FCC Test Report

Report No.:	RF150826C05L R1
FCC ID:	PY315100319
Test Model:	R7800
Received Date:	Apr. 24, 2019
Test Date:	Apr. 29 ~ Apr. 30, 2019
Issued Date:	Jun. 13, 2019
Applicant:	NETGEAR, INC.
Address:	350 East Plumeria Drive San Jose, CA 95134
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF150826C05L	Original release	May 15, 2019
RF150826C05L R1	Revised operating frequency	Jun. 13, 2019

1 Certificate of Conformity

Product:	Nighthawk X4S AC2600 Smart WiFi Router
Brand:	NETGEAR
Test Model:	R7800
Sample Status:	Engineering sample
Applicant:	NETGEAR, INC.
Test Date:	Apr. 29 ~ Apr. 30, 2019
Standards:	47 CFR FCC Part 15, Subpart E (Section 15.407) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Polly Chien , **Date:** Jun. 13, 2019

Polly Chien / Specialist

Approved by : Bruce Chen , **Date:** Jun. 13, 2019

Bruce Chen / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -16.08dB at 0.34159MHz.
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -2.2dB at 11440.00MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	-	Reference only.
15.407(a)(1/2/3)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.407(e)	6dB bandwidth	Pass	Meet the requirement of limit. (U-NII-3 Band only)
15.407(g)	Frequency Stability	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is RSMA not a standard connector.

Note:
1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.63 dB
	200MHz ~1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Nighthawk X4S AC2600 Smart WiFi Router
Brand	NETGEAR
Test Model	R7800
Sample Status	Engineering sample
Power Supply Rating	12Vdc from adapter
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK
Modulation Technology	OFDM
Transfer Rate	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 800Mbps 802.11ac: 1733.3Mbps
Operating Frequency	5650 ~ 5725MHz
Number of Channel	802.11a, 802.11n (HT20), 802.11ac (VHT20): 1 802.11n (HT40), 802.11ac (VHT40): 1 802.11ac (VHT80): 1
Conducted Output Power	CDD Mode: 170.631mW Beamforming_NSS1 Mode: 170.631mW Beamforming_NSS2 Mode: 170.631mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter
Cable Supplied	1.45m shielded RJ45 cable w/o core

Note:

1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report to BV CPS report no. RF150826C05A and RF150826C05B. The difference compared with the original report is adding Ch144, Ch142 and Ch138 test data for 5.65GHz to 5.725GHz. Therefore, test items for Ch144, Ch142 and Ch138 had been tested in this report. Please refer to the original report for other test data.
2. The EUT incorporates a MIMO function. Physically, the EUT provides 4 completed transmitters and 4 receivers.

Band	Modulation Mode	Beamforming Mode	TX Function
5GHz	802.11a	Not Support	4TX
	802.11n (20MHz)	Support (CDD / Nss=1 / Nss=2)	4TX
	802.11n (40MHz)	Support (CDD / Nss=1 / Nss=2)	4TX
	802.11ac (80MHz)	Support (CDD / Nss=1 / Nss=2)	4TX

* For 802.11a, the EUT doesn't support Beamforming mode.
* The modulation and bandwidth are similar for 802.11n mode for 20MHz / 40MHz and 802.11ac mode for V20MHz / V40MHz, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)
* For 5GHz band 802.11n and 802.11ac, after pre-tested two modes (with beamforming mode Nss=1 / 2 and CDD mode) found CDD mode was the worst, therefore chosen for final test for radiated emission and power line conducted emission test and presented in the test report.

3. The EUT uses following antennas.

Ant. Type	Connecter Type	Antenna Gain (dBi)		
		5710 MHz	5720 MHz	5690 MHz
Dipole	RSMA	1.61	1.51	1.51

4. The EUT consumes power from the following adapters.

Adapter 1	
Brand	NETGEAR (LEI)
Model	MU42-3120350-A1
Part No.	332-10762-01
Input Power	100-240Vac, 50/60Hz, 1.5A
Output Power	12Vdc, 3.5A
Power Line	1.8m cable without core attached on adapter

Adapter 2	
Brand	NETGEAR (CWT)
Model	2ABN042F NA
Part No.	332-10761-01
Input Power	100-240Vac, 50/60Hz, 1.3A
Output Power	12Vdc, 3.5A
Power Line	1.85m cable without core attached on adapter

**After pre-tested two of adapters found adapter 2 was the worst case, therefore chosen for final tests and presented in the test report.

3.2 Description of Test Modes

1 channel is provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency
144	5720 MHz

1 channel is provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency
142	5710 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
138	5690 MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission APCM: Antenna Port Conducted Measurement

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5650-5725	144	144	OFDM	6.0
	802.11ac (VHT20)		144	144	OFDM	7.2
	802.11ac (VHT40)		142	142	OFDM	15.0
	802.11ac (VHT80)		38	38	OFDM	130.0

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5650-5725	144	144	OFDM	6.0

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5650-5725	144	144	OFDM	6.0

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5650-5725	144	144	OFDM	6.0
	802.11ac (VHT20)		144	144	OFDM	7.2
	802.11ac (VHT40)		142	142	OFDM	15.0
	802.11ac (VHT80)		38	38	OFDM	130.0

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	25deg. C, 70%RH	120Vac, 60Hz	Luis Lee
RE<1G	25deg. C, 70%RH	120Vac, 60Hz	Luis Lee
PLC	25deg. C, 75%RH	120Vac, 60Hz	Luis Lee
APCM	25deg. C, 60%RH	120Vac, 60Hz	Alan Wu

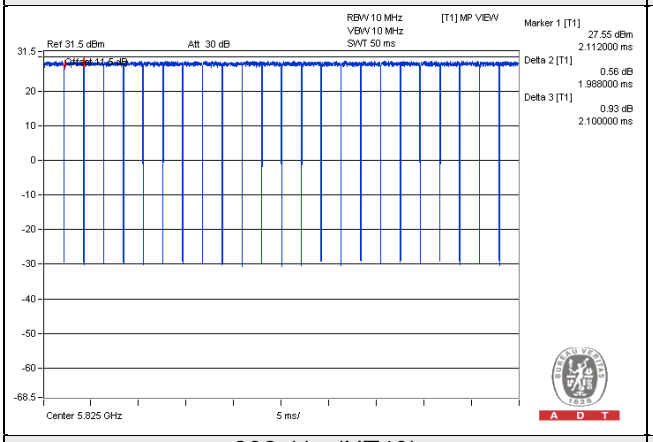
3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98%, duty factor is required.

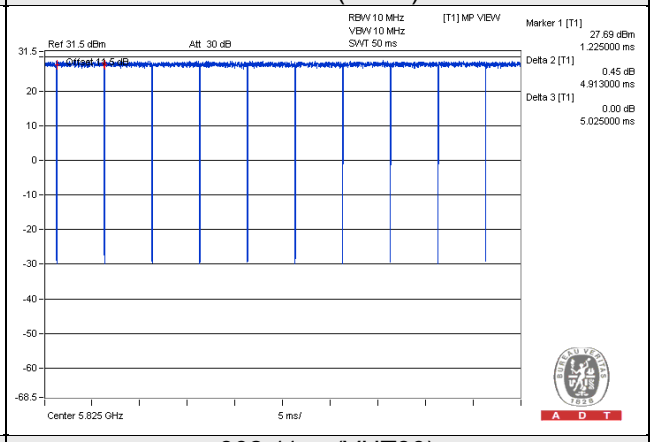
CDD Mode

802.11a: Duty cycle = 1.99/2.10 = 0.948, Duty factor = 10 * log (1/0.948) = 0.23
802.11n (HT20): Duty cycle = 4.91/5.03 = 0.976, Duty factor = 10 * log (1/0.976) = 0.10
802.11n (HT40): Duty cycle = 2.37/2.47 = 0.960, Duty factor = 10 * log (1/0.960) = 0.18
802.11ac (VHT80): Duty cycle = 1.08/1.25 = 0.864, Duty factor = 10 * log (1/0.864) = 0.63

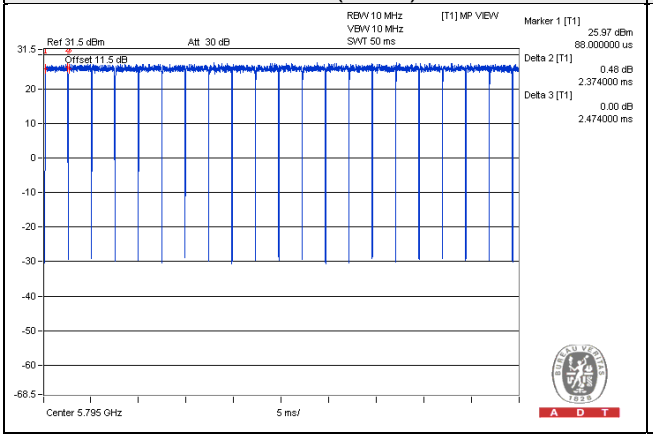
802.11a



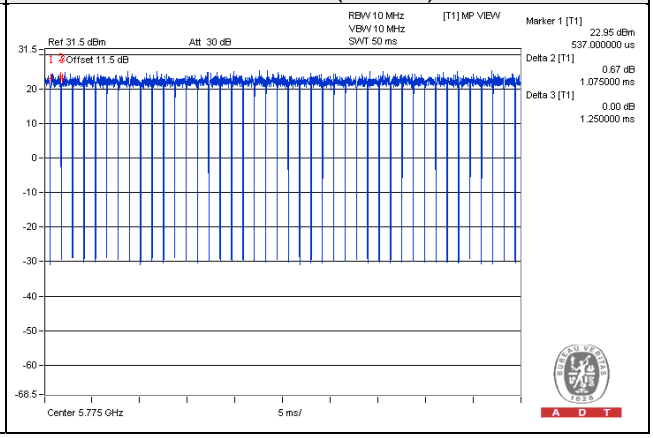
802.11n (HT20)



802.11n (HT40)



