

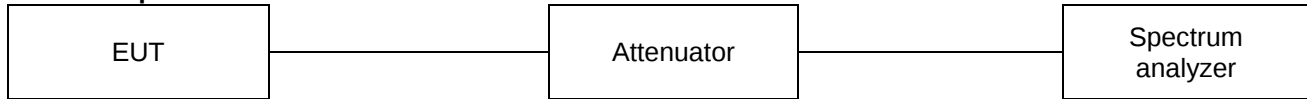


3.2. 6 dB bandwidth

Test procedure

KDB 789033 D02 v02r01– Section C.2

Test setup



Section C.2

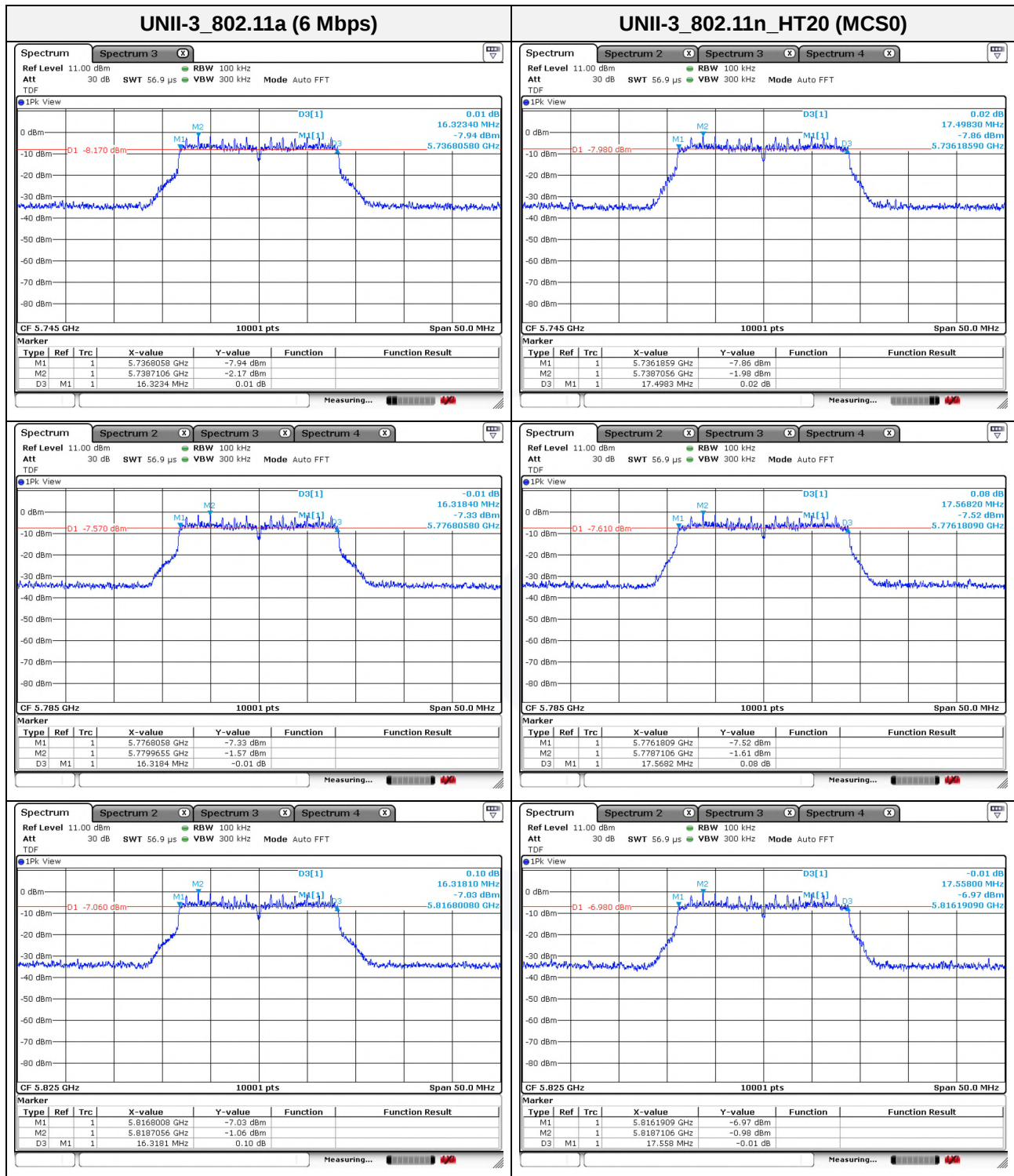
1. Set RBW = 100 kHz
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = peak.
4. Sweep = auto couple.
5. Allow the trace to stabilize
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower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

