FCC Test Report

Report No.:	RF161109C19-1
FCC ID:	A8J-EWS380AP
Test Model:	EWS380AP
Series Model:	EAP2200 (refer to item 3.1 for more details)
Received Date:	Nov. 09, 2016
Test Date:	May 18 ~ Jun. 20, 2017
Issued Date:	Jul. 10, 2017
Applicant:	EnGenius Technologies
Address:	1580 Scenic Avenue, Costa Mesa, CA92626
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.)

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.
The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF161109C19-1	Original release.	Jul. 10, 2017

1 Certificate of Conformity

Product:	Wireless device
Brand:	EnGenius
Test Model:	EWS380AP
Series Model:	EAP2200 (refer to item 3.1 for more details)
Sample Status:	Engineering sample
Applicant:	EnGenius Technologies
Test Date:	May 18 ~ Jun. 20, 2017
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 EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Jul. 10, 2017

Suntee Liu / Specialist

Approved by : _____ , **Date:** Jul. 10, 2017

Ken Liu / Senior Manager

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 -6.67dB at 0.48190MHz.
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 -1.4dB at 5650.00, 15600.00MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Meet the requirement of limit.
15.407(a)(1/2/3)	Peak Power Spectral Density	Pass	Meet the requirement of limit. (U-NII-3 Band only)
15.407(e)	6dB bandwidth	Pass	Meet the requirement of limit.
15.407(g)	Frequency Stability	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is IPEX not a standard connector.

*For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OOBE test plots were recorded in Annex A.

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	30MHz ~ 200MHz	3.86 dB
	200MHz ~1000MHz	3.87 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	Wireless device
Brand	EnGenius
Test Model	EWS380AP
Series Model	EAP2200
Model Difference	Refer to Note
Sample Status	Engineering sample
Power Supply Rating	12Vdc (adapter) 54Vdc (POE)
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 300Mbps 802.11ac: up to 867Mbps
Operating Frequency	5180~5240MHz, 5745~5825MHz
Number of Channel	5180~5240MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5745~5825MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
Output Power	CDD Mode: 5180~5240MHz: 194.950mW 5745~5825MHz: 219.483mW Beamforming Mode: 5180~5240MHz: 96.376mW 5745~5825MHz: 109.640mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter
Cable Supplied	NA

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

Modulation Mode	TX Function	Beamforming
802.11b	2TX	Not Support
802.11g	2TX	Not Support
802.11a	2TX	Not Support
802.11n (HT20)	2TX	Support
802.11n (HT40)	2TX	Support
802.11ac (VHT20)	2TX	Support
802.11ac (VHT40)	2TX	Support
802.11ac (VHT80)	2TX	Support

* The modulation and bandwidth are similar for 802.11n mode for 20MHz/40MHz and 802.11ac mode for 20MHz/40MHz, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

* For 802.11n and 802.11ac, CDD mode and Beamforming mode are presented in power output test item. For other test items, CDD mode is the worst case for final tests after pretesting.

2. All models are listed as below. Model EWS380AP is the representative for final test.

Brand	Model	Difference
EnGenius	EWS380AP	Marketing requirement
	EAP2200	

3. The EUT uses following antennas.

Antenna Type	PIFA		Antenna Connector		IPEX	
Frequency	2.4GHz		5GHz Band 1, 2		5GHz Band 3, 4	
Radio	1		3		2	
Antenna	1	2	3	4	5	6
Gain (dBi)	4.62	4.44	5.88	5.94	5.97	5.99

4. The EUT uses following adapter.

Brand	DVE
Model	DSA-12PFT-12 FUS 120100
Input Power	100-240Vac, 50/60Hz, 0.5A
Output Power	+12Vdc, 1A
Power Line	1.45m DC cable without core attached on adapter

5. Radio 1 and Radio 2 / Radio 1 and Radio 3 / Radio 2 and Radio 3 can transmit at same time.

6. Spurious emission of the simultaneous operation (Radio 1 and Radio 2 / Radio 1 and Radio 3 / Radio 2 and Radio 3) has been evaluated and no non-compliance was found.

3.2 Description of Test Modes

5180~5240MHz:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

5745~5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE≥1G	RE<1G	PLC	APCM	
A	-	√	√	-	Power from adapter
B	√	√	√	√	Power from POE

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:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Y-plane.
2. "-" means no effect.

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)	Remark
B	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0	Radio 3
	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	13.0	Radio 3
	802.11n (HT40)		38 to 46	38, 46	OFDM	27.0	Radio 3
	802.11ac (VHT80)		42	42	OFDM	58.5	Radio 3
B	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0	Radio 2
	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	13.0	Radio 2
	802.11n (HT40)		151 to 159	151, 159	OFDM	27.0	Radio 2
	802.11ac (VHT80)		155	155	OFDM	58.5	Radio 2

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)	Remark
A, B	802.11a	5180-5240	36 to 48	149	OFDM	6.0	Radio 3
		5745-5825	149 to 165		OFDM	6.0	Radio 2

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)	Remark
A, B	802.11a	5180-5240	36 to 48	149	OFDM	6.0	Radio 3
		5745-5825	149 to 165		OFDM	6.0	Radio 2

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)	Remark
B	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0	Radio 3
	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	13.0	Radio 3
	802.11n (HT40)		38 to 46	38, 46	OFDM	27.0	Radio 3
	802.11ac (VHT80)		42	42	OFDM	58.5	Radio 3
B	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0	Radio 2
	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	13.0	Radio 2
	802.11n (HT40)		151 to 159	151, 159	OFDM	27.0	Radio 2
	802.11ac (VHT80)		155	155	OFDM	58.5	Radio 2

Test Condition:

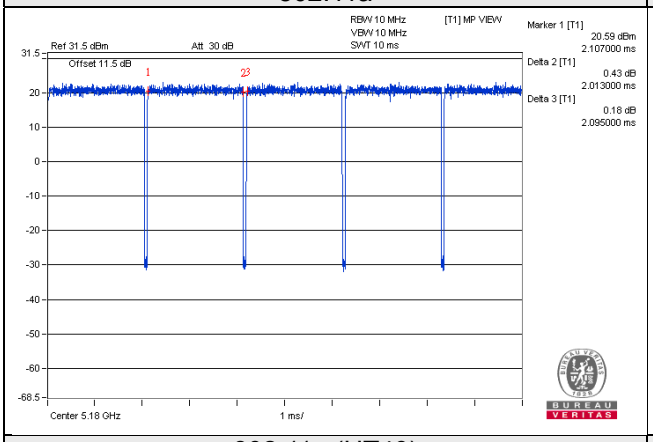
Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	27 deg. C, 69% RH 26 deg. C, 68% RH 25 deg. C, 66% RH	120Vac, 60Hz	James Yang Jones Chang
RE<1G	20 deg. C, 63% RH	120Vac, 60Hz	Jones Chang
PLC	25 deg. C, 67% RH	120Vac, 60Hz	Jones Chang
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Cedric Wu

3.3 Duty Cycle of Test Signal

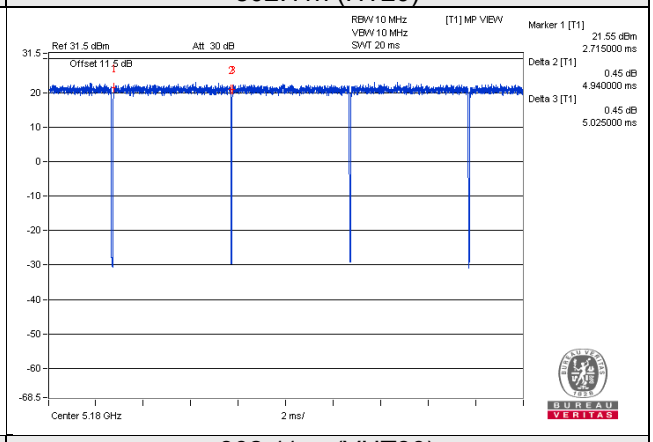
Duty cycle of test signal is ≥ 98%, duty factor is not required.
Duty cycle of test signal is < 98%, duty factor shall be considered.

802.11a: Duty cycle = 2.013/2.095 = 0.961, Duty factor = 10 * log(1/0.961) = 0.17
802.11n (HT20): Duty cycle = 4.940/5.025 = 0.983
802.11n (HT40): Duty cycle = 2.380/2.485 = 0.958, Duty factor = 10 * log(1/0.958) = 0.19
802.11ac (VHT80): Duty cycle = 1.133/1.200 = 0.944, Duty factor = 10 * log(1/0.944) = 0.25

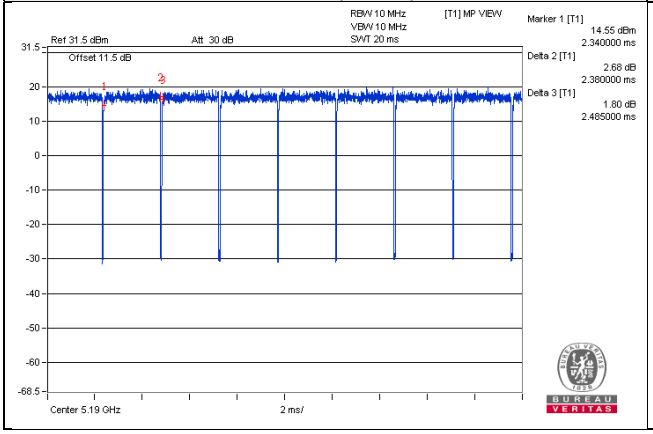
802.11a



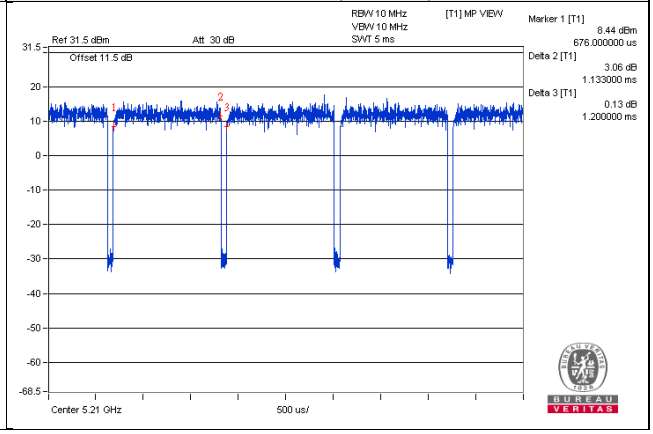
802.11n (HT20)



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	E5410	1HC2XM1	FCC DoC Approved	-
B.	Load	NA	NA	NA	NA	-
C.	POE	EnGenius	EPA5006GP	NA	NA	Provided by manufacturer I/P: 100-240Vac, 0.8A, 50-60Hz O/P: 54Vdc, 0.6A

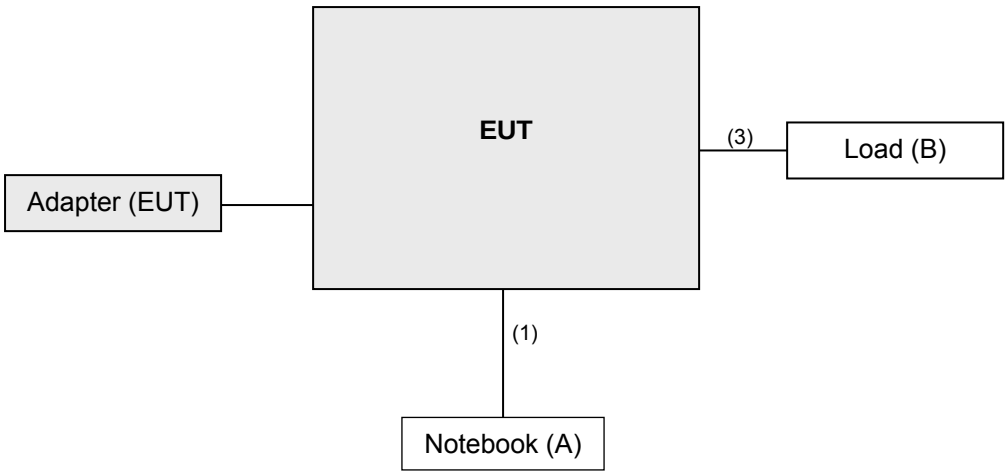
Note:

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.

