

TEST REPORT

Part 15 Subpart E 15.407

Equipment under test NETWORK VIDEO RECORDER

Model name TRM-410S

FCC ID NLMTRM410S

Applicant Hanwha Techwin Co., Ltd.

Manufacturer Hanwha Techwin (Tianjin) Co.,Ltd.
Hanwha Techwin Security Vietnam Co.,Ltd.
D-TECH Co.,Ltd.

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Test report No.:
KES-RF-19T0013
Page (2) of (112)

Revision history

Revision	Date of issue	Test report No.	Description
-	2019.02.14	KES-RF-19T0013	Initial

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1. General information

Applicant: Hanwha Techwin Co., Ltd.
Applicant address: 6, Pangyo-ro 319 Beon-gil, Bundang-gu Seongnam-si,
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Test site: KES Co., Ltd.
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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: NLMTRM410S
Test device serial No.: ☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test: NETWORK VIDEO RECORDER
Frequency range: UNII-1 5 180 MHz ~ 5 240 MHz (11ac_VHT20)
5 190 MHz ~ 5 230 MHz (11ac_VHT40)
5 210 MHz (11ac_VHT80)
UNII-2A 5 260 MHz ~ 5 320 MHz (11ac_VHT20)
5 270 MHz ~ 5 310 MHz (11ac_VHT40)
5 290 MHz (11ac_VHT80)
UNII-2C 5 500 MHz ~ 5 720 MHz (11ac_VHT20)
5 510 MHz ~ 5 710 MHz (11ac_VHT40)
5 530 MHz ~ 5 690 MHz (11ac_VHT80)
UNII-3 5 745 MHz ~ 5 825 MHz (11ac_VHT20)
5 755 MHz ~ 5 795 MHz (11ac_VHT40)
5 775 MHz (11ac_VHT80)
GPS 1 575.42 MHz (GPS)
Model: TRM-410S
Modulation technique: OFDM
Antenna specification: 5 GHz_UNII 1, 2A // Dipole Antenna & 2.72 dBi
5 GHz_UNII 2C // Dipole Antenna & 3.45 dBi
5 GHz_UNII 3 // Dipole Antenna & 5.63 dBi
Power source: DC 9V~36V

Number of channels 5 180 MHz ~ 5 240 MHz (11ac_VHT20) : 4ch
 5 190 MHz ~ 5 230 MHz (11ac_VHT40) : 2ch
 5 210 MHz (11ac_VHT80) : 1ch
 5 260 MHz ~ 5 320 MHz (11ac_VHT20) : 4ch
 5 270 MHz ~ 5 310 MHz (11ac_VHT40) : 2ch
 5 290 MHz (11ac_VHT80) : 1ch
 5 500 MHz ~ 5 720 MHz (11ac_VHT20) : 12ch
 5 510 MHz ~ 5 710 MHz (11ac_VHT40) : 6ch
 5 530 MHz ~ 5 690 MHz (11ac_VHT80) : 3ch
 5 745 MHz ~ 5 825 MHz (11ac_VHT20) : 5ch
 5 755 MHz ~ 5 795 MHz (11ac_VHT40) : 2ch
 5 775 MHz (11ac_VHT80) : 1ch
 1 575.42 MHz (GPS) : 1ch

1.2. Test configuration

The **Hanwha Techwin Co., Ltd. NETWORK VIDEO RECORDER FCC ID: NLMTRM410S** 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. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
Control Box	Hanwha Techwin(Tianjin) Co., Ltd.	-	-	-

1.4. Software and Firmware description

The software and firmware installed in the EUT is version V1.00_190129183607

1.5. 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.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 1.70 + 10 = 11.70 \text{ (dB)}\end{aligned}$$

1.6. Measurement Uncertainty

Test Item		Uncertainty
Uncertainty for Conduction emission test		2.62 dB
Uncertainty for Radiation emission test (include Fundamental emission)	9kHz - 30MHz	4.54 dB
	30MHz - 1GHz	4.36 dB
	Above 1GHz	5.00 dB
Note. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

1.7. Frequency/channel operations

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

Table 1.7-1. 802.11ac_VHT20 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

Table 1.7-2. 802.11ac_VHT40 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

Table 1.7-3. 802.11ac_VHT80 mode

1.8. Maximum average output power

Refer to the average output power.

Note.

- Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.
- Worst-case data rates as provided by the client were:
UNII-1 ac_VHT20 : **MCS8**, ac_VHT40/80 : **MCS9**
UNII-2A ac_VHT20 : **MCS8**, ac_VHT40/80 : **MCS9**
UNII-2C ac_VHT20 : **MCS8**, ac_VHT40/80 : **MCS9**
UNII-3 ac_VHT20 : **MCS8**, ac_VHT40/80 : **MCS9**
- This report contains the worst case data from the following mode of the test in 20/40/80 MHz signal bandwidth.

2. Summary of tests

Reference	Parameter	Test results
15.407(a)	26 dB bandwidth & 99 % Occupied Bandwidth	Pass
15.407(e)	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	Radiated restricted band and emission	Pass
15.407(d)	General field strength limit (Restricted bands and radiated emission limit)	Pass
15.207	AC power line conducted emissions	N/A ^{Note.1}

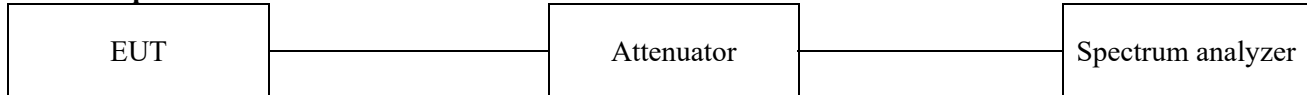
Note.

1. This device doesn't required AC conducted emission test because only use DC power.

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%.

Limit

N/A

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.

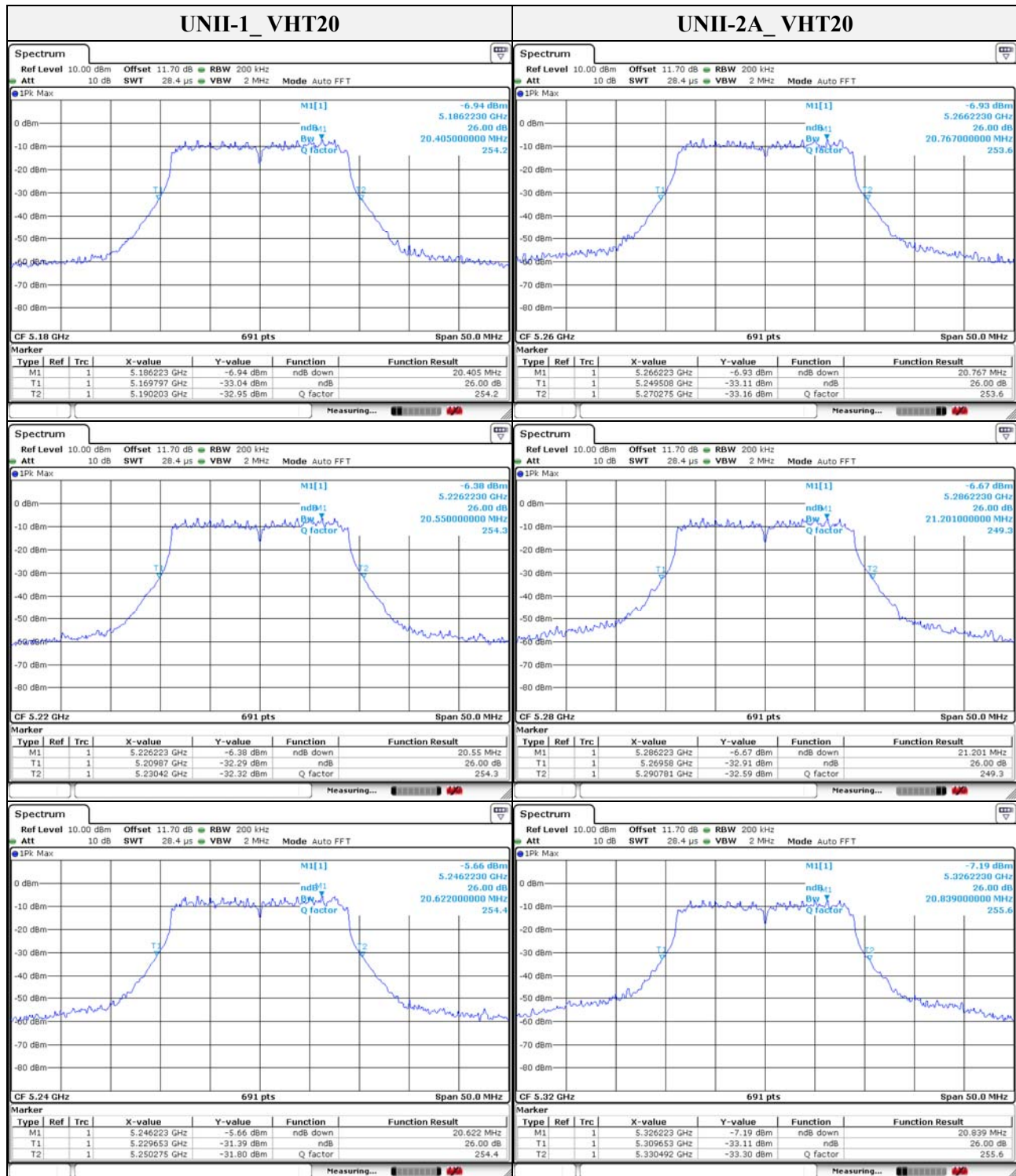
In the result,

-DFS requirements are not applicable in the 5 150 MHz ~ 5 250 MHz.

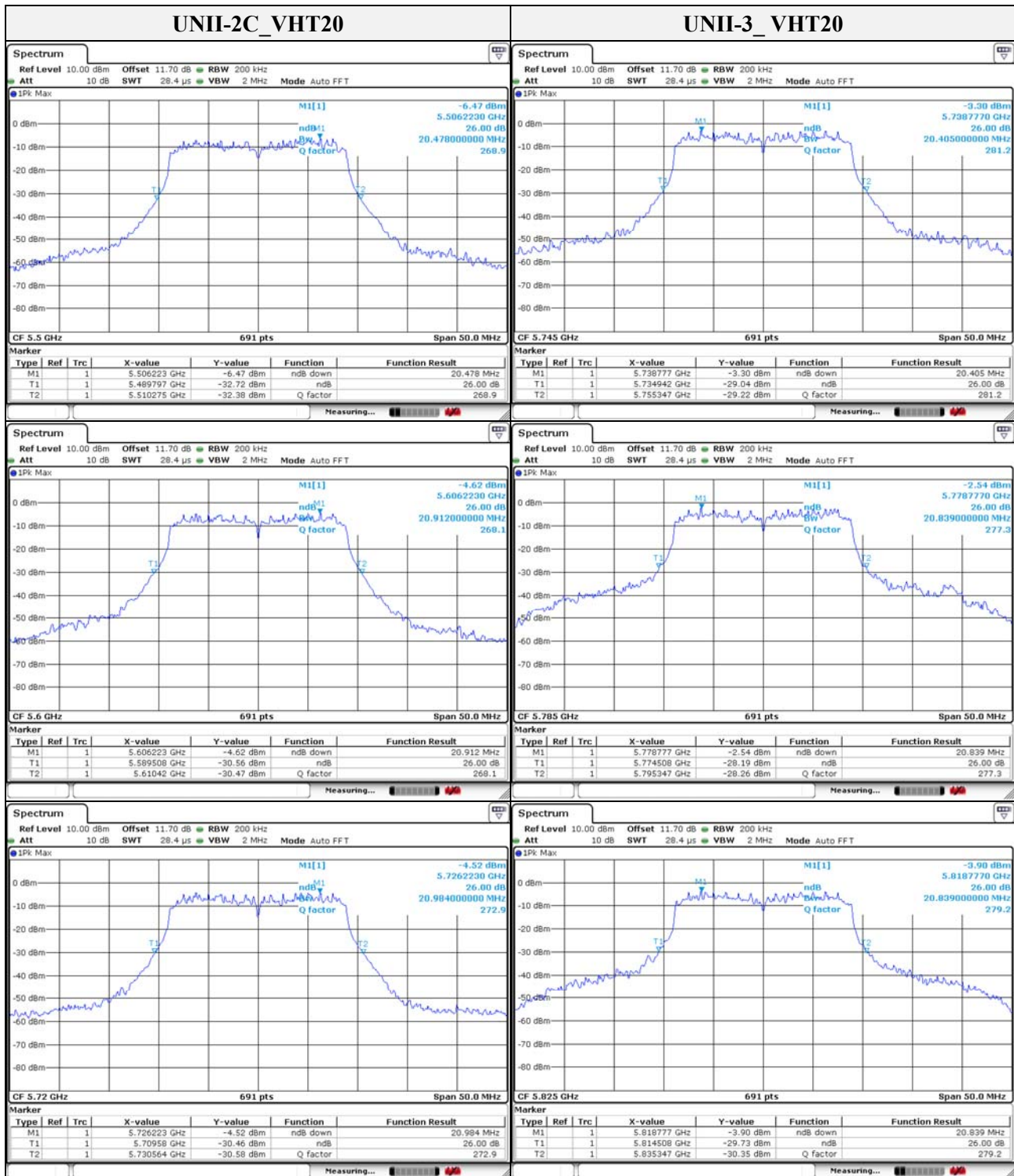
Test results

Band	Frequency(MHz)	Mode	26 dB bandwidth(MHz)	99 % bandwidth(MHz)
UNII-1	5 180	VHT20	20.405	17.800
	5 220		20.550	17.873
	5 240		20.622	17.945
UNII-2A	5 260		20.767	17.873
	5 280		21.201	17.728
	5 320		20.839	17.800
UNII-2C	5 500		20.478	17.873
	5 600		20.912	17.873
	5 720		20.984	17.873
UNII-3	5 745		20.405	17.728
	5 785		20.839	17.873
	5 825		20.839	17.945
UNII-1	5 190	VHT40	42.950	36.700
	5 230		42.260	36.816
UNII-2A	5 270		42.840	36.816
	5 310		41.910	36.700
UNII-2C	5 510		43.180	37.164
	5 590		42.720	36.816
	5 710		42.600	36.585
UNII-3	5 755		42.370	36.816
	5 795		42.720	36.932
UNII-1	5 210	VHT80	81.970	75.543
UNII-2A	5 290		82.140	75.543
UNII-2C	5 530		81.100	75.716
	5 610		81.790	75.543
	5 690		81.270	75.543
UNII-3	5 775		81.100	75.716
UNII-2C (Band-crossing channel)	5 720	VHT20	15.926	-
	5 710	VHT40	35.490	-
	5 690	VHT80	74.220	-

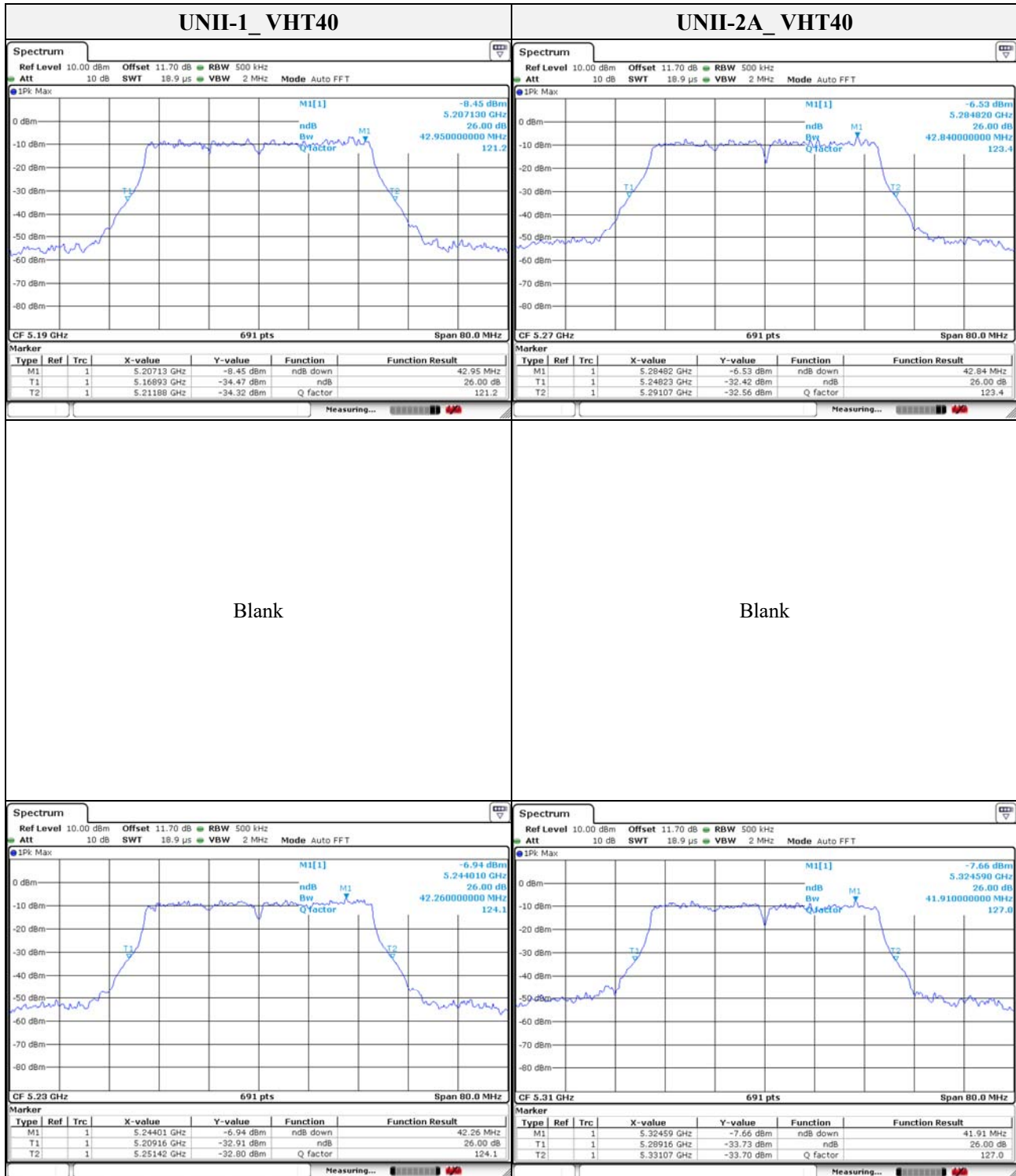
26 dB bandwidth

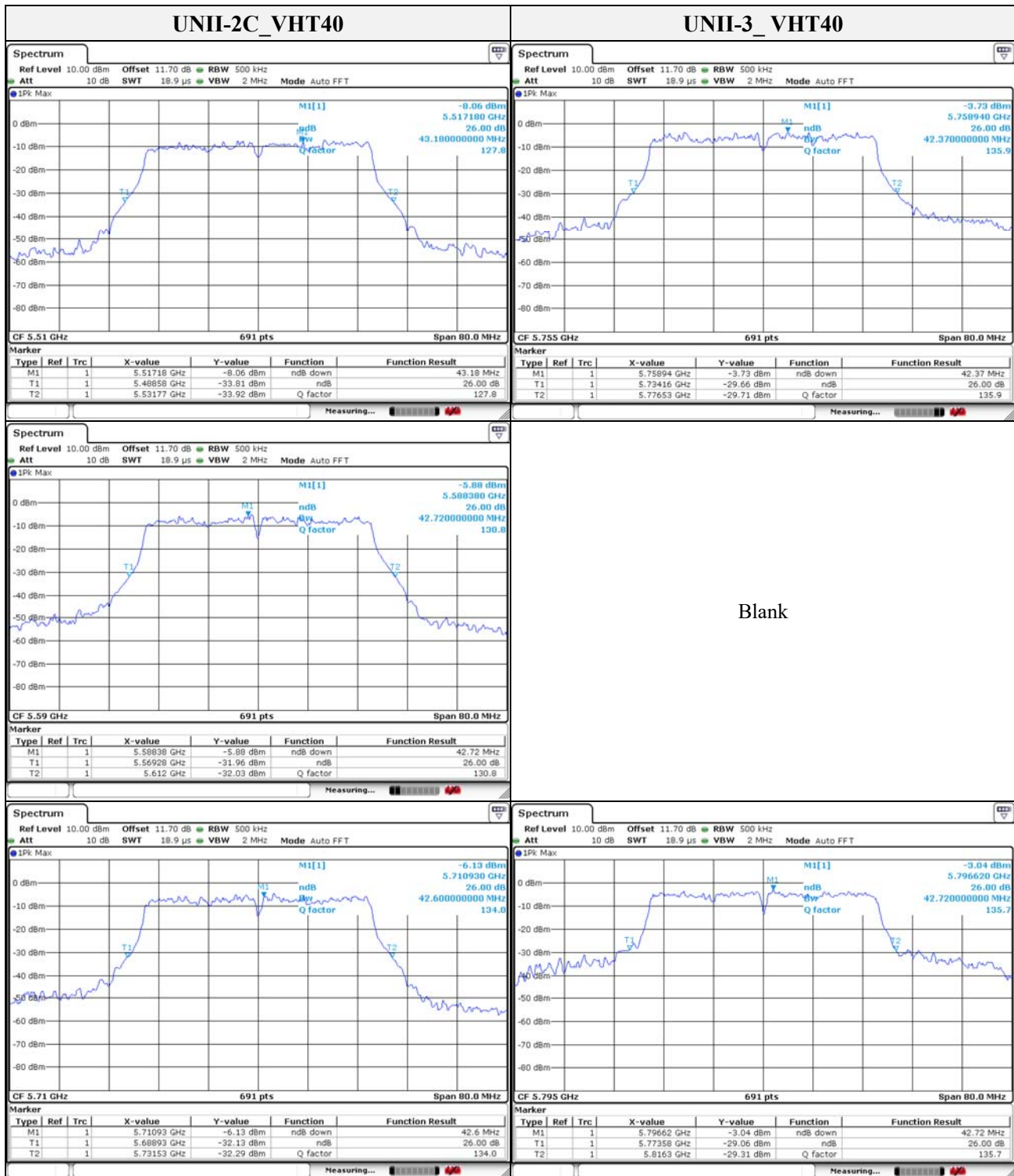


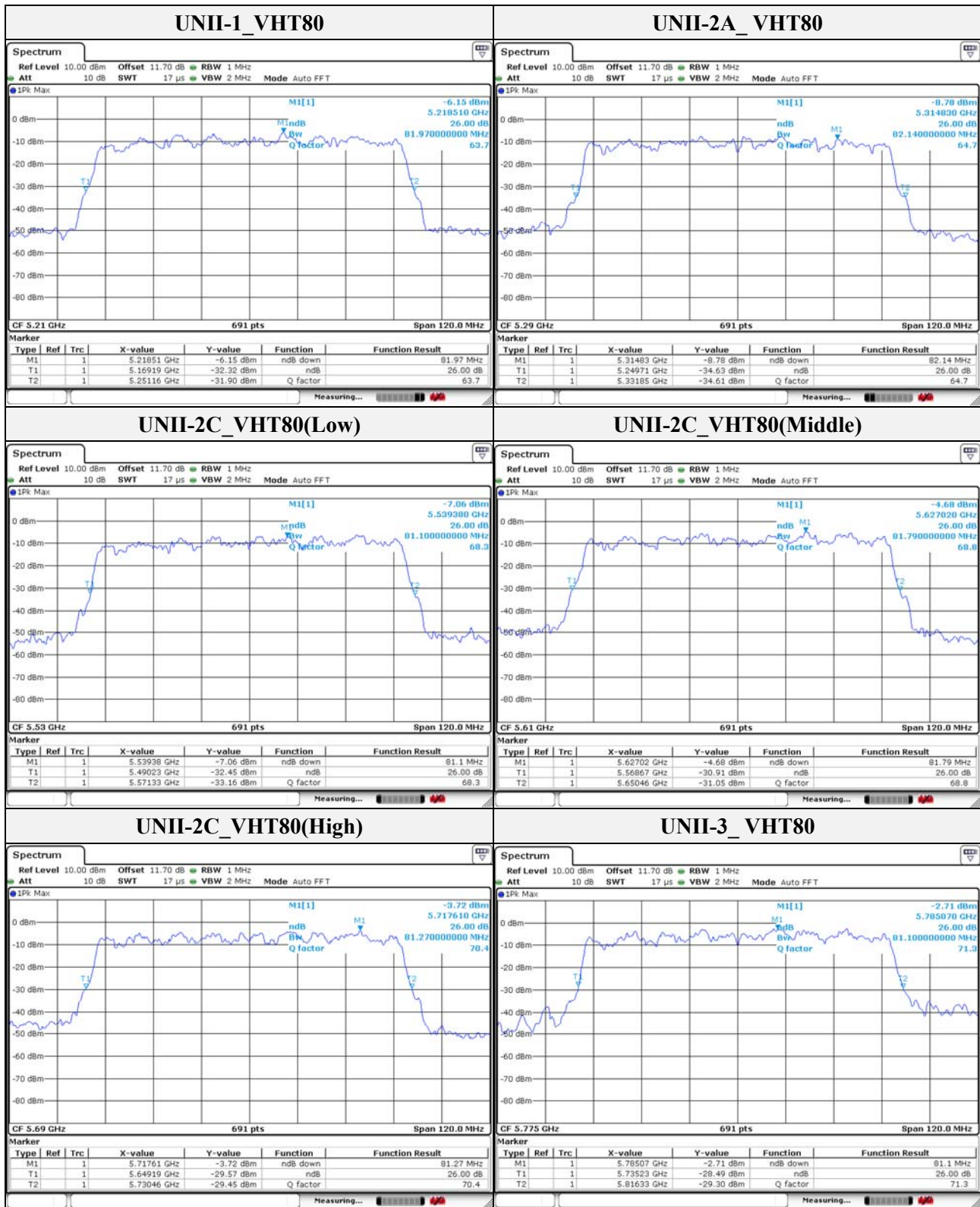
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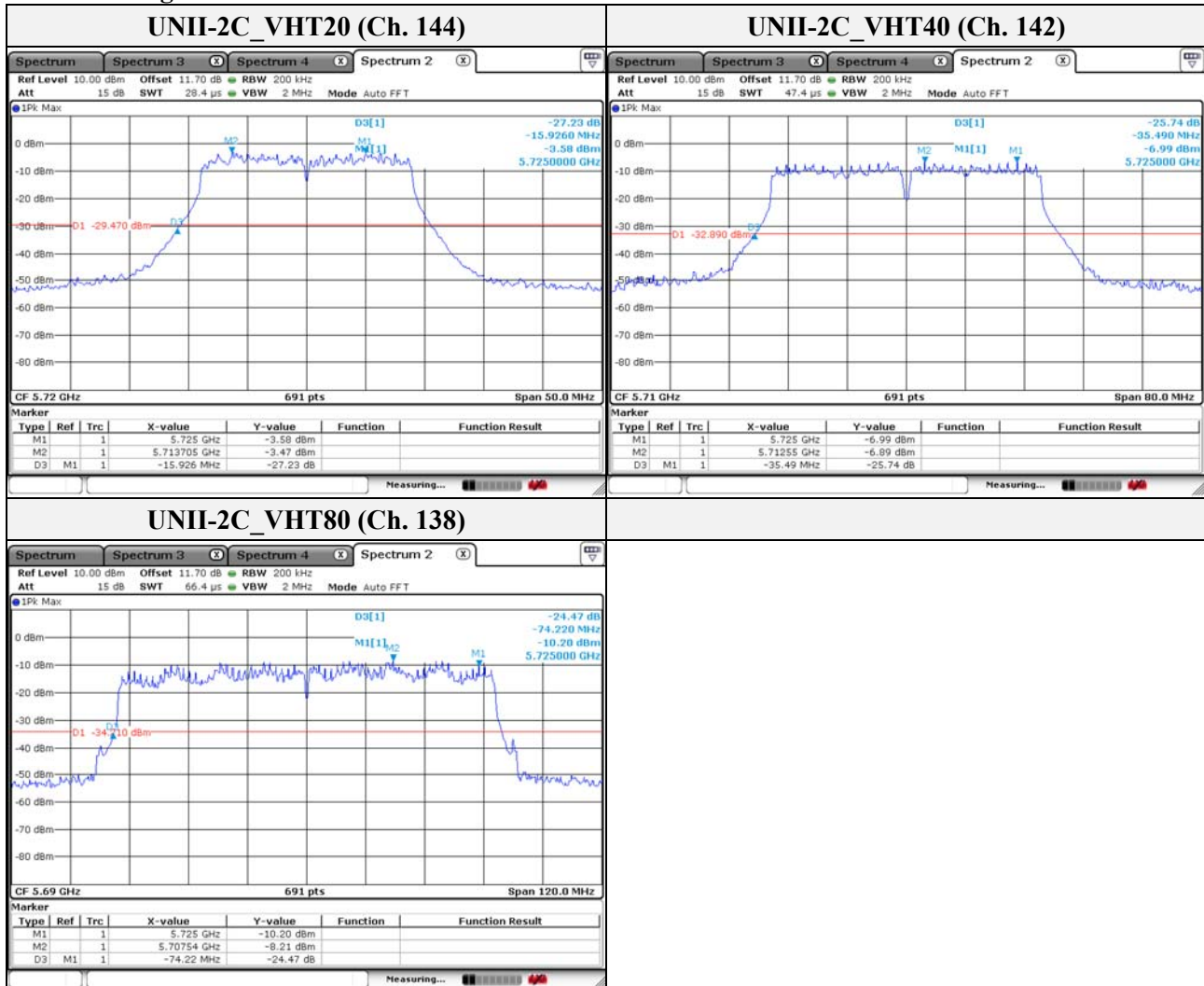




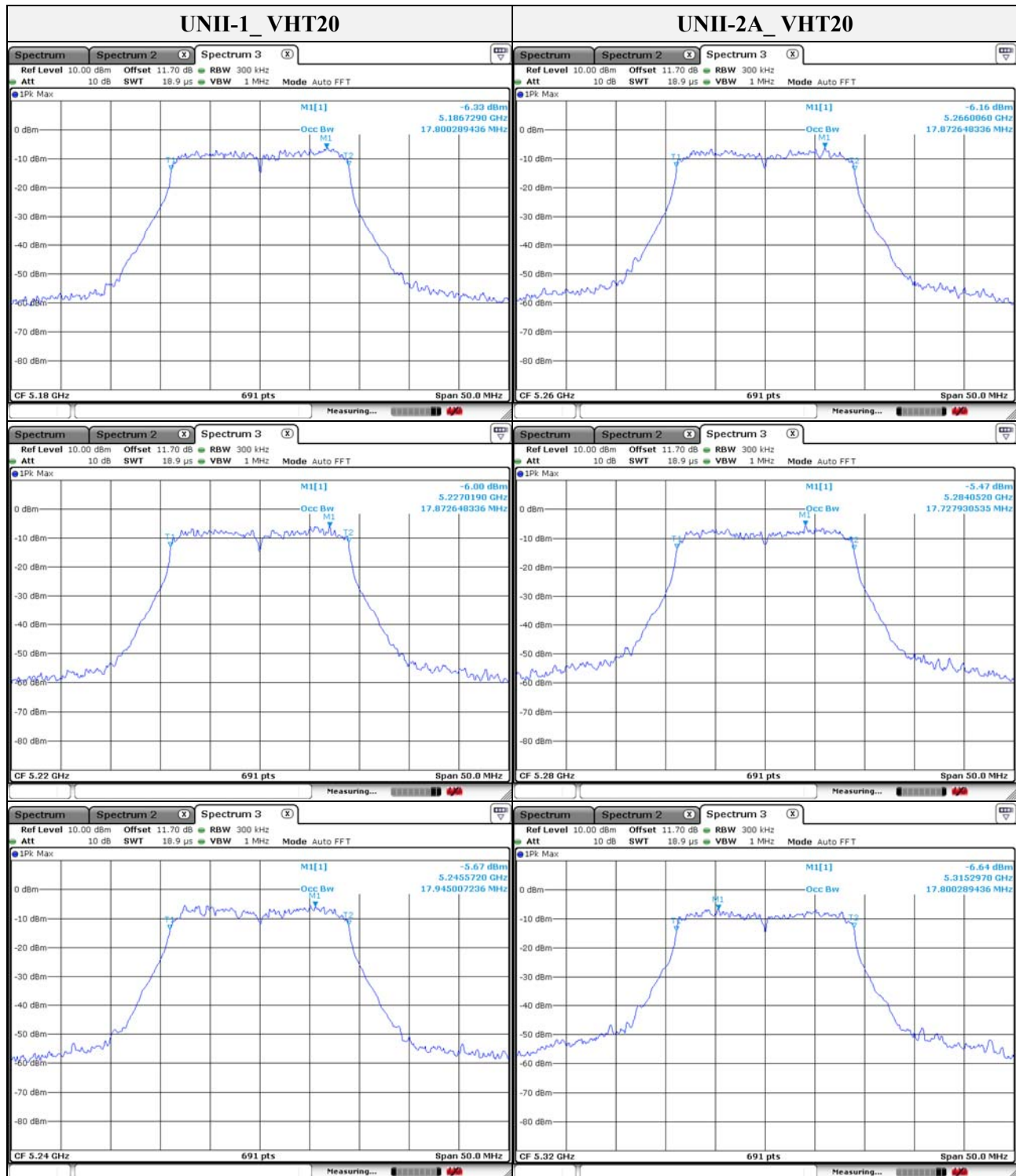


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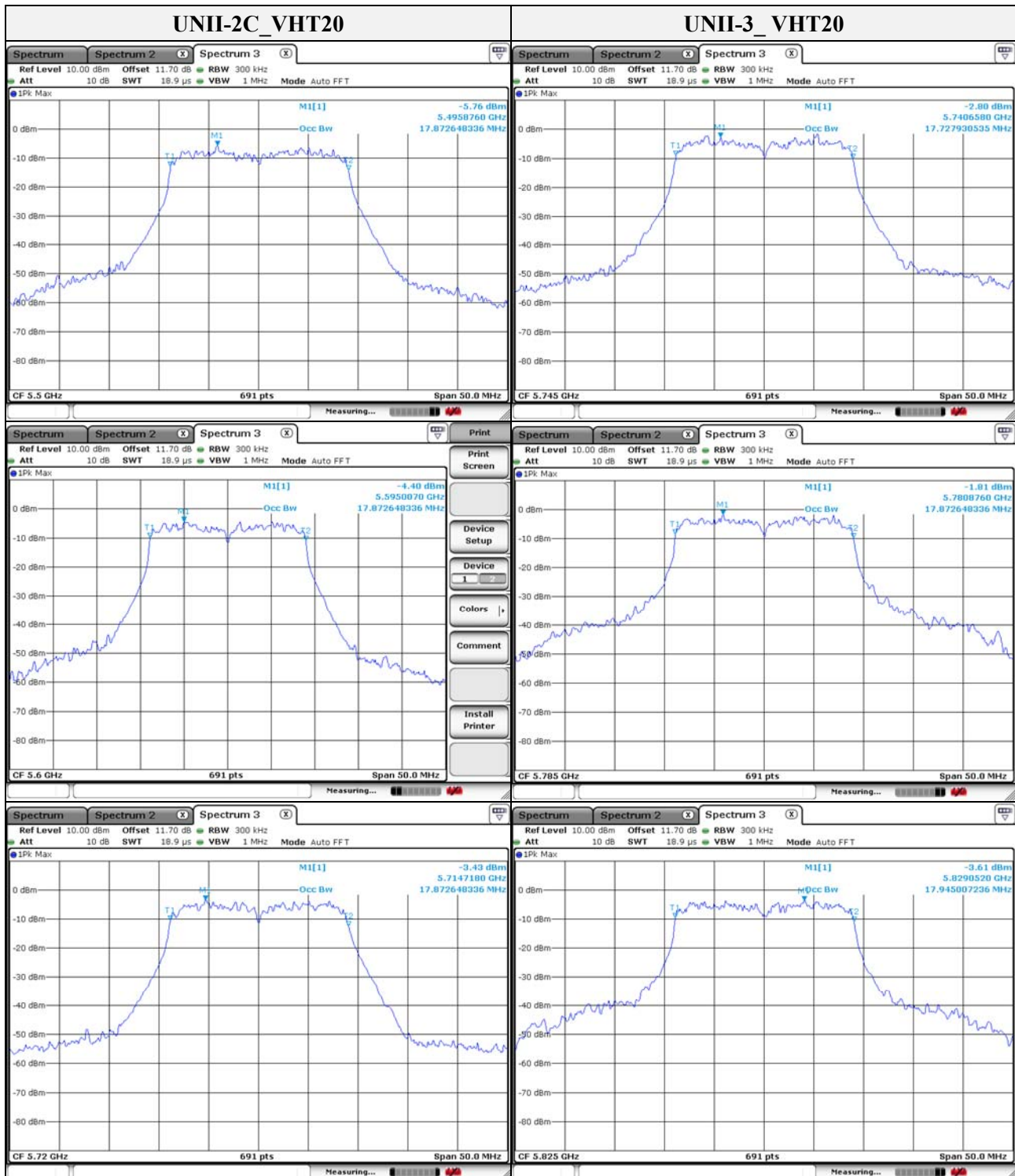
Band-crossing channels



