FCC Test Report

Report No.:	RF180302C27-1
FCC ID:	A8J-EMD1
Test Model:	EMD1, EMD2
Series Model:	ERP1
Received Date:	Mar. 01, 2018
Test Date:	Mar. 01 ~ May 18, 2018
Issued Date:	May 21, 2018
Applicant:	EnGenius Technologies
Address:	1580 Scenic Avenue, Costa Mesa, CA92626
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
FCC Registration/ Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RF180302C27-1	Original release.	May 21, 2018

1 Certificate of Conformity

Product:	AC1300 Dual-Band Mesh AP
Brand:	EnGenius
Test Model:	EMD1, EMD2
Series Model:	ERP1
Sample Status:	Engineering sample
Applicant:	EnGenius Technologies
Test Date:	Mar. 01 ~ May 18, 2018
Standards:	47 CFR FCC Part 15, Subpart E (Section 15.407) ANSI C63.10:2013

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

Prepared by : _____ , **Date:** May 21, 2018
Polly Chien / Specialist

Approved by : _____ , **Date:** May 21, 2018
Bruce Chen / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -8.86dB at 0.47684MHz.
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 -1.2dB at 5650.00MHz.
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 I-PEX not a standard connector.

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

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	AC1300 Dual-Band Mesh AP
Brand	EnGenius
Test Model	EMD1, EMD2
Series Model	ERP1
Model Difference	Refer to Note
Sample Status	Engineering sample
Power Supply Rating	EMD1 & ERP1: 100-240Vac, 50-60Hz EMD2: 12Vdc (adapter) & 54Vdc (PoE)
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK
Modulation Technology	OFDM
Transfer Rate	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 300Mbps 802.11ac: up to 867Mbps
Operating Frequency	5180~5240MHz, 5745~5825MHz
Number of Channel	5180~5240MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5745~5825MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
Output Power	CDD Mode: 5180~5240MHz: 179.938mW 5745~5825MHz: 385.677mW Beamforming Mode: 5180~5240MHz: 89.950mW 5745~5825MHz: 192.752mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter
Cable Supplied	NA

Note:

1. All models are listed as below.

Brand	Model	Difference
EnGenius	EMD1	Main test model.
	EMD2	1. Remove power plug (change to external power supply from power adaptor) 2. With PoE power (not in the package) 3. RF circuit design & SW unchanged.
	ERP1	1. RF circuit design Identical to EMD1 except SW. (EMD1 SW support Mesh model, ERP1 only support Repeater mode.)

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

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

* 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)

3. The following antennas were provided to the EUT.

Ant. Type	PIFA	
Connecter Type	I-PEX	
Antenna Gain (dBi)		
Item	2.4G	5G
Ant. 1	2.0	5.6
Ant. 2	**2.2**	**5.9**

* The maximum antenna gain is chosen for final test.

4. The EUT consumes power from the following Adapter.

Adapter for EMD2	
Brand	Asian Power Devices Inc.
Model	WB-12G12FU
Input Power	100-240Vac, 50-60Hz, 0.3A Max
Output Power	12Vdc, 1A
Power Line	1.47m cable without core attached on adapter

5. The EUT consumes power from the following PoE.

PoE for EMD2 (Suporrt unit)	
Brand	EnGenius
Model	EPA5006GP
Input Power	100-240Vac~0.8A, 50-60Hz
Output Power	54Vdc / 0.6A PIN 4,5:54V PIN 7,8:RETURN

6. WLAN 2.4GHz and WLAN 5GHz technologies can transmit at same time.
7. Spurious emission of the simultaneous operation (WLAN 2.4GHz and WLAN 5GHz) has been evaluated and no non-compliance was found.

3.2 Description of Test Modes

5180~5240MHz:

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

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

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

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

5745~5825MHz:

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

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

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

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	EUT (EMD1)
B	-	√	√	-	EUT (EMD2) + adapter
C	-	√	√	-	EUT (EMD2) + POE

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

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

Radiated Emission Test (Above 1GHz):

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
A	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	7.2
	802.11n (HT40)		38 to 46	38, 46	OFDM	15.0
	802.11ac (VHT80)		42	42	OFDM	58.5
A	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	7.2
	802.11n (HT40)		151 to 159	151, 159	OFDM	15.0
	802.11ac (VHT80)		155	155	OFDM	58.5

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)
A, B, C	802.11a	5180-5240	36 to 48	157	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)
A, B, C	802.11a	5180-5240	36 to 48	157	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						
A	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	7.2
	802.11n (HT40)		38 to 46	38, 46	OFDM	15.0
	802.11ac (VHT80)		42	42	OFDM	58.5
A	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	7.2
	802.11n (HT40)		151 to 159	151, 159	OFDM	15.0
	802.11ac (VHT80)		155	155	OFDM	58.5
Beamforming Mode						
A	802.11n (HT20)	5180-5240	36 to 48	36, 40, 48	OFDM	7.2
	802.11n (HT40)		38 to 46	38, 46	OFDM	15.0
	802.11ac (VHT80)		42	42	OFDM	58.5
A	802.11n (HT20)	5745-5825	149 to 165	149, 157, 165	OFDM	7.2
	802.11n (HT40)		151 to 159	151, 159	OFDM	15.0
	802.11ac (VHT80)		155	155	OFDM	58.5

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)
A	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	7.2
	802.11n (HT40)		38 to 46	38, 46	OFDM	15.0
	802.11ac (VHT80)		42	42	OFDM	58.5
A	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	7.2
	802.11n (HT40)		151 to 159	151, 159	OFDM	15.0
	802.11ac (VHT80)		155	155	OFDM	58.5

Test Condition:

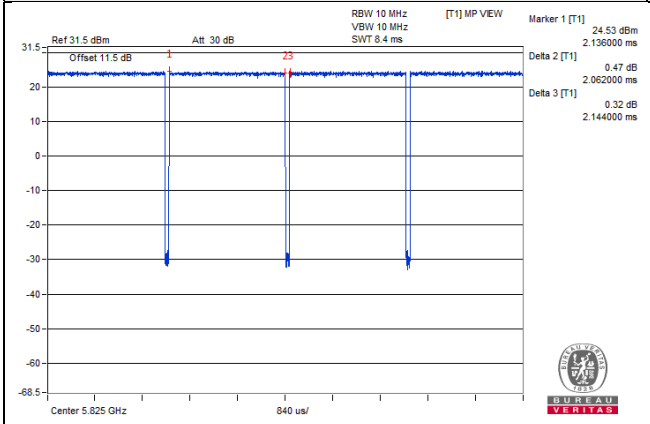
Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	22 deg. C, 68% RH	120Vac, 60Hz	Willy Cheng, Adair Peng
RE<1G	22 deg. C, 69% RH	120Vac, 60Hz 54Vdc (PoE)	Adair Peng
	22 deg. C, 70% RH	120Vac, 60Hz	
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Adair Peng
	23 deg. C, 69% RH	120Vac, 60Hz 54Vdc (PoE)	Willy Cheng
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Chris Lin

3.3 Duty Cycle of Test Signal

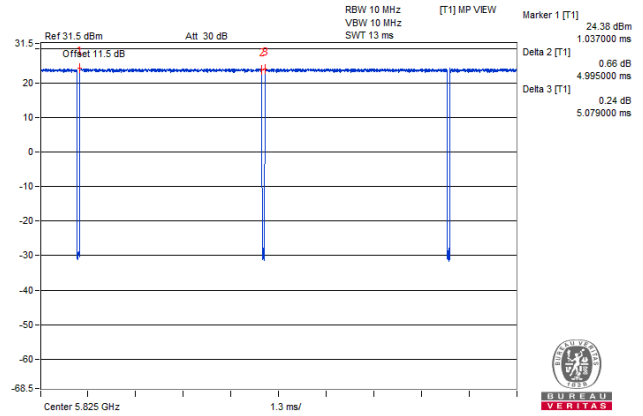
Duty cycle of test signal is > 98%, duty factor is not required
802.11n (HT20): Duty cycle = 4.995/5.079 = 0.983

Duty cycle of test signal is < 98 %, duty factor is required
802.11a: Duty cycle = 2.062/2.144 = 0.962, Duty factor = 10 * log(1/0.962) = 0.17
802.11n (HT40): Duty cycle = 2.415/2.494 = 0.968, Duty factor = 10 * log(1/0.968) = 0.14
802.11ac (VHT80): Duty cycle = 1.146/1.228 = 0.933, Duty factor = 10 * log(1/0.933) = 0.30

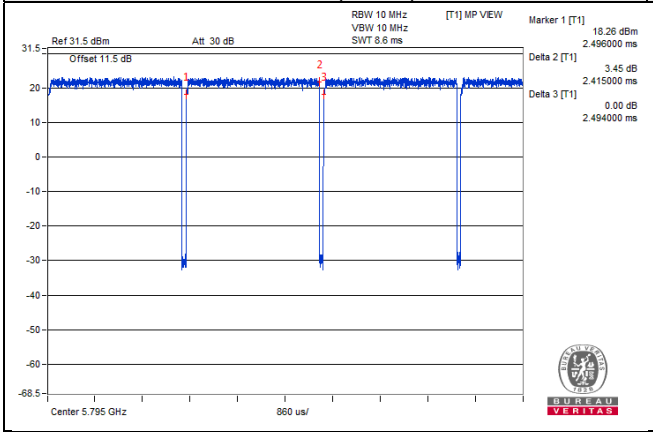
802.11a



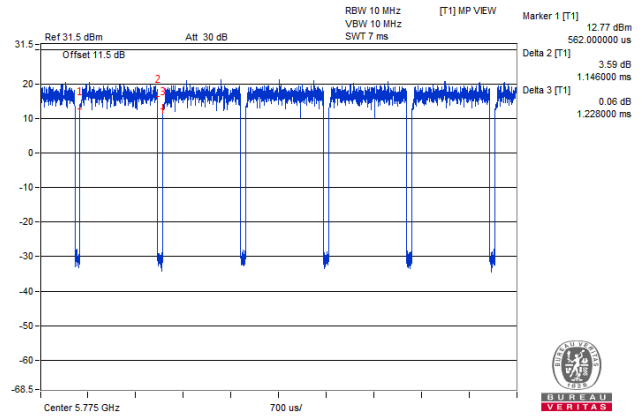
802.11n (HT20)



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	Lenovo	80Q7	PF0KUGU6	FCC DoC Approved	Mode A
	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	Mode B, C
B.	PoE	EnGenius	EPA5006GP	NA	NA	Provided by client

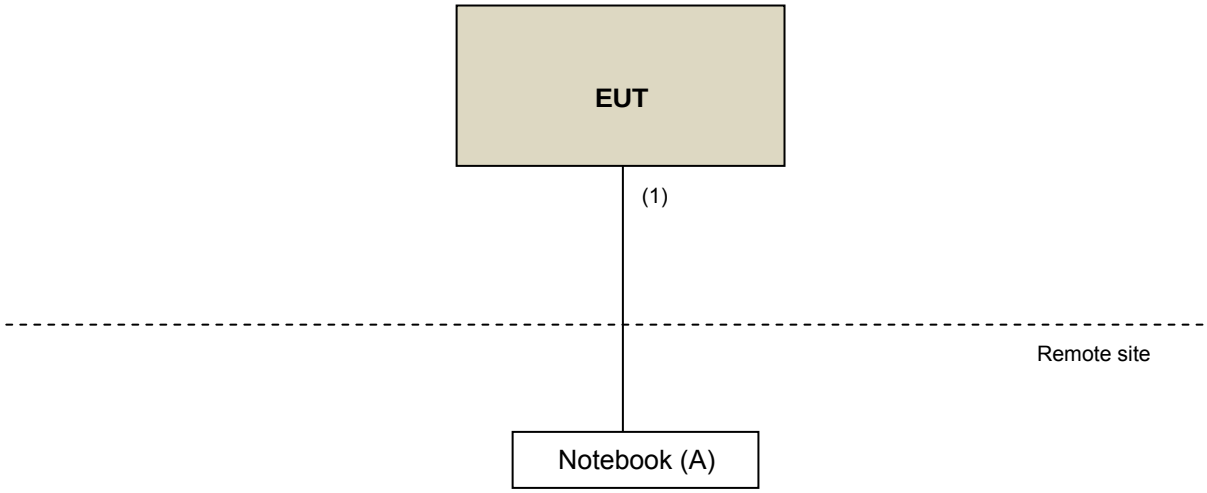
Note:

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.
3. Item B was placed under the test table.

