FCC Test Report

Report No.:	RF170720C12-1
FCC ID:	TVE-291BB033
Test Model:	FortiAP U422EV
Series Model:	FortiAP U422EVxxxxxx, FAP-U422EVxxxxxx, FORTIAP-U422EVxxxxxx (where “x” can be used as “A-Z”, or “0-9”, or “-“, or blank for marketing purposes only) (refer to item 3.1 for more details)
Received Date:	Jul. 20, 2017
Test Date:	Sep. 14 ~ Oct. 03, 2017
Issued Date:	Oct. 13, 2017
Applicant:	Fortinet Inc.
Address:	899 Kifer Road Sunnyvale, CA 94086 USA
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.)

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF170720C12-1	Original release.	Oct. 13, 2017

1 Certificate of Conformity

Product:	Secured Wireless Access Point
Brand:	Fortinet Inc.
Test Model:	FortiAP U422EV
Series Model:	FortiAP U422EVxxxxxx, FAP-U422EVxxxxxx, FORTIAP-U422EVxxxxxx (where "x" can be used as "A-Z", or "0-9", or "-", or blank for marketing purposes only) (refer to item 3.1 for more details)
Sample Status:	Engineering sample
Applicant:	Fortinet Inc.
Test Date:	Sep. 14 ~ Oct. 03, 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 : Celine Chou , **Date:** Oct. 13, 2017

Celine Chou / Specialist

Approved by : Ken Liu , **Date:** Oct. 13, 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 -9.25dB at 0.44273MHz.
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 -1.0dB at 5924.80MHz and 5150.00MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	-	Reference only.
15.407(a)(1/2/3)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.407(e)	6dB bandwidth	Pass	Meet the requirement of limit. (U-NII-3 Band only)
15.407(g)	Frequency Stability	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is N-Type plug 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	3.63 dB
	200MHz ~1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Secured Wireless Access Point
Brand	Fortinet Inc.
Test Model	FortiAP U422EV
Series Model	FortiAP U422EVxxxxxx, FAP-U422EVxxxxxx, FORTIAP-U422EVxxxxxx (where “x” can be used as “A-Z”, or “0-9”, or “-“, or blank for marketing purposes only)
Model Difference	Refer to note
Sample Status	Engineering sample
Power Supply Rating	54Vdc from 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 600Mbps 802.11ac: up to 1733Mbps
Operating Frequency	5180~5240MHz, 5745~5825MHz
Number of Channel	5180~5240MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11n (HT40): 2 802.11ac (VHT80): 1 5745~5825MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11n (HT40): 2 802.11ac (VHT80): 1
Output Power	CDD Mode: 5180~5240MHz: 220.659mW 5745~5825MHz: 581.845mW Beamforming Mode: 5180~5240MHz: 55.208mW 5745~5825MHz: 142.889mW
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	POE, Wall mount
Cable Supplied	1.75m non-shielded Grounding cable without core connected EUT

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides 4 completed transmitters and 4 receivers.

Modulation Mode	Beamforming Mode	TX Function
802.11a	Not Support	4TX
802.11n (HT20)	Support	4TX
802.11n (HT40)	Support	4TX
802.11ac (VHT20)	Support	4TX
802.11ac (VHT40)	Support	4TX
802.11ac (VHT80)	Support	4TX

* 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, CDD mode is the worst case for final radiated emission and power line conducted emission tests after pretesting CDD mode and beamforming mode.

2. The following models are provided to this EUT.

Brand	Model	Description
Fortinet Inc.	FortiAP U422EVxxxxxx	where “x” can be used as “A-Z”, or “0-9”, or“-“, or blank for marketing purposes only
	FAP-U422EVxxxxxx	
	FORTIAP-U422EVxxxxxx	

* The model FortiAP U422EV was chosen for final test.

3. The EUT consumes power from the following POE.

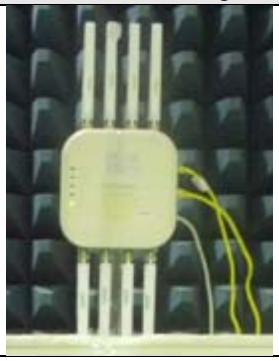
Brand	SENAO
Model	PIN060-54PR
Input Power	100-240Vac, 50/60Hz, 1.5A
Output Power	54Vdc / 1.11A PIN 3,4,5,6: 54Vdc PIN 1,2,7,8 RETURN
Power Line	0.5m non-shielded without core

4. The following antennas were provided to the EUT.

Antenna Type	Dipole				Antenna Connector				N-Type plug			
Gain (dBi)	Frequency (MHz)											
	2400	2450	2500	4900	5150	5250	5350	5500	5600	5725	5850	5925
WLAN Ant.	4.4	4.6	5.0	6.5	6.8	7.0	6.2	5.9	6.1	6.3	5.8	5.8

Antenna Type	Printed		Antenna Connector	MMCX
Gain (dBi)	Frequency (MHz)			
	2400	2450		2500
BT Ant.	5.77	5.52		5.57

5. The EUT will install at outdoor area, the highest antenna gain from the horizon above 30 degrees as below, for more detail information please refer to antenna specification and user manual

Antenna gain	Antenna install degree
-3.887dBi	
Due to device will restricted installation position as above photo, thus consider to above 30 degrees highest antenna gain are chosen from YZ Plane and and XZ Plane (antenna specification of 0-60°, 150-240° and 300-360°).	

6. 2.4GHz, 5GHz & BT or 2.4GHz, 5GHz & BT LE technology can transmit at same time. BT and BT LE cannot transmit simultaneously.
7. Spurious emission of the simultaneous operation (2.4GHz, 5GHz & BT or 2.4GHz, 5GHz & BT LE) 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	
-	√	√	√	√	-

Where RE≥1G: Radiated Emission above 1GHz & RE<1G: Radiated Emission below 1GHz
Bandedge Measurement
PLC: Power Line Conducted Emission APCM: Antenna Port Conducted Measurement

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

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	6.5
	802.11n (HT40)		38 to 46	38, 46	OFDM	13.5
	802.11ac (VHT80)		42	42	OFDM	29.3
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	6.5
	802.11n (HT40)		151 to 159	151, 159	OFDM	13.5
	802.11ac (VHT80)		155	155	OFDM	29.3

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	36	OFDM	6.0
	802.11a	5745-5825	149 to 165		OFDM	6.0

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	36	OFDM	6.0
	802.11a	5745-5825	149 to 165		OFDM	6.0

Transmit Power 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)
CDD Mode						
-	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	6.5
	802.11n (HT40)		38 to 46	38, 46	OFDM	13.5
	802.11ac (VHT80)		42	42	OFDM	29.3
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	6.5
	802.11n (HT40)		151 to 159	151, 159	OFDM	13.5
	802.11ac (VHT80)		155	155	OFDM	29.3
Beamforming Mode						
-	802.11n (HT20)	5180-5240	36 to 48	36, 40, 48	OFDM	6.5
	802.11n (HT40)		38 to 46	38, 46	OFDM	13.5
	802.11ac (VHT80)		42	42	OFDM	29.3
-	802.11n (HT20)	5745-5825	149 to 165	149, 157, 165	OFDM	6.5
	802.11n (HT40)		151 to 159	151, 159	OFDM	13.5
	802.11ac (VHT80)		155	155	OFDM	29.3

Peak Power Spectral Density, Bandwidth and Frequency Stability Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	6.5
	802.11n (HT40)		38 to 46	38, 46	OFDM	13.5
	802.11ac (VHT80)		42	42	OFDM	29.3
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	6.5
	802.11n (HT40)		151 to 159	151, 159	OFDM	13.5
	802.11ac (VHT80)		155	155	OFDM	29.3

Test Condition:

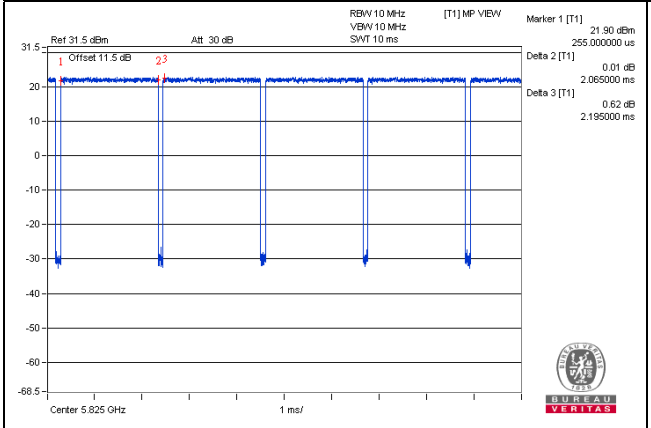
Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 70% RH	120Vac, 60Hz	Matthew Yang
RE<1G	25 deg. C, 70% RH	120Vac, 60Hz	Matthew Yang
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Matthew Yang
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Credic Wu

3.3 Duty Cycle of Test Signal

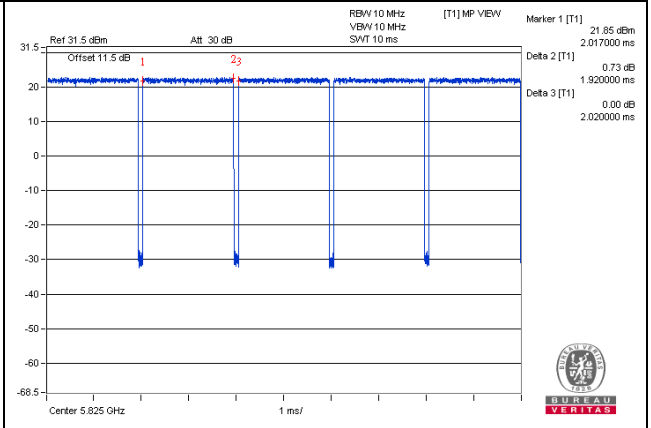
Duty cycle of test signal is < 98%, duty factor is required.

802.11a: Duty cycle = 2.065/2.195 = 0.941, Duty factor = 10 * log(1/0.941) = 0.27
802.11n (HT20): Duty cycle = 1.920/2.020 = 0.950, Duty factor = 10 * log(1/0.950) = 0.22
802.11n (HT40): Duty cycle = 0.942/1.042 = 0.904, Duty factor = 10 * log(1/0.904) = 0.44
802.11ac (VHT80): Duty cycle = 0.459/0.488 = 0.941, Duty factor = 10 * log(1/0.941) = 0.27

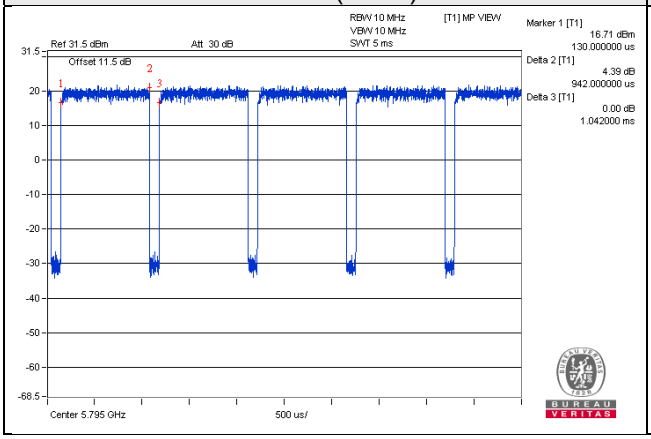
802.11a



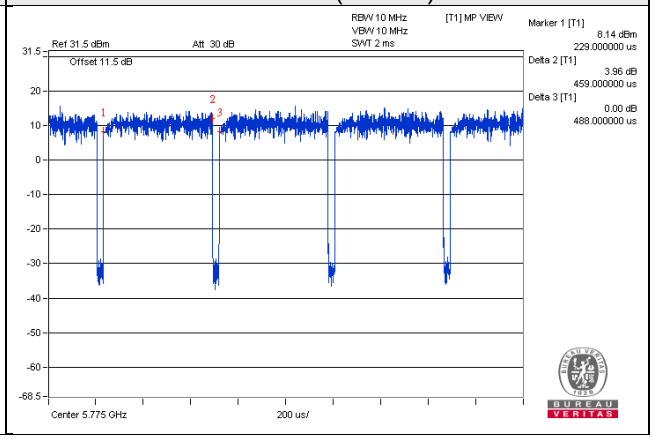
802.11n (HT20)



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.