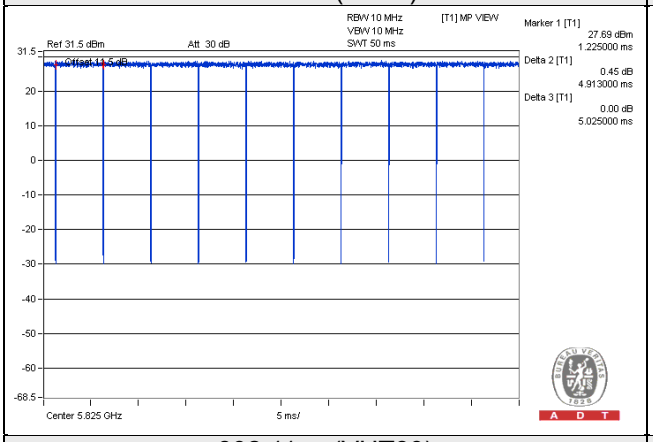
802.11ac (VHT80)



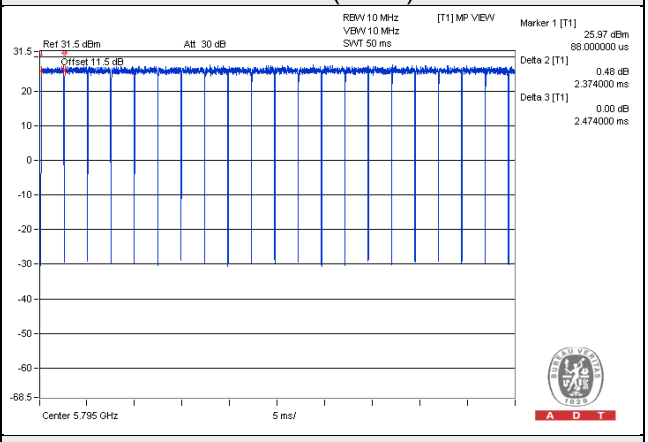
Beamforming Mode

802.11n (HT20): Duty cycle = 4.91/5.03 = 0.976, Duty factor = 10 * log (1/0.976) = 0.10
802.11n (HT40): Duty cycle = 2.37/2.47 = 0.960, Duty factor = 10 * log (1/0.960) = 0.18
802.11ac (VHT80): Duty cycle = 1.08/1.25 = 0.864, Duty factor = 10 * log (1/0.864) = 0.63

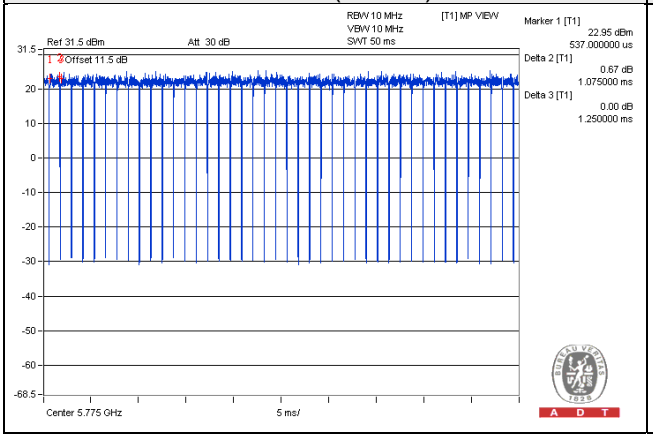
802.11n (HT20)



802.11n (HT40)



802.11ac (VHT80)



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

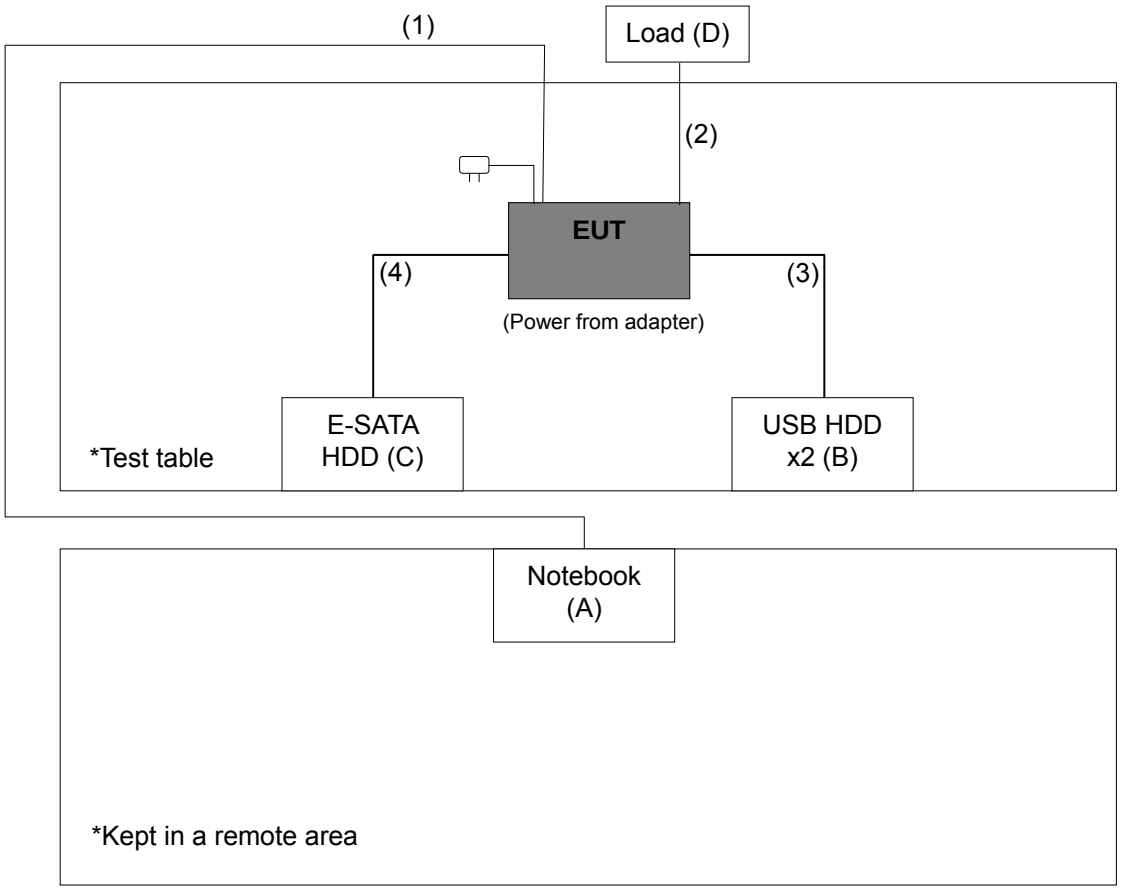
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5420	BPQ7MQ1	FCC DoC Approved	-
B.	USB HDD x 2	TOSHIBA	v63700-G-1.5G	13GUTE2ZTTV2	FCC DoC Approved	-
		TOSHIBA	v63700-G-1.5G	3F8PBV6ZTTV2	FCC DoC Approved	-
C.	E-SATA HDD	Sarotech	FHD-354US	E80P048380919	FCC DoC Approved	-
D.	Load	NA	NA	NA	NA	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ 45	1	3	N	0	-
2.	RJ 45	4	1.8	N	0	-
3.	USB	2	1.8	Y	0	-
4.	E-SATA	1	0.5	Y	0	-

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart E (15.407)
KDB 789033 D02 General UNII Test Procedure New Rules v02r01
KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10:2013

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

<table>
<tr><td colspan="3">Applicable To</td><td colspan="2">Limit</td></tr>
<tr><td colspan="3" rowspan="2">789033 D02 General UNII Test Procedure New Rules v02r01</td><td colspan="2">Field Strength at 3m</td></tr>
<tr><td>PK: 74 (dBμV/m)</td><td>AV: 54 (dBμV/m)</td></tr>
<tr><td>Frequency Band</td><td colspan="2">Applicable To</td><td>EIRP Limit</td><td>Equivalent Field Strength at 3m</td></tr>
<tr><td>5150~5250 MHz</td><td colspan="2">15.407(b)(1)</td><td rowspan="3">PK: -27 (dBm/MHz)</td><td rowspan="3">PK: 68.2(dBμV/m)</td></tr>
<tr><td>5250~5350 MHz</td><td colspan="2">15.407(b)(2)</td></tr>
<tr><td>5470~5725 MHz</td><td colspan="2">15.407(b)(3)</td></tr>
<tr><td rowspan="2">5725~5850 MHz</td><td>☒</td><td>15.407(b)(4)(i)</td><td>PK: -27 (dBm/MHz) *1
PK: 10 (dBm/MHz) *2
PK: 15.6 (dBm/MHz) *3
PK: 27 (dBm/MHz) *4</td><td>PK: 68.2(dBμV/m) *1
PK: 105.2 (dBμV/m) *2
PK: 110.8(dBμV/m) *3
PK: 122.2 (dBμV/m) *4</td></tr>
<tr><td>☐</td><td>15.407(b)(4)(ii)</td><td colspan="2">Emission limits in section 15.247(d)</td></tr>
<tr><td colspan="5">*1 beyond 75 MHz or more above of the band edge.
*2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.
*3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.
*4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.</td></tr>
</table>

Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts).

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Jan. 03, 2019	Jan. 02, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 25, 2018	Sep. 24, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 21, 2018	Nov. 20, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
Loop Antenna TESEQ	HLA 6121	45745	Jun. 14, 2018	Jun. 13, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Aug. 08, 2018	Aug. 07, 2019
Preamplifier KEYSIGHT (Above 1GHz)	83017A	MY53270295	Jul. 02, 2018	Jul. 01, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Aug. 08, 2018	Aug. 07, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Aug. 08, 2018	Aug. 07, 2019
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	Jul. 17, 2018	Jul. 16, 2019
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Nov. 14, 2018	Nov. 13, 2019

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 4.

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna 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.

d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.

2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.

3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.

