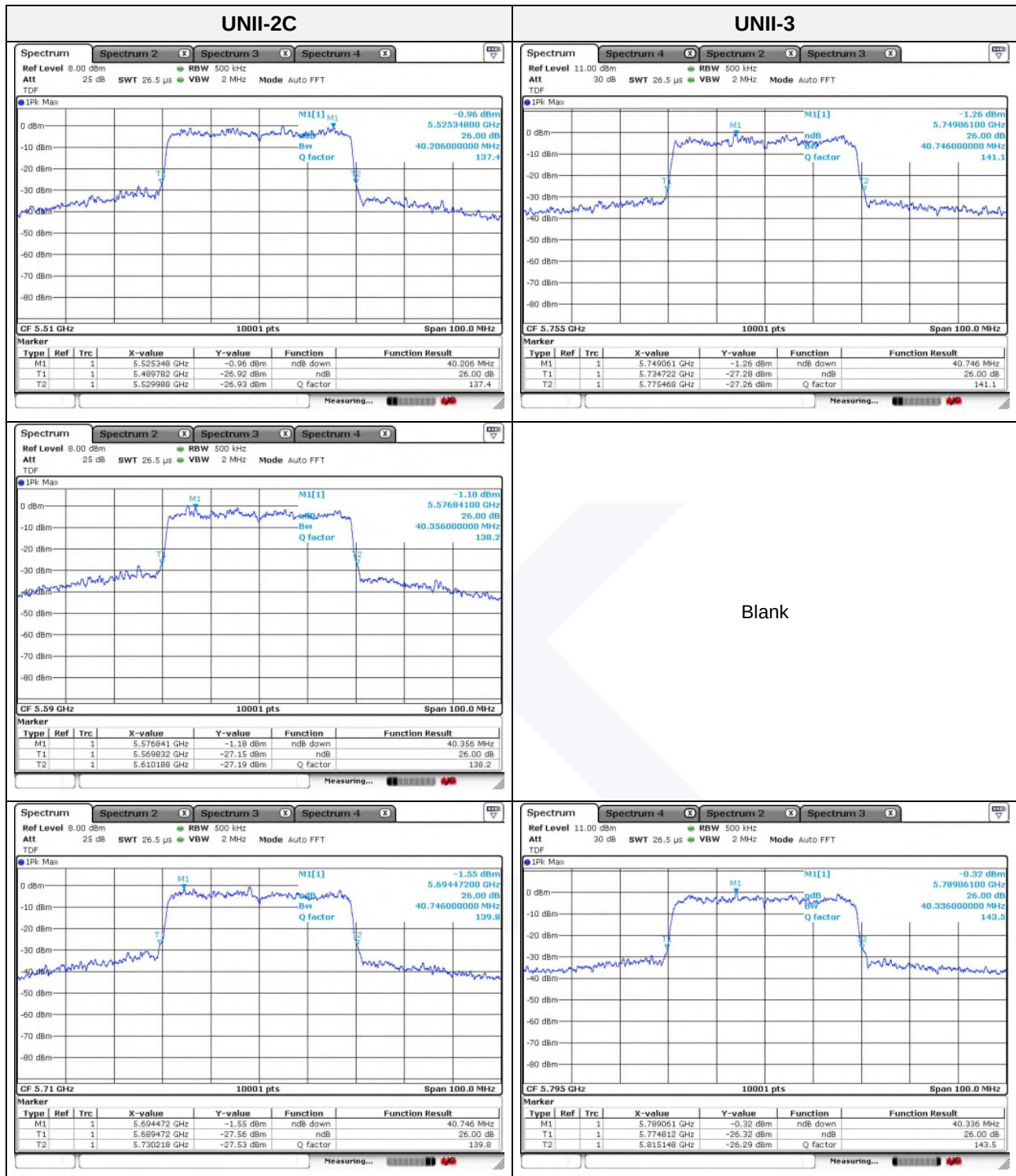






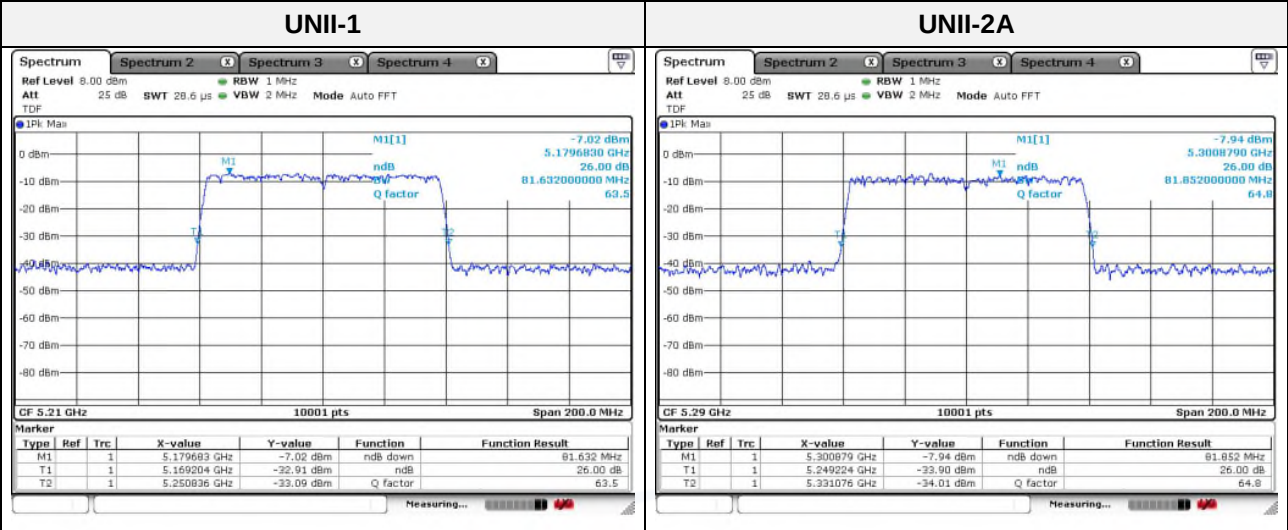
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