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TEST REPORT

of

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

FCC ID: BEJIGCJ2PHN
IC Certification: 2703H-IGCJ2PHN

Equipment Under Test	:	Car AVN
Model Name	:	IGCJ2PHN
Variant Model Name(s)	:	-
FCC Applicant	:	LG Electronics USA
IC Applicant	:	LG ELECTRONICS INC.
Manufacturer	:	LG Electronics Inc.
Date of Receipt	:	2022.12.07
Date of Test(s)	:	2022.12.23 ~ 2023.02.16
Date of Issue	:	2023.03.06

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

1) The results of this test report are effective only to the items tested.
2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.
3) This test report cannot be reproduced, except in full, without prior written permission of the Company.
4) The data marked ※ in this report was provided by the customer and may affect the validity of the test results. We are responsible for all the information of this test report except for the data(※) provided by the customer.

Tested by: Teo Kim

Technical Manager: Inho Park

SGS Korea Co., Ltd. Gunpo Laboratory

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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 : 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 : Cho, Hee-jae
Phone No. : +1 201 470 2696

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		IGCJ2PHN
Serial Number		211VIAXC96880
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※	**Port 1**	5 150 ㎒ ~ 5 250 ㎒: 5 ㏈i 5 725 ㎒ ~ 5 850 ㎒: 5 ㏈i
	Port 2	5 150 ㎒ ~ 5 250 ㎒: 5 ㏈i 5 725 ㎒ ~ 5 850 ㎒: 5 ㏈i
H/W Version		V9.0
S/W Version		IP36
FVIN		N/A

1.5. Declaration by the Manufacturer

- The EUT is a slave without radar detection.
- The EUT Supports Transmit Power Control (TPC).
- WLAN 5G transmits on both Port 1 and Port 2.
- The EUT Only Supports UNII-1 Band and UNII-3 Band.

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

The device complies with this requirement, by automatically discontinue transmission when there’s no more information to transmit and any case of operational failure occurs.

1.7. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	R&S	SMA100B	106887	Oct. 13, 2022	Annual	Oct. 13, 2023
Signal Generator	R&S	SMBV100A	255834	May 25, 2022	Annual	May 25, 2023
Spectrum Analyzer	R&S	FSV30	103210	Dec. 07, 2022	Annual	Dec. 07, 2023
Spectrum Analyzer	Agilent	N9020A	MY53421758	Aug. 26, 2022	Annual	Aug. 26, 2023
Spectrum Analyzer	Agilent	N9030A	US51350132	Nov. 11, 2022	Annual	Nov. 11, 2023
Power Meter	Anritsu	ML2495A	1223004	Nov. 29, 2022	Annual	Nov 29, 2023
Power Sensor	Anritsu	MA2411B	1207272	May 27, 2022	Annual	May 27, 2023
Attenuator	AEROFLEX / INMET	40AH2W-10	40G-1	Jun. 08, 2022	Annual	Jun. 08, 2023
Low Pass Filter	Mini-Circuits	NLP-1200+	V 8979400903-2	Feb. 09, 2023	Annual	Feb. 09, 2024
Low Pass Filter	WT MICROWAVE INC	WT-A1700-LS	WT151207001	Apr. 05, 2022	Annual	Apr. 05, 2023
High Pass Filter	Wainwright Instrument GmbH	WHKX6.0/18G-10SS	51	Jun. 15, 2022	Annual	Jun. 15, 2023
High Pass Filter	Wainwright Instrument GmbH	WHNX7.5/26.5G-6SS	15	May 31, 2022	Annual	May 31, 2023
DC Power Supply	R&S	HMP2020	020089489	May 17, 2022	Annual	May 17, 2023
Preamplifier	H.P.	8447F	2944A03909	Aug. 04, 2022	Annual	Aug. 04, 2023
Signal Conditioning Unit	R&S	SCU-18	10117	Jun. 13, 2022	Annual	Jun. 13, 2023
Preamplifier	TESTEK	TK-PA1840H	130016	Jan. 11, 2023	Annual	Jan. 11, 2024
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 23, 2021	Biennial	Aug. 23, 2023
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB 9163	390	Feb. 21, 2022	Annual	Feb. 21, 2023
Horn Antenna	R&S	HF906	100326	Feb. 18, 2022	Annual	Feb. 18, 2023
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9170	9170-540	Nov. 30, 2022	Annual	Nov. 30, 2023
EMI Test Receiver	R&S	ESCI 7	100911	Feb. 23, 2022	Annual	Feb. 23, 2023
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	CO3000/963/3 8330516/L	N.C.R.	N/A	N.C.R.
Antenna Mast	Innco systems GmbH	MA4640-XP-ET	MA4640/536/3 8330516/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	RFONE	MWX221-NMSNMS (4 m)	J1023142	Oct. 04, 2022	Semi-Annual	Apr. 04, 2023
Coaxial Cable	Qualwave Inc.	QA500-18-NN-10 (10 m)	22200114	Oct. 04, 2022	Semi-Annual	Apr. 04, 2023
Coaxial Cable	RFONE	PL360P-292M292M-1.5M-A	20200324002	Aug. 18, 2022	Semi-Annual	Feb. 18, 2023

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 calibraition due date

1.8. Summary of Test Result

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15 Subpart E, IC 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
15.207	RSS-Gen Issue 5 8.8	AC Power Line Conducted Emission	N/A[1)]

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

1.10.2. Radiation Test

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

1.11. Information of software for test

- Using the software of PuTTY (Version 0.78) to testing of EUT.

1.12. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL003835	2023.02.20	Initial
1	F690501-RF-RTL003835-1	2023.03.06	Revised an antenna gain and E.I.R.P. results

1.13. Measurement Uncertainty

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

Parameter		Uncertainty
RF Output Power		0.32 dB
Occupied Bandwidth		3.90 kHz
Power Spectral Density		0.62 dB
Radiated Emission, 9 kHz to 30 MHz	H	3.40 dB
	V	3.40 dB
Radiated Emission, below 1 GHz	H	4.50 dB
	V	5.10 dB
Radiated Emission, above 1 GHz	H	3.70 dB
	V	3.90 dB

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

1.14. Device Capabilities

Mode	SISO		MIMO	
	Ant.1	Ant.2	Ant.1	Ant.2
BT	O	X	X	X
WLAN 2.4G	X	O	X	X
WLAN 5G	O	O	O	O

1.15. Maximum Average Power

Modulation	Band	Mode	Maximum Average Power (dBm)		
			Ant. 1	Ant. 2	MIMO
OFDM	U-NII 1	11a	0.69	2.23	4.66
		11ac_VHT20	0.50	2.27	4.39
		11ac_VHT40	-0.36	1.24	3.66
		11ac_VHT80	-0.08	1.62	3.84
	U-NII 3	11a	1.62	1.92	4.68
		11ac_VHT20	1.66	1.62	4.52
		11ac_VHT40	1.29	2.05	4.69
		11ac_VHT80	0.95	2.13	4.80

Note ;

All radiated emission tests were performed with MIMO Mode as the worst case based on output power.