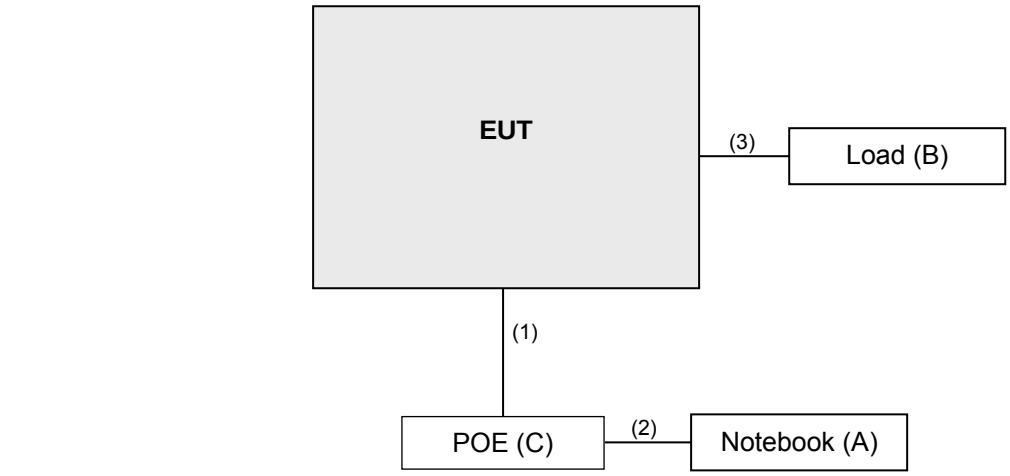
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45, Cat5e	1	3	N	0	-
2.	RJ45, Cat5e	1	3	N	0	-
3.	RJ45, Cat5e	1	3	N	0	-

3.4.1 Configuration of System under Test

Mode A



Mode B



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 v01r04
662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10:2013

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

Note: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

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 v01r04</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	ESIB7	100187	May 02, 2017	May 01, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Nov. 16, 2016	Nov. 15, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Dec. 28, 2016	Dec. 27, 2017
HORN Antenna SCHWARZBECK	9120D	209	Dec. 27, 2016	Dec. 26, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 2017
Loop Antenna	EM-6879	269	Aug. 11, 2016	Aug. 10, 2017
Preamplifier Agilent	8447D	2944A10738	Aug. 22, 2016	Aug. 21, 2017
Preamplifier Agilent	8449B	3008A01922	Sep. 18, 2016	Sep. 17, 2017
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (214378)	Aug. 22, 2016	Aug. 21, 2017
RF signal cable HUBER+SUHNER	SUCOFLEX 106	Cable-CH3-03 (309224+12738)	Aug. 22, 2016	Aug. 21, 2017
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 17, 2016	Oct. 16, 2017
High Speed Peak Power Meter	ML2495A	0824012	Aug. 11, 2016	Aug. 10, 2017
Power Sensor	MA2411B	0738171	Aug. 11, 2016	Aug. 10, 2017

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 3.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 988962.
5. The IC Site Registration No. is IC 7450F-3.

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. Both X and Y axes 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:

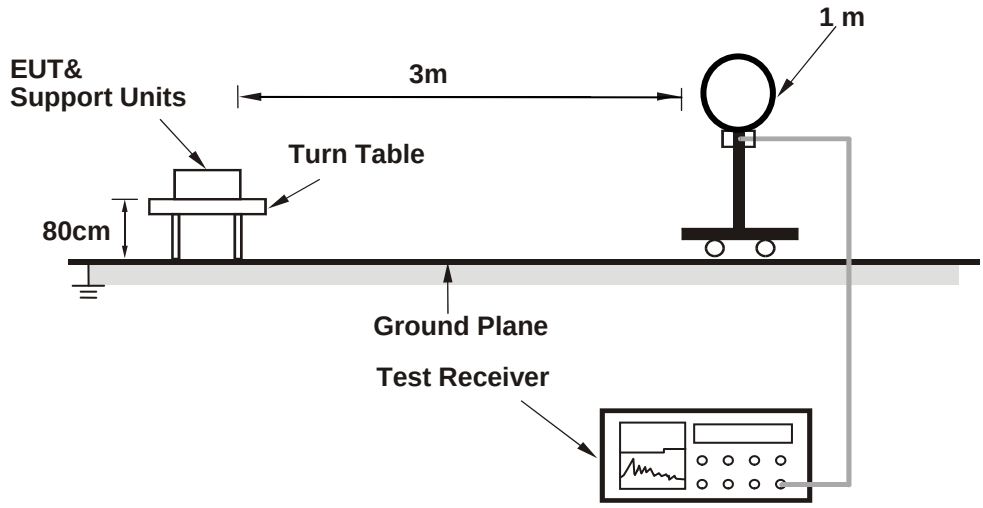
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

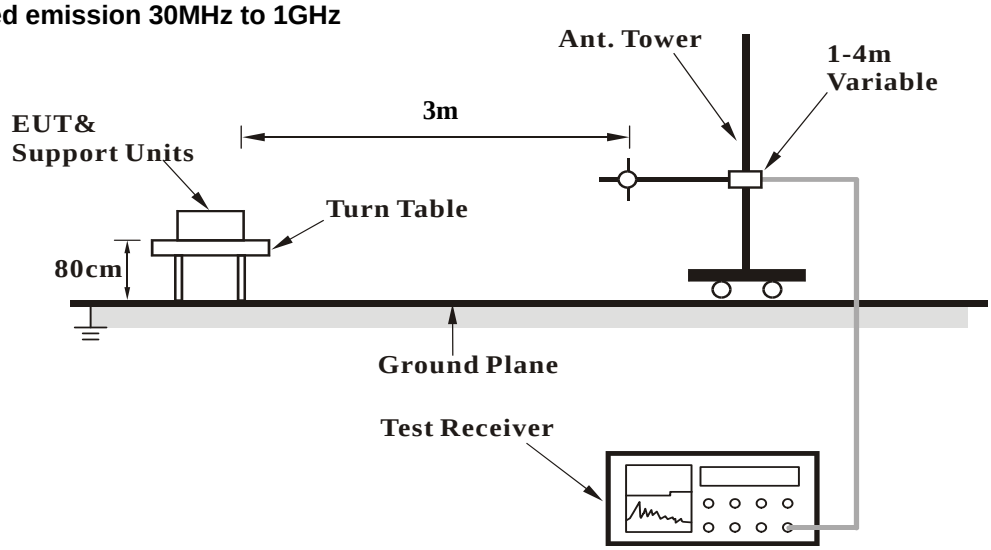
No deviation.

4.1.5 Test Setup

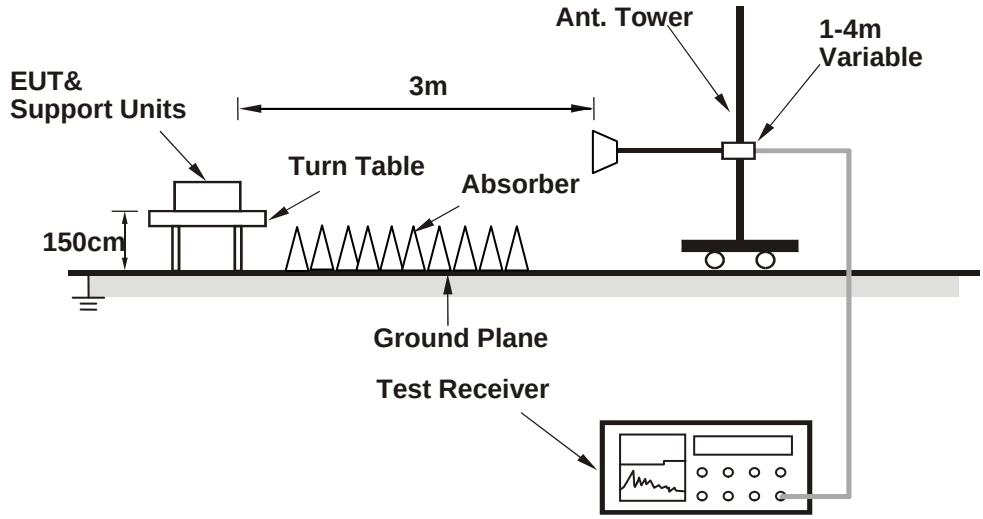
For Radiated emission below 30MHz



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 a 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".
e. The necessary accessories enable the system in full functions.

4.1.7 Test Results

Above 1GHz data:

802.11a

CHANNEL	TX Channel 36	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	5150.00	67.0 PK	74.0	-7.0	1.57 H	285	66.2	0.8
2	5150.00	52.3 AV	54.0	-1.7	1.57 H	285	51.5	0.8
3	*5180.00	112.2 PK			1.31 H	39	73.5	38.7
4	*5180.00	102.1 AV			1.31 H	39	63.4	38.7
5	#10360.00	56.8 PK	74.0	-17.2	2.04 H	359	44.1	12.7
6	#10360.00	44.0 AV	54.0	-10.0	2.04 H	359	31.3	12.7
7	15600.00	64.1 PK	74.0	-9.9	2.04 H	130	49.6	14.5
8	15600.00	50.6 AV	54.0	-3.4	2.04 H	130	36.1	14.5
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	5150.00	57.1 PK	74.0	-16.9	3.59 V	359	56.3	0.8
2	5150.00	44.2 AV	54.0	-9.8	3.59 V	359	43.4	0.8
3	*5180.00	108.0 PK			3.69 V	7	69.3	38.7
4	*5180.00	98.6 AV			3.69 V	7	59.9	38.7
5	#10360.00	55.6 PK	74.0	-18.4	2.01 V	155	42.9	12.7
6	#10360.00	42.7 AV	54.0	-11.3	2.01 V	155	30.0	12.7
7	15540.00	61.2 PK	74.0	-12.8	1.59 V	189	46.8	14.4
8	15540.00	48.7 AV	54.0	-5.3	1.59 V	189	34.3	14.4

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.

CHANNEL	TX Channel 40	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	5150.00	69.9 PK	74.0	-4.1	3.55 H	285	69.1	0.8
2	5150.00	51.2 AV	54.0	-2.8	3.55 H	285	50.4	0.8
3	*5200.00	113.7 PK			1.21 H	50	75.0	38.7
4	*5200.00	103.7 AV			1.21 H	50	65.0	38.7
5	#10400.00	56.6 PK	74.0	-17.4	1.79 H	298	43.9	12.7
6	#10400.00	43.5 AV	54.0	-10.5	1.79 H	298	30.8	12.7
7	15600.00	66.2 PK	74.0	-7.8	2.04 H	146	51.7	14.5
8	15600.00	52.3 AV	54.0	-1.7	2.04 H	146	37.8	14.5
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	5150.00	56.3 PK	74.0	-17.7	3.55 V	0	55.5	0.8
2	5150.00	44.4 AV	54.0	-9.6	3.55 V	0	43.6	0.8
3	*5200.00	111.1 PK			3.69 V	0	72.4	38.7
4	*5200.00	101.1 AV			3.69 V	0	62.4	38.7
5	#10400.00	54.6 PK	74.0	-19.4	1.98 V	69	41.9	12.7
6	#10400.00	42.5 AV	54.0	-11.5	1.98 V	69	29.8	12.7
7	15600.00	63.7 PK	74.0	-10.3	1.63 V	186	49.2	14.5
8	15600.00	51.3 AV	54.0	-2.7	1.63 V	186	36.8	14.5

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.

CHANNEL	TX Channel 48	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	*5240.00	114.4 PK			1.46 H	45	75.6	38.8
2	*5240.00	104.4 AV			1.46 H	45	65.6	38.8
3	5380.00	55.8 PK	74.0	-18.2	1.61 H	111	54.6	1.2
4	5380.00	43.8 AV	54.0	-10.2	1.61 H	111	42.6	1.2
5	#10480.00	57.5 PK	74.0	-16.5	1.68 H	70	44.0	13.5
6	#10480.00	44.8 AV	54.0	-9.2	1.68 H	70	31.3	13.5
7	15720.00	64.6 PK	74.0	-9.4	2.01 H	132	50.7	13.9
8	15720.00	52.2 AV	54.0	-1.8	2.01 H	132	38.3	13.9
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	*5240.00	112.7 PK			3.70 V	12	73.9	38.8
2	*5240.00	102.8 AV			3.70 V	12	64.0	38.8
3	5350.00	54.4 PK	74.0	-19.6	3.60 V	350	53.3	1.1
4	5350.00	42.8 AV	54.0	-11.2	3.60 V	350	41.7	1.1
5	#10480.00	56.7 PK	74.0	-17.3	2.20 V	139	43.2	13.5
6	#10480.00	42.6 AV	54.0	-11.4	2.20 V	139	29.1	13.5
7	15720.00	63.0 PK	74.0	-11.0	1.56 V	189	49.1	13.9
8	15720.00	51.2 AV	54.0	-2.8	1.56 V	189	37.3	13.9

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.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 149	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	#5648.00	56.5 PK	68.2	-11.7	3.14 H	46	54.8	1.7
2	*5745.00	118.2 PK			3.14 H	46	78.3	39.9
3	*5745.00	107.5 AV			3.14 H	46	67.6	39.9
4	#5958.40	57.6 PK	68.2	-10.6	3.14 H	46	55.0	2.6
5	7333.00	53.9 PK	74.0	-20.1	3.75 H	101	46.1	7.8
6	7333.00	44.4 AV	54.0	-9.6	3.75 H	101	36.6	7.8
7	11490.00	61.2 PK	74.0	-12.8	1.56 H	191	46.7	14.5
8	11490.00	47.8 AV	54.0	-6.2	1.56 H	191	33.3	14.5
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	#5633.60	55.3 PK	68.2	-12.9	1.21 V	1	53.6	1.7
2	*5745.00	115.6 PK			1.19 V	2	75.7	39.9
3	*5745.00	104.7 AV			1.19 V	2	64.8	39.9
4	#5967.20	57.1 PK	68.2	-11.1	1.21 V	1	54.4	2.7
5	7333.00	54.3 PK	74.0	-19.7	2.92 V	358	46.5	7.8
6	7333.00	44.6 AV	54.0	-9.4	2.92 V	358	36.8	7.8
7	11490.00	61.1 PK	74.0	-12.9	3.05 V	190	46.6	14.5
8	11490.00	47.8 AV	54.0	-6.2	3.05 V	190	33.3	14.5

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.

