

# TEST REPORT

of

FCC Part 15 Subpart E §15.407  
IC RSS-247 Issue 2 and RSS-Gen Issue 5

FCC ID: BEJTLHOBDDNN0B  
IC Certification: 2703H-TLHOBDDNN0B

Equipment Under Test : Car Telematics Device  
Model Name : TLHOBDDNN0B2  
Variant Model Name(s) : Refer to the page 3  
Applicant : FCC: LG Electronics USA  
IC: LG ELECTRONICS INC.  
Manufacturer : LG Electronics Inc.  
Date of Receipt : 2021.06.03  
Date of Test(s) : 2021.06.04 ~ 2021.08.03  
Date of Issue : 2021.08.04

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

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  - 2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.
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Tested by:



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Technical  
Manager:

Jinhyoung Cho

**SGS Korea Co., Ltd. Gunpo Laboratory**



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## 1. General Information

### 1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

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- Designation number: KR0150

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### 1.2. Details of Applicant

FCC Applicant : LG Electronics USA

FCC Address : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, United States, 07632

IC Applicant : LG ELECTRONICS INC.

IC Address : 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, Korea (Republic of), 451-713

Contact Person : Kim, Dae-woong

Phone No. : +1 201 266 2215

### 1.3. Details of Manufacturer

Company : LG Electronics Inc.

Address : 10, Magokjungang 10-ro, Gangseo-gu, Seoul, Korea, 07796

### 1.4. Description of EUT

<b>Kind of Product</b>	Car Telematics Device
<b>Model Name</b>	TLHOBDDNN0B2
<b>Variant Model Name</b>	TLHOBDDNN0B1, TLHOBDDNN0B5
<b>Serial Number</b>	353342700000291, 353342700000309
<b>Power Supply</b>	DC 13.2 V
<b>Frequency Range</b>	5 180 MHz ~ 5 240 MHz (Band 1: 11a/n_HT20, 11ac_VHT20) 5 190 MHz ~ 5 230 MHz (Band 1: 11n_HT40, 11ac_VHT40) 5 210 MHz (Band 1: 11ac_VHT80) 5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20, 11ac_VHT20) 5 755 MHz ~ 5 795 MHz (Band 3: 11n_HT40, 11ac_VHT40) 5 775 MHz (Band 3: 11ac_VHT80)
<b>Modulation Technique</b>	OFDM
<b>Number of Channels</b>	4 channels (Band 1: 11a/n_HT20, 11ac_VHT20) 2 channels (Band 1: 11n_HT40, 11ac_VHT40) 1 channel (Band 1: 11ac_VHT80) 5 channels (Band 3: 11a/n_HT20, 11ac_VHT20) 2 channels (Band 3: 11n_HT40, 11ac_VHT40) 1 channel (Band 3: 11ac_VHT80)
<b>Antenna Type</b>	Planar Inverted F Antenna
<b>Antenna Gain</b> *	5 150 MHz ~ 5 250 MHz: 2.49 dB i 5 725 MHz ~ 5 850 MHz: 2.74 dB i
<b>H/W Version</b>	Rev.C1
<b>S/W Version</b>	V3.6_20210526

## **1.5. Declaration by the Manufacturer**

- The EUT supported transmitter power control (TPC).

## **1.6. Automatically Discontinue Transmission**

### **1.6.1. Limit of Automatically Discontinue Transmission**

The device shall automatically discontinue transmission in case of either absence of information to transmit or operating failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

### **1.6.2. Test Result of Automatically Discontinue Transmission**

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

### 1.7. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	R&S	SMR40	100272	Jun. 16, 2021	Annual	Jun. 16, 2022
Signal Generator	R&S	SMBV100A	255834	May 31, 2021	Annual	May 31, 2022
Spectrum Analyzer	R&S	FSV30	103210	Dec. 07, 2020	Annual	Dec. 07, 2021
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 04, 2020	Annual	Sep. 04, 2021
Spectrum Analyzer	Agilent	N9030A	US51350132	Nov. 12, 2020	Annual	Nov. 12, 2021
Power Meter	Anritsu	ML2495A	1223004	Jun. 01, 2021	Annual	Jun. 01, 2022
Power Sensor	Anritsu	MA2411B	1207272	Jun. 01, 2021	Annual	Jun. 01, 2022
Attenuator	AEROFLEX / INMET	40AH2W-10	40G-3	Jun. 16, 2021	Annual	Jun. 16, 2022
Low Pass Filter	Mini-Circuits	NLP-1200+	V 8979400903-2	Feb. 08, 2021	Annual	Feb. 08, 2022
High Pass Filter	Wainwright Instrument GmbH	WHKX6.0/18G-10SS	51	Jun. 16, 2021	Annual	Jun. 16, 2022
High Pass Filter	Wainwright Instrument GmbH	WHNX7.5/26.5G-6SS	15	Jun. 16, 2021	Annual	Jun. 16, 2022
DC Power Supply	R&S	HMP2020	20089489	May 14, 2021	Annual	May 14, 2022
Preamplifier	H.P.	8447F	2944A03909	Aug. 06, 2020	Annual	Aug. 06, 2021
Signal Conditioning Unit	R&S	SCU-18	10117	Jun. 09, 2021	Annual	Jun. 09, 2022
Pre Amplifier	TESTEK	TK-PA1840H	130016	Jan. 07, 2021	Annual	Jan. 07, 2022
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 22, 2019	Biennial	Aug. 22, 2021
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB 9163	01126	Dec. 22, 2020	Biennial	Dec. 22, 2022
Horn Antenna	R&S	HF906	100326	Feb. 04, 2021	Annual	Feb. 04, 2022
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9170	9170-540	Nov. 26, 2020	Annual	Nov. 26, 2021
Test Receiver	R&S	ESU26	100109	Feb. 19, 2021	Annual	Feb. 19, 2022
Turn Table	Innco systems GmbH	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-4P	CO3000/963/383 30516/L	N.C.R.	N/A	N.C.R.
Antenna Mast	Innco systems GmbH	MA4640-XP-ET	MA4640/536/383 30516/L	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L x W x H (9.6 m x 6.4 m x 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	RFONE	MWX221-NMSNMS (4 m)	J1023142	Jul. 05, 2021	Semi-annual	Jan. 05, 2022
Coaxial Cable	RFONE	PL520-NMNM-10M (10 m)	20200324001	Jul. 05, 2021	Semi-annual	Jan. 05, 2022
Coaxial Cable	RFONE	PL360P-292M292M-1.5M-A	20200324002	Feb. 19, 2021	Semi-annual	Aug. 19, 2021

**Note;**

- For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

### 1.8. Summary of Test Result

The EUT has been tested according to the following specifications:

<b>APPLIED STANDARD: FCC Part 15 Subpart E, IC RSS-247 Issue 2, RSS-Gen Issue 5</b>			
Section in FCC	Section in IC	Test Item(s)	Result
15.205(a) 15.209(a) 15.407(b)(1) 15.407(b)(2) 15.407(b)(3) 15.407(b)(4)	RSS-Gen Issue 5 8.9 RSS-247 Issue 2 6.2.1.2 RSS-247 Issue 2 6.2.2.2 RSS-247 Issue 2 6.2.3.2 RSS-247 Issue 2 6.2.4.2	Transmitter Radiated Spurious Emissions	Complied
15.407(a)	RSS-Gen Issue 5 6.7	26 dB Bandwidth & 99 % Bandwidth	Complied
15.407(e)	RSS-247 Issue 2 6.2.4.1	6 dB Bandwidth	Complied
15.407(a)(1) 15.407(a)(2) 15.407(a)(3)	RSS-247 Issue 2 6.2.1.1 RSS-247 Issue 2 6.2.2.1 RSS-247 Issue 2 6.2.3.1 RSS-247 Issue 2 6.2.4.1	Maximum Conducted Output Power	Complied
15.407(a)(1) 15.407(a)(2) 15.407(a)(3)	RSS-247 Issue 2 6.2.1.1 RSS-247 Issue 2 6.2.2.1 RSS-247 Issue 2 6.2.3.1 RSS-247 Issue 2 6.2.4.1	Peak Power Spectral Density	Complied
15.207	RSS-Gen Issue 5 8.8	AC Power Line Conducted Emission	N/A <sup>1)</sup>

**Note;**

1) The AC power line test was not performed because the EUT use battery power for operation and which do not operate from the AC power lines.

### 1.9. Test Procedure(s)

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 789033 D02 General UNII Test Procedures New Rules v02r01 were used in the measurement of the DUT.

### 1.10. Sample Calculation

Where relevant, the following sample calculation is provided:

#### 1.10.1. Conducted Test

Offset value (dB) = Attenuator (dB) + Cable loss (dB)

#### 1.10.2. Radiation Test

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

### 1.11. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL002423	2021.08.04	Initial

### 1.12. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
RF Output Power	± 0.36 dB
Occupied Bandwidth	± 13.12 kHz
Power Spectral Density	± 0.63 dB
Radiated Emission, 9 kHz to 30 MHz	H ± 3.66 dB
	V ± 3.66 dB
Radiated Emission, below 1 GHz	H ± 4.90 dB
	V ± 4.82 dB
Radiated Emission, above 1 GHz	H ± 3.62 dB
	V ± 3.64 dB

All measurement uncertainty values are shown with a coverage factor  $k = 2$  to indicate a 95 % level of confidence.

### 1.13. Information of Variant Model

Model Name	Description
Basic Model	TLHOBDNN0B2 D-Class AMP condition
Variant Models	TLHOBDNN0B1 Same RF module and circuit to basic model, Except below - Buffer AMP condition - De-populated to BUB (Backup battery) part
	TLHOBDNN0B5 Same circuit to basic model, except below - De-populated to Audio Amp part and BUB (Backup battery) part - Model name for Global market



### 1.14. Worst- Case Configuration and Mode

Radiated Emission Test (Below 1 GHz)			
Mode	Test Channel	Modulation	Data Rate (Mbps)
11a	48	DSSS	24

Radiated Emission Test (Above 1 GHz)			
Mode	Test Channel	Modulation	Data Rate (Mbps)
11a	36,44,48,149,157,165	OFDM	24
11n 20	36,44,48,149,157,165	OFDM	MCS0
11n 40	38	OFDM	MCS5
	46,151,159		MCS0
11ac 80	42	OFDM	MCS5
	155		MCS0

Conducted Test			
Mode	Test Channel	Modulation	Data Rate (Mbps)
11a	36,44,48,149,157,165	OFDM	24
11n 20	36,44,48,149,157,165	OFDM	MCS0
11n 40	38	OFDM	MCS5
	46,151,159		MCS0
11ac 80	42	OFDM	MCS5
	155		MCS0

**Note;**

All data rates were investigated and chosen above data rate for worst case and measurement was performed with the EUT set highest output power.

### 1.15. Duty Cycle of EUT

Regarding to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, II.B, the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below.  
 Set RBW ≥ EBW if possible; otherwise, set RBW to the largest available value, Set VBW ≥ RBW.  
 Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100.

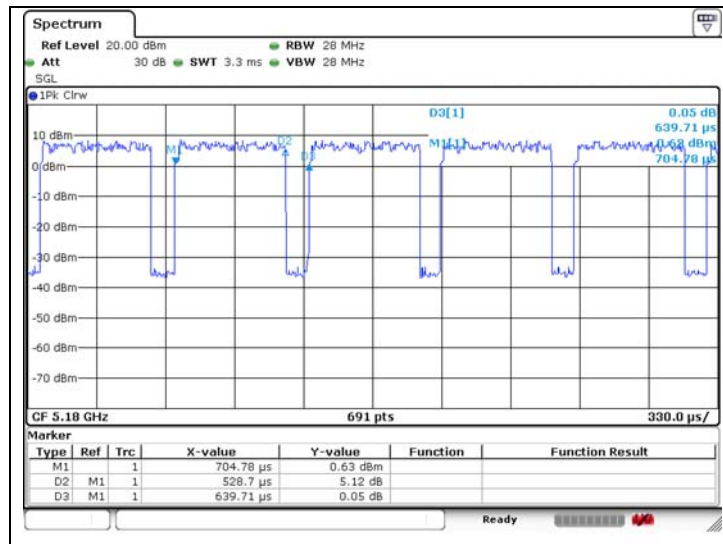
Mode	Data Rate (Mbps)	Duty Cycle (%)	Correction Factor (dB)
11a	24	82.65	0.83
11n_HT20	MCS0	95.10	0.22
11n_HT40	MCS0	89.52	0.48
	MCS5	50.00	3.01
11ac_VHT80	MCS0	82.87	0.82
	MCS5	50.00	3.01

**Remark;**

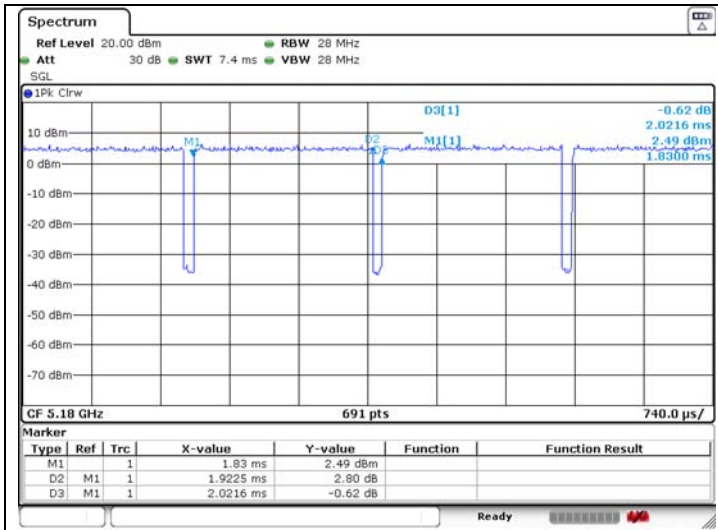
- As measured duty cycles of EUT, all of mode and data rate keep constant period and are converted to log scale (power averaging) to compensate correction factor to result of average test items.
- Duty Cycle (%) = (Tx on time / Tx on + off time) x 100
- Correction Factor (dB) = 10 log (1 / Duty Cycle)