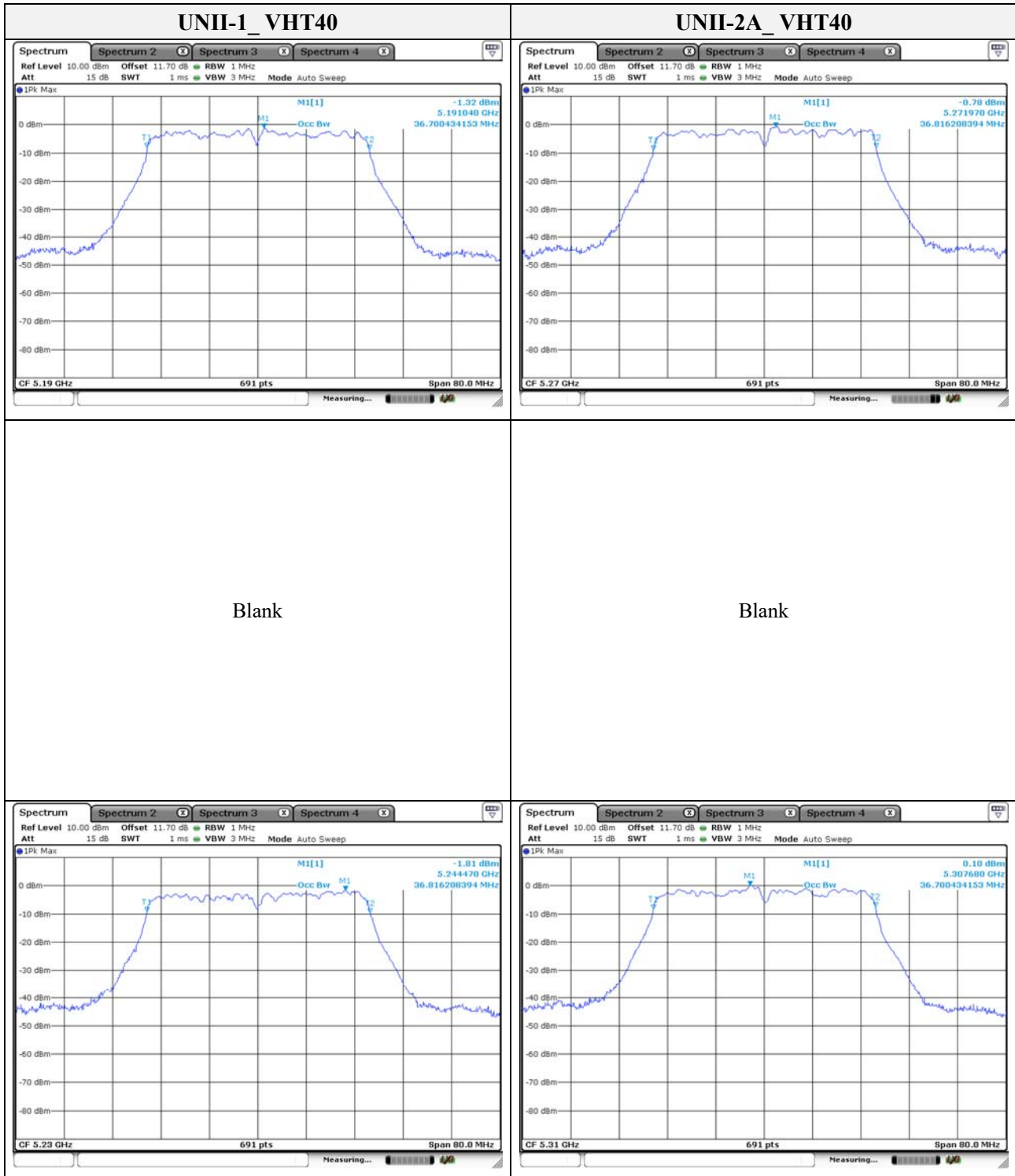
99% bandwidth

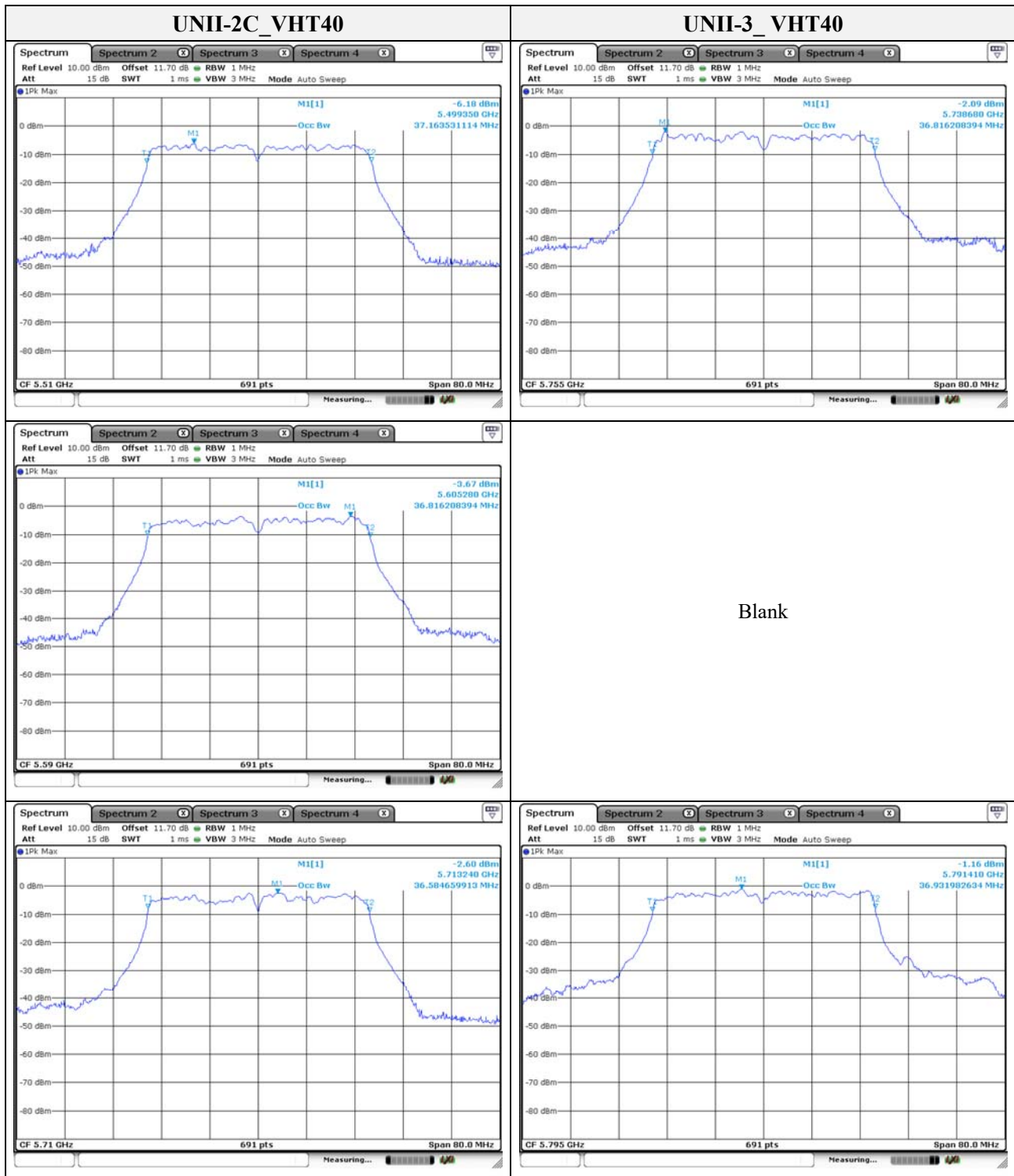


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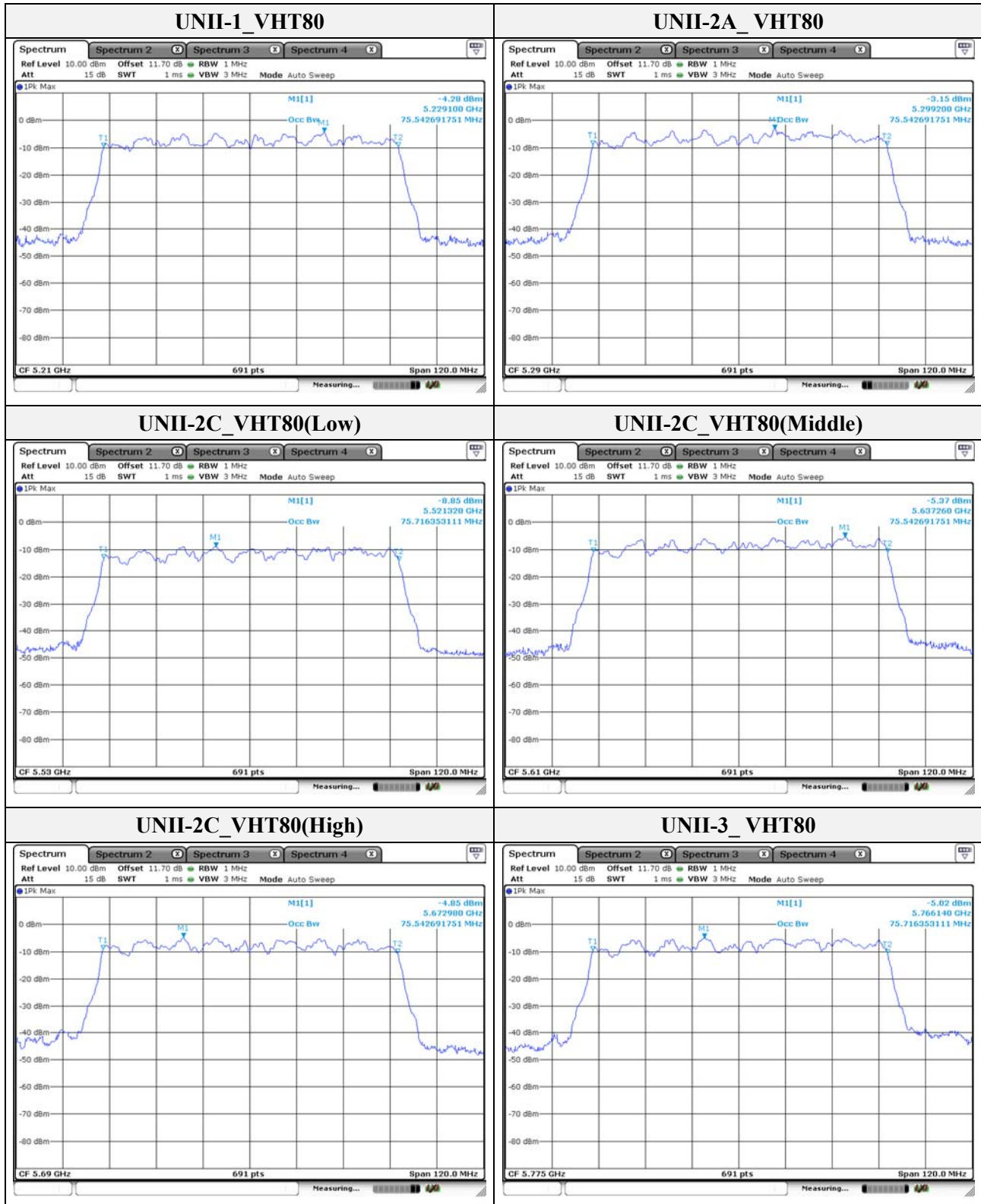


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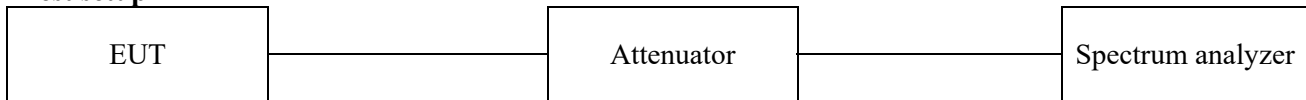
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3.2. 6 dB bandwidth

Test procedure

KDB 789033 D02 v02r01– Section C.2

Test setup



Section C.2

1. Set RBW = 100 kHz
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = peak.
4. Sweep = auto couple.
5. Allow the trace to stabilize
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Limit

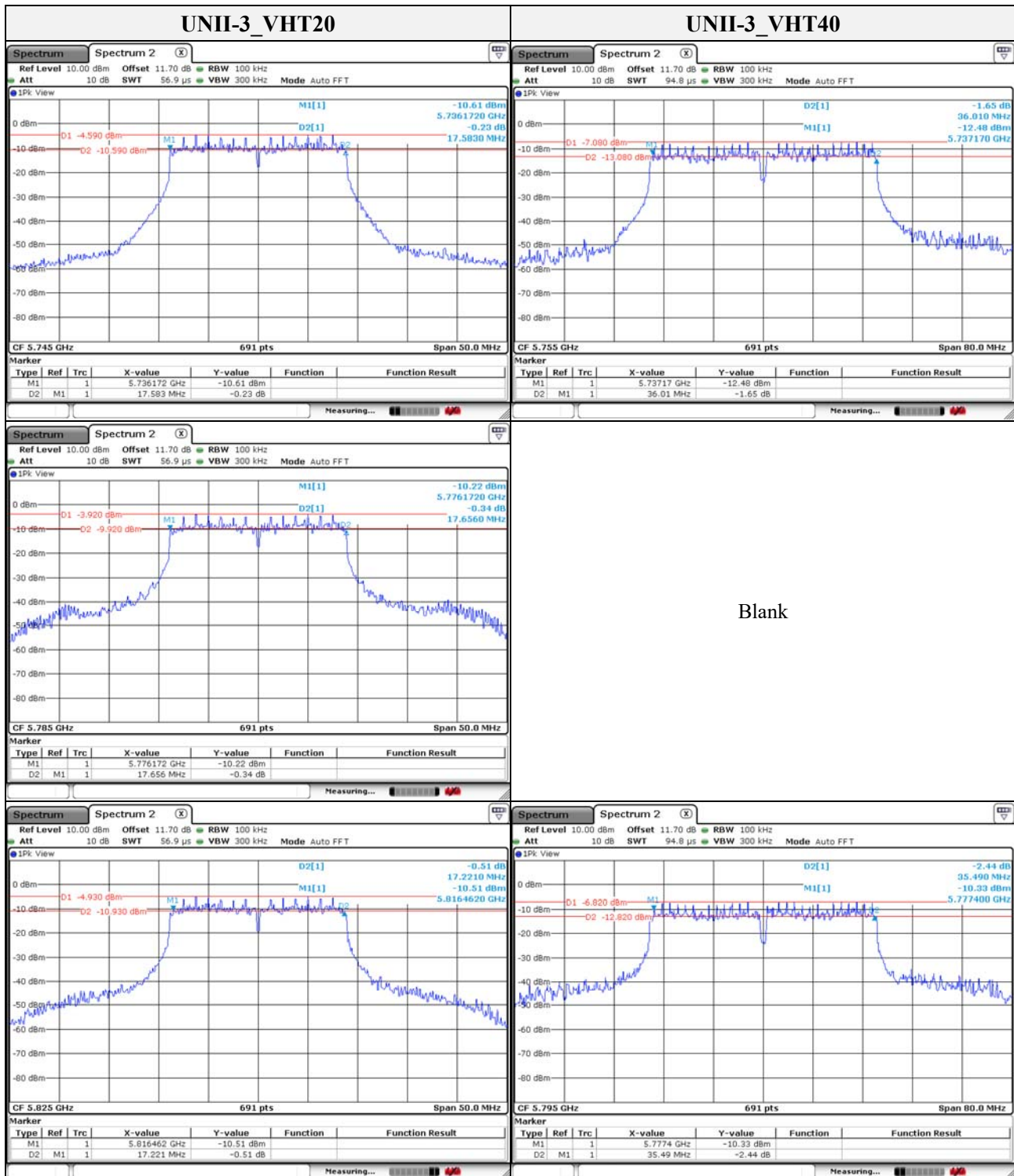
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

According to RSS-247 6.1 (1), equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

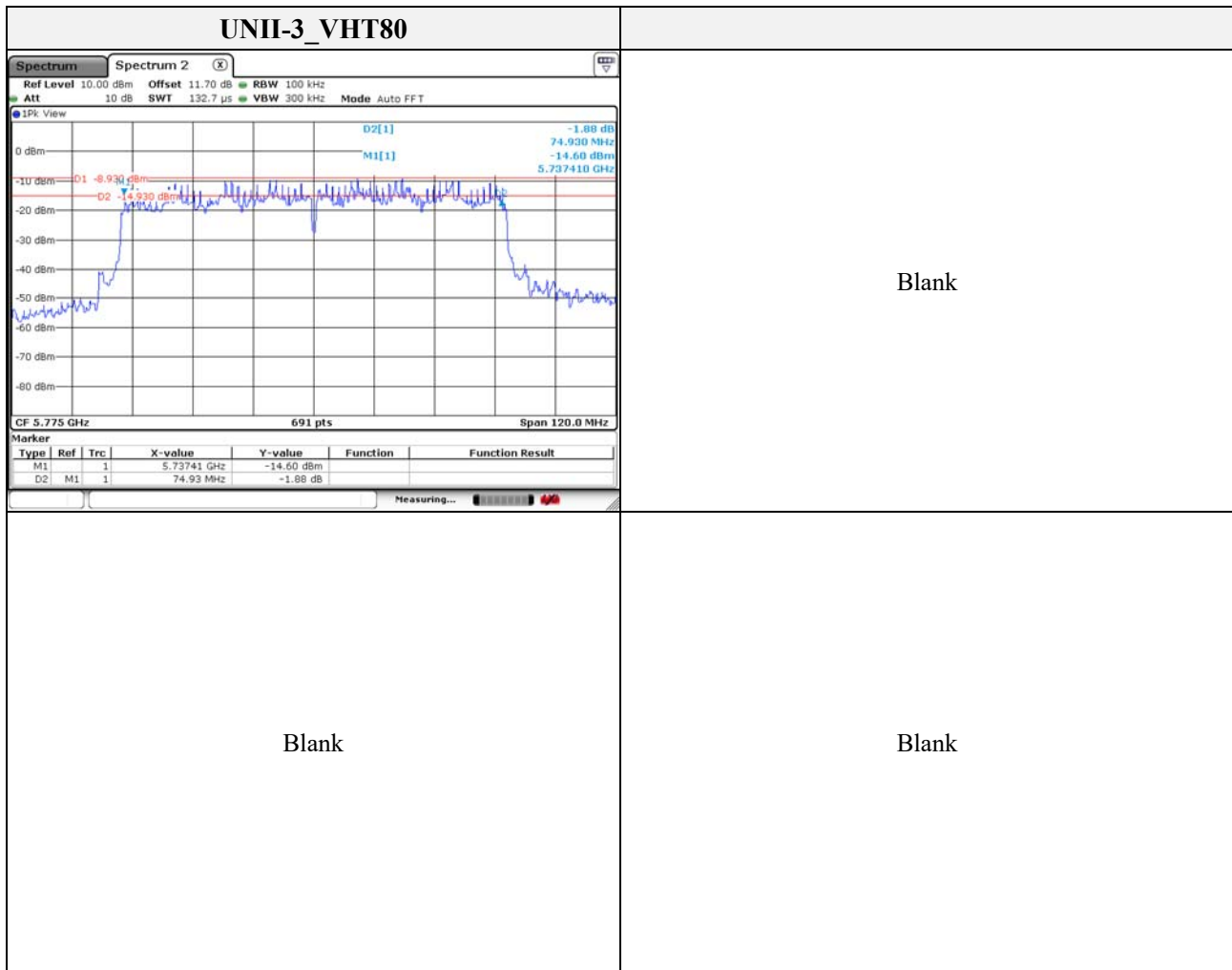
Test results

Band	Frequency(MHz)	Mode	6 dB bandwidth(MHz)
UNII-3	5 745	VHT20	17.583
	5 785		17.656
	5 825		17.221
	5 755	VHT40	36.010
	5 795		35.490
	5 775	VHT80	74.930
UNII-3 (Band-crossing channels)	5 720	VHT20	3.160
	5 710	VHT40	2.810
	5 690	VHT80	3.857

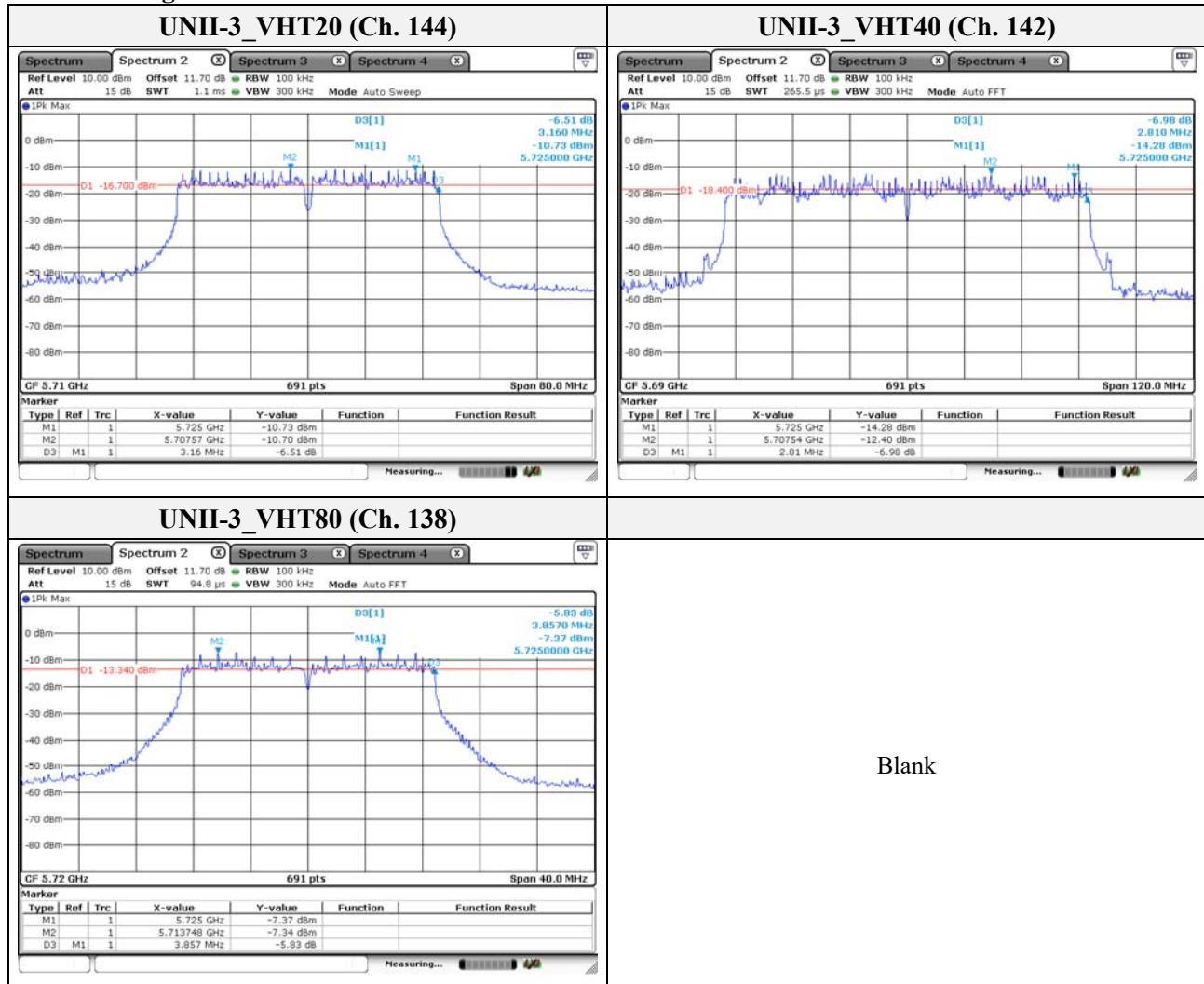
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Band-crossing channels



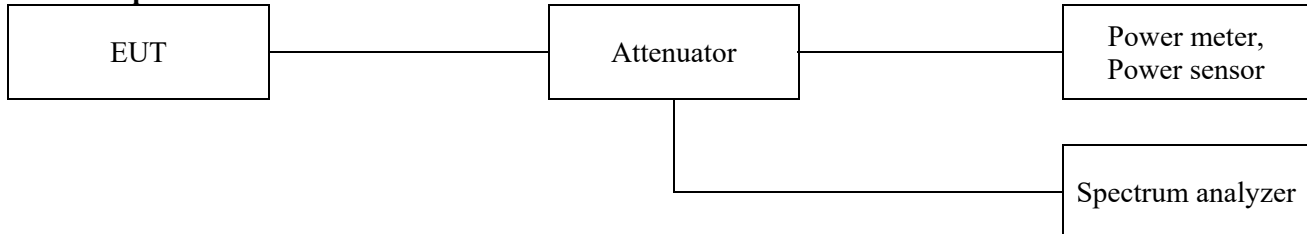
3.3. Maximum conducted output power

Test procedure

KDB 789033 D02 v02r01– Section E.3.a) or b)

Used test method is Section E.3.b)

Test setup



Section E.3.a)

Method PM (Measurement using an RF average power meter):

- i. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.
 - The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
 - At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
 - The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- ii. If the transmitter does not transmit continuously, measure the duty cycle, x , of the transmitter output signal as described in section II.B.
- iii. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
- iv. Adjust the measurement in dBm by adding $10 \log (1/x)$ where x is the duty cycle (e.g., $10 \log (1/0.25)$ if the duty cycle is 25 %).

Section E.3.b)

Method PM-G (Measurement using a gated RF average power meter):

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

**Limit
FCC**

Band	EUT Category		Limit
UNII-1		Outdoor access point	1 W (30 dBm)
		Indoor access point	
		Fixed point-to-point access point	
	✓	Mobile and portable client device	250 mW(24 dBm)
UNII-2A	✓		250 mW or 11 dBm + 10logB*
UNII-2C	✓		250 mW or 11 dBm + 10logB*
UNII-3	✓		1 W (30 dBm)

Note.

1. FCC Limit B is the 26 dB emission bandwidth.

Test results

Band	Frequency (MHz)	Mode	Detector mode	Output power (dBm)	Limit(dBm)
					FCC
UNII-1	5 180	VHT20	AV	7.59	24.00
	5 220		AV	7.76	
	5 240		AV	8.05	
UNII-2A	5 260		AV	6.45	24.00
	5 280		AV	6.66	
	5 320		AV	6.52	
UNII-2C	5 500		AV	6.99	24.00
	5 600		AV	7.50	
	5 720		AV	7.72	
UNII-3	5 745		AV	10.09	30.00
	5 785		AV	10.29	
	5 825		AV	9.71	

Band	Frequency (MHz)	Mode	Detector mode	Output power (dBm)	Limit(dBm)
					FCC
UNII-1	5 190	VHT40	AV	6.52	24.00
	5 230		AV	6.93	
UNII-2A	5 270		AV	5.85	24.00
	5 310		AV	6.13	
UNII-2C	5 510		AV	7.90	24.00
	5 590		AV	7.53	
	5 710		AV	7.96	
UNII-3	5 755		AV	10.23	30.00
	5 795		AV	10.19	

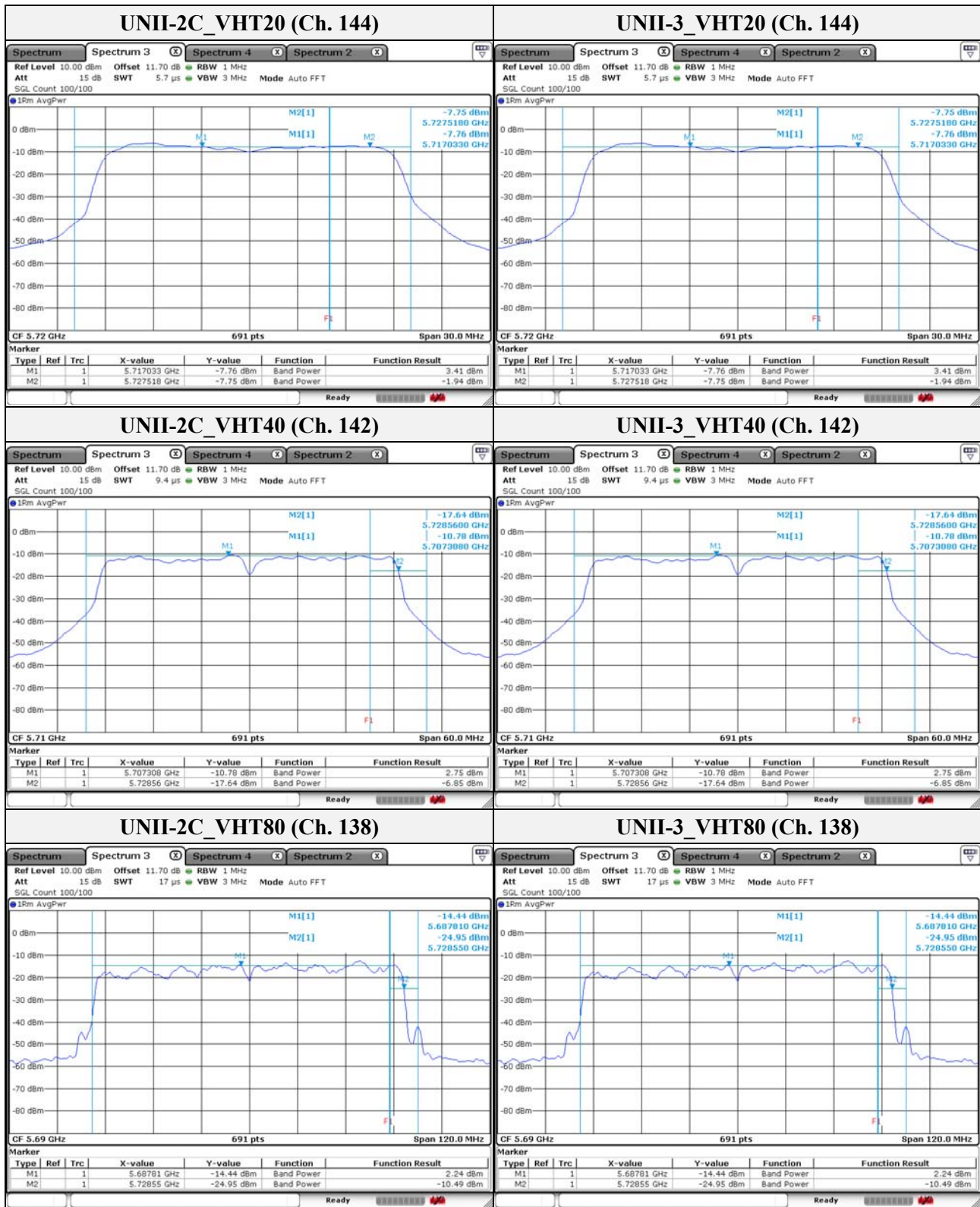
Band	Frequency (MHz)	Mode	Detector mode	Output power (dBm)	Limit(dBm)
					FCC
UNII-1	5 210	VHT80	AV	7.09	24.00
UNII-2A	5 290		AV	5.77	24.00
UNII-2C	5 530		AV	6.08	24.00
	5 610		AV	6.88	
	5 690		AV	6.94	
UNII-3	5 775		AV	9.68	30.00



Band-crossing channels

Band	Frequency (MHz)	Mode	Detector mode	Output power (dBm)	Limit(dBm)
					FCC
UNII-2C	5 720	VHT20	AV	3.41	22.90
	5 710	VHT40	AV	2.75	24.00
	5 690	VHT80	AV	2.24	24.00
UNII-3	5 720	VHT20	AV	-1.94	30.00
	5 710	VHT40	AV	-6.85	
	5 690	VHT80	AV	-10.49	

Band-crossing channels



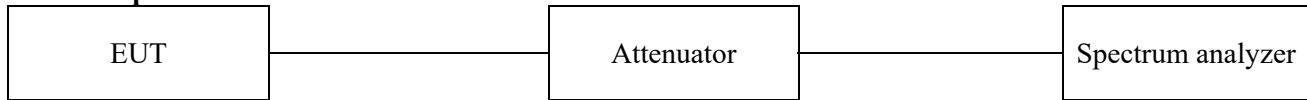
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3.4. Power spectral density

Test procedure

KDB 789033 D02 v02r01 – Section F

Test setup



Section F

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power...” (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
3. Make the following adjustments to the peak value of the spectrum, if applicable:
 - a) If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.
 - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
4. The result is the Maximum PSD over 1 MHz reference bandwidth.
5. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
 - a) Set $RBW \geq 1/T$, where T is defined in section II.B.1.a)
 - b) Set $VBW \geq 3 \text{ RBW}$.
 - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log(500 \text{ kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ kHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
 - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10 \log(1 \text{ MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
 - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note.

As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since $RBW=100 \text{ kHz}$ is available on nearly all spectrum analyzers.

**Limit
FCC**

Band	EUT Category		Limit
UNII-1		Outdoor access point	17 dBm/MHz
		Indoor access point	
		Fixed point-to-point access point	
	✓	Mobile and portable client device	11 dBm/MHz
UNII-2A	✓		11 dBm/MHz
UNII-2C	✓		11 dBm/MHz
UNII-3	✓		30 dBm/500 kHz

Note.

1. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceed 6 dBi.

Test results

Band	Frequency (MHz)	Mode	PSD (dBm/MHz)	RBWF Note1	DCF Note2	Sum Note3	Limit(dBm/MHz)
							FCC
UNII-1	5 180	VHT20	-6.88	-	2.20	-4.68	11.00
	5 220		-7.49			-5.29	
	5 240		-6.88			-4.68	
	5 190	VHT40	-11.89		3.71	-8.18	
	5 230		-11.99			-8.28	
	5 210	VHT80	-14.59		3.70	-10.89	

Band	Frequency (MHz)	Mode	PSD (dBm/MHz)	RBWF Note1	DCF Note2	Sum Note3	Limit(dBm/MHz)
							FCC
UNII-2A	5 260	VHT20	-7.90	-	1.75	-6.15	11.00
	5 280		-7.40			-5.65	
	5 320		-7.63			-5.88	
	5 270	VHT40	-11.75		3.14	-8.61	
	5 310		-10.98			-7.84	
	5 290	VHT80	-15.04		3.78	-11.26	

Band	Frequency (MHz)	Mode	PSD (dBm/MHz)	RBWF Note1	DCF Note2	Sum Note3	Limit(dBm/MHz)
							FCC
UNII-2C	5 500	VHT20	-6.20	-	2.07	-4.13	11.00
	5 600		-6.93			-4.86	
	5 720		-5.56			-3.49	
	5 500	VHT40	-10.54		3.85	-6.69	
	5 600		-10.98			-7.13	
	5 720		-9.49			-5.64	
	5 530	VHT80	-14.17		4.52	-9.65	
	5 610		-14.03			-9.51	
	5 690		-12.59			-8.07	

Band	Frequency (MHz)	Mode	PSD (dBm/500kHz)	RBWF Note1	DCF Note2	Sum Note3	Limit(dBm/MHz)
							FCC
UNII-3	5 745	VHT20	-6.29	-	2.40	-3.89	30.00
	5 785		-6.24			-3.84	
	5 825		-7.54			-5.14	
	5 755	VHT40	-11.15		3.51	-7.64	
	5 795		-10.09			-6.58	
	5 775	VHT80	-12.75		4.07	-8.68	

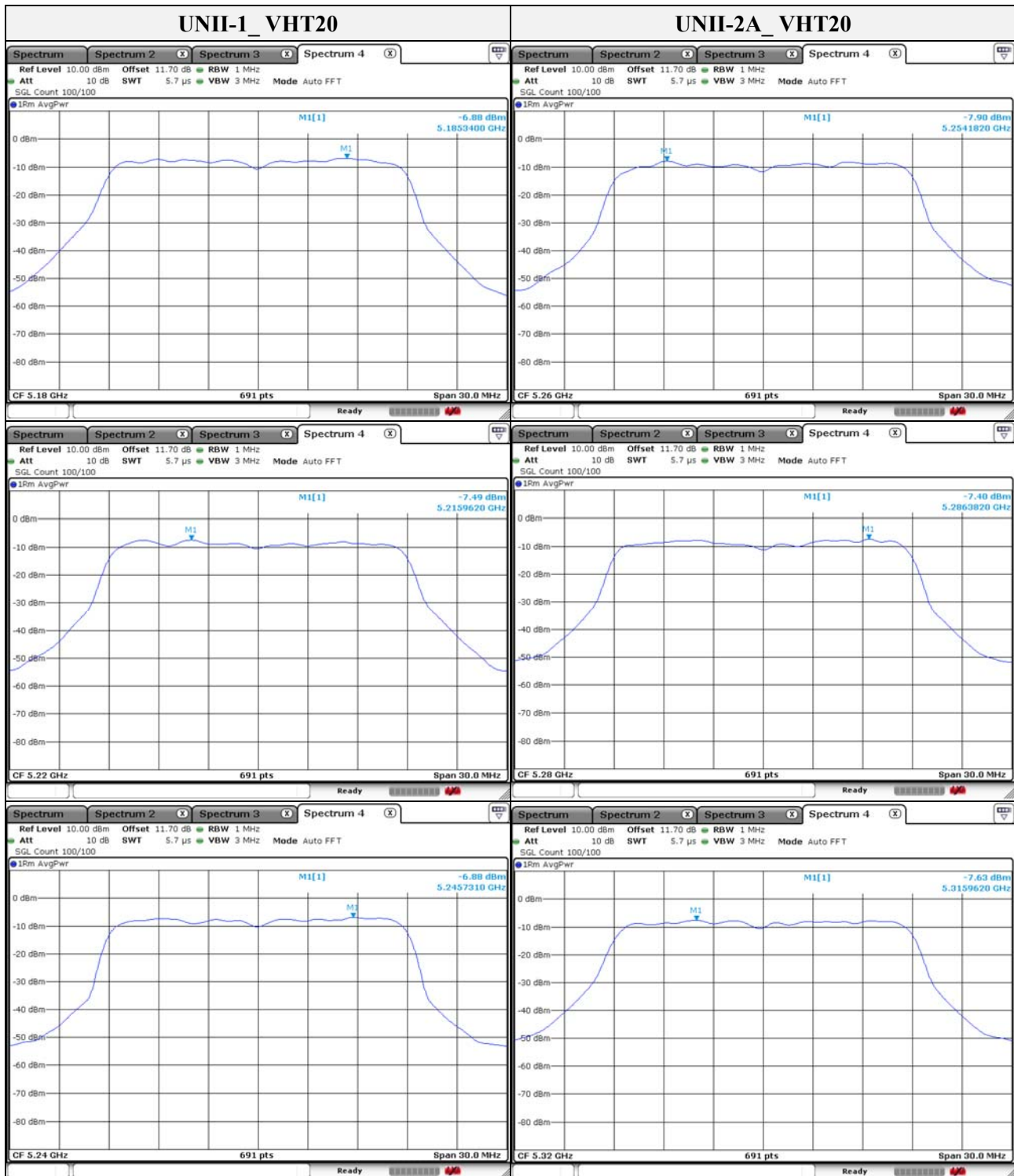
Band-crossing channels

Band	Frequency (MHz)	Mode	PSD (dBm/MHz)	RBWF Note1	DCF Note2	Sum Note3	Limit(dBm/MHz)
							FCC
UNII-2C	5 720	VHT20	-6.01	-	2.07	-3.94	11.00
	5 710	VHT40	-9.81	-	3.85	-5.96	
	5 690	VHT80	-12.24	-	4.52	-7.72	

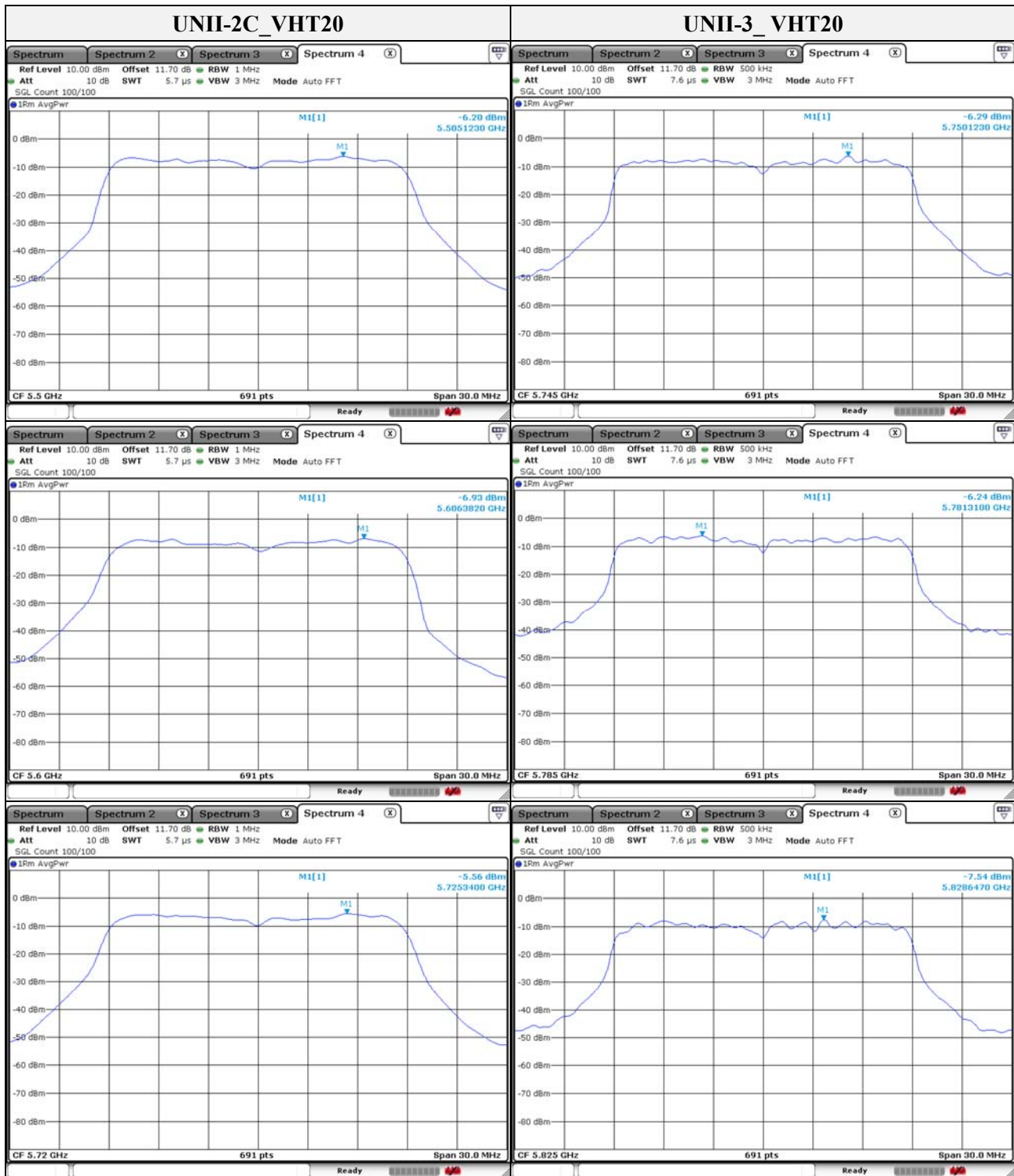
Band	Frequency (MHz)	Mode	PSD (dBm/500kHz)	RBWF Note1	DCF Note2	Sum Note3	Limit (dBm/500kHz)
							FCC
UNII-3	5 720	VHT20	-9.45	-	2.40	-7.05	30.00
	5 710	VHT40	-13.92	-	3.51	-10.41	
	5 690	VHT80	-17.69	-	4.07	-13.62	

Note.

