

## FCC Test Report

**Report No.:** RF161004D09-1

**FCC ID:** HFS-C401U

**Test Model:** C401U

**Received Date:** Oct. 04, 2016

**Test Date:** Dec. 26, 2016 ~ Jan. 10, 2017

**Issued Date:** Jan. 19, 2017

**Applicant:** QUANTA COMPUTER INC.

**Address:** 188, WEN HUA 2ND RD., GUISHAN DIST., TAO YUAN CITY 33377,  
TAIWAN

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

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan,  
R.O.C.

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



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### Release Control Record

Issue No.	Description	Date Issued
RF161004D09-1	Original release.	Jan. 19, 2017

## 1 Certificate of Conformity

**Product:** Clover Flex

**Brand:** clover

**Test Model:** C401U

**Sample Status:** Engineering sample


**Applicant:** QUANTA COMPUTER INC.

**Test Date:** Dec. 26, 2016 ~ Jan. 10, 2017

**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:** Jan. 19, 2017  
Pettie Chen / Senior Specialist

**Approved by :** , **Date:** Jan. 19, 2017  
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 -24.81dB at 0.37678MHz.
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 -1.2dB 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	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 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	Clover Flex
Brand	clover
Test Model	C401U
Status of EUT	Engineering sample
Power Supply Rating	7.6 Vdc (Battery) 12Vdc (Adapter)
Modulation Type	64QAM, 16QAM, QPSK, BPSK
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 150Mbps
Operating Frequency	5180 ~ 5240MHz, 5745 ~ 5825MHz
Number of Channel	5180 ~ 5240MHz: 4 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40) 5745 ~ 5825MHz: 5 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40)
Output Power	5180 ~ 5240MHz: 39.537mW 5745 ~ 5825MHz: 38.459mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Charging Dock (Brand: Clover, Model: K400) Microhub (Brand: Clover, Model: H400)
Data Cable Supplied	0.8m shielded Type-C cable without core

Note:

1. The EUT provides one completed transmitter and one receiver.

Modulation Mode	TX Function
802.11a	1TX
802.11n (HT20)	1TX
802.11n (HT40)	1TX

2. The EUT consumes power from the following battery and adapter.

Battery	
Brand	LG Chem, Ltd.
Model	MPPCLOYJ4
Rating	7.6Vdc, 2170mAh (Typ)

Adapter	
Brand	clover
Model	FSP040-RHBN2 A
Input Power	100-240Vac~, 1.5A, 50-60Hz
Output Power	12.0Vdc / 3.33A
Power Line	1.2m shielded DC cable with one core

3. The EUT uses following antennas.

Ant. Type	Connector	Antenna Gain (dBi)			
		Frequency (GHz)			
		2.4	5.150	5.470	5.850
PIFA	NA	-2.5	4.0	4.4	3.4

4. 2.4GHz and 5GHz technology cannot transmit at same time.

5. Spurious emission of the simultaneous operation (WLAN+WWAN+NFC or BT+WWAN+NFC) 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):

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

2 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

#### FOR 5745 ~ 5825MHz:

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

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

2 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz



### 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: 1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-axis**.

#### 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	6.5
-	802.11n (HT40)		38 to 46	38, 46	OFDM	BPSK	13.5
-	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	6.5
-	802.11n (HT40)		151 to 159	151, 159	OFDM	BPSK	13.5

#### 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	36	OFDM	BPSK	6.0
-	802.11a	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	36	OFDM	BPSK	6.0
-	802.11a	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	6.5
-	802.11n (HT40)		38 to 46	38, 46	OFDM	BPSK	13.5
-	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	6.5
-	802.11n (HT40)		151 to 159	151, 159	OFDM	BPSK	13.5

**Test Condition:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
<b>RE<math>\geq</math>1G</b>	20deg. C, 66%RH	120Vac, 60Hz	James Yang Jones Chang
<b>RE&lt;1G</b>	20deg. C, 66%RH	120Vac, 60Hz	Jones Chang
<b>PLC</b>	24deg. C, 65%RH	120Vac, 60Hz	Jones Chang
<b>APCM</b>	25deg. C, 60%RH	120Vac, 60Hz	Antony Lee

### 3.3 Duty Cycle of Test Signal

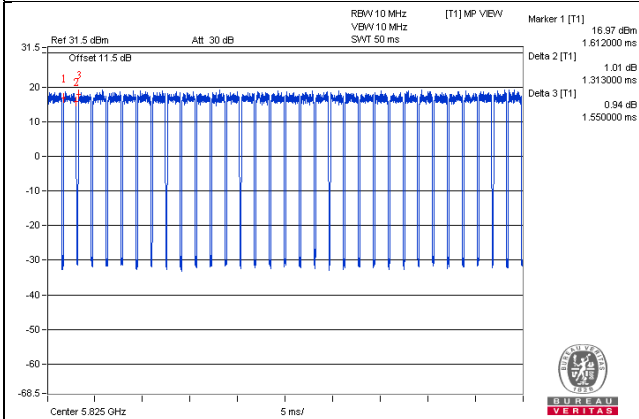
Duty cycle of test signal is < 98%, duty factor is required.

**802.11a:** Duty cycle =  $1.313/1.55 = 0.847$ , Duty factor =  $10 * \log(1/0.847) = 0.72$

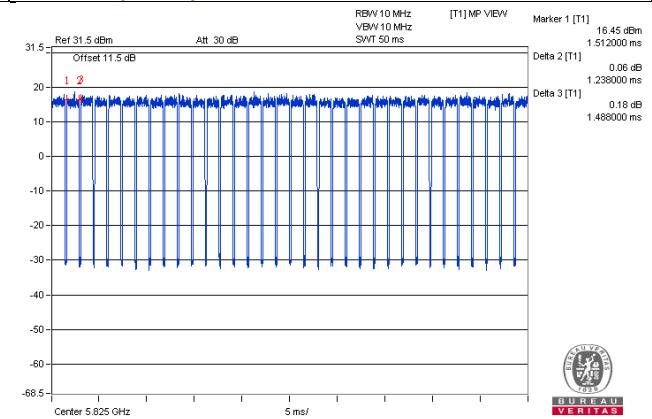
**802.11n (HT20):** Duty cycle =  $1.238/1.488 = 0.832$ , Duty factor =  $10 * \log(1/0.832) = 0.80$

**802.11n (HT40):** Duty cycle =  $0.601/0.875 = 0.687$ , Duty factor =  $10 * \log(1/0.687) = 1.63$

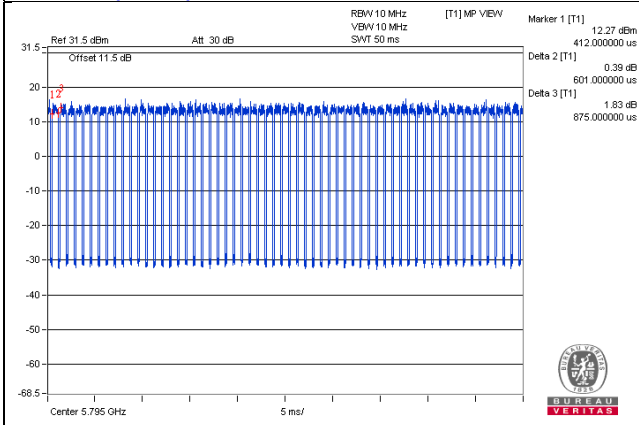
#### 802.11a



#### 802.11n (HT20)



#### 802.11n (HT40)



### 3.4 Description of Support Units

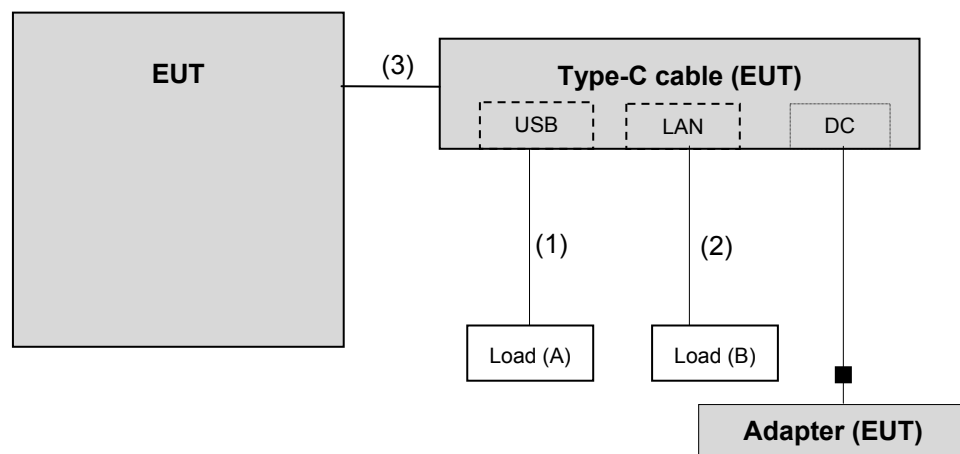
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Load	N/A	N/A	N/A	N/A	-
B.	Load	N/A	N/A	N/A	N/A	-

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.	USB cable	1	1.8	N	0	-
2.	LAN cable	1	1.8	N	0	-
3.	Type-C cable	1	0.8	Y	0	Accessory of EUT

