

FCC Test Report

Report No.: RF181107C49-1

FCC ID: A8J-ENSTACV2

Test Model: EnStationACv2

Received Date: Nov. 07, 2018

Test Date: Nov. 16 ~ Nov. 27, 2018

Issued Date: Dec. 07, 2018

Applicant: EnGenius Technologies

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

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Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

FCC Registration / 788550 / TW0003
Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
RF181107C49-1	Original release	Dec. 07, 2018

1 Certificate of Conformity

Product: Outdoor Long Range Wireless Access Point

Brand: EnGenius

Test Model: EnStationACv2

Sample Status: Engineering sample

Applicant: EnGenius Technologies

Test Date: Nov. 16 ~ Nov. 27, 2018

Standards: 47 CFR FCC Part 15, Subpart E (Section 15.407)
ANSI C63.10:2013

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

Prepared by : Celine Chou , **Date:** Dec. 07, 2018
Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Dec. 07, 2018
Bruce Chen / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -9.34dB at 0.49064MHz.
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 -3.8dB at 43.51MHz.
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 IPEX not a standard connector.

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

2.1 Measurement Uncertainty

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

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

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Outdoor Long Range Wireless Access Point
Brand	EnGenius
Test Model	EnStationACv2
Sample Status	Engineering sample
Power Supply Rating	54Vdc (POE)
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK
Modulation Technology	OFDM
Transfer Rate	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 300Mbps 802.11ac: up to 867Mbps
Operating Frequency	5180 ~ 5240MHz, 5745 ~ 5825MHz
Number of Channel	5180 ~ 5240MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5745 ~ 5825MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
Output Power	CDD Mode: 5180 ~ 5240MHz: 5.980mW 5745 ~ 5825MHz: 111.824mW Beamforming Mode: 5180 ~ 5240MHz: 2.990mW 5745 ~ 5825MHz: 55.916mW
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	PoE
Cable Supplied	0.5m non-shielded power cable without core

Note:

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

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

* The modulation and bandwidth are similar for 802.11n mode for 20MHz/40MHz and 802.11ac mode for 20MHz/40MHz, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

* For 802.11n and 802.11ac, CDD mode and Beamforming mode are presented in power output test item. For other test items, CDD mode is the worst case for final tests after pretesting.

2. The EUT with follow antennas gain is listed as table below.

Ant. No.	Antenna Type	Connector	Gain(dBi)	
			2.4-2.5GHz	5.15-5.925GHz
1	PIFA	IPEX	-	15.5
2			-	15.5
3			3.81	-

3. The EUT uses following POE.

POE	
Brand	EnGenius
Model	EPA5006GR
Input	100-240Vac, 50/60Hz, ~0.8A
Output	54Vdc, 0.6A PIN 4,5:54Vdc PIN 7,8 RETURN

4. The EUT will install at outdoor area, the highest antenna gain from the horizon above 30 degrees as below, for more detail information please refer to antenna specification and user manual

Antenna No.	Antenna gain	Antenna install degree
1, 2	13.189 dBi	

Due to device can be configuration at different angle ,thus consider to above 30 degrees from the horizon the highest antenna gain are chosen from antenna specification exhibits from 0 to 360 degrees for U-NII-1 band.

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

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 $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

Radiated Emission Test (Above 1GHz):

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	6.5
	802.11n (HT40)		38 to 46	38, 46	OFDM	13.5
	802.11ac (VHT80)		42	42	OFDM	29.3
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	6.5
	802.11n (HT40)		151 to 159	151, 159	OFDM	13.5
	802.11ac (VHT80)		155	155	OFDM	29.3

Radiated Emission Test (Below 1GHz):

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	165	OFDM	6.0
	802.11a	5745-5825	149 to 165		OFDM	6.0

Power Line Conducted Emission Test:

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	165	OFDM	6.0
	802.11a	5745-5825	149 to 165		OFDM	6.0

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.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	6.5
	802.11n (HT40)		38 to 46	38, 46	OFDM	13.5
	802.11ac (VHT80)		42	42	OFDM	29.3
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	6.5
	802.11n (HT40)		151 to 159	151, 159	OFDM	13.5
	802.11ac (VHT80)		155	155	OFDM	29.3

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 68% RH 25 deg. C, 67% RH	120Vac, 60Hz	Willy Cheng
RE<1G	25 deg. C, 68% RH	120Vac, 60Hz	Willy Cheng
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Adair Peng
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Alan Wu

3.3 Duty Cycle of Test Signal

802.11n (HT20): Duty cycle of test signal is $\geq 98\%$, duty factor is not required.

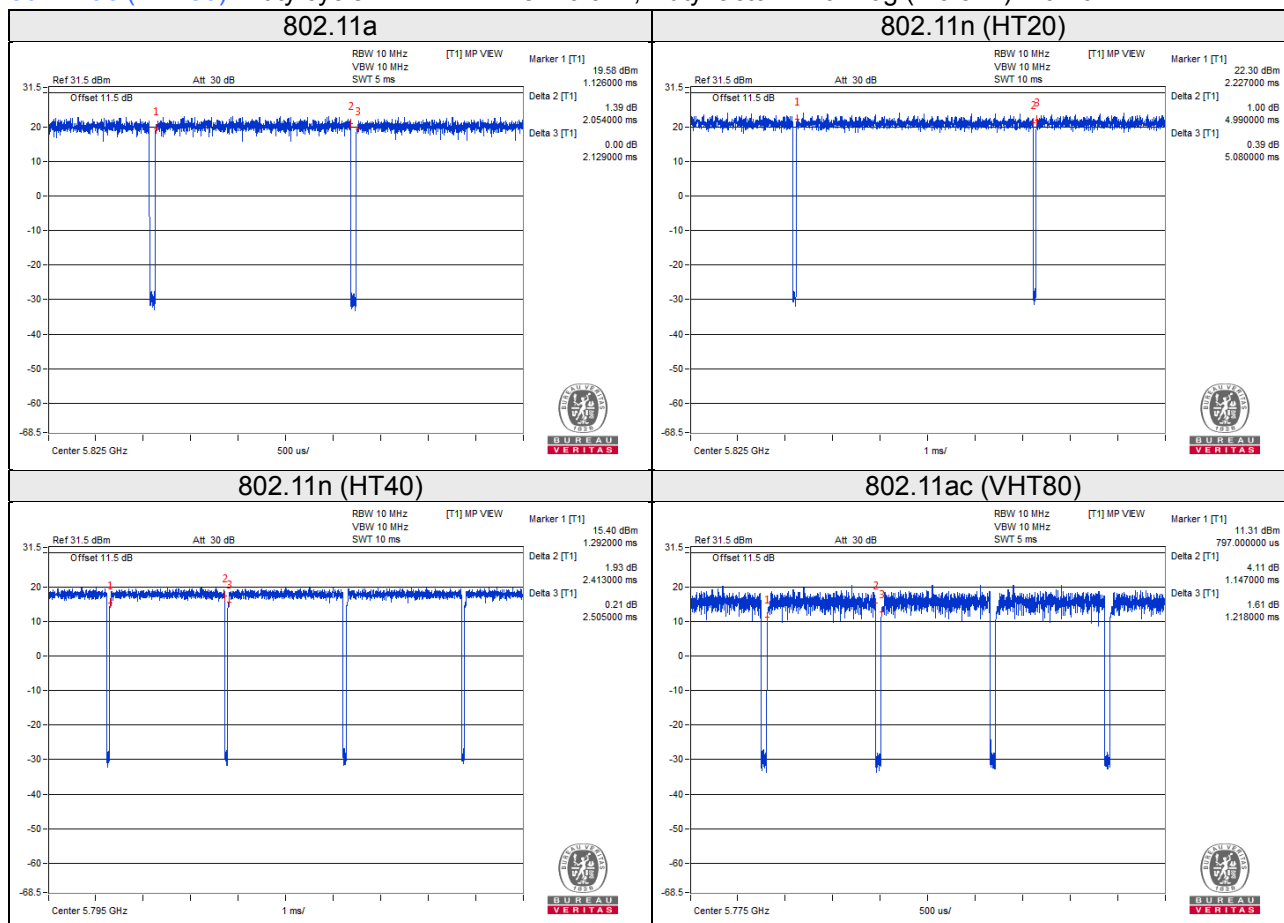
802.11a, 802.11n (HT40), 802.11ac (VHT80): Duty cycle of test signal is $< 98\%$, duty factor is required.

802.11a: Duty cycle = $2.054/2.129 = 0.965$, Duty factor = $10 * \log (1/0.965) = 0.16$

802.11n (HT20): Duty cycle = $4.990/5.080 = 0.982$

802.11n (HT40): Duty cycle = $2.413/2.505 = 0.963$, Duty factor = $10 * \log (1/0.963) = 0.16$

802.11ac (VHT80): Duty cycle = $1.147/1.218 = 0.942$, Duty factor = $10 * \log (1/0.942) = 0.26$



3.4 Description of Support Units

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

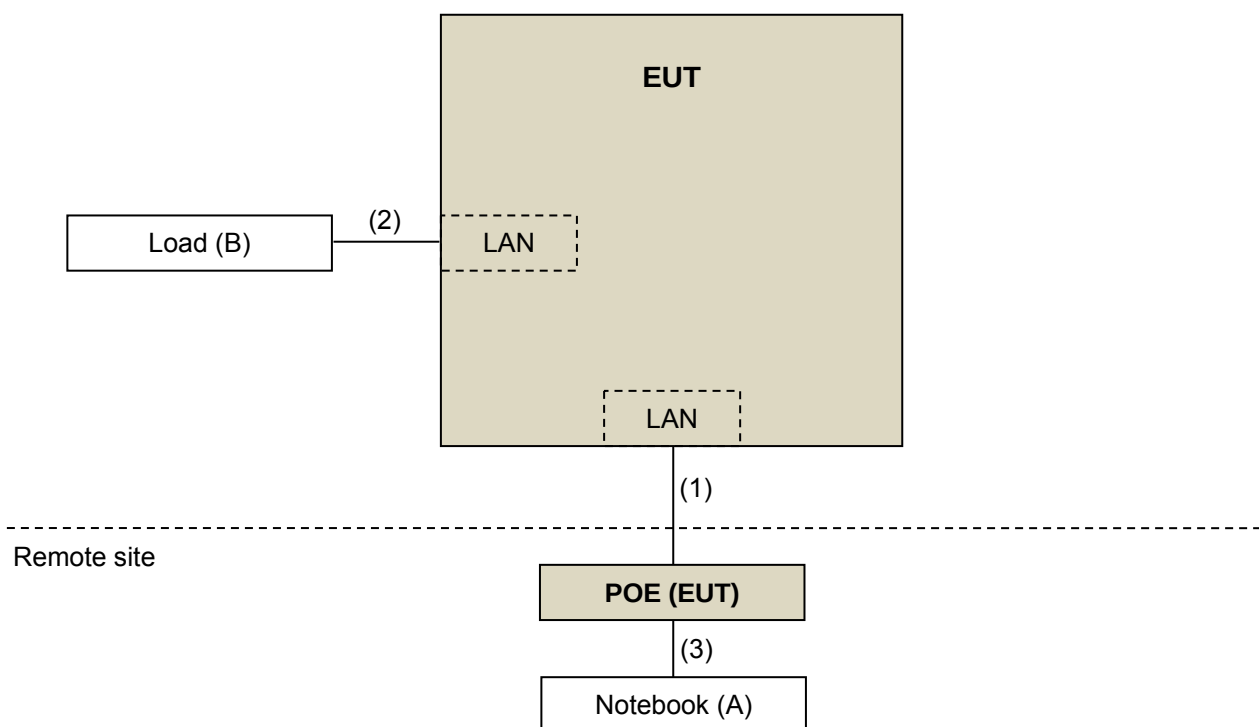
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	Load	NA	NA	NA	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45, Cat5e	1	5	N	0	-
2.	RJ45, Cat5e	1	1.5	N	0	-
3.	RJ45, Cat5e	1	1.5	N	0	-

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart E (15.407)

KDB 789033 D02 General UNII Test Procedure New Rules v02r01

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10:2013

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

Note:

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

Limits of unwanted emission out of the restricted bands

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

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

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 29, 2018	May 28, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Dec. 12, 2017	Dec. 11, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Dec. 01, 2017	Nov. 30, 2018
HORN Antenna SCHWARZBECK	BBHA 9120 D	209	Dec. 13, 2017	Dec. 12, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 01, 2017	Nov. 30, 2018
Loop Antenna TESEQ	HLA 6121	45745	Jun. 14, 2018	Jun. 13, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 21, 2018	Aug. 20, 2019
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Apr. 03, 2018	Apr. 02, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 21, 2018	Aug. 20, 2019
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM-S M-8000	Cable-CH3-03 (309224+170907)	Aug. 21, 2018	Aug. 20, 2019
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Nov. 14, 2018	Nov. 13, 2019
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY5519 0004/MY55190007/MY 55210005	Jul. 17, 2018	Jul. 16, 2019

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 3.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is 7450F-3.