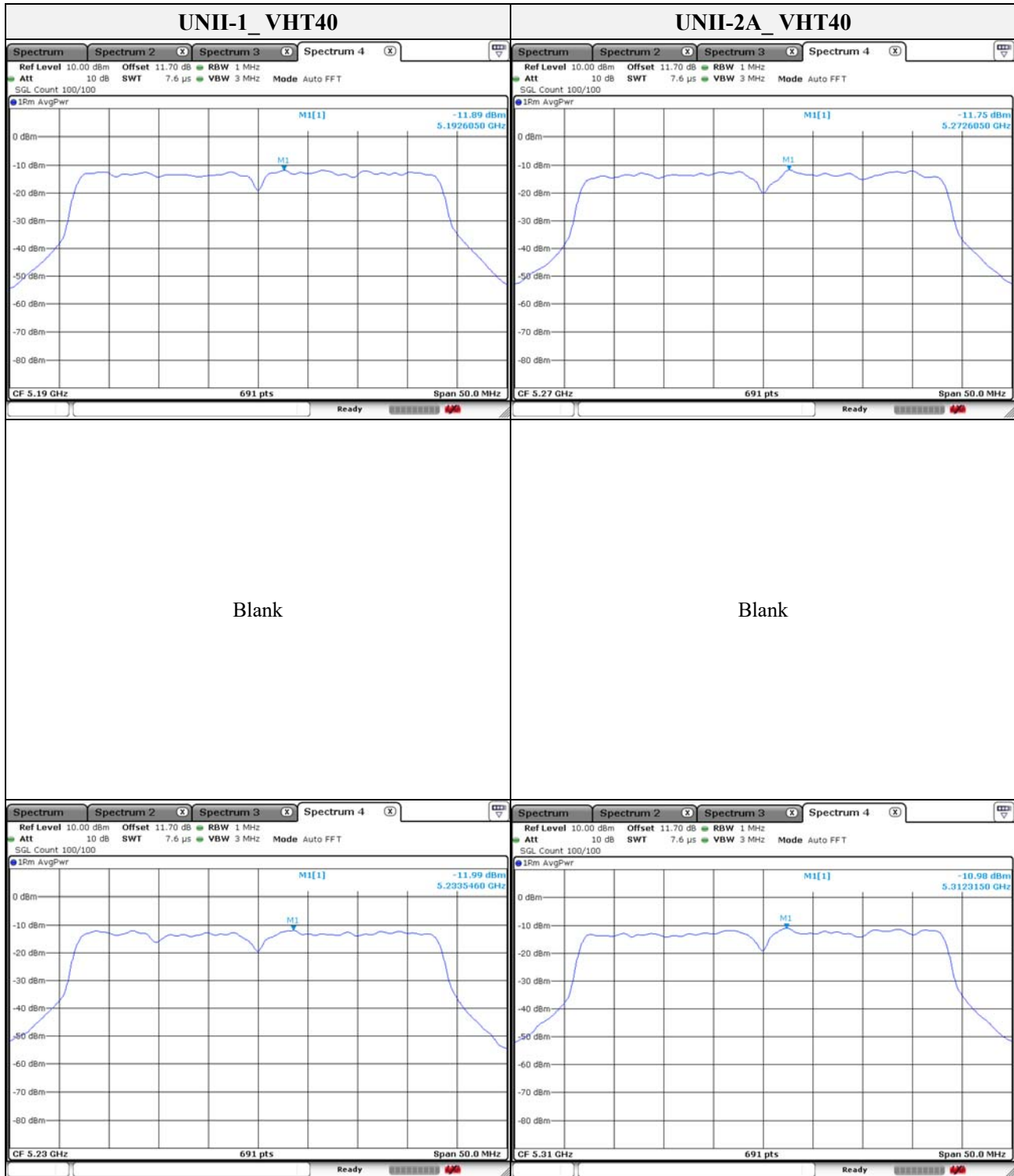
- UNII-1 = $10\log(1 \text{ MHz}/1 \text{ MHz})$
UNII-2A = $10\log(1 \text{ MHz}/1 \text{ MHz})$
UNII-2C = $10\log(1 \text{ MHz}/1 \text{ MHz})$
UNII-3 = $10\log(500 \text{ kHz} / 500 \text{ kHz})$
- Refer to the page 53 on this report.
- $\text{Sum(dBm)} = \text{PSD(dBm)} + \text{RBWF} + \text{Duty correction factor (dB)}$



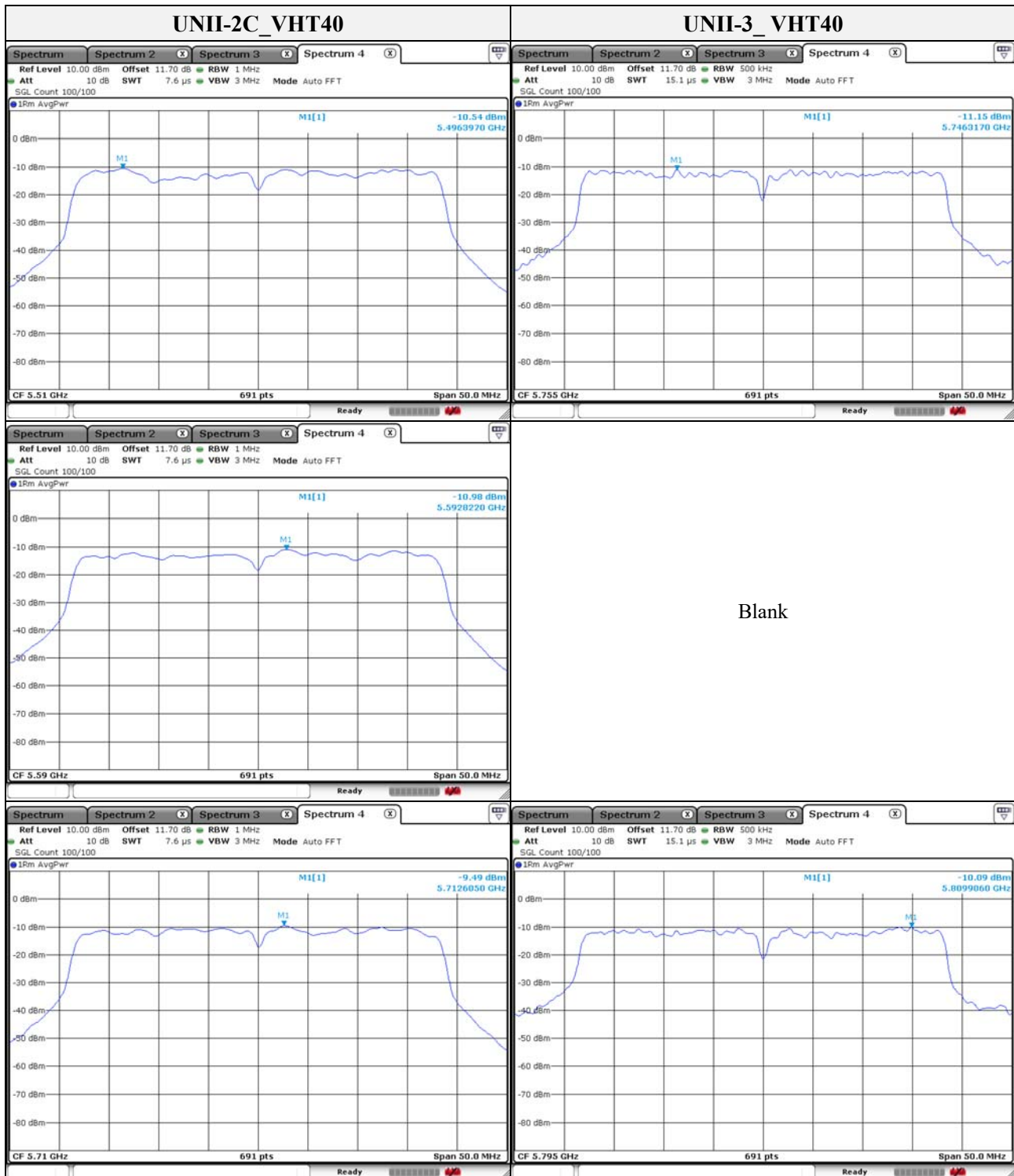
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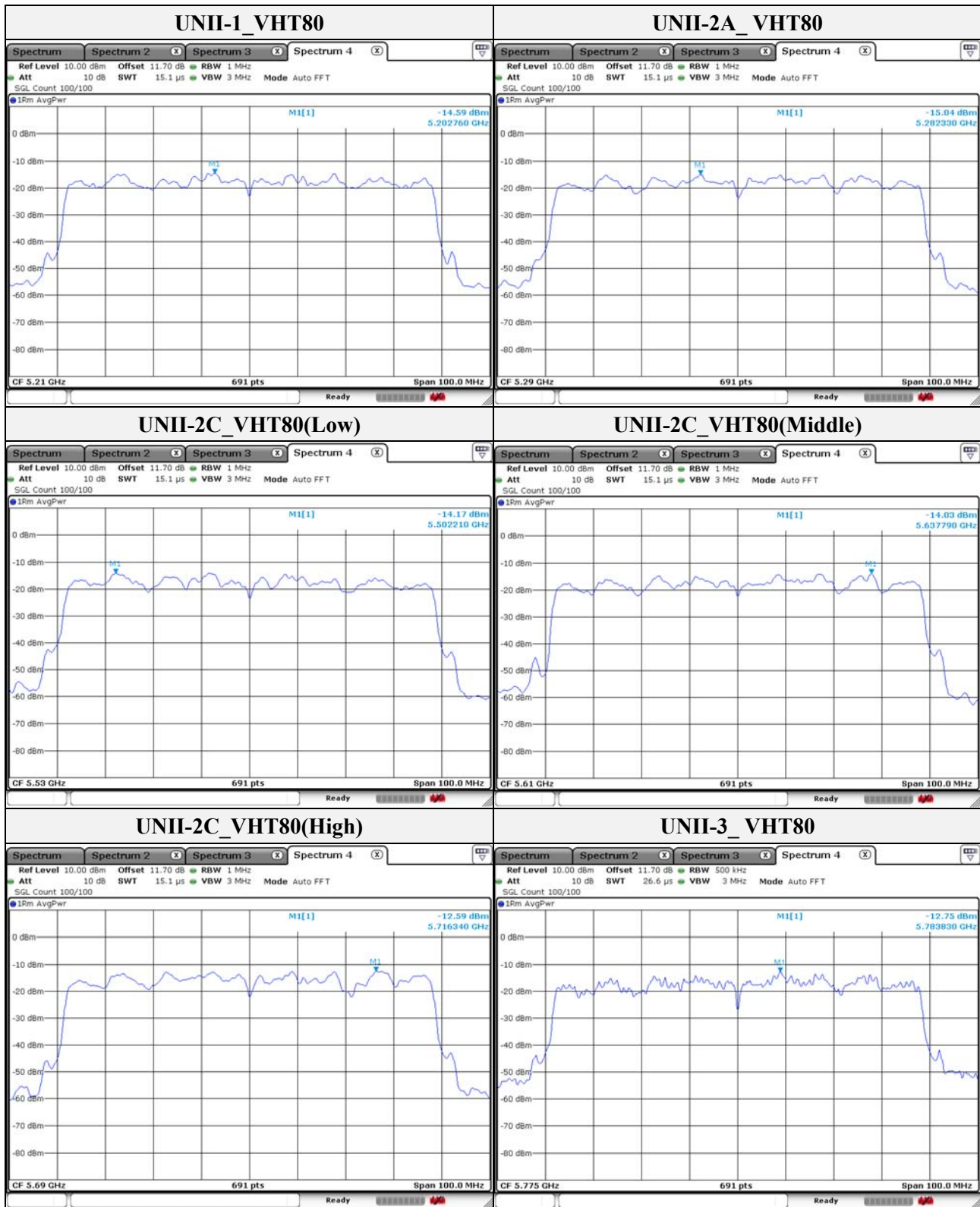
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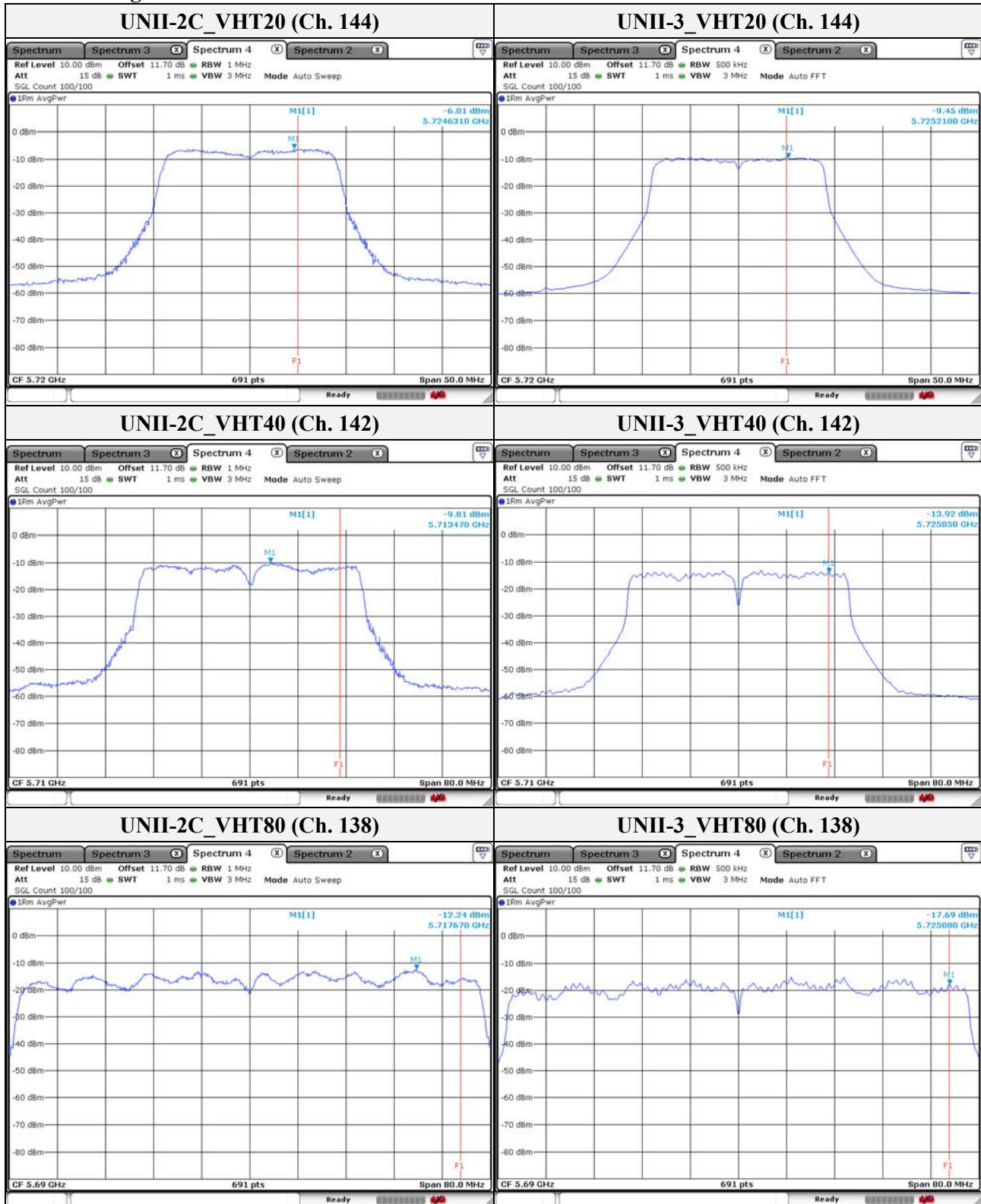


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Band-crossing channels



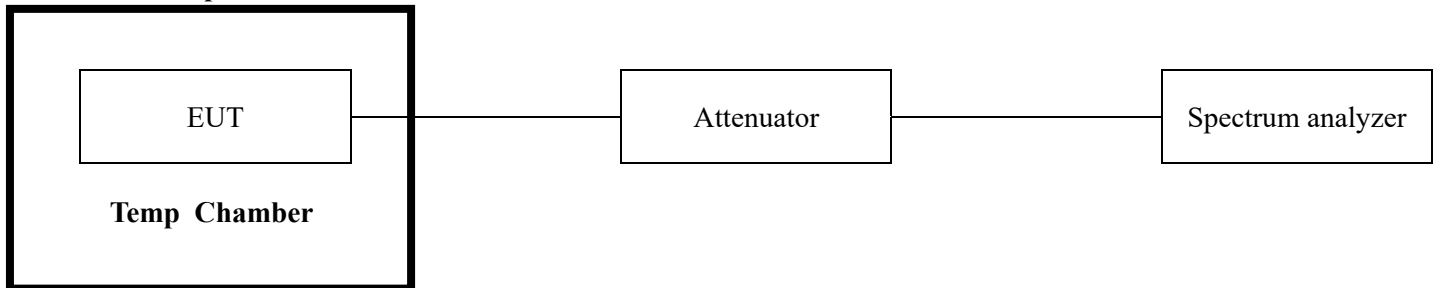
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3.5. Frequency Stability

Test procedure

ANSI C63.10-2013, clause 6.8.1

Test setup



1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.
7. While maintaining a constant temperature inside the environmental chamber, turn the EUT on and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

Limit

N/A

Test results

Mode:

UNII-1

Operating frequency:

5 180 MHz

Test voltage (%)	Test voltage (V)	Temperature (℃)	Maintaining time	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)
100 %	DC 24	-20	Startup	5 180.028 413	28 413	0.000 549
			2 minutes	5 180.028 009	28 009	0.000 541
			5 minutes	5 180.027 169	27 169	0.000 524
			10 minutes	5 180.026 958	26 958	0.000 520
100 %		-10	Startup	5 180.024 289	24 289	0.000 469
			2 minutes	5 180.024 207	24 207	0.000 467
			5 minutes	5 180.023 729	23 729	0.000 458
			10 minutes	5 180.023 460	23 460	0.000 453
100 %		0	Startup	5 180.016 706	16 706	0.000 323
			2 minutes	5 180.016 633	16 633	0.000 321
			5 minutes	5 180.016 550	16 550	0.000 319
			10 minutes	5 180.015 159	15 159	0.000 293
100 %		10	Startup	5 180.009 413	9 413	0.000 182
			2 minutes	5 180.009 323	9 323	0.000 180
			5 minutes	5 180.009 228	9 228	0.000 178
			10 minutes	5 180.008 653	8 653	0.000 167
100 %		20	Startup	5 180.008 071	8 071	0.000 156
			2 minutes	5 180.007 476	7 476	0.000 144
			5 minutes	5 180.007 189	7 189	0.000 139
			10 minutes	5 180.006 492	6 492	0.000 125
100 %		23	Startup	5 180.006 733	6 733	0.000 130
			2 minutes	5 180.006 527	6 527	0.000 126
			5 minutes	5 180.005 570	5 570	0.000 108
			10 minutes	5 180.005 245	5 245	0.000 101
100 %		30	Startup	5 180.005 873	5 873	0.000 113
			2 minutes	5 180.006 445	6 445	0.000 124
			5 minutes	5 180.006 131	6 131	0.000 118
			10 minutes	5 180.005 183	5 183	0.000 100
100 %		40	Startup	5 179.991 197	-880 3	-0.000 170
			2 minutes	5 179.991 055	-894 5	-0.000 173
			5 minutes	5 179.990 936	-906 4	-0.000 175
			10 minutes	5 179.990 106	-989 4	-0.000 191
100 %		50	Startup	5 179.987 750	-122 50	-0.000 236
			2 minutes	5 179.987 607	-123 93	-0.000 239
			5 minutes	5 179.987 259	-127 41	-0.000 246
			10 minutes	5 179.986 965	-130 35	-0.000 252
85 %	DC 20.4	23	Startup	5 180.008 214	8 214	0.000 159
			2 minutes	5 180.007 896	7 896	0.000 152
			5 minutes	5 180.007 612	7 612	0.000 147
			10 minutes	5 180.007 573	7 573	0.000 146
115 %	DC 27.6	23	Startup	5 180.008 825	8 825	0.000 170
			2 minutes	5 180.008 317	8 317	0.000 161
			5 minutes	5 180.008 305	8 305	0.000 160
			10 minutes	5 180.007 463	7 463	0.000 144

Note.

- All 9-36V DC mode were investigated and the data 24VDC was reported in this section is the worst case condition

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Mode: UNII-2A

Operating frequency: 5 260 MHz

Test voltage (%)	Test voltage (V)	Temperature (°C)	Maintaining time	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)
100 %	DC 24	-20	Startup	5 260.028 324	28 324	0.000 538
			2 minutes	5 260.028 202	28 202	0.000 536
			5 minutes	5 260.027 813	27 813	0.000 529
			10 minutes	5 260.026 859	26 859	0.000 511
100 %		-10	Startup	5 260.025 149	25 149	0.000 478
			2 minutes	5 260.024 985	24 985	0.000 475
			5 minutes	5 260.024 497	24 497	0.000 466
			10 minutes	5 260.023 654	23 654	0.000 450
100 %		0	Startup	5 260.016 292	16 292	0.000 310
			2 minutes	5 260.015 586	15 586	0.000 296
			5 minutes	5 260.015 188	15 188	0.000 289
			10 minutes	5 260.015 073	15 073	0.000 287
100 %		10	Startup	5 260.010 189	10 189	0.000 194
			2 minutes	5 260.009 201	9 201	0.000 175
			5 minutes	5 260.008 824	8 824	0.000 168
			10 minutes	5 260.008 702	8 702	0.000 165
100 %		20	Startup	5 260.007 762	7 762	0.000 148
			2 minutes	5 260.007 748	7 748	0.000 147
			5 minutes	5 260.006 950	6 950	0.000 132
			10 minutes	5 260.006 306	6 306	0.000 120
100 %		23	Startup	5 260.007 136	7 136	0.000 136
			2 minutes	5 260.007 006	7 006	0.000 133
			5 minutes	5 260.006 122	6 122	0.000 116
			10 minutes	5 260.005 483	5 483	0.000 104
100 %		30	Startup	5 260.004 557	4 557	0.000 087
			2 minutes	5 260.005 364	5 364	0.000 102
			5 minutes	5 260.005 126	5 126	0.000 097
			10 minutes	5 260.004 134	4 134	0.000 079
100 %		40	Startup	5 259.991 286	-871 4	-0.000 166
			2 minutes	5 259.990 910	-909 0	-0.000 173
			5 minutes	5 259.990 841	-915 9	-0.000 174
			10 minutes	5 259.990 384	-961 6	-0.000 183
100 %		50	Startup	5 259.988 373	-116 27	-0.000 221
			2 minutes	5 259.988 253	-117 47	-0.000 223
			5 minutes	5 259.987 592	-124 08	-0.000 236
			10 minutes	5 259.987 322	-126 78	-0.000 241
85 %	DC 20.4	23	Startup	5 260.008 737	8 737	0.000 166
			2 minutes	5 260.008 270	8 270	0.000 157
			5 minutes	5 260.008 174	8 174	0.000 155
			10 minutes	5 260.007 906	7 906	0.000 150
115 %	DC 27.6	23	Startup	5 260.009 293	9 293	0.000 177
			2 minutes	5 260.008 543	8 543	0.000 162
			5 minutes	5 260.008 477	8 477	0.000 161
			10 minutes	5 260.008 442	8 442	0.000 160

Note.

- All 9-36V DC mode were investigated and the data 24VDC was reported in this section is the worst case condition

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Mode: UNII-2C

Operating frequency: 5500 MHz

Test voltage (%)	Test voltage (V)	Temperature (°C)	Maintaining time	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)
100 %	DC 24	-20	Startup	5 500.028837	28 837	0.000 524
			2 minutes	5 500.028737	28 737	0.000 522
			5 minutes	5 500.027351	27 351	0.000 497
			10 minutes	5 500.027066	27 066	0.000 492
100 %		-10	Startup	5 500.024991	24 991	0.000 454
			2 minutes	5 500.023921	23 921	0.000 435
			5 minutes	5 500.023803	23 803	0.000 433
			10 minutes	5 500.023749	23 749	0.000 432
100 %		0	Startup	5 500.016768	16 768	0.000 305
			2 minutes	5 500.016352	16 352	0.000 297
			5 minutes	5 500.016295	16 295	0.000 296
			10 minutes	5 500.015020	15 020	0.000 273
100 %		10	Startup	5 500.010558	10 558	0.000 192
			2 minutes	5 500.010188	10 188	0.000 185
			5 minutes	5 500.009717	9 717	0.000 177
			10 minutes	5 500.008928	8 928	0.000 162
100 %		20	Startup	5 500.007737	7 737	0.000 141
			2 minutes	5 500.007193	7 193	0.000 131
			5 minutes	5 500.006817	6 817	0.000 124
			10 minutes	5 500.006425	6 425	0.000 117
100 %		23	Startup	5 500.007068	7 068	0.000 129
			2 minutes	5 500.006436	6 436	0.000 117
			5 minutes	5 500.006038	6 038	0.000 110
			10 minutes	5 500.005391	5 391	0.000 098
100 %		30	Startup	5 500.005976	5 976	0.000 109
			2 minutes	5 500.006113	6 113	0.000 111
			5 minutes	5 500.006111	6 111	0.000 111
			10 minutes	5 500.005020	5 020	0.000 091
100 %		40	Startup	5 499.990867	-913 3	-0.000 166
			2 minutes	5 499.990466	-953 4	-0.000 173
			5 minutes	5 499.990262	-973 8	-0.000 177
			10 minutes	5 499.989965	-100 35	-0.000 182
100 %		50	Startup	5 499.988228	-117 72	-0.000 214
			2 minutes	5 499.988045	-119 55	-0.000 217
			5 minutes	5 499.987716	-122 84	-0.000 223
			10 minutes	5 499.987693	-123 07	-0.000 224
85 %	DC 20.4	23	Startup	5 500.008405	8 405	0.0001 53
			2 minutes	5 500.007793	7 793	0.0001 42
			5 minutes	5 500.007653	7 653	0.0001 39
			10 minutes	5 500.007498	7 498	0.0001 36
115 %	DC 27.6	23	Startup	5 500.008287	8 287	0.0001 51
			2 minutes	5 500.007920	7 920	0.0001 44
			5 minutes	5 500.007852	7 852	0.0001 43
			10 minutes	5 500.007622	7 622	0.0001 39

Note.

- All 9-36V DC mode were investigated and the data 24VDC was reported in this section is the worst case condition

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Mode: UNII-3

Operating frequency: 5 745 MHz

Test voltage (%)	Test voltage (V)	Temperature (°C)	Maintaining time	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)
100 %	DC 24	-20	Startup	5 745.028540	28 540	0.000 497
			2 minutes	5 745.028322	28 322	0.000 493
			5 minutes	5 745.027106	27 106	0.000 472
			10 minutes	5 745.026950	26 950	0.000 469
100 %		-10	Startup	5 745.025402	25 402	0.000 442
			2 minutes	5 745.024727	24 727	0.000 430
			5 minutes	5 745.024063	24 063	0.000 419
			10 minutes	5 745.024027	24 027	0.000 418
100 %		0	Startup	5 745.016845	16 845	0.000 293
			2 minutes	5 745.016668	16 668	0.000 290
			5 minutes	5 745.015610	15 610	0.000 272
			10 minutes	5 745.015325	15 325	0.000 267
100 %		10	Startup	5 745.010609	10 609	0.000 185
			2 minutes	5 745.010548	10 548	0.000 184
			5 minutes	5 745.009115	9 115	0.000 159
			10 minutes	5 745.008938	8 938	0.000 156
100 %		20	Startup	5 745.008371	8 371	0.000 146
			2 minutes	5 745.006909	6 909	0.000 120
			5 minutes	5 745.006861	6 861	0.000 119
			10 minutes	5 745.006544	6 544	0.000 114
100 %		23	Startup	5 745.007063	7 063	0.000 123
			2 minutes	5 745.006530	6 530	0.000 114
			5 minutes	5 745.006516	6 516	0.000 113
			10 minutes	5 745.006368	6 368	0.000 111
100 %		30	Startup	5 745.006083	6 083	0.000 106
			2 minutes	5 745.005895	5 895	0.000 103
			5 minutes	5 745.005841	5 841	0.000 102
			10 minutes	5 745.005578	5 578	0.000 097
100 %		40	Startup	5 744.991779	-822 1	-0.000 143
			2 minutes	5 744.991634	-836 6	-0.000 146
			5 minutes	5 744.990026	-997 4	-0.000 174
			10 minutes	5 744.989849	-101 51	-0.000 177
100 %		50	Startup	5 744.987574	-124 26	-0.000 216
			2 minutes	5 744.987572	-124 28	-0.000 216
			5 minutes	5 744.987452	-125 48	-0.000 218
			10 minutes	5 744.987121	-128 79	-0.000 224
85 %	DC 20.4	23	Startup	5 745.008795	8 795	0.000 153
			2 minutes	5 745.008741	8 741	0.000 152
			5 minutes	5 745.008612	8 612	0.000 150
			10 minutes	5 745.008027	8 027	0.000 140
115 %	DC 27.6	23	Startup	5 745.009214	9 214	0.000 160
			2 minutes	5 745.008654	8 654	0.000 151
			5 minutes	5 745.008342	8 342	0.000 145
			10 minutes	5 745.007792	7 792	0.000 136

Note.

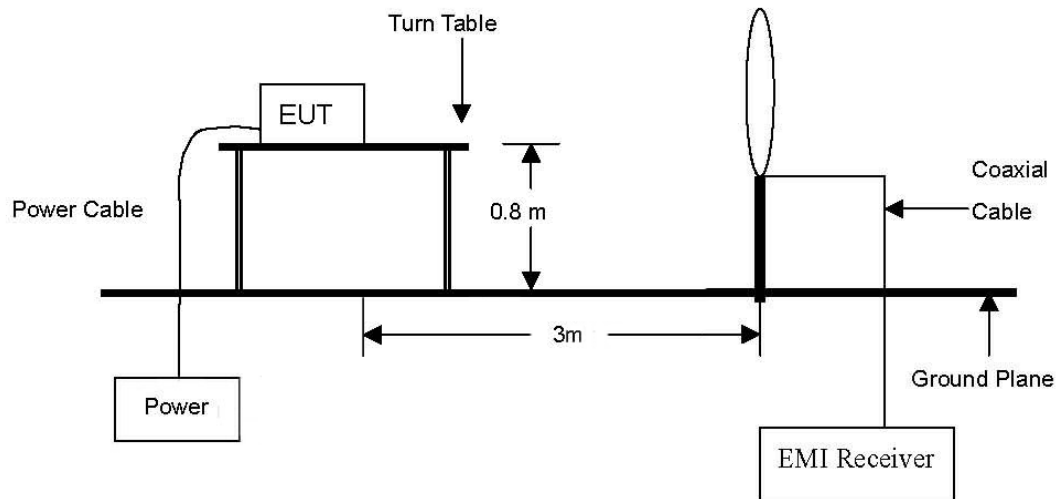
- All 9-36V DC mode were investigated and the data 24VDC was reported in this section is the worst case condition

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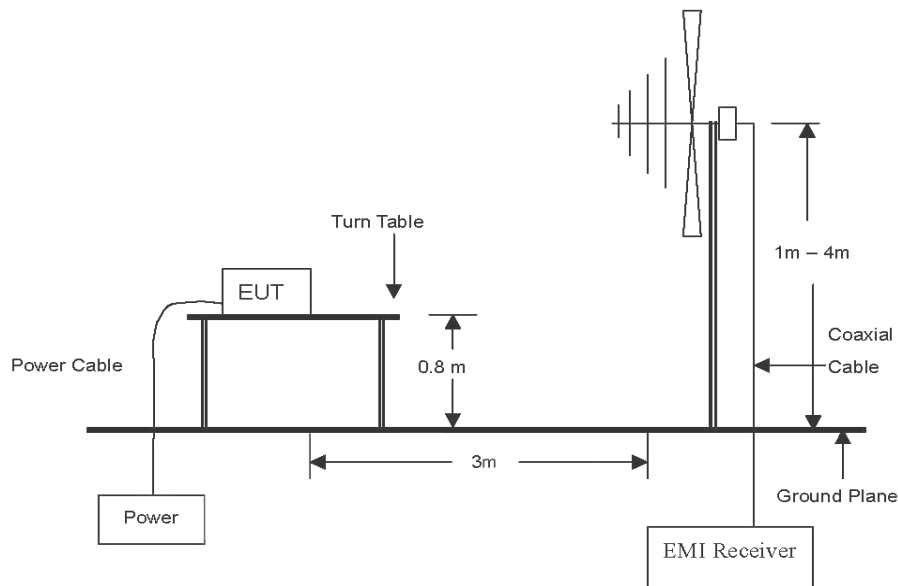
3.6. Radiated restricted band and emissions

Test setup

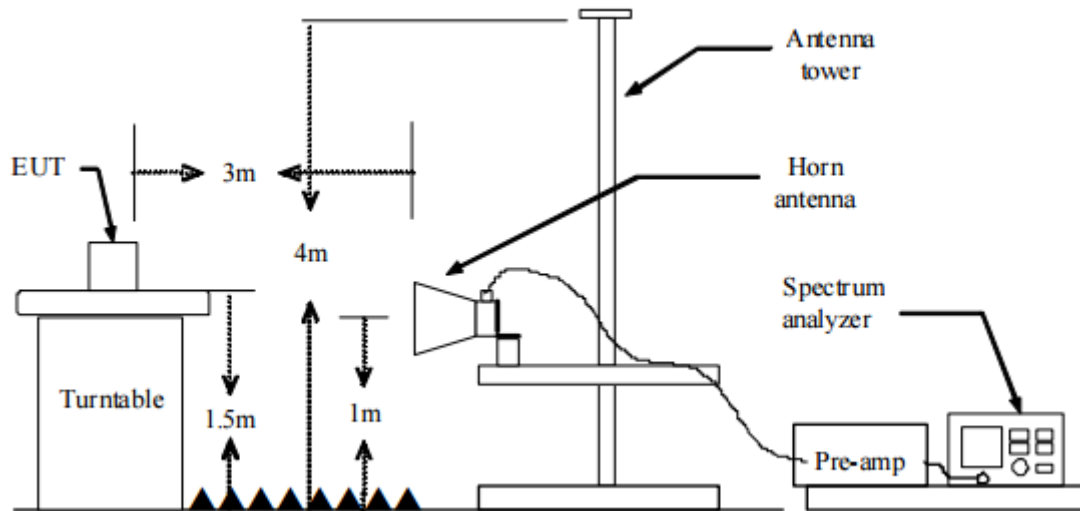
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz emissions, whichever is lower.



