TEST REPORT

of

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

FCC ID: BEJIGCJ1PMN
IC Certification: 2703H-IGCJ1PMN

Equipment Under Test	:	Car AVN
Model Name	:	IGCJ1PMN
Variant Model Name	:	IGCJ1PME
FCC Applicant	:	LG Electronics USA
IC Applicant	:	LG Electronics Inc.
Manufacturer	:	LG Electronics Inc.
Date of Receipt	:	2019.07.09
Date of Test(s)	:	2018.07.15 ~ 2019.07.23
Date of Issue	:	2019.07.31

In the configuration tested, the EUT complied with the standards specified above.

Tested By: **Nancy Park** **Date:** **2019.07.31**

Technical Manager: **Jungmin Yang** **Date:** **2019.07.31**

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

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1.2. Details of Applicant

FCC Applicant : LG Electronics USA
FCC Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 07632
IC Applicant LG Electronics Inc.
IC Address 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea (Republic of)
Contact Person : Han, Kyung-su
Phone No. : +2 201 472 2623

1.3. Details of Manufacturer

Company : LG Electronics Inc.
Address : 10, Magokjungang 10-ro, Gangseo-gu, Seoul, Korea, 07796

1.4. Description of EUT

Kind of Product		Car AVN
Model Name		IGCJ1PMN
Variant Model Name		IGCJ1PME
Power Supply		DC 12 V
Frequency Range		5 180 ㎒ ~ 5 240 ㎒ (Band 1: 11a/n_HT20, 11ac_VHT20) 5 190 ㎒ ~ 5 230 ㎒ (Band 1: 11n_HT40, 11ac_VHT40) 5 210 ㎒ (Band 1: 11ac_VHT80) 5 745 ㎒ ~ 5 825 ㎒ (Band 3: 11a/n_HT20, 11ac_VHT20) 5 755 ㎒ ~ 5 795 ㎒ (Band 3: 11n_HT40, 11ac_VHT40) 5 775 ㎒ (Band 3: 11ac_VHT80)
Modulation Technique		OFDM
Number of Channels		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)
Antenna Type		External antenna
Antenna Gain	**ANT 1**	5 150 ㎒ ~ 5 250 ㎒: 5 ㏈i 5 725 ㎒ ~ 5 850 ㎒: 5 ㏈i
	ANT 2	5 150 ㎒ ~ 5 250 ㎒: 5 ㏈i 5 725 ㎒ ~ 5 850 ㎒: 5 ㏈i

1.5. Declaration by the Manufacturer

- The EUT is supported transmitter power control (TPC).

1.6. Information of Variant Model

Model Name		Description	
		DAB	SXM
Basic Model	IGCJ1PMN	O	X
Variant Model	IGCJ1PME	X	O

Note;

- IGCJ1PME is only for FCC

1.7. Automatically Discontinue Transmission

1.7.1. 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.

1.7.2. 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 form remote device and verify whether it shall resend or discontinue transmission.

1.8. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	Agilent	E8257D	MY51501169	Jul. 03, 2019	Annual	Jul. 03, 2020
Signal Generator	R&S	SMBV100A	255834	Jun. 10, 2019	Annual	Jun. 10, 2020
Spectrum Analyzer	R&S	FSV30	103210	Dec. 05, 2018	Annual	Dec. 05, 2019
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 21, 2018	Annual	Sep. 21, 2019
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 21, 2018	Annual	Sep. 21, 2019
Power Meter	Anritsu	ML2495A	1223004	Jun. 05, 2019	Annual	Jun. 05, 2020
Power Sensor	Anritsu	MA2411B	1207272	Jun. 05, 2019	Annual	Jun. 05, 2020
Attenuator	MCLI	FAS-12-10	2	Jun. 07, 2019	Annual	Jun. 07, 2020
Low Pass Filter	Mini-Circuits	NLP-1200+	V 8979400903-2	Feb. 19, 2019	Annual	Feb. 19, 2020
High Pass Filter	Wainwright Instrument GmbH	WHKX6.0/18G-10SS	51	Jun. 07, 2019	Annual	Jun. 07, 2020
High Pass Filter	Wainwright Instrument GmbH	WHNX7.5/26.5G-6SS	15	Jun. 05, 2019	Annual	Jun. 05, 2020
DC Power Supply	R&S	HMP2020	019258024	Nov. 06, 2018	Annual	Nov. 06, 2019
Preamplifier	H.P.	8447F	2944A03909	Aug. 07, 2018	Annual	Aug. 07, 2019
Signal Conditioning Unit	R&S	SCU-18	10117	Jun. 12, 2019	Annual	Jun. 12, 2020
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	May 13, 2019	Annual	May 13, 2020
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 23, 2017	Biennial	Aug. 23, 2019
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB 9163	01126	Mar. 26, 2018	Biennial	Mar. 26, 2020
Horn Antenna	R&S	HF906	100326	Feb. 14, 2018	Biennial	Feb. 14, 2020
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9170	BBHA9170431	Sep. 10, 2018	Biennial	Sep. 10, 2020
Test Receiver	R&S	ESCI 7	100911	Feb. 20, 2019	Annual	Feb. 20, 2020
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 × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	SUCOFLEX	104 (3 m)	MY3258414	Jul. 04, 2019	Semi-annual	Jan. 04, 2020
Coaxial Cable	SUCOFLEX	104 (10 m)	MY3145814	Jul. 04, 2019	Semi-annual	Jan. 04, 2020
Coaxial Cable	Rosenberger	LA1-C006-1500	131014 01/20	Feb. 28, 2019	Semi-annual	Aug. 28, 2019

1.9. Summary of Test Result

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15 Subpart E, RSS-247 Issue 2, RSS-Gen Issue 5			
Section in FCC	**Section in IC**	**Test Item(s)**	**Result**
15.205(a) 15.209(a) 15.407(b)(1) 15.407(b)(4)	RSS-Gen Issue 5 8.9 RSS-247 Issue 2 6.2.1.2 RSS-247 Issue 2 6.2.4.2	Transmitter Radiated Spurious Emissions	Complied
15.407(a)	RSS-Gen Issue 5 6.7	26 ㏈ Bandwidth & 99 % Bandwidth	Complied
15.407(e)	RSS-247 Issue 2 6.2.4.1	6 ㏈ Bandwidth	Complied
15.407(a)(1) 15.407(a)(3)	RSS-247 Issue 2 6.2.1.1 RSS-247 Issue 2 6.2.4.1	Maximum Conducted Output Power	Complied
15.407(a)(1) 15.407(a)(3)	RSS-247 Issue 2 6.2.1.1 RSS-247 Issue 2 6.2.4.1	Peak Power Spectral Density	Complied

1.10. 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.

1.11. Sample Calculation

Where relevant, the following sample calculation is provided:

1.11.1. Conducted Test

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

1.11.2. Radiation Test

Field strength level (㏈㎶/m) = Measured level (㏈㎶) + Antenna factor (㏈) + Cable loss (㏈) - Amplifier gain (㏈)

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	±0.34 dB
Occupied Bandwidth	±**9.66** kHz
Power Spectral Density	±0.41 dB
Conducted Spurious Emission	±0.76 dB
Radiated Emission, 9 kHz to 30 MHz	±**3**.59 dB
Radiated Emission, below 1 GHz	±5.88 dB
Radiated Emission, above 1 GHz	±5.94 dB

Uncertainty figures are valid to a confidence level of 95 %.

1.13. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501/RF-RTL014155	2019.07.31	Initial

1.13. Duty Cycle of EUT

Regarding to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, 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.

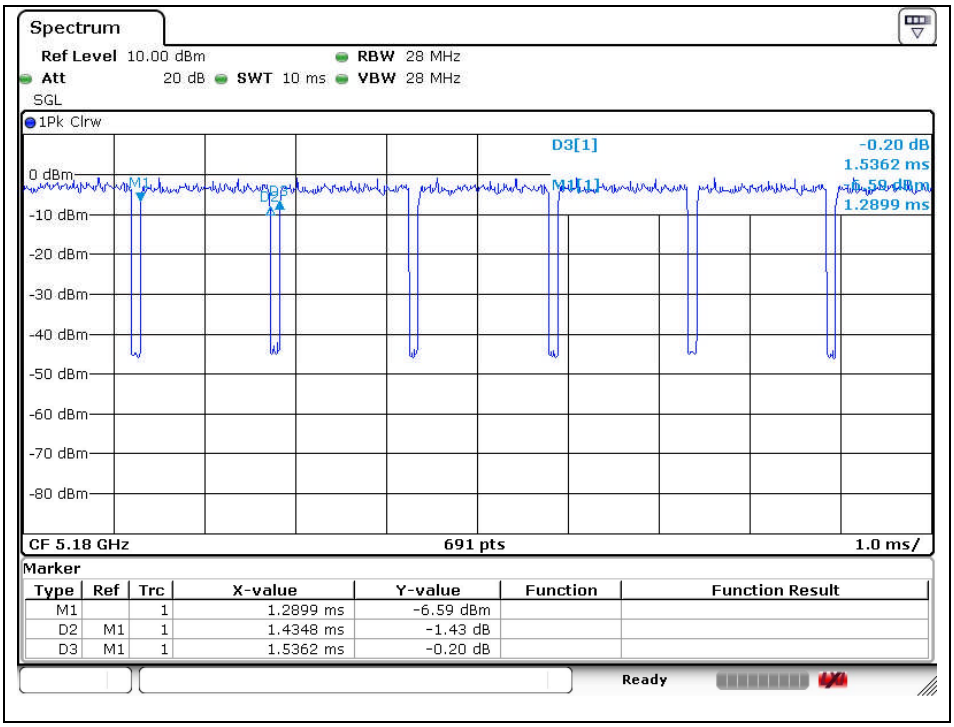
Mode	Data Rate (Mbps)	Duty Cycle (%)	Correction factor (dB)
11a	6	93.40	0.30
11n_HT20	MCS0	93.00	0.32
11n_HT40	MCS0	86.79	0.62
11ac_VHT80	MCS0	76.92	1.14

Remark;