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

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

For Radiated emission above 30MHz

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

Note:

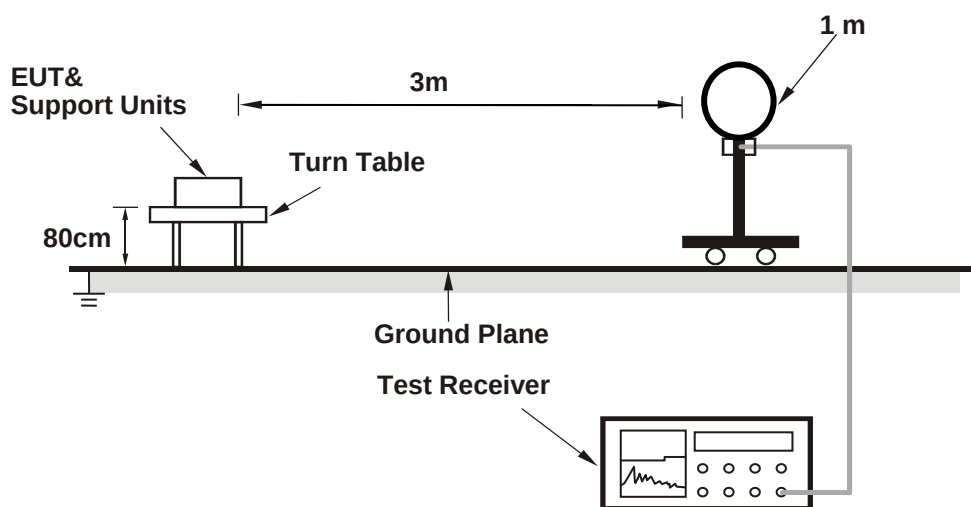
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

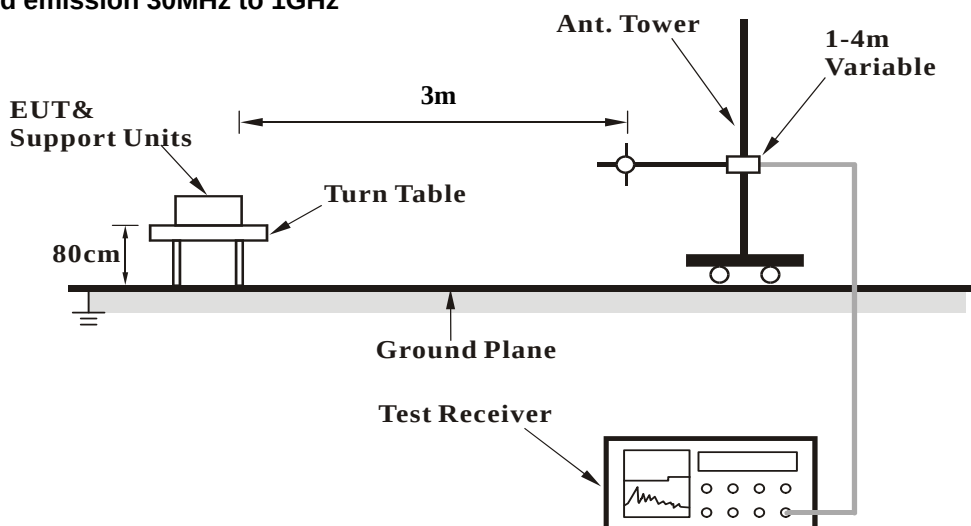
No deviation.

4.1.5 Test Setup

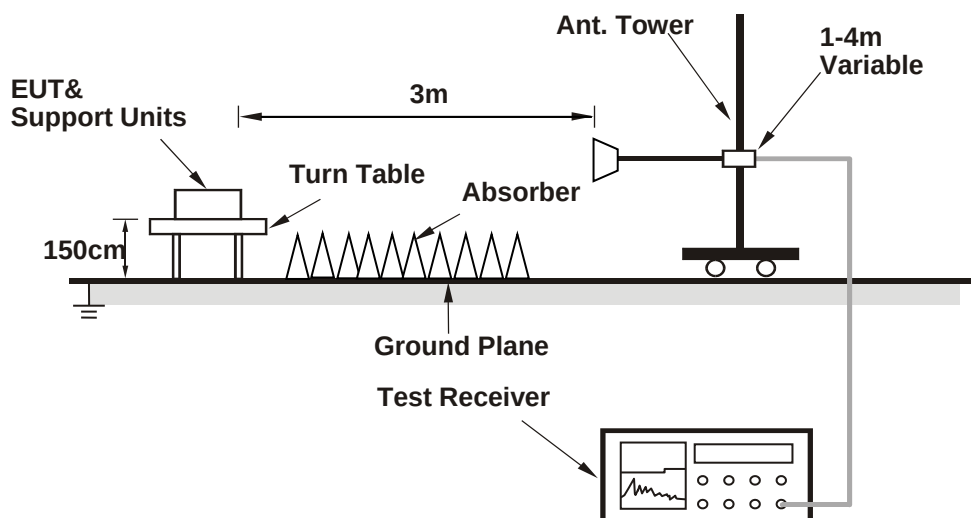
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Prepared a notebook to act as a communication partner and placed it outside of testing area.
- The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The communication partner sent data to EUT by command "PING".

4.1.7 Test Results

Above 1GHz data:

802.11a

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Peak (PK)
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	55.1 PK	74.0	-18.9	3.34 H	156	51.6	3.5
2	5150.00	43.1 AV	54.0	-10.9	3.34 H	156	39.6	3.5
3	*5180.00	99.3 PK			3.54 H	92	60.1	39.2
4	*5180.00	87.6 AV			3.54 H	92	48.4	39.2
5	#10360.00	54.0 PK	68.2	-14.2	2.51 H	217	38.6	15.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	54.8 PK	74.0	-19.2	2.51 V	79	51.3	3.5
2	5150.00	42.9 AV	54.0	-11.1	2.51 V	79	39.4	3.5
3	*5180.00	99.3 PK			2.91 V	83	60.1	39.2
4	*5180.00	88.0 AV			2.91 V	83	48.8	39.2
5	#10360.00	54.7 PK	68.2	-13.5	1.93 V	256	39.3	15.4

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	98.0 PK			3.01 H	60	58.7	39.3
2	*5200.00	87.6 AV			3.01 H	60	48.3	39.3
3	#10400.00	53.9 PK	68.2	-14.3	2.64 H	79	38.3	15.6
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	*5200.00	98.8 PK			2.93 V	84	59.5	39.3
2	*5200.00	87.8 AV			2.93 V	84	48.5	39.3
3	#10400.00	54.8 PK	68.2	-13.4	2.31 V	164	39.2	15.6

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 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	98.8 PK			3.42 H	94	59.7	39.1
2	*5240.00	87.2 AV			3.42 H	94	48.1	39.1
3	5350.00	56.6 PK	74.0	-17.4	3.26 H	131	52.9	3.7
4	5350.00	43.3 AV	54.0	-10.7	3.26 H	131	39.6	3.7
5	#10480.00	52.7 PK	68.2	-15.5	2.71 H	258	36.5	16.2
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	*5240.00	98.3 PK			2.61 V	87	59.2	39.1
2	*5240.00	86.9 AV			2.61 V	87	47.8	39.1
3	5350.00	55.8 PK	74.0	-18.2	2.79 V	102	52.1	3.7
4	5350.00	43.2 AV	54.0	-10.8	2.79 V	102	39.5	3.7
5	#10480.00	53.1 PK	68.2	-15.1	2.19 V	173	36.9	16.2

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5607.69	55.1 PK	68.2	-13.1	3.07 H	153	50.9	4.2
2	*5745.00	110.3 PK			3.07 H	153	70.5	39.8
3	*5745.00	99.3 AV			3.07 H	153	59.5	39.8
4	#5970.51	56.8 PK	68.2	-11.4	3.07 H	153	51.9	4.9
5	11490.00	57.7 PK	74.0	-16.3	1.96 H	231	40.9	16.8
6	11490.00	43.9 AV	54.0	-10.1	1.96 H	231	27.1	16.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5633.33	54.6 PK	68.2	-13.6	2.75 V	109	50.4	4.2
2	*5745.00	110.4 PK			2.75 V	109	70.6	39.8
3	*5745.00	99.6 AV			2.75 V	109	59.8	39.8
4	#5985.26	56.5 PK	68.2	-11.7	2.75 V	109	51.5	5.0
5	11490.00	58.0 PK	74.0	-16.0	2.55 V	189	41.2	16.8
6	11490.00	44.2 AV	54.0	-9.8	2.55 V	189	27.4	16.8

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5601.28	55.6 PK	68.2	-12.6	3.07 H	151	51.4	4.2
2	*5785.00	110.0 PK			3.07 H	151	69.9	40.1
3	*5785.00	98.9 AV			3.07 H	151	58.8	40.1
4	#5981.41	56.8 PK	68.2	-11.4	3.07 H	151	51.8	5.0
5	11570.00	59.3 PK	74.0	-14.7	1.96 H	152	42.3	17.0
6	11570.00	45.1 AV	54.0	-8.9	1.96 H	152	28.1	17.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5610.26	55.3 PK	68.2	-12.9	2.29 V	107	51.1	4.2
2	*5785.00	111.7 PK			2.29 V	107	71.6	40.1
3	*5785.00	100.6 AV			2.29 V	107	60.5	40.1
4	#5968.59	57.7 PK	68.2	-10.5	2.29 V	107	52.8	4.9
5	11570.00	58.9 PK	74.0	-15.1	2.42 V	193	41.9	17.0
6	11570.00	44.4 AV	54.0	-9.6	2.42 V	193	27.4	17.0

Remarks:

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

CHANNEL	TX Channel 165	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz	FUNCTION	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	#5616.03	54.6 PK	68.2	-13.6	3.14 H	149	50.4	4.2
2	*5825.00	111.3 PK			3.14 H	149	71.0	40.3
3	*5825.00	100.1 AV			3.14 H	149	59.8	40.3
4	#5961.54	56.4 PK	68.2	-11.8	3.14 H	149	51.6	4.8
5	11650.00	59.1 PK	74.0	-14.9	1.99 H	220	42.5	16.6
6	11650.00	45.6 AV	54.0	-8.4	1.99 H	220	29.0	16.6
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	#5608.97	55.2 PK	68.2	-13.0	2.46 V	105	51.0	4.2
2	*5825.00	112.4 PK			2.46 V	105	72.1	40.3
3	*5825.00	101.5 AV			2.46 V	105	61.2	40.3
4	#5987.18	57.0 PK	68.2	-11.2	2.46 V	105	52.0	5.0
5	11650.00	58.3 PK	74.0	-15.7	2.33 V	179	41.7	16.6
6	11650.00	45.4 AV	54.0	-8.6	2.33 V	179	28.8	16.6