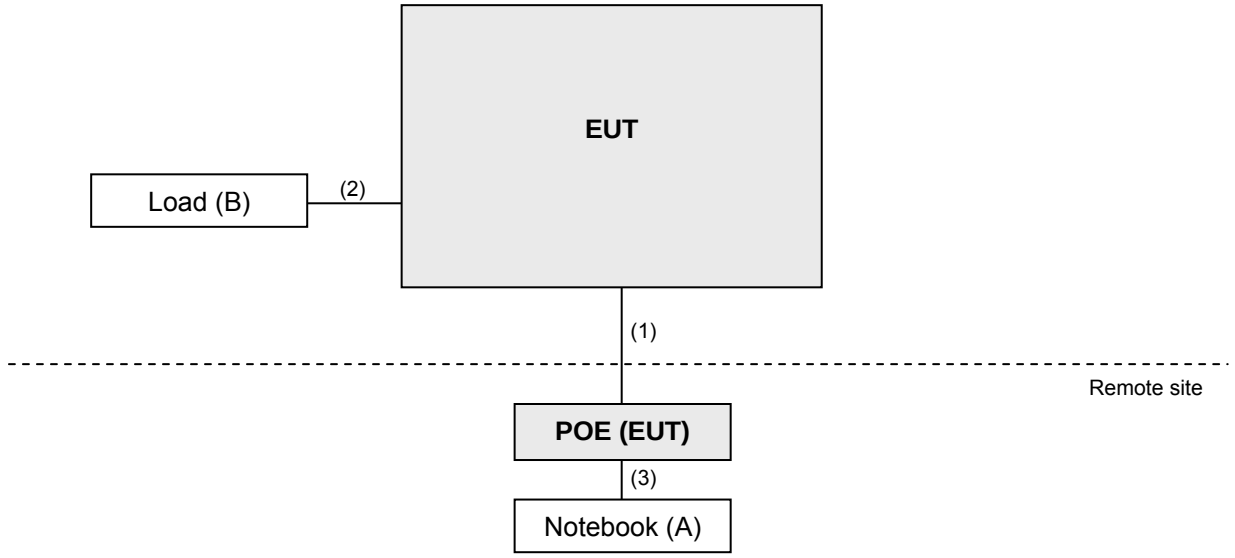
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	6RP2YM1	FCC DoC Approved	-
B.	Load	NA	NA	NA	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45, Cat5e	1	3	N	0	-
2.	RJ45, Cat5e	2	1.8	N	0	-
3.	RJ45, Cat5e	1	1.8	N	0	-

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart E (15.407)
KDB 789033 D02 General UNII Test Procedure New Rules v01r04
KDB 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	ESCI	100424	Oct. 24, 2016	Oct. 23, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Aug. 18, 2017	Aug. 17, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Dec. 28, 2016	Dec. 27, 2017
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Dec. 15, 2016	Dec. 14, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 2017
Loop Antenna EMCI	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier Agilent	8449B	3008A01960	Aug. 08, 2017	Aug. 07, 2018
Preamplifier Agilent	8447D	2944A10631	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Aug. 08, 2017	Aug. 07, 2018
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 17, 2016	Oct. 16, 2017
High Speed Peak Power Meter	ML2495A	0824012	Aug. 18, 2017	Aug. 17, 2018
Power Sensor	MA2411B	0738171	Aug. 18, 2017	Aug. 17, 2018
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 07, 2017	Jun. 06, 2018

Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 4.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is IC7450F-4.

4.1.3 Test Procedures

For Radiated emission below 30MHz

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

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

c. 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:

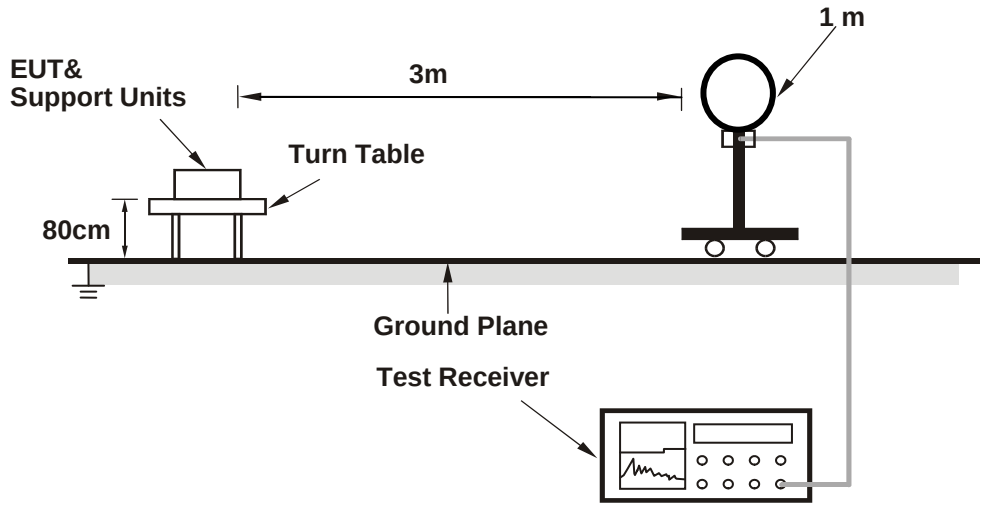
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

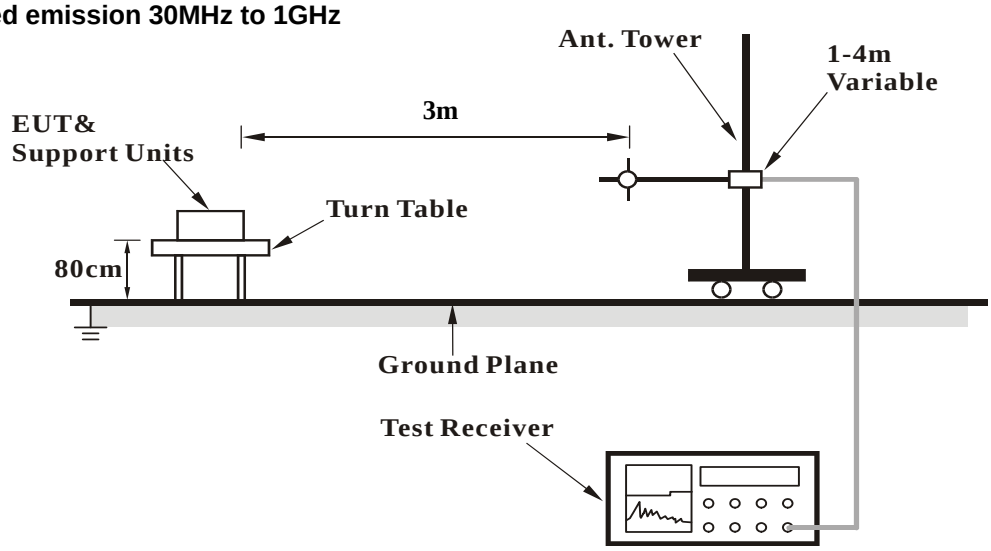
No deviation.

4.1.5 Test Setup

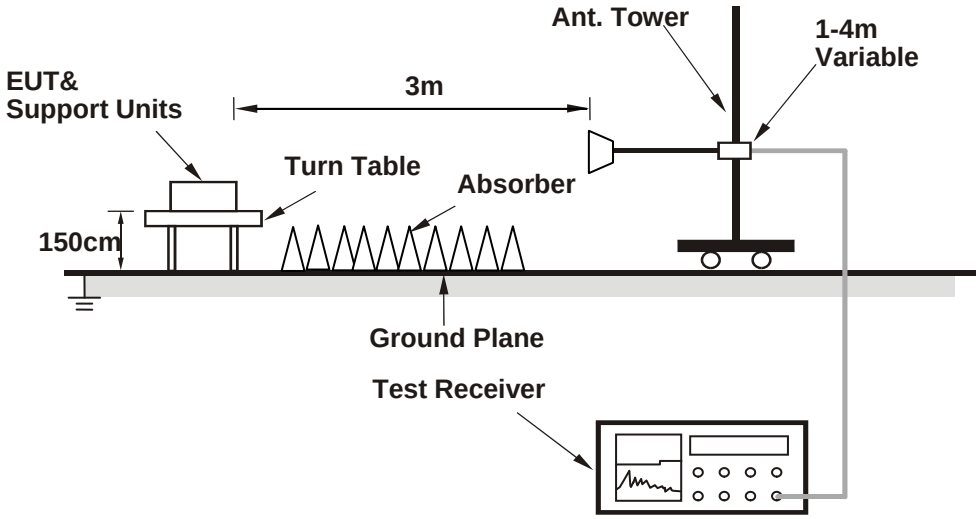
For Radiated emission below 30MHz



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".

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	58.8 PK	74.0	-15.2	1.33 H	29	51.4	7.4
2	5150.00	45.6 AV	54.0	-8.4	1.33 H	29	38.2	7.4
3	*5180.00	101.2 PK			1.42 H	23	59.9	41.3
4	*5180.00	91.5 AV			1.42 H	23	50.2	41.3
5	#10360.00	61.8 PK	74.0	-12.2	1.25 H	324	41.8	20.0
6	#10360.00	48.9 AV	54.0	-5.1	1.25 H	324	28.9	20.0
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	70.2 PK	74.0	-3.8	1.96 V	356	62.8	7.4
2	5150.00	52.5 AV	54.0	-1.5	1.96 V	356	45.1	7.4
3	*5180.00	122.0 PK			1.85 V	4	80.7	41.3
4	*5180.00	112.1 AV			1.85 V	4	70.8	41.3
5	#10360.00	62.6 PK	74.0	-11.4	1.69 V	188	42.6	20.0
6	#10360.00	50.1 AV	54.0	-3.9	1.69 V	188	30.1	20.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
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	*5200.00	103.6 PK			1.40 H	22	62.3	41.3
2	*5200.00	93.5 AV			1.40 H	22	52.2	41.3
3	#10400.00	62.2 PK	74.0	-11.8	1.21 H	319	42.0	20.2
4	#10400.00	49.4 AV	54.0	-4.6	1.21 H	319	29.2	20.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	123.7 PK			1.83 V	4	82.4	41.3
2	*5200.00	114.2 AV			1.83 V	4	72.9	41.3
3	#10400.00	63.0 PK	74.0	-11.0	1.72 V	194	42.8	20.2
4	#10400.00	50.5 AV	54.0	-3.5	1.72 V	194	30.3	20.2

Remarks:

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

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	103.2 PK			1.42 H	20	61.7	41.5
2	*5240.00	93.1 AV			1.42 H	20	51.6	41.5
3	5350.00	59.9 PK	74.0	-14.1	1.39 H	25	51.9	8.0
4	5350.00	47.5 AV	54.0	-6.5	1.39 H	25	39.5	8.0
5	#10480.00	62.2 PK	74.0	-11.8	1.18 H	317	41.9	20.3
6	#10480.00	49.3 AV	54.0	-4.7	1.18 H	317	29.0	20.3
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	*5240.00	124.0 PK			1.85 V	5	82.5	41.5
2	*5240.00	114.2 AV			1.85 V	5	72.7	41.5
3	5350.00	62.2 PK	74.0	-11.8	1.89 V	354	54.2	8.0
4	5350.00	51.1 AV	54.0	-2.9	1.89 V	354	43.1	8.0
5	#10480.00	62.8 PK	74.0	-11.2	1.64 V	176	42.5	20.3
6	#10480.00	50.5 AV	54.0	-3.5	1.64 V	176	30.2	20.3