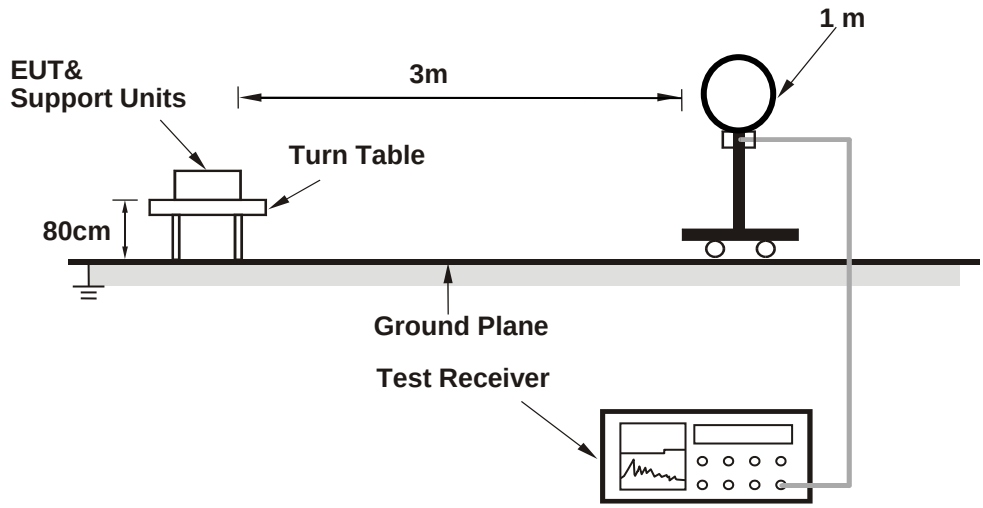
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

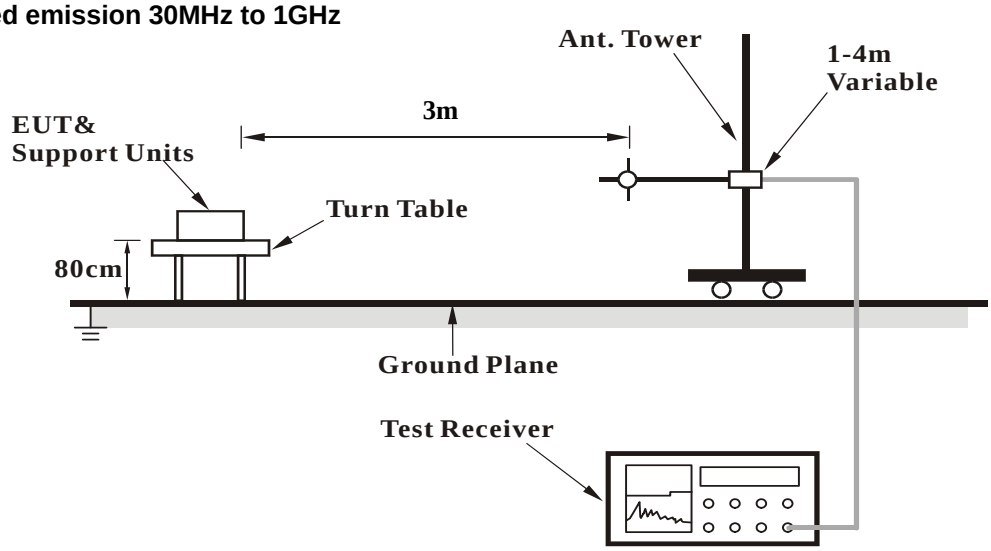
No deviation.

4.1.5 Test Setup

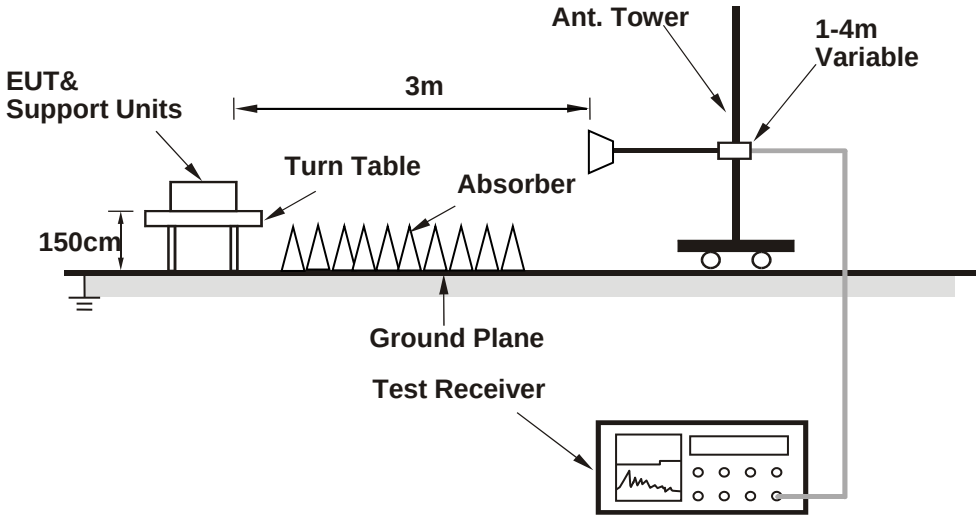
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Prepared a notebook to act as communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
d. The communication partner sent data to EUT by command "PING".

4.1.7 Test Results

Above 1GHz data:

802.11a

CHANNEL	TX Channel 144	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5470.00	61.4 PK	68.2	-6.8	2.71 H	53	48.5	12.9
2	*5720.00	108.0 PK			2.71 H	53	65.8	42.2
3	*5720.00	97.5 AV			2.71 H	53	55.3	42.2
4	#5850.00	62.1 PK	68.2	-6.1	2.71 H	53	48.8	13.3
5	11440.00	65.2 PK	74.0	-8.8	1.65 H	114	41.0	24.2
6	11440.00	51.5 AV	54.0	-2.5	1.65 H	114	27.3	24.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5470.00	61.2 PK	68.2	-7.0	1.59 V	352	48.3	12.9
2	*5720.00	120.8 PK			1.59 V	352	78.6	42.2
3	*5720.00	109.6 AV			1.59 V	352	67.4	42.2
4	#5850.00	62.3 PK	68.2	-5.9	1.59 V	352	49.0	13.3
5	11440.00	65.5 PK	74.0	-8.5	2.84 V	193	41.3	24.2
6	**11440.00**	**51.8 AV**	**54.0**	**-2.2**	**2.84 V**	**193**	**27.6**	**24.2**

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11n (HT20)

CHANNEL	TX Channel 144	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5470.00	61.7 PK	68.2	-6.5	2.77 H	68	48.8	12.9
2	*5720.00	106.5 PK			2.77 H	68	64.3	42.2
3	*5720.00	96.0 AV			2.77 H	68	53.8	42.2
4	#5850.00	61.9 PK	68.2	-6.3	2.77 H	68	48.6	13.3
5	11440.00	65.2 PK	74.0	-8.8	1.95 H	201	41.0	24.2
6	11440.00	51.0 AV	54.0	-3.0	1.95 H	201	26.8	24.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5470.00	61.9 PK	68.2	-6.3	2.17 V	232	49.0	12.9
2	*5720.00	118.7 PK			2.17 V	232	76.5	42.2
3	*5720.00	108.1 AV			2.17 V	232	65.9	42.2
4	#5850.00	62.2 PK	68.2	-6.0	2.17 V	232	48.9	13.3
5	11440.00	65.5 PK	74.0	-8.5	1.97 V	255	41.3	24.2
6	11440.00	51.3 AV	54.0	-2.7	1.97 V	255	27.1	24.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11n (HT40)

CHANNEL	TX Channel 142	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5470.00	61.4 PK	68.2	-6.8	2.89 H	63	48.5	12.9
2	*5710.00	103.9 PK			2.89 H	63	61.8	42.1
3	*5710.00	96.1 AV			2.89 H	63	54.0	42.1
4	#5850.00	62.1 PK	68.2	-6.1	2.89 H	63	48.8	13.3
5	11420.00	65.4 PK	74.0	-8.6	3.31 H	175	41.0	24.4
6	11420.00	51.2 AV	54.0	-2.8	3.31 H	175	26.8	24.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5470.00	61.5 PK	68.2	-6.7	2.15 V	232	48.6	12.9
2	*5710.00	116.3 PK			2.15 V	232	74.2	42.1
3	*5710.00	105.9 AV			2.15 V	232	63.8	42.1
4	#5850.00	62.2 PK	68.2	-6.0	2.15 V	232	48.9	13.3
5	11420.00	65.6 PK	74.0	-8.4	2.69 V	174	41.2	24.4
6	11420.00	51.4 AV	54.0	-2.6	2.69 V	174	27.0	24.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11ac (VHT80)

CHANNEL	TX Channel 138	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5470.00	61.8 PK	68.2	-6.4	2.82 H	58	48.9	12.9
2	*5690.00	102.0 PK			2.82 H	58	60.0	42.0
3	*5690.00	91.5 AV			2.82 H	58	49.5	42.0
4	#5850.00	62.8 PK	68.2	-5.4	2.82 H	58	49.5	13.3
5	11380.00	64.7 PK	74.0	-9.3	2.30 H	142	40.5	24.2
6	11380.00	50.9 AV	54.0	-3.1	2.30 H	142	26.7	24.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5470.00	61.7 PK	68.2	-6.5	2.17 V	230	48.8	12.9
2	*5690.00	112.2 PK			2.17 V	230	70.2	42.0
3	*5690.00	102.3 AV			2.17 V	230	60.3	42.0
4	#5850.00	63.0 PK	68.2	-5.2	2.17 V	230	49.7	13.3
5	11380.00	65.0 PK	74.0	-9.0	2.51 V	190	40.8	24.2
6	11380.00	51.3 AV	54.0	-2.7	2.51 V	190	27.1	24.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Below 1GHz Worst-Case Data:

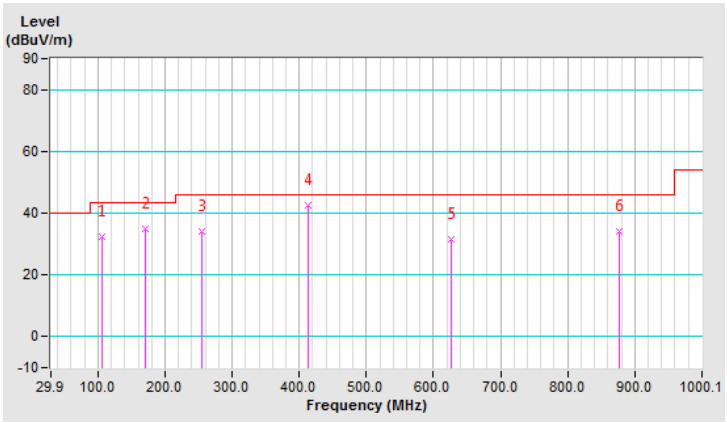
802.11a

CHANNEL	TX Channel 144	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	105.58	32.3 QP	43.5	-11.2	1.50 H	115	44.8	-12.5
2	171.55	35.1 QP	43.5	-8.4	1.50 H	263	44.5	-9.4
3	254.99	34.0 QP	46.0	-12.0	1.01 H	150	43.3	-9.3
4	414.10	42.7 QP	46.0	-3.3	2.00 H	12	49.1	-6.4
5	625.60	31.4 QP	46.0	-14.6	1.01 H	218	33.2	-1.8
6	875.91	33.9 QP	46.0	-12.1	1.50 H	207	31.0	2.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report

