TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR22-SRF0186-A Page (1) of (30)	eurofins | KCTL

1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2022-09-20

2. Use of Report : Certification

3. Name of Product / Model : Notebook PC / NP340XNA

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam

5. FCC ID : A3LNP340XNA

6. IC Certificate No. : 649E-NP340XNA

7. Date of Test : 2022-10-18 to 2022-11-01

8. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

9. Test method used : FCC Part 15 Subpart E, 15.407
RSS-247 Issue 2 February 2017
RSS-Gen Issue 5 February 2021

10. Test Result : Refer to the test result in the test report

	Tested by	Technical Manager
Affirmation	Name : Kwonse Kim (Signature)	Name : Seungyong Kim (Signature)

2022-11-21

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2022-11-08	Originally issued	-
2022-11-21	Added note of IC ID	11 ~ 12

Note. The report No. KR22-SRF0186 is superseded by the report No. KR22-SRF0186-A.

General remarks for test reports

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

(may be required by the product standard or client)

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

Procedure number, issue date and title:

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

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

CONTENTS

1. General information

Client	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory	:	SAMSUNG ELECTRONICS VIETNAM CO.,LTD.(SEV)
Address	:	Khu Cong nghiep Ten Phong 1, Yen Trung, Yen Phong, Bac Ning, Vietnam
Laboratory	:	KCTL Inc.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056 CAB Identifier: KR0040 ISED Number: 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Notebook PC			
Model	:	NP340XNA			
Modulation technique		WIFI(802.11a/b/g/n/ac/ax)	:	OFDM, OFDMA	
Number of channels		UNII-1	:	4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒), 1 ch (160 ㎒)	
		UNII-2A	:	4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)	
		UNII-2C	:	12 ch (20 ㎒), 6 ch (40 ㎒), 3 ch (80 ㎒), 1 ch (160 ㎒)	
		UNII-3	:	5 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)	
Power source	:	DC 7.72 V			
Antenna specification		Antenna 1	:	FPCB Antenna	
		Antenna 2	:	FPCB Antenna	
Antenna gain	:		Antenna 1		Antenna 2
		UNII-1	: -7.46 dBi	UNII-1	: -6.79 dBi
		UNII-2A	: -7.52 dBi	UNII-2A	: -7.11 dBi
		UNII-2C	: -7.16 dBi	UNII-2C	: -6.99 dBi
		UNII-3	: -7.16 dBi	UNII-3	: -6.89 dBi
Frequency range		UNII-1	: 5 180 ㎒ ~ 5 240 ㎒	(802.11a/n/ac/ax_HT20/VHT20/HE20)	
		UNII-1	: 5 190 ㎒ ~ 5 230 ㎒	(802.11n/ac/ax_HT40/VHT40/HE40)	
		UNII-1	: 5 210 ㎒	(802.11ac/ax_VHT80/HE80)	
		UNII-1	: 5 250 ㎒	(802.11ac/ax_VHT160/HE160)	
		UNII-2A	: 5 260 ㎒ ~ 5 320 ㎒	(802.11a/n/ac/ax_HT20/VHT20/HE20)	
		UNII-2A	: 5 270 ㎒ ~ 5 310 ㎒	(802.11n/ac/ax_HT40/VHT40/HE40)	
		UNII-2A	: 5 290 ㎒	(802.11ac/ax_VHT80/HE80)	
		UNII-2C	: 5 500 ㎒ ~ 5 720 ㎒	(802.11a/n/ac/ax_HT20/VHT20/HE20)	
		UNII-2C	: 5 510 ㎒ ~ 5 710 ㎒	(802.11n/ac/ax_HT40/VHT40/HE40)	
		UNII-2C	: 5 530 ㎒ ~ 5 690 ㎒	(802.11ac/ax_VHT80/HE80)	
		UNII-2C	: 5 570 ㎒	(802.11ac/ax_VHT160/HE160)	
		UNII-3	: 5 745 ㎒ ~ 5 825 ㎒	(802.11a/n/ac/ax_HT20/VHT20/HE20)	
		UNII-3	: 5 755 ㎒ ~ 5 795 ㎒	(802.11n/ac/ax_HT40/VHT40/HE40)	
		UNII-3	: 5 775 ㎒	(802.11ac/ax_VHT80/HE80)	
Software version	:	NP340XNA.001			
Hardware version	:	REV0.3			
Test device serial No.	:	Conducted	:	KE86930T900162Y	
		Radiated	:	KE86930T900163N	
Operation temperature	:	-20 ℃ ~ 60 ℃			

2.1. Frequency/channel operations

This device contains the following capabilities:
WLAN (11a/b/g/n/ac/ax), Bluetooth (BDR/EDR/BLE)

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
36	5 180	52	5 260	100	5 500	149	5 745
40	5 200	56	5 280	120	5 600	157	5 785
48	5 240	64	5 320	140	5 700	165	5 825
				144	5 720		

Table 2.1-1. 802.11a/n/ac HT20/VHT20 mode

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
38	5 190	54	5 270	102	5 510	151	5 755
46	5 230	62	5 310	118	5 590	159	5 795
				134	5 670		
				142	5 710		

Table 2.1-2. 802.11n/ac HT40/VHT40 mode

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
42	5 210	58	5 290	106	5 530	155	5 775
				122	5 610		
				138	5 690		

Table 2.1-3. 802.11ac VHT80 mode

UNII-1,2A		UNII-2C	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
50	5 250	114	5 570

Table 2.1-4. 802.11ac VHT160 mode

2.2. Duty Cycle Factor

SISO

Test mode	Period (ms)	T_{on} time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.555	1.457	0.937 0	93.70	0.28