#### 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 Procedures New Rules v01r03**

ANSI C63.10-2013

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

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

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

#### NOTE:

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

#### LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Applicable To		Limit	
789033 D02 General UNII Test Procedure New Rules v01r03		Field Strength at 3m	
		PK:74 (dBuV/m)	AV:54 (dBuV/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(dBuV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	<input checked="" type="checkbox"/> 15.407(b)(4)(i)	PK:-27 (dBm/MHz) <sup>*1</sup> PK:10 (dBm/MHz) <sup>*2</sup> PK:15.6 (dBm/MHz) <sup>*3</sup> PK:27 (dBm/MHz) <sup>*4</sup>	PK: 68.2(dBuV/m) <sup>*1</sup> PK:105.2 (dBuV/m) <sup>*2</sup> PK: 110.8(dBuV/m) <sup>*3</sup> PK:122.2 (dBuV/m) <sup>*4</sup>
	<input type="checkbox"/> 15.407(b)(4)(ii)	Emission limits in section 15.247(d)	
		<sup>*1</sup> beyond 75 MHz or more above of the band edge.	<sup>*2</sup> below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.
		<sup>*3</sup> below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.	<sup>*4</sup> from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

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

#### 4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	Apr. 18, 2016	Apr. 17, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Nov. 16, 2016	Nov. 15, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-151	Dec. 16, 2016	Dec. 15, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Dec. 12, 2016	Dec. 13, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 2017
Loop Antenna	EM-6879	269	Aug. 11, 2016	Aug. 10, 2017
Preamplifier Agilent	8447D	2944A10738	Aug. 22, 2016	Aug. 21, 2017
Preamplifier Agilent	8449B	3008A01964	Aug. 22, 2016	Aug. 21, 2017
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (214378)	Aug. 22, 2016	Aug. 21, 2017
RF signal cable HUBER+SUHNER	SUCOFLEX 106	Cable-CH3-03 (309224+12738)	Aug. 22, 2016	Aug. 21, 2017
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	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
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 17, 2016	Oct. 16, 2017
High Speed Peak Power Meter	ML2495A	0824012	Aug. 11, 2016	Aug. 10, 2017
Power Sensor	MA2411B	0738171	Aug. 11, 2016	Aug. 10, 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 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 Site Registration No. is 988962.  
5. The IC Site Registration No. is IC 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. Both X and Y axes of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

#### NOTE:

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

#### For Radiated emission above 30MHz

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

#### Note:

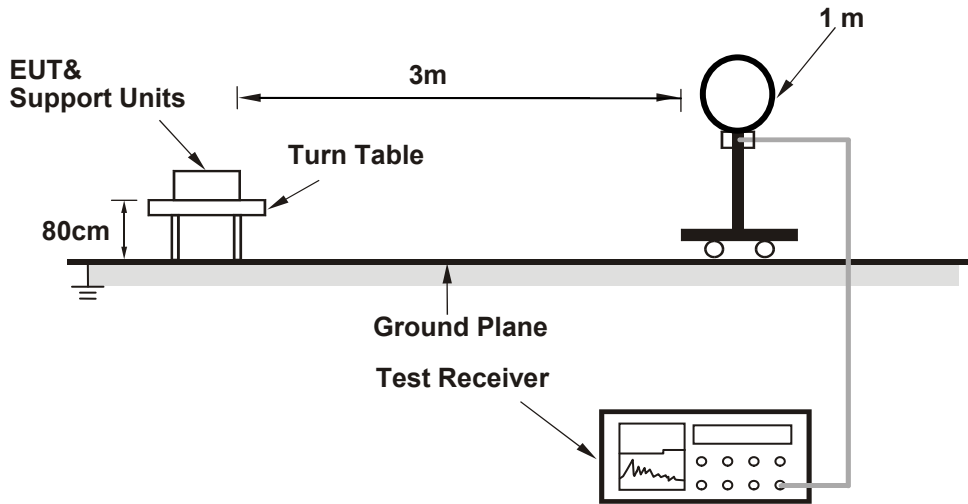
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

### 4.1.4 Deviation from Test Standard

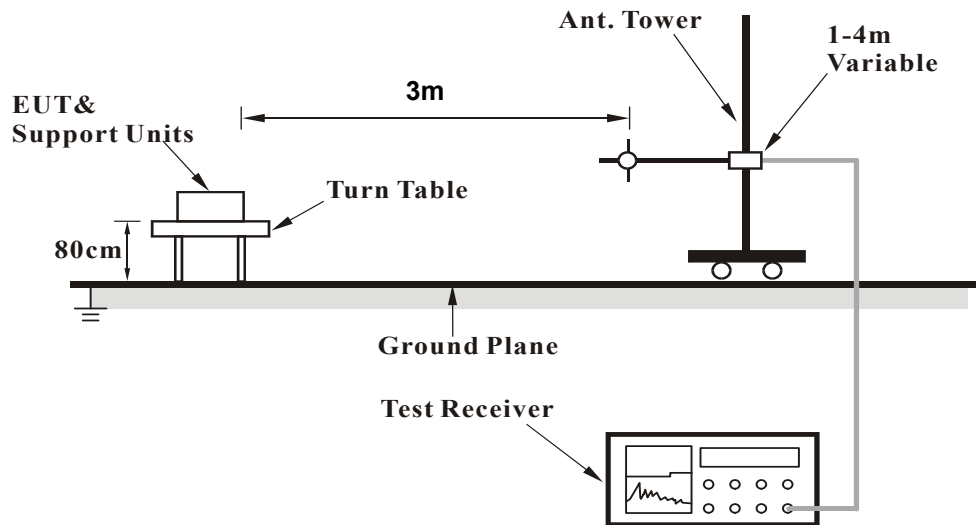
No deviation.

#### 4.1.5 Test Setup

For Radiated emission below 30MHz

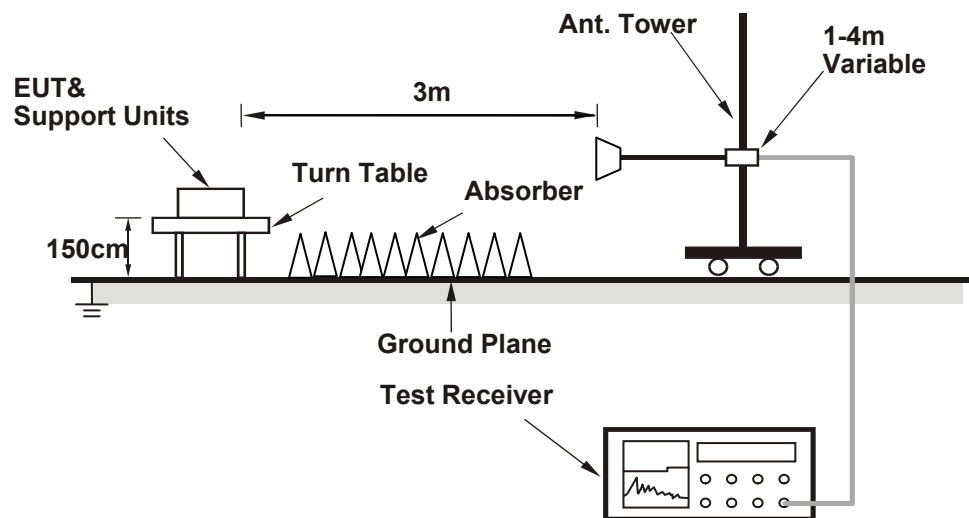


For Radiated emission 30MHz to 1GHz





### For Radiated emission above 1GHz



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

#### 4.1.6 EUT Operating Conditions

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

#### 4.1.7 Test Results

Above 1GHz data:

802.11a

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

#### ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	70.3 PK	74.0	-3.7	1.91 H	247	65.5	4.8
2	5150.00	50.8 AV	54.0	-3.2	1.91 H	247	46.0	4.8
3	*5180.00	107.0 PK			2.60 H	245	68.3	38.7
4	*5180.00	96.9 AV			2.60 H	245	58.2	38.7
5	#10360.00	62.2 PK	74.0	-11.8	2.33 H	236	44.6	17.6
6	#10360.00	48.7 AV	54.0	-5.3	2.33 H	236	31.1	17.6

#### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	58.9 PK	74.0	-15.1	1.80 V	33	54.1	4.8
2	5150.00	46.8 AV	54.0	-7.2	1.80 V	33	42.0	4.8
3	*5180.00	97.2 PK			1.83 V	28	58.5	38.7
4	*5180.00	87.1 AV			1.83 V	28	48.4	38.7
5	#10360.00	62.6 PK	74.0	-11.4	2.03 V	242	45.0	17.6
6	#10360.00	48.2 AV	54.0	-5.8	2.03 V	242	30.6	17.6

#### 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 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	106.0 PK			2.67 H	256	67.3	38.7
2	*5200.00	95.3 AV			2.67 H	256	56.6	38.7
3	#10400.00	62.1 PK	74.0	-11.9	2.30 H	244	44.5	17.6
4	#10400.00	48.9 AV	54.0	-5.1	2.30 H	244	31.3	17.6

**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	97.0 PK			1.89 V	15	58.3	38.7
2	*5200.00	86.9 AV			1.89 V	15	48.2	38.7
3	#10400.00	60.2 PK	74.0	-13.8	1.98 V	236	42.6	17.6
4	#10400.00	47.1 AV	54.0	-6.9	1.98 V	236	29.5	17.6