1.16. Worst-Case Configuration and Test Mode

Radiated emission below 1GHz was performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Radiated emission above 1GHz was performed with the EUT set to transmit Low/Middle/High Channels for each mode.

Conducted tests were performed with the EUT set to transmit Low/Middle/High channels with highest output power.

Modulation	Bandwidth	Antenna	Frequency	Mode	Average Power (dBm)
OFDM	20 ㎒	Ant.1	5 220	11n_HT20	0.61
				11ac_VHT20	**0.77**
		Ant.2		11n_HT20	2.37
				11ac_VHT20	**2.45**
		MIMO		11n_HT20	2.12
				11ac_VHT20	**2.40**
	40 ㎒	Ant.1	5 190	11n_HT40	-0.19
				11ac_VHT40	**-0.11**
		Ant.2		11n_HT40	1.26
				11ac_VHT40	**1.27**
		MIMO		11n_HT40	1.51
				11ac_VHT40	**1.63**

Note ;

For duplicate test items among 802.11n_HT20, HT40, 802.11ac_VHT20 and VHT40 mode, the test mode with the highest power level was tested.

In MIMO mode, average power level was compared with one port only which was the highest power level than other port.

SISO

802.11a mode:
We found out the test mode with the highest power level after we analyze all the data rates. 6 Mbps data rate among 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps and 54 Mbps is chosen as worst case.

802.11ac_VHT20 mode:
We found out the test mode with the highest power level after we analyze all the data rates. MCS0 data rate among MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7 and MCS8 is chosen as worst case.

802.11ac_VHT40 mode:
We found out the test mode with the highest power level after we analyze all the data rates. MCS0 data rate among MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7, MCS8 and MCS9 is chosen as worst case.

802.11ac_VHT80 mode:
We found out the test mode with the highest power level after we analyze all the data rates. MCS0 data rate among MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7, MCS8 and MCS9 is chosen as worst case.

MIMO

802.11a mode:
We found out the test mode with the highest power level after we analyze all the data rates. 6 Mbps data rate among 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps and 54 Mbps is chosen as worst case.

802.11ac_VHT20 mode:
We found out the test mode with the highest power level after we analyze all the data rates. MCS0 data rate among MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7 and MCS8 is chosen as worst case.

802.11ac_VHT40 mode:
We found out the test mode with the highest power level after we analyze all the data rates. MCS0 data rate among MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7, MCS8 and MCS9 is chosen as worst case.

802.11ac_VHT80 mode:
We found out the test mode with the highest power level after we analyze all the data rates. MCS0 data rate among MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7, MCS8 and MCS9 is chosen as worst case.

1.17. 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.

- **SISO**

Mode	Data Rate (Mbps)	Duty Cycle (%)	Correction Factor (dB)
802.11a	6	93.46	0.29
11ac_VHT20	MCS0	92.41	0.34
11ac_VHT40	MCS0	86.75	0.62
11ac_VHT80	MCS0	76.50	1.16

- **MIMO**

Mode	Data Rate (Mbps)	Duty Cycle (%)	Correction Factor (dB)
802.11a	6	92.86	0.32
11ac_VHT20	MCS0	93.06	0.31
11ac_VHT40	MCS0	86.75	0.62
11ac_VHT80	MCS0	76.96	1.14

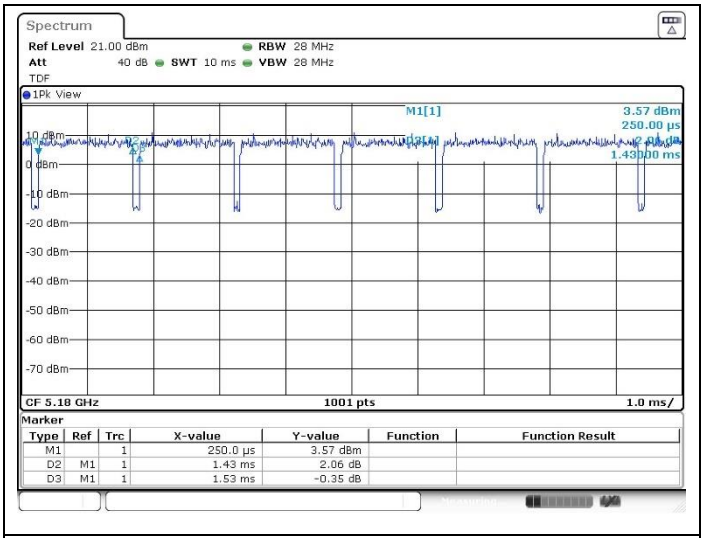
Remark;

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)

