FCC Test Report

Report No.:	RF170315E03-1
FCC ID:	I88C3000Z
Test Model:	C3000Z
Received Date:	Mar. 15, 2017
Test Date:	Mar. 23 to Apr. 20, 2017
Issued Date:	May 29, 2017
Applicant:	Zyxel Communications Corporation
Address:	No.2 Industry East RD. IX, Hsinchu Science Park, Hsinchu 30075, Taiwan
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 (1):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
RF170315E03-1	Original release.	May 29, 2017

1 Certificate of Conformity

Product:	WiFi-N VDSL2 4-port Combo WAN CPE
Brand:	ZYXEL
Test Model:	C3000Z
Sample Status:	ENGINEERING SAMPLE
Applicant:	Zyxel Communications Corporation
Test Date:	Mar. 23 to Apr. 20, 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 : Cindy Hsin , **Date:** May 29, 2017

Cindy Hsin / Specialist

Approved by : , **Date:** May 29, 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 -9.37dB at 0.32969MHz.
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 17475.00MHz, 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	5.30 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.78 dB
	6GHz ~ 18GHz	4.52 dB
	18GHz ~ 40GHz	5.08 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	WiFi-N VDSL2 4-port Combo WAN CPE
Brand	ZYXEL
Test Model	C3000Z
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 12V from power adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT20/40 in 2.4GHz band
Modulation Technology	DSSS,OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 600Mbps 802.11ac: up to 1733.3Mbps
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, 802.11n (HT20), VHT20: 11 802.11n (HT40), VHT40: 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:** **CDD Mode:** 989.071mW **Beamforming Mode:** 509.874mW **5GHz:** **5.18 ~ 5.24GHz:** **CDD Mode:** 703.104mW **Beamforming Mode:** 339.509mW **5.745 ~ 5.825GHz:** **CDD Mode:** 926.785mW **Beamforming Mode:** 346.281mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x1
Data Cable Supplied	RJ 11 cable(unshielded, 3.6m) x1 RJ 45 cable(unshielded, 1.8m) x1

Note:

1. Simultaneously transmission condition.

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

2. The EUT must be supplied from a power adapter as following table:

Brand	Model	Spec.
UMEC	UP0251M-12PA	Input: 100-240Vac, 50/60Hz, 0.6A Output: 12V, 2A DC output cable (Unshielded, 1.8m)

3. The EUT incorporates a MIMO function.

2.4GHz Band			
MODULATION MODE	**DATA RATE (MCS)**	**TX & RX CONFIGURATION**	
802.11b	1 ~ 11Mbps	3TX	3RX
802.11g	6 ~ 54Mbps	3TX	3RX
802.11n (HT20)	MCS 0~7	3TX	3RX
	MCS 8~15	3TX	3RX
	MCS 16~23	3TX	3RX
802.11n (HT40)	MCS 0~7	3TX	3RX
	MCS 8~15	3TX	3RX
	MCS 16~23	3TX	3RX
VHT20	MCS 0~8, Nss=1	3TX	3RX
	MCS 0~8, Nss=2	3TX	3RX
	MCS 0~9, Nss=3	3TX	3RX
VHT40	MCS0~9 Nss=1	3TX	3RX
	MCS0~9 Nss=2	3TX	3RX
	MCS0~9 Nss=3	3TX	3RX
5GHz Band			
MODULATION MODE	**DATA RATE (MCS)**	**TX & RX CONFIGURATION**	
802.11a	6 ~ 54Mbps	4TX	4RX
802.11n (HT20)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
802.11n (HT40)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
802.11ac (VHT20)	MCS 0~8, Nss=1	4TX	4RX
	MCS 0~8, Nss=2	4TX	4RX
	MCS 0~9, Nss=3	4TX	4RX
	MCS 0~8, Nss=4	4TX	4RX
802.11ac (VHT40)	MCS 0~9, Nss=1	4TX	4RX
	MCS 0~9, Nss=2	4TX	4RX
	MCS 0~9, Nss=3	4TX	4RX
	MCS 0~9, Nss=4	4TX	4RX
802.11ac (VHT80)	MCS 0~9, Nss=1	4TX	4RX
	MCS 0~9, Nss=2	4TX	4RX
	MCS 0~9, Nss=3	4TX	4RX
	MCS 0~9, Nss=4	4TX	4RX

Note:
1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and 802.11ac mode for 20MHz (40MHz), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)
3. The EUT support Beamforming and CDD mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.

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

2.4GHz antenna								
Antenna NO.	PCB NO.	Brand	Model	Antenna Gain(dBi) Including cable loss	Frequency range (GHz)	Antenna Type	Antenna Connector	Cable Length (mm)
1	WJ1	Airgain	65-031-049008B	4.5	2.4~2.4835	Dipole	NA	295
2	WJ0	Airgain	65-031-049007B	4.1	2.4~2.4835	Dipole	NA	320
3	WJ2	Airgain	65-031-049009B	3.1	2.4~2.4835	Dipole	NA	270
5GHz antenna								
Antenna NO.	PCB NO.	Brand	Model	Antenna Gain(dBi) Including cable loss	Frequency range (GHz)	Antenna Type	Antenna Connector	Cable Length (mm)
1	JC2	Airgain	65-031-049003B	4.4	5.15~5.85	Dipole	i-pex(MHF)	50
2	JC3	Airgain	65-031-049004B	4.8	5.15~5.85	Dipole	i-pex(MHF)	85
3	JC1	Airgain	65-031-049005B	4.4	5.15~5.85	Dipole	i-pex(MHF)	50
4	JC0	Airgain	65-031-049006B	4.4	5.15~5.85	Dipole	i-pex(MHF)	65

5. The power setting are list as below:

Modulation Mode	Frequency (MHz)	Power Setting (CDD)	Power Setting (Beamforming)
802.11a	5180	78	-
	5200	78	-
	5240	78	-
	5745	88	-
	5785	89	-
	5825	84	-
802.11ac (VHT20)	5180	78	78
	5200	78	78
	5240	78	78
	5745	88	73
	5785	89	73
	5825	84	73
802.11ac (VHT40)	5190	74	74
	5230	91	78
	5755	92	74
	5795	92	74
802.11ac (VHT80)	5210	71	71
	5775	78	75

6. 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	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

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

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

FOR 5745 ~ 5825MHz:

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

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

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

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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

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.

CDD Mode						
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.

CDD Mode						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11ac (VHT40)	5180-5240 5745-5825	38 to 46 151 to 159	151	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.

CDD Mode						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11ac (VHT40)	5180-5240 5745-5825	38 to 46 151 to 159	151	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.

CDD Mode						
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
Beamforming Mode (Output power only)						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11ac (VHT20)	5180-5240	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
802.11ac (VHT20)	5745-5825	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≥1G	21deg. C, 65%RH	120Vac, 60Hz	Terry Huang
RE<1G	25deg. C, 66%RH	120Vac, 60Hz	Terry Huang
PLC	25deg. C, 75%RH	120Vac, 60Hz	Andy Ho
APCM	23deg. C, 66%RH	120Vac, 60Hz	Robert Cheng

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 is required

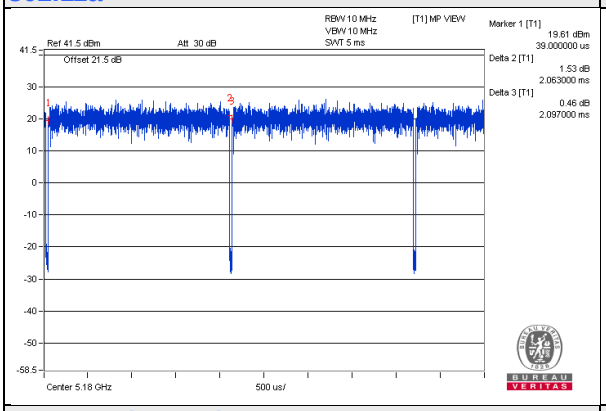
802.11a: Duty cycle = 2.063/2.097 = 0.984

802.11ac (VHT20): Duty cycle = 1.925/1.958 = 0.983

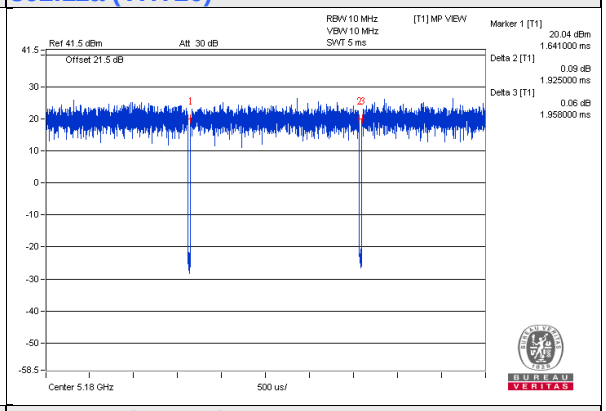
802.11ac (VHT40): Duty cycle = 0.95/0.983 = 0.966, Duty factor = 10 * log(1/0.966) = 0.15

802.11ac (VHT80): Duty cycle = 0.46/0.49 = 0.939, Duty factor = 10 * log(1/0.939) = 0.27

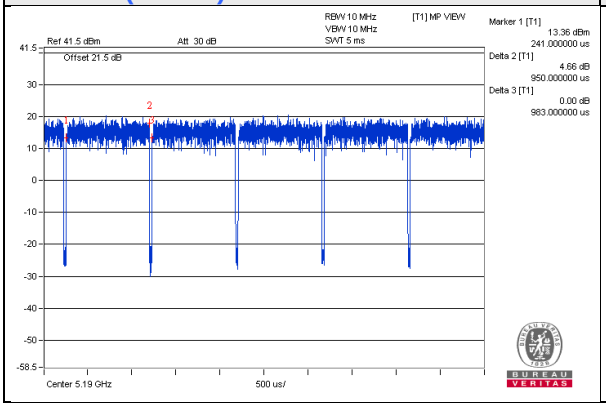
802.11a



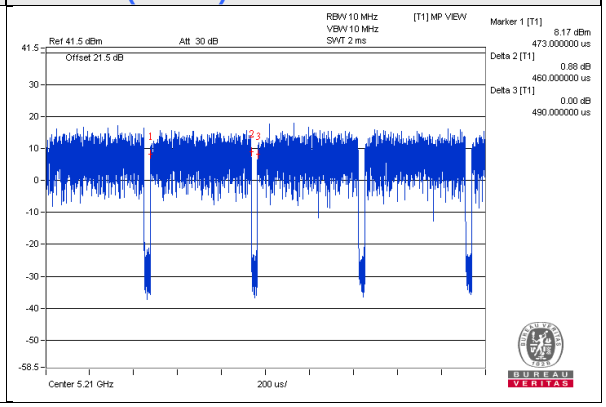
802.11a (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)



3.4 Description of Support Units

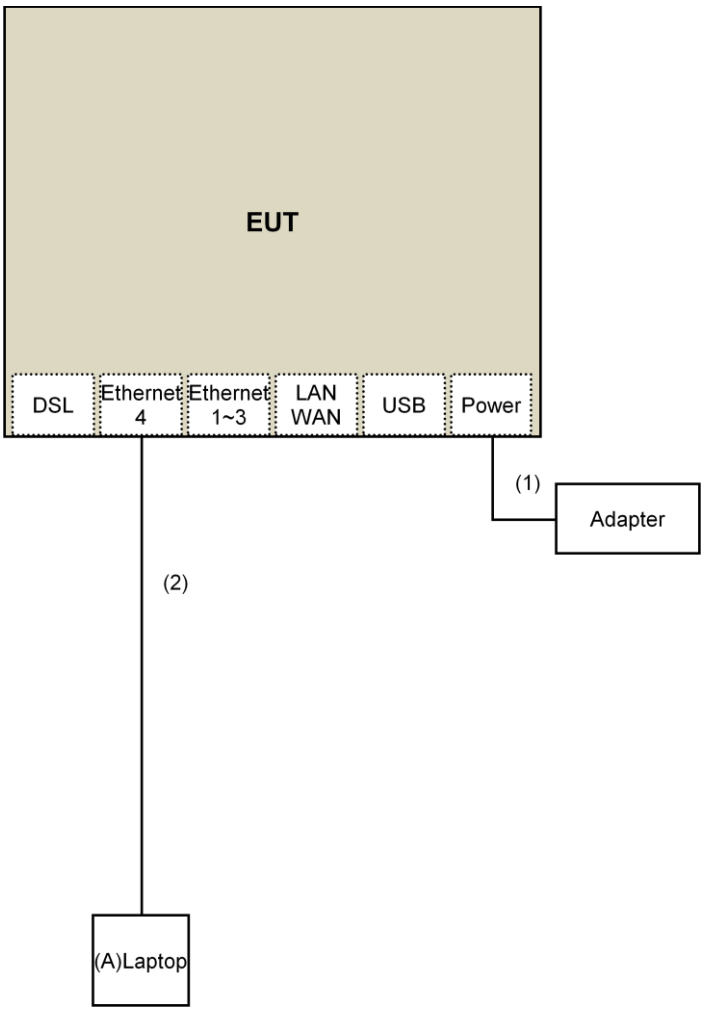
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E5440	6FC7F12	FCC DoC	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	1.8	No	0	Supplied by client
2.	RJ-45 Cable	1	10	No	0	Provided by Lab

3.4.1 Configuration of System under Test



Note: The test configuration was defined by the client requirement.

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:

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="2">Applicable To</td><td colspan="2">Limit</td></tr>
<tr><td colspan="2" rowspan="2">789033 D02 General UNII Test Procedure New Rules v01r03</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="4">*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 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
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-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160923 150318 150323	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	FSV40	100964	June 28, 2016	June 27, 2017
Power meter Anritsu	ML2495A	1014008	May 5, 2016	May 04, 2017
Power sensor Anritsu	MA2411B	0917122	May 5, 2016	May 04, 2017
AC Power Source Extech Electronics	6205	1440452	NA	NA
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	Jan. 11, 2017	Jan. 10, 2018
Digital Multimeter FLUKE	87III	73680266	Nov. 10, 2016	Nov. 09, 2017

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 FCC Site Registration No. is 292998
5. The CANADA Site Registration No. is 20331-2
6 Loop antenna was used for all emissions below 30 MHz.
7. Tested Date: Apr. 18 to 20, 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:

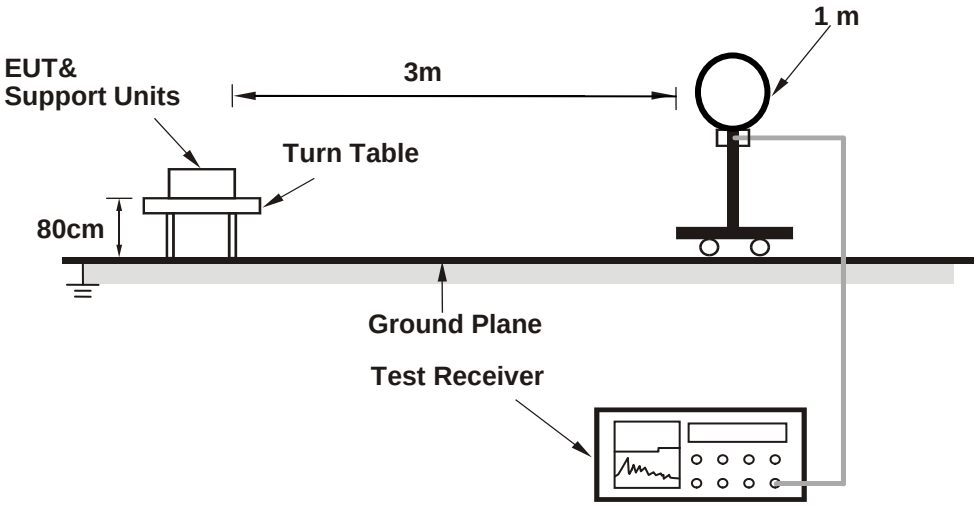
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

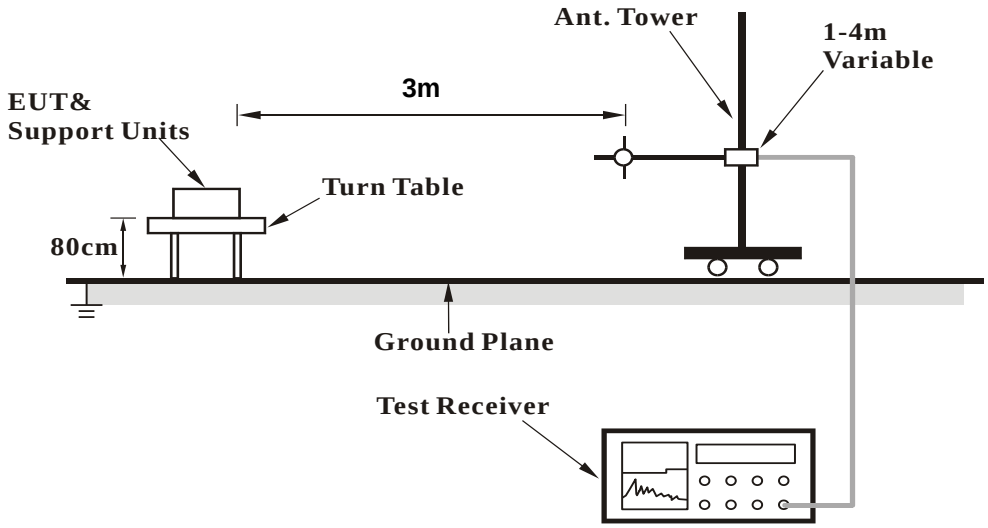
No deviation.