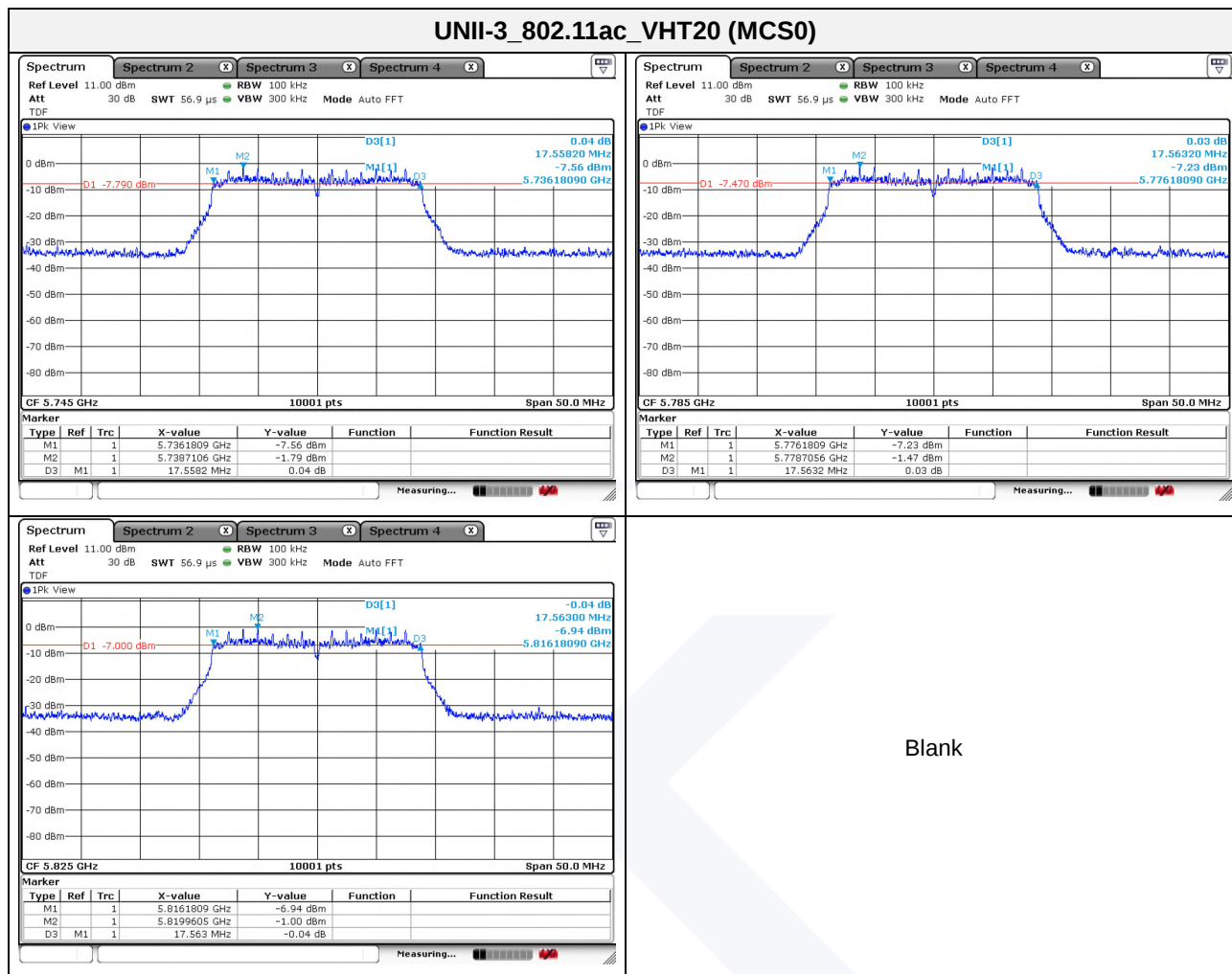
Limit

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

**Test results**

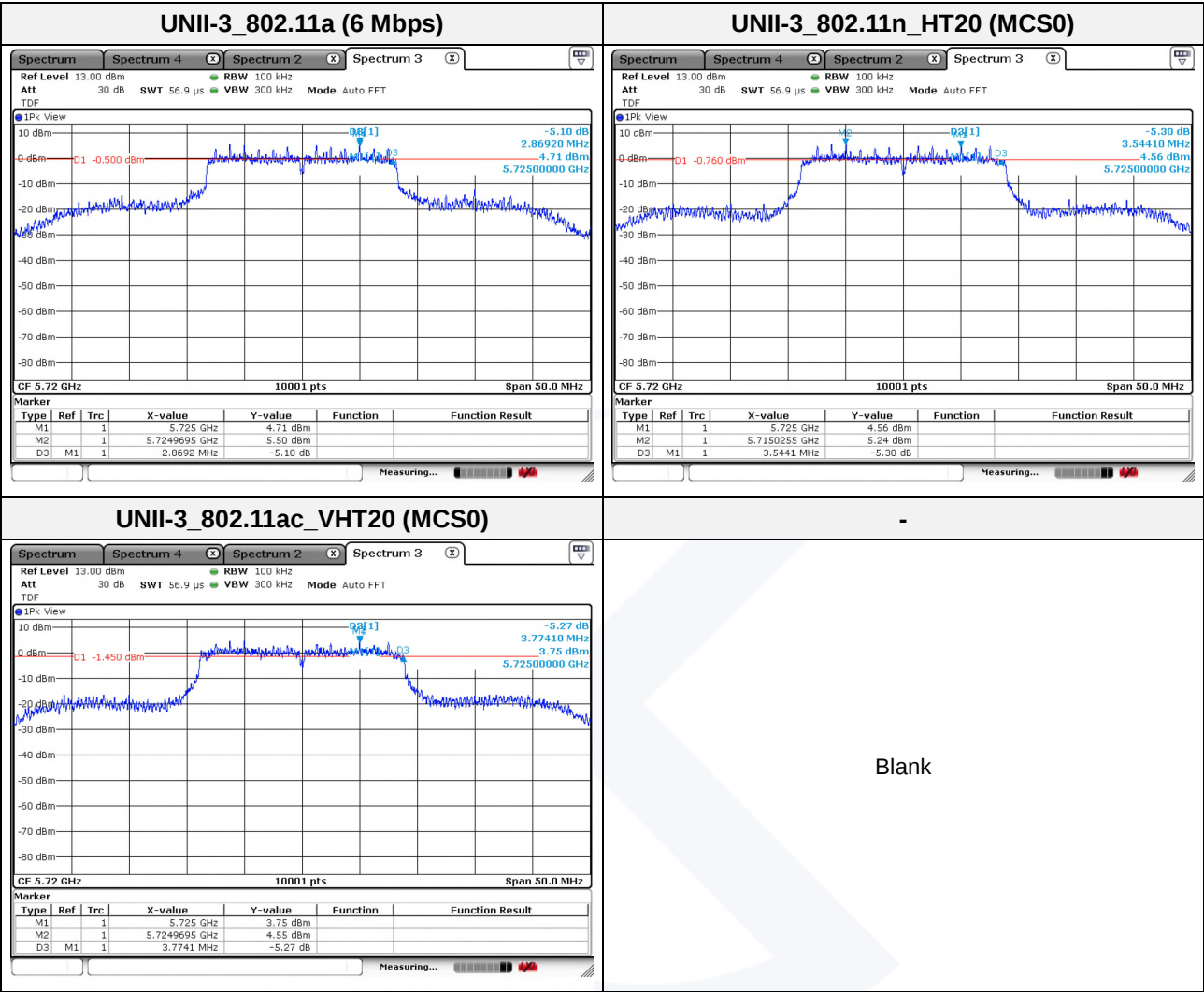
Band	Frequency(MHz)	Mode	6 dB bandwidth(MHz)
UNII-3	5 745	802.11a (6 Mbps)	16.32
	5 785		16.32
	5 825		16.32
	5 745	802.11n_HT20 (MCS0)	17.50
	5 785		17.57
	5 825		17.56
	5 745	802.11ac_VHT20 (MCS0)	17.56
	5 785		17.56
	5 825		17.56
UNII-3 (Band-Crossing channels)	5 720	802.11a (6 Mbps)	2.87
		802.11n_HT20 (MCS0)	3.77
		802.11ac_VHT20 (MCS0)	3.54







Band-crossing channels





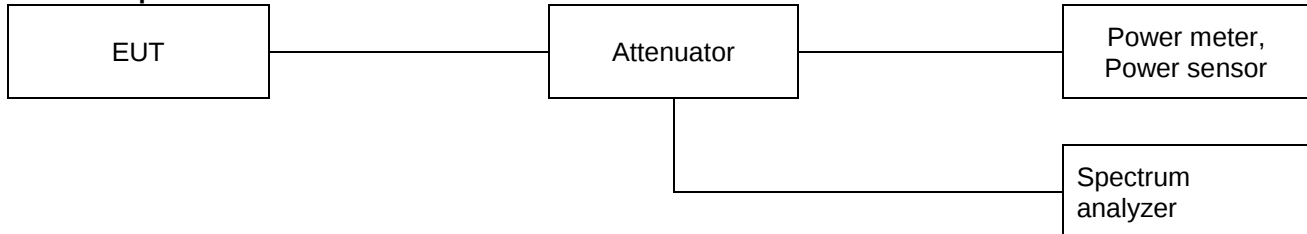
3.3. Maximum conducted output power

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**

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(23.97 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. Limit B is the 26 dB emission bandwidth.