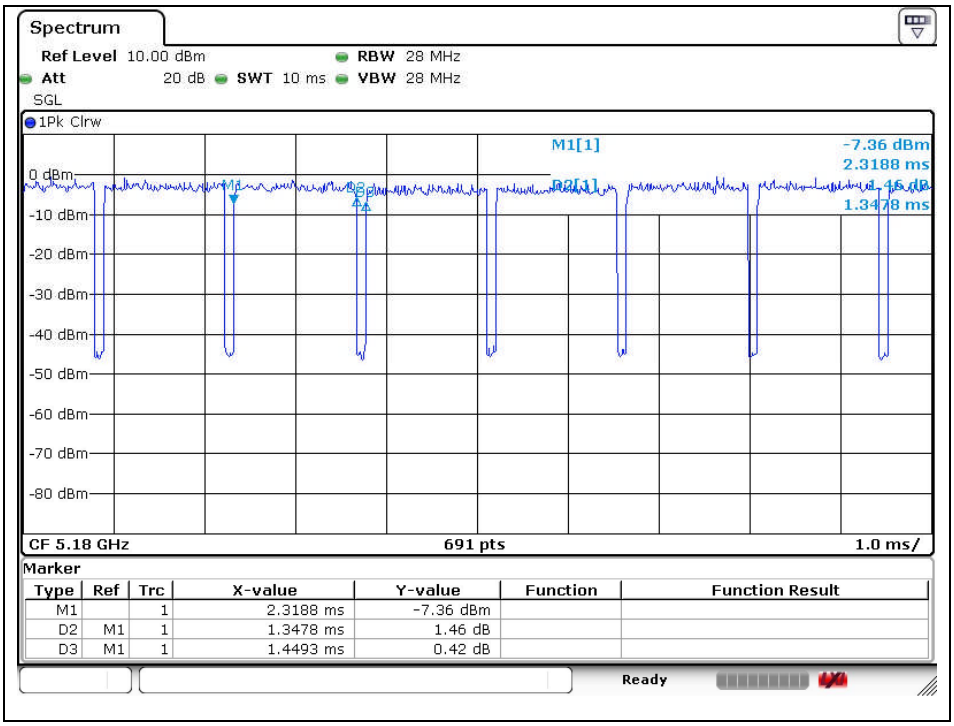
1. As measured duty cycles of EUT, all of mode and data rate keep constant period and are converted to log scale (power averaging) to compensate correction factor to result of average test items.
2. Duty cycle (%) = (Tx on time / Tx on + off time) x 100
3. Correction Factor (dB) = 10 log (1 / Duty cycle)

- Test plots

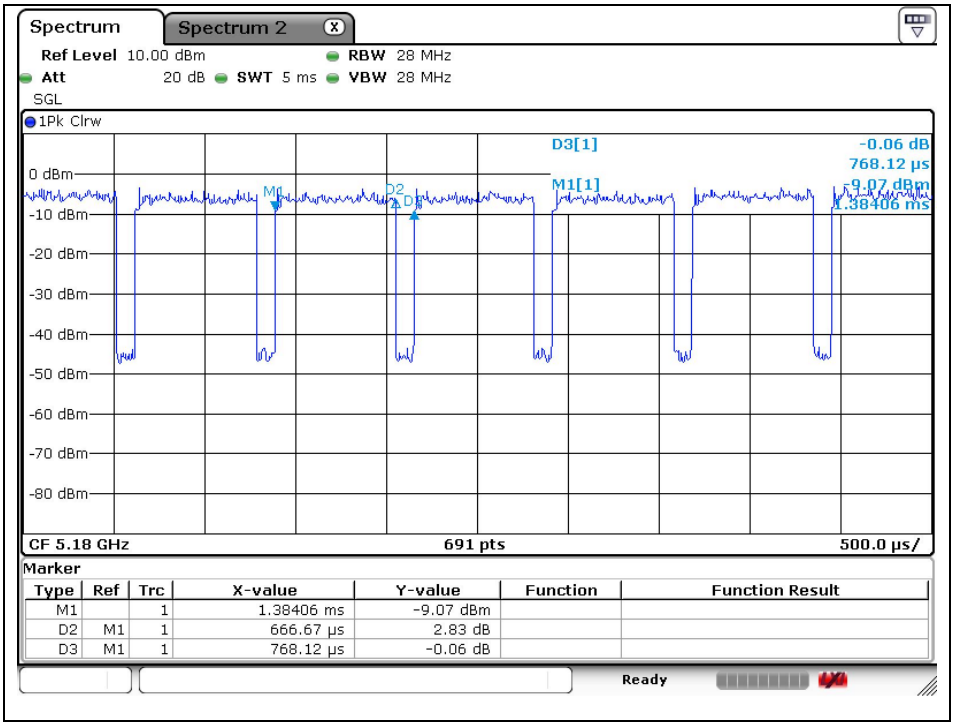
802.11a



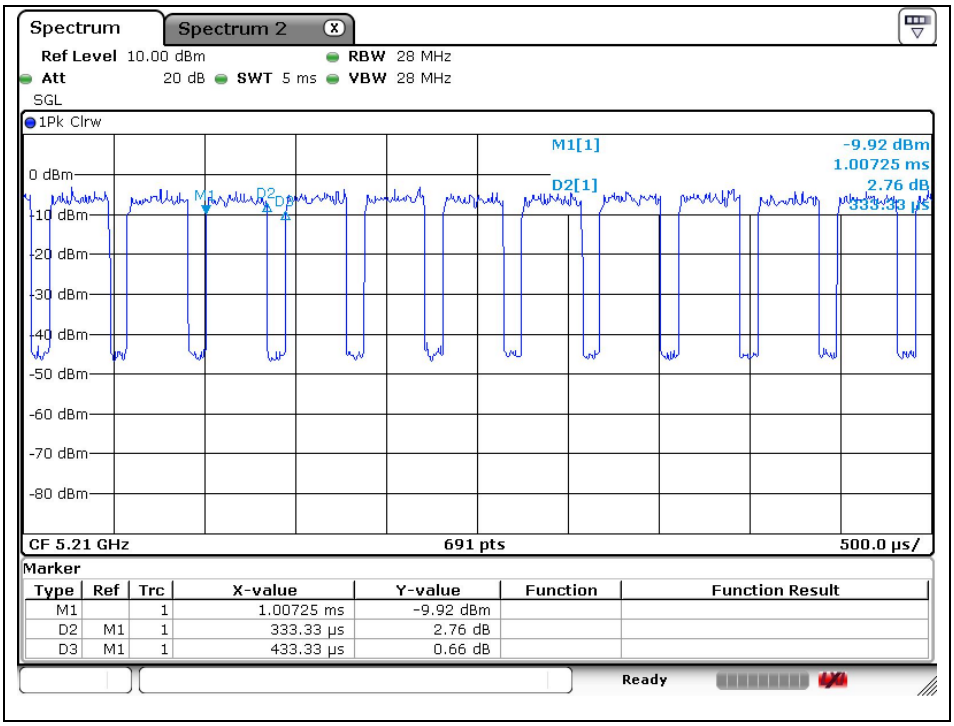
802.11n_HT20



802.11n_HT40



802.11ac_VHT80

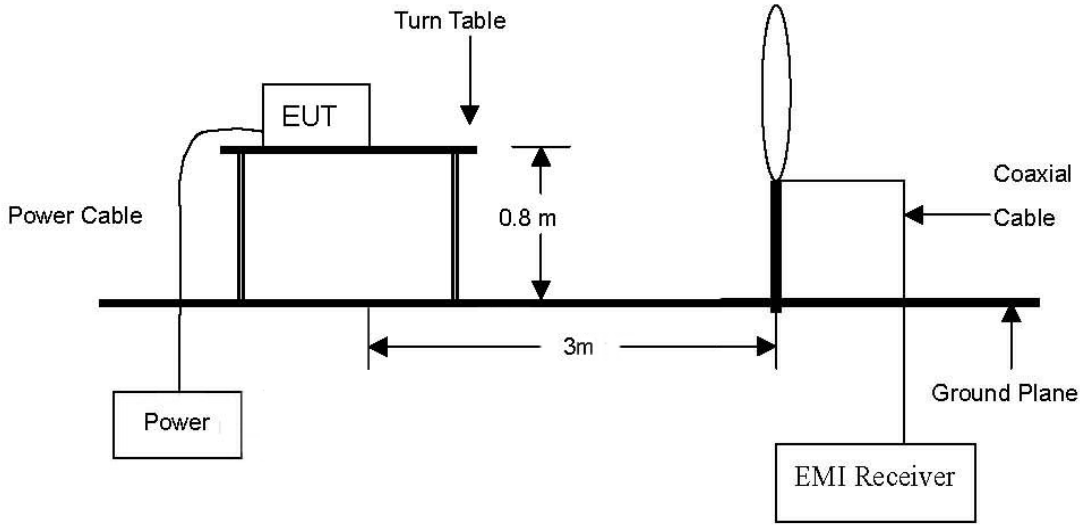


2. Transmitter Radiated Spurious Emissions

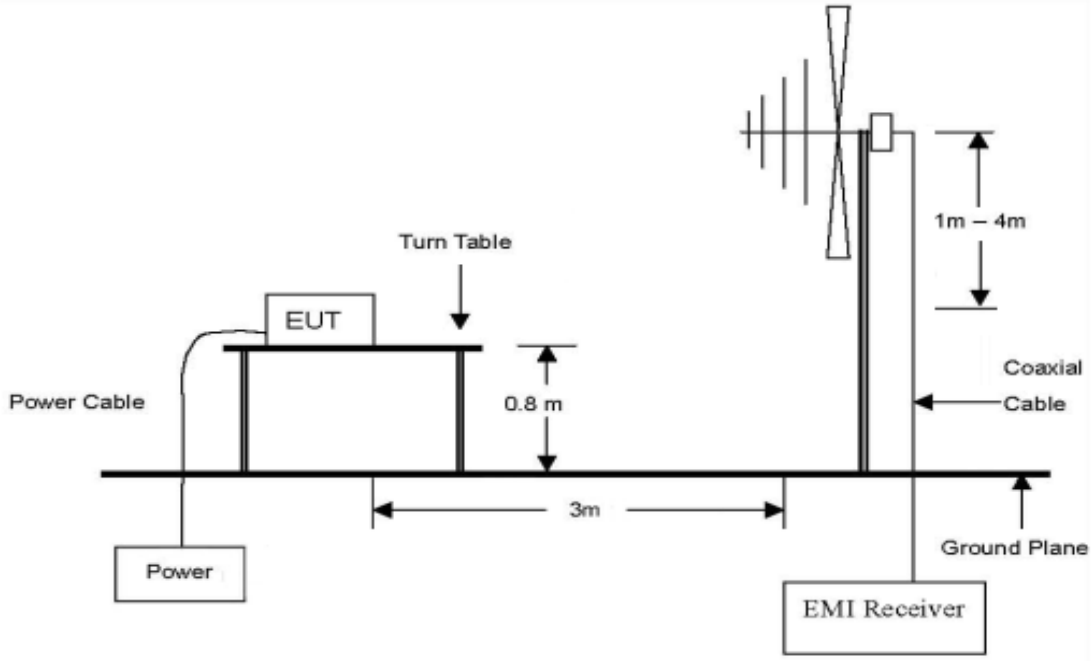
2.1. Test Setup

2.1.1. Transmitter radiated spurious emissions

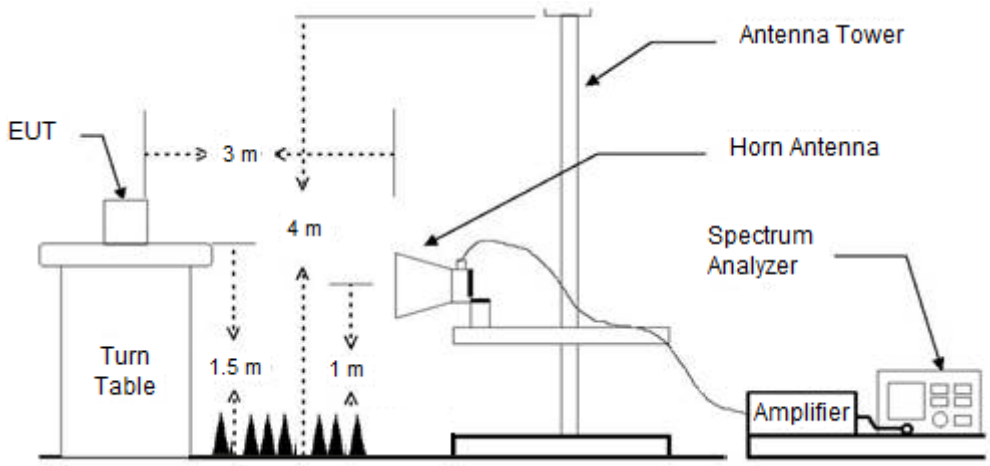
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ emissions.