CHANNEL	TX Channel 157	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	#5610.40	56.2 PK	68.2	-12.0	2.83 H	40	54.5	1.7
2	*5785.00	119.4 PK			2.83 H	40	79.3	40.1
3	*5785.00	108.9 AV			2.83 H	40	68.8	40.1
4	#5975.20	56.9 PK	68.2	-11.3	2.83 H	40	54.1	2.8
5	11570.00	61.4 PK	74.0	-12.6	1.56 H	193	47.1	14.3
6	11570.00	47.8 AV	54.0	-6.2	1.56 H	193	33.5	14.3
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	#5634.40	56.6 PK	68.2	-11.6	1.17 V	3	54.9	1.7
2	*5785.00	115.5 PK			1.17 V	3	75.4	40.1
3	*5785.00	105.0 AV			1.17 V	3	64.9	40.1
4	#5948.00	56.8 PK	68.2	-11.4	1.17 V	3	54.2	2.6
5	11570.00	62.4 PK	74.0	-11.6	1.55 V	162	48.1	14.3
6	11570.00	48.6 AV	54.0	-5.4	1.55 V	162	34.3	14.3

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.

CHANNEL	TX Channel 165	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	#5638.40	56.0 PK	68.2	-12.2	2.22 H	42	54.3	1.7
2	*5825.00	120.2 PK			2.22 H	42	80.0	40.2
3	*5825.00	109.9 AV			2.22 H	42	69.7	40.2
4	#5967.20	57.8 PK	68.2	-10.4	2.22 H	42	55.1	2.7
5	11650.00	60.1 PK	74.0	-13.9	2.14 H	213	45.7	14.4
6	11650.00	47.0 AV	54.0	-7.0	2.14 H	213	32.6	14.4
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	#5628.00	55.2 PK	68.2	-13.0	3.46 V	14	53.5	1.7
2	*5825.00	111.0 PK			3.46 V	14	70.8	40.2
3	*5825.00	100.5 AV			3.46 V	14	60.3	40.2
4	#5944.80	57.1 PK	68.2	-11.1	3.46 V	14	54.5	2.6
5	11650.00	62.5 PK	74.0	-11.5	1.39 V	173	48.1	14.4
6	11650.00	48.3 AV	54.0	-5.7	1.39 V	173	33.9	14.4

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.

802.11n (HT20)

CHANNEL	TX Channel 36	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	5150.00	69.2 PK	74.0	-4.8	1.58 H	37	68.4	0.8
2	5150.00	52.3 AV	54.0	-1.7	1.58 H	37	51.5	0.8
3	*5180.00	112.2 PK			1.07 H	46	73.5	38.7
4	*5180.00	101.6 AV			1.07 H	46	62.9	38.7
5	#10360.00	56.1 PK	74.0	-17.9	1.62 H	263	43.4	12.7
6	#10360.00	42.9 AV	54.0	-11.1	1.62 H	263	30.2	12.7
7	15540.00	64.0 PK	74.0	-10.0	2.05 H	130	49.6	14.4
8	15540.00	50.1 AV	54.0	-3.9	2.05 H	130	35.7	14.4
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	5150.00	62.2 PK	74.0	-11.8	3.69 V	34	61.4	0.8
2	5150.00	47.4 AV	54.0	-6.6	3.69 V	34	46.6	0.8
3	*5180.00	108.4 PK			3.59 V	8	69.7	38.7
4	*5180.00	98.4 AV			3.59 V	8	59.7	38.7
5	#10360.00	54.8 PK	74.0	-19.2	1.55 V	111	42.1	12.7
6	#10360.00	42.1 AV	54.0	-11.9	1.55 V	111	29.4	12.7
7	15540.00	62.1 PK	74.0	-11.9	1.80 V	173	47.7	14.4
8	15540.00	48.7 AV	54.0	-5.3	1.80 V	173	34.3	14.4

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.

CHANNEL	TX Channel 40	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	5150.00	64.2 PK	74.0	-9.8	1.60 H	287	63.4	0.8
2	5150.00	46.6 AV	54.0	-7.4	1.60 H	287	45.8	0.8
3	*5200.00	113.4 PK			1.18 H	289	74.7	38.7
4	*5200.00	103.7 AV			1.18 H	289	65.0	38.7
5	#10400.00	56.3 PK	74.0	-17.7	1.58 H	57	43.6	12.7
6	#10400.00	43.3 AV	54.0	-10.7	1.58 H	57	30.6	12.7
7	15600.00	67.0 PK	74.0	-7.0	2.23 H	138	52.5	14.5
8	**15600.00**	**52.6 AV**	**54.0**	**-1.4**	**2.23 H**	**138**	**38.1**	**14.5**
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	5150.00	59.1 PK	74.0	-14.9	3.50 V	19	58.3	0.8
2	5150.00	43.2 AV	54.0	-10.8	3.50 V	19	42.4	0.8
3	*5200.00	111.0 PK			3.59 V	8	72.3	38.7
4	*5200.00	100.7 AV			3.59 V	8	62.0	38.7
5	#10400.00	55.4 PK	74.0	-18.6	1.75 V	200	42.7	12.7
6	#10400.00	42.4 AV	54.0	-11.6	1.75 V	200	29.7	12.7
7	15600.00	63.6 PK	74.0	-10.4	1.63 V	178	49.1	14.5
8	15600.00	50.7 AV	54.0	-3.3	1.63 V	178	36.2	14.5

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.

CHANNEL	TX Channel 48	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	*5240.00	114.3 PK			1.29 H	46	75.5	38.8
2	*5240.00	104.2 AV			1.29 H	46	65.4	38.8
3	5375.00	56.3 PK	74.0	-17.7	1.69 H	187	55.1	1.2
4	5375.00	44.2 AV	54.0	-9.8	1.69 H	187	43.0	1.2
5	#10480.00	56.5 PK	74.0	-17.5	1.74 H	82	43.0	13.5
6	#10480.00	43.7 AV	54.0	-10.3	1.74 H	82	30.2	13.5
7	15720.00	66.4 PK	74.0	-7.6	2.11 H	130	52.5	13.9
8	15720.00	52.4 AV	54.0	-1.6	2.11 H	130	38.5	13.9
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	*5240.00	112.4 PK			3.51 V	7	73.6	38.8
2	*5240.00	102.5 AV			3.51 V	7	63.7	38.8
3	5350.00	53.8 PK	74.0	-20.2	3.13 V	151	52.7	1.1
4	5350.00	41.7 AV	54.0	-12.3	3.13 V	151	40.6	1.1
5	#10480.00	56.3 PK	74.0	-17.7	1.94 V	4	42.8	13.5
6	#10480.00	43.4 AV	54.0	-10.6	1.94 V	4	29.9	13.5
7	15720.00	64.8 PK	74.0	-9.2	2.09 V	170	50.9	13.9
8	15720.00	51.0 AV	54.0	-3.0	2.09 V	170	37.1	13.9

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.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 149	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	#5648.00	58.8 PK	68.2	-9.4	1.95 H	43	57.1	1.7
2	*5745.00	120.0 PK			1.95 H	43	80.1	39.9
3	*5745.00	109.4 AV			1.95 H	43	69.5	39.9
4	#5974.40	57.0 PK	68.2	-11.2	1.95 H	43	54.3	2.7
5	11490.00	61.0 PK	74.0	-13.0	1.81 H	146	46.5	14.5
6	11490.00	47.1 AV	54.0	-6.9	1.81 H	146	32.6	14.5
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	#5612.80	55.8 PK	68.2	-12.4	3.23 V	26	54.1	1.7
2	*5745.00	112.4 PK			3.23 V	26	72.5	39.9
3	*5745.00	101.1 AV			3.23 V	26	61.2	39.9
4	#5965.60	57.4 PK	68.2	-10.8	3.23 V	26	54.7	2.7
5	11490.00	61.3 PK	74.0	-12.7	2.13 V	164	46.8	14.5
6	11490.00	47.5 AV	54.0	-6.5	2.13 V	164	33.0	14.5

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.

CHANNEL	TX Channel 157	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	#5620.80	56.7 PK	68.2	-11.5	1.97 H	46	55.0	1.7
2	*5785.00	120.0 PK			1.97 H	46	79.9	40.1
3	*5785.00	109.3 AV			1.97 H	46	69.2	40.1
4	#5960.00	57.3 PK	68.2	-10.9	1.97 H	46	54.7	2.6
5	11570.00	61.5 PK	74.0	-12.5	1.95 H	184	47.2	14.3
6	11570.00	47.4 AV	54.0	-6.6	1.95 H	184	33.1	14.3
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	#5648.80	55.2 PK	68.2	-13.0	3.30 V	162	53.5	1.7
2	*5785.00	110.9 PK			3.30 V	162	70.8	40.1
3	*5785.00	99.9 AV			3.30 V	162	59.8	40.1
4	#5962.40	57.2 PK	68.2	-11.0	3.30 V	162	54.6	2.6
5	11570.00	61.4 PK	74.0	-12.6	1.75 V	163	47.1	14.3
6	11570.00	48.1 AV	54.0	-5.9	1.75 V	163	33.8	14.3

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.

CHANNEL	TX Channel 165	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	#5608.80	56.1 PK	68.2	-12.1	2.01 H	42	54.4	1.7
2	*5825.00	119.7 PK			2.01 H	42	79.5	40.2
3	*5825.00	108.8 AV			2.01 H	42	68.6	40.2
4	#5976.80	57.0 PK	68.2	-11.2	2.01 H	42	54.2	2.8
5	11650.00	60.2 PK	74.0	-13.8	1.93 H	148	45.8	14.4
6	11650.00	46.6 AV	54.0	-7.4	1.93 H	148	32.2	14.4
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	#5645.60	56.9 PK	68.2	-11.3	3.03 V	15	55.2	1.7
2	*5825.00	111.0 PK			3.03 V	15	70.8	40.2
3	*5825.00	99.7 AV			3.03 V	15	59.5	40.2
4	#5932.80	57.5 PK	68.2	-10.7	3.03 V	15	54.9	2.6
5	11650.00	60.6 PK	74.0	-13.4	1.66 V	176	46.2	14.4
6	11650.00	47.3 AV	54.0	-6.7	1.66 V	176	32.9	14.4

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.

802.11n (HT40)

CHANNEL	TX Channel 38	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	5150.00	55.5 PK	74.0	-18.5	1.94 H	286	54.7	0.8
2	5150.00	52.2 AV	54.0	-1.8	1.94 H	286	51.4	0.8
3	*5190.00	106.8 PK			1.51 H	38	68.1	38.7
4	*5190.00	97.2 AV			1.51 H	38	58.5	38.7
5	#10380.00	55.4 PK	74.0	-18.6	1.60 H	100	42.6	12.8
6	#10380.00	42.6 AV	54.0	-11.4	1.60 H	100	29.8	12.8
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	5150.00	63.7 PK	74.0	-10.3	3.70 V	4	62.9	0.8
2	5150.00	47.1 AV	54.0	-6.9	3.70 V	4	46.3	0.8
3	*5190.00	103.8 PK			3.62 V	9	65.1	38.7
4	*5190.00	94.6 AV			3.62 V	9	55.9	38.7
5	#10380.00	55.3 PK	74.0	-18.7	2.22 V	68	42.5	12.8
6	#10380.00	42.3 AV	54.0	-11.7	2.22 V	68	29.5	12.8

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.

