

FCC Test Report

Report No.: RF160330C17-1

FCC ID: BKMAE-WLU5000

Test Model: WLU5000-D101(RoHS)

Received Date: Mar. 30, 2016

Test Date: Apr. 14 ~ May 09, 2016

Issued Date: May 12, 2016

Applicant: SEIKO EPSON CORPORATION

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Release Control Record

Issue No.	Description	Date Issued
RF160330C17-1	Original release	May 12, 2016

1 Certificate of Conformity

Product: Wireless LAN Module

Brand: EPSON

Test Model: WLU5000-D101(RoHS)

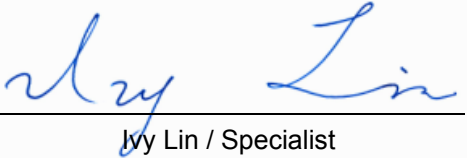
Sample Status: DV sample

Applicant: SEIKO EPSON CORPORATION

Test Date: Apr. 14 ~ May 09, 2016

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 EMC characteristics under the conditions specified in this report.

Prepared by :  , **Date:** May 12, 2016
Ivy Lin / Specialist

Approved by :  , **Date:** May 12, 2016
Ken Liu / Senior 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 -21.44dB at 0.15781MHz, 0.21250MHz.
15.407(b)(1/2/3/4(i/ii)/6)	Radiated Emissions Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.0dB at 37.76MHz.
15.407(b)(1/2/3/4(i/ii)/6)	Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.5dB at 5150.00MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
15.407(a)(1/2/3)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.407(e)	6dB bandwidth	Pass	Meet the requirement of limit. (U-NII-3 Band only)
15.407(g)	Frequency Stability	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

*For U-NII-3 band compliance with rule part 15.407(b)(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	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.63 dB
	200MHz ~ 1000MHz	3.64 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	Wireless LAN Module
Brand	EPSON
Test Model	WLU5000-D101(RoHS)
Status of EUT	DV sample
Power Supply Rating	5Vdc from host equipment
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	OFDM
Transfer Rate	802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.7Mbps
Operating Frequency	5180 ~ 5240MHz, 5745 ~ 5825MHz
Number of Channel	5180 ~ 5240MHz: 4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80) 5745 ~ 5825MHz: 5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80)
Output Power	5180 ~ 5240MHz: 83.954mW 5745 ~ 5825MHz: 84.055mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

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

Modulation Mode	TX Function
802.11a	2TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX
802.11ac (VHT20)	2TX
802.11ac (VHT40)	2TX
802.11ac (VHT80)	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)

2. The following antennas were provided to the EUT.

Antenna	Brand	Model	Antenna Type	Antenna Connector	Gain (dBi)		
					2.4GHz	5.15~5.25GHz	5.725~5.850GHz
L Side Antenna	HONGBO	290-40168	PIFA	N/A	1.6	1.9	2.2
R Side Antenna	HONGBO	290-40167	PIFA	N/A	1.8	3.4	3.2

3. The 2.4 and 5GHz cannot transmit simultaneously.

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 & 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	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	6.0
-	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	BPSK	7.2
-	802.11n (HT40)		38 to 46	38, 46	OFDM	BPSK	15.0
-	802.11ac (VHT80)		42	42	OFDM	BPSK	58.5
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6.0
-	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	BPSK	7.2
-	802.11n (HT40)		151 to 159	151, 159	OFDM	BPSK	15.0
-	802.11ac (VHT80)		155	155	OFDM	BPSK	58.5

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	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5180-5240	36 to 48	165	OFDM	BPSK	6.0
		5745-5825	149 to 165		OFDM	BPSK	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	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5180-5240	36 to 48	165	OFDM	BPSK	6.0
		5745-5825	149 to 165		OFDM	BPSK	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	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	6.0
-	802.11n (HT20)		36 to 48	36, 40, 48	OFDM	BPSK	7.2
-	802.11n (HT40)		38 to 46	38, 46	OFDM	BPSK	15.0
-	802.11ac (VHT80)		42	42	OFDM	BPSK	58.5
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6.0
-	802.11n (HT20)		149 to 165	149, 157, 165	OFDM	BPSK	7.2
-	802.11n (HT40)		151 to 159	151, 159	OFDM	BPSK	15.0
-	802.11ac (VHT80)		155	155	OFDM	BPSK	58.5

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (System)	TESTED BY
RE≥1G	20deg. C, 69%RH, 25deg. C, 69%RH	120Vac, 60Hz	Bayu Chen, Tank Wu
RE<1G	20deg. C, 69%RH	120Vac, 60Hz	Tank Wu
PLC	25deg. C, 60%RH	120Vac, 60Hz	Tank Wu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Leo Tsai

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is > 98 %, duty factor is not required.

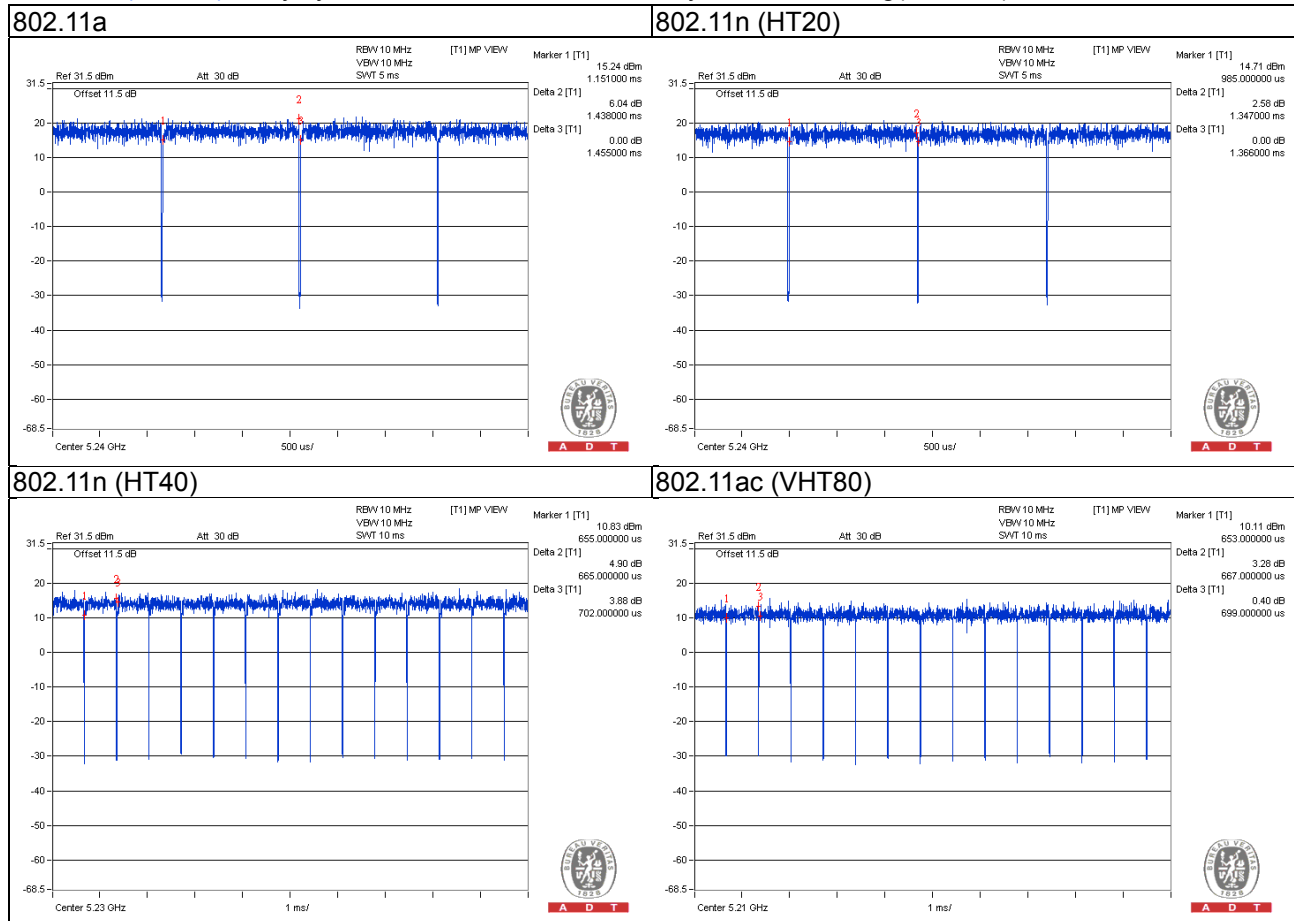
802.11a: Duty cycle = $1.438/1.455 = 0.988$

802.11n (HT20): Duty cycle = $1.347/1.366 = 0.986$

Duty cycle of test signal is < 98 %, duty factor is required.

802.11n (HT40): Duty cycle = $0.665/0.702 = 0.947$, Duty factor = $10 * \log(1/0.947) = 0.24$

802.11ac (VHT80): Duty cycle = $0.667/0.699 = 0.954$, Duty factor = $10 * \log(1/0.954) = 0.20$



3.4 Description of Support Units

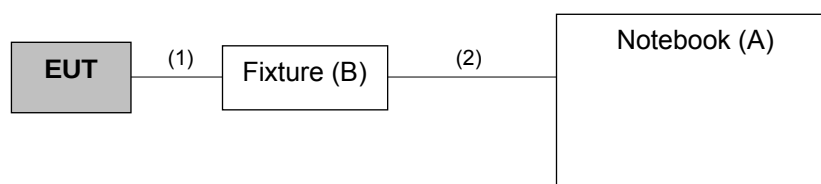
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5420	BPQ8MQ1	FCC DoC Approved	-
B.	Fixture	ASKEY	WLU5000-D101-E VB(RoHS)	N/A	N/A	Provided by manufacturer

Note: 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.	Cable	1	0.10	-	0	Provided by manufacturer
2.	USB cable	1	0.8	-	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)

789033 D02 General UNII Test Procedures New Rules v01r02

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 Procedures New Rules v01r02	FIELD STRENGTH AT 3m	
	PK:74 (dBμV/m)	AV:54 (dBμV/m)
APPLICABLE TO	EIRP LIMIT	EQUIVALENT FIELD STRENGTH AT 3m
15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
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)	FIELD STRENGTH at 3m / § 15.247(d),	
	PK:74 (dBμV/m)	AV:54 (dBμV/m)
^{*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	ESCS30	100289	Dec. 23, 2015	Dec. 22, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Sep. 02, 2015	Sep. 01, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Jan. 18, 2016	Jan. 17, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Jan. 08, 2016	Jan. 07, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Jan. 18, 2016	Jan. 17, 2017
Preamplifier Agilent	8449B	3008A01911	Aug. 09, 2015	Aug. 08, 2016
Preamplifier Agilent	8447D	2944A10638	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-02(309222 +248780)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-03(274092)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable Woken	8D-FB	Cable-CH9-01	Aug. 11, 2015	Aug. 10, 2016
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 18, 2015	Oct. 17, 2016
High Speed Peak Power Meter	ML2495A	0824011	Jul. 09, 2015	Jul. 08, 2016
Power Sensor	MA2411B	0738171	Jul. 09, 2015	Jul. 08, 2016
RF FLITER	BRM50716	058	Jan. 14, 2016	Jan. 13, 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 test was performed in HwaYa Chamber 9.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 215374.
5. The IC Site Registration No. is IC 7450F-9.

