

FCC Test Report

Report No.: RF160531C14

FCC ID: SMH-NPCS600

Test Model: NPC600-T

Received Date: May 31, 2016

Test Date: Jun. 09 ~ Jun. 14, 2016

Issued Date: Jun. 16, 2016

Applicant: CIRCUS WORLD DISPLAYS LTD

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Release Control Record

Issue No.	Description	Date Issued
RF160531C14	Original release	Jun. 16, 2016

1 Certificate of Conformity

Product: Nyrius Geronimo Wireless HD Transmitter

Brand: Nyrius

Test Model: NPC600-T

Sample Status: Engineering sample

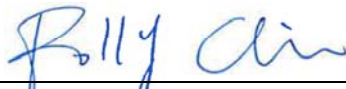
Applicant: CIRCUS WORLD DISPLAYS LTD

Test Date: Jun. 09 ~ Jun. 14, 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:

Jun. 16, 2016

Polly Chien / Specialist

Approved by :



Date:

Jun. 16, 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 -8.48dB at 0.51719MHz.
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 -6.1dB at 11020.00MHz.
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	Antenna connector is I-pex not a standard connector.

*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	3.63 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	Nyrius Geronimo Wireless HD Transmitter
Brand	Nyrius
Test Model	NPCS600-T
Status of EUT	Engineering sample
Power Supply Rating	5Vdc from host equipment
Modulation Technology	OFDM
Transfer Rate	500Mbps
Operating Frequency	5190-5230MHz, 5270-5310MHz, 5510-5670MHz, 5755-5795MHz
Number of Channel	5190-5230MHz: 2 5270-5310MHz: 2 5510-5670MHz: 3 5755-5795MHz: 2
Output Power	5190-5230MHz: 34.706mW 5270-5310MHz: 36.961mW 5510-5670MHz: 39.932mW 5755-5795MHz: 35.158mW
Antenna Type	TX: Chip antenna with 4.6dBi gain RX: PIFA antenna with 6.2dBi gain
Antenna Connector	I-pex
Accessory Device	Receiver: box (Model : NPCS600-R Brand: Nyrius), adapter (RX Box used only)
Data Cable Supplied	0.6m shielded USB cable w/o core

Note:

- The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and one receiver.

Modulation Mode	TX Function
WHDl (40MHz)	2TX

- The EUT uses following adapter.

Adapter (RX Box used only)	
Brand	Asian Power Devices Inc.
Model	WB-10E05FU
Input Power	100-240Vac, 50-60Hz, 0.4A Max.
Output Power	5Vdc, 2A
Power Line	1.45m cable with one core attached on adapter

3.2 Description of Test Modes

Operated in 5190 - 5230MHz

2 channels are provided as below:

Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz

Operated in 5270 - 5310MHz

2 channels are provided as below:

Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz

Operated in 5510 - 5670MHz

3 channels are provided as below:

Channel	Frequency	Channel	Frequency
102	5510 MHz	134	5670 MHz
110	5550 MHz		

Operated in 5755 - 5795MHz

2 channels are provided as below:

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: 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	DATA RATE (Mbps)
-	WHDI (40MHz)	5190-5230	38 to 46	38, 46	OFDM	500
		5270-5310	54 to 62	54, 62	OFDM	500
		5510-5670	102 to 134	102, 110, 134	OFDM	500
		5755-5795	151 to 159	151, 159	OFDM	500

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	DATA RATE (Mbps)
-	WHDI (40MHz)	5190-5230	38 to 46	38	OFDM	500
		5270-5310	54 to 62		OFDM	500
		5510-5670	102 to 134		OFDM	500
		5755-5795	151 to 159		OFDM	500

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	DATA RATE (Mbps)
-	WHDI (40MHz)	5190-5230	38 to 46	38	OFDM	500
		5270-5310	54 to 62		OFDM	500
		5510-5670	102 to 134		OFDM	500
		5755-5795	151 to 159		OFDM	500

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	DATA RATE (Mbps)
-	WHDI (40MHz)	5190-5230	38 to 46	38, 46	OFDM	500
		5270-5310	54 to 62	54, 62	OFDM	500
		5510-5670	102 to 134	102, 110, 134	OFDM	500
		5755-5795	151 to 159	151, 159	OFDM	500

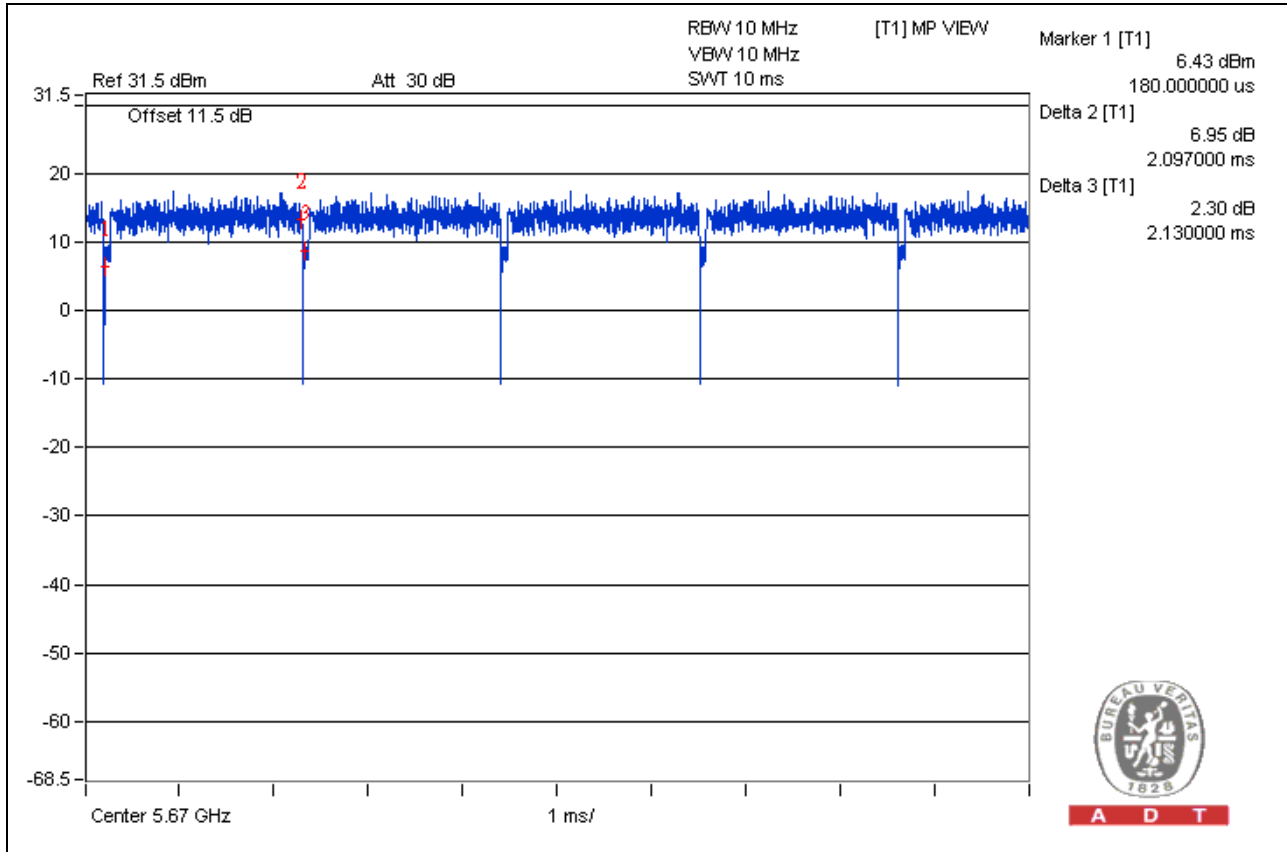
Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (System)	TESTED BY
RE \geq 1G	16deg. C, 70%RH	120Vac, 60Hz	James Yang
RE $<$ 1G	25deg. C, 70%RH	120Vac, 60Hz	Tank Wu
PLC	16deg. C, 70%RH	120Vac, 60Hz	Nick Hsu
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.

