FCC Test Report

Report No.:	RF161004C24H
FCC ID:	TVE-140701
Test Model:	FAP-221E, FAP-223E (refer to item 3.1 for more details)
Series Model:	FortiAP 221Exxxxx, FAP-221Exxxxx, FORTIAP-221Exxxxxx, FortiAP 223Exxxxxx, FAP-223Exxxxxx, FORTIAP-223Exxxxx (where “x” can be used as “A-Z”, or “0-9”, or “-“, or blank for marketing purposes only) (refer to item 3.1 for more details)
Received Date:	Jun. 04, 2018
Test Date:	Jun. 06 ~ Jun. 08, 2018
Issued Date:	Jun. 12, 2018
Applicant:	Fortinet Inc.
Address:	899 Kifer Road Sunnyvale, CA 94086 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF161004C24H	Original release	Jun. 12, 2018

1 Certificate of Conformity

Product:	Secured Wireless Access Point
Brand:	Fortinet Inc.
Test Model:	FAP-221E, FAP-223E (refer to item 3.1 for more details)
Series Model:	FortiAP 221Exxxxx, FAP-221Exxxxx, FORTIAP-221Exxxxxx, FortiAP 223Exxxxxx, FAP-223Exxxxxx, FORTIAP-223Exxxxx (where “x” can be used as “A-Z”, or “0-9”, or “-“, or blank for marketing purposes only) (refer to item 3.1 for more details)
Sample Status:	Engineering sample
Applicant:	Fortinet Inc.
Test Date:	Jun. 06 ~ Jun. 08, 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 RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** Jun. 12, 2018

Celine Chou / Specialist

Approved by : Bruce Chen , **Date:** Jun. 12, 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 -9.47dB at 0.47039MHz.
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.4dB at 5150.00MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	-	Reference only.
15.407(a)(1/2/3)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.407(g)	Frequency Stability	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	For printed antenna Antenna connector is IPEX not a standard connector. For dipole antenna Antenna connector is RP SMA plug not a standard connector.

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	Secured Wireless Access Point
Brand	Fortinet Inc.
Test Model	FAP-221E, FAP-223E
Series Model	FortiAP 221Exxxxx, FAP-221Exxxxx, FORTIAP-221Exxxxxx, FortiAP 223Exxxxxx, FAP-223Exxxxxx, FORTIAP-223Exxxxx (where “x” can be used as “A-Z”, or “0-9”, or “-“, or blank for marketing purposes only)
Model Difference	Refer to note for more details
Sample Status	Engineering sample
Power Supply Rating	12Vdc from adapter 54Vdc from POE
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK
Modulation Technology	OFDM
Transfer Rate	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 300Mbps 802.11ac: up to 867Mbps
Operating Frequency	5180 ~ 5240MHz
Number of Channel	802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
Output Power	CDD Mode: 52.252mW Beamforming Mode: 26.128mW
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	Adapter (option)
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the original report (BV CPS report no.: RF161004C24-1) is updated the software version to adjust U-NII-1 band RF characteristic performance. Only the U-NII-1 band band 802.11a, 802.11n (HT20) / 802.11ac (VHT20) and 802.11n (HT40) / 802.11ac (VHT40) mode had been tested for this addendum, the 802.11ac (VHT80) mode test data was copy from original report.
2. All models are listed as below. Model: FAP-221E and FAP-223E were chosen for final test.

Brand	Model		Difference
Fortinet Inc.	FortiAP 221Exxxxx	where “x” can be used as “A-Z”, or “0-9”, or “-“, or blank for marketing purposes only	With Internal Antenna
	FAP-221Exxxxx (Main test model: FAP-221E)		
	FORTIAP-221Exxxxxx		
	FortiAP 223Exxxxxx		With External Antenna
	FAP-223Exxxxxx (Main test model: FAP-223E)		
	FORTIAP-223Exxxxx		

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

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

* For 5GHz band, CDD mode is the worst case for final tests except RF output power test after pretesting CDD mode and beamforming mode.

*The modulation and bandwidth are similar for 802.11n mode for HT20/HT40 and 802.11ac mode for VHT20/VHT40, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

4. The EUT uses following antennas.

For Model: FAP-221E (Internal antenna)

Antenna Type	Printed	Antenna Connector	IPEX
Gain (dBi)	Frequency (MHz)		
	2400-2500	5150-5850	
Internal Ant. 1	4.4	-	
Internal Ant. 2	4.5	-	
Internal Ant. 3	-	5.6	
Internal Ant. 4	-	5.6	

For Model: FAP-223E (External antenna)

Antenna Type	Dipole		Antenna Connector		RP SMA plug	
Gain (dBi)	Frequency (MHz)					
	2400	2450	2500	5150	5550	5850
External Ant.	4.06	4.26	4.58	5.27	5.35	5.04

* The highest antanna gain was chosen for antenna port conducted measurement tested only

5. 2.4GHz and 5GHz technology can transmit at same time.

6. Spurious emission of the simultaneous operation (2.4GHz and 5GHz) has been evaluated and no non-compliance was found.

3.2 Description of Test Modes

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	Model: FAP-221E Power from adapter
B	-	√	√	-	Model: FAP-221E Power from POE
C	√	√	√	-	Model: FAP-223E Power from adapter
D	-	√	√	-	Model: FAP-223E Power from POE

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

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

Note:
1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **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, C	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
A, C	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	6.5
A, C	802.11n (HT40)		38 to 46	38, 46	OFDM	13.5
A, C	802.11ac (VHT80)		42	42	OFDM	29.3

Radiated Emission Test (Below 1GHz):

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
A, B, C, D	802.11a	5180-5240	36 to 48	36	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, D	802.11a	5180-5240	36 to 48	36	OFDM	6.0

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, C	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
A, C	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	6.5
A, C	802.11n (HT40)		38 to 46	38, 46	OFDM	13.5
A, C	802.11ac (VHT80)		42	42	OFDM	29.3

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
A	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	6.5
A	802.11n (HT40)		38 to 46	38, 46	OFDM	13.5
A	802.11ac (VHT80)		42	42	OFDM	29.3
Beamforming Mode						
A	802.11n (HT20)	5180-5240	36 to 48	36, 40, 48	OFDM	6.5
A	802.11n (HT40)		38 to 46	38, 46	OFDM	13.5
A	802.11ac (VHT80)		42	42	OFDM	29.3

Test Condition:

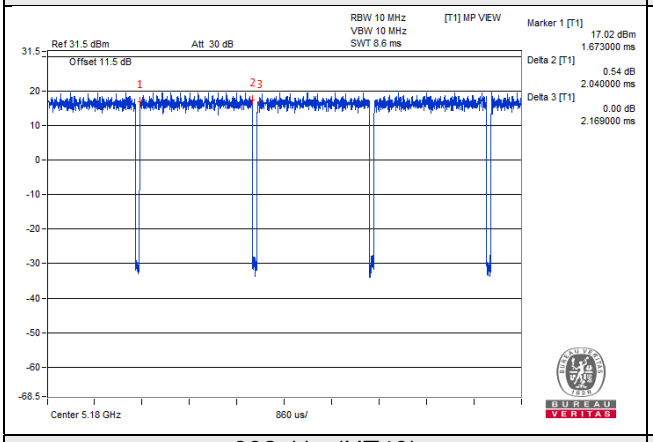
Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	24 deg. C, 67% RH 19deg. C, 70%RH 18deg. C, 70%RH	120Vac, 60Hz	Will Cheng James Yang Nick Hsu
RE<1G	24 deg. C, 67% RH	120Vac, 60Hz 54Vdc	Adair Peng
PLC	25 deg. C, 66% RH	120Vac, 60Hz 54Vdc	Will Cheng
APCM	25 deg. C, 60% RH 16deg. C, 70%RH	120Vac, 60Hz	Chris Lin Nick Hsu

3.3 Duty Cycle of Test Signal

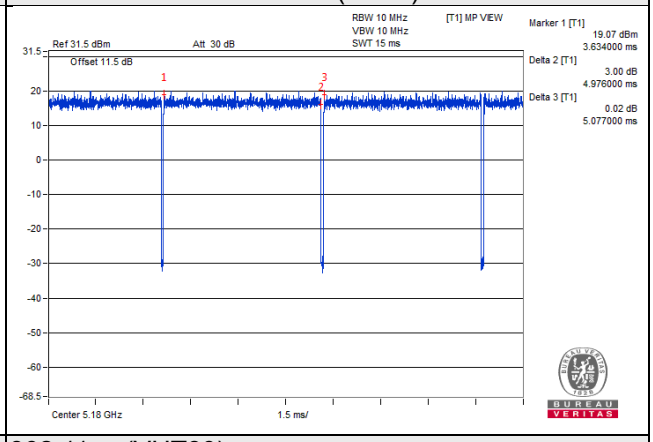
802.11n (HT20): Duty cycle of test signal is > 98%, duty factor is not required.
802.11a, 802.11n (HT40) , 802.11ac (VHT80): Duty cycle of test signal is < 98%, duty factor is required.