Test results

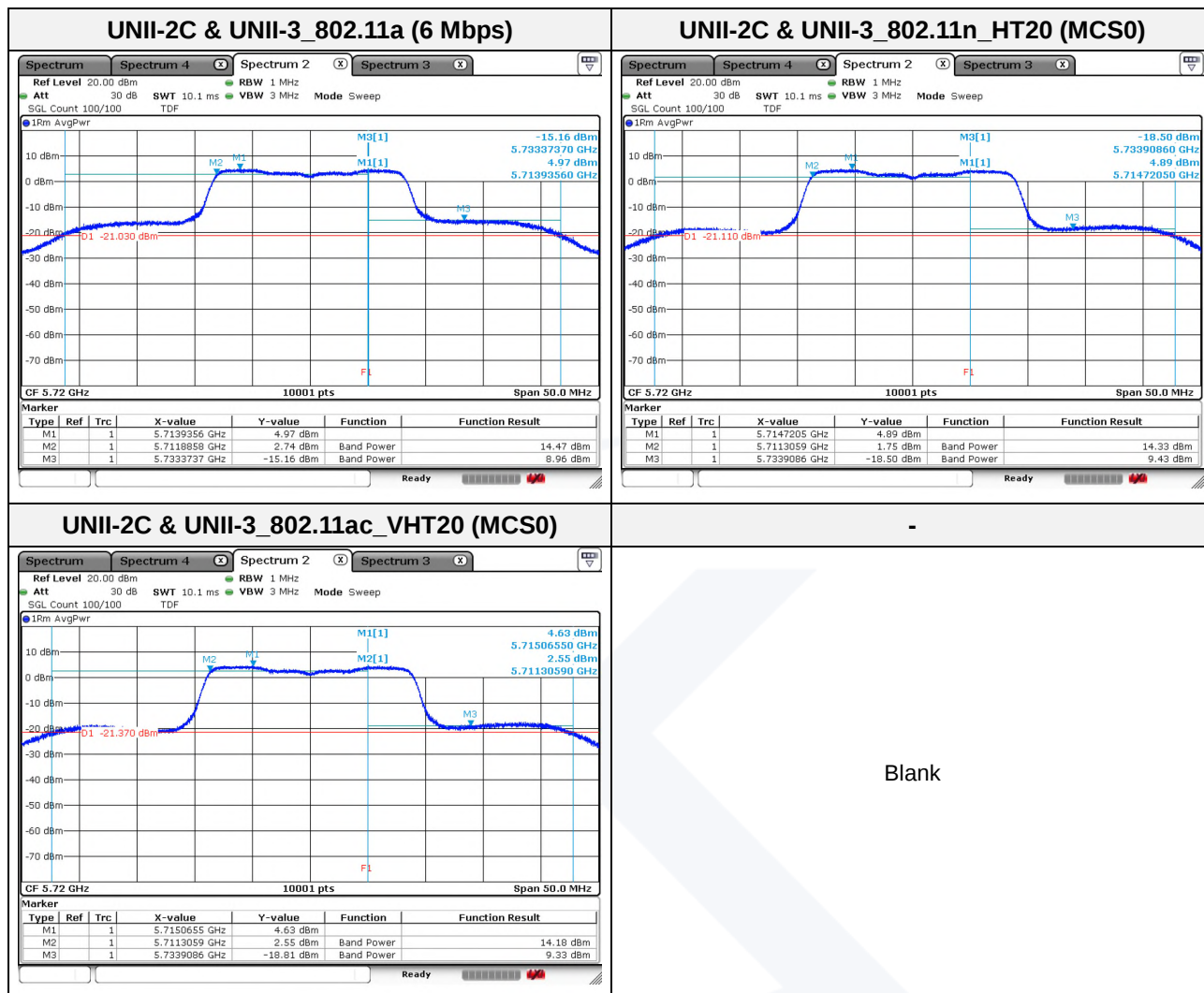
Band	Frequency (MHz)	Mode	Detector mode	Ant Gain (dBi)	Output power (dBm)	Limit (dBm)
UNII-1	5 180	802.11a (6 Mbps)	AV	2.95	16.84	23.97
	5 220		AV		16.52	
	5 240		AV		16.57	
UNII-2A	5 260		AV	2.95	16.33	23.97
	5 280		AV		15.87	
	5 320		AV		15.44	
UNII-2C	5 500		AV	3.24	15.83	23.97
	5 600		AV		15.87	
	5 700		AV		10.89	
	5 720		AV		13.69	
UNII-3	5 745		AV	3.24	10.38	30.00
	5 785		AV		10.06	
	5 825		AV		10.36	

Band	Frequency (MHz)	Mode	Detector mode	Ant Gain (dBi)	Output power (dBm)	Limit (dBm)
UNII-1	5 180	802.11n_ HT20 (MCS0)	AV	2.95	16.84	23.97
	5 220		AV		16.90	
	5 240		AV		16.77	
UNII-2A	5 260		AV	2.95	16.40	23.97
	5 280		AV		16.03	
	5 320		AV		15.63	
UNII-2C	5 500		AV	3.24	16.08	23.97
	5 600		AV		15.72	
	5 700		AV		10.92	
	5 720		AV		13.74	
UNII-3	5 745		AV	3.24	9.98	30.00
	5 785		AV		10.35	
	5 825		AV		10.10	



Band	Frequency (MHz)	Mode	Detector mode	Ant Gain (dBi)	Output power (dBm)	Limit (dBm)
UNII-1	5 180	802.11ac_VHT20 (MCS0)	AV	2.95	15.84	23.97
	5 220		AV		16.53	
	5 240		AV		16.27	
UNII-2A	5 260		AV		15.92	23.97
	5 280		AV		15.59	
	5 320		AV		16.04	
UNII-2C	5 500		AV	3.24	16.89	23.97
	5 600		AV		16.07	
	5 700		AV		11.02	
	5 720		AV		13.75	
UNII-3	5 745		AV		10.18	30.00
	5 785		AV		10.41	
	5 825		AV		10.23	

Band	Frequency (MHz)	Mode	Detector mode	Ant Gain (dBi)	Output power (dBm)	Limit (dBm)
UNII-2C (Band-crossing channels)	5 720	802.11a (6 Mbps)	AV	3.24	14.47	23.97
	5 720	802.11n_HT20 (MCS0)	AV		14.33	23.97
	5 720	802.11ac_VHT20 (MCS0)	AV		14.18	23.97
UNII-3 (Band-crossing channels)	5 720	802.11a (6 Mbps)	AV		8.96	30.00
	5 720	802.11n_HT20 (MCS0)	AV		9.43	
	5 720	802.11ac_VHT20 (MCS0)	AV		9.33	

**Band-crossing channels**

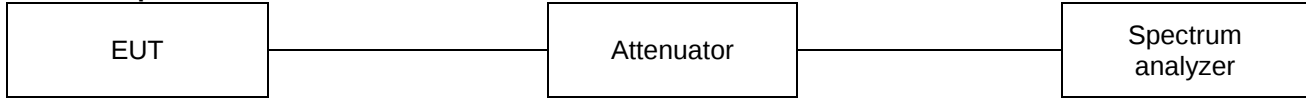


3.4. Power spectral density

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.I.a)
 - b) Set $VBW \geq 3$ 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**

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

Mode	Frequency (MHz)	Band	RBWF Note1	DCF Note2	Ant Gain	PSD (dBm/MHz)	Limit	
802.11a (6 Mbps)	5 180	UNII-1	-	-	2.95	6.66	11.00 (dB m/MHz)	
	5 220					6.09		
	5 240					5.59		
	5 260	UNII-2A		-	2.95	5.32	11.00 (dB m/MHz)	
	5 280					4.68		
	5 320					4.74		
	5 500	UNII-2C		-	3.24	4.18		
	5 600					4.49		
	5 720					5.08		
	5 745	UNII-3		-		3.24	-4.37	30.00 (dBm/500 kHz)
	5 785						-3.95	
	5 825						-3.60	

Mode	Frequency (MHz)	Band	RBWF Note1	DCF Note2	Ant Gain	PSD (dBm/MHz)	Limit	
802.11n_ HT20 (MCS0)	5 180	UNII-1	-	-	2.95	6.79	11.00 (dB m/MHz)	
	5 220					6.37		
	5 240					5.58		
	5 260	UNII-2A		-	2.95	5.03	11.00 (dB m/MHz)	
	5 280					5.23		
	5 320					4.15		
	5 500	UNII-2C		-	3.24	4.23		
	5 600					3.99		
	5 720					4.97		
	5 745	UNII-3		-		3.24	-4.67	30.00 (dBm/500 kHz)
	5 785						-4.15	
	5 825						-3.63	



Mode	Frequency (MHz)	Band	RBWF Note1	DCF Note2	Ant Gain	PSD (dBm/MHz)	Limit	
802.11ac_ VHT20 (MCS0)	5 180	UNII-1	-	-	2.95	7.17	11.00 (dB m/MHz)	
	5 220					5.68		
	5 240					5.30		
	5 260	UNII-2A		-	2.95	5.52	11.00 (dB m/MHz)	
	5 280					4.89		
	5 320					4.40		
	5 500	UNII-2C		-	3.24	3.51		
	5 600					3.90		
	5 720					4.68		
	5 745	UNII-3		-		3.24	-4.24	30.00 (dBm/500 kHz)
	5 785						-4.17	
	5 825						-3.66	