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 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	#5601.60	59.6 PK	68.2	-8.6	2.21 H	45	51.1	8.5
2	*5745.00	110.0 PK			2.21 H	45	67.3	42.7
3	*5745.00	98.8 AV			2.21 H	45	56.1	42.7
4	#5975.20	61.4 PK	68.2	-6.8	2.21 H	45	51.8	9.6
5	11490.00	63.6 PK	74.0	-10.4	1.29 H	311	41.8	21.8
6	11490.00	50.4 AV	54.0	-3.6	1.29 H	311	28.6	21.8
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	#5651.20	66.9 PK	69.1	-2.2	1.68 V	182	58.3	8.6
2	*5745.00	129.1 PK			1.68 V	182	86.4	42.7
3	*5745.00	117.9 AV			1.68 V	182	75.2	42.7
4	#5989.60	66.7 PK	68.2	-1.5	1.68 V	182	57.0	9.7
5	11490.00	63.9 PK	74.0	-10.1	2.04 V	89	42.1	21.8
6	11490.00	50.7 AV	54.0	-3.3	2.04 V	89	28.9	21.8

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 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	#5617.60	60.2 PK	68.2	-8.0	2.35 H	44	51.7	8.5
2	*5785.00	111.2 PK			2.35 H	44	68.5	42.7
3	*5785.00	99.2 AV			2.35 H	44	56.5	42.7
4	#5941.60	61.6 PK	68.2	-6.6	2.35 H	44	52.2	9.4
5	11570.00	63.3 PK	74.0	-10.7	1.33 H	304	41.5	21.8
6	11570.00	50.3 AV	54.0	-3.7	1.33 H	304	28.5	21.8
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	#5627.20	65.8 PK	68.2	-2.4	1.65 V	182	57.3	8.5
2	*5785.00	128.0 PK			1.65 V	182	85.3	42.7
3	*5785.00	117.4 AV			1.65 V	182	74.7	42.7
4	#5947.20	64.3 PK	68.2	-3.9	1.65 V	182	54.9	9.4
5	11570.00	63.7 PK	74.0	-10.3	2.08 V	81	41.9	21.8
6	11570.00	50.6 AV	54.0	-3.4	2.08 V	81	28.8	21.8

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 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	#5602.40	61.1 PK	68.2	-7.1	2.34 H	48	52.6	8.5
2	*5825.00	110.4 PK			2.34 H	48	67.5	42.9
3	*5825.00	99.0 AV			2.34 H	48	56.1	42.9
4	#5980.00	62.6 PK	68.2	-5.6	2.34 H	48	53.0	9.6
5	11650.00	63.2 PK	74.0	-10.8	1.30 H	323	41.8	21.4
6	11650.00	50.1 AV	54.0	-3.9	1.30 H	323	28.7	21.4
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	#5612.00	61.3 PK	68.2	-6.9	1.84 V	185	52.8	8.5
2	*5825.00	127.7 PK			1.84 V	185	84.8	42.9
3	*5825.00	117.0 AV			1.84 V	185	74.1	42.9
4	**#5924.80**	**67.3 PK**	**68.3**	**-1.0**	**1.84 V**	**185**	**57.9**	**9.4**
5	11650.00	63.5 PK	74.0	-10.5	2.04 V	76	42.1	21.4
6	11650.00	50.4 AV	54.0	-3.6	2.04 V	76	29.0	21.4

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	58.5 PK	74.0	-15.5	1.48 H	30	51.1	7.4
2	5150.00	46.2 AV	54.0	-7.8	1.48 H	30	38.8	7.4
3	*5180.00	101.7 PK			1.42 H	24	60.4	41.3
4	*5180.00	91.1 AV			1.42 H	24	49.8	41.3
5	#10360.00	61.6 PK	74.0	-12.4	1.20 H	296	41.6	20.0
6	#10360.00	48.7 AV	54.0	-5.3	1.20 H	296	28.7	20.0
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	69.2 PK	74.0	-4.8	1.83 V	357	61.8	7.4
2	5150.00	52.8 AV	54.0	-1.2	1.83 V	357	45.4	7.4
3	*5180.00	119.8 PK			2.05 V	8	78.5	41.3
4	*5180.00	109.7 AV			2.05 V	8	68.4	41.3
5	#10360.00	62.1 PK	74.0	-11.9	2.61 V	147	42.1	20.0
6	#10360.00	49.8 AV	54.0	-4.2	2.61 V	147	29.8	20.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
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	*5200.00	103.2 PK			1.39 H	21	61.9	41.3
2	*5200.00	92.9 AV			1.39 H	21	51.6	41.3
3	#10400.00	62.0 PK	74.0	-12.0	1.17 H	293	41.8	20.2
4	#10400.00	49.1 AV	54.0	-4.9	1.17 H	293	28.9	20.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	122.8 PK			2.04 V	6	81.5	41.3
2	*5200.00	112.8 AV			2.04 V	6	71.5	41.3
3	#10400.00	62.4 PK	74.0	-11.6	2.65 V	144	42.2	20.2
4	#10400.00	50.1 AV	54.0	-3.9	2.65 V	144	29.9	20.2

Remarks:

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

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	103.4 PK			1.38 H	24	61.9	41.5
2	*5240.00	93.0 AV			1.38 H	24	51.5	41.5
3	5350.00	60.2 PK	74.0	-13.8	1.46 H	33	52.2	8.0
4	5350.00	47.8 AV	54.0	-6.2	1.46 H	33	39.8	8.0
5	#10480.00	62.0 PK	74.0	-12.0	1.19 H	300	41.7	20.3
6	#10480.00	48.9 AV	54.0	-5.1	1.19 H	300	28.6	20.3
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	*5240.00	123.6 PK			1.68 V	2	82.1	41.5
2	*5240.00	113.7 AV			1.68 V	2	72.2	41.5
3	5350.00	62.3 PK	74.0	-11.7	1.69 V	355	54.3	8.0
4	5350.00	49.8 AV	54.0	-4.2	1.69 V	355	41.8	8.0
5	#10480.00	62.5 PK	74.0	-11.5	2.48 V	150	42.2	20.3
6	#10480.00	49.9 AV	54.0	-4.1	2.48 V	150	29.6	20.3

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 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	#5629.60	60.3 PK	68.2	-7.9	2.19 H	47	51.8	8.5
2	*5745.00	109.2 PK			2.19 H	47	66.5	42.7
3	*5745.00	98.3 AV			2.19 H	47	55.6	42.7
4	#5989.60	61.6 PK	68.2	-6.6	2.19 H	47	51.9	9.7
5	11490.00	63.1 PK	74.0	-10.9	1.38 H	255	41.3	21.8
6	11490.00	50.2 AV	54.0	-3.8	1.38 H	255	28.4	21.8
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	#5646.40	66.9 PK	68.2	-1.3	1.88 V	183	58.3	8.6
2	*5745.00	127.6 PK			1.88 V	183	84.9	42.7
3	*5745.00	116.9 AV			1.88 V	183	74.2	42.7
4	#5992.00	63.8 PK	68.2	-4.4	1.88 V	183	54.1	9.7
5	11490.00	63.7 PK	74.0	-10.3	2.11 V	102	41.9	21.8
6	11490.00	50.5 AV	54.0	-3.5	2.11 V	102	28.7	21.8

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 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	#5642.40	60.6 PK	68.2	-7.6	2.20 H	46	52.0	8.6
2	*5785.00	108.8 PK			2.20 H	46	66.1	42.7
3	*5785.00	98.1 AV			2.20 H	46	55.4	42.7
4	#5970.40	61.7 PK	68.2	-6.5	2.20 H	46	52.1	9.6
5	11570.00	63.2 PK	74.0	-10.8	1.42 H	258	41.4	21.8
6	11570.00	50.2 AV	54.0	-3.8	1.42 H	258	28.4	21.8
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	#5636.80	65.4 PK	68.2	-2.8	1.89 V	180	56.9	8.5
2	*5785.00	127.3 PK			1.89 V	180	84.6	42.7
3	*5785.00	116.5 AV			1.89 V	180	73.8	42.7
4	#5936.80	64.5 PK	68.2	-3.7	1.89 V	180	55.1	9.4
5	11570.00	63.5 PK	74.0	-10.5	2.32 V	114	41.7	21.8
6	11570.00	50.3 AV	54.0	-3.7	2.32 V	114	28.5	21.8

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 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	#5609.60	60.7 PK	68.2	-7.5	2.18 H	47	52.2	8.5
2	*5825.00	109.5 PK			2.18 H	47	66.6	42.9
3	*5825.00	98.4 AV			2.18 H	47	55.5	42.9
4	#5971.20	61.1 PK	68.2	-7.1	2.18 H	47	51.5	9.6
5	11650.00	63.1 PK	74.0	-10.9	1.44 H	239	41.7	21.4
6	11650.00	49.8 AV	54.0	-4.2	1.44 H	239	28.4	21.4
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	#5616.80	62.4 PK	68.2	-5.8	1.86 V	183	53.9	8.5
2	*5825.00	127.3 PK			1.86 V	183	84.4	42.9
3	*5825.00	116.1 AV			1.86 V	183	73.2	42.9
4	#5924.00	67.8 PK	68.9	-1.1	1.86 V	183	58.4	9.4
5	11650.00	63.4 PK	74.0	-10.6	2.24 V	91	42.0	21.4
6	11650.00	50.0 AV	54.0	-4.0	2.24 V	91	28.6	21.4

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	58.8 PK	74.0	-15.2	1.47 H	34	51.4	7.4
2	5150.00	46.0 AV	54.0	-8.0	1.47 H	34	38.6	7.4
3	*5190.00	94.0 PK			1.41 H	24	52.7	41.3
4	*5190.00	83.7 AV			1.41 H	24	42.4	41.3
5	#10380.00	61.7 PK	74.0	-12.3	1.22 H	352	41.7	20.0
6	#10380.00	48.7 AV	54.0	-5.3	1.22 H	352	28.7	20.0
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	70.3 PK	74.0	-3.7	1.74 V	6	62.9	7.4
2	**5150.00**	**53.0 AV**	**54.0**	**-1.0**	**1.74 V**	**6**	**45.6**	**7.4**
3	*5190.00	113.2 PK			1.70 V	2	71.9	41.3
4	*5190.00	103.5 AV			1.70 V	2	62.2	41.3
5	#10380.00	62.4 PK	74.0	-11.6	2.02 V	118	42.4	20.0
6	#10380.00	49.6 AV	54.0	-4.4	2.02 V	118	29.6	20.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
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	*5230.00	98.7 PK			1.39 H	27	57.3	41.4
2	*5230.00	88.6 AV			1.39 H	27	47.2	41.4
3	5350.00	58.7 PK	74.0	-15.3	1.44 H	41	50.7	8.0
4	5350.00	46.4 AV	54.0	-7.6	1.44 H	41	38.4	8.0
5	#10460.00	62.0 PK	74.0	-12.0	1.28 H	336	41.8	20.2
6	#10460.00	49.6 AV	54.0	-4.4	1.28 H	336	29.4	20.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	118.9 PK			1.70 V	0	77.5	41.4
2	*5230.00	109.3 AV			1.70 V	0	67.9	41.4
3	5350.00	63.3 PK	74.0	-10.7	1.74 V	2	55.3	8.0
4	5350.00	52.8 AV	54.0	-1.2	1.74 V	2	44.8	8.0
5	#10460.00	62.8 PK	74.0	-11.2	2.11 V	109	42.6	20.2
6	#10460.00	50.2 AV	54.0	-3.8	2.11 V	109	30.0	20.2

Remarks:

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

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	#5625.60	62.2 PK	68.2	-6.0	2.26 H	45	53.7	8.5
2	*5755.00	103.3 PK			2.26 H	45	60.6	42.7
3	*5755.00	93.3 AV			2.26 H	45	50.6	42.7
4	#5935.20	62.3 PK	68.2	-5.9	2.26 H	45	52.9	9.4
5	11510.00	63.2 PK	74.0	-10.8	1.55 H	284	41.5	21.7
6	11510.00	50.3 AV	54.0	-3.7	1.55 H	284	28.6	21.7
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	#5646.40	66.7 PK	68.2	-1.5	1.88 V	183	58.1	8.6
2	*5755.00	121.8 PK			1.88 V	183	79.1	42.7
3	*5755.00	111.9 AV			1.88 V	183	69.2	42.7
4	#5972.80	61.2 PK	68.2	-7.0	1.88 V	183	51.6	9.6
5	11510.00	63.6 PK	74.0	-10.4	1.95 V	85	41.9	21.7
6	11510.00	50.7 AV	54.0	-3.3	1.95 V	85	29.0	21.7

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	#5648.80	60.5 PK	68.2	-7.7	2.13 H	44	51.9	8.6
2	*5795.00	104.2 PK			2.13 H	44	61.5	42.7
3	*5795.00	93.9 AV			2.13 H	44	51.2	42.7
4	#5974.40	61.3 PK	68.2	-6.9	2.13 H	44	51.7	9.6
5	11590.00	63.4 PK	74.0	-10.6	1.56 H	279	41.7	21.7
6	11590.00	50.5 AV	54.0	-3.5	1.56 H	279	28.8	21.7
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	#5646.40	66.2 PK	68.2	-2.0	1.90 V	186	57.6	8.6
2	*5795.00	123.0 PK			1.90 V	186	80.3	42.7
3	*5795.00	112.6 AV			1.90 V	186	69.9	42.7
4	#5928.80	66.7 PK	68.2	-1.5	1.90 V	186	57.3	9.4
5	11590.00	63.7 PK	74.0	-10.3	1.98 V	93	42.0	21.7
6	11590.00	50.8 AV	54.0	-3.2	1.98 V	93	29.1	21.7

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	59.1 PK	74.0	-14.9	1.48 H	33	51.7	7.4
2	5150.00	45.9 AV	54.0	-8.1	1.48 H	33	38.5	7.4
3	*5210.00	90.6 PK			1.43 H	26	49.2	41.4
4	*5210.00	80.3 AV			1.43 H	26	38.9	41.4
5	5350.00	58.8 PK	74.0	-15.2	1.38 H	29	50.8	8.0
6	5350.00	46.4 AV	54.0	-7.6	1.38 H	29	38.4	8.0
7	#10420.00	61.9 PK	74.0	-12.1	1.17 H	346	41.9	20.0
8	#10420.00	48.8 AV	54.0	-5.2	1.17 H	346	28.8	20.0
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	71.6 PK	74.0	-2.4	1.76 V	359	64.2	7.4
2	**5150.00**	**53.0 AV**	**54.0**	**-1.0**	**1.76 V**	**359**	**45.6**	**7.4**
3	*5210.00	109.8 PK			1.71 V	2	68.4	41.4
4	*5210.00	99.8 AV			1.71 V	2	58.4	41.4
5	5350.00	59.5 PK	74.0	-14.5	1.77 V	357	51.5	8.0
6	5350.00	48.2 AV	54.0	-5.8	1.77 V	357	40.2	8.0
7	#10420.00	62.4 PK	74.0	-11.6	2.30 V	98	42.4	20.0
8	#10420.00	49.3 AV	54.0	-4.7	2.30 V	98	29.3	20.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
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	#5620.00	60.7 PK	68.2	-7.5	2.27 H	47	52.2	8.5
2	*5775.00	95.8 PK			2.27 H	47	53.1	42.7
3	*5775.00	85.9 AV			2.27 H	47	43.2	42.7
4	#5970.40	61.2 PK	68.2	-7.0	2.27 H	47	51.6	9.6
5	11550.00	63.3 PK	74.0	-10.7	1.49 H	268	41.5	21.8
6	11550.00	50.1 AV	54.0	-3.9	1.49 H	268	28.3	21.8
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	#5644.00	66.9 PK	68.2	-1.3	1.90 V	187	58.3	8.6
2	*5775.00	114.9 PK			1.90 V	187	72.2	42.7
3	*5775.00	104.4 AV			1.90 V	187	61.7	42.7
4	#5932.80	62.9 PK	68.2	-5.3	1.90 V	187	53.5	9.4
5	11550.00	63.5 PK	74.0	-10.5	1.96 V	105	41.7	21.8
6	11550.00	50.3 AV	54.0	-3.7	1.96 V	105	28.5	21.8

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.

Below 1GHz Worst-Case Data: 802.11a

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	101.69	32.2 QP	43.5	-11.3	1.24 H	77	50.3	-18.1
2	144.38	26.2 QP	43.5	-17.3	1.50 H	19	40.1	-13.9
3	239.46	28.6 QP	46.0	-17.4	1.00 H	6	43.2	-14.6
4	499.48	25.2 QP	46.0	-20.8	1.24 H	4	33.5	-8.3
5	747.85	30.9 QP	46.0	-15.1	1.24 H	142	33.7	-2.8
6	932.19	39.8 QP	46.0	-6.2	2.00 H	262	39.6	0.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	43.48	35.1 QP	40.0	-4.9	1.50 V	124	49.8	-14.7
2	97.81	31.5 QP	43.5	-12.0	1.24 V	146	50.2	-18.7
3	144.38	27.6 QP	43.5	-15.9	1.24 V	351	41.5	-13.9
4	317.08	28.5 QP	46.0	-17.5	1.24 V	76	40.0	-11.5
5	740.09	36.1 QP	46.0	-9.9	1.00 V	9	39.2	-3.1
6	938.01	40.3 QP	46.0	-5.7	2.00 V	67	39.8	0.5

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

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	Aug. 15, 2017	Aug. 14, 2018
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.

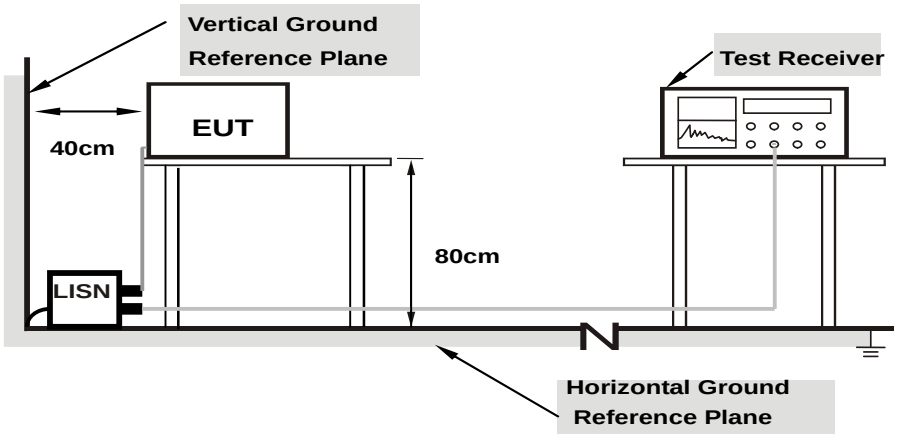
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

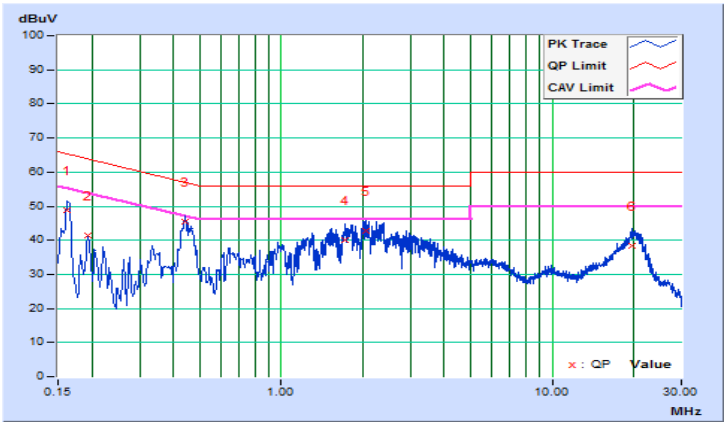
Worst-case data: 802.11a

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16181	10.45	38.23	23.75	48.68	34.20	65.37	55.37	-16.69	-21.17
2	0.19305	10.45	30.97	15.80	41.42	26.25	63.90	53.90	-22.48	-27.65
3	**0.44273**	**10.51**	**34.84**	**27.25**	**45.35**	**37.76**	**57.01**	**47.01**	**-11.66**	**-9.25**
4	1.72182	10.51	29.72	22.85	40.23	33.36	56.00	46.00	-15.77	-12.64
5	2.06263	10.53	32.16	25.79	42.69	36.32	56.00	46.00	-13.31	-9.68
6	19.78602	11.41	26.88	20.54	38.29	31.95	60.00	50.00	-21.71	-18.05

Remarks:

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

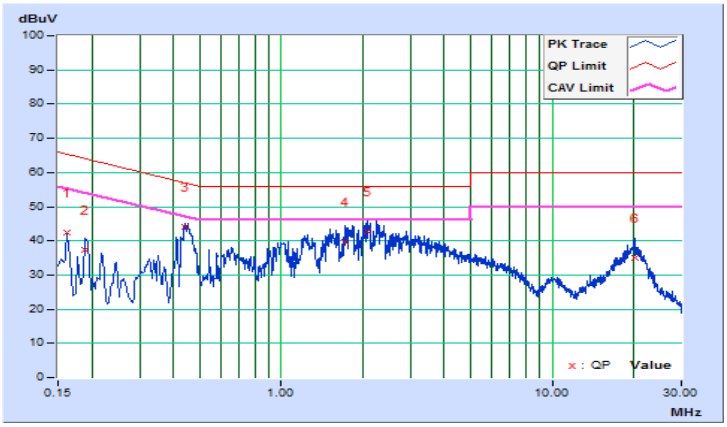


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16181	10.21	32.27	19.54	42.48	29.75	65.37	55.37	-22.89	-25.62
2	0.18953	10.22	27.22	13.60	37.44	23.82	64.06	54.06	-26.62	-30.24
3	0.43934	10.24	33.98	27.30	44.22	37.54	57.07	47.07	-12.85	-9.53
4	1.71400	10.30	29.48	22.27	39.78	32.57	56.00	46.00	-16.22	-13.43
5	2.08545	10.32	32.44	26.06	42.76	36.38	56.00	46.00	-13.24	-9.62
6	20.16920	11.06	24.04	17.51	35.10	28.57	60.00	50.00	-24.90	-21.43

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

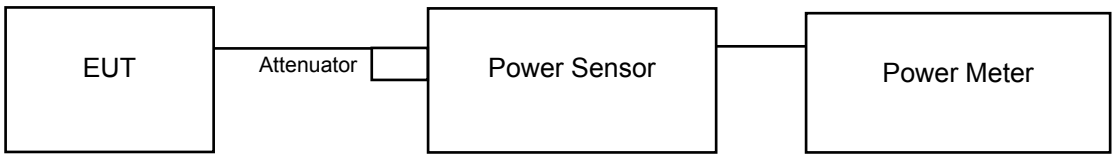
Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

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 $N_{ANT} \geq 5$.