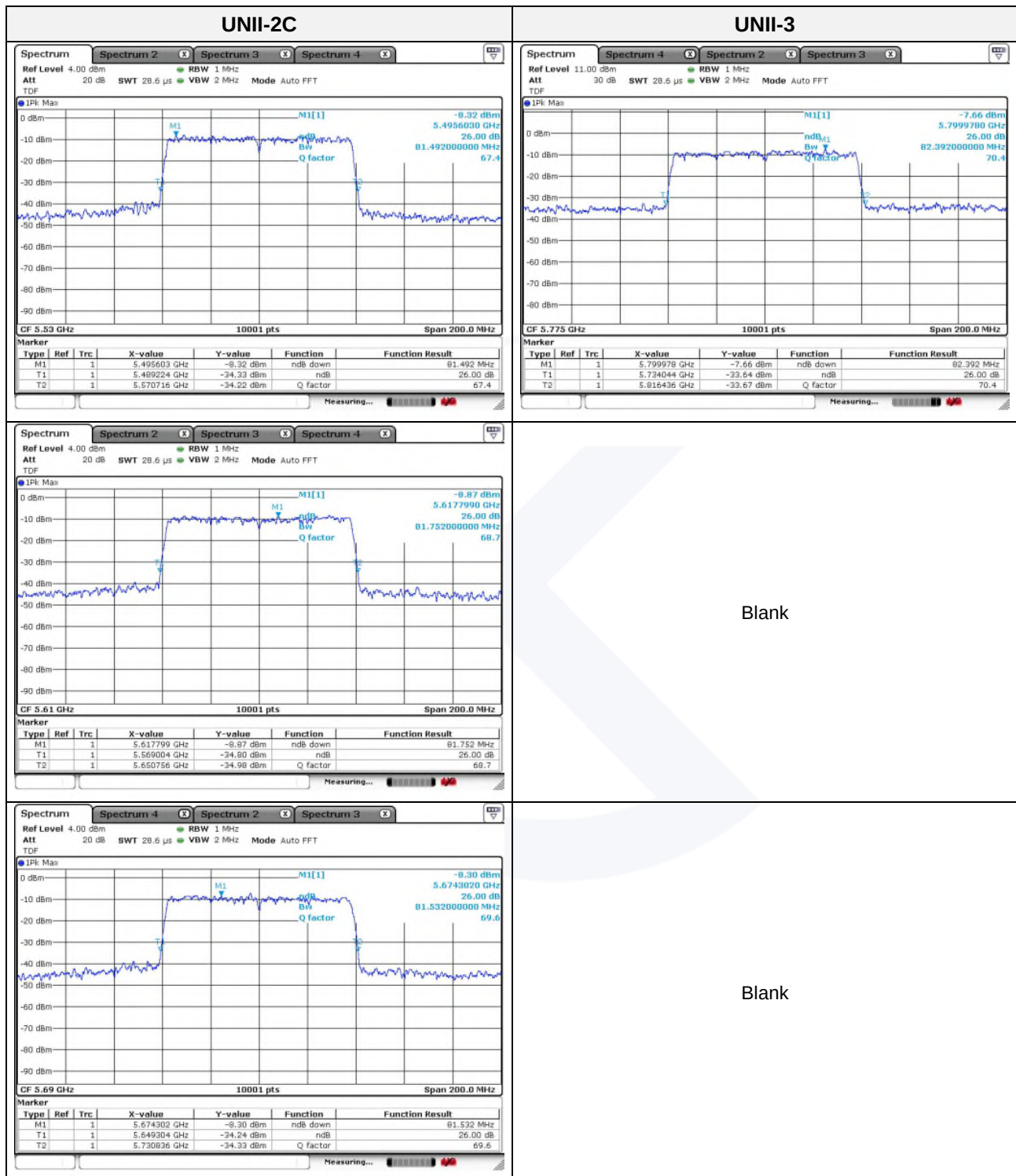






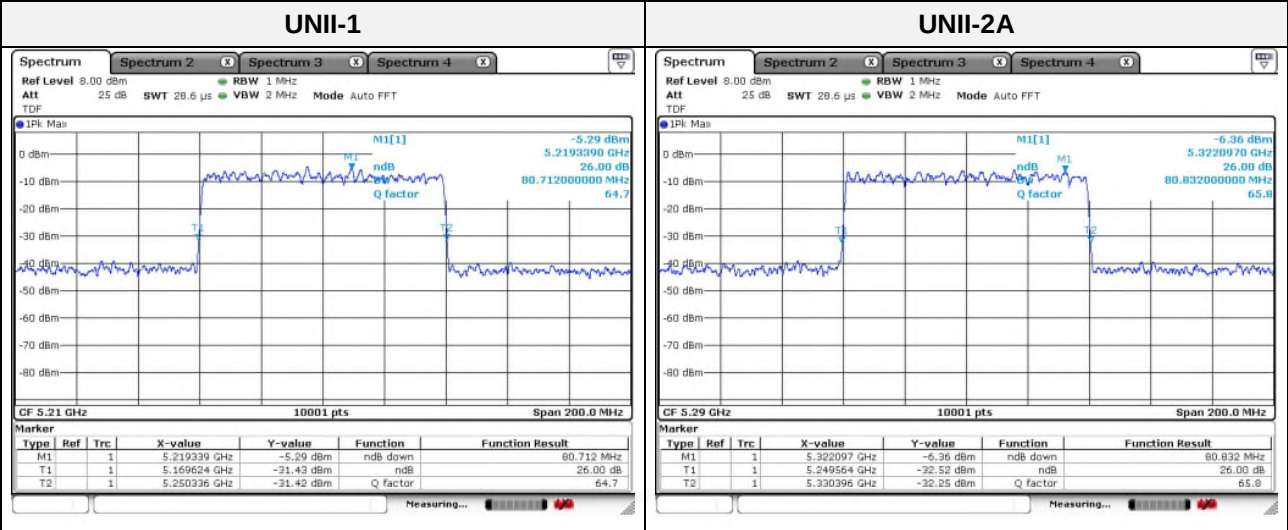
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