Test procedure below 30 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
3. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
4. The test-receiver system was set to average or quasi peak detect function and Specified Bandwidth with Maximum hold mode.

Test procedure above 30 MHz

1. Spectrum analyzer settings for $f < 1$ GHz:
 - ① Span = wide enough to fully capture the emission being measured
 - ② RBW = 120 kHz
 - ③ VBW $\geq$ RBW
 - ④ Detector = quasi peak
 - ⑤ Sweep time = auto
 - ⑥ Trace = max hold
2. Spectrum analyzer settings for $f \geq 1$ GHz: Peak
 - ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
 - ② RBW = 1 MHz
 - ③ VBW = 3 MHz ($\geq 3 \times$ RBW)
 - ④ Detector = peak
 - ⑤ Sweep time = auto
 - ⑥ Trace = max hold
 - ⑦ Trace was allowed to stabilize

3. Spectrum analyzer settings for $f \geq 1$ GHz: Average

- ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- ② RBW = 1 MHz
- ③ VBW $\geq 3 \times$ RBW
- ④ Detector = RMS, if span/(# of points in sweep) $\leq$ (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
- ⑤ Averaging type = power(i.e., RMS)
 - 1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
 - 2) Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.
- ⑥ Sweep = auto
- ⑦ Trace = max hold
- ⑧ Perform a trace average of at least 100 traces.
- ⑨ A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
 - 1) If power averaging (RMS) mode was used in step ⑤, then the applicable correction factor is $10 \log(1/x)$, where x is the duty cycle.
 - 2) If linear voltage averaging mode was used in step ⑤, then the applicable correction factor is $20 \log(1/x)$, where x is the duty cycle.
 - 3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

Note.

1. $f < 30$ MHz, extrapolation factor of 40 dB/decade of distance. $F_d = 40 \log(D_m/D_s)$
 $f \geq 30$ MHz, extrapolation factor of 20 dB/decade of distance. $F_d = 20 \log(D_m/D_s)$
 Where:
 F_d = Distance factor in dB
 D_m = Measurement distance in meters
 D_s = Specification distance in meters
2. CF(Correction factors(dB)) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or F_d (dB)
4. Field strength(dBμV/m) = Level(dBμV) + CF (dB) + or DCF(dB)
5. Margin(dB) = Limit(dBμV/m) - Field strength(dBμV/m)
6. Emissions below 18 GHz were measured at a 3 meter test distance while emissions above 18 GHz were measured at a 1 meter test distance with the application of a distance correction factor.
7. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z, it was determined that **X orientation** was worst-case orientation; therefore, all final radiated testing was performed with the EUT in **X orientation**.
8. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
9. All channels, modes (e.g. 802.11a, 802.11n (20 MHz/40 MHz BW), 802.11ac (20 MHz/40 MHz /80 MHz)), and modulations/data rates were investigated among all UNII bands. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

10. According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

Limit

According to 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values :

Frequency (MHz)	Distance (Meters)	Radiated ($\mu\text{V/m}$)
0.009 ~ 0.490	300	2400/F(kHz)
0.490 ~ 1.705	30	24000/F(kHz)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 72 MHz, 76 ~ 88 MHz, 174 ~ 216 MHz or 470 ~ 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

According to 15.407(b), (b) Undesirable emission limits: Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25–5.35 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47–5.725 GHz band: All emissions outside of the 5.47–5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725–5.85 GHz band:
 - i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
 - ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in § 15.207.
- (7) The provisions of §15.205 apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

According to RSS-247 6.2 The equipment output power and e.i.r.p. shall be measured in terms of average value. If the transmission is in bursts, the provisions of RSS-Gen for pulsed operation shall apply.

(1) For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.

(2) For transmitters operating in the band 5250-5350 MHz Devices shall comply with the following:

- a) All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p.; or
- b) All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device, except devices installed in vehicles, shall be labelled or include in the user manual the following text “for indoor use only.”

(3) For transmitters operating in the band 5470-5600 MHz and 5650-5725 MHz, Emissions outside the band 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, devices with bandwidth overlapping the band edge of 5725 MHz can meet the emission limit of -27 dBm/MHz e.i.r.p. at 5850 MHz instead of 5725 MHz.

(4) For the band 5725-5850 MHz, Devices operating in the band 5725-5850 MHz with antenna gain greater than 10 dBi can have unwanted emissions that comply with either the limits in this section or in section 5.5 until six (6) months after the publication date of this standard for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2018.

Devices operating in the band 5725-5850 MHz with antenna gain of 10 dBi or less can have unwanted emissions that comply with either the limits in this section or in section 5.5 until April 1, 2018 for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2020.

Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

- a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;
- b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
- c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and
- d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

Duty cycle

Regarding to KDB 789033 D02 v02r01, B)2)b), the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below.

Set RBW $\geq$ OBW if possible; otherwise, set RBW to the largest available value. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$, where T is defined in II.B.1.a), and the number of sweep points across duration T exceeds 100.

For the band 5.15-5.25 GHz

Test mode	T _{on} time (ms)	Period (ms)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (dB)
802.11ac_VHT20	0.206	0.342	0.602	60.23	2.20
802.11ac_VHT40	0.117	0.275	0.425	42.55	3.71
802.11ac_VHT80	0.078	0.183	0.426	42.62	3.70

For the band 5.250-5.350 GHz

Test mode	T _{on} time (ms)	Period (ms)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (dB)
802.11ac_VHT20	0.207	0.310	0.668	66.77	1.75
802.11ac_VHT40	0.120	0.247	0.486	48.58	3.14
802.11ac_VHT80	0.080	0.191	0.419	41.88	3.78

For the band 5.470-5.725 GHz

Test mode	T _{on} time (ms)	Period (ms)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (dB)
802.11ac_VHT20	0.210	0.338	0.621	62.13	2.07
802.11ac_VHT40	0.117	0.284	0.412	41.20	3.85
802.11ac_VHT80	0.083	0.235	0.353	35.32	4.52

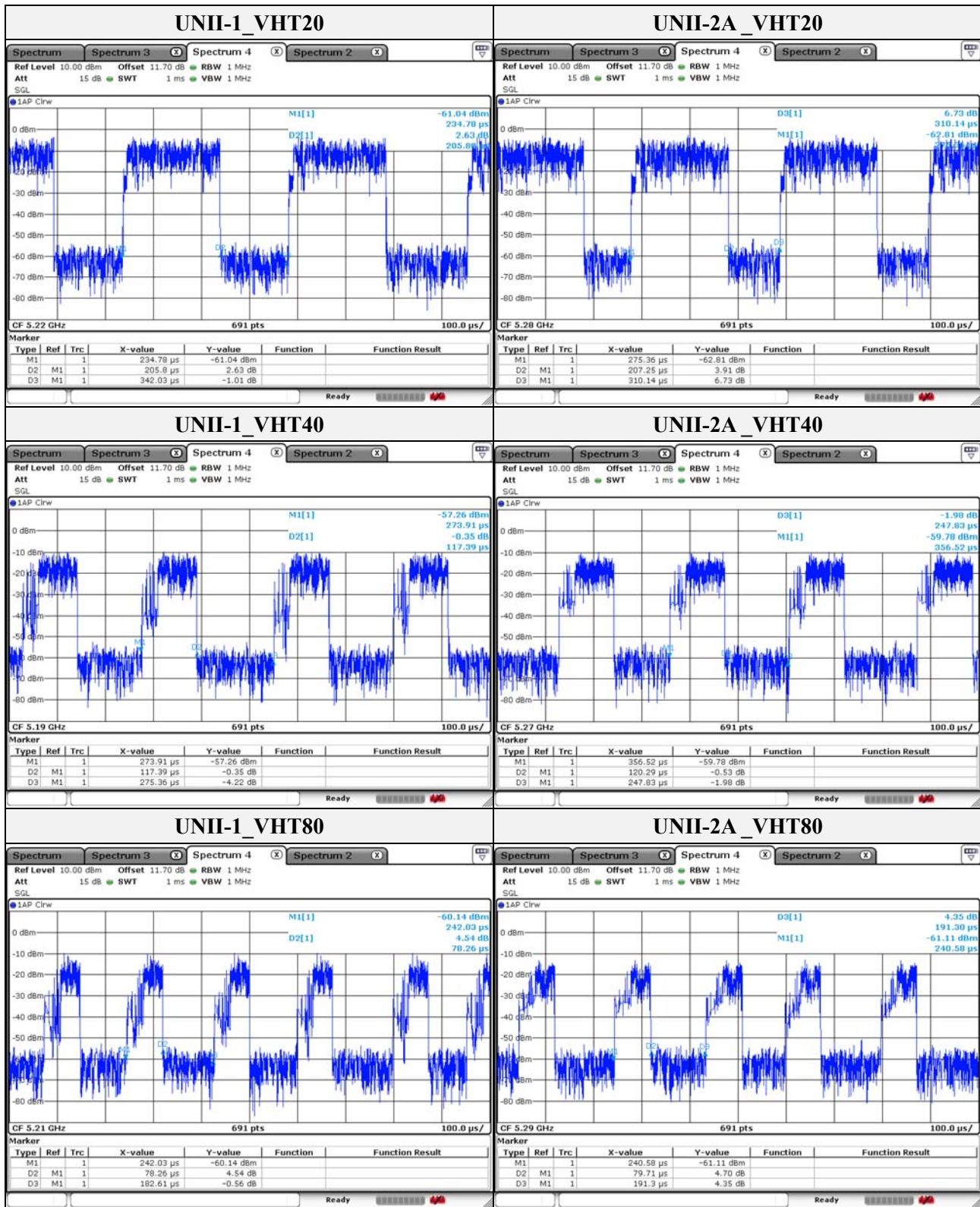
For the band 5.725-5.85 GHz

Test mode	T _{on} time (ms)	Period (ms)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (dB)
802.11ac_VHT20	0.210	0.365	0.575	57.53	2.40
802.11ac_VHT40	0.119	0.267	0.446	44.57	3.51
802.11ac_VHT80	0.078	0.199	0.392	39.20	4.07

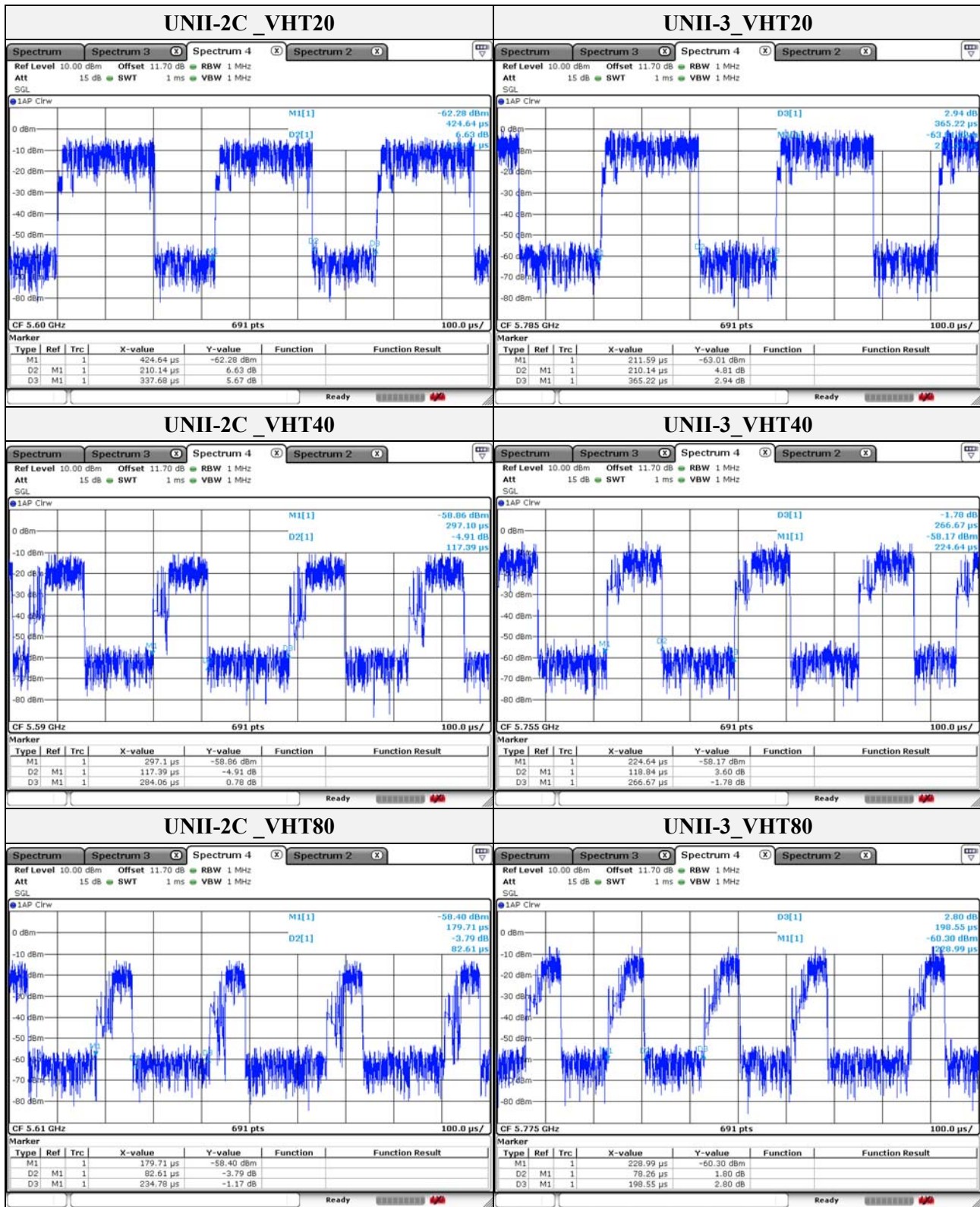
Note:

Duty cycle (Linear) = T_{on} time/Period

DCF(Duty cycle correction factor (dB)) = 10log(1/duty cycle)



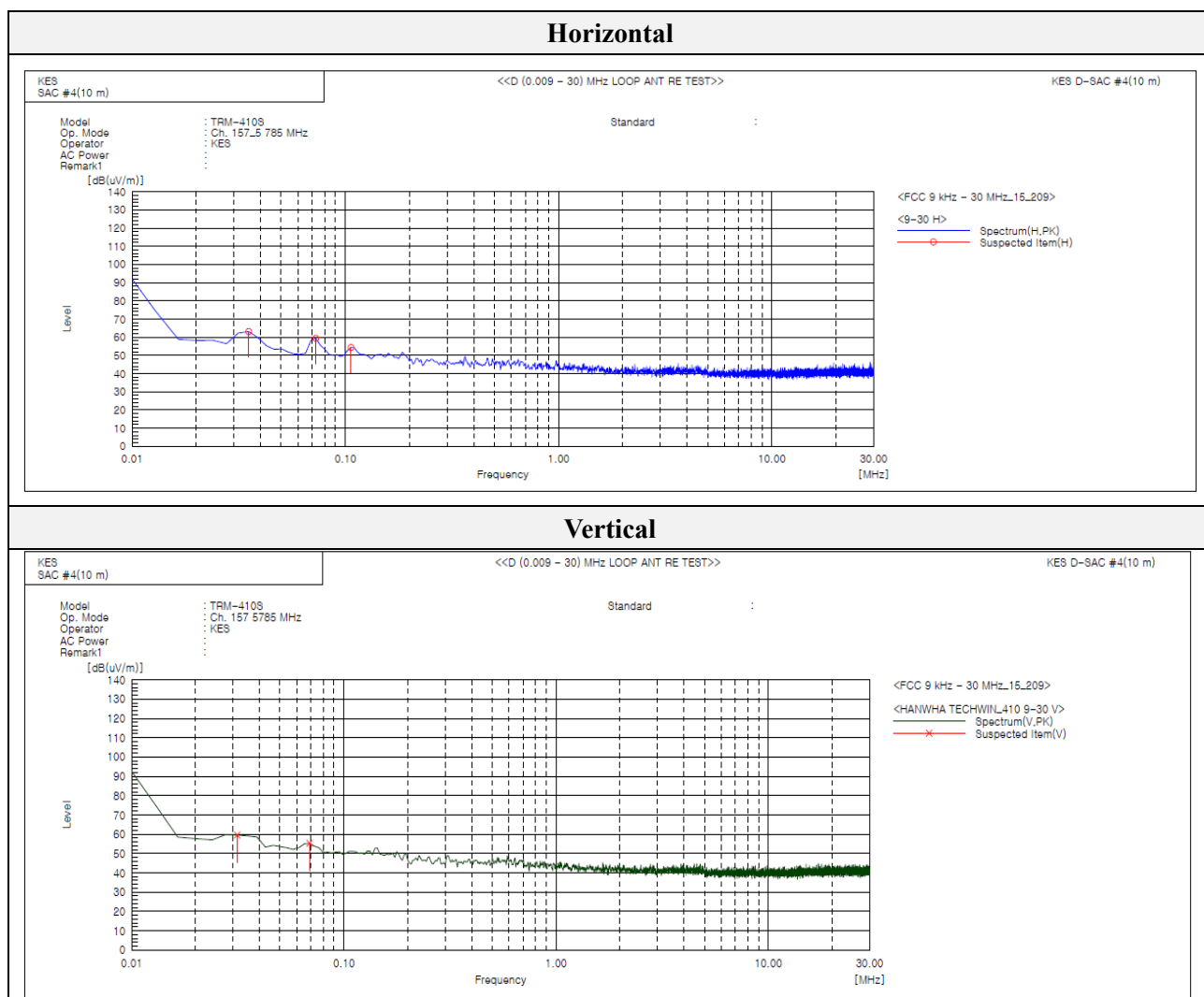
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Test results (Below 30 MHz) – Worst case

Mode: UNII-3
 Distance of measurement: 3 meter
 Channel: 157(worst case)

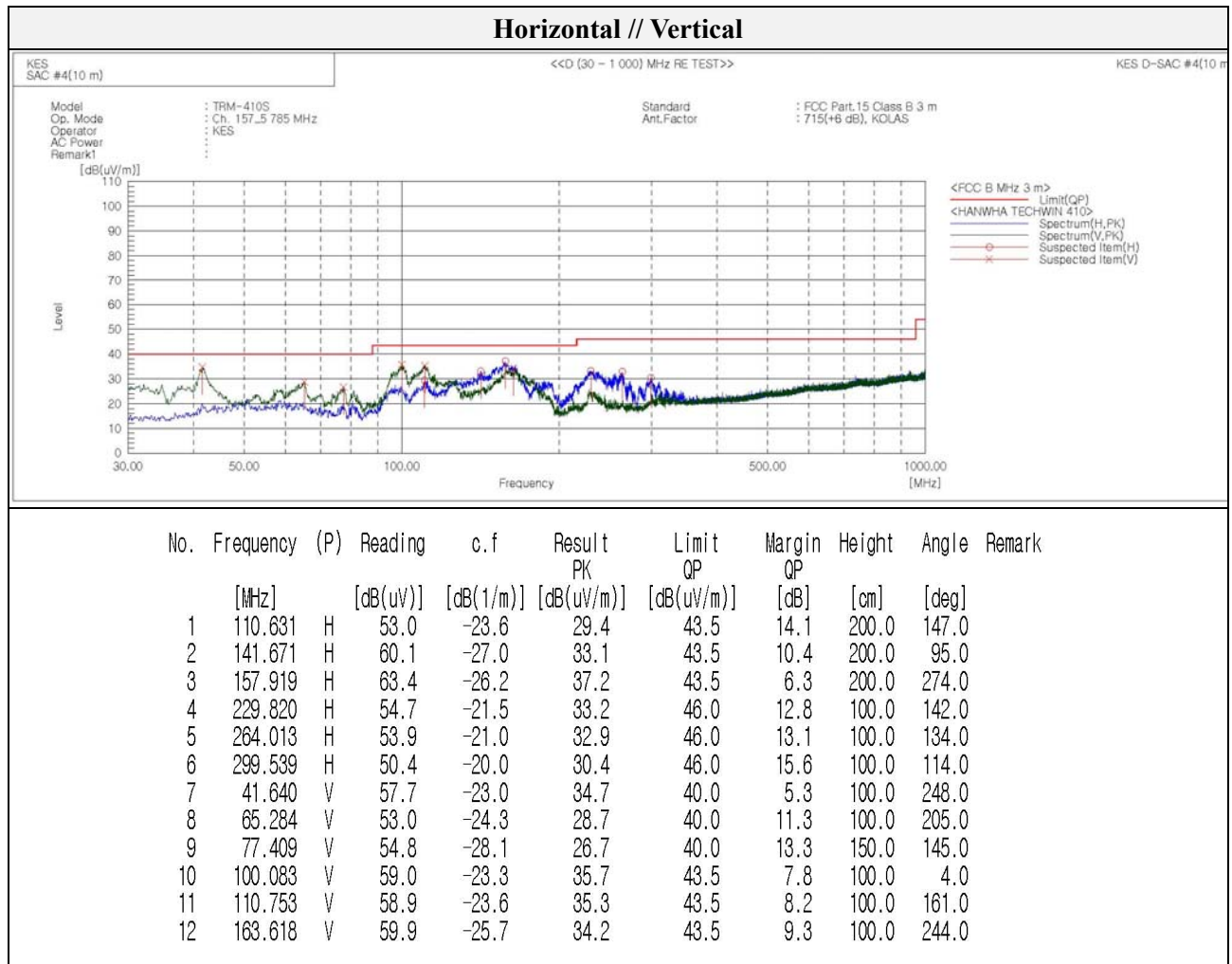


Frequency (MHz)	Level (dB μ V)	Ant. Pol. (H/V)	CF (dB)	Distance factor (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
0.035	43.60	H	19.50	-80	-16.90	36.70	53.60
0.073	39.60	H	19.70	-80	-20.70	30.40	51.10
0.106	34.60	H	19.70	-80	-25.70	27.10	52.80
0.069	35.60	V	19.70	-80	-24.70	30.80	55.50
0.031	40.20	V	19.40	-80	-20.40	37.60	58.00

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Test results (Below 1 000 MHz) – Worst case

Mode: UNII-3
 Distance of measurement: 3 meter
 Channel: 157(worst case)



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Test results (Above 1 000 MHz)

Mode: UNII-1(VHT20)
Distance of measurement: 3 meter
Channel: 36

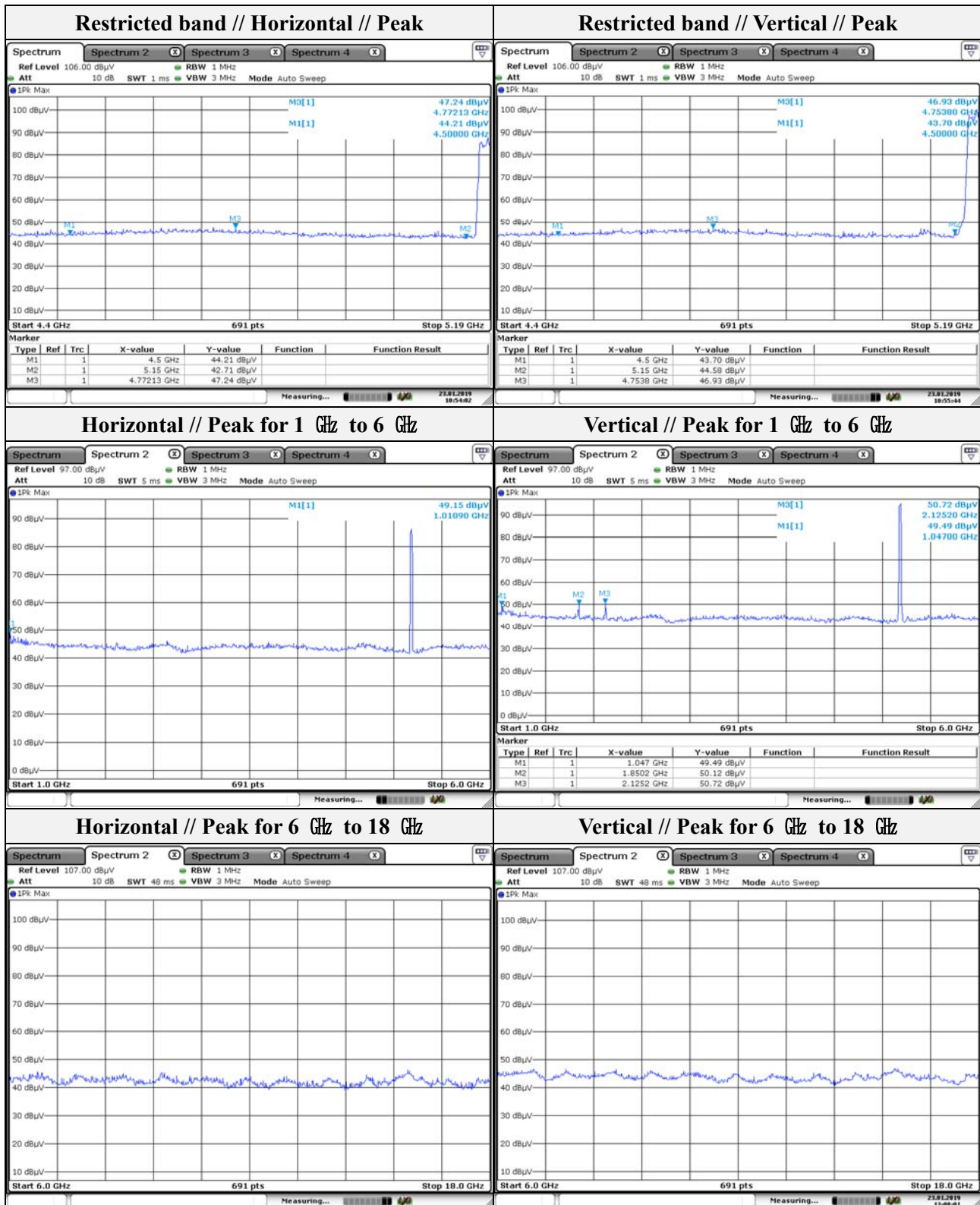
- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 010.90	49.15	Peak	H	-8.58	-	40.57	74.00	33.43
1 047.00	49.49	Peak	V	-8.37	-	41.12	74.00	32.88
1 850.20	50.12	Peak	V	-2.35	-	47.77	68.20	20.43
2 125.20	50.72	Peak	V	-0.67	-	50.05	68.20	18.15

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4 772.13	47.24	Peak	H	6.75	-	53.99	74.00	20.01
4 753.80	46.93	Peak	V	6.61	-	53.54	74.00	20.46

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Note.

1. No spurious emission were detected above 6 GHz.

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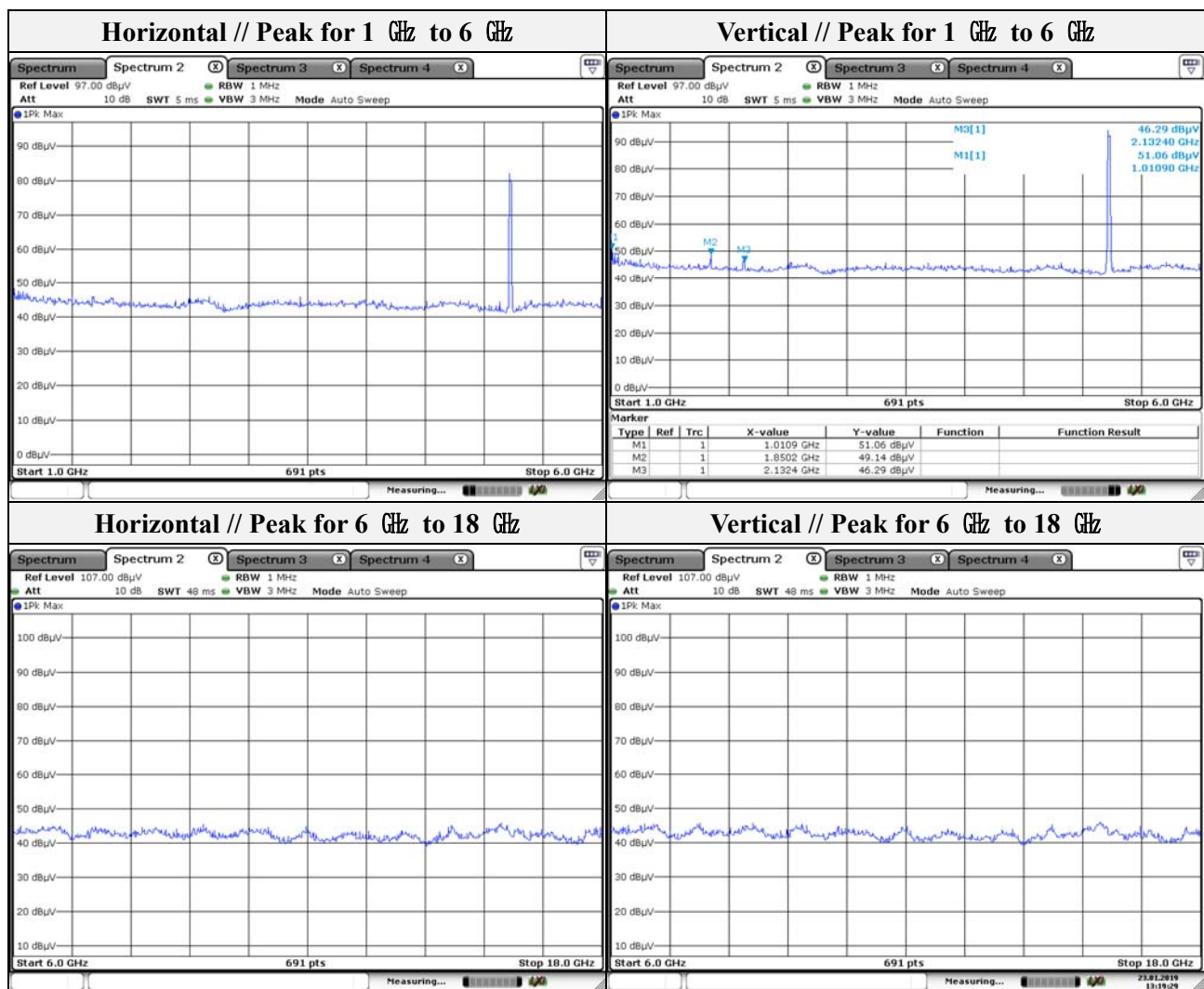
Mode: UNII-1(VHT20)

Distance of measurement: 3 meter

Channel: 44

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 010.90	51.06	Peak	V	-8.58	-	42.48	74.00	31.52
1 850.20	49.14	Peak	V	-2.35	-	46.79	68.20	21.41
2 132.40	46.29	Peak	V	-0.66	-	45.63	68.20	22.57



Note.

1. No spurious emission were detected above 6 GHz.

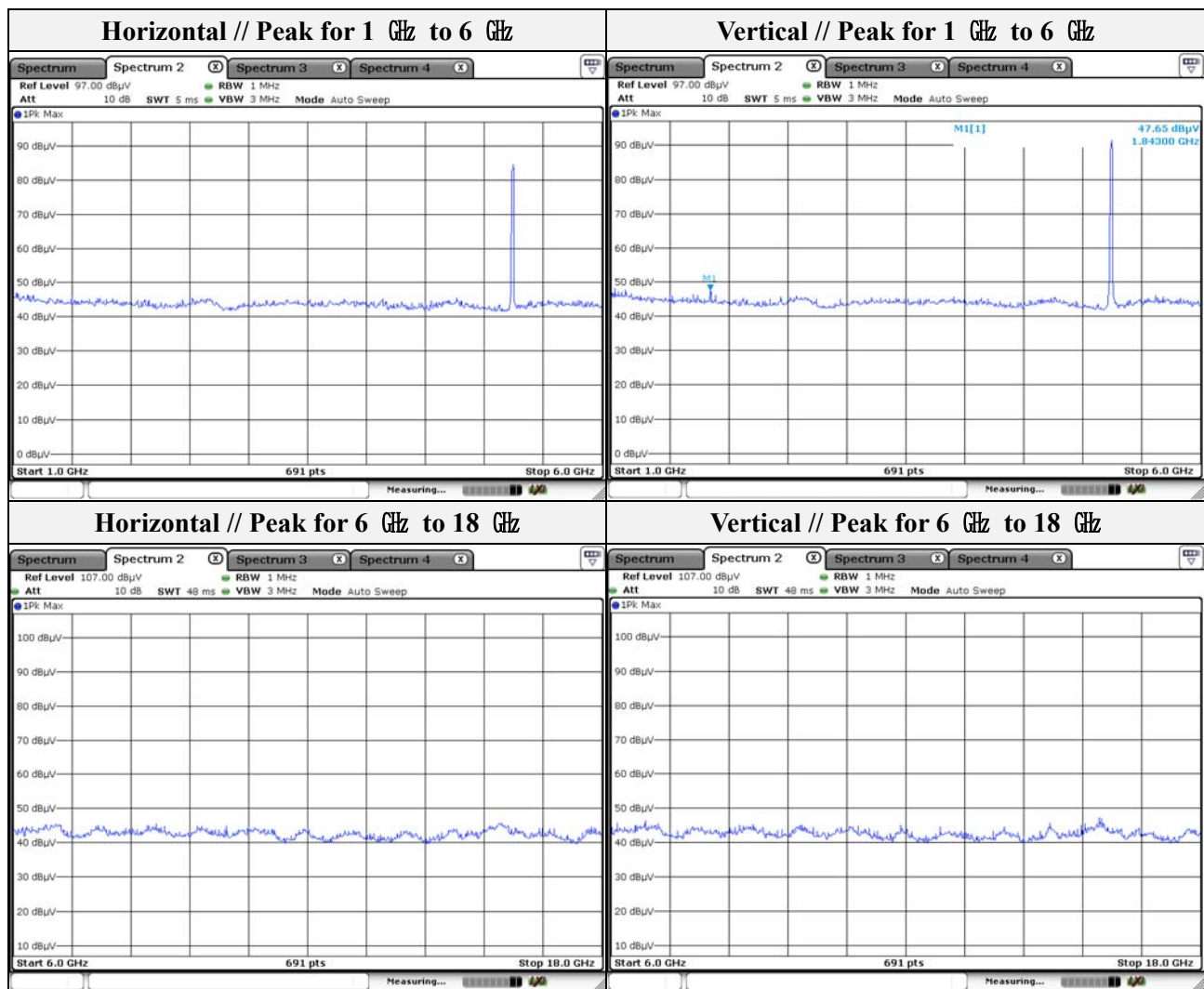
Mode: UNII-1(VHT20)

Distance of measurement: 3 meter

Channel: 48

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 843.00	47.65	Peak	V	-2.42	-	45.23	68.20	22.97



Note.

1. No spurious emission were detected above 6 GHz.

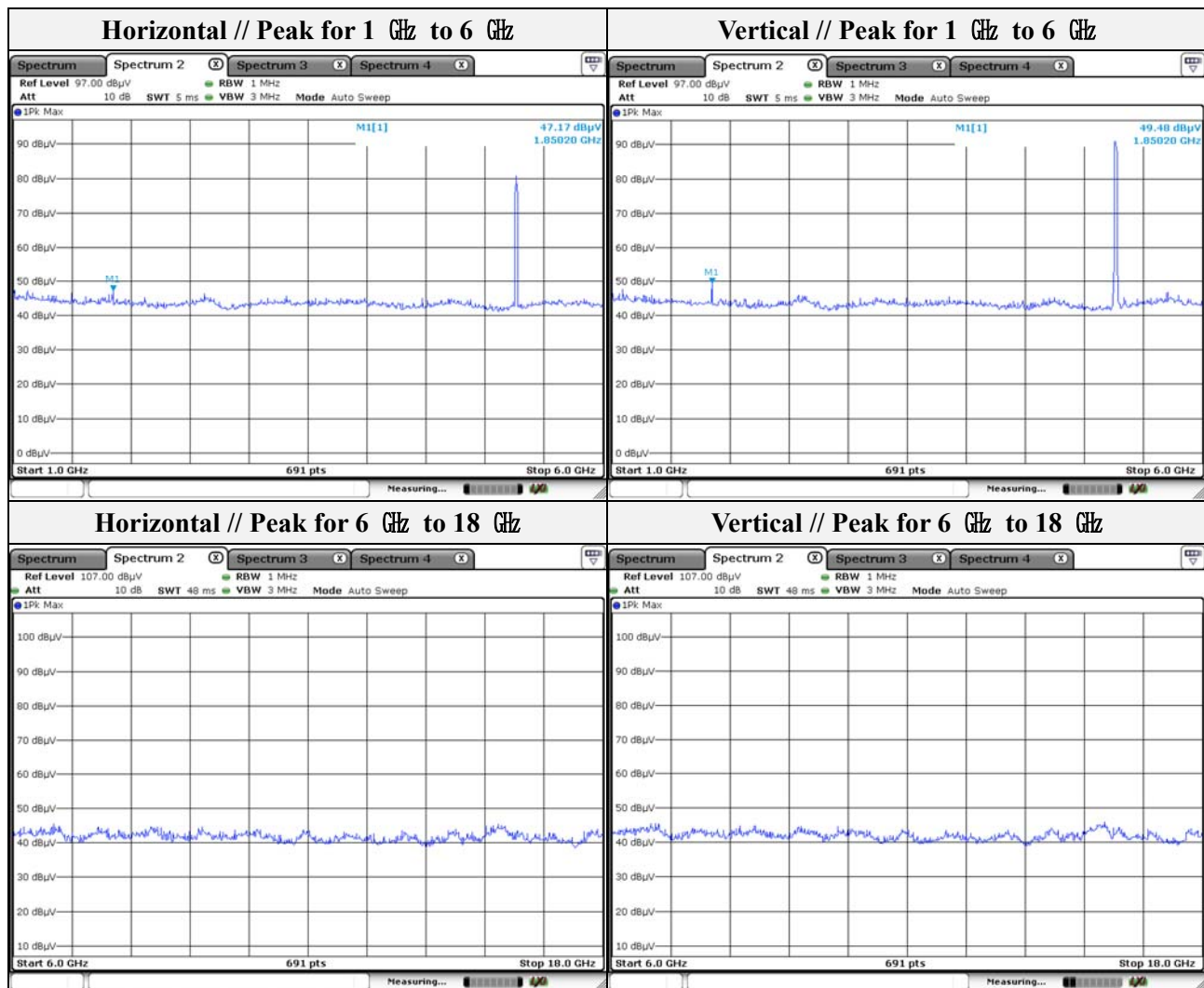
Mode: UNII-2A(VHT20)

Distance of measurement: 3 meter

Channel: 52

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 850.20	47.17	Peak	H	-2.35	-	44.82	68.20	23.38
1 850.20	49.48	Peak	V	-2.35	-	47.13	68.20	21.07



Note.

