FCC Test Report (WLAN)

Report No.:	RF180206E03-1
FCC ID:	S9GM510
Test Model:	M510
Received Date:	Feb. 06, 2018
Test Date:	Feb. 14 to Mar. 27, 2018
Issued Date:	May 16, 2018
Applicant:	Ruckus Wireless, Inc.
Address:	350 West Java Drive, Sunnyvale, CA 94089
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RF180206E03-1	Original release.	May 16, 2018

1 Certificate of Conformity

Product:	M510 Access Point
Brand:	Ruckus Wireless
Test Model:	M510
Sample Status:	ENGINEERING SAMPLE
Applicant:	Ruckus Wireless, Inc.
Test Date:	Feb. 14 to Mar. 27, 2018
Standard:	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 : Phoenix Huang , **Date:** May 16, 2018

Phoenix Huang / Specialist

Approved by : , **Date:** May 16, 2018

May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -3.32dB at 0.46363MHz.
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 -0.6dB 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(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(MHF) 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	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.33 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.10 dB
	6GHz ~ 18GHz	4.85 dB
	18GHz ~ 40GHz	5.24 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	M510 Access Point
Brand	Ruckus Wireless
Test Model	M510
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 48V from POE or DC 12V from adapter or DC 12V from Terminal
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT (20/40) mode in 2.4GHz
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.7Mbps
Operating Frequency	**2.4GHz:** 2.412 ~ 2.462GHz **5GHz:** 5.18~ 5.24GHz, 5.745 ~ 5.825GHz
Number of Channel	**2.4GHz:** 802.11b, 802.11g, 802.11ac (VHT20), VHT20: 11 802.11ac (VHT40), VHT40: 7 **5GHz:** 802.11a, 802.11ac (VHT20), 802.11ac (VHT20): 9 802.11ac (VHT40), 802.11ac (VHT40): 4 802.11ac (VHT80): 2
Output Power	**2.4GHz:** 702.651mW **5GHz:** 5.18 ~ 5.24GHz: 652.747mW 5.745 ~ 5.825GHz: 830.988mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. There are WLAN, WWAN and GPS technology used for the EUT. The EUT has below radios as following table:

Radio 1	Radio 2
WLAN (2.4GHz + 5GHz)	WWAN (LTE + WCDMA) +GPS

2. Simultaneously transmission condition.

Condition	Technology			
1	WLAN 2.4GHz	WLAN 5GHz	WWAN WCDMA	GPS
2	WLAN 2.4GHz	WLAN 5GHz	WWAN LTE	GPS
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.				

3. The EUT must be supplied with a POE or power adapter as following table:

PoE (only for test)		
Brand	Model No.	Spec.
Ruckus Wireless, Inc	740-64214-001	Input: 100-240V, 0.75A, 50/60Hz Output: 48V, 0.5A
Adapter (only for test)		
Brand	Model No.	Spec.
Ruckus Wireless, Inc	NBS24J120200B3	Input: 100-240V, 0.6A, 50/60Hz Output: 12V, 2.0A

4. For radiated emissions test, the EUT was pre-tested under the following modes:

Test Mode	Description
Mode A	**Power from POE**
Mode B	Power from Adapter
Mode C	Power from Terminal
Note: From the above modes, the worst cases were found in **Mode A**. Therefore only the test data of the mode was recorded in this report.	

5. The antennas provided to the EUT, please refer to the following table:

WLAN								
Antenna NO.	Transmitter Circuit	Antenna Net Gain(dBi)	Frequency range (GHz)	Antenna Type	Connecter Type	Cable Length (mm)	Cable Loss (dB)	Excluding cable loss Antenna Gain(dBi)
1	5GHz_chain_0 2.4GHz_chain_1	1	2.4~2.4835	PIFA	i-pex (MHF)	120	0	1
		3	5.15~5.85				0	3
2	5GHz_chain_1 2.4GHz_chain_0	1.2	2.4~2.4835	PIFA	i-pex (MHF)	70	0	1.2
		3	5.15~5.85				0	3

GPS						
Antenna Net Gain(dBi)	Frequency range (MHz)	Antenna Type	Connecter Type	Cable Length (mm)	Cable Loss (dB)	Excluding cable loss Antenna Gain(dBi)
1.66	1575.42	Dipole	i-pex (MHF)	80	0.34	2

WWAN						
Antenna NO.	Antenna Type	Brand	Model	Band	Freq. Range	Gain (dBi)
1 (Main)	Dipole	Aristotle	RFA-LTE-C55-B70-C255	WCDMA II (B2)	1850~1910	1.66
				WCDMA IV (B4)	1710~1755	1.66
				WCDMA V (B5)	824~849	1.66
				LTE Band (2)	1850~1910	1.66
				LTE Band (4)	1710~1755	1.66
				LTE Band (12)	698~716	1.53
2 (Aux)	Dipole	Aristotle	RFA-LTE-C55-B70-C255	WCDMA II (B2)	1850~1910	1.5
				WCDMA IV (B4)	1710~1755	1.5
				WCDMA V (B5)	824~849	1.5
				LTE Band (2)	1850~1910	1.5
				LTE Band (4)	1710~1755	1.5
				LTE Band (12)	698~716	1.37

Note: There are two WLAN antennas will transmit simultaneously (one is Horizontal and the other one is Vertical-- MIMO system with two outputs driving a cross-polarized pair of linearly polarized antennas). As the antenna combination must be supplied with one Horizontal and one Vertical antenna.

6. The EUT incorporates a MIMO function.

2.4GHz Band			
Modulation Mode	Data Rate (MCS)	TX & RX Configuration	
802.11b	1 ~ 11Mbps	2TX	2RX
802.11g	6 ~ 54Mbps	2TX	2RX
802.11ac (VHT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
VHT20	MCS 0~8, Nss=1	2TX	2RX
	MCS 0~8, Nss=2	2TX	2RX
VHT40	MCS 0~9, Nss=1	2TX	2RX
	MCS 0~9, Nss=2	2TX	2RX
5GHz Band			
Modulation Mode	Data Rate (MCS)	TX & RX Configuration	
802.11a	6 ~ 54Mbps	2TX	2RX
802.11ac (VHT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT20)	MCS 0~8, Nss=1	2TX	2RX
	MCS 0~8, Nss=2	2TX	2RX
802.11ac (VHT40)	MCS 0~9, Nss=1	2TX	2RX
	MCS 0~9, Nss=2	2TX	2RX
802.11ac (VHT80)	MCS 0~9, Nss=1	2TX	2RX
	MCS 0~9, Nss=2	2TX	2RX
Note: 1. 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)			

7. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

FOR 5180 ~ 5240MHz

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

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

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

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210 MHz

FOR 5745 ~ 5825MHz:

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

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

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

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775 MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
1	√	√	√	√	Power from POE
2	-	-	√	-	Power from Adapter
3	-	-	√	-	Power from Terminal Blocking

Where **RE≥1G:** Radiated Emission above 1GHz **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 2 axis. The worst case was found when positioned on **Y-plane**.
2. "-" means no effect.

Radiated Emission Test (Above 1GHz):

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

Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11ac (VHT20)		36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)		42	42	OFDM	BPSK	29.3
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6
802.11ac (VHT20)		149 to 165	149, 157, 165	OFDM	BPSK	6.5
802.11ac (VHT40)		151 to 159	151, 159	OFDM	BPSK	13.5
802.11ac (VHT80)		155	155	OFDM	BPSK	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.

Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11ac (VHT40)	5745-5825	149 to 165	159	OFDM	BPSK	13.5

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.

Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11ac (VHT40)	5745-5825	149 to 165	159	OFDM	BPSK	13.5

Antenna Port Conducted Measurement:

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

Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11ac (VHT20)		36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)		42	42	OFDM	BPSK	29.3
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6
802.11ac (VHT20)		149 to 165	149, 157, 165	OFDM	BPSK	6.5
802.11ac (VHT40)		151 to 159	151, 159	OFDM	BPSK	13.5
802.11ac (VHT80)		155	155	OFDM	BPSK	29.3

Test Condition:

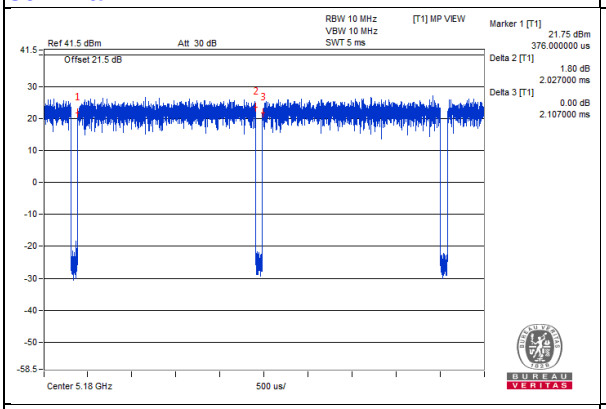
Applicable To	Environmental Conditions	Input Power (System)	Tested By
RE≥1G	23deg. C, 57%RH	120Vac, 60Hz	Eason Tseng
	22deg. C, 64%RH	120Vac, 60Hz	Robert Cheng
RE<1G	23deg. C, 61%RH	120Vac, 60Hz	Eason Tseng
PLC	24deg. C, 67%RH	120Vac, 60Hz	Andy Ho
	25deg. C, 75%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin

3.3 Duty Cycle of Test Signal

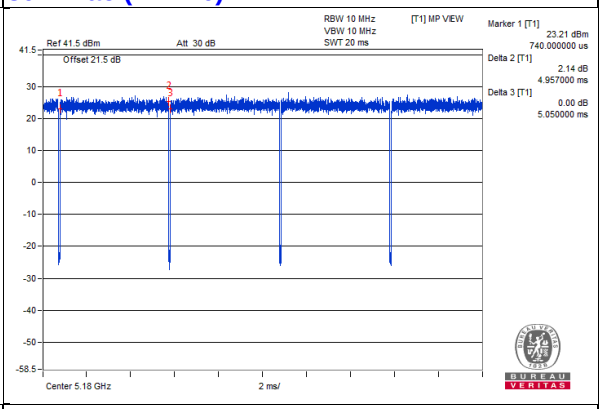
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11a: Duty cycle = 2.027 ms/2.107 ms = 0.962, Duty factor = 10 * log(1/0.962) = 0.17
802.11ac (VHT20): Duty cycle = 4.957 ms/5.05 ms = 0.982
802.11ac (VHT40): Duty cycle = 2.411 ms/2.5 ms = 0.964, Duty factor = 10 * log(1/0.964) = 0.16
802.11ac (VHT80): Duty cycle = 1.133 ms/1.214 ms = 0.933, Duty factor = 10 * log(1/0.933) = 0.30

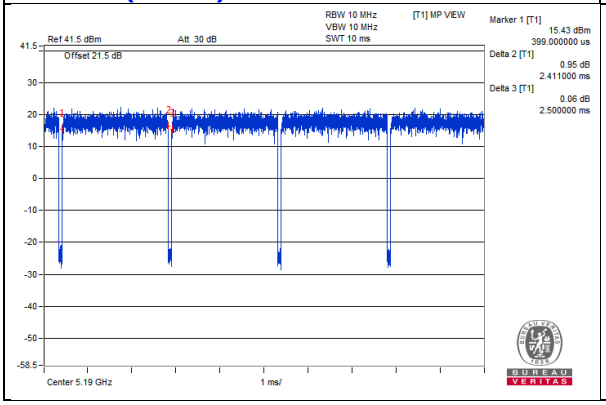
802.11a



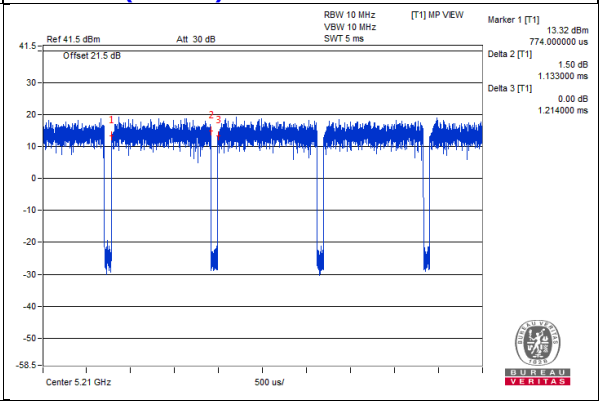
802.11ac (VHT20)



802.11ac (VHT40)



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.

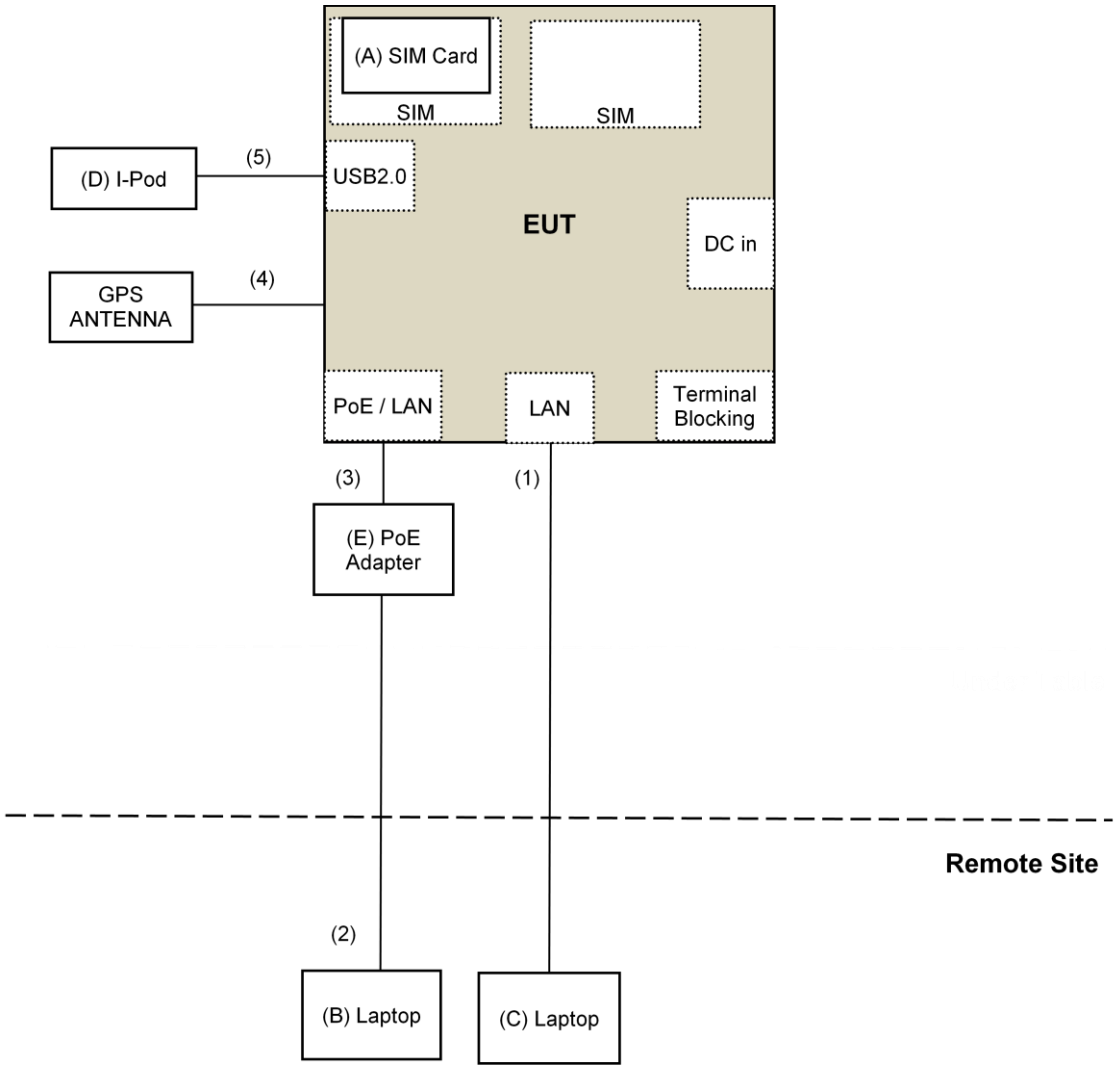
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	SIM Card	R&S	CMW-Z04	NA	NA	Provided by Lab
B.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab
C.	Laptop	DELL	E6420	482T3R1	FCC DoC	Provided by Lab
D.	iPod	Apple	MD778TA/A	CC4JL03FF4T1	NA	Provided by Lab
E.	PoE Adapter	Ruckus Wireless	740-64214-001	NA	NA	Supplied by client
F.	DC Power supply	GOOD WILL INSTRUMENT CO., LTD	GPC-3030D	E847076	NA	Provided by Lab
G.	Adapter	Ruckus Wireless	NBS24J120200B3	NA	NA	Supplied by client

Note:
1. All power cords of the above support units are non-shielded (1.8m).