WHDI (40MHz): Duty cycle = $2.097/2.130 = 0.985$



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.

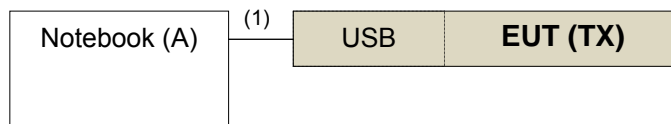
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5420	BPQ8MQ1	FCC DoC Approved	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB cable	1	0.6	Y	0	Accessory of the 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 v01r02

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2013

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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

NOTE:

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

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Applicable To	Limit	
789033 D02 General UNII Test Procedure New Rules 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:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Dec. 23, 2015	Dec. 22, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Apr. 19, 2016	Apr. 18, 2017
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(30 9222 +248780)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-03(27 4092)	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

- 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:

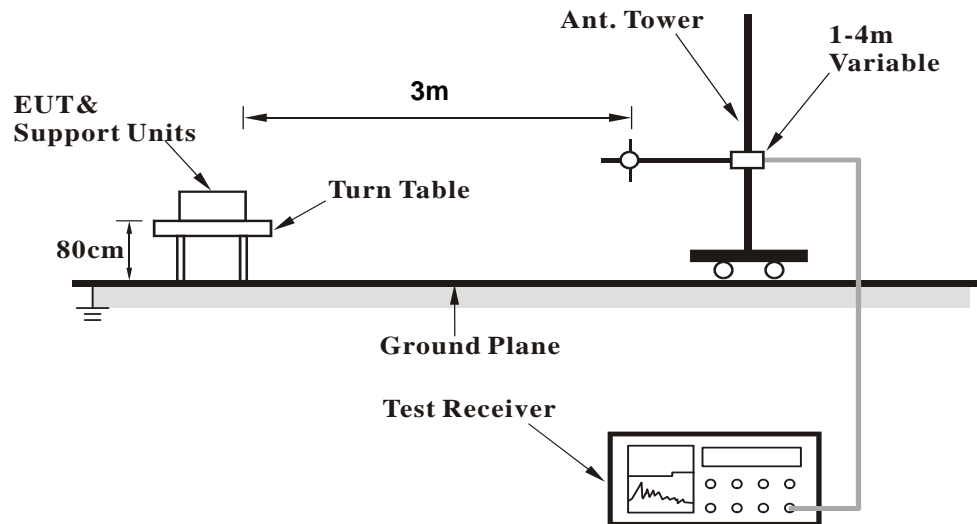
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

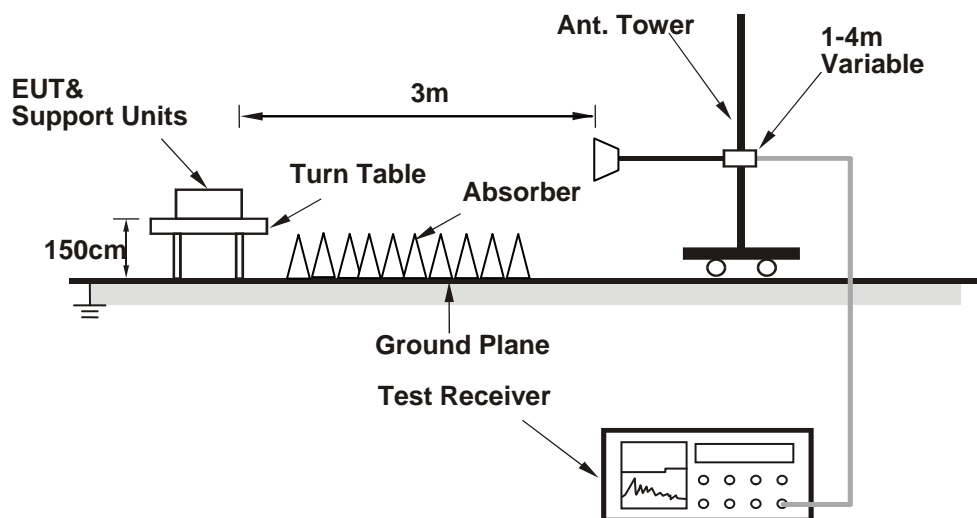
No deviation.

4.1.5 Test Set Up

<Frequency Range 30MHz ~ 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

- The EUT connected with the notebook via USB cable.
- The notebook ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz data:

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	57.9 PK	74.0	-16.1	2.03 H	301	53.30	4.60
2	5150.00	45.1 AV	54.0	-8.9	2.03 H	301	40.50	4.60
3	*5190.00	105.3 PK			1.00 H	316	63.10	42.20
4	*5190.00	91.5 AV			1.00 H	316	49.30	42.20
5	#10380.00	59.9 PK	74.0	-14.1	1.78 H	149	44.00	15.90
6	#10380.00	47.2 AV	54.0	-6.8	1.78 H	149	31.30	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	58.2 PK	74.0	-15.8	1.66 V	229	53.60	4.60
2	5150.00	45.2 AV	54.0	-8.8	1.66 V	229	40.60	4.60
3	*5190.00	106.5 PK			3.17 V	305	64.30	42.20
4	*5190.00	92.3 AV			3.17 V	305	50.10	42.20
5	#10380.00	59.2 PK	74.0	-14.8	1.94 V	78	43.30	15.90
6	#10380.00	46.8 AV	54.0	-7.2	1.94 V	78	30.90	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)
– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	105.1 PK			1.25 H	180	62.80	42.30
2	*5230.00	91.8 AV			1.25 H	180	49.50	42.30
3	5350.00	59.8 PK	74.0	-14.2	1.60 H	310	55.00	4.80
4	5350.00	46.1 AV	54.0	-7.9	1.60 H	310	41.30	4.80
5	#10460.00	59.4 PK	74.0	-14.6	1.84 H	236	43.50	15.90
6	#10460.00	47.0 AV	54.0	-7.0	1.84 H	236	31.10	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	*5230.00	106.6 PK			3.19 V	305	64.30	42.30
2	*5230.00	93.6 AV			3.19 V	305	51.30	42.30
3	5350.00	58.3 PK	74.0	-15.7	2.98 V	93	53.50	4.80
4	5350.00	46.0 AV	54.0	-8.0	2.98 V	93	41.20	4.80
5	#10460.00	60.0 PK	74.0	-14.0	2.79 V	185	44.10	15.90
6	#10460.00	47.1 AV	54.0	-6.9	2.79 V	185	31.20	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)
– 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 54	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	59.1 PK	74.0	-14.9	1.24 H	236	54.50	4.60
2	5150.00	46.1 AV	54.0	-7.9	1.24 H	236	41.50	4.60
3	*5270.00	104.8 PK			1.00 H	180	62.40	42.40
4	*5270.00	91.0 AV			1.00 H	180	48.60	42.40
5	#10540.00	60.4 PK	74.0	-13.6	1.50 H	104	44.20	16.20
6	#10540.00	47.8 AV	54.0	-6.2	1.50 H	104	31.60	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	5150.00	59.1 PK	74.0	-14.9	3.34 V	133	54.50	4.60
2	5150.00	46.5 AV	54.0	-7.5	3.34 V	133	41.90	4.60
3	*5270.00	107.9 PK			3.81 V	294	65.50	42.40
4	*5270.00	93.9 AV			3.81 V	294	51.50	42.40
5	#10540.00	60.3 PK	74.0	-13.7	2.84 V	237	44.10	16.20
6	#10540.00	47.7 AV	54.0	-6.3	2.84 V	237	31.50	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)
– 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 62	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	*5310.00	105.4 PK			1.42 H	181	63.00	42.40
2	*5310.00	91.6 AV			1.42 H	181	49.20	42.40
3	5350.00	58.9 PK	74.0	-15.1	1.33 H	250	54.10	4.80
4	5350.00	46.1 AV	54.0	-7.9	1.33 H	250	41.30	4.80
5	10620.00	59.7 PK	74.0	-14.3	1.69 H	159	43.30	16.40
6	10620.00	47.4 AV	54.0	-6.6	1.69 H	159	31.00	16.40