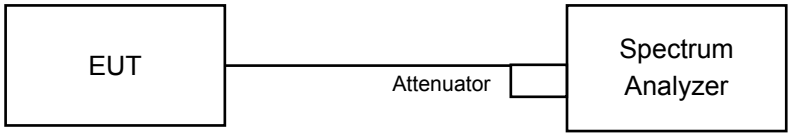
For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.3.2 Test Setup

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



802.11ac (VHT80)



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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)

a. Set span to encompass the entire 26 dB EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.

b. Set sweep trigger to “free run”.

c. Set RBW = 1 MHz.

d. Set VBW ≥ 3 MHz.

e. Number of points in sweep ≥ 2 Span / RBW.

f. Sweep time ≤ (number of points in sweep) * T

g. Using emission bandwidth to determine the frequency span for integration the channel bandwidth.

h. Detector = RMS.

i. Trace mode = max hold.

j. Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.

k. Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

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:

For U-NII-1 band (Outdoor Access Point):

CDD Mode

802.11a

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3							
36	5180	16.22	15.63	16.87	16.11	167.911	22.25	29.00	-3.887	18.36	21.00	Pass
40	5200	17.03	16.49	17.85	17.41	211.067	23.24	29.00	-3.887	19.35	21.00	Pass
48	5240	17.32	16.64	17.95	17.58	219.736	23.42	29.00	-3.887	19.53	21.00	Pass

Note:
1. Gain = 7dBi > 6dBi, so the power limit shall be reduced to 30-(7-6) = 29.00dBm.
2. Gain = -3.887dBi (above 30 degrees from the horizon).
3. EIRP = conducted power +(-3.887dBi) + array gain = (0 dB (i.e., no array gain) for $N_{ANT} \leq 4$).

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3							
36	5180	16.01	15.49	16.54	15.86	158.932	22.01	29.00	-3.887	18.12	21.00	Pass
40	5200	17.31	16.41	17.66	17.48	211.900	23.26	29.00	-3.887	19.37	21.00	Pass
48	5240	17.31	16.72	17.86	17.69	**220.659**	23.44	29.00	-3.887	19.55	21.00	Pass

Note:
1. Gain = 7dBi > 6dBi, so the power limit shall be reduced to 30-(7-6) = 29.00dBm.
2. Gain = -3.887dBi (above 30 degrees from the horizon).
3. EIRP = conducted power +(-3.887dBi) + array gain = (0 dB (i.e., no array gain) for $N_{ANT} \leq 4$).

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3							
38	5190	11.88	10.69	12.32	11.48	58.260	17.65	29.00	-3.887	13.76	21.00	Pass
46	5230	17.16	17.02	17.80	16.75	209.921	23.22	29.00	-3.887	19.33	21.00	Pass

Note:
1. Gain = 7dBi > 6dBi, so the power limit shall be reduced to 30-(7-6) = 29.00dBm.
2. Gain = -3.887dBi (above 30 degrees from the horizon).
3. EIRP = conducted power +(-3.887dBi) + array gain = (0 dB (i.e., no array gain) for $N_{ANT} \leq 4$).

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3							
42	5210	10.31	10.04	11.33	9.69	43.727	16.41	29.00	-3.887	12.52	21.00	Pass

Note:
1. Gain = 7dBi > 6dBi, so the power limit shall be reduced to 30-(7-6) = 29.00dBm.
2. Gain = -3.887dBi (above 30 degrees from the horizon).
3. EIRP = conducted power +(-3.887dBi) + array gain = (0 dB (i.e., no array gain) for $N_{ANT} \leq 4$).

Beamforming Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3							
36	5180	9.99	9.47	10.52	9.84	39.719	15.99	22.98	-3.887	18.13	21.00	Pass
40	5200	11.29	10.39	11.64	11.46	52.966	17.24	22.98	-3.887	19.37	21.00	Pass
48	5240	11.29	10.70	11.84	11.67	**55.208**	17.42	22.98	-3.887	19.55	21.00	Pass

Note:
1. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power limit shall be reduced to 30-(13.02-6) = 22.98dBm.
2. Gain = -3.887dBi (above 30 degrees from the horizon).
3. Beamforming Gain = 6.02dBi
4. EIRP = conducted power + (-3.887dBi) + beamforming gain (6.02dBi).

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3							
38	5190	5.86	4.67	6.30	5.46	14.555	11.63	22.98	-3.887	13.77	21.00	Pass
46	5230	11.14	11.00	11.78	10.73	52.481	17.20	22.98	-3.887	19.33	21.00	Pass

Note:
1. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power limit shall be reduced to 30-(13.02-6) = 22.98dBm.
2. Gain = -3.887dBi (above 30 degrees from the horizon).
3. Beamforming Gain = 6.02dBi
4. EIRP = conducted power + (-3.887dBi) + beamforming gain (6.02dBi).

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3							
42	5210	4.29	4.02	5.31	3.67	10.940	10.39	22.98	-3.887	12.52	21.00	Pass

Note:
1. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power limit shall be reduced to 30-(13.02-6) = 22.98dBm.
2. Gain = -3.887dBi (above 30 degrees from the horizon).
3. Beamforming Gain = 6.02dBi
4. EIRP = conducted power + (-3.887dBi) + beamforming gain (6.02dBi).

For U-NII-3 band:

CDD Mode

802.11a

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
149	5745	21.41	20.33	21.47	20.21	491.487	26.92	29.00	Pass
157	5785	22.43	20.72	21.82	21.36	**581.845**	27.65	29.00	Pass
165	5825	21.73	20.23	21.67	20.91	524.578	27.20	29.00	Pass

Note: Gain = 7dBi > 6dBi, so the power limit shall be reduced to 30-(7-6) = 29.00dBm.

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	Chain 2	Chain 3				
149	5745	21.59	20.21	21.54	20.76	510.851	27.08	29.00	Pass
157	5785	22.33	20.68	21.79	21.22	571.394	27.57	29.00	Pass
165	5825	21.63	20.19	21.62	20.80	515.455	27.12	29.00	Pass

Note: Gain = 7dBi > 6dBi, so the power limit shall be reduced to 30-(7-6) = 29.00dBm.

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	Chain 2	Chain 3				
151	5755	19.52	18.51	20.39	18.62	342.668	25.35	29.00	Pass
159	5795	20.72	19.38	21.09	19.53	423.000	26.26	29.00	Pass

Note: Gain = 7dBi > 6dBi, so the power limit shall be reduced to 30-(7-6) = 29.00dBm.

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	Chain 2	Chain 3				
155	5775	15.44	14.70	16.03	14.79	134.724	21.29	29.00	Pass

Note: Gain = 7dBi > 6dBi, so the power limit shall be reduced to 30-(7-6) = 29.00dBm.

Beamforming Mode

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	Chain 2	Chain 3				
149	5745	15.57	14.19	15.52	14.74	127.644	21.06	22.98	Pass
157	5785	16.31	14.66	15.77	15.20	**142.889**	21.55	22.98	Pass
165	5825	15.61	14.17	15.60	14.78	128.825	21.10	22.98	Pass

Note: Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power limit shall be reduced to 30-(13.02-6) = 22.98dBm.

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	Chain 2	Chain 3				
151	5755	13.50	12.49	14.37	12.60	85.704	19.33	22.98	Pass
159	5795	14.70	13.36	15.07	13.51	105.682	20.24	22.98	Pass

Note: Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power limit shall be reduced to 30-(13.02-6) = 22.98dBm.

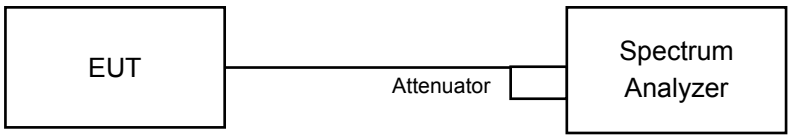
802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
155	5775	9.42	8.68	10.01	8.77	33.651	15.27	22.98	Pass

Note: Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power limit shall be reduced to 30-(13.02-6) = 22.98dBm.

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

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
36	5180	17.28	17.16	17.16	17.16
40	5200	17.76	17.52	18.36	17.64
48	5240	17.88	17.64	18.36	17.76
149	5745	29.82	29.13	27.72	28.70
157	5785	32.88	34.44	30.00	32.76
165	5825	31.44	30.48	29.04	30.96

802.11n (HT20)

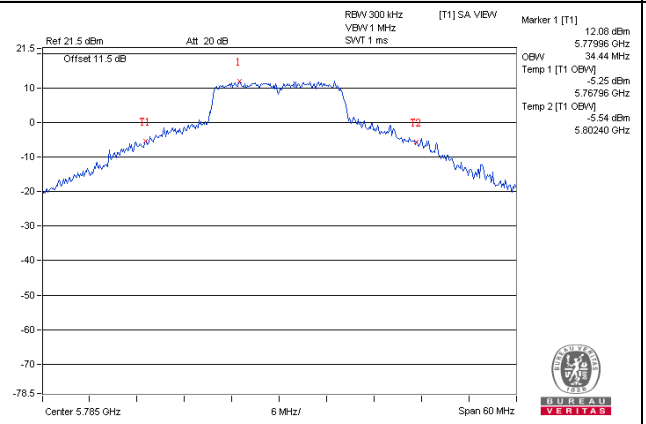
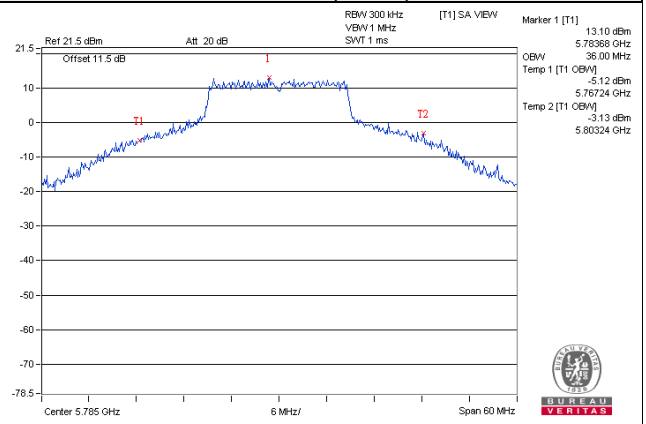
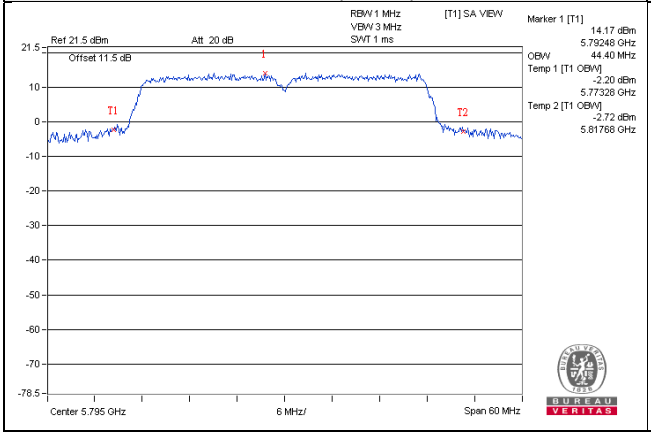
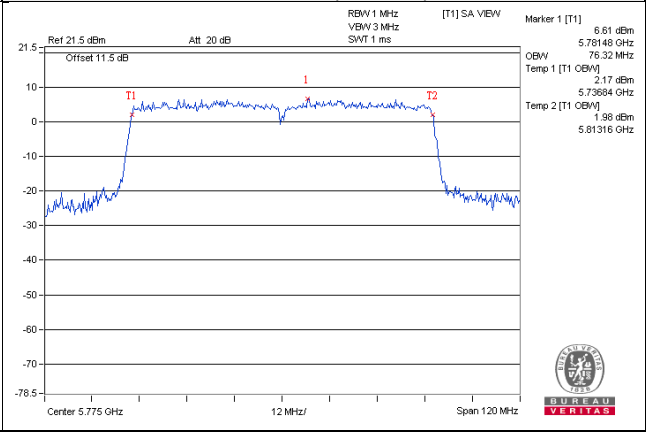
Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
36	5180	18.24	18.12	18.24	18.12
40	5200	18.72	18.48	19.20	18.72
48	5240	18.84	18.48	19.20	18.72
149	5745	31.20	31.20	29.30	31.80
157	5785	35.28	35.40	31.92	36.00
165	5825	32.76	32.52	30.96	33.36

802.11n (HT40)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
38	5190	36.72	36.60	36.84	36.72
46	5230	37.32	37.08	37.20	37.08
151	5755	38.76	38.04	39.60	38.28
159	5795	44.40	41.52	44.16	42.60

802.11ac (VHT80)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
42	5210	75.36	75.36	75.12	75.36
155	5775	76.08	76.08	76.08	76.32

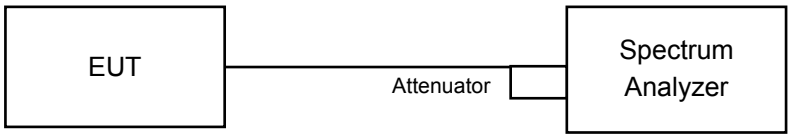
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

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:

Using method SA-2

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

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

c. Set Channel power measure = 1MHz

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

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

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

For U-NII-3 band:

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

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

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

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

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

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

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

Same as 4.3.6.