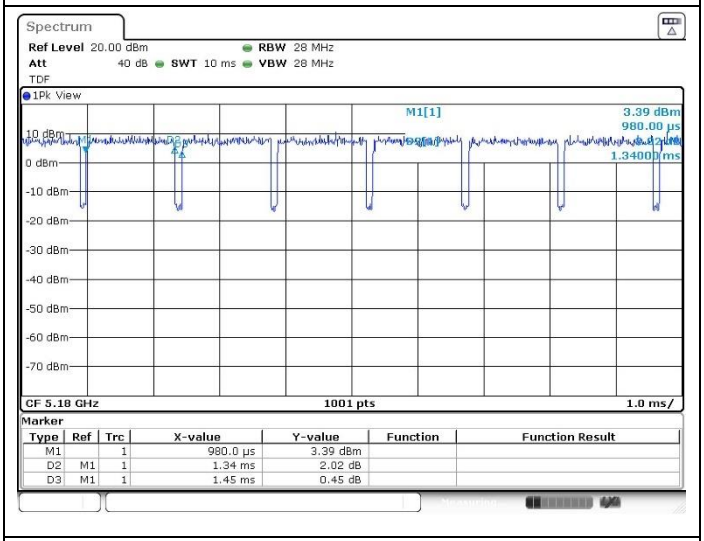
- Test plots

SISO

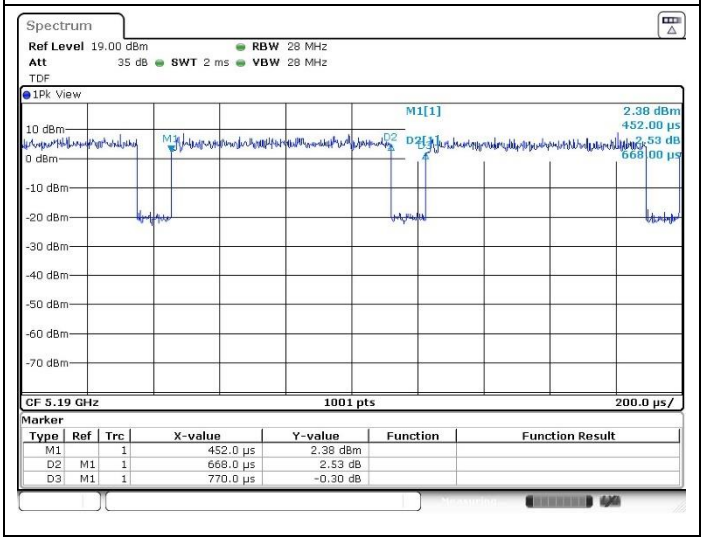
802.11a



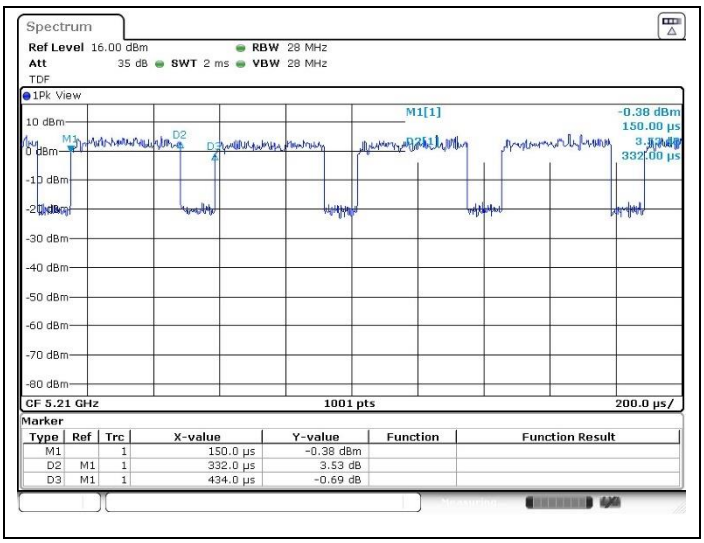
802.11ac_VHT20



802.11ac_VHT40

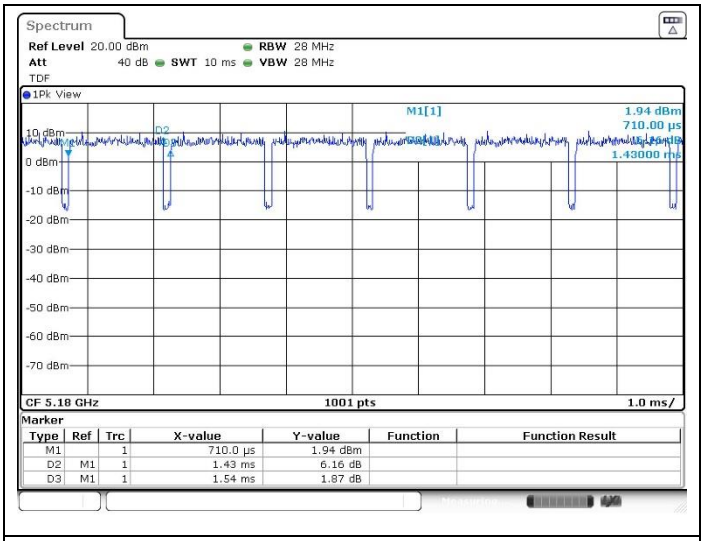


802.11ac_VHT80

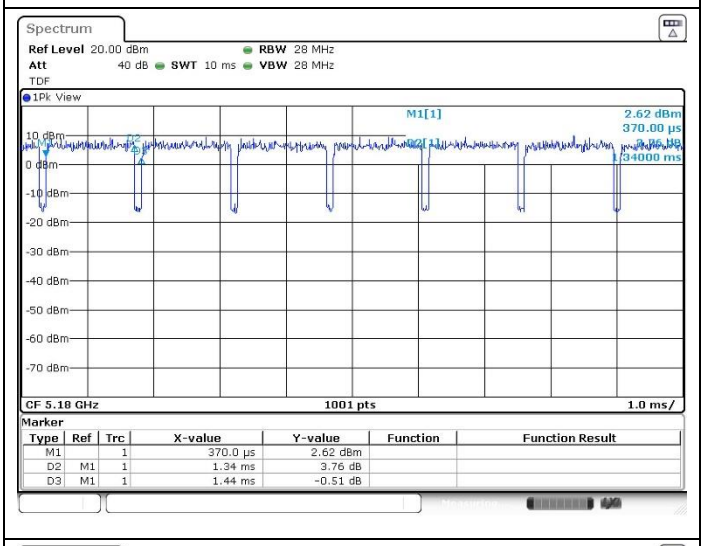


MIMO

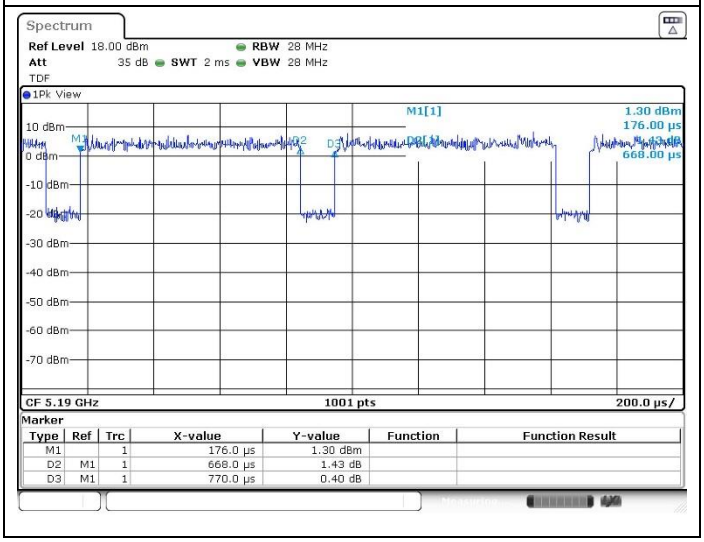
802.11a



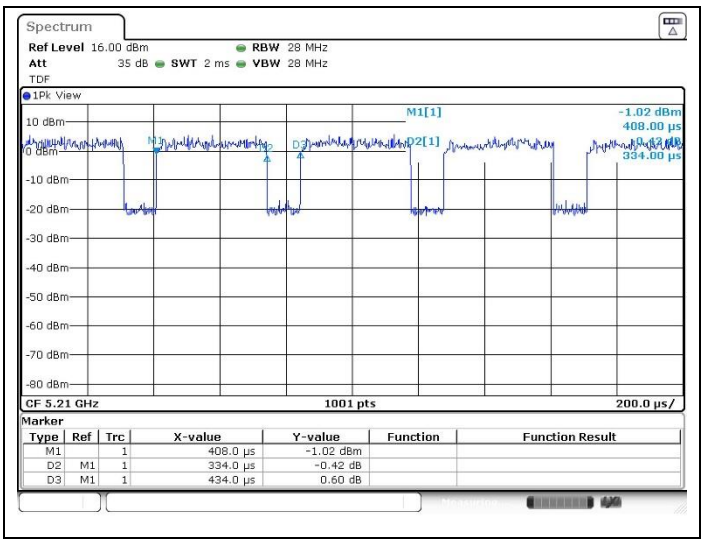
802.11ac_VHT20



802.11ac_VHT40



802.11ac_VHT80



1.18. Test information of Cable Loss and Antenna Gain

Test Item	Frequency Range (㎒)	Cable Loss (dB)	Antenna Gain of EUT (dB i)	Final Antenna Gain (dB i)
Bluetooth	2 400 ~ 2 483.5	-1.94	3.00	1.06
WLAN 2.4G	2 400 ~ 2 483.5	-1.94	3.00	1.06
WLAN 5G (Ant. 1)	5 150 ~ 5 250	-2.08	5.00	2.92
WLAN 5G (Ant. 1)	5 725 ~ 5 850	-2.08	5.00	2.92
WLAN 5G (Ant. 2)	5 150 ~ 5 250	-2.08	5.00	2.92
WLAN 5G (Ant. 2)	5 725 ~ 5 850	-2.08	5.00	2.92