CHANNEL	TX Channel 46	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	5150.00	65.4 PK	74.0	-8.6	2.00 H	285	64.6	0.8
2	5150.00	52.3 AV	54.0	-1.7	2.00 H	285	51.5	0.8
3	*5230.00	112.0 PK			1.33 H	46	73.2	38.8
4	*5230.00	102.1 AV			1.33 H	46	63.3	38.8
5	5350.00	59.7 PK	74.0	-14.3	1.87 H	287	58.6	1.1
6	5350.00	43.7 AV	54.0	-10.3	1.87 H	287	42.6	1.1
7	#10460.00	56.4 PK	74.0	-17.6	1.69 H	206	43.1	13.3
8	#10460.00	43.2 AV	54.0	-10.8	1.69 H	206	29.9	13.3
9	15690.00	63.0 PK	74.0	-11.0	1.99 H	147	48.7	14.3
10	15690.00	50.8 AV	54.0	-3.2	1.99 H	147	36.5	14.3
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	5150.00	64.3 PK	74.0	-9.7	3.71 V	6	63.5	0.8
2	5150.00	49.5 AV	54.0	-4.5	3.71 V	6	48.7	0.8
3	*5230.00	108.9 PK			3.70 V	10	70.1	38.8
4	*5230.00	99.5 AV			3.70 V	10	60.7	38.8
5	5350.00	57.2 PK	74.0	-16.8	1.90 V	172	56.1	1.1
6	5350.00	44.4 AV	54.0	-9.6	1.90 V	172	43.3	1.1
7	#10460.00	55.6 PK	74.0	-18.4	1.93 V	124	42.3	13.3
8	#10460.00	42.7 AV	54.0	-11.3	1.93 V	124	29.4	13.3
9	15690.00	61.6 PK	74.0	-12.4	1.69 V	179	47.3	14.3
10	15690.00	49.6 AV	54.0	-4.4	1.69 V	179	35.3	14.3

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.

CHANNEL	TX Channel 151	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	#5648.80	62.6 PK	68.2	-5.6	2.00 H	39	60.9	1.7
2	**#5650.00**	**66.8 PK**	**68.2**	**-1.4**	**1.87 H**	**42**	**65.1**	**1.7**
3	*5755.00	116.3 PK			2.00 H	39	76.4	39.9
4	*5755.00	105.8 AV			2.00 H	39	65.9	39.9
5	#5957.60	57.8 PK	68.2	-10.4	2.00 H	39	55.2	2.6
6	11510.00	59.7 PK	74.0	-14.3	1.89 H	244	45.2	14.5
7	11510.00	46.9 AV	54.0	-7.1	1.89 H	244	32.4	14.5
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	#5645.60	59.9 PK	68.2	-8.3	1.23 V	1	58.2	1.7
2	#5650.00	60.5 PK	68.2	-7.7	1.57 V	336	58.8	1.7
3	*5755.00	111.6 PK			1.23 V	1	71.7	39.9
4	*5755.00	101.3 AV			1.23 V	1	61.4	39.9
5	#5981.60	57.3 PK	68.2	-10.9	1.23 V	1	54.5	2.8
6	11510.00	59.7 PK	74.0	-14.3	2.27 V	328	45.2	14.5
7	11510.00	47.3 AV	54.0	-6.7	2.27 V	328	32.8	14.5

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.

CHANNEL	TX Channel 159	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	#5640.00	63.8 PK	68.2	-4.4	1.88 H	36	62.1	1.7
2	*5795.00	117.7 PK			1.88 H	36	77.6	40.1
3	*5795.00	107.5 AV			1.88 H	36	67.4	40.1
4	#5932.00	63.4 PK	68.2	-4.8	1.88 H	36	60.8	2.6
5	11590.00	59.7 PK	74.0	-14.3	2.23 H	47	45.4	14.3
6	11590.00	46.8 AV	54.0	-7.2	2.23 H	47	32.5	14.3
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	#5647.20	58.4 PK	68.2	-9.8	3.88 V	5	56.7	1.7
2	*5795.00	115.0 PK			3.88 V	5	74.9	40.1
3	*5795.00	104.4 AV			3.88 V	5	64.3	40.1
4	#5928.80	61.5 PK	68.2	-6.7	3.88 V	5	58.9	2.6
5	11590.00	59.8 PK	74.0	-14.2	2.62 V	124	45.5	14.3
6	11590.00	46.9 AV	54.0	-7.1	2.62 V	124	32.6	14.3

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 42	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	5150.00	65.8 PK	74.0	-8.2	1.12 H	282	65.0	0.8
2	5150.00	52.4 AV	54.0	-1.6	1.12 H	282	51.6	0.8
3	*5210.00	102.4 PK			1.57 H	45	63.7	38.7
4	*5210.00	92.8 AV			1.57 H	45	54.1	38.7
5	5350.00	53.1 PK	74.0	-20.9	1.83 H	4	52.0	1.1
6	5350.00	42.4 AV	54.0	-11.6	1.83 H	4	41.3	1.1
7	#10420.00	55.7 PK	74.0	-18.3	1.66 H	213	42.8	12.9
8	#10420.00	43.3 AV	54.0	-10.7	1.66 H	213	30.4	12.9
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	5150.00	61.6 PK	74.0	-12.4	2.02 V	20	60.8	0.8
2	5150.00	46.4 AV	54.0	-7.6	2.02 V	20	45.6	0.8
3	*5210.00	101.2 PK			3.71 V	5	62.5	38.7
4	*5210.00	91.5 AV			3.71 V	5	52.8	38.7
5	5350.00	53.6 PK	74.0	-20.4	1.85 V	169	52.5	1.1
6	5350.00	42.6 AV	54.0	-11.4	1.85 V	169	41.5	1.1
7	#10420.00	55.4 PK	74.0	-18.6	2.20 V	222	42.5	12.9
8	#10420.00	42.5 AV	54.0	-11.5	2.20 V	222	29.6	12.9

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.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 155	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	#5649.60	63.6 PK	68.2	-4.6	1.97 H	39	61.9	1.7
2	#5650.00	66.5 PK	68.2	-1.7	2.20 H	42	64.8	1.7
3	*5775.00	109.3 PK			1.97 H	39	69.3	40.0
4	*5775.00	99.5 AV			1.97 H	39	59.5	40.0
5	#5927.20	62.3 PK	68.2	-5.9	1.97 H	39	59.7	2.6
6	11550.00	60.3 PK	74.0	-13.7	2.29 H	69	45.8	14.5
7	11550.00	47.0 AV	54.0	-7.0	2.29 H	69	32.5	14.5
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	#5642.40	58.7 PK	68.2	-9.5	1.54 V	19	57.0	1.7
2	#5650.00	64.0 PK	74.0	-10.0	1.25 V	4	62.3	1.7
3	#5650.00	48.8 AV	54.0	-5.2	1.25 V	4	47.1	1.7
4	*5775.00	104.2 PK			1.54 V	19	64.2	40.0
5	*5775.00	94.1 AV			1.54 V	19	54.1	40.0
6	#5961.60	57.3 PK	68.2	-10.9	1.54 V	19	54.7	2.6
7	11550.00	60.8 PK	74.0	-13.2	1.71 V	120	46.3	14.5
8	11550.00	47.1 AV	54.0	-6.9	1.71 V	120	32.6	14.5

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 149	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	A		

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	57.12	26.9 QP	40.0	-13.1	2.00 H	208	41.5	-14.6
2	391.54	32.9 QP	46.0	-13.1	1.00 H	181	43.1	-10.2
3	671.52	35.3 QP	46.0	-10.7	1.00 H	136	39.4	-4.1
4	889.28	36.3 QP	46.0	-9.7	1.00 H	201	36.4	-0.1
5	924.27	34.2 QP	46.0	-11.8	1.50 H	190	33.4	0.8
6	992.32	36.3 QP	54.0	-17.7	2.00 H	213	34.4	1.9
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	35.73	30.0 QP	40.0	-10.0	1.49 V	16	45.9	-15.9
2	131.00	21.8 QP	43.5	-21.7	1.49 V	103	37.2	-15.4
3	391.54	32.0 QP	46.0	-14.0	1.00 V	169	42.2	-10.2
4	671.52	31.1 QP	46.0	-14.9	1.00 V	216	35.2	-4.1
5	745.40	31.1 QP	46.0	-14.9	2.00 V	163	33.4	-2.3
6	945.66	33.2 QP	46.0	-12.8	2.00 V	163	32.1	1.1

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

CHANNEL	TX Channel 149	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	B		

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	57.12	26.5 QP	40.0	-13.5	2.00 H	275	41.1	-14.6
2	140.72	23.0 QP	43.5	-20.5	2.00 H	255	37.3	-14.3
3	389.59	36.2 QP	46.0	-9.8	2.00 H	303	46.4	-10.2
4	671.52	37.6 QP	46.0	-8.4	1.01 H	210	41.7	-4.1
5	747.34	41.6 QP	46.0	-4.4	1.01 H	199	43.9	-2.3
6	998.16	34.4 QP	54.0	-19.6	2.00 H	182	32.7	1.7
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	35.73	32.5 QP	40.0	-7.5	1.01 V	349	48.4	-15.9
2	57.12	24.0 QP	40.0	-16.0	1.01 V	321	38.6	-14.6
3	109.62	20.2 QP	43.5	-23.3	1.01 V	3	37.5	-17.3
4	389.59	33.7 QP	46.0	-12.3	1.01 V	140	43.9	-10.2
5	504.31	25.8 QP	46.0	-20.2	1.51 V	340	33.5	-7.7
6	671.52	30.9 QP	46.0	-15.1	1.01 V	264	35.0	-4.1

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

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	ESCI	100613	Nov. 21, 2016	Nov. 20, 2017
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 22, 2016	Dec. 21, 2017
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 28, 2016	Jul. 27, 2017
Software ADT	BV ADT_Cond_ V7.3.7.3	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-2040.

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.

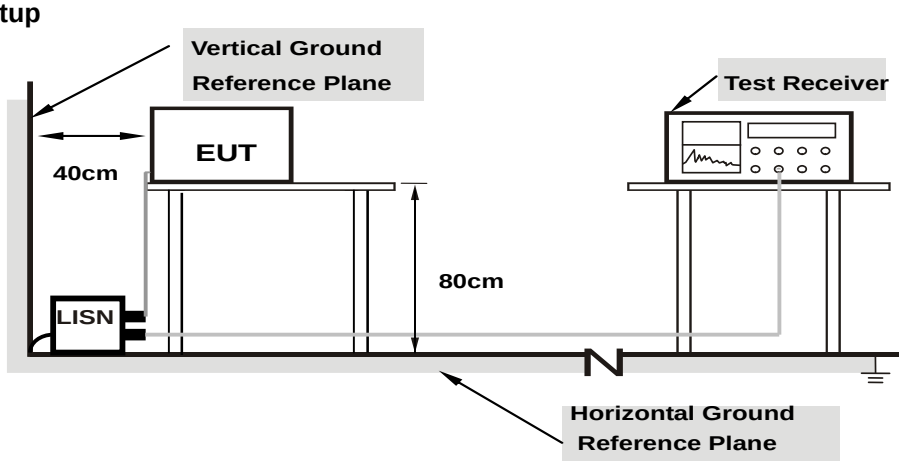
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

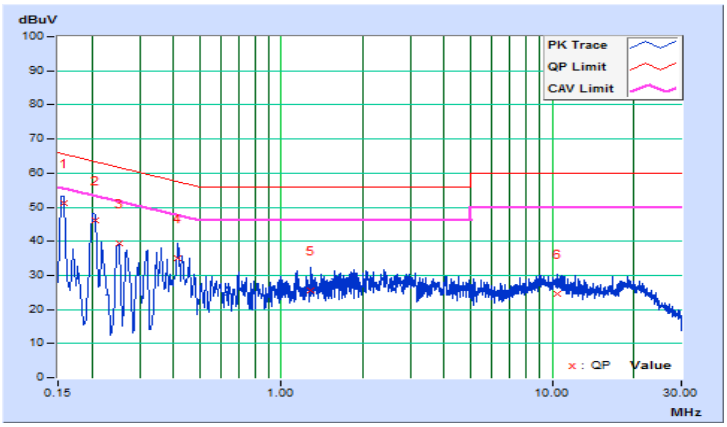
Worst-case data: 802.11a

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

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15800	10.41	40.77	27.27	51.18	37.68	65.57	55.57	-14.39	-17.89
2	0.20600	10.43	35.61	22.96	46.04	33.39	63.37	53.37	-17.33	-19.98
3	0.25271	10.45	28.78	14.38	39.23	24.83	61.67	51.67	-22.44	-26.84
4	0.41400	10.51	24.36	14.11	34.87	24.62	57.57	47.57	-22.70	-22.95
5	1.28600	10.48	15.09	7.50	25.57	17.98	56.00	46.00	-30.43	-28.02
6	10.38600	10.92	13.59	6.55	24.51	17.47	60.00	50.00	-35.49	-32.53

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.