802.11a: Duty cycle = 2.040/2.169 = 0.941, Duty factor = 10 * log (1/0.941) = 0.27
802.11n (HT20): Duty cycle = 4.976/5.077 = 0.980
802.11n (HT40): Duty cycle = 2.407/2.505 = 0.961, Duty factor = 10 * log (1/0.961) = 0.17
802.11ac (VHT80): Duty cycle = 1.135/1.232 = 0.921, Duty factor = 10 * log(1/0.921) = 0.36

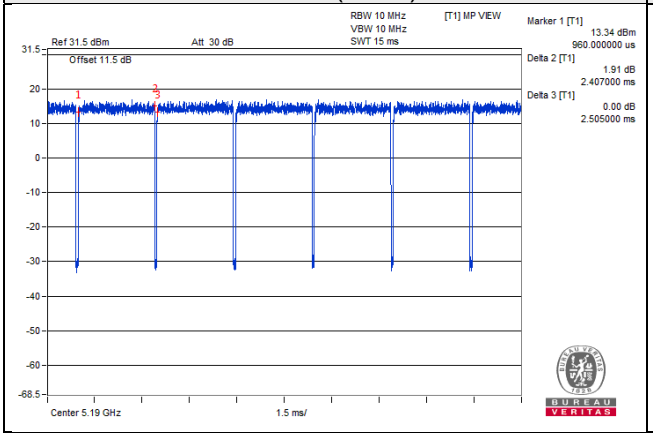
802.11a



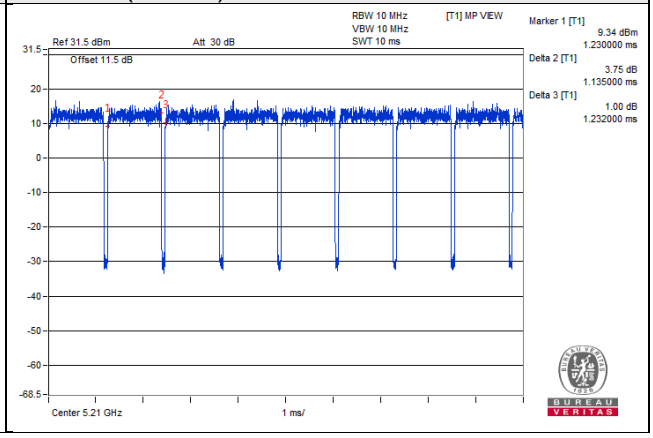
802.11n (HT20)



802.11n (HT40)



802.11ac (VHT80)



3.4 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	Latitude E6420	HPFC5Q1	FCC DoC Approved	-
B.	Adapter	Asian Power Devices Inc.	WA-30J12R	NA	NA	Option of EUT I/P: 100-240Vac, 50-60Hz, 0.9A Max. O/P: 12Vdc, 2.5A 1.8m power cable without core attached on adapter For test mode A and C only
C.	POE	EnGenius	EPA5006GAT	NA	NA	Provided by client I/P: 100-240Vac, 50-60Hz 0.8A O/P: 54Vdc, 0.6A 0.5m power cable without core For test mode B and D only

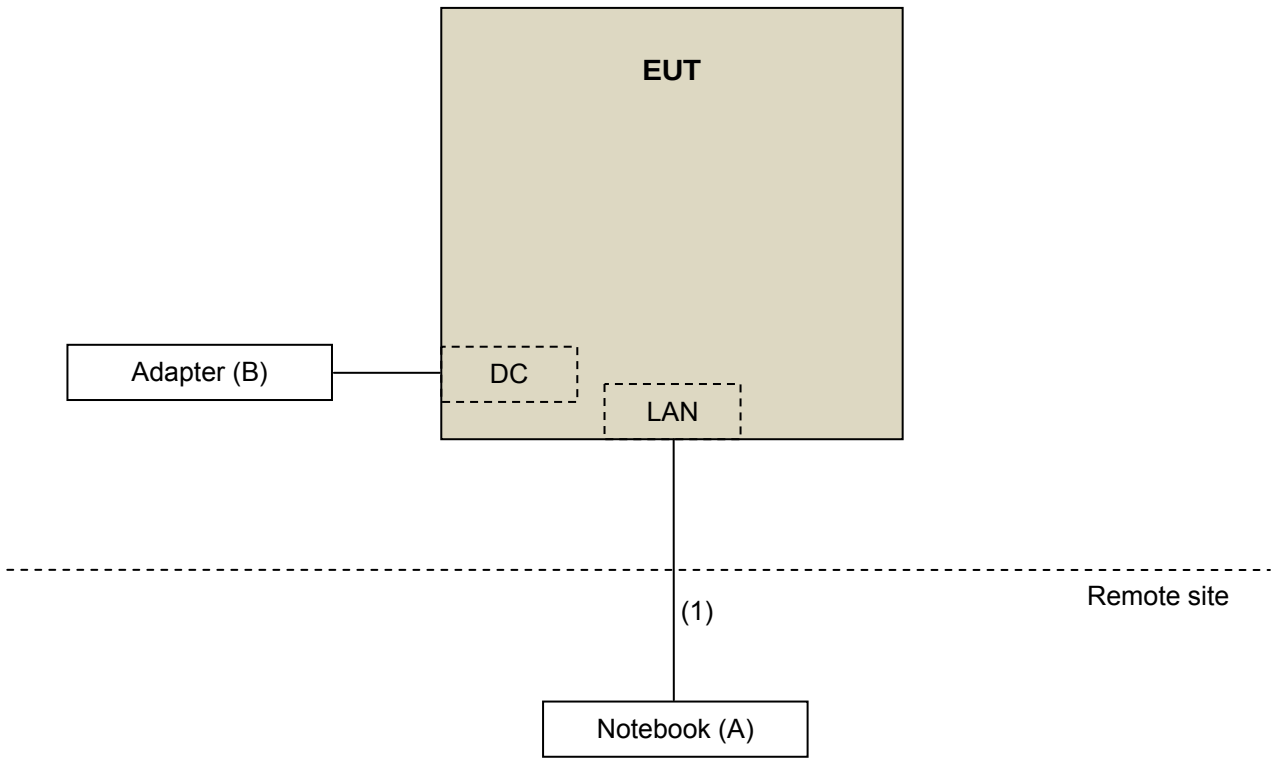
Note:

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

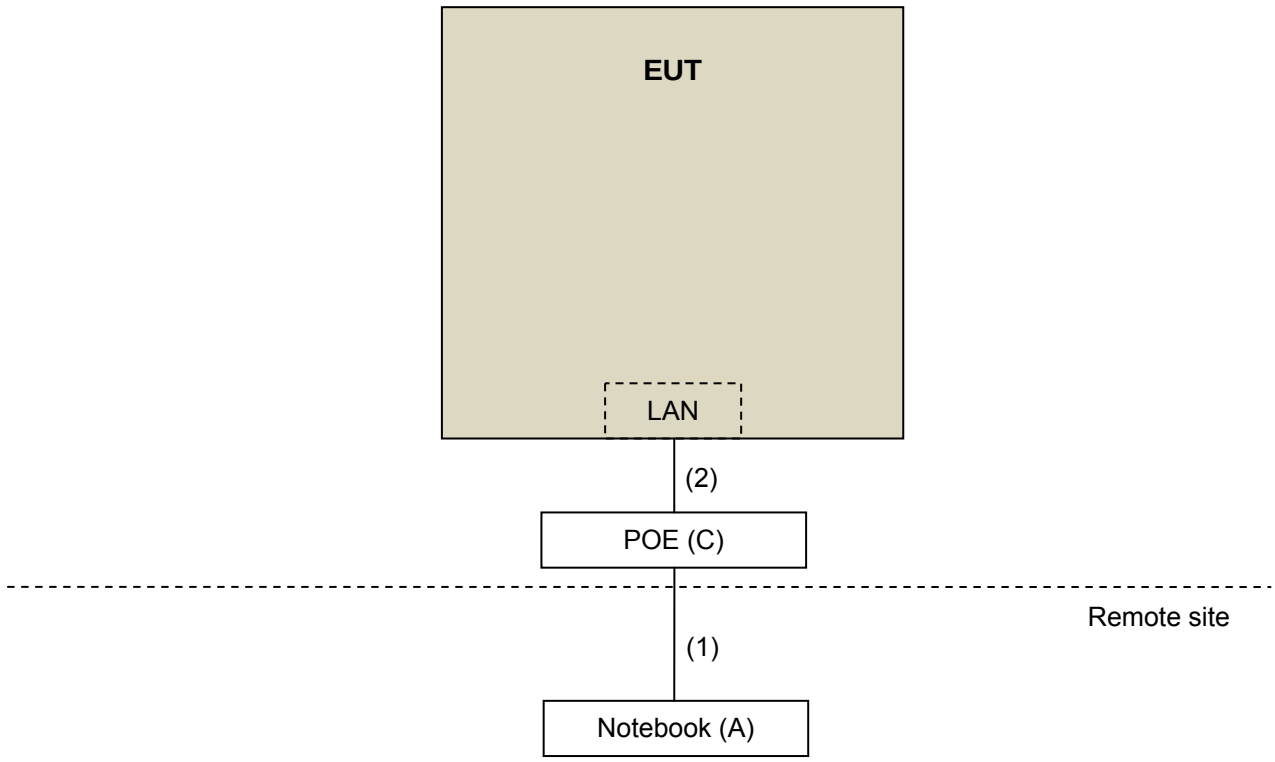
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45 Cable	1	3	N	0	Cat5e
2.	RJ45 Cable	1	1.8	N	0	Cat5e For test mode B and D only

3.4.1 Configuration of System under Test

Test Mode A, C



Test Mode B, D



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	ESIB7	100187	May 29, 2018	May 28, 2019
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. 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_ V7.6.15.9.5	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
26GHz ~ 40GHz Amplifier Agilent	8449B	3008A1960	Aug. 08, 2017	Aug. 07, 2018
High Speed Peak Power Meter	ML2495A	0824012	Aug. 18, 2017	Aug. 17, 2018
Power Sensor	MA2411B	0738171	Aug. 18, 2017	Aug. 17, 2018
WIT Standard Temperature And Humidity Chamber	HRM-120RF	931022	Nov. 20, 2017	Nov. 19, 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.

