




TEST REPORT

KCTL Inc. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR21-SRF0234 Page (1) of (109)	
<p>1. Client</p> <ul style="list-style-type: none"> ◦ Name : Samsung Electronics Co., Ltd. ◦ Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea ◦ Date of Receipt : 2021-08-09 <p>2. Use of Report : Certification</p> <p>3. Name of Product / Model : Mobile phone / SC-56B</p> <p>4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam</p> <p>5. FCC ID : A3LSMA223JPN</p> <p>6. Date of Test : 2021-08-17 to 2021-09-16</p> <p>7. Location of Test : <input checked="" type="checkbox"/> Permanent Testing Lab <input type="checkbox"/> On Site Testing (Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)</p> <p>8. Test method used : FCC Part 15 Subpart E, 15.407</p> <p>9. Test Result : Refer to the test result in the test report</p>		
Affirmation	Tested by Name : Kwonse Kim (Signature)	Technical Manager Name : Seungyong Kim (Signature)
<p style="text-align: right;">2021-09-29</p> <p style="text-align: center;">KCTL Inc.</p> <p>As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.</p>		

REPORT REVISION HISTORY

Date	Revision	Page No
2021-09-29	Originally issued	-

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General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

Statement not required by the standard or client used for type testing

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1. General information

Client : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677,
Rep. of Korea
Manufacturer : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677,
Rep. of Korea
Laboratory : KCTL Inc.
Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132
VCCI Registration No. : R-20080, G-20078, C-20059, T-20056
CAB Identifier: KR0040
ISED Number: 8035A
KOLAS No.: KT231

2. Device information

Equipment under test : Mobile phone
Model : SC-56B
Modulation technique : Bluetooth(BDR/EDR)_GFSK, $\pi/4$ DQPSK, 8DPSK
Bluetooth(BLE)_GFSK
WIFI(802.11a/b/g/n/ac)_DSSS, OFDM
LTE_QPSK, 16QAM, 64QAM
WCDMA_QPSK
NFC_ASK
Number of channels : Bluetooth(BDR/EDR)_79 ch / Bluetooth(BLE)_40 ch
802.11b/g/n_HT20 : 13 ch
UNII-1: 4 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)
UNII-2A: 4 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)
UNII-2C: 12 ch (20 MHz), 6 ch (40 MHz), 3 ch (80 MHz)
UNII-3: 5 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)
NFC: 1 ch
Power source : DC 3.88 V
Antenna specification : LTE/WCDMA_Metal Antenna
WIFI/Bluetooth(BDR/EDR/BLE)_LDS Antenna
NFC_LDS Antenna
Antenna gain : WIFI/Bluetooth(BDR/EDR/BLE)_-2.95 dBi
UNII-1 : -3.06 dBi
UNII-2A : -3.06 dBi
UNII-2C : -4.03 dBi
UNII-3 : -4.80 dBi

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Frequency range : Bluetooth(BDR/EDR/BLE)_2 402 MHz ~ 2 480 MHz
2 412 MHz ~ 2 472 MHz (802.11b/g/n_HT20)
UNII-1: 5 180 MHz ~ 5 240 MHz (802.11a/n/ac_HT20/VHT20)
UNII-1: 5 190 MHz ~ 5 230 MHz (802.11n/ac_HT40/VHT40)
UNII-1: 5 210 MHz (802.11ac_VHT80)
UNII-2A: 5 260 MHz ~ 5 320 MHz (802.11a/n/ac_HT20/VHT20)
UNII-2A: 5 270 MHz ~ 5 310 MHz (802.11n/ac_HT40/VHT40)
UNII-2A: 5 290 MHz (802.11ac_VHT80)
UNII-2C: 5 500 MHz ~ 5 720 MHz (802.11a/n/ac_HT20/VHT20)
UNII-2C: 5 510 MHz ~ 5 710 MHz (802.11n/ac_HT40/VHT40)
UNII-2C: 5 530 MHz ~ 5 690 MHz (802.11ac_VHT80)
UNII-3: 5 745 MHz ~ 5 825 MHz (802.11a/n/ac_HT20/VHT20)
UNII-3: 5 755 MHz ~ 5 795 MHz (802.11n/ac_HT40/VHT40)
UNII-3: 5 775 MHz (802.11ac_VHT80)
LTE Band 5_824.7 MHz ~ 848.3 MHz
LTE Band 12_699.7 MHz ~ 715.3 MHz
LTE Band 41_2 498.5 MHz ~ 2 687.5 MHz
GSM 850_824.2 MHz ~ 848.8 MHz
GSM 1900_1 850.2 MHz ~ 1 909.8 MHz
WCDMA 850_826.4 MHz ~ 846.6 MHz
NFC_13.56 MHz

Software version : A223D.001

Hardware version : REV1.0

Test device serial No. : Conducted(R3CR70CAFJT, FD100000211C7ECE, R3CR70CAFGE,
R3CR70CALHR)
Radiated(R3CR70CAPCH, R3CR70CAPAA, R3CR70C6NHV)

Operation temperature : -30 °C ~ 50 °C

2.1. Frequency/channel operations

This device contains the following capabilities:

WiFi (802.11a/b/g/n/ac), Bluetooth (BDR/EDR/BLE), NFC, LTE Band 5, LTE Band 12, LTE Band 41
GSM 850, GSM 1900, WCDMA 850**UNII-1**

Ch.	Frequency (MHz)
36	5 180
40	5 200
⋮	⋮
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
⋮	⋮
140	5 700
144	5 720

UNII-3

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

Table 2.1-1. 802.11a/n/ac_HT20/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
⋮	⋮
134	5 670
142	5 710

UNII-3

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

Table 2.1-2. 802.11n/ac_HT40/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 2.1-3. 802.11ac_VHT80 mode

2.2. Simultaneous Tx Condition

Mode	WLAN 5 GHz	Bluetooth LE
WLAN 5 GHz + Bluetooth LE	O	O

2.3. Duty Cycle Factor

Test mode	Period (ms)	T _{on} time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.451 4	1.388 4	0.956 6	95.66	0.19
802.11n_HT20	1.341 6	1.294 2	0.964 7	96.47	0.16
802.11n_HT40	0.692 1	0.648 0	0.936 3	93.63	0.29
802.11ac_VHT20	1.353 0	1.308 6	0.967 2	96.72	0.14
802.11ac_VHT40	0.696 0	0.650 1	0.934 1	93.41	0.30
802.11ac_VHT80	0.368 0	0.323 8	0.879 9	87.99	0.56

Notes.

1. Duty cycle (Linear) = T_{on} time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)
3. DCF is not compensated to average result if duty cycle is more than 98%

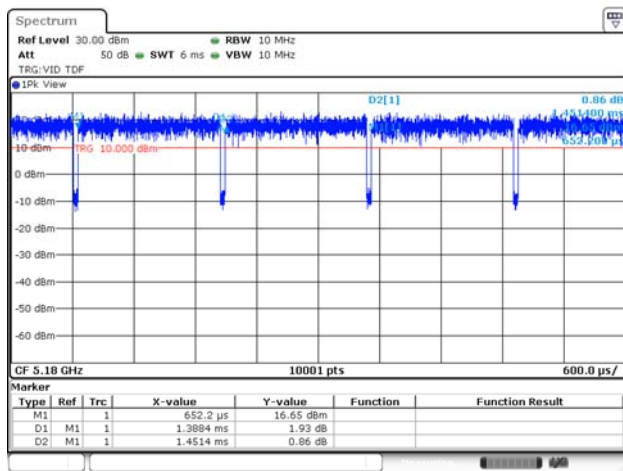
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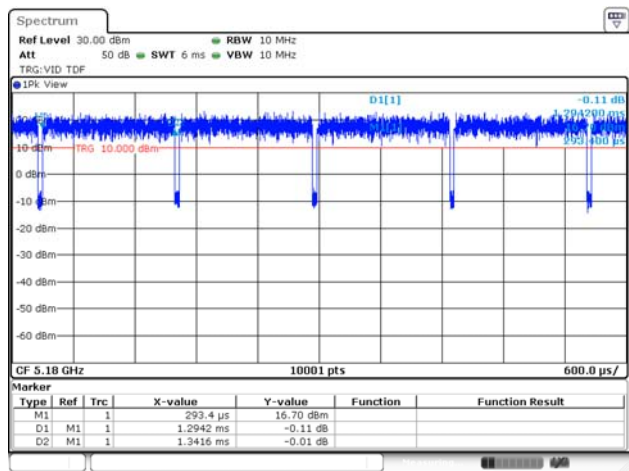
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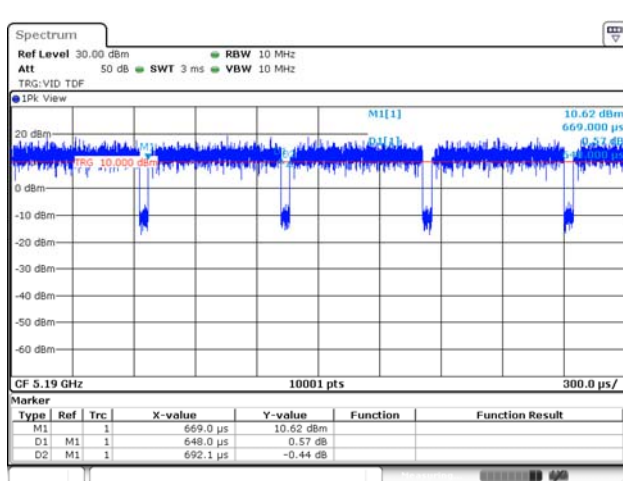
802.11a



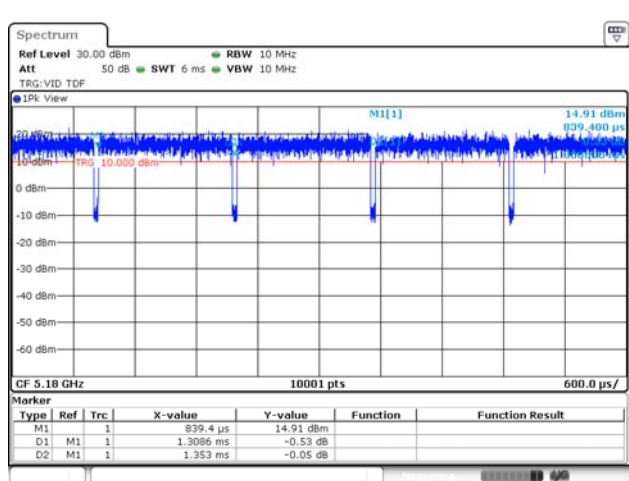
802.11n_HT20



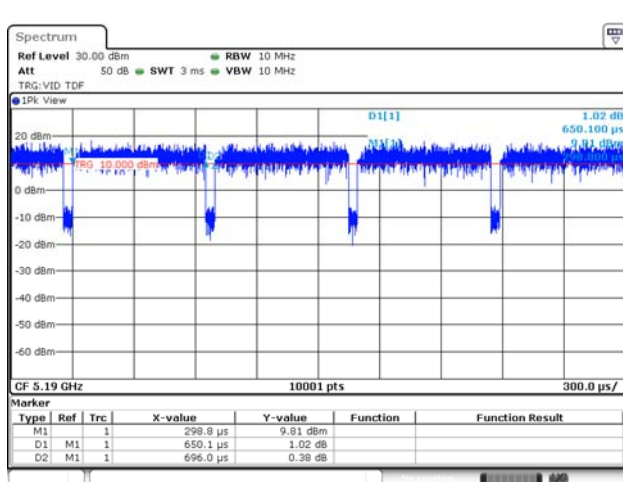
802.11n_HT40



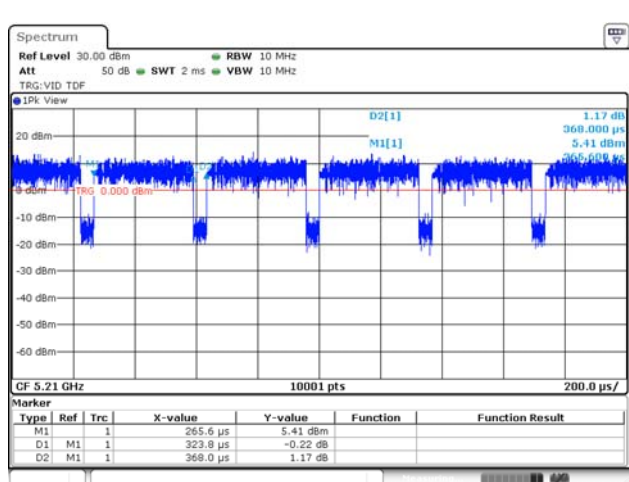
802.11ac_VHT20



802.11ac_VHT40



802.11ac_VHT80



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**3. Antenna requirement**

Requirement of FCC part section 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

- The transmitter has permanently attached LDS Antenna (Internal antenna) on board.

4. Summary of tests

FCC Part section(s)	Parameter	Test Condition	Test results
15.407(a)	Maximum conducted output power	Conducted	Pass
15.407(a)	Maximum power spectral density		Pass
15.407(a)	26 dB Channel Bandwidth		Pass
15.407(e)	6 dB Channel Bandwidth		Pass
15.207(a)	AC Conducted Emissions		Pass
15.407(b), 15.205(a), 15.209(a)	Spurious emission	Radiated	Pass
	Band-edge, restricted band		Pass

Notes:

- All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 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.
- The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **Z** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **Z** orientation.
- The test procedure(s) in this report were performed in accordance as following.
 - ANSI C63.10-2013
 - KDB 789033 D02 v02r01
- Based on the baseline scan, the worst-case data rates were:
 - 802.11a mode: 6Mbps
 - 802.11n HT20 mode: MCS0
 - 802.11n HT40 mode: MCS0
 - 802.11ac VHT20 mode: MCS0
 - 802.11ac VHT40 mode: MCS0
 - 802.11ac VHT80 mode: MCS0

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5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of $k=2$ to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (\pm)	
Conducted RF power	0.9 dB	
Conducted spurious emissions	1.6 dB	
Radiated spurious emissions	9 kHz ~ 30 MHz:	2.3 dB
	30 MHz ~ 1 000 MHz	2.2 dB
	1 000 MHz ~ 18 000 MHz	5.6 dB
	Above 18 000 MHz	5.7 dB
Conducted emissions	9 kHz ~ 150 kHz	3.7 dB
	150 kHz ~ 30 MHz	3.3 dB

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6. Measurement results explanation example

Frequency (MHz)	Factor(dB)	Frequency (MHz)	Factor(dB)
30	9.67	9 000	11.92
50	9.95	10 000	11.92
100	10.23	11 000	11.86
200	10.28	12 000	11.91
300	10.35	13 000	12.42
400	10.43	14 000	12.54
500	10.64	15 000	12.13
600	10.71	16 000	13.26
700	10.75	17 000	12.18
800	10.76	18 000	13.00
900	10.80	19 000	12.90
1 000	10.82	20 000	12.85
2 000	11.48	21 000	13.67
3 000	11.77	22 000	13.42
4 000	12.03	23 000	13.48
5 000	12.66	24 000	13.65
6 000	12.99	25 000	13.57
7 000	11.57	26 000	14.16
8 000	11.67	26 500	13.51

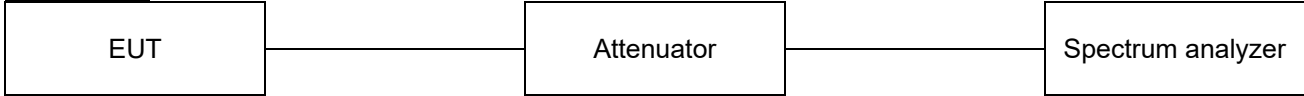
Notes:

Offset(dB) = RF cable loss(dB) + Attenuator(dB)

7. Test results

7.1. Maximum conducted output power

Test setup



Limit

According to §15.407(a),

Band	EUT category	Conducted output power limit
UNII-1	Outdoor access point	1 W (30 dBm)
	Indoor access point	
	Fixed point-to-point access point	
	√ Client device	250 mW (23.98 dBm)
UNII-2A	√	250 mW or 11 dBm + 10logB ¹⁾
UNII-2C	√	250 mW or 11 dBm + 10logB ¹⁾
UNII-3	√	1 W (30 dBm)

Note:

1) Conducted output power limit B is the 26 dB emission bandwidth.

Test procedure

ANSI C63.10-2013-Section 12.3.3.2 and 14.2
 KDB 789033 D02 v02r01 - Section E.2.d) or e)

Test settings**Used test method is Section E.2.d)**◆ **KDB 789033 D02 v02r01****Section E.2.d)****Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction):**

- (i) Measure the duty cycle, x , of the transmitter output signal as described in II.B..
- (ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (iii) Set RBW = 1 MHz
- (iv) Set RBW \geq 3 MHz
- (v) Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. (This ensures that bin-to-bin spacing is $\leq \text{RBW} / 2$, so that narrowband signals are not lost between frequency bins.)
- (vi) Sweep time = auto.
- (vii) Detector = power averaging (rms), if available. Otherwise use sample detector mode.
- (viii) Do not use sweep triggering. Allow the sweep to "free run."
- (ix) Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
- (x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (xi) Add $10 \log(1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add $10 \log(1/0,25) = 6$ dB if the duty cycle is 25%.

Section E.2.e)**Method SA-2 Alternative (power averaging(rms) detection with slow sweep with each spectrum bin averaging across on and off times of the EUT transmissions, followed by duty cycle correction):**

- (i) Measure the duty cycle, x , of the transmitter output signal as described in II.B..
- (ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (iii) Set RBW = 1 MHz
- (iv) Set RBW \geq 3 MHz
- (v) Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. (This ensures that bin-to-bin spacing is $\leq \text{RBW} / 2$, so that narrowband signals are not lost between frequency bins.)
- (vi) Manually set sweep time $\geq 10 \times (\text{number of points in sweep}) \times (\text{total on/off period of the transmitted signal})$.
- (vii) Set detector = power averaging (rms)
- (viii) Perform a single sweep.
- (ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If

the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

- (x) Add $10 \log(1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add $10 \log(1/0.25) = 6$ dB if the duty cycle is 25%.

Section E.3.a)**Method PM (Measurement using an RF average power meter):**

- (xi) 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
- (xii) If the transmitter does not transmit continuously, measure the duty cycle, x , of the transmitter output signal as described in II
- (xiii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
- (xiv) 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.

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KCTL**Test results**

Test mode	Band	Frequency (MHz)	Measured output power			Limit (dBm)
			Reading (dBm)	DCF (dB)	Result (dBm)	
802.11a	UNII 1	5 180	15.54	0.19	15.73	23.98
		5 200	15.49	0.19	15.68	
		5 240	15.48	0.19	15.67	
	UNII 2A	5 260	15.97	0.19	16.16	23.96
		5 280	16.02	0.19	16.21	
		5 320	15.90	0.19	16.09	
	UNII 2C	5 500	16.02	0.19	16.21	23.97
		5 600	16.10	0.19	16.29	
		5 700	16.32	0.19	16.51	
	UNII 3	5 745	15.48	0.19	15.67	30.00
		5 785	15.50	0.19	15.69	
		5 825	15.58	0.19	15.77	
802.11n HT20	UNII 1	5 180	15.40	0.16	15.56	23.98
		5 200	15.35	0.16	15.51	
		5 240	15.36	0.16	15.52	
	UNII 2A	5 260	15.88	0.16	16.04	23.98
		5 280	15.89	0.16	16.05	
		5 320	15.82	0.16	15.98	
	UNII 2C	5 500	15.84	0.16	16.00	23.98
		5 600	15.99	0.16	16.15	
		5 700	15.38	0.16	15.54	
	UNII 3	5 745	15.32	0.16	15.48	30.00
		5 785	15.14	0.16	15.30	
		5 825	15.26	0.16	15.42	
802.11n HT40	UNII 1	5 190	13.31	0.29	13.60	23.98
		5 230	13.17	0.29	13.46	
	UNII 2A	5 270	13.74	0.29	14.03	23.98
		5 310	13.82	0.29	14.11	
	UNII 2C	5 510	13.77	0.29	14.06	23.98
		5 590	13.85	0.29	14.14	
		5 670	14.04	0.29	14.33	
	UNII 3	5 755	13.42	0.29	13.71	30.00
		5 795	13.43	0.29	13.72	

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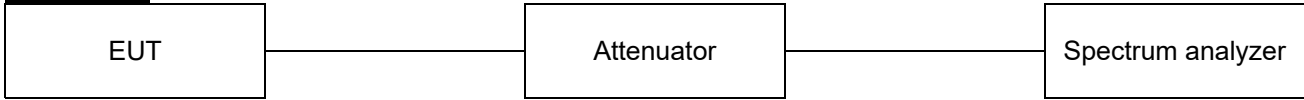
Test mode	Band	Frequency (MHz)	Measured output power			Limit (dBm)
			Reading (dBm)	DCF (dB)	Result (dBm)	
802.11ac VHT20	UNII 1	5 180	14.33	0.14	14.47	23.98
		5 200	14.33	0.14	14.47	
		5 240	14.39	0.14	14.53	
	UNII 2A	5 260	14.90	0.14	15.04	23.98
		5 280	14.92	0.14	15.06	
		5 320	14.84	0.14	14.98	
	UNII 2C	5 500	14.83	0.14	14.97	23.98
		5 600	15.03	0.14	15.17	
		5 700	15.14	0.14	15.28	
	UNII 3	5 745	14.21	0.14	14.35	30.00
		5 785	14.16	0.14	14.30	
		5 825	14.23	0.14	14.37	
802.11ac VHT40	UNII 1	5 190	13.28	0.30	13.58	23.98
		5 230	13.21	0.30	13.51	
	UNII 2A	5 270	13.86	0.30	14.16	23.98
		5 310	13.83	0.30	14.13	
	UNII 2C	5 510	13.78	0.30	14.08	23.98
		5 590	13.80	0.30	14.10	
		5 670	14.05	0.30	14.35	
	UNII 3	5 755	13.47	0.30	13.77	30.00
5 795		13.41	0.30	13.71		
802.11ac VHT80	UNII 1	5 210	11.86	0.56	12.42	23.98
	UNII 2A	5 290	12.45	0.56	13.01	23.98
	UNII 2C	5 530	12.35	0.56	12.91	23.98
		5 610	12.63	0.56	13.19	
	UNII 3	5 775	12.08	0.56	12.64	30.00

Note.

1. Result(dBm) = Reading Power + D.C.F

7.2. Maximum Power Spectral Density

Test setup



Limit

According to §15.407(a)

Band	EUT category		Limit
UNII-1		Outdoor access point	17dBm/MHz
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	11 dBm /MHz
UNII-2A		√	11 dBm /MHz
UNII-2C		√	11 dBm /MHz
UNII-3		√	30 dBm /500 kHz

Notes:

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 if the antenna exceed 6 dBi

Test procedure

ANSI C63.10-2013 Section 12.3.2.2, 14.3.2.2
 KDB 789033 D02 v02r01 - Section F

Test settings

Section F

The rules requires “maximum power spectral density” measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission. Refer to III.A for additional guidance for devices that use channel aggregation.

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in 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. Search function on the instrument to find the peak of the spectrum and record its value.
3. 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 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 1MHz 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 preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference

bandwidth specified in Section 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 RBWs less than 1MHz, 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 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 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 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 II.F.5.c) and II.F.5.d), since $RBW=100 \text{ kHz}$ is available on nearly all spectrum analyzers.

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KCTL**Test results**

Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)	DCF (dB)	Maximum PSD (dB m/MHz)	Limit (dBm/MHz)
802.11a	UNII 1	5 180	5.24	0.19	5.43	11
		5 200	5.17	0.19	5.36	
		5 240	5.37	0.19	5.56	
	UNII 2A	5 260	5.74	0.19	5.93	11
		5 280	5.87	0.19	6.06	
		5 320	5.80	0.19	5.99	
	UNII 2C	5 500	5.82	0.19	6.01	11
		5 600	5.99	0.19	6.18	
		5 700	6.12	0.19	6.31	
802.11n HT20	UNII 1	5 180	4.97	0.16	5.13	11
		5 200	4.89	0.16	5.05	
		5 240	5.08	0.16	5.24	
	UNII 2A	5 260	5.41	0.16	5.57	11
		5 280	5.49	0.16	5.65	
		5 320	5.45	0.16	5.61	
	UNII 2C	5 500	5.48	0.16	5.64	11
		5 600	5.60	0.16	5.76	
		5 700	5.06	0.16	5.22	
802.11n HT40	UNII 1	5 190	-0.12	0.29	0.17	11
		5 230	0.13	0.29	0.42	
	UNII 2A	5 270	0.39	0.29	0.68	11
		5 310	0.55	0.29	0.84	
	UNII 2C	5 510	0.50	0.29	0.79	11
		5 590	0.43	0.29	0.72	
5 670	0.82	0.29	1.11			
802.11ac VHT20	UNII 1	5 180	3.94	0.14	4.08	11
		5 200	3.78	0.14	3.92	
		5 240	3.95	0.14	4.09	
	UNII 2A	5 260	4.64	0.14	4.78	11
		5 280	4.61	0.14	4.75	
		5 320	4.33	0.14	4.47	
	UNII 2C	5 500	4.35	0.14	4.49	11
		5 600	4.54	0.14	4.68	
		5 700	4.74	0.14	4.88	

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Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)	DCF (dB)	Maximum PSD (dBm/MHz)	Limit (dBm/MHz)
802.11ac VHT40	UNII 1	5 190	-0.09	0.30	0.21	11
		5 230	0.05	0.30	0.35	
	UNII 2A	5 270	0.55	0.30	0.85	11
		5 310	0.61	0.30	0.91	
	UNII 2C	5 510	0.45	0.30	0.75	11
		5 590	0.65	0.30	0.95	
5 670		0.71	0.30	1.01		
802.11ac VHT80	UNII 1	5 210	-4.69	0.56	-4.13	11
	UNII 2A	5 290	-3.90	0.56	-3.34	11
	UNII 2C	5 530	-4.05	0.56	-3.49	11
		5 610	-3.71	0.56	-3.15	

Test mode	Band	Frequency (MHz)	Measured PSD (dBm /500 kHz)	DCF (dB)	Maximum PSD (dBm /500 kHz)	Limit (dBm /500 kHz)
802.11a	UNII 3	5 745	2.87	0.19	3.06	30
		5 785	2.68	0.19	2.87	
		5 825	2.83	0.19	3.02	
802.11n HT20		5 745	2.44	0.16	2.60	
		5 785	2.39	0.16	2.55	
		5 825	2.42	0.16	2.58	
802.11n HT40		5 755	-2.69	0.29	-2.40	
		5 795	-2.46	0.29	-2.17	
802.11ac VHT20		5 745	1.39	0.14	1.53	
		5 785	1.26	0.14	1.40	
		5 825	1.39	0.14	1.53	
802.11ac VHT40		5 755	-2.51	0.30	-2.21	
		5 795	-2.68	0.30	-2.38	
802.11ac VHT80		5 775	-7.04	0.56	-6.48	

Notes:

- Maximum PSD calculation
- Maximum PSD = Measured PSD + D.C.F

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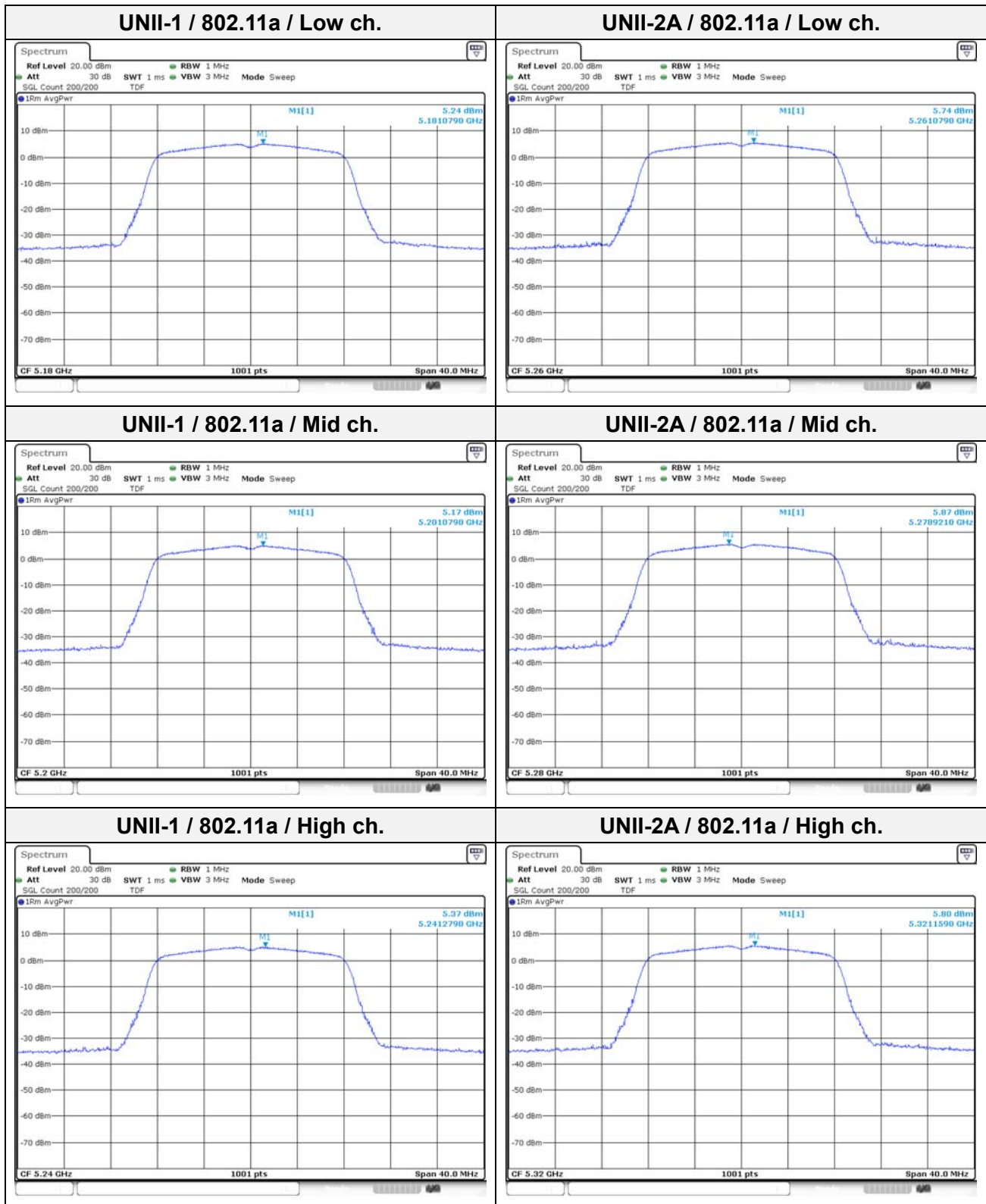
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Power Spectral Density

In order to simplify the report, attached plots were only the Worst Case per bandwidth.



