

FCC Test Report (WLAN)

Report No.: RF170605E06A-1

FCC ID: M82-WISE3610

Model: WISE-3610XXXXXXXXXXXXXXXXXX
("x"=0-9, A-Z, a-z, dot, diagonal, hyphen or blank.)

Received Date: June 22, 2017

Test Date: June 29 to July 27, 2017

Issued Date: Sep. 14, 2017

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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Release Control Record

Issue No.	Description	Date Issued
RF170605E06A-1	Original release.	Sep. 14, 2017

1 Certificate of Conformity

Product: IoT Gateway

Brand: ADVANTECH

Model: WISE-3610XXXXXXXXXXXXXXXXXX
("x"=0-9, A-Z, a-z, dot, diagonal, hyphen or blank.)

Sample Status: ENGINEERING SAMPLE

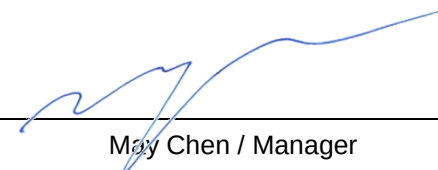
Applicant: ADVANTECH CO., LTD

Test Date: June 29 to July 27, 2017

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 :  , **Date:** Sep. 14, 2017
Claire Kuan / Specialist

Approved by :  , **Date:** Sep. 14, 2017
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 -14.29dB at 0.43906MHz.
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 -0.1dB at 5150.00MHz, 17235.00MHz and 17355.00MHz.
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	No antenna connector is used.

*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) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.30 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.16 dB
	6GHz ~ 18GHz	4.91 dB
	18GHz ~ 40GHz	5.30 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	IoT Gateway
Brand	ADVANTECH
Model	WISE-3610XXXXXXXXXXXXXXXXXX ("x"=0-9, A-Z, a-z, dot, diagonal, hyphen or blank.)
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 12V from adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode
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/g, 802.11n (HT20): 11 802.11n (HT40): 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 9 802.11n (HT40), 802.11ac (VHT40): 4 802.11ac (VHT80): 2
Output Power	2.4GHz: 825.237mW 5.18 ~ 5.24GHz: 632.462mW 5.745 ~ 5.825GHz: 934.079mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1

Note:

1. The EUT has below type, which are identical to each other in all aspects except for the following:

Brand	Model	Type	Difference
ADVANTECH	WISE-3610XXXXXXXXXXXXXXXXXX ("x"=0-9, A-Z, a-z, dot, diagonal, hyphen or blank.)	1	With 3G card : 1x WAN, 1x LAN, 1x RS232/422/485, LoRa (Module) + 3G (Telit HE-910D Module, 1x2, Rx diversity, certificated already) + Wi-Fi 2x2 IEEE 802.11a/b/g/n/ac (On board design)
		2	Without 3G card : 1x WAN, 1x LAN, 1x RS232/422/485, LoRa (Module) + Wi-Fi 2x2 IEEE 802.11a/b/g/n/ac (On board design)

Note:

- Type 1 was chosen for final test.
- From the above models, model: WISE-3610XXXXXXXXXXXXXXXXXX was selected as representative model for the test and its data was recorded in this report.

2. The EUT is a WLAN, WWAN, LTE and LoRa device.

3. Simultaneously transmission condition.

Condition	Technology			
1	WLAN 2.4GHz	WLAN 5GHz	WWAN (3G)	LoRa
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.				

4. The EUT must be supplied with a adapter as following table:

Brand	Model No.	Spec.
FSP	FSP036-RBBN2	AC Input: 100-240V, 1.2A, 50-60Hz DC Output: 12V, 3.0A DC Out put cable: Unshielded, 1.5m with one core

5. 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
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
5GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	2TX	2RX
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT20)	MCS0~8 Nss= 1	2TX	2RX
	MCS0~8 Nss= 2	2TX	2RX
802.11ac (VHT40)	MCS0~9 Nss= 1	2TX	2RX
	MCS0~9 Nss= 2	2TX	2RX
802.11ac (VHT80)	MCS0~9 Nss= 1	2TX	2RX
	MCS0~9 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)

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

For LoRa								
Antenna No	Brand	Model	Antenna Gain(dBi) without cable loss	Frequency	Antenna Type	Antenna Connector	Cable Loss(dB)	Cable Length (mm)
1	Cortec	AN0915-9207BSM	0.96	902~928 MHz	Dipole	Reverse SMA	0.5	160
2	Cortec	AN0915-9207BSM	0.96	902~928 MHz	Dipole	Reverse SMA	0.5	160
For WLAN								
Antenna No	Brand	Model	Antenna Gain(dBi) without cable loss	Frequency	Antenna Type	Antenna Connector	Cable Loss(dB)	Cable Length (mm)
3	Cortec	AN2450-92K01BRS	5.03	2400~2483.5 MHz	Dipole	Reverse SMA	0.5	180
			5.01	5150~5850 MHz	Dipole	Reverse SMA	0.8	180
For WWAN								
Antenna No	Brand	Model	Gain (dBi) <excluding cable loss>	Frequency	Antenna Type	Antenna Connector		
4	SINBON.	1750008424-01	-0.5	824~896 MHz	Dipole	SMA		
			-0.2	880~960 MHz				
			1.5	1427~1880 MHz				
			1.95	1850~1990 MHz				

7. The above EUT information is declared by manufacturer and for more detailed features description, please refer 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, 802.11n (HT20), 802.11ac (VHT20):

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

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

Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

FOR 5745 ~ 5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 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 802.11n (HT40), 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 $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

NOTE:

- The EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on **X-plane**.

Radiated Emission Test (Above 1GHz):

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

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)
802.11a	5180-5240 5745-5825	36 to 48 149 to 165	157	OFDM	BPSK	6

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)
802.11a	5180-5240 5745-5825	36 to 48 149 to 165	157	OFDM	BPSK	6

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	Tested By
RE $\geq$ 1G	24deg. C, 62%RH	120Vac, 60Hz	Jyunchun Lin
RE<1G	24deg. C, 68%RH	120Vac, 60Hz	Eason Tseng
PLC	24deg. C, 75%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

If duty cycle of test signal is < 98 %, duty factor shall be considered.

If duty cycle of test signal is < 98%, duty factor shall be considered.

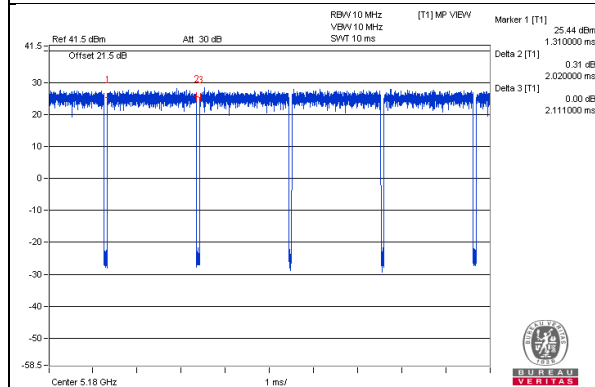
802.11a: Duty cycle = 2.02 ms / 2.111 ms = 0.957, Duty factor = $10 * \log(1/0.957) = 0.19$

802.11ac (VHT20): Duty cycle = 4.965 ms / 5.057 ms = 0.982

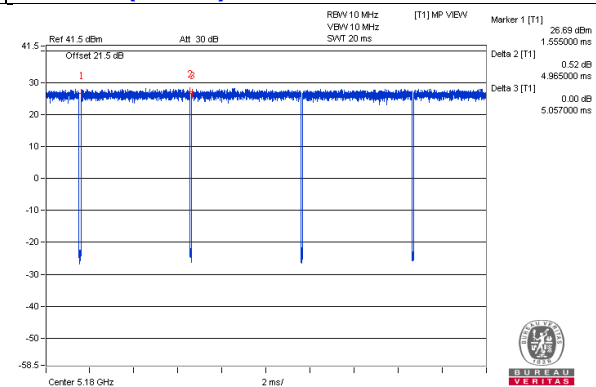
802.11ac (VHT40): Duty cycle = 2.409 ms / 2.496 ms = 0.965, Duty factor = $10 * \log(1/0.965) = 0.15$

802.11ac (VHT80): Duty cycle = 1.132 ms / 1.217 ms = 0.93, Duty factor = $10 * \log(1/0.93) = 0.31$

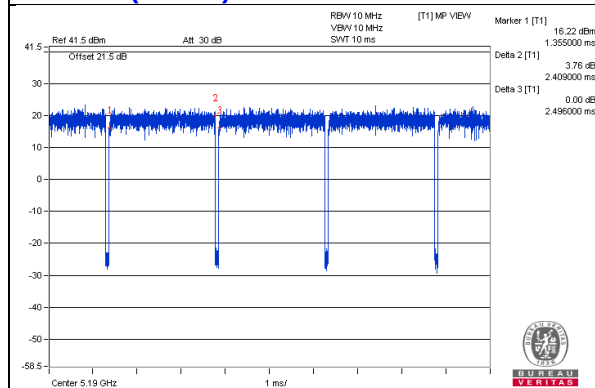
802.11a



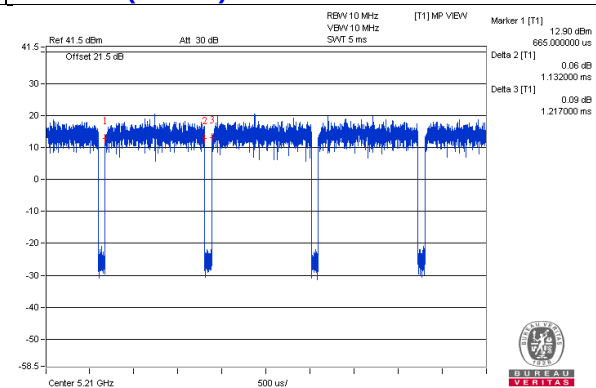
802.11ac (VHT20)



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.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
B.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab
C.	USB Disk 3.0	Transcend	16GB	NA	NA	Provided by Lab
D.	Sim Card	R&S	CRT-Z3	NA	NA	Provided by Lab

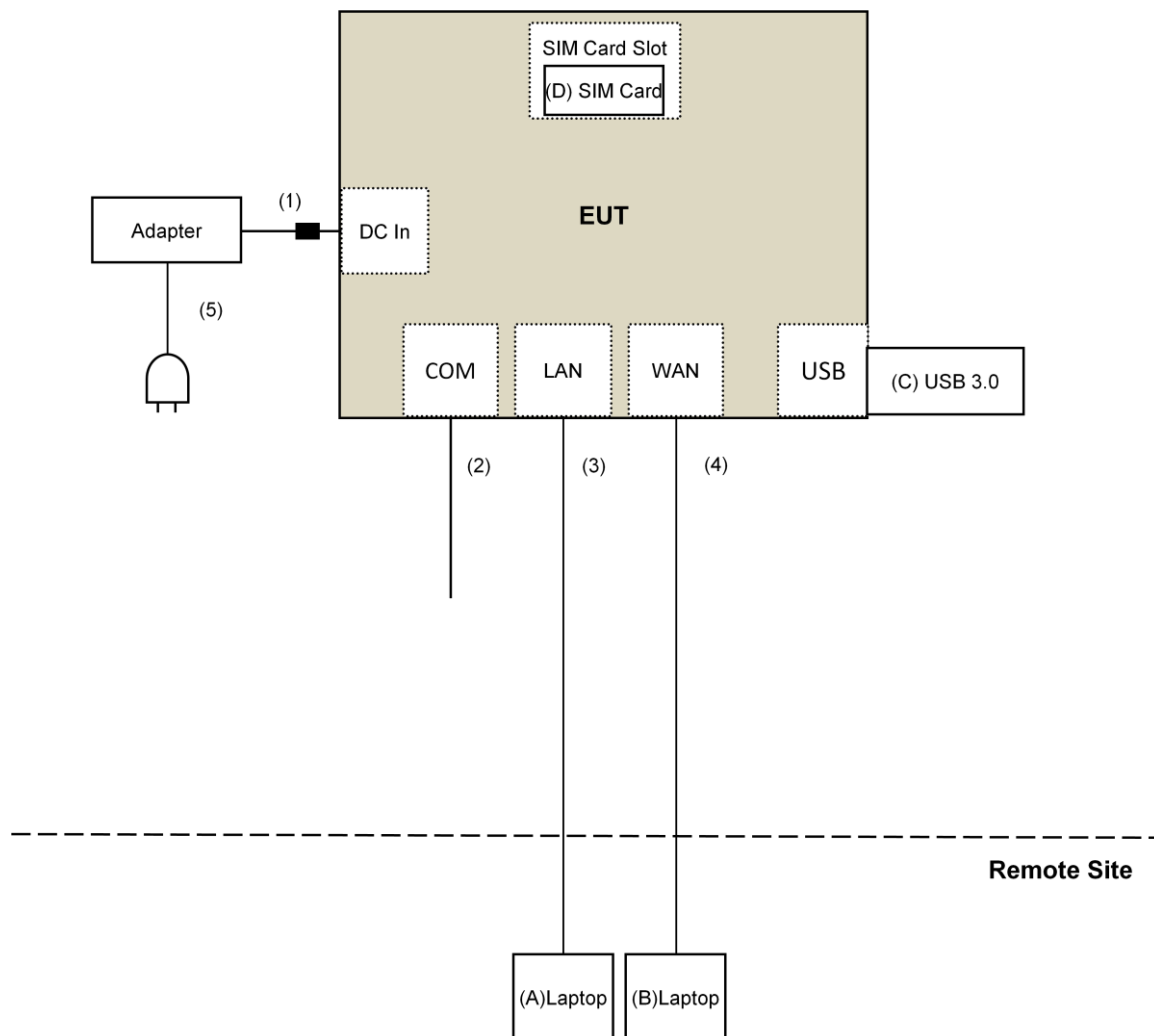
Note:

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.	DC Cable	1	1.5	No	1	Supplied by client
2.	Console Cable	1	1.6	No	0	Provided by Lab
3.	RJ-45 Cable	1	10	No	0	Provided by Lab
4.	RJ-45 Cable	1	10	No	0	Provided by Lab
5.	AC Cable	1	1.8	No	0	Supplied by client

Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test



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 v01r04

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2013

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 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

Applicable To			Limit	
789033 D02 General UNII Test Procedure New Rules v01r04			Field Strength at 3m	
			PK:74 (dBμV/m)	AV:54 (dBμV/m)
Frequency Band	Applicable To		EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)		PK:-27 (dBm/MHz)	PK:68.2(dBμV/m)
5250~5350 MHz	15.407(b)(2)			
5470~5725 MHz	15.407(b)(3)			
5725~5850 MHz	☒	15.407(b)(4)(i)	PK:-27 (dBm/MHz) ^{*1} PK:10 (dBm/MHz) ^{*2} PK:15.6 (dBm/MHz) ^{*3} PK:27 (dBm/MHz) ^{*4}	PK: 68.2(dBμV/m) ^{*1} PK:105.2 (dBμV/m) ^{*2} PK: 110.8(dBμV/m) ^{*3} PK:122.2 (dBμV/m) ^{*4}
	☐	15.407(b)(4)(ii)	Emission limits in section 15.247(d)	
^{*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.	

Note:

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

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

4.1.2 Test Instruments

For below 1GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 20, 2016	July 19, 2017
Pre-Amplifier ^(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna ^(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 17, 2017	Jan. 16, 2018
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 10, 2016	Nov. 09, 2017
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Dec. 13, 2016	Dec. 12, 2017
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. 05, 2016	Oct. 04, 2017
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208410	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. 4.
4. The FCC Site Registration No. is 292998
5. The CANADA Site Registration No. is 20331-2
6. Tested Date: June 30, 2017

For above 1GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test ReceiverKeysight	N9038A	MY54450088	July 08, 2017	July 07, 2018
Pre-Amplifier ^(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 27, 2016	Dec. 26, 2017
Pre-Amplifier EMCI	EMC12630SE	980385	Feb. 02, 2017	Feb. 01, 2018
RF Cable	EMC104-SM-SM-1 200 EMC104-SM-SM-2 000 EMC104-SM-SM-5 000	160923 150318 150321	Feb. 02, 2017 Mar. 29, 2017 Mar. 29, 2017	Feb. 01, 2018 Mar. 28, 2018 Mar. 28, 2018
Pre-Amplifier EMCI	EMC184045SE	980387	Feb. 02, 2017	Feb. 01, 2018
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 15, 2016	Dec. 14, 2017
RF Cable	SUCOFLEX 102	36432/2 36433/2	Jan. 15, 2017	Jan. 14, 2018
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
Spectrum Analyzer R&S	FSP40	100964	July 01, 2017	June 30, 2018
Power meter Anritsu	ML2495A	MY48250253	Dec. 21, 2016	Dec. 20, 2017
Power sensor Anritsu	MA2411B	1014008	May 11, 2017	May 10, 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: July 26 to 27, 2017.

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. Both X and Y axes of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

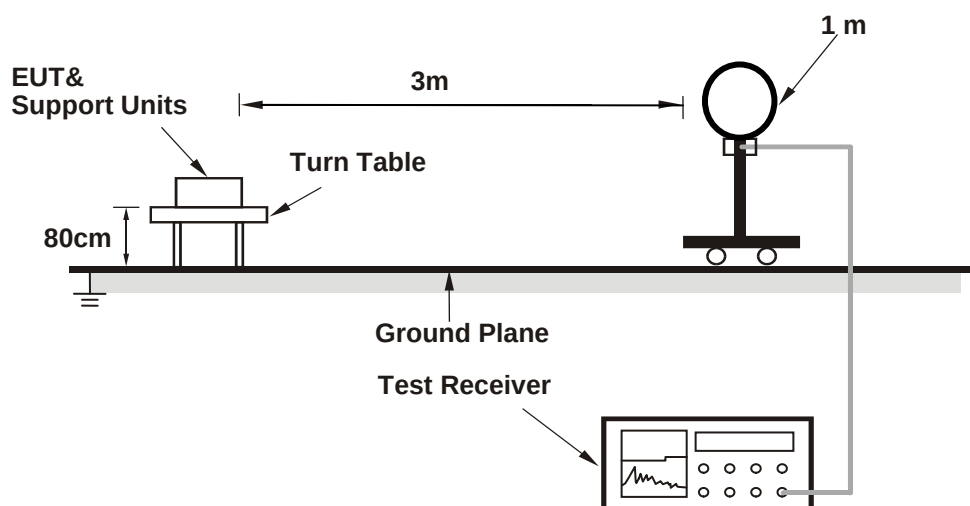
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) 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

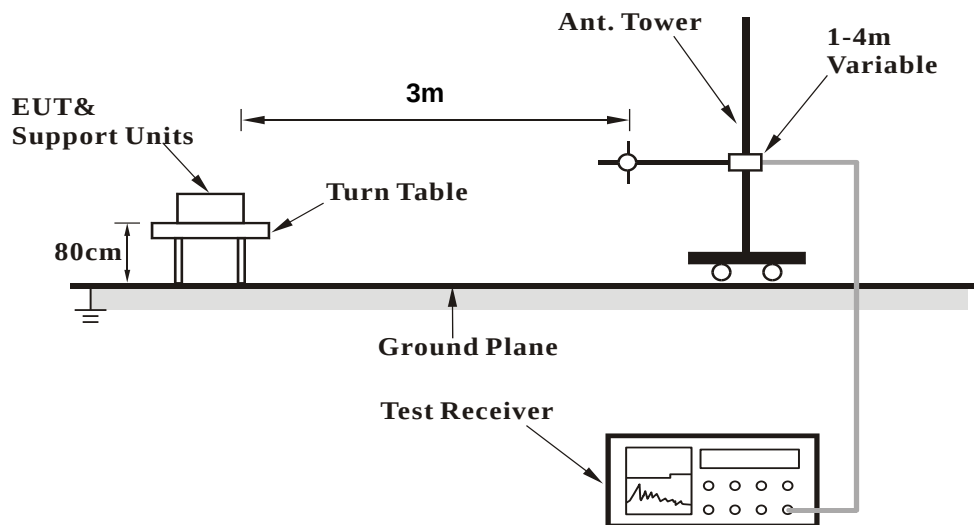
No deviation.

4.1.5 Test Setup

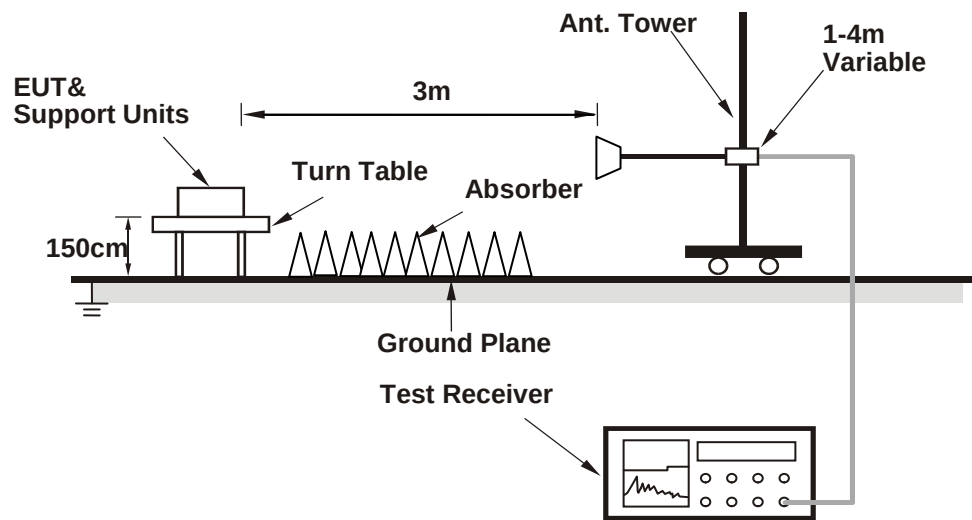
For Radiated emission below 30MHz



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

- Connected the EUT with the Laptop which is placed on remote site.
- Controlling software (QDART_CONN.WIN.1.0 Installer-00039.1) 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)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	1.43 H	358	58.9	4.0
2	5150.00	44.2 AV	54.0	-9.8	1.43 H	358	40.2	4.0
3	*5180.00	105.9 PK			1.43 H	358	101.9	4.0
4	*5180.00	95.5 AV			1.43 H	358	91.5	4.0
5	#10360.00	48.6 PK	74.0	-25.4	1.36 H	264	35.0	13.6
6	#10360.00	36.1 AV	54.0	-17.9	1.36 H	264	22.5	13.6
7	15540.00	49.2 PK	74.0	-24.8	1.34 H	217	36.0	13.2
8	15540.00	36.9 AV	54.0	-17.1	1.34 H	217	23.7	13.2
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	5150.00	72.6 PK	74.0	-1.4	1.90 V	350	68.6	4.0
2	5150.00	53.9 AV	54.0	-0.1	1.90 V	350	49.9	4.0
3	*5180.00	117.3 PK			1.90 V	350	113.3	4.0
4	*5180.00	106.3 AV			1.90 V	350	102.3	4.0
5	#10360.00	49.1 PK	74.0	-24.9	1.62 V	26	35.5	13.6
6	#10360.00	36.9 AV	54.0	-17.1	1.62 V	26	23.3	13.6
7	15540.00	47.2 PK	74.0	-26.8	1.50 V	167	34.0	13.2
8	15540.00	35.3 AV	54.0	-18.7	1.50 V	167	22.1	13.2

REMARKS:

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

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

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	61.1 PK	74.0	-12.9	1.39 H	345	57.1	4.0
2	5150.00	44.3 AV	54.0	-9.7	1.39 H	345	40.3	4.0
3	*5200.00	107.8 PK			1.39 H	345	103.8	4.0
4	*5200.00	97.8 AV			1.39 H	345	93.8	4.0
5	#10400.00	49.2 PK	74.0	-24.8	1.32 H	251	35.6	13.6
6	#10400.00	37.1 AV	54.0	-16.9	1.32 H	251	23.5	13.6
7	15600.00	50.2 PK	74.0	-23.8	1.37 H	208	36.8	13.4
8	15600.00	37.5 AV	54.0	-16.5	1.37 H	208	24.1	13.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	68.1 PK	74.0	-5.9	1.90 V	251	64.1	4.0
2	5150.00	51.2 AV	54.0	-2.8	1.90 V	251	47.2	4.0
3	*5200.00	117.8 PK			1.90 V	251	113.8	4.0
4	*5200.00	106.9 AV			1.90 V	251	102.9	4.0
5	#10400.00	49.9 PK	74.0	-24.1	1.60 V	20	36.3	13.6
6	#10400.00	37.9 AV	54.0	-16.1	1.60 V	20	24.3	13.6
7	15600.00	47.4 PK	74.0	-26.6	1.50 V	180	34.0	13.4
8	15600.00	35.2 AV	54.0	-18.8	1.50 V	180	21.8	13.4

REMARKS:

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

CHANNEL	TX Channel 48	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	107.5 PK			1.37 H	343	103.3	4.2
2	*5240.00	97.2 AV			1.37 H	343	93.0	4.2
3	5350.00	50.7 PK	74.0	-23.3	1.37 H	343	46.3	4.4
4	5350.00	37.5 AV	54.0	-16.5	1.37 H	343	33.1	4.4
5	#10480.00	49.1 PK	74.0	-24.9	1.34 H	253	35.4	13.7
6	#10480.00	36.9 AV	54.0	-17.1	1.34 H	253	23.2	13.7
7	15720.00	49.6 PK	74.0	-24.4	1.43 H	220	35.6	14.0
8	15720.00	37.2 AV	54.0	-16.8	1.43 H	220	23.2	14.0
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	*5240.00	118.7 PK			1.90 V	349	114.5	4.2
2	*5240.00	107.8 AV			1.90 V	349	103.6	4.2
3	5350.00	58.1 PK	74.0	-15.9	1.90 V	349	53.7	4.4
4	5350.00	41.5 AV	54.0	-12.5	1.90 V	349	37.1	4.4
5	#10480.00	49.8 PK	74.0	-24.2	1.62 V	17	36.1	13.7
6	#10480.00	37.5 AV	54.0	-16.5	1.62 V	17	23.8	13.7
7	15720.00	47.3 PK	74.0	-26.7	1.54 V	190	33.3	14.0
8	15720.00	35.1 AV	54.0	-18.9	1.54 V	190	21.1	14.0