4.1.5 Test Setup

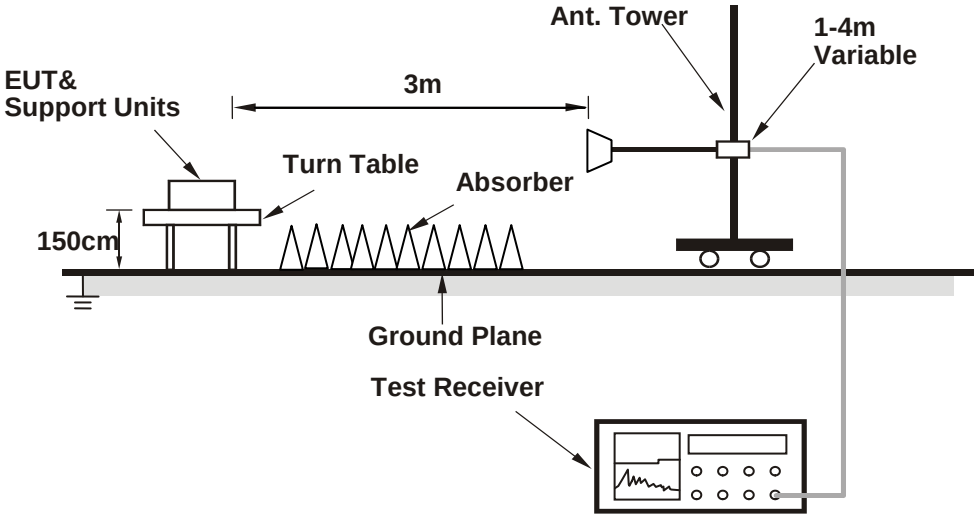
For Radiated emission below 30MHz



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 Laptop which is placed on remote site.