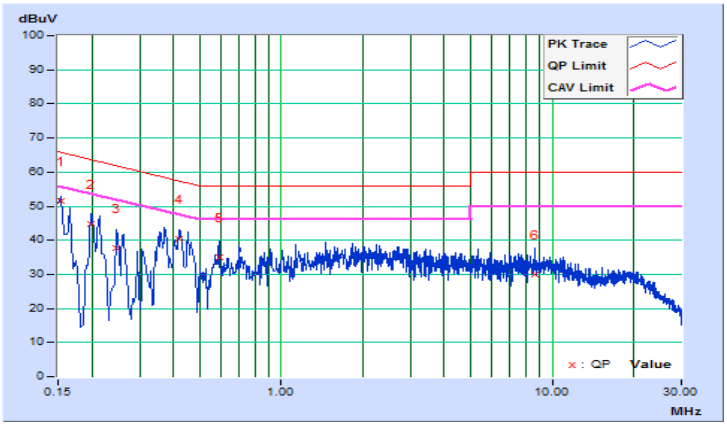


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15400	10.16	41.43	31.05	51.59	41.21	65.78	55.78	-14.19	-14.57
2	0.19832	10.20	34.51	19.52	44.71	29.72	63.68	53.68	-18.97	-23.96
3	0.24614	10.21	27.61	9.94	37.82	20.15	61.89	51.89	-24.07	-31.74
4	0.42242	10.23	30.22	19.64	40.45	29.87	57.40	47.40	-16.95	-17.53
5	0.59000	10.23	24.71	12.41	34.94	22.64	56.00	46.00	-21.06	-23.36
6	8.61800	10.59	19.38	10.85	29.97	21.44	60.00	50.00	-30.03	-28.56

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.

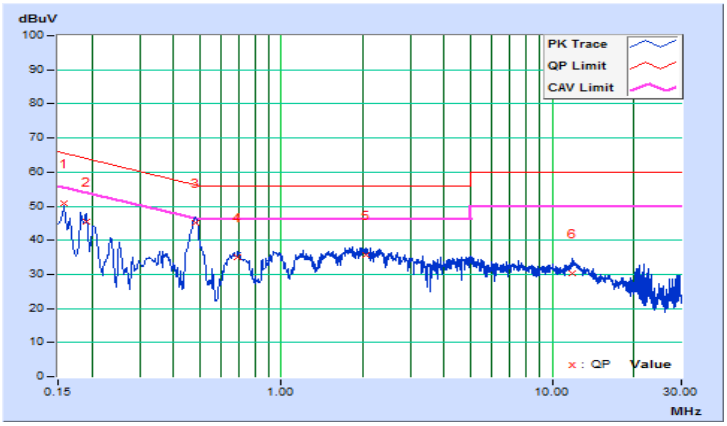


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15800	10.41	40.50	26.95	50.91	37.36	65.57	55.57	-14.66	-18.21
2	0.19000	10.42	35.00	22.82	45.42	33.24	64.04	54.04	-18.62	-20.80
3	**0.48190**	**10.50**	**34.78**	**29.14**	**45.28**	**39.64**	**56.31**	**46.31**	**-11.03**	**-6.67**
4	0.69000	10.49	24.42	19.69	34.91	30.18	56.00	46.00	-21.09	-15.82
5	2.05000	10.52	25.29	20.98	35.81	31.50	56.00	46.00	-20.19	-14.50
6	11.89000	11.00	19.31	14.02	30.31	25.02	60.00	50.00	-29.69	-24.98

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.

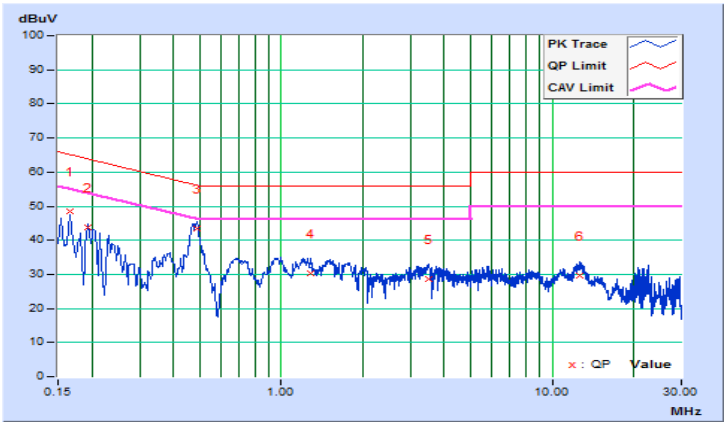


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16600	10.17	38.41	24.12	48.58	34.29	65.16	55.16	-16.58	-20.87
2	0.19400	10.19	33.65	20.68	43.84	30.87	63.86	53.86	-20.02	-22.99
3	0.48957	10.23	33.31	28.81	43.54	39.04	56.18	46.18	-12.64	-7.14
4	1.29000	10.26	20.16	16.39	30.42	26.65	56.00	46.00	-25.58	-19.35
5	3.52218	10.39	18.25	12.10	28.64	22.49	56.00	46.00	-27.36	-23.51
6	12.71800	10.75	18.81	13.76	29.56	24.51	60.00	50.00	-30.44	-25.49

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

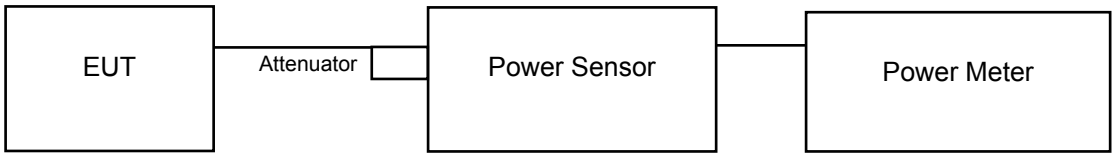
Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

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 $N_{ANT} \geq 5$.

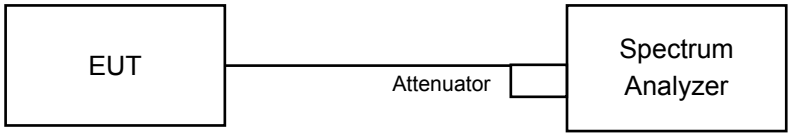
For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.3.2 Test Setup

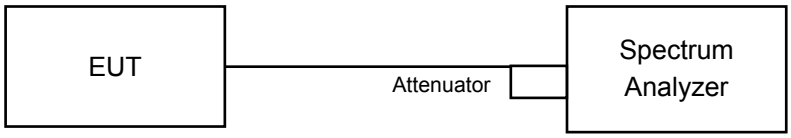
For Power Output
802.11a, 802.11n (HT20), 802.11n (HT40)



802.11ac (VHT80)



For 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

For 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)
1) Set span to encompass the entire 26 dB EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
2) Set sweep trigger to “free run”.
3) Set RBW = 1 MHz.
4) Set VBW ≥ 3 MHz.
5) Number of points in sweep ≥ 2 Span / RBW.
6) Sweep time ≤ (number of points in sweep) * T
7) Using emission bandwidth to determine the frequency span for integration the channel bandwidth.
8) Detector = RMS.
9) Trace mode = max hold.
10) Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.
11) 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
1) Set RBW = approximately 1% of the emission bandwidth.
2) Set the VBW > RBW.
3) Detector = Peak.
4) Trace mode = max hold.
5) 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

For U-NII-1 Band

802.11a

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	16.39	16.26	85.818	19.34	30	Pass
40	5200	18.67	18.52	144.742	21.61	30	Pass
48	5240	19.70	20.07	**194.950**	22.90	30	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	16.53	16.27	87.342	19.41	30	Pass
40	5200	18.12	18.06	128.836	21.10	30	Pass
48	5240	19.78	19.89	192.559	22.85	30	Pass

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	14.59	14.12	54.597	17.37	30	Pass
46	5230	19.31	19.23	169.063	22.28	30	Pass

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	14.46	14.19	54.167	17.34	30	Pass

For U-NII-3 Band

802.11a

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
149	5745	21.07	19.61	219.349	23.41	30	Pass
157	5785	20.58	20.16	218.041	23.39	30	Pass
165	5825	20.19	19.14	186.507	22.71	30	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
149	5745	20.13	20.15	206.553	23.15	30	Pass
157	5785	20.67	20.12	**219.483**	23.41	30	Pass
165	5825	20.29	19.14	188.940	22.76	30	Pass

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
151	5755	18.34	18.59	140.511	21.48	30	Pass
159	5795	20.25	20.00	205.925	23.14	30	Pass

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
155	5775	15.81	16.10	78.845	18.97	30	Pass

Beamforming Mode

For U-NII-1 Band

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	13.52	13.26	43.649	16.40	27.05	Pass
40	5200	15.11	15.05	64.412	18.09	27.05	Pass
48	5240	16.77	16.88	**96.376**	19.84	27.05	Pass

Note:

1. 5180~5240MHz Max. directional gain = 5.94dBi + 10log(2) = 8.95dBi > 6dBi, so the limit shall be reduced to 30-(8.95-6) = 27.05dBm.

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	11.58	11.11	27.288	14.36	27.05	Pass
46	5230	16.30	16.22	84.522	19.27	27.05	Pass

Note:

1. 5180~5240MHz Max. directional gain = 5.94dBi + 10log(2) = 8.95dBi > 6dBi, so the limit shall be reduced to 30-(8.95-6) = 27.05dBm.

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	11.45	11.18	27.100	14.33	27.05	Pass

Note:

1. 5180~5240MHz Max. directional gain = 5.94dBi + 10log(2) = 8.95dBi > 6dBi, so the limit shall be reduced to 30-(8.95-6) = 27.05dBm.

For U-NII-3 Band

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
149	5745	17.12	17.14	103.269	20.14	27	Pass
157	5785	17.66	17.11	**109.640**	20.40	27	Pass
165	5825	17.28	16.13	94.400	19.75	27	Pass

Note:
1. 5745~5825MHz Max. directional gain = 5.99dBi + 10log(2) = 9dBi > 6dBi, so the limit shall be reduced to 30-(9-6) = 27dBm.

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
151	5755	15.33	15.58	70.302	18.47	27	Pass
159	5795	17.24	16.99	103.031	20.13	27	Pass

Note:
1. 5745~5825MHz Max. directional gain = 5.99dBi + 10log(2) = 9dBi > 6dBi, so the limit shall be reduced to 30-(9-6) = 27dBm.

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
155	5775	12.80	13.09	39.443	15.96	27	Pass

Note:
1. 5745~5825MHz Max. directional gain = 5.99dBi + 10log(2) = 9dBi > 6dBi, so the limit shall be reduced to 30-(9-6) = 27dBm.

26dB Bandwidth:

802.11a

Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	20.92	22.25
40	5200	36.24	37.87
48	5240	37.43	41.86

802.11n (HT20)

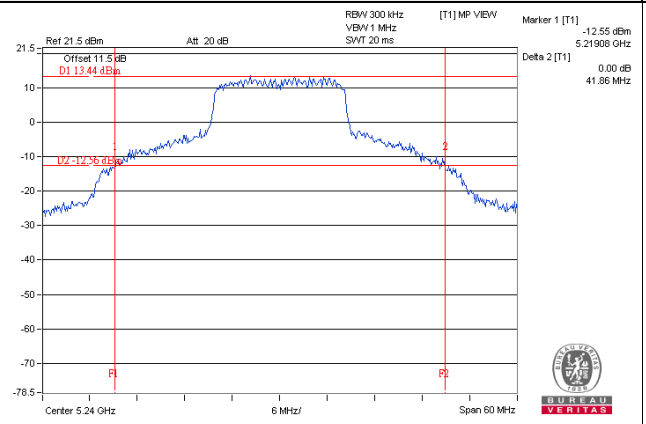
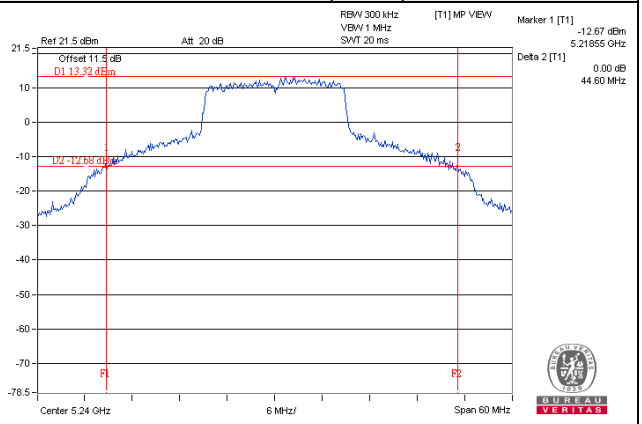
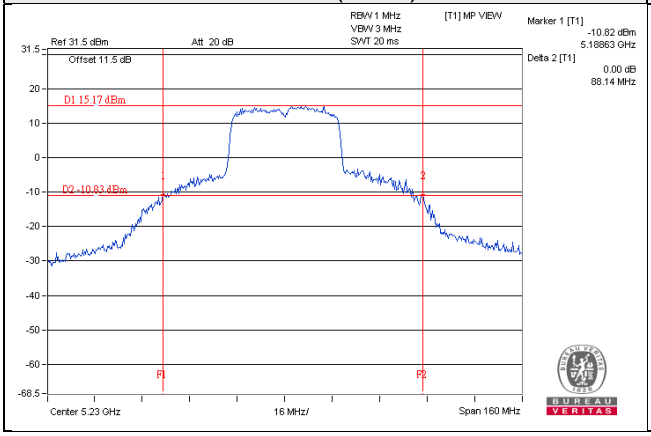
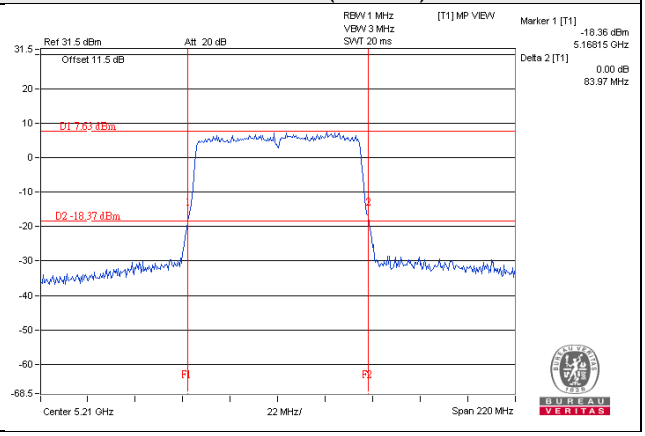
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	21.66	21.79
40	5200	30.87	37.19
48	5240	38.08	44.60