4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 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:

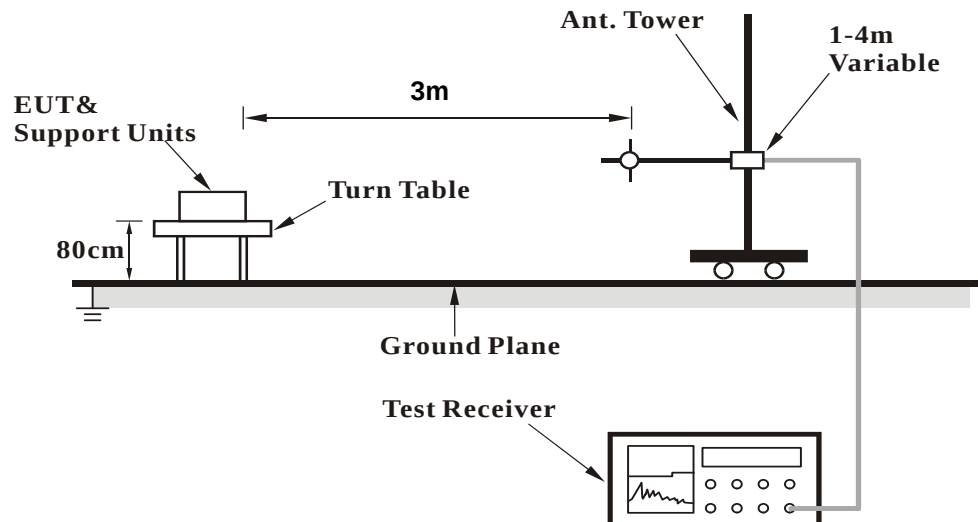
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

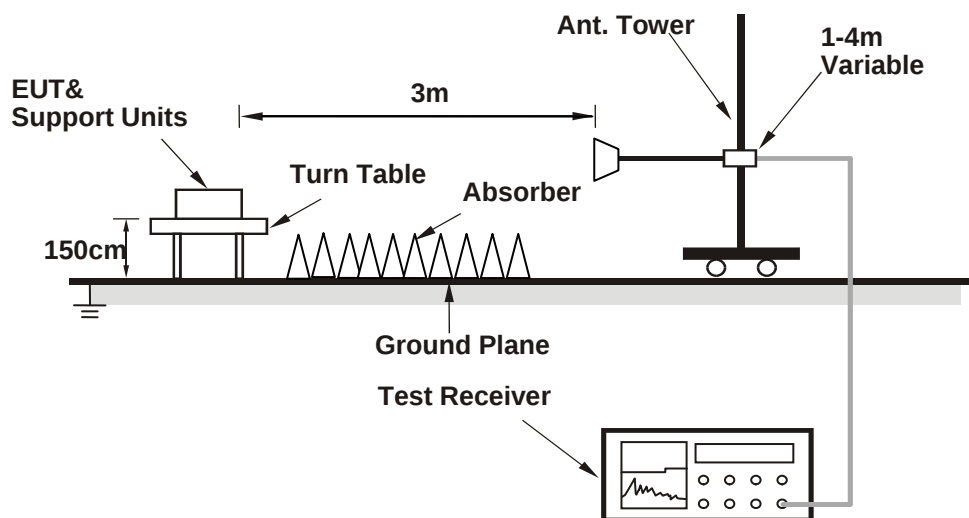
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT Operating Conditions

- Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Worst-Case 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	68.3 PK	74.0	-5.7	1.26 H	313	63.70	4.60
2	5150.00	47.8 AV	54.0	-6.2	1.26 H	313	43.20	4.60
3	*5180.00	112.0 PK			1.08 H	260	69.80	42.20
4	*5180.00	101.9 AV			1.08 H	260	59.70	42.20
5	#10360.00	61.6 PK	74.0	-12.4	1.00 H	196	45.80	15.80
6	#10360.00	48.7 AV	54.0	-5.3	1.00 H	196	32.90	15.80
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	60.8 PK	74.0	-13.2	3.76 V	25	56.20	4.60
2	5150.00	46.1 AV	54.0	-7.9	3.76 V	25	41.50	4.60
3	*5180.00	107.6 PK			3.87 V	4	65.40	42.20
4	*5180.00	97.2 AV			3.87 V	4	55.00	42.20
5	#10360.00	62.2 PK	74.0	-11.8	1.36 V	174	46.40	15.80
6	#10360.00	48.6 AV	54.0	-5.4	1.36 V	174	32.80	15.80

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)
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	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	*5200.00	110.4 PK			1.33 H	301	68.20	42.20
2	*5200.00	100.3 AV			1.33 H	301	58.10	42.20
3	#10400.00	61.2 PK	74.0	-12.8	1.07 H	206	45.30	15.90
4	#10400.00	48.4 AV	54.0	-5.6	1.07 H	206	32.50	15.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	106.5 PK			3.85 V	10	64.30	42.20
2	*5200.00	96.2 AV			3.85 V	10	54.00	42.20
3	#10400.00	61.4 PK	74.0	-12.6	1.33 V	265	45.50	15.90
4	#10400.00	48.2 AV	54.0	-5.8	1.33 V	265	32.30	15.90

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)
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	4600.00	58.3 PK	74.0	-15.7	1.38 H	243	54.80	3.50
2	4600.00	44.9 AV	54.0	-9.1	1.38 H	243	41.40	3.50
3	*5240.00	112.4 PK			1.24 H	258	70.10	42.30
4	*5240.00	101.8 AV			1.24 H	258	59.50	42.30
5	#10480.00	62.2 PK	74.0	-11.8	1.63 H	182	46.00	16.20
6	#10480.00	48.9 AV	54.0	-5.1	1.63 H	182	32.70	16.20
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	4600.00	57.8 PK	74.0	-16.2	3.81 V	23	54.30	3.50
2	4600.00	44.5 AV	54.0	-9.5	3.81 V	23	41.00	3.50
3	*5240.00	108.2 PK			3.90 V	4	65.90	42.30
4	*5240.00	97.9 AV			3.90 V	4	55.60	42.30
5	#10480.00	61.7 PK	74.0	-12.3	1.19 V	253	45.50	16.20
6	#10480.00	48.5 AV	54.0	-5.5	1.19 V	253	32.30	16.20

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)
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	#5648.80	59.4 PK	68.2	-8.8	1.18 H	309	54.40	5.00
2	*5745.00	110.9 PK			1.18 H	309	68.10	42.80
3	*5745.00	100.5 AV			1.18 H	309	57.70	42.80
4	#5960.00	60.3 PK	68.2	-7.9	1.18 H	309	55.10	5.20
5	11490.00	61.6 PK	74.0	-12.4	1.35 H	264	45.80	15.80
6	11490.00	47.7 AV	54.0	-6.3	1.35 H	264	31.90	15.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5646.40	58.9 PK	68.2	-9.3	3.62 V	195	53.90	5.00
2	*5745.00	107.0 PK			3.62 V	195	64.20	42.80
3	*5745.00	97.3 AV			3.62 V	195	54.50	42.80
4	#5992.80	59.4 PK	68.2	-8.8	3.62 V	195	54.20	5.20
5	11490.00	62.0 PK	74.0	-12.0	1.74 V	284	46.20	15.80
6	11490.00	47.9 AV	54.0	-6.1	1.74 V	284	32.10	15.80

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)
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	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	*5785.00	111.4 PK			1.10 H	302	68.60	42.80
2	*5785.00	101.0 AV			1.10 H	302	58.20	42.80
3	11570.00	61.7 PK	74.0	-12.3	1.52 H	316	46.20	15.50
4	11570.00	47.7 AV	54.0	-6.3	1.52 H	316	32.20	15.50
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	*5785.00	106.6 PK			3.46 V	176	63.80	42.80
2	*5785.00	96.1 AV			3.46 V	176	53.30	42.80
3	11570.00	61.7 PK	74.0	-12.3	1.32 V	225	46.20	15.50
4	11570.00	47.8 AV	54.0	-6.2	1.32 V	225	32.30	15.50

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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	#5647.20	58.6 PK	68.2	-9.6	1.30 H	255	53.60	5.00
2	*5825.00	108.2 PK			1.30 H	255	65.40	42.80
3	*5825.00	97.5 AV			1.30 H	255	54.70	42.80
4	#5995.20	59.4 PK	68.2	-8.8	1.30 H	255	54.20	5.20
5	11650.00	61.8 PK	74.0	-12.2	1.58 H	253	46.00	15.80
6	11650.00	47.9 AV	54.0	-6.1	1.58 H	253	32.10	15.80
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	#5626.40	59.1 PK	68.2	-9.1	3.56 V	12	54.20	4.90
2	*5825.00	108.1 PK			3.56 V	12	65.30	42.80
3	*5825.00	97.4 AV			3.56 V	12	54.60	42.80
4	#5979.20	59.0 PK	68.2	-9.2	3.56 V	12	53.80	5.20
5	11650.00	62.2 PK	74.0	-11.8	1.85 V	66	46.40	15.80
6	11650.00	48.1 AV	54.0	-5.9	1.85 V	66	32.30	15.80