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



The diagram below shows the test setup that is utilized to make the measurements for emission. The spurious emissions were investigated form 1 ㎓ to the 10th harmonic of the highest fundamental frequency or 40 ㎓, 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 ㎓ band: All emissions outside of the 5.15-5.35 ㎓ band shall not exceed an e.i.r.p. of -27 ㏈m/㎒.

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

(i) All emissions shall be limited to a level of -27 ㏈m/㎒ at 75 ㎒ or more above or below the band edge increasing linearly to 10 ㏈m/㎒ at 25 ㎒ above or below the band edge, and from 25 ㎒ above or below the band edge increasing linearly to a level of 15.6 ㏈m/㎒ at 5 ㎒ above or below the band edge, and from 5 ㎒ above or below the band edge increasing linearly to a level of 27 ㏈m/㎒ 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 (㎒)	Field Strength (㎶/m)	Measurement Distance (Meters)
0.009-0.490	2 400/F(㎑)	300
0.490-1.705	24 000/F(㎑)	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 ㎒, 76-88 ㎒, 174-216 ㎒ or 470-806 ㎒. 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 ㎒
For transmitters with operating frequencies in the band 5 150-5 250 ㎒, all emissions outside the band 5 150-5 350 ㎒ shall not exceed -27 ㏈m/㎒ e.i.r.p. Any unwanted emissions that fall into the band 5 250-5 350 ㎒ shall be attenuated below the channel power by at least 26 ㏈, when measured using a resolution bandwidth between 1 and 5 % of the occupied bandwidth (i.e. 99% bandwidth), above 5 250 ㎒. The 26 ㏈ bandwidth may fall into the 5 250-5 350 ㎒ band; however, if the occupied bandwidth also falls within the 5 250- 5350 ㎒ band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5 250-5 350 ㎒ including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5 250-5 350 ㎒ band.

6.2.4.2 Frequency band 5 725-5 850 ㎒
Devices operating in the band 5 725-5 850 ㎒ with antenna gain greater than 10 ㏈i 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 ㎒ with antenna gain of 10 ㏈i 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 ㎒ shall have e.i.r.p. of unwanted emissions comply with the following:
a) 27 ㏈m/㎒ at frequencies from the band edges decreasing linearly to 15.6 ㏈m/㎒ at 5 ㎒ above or below the band edges;

b) 15.6 ㏈m/㎒ at 5 ㎒ above or below the band edges decreasing linearly to 10 ㏈m/㎒ at 25 ㎒ above or below the band edges;

c) 10 ㏈m/㎒ at 25 ㎒ above or below the band edges decreasing linearly to -27 ㏈m/㎒ at 75 ㎒ above or below the band edges; and

d) -27 ㏈m/㎒ at frequencies more than 75 ㎒ 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 ㎒

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 ㎒

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 ㎓ and 1.5 meter above the ground at a 3 meter anechoic chamber test site above 1 ㎓. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 ㎓, 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 ㎓, 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 ㎓.
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 ㎓.
Peak emission levels are measured by setting the analyzer as follows:
Set to RBW = 1 ㎒, VBW ≥ 3 ㎒, Detector = Peak, Sweep time = auto, Trace mode= Max hold.

- II.G.6. Average unwanted emissions measurements above 1 ㎓.
Set to RBW = 1 ㎒, VBW ≥ 3 ㎒, 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 ㏈ 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 **X – axis** during radiation test.

2.4. Test Result

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

2.4.1. Radiated Spurious Emission below 1 000 ㎒

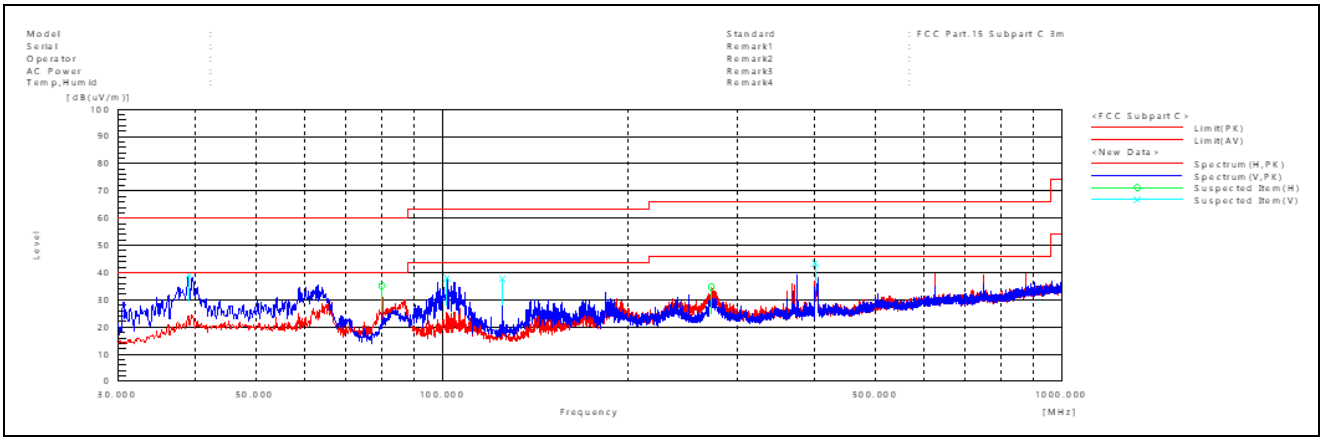
The frequency spectrum from 9 ㎑ to 1 000 ㎒ was investigated. All reading values are peak values.

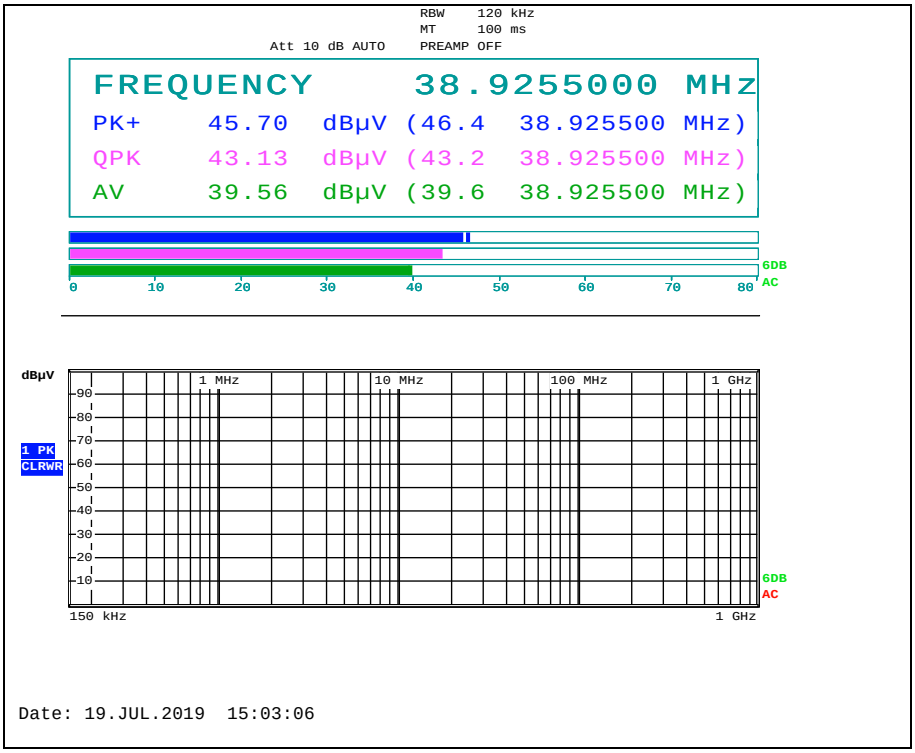
Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
38.93	43.20	Quasi-peak	V	19.57	-26.76	36.01	40.00	3.99
79.96	49.30	Peak	H	11.80	-25.74	35.36	40.00	4.64
101.78	46.50	Peak	V	17.08	-25.48	38.10	43.50	5.40
124.94	48.30	Peak	V	14.81	-25.38	37.73	43.50	5.77
272.14	39.00	Peak	H	18.64	-24.30	33.34	46.00	12.66
400.66	44.50	Peak	V	21.61	-23.30	42.81	46.00	3.19
Above 500.00	Not detected	-	-	-	-	-	-	-

Remark;

1. Spurious emissions for all channels and modes were investigated and almost the same below 1 ㎓.
2. Reported spurious emissions are in **11a (Band 3) / 6 Mbps / Low channel** as worst case among other modes.
3. Radiated spurious emission measurement as below.
   (Actual = Reading + AF + AMP + CL)
4. According to §15.31(o), emission levels are not report much lower than the limits by over 20 ㏈.