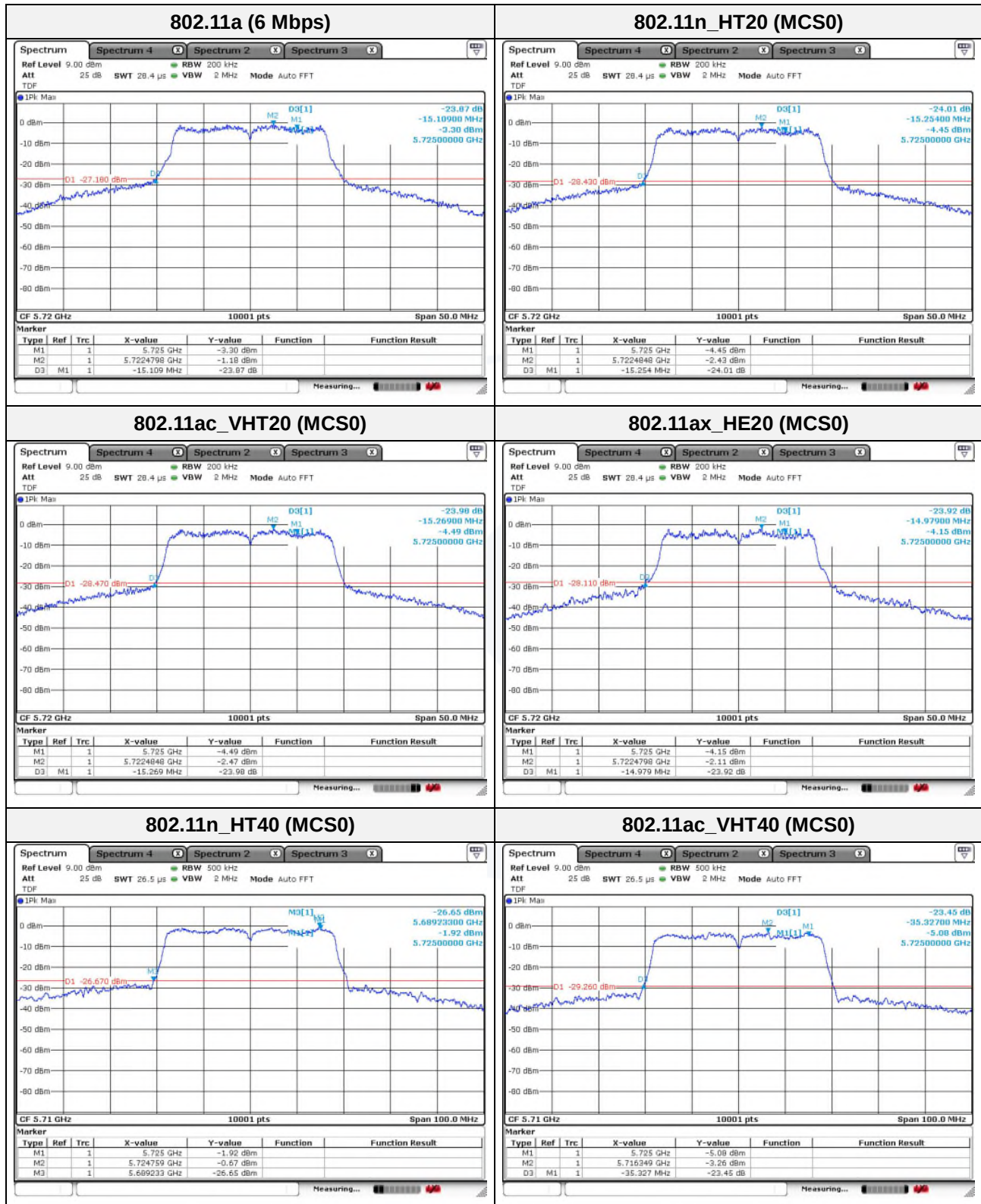


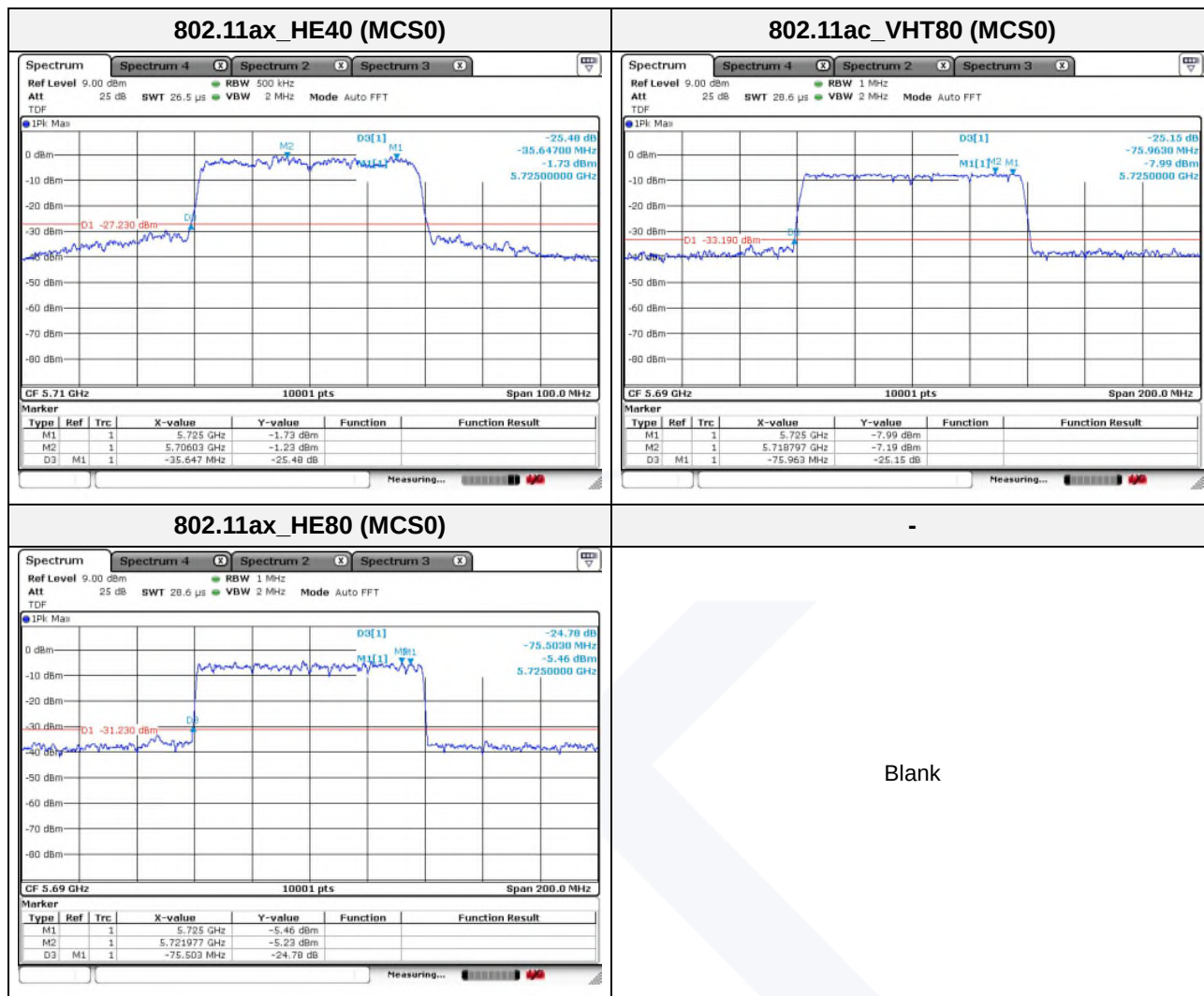


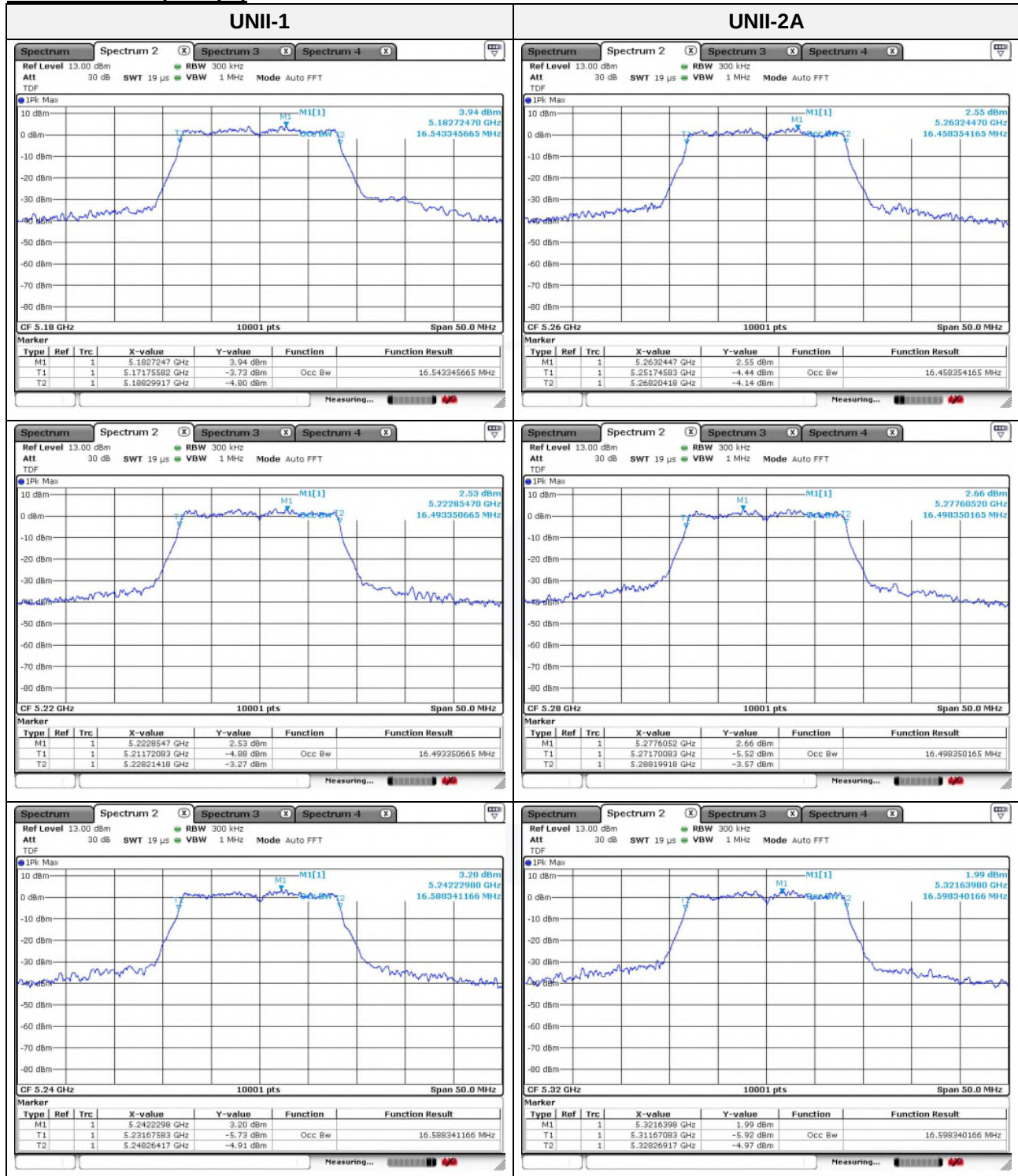