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)
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	64.5 PK	74.0	-9.5	1.29 H	236	59.90	4.60
2	5150.00	47.3 AV	54.0	-6.7	1.29 H	236	42.70	4.60
3	*5180.00	111.0 PK			1.35 H	260	68.80	42.20
4	*5180.00	100.5 AV			1.35 H	260	58.30	42.20
5	#10360.00	63.4 PK	74.0	-10.6	1.00 H	326	47.60	15.80
6	#10360.00	48.3 AV	54.0	-5.7	1.00 H	326	32.50	15.80
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	3.66 V	12	60.30	4.60
2	5150.00	47.0 AV	54.0	-7.0	3.66 V	12	42.40	4.60
3	*5180.00	105.9 PK			3.87 V	2	63.70	42.20
4	*5180.00	95.7 AV			3.87 V	2	53.50	42.20
5	#10360.00	62.1 PK	74.0	-11.9	1.12 V	359	46.30	15.80
6	#10360.00	48.6 AV	54.0	-5.4	1.12 V	359	32.80	15.80

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)
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	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	*5200.00	109.8 PK			1.43 H	303	67.60	42.20
2	*5200.00	98.8 AV			1.43 H	303	56.60	42.20
3	#10400.00	61.7 PK	74.0	-12.3	1.36 H	229	45.80	15.90
4	#10400.00	48.3 AV	54.0	-5.7	1.36 H	229	32.40	15.90
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	67.8 PK			3.88 V	5	63.30	4.50
2	*5200.00	58.0 AV			3.88 V	5	53.50	4.50
3	#10400.00	62.2 PK	74.0	-11.8	1.16 V	325	46.30	15.90
4	#10400.00	48.7 AV	54.0	-5.3	1.16 V	325	32.80	15.90

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)
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	4655.00	58.0 PK	74.0	-16.0	1.23 H	246	54.40	3.60
2	4655.00	44.9 AV	54.0	-9.1	1.23 H	246	41.30	3.60
3	*5240.00	110.9 PK			1.33 H	257	68.60	42.30
4	*5240.00	100.6 AV			1.33 H	257	58.30	42.30
5	#10480.00	61.9 PK	74.0	-12.1	1.16 H	225	45.70	16.20
6	#10480.00	48.8 AV	54.0	-5.2	1.16 H	225	32.60	16.20
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	4655.00	57.8 PK	74.0	-16.2	3.79 V	351	54.20	3.60
2	4655.00	44.6 AV	54.0	-9.4	3.79 V	351	41.00	3.60
3	*5240.00	107.1 PK			3.83 V	4	64.80	42.30
4	*5240.00	96.3 AV			3.83 V	4	54.00	42.30
5	#10480.00	62.4 PK	74.0	-11.6	1.66 V	147	46.20	16.20
6	#10480.00	49.0 AV	54.0	-5.0	1.66 V	147	32.80	16.20

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)
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	#5636.00	57.6 PK	68.2	-10.6	1.22 H	258	52.60	5.00
2	*5745.00	98.1 AV			1.22 H	258	55.30	42.80
3	*5745.00	108.2 PK			1.22 H	258	65.40	42.80
4	#5943.20	59.0 PK	68.2	-9.2	1.22 H	258	53.80	5.20
5	11490.00	60.9 PK	74.0	-13.1	1.48 H	270	45.10	15.80
6	11490.00	47.2 AV	54.0	-6.8	1.48 H	270	31.40	15.80
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	#5632.00	57.7 PK	68.2	-10.5	3.65 V	197	52.70	5.00
2	*5745.00	108.1 PK			3.65 V	197	65.30	42.80
3	*5745.00	97.8 AV			3.65 V	197	55.00	42.80
4	#5982.40	58.4 PK	68.2	-9.8	3.56 V	197	53.20	5.20
5	11490.00	61.3 PK	74.0	-12.7	1.77 V	289	45.50	15.80
6	11490.00	47.6 AV	54.0	-6.4	1.77 V	289	31.80	15.80

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)
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	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	*5785.00	108.4 PK			1.25 H	250	65.60	42.80
2	*5785.00	98.3 AV			1.25 H	250	55.50	42.80
3	11570.00	61.1 PK	74.0	-12.9	1.49 H	268	45.60	15.50
4	11570.00	47.6 AV	54.0	-6.4	1.49 H	268	32.10	15.50
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	*5785.00	107.6 PK			3.99 V	173	64.80	42.80
2	*5785.00	97.9 AV			3.99 V	173	55.10	42.80
3	11570.00	61.3 PK	74.0	-12.7	1.77 V	299	45.80	15.50
4	11570.00	47.9 AV	54.0	-6.1	1.77 V	299	32.40	15.50

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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	#5614.40	57.3 PK	68.2	-10.9	1.22 H	255	52.40	4.90
2	*5825.00	108.3 PK			1.22 H	255	65.50	42.80
3	*5825.00	98.1 AV			1.22 H	255	55.30	42.80
4	#5951.20	58.1 PK	68.2	-10.1	1.22 H	255	52.90	5.20
5	11650.00	61.0 PK	74.0	-13.0	1.49 H	281	45.20	15.80
6	11650.00	47.6 AV	54.0	-6.4	1.49 H	281	31.80	15.80
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	#5604.00	57.3 PK	68.2	-10.9	3.98 V	173	52.40	4.90
2	*5825.00	106.4 PK			3.98 V	173	63.60	42.80
3	*5825.00	96.6 AV			3.98 V	173	53.80	42.80
4	#5948.00	58.0 PK	68.2	-10.2	3.98 V	173	52.80	5.20
5	11650.00	61.5 PK	74.0	-12.5	1.79 V	291	45.70	15.80
6	11650.00	48.3 AV	54.0	-5.7	1.79 V	291	32.50	15.80

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)
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	73.0 PK	74.0	-1.0	2.02 H	314	68.40	4.60
2	5150.00	53.5 AV	54.0	-0.5	2.02 H	314	48.90	4.60
3	*5190.00	104.6 PK			1.63 H	248	62.40	42.20
4	*5190.00	94.4 AV			1.63 H	248	52.20	42.20
5	#10380.00	61.8 PK	74.0	-12.2	1.24 H	241	45.90	15.90
6	#10380.00	47.5 AV	54.0	-6.5	1.24 H	241	31.60	15.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	69.9 PK	74.0	-4.1	1.68 V	182	65.30	4.60
2	5150.00	49.6 AV	54.0	-4.4	1.68 V	182	45.00	4.60
3	*5190.00	98.5 PK			1.54 V	251	56.30	42.20
4	*5190.00	88.2 AV			1.54 V	251	46.00	42.20
5	#10380.00	61.7 PK	74.0	-12.3	1.25 V	341	45.80	15.90
6	#10380.00	47.2 AV	54.0	-6.8	1.25 V	341	31.30	15.90

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)
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	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	4757.00	60.2 PK	74.0	-13.8	1.43 H	261	56.30	3.90
2	4757.00	45.5 AV	54.0	-8.5	1.43 H	261	41.60	3.90
3	*5230.00	107.9 PK			1.54 H	251	65.60	42.30
4	*5230.00	97.5 AV			1.54 H	251	55.20	42.30
5	#10460.00	62.2 PK	74.0	-11.8	1.63 H	298	46.30	15.90
6	#10460.00	49.4 AV	54.0	-4.6	1.63 H	298	33.50	15.90
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	4757.00	59.7 PK	74.0	-14.3	3.51 V	339	55.80	3.90
2	4757.00	45.2 AV	54.0	-8.8	3.51 V	339	41.30	3.90
3	*5230.00	101.9 PK			3.61 V	4	59.60	42.30
4	*5230.00	91.6 AV			3.61 V	4	49.30	42.30
5	#10460.00	62.6 PK	74.0	-11.4	1.95 V	224	46.70	15.90
6	#10460.00	49.6 AV	54.0	-4.4	1.95 V	224	33.70	15.90

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)
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	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	#5612.00	58.3 PK	68.2	-9.9	1.24 H	257	53.40	4.90
2	*5755.00	105.7 PK			1.24 H	257	62.90	42.80
3	*5755.00	94.3 AV			1.24 H	257	51.50	42.80
4	#5975.20	58.4 PK	68.2	-9.8	1.24 H	257	53.20	5.20
5	11510.00	61.2 PK	74.0	-12.8	1.55 H	274	45.60	15.60
6	11510.00	48.0 AV	54.0	-6.0	1.55 H	274	32.40	15.60
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	#5640.80	58.1 PK	68.2	-10.1	3.94 V	200	53.10	5.00
2	*5755.00	104.6 PK			3.94 V	200	61.80	42.80
3	*5755.00	93.9 AV			3.94 V	200	51.10	42.80
4	#5974.40	59.3 PK	68.2	-8.9	3.94 V	200	54.10	5.20
5	11510.00	61.5 PK	74.0	-12.5	1.70 V	293	45.90	15.60
6	11510.00	48.4 AV	54.0	-5.6	1.70 V	293	32.80	15.60

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)
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	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	#5632.80	57.6 PK	68.2	-10.6	1.08 H	300	52.60	5.00
2	*5795.00	104.7 PK			1.08 H	300	61.90	42.80
3	*5795.00	94.5 AV			1.08 H	300	51.70	42.80
4	#5991.20	58.1 PK	68.2	-10.1	1.08 H	300	52.90	5.20
5	11590.00	61.1 PK	74.0	-12.9	1.49 H	288	45.60	15.50
6	11590.00	47.9 AV	54.0	-6.1	1.49 H	288	32.40	15.50
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	#5640.00	57.6 PK	68.2	-10.6	3.87 V	196	52.60	5.00
2	*5795.00	103.9 PK			3.87 V	196	61.10	42.80
3	*5795.00	93.8 AV			3.87 V	196	51.00	42.80
4	#5942.40	58.3 PK	68.2	-9.9	3.87 V	196	53.10	5.20
5	11590.00	61.6 PK	74.0	-12.4	1.70 V	299	46.10	15.50
6	11590.00	48.3 AV	54.0	-5.7	1.70 V	299	32.80	15.50