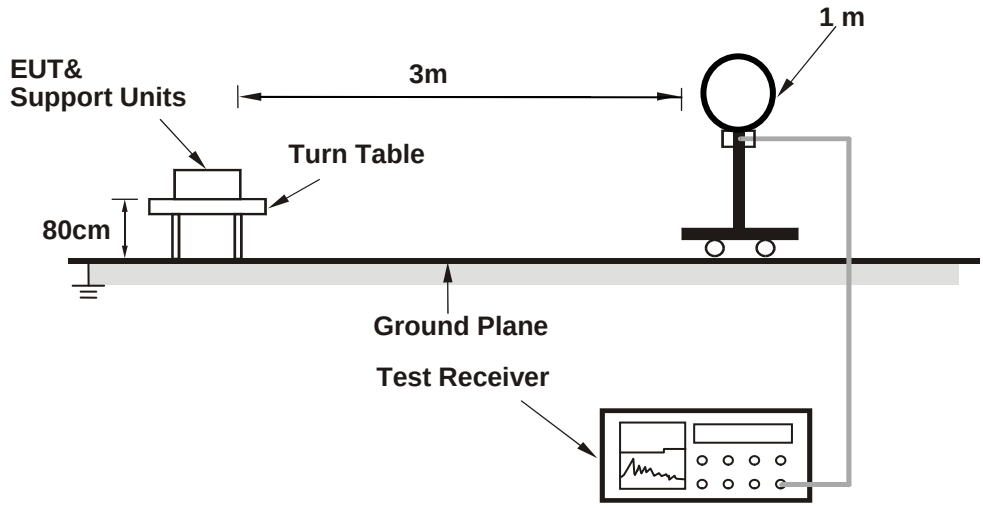
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

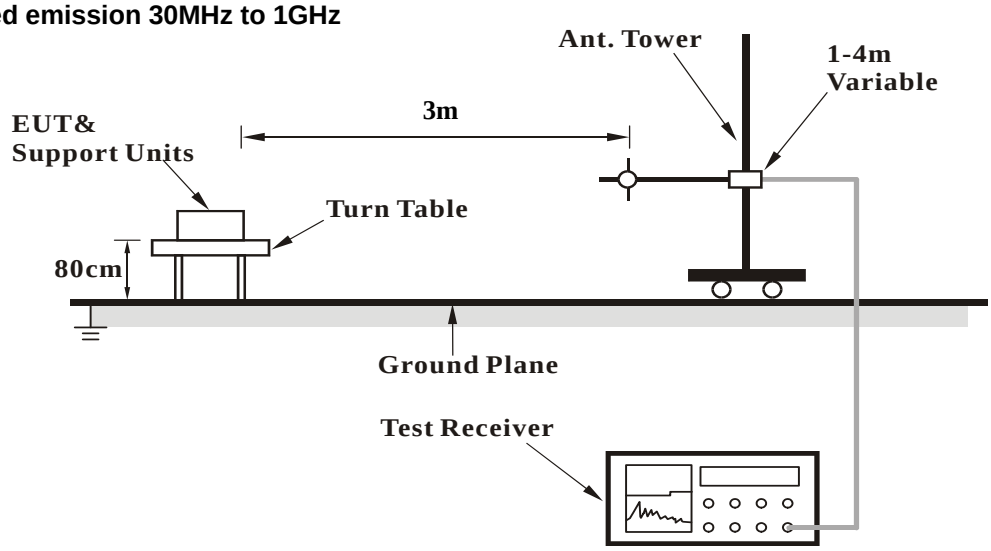
No deviation.

4.1.5 Test Setup

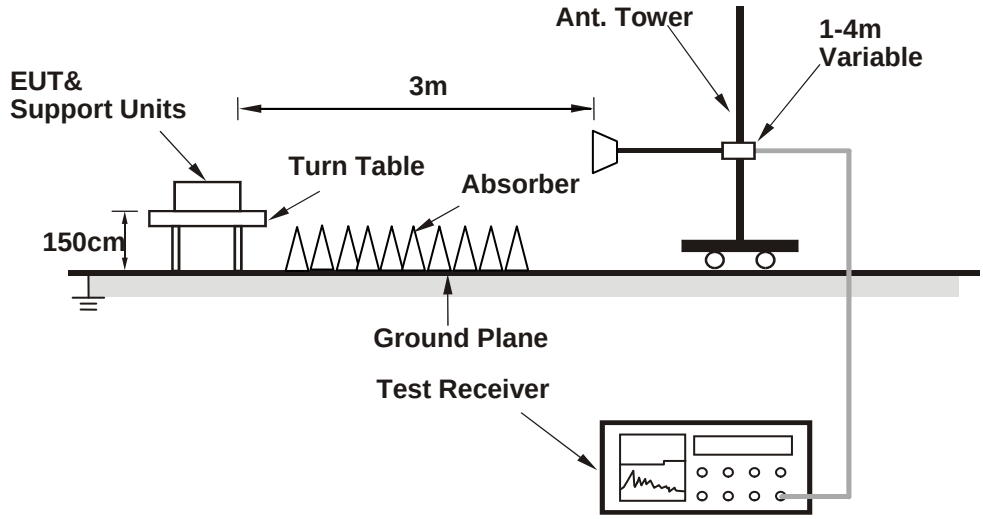
For Radiated emission below 30MHz



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:

Test Mode A

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	64.1 PK	74.0	-9.9	1.42 H	315	60.2	3.9
2	5150.00	46.0 AV	54.0	-8.0	1.42 H	315	42.1	3.9
3	*5180.00	110.9 PK			1.93 H	301	71.3	39.6
4	*5180.00	100.4 AV			1.93 H	301	60.8	39.6
5	#10360.00	57.7 PK	74.0	-16.3	2.05 H	114	41.9	15.8
6	#10360.00	45.7 AV	54.0	-8.3	2.05 H	114	29.9	15.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	61.8 PK	74.0	-12.2	1.77 V	335	57.9	3.9
2	5150.00	43.8 AV	54.0	-10.2	1.77 V	335	39.9	3.9
3	*5180.00	105.2 PK			1.77 V	343	65.6	39.6
4	*5180.00	95.0 AV			1.77 V	343	55.4	39.6
5	#10360.00	58.0 PK	74.0	-16.0	1.87 V	254	42.2	15.8
6	#10360.00	45.9 AV	54.0	-8.1	1.87 V	254	30.1	15.8

Remarks:

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

CHANNEL	TX Channel 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	112.6 PK			1.18 H	324	73.0	39.6
2	*5200.00	102.4 AV			1.18 H	324	62.8	39.6
3	#10400.00	57.2 PK	74.0	-16.8	1.98 H	145	41.3	15.9
4	#10400.00	45.6 AV	54.0	-8.4	1.98 H	145	29.7	15.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	106.4 PK			1.66 V	318	66.8	39.6
2	*5200.00	96.1 AV			1.66 V	318	56.5	39.6
3	#10400.00	57.8 PK	74.0	-16.2	1.78 V	224	41.9	15.9
4	#10400.00	45.5 AV	54.0	-8.5	1.78 V	224	29.6	15.9

Remarks:

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

CHANNEL	TX Channel 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	110.7 PK			1.11 H	286	71.3	39.4
2	*5240.00	99.8 AV			1.11 H	286	60.4	39.4
3	5350.00	57.2 PK	74.0	-16.8	1.25 H	299	53.2	4.0
4	5350.00	44.0 AV	54.0	-10.0	1.25 H	299	40.0	4.0
5	#10480.00	58.3 PK	74.0	-15.7	1.62 H	255	41.6	16.7
6	#10480.00	46.4 AV	54.0	-7.6	1.62 H	255	29.7	16.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	107.0 PK			1.93 V	324	67.6	39.4
2	*5240.00	96.6 AV			1.93 V	324	57.2	39.4
3	5350.00	56.1 PK	74.0	-17.9	1.61 V	358	52.1	4.0
4	5350.00	43.5 AV	54.0	-10.5	1.61 V	358	39.5	4.0
5	#10480.00	58.9 PK	74.0	-15.1	1.74 V	313	42.2	16.7
6	#10480.00	46.8 AV	54.0	-7.2	1.74 V	313	30.1	16.7

Remarks:

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

802.11n (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	63.0 PK	74.0	-11.0	1.82 H	311	59.1	3.9
2	5150.00	46.3 AV	54.0	-7.7	1.82 H	311	42.4	3.9
3	*5180.00	110.1 PK			1.95 H	295	70.5	39.6
4	*5180.00	99.5 AV			1.95 H	295	59.9	39.6
5	#10360.00	58.7 PK	74.0	-15.3	2.43 H	285	42.9	15.8
6	#10360.00	46.1 AV	54.0	-7.9	2.43 H	285	30.3	15.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	55.7 PK	74.0	-18.3	1.99 V	311	51.8	3.9
2	5150.00	44.1 AV	54.0	-9.9	1.99 V	311	40.2	3.9
3	*5180.00	106.0 PK			1.79 V	345	66.4	39.6
4	*5180.00	95.8 AV			1.79 V	345	56.2	39.6
5	#10360.00	57.9 PK	74.0	-16.1	1.76 V	226	42.1	15.8
6	#10360.00	45.4 AV	54.0	-8.6	1.76 V	226	29.6	15.8

Remarks:

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

CHANNEL	TX Channel 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	109.4 PK			1.12 H	300	69.8	39.6
2	*5200.00	98.9 AV			1.12 H	300	59.3	39.6
3	#10400.00	57.8 PK	74.0	-16.2	1.86 H	259	41.9	15.9
4	#10400.00	45.6 AV	54.0	-8.4	1.86 H	259	29.7	15.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	106.1 PK			1.75 V	346	66.5	39.6
2	*5200.00	95.8 AV			1.75 V	346	56.2	39.6
3	#10400.00	58.3 PK	74.0	-15.7	2.88 V	99	42.4	15.9
4	#10400.00	46.0 AV	54.0	-8.0	2.88 V	99	30.1	15.9

Remarks:

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

CHANNEL	TX Channel 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	110.3 PK			1.00 H	297	70.9	39.4
2	*5240.00	99.8 AV			1.00 H	297	60.4	39.4
3	5350.00	57.2 PK	74.0	-16.8	1.11 H	301	53.2	4.0
4	5350.00	43.9 AV	54.0	-10.1	1.11 H	301	39.9	4.0
5	#10480.00	59.9 PK	74.0	-14.1	1.77 H	189	43.2	16.7
6	#10480.00	46.7 AV	54.0	-7.3	1.77 H	189	30.0	16.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	106.7 PK			1.89 V	332	67.3	39.4
2	*5240.00	96.9 AV			1.89 V	332	57.5	39.4
3	5350.00	56.9 PK	74.0	-17.1	1.77 V	352	52.9	4.0
4	5350.00	44.4 AV	54.0	-9.6	1.77 V	352	40.4	4.0
5	#10480.00	59.8 PK	74.0	-14.2	2.27 V	146	43.1	16.7
6	#10480.00	46.9 AV	54.0	-7.1	2.27 V	146	30.2	16.7