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	*5310.00	107.8 PK			3.57 V	295	65.40	42.40
2	*5310.00	94.1 AV			3.57 V	295	51.70	42.40
3	5350.00	58.4 PK	74.0	-15.6	3.40 V	252	53.60	4.80
4	5350.00	46.1 AV	54.0	-7.9	3.40 V	252	41.30	4.80
5	10620.00	60.2 PK	74.0	-13.8	2.87 V	303	43.80	16.40
6	10620.00	47.4 AV	54.0	-6.6	2.87 V	303	31.00	16.40

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 102	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	5460.00	58.1 PK	74.0	-15.9	1.73 H	158	53.30	4.80
2	5460.00	45.6 AV	54.0	-8.4	1.73 H	158	40.80	4.80
3	#5470.00	58.9 PK	74.0	-15.1	1.37 H	253	54.10	4.80
4	#5470.00	46.2 AV	54.0	-7.8	1.37 H	253	41.40	4.80
5	*5510.00	105.9 PK			1.00 H	178	63.40	42.50
6	*5510.00	92.4 AV			1.00 H	178	49.90	42.50
7	11020.00	60.4 PK	74.0	-13.6	1.33 H	222	43.00	17.40
8	11020.00	47.9 AV	54.0	-6.1	1.33 H	222	30.50	17.40

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	5460.00	59.2 PK	74.0	-14.8	2.91 V	256	54.40	4.80
2	5460.00	45.9 AV	54.0	-8.1	2.91 V	256	41.10	4.80
3	#5470.00	61.7 PK	74.0	-12.3	3.13 V	305	56.90	4.80
4	#5470.00	46.4 AV	54.0	-7.6	3.13 V	305	41.60	4.80
5	*5510.00	108.2 PK			3.32 V	292	65.70	42.50
6	*5510.00	94.7 AV			3.32 V	292	52.20	42.50
7	11020.00	60.9 PK	74.0	-13.1	2.65 V	324	43.50	17.40
8	11020.00	47.8 AV	54.0	-6.2	2.65 V	324	30.40	17.40

REMARKS:

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

CHANNEL	TX Channel 110	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	*5550.00	107.6 PK			1.11 H	301	65.10	42.50
2	*5550.00	92.8 AV			1.11 H	301	50.30	42.50
3	11100.00	59.2 PK	74.0	-14.8	1.54 H	281	43.00	16.20
4	11100.00	46.8 AV	54.0	-7.2	1.54 H	281	30.60	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	*5550.00	108.5 PK			2.97 V	303	66.00	42.50
2	*5550.00	95.0 AV			2.97 V	303	52.50	42.50
3	11100.00	60.0 PK	74.0	-14.0	3.19 V	250	43.80	16.20
4	11100.00	47.0 AV	54.0	-7.0	3.19 V	250	30.80	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)
– 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 134	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	*5670.00	106.1 PK			1.16 H	302	63.40	42.70
2	*5670.00	93.1 AV			1.16 H	302	50.40	42.70
3	#5725.00	48.4 PK	74.0	-25.6	1.77 H	264	43.40	5.00
4	#5725.00	45.3 AV	54.0	-8.7	1.77 H	264	40.30	5.00
5	11340.00	60.1 PK	74.0	-13.9	1.44 H	325	42.90	17.20
6	11340.00	46.9 AV	54.0	-7.1	1.44 H	325	29.70	17.20

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	*5670.00	108.7 PK			3.46 V	293	66.00	42.70
2	*5670.00	95.0 AV			3.46 V	293	52.30	42.70
3	#5725.00	59.0 PK	74.0	-15.0	3.14 V	239	54.00	5.00
4	#5725.00	45.1 AV	54.0	-8.9	3.14 V	239	40.10	5.00
5	11340.00	60.4 PK	74.0	-13.6	2.79 V	290	43.20	17.20
6	11340.00	47.5 AV	54.0	-6.5	2.79 V	290	30.30	17.20

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)
– 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	#5604.00	60.0 PK	68.2	-8.2	1.00 H	309	55.10	4.90
2	#5714.90	59.8 PK	74.0	-14.2	1.09 H	177	54.80	5.00
3	#5714.90	46.0 AV	54.0	-8.0	1.09 H	177	41.00	5.00
4	#5722.90	63.5 PK	78.2	-14.7	1.00 H	179	58.50	5.00
5	#5725.00	56.5 PK	78.2	-21.7	1.00 H	179	51.50	5.00
6	*5755.00	106.7 PK			1.00 H	309	63.90	42.80
7	*5755.00	92.2 AV			1.00 H	309	49.40	42.80
8	#5989.60	60.6 PK	68.2	-7.6	1.00 H	309	55.40	5.20
9	11510.00	58.1 PK	74.0	-15.9	1.50 H	229	42.50	15.60
10	11510.00	46.2 AV	54.0	-7.8	1.50 H	229	30.60	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	#5620.80	60.2 PK	68.2	-8.0	3.37 V	294	55.30	4.90
2	#5714.90	60.4 PK	74.0	-13.6	3.38 V	295	55.40	5.00
3	#5714.90	46.5 AV	54.0	-7.5	3.38 V	295	41.50	5.00
4	#5722.90	64.5 PK	78.2	-13.7	3.38 V	295	59.50	5.00
5	#5725.00	47.7 PK	78.2	-30.5	3.38 V	295	42.70	5.00
6	*5755.00	107.6 PK			3.37 V	294	64.80	42.80
7	*5755.00	93.5 AV			3.37 V	294	50.70	42.80
8	#5953.60	59.9 PK	68.2	-8.3	3.37 V	294	54.70	5.20
9	11510.00	58.9 PK	74.0	-15.1	2.64 V	248	43.30	15.60
10	11510.00	46.4 AV	54.0	-7.6	2.64 V	248	30.80	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)
– 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	#5604.00	60.0 PK	68.2	-8.2	1.11 H	310	55.10	4.90
2	*5795.00	106.4 PK			1.11 H	310	63.60	42.80
3	*5795.00	92.2 AV			1.11 H	310	49.40	42.80
4	#5850.00	49.7 PK	78.2	-28.5	1.58 H	308	44.60	5.10
5	#5852.10	59.9 PK	78.2	-18.3	1.58 H	308	54.80	5.10
6	#5860.10	58.3 PK	74.0	-15.7	1.38 H	274	53.20	5.10
7	#5860.10	45.5 AV	54.0	-8.5	1.38 H	274	40.40	5.10
8	#5961.60	60.6 PK	68.2	-7.6	1.11 H	310	55.40	5.20
9	11590.00	58.2 PK	74.0	-15.8	1.96 H	251	42.70	15.50
10	11590.00	45.8 AV	54.0	-8.2	1.96 H	251	30.30	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	#5627.20	60.1 PK	68.2	-8.1	3.31 V	291	55.20	4.90
2	*5795.00	107.9 PK			3.31 V	291	65.10	42.80
3	*5795.00	94.5 AV			3.31 V	291	51.70	42.80
4	#5850.00	51.3 PK	78.2	-26.9	3.12 V	336	46.20	5.10
5	#5852.10	59.0 PK	78.2	-19.2	3.12 V	336	53.90	5.10
6	#5860.10	58.2 PK	74.0	-15.8	2.88 V	289	53.10	5.10
7	#5860.10	45.3 AV	54.0	-8.7	2.88 V	289	40.20	5.10
8	#5933.60	59.9 PK	68.2	-8.3	3.31 V	291	54.70	5.20
9	11590.00	58.8 PK	74.0	-15.2	2.86 V	274	43.30	15.50
10	11590.00	45.5 AV	54.0	-8.5	2.86 V	274	30.00	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)
– 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:

CHANNEL	TX Channel 38	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	111.48	36.4 QP	43.5	-7.1	1.01 H	15	53.60	-17.20
2	144.46	31.0 QP	43.5	-12.5	2.00 H	349	45.20	-14.20
3	227.88	33.8 QP	46.0	-12.2	1.51 H	214	50.30	-16.50
4	336.52	31.0 QP	46.0	-15.0	1.01 H	237	42.50	-11.50
5	431.58	29.0 QP	46.0	-17.0	2.00 H	274	38.60	-9.60
6	499.48	30.2 QP	46.0	-15.8	1.51 H	193	38.70	-8.50

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	99.84	29.8 QP	43.5	-13.7	1.00 V	264	48.70	-18.90
2	177.44	29.8 QP	43.5	-13.7	1.00 V	355	44.50	-14.70
3	227.88	27.9 QP	46.0	-18.1	1.00 V	184	44.40	-16.50
4	336.52	29.4 QP	46.0	-16.6	1.49 V	237	40.90	-11.50
5	431.58	29.2 QP	46.0	-16.8	1.00 V	223	38.80	-9.60
6	480.08	29.3 QP	46.0	-16.7	1.24 V	326	38.20	-8.90

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)
– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver 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

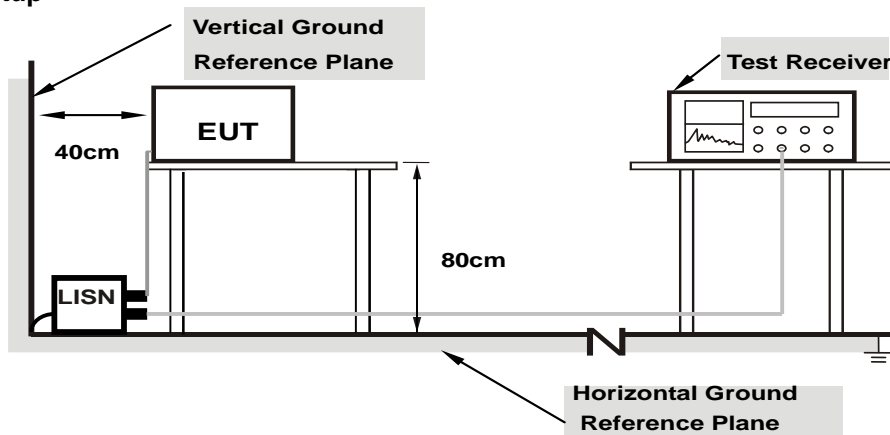
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

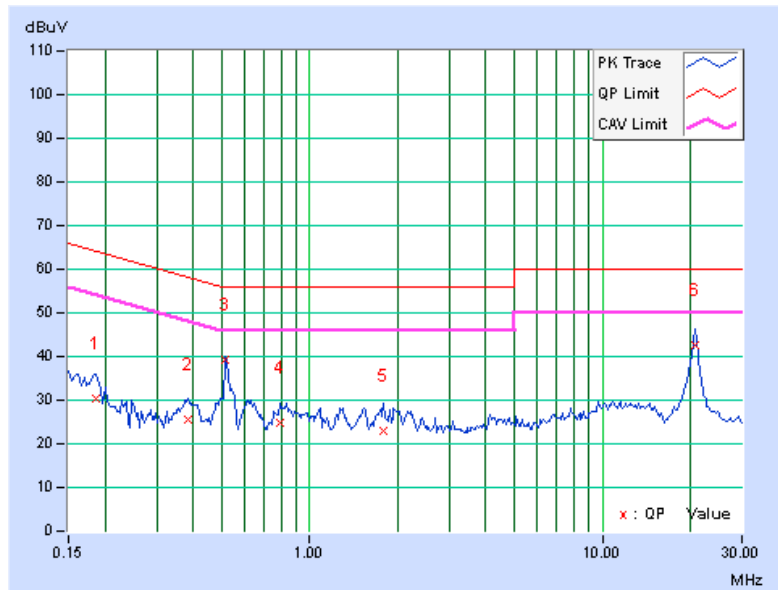
4.2.7 Test Results

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	0.18516	10.15	20.36	12.58	30.51	22.73	64.25
2	0.38438	10.19	15.30	10.13	25.49	20.32	58.18	48.18	-32.69	-27.86
3	0.51719	10.20	28.97	27.32	39.17	37.52	56.00	46.00	-16.83	-8.48
4	0.79063	10.21	14.46	10.47	24.67	20.68	56.00	46.00	-31.33	-25.32
5	1.79688	10.27	12.68	8.77	22.95	19.04	56.00	46.00	-33.05	-26.96
6	20.62891	10.61	31.97	25.89	42.58	36.50	60.00	50.00	-17.42	-13.50

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.

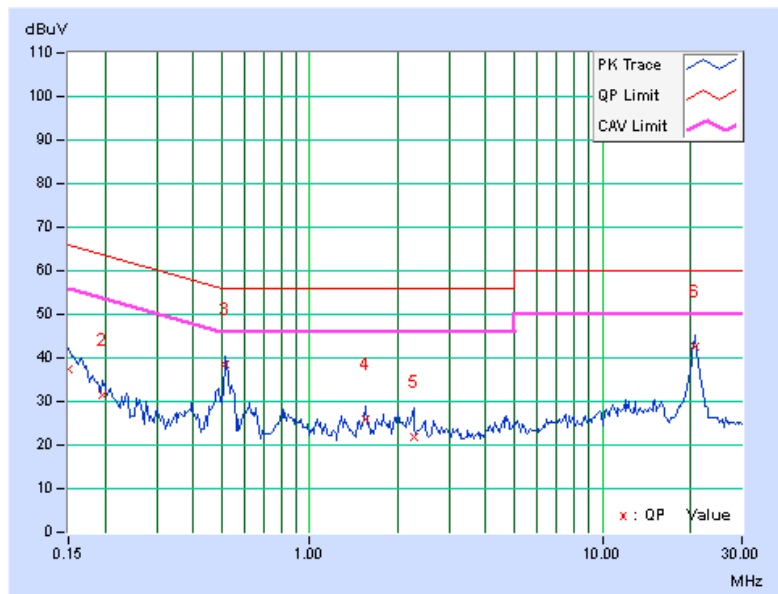


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	10.13	27.20	13.82	37.33	23.95	66.00
2	0.19687	10.16	21.47	10.72	31.63	20.88	63.74	53.74	-32.11	-32.86
3	0.51719	10.19	28.25	26.56	38.44	36.75	56.00	46.00	-17.56	-9.25
4	1.55469	10.26	15.80	12.78	26.06	23.04	56.00	46.00	-29.94	-22.96
5	2.26172	10.31	11.64	7.37	21.95	17.68	56.00	46.00	-34.05	-28.32
6	20.73047	10.77	31.79	25.22	42.56	35.99	60.00	50.00	-17.44	-14.01

REMARKS:

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



4.3 Transmit Power Measurement

4.3.1 Limits of Transmit Power Measurement

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

*B is the 26 dB emission bandwidth in megahertz

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

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

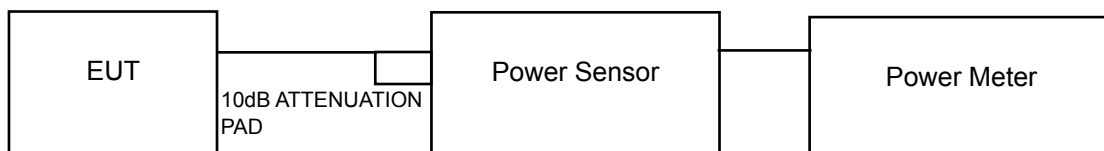
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