**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	106.1 PK			2.61 H	257	67.2	38.9
2	*5240.00	96.0 AV			2.61 H	257	57.1	38.9
3	5350.00	57.0 PK	74.0	-17.0	2.50 H	260	51.5	5.5
4	5350.00	45.9 AV	54.0	-8.1	2.50 H	260	40.4	5.5
5	#10480.00	61.2 PK	74.0	-12.8	2.01 H	291	42.8	18.4
6	#10480.00	48.3 AV	54.0	-5.7	2.01 H	291	29.9	18.4

**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	*5240.00	96.2 PK			1.70 V	227	57.3	38.9
2	*5240.00	86.3 AV			1.70 V	227	47.4	38.9
3	5350.00	55.9 PK	74.0	-18.1	1.70 V	66	50.4	5.5
4	5350.00	45.0 AV	54.0	-9.0	1.70 V	66	39.5	5.5
5	#10480.00	60.5 PK	74.0	-13.5	2.00 V	255	42.1	18.4
6	#10480.00	47.5 AV	54.0	-6.5	2.00 V	255	29.1	18.4

**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 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	#5644.80	57.2 PK	68.2	-11.0	1.10 H	274	51.1	6.1
2	*5745.00	109.2 PK			1.10 H	274	69.2	40.0
3	*5745.00	99.1 AV			1.10 H	274	59.1	40.0
4	#5942.40	58.6 PK	68.2	-9.6	1.10 H	274	52.0	6.6
5	11490.00	62.0 PK	74.0	-12.0	2.40 H	280	42.7	19.3
6	11490.00	48.6 AV	54.0	-5.4	2.40 H	280	29.3	19.3

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5610.40	57.0 PK	68.2	-11.2	2.23 V	41	50.9	6.1
2	*5745.00	98.7 PK			2.23 V	41	58.7	40.0
3	*5745.00	88.5 AV			2.23 V	41	48.5	40.0
4	#5948.00	57.3 PK	68.2	-10.9	2.23 V	41	50.7	6.6
5	11490.00	62.4 PK	74.0	-11.6	1.90 V	190	43.1	19.3
6	11490.00	49.5 AV	54.0	-4.5	1.90 V	190	30.2	19.3

**REMARKS:**

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



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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5645.60	57.7 PK	68.2	-10.5	1.07 H	258	51.6	6.1
2	*5785.00	110.0 PK			1.07 H	258	69.9	40.1
3	*5785.00	98.8 AV			1.07 H	258	58.7	40.1
4	#5987.20	58.5 PK	68.2	-9.7	1.07 H	258	51.8	6.7
5	11570.00	62.0 PK	74.0	-12.0	2.29 H	302	42.8	19.2
6	11570.00	48.8 AV	54.0	-5.2	2.29 H	302	29.6	19.2

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	#5632.00	57.0 PK	68.2	-11.2	2.14 V	30	50.9	6.1
2	*5785.00	99.7 PK			2.15 V	32	59.6	40.1
3	*5785.00	89.6 AV			2.15 V	32	49.5	40.1
4	#5938.40	58.9 PK	68.2	-9.3	2.14 V	30	52.3	6.6
5	11570.00	62.0 PK	74.0	-12.0	1.89 V	200	42.8	19.2
6	11570.00	49.2 AV	54.0	-4.8	1.89 V	200	30.0	19.2

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.

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	#5647.20	57.6 PK	68.2	-10.6	1.12 H	260	51.5	6.1
2	*5825.00	110.0 PK			1.12 H	260	69.9	40.1
3	*5825.00	99.4 AV			1.12 H	260	59.3	40.1
4	#5954.40	58.4 PK	68.2	-9.8	1.12 H	260	51.8	6.6
5	11650.00	62.2 PK	74.0	-11.8	2.30 H	288	42.9	19.3
6	11650.00	49.0 AV	54.0	-5.0	2.30 H	288	29.7	19.3

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5618.40	56.9 PK	68.2	-11.3	2.17 V	43	50.8	6.1
2	*5825.00	99.6 PK			2.17 V	43	59.5	40.1
3	*5825.00	89.1 AV			2.17 V	43	49.0	40.1
4	#5971.20	57.8 PK	68.2	-10.4	2.17 V	43	51.1	6.7
5	11650.00	62.0 PK	74.0	-12.0	1.87 V	201	42.7	19.3
6	11650.00	49.1 AV	54.0	-4.9	1.87 V	201	29.8	19.3

**REMARKS:**

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

**802.11n (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	68.7 PK	74.0	-5.3	1.30 H	276	63.9	4.8
2	5150.00	49.7 AV	54.0	-4.3	1.30 H	276	44.9	4.8
3	*5180.00	107.4 PK			1.18 H	283	68.7	38.7
4	*5180.00	97.2 AV			1.18 H	283	58.5	38.7
5	#10360.00	59.7 PK	74.0	-14.3	1.94 H	233	42.1	17.6
6	#10360.00	46.5 AV	54.0	-7.5	1.94 H	233	28.9	17.6

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	56.7 PK	74.0	-17.3	2.10 V	22	51.9	4.8
2	5150.00	45.0 AV	54.0	-9.0	2.10 V	22	40.2	4.8
3	*5180.00	96.0 PK			2.20 V	17	57.3	38.7
4	*5180.00	86.8 AV			2.20 V	17	48.1	38.7
5	#10360.00	58.6 PK	74.0	-15.4	2.33 V	250	41.0	17.6
6	#10360.00	45.8 AV	54.0	-8.2	2.33 V	250	28.2	17.6

**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 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	108.4 PK			1.10 H	273	69.7	38.7
2	*5200.00	98.0 AV			1.10 H	273	59.3	38.7
3	#10400.00	60.6 PK	74.0	-13.4	1.80 H	311	43.0	17.6
4	#10400.00	47.6 AV	54.0	-6.4	1.80 H	311	30.0	17.6

**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	97.4 PK			1.97 V	24	58.7	38.7
2	*5200.00	87.1 AV			1.97 V	24	48.4	38.7
3	#10400.00	60.6 PK	74.0	-13.4	2.45 V	260	43.0	17.6
4	#10400.00	48.1 AV	54.0	-5.9	2.45 V	260	30.5	17.6

**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	109.3 PK			1.26 H	273	70.4	38.9
2	*5240.00	98.4 AV			1.26 H	273	59.5	38.9
3	5350.00	56.0 PK	74.0	-18.0	1.50 H	19	50.5	5.5
4	5350.00	45.1 AV	54.0	-8.9	1.50 H	19	39.6	5.5
5	#10480.00	60.7 PK	74.0	-13.3	1.80 H	266	42.3	18.4
6	#10480.00	47.8 AV	54.0	-6.2	1.80 H	266	29.4	18.4

**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	*5240.00	98.0 PK			2.16 V	20	59.1	38.9
2	*5240.00	88.8 AV			2.16 V	20	49.9	38.9
3	5350.00	55.8 PK	74.0	-18.2	2.30 V	27	50.3	5.5
4	5350.00	44.6 AV	54.0	-9.4	2.30 V	27	39.1	5.5
5	#10480.00	61.3 PK	74.0	-12.7	2.40 V	254	42.9	18.4
6	#10480.00	48.3 AV	54.0	-5.7	2.40 V	254	29.9	18.4

**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 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	#5608.00	57.3 PK	68.2	-10.9	1.13 H	277	51.2	6.1
2	*5745.00	109.9 PK			1.13 H	277	69.9	40.0
3	*5745.00	98.9 AV			1.13 H	277	58.9	40.0
4	#5960.00	57.7 PK	68.2	-10.5	1.13 H	277	51.1	6.6
5	11490.00	61.8 PK	74.0	-12.2	2.44 H	290	42.5	19.3
6	11490.00	48.8 AV	54.0	-5.2	2.44 H	290	29.5	19.3

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5643.20	56.6 PK	68.2	-11.6	2.17 V	35	50.5	6.1
2	*5745.00	100.3 PK			2.17 V	35	60.3	40.0
3	*5745.00	90.0 AV			2.17 V	35	50.0	40.0
4	#5942.40	59.2 PK	68.2	-9.0	2.17 V	35	52.6	6.6
5	11490.00	61.2 PK	74.0	-12.8	1.56 V	322	41.9	19.3
6	11490.00	48.1 AV	54.0	-5.9	1.56 V	322	28.8	19.3

**REMARKS:**

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

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

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5628.00	56.6 PK	68.2	-11.6	1.15 H	270	50.5	6.1
2	*5785.00	110.3 PK			1.15 H	270	70.2	40.1
3	*5785.00	99.3 AV			1.15 H	270	59.2	40.1
4	#5956.80	58.4 PK	68.2	-9.8	1.15 H	270	51.8	6.6
5	11570.00	61.6 PK	74.0	-12.4	2.36 H	277	42.4	19.2
6	11570.00	48.6 AV	54.0	-5.4	2.36 H	277	29.4	19.2

**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	#5623.20	58.1 PK	68.2	-10.1	2.16 V	32	52.0	6.1
2	*5785.00	100.1 PK			2.16 V	32	60.0	40.1
3	*5785.00	89.0 AV			2.16 V	32	48.9	40.1
4	#5936.80	58.1 PK	68.2	-10.1	2.16 V	32	51.5	6.6
5	11570.00	61.7 PK	74.0	-12.3	2.01 V	190	42.5	19.2
6	11570.00	48.7 AV	54.0	-5.3	2.01 V	190	29.5	19.2