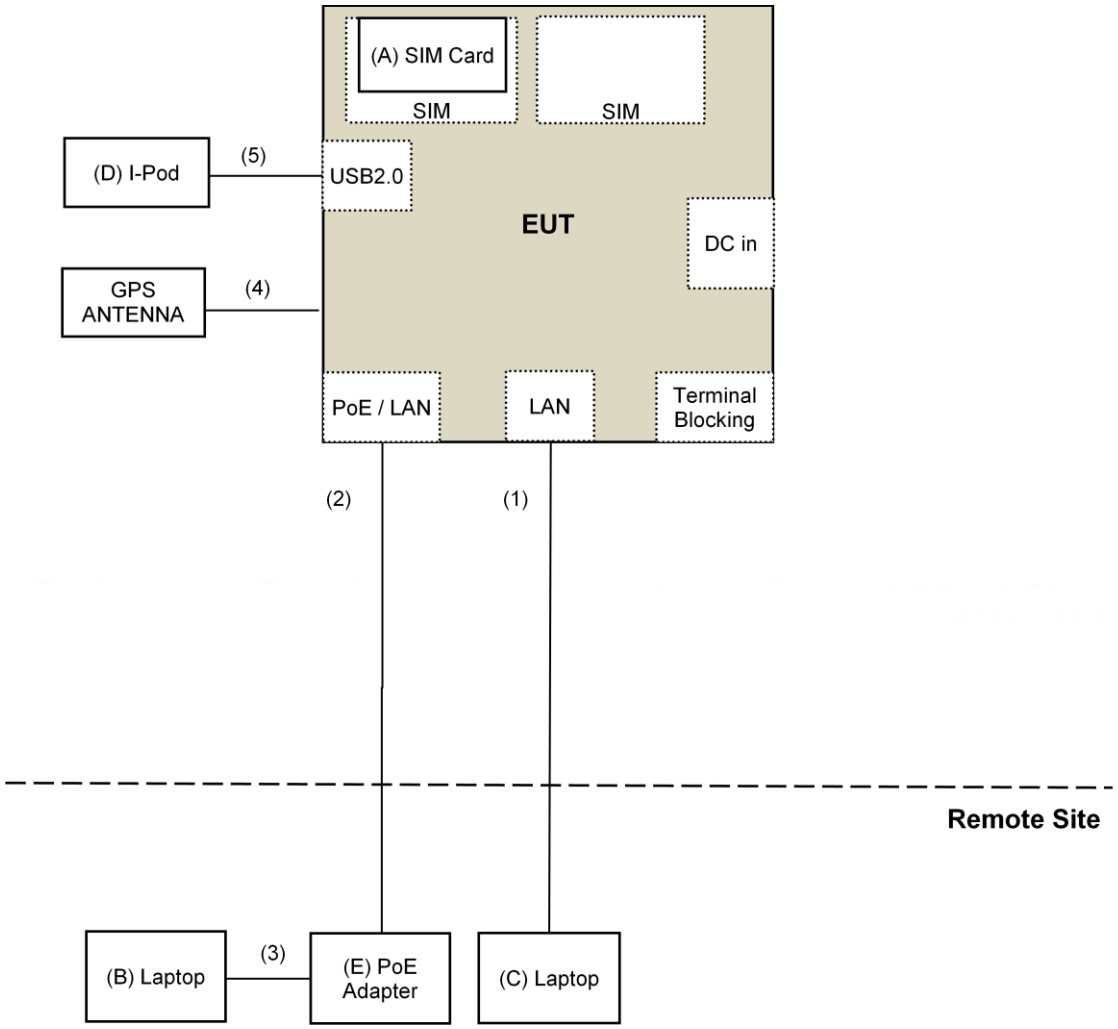
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ-45 Cable	1	10	No	0	Provided by Lab
2.	RJ-45 Cable	1	10	No	0	Provided by Lab
3.	RJ-45 Cable	1	3	No	0	Provided by Lab
4.	GPS Cable	1	5	No	0	Supplied by client
5.	USB Cable	1	0.1	Yes	0	Provided by Lab
6.	AC Cable	1	1.8	No	0	Supplied by client
7.	DC Cable	1	1.8	No	0	Supplied by client
8.	DC Cable	1	1.2	No	0	Provided by Lab

3.4.1 Configuration of System under Test

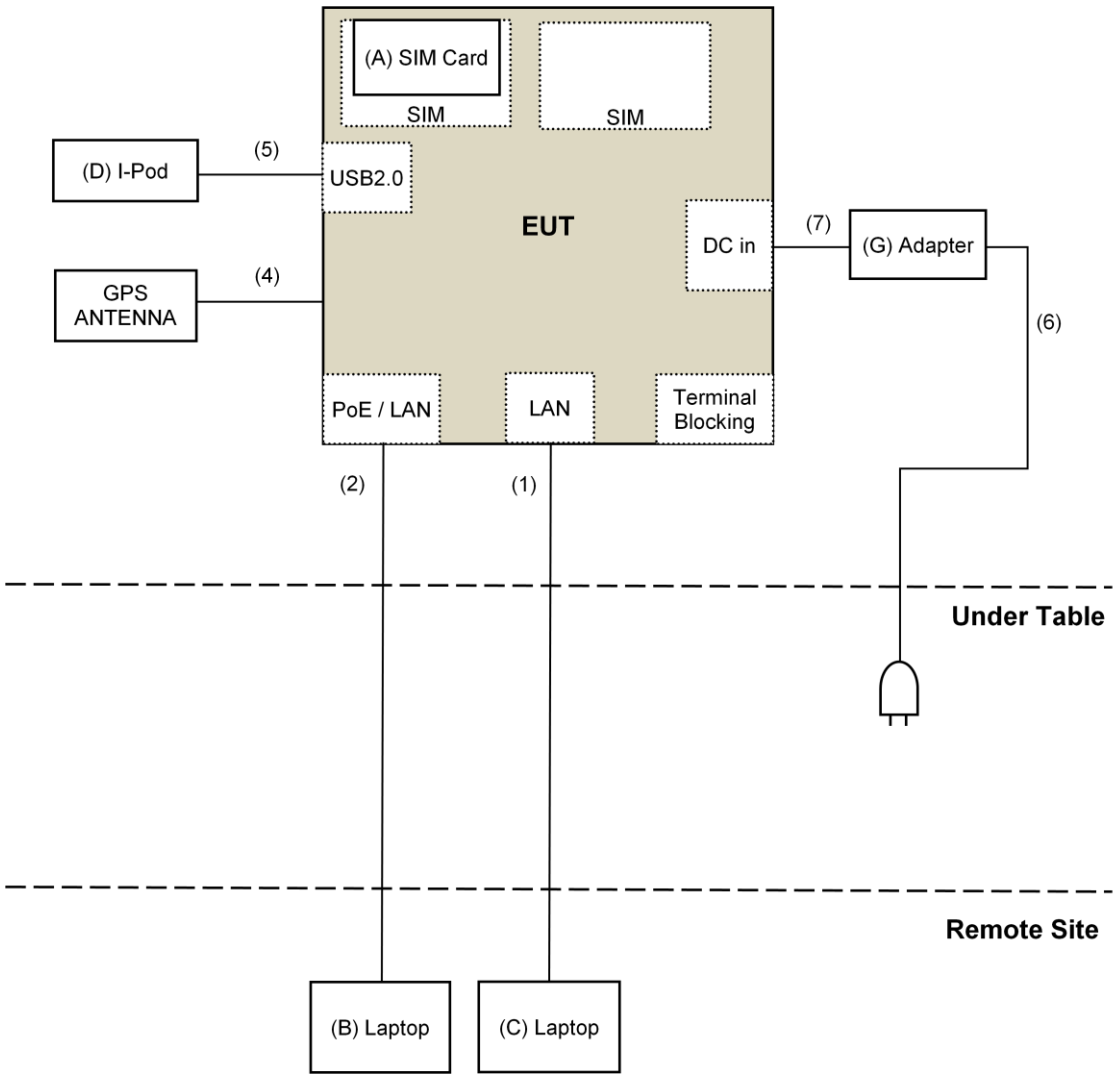
For Mode 1:
Conducted emission test item



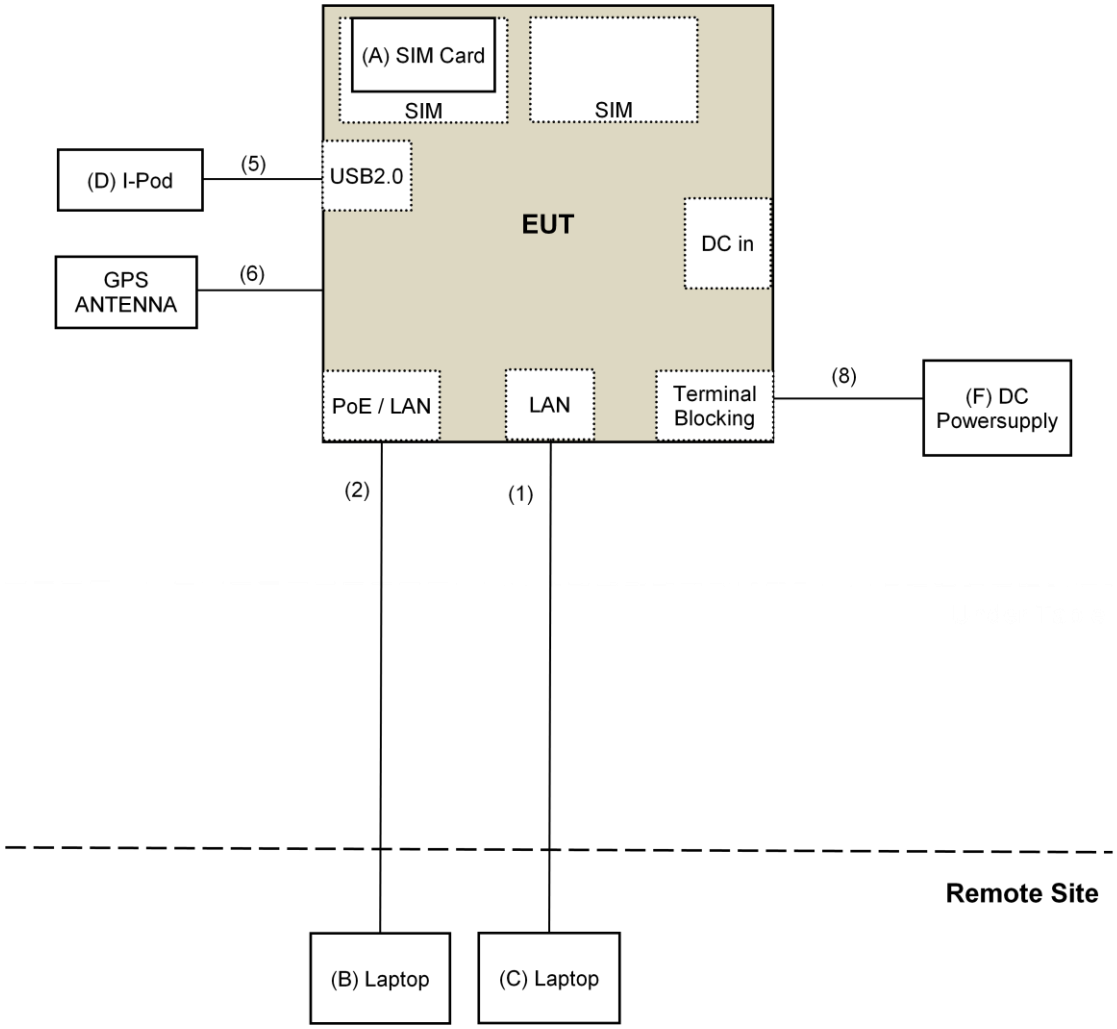
Other test items



For Mode 2


(A) SIM Card
SIM
SIM
(D) I-Pod
(5)
USB2.0
EUT
DC in
(7)
(G) Adapter
GPS ANTENNA
(4)
(6)
PoE / LAN
LAN
Terminal Blocking
(2)
(1)
Under Table
Remote Site
(B) Laptop
(C) Laptop

For Mode 3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SIM
SIM
(D) I-Pod
(5)
USB2.0
EUT
DC in
GPS ANTENNA
(6)
PoE / LAN
LAN
Terminal Blocking
(8)
(F) DC Powersupply
(2)
(1)
Remote Site
(B) Laptop
(C) Laptop

3.5 General Description of Applied Standard

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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 08, 2017	July 07, 2018
Pre-Amplifier(*) EMCI	EMC001340	980142	Feb. 09, 2018	Feb. 08, 2019
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	5D-FB	LOOPCAB-001 LOOPCAB-002	Jan. 15, 2018	Jan. 14, 2019
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 09, 2017	Nov. 08, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 29, 2017	Nov. 28, 2018
RF Cable	8D	966-4-1 966-4-2 966-4-3	Apr. 01, 2017	Mar. 31, 2018
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Oct. 03, 2017	Oct. 02, 2018
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 12, 2017	Dec. 11, 2018
Pre-Amplifier EMCI	EMC12630SE	980385	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160923 150318 150321	Jan. 29, 2018	Jan. 28, 2019
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 29, 2018	Jan. 28, 2019
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 14, 2017	Dec. 13, 2018
RF Cable	EMC102-KM-KM-1200	160925	Jan. 29, 2018	Jan. 28, 2019
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208410	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP02	NA	NA
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	Jan. 10, 2018	Jan. 09, 2019
DC Power Supply Topward	6603D	795558	NA	NA
True RMS Clamp Meter FLUKE	325	31130711WS	May 29, 2017	May 28, 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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 4.
4. The CANADA Site Registration No. is 20331-2
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: Feb. 14 to Mar. 12, 2018

4.1.3 Test Procedure

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 detects 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:

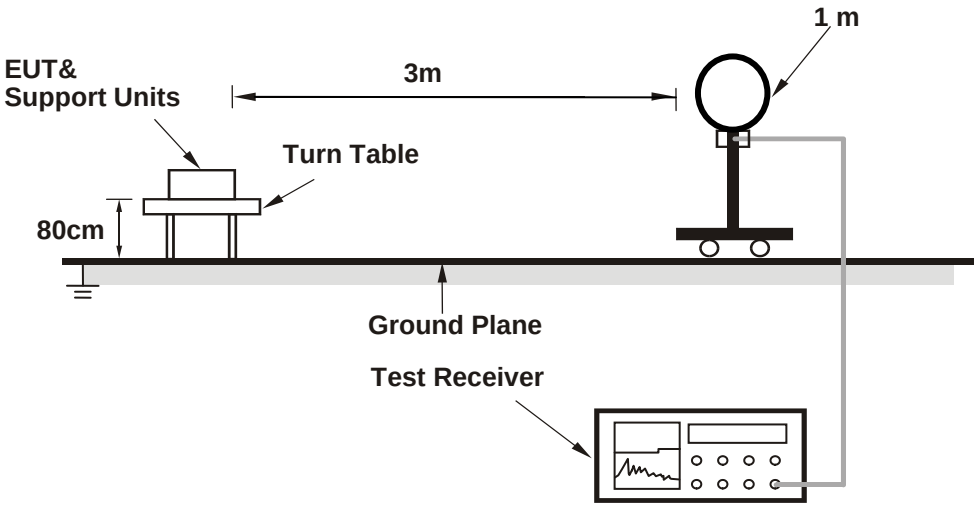
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

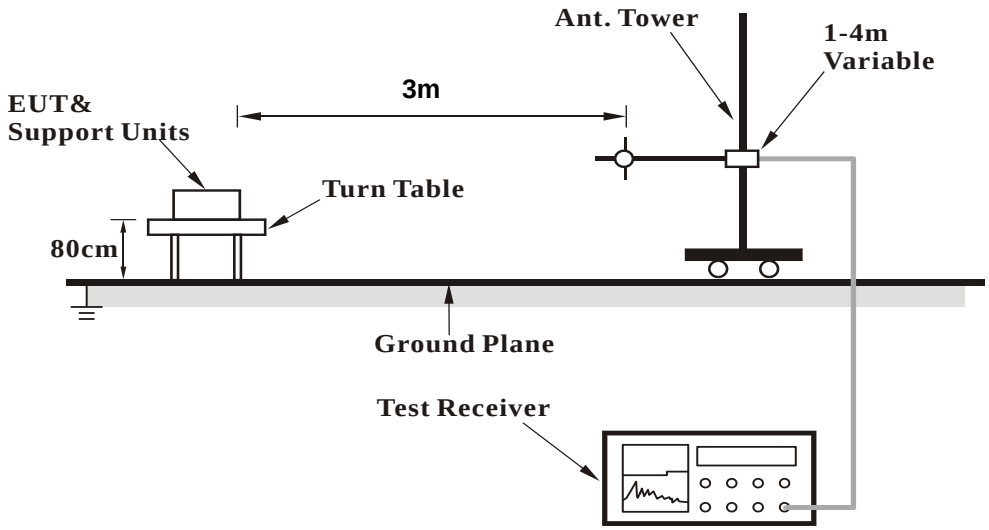
No deviation.