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)
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	70.6 PK	74.0	-3.4	1.29 H	297	66.00	4.60
2	5150.00	53.4 AV	54.0	-0.6	1.29 H	297	48.80	4.60
3	*5210.00	102.9 PK			2.57 H	304	60.60	42.30
4	*5210.00	92.7 AV			2.57 H	304	50.40	42.30
5	#10420.00	62.1 PK	74.0	-11.9	1.36 H	148	46.10	16.00
6	#10420.00	49.2 AV	54.0	-4.8	1.36 H	148	33.20	16.00
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	54.0 PK	74.0	-20.0	3.46 V	201	49.40	4.60
2	5150.00	47.2 AV	54.0	-6.8	3.46 V	201	42.60	4.60
3	*5210.00	98.6 PK			3.59 V	196	56.30	42.30
4	*5210.00	88.9 AV			3.59 V	196	46.60	42.30
5	#10420.00	62.3 PK	74.0	-11.7	1.75 V	48	46.30	16.00
6	#10420.00	49.5 AV	54.0	-4.5	1.75 V	48	33.50	16.00

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)
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	5632.00	57.8 QP	68.2	-10.4	1.36 H	259	52.80	5.00
2	*5775.00	102.1 PK			1.36 H	259	59.30	42.80
3	*5775.00	92.2 AV			1.36 H	259	49.40	42.80
4	5942.40	57.9 QP	68.2	-10.3	1.36 H	259	52.70	5.20
5	11550.00	60.8 PK	74.0	-13.2	1.50 H	268	45.30	15.50
6	11550.00	47.1 AV	54.0	-6.9	1.50 H	268	31.60	15.50
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5649.60	59.3 QP	68.2	-8.9	3.57 V	181	54.30	5.00
2	*5775.00	101.1 PK			3.57 V	181	58.30	42.80
3	*5775.00	91.1 AV			3.57 V	181	48.30	42.80
4	5975.20	59.3 QP	68.2	-8.9	3.57 V	181	54.10	5.20
5	11550.00	61.3 PK	74.0	-12.7	1.73 V	295	45.80	15.50
6	11550.00	47.6 AV	54.0	-6.4	1.73 V	295	32.10	15.50

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)
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	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	37.76	37.0 QP	40.0	-3.0	1.00 H	16	51.90	-14.90
2	62.98	31.2 QP	40.0	-8.8	2.00 H	11	46.40	-15.20
3	144.46	37.4 QP	43.5	-6.1	1.00 H	208	51.60	-14.20
4	480.08	35.0 QP	46.0	-11.0	2.00 H	339	43.90	-8.90
5	873.90	37.5 QP	46.0	-8.5	1.51 H	8	38.90	-1.40
6	961.20	39.9 QP	54.0	-14.1	1.26 H	151	39.50	0.40
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.00	35.4 QP	40.0	-4.6	1.50 V	14	51.00	-15.60
2	62.98	31.5 QP	40.0	-8.5	1.24 V	21	46.70	-15.20
3	109.54	34.3 QP	43.5	-9.2	1.00 V	28	51.80	-17.50
4	144.46	33.3 QP	43.5	-10.2	1.00 V	257	47.50	-14.20
5	873.90	37.6 QP	46.0	-8.4	1.00 V	73	39.00	-1.40
6	947.62	41.1 QP	46.0	-4.9	1.24 V	126	41.10	0.00

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 12, 2015	Oct. 11, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Dec. 26, 2015	Dec. 25, 2016
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 11, 2016	Jan. 10, 2017
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 21, 2015	Jul. 20, 2016
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

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

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

3. The VCCI Site Registration No. is C-2047.

4.2.3 Test Procedures

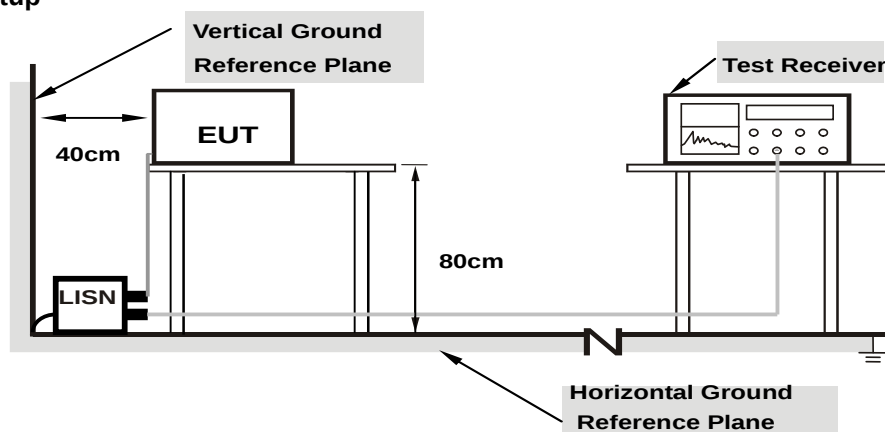
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

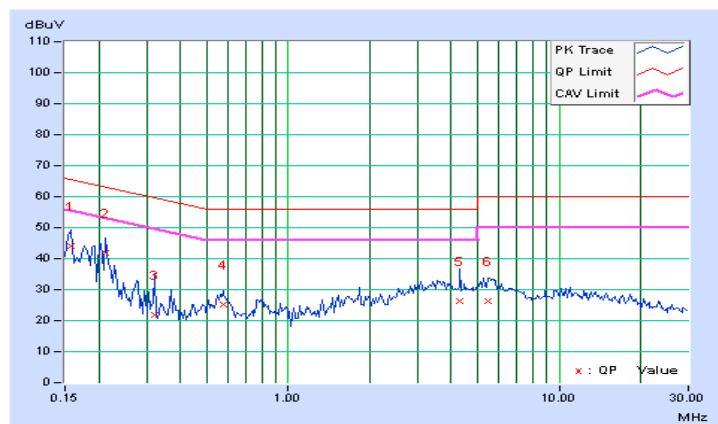
Worst-Case Data: 802.11a

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	0.15781	10.13	34.01	14.56	44.14	24.69	65.58	55.58	-21.44	-30.89
2	0.21250	10.16	31.51	14.86	41.67	25.02	63.11	53.11	-21.44	-28.09
3	0.32188	10.18	11.72	-1.39	21.90	8.79	59.66	49.66	-37.76	-40.87
4	0.57578	10.20	14.85	8.26	25.05	18.46	56.00	46.00	-30.95	-27.54
5	4.31250	10.36	15.89	10.75	26.25	21.11	56.00	46.00	-29.75	-24.89
6	5.49219	10.38	16.07	10.75	26.45	21.13	60.00	50.00	-33.55	-28.87

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.

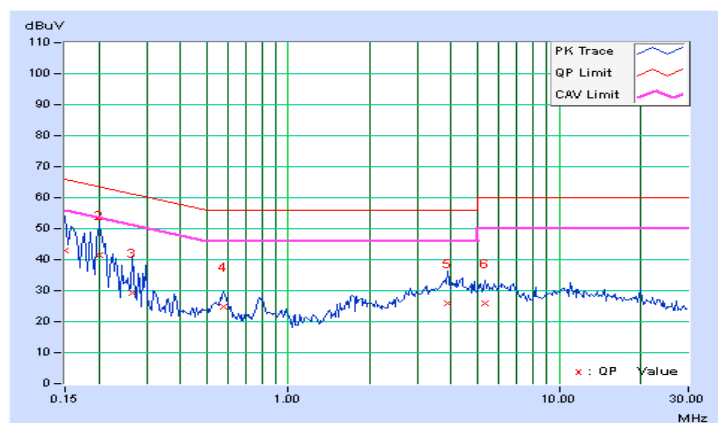


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.13	32.78	18.64	42.91	28.77	66.00	56.00	-23.09	-27.23
2	0.20078	10.16	31.42	11.59	41.58	21.75	63.58	53.58	-22.00	-31.83
3	0.26719	10.17	19.16	4.32	29.33	14.49	61.20	51.20	-31.87	-36.71
4	0.57969	10.20	14.77	7.78	24.97	17.98	56.00	46.00	-31.03	-28.02
5	3.87500	10.38	15.55	11.05	25.93	21.43	56.00	46.00	-30.07	-24.57
6	5.32813	10.43	15.67	10.71	26.10	21.14	60.00	50.00	-33.90	-28.86

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

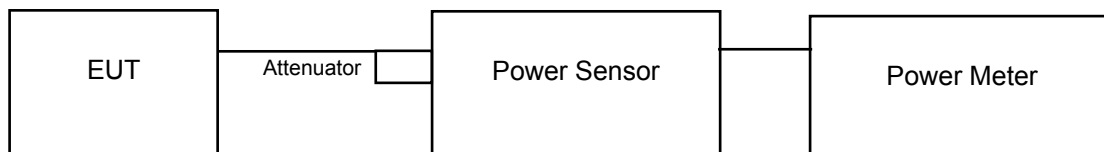
4.3.1 Limits of Transmit Power Measurement

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)

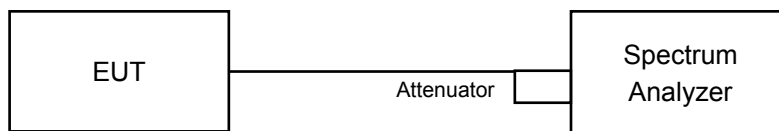
*B is the 26 dB emission bandwidth in megahertz

4.3.2 Test Setup

For 802.11a, 802.11n (HT20), 802.11n (HT40), 802.11ac (VHT20), 802.11ac (VHT40)



For 802.11ac (VHT80)



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

For Average Power Measurement

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

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

For 802.11ac (VHT80)

- a. Set span to encompass the entire 26 dB EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- b. Set sweep trigger to “free run”.
- c. Set RBW = 1 MHz.
- d. Set VBW $\geq$ 3 MHz
- e. Number of points in sweep $\geq$ 2 Span / RBW.
- f. Sweep time $\leq$ (number of points in sweep) * T
- g. Using emission bandwidth to determine the frequency span for integration the channel bandwidth.
- h. Detector = RMS.
- i. Trace mode = max hold.
- j. Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.
- k. Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument 's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

Power Output:

802.11a

Chan.	Freq. (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	16.28	16.04	82.641	19.17	24.00	Pass
40	5200	16.17	16.15	82.610	19.17	24.00	Pass
48	5240	16.26	16.20	83.954	19.24	24.00	Pass
149	5745	16.15	16.14	82.325	19.16	30.00	Pass
157	5785	16.40	16.02	83.646	19.22	30.00	Pass
165	5825	16.29	16.18	84.055	19.25	30.00	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	15.58	15.78	73.985	18.69	24.00	Pass
40	5200	15.69	15.71	74.307	18.71	24.00	Pass
48	5240	15.57	15.50	71.539	18.55	24.00	Pass
149	5745	15.77	15.55	73.649	18.67	30.00	Pass
157	5785	15.51	15.78	73.407	18.66	30.00	Pass
165	5825	15.54	15.52	71.455	18.54	30.00	Pass