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 149	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	#5568.05	58.1 PK	68.2	-10.1	3.55 H	56	53.5	4.6
2	*5745.00	111.0 PK			3.55 H	56	106.0	5.0
3	*5745.00	100.0 AV			3.55 H	56	95.0	5.0
4	#5977.50	58.9 PK	68.2	-9.3	3.55 H	56	53.4	5.5
5	11490.00	53.8 PK	74.0	-20.2	1.47 H	176	39.7	14.1
6	11490.00	41.6 AV	54.0	-12.4	1.47 H	176	27.5	14.1
7	#17235.00	68.2 PK	74.0	-5.8	1.64 H	178	49.9	18.3
8	#17235.00	53.7 AV	54.0	-0.3	1.64 H	178	35.4	18.3
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	#5639.77	58.7 PK	68.2	-9.5	1.90 V	184	53.9	4.8
2	*5745.00	121.4 PK			1.90 V	184	116.4	5.0
3	*5745.00	110.0 AV			1.90 V	184	105.0	5.0
4	#5945.20	59.2 PK	68.2	-9.0	1.90 V	184	53.8	5.4
5	11490.00	54.0 PK	74.0	-20.0	1.56 V	192	39.9	14.1
6	11490.00	40.8 AV	54.0	-13.2	1.56 V	192	26.7	14.1
7	#17235.00	61.0 PK	74.0	-13.0	2.73 V	167	42.7	18.3
8	#17235.00	47.8 AV	54.0	-6.2	2.73 V	167	29.5	18.3

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 157	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	#5633.60	58.2 PK	68.2	-10.0	3.55 H	124	53.4	4.8
2	*5785.00	112.3 PK			3.55 H	124	107.3	5.0
3	*5785.00	101.3 AV			3.55 H	124	96.3	5.0
4	#5933.32	59.3 PK	68.2	-8.9	3.55 H	124	53.9	5.4
5	11570.00	53.2 PK	74.0	-20.8	2.10 H	174	39.2	14.0
6	11570.00	40.6 AV	54.0	-13.4	2.10 H	174	26.6	14.0
7	#17355.00	67.8 PK	74.0	-6.2	2.30 H	177	48.9	18.9
8	#17355.00	53.9 AV	54.0	-0.1	2.30 H	177	35.0	18.9
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	#5616.02	58.7 PK	68.2	-9.5	1.90 V	184	54.0	4.7
2	*5785.00	122.5 PK			1.90 V	184	117.5	5.0
3	*5785.00	111.0 AV			1.90 V	184	106.0	5.0
4	#5968.95	58.8 PK	68.2	-9.4	1.90 V	184	53.3	5.5
5	11570.00	54.3 PK	74.0	-19.7	1.50 V	193	40.3	14.0
6	11570.00	41.3 AV	54.0	-12.7	1.50 V	193	27.3	14.0
7	#17355.00	60.8 PK	74.0	-13.2	2.77 V	171	41.9	18.9
8	#17355.00	47.6 AV	54.0	-6.4	2.77 V	171	28.7	18.9

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

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	#5577.07	57.8 PK	68.2	-10.4	2.66 H	122	53.2	4.6
2	*5825.00	113.3 PK			2.66 H	122	108.1	5.2
3	*5825.00	102.0 AV			2.66 H	122	96.8	5.2
4	#6003.62	58.3 PK	68.2	-9.9	2.66 H	122	52.7	5.6
5	11650.00	55.9 PK	74.0	-18.1	2.10 H	178	41.8	14.1
6	11650.00	42.7 AV	54.0	-11.3	2.10 H	178	28.6	14.1
7	#17475.00	67.1 PK	74.0	-6.9	2.32 H	169	47.4	19.7
8	#17475.00	53.5 AV	54.0	-0.5	2.32 H	169	33.8	19.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5624.57	58.5 PK	68.2	-9.7	1.90 V	185	53.8	4.7
2	*5825.00	123.0 PK			1.90 V	185	117.8	5.2
3	*5825.00	112.6 AV			1.90 V	185	107.4	5.2
4	#5939.02	60.1 PK	68.2	-8.1	1.90 V	185	54.7	5.4
5	11650.00	54.4 PK	74.0	-19.6	1.59 V	199	40.3	14.1
6	11650.00	41.2 AV	54.0	-12.8	1.59 V	199	27.1	14.1
7	#17475.00	61.2 PK	74.0	-12.8	2.69 V	181	41.5	19.7
8	#17475.00	48.3 AV	54.0	-5.7	2.69 V	181	28.6	19.7

REMARKS:

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

802.11ac (VHT20)

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	63.5 PK	74.0	-10.5	1.41 H	354	59.5	4.0
2	5150.00	44.7 AV	54.0	-9.3	1.41 H	354	40.7	4.0
3	*5180.00	106.7 PK			1.41 H	354	102.7	4.0
4	*5180.00	96.9 AV			1.41 H	354	92.9	4.0
5	#10360.00	47.4 PK	74.0	-26.6	1.39 H	240	33.8	13.6
6	#10360.00	35.8 AV	54.0	-18.2	1.39 H	240	22.2	13.6
7	15540.00	49.0 PK	74.0	-25.0	1.29 H	223	35.8	13.2
8	15540.00	37.1 AV	54.0	-16.9	1.29 H	223	23.9	13.2
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	5150.00	71.9 PK	74.0	-2.1	1.90 V	257	67.9	4.0
2	5150.00	53.9 AV	54.0	-0.1	1.90 V	257	49.9	4.0
3	*5180.00	117.9 PK			1.90 V	257	113.9	4.0
4	*5180.00	107.7 AV			1.90 V	257	103.7	4.0
5	#10360.00	48.8 PK	74.0	-25.2	1.65 V	26	35.2	13.6
6	#10360.00	37.1 AV	54.0	-16.9	1.65 V	26	23.5	13.6
7	15540.00	47.4 PK	74.0	-26.6	1.48 V	181	34.2	13.2
8	15540.00	35.7 AV	54.0	-18.3	1.48 V	181	22.5	13.2

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	64.4 PK	74.0	-9.6	1.46 H	356	60.4	4.0
2	5150.00	44.8 AV	54.0	-9.2	1.46 H	356	40.8	4.0
3	*5200.00	106.9 PK			1.46 H	356	102.9	4.0
4	*5200.00	97.4 AV			1.46 H	356	93.4	4.0
5	#10400.00	49.2 PK	74.0	-24.8	1.29 H	255	35.6	13.6
6	#10400.00	37.3 AV	54.0	-16.7	1.29 H	255	23.7	13.6
7	15600.00	50.2 PK	74.0	-23.8	1.39 H	204	36.8	13.4
8	15600.00	37.3 AV	54.0	-16.7	1.39 H	204	23.9	13.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	69.4 PK	74.0	-4.6	1.90 V	251	65.4	4.0
2	5150.00	50.2 AV	54.0	-3.8	1.90 V	251	46.2	4.0
3	*5200.00	118.5 PK			1.90 V	251	114.5	4.0
4	*5200.00	108.0 AV			1.90 V	251	104.0	4.0
5	#10400.00	49.9 PK	74.0	-24.1	1.58 V	5	36.3	13.6
6	#10400.00	37.9 AV	54.0	-16.1	1.58 V	5	24.3	13.6
7	15600.00	47.0 PK	74.0	-27.0	1.54 V	186	33.6	13.4
8	15600.00	35.5 AV	54.0	-18.5	1.54 V	186	22.1	13.4

REMARKS:

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

CHANNEL	TX Channel 48	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	107.6 PK			1.44 H	351	103.4	4.2
2	*5240.00	97.5 AV			1.44 H	351	93.3	4.2
3	5350.00	50.2 PK	74.0	-23.8	1.44 H	351	45.8	4.4
4	5350.00	37.2 AV	54.0	-16.8	1.44 H	351	32.8	4.4
5	#10480.00	48.8 PK	74.0	-25.2	1.32 H	240	35.1	13.7
6	#10480.00	36.8 AV	54.0	-17.2	1.32 H	240	23.1	13.7
7	15720.00	48.9 PK	74.0	-25.1	1.43 H	226	34.9	14.0
8	15720.00	36.8 AV	54.0	-17.2	1.43 H	226	22.8	14.0
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	*5240.00	118.7 PK			1.90 V	246	114.5	4.2
2	*5240.00	108.3 AV			1.90 V	246	104.1	4.2
3	5350.00	54.5 PK	74.0	-19.5	1.90 V	246	50.1	4.4
4	5350.00	41.2 AV	54.0	-12.8	1.90 V	246	36.8	4.4
5	#10480.00	49.2 PK	74.0	-24.8	1.63 V	29	35.5	13.7
6	#10480.00	37.3 AV	54.0	-16.7	1.63 V	29	23.6	13.7
7	15720.00	47.8 PK	74.0	-26.2	1.59 V	174	33.8	14.0
8	15720.00	35.5 AV	54.0	-18.5	1.59 V	174	21.5	14.0

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 149	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	#5647.37	58.5 PK	68.2	-9.7	3.70 H	113	53.7	4.8
2	*5745.00	112.0 PK			3.70 H	111	107.0	5.0
3	*5745.00	101.6 AV			3.70 H	111	96.6	5.0
4	#5957.55	58.5 PK	68.2	-9.7	3.70 H	113	53.0	5.5
5	11490.00	53.6 PK	74.0	-20.4	1.44 H	183	39.5	14.1
6	11490.00	41.5 AV	54.0	-12.5	1.44 H	183	27.4	14.1
7	#17235.00	68.6 PK	74.0	-5.4	2.10 H	172	50.3	18.3
8	#17235.00	53.9 AV	54.0	-0.1	2.10 H	172	35.6	18.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5634.07	58.9 PK	68.2	-9.3	1.93 V	185	54.1	4.8
2	*5745.00	121.0 PK			1.93 V	185	116.0	5.0
3	*5745.00	110.5 AV			1.93 V	185	105.5	5.0
4	#5965.62	59.5 PK	68.2	-8.7	1.93 V	185	54.0	5.5
5	11490.00	54.2 PK	74.0	-19.8	1.54 V	195	40.1	14.1
6	11490.00	41.0 AV	54.0	-13.0	1.54 V	195	26.9	14.1
7	#17235.00	60.7 PK	74.0	-13.3	2.72 V	169	42.4	18.3
8	#17235.00	47.6 AV	54.0	-6.4	2.72 V	169	29.3	18.3

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 157	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5631.23	58.7 PK	68.2	-9.5	3.17 H	122	53.9	4.8
2	*5785.00	112.4 PK			3.17 H	122	107.4	5.0
3	*5785.00	101.5 AV			3.17 H	122	96.5	5.0
4	#5928.10	58.6 PK	68.2	-9.6	3.17 H	122	53.2	5.4
5	11570.00	53.7 PK	74.0	-20.3	1.52 H	163	39.7	14.0
6	11570.00	41.6 AV	54.0	-12.4	1.52 H	163	27.6	14.0
7	#17355.00	68.0 PK	74.0	-6.0	2.25 H	172	49.1	18.9
8	#17355.00	53.5 AV	54.0	-0.5	2.25 H	172	34.6	18.9

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	#5647.85	58.2 PK	68.2	-10.0	1.90 V	185	53.4	4.8
2	*5785.00	122.0 PK			1.93 V	185	117.0	5.0
3	*5785.00	111.0 AV			1.93 V	185	106.0	5.0
4	#5952.32	59.5 PK	68.2	-8.7	1.90 V	185	54.1	5.4
5	11570.00	53.9 PK	74.0	-20.1	1.61 V	181	39.9	14.0
6	11570.00	40.8 AV	54.0	-13.2	1.61 V	181	26.8	14.0
7	#17355.00	61.1 PK	74.0	-12.9	2.70 V	165	42.2	18.9
8	#17355.00	47.8 AV	54.0	-6.2	2.70 V	165	28.9	18.9

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

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	#5619.35	60.5 PK	68.2	-7.7	2.64 H	124	55.8	4.7
2	*5825.00	113.5 PK			2.64 H	124	108.3	5.2
3	*5825.00	102.3 AV			2.64 H	124	97.1	5.2
4	#5929.52	61.3 PK	68.2	-6.9	2.64 H	124	55.9	5.4
5	11650.00	53.7 PK	74.0	-20.3	1.52 H	165	39.6	14.1
6	11650.00	41.7 AV	54.0	-12.3	1.52 H	165	27.6	14.1
7	#17475.00	67.6 PK	74.0	-6.4	2.28 H	171	47.9	19.7
8	#17475.00	53.4 AV	54.0	-0.6	2.28 H	171	33.7	19.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5636.45	58.7 PK	68.2	-9.5	1.90 V	185	53.9	4.8
2	*5825.00	122.4 PK			1.90 V	184	117.2	5.2
3	*5825.00	112.0 AV			1.90 V	184	106.8	5.2
4	#5925.73	64.0 PK	68.2	-4.2	1.90 V	185	58.6	5.4
5	11650.00	53.7 PK	74.0	-20.3	1.53 V	201	39.6	14.1
6	11650.00	40.8 AV	54.0	-13.2	1.53 V	201	26.7	14.1
7	#17475.00	60.6 PK	74.0	-13.4	2.78 V	174	40.9	19.7
8	#17475.00	47.3 AV	54.0	-6.7	2.78 V	174	27.6	19.7