Remarks:

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

802.11n (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	63.7 PK	74.0	-10.3	2.47 H	297	59.8	3.9
2	5150.00	48.1 AV	54.0	-5.9	2.47 H	297	44.2	3.9
3	*5190.00	107.0 PK			2.44 H	298	67.4	39.6
4	*5190.00	97.6 AV			2.44 H	298	58.0	39.6
5	#10380.00	59.4 PK	74.0	-14.6	2.54 H	336	43.5	15.9
6	#10380.00	46.5 AV	54.0	-7.5	2.54 H	336	30.6	15.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	59.5 PK	74.0	-14.5	1.89 V	351	55.6	3.9
2	5150.00	44.0 AV	54.0	-10.0	1.89 V	351	40.1	3.9
3	*5190.00	103.1 PK			1.84 V	349	63.5	39.6
4	*5190.00	93.6 AV			1.84 V	349	54.0	39.6
5	#10380.00	58.1 PK	74.0	-15.9	1.87 V	286	42.2	15.9
6	#10380.00	45.7 AV	54.0	-8.3	1.87 V	286	29.8	15.9

Remarks:

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

CHANNEL	TX Channel 46	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	57.2 PK	74.0	-16.8	2.22 H	281	53.3	3.9
2	5150.00	46.4 AV	54.0	-7.6	2.22 H	281	42.5	3.9
3	*5230.00	107.9 PK			2.50 H	287	68.5	39.4
4	*5230.00	97.8 AV			2.50 H	287	58.4	39.4
5	5350.00	58.5 PK	74.0	-15.5	2.40 H	303	54.5	4.0
6	5350.00	47.2 AV	54.0	-6.8	2.40 H	303	43.2	4.0
7	#10460.00	58.9 PK	74.0	-15.1	2.63 H	344	42.5	16.4
8	#10460.00	46.3 AV	54.0	-7.7	2.63 H	344	29.9	16.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	55.5 PK	74.0	-18.5	1.89 V	324	51.6	3.9
2	5150.00	44.5 AV	54.0	-9.5	1.89 V	324	40.6	3.9
3	*5230.00	104.4 PK			1.83 V	348	65.0	39.4
4	*5230.00	94.6 AV			1.83 V	348	55.2	39.4
5	5350.00	57.5 PK	74.0	-16.5	1.93 V	333	53.5	4.0
6	5350.00	45.9 AV	54.0	-8.1	1.93 V	333	41.9	4.0
7	#10460.00	58.7 PK	74.0	-15.3	1.68 V	63	42.3	16.4
8	#10460.00	46.0 AV	54.0	-8.0	1.68 V	63	29.6	16.4

Remarks:

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

802.11ac (VHT80)

CHANNEL	TX Channel 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	67.2 PK	74.0	-6.8	2.42 H	299	62.4	4.8
2	**5150.00**	**52.6 AV**	**54.0**	**-1.4**	**2.42 H**	**299**	**47.8**	**4.8**
3	*5210.00	107.5 PK			2.40 H	291	68.8	38.7
4	*5210.00	97.4 AV			2.40 H	291	58.7	38.7
5	5350.00	58.3 PK	74.0	-15.7	2.45 H	302	52.8	5.5
6	5350.00	45.5 AV	54.0	-8.5	2.45 H	302	40.0	5.5
7	#10420.00	59.8 PK	74.0	-14.2	1.82 H	135	42.0	17.8
8	#10420.00	46.6 AV	54.0	-7.4	1.82 H	135	28.8	17.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	61.4 PK	74.0	-12.6	1.70 V	348	56.6	4.8
2	5150.00	48.7 AV	54.0	-5.3	1.70 V	348	43.9	4.8
3	*5210.00	103.4 PK			1.72 V	346	64.7	38.7
4	*5210.00	94.3 AV			1.72 V	346	55.6	38.7
5	5350.00	57.7 PK	74.0	-16.3	1.77 V	352	52.2	5.5
6	5350.00	44.6 AV	54.0	-9.4	1.77 V	352	39.1	5.5
7	#10420.00	59.5 PK	74.0	-14.5	2.55 V	87	41.7	17.8
8	#10420.00	46.6 AV	54.0	-7.4	2.55 V	87	28.8	17.8

Remarks:

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

Test Mode C

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	61.2 PK	74.0	-12.8	1.83 H	191	57.3	3.9
2	5150.00	45.0 AV	54.0	-9.0	1.83 H	191	41.1	3.9
3	*5180.00	105.8 PK			1.89 H	162	66.2	39.6
4	*5180.00	96.0 AV			1.89 H	162	56.4	39.6
5	#10360.00	58.7 PK	74.0	-15.3	1.67 H	144	42.9	15.8
6	#10360.00	46.5 AV	54.0	-7.5	1.67 H	144	30.7	15.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	63.9 PK	74.0	-10.1	1.51 V	329	60.0	3.9
2	5150.00	46.4 AV	54.0	-7.6	1.51 V	329	42.5	3.9
3	*5180.00	110.3 PK			1.52 V	347	70.7	39.6
4	*5180.00	100.0 AV			1.52 V	347	60.4	39.6
5	#10360.00	56.7 PK	74.0	-17.3	2.43 V	156	40.9	15.8
6	#10360.00	44.5 AV	54.0	-9.5	2.43 V	156	28.7	15.8

Remarks:

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

CHANNEL	TX Channel 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	105.5 PK			3.10 H	279	65.9	39.6
2	*5200.00	95.7 AV			3.10 H	279	56.1	39.6
3	#10400.00	57.1 PK	74.0	-16.9	2.13 H	155	41.2	15.9
4	#10400.00	44.8 AV	54.0	-9.2	2.13 H	155	28.9	15.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	109.1 PK			1.50 V	9	69.5	39.6
2	*5200.00	98.8 AV			1.50 V	9	59.2	39.6
3	#10400.00	57.0 PK	74.0	-17.0	1.55 V	231	41.1	15.9
4	#10400.00	44.6 AV	54.0	-9.4	1.55 V	231	28.7	15.9

Remarks:

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

CHANNEL	TX Channel 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	105.9 PK			1.56 H	163	66.5	39.4
2	*5240.00	95.3 AV			1.56 H	163	55.9	39.4
3	5350.00	56.0 PK	74.0	-18.0	1.75 H	168	52.0	4.0
4	5350.00	43.7 AV	54.0	-10.3	1.75 H	168	39.7	4.0
5	#10480.00	59.3 PK	74.0	-14.7	2.12 H	186	42.6	16.7
6	#10480.00	46.6 AV	54.0	-7.4	2.12 H	186	29.9	16.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	110.9 PK			1.48 V	351	71.5	39.4
2	*5240.00	100.2 AV			1.48 V	351	60.8	39.4
3	5350.00	56.6 PK	74.0	-17.4	1.82 V	319	52.6	4.0
4	5350.00	44.8 AV	54.0	-9.2	1.82 V	319	40.8	4.0
5	#10480.00	59.5 PK	74.0	-14.5	1.68 V	89	42.8	16.7
6	#10480.00	46.6 AV	54.0	-7.4	1.68 V	89	29.9	16.7

Remarks:

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

802.11n (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	61.2 PK	74.0	-12.8	2.03 H	188	57.3	3.9
2	5150.00	44.1 AV	54.0	-9.9	2.03 H	188	40.2	3.9
3	*5180.00	107.1 PK			1.86 H	171	67.5	39.6
4	*5180.00	95.9 AV			1.86 H	171	56.3	39.6
5	#10360.00	58.8 PK	74.0	-15.2	1.73 H	118	43.0	15.8
6	#10360.00	45.6 AV	54.0	-8.4	1.73 H	118	29.8	15.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	64.3 PK	74.0	-9.7	1.72 V	340	60.4	3.9
2	5150.00	46.2 AV	54.0	-7.8	1.72 V	340	42.3	3.9
3	*5180.00	110.5 PK			1.44 V	318	70.9	39.6
4	*5180.00	99.2 AV			1.44 V	318	59.6	39.6
5	#10360.00	57.3 PK	74.0	-16.7	1.43 V	261	41.5	15.8
6	#10360.00	45.4 AV	54.0	-8.6	1.43 V	261	29.6	15.8

Remarks:

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

CHANNEL	TX Channel 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	107.3 PK			1.78 H	170	67.7	39.6
2	*5200.00	96.0 AV			1.78 H	170	56.4	39.6
3	#10400.00	58.7 PK	74.0	-15.3	1.71 H	116	42.8	15.9
4	#10400.00	45.4 AV	54.0	-8.6	1.71 H	116	29.5	15.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	110.2 PK			1.64 V	346	70.6	39.6
2	*5200.00	99.6 AV			1.64 V	346	60.0	39.6
3	#10400.00	57.7 PK	74.0	-16.3	1.53 V	242	41.8	15.9
4	#10400.00	45.8 AV	54.0	-8.2	1.53 V	242	29.9	15.9

Remarks:

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

CHANNEL	TX Channel 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	107.8 PK			1.84 H	169	68.4	39.4
2	*5240.00	96.3 AV			1.84 H	169	56.9	39.4
3	5350.00	55.9 PK	74.0	-18.1	1.67 H	156	51.9	4.0
4	5350.00	43.5 AV	54.0	-10.5	1.67 H	156	39.5	4.0
5	#10480.00	59.1 PK	74.0	-14.9	1.75 H	134	42.4	16.7
6	#10480.00	46.4 AV	54.0	-7.6	1.75 H	134	29.7	16.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	110.6 PK			1.65 V	348	71.2	39.4
2	*5240.00	100.6 AV			1.65 V	348	61.2	39.4
3	5350.00	47.2 PK	74.0	-26.8	1.52 V	316	43.2	4.0
4	5350.00	44.8 AV	54.0	-9.2	1.52 V	316	40.8	4.0
5	#10480.00	59.2 PK	74.0	-14.8	1.64 V	228	42.5	16.7
6	#10480.00	46.1 AV	54.0	-7.9	1.64 V	228	29.4	16.7

Remarks:

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

802.11n (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	60.4 PK	74.0	-13.6	1.88 H	172	56.5	3.9
2	5150.00	44.6 AV	54.0	-9.4	1.88 H	172	40.7	3.9
3	*5190.00	103.4 PK			1.81 H	170	63.8	39.6
4	*5190.00	93.7 AV			1.81 H	170	54.1	39.6
5	#10380.00	57.2 PK	74.0	-16.8	1.67 H	242	41.3	15.9
6	#10380.00	45.4 AV	54.0	-8.6	1.67 H	242	29.5	15.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	62.2 PK	74.0	-11.8	1.41 V	349	58.3	3.9
2	5150.00	46.2 AV	54.0	-7.8	1.41 V	349	42.3	3.9
3	*5190.00	107.9 PK			1.50 V	347	68.3	39.6
4	*5190.00	98.1 AV			1.50 V	347	58.5	39.6
5	#10380.00	58.4 PK	74.0	-15.6	1.61 V	255	42.5	15.9
6	#10380.00	45.7 AV	54.0	-8.3	1.61 V	255	29.8	15.9

Remarks:

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

CHANNEL	TX Channel 46	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	57.1 PK	74.0	-16.9	1.26 H	339	53.2	3.9
2	5150.00	46.1 AV	54.0	-7.9	1.26 H	339	42.2	3.9
3	*5230.00	102.8 PK			1.56 H	344	63.4	39.4
4	*5230.00	93.3 AV			1.56 H	344	53.9	39.4
5	5350.00	59.4 PK	74.0	-14.6	1.44 H	351	55.4	4.0
6	5350.00	48.1 AV	54.0	-5.9	1.44 H	351	44.1	4.0
7	#10460.00	59.8 PK	74.0	-14.2	1.35 H	229	43.4	16.4
8	#10460.00	46.2 AV	54.0	-7.8	1.35 H	229	29.8	16.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	59.6 PK	74.0	-14.4	1.47 V	349	55.7	3.9
2	5150.00	45.1 AV	54.0	-8.9	1.47 V	349	41.2	3.9
3	*5230.00	108.2 PK			1.67 V	348	68.8	39.4
4	*5230.00	98.5 AV			1.67 V	348	59.1	39.4
5	5350.00	59.5 PK	74.0	-14.5	1.67 V	344	55.5	4.0
6	5350.00	46.3 AV	54.0	-7.7	1.67 V	344	42.3	4.0
7	#10460.00	58.2 PK	74.0	-15.8	1.59 V	243	41.8	16.4
8	#10460.00	46.0 AV	54.0	-8.0	1.59 V	243	29.6	16.4

Remarks:

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

802.11ac (VHT80)

CHANNEL	TX Channel 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	63.5 PK	74.0	-10.5	2.24 H	180	58.7	4.8
2	5150.00	49.6 AV	54.0	-4.4	2.24 H	180	44.8	4.8
3	*5210.00	105.1 PK			1.76 H	170	66.4	38.7
4	*5210.00	95.0 AV			1.76 H	170	56.3	38.7
5	5350.00	56.9 PK	74.0	-17.1	1.47 H	173	51.4	5.5
6	5350.00	44.1 AV	54.0	-9.9	1.47 H	173	38.6	5.5
7	#10420.00	58.8 PK	74.0	-15.2	1.77 H	263	41.0	17.8
8	#10420.00	46.2 AV	54.0	-7.8	1.77 H	263	28.4	17.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	65.0 PK	74.0	-9.0	1.52 V	347	60.2	4.8
2	5150.00	52.3 AV	54.0	-1.7	1.52 V	347	47.5	4.8
3	*5210.00	109.0 PK			1.71 V	348	70.3	38.7
4	*5210.00	98.5 AV			1.71 V	348	59.8	38.7
5	5350.00	58.3 PK	74.0	-15.7	1.53 V	333	52.8	5.5
6	5350.00	45.7 AV	54.0	-8.3	1.53 V	333	40.2	5.5
7	#10420.00	58.2 PK	74.0	-15.8	1.61 V	262	40.4	17.8
8	#10420.00	46.1 AV	54.0	-7.9	1.61 V	262	28.3	17.8

Remarks:

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

Below 1GHz Worst-Case Data: 802.11a

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
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	70.73	30.1 QP	40.0	-9.9	1.99 H	242	41.4	-11.3
2	171.83	27.4 QP	43.5	-16.1	1.51 H	80	36.5	-9.1
3	249.60	27.0 QP	46.0	-19.0	1.00 H	99	36.1	-9.1
4	362.37	32.3 QP	46.0	-13.7	1.00 H	90	38.2	-5.9
5	523.75	34.5 QP	46.0	-11.5	1.51 H	200	37.0	-2.5
6	933.99	40.3 QP	46.0	-5.7	1.51 H	332	34.5	5.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	42.68	28.2 QP	40.0	-11.8	1.00 V	186	37.8	-9.6
2	68.79	36.6 QP	40.0	-3.4	1.00 V	183	47.4	-10.8
3	125.17	26.8 QP	43.5	-16.7	1.00 V	6	37.7	-10.9
4	364.32	30.8 QP	46.0	-15.2	1.49 V	329	36.6	-5.8
5	525.69	36.1 QP	46.0	-9.9	1.00 V	169	38.6	-2.5
6	934.67	37.2 QP	46.0	-8.8	1.99 V	204	31.4	5.8

Remarks:

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

CHANNEL	TX Channel 36	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	30.90	24.5 QP	40.0	-15.5	1.51 H	66	35.5	-11.0
2	97.95	26.3 QP	43.5	-17.2	1.99 H	108	40.0	-13.7
3	167.94	27.2 QP	43.5	-16.3	1.99 H	94	36.2	-9.0
4	296.27	27.1 QP	46.0	-18.9	1.00 H	128	34.3	-7.2
5	523.75	34.5 QP	46.0	-11.5	1.51 H	200	37.0	-2.5
6	799.84	33.2 QP	46.0	-12.8	1.99 H	94	30.0	3.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	64.90	36.8 QP	40.0	-3.2	1.00 V	284	47.1	-10.3
2	109.62	25.4 QP	43.5	-18.1	1.00 V	78	37.7	-12.3
3	181.55	22.7 QP	43.5	-20.8	1.00 V	158	32.9	-10.2
4	298.21	26.7 QP	46.0	-19.3	1.49 V	148	33.9	-7.2
5	525.69	36.1 QP	46.0	-9.9	1.00 V	169	38.6	-2.5
6	764.84	32.0 QP	46.0	-14.0	1.49 V	128	29.1	2.9

Remarks:

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

CHANNEL	TX Channel 36	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	28.6 QP	40.0	-11.4	2.00 H	241	38.1	-9.5
2	97.95	28.0 QP	43.5	-15.5	2.00 H	101	41.7	-13.7
3	206.83	28.1 QP	43.5	-15.4	1.00 H	331	39.6	-11.5
4	315.71	27.5 QP	46.0	-18.5	1.00 H	109	34.2	-6.7
5	500.42	31.3 QP	46.0	-14.7	1.50 H	115	34.2	-2.9
6	939.83	37.1 QP	46.0	-8.9	1.00 H	85	31.2	5.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	43.51	36.8 QP	40.0	-3.2	1.00 V	17	46.4	-9.6
2	64.90	34.5 QP	40.0	-5.5	1.00 V	226	44.8	-10.3
3	127.11	31.1 QP	43.5	-12.4	1.00 V	293	41.8	-10.7
4	317.65	29.1 QP	46.0	-16.9	1.49 V	205	35.8	-6.7
5	500.42	29.8 QP	46.0	-16.2	1.00 V	169	32.7	-2.9
6	939.83	39.6 QP	46.0	-6.4	1.99 V	16	33.7	5.9

Remarks:

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

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

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	28.6 QP	40.0	-11.4	2.00 H	241	38.1	-9.5
2	125.17	27.2 QP	43.5	-16.3	1.50 H	61	38.1	-10.9
3	249.60	27.9 QP	46.0	-18.1	1.00 H	208	37.0	-9.1
4	459.59	27.0 QP	46.0	-19.0	1.00 H	4	30.7	-3.7
5	679.29	30.4 QP	46.0	-15.6	1.00 H	212	29.6	0.8
6	873.72	34.6 QP	46.0	-11.4	2.00 H	195	29.7	4.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	64.90	34.5 QP	40.0	-5.5	1.00 V	226	44.8	-10.3
2	109.62	26.8 QP	43.5	-16.7	1.00 V	82	39.1	-12.3
3	249.60	26.0 QP	46.0	-20.0	1.49 V	140	35.1	-9.1
4	317.65	29.1 QP	46.0	-16.9	1.49 V	205	35.8	-6.7
5	500.42	29.8 QP	46.0	-16.2	1.00 V	169	32.7	-2.9
6	774.56	32.8 QP	46.0	-13.2	1.99 V	77	29.9	2.9

Remarks:

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

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102412	Feb. 08, 2018	Feb. 07, 2019
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_ V7.3.7.4	NA	NA	NA

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

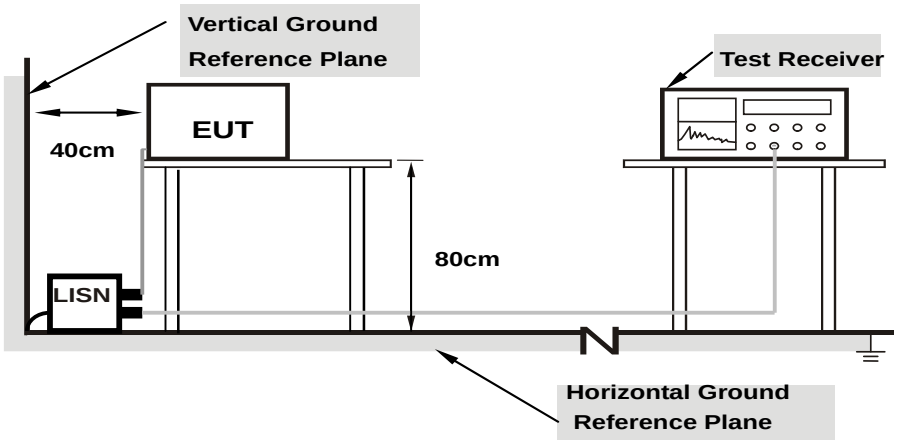
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