Band-crossing channels

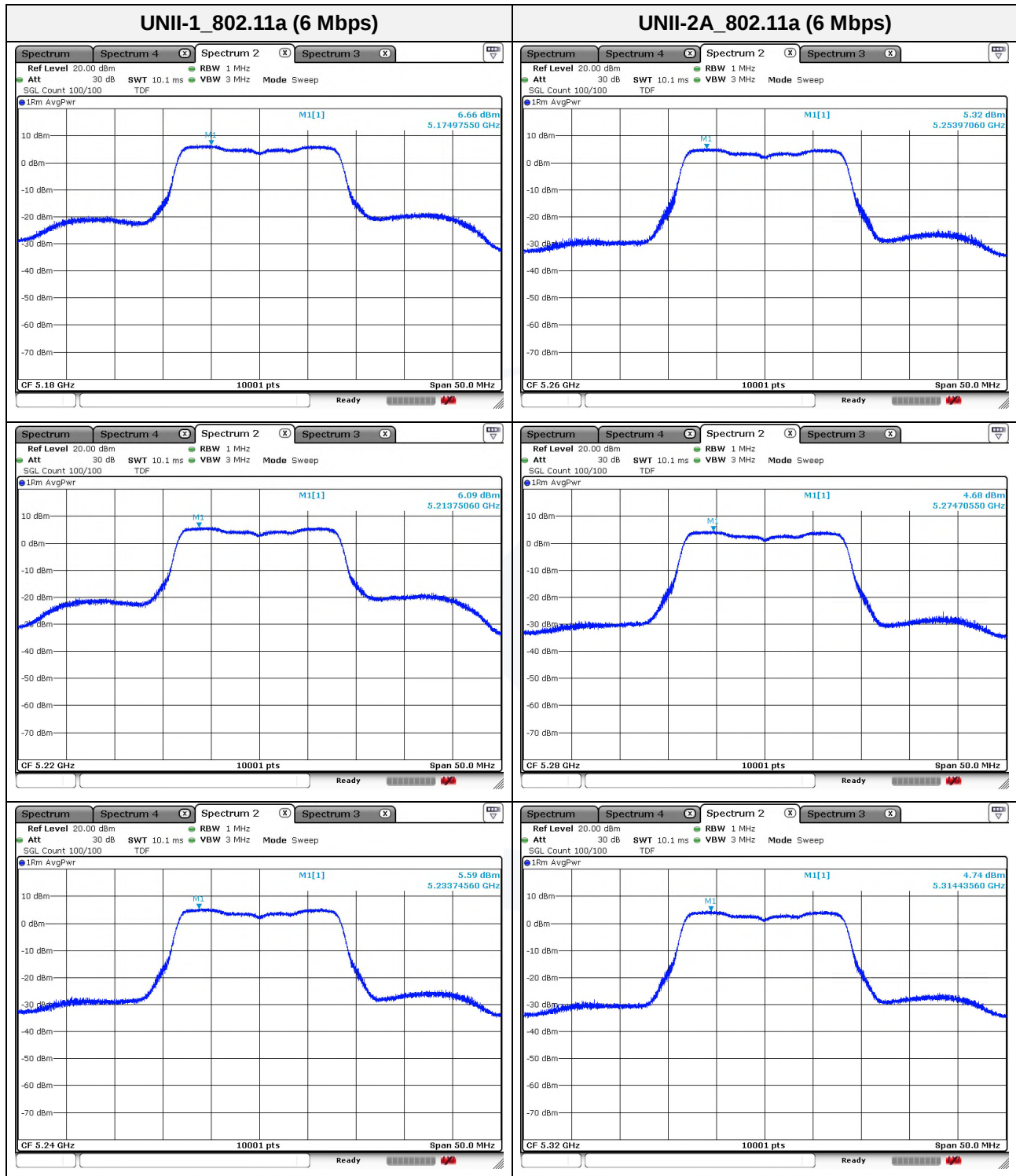
Mode	Frequency (MHz)	Band	RBWF Note1	DCF Note2	Ant Gain	PSD (dBm/MHz)	Limit
802.11a (6 Mbps)	5 720	UNII-2C	-	-	3.24	5.32	11.00 (dB m/MHz)
802.11n_HT20 (MCS0)				-		4.73	
802.11ac_VHT20 (MCS0)				-		4.61	
802.11a (6 Mbps)	5 720	UNII-3	-	-		2.17	30.00 (dBm/500 kHz)
802.11n_HT20 (MCS0)				-		1.43	
802.11ac_VHT20 (MCS0)				-		1.75	

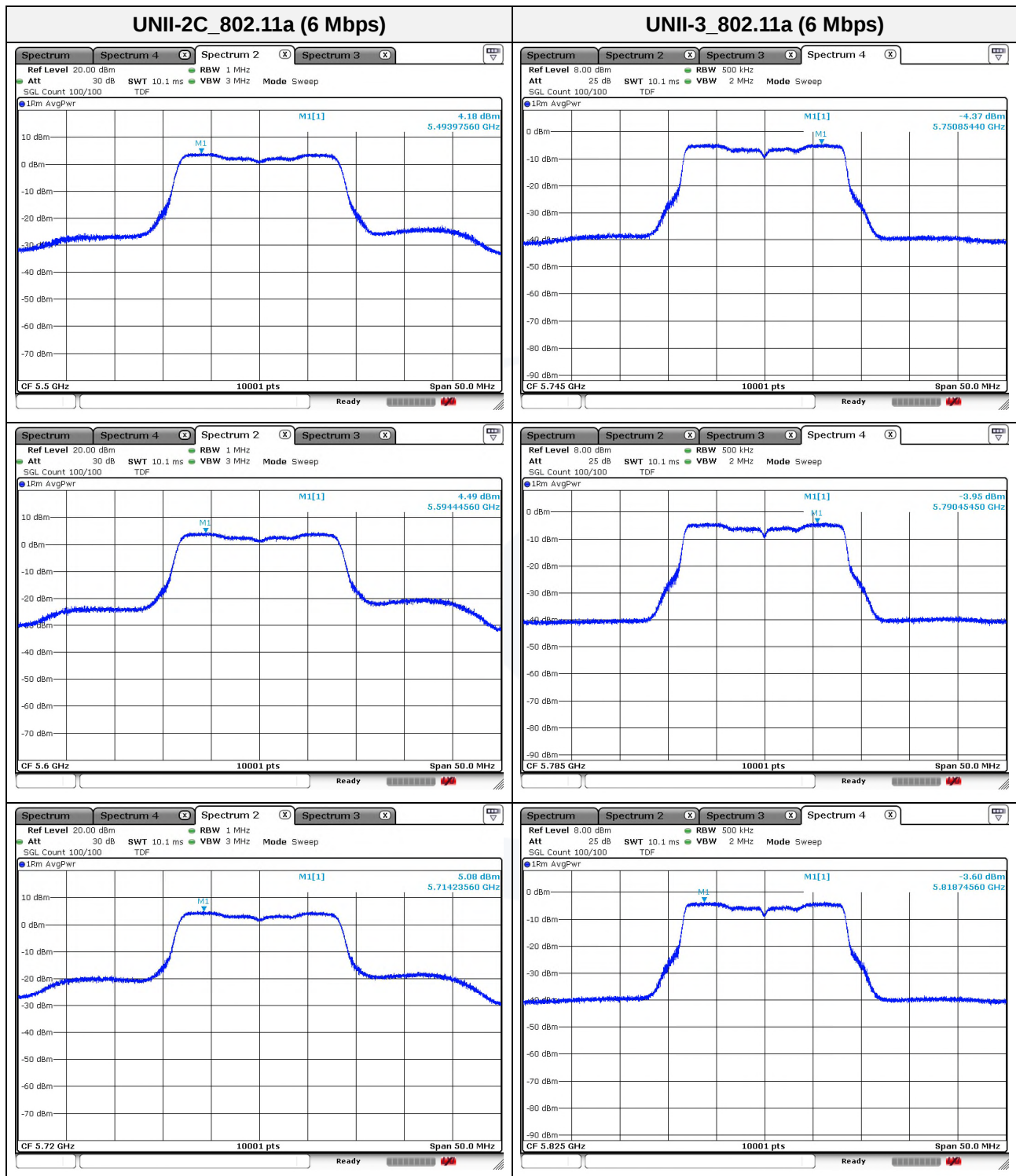
Note.