REMARKS:

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

802.11ac (VHT40)

CHANNEL	TX Channel 38	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	61.5 PK	74.0	-12.5	1.44 H	339	57.5	4.0
2	5150.00	44.3 AV	54.0	-9.7	1.44 H	339	40.3	4.0
3	*5190.00	103.3 PK			1.44 H	339	99.3	4.0
4	*5190.00	93.8 AV			1.44 H	339	89.8	4.0
5	5350.00	50.3 PK	74.0	-23.7	1.44 H	339	45.9	4.4
6	5350.00	37.5 AV	54.0	-16.5	1.44 H	339	33.1	4.4
7	#10380.00	46.9 PK	74.0	-27.1	1.30 H	240	33.3	13.6
8	#10380.00	34.6 AV	54.0	-19.4	1.30 H	240	21.0	13.6
9	15570.00	48.7 PK	74.0	-25.3	1.41 H	212	35.4	13.3
10	15570.00	35.9 AV	54.0	-18.1	1.41 H	212	22.6	13.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	67.2 PK	74.0	-6.8	1.90 V	246	63.2	4.0
2	5150.00	53.5 AV	54.0	-0.5	1.90 V	246	49.5	4.0
3	*5190.00	111.5 PK			1.90 V	246	107.5	4.0
4	*5190.00	102.3 AV			1.90 V	246	98.3	4.0
5	5350.00	54.5 PK	74.0	-19.5	1.90 V	246	50.1	4.4
6	5350.00	43.0 AV	54.0	-11.0	1.90 V	246	38.6	4.4
7	#10380.00	47.2 PK	74.0	-26.8	1.55 V	21	33.6	13.6
8	#10380.00	34.8 AV	54.0	-19.2	1.55 V	21	21.2	13.6
9	15570.00	48.2 PK	74.0	-25.8	1.43 V	176	34.9	13.3
10	15570.00	35.7 AV	54.0	-18.3	1.43 V	176	22.4	13.3

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	60.5 PK	74.0	-13.5	1.48 H	336	56.5	4.0
2	5150.00	44.1 AV	54.0	-9.9	1.48 H	336	40.1	4.0
3	*5230.00	99.3 PK			1.48 H	336	95.1	4.2
4	*5230.00	90.1 AV			1.48 H	336	85.9	4.2
5	5350.00	51.3 PK	74.0	-22.7	1.48 H	336	46.9	4.4
6	5350.00	37.2 AV	54.0	-16.8	1.48 H	336	32.8	4.4
7	#10460.00	47.8 PK	74.0	-26.2	1.36 H	228	34.1	13.7
8	#10460.00	35.7 AV	54.0	-18.3	1.36 H	228	22.0	13.7
9	15690.00	49.6 PK	74.0	-24.4	1.42 H	236	35.6	14.0
10	15690.00	37.3 AV	54.0	-16.7	1.42 H	236	23.3	14.0

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	68.9 PK	74.0	-5.1	1.90 V	246	64.9	4.0
2	5150.00	53.9 AV	54.0	-0.1	1.90 V	246	49.9	4.0
3	*5230.00	115.5 PK			1.90 V	246	111.3	4.2
4	*5230.00	106.0 AV			1.90 V	246	101.8	4.2
5	5350.00	57.2 PK	74.0	-16.8	1.90 V	246	52.8	4.4
6	5350.00	44.2 AV	54.0	-9.8	1.90 V	246	39.8	4.4
7	#10460.00	48.6 PK	74.0	-25.4	1.61 V	21	34.9	13.7
8	#10460.00	36.5 AV	54.0	-17.5	1.61 V	21	22.8	13.7
9	15690.00	48.0 PK	74.0	-26.0	1.60 V	163	34.0	14.0
10	15690.00	35.7 AV	54.0	-18.3	1.60 V	163	21.7	14.0

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 151	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5629.32	59.5 PK	68.2	-8.7	2.44 H	128	54.7	4.8
2	*5755.00	107.4 PK			2.44 H	128	102.4	5.0
3	*5755.00	97.6 AV			2.44 H	128	92.6	5.0
4	#6022.15	59.4 PK	68.2	-8.8	2.44 H	128	53.7	5.7
5	11510.00	51.7 PK	74.0	-22.3	1.39 H	183	37.7	14.0
6	11510.00	39.6 AV	54.0	-14.4	1.39 H	183	25.6	14.0
7	#17265.00	66.5 PK	74.0	-7.5	2.08 H	178	48.0	18.5
8	#17265.00	52.1 AV	54.0	-1.9	2.08 H	178	33.6	18.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5651.65	69.2 PK	69.4	-0.2	1.90 V	184	64.5	4.7
2	*5755.00	120.2 PK			1.90 V	184	115.2	5.0
3	*5755.00	110.2 AV			1.90 V	184	105.2	5.0
4	#5932.85	60.8 PK	68.2	-7.4	1.90 V	184	55.4	5.4
5	11510.00	51.5 PK	74.0	-22.5	1.50 V	183	37.5	14.0
6	11510.00	39.2 AV	54.0	-14.8	1.50 V	183	25.2	14.0
7	#17265.00	58.5 PK	74.0	-15.5	2.69 V	173	40.0	18.5
8	#17265.00	45.3 AV	54.0	-8.7	2.69 V	173	26.8	18.5

REMARKS:

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

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

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	#5554.27	58.0 PK	68.2	-10.2	2.44 H	125	53.5	4.5
2	*5795.00	109.2 PK			2.44 H	125	104.1	5.1
3	*5795.00	99.1 AV			2.44 H	125	94.0	5.1
4	#5929.52	60.8 PK	68.2	-7.4	2.44 H	125	55.4	5.4
5	11590.00	53.4 PK	74.0	-20.6	1.47 H	174	39.4	14.0
6	11590.00	41.4 AV	54.0	-12.6	1.47 H	174	27.4	14.0
7	#17385.00	67.1 PK	74.0	-6.9	2.34 H	161	48.0	19.1
8	#17385.00	53.0 AV	54.0	-1.0	2.34 H	161	33.9	19.1
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	#5649.27	65.1 PK	68.2	-3.1	1.87 V	188	60.3	4.8
2	*5795.00	121.2 PK			1.87 V	188	116.1	5.1
3	*5795.00	111.0 AV			1.87 V	188	105.9	5.1
4	#5941.40	67.8 PK	68.2	-0.4	1.87 V	188	62.4	5.4
5	11590.00	53.2 PK	74.0	-20.8	1.49 V	210	39.2	14.0
6	11590.00	40.2 AV	54.0	-13.8	1.49 V	210	26.2	14.0
7	#17385.00	59.4 PK	74.0	-14.6	2.78 V	184	40.3	19.1
8	#17385.00	46.3 AV	54.0	-7.7	2.78 V	184	27.2	19.1

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.

802.11ac (VHT80)

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

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	61.1 PK	74.0	-12.9	1.47 H	335	57.1	4.0
2	5150.00	44.6 AV	54.0	-9.4	1.47 H	335	40.6	4.0
3	*5210.00	97.2 PK			1.47 H	335	93.1	4.1
4	*5210.00	87.5 AV			1.47 H	335	83.4	4.1
5	5350.00	51.3 PK	74.0	-22.7	1.47 H	335	46.9	4.4
6	5350.00	37.2 AV	54.0	-16.8	1.47 H	335	32.8	4.4
7	#10420.00	46.8 PK	74.0	-27.2	1.24 H	248	33.2	13.6
8	#10420.00	34.3 AV	54.0	-19.7	1.24 H	248	20.7	13.6
9	15630.00	48.1 PK	74.0	-25.9	1.43 H	214	34.5	13.6
10	15630.00	35.5 AV	54.0	-18.5	1.43 H	214	21.9	13.6
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	66.6 PK	74.0	-7.4	1.90 V	246	62.6	4.0
2	5150.00	53.9 AV	54.0	-0.1	1.90 V	246	49.9	4.0
3	*5210.00	110.1 PK			1.90 V	246	106.0	4.1
4	*5210.00	100.0 AV			1.90 V	246	95.9	4.1
5	5350.00	54.9 PK	74.0	-19.1	1.90 V	246	50.5	4.4
6	5350.00	40.5 AV	54.0	-13.5	1.90 V	246	36.1	4.4
7	#10420.00	46.7 PK	74.0	-27.3	1.51 V	33	33.1	13.6
8	#10420.00	34.4 AV	54.0	-19.6	1.51 V	33	20.8	13.6
9	15630.00	48.2 PK	74.0	-25.8	1.48 V	173	34.6	13.6
10	15630.00	35.8 AV	54.0	-18.2	1.48 V	173	22.2	13.6

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
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

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	#5633.60	58.7 PK	68.2	-9.5	2.44 H	128	53.9	4.8
2	*5775.00	101.0 PK			2.44 H	128	96.0	5.0
3	*5775.00	91.0 AV			2.44 H	128	86.0	5.0
4	#5960.87	58.5 PK	68.2	-9.7	2.44 H	128	53.0	5.5
5	11550.00	50.2 PK	74.0	-23.8	1.35 H	189	36.2	14.0
6	11550.00	38.1 AV	54.0	-15.9	1.35 H	189	24.1	14.0
7	#17325.00	63.7 PK	74.0	-10.3	2.06 H	192	45.1	18.6
8	#17325.00	49.3 AV	54.0	-4.7	2.06 H	192	30.7	18.6
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	#5654.98	71.7 PK	71.9	-0.2	1.90 V	186	67.0	4.7
2	*5775.00	112.8 PK			1.90 V	186	107.8	5.0
3	*5775.00	102.5 AV			1.90 V	186	97.5	5.0
4	#5932.85	65.7 PK	68.2	-2.5	1.90 V	186	60.3	5.4
5	11550.00	49.8 PK	74.0	-24.2	1.46 V	188	35.8	14.0
6	11550.00	37.5 AV	54.0	-16.5	1.46 V	188	23.5	14.0
7	#17325.00	55.6 PK	74.0	-18.4	2.64 V	180	37.0	18.6
8	#17325.00	42.8 AV	54.0	-11.2	2.64 V	180	24.2	18.6

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
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

BELOW 1GHz WORST-CASE DATA

802.11a

CHANNEL	TX Channel 157	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	63.37	31.4 QP	40.0	-8.6	2.00 H	23	40.2	-8.8
2	142.35	34.5 QP	43.5	-9.0	2.00 H	109	42.6	-8.1
3	191.58	35.3 QP	43.5	-8.2	1.50 H	35	46.3	-11.0
4	341.66	34.5 QP	46.0	-11.5	1.00 H	355	41.1	-6.6
5	672.02	42.6 QP	46.0	-3.4	2.50 H	41	42.2	0.4
6	811.34	35.4 QP	46.0	-10.6	1.00 H	146	32.8	2.6
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	34.20	35.7 QP	40.0	-4.3	3.00 V	150	44.5	-8.8
2	63.37	30.7 QP	40.0	-9.3	2.50 V	2	39.5	-8.8
3	142.18	30.8 QP	43.5	-12.7	1.00 V	42	38.9	-8.1
4	191.48	34.9 QP	43.5	-8.6	1.00 V	237	45.9	-11.0
5	672.07	38.3 QP	46.0	-7.7	3.00 V	360	37.9	0.4
6	811.84	40.1 QP	46.0	-5.9	1.00 V	21	37.5	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.	Date Of Calibration	Due Date Of Calibration
Test Receiver R&S	ESCS 30	847124/029	Oct. 24, 2016	Oct. 23, 2017
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 26, 2016	Oct. 25, 2017
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 03, 2017	June 02, 2018
50 ohms Terminator	N/A	EMC-02	Sep. 29, 2016	Sep. 28, 2017
RF Cable	5D-FB	COCCAB-001	Sep. 30, 2016	Sep. 29, 2017
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 Shielded Room No. 1.
3. Tested Date: July 18, 2017.