- Test plots





2.4.2. Radiated Spurious Emission above 1 000 ㎒

OFDM: 802.11a (6 Mbps) Band 1_ANT 1+ANT 2

A. Low Channel (5 180 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 500.00	40.25	Peak	V	31.80	-31.95	-	40.10	74.00	33.90
*4 500.00	30.01	Average	V	31.80	-31.95	0.30	30.16	54.00	23.84
*5 031.25	46.02	Peak	V	33.03	-31.17	-	47.88	74.00	26.12
*5 030.50	35.89	Average	V	33.02	-31.17	0.30	38.04	54.00	15.96
*5 150.00	41.95	Peak	V	33.30	-31.11	-	44.14	74.00	29.86
*5 150.00	31.29	Average	V	33.30	-31.11	0.30	33.78	54.00	20.22

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 220 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 240 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

OFDM: 802.11a (6 Mbps) Band 3_ANT 1+ANT 2

A. Low Channel (5 745 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 593.94	45.47	Peak	H	33.71	-30.43	48.75	68.23	19.48
5 695.38	44.16	Peak	H	33.88	-30.30	47.74	101.81	54.07
5 719.38	46.58	Peak	H	33.90	-30.35	50.13	110.65	60.52
5 724.81	54.66	Peak	H	33.90	-30.37	58.19	121.79	63.60

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 785 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 825 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 851.70	44.30	Peak	H	34.01	-30.24	48.07	118.35	70.28
5 865.30	41.22	Peak	H	34.09	-30.15	45.16	107.94	62.78
5 886.20	41.11	Peak	H	34.22	-30.01	45.32	96.94	51.62
5 978.90	41.84	Peak	H	34.40	-30.08	46.16	68.56	22.40

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

OFDM: 802.11n_HT20 (MCS0) Band 1_ANT 1+ANT 2

A. Low Channel (5 180 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 500.00	39.05	Peak	V	31.80	-31.95	-	38.90	74.00	35.10
*4 500.00	29.74	Average	V	31.80	-31.95	0.32	29.91	54.00	24.09
*5 032.00	44.73	Peak	V	33.03	-31.17	-	46.59	74.00	27.41
*5 029.00	35.82	Average	V	33.02	-31.17	0.32	37.99	54.00	16.01
*5 150.00	41.44	Peak	V	33.30	-31.11	-	43.63	74.00	30.37
*5 150.00	31.98	Average	V	33.30	-31.11	0.32	34.49	54.00	19.51

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 220 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 240 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

OFDM: 802.11n_HT20 (MCS0) Band 3_ANT 1+ANT 2

A. Low Channel (5 745 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 597.13	46.43	Peak	H	33.71	-30.42	49.72	68.23	18.51
5 671.38	44.66	Peak	H	33.79	-30.45	48.00	84.05	36.05
5 720.00	48.83	Peak	H	33.90	-30.36	52.37	110.83	58.46
5 724.81	58.83	Peak	H	33.90	-30.37	62.36	121.79	59.43

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 785 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 825 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 850.30	45.72	Peak	H	34.00	-30.25	49.47	121.54	72.07
5 855.90	41.66	Peak	H	34.04	-30.21	45.49	110.58	65.09
5 898.20	40.66	Peak	H	34.29	-29.93	45.02	88.06	43.04
5 978.30	41.80	Peak	H	34.40	-30.08	46.12	68.55	22.43

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

OFDM: 802.11n_HT40 (MCS0) Band 1_ANT 1+ANT 2

A. Low Channel (5 190 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 500.00	41.01	Peak	V	31.80	-31.95	-	40.86	74.00	33.14
*4 500.00	29.89	Average	V	31.80	-31.95	0.62	30.36	54.00	23.64
*5 147.52	44.33	Peak	V	33.30	-31.11	-	46.52	74.00	27.48
*5 149.04	32.72	Average	V	33.30	-31.11	0.62	35.53	54.00	18.47
*5 150.00	43.88	Peak	V	33.30	-31.11	-	46.07	74.00	27.93
*5 150.00	32.19	Average	V	33.30	-31.11	0.62	35.00	54.00	19.00

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

B. High Channel (5 230 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

OFDM: 802.11n_HT40 (MCS0) Band 3_ANT 1+ANT 2

A. Low Channel (5 755 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 606.10	43.96	Peak	H	33.70	-30.43	47.23	68.23	21.00
5 700.00	45.64	Peak	H	33.90	-30.27	49.27	105.23	55.96
5 720.00	59.11	Peak	H	33.90	-30.36	62.65	110.83	48.18
5 720.40	59.27	Peak	H	33.90	-30.36	62.81	111.74	48.93

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

B. High Channel (5 795 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 851.08	45.05	Peak	H	34.01	-30.24	48.82	119.77	70.95
5 863.65	40.70	Peak	H	34.08	-30.16	44.62	108.41	63.79
5 888.61	40.83	Peak	H	34.23	-30.00	45.06	95.16	50.10
5 933.85	39.84	Peak	H	34.37	-30.01	44.20	68.23	24.03

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

OFDM: 802.11ac_VHT80 (MCS0) Band 1_ANT 1+ANT 2

A. Middle Channel (5 210 ㎒)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 500.00	39.00	Peak	V	31.80	-31.95	-	38.85	74.00	35.15
*4 500.00	29.83	Average	V	31.80	-31.95	1.14	30.82	54.00	23.18
*5 149.00	49.30	Peak	V	33.30	-31.11	-	51.49	74.00	22.51
*5 149.00	35.46	Average	V	33.30	-31.11	1.14	38.79	54.00	15.21
*5 150.00	48.12	Peak	V	33.30	-31.11	-	50.31	74.00	23.69
*5 150.00	34.64	Average	V	33.30	-31.11	1.14	37.97	54.00	16.03

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

OFDM: 802.11ac_VHT80 (MCS0) Band 3_ANT 1+ANT 2

A. Middle Channel (5 775 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 597.25	44.35	Peak	H	33.71	-30.42	47.64	68.23	20.59
5 691.38	51.90	Peak	H	33.87	-30.33	55.44	98.85	43.41
5 718.79	57.36	Peak	H	33.90	-30.35	60.91	110.49	49.58
5 722.33	56.14	Peak	H	33.90	-30.36	59.68	116.14	56.46
5 852.04	48.04	Peak	H	34.01	-30.24	51.81	117.58	65.77
5 861.49	45.82	Peak	H	34.07	-30.17	49.72	109.01	59.29
5 893.89	41.27	Peak	H	34.26	-29.96	45.57	91.25	45.68
5 936.01	41.74	Peak	H	34.37	-30.02	46.09	68.23	22.14

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

Remark;

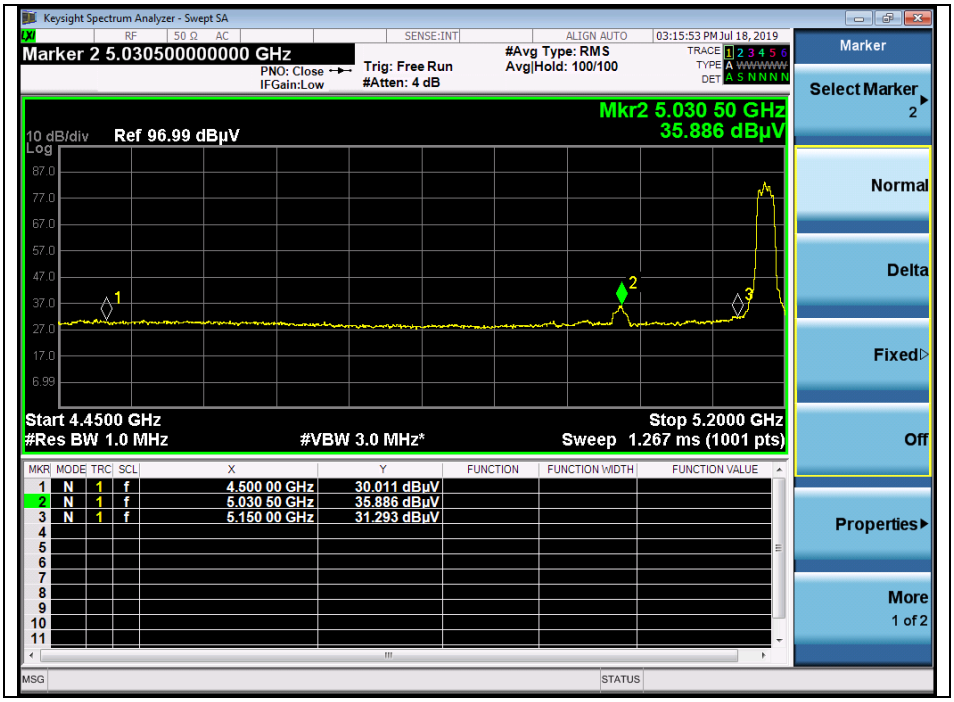
1. "*" means the restricted band.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using Peak / average detector mode if frequency was in restricted band. Otherwise the frequency was out of restricted band, only peak detector should be used.
3. Actual = Reading + AF + AMP + CL + (DF)
4. If frequency was out of restricted band, the calculation method for peak limit is same as below.
   68.23 dB㎶/m = EIRP - 20 log (d) + 104.77 = -27 - 20 log (3) + 104.77
5. In case of the emissions within ±75 ㎒ 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