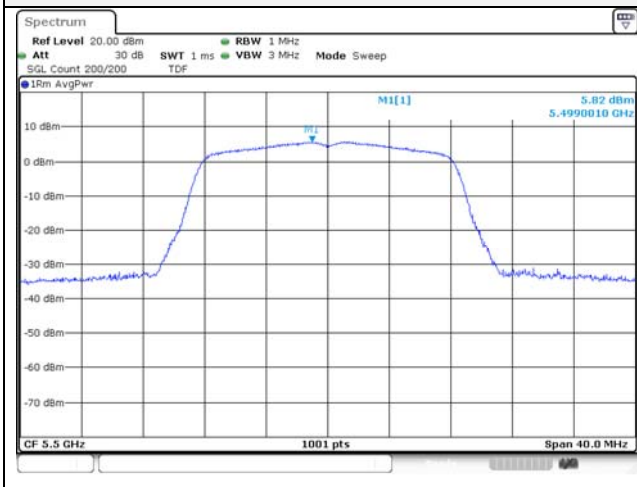
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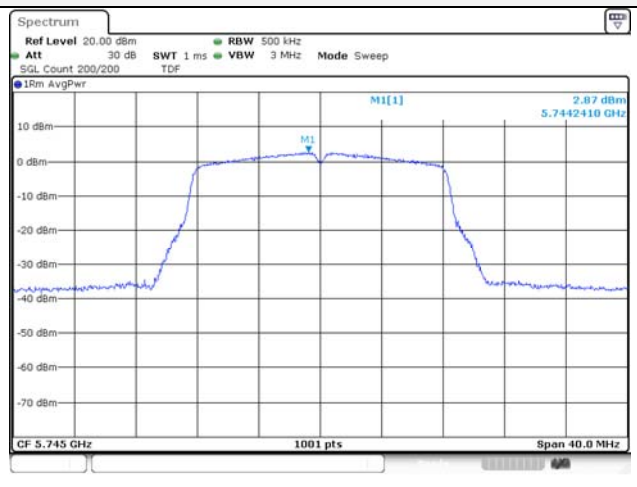
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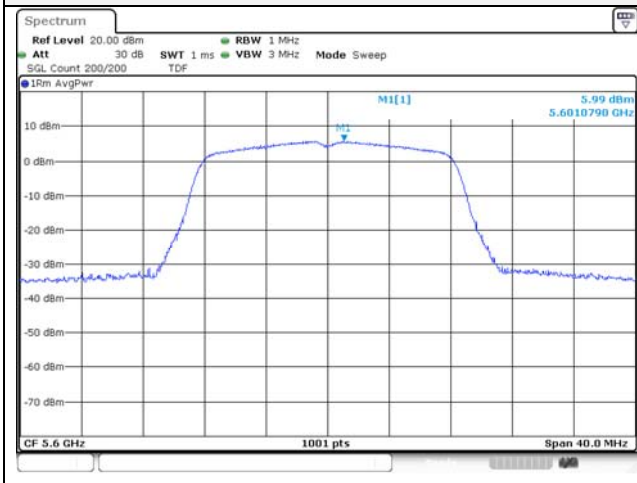
UNII-2C / 802.11a / Low ch.



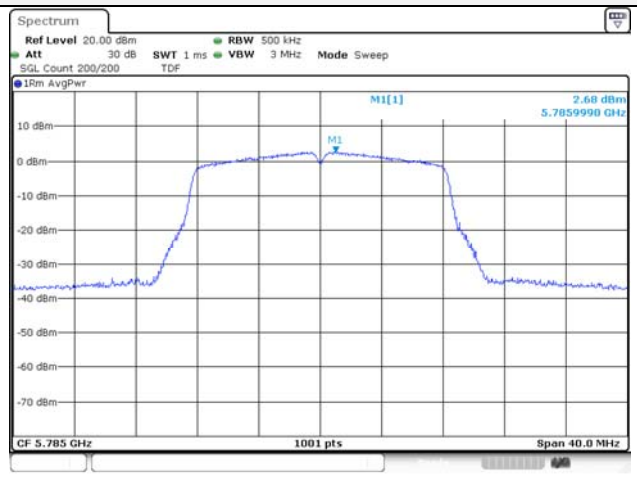
UNII-3 / 802.11a / Low ch.



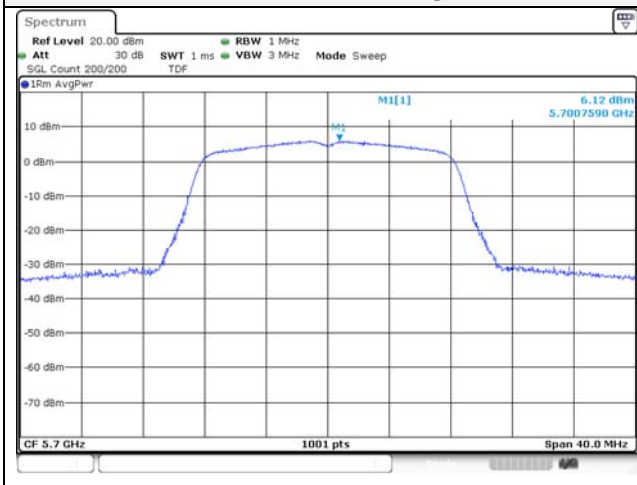
UNII-2C / 802.11a / Mid ch.



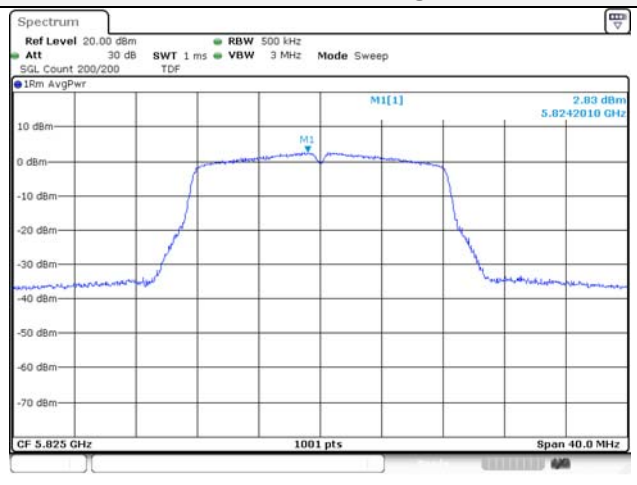
UNII-3 / 802.11a / Mid ch.



UNII-2C / 802.11a / High ch.



UNII-3 / 802.11a / High ch.



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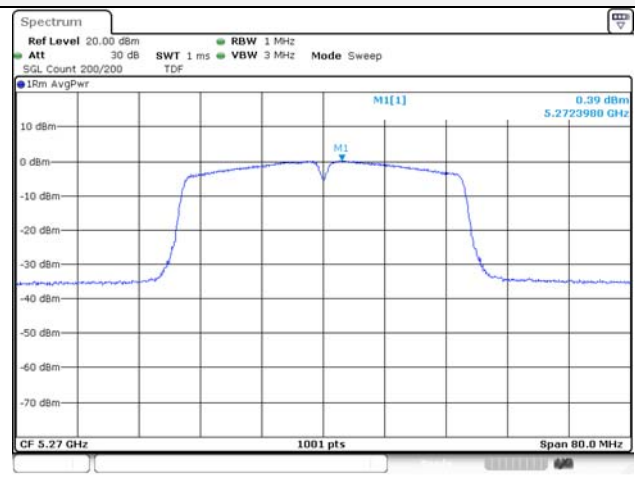
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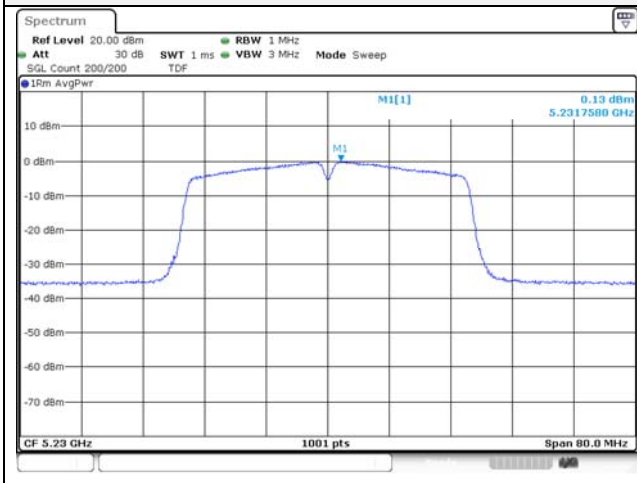
UNII-1 / 802.11n HT40 / Low ch.



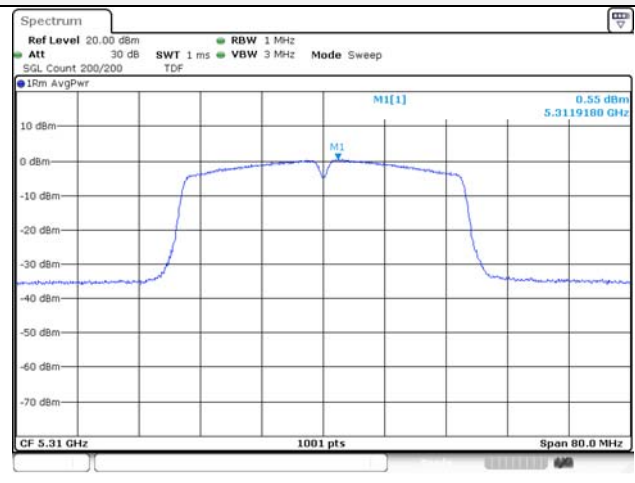
UNII-2A / 802.11n HT40 / Low ch.



UNII-1 / 802.11n HT40 / High ch.



UNII-2A 802.11n HT40 / High ch.



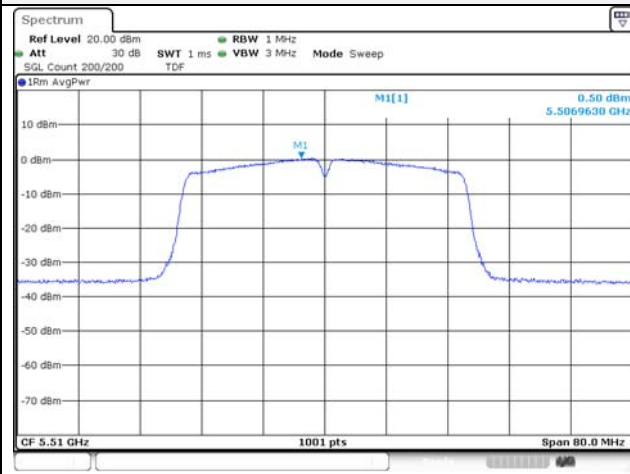
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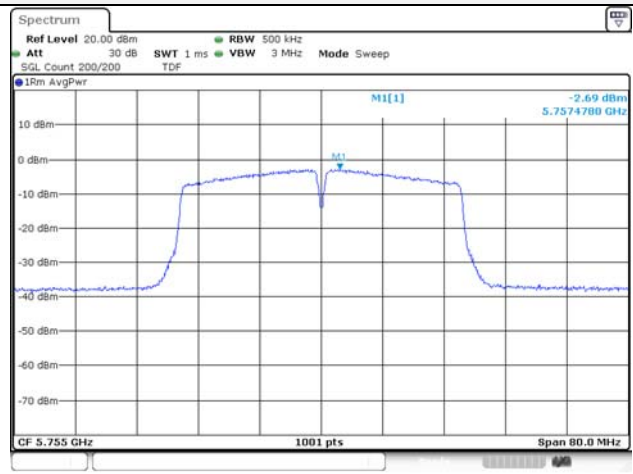
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UNII-2C / 802.11n HT40 / Low ch.



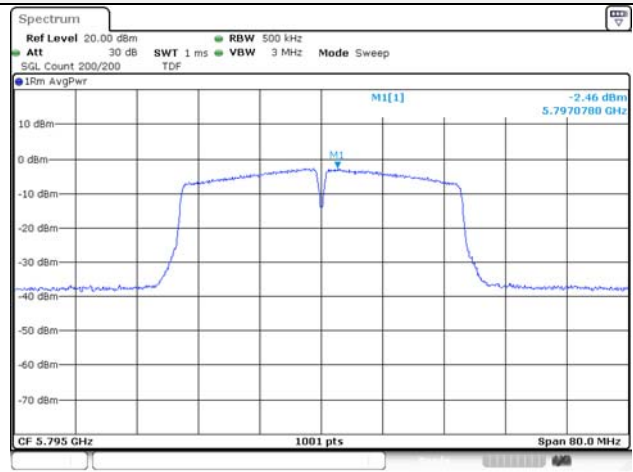
UNII-3 / 802.11n HT40 / Low ch.



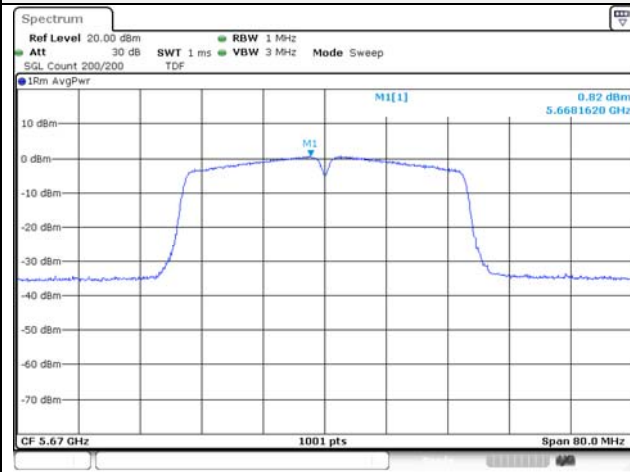
UNII-2C / 802.11n HT40 / Mid ch.



UNII-3 / 802.11n HT40 / High ch.



UNII-2C / 802.11n HT40 / High ch.



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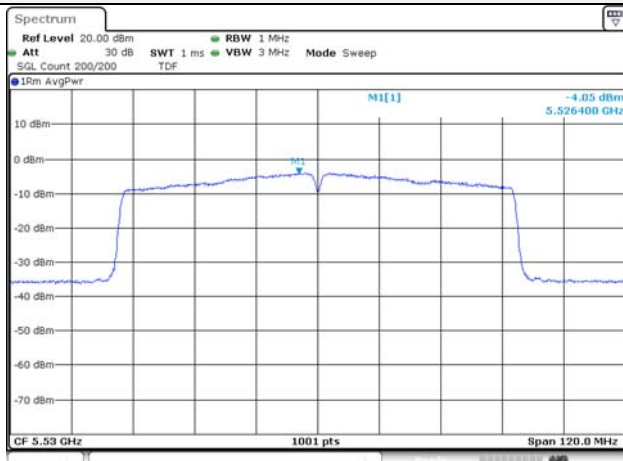
UNII-1 / 802.11ac VHT80 / Low ch.



UNII-2A / 802.11ac VHT80 / Low ch.



UNII-2C / 802.11ac VHT80 / Low ch.



UNII-2C / 802.11ac VHT80 / High ch.



UNII-3 / 802.11ac VHT80 / Low ch.



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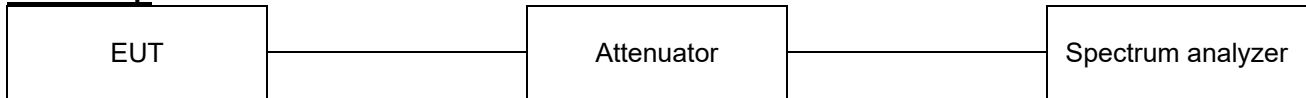
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7.3. 26 dB Bandwidth & 99% Bandwidth

Test setup



Limit

N/A

Test procedure

ANSI C63.10-2013 Section 12.4

KDB 789033 D02 v02r01 - Section C.1 (26dB bandwidth)

KDB 789033 D02 v02r01 - Section D (99% bandwidth)

Test settings

1. 26 dB Bandwidth

- a. Set RBW = approximately 1% of the emission bandwidth.
- b. Set the VBW > RBW.
- c. Detector = Peak.
- d. Trace mode = max hold.
- e. Measure the maximum width of the emission that is 26 dB down from the maximum 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%.

2. 99% Occupied Bandwidth

- a. Set center frequency to the nominal EUT channel center frequency.
- b. Set span = 1.5 times to 5.0 times the OBW.
- c. Set RBW = 1% to 5% of the OBW
- d. Set VBW $\geq 3 \times$ RBW
- e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- f. Use the 99% power bandwidth function of the instrument (if available).
- g. 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.

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**Test results****26 dB bandwidth**

Test mode	Band	Frequency(MHz)	Measured Bandwidth (MHz)
802.11a	UNII-1	5 180	20.08
		5 200	20.13
		5 240	20.08
	UNII-2A	5 260	20.08
		5 280	19.93
		5 320	19.93
	UNII-2C	5 500	20.23
		5 600	20.03
		5 700	19.93
802.11n HT20	UNII-1	5 180	20.33
		5 200	20.33
		5 240	20.18
	UNII-2A	5 260	21.53
		5 280	20.33
		5 320	20.48
	UNII-2C	5 500	20.28
		5 600	21.28
		5 700	20.38
802.11n HT40	UNII-1	5 190	40.96
		5 230	41.06
	UNII-2A	5 270	41.16
		5 310	41.46
	UNII-2C	5 510	41.26
		5 590	41.16
		5 670	41.46

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Test mode	Band	Frequency(MHz)	Measured Bandwidth (MHz)
802.11ac VHT20	UNII-1	5 180	20.38
		5 200	20.28
		5 240	20.23
	UNII-2A	5 260	20.23
		5 280	20.38
		5 320	20.33
	UNII-2C	5 500	20.38
		5 600	20.23
		5 700	20.38
802.11ac VHT40	UNII-1	5 190	40.86
		5 230	41.46
	UNII-2A	5 270	40.96
		5 310	41.26
	UNII-2C	5 510	41.46
		5 590	41.16
802.11ac VHT80	UNII-1	5 210	81.64
	UNII-2A	5 290	81.88
	UNII-2C	5 530	81.76
		5 610	81.64

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**99% bandwidth**

Test mode	Band	Frequency(MHz)	Measured Bandwidth (MHz)
802.11a	UNII-1	5 240	16.53
	UNII-2A	5 260	16.53
802.11n HT20	UNII-1	5 240	17.68
	UNII-2A	5 260	17.68
802.11n HT40	UNII-1	5 230	36.36
	UNII-2A	5 270	36.26
802.11ac VHT20	UNII-1	5 240	17.58
	UNII-2A	5 260	17.58
802.11ac VHT40	UNII-1	5 230	36.16
	UNII-2A	5 270	36.16
802.11ac VHT80	UNII-1	5 210	75.16
	UNII-2A	5 290	75.28

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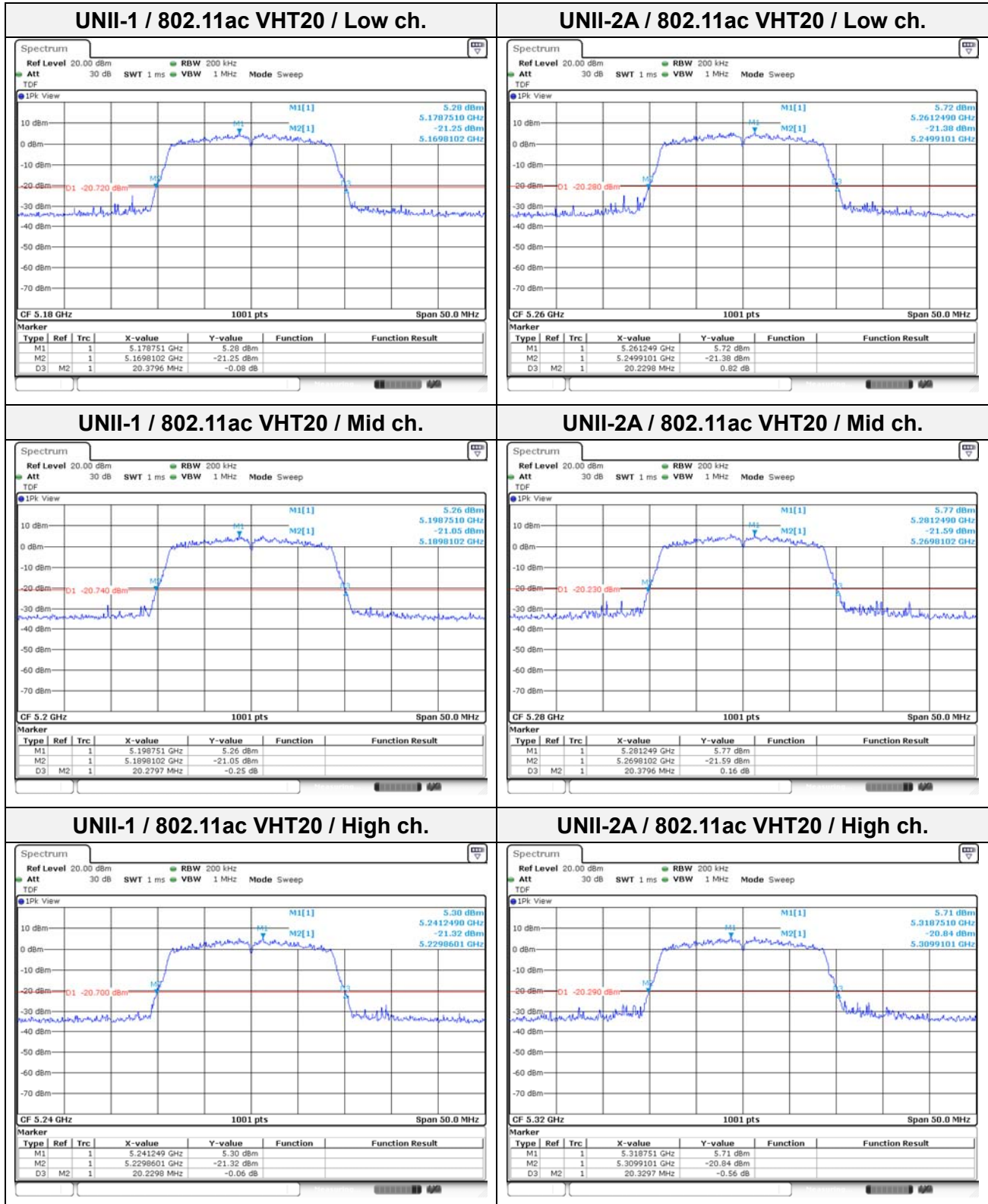
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26 dB bandwidth

In order to simplify the report, only 802.11ac mode test plots are attached.



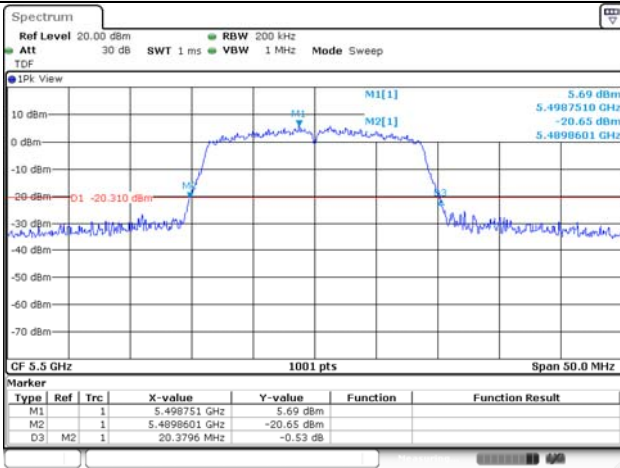
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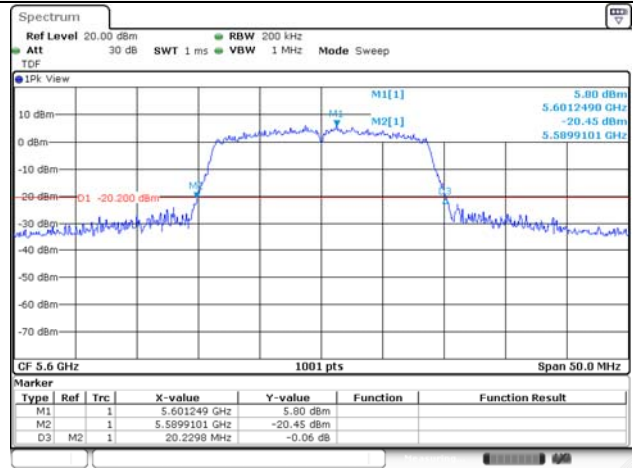
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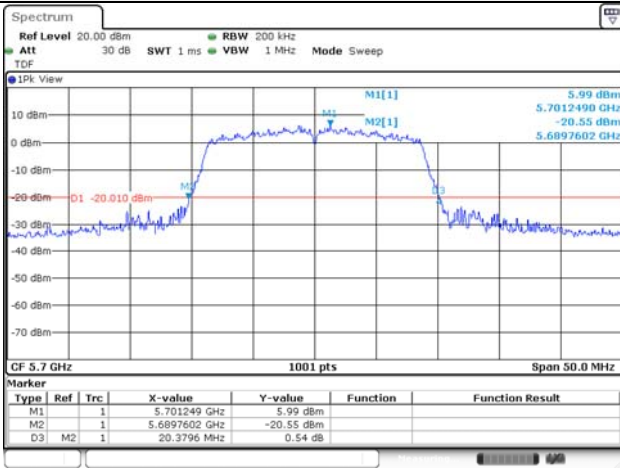
UNII-2C / 802.11ac VHT20 / Low ch.



UNII-2C / 802.11ac VHT20 / Mid ch.



UNII-2C / 802.11ac VHT20 / High ch.



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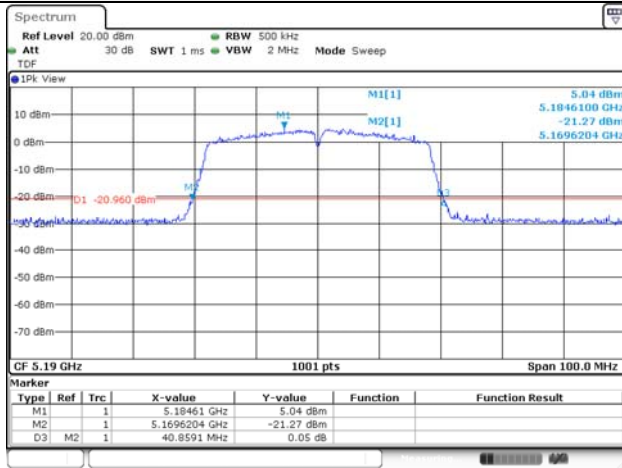
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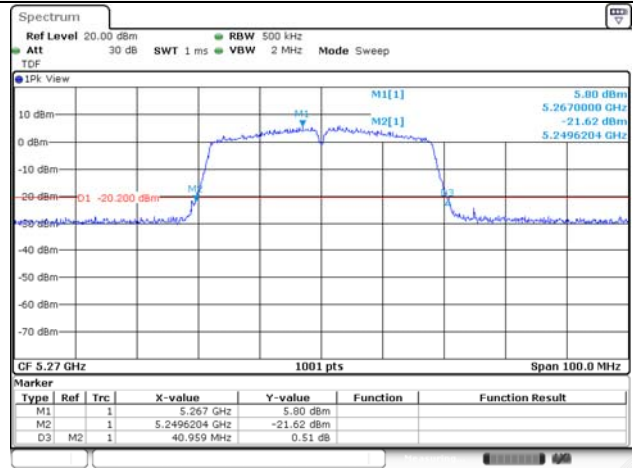
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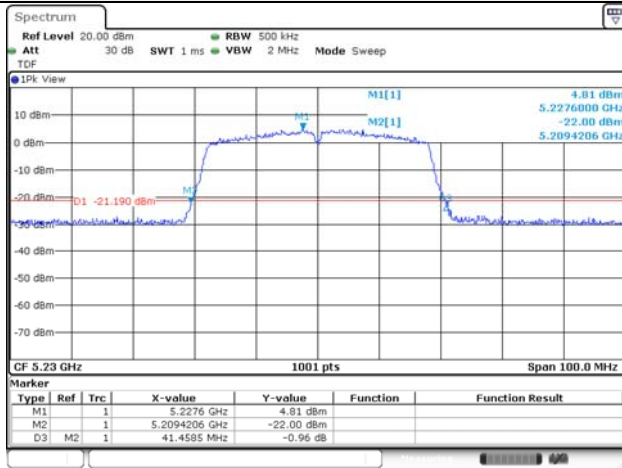
UNII-1 / 802.11ac VHT40 / Low ch.



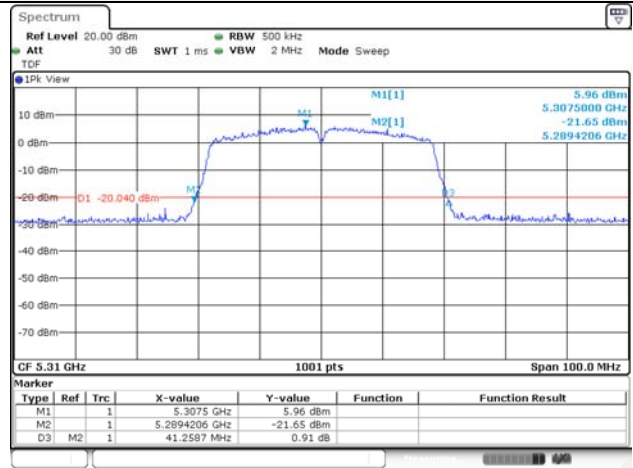
UNII-2A / 802.11ac VHT40 / Low ch.



UNII-1 / 802.11ac VHT40 / High ch.



UNII-2A / 802.11ac VHT40 / High ch.