**- Test plots**

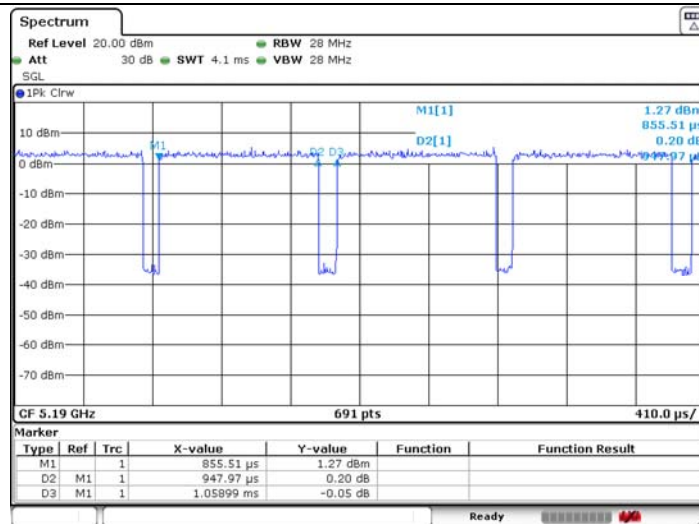
802.11a



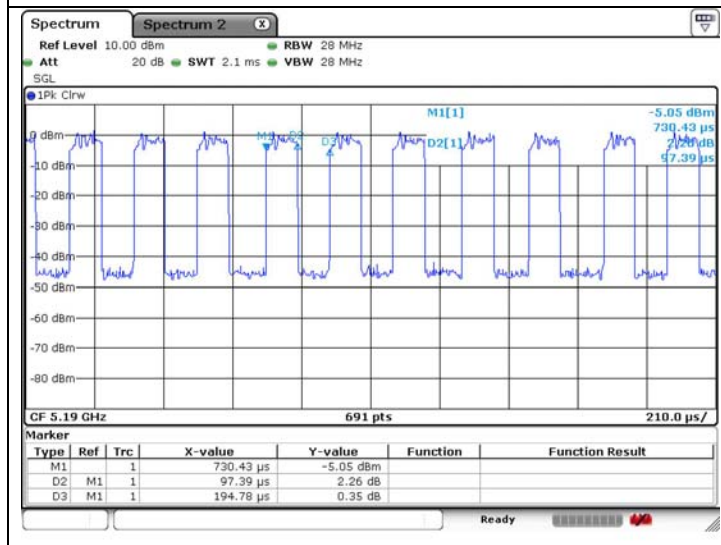
802.11n\_HT20



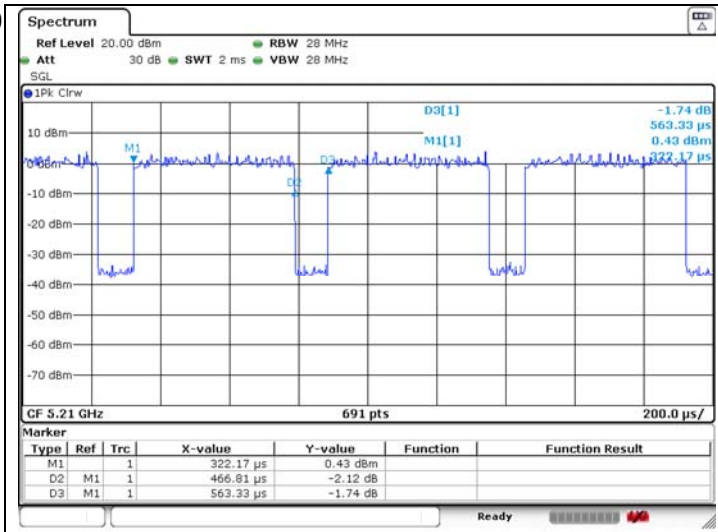
802.11n\_HT40  
MCS0



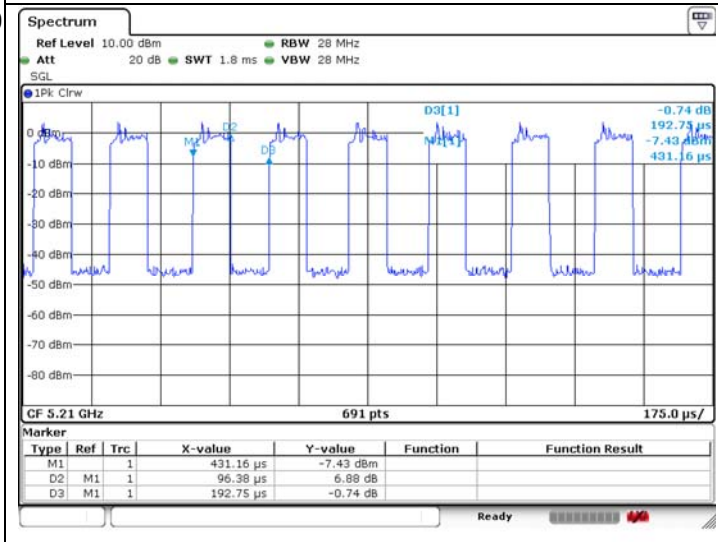
802.11n\_HT40  
MCS5



802.11ac\_VHT80  
MCS0



802.11ac\_VHT80  
MCS5

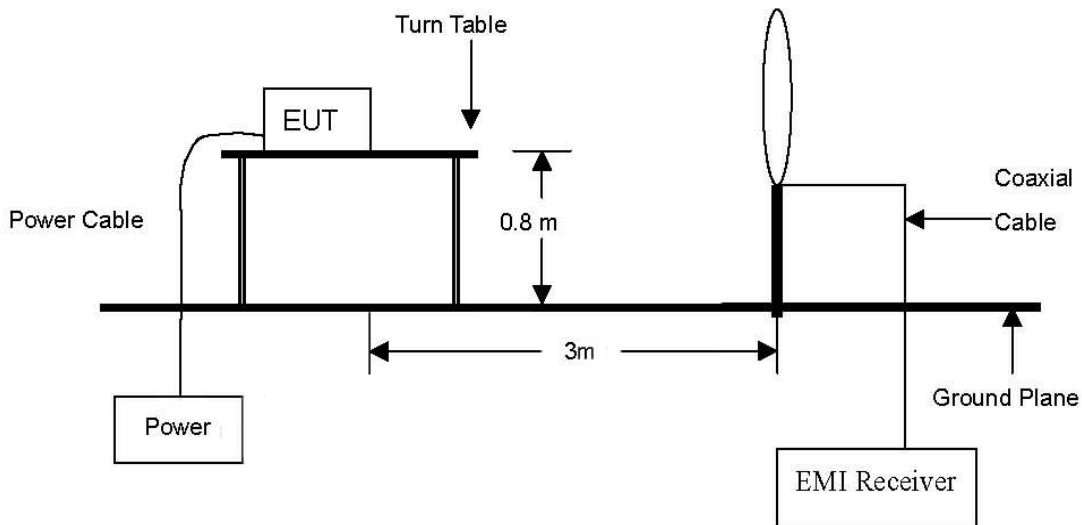


## 2. Transmitter Radiated Spurious Emissions

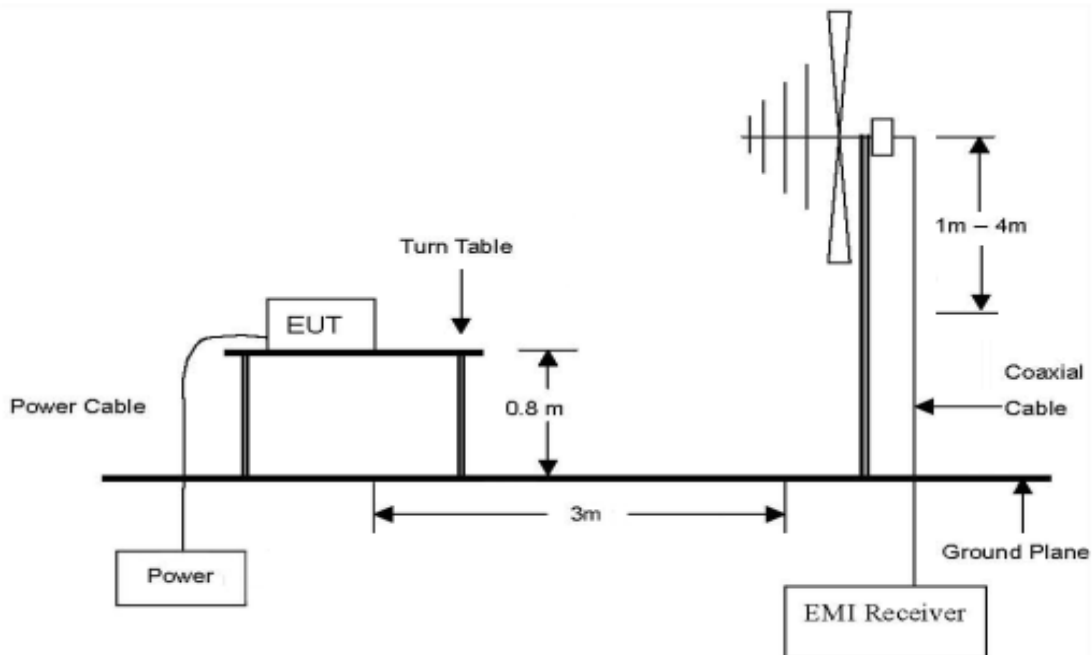
### 2.1. Test Setup

#### 2.1.1. Transmitter radiated spurious emissions

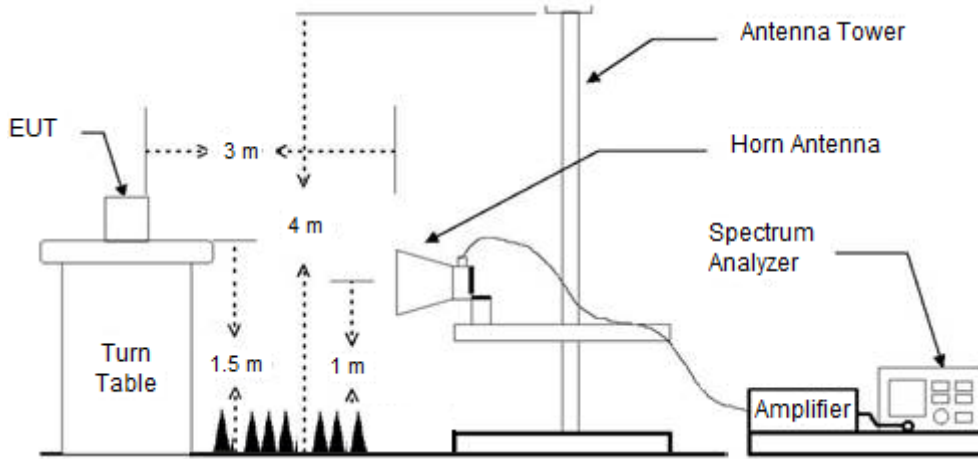
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz emissions.



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. The spurious emissions were investigated from 1 GHz to the 10th harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.



## 2.2. Limit

### 2.2.1. FCC

According to § 15.407(b)

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dB m/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of -27 dB m/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dB m/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 dB m/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 dB m/MHz at the band edge.

According to § 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 (Meters)
0.009-0.490	2 400/F(kHz)	300
0.490-1.705	24 000/F(kHz)	30
1.705-30.0	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., §§15.231 and 15.241.

**2.2.2. IC**

According to RSS-247 Issue 2,

6.2.1.2 Frequency band 5 150-5 250 MHz

For transmitters with operating frequencies in the band 5 150-5 250 MHz, all emissions outside the band 5 150-5 350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5 250-5 350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5 % of the occupied bandwidth (i.e. 99% bandwidth), above 5 250 MHz. The 26 dB bandwidth may fall into the 5 250-5 350 MHz band; however, if the occupied bandwidth also falls within the 5 250- 5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5 250-5 350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5 250-5 350 MHz band.

6.2.4.2 Frequency band 5 725-5 850 MHz

Devices operating in the band 5 725-5 850 MHz with antenna gain greater than 10 dBi can have unwanted emissions that comply with either the limits in this section or in section 5.5 until six (6) months after the publication date of this standard for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2018.

Devices operating in the band 5 725-5 850 MHz with antenna gain of 10 dBi or less can have unwanted emissions that comply with either the limits in this section or in section 5.5 until April 1, 2018 for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2020.

Devices operating in the band 5 725-5 850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

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



## 2.3. Test Procedures

Radiated spurious emissions from the EUT were measured according to the dictates in section G of KDB 789033 D02 General UNII Test Procedures New Rules v02r01 and ANSI C63.10-2013.

### 2.3.1. Test Procedures for emission below 30 MHz

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

### 2.3.2. Test Procedures for emission from above 30 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site below 1 GHz and 1.5 meter above the ground at a 3 meter anechoic chamber test site above 1 GHz. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a bi-log antenna, a horn antenna and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

**Note;**

All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

- II.G.4. Unwanted emissions measurements below 1 GHz.

Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

- II.G.5. Unwanted maximum emissions measurements above 1 GHz.

Peak emission levels are measured by setting the analyzer as follows:

Set to RBW = 1 MHz, VBW ≥ 3 MHz, Detector = Peak, Sweep time = auto, Trace mode= Max hold.

- II.G.6. Average unwanted emissions measurements above 1 GHz.

Set to RBW = 1 MHz, VBW ≥ 3 MHz, Detector = power averaging (rms), Averaging type = power averaging (rms), Sweep time = auto, Perform a trace average of at least 100 traces. If the transmission is continuous, if the transmission is not continuous, the number of traces shall be increased by a factor of 1/x, where x is the duty cycle. For example, with 50 % duty cycle, at least 200 traces shall be averaged.

If tests are performed with the EUT transmitting at a duty cycle less than 98 %, a correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle. The correction factor is computed as follows:

- If power averaging (rms) mode was used in II.G.6.c)(iv), the correction factor is  $10 \log (1 / x)$ , where x is the duty cycle. For example, if the transmit duty cycle was 50 %, then 3 dB must be added to the measured emission levels.

- Definition of the test orthogonal plan for EUT was described in the test setup photo.

The test orthogonal plan of EUT is **Z – axis** during radiation test.

## 2.4. Test Result

Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

### 2.4.1. Radiated Spurious Emission below 1 000 MHz

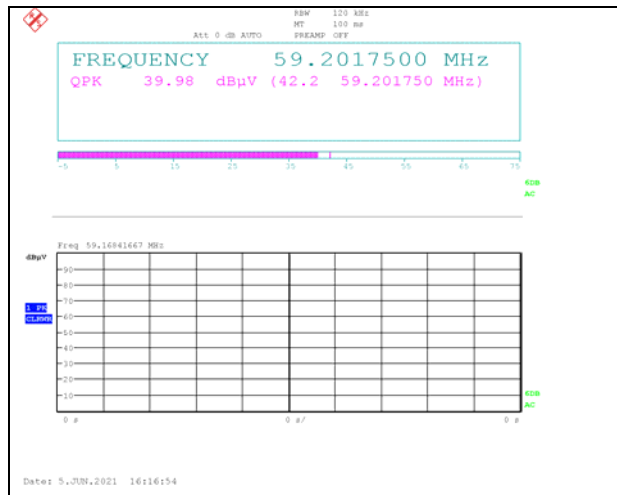
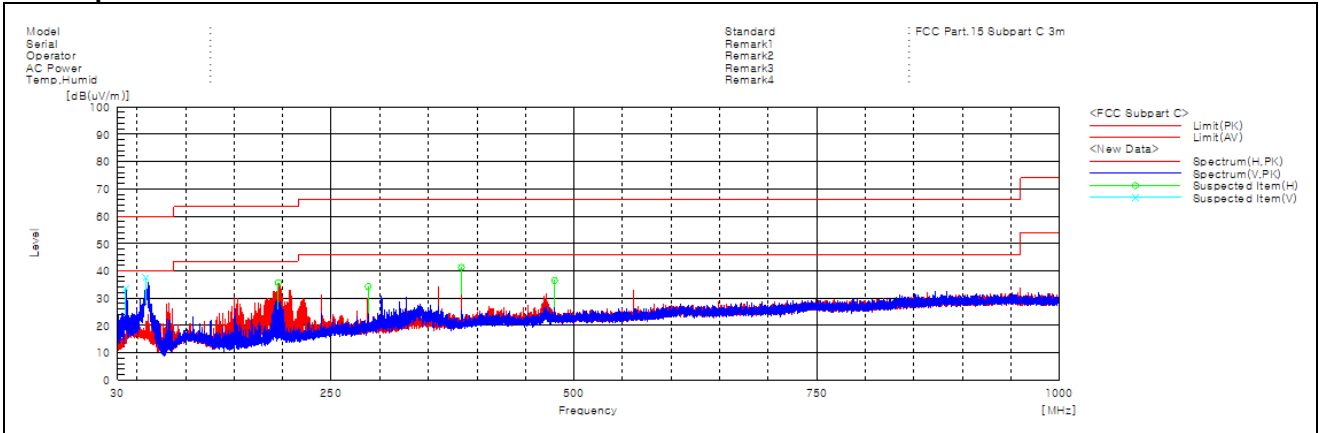
The frequency spectrum from 9 kHz to 1 000 MHz was investigated. All reading values are peak values.

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
38.25	43.60	Peak	V	17.45	-27.35	33.70	40.00	6.30
59.20	42.20	Quasi-Peak	V	18.36	-27.15	33.41	40.00	6.59
195.59	44.70	Peak	H	16.76	-25.77	35.69	43.50	7.81
287.98	40.60	Peak	H	18.76	-25.15	34.21	46.00	11.79
384.01	45.80	Peak	H	20.86	-25.31	<b>41.35</b>	46.00	4.65
480.00	39.90	Peak	H	22.50	-25.82	36.58	46.00	9.42
Above 500.00	Not detected	-	-	-	-	-	-	-

#### Remark;

- Spurious emissions for all channels and modes were investigated and almost the same below 1 GHz.
- Reported spurious emissions are in **11a (Band 1) / 24 Mbps / High channel** as worst case among other modes.
- Radiated spurious emission measurement as below.  
(Actual = Reading + AF + AMP + CL)
- According to §15.31(o), emission levels are not report much lower than the limits by over 20 dB.

**- Test plots**



**2.4.2. Radiated Spurious Emission above 1 000 MHz**

**OFDM: 802.11a (Band 1)\_24 Mbps**

A. Low Channel (5 180 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*4 500.00	39.57	Peak	V	31.90	-31.64	-	39.83	74.00	34.17
*4 500.00	32.15	Average	V	31.90	-31.64	0.83	33.24	54.00	20.76
*5 148.06	51.91	Peak	V	33.50	-31.06	-	54.35	74.00	19.65
*5 148.06	42.83	Average	V	33.50	-31.06	0.83	46.10	54.00	7.90
*5 150.00	55.09	Peak	V	33.50	-31.06	-	57.53	74.00	16.47
*5 150.00	44.51	Average	V	33.50	-31.06	0.83	47.78	54.00	6.22

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10 360.50	41.74	Peak	H	37.78	-26.69	-	52.83	68.23	15.40
Above 10 400.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 220 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10 440.54	41.13	Peak	H	37.70	-26.70	-	52.13	68.23	16.10
Above 10 500.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 240 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10 480.32	39.50	Peak	H	37.70	-27.06	-	50.14	68.23	18.09
Above 10 500.00	Not detected	-	-	-	-	-	-	-	-

**OFDM: 802.11a (Band 3)\_24 Mbps**

A. Low Channel (5 745 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
5 644.75	45.71	Peak	H	34.00	-29.92	-	49.79	68.23	18.44
5 694.31	51.92	Peak	H	34.00	-30.07	-	55.85	101.02	45.17
5 718.27	66.10	Peak	H	34.00	-30.06	-	70.04	110.34	40.30
5 725.00	74.33	Peak	H	34.00	-30.04	-	78.29	122.23	43.94

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*11 487.45	43.52	Peak	H	38.57	-25.24	-	56.85	74.00	17.15
*11 491.80	32.45	Peak	H	38.58	-25.19	0.83	<b>46.67</b>	54.00	7.33
Above 11 500.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 785 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*11 573.00	43.17	Peak	H	38.70	-25.77	-	56.10	74.00	17.90
*11 572.00	32.01	Peak	H	38.70	-25.77	0.83	45.77	54.00	8.23
Above 11 600.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 825 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)		Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
5 850.35	65.38	Peak	H	34.20	-29.54		70.04	121.43	51.39
5 855.00	62.45	Peak	H	34.22	-29.52		67.15	110.83	43.68
5 881.14	47.36	Peak	H	34.32	-29.55		52.13	100.68	48.55
5 969.60	43.26	Peak	H	34.58	-30.25		47.59	68.45	20.86

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*11 651.05	39.93	Peak	H	38.70	-25.14	-	53.49	74.00	20.51
Above 11 700.00	Not detected	-	-	-	-	-	-	-	-

**OFDM: 802.11n\_HT20 (Band 1)\_MCS0**

A. Low Channel (5 180 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*4 500.00	39.64	Peak	V	31.90	-31.64	-	39.90	74.00	34.10
*4 500.00	32.21	Average	V	31.90	-31.64	0.22	32.69	54.00	21.31
*5 147.27	52.75	Peak	V	33.49	-31.06	-	55.18	74.00	18.82
*5 148.06	43.79	Average	V	33.50	-31.06	0.22	46.45	54.00	7.55
*5 150.00	53.64	Peak	V	33.50	-31.06	-	56.08	74.00	17.92
*5 150.00	44.51	Average	V	33.50	-31.06	0.22	<b>47.17</b>	54.00	6.83

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
10 358.40	41.89	Peak	H	37.78	-26.66	-	53.01	68.23	15.22
Above 10 400.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 220 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
10 440.72	41.08	Peak	H	37.70	-26.70	-	52.08	68.23	16.15
Above 10 500.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 240 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
10 480.14	39.57	Peak	H	37.70	-27.06	-	50.21	68.23	18.02
Above 10 500.00	Not detected	-	-	-	-	-	-	-	-



**OFDM: 802.11n\_HT20 (Band 3)\_MCS0**

A. Low Channel (5 745 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
5 642.50	45.78	Peak	H	34.00	-29.93	49.85	68.23	18.38
5 700.00	57.99	Peak	H	34.00	-30.10	61.89	105.23	43.34
5 719.29	66.48	Peak	H	34.00	-30.06	70.42	110.63	40.21
5 721.55	67.36	Peak	H	34.00	-30.05	71.31	114.36	43.05

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*11 487.90	44.16	Peak	H	38.58	-25.24	-	57.50	74.00	16.50
*11 489.95	31.49	Peak	H	38.58	-25.22	0.22	<b>45.07</b>	54.00	8.93
Above 11 500.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 785 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*11 568.30	44.04	Peak	H	38.70	-25.75	-	56.99	74.00	17.01
*11 568.95	31.52	Peak	H	38.70	-25.75	0.22	44.69	54.00	9.31
Above 11 600.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 825 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
5 851.04	65.08	Peak	H	34.20	-29.54		69.74	119.86	50.12
5 856.55	62.30	Peak	H	34.23	-29.52		67.01	110.39	43.38
5 877.46	51.54	Peak	H	34.31	-29.48		56.37	103.41	47.04
5 952.83	42.94	Peak	H	34.51	-30.05		47.40	68.26	20.86

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*11 648.25	41.38	Peak	H	38.70	-25.14	-	54.94	74.00	19.06
*11 649.25	28.94	Peak	H	38.70	-25.14	0.22	42.72	54.00	11.28
Above 11 700.00	Not detected	-	-	-	-	-	-	-	-

**OFDM: 802.11n\_HT40 (Band 1)\_MCS0, MCS5**

A. Low Channel\_MCS5 (5 190 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*4 500.00	41.90	Peak	V	31.90	-31.64	-	42.16	74.00	31.84
*4 500.00	31.83	Average	V	31.90	-31.64	3.01	35.10	54.00	18.90
*5 149.15	59.50	Peak	V	33.50	-31.06	-	61.94	74.00	12.06
*5 149.94	44.51	Average	V	33.50	-31.06	3.01	49.96	54.00	4.04
*5 150.00	58.97	Peak	V	33.50	-31.06	-	61.41	74.00	12.59
*5 150.00	44.51	Average	V	33.50	-31.06	3.01	<b>49.96</b>	54.00	4.04

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
10 380.75	39.98	Peak	H	37.74	-26.78	-	50.94	68.23	17.29
Above 10 400.00	Not detected	-	-	-	-	-	-	-	-

B. High Channel\_MCS0 (5 230 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
10 459.78	38.99	Peak	H	37.70	-26.90	-	49.79	68.23	18.44
Above 10 500.00	Not detected	-	-	-	-	-	-	-	-

**OFDM: 802.11n\_HT40 (Band 3)\_MCS0**

A. Low Channel (5 755 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
5 640.86	54.65	Peak	H	34.00	-29.94	<b>58.71</b>	68.23	9.52
5 692.26	62.12	Peak	H	34.00	-30.07	66.05	99.50	33.45
5 719.09	70.39	Peak	H	34.00	-30.06	74.33	110.57	36.24
5 723.80	72.80	Peak	H	34.00	-30.05	76.75	119.49	42.74

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*11 511.15	40.07	Peak	H	38.62	-24.90	-	53.79	74.00	20.21
Above 11 600.00	Not detected	-	-	-	-	-	-	-	-

B. High Channel (5 795 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
5 854.03	60.70	Peak	H	34.22	-29.53	65.39	113.04	47.65
5 855.63	58.90	Peak	H	34.22	-29.52	63.60	110.65	47.05
5 876.08	54.44	Peak	H	34.30	-29.46	59.28	104.43	45.15
5 954.21	49.42	Peak	H	34.52	-30.07	53.87	68.28	14.41

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*11 589.80	39.68	Peak	H	38.70	-25.58	-	52.80	74.00	21.20
Above 11 600.00	Not detected	-	-	-	-	-	-	-	-

**OFDM: 802.11ac\_VHT80 (Band 1)\_MCS5**

A. Middle Channel (5 210 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*4 500.00	41.53	Peak	V	31.90	-31.64	-	41.79	74.00	32.21
*4 500.00	31.86	Average	V	31.90	-31.64	3.01	35.13	54.00	18.87
*5 143.62	63.60	Peak	V	33.49	-31.05	-	66.04	74.00	7.96
*5 141.25	47.24	Average	V	33.48	-31.04	3.01	<b>52.69</b>	54.00	1.31
*5 150.00	62.64	Peak	V	33.50	-31.06	-	65.08	74.00	8.92
*5 150.00	46.88	Average	V	33.50	-31.06	3.01	52.33	54.00	1.67

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
10 419.68	39.04	Peak	H	37.70	-26.52	-	50.22	68.23	18.01
Above 10 500.00	Not detected	-	-	-	-	-	-	-	-

**OFDM: 802.11ac\_VHT80 (Band 3)\_MCS0**

A. Middle Channel (5 775 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
5 638.81	56.00	Peak	H	34.00	-29.95		<b>60.05</b>	68.23	8.18
5 695.33	69.22	Peak	H	34.00	-30.08		73.14	101.77	28.63
5 718.06	71.05	Peak	H	34.00	-30.06		74.99	110.28	35.29
5 725.00	71.85	Peak	H	34.00	-30.04		75.81	122.23	46.42
5 851.27	66.40	Peak	H	34.21	-29.54		71.07	119.33	48.26
5 860.00	63.72	Peak	H	34.24	-29.50		68.46	109.43	40.97
5 875.62	56.97	Peak	H	34.30	-29.45		61.82	104.77	42.95
5 964.09	49.91	Peak	H	34.56	-30.18		54.29	68.39	14.10

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
*11 550.10	40.84	Peak	H	38.70	-25.65	-	53.89	74.00	20.11
Above 11 600.00	Not detected	-	-	-	-	-	-	-	-

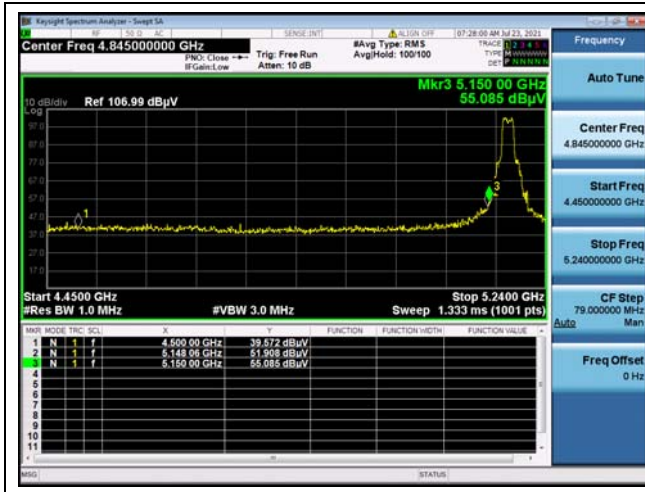
**Remark;**

1. "\*" means the restricted band.
2. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using Peak / average detector mode if frequency was in restricted band. Otherwise the frequency was out of restricted band, only peak detector should be used.
3. Actual = Reading + AF + AMP + CL + (DF).
4. If frequency was out of restricted band, the calculation method for peak limit is same as below.  
 $68.23 \text{ dB}\mu\text{V/m} = \text{EIRP} - 20 \log(d) + 104.77 = -27 - 20 \log(3) + 104.77$
5. In case of the emissions within  $\pm 75 \text{ MHz}$  from band edge of band 3, limit should be adjusted to emission mask of 15.407(4)(i).
6. According to § 15.31(o), emission levels are not reported much lower than the limits by over 20 dB.
7. The maximized peak measured value complies with the average limit, to perform an average measurement is unnecessary.