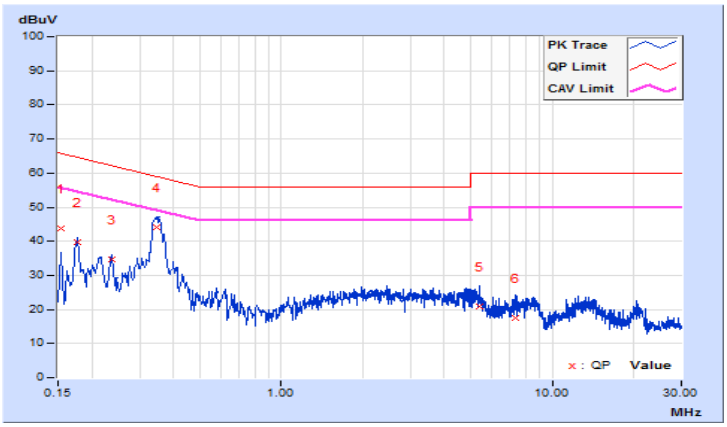
Worst-case data: 802.11a

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

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.28	33.56	16.84	43.84	27.12	65.79	55.79	-21.95	-28.67
2	0.17737	10.30	29.43	14.00	39.73	24.30	64.61	54.61	-24.88	-30.31
3	0.23602	10.32	24.26	13.68	34.58	24.00	62.24	52.24	-27.66	-28.24
4	0.34560	10.33	33.83	25.09	44.16	35.42	59.07	49.07	-14.91	-13.65
5	5.38940	10.55	10.32	3.37	20.87	13.92	60.00	50.00	-39.13	-36.08
6	7.34049	10.58	7.01	2.00	17.59	12.58	60.00	50.00	-42.41	-37.42

Remarks:

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

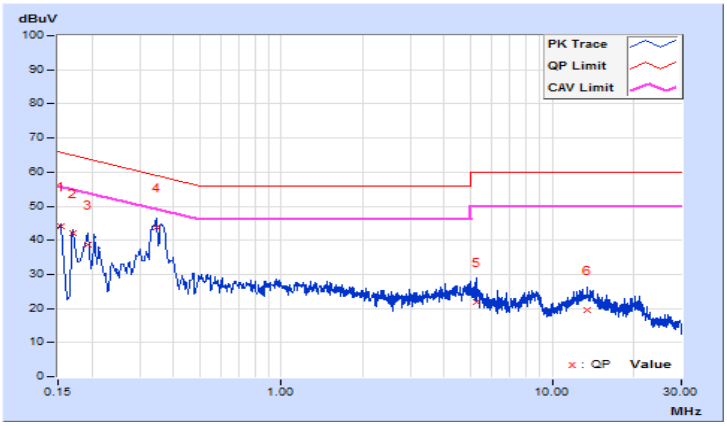


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.34	33.87	17.43	44.21	27.77	65.79	55.79	-21.58	-28.02
2	0.16955	10.33	31.65	16.98	41.98	27.31	64.98	54.98	-23.00	-27.67
3	0.19301	10.31	28.33	15.04	38.64	25.35	63.91	53.91	-25.27	-28.56
4	0.34550	10.31	33.56	24.30	43.87	34.61	59.07	49.07	-15.20	-14.46
5	5.22909	10.59	11.44	4.47	22.03	15.06	60.00	50.00	-37.97	-34.94
6	13.43618	10.82	8.82	3.35	19.64	14.17	60.00	50.00	-40.36	-35.83

Remarks:

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

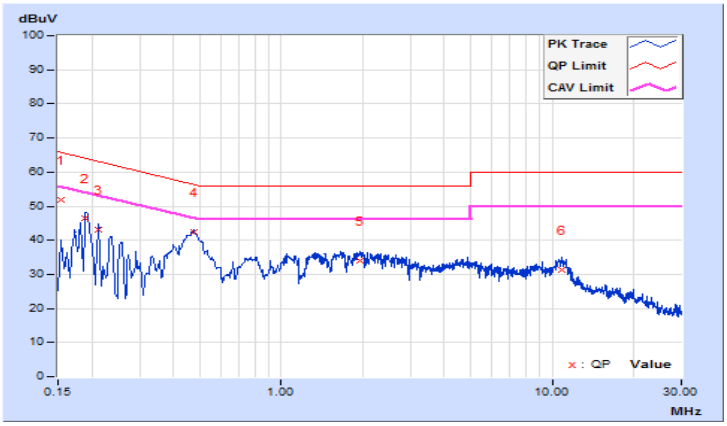


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.24	41.53	26.32	51.77	36.56	65.79	55.79	-14.02	-19.23
2	0.18903	10.25	36.12	21.88	46.37	32.13	64.08	54.08	-17.71	-21.95
3	0.21256	10.26	32.86	19.30	43.12	29.56	63.10	53.10	-19.98	-23.54
4	0.47453	10.28	32.15	26.36	42.43	36.64	56.43	46.43	-14.00	-9.79
5	1.95675	10.38	23.76	19.97	34.14	30.35	56.00	46.00	-21.86	-15.65
6	10.80866	10.59	20.70	15.22	31.29	25.81	60.00	50.00	-28.71	-24.19

Remarks:

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

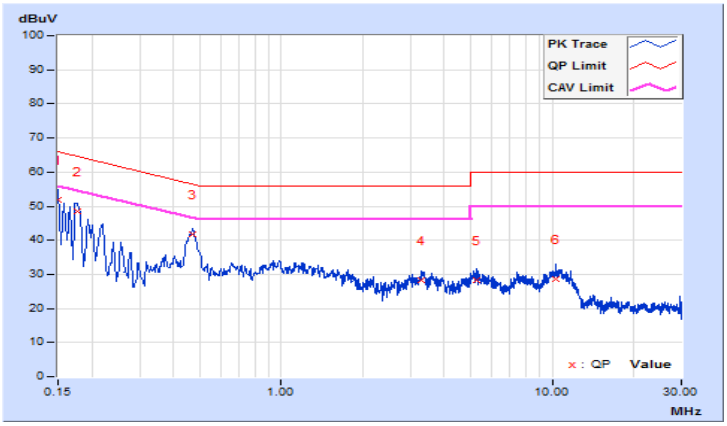


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.25	41.71	25.82	51.96	36.07	66.00	56.00	-14.04	-19.93
2	0.17737	10.26	38.09	23.13	48.35	33.39	64.61	54.61	-16.26	-21.22
3	**0.47039**	**10.29**	**31.62**	**26.75**	**41.91**	**37.04**	**56.51**	**46.51**	**-14.60**	**-9.47**
4	3.28191	10.44	17.97	11.76	28.41	22.20	56.00	46.00	-27.59	-23.80
5	5.27210	10.51	17.76	11.85	28.27	22.36	60.00	50.00	-31.73	-27.64
6	10.33946	10.66	17.88	12.42	28.54	23.08	60.00	50.00	-31.46	-26.92

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.

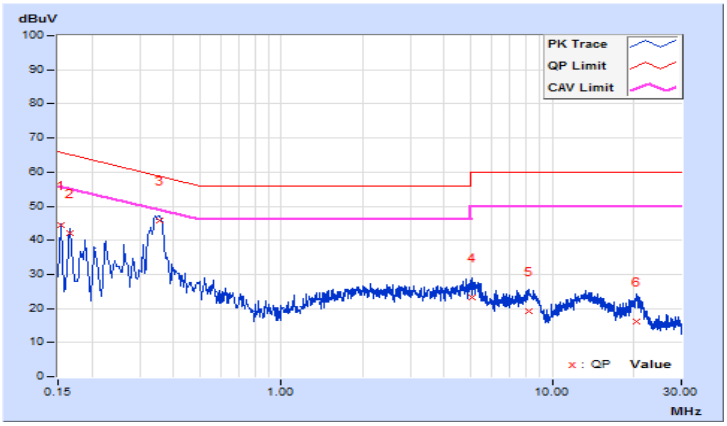


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	C		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.28	34.07	16.67	44.35	26.95	65.79	55.79	-21.44	-28.84
2	0.16564	10.29	31.96	14.92	42.25	25.21	65.18	55.18	-22.93	-29.97
3	0.35483	10.34	35.58	27.43	45.92	37.77	58.85	48.85	-12.93	-11.08
4	5.05705	10.55	12.52	5.02	23.07	15.57	60.00	50.00	-36.93	-34.43
5	8.18114	10.59	8.50	3.14	19.09	13.73	60.00	50.00	-40.91	-36.27
6	20.56411	10.92	5.29	2.36	16.21	13.28	60.00	50.00	-43.79	-36.72

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.

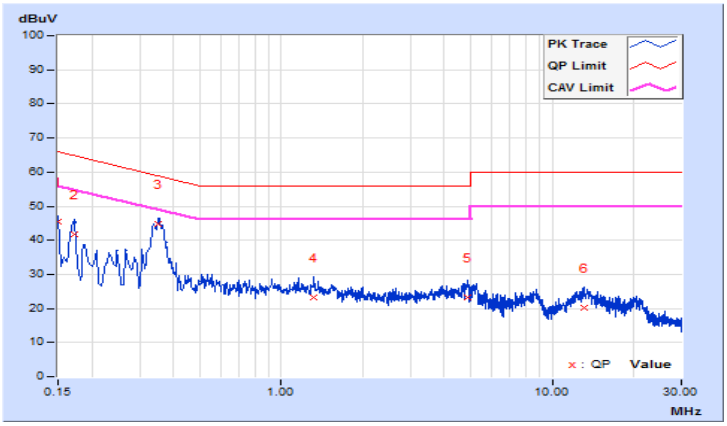


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	C		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.34	35.25	19.40	45.59	29.74	66.00	56.00	-20.41	-26.26
2	0.17328	10.32	31.56	17.04	41.88	27.36	64.80	54.80	-22.92	-27.44
3	0.35332	10.31	34.42	25.99	44.73	36.30	58.88	48.88	-14.15	-12.58
4	1.32300	10.43	12.80	6.84	23.23	17.27	56.00	46.00	-32.77	-28.73
5	4.89283	10.58	12.53	5.65	23.11	16.23	56.00	46.00	-32.89	-29.77
6	13.17812	10.81	9.35	3.86	20.16	14.67	60.00	50.00	-39.84	-35.33

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.