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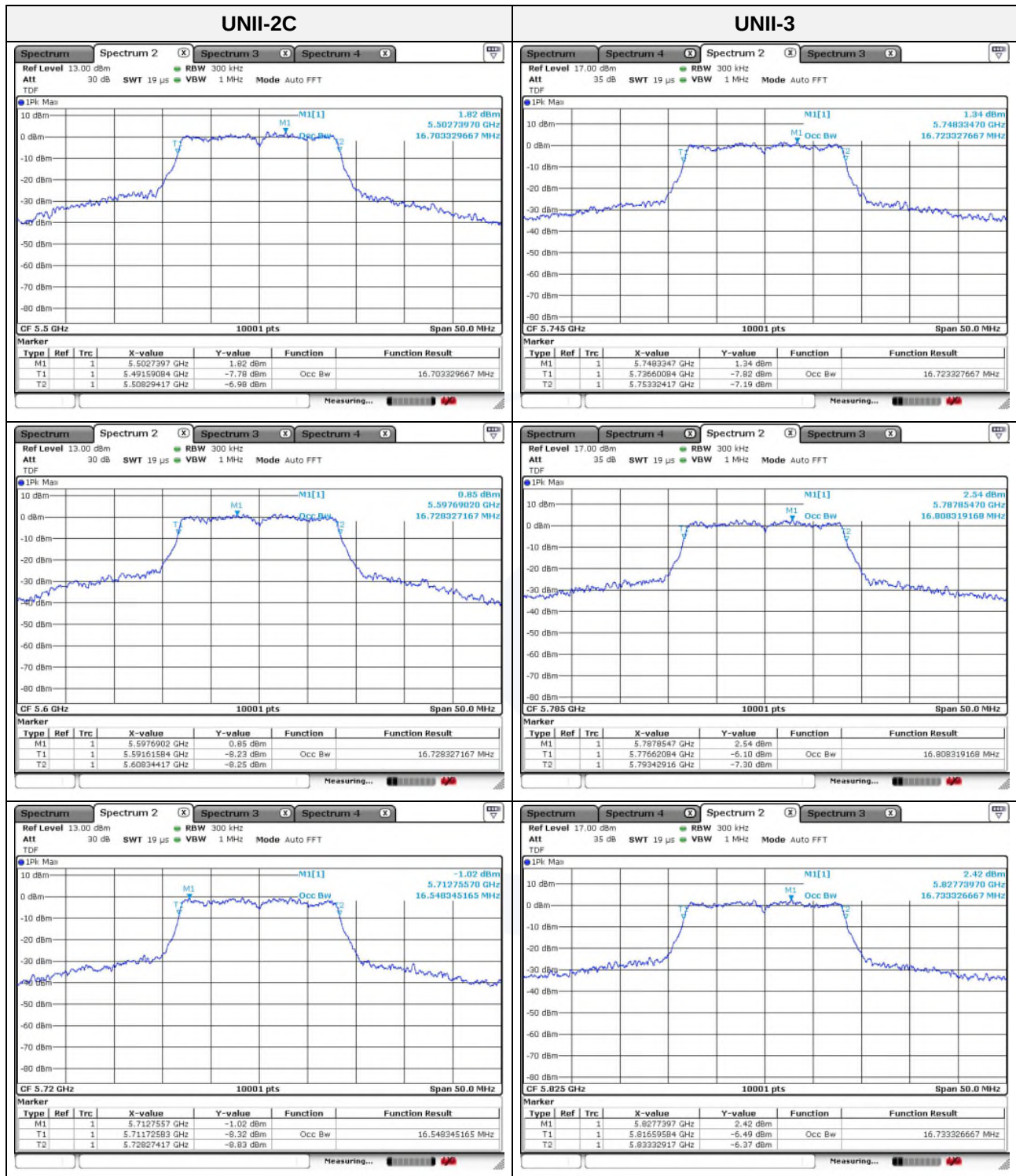




**Band-crossing channels**