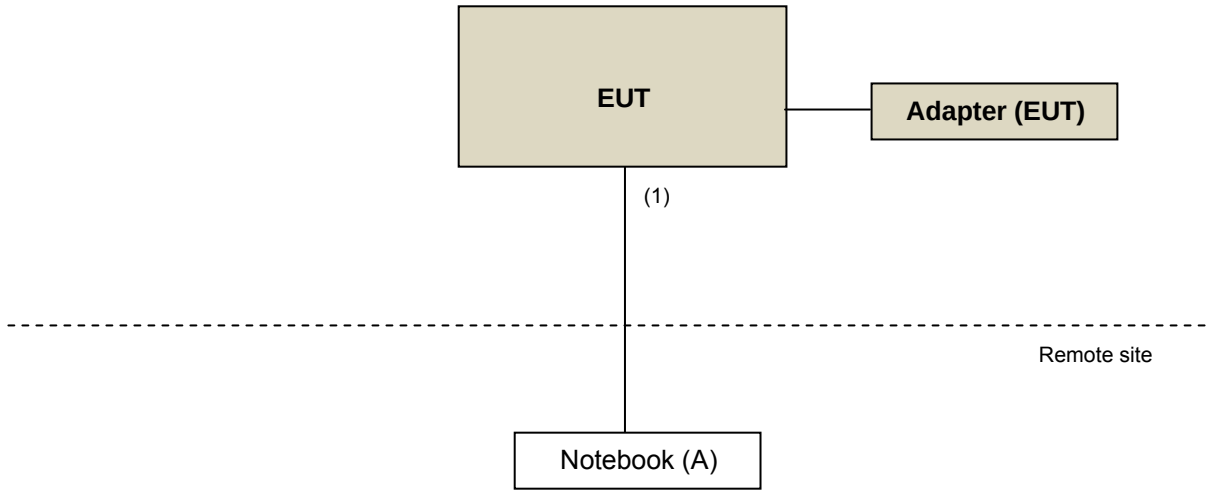
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45 cable	1	6	N	0	Cat5e
2.	RJ45 cable	1	1	N	0	Cat5e

3.4.1 Configuration of System under Test

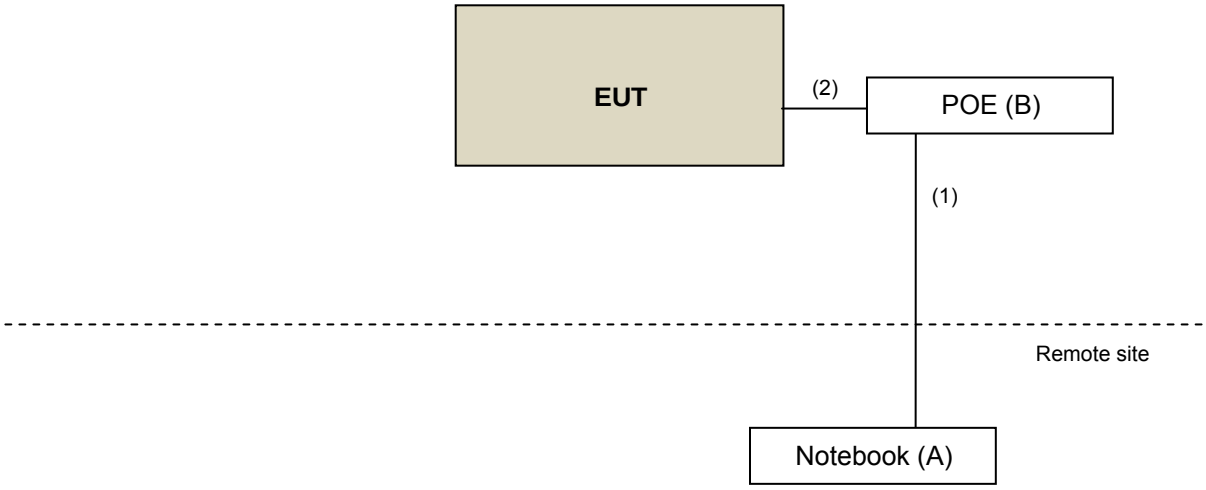
Mode A



Mode B



Mode C



3.5 General Description of Applied Standards

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

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

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

Limits of unwanted emission out of the restricted bands

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

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

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 17, 2017	Oct. 16, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Dec. 12, 2017	Dec. 11, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Dec. 11, 2017	Dec. 10, 2018
HORN Antenna SCHWARZBECK	9120D	209	Dec. 13, 2017	Dec. 12, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 01, 2017	Nov. 30, 2018
Loop Antenna EMCI	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 21, 2017	Aug. 20, 2018
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Apr. 05, 2017	Apr. 04, 2018
			Apr. 03, 2018	Apr. 02, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 21, 2017	Aug. 20, 2018
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM-SM-8000	Cable-CH3-03 (309224+170907)	Sep.11, 2017	Sep. 10, 2018
Software BV ADT	ADT_Radiated_V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
High Speed Peak Power Meter	ML2495A	0824012	Aug. 18, 2017	Aug. 17, 2018
Power Sensor	MA2411B	0738171	Aug. 18, 2017	Aug. 17, 2018
26GHz ~ 40GHz Amplifier Agilent	8449B	3008A1960	Aug. 08, 2017	Aug. 07, 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 3.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is IC 7450F-3.

4.1.3 Test Procedures

For Radiated emission below 30MHz

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

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

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

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

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

Note:

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

For Radiated emission above 30MHz

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

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

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

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

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

Note:

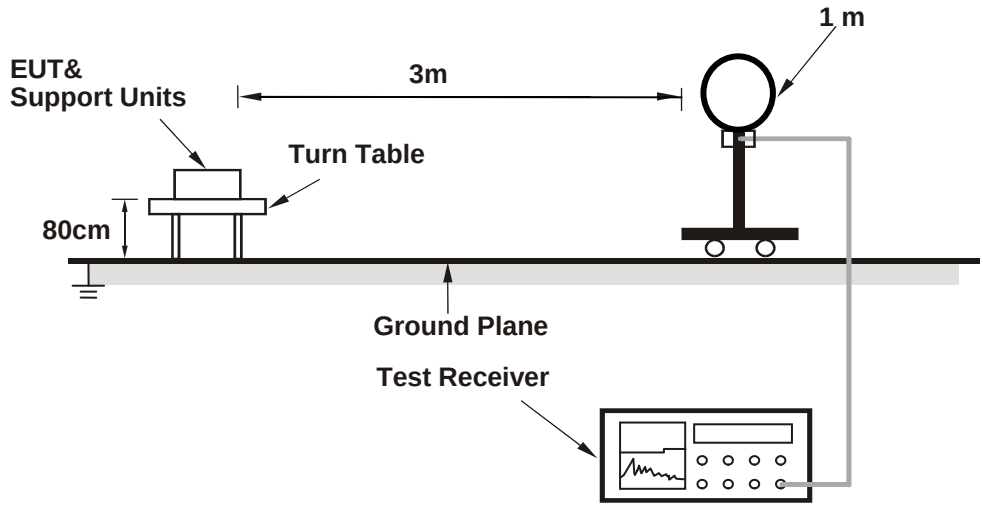
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

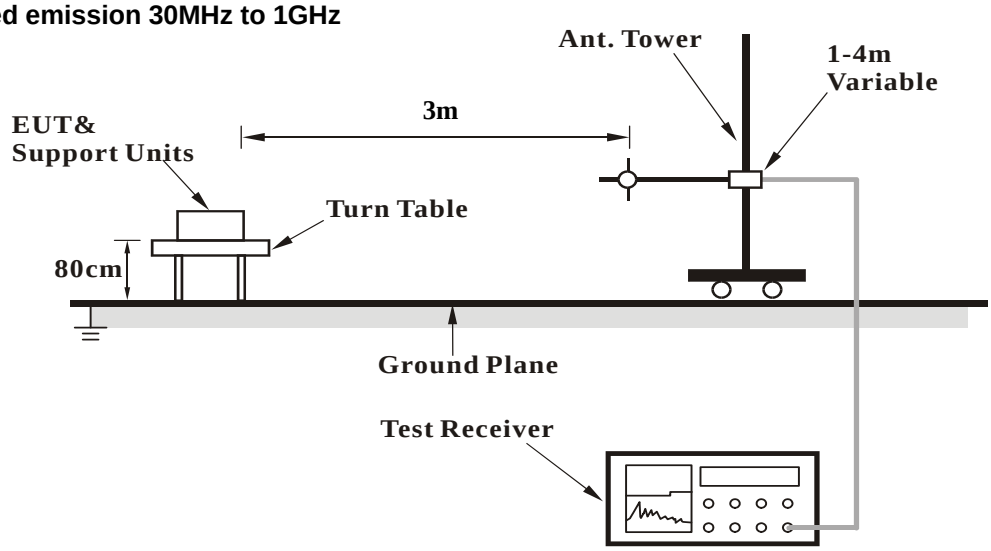
No deviation.

4.1.5 Test Setup

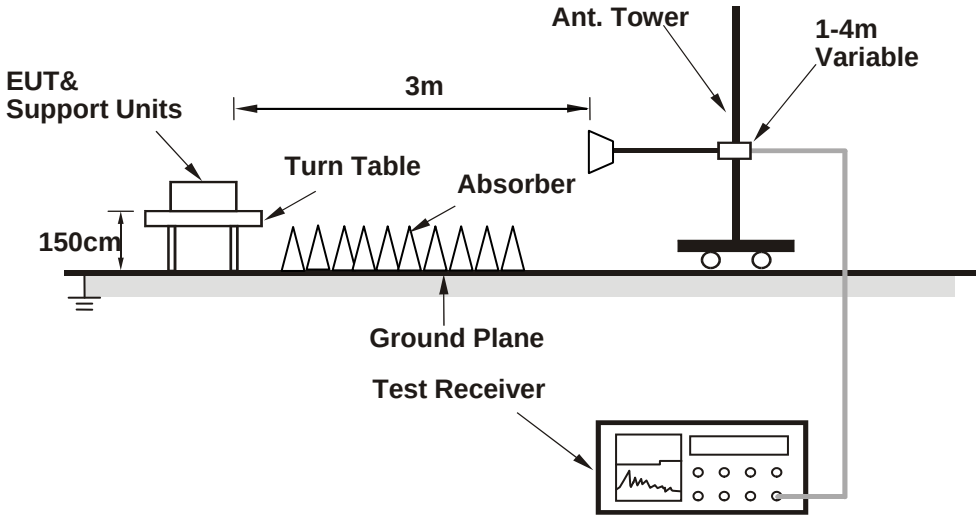
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Prepared a notebook to act as 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	69.0 PK	74.0	-5.0	1.24 H	338	65.30	3.70
2	5150.00	47.7 AV	54.0	-6.3	1.24 H	338	44.00	3.70
3	*5180.00	113.4 PK			1.25 H	337	73.80	39.60
4	*5180.00	102.7 AV			1.25 H	337	63.10	39.60
5	#10360.00	55.2 PK	74.0	-18.8	1.99 H	184	39.60	15.60
6	#10360.00	43.4 AV	54.0	-10.6	1.99 H	184	27.80	15.60
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	72.6 PK	74.0	-1.4	1.15 V	3	68.90	3.70
2	5150.00	51.6 AV	54.0	-2.4	1.15 V	3	47.90	3.70
3	*5180.00	114.6 PK			1.48 V	2	75.00	39.60
4	*5180.00	104.2 AV			1.48 V	2	64.60	39.60
5	#10360.00	57.9 PK	74.0	-16.1	1.86 V	48	42.30	15.60
6	#10360.00	44.4 AV	54.0	-9.6	1.86 V	48	28.80	15.60

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	116.3 PK			1.21 H	341	76.70	39.60
2	*5200.00	105.8 AV			1.21 H	341	66.20	39.60
3	#10400.00	57.6 PK	74.0	-16.4	1.79 H	269	42.00	15.60
4	#10400.00	44.3 AV	54.0	-9.7	1.79 H	269	28.70	15.60
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	117.0 PK			1.34 V	14	77.40	39.60
2	*5200.00	106.4 AV			1.34 V	14	66.80	39.60
3	#10400.00	57.7 PK	74.0	-16.3	1.68 V	212	42.10	15.60
4	#10400.00	44.2 AV	54.0	-9.8	1.68 V	212	28.60	15.60