4.2.3 Test Procedure

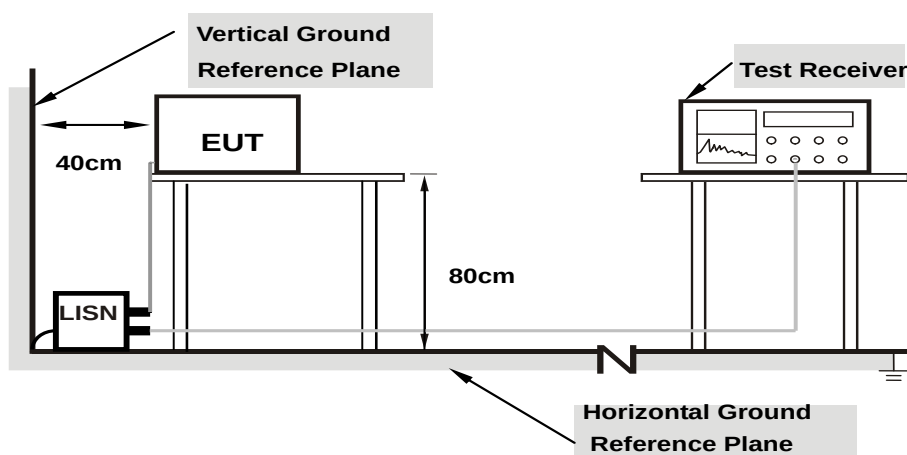
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

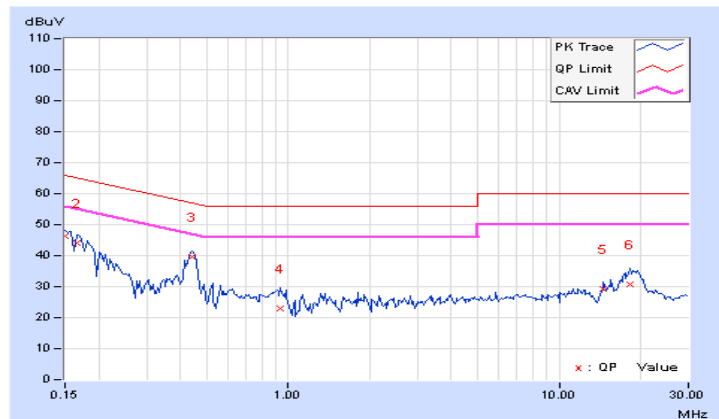
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.07	36.29	20.29	46.36	30.36	66.00	56.00	-19.64	-25.64
2	0.16562	10.07	34.01	18.48	44.08	28.55	65.18	55.18	-21.10	-26.63
3	0.43906	10.11	29.46	22.68	39.57	32.79	57.08	47.08	-17.51	-14.29
4	0.93906	10.14	12.69	7.86	22.83	18.00	56.00	46.00	-33.17	-28.00
5	14.53516	10.93	18.25	16.30	29.18	27.23	60.00	50.00	-30.82	-22.77
6	18.19531	11.17	19.47	14.52	30.64	25.69	60.00	50.00	-29.36	-24.31

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.

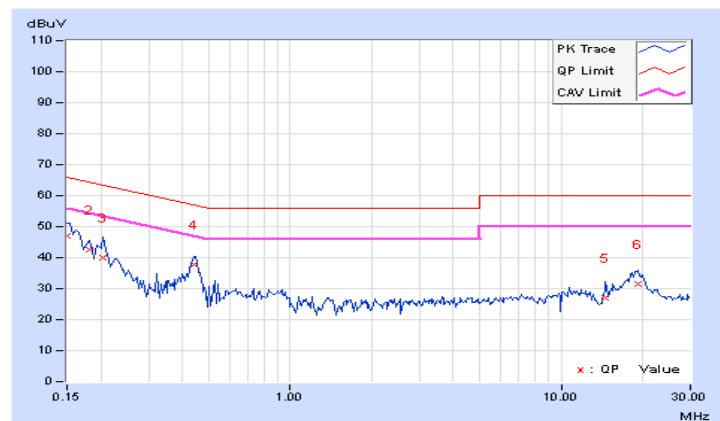


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.06	36.85	19.28	46.91	29.34	66.00	56.00	-19.09	-26.66
2	0.18125	10.04	32.56	16.60	42.60	26.64	64.43	54.43	-21.83	-27.79
3	0.20469	10.03	29.79	14.98	39.82	25.01	63.42	53.42	-23.60	-28.41
4	0.43906	10.10	27.77	20.77	37.87	30.87	57.08	47.08	-19.21	-16.21
5	14.55859	10.77	16.27	14.46	27.04	25.23	60.00	50.00	-32.96	-24.77
6	19.20313	10.97	20.50	15.19	31.47	26.16	60.00	50.00	-28.53	-23.84

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 $\leq$ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
	√	Indoor Access Point	1 Watt (30 dBm)
		Mobile and Portable client device	250mW (24 dBm)
U-NII-2A			250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C			250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	√		1 Watt (30 dBm)

*B is the 26 dB emission bandwidth in megahertz

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

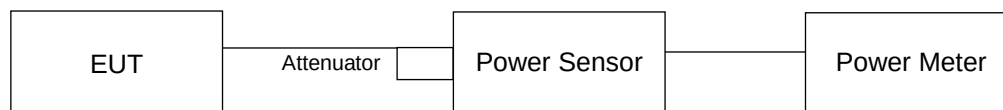
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

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

4.3.2 Test Setup



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 Result

802.11a

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	23.68	23.74	469.938	26.72	30.00	Pass
40	5200	24.98	25.02	632.462	28.01	30.00	Pass
48	5240	24.90	24.99	624.53	27.96	30.00	Pass
149	5745	25.89	25.20	719.281	28.57	30.00	Pass
157	5785	26.67	25.77	842.087	29.25	30.00	Pass
165	5825	27.56	25.61	934.079	29.70	30.00	Pass

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	24.49	24.41	557.248	27.46	30.00	Pass
40	5200	24.56	24.43	563.091	27.51	30.00	Pass
48	5240	24.41	24.62	565.792	27.53	30.00	Pass
149	5745	25.74	25.10	698.567	28.44	30.00	Pass
157	5785	26.62	25.76	835.902	29.22	30.00	Pass
165	5825	27.31	25.88	925.528	29.66	30.00	Pass

802.11ac (VHT40)

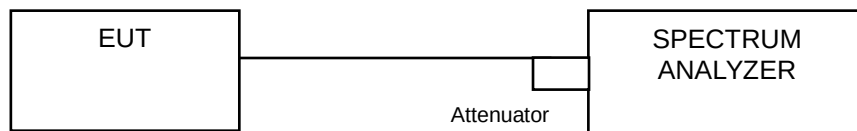
Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	21.20	20.98	257.14	24.10	30.00	Pass
46	5230	24.55	24.47	565	27.52	30.00	Pass
151	5755	25.85	25.36	728.15	28.62	30.00	Pass
159	5795	27.27	25.91	923.277	29.65	30.00	Pass

802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	20.95	20.89	247.195	23.93	30.00	Pass
155	5775	21.76	21.10	278.793	24.45	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	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
36	5180	18.00	16.92
40	5200	23.28	16.72
48	5240	19.08	17.17
149	5745	22.44	21.00
157	5785	28.92	26.16
165	5825	29.16	27.84

802.11ac (VHT20)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
36	5180	26.16	17.88
40	5200	24.12	17.76
48	5240	18.84	17.88
149	5745	22.32	20.16
157	5785	27.72	28.56
165	5825	27.72	29.40

802.11ac (VHT40)

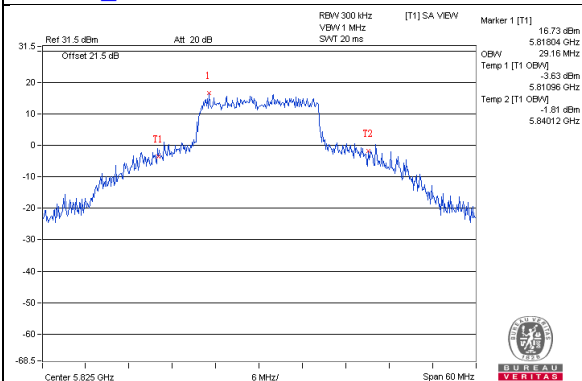
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
38	5190	36.24	36.24
46	5230	36.96	36.72
151	5755	47.04	47.28
159	5795	67.44	56.16

802.11ac (VHT80)

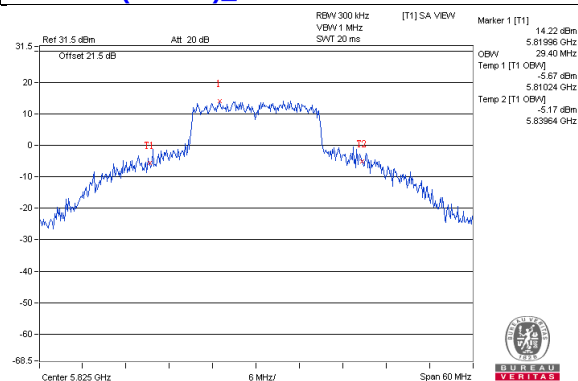
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
42	5210	75.84	75.84
155	5775	75.84	75.84

Spectrum Plot of Worst Value

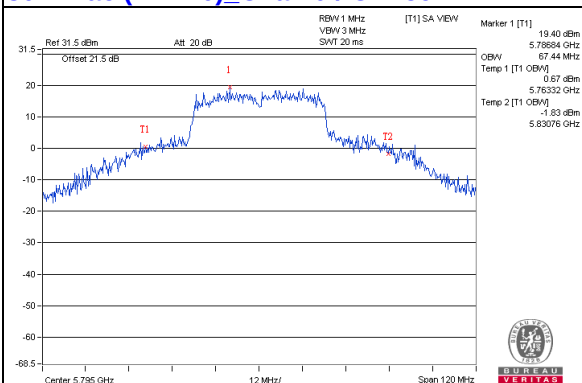
802.11a_Chain0 / CH165



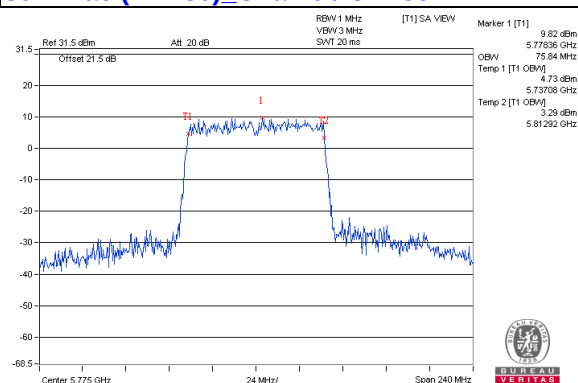
802.11ac (VHT20)_Chain1 / CH165



802.11ac (VHT40)_Chain0 / CH159

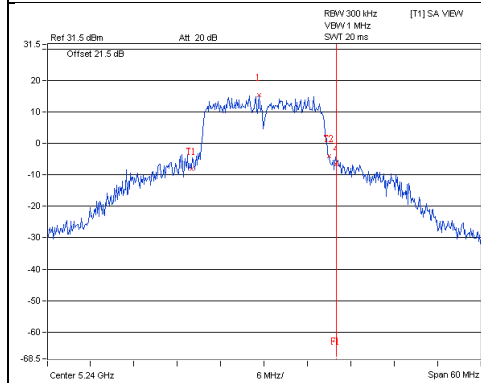


802.11ac (VHT80)_Chain0 / CH155

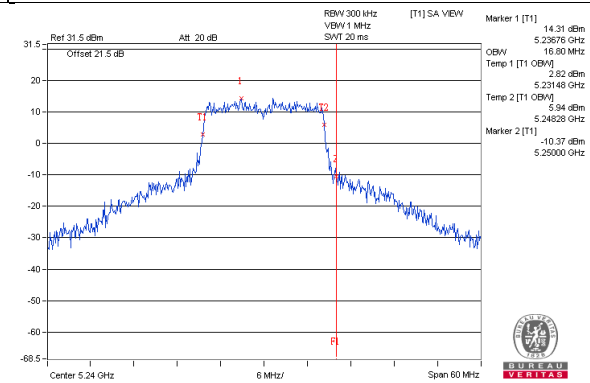


Spectrum Plot for near by DFS band (DFS is required, if 99% OCP straddle into U-NII-2A band)