b. Contorlling software (Mtool 3.0.0.2) 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	62.7 PK	74.0	-11.3	1.50 H	360	58.7	4.0
2	5150.00	47.2 AV	54.0	-6.8	1.50 H	360	43.2	4.0
3	*5180.00	115.5 PK			1.50 H	360	111.5	4.0
4	*5180.00	104.9 AV			1.50 H	360	100.9	4.0
5	#10360.00	51.2 PK	74.0	-22.8	1.45 H	317	37.6	13.6
6	#10360.00	40.7 AV	54.0	-13.3	1.45 H	317	27.1	13.6
7	15540.00	54.3 PK	74.0	-19.7	1.51 H	311	41.1	13.2
8	15540.00	41.0 AV	54.0	-13.0	1.51 H	311	27.8	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	65.7 PK	74.0	-8.3	1.66 V	108	61.7	4.0
2	5150.00	48.3 AV	54.0	-5.7	1.66 V	108	44.3	4.0
3	*5180.00	115.3 PK			1.66 V	81	111.3	4.0
4	*5180.00	105.2 AV			1.66 V	81	101.2	4.0
5	#10360.00	60.1 PK	74.0	-13.9	1.48 V	251	46.5	13.6
6	#10360.00	48.6 AV	54.0	-5.4	1.48 V	251	35.0	13.6
7	15540.00	65.3 PK	74.0	-8.7	1.74 V	266	52.1	13.2
8	15540.00	51.1 AV	54.0	-2.9	1.74 V	266	37.9	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	115.4 PK			1.45 H	360	111.4	4.0
2	*5200.00	104.8 AV			1.45 H	360	100.8	4.0
3	#10400.00	51.5 PK	74.0	-22.5	1.49 H	306	37.9	13.6
4	#10400.00	40.8 AV	54.0	-13.2	1.49 H	306	27.2	13.6
5	15600.00	54.4 PK	74.0	-19.6	1.53 H	305	41.0	13.4
6	15600.00	41.2 AV	54.0	-12.8	1.53 H	305	27.8	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	*5200.00	115.9 PK			1.67 V	85	111.9	4.0
2	*5200.00	105.5 AV			1.67 V	85	101.5	4.0
3	#10400.00	59.9 PK	74.0	-14.1	1.47 V	260	46.3	13.6
4	#10400.00	48.5 AV	54.0	-5.5	1.47 V	260	34.9	13.6
5	15600.00	65.1 PK	74.0	-8.9	1.72 V	260	51.7	13.4
6	15600.00	51.1 AV	54.0	-2.9	1.72 V	260	37.7	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) 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	114.9 PK			1.50 H	360	110.7	4.2
2	*5240.00	104.4 AV			1.50 H	360	100.2	4.2
3	5397.00	54.1 PK	74.0	-19.9	1.50 H	360	49.7	4.4
4	5397.00	43.1 AV	54.0	-10.9	1.50 H	360	38.7	4.4
5	#10480.00	50.6 PK	74.0	-23.4	1.41 H	321	36.9	13.7
6	#10480.00	40.3 AV	54.0	-13.7	1.41 H	321	26.6	13.7
7	15720.00	54.0 PK	74.0	-20.0	1.53 H	297	40.0	14.0
8	15720.00	40.6 AV	54.0	-13.4	1.53 H	297	26.6	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	115.3 PK			1.66 V	81	111.1	4.2
2	*5240.00	105.0 AV			1.66 V	81	100.8	4.2
3	5397.00	55.3 PK	74.0	-18.7	1.66 V	81	50.9	4.4
4	5397.00	44.3 AV	54.0	-9.7	1.66 V	81	39.9	4.4
5	#10480.00	60.0 PK	74.0	-14.0	1.54 V	237	46.3	13.7
6	#10480.00	48.2 AV	54.0	-5.8	1.54 V	237	34.5	13.7
7	15720.00	64.7 PK	74.0	-9.3	1.73 V	260	50.7	14.0
8	15720.00	50.7 AV	54.0	-3.3	1.73 V	260	36.7	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 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	#5627.10	60.5 PK	68.2	-7.7	1.42 H	162	56.8	3.7
2	*5745.00	117.6 PK			1.42 H	162	112.6	5.0
3	*5745.00	108.0 AV			1.42 H	162	103.0	5.0
4	#5988.50	59.6 PK	68.2	-8.6	1.42 H	162	55.2	4.4
5	11490.00	53.9 PK	74.0	-20.1	1.46 H	306	39.8	14.1
6	11490.00	43.2 AV	54.0	-10.8	1.46 H	306	29.1	14.1
7	#17235.00	55.9 PK	74.0	-18.1	1.46 H	327	37.6	18.3
8	#17235.00	42.9 AV	54.0	-11.1	1.46 H	327	24.6	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	#5592.86	60.1 PK	68.2	-8.1	1.51 V	284	56.5	3.6
2	*5745.00	117.8 PK			1.51 V	284	112.8	5.0
3	*5745.00	108.1 AV			1.51 V	284	103.1	5.0
4	#5977.67	57.7 PK	68.2	-10.5	1.51 V	284	53.3	4.4
5	11490.00	62.7 PK	74.0	-11.3	1.68 V	238	48.6	14.1
6	11490.00	51.0 AV	54.0	-3.0	1.68 V	238	36.9	14.1
7	#17235.00	68.6 PK	74.0	-5.4	2.08 V	249	50.3	18.3
8	#17235.00	53.7 AV	54.0	-0.3	2.08 V	249	35.4	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) 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	#5628.85	59.8 PK	68.2	-8.4	1.33 H	165	56.1	3.7
2	*5785.00	117.9 PK			1.33 H	165	112.9	5.0
3	*5785.00	108.1 AV			1.33 H	165	103.1	5.0
4	#5947.22	56.3 PK	68.2	-11.9	1.33 H	165	52.0	4.3
5	11570.00	54.2 PK	74.0	-19.8	1.48 H	304	40.2	14.0
6	11570.00	43.4 AV	54.0	-10.6	1.48 H	304	29.4	14.0
7	#17355.00	56.3 PK	74.0	-17.7	1.51 H	314	37.4	18.9
8	#17355.00	43.1 AV	54.0	-10.9	1.51 H	314	24.2	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	#5550.56	60.0 PK	68.2	-8.2	1.53 V	281	56.6	3.4
2	*5785.00	118.1 PK			1.53 V	281	113.1	5.0
3	*5785.00	108.3 AV			1.53 V	281	103.3	5.0
4	#5937.42	57.6 PK	68.2	-10.6	1.53 V	281	53.3	4.3
5	11570.00	63.0 PK	74.0	-11.0	1.71 V	232	49.0	14.0
6	11570.00	51.5 AV	54.0	-2.5	1.71 V	232	37.5	14.0
7	#17355.00	68.4 PK	74.0	-5.6	2.06 V	244	49.5	18.9
8	#17355.00	53.6 AV	54.0	-0.4	2.06 V	244	34.7	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) 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	#5578.30	60.0 PK	68.2	-8.2	1.39 H	154	56.5	3.5
2	*5825.00	115.1 PK			1.39 H	154	109.9	5.2
3	*5825.00	105.5 AV			1.39 H	154	100.3	5.2
4	#5942.58	57.2 PK	68.2	-11.0	1.39 H	154	52.9	4.3
5	11650.00	53.1 PK	74.0	-20.9	1.50 H	313	39.0	14.1
6	11650.00	42.6 AV	54.0	-11.4	1.50 H	313	28.5	14.1
7	#17475.00	55.2 PK	74.0	-18.8	1.46 H	342	35.5	19.7
8	#17475.00	42.2 AV	54.0	-11.8	1.46 H	342	22.5	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	#5589.60	61.8 PK	68.2	-6.4	1.52 V	282	58.2	3.6
2	*5825.00	115.3 PK			1.52 V	282	110.1	5.2
3	*5825.00	105.8 AV			1.52 V	282	100.6	5.2
4	#5926.58	58.5 PK	68.2	-9.7	1.52 V	282	54.2	4.3
5	11650.00	61.5 PK	74.0	-12.5	1.69 V	225	47.4	14.1
6	11650.00	49.8 AV	54.0	-4.2	1.69 V	225	35.7	14.1
7	#17475.00	68.8 PK	74.0	-5.2	2.06 V	244	49.1	19.7
8	**#17475.00**	**53.9 AV**	**54.0**	**-0.1**	**2.06 V**	**244**	**34.2**	**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) 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	66.6 PK	74.0	-7.4	2.02 H	196	62.6	4.0
2	5150.00	50.5 AV	54.0	-3.5	2.02 H	196	46.5	4.0
3	*5180.00	114.6 PK			2.02 H	196	110.6	4.0
4	*5180.00	104.8 AV			2.02 H	196	100.8	4.0
5	#10360.00	52.9 PK	74.0	-21.1	1.51 H	327	39.3	13.6
6	#10360.00	43.5 AV	54.0	-10.5	1.51 H	327	29.9	13.6
7	15540.00	54.0 PK	74.0	-20.0	1.54 H	340	40.8	13.2
8	15540.00	40.6 AV	54.0	-13.4	1.54 H	340	27.4	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	68.1 PK	74.0	-5.9	2.14 V	294	64.1	4.0
2	5150.00	50.6 AV	54.0	-3.4	2.14 V	294	46.6	4.0
3	*5180.00	115.2 PK			2.14 V	294	111.2	4.0
4	*5180.00	103.5 AV			2.14 V	294	99.5	4.0
5	#10360.00	63.5 PK	74.0	-10.5	1.92 V	260	49.9	13.6
6	#10360.00	51.4 AV	54.0	-2.6	1.92 V	260	37.8	13.6
7	15540.00	67.1 PK	74.0	-6.9	1.75 V	269	53.9	13.2
8	15540.00	48.0 AV	54.0	-6.0	1.75 V	269	34.8	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	114.5 PK			2.01 H	184	110.5	4.0
2	*5200.00	104.6 AV			2.01 H	184	100.6	4.0
3	#10400.00	53.2 PK	74.0	-20.8	1.52 H	326	39.6	13.6
4	#10400.00	44.0 AV	54.0	-10.0	1.52 H	326	30.4	13.6
5	15600.00	53.5 PK	74.0	-20.5	1.48 H	353	40.1	13.4
6	15600.00	40.3 AV	54.0	-13.7	1.48 H	353	26.9	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	*5200.00	115.2 PK			2.03 V	295	111.2	4.0
2	*5200.00	103.5 AV			2.03 V	295	99.5	4.0
3	#10400.00	63.8 PK	74.0	-10.2	1.92 V	259	50.2	13.6
4	#10400.00	51.5 AV	54.0	-2.5	1.92 V	259	37.9	13.6
5	15600.00	67.1 PK	74.0	-6.9	1.66 V	293	53.7	13.4
6	15600.00	48.1 AV	54.0	-5.9	1.66 V	293	34.7	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	114.2 PK			1.97 H	191	110.0	4.2
2	*5240.00	104.6 AV			1.97 H	191	100.4	4.2
3	5404.00	52.8 PK	74.0	-21.2	1.97 H	191	48.4	4.4
4	5404.00	42.1 AV	54.0	-11.9	1.97 H	191	37.7	4.4
5	#10480.00	53.2 PK	74.0	-20.8	1.46 H	313	39.5	13.7
6	#10480.00	43.9 AV	54.0	-10.1	1.46 H	313	30.2	13.7
7	15720.00	54.1 PK	74.0	-19.9	1.58 H	340	40.1	14.0
8	15720.00	40.9 AV	54.0	-13.1	1.58 H	340	26.9	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	114.5 PK			2.20 V	295	110.3	4.2
2	*5240.00	103.0 AV			2.20 V	295	98.8	4.2
3	5404.00	53.3 PK	74.0	-20.7	2.20 V	295	48.9	4.4
4	5404.00	42.4 AV	54.0	-11.6	2.20 V	295	38.0	4.4
5	#10480.00	63.5 PK	74.0	-10.5	1.94 V	260	49.8	13.7
6	#10480.00	51.6 AV	54.0	-2.4	1.94 V	260	37.9	13.7
7	15720.00	66.9 PK	74.0	-7.1	1.69 V	305	52.9	14.0
8	15720.00	47.7 AV	54.0	-6.3	1.69 V	305	33.7	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 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	#5584.40	59.6 PK	68.2	-8.6	2.53 H	173	56.0	3.6
2	*5745.00	119.2 PK			2.53 H	173	114.2	5.0
3	*5745.00	109.5 AV			2.53 H	173	104.5	5.0
4	#5991.87	60.1 PK	68.2	-8.1	2.53 H	173	55.7	4.4
5	11490.00	53.5 PK	74.0	-20.5	1.53 H	344	39.4	14.1
6	11490.00	40.5 AV	54.0	-13.5	1.53 H	344	26.4	14.1
7	#17235.00	52.8 PK	74.0	-21.2	1.47 H	324	34.5	18.3
8	#17235.00	43.5 AV	54.0	-10.5	1.47 H	324	25.2	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	#5588.19	59.9 PK	68.2	-8.3	1.42 V	285	56.3	3.6
2	*5745.00	117.6 PK			1.42 V	285	112.6	5.0
3	*5745.00	107.2 AV			1.42 V	285	102.2	5.0
4	#5979.51	59.1 PK	68.2	-9.1	1.42 V	285	54.7	4.4
5	11490.00	58.6 PK	74.0	-15.4	1.40 V	313	44.5	14.1
6	11490.00	47.3 AV	54.0	-6.7	1.40 V	313	33.2	14.1
7	#17235.00	69.1 PK	74.0	-4.9	1.12 V	301	50.8	18.3
8	#17235.00	53.8 AV	54.0	-0.2	1.12 V	301	35.5	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5620.02	60.8 PK	68.2	-7.4	2.55 H	178	57.1	3.7
2	*5785.00	118.4 PK			2.55 H	178	113.4	5.0
3	*5785.00	108.0 AV			2.55 H	178	103.0	5.0
4	#5945.89	59.3 PK	68.2	-8.9	2.55 H	178	55.0	4.3
5	11570.00	54.0 PK	74.0	-20.0	1.52 H	344	40.0	14.0
6	11570.00	40.9 AV	54.0	-13.1	1.52 H	344	26.9	14.0
7	#17355.00	53.0 PK	74.0	-21.0	1.50 H	311	34.1	18.9
8	#17355.00	43.8 AV	54.0	-10.2	1.50 H	311	24.9	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	#5628.83	59.8 PK	68.2	-8.4	1.45 V	288	56.1	3.7
2	*5785.00	118.4 PK			1.45 V	288	113.4	5.0
3	*5785.00	107.5 AV			1.45 V	288	102.5	5.0
4	#5948.75	58.5 PK	68.2	-9.7	1.45 V	288	54.2	4.3
5	11570.00	58.9 PK	74.0	-15.1	1.41 V	321	44.9	14.0
6	11570.00	47.7 AV	54.0	-6.3	1.41 V	321	33.7	14.0
7	#17355.00	68.6 PK	74.0	-5.4	1.13 V	302	49.7	18.9
8	#17355.00	53.7 AV	54.0	-0.3	1.13 V	302	34.8	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) 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	#5575.91	60.9 PK	68.2	-7.3	2.59 H	176	57.4	3.5
2	*5825.00	117.2 PK			2.59 H	176	112.0	5.2
3	*5825.00	107.1 AV			2.59 H	176	101.9	5.2
4	#5987.00	57.6 PK	68.2	-10.6	2.59 H	176	53.2	4.4
5	11650.00	52.5 PK	74.0	-21.5	1.56 H	346	38.4	14.1
6	11650.00	39.6 AV	54.0	-14.4	1.56 H	346	25.5	14.1
7	#17475.00	51.6 PK	74.0	-22.4	1.46 H	320	31.9	19.7
8	#17475.00	42.6 AV	54.0	-11.4	1.46 H	320	22.9	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	#5580.19	60.2 PK	68.2	-8.0	1.39 V	286	56.6	3.6
2	*5825.00	116.5 PK			1.39 V	286	111.3	5.2
3	*5825.00	105.7 AV			1.39 V	286	100.5	5.2
4	#5944.91	58.4 PK	68.2	-9.8	1.39 V	286	54.1	4.3
5	11650.00	59.1 PK	74.0	-14.9	1.44 V	328	45.0	14.1
6	11650.00	48.2 AV	54.0	-5.8	1.44 V	328	34.1	14.1
7	#17475.00	68.8 PK	74.0	-5.2	1.19 V	308	49.1	19.7
8	#17475.00	53.6 AV	54.0	-0.4	1.19 V	308	33.9	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	65.3 PK	74.0	-8.7	1.51 H	19	61.3	4.0
2	5150.00	50.6 AV	54.0	-3.4	1.51 H	19	46.6	4.0
3	*5190.00	111.8 PK			1.51 H	19	107.8	4.0
4	*5190.00	99.9 AV			1.51 H	19	95.9	4.0
5	5350.00	57.2 PK	74.0	-16.8	1.51 H	19	52.8	4.4
6	5350.00	46.5 AV	54.0	-7.5	1.51 H	19	42.1	4.4
7	#10380.00	50.1 PK	74.0	-23.9	1.59 H	276	36.5	13.6
8	#10380.00	37.0 AV	54.0	-17.0	1.59 H	276	23.4	13.6
9	15570.00	48.9 PK	74.0	-25.1	1.18 H	36	35.6	13.3
10	15570.00	39.7 AV	54.0	-14.3	1.18 H	36	26.4	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	70.6 PK	74.0	-3.4	1.60 V	283	66.6	4.0
2	**5150.00**	**53.9 AV**	**54.0**	**-0.1**	**1.60 V**	**283**	**49.9**	**4.0**
3	*5190.00	111.4 PK			1.60 V	283	107.4	4.0
4	*5190.00	100.8 AV			1.60 V	283	96.8	4.0
5	5350.00	57.7 PK	74.0	-16.3	1.60 V	283	53.3	4.4
6	5350.00	47.7 AV	54.0	-6.3	1.60 V	283	43.3	4.4
7	#10380.00	56.4 PK	74.0	-17.6	1.00 V	259	42.8	13.6
8	#10380.00	44.6 AV	54.0	-9.4	1.00 V	259	31.0	13.6
9	15570.00	63.3 PK	74.0	-10.7	1.81 V	272	50.0	13.3
10	15570.00	48.2 AV	54.0	-5.8	1.81 V	272	34.9	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	62.0 PK	74.0	-12.0	1.54 H	24	58.0	4.0
2	5150.00	50.0 AV	54.0	-4.0	1.54 H	24	46.0	4.0
3	*5230.00	115.0 PK			1.54 H	24	110.8	4.2
4	*5230.00	103.5 AV			1.54 H	24	99.3	4.2
5	5384.00	59.4 PK	74.0	-14.6	1.54 H	24	55.0	4.4
6	5384.00	49.9 AV	54.0	-4.1	1.54 H	24	45.5	4.4
7	#10460.00	54.5 PK	74.0	-19.5	1.56 H	283	40.8	13.7
8	#10460.00	41.3 AV	54.0	-12.7	1.56 H	283	27.6	13.7
9	15690.00	53.1 PK	74.0	-20.9	1.12 H	29	39.1	14.0
10	15690.00	44.0 AV	54.0	-10.0	1.12 H	29	30.0	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	65.2 PK	74.0	-8.8	1.61 V	283	61.2	4.0
2	5150.00	50.2 AV	54.0	-3.8	1.61 V	283	46.2	4.0
3	*5230.00	117.0 PK			1.61 V	283	112.8	4.2
4	*5230.00	104.7 AV			1.61 V	283	100.5	4.2
5	5384.00	60.1 PK	74.0	-13.9	1.61 V	283	55.7	4.4
6	5384.00	49.6 AV	54.0	-4.4	1.61 V	283	45.2	4.4
7	#10460.00	61.4 PK	74.0	-12.6	1.00 V	270	47.7	13.7
8	#10460.00	48.6 AV	54.0	-5.4	1.00 V	270	34.9	13.7
9	15690.00	66.5 PK	74.0	-7.5	1.75 V	270	52.5	14.0
10	15690.00	52.5 AV	54.0	-1.5	1.75 V	270	38.5	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 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	#5637.87	65.6 PK	68.2	-2.6	1.88 H	357	61.9	3.7
2	*5755.00	118.5 PK			1.88 H	357	113.5	5.0
3	*5755.00	106.8 AV			1.88 H	357	101.8	5.0
4	#5982.25	58.0 PK	68.2	-10.2	1.88 H	357	53.6	4.4
5	11510.00	51.4 PK	74.0	-22.6	1.58 H	270	37.4	14.0
6	11510.00	37.4 AV	54.0	-16.6	1.58 H	270	23.4	14.0
7	#17265.00	53.0 PK	74.0	-21.0	2.89 H	111	34.5	18.5
8	#17265.00	43.6 AV	54.0	-10.4	2.89 H	111	25.1	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	#5643.57	67.7 PK	68.2	-0.5	1.51 V	285	64.0	3.7
2	*5755.00	117.0 PK			1.51 V	285	112.0	5.0
3	*5755.00	106.0 AV			1.51 V	285	101.0	5.0
4	#5926.68	59.8 PK	68.2	-8.4	1.51 V	285	55.5	4.3
5	11510.00	58.2 PK	74.0	-15.8	2.30 V	317	44.2	14.0
6	11510.00	44.3 AV	54.0	-9.7	2.30 V	317	30.3	14.0
7	#17265.00	67.7 PK	74.0	-6.3	3.93 V	251	49.2	18.5
8	#17265.00	52.9 AV	54.0	-1.1	3.93 V	251	34.4	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5642.62	60.7 PK	68.2	-7.5	1.81 H	360	57.0	3.7
2	*5795.00	117.2 PK			1.83 H	360	112.1	5.1
3	*5795.00	106.7 AV			1.83 H	360	101.6	5.1
4	#5929.52	64.8 PK	68.2	-3.4	1.81 H	360	60.5	4.3
5	11590.00	51.5 PK	74.0	-22.5	1.63 H	283	37.5	14.0
6	11590.00	37.7 AV	54.0	-16.3	1.63 H	283	23.7	14.0
7	#17385.00	52.9 PK	74.0	-21.1	2.92 H	125	33.8	19.1
8	#17385.00	43.4 AV	54.0	-10.6	2.92 H	125	24.3	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	#5648.80	63.9 PK	68.2	-4.3	1.50 V	284	60.2	3.7
2	*5795.00	117.6 PK			1.50 V	284	112.5	5.1
3	*5795.00	106.8 AV			1.50 V	284	101.7	5.1
4	#5929.52	64.5 PK	68.2	-3.7	1.50 V	284	60.2	4.3
5	11590.00	59.7 PK	74.0	-14.3	2.24 V	311	45.7	14.0
6	11590.00	45.7 AV	54.0	-8.3	2.24 V	311	31.7	14.0
7	#17385.00	67.6 PK	74.0	-6.4	1.86 V	302	48.5	19.1
8	#17385.00	53.6 AV	54.0	-0.4	1.86 V	302	34.5	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	60.3 PK	74.0	-13.7	1.53 H	18	56.3	4.0
2	5150.00	50.5 AV	54.0	-3.5	1.53 H	18	46.5	4.0
3	*5210.00	108.2 PK			1.53 H	18	104.1	4.1
4	*5210.00	99.4 AV			1.53 H	18	95.3	4.1
5	5350.00	56.2 PK	74.0	-17.8	1.53 H	18	51.8	4.4
6	5350.00	46.4 AV	54.0	-7.6	1.53 H	18	42.0	4.4
7	#10420.00	46.3 PK	74.0	-27.7	1.00 H	155	32.7	13.6
8	#10420.00	33.2 AV	54.0	-20.8	1.00 H	155	19.6	13.6
9	15630.00	51.4 PK	74.0	-22.6	1.00 H	113	37.8	13.6
10	15630.00	36.9 AV	54.0	-17.1	1.00 H	113	23.3	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	64.9 PK	74.0	-9.1	1.59 V	76	60.9	4.0
2	5150.00	53.7 AV	54.0	-0.3	1.59 V	76	49.7	4.0
3	*5210.00	110.6 PK			1.59 V	76	106.5	4.1
4	*5210.00	99.9 AV			1.59 V	76	95.8	4.1
5	5350.00	64.3 PK	74.0	-9.7	1.59 V	76	59.9	4.4
6	5350.00	53.4 AV	54.0	-0.6	1.59 V	76	49.0	4.4
7	#10420.00	53.1 PK	74.0	-20.9	2.74 V	261	39.5	13.6
8	#10420.00	40.0 AV	54.0	-14.0	2.74 V	261	26.4	13.6
9	15630.00	58.1 PK	74.0	-15.9	2.45 V	264	44.5	13.6
10	15630.00	43.7 AV	54.0	-10.3	2.45 V	264	30.1	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) 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	#5649.75	67.2 PK	68.2	-1.0	1.50 H	196	63.5	3.7
2	*5775.00	109.4 PK			1.50 H	196	104.4	5.0
3	*5775.00	100.3 AV			1.50 H	196	95.3	5.0
4	#5930.95	63.6 PK	68.2	-4.6	1.50 H	196	59.3	4.3
5	11550.00	49.1 PK	74.0	-24.9	1.69 H	276	35.1	14.0
6	11550.00	35.8 AV	54.0	-18.2	1.69 H	276	21.8	14.0
7	#17325.00	52.9 PK	74.0	-21.1	2.51 H	133	34.3	18.6
8	#17325.00	39.8 AV	54.0	-14.2	2.51 H	133	21.2	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	#5645.95	67.7 PK	68.2	-0.5	1.90 V	275	64.0	3.7
2	*5775.00	110.8 PK			1.90 V	275	105.8	5.0
3	*5775.00	101.7 AV			1.90 V	275	96.7	5.0
4	#5931.43	61.3 PK	68.2	-6.9	1.90 V	275	57.0	4.3
5	11550.00	55.8 PK	74.0	-18.2	2.69 V	270	41.8	14.0
6	11550.00	42.6 AV	54.0	-11.4	2.69 V	270	28.6	14.0
7	#17325.00	59.6 PK	74.0	-14.4	1.92 V	301	41.0	18.6
8	#17325.00	46.7 AV	54.0	-7.3	1.92 V	301	28.1	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 Data:

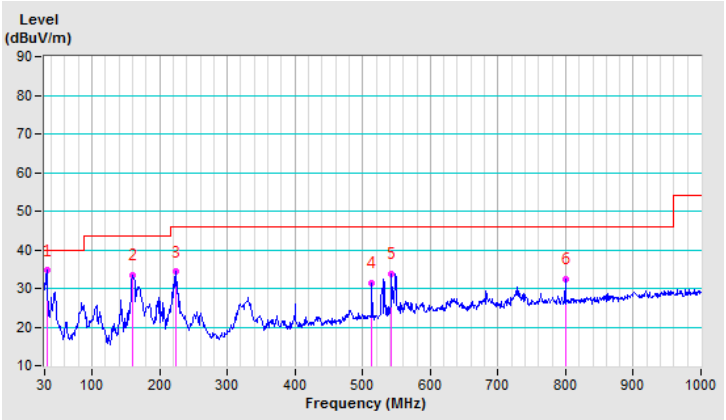
802.11ac (VHT40)

CHANNEL	TX Channel 151	**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	33.35	34.6 QP	40.0	-5.4	3.00 H	360	44.3	-9.7
2	160.15	33.5 QP	43.5	-10.0	2.00 H	92	41.9	-8.4
3	224.53	34.3 QP	46.0	-11.7	1.00 H	73	45.8	-11.5
4	513.64	31.3 QP	46.0	-14.7	1.50 H	62	33.7	-2.4
5	542.69	33.7 QP	46.0	-12.3	1.50 H	321	35.9	-2.2
6	799.21	32.5 QP	46.0	-13.5	1.50 H	85	30.2	2.3

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

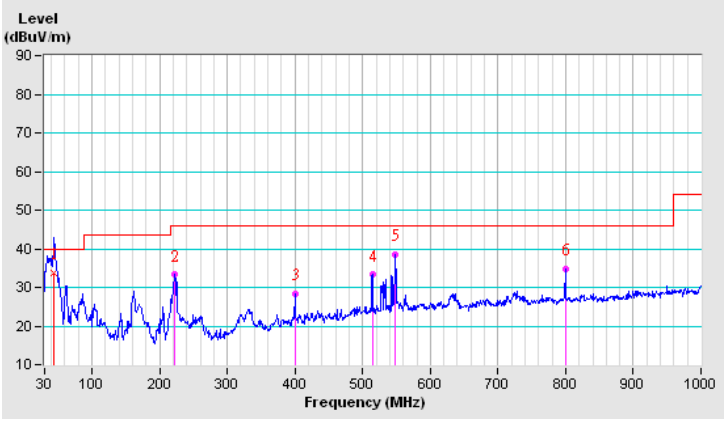


CHANNEL	TX Channel 151	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	43.82	33.7 QP	40.0	-6.3	1.50 V	46	14.9	18.8
2	222.62	33.3 QP	46.0	-12.7	1.00 V	33	44.7	-11.4
3	399.59	28.3 QP	46.0	-17.7	1.00 V	354	33.6	-5.3
4	514.25	33.3 QP	46.0	-12.7	2.50 V	360	35.7	-2.4
5	548.66	38.4 QP	46.0	-7.6	2.00 V	0	40.4	-2.0
6	799.21	34.8 QP	46.0	-11.2	1.00 V	359	32.5	2.3

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



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	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 13, 2016	June 12, 2017
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 20, 2016	June 19, 2017
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: Apr. 06, 2017

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.