**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.

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	#5628.80	57.0 PK	68.2	-11.2	2.38 H	269	50.9	6.1
2	*5825.00	109.9 PK			1.11 H	270	69.8	40.1
3	*5825.00	99.2 AV			1.11 H	270	59.1	40.1
4	#5975.20	58.7 PK	68.2	-9.5	2.38 H	269	52.0	6.7
5	11650.00	61.4 PK	74.0	-12.6	2.38 H	269	42.1	19.3
6	11650.00	48.4 AV	54.0	-5.6	2.38 H	269	29.1	19.3

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5632.00	56.8 PK	68.2	-11.4	2.20 V	36	50.7	6.1
2	*5825.00	96.8 PK			2.20 V	36	56.7	40.1
3	*5825.00	87.0 AV			2.20 V	36	46.9	40.1
4	#5950.40	56.8 PK	68.2	-11.4	2.20 V	36	50.2	6.6
5	11650.00	61.6 PK	74.0	-12.4	1.92 V	200	42.3	19.3
6	11650.00	48.9 AV	54.0	-5.1	1.92 V	200	29.6	19.3

**REMARKS:**

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

**802.11n (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	67.9 PK	74.0	-6.1	1.04 H	283	63.0	4.9
<b>2</b>	<b>5150.00</b>	<b>52.8 AV</b>	<b>54.0</b>	<b>-1.2</b>	<b>1.04 H</b>	<b>283</b>	<b>47.9</b>	<b>4.9</b>
3	*5190.00	102.3 PK			1.02 H	282	63.6	38.7
4	*5190.00	91.8 AV			1.02 H	282	53.1	38.7
5	#10380.00	55.8 PK	74.0	-18.2	1.71 H	66	38.6	17.2
6	#10380.00	45.7 AV	54.0	-8.3	1.71 H	66	28.5	17.2

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	58.6 PK	74.0	-15.4	1.61 V	228	53.7	4.9
2	5150.00	45.3 AV	54.0	-8.7	1.61 V	228	40.4	4.9
3	*5190.00	92.7 PK			1.52 V	228	54.0	38.7
4	*5190.00	82.8 AV			1.52 V	228	44.1	38.7
5	#10380.00	57.1 PK	74.0	-16.9	1.39 V	211	39.9	17.2
6	#10380.00	45.4 AV	54.0	-8.6	1.39 V	211	28.2	17.2

**REMARKS:**

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

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

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	56.9 PK	74.0	-17.1	1.14 H	286	52.0	4.9
2	5150.00	44.3 AV	54.0	-9.7	1.14 H	286	39.4	4.9
3	*5230.00	105.2 PK			1.10 H	279	66.4	38.8
4	*5230.00	94.7 AV			1.10 H	279	55.9	38.8
5	#10460.00	56.8 PK	74.0	-17.2	1.80 H	89	39.1	17.7
6	#10460.00	44.8 AV	54.0	-9.2	1.80 H	89	27.1	17.7

**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	54.6 PK	74.0	-19.4	1.71 V	209	49.7	4.9
2	5150.00	42.7 AV	54.0	-11.3	1.71 V	209	37.8	4.9
3	*5230.00	96.0 PK			1.57 V	228	57.2	38.8
4	*5230.00	85.2 AV			1.57 V	228	46.4	38.8
5	#10460.00	56.7 PK	74.0	-17.3	1.66 V	77	39.0	17.7
6	#10460.00	45.2 AV	54.0	-8.8	1.66 V	77	27.5	17.7

**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 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	#5635.20	51.2 PK	68.2	-17.0	1.17 H	278	45.3	5.9
2	*5755.00	105.5 PK			1.17 H	278	65.6	39.9
3	*5755.00	95.7 AV			1.17 H	278	55.8	39.9
4	#5948.00	47.8 PK	68.2	-20.4	1.17 H	278	41.0	6.8
5	11510.00	58.1 PK	74.0	-15.9	1.34 H	219	39.0	19.1
6	11510.00	46.7 AV	54.0	-7.3	1.34 H	219	27.6	19.1

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5620.80	46.6 PK	68.2	-21.6	1.20 V	322	40.7	5.9
2	*5755.00	99.4 PK			1.20 V	322	59.5	39.9
3	*5755.00	89.1 AV			1.20 V	322	49.2	39.9
4	#5965.60	47.5 PK	68.2	-20.7	1.20 V	322	40.6	6.9
5	11550.00	59.2 PK	74.0	-14.8	1.13 V	322	40.1	19.1
6	11550.00	47.6 AV	54.0	-6.4	1.13 V	322	28.5	19.1

**REMARKS:**

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



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	#5636.80	49.2 PK	68.2	-19.0	1.02 H	281	43.3	5.9
2	*5795.00	107.0 PK			1.02 H	281	66.9	40.1
3	*5795.00	96.8 AV			1.02 H	281	56.7	40.1
4	#5934.40	49.5 PK	68.2	-18.7	1.02 H	281	42.7	6.8
5	11590.00	58.6 PK	74.0	-15.4	1.22 H	184	39.6	19.0
6	11590.00	47.3 AV	54.0	-6.7	1.22 H	184	28.3	19.0

**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	#5625.60	46.8 PK	68.2	-21.4	1.01 V	37	40.9	5.9
2	*5795.00	100.1 PK			1.01 V	37	60.0	40.1
3	*5795.00	89.9 AV			1.01 V	37	49.8	40.1
4	#5975.20	48.1 PK	68.2	-20.1	1.01 V	37	41.2	6.9
5	11590.00	59.0 PK	74.0	-15.0	1.14 V	64	40.0	19.0
6	11590.00	47.4 AV	54.0	-6.6	1.14 V	64	28.4	19.0

**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 36	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	57.12	22.0 QP	40.0	-18.0	1.00 H	141	36.5	-14.5
2	70.73	19.1 QP	40.0	-20.9	1.00 H	84	35.4	-16.3
3	144.61	20.1 QP	43.5	-23.4	1.00 H	99	34.0	-13.9
4	162.11	20.3 QP	43.5	-23.2	1.00 H	113	33.9	-13.6
5	249.60	18.3 QP	46.0	-27.7	1.00 H	288	32.2	-13.9
6	899.00	35.1 QP	46.0	-10.9	1.00 H	150	34.8	0.3

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	37.68	22.4 QP	40.0	-17.6	1.00 V	120	37.7	-15.3
2	57.12	22.4 QP	40.0	-17.6	1.00 V	87	36.9	-14.5
3	72.67	21.2 QP	40.0	-18.8	1.00 V	115	37.9	-16.7
4	96.01	20.2 QP	43.5	-23.3	1.00 V	243	39.3	-19.1
5	129.06	22.1 QP	43.5	-21.4	1.00 V	9	37.7	-15.6
6	899.00	34.5 QP	46.0	-11.5	1.50 V	9	34.2	0.3

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

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

- Note:** 1. The lower limit shall apply at the transition frequencies.  
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 24, 2016	Oct. 23, 2017
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 22, 2016	Dec. 21, 2017
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2016	Feb. 25, 2017
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 28, 2016	Jul. 27, 2017
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 1.  
 3. The VCCI Site Registration No. is C-2040.

#### 4.2.3 Test Procedures

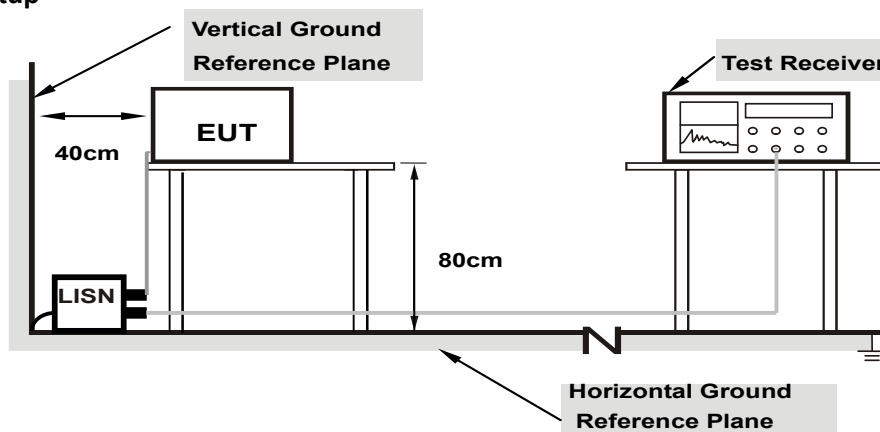
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

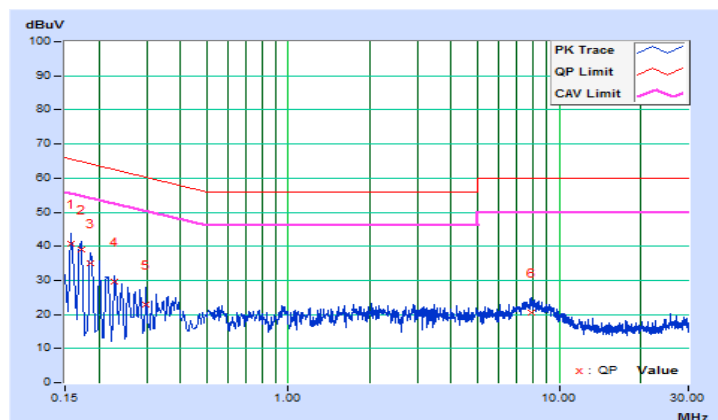
#### 4.2.7 Test Results

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	0.15782	10.18	30.53	12.50	40.71	22.68	65.58
2	0.17283	10.18	28.76	13.48	38.94	23.66	64.82	54.82	-25.88	-31.16
3	0.18519	10.19	24.88	8.81	35.07	19.00	64.25	54.25	-29.18	-35.25
4	0.22820	10.19	19.41	6.01	29.60	16.20	62.51	52.51	-32.91	-36.31
5	0.29858	10.20	12.57	2.49	22.77	12.69	60.28	50.28	-37.51	-37.59
6	7.88007	10.63	9.89	4.50	20.52	15.13	60.00	50.00	-39.48	-34.87