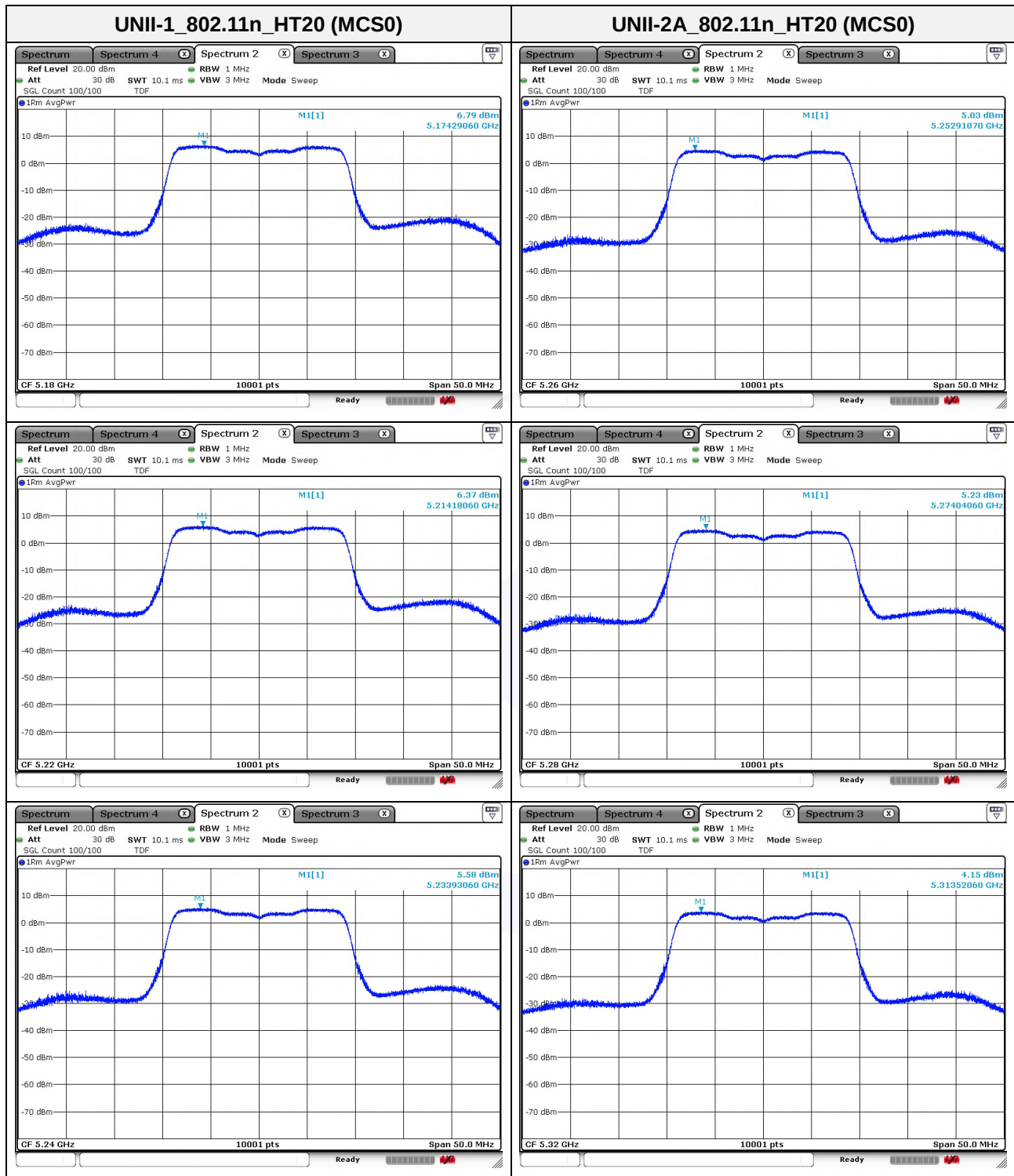
- UNII-1 = $10\log(1 \text{ MHz}/1 \text{ MHz})$
UNII-2A = $10\log(1 \text{ MHz}/1 \text{ MHz})$
UNII-2C = $10\log(1 \text{ MHz}/1 \text{ MHz})$
UNII-3 = $10\log(500 \text{ kHz}/500 \text{ kHz})$
- Refer to the page 56 on this report.
- $\text{Sum(dBm)} = \text{PSD(dBm)} + \text{RBWF} + \text{Duty correction factor (dB)}$