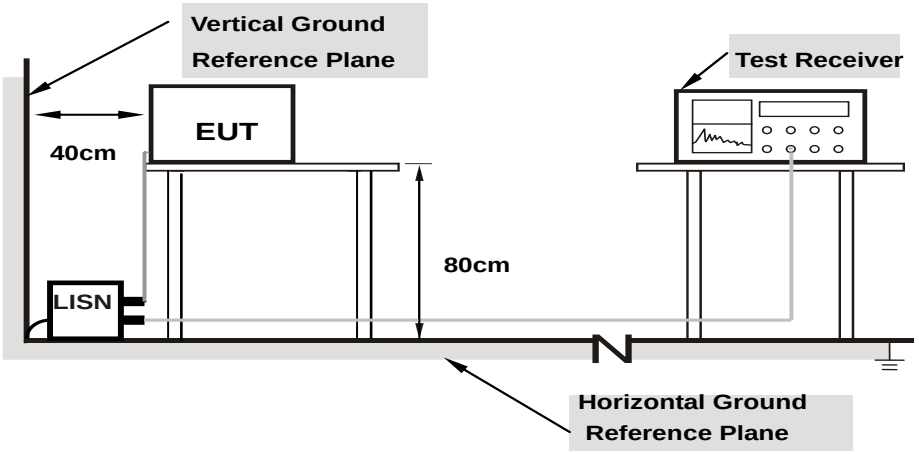
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

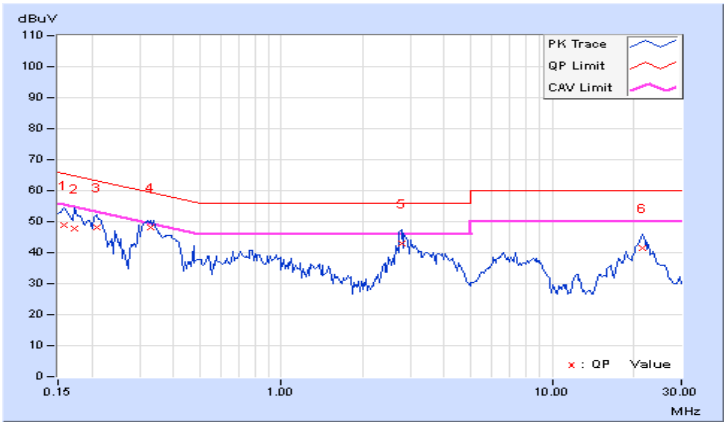
4.2.7 Test Results

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	0.15781	10.20	38.79	24.16	48.99	34.36	65.58	55.58	-16.59	-21.22
2	0.17344	10.20	37.49	25.04	47.69	35.24	64.79	54.79	-17.10	-19.55
3	0.20859	10.20	37.92	27.49	48.12	37.69	63.26	53.26	-15.14	-15.57
4	**0.32969**	**10.23**	**37.88**	**29.86**	**48.11**	**40.09**	**59.46**	**49.46**	**-11.35**	**-9.37**
5	2.77734	10.30	32.80	18.56	43.10	28.86	56.00	46.00	-12.90	-17.14
6	21.51563	11.72	29.75	22.58	41.47	34.30	60.00	50.00	-18.53	-15.70

REMARKS:

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

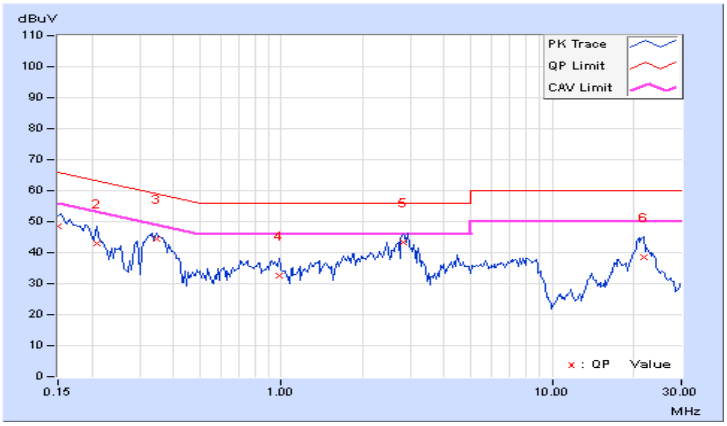


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	10.19	38.45	23.70	48.64	33.89	66.00	56.00	-17.36	-22.11
2	0.20859	10.17	32.86	22.54	43.03	32.71	63.26	53.26	-20.23	-20.55
3	0.34531	10.22	34.07	22.29	44.29	32.51	59.07	49.07	-14.78	-16.56
4	0.97813	10.26	22.46	14.26	32.72	24.52	56.00	46.00	-23.28	-21.48
5	2.81641	10.27	33.00	21.14	43.27	31.41	56.00	46.00	-12.73	-14.59
6	21.71094	11.38	27.11	18.91	38.49	30.29	60.00	50.00	-21.51	-19.71

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 Measurment

4.3.1 Limits of Transmit Power Measurement

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

*B is the 26 dB emission bandwidth in megahertz

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

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

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

4.3.2 Test Setup

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

CDD Mode

802.11a

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
36	5180	19.27	19.35	19.21	19.22	337.555	25.28	30.00	Pass
40	5200	19.30	19.29	19.12	19.25	335.83	25.26	30.00	Pass
48	5240	19.34	19.20	19.38	19.22	339.333	25.31	30.00	Pass
149	5745	22.69	22.70	22.65	22.37	728.65	28.63	30.00	Pass
157	5785	22.88	22.75	22.94	22.86	772.44	28.88	30.00	Pass
165	5825	21.53	21.31	21.40	21.62	560.689	27.49	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	Chain 2	Chain 3				
36	5180	19.37	19.33	19.23	19.08	336.864	25.27	30.00	Pass
40	5200	19.36	19.21	19.24	19.13	335.458	25.26	30.00	Pass
48	5240	19.32	19.29	19.35	19.19	339.509	25.31	30.00	Pass
149	5745	22.84	22.54	22.57	22.74	740.431	28.69	30.00	Pass
157	5785	23.03	22.90	22.91	22.96	789.024	28.97	30.00	Pass
165	5825	21.74	21.38	21.44	21.62	571.21	27.57	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	Chain 2	Chain 3				
38	5190	17.92	18.12	18.11	18.14	256.684	24.09	30.00	Pass
46	5230	22.87	22.06	22.44	22.39	703.104	28.47	30.00	Pass
151	5755	23.65	23.77	23.72	23.45	926.785	29.67	30.00	Pass
159	5795	23.65	23.71	23.65	23.49	921.798	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	Chain 2	Chain 3				
42	5210	17.20	17.81	17.69	17.40	226.579	23.55	30.00	Pass
155	5775	19.65	20.01	20.15	20.11	398.567	26.01	30.00	Pass

Beamforming Mode

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
36	5180	19.37	19.33	19.23	19.08	336.864	25.27	25.48	Pass
40	5200	19.36	19.21	19.24	19.13	335.458	25.26	25.48	Pass
48	5240	19.32	19.29	19.35	19.19	339.509	25.31	25.48	Pass
149	5745	19.25	19.38	19.33	19.14	338.575	25.30	25.48	Pass
157	5785	19.08	19.26	19.32	19.27	335.278	25.25	25.48	Pass
165	5825	19.12	19.29	19.30	18.93	329.853	25.18	25.48	Pass

Note: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 10.52dBi > 6dBi , so the power limit shall be reduced to 30-(10.52-6) = 25.48dBm.

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
38	5190	17.92	18.12	18.11	18.14	256.684	24.09	25.48	Pass
46	5230	19.20	19.08	19.26	19.26	332.752	25.22	25.48	Pass
151	5755	19.11	19.65	19.54	19.17	346.281	25.39	25.48	Pass
159	5795	18.92	19.62	19.54	19.11	341.025	25.33	25.48	Pass

Note: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 10.52dBi > 6dBi , so the power limit shall be reduced to 30-(10.52-6) = 25.48dBm.

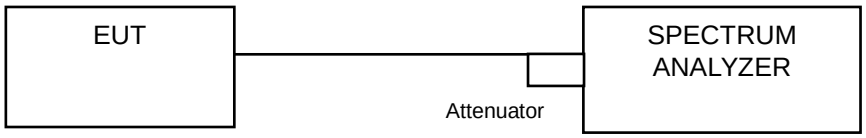
802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
42	5210	17.20	17.81	17.69	17.40	226.579	23.55	25.48	Pass
155	5775	18.94	19.27	19.41	19.30	335.282	25.25	25.48	Pass

Note: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 10.52dBi > 6dBi , so the power limit shall be reduced to 30-(10.52-6) = 25.48dBm.

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

CDD Mode

802.11a

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		CHAIN 0	CHAIN 1	CHAIN 2	CHAIN 3
36	5180	17.04	16.80	16.92	16.92
40	5200	16.92	16.92	17.04	17.04
48	5240	17.04	17.16	16.80	16.92
149	5745	17.16	17.28	17.16	17.04
157	5785	17.16	17.16	17.04	17.28
165	5825	17.04	17.04	16.92	16.92

802.11n (HT20)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		CHAIN 0	CHAIN 1	CHAIN 2	CHAIN 3
36	5180	18.24	18.12	18.00	18.00
40	5200	18.12	18.00	18.00	18.00
48	5240	18.12	18.00	18.24	18.00
149	5745	18.12	18.24	18.12	18.12
157	5785	18.24	18.24	18.24	18.24
165	5825	18.12	18.12	18.24	18.24

802.11ac (VHT40)

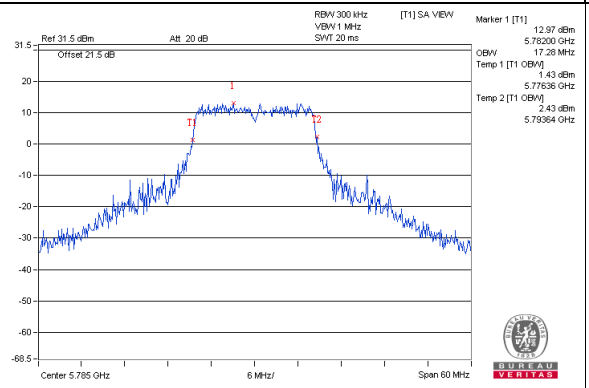
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		CHAIN 0	CHAIN 1	CHAIN 2	CHAIN 3
38	5190	36.72	36.72	36.48	36.48
46	5230	36.96	36.96	36.72	36.96
151	5755	37.20	37.44	37.68	37.20
159	5795	37.20	37.20	37.20	37.68

802.11ac (VHT80)

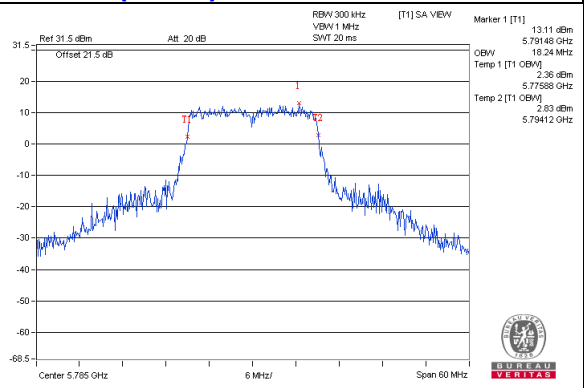
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		CHAIN 0	CHAIN 1	CHAIN 2	CHAIN 3
42	5210	74.88	75.36	74.88	74.88
155	5775	76.32	76.32	76.32	76.32

Spectrum Plot of Worst Value

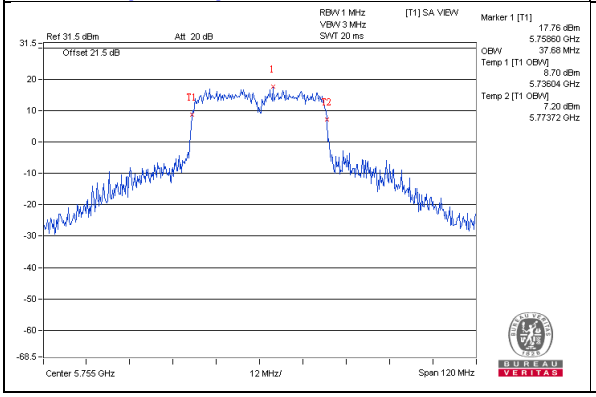
802.11a_Chain3 / CH157



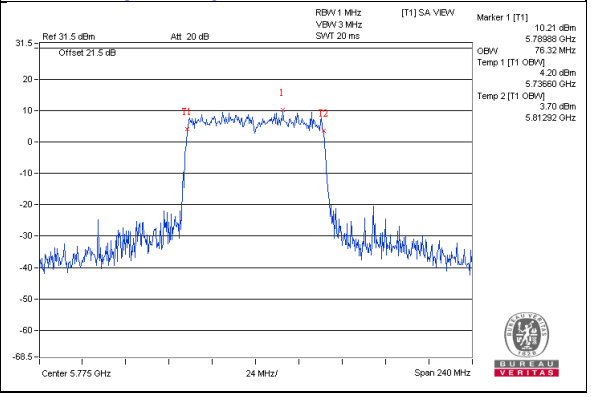
802.11ac (VHT20)_Chain0 / CH157



802.11ac (VHT40)_Chain2 / CH151

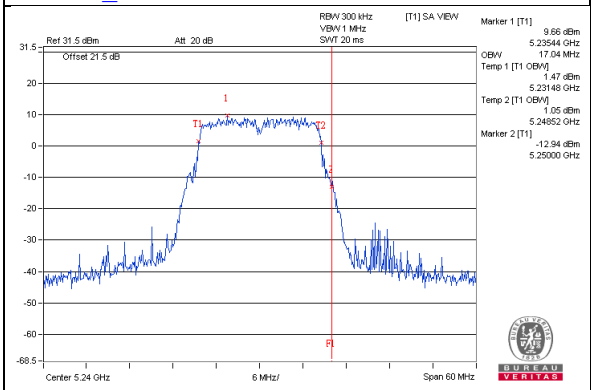


802.11ac (VHT80)_Chain2 / CH155

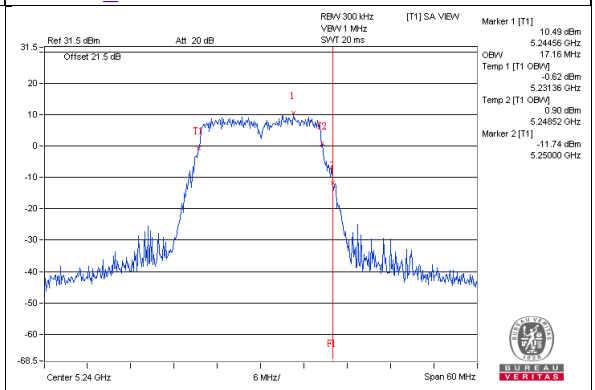


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2A band)