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

802.11n (HT20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	55.5 PK	74.0	-18.5	3.24 H	115	52.0	3.5
2	5150.00	42.8 AV	54.0	-11.2	3.24 H	115	39.3	3.5
3	*5180.00	98.3 PK			3.51 H	93	59.1	39.2
4	*5180.00	86.5 AV			3.51 H	93	47.3	39.2
5	#10360.00	53.6 PK	68.2	-14.6	2.26 H	138	38.2	15.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	55.0 PK	74.0	-19.0	2.96 V	111	51.5	3.5
2	5150.00	42.9 AV	54.0	-11.1	2.96 V	111	39.4	3.5
3	*5180.00	98.5 PK			2.76 V	84	59.3	39.2
4	*5180.00	87.2 AV			2.76 V	84	48.0	39.2
5	#10360.00	53.9 PK	68.2	-14.3	2.92 V	124	38.5	15.4

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	97.6 PK			2.86 H	181	58.3	39.3
2	*5200.00	87.0 AV			2.86 H	181	47.7	39.3
3	#10400.00	54.5 PK	68.2	-13.7	2.58 H	137	38.9	15.6
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	*5200.00	98.7 PK			2.80 V	87	59.4	39.3
2	*5200.00	87.4 AV			2.80 V	87	48.1	39.3
3	#10400.00	54.8 PK	68.2	-13.4	1.89 V	236	39.2	15.6

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 48	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz	FUNCTION	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	97.6 PK			3.10 H	181	58.5	39.1
2	*5240.00	86.9 AV			3.10 H	181	47.8	39.1
3	5350.00	56.5 PK	74.0	-17.5	3.02 H	186	52.8	3.7
4	5350.00	43.4 AV	54.0	-10.6	3.02 H	186	39.7	3.7
5	#10480.00	55.4 PK	68.2	-12.8	2.66 H	182	39.2	16.2
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	*5240.00	98.3 PK			2.60 V	89	59.2	39.1
2	*5240.00	87.1 AV			2.60 V	89	48.0	39.1
3	5350.00	55.6 PK	74.0	-18.4	2.48 V	116	51.9	3.7
4	5350.00	43.2 AV	54.0	-10.8	2.48 V	116	39.5	3.7
5	#10480.00	55.7 PK	68.2	-12.5	2.10 V	131	39.5	16.2

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5612.18	54.8 PK	68.2	-13.4	3.10 H	179	50.6	4.2
2	*5745.00	110.9 PK			3.10 H	179	71.1	39.8
3	*5745.00	99.3 AV			3.10 H	179	59.5	39.8
4	#5977.56	56.7 PK	68.2	-11.5	3.10 H	179	51.7	5.0
5	11490.00	58.0 PK	74.0	-16.0	2.05 H	174	41.2	16.8
6	11490.00	43.8 AV	54.0	-10.2	2.05 H	174	27.0	16.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5601.92	54.9 PK	68.2	-13.3	2.33 V	117	50.7	4.2
2	*5745.00	110.9 PK			2.33 V	117	71.1	39.8
3	*5745.00	99.3 AV			2.33 V	117	59.5	39.8
4	#5953.21	57.6 PK	68.2	-10.6	2.33 V	117	52.8	4.8
5	11490.00	57.7 PK	74.0	-16.3	1.73 V	221	40.9	16.8
6	11490.00	44.1 AV	54.0	-9.9	1.73 V	221	27.3	16.8

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5633.97	55.2 PK	68.2	-13.0	3.32 H	89	51.0	4.2
2	*5785.00	112.0 PK			3.32 H	89	71.9	40.1
3	*5785.00	100.5 AV			3.32 H	89	60.4	40.1
4	#5985.90	58.3 PK	68.2	-9.9	3.32 H	89	53.3	5.0
5	11570.00	58.2 PK	74.0	-15.8	2.31 H	155	41.2	17.0
6	11570.00	44.6 AV	54.0	-9.4	2.31 H	155	27.6	17.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5626.28	54.8 PK	68.2	-13.4	2.73 V	110	50.6	4.2
2	*5785.00	111.8 PK			2.73 V	110	71.7	40.1
3	*5785.00	100.7 AV			2.73 V	110	60.6	40.1
4	#5973.72	56.4 PK	68.2	-11.8	2.73 V	110	51.4	5.0
5	11570.00	57.5 PK	74.0	-16.5	1.68 V	234	40.5	17.0
6	11570.00	44.2 AV	54.0	-9.8	1.68 V	234	27.2	17.0

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5613.46	55.6 PK	68.2	-12.6	3.41 H	87	51.4	4.2
2	*5825.00	112.1 PK			3.41 H	87	71.8	40.3
3	*5825.00	100.3 AV			3.41 H	87	60.0	40.3
4	#5955.13	56.7 PK	68.2	-11.5	3.41 H	87	51.9	4.8
5	11650.00	59.2 PK	74.0	-14.8	2.31 H	164	42.6	16.6
6	11650.00	45.4 AV	54.0	-8.6	2.31 H	164	28.8	16.6
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	#5610.26	55.3 PK	68.2	-12.9	2.46 V	108	51.1	4.2
2	*5825.00	113.2 PK			2.46 V	108	72.9	40.3
3	*5825.00	101.9 AV			2.46 V	108	61.6	40.3
4	#5927.56	56.9 PK	68.2	-11.3	2.46 V	108	52.0	4.9
5	11650.00	58.3 PK	74.0	-15.7	1.73 V	156	41.7	16.6
6	11650.00	44.9 AV	54.0	-9.1	1.73 V	156	28.3	16.6

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

802.11n (HT40)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	55.9 PK	74.0	-18.1	2.99 H	123	52.4	3.5
2	5150.00	43.0 AV	54.0	-11.0	2.99 H	123	39.5	3.5
3	*5190.00	95.3 PK			3.54 H	92	56.0	39.3
4	*5190.00	84.9 AV			3.54 H	92	45.6	39.3
5	#10380.00	54.7 PK	68.2	-13.5	2.84 H	196	39.2	15.5
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	5150.00	55.3 PK	74.0	-18.7	2.93 V	72	51.8	3.5
2	5150.00	43.1 AV	54.0	-10.9	2.93 V	72	39.6	3.5
3	*5190.00	95.9 PK			3.12 V	85	56.6	39.3
4	*5190.00	85.7 AV			3.12 V	85	46.4	39.3
5	#10380.00	55.0 PK	68.2	-13.2	1.63 V	259	39.5	15.5

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 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	*5230.00	94.5 PK			3.38 H	181	55.4	39.1
2	*5230.00	84.3 AV			3.38 H	181	45.2	39.1
3	5350.00	56.8 PK	74.0	-17.2	3.09 H	138	53.1	3.7
4	5350.00	43.5 AV	54.0	-10.5	3.09 H	138	39.8	3.7
5	#10460.00	55.1 PK	68.2	-13.1	2.58 H	154	39.1	16.0
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	*5230.00	95.4 PK			2.93 V	87	56.3	39.1
2	*5230.00	85.3 AV			2.93 V	87	46.2	39.1
3	5350.00	56.6 PK	74.0	-17.4	2.35 V	93	52.9	3.7
4	5350.00	43.4 AV	54.0	-10.6	2.35 V	93	39.7	3.7
5	#10460.00	55.3 PK	68.2	-12.9	1.57 V	235	39.3	16.0

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5600.00	55.0 PK	68.2	-13.2	3.18 H	91	50.8	4.2
2	*5755.00	108.5 PK			3.18 H	91	68.7	39.8
3	*5755.00	98.1 AV			3.18 H	91	58.3	39.8
4	#5989.74	57.3 PK	68.2	-10.9	3.18 H	91	52.3	5.0
5	11510.00	58.0 PK	74.0	-16.0	2.21 H	235	41.1	16.9
6	11510.00	44.2 AV	54.0	-9.8	2.21 H	235	27.3	16.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5610.26	55.4 PK	68.2	-12.8	2.34 V	81	51.2	4.2
2	*5755.00	107.7 PK			2.34 V	81	67.9	39.8
3	*5755.00	97.5 AV			2.34 V	81	57.7	39.8
4	#5991.67	56.9 PK	68.2	-11.3	2.34 V	81	51.9	5.0
5	11510.00	57.7 PK	74.0	-16.3	2.56 V	174	40.8	16.9
6	11510.00	44.4 AV	54.0	-9.6	2.56 V	174	27.5	16.9

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5602.56	54.9 PK	68.2	-13.3	3.48 H	150	50.7	4.2
2	*5795.00	108.2 PK			3.48 H	150	68.1	40.1
3	*5795.00	97.7 AV			3.48 H	150	57.6	40.1
4	#5939.10	57.5 PK	68.2	-10.7	3.48 H	150	52.7	4.8
5	11590.00	58.9 PK	74.0	-15.1	1.87 H	201	41.9	17.0
6	11590.00	45.5 AV	54.0	-8.5	1.87 H	201	28.5	17.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5607.05	55.5 PK	68.2	-12.7	2.74 V	115	51.3	4.2
2	*5795.00	107.9 PK			2.74 V	115	67.8	40.1
3	*5795.00	97.5 AV			2.74 V	115	57.4	40.1
4	#5987.82	56.9 PK	68.2	-11.3	2.74 V	115	51.9	5.0
5	11590.00	58.3 PK	74.0	-15.7	2.39 V	178	41.3	17.0
6	11590.00	45.1 AV	54.0	-8.9	2.39 V	178	28.1	17.0

Remarks:

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

802.11ac (VHT80)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	55.8 PK	74.0	-18.2	3.52 H	135	52.3	3.5
2	5150.00	43.1 AV	54.0	-10.9	3.52 H	135	39.6	3.5
3	*5210.00	91.8 PK			3.46 H	92	52.6	39.2
4	*5210.00	81.5 AV			3.46 H	92	42.3	39.2
5	5350.00	57.3 PK	74.0	-16.7	2.89 H	152	53.6	3.7
6	5350.00	43.9 AV	54.0	-10.1	2.89 H	152	40.2	3.7
7	#10420.00	54.5 PK	68.2	-13.7	2.63 H	214	38.8	15.7
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	5150.00	55.7 PK	74.0	-18.3	3.01 V	132	52.2	3.5
2	5150.00	43.1 AV	54.0	-10.9	3.01 V	132	39.6	3.5
3	*5210.00	91.3 PK			2.86 V	85	52.1	39.2
4	*5210.00	81.7 AV			2.86 V	85	42.5	39.2
5	5350.00	56.9 PK	74.0	-17.1	2.51 V	55	53.2	3.7
6	5350.00	43.6 AV	54.0	-10.4	2.51 V	55	39.9	3.7
7	#10420.00	54.6 PK	68.2	-13.6	1.96 V	281	38.9	15.7

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

CHANNEL	TX Channel 155	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz	FUNCTION	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	#5603.85	55.5 PK	68.2	-12.7	3.06 H	92	51.3	4.2
2	#5650.00	56.9 PK	68.2	-11.3	2.95 H	133	52.6	4.3
3	*5775.00	104.7 PK			3.06 H	92	64.7	40.0
4	*5775.00	94.3 AV			3.06 H	92	54.3	40.0
5	#5925.00	58.5 PK	68.2	-9.7	3.37 H	115	53.6	4.9
6	#5929.49	57.0 PK	68.2	-11.2	3.06 H	92	52.1	4.9
7	11550.00	59.6 PK	74.0	-14.4	2.33 H	189	42.6	17.0
8	11550.00	45.3 AV	54.0	-8.7	2.33 H	189	28.3	17.0
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5622.44	56.0 PK	68.2	-12.2	2.71 V	109	51.8	4.2
2	#5650.00	57.3 PK	68.2	-10.9	2.63 V	152	53.0	4.3
3	*5775.00	106.0 PK			2.71 V	109	66.0	40.0
4	*5775.00	95.4 AV			2.71 V	109	55.4	40.0
5	#5925.00	58.3 PK	68.2	-9.9	2.65 V	121	53.4	4.9
6	#5994.23	57.7 PK	68.2	-10.5	2.71 V	109	52.7	5.0
7	11550.00	58.9 PK	74.0	-15.1	1.78 V	236	41.9	17.0
8	11550.00	44.9 AV	54.0	-9.1	1.78 V	236	27.9	17.0