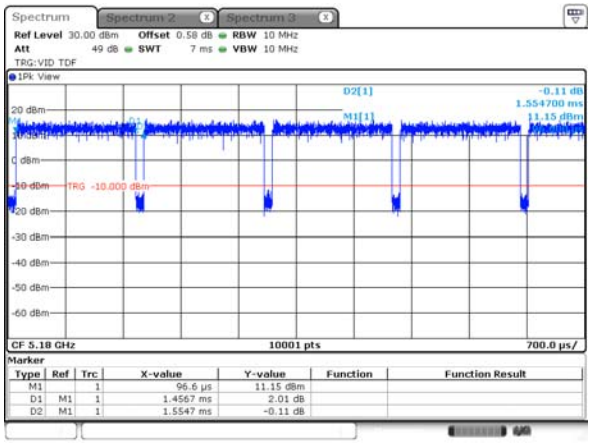
MIMO

Test mode	Period (ms)	T_{on} time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.555	1.456	0.936 3	93.63	0.29
802.11n_HT20	0.746	0.648	0.868 6	86.86	0.61
802.11n_HT40	0.429	0.331	0.771 6	77.16	1.13
802.11ac_VHT20	0.750	0.652	0.869 3	86.93	0.61
802.11ac_VHT40	0.433	0.336	0.776 0	77.60	1.10
802.11ac_VHT80	0.276	0.180	0.652 2	65.22	1.86
802.11ac_VHT160	0.272	0.176	0.647 1	64.71	1.89

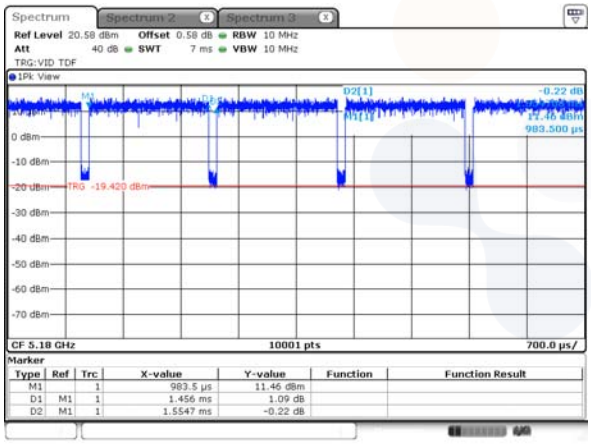
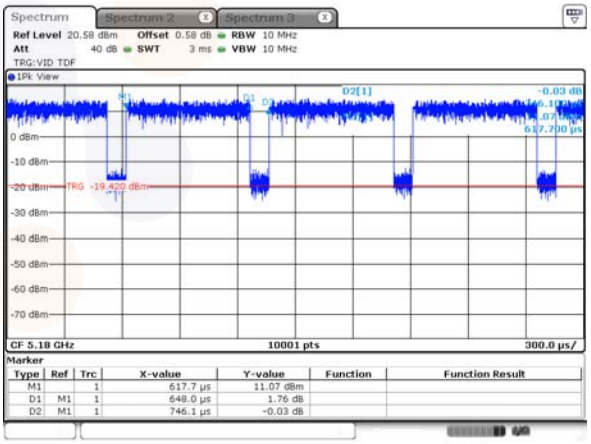
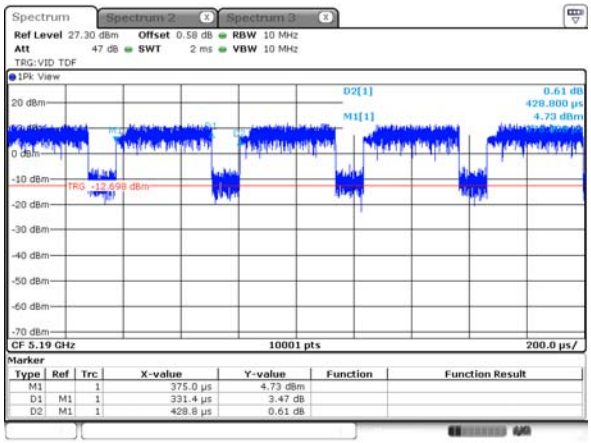
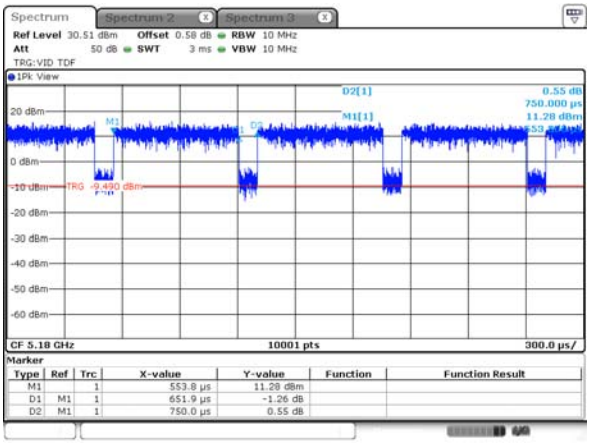
Notes.

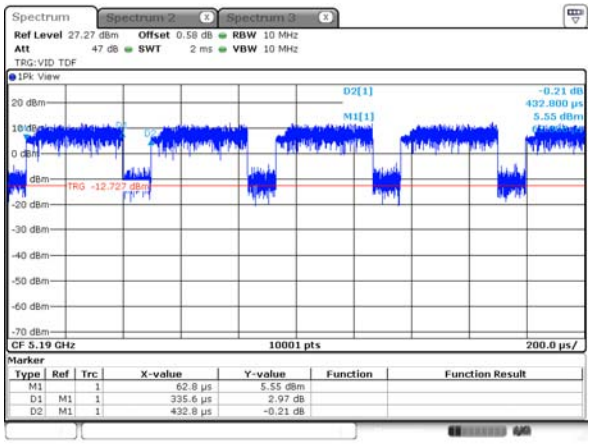
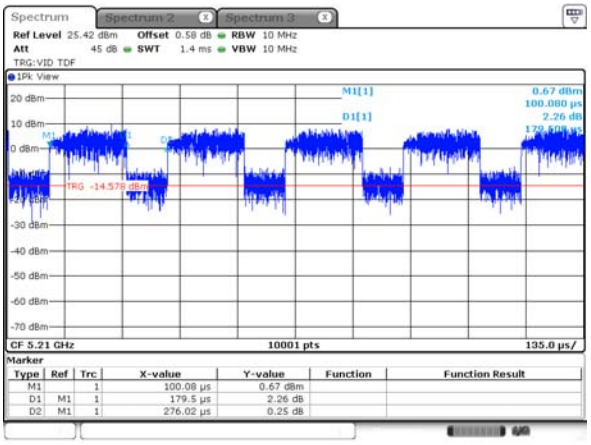
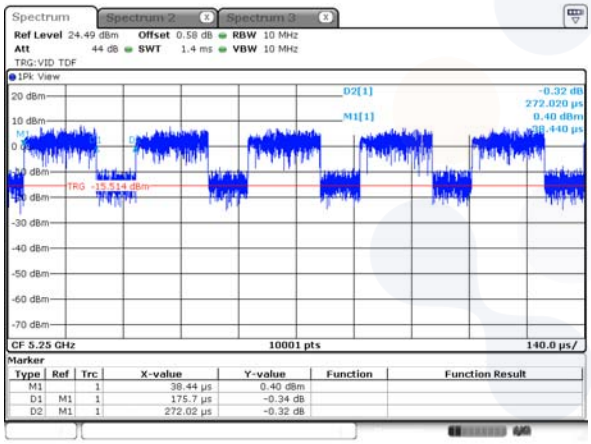
1. Duty cycle (Linear) = T_{on} time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)
3. DCF is not compensated to average result if duty cycle is more than 98%