4.5.7 Test Results

For U-NII-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	Chain 2	Chain 3				
36	5180	2.38	2.12	3.05	2.69	0.27	8.86	9.98	Pass
40	5200	2.86	2.72	4.11	3.25	0.27	9.55	9.98	Pass
48	5240	3.24	2.88	4.02	3.86	0.27	9.81	9.98	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power density limit shall be reduced to 17-(13.02-6) = 9.98dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
36	5180	1.87	1.08	2.29	2.24	0.22	8.14	9.98	Pass
40	5200	3.53	3.03	3.89	4.04	0.22	9.88	9.98	Pass
48	5240	3.63	3.07	3.80	3.98	0.22	9.88	9.98	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power density limit shall be reduced to 17-(13.02-6) = 9.98dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT40)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
38	5190	-5.02	-6.21	-4.58	-4.60	0.44	1.40	9.98	Pass
46	5230	0.30	0.11	1.07	0.76	0.44	7.04	9.98	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power density limit shall be reduced to 17-(13.02-6) = 9.98dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

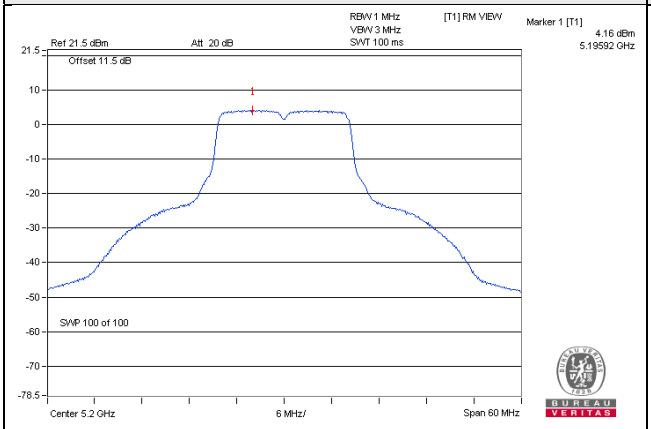
802.11ac (VHT80)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
42	5210	-8.13	-8.49	-7.26	-7.77	0.27	-1.60	9.98	Pass

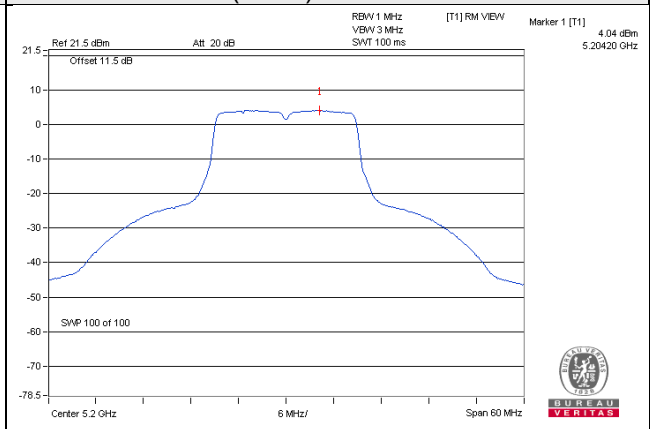
Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power density limit shall be reduced to 17-(13.02-6) = 9.98dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

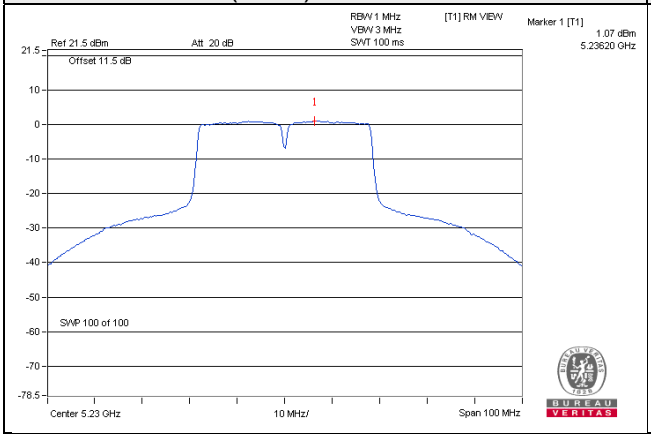
802.11a / Chain 2 / CH 40



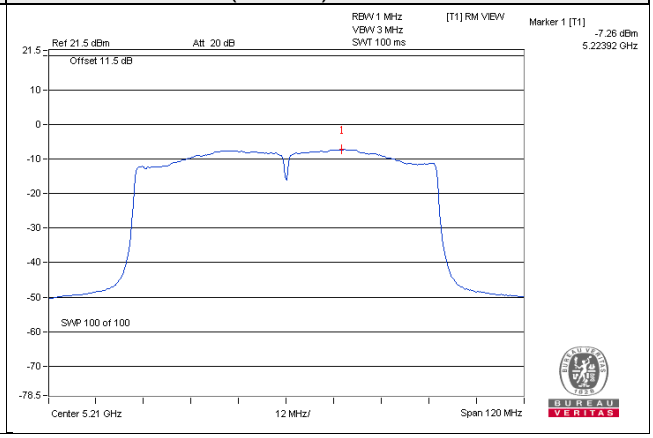
802.11n (HT20) / Chain 3 / CH 40



802.11n (HT40) / Chain 2 / CH 46



802.11ac (VHT80) / Chain 2 / CH 42



For U-NII-3 band:

802.11a

TX chain	Chan.	Freq. (MHz)	PSD w/o Duty Factor		10 log (N=4) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	149	5745	-0.99	1.23	6.02	0.27	7.52	22.98	Pass
	157	5785	-0.33	1.89	6.02	0.27	8.18	22.98	Pass
	165	5825	-1.03	1.19	6.02	0.27	7.48	22.98	Pass
1	149	5745	-0.95	1.27	6.02	0.27	7.56	22.98	Pass
	157	5785	-0.79	1.43	6.02	0.27	7.72	22.98	Pass
	165	5825	-1.38	0.84	6.02	0.27	7.13	22.98	Pass
2	149	5745	-0.98	1.24	6.02	0.27	7.53	22.98	Pass
	157	5785	-0.74	1.48	6.02	0.27	7.77	22.98	Pass
	165	5825	-0.95	1.27	6.02	0.27	7.56	22.98	Pass
3	149	5745	-1.23	0.99	6.02	0.27	7.28	22.98	Pass
	157	5785	-0.43	1.79	6.02	0.27	8.08	22.98	Pass
	165	5825	-1.04	1.18	6.02	0.27	7.47	22.98	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power density limit shall be reduced to 30-(13.02-6) = 22.98dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

TX chain	Chan.	Freq. (MHz)	PSD w/o Duty Factor		10 log (N=4) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	149	5745	-1.23	0.99	6.02	0.22	7.23	22.98	Pass
	157	5785	-0.81	1.41	6.02	0.22	7.65	22.98	Pass
	165	5825	-1.23	0.99	6.02	0.22	7.23	22.98	Pass
1	149	5745	-1.91	0.31	6.02	0.22	6.55	22.98	Pass
	157	5785	-1.49	0.73	6.02	0.22	6.97	22.98	Pass
	165	5825	-1.98	0.24	6.02	0.22	6.48	22.98	Pass
2	149	5745	-1.40	0.82	6.02	0.22	7.06	22.98	Pass
	157	5785	-1.05	1.17	6.02	0.22	7.41	22.98	Pass
	165	5825	-1.13	1.09	6.02	0.22	7.33	22.98	Pass
3	149	5745	-1.29	0.93	6.02	0.22	7.17	22.98	Pass
	157	5785	-0.78	1.44	6.02	0.22	7.68	22.98	Pass
	165	5825	-1.38	0.84	6.02	0.22	7.08	22.98	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power density limit shall be reduced to 30-(13.02-6) = 22.98dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT40)

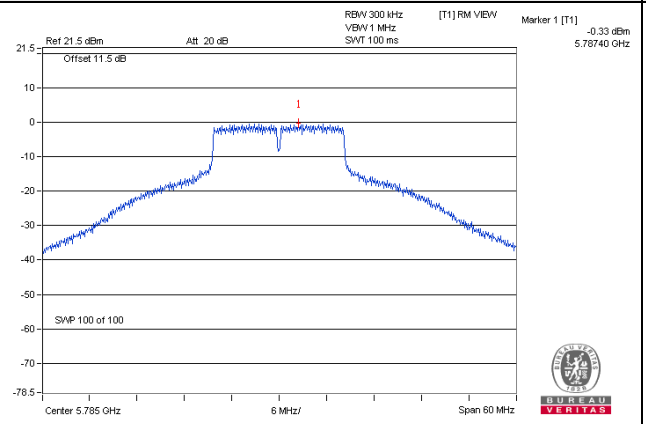
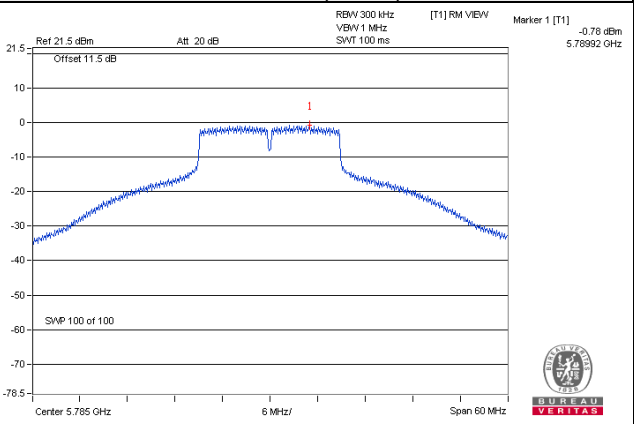
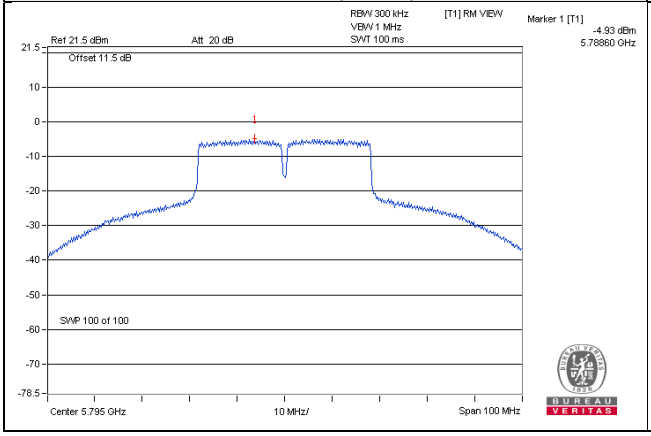
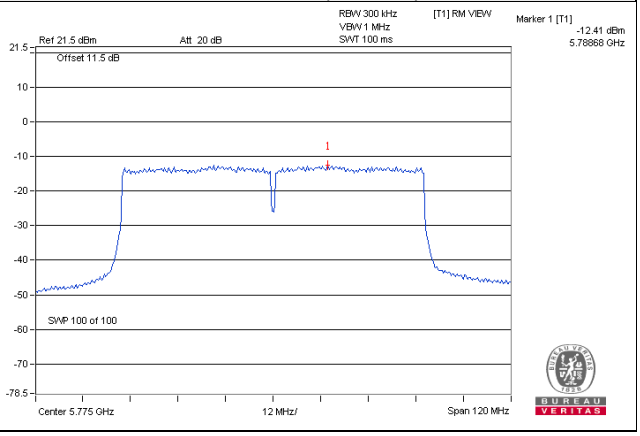
TX chain	Chan.	Freq. (MHz)	PSD w/o Duty Factor		10 log (N=4) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	151	5755	-6.09	-3.87	6.02	0.44	2.59	22.98	Pass
	159	5795	-5.17	-2.95	6.02	0.44	3.51	22.98	Pass
1	151	5755	-7.19	-4.97	6.02	0.44	1.49	22.98	Pass
	159	5795	-6.24	-4.02	6.02	0.44	2.44	22.98	Pass
2	151	5755	-5.67	-3.45	6.02	0.44	3.01	22.98	Pass
	159	5795	-4.93	-2.71	6.02	0.44	3.75	22.98	Pass
3	151	5755	-6.53	-4.31	6.02	0.44	2.15	22.98	Pass
	159	5795	-5.65	-3.43	6.02	0.44	3.03	22.98	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power density limit shall be reduced to 30-(13.02-6) = 22.98dBm.
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=4) dB	Duty Factor (dB)	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	155	5775	-12.80	-10.58	6.02	0.27	-4.29	22.98	Pass
1	155	5775	-13.71	-11.49	6.02	0.27	-5.20	22.98	Pass
2	155	5775	-12.41	-10.19	6.02	0.27	-3.90	22.98	Pass
3	155	5775	-13.24	-11.02	6.02	0.27	-4.73	22.98	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7dBi + 10log(4) = 13.02dBi > 6dBi, so the power density limit shall be reduced to 30-(13.02-6) = 22.98dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