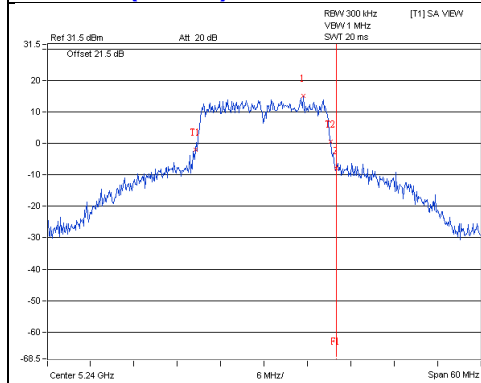
802.11a_Chain0 / CH48



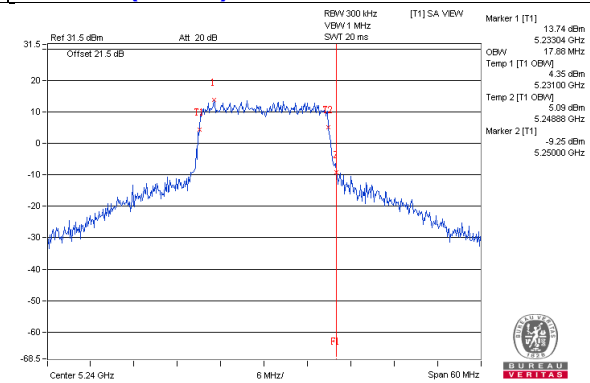
802.11a_Chain1 / CH48



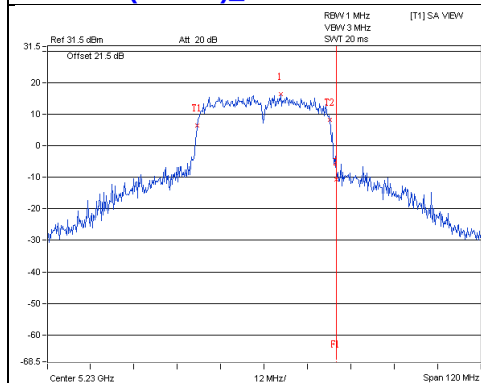
802.11ac (VHT20)_Chain0 / CH48



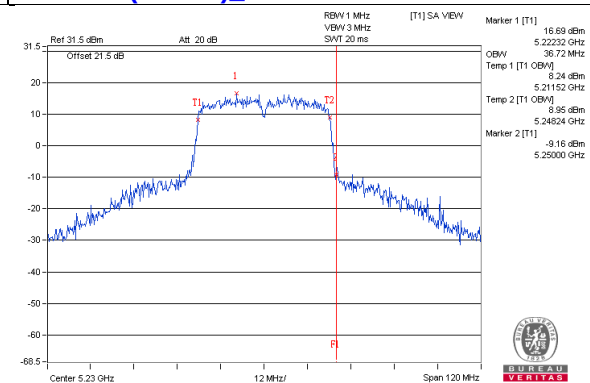
802.11ac (VHT20)_Chain1 / CH48



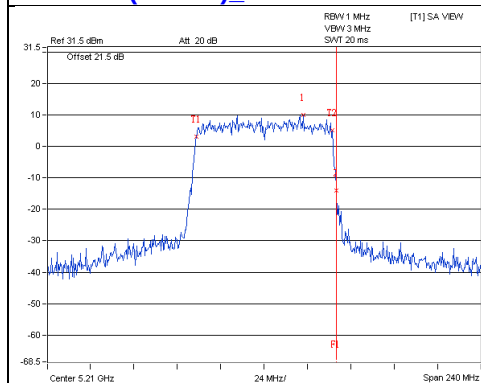
802.11ac (VHT40)_Chain0 / CH46



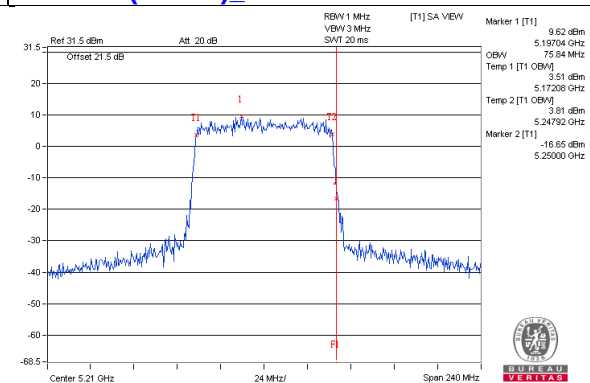
802.11ac (VHT40)_Chain1 / CH46



802.11ac (VHT80)_Chain0 / CH42

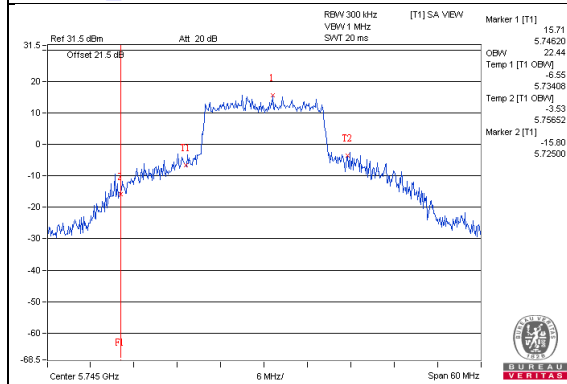


802.11ac (VHT80)_Chain1 / CH42

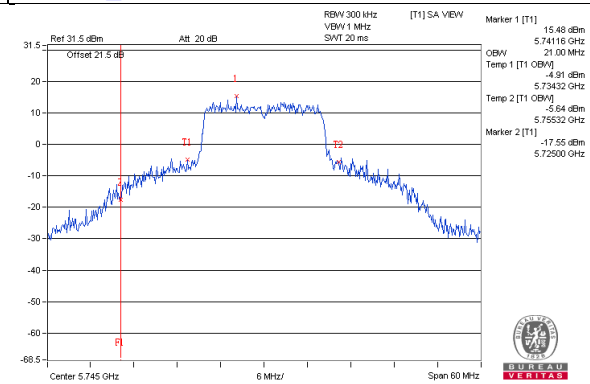


Spectrum Plot for near by DFS band (DFS is required, if 99% OCP straddle into U-NII-2C band)

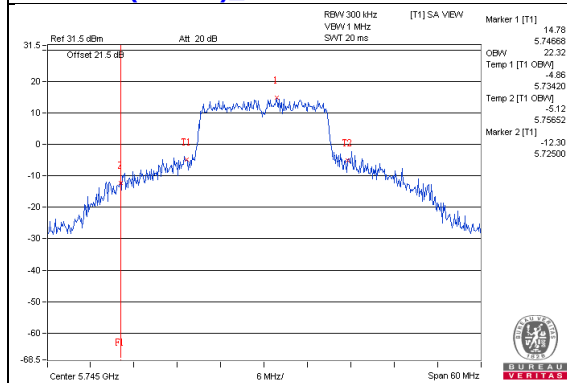
802.11a_Chain0 / CH149



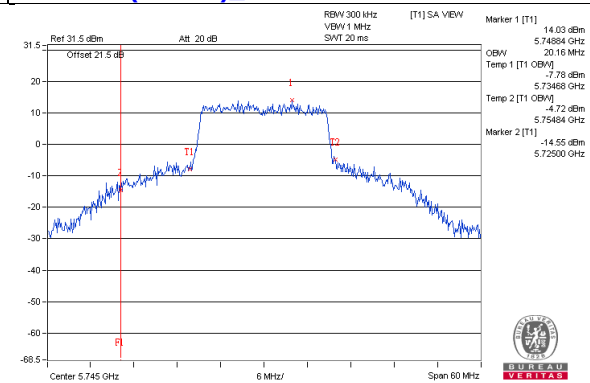
802.11a_Chain1 / CH149



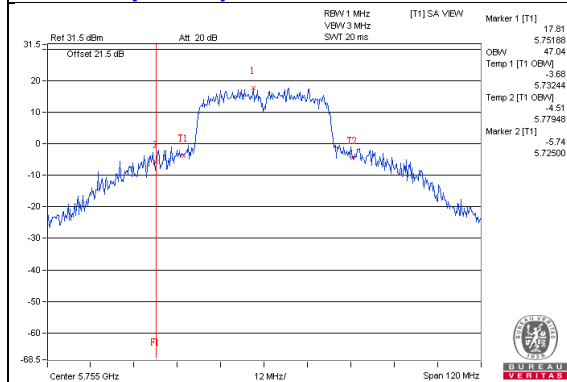
802.11ac (VHT20)_Chain0 / CH149



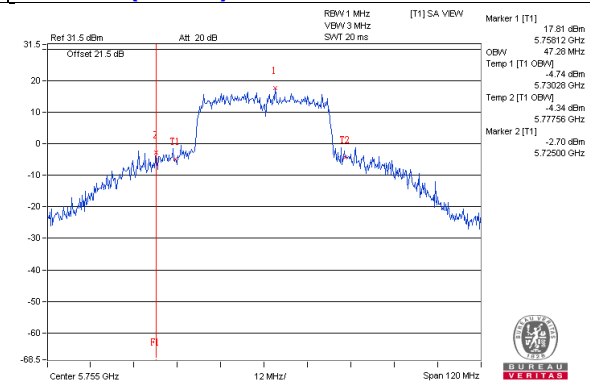
802.11ac (VHT20)_Chain1 / CH149



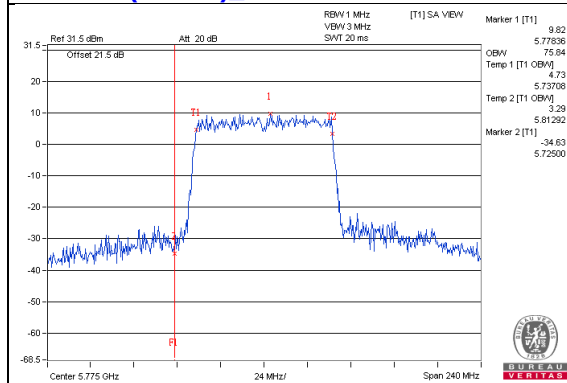
802.11ac (VHT40)_Chain0 / CH151



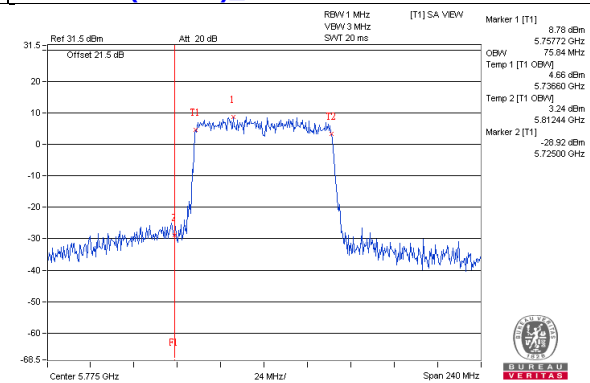
802.11ac (VHT40)_Chain1 / CH151



802.11ac (VHT80)_Chain0 / CH155



802.11ac (VHT80)_Chain1 / CH155

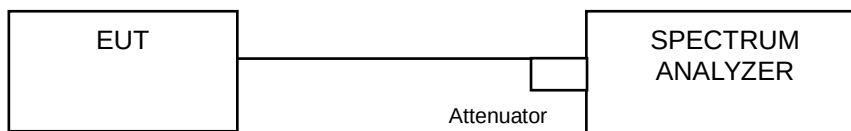


4.5 Peak Power Spectral Density Measurement

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	
		Mobile and Portable client device	11dBm/ MHz
U-NII-2A			11dBm/ MHz
U-NII-2C			11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

For UNII-1:

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:

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 $BWCF = 10\log(500\text{ kHz}/300\text{kHz})$
5. Sweep time = auto, trigger set to "free run".
6. Trace average at least 100 traces in power averaging mode.
7. Record the max value and add 10 log (1/duty cycle)

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6.

4.5.7 Test Results

For UNII-1:

802.11a

Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/MHz)		Duty Factor (dB/MHz)	Total PSD With Duty Factor (dBm/MHz)	MAX. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
36	5180	9.77	10.25	0.19	13.22	15.78	Pass
40	5200	10.70	11.26	0.19	14.19	15.78	Pass
48	5240	9.68	10.38	0.19	13.25	15.78	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. Directional gain = $4.21\text{dBi} + 10\log(2) = 7.22\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17 - (7.22 - 6) = 15.78\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

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	10.63	9.17	12.97	15.78	Pass
40	5200	10.94	9.45	13.27	15.78	Pass
48	5240	9.66	9.31	12.50	15.78	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. Directional gain = $4.21\text{dBi} + 10\log(2) = 7.22\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17 - (7.22 - 6) = 15.78\text{dBm}$.

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/MHz)		Duty Factor (dB/MHz)	Total PSD With Duty Factor (dBm/MHz)	MAX. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
38	5190	3.21	3.04	0.15	6.29	15.78	Pass
46	5230	6.29	6.22	0.15	9.42	15.78	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. Directional gain = $4.21\text{dBi} + 10\log(2) = 7.22\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17 - (7.22 - 6) = 15.78\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

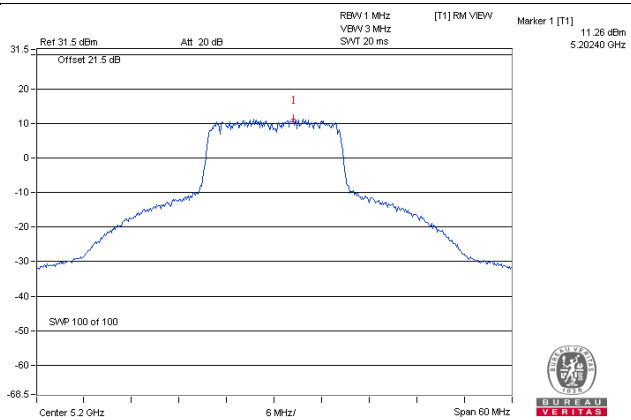
802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/MHz)		Duty Factor (dB/MHz)	Total PSD With Duty Factor (dBm/MHz)	MAX. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
42	5210	-0.35	-0.80	0.31	2.76	15.78	Pass

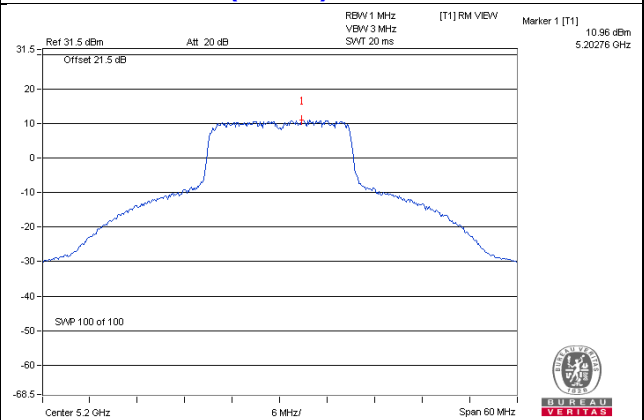
- Note:** 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $4.21\text{dBi} + 10\log(2) = 7.22\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17 - (7.22 - 6) = 15.78\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