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

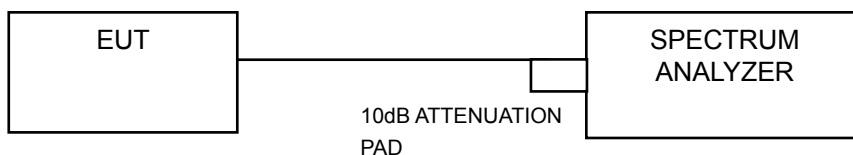
For power measurements on all other devices: Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

4.3.2 Test Setup

For Power Output Measurement



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

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating 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:

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	12.16	12.53	34.350	15.36	24	Pass
46	5230	12.21	12.57	34.706	15.40	24	Pass
54	5270	12.33	12.98	36.961	15.68	24	Pass
62	5310	12.42	12.35	34.637	15.40	24	Pass
102	5510	12.28	12.51	34.728	15.41	24	Pass
110	5550	12.84	13.16	39.932	16.01	24	Pass
134	5670	12.56	12.65	36.438	15.62	24	Pass
151	5755	12.02	12.49	33.664	15.27	30	Pass
159	5795	12.45	12.45	35.158	15.46	30	Pass

NOTE:

For U-NII-2A, U-NII-2C Band:

Chain 0

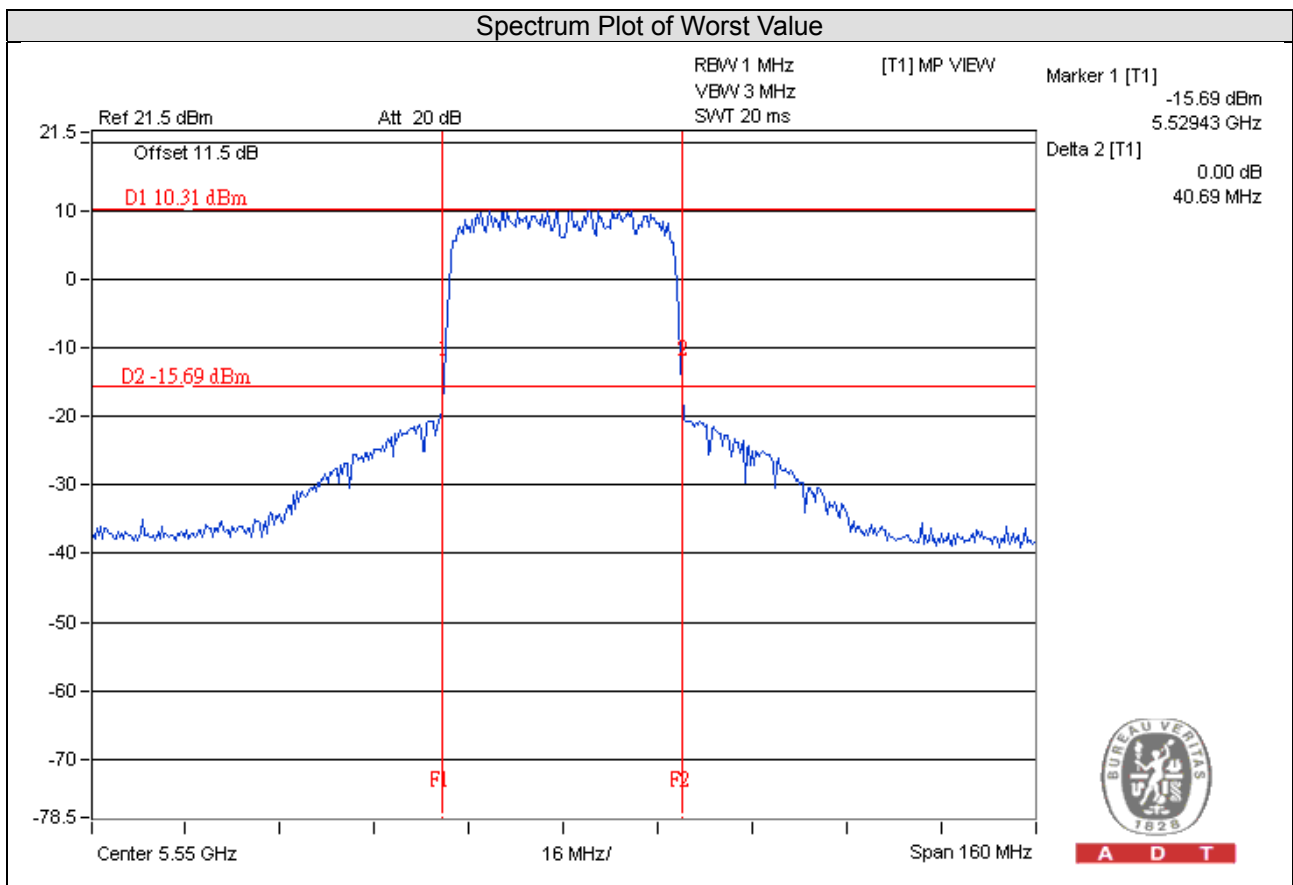
1. $11\text{dBm} + 10\log(40.47) = 27.07\text{ dBm} > 24\text{dBm}$.
2. $11\text{dBm} + 10\log(40.58) = 27.08\text{ dBm} > 24\text{dBm}$.
3. $11\text{dBm} + 10\log(40.47) = 27.07\text{ dBm} > 24\text{dBm}$.
4. $11\text{dBm} + 10\log(40.69) = 27.09\text{ dBm} > 24\text{dBm}$.
5. $11\text{dBm} + 10\log(40.50) = 27.07\text{ dBm} > 24\text{dBm}$.

Chain 1

1. $11\text{dBm} + 10\log(40.37) = 27.06\text{ dBm} > 24\text{dBm}$.
2. $11\text{dBm} + 10\log(40.47) = 27.07\text{ dBm} > 24\text{dBm}$.
3. $11\text{dBm} + 10\log(40.49) = 27.07\text{ dBm} > 24\text{dBm}$.
4. $11\text{dBm} + 10\log(40.52) = 27.08\text{ dBm} > 24\text{dBm}$.
5. $11\text{dBm} + 10\log(40.52) = 27.08\text{ dBm} > 24\text{dBm}$.