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	115.9 PK			1.66 H	333	76.50	39.40
2	*5240.00	105.2 AV			1.66 H	333	65.80	39.40
3	5350.00	55.7 PK	74.0	-18.3	1.66 H	318	51.90	3.80
4	5350.00	42.5 AV	54.0	-11.5	1.66 H	318	38.70	3.80
5	#10480.00	59.0 PK	74.0	-15.0	2.88 H	301	42.40	16.60
6	#10480.00	44.9 AV	54.0	-9.1	2.88 H	301	28.30	16.60
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	116.7 PK			1.28 V	13	77.30	39.40
2	*5240.00	105.9 AV			1.28 V	13	66.50	39.40
3	5350.00	55.1 PK	74.0	-18.9	1.37 V	22	51.30	3.80
4	5350.00	42.2 AV	54.0	-11.8	1.37 V	22	38.40	3.80
5	#10480.00	58.7 PK	74.0	-15.3	1.48 V	186	42.10	16.60
6	#10480.00	45.0 AV	54.0	-9.0	1.48 V	186	28.40	16.60

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	#5647.20	53.1 PK	68.2	-15.1	1.47 H	11	48.80	4.30
2	*5745.00	118.3 PK			1.47 H	11	78.20	40.10
3	*5745.00	107.5 AV			1.47 H	11	67.40	40.10
4	#5932.00	52.3 PK	68.2	-15.9	1.47 H	11	47.30	5.00
5	11490.00	61.8 PK	74.0	-12.2	1.26 H	17	44.00	17.80
6	11490.00	48.1 AV	54.0	-5.9	1.26 H	17	30.30	17.80
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	#5649.60	57.0 PK	68.2	-11.2	1.50 V	5	52.70	4.30
2	*5745.00	117.0 PK			1.50 V	5	76.90	40.10
3	*5745.00	105.7 AV			1.50 V	5	65.60	40.10
4	#5960.00	57.0 PK	68.2	-11.2	1.50 V	5	52.00	5.00
5	11490.00	61.2 PK	74.0	-12.8	1.75 V	31	43.40	17.80
6	11490.00	47.8 AV	54.0	-6.2	1.75 V	31	30.00	17.80

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	#5611.20	51.4 PK	68.2	-16.8	1.89 H	12	47.20	4.20
2	*5785.00	117.9 PK			1.89 H	12	77.60	40.30
3	*5785.00	107.3 AV			1.89 H	12	67.00	40.30
4	#5926.40	52.7 PK	68.2	-15.5	1.89 H	12	47.80	4.90
5	11570.00	62.3 PK	74.0	-11.7	1.30 H	18	44.20	18.10
6	11570.00	49.0 AV	54.0	-5.0	1.30 H	18	30.90	18.10
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	#5643.20	55.7 PK	68.2	-12.5	1.50 V	6	51.40	4.30
2	*5785.00	117.0 PK			1.50 V	6	76.70	40.30
3	*5785.00	105.9 AV			1.50 V	6	65.60	40.30
4	#5951.20	57.0 PK	68.2	-11.2	1.50 V	6	52.00	5.00
5	11570.00	60.6 PK	74.0	-13.4	1.81 V	164	42.50	18.10
6	11570.00	47.8 AV	54.0	-6.2	1.81 V	164	29.70	18.10

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	#5644.80	51.3 PK	68.2	-16.9	1.92 H	12	47.00	4.30
2	*5825.00	118.9 PK			1.92 H	12	78.40	40.50
3	*5825.00	108.0 AV			1.92 H	12	67.50	40.50
4	#5927.20	54.4 PK	68.2	-13.8	1.92 H	12	49.50	4.90
5	11650.00	63.1 PK	74.0	-10.9	1.05 H	260	45.40	17.70
6	11650.00	49.7 AV	54.0	-4.3	1.05 H	260	32.00	17.70
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	#5613.60	56.7 PK	68.2	-11.5	2.13 V	327	52.50	4.20
2	*5825.00	116.4 PK			2.13 V	327	75.90	40.50
3	*5825.00	105.6 AV			2.13 V	327	65.10	40.50
4	#5932.80	59.5 PK	68.2	-8.7	2.13 V	327	54.50	5.00
5	11650.00	63.4 PK	74.0	-10.6	1.59 V	18	45.70	17.70
6	11650.00	50.8 AV	54.0	-3.2	1.59 V	18	33.10	17.70

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	70.1 PK	74.0	-3.9	1.52 H	343	66.40	3.70
2	5150.00	52.3 AV	54.0	-1.7	1.52 H	343	48.60	3.70
3	*5180.00	113.2 PK			1.26 H	335	73.60	39.60
4	*5180.00	102.2 AV			1.26 H	335	62.60	39.60
5	#10360.00	58.5 PK	74.0	-15.5	2.12 H	308	42.90	15.60
6	#10360.00	44.2 AV	54.0	-9.8	2.12 H	308	28.60	15.60
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	71.9 PK	74.0	-2.1	1.47 V	17	68.20	3.70
2	5150.00	52.5 AV	54.0	-1.5	1.47 V	17	48.80	3.70
3	*5180.00	115.6 PK			1.49 V	360	76.00	39.60
4	*5180.00	104.5 AV			1.49 V	360	64.90	39.60
5	#10360.00	56.9 PK	74.0	-17.1	2.13 V	177	41.30	15.60
6	#10360.00	44.0 AV	54.0	-10.0	2.13 V	177	28.40	15.60

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	115.6 PK			1.21 H	339	76.00	39.60
2	*5200.00	105.0 AV			1.21 H	339	65.40	39.60
3	#10400.00	57.4 PK	74.0	-16.6	2.01 H	334	41.80	15.60
4	#10400.00	44.0 AV	54.0	-10.0	2.01 H	334	28.40	15.60
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	117.3 PK			1.47 V	13	77.70	39.60
2	*5200.00	106.4 AV			1.47 V	13	66.80	39.60
3	#10400.00	57.2 PK	74.0	-16.8	2.09 V	194	41.60	15.60
4	#10400.00	43.7 AV	54.0	-10.3	2.09 V	194	28.10	15.60

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	116.0 PK			1.51 H	334	76.60	39.40
2	*5240.00	105.1 AV			1.51 H	334	65.70	39.40
3	5350.00	56.1 PK	74.0	-17.9	1.47 H	342	52.30	3.80
4	5350.00	42.4 AV	54.0	-11.6	1.47 H	342	38.60	3.80
5	#10480.00	58.7 PK	74.0	-15.3	2.05 H	311	42.10	16.60
6	#10480.00	44.7 AV	54.0	-9.3	2.05 H	311	28.10	16.60
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	116.2 PK			1.69 V	21	76.80	39.40
2	*5240.00	105.5 AV			1.69 V	21	66.10	39.40
3	5350.00	55.6 PK	74.0	-18.4	1.52 V	17	51.80	3.80
4	5350.00	42.3 AV	54.0	-11.7	1.52 V	17	38.50	3.80
5	#10480.00	58.0 PK	74.0	-16.0	2.17 V	186	41.40	16.60
6	#10480.00	44.5 AV	54.0	-9.5	2.17 V	186	27.90	16.60

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	#5645.60	53.1 PK	68.2	-15.1	1.71 H	10	48.80	4.30
2	*5745.00	117.6 PK			1.71 H	10	77.50	40.10
3	*5745.00	106.1 AV			1.71 H	10	66.00	40.10
4	#5962.40	52.0 PK	68.2	-16.2	1.71 H	10	47.00	5.00
5	11490.00	60.8 PK	74.0	-13.2	1.62 H	262	43.00	17.80
6	11490.00	47.2 AV	54.0	-6.8	1.62 H	262	29.40	17.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5647.20	57.6 PK	68.2	-10.6	1.44 V	359	53.30	4.30
2	*5745.00	117.6 PK			1.44 V	359	77.50	40.10
3	*5745.00	106.1 AV			1.44 V	359	66.00	40.10
4	#5941.60	57.2 PK	68.2	-11.0	1.44 V	359	52.30	4.90
5	11490.00	59.9 PK	74.0	-14.1	1.77 V	48	42.10	17.80
6	11490.00	47.1 AV	54.0	-6.9	1.77 V	48	29.30	17.80

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	#5631.20	53.2 PK	68.2	-15.0	1.50 H	319	49.00	4.20
2	*5785.00	118.4 PK			1.50 H	319	78.10	40.30
3	*5785.00	107.0 AV			1.50 H	319	66.70	40.30
4	#5925.60	52.2 PK	68.2	-16.0	1.50 H	319	47.30	4.90
5	11570.00	61.2 PK	74.0	-12.8	1.82 H	259	43.10	18.10
6	11570.00	48.2 AV	54.0	-5.8	1.82 H	259	30.10	18.10
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	#5602.40	56.0 PK	68.2	-12.2	2.05 V	356	51.80	4.20
2	*5785.00	117.7 PK			2.05 V	356	77.40	40.30
3	*5785.00	106.8 AV			2.05 V	356	66.50	40.30
4	#5930.40	57.4 PK	68.2	-10.8	2.05 V	356	52.40	5.00
5	11570.00	61.8 PK	74.0	-12.2	1.83 V	37	43.70	18.10
6	11570.00	48.4 AV	54.0	-5.6	1.83 V	37	30.30	18.10

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	#5607.20	51.1 PK	68.2	-17.1	1.62 H	317	46.90	4.20
2	*5825.00	118.0 PK			1.62 H	317	77.50	40.50
3	*5825.00	106.7 AV			1.62 H	317	66.20	40.50
4	#5925.60	56.5 PK	68.2	-11.7	1.62 H	317	51.60	4.90
5	11650.00	63.1 PK	74.0	-10.9	1.11 H	257	45.40	17.70
6	11650.00	49.9 AV	54.0	-4.1	1.11 H	257	32.20	17.70
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	#5605.60	57.3 PK	68.2	-10.9	1.81 V	359	53.10	4.20
2	*5825.00	117.9 PK			1.81 V	359	77.40	40.50
3	*5825.00	106.3 AV			1.81 V	359	65.80	40.50
4	#5927.20	60.6 PK	68.2	-7.6	1.81 V	359	55.70	4.90
5	11650.00	65.5 PK	74.0	-8.5	1.83 V	47	47.80	17.70
6	11650.00	51.8 AV	54.0	-2.2	1.83 V	47	34.10	17.70

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	65.0 PK	74.0	-9.0	1.52 H	339	61.30	3.70
2	5150.00	49.0 AV	54.0	-5.0	1.52 H	339	45.30	3.70
3	*5190.00	108.4 PK			1.24 H	339	68.80	39.60
4	*5190.00	98.3 AV			1.24 H	339	58.70	39.60
5	#10380.00	57.4 PK	74.0	-16.6	2.54 H	301	41.80	15.60
6	#10380.00	44.2 AV	54.0	-9.8	2.54 H	301	28.60	15.60
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	69.0 PK	74.0	-5.0	1.43 V	4	65.30	3.70
2	5150.00	52.5 AV	54.0	-1.5	1.43 V	4	48.80	3.70
3	*5190.00	109.7 PK			1.65 V	5	70.10	39.60
4	*5190.00	99.3 AV			1.65 V	5	59.70	39.60
5	#10380.00	57.4 PK	74.0	-16.6	2.15 V	198	41.80	15.60
6	#10380.00	43.9 AV	54.0	-10.1	2.15 V	198	28.30	15.60

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	113.6 PK			1.47 H	338	74.20	39.40
2	*5230.00	103.2 AV			1.47 H	338	63.80	39.40
3	5350.00	56.7 PK	74.0	-17.3	2.18 H	314	52.90	3.80
4	5350.00	42.4 AV	54.0	-11.6	2.18 H	314	38.60	3.80
5	#10460.00	57.8 PK	74.0	-16.2	1.64 H	299	41.60	16.20
6	#10460.00	44.5 AV	54.0	-9.5	1.64 H	299	28.30	16.20
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	113.7 PK			1.23 V	13	74.30	39.40
2	*5230.00	103.8 AV			1.23 V	13	64.40	39.40
3	5350.00	55.8 PK	74.0	-18.2	1.48 V	23	52.00	3.80
4	5350.00	42.3 AV	54.0	-11.7	1.48 V	23	38.50	3.80
5	#10460.00	58.0 PK	74.0	-16.0	2.31 V	188	41.80	16.20
6	#10460.00	44.4 AV	54.0	-9.6	2.31 V	188	28.20	16.20