#### 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.

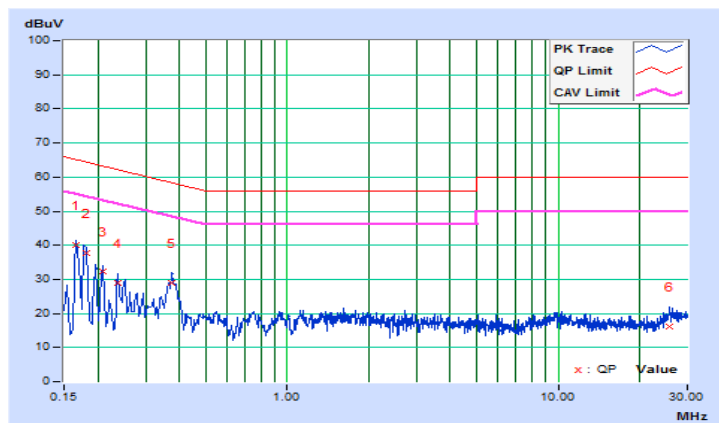


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.16569	10.19	29.75	12.44	39.94	22.63	65.17
2	0.18128	10.19	27.45	10.99	37.64	21.18	64.43	54.43	-26.79	-33.25
3	0.20865	10.19	22.27	7.68	32.46	17.87	63.26	53.26	-30.80	-35.39
4	0.23602	10.21	18.66	6.45	28.87	16.66	62.24	52.24	-33.37	-35.58
<b>5</b>	<b>0.37678</b>	<b>10.28</b>	<b>18.79</b>	<b>13.26</b>	<b>29.07</b>	<b>23.54</b>	<b>58.35</b>	<b>48.35</b>	<b>-29.28</b>	<b>-24.81</b>
6	25.74486	12.01	4.06	-0.55	16.07	11.46	60.00	50.00	-43.93	-38.54

**REMARKS:**

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



### 4.3 Transmit Power Measurement

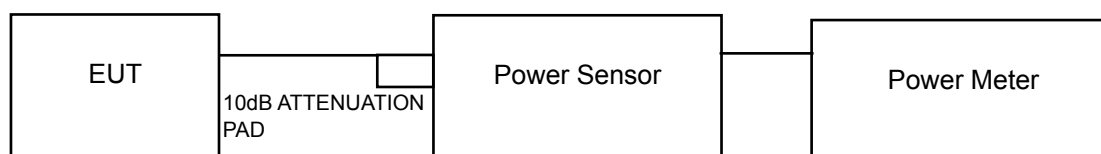
#### 4.3.1 Limits of Transmit Power Measurement

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

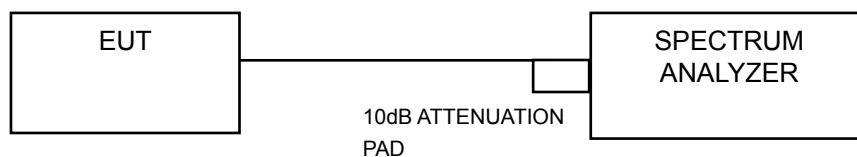
\*B is the 26 dB emission bandwidth in megahertz

#### 4.3.2 Test Setup

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



For 26dB and Occupied Bandwidth



#### 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 26dB BANDWIDTH

- 1) Set RBW = approximately 1% of the emission bandwidth.
- 2) Set the VBW > RBW.
- 3) Detector = Peak.
- 4) Trace mode = max hold.
- 5) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

##### FOR OCCUPIED BANDWIDTH

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.

#### 4.3.5 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)	Maximum Conducted Power (mW)	Maximum Conducted Power (dBm)	Power Limit (dBm)	Pass / Fail
36	5180	37.497	15.74	24.00	Pass
40	5200	37.931	15.79	24.00	Pass
48	5240	38.548	15.86	24.00	Pass
149	5745	20.091	13.03	30.00	Pass
157	5785	37.670	15.76	30.00	Pass
165	5825	31.696	15.01	30.00	Pass

##### 802.11n (HT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (mW)	Maximum Conducted Power (dBm)	Limit (dBm)	Pass / Fail
36	5180	38.726	15.88	24.00	Pass
40	5200	38.194	15.82	24.00	Pass
48	5240	39.174	15.93	24.00	Pass
149	5745	15.382	11.87	30.00	Pass
157	5785	<b>38.459</b>	15.85	30.00	Pass
165	5825	25.410	14.05	30.00	Pass

##### 802.11n (HT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (mW)	Maximum Conducted Power (dBm)	Limit (dBm)	Pass / Fail
38	5190	17.906	12.53	24.00	Pass
46	5230	<b>39.537</b>	15.97	24.00	Pass
151	5755	10.046	10.02	30.00	Pass
159	5795	30.620	14.86	30.00	Pass

**26dB BANDWIDTH:**
**802.11a**

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)
36	5180	34.46
40	5200	38.42
48	5240	37.03

**802.11n (HT20)**

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)
36	5180	38.21
40	5200	39.20
48	5240	39.96

**802.11n (HT40)**

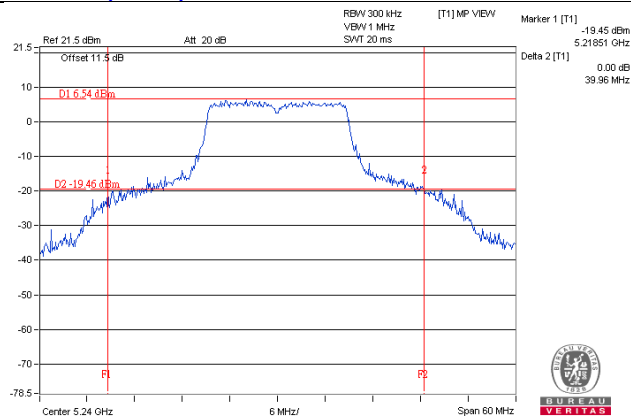
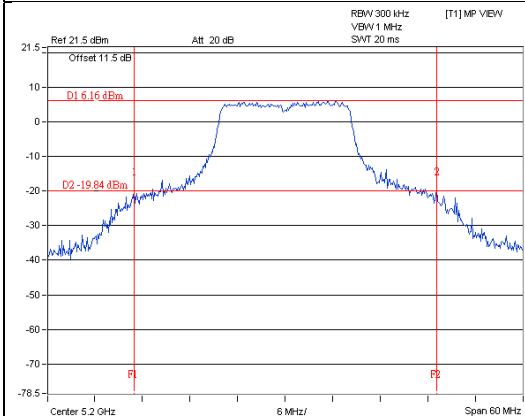
Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)
38	5190	49.69
46	5230	81.19



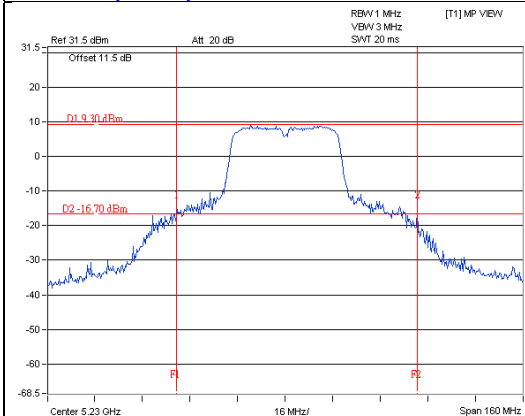
### Spectrum Plot of Worst Value

802.11a

802.11n (HT20)



802.11n (HT40)



**OCCUPIED BANDWIDTH:**
**802.11a**

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)
36	5180	17.76
40	5200	17.88
48	5240	18.24
149	5745	16.80
157	5785	17.40
165	5825	17.28

**802.11n (HT20)**

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)
36	5180	18.48
40	5200	18.84
48	5240	19.08
149	5745	18.12
157	5785	17.64
165	5825	18.12

**802.11n (HT40)**

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)
38	5190	36.72
46	5230	37.32
151	5755	36.48
159	5795	36.84

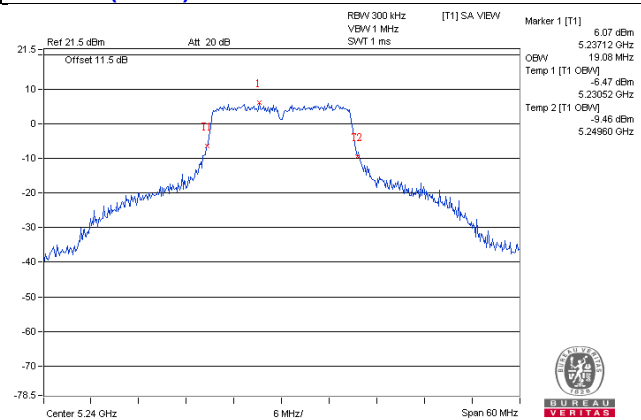
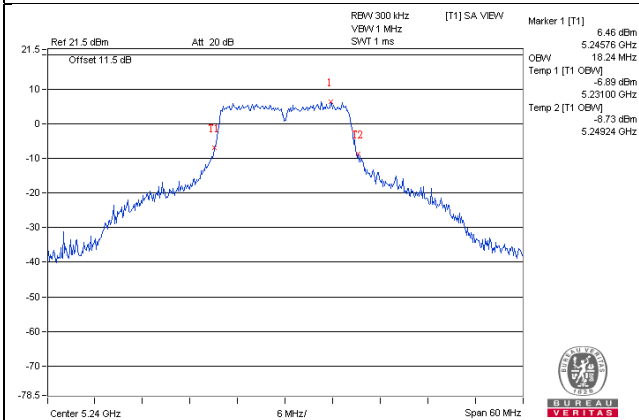