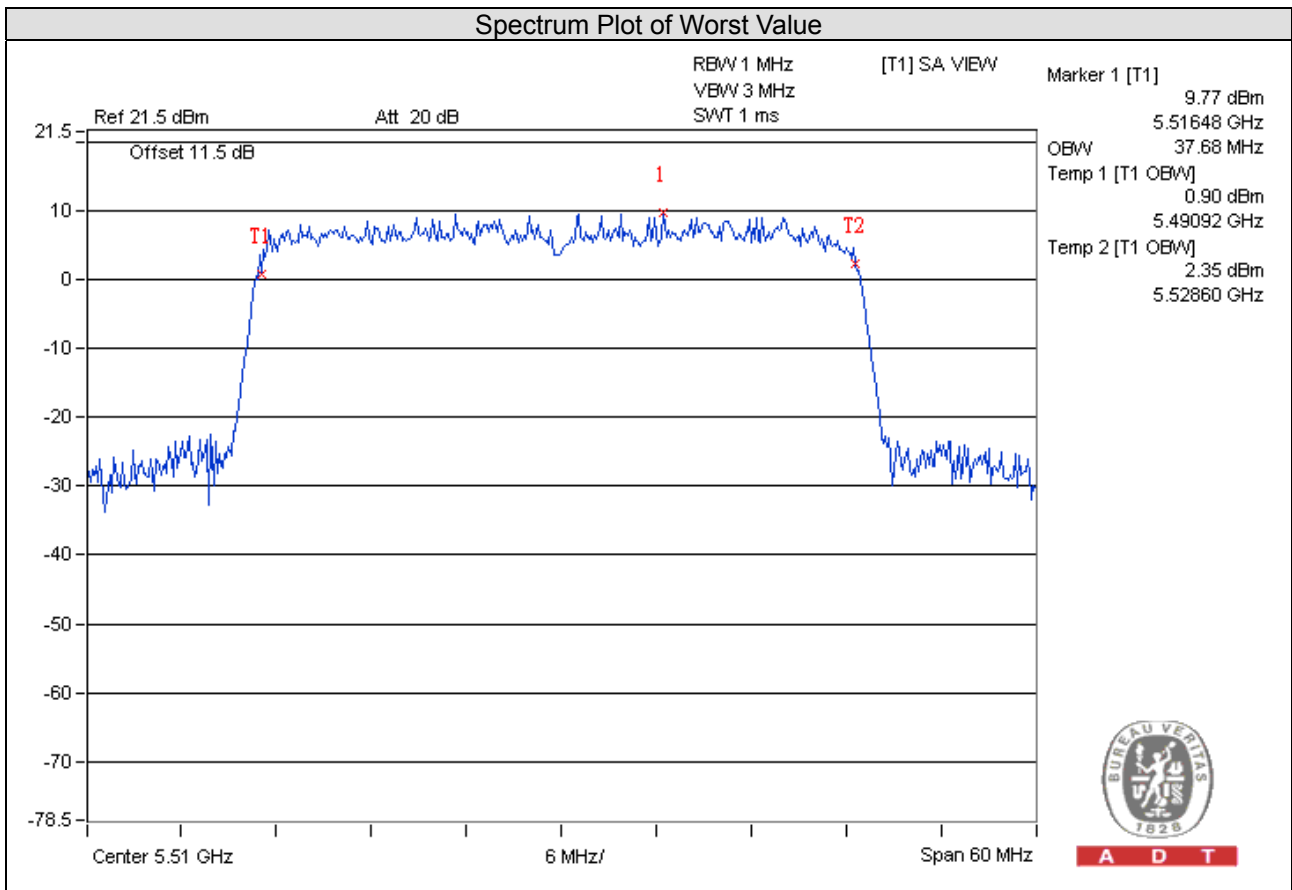
26dB BANDWIDTH:

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	40.54	40.37
46	5230	40.36	40.56
54	5270	40.47	40.37
62	5310	40.58	40.47
102	5510	40.47	40.49
110	5550	40.69	40.52
134	5670	40.50	40.52



OCCUPIED BANDWIDTH:

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	37.56	37.44
46	5230	37.56	37.56
54	5270	37.44	37.44
62	5310	37.44	37.56
102	5510	37.68	37.44
110	5550	37.56	37.56
134	5670	37.56	37.44
151	5755	37.57	37.48
159	5795	37.56	37.32



EUT MAXIMUM CONDUCTED POWER

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5250~5350	36.961	15.68
5470~5725	39.932	16.01

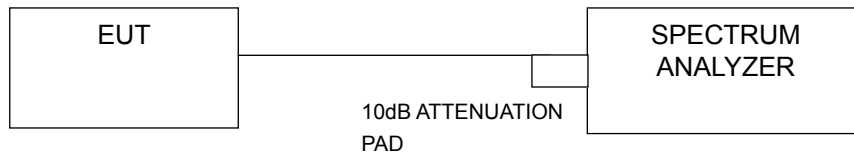
NOTE: Manufacturer provides Transmit Power Control description to meet this requirement.

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, U-NII-2A, U-NII-2C band:

Using method SA-1

- 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

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.

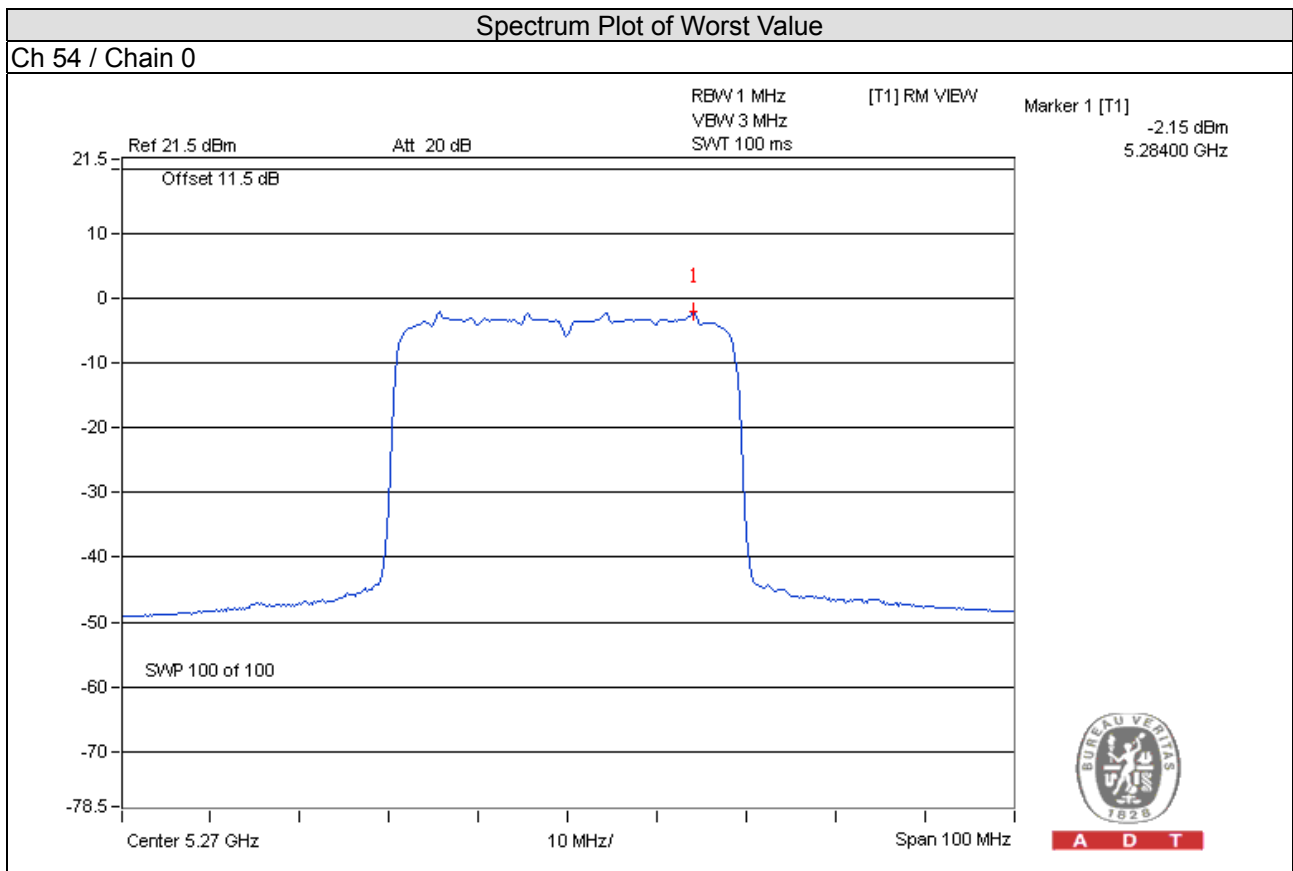
4.4.7 Test Results

For U-NII-1, U-NII-2A, U-NII-2C Band

Chan.	Freq. (MHz)	PSD (dBm)		Total PSD (dBm)	Max. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1			
38	5190	-2.56	-3.36	0.07	9.39	Pass
46	5230	-2.47	-3.23	0.18	9.39	Pass
54	5270	-2.15	-3.11	0.41	9.39	Pass
62	5310	-2.62	-3.14	0.14	9.39	Pass
102	5510	-2.80	-3.24	0.00	9.39	Pass
110	5550	-2.23	-2.94	0.44	9.39	Pass
134	5670	-2.50	-2.69	0.42	9.39	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 = $4.6\text{dBi} + 10\log(2) = 7.61\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $11 - (7.61 - 6) = 9.39\text{dBm}$.