802.11n (HT40)

Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	40.66	40.21
46	5230	77.19	88.14

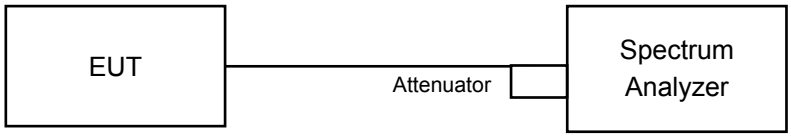
802.11ac (VHT80)

Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
42	5210	83.76	83.97

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

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
36	5180	16.56	16.56
40	5200	17.04	18.96
48	5240	18.12	19.12
149	5745	31.91	29.13
157	5785	30.36	26.28
165	5825	28.80	25.32

802.11n (HT20)

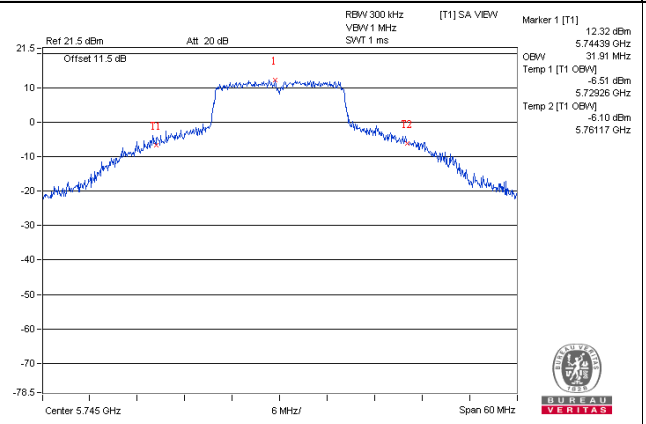
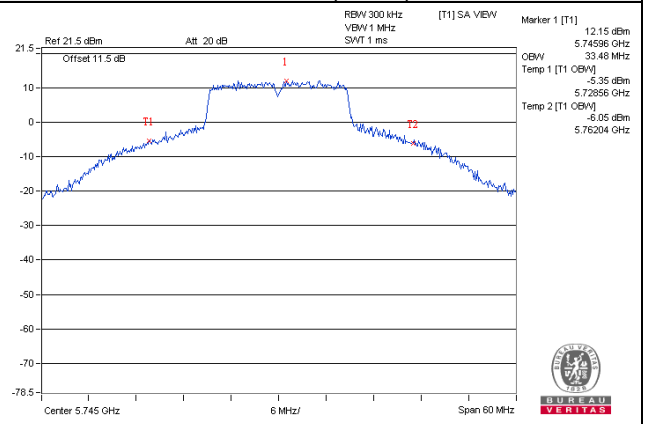
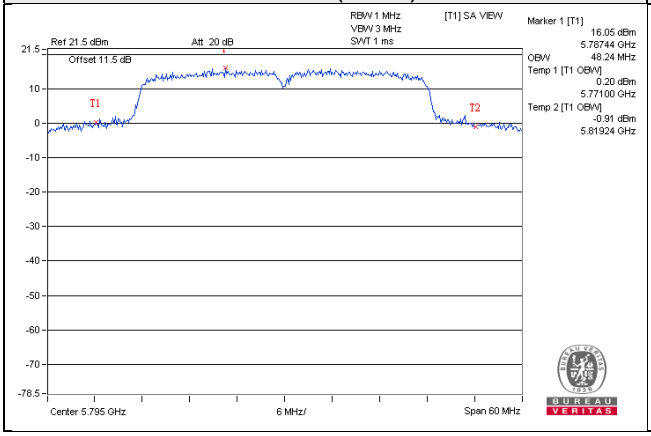
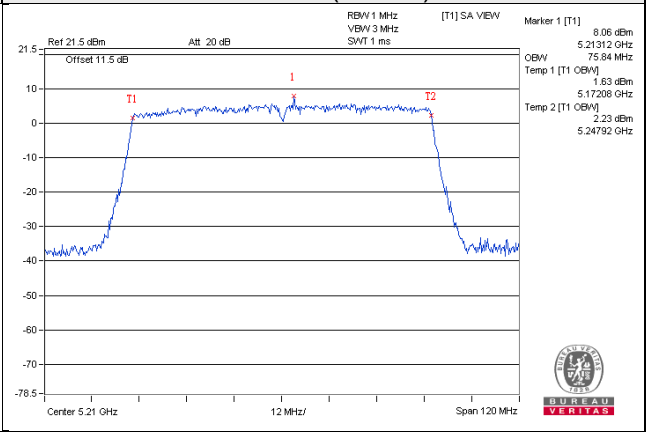
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	17.76	17.64
40	5200	18.00	18.48
48	5240	18.48	19.48
149	5745	33.48	30.84
157	5785	32.04	27.84
165	5825	30.12	26.28

802.11n (HT40)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	36.24	36.00
46	5230	36.60	37.44
151	5755	40.08	37.32
159	5795	48.24	42.24

802.11ac (VHT80)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
42	5210	75.84	75.84
155	5775	75.84	75.60

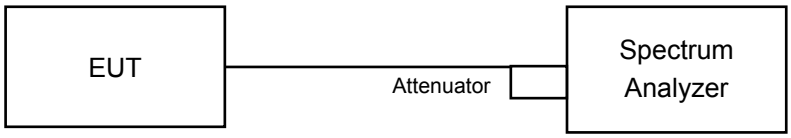
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

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-1 band:
Duty cycle of test signal is ≥ 98%
Using method SA-1
1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 1MHz, Set VBW ≥ 3 MHz, Detector = RMS
3) Set Channel power measure = 1MHz
4) Sweep time = auto, trigger set to “free run”.
5) Trace average at least 100 traces in power averaging mode.
6) Record the max value

Duty cycle of test signal is < 98%
Using method SA-2
1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 1MHz, Set VBW ≥ 3 MHz, Detector = RMS
3) Set Channel power measure = 1MHz
4) Sweep time = auto, trigger set to “free run”.
5) Trace average at least 100 traces in power averaging mode.
6) Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:
Duty cycle of test signal is ≥ 98%
Using method SA-1
1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS.
3) Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
4) Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured 1) power by a bandwidth correction factor (BWCF) where BWCF = 10log(500 kHz / 300 kHz).
5) Sweep time = auto, trigger set to “free run”.
6) Trace average at least 100 traces in power averaging mode.
7) Record the max value.

Duty cycle of test signal is < 98%
1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS
3) Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
4) 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)
5) Sweep time = auto, trigger set to “free run”.
6) Trace average at least 100 traces in power averaging mode.
7) 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-1 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				
36	5180	4.50	4.77	0.17	7.82	14.05	Pass
40	5200	6.30	6.88	0.17	9.78	14.05	Pass
48	5240	7.15	7.86	0.17	10.70	14.05	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. Max. directional gain = 5.94dBi + 10log(2) = 8.95dBi > 6dBi, so the limit shall be reduced to 17-(8.95-6) = 14.05dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

Chan.	Freq. (MHz)	PSD (dBm/MHz)		Total PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1			
36	5180	4.55	4.67	7.62	14.05	Pass
40	5200	5.97	6.16	9.08	14.05	Pass
48	5240	6.75	7.71	10.27	14.05	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. Max. directional gain = 5.94dBi + 10log(2) = 8.95dBi > 6dBi, so the limit shall be reduced to 17-(8.95-6) = 14.05dBm.

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				
38	5190	-0.70	0.05	0.19	2.89	14.05	Pass
46	5230	3.85	4.34	0.19	7.30	14.05	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. Max. directional gain = 5.94dBi + 10log(2) = 8.95dBi > 6dBi, so the limit shall be reduced to 17-(8.95-6) = 14.05dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

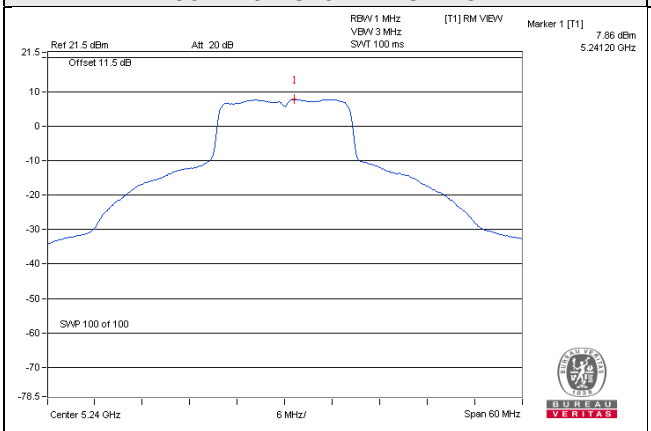
802.11ac (VHT80)

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				
42	5210	-4.49	-3.93	0.25	-0.94	14.05	Pass

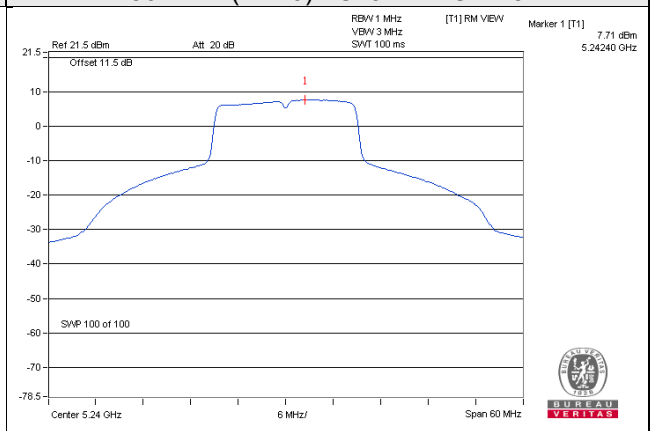
Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Max. directional gain = 5.94dBi + 10log(2) = 8.95dBi > 6dBi, so the limit shall be reduced to 17-(8.95-6) = 14.05dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

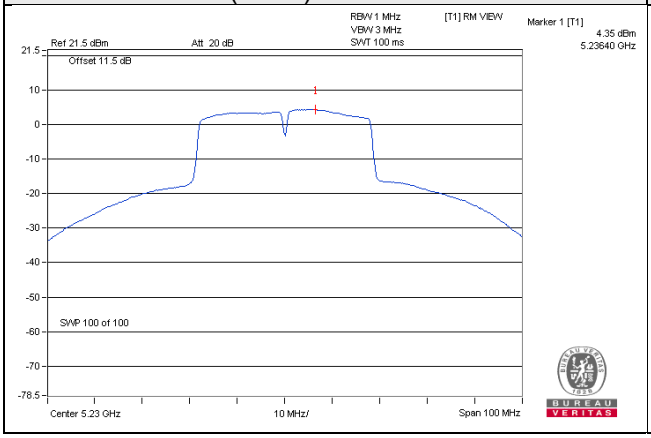
802.11a / Chain 1 / CH 48



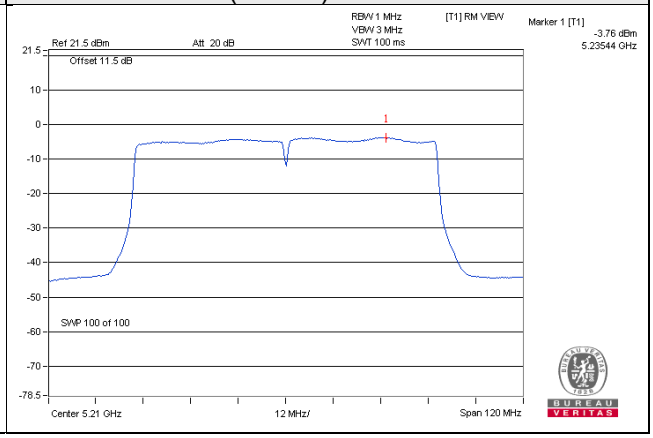
802.11n (HT20) / Chain 1 / CH 48



802.11n (HT40) / Chain 1 / CH 46



802.11ac (VHT80) / Chain 1 / CH 42



For U-NII-3 band:

802.11a

TX chain	Chan.	Freq. (MHz)	PSD W/O Duty Factor		10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	149	5745	-0.61	1.61	3.01	0.17	4.79	27	Pass
	157	5785	-0.63	1.59	3.01	0.17	4.77	27	Pass
	165	5825	-0.93	1.29	3.01	0.17	4.47	27	Pass
1	149	5745	-0.56	1.66	3.01	0.17	4.84	27	Pass
	157	5785	-0.77	1.45	3.01	0.17	4.63	27	Pass
	165	5825	-1.31	0.91	3.01	0.17	4.09	27	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. Max. directional gain = 5.99dBi + 10log(2) = 9dBi > 6dBi, so the limit shall be reduced to 30-(9-6) = 27dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

TX chain	Chan.	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	10 log (N=2) dB	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
0	149	5745	-1.01	1.21	3.01	4.22	27	Pass
	157	5785	-0.86	1.36	3.01	4.37	27	Pass
	165	5825	-1.26	0.96	3.01	3.97	27	Pass
1	149	5745	-1.00	1.22	3.01	4.23	27	Pass
	157	5785	-1.06	1.16	3.01	4.17	27	Pass
	165	5825	-1.64	0.58	3.01	3.59	27	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. Max. directional gain = 5.99dBi + 10log(2) = 9dBi > 6dBi, so the limit shall be reduced to 30-(9-6) = 27dBm.