Remarks:

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

Below 1GHz Worst-Case Data:

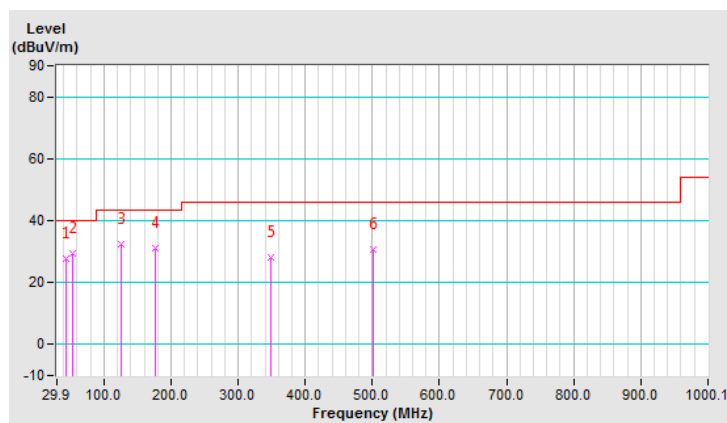
802.11a

CHANNEL	TX Channel 165	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	43.51	27.6 QP	40.0	-12.4	1.49 H	133	37.2	-9.6
2	53.23	29.5 QP	40.0	-10.5	1.49 H	258	38.9	-9.4
3	125.17	32.4 QP	43.5	-11.1	1.99 H	254	43.5	-11.1
4	175.72	31.0 QP	43.5	-12.5	1.49 H	263	40.7	-9.7
5	348.76	28.0 QP	46.0	-18.0	1.00 H	62	34.6	-6.6
6	500.42	30.6 QP	46.0	-15.4	1.00 H	12	34.1	-3.5

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 of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report

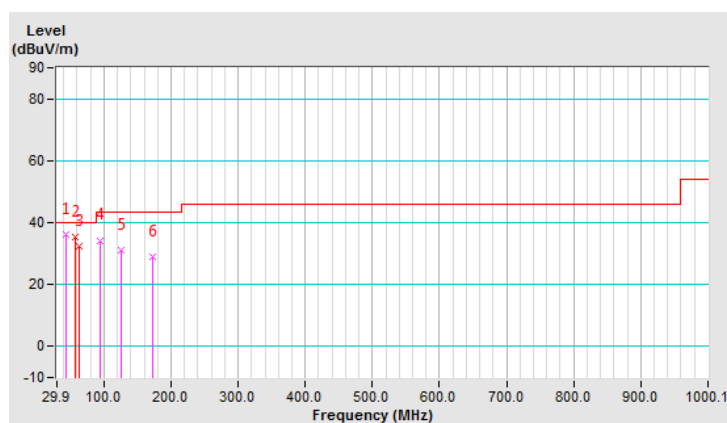


CHANNEL	TX Channel 165	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	43.51	36.2 QP	40.0	-3.8	1.00 V	30	45.8	-9.6
2	56.53	35.4 QP	40.0	-4.6	1.00 V	28	45.0	-9.6
3	63.58	32.5 QP	40.0	-7.5	1.00 V	15	42.7	-10.2
4	94.06	34.3 QP	43.5	-9.2	1.00 V	129	48.8	-14.5
5	125.17	31.3 QP	43.5	-12.2	1.00 V	12	42.4	-11.1
6	171.83	28.8 QP	43.5	-14.7	1.49 V	310	38.2	-9.4

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 of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS30	100291	Sep. 03, 2018	Sep. 02, 2019
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 26, 2018	Feb. 25, 2019
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
Software ADT	BV ADT_Conc_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Shielded Room 1.

3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

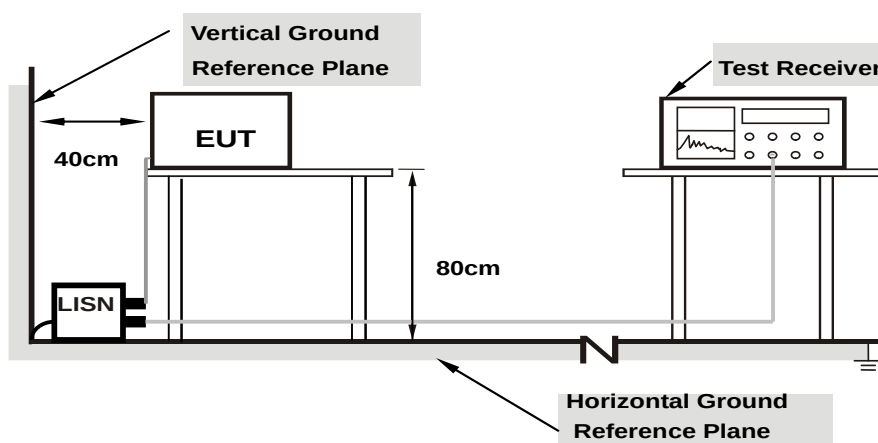
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Results

Worst-case data:

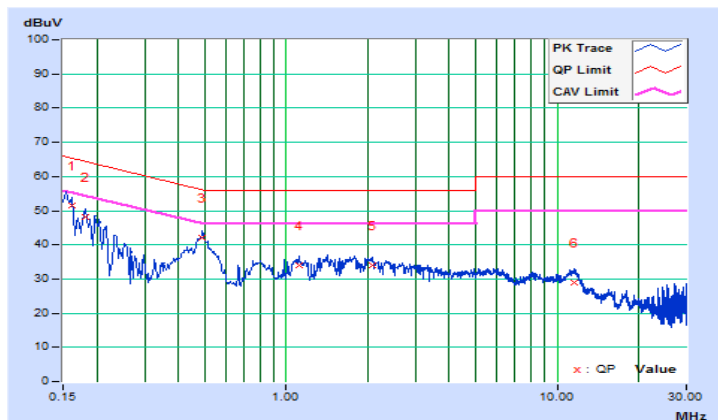
802.11a

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16173	9.67	41.72	26.12	51.39	35.79	65.37	55.37	-13.98	-19.58
2	0.18122	9.67	38.51	23.68	48.18	33.35	64.43	54.43	-16.25	-21.08
3	0.49064	9.66	32.47	27.16	42.13	36.82	56.16	46.16	-14.03	-9.34
4	1.11634	9.65	24.28	20.51	33.93	30.16	56.00	46.00	-22.07	-15.84
5	2.07353	9.68	24.17	19.84	33.85	29.52	56.00	46.00	-22.15	-16.48
6	11.53983	9.86	19.10	13.81	28.96	23.67	60.00	50.00	-31.04	-26.33

Remarks:

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

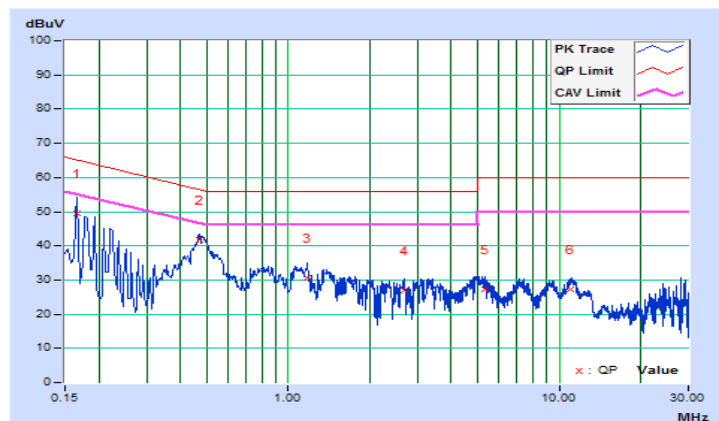


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16569	9.68	39.93	24.56	49.61	34.24	65.17	55.17	-15.56	-20.93
2	0.47039	9.67	32.16	26.48	41.83	36.15	56.51	46.51	-14.68	-10.36
3	1.17833	9.66	20.89	16.60	30.55	26.26	56.00	46.00	-25.45	-19.74
4	2.68759	9.70	17.22	12.14	26.92	21.84	56.00	46.00	-29.08	-24.16
5	5.35421	9.76	17.54	11.14	27.30	20.90	60.00	50.00	-32.70	-29.10
6	11.04717	9.88	17.44	11.93	27.32	21.81	60.00	50.00	-32.68	-28.19

Remarks:

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



4.3 Transmit Power Measurement

4.3.1 Limits of Transmit Power Measurement

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

*B is the 26 dB emission bandwidth in megahertz

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

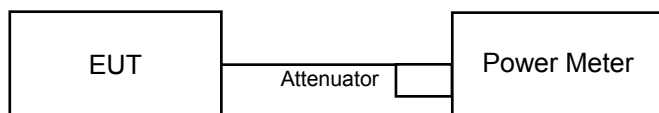
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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

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

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

4.3.2 Test Setup



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 and set the detector to average. Duty factor is not added to measured value.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

For U-NII-1 Band (Outdoor Access Point)

CDD Mode

802.11a

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
36	5180	4.58	4.79	5.884	7.70	20.50	13.189	20.89	21.00	Pass
40	5200	4.46	4.89	5.876	7.69	20.50	13.189	20.88	21.00	Pass
48	5240	3.83	4.74	5.394	7.32	20.50	13.189	20.51	21.00	Pass

Note:

1. Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to $30 - (15.5 - 6) = 20.50$ dBm.
2. Gain = 5.46dBi (above 30 degrees from the horizon).
3. EIRP = conducted power + (13.189dBi) + array gain (0 dB (i.e., no array gain) for $N_{ANT} \leq 4$).

802.11n (HT20)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
36	5180	3.93	4.60	5.356	7.29	20.50	13.189	20.48	21.00	Pass
40	5200	4.00	4.57	5.376	7.30	20.50	13.189	20.49	21.00	Pass
48	5240	4.13	5.07	5.802	7.64	20.50	13.189	20.83	21.00	Pass

Note:

1. Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to $30 - (15.5 - 6) = 20.50$ dBm.
2. Gain = 5.46dBi (above 30 degrees from the horizon).
3. EIRP = conducted power + (13.189dBi) + array gain (0 dB (i.e., no array gain) for $N_{ANT} \leq 4$).

802.11n (HT40)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
38	5190	4.25	4.96	5.794	7.63	20.50	13.189	20.82	21.00	Pass
46	5230	4.25	5.21	5.980	7.77	20.50	13.189	20.96	21.00	Pass

Note:

1. Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to $30 - (15.5 - 6) = 20.50$ dBm.
2. Gain = 5.46dBi (above 30 degrees from the horizon).
3. EIRP = conducted power + (13.189dBi) + array gain (0 dB (i.e., no array gain) for $N_{ANT} \leq 4$).

802.11ac (VHT80)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
42	5210	3.88	4.67	5.374	7.30	20.50	13.189	20.49	21.00	Pass

Note:

1. Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to $30 - (15.5 - 6) = 20.50$ dBm.
2. Gain = 5.46dBi (above 30 degrees from the horizon).
3. EIRP = conducted power + (13.189dBi) + array gain (0 dB (i.e., no array gain) for $N_{ANT} \leq 4$).

Beamforming Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
36	5180	0.92	1.59	2.678	4.28	17.49	13.189	20.48	21.00	Pass
40	5200	0.99	1.56	2.688	4.29	17.49	13.189	20.49	21.00	Pass
48	5240	1.12	2.06	2.901	4.63	17.49	13.189	20.83	21.00	Pass

Note:

1. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (18.51 - 6) = 17.49\text{dBm}$.
2. Gain = 13.189dBi (above 30 degrees from the horizon).
3. Beamforming gain = 3.01dBi
4. EIRP = conducted power + (13.189dBi) + beamforming gain (3.01dBi).

802.11n (HT40)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
38	5190	1.24	1.95	2.897	4.62	17.49	13.189	20.82	21.00	Pass
46	5230	1.24	2.20	2.990	4.76	17.49	13.189	20.96	21.00	Pass

Note:

1. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (18.51 - 6) = 17.49\text{dBm}$.
2. Gain = 13.189dBi (above 30 degrees from the horizon).
3. Beamforming gain = 3.01dBi
4. EIRP = conducted power + (13.189dBi) + beamforming gain (3.01dBi).