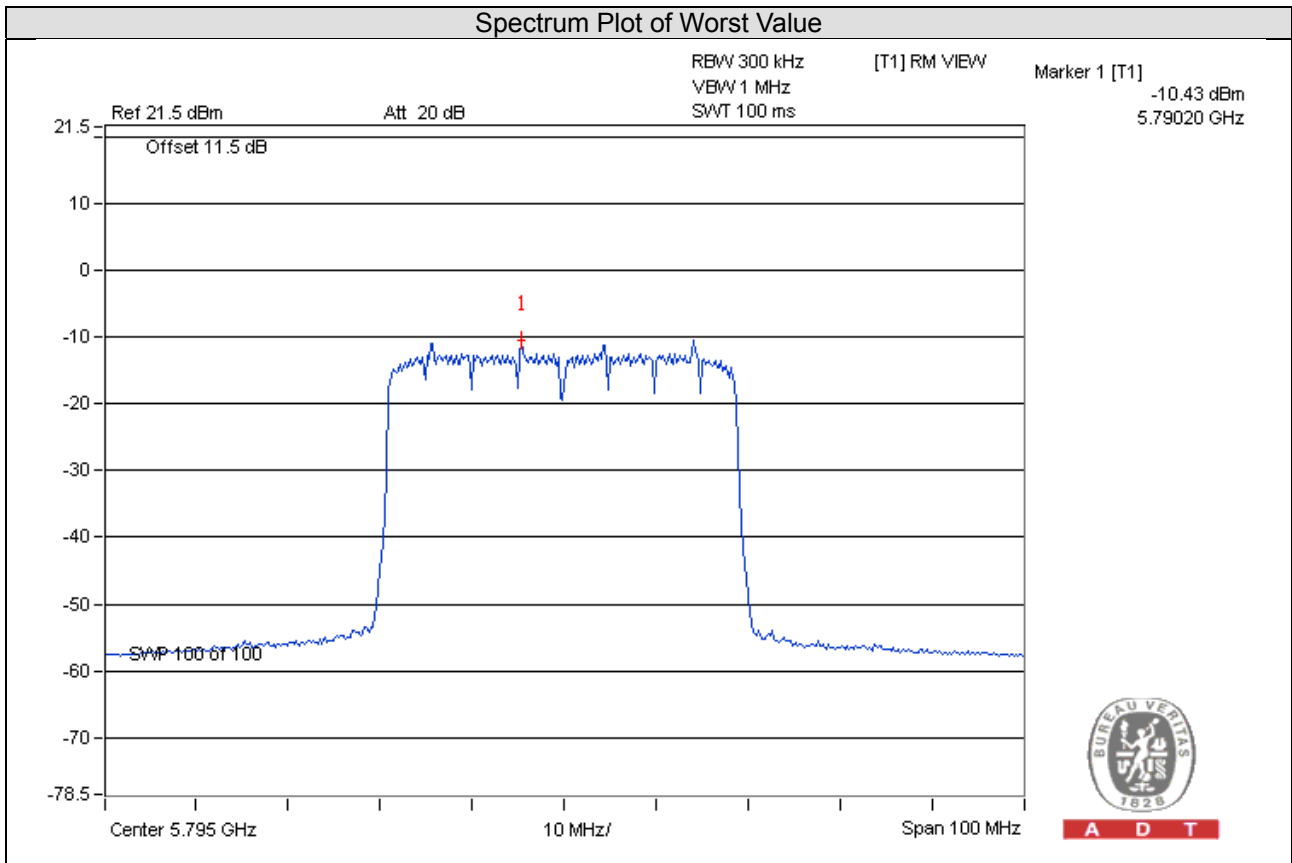


For U-NII-3 Band

TX chain	Chan.	Freq. (MHz)	PSD (dBm/300k Hz)	PSD (dBm/500k Hz)	10 log (N=2) dB	Total PSD (dBm/500k Hz)	Limit (dBm/500k Hz)	Pass / Fail
0	151	5755	-11.23	-9.01	3.01	-6.00	28.39	Pass
	159	5795	-10.71	-8.49	3.01	-5.48	28.39	Pass
1	151	5755	-10.52	-8.30	3.01	-5.29	28.39	Pass
	159	5795	-10.43	-8.21	3.01	-5.20	28.39	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 = $4.6\text{dBi} + 10\log(2) = 7.61\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30 - (7.61 - 6) = 28.39\text{dBm}$.

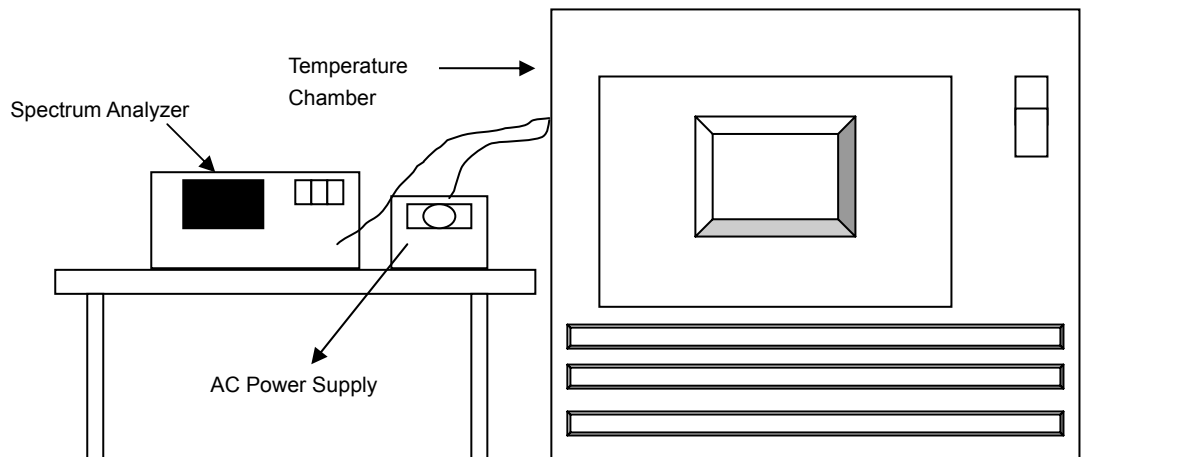


4.5 Frequency Stability

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: 5190MHz									
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	5190.0167	0.00032	5190.0171	0.00033	5190.0200	0.00039	5190.0190	0.00037
40	120	5189.9759	-0.00046	5189.9759	-0.00046	5189.9770	-0.00044	5189.9764	-0.00045
30	120	5189.9734	-0.00051	5189.9759	-0.00046	5189.9783	-0.00042	5189.9751	-0.00048
20	120	5190.0043	0.00008	5190.0007	0.00001	5190.0018	0.00003	5190.0052	0.00010
10	120	5189.9760	-0.00046	5189.9742	-0.00050	5189.9760	-0.00046	5189.9762	-0.00046
0	120	5189.9897	-0.00020	5189.9921	-0.00015	5189.9924	-0.00015	5189.9904	-0.00018
-10	120	5190.0026	0.00005	5190.0001	0.00000	5190.0032	0.00006	5189.9995	-0.00001
-20	120	5190.0088	0.00017	5190.0103	0.00020	5190.0082	0.00016	5190.0116	0.00022
-30	120	5190.0110	0.00021	5190.0075	0.00014	5190.0088	0.00017	5190.0111	0.00021