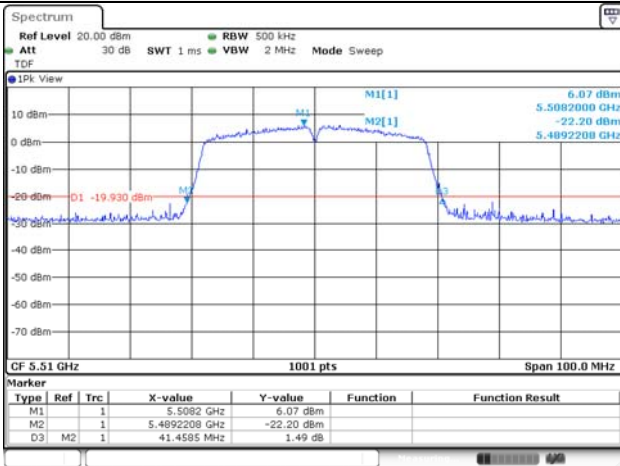
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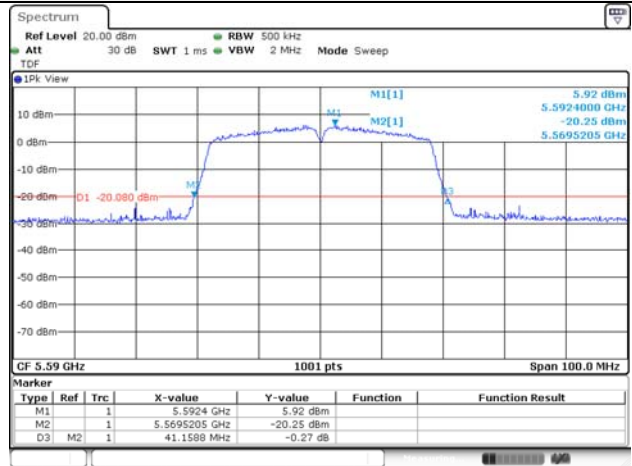
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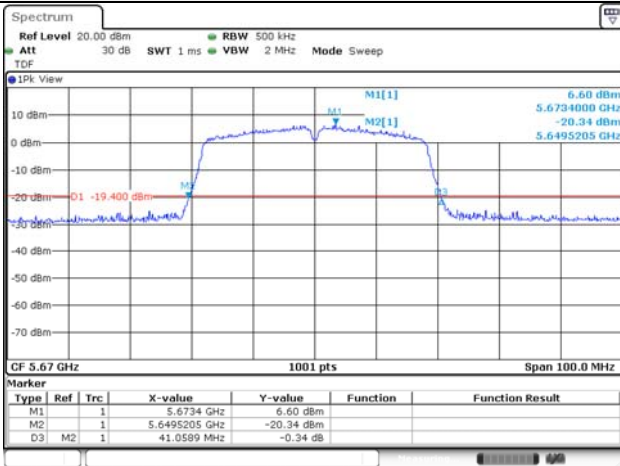
UNII-2C / 802.11ac VHT40 / Low ch.



UNII-2C / 802.11ac VHT40 / Mid ch.



UNII-2C / 802.11ac VHT40 / High ch.



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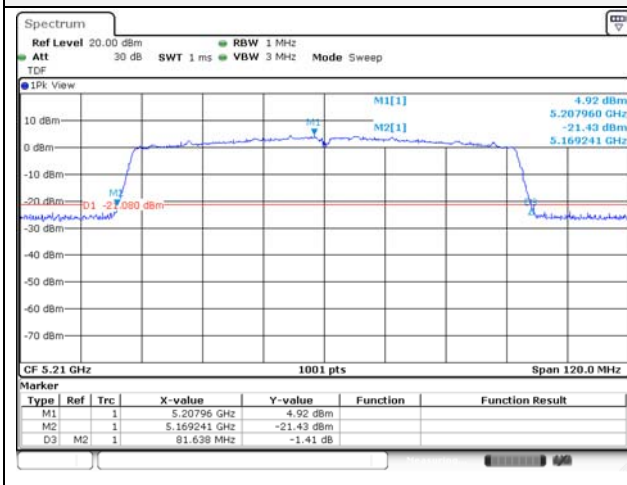
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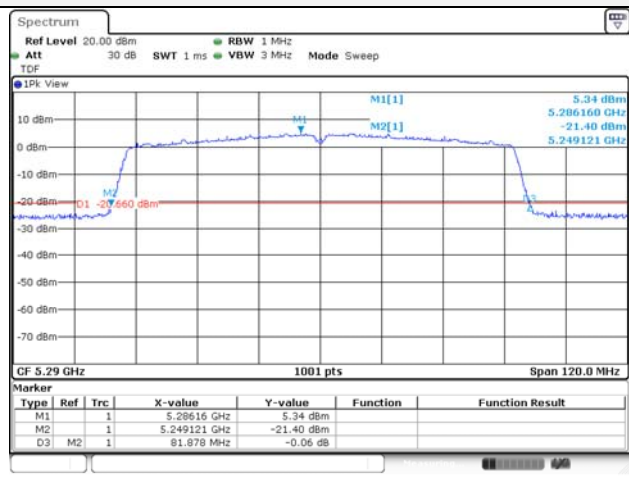
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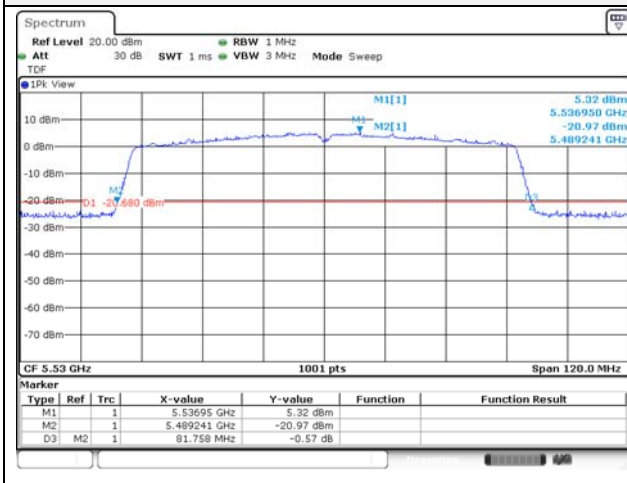
UNII-1 / 802.11ac VHT80 / Low ch.



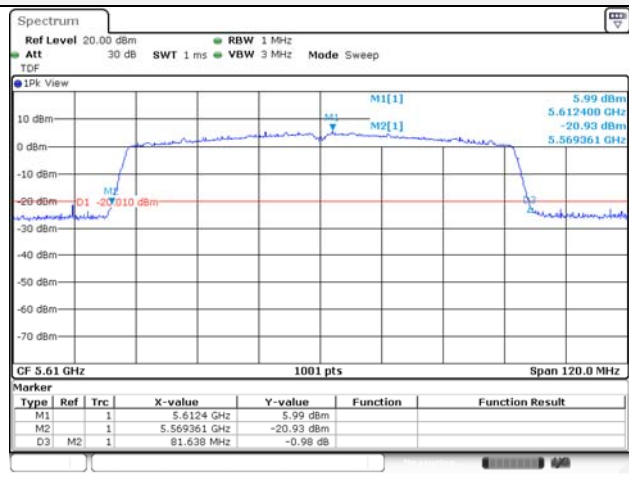
UNII-2A / 802.11ac VHT80 / Low ch.



UNII-2C / 802.11ac VHT80 / Low ch.



UNII-2C / 802.11ac VHT80 / High ch.



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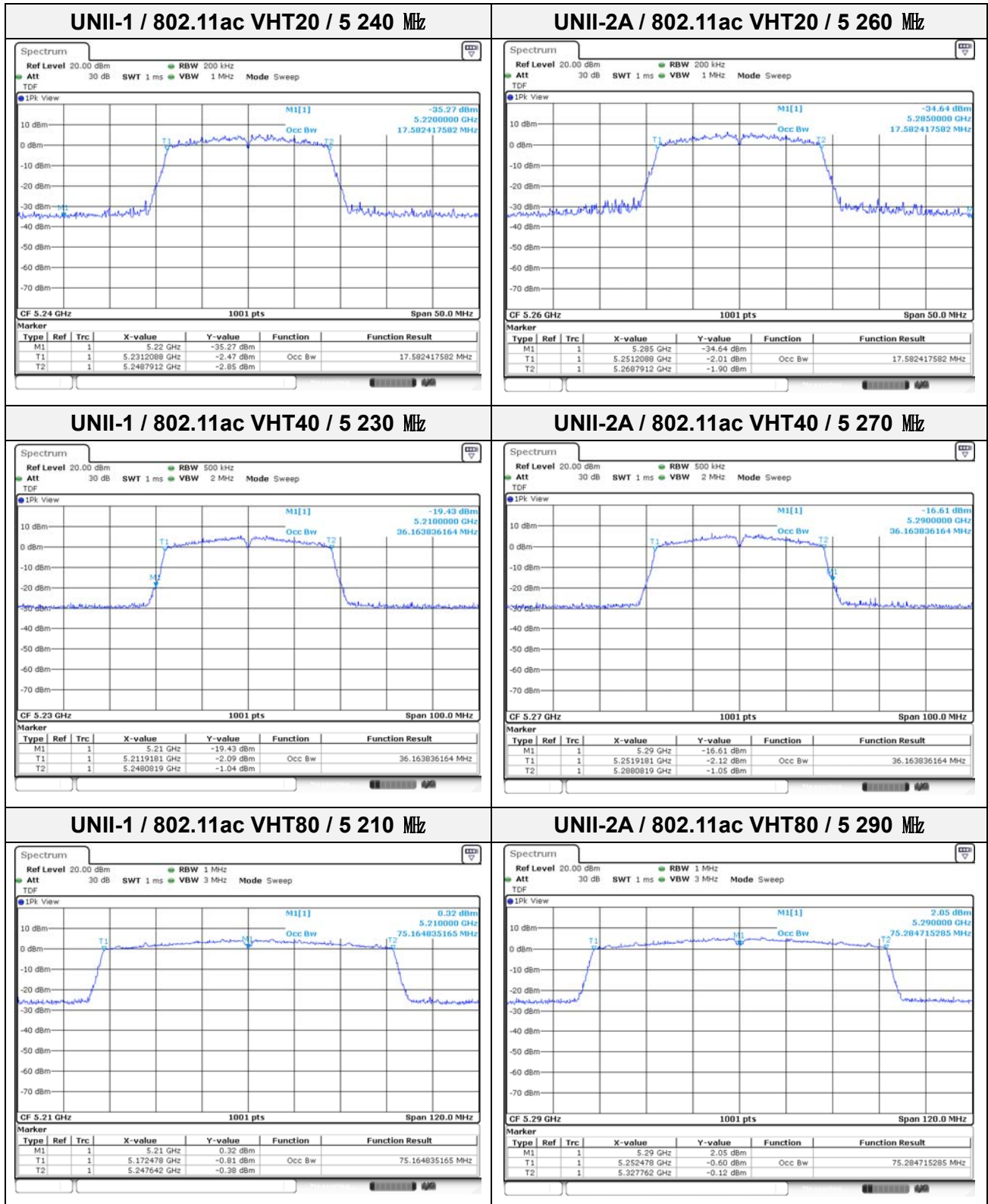
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99% bandwidth

In order to simplify the report, only 802.11ac mode test plots are attached.



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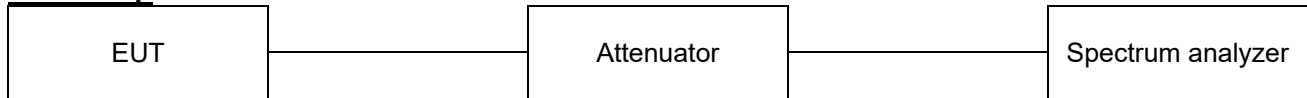
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7.4. 6 dB Bandwidth

Test setup



Limit

According to §15.407(e)

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

Test procedure

ANSI C63.10-2013 Section 6.9.2

KDB 789033 D02 v02r01 - Section C.2

Test settings

Minimum Emission Bandwidth for the band 5.725–5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 kHz for the band 5.725–5.85 GHz. The following procedure shall be used for measuring this bandwidth:

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. 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.

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**Test results**

Test mode	Band	Frequency (MHz)	Measured Bandwidth (MHz)	Limit (MHz)
802.11a	UNII-3	5 745	15.18	0.50
		5 785	15.18	0.50
		5 825	15.18	0.50
802.11n HT20	UNII-3	5 745	15.58	0.50
		5 785	15.18	0.50
		5 825	15.18	0.50
802.11n HT40	UNII-3	5 755	35.26	0.50
		5 795	35.26	0.50
802.11ac VHT20	UNII-3	5 745	15.23	0.50
		5 785	15.18	0.50
		5 825	15.18	0.50
802.11ac VHT40	UNII-3	5 755	35.26	0.50
		5 795	35.36	0.50
802.11ac VHT80	UNII-3	5 775	75.28	0.50

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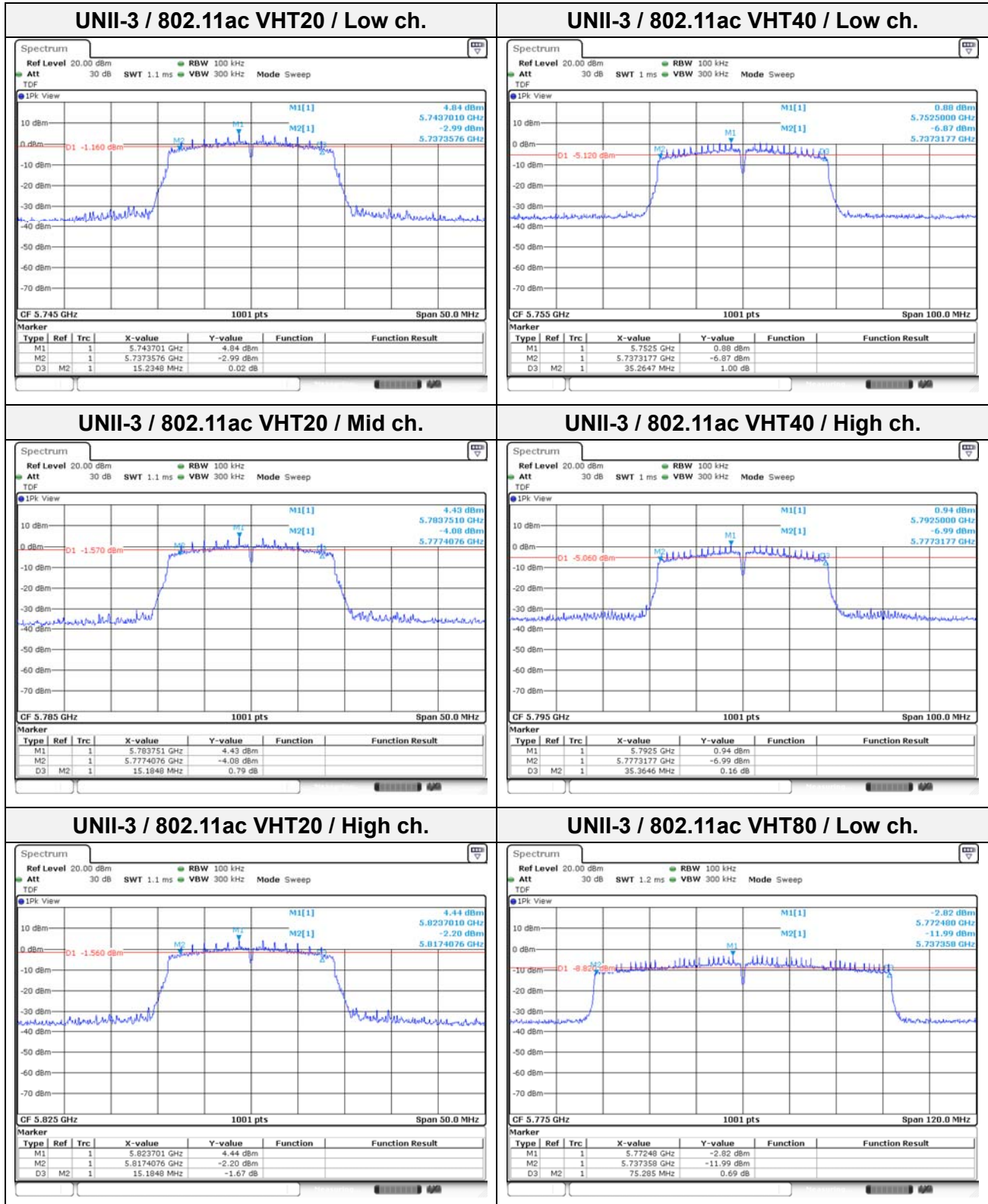
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6 dB bandwidth

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7.5. Straddle channel

26dB bandwidth

Test mode	Band	Frequency (MHz)	26dB Bandwidth (MHz)
802.11a	UNII-2C	5 720	15.19
802.11n HT20			15.64
802.11ac VHT20			15.19
802.11a	UNII-3	5 720	4.99
802.11n HT20			5.34
802.11ac VHT20			5.14
802.11n HT40	UNII-2C	5 710	35.48
802.11ac VHT40			35.58
802.11n HT40	UNII-3	5 710	5.58
802.11ac VHT40			5.48
802.11ac VHT80	UNII-2C	5 690	75.88
	UNII-3	5 690	5.88

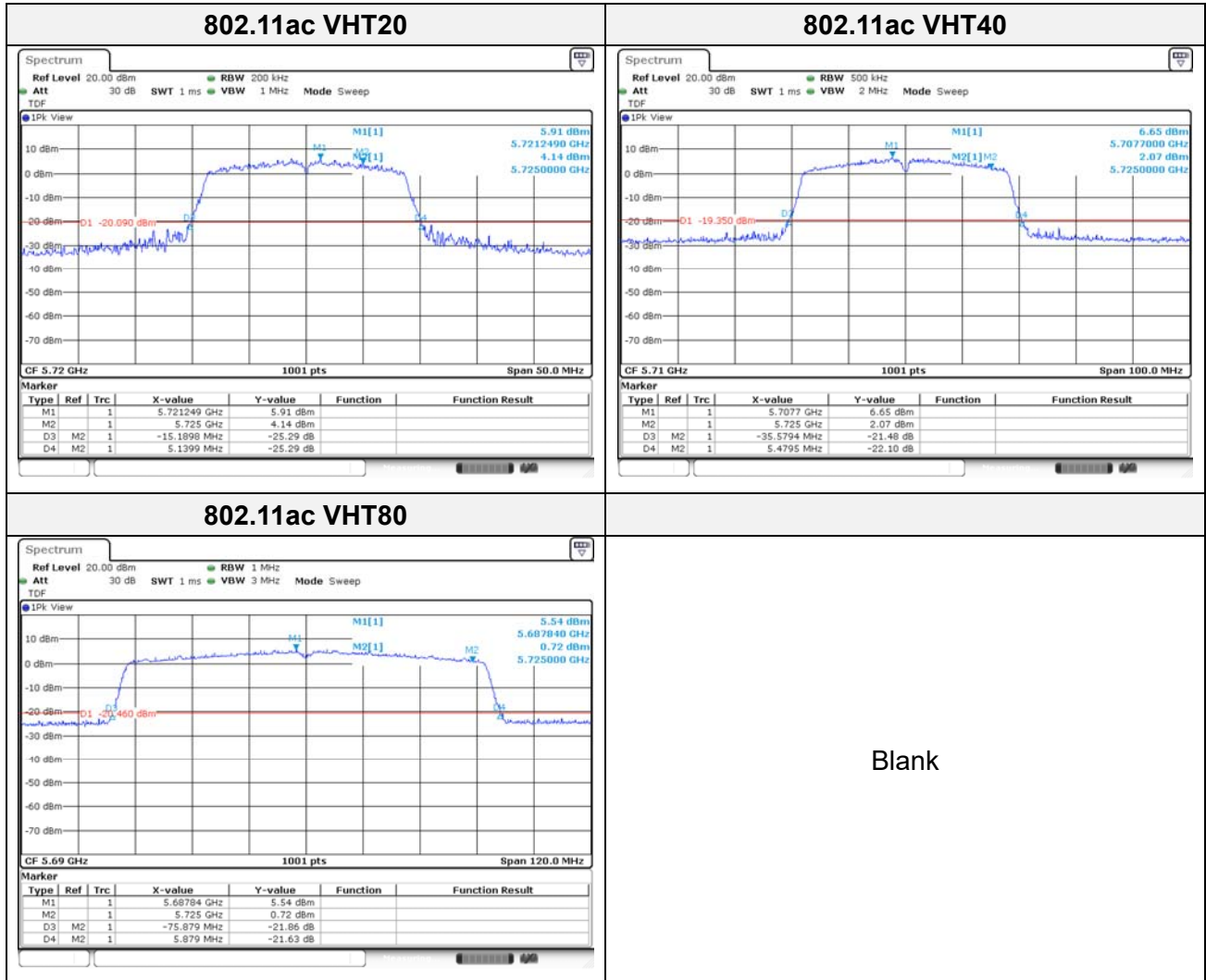
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**6dB bandwidth**

Test mode	Band	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
802.11a	UNII-3	5 720	2.79	0.50
802.11n HT20			2.59	0.50
802.11ac VHT20			2.59	0.50
802.11n HT40	UNII-3	5 710	2.68	0.50
802.11ac VHT40			2.68	0.50
802.11ac VHT80	UNII-3	5 690	2.64	0.50

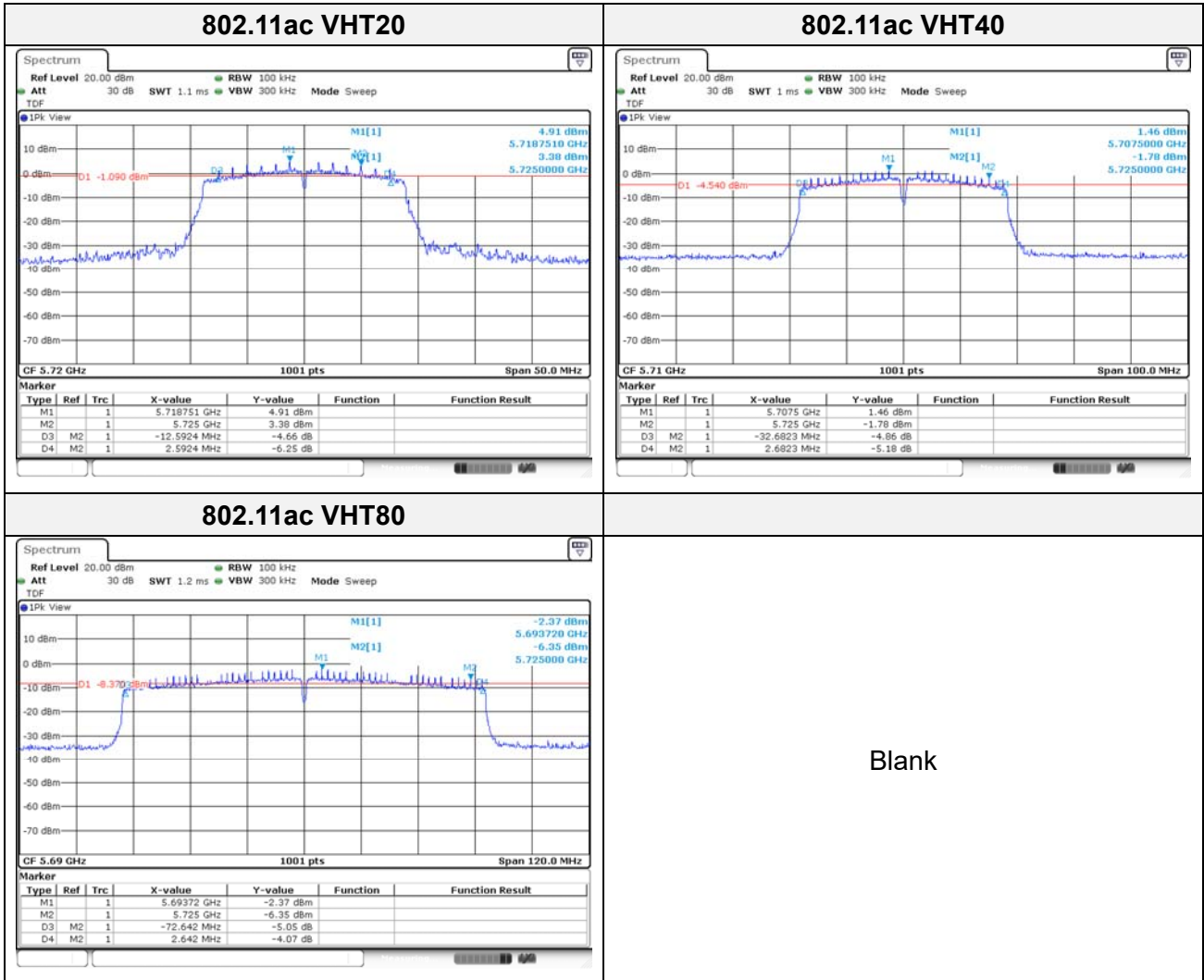
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**Output Power**

Test mode	Band	Frequency (MHz)	Measured output power			Limit (dBm)
			Reading (dBm)	DCF (dB)	Result (dBm)	
802.11a	UNII-2C	5 720	15.42	0.19	15.61	22.82
802.11n HT20			15.27	0.16	15.43	22.94
802.11ac VHT20			14.28	0.14	14.42	22.82
802.11a	UNII-3	5 720	7.91	0.19	8.10	30.00
802.11n HT20			8.14	0.16	8.30	
802.11ac VHT20			7.15	0.14	7.29	
802.11n HT40	UNII-2C	5 710	13.76	0.29	14.05	23.98
802.11ac VHT40			13.75	0.30	14.05	
802.11n HT40	UNII-3	5 710	1.36	0.29	1.65	30.00
802.11ac VHT40			1.53	0.30	1.83	
802.11ac VHT80	UNII-2C	5 690	12.45	0.56	13.01	23.98
	UNII-3	5 690	-3.14	0.56	-2.58	30.00

Note.

1. Result(dB m) = Reading Power + D.C.F

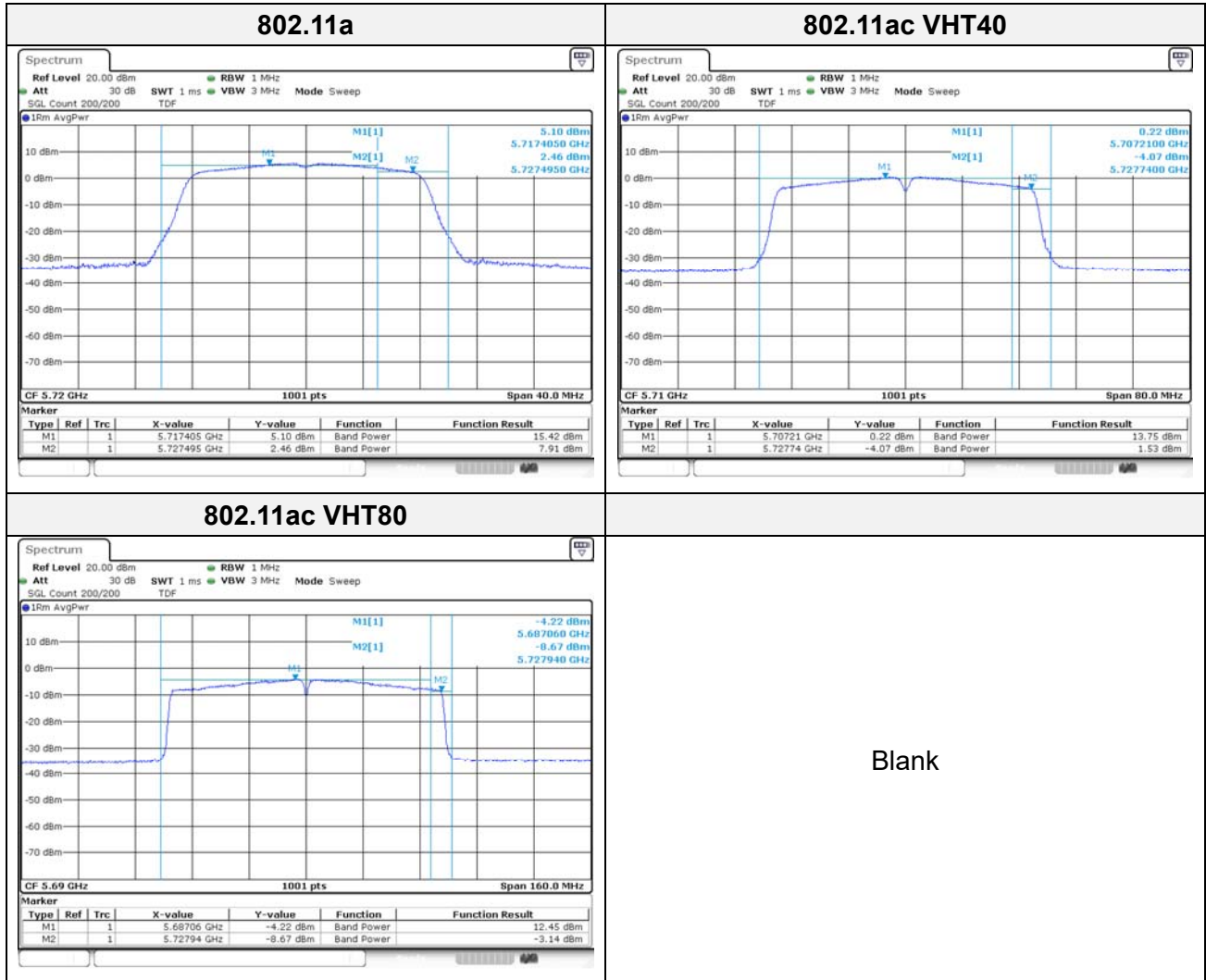
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In order to simplify the report, attached plots were only the Worst Case per bandwidth.