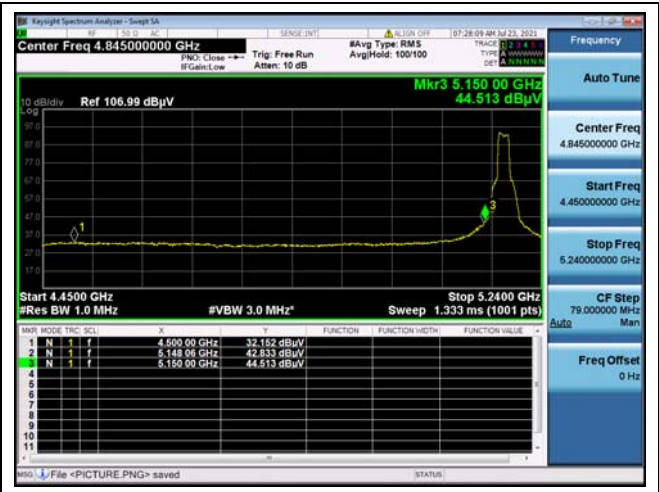
- Test plots

802.11a (24 Mbps)

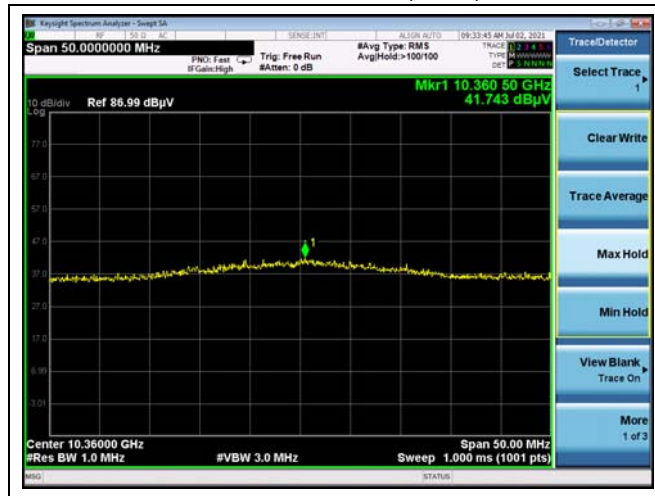
Low channel Band edge (Peak) - Band 1



Low channel Band edge (Average) - Band 1



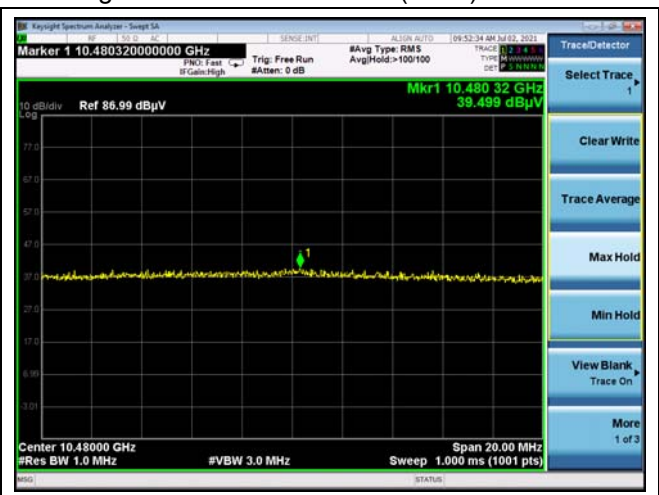
Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



High channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



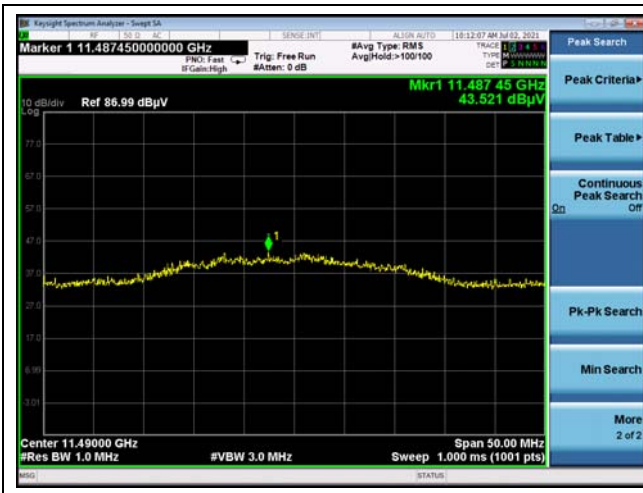
Low channel Band edge (Peak) - Band 3



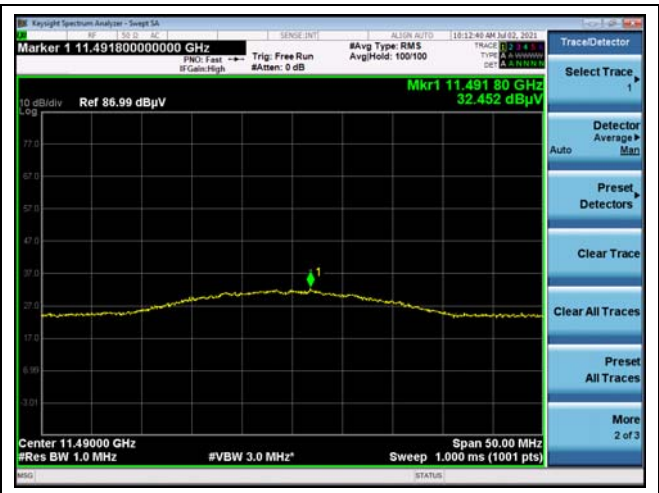
Low channel Band edge (Average) - Band 3



Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 3



Low channel 2<sup>nd</sup> Harmonic (Average) - Band 3



Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 3

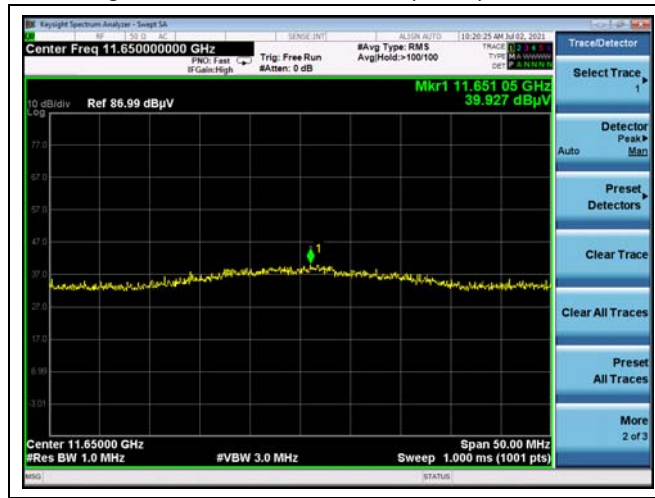


Middle channel 2<sup>nd</sup> Harmonic (Average) - Band 3



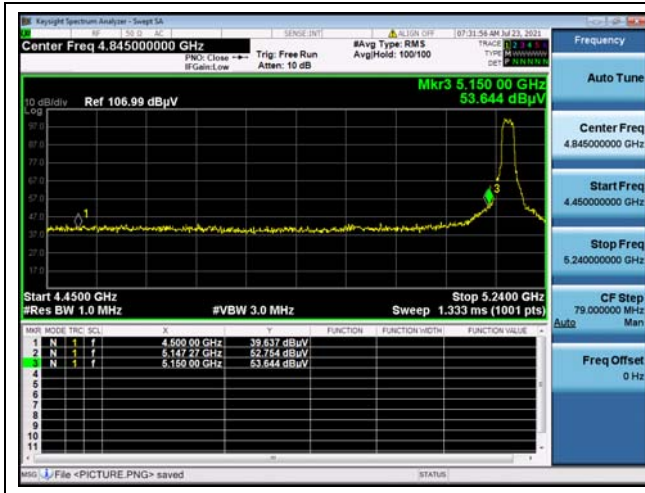


High channel 2<sup>nd</sup> Harmonic (Peak) - Band 3

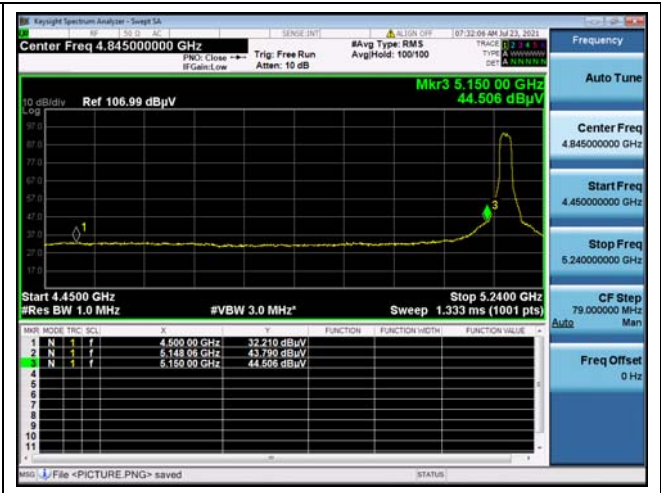


**802.11n\_HT20 (MCS0)**

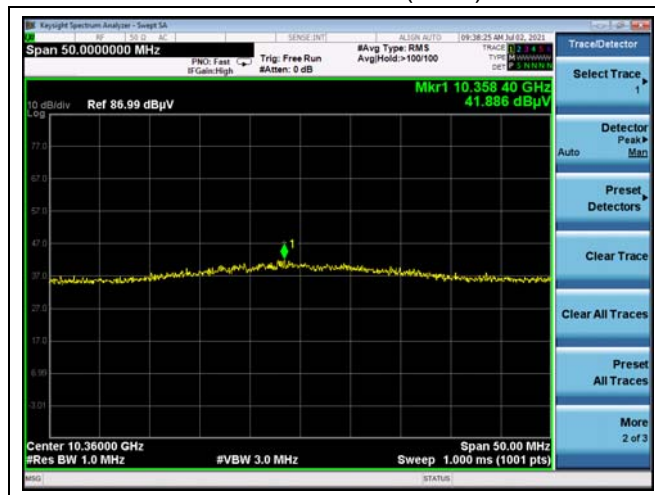
Low channel Band edge (Peak) - Band 1



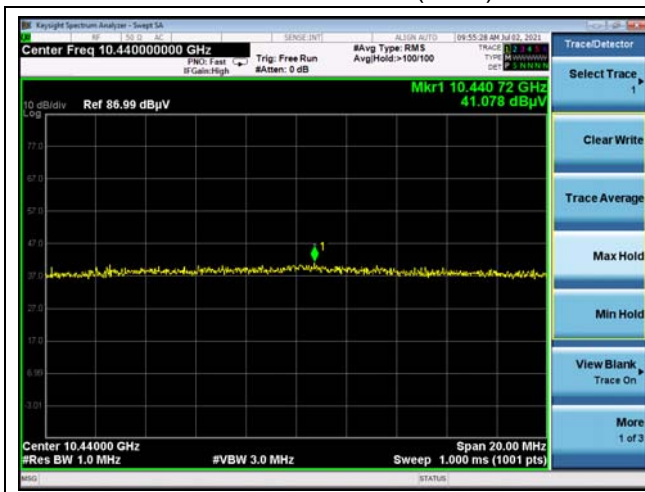
Low channel Band edge (Average) - Band 1



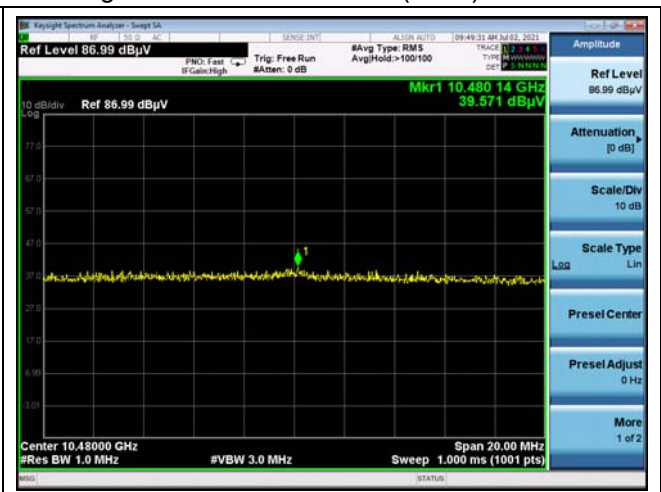
Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



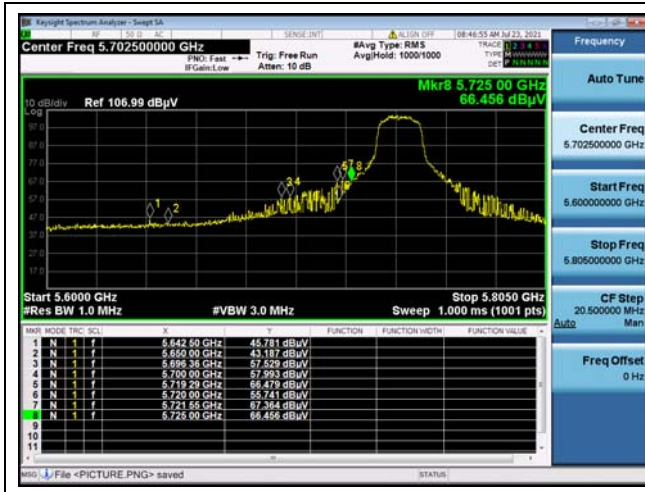
Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



High channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



Low channel Band edge (Peak) - Band 3



Low channel Band edge (Average) - Band 3



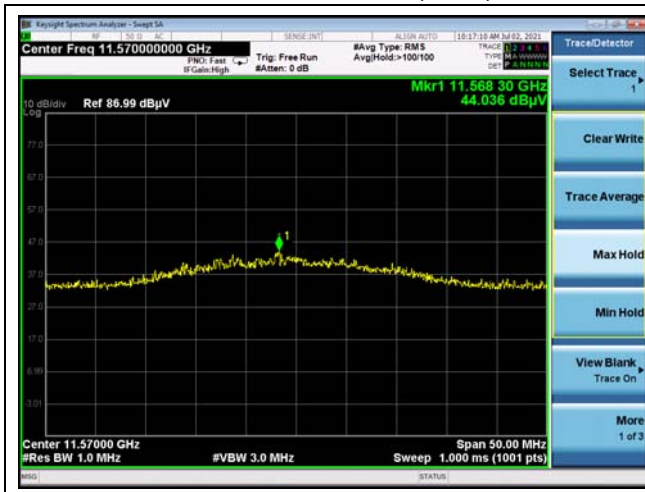
Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 3



Low channel 2<sup>nd</sup> Harmonic (Average) - Band 3



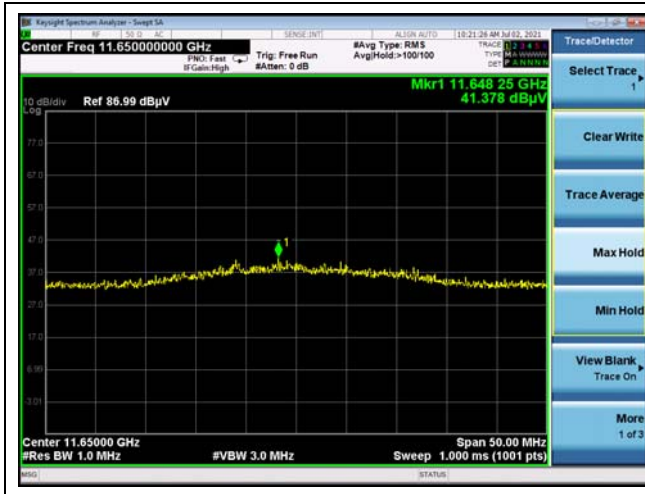
Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 3



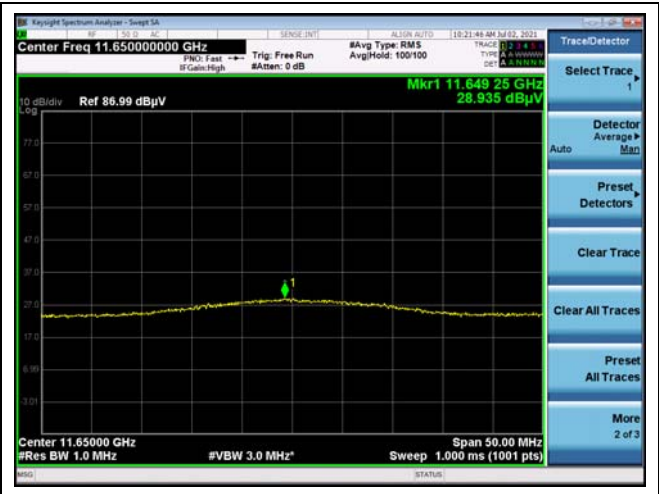
Middle channel 2<sup>nd</sup> Harmonic (Average) - Band 3



High channel 2<sup>nd</sup> Harmonic (Peak) - Band 3



High channel 2<sup>nd</sup> Harmonic (Average) - Band 3

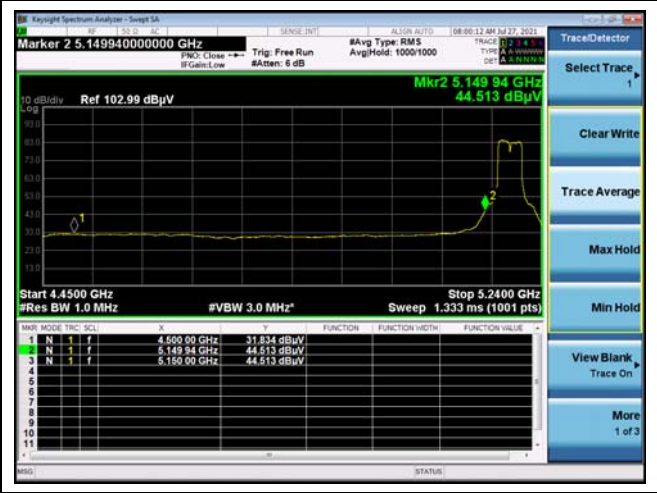


**802.11n\_HT40 (MCS0, MCS5)**

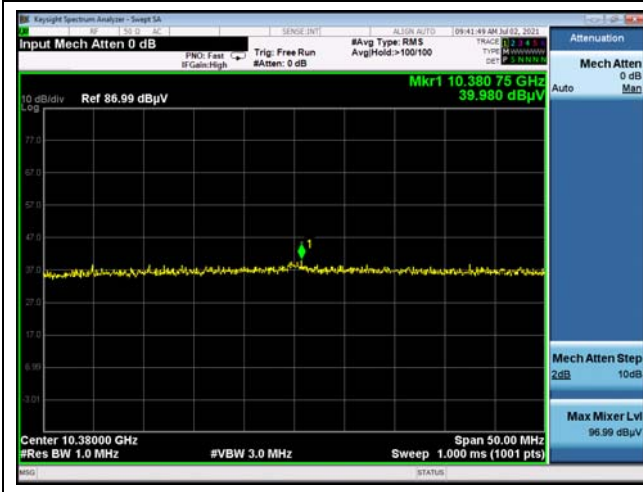
Low channel Band edge (Peak) - Band 1\_MCS5