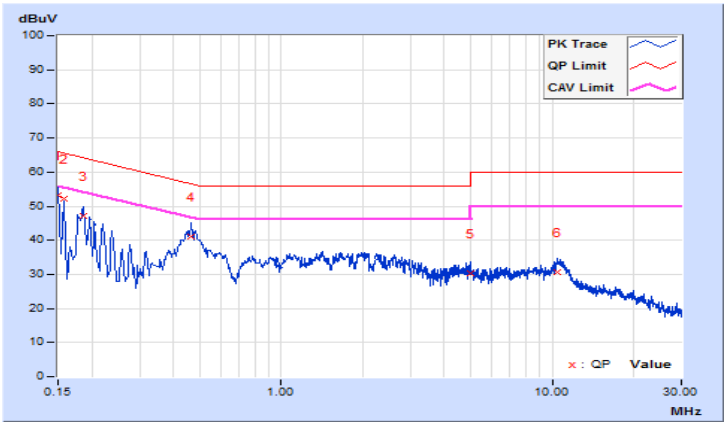


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	D		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.24	42.85	26.02	53.09	36.26	66.00	56.00	-12.91	-19.74
2	0.15782	10.24	41.85	25.93	52.09	36.17	65.58	55.58	-13.49	-19.41
3	0.18519	10.25	37.00	22.00	47.25	32.25	64.25	54.25	-17.00	-22.00
4	0.46301	10.28	30.94	25.47	41.22	35.75	56.64	46.64	-15.42	-10.89
5	4.99449	10.47	19.93	14.33	30.40	24.80	56.00	46.00	-25.60	-21.20
6	10.45676	10.59	19.90	14.47	30.49	25.06	60.00	50.00	-29.51	-24.94

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.

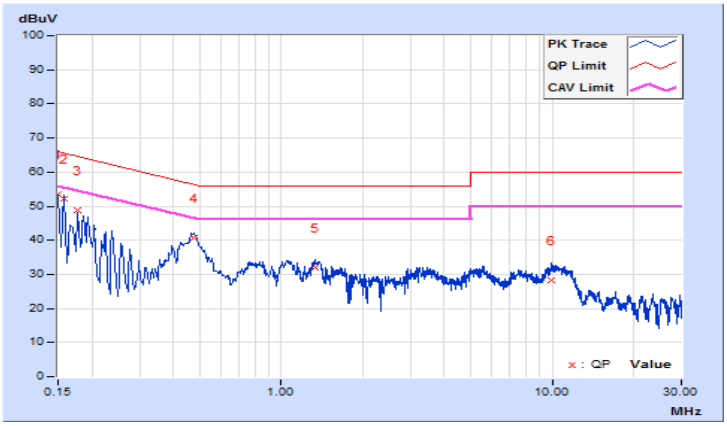


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	D		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.25	43.13	26.80	53.38	37.05	66.00	56.00	-12.62	-18.95
2	0.15760	10.25	41.84	26.53	52.09	36.78	65.59	55.59	-13.50	-18.81
3	0.17737	10.26	38.51	23.35	48.77	33.61	64.61	54.61	-15.84	-21.00
4	0.47844	10.29	30.47	24.50	40.76	34.79	56.37	46.37	-15.61	-11.58
5	1.33891	10.35	21.61	17.63	31.96	27.98	56.00	46.00	-24.04	-18.02
6	9.89372	10.64	17.65	12.19	28.29	22.83	60.00	50.00	-31.71	-27.17

Remarks:

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



4.3 Transmit Power Measurement

4.3.1 Limits of Transmit Power Measurement

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

*B is the 26 dB emission bandwidth in megahertz

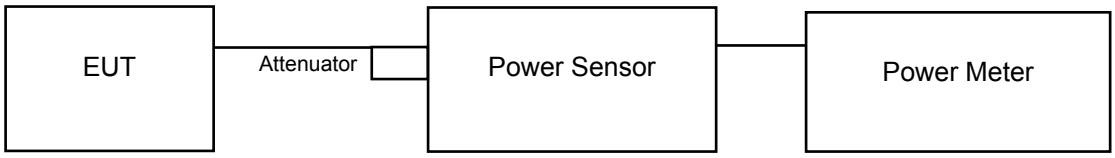
Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

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

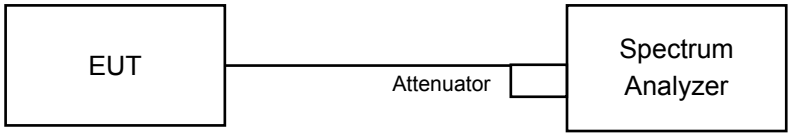
For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.3.2 Test Setup

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



802.11ac (VHT80)



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 Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	13.77	13.68	47.158	16.74	30.00	Pass
40	5200	13.88	13.72	47.984	16.81	30.00	Pass
48	5240	14.06	13.88	49.902	16.98	30.00	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	13.72	13.69	46.938	16.72	30.00	Pass
40	5200	13.75	13.75	47.428	16.76	30.00	Pass
48	5240	14.08	13.95	50.417	17.03	30.00	Pass

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	13.86	13.72	47.872	16.80	30.00	Pass
46	5230	14.05	14.21	51.773	17.14	30.00	Pass

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	14.09	14.25	**52.252**	17.18	30.00	Pass

Beamforming Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	10.71	10.68	23.496	13.71	27.39	Pass
40	5200	10.74	10.74	23.714	13.75	27.39	Pass
48	5240	11.07	10.94	25.235	14.02	27.39	Pass

Note: Directional gain = 5.60dBi + 10log(2) = 8.61dBi > 6dBi, so the power limit shall be reduced to 30-(8.61-6) = 27.39dBm

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	10.85	10.71	23.933	13.79	27.39	Pass
46	5230	11.04	11.20	25.882	14.13	27.39	Pass

Note: Directional gain = 5.60dBi + 10log(2) = 8.61dBi > 6dBi, so the power limit shall be reduced to 30-(8.61-6) = 27.39dBm

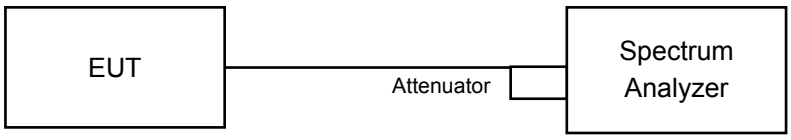
802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	11.08	11.24	**26.128**	14.17	27.39	Pass

Note: Directional gain = 5.60dBi + 10log(2) = 8.61dBi > 6dBi, so the power limit shall be reduced to 30-(8.61-6) = 27.39dBm

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	16.44	16.44
40	5200	16.44	16.44
48	5240	16.44	16.44

802.11n (HT20)

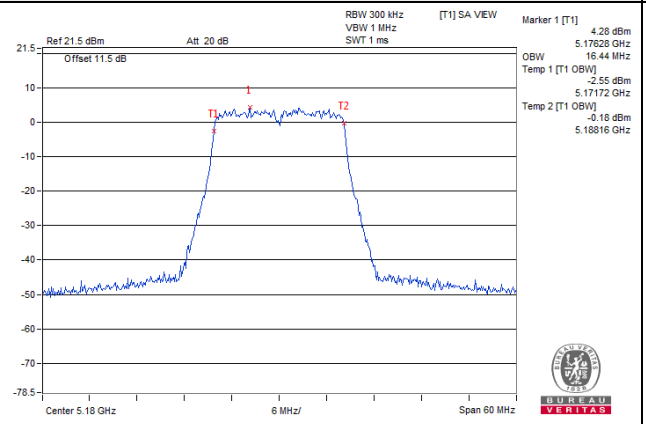
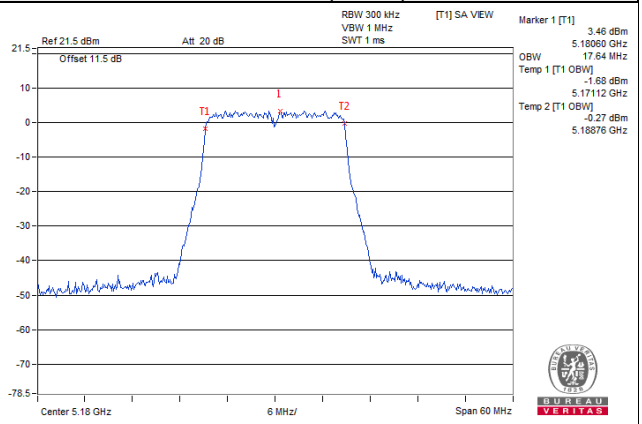
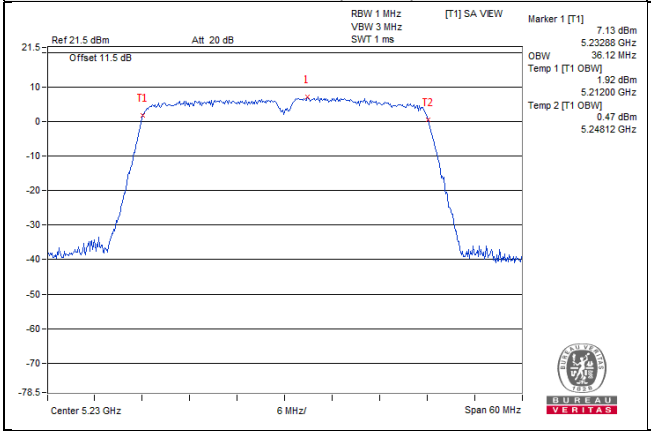
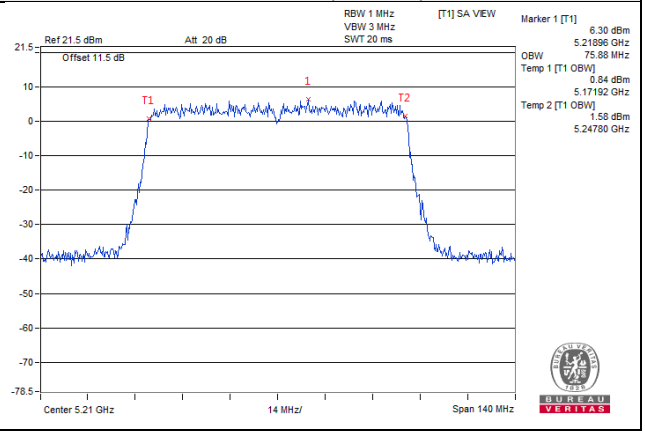
Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	17.64	17.64
40	5200	17.64	17.64
48	5240	17.64	17.64