4.1.5 Test Setup

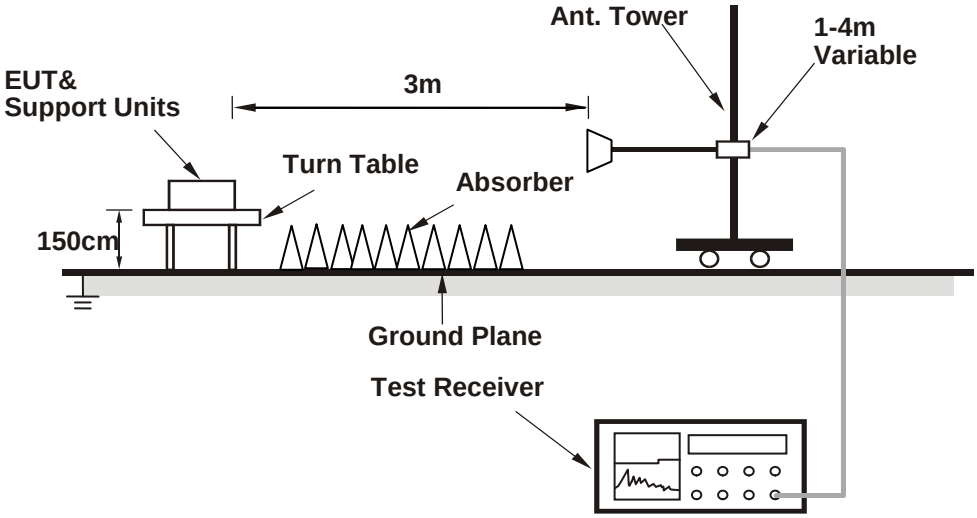
For Radiated emission below 30MHz



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 Condition

a. Connected the EUT with the Notebook Computer which is placed on remote site.
b. Controlling software (QRCT.exe VER 3.0.297.0) has been activated to set the EUT on specific status.

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	62.9 PK	74.0	-11.1	1.14 H	135	58.8	4.1
2	5150.00	48.3 AV	54.0	-5.7	1.14 H	135	44.2	4.1
3	*5180.00	108.9 PK			1.14 H	135	105.1	3.8
4	*5180.00	99.5 AV			1.14 H	135	95.7	3.8
5	#10360.00	61.3 PK	74.0	-12.7	2.25 H	183	48.2	13.1
6	#10360.00	49.9 AV	54.0	-4.1	2.25 H	183	36.8	13.1
7	15540.00	42.8 PK	74.0	-31.2	1.14 H	208	29.7	13.1
8	15540.00	33.8 AV	54.0	-20.2	1.14 H	208	20.7	13.1
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	65.3 PK	74.0	-8.7	2.32 V	121	61.2	4.1
2	**5150.00**	**53.4 AV**	**54.0**	**-0.6**	**2.32 V**	**121**	**49.3**	**4.1**
3	*5180.00	113.9 PK			2.32 V	121	110.1	3.8
4	*5180.00	102.8 AV			2.32 V	121	99.0	3.8
5	#10360.00	60.2 PK	74.0	-13.8	2.89 V	168	47.1	13.1
6	#10360.00	48.7 AV	54.0	-5.3	2.89 V	168	35.6	13.1
7	15540.00	41.5 PK	74.0	-32.5	1.70 V	176	28.4	13.1
8	15540.00	32.4 AV	54.0	-21.6	1.70 V	176	19.3	13.1

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	#3466.00	44.8 PK	74.0	-29.2	1.27 H	199	45.4	-0.6
2	#3466.00	33.9 AV	54.0	-20.1	1.27 H	199	34.5	-0.6
3	5150.00	61.7 PK	74.0	-12.3	1.14 H	148	57.6	4.1
4	5150.00	46.8 AV	54.0	-7.2	1.14 H	148	42.7	4.1
5	*5200.00	114.8 PK			1.14 H	148	111.1	3.7
6	*5200.00	103.7 AV			1.14 H	148	100.0	3.7
7	5350.00	46.9 PK	74.0	-27.1	1.14 H	148	43.3	3.6
8	5350.00	34.8 AV	54.0	-19.2	1.14 H	148	31.2	3.6
9	#6933.00	52.7 PK	74.0	-21.3	1.68 H	248	44.8	7.9
10	#6933.00	41.6 AV	54.0	-12.4	1.68 H	248	33.7	7.9
11	#10400.00	64.4 PK	74.0	-9.6	2.19 H	181	51.3	13.1
12	#10400.00	52.8 AV	54.0	-1.2	2.19 H	181	39.7	13.1
13	15600.00	46.9 PK	74.0	-27.1	1.21 H	244	33.9	13.0
14	15600.00	37.2 AV	54.0	-16.8	1.21 H	244	24.2	13.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#3466.00	45.5 PK	74.0	-28.5	2.18 V	193	46.1	-0.6
2	#3466.00	34.5 AV	54.0	-19.5	2.18 V	193	35.1	-0.6
3	5150.00	66.4 PK	74.0	-7.6	2.29 V	122	62.3	4.1
4	5150.00	51.8 AV	54.0	-2.2	2.29 V	122	47.7	4.1
5	*5200.00	117.1 PK			2.29 V	122	113.4	3.7
6	*5200.00	106.9 AV			2.29 V	122	103.2	3.7
7	5350.00	51.9 PK	74.0	-22.1	2.29 V	122	48.3	3.6
8	5350.00	39.1 AV	54.0	-14.9	2.29 V	122	35.5	3.6
9	#6933.00	53.5 PK	74.0	-20.5	2.53 V	146	45.6	7.9
10	#6933.00	42.9 AV	54.0	-11.1	2.53 V	146	35.0	7.9
11	#10400.00	62.3 PK	74.0	-11.7	2.58 V	175	49.2	13.1
12	#10400.00	51.2 AV	54.0	-2.8	2.58 V	175	38.1	13.1
13	15600.00	44.9 PK	74.0	-29.1	1.74 V	179	31.9	13.0
14	15600.00	35.8 AV	54.0	-18.2	1.74 V	179	22.8	13.0

REMARKS:

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

CHANNEL	TX Channel 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	110.8 PK			1.09 H	122	107.3	3.5
2	*5240.00	101.7 AV			1.09 H	122	98.2	3.5
3	5350.00	45.8 PK	74.0	-28.2	1.09 H	122	42.2	3.6
4	5350.00	34.4 AV	54.0	-19.6	1.09 H	122	30.8	3.6
5	#10480.00	63.2 PK	74.0	-10.8	1.92 H	182	49.7	13.5
6	#10480.00	51.7 AV	54.0	-2.3	1.92 H	182	38.2	13.5
7	15720.00	44.7 PK	74.0	-29.3	1.10 H	195	31.9	12.8
8	15720.00	35.9 AV	54.0	-18.1	1.10 H	195	23.1	12.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	113.7 PK			2.37 V	127	110.2	3.5
2	*5240.00	103.9 AV			2.37 V	127	100.4	3.5
3	5350.00	50.6 PK	74.0	-23.4	2.37 V	127	47.0	3.6
4	5350.00	39.6 AV	54.0	-14.4	2.37 V	127	36.0	3.6
5	#10480.00	60.2 PK	74.0	-13.8	2.85 V	177	46.7	13.5
6	#10480.00	49.2 AV	54.0	-4.8	2.85 V	177	35.7	13.5
7	15720.00	43.3 PK	74.0	-30.7	1.74 V	179	30.5	12.8
8	15720.00	34.6 AV	54.0	-19.4	1.74 V	179	21.8	12.8

REMARKS:

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

CHANNEL	TX Channel 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	#5635.16	50.6 PK	68.2	-17.6	1.84 H	121	46.3	4.3
2	*5745.00	113.7 PK			1.84 H	121	109.4	4.3
3	*5745.00	103.1 AV			1.84 H	121	98.8	4.3
4	#5929.81	49.8 PK	68.2	-18.4	1.84 H	121	45.2	4.6
5	11490.00	64.3 PK	74.0	-9.7	3.15 H	185	50.3	14.0
6	11490.00	52.9 AV	54.0	-1.1	3.15 H	185	38.9	14.0
7	#17235.00	51.6 PK	74.0	-22.4	1.67 H	155	34.7	16.9
8	#17235.00	42.2 AV	54.0	-11.8	1.67 H	155	25.3	16.9
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	#5575.46	52.8 PK	68.2	-15.4	3.07 V	128	48.5	4.3
2	*5745.00	116.7 PK			3.07 V	128	112.4	4.3
3	*5745.00	106.5 AV			3.07 V	128	102.2	4.3
4	#5941.44	52.6 PK	68.2	-15.6	3.07 V	128	48.0	4.6
5	11490.00	64.8 PK	74.0	-9.2	1.04 V	167	50.8	14.0
6	11490.00	52.7 AV	54.0	-1.3	1.04 V	167	38.7	14.0
7	#17235.00	50.4 PK	74.0	-23.6	2.37 V	134	33.5	16.9
8	#17235.00	41.4 AV	54.0	-12.6	2.37 V	134	24.5	16.9

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 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	#5550.00	49.8 PK	74.0	-24.2	1.89 H	126	45.7	4.1
2	#5550.00	36.5 AV	54.0	-17.5	1.89 H	126	32.4	4.1
3	#5649.64	50.8 PK	68.2	-17.4	1.89 H	126	46.5	4.3
4	*5785.00	113.4 PK			1.89 H	126	109.1	4.3
5	*5785.00	102.9 AV			1.89 H	126	98.6	4.3
6	#5956.14	49.4 PK	68.2	-18.8	1.89 H	126	44.8	4.6
7	#6025.00	48.7 PK	74.0	-25.3	1.89 H	126	43.9	4.8
8	#6025.00	36.1 AV	54.0	-17.9	1.89 H	126	31.3	4.8
9	11570.00	65.8 PK	74.0	-8.2	2.98 H	182	51.8	14.0
10	11570.00	52.9 AV	54.0	-1.1	2.98 H	182	38.9	14.0
11	#17355.00	51.4 PK	74.0	-22.6	1.61 H	163	34.1	17.3
12	#17355.00	42.1 AV	54.0	-11.9	1.61 H	163	24.8	17.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5550.00	50.1 PK	74.0	-23.9	2.05 V	118	46.0	4.1
2	#5550.00	37.5 AV	54.0	-16.5	2.05 V	118	33.4	4.1
3	#5614.56	52.3 PK	68.2	-15.9	2.05 V	118	48.0	4.3
4	*5785.00	117.2 PK			2.05 V	118	112.9	4.3
5	*5785.00	106.4 AV			2.05 V	118	102.1	4.3
6	#6024.19	52.3 PK	68.2	-15.9	2.05 V	118	47.5	4.8
7	#6025.00	49.1 PK	74.0	-24.9	2.05 V	118	44.3	4.8
8	#6025.00	37.2 AV	54.0	-16.8	2.05 V	118	32.4	4.8
9	11570.00	64.3 PK	74.0	-9.7	1.10 V	174	50.3	14.0
10	11570.00	52.4 AV	54.0	-1.6	1.10 V	174	38.4	14.0
11	#17355.00	51.5 PK	74.0	-22.5	2.37 V	129	34.2	17.3
12	#17355.00	42.0 AV	54.0	-12.0	2.37 V	129	24.7	17.3

REMARKS:

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

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5586.54	50.5 PK	68.2	-17.7	1.90 H	127	46.2	4.3
2	*5825.00	112.7 PK			1.90 H	127	108.3	4.4
3	*5825.00	102.2 AV			1.90 H	127	97.8	4.4
4	#5996.39	49.6 PK	68.2	-18.6	1.90 H	127	44.9	4.7
5	11650.00	65.6 PK	74.0	-8.4	2.95 H	210	51.7	13.9
6	11650.00	52.5 AV	54.0	-1.5	2.95 H	210	38.6	13.9
7	#17475.00	51.6 PK	74.0	-22.4	1.63 H	148	33.4	18.2
8	#17475.00	42.2 AV	54.0	-11.8	1.63 H	148	24.0	18.2
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	#5622.77	52.5 PK	68.2	-15.7	2.06 V	116	48.1	4.4
2	*5825.00	116.6 PK			2.06 V	116	112.2	4.4
3	*5825.00	106.3 AV			2.06 V	116	101.9	4.4
4	#5959.47	52.5 PK	68.2	-15.7	2.06 V	116	47.9	4.6
5	11650.00	64.2 PK	74.0	-9.8	1.05 V	160	50.3	13.9
6	11650.00	52.2 AV	54.0	-1.8	1.05 V	160	38.3	13.9
7	#17475.00	50.9 PK	74.0	-23.1	2.42 V	137	32.7	18.2
8	#17475.00	41.7 AV	54.0	-12.3	2.42 V	137	23.5	18.2

REMARKS:

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

802.11ac (VHT20)

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	62.6 PK	74.0	-11.4	1.07 H	155	58.5	4.1
2	5150.00	47.8 AV	54.0	-6.2	1.07 H	155	43.7	4.1
3	*5180.00	109.5 PK			1.07 H	155	105.7	3.8
4	*5180.00	99.4 AV			1.07 H	155	95.6	3.8
5	#10360.00	65.3 PK	74.0	-8.7	1.95 H	179	52.2	13.1
6	#10360.00	52.7 AV	54.0	-1.3	1.95 H	179	39.6	13.1
7	15540.00	47.5 PK	74.0	-26.5	2.01 H	199	34.4	13.1
8	15540.00	37.4 AV	54.0	-16.6	2.01 H	199	24.3	13.1
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	68.1 PK	74.0	-5.9	2.36 V	120	64.0	4.1
2	5150.00	53.2 AV	54.0	-0.8	2.36 V	120	49.1	4.1
3	*5180.00	114.2 PK			2.36 V	120	110.4	3.8
4	*5180.00	103.5 AV			2.36 V	120	99.7	3.8
5	#10360.00	60.8 PK	74.0	-13.2	2.88 V	160	47.7	13.1
6	#10360.00	49.1 AV	54.0	-4.9	2.88 V	160	36.0	13.1
7	15540.00	41.3 PK	74.0	-32.7	1.71 V	192	28.2	13.1
8	15540.00	32.0 AV	54.0	-22.0	1.71 V	192	18.9	13.1

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	61.7 PK	74.0	-12.3	1.11 H	154	57.6	4.1
2	5150.00	46.8 AV	54.0	-7.2	1.11 H	154	42.7	4.1
3	*5200.00	114.5 PK			1.11 H	154	110.8	3.7
4	*5200.00	104.1 AV			1.11 H	154	100.4	3.7
5	5350.00	47.5 PK	74.0	-26.5	1.13 H	160	43.9	3.6
6	5350.00	35.2 AV	54.0	-18.8	1.13 H	160	31.6	3.6
7	#10400.00	65.4 PK	74.0	-8.6	2.22 H	191	52.3	13.1
8	#10400.00	52.9 AV	54.0	-1.1	2.22 H	191	39.8	13.1
9	15600.00	47.3 PK	74.0	-26.7	1.26 H	244	34.3	13.0
10	15600.00	37.7 AV	54.0	-16.3	1.26 H	244	24.7	13.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	65.8 PK	74.0	-8.2	2.18 V	121	61.7	4.1
2	5150.00	52.5 AV	54.0	-1.5	2.18 V	121	48.4	4.1
3	*5200.00	117.5 PK			2.18 V	121	113.8	3.7
4	*5200.00	107.4 AV			2.18 V	121	103.7	3.7
5	5350.00	52.1 PK	74.0	-21.9	2.18 V	121	48.5	3.6
6	5350.00	38.8 AV	54.0	-15.2	2.18 V	121	35.2	3.6
7	#10400.00	63.4 PK	74.0	-10.6	2.55 V	162	50.3	13.1
8	#10400.00	51.8 AV	54.0	-2.2	2.55 V	162	38.7	13.1
9	15600.00	45.4 PK	74.0	-28.6	1.77 V	194	32.4	13.0
10	15600.00	36.9 AV	54.0	-17.1	1.77 V	194	23.9	13.0

REMARKS:

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

CHANNEL	TX Channel 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	111.3 PK			1.14 H	142	107.8	3.5
2	*5240.00	101.2 AV			1.14 H	142	97.7	3.5
3	5350.00	45.2 PK	74.0	-28.8	1.14 H	142	41.6	3.6
4	5350.00	34.0 AV	54.0	-20.0	1.14 H	142	30.4	3.6
5	#10480.00	64.3 PK	74.0	-9.7	1.98 H	191	50.8	13.5
6	#10480.00	51.4 AV	54.0	-2.6	1.98 H	191	37.9	13.5
7	15720.00	44.3 PK	74.0	-29.7	1.10 H	210	31.5	12.8
8	15720.00	35.5 AV	54.0	-18.5	1.10 H	210	22.7	12.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	115.4 PK			2.73 V	123	111.9	3.5
2	*5240.00	105.3 AV			2.73 V	123	101.8	3.5
3	5350.00	45.3 PK	74.0	-28.7	2.73 V	123	41.7	3.6
4	5350.00	35.4 AV	54.0	-18.6	2.73 V	123	31.8	3.6
5	#10480.00	59.9 PK	74.0	-14.1	2.89 V	168	46.4	13.5
6	#10480.00	49.1 AV	54.0	-4.9	2.89 V	168	35.6	13.5
7	15720.00	42.6 PK	74.0	-31.4	1.68 V	185	29.8	12.8
8	15720.00	34.1 AV	54.0	-19.9	1.68 V	185	21.3	12.8

REMARKS:

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

CHANNEL	TX Channel 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	#5615.68	50.4 PK	68.2	-17.8	1.82 H	135	46.1	4.3
2	*5745.00	113.8 PK			1.82 H	135	109.5	4.3
3	*5745.00	104.1 AV			1.82 H	135	99.8	4.3
4	#6021.48	50.7 PK	68.2	-17.5	1.82 H	135	45.9	4.8
5	11490.00	65.2 PK	74.0	-8.8	3.18 H	181	51.2	14.0
6	11490.00	52.9 AV	54.0	-1.1	3.18 H	181	38.9	14.0
7	#17235.00	50.7 PK	74.0	-23.3	1.68 H	157	33.8	16.9
8	#17235.00	42.6 AV	54.0	-11.4	1.68 H	157	25.7	16.9
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	#5629.21	53.3 PK	68.2	-14.9	2.13 V	117	48.9	4.4
2	*5745.00	114.4 PK			2.13 V	117	110.1	4.3
3	*5745.00	106.3 AV			2.13 V	117	102.0	4.3
4	#5936.67	52.8 PK	68.2	-15.4	2.13 V	117	48.2	4.6
5	11490.00	63.7 PK	74.0	-10.3	1.09 V	152	49.7	14.0
6	11490.00	50.8 AV	54.0	-3.2	1.09 V	152	36.8	14.0
7	#17235.00	50.3 PK	74.0	-23.7	2.36 V	144	33.4	16.9
8	#17235.00	41.1 AV	54.0	-12.9	2.36 V	144	24.2	16.9

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 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	#5615.98	49.4 PK	68.2	-18.8	1.85 H	124	45.1	4.3
2	*5785.00	114.0 PK			1.85 H	124	109.7	4.3
3	*5785.00	104.2 AV			1.85 H	124	99.9	4.3
4	#5953.81	50.5 PK	68.2	-17.7	1.85 H	124	45.9	4.6
5	11570.00	65.4 PK	74.0	-8.6	2.79 H	185	51.4	14.0
6	11570.00	52.8 AV	54.0	-1.2	2.79 H	185	38.8	14.0
7	#17355.00	50.4 PK	74.0	-23.6	1.68 H	173	33.1	17.3
8	#17355.00	42.3 AV	54.0	-11.7	1.68 H	173	25.0	17.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5646.89	52.6 PK	68.2	-15.6	3.10 V	113	48.3	4.3
2	*5785.00	114.3 PK			3.10 V	113	110.0	4.3
3	*5785.00	106.1 AV			3.10 V	113	101.8	4.3
4	#5933.28	50.1 PK	68.2	-18.1	3.10 V	113	45.5	4.6
5	11570.00	63.6 PK	74.0	-10.4	1.12 V	142	49.6	14.0
6	11570.00	50.8 AV	54.0	-3.2	1.12 V	142	36.8	14.0
7	#17355.00	50.3 PK	74.0	-23.7	2.30 V	146	33.0	17.3
8	#17355.00	40.9 AV	54.0	-13.1	2.30 V	146	23.6	17.3

REMARKS:

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

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5570.88	50.1 PK	68.2	-18.1	1.88 H	114	45.8	4.3
2	*5825.00	114.1 PK			1.88 H	114	109.7	4.4
3	*5825.00	104.3 AV			1.88 H	114	99.9	4.4
4	#5925.40	58.6 PK	68.2	-9.6	1.88 H	114	54.0	4.6
5	11650.00	64.2 PK	74.0	-9.8	2.81 H	186	50.3	13.9
6	11650.00	52.5 AV	54.0	-1.5	2.81 H	186	38.6	13.9
7	#17475.00	51.9 PK	74.0	-22.1	1.66 H	155	33.7	18.2
8	#17475.00	43.8 AV	54.0	-10.2	1.66 H	155	25.6	18.2
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	#5641.38	50.5 PK	68.2	-17.7	3.02 V	112	46.2	4.3
2	*5825.00	115.4 PK			3.02 V	112	111.0	4.4
3	*5825.00	107.1 AV			3.02 V	112	102.7	4.4
4	#5924.36	50.4 PK	68.7	-18.3	3.02 V	112	45.8	4.6
5	11650.00	64.8 PK	74.0	-9.2	1.09 V	145	50.9	13.9
6	11650.00	51.1 AV	54.0	-2.9	1.09 V	145	37.2	13.9
7	#17475.00	51.2 PK	74.0	-22.8	2.38 V	132	33.0	18.2
8	#17475.00	41.9 AV	54.0	-12.1	2.38 V	132	23.7	18.2

REMARKS:

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

802.11ac (VHT40)

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	59.6 PK	74.0	-14.4	1.10 H	148	55.5	4.1
2	5150.00	47.5 AV	54.0	-6.5	1.10 H	148	43.4	4.1
3	*5190.00	102.4 PK			1.10 H	148	98.6	3.8
4	*5190.00	93.1 AV			1.10 H	148	89.3	3.8
5	5350.00	47.8 PK	74.0	-26.2	1.10 H	148	44.2	3.6
6	5350.00	35.6 AV	54.0	-18.4	1.10 H	148	32.0	3.6
7	#10380.00	53.7 PK	74.0	-20.3	2.27 H	186	40.6	13.1
8	#10380.00	43.5 AV	54.0	-10.5	2.27 H	186	30.4	13.1
9	15570.00	48.8 PK	74.0	-25.2	1.18 H	209	35.7	13.1
10	15570.00	35.9 AV	54.0	-18.1	1.18 H	209	22.8	13.1
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	65.6 PK	74.0	-8.4	2.24 V	120	61.5	4.1
2	**5150.00**	**53.4 AV**	**54.0**	**-0.6**	**2.24 V**	**120**	**49.3**	**4.1**
3	*5190.00	107.7 PK			2.24 V	120	103.9	3.8
4	*5190.00	98.3 AV			2.24 V	120	94.5	3.8
5	5350.00	52.2 PK	74.0	-21.8	2.24 V	120	48.6	3.6
6	5350.00	40.2 AV	54.0	-13.8	2.24 V	120	36.6	3.6
7	#10380.00	54.6 PK	74.0	-19.4	2.93 V	183	41.5	13.1
8	#10380.00	41.3 AV	54.0	-12.7	2.93 V	183	28.2	13.1
9	15570.00	46.9 PK	74.0	-27.1	1.73 V	207	33.8	13.1
10	15570.00	33.8 AV	54.0	-20.2	1.73 V	207	20.7	13.1

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	108.8 PK			1.08 H	156	105.3	3.5
2	*5230.00	99.4 AV			1.08 H	156	95.9	3.5
3	5350.00	51.6 PK	74.0	-22.4	1.08 H	156	48.0	3.6
4	5350.00	42.4 AV	54.0	-11.6	1.08 H	156	38.8	3.6
5	#10460.00	63.2 PK	74.0	-10.8	2.38 H	197	49.8	13.4
6	#10460.00	50.9 AV	54.0	-3.1	2.38 H	197	37.5	13.4
7	15690.00	56.4 PK	74.0	-17.6	1.12 H	208	43.5	12.9
8	15690.00	42.8 AV	54.0	-11.2	1.12 H	208	29.9	12.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	111.2 PK			2.27 V	123	107.7	3.5
2	*5230.00	102.3 AV			2.27 V	123	98.8	3.5
3	5350.00	61.2 PK	74.0	-12.8	2.27 V	123	57.6	3.6
4	5350.00	47.7 AV	54.0	-6.3	2.27 V	123	44.1	3.6
5	#10460.00	61.1 PK	74.0	-12.9	2.93 V	169	47.7	13.4
6	#10460.00	48.7 AV	54.0	-5.3	2.93 V	169	35.3	13.4
7	15690.00	54.9 PK	74.0	-19.1	1.69 V	199	42.0	12.9
8	15690.00	40.5 AV	54.0	-13.5	1.69 V	199	27.6	12.9

REMARKS:

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

CHANNEL	TX Channel 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	#5647.71	62.8 PK	68.2	-5.4	1.87 H	118	58.5	4.3
2	*5755.00	113.1 PK			1.87 H	118	108.8	4.3
3	*5755.00	102.0 AV			1.87 H	118	97.7	4.3
4	#5925.07	51.2 PK	68.2	-17.0	1.87 H	118	46.6	4.6
5	11510.00	63.6 PK	74.0	-10.4	3.17 H	178	49.6	14.0
6	11510.00	52.8 AV	54.0	-1.2	3.17 H	178	38.8	14.0
7	#17265.00	48.5 PK	74.0	-25.5	1.77 H	164	31.5	17.0
8	#17265.00	39.9 AV	54.0	-14.1	1.77 H	164	22.9	17.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5646.88	65.8 PK	68.2	-2.4	3.02 V	131	61.5	4.3
2	*5755.00	113.6 PK			3.02 V	131	109.3	4.3
3	*5755.00	105.2 AV			3.02 V	131	100.9	4.3
4	#5937.58	51.9 PK	68.2	-16.3	3.02 V	131	47.3	4.6
5	11510.00	61.2 PK	74.0	-12.8	1.04 V	155	47.2	14.0
6	11510.00	48.4 AV	54.0	-5.6	1.04 V	155	34.4	14.0
7	#17265.00	47.6 PK	74.0	-26.4	2.31 V	158	30.6	17.0
8	#17265.00	38.7 AV	54.0	-15.3	2.31 V	158	21.7	17.0

REMARKS:

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

CHANNEL	TX Channel 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	#5634.80	52.9 PK	68.2	-15.3	1.83 H	126	48.6	4.3
2	*5795.00	112.6 PK			1.83 H	126	108.3	4.3
3	*5795.00	101.5 AV			1.83 H	126	97.2	4.3
4	#5923.75	59.6 PK	69.1	-9.5	1.83 H	126	55.0	4.6
5	11590.00	61.5 PK	74.0	-12.5	2.99 H	199	47.5	14.0
6	11590.00	51.7 AV	54.0	-2.3	2.99 H	199	37.7	14.0
7	#17385.00	50.2 PK	74.0	-23.8	1.62 H	166	32.9	17.3
8	#17385.00	41.2 AV	54.0	-12.8	1.62 H	166	23.9	17.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5645.18	54.1 PK	68.2	-14.1	3.11 V	115	49.8	4.3
2	*5795.00	113.0 PK			3.11 V	115	108.7	4.3
3	*5795.00	104.6 AV			3.11 V	115	100.3	4.3
4	#5927.39	55.7 PK	68.2	-12.5	3.11 V	115	51.1	4.6
5	11590.00	62.8 PK	74.0	-11.2	1.14 V	129	48.8	14.0
6	11590.00	49.2 AV	54.0	-4.8	1.14 V	129	35.2	14.0
7	#17385.00	48.7 PK	74.0	-25.3	2.33 V	135	31.4	17.3
8	#17385.00	40.3 AV	54.0	-13.7	2.33 V	135	23.0	17.3

REMARKS:

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

802.11ac (VHT80)

CHANNEL	TX Channel 42	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	62.3 PK	74.0	-11.7	1.03 H	145	58.2	4.1
2	5150.00	48.4 AV	54.0	-5.6	1.03 H	145	44.3	4.1
3	*5210.00	101.3 PK			1.03 H	145	97.6	3.7
4	*5210.00	92.4 AV			1.03 H	145	88.7	3.7
5	5350.00	54.7 PK	74.0	-19.3	1.03 H	145	51.1	3.6
6	5350.00	40.6 AV	54.0	-13.4	1.03 H	145	37.0	3.6
7	#10420.00	58.9 PK	74.0	-15.1	2.38 H	210	45.7	13.2
8	#10420.00	47.7 AV	54.0	-6.3	2.38 H	210	34.5	13.2
9	15630.00	48.9 PK	74.0	-25.1	1.07 H	200	35.9	13.0
10	15630.00	35.6 AV	54.0	-18.4	1.07 H	200	22.6	13.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	63.5 PK	74.0	-10.5	2.76 V	127	59.4	4.1
2	5150.00	53.2 AV	54.0	-0.8	2.76 V	127	49.1	4.1
3	*5210.00	104.2 PK			2.76 V	127	100.5	3.7
4	*5210.00	95.7 AV			2.76 V	127	92.0	3.7
5	5350.00	59.8 PK	74.0	-14.2	2.76 V	127	56.2	3.6
6	5350.00	45.6 AV	54.0	-8.4	2.76 V	127	42.0	3.6
7	#10420.00	54.3 PK	74.0	-19.7	2.91 V	188	41.1	13.2
8	#10420.00	41.2 AV	54.0	-12.8	2.91 V	188	28.0	13.2
9	15630.00	46.2 PK	74.0	-27.8	1.73 V	196	33.2	13.0
10	15630.00	33.4 AV	54.0	-20.6	1.73 V	196	20.4	13.0

REMARKS:

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

CHANNEL	TX Channel 155	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5647.99	60.3 PK	68.2	-7.9	1.81 H	134	56.0	4.3
2	*5775.00	106.6 PK			1.81 H	134	102.2	4.4
3	*5775.00	96.2 AV			1.81 H	134	91.8	4.4
4	#5930.96	60.2 PK	68.2	-8.0	1.81 H	134	55.6	4.6
5	11550.00	60.7 PK	74.0	-13.3	3.15 H	167	46.8	13.9
6	11550.00	49.8 AV	54.0	-4.2	3.15 H	167	35.9	13.9
7	#17325.00	46.2 PK	74.0	-27.8	1.82 H	178	29.0	17.2
8	#17325.00	37.8 AV	54.0	-16.2	1.82 H	178	20.6	17.2
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	#5641.82	65.6 PK	68.2	-2.6	3.11 V	140	61.3	4.3
2	*5775.00	108.2 PK			3.11 V	140	103.8	4.4
3	*5775.00	98.3 AV			3.11 V	140	93.9	4.4
4	#5933.25	62.2 PK	68.2	-6.0	3.11 V	140	57.6	4.6
5	11550.00	58.7 PK	74.0	-15.3	1.05 V	149	44.8	13.9
6	11550.00	46.2 AV	54.0	-7.8	1.05 V	149	32.3	13.9
7	#17325.00	45.1 PK	74.0	-28.9	2.37 V	173	27.9	17.2
8	#17325.00	36.4 AV	54.0	-17.6	2.37 V	173	19.2	17.2

REMARKS:

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

Below 1GHz Data:

802.11ac (VHT40)

CHANNEL	TX Channel 159	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	82.49	33.5 QP	40.0	-6.5	1.88 H	94	46.6	-13.1
2	269.51	38.7 QP	46.0	-7.3	1.69 H	71	46.9	-8.2
3	305.22	40.5 QP	46.0	-5.5	1.34 H	49	47.5	-7.0
4	319.26	41.4 QP	46.0	-4.6	1.63 H	82	47.9	-6.5
5	346.36	39.8 QP	46.0	-6.2	1.79 H	310	45.8	-6.0
6	353.91	41.5 QP	46.0	-4.5	3.21 H	343	47.4	-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	30.49	36.6 QP	40.0	-3.4	1.14 V	36	45.4	-8.8
2	84.71	36.9 QP	40.0	-3.1	1.44 V	138	50.4	-13.5
3	253.69	36.8 QP	46.0	-9.2	3.05 V	277	45.7	-8.9
4	343.56	40.1 QP	46.0	-5.9	1.27 V	69	46.2	-6.1
5	421.58	38.7 QP	46.0	-7.3	1.21 V	241	42.6	-3.9
6	477.21	38.4 QP	46.0	-7.6	2.74 V	284	41.0	-2.6

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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Nov. 01, 2017	Oct. 31, 2018
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Nov. 15, 2017	Nov. 14, 2018
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 03, 2017	June 02, 2018
50 ohms Terminator	N/A	EMC-02	Sep. 22, 2017	Sep. 21, 2018
RF Cable	5D-FB	COCCAB-001	Sep. 29, 2017	Sep. 28, 2018
10 dB PAD Mini-Circuits	HAT-10+	CONATT-004	June 18, 2017	June 17, 2018
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3 Tested Date: Feb. 23 to Mar. 27, 2018

4.2.3 Test Procedure

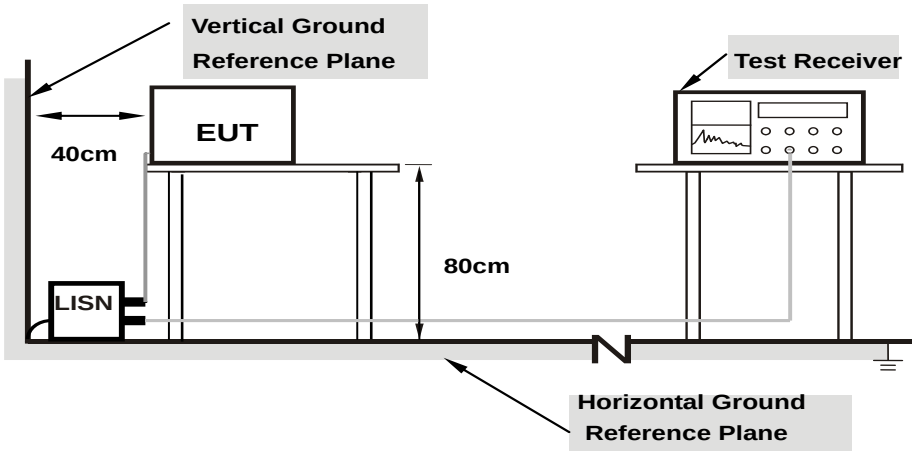
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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: All modes of operation were investigated and the worst-case emissions are reported.