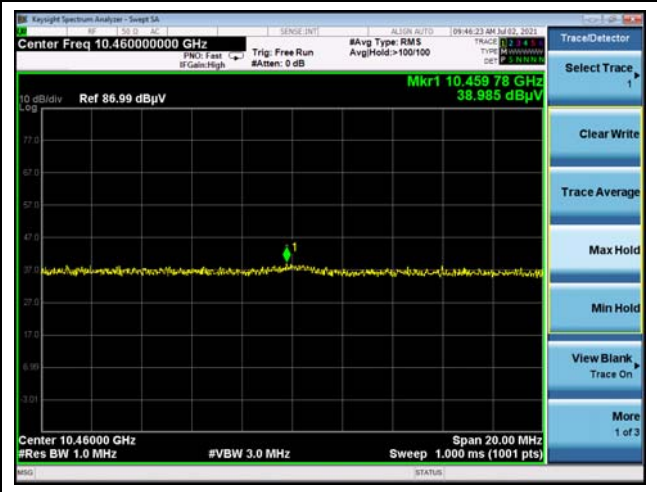
Low channel Band edge (Average) - Band 1\_MCS5



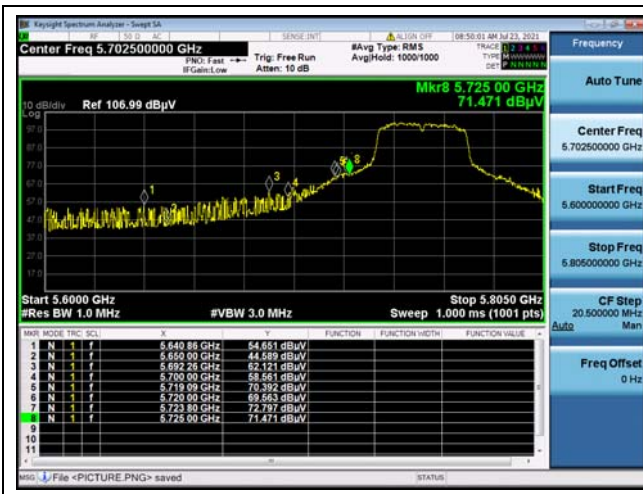
Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 1\_MCS5



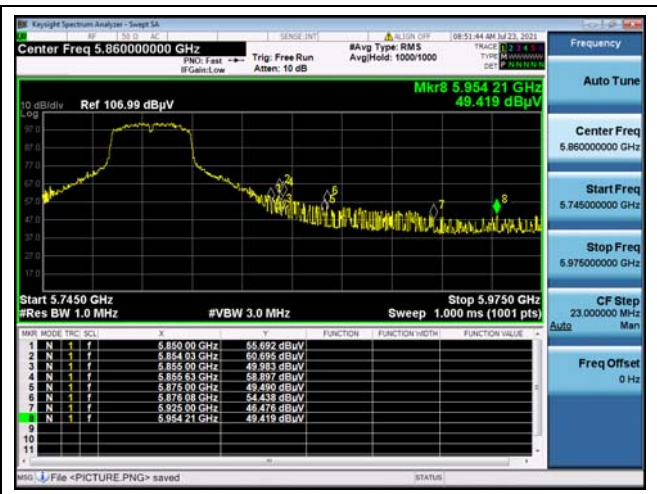
High channel 2<sup>nd</sup> Harmonic (Peak) - Band 1\_MCS5



Low channel Band edge (Peak) - Band 3\_MCS0

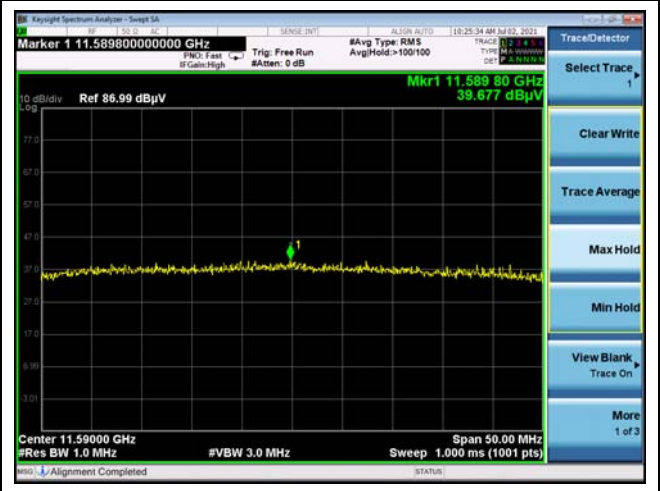
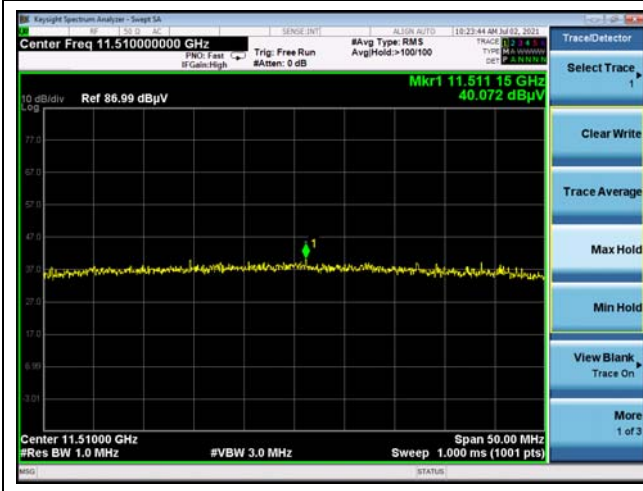


High channel Band edge (Peak) - Band 3\_MCS0



Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 3\_MCS0

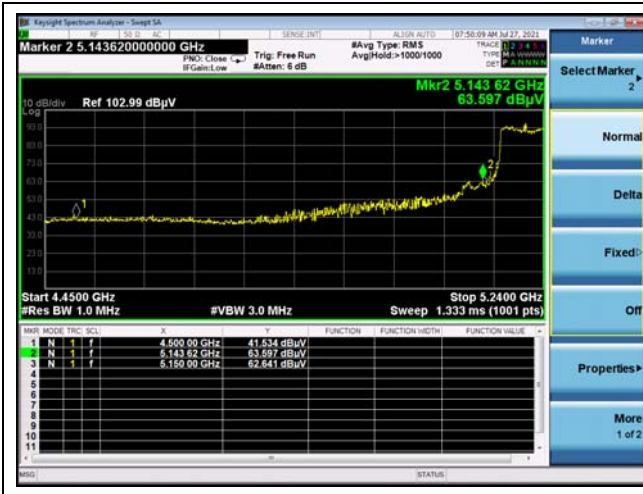
High channel 2<sup>nd</sup> Harmonic (Peak) - Band 3\_MCS0



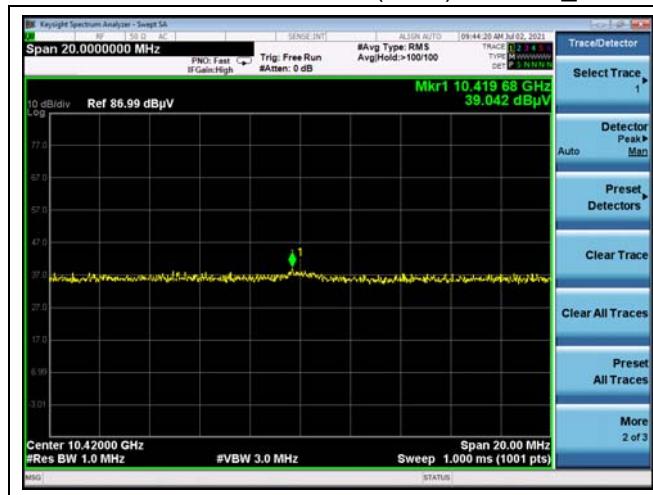
**802.11ac\_VHT80 (MCS0, MCS5)**

Middle channel Band edge (Peak) - Band 1\_MCS5

Middle channel Band edge (Average) - Band 1\_MCS5



Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 1\_MCS5

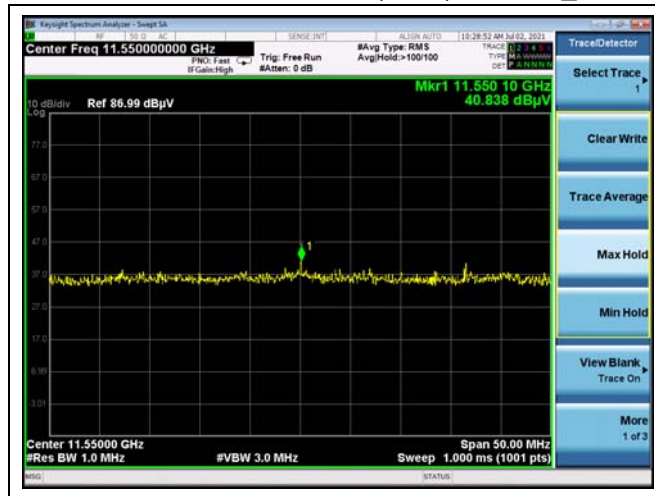


Middle channel Band edge (Peak) - Band 3\_MCS0

Middle channel Band edge (Peak) - Band 3\_MCS0



Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 3\_MCS0





### 3. 26 dB Bandwidth & 99 % Bandwidth

#### 3.1. Test Setup



#### 3.2. Limit

None; for reporting purpose only.

#### 3.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

##### 3.3.1. 26 dB Bandwidth

1. This measurement settings are specified in section II.C.1 of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = approximately 1 % of the emission bandwidth.
3. Set the VBW > RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

### 3.3.2. 99 % Bandwidth

#### 3.3.2.1 FCC

1. This measurement settings are specified in section II.D of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set center frequency to the nominal EUT channel center frequency.
3. Set span = 1.5 times to 5.0 times the OBW.
4. Set RBW = 1 % to 5 % of the OBW.
5. Set VBW  $\geq 3 \times$  RBW.
6. 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.
7. Use the 99 % power bandwidth function of the instrument (if available).
8. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99 % occupied bandwidth is the difference between these two frequencies.

In the result,

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

#### 3.3.2.2 IC

- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99 % emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99 % emission bandwidth).

### 3.4. Test Result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

#### Test mode: 11a

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 180	36	24	20.376	16.729
	5 220	44		20.261	16.729
	5 240	48		20.839	16.787
U-NII 3	5 745	149		20.261	16.729
	5 785	157		20.376	16.729
	5 825	165		20.666	16.729

#### Test mode: 11n\_HT20

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 180	36	MCS0	20.087	17.482
	5 220	44		20.608	17.482
	5 240	48		20.434	17.482
U-NII 3	5 745	149		20.434	17.482
	5 785	157		20.550	17.482
	5 825	165		20.550	17.482

#### Test mode: 11n\_HT40

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 190	38	MCS5	44.805	36.585
	5 230	46	MCS0	44.342	36.006
U-NII 3	5 755	151		43.531	36.006
	5 795	159		44.573	36.006

#### Test mode: 11ac\_VHT80

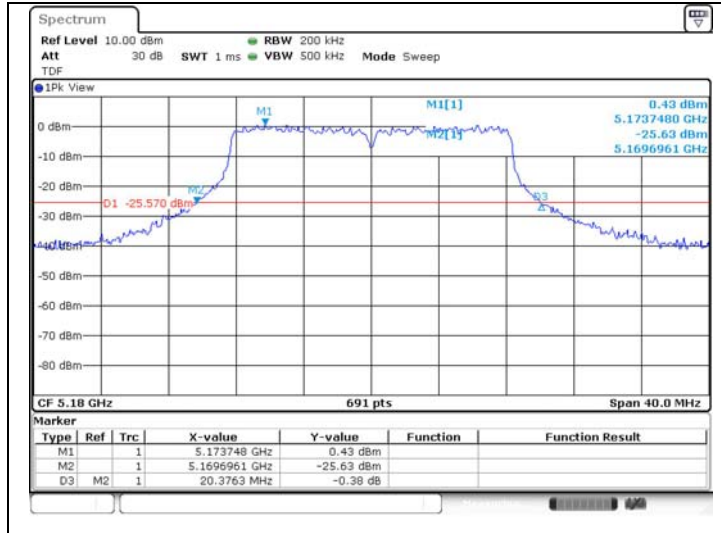
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 210	42	MCS5	87.988	76.411
U-NII 3	5 775	155	MCS0	82.663	75.022

**- Test plots**

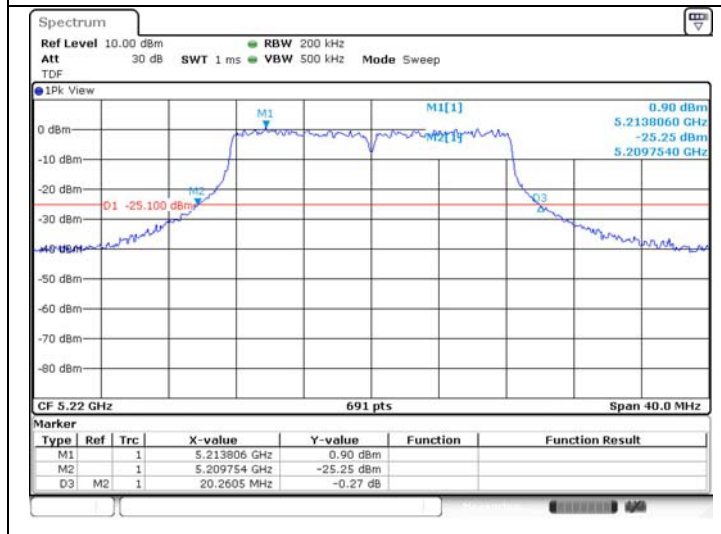
**26 dB Bandwidth**

**802.11a (Band 1)**

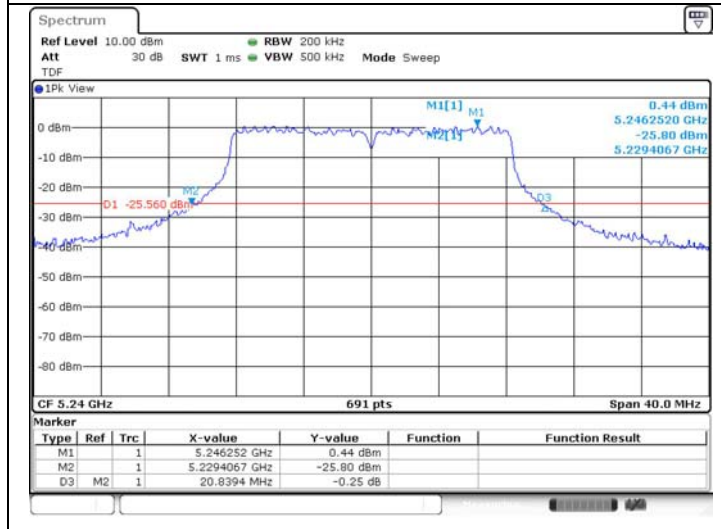
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

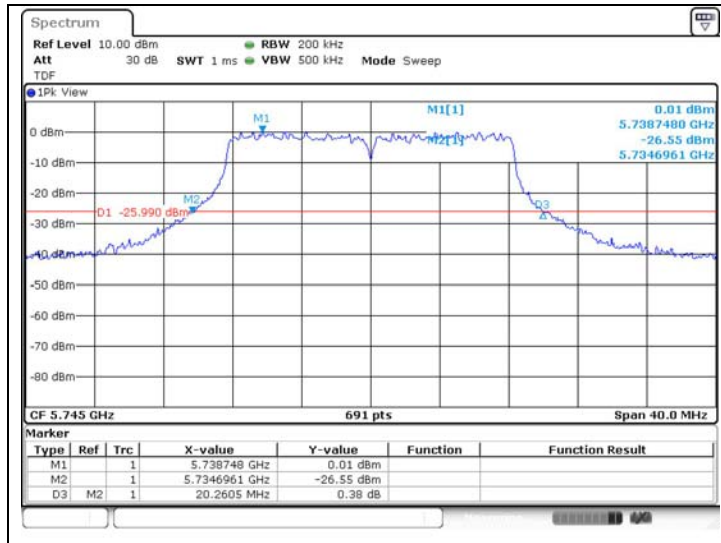


High Channel  
(5 240 MHz)

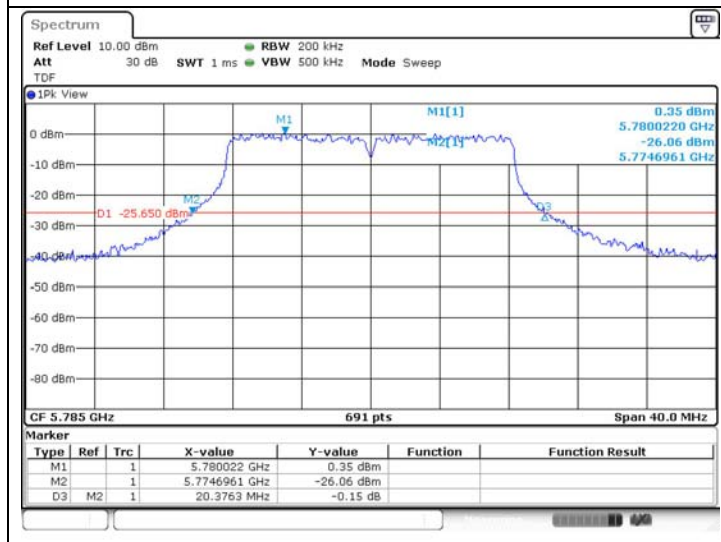


**802.11a (Band 3)**

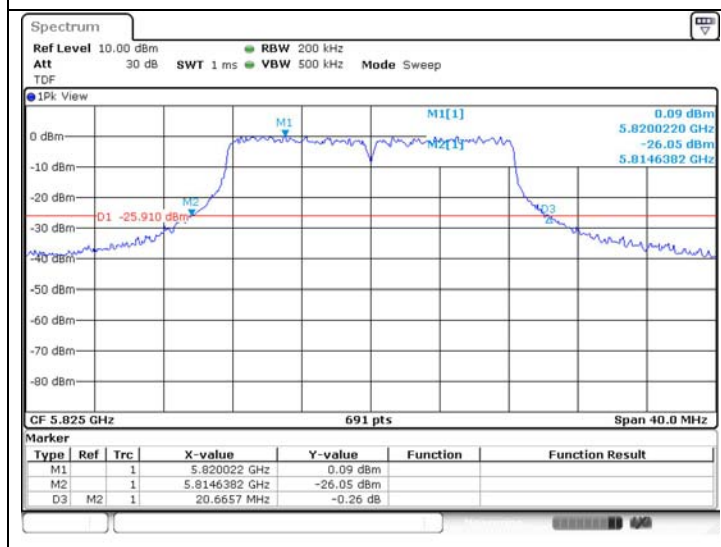
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

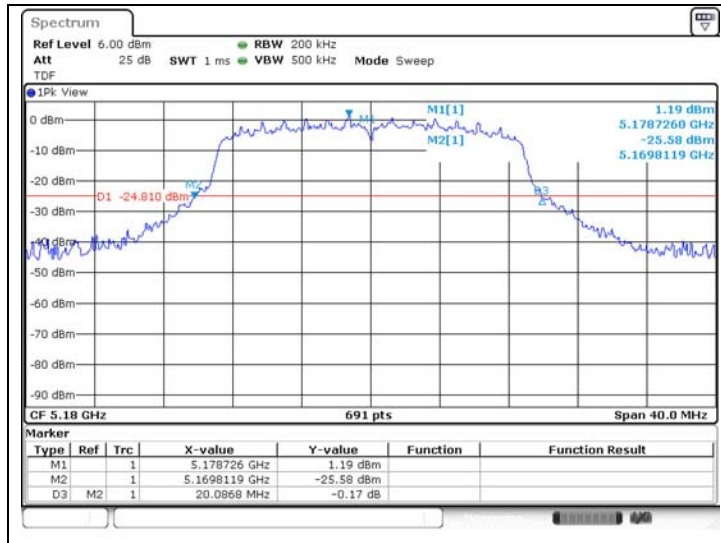


High Channel  
(5 825 MHz)