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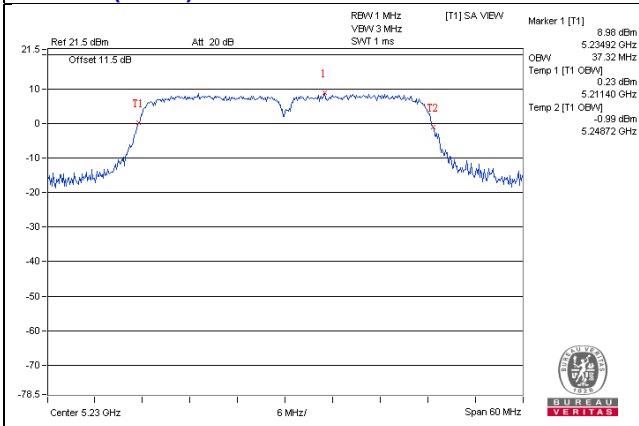
### Spectrum Plot of Worst Value

802.11a

802.11n (HT20)



802.11n (HT40)

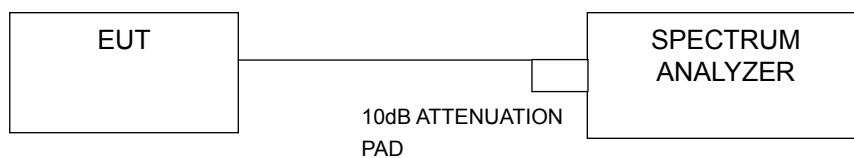


#### 4.4 Peak Power Spectral Density Measurement

##### 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:

With duty cycle (Using method SA-2):

- 1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- 2) Set RBW = 1MHz, Set VBW  $\geq$  3MHz, Detector = RMS
- 3) Set Channel power measure = 1MHz
- 4) Sweep time = auto, trigger set to "free run".
- 5) Trace average at least 100 traces in power averaging mode.
- 6) Record the max value and add  $10 \log (1/\text{duty cycle})$

##### For U-NII-3 band:

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

#### 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 w/o duty factor (dBm)	Duty factor	PSD with duty factor (dBm)	Max. Limit (dBm)	Pass / Fail
36	5180	0.82	0.72	1.54	11.00	Pass
40	5200	0.90	0.72	1.62	11.00	Pass
48	5240	1.05	0.72	1.77	11.00	Pass

NOTE: Refer to section 3.3 for duty cycle spectrum plot.

##### 802.11n (HT20)

Chan.	Freq. (MHz)	PSD w/o duty factor (dBm)	Duty factor	PSD with duty factor (dBm)	Max. Limit (dBm)	Pass / Fail
36	5180	0.50	0.80	1.30	11.00	Pass
40	5200	0.56	0.80	1.36	11.00	Pass
48	5240	0.96	0.80	1.76	11.00	Pass

NOTE: Refer to section 3.3 for duty cycle spectrum plot.

##### 802.11n (HT40)

Chan.	Freq. (MHz)	PSD w/o duty factor (dBm)	Duty factor	PSD with duty factor (dBm)	Max. Limit (dBm)	Pass / Fail
38	5190	-5.64	1.63	-4.01	11.00	Pass
46	5230	-2.56	1.63	-0.93	11.00	Pass

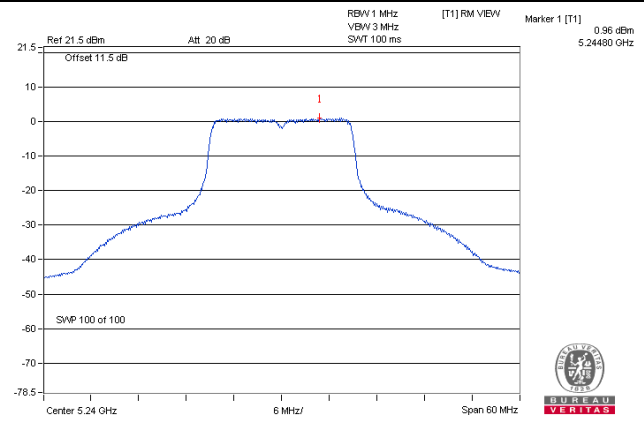
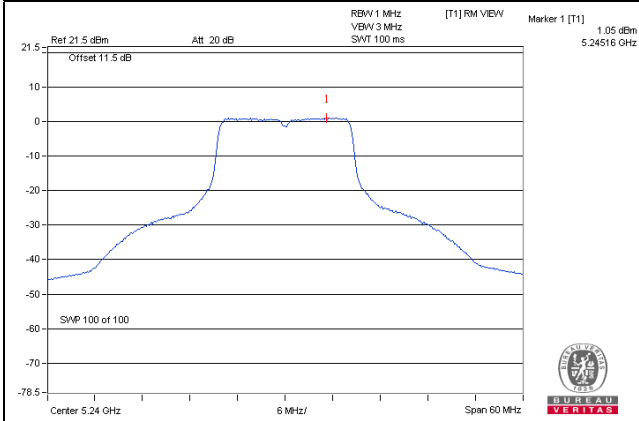
NOTE: Refer to section 3.3 for duty cycle spectrum plot.



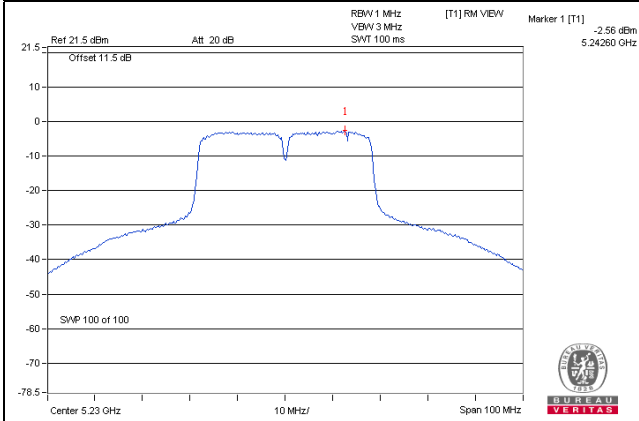
### Spectrum Plot of Worst Value

**802.11a**

**802.11n (HT20)**



**802.11n (HT40)**



### For U-NII-3 Band

#### 802.11a

Chan.	Freq. (MHz)	PSD (dBm/300k Hz)	PSD (dBm/500k Hz)	Duty factor	Total PSD (dBm/500k Hz)	Limit (dBm/500k Hz)	Pass / Fail
149	5745	-10.44	-8.22	0.72	-7.50	30.00	Pass
157	5785	-7.77	-5.55	0.72	-4.83	30.00	Pass
165	5825	-8.00	-5.78	0.72	-5.06	30.00	Pass

NOTE: Refer to section 3.3 for duty cycle spectrum plot.

#### 802.11n (HT20)

Chan.	Freq. (MHz)	PSD (dBm/300k Hz)	PSD (dBm/500k Hz)	Duty factor	Total PSD (dBm/500k Hz)	Limit (dBm/500k Hz)	Pass / Fail
149	5745	-11.63	-9.41	0.80	-8.61	30.00	Pass
157	5785	-7.52	-5.30	0.80	-4.50	30.00	Pass
165	5825	-10.16	-7.94	0.80	-7.14	30.00	Pass

NOTE: Refer to section 3.3 for duty cycle spectrum plot.

#### 802.11n (HT40)

Chan.	Freq. (MHz)	PSD (dBm/300k Hz)	PSD (dBm/500k Hz)	Duty factor	Total PSD (dBm/500k Hz)	Limit (dBm/500k Hz)	Pass / Fail
151	5755	-17.72	-15.50	1.63	-13.87	30.00	Pass
159	5795	-13.23	-11.01	1.63	-9.38	30.00	Pass

NOTE: Refer to section 3.3 for duty cycle spectrum plot.