SISO

802.11a	
	Blank

MIMO

802.11a	802.11n_HT20
	
802.11n_HT40	**802.11ac_VHT20**
	

802.11ac_VHT40	802.11ac_VHT80
	
802.11ac_VHT160	
	Blank

3. Antenna requirement

Requirement of FCC part section 15.203

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

Requirement of RSS-Gen Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

- The transmitter has permanently attached FPCB Antenna (Internal antenna) on board.
- The E.U.T Complies with the requirement of §15.203, §15.247, §15.407.

3.1 Antenna information

Mode	SISO		CDD	MIMO
	ANT 1	ANT 2	ANT 1 + 2	ANT 1 + 2
802.11a	√	X	√	√
802.11n HT20	X	X	√	√
802.11n HT40	X	X	√	√
802.11ac VHT20	X	X	√	√
802.11ac VHT40	X	X	√	√
802.11ac VHT80	X	X	√	√
802.11ac VHT160	X	X	√	√

√ = Support, ✕ = Not support

3.2 Directional Gain Calculations

According to clause F), 2), d), (i) of KDB 662911 D01 Multiple Transmitter Output, Directional gain may be calculated by using the formulas as below.

Directional Antenna Gain

Band	ANT 1 Gain (dBi)	ANT 2 Gain (dBi)	Power Directional Gain (dBi)
UNII 1	-7.46	-6.79	-4.11
UNII 2A	-7.52	-7.11	-4.30
UNII 2C	-7.16	-6.99	-4.06
UNII 3	-7.16	-6.89	-4.01

Note.

Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N dBi

Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

Sample calculation

In case of UNII 1, directional gain = $10 \log[(10^{-7.46/20} + 10^{-6.79/20})^2 / 2] = -4.11$ dBi

4. Introduction

This report referenced from the FCC ID : A3LNP345XNA
Based on their similarity, the FCC Part 15E and RSS-247 (equipment class: NII) reuse the original model's result and do spot-check, following the FCC KDB 484596 D01 v01.
And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

4.1 Difference

The FCC ID: A3LNP340XNA and IC ID: 649E-NP340XNA share the same enclosure and circuit board as FCC ID: A3LNP345XNA. The WIFI/BT/BLE antenna and surrounding circuitry and layout are identical between these two units.
As for all bands, they have been verified and the parent model test results under FCC ID : A3LNP345XNA shall remain representative of FCC ID : A3LNP340XNA and IC ID: 649E-NP340XNA.

Note. The difference between the parent and variant is that the RF circuit for WCDMA/LTE/NR bands in the parent model NP345XNA is removed from the variant model NP340XNA.

4.2 Spot check verification data (Band-edge & Spurious emission)

Test band	Test item	Test mode	CH	Measured frequency (㎒)	NP345XNA (dBμV)		NP340XNA (dBμV)		Deviation (dB)	
					Avg	Peak	Avg	Peak	Avg	Peak
UNII-1	Band edge	802.11ac VHT160 MIMO	50	4 500 ~ 5 150	50.05	58.97	49.93	59.35	-0.12	0.38
	RSE			15 684.17	43.15	51.30	43.99	51.74	0.84	0.44
UNII-2A	Band edge	802.11ac VHT80 MIMO	58	5 350 ~ 5 460	49.10	54.51	49.76	54.54	0.66	0.03
	RSE	802.11n HT40 MIMO	54	10 593.64	-	48.93	-	47.89	-	-1.04
UNII-2C	Band edge	802.11ac VHT160 MIMO	114	5 350 ~ 5 460	50.00	57.60	49.99	57.66	-0.01	0.06
	RSE	802.11a ANT 1	100	16 599.16	-	54.29	-	54.70	-	0.41
UNII-3	Band edge	802.11a ANT 1	149	5 600 ~ 5 725	-	52.18	-	53.27	-	1.09
	RSE	802.11n HT40 MIMO	151	17 448.00	-	53.44	-	52.62	-	-0.82

Notes:
1. FCC ID: A3LNP340XNA and IC ID: 649E-NP340XNA have been verified the performance as for WIFI identical with the FCC ID: A3LNP345XNA.
2. Comparison of two models, the variant model emissions are less than 3 dB higher than the parent model, and all test results are under FCC/ISED technical limits.
3. The test procedure(s) in this report were performed in accordance as following.
   - KDB 484596 D01 v01

4.3 Reference Detail

Reference application that contains the reused reference data in the individual test reports. .

Equipment Class	Reference FCC ID	Application Type	Reference Test report Number	Exhibit Type	Variant Test Report Number	Data Re-used
DTS	A3LNP345XNA	Original	KR22-SRF0169 (802.11b/g/n/ac)	Test report	KR22-SRF0185	All
			KR22-SRF0177 (802.11ax)	Test report	KR22-SRF0189	All
			KR22-SRF0168 (Bluetooth LE)	Test report	KR22-SRF0184	All
DSS	A3LNP345XNA	Original	KR22-SRF0167 (Bluetooth)	Test report	KR22-SRF0183	All
NII	A3LNP345XNA	Original	KR22-SRF0170 (802.11a/n/ac)	Test report	KR22-SRF0186	Partial[1)]
			KR22-SRF0178 (802.11ax)	Test report	KR22-SRF0190	Partial[1)]
6XD	A3LNP345XNA	Original	KR22-SRF0176 (802.11a/ax)	Test report	KR22-SRF0188	Partial[2)]

Notes:

1. This device does not support the UNII-4 band (5 850 ㎒ ~ 5 895 ㎒). So All data were re-used except for the UNII-4 band.
2. Contention based protocol test item was investigated.