OFDM: 802.11a (6 Mbps)_ANT 1+ANT 2

Low channel Band edge (Peak) - Band 1

Low channel Band edge (Average) - Band 1

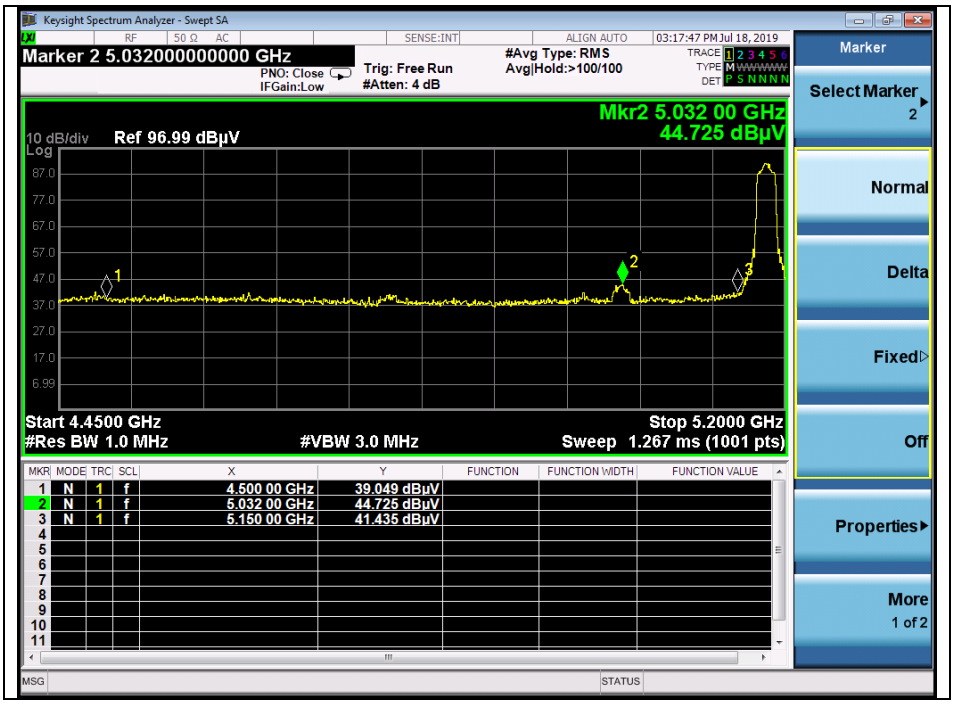


Low channel Band edge (Peak) - Band 3

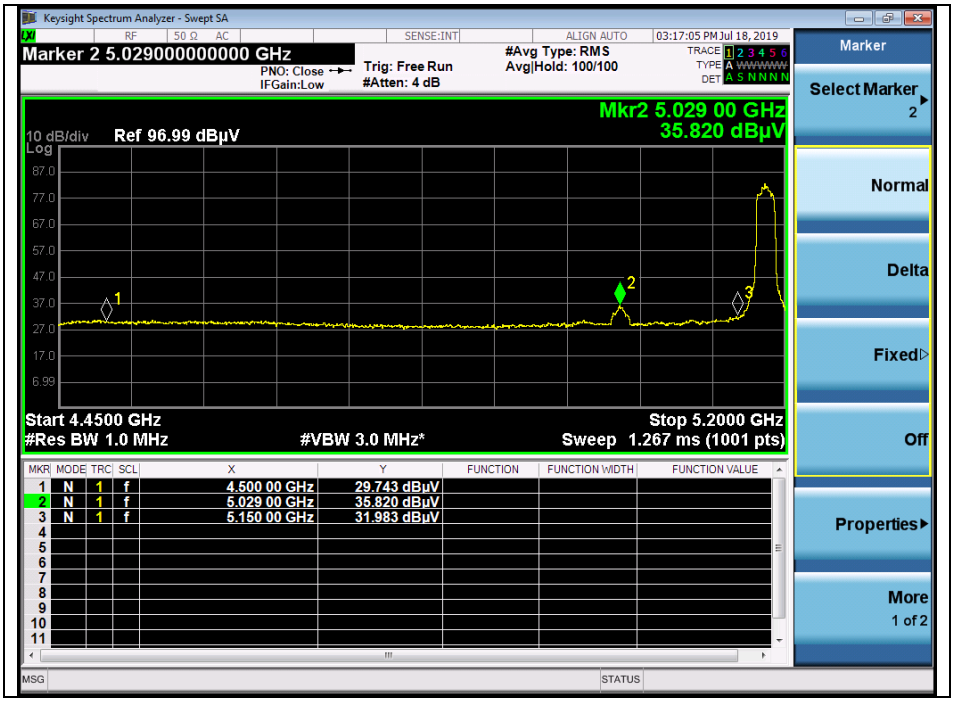
High channel Band edge (Peak) - Band 3

OFDM: 802.11n_HT20 (MCS0)_ANT 1+ANT 2

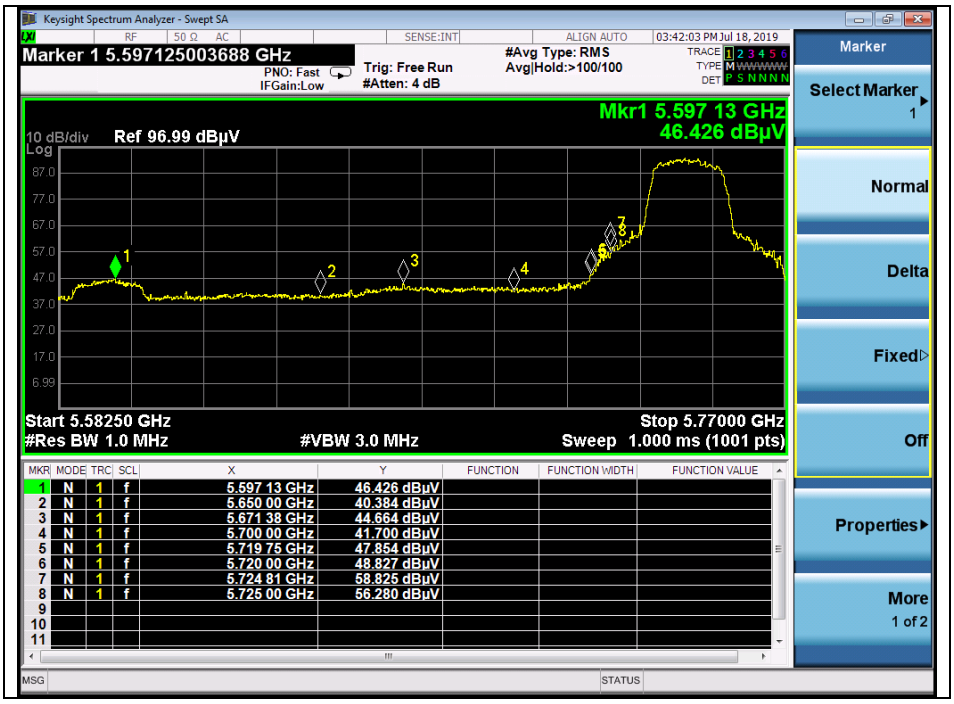
Low channel Band edge (Peak) - Band 1



Low channel Band edge (Average) - Band 1



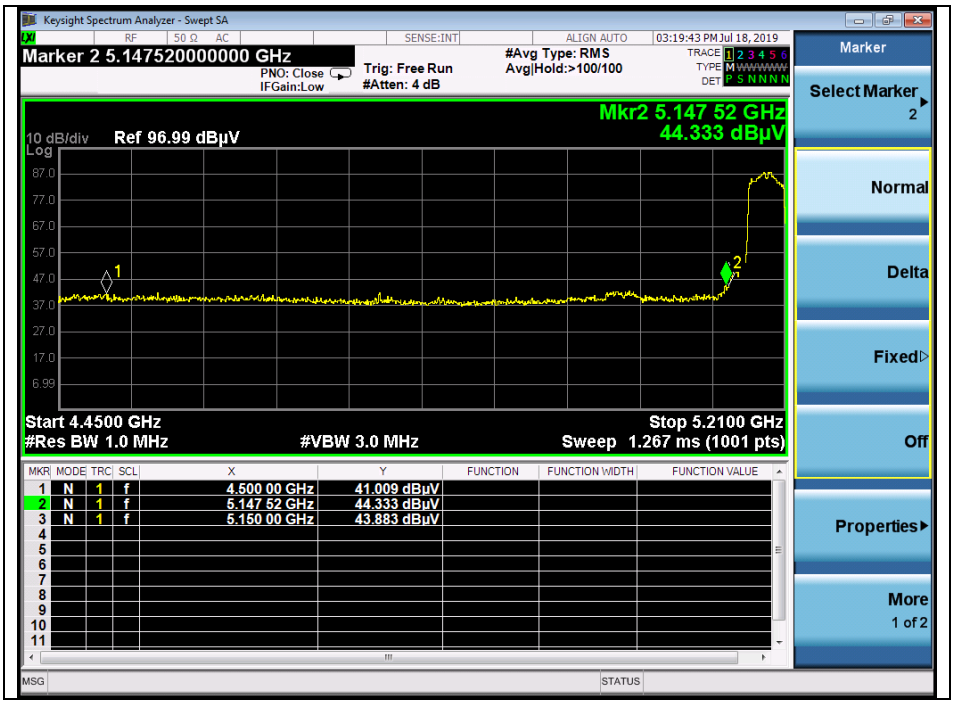
Low channel Band edge (Peak) - Band 3



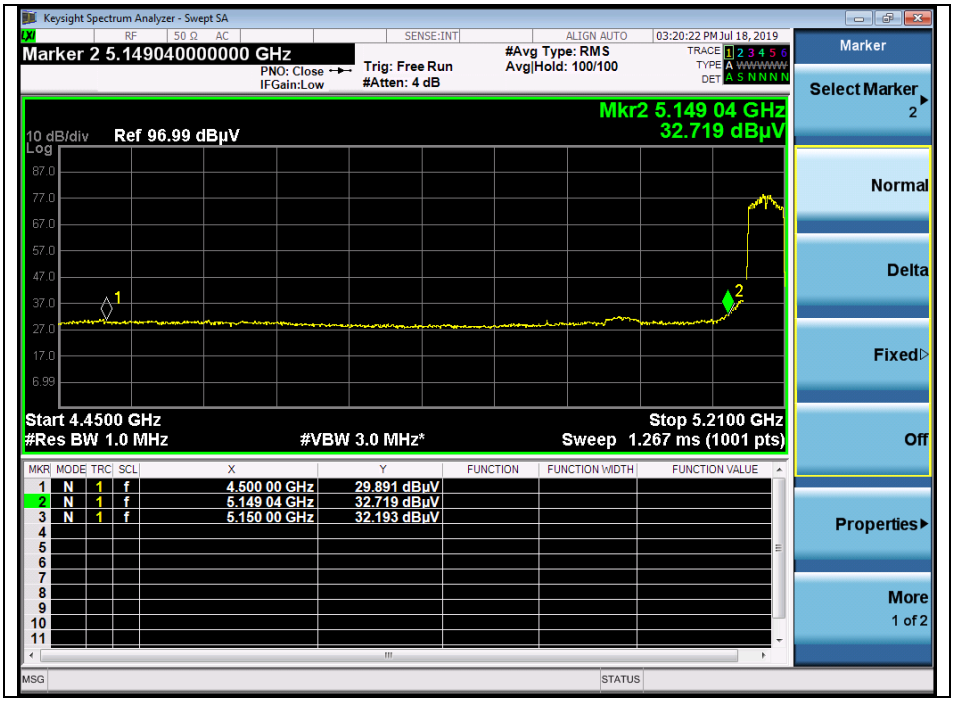
High channel Band edge (Peak) - Band 3

OFDM: 802.11n_HT40 (MCS0)_ANT 1+ANT 2

Low channel Band edge (Peak) - Band 1



Low channel Band edge (Average) - Band 1

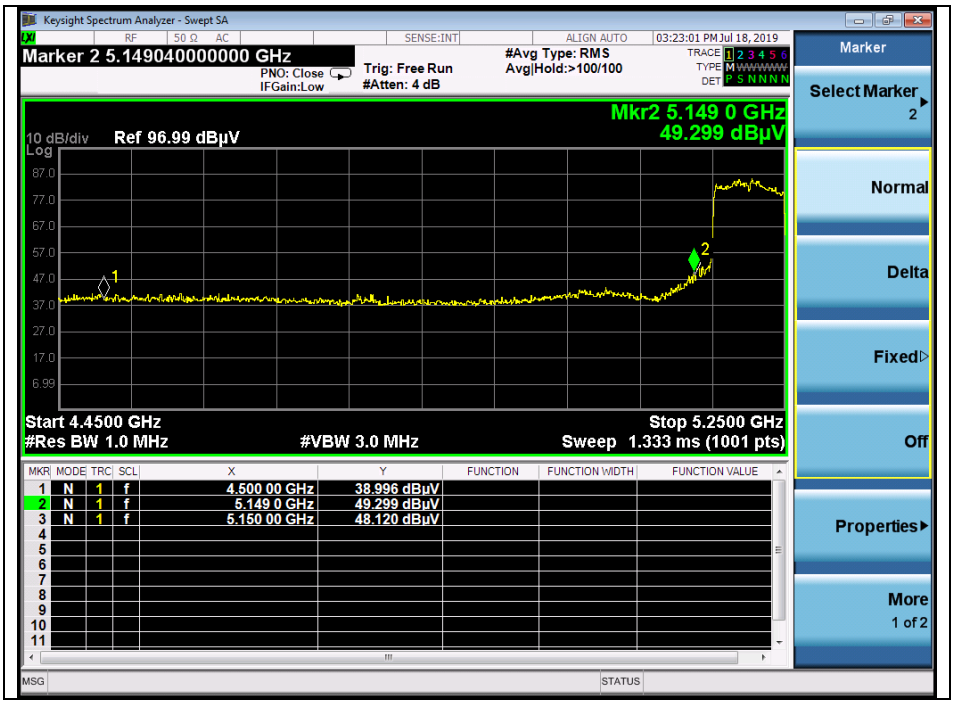


Low channel Band edge (Peak) - Band 3

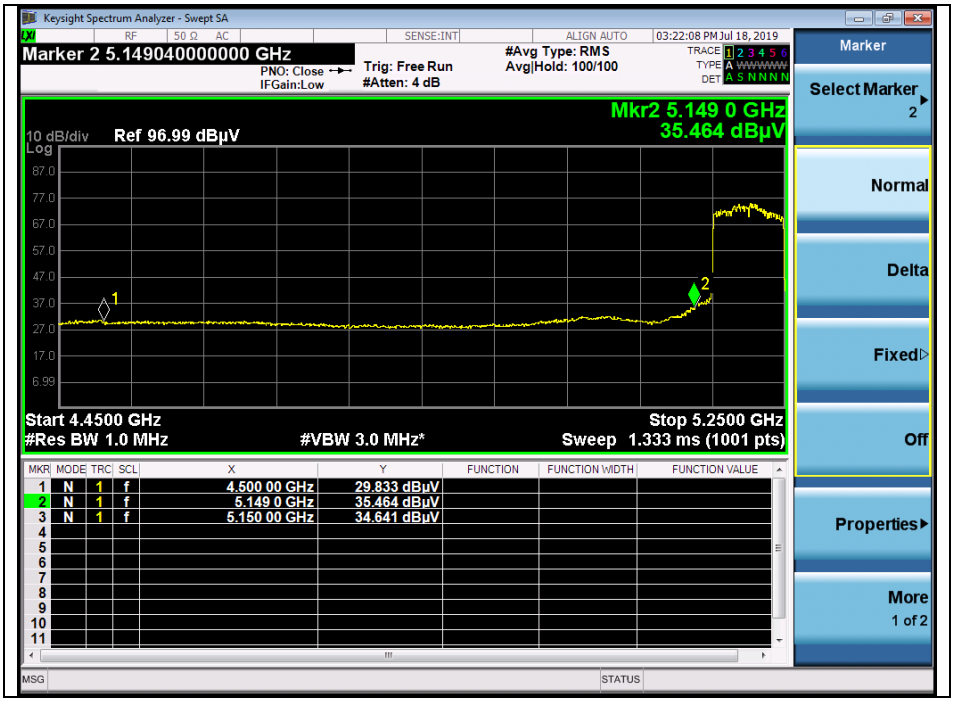
High channel Band edge (Peak) - Band 3

OFDM: 802.11ac_VHT80 (MCS0)_ANT 1+ANT 2

Middle channel Band edge (Peak) - Band 1



Middle channel Band edge (Average) - Band 1

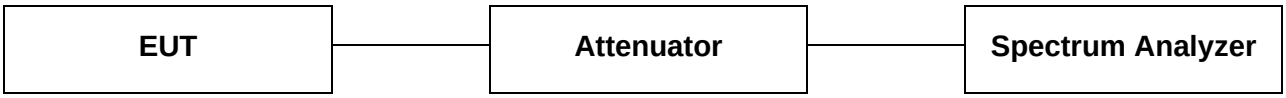


Middle channel Band edge (Peak) - Band 3

Middle channel Band edge (Peak) - Band 3

3. 26 ㏈ 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 ㏈ Bandwidth

1. This measurement settings are specified in section 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 ㏈ 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 %.

3.2.2. 99 % Bandwidth

3.2.2.1 FCC

1. This measurement settings are specified in section 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 ≥ 3 x 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 ㎒ ~ 5 250 ㎒.

3.2.2.2 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.

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) ℃
Relative humidity : 47 % R.H.

Test mode: 11a

Band	Frequency (㎒)	Ch.	Data Rate (Mbps)	26 ㏈ Bandwidth (㎒)	