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**Power Spectral Density**

Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)	DCF (dB)	Maximum PSD (dB m/MHz)	Limit (dBm/MHz)
802.11a	UNII-2C	5 720	5.91	0.19	6.10	11.00
802.11n HT20			5.65	0.16	5.81	
802.11ac VHT20			4.70	0.14	4.84	
802.11n HT40		5 710	0.69	0.29	0.98	
802.11ac VHT40			0.51	0.30	0.81	
802.11ac VHT80			5 690	-3.80	0.56	

Test mode	Band	Frequency (MHz)	Measured PSD (dBm/ 500 kHz)	DCF (dB)	Maximum PSD (dBm/ 500 kHz)	Limit (dBm /500 kHz)
802.11a	UNII-3	5 720	1.49	0.19	1.68	30.00
802.11n HT20			0.95	0.16	1.11	
802.11ac VHT20			0.13	0.14	0.27	
802.11n HT40		5 710	-5.60	0.29	-5.31	
802.11ac VHT40			-5.56	0.30	-5.26	
802.11ac VHT80			5 690	-10.29	0.56	

Notes:

- Maximum PSD calculation
- Maximum PSD = Measured PSD + D.C.F

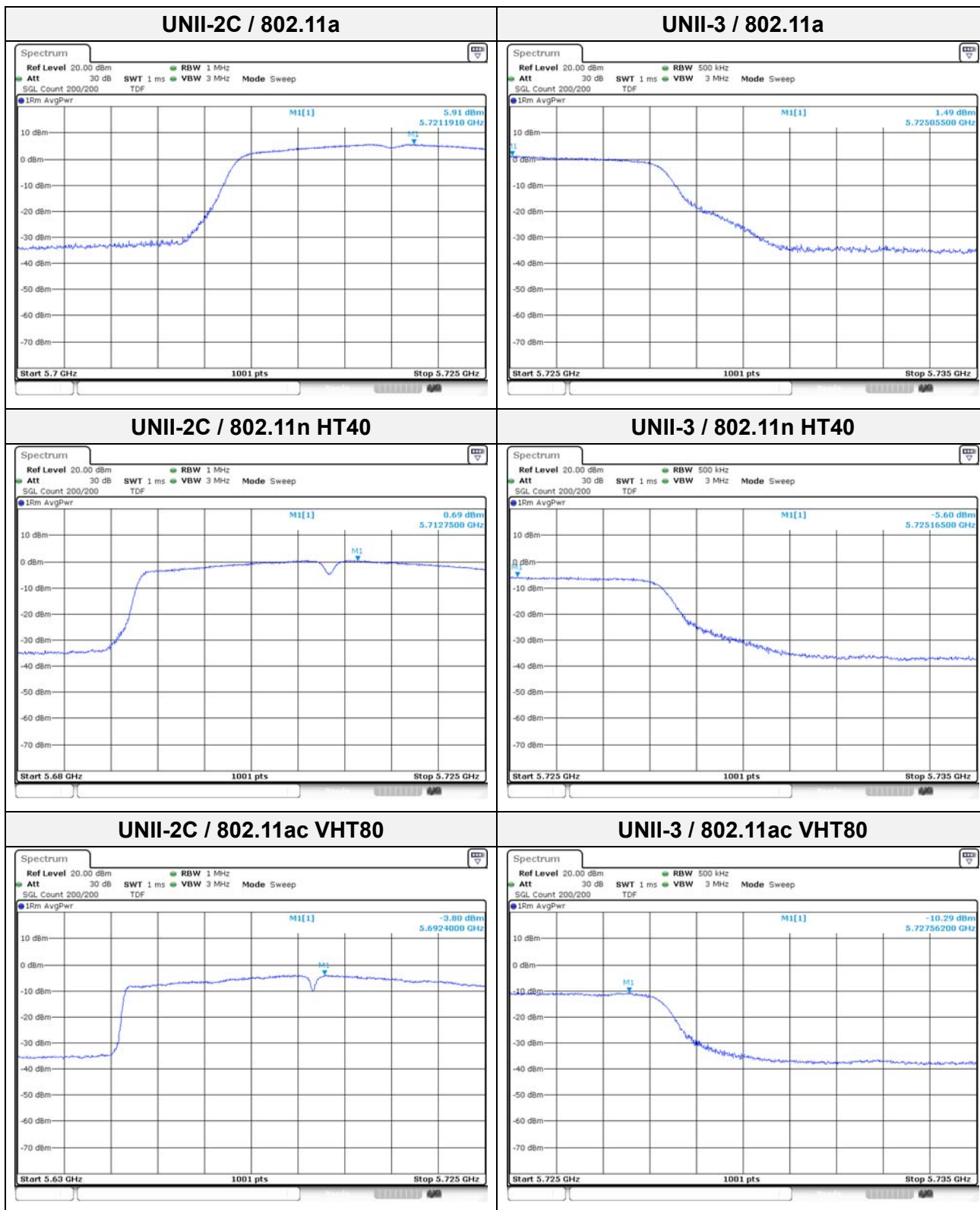
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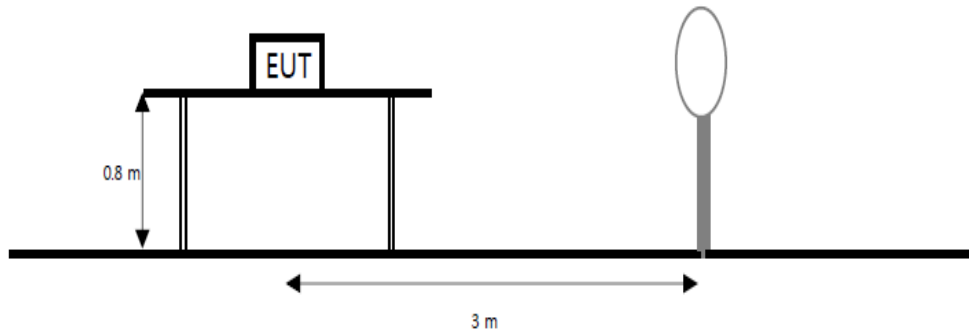
In order to simplify the report, attached plots were only the Worst Case per bandwidth.



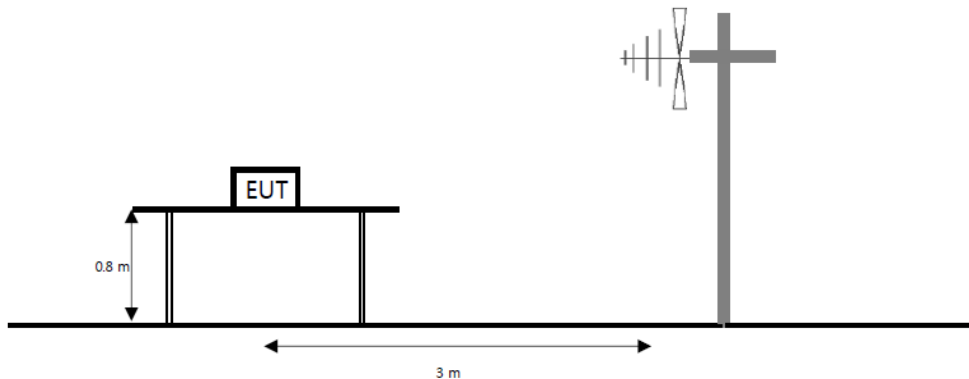
7.6. Spurious Emission, Band Edge and Restricted bands

Test setup

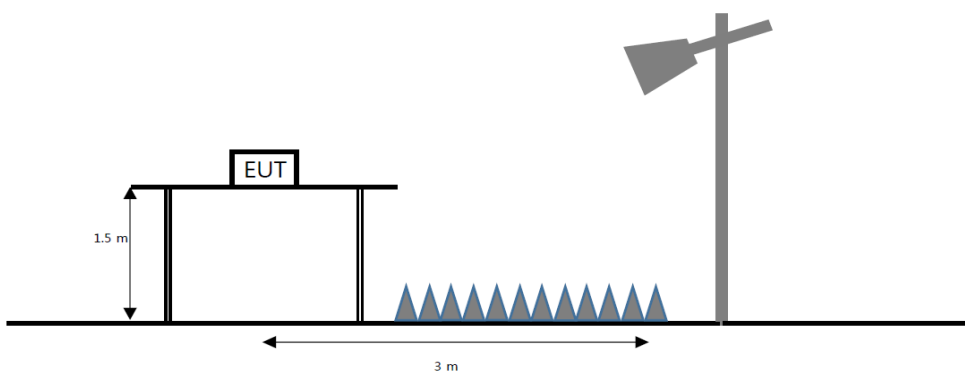
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions



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.



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**Limit**

According to section 15.209(a) except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength ($\mu\text{V}/\text{m}$)	Measurement distance (m)
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/F(kHz)	30
1.705 - 30	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

**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., Section 15.231 and 15.241.

According to section 15.205(a) and (b) only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.009 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 - 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 - 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 - 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 - 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 - 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 - 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 - 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 - 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525	2 483.5 - 2 500	17.7 - 21.4
8.376 25 - 8.386 75	25	2 690 - 2 900	22.01 - 23.12
8.414 25 - 8.414 75	156.7 - 156.9	3 260 - 3 267	23.6 - 24.0
12.29 - 12.293	162.012 5 - 167.17	3 332 - 3 339	31.2 - 31.8
12.519 75 - 12.520 25	167.72 - 173.2	3 345.8 - 3 358	36.43 - 36.5
12.576 75 - 12.577 25	240 - 285	3 600 - 4 400	Above 38.6
13.36 - 13.41	322 - 335.4		

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in section 15.209. At frequencies equal to or less than 1 000 MHz, compliance with the limits in section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 MHz, compliance with the emission limits in section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in section 15.35 apply to these measurements.

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According to section 15.407(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:

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

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.

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.

For transmitters operating in the 5.725-5.85 GHz band: 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.

Test procedureANSI C63.10-2013 Section 12.7.7.2, 12.7.5, 12.7.6
KDB 789033 D02 v02r01 – Section G**Test settings****Peak field strength measurements**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in table
3. VBW \geq (3 \times RBW)
4. Detector = peak
5. Sweep time = auto
6. Trace mode = max hold
7. Allow sweeps to continue until the trace stabilizes

Table. RBW as a function of frequency

Frequency	RBW
9 kHz to 150 kHz	200 Hz to 300 Hz
0.15 MHz to 30 MHz	9 kHz to 10 kHz
30 MHz to 1 000 MHz	100 kHz to 120 kHz
> 1 000 MHz	1 MHz

Average field strength measurements**Trace averaging with continuous EUT transmission at full power**

If the EUT can be configured or modified to transmit continuously (D \geq 98%), then the average emission levels shall be measured using the following method (with EUT transmitting continuously):

1. RBW = 1 MHz (unless otherwise specified).
2. VBW \geq (3 \times RBW).
3. Detector = RMS (power averaging), 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.
4. 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 to use linear voltage averaging. Log or dB averaging shall not be used.
5. Sweep time = auto.
6. Perform a trace average of at least 100 traces.

Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (D \geq 98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less than $\pm 2\%$), then the following procedure shall be used:

1. The EUT shall be configured to operate at the maximum achievable duty cycle.
2. Measure the duty cycle D of the transmitter output signal as described in 11.6.
3. RBW = 1 MHz (unless otherwise specified).
4. VBW \geq [3 \times RBW].
5. Detector = RMS (power averaging), 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.

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6. 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 to use linear voltage averaging. Log or dB averaging shall not be used.
7. Sweep time = auto.
8. Perform a trace average of at least 100 traces.
9. A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
 - 1) If power averaging (rms) mode was used in step f), then the applicable correction factor is $[10 \log (1 / D)]$, where D is the duty cycle.
 - 2) If linear voltage averaging mode was used in step f), then the applicable correction factor is $[20 \log (1 / D)]$, where D is the duty cycle.
 - 3) If a specific emission is demonstrated to be continuous ($D \geq 98\%$) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Notes:

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. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or F_d (dB)
3. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
4. Average test would be performed if the peak result were greater than the average limit.
5. ¹⁾ means restricted band.
6. According to part 15.31(f)(2), an extrapolation factor of 40 dB/decade is applied because measured distance of radiated emission is 3 m.
7. Below 30 MHz frequency range, In order to search for the worst result, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported. when the emission level was higher than 20 dB of the limit, then the following statement shall be made: "No spurious emissions were detected within 20 dB of the limit."
8. For above 1 GHz pre-scan to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 kHz for peak measurements.

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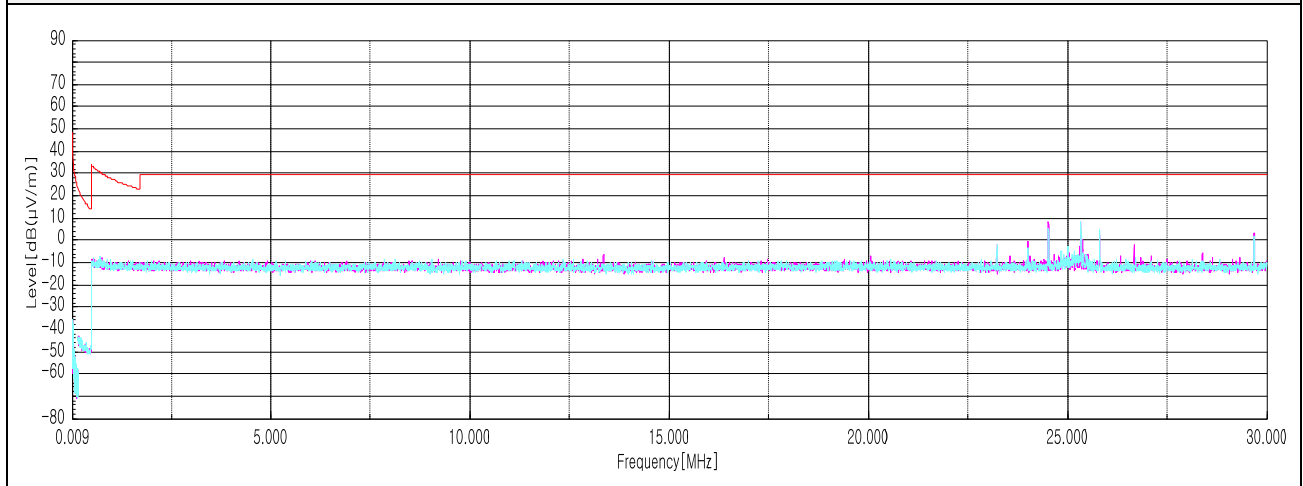


Test results (Below 30 MHz) – Worst case: 802.11a / UNII-2C 5 700 MHz

Frequency	Pol.	Reading	Ant. Factor	Amp. +Cable	Distance Factor	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μ V)]	[dB]	[dB]	[dB]	[dB]	[dB(μ V/m)]	[dB(μ V/m)]	[dB]

No spurious emissions were detected within 20 dB of the limit.

Horizontal/Vertical



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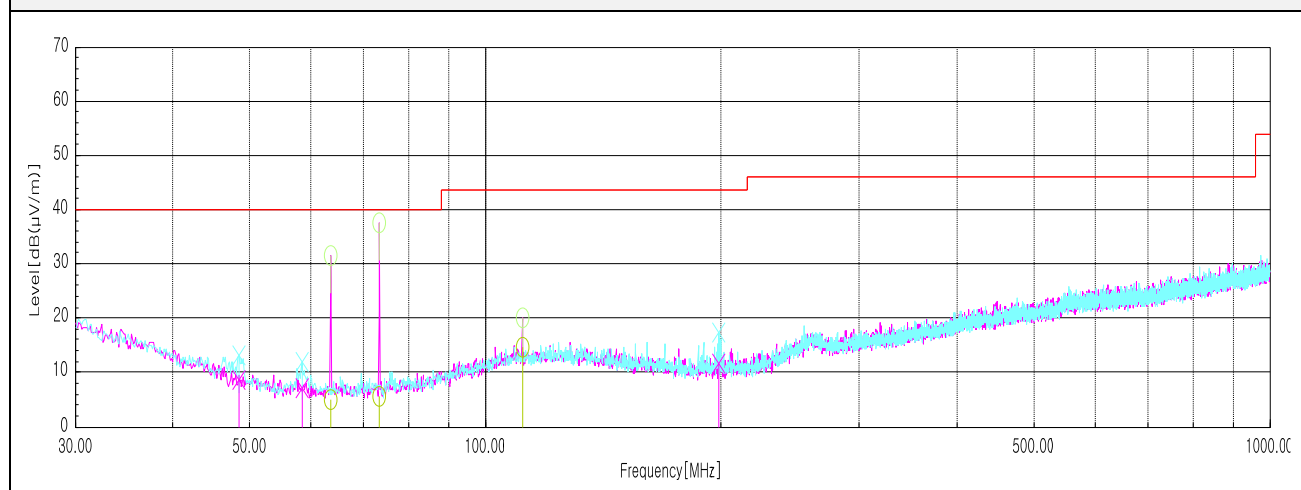
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Test results (Below 1 000 MHz) – Worst case: 802.11a / UNII-2C 5 700 MHz

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Quasi peak data								
48.55	V	23.90	14.52	-29.92	-	8.50	40.00	31.50
58.37	V	24.30	12.36	-29.67	-	6.99	40.00	33.01
63.59	H	22.30	12.20	-29.64	-	4.86	40.00	35.14
73.29 ¹⁾	H	22.70	12.43	-29.43	-	5.70	40.00	34.30
111.48 ¹⁾	H	25.30	17.70	-28.53	-	14.47	43.50	29.03
198.78	V	23.50	15.18	-27.15	-	11.53	43.50	31.97

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**Test results (Above 1 000 MHz)****802.11a UNII-1****Lowest Channel (5 180 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 149.96 ¹⁾	H	47.31	34.17	-26.51	-	54.97	74.00	19.03
10 275.95	H	58.64	37.48	-49.67	-	46.45	68.20	21.75
15 513.13 ¹⁾	H	53.78	39.99	-45.52	-	48.25	74.00	25.75
Average Data								
5 149.96 ¹⁾	H	34.46	34.17	-26.51	0.19	42.31	54.00	11.69

Middle Channel (5 200 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 603.34 ¹⁾	V	59.16	37.80	-49.66	-	47.30	74.00	26.70
15 182.50	V	54.63	40.16	-42.77	-	52.02	68.20	16.18
Average Data								
No spurious emissions were detected within 20 dB of the limit								

Highest Channel (5 240 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 272.36	V	58.57	37.47	-49.67	-	46.37	68.20	21.83
15 652.92 ¹⁾	V	54.73	39.94	-45.62	-	49.05	74.00	24.95
Average Data								
No spurious emissions were detected within 20 dB of the limit								

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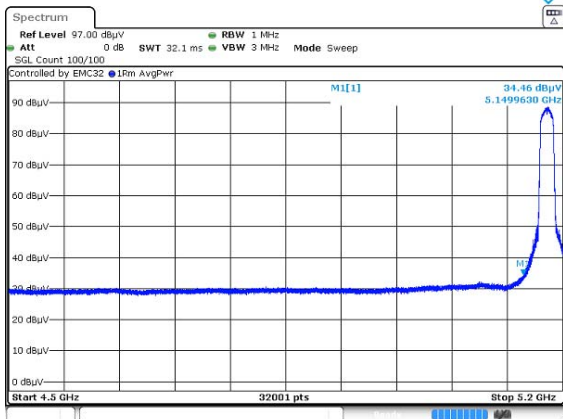
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802.11a UNII-1

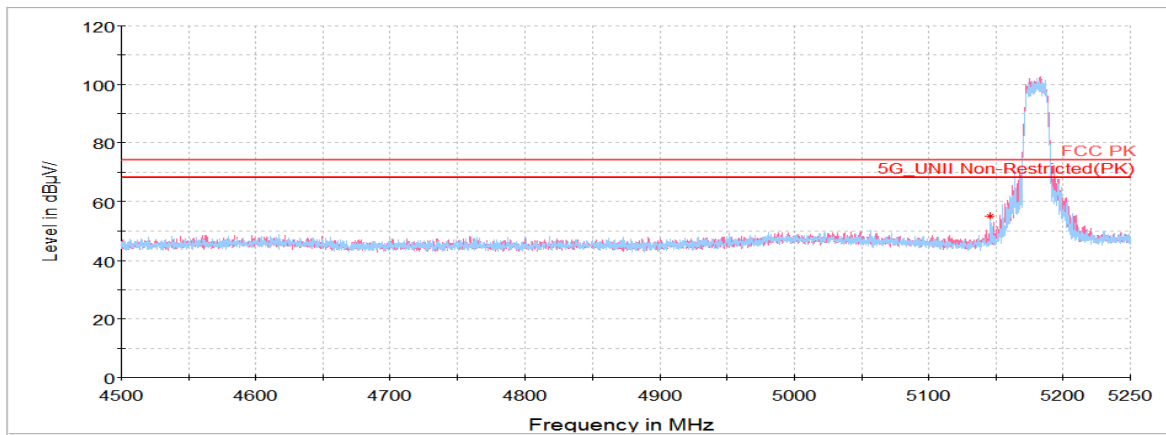
Lowest Channel (5 180 MHz)

Average data



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Horizontal/Vertical for Band-edge



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**802.11n HT20 UNII-1****Lowest Channel (5 180 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 149.18 ¹⁾	V	54.13	34.17	-26.51	-	61.79	74.00	12.21
10 276.67	H	57.92	37.48	-49.67	-	45.73	68.20	22.47
15 615.91 ¹⁾	V	54.60	39.95	-45.60	-	48.95	74.00	25.05
Average Data								
5 149.18 ¹⁾	V	37.38	34.17	-26.51	0.16	45.20	54.00	8.80

Middle Channel (5 200 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 587.17	V	59.05	37.79	-49.68	-	47.16	68.20	21.04
15 564.88 ¹⁾	V	54.69	39.97	-45.56	-	49.10	74.00	24.90
Average Data								
No spurious emissions were detected within 20 dB of the limit								

Highest Channel (5 240 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 585.38	H	58.51	37.79	-49.68	-	46.62	68.20	21.58
15 567.39 ¹⁾	H	55.27	39.97	-45.56	-	49.68	74.00	24.32
Average Data								
No spurious emissions were detected within 20 dB of the limit								

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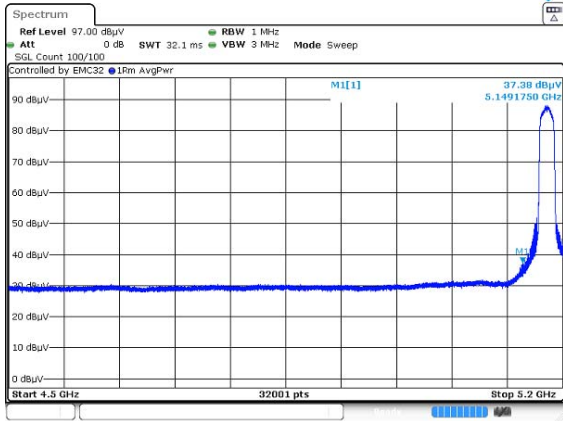
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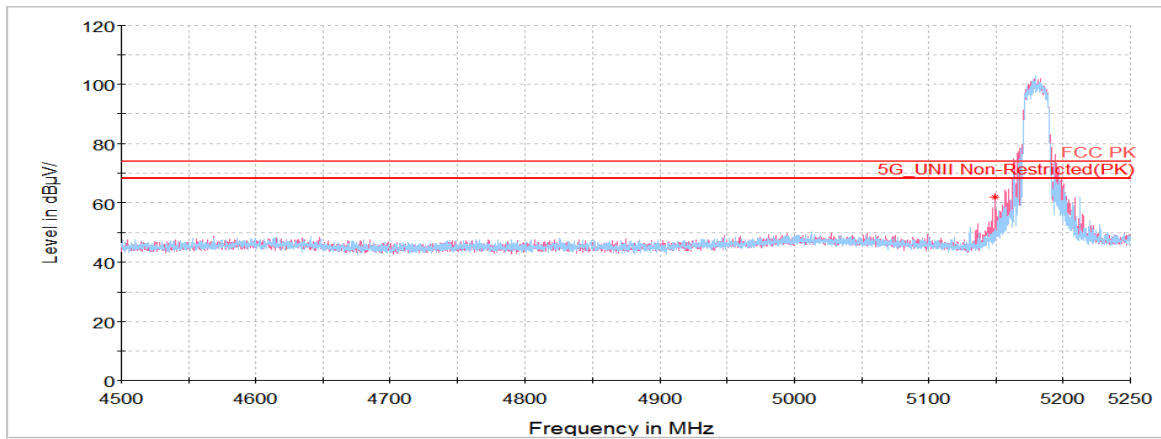
Lowest Channel (5 180 MHz)

Average data



Blank

Horizontal/Vertical for Band-edge



802.11n HT40 UNII-1

Lowest Channel (5 190 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB($\mu V/m$))	(dB($\mu V/m$))	(dB)
Peak data								
5 149.46 ¹⁾	V	51.49	34.17	-26.51	-	59.15	74.00	14.85
10 394.19	V	57.71	37.59	-49.73	-	45.57	68.20	22.63
15 566.31 ¹⁾	H	54.48	39.97	-45.56	-	48.89	74.00	25.11
Average Data								
5 149.46 ¹⁾	V	35.42	34.17	-26.51	0.29	43.37	54.00	10.63

Highest Channel (5 230 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB($\mu V/m$))	(dB($\mu V/m$))	(dB)
Peak data								
10 455.64	H	57.08	37.66	-49.76	-	44.98	68.20	23.22
15 700.36 ¹⁾	V	53.69	39.92	-45.66	-	47.95	74.00	26.05
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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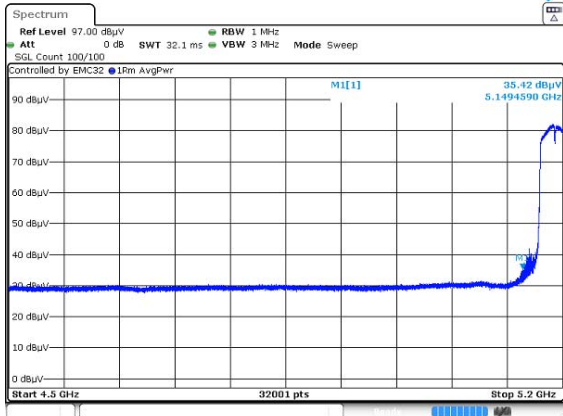
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802.11n HT40 UNII-1

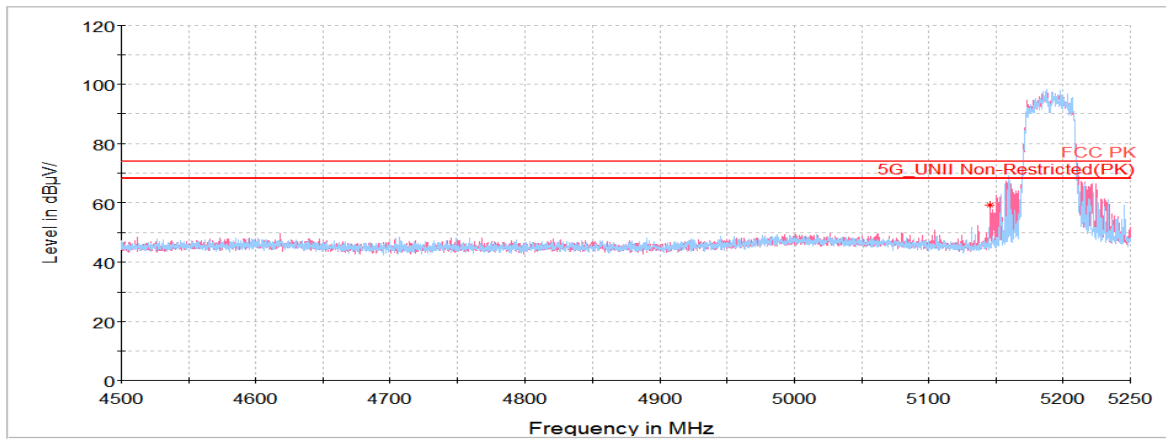
Lowest Channel (5 190 MHz)

Average data



Blank

Horizontal/Vertical for Band-edge



802.11ac VHT20 UNII-1

Lowest Channel (5 180 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB($\mu V/m$))	(dB($\mu V/m$))	(dB)
Peak data								
5 146.90 ¹⁾	V	48.31	34.16	-26.53	-	55.94	74.00	18.06
10 270.92	H	58.94	37.47	-49.66	-	46.75	68.20	21.45
15 230.30	H	55.25	40.15	-43.19	-	52.21	68.20	15.99
Average Data								
5 146.90 ¹⁾	V	32.92	34.16	-26.53	0.14	40.69	54.00	13.31

Middle Channel (5 200 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB($\mu V/m$))	(dB($\mu V/m$))	(dB)
Peak data								
10 325.91	H	58.09	37.53	-49.69	-	45.93	68.20	22.27
15 374.77 ¹⁾	H	53.41	40.13	-44.43	-	49.11	74.00	24.89
Average Data								
No spurious emissions were detected within 20 dB of the limit								

Highest Channel (5 240 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB($\mu V/m$))	(dB($\mu V/m$))	(dB)
Peak data								
10 484.75	H	56.95	37.68	-49.78	-	44.85	68.20	23.35
15 715.45 ¹⁾	V	54.93	39.91	-45.67	-	49.17	74.00	24.83
Average Data								
No spurious emissions were detected within 20 dB of the limit								

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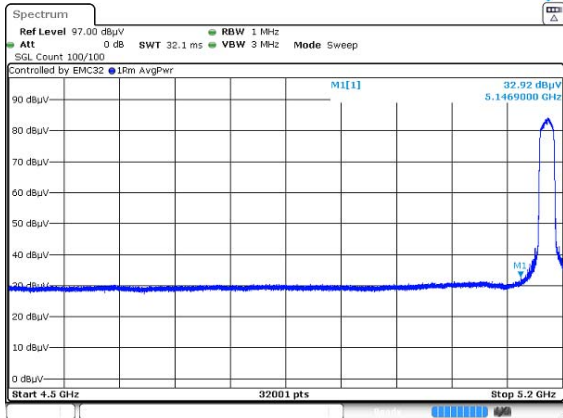
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802.11ac VHT20 UNII-1

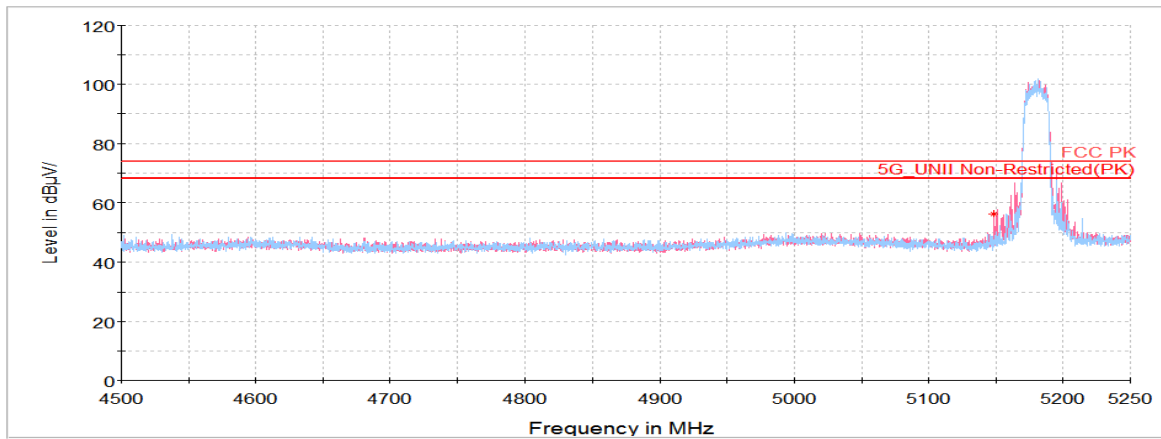
Lowest Channel (5 180 MHz)