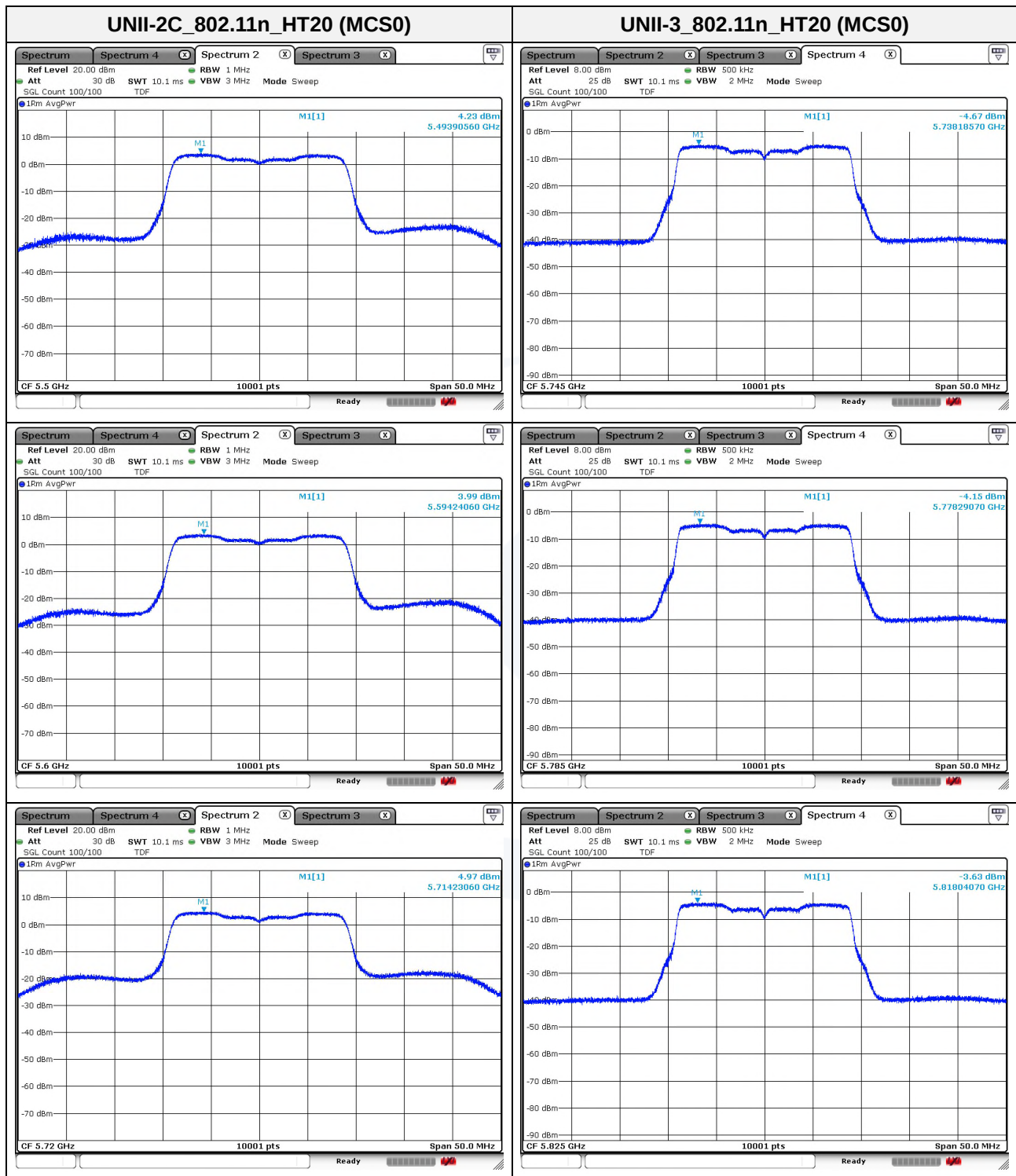


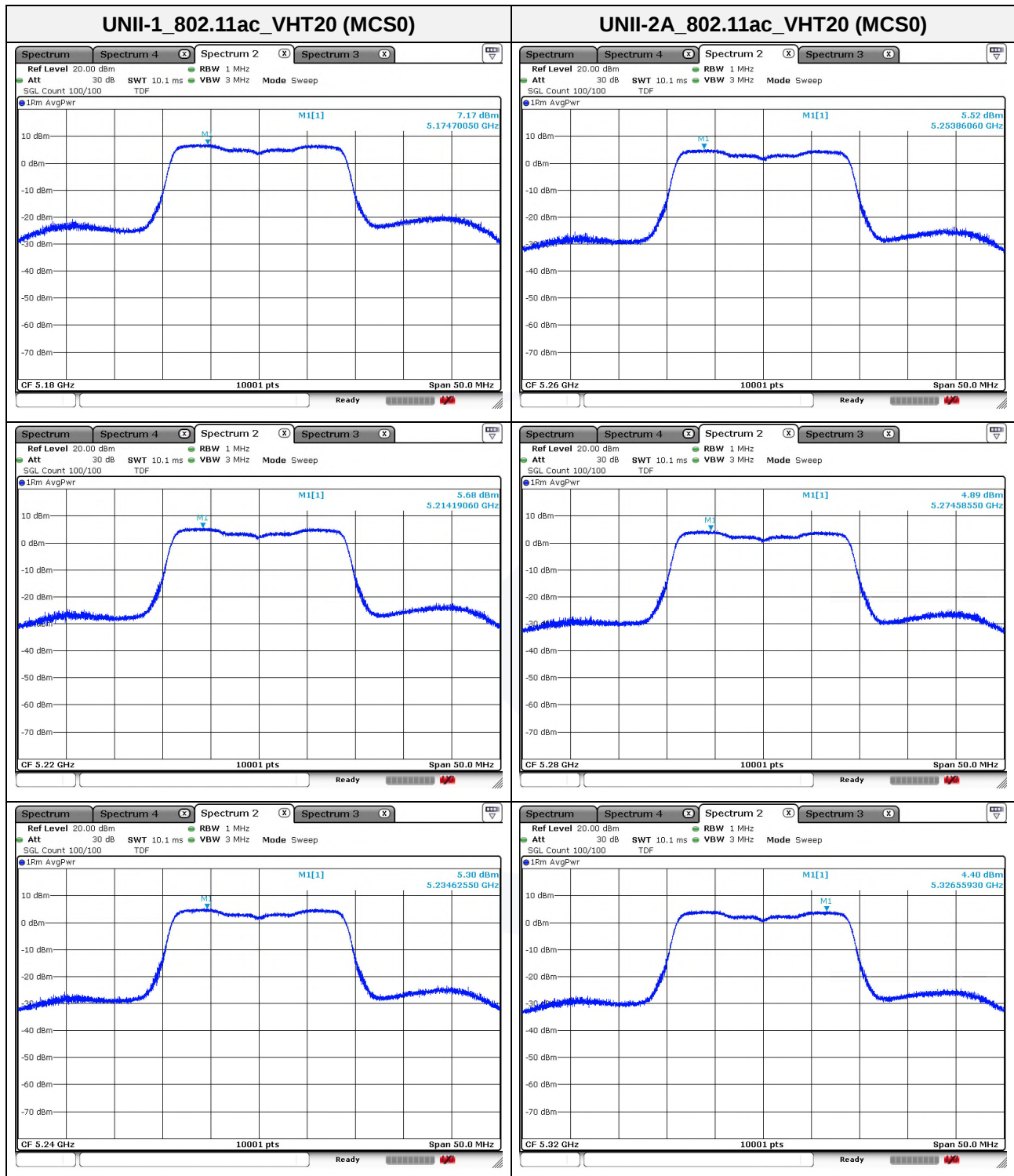
Test Plot

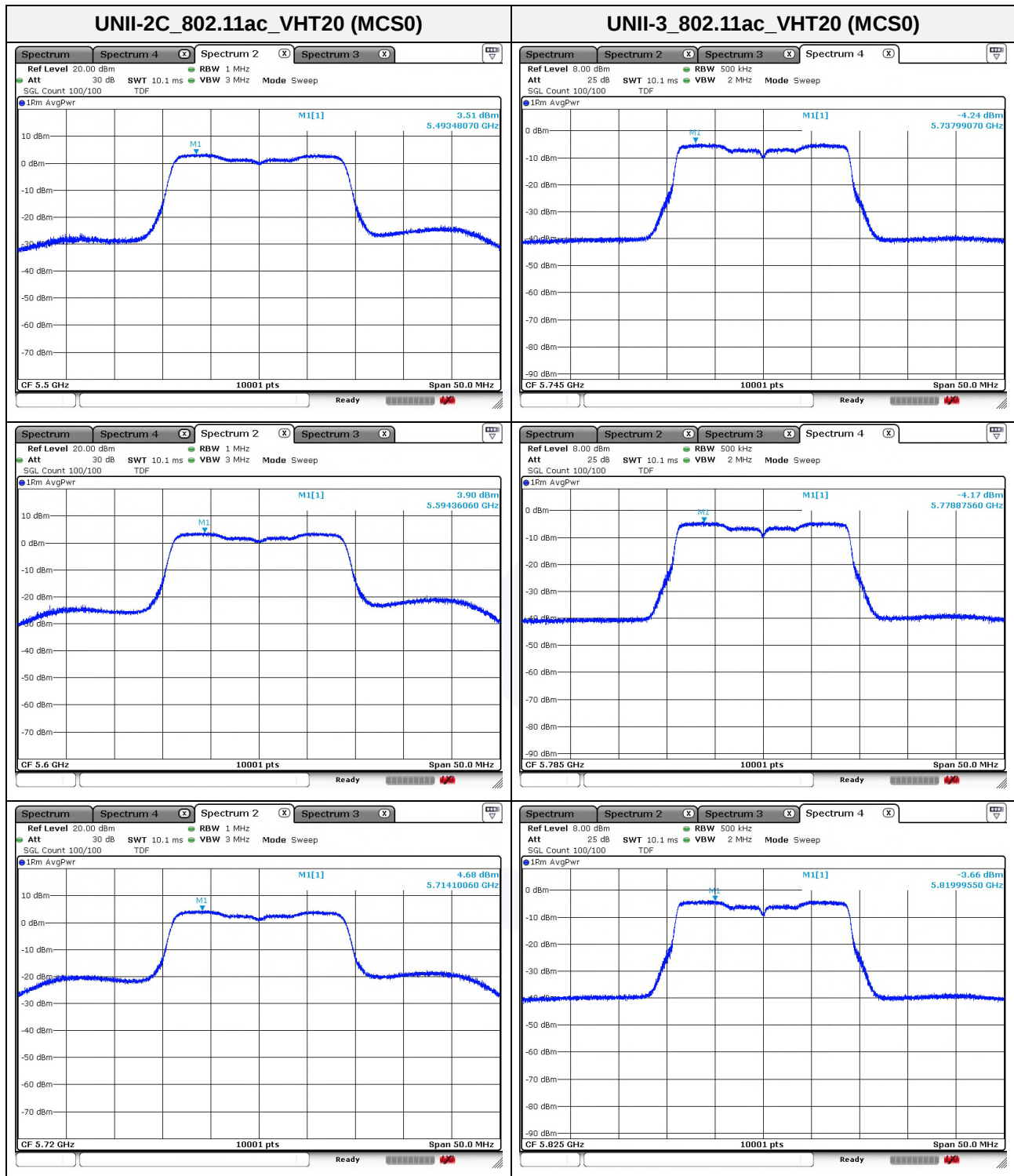


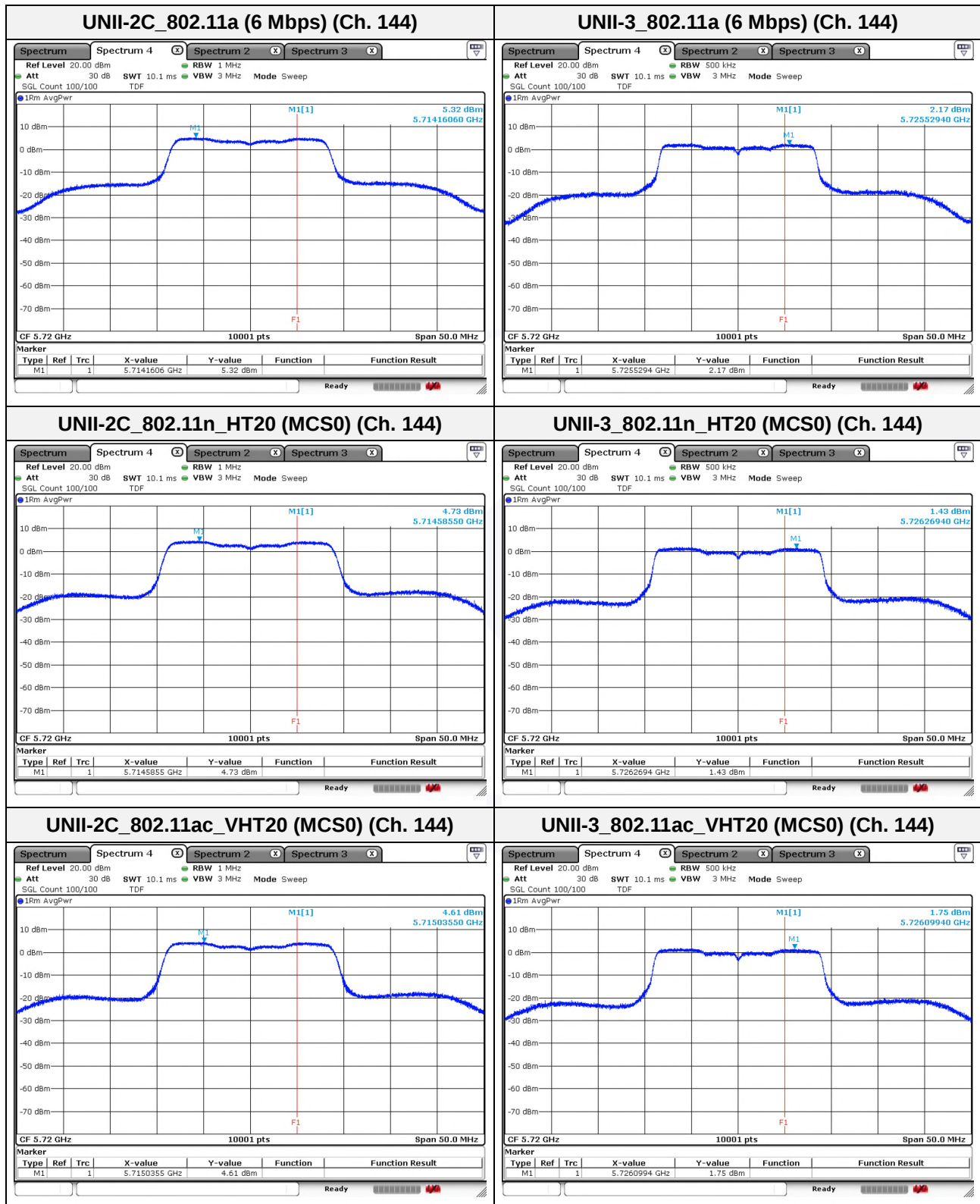










**Band-crossing channels**

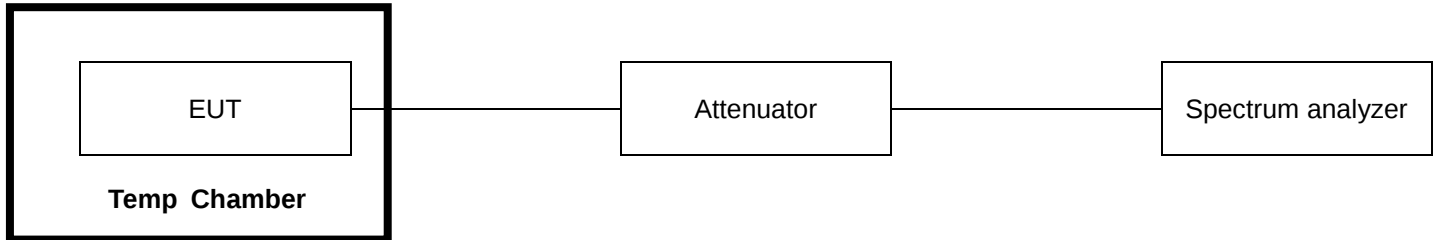


3.5. Frequency Stability

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 AC 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 (°C)	Maintaining time	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)
100 %	DC 3.850	-20.0	Startup	5 180.007 500	7 500	0.000 14
			2 minutes	5 180.005 000	5 000	0.000 10
			5 minutes	5 180.015 000	15 000	0.000 29
			10 minutes	5 179.992 500	-7 500	-0.000 14
100 %		-10.0	Startup	5 180.010 000	10 000	0.000 19
			2 minutes	5 180.007 500	7 500	0.000 14
			5 minutes	5 179.995 000	-5 000	-0.000 10
			10 minutes	5 180.015 000	15 000	0.000 29
100 %		0.0	Startup	5 179.987 500	-12 500	-0.000 24
			2 minutes	5 180.010 000	10 000	0.000 19
			5 minutes	5 179.992 500	-7 500	-0.000 14
			10 minutes	5 179.990 000	-10 000	-0.000 19
100 %		10.0	Startup	5 179.975 000	-25 000	-0.000 48
			2 minutes	5 179.987 500	-12 500	-0.000 24
			5 minutes	5 179.980 000	-20 000	-0.000 39
			10 minutes	5 179.982 500	-17 500	-0.000 34
100 %		20.0	Startup	5 179.962 500	-37 500	-0.000 72
			2 minutes	5 179.967 500	-32 500	-0.000 63
			5 minutes	5 179.972 500	-27 500	-0.000 53