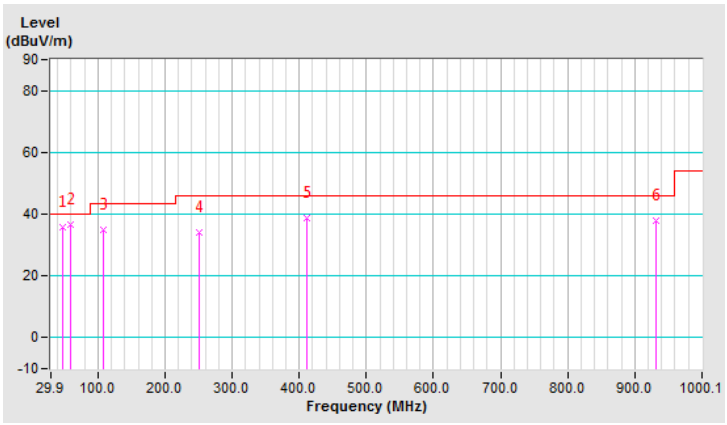


CHANNEL	TX Channel 144	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	47.36	35.8 QP	40.0	-4.2	1.49 V	13	44.8	-9.0
2	59.01	36.7 QP	40.0	-3.3	1.00 V	272	46.4	-9.7
3	107.52	35.1 QP	43.5	-8.4	1.00 V	238	47.3	-12.2
4	251.11	33.9 QP	46.0	-12.1	1.00 V	103	43.3	-9.4
5	412.16	38.7 QP	46.0	-7.3	2.00 V	105	45.2	-6.5
6	932.19	38.0 QP	46.0	-8.0	2.00 V	6	34.0	4.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS 30	100288	Jan. 03, 2019	Jan. 02, 2020
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 21, 2019	Feb. 20, 2020
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

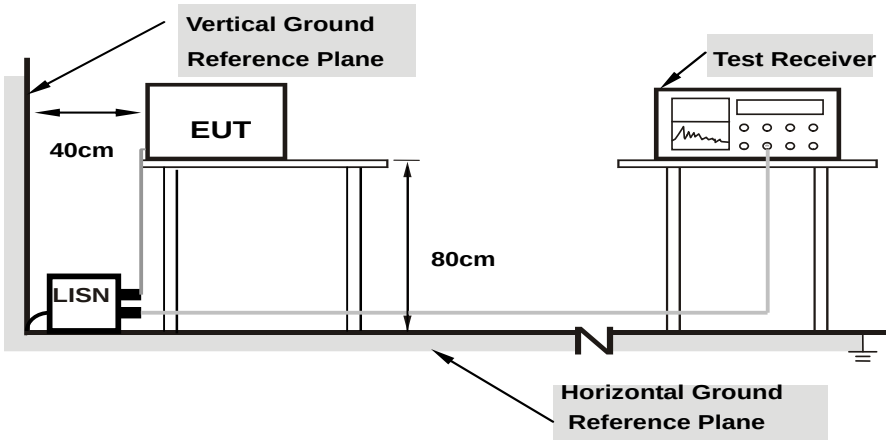
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Results

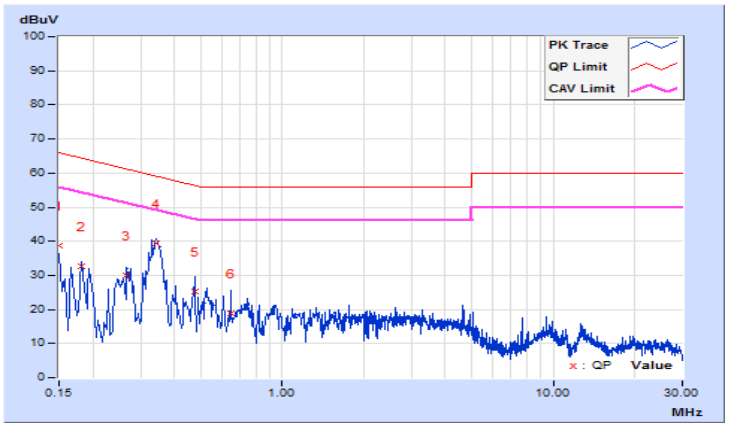
Worst-case data:

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.16	38.47	24.05	38.63	24.21	66.00	56.00	-27.37	-31.79
2	0.18128	0.15	32.49	15.49	32.64	15.64	64.43	54.43	-31.79	-38.79
3	0.26730	0.17	29.79	24.03	29.96	24.20	61.20	51.20	-31.24	-27.00
4	**0.34159**	**0.19**	**39.23**	**32.89**	**39.42**	**33.08**	**59.16**	**49.16**	**-19.74**	**-16.08**
5	0.47453	0.19	25.00	11.17	25.19	11.36	56.43	46.43	-31.24	-35.07
6	0.64657	0.18	18.66	8.01	18.84	8.19	56.00	46.00	-37.16	-37.81

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

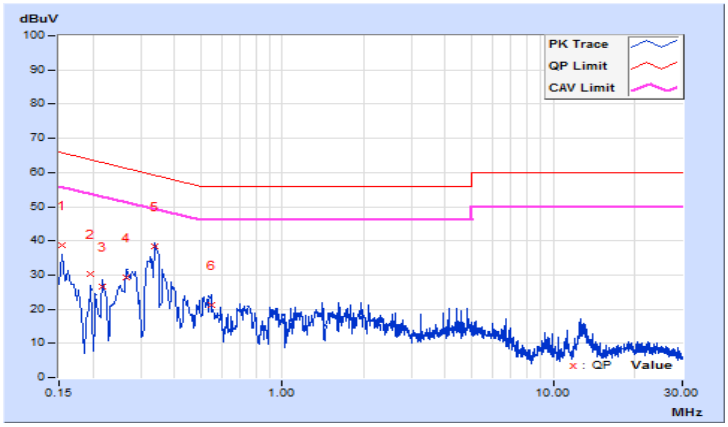


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	0.13	38.44	22.80	38.57	22.93	65.79	55.79	-27.22	-32.86
2	0.19692	0.15	30.10	15.14	30.25	15.29	63.74	53.74	-33.49	-38.45
3	0.21647	0.15	26.38	11.12	26.53	11.27	62.95	52.95	-36.42	-41.68
4	0.26730	0.16	29.19	23.12	29.35	23.28	61.20	51.20	-31.85	-27.92
5	0.33768	0.17	38.07	30.70	38.24	30.87	59.26	49.26	-21.02	-18.39
6	0.54491	0.18	21.02	11.56	21.20	11.74	56.00	46.00	-34.80	-34.26

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.



4.3 Transmit Power Measurement

4.3.1 Limits of Transmit Power Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p ≦ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
		Indoor Access Point	1 Watt (30 dBm)
		Mobile and Portable client device	250mW (24 dBm)
U-NII-2A			250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C	√		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	√		1 Watt (30 dBm)

*B is the 26 dB emission bandwidth in megahertz

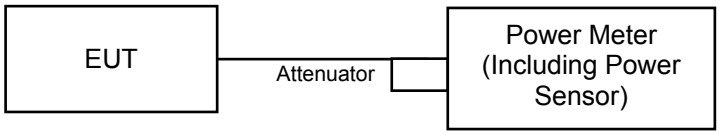
Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

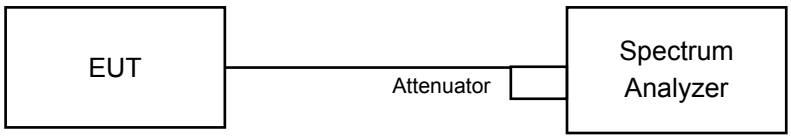
For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.3.2 Test Setup

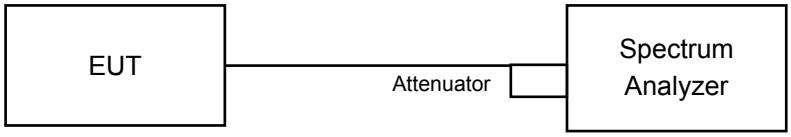
For Power Output
802.11a, 802.11n (HT20), 802.11n (HT40)



802.11ac (VHT80)



For 26dB Bandwidth



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

For Average Power Measurement

802.11a, 802.11n (HT20), 802.11n (HT40)

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

For 802.11ac (VHT80)

a. Set span to encompass the entire 26 dB EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
b. Set sweep trigger to “free run”.
c. Set RBW = 1 MHz
d. Set VBW ≥ 3 MHz
e. Number of points in sweep ≥ 2 Span / RBW
f. Sweep time ≤ (number of points in sweep) * T
g. Using emission bandwidth to determine the frequency span for integration the channel bandwidth.
h. Detector = RMS
i. Trace mode = max hold
j. Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.
k. Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

For 26dB Bandwidth

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Result

Power Output:

CDD Mode

802.11a

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
144	5720 (For U-NII-2C)	13.33	14.16	13.03	13.66	95.933	19.82	22.74	Pass
144	5720 (For U-NII-3)	6.04	7.41	7.76	7.59	22.411	13.50	30.00	Pass

Note:
For U-NII-2C Band:
Chain 0
1. 11dBm + 10log (5725.00 - 5710.06) = 22.74 < 24dBm
Chain 1
1. 11dBm + 10log (5725.00 - 5709.90) = 22.78 < 24dBm
Chain 2
1. 11dBm + 10log (5725.00 - 5709.86) = 22.80 < 24dBm
Chain 3
1. 11dBm + 10log (5725.00 - 5710.07) = 22.74 < 24dBm

For reference only - power meter value
The power value was measured by power meter with average sensor

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)
144	5720	168.267	22.26

802.11n (HT20)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
144	5720 (For U-NII-2C)	13.93	13.89	14.40	14.46	107.233	20.30	22.83	Pass
144	5720 (For U-NII-3)	8.11	7.86	8.34	8.61	27.316	14.36	30.00	Pass