802.11n (HT40)

Chan.	Freq. (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	13.70	13.60	46.351	16.66	24.00	Pass
46	5230	15.56	15.59	72.199	18.59	24.00	Pass
151	5755	15.62	15.62	72.95	18.63	30.00	Pass
159	5795	15.62	15.80	74.494	18.72	30.00	Pass

802.11ac (VHT80)

Chan.	Freq. (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	12.13	12.08	32.475	15.12	24.00	Pass
155	5775	15.57	15.51	71.621	18.55	30.00	Pass

26dB Bandwidth:

802.11a

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
36	5180	20.50	22.08	Pass
40	5200	22.35	22.87	Pass
48	5240	21.91	24.41	Pass

802.11n (HT20)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
36	5180	20.77	22.64	Pass
40	5200	21.90	23.68	Pass
48	5240	21.51	22.33	Pass

802.11n (HT40)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
38	5190	52.85	48.82	Pass
46	5230	42.36	49.79	Pass

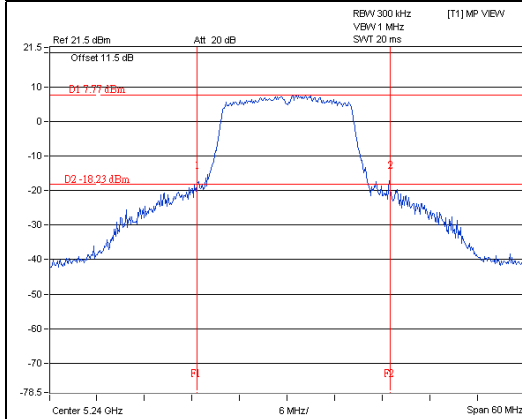
802.11ac (VHT80)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
42	5210	81.43	81.44	Pass

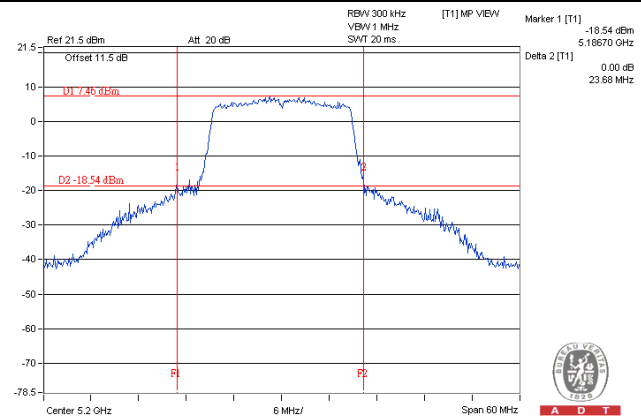
Spectrum Plot of Worst Value

802.11a

802.11n (HT20)



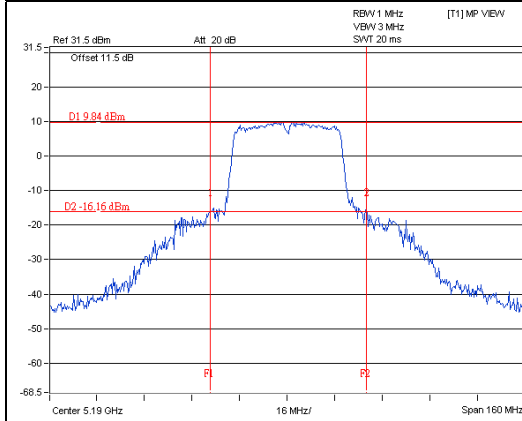
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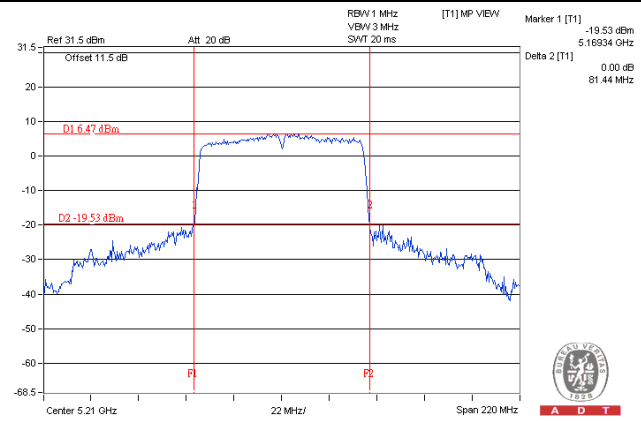
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802.11n (HT40)

802.11ac (VHT80)



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Occupied Bandwidth:

802.11a

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	16.92	16.80
40	5200	16.92	16.92
48	5240	16.80	16.92
149	5745	16.87	16.87
157	5785	16.92	16.92
165	5825	17.04	16.80

802.11n (HT20)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	17.76	17.88
40	5200	17.88	17.76
48	5240	17.76	17.76
149	5745	17.88	17.88
157	5785	17.76	17.88
165	5825	17.76	17.88

802.11n (HT40)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	36.48	36.24
46	5230	36.48	36.60
151	5755	36.48	36.36
159	5795	36.72	36.48

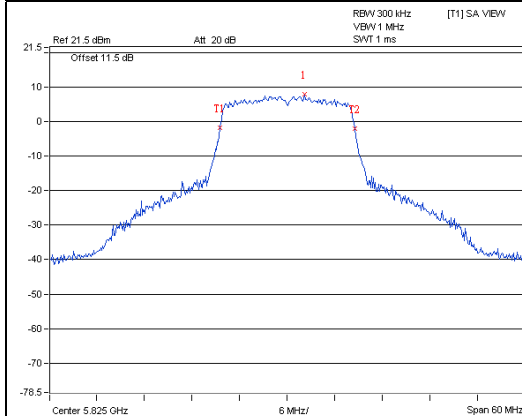
802.11ac (VHT80)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
42	5210	75.12	75.36
155	5775	75.36	75.36

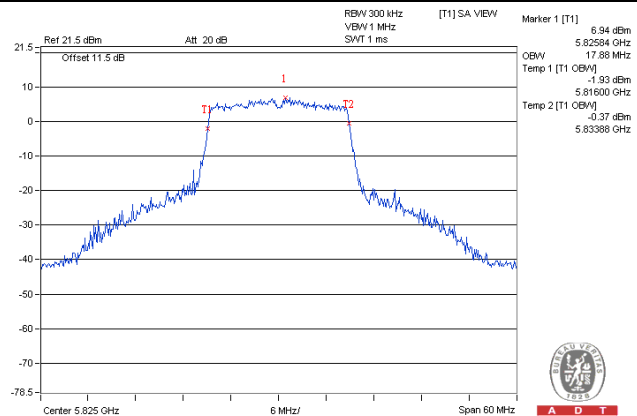
Spectrum Plot of Worst Value

802.11a

802.11n (HT20)



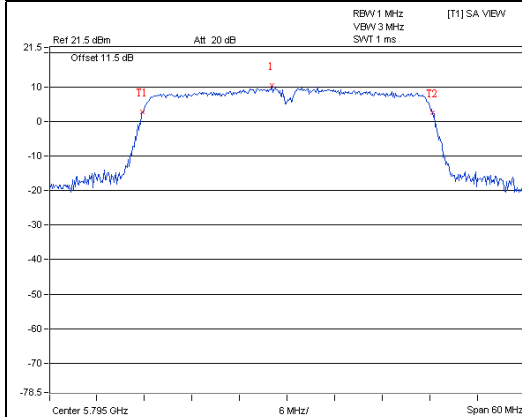
A D T



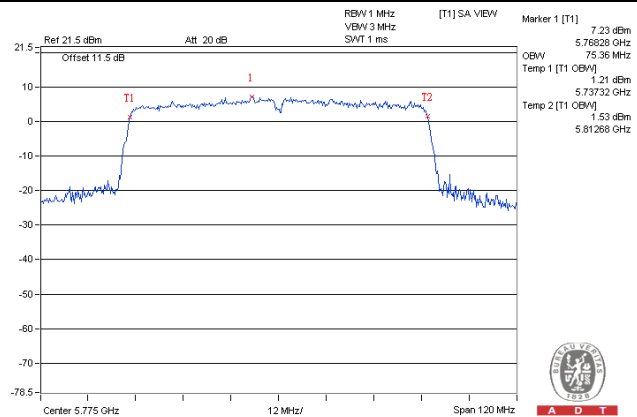
A D T

802.11n (HT40)

802.11ac (VHT80)



A D T



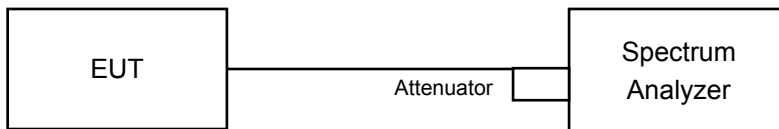
A D T

4.4 Peak Power Spectral Density Measurement

4.4.1 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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 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 $\geq$ 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

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 = 1 MHz, Set VBW $\geq$ 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 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 $10 \log (1/\text{duty cycle})$

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

For U-NII-1 Band

802.11a

Chan.	Freq. (MHz)	PSD (dBm)		Total PSD (dBm)	Max. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1			
36	5180	3.53	3.60	6.58	11.00	Pass
40	5200	3.58	3.53	6.57	11.00	Pass
48	5240	3.64	3.81	6.74	11.00	Pass

Note:

- 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.
- Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.69\text{dBi} < 6\text{dBi}$, so the power density limit no need to reduced

802.11n (HT20)

Chan.	Freq. (MHz)	PSD (dBm)		Total PSD (dBm)	Max. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1			
36	5180	2.56	2.85	5.72	11.00	Pass
40	5200	2.92	2.91	5.93	11.00	Pass
48	5240	3.21	2.88	6.06	11.00	Pass

Note:

- 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.
- Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.69\text{dBi} < 6\text{dBi}$, so the power density limit no need to reduced

802.11n (HT40)

Chan.	Freq. (MHz)	PSD (dBm)		Total PSD w/o duty factor (dBm)	Duty factor	Total PSD with duty factor (dBm)	Max. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1					
38	5190	-0.56	-0.73	2.36	0.24	2.60	11.00	Pass
46	5230	-0.60	-0.03	2.70	0.24	2.94	11.00	Pass