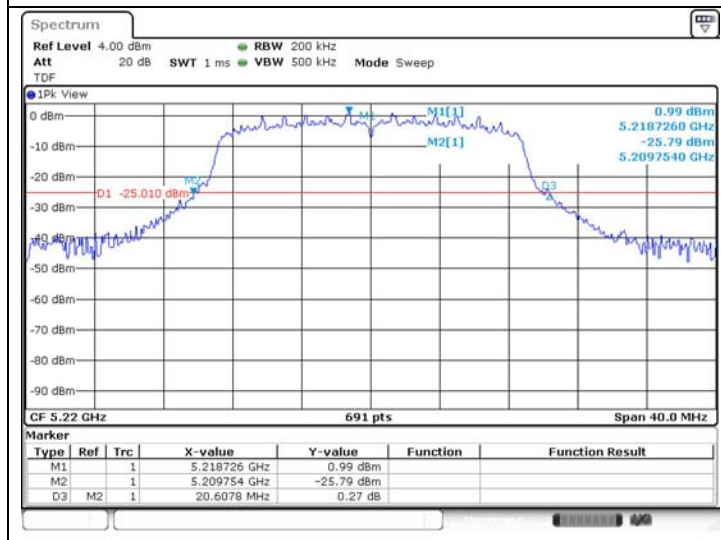


**802.11n\_HT20 (Band 1)**

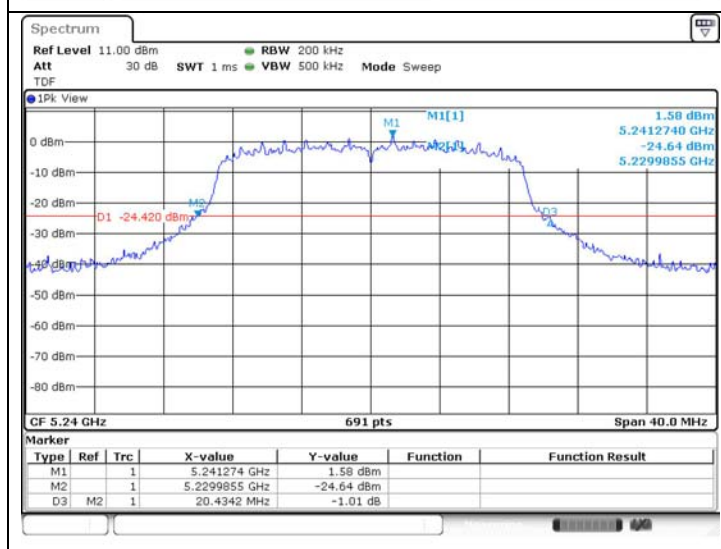
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

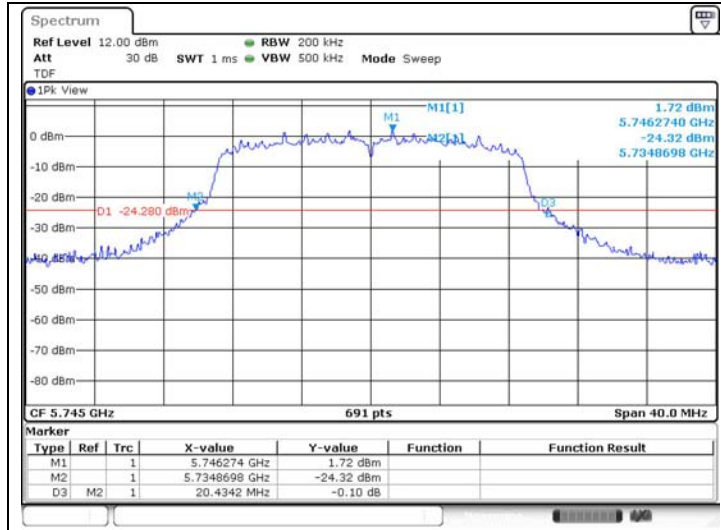


High Channel  
(5 240 MHz)

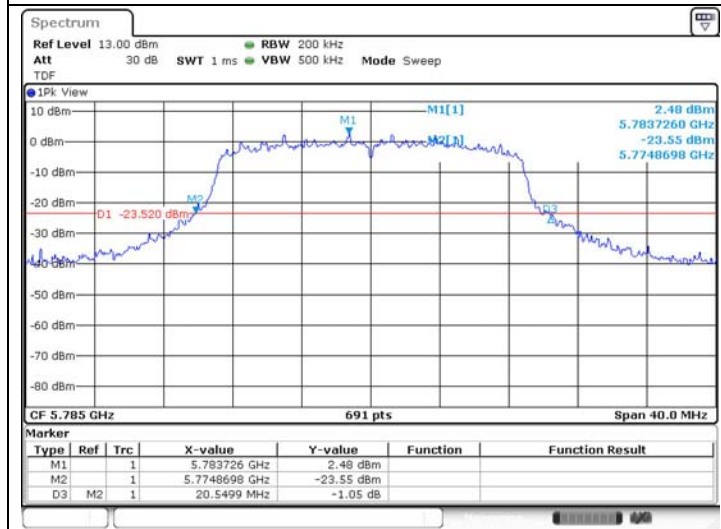


**802.11n\_HT20 (Band 3)**

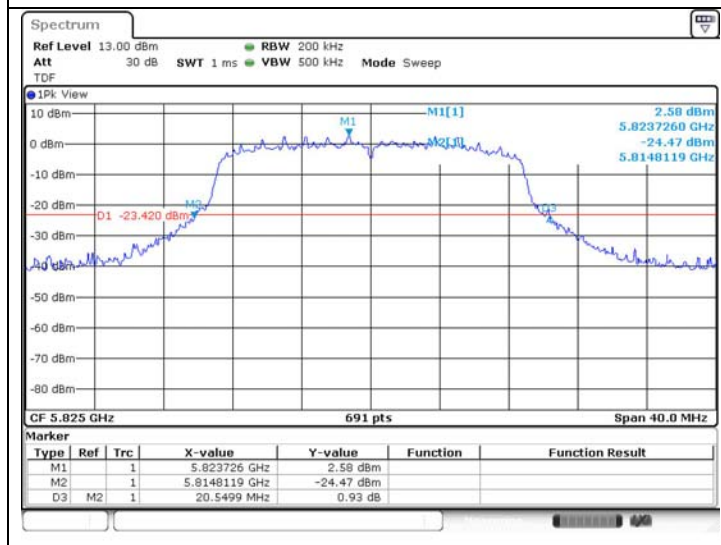
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

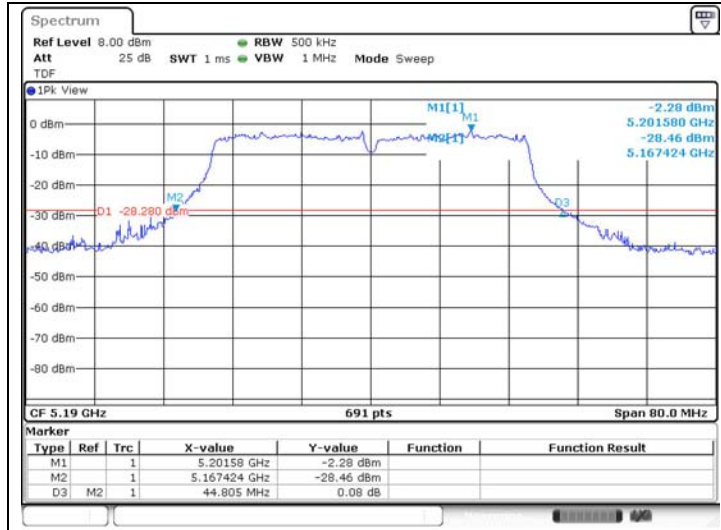


High Channel  
(5 825 MHz)

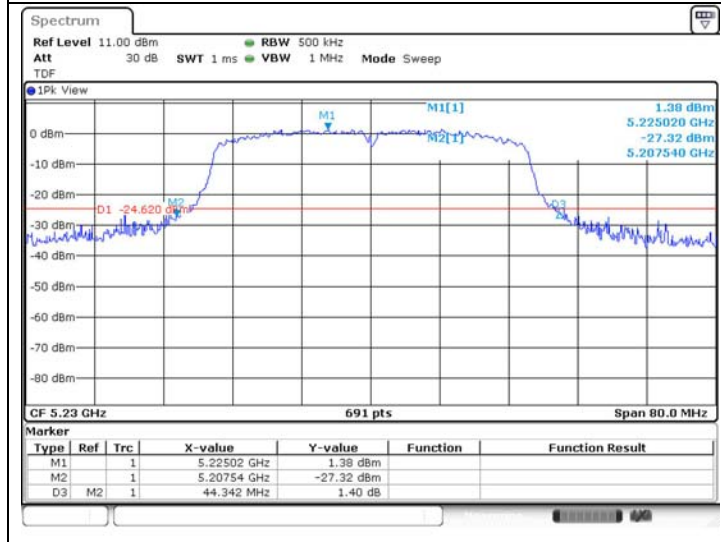


**802.11n\_HT40 (Band 1)**

Low Channel  
(5 190 MHz)



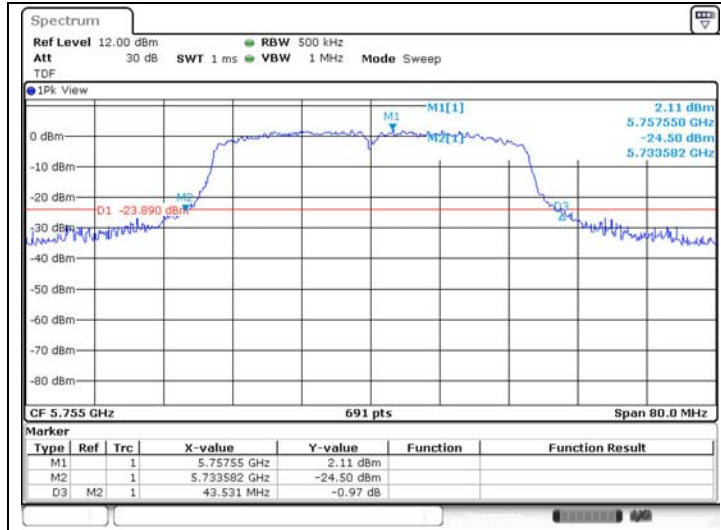
High Channel  
(5 230 MHz)



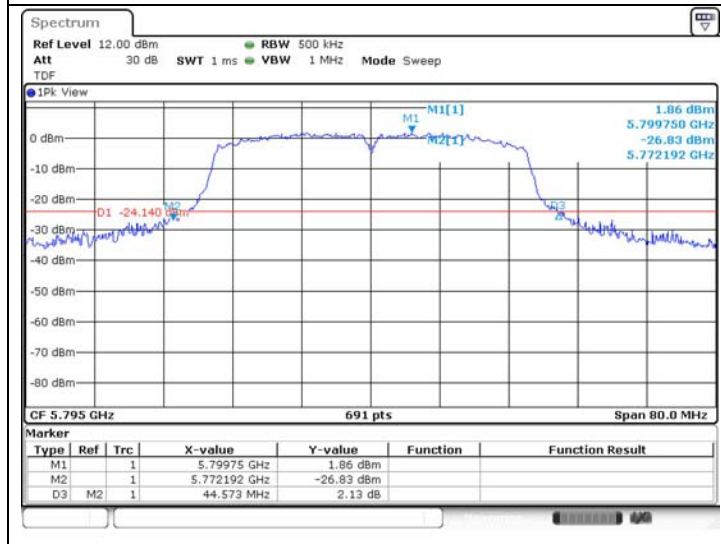


**802.11n\_HT40 (Band 3)**

Low Channel  
(5 755 MHz)

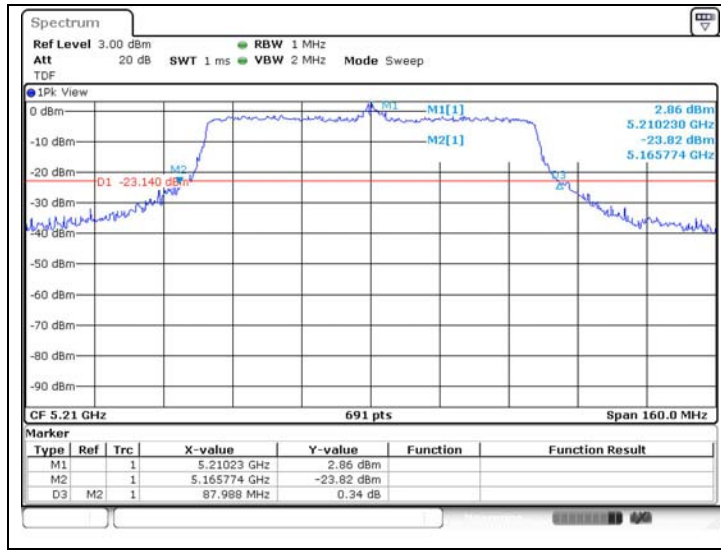


High Channel  
(5 795 MHz)



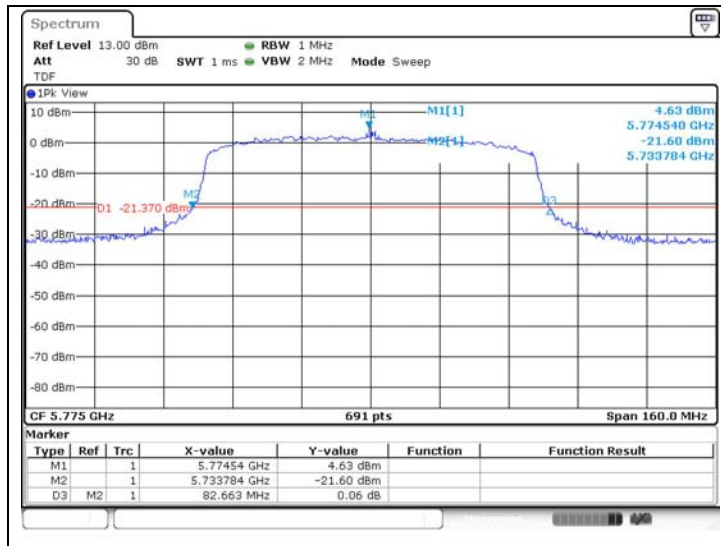
**802.11ac\_VHT80 (Band 1)**

Middle Channel  
(5 210 MHz)



**802.11ac\_VHT80 (Band 3)**

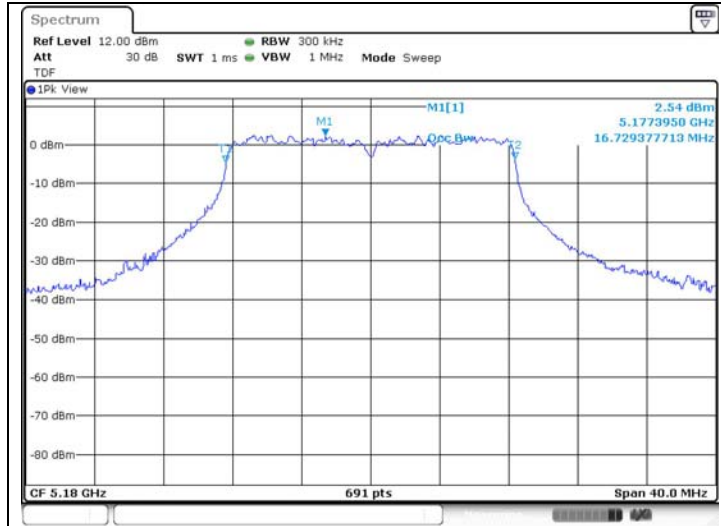
Middle Channel  
(5 775 MHz)



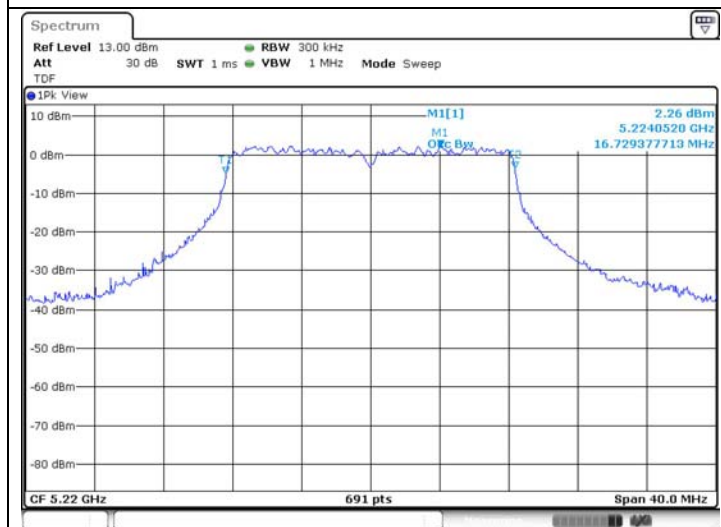
**99 % Bandwidth**

**802.11a (Band 1)**

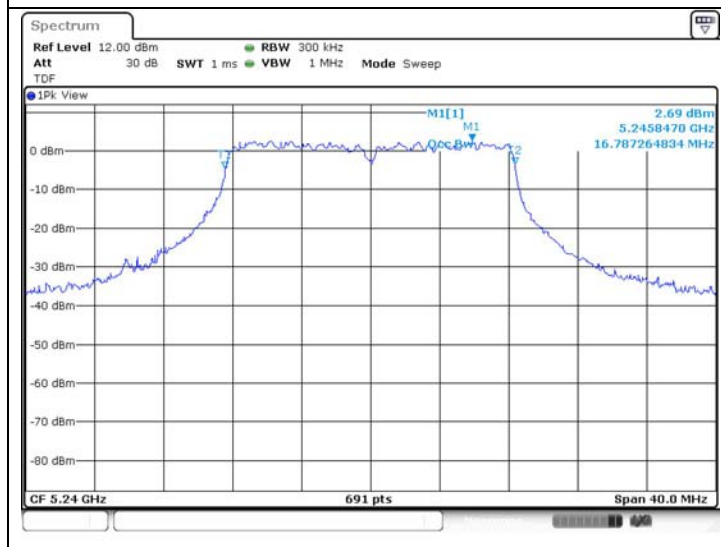
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

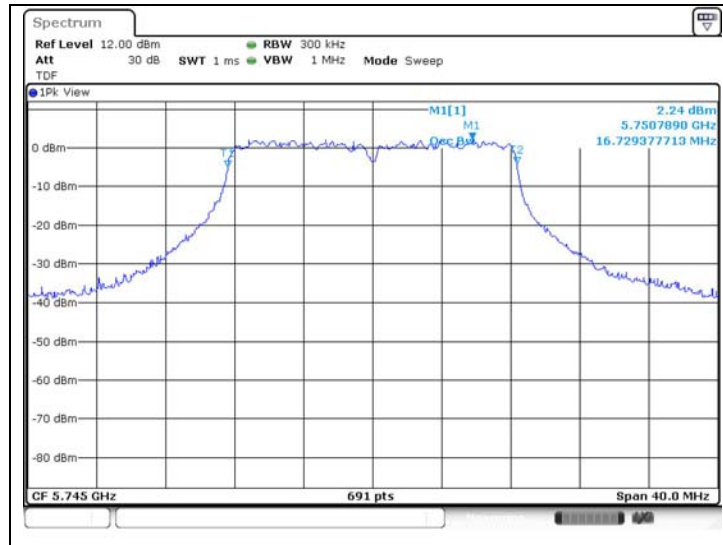


High Channel  
(5 240 MHz)

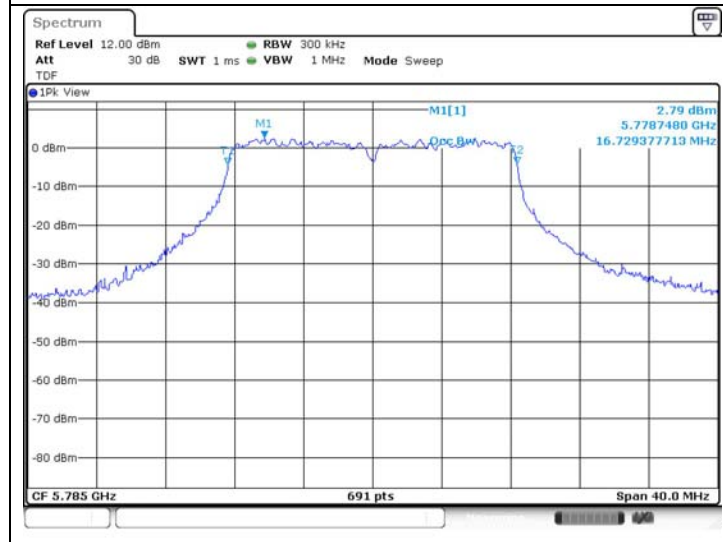


**802.11a (Band 3)**

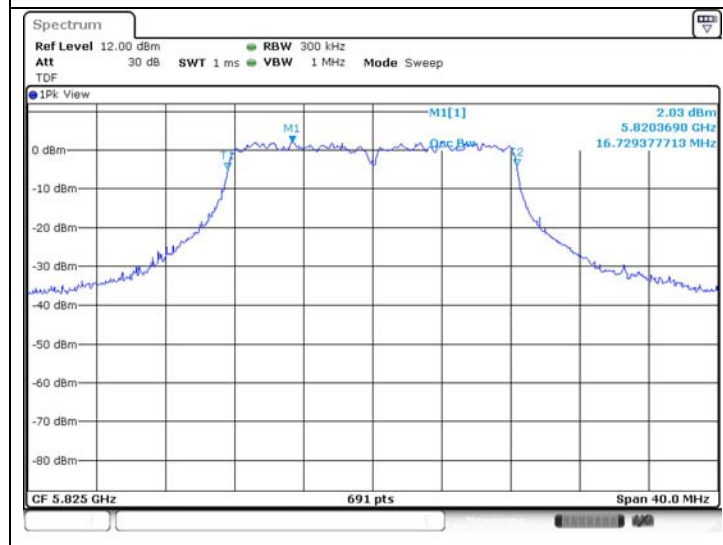
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