1. No spurious emission were detected above 6 GHz.

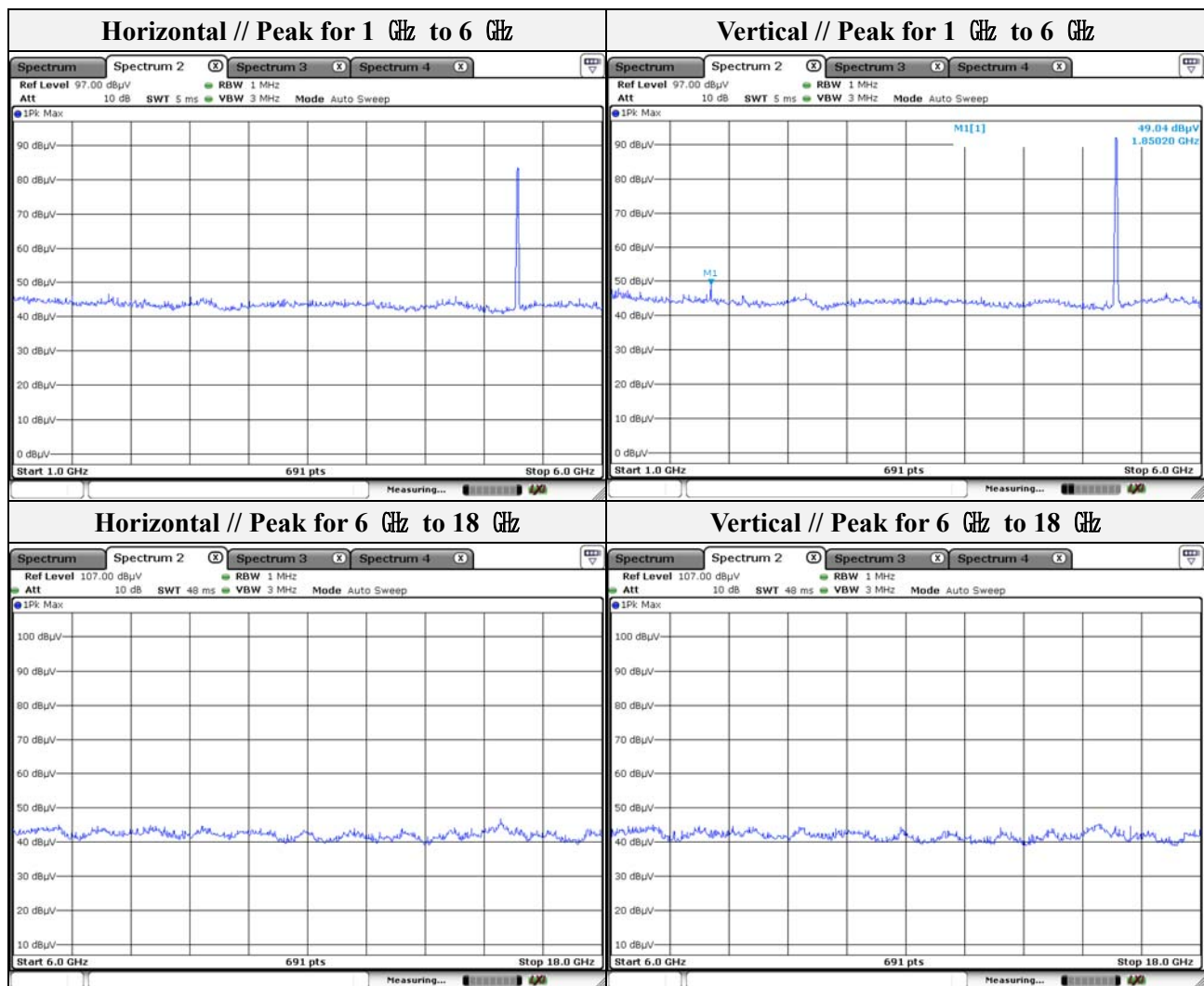
Mode: UNII-2A(VHT20)

Distance of measurement: 3 meter

Channel: 56

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 850.20	49.04	Peak	V	-2.35	-	46.69	68.20	21.51



Note.

1. No spurious emission were detected above 6 GHz.



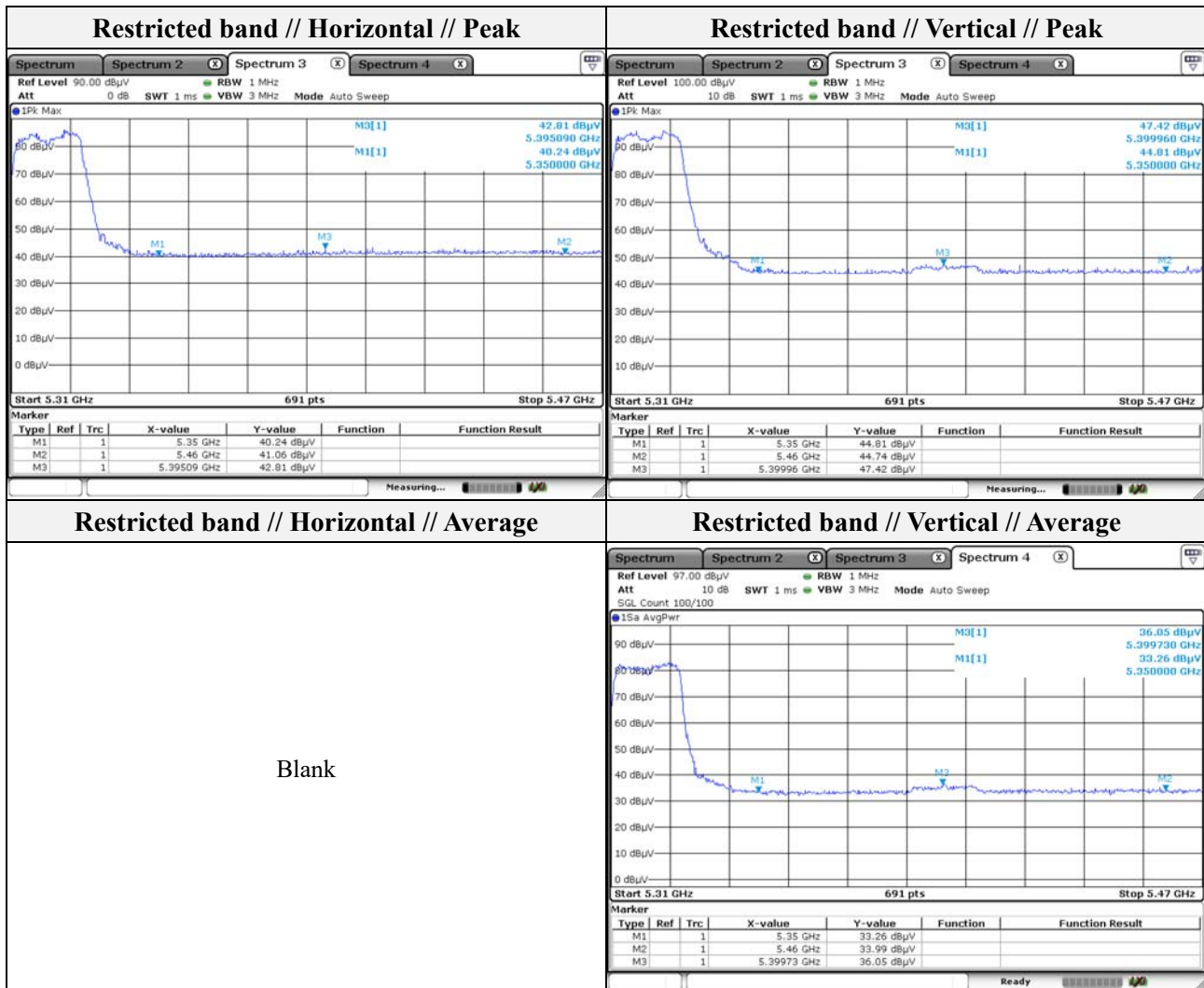
Mode: UNII-2A(VHT20)
Distance of measurement: 3 meter
Channel: 64

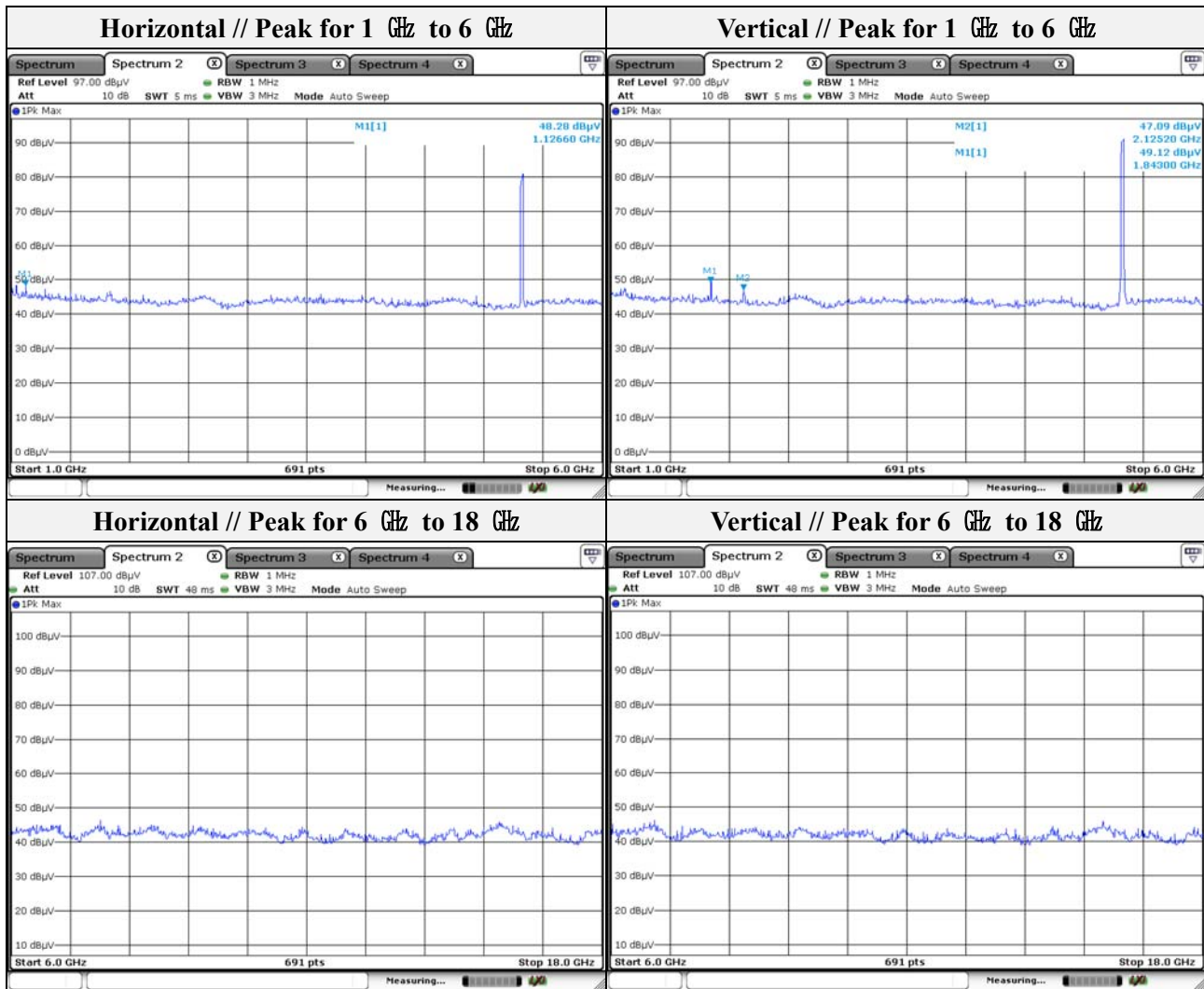
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 126.60	48.28	Peak	H	-7.93	-	40.35	74.00	33.65
1 843.00	49.12	Peak	V	-2.42	-	46.70	68.20	21.50
2 125.20	47.09	Peak	V	-0.67	-	46.42	68.20	21.78

- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 395.09	42.81	Peak	H	7.89	-	50.70	74.00	23.30
5 399.96	47.42	Peak	V	7.88	-	55.30	74.00	18.70
5 399.73	36.05	Average	H	7.88	1.75	45.68	54.00	8.32





Note.

1. No spurious emission were detected above 6 GHz.
2. Average test would be performed if the peak result were greater than the average limit.

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KES-RF-19T0013
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Mode: UNII-2C(VHT20)
Distance of measurement: 3 meter
Channel: 100

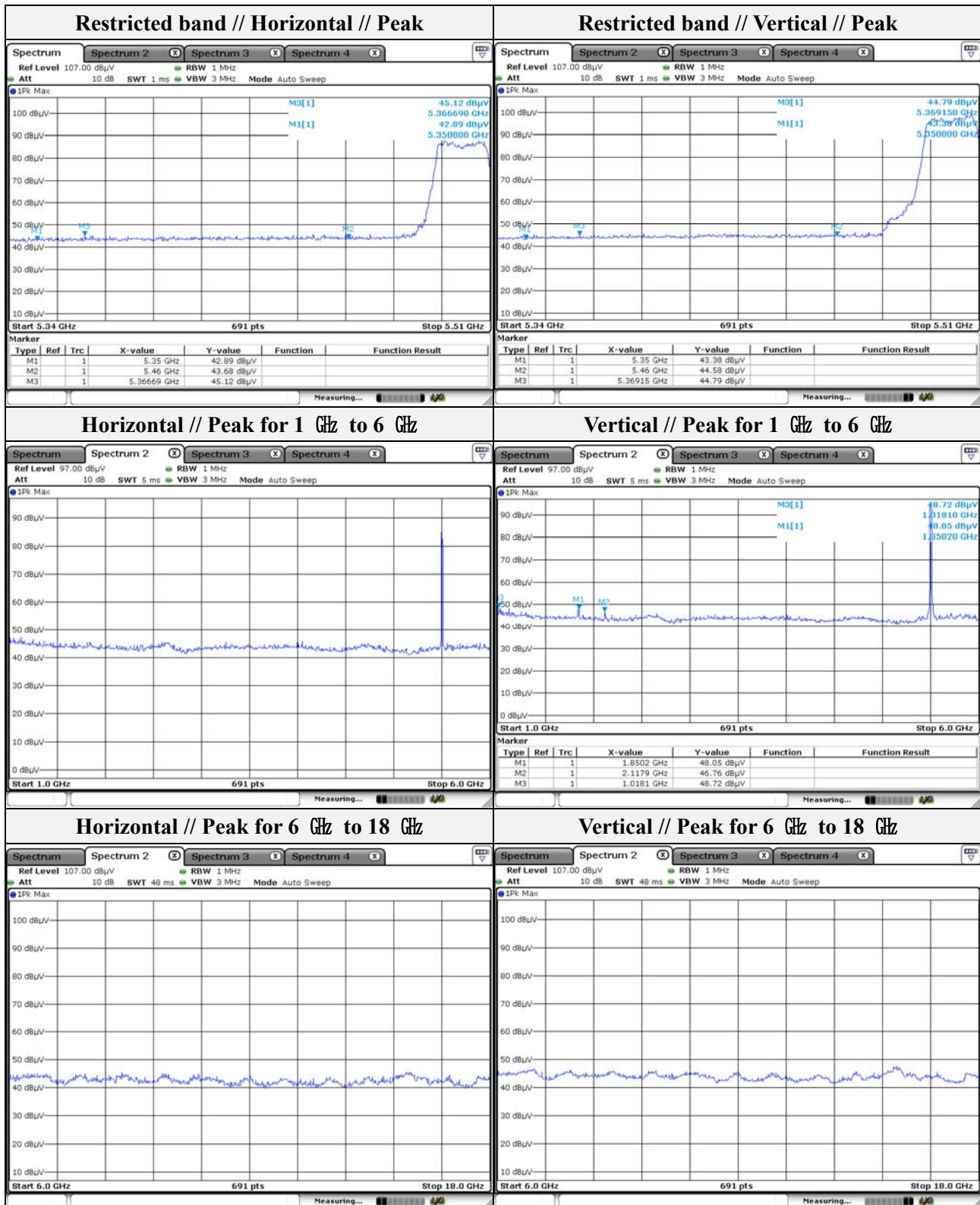
- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 018.10	48.72	Peak	V	-8.54	-	40.18	74.00	33.82
1 850.20	48.05	Peak	V	-2.35	-	45.70	68.20	22.50
2 117.90	46.76	Peak	V	-0.69	-	46.07	68.20	22.13

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 366.69	45.12	Peak	H	7.92	-	53.04	74.00	20.96
5 369.15	44.79	Peak	H	7.92	-	52.71	74.00	21.29

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Note.

1. No spurious emission were detected above 6 GHz.

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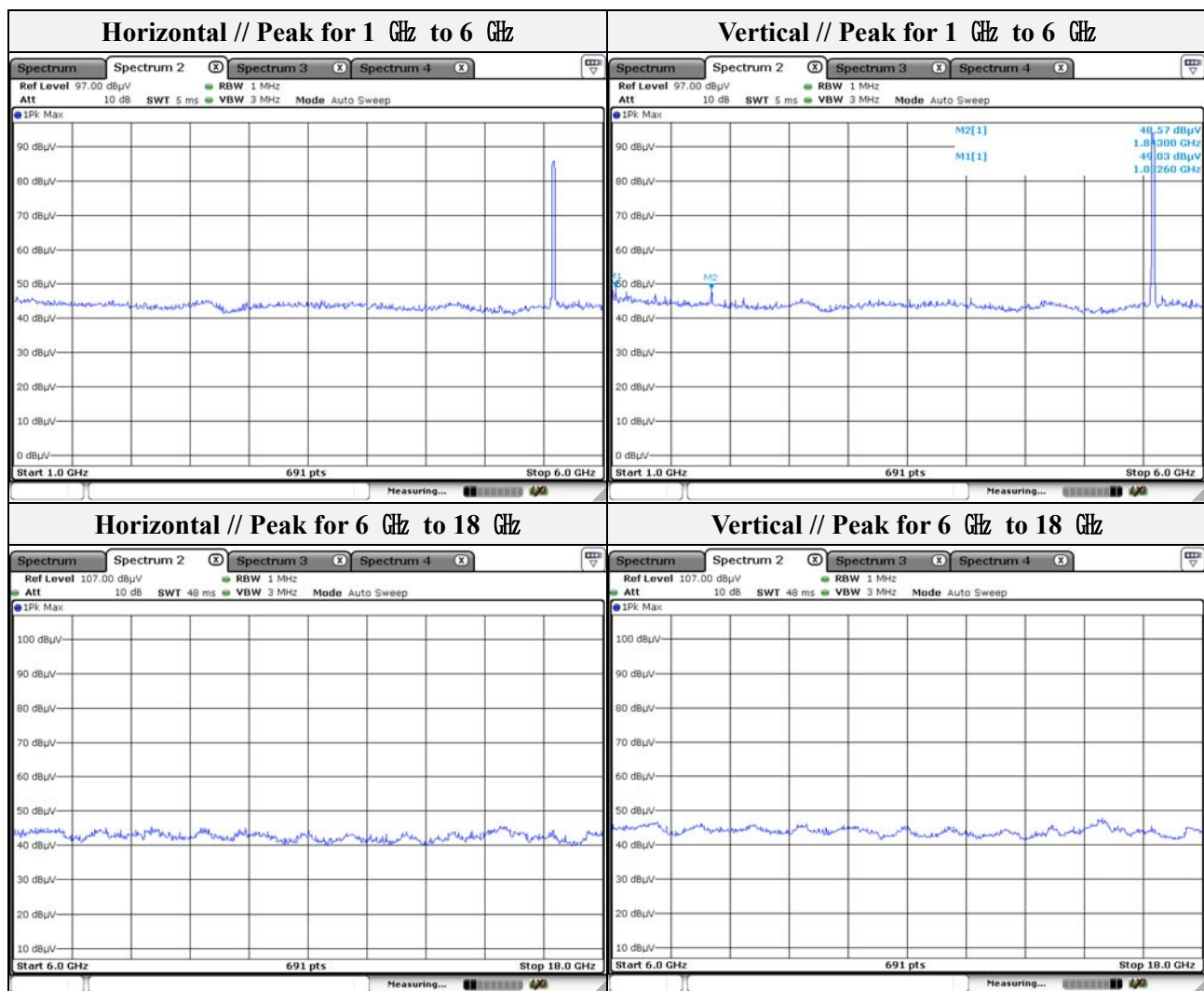
Mode: UNII-2C(VHT20)

Distance of measurement: 3 meter

Channel: 120

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 032.60	49.03	Peak	V	-8.46	-	40.57	74.00	33.43
1 843.00	48.57	Peak	V	-2.42	-	46.15	68.20	22.05



Note.

1. No spurious emission were detected above 6 GHz.

Mode: UNII-2C(VHT20)

Distance of measurement: 3 meter

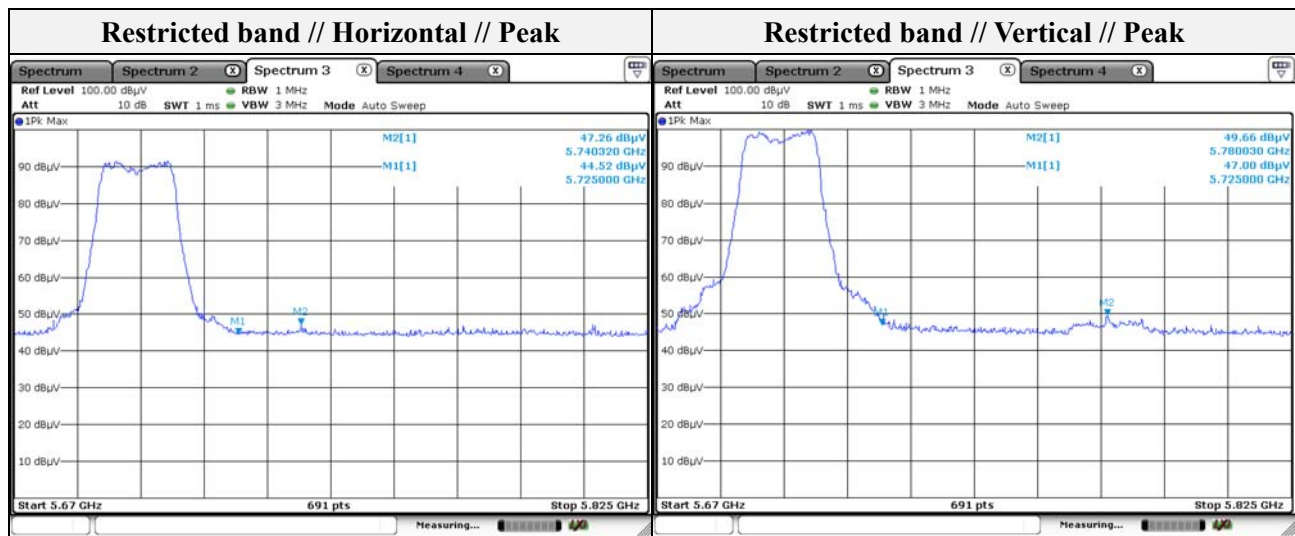
Channel: 140

- Spurious

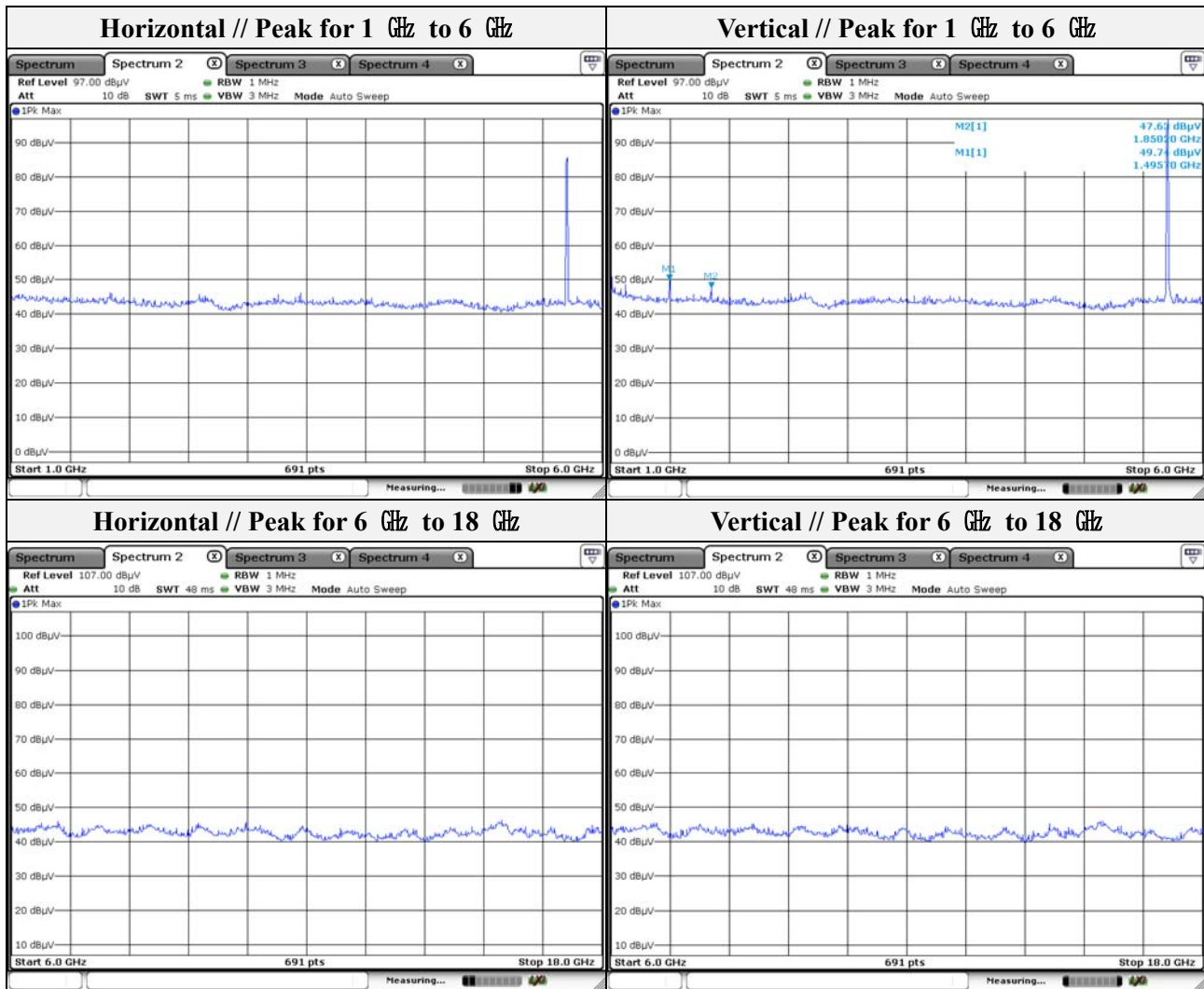
Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 495.70	49.74	Peak	V	-5.69	-	44.05	74.00	29.95
1 850.20	47.63	Peak	V	-2.35	-	45.28	68.20	22.92

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 740.32	47.26	Peak	H	8.85	-	56.11	68.20	12.09
5 780.03	49.66	Peak	V	9.04	-	58.70	68.20	9.50



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Note.

1. No spurious emission were detected above 6 GHz.

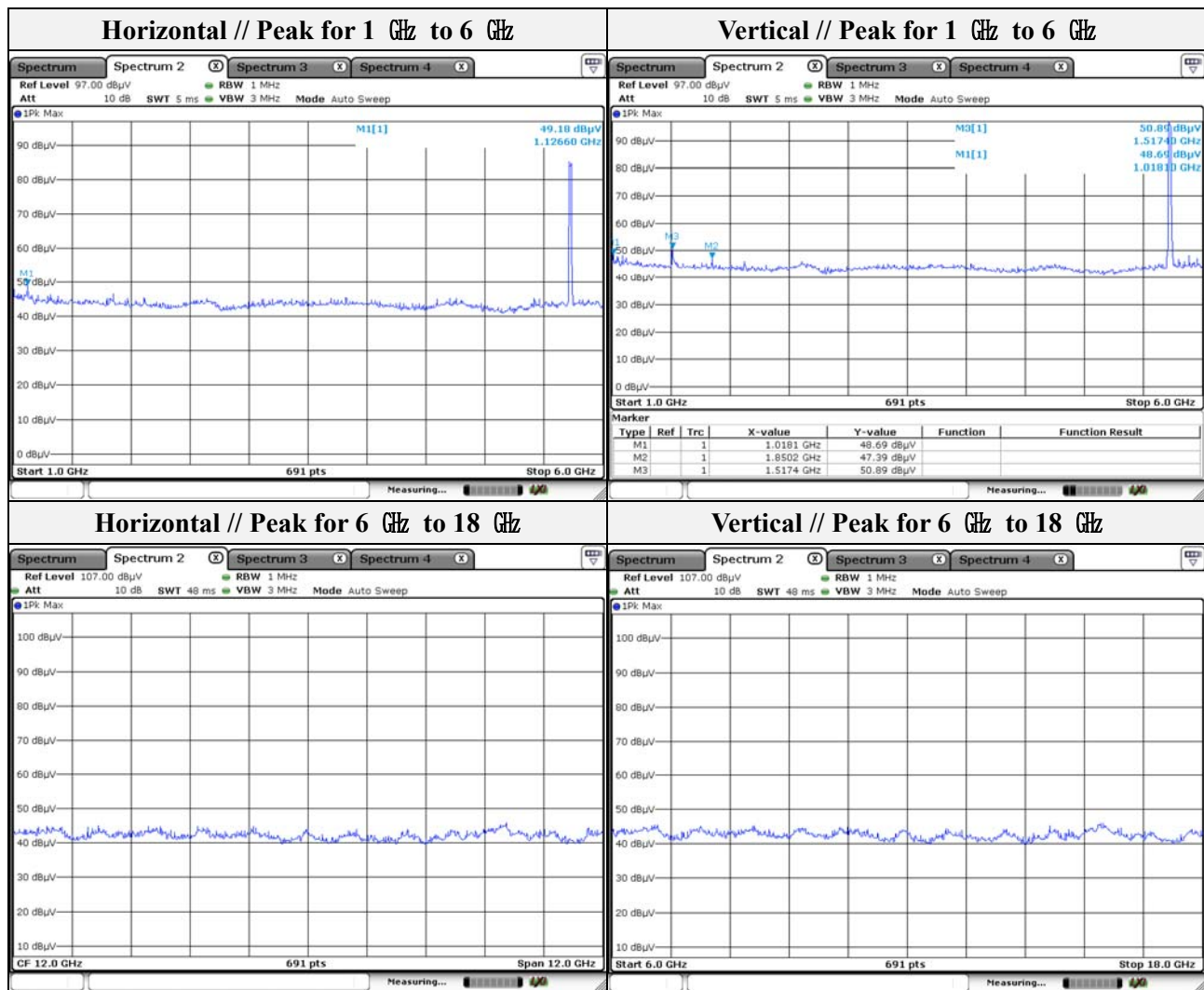
Mode: UNII-2C(VHT20)

Distance of measurement: 3 meter

Channel: 144

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 126.60	49.18	Peak	H	-7.93	-	41.25	74.00	32.75
1 018.10	48.69	Peak	V	-8.54	-	40.15	74.00	33.85
1 517.40	50.89	Peak	V	-5.51	-	45.38	74.00	28.62
1 850.20	47.39	Peak	V	-2.35	-	45.04	68.20	23.16



Note.

1. No spurious emission were detected above 6 GHz.

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KES-RF-19T0013
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Mode: UNII-3(VHT20)

Distance of measurement: 3 meter

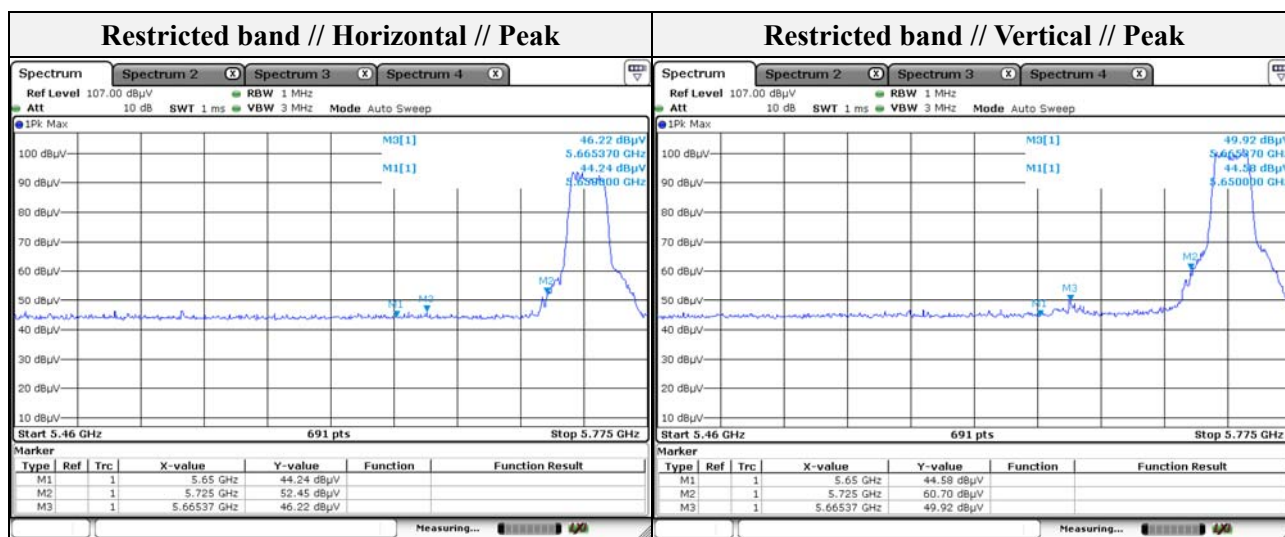
Channel: 149

- Spurious

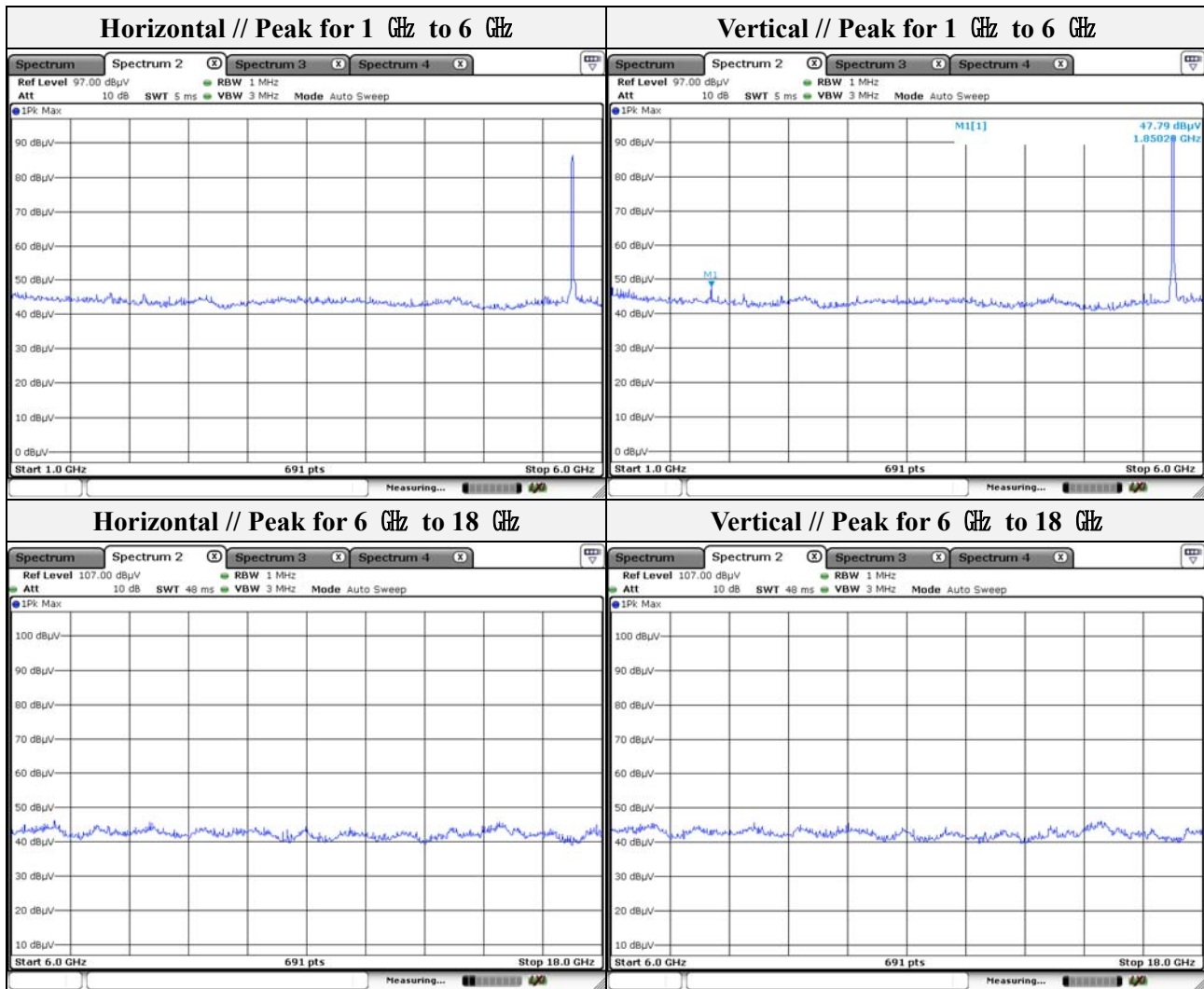
Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 850.20	47.79	Peak	V	-2.35	-	45.44	68.20	22.76

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 665.37	46.22	Peak	H	8.49	-	54.71	79.57	24.86
5 725.00	52.45	Peak	H	8.77	-	61.22	122.20	60.98
5 665.37	49.92	Peak	V	8.49	-	58.41	79.57	21.16
5 725.00	60.70	Peak	V	8.77	-	69.47	122.20	52.73



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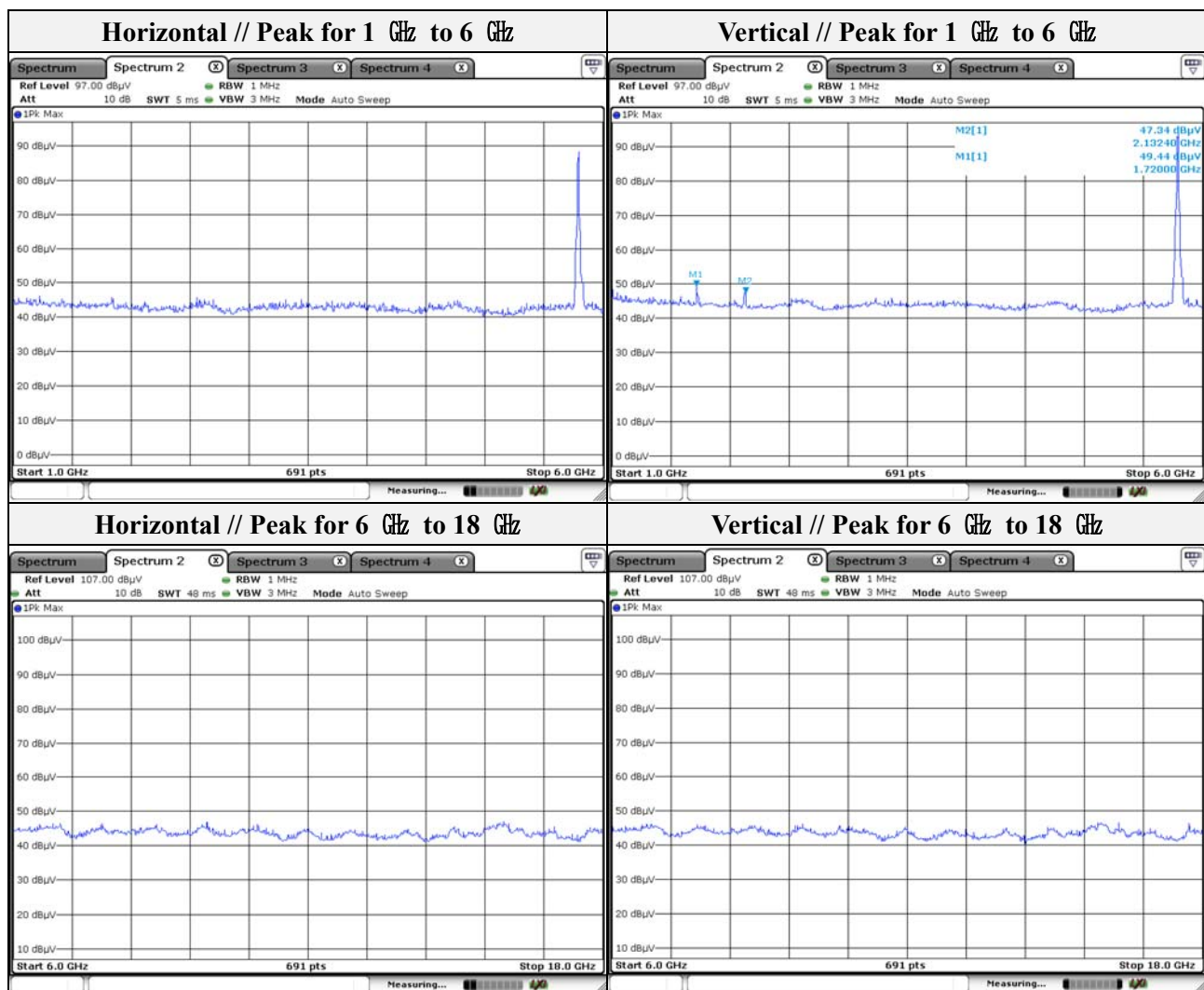
Note.