5. Summary of tests

FCC Part section(s)	IC Rule Reference	Parameter	Test Condition	Test results
15.407(b), 15.205(a), 15.209(a)	RSS-Gen Issue 5, 8.9, 8.10 RSS-247 Issue 2, 6.2	Spurious emission	Radiated	Pass
		Band-edge, restricted band		Pass

Notes:

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. According to exploratory test no any obvious emission were detected from 9 ㎑ to 30 ㎒. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
3. The orthogonal plan is configured as x-axis because the device operates as desktop device in standard laptop mode. Therefore, all final radiated testing was performed with the EUT in X orientation.
4. The maximum production power and tolerance are not impacted by the change. So only spot-check test was done against the worst case from the original model.
5. All the radiated tests have been performed several case. (Stand-alone, with accessories (TA etc.)) Worst case: stand-alone
6. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 662911 D01 v02r01
   - KDB 789033 D02 v02r01
   - KDB 291074 D02 v01
7. Based on the baseline scan, the worst-case data rates were:
   802.11a mode: 6Mbps
   802.11n HT20 mode: MCS8
   802.11n HT40 mode: MCS8
   802.11ac VHT20 mode: MCS0
   802.11ac VHT40 mode: MCS0
   802.11ac VHT80 mode: MCS0
   802.11ac VHT160 mode: MCS0

6. Measurement uncertainty

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

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

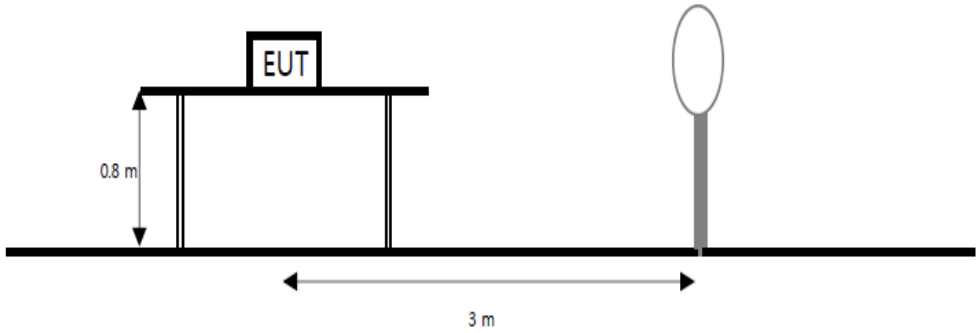
Parameter	Expanded uncertainty (±)	
Radiated spurious emissions	Below 30 ㎒:	2.4 ㏈
	30 ㎒ ~ 1 000 ㎒	2.3 ㏈
	1 000 ㎒ ~ 18 000 ㎒	5.6 ㏈
	Above 18 000 ㎒	5.7 ㏈

7. Test results

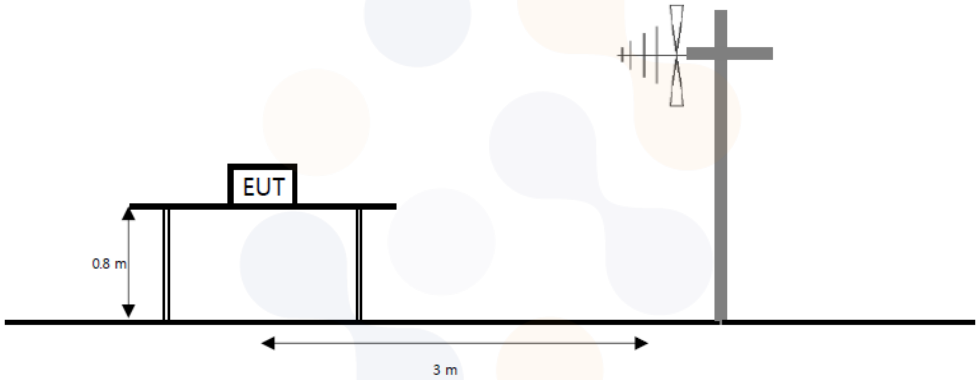
7.1. Spurious Emission, Band Edge and Restricted bands

Test setup

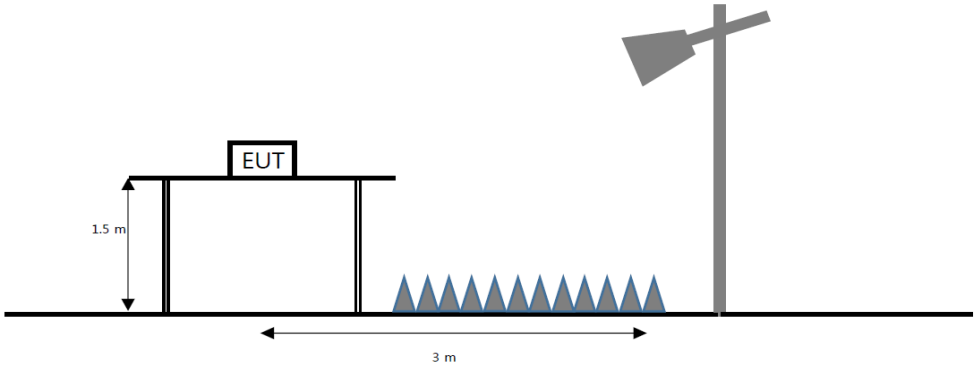
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions



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 from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ emissions, whichever is lower.



Limit

FCC

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

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

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 ㎒, 76–88 ㎒, 174–216 ㎒ or 470–806 ㎒. However, operation within these frequency bands is permitted under other sections of this part, e.g., Section15.231 and 15.241.