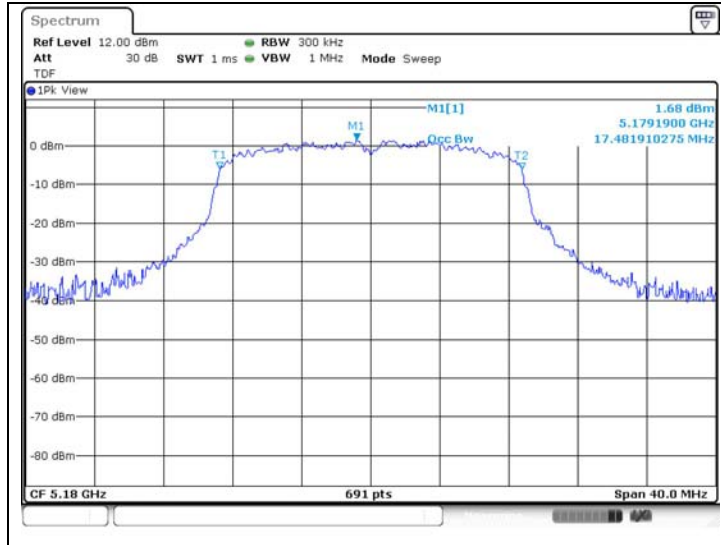


High Channel  
(5 825 MHz)

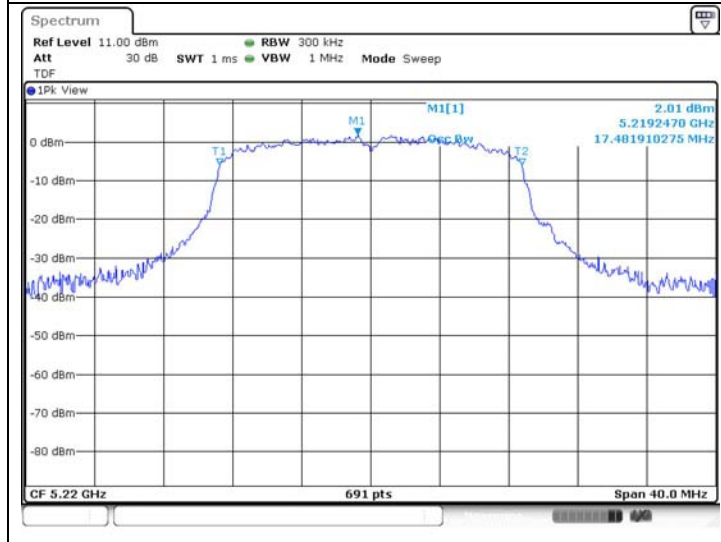


**802.11n\_HT20 (Band 1)**

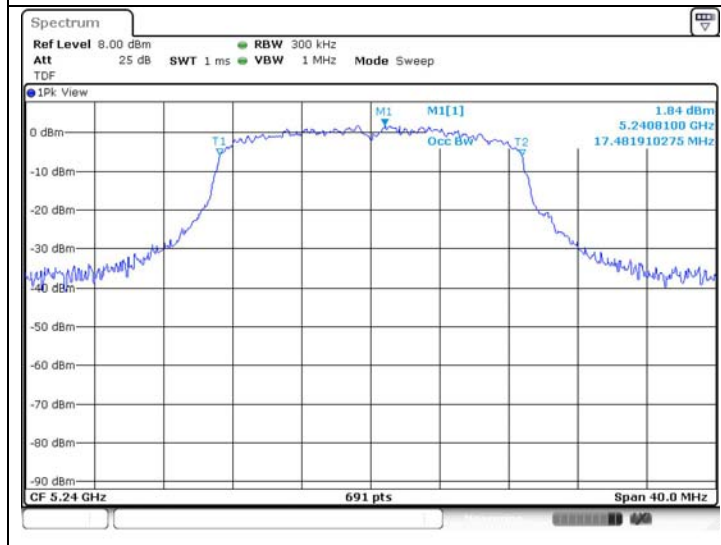
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

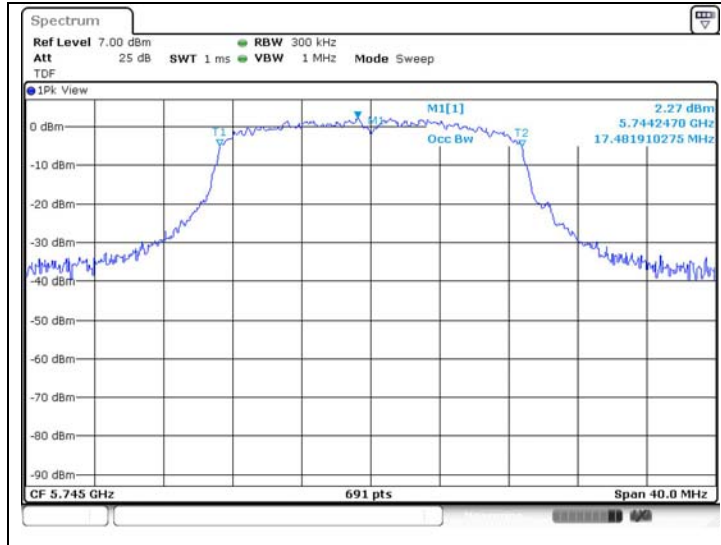


High Channel  
(5 240 MHz)

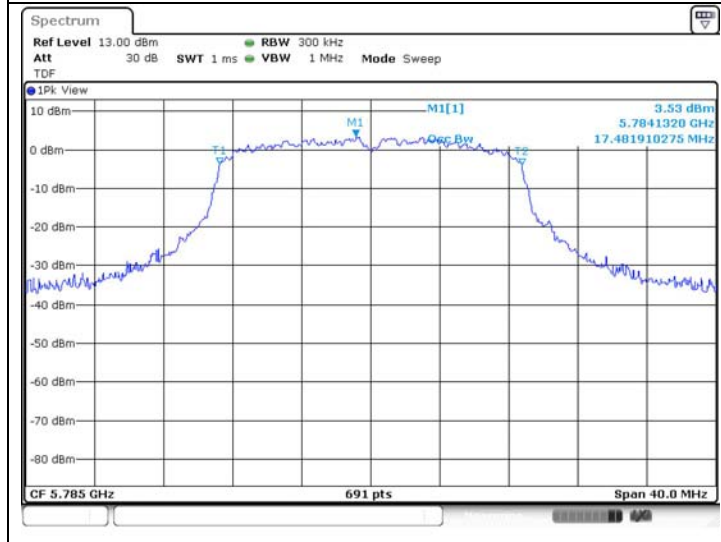


**802.11n\_HT20 (Band 3)**

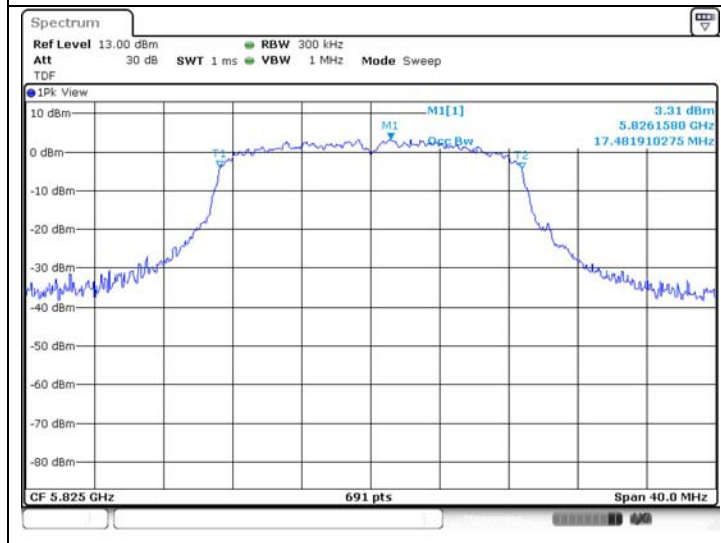
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

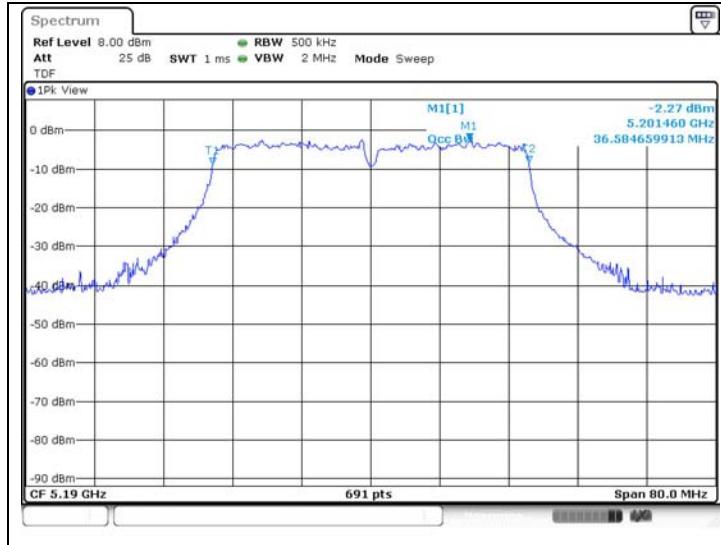


High Channel  
(5 825 MHz)

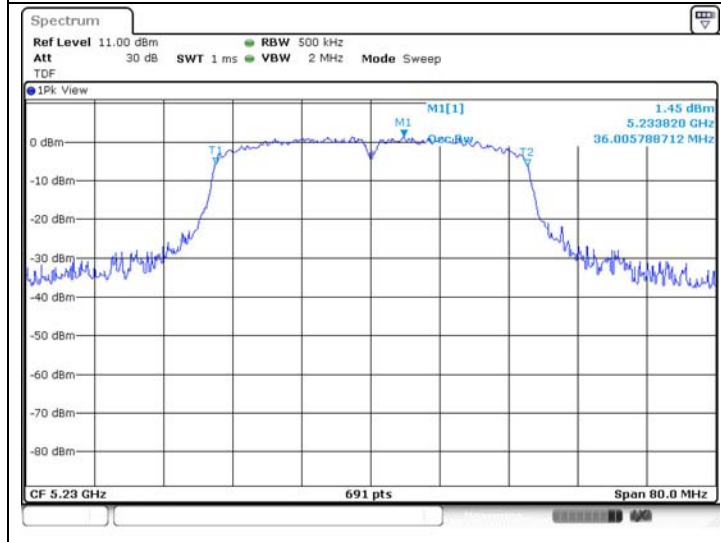


**802.11n\_HT40 (Band 1)**

Low Channel  
(5 190 MHz)

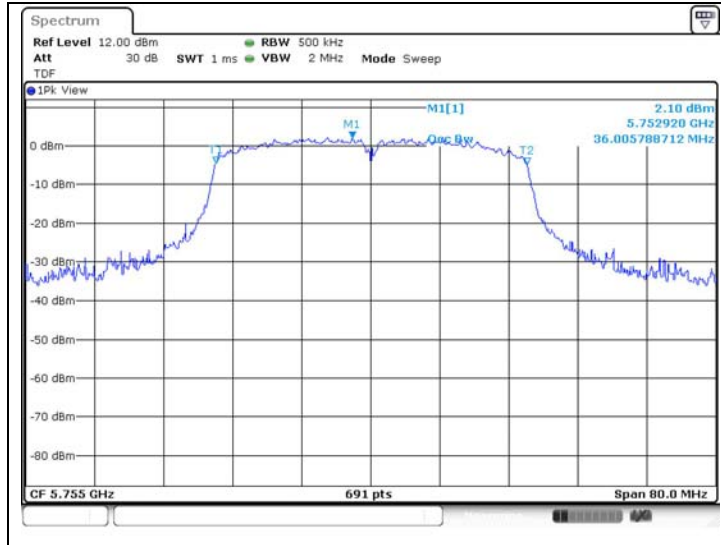


High Channel  
(5 230 MHz)

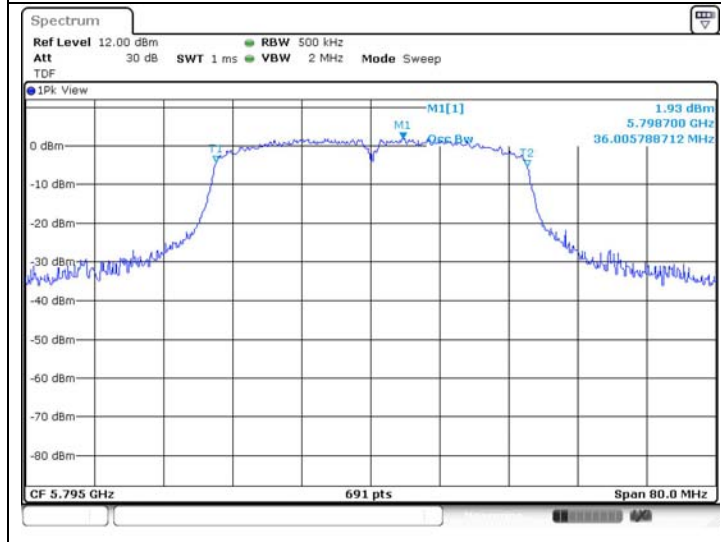


**802.11n\_HT40 (Band 3)**

Low Channel  
(5 755 MHz)



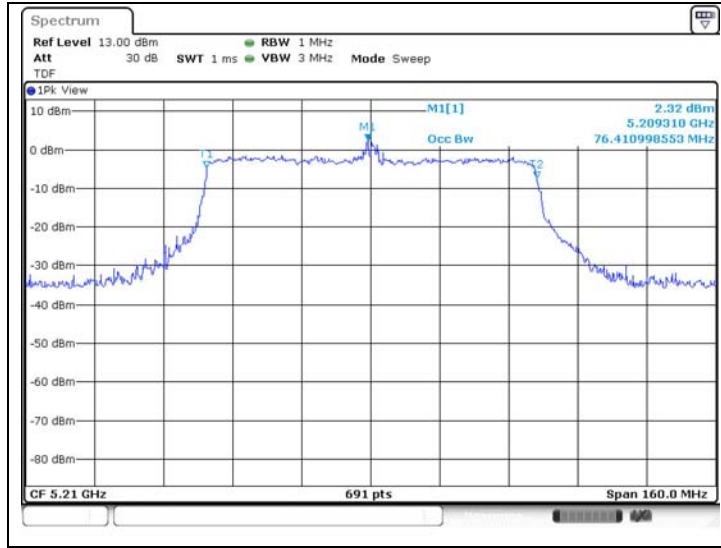
High Channel  
(5 795 MHz)





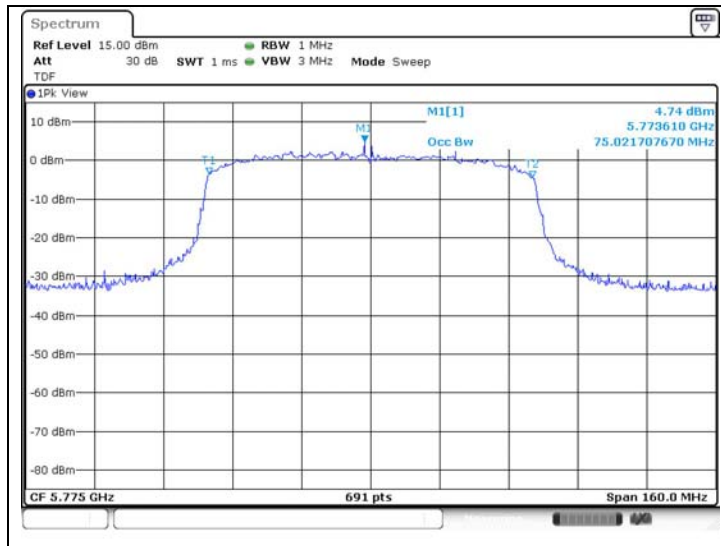
**802.11ac\_VHT80 (Band 1)**

Middle Channel  
(5 210 MHz)



**802.11ac\_VHT80 (Band 3)**

Middle Channel  
(5 775 MHz)



## 4. 6 dB Bandwidth

### 4.1. Test Setup



### 4.2. Limit

#### 4.2.1. FCC

According to §15.407(e), within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

#### 4.2.2. IC

According to RSS-247 Issue 2, 6.2.4.1, the minimum -6 dB Bandwidth shall be at least 500 kHz.

### 4.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section II.C.2 of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = 100 kHz.
3. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. 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.

#### 4.4. Test Result

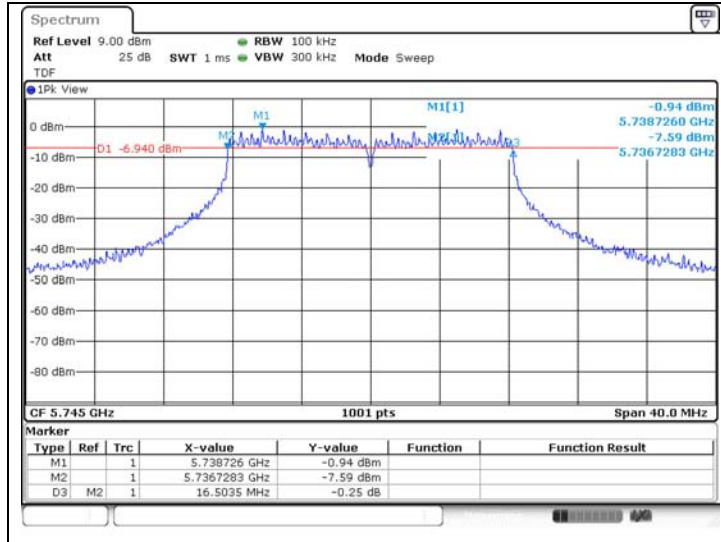
Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

Band	Mode	Frequency (MHz)	Ch.	Data Rate (Mbps)	6 dB Bandwidth (MHz)	Minimum Bandwidth (kHz)
U-NII 3	11a	5 745	149	24	16.504	500
		5 785	157		16.504	
		5 825	165		16.504	
	11n_HT20	5 745	149	MCS0	15.225	
		5 785	157		14.106	
		5 825	165		15.185	
	11n_HT40	5 755	151	MCS0	35.165	
		5 795	159		35.165	
	11ac_VHT80	5 775	155	MCS0	72.887	

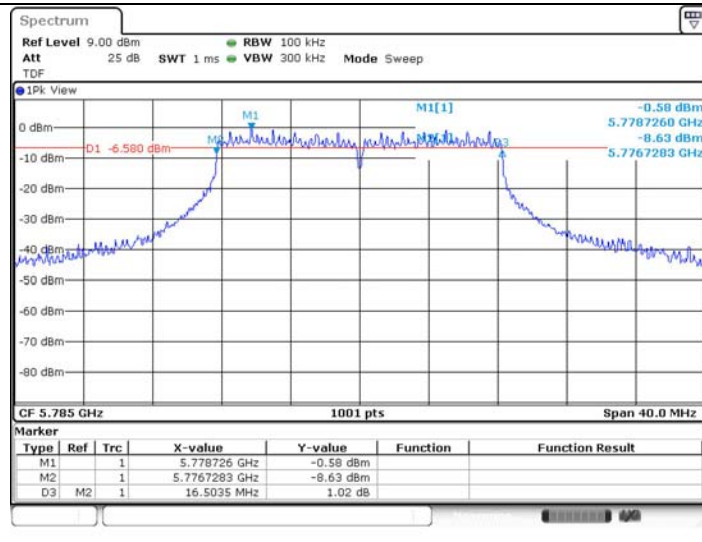
**- Test plots**

**802.11a (Band 3)**

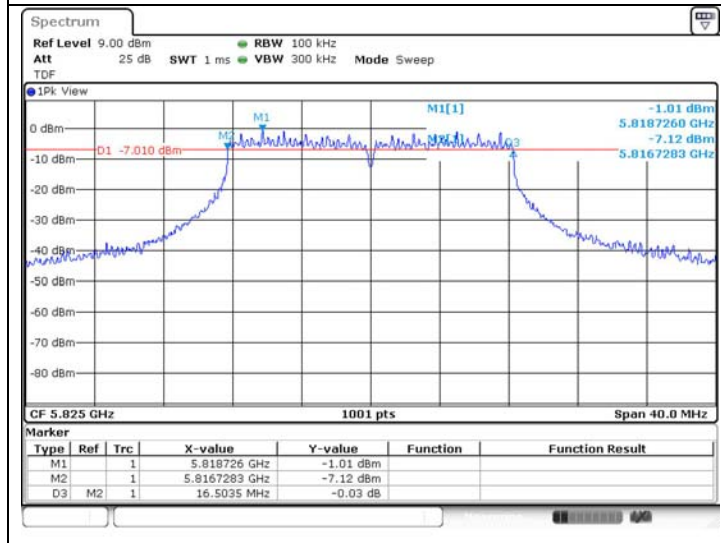
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