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 Condition

Same as 4.1.6.

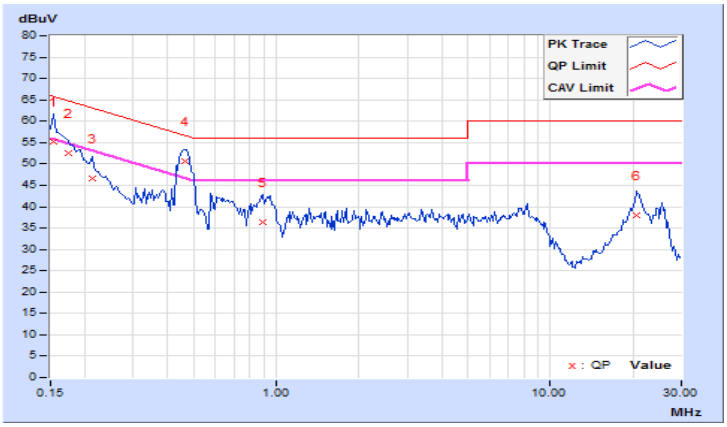
4.2.7 Test Results (Mode 1)

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.13	44.98	27.46	55.11	37.59	65.79	55.79	-10.68	-18.20
2	0.17344	10.13	42.48	26.24	52.61	36.37	64.79	54.79	-12.18	-18.42
3	0.21250	10.14	36.39	20.17	46.53	30.31	63.11	53.11	-16.58	-22.80
4	**0.46363**	**10.19**	**40.40**	**33.12**	**50.59**	**43.31**	**56.63**	**46.63**	**-6.04**	**-3.32**
5	0.89219	10.22	26.21	19.05	36.43	29.27	56.00	46.00	-19.57	-16.73
6	20.69922	11.23	26.84	20.97	38.07	32.20	60.00	50.00	-21.93	-17.80

Remarks:

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

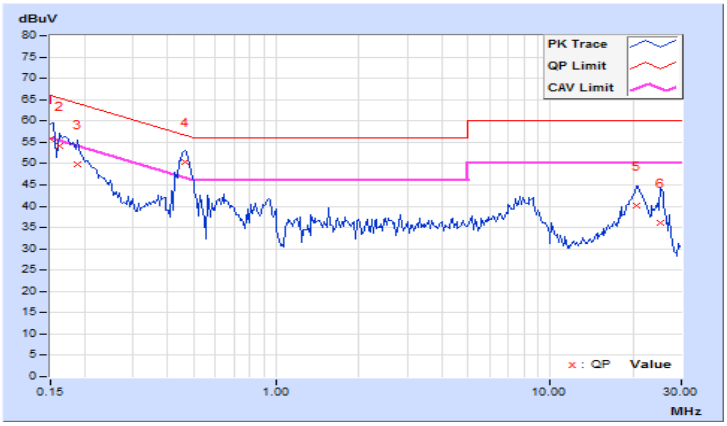


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.04	45.76	27.73	55.80	37.77	66.00	56.00	-10.20	-18.23
2	0.16172	10.04	44.12	26.36	54.16	36.40	65.38	55.38	-11.22	-18.98
3	0.18906	10.04	39.76	21.93	49.80	31.97	64.08	54.08	-14.28	-22.11
4	0.46325	10.08	40.36	32.81	50.44	42.89	56.63	46.63	-6.19	-3.74
5	20.49219	11.02	29.15	23.82	40.17	34.84	60.00	50.00	-19.83	-15.16
6	25.24609	11.04	25.00	17.81	36.04	28.85	60.00	50.00	-23.96	-21.15

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



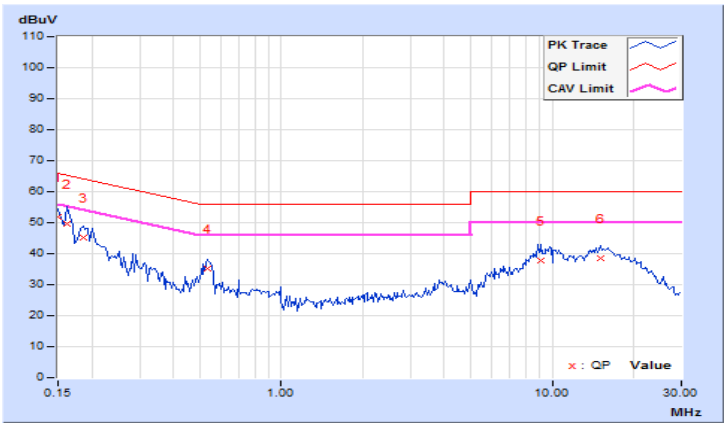
4.2.8 Test Results (Mode 2)

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.03	41.69	24.87	51.72	34.90	66.00	56.00	-14.28	-21.10
2	0.16172	10.04	39.76	24.19	49.80	34.23	65.38	55.38	-15.58	-21.15
3	0.18516	10.05	35.20	21.99	45.25	32.04	64.25	54.25	-19.00	-22.21
4	0.53281	10.12	24.90	15.45	35.02	25.57	56.00	46.00	-20.98	-20.43
5	9.10938	10.50	27.14	20.58	37.64	31.08	60.00	50.00	-22.36	-18.92
6	15.07813	10.83	27.81	22.25	38.64	33.08	60.00	50.00	-21.36	-16.92

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

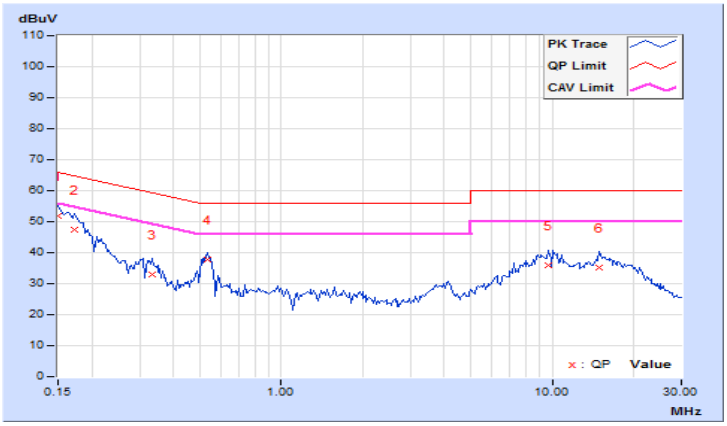


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.94	41.96	24.55	51.90	34.49	66.00	56.00	-14.10	-21.51
2	0.17344	9.95	37.28	20.95	47.23	30.90	64.79	54.79	-17.56	-23.89
3	0.33359	9.99	23.14	11.59	33.13	21.58	59.36	49.36	-26.23	-27.78
4	0.53281	10.01	27.86	20.37	37.87	30.38	56.00	46.00	-18.13	-15.62
5	9.65625	10.38	25.56	18.93	35.94	29.31	60.00	50.00	-24.06	-20.69
6	14.96094	10.65	24.56	18.57	35.21	29.22	60.00	50.00	-24.79	-20.78

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



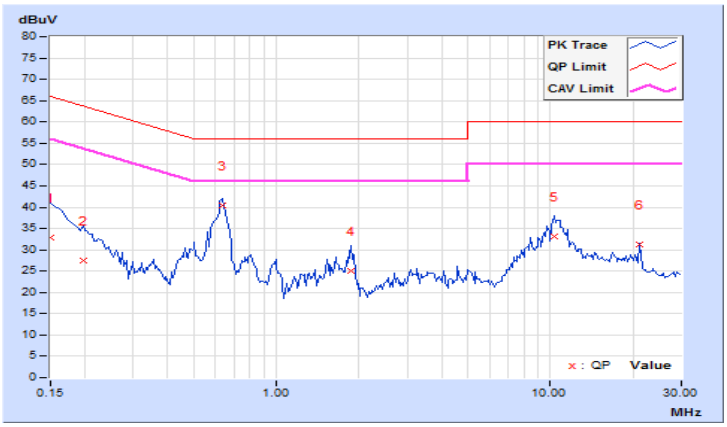
4.2.9 Test Results (Mode 3)

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.13	22.82	8.14	32.95	18.27	66.00	56.00	-33.05	-37.73
2	0.19687	10.14	17.22	6.45	27.36	16.59	63.74	53.74	-36.38	-37.15
3	0.63828	10.21	30.14	26.42	40.35	36.63	56.00	46.00	-15.65	-9.37
4	1.87500	10.26	14.71	6.44	24.97	16.70	56.00	46.00	-31.03	-29.30
5	10.27734	10.66	22.52	15.88	33.18	26.54	60.00	50.00	-26.82	-23.46
6	21.16797	11.23	20.15	19.15	31.38	30.38	60.00	50.00	-28.62	-19.62

Remarks:

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



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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.04	23.52	8.71	33.56	18.75	66.00	56.00	-32.44	-37.25
2	0.63438	10.09	30.85	25.37	40.94	35.46	56.00	46.00	-15.06	-10.54
3	0.71641	10.10	5.57	-0.82	15.67	9.28	56.00	46.00	-40.33	-36.72
4	1.86328	10.14	13.56	5.85	23.70	15.99	56.00	46.00	-32.30	-30.01
5	10.89844	10.54	22.08	15.35	32.62	25.89	60.00	50.00	-27.38	-24.11
6	21.16797	11.02	19.83	18.82	30.85	29.84	60.00	50.00	-29.15	-20.16

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

4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Condition

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

4.3.7 Test Results

802.11a

Chan.	Chan. Freq. (MHz)	Maximum Conducted (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	21.26	20.46	244.833	23.89	30.00	Pass
40	5200	24.57	24.03	539.348	27.32	30.00	Pass
48	5240	22.70	22.06	346.903	25.40	30.00	Pass
149	5745	24.63	23.93	537.574	27.30	30.00	Pass
157	5785	24.21	23.84	505.736	27.04	30.00	Pass
165	5825	23.99	23.94	498.353	26.98	30.00	Pass

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	Maximum Conducted (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	22.02	21.29	293.807	24.68	30.00	Pass
40	5200	25.45	24.80	652.747	28.15	30.00	Pass
48	5240	22.49	21.97	334.817	25.25	30.00	Pass
149	5745	25.26	24.07	591.008	27.72	30.00	Pass
157	5785	25.06	24.12	578.853	27.63	30.00	Pass
165	5825	26.12	25.33	750.454	28.75	30.00	Pass

802.11ac (VHT40)

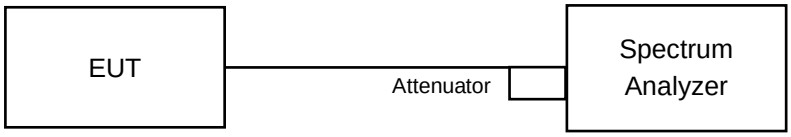
Chan.	Chan. Freq. (MHz)	Maximum Conducted (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	19.02	18.26	146.787	21.67	30.00	Pass
46	5230	23.25	22.56	391.651	25.93	30.00	Pass
151	5755	25.38	25.00	661.372	28.20	30.00	Pass
159	5795	26.26	26.11	830.988	29.20	30.00	Pass

802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	Maximum Conducted (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	19.57	18.95	169.097	22.28	30.00	Pass
155	5775	23.07	22.49	380.187	25.80	30.00	Pass

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 SAMPLE. 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 Results

802.11a

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	16.44	16.44
40	5200	22.92	19.92
48	5240	16.80	16.68
149	5745	18.12	17.04
157	5785	17.28	17.04
165	5825	17.16	17.28

802.11ac (VHT20)

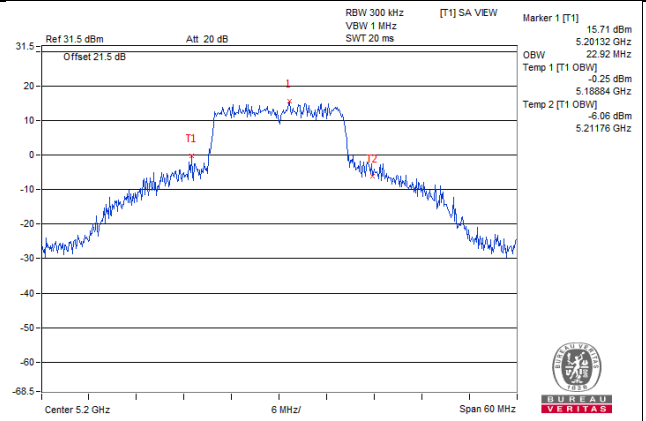
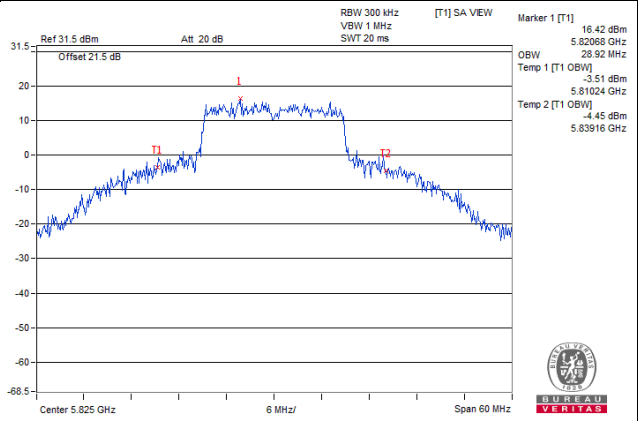
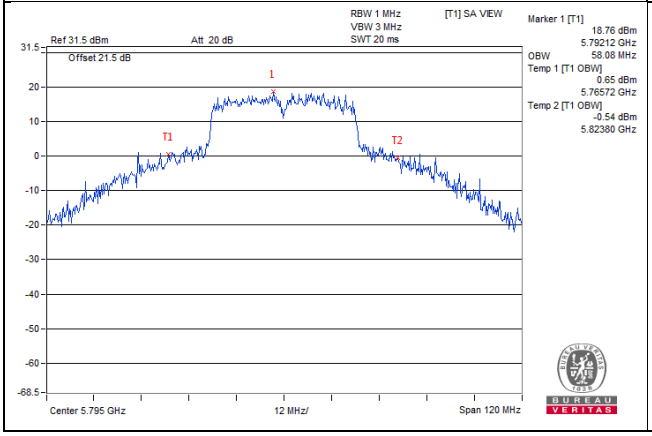
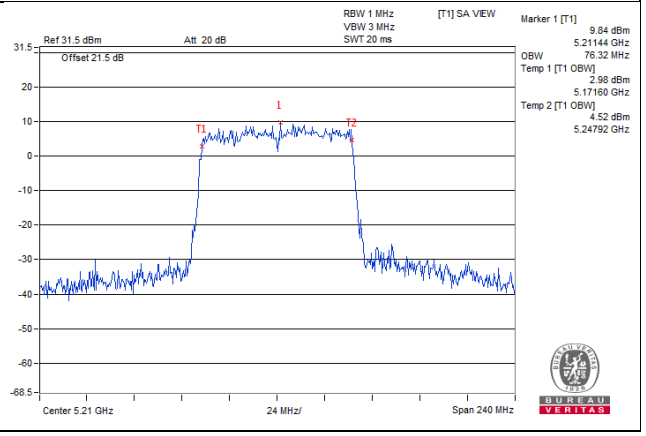
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	17.88	17.76
40	5200	27.72	23.04
48	5240	17.88	17.88
149	5745	21.84	18.60
157	5785	19.20	18.48
165	5825	28.92	25.08