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

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

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

According to section 15.407(b), undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

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

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

IC

According to RSS-247(5.5), In any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general field strength limits specified in RSS-Gen is not required.

According to RSS-Gen(8.9), Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5- General field strength limits at frequencies above 30 ㎒

Frequency(㎒)	Field strength (㎶/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 6- General field strength limits at frequencies below 30 ㎒

Frequency	Magnetic field strength (H-Field) (㎂/m)	Measurement distance(m)
9 – 490 ㎑ 1)	6.37/F (F in ㎑)	300
490 – 1705 ㎑	63.7/F (F in ㎑)	30
1.705 - 30 ㎒	0.08	30

According to RSS-Gen(8.10), Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

(a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).
(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.
(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Table 7- Restricted frequency bands*

MHz
0.090 - 0.110
0.495 - 0.505
2.1735 - 2.1905
3.020 - 3.026
4.125 - 4.128
4.17725 - 4.17775
4.20725 - 4.20775
5.677 - 5.683
6.215 - 6.218
6.26775 - 6.26825
6.31175 - 6.31225
8.291 - 8.294
8.362 - 8.366
8.37625 - 8.38675
8.41425 - 8.41475
12.29 - 12.293
12.51975 - 12.52025
12.57675 - 12.57725
13.36 - 13.41
16.42 - 16.423
16.69475 - 16.69525
16.80425 - 16.80475
25.5 - 25.67
37.5 - 38.25
73 - 74.6
74.8 - 75.2
108 - 138

MHz
149.9 - 150.05
156.52475 - 156.52525
156.7 - 156.9
162.0125 - 167.17
167.72 - 173.2
240 - 285
322 - 335.4
399.9 - 410
608 - 614
960 - 1427
1435 - 1626.5
1645.5 - 1646.5
1660 - 1710
1718.8 - 1722.2
2200 - 2300
2310 - 2390
2483.5 - 2500
2655 - 2900
3260 - 3267
3332 - 3339
3345.8 - 3358
3500 - 4400
4500 - 5150
5350 - 5460
7250 - 7750
8025 - 8500
--

GHz
9.0 - 9.2
9.3 - 9.5
10.6 - 12.7
13.25 - 13.4
14.47 - 14.5
15.35 - 16.2
17.7 - 21.4
22.01 - 23.12
23.6 - 24.0
31.2 - 31.8
36.43 - 36.5
Above 38.6

* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

Test procedure

ANSI C63.10-2013 Section 12.7.7.2, 12.7.5, 12.7.6
KDB 789033 D02 v02r01 – Section G
KDB 291074 D02 v01 – 2.10.2

Test settings

Peak field strength measurements

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

Table. RBW as a function of frequency

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

Average field strength measurements

Trace averaging with continuous EUT transmission at full power

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

1. RBW = 1 ㎒ (unless otherwise specified).
2. VBW ≥ (3×RBW).
3. Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
4. Averaging type = power (i.e., rms):
   1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
   2) Some instruments require linear display mode to use linear voltage averaging. Log or ㏈ averaging shall not be used.
5. Sweep time = auto.
6. Perform a trace average of at least 100 traces.

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

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

1. The EUT shall be configured to operate at the maximum achievable duty cycle.
2. Measure the duty cycle D of the transmitter output signal as described in 11.6.
3. RBW = 1 ㎒ (unless otherwise specified).
4. VBW ≥ [3 × RBW].
5. Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this

condition cannot be satisfied, then the detector mode shall be set to peak.

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

Notes:

1. *f* <30 ㎒, extrapolation factor of 40 dB/decade of distance. $F_d = 40\log(D_m/D_s)$
   f ≥30 ㎒, extrapolation factor of 20 dB/decade of distance. $F_d = 20\log(D_m/D_s)$
   Where:
   F_d= Distance factor in dB
   D_m= Measurement distance in meters
   D_s= Specification distance in meters
2. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or F_d(dB)
3. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
4. Average test would be performed if the peak result were greater than the average limit.
5. 1) means restricted band.
6. Below 30 ㎒ frequency range, In order to search for the worst result, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported. when the emission level was higher than 20 dB of the limit, then the following statement shall be made: “No spurious emissions were detected within 20 dB of the limit.”
7. For above 1 ㎓ pre-scan to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 ㎒; the video bandwidth is set to 30 ㎑ for peak measurements.
8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X ㎑ resulted in a level of Y dB㎶/m, which is equivalent to Y - 51.5 = Z dB㎂/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

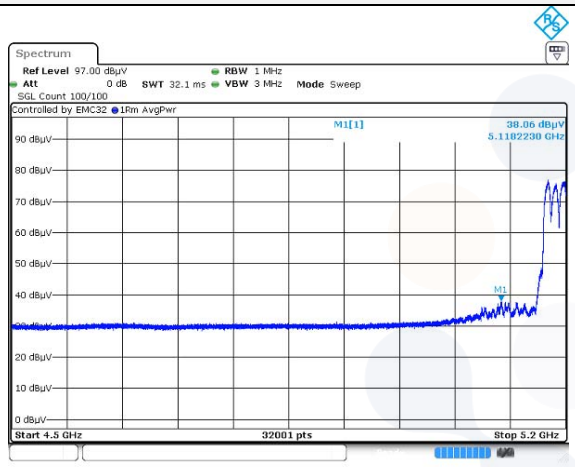
Spot-check Test results

MIMO 802.11ac VHT160 UNII-1 / Band-edge

Middle Channel (5 250 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 118.22[1)]	V	49.37	33.84	-23.86	-	59.35	74.00	14.65
Average Data								
5 118.22[1)]	V	38.06	33.84	-23.86	1.89	49.93	54.00	4.07