				ANT 1	ANT 2
U-NII 1	5 180	36	6	21.013	21.187
	5 220	44		21.071	21.360
	5 240	48		21.071	21.360
U-NII 3	5 745	149		21.418	21.303
	5 785	157		21.187	21.303
	5 825	165		21.476	21.303

Test mode: 11n_HT20

Band	Frequency (㎒)	Ch.	Data Rate (Mbps)	26 ㏈ Bandwidth (㎒)	
				ANT 1	ANT 2
U-NII 1	5 180	36	MCS0	21.360	21.245
	5 220	44		21.476	21.360
	5 240	48		21.708	21.476
U-NII 3	5 745	149		21.823	21.360
	5 785	157		22.113	21.476
	5 825	165		21.823	21.476

Test mode: 11n_HT40

Band	Frequency (㎒)	Ch.	Data Rate (Mbps)	26 ㏈ Bandwidth (㎒)	
				ANT 1	ANT 2
U-NII 1	5 190	38	MCS0	40.174	39.595
	5 230	46		39.942	39.363
U-NII 3	5 755	151		40.984	39.595
	5 795	159		44.573	39.711

Test mode: 11ac_VHT80

Band	Frequency (㎒)	Ch.	Data Rate (Mbps)	26 ㏈ Bandwidth (㎒)	
				ANT 1	ANT 2
U-NII 1	5 210	42	MCS0	81.968	81.737
U-NII 3	5 775	155		82.663	81.737

Test mode: 11a

Band	Frequency (㎒)	Ch.	Data Rate (Mbps)	99% Bandwidth (㎒)	
				ANT 1	ANT 2
U-NII 1	5 180	36	6	16.961	16.961
	5 220	44		17.077	17.019
	5 240	48		17.077	16.961
U-NII 3	5 745	149		17.192	16.903
	5 785	157		17.250	16.903
	5 825	165		17.308	16.903

Test mode: 11n_HT20

Band	Frequency (㎒)	Ch.	Data Rate (Mbps)	99% Bandwidth (㎒)	
				ANT 1	ANT 2
U-NII 1	5 180	36	MCS0	18.119	17.829
	5 220	44		18.119	17.887
	5 240	48		18.177	17.887
U-NII 3	5 745	149		18.234	17.771
	5 785	157		18.234	17.771
	5 825	165		18.350	17.829

Test mode: 11n_HT40

Band	Frequency (㎒)	Ch.	Data Rate (Mbps)	99% Bandwidth (㎒)	
				ANT 1	ANT 2
U-NII 1	5 190	38	MCS0	36.237	36.122
	5 230	46		36.353	36.122
U-NII 3	5 755	151		36.469	36.122
	5 795	159		36.469	36.122

Test mode: 11ac_VHT80

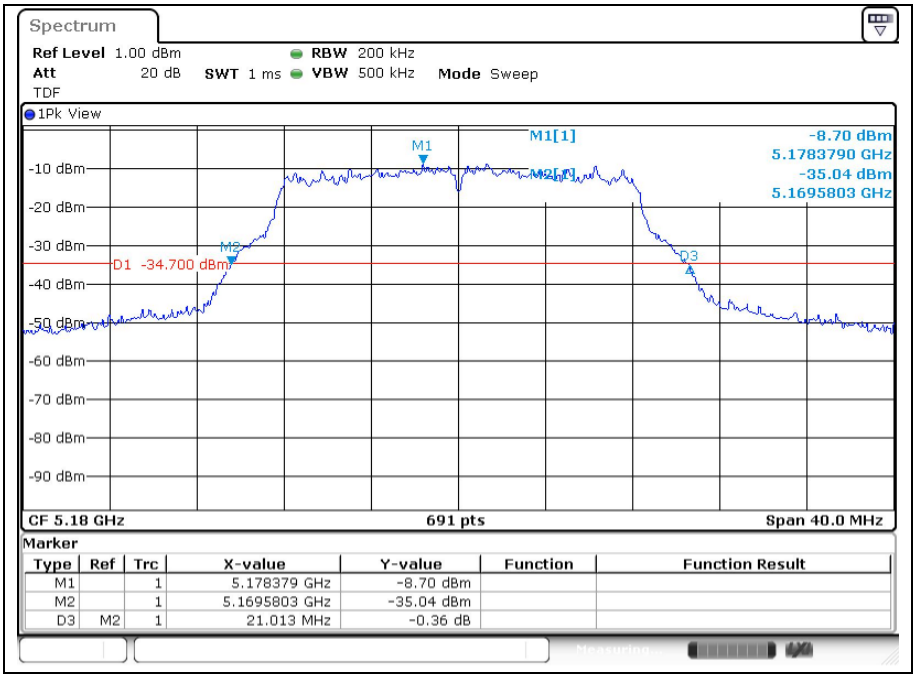
Band	Frequency (㎒)	Ch.	Data Rate (Mbps)	99% Bandwidth (㎒)	
				ANT 1	ANT 2
U-NII 1	5 210	42	MCS0	75.716	75.716
U-NII 3	5 775	155		75.716	75.716