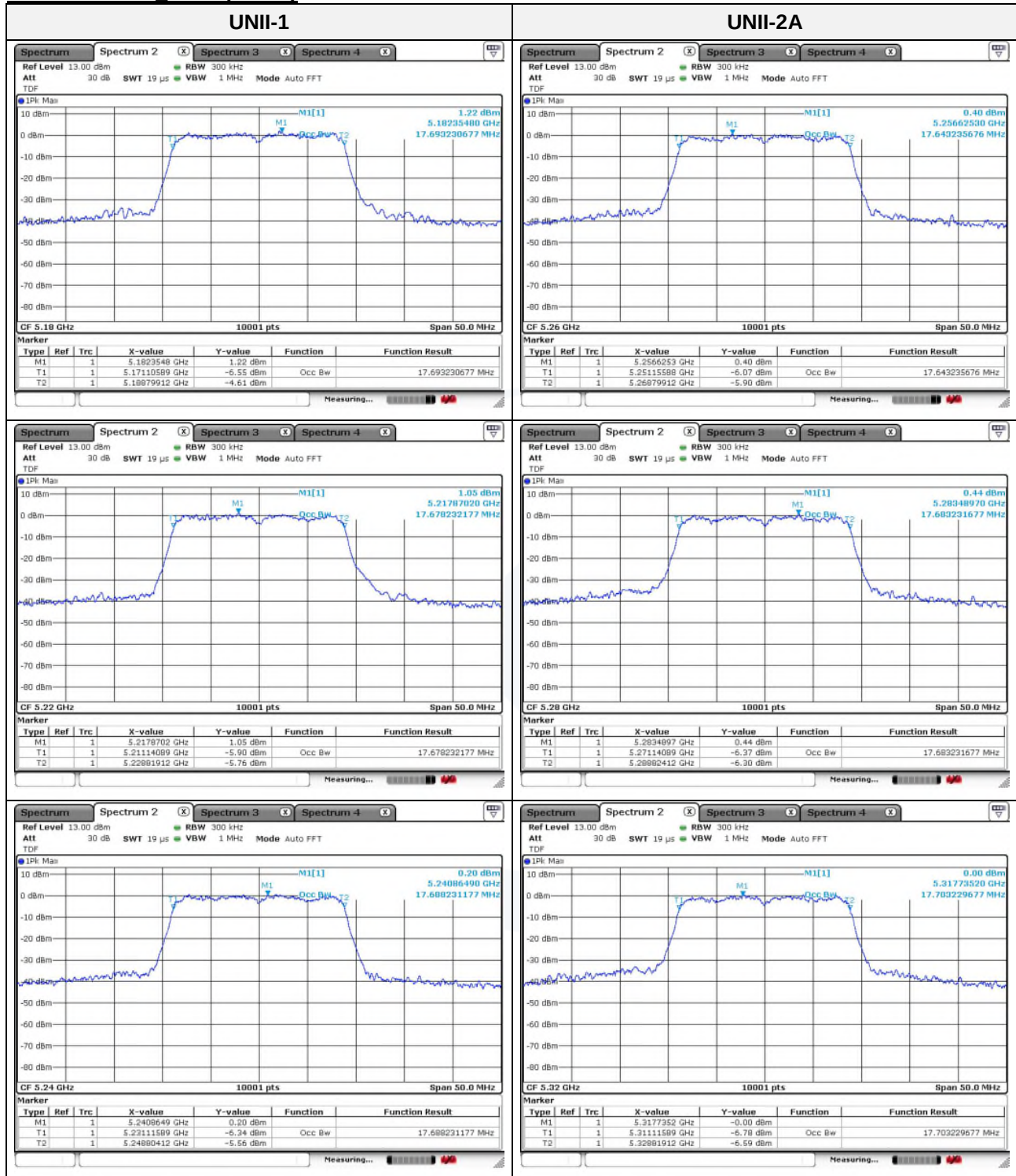


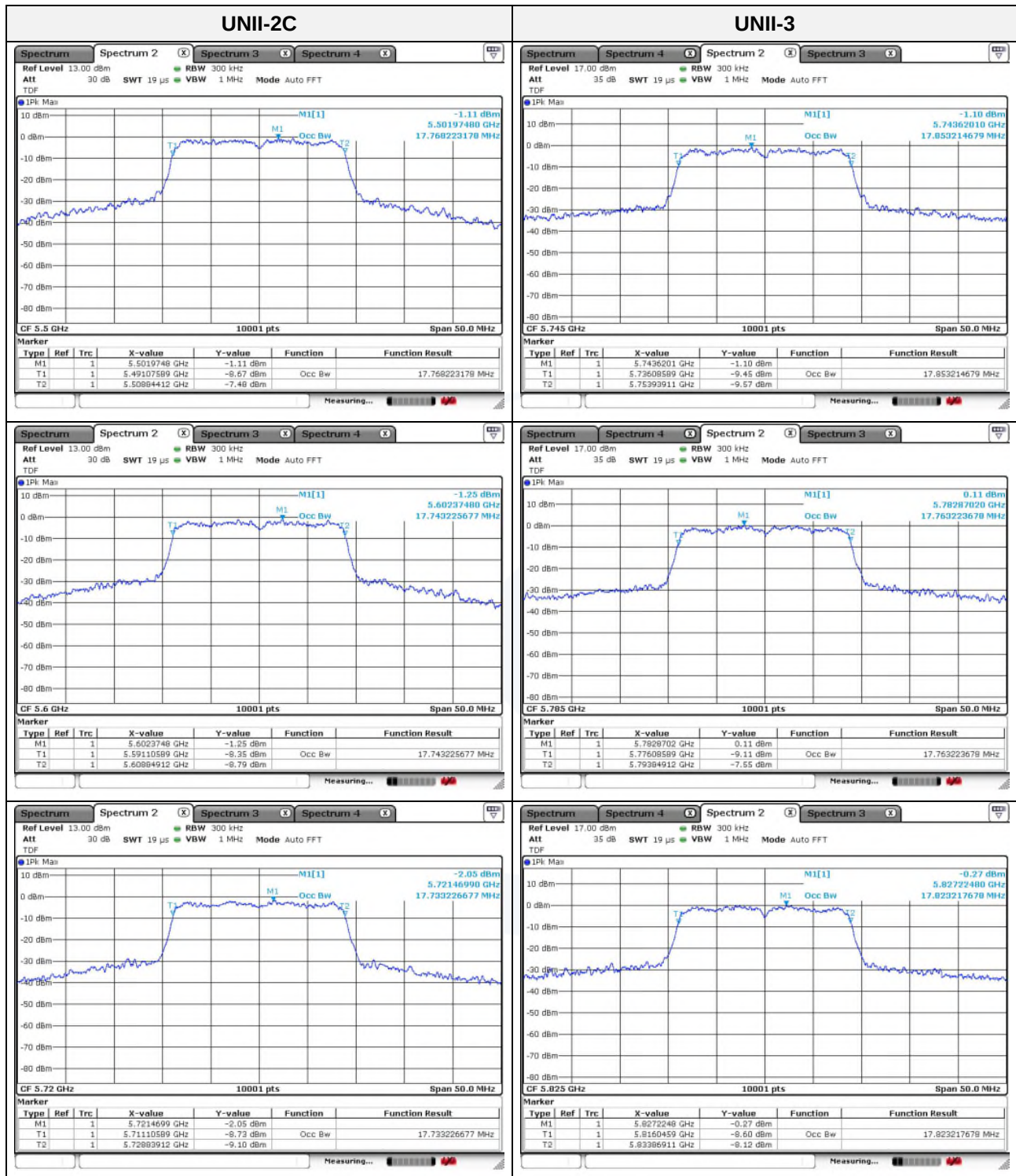
**99% bandwidth****Mode : 802.11a (6 Mbps)**