Average data



Blank

Horizontal/Vertical for Band-edge



802.11ac VHT40 UNII-1

Lowest Channel (5 190 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 146.53 ¹⁾	V	45.76	34.16	-26.53	-	53.39	74.00	20.61
10 390.23	H	57.28	37.59	-49.73	-	45.14	68.20	23.06
15 563.80 ¹⁾	H	53.71	39.97	-45.56	-	48.12	74.00	25.88
Average Data								
5 146.53 ¹⁾	V	33.83	34.16	-26.53	0.30	41.76	54.00	12.24

Highest Channel (5 230 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 461.75	V	56.47	37.66	-49.76	-	44.37	68.20	23.83
15 699.64 ¹⁾	H	53.61	39.92	-45.66	-	47.87	74.00	26.13
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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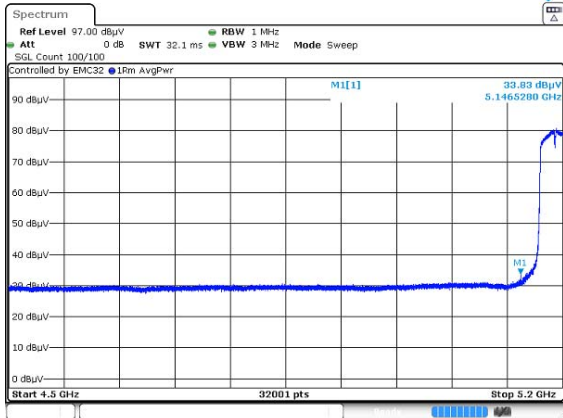
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802.11ac VHT40 UNII-1

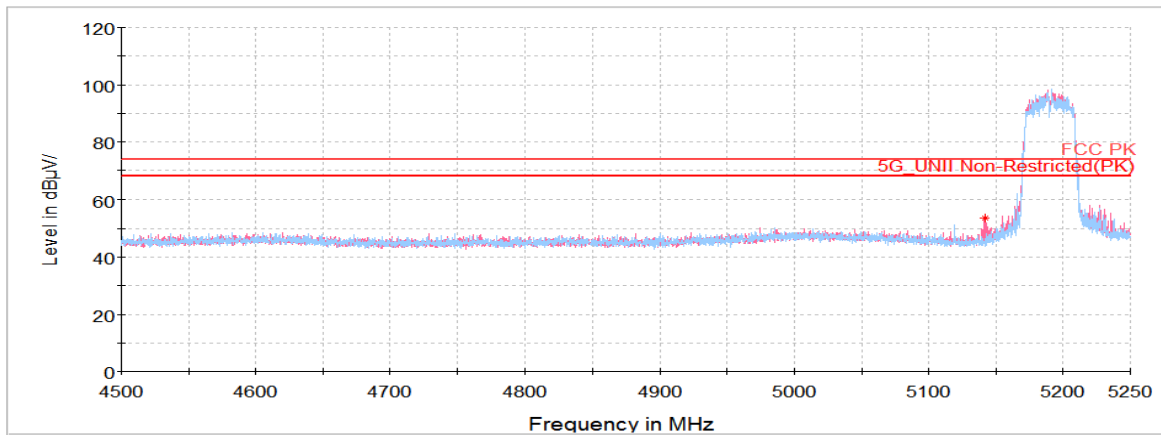
Lowest Channel (5 190 MHz)

Average data



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Horizontal/Vertical for Band-edge



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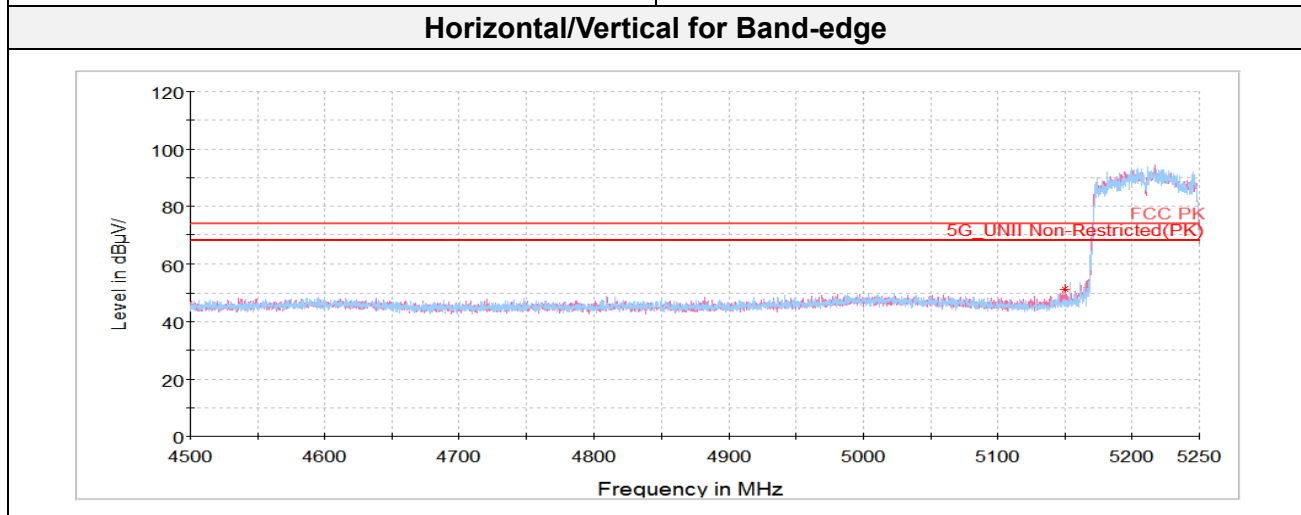
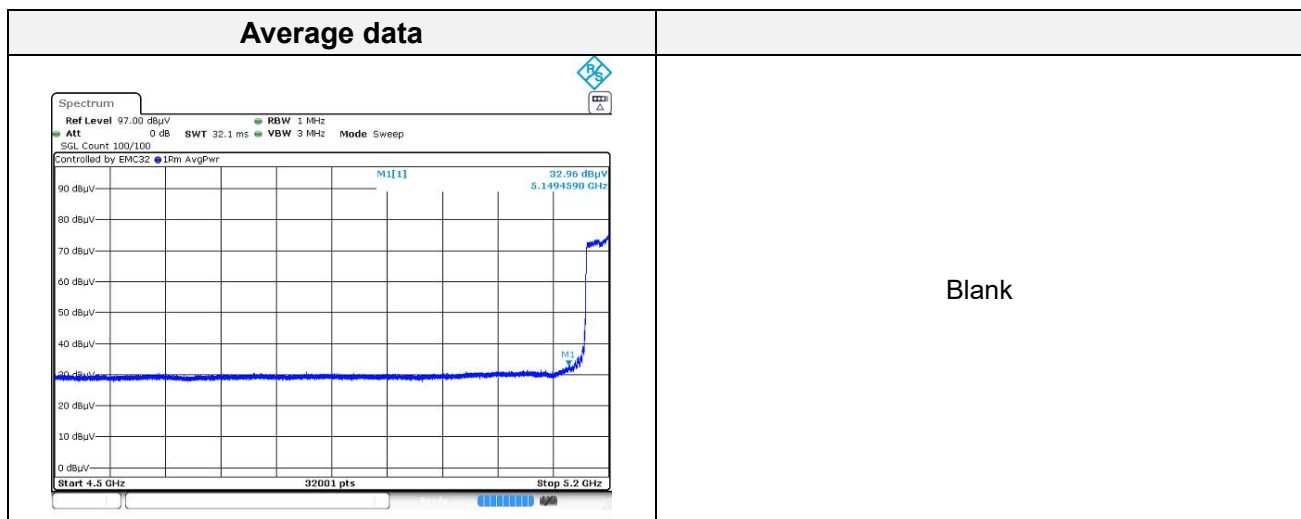
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802.11ac VHT80 UNII-1

Lowest Channel (5 210 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 149.46 ¹⁾	V	43.53	34.17	-26.51	-	51.19	74.00	22.81
10 429.41	V	56.20	37.63	-49.75	-	44.08	68.20	24.12
15 624.89 ¹⁾	V	52.99	39.95	-45.60	-	47.34	74.00	26.66
Average Data								
5 149.46 ¹⁾	V	32.96	34.17	-26.51	0.56	41.18	54.00	12.82



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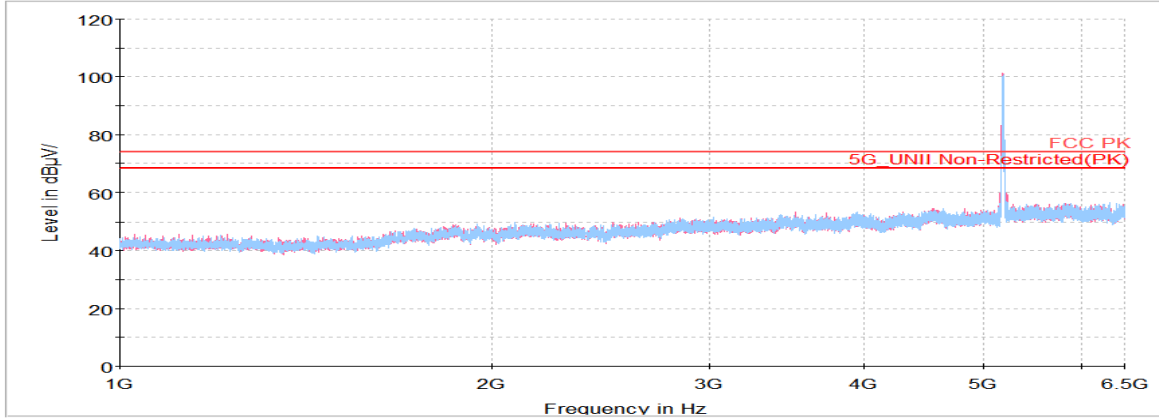


Plot of Harmonics and Spurious Emissions

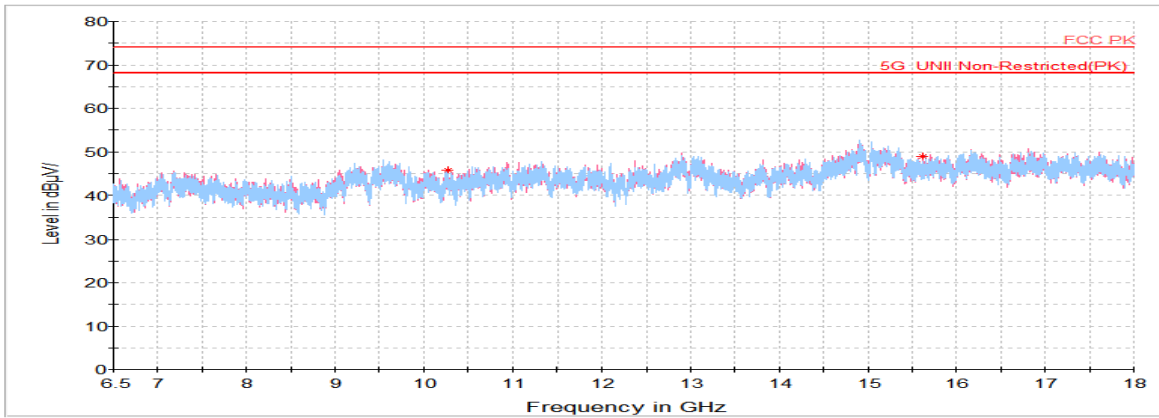
In order to simplify the report, attached plots were only the lowest margin condition

802.11n HT20_UNII-1_Lowest Channel (5 180 MHz)

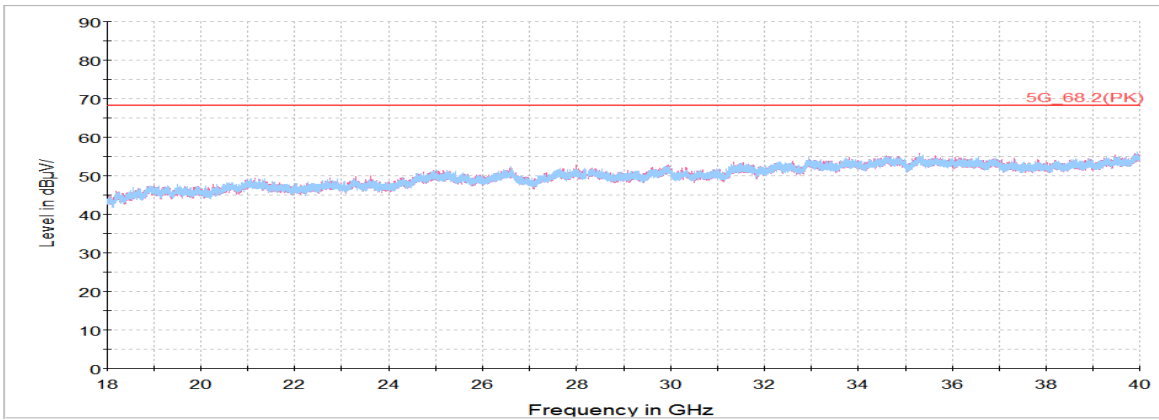
Horizontal/Vertical for 1 GHz ~ 6.5 GHz



Horizontal/Vertical for 6.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 40 GHz



802.11a UNII-2A

Lowest Channel (5 260 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 531.47	H	55.68	37.73	-49.74	-	43.67	68.20	24.53
15 765.77 ¹⁾	H	55.66	39.89	-45.71	-	49.84	74.00	24.16
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Middle Channel (5 280 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 560.94	H	57.81	37.76	-49.71	-	45.86	68.20	22.34
15 482.22 ¹⁾	H	52.48	40.10	-45.36	-	47.22	74.00	26.78
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 320 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 351.32 ¹⁾	V	48.17	34.53	-25.48	-	57.22	74.00	16.78
10 640.72 ¹⁾	H	56.87	37.84	-49.61	-	45.10	74.00	28.90
15 956.23 ¹⁾	H	52.34	39.82	-45.84	-	46.32	74.00	27.68
Average Data								
5 351.32 ¹⁾	V	34.25	34.53	-25.48	0.19	43.49	54.00	10.51

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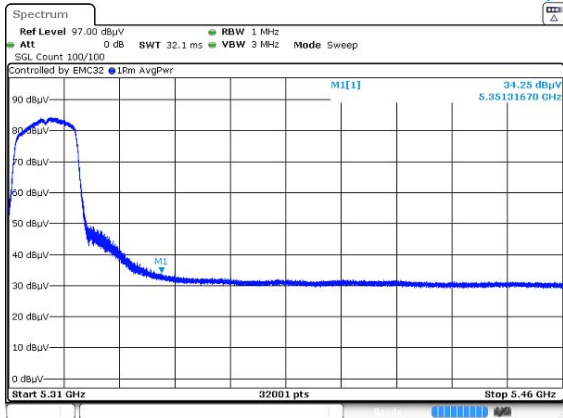
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802.11a UNII-2A

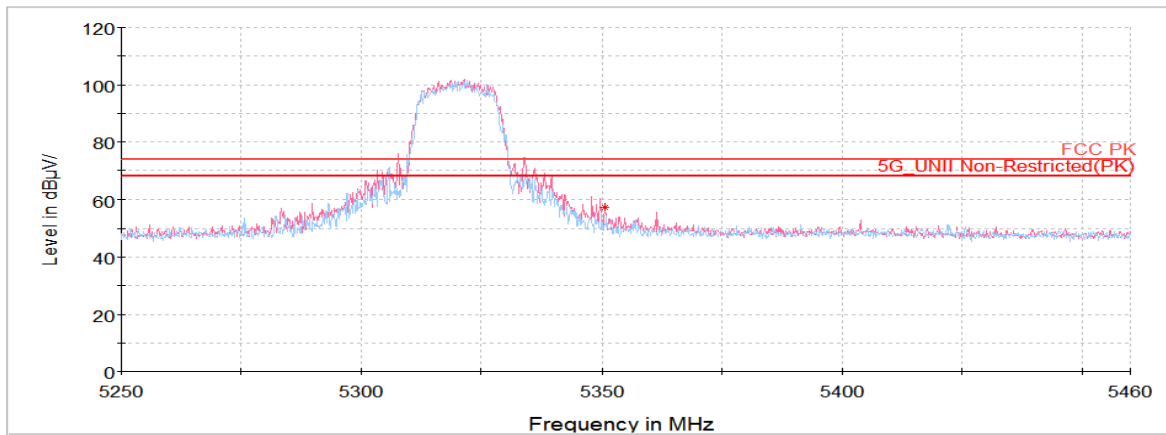
Highest Channel (5 320 MHz)

Average data



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Horizontal/Vertical for Band-edge



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KCTL**802.11n HT20 UNII-2A**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 582.50	V	58.16	37.78	-49.68	-	46.26	68.20	21.94
15 892.27 ¹⁾	V	55.45	39.84	-45.80	-	49.49	74.00	24.51
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Middle Channel (5 280 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 637.13 ¹⁾	H	58.29	37.84	-49.61	-	46.52	74.00	27.48
15 792.72 ¹⁾	V	55.68	39.88	-45.72	-	49.84	74.00	24.16
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 320 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 350.78 ¹⁾	V	50.28	34.53	-25.48	-	59.33	74.00	14.67
10 794.89 ¹⁾	H	58.15	37.99	-49.42	-	46.72	74.00	27.28
15 900.53 ¹⁾	H	55.87	39.84	-45.80	-	49.91	74.00	24.09
Average Data								
5 350.78 ¹⁾	V	35.31	34.53	-25.48	0.16	44.52	54.00	9.48

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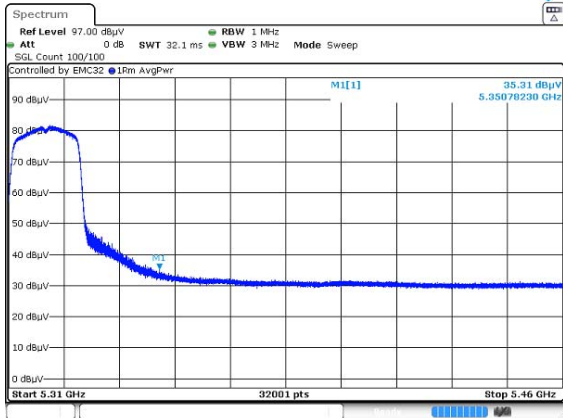
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802.11n HT20 UNII-2A

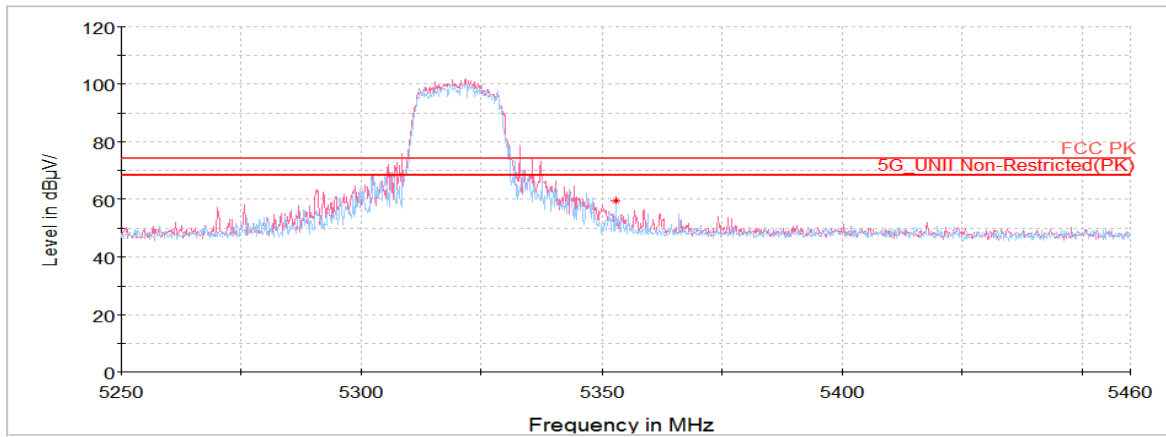
Highest Channel (5 320 MHz)

Average data



Blank

Horizontal/Vertical for Band-edge



802.11n HT40 UNII-2A

Lowest Channel (5 270 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ N/m))	(dB(μ N/m))	(dB)
Peak data								
10 590.05	V	58.79	37.79	-49.67	-	46.91	68.20	21.29
15 812.48 ¹⁾	H	54.60	39.88	-45.74	-	48.74	74.00	25.26
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 310 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ N/m))	(dB(μ N/m))	(dB)
Peak data								
5 350.20 ¹⁾	V	53.91	34.53	-25.48	-	62.96	74.00	11.04
10 615.20 ¹⁾	V	58.82	37.82	-49.64	-	47.00	74.00	27.00
16 050.75 ¹⁾	V	55.42	40.66	-46.03	-	50.05	74.00	23.95
Average Data								
5 350.20 ¹⁾	V	37.88	34.53	-25.48	0.29	47.22	54.00	6.78

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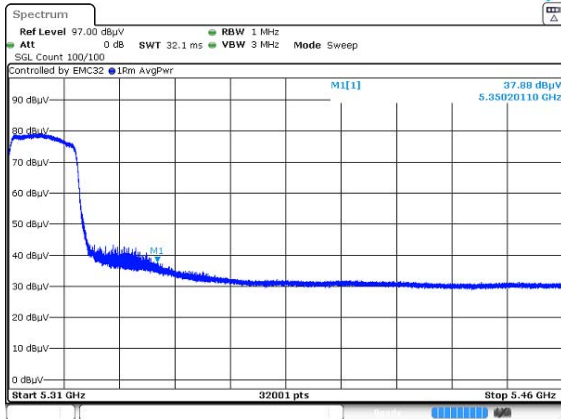
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802.11n HT40 UNII-2A

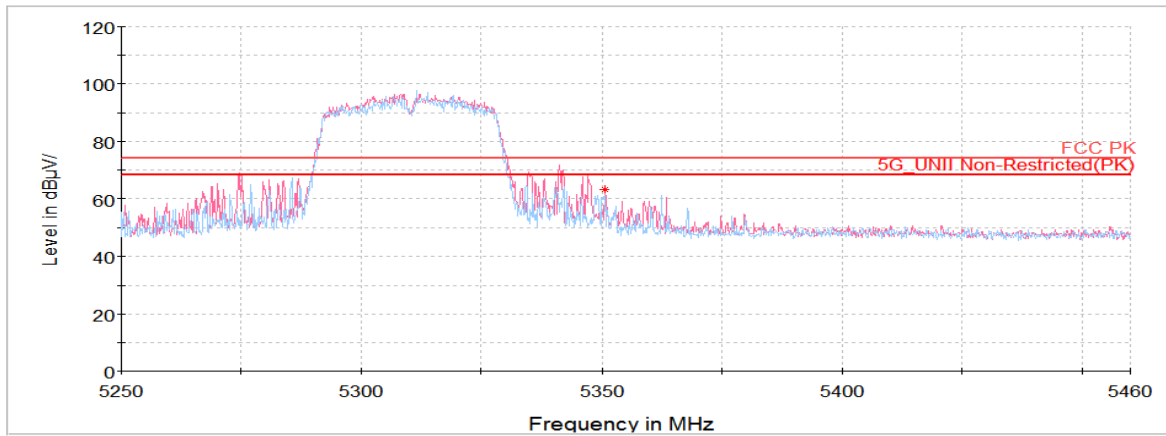
Highest Channel (5 310 MHz)

Average data



Blank

Horizontal/Vertical for Band-edge



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**802.11ac VHT20 UNII-2A****Lowest Channel (5 260 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 588.97	H	58.04	37.79	-49.67	-	46.16	68.20	22.04
15 720.13 ¹⁾	V	54.94	39.91	-45.67	-	49.18	74.00	24.82
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Middle Channel (5 280 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
10 587.53	H	57.84	37.79	-49.68	-	45.95	68.20	22.25
15 903.41 ¹⁾	V	55.53	39.84	-45.80	-	49.57	74.00	24.43
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 320 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 351.33 ¹⁾	V	46.12	34.53	-25.47	-	55.18	74.00	18.82
10 732.36 ¹⁾	V	58.20	37.93	-49.50	-	46.63	74.00	27.37
15 913.83 ¹⁾	V	55.02	39.83	-45.81	-	49.04	74.00	24.96
Average Data								
5 351.33 ¹⁾	V	34.78	34.53	-25.47	0.14	43.98	54.00	10.02

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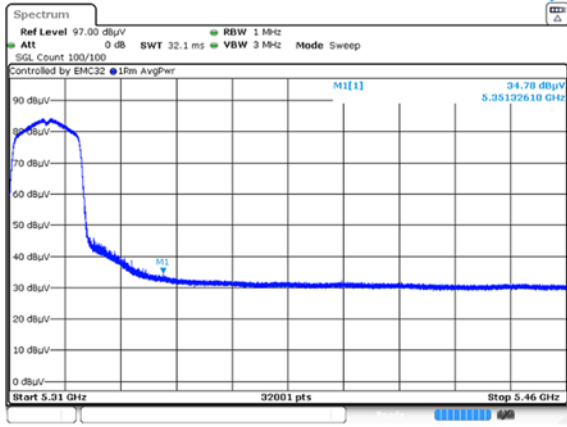
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802.11ac VHT20 UNII-2A

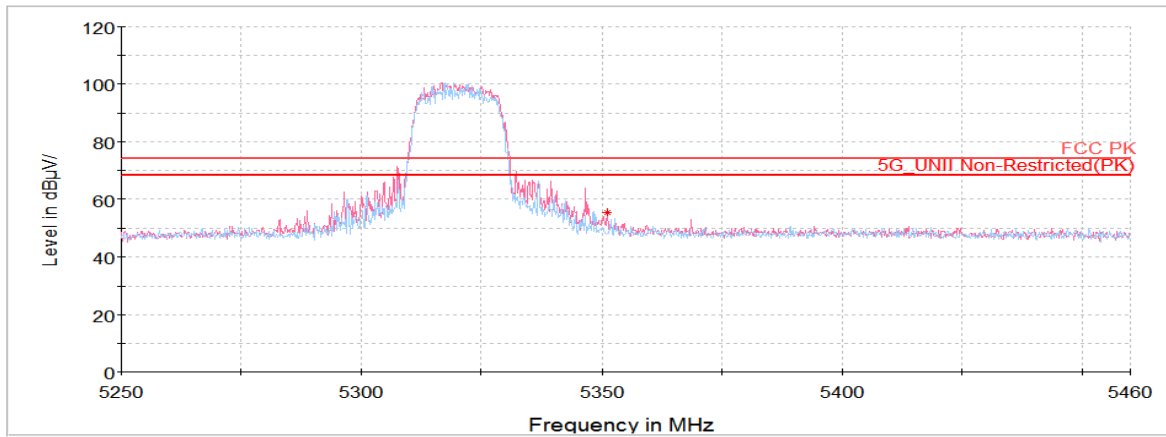
Highest Channel (5 320 MHz)

Average data



Blank

Horizontal/Vertical for Band-edge



802.11ac VHT40 UNII-2A

Lowest Channel (5 270 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
10 585.02	V	58.77	37.79	-49.68	-	46.88	68.20	21.32
15 724.08 ¹⁾	V	55.02	39.91	-45.67	-	49.26	74.00	24.74
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 310 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
5 350.12 ¹⁾	V	52.45	34.53	-25.48	-	61.50	74.00	12.50
10 737.39 ¹⁾	V	58.29	37.94	-49.49	-	46.74	74.00	27.26
15 903.41 ¹⁾	V	55.59	39.84	-45.80	-	49.63	74.00	24.37
Average Data								
5 350.12 ¹⁾	V	37.77	34.53	-25.48	0.30	47.12	54.00	6.88

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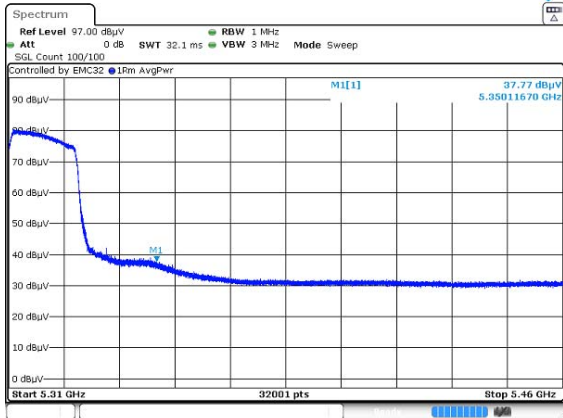
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802.11ac VHT40 UNII-2A

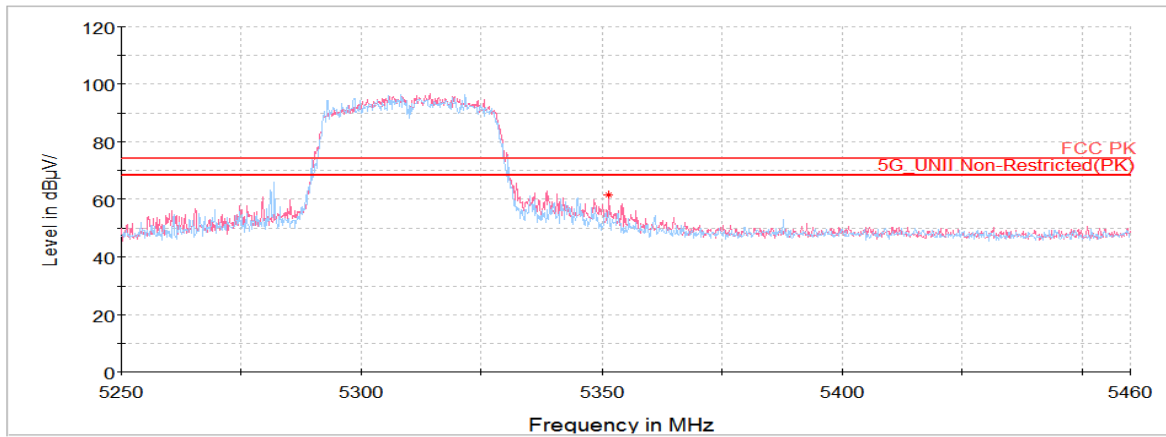
Highest Channel (5 310 MHz)

Average data



Blank

Horizontal/Vertical for Band-edge



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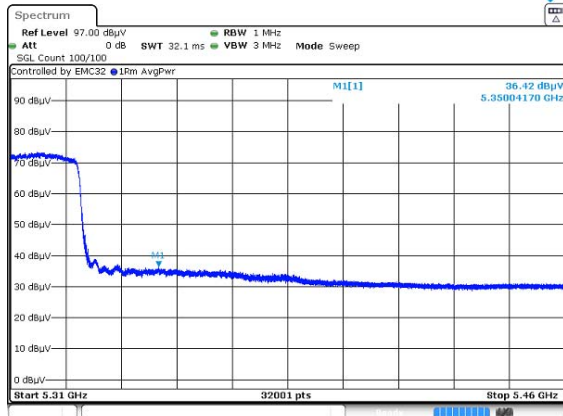