1. No spurious emission were detected above 6 GHz.

Mode: UNII-3(VHT20)
Distance of measurement: 3 meter
Channel: 157

- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 720.00	49.44	Peak	V	-3.59	-	45.85	74.00	28.15
2 132.40	47.34	Peak	V	-0.66	-	46.68	68.20	21.52



Note.

1. No spurious emission were detected above 6 GHz.

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Test report No.:
KES-RF-19T0013
Page (76) of (112)

Mode: UNII-3(VHT20)

Distance of measurement: 3 meter

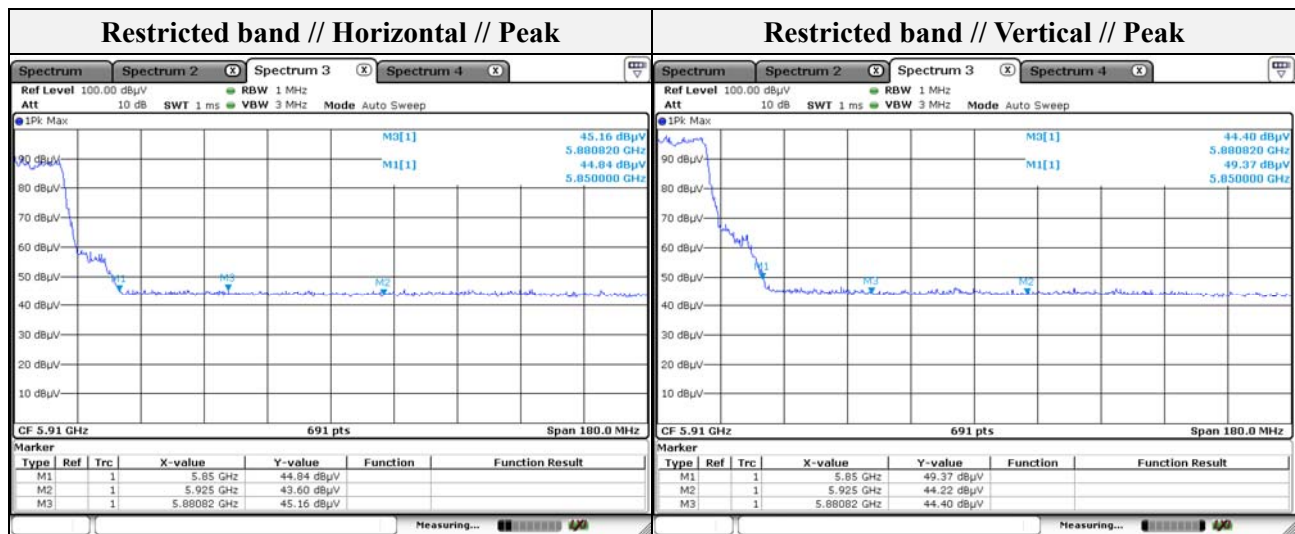
Channel: 165

- Spurious

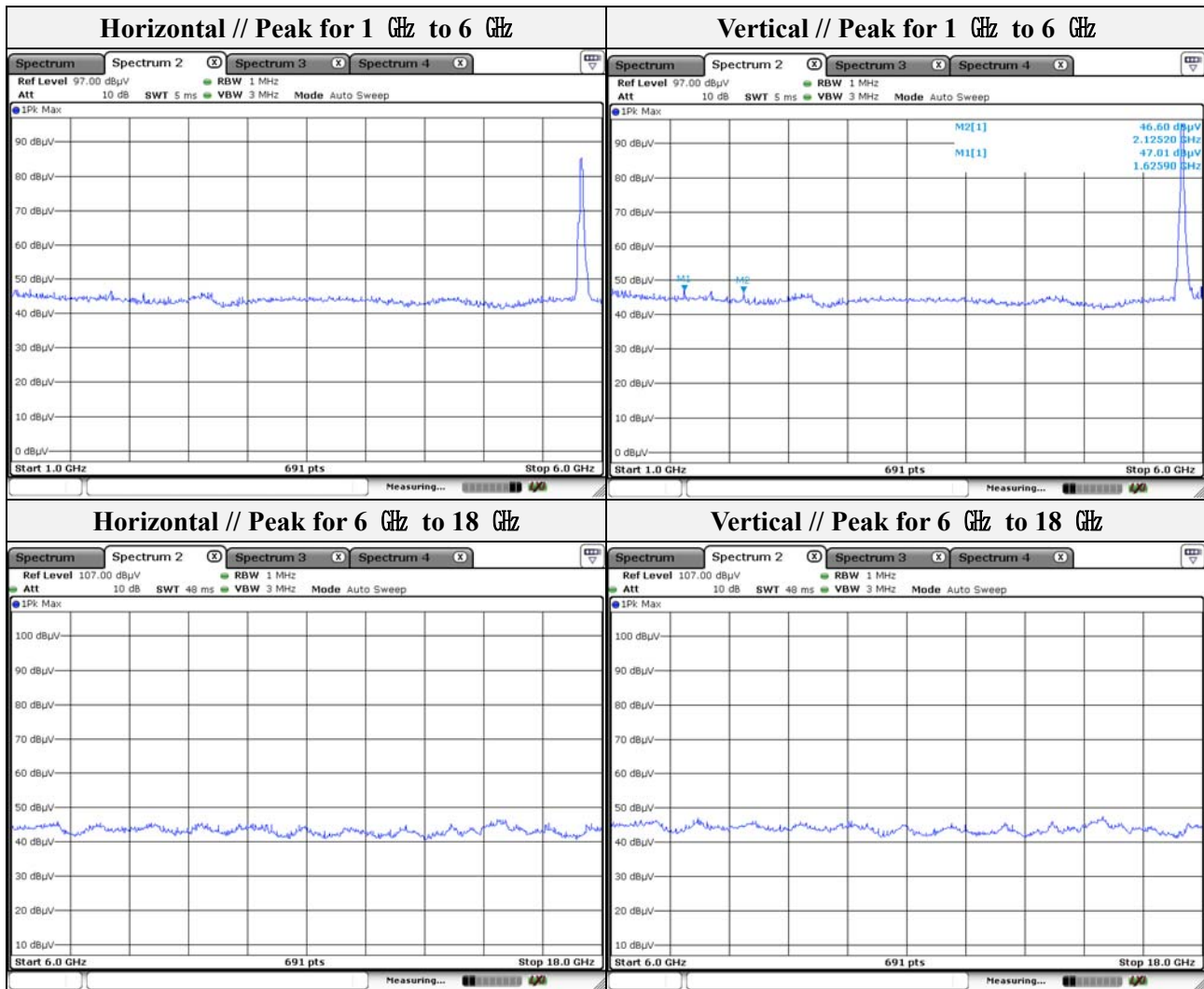
Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 625.90	47.01	Peak	V	-4.51	-	42.50	74.00	31.50
2 125.20	46.60	Peak	V	-0.67	-	45.93	68.20	22.27

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 850.00	44.48	Peak	H	9.32	-	53.80	122.20	68.40
5 880.82	45.16	Peak	H	9.44	-	54.60	100.41	45.81
5 850.00	49.37	Peak	V	9.32	-	58.69	122.20	63.51
5 880.82	44.40	Peak	V	9.44	-	53.84	100.41	46.57



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Note.

1. No spurious emission were detected above 6 GHz.

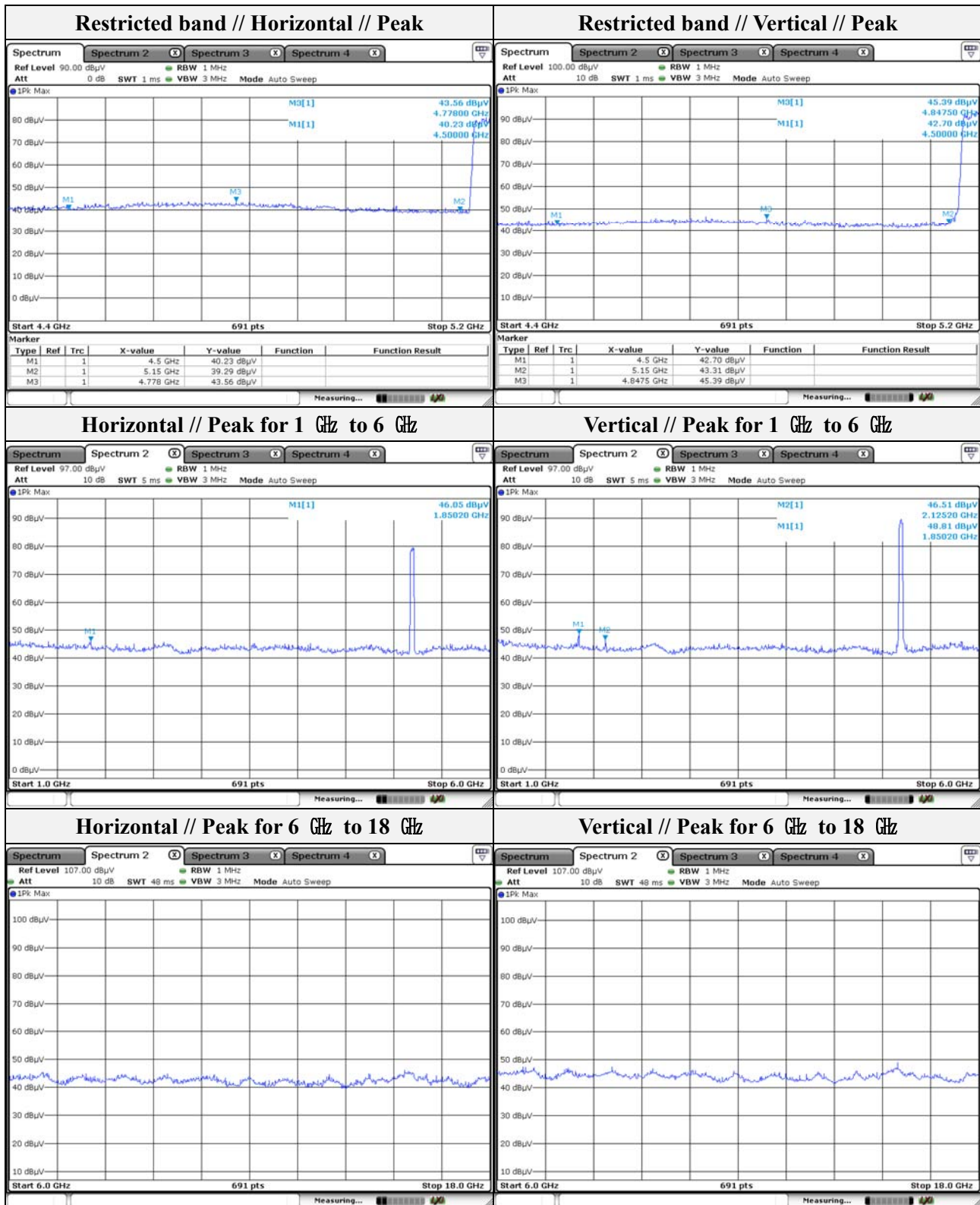
Mode: UNII-1(VHT40)
Distance of measurement: 3 meter
Channel: 38

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 850.20	46.05	Peak	H	-2.35	-	43.70	68.20	24.50
1 850.20	48.81	Peak	V	-2.35	-	46.46	68.20	21.74
2 125.20	46.51	Peak	V	-0.67	-	45.84	68.20	22.36

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4 778.00	43.56	Peak	H	6.80	-	50.36	74.00	23.64
4 847.50	45.39	Peak	V	7.32	-	52.71	74.00	21.29



Note.

1. No spurious emission were detected above 6 GHz.

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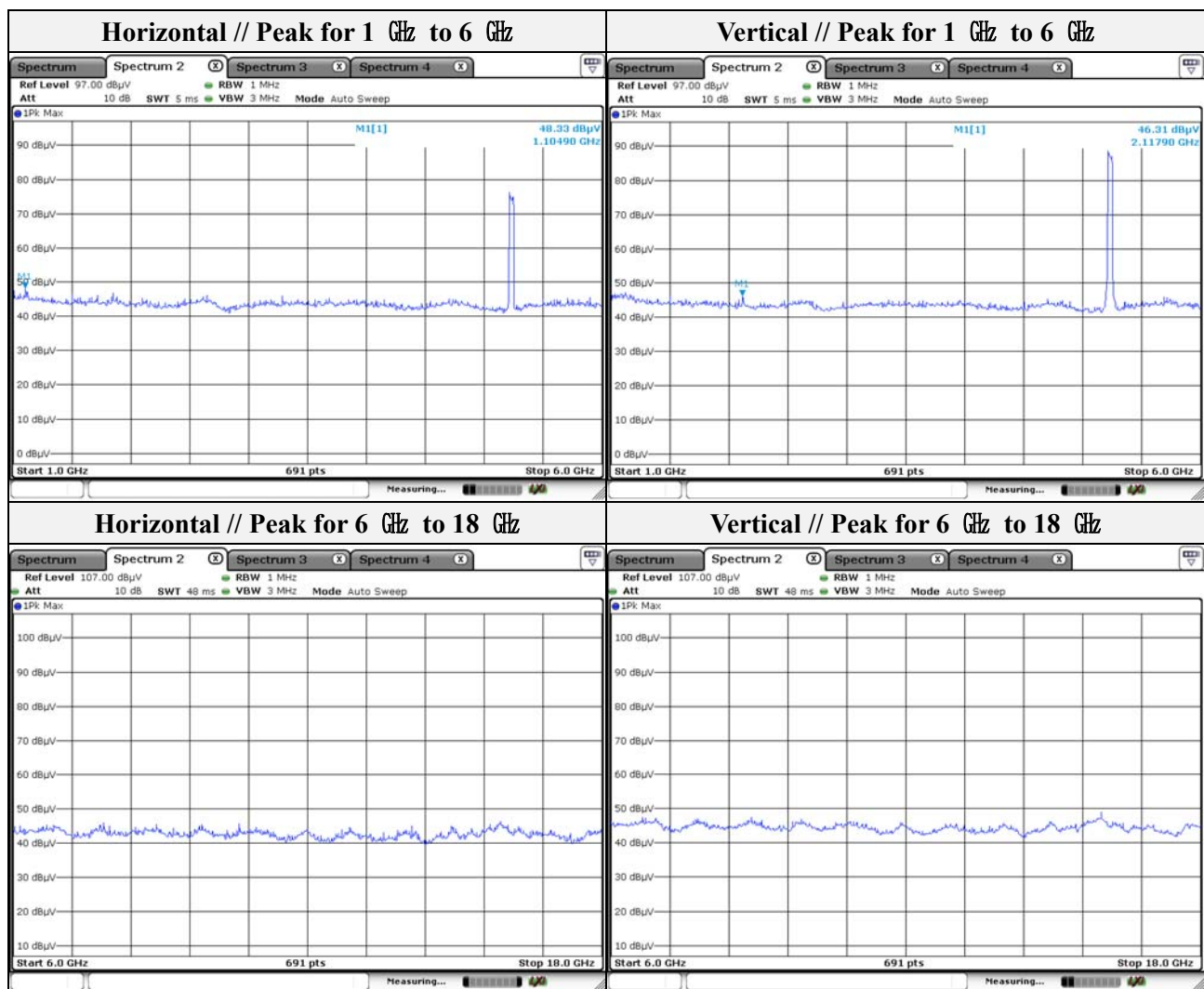
Mode: UNII-1(VHT40)

Distance of measurement: 3 meter

Channel: 46

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 104.90	48.33	Peak	H	-8.05	-	40.28	74.00	33.72
2 117.90	46.31	Peak	V	-0.69	-	45.62	68.20	22.58



Note.

1. No spurious emission were detected above 6 GHz.

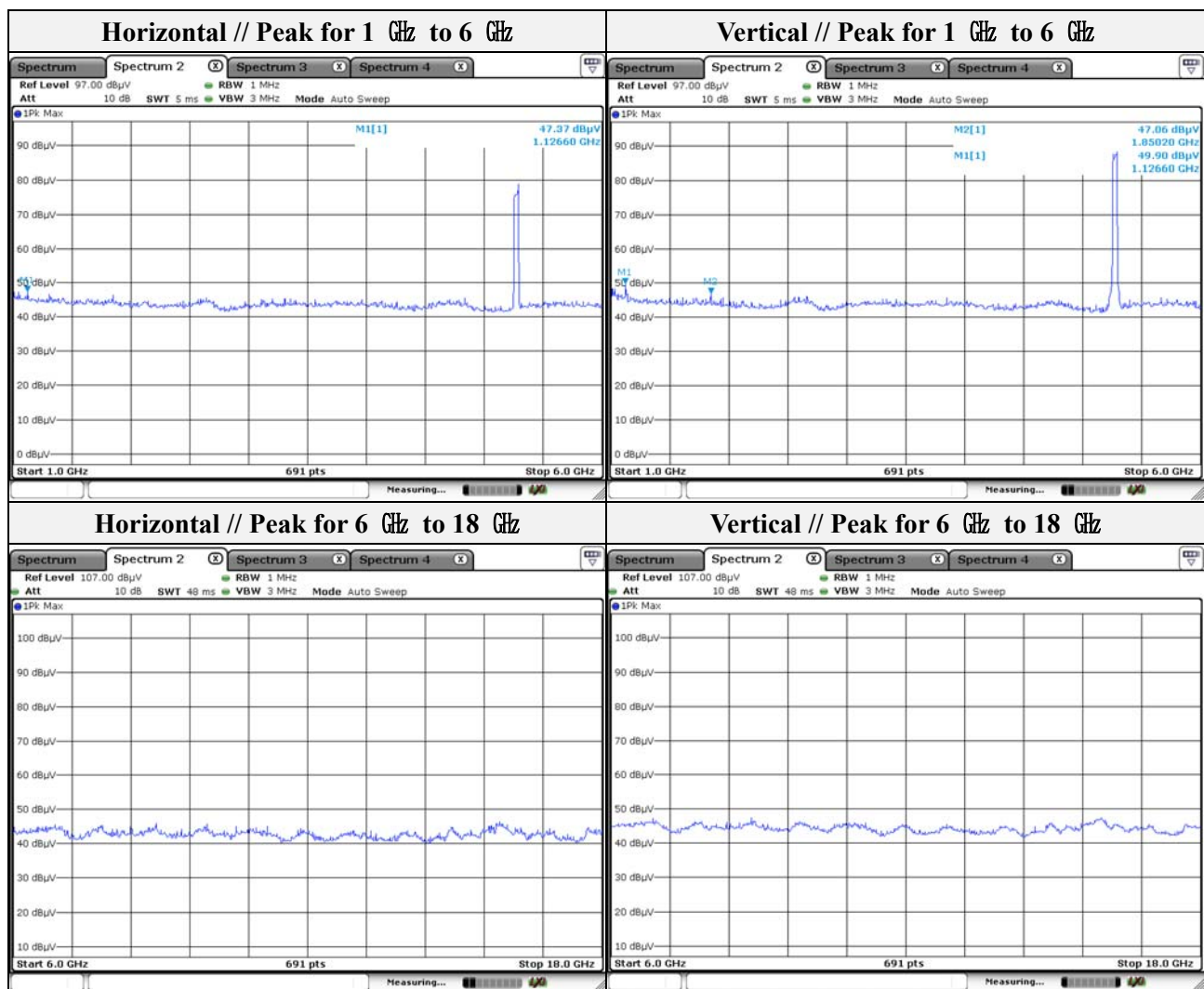
Mode: UNII-2A(VHT40)

Distance of measurement: 3 meter

Channel: 54

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 126.60	47.37	Peak	H	-7.93	-	39.44	74.00	34.56
1 126.60	49.90	Peak	V	-7.93	-	41.97	74.00	32.03
1 850.20	47.06	Peak	V	-2.35	-	44.71	68.20	23.49



Note.

1. No spurious emission were detected above 6 GHz.



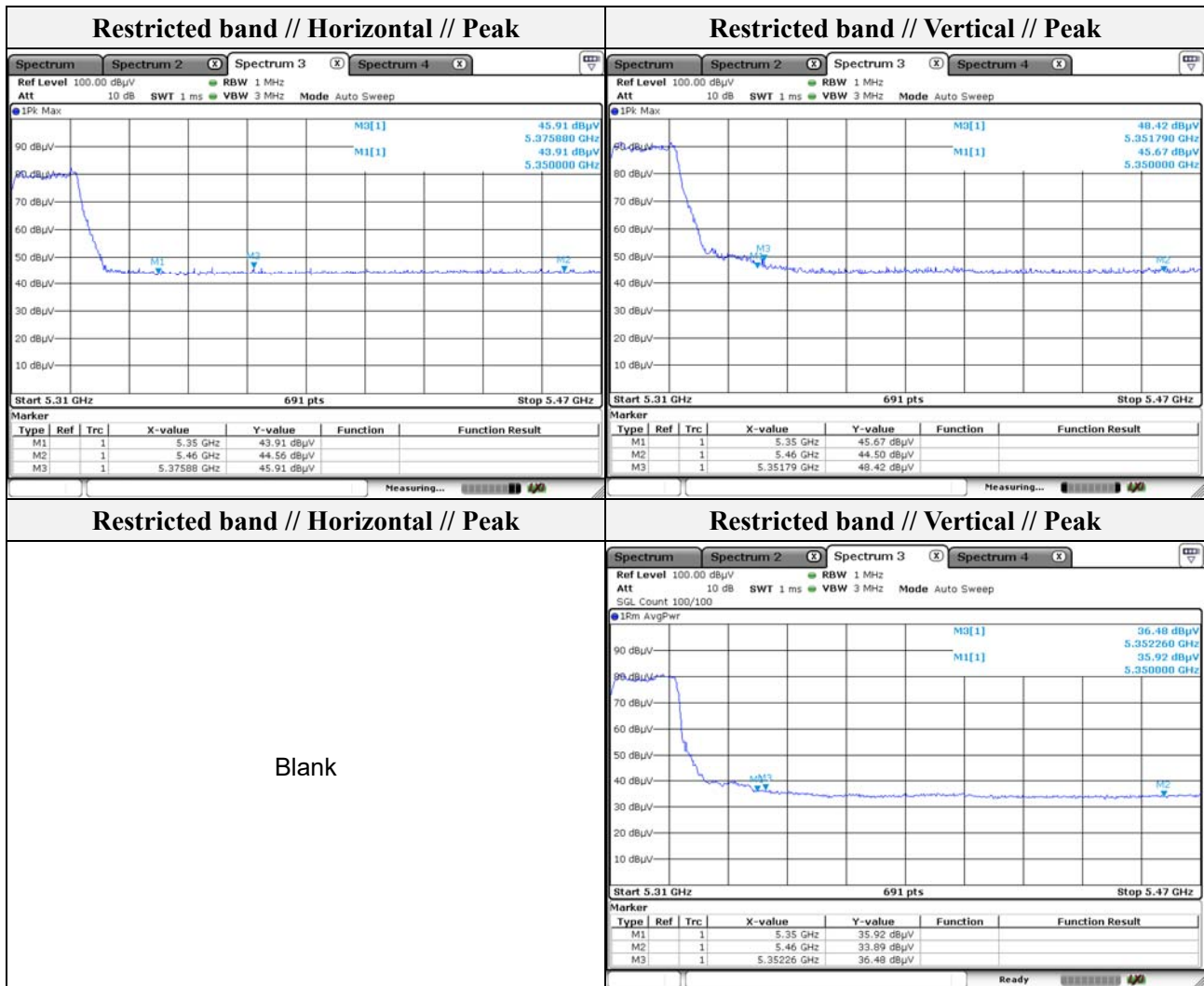
Mode: UNII-2A(VHT40)
Distance of measurement: 3 meter
Channel: 62

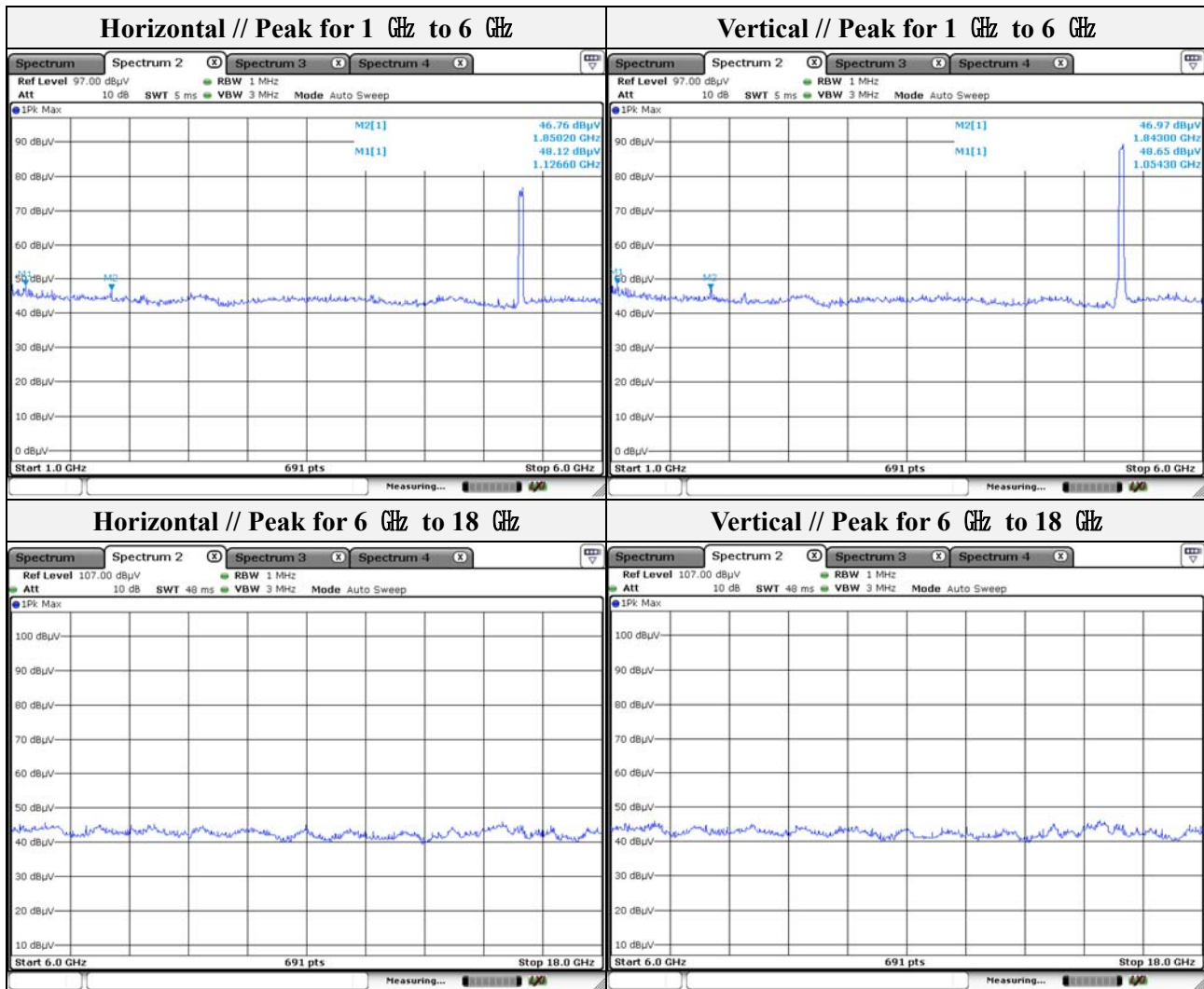
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 126.60	48.12	Peak	H	-7.93	-	40.19	74.00	33.81
1 850.20	46.76	Peak	H	-2.35	-	44.41	68.20	23.79
1 054.30	48.65	Peak	V	-8.33	-	40.32	74.00	33.68
1 843.00	46.97	Peak	V	-2.42	-	44.55	68.20	23.65

- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 375.88	45.91	Peak	H	7.91	-	53.82	74.00	20.18
5 351.79	48.42	Peak	V	7.95	-	56.37	74.00	17.63
5 352.26	36.48	Average	V	7.94	3.14	47.56	54.00	6.44





Note.

1. No spurious emission were detected above 6 GHz.
2. Average test would be performed if the peak result were greater than the average limit.

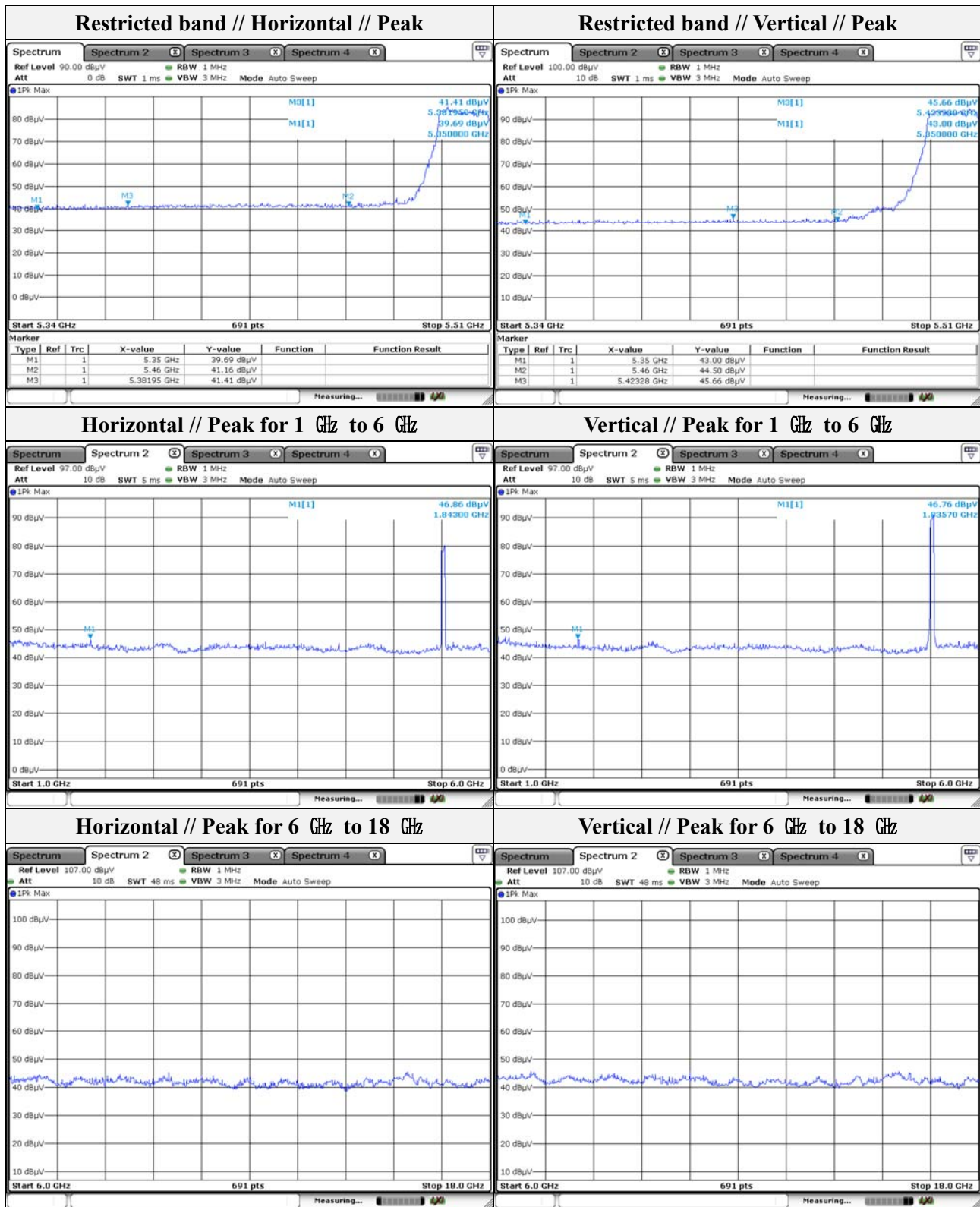
Mode: UNII-2C(VHT40)
Distance of measurement: 3 meter
Channel: 102

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 843.00	46.86	Peak	H	-2.42	-	44.44	68.20	23.76
1 835.70	46.76	Peak	V	-2.48	-	44.28	68.20	23.92

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 381.95	41.41	Peak	H	7.90	-	49.31	74.00	24.69
5 423.28	45.66	Peak	V	7.85	-	53.51	74.00	20.49



Note.