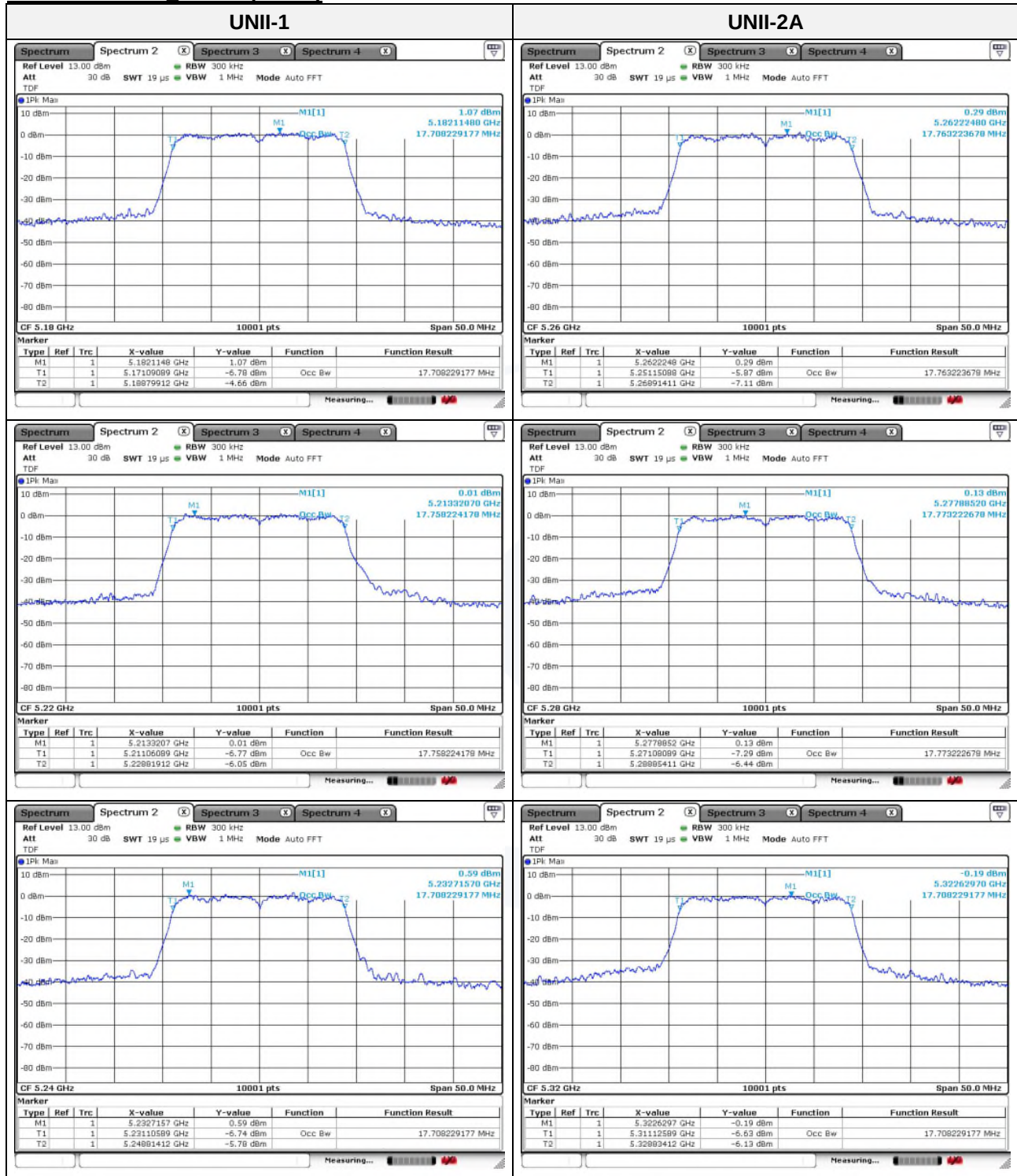
Mode : 802.11n HT20 (MCS0)

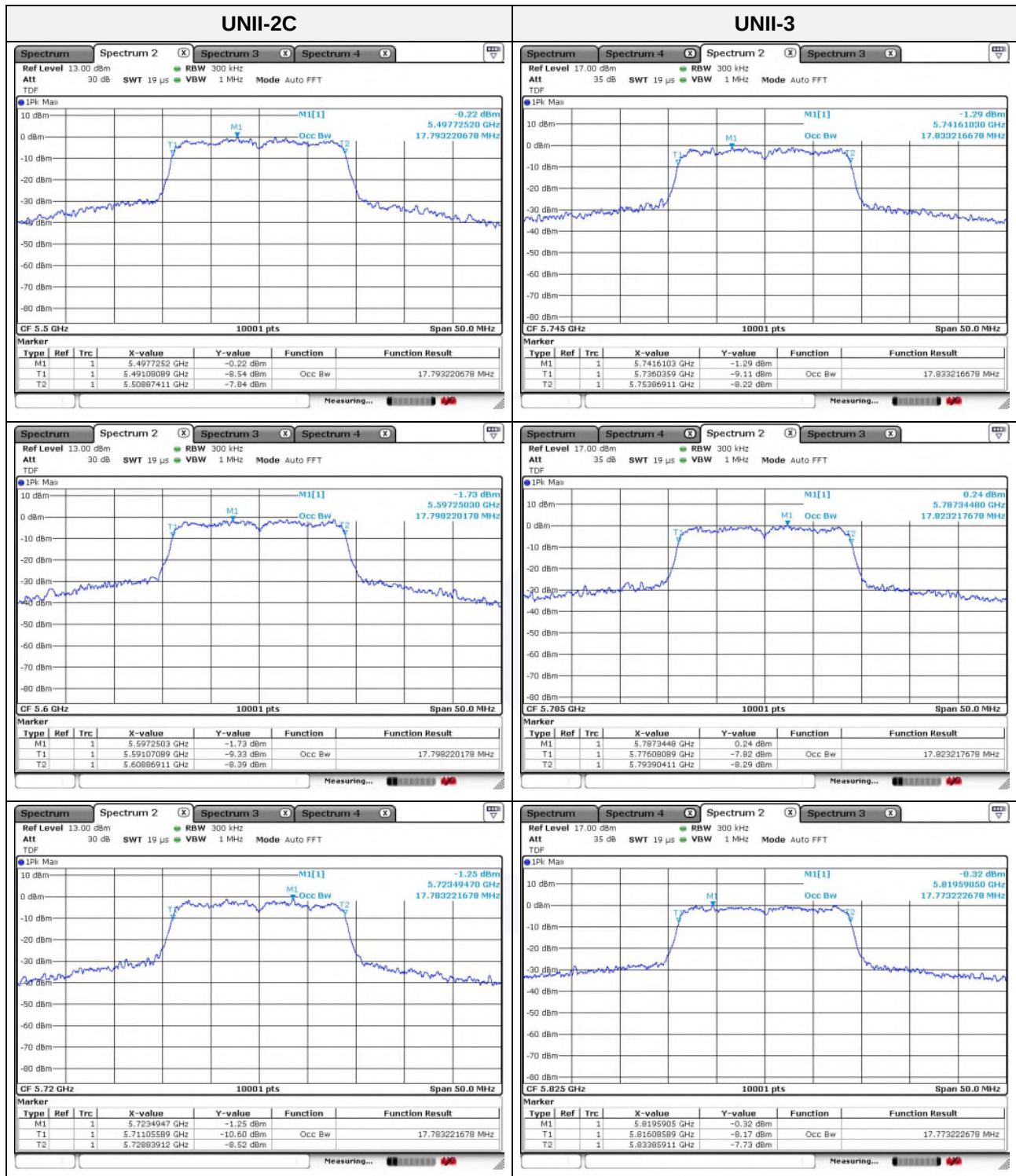






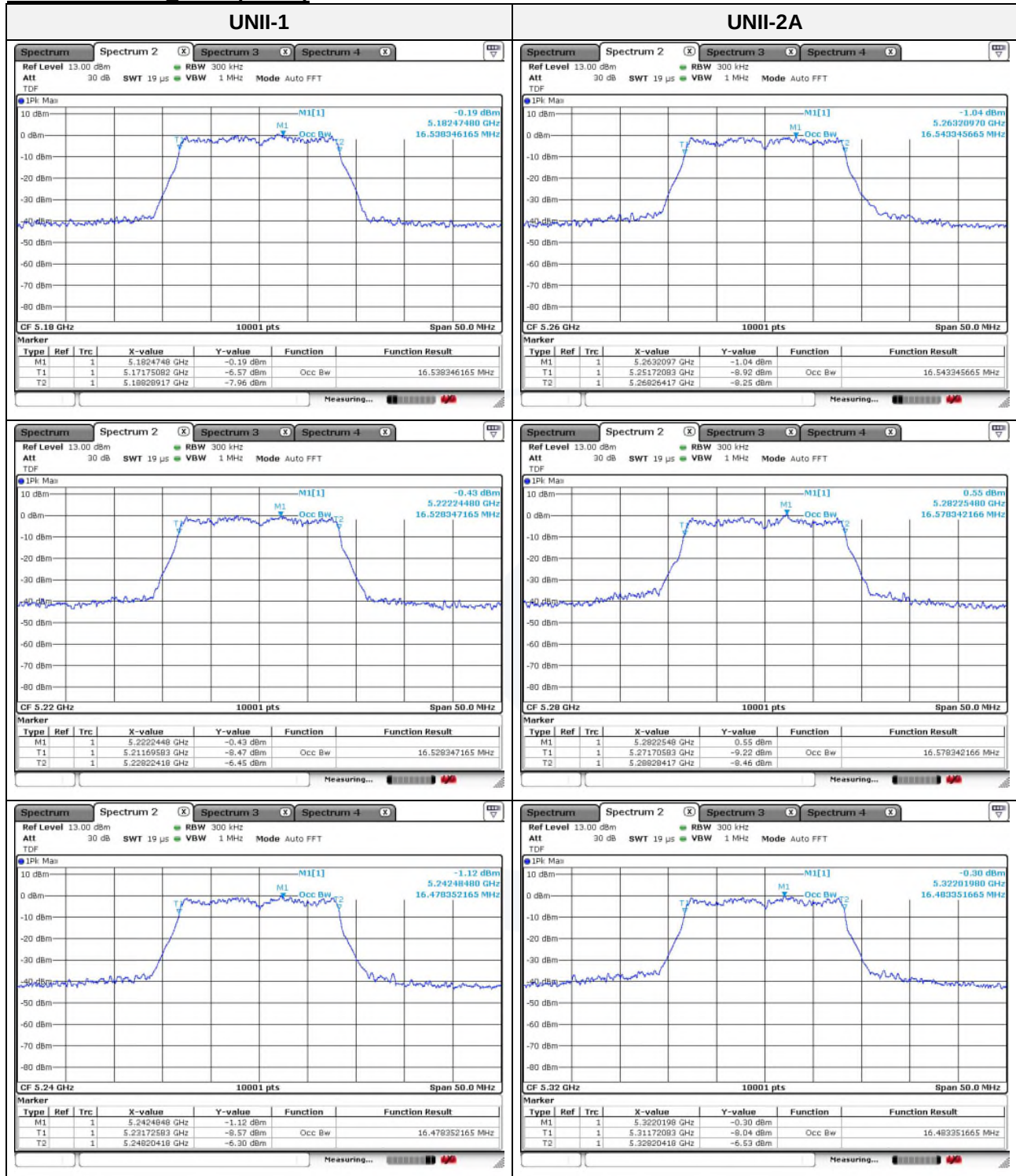