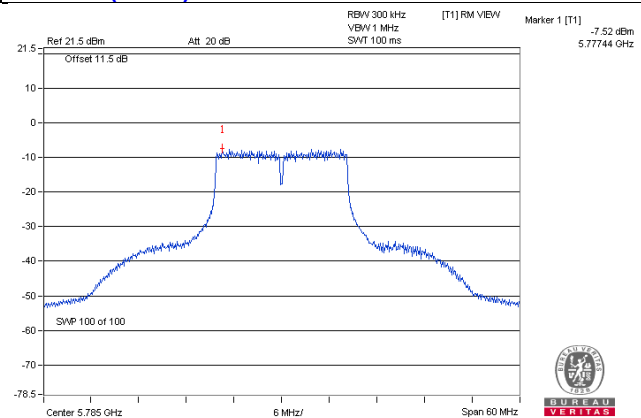
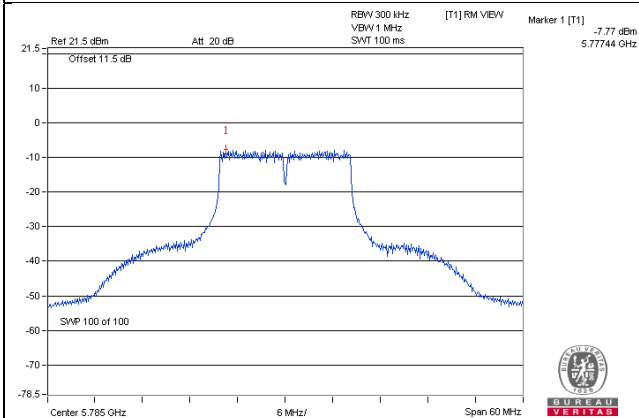


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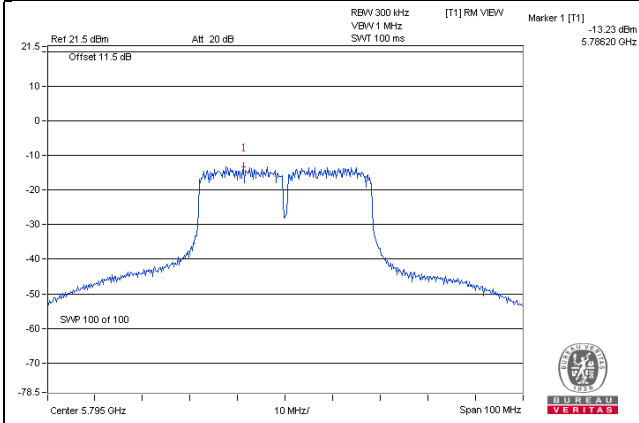
### Spectrum Plot of Worst Value

802.11a

802.11n (HT20)



802.11n (HT40)

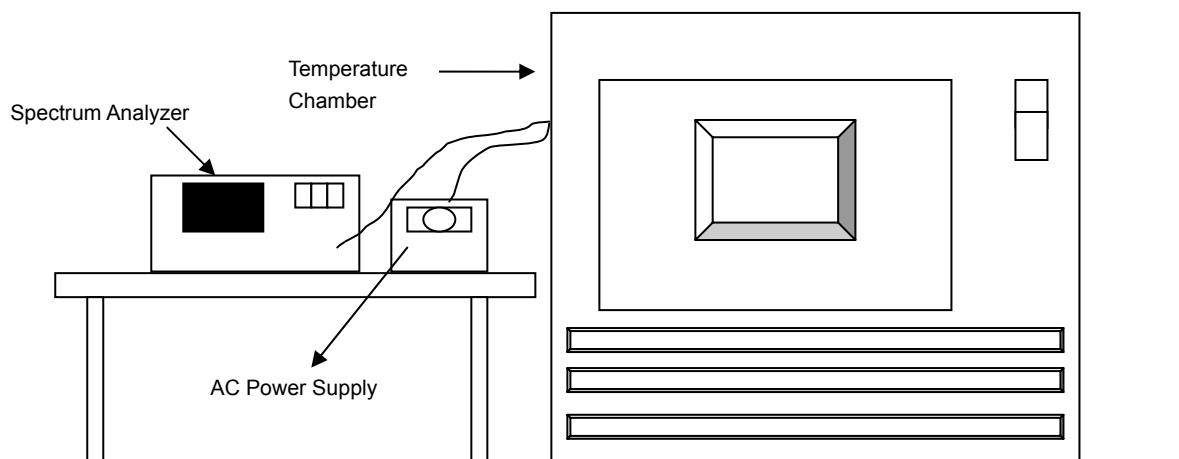


## 4.5 Frequency Stability

### 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

Refer to section 4.1.2 to get information of above instrument.

### 4.5.4 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.

### 4.5.5 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. (°C)	Power Supply (Vac)	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 (%)
50	120	5180.0098	0.00019	5180.0101	0.00019	5180.009	0.00017	5180.0111	0.00021
40	120	5179.9758	-0.00047	5179.9786	-0.00041	5179.9801	-0.00038	5179.9766	-0.00045
30	120	5180.0204	0.00039	5180.0232	0.00045	5180.0220	0.00042	5180.0205	0.00040
20	120	5180.0121	0.00023	5180.0163	0.00031	5180.0144	0.00028	5180.0161	0.00031
10	120	5179.9760	-0.00046	5179.9756	-0.00047	5179.9745	-0.00049	5179.9733	-0.00052
0	120	5179.9942	-0.00011	5179.9904	-0.00019	5179.9930	-0.00014	5179.9903	-0.00019
-10	120	5179.9737	-0.00051	5179.9746	-0.00049	5179.9761	-0.00046	5179.9755	-0.00047
-20	120	5179.9903	-0.00019	5179.9877	-0.00024	5179.9889	-0.00021	5179.9914	-0.00017
-30	120	5180.0037	0.00007	5180.0060	0.00012	5180.0016	0.00003	5180.0055	0.00011

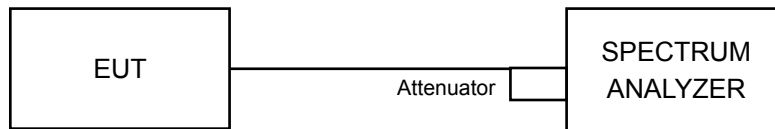
Frequency Stability Versus Voltage									
Operating Frequency: 5180MHz									
Temp. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5180.0129	0.00025	5180.0153	0.00030	5180.0149	0.00029	5180.0167	0.00032
	120	5180.0121	0.00023	5180.0163	0.00031	5180.0144	0.00028	5180.0161	0.00031
	102	5180.0126	0.00024	5180.0160	0.00031	5180.0148	0.00029	5180.0156	0.00030

## 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
149	5745	16.42	0.5	Pass
157	5785	16.45	0.5	Pass
165	5825	16.42	0.5	Pass

##### 802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
149	5745	17.67	0.5	Pass
157	5785	16.41	0.5	Pass
165	5825	17.63	0.5	Pass

##### 802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
151	5755	35.51	0.5	Pass
159	5795	35.27	0.5	Pass

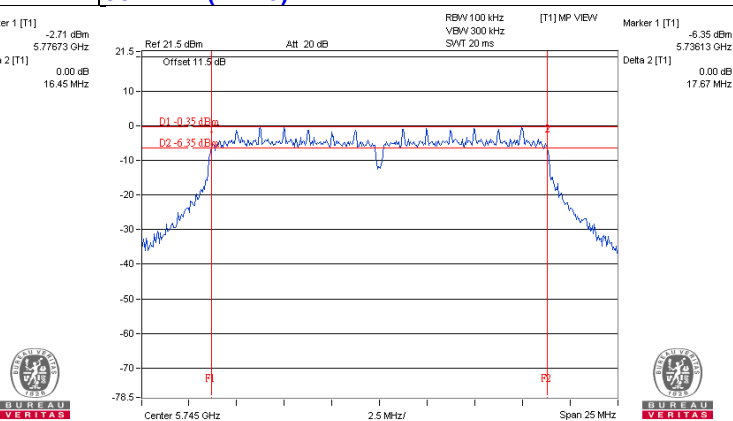
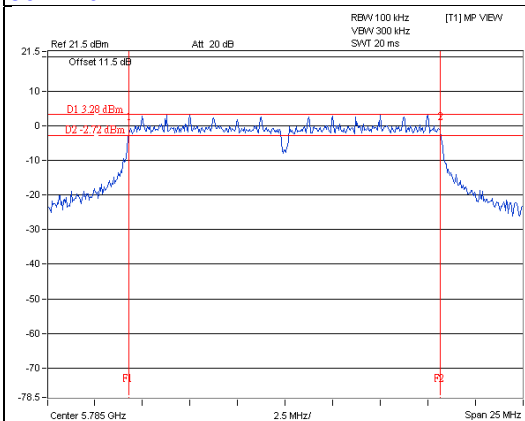


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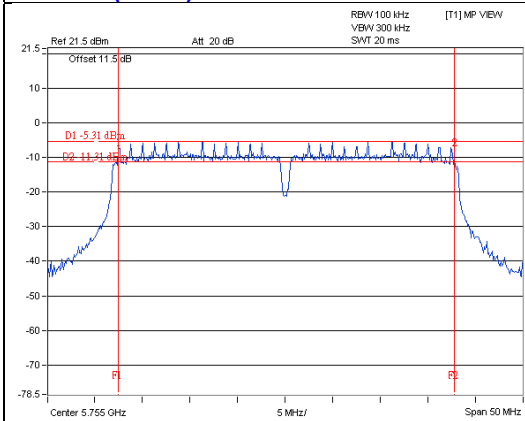
### Spectrum Plot of Worst Value

802.11a

802.11n (HT20)



802.11n (HT40)





## 5 Pictures of Test Arrangements

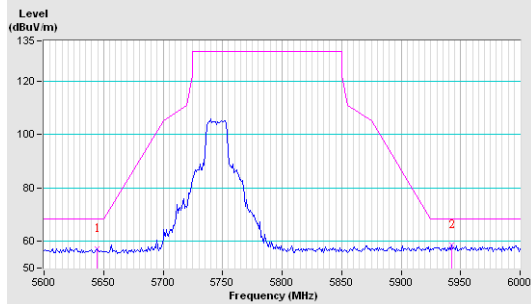
Please refer to the attached file (Test Setup Photo).