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	#5641.60	58.3 PK	68.2	-9.9	1.55 H	13	54.10	4.20
2	**#5650.00**	**67.0 PK**	**68.2**	**-1.2**	**1.28 H**	**9**	**62.70**	**4.30**
3	*5755.00	113.4 PK			1.55 H	13	73.30	40.10
4	*5755.00	103.1 AV			1.55 H	13	63.00	40.10
5	#5959.20	52.2 PK	68.2	-16.0	1.55 H	13	47.20	5.00
6	11510.00	60.8 PK	74.0	-13.2	1.21 H	18	43.00	17.80
7	11510.00	47.4 AV	54.0	-6.6	1.21 H	18	29.60	17.80
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	#5620.80	63.4 PK	68.2	-4.8	2.11 V	359	59.20	4.20
2	#5650.00	65.5 PK	68.2	-2.7	1.20 V	360	61.20	4.30
3	*5755.00	113.2 PK			2.11 V	359	73.10	40.10
4	*5755.00	102.2 AV			2.11 V	359	62.10	40.10
5	#5930.40	59.1 PK	68.2	-9.1	2.11 V	359	54.10	5.00
6	11510.00	58.8 PK	74.0	-15.2	1.23 V	22	41.00	17.80
7	11510.00	45.8 AV	54.0	-8.2	1.23 V	22	28.00	17.80

Remarks:

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

CHANNEL	TX Channel 159	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5640.00	56.9 PK	68.2	-11.3	1.70 H	13	52.70	4.20
2	*5795.00	114.6 PK			1.70 H	13	74.30	40.30
3	*5795.00	104.5 AV			1.70 H	13	64.20	40.30
4	#5927.20	59.1 PK	68.2	-9.1	1.70 H	13	54.20	4.90
5	11590.00	62.0 PK	74.0	-12.0	1.06 H	16	44.00	18.00
6	11590.00	48.3 AV	54.0	-5.7	1.06 H	16	30.30	18.00
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	#5636.00	59.7 PK	68.2	-8.5	2.16 V	345	55.50	4.20
2	*5795.00	114.2 PK			2.16 V	345	73.90	40.30
3	*5795.00	103.2 AV			2.16 V	345	62.90	40.30
4	#5929.60	62.5 PK	68.2	-5.7	2.16 V	345	57.50	5.00
5	11590.00	61.3 PK	74.0	-12.7	1.94 V	45	43.30	18.00
6	11590.00	48.6 AV	54.0	-5.4	1.94 V	45	30.60	18.00

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	63.4 PK	74.0	-10.6	2.13 H	341	59.70	3.70
2	5150.00	49.6 AV	54.0	-4.4	2.13 H	341	45.90	3.70
3	*5210.00	102.1 PK			1.49 H	339	62.60	39.50
4	*5210.00	92.0 AV			1.49 H	339	52.50	39.50
5	5350.00	55.4 PK	74.0	-18.6	2.01 H	334	51.60	3.80
6	5350.00	42.3 AV	54.0	-11.7	2.01 H	334	38.50	3.80
7	#10420.00	56.9 PK	74.0	-17.1	1.45 H	322	41.10	15.80
8	#10420.00	44.2 AV	54.0	-9.8	1.45 H	322	28.40	15.80
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	68.7 PK	74.0	-5.3	1.48 V	357	65.00	3.70
2	5150.00	52.6 AV	54.0	-1.4	1.48 V	357	48.90	3.70
3	*5210.00	103.3 PK			1.75 V	12	63.80	39.50
4	*5210.00	93.0 AV			1.75 V	12	53.50	39.50
5	5350.00	45.4 PK	74.0	-28.6	1.55 V	13	41.60	3.80
6	5350.00	42.3 AV	54.0	-11.7	1.55 V	13	38.50	3.80
7	#10420.00	57.2 PK	74.0	-16.8	2.21 V	184	41.40	15.80
8	#10420.00	44.1 AV	54.0	-9.9	2.21 V	184	28.30	15.80

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	#5642.40	59.3 PK	68.2	-8.9	1.36 H	16	55.00	4.30
2	#5650.00	66.9 PK	68.2	-1.3	1.44 H	7	62.60	4.30
3	*5775.00	106.9 PK			1.36 H	16	66.70	40.20
4	*5775.00	97.4 AV			1.36 H	16	57.20	40.20
5	#5925.00	66.0 PK	68.2	-2.2	2.14 H	15	61.10	4.90
6	#5925.60	57.3 PK	68.2	-10.9	1.36 H	16	52.40	4.90
7	11550.00	59.7 PK	74.0	-14.3	2.11 H	232	41.70	18.00
8	11550.00	46.8 AV	54.0	-7.2	2.11 H	232	28.80	18.00
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	#5640.00	63.7 PK	68.2	-4.5	1.90 V	1	59.50	4.20
2	#5650.00	66.6 PK	68.2	-1.6	2.13 V	335	62.30	4.30
3	*5775.00	106.4 PK			1.90 V	1	66.20	40.20
4	*5775.00	96.3 AV			1.90 V	1	56.10	40.20
5	#5925.00	64.0 PK	68.2	-4.2	1.89 V	319	59.10	4.90
6	#5927.20	60.8 PK	68.2	-7.4	1.90 V	1	55.90	4.90
7	11550.00	60.1 PK	74.0	-13.9	1.76 V	77	42.10	18.00
8	11550.00	47.5 AV	54.0	-6.5	1.76 V	77	29.50	18.00

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	57.12	26.9 QP	40.0	-13.1	1.99 H	197	41.30	-14.40
2	134.89	24.7 QP	43.5	-18.8	1.99 H	251	39.60	-14.90
3	274.88	33.1 QP	46.0	-12.9	1.00 H	231	46.40	-13.30
4	325.43	25.2 QP	46.0	-20.8	1.00 H	204	37.40	-12.20
5	593.74	24.2 QP	46.0	-21.8	1.00 H	168	31.70	-7.50
6	624.85	25.5 QP	46.0	-20.5	1.00 H	93	32.30	-6.80
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	45.45	31.1 QP	40.0	-8.9	1.49 V	179	45.50	-14.40
2	197.11	24.6 QP	43.5	-18.9	1.00 V	217	41.40	-16.80
3	272.94	29.7 QP	46.0	-16.3	1.49 V	252	43.10	-13.40
4	335.15	25.5 QP	46.0	-20.5	1.00 V	66	37.60	-12.10
5	512.08	22.3 QP	46.0	-23.7	1.99 V	333	31.40	-9.10
6	624.85	25.8 QP	46.0	-20.2	1.00 V	55	32.60	-6.80

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

CHANNEL	TX Channel 157	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz	TEST MODE	B

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	70.73	25.2 QP	40.0	-14.8	1.99 H	217	41.40	-16.20
2	136.84	35.8 QP	43.5	-7.7	1.99 H	65	50.60	-14.80
3	162.11	38.3 QP	43.5	-5.2	1.50 H	250	52.20	-13.90
4	208.77	37.3 QP	43.5	-6.2	1.01 H	241	54.00	-16.70
5	307.93	35.2 QP	46.0	-10.8	1.01 H	226	47.80	-12.60
6	453.75	22.2 QP	46.0	-23.8	1.99 H	222	32.20	-10.00
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	37.68	35.3 QP	40.0	-4.7	1.00 V	247	50.60	-15.30
2	61.01	35.5 QP	40.0	-4.5	1.00 V	353	50.10	-14.60
3	166.00	32.8 QP	43.5	-10.7	1.00 V	121	46.80	-14.00
4	208.77	29.1 QP	43.5	-14.4	1.49 V	16	45.80	-16.70
5	304.04	35.3 QP	46.0	-10.7	1.49 V	172	47.90	-12.60
6	405.15	22.6 QP	46.0	-23.4	1.49 V	258	33.70	-11.10

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

CHANNEL	TX Channel 157	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz	TEST MODE	C

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	57.12	30.4 QP	40.0	-9.6	1.99 H	91	44.80	-14.40
2	144.61	33.3 QP	43.5	-10.2	1.99 H	239	47.50	-14.20
3	232.11	24.1 QP	46.0	-21.9	1.49 H	248	40.10	-16.00
4	329.32	26.0 QP	46.0	-20.0	1.00 H	211	38.10	-12.10
5	405.15	22.6 QP	46.0	-23.4	1.00 H	207	33.70	-11.10
6	593.74	23.4 QP	46.0	-22.6	1.49 H	140	30.90	-7.50
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	56.23	36.2 QP	40.0	-3.8	1.00 V	285	50.60	-14.40
2	96.01	30.1 QP	43.5	-13.4	1.00 V	96	49.00	-18.90
3	150.45	27.7 QP	43.5	-15.8	1.49 V	239	41.40	-13.70
4	309.88	22.3 QP	46.0	-23.7	1.49 V	170	34.80	-12.50
5	405.15	21.0 QP	46.0	-25.0	1.00 V	345	32.10	-11.10
6	593.74	24.3 QP	46.0	-21.7	1.00 V	15	31.80	-7.50

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

Tested date: Mar. 09 ~ May 18, 2018

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCS 30	100288	Aug. 17, 2017	Aug. 16, 2018
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 08, 2017	Sep. 07, 2018
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Feb. 05, 2018	Feb. 04, 2019
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Aug. 02, 2017	Aug. 01, 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 2.
3. The VCCI Site Registration No. is C-2047.

4.2.3 Test Procedures

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

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

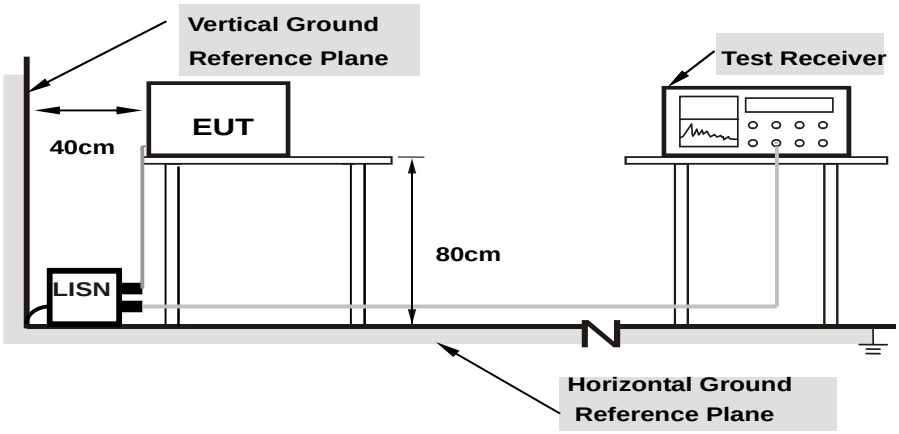
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Results

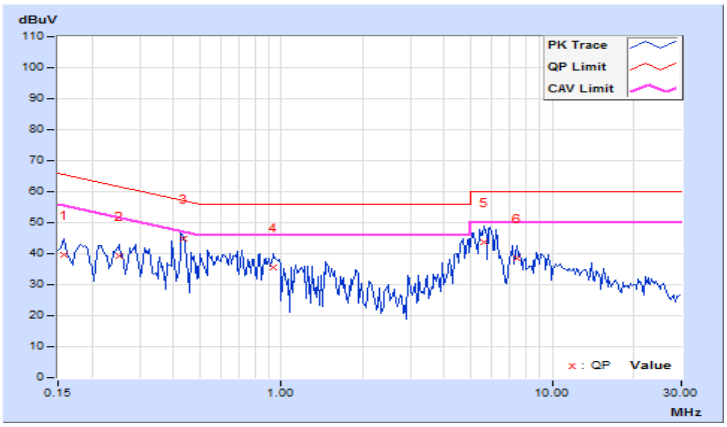
Worst-case data: 802.11a

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

No	Freq.	Corr. Factor	Reading Value [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	0.15781	10.29	29.16	12.90	39.45	23.19	65.58	55.58	-26.13	-32.39
2	0.25156	10.32	28.99	16.51	39.31	26.83	61.71	51.71	-22.40	-24.88
3	0.43516	10.35	34.46	27.67	44.81	38.02	57.15	47.15	-12.34	-9.13
4	0.93125	10.40	25.31	15.11	35.71	25.51	56.00	46.00	-20.29	-20.49
5	5.60547	10.55	33.22	22.29	43.77	32.84	60.00	50.00	-16.23	-17.16
6	7.42969	10.58	27.94	16.78	38.52	27.36	60.00	50.00	-21.48	-22.64

REMARKS:

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

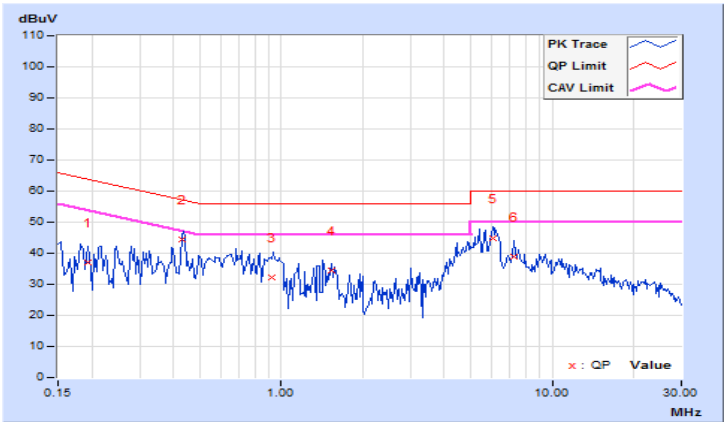


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq.	Corr. Factor	Reading Value [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	0.19297	10.31	26.81	13.14	37.12	23.45	63.91	53.91	-26.79	-30.46
2	0.43125	10.32	34.23	26.79	44.55	37.11	57.23	47.23	-12.68	-10.12
3	0.91953	10.40	21.75	13.91	32.15	24.31	56.00	46.00	-23.85	-21.69
4	1.53906	10.45	23.88	15.49	34.33	25.94	56.00	46.00	-21.67	-20.06
5	6.02734	10.61	34.16	22.80	44.77	33.41	60.00	50.00	-15.23	-16.59
6	7.21484	10.64	28.29	17.66	38.93	28.30	60.00	50.00	-21.07	-21.70

REMARKS:

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

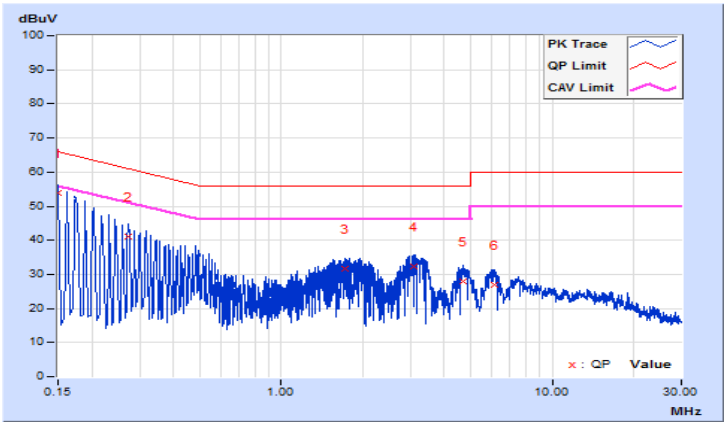


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.16	43.71	28.92	53.87	39.08	66.00	56.00	-12.13	-16.92
2	0.27120	10.17	30.84	16.34	41.01	26.51	61.08	51.08	-20.07	-24.57
3	1.72182	10.22	21.55	9.87	31.77	20.09	56.00	46.00	-24.23	-25.91
4	3.07863	10.30	21.97	10.15	32.27	20.45	56.00	46.00	-23.73	-25.55
5	4.66605	10.38	17.72	6.87	28.10	17.25	56.00	46.00	-27.90	-28.75
6	6.15576	10.45	16.36	5.51	26.81	15.96	60.00	50.00	-33.19	-34.04

REMARKS:

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

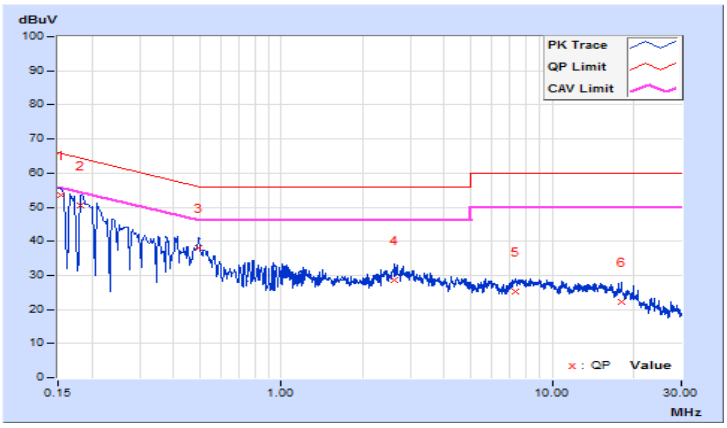


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.15	43.31	28.99	53.46	39.14	65.79	55.79	-12.33	-16.65
2	0.18170	10.16	40.39	26.05	50.55	36.21	64.41	54.41	-13.86	-18.20
3	0.49799	10.20	27.78	22.77	37.98	32.97	56.03	46.03	-18.05	-13.06
4	2.60548	10.26	18.41	12.97	28.67	23.23	56.00	46.00	-27.33	-22.77
5	7.30530	10.47	14.70	9.05	25.17	19.52	60.00	50.00	-34.83	-30.48
6	17.94050	10.93	11.38	6.77	22.31	17.70	60.00	50.00	-37.69	-32.30

REMARKS:

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

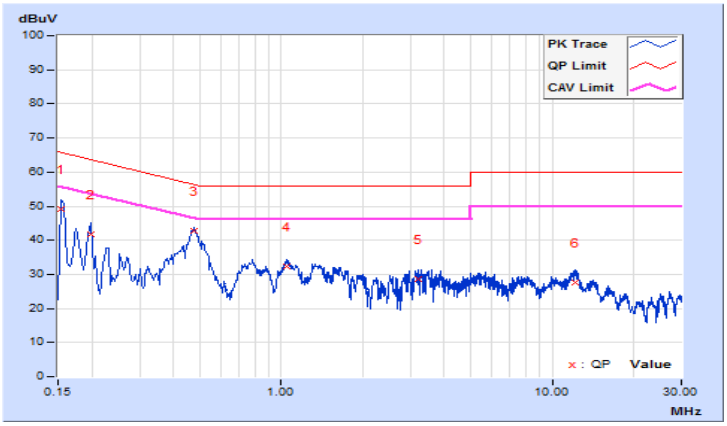


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	C		

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	0.15400	10.10	39.07	25.72	49.17	35.82	65.78	55.78	-16.61	-19.96
2	0.19800	10.10	31.67	18.84	41.77	28.94	63.69	53.69	-21.92	-24.75
3	0.47684	10.12	32.62	26.94	42.74	37.06	56.39	46.39	-13.65	-9.33
4	1.05000	10.14	22.34	18.91	32.48	29.05	56.00	46.00	-23.52	-16.95
5	3.21400	10.25	18.34	13.08	28.59	23.33	56.00	46.00	-27.41	-22.67
6	12.12600	10.75	16.97	11.73	27.72	22.48	60.00	50.00	-32.28	-27.52

REMARKS:

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

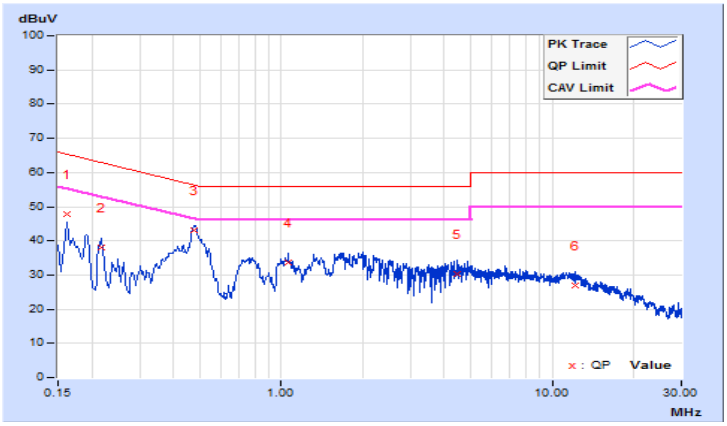


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	C		

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	0.16200	10.10	37.59	24.49	47.69	34.59	65.36	55.36	-17.67	-20.77
2	0.21805	10.11	27.78	16.03	37.89	26.14	62.89	52.89	-25.00	-26.75
3	**0.47684**	**10.12**	**33.14**	**27.41**	**43.26**	**37.53**	**56.39**	**46.39**	**-13.13**	**-8.86**
4	1.06200	10.13	23.51	20.20	33.64	30.33	56.00	46.00	-22.36	-15.67
5	4.43800	10.28	20.09	14.74	30.37	25.02	56.00	46.00	-25.63	-20.98
6	12.10200	10.61	16.49	11.05	27.10	21.66	60.00	50.00	-32.90	-28.34

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)
	√	Client device	250mW (24 dBm)
U-NII-2A			250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C			250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	√		1 Watt (30 dBm)

*B is the 26 dB emission bandwidth in megahertz

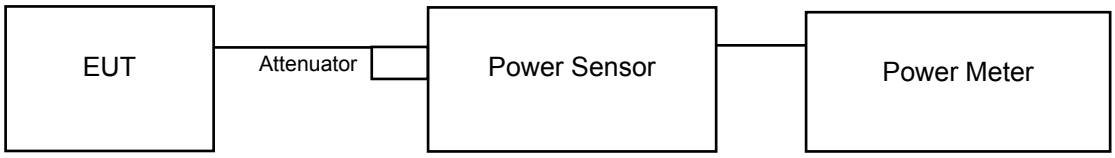
Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

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

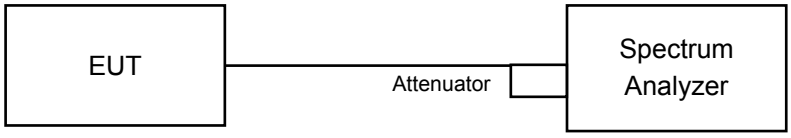
For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.3.2 Test Setup

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



802.11ac (VHT80)



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

For Average Power Measurement

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

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst and set the detector to AVERAGE. 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:

CDD Mode

802.11a

Chan.	Freq. (MHz)	Maximum Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	16.12	16.38	84.377	19.26	24.00	Pass
40	5200	16.58	16.74	92.705	19.67	24.00	Pass
48	5240	16.69	16.74	93.872	19.73	24.00	Pass
149	5745	23.36	22.22	383.495	25.84	30.00	Pass
157	5785	22.85	22.20	358.711	25.55	30.00	Pass
165	5825	23.16	22.41	381.195	25.81	30.00	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	16.54	16.85	93.499	19.71	24.00	Pass
40	5200	16.68	16.48	91.022	19.59	24.00	Pass
48	5240	16.57	16.62	91.314	19.61	24.00	Pass
149	5745	23.37	22.25	385.15	25.86	30.00	Pass
157	5785	22.97	22.23	365.262	25.63	30.00	Pass
165	5825	22.95	22.46	373.44	25.72	30.00	Pass

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	15.49	16.13	76.420	18.83	24.00	Pass
46	5230	19.45	19.63	**179.938**	22.55	24.00	Pass
151	5755	21.64	20.91	269.191	24.30	30.00	Pass
159	5795	22.98	22.72	**385.677**	25.86	30.00	Pass

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	12.97	13.63	42.882	16.32	24.00	Pass
155	5775	19.08	18.33	148.987	21.73	30.00	Pass

Beamforming Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	13.53	13.84	46.774	16.70	21.09	Pass
40	5200	13.67	13.47	45.499	16.58	21.09	Pass
48	5240	13.56	13.61	45.709	16.60	21.09	Pass
149	5745	20.36	19.24	**192.752**	22.85	27.09	Pass
157	5785	19.96	19.22	182.810	22.62	27.09	Pass
165	5825	19.94	19.45	186.638	22.71	27.09	Pass

Note:
U-NII-1: Beamforming gain = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)=8.91dBi > 6dBi, so the power limit shall be reduced to 24-(8.91-6) = 21.09dBm.
U-NII-3: Beamforming gain = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)=8.91dBi > 6dBi, so the power limit shall be reduced to 30-(8.91-6) = 27.09dBm.

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	12.48	13.12	38.194	15.82	21.09	Pass
46	5230	16.44	16.62	**89.950**	19.54	21.09	Pass
151	5755	18.63	17.90	134.586	21.29	27.09	Pass
159	5795	19.97	19.71	**192.752**	22.85	27.09	Pass

Note:
U-NII-1: Beamforming gain = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)=8.91dBi > 6dBi, so the power limit shall be reduced to 24-(8.91-6) = 21.09dBm.
U-NII-3: Beamforming gain = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)=8.91dBi > 6dBi, so the power limit shall be reduced to 30-(8.91-6) = 27.09dBm.

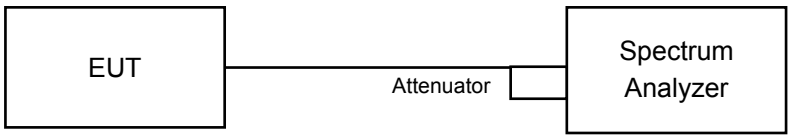
802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	9.96	10.62	21.429	13.31	21.09	Pass
155	5775	16.07	15.32	74.473	18.72	27.09	Pass

Note:
U-NII-1: Beamforming gain = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)=8.91dBi > 6dBi, so the power limit shall be reduced to 24-(8.91-6) = 21.09dBm.
U-NII-3: Beamforming gain = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)=8.91dBi > 6dBi, so the power limit shall be reduced to 30-(8.91-6) = 27.09dBm.