Note:

- 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.
- Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.69\text{dBi} < 6\text{dBi}$, so the power density limit no need to reduced
- Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

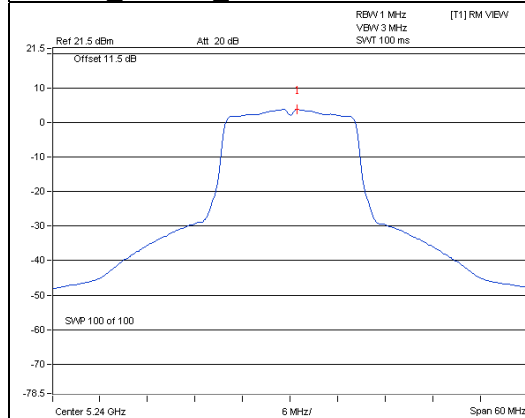
Chan.	Freq. (MHz)	PSD (dBm)		Total PSD w/o duty factor (dBm)	Duty factor	Total PSD with duty factor (dBm)	Max. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1					
42	5210	-4.19	-4.53	-1.34	0.20	-1.14	11.00	Pass

Note:

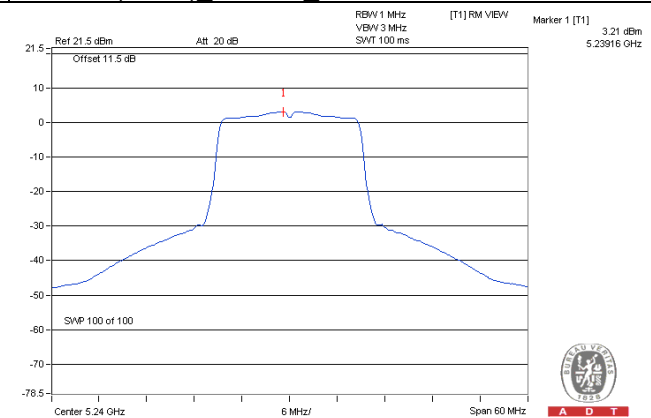
- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.69\text{dBi} < 6\text{dBi}$, so the power density limit no need to reduced
- Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

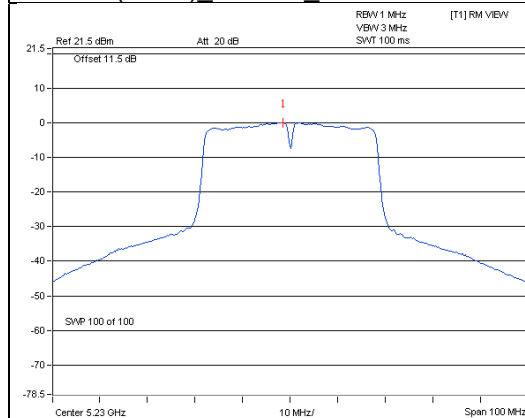
802.11a_Chain 1_Ch48



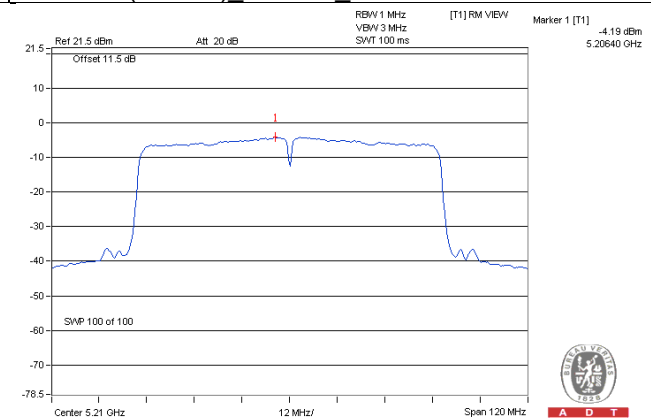
802.11n (HT20)_Chain 0_Ch48



802.11n (HT40)_Chain 1_Ch46



802.11ac (VHT80)_Chain 0_Ch42



For U-NII-3 Band

802.11a

TX chain	Channel	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	-5.31	-3.09	3.01	-0.08	30.00	Pass
	157	5785	-4.69	-2.47	3.01	0.54	30.00	Pass
	165	5825	-4.88	-2.66	3.01	0.35	30.00	Pass
1	149	5745	-4.56	-2.34	3.01	0.67	30.00	Pass
	157	5785	-4.38	-2.16	3.01	0.85	30.00	Pass
	165	5825	-5.15	-2.93	3.01	0.08	30.00	Pass

Note:

- 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.
- Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.72\text{dBi} < 6\text{dBi}$, so the power density limit no need to reduced.

802.11n (HT20)

TX chain	Channel	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	-5.66	-3.44	3.01	-0.43	30.00	Pass
	157	5785	-5.69	-3.47	3.01	-0.46	30.00	Pass
	165	5825	-5.36	-3.14	3.01	-0.13	30.00	Pass
1	149	5745	-5.11	-2.89	3.01	0.12	30.00	Pass
	157	5785	-5.07	-2.85	3.01	0.16	30.00	Pass
	165	5825	-4.95	-2.73	3.01	0.28	30.00	Pass

Note:

- 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.
- Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.72\text{dBi} < 6\text{dBi}$, so the power density limit no need to reduced.

802.11n (HT40)

TX chain	Channel	Freq. (MHz)	PSD (dBm/300 kHz)	PSD (dBm/500 kHz)	10 log (N=2) dB	Duty factor	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	151	5755	-9.10	-6.88	3.01	0.24	-3.63	30.00	Pass
	159	5795	-8.58	-6.36	3.01	0.24	-3.11	30.00	Pass
1	151	5755	-9.11	-6.89	3.01	0.24	-3.64	30.00	Pass
	159	5795	-9.14	-6.92	3.01	0.24	-3.67	30.00	Pass

Note:

- 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.
- Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.72\text{dBi} < 6\text{dBi}$, so the power density limit no need to reduced
- Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

TX chain	Channel	Freq. (MHz)	PSD (dBm/300 kHz)	PSD (dBm/500 kHz)	10 log (N=2) dB	Duty factor	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	155	5775	-11.62	-9.40	3.01	0.20	-6.19	30.00	Pass
1	155	5775	-11.36	-9.14	3.01	0.20	-5.93	30.00	Pass

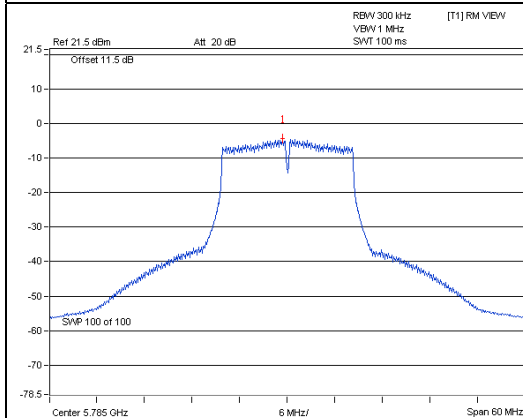
Note:

- 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.
- Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.72\text{dBi} < 6\text{dBi}$, so the power density limit no need to reduced
- Refer to section 3.3 for duty cycle spectrum plot.

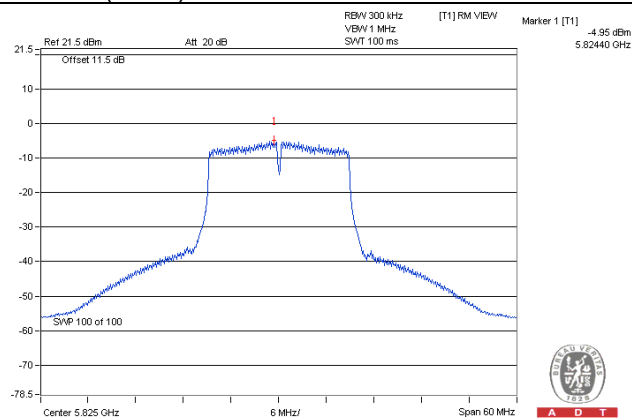
Spectrum Plot of Worst Value

802.11a

802.11n (HT20)



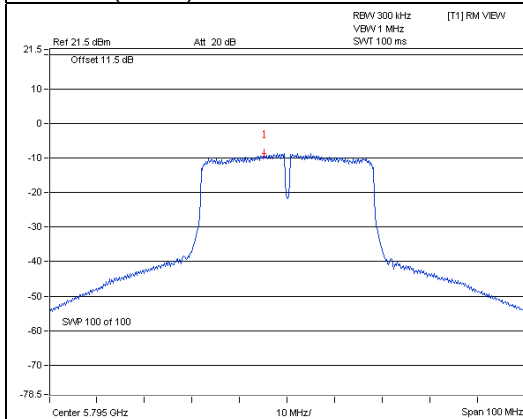
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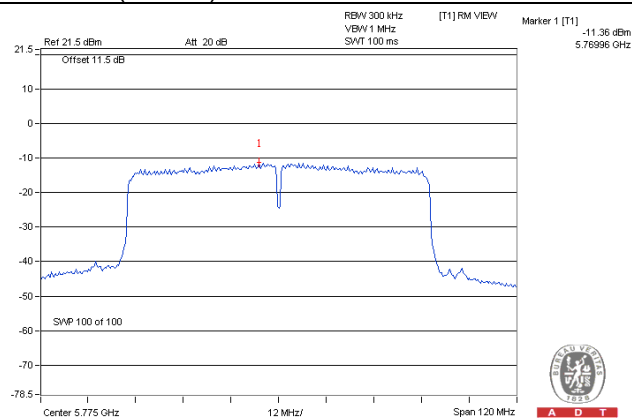
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802.11n (HT40)

802.11ac (VHT80)