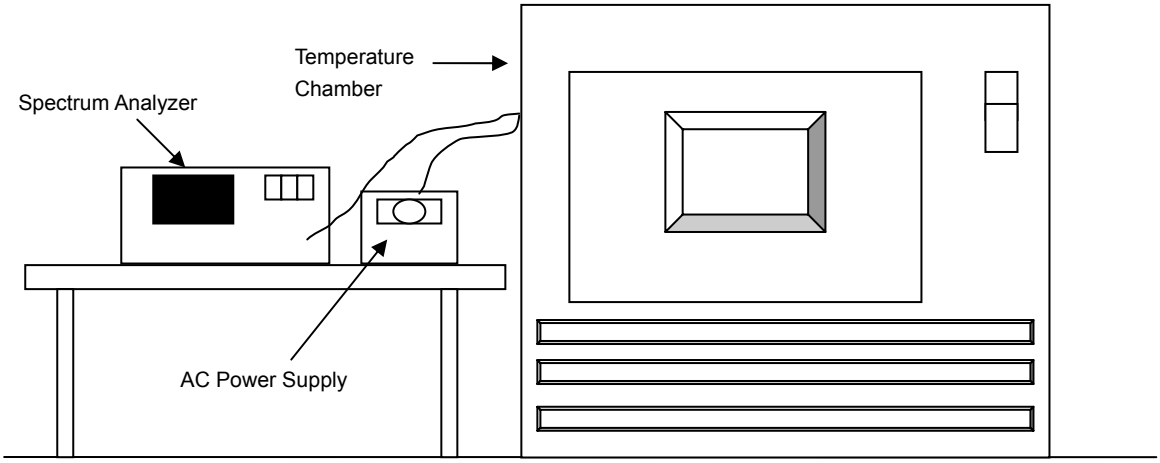
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

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	5179.9845	-0.00030	5179.9859	-0.00027	5179.9864	-0.00026	5179.9846	-0.00030
40	120	5179.9884	-0.00022	5179.9869	-0.00025	5179.9869	-0.00025	5179.9849	-0.00029
30	120	5180.0088	0.00017	5180.0061	0.00012	5180.0083	0.00016	5180.0104	0.00020
20	120	5179.9765	-0.00045	5179.9786	-0.00041	5179.9762	-0.00046	5179.9789	-0.00041
10	120	5179.986	-0.00027	5179.9867	-0.00026	5179.9869	-0.00025	5179.9828	-0.00033
0	120	5179.9926	-0.00014	5179.9924	-0.00015	5179.9955	-0.00009	5179.9936	-0.00012
-10	120	5180.0041	0.00008	5180.0061	0.00012	5180.0064	0.00012	5180.0025	0.00005
-20	120	5179.996	-0.00008	5179.997	-0.00006	5179.9963	-0.00007	5179.994	-0.00012
-30	120	5180.0044	0.00008	5180.0054	0.00010	5180.0048	0.00009	5180.0086	0.00017

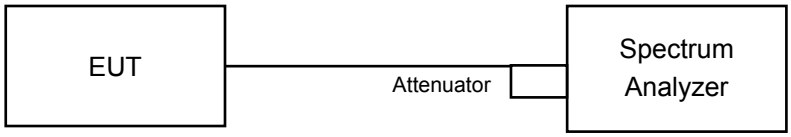
Frequency Stability Versus Voltage									
Operating Frequency: 5180MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5179.9764	-0.00046	5179.9788	-0.00041	5179.9764	-0.00046	5179.9789	-0.00041
	120	5179.9765	-0.00045	5179.9786	-0.00041	5179.9762	-0.00046	5179.9789	-0.00041
	102	5179.9771	-0.00044	5179.9786	-0.00041	5179.9754	-0.00047	5179.9785	-0.00042

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	Chain 2	Chain 3		
149	5745	16.38	16.37	16.36	16.37	0.5	Pass
157	5785	16.40	16.35	16.37	16.36	0.5	Pass
165	5825	16.39	16.36	16.38	16.39	0.5	Pass

802.11n (HT20)

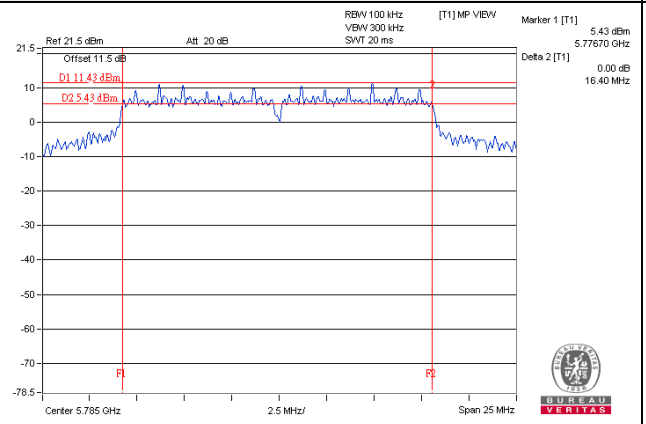
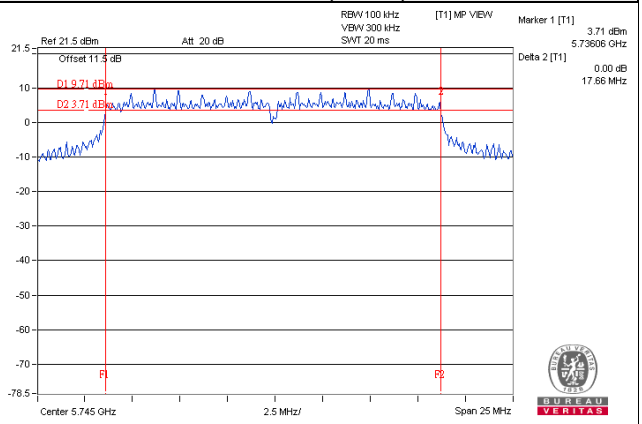
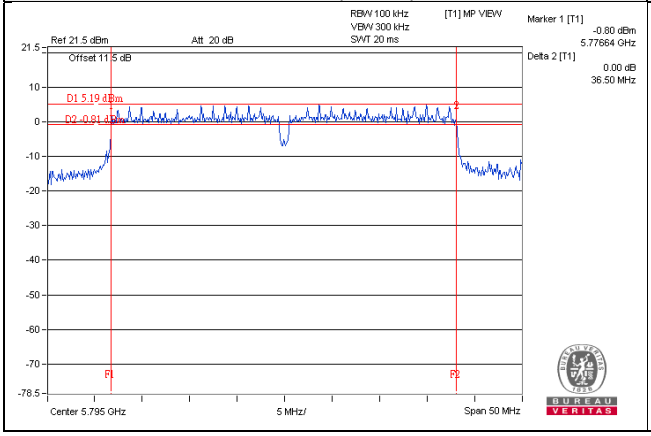
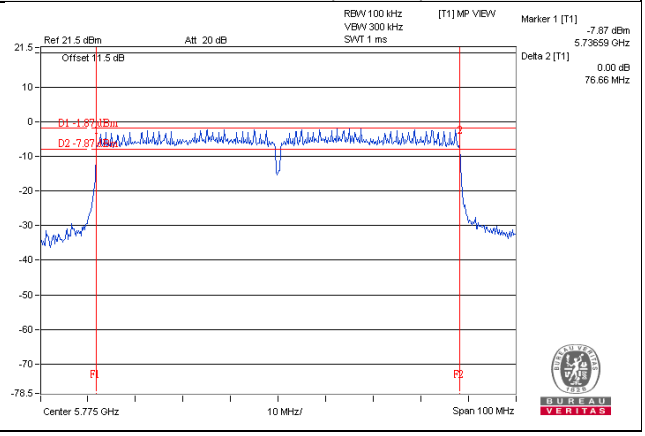
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
149	5745	17.63	17.66	17.62	17.63	0.5	Pass
157	5785	17.61	17.64	17.65	17.63	0.5	Pass
165	5825	17.63	17.64	17.64	17.63	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
151	5755	36.48	36.49	36.46	36.47	0.5	Pass
159	5795	36.49	36.50	36.49	36.49	0.5	Pass

802.11ac (VHT80)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
155	5775	76.49	76.66	76.58	76.48	0.5	Pass