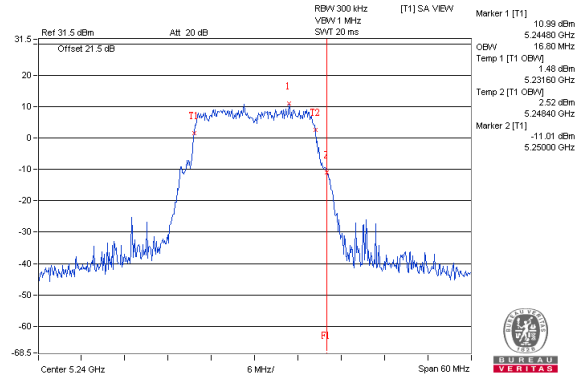
802.11a_Chain0 / CH48



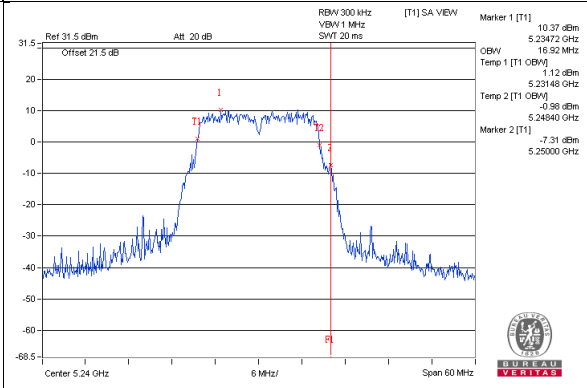
802.11a_Chain1 / CH48



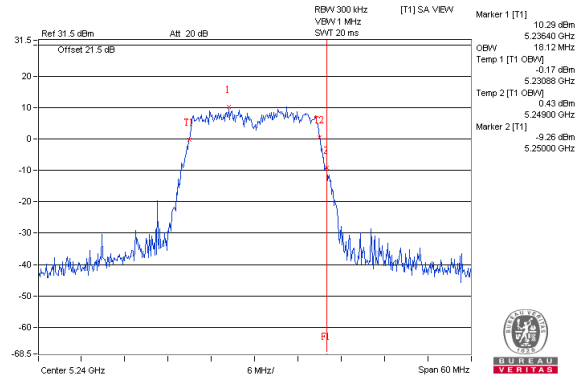
802.11a_Chain2 / CH48



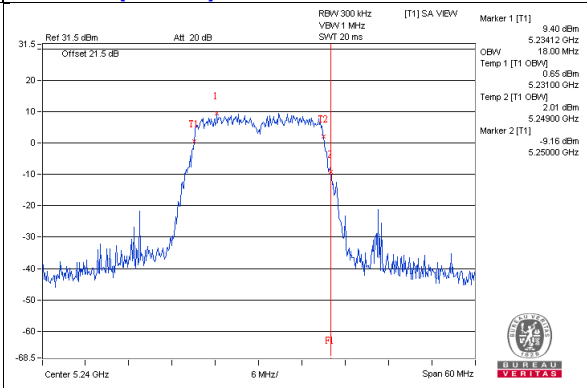
802.11a_Chain3 / CH48



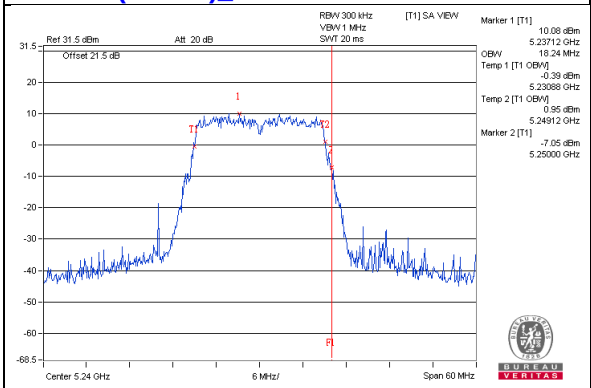
802.11ac(VHT20)_Chain0 / CH48



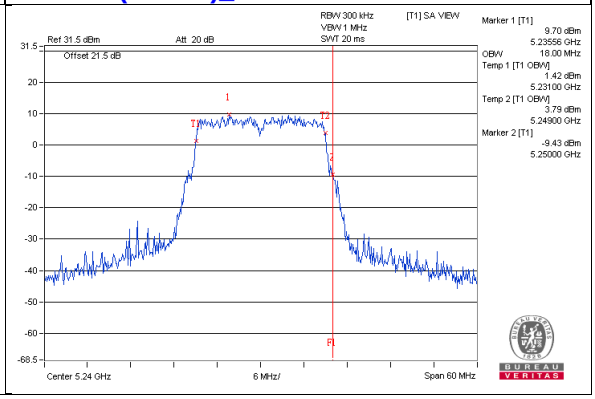
802.11ac(VHT20)_Chain1 / CH48



802.11ac(VHT20)_Chain2 / CH48

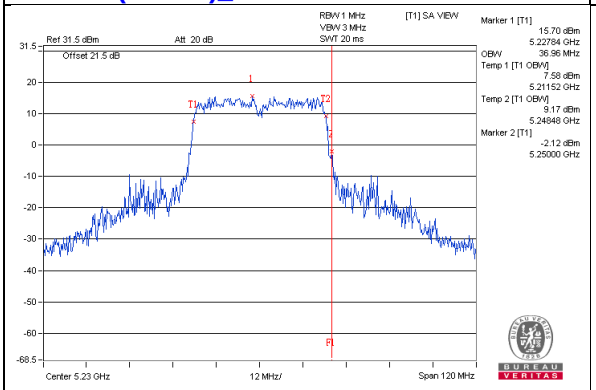


802.11ac(VHT20)_Chain3 / CH48

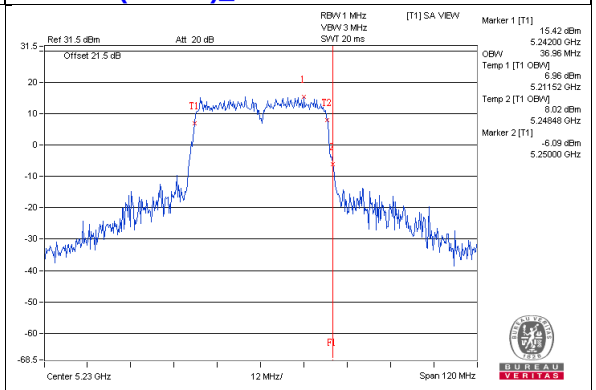


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2A band)

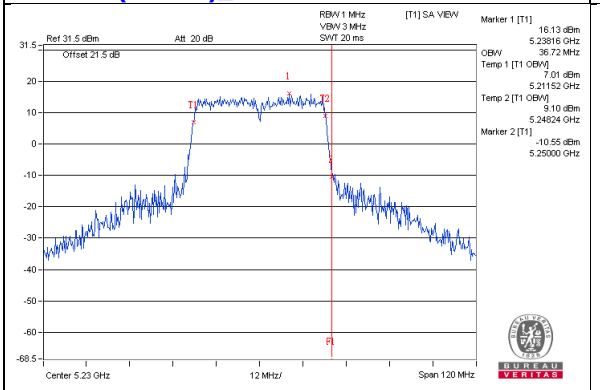
802.11ac(VHT40)_Chain0 / CH46



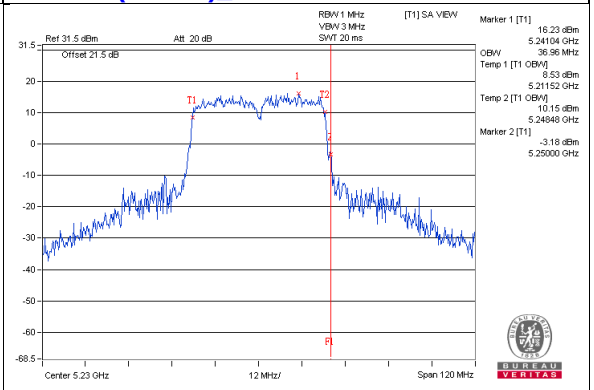
802.11ac(VHT40)_Chain1 / CH46



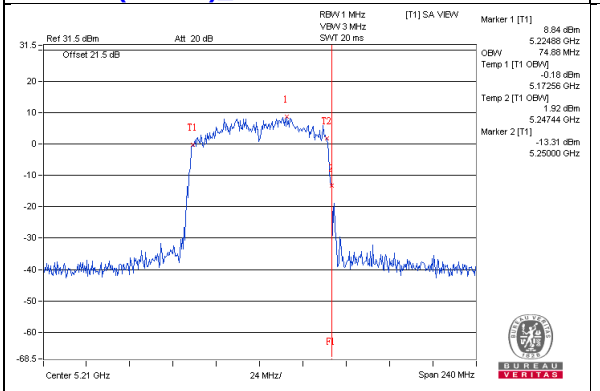
802.11ac(VHT40)_Chain2 / CH46



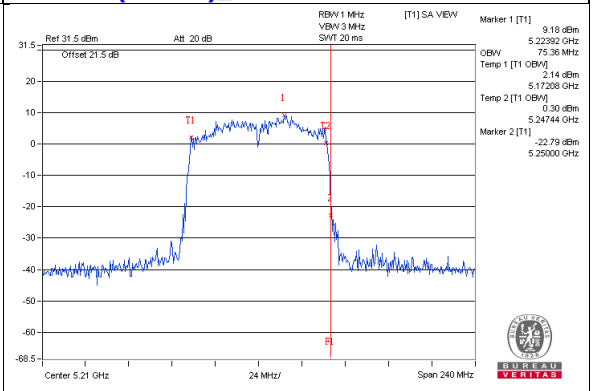
802.11ac(VHT40)_Chain3 / CH46



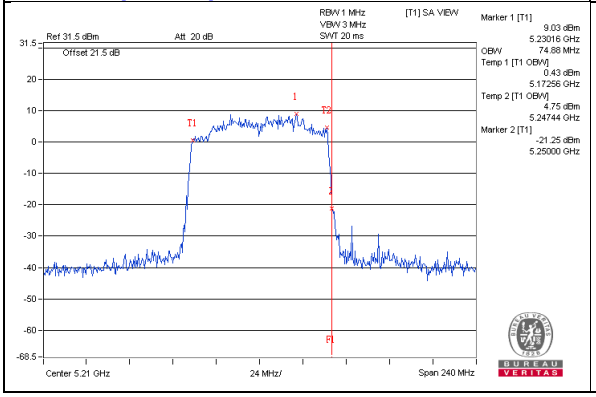
802.11ac(VHT80)_Chain0 / CH42



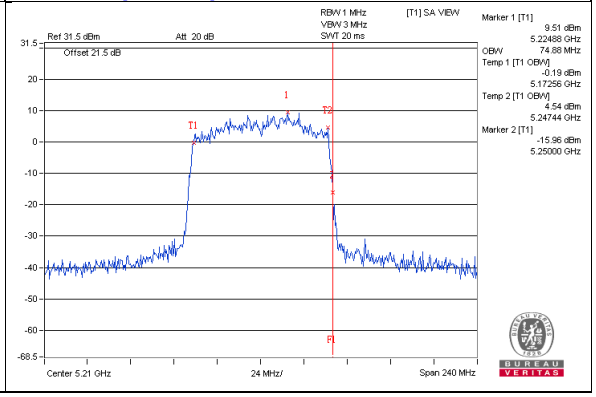
802.11ac(VHT80)_Chain1 / CH42



802.11ac(VHT80)_Chain2 / CH42

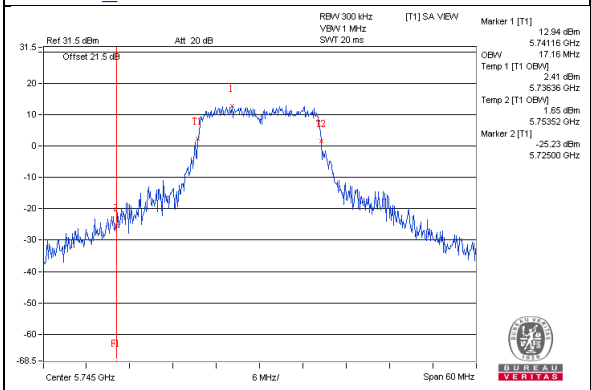


802.11ac(VHT80)_Chain3 / CH42

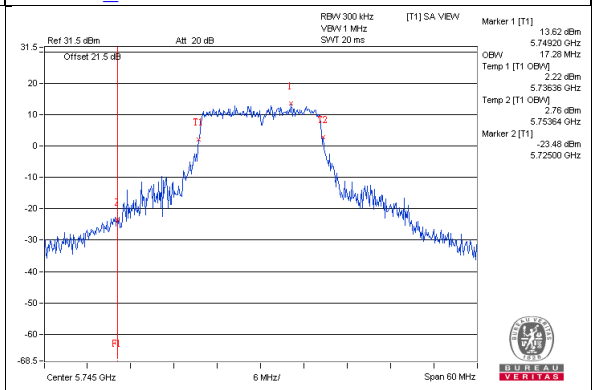


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2C band)