			10 minutes	5 179.960 000	-40 000	-0.000 77
100 %		25.4	Startup	5 179.945 000	-55 000	-0.001 06
			2 minutes	5 179.955 000	-45 000	-0.000 87
			5 minutes	5 179.962 500	-37 500	-0.000 72
			10 minutes	5 179.947 500	-52 500	-0.001 01
100 %		30.0	Startup	5 179.962 500	-37 500	-0.000 72
			2 minutes	5 179.955 000	-45 000	-0.000 87
			5 minutes	5 179.972 500	-27 500	-0.000 53
			10 minutes	5 179.975 000	-25 000	-0.000 48
100 %		40.0	Startup	5 179.970 000	-30 000	-0.000 58
			2 minutes	5 179.967 500	-32 500	-0.000 63
			5 minutes	5 179.960 000	-40 000	-0.000 77
			10 minutes	5 179.962 500	-37 500	-0.000 72
100 %		50.0	Startup	5 179.975 000	-25 000	-0.000 48
			2 minutes	5 179.962 500	-37 500	-0.000 72
			5 minutes	5 179.962 500	-37 500	-0.000 72
			10 minutes	5 179.970 000	-30 000	-0.000 58
100 %		55.0	Startup	5 179.975 000	-25 000	-0.000 48
			2 minutes	5 179.967 500	-32 500	-0.000 63
			5 minutes	5 179.980 000	-20 000	-0.000 39
			10 minutes	5 179.977 500	-22 500	-0.000 43
85 %	DC 3.272	25.4	Startup	5 179.967 500	-32 500	-0.000 63
			2 minutes	5 179.970 000	-30 000	-0.000 58
			5 minutes	5 179.962 500	-37 500	-0.000 72
			10 minutes	5 179.967 500	-32 500	-0.000 63
115 %	DC 4.428	25.4	Startup	5 179.965 000	-35 000	-0.000 68
			2 minutes	5 179.965 000	-35 000	-0.000 68
			5 minutes	5 179.960 000	-40 000	-0.000 77
			10 minutes	5 179.972 500	-27 500	-0.000 53