802.11ac (VHT80)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
42	5210	0.87	1.66	2.688	4.29	17.49	13.189	20.49	21.00	Pass

Note:

1. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (18.51 - 6) = 17.49\text{dBm}$.
2. Gain = 13.189dBi (above 30 degrees from the horizon).
3. Beamforming gain = 3.01dBi
4. EIRP = conducted power + (13.189dBi) + beamforming gain (3.01dBi).

For U-NII-1 Band (Mobile and Portable client device)

CDD Mode

802.11a

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	4.58	4.79	5.884	7.70	20.50	Pass
40	5200	4.46	4.89	5.876	7.69	20.50	Pass
48	5240	3.83	4.74	5.394	7.32	20.50	Pass

Note: Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to 30-(15.5-6) = 20.50dBm.

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	3.93	4.60	5.356	7.29	20.50	Pass
40	5200	4.00	4.57	5.376	7.30	20.50	Pass
48	5240	4.13	5.07	5.802	7.64	20.50	Pass

Note: Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to 30-(15.5-6) = 20.50dBm.

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	4.25	4.96	5.794	7.63	20.50	Pass
46	5230	4.25	5.21	5.980	7.77	20.50	Pass

Note: Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to 30-(15.5-6) = 20.50dBm.

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	3.88	4.67	5.374	7.30	20.50	Pass

Note: Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to 30-(15.5-6) = 20.50dBm.

Beamforming Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	0.92	1.59	2.678	4.28	17.49	Pass
40	5200	0.99	1.56	2.688	4.29	17.49	Pass
48	5240	1.12	2.06	2.901	4.63	17.49	Pass

Note: Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (18.51 - 6) = 17.49\text{dBm}$.

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	1.24	1.95	2.897	4.62	17.49	Pass
46	5230	1.24	2.20	2.990	4.76	17.49	Pass

Note: Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (18.51 - 6) = 17.49\text{dBm}$.

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	0.87	1.66	2.688	4.29	17.49	Pass

Note: Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (18.51 - 6) = 17.49\text{dBm}$.

For U-NII-3 Band

CDD Mode

802.11a

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
149	5745	17.05	17.11	102.103	20.09	20.50	Pass
157	5785	16.99	17.13	101.645	20.07	20.50	Pass
165	5825	16.91	17.26	102.302	20.10	20.50	Pass

Note: Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to $30-(15.5-6) = 20.50$ dBm.

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
149	5745	17.23	17.50	109.079	20.38	20.50	Pass
157	5785	17.13	17.29	105.222	20.22	20.50	Pass
165	5825	17.11	17.30	105.107	20.22	20.50	Pass

Note: Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to $30-(15.5-6) = 20.50$ dBm.

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
151	5755	17.03	17.31	104.293	20.18	20.50	Pass
159	5795	17.02	17.21	102.952	20.13	20.50	Pass

Note: Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to $30-(15.5-6) = 20.50$ dBm.

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
155	5775	17.45	17.50	111.824	20.49	20.50	Pass

Note: Gain = 15.50dBi > 6dBi, so the power limit shall be reduced to $30-(15.5-6) = 20.50$ dBm.

Beamforming Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
149	5745	14.22	14.49	54.543	17.37	17.49	Pass
157	5785	14.12	14.28	52.615	17.21	17.49	Pass
165	5825	14.10	14.29	52.557	17.21	17.49	Pass

Note: Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (18.51 - 6) = 17.49\text{dBm}$.

802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
151	5755	14.02	14.30	52.150	17.17	17.49	Pass
159	5795	14.01	14.20	51.480	17.12	17.49	Pass

Note: Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (18.51 - 6) = 17.49\text{dBm}$.

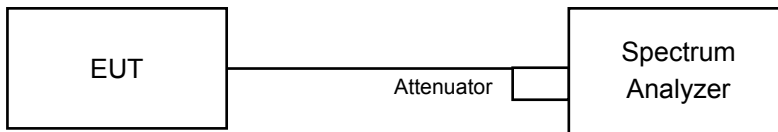
802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
155	5775	14.44	14.49	55.916	17.48	17.49	Pass

Note: Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (18.51 - 6) = 17.49\text{dBm}$.

4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

4.4.4 Test Result

802.11a

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	16.44	16.56
40	5200	16.56	16.56
48	5240	16.56	16.56
149	5745	16.43	16.44
157	5785	16.44	16.44
165	5825	16.44	16.44

802.11n (HT20)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	17.64	17.64
40	5200	17.64	17.64
48	5240	17.64	17.64
149	5745	17.64	17.64
157	5785	17.64	17.64
165	5825	17.64	17.64

802.11n (HT40)

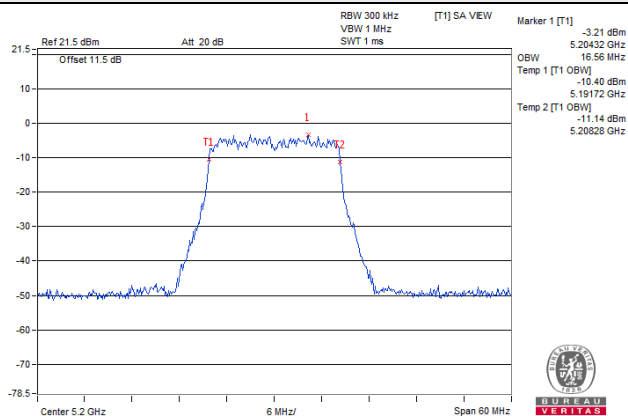
Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	36.24	36.12
46	5230	36.12	36.12
151	5755	36.00	36.00
159	5795	36.12	36.12

802.11ac (VHT80)

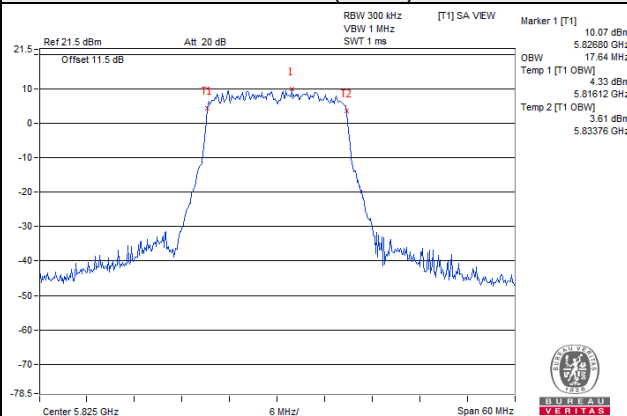
Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
42	5210	75.84	75.84
155	5775	75.84	75.84

Spectrum Plot of Worst Value

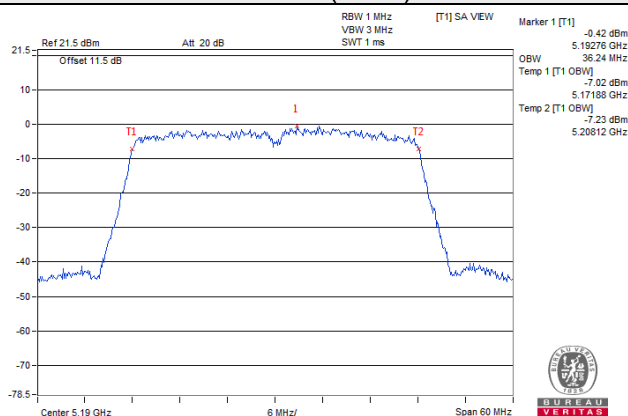
802.11a



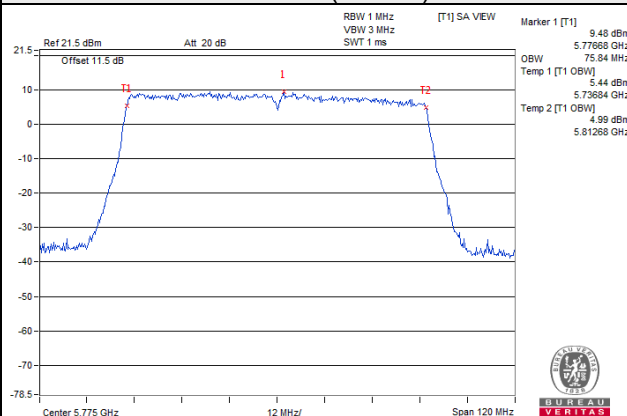
802.11n (HT20)



802.11n (HT40)



802.11ac (VHT80)

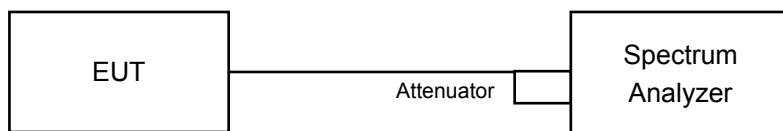


4.5 Peak Power Spectral Density Measurement

4.5.1 Limits of Peak Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

For U-NII-1 band:

Duty cycle of test signal is > 98%

Using method SA-1

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

Duty cycle of test signal is < 98%

Using method SA-2

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

For U-NII-3 band:

Duty cycle of test signal is > 98%

- a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
- b. Set RBW = 300 kHz, Set VBW $\geq$ 1 MHz, Detector = RMS
- c. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
- d. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$
- e. Sweep time = auto, trigger set to "free run".
- f. Trace average at least 100 traces in power averaging mode.
- g. Record the max value

Duty cycle of test signal is < 98%

- a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
- b. Set RBW = 300 kHz, Set VBW $\geq$ 1 MHz, Detector = RMS
- c. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
- d. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(500 \text{ kHz} / 300 \text{ kHz})$
- e. Sweep time = auto, trigger set to "free run".
- f. Trace average at least 100 traces in power averaging mode.
- g. Record the max value and add $10 \log (1/\text{duty cycle})$

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

Same as 4.3.6.

4.5.7 Test Results

For U-NII-1 Band (Outdoor Access Point)

802.11a

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
36	5180	-8.16	-8.51	0.16	-5.16	4.49	Pass
40	5200	-7.93	-8.44	0.16	-5.01	4.49	Pass
48	5240	-8.09	-8.66	0.16	-5.20	4.49	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17 - (18.51 - 6) = 4.49\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

Chan.	Freq. (MHz)	PSD (dBm/MHz)		Total PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1			
36	5180	-8.62	-9.18	-5.88	4.49	Pass
40	5200	-8.30	-9.10	-5.67	4.49	Pass
48	5240	-8.50	-9.30	-5.87	4.49	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17 - (18.51 - 6) = 4.49\text{dBm}$.