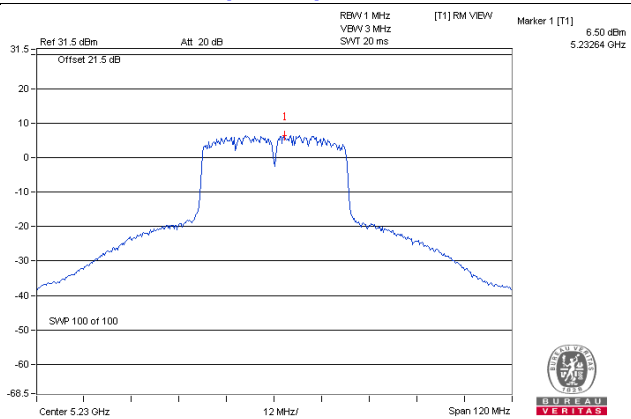
802.11a_Chain 1 / CH40



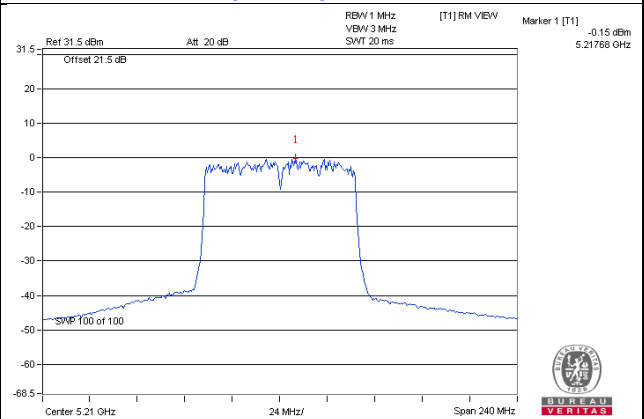
802.11ac (VHT20)_Chain 0 / CH40



802.11ac (VHT40)_Chain 0 / CH46



802.11ac (VHT80)_Chain 0 / CH42



For UNII-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	2.54	4.76	3.01	0.19	7.96	28.78	Pass
	157	5785	3.20	5.42	3.01	0.19	8.62	28.78	Pass
	165	5825	3.96	6.18	3.01	0.19	9.38	28.78	Pass
1	149	5745	1.85	4.07	3.01	0.19	7.27	28.78	Pass
	157	5785	2.16	4.38	3.01	0.19	7.58	28.78	Pass
	165	5825	2.33	4.55	3.01	0.19	7.75	28.78	Pass

Note: 1. Directional gain = $4.21\text{dBi} + 10\log(2) = 7.22\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30-(7.22-6) = 28.78\text{dBm}$.

2. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT20)

TX chain	Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor		10 log (N=2) dB	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
			(dBm/300kHz)	(dBm/500kHz)				
0	149	5745	2.25	4.47	3.01	7.48	28.78	Pass
	157	5785	2.72	4.94	3.01	7.95	28.78	Pass
	165	5825	3.17	5.39	3.01	8.40	28.78	Pass
1	149	5745	1.42	3.64	3.01	6.65	28.78	Pass
	157	5785	1.91	4.13	3.01	7.14	28.78	Pass
	165	5825	2.28	4.50	3.01	7.51	28.78	Pass

Note: 1. Directional gain = $4.21\text{dBi} + 10\log(2) = 7.22\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30-(7.22-6) = 28.78\text{dBm}$.

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	5755	-0.76	1.46	3.01	0.15	4.62	28.78	Pass
	159	5795	-0.02	2.20	3.01	0.15	5.36	28.78	Pass
1	151	5755	-1.72	0.50	3.01	0.15	3.66	28.78	Pass
	159	5795	-1.31	0.91	3.01	0.15	4.07	28.78	Pass

Note: 1. Directional gain = $4.21\text{dBi} + 10\log(2) = 7.22\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30-(7.22-6) = 28.78\text{dBm}$.

2. Refer to section 3.3 for duty cycle spectrum plot.

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	5775	-8.38	-6.16	3.01	0.31	-2.84	28.78	Pass
1	155	5775	-9.39	-7.17	3.01	0.31	-3.85	28.78	Pass

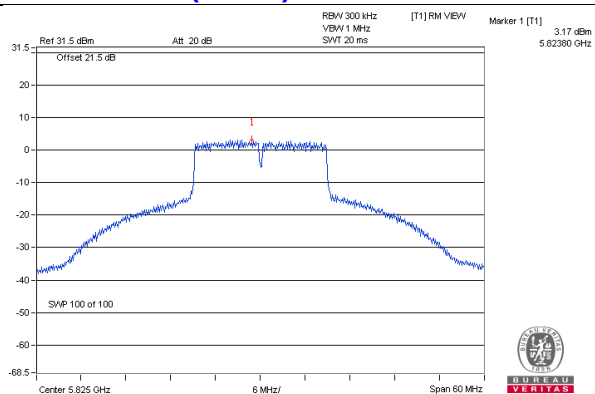
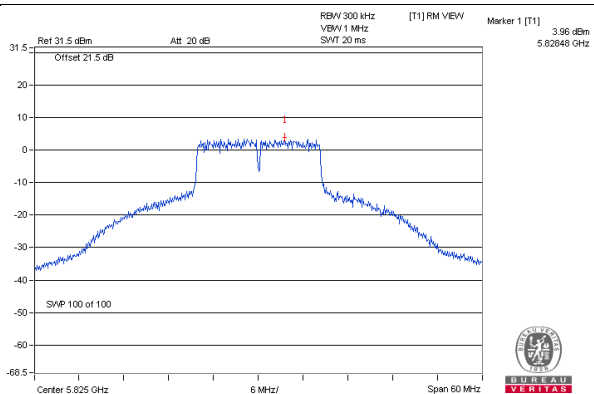
Note: 1. Directional gain = $4.21\text{dBi} + 10\log(2) = 7.22\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30-(7.22-6) = 28.78\text{dBm}$.

2. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

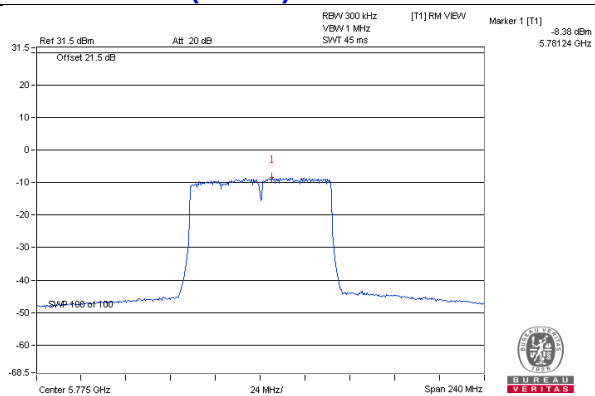
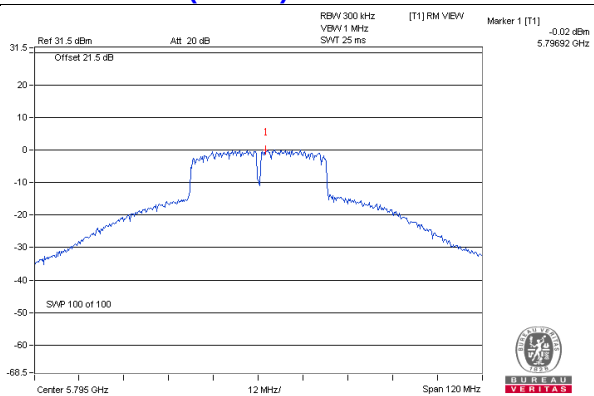
802.11a – Chain 0: CH 165

802.11ac (VHT20) – Chain 0: CH 165



802.11ac (VHT40) – Chain 0: CH 159

802.11ac (VHT80) – Chain 0: CH 155

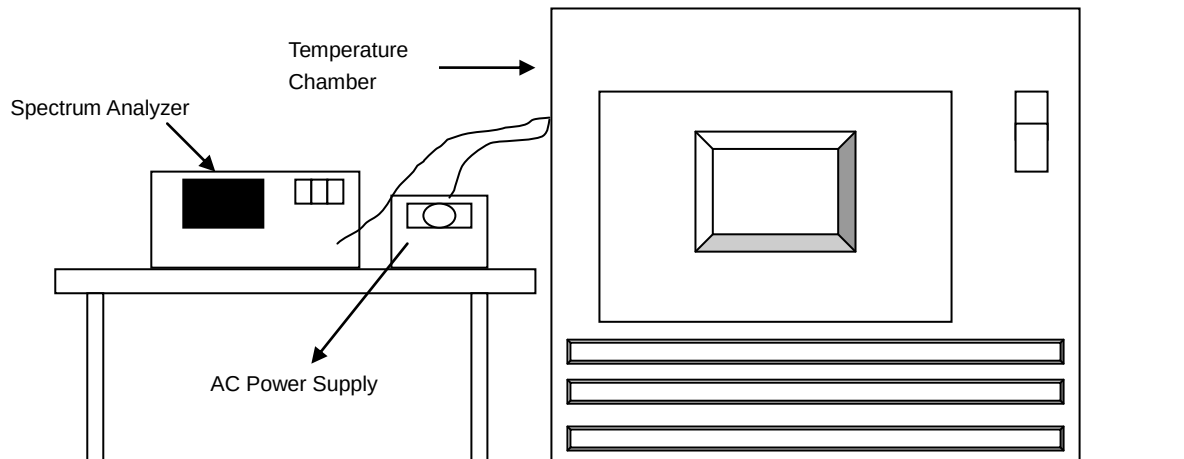


4.6 Frequency Stability Measurement

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

- The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- Turn the EUT on and couple its output to a spectrum analyzer.
- Turn the EUT off and set the chamber to the highest temperature specified.
- 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.
- Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
- 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. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
50	120	5180.0112	PASS	5180.0123	PASS	5180.0143	PASS	5180.0114	PASS
40	120	5179.9749	PASS	5179.977	PASS	5179.9746	PASS	5179.9753	PASS
30	120	5180.0135	PASS	5180.0136	PASS	5180.0132	PASS	5180.0108	PASS
20	120	5179.9802	PASS	5179.9778	PASS	5179.9818	PASS	5179.9815	PASS
10	120	5180.0114	PASS	5180.0115	PASS	5180.0141	PASS	5180.0113	PASS
0	120	5180.0139	PASS	5180.0159	PASS	5180.0158	PASS	5180.0136	PASS
-10	120	5179.9807	PASS	5179.9791	PASS	5179.9805	PASS	5179.9819	PASS
-20	120	5179.991	PASS	5179.9899	PASS	5179.9882	PASS	5179.9896	PASS
-30	120	5180.0068	PASS	5180.0057	PASS	5180.0066	PASS	5180.004	PASS

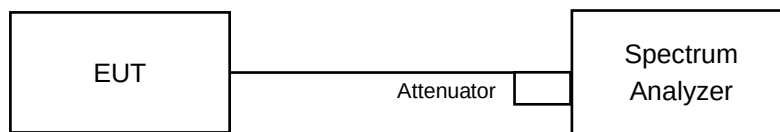
Frequency Stability Versus Voltage									
Operating Frequency: 5180 MHz									
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
20	138	5179.9805	PASS	5179.9768	PASS	5179.982	PASS	5179.9825	PASS
	120	5179.9802	PASS	5179.9778	PASS	5179.9818	PASS	5179.9815	PASS
	102	5179.981	PASS	5179.9782	PASS	5179.9816	PASS	5179.9823	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

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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	16.42	0.5	PASS
157	5785	16.38	16.37	0.5	PASS
165	5825	16.40	16.37	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	17.64	0.5	PASS
157	5785	17.63	17.62	0.5	PASS
165	5825	17.61	17.55	0.5	PASS

802.11ac (VHT40)

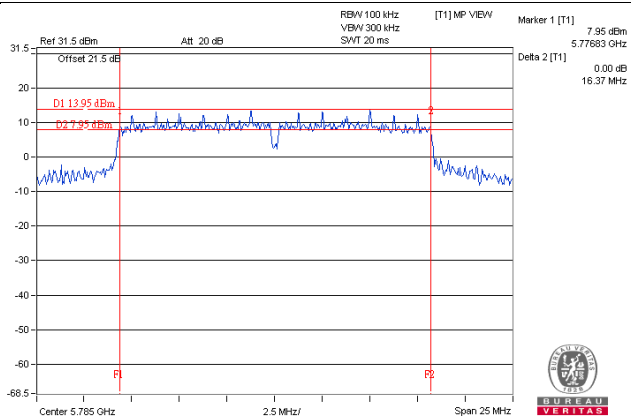
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	36.33	36.36	0.5	PASS
159	5795	35.32	35.86	0.5	PASS

802.11ac (VHT80)