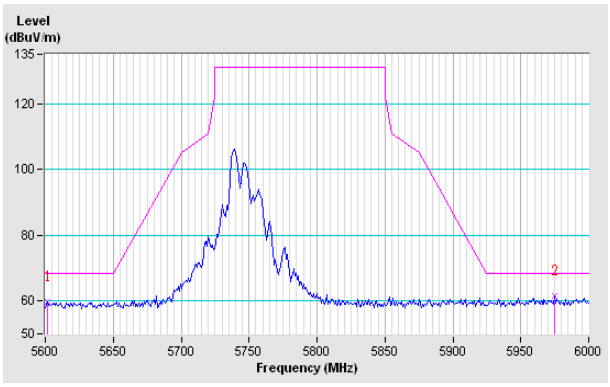
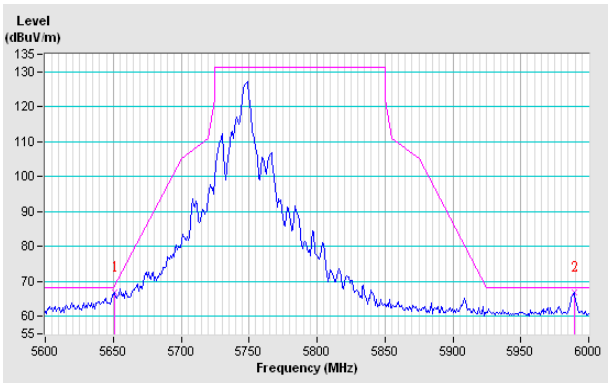
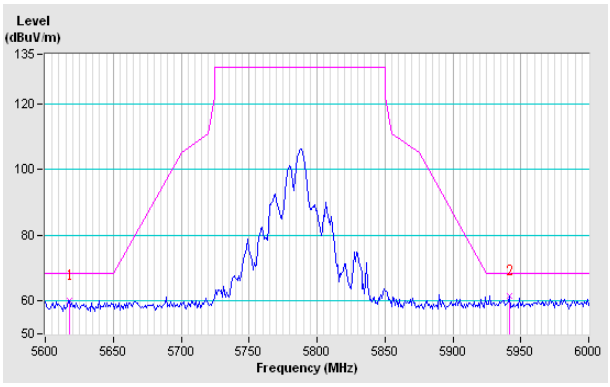
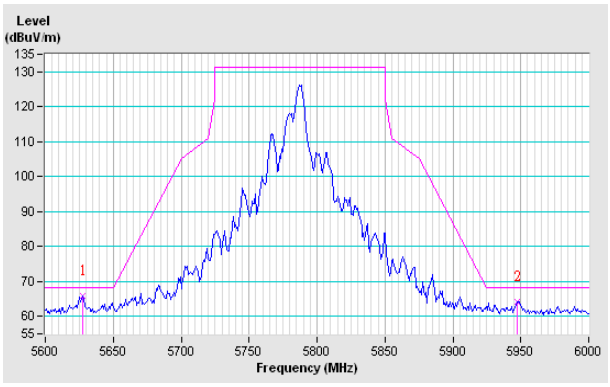
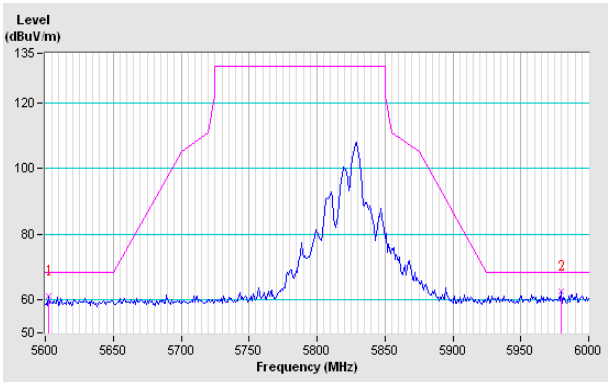
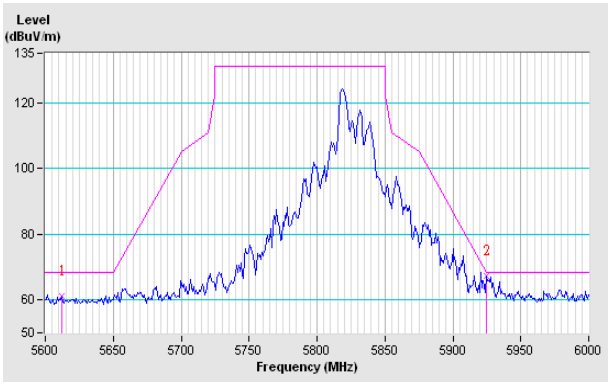
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

5 Pictures of Test Arrangements

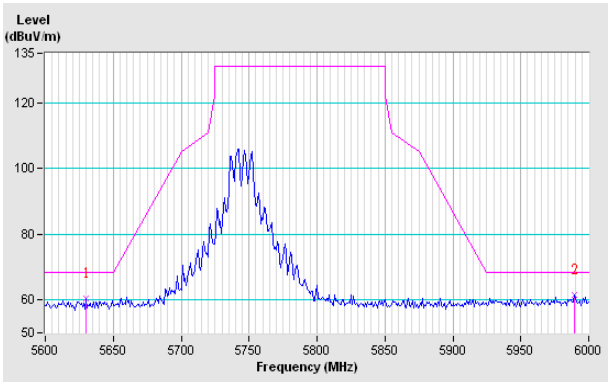
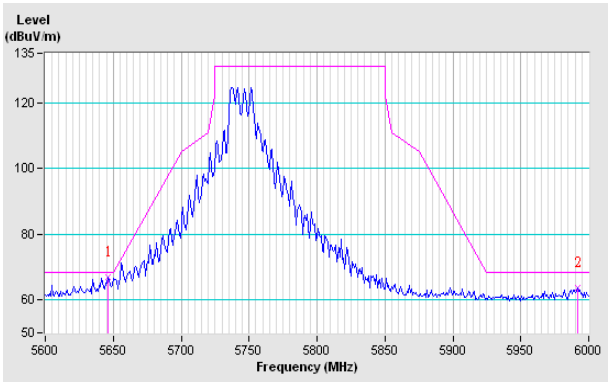
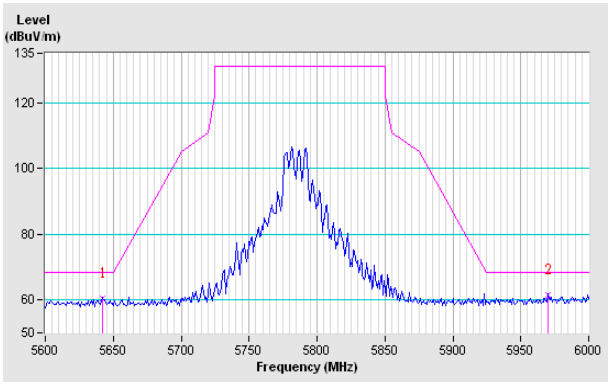
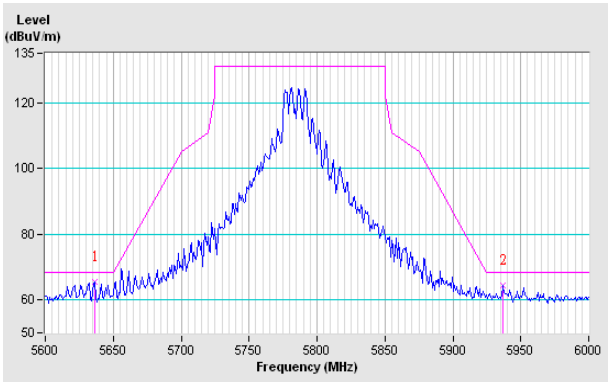
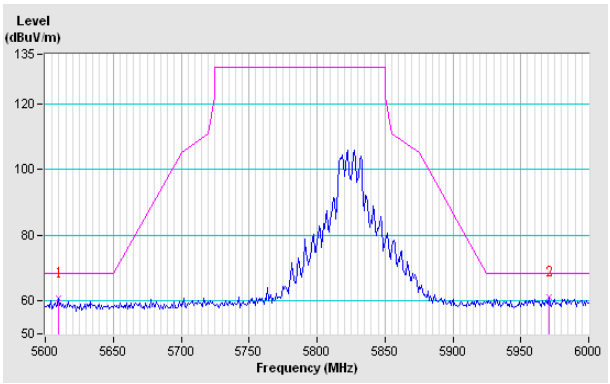
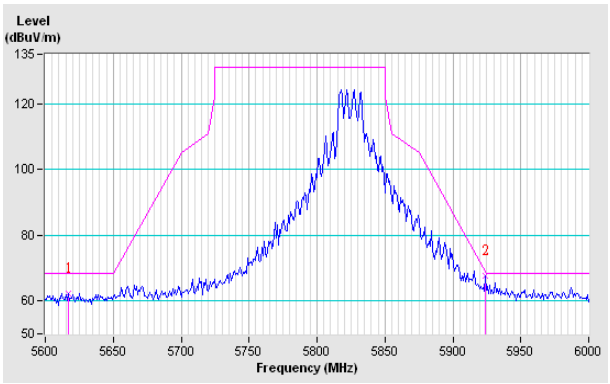
Please refer to the attached file (Test Setup Photo).

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

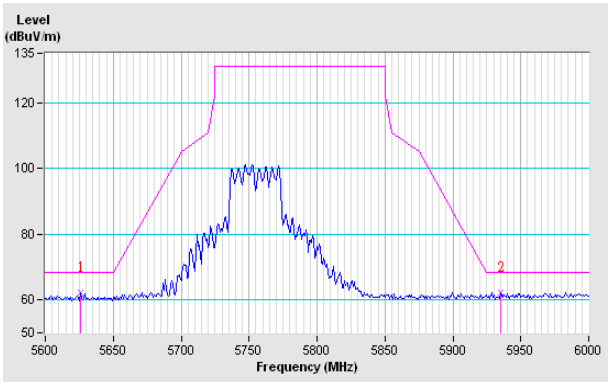
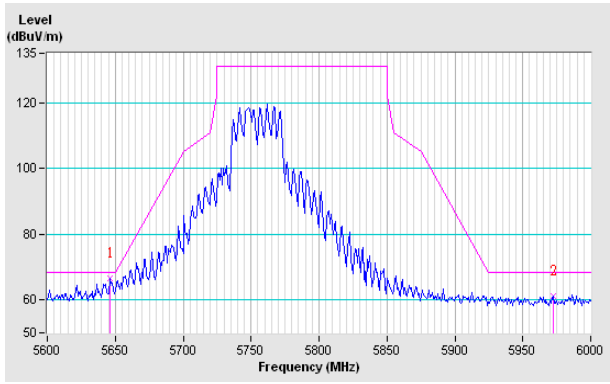
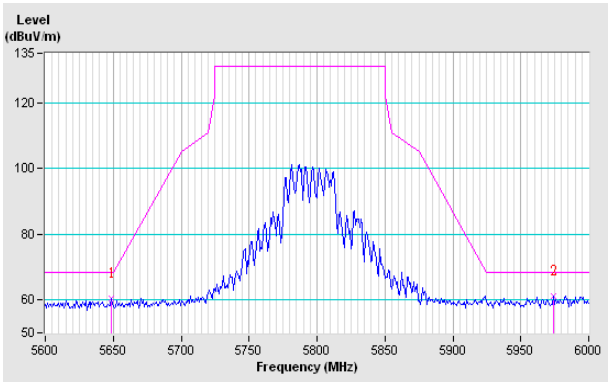
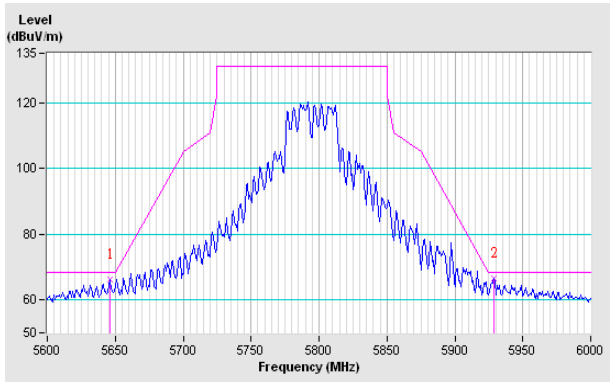
802.11a

CH149	
Horizontal	Vertical
	
CH157	
Horizontal	Vertical
	
CH165	
Horizontal	Vertical
	

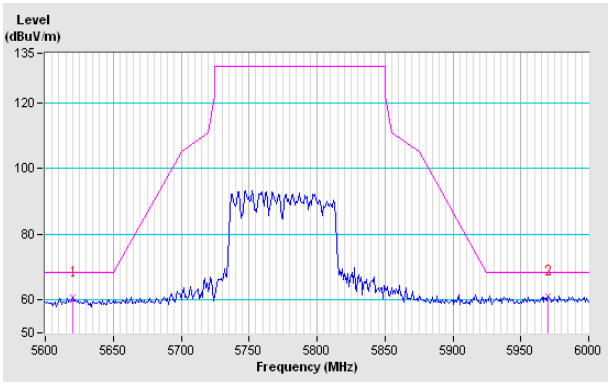
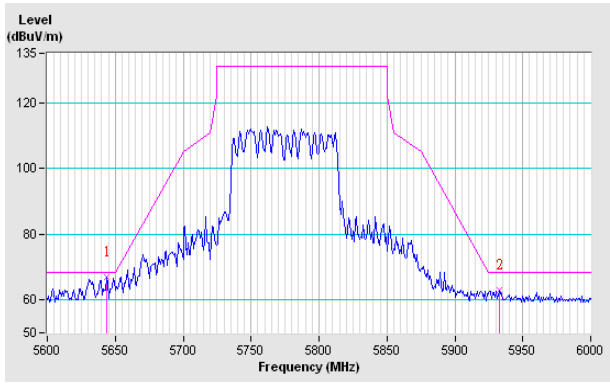
802.11n (HT20)

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 FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

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 ---