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
36	5180	16.52	16.52
40	5200	16.56	16.56
48	5240	16.44	16.56
149	5745	31.20	33.24
157	5785	31.80	34.92
165	5825	31.56	38.40

802.11n (HT20)

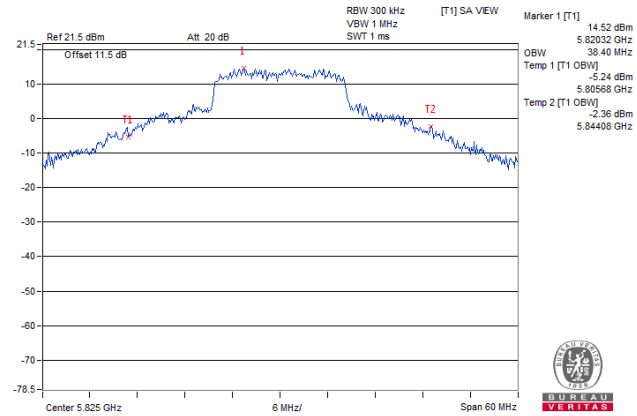
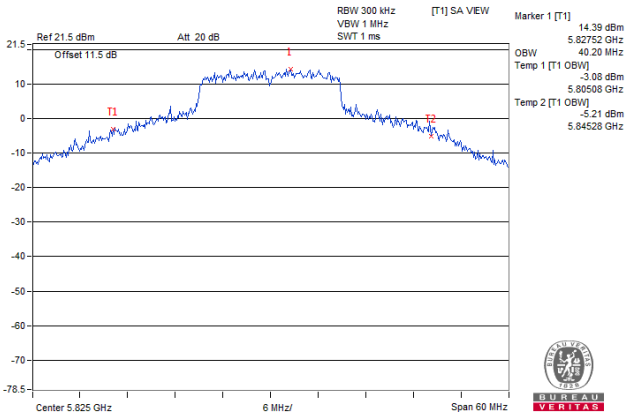
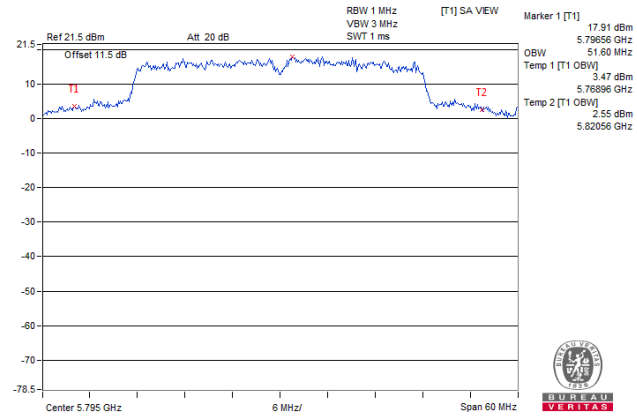
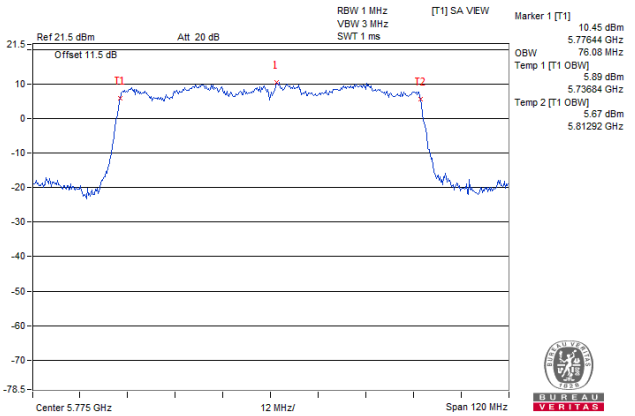
Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	17.64	17.76
40	5200	17.64	17.76
48	5240	17.76	17.76
149	5745	34.92	36.24
157	5785	34.80	38.64
165	5825	34.44	40.20

802.11n (HT40)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	35.88	36.12
46	5230	36.84	36.60
151	5755	38.64	39.96
159	5795	38.76	51.60

802.11ac (VHT80)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
42	5210	75.12	75.60
155	5775	76.08	76.08

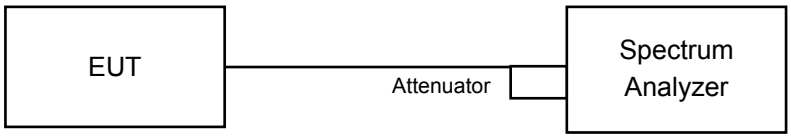
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

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	
	√	Client device	11dBm/ MHz
U-NII-2A			11dBm/ MHz
U-NII-2C			11dBm/ MHz
U-NII-3		√	30dBm/ 500kHz

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

For U-NII-1 band:

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

Using method SA-2, Duty cycle <98%

1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 30 kHz, Set VBW ≥ 1 MHz, Detector = RMS
3) Set Channel power measure = 1MHz
4) Sweep time = auto, trigger set to “free run”.
5) Trace average at least 100 traces in power averaging mode.
6) Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:

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

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

Same as 4.3.6.

4.5.7 Test Results

For U-NII-1 band:

802.11a

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
36	5180	5.55	3.51	0.17	7.83	8.09	Pass
40	5200	5.79	3.70	0.17	8.05	8.09	Pass
48	5240	5.80	3.52	0.17	7.99	8.09	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 = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)= 8.91dBi > 6dBi, so the power density limit shall be reduced to 11-(8.91-6) = 8.09dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Total PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1			
36	5180	5.99	3.34	7.87	8.09	Pass
40	5200	5.75	3.54	7.79	8.09	Pass
48	5240	5.76	3.69	7.86	8.09	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 = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)= 8.91dBi > 6dBi, so the power density limit shall be reduced to 11-(8.91-6) = 8.09dBm.

802.11n (HT40)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
38	5190	1.46	-0.74	0.14	3.65	8.09	Pass
46	5230	5.60	3.29	0.14	7.75	8.09	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 = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)= 8.91dBi > 6dBi, so the power density limit shall be reduced to 11-(8.91-6) = 8.09dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

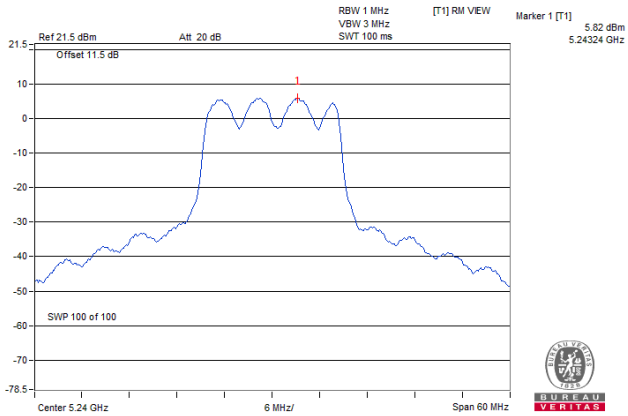
Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
42	5210	-4.69	-7.13	0.30	-2.43	8.09	Pass

Note:

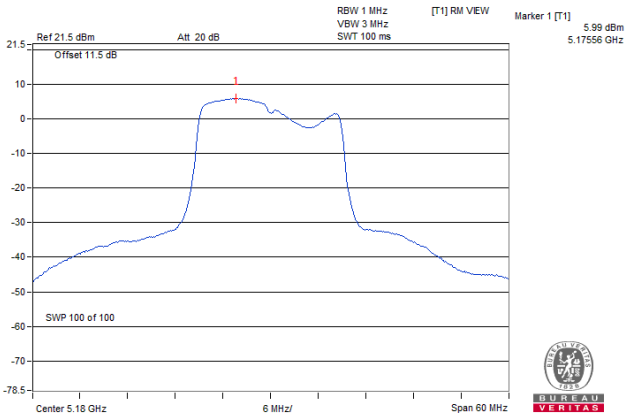
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)= 8.91dBi > 6dBi, so the power density limit shall be reduced to 11-(8.91-6) = 8.09dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

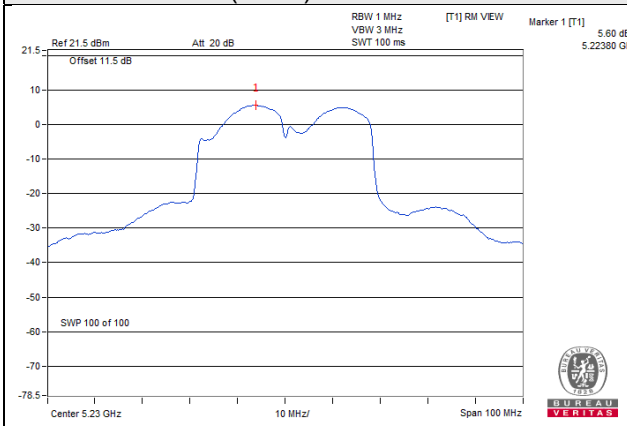
802.11a / Chain 0 / CH 48



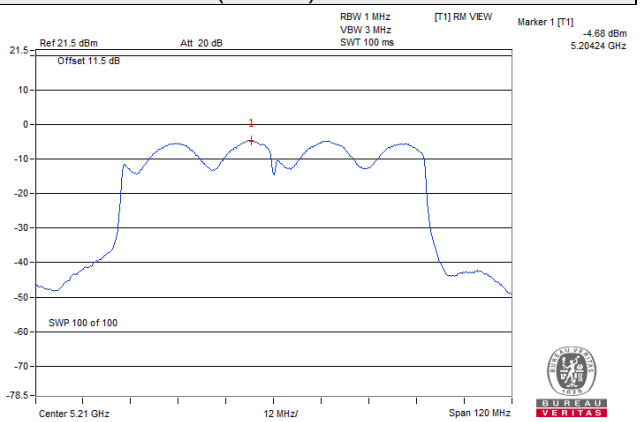
802.11n (HT20) / Chain 0 / CH 36



802.11n (HT40) / Chain 0 / CH 46



802.11ac (VHT80) / Chain 0 / CH 42



For U-NII-3 band:

802.11a

TX chain	Chan.	Freq. (MHz)	PSD W/O Duty Factor		10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/ 500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	149	5745	1.79	4.01	3.01	0.17	7.19	27.09	Pass
	157	5785	1.99	4.21	3.01	0.17	7.39	27.09	Pass
	165	5825	1.82	4.04	3.01	0.17	7.22	27.09	Pass
1	149	5745	1.48	3.70	3.01	0.17	6.88	27.09	Pass
	157	5785	1.72	3.94	3.01	0.17	7.12	27.09	Pass
	165	5825	1.82	4.04	3.01	0.17	7.22	27.09	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 = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)=8.91dBi > 6dBi, so the power density limit shall be reduced to 30-(8.91-6) = 27.09dBm.
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=2) dB	Total PSD (dBm/500kHz)	Limit (dBm/ 500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)				
0	149	5745	1.45	3.67	3.01	6.68	27.09	Pass
	157	5785	1.58	3.80	3.01	6.81	27.09	Pass
	165	5825	1.43	3.65	3.01	6.66	27.09	Pass
1	149	5745	1.21	3.43	3.01	6.44	27.09	Pass
	157	5785	1.34	3.56	3.01	6.57	27.09	Pass
	165	5825	1.37	3.59	3.01	6.60	27.09	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 = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)=8.91dBi > 6dBi, so the power density limit shall be reduced to 30-(8.91-6) = 27.09dBm.