802.11ac VHT80 UNII-2A

Lowest Channel (5 290 MHz)

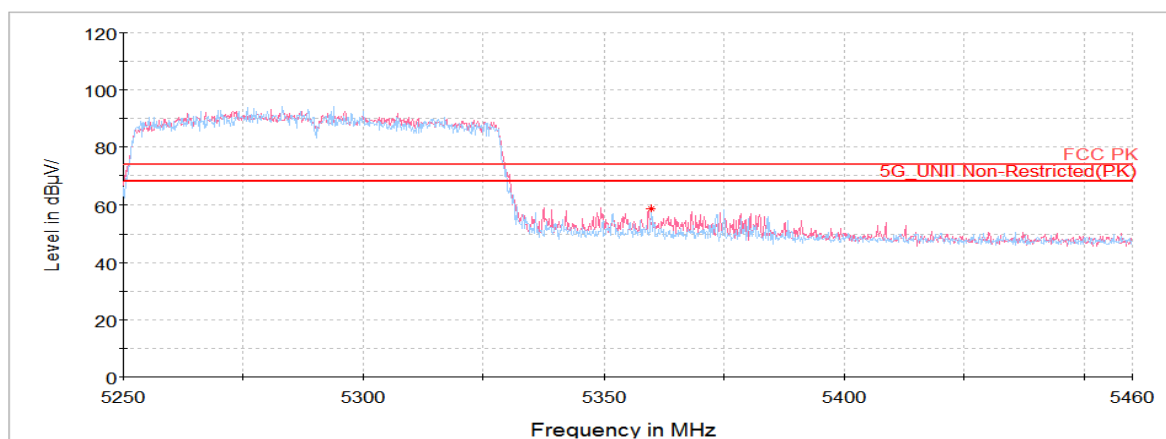
Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 350.04 ¹⁾	V	49.58	34.53	-25.49	-	58.62	74.00	15.38
10 594.00	V	58.70	37.79	-49.67	-	46.82	68.20	21.38
15 054.56	V	53.77	40.19	-41.67	-	52.29	68.20	15.91
Average Data								
5 350.04 ¹⁾	V	36.42	34.53	-25.49	0.56	46.02	54.00	7.98

Average data



Blank

Horizontal/Vertical for Band-edge



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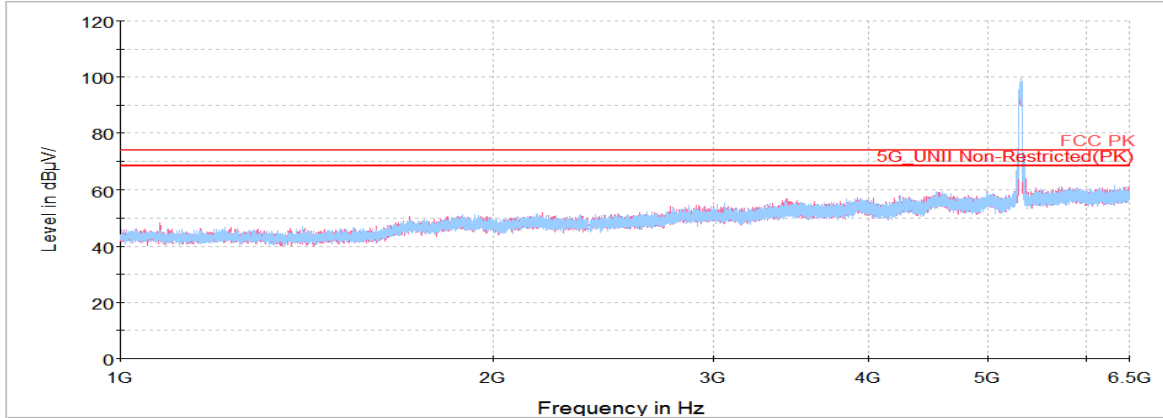


Plot of Harmonics and Spurious Emissions

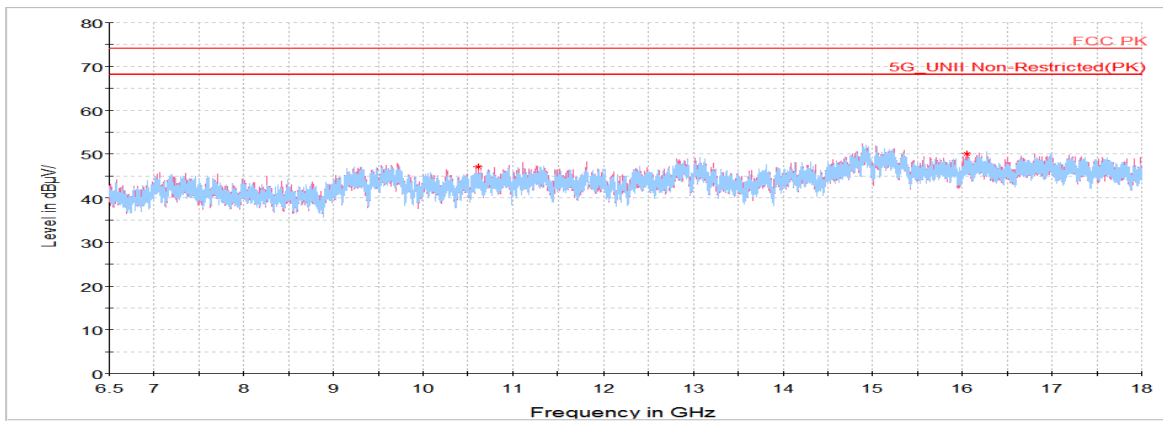
In order to simplify the report, attached plots were only the lowest margin condition

802.11n HT40_UNII-2A_Highest Channel (5 310 MHz)

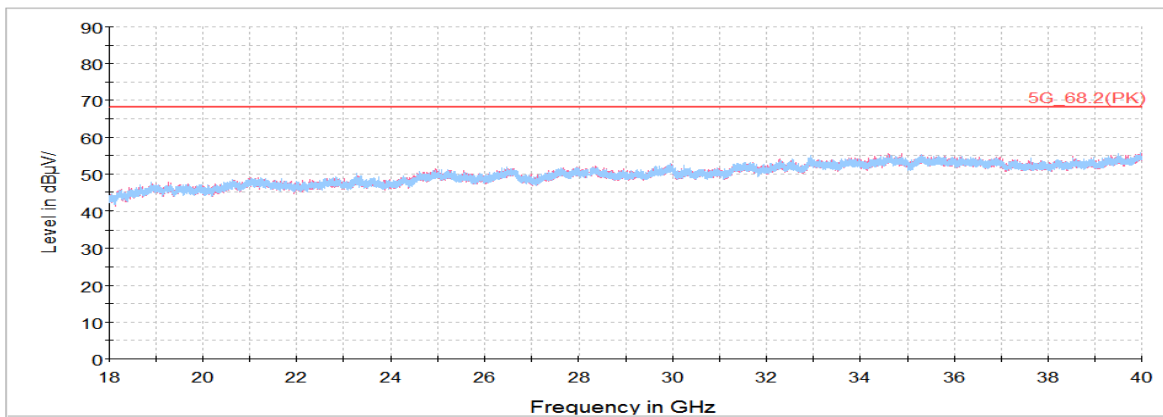
Horizontal/Vertical for 1 GHz ~ 6.5 GHz



Horizontal/Vertical for 6.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 40 GHz



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**802.11a UNII-2C****Lowest Channel (5 500 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 459.96 ¹⁾	V	43.42	34.73	-25.55	-	52.60	74.00	21.40
11 001.89 ¹⁾	H	63.02	38.20	-49.16	-	52.06	74.00	21.94
16 504.64	H	55.05	41.00	-47.35	-	48.70	68.20	19.50
Average Data								
5 459.96 ¹⁾	V	34.53	34.73	-25.55	0.19	43.90	54.00	10.10
11 001.89 ¹⁾	H	54.48	38.20	-49.16	0.19	43.71	54.00	10.29

Middle Channel (5 600 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 199.34 ¹⁾	H	62.75	38.24	-49.22	-	51.77	74.00	22.23
16 735.00	V	56.19	41.19	-47.03	-	50.35	68.20	17.85
Average Data								
11 199.34 ¹⁾	H	55.04	38.24	-49.22	0.19	44.25	54.00	9.75

Highest Channel (5 700 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 725.70	V	54.90	35.03	-25.53	-	64.40	68.20	3.80
11 400.08 ¹⁾	V	61.17	38.28	-49.28	-	50.17	74.00	23.83
17 151.88	H	55.30	40.61	-46.70	-	49.21	68.20	18.99
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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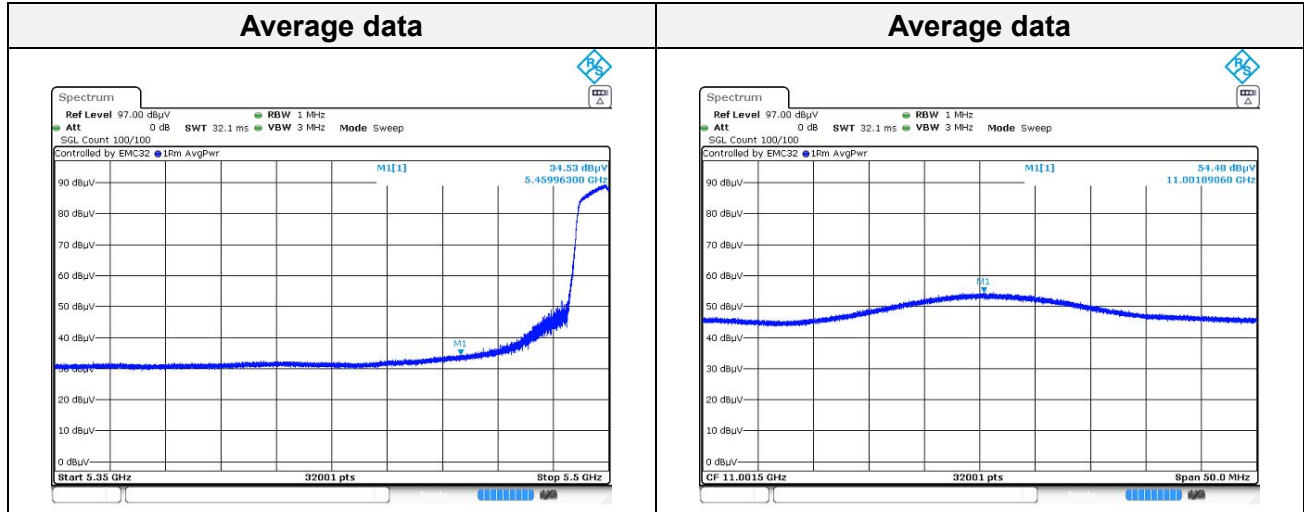
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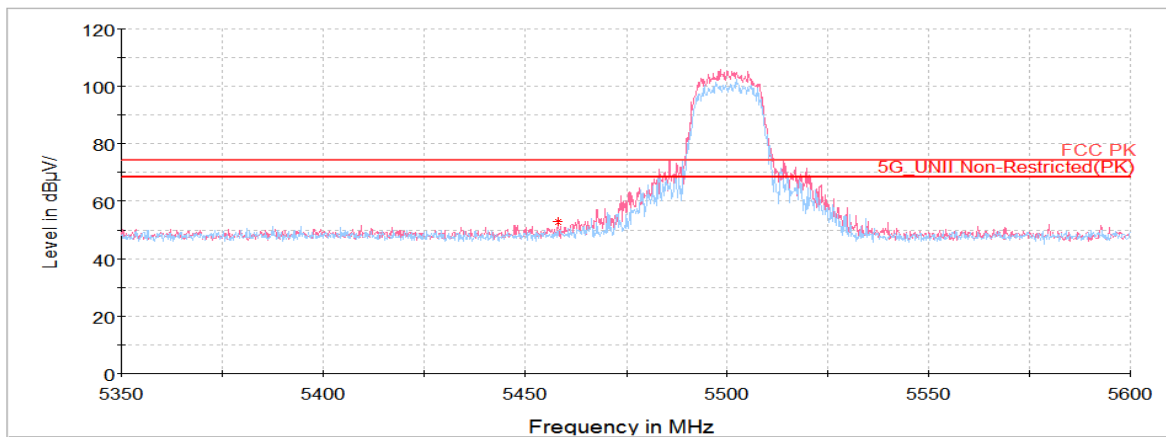


802.11a UNII-2C

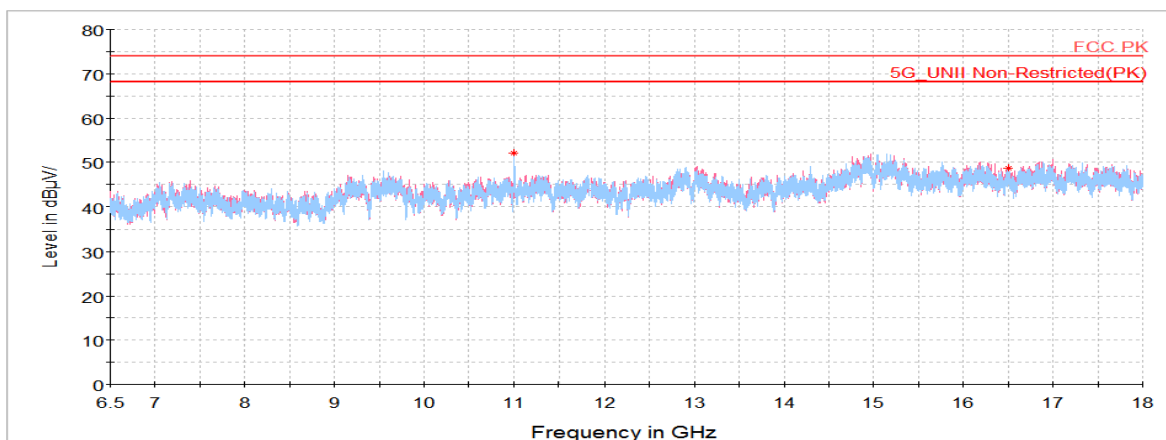
Lowest Channel (5 500 MHz)



Horizontal/Vertical for Band-edge



Horizontal/Vertical for 6.5GHz ~ 18 GHz



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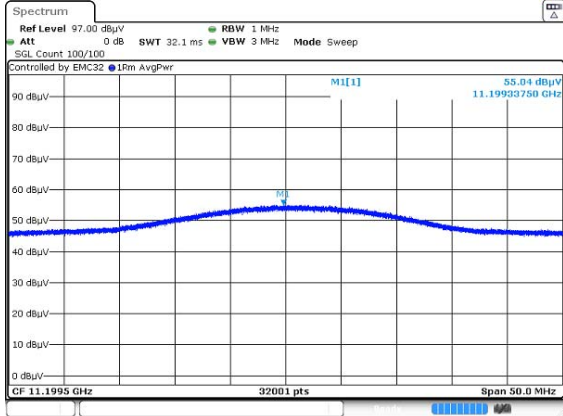
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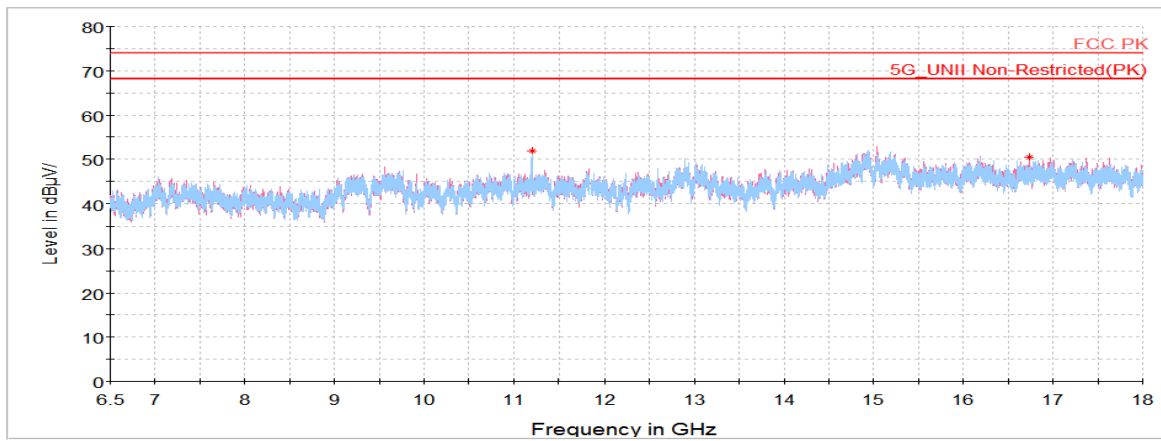
Middle Channel (5 600 MHz)

Average data



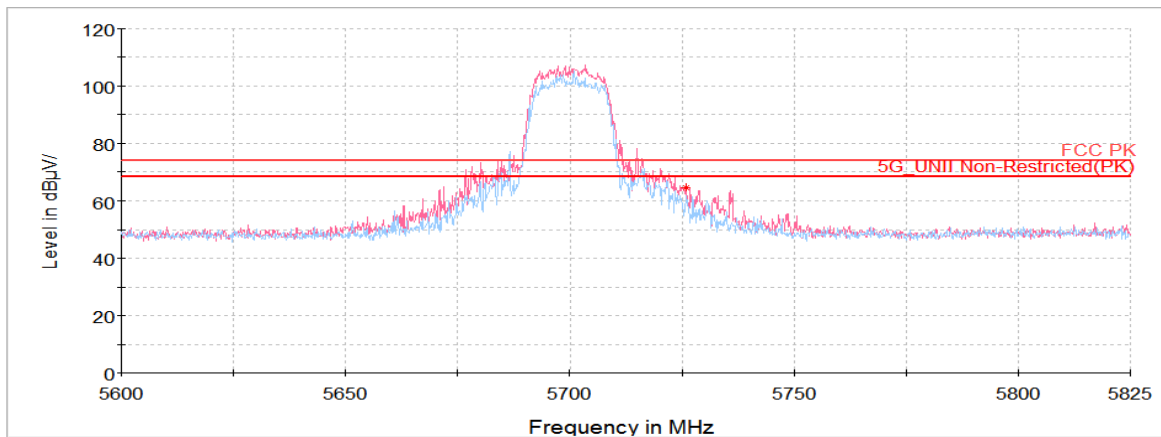
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Horizontal/Vertical for 6.5 GHz ~ 18 GHz



Highest Channel (5 700 MHz)

Horizontal/Vertical for Band-edge (5 700 MHz)



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**802.11n HT20 UNII-2C****Lowest Channel (5 500 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 459.47 ¹⁾	V	45.64	34.73	-25.54	-	54.83	74.00	19.17
11 000.45 ¹⁾	H	61.13	38.20	-49.16	-	50.17	74.00	23.83
16 502.13	H	55.29	41.00	-47.36	-	48.93	68.20	19.27
Average Data								
5 459.47 ¹⁾	V	35.68	34.73	-25.54	0.16	45.03	54.00	8.97

Middle Channel (5 600 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 202.06 ¹⁾	H	61.18	38.24	-49.22	-	50.20	74.00	23.80
16 828.80	V	55.60	41.26	-46.90	-	49.96	68.20	18.24
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 700 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 727.08	V	50.29	35.03	-25.51	-	59.81	68.20	8.39
11 361.27 ¹⁾	V	58.19	38.27	-49.27	-	47.19	74.00	26.81
17 209.38	V	56.20	40.57	-46.72	-	50.05	68.20	18.15
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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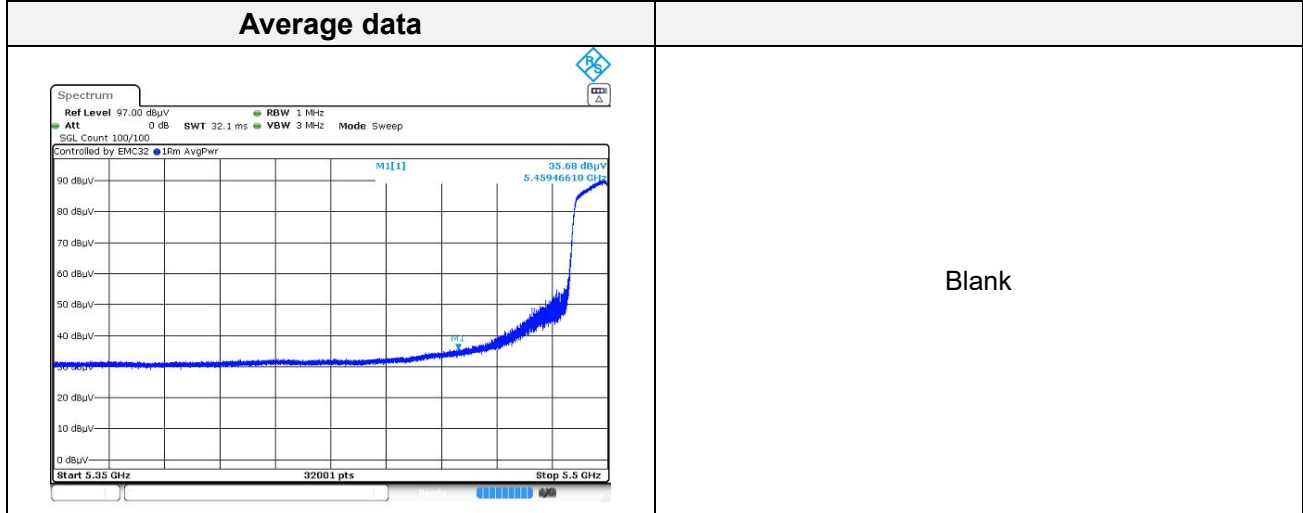
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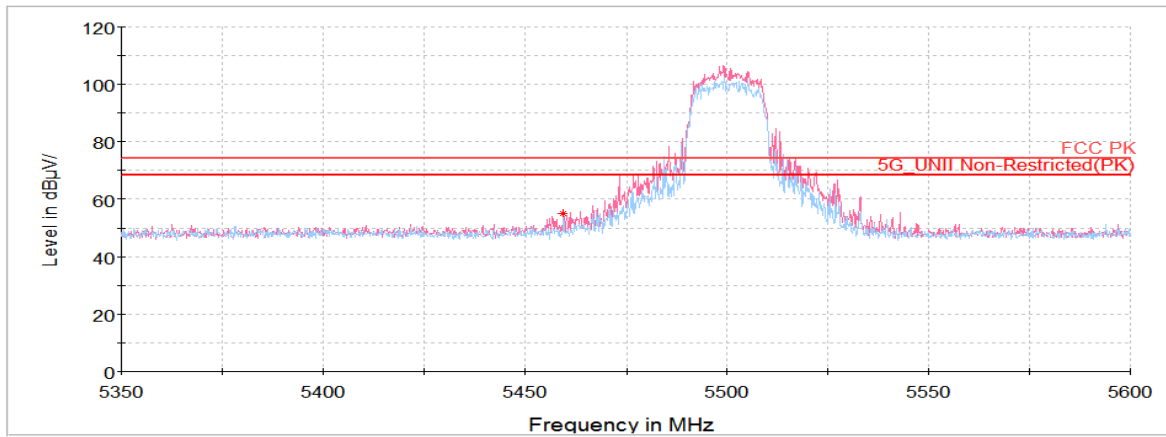


802.11n HT20 UNII-2C

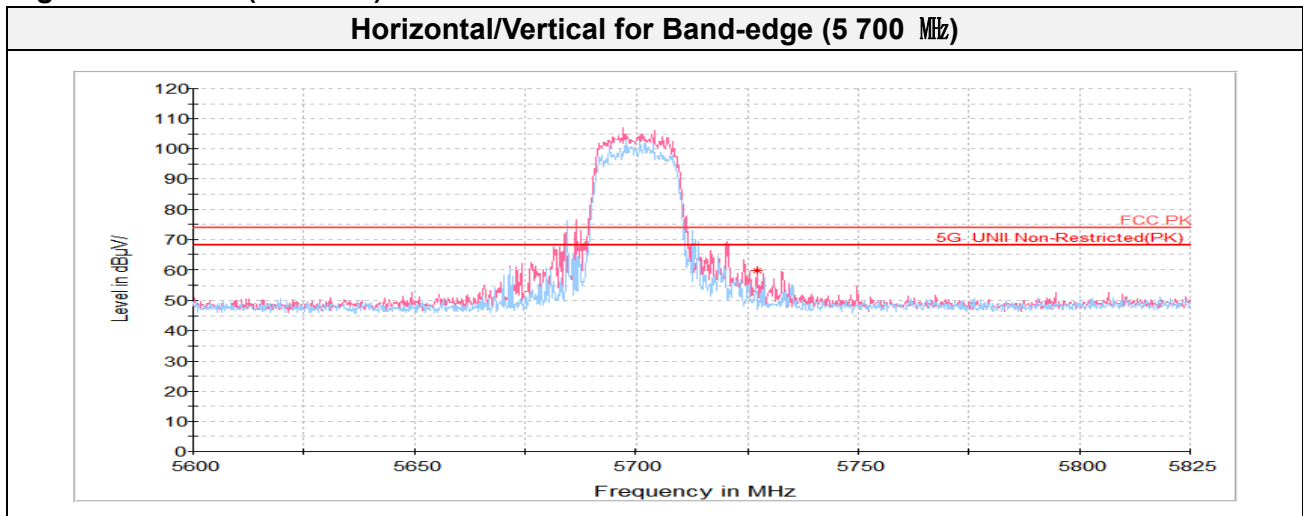
Lowest Channel (5 500 MHz)



Horizontal/Vertical for Band-edge



Highest Channel (5 700 MHz)



802.11n HT40 UNII-2C

Lowest Channel (5 510 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB($\mu V/m$))	(dB($\mu V/m$))	(dB)
Peak data								
5 459.34 ¹⁾	V	47.75	34.73	-25.54	-	56.94	74.00	17.06
11 018.42 ¹⁾	H	60.04	38.20	-49.17	-	49.07	74.00	24.93
16 487.75	V	55.88	41.19	-47.32	-	49.75	68.20	18.45
Average Data								
5 459.34 ¹⁾	V	34.97	34.73	-25.54	0.29	44.45	54.00	9.55

Middle Channel (5 590 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB($\mu V/m$))	(dB($\mu V/m$))	(dB)
Peak data								
11 200.63 ¹⁾	V	58.51	38.24	-49.22	-	47.53	74.00	26.47
16 671.03	V	54.90	41.14	-47.12	-	48.92	68.20	19.28
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 670 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB($\mu V/m$))	(dB($\mu V/m$))	(dB)
Peak data								
5 740.31	V	48.63	35.04	-25.25	-	58.42	68.20	9.78
11 338.27 ¹⁾	H	58.64	38.27	-49.26	-	47.65	74.00	26.35
16 981.89	H	55.14	41.39	-46.69	-	49.84	68.20	18.36
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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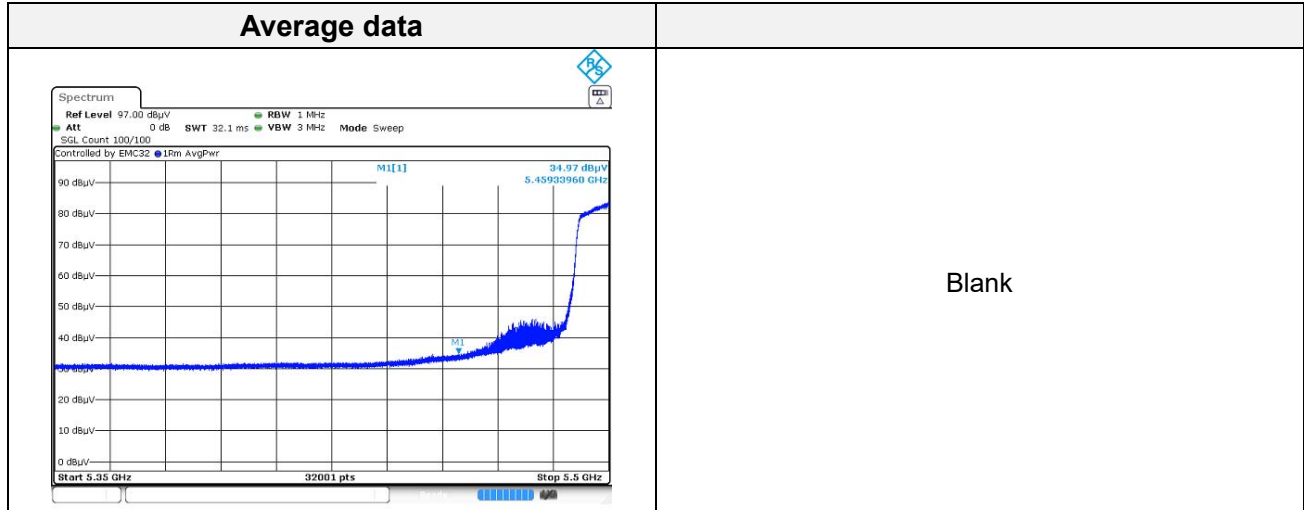
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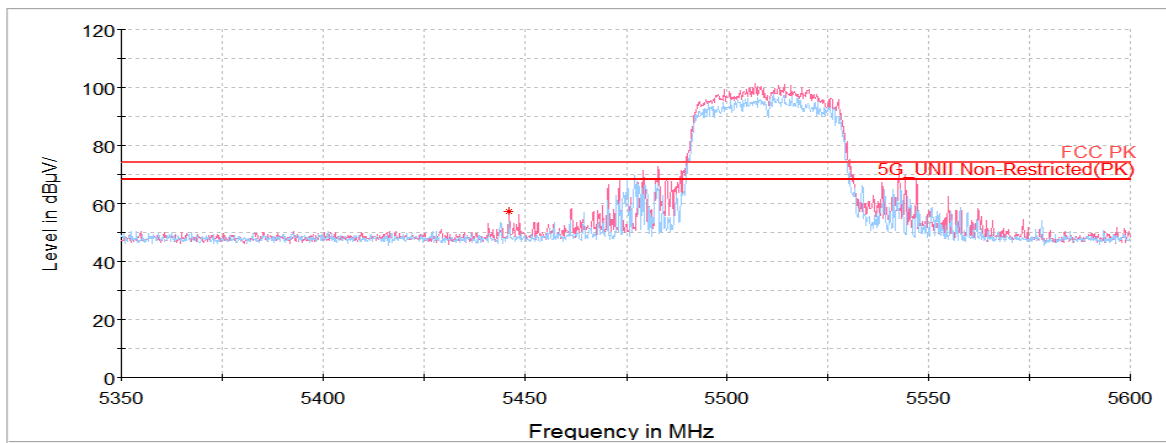


802.11n HT40 UNII-2C

Lowest Channel (5 510 MHz)