802.11n (HT40)

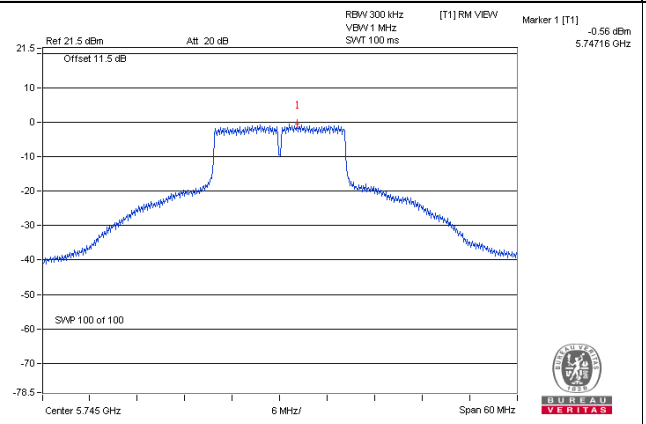
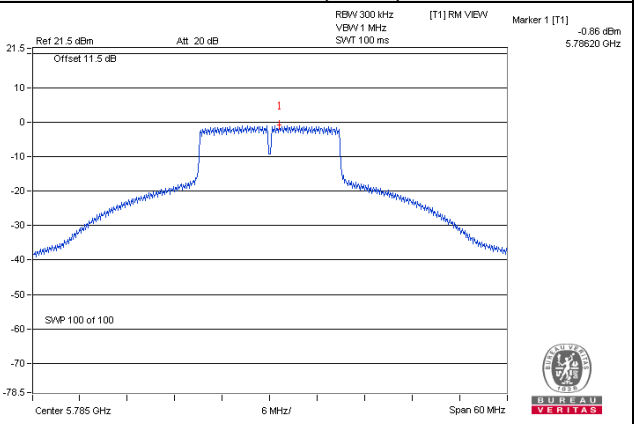
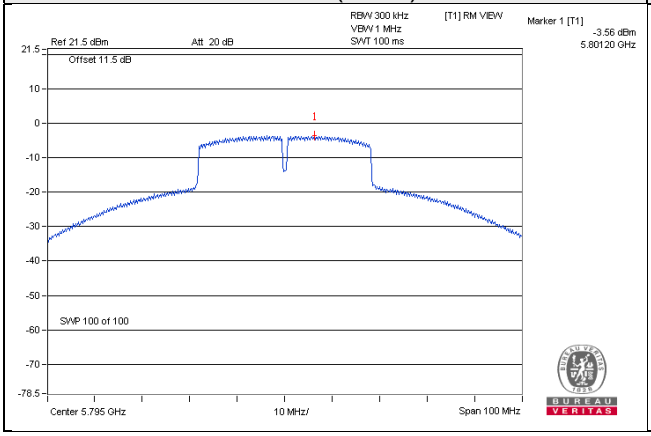
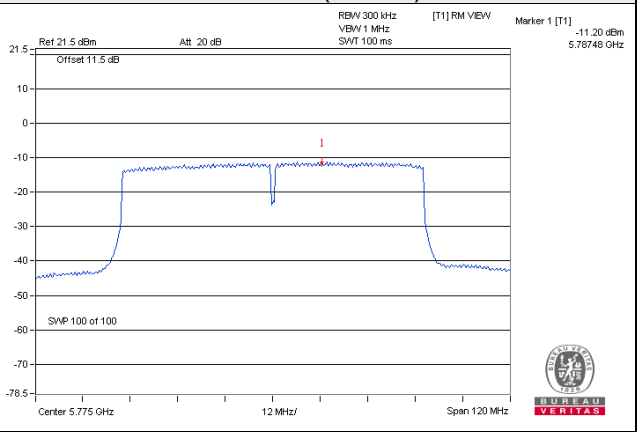
TX chain	Chan.	Freq. (MHz)	PSD W/O Duty Factor		10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	151	5755	-5.00	-2.78	3.01	0.19	0.42	27	Pass
	159	5795	-3.56	-1.34	3.01	0.19	1.86	27	Pass
1	151	5755	-4.90	-2.68	3.01	0.19	0.52	27	Pass
	159	5795	-3.74	-1.52	3.01	0.19	1.68	27	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. Max. directional gain = 5.99dBi + 10log(2) = 9dBi > 6dBi, so the limit shall be reduced to 30-(9-6) = 27dBm.
3. 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=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	155	5775	-11.20	-8.98	3.01	0.25	-5.72	27	Pass
1	155	5775	-11.22	-9.00	3.01	0.25	-5.74	27	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. Max. directional gain = 5.99dBi + 10log(2) = 9dBi > 6dBi, so the limit shall be reduced to 30-(9-6) = 27dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

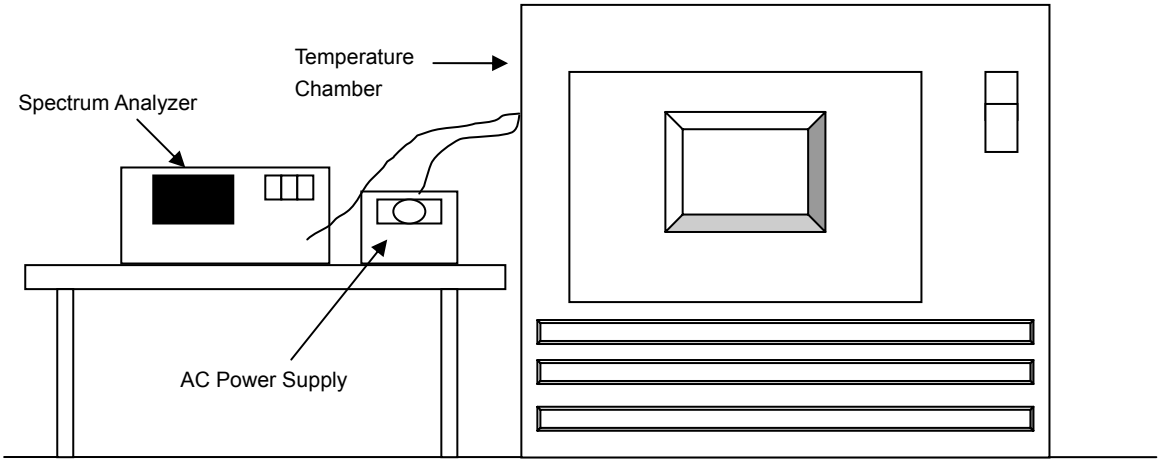
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

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

Refer to section 4.1.2 to get information of above instrument.

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 2 and 3 with the temperature chamber set to the lowest temperature.
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: 5180MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
50	120	5180.0049	0.00009	5180.0036	0.00007	5180.0064	0.00012	5180.0049	0.00009
40	120	5179.9843	-0.00030	5179.9873	-0.00025	5179.9858	-0.00027	5179.9877	-0.00024
30	120	5180	0.00000	5179.9976	-0.00005	5179.998	-0.00004	5179.9972	-0.00005
20	120	5179.9781	-0.00042	5179.9745	-0.00049	5179.9757	-0.00047	5179.9774	-0.00044
10	120	5179.9847	-0.00030	5179.9824	-0.00034	5179.9858	-0.00027	5179.9843	-0.00030
0	120	5179.9885	-0.00022	5179.9912	-0.00017	5179.9877	-0.00024	5179.9894	-0.00020
-10	120	5180.02	0.00039	5180.0178	0.00034	5180.0198	0.00038	5180.018	0.00035
-20	120	5179.9932	-0.00013	5179.9931	-0.00013	5179.9924	-0.00015	5179.9895	-0.00020
-30	120	5179.9905	-0.00018	5179.9892	-0.00021	5179.9895	-0.00020	5179.9927	-0.00014

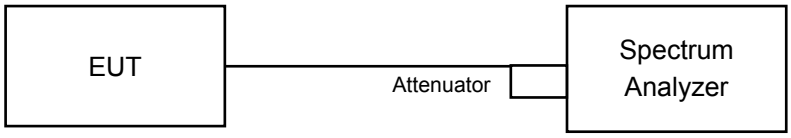
Frequency Stability Versus Voltage									
Operating Frequency: 5180MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5179.9784	-0.00042	5179.9744	-0.00049	5179.9765	-0.00045	5179.9773	-0.00044
	120	5179.9781	-0.00042	5179.9745	-0.00049	5179.9757	-0.00047	5179.9774	-0.00044
	102	5179.9782	-0.00042	5179.9746	-0.00049	5179.9747	-0.00049	5179.9774	-0.00044

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

Measurement Procedure REF

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		
149	5745	16.36	16.40	0.5	Pass
157	5785	16.39	16.42	0.5	Pass
165	5825	16.40	16.42	0.5	Pass

802.11n (HT20)

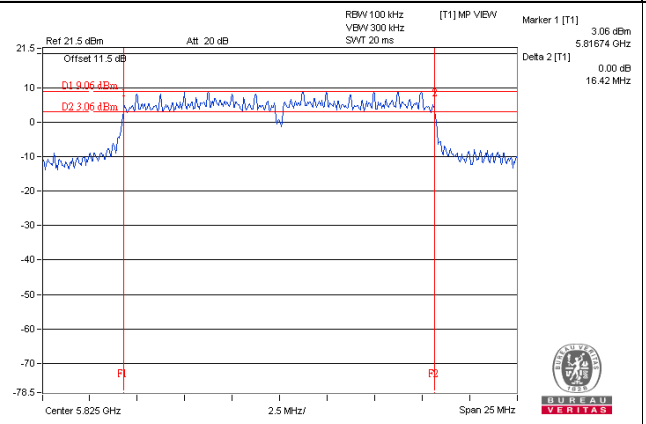
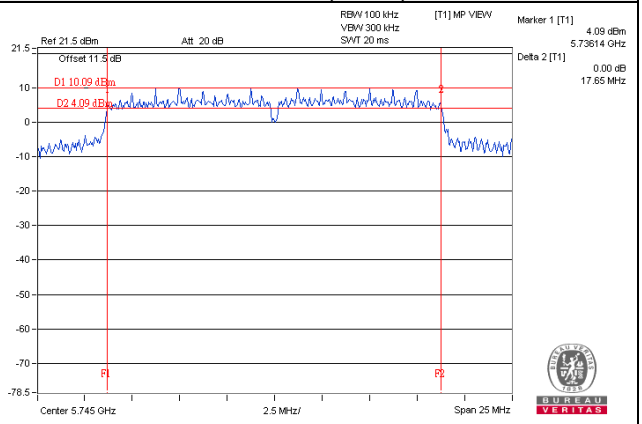
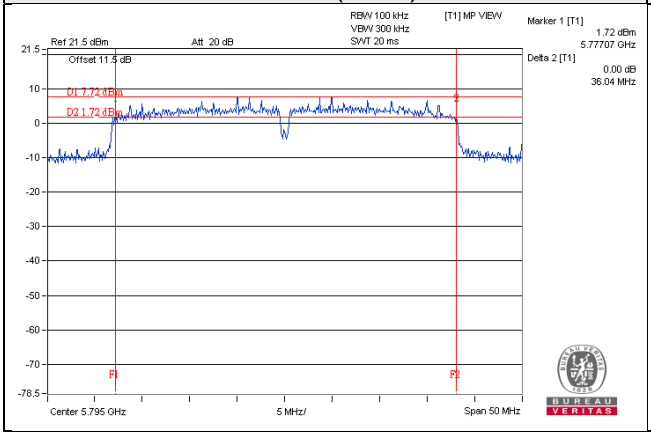
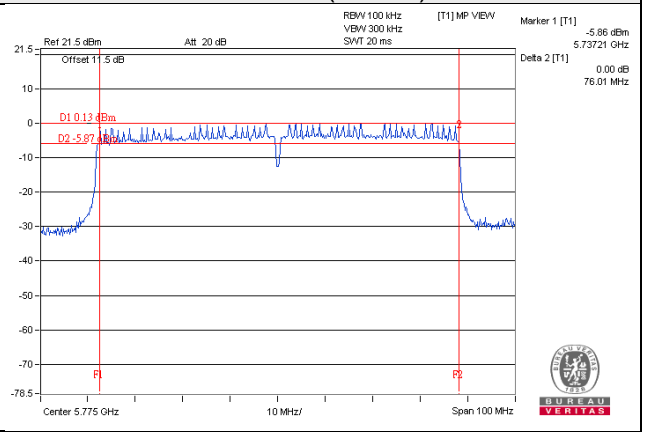
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	17.65	17.64	0.5	Pass
157	5785	17.64	17.65	0.5	Pass
165	5825	17.65	17.63	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	35.73	35.46	0.5	Pass
159	5795	36.04	35.19	0.5	Pass