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 3.850	-20.0	Startup	5 260.015 000	15 000	0.000 29
			2 minutes	5 260.012 500	12 500	0.000 24
			5 minutes	5 260.020 000	20 000	0.000 38
			10 minutes	5 259.997 500	-2 500	-0.000 05
100 %		-10.0	Startup	5 260.010 000	10 000	0.000 19
			2 minutes	5 260.002 500	2 500	0.000 05
			5 minutes	5 259.987 500	-12 500	-0.000 24
			10 minutes	5 260.007 500	7 500	0.000 14
100 %		0.0	Startup	5 259.985 000	-15 000	-0.000 29
			2 minutes	5 260.017 500	17 500	0.000 33
			5 minutes	5 259.987 500	-12 500	-0.000 24
			10 minutes	5 259.987 500	-12 500	-0.000 24
100 %		10.0	Startup	5 259.970 000	-30 000	-0.000 57
			2 minutes	5 259.985 000	-15 000	-0.000 29
			5 minutes	5 259.977 500	-22 500	-0.000 43
			10 minutes	5 259.977 500	-22 500	-0.000 43
100 %		20.0	Startup	5 259.970 000	-30 000	-0.000 57
			2 minutes	5 259.962 500	-37 500	-0.000 71
			5 minutes	5 259.965 000	-35 000	-0.000 67
			10 minutes	5 259.957 500	-42 500	-0.000 81
100 %		25.4	Startup	5 259.937 500	-62 500	-0.001 19
			2 minutes	5 259.950 000	-50 000	-0.000 95
			5 minutes	5 259.962 500	-37 500	-0.000 71
			10 minutes	5 259.942 500	-57 500	-0.001 09
100 %		30.0	Startup	5 259.955 000	-45 000	-0.000 86
			2 minutes	5 259.960 000	-40 000	-0.000 76
			5 minutes	5 259.977 500	-22 500	-0.000 43
			10 minutes	5 259.972 500	-27 500	-0.000 52
100 %		40.0	Startup	5 259.962 500	-37 500	-0.000 71
			2 minutes	5 259.967 500	-32 500	-0.000 62
			5 minutes	5 259.957 500	-42 500	-0.000 81
			10 minutes	5 259.960 000	-40 000	-0.000 76
100 %		50.0	Startup	5 259.980 000	-20 000	-0.000 38
			2 minutes	5 259.970 000	-30 000	-0.000 57
			5 minutes	5 259.970 000	-30 000	-0.000 57
			10 minutes	5 259.975 000	-25 000	-0.000 48
100 %		55.0	Startup	5 259.970 000	-30 000	-0.000 57
			2 minutes	5 259.960 000	-40 000	-0.000 76
			5 minutes	5 259.977 500	-22 500	-0.000 43
			10 minutes	5 259.970 000	-30 000	-0.000 57
85 %	DC 3.272	25.4	Startup	5 259.967 500	-32 500	-0.000 62
			2 minutes	5 259.965 000	-35 000	-0.000 67
			5 minutes	5 259.960 000	-40 000	-0.000 76
			10 minutes	5 259.975 000	-25 000	-0.000 48
115 %	DC 4.428	25.4	Startup	5 259.960 000	-40 000	-0.000 76
			2 minutes	5 259.957 500	-42 500	-0.000 81
			5 minutes	5 259.960 000	-40 000	-0.000 76
			10 minutes	5 259.970 000	-30 000	-0.000 57



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 3.850	-20.0	Startup	5 500.002 500	2 500	0.000 05
			2 minutes	5 500.007 500	7 500	0.000 14
			5 minutes	5 500.010 000	10 000	0.000 18
			10 minutes	5 499.987 500	-12 500	-0.000 23
100 %		-10.0	Startup	5 500.002 500	2 500	0.000 05
			2 minutes	5 500.015 000	15 000	0.000 27
			5 minutes	5 500.000 000	0 000	0.000 00
			10 minutes	5 500.017 500	17 500	0.000 32
100 %		0.0	Startup	5 499.990 000	-10 000	-0.000 18
			2 minutes	5 500.007 500	7 500	0.000 14
			5 minutes	5 500.000 000	0 000	0.000 00
			10 minutes	5 499.987 500	-12 500	-0.000 23
100 %		10.0	Startup	5 499.972 500	-27 500	-0.000 50
			2 minutes	5 499.990 000	-10 000	-0.000 18
			5 minutes	5 499.977 500	-22 500	-0.000 41
			10 minutes	5 499.990 000	-10 000	-0.000 18
100 %		20.0	Startup	5 499.960 000	-40 000	-0.000 73
			2 minutes	5 499.970 000	-30 000	-0.000 55
			5 minutes	5 499.967 500	-32 500	-0.000 59
			10 minutes	5 499.960 000	-40 000	-0.000 73
100 %		25.4	Startup	5 499.957 500	-42 500	-0.000 77
			2 minutes	5 499.962 500	-37 500	-0.000 68
			5 minutes	5 499.955 000	-45 000	-0.000 82
			10 minutes	5 499.942 500	-57 500	-0.001 05
100 %		30.0	Startup	5 499.957 500	-42 500	-0.000 77
			2 minutes	5 499.957 500	-42 500	-0.000 77
			5 minutes	5 499.965 000	-35 000	-0.000 64
			10 minutes	5 499.967 500	-32 500	-0.000 59
100 %		40.0	Startup	5 499.970 000	-30 000	-0.000 55
			2 minutes	5 499.960 000	-40 000	-0.000 73
			5 minutes	5 499.957 500	-42 500	-0.000 77
			10 minutes	5 499.967 500	-32 500	-0.000 59
100 %		50.0	Startup	5 499.977 500	-22 500	-0.000 41
			2 minutes	5 499.967 500	-32 500	-0.000 59
			5 minutes	5 499.957 500	-42 500	-0.000 77
			10 minutes	5 499.972 500	-27 500	-0.000 50
100 %		55.0	Startup	5 499.975 000	-25 000	-0.000 45
			2 minutes	5 499.965 000	-35 000	-0.000 64
			5 minutes	5 499.982 500	-17 500	-0.000 32
			10 minutes	5 499.977 500	-22 500	-0.000 41
85 %	DC 3.272	25.4	Startup	5 499.970 000	-30 000	-0.000 55
			2 minutes	5 499.962 500	-37 500	-0.000 68
			5 minutes	5 499.967 500	-32 500	-0.000 59
			10 minutes	5 499.972 500	-27 500	-0.000 50
115 %	DC 4.428	25.4	Startup	5 499.960 000	-40 000	-0.000 73
			2 minutes	5 499.962 500	-37 500	-0.000 68
			5 minutes	5 499.960 000	-40 000	-0.000 73
			10 minutes	5 499.965 000	-35 000	-0.000 64