802.11n (HT40)

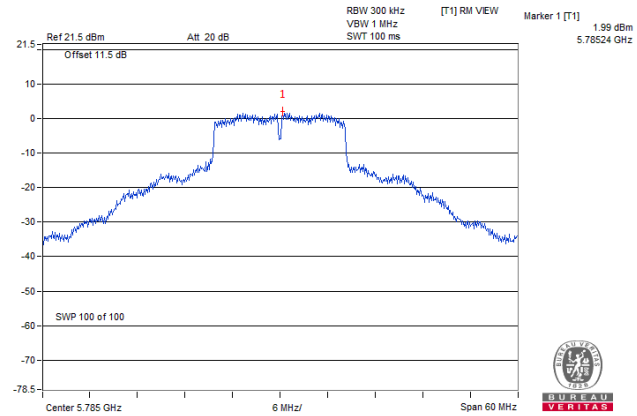
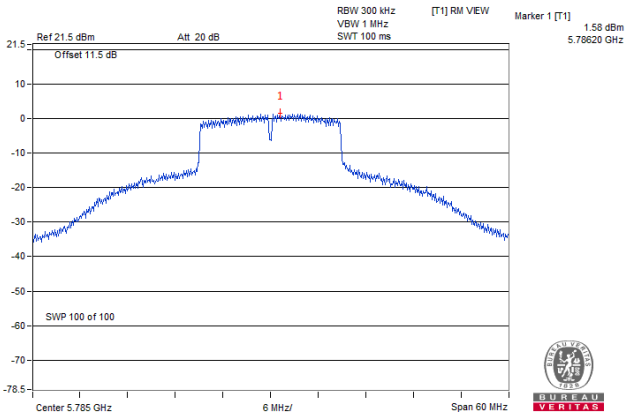
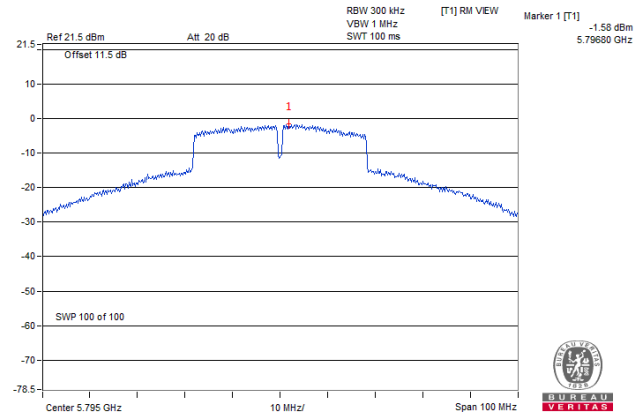
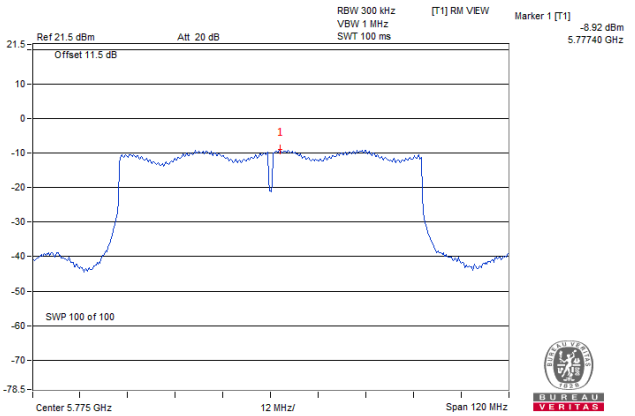
TX chain	Chan.	Freq. (MHz)	PSD W/O Duty Factor		10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/ 500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	151	5755	-2.60	-0.38	3.01	0.14	2.77	27.09	Pass
	159	5795	-2.71	-0.49	3.01	0.14	2.66	27.09	Pass
1	151	5755	-3.17	-0.95	3.01	0.14	2.20	27.09	Pass
	159	5795	-1.58	0.64	3.01	0.14	3.79	27.09	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 = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)=8.91dBi > 6dBi, so the power density limit shall be reduced to 30-(8.91-6) = 27.09dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

TX chain	Chan.	Freq. (MHz)	PSD W/O Duty Factor		10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/ 500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	155	5775	-8.92	-6.70	3.01	0.30	-3.39	27.09	Pass
1	155	5775	-9.54	-7.32	3.01	0.30	-4.01	27.09	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 = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) = 5.9dBi +10 log(2/1)=8.91dBi > 6dBi, so the power density limit shall be reduced to 30-(8.91-6) = 27.09dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

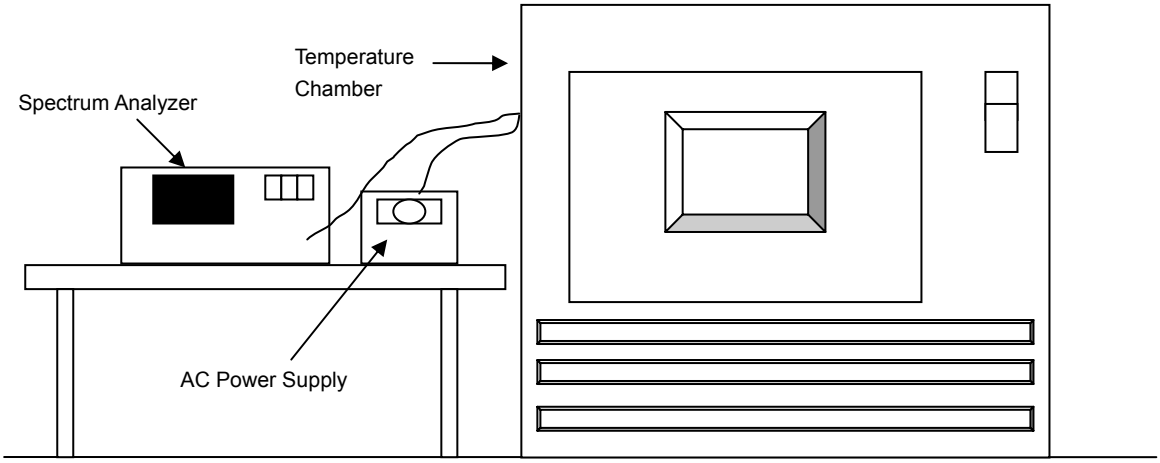
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

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)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result
50	120	5179.9772	PASS	5179.982	PASS	5179.9795	PASS	5179.9809	PASS
40	120	5179.9927	PASS	5179.9926	PASS	5179.993	PASS	5179.9917	PASS
30	120	5179.9765	PASS	5179.977	PASS	5179.9766	PASS	5179.9805	PASS
20	120	5179.9951	PASS	5179.9977	PASS	5179.9984	PASS	5179.994	PASS
10	120	5180.0061	PASS	5180.0051	PASS	5180.0071	PASS	5180.0073	PASS
0	120	5180.0207	PASS	5180.0208	PASS	5180.0225	PASS	5180.0215	PASS
-10	120	5180.0062	PASS	5180.0044	PASS	5180.0079	PASS	5180.0041	PASS
-20	120	5180.0209	PASS	5180.0209	PASS	5180.0175	PASS	5180.0201	PASS
-30	120	5179.9870	PASS	5179.9842	PASS	5179.9862	PASS	5179.9868	PASS

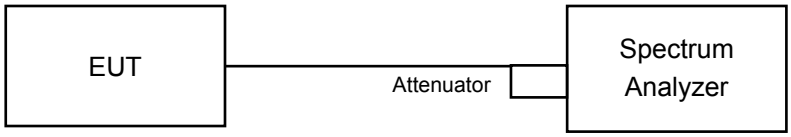
Frequency Stability Versus Voltage									
Operating Frequency: 5180MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result
20	138	5179.9955	PASS	5179.9973	PASS	5179.9978	PASS	5179.9942	PASS
	120	5179.9951	PASS	5179.9977	PASS	5179.9984	PASS	5179.994	PASS
	102	5179.996	PASS	5179.9976	PASS	5179.9987	PASS	5179.9943	PASS

4.7 6dB Bandwidth Measurement

4.7.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

Measurement Procedure REF

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

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

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

4.7.7 Test Results

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	15.16	15.78	0.5	Pass
157	5785	15.19	15.74	0.5	Pass
165	5825	15.18	16.34	0.5	Pass

802.11n (HT20)

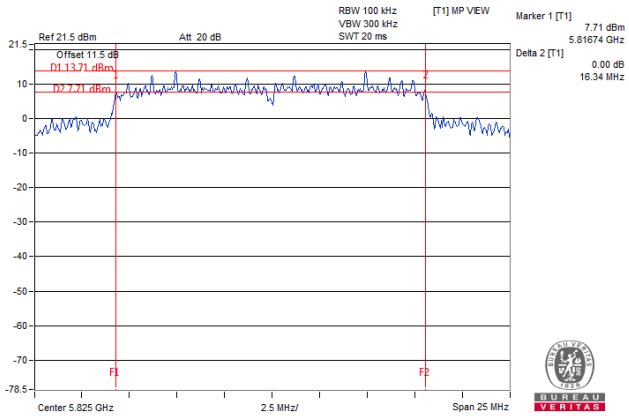
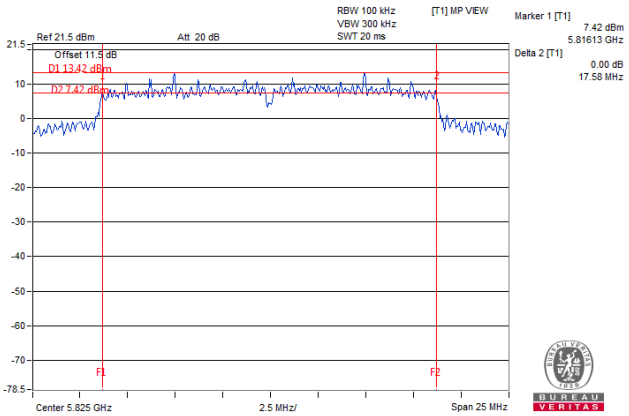
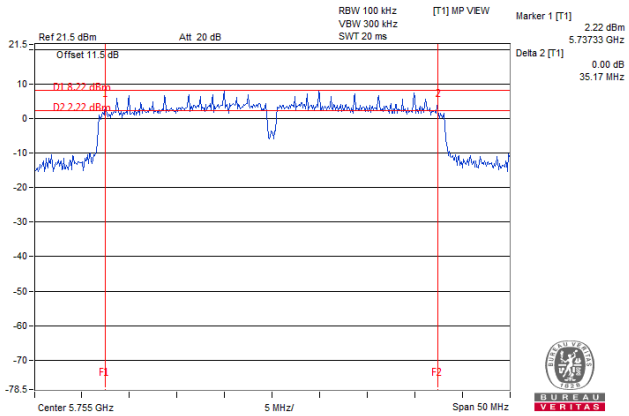
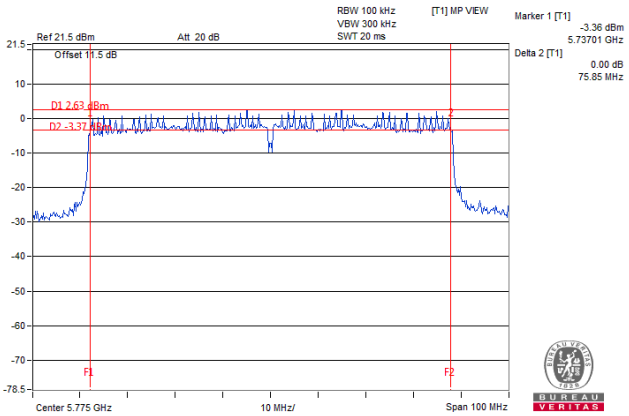
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	15.69	17.24	0.5	Pass
157	5785	16.32	16.93	0.5	Pass
165	5825	15.73	17.58	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	34.09	35.17	0.5	Pass
159	5795	33.99	33.88	0.5	Pass

802.11ac (VHT80)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
155	5775	75.67	75.85	0.5	Pass