- Test plots

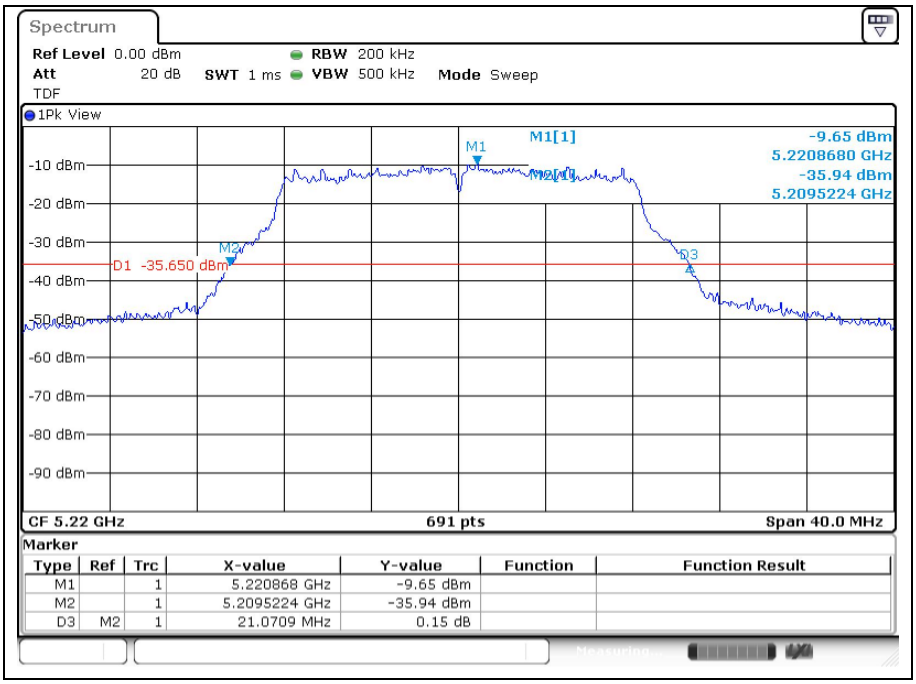
26 ㏈ Bandwidth

802.11a (Band 1)_ANT 1

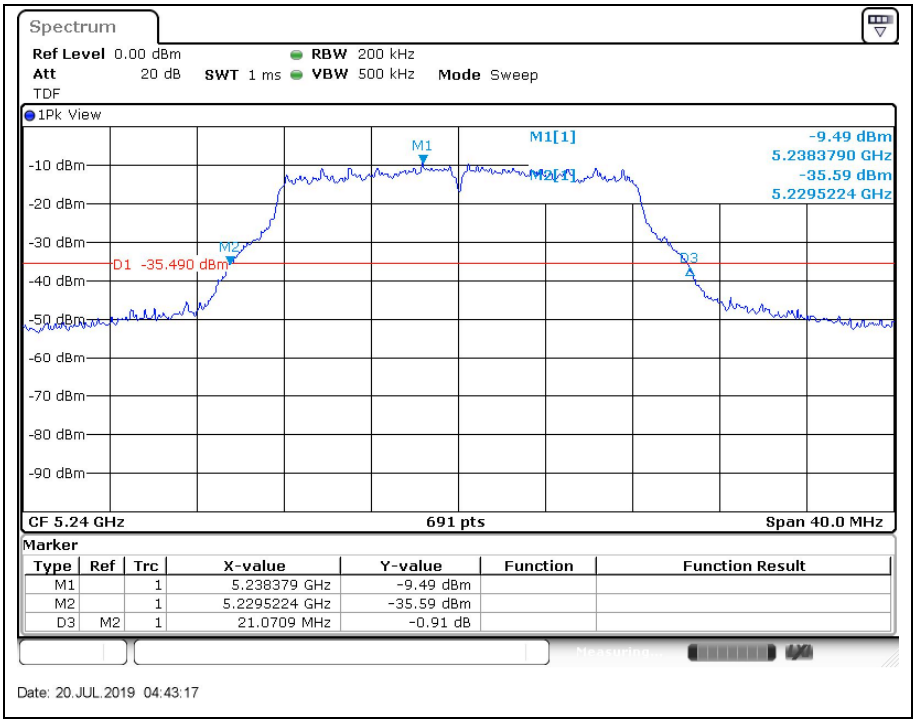
Low Channel (5 180 ㎒)



Middle Channel (5 220 ㎒)

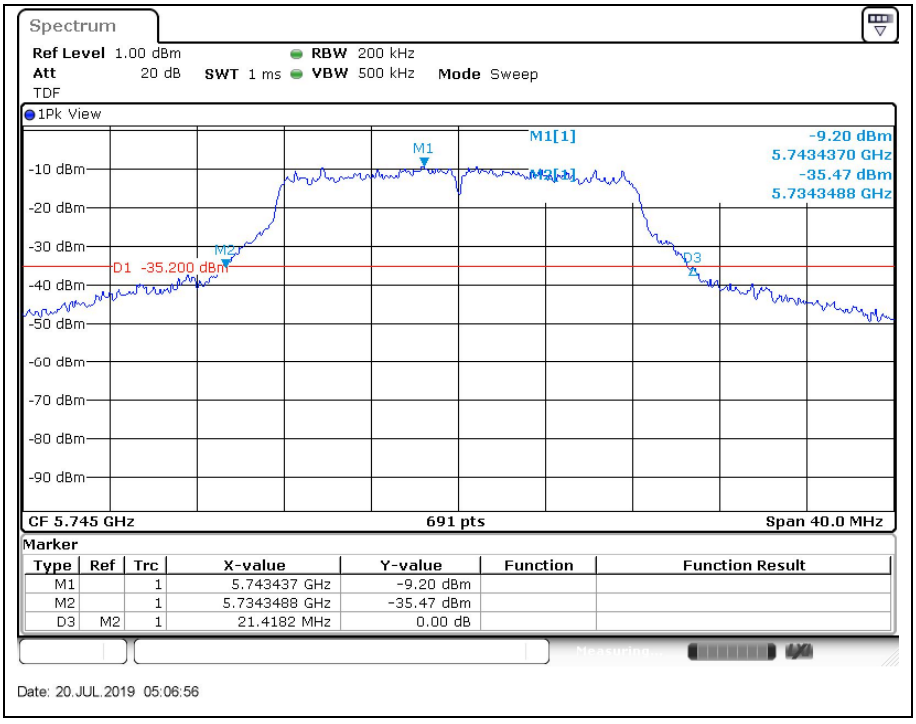


High Channel (5 240 ㎒)

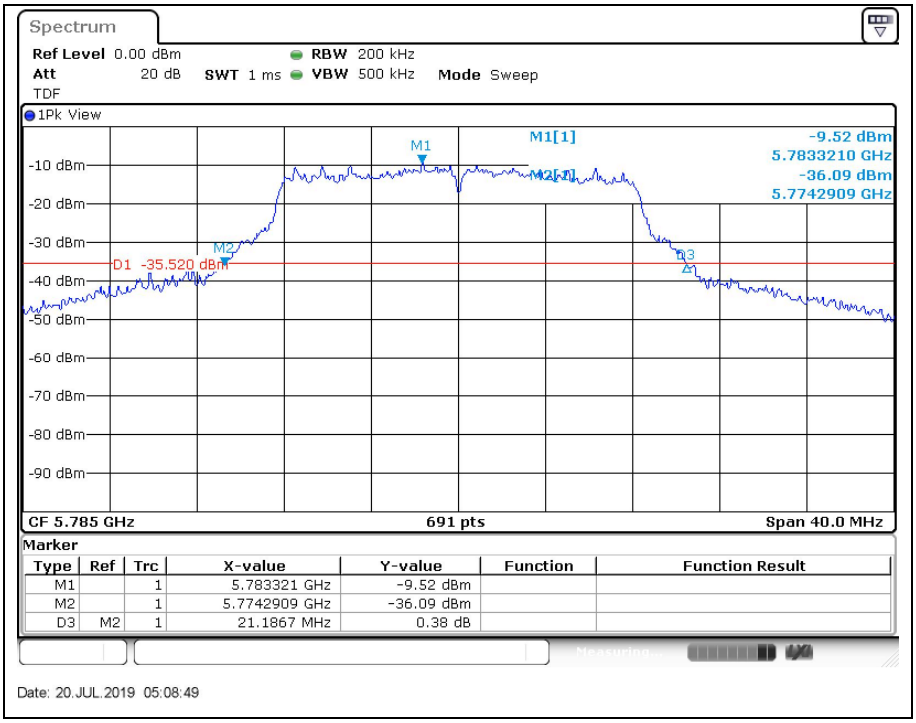


802.11a (Band 3)_ANT 1

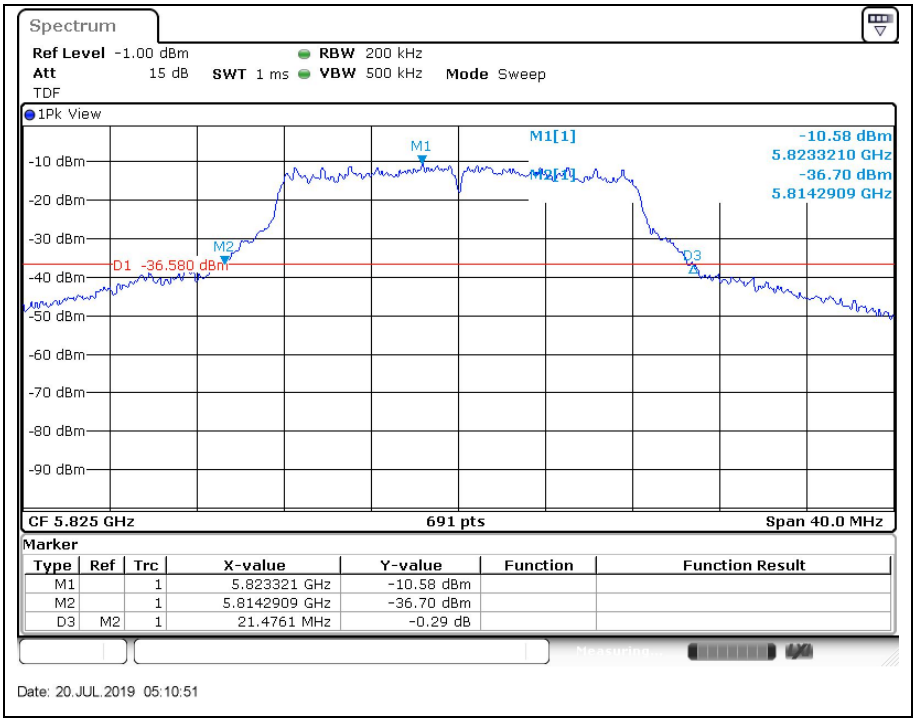
Low Channel (5 745 ㎒)



Middle Channel (5 785 ㎒)