Average data



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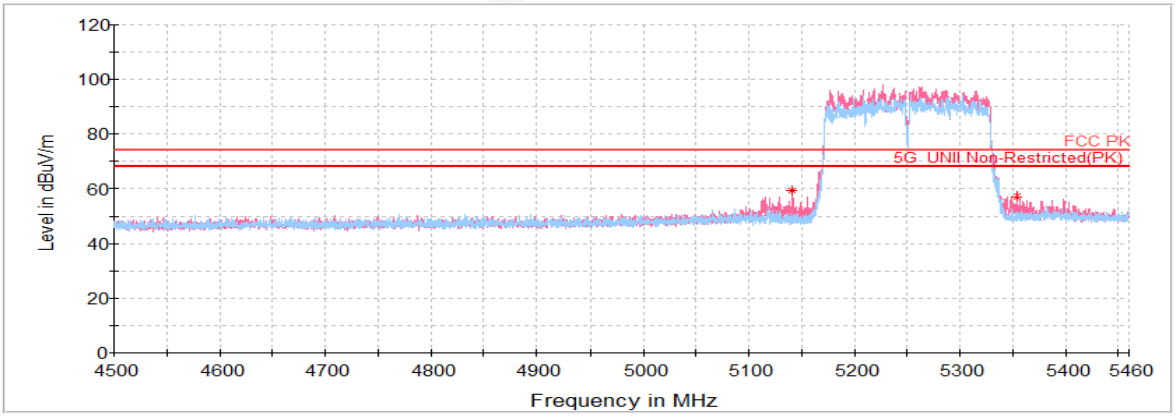
Horizontal/Vertical for Band-edge

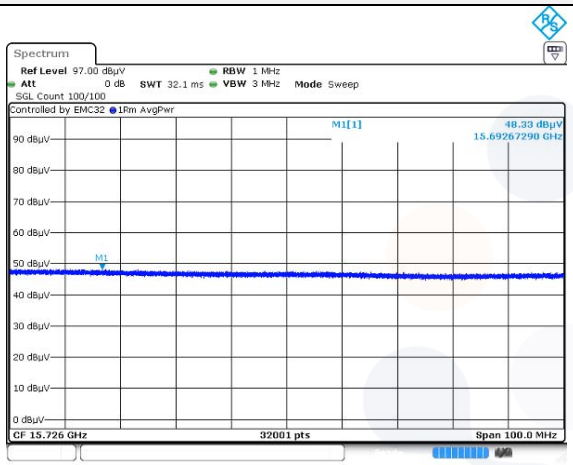


MIMO 802.11ac VHT160 UNII-1 / Harmonic

Middle Channel (5 250 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 549.08	V	58.61	37.23	-47.84	-	48.00	68.20	20.20
15 692.67[1)]	V	57.97	40.45	-46.68	-	51.74	74.00	22.26
Average Data								
15 692.67[1)]	V	48.33	40.45	-46.68	1.89	43.99	54.00	10.01

Average data



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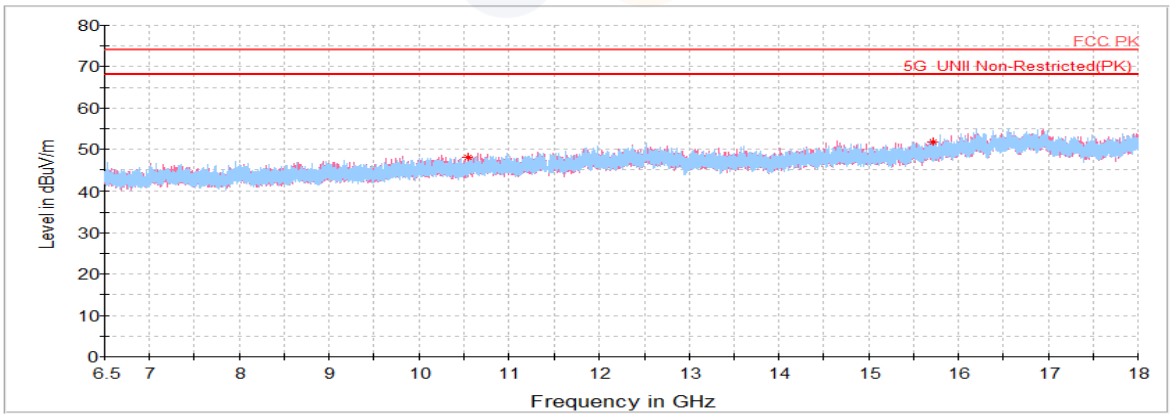
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

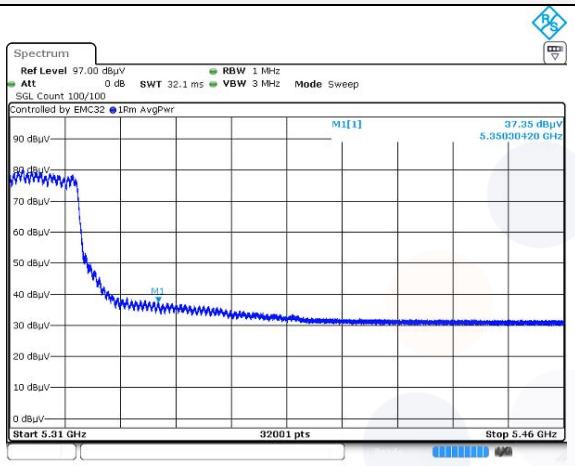


MIMO 802.11ac VHT80 UNII-2A / Band-edge

Middle Channel (5 290 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 350.30[1)]	V	43.99	34.12	-23.57	-	54.54	74.00	19.46
Average Data								
5 350.30[1)]	V	37.35	34.12	-23.57	1.86	49.76	54.00	4.24

Average data



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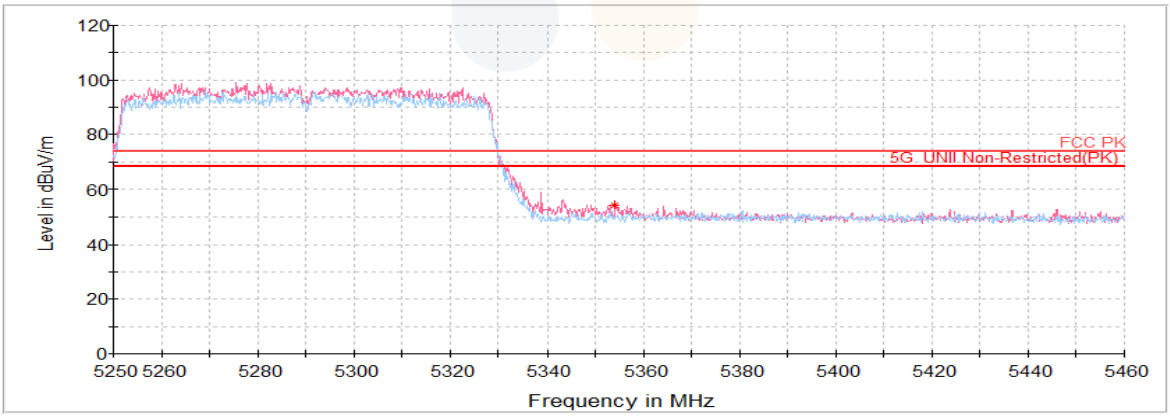
Horizontal/Vertical for Band-edge