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

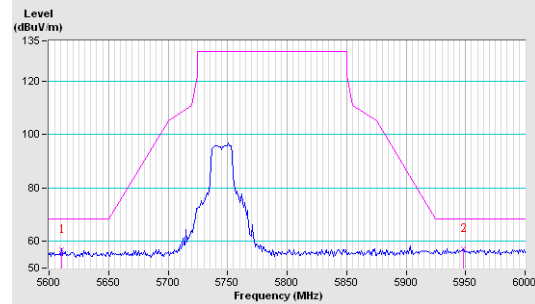
802.11a

CH149

**Horizontal**

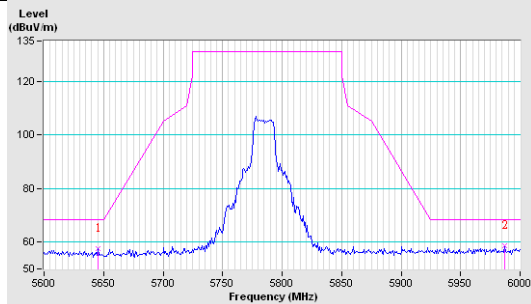


**Vertical**

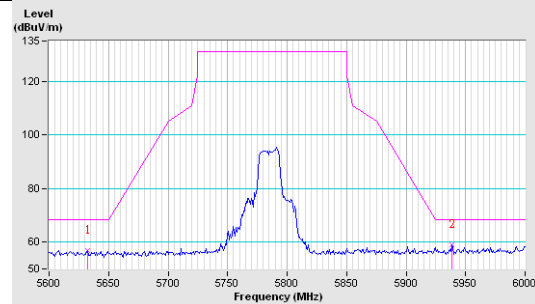


CH157

**Horizontal**

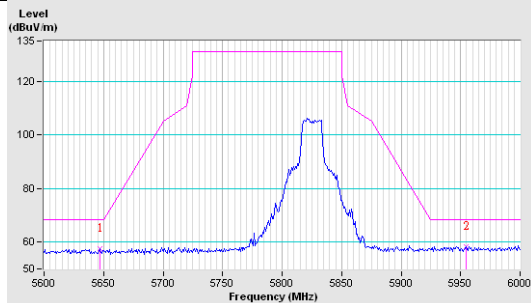


**Vertical**

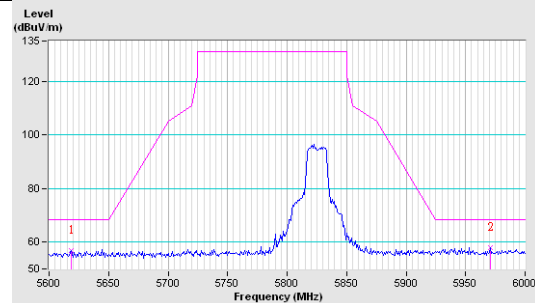


CH165

**Horizontal**



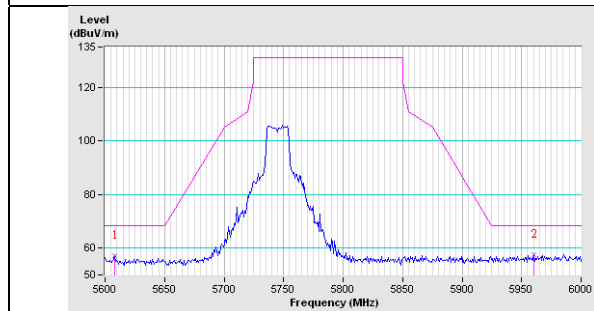
**Vertical**



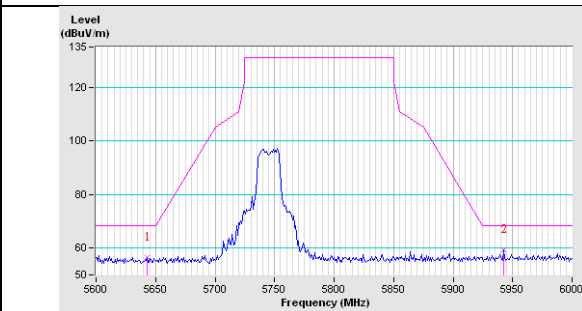
### 802.11n (HT20)

#### CH149

Horizontal

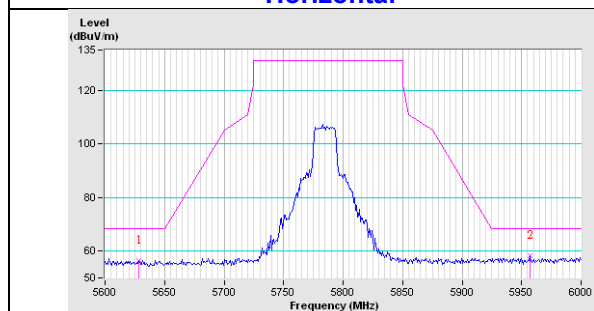


Vertical

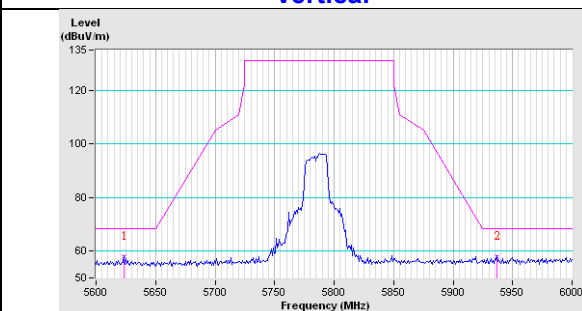


#### CH157

Horizontal

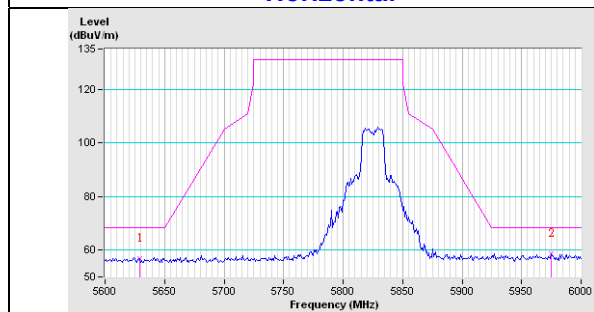


Vertical

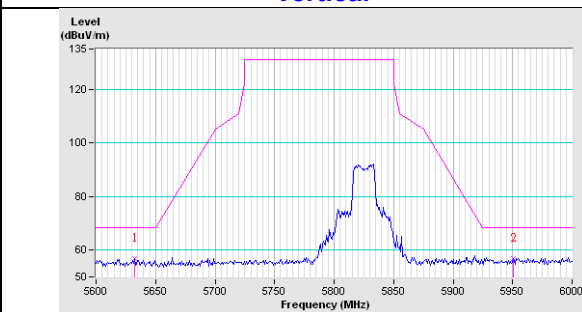


#### CH165

Horizontal



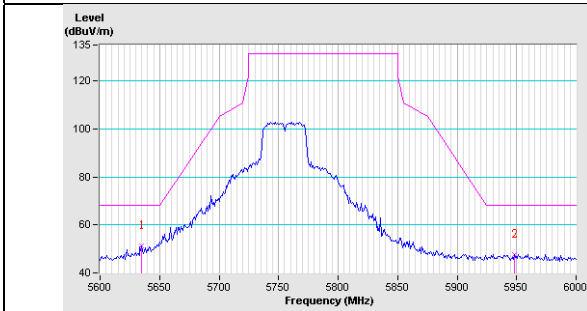
Vertical



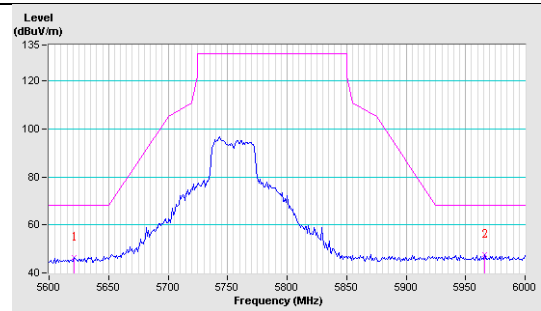
802.11n (HT40)

CH151

Horizontal

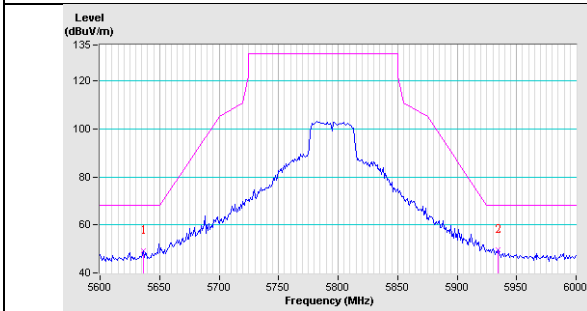


Vertical

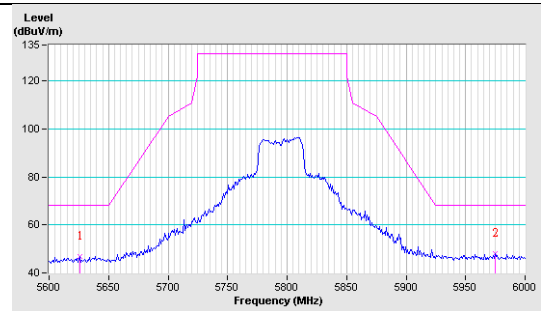


CH159

Horizontal



Vertical



## Appendix – Information on the Testing Laboratories

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

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

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**Web Site:** [www.bureauveritas-adt.com](http://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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