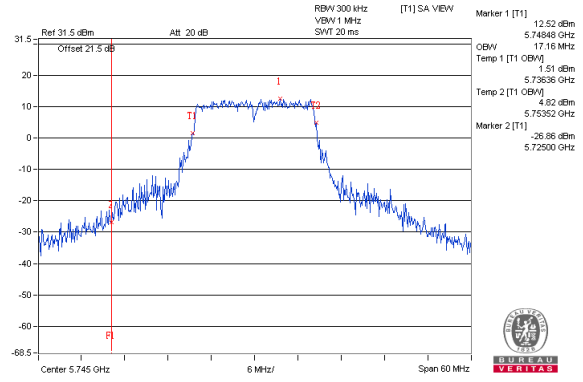
802.11a_Chain0 / CH149



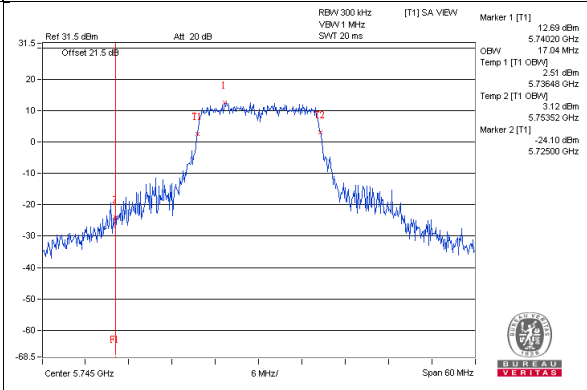
802.11a_Chain1 / CH149



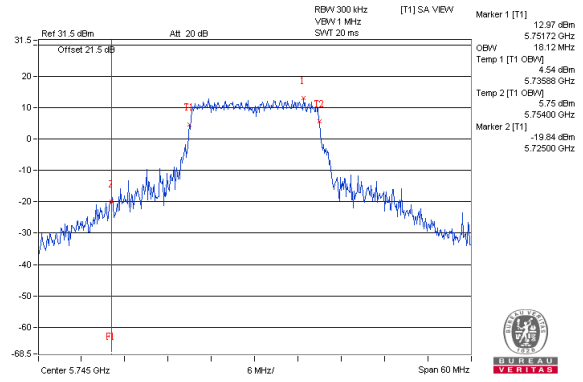
802.11a_Chain2 / CH149



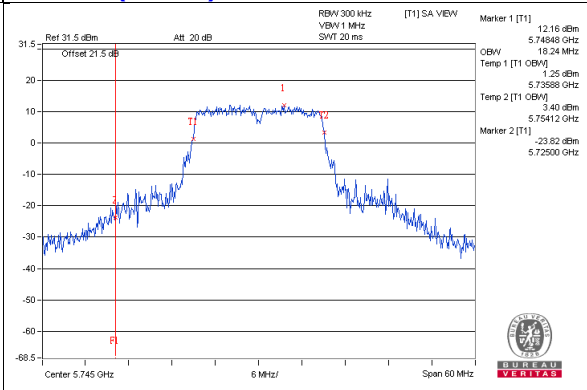
802.11a_Chain3 / CH149



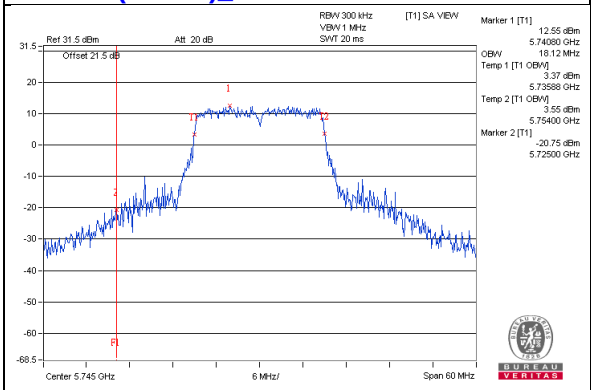
802.11ac(VHT20)_Chain0 / CH149



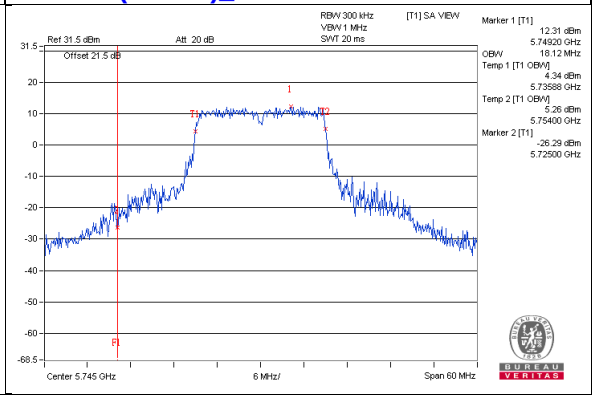
802.11ac(VHT20)_Chain1 / CH149



802.11ac(VHT20)_Chain2 / CH149

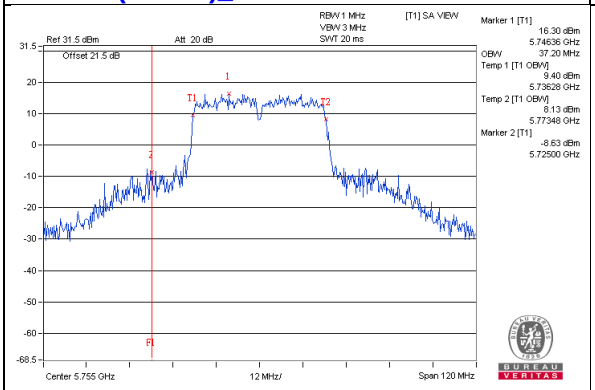


802.11ac(VHT20)_Chain3 / CH149

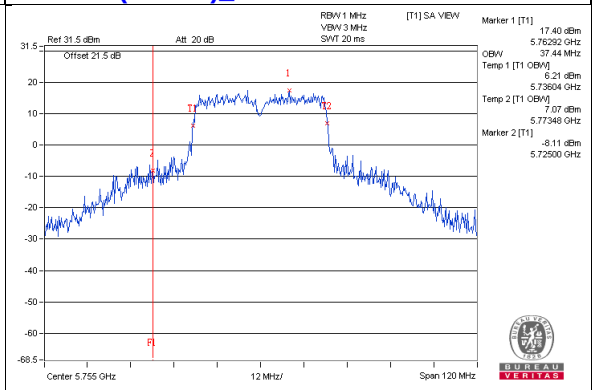


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2C band)

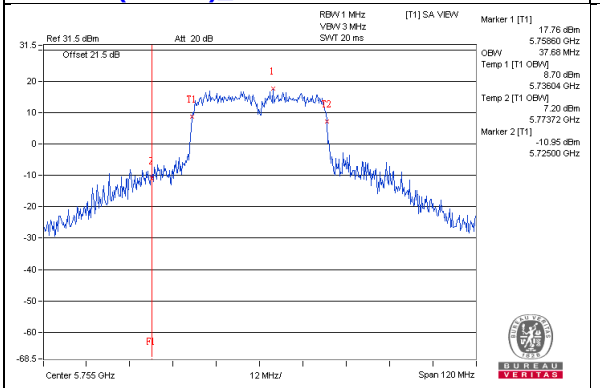
802.11ac(VHT40)_Chain0 / CH151



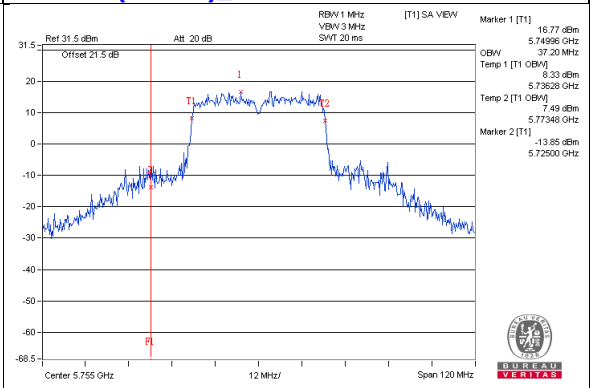
802.11ac(VHT40)_Chain1 / CH151



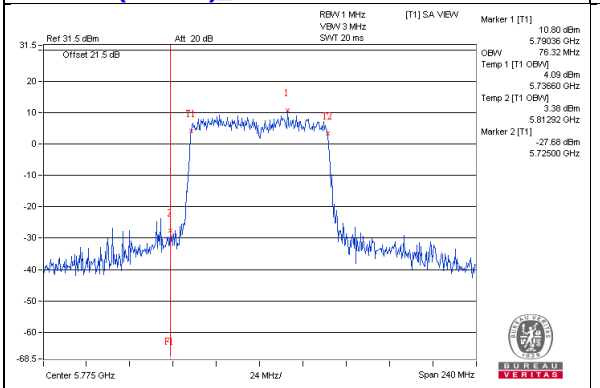
802.11ac(VHT40)_Chain2 / CH151



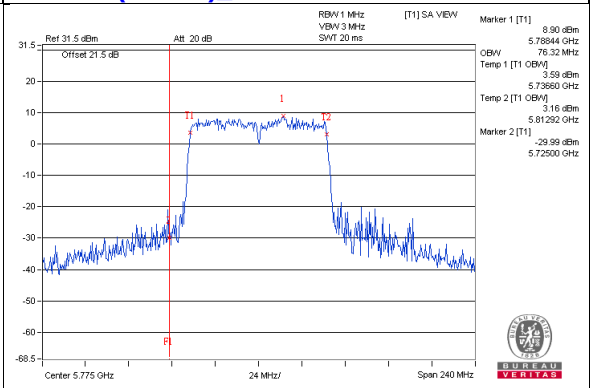
802.11ac(VHT40)_Chain3 / CH151



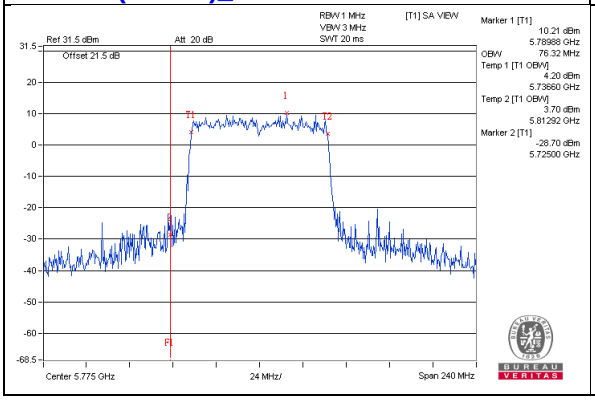
802.11ac(VHT80)_Chain0 / CH155



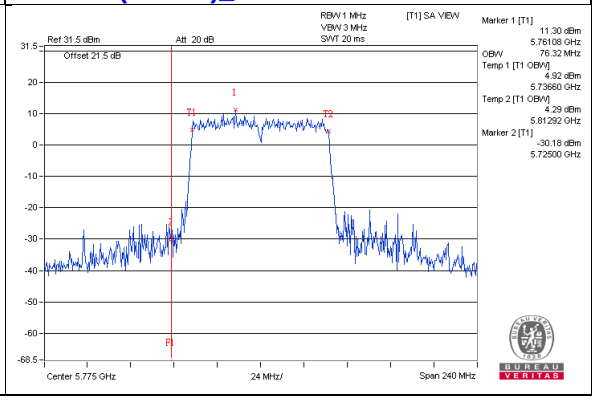
802.11ac(VHT80)_Chain1 / CH155



802.11ac(VHT80)_Chain2 / CH149



802.11ac(VHT80)_Chain3 / CH155

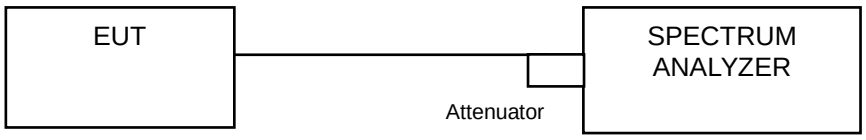


4.5 Peak Power Spectral Density Measurement

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

802.11a, 802.11ac (VHT20)

For U-NII-1 band:

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

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 = 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

802.11ac (VHT40), 802.11ac (VHT80)

For U-NII-1 band:

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 = 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

CDD Mode

802.11a

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)				Total Power Density (dBm/MHz)	MAX. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3			
36	5180	5.56	5.64	5.67	5.66	11.65	12.48	Pass
40	5200	5.81	5.85	5.92	5.89	11.89	12.48	Pass
48	5240	5.74	5.72	5.83	6.03	11.85	12.48	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 = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 10.52dBi > 6dBi , so the power density limit shall be reduced to 17-(10.52-6) = 12.48dBm.

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	Chain 2	Chain 3			
36	5180	5.59	5.52	5.61	5.49	11.57	12.48	Pass
40	5200	5.70	5.70	5.73	5.59	11.70	12.48	Pass
48	5240	5.69	5.36	5.81	5.83	11.70	12.48	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 = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 10.52dBi > 6dBi , so the power density limit shall be reduced to 17-(10.52-6) = 12.48dBm.

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	Chain 2	Chain 3				
38	5190	1.62	1.81	1.92	1.83	0.15	7.97	12.48	Pass
46	5230	6.02	5.35	6.04	5.97	0.15	12.02	12.48	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 = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 10.52dBi > 6dBi , so the power density limit shall be reduced to 17-(10.52-6) = 12.48dBm.

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

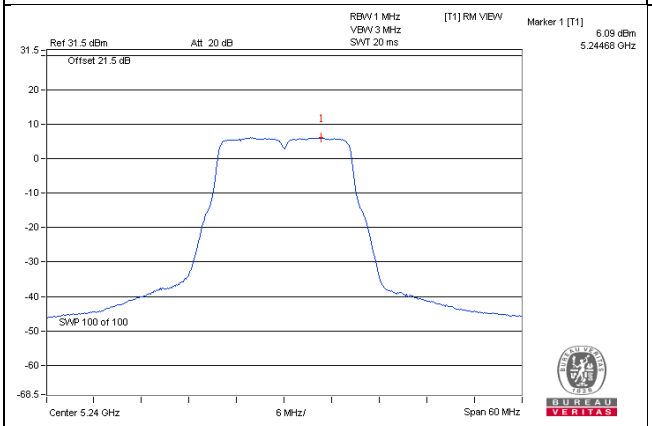
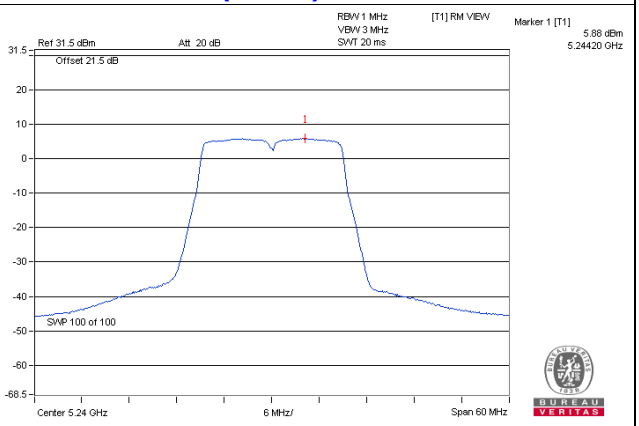
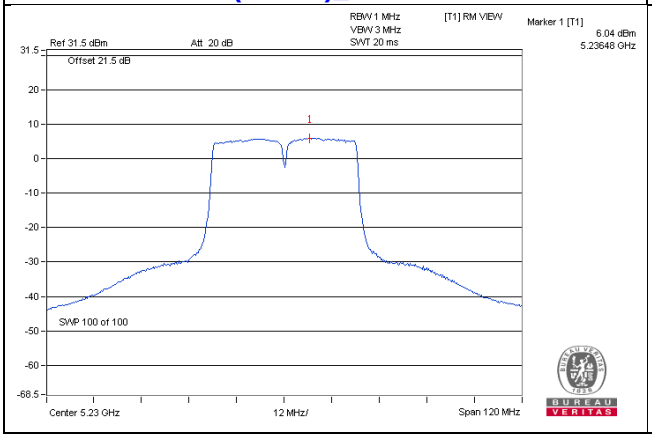
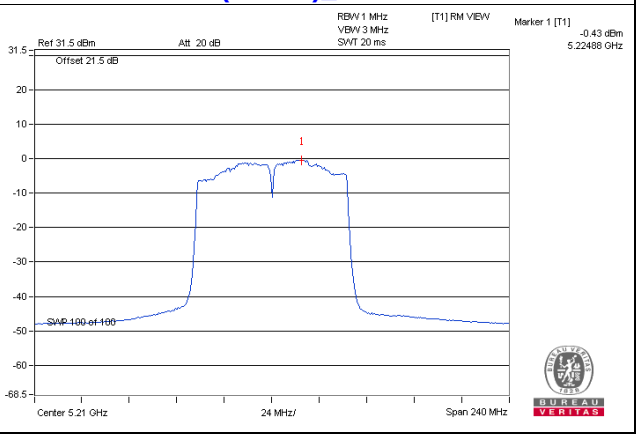
802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD With Duty Factor (dBm/MHz)	MAX. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
38	5190	-0.59	-0.47	-0.57	-0.70	0.27	5.71	12.48	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 = 10 log[($10^{G1/20}$ + $10^{G2/20}$ + $10^{G3/20}$ + $10^{G4/20}$)^2 / 4] = 10.52dBi > 6dBi , so the power density limit shall be reduced to 17-(10.52-6) = 12.48dBm.