802.11n (HT40)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	36.00	36.00
46	5230	36.00	36.12

802.11ac (VHT80)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
42	5210	75.88	75.88

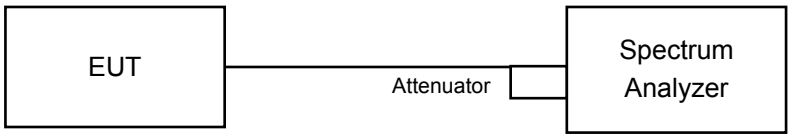
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

4.5 Peak Power Spectral Density Measurement

4.5.1 Limits of Peak Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

Duty cycle of test signal is > 98%

Using method SA-1

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

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

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

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

e. Record the max value

Duty cycle of test signal is < 98%

Using method SA-2

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

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

c. Set Channel power measure = 1MHz

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

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

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

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

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	0.00	-0.82	0.27	2.89	14.39	Pass
40	5200	0.16	-0.39	0.27	3.17	14.39	Pass
48	5240	0.12	0.08	0.27	3.38	14.39	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 = 5.60dBi + 10log(2) = 8.61dBi > 6dBi, so the power density limit shall be reduced to 17-(8.61-6) = 14.39dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

Chan.	Freq. (MHz)	PSD (dBm/MHz)		Total PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1			
36	5180	-0.37	-1.13	2.28	14.39	Pass
40	5200	-0.24	-0.55	2.62	14.39	Pass
48	5240	0.04	0.07	3.07	14.39	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 = 5.60dBi + 10log(2) = 8.61dBi > 6dBi, so the power density limit shall be reduced to 17-(8.61-6) = 14.39dBm

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	-2.80	-3.63	0.17	-0.01	14.39	Pass
46	5230	-2.80	-2.72	0.17	0.42	14.39	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 = 5.60dBi + 10log(2) = 8.61dBi > 6dBi, so the power density limit shall be reduced to 17-(8.61-6) = 14.39dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

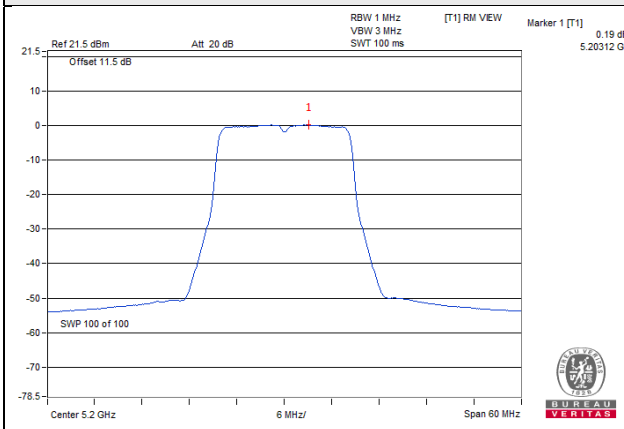
802.11ac (VHT80)

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	-2.25	-3.74	0.36	0.44	14.39	Pass

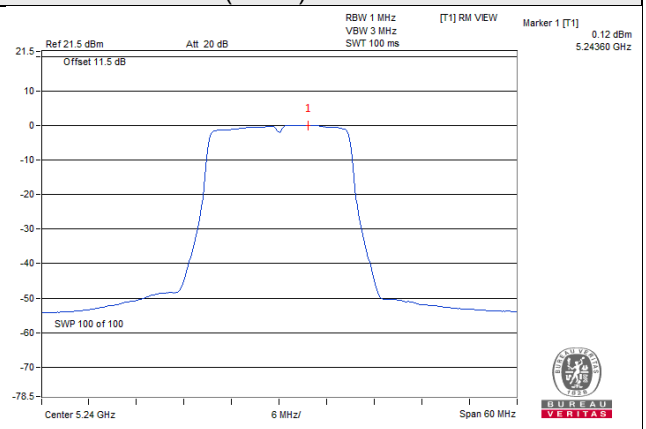
Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 5.60dBi + 10log(2) = 8.61dBi > 6dBi, so the power density limit shall be reduced to 17-(8.61-6) = 14.39dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

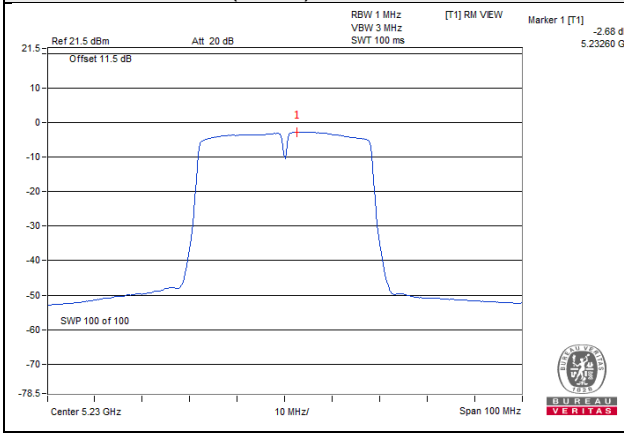
802.11a / Chain 0 / CH 40



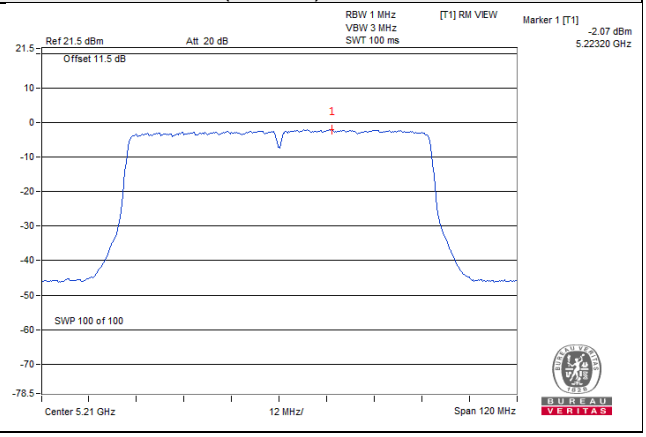
802.11n (HT20) / Chain 1 / CH 48



802.11n (HT40) / Chain 1 / CH 46



802.11ac (VHT80) / Chain 0 / CH 42

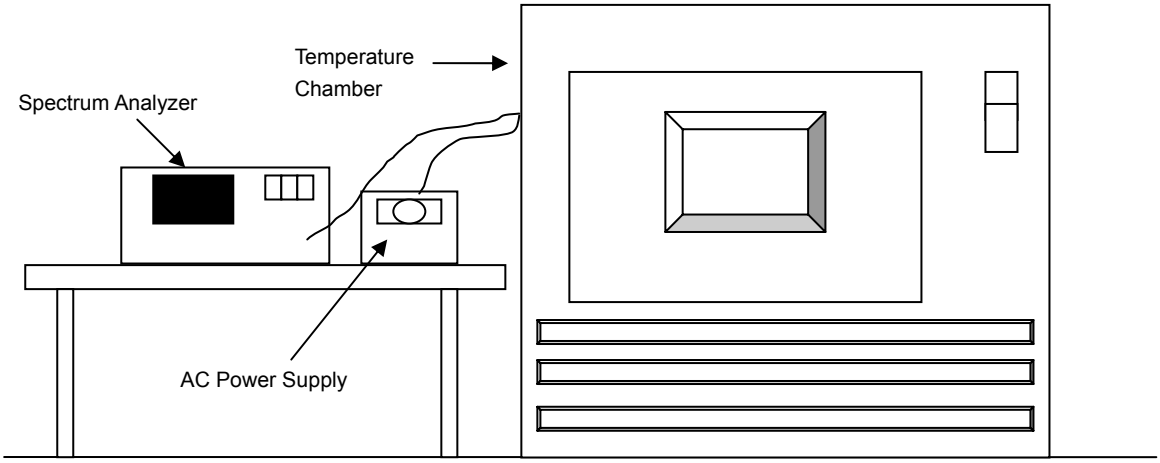


4.6 Frequency Stability

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	5179.9814	Pass	5179.9824	Pass	5179.9817	Pass	5179.9808	Pass
40	120	5180.0016	Pass	5179.9996	Pass	5179.9982	Pass	5180.0031	Pass
30	120	5180.0253	Pass	5180.0259	Pass	5180.0257	Pass	5180.0221	Pass
20	120	5179.9858	Pass	5179.986	Pass	5179.9869	Pass	5179.9876	Pass
10	120	5180.0199	Pass	5180.0193	Pass	5180.0157	Pass	5180.0204	Pass
0	120	5180.0136	Pass	5180.0124	Pass	5180.0109	Pass	5180.0097	Pass
-10	120	5179.9899	Pass	5179.9916	Pass	5179.9904	Pass	5179.9935	Pass
-20	120	5180.0183	Pass	5180.015	Pass	5180.0141	Pass	5180.015	Pass
-30	120	5180.0016	Pass	5180.0023	Pass	5179.9998	Pass	5180.0016	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	5179.9864	Pass	5179.9866	Pass	5179.9869	Pass	5179.9881	Pass
	120	5179.9858	Pass	5179.986	Pass	5179.9869	Pass	5179.9876	Pass
	102	5179.9856	Pass	5179.9861	Pass	5179.986	Pass	5179.9869	Pass

5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

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

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

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

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

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

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

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

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