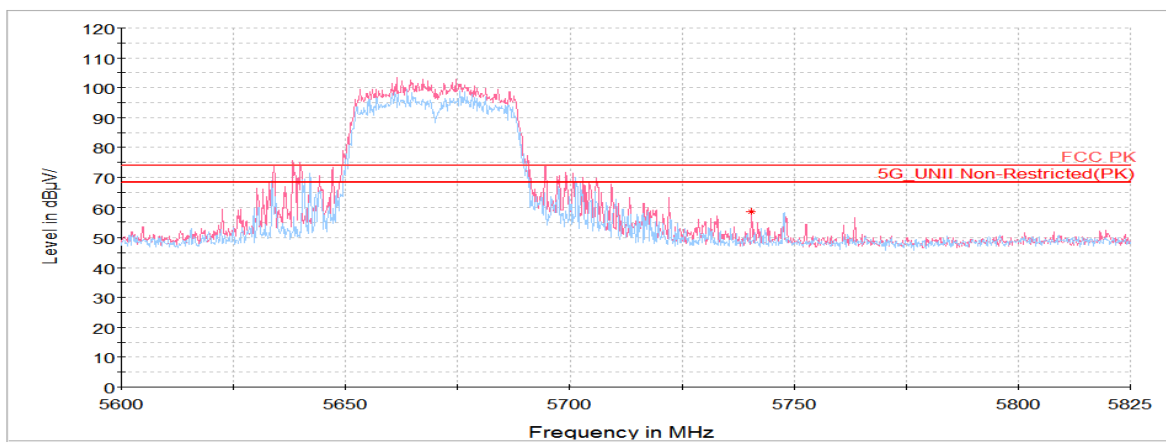


Horizontal/Vertical for Band-edge



Highest Channel (5 670 MHz)

Horizontal/Vertical for Band-edge (5 700 MHz)



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**802.11ac VHT20 UNII-2C****Lowest Channel (5 500 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 455.24 ¹⁾	V	42.19	34.72	-25.51	-	51.40	74.00	22.60
11 009.08 ¹⁾	H	61.26	38.20	-49.17	-	50.29	74.00	23.71
16 609.58	H	54.94	41.09	-47.21	-	48.82	68.20	19.38
Average Data								
5 455.24 ¹⁾	V	37.63	34.72	-25.51	0.14	46.98	54.00	7.02

Middle Channel (5 600 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 197.03 ¹⁾	H	60.77	38.24	-49.22	-	49.79	74.00	24.21
16 856.11	V	55.15	41.28	-46.86	-	49.57	68.20	18.63
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 700 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 725.70	V	52.71	35.03	-25.53	-	62.21	68.20	5.99
11 343.30 ¹⁾	V	58.77	38.27	-49.26	-	47.78	74.00	26.22
17 178.47	H	57.12	40.59	-46.71	-	51.00	68.20	17.20
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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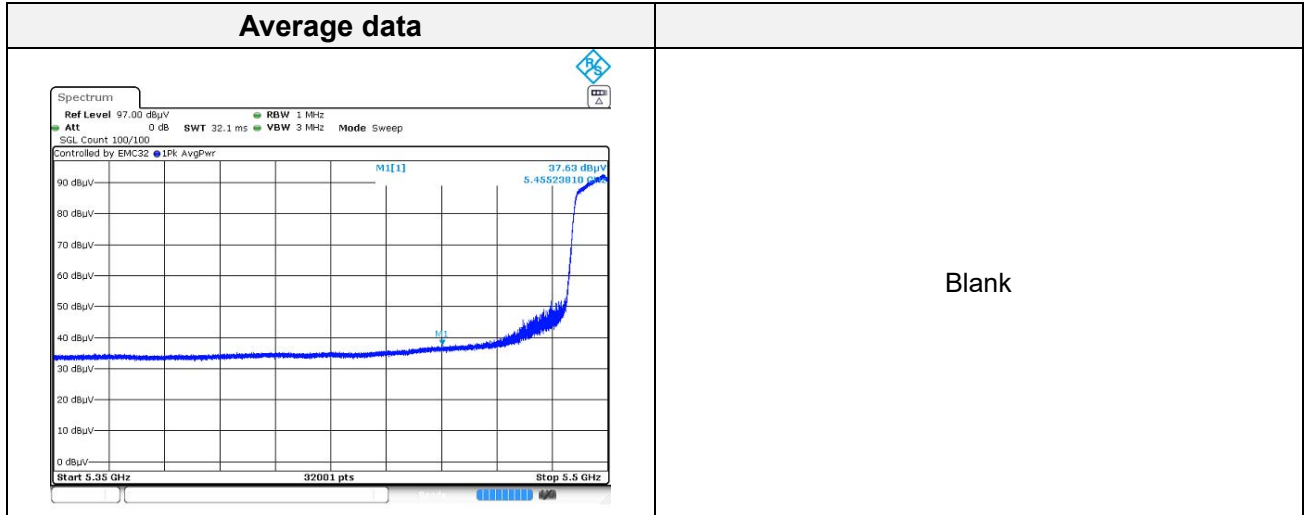
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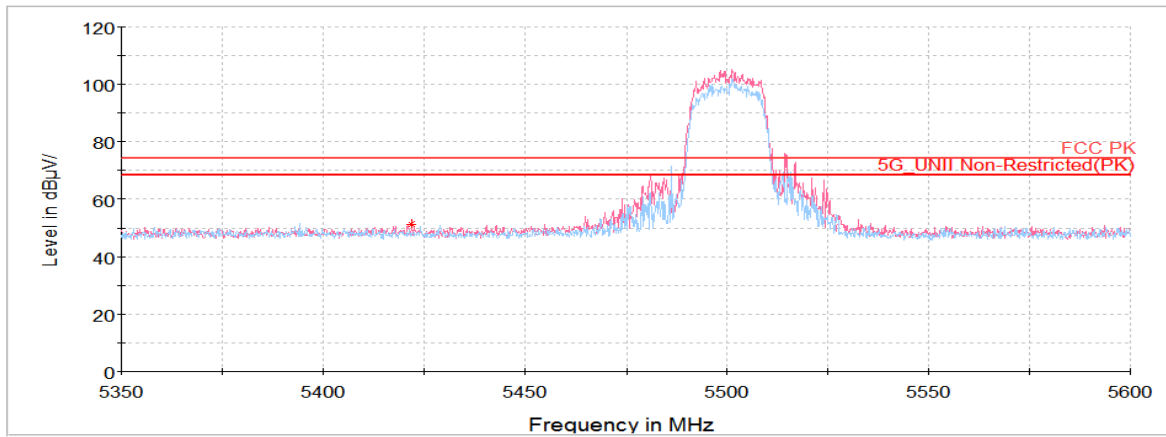


802.11ac VHT20 UNII-2C

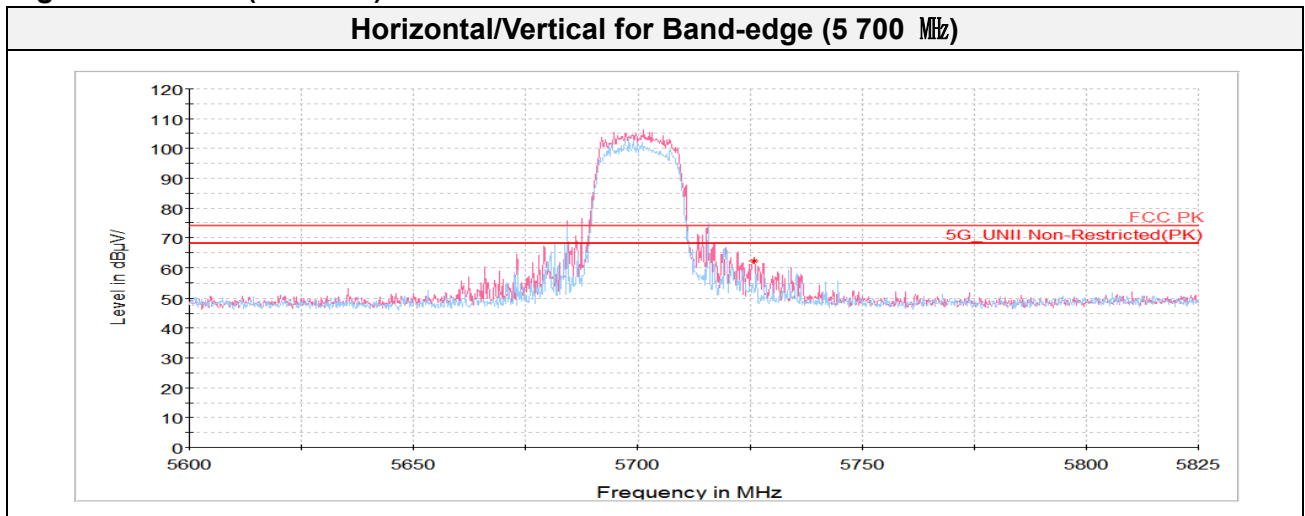
Lowest Channel (5 500 MHz)



Horizontal/Vertical for Band-edge



Highest Channel (5 700 MHz)



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**802.11ac VHT40 UNII-2C****Lowest Channel (5 510 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 458.97 ¹⁾	V	45.88	34.73	-25.54	-	55.07	74.00	18.93
11 010.16 ¹⁾	H	57.18	38.20	-49.17	-	46.21	74.00	27.79
16 664.20	H	54.68	41.13	-47.13	-	48.68	68.20	19.52
Average Data								
5 458.97 ¹⁾	V	34.52	34.73	-25.54	0.30	44.01	54.00	9.99

Middle Channel (5 590 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 253.81 ¹⁾	H	57.97	38.25	-49.24	-	46.98	74.00	27.02
16 839.22	H	56.31	41.27	-46.89	-	50.69	68.20	17.51
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 670 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 729.48	V	44.57	35.03	-25.46	-	54.14	68.20	14.06
11 353.36 ¹⁾	H	58.88	38.27	-49.26	-	47.89	74.00	26.11
16 982.61	H	56.43	41.39	-46.69	-	51.13	68.20	17.07
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

KCTL Inc.

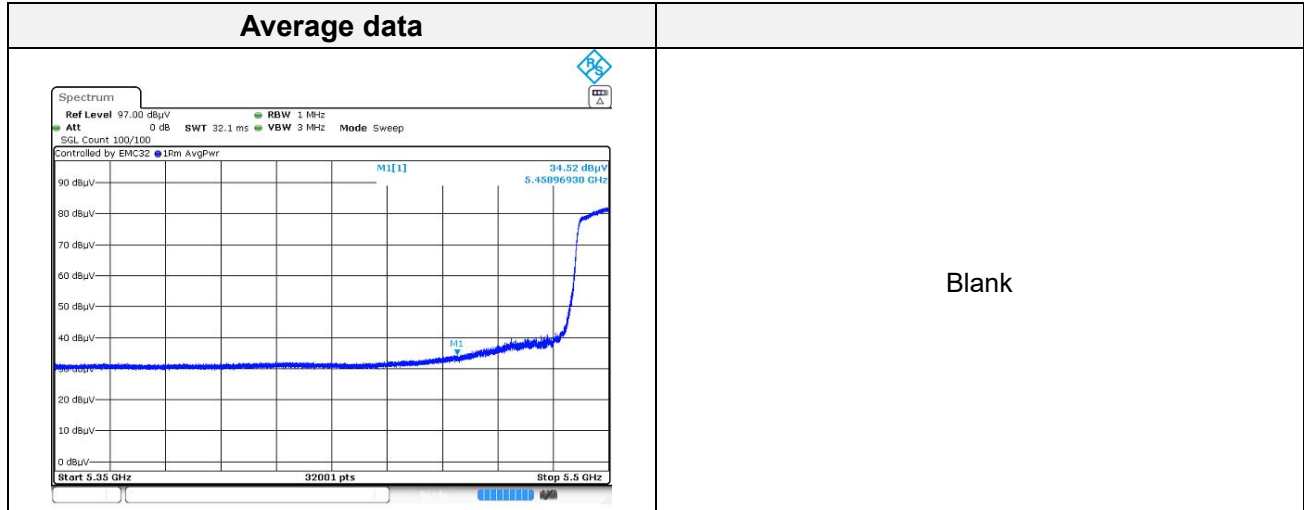
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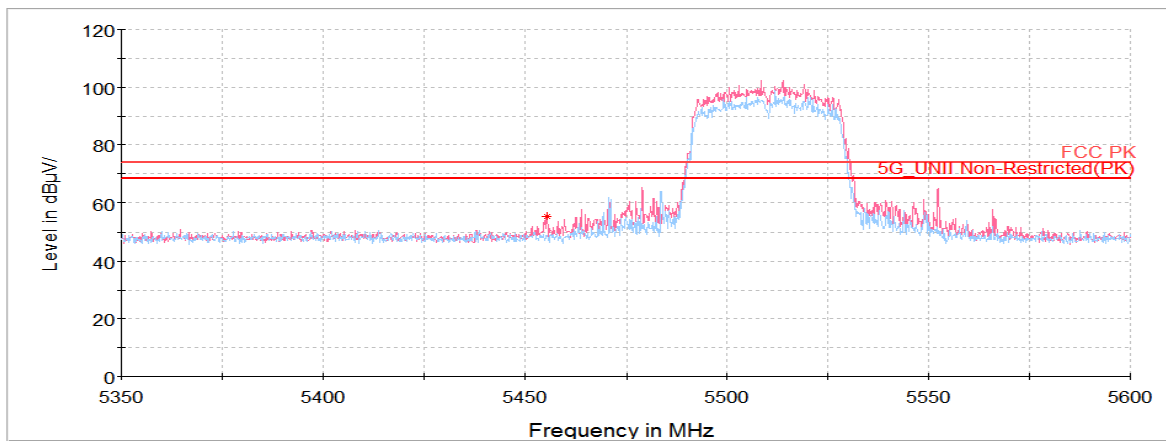


802.11ac VHT40 UNII-2C

Lowest Channel (5 510 MHz)

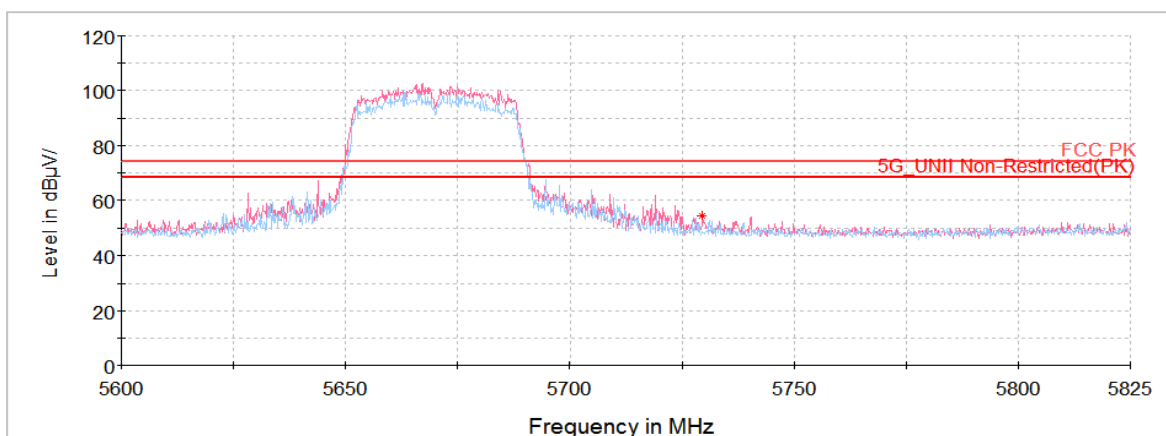


Horizontal/Vertical for Band-edge



Highest Channel (5 670 MHz)

Horizontal/Vertical for Band-edge (5 670 MHz)



802.11ac VHT80 UNII-2C

Lowest Channel (5 530 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB($\mu V/m$))	(dB($\mu V/m$))	(dB)
Peak data								
5 458.98 ¹⁾	V	45.99	34.73	-25.54	-	55.18	74.00	18.82
11 074.48 ¹⁾	V	57.29	38.21	-49.18	-	46.32	74.00	27.68
16 517.22	V	55.45	41.01	-47.34	-	49.12	68.20	19.08
Average Data								
5 458.98 ¹⁾	V	37.45	34.73	-25.54	0.56	47.20	54.00	6.80

Highest Channel (5 610 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB($\mu V/m$))	(dB($\mu V/m$))	(dB)
Peak data								
5 736.02	V	45.42	35.04	-25.33	-	55.13	68.20	13.07
11 266.75 ¹⁾	H	58.66	38.25	-49.24	-	47.67	74.00	26.33
16 827.36	H	55.34	41.26	-46.90	-	49.70	68.20	18.50
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

KCTL Inc.

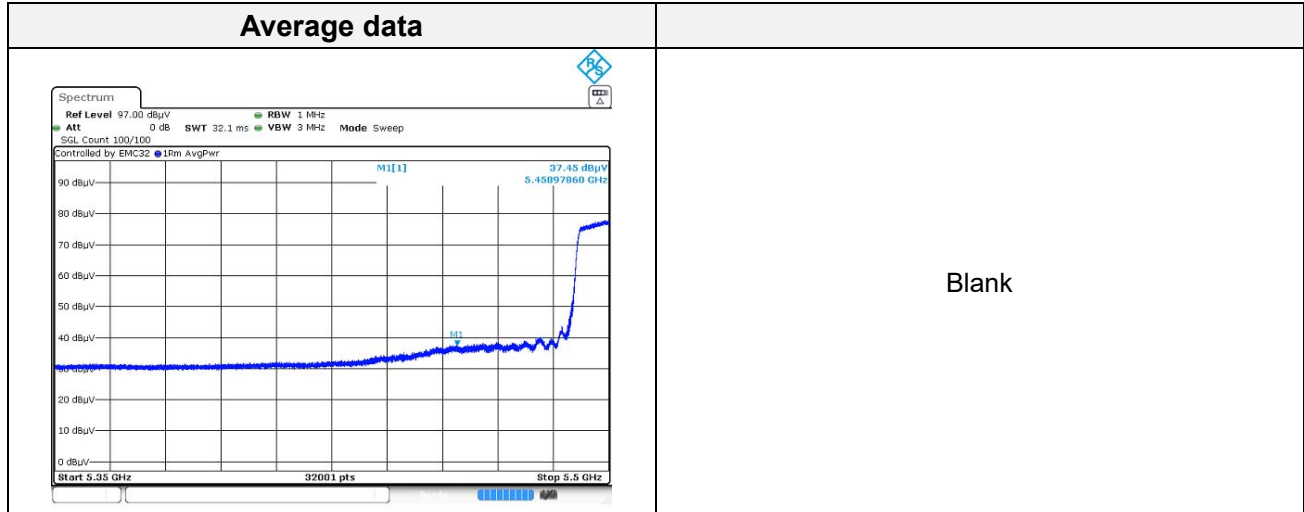
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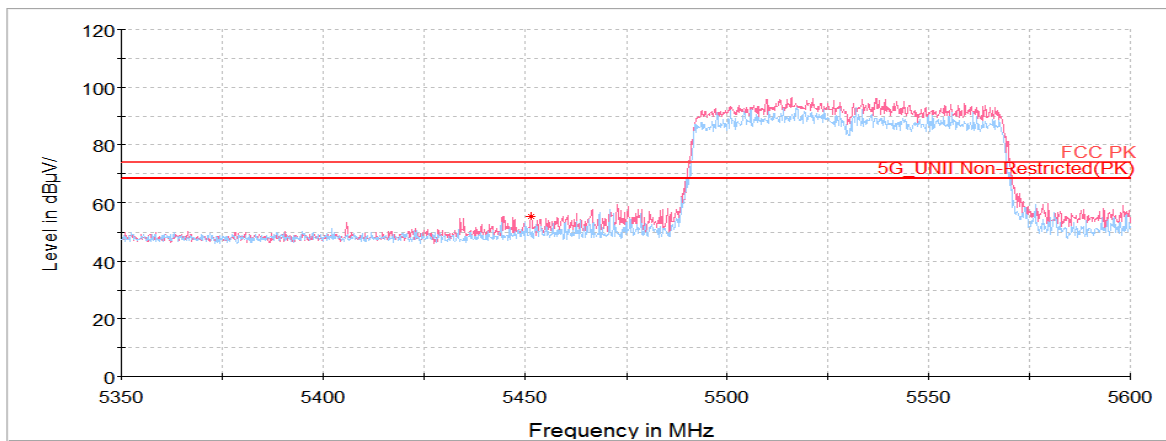


802.11ac VHT80 UNII-2C

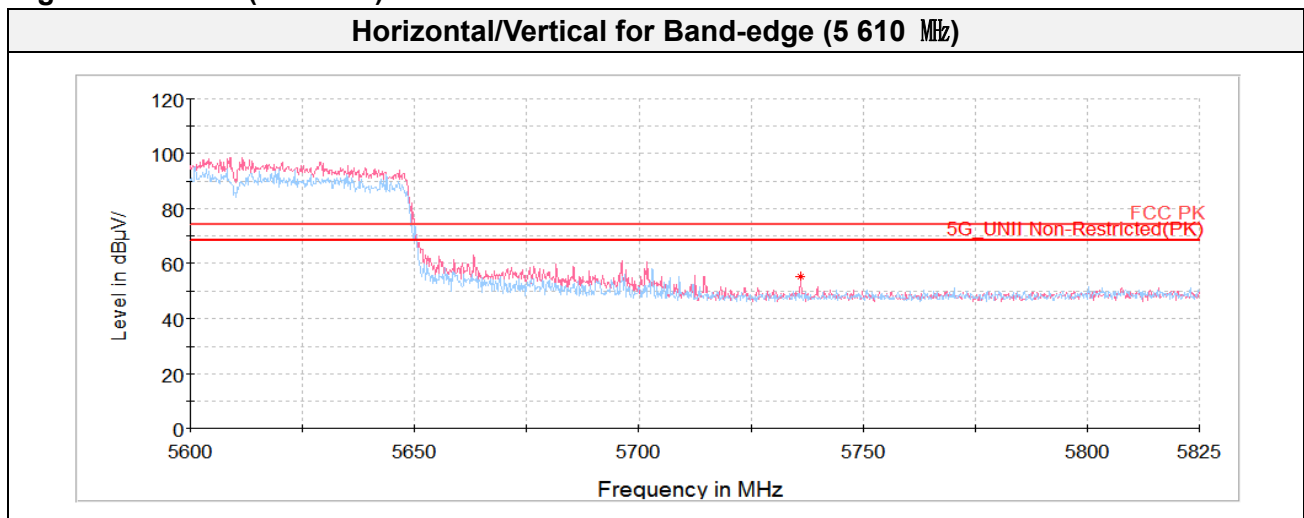
Lowest Channel (5 530 MHz)



Horizontal/Vertical for Band-edge



Highest Channel (5 610 MHz)



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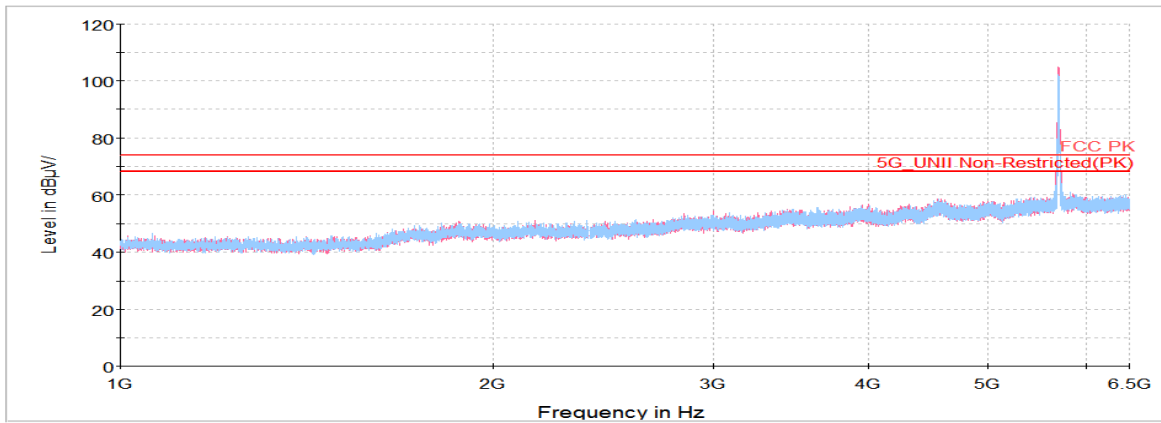


Plot of Harmonics and Spurious Emissions

In order to simplify the report, attached plots were only the lowest margin condition

802.11a_UNII-2C_Highest Channel (5 700 MHz)

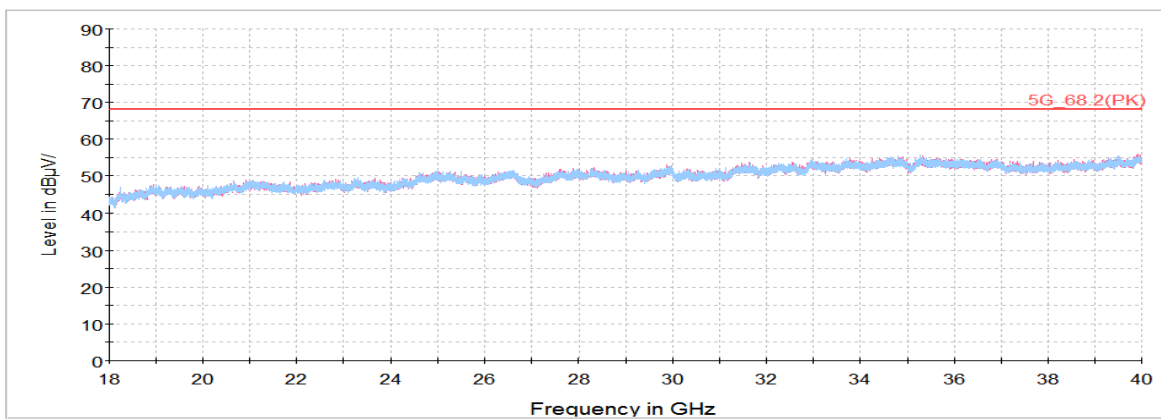
Horizontal/Vertical for 1 GHz ~ 6.5 GHz



Horizontal/Vertical for 6.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 40 GHz



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**Straddle Channel****802.11a (5 720 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 309.52 ¹⁾	V	59.09	38.26	-49.25	-	48.10	74.00	25.90
17 209.38	V	55.78	40.57	-46.72	-	49.63	68.20	18.57
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

802.11n HT20 (5 720 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 356.95 ¹⁾	V	58.15	38.27	-49.26	-	47.16	74.00	26.84
17 185.30	H	56.11	40.59	-46.71	-	49.99	68.20	18.21
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

802.11n HT40 (5 710 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 355.88 ¹⁾	V	58.46	38.27	-49.26	-	47.47	74.00	26.53
17 184.94	H	56.05	40.59	-46.71	-	49.93	68.20	18.27
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

802.11ac VHT20 (5 720 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 369.89 ¹⁾	V	58.51	38.27	-49.27	-	47.51	74.00	26.49
17 203.63	V	55.86	40.58	-46.72	-	49.72	68.20	18.48
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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**802.11ac VHT40 (5 710 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 471.95 ¹⁾	V	57.79	38.29	-49.30	-	46.78	74.00	27.22
17 186.38	V	55.92	40.59	-46.71	-	49.80	68.20	18.40
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

802.11ac VHT80 (5 690 MHz)

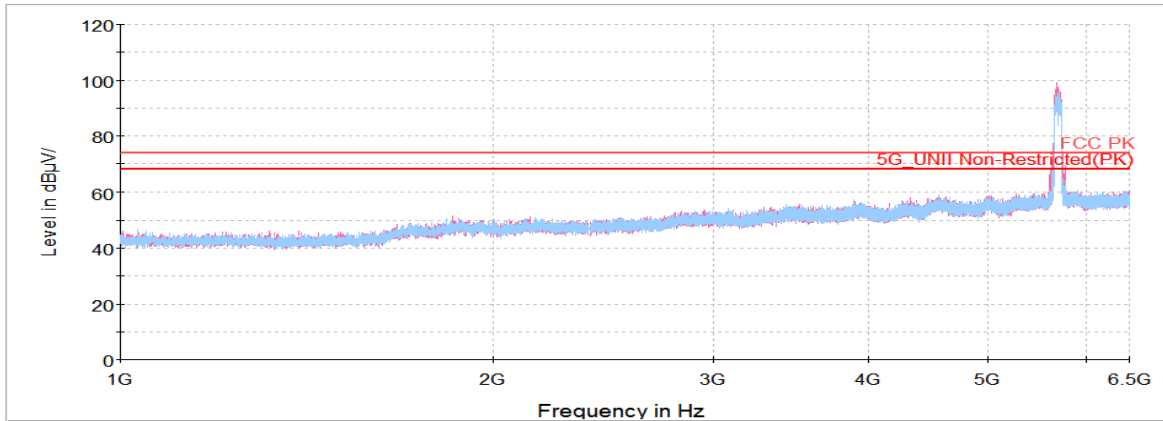
Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 358.75 ¹⁾	H	58.26	38.27	-49.27	-	47.26	74.00	26.74
16 989.44	V	56.13	41.39	-46.68	-	50.84	68.20	17.36
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Plot of Harmonics and Spurious Emissions

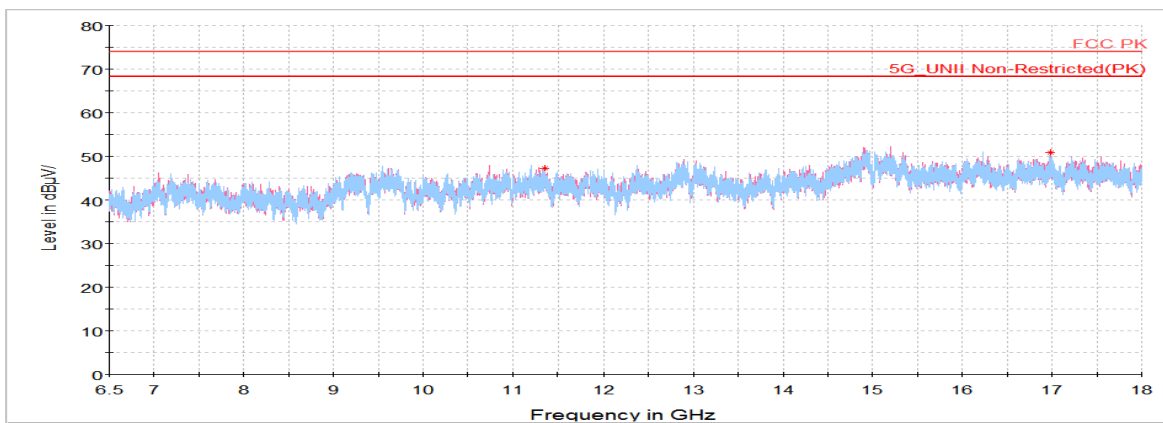
In order to simplify the report, attached plots were only the lowest margin condition