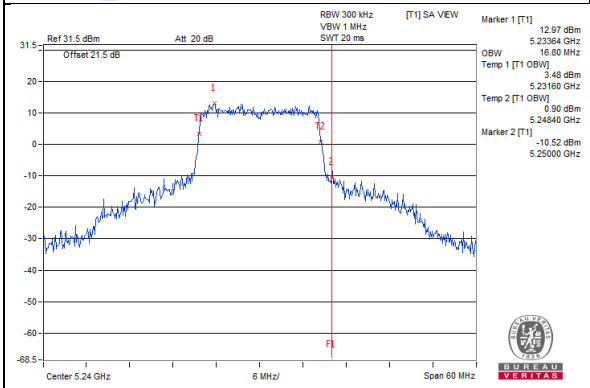
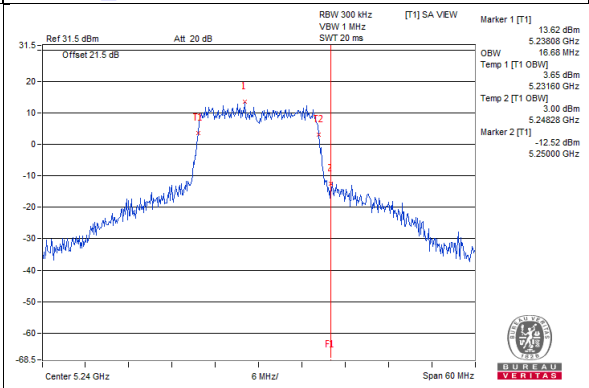
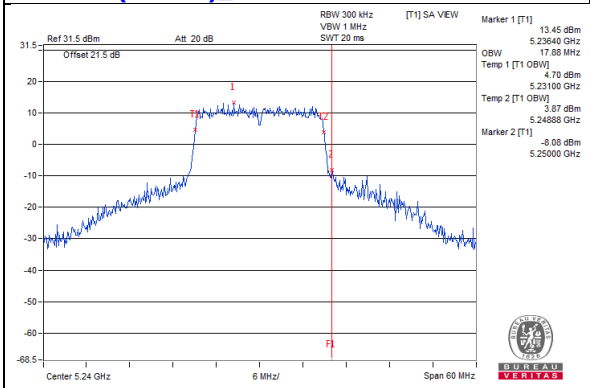
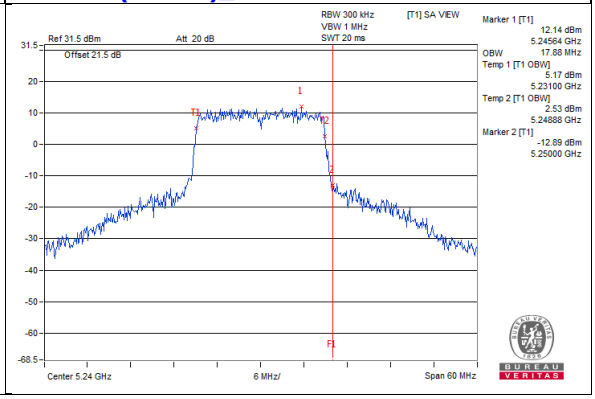
802.11ac (VHT40)

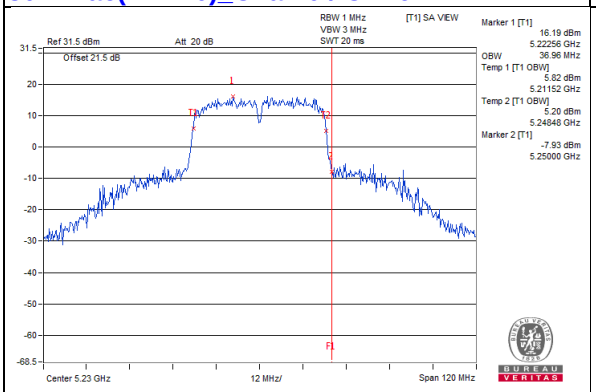
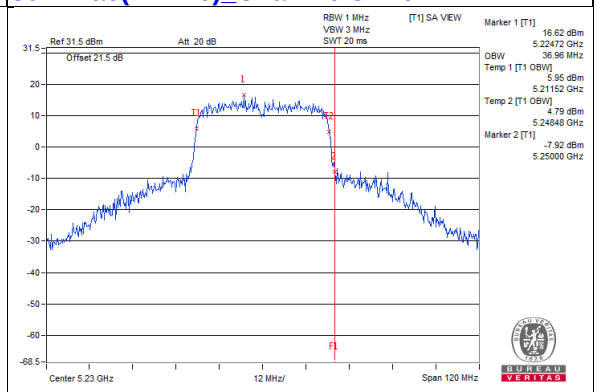
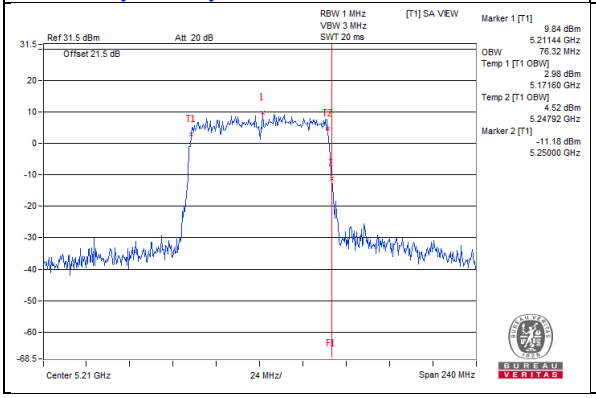
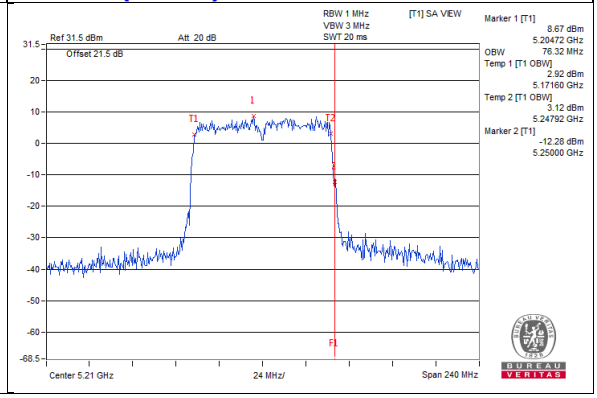
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	36.24	36.24
46	5230	36.96	36.96
151	5755	54.00	45.84
159	5795	58.08	53.04

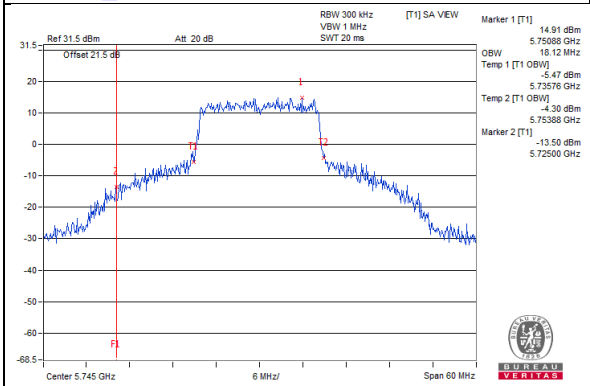
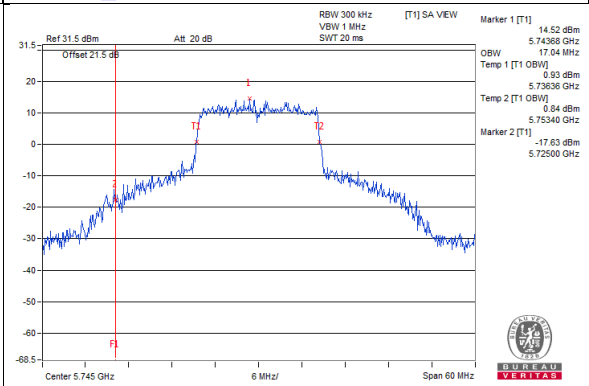
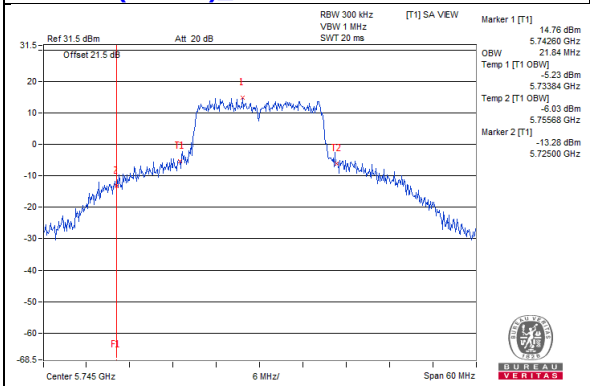
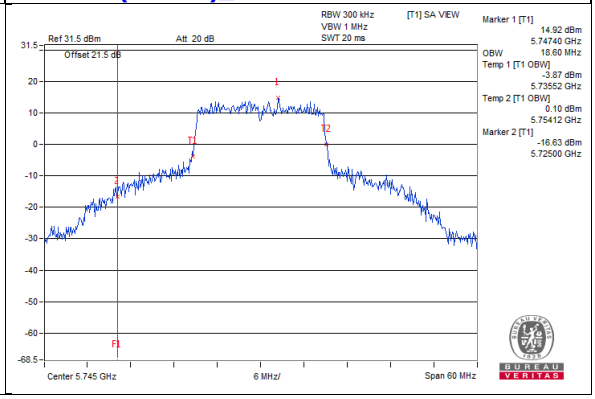
802.11ac (VHT80)

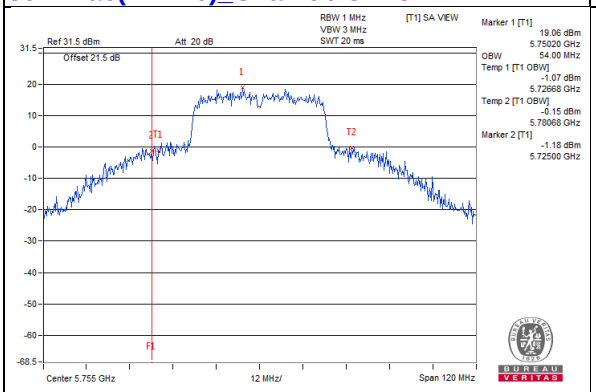
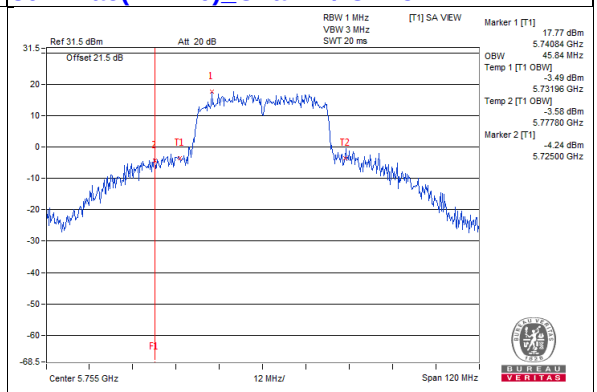
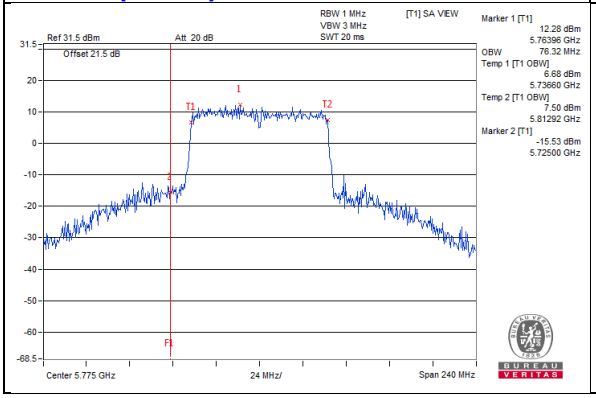
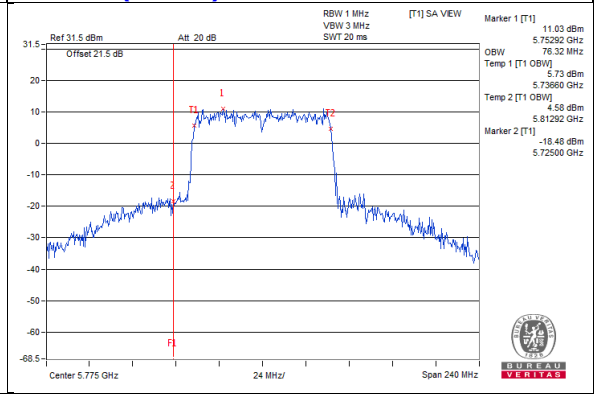
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
42	5210	76.32	76.32
155	5775	76.32	76.32

Spectrum Plot of Worst Value	
802.11a_Chain 0 / CH40	**802.11ac (VHT20)_Chain 0 / CH165**
	
802.11ac (VHT40) _Chain 0 / CH159	**802.11ac (VHT80) _Chain 0 / CH42**
	

Spectrum Plot for near by DFS band (DFS is required, if 99% OCP straddle into U-NII-2A band)	
802.11a_Chain0 / CH48	**802.11a_Chain1 / CH48**
	
802.11ac(VHT20)_Chain0 / CH48	**802.11ac(VHT20)_Chain1 / CH48**
	

Spectrum Plot for near by DFS band (DFS is required, if 99% OCP straddle into U-NII-2A band)	
802.11ac(VHT40)_Chain0 / CH46	**802.11ac(VHT40)_Chain1 / CH46**
	
802.11ac(VHT80)_Chain0 / CH42	**802.11ac(VHT80)_Chain1 / CH42**
	

Spectrum Plot for near by DFS band (DFS is required, if 99% OCP straddle into U-NII-2C band)	
802.11a_Chain0 / CH149	**802.11a_Chain1 / CH149**
	
802.11ac(VHT20)_Chain0 / CH149	**802.11ac(VHT20)_Chain1 / CH149**
	

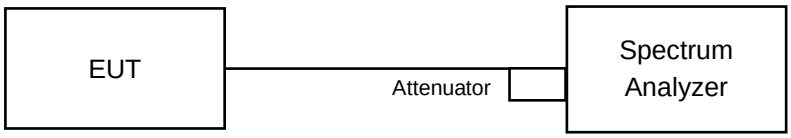
Spectrum Plot for near by DFS band (DFS is required, if 99% OCP straddle into U-NII-2C band)	
802.11ac(VHT40)_Chain0 / CH151	**802.11ac(VHT40)_Chain1 / CH151**
	
802.11ac(VHT80)_Chain0 / CH155	**802.11ac(VHT80)_Chain1 / CH155**
	

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 Procedure

For U-NII-1:

802.11ac (VHT20)

Using method SA-1

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

802.11a, 802.11ac (VHT40), 802.11ac (VHT80)

Using method SA-2

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

For U-NII-3:

802.11ac (VHT20)

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

802.11a, 802.11ac (VHT40), 802.11ac (VHT80)

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 Condition

Same as Item 4.3.6.

4.5.7 Test Results

For U-NII-1:

802.11a

Chan.	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	7.49	6.43	0.17	10.17	17	Pass
40	5200	10.93	9.98	0.17	13.66	17	Pass
48	5240	8.58	7.73	0.17	11.35	17	Pass

Note: 1. Method a) 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. Refer to section 3.3 for duty cycle spectrum plot.

3. There are two WLAN antennas will transmit simultaneously (one is Horizontal and the other one is Vertical-- MIMO system with two outputs driving a cross-polarized pair of linearly polarized antennas). As the antenna combination must be supplied with one Horizontal and one Vertical antenna.

4. The max gain is 3dBi < 6dBi, so the power density limit shall not be reduced.

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)		Total Power Density (dBm/MHz)	MAX. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1			
36	5180	7.97	6.84	10.45	17	Pass
40	5200	10.97	9.99	13.52	17	Pass
48	5240	8.44	7.60	11.05	17	Pass

Note: 1. Method a) 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. There are two WLAN antennas will transmit simultaneously (one is Horizontal and the other one is Vertical-- MIMO system with two outputs driving a cross-polarized pair of linearly polarized antennas). As the antenna combination must be supplied with one Horizontal and one Vertical antenna.

3. The max gain is 3dBi < 6dBi, so the power density limit shall not be reduced.

802.11ac (VHT40)

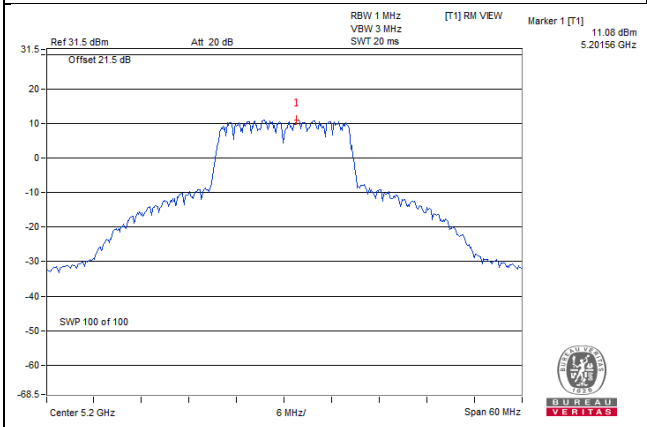
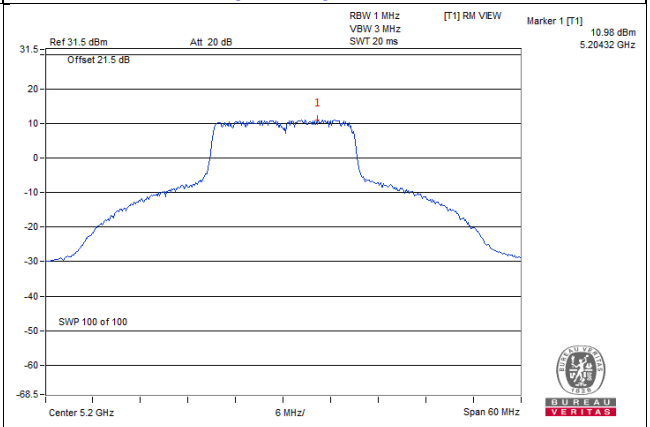
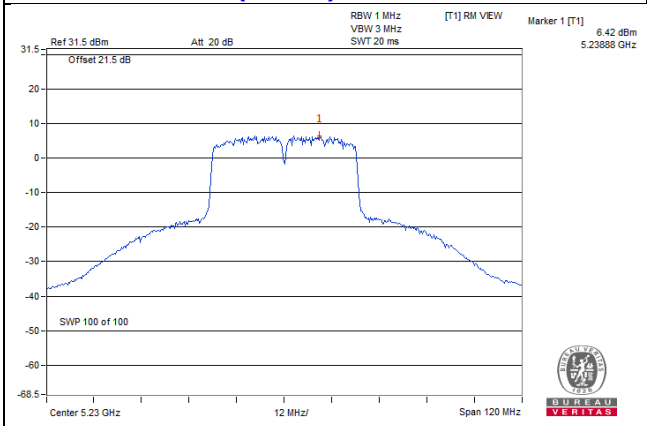
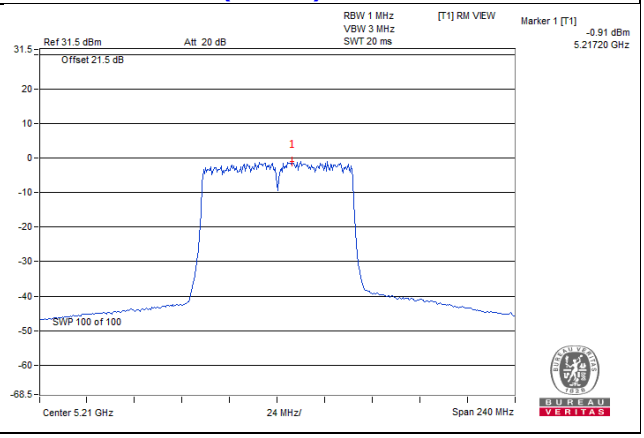
Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD With Duty Factor (dBm/MHz)	MAX. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
38	5190	2.22	1.23	0.16	4.92	17	Pass
46	5230	6.33	5.28	0.16	9.00	17	Pass

Note:
1. Method a) 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. Refer to section 3.3 for duty cycle spectrum plot.
3. There are two WLAN antennas will transmit simultaneously (one is Horizontal and the other one is Vertical-- MIMO system with two outputs driving a cross-polarized pair of linearly polarized antennas). As the antenna combination must be supplied with one Horizontal and one Vertical antenna.
4. The max gain is 3dBi < 6dBi, so the power density limit shall not be reduced.