Note:
For U-NII-2C Band:
Chain 0
1. 11dBm + 10log (5725.00 - 5709.59) = 22.87 < 24dBm
Chain 1
1. 11dBm + 10log (5725.00 - 5709.69) = 22.84 < 24dBm
Chain 2
1. 11dBm + 10log (5725.00 - 5709.73) = 22.83 < 24dBm
Chain 3
1. 11dBm + 10log (5725.00 - 5709.58) = 22.88 < 24dBm

For reference only - power meter value
The power value was measured by power meter with average sensor

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)
144	5720	169.824	22.30

802.11n (HT40)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
142	5710 (For U-NII-2C)	16.08	16.00	16.59	15.77	**170.631**	22.32	24.00	Pass
142	5710 (For U-NII-3)	4.87	6.79	7.23	4.79	16.822	12.26	30.00	Pass

Note:
For U-NII-2C Band:
Chain 0
1. 11dBm + 10log (5725.00 - 5689.63) = 26.48 > 24dBm
Chain 1
1. 11dBm + 10log (5725.00 - 5689.59) = 26.49 > 24dBm
Chain 2
1. 11dBm + 10log (5725.00 - 5689.52) = 26.49 > 24dBm
Chain 3
1. 11dBm + 10log (5725.00 - 5689.58) = 26.49 > 24dBm

For reference only - power meter value
The power value was measured by power meter with average sensor

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)
142	5710	206.538	23.15

802.11ac (VHT80)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
138	5690 (For U-NII-2C)	14.91	15.34	15.79	15.09	156.699	21.95	24.00	Pass
138	5690 (For U-NII-3)	2.79	0.62	2.24	2.21	7.398	8.69	30.00	Pass

Note:
For U-NII-2C Band:
Chain 0
1. 11dBm + 10log (5725.00 - 5649.62) = 29.77 > 24dBm
Chain 1
1. 11dBm + 10log (5725.00 - 5649.70) = 29.76 > 24dBm
Chain 2
1. 11dBm + 10log (5725.00 - 5649.53) = 29.77 > 24dBm
Chain 3
1. 11dBm + 10log (5725.00 - 5649.68) = 29.76 > 24dBm

For reference only - power meter value
The power value was measured by power meter with average sensor

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)
138	5690	204.174	23.10

Beamforming_NSS1 Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
144	5720 (For U-NII-2C)	13.93	13.89	14.40	14.46	107.233	20.30	22.47	Pass
144	5720 (For U-NII-3)	8.11	7.86	8.34	8.61	27.316	14.36	28.37	Pass

Note:

1. 5720 (For U-NII-2C): Beamforming gain = 1.51dBi + 10log(4) = 7.53dBi > 6dBi, so the power limit shall be reduced to 24-(7.53-6) = 22.47dBm.
2. 5720 (For U-NII-3): Beamforming gain = 1.61dBi + 10log(4) = 7.63dBi > 6dBi, so the power limit shall be reduced to 24-(7.63-6) = 28.37dBm.

For U-NII-2C Band:
Chain 0
1. 11dBm + 10log (5725.00 - 5709.59) = 22.87 > 22.47dBm
Chain 1
1. 11dBm + 10log (5725.00 - 5709.69) = 22.84 > 22.47dBm
Chain 2
1. 11dBm + 10log (5725.00 - 5709.73) = 22.83 > 22.47dBm
Chain 3
1. 11dBm + 10log (5725.00 - 5709.58) = 22.88 > 22.47dBm

For reference only - power meter value
The power value was measured by power meter with average sensor

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)
144	5720	169.824	22.30

802.11n (HT40)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
142	5710 (For U-NII-2C)	16.08	16.00	16.59	15.77	**170.631**	22.32	22.47	Pass
142	5710 (For U-NII-3)	4.87	6.79	7.23	4.79	16.822	12.26	28.37	Pass

Note:

1. 5710 (For U-NII-2C): Beamforming gain = 1.51dBi + 10log(4) = 7.53dBi > 6dBi, so the power limit shall be reduced to 24-(7.53-6) = 22.47dBm.
2. 5710 (For U-NII-3): Beamforming gain = 1.61dBi + 10log(4) = 7.63dBi > 6dBi, so the power limit shall be reduced to 24-(7.63-6) = 28.37dBm.

For U-NII-2C Band:
Chain 0
1. 11dBm + 10log (5725.00 - 5689.63) = 26.48 > 22.47dBm
Chain 1
1. 11dBm + 10log (5725.00 - 5689.59) = 26.49 > 22.47dBm
Chain 2
1. 11dBm + 10log (5725.00 - 5689.52) = 26.49 > 22.47dBm
Chain 3
1. 11dBm + 10log (5725.00 - 5689.58) = 26.49 > 22.47dBm

For reference only - power meter value
The power value was measured by power meter with average sensor

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)
142	5710	165.196	22.18

802.11ac (VHT80)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
138	5690 (For U-NII-2C)	14.91	15.34	15.79	15.09	156.699	21.95	22.47	Pass
138	5690 (For U-NII-3)	2.79	0.62	2.24	2.21	7.398	8.69	28.37	Pass

Note:

1. 5690 (For U-NII-2C): Beamforming gain = 1.51dBi + 10log(4) = 7.53dBi > 6dBi, so the power limit shall be reduced to 24-(7.53-6) = 22.47dBm.
2. 5690 (For U-NII-3): Beamforming gain = 1.61dBi + 10log(4) = 7.63dBi > 6dBi, so the power limit shall be reduced to 24-(7.63-6) = 28.37dBm.

For U-NII-2C Band:
Chain 0
1. 11dBm + 10log (5725.00 - 5649.62) = 29.77 > 22.47dBm
Chain 1
1. 11dBm + 10log (5725.00 - 5649.70) = 29.76 > 22.47dBm
Chain 2
1. 11dBm + 10log (5725.00 - 5649.53) = 29.77 > 22.47dBm
Chain 3
1. 11dBm + 10log (5725.00 - 5649.68) = 29.76 > 22.47dBm

For reference only - power meter value
The power value was measured by power meter with average sensor

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)
138	5690	163.305	22.13

Beamforming_NSS2 Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
144	5720 (For U-NII-2C)	13.93	13.89	14.40	14.46	107.233	20.30	22.83	Pass
144	5720 (For U-NII-3)	8.11	7.86	8.34	8.61	27.316	14.36	30.00	Pass

Note:

1. 5720 (For U-NII-2C): Beamforming gain = 1.51dBi + 10log(4/2) = 4.52dBi < 6dBi, so the power limit no need to reduced.
2. 5720 (For U-NII-3): Beamforming gain = 1.61dBi + 10log(4/2) = 4.62dBi < 6dBi, so the power limit no need to reduced.

For U-NII-2C Band:
Chain 0
1. 11dBm + 10log (5725.00 - 5709.59) = 22.87 < 24dBm
Chain 1
1. 11dBm + 10log (5725.00 - 5709.69) = 22.84 < 24dBm
Chain 2
1. 11dBm + 10log (5725.00 - 5709.73) = 22.83 < 24dBm
Chain 3
1. 11dBm + 10log (5725.00 - 5709.58) = 22.88 < 24dBm

For reference only - power meter value
The power value was measured by power meter with average sensor

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)
144	5720	169.824	22.30

802.11n (HT40)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
142	5710 (For U-NII-2C)	16.08	16.00	16.59	15.77	**170.631**	22.32	24.00	Pass
142	5710 (For U-NII-3)	4.87	6.79	7.23	4.79	16.822	12.26	30.00	Pass

Note:

1. 5710 (For U-NII-2C): Beamforming gain = 1.51dBi + 10log(4/2) = 4.52dBi < 6dBi, so the power limit no need to reduced.
2. 5710 (For U-NII-3): Beamforming gain = 1.61dBi + 10log(4/2) = 4.62dBi < 6dBi, so the power limit no need to reduced.

For U-NII-2C Band:
Chain 0
1. 11dBm + 10log (5725.00 - 5689.63) = 26.48 > 24dBm
Chain 1
1. 11dBm + 10log (5725.00 - 5689.59) = 26.49 > 24dBm m
Chain 2
1. 11dBm + 10log (5725.00 - 5689.52) = 26.49 > 24dBm
Chain 3
1. 11dBm + 10log (5725.00 - 5689.58) = 26.49 > 24dBm

For reference only - power meter value
The power value was measured by power meter with average sensor

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)
142	5710	206.538	23.15

802.11ac (VHT80)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
138	5690 (For U-NII-2C)	14.91	15.34	15.79	15.09	156.699	21.95	24.00	Pass
138	5690 (For U-NII-3)	2.79	0.62	2.24	2.21	7.398	8.69	30.00	Pass

Note:

1. 5690 (For U-NII-2C): Beamforming gain = 1.51dBi + 10log(4/2) = 4.52dBi < 6dBi, so the power limit no need to reduced.
2. 5690 (For U-NII-3): Beamforming gain = 1.61dBi + 10log(4/2) = 4.62dBi < 6dBi, so the power limit no need to reduced.