WLAN 5G (Ant. 1+ Ant. 2)	5 150 ~ 5 250	-2.08	8.01	5.93
WLAN 5G (Ant. 1+ Ant. 2)	5 725 ~ 5 850	-2.08	8.01	5.93
GSM 850	824 ~ 849	-1.12	-0.69	-1.81
GSM 1900	1 850 ~ 1 910	-1.12	0.85	-0.27
WCDMA 2	1 850 ~ 1 910	-1.12	0.85	-0.27
WCDMA 4	1 710 ~ 1 755	-1.12	0.76	-0.36
WCDMA 5	824 ~ 849	-1.12	-0.69	-1.81
LTE 2	1 850 ~ 1 910	-1.12	0.85	-0.27
LTE 4	1 710 ~ 1 755	-1.12	0.76	-0.36
LTE 5	824 ~ 849	-1.12	-0.69	-1.81
LTE 7	2 500 ~ 2 570	-1.94	0.99	-0.95
LTE 12	699 ~ 716	-0.76	-1.38	-2.14
LTE 26	814 ~ 849	-1.12	-0.69	-1.81

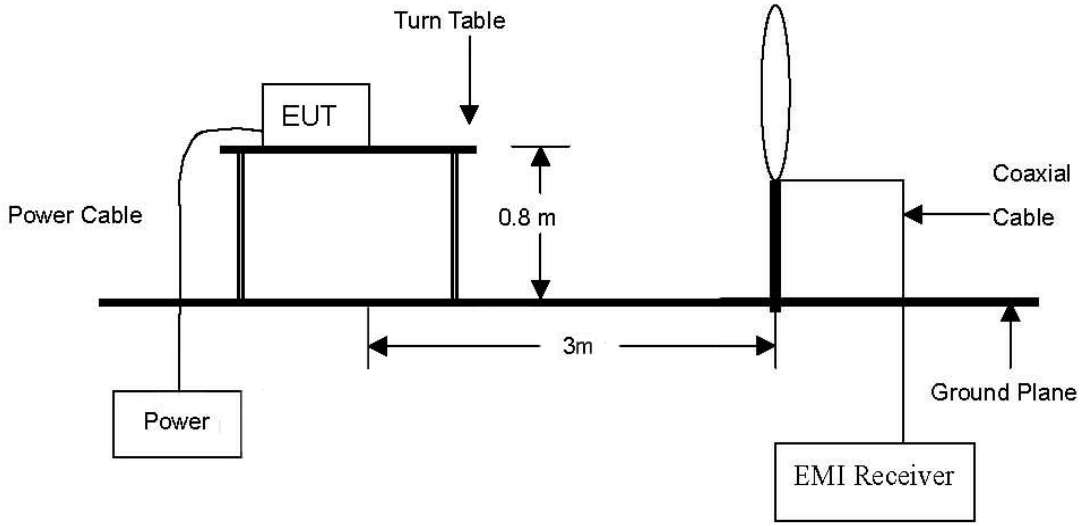
Note;
-Final Antenna Gain (㏈ i) = Cable Loss (㏈) + Antenna Gain of EUT (㏈ i)

2. Transmitter Radiated Spurious Emissions

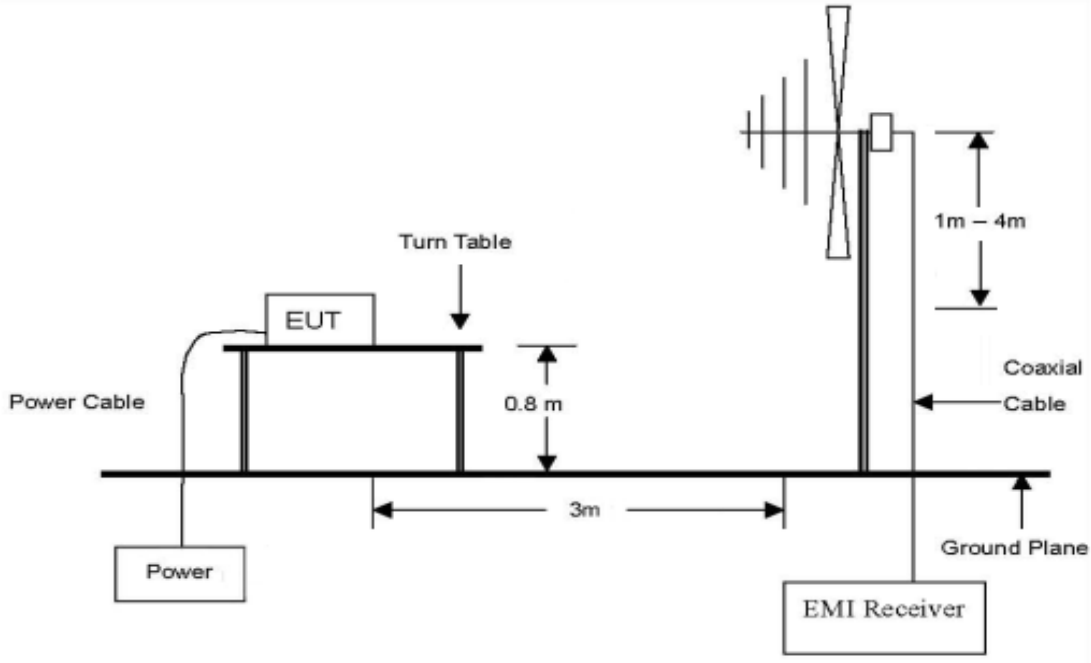
2.1. Test Setup

2.1.1. Transmitter radiated spurious emissions

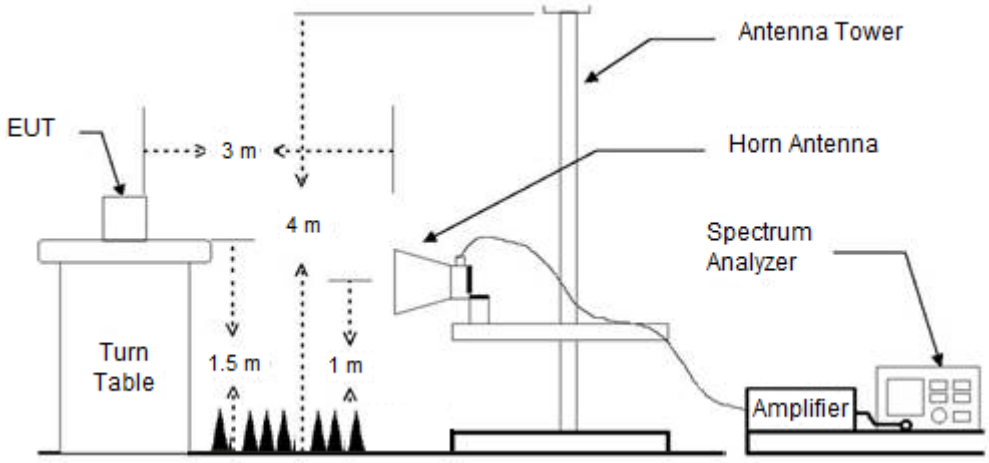
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ emissions.