802.11ac (VHT80)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
155	5775	76.01	75.52	0.5	Pass

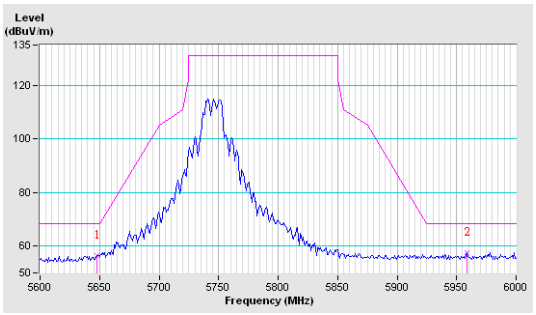
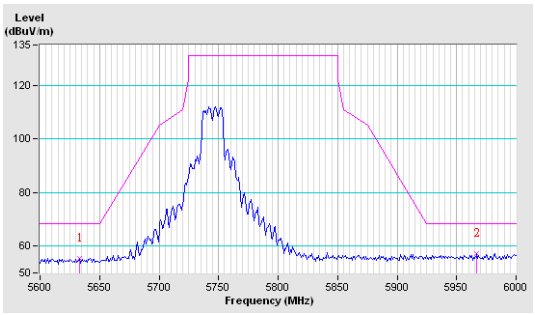
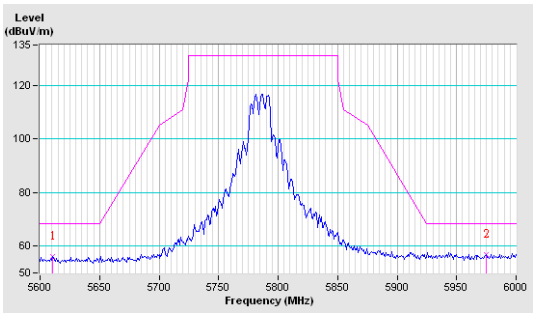
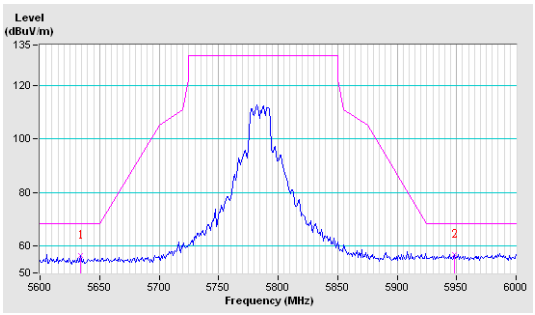
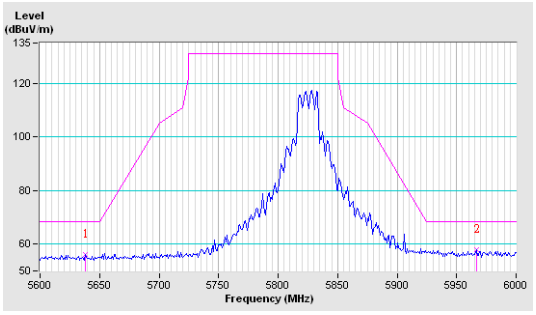
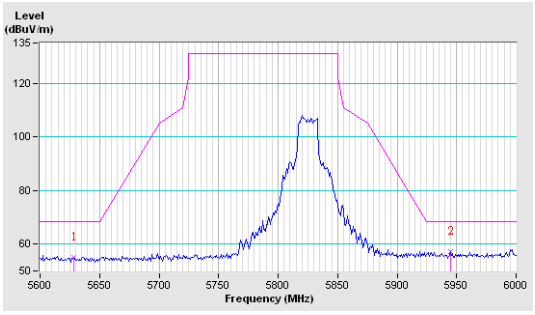
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

5 Pictures of Test Arrangements

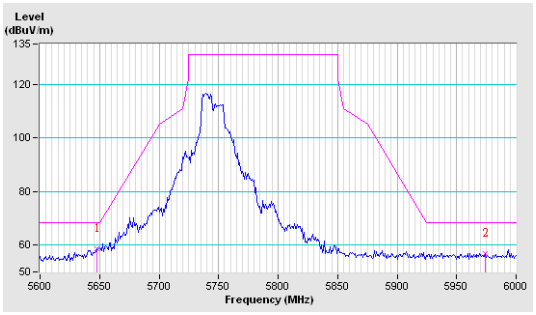
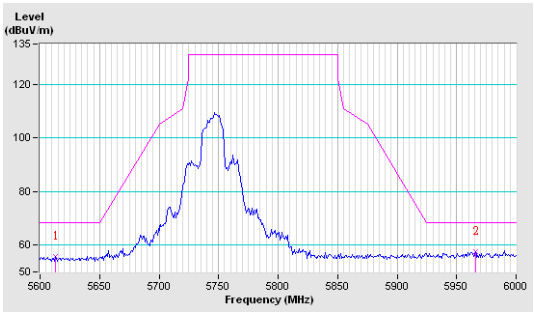
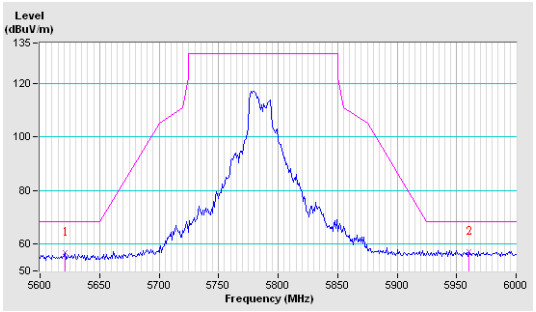
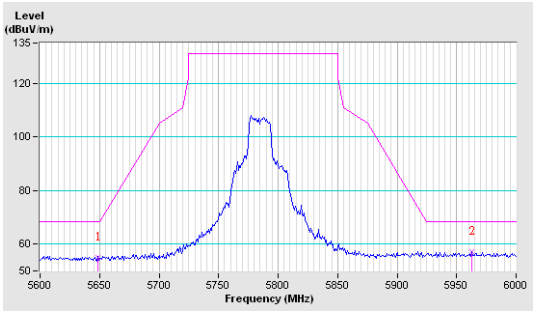
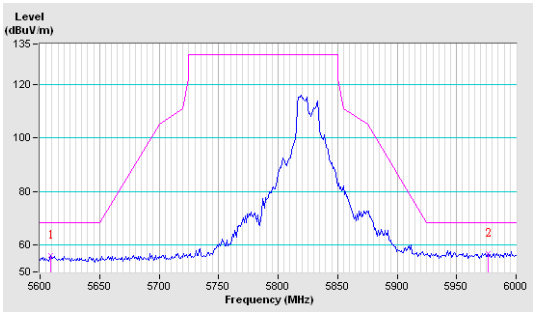
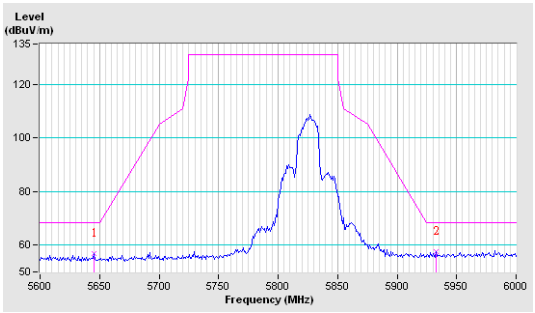
Please refer to the attached file (Test Setup Photo).

Annex A- Radiated Out of Band Emission (OOBE) Measurement (For U-NII-3 band)

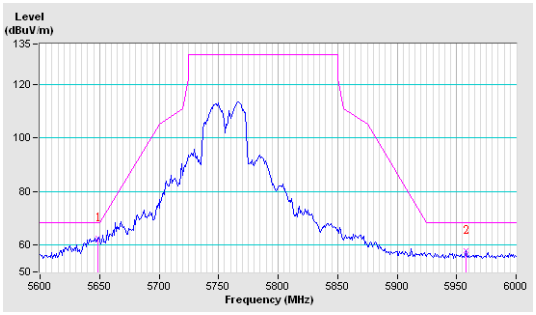
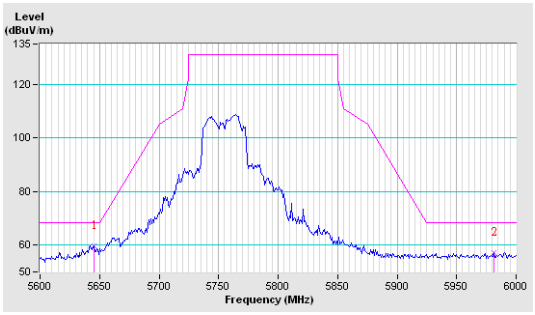
802.11a

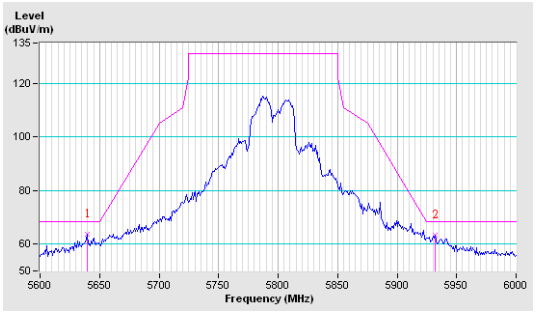
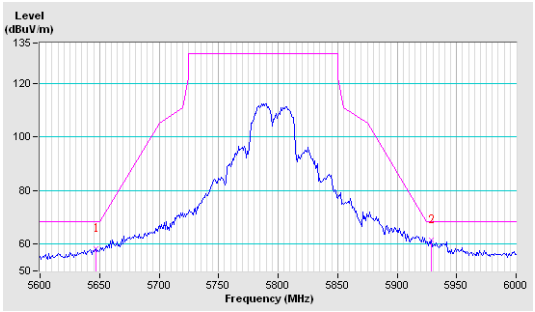
CH149	
Horizontal	Vertical
	
CH157	
Horizontal	Vertical
	
CH165	
Horizontal	Vertical
	

802.11n (HT20)

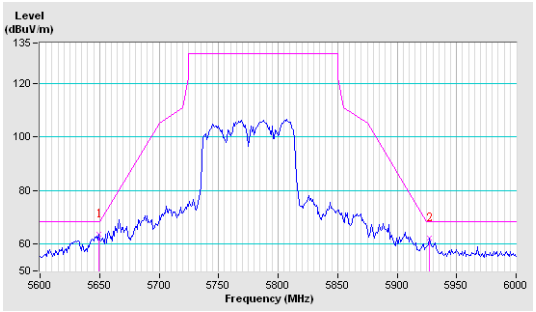
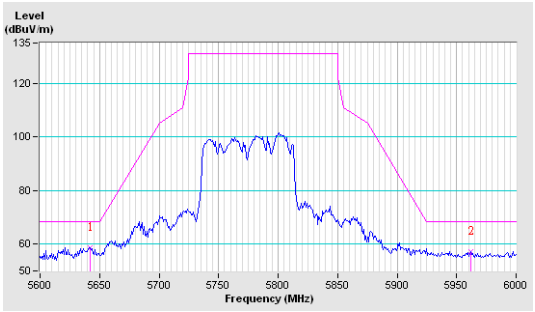
CH149	
Horizontal	Vertical
	
CH157	
Horizontal	Vertical
	
CH165	
Horizontal	Vertical
	

802.11n (HT40)

CH151	
Horizontal	Vertical
	

CH159	
Horizontal	Vertical
	

802.11ac (VHT80)

CH155	
Horizontal	Vertical
	

Appendix – Information on 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 accredited and approved according to ISO/IEC 17025.

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

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

--- END ---