For U-NII-2C Band:
Chain 0
1. 11dBm + 10log (5725.00 - 5649.62) = 29.77 > 24dBm
Chain 1
1. 11dBm + 10log (5725.00 - 5649.70) = 29.76 > 24dBm
Chain 2
1. 11dBm + 10log (5725.00 - 5649.53) = 29.77 > 24dBm
Chain 3
1. 11dBm + 10log (5725.00 - 5649.68) = 29.76 > 24dBm

For reference only - power meter value
The power value was measured by power meter with average sensor

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)
138	5690	204.174	23.10

26dB Bandwidth:

802.11a

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
144	5720 (For U-NII-2C)	14.94	15.10	15.14	14.93
144	5720 (For U-NII-3)	4.81	4.79	4.83	4.84

802.11n (HT20)

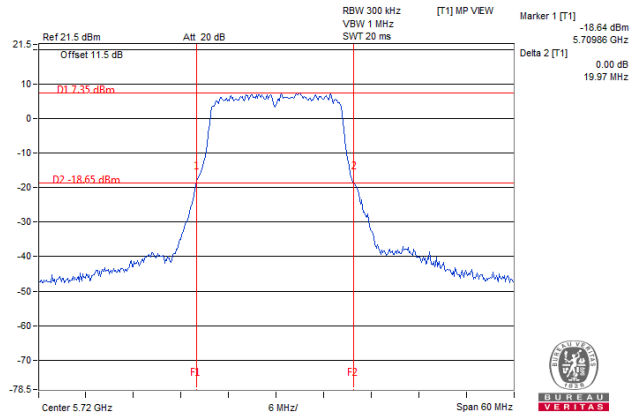
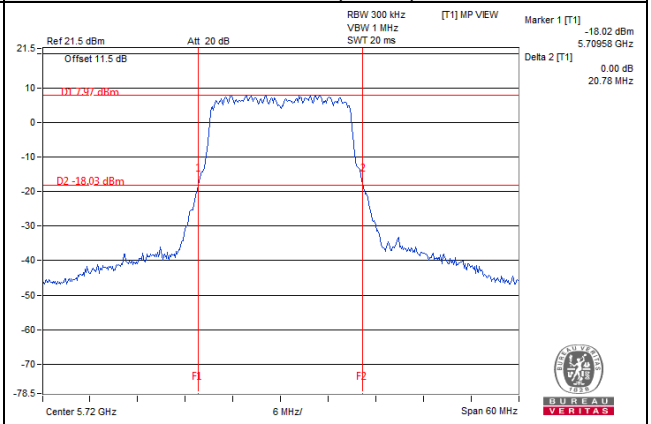
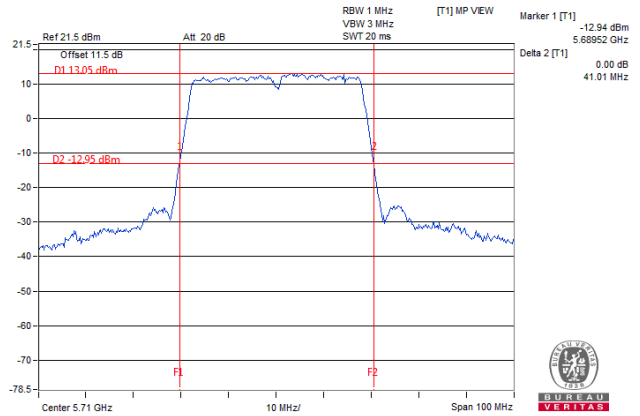
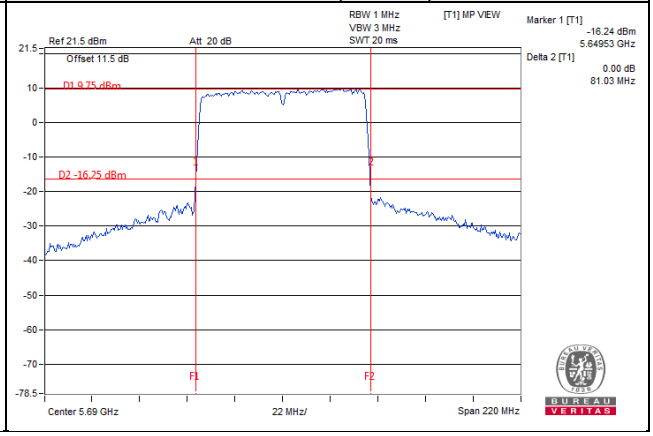
Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
144	5720 (For U-NII-2C)	15.41	15.31	15.27	15.42
144	5720 (For U-NII-3)	5.35	5.48	5.28	5.36

802.11n (HT40)

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
142	5710 (For U-NII-2C)	35.37	35.41	35.48	35.42
142	5710 (For U-NII-3)	5.55	5.50	5.53	5.55

802.11ac (VHT80)

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
138	5690 (For U-NII-2C)	75.38	75.30	75.47	75.32
138	5690 (For U-NII-3)	5.55	5.41	5.56	5.51

Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

EUT Maximum Conducted Power

CDD Mode

802.11a

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5470~5725	95.933	19.82

802.11n (HT20)

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5470~5725	107.233	20.30

802.11n (HT40)

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5470~5725	170.631	22.32

802.11ac (VHT80)

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5470~5725	156.699	21.95

Beamforming_NSS1 & Beamforming_NSS2 Mode

802.11n (HT20)

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5470~5725	107.233	20.30

802.11n (HT40)

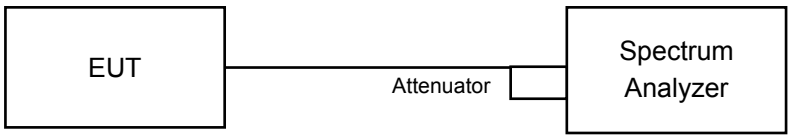
Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5470~5725	170.631	22.32

802.11ac (VHT80)

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5470~5725	156.699	21.95

4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

4.4.4 Test Result

802.11a

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
144	5720 For U-NII-2C	13.28	13.28	13.28	13.28
144	5720 For U-NII-3	3.04	3.16	3.16	3.16

802.11n (HT20)

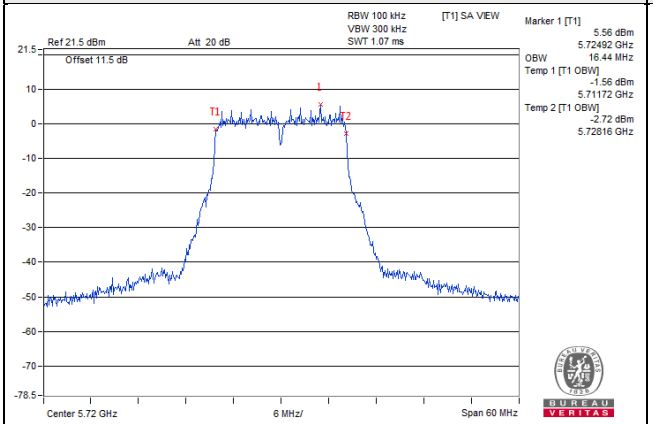
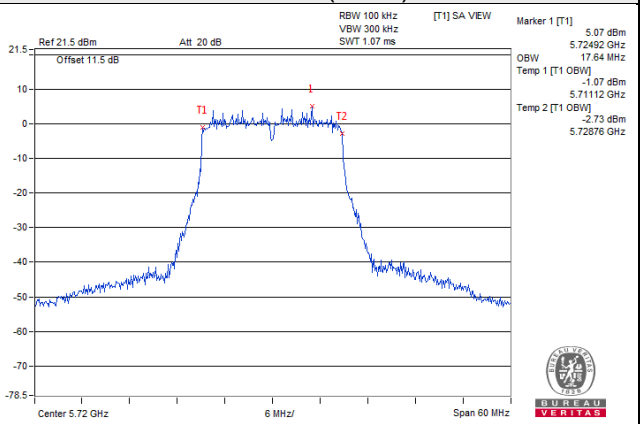
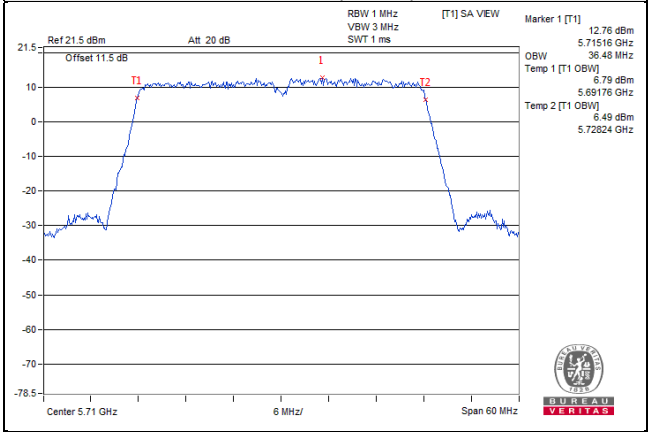
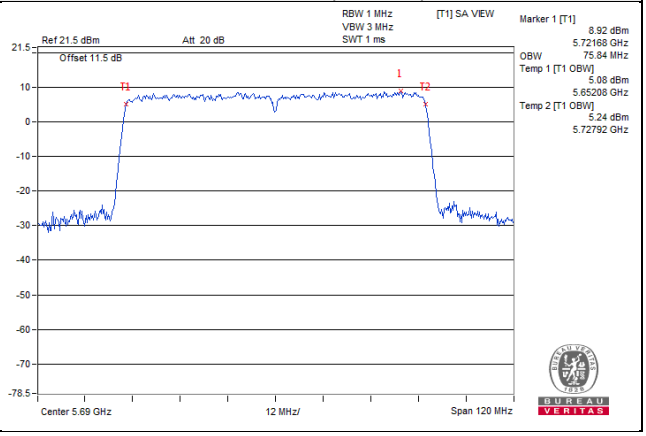
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
144	5720 For U-NII-2C	13.88	13.88	13.88	13.88
144	5720 For U-NII-3	3.76	3.76	3.76	3.76

802.11n (HT40)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
142	5710 For U-NII-2C	33.12	33.12	33.24	33.12
142	5710 For U-NII-3	3.12	3.12	3.24	3.12

802.11ac (VHT80)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
138	5690 For U-NII-2C	72.92	72.92	72.92	72.92
138	5690 For U-NII-3	2.92	2.92	2.92	2.92

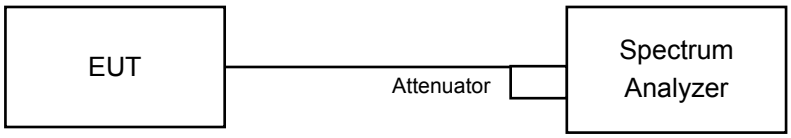
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

4.5 Peak Power Spectral Density Measurement

4.5.1 Limits of Peak Power Spectral Density Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
		Mobile and Portable client device	11dBm/ MHz
U-NII-2A			11dBm/ MHz
U-NII-2C	√		11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

For U-NII-2C band:

Using method SA-2

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.

b. Set RBW = 1MHz, Set VBW ≥ 3 MHz, Detector = RMS

c. Set Channel power measure = 1MHz

d. Sweep time = auto, trigger set to “free run”.

e. Trace average at least 100 traces in power averaging mode.

f. Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.

b. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS

c. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.

d. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(500 kHz / 300 kHz)

e. Sweep time = auto, trigger set to “free run”.

f. Trace average at least 100 traces in power averaging mode.

g. Record the max value and add 10 log (1/duty cycle)

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

Same as 4.3.6.