802.11n (HT40)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
38	5190	-10.94	-11.81	0.16	-8.18	4.49	Pass
46	5230	-10.89	-11.11	0.16	-7.83	4.49	Pass

Note:

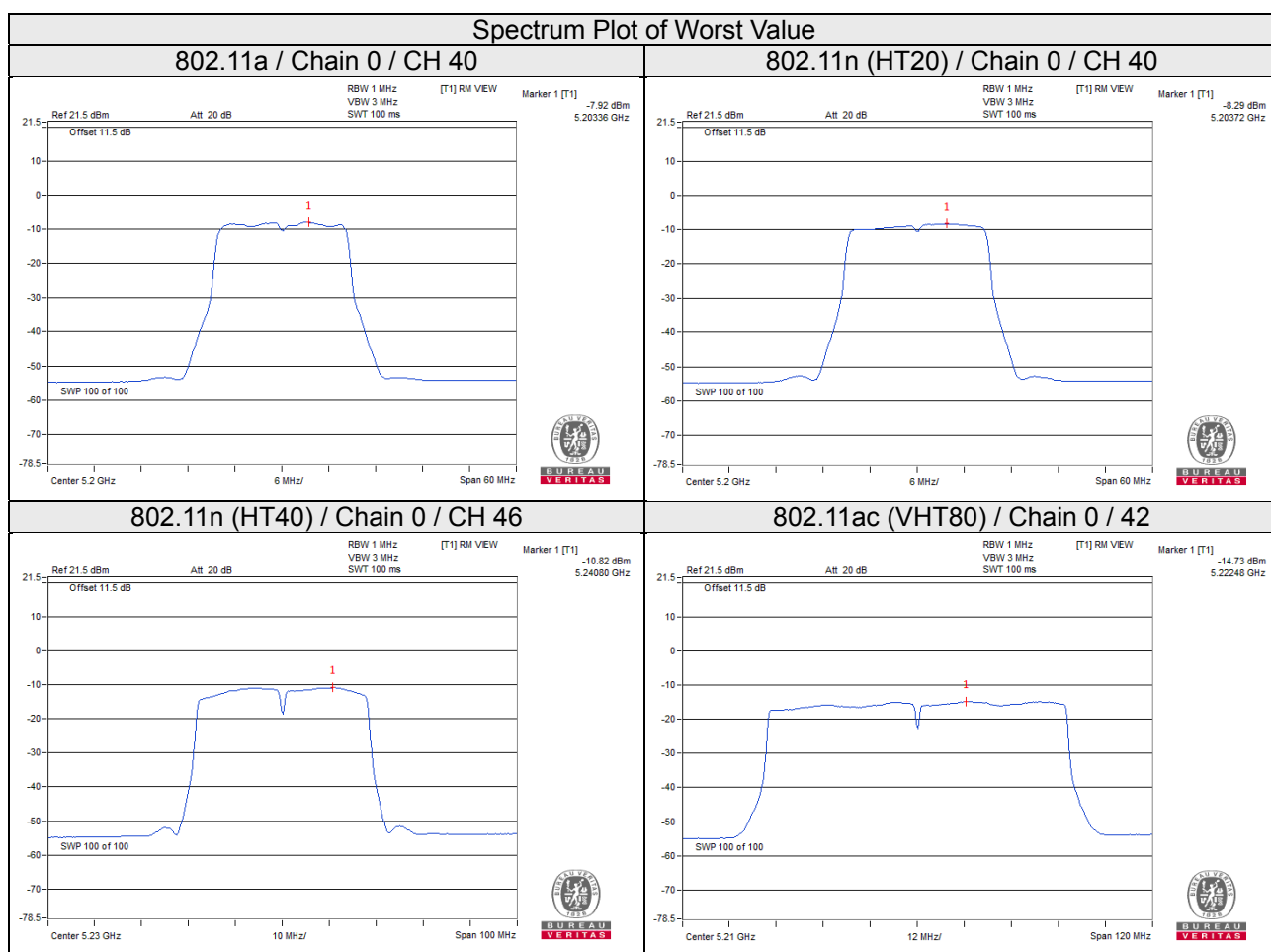
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17 - (18.51 - 6) = 4.49\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
42	5210	-14.73	-15.60	0.26	-11.87	4.49	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17 - (18.51 - 6) = 4.49\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.



For U-NII-1 Band (Mobile and Portable client device)

802.11a

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
36	5180	-8.16	-8.51	0.16	-5.16	-1.51	Pass
40	5200	-7.93	-8.44	0.16	-5.01	-1.51	Pass
48	5240	-8.09	-8.66	0.16	-5.20	-1.51	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $11-(18.51-6) = -1.51\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

Chan.	Freq. (MHz)	PSD (dBm/MHz)		Total PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1			
36	5180	-8.62	-9.18	-5.88	-1.51	Pass
40	5200	-8.30	-9.10	-5.67	-1.51	Pass
48	5240	-8.50	-9.30	-5.87	-1.51	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $11-(18.51-6) = -1.51\text{dBm}$.

802.11n (HT40)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
38	5190	-10.94	-11.81	0.16	-8.18	-1.51	Pass
46	5230	-10.89	-11.11	0.16	-7.83	-1.51	Pass

Note:

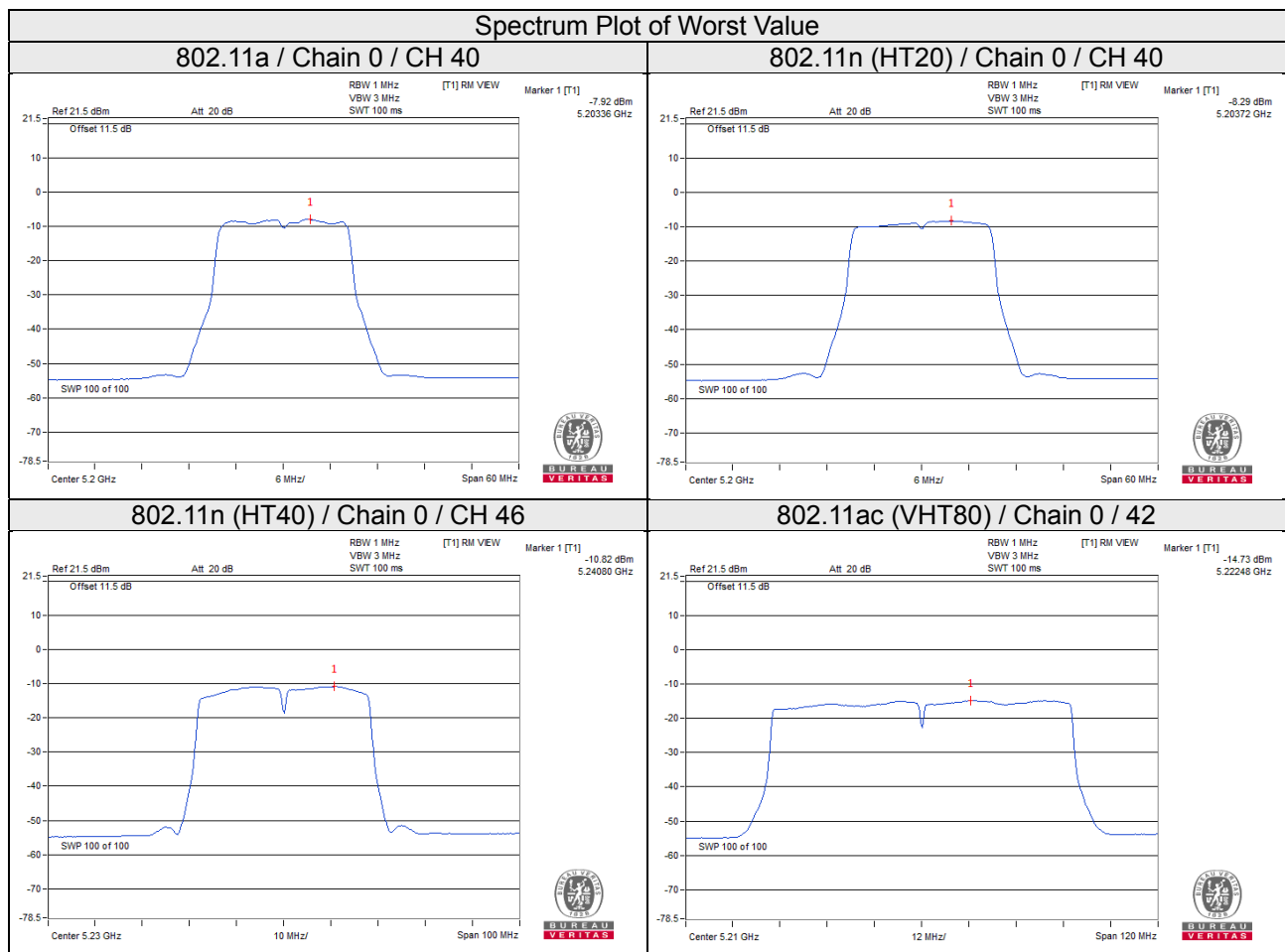
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $11-(18.51-6) = -1.51\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
42	5210	-14.73	-15.60	0.26	-11.87	-1.51	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $11-(18.51-6) = -1.51\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.



For U-NII-3 band:

802.11a

TX chain	Chan.	Freq. (MHz)	PSD W/O Duty Factor		10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	149	5745	-3.64	-1.42	3.01	0.16	1.75	17.49	Pass
	157	5785	-3.12	-0.90	3.01	0.16	2.27	17.49	Pass
	165	5825	-3.21	-0.99	3.01	0.16	2.18	17.49	Pass
1	149	5745	-3.60	-1.38	3.01	0.16	1.79	17.49	Pass
	157	5785	-3.44	-1.22	3.01	0.16	1.95	17.49	Pass
	165	5825	-3.47	-1.25	3.01	0.16	1.92	17.49	Pass

Note:

1. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30-(18.51-6) = 17.49\text{dBm}$.
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

TX chain	Chan.	Freq. (MHz)	PSD (dBm/300 kHz)	PSD (dBm/500 kHz)	10 log (N=2) dB	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	149	5745	-3.36	-1.14	3.01	1.87	17.49	Pass
	157	5785	-3.12	-0.90	3.01	2.11	17.49	Pass
	165	5825	-2.93	-0.71	3.01	2.30	17.49	Pass
1	149	5745	-3.50	-1.28	3.01	1.73	17.49	Pass
	157	5785	-3.52	-1.30	3.01	1.71	17.49	Pass
	165	5825	-3.78	-1.56	3.01	1.45	17.49	Pass

Note: Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30-(18.51-6) = 17.49\text{dBm}$.

802.11n (HT40)

TX chain	Chan.	Freq. (MHz)	PSD W/O Duty Factor		10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	151	5755	-6.53	-4.31	3.01	0.16	-1.14	17.49	Pass
	159	5795	-6.30	-4.08	3.01	0.16	-0.91	17.49	Pass
1	151	5755	-6.82	-4.60	3.01	0.16	-1.43	17.49	Pass
	159	5795	-6.94	-4.72	3.01	0.16	-1.55	17.49	Pass

Note:

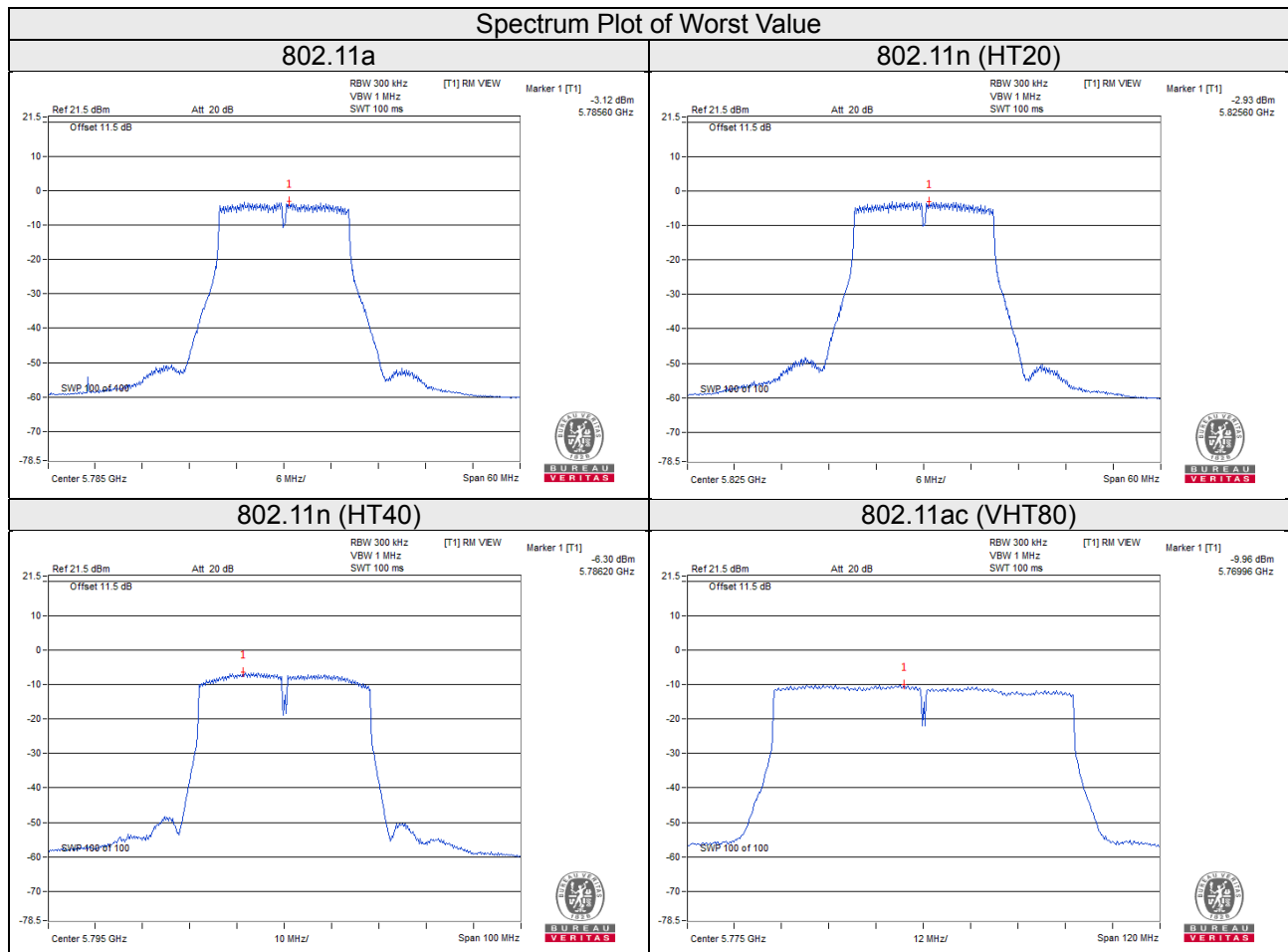
1. Directional gain = $15.5\text{dBi} + 10\log(2) = 18.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30-(18.51-6) = 17.49\text{dBm}$.
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