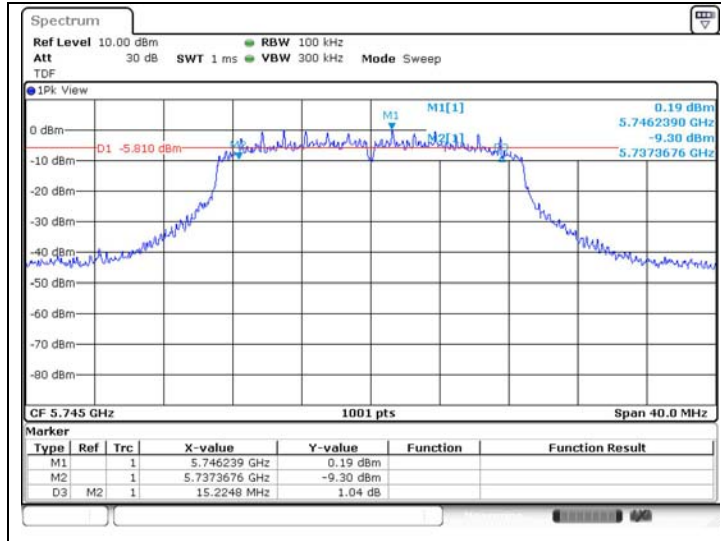


High Channel  
(5 825 MHz)

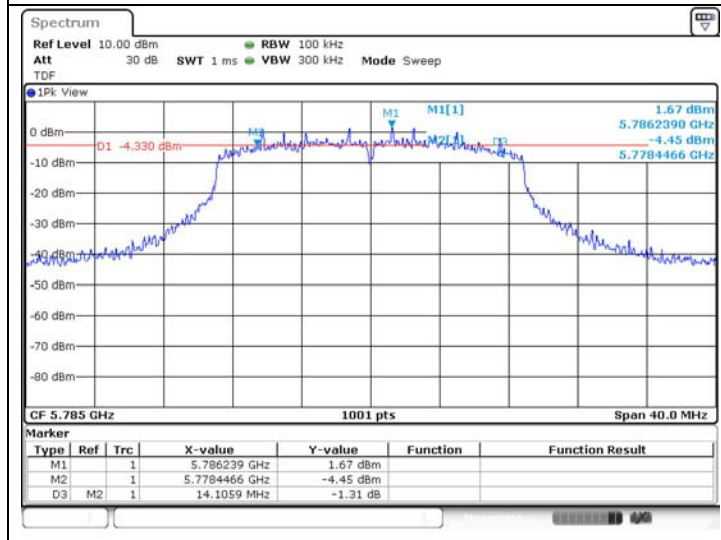


**802.11n\_HT20 (Band 3)**

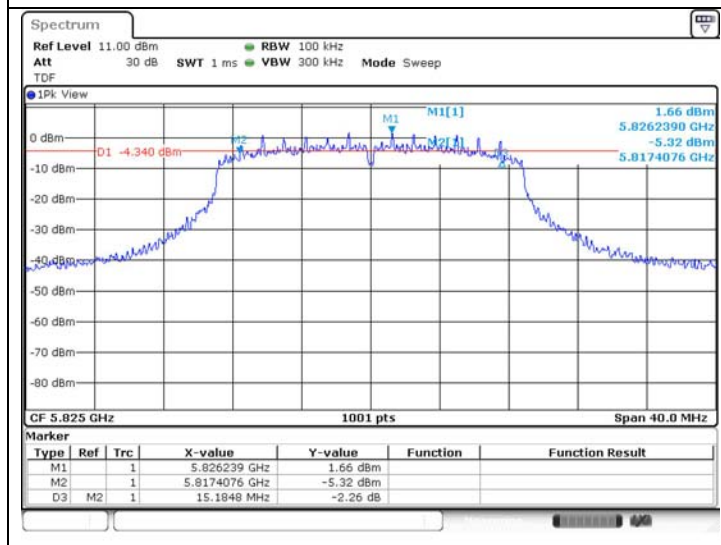
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

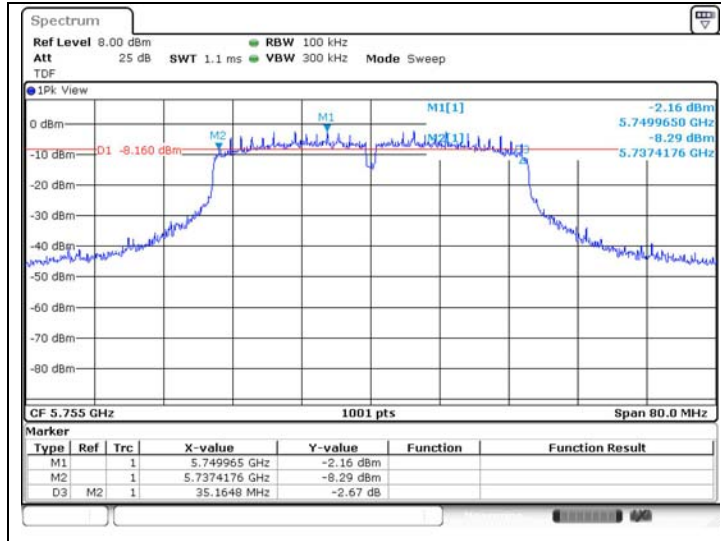


High Channel  
(5 825 MHz)

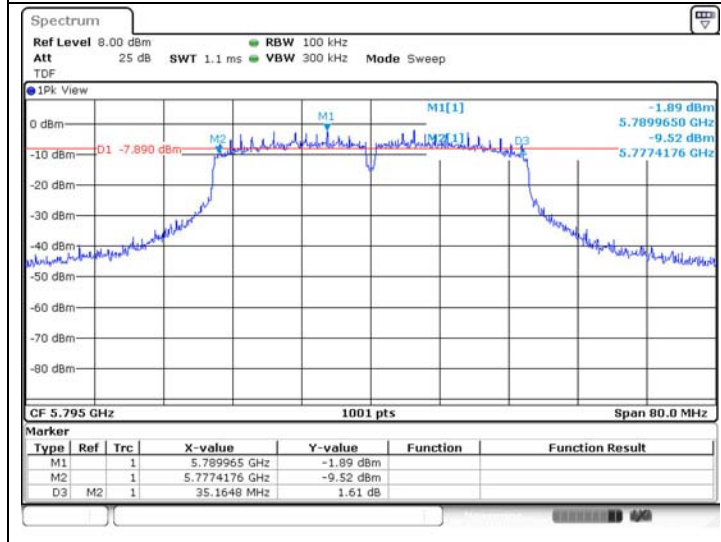


**802.11n\_HT40 (Band 3)**

Low Channel  
(5 755 MHz)

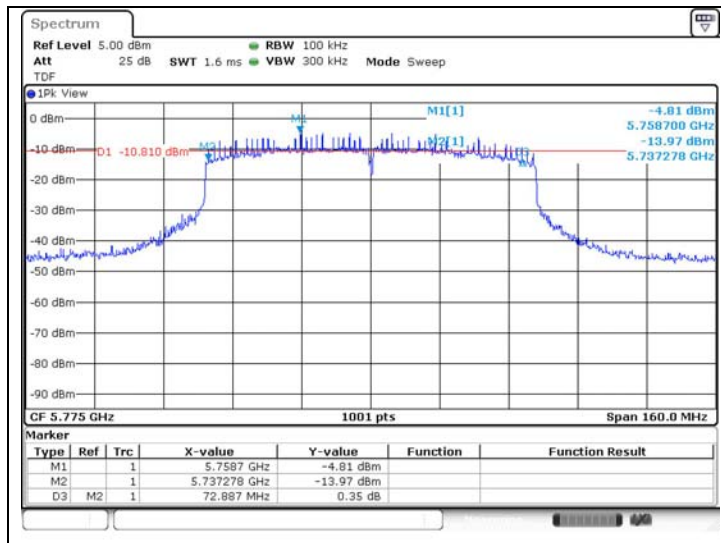


High Channel  
(5 795 MHz)



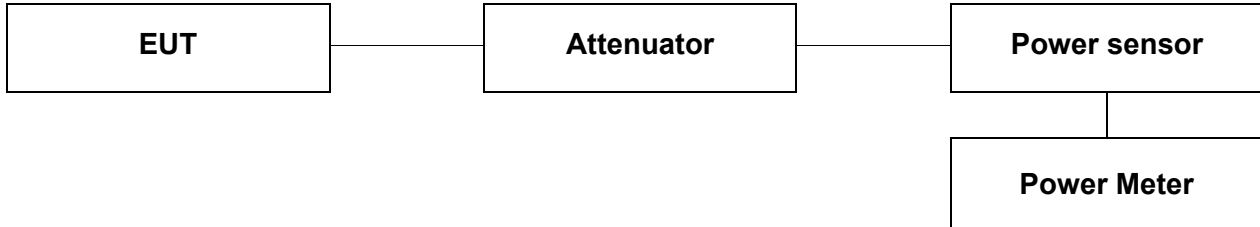
**802.11ac\_VHT80 (Band 3)**

Middle Channel  
(5 775 MHz)



## 5. Maximum Conducted Output Power

### 5.1. Test Setup



### 5.2. Limit

#### 5.2.1. FCC

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dB i. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

According to 15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dB m in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

**5.2.2. IC**

According to RSS-247 Issue 2,

**6.2.1.1 Frequency band 5 150-5 250 MHz**

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or  $1.76 + 10 \log_{10} B$ , dB m, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dB m, whichever power is less. B is the 99 % emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dB m in any 1.0 MHz band.

**6.2.4.1 Frequency band 5 725-5 850 MHz**

For equipment operating in the band 5 725-5 850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz. The maximum conducted output power shall not exceed 1 W. The output power spectral density shall not exceed 30 dB m in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint<sup>3</sup> systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.



### 5.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section II.E.3.a of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. 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 consistent 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.
3. If the transmitter does not transmit continuously, measure the duty cycle,  $x$ , of the transmitter output signal as described in section II.B.
4. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
5. 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 %).

### 5.4. Test Result

Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

**Test mode: 11a**

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 180	24	10.06	0.83	10.89
	5 220		9.77		10.60
	5 240		10.11		10.94
U-NII 3	5 745		9.47		10.30
	5 785		9.64		10.47
	5 825		9.37		10.20

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power Result (dB m)	Antenna Gain (dB i)	E.I.R.P. (dB m)
U-NII 1	5 180	24	10.89	2.49	13.38
	5 220		10.60		13.09
	5 240		10.94		13.43

Band	FCC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 180	23.98			2.49	23.98
	5 220					
	5 240					
U-NII 3	5 745	30			2.74	30
	5 785					
	5 825					

Band	IC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	99 % BW (MHz)	1.76+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 180	14.77	16.729	13.99	2.49	13.99
	5 220		16.729	13.99		13.99
	5 240		16.787	14.01		14.01

Band	IC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	99 % BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 3	5 745	30			2.74	30
	5 785					
	5 825					

**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

**Test mode: 11n\_HT20**

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 180	MCS0	9.65	0.22	9.87
	5 220		9.48		9.70
	5 240		9.72		9.94
U-NII 3	5 745		10.33		10.55
	5 785		10.65		10.87
	5 825		10.25		10.47

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power Result (dB m)	Antenna Gain (dB i)	E.I.R.P. (dB m)
U-NII 1	5 180	MCS0	9.87	2.49	12.36
	5 220		9.70		12.19
	5 240		9.94		12.43

Band	FCC Limit							
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)		
U-NII 1	5 180	23.98	/		2.49	23.98		
	5 220							
	5 240							
U-NII 3	5 745	30			/		2.74	30
	5 785							
	5 825							

Band	IC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	99 % BW (MHz)	1.76+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 180	14.77	17.482	14.19	2.49	14.19
	5 220		17.482	14.19		14.19
	5 240		17.482	14.19		14.19

Band	IC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	99 % BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 3	5 745	30	/		2.74	30
	5 785					
	5 825					


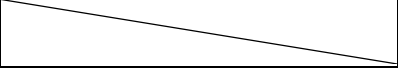
**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

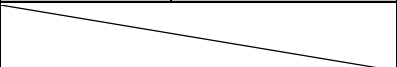
**Test mode: 11n HT40**

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 190	MCS5	4.24	3.01	7.25
	5 230	MCS0	9.95		10.43
U-NII 3	5 755		9.81	0.48	10.29
	5 795		9.97		10.45

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power Result (dB m)	Antenna Gain (dB i)	E.I.R.P. (dB m)
U-NII 1	5 190	MCS5	7.25	2.49	9.74
	5 230	MCS0	10.43		12.92

Band	FCC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 190	23.98			2.49	23.98
	5 230					
U-NII 3	5 755	30			2.74	30
	5 795					

Band	IC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	99 % BW (MHz)	1.76+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 190	14.77	36.585	17.39	2.49	14.77
	5 230		36.006	17.32		

Band	IC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	99 % BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 3	5 755	30			2.74	30
	5 795					

**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

**Test mode: 11ac\_VHT80**

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 210	MCS5	4.28	3.01	7.29
U-NII 3	5 775	MCS0	8.98	0.82	9.80

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power Result (dB m)	Antenna Gain (dB i)	E.I.R.P. (dB m)
U-NII 1	5 210	MCS5	7.29	2.49	9.78

Band	FCC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 210	23.98			2.49	23.98
U-NII 3	5 775	30			2.74	30

Band	IC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	99 % BW (MHz)	1.76+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 210	14.77	76.411	20.59	2.49	14.77

Band	IC Limit					
	Frequency (MHz)	Fixed Limit (dB m)	99 % BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 3	5 775	30			2.74	30

**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

## 6. Peak Power Spectral Density

### 6.1. Test Setup



### 6.2. Limit

#### 6.2.1. FCC

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to 15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

**6.2.2. IC**

According to RSS-247 Issue 2,

**6.2.1.1 Frequency band 5 150-5 250 MHz**

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or  $1.76 + 10 \log_{10}B$ , dB m, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10}B$ , dB m, whichever power is less. B is the 99 % emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dB m in any 1.0 MHz band.

**6.2.4.1 Frequency band 5 725-5 850 MHz**

For equipment operating in the band 5 725-5 850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz. The maximum conducted output power shall not exceed 1 W. The output power spectral density shall not exceed 30 dB m in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint<sup>3</sup> systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

### 6.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section II.F of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
3. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
4. Make the following adjustments to the peak value of the spectrum, if applicable:
  - a) **If Method SA-2 or SA-2 Alternative was used, add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the peak of the spectrum.**
  - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
5. The result is the Maximum PSD over 1 MHz reference bandwidth.
6. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (*i.e.*, 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth ( $< 1$  MHz, or  $< 500$  kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
  - a) Set  $RBW \geq 1/T$ , where  $T$  is defined in section II.B.1.a).
  - b) Set  $VBW \geq 3$  RBW.
  - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10 \log(500 \text{ kHz}/RBW)$  to the measured result, whereas  $RBW (< 500 \text{ kHz})$  is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
  - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10 \log(1 \text{ MHz}/RBW)$  to the measured result, whereas  $RBW (< 1 \text{ MHz})$  is the reduced resolution bandwidth of spectrum analyzer set during measurement.
  - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.



### 6.4. Test Result

Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

**Test mode: 11a**

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)
U-NII 1	5 180	36	24	-0.74	0.83	0.09	11
	5 220	44		-1.42		-0.59	
	5 240	48		-1.10		-0.27	
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
U-NII 3	5 745	149	24	-4.21	0.83	-3.38	30
	5 785	157		-4.01		-3.18	
	5 825	165		-4.58		-3.75	

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Final PPSD (dB m)	Antenna Gain (dB i)	E.I.R.P. PPSD (dB m)	IC Limit (dB m/1 MHz)
U-NII 1	5 180	36	24	0.09	2.49	2.58	10
	5 220	44		-0.59		1.90	
	5 240	48		-0.27		2.22	

**Remark;**

1. Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. PPSD (dB m) = Final PPSD (dB m) + Antenna Gain (dB i)

**Test mode: 11n\_HT20**

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)
U-NII 1	5 180	36	MCS0	-1.73	0.22	-1.51	11
	5 220	44		-1.92		-1.70	
	5 240	48		-1.74		-1.52	
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
U-NII 3	5 745	149	MCS0	-3.27	0.22	-3.05	30
	5 785	157		-3.52		-3.30	
	5 825	165		-3.26		-3.04	

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Final PPSD (dB m)	Antenna Gain (dB i)	E.I.R.P. PPSD (dB m)	IC Limit (dB m/1 MHz)
U-NII 1	5 180	36	MCS0	-1.51	2.49	0.98	10
	5 220	44		-1.70		0.79	
	5 240	48		-1.52		0.97	

**Remark;**

- Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)
- E.I.R.P. PPSD (dB m) = Final PPSD (dB m) + Antenna Gain (dB i)

**Test mode: 11n\_HT40**

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)
U-NII 1	5 190	38	MCS5	-9.73	3.01	-6.72	11
	5 230	46	MCS0	-3.95	0.48	-3.47	
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
U-NII 3	5 755	151	MCS0	-6.98	0.48	-6.50	30
	5 795	159		-6.83		-6.35	

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Final PPSD (dB m)	Antenna Gain (dB i)	E.I.R.P. PPSD (dB m)	IC Limit (dB m/1 MHz)
U-NII 1	5 190	38	MCS5	-6.72	2.49	-4.23	10
	5 230	46	MCS0	-3.47		-0.98	

**Remark;**

- Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)
- E.I.R.P. PPSD (dB m) = Final PPSD (dB m) + Antenna Gain (dB i)

**Test mode: 11ac\_VHT80**

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)
U-NII 1	5 210	42	MCS5	-12.61	3.01	-9.60	11
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
U-NII 3	5 775	155	MCS0	-10.13	0.82	-9.31	30

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Final PPSD (dB m)	Antenna Gain (dB i)	E.I.R.P. PPSD (dB m)	IC Limit (dB m/1 MHz)
U-NII 1	5 210	42	MCS5	-9.60	2.49	-7.11	10

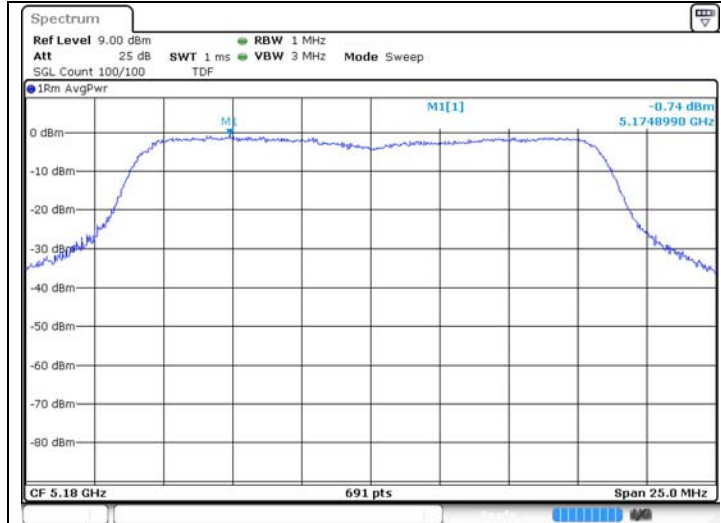
**Remark;**

1. Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. PPSD (dB m) = Final PPSD (dB m) + Antenna Gain (dB i)

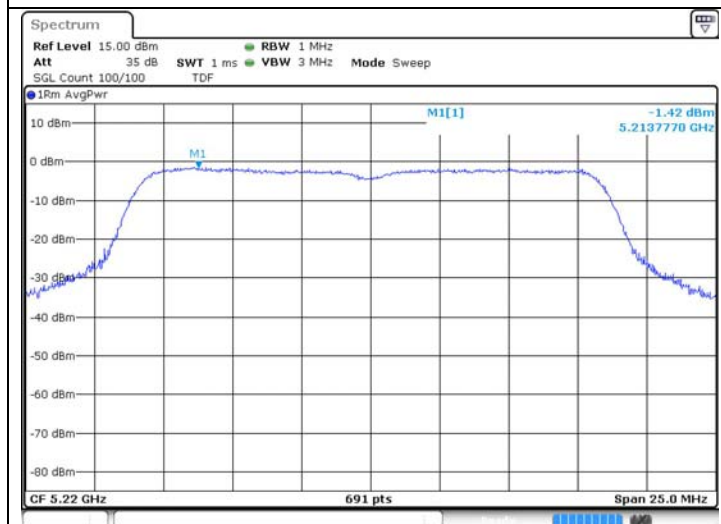
- Test plots

802.11a (Band 1)

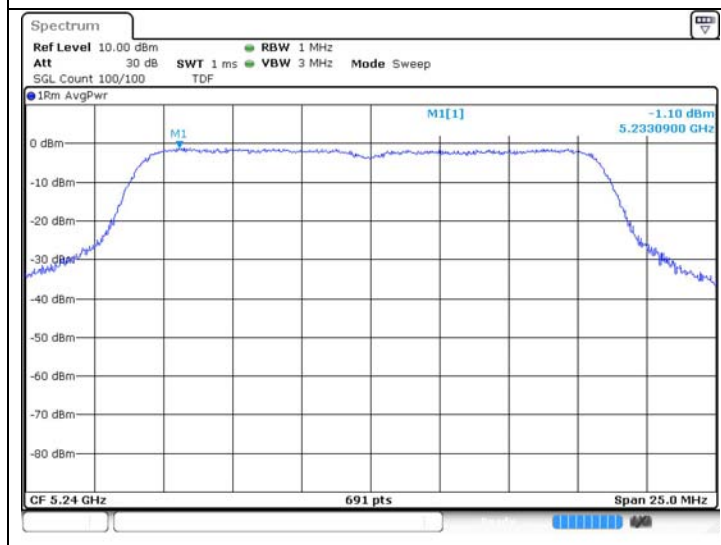
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