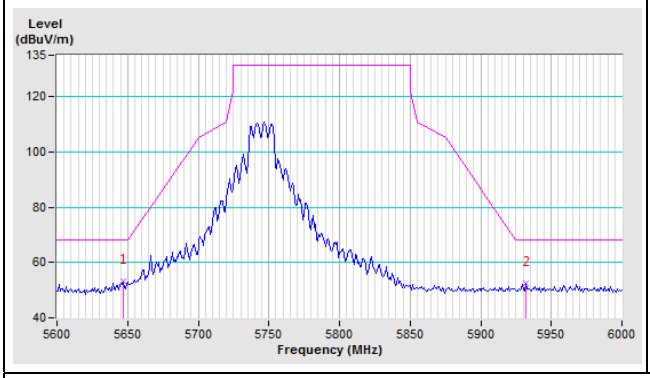
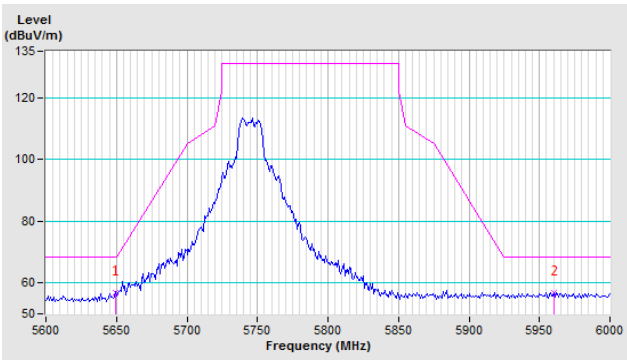
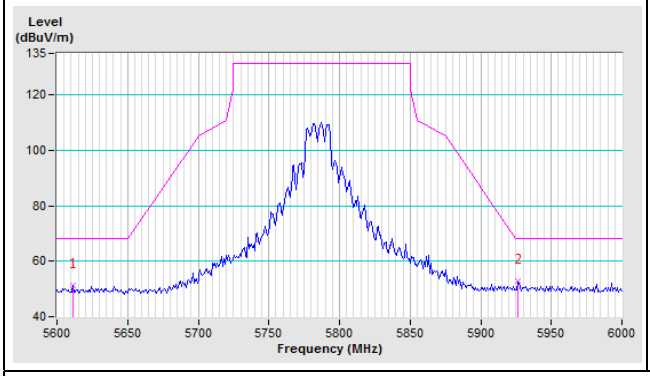
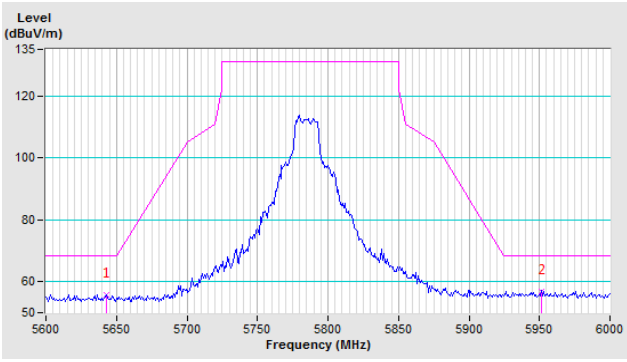
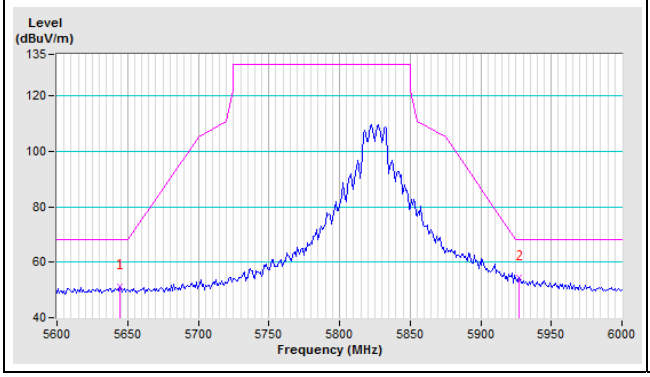
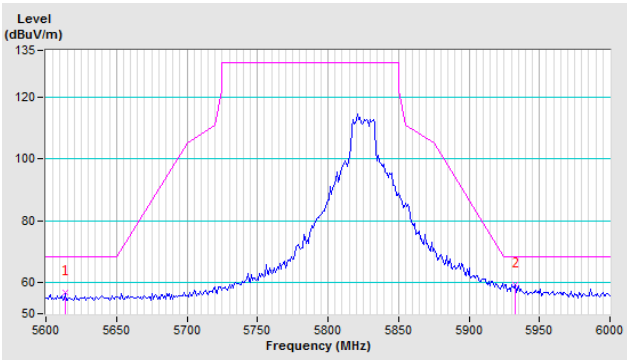
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

5 Pictures of Test Arrangements

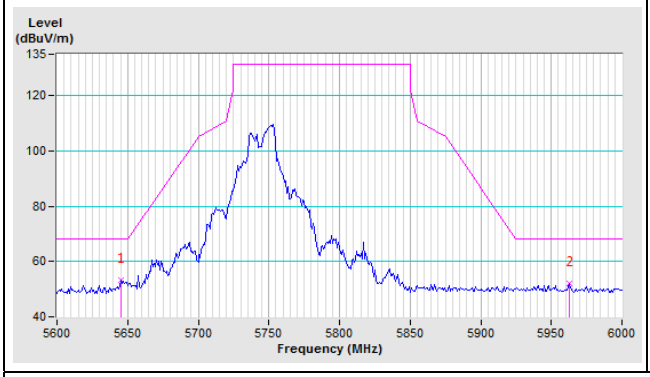
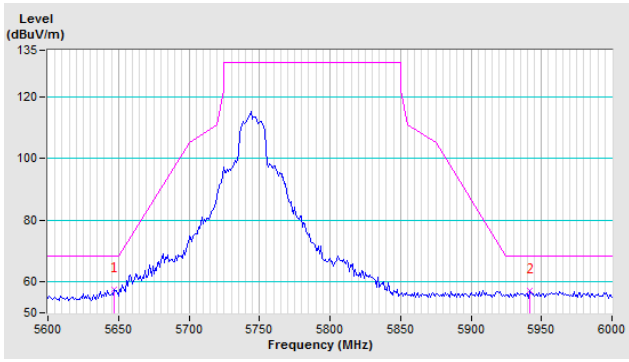
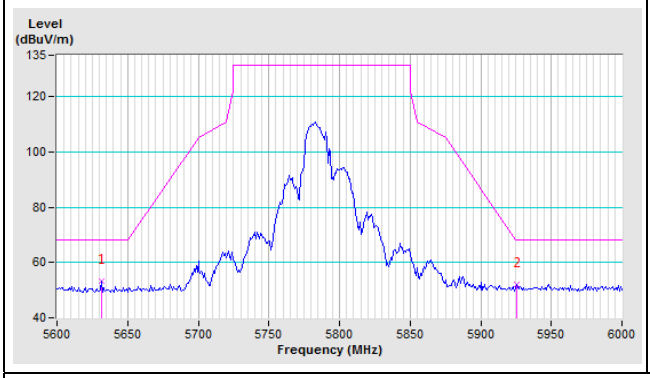
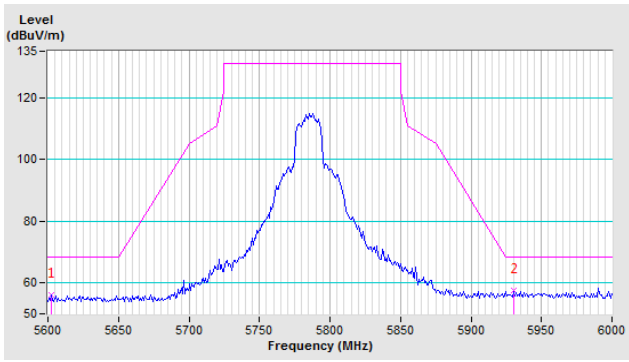
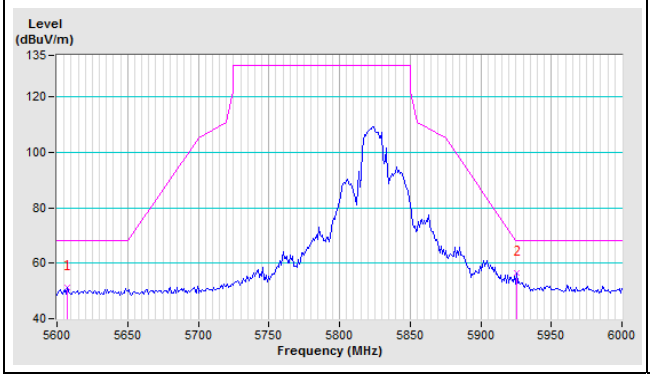
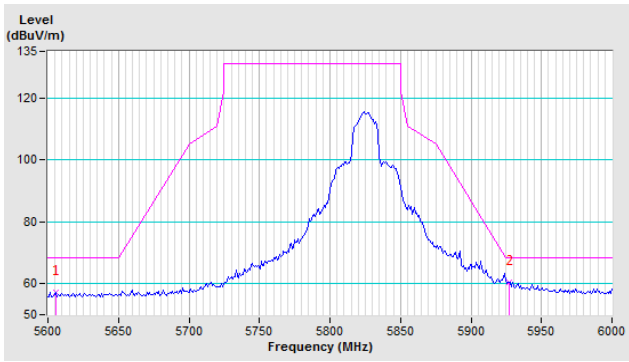
Please refer to the attached file (Test Setup Photo).

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

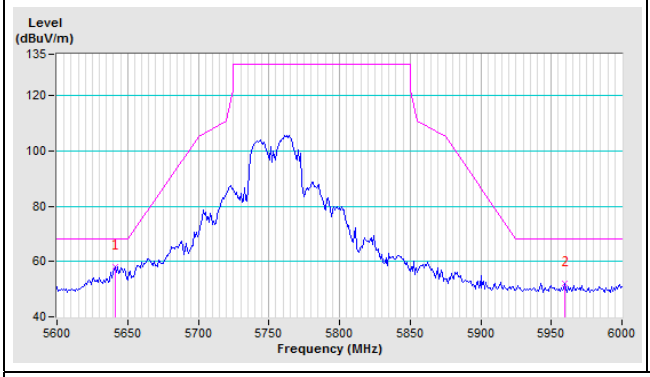
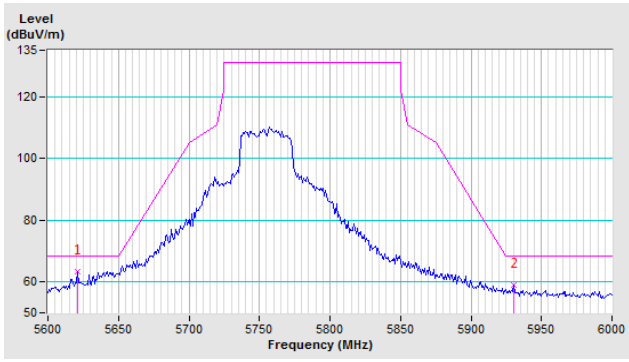
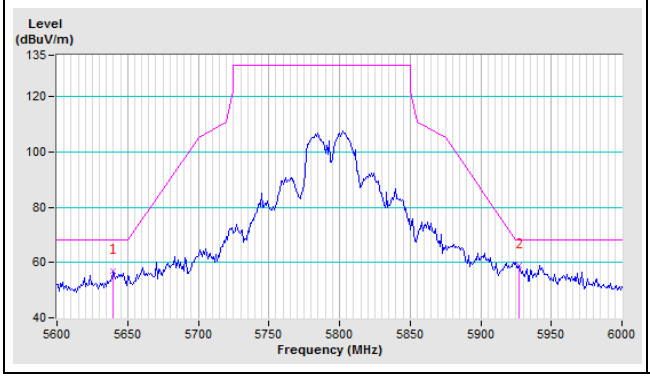
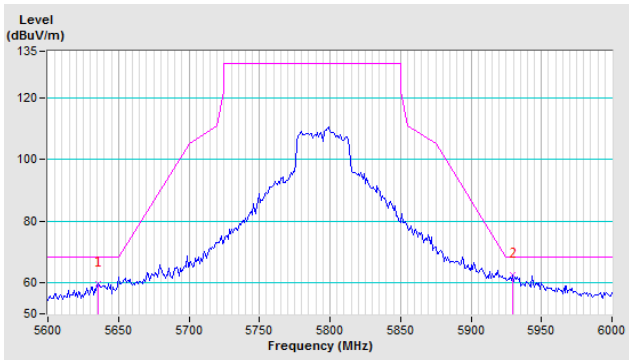
802.11a

CH149	
Horizontal	Vertical
	
CH157	
Horizontal	Vertical
	
CH165	
Horizontal	Vertical
	

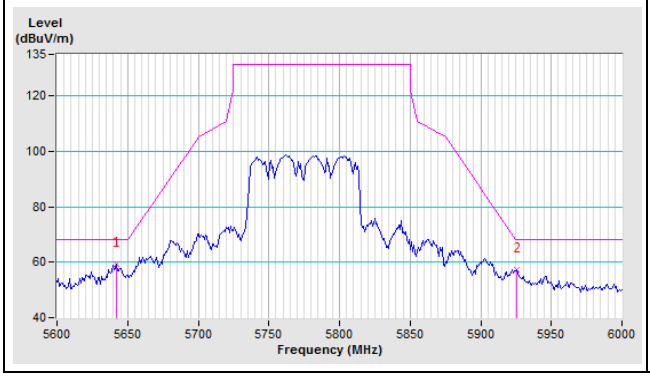
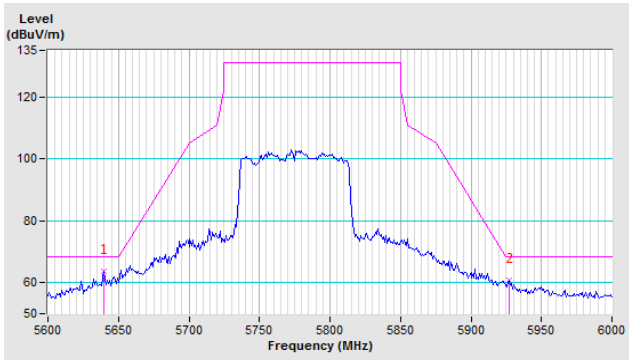
802.11n (HT20)

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:

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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.

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