TX chain	Chan.	Freq. (MHz)	PSD W/O Duty Factor		10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	155	5775	-9.97	-7.75	3.01	0.26	-4.48	17.49	Pass
1	155	5775	-9.96	-7.74	3.01	0.26	-4.47	17.49	Pass

Note:

1. Directional gain = 15.5dBi + 10log(2) = 18.51dBi > 6dBi, so the power density limit shall be reduced to 30-(18.51-6) = 17.49dBm.
2. Refer to section 3.3 for duty cycle spectrum plot.

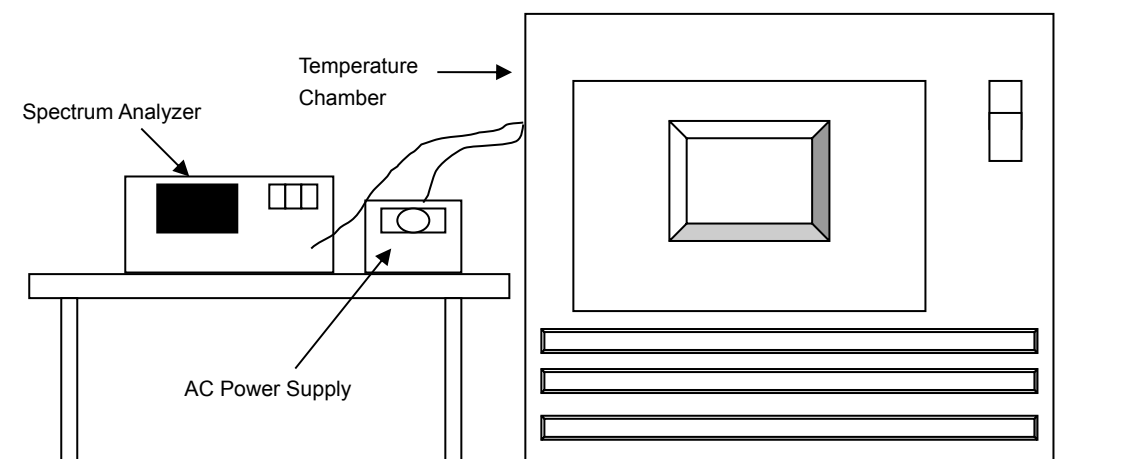


4.6 Frequency Stability

4.6.1 Limits of Frequency Stability Measurement

The frequency of the carrier signal shall be maintained within band of operation

4.6.2 Test Setup



4.6.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 11, 2018	Jun. 10, 2019
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 04, 2018	Jun. 03, 2019
Digital Multimeter Fluke	87-III	70360742	Jun. 29, 2018	Jun. 28, 2019
AC Power Supply Extech	CFW-105	E000603	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.6.4 Test Procedure

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

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

4.6.7 Test Results

Frequency Stability Versus Temp.									
Operating Frequency: 5180MHz									
Temp. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result
60	120	5180.0031	Pass	5180.0027	Pass	5180.0055	Pass	5180.0057	Pass
50	120	5180.0083	Pass	5180.012	Pass	5180.0103	Pass	5180.0079	Pass
40	120	5180.0214	Pass	5180.0256	Pass	5180.0224	Pass	5180.0261	Pass
30	120	5180.008	Pass	5180.0085	Pass	5180.0069	Pass	5180.0044	Pass
20	120	5179.9941	Pass	5179.9934	Pass	5179.9949	Pass	5179.9957	Pass
10	120	5179.9929	Pass	5179.9931	Pass	5179.9937	Pass	5179.9937	Pass
0	120	5179.9967	Pass	5179.9999	Pass	5179.9965	Pass	5179.9997	Pass
-10	120	5180.0054	Pass	5180.0042	Pass	5180.0056	Pass	5180.0046	Pass
-20	120	5180.0136	Pass	5180.014	Pass	5180.0121	Pass	5180.0132	Pass

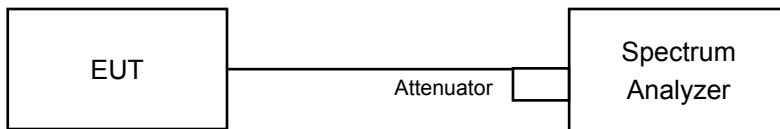
Frequency Stability Versus Voltage									
Operating Frequency: 5180MHz									
Temp. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result
20	138	5179.9938	Pass	5179.9937	Pass	5179.9946	Pass	5179.9967	Pass
	120	5179.9941	Pass	5179.9934	Pass	5179.9949	Pass	5179.9957	Pass
	102	5179.9936	Pass	5179.9937	Pass	5179.9943	Pass	5179.9955	Pass

4.7 6dB Bandwidth Measurement

4.7.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

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

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

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

4.7.7 Test Results

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	16.37	16.38	0.5	Pass
157	5785	16.37	16.13	0.5	Pass
165	5825	16.41	16.37	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	17.36	16.89	0.5	Pass
157	5785	16.97	17.58	0.5	Pass
165	5825	16.63	17.58	0.5	Pass

802.11n (HT40)

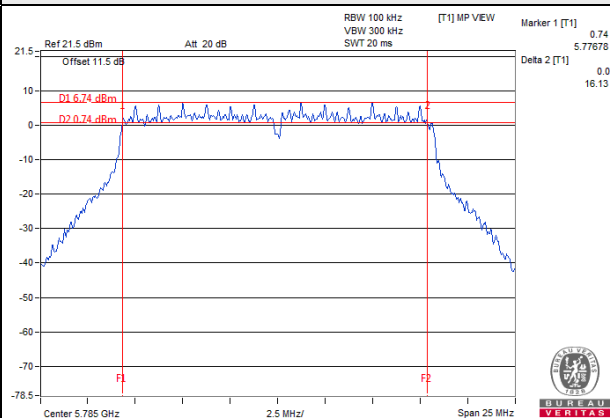
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	35.18	35.27	0.5	Pass
159	5795	35.18	35.18	0.5	Pass

802.11ac (VHT80)

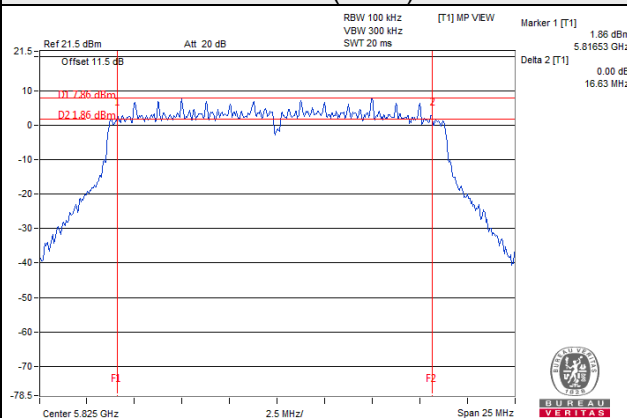
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
155	5775	76.04	76.05	0.5	Pass

Spectrum Plot of Worst Value

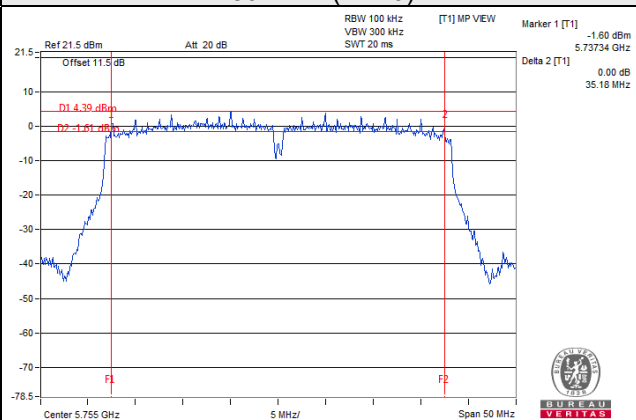
802.11a



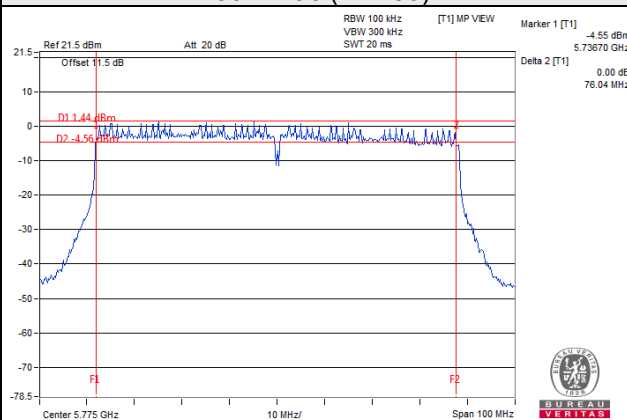
802.11n (HT20)



802.11n (HT40)



802.11ac (VHT80)