1. No spurious emission were detected above 6 GHz.

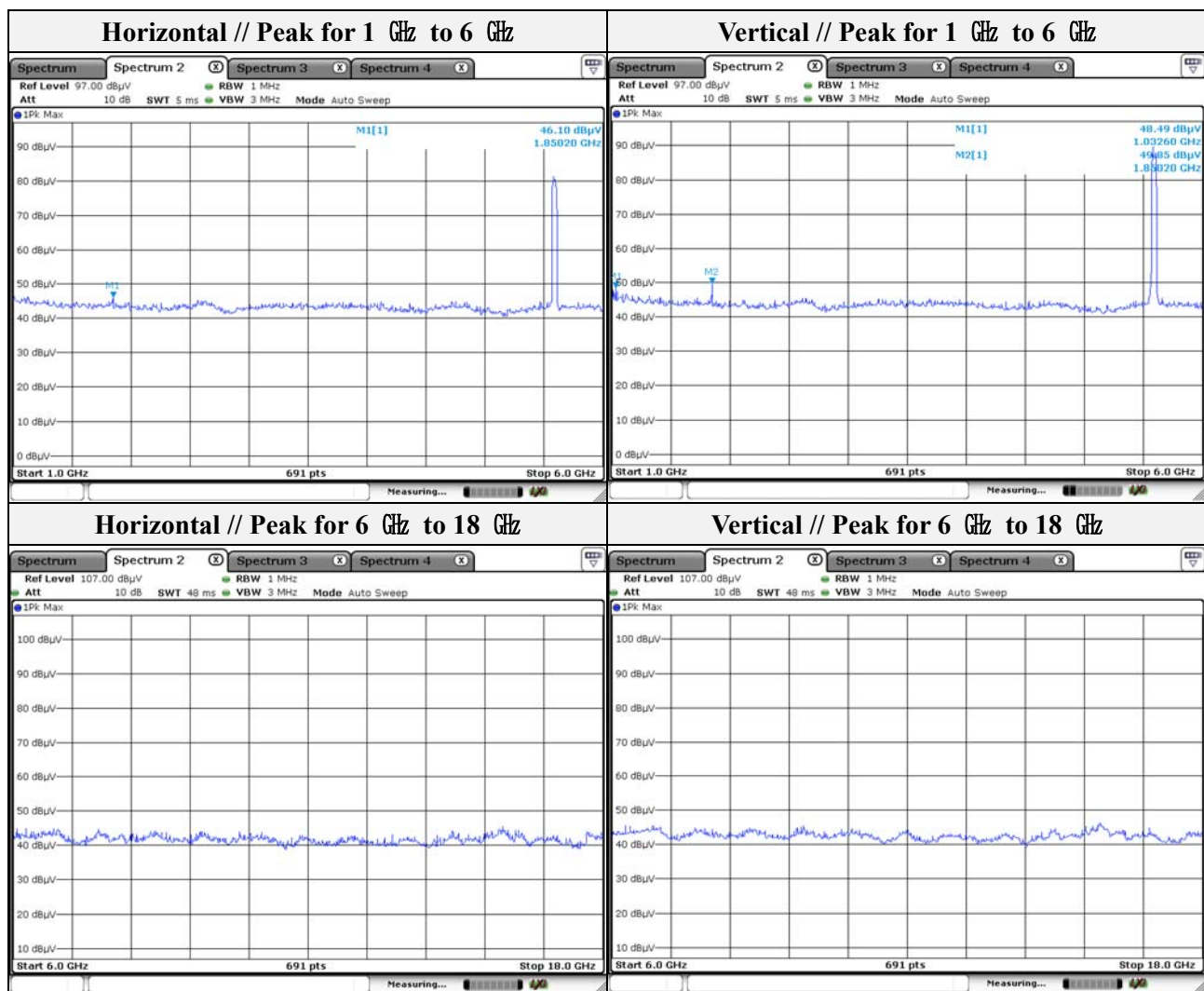
Mode: UNII-2C(VHT40)

Distance of measurement: 3 meter

Channel: 118

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 850.20	46.10	Peak	H	-2.35	-	43.75	68.20	24.45
1 032.60	48.49	Peak	V	-8.46	-	40.03	74.00	33.97
1 850.20	49.85	Peak	V	-2.35	-	47.50	68.20	20.70



Note.

1. No spurious emission were detected above 6 GHz.

Mode: UNII-2C(VHT40)

Distance of measurement: 3 meter

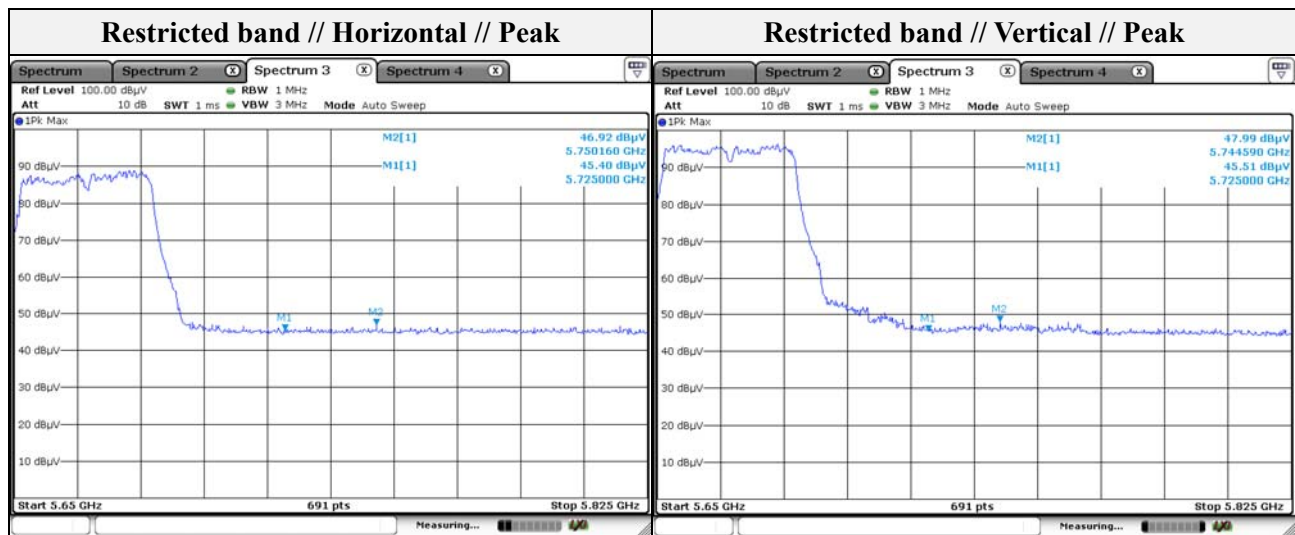
Channel: 134

- Spurious

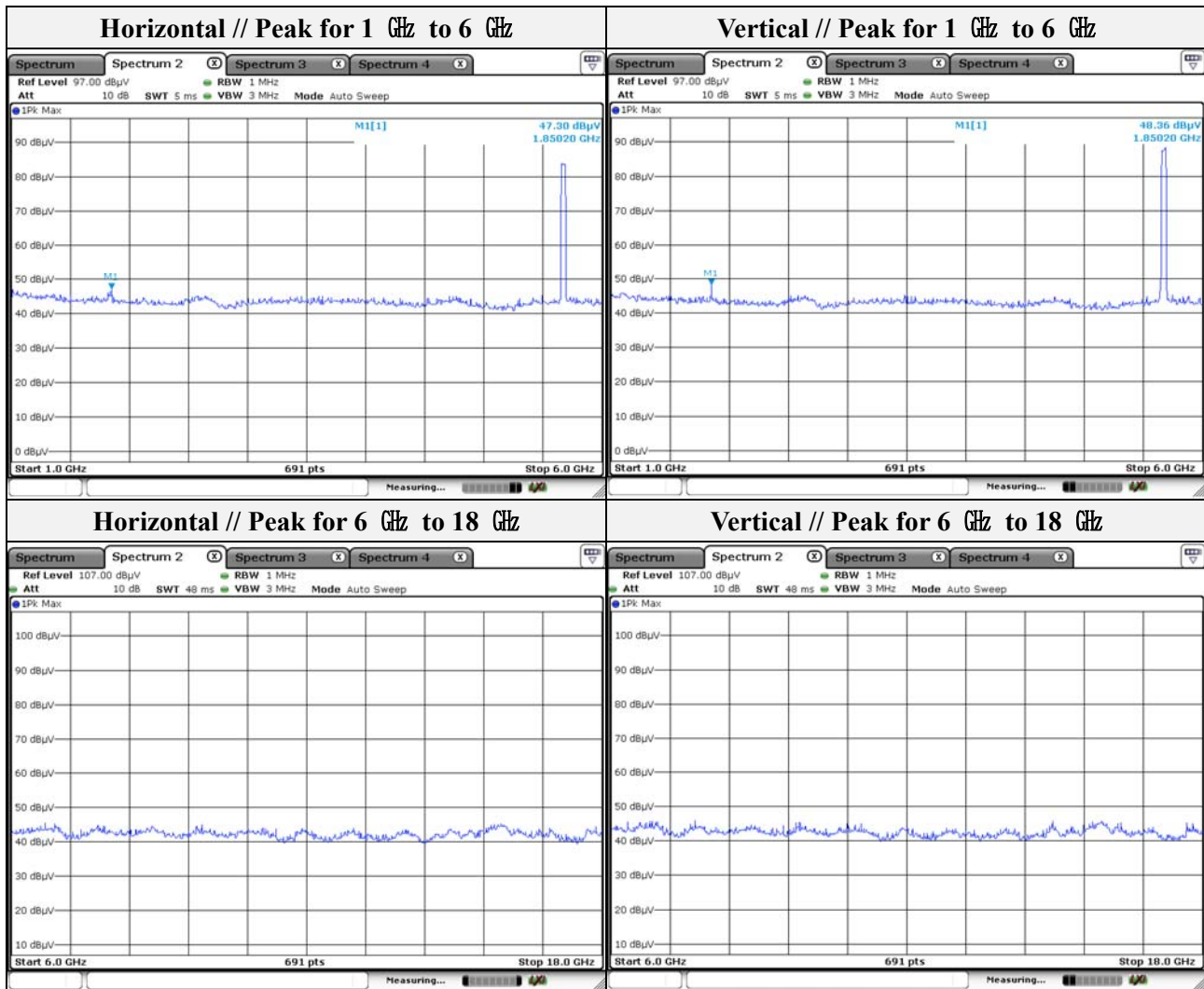
Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 850.20	47.30	Peak	H	-2.35	-	44.95	68.20	23.25
1 850.20	48.36	Peak	V	-2.35	-	46.01	68.20	22.19

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 750.16	46.92	Peak	H	8.89	-	55.81	68.20	12.39
5 744.59	47.99	Peak	V	8.87	-	56.86	68.20	11.34



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Note.

1. No spurious emission were detected above 6 GHz.

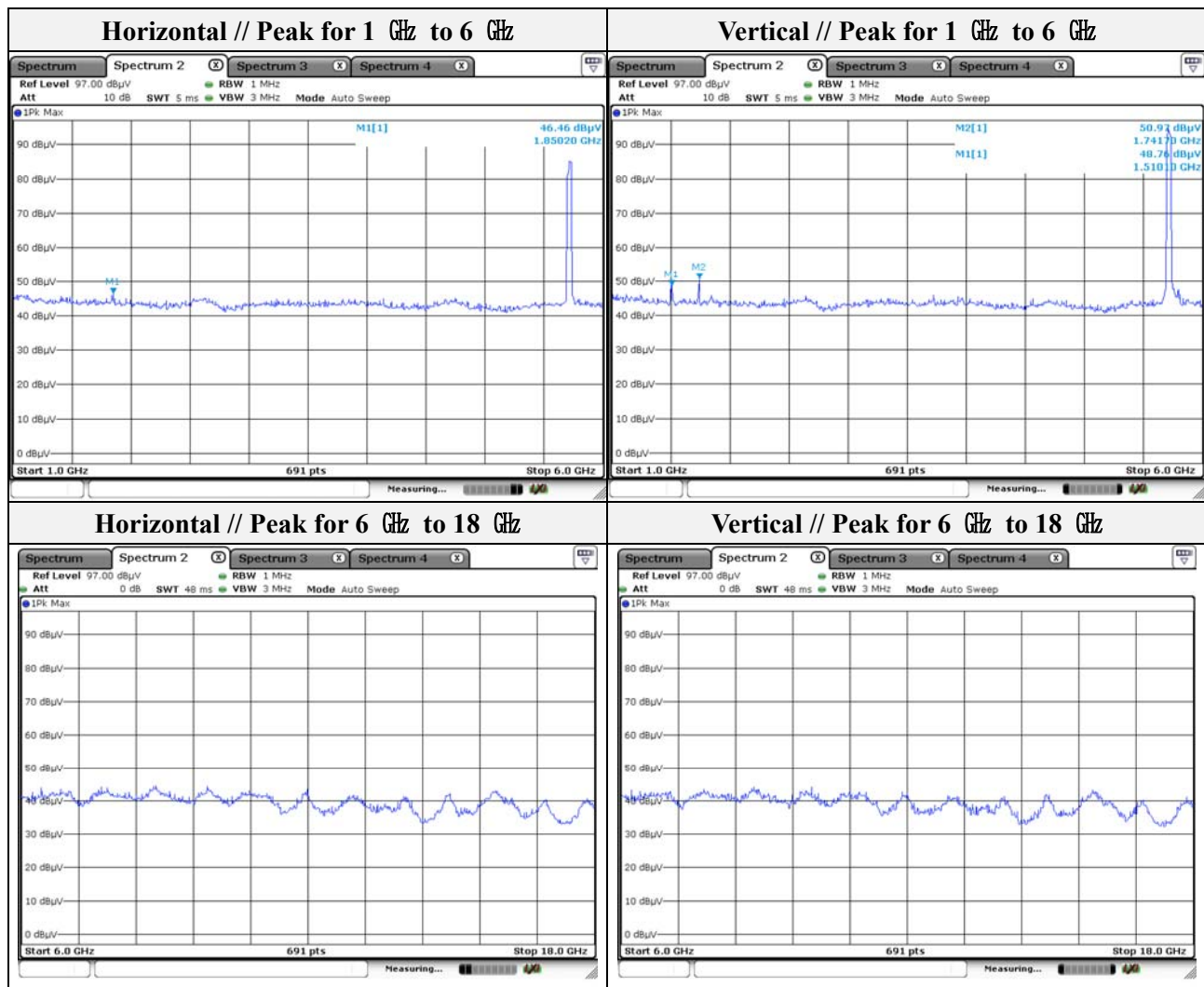
Mode: UNII-2C(VHT40)

Distance of measurement: 3 meter

Channel: 142

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 850.20	46.46	Peak	H	-2.35	-	44.11	68.20	24.09
1 510.10	48.76	Peak	V	-5.58	-	43.18	74.00	30.82
1 741.70	50.97	Peak	V	-3.38	-	47.59	68.20	20.61



Note.

1. No spurious emission were detected above 6 GHz.

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Test report No.:
KES-RF-19T0013
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Mode: UNII-3(VHT40)

Distance of measurement: 3 meter

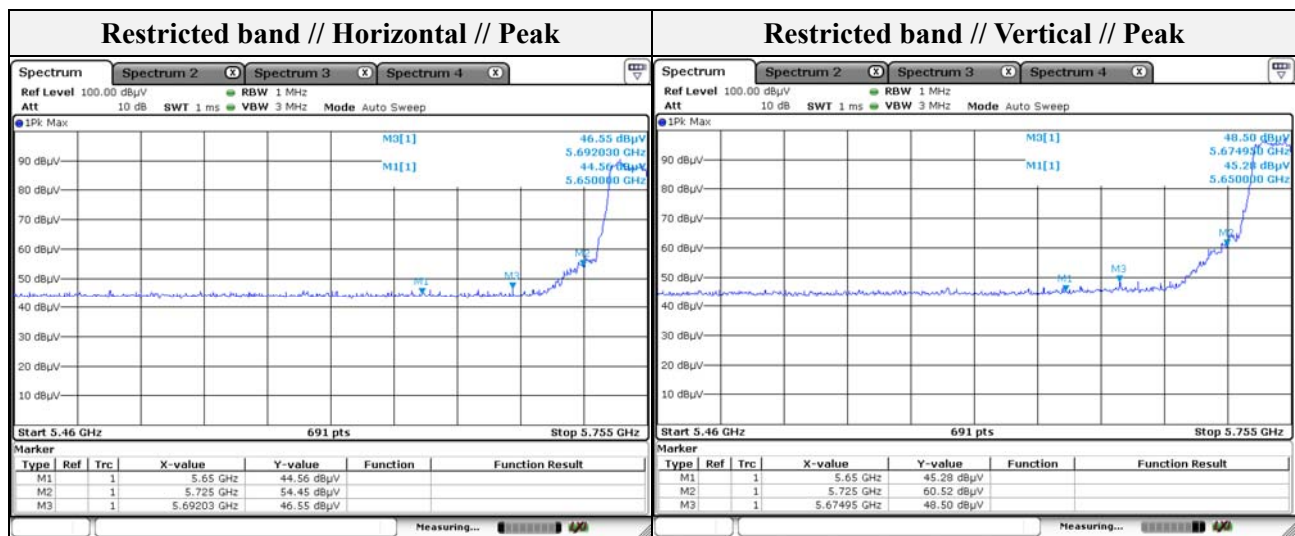
Channel: 151

- Spurious

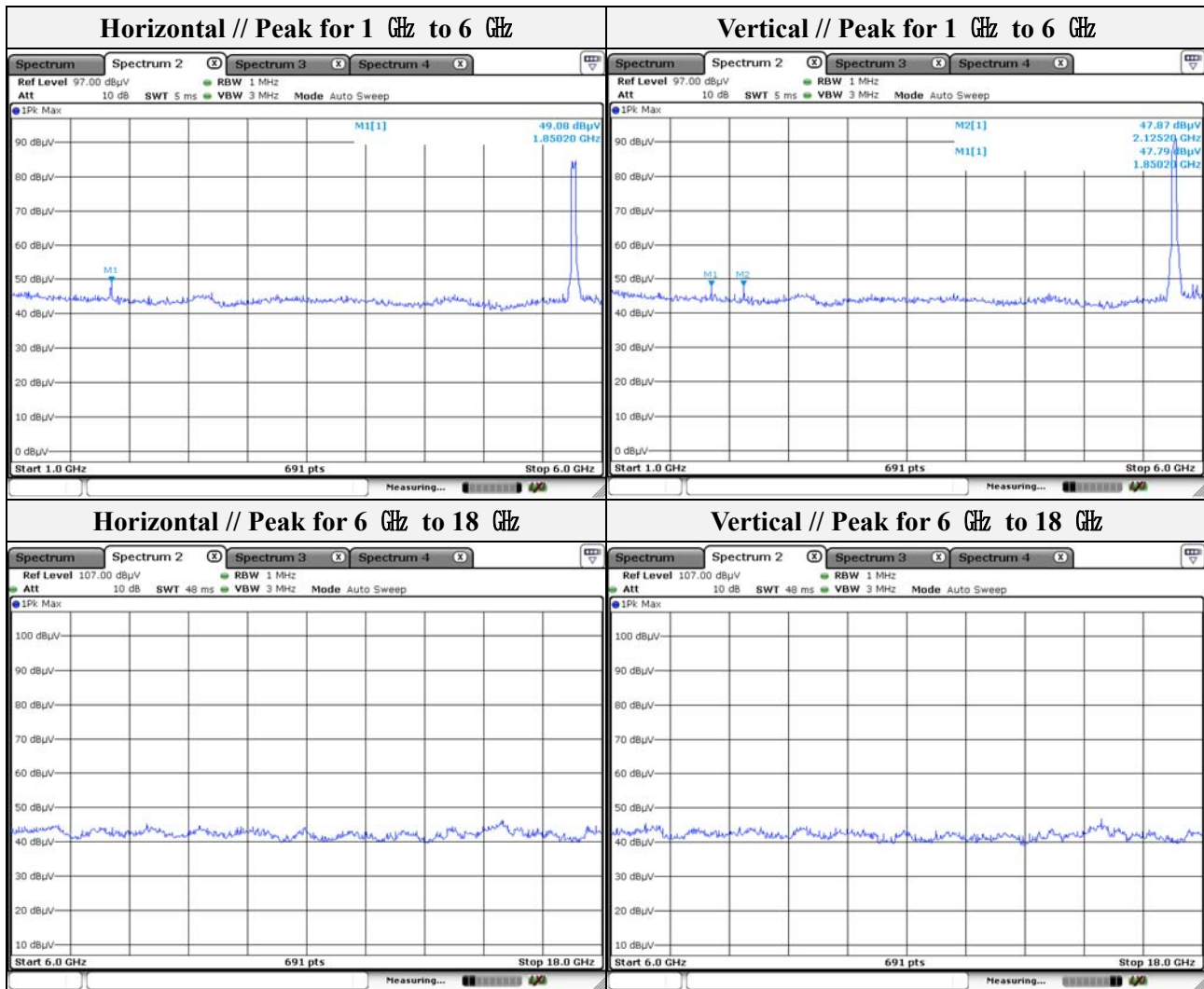
Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 850.20	49.08	Peak	H	-2.35	-	46.73	68.20	21.47
1 850.20	47.79	Peak	V	-2.35	-	45.44	68.20	22.76
2 125.20	47.87	Peak	V	-0.67	-	47.20	68.20	21.00

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 692.03	46.55	Peak	H	8.62	-	55.17	99.30	44.13
5 725.00	54.45	Peak	H	8.77	-	63.22	122.20	58.98
5 674.95	48.50	Peak	V	8.54	-	57.04	86.66	29.62
5 725.00	60.52	Peak	V	8.77	-	69.29	122.20	52.91



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Note.

1. No spurious emission were detected above 6 GHz.

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Mode: UNII-3(VHT40)
Distance of measurement: 3 meter
Channel: 159

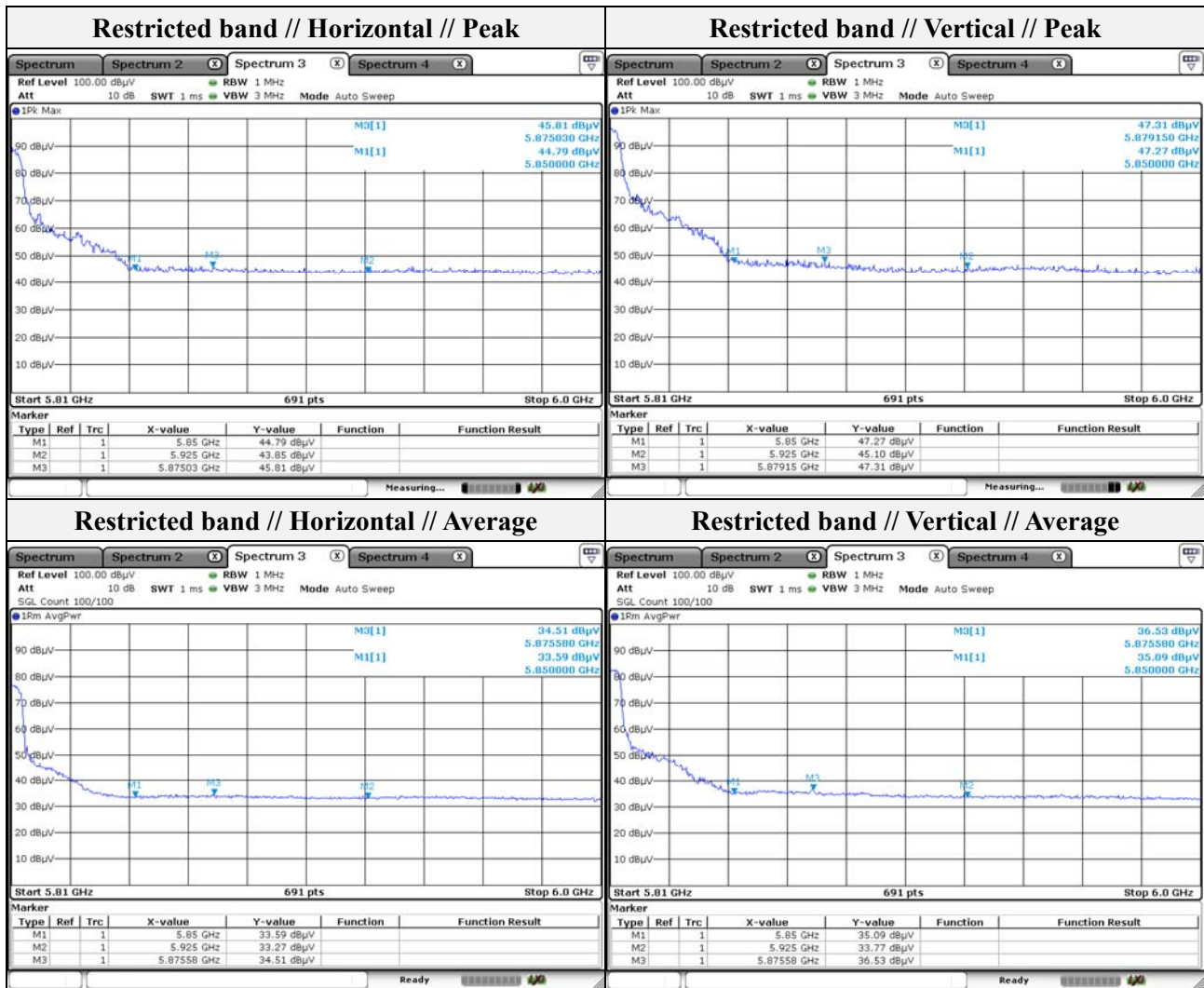
- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 850.20	46.63	Peak	H	-6.98	-	44.28	68.20	23.92
1 589.70	47.91	Peak	V	-5.95	-	43.06	74.00	30.94
2 125.20	47.11	Peak	V	-4.32	-	46.44	68.20	21.76

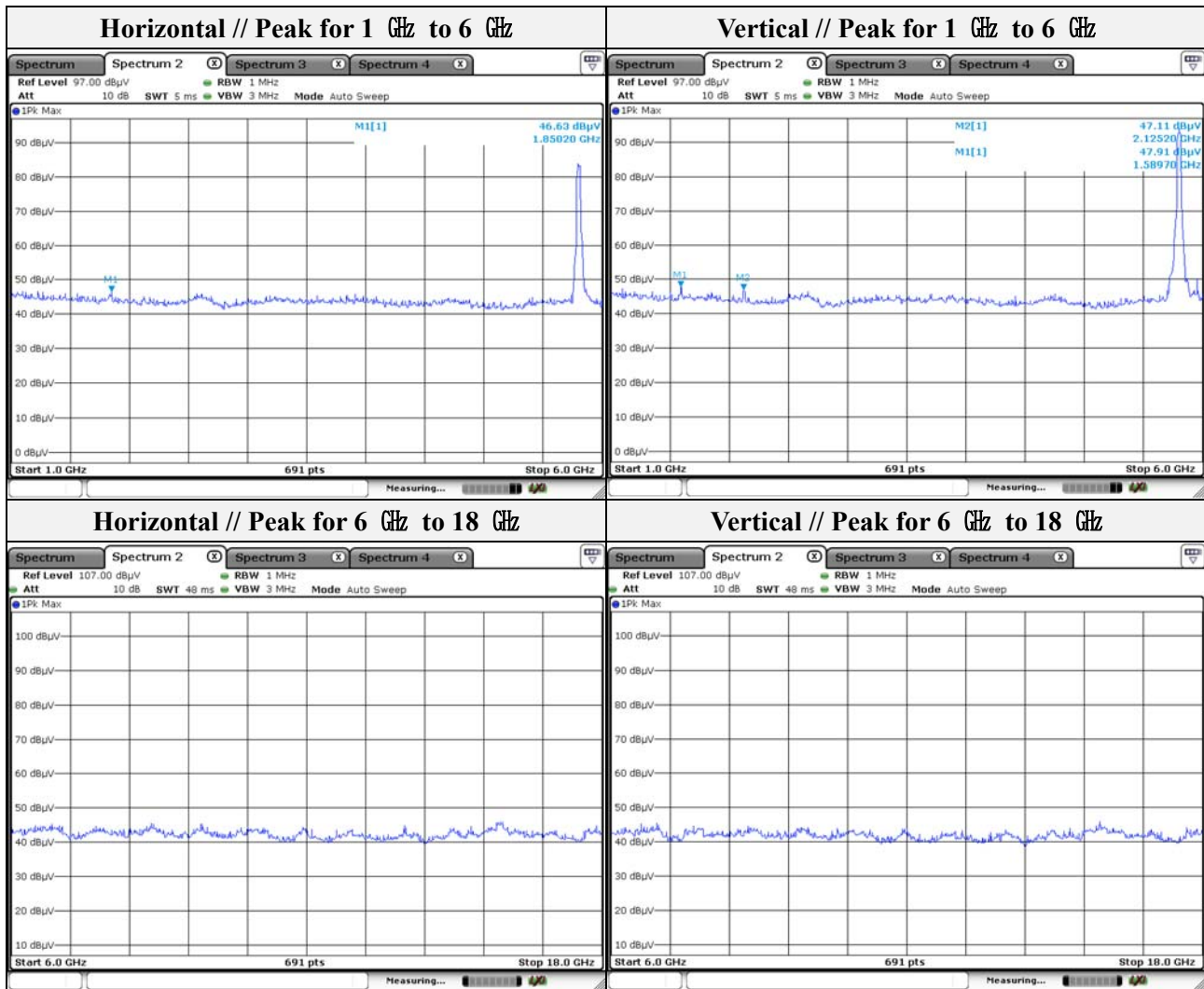
- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 875.03	45.81	Peak	H	9.42	-	55.23	105.18	49.95
5 879.15	47.31	Peak	V	9.43	-	56.74	101.79	45.05

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Note.

1. No spurious emission were detected above 6 GHz.

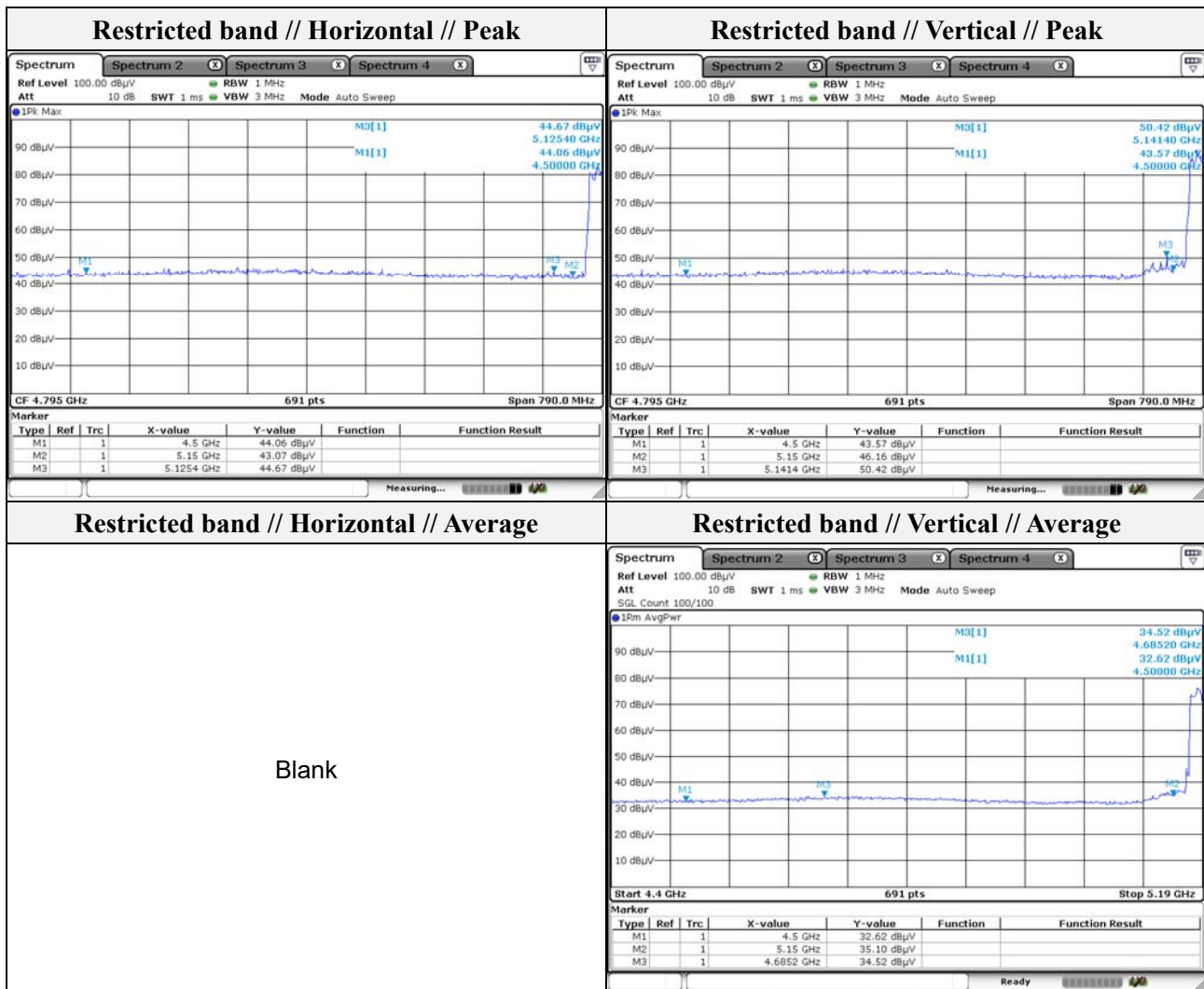
Mode: UNII-1(VHT80)
Distance of measurement: 3 meter
Channel: 42

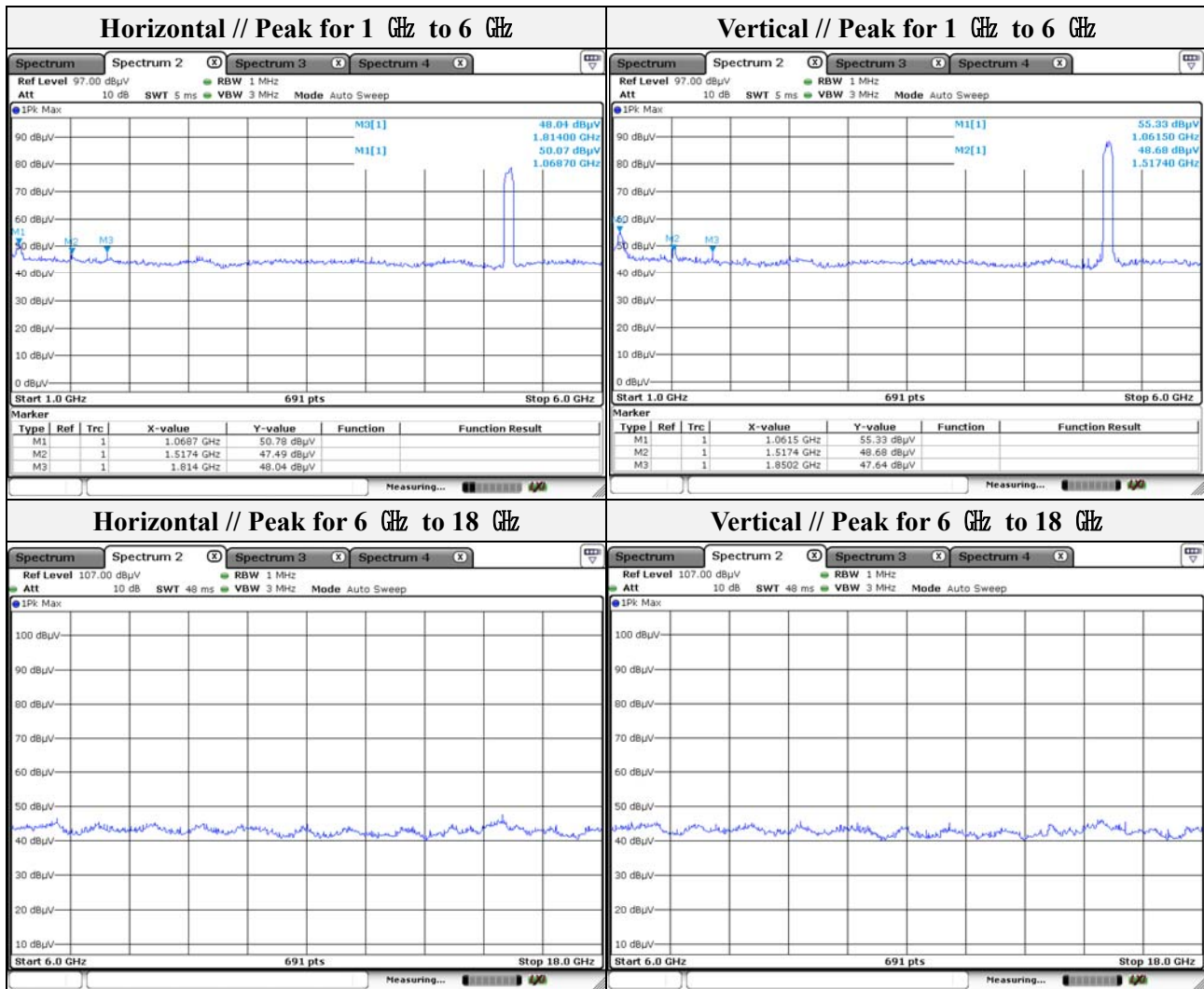
- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 068.70	50.78	Peak	H	-8.25	-	42.53	74.00	31.47
1 517.40	47.49	Peak	H	-5.51	-	41.98	74.00	32.02
1 814.00	48.04	Peak	H	-2.68	-	45.36	68.20	22.84
1 061.50	55.33	Peak	V	-8.29	-	47.04	74.00	26.96
1 517.40	48.68	Peak	V	-5.51	-	43.17	74.00	30.83
1 850.20	47.64	Peak	V	-2.35	-	45.29	68.20	22.91

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 125.40	44.67	Peak	H	8.26	-	52.93	74.00	21.07
5 141.40	50.42	Peak	V	8.23	-	58.65	74.00	15.35
4 685.20	34.53	Average	V	6.09	3.70	44.32	54.00	9.87
5 150.00	35.10	Average	V	8.22	3.70	47.02	54.00	7.17





Note.

1. No spurious emission were detected above 6 GHz.
2. Average test would be performed if the peak result were greater than the average limit.