A D T



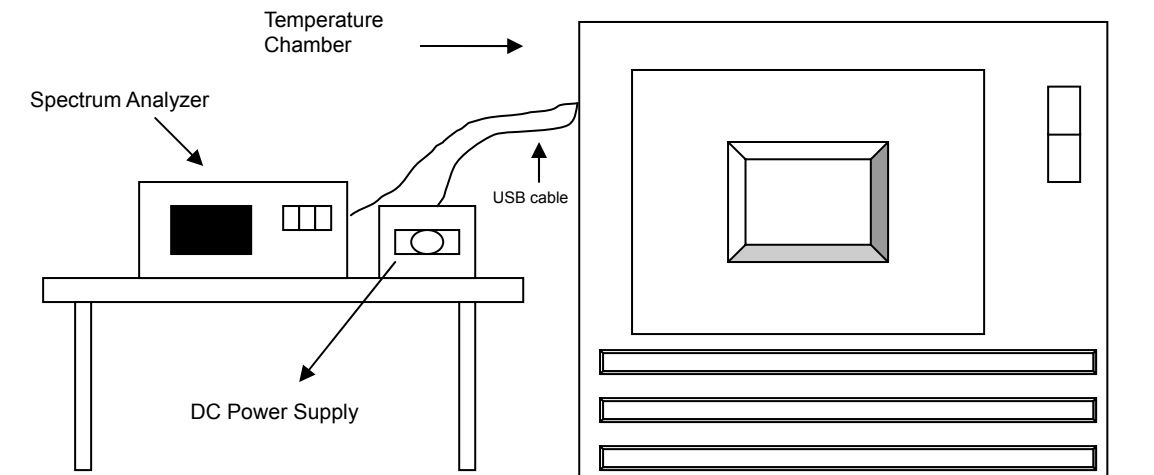
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4.5 Frequency Stability

4.5.1 Limits of Frequency Stability Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Spectrum Analyzer Agilent	E4446A	MY51100039	Aug. 18, 2015	Aug. 17, 2016
WIT STANDARD TEMPERATURE AND HUMIDITY CHAMBER	TH-4S-C	W981030	Jun. 08, 2015	Jun. 07, 2016
Digital Multimeter Fluke	87-III	70360742	Jul. 03, 2015	Jul. 02, 2016
DC Power Supply Topward	6306A	727263	NA	NA

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

4.5.4 Test Procedure

- The EUT was placed inside the environmental test chamber and powered by nominal DC 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 4Vdc to 6Vdc and the frequency record.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

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

4.5.7 Test Results

Frequency Stability Versus Temp.									
Operating Frequency: 5180MHz									
Temp. ()	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
60	5	5180.0232	0.00045	5180.0276	0.00053	5180.0264	0.00051	5180.023	0.00044
50	5	5179.9737	-0.00051	5179.9773	-0.00044	5179.9759	-0.00047	5179.9779	-0.00043
40	5	5179.9863	-0.00026	5179.9894	-0.00020	5179.9893	-0.00021	5179.9888	-0.00022
30	5	5180.0121	0.00023	5180.0144	0.00028	5180.0124	0.00024	5180.0111	0.00021
20	5	5180.0164	0.00032	5180.0192	0.00037	5180.0206	0.00040	5180.0164	0.00032
10	5	5180.0034	0.00007	5180.0021	0.00004	5180.0017	0.00003	5179.9997	-0.00001
0	5	5179.9923	-0.00015	5179.9932	-0.00013	5179.9916	-0.00016	5179.9892	-0.00021

Frequency Stability Versus Voltage									
Operating Frequency: 5180MHz									
Temp. ()	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	6	5180.0117	0.00023	5180.0139	0.00027	5180.0132	0.00025	5180.0114	0.00022
	5	5180.0121	0.00023	5180.0144	0.00028	5180.0124	0.00024	5180.0111	0.00021
	4	5180.0119	0.00023	5180.015	0.00029	5180.0127	0.00025	5180.0108	0.00021

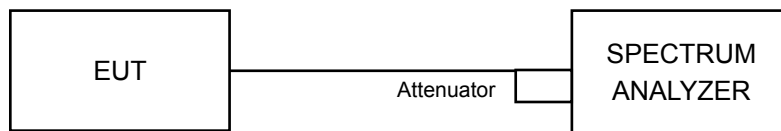
Note: The manufacturer defined the working voltage is from 4Vdc to 6Vdc.

4.6 6dB Bandwidth Measurement

4.6.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

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

MEASUREMENT PROCEDURE REF

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

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

4.6.7 Test Results

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	16.36	16.33	0.5	Pass
157	5785	16.35	16.36	0.5	Pass
165	5825	16.35	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	17.09	17.10	0.5	Pass
157	5785	17.12	17.00	0.5	Pass
165	5825	17.09	17.11	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	35.34	35.35	0.5	Pass
159	5795	35.30	35.34	0.5	Pass

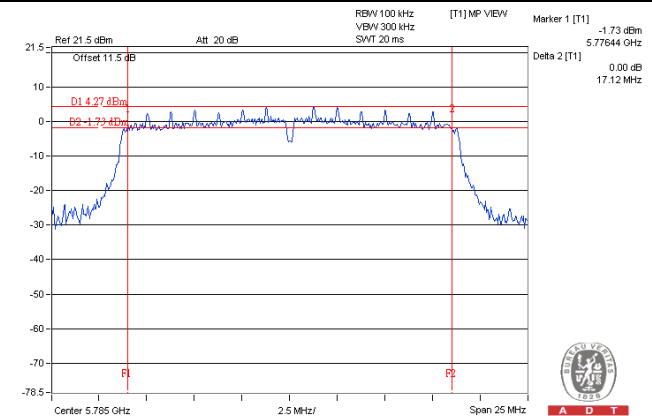
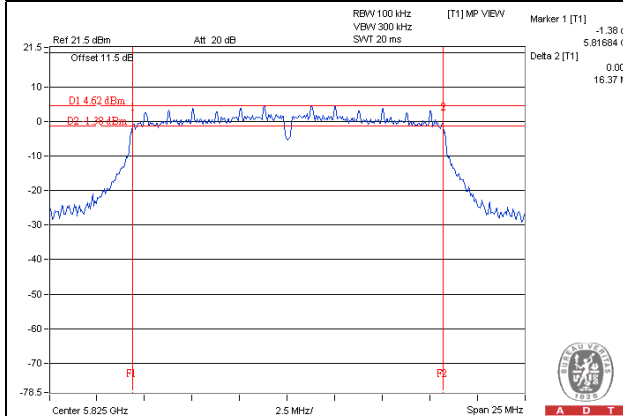
802.11ac (VHT80)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
155	5775	75.36	75.35	0.5	Pass

Spectrum Plot of Worst Value

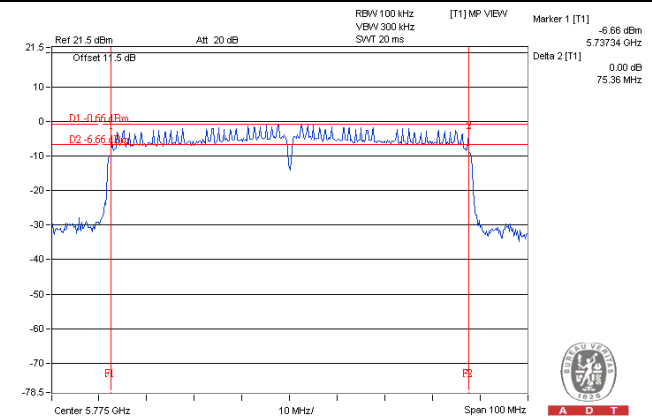
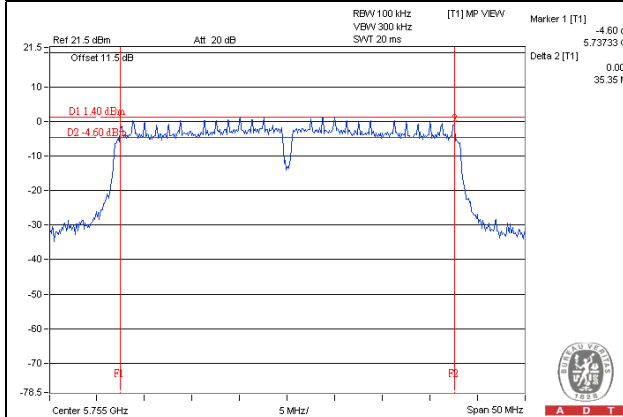
802.11a

802.11n (HT20)



802.11n (HT40)

802.11ac (VHT80)