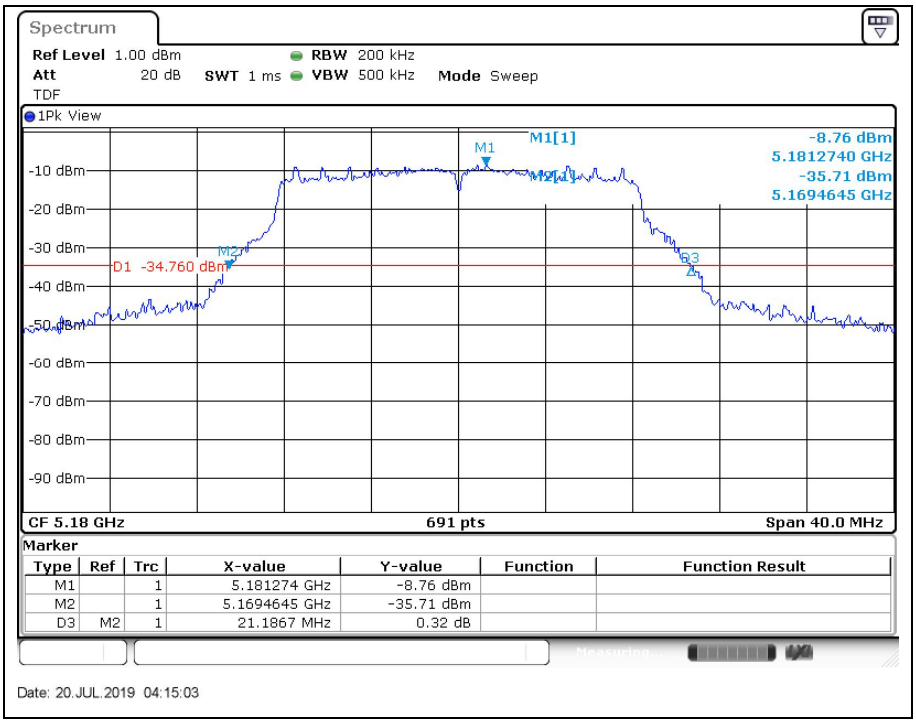


High Channel (5 825 ㎒)

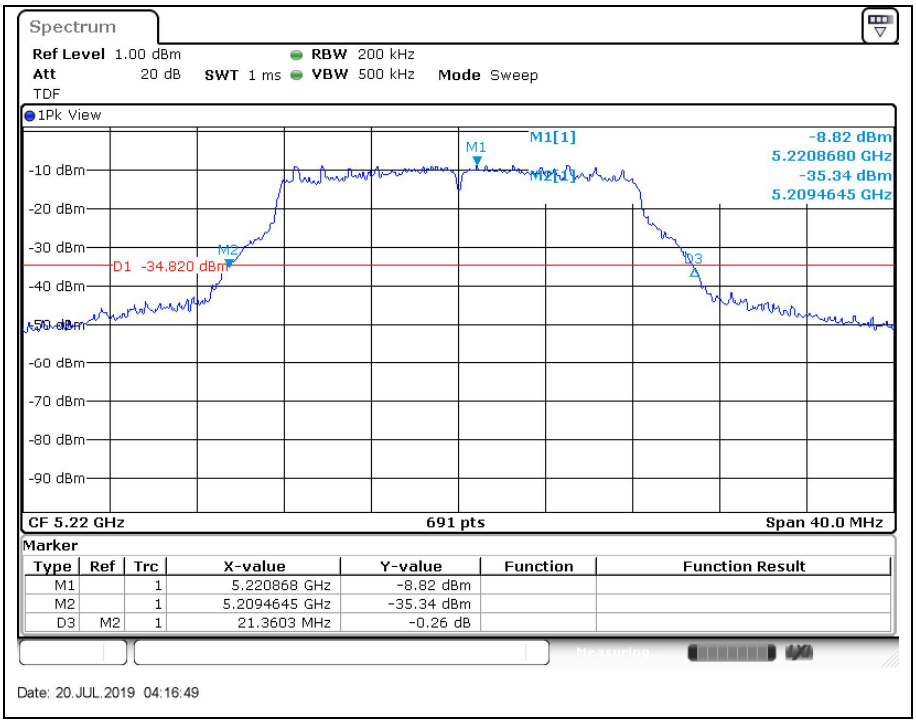


802.11a (Band 1)_ANT 2

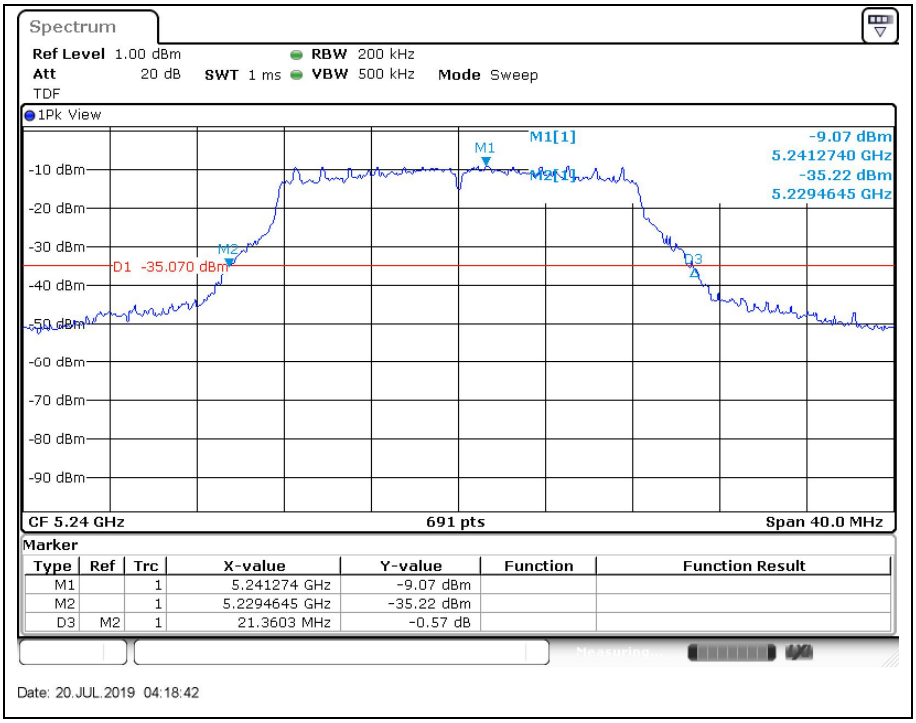
Low Channel (5 180 ㎒)



Middle Channel (5 220 ㎒)

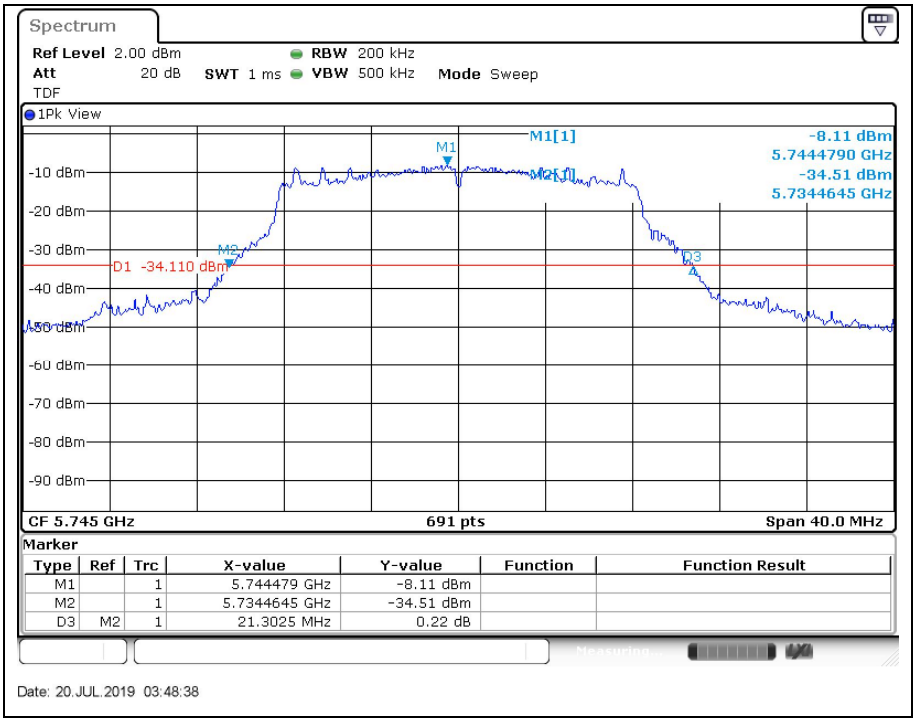


High Channel (5 240 ㎒)

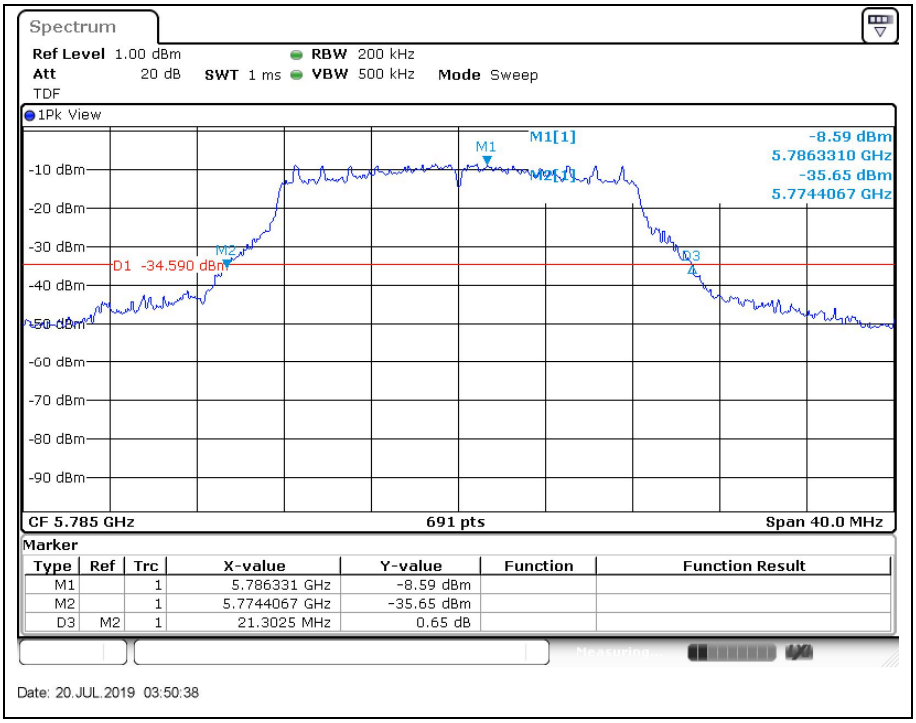


802.11a (Band 3)_ANT 2

Low Channel (5 745 ㎒)



Middle Channel (5 785 ㎒)



High Channel (5 825 ㎒)