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

Spectrum Plot of Worst Value	
802.11a_Chain 3 / CH48	**802.11ac (VHT20)_Chain 3 / CH48**
	
802.11ac (VHT40)_Chain 2 / CH46	**802.11ac (VHT80)_Chain 1 / CH38**
	

For U-NII-3:

802.11a

TX chain	Channel	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	10 log (N=4) dB	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
0	149	5745	1.22	3.44	6.02	9.46	25.48	Pass
	157	5785	1.13	3.35	6.02	9.37	25.48	Pass
	165	5825	-0.01	2.21	6.02	8.23	25.48	Pass
1	149	5745	1.18	3.40	6.02	9.42	25.48	Pass
	157	5785	1.05	3.27	6.02	9.29	25.48	Pass
	165	5825	-0.11	2.11	6.02	8.13	25.48	Pass
2	149	5745	1.19	3.41	6.02	9.43	25.48	Pass
	157	5785	1.11	3.33	6.02	9.35	25.48	Pass
	165	5825	-0.41	1.81	6.02	7.83	25.48	Pass
3	149	5745	0.80	3.02	6.02	9.04	25.48	Pass
	157	5785	1.17	3.39	6.02	9.41	25.48	Pass
	165	5825	-0.13	2.09	6.02	8.11	25.48	Pass

Note: Directional gain = 10 log[($10^{G1/20}$ + $10^{G2/20}$ + $10^{G3/20}$ + $10^{G4/20}$)^2 / 4] = 10.52dBi > 6dBi , so the power density limit shall be reduced to 30-(10.52-6) = 25.48dBm.

802.11ac (VHT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	10 log (N=4) dB	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
0	149	5745	0.91	3.13	6.02	9.15	25.48	Pass
	157	5785	0.65	2.87	6.02	8.89	25.48	Pass
	165	5825	-0.31	1.91	6.02	7.93	25.48	Pass
1	149	5745	0.55	2.77	6.02	8.79	25.48	Pass
	157	5785	0.64	2.86	6.02	8.88	25.48	Pass
	165	5825	-0.40	1.82	6.02	7.84	25.48	Pass
2	149	5745	0.67	2.89	6.02	8.91	25.48	Pass
	157	5785	0.73	2.95	6.02	8.97	25.48	Pass
	165	5825	-0.34	1.88	6.02	7.90	25.48	Pass
3	149	5745	1.08	3.30	6.02	9.32	25.48	Pass
	157	5785	0.99	3.21	6.02	9.23	25.48	Pass
	165	5825	-0.67	1.55	6.02	7.57	25.48	Pass

Note: Directional gain = 10 log[($10^{G1/20}$ + $10^{G2/20}$ + $10^{G3/20}$ + $10^{G4/20}$)^2 / 4] = 10.52dBi > 6dBi , so the power density limit shall be reduced to 30-(10.52-6) = 25.48dBm.

802.11ac (VHT40)

TX chain	Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor		10 log (N=4) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	151	5755	-1.98	0.24	6.02	0.15	6.41	25.48	Pass
	159	5795	-2.12	0.10	6.02	0.15	6.27	25.48	Pass
1	151	5755	-1.57	0.65	6.02	0.15	6.82	25.48	Pass
	159	5795	-1.91	0.31	6.02	0.15	6.48	25.48	Pass
2	151	5755	-1.09	1.13	6.02	0.15	7.30	25.48	Pass
	159	5795	-1.69	0.53	6.02	0.15	6.70	25.48	Pass
3	151	5755	-1.86	0.36	6.02	0.15	6.53	25.48	Pass
	159	5795	-2.05	0.17	6.02	0.15	6.34	25.48	Pass

Note: 1. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 10.52dBi > 6dBi , so the power density limit shall be reduced to 30-(10.52-6) = 25.48dBm.

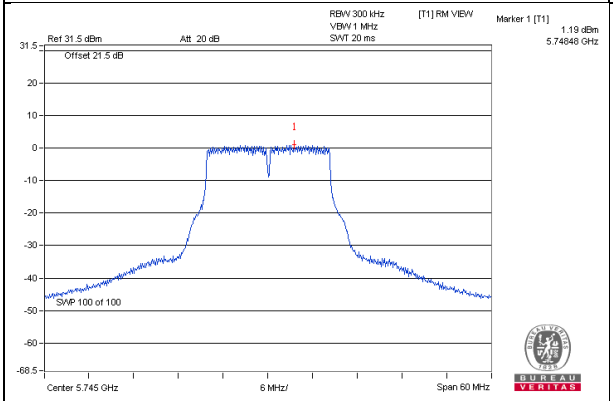
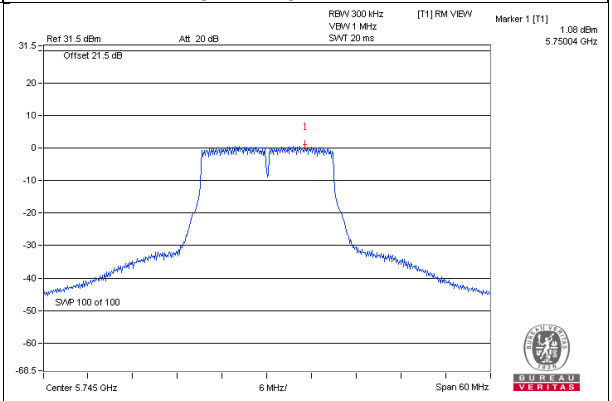
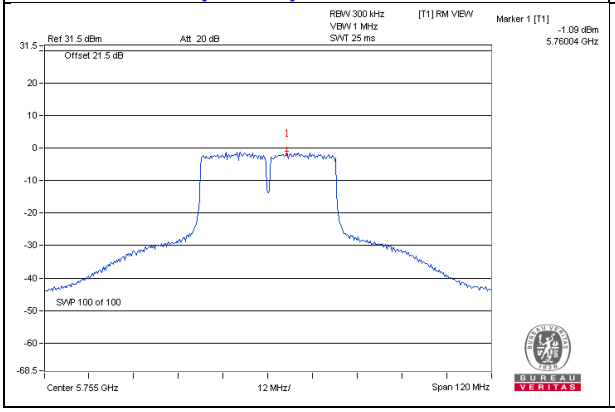
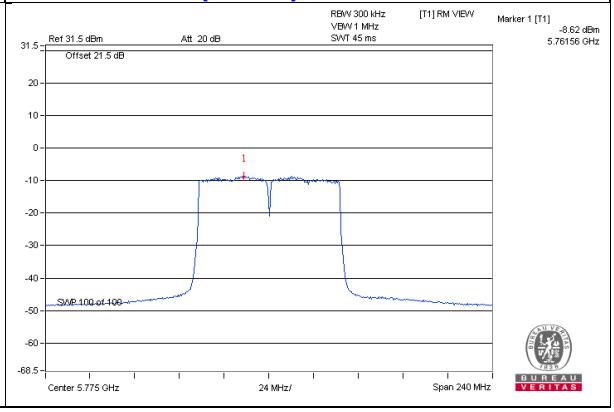
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

TX chain	Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor		10 log (N=4) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	155	5755	-9.18	-6.96	6.02	0.27	-0.67	25.48	Pass
1	155	5755	-8.88	-6.66	6.02	0.27	-0.37	25.48	Pass
2	155	5755	-8.62	-6.40	6.02	0.27	-0.11	25.48	Pass
3	155	5755	-8.80	-6.58	6.02	0.27	-0.29	25.48	Pass

Note: 1. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 10.52dBi > 6dBi , so the power density limit shall be reduced to 30-(10.52-6) = 25.48dBm.

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

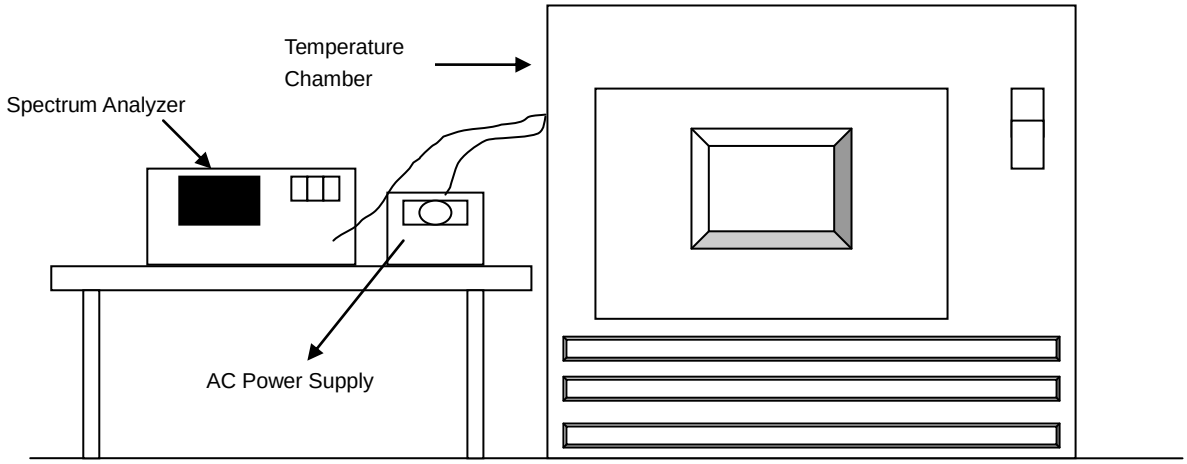
Spectrum Plot of Worst Value	
802.11a – Chain 2: CH 149	**802.11ac (VHT20) – Chain 3: CH 149**
	
802.11ac (VHT40) – Chain 2: CH 151	**802.11ac (VHT80) – Chain 2: CH 155**
	

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

a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
b. Turn the EUT on and couple its output to a spectrum analyzer.
c. Turn the EUT off and set the chamber to the highest temperature specified.
d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 Minutes.
e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 Minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.
.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Set the EUT transmit at un-modulation mode to test frequency stability.

4.6.7 Test Results

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
TEMP. (℃)	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	5179.9973	Pass	5179.9981	Pass	5180.001	Pass	5180.0004	Pass
40	120	5179.994	Pass	5179.9931	Pass	5179.9944	Pass	5179.9942	Pass
30	120	5179.9991	Pass	5179.998	Pass	5179.996	Pass	5179.9985	Pass
20	120	5180.0161	Pass	5180.0152	Pass	5180.0147	Pass	5180.0125	Pass
10	120	5179.9805	Pass	5179.9809	Pass	5179.9827	Pass	5179.9822	Pass
0	120	5180.02	Pass	5180.0212	Pass	5180.0235	Pass	5180.0194	Pass
-10	120	5179.9738	Pass	5179.9736	Pass	5179.9761	Pass	5179.974	Pass
-20	120	5180.0106	Pass	5180.0074	Pass	5180.0069	Pass	5180.0099	Pass
-30	120	5180.0273	Pass	5180.0258	Pass	5180.023	Pass	5180.0263	Pass

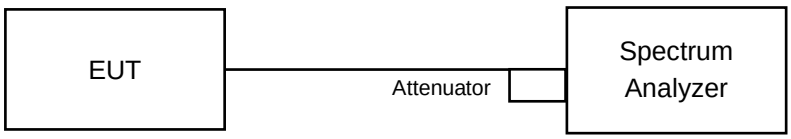
Frequency Stability Versus Voltage									
Operating Frequency: 5180 MHz									
TEMP. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
20	138	5180.0164	Pass	5180.0149	Pass	5180.0137	Pass	5180.0123	Pass
	120	5180.0161	Pass	5180.0152	Pass	5180.0147	Pass	5180.0125	Pass
	102	5180.0155	Pass	5180.0162	Pass	5180.0144	Pass	5180.0131	Pass

4.7 6dB Bandwidth Measurment

4.7.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

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

4.7.7 Test Results

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
149	5745	16.43	16.43	16.42	16.43	0.5	PASS
157	5785	16.44	16.43	16.44	16.42	0.5	PASS
165	5825	16.44	16.43	16.43	16.43	0.5	PASS

802.11ac (VHT20)

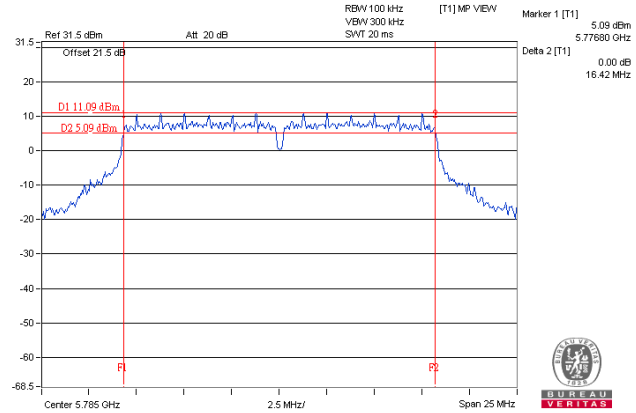
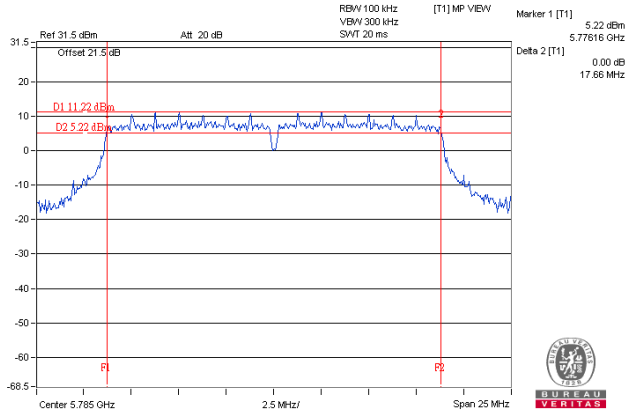
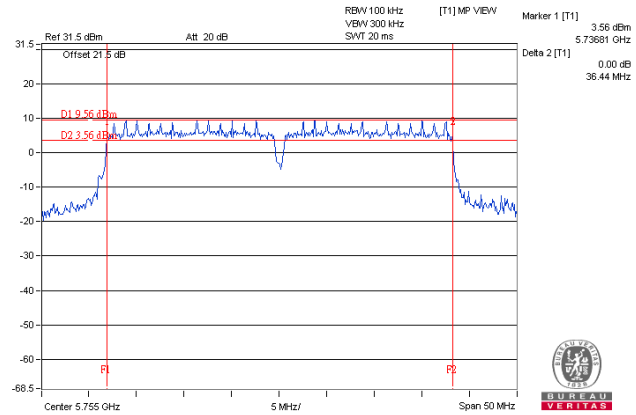
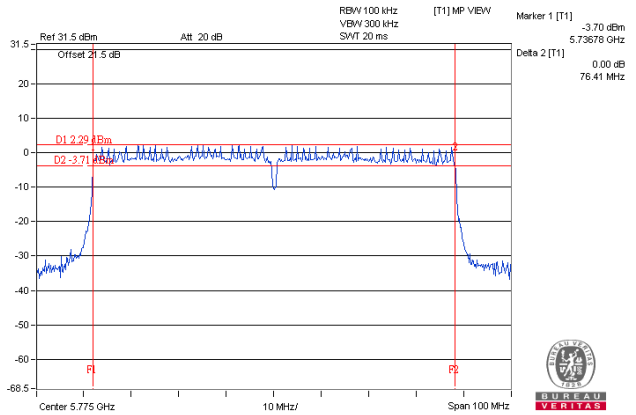
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
149	5745	17.68	17.66	17.68	17.69	0.5	PASS
157	5785	17.68	17.70	17.67	17.66	0.5	PASS
165	5825	17.67	17.70	17.68	17.68	0.5	PASS