4.5.7 Test Results

For U-NII-2C band:

802.11a

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/ MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
144	5720	2.81	3.01	2.72	3.09	0.23	9.16	9.47	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 1.51dBi + 10log(4) = 7.53dBi > 6dBi, so the power density limit shall be reduced to 11-(7.53-6) = 9.47dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/ MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
144	5720	2.64	2.65	2.86	3.10	0.10	8.94	9.47	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 1.51dBi + 10log(4) = 7.53dBi > 6dBi, so the power density limit shall be reduced to 11-(7.53-6) = 9.47dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT40)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/ MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
142	5710	1.72	2.17	1.93	1.68	0.18	8.08	9.47	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 1.51dBi + 10log(4) = 7.53dBi > 6dBi, so the power density limit shall be reduced to 11-(7.53-6) = 9.47dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

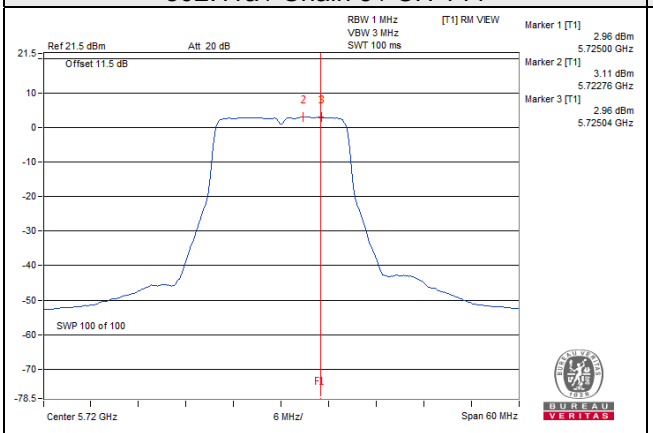
Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/ MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
138	5690	-1.48	-1.12	-1.03	-1.49	0.63	5.38	9.47	Pass

Note:

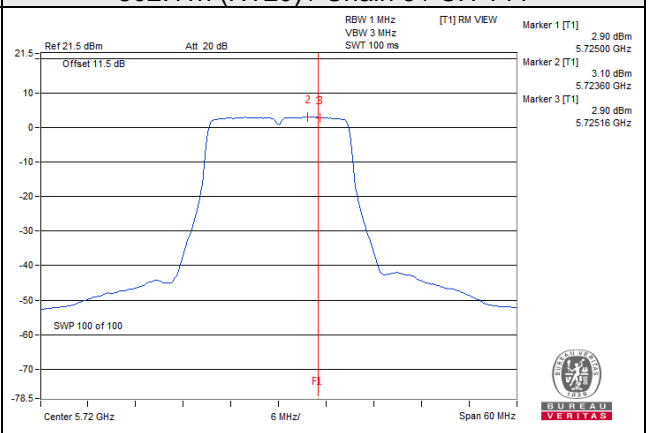
11. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 1.51dBi + 10log(4) = 7.53dBi > 6dBi, so the power density limit shall be reduced to 11-(7.53-6) = 9.47dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

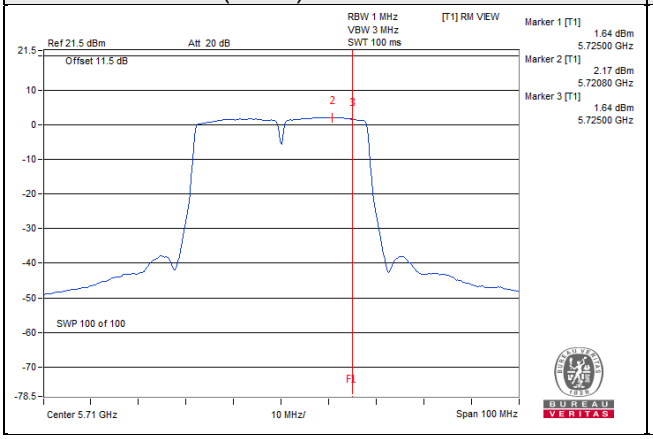
802.11a / Chain 3 / CH 144



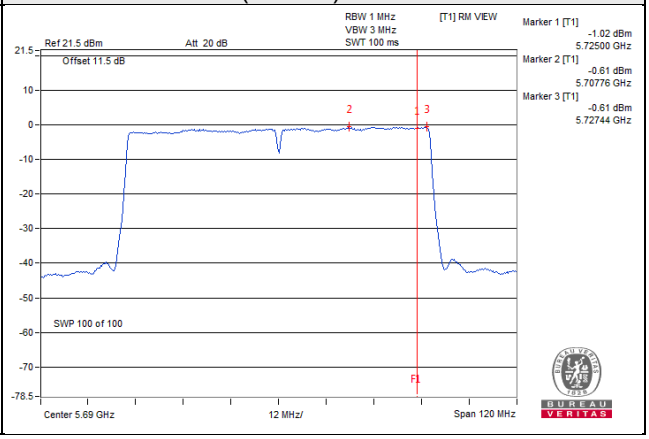
802.11n (HT20) / Chain 3 / CH 144



802.11n (HT40) / Chain 1 / CH 142



802.11ac (VHT80) / Chain 2 / 138



For U-NII-3 band:

802.11a

TX chain	Chan.	Freq. (MHz)	PSD w/o Duty Factor		10 log (N=4) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	144	5720	-5.60	-3.38	6.02	0.23	2.87	28.37	Pass
1	144	5720	-5.17	-2.95	6.02	0.23	3.30	28.37	Pass
2	144	5720	-5.75	-3.53	6.02	0.23	2.72	28.37	Pass
3	144	5720	-5.48	-3.26	6.02	0.23	2.99	28.37	Pass

Note:
1. Directional gain = 1.61dBi + 10log(4) = 7.63dBi > 6dBi, so the power density limit shall be reduced to 30-(7.63-6) = 28.37dBm.
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

TX chain	Chan.	Freq. (MHz)	PSD w/o Duty Factor		10 log (N=4) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	144	5720	-5.98	-3.76	6.02	0.10	2.36	28.37	Pass
1	144	5720	-5.44	-3.22	6.02	0.10	2.90	28.37	Pass
2	144	5720	-5.73	-3.51	6.02	0.10	2.61	28.37	Pass
3	144	5720	-5.46	-3.24	6.02	0.10	2.88	28.37	Pass

Note:
1. Directional gain = 1.61dBi + 10log(4) = 7.63dBi > 6dBi, so the power density limit shall be reduced to 30-(7.63-6) = 28.37dBm.
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT40)

TX chain	Chan.	Freq. (MHz)	PSD w/o Duty Factor		10 log (N=4) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	142	5710	-7.46	-5.24	6.02	0.18	0.96	28.37	Pass
1	142	5710	-7.14	-4.92	6.02	0.18	1.28	28.37	Pass
2	142	5710	-7.01	-4.79	6.02	0.18	1.41	28.37	Pass
3	142	5710	-7.44	-5.22	6.02	0.18	0.98	28.37	Pass

Note:
1. Directional gain = 1.61dBi + 10log(4) = 7.63dBi > 6dBi, so the power density limit shall be reduced to 30-(7.63-6) = 28.37dBm.
2. Refer to section 3.3 for duty cycle spectrum plot.

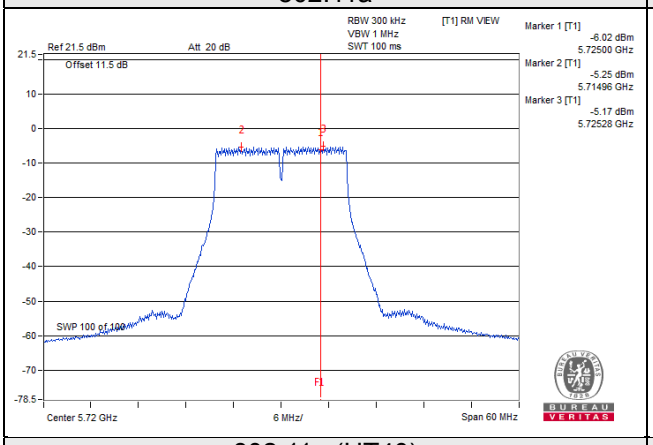
802.11ac (VHT80)

TX chain	Chan.	Freq. (MHz)	PSD w/o Duty Factor		10 log (N=4) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	138	5690	-10.65	-8.43	6.02	0.63	-1.78	28.37	Pass
1	138	5690	-10.21	-7.99	6.02	0.63	-1.34	28.37	Pass
2	138	5690	-9.74	-7.52	6.02	0.63	-0.87	28.37	Pass
3	138	5690	-10.76	-8.54	6.02	0.63	-1.89	28.37	Pass

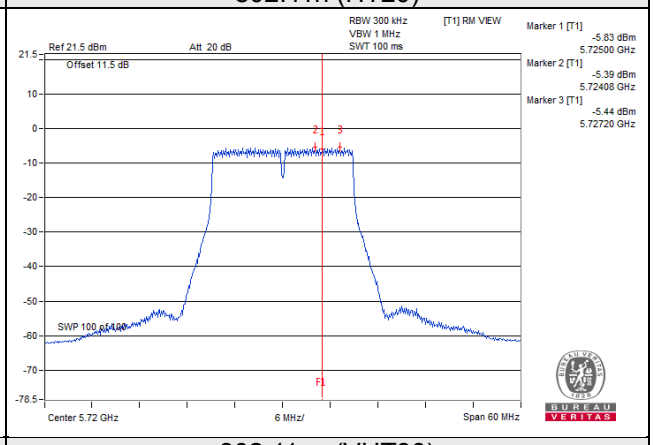
Note:
1. Directional gain = 1.61dBi + 10log(4) = 7.63dBi > 6dBi, so the power density limit shall be reduced to 30-(7.63-6) = 28.37dBm.
2. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