Mode : 802.11ac VHT20 (MCS0)







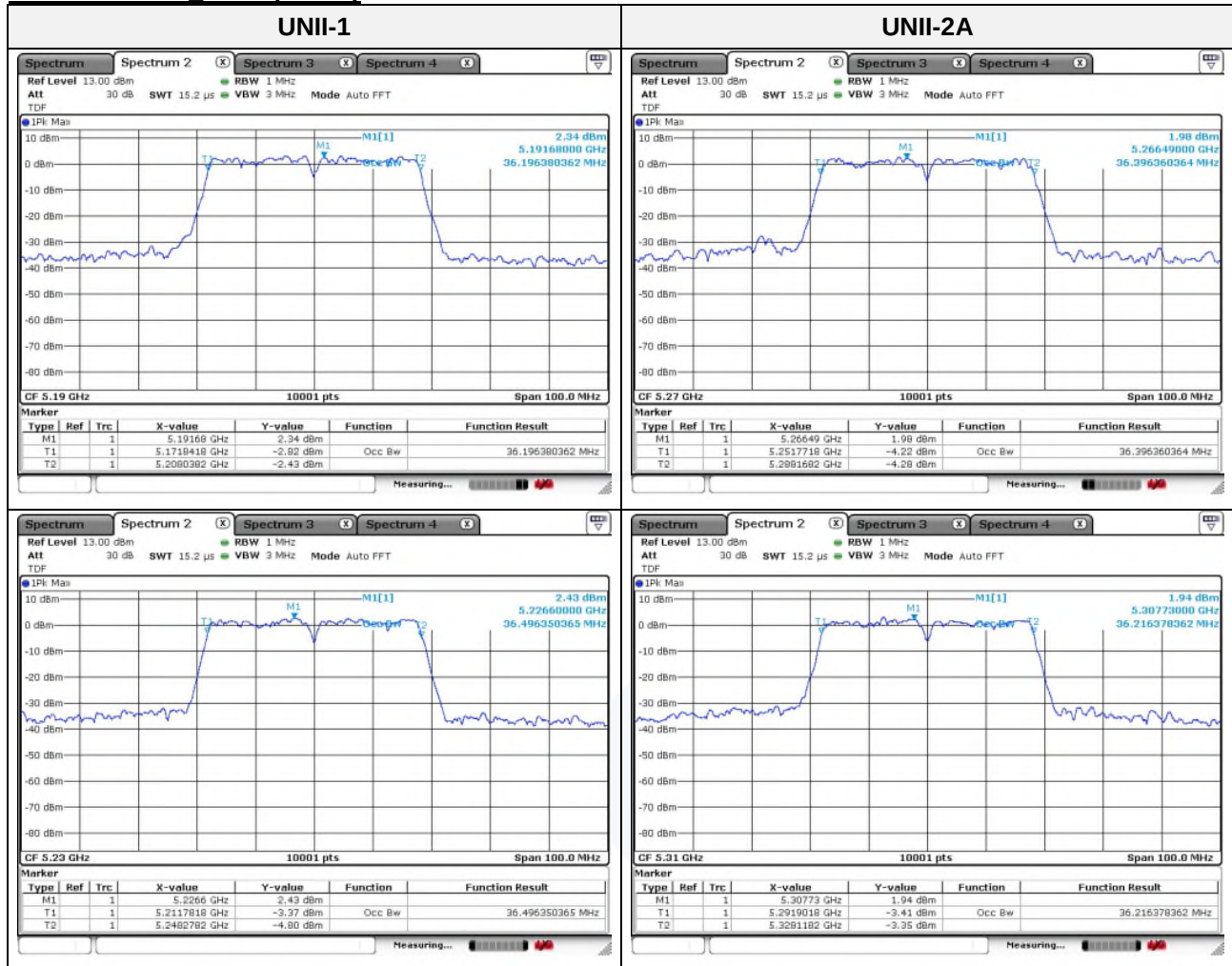
Mode : 802.11ax HE20 (MCS0)