802.11ac (VHT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
151	5755	36.47	36.45	36.44	36.44	0.5	PASS
159	5795	36.50	36.49	36.49	36.49	0.5	PASS

802.11ac (VHT80)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
155	5775	76.48	76.47	76.41	76.41	0.5	PASS

Spectrum Plot of Worst Value	
802.11a_Chain 3 / CH157	**802.11ac (VHT20)_Chain 3 / CH157**
	
802.11ac (VHT40)_Chain 2 / CH151	**802.11ac (VHT80)_Chain 2 / CH155**
	

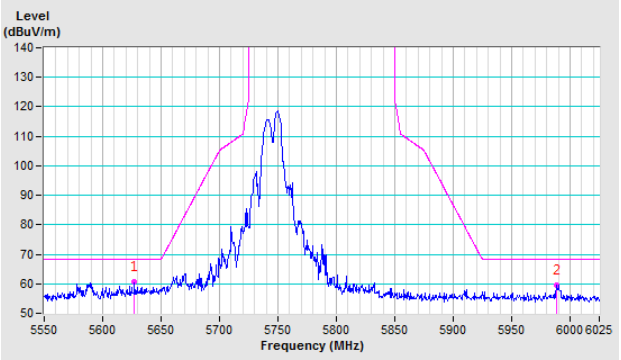
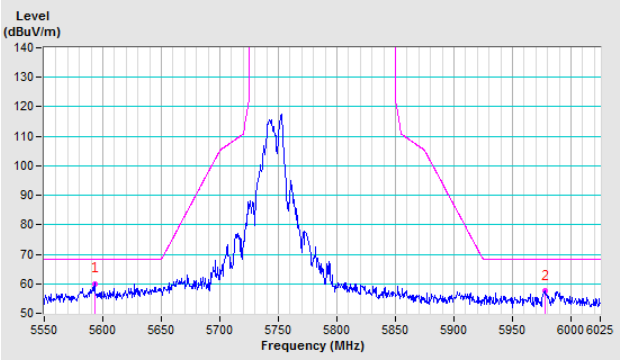
5 Pictures of Test Arrangements

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

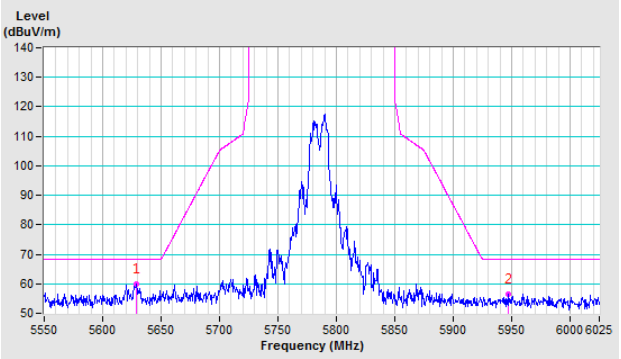
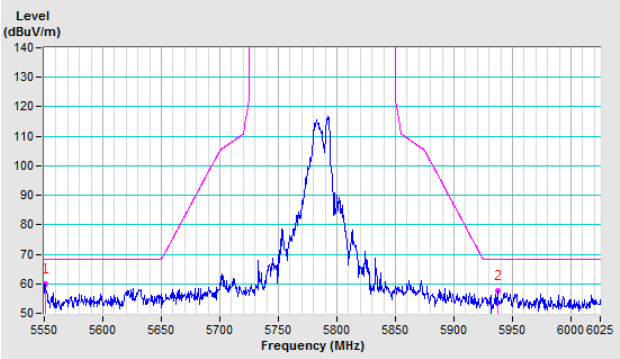
Annex A- Radiated Out of Band Emission (OOBE) Measurement (For U-NII-3 band)

802.11a

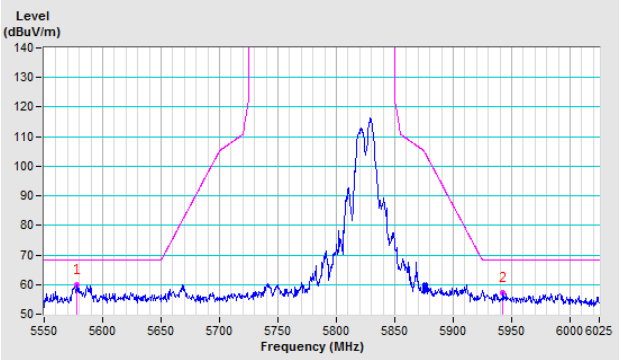
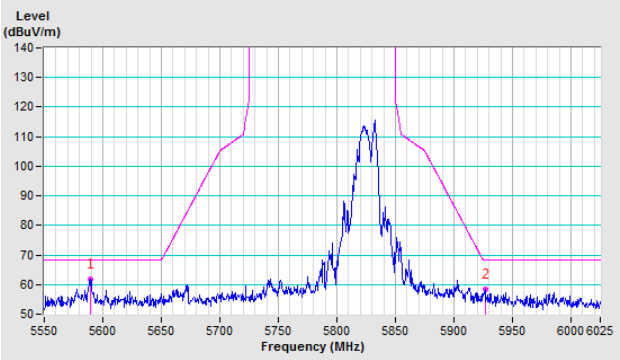
CH 149 5745 MHz

Horizontal	Vertical
	

CH 157 5785 MHz

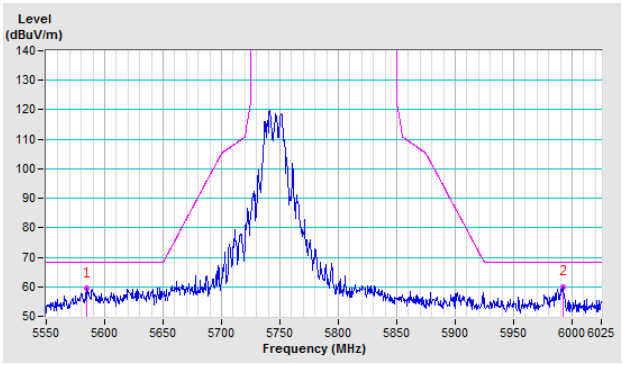
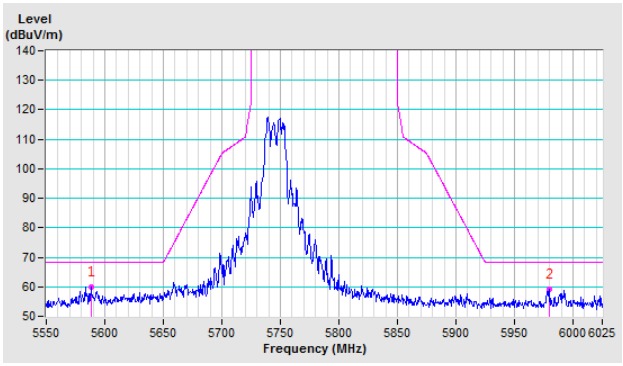
Horizontal	Vertical
	

CH 165 5825 MHz

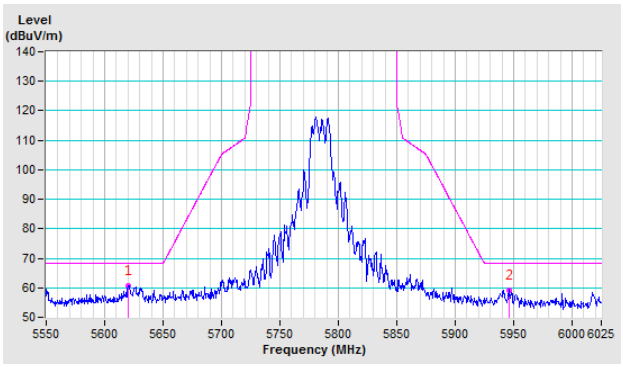
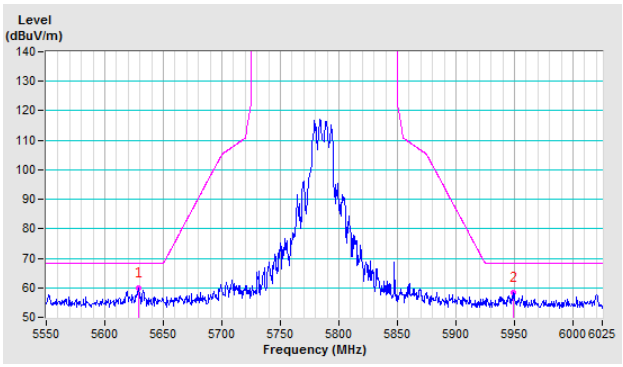
Horizontal	Vertical
	

802.11ac (VHT20)

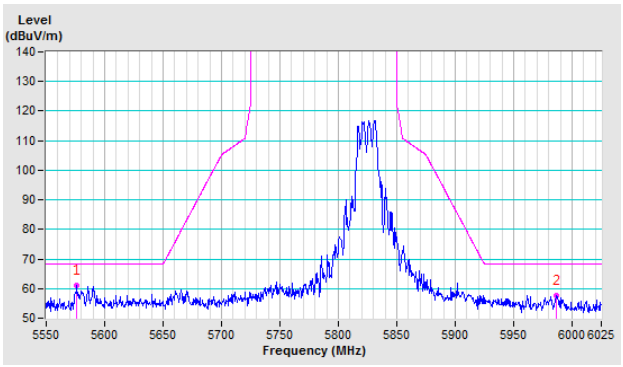
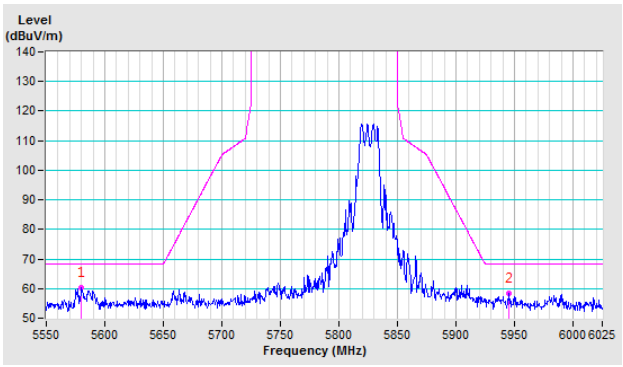
CH 149 5745 MHz

Horizontal	Vertical
	

CH 157 5785 MHz

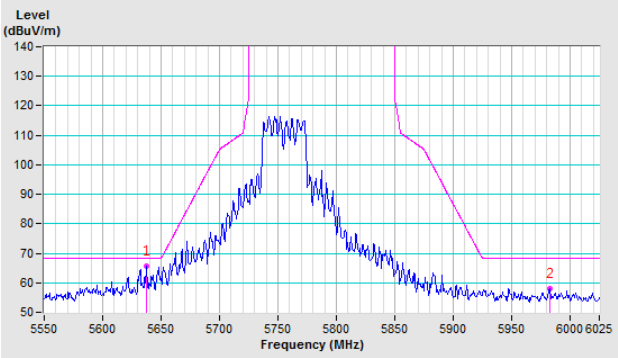
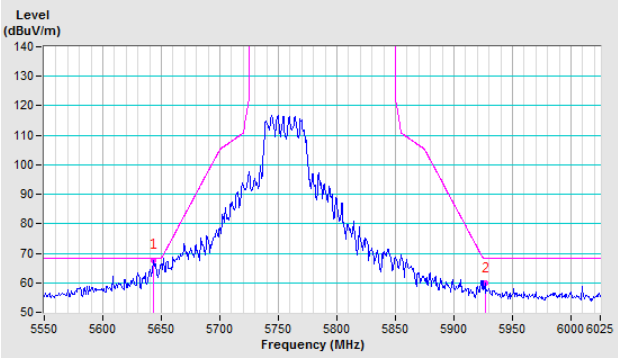
Horizontal	Vertical
	

CH 165 5825 MHz

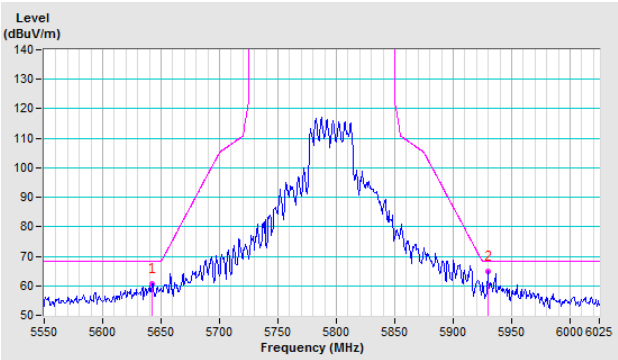
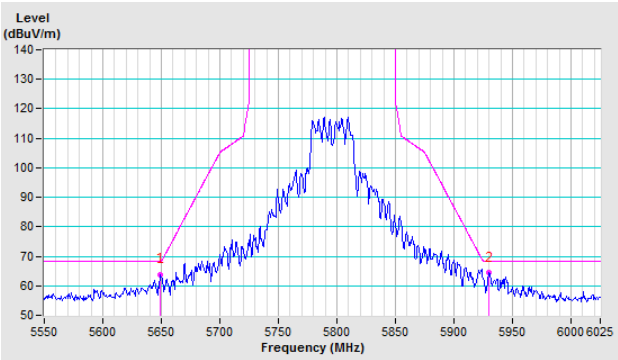
Horizontal	Vertical
	

802.11ac (VHT40)

CH 151 5755 MHz

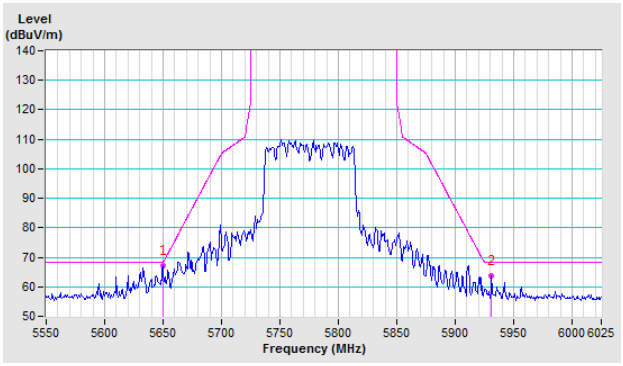
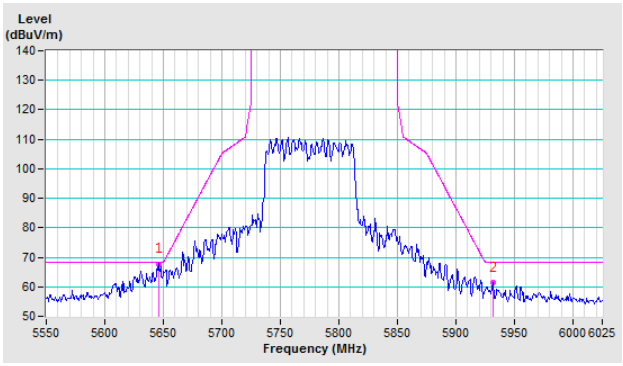
Horizontal	Vertical
	

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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Hsin Chu EMC/RF/Telecom Lab
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Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

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