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. For measurements below 1 ㎓ resolution bandwidth is set to 100 ㎑ for peak detection measurements or 120 ㎑ for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.
6. For measurements Above 1 ㎓ resolution bandwidth is set to 1 ㎒, the video bandwidth is set to 3 ㎒ for peak measurements and as applicable for average measurements.

- 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.

- The test orthogonal plan of EUT was investigated with three axis described in the test setup photo.
The Z-axis was worst-case, all radiated testing of EUT was performed with **Z-axis**.

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.

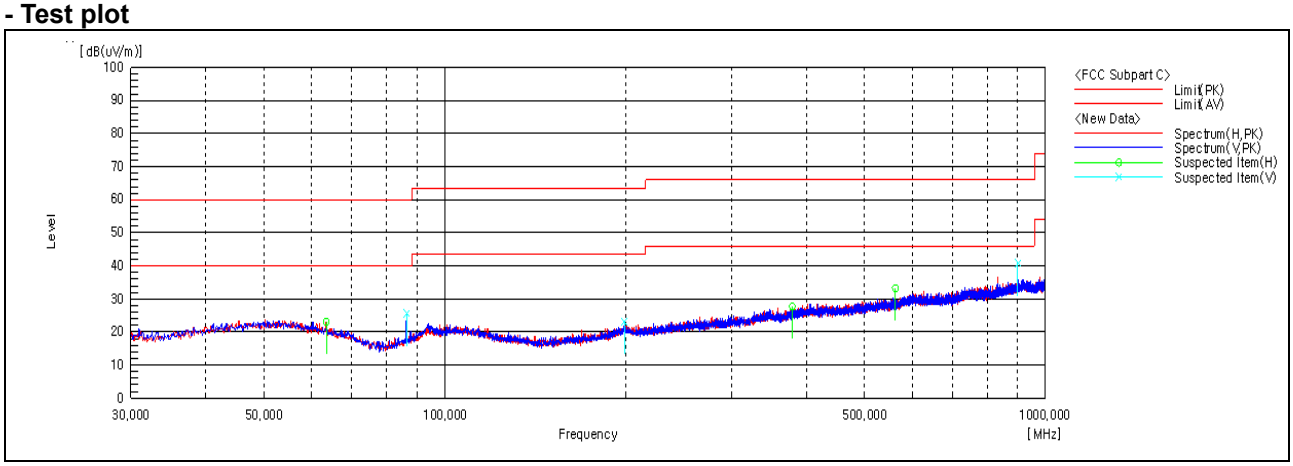
- Ant.1 + Ant.2

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)
63.47	28.70	Peak	H	21.66	-27.25	23.11	40.00	16.89
86.38	34.20	Peak	V	18.51	-27.21	25.50	40.00	14.50
379.08	28.00	Peak	H	24.88	-25.23	27.65	46.00	18.35
562.53	31.30	Peak	H	27.90	-26.01	33.19	46.00	12.81
900.09	34.20	Peak	V	32.10	-25.37	**40.93**	46.00	5.07

Remark;

1. Spurious emissions for all channels and modes were investigated and almost the same below 1 ㎓.
2. Reported spurious emissions are in **11ac_VHT80 (Band 3) / MCS0 / Middle 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 plot



2.4.2. Radiated Spurious Emission above 1 000 ㎒

- MIMO

OFDM: 802.11a (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	39.57	Peak	V	31.90	-35.69	-	35.78	74.00	38.22
*4 500.00	32.04	Average	V	31.90	-35.69	0.32	28.57	54.00	25.43
*5 146.48	44.57	Peak	V	33.29	-35.49	-	42.37	74.00	31.63
*5 147.57	34.20	Average	V	33.30	-35.49	0.32	32.33	54.00	21.67
*5 150.00	41.37	Peak	V	33.30	-35.49	-	39.18	74.00	34.82
*5 150.00	34.36	Average	V	33.30	-35.49	0.32	**32.49**	54.00	21.51

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: 802.11a (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)
5 601.95	42.99	Peak	V	33.90	-33.80	43.09	68.23	25.14
5 696.97	48.08	Peak	V	33.90	-33.53	48.45	102.99	54.54
5 709.87	48.15	Peak	V	33.92	-33.56	48.51	107.99	59.48
5 724.00	51.03	Peak	V	33.95	-33.54	51.44	119.95	68.51

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 (5 785 ㎒)

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)
5 850.35	44.81	Peak	V	34.20	-33.61	45.40	121.43	76.03
5 867.58	44.36	Peak	V	34.24	-33.40	45.20	107.31	62.11
5 895.84	42.61	Peak	V	34.29	-33.08	43.82	89.81	45.99
5 973.28	45.52	Peak	V	34.55	-33.26	**46.81**	68.49	21.68

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_VHT20 (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	42.35	Peak	V	31.90	-35.69	-	38.56	74.00	35.44
*4 500.00	32.37	Average	V	31.90	-35.69	0.31	28.89	54.00	25.11
*5 142.53	44.69	Peak	V	33.29	-35.48	-	42.50	74.00	31.50
*5 145.20	33.84	Average	V	33.29	-35.48	0.31	31.96	54.00	22.04
*5 150.00	42.18	Peak	V	33.30	-35.49	-	39.99	74.00	34.01
*5 150.00	34.07	Average	V	33.30	-35.49	0.31	**32.19**	54.00	21.81

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: 802.11ac_VHT20 (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)
5 600.72	43.35	Peak	V	33.90	-33.81	43.44	68.23	24.79
5 693.08	47.89	Peak	V	33.90	-33.49	48.30	100.11	51.81
5 713.35	48.22	Peak	V	33.93	-33.54	48.61	108.97	60.36
5 723.80	51.15	Peak	V	33.95	-33.54	51.56	119.49	67.93

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. 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)
5 851.96	44.97	Peak	V	34.20	-33.60	45.57	117.76	72.19
5 857.01	45.05	Peak	V	34.21	-33.54	45.72	110.26	64.54
5 886.65	43.41	Peak	V	34.27	-33.19	44.49	96.61	52.12
5 974.43	44.01	Peak	V	34.55	-33.25	**45.31**	68.51	23.20

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_VHT40 (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	40.60	Peak	V	31.90	-35.69	-	36.81	74.00	37.19
*4 500.00	32.24	Average	V	31.90	-35.69	0.62	29.07	54.00	24.93
*5 148.06	43.41	Peak	V	33.30	-35.49	-	41.22	74.00	32.78
*5 148.36	33.82	Average	V	33.30	-35.49	0.62	**32.25**	54.00	21.75
*5 150.00	42.82	Peak	V	33.30	-35.49	-	40.63	74.00	33.37
*5 150.00	33.82	Average	V	33.30	-35.49	0.62	32.25	54.00	21.75