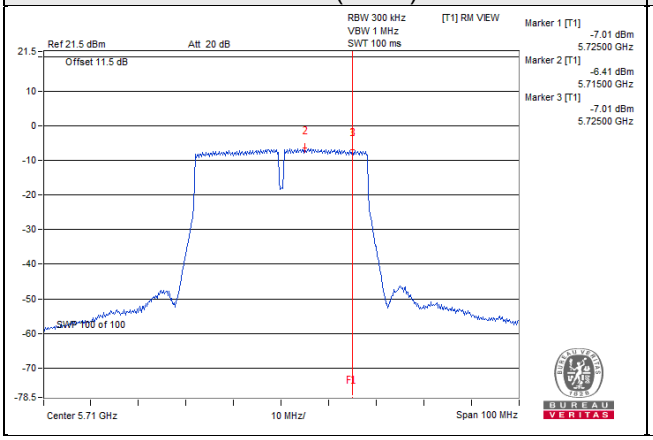
802.11a



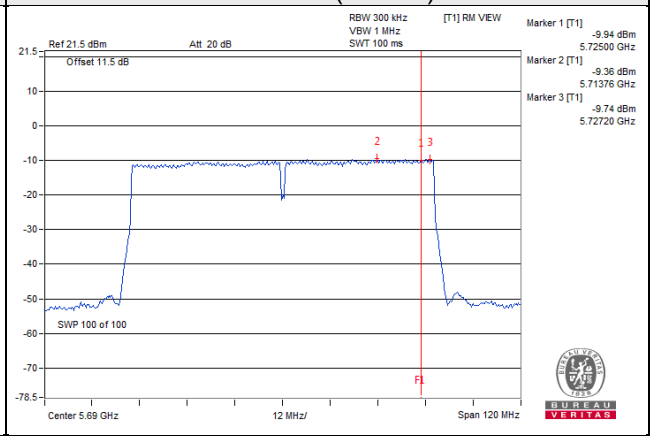
802.11n (HT20)



802.11n (HT40)



802.11ac (VHT80)

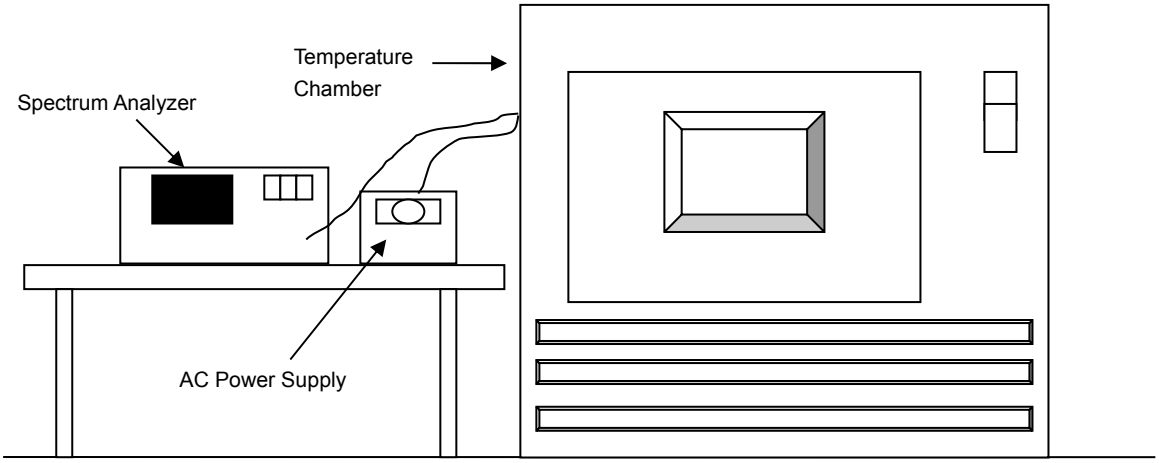


4.6 Frequency Stability

4.6.1 Limits of Frequency Stability Measurement

The frequency of the carrier signal shall be maintained within band of operation

4.6.2 Test Setup



4.6.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 11, 2018	Jun. 10, 2019
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 04, 2018	Jun. 03, 2019
Digital Multimeter Fluke	87-III	70360742	Jun. 29, 2018	Jun. 28, 2019
AC Power Supply Extech	CFW-105	E000603	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.6.4 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.

b. Turn the EUT on and couple its output to a spectrum analyzer.

c. Turn the EUT off and set the chamber to the highest temperature specified.

d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.

e. Repeat step c and d with every 10 degrees reduction until the lowest temperature achieved.

f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Set the EUT transmit at un-modulation mode to test frequency stability.

4.6.7 Test Results

Frequency Stability Versus Temp.									
Operating Frequency: 5720MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result
40	120	5720.0083	Pass	5720.0081	Pass	5720.0087	Pass	5720.0103	Pass
30	120	5719.9842	Pass	5719.9856	Pass	5719.9855	Pass	5719.9844	Pass
20	120	5719.9837	Pass	5719.9841	Pass	5719.9825	Pass	5719.9834	Pass
10	120	5719.9812	Pass	5719.9837	Pass	5719.9839	Pass	5719.9849	Pass
0	120	5719.9865	Pass	5719.986	Pass	5719.985	Pass	5719.9875	Pass

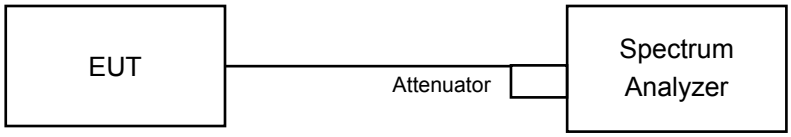
Frequency Stability Versus Voltage									
Operating Frequency: 5720MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result
20	138	5719.9840	Pass	5719.9844	Pass	5719.9815	Pass	5719.9824	Pass
	120	5719.9837	Pass	5719.9841	Pass	5719.9825	Pass	5719.9834	Pass
	102	5719.9843	Pass	5719.9834	Pass	5719.9836	Pass	5719.9845	Pass

4.7 6dB Bandwidth Measurement

4.7.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.7.7 Test Results

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
144	5720 (For U-NII-3)	16.40	16.39	16.37	16.40	0.5	Pass

802.11n (HT20)

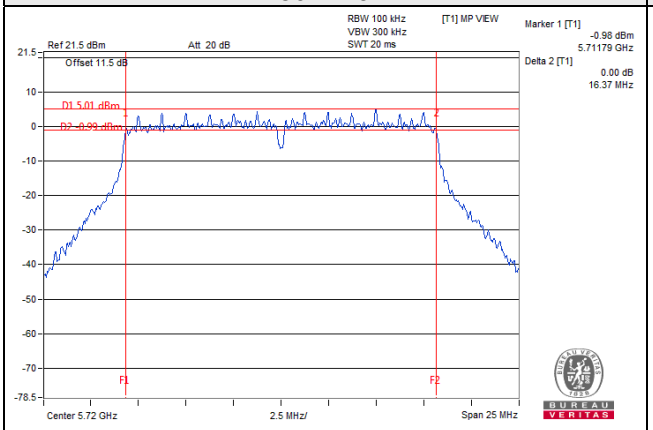
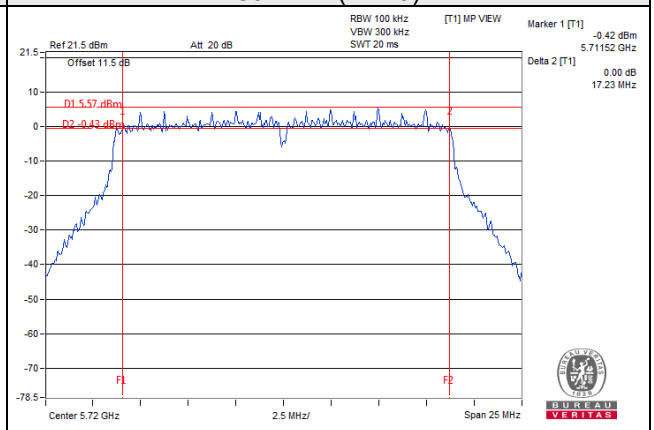
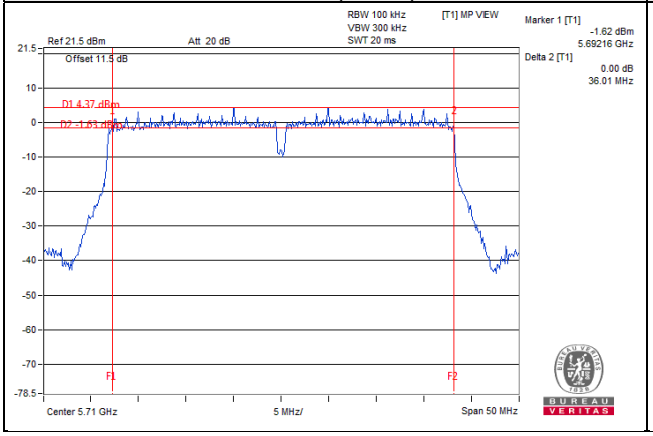
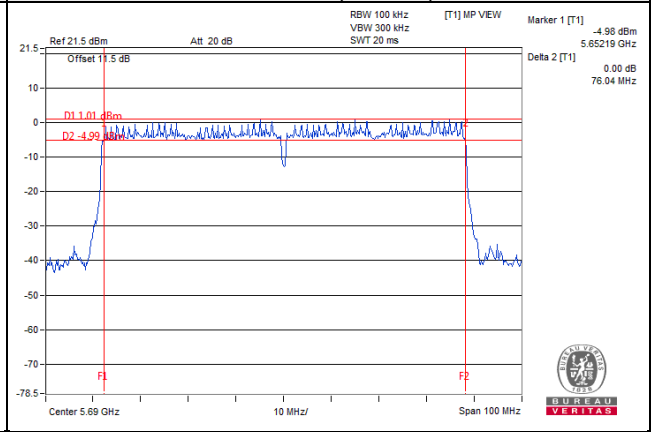
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
144	5720 (For U-NII-3)	17.61	17.61	17.23	17.60	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
142	5710 (For U-NII-2C)	36.37	36.01	36.41	36.42	0.5	Pass

802.11ac (VHT80)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
138	5690 (For U-NII-2C)	76.44	76.07	76.47	76.04	0.5	Pass

Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

Note:

For CH144 (UNII-3 Band): The 6dB bandwidth above 5725MHz = Marker 1 + Delta 2 - 5725MHz

For CH142 (UNII-3 Band): The 6dB bandwidth above 5725MHz = Marker 1 + Delta 2 - 5725MHz

For CH138 (UNII-3 Band): The 6dB bandwidth above 5725MHz = Marker 1 + Delta 2 - 5725MHz

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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