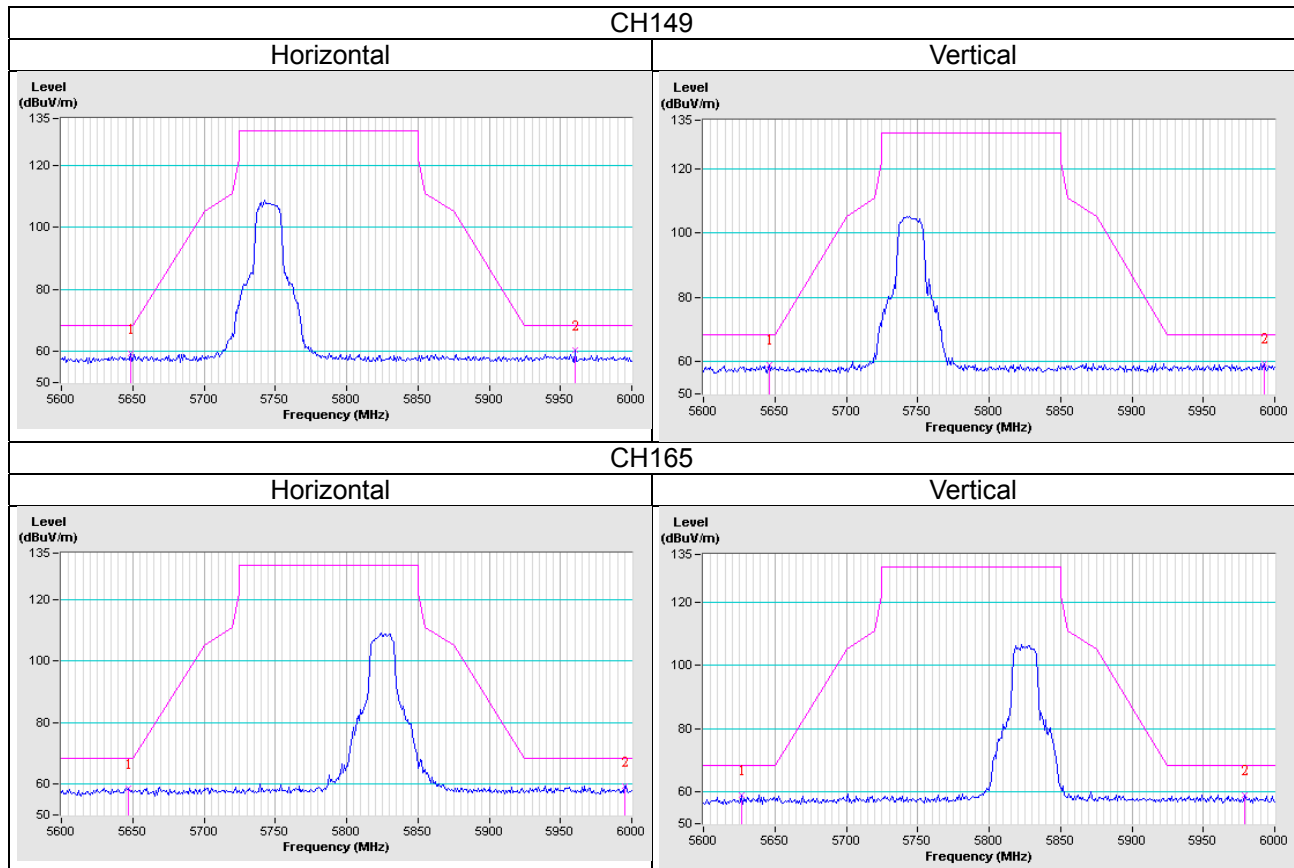


5 Pictures of Test Arrangements

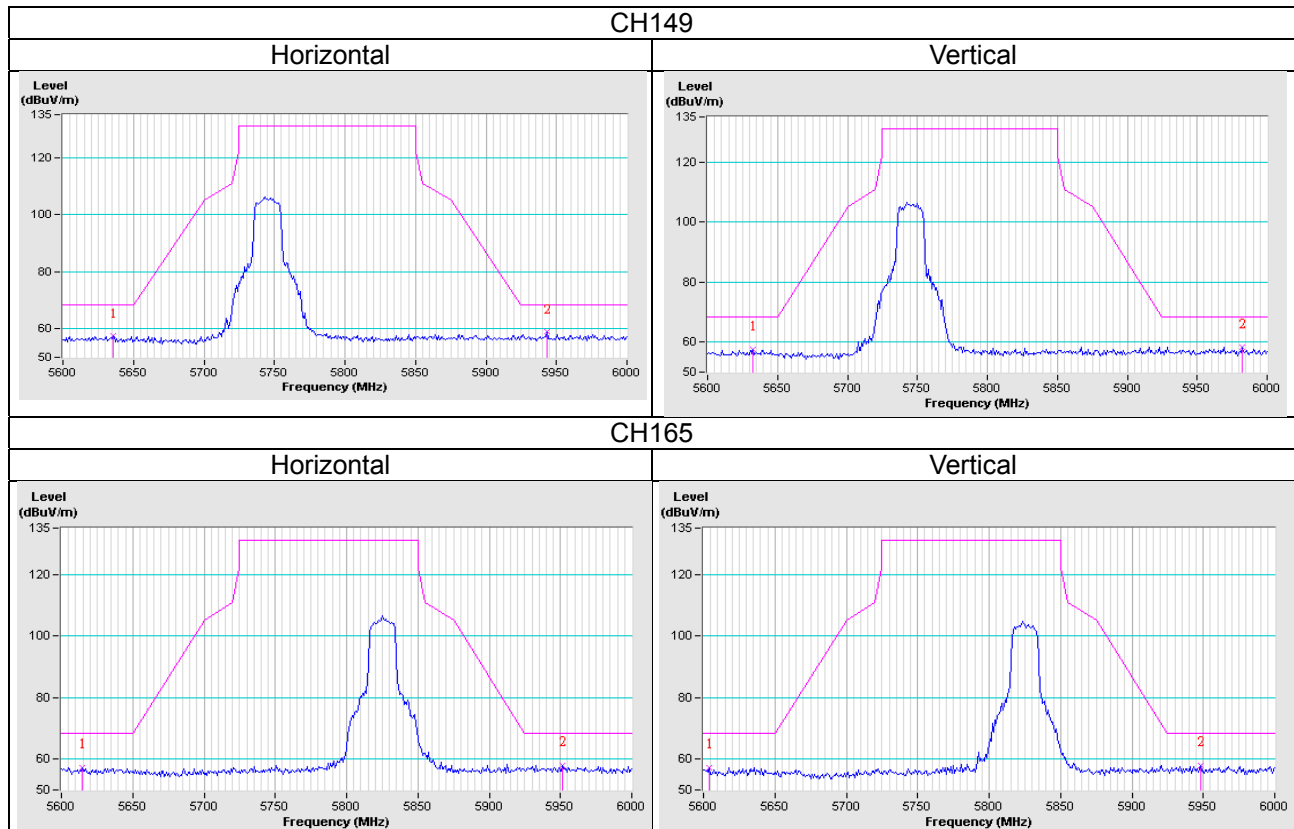
Please refer to the attached file (Test Setup Photo).

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

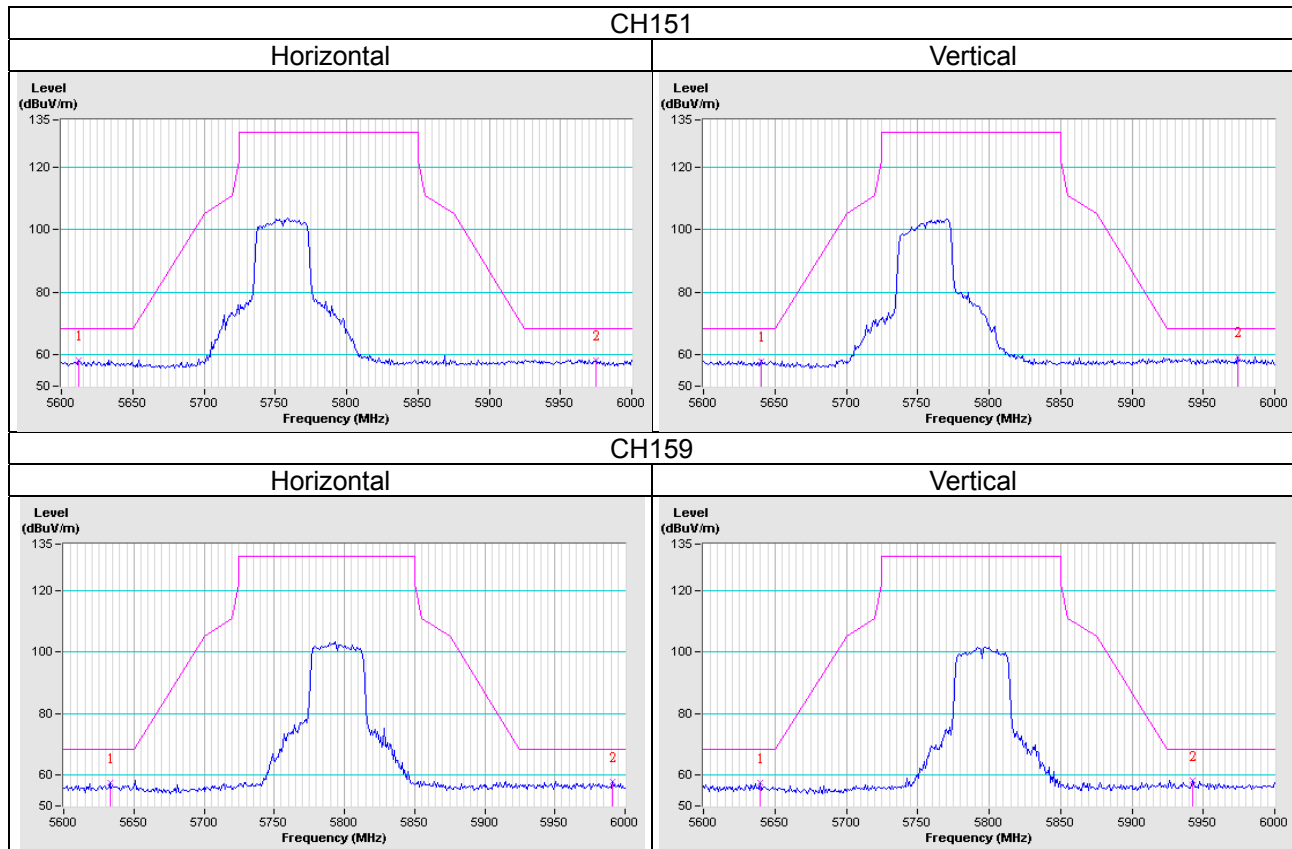
802.11a



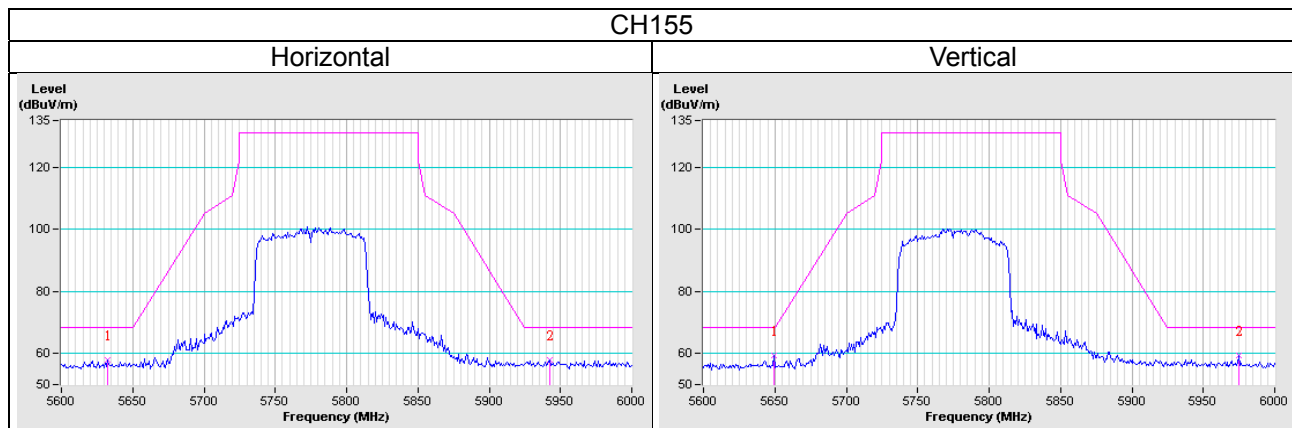
802.11n (HT20)



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 accredited and approved according to ISO/IEC 17025.

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

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Web Site: www.bureauveritas-adt.com

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

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