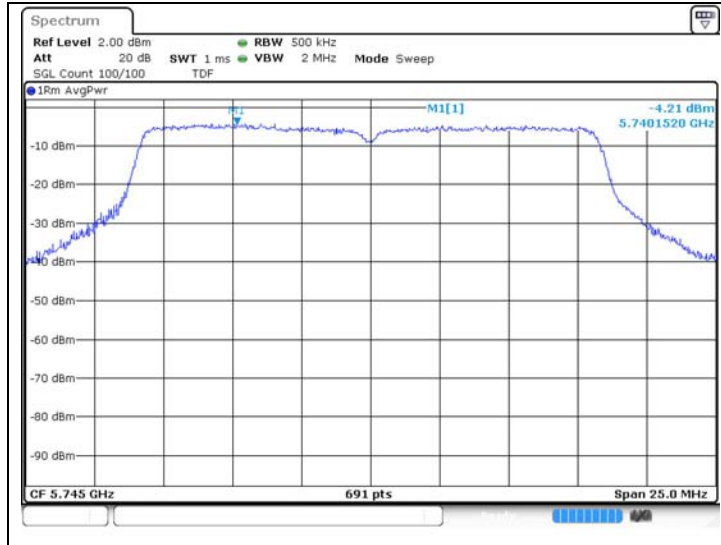


High Channel  
(5 240 MHz)

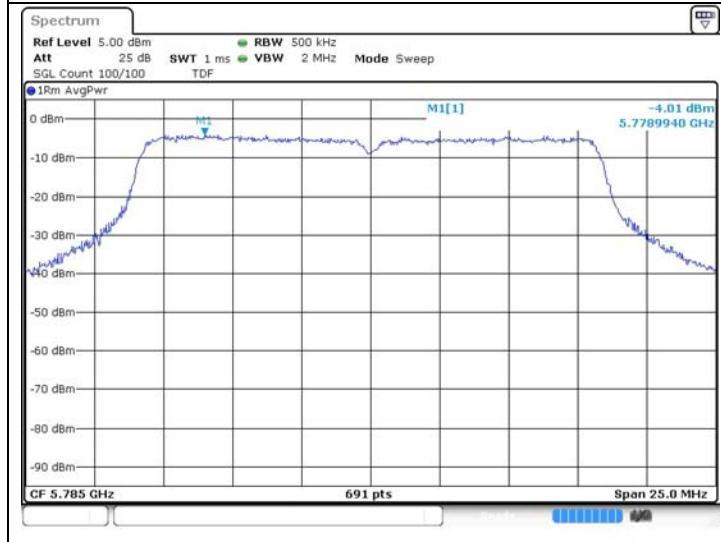


**802.11a (Band 3)**

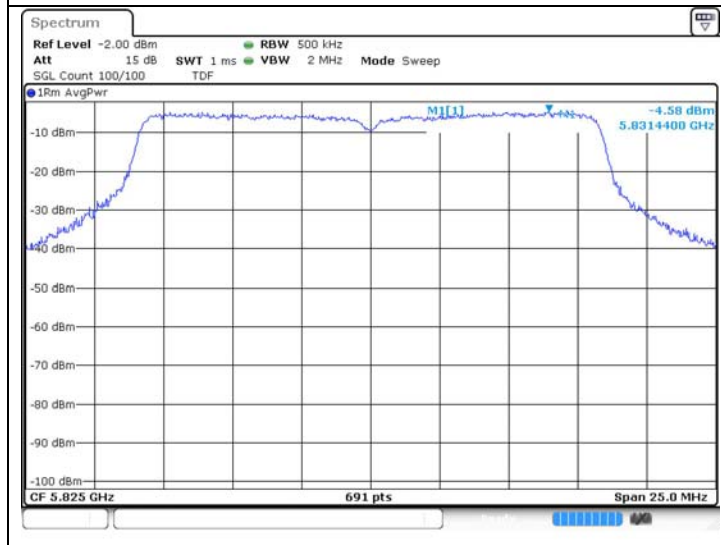
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

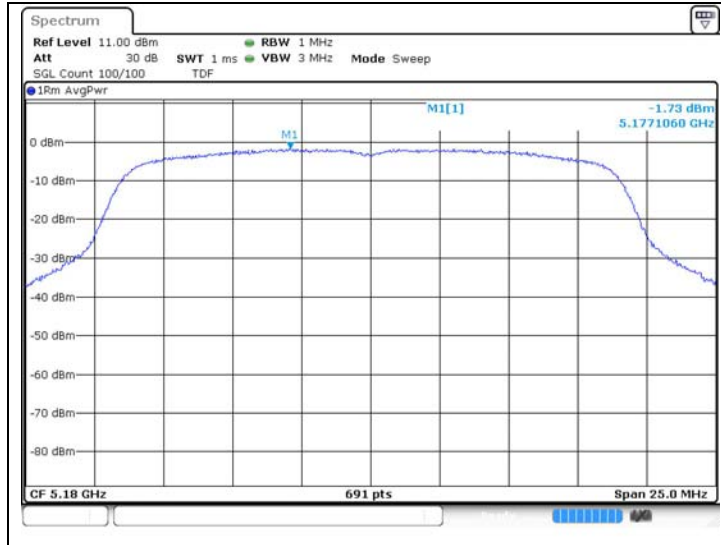


High Channel  
(5 825 MHz)

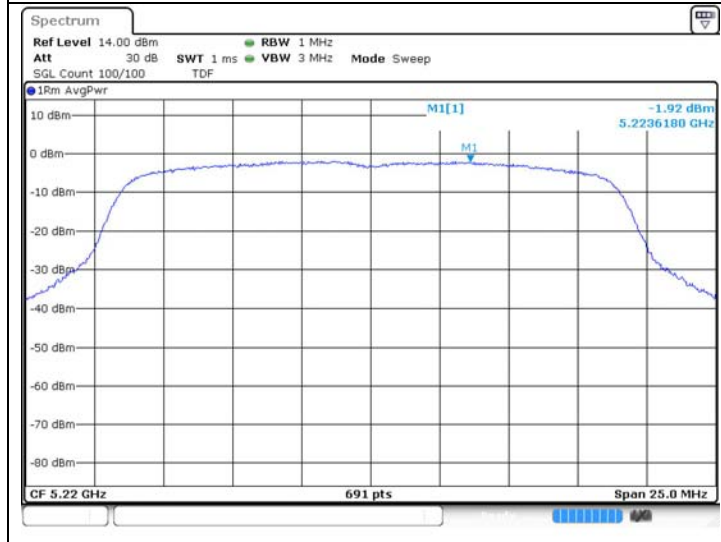


**802.11n\_HT20 (Band 1)**

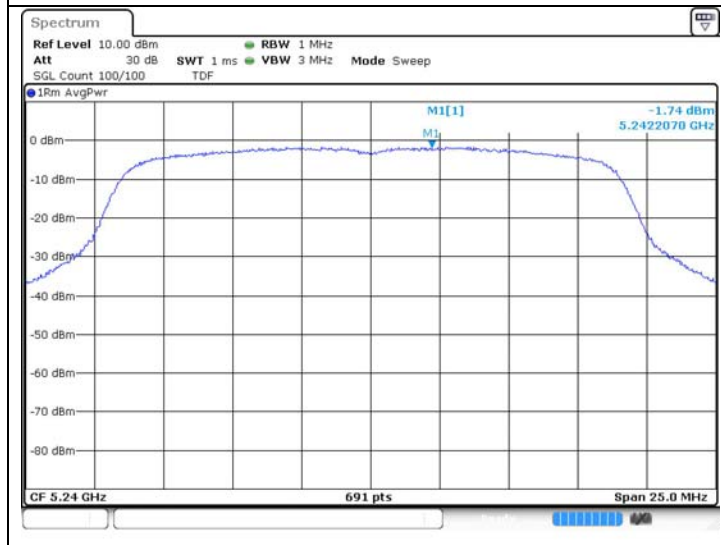
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

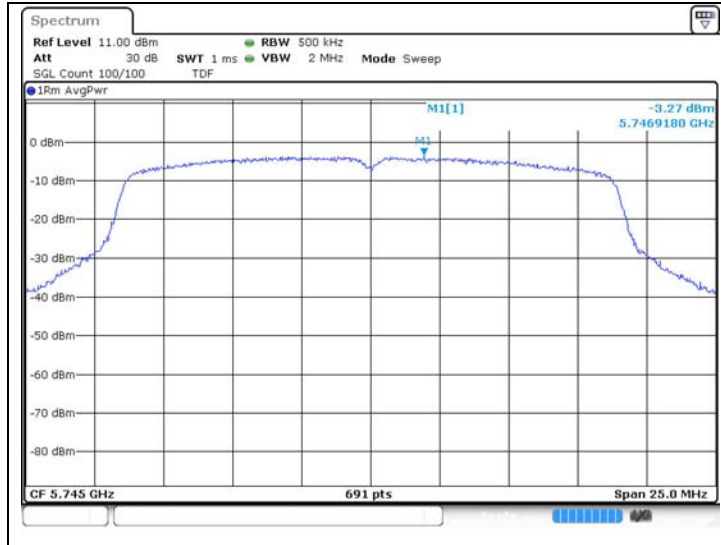


High Channel  
(5 240 MHz)

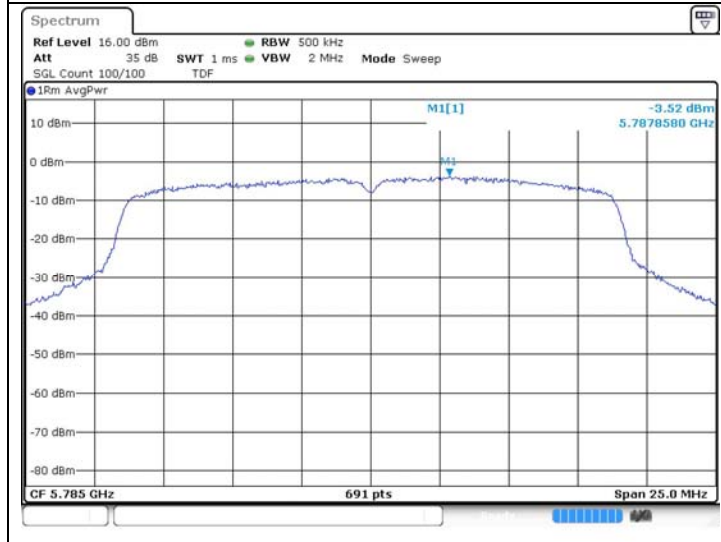


**802.11n\_HT20 (Band 3)**

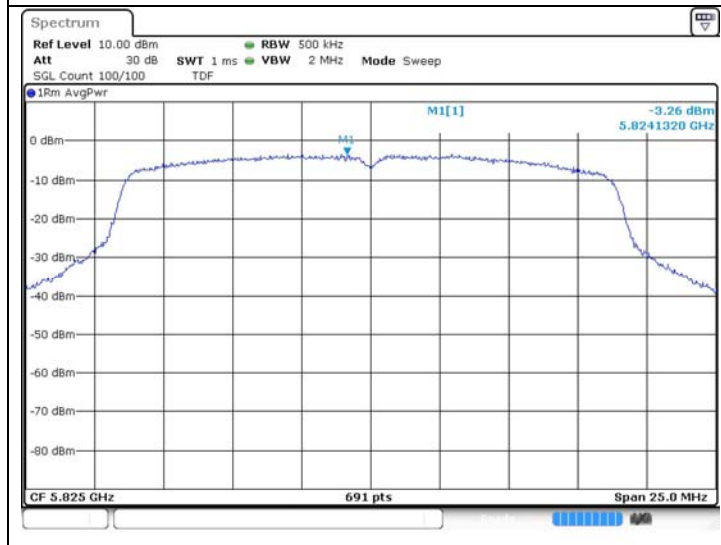
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)



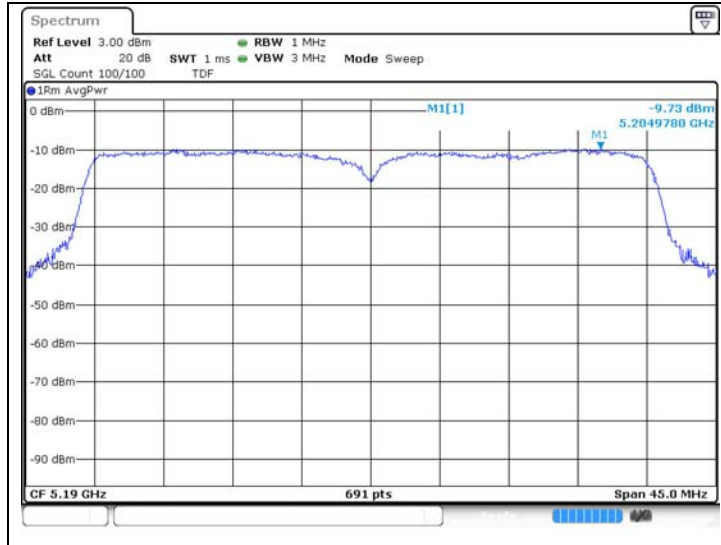
High Channel  
(5 825 MHz)



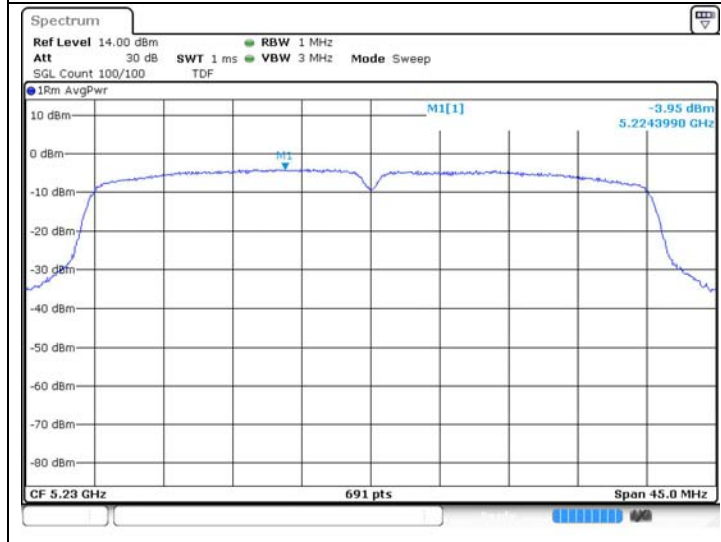


**802.11n\_HT40 (Band 1)**

Low Channel  
(5 190 MHz)

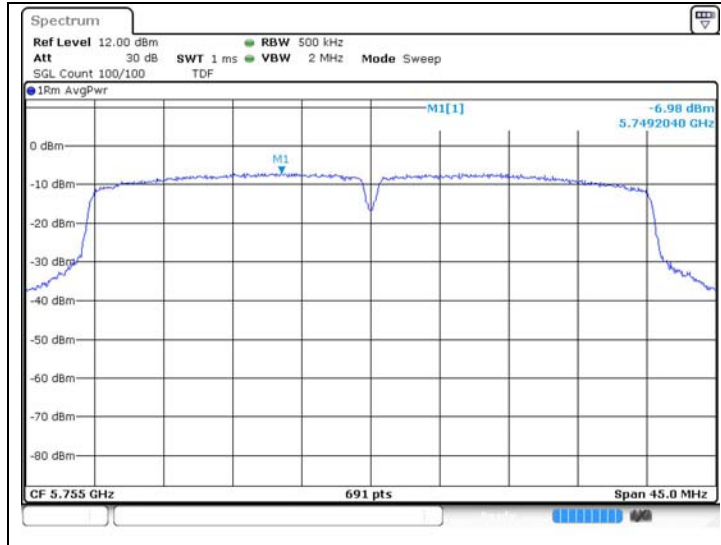


High Channel  
(5 230 MHz)

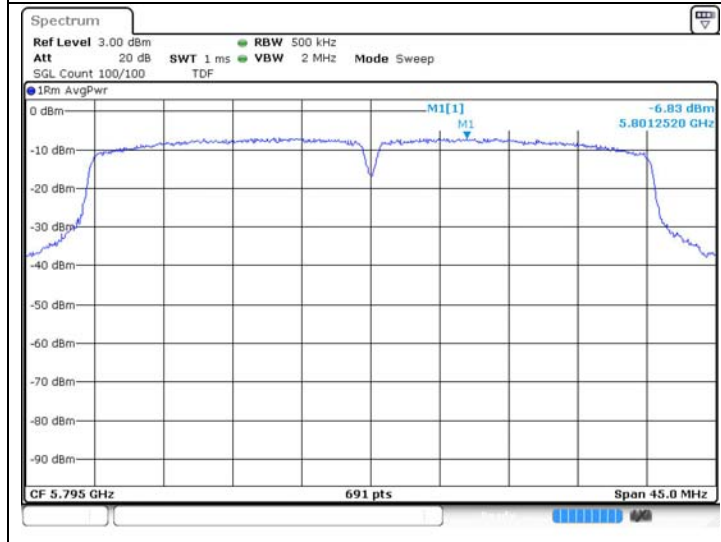


**802.11n\_HT40 (Band 3)**

Low Channel  
(5 755 MHz)

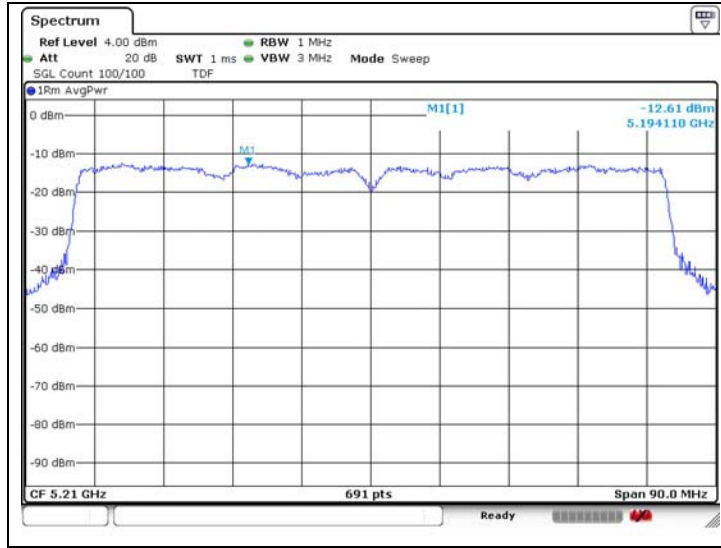


High Channel  
(5 795 MHz)



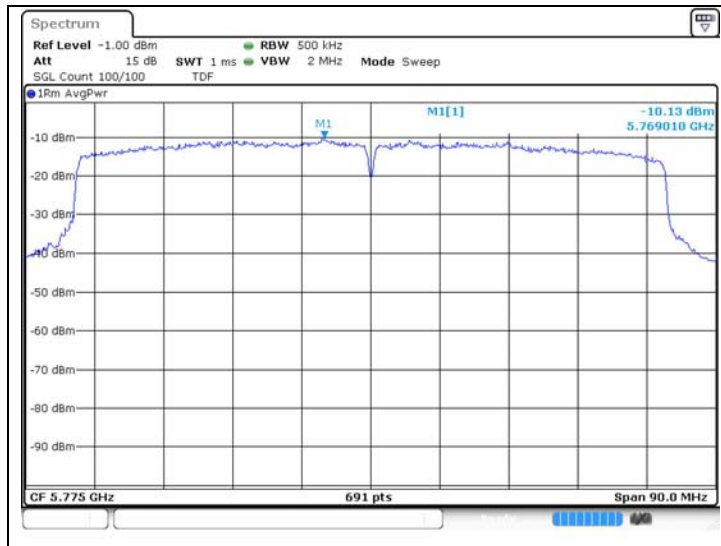
**802.11ac\_VHT80 (Band 1)**

Middle Channel  
(5 210 MHz)



**802.11ac\_VHT80 (Band 3)**

Middle Channel  
(5 775 MHz)



## 7. Antenna Requirement

### 7.1. Standard Applicable

For intentional device, according to FCC 47 CFR 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. And according to FCC 47 CFR Section §15.407(b) if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi.

### 7.2. Antenna Connected Construction

Antenna used in this product is Pattern antenna and peak max gain of antenna as below.

<b>Band</b>	5 150 MHz ~ 5 250 MHz	5 725 MHz ~ 5 850 MHz
<b>Mode</b>	11a/n_HT20, HT40, 11ac_VHT20, VHT40, VHT80	
<b>Gain</b>	2.49 dBi	2.74 dBi

**- End of the Test Report -**