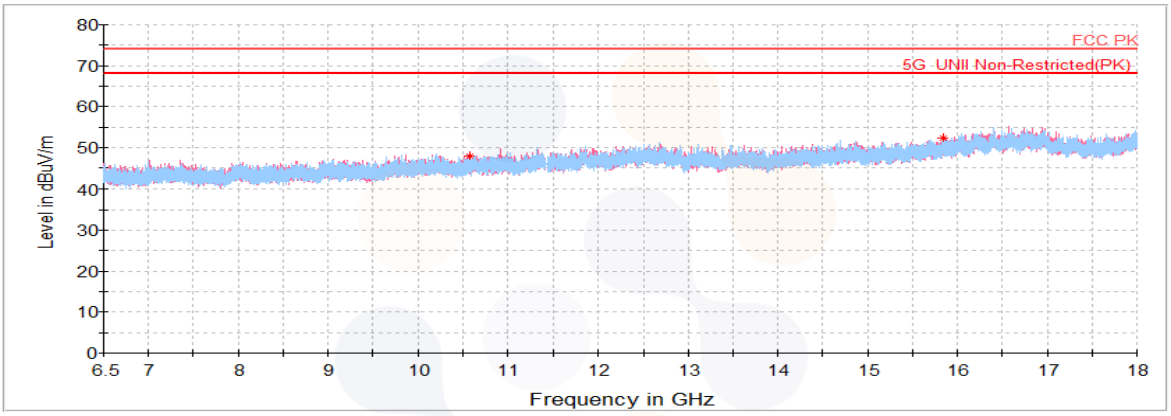


MIMO 802.11n HT40 UNII-2A / Harmonic

Lowest Channel (5 270 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 578.55	H	58.47	37.25	-47.83	-	47.89	68.20	20.31
15 851.97[1)]	H	58.33	40.58	-46.54	-	52.37	74.00	21.63
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

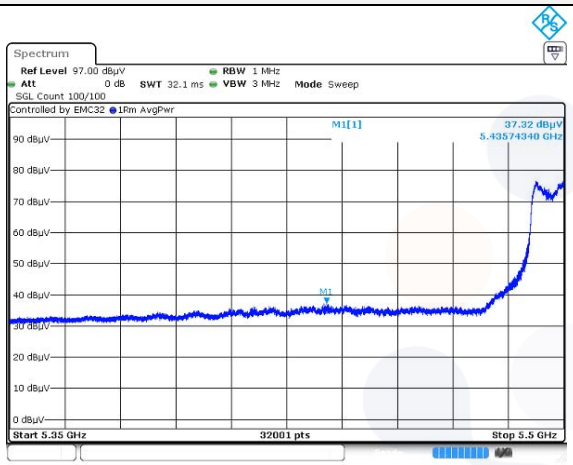


MIMO 802.11ac VHT160 UNII-2C / Band-edge

Middle Channel (5 570 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 435.74[1)]	V	46.88	34.22	-23.44	-	57.66	74.00	16.34
5 727.08	V	44.10	34.71	-22.96	-	55.85	68.20	12.35
Average Data								
5 435.74[1)]	V	37.32	34.22	-23.44	1.89	49.99	54.00	4.01

Average data



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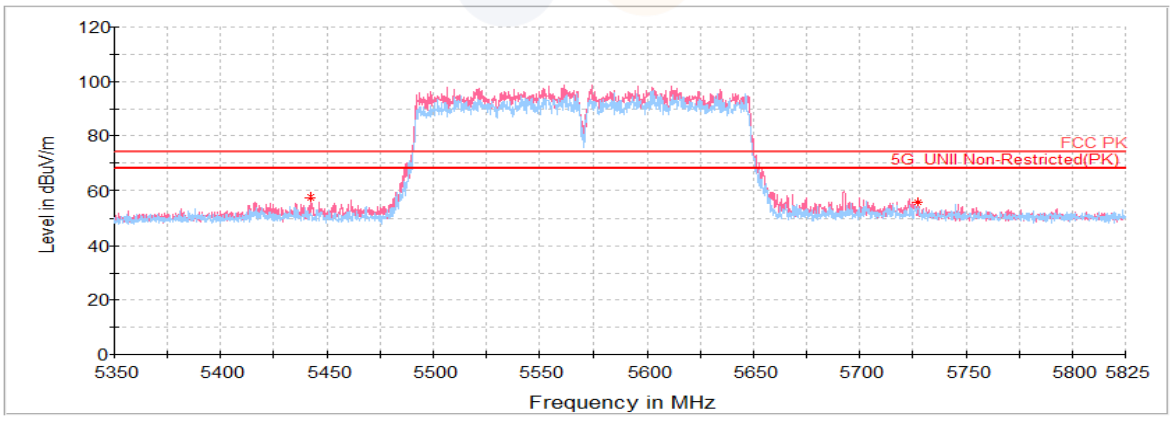
Horizontal/Vertical for Band-edge