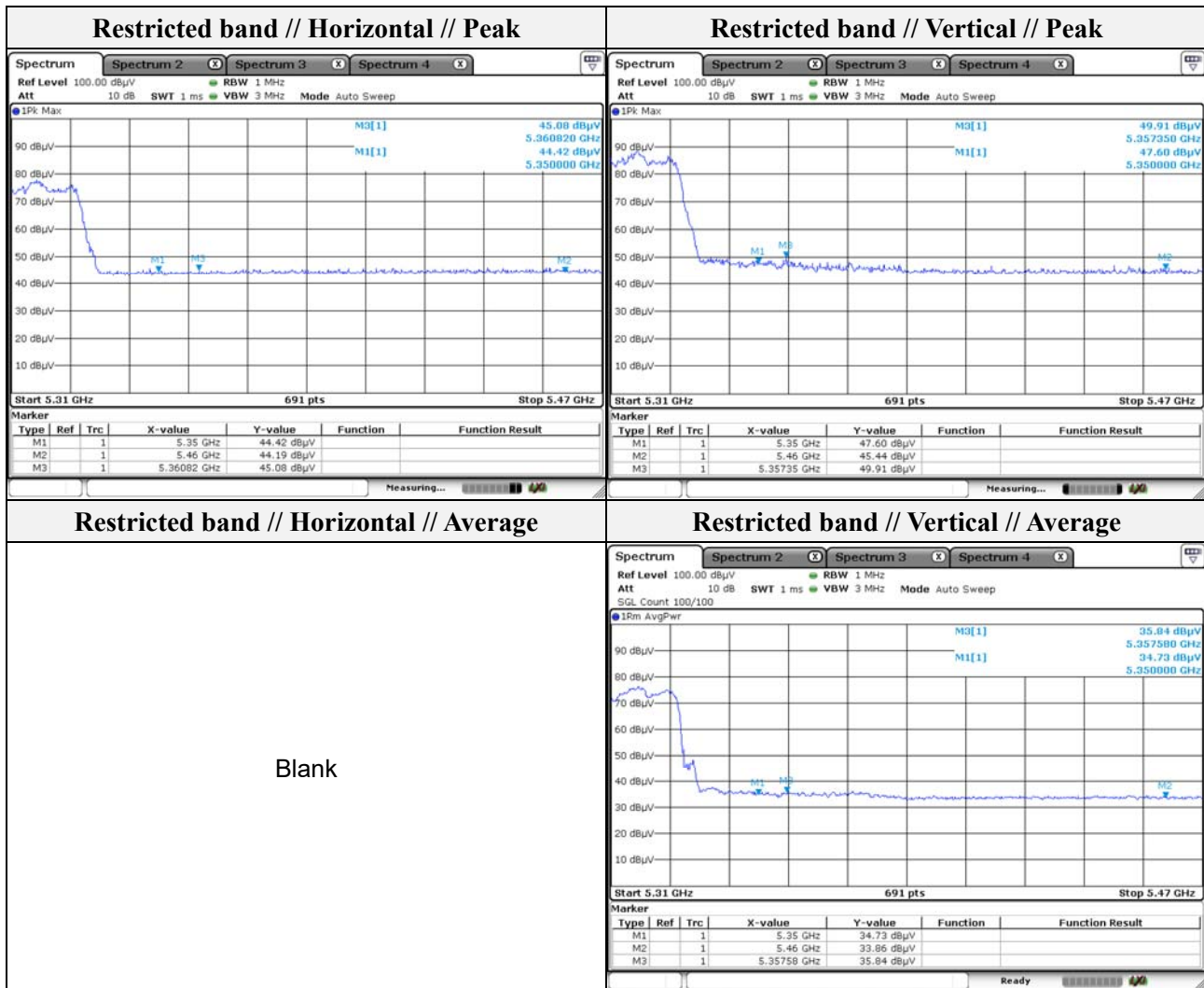
Mode: UNII-2A(VHT80)
Distance of measurement: 3 meter
Channel: 58

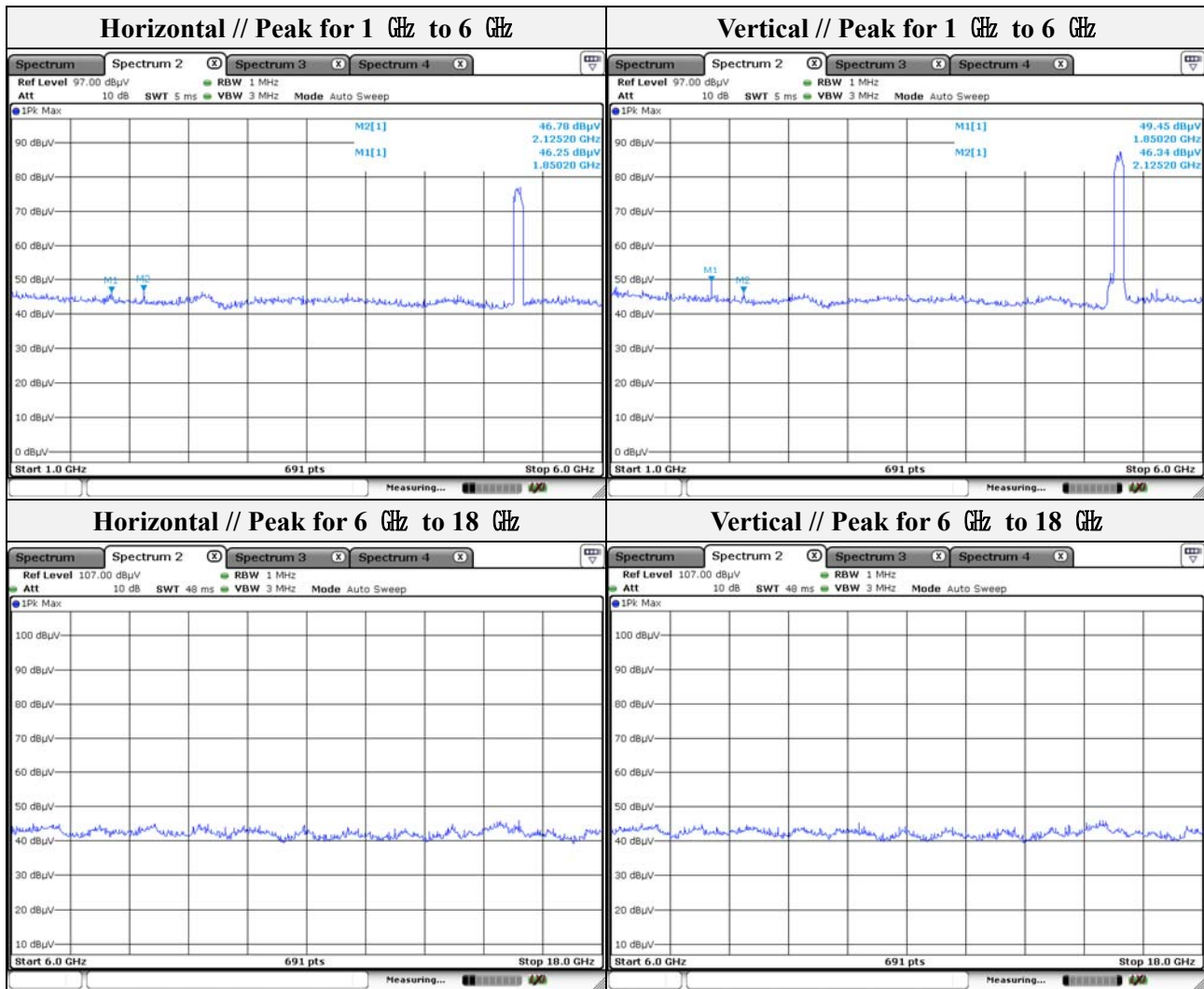
- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 850.20	46.25	Peak	H	-2.35	-	43.90	68.20	24.30
2 125.20	46.78	Peak	H	-0.67	-	46.11	68.20	22.09
1 950.20	49.45	Peak	V	-1.42	-	48.03	68.20	20.17
2 125.20	46.34	Peak	V	-0.67	-	45.67	68.20	22.53

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 360.82	45.08	Peak	H	7.93	-	53.74	74.00	20.26
5 357.35	49.91	Peak	H	7.94	-	53.52	74.00	20.48
5 357.58	35.84	Average	V	7.94	3.78	47.56	54.00	6.44





Note.

1. No spurious emission were detected above 6 GHz.
2. Average test would be performed if the peak result were greater than the average limit.

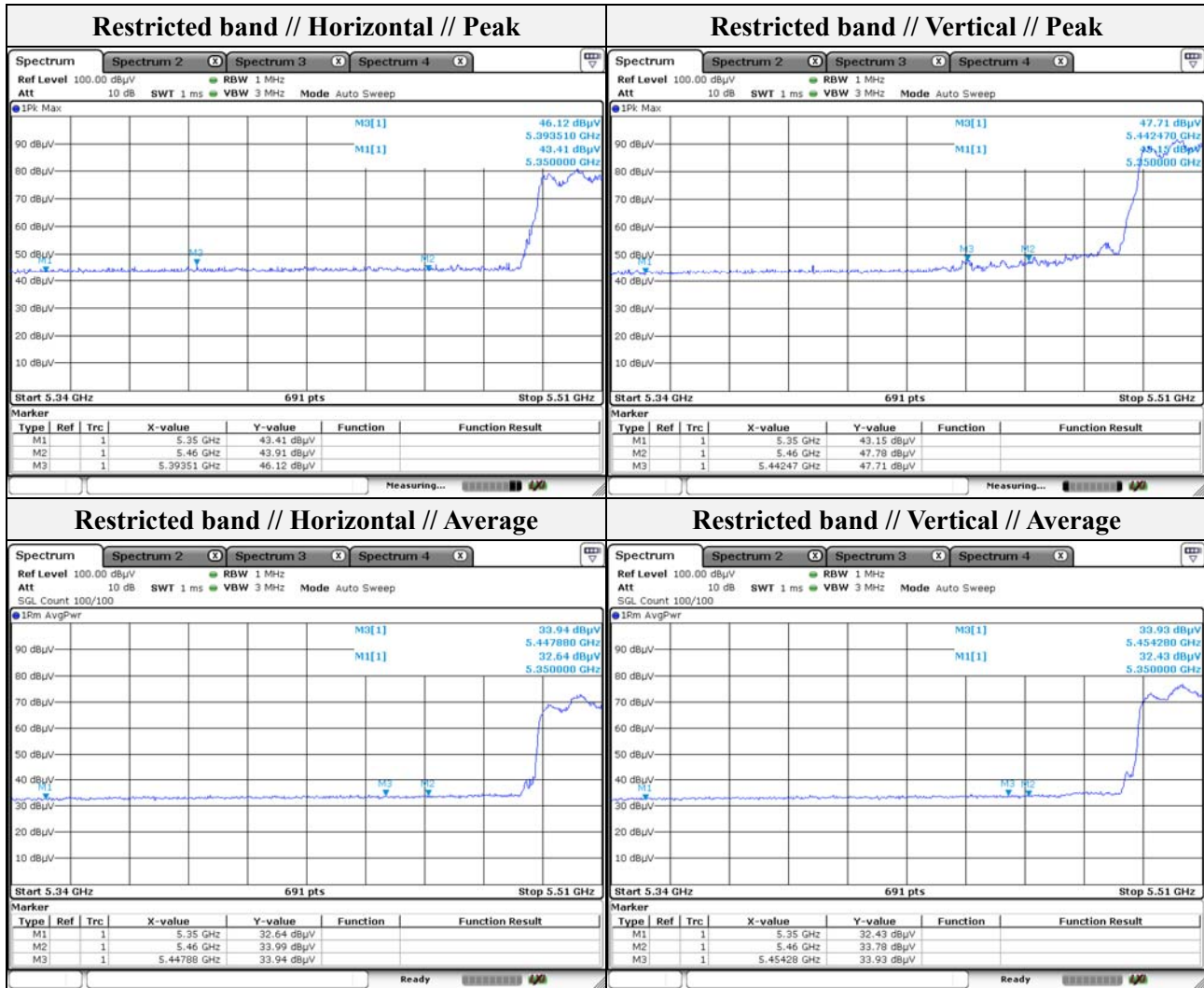
Mode: UNII-2C(VHT80)
Distance of measurement: 3 meter
Channel: 106

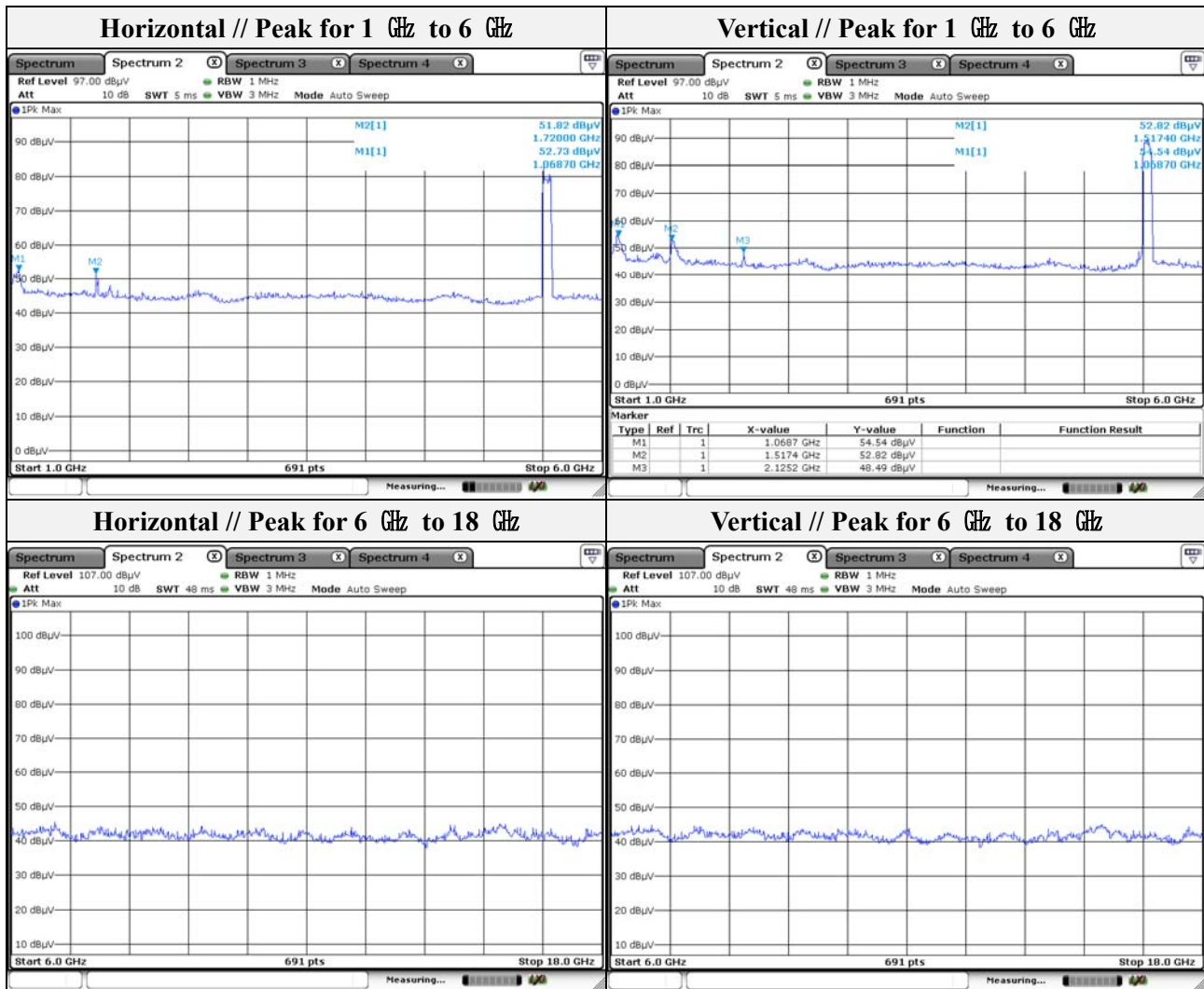
- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 068.70	52.73	Peak	H	-8.25	-	44.48	74.00	29.52
1 720.00	51.82	Peak	H	-3.59	-	48.23	74.00	25.77
1 068.70	54.54	Peak	V	-8.25	-	46.29	74.00	27.71
1 517.40	52.82	Peak	V	-5.51	-	47.31	74.00	26.69
2 125.20	48.49	Peak	V	-0.67	-	47.82	68.20	20.38

- Band edge

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 393.51	46.12	Peak	H	7.89	-	54.01	74.00	19.99
5 442.47	47.71	Peak	V	7.83	-	55.54	74.00	18.46
5 460.00	47.78	Peak	V	7.81	-	55.59	74.00	18.41
5 447.88	33.94	Average	H	7.83	4.52	46.29	54.00	7.71
5 460.00	33.99	Average	H	7.81	4.52	46.32	54.00	7.68
5 454.28	33.93	Average	V	7.82	4.52	46.27	54.00	7.73
5 460.00	33.78	Average	V	7.81	4.52	46.11	54.00	7.89





Note.

1. No spurious emission were detected above 6 GHz.
2. Average test would be performed if the peak result were greater than the average limit.

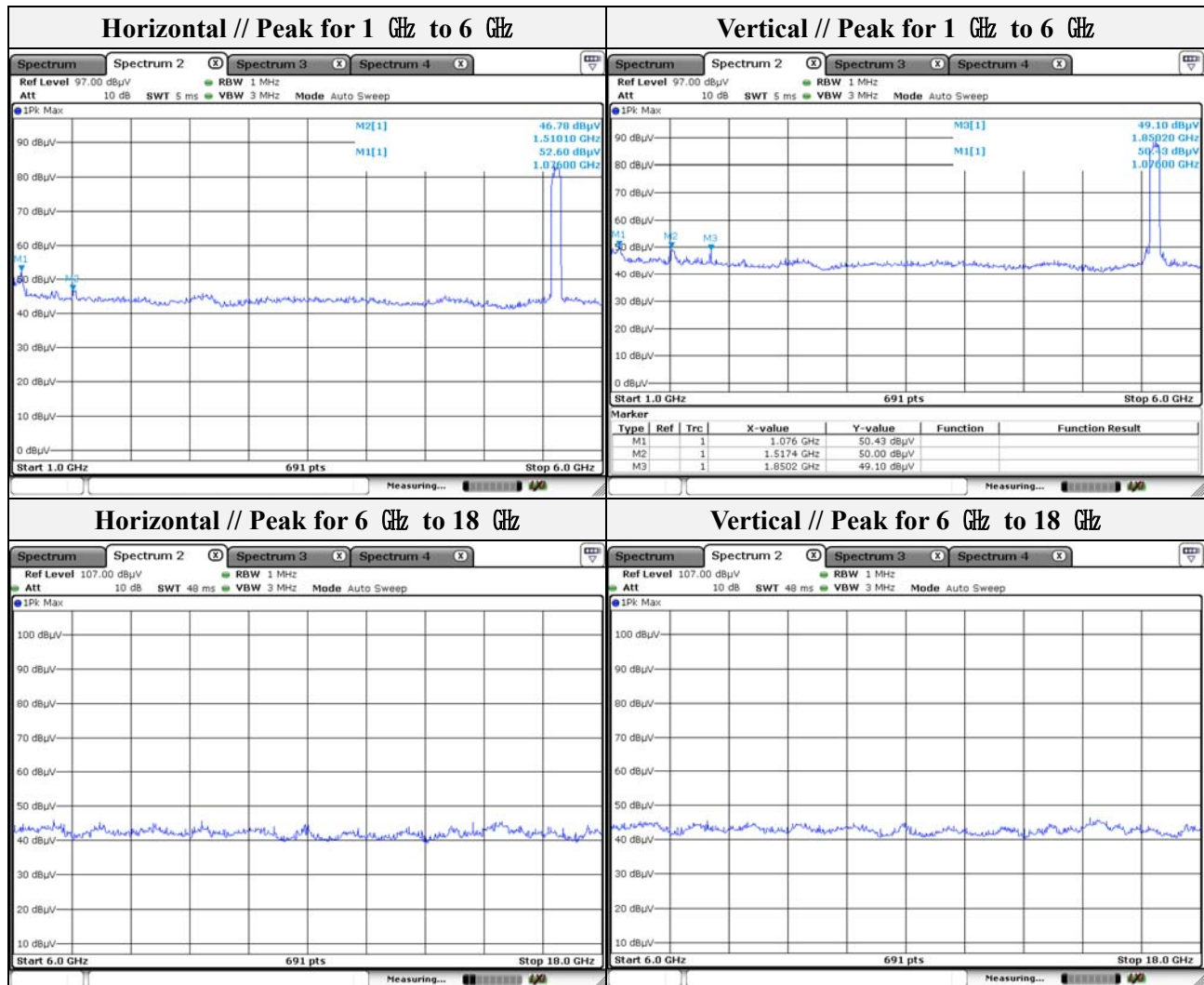
Mode: UNII-2C(VHT80)

Distance of measurement: 3 meter

Channel: 122

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 076.00	52.60	Peak	H	-8.21	-	44.39	74.00	29.61
1 510.10	46.78	Peak	H	-5.58	-	41.20	74.00	32.80
1 076.00	50.43	Peak	V	-8.21	-	42.22	74.00	31.78
1 517.40	50.00	Peak	V	-5.51	-	44.49	74.00	29.51
1 850.20	49.10	Peak	V	-2.35	-	46.75	68.20	21.45



Note.

1. No spurious emission were detected above 6 GHz.

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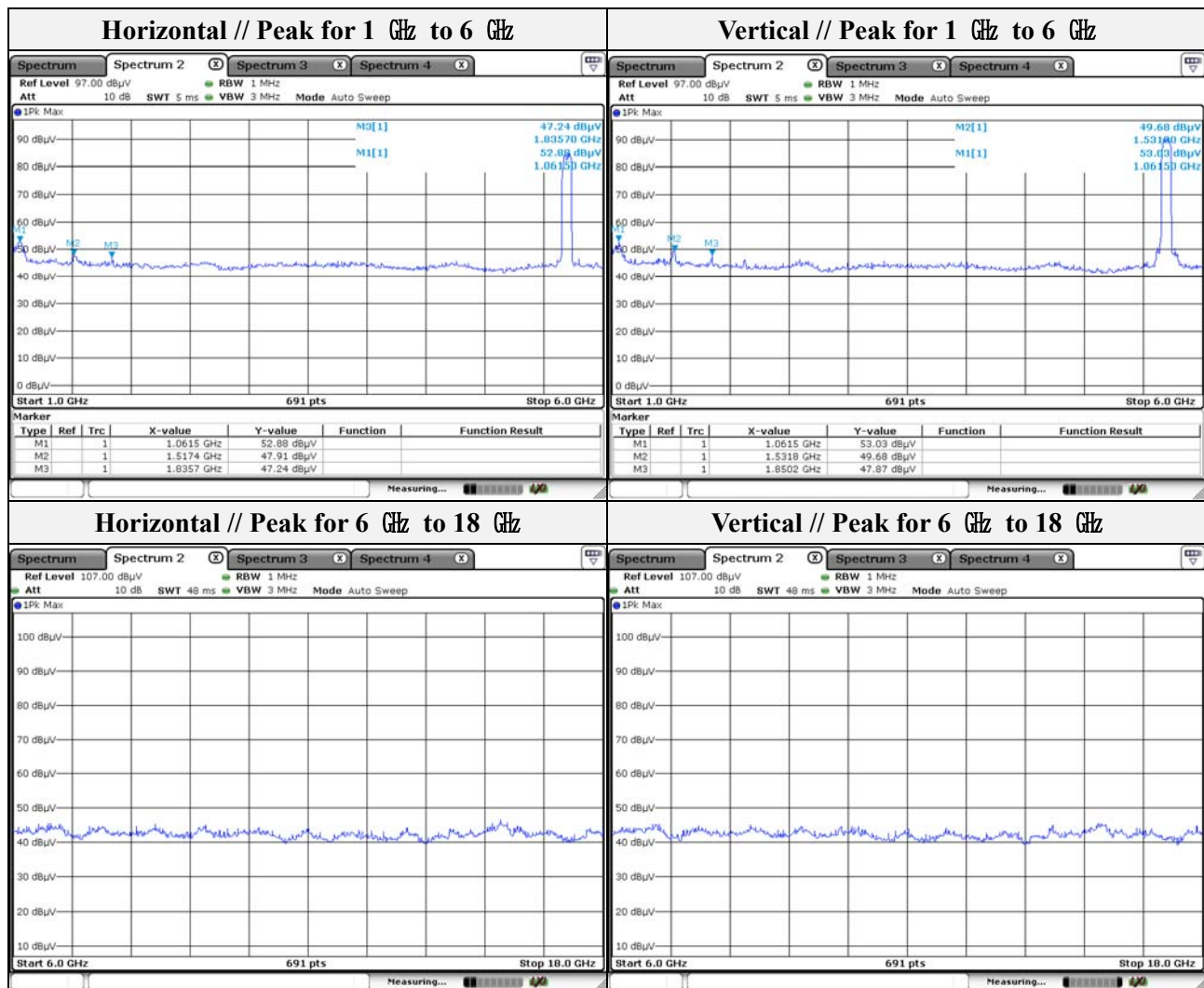
Mode: UNII-2C(VHT80)

Distance of measurement: 3 meter

Channel: 138

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 061.50	52.88	Peak	H	-8.29	-	44.59	74.00	29.41
1 517.40	47.91	Peak	H	-5.51	-	42.40	74.00	31.60
1 835.70	47.24	Peak	H	-2.48	-	44.76	68.20	23.44
1 061.50	53.03	Peak	V	-8.29	-	44.74	74.00	29.26
1 531.80	49.68	Peak	V	-5.38	-	44.30	74.00	29.70
1 850.20	47.87	Peak	V	-2.35	-	45.52	68.20	22.68



Note.

1. No spurious emission were detected above 6 GHz.

Mode: UNII-3(VHT80)
Distance of measurement: 3 meter
Channel: 155

- Spurious

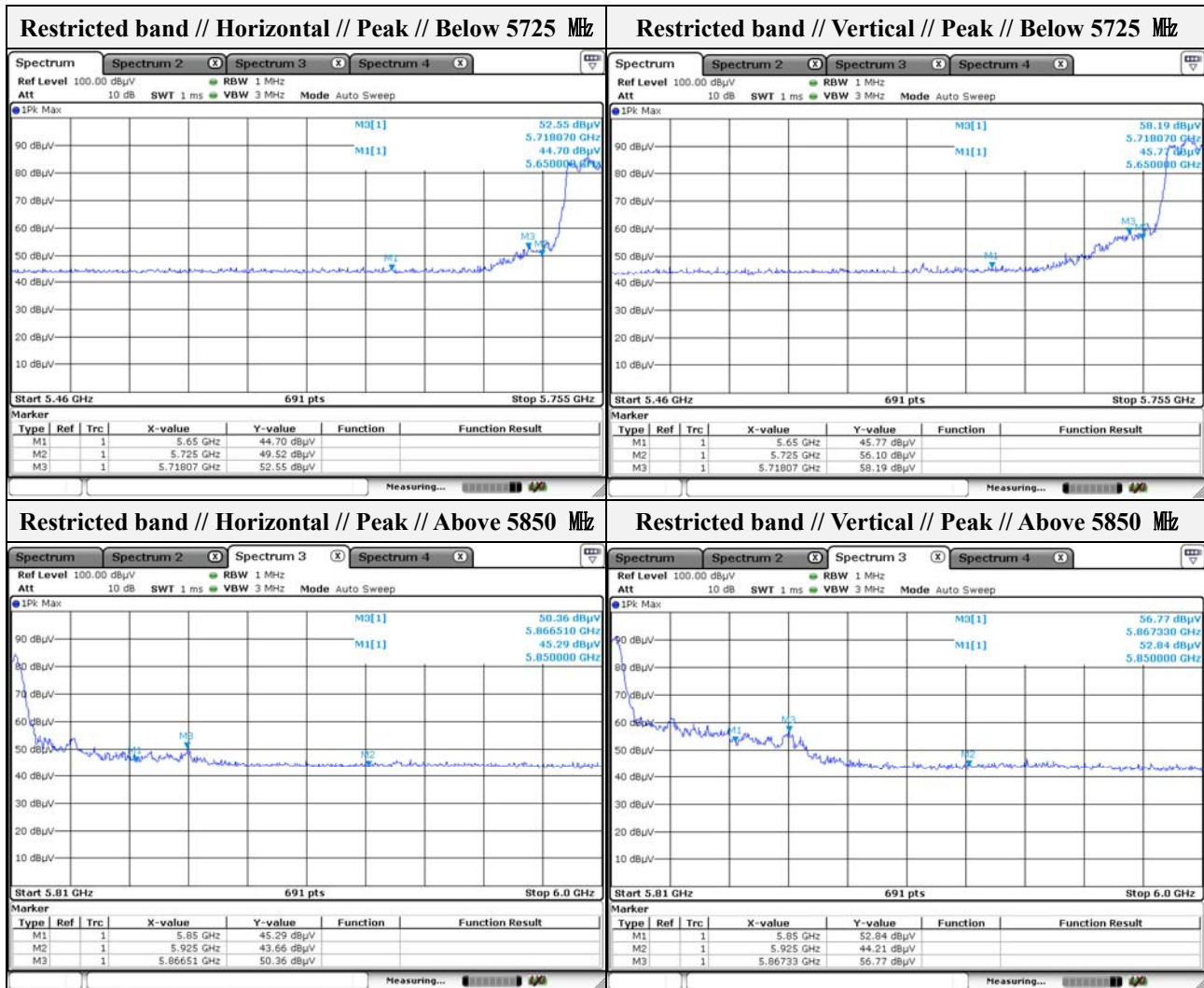
Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 843.00	46.66	Peak	H	-2.42	-	44.24	68.20	23.96
2 139.70	45.53	Peak	H	-0.64	-	44.89	68.20	23.31
1 850.20	48.08	Peak	V	-2.35		45.73	68.20	22.47
2 125.20	48.46	Peak	V	-0.67		47.79	68.20	20.41

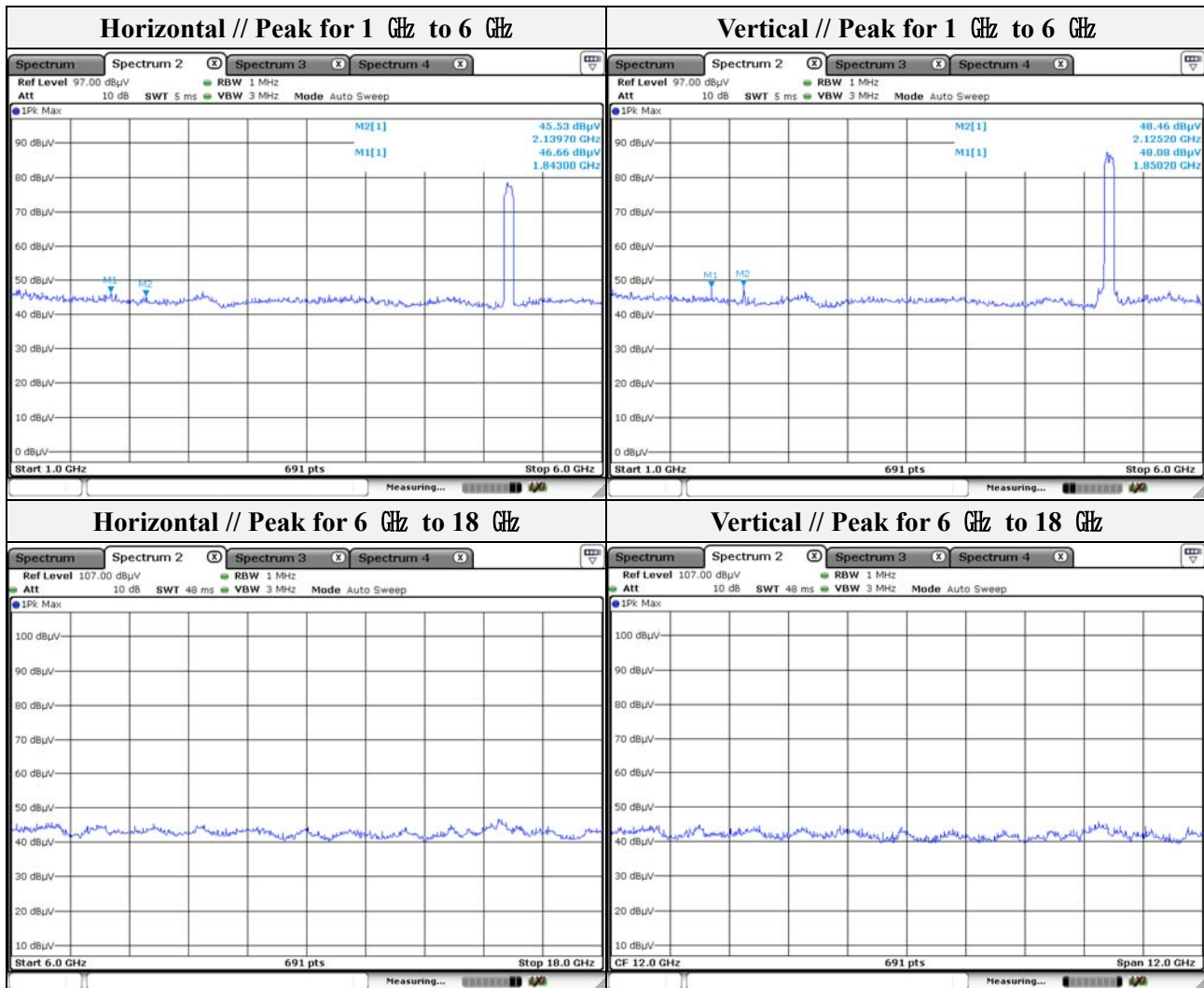
- Band edge // Below 5725 MHz

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 718.07	52.55	Peak	H	8.74	-	61.29	110.26	48.97
5 725.00	49.52	Peak	H	8.77	-	58.29	122.20	63.91
5 718.07	58.19	Peak	V	8.74	-	66.93	110.26	43.33
5 725.00	56.10	Peak	V	8.77	-	64.87	122.20	57.33

- Band edge // Above 5850 MHz

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5 866.51	50.36	Peak	H	9.38	-	59.74	107.58	47.84
5 850.00	52.84	Peak	V	9.32	-	62.16	122.20	60.04
5 867.33	56.77	Peak	V	9.39	-	66.16	107.35	41.19



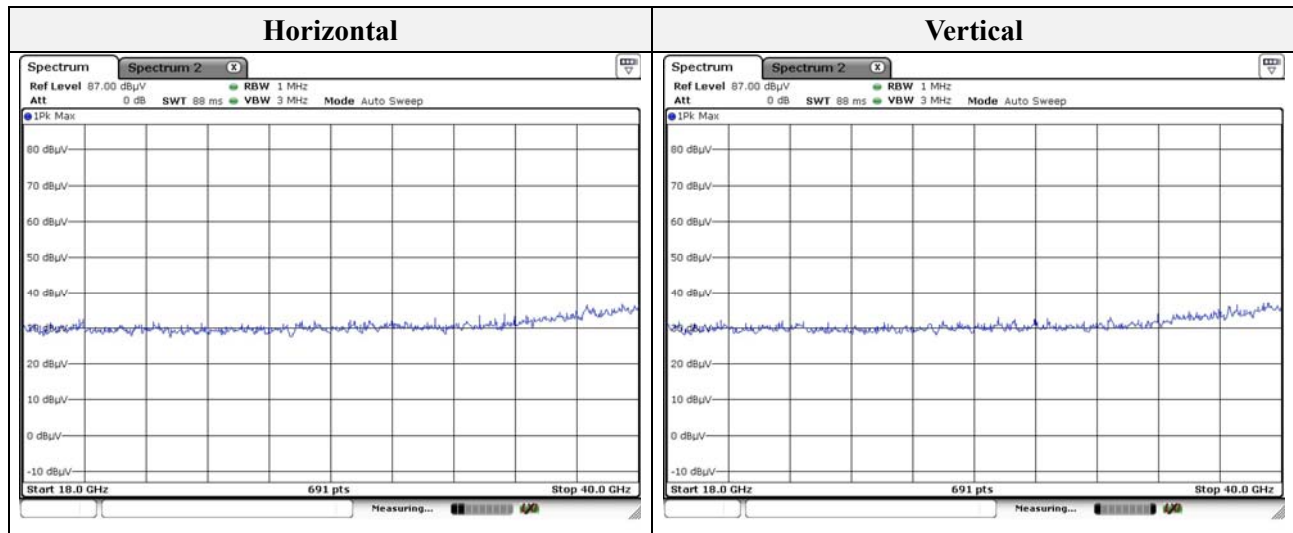


Note.

1. No spurious emission were detected above 6 GHz.

Test results (18 GHz to 40 GHz) – Worst case

Mode: UNII-3
 Distance of measurement: 3 meter
 Channel: 157(worst case)



Note.

1. No spurious emission were detected above 18 GHz.

Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration date.	Calibration due.
Spectrum Analyzer	R&S	FSV30	100736	1 year	2018.06.28	2019.06.28
					2019.01.09	2020.01.09
Spectrum Analyzer	R&S	FSV40	101002	1 year	2018.06.29	2019.06.29
8360B Series Swept Signal Generator	HP	83630B	3844A00786	1 year	2018.01.22	2019.01.22
					2019.01.15	2020.01.15
Power Meter	Anritsu	ML2495A	1438001	1 year	2018.01.25	2019.01.25
					2019.01.15	2020.01.15
Pulse Power Sensor	Anritsu	MA2411B	1339205	1 year	2018.01.25	2019.01.25
					2019.01.15	2020.01.15
Attenuator	HP	8494B	2630A12857	1 year	2018.01.18	2019.01.18
					2019.01.15	2020.01.15
Loop Antenna	Schwarzbeck	FMZB1513	225	2 years	2017.05.10	2019.05.10
Trilog-broadband antenna	SCHWARZBECK	VULB 9163	9168-714	2 years	2018.11.26	2020.11.26
Horn Antenna	A.H	SAS-571	414	2 years	2017.02.15	2019.02.15
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1802	2 years	2017.09.04	2019.09.04
High Pass Filter	Wainwright Instrument GmbH	WHJS3000-10TT	1	1 year	2018.06.29	2019.06.29
Amplifier	R&S	SCU 01	100603	1 year	2018.11.26	2019.11.26
Preamplifier	AGILENT	8449B	3008A01742	1 year	2018.01.11	2019.01.11
					2019.01.08	2020.01.08
EMI Test Receiver	R&S	ESR3	101781	1 year	2018.04.25	2019.04.25
EMI Test Receiver	R&S	ESU26	100551	1 year	2018.04.11	2019.04.11
Pulse Limiter	R&S	ESH3-Z2	101915	1 year	2018.11.26	2019.11.26
LISN	R&S	ENV216	101787	1 year	2018.01.31	2019.01.31
					2019.01.04	2020.01.04
DC Power supply	EXTENDED	EX-1500H2	405410100030	1 year	2018.04.13	2019.04.13

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook Computer	SAMSUNG	NT-R519	ZKPA93ES900086Z