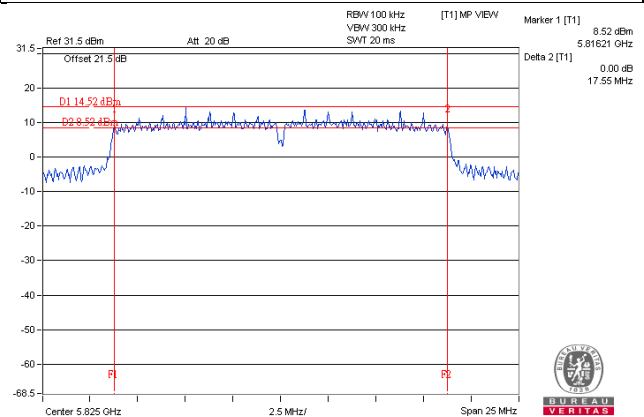
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
155	5775	76.21	76.08	0.5	PASS

Spectrum Plot of Worst Value

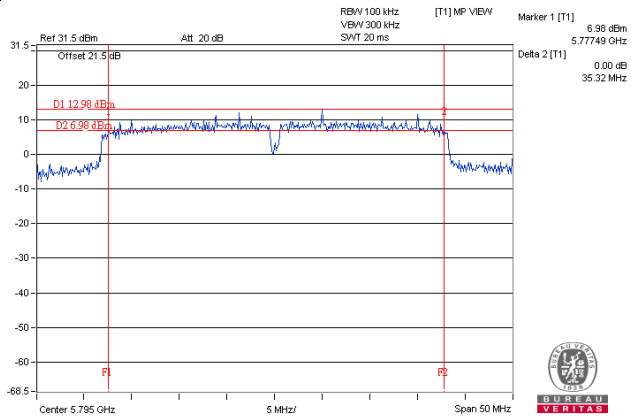
802.11a_Chain 1 / CH157



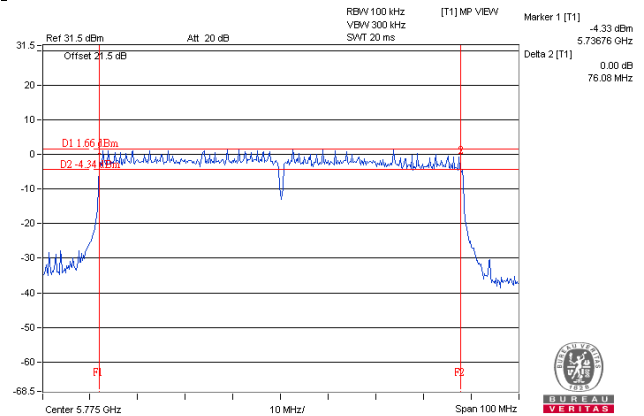
802.11ac (VHT20)_Chain 1 / CH165



802.11ac (VHT40)_Chain 0 / CH159



802.11ac (VHT80)_Chain 1 / CH155



5 Pictures of Test Arrangements

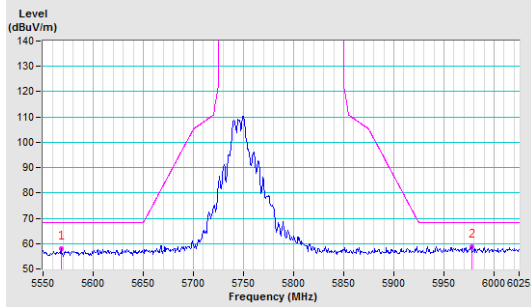
Please refer to the attached file (Test Setup Photo).

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

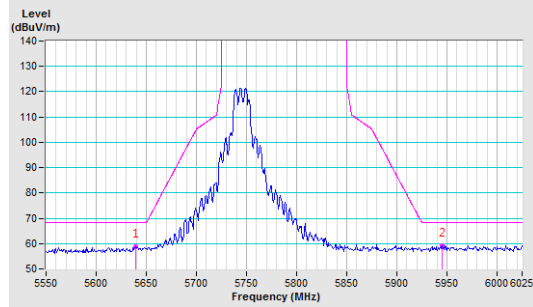
802.11a

CH 149 5745 MHz

Horizontal

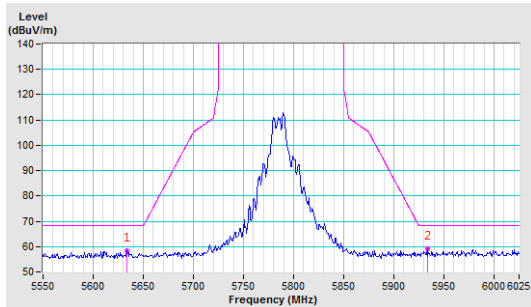


Vertical

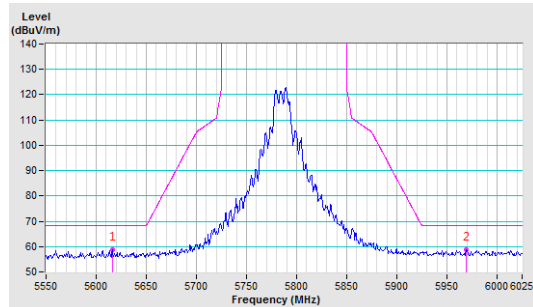


CH 157 5785 MHz

Horizontal

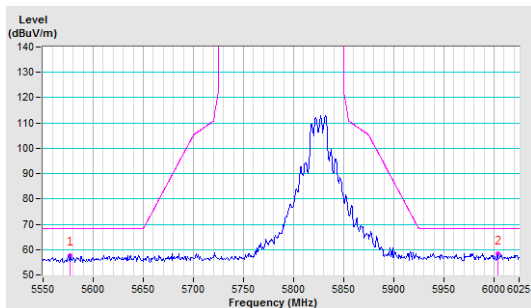


Vertical

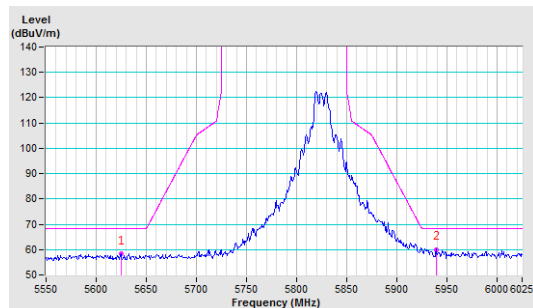


CH 165 5825 MHz

Horizontal



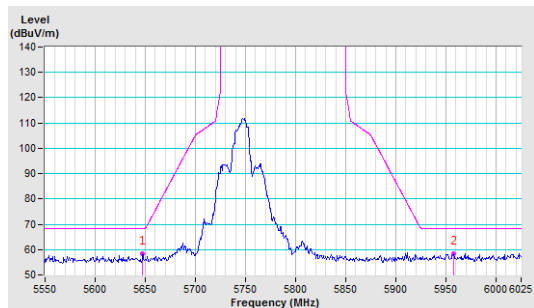
Vertical



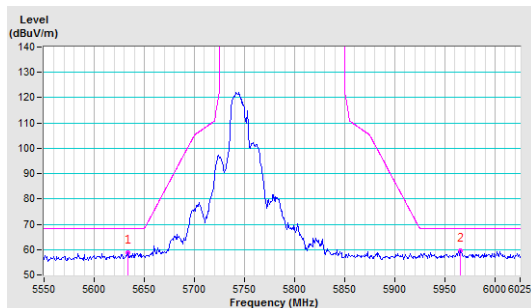
802.11ac (VHT20)

CH 149 5745 MHz

Horizontal

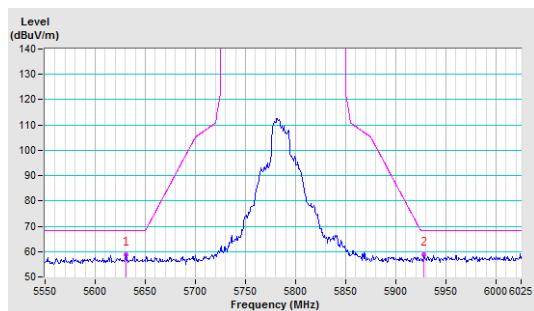


Vertical

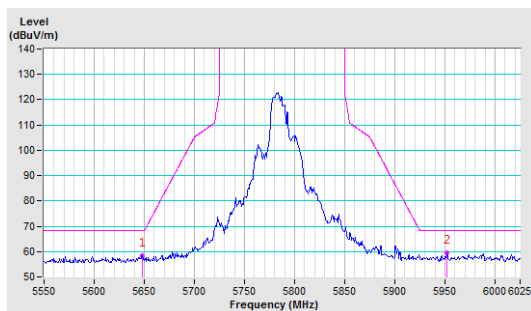


CH 157 5785 MHz

Horizontal

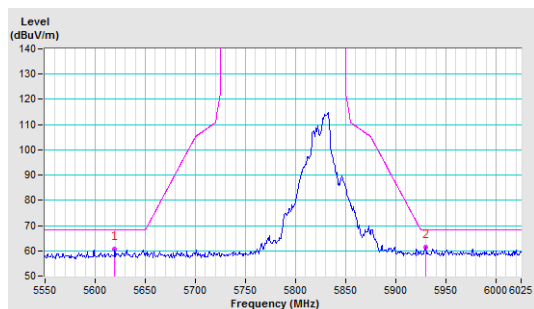


Vertical

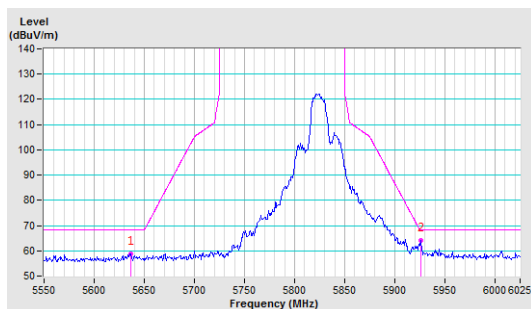


CH 165 5825 MHz

Horizontal



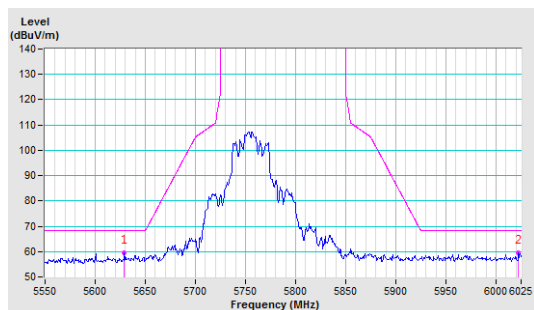
Vertical



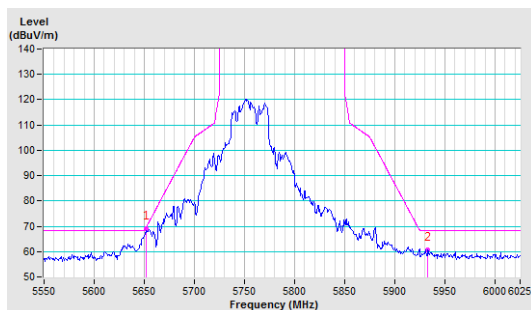
802.11ac (VHT40)

CH 151 5755 MHz

Horizontal

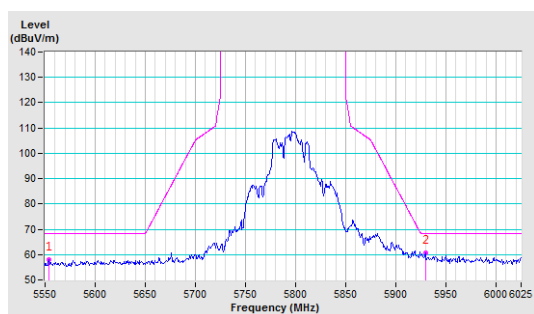


Vertical

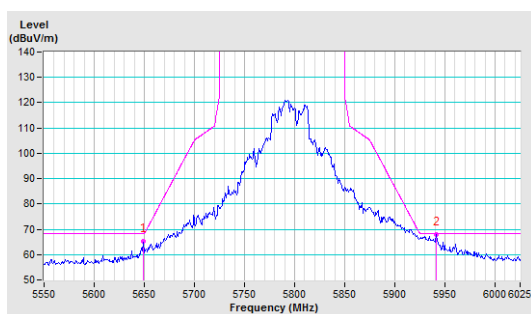


CH 159 5795 MHz

Horizontal



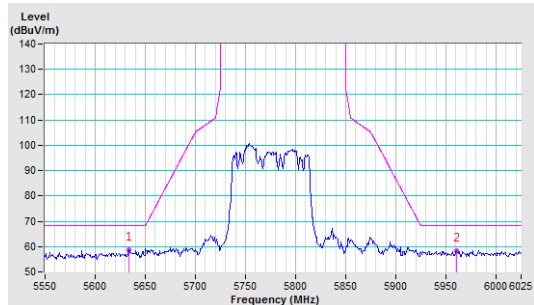
Vertical



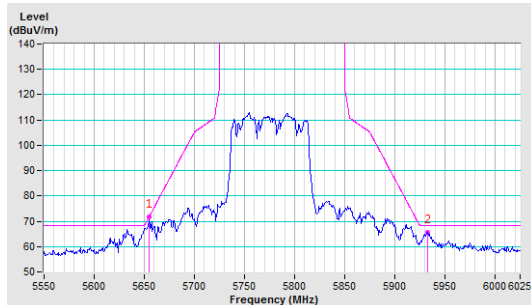
802.11ac (VHT80)

CH 155 5775 MHz

Horizontal



Vertical



Appendix – Information on the Testing Laboratories

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

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

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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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