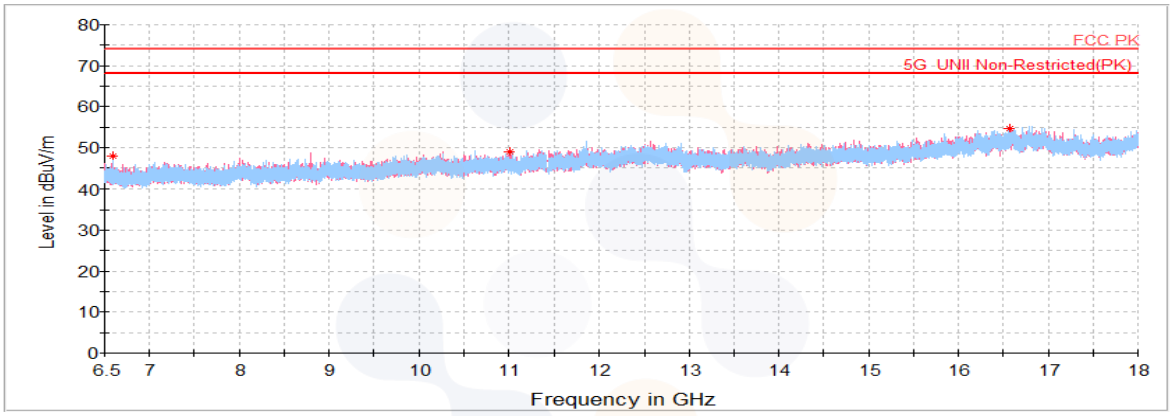


SISO ANT1 802.11a UNII-2C / Harmonic

Lowest Channel (5 500 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
6 599.91	V	64.79	35.18	-52.04	-	47.93	68.20	20.27
11 019.50[1)]	V	59.13	37.52	-47.69	-	48.96	74.00	25.04
16 567.89	H	56.88	42.31	-44.49	-	54.70	68.20	13.50
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

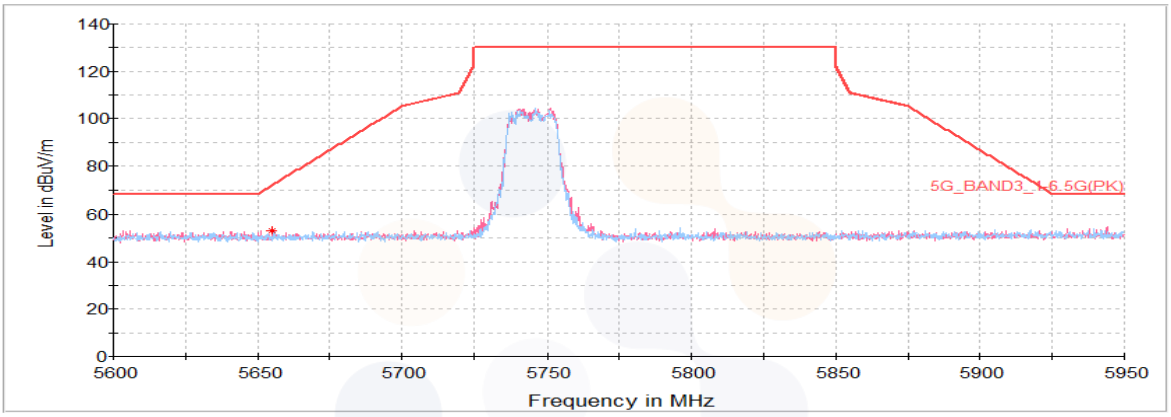


SISO ANT1 802.11a UNII-3 / Band-edge

Lowest Channel (5 745 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 655.06	V	41.78	34.58	-23.09	-	53.27	71.95	18.68
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Horizontal/Vertical for Band-edge

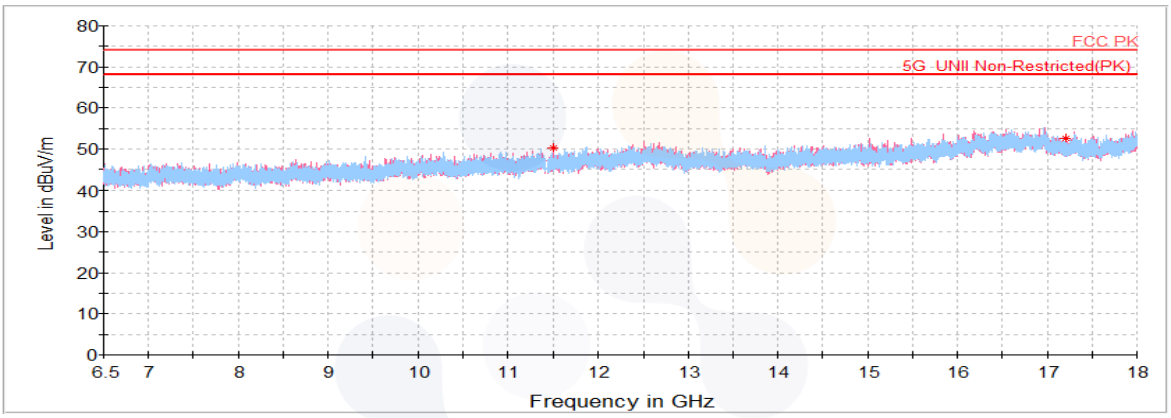


MIMO 802.11n HT40 UNII-3 / Harmonic

Lowest Channel (5 755 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
11 491.72[1)]	V	59.98	37.99	-47.64	-	50.33	74.00	23.67
17 216.20	V	56.04	41.48	-44.90	-	52.62	68.20	15.58
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
DC Power Supply	AGILENT	E3632A	KR75304571	23.05.02
Vector Signal Generator	R&S	SMBV100A	257566	23.07.04
Signal Generator	R&S	SMB100A	176206	23.01.19
Spectrum Analyzer	R&S	FSV40	100989	23.10.14
Horn antenna	ETS.lindgren	3117	155787	23.09.29
Horn antenna	ETS.lindgren	3116	00086632	23.01.25
Attenuator	API Inmet	40AH2W-10	12	23.05.03
AMPLIFIER	B&Z Technologies	BZRT-00504000-481055-382525	26299-27735	23.09.19
AMPLIFIER	B&Z Technologies	BZR-0050400-551028-252525	27736	23.09.19
Antenna Mast	Innco Systems	MA4640-XP-ET	-	-
Turn Table	Innco Systems	CO3000	1175/45850319/P	-
Antenna Mast	Innco Systems	MA4000-EP	303	-
Turn Table	Innco Systems	CO3000	1175/45850319/P	-
High pass Filter	WT	WT-A1698-HS	WT160411001	23.05.03

End of test report