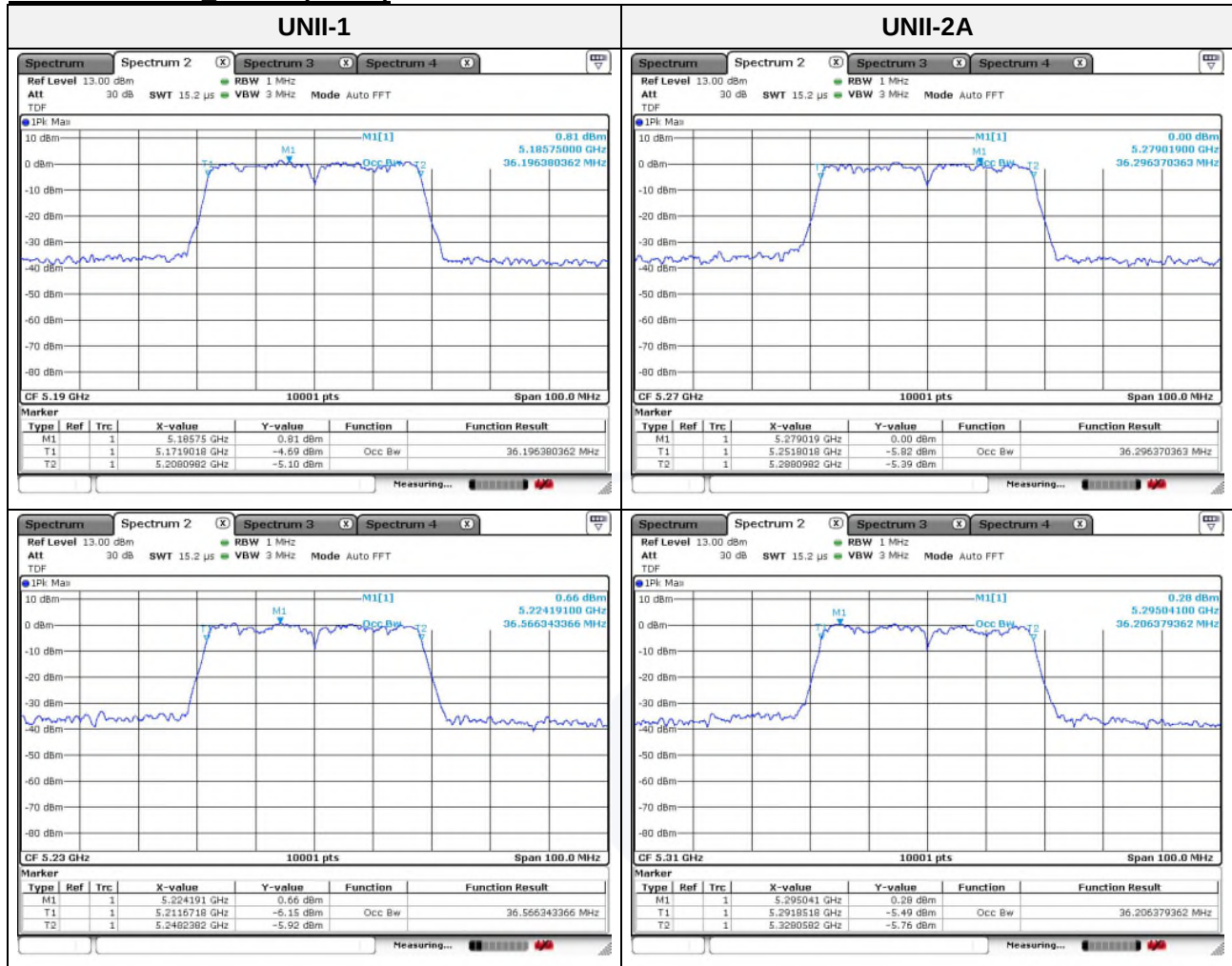
Mode : 802.11n HT40 (MCS0)







Mode : 802.11ac VHT40 (MCS0)







Mode : 802.11ax HE40 (MCS0)