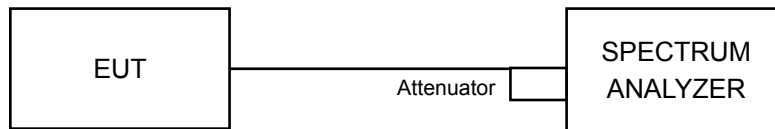
Frequency Stability Versus Voltage.									
Operating Frequency: 5190MHz									
Temp. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5190.0033	0.00006	5190.0008	0.00002	5190.0020	0.00004	5190.0051	0.00010
	120	5190.0043	0.00008	5190.0007	0.00001	5190.0018	0.00003	5190.0052	0.00010
	102	5190.0045	0.00009	5190.0010	0.00002	5190.0016	0.00003	5190.0062	0.00012

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

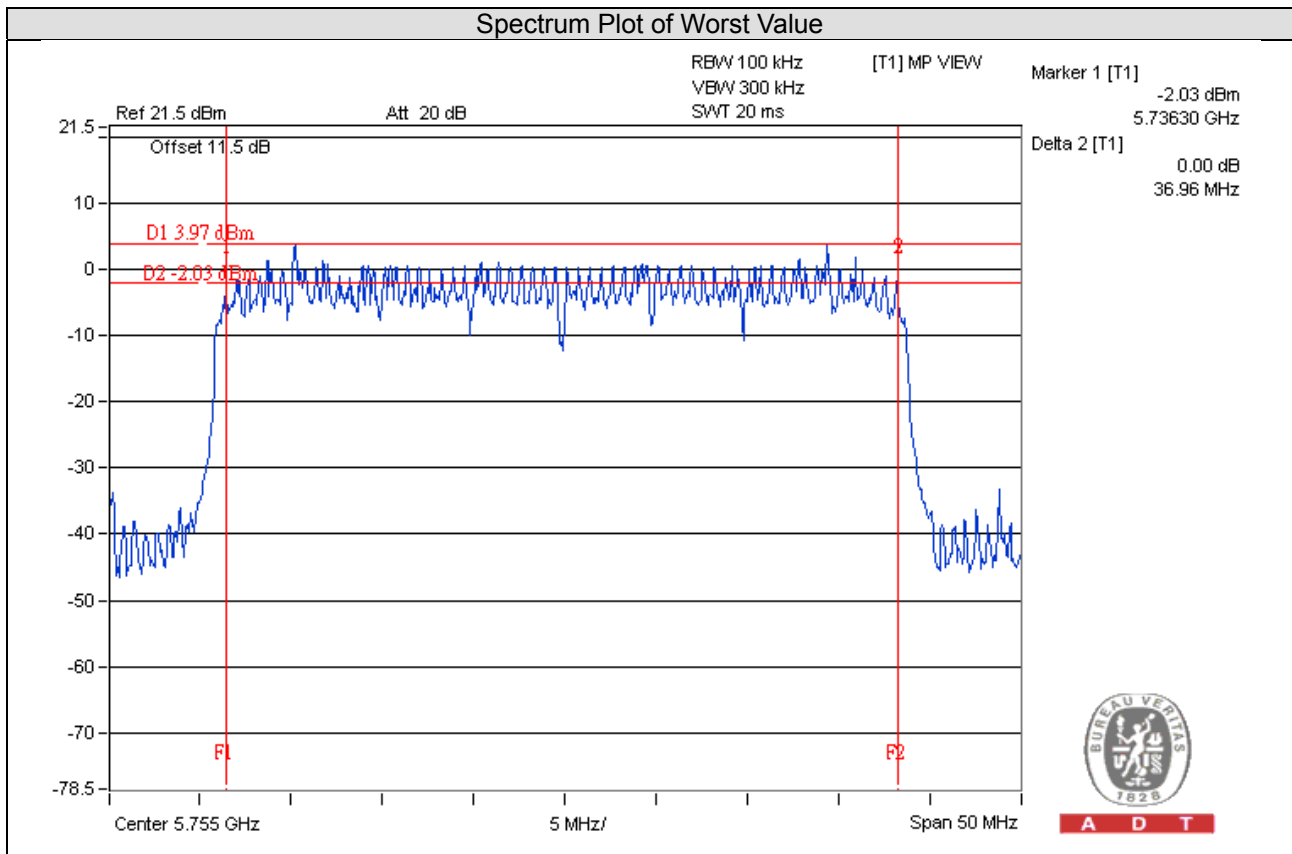
No deviation.

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

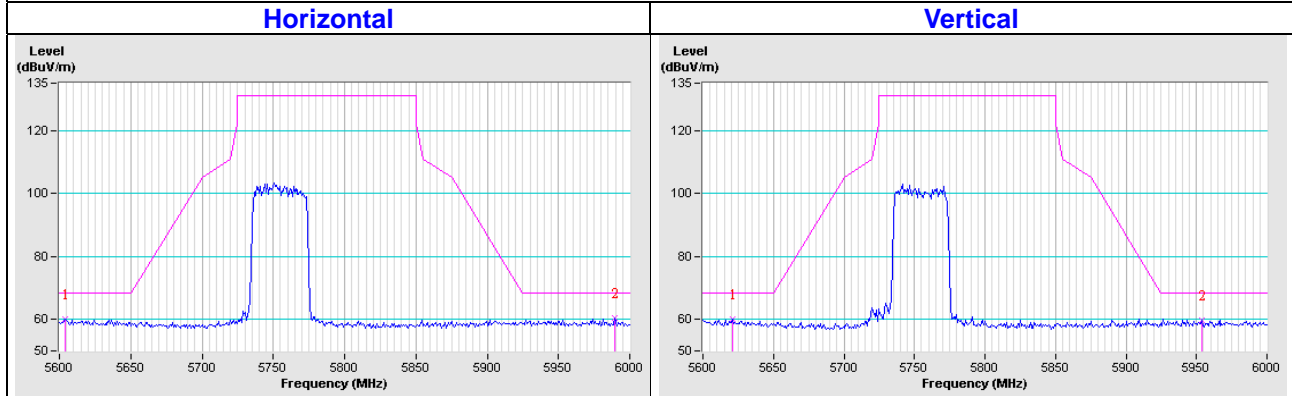
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	36.35	36.96	0.5	Pass
159	5795	36.91	36.39	0.5	Pass



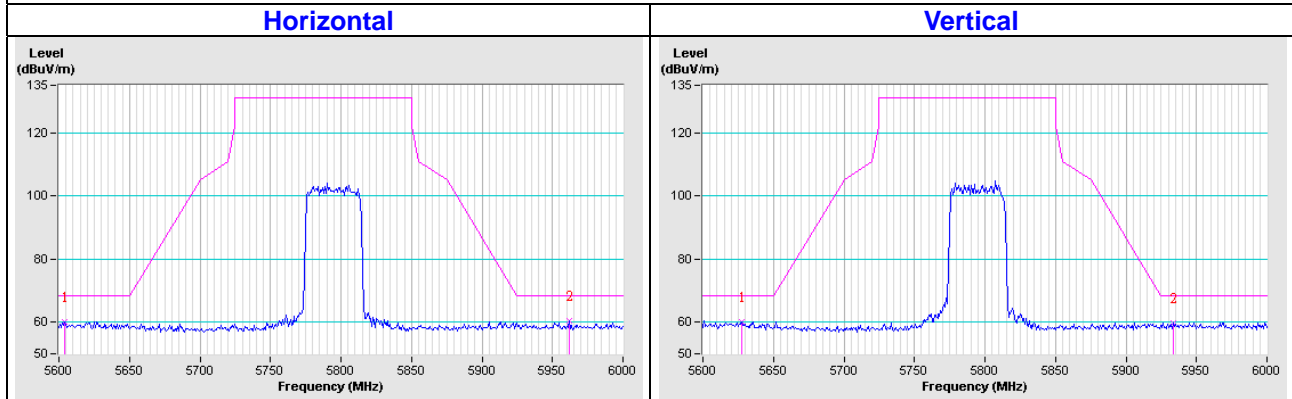
Annex A- Radiated Out of Band Emission (OOBE) Measurement (For U-NII-3 band)

WHDI (40MHz)

CH151



CH159



5 Pictures of Test Arrangements

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

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

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