802.11ac VHT80_ Straddle Channel (5 690 MHz)

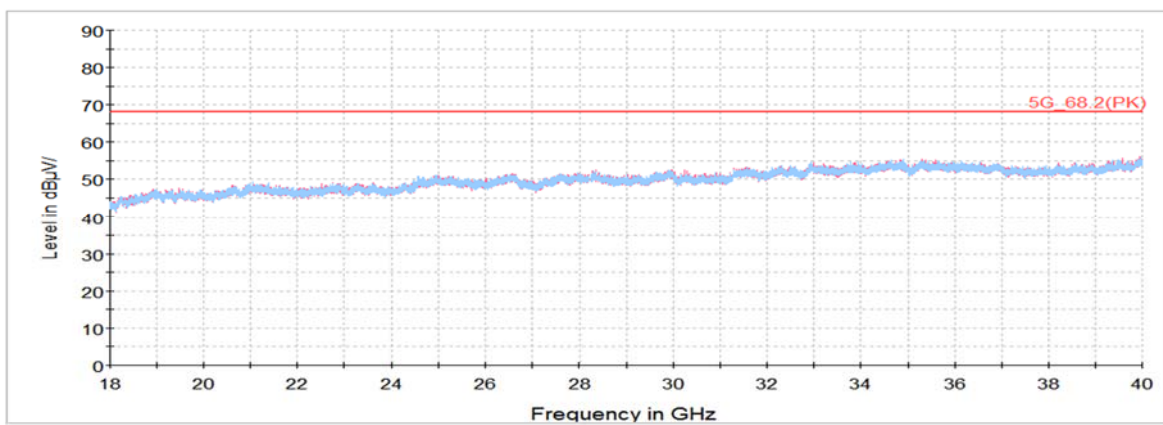
Horizontal/Vertical for 1 GHz ~ 6.5 GHz



Horizontal/Vertical for 6.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 40 GHz



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**802.11a UNII-3****Lowest Channel (5 745 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 724.33	V	54.99	35.02	-25.56	-	64.45	121.06	56.61
11 482.38 ¹⁾	V	61.22	38.30	-49.30	-	50.22	74.00	23.78
17 234.17	V	56.70	40.56	-46.73	-	50.53	68.20	17.67
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Middle Channel (5 785 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 570.78 ¹⁾	V	61.01	38.36	-49.36	-	50.01	74.00	23.99
17 364.98	V	55.50	40.48	-46.76	-	49.22	68.20	18.98
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 825 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 855.81	H	48.99	35.16	-23.82	-	60.33	110.52	50.19
11 652.72 ¹⁾	V	60.80	38.42	-49.43	-	49.79	74.00	24.21
17 485.02	V	56.69	40.41	-46.79	-	50.31	68.20	17.89
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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**802.11n HT20 UNII-3****Lowest Channel (5 745 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 724.50	H	58.91	35.02	-25.56	-	68.37	121.06	52.69
11 492.44 ¹⁾	V	59.98	38.30	-49.30	-	48.98	74.00	25.02
17 161.58	H	56.03	40.60	-46.71	-	49.92	68.20	18.28
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Middle Channel (5 785 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 578.33 ¹⁾	V	60.40	38.36	-49.37	-	49.39	74.00	24.61
17 321.50	V	55.89	40.51	-46.75	-	49.65	68.20	18.55
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 825 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 855.98	V	49.89	35.16	-23.82	-	61.23	110.52	49.30
11 649.86 ¹⁾	V	63.34	38.42	-49.42	-	52.34	74.00	21.66
17 466.69	H	55.61	40.42	-46.79	-	49.24	68.20	18.96
Average Data								
11 649.86 ¹⁾	V	51.60	38.42	-49.42	0.16	40.76	54.00	13.24

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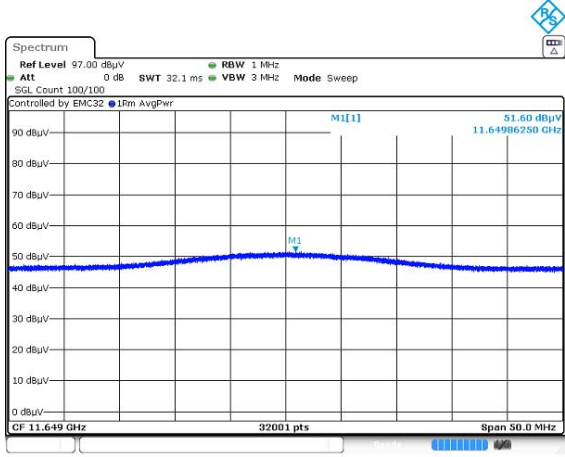
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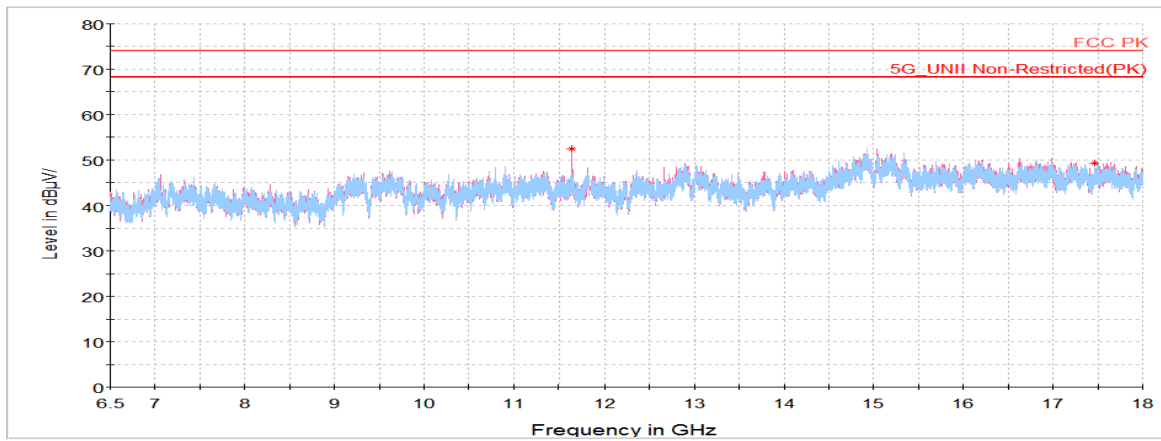
Highest Channel (5 825 MHz)

Average data



Blank

Horizontal/Vertical for 6.5 GHz ~ 18 GHz



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**802.11n HT40 UNII-3****Lowest Channel (5 755 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 724.50	H	57.66	35.02	-25.56	-	67.12	121.06	53.94
11 526.94 ¹⁾	H	57.49	38.32	-49.33	-	46.48	74.00	27.52
17 223.03	V	55.80	40.57	-46.72	-	49.65	68.20	18.55
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 795 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 850.48	V	47.91	35.15	-23.85	-	59.21	121.10	61.89
11 586.23 ¹⁾	V	58.11	38.37	-49.37	-	47.11	74.00	26.89
17 477.83	V	56.24	40.41	-46.79	-	49.86	68.20	18.34
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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**802.11ac VHT20 UNII-3****Lowest Channel (5 745 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 721.23	V	57.57	35.02	-25.62	-	66.97	113.61	46.64
11 492.80 ¹⁾	V	59.57	38.30	-49.30	-	48.57	74.00	25.43
17 180.63	V	55.64	40.59	-46.71	-	49.52	68.20	18.68
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Middle Channel (5 785 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
11 574.02 ¹⁾	V	60.56	38.36	-49.36	-	49.56	74.00	24.44
17 363.91	V	55.88	40.48	-46.76	-	49.60	68.20	18.60
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 825 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 850.83	V	46.52	35.15	-23.85	-	57.82	120.31	62.49
11 656.67 ¹⁾	V	59.51	38.43	-49.43	-	48.51	74.00	25.49
17 376.48	H	55.20	40.47	-46.76	-	48.91	68.20	19.29
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

802.11ac VHT40 UNII-3

Lowest Channel (5 755 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 723.13	V	51.14	35.02	-25.58	-	60.58	117.93	57.35
11 512.56 ¹⁾	V	57.94	38.31	-49.32	-	46.93	74.00	27.07
17 243.16	H	55.11	40.55	-46.73	-	48.93	68.20	19.27
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Highest Channel (5 795 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 853.23	V	42.37	35.15	-23.84	-	53.68	114.83	61.15
11 483.09 ¹⁾	H	57.41	38.30	-49.30	-	46.41	74.00	27.59
17 356.36	V	55.45	40.49	-46.76	-	49.18	68.20	19.02
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

802.11ac VHT80 UNII-3

Lowest Channel (5 775 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
5 723.13	V	46.90	35.02	-25.58	-	56.34	117.93	61.58
5 864.58	V	49.80	35.16	-23.78	-	61.18	108.12	46.94
11 554.25 ¹⁾	V	58.07	38.34	-49.35	-	47.06	74.00	26.94
17 477.11	V	55.06	40.41	-46.79	-	48.68	68.20	19.52
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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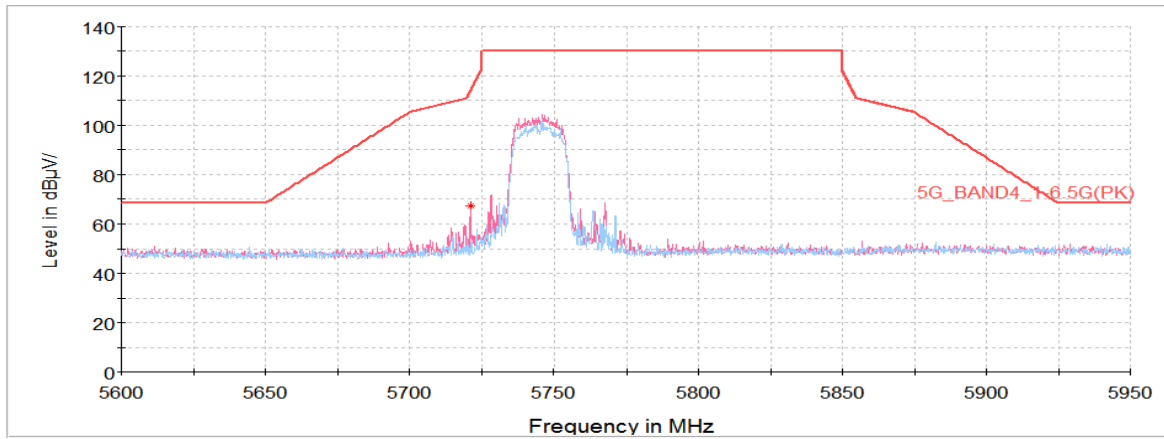


Plot of Band-edge, Harmonics and Spurious Emissions

In order to simplify the report, attached plots were only the lowest margin condition

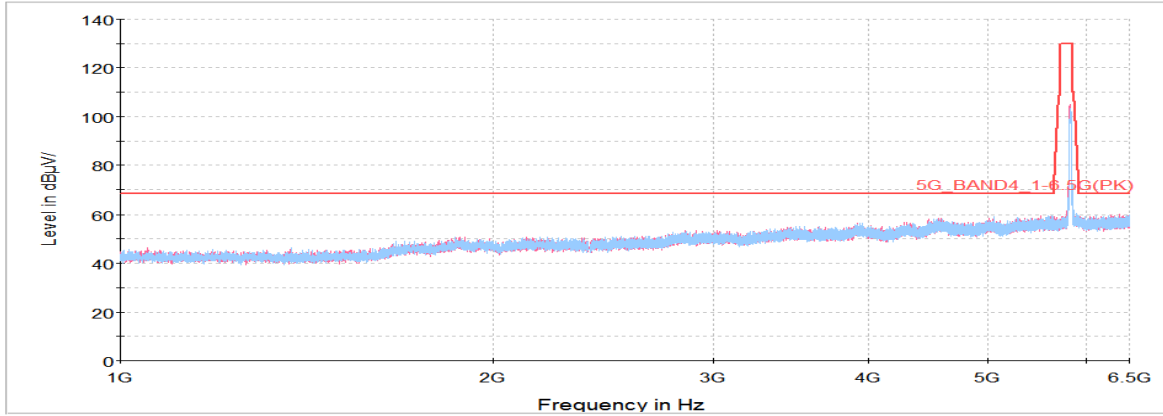
802.11ac VHT20_UNII-3_Lowest Channel (5 745 MHz)

Horizontal/Vertical for Band-edge

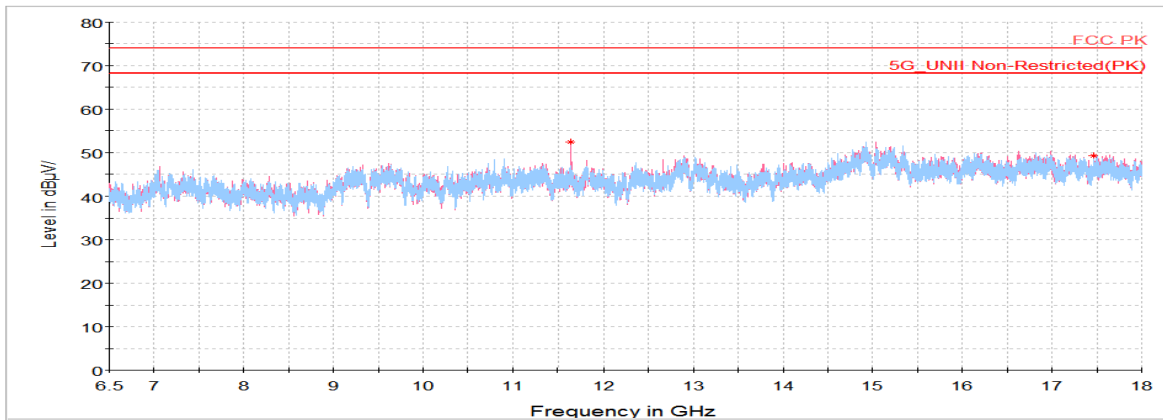


802.11n HT20_UNII-3_Highest Channel (5 825 MHz)

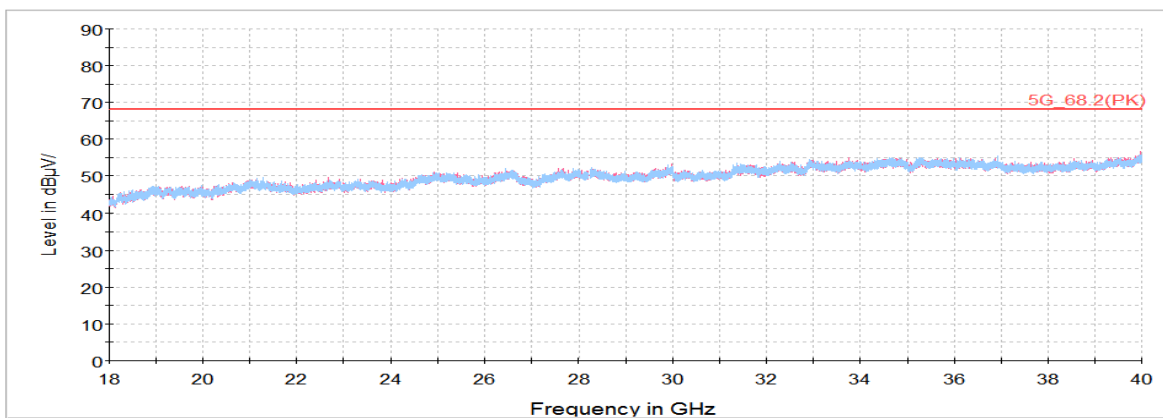
Horizontal/Vertical for 1 GHz ~ 6.5 GHz



Horizontal/Vertical for 6.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 40 GHz



Spurious Emission for Simultaneous Tx Condition

Case	WLAN 5 GHz	Bluetooth LE
Mode	802.11a	2 MBits/s (37 Bytes)
Channel	140	0
Frequency	5 700	2 402
Data Rate	6 Mbps	2 Mbps

Notes.

The lowest margin condition among the channels and modes were selected for test.

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
4 808.17 ¹⁾	V	62.79	33.78	-53.10	-	43.47	74.00	30.53
11 391.45 ¹⁾	H	60.39	38.28	-49.27	-	49.40	74.00	24.60
17 085.03	H	60.21	40.65	-46.69	-	54.17	68.20	14.03
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

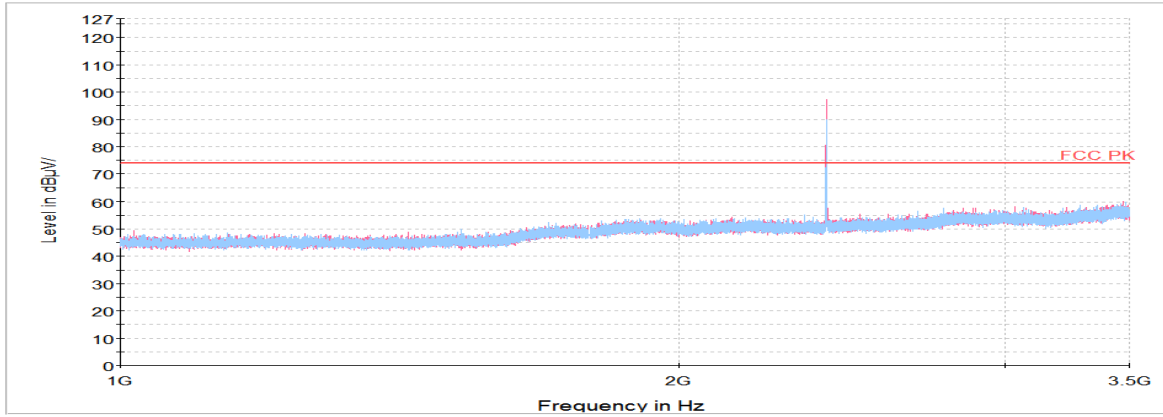
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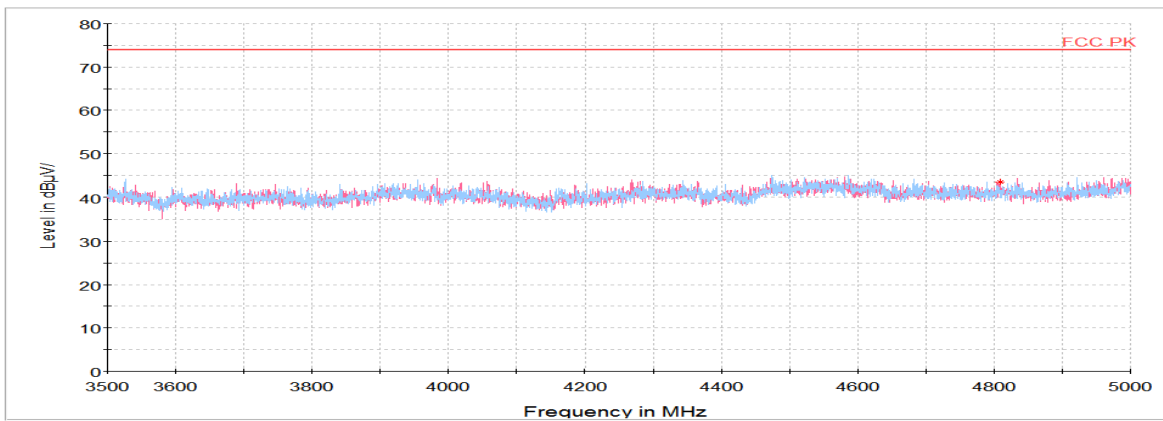
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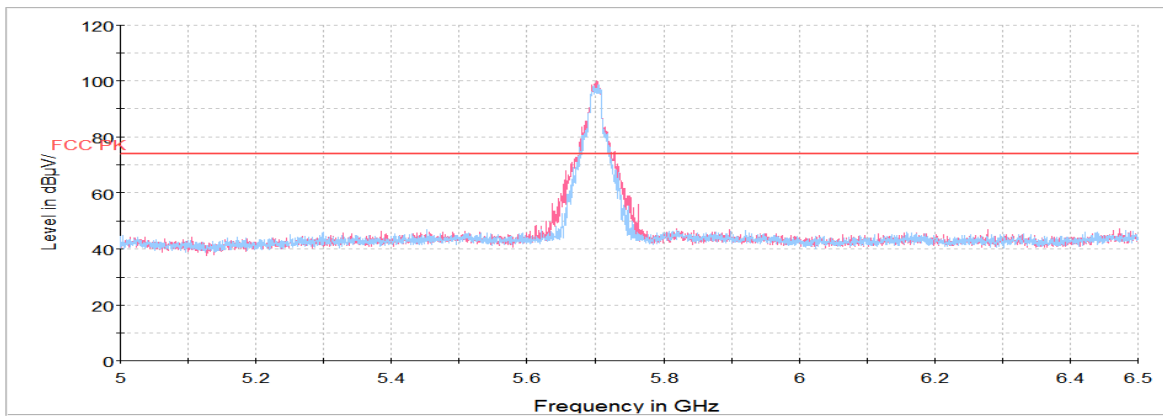
Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 5 GHz



Horizontal/Vertical for 5 GHz ~ 6.5 GHz



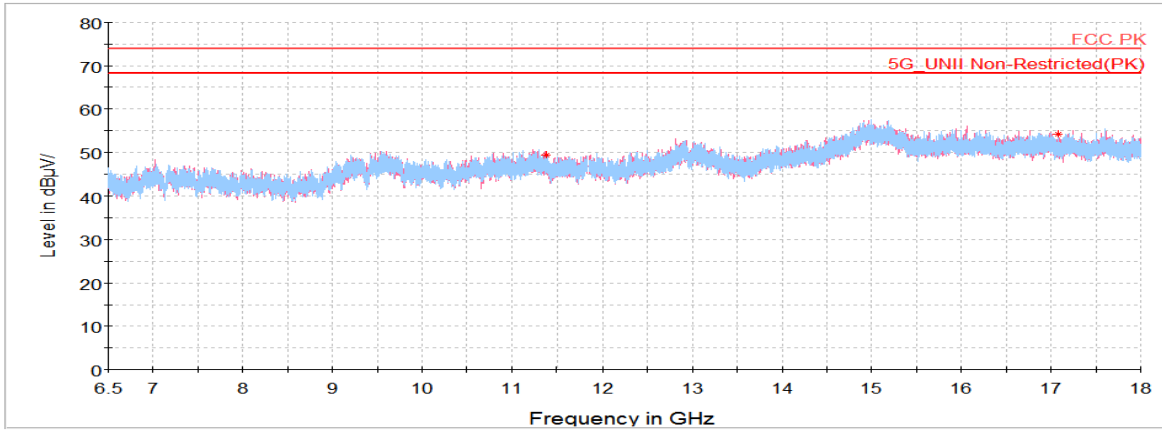
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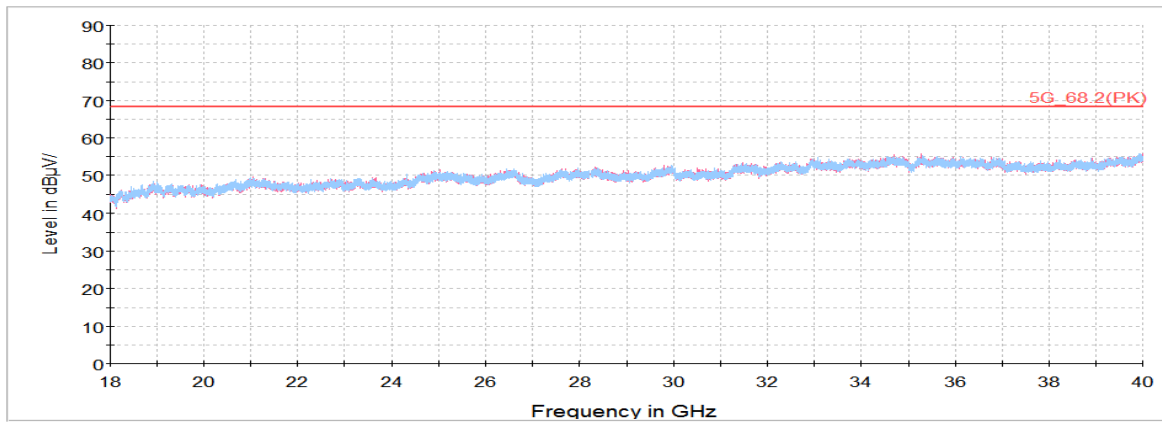
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Horizontal/Vertical for 6.5 GHz ~ 18 GHz

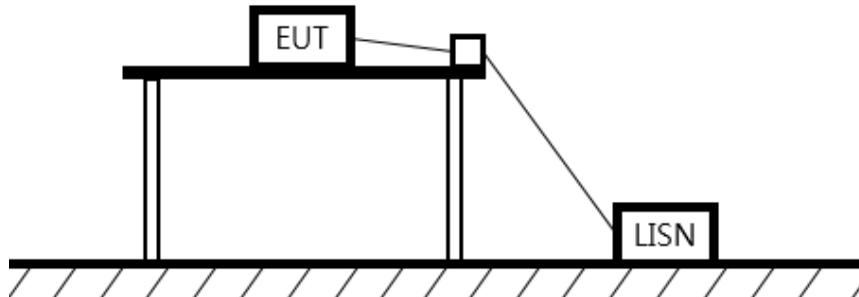


Horizontal/Vertical for 18 GHz ~ 40 GHz



7.7. AC Conducted emission

Test setup



Limit

§15.407

According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall be on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted limit (dB μ V/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Measurement procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50 Ω /50 μ H LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity — Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 kHz or to quasi-peak and average within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

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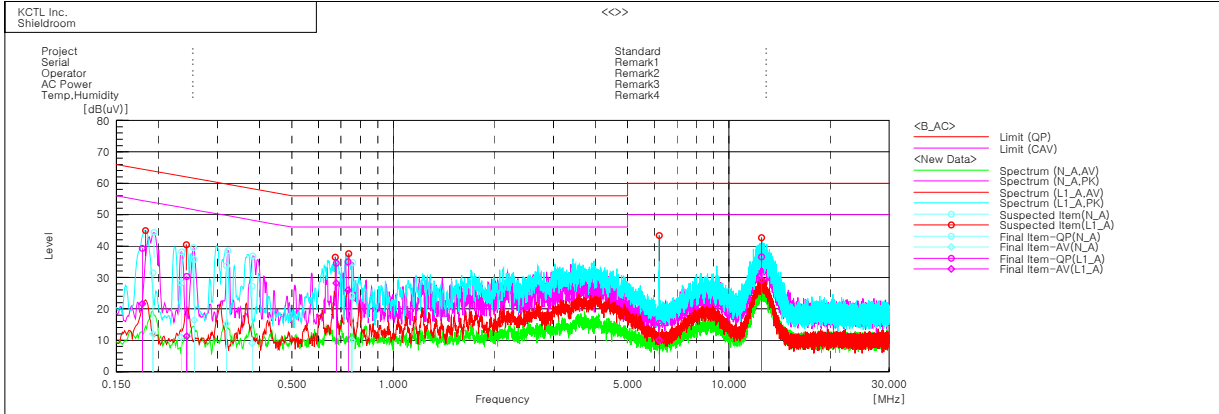
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Test results

Worst case: 802.11a / UNII-2C 5 700 MHz



Final Result

--- N_A Phase ---										
No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.19295	21.4	1.8	10.1	31.5	11.9	63.9	53.9	32.4	42.0
2	0.23371	18.5	1.2	9.8	28.3	11.0	62.3	52.3	34.0	41.3
3	0.25544	25.9	6.7	9.8	35.7	16.5	61.6	51.6	25.9	35.1
4	0.31918	23.9	5.5	9.8	33.7	15.3	59.7	49.7	26.0	34.4
5	0.38062	17.3	-0.8	9.9	27.2	9.1	58.3	48.3	31.1	39.2
6	0.75431	14.2	0.2	9.9	24.1	10.1	56.0	46.0	31.9	35.9

--- L1_A Phase ---										
No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.17935	29.1	11.4	10.2	39.3	21.6	64.5	54.5	25.2	32.9
2	0.24269	20.7	1.7	9.7	30.4	11.4	62.0	52.0	31.6	40.6
3	0.67705	24.6	18.3	9.9	34.5	28.2	56.0	46.0	21.5	17.8
4	0.73454	25.1	16.0	9.9	35.0	25.9	56.0	46.0	21.0	20.1
5	6.19634	5.4	0.1	10.0	15.4	10.1	60.0	50.0	44.6	39.9
6	12.52574	26.2	18.8	10.3	36.5	29.1	60.0	50.0	23.5	20.9

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KCTL**8. Measurement equipment**

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100807	22.07.27
Spectrum Analyzer	R&S	FSV40	100989	21.12.23
Signal Generator	R&S	SMB100A	176206	22.01.20
Vector Signal Generator	R&S	SMBV100A	257566	22.07.09
DC Power Supply	Agilent	E3632A	MY40007371	22.05.10
Attenuator	API Inmet	40AH2W-10	16	22.05.11
EMI TEST RECEIVER	R&S	ESC17	100732	22.03.05
EMI TEST RECEIVER	R&S	ESC13	100001	22.08.19*
LOOP Antenna	R&S	HFH2-Z2	100355	22.08.21
Bi-Log Antenna	TESEQ	CBL 6112D	55545	23.01.14
Horn antenna	ETS.lindgren	3117	155787	21.10.28
Horn antenna	ETS.lindgren	3116	00086635	22.05.17
High pass Filter	WT	WT-A1699-HS	WT160411002	22.05.10
Attenuator	KEYSIGHT	8491B-6dB	MY39271060	23.01.14
Attenuator	API Inmet	40AH2W-10	12	22.05.11
ISOLATION TRANSFORMER	ONETECH CO., LTD	OT-IT500VA	OTR1-16026	22.04.02
Amplifier	SONOMA INSTRUMENT	310N	284608	22.08.19*
Broadband Pre-Amplifier	SCHWARZBECK	BBV9718	216	22.07.27
AMPLIFIER	L-3 Narda-MITEQ	AMF-7D-01001800 -22-10P	2003683	22.08.19*
AMPLIFIER	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	22.01.21
TWO-LINE V - NETWORK	R&S	ENV216	101358	21.09.29
Antenna Mast	Innco Systems	MA4640-XP-ET	-	-
Turn Table	Innco Systems	DT2000	79	-
Antenna Mast	Innco Systems	MA4000-EP	303	-
Turn Table	Innco Systems	DT2000	79	-

* Tests related to this equipment were progressed after the calibration was completed.

End of test report