802.11ac (VHT80)

Chan.	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	-1.72	-1.72	0.30	1.88	17	Pass

Note:
1. Method a) 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. Refer to section 3.3 for duty cycle spectrum plot.
3. There are two WLAN antennas will transmit simultaneously (one is Horizontal and the other one is Vertical-- MIMO system with two outputs driving a cross-polarized pair of linearly polarized antennas). As the antenna combination must be supplied with one Horizontal and one Vertical antenna.
4. The max gain is 3dBi < 6dBi, so the power density limit shall not be reduced.

Spectrum Plot of Worst Value	
802.11a_Chain 0 / CH40	**802.11ac (VHT20)_Chain 0 / CH40**
	
8802.11ac (VHT40) _Chain 0 / CH46	**802.11ac (VHT80) _Chain 0 / CH42**
	

For U-NII-3:

802.11a

TX chain	Chan.	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	2.07	4.29	3.01	0.17	7.47	30	Pass
	157	5785	1.60	3.82	3.01	0.17	7.00	30	Pass
	165	5825	1.80	4.02	3.01	0.17	7.20	30	Pass
1	149	5745	1.20	3.42	3.01	0.17	6.60	30	Pass
	157	5785	1.40	3.62	3.01	0.17	6.80	30	Pass
	165	5825	1.48	3.70	3.01	0.17	6.88	30	Pass

Note: 1. Refer to section 3.3 for duty cycle spectrum plot.

2. There are two WLAN antennas will transmit simultaneously (one is Horizontal and the other one is Vertical-- MIMO system with two outputs driving a cross-polarized pair of linearly polarized antennas). As the antenna combination must be supplied with one Horizontal and one Vertical antenna.

3. The max gain is 3dBi < 6dBi, so the power density limit shall not be reduced.

802.11ac (VHT20)

TX chain	Chan.	Chan. Freq. (MHz)	PSD		10 log (N=2) dB	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
			(dBm/300kHz)	(dBm/500kHz)				
0	149	5745	2.40	4.62	3.01	7.63	30	Pass
	157	5785	2.15	4.37	3.01	7.38	30	Pass
	165	5825	3.17	5.39	3.01	8.40	30	Pass
1	149	5745	1.78	4.00	3.01	7.01	30	Pass
	157	5785	1.54	3.76	3.01	6.77	30	Pass
	165	5825	2.56	4.78	3.01	7.79	30	Pass

Note: 1. There are two WLAN antennas will transmit simultaneously (one is Horizontal and the other one is Vertical-- MIMO system with two outputs driving a cross-polarized pair of linearly polarized antennas). As the antenna combination must be supplied with one Horizontal and one Vertical antenna.

2. The max gain is 3dBi < 6dBi, so the power density limit shall not be reduced.

802.11ac (VHT40)

TX chain	Chan.	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	5745	-0.50	1.72	3.01	0.16	4.89	30	Pass
	159	5785	-0.01	2.21	3.01	0.16	5.38	30	Pass
1	151	5745	-1.03	1.19	3.01	0.16	4.36	30	Pass
	159	5785	-0.34	1.88	3.01	0.16	5.05	30	Pass

Note: 1. Refer to section 3.3 for duty cycle spectrum plot.

2. There are two WLAN antennas will transmit simultaneously (one is Horizontal and the other one is Vertical-- MIMO system with two outputs driving a cross-polarized pair of linearly polarized antennas). As the antenna combination must be supplied with one Horizontal and one Vertical antenna.

3. The max gain is 3dBi < 6dBi, so the power density limit shall not be reduced.

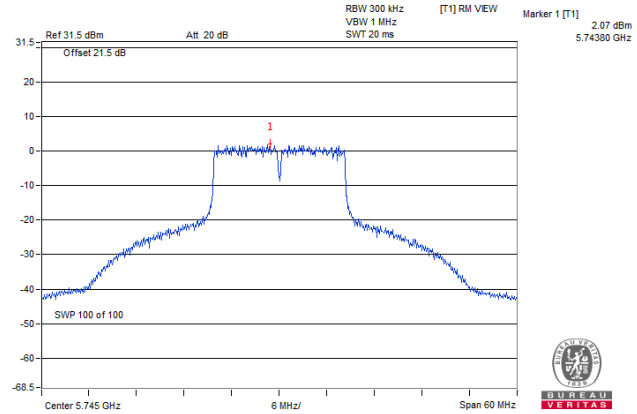
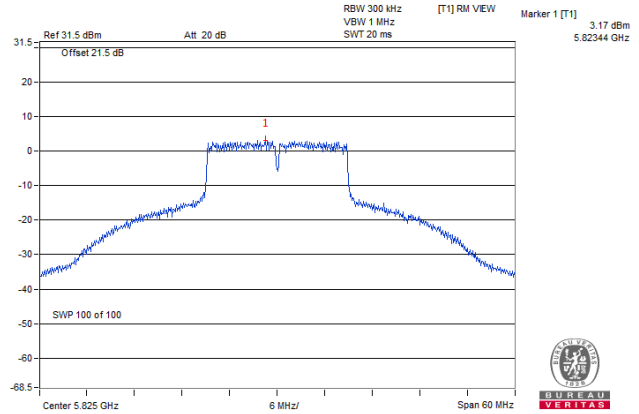
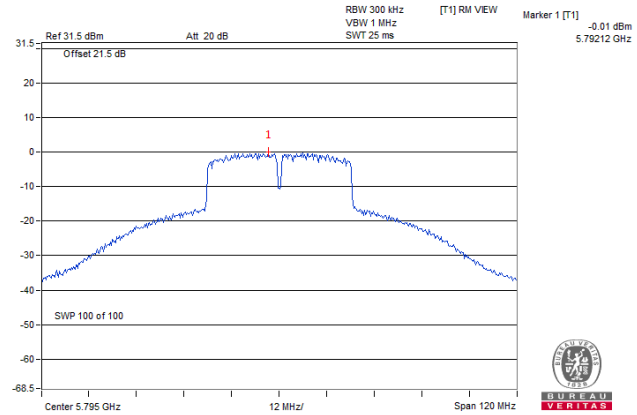
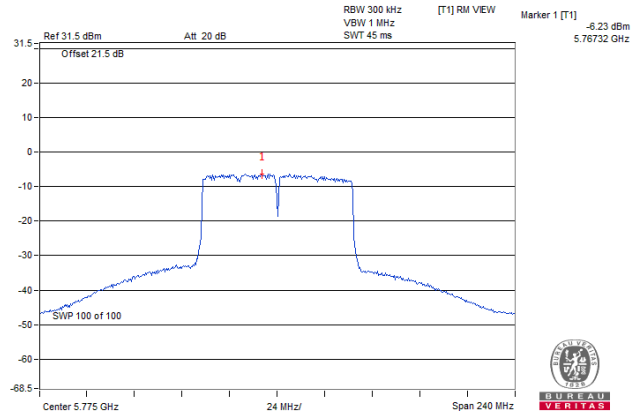
802.11ac (VHT80)

TX chain	Chan.	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	5745	-6.23	-4.01	3.01	0.30	-0.70	30	Pass
1	155	5745	-6.82	-4.60	3.01	0.30	-1.29	30	Pass

Note: 1. Refer to section 3.3 for duty cycle spectrum plot.

2. There are two WLAN antennas will transmit simultaneously (one is Horizontal and the other one is Vertical-- MIMO system with two outputs driving a cross-polarized pair of linearly polarized antennas). As the antenna combination must be supplied with one Horizontal and one Vertical antenna.

3. The max gain is 3dBi < 6dBi, so the power density limit shall not be reduced.

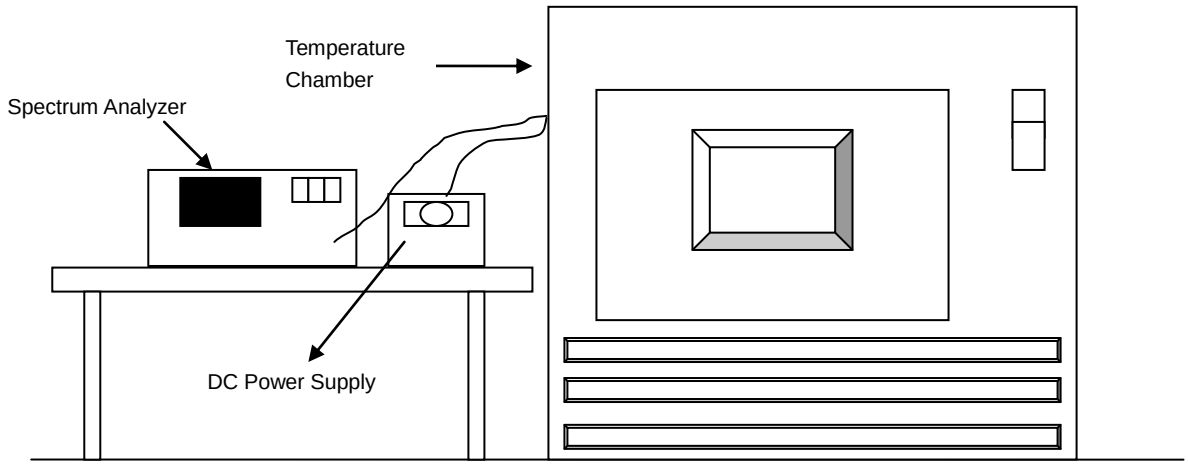
Spectrum Plot of Worst Value	
802.11a_Chain 0 / CH149	**802.11ac (VHT20)_Chain 0 / CH165**
	
8802.11ac (VHT40) _Chain 0 / CH159	**802.11ac (VHT80) _Chain 0 / CH155**
	

4.6 Frequency Stability Measurement

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 DC 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: 5180 MHz									
TEMP. (℃)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
50	12	5179.977	Pass	5179.981	Pass	5179.9768	Pass	5179.9805	Pass
40	12	5180.0111	Pass	5180.0087	Pass	5180.0128	Pass	5180.0092	Pass
30	12	5179.9979	Pass	5179.9972	Pass	5179.9986	Pass	5179.997	Pass
20	12	5179.9962	Pass	5179.9961	Pass	5179.9942	Pass	5179.9935	Pass
10	12	5179.9746	Pass	5179.9722	Pass	5179.9744	Pass	5179.976	Pass
0	12	5180.024	Pass	5180.0248	Pass	5180.0267	Pass	5180.0235	Pass
-10	12	5180.0216	Pass	5180.0215	Pass	5180.0234	Pass	5180.0191	Pass
-20	12	5179.9869	Pass	5179.9914	Pass	5179.9896	Pass	5179.9885	Pass
-30	12	5180.0039	Pass	5180.007	Pass	5180.0028	Pass	5180.0035	Pass

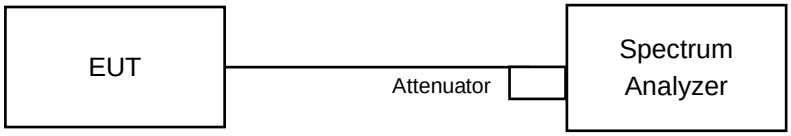
Frequency Stability Versus Voltage									
Operating Frequency: 5180 MHz									
TEMP. (℃)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
20	13.8	5179.9964	Pass	5179.9954	Pass	5179.9946	Pass	5179.9928	Pass
	12	5179.9962	Pass	5179.9961	Pass	5179.9942	Pass	5179.9935	Pass
	10.2	5179.9972	Pass	5179.9957	Pass	5179.9936	Pass	5179.9935	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	16.40	16.40	0.5	Pass
157	5785	16.42	16.40	0.5	Pass
165	5825	16.39	16.39	0.5	Pass

802.11ac (VHT20)

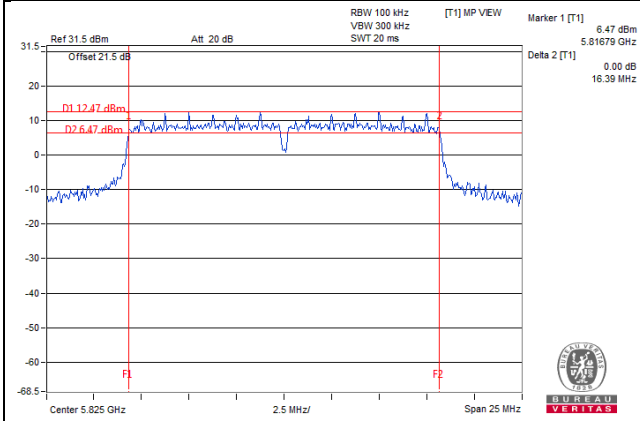
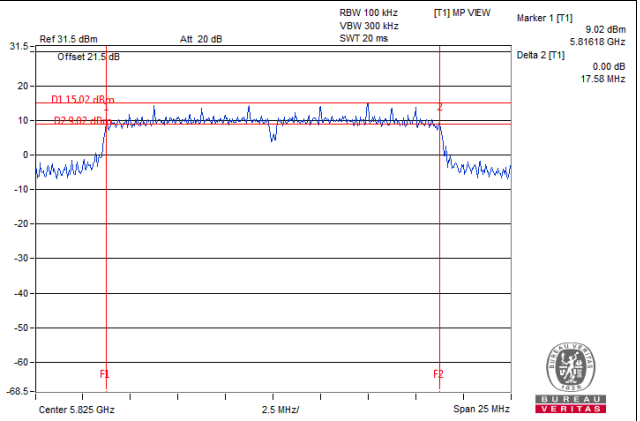
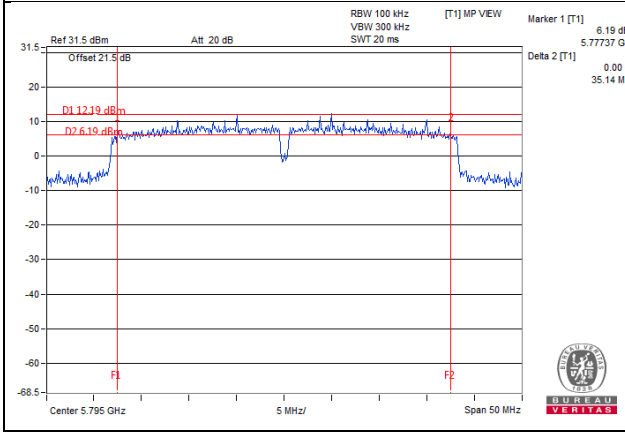
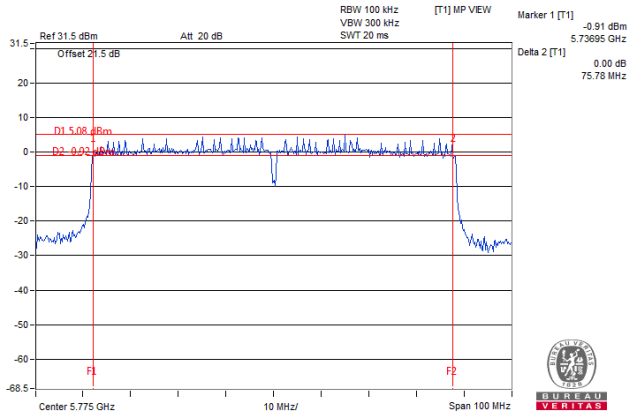
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	17.65	17.62	0.5	Pass
157	5785	17.64	17.63	0.5	Pass
165	5825	17.58	17.61	0.5	Pass

802.11ac (VHT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	35.41	35.17	0.5	Pass
159	5795	35.14	35.22	0.5	Pass

802.11ac (VHT80)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
155	5775	75.99	75.78	0.5	Pass

Spectrum Plot of Worst Value	
802.11a_Chain 0 / CH165	**802.11ac (VHT20)_Chain 0 / CH165**
	
802.11ac (VHT40) __Chain 0 / CH159	**802.11ac (VHT80) _Chain 1 / CH155**
	

5 Pictures of Test Arrangements

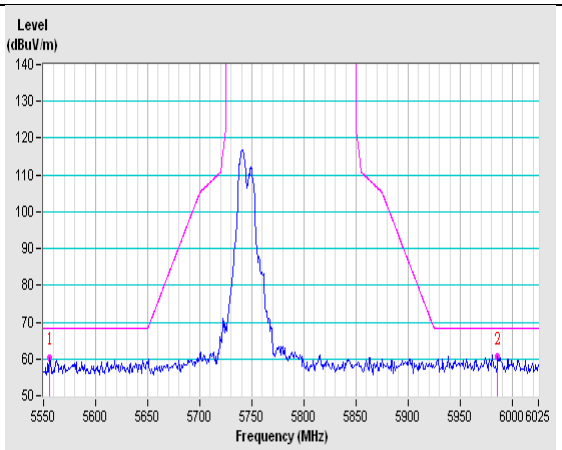
Please refer to the attached file (Test Setup Photo).