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: 802.11ac_VHT40 (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)
5 614.44	43.87	Peak	V	33.90	-33.65	44.12	68.23	24.11
5 697.99	47.01	Peak	V	33.90	-33.54	47.37	103.74	56.37
5 714.58	52.61	Peak	V	33.93	-33.54	53.00	109.31	56.31
5 724.00	51.94	Peak	V	33.95	-33.54	52.35	119.95	67.60

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. 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)
5 853.34	43.37	Peak	V	34.21	-33.58	44.00	114.61	70.61
5 870.34	45.13	Peak	V	34.24	-33.37	46.00	106.53	60.53
5 877.23	42.95	Peak	V	34.25	-33.29	43.91	103.58	59.67
5 973.51	43.62	Peak	V	34.55	-33.26	**44.91**	68.50	23.59

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 (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	42.52	Peak	V	31.90	-35.69	-	38.73	74.00	35.27
*4 500.00	33.03	Average	V	31.90	-35.69	1.14	30.38	54.00	23.62
*5 119.13	47.65	Peak	V	33.24	-35.43	-	45.46	74.00	28.54
*5 145.99	34.55	Average	V	33.29	-35.48	1.14	**33.50**	54.00	20.50
*5 150.00	44.74	Peak	V	33.30	-35.49	-	42.55	74.00	31.45
*5 150.00	34.19	Average	V	33.30	-35.49	1.14	33.14	54.00	20.86

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 (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)
5 615.87	46.02	Peak	V	33.90	-33.63	46.29	68.23	21.94
5 696.77	48.24	Peak	V	33.90	-33.53	48.61	102.84	54.23
5 710.90	48.22	Peak	V	33.92	-33.56	48.58	108.28	59.70
5 720.93	46.42	Peak	V	33.94	-33.54	46.82	112.95	66.13
5 850.00	43.35	Peak	V	34.20	-33.62	43.93	122.23	78.30
5 862.53	43.47	Peak	V	34.23	-33.46	44.24	108.72	64.48
5 893.09	44.10	Peak	V	34.29	-33.11	45.28	91.84	46.56
5 973.74	44.56	Peak	V	34.55	-33.26	45.85	68.50	22.65

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	-	-	-	-	-	-	-	-

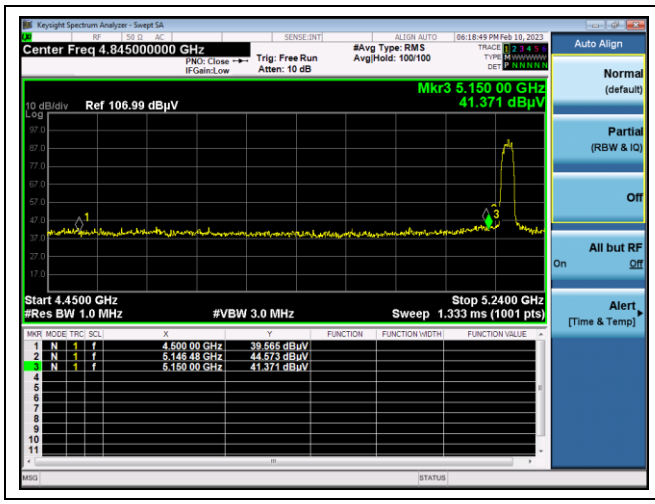
Remark;

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 ㏈㎶/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 ㏈.
7. The maximized peak measured value complies with the average limit, to perform an average measurement is unnecessary.

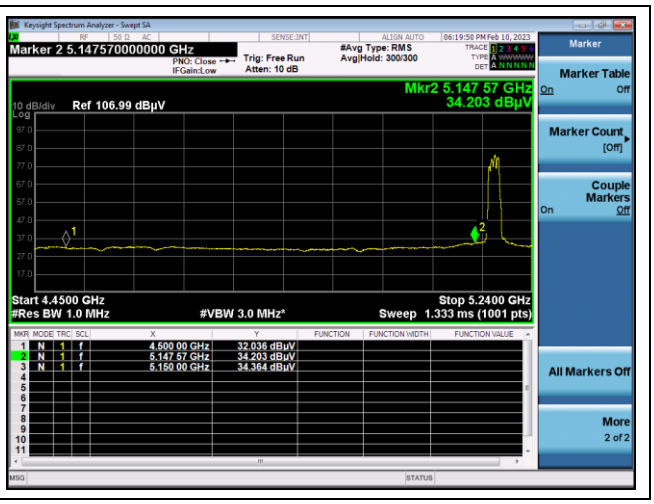
- Test plots

802.11a_ Ant.1+Ant.2

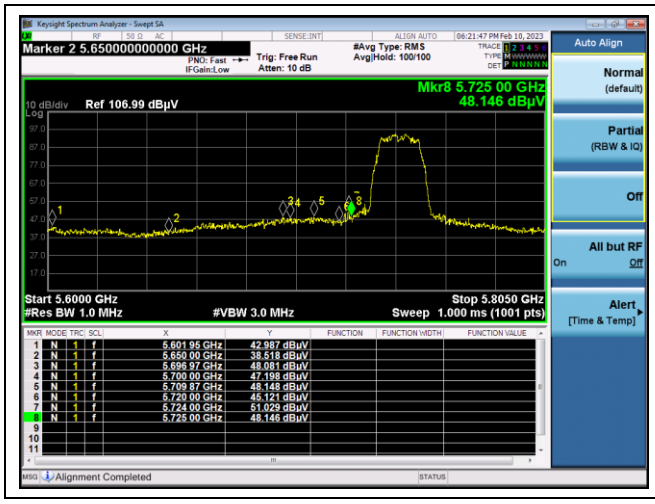
Low channel Band edge (Peak) - Band 1



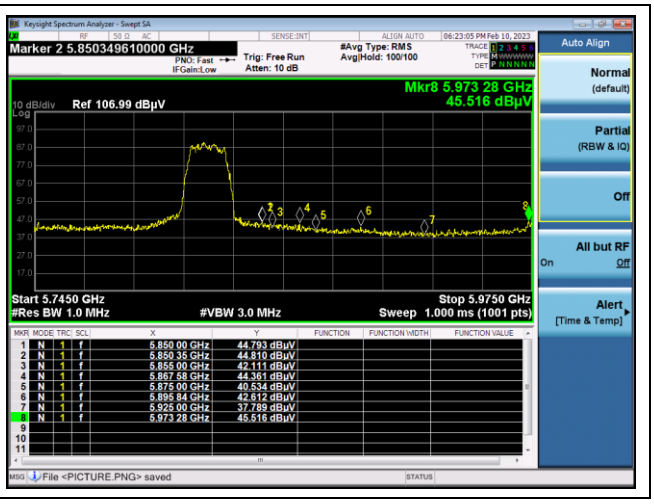
Low channel Band edge (Average) - Band 1