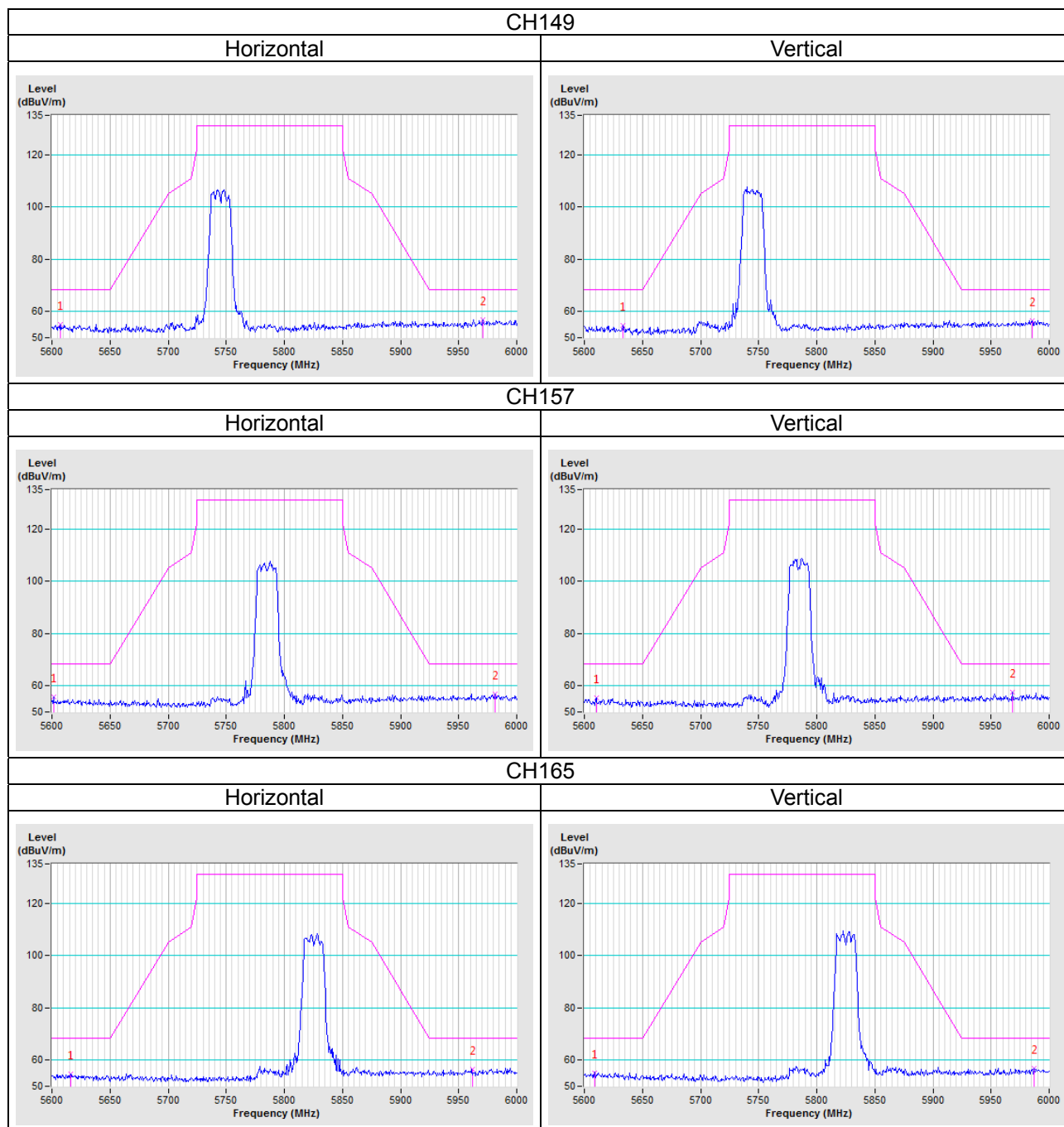


5 Pictures of Test Arrangements

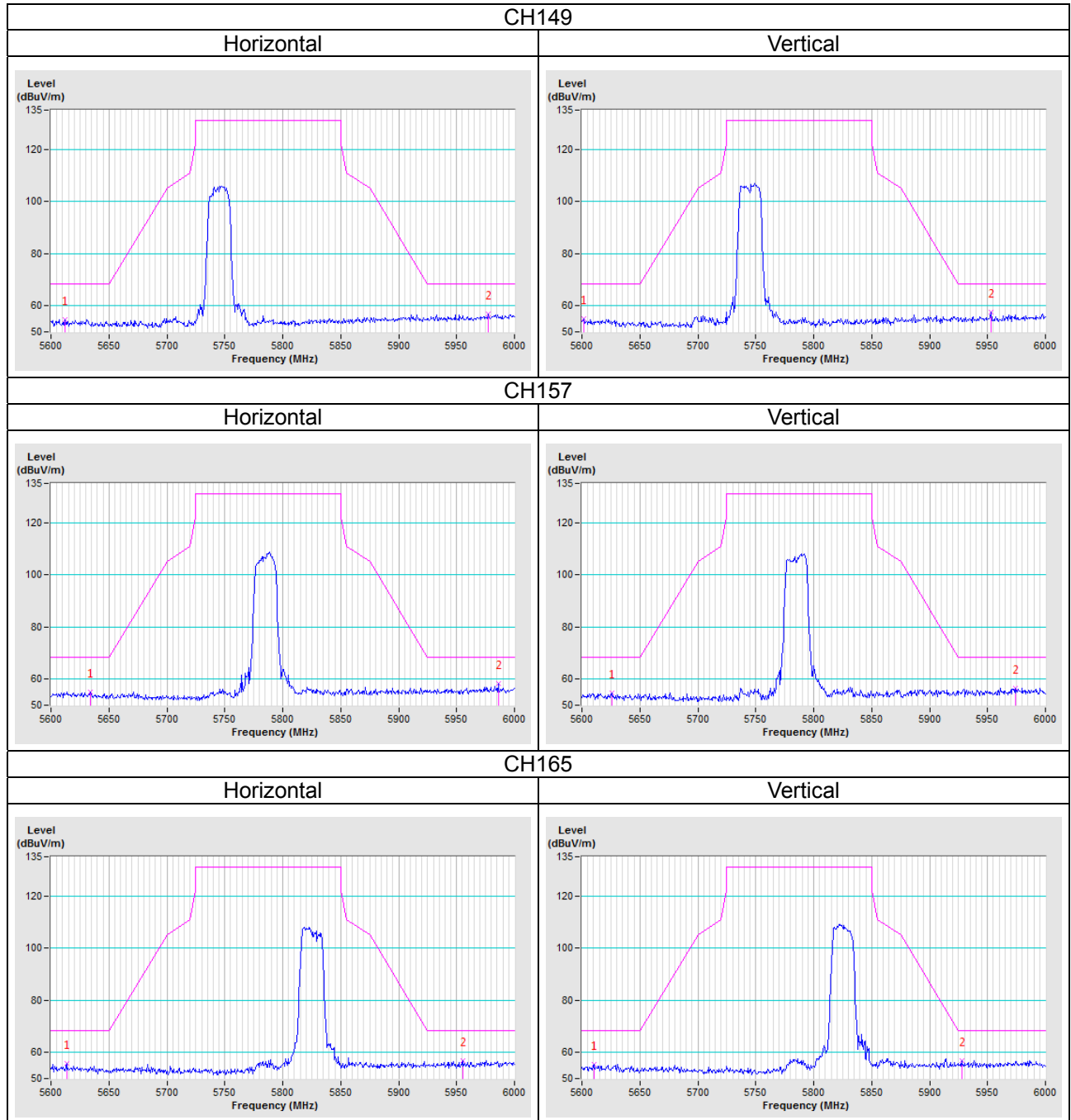
Please refer to the attached file (Test Setup Photo).

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

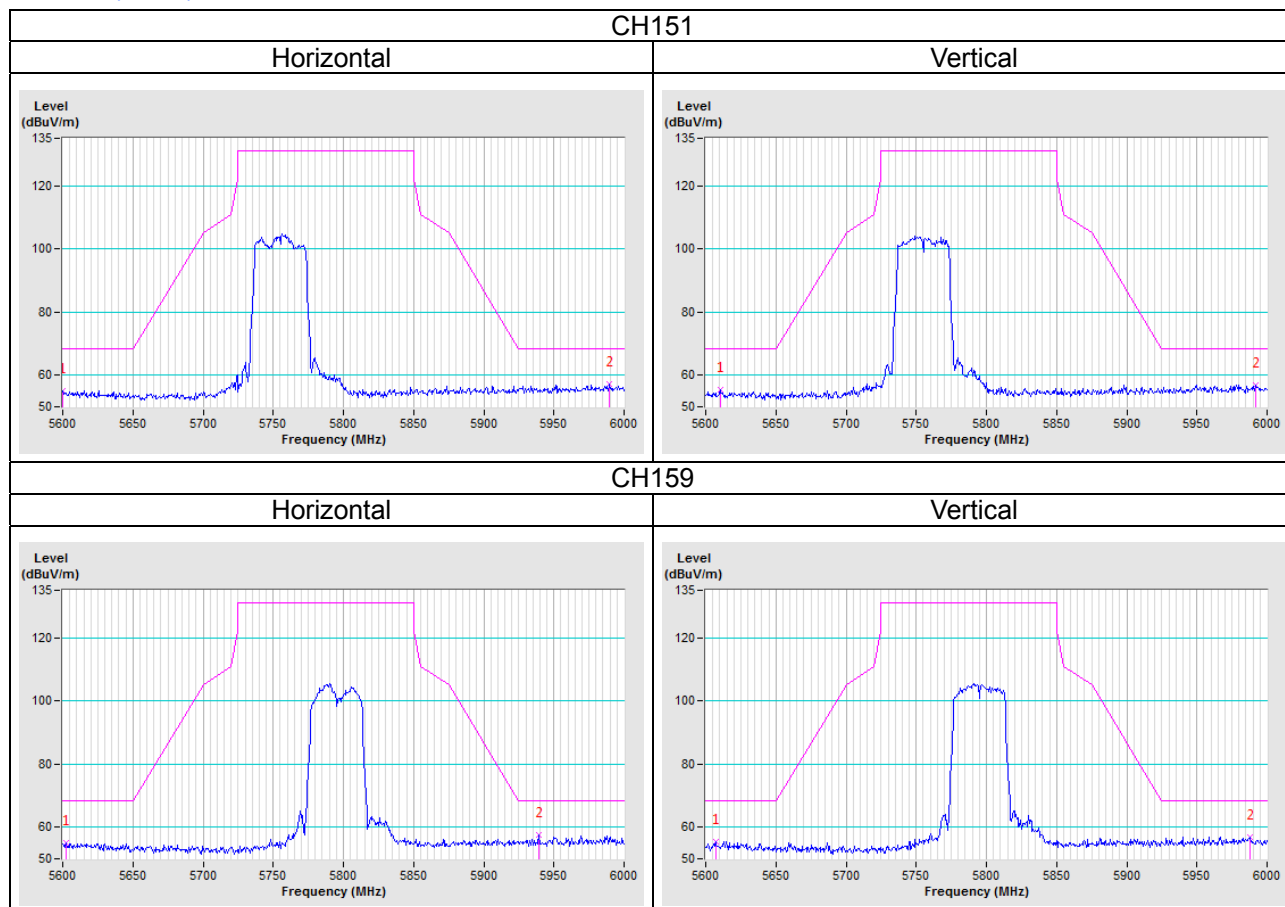
802.11a



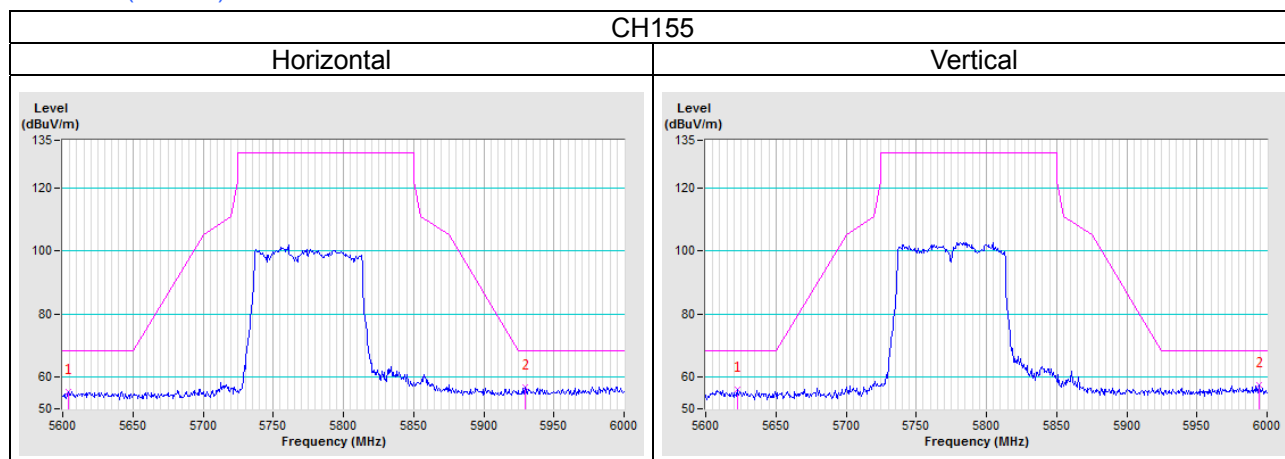
802.11n (HT20)



802.11n (HT40)



802.11ac (VHT80)



Appendix – Information on the Testing Laboratories

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

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

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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