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

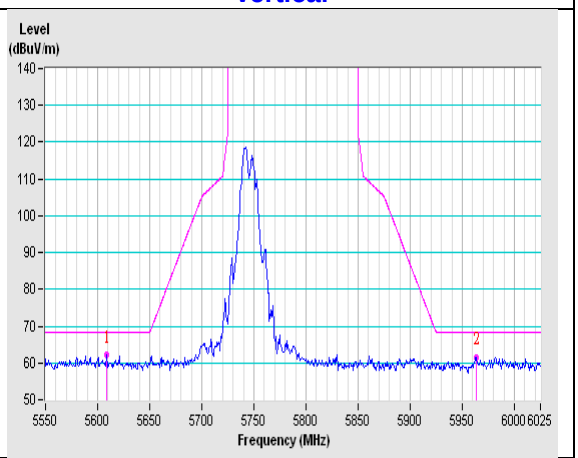
802.11a

CH149

Horizontal

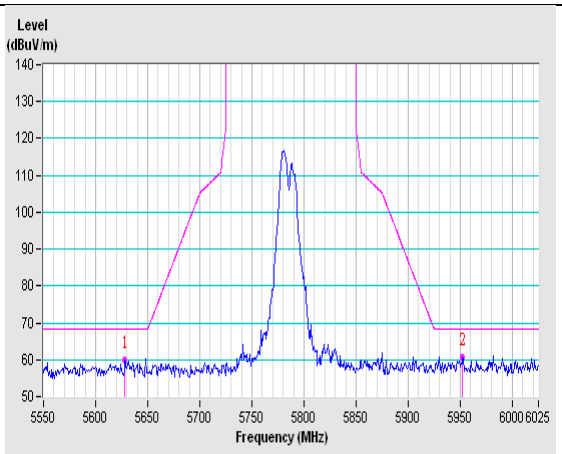


Vertical

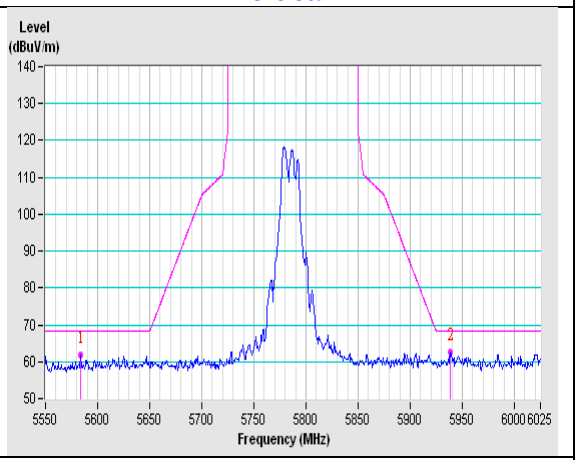


CH157

Horizontal

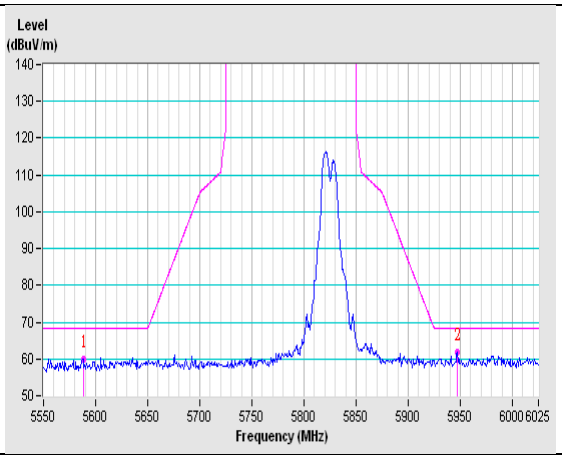


Vertical

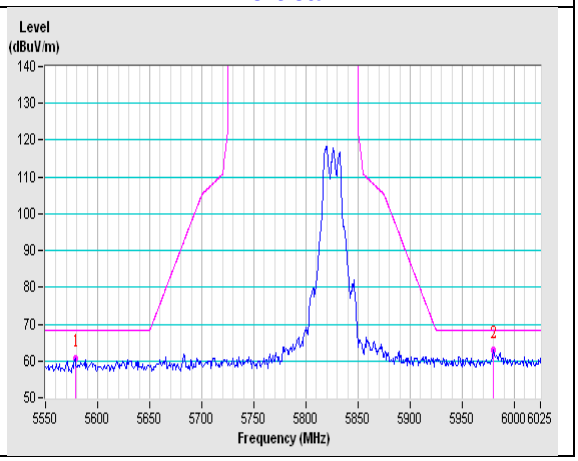


CH165

Horizontal

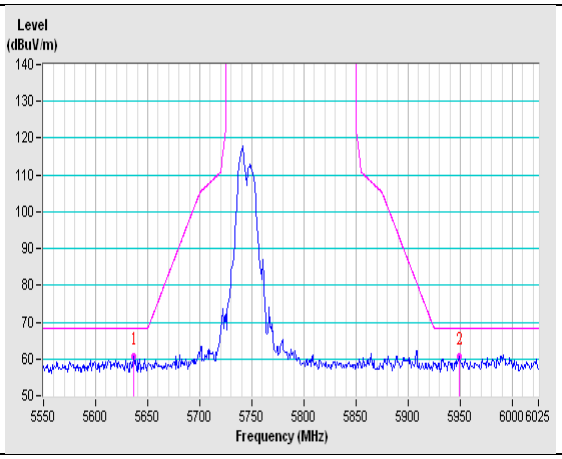
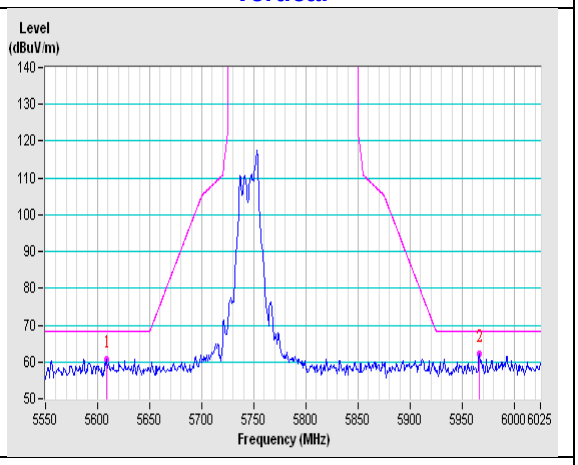


Vertical

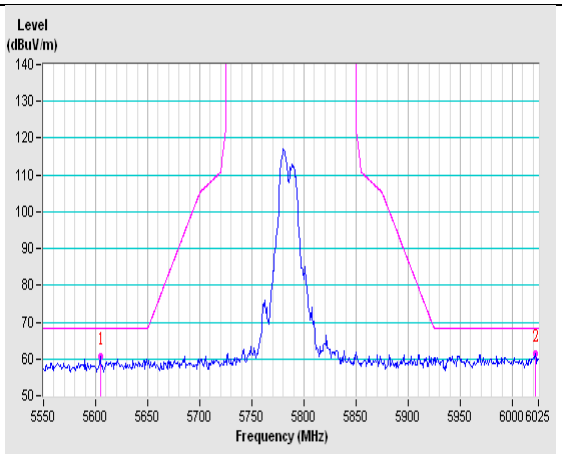
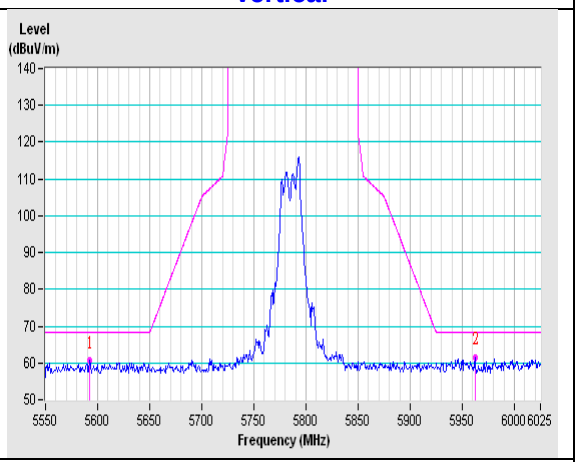


802.11ac (VHT20)

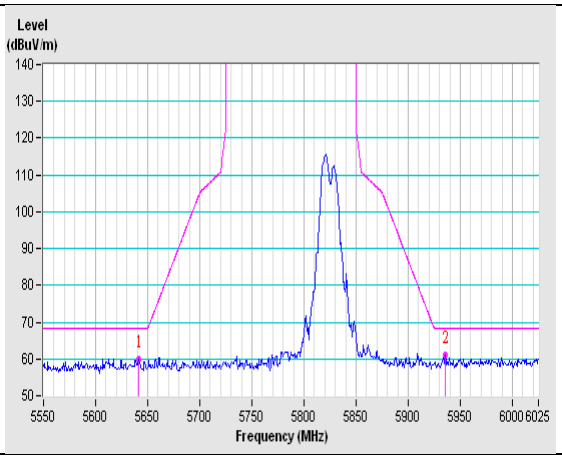
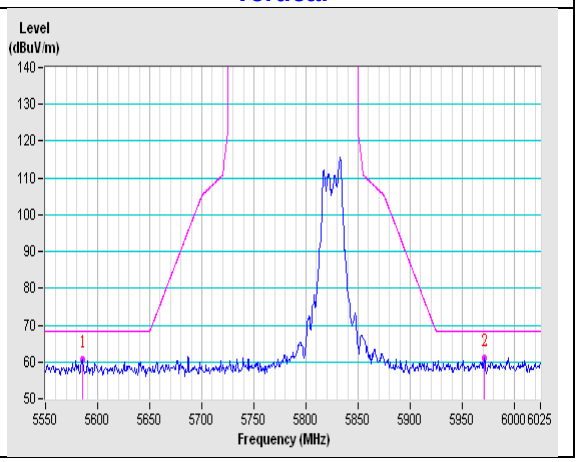
CH149

Horizontal	Vertical
	

CH157

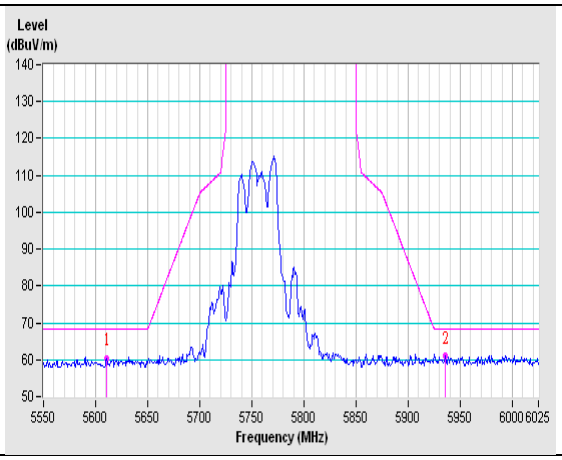
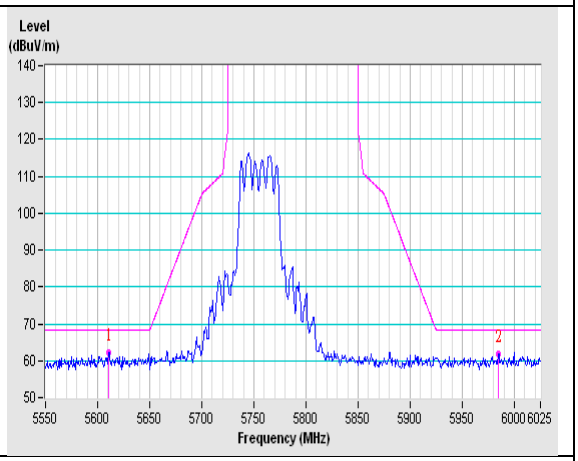
Horizontal	Vertical
	

CH165

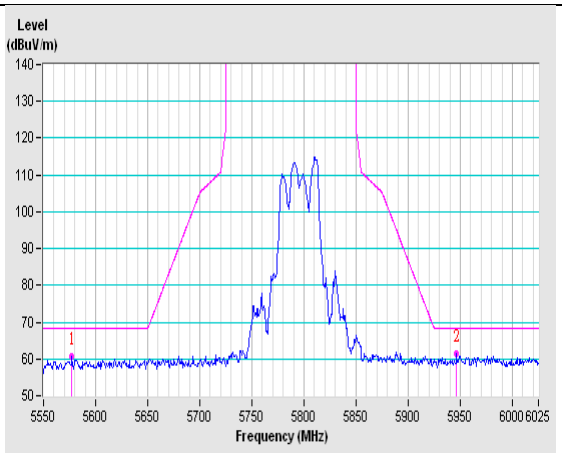
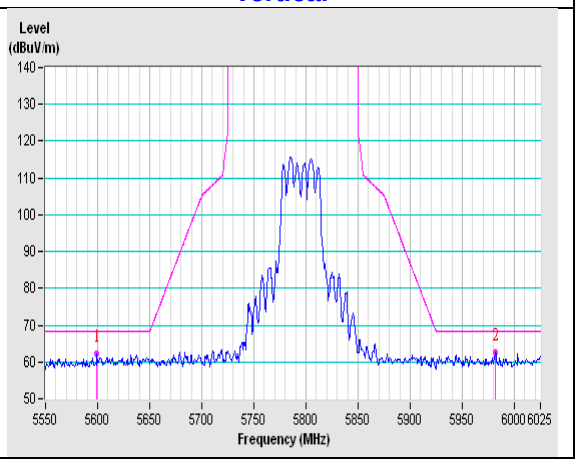
Horizontal	Vertical
	

802.11ac (VHT40)

CH151

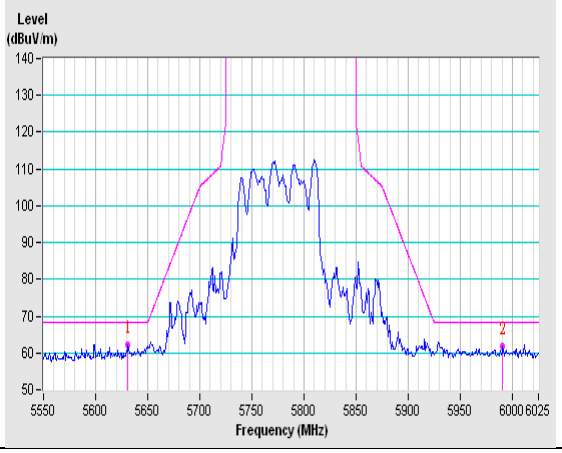
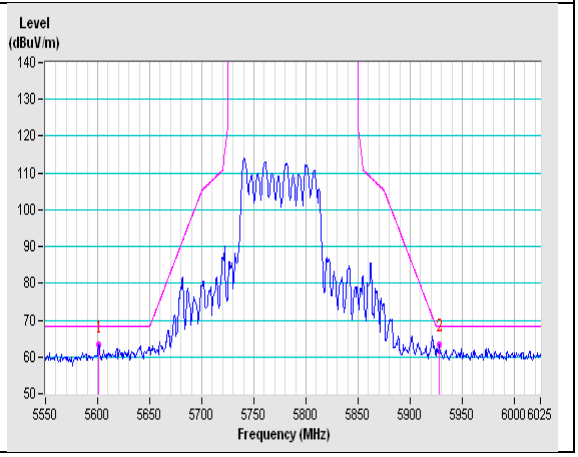
Horizontal	Vertical
	

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 according to ISO/IEC 17025.

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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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