Low channel Band edge (Peak) - Band 3

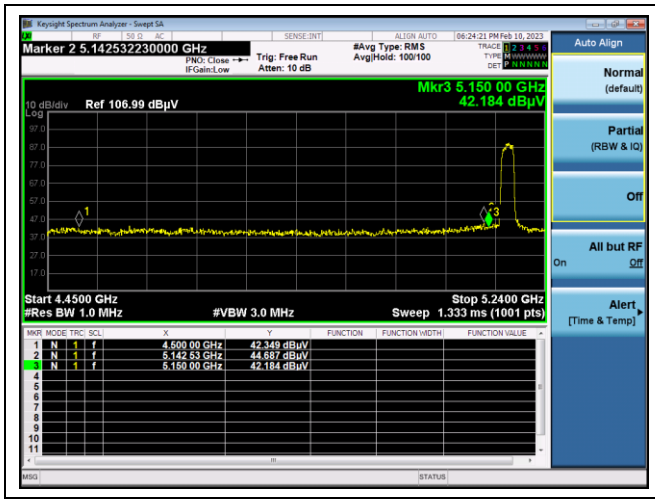


High channel Band edge (Peak) - Band 3

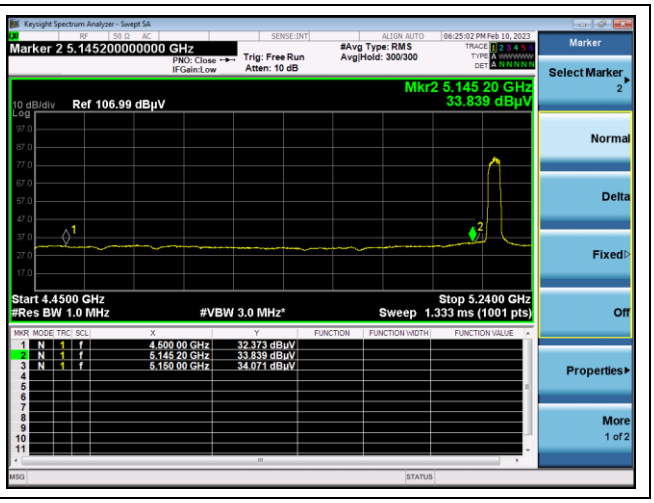


802.11ac_VHT20_ Ant.1+Ant.2

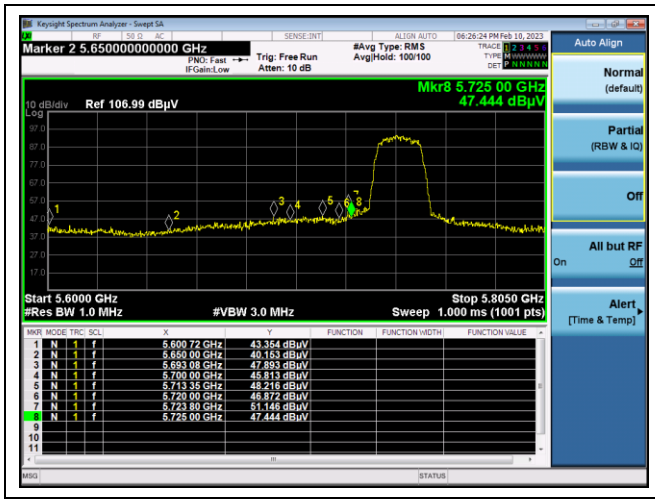
Low channel Band edge (Peak) - Band 1



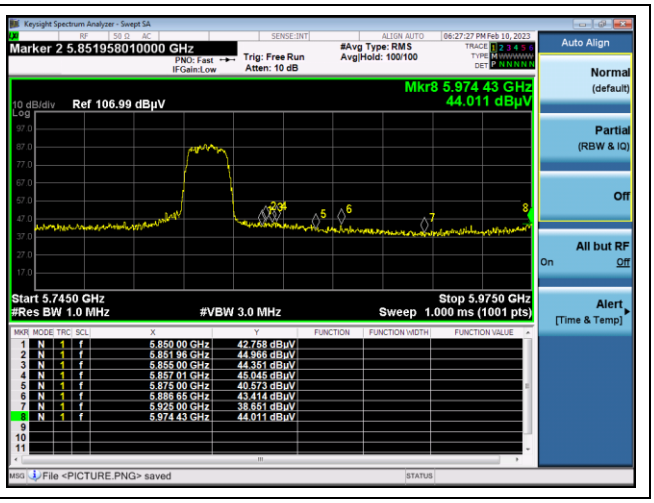
Low channel Band edge (Average) - Band 1



Low channel Band edge (Peak) - Band 3

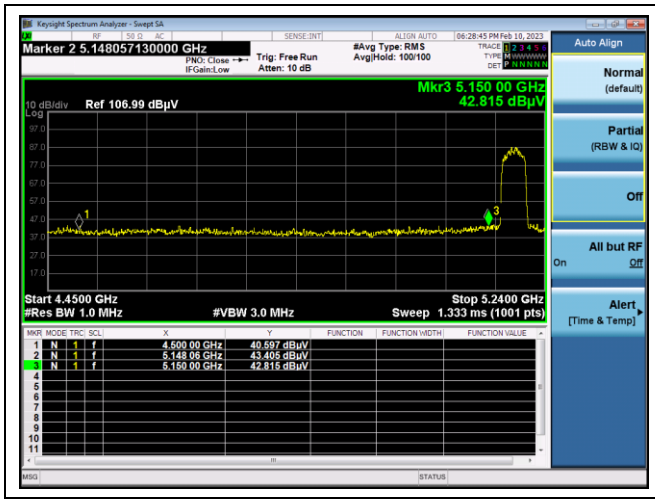


High channel Band edge (Peak) - Band 3

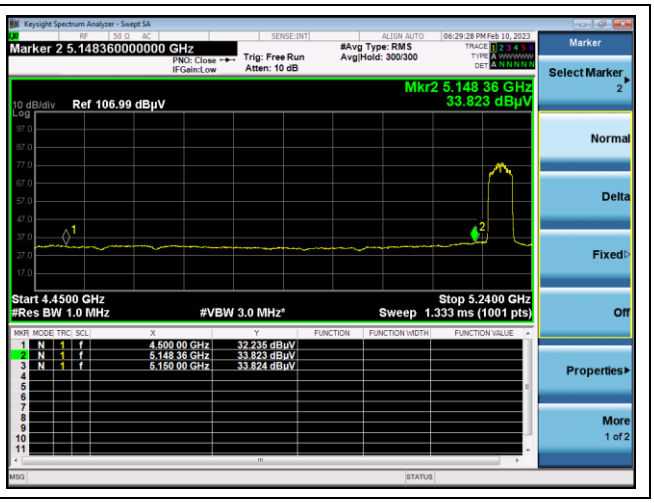


802.11ac_VHT40_ Ant.1+Ant.2

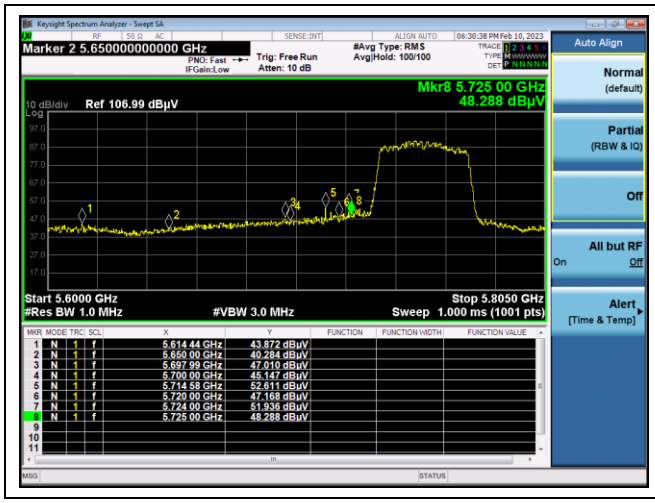
Low channel Band edge (Peak) - Band 1



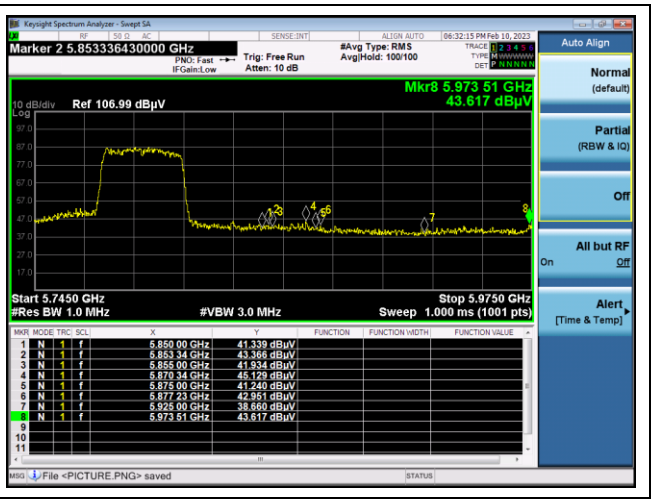
Low channel Band edge (Average) - Band 1



Low channel Band edge (Peak) - Band 3

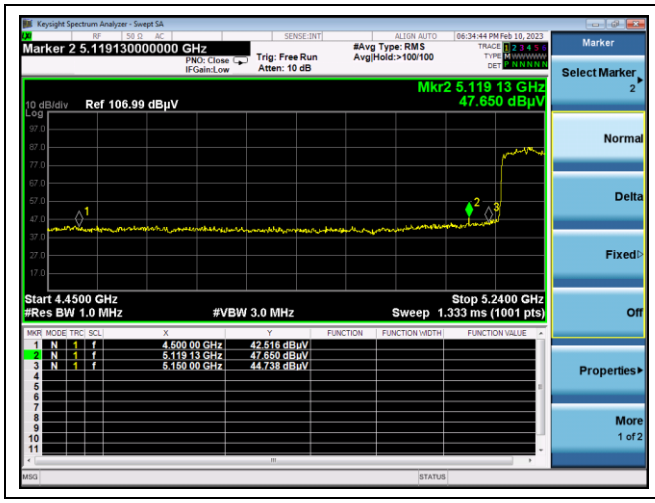


High channel Band edge (Peak) - Band 3

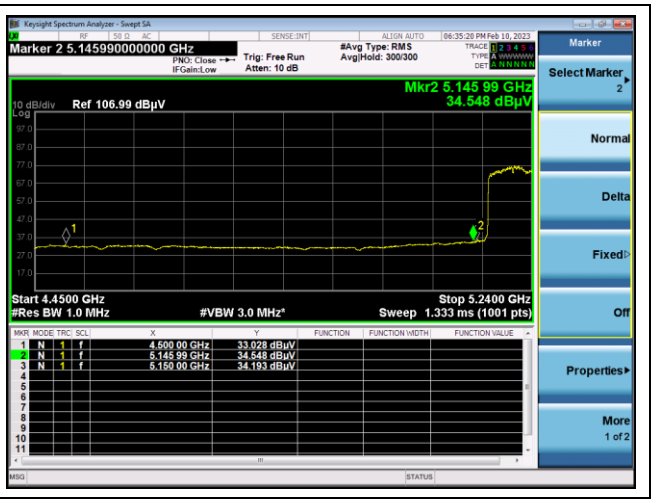


802.11ac_VHT80_ Ant.1+Ant.2

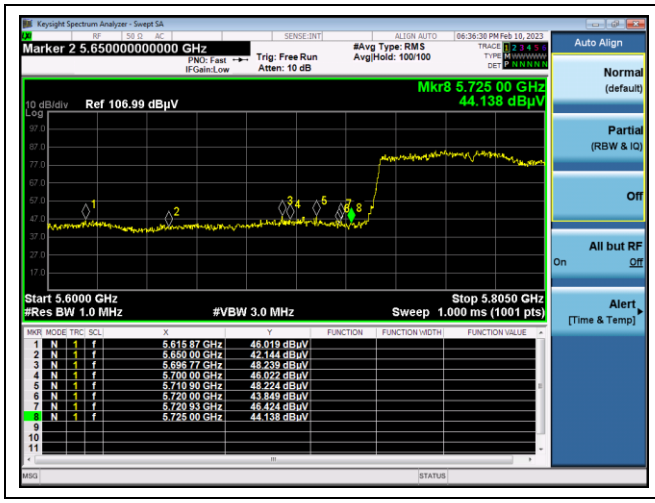
Middle channel Band edge (Peak) - Band 1



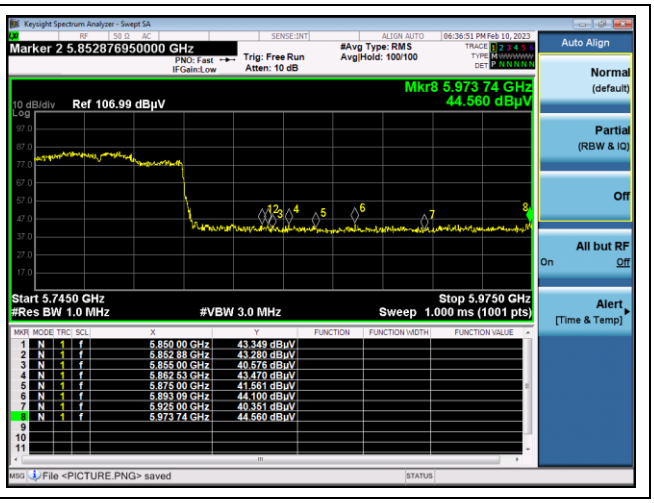
Middle channel Band edge (Average) - Band 1



Middle channel Band edge (Peak) - Band 3

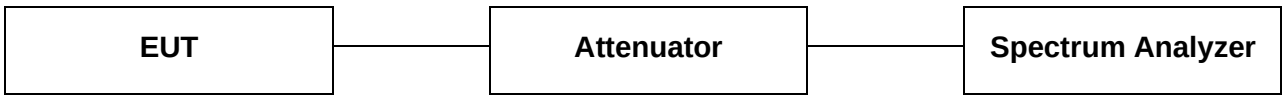


Middle channel Band edge (Peak) - Band 3



3. 26 dB Bandwidth & 99 % Bandwidth

3.1. Test Setup



3.2. Limit

None; for reporting purpose only.

3.3. Test Procedure

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 %.