FCC Test Report (WLAN-15.407)

Report No.: RF150508E01-1

FCC ID: JNZVR0005

Test Model: V-R0005

Received Date: May 08, 2015

Test Date: June 05 to July 09, 2015

Issued Date: July 13, 2015

Applicant: LOGITECH FAR EAST LTD.

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

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Table of Contents

Release Control Record **4**

1 Certificate of Conformity **5**

2 Summary of Test Results **6**

2.1 Measurement Uncertainty 6
2.2 Modification Record 6

3 General Information **7**

3.1 General Description of EUT (WLAN) 7
3.2 Description of Test Modes 9
3.2.1 Test Mode Applicability and Tested Channel Detail 10
3.3 Duty Cycle of Test Signal 12
3.4 Description of Support Units 13
3.4.1 Configuration of System under Test 13
3.5 General Description of Applied Standard 14

4 Test Types and Results **15**

4.1 Radiated Emission and Bandedge Measurement 15
4.1.1 Limits of Radiated Emission and Bandedge Measurement 15
4.1.2 Test Instruments 16
4.1.3 Test Procedure 18
4.1.4 Deviation from Test Standard 18
4.1.5 Test Setup 19
4.1.6 EUT Operating Condition 19
4.1.7 Test Results 20
4.2 Conducted Emission Measurement 33
4.2.1 Limits of Conducted Emission Measurement 33
4.2.2 Test Instruments 33
4.2.3 Test Procedure 34
4.2.4 Deviation from Test Standard 34
4.2.5 Test Setup 34
4.2.6 EUT Operating Condition 34
4.2.7 Test Results 35
4.3 Transmit Power Measurment 37
4.3.1 Limits of Transmit Power Measurement 37
4.3.2 Test Setup 37
4.3.3 Test Instruments 37
4.3.4 Test Procedure 38
4.3.5 Deviation from Test Standard 38
4.3.6 EUT Operating Condition 38
4.3.7 Test Result 39
4.4 Peak Power Spectral Density Measurement 40
4.4.1 Limits of Peak Power Spectral Density Measurement 40
4.4.2 Test Setup 40
4.4.3 Test Instruments 40
4.4.4 Test Procedure 41
4.4.5 Deviation from Test Standard 41
4.4.6 EUT Operating Condition 41
4.4.7 Test Results 42
4.5 Frequency Stability Measurement 44
4.5.1 Limits of Frequency Stability Measurement 44
4.5.2 Test Setup 44
4.5.3 Test Instruments 44
4.5.4 Test Procedure 44
4.5.5 Deviation from Test Standard 44
4.5.6 EUT Operating Condition 44

4.5.7 Test Results 45
4.6 6dB Bandwidth Measurment 46
4.6.1 Limits of 6dB Bandwidth Measurement 46
4.6.2 Test Setup 46
4.6.3 Test Instruments 46
4.6.4 Test Procedure 46
4.6.5 Deviation from Test Standard 46
4.6.6 EUT Operating Condition 46
4.6.7 Test Results 47

5 Pictures of Test Arrangements 48

Appendix – Information on the Testing Laboratories 49

Release Control Record

Issue No.	Description	Date Issued
RF150508E01-1	Original release.	July 13, 2015

1 Certificate of Conformity

Product: Webcam

Brand: Logitech

Test Model: V-R0005

Sample Status: ENGINEERING SAMPLE

Applicant: LOGITECH FAR EAST LTD.

Test Date: June 05 to July 09, 2015

Standard: 47 CFR FCC Part 15, Subpart E (Section 15.407)
ANSI C63.10: 2009

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:** July 13, 2015
Lori Chung / Specialist

Approved by : _____ , **Date:** July 13, 2015
May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (SECTION 15.407 Under New Rule)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -13.60dB at 0.58750MHz.
15.407(b) (1/2/3/4/6)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.1dB at 5725.00MHz.
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.

NOTE: The EUT was operating in 2400 ~ 2483.5MHz, 5150~5250MHz and 5725~5850MHz frequencies band. This report was recorded the RF parameters including 5150~5250MHz and 5725~5850MHz. For the 2400 ~ 2483.5MHz RF parameters was recorded in another test report.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.86 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.43 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz – Chamber H	3.72 dB
	1GHz ~ 6GHz – Chamber G	3.65 dB
	6GHz ~ 18GHz – Chamber H	4.00 dB
	6GHz ~ 18GHz – Chamber G	3.88 dB
	18GHz ~ 40GHz	4.11 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (WLAN)

Product	Webcam
Brand	Logitech
Test Model	V-R0005
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	5.1Vdc from power adapter or 3.7Vdc from battery
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 72.2Mbps
Operating Frequency	**For 15.407** 5.18 ~ 5.24GHz, 5.745 ~ 5.825GHz
	For 15.247 2.412 ~ 2.462GHz
Number of Channel	**For 15.407** 9 for 802.11a, 802.11n (HT20)
	For 15.247 11 for 802.11b, 802.11g, 802.11n (HT20)
Output Power	**For 15.407** 802.11a: 65.163mW 802.11n (HT20): 64.565mW
	For 15.247 802.11b: 191.867mW 802.11g: 224.388mW 802.11n (HT20): 231.206mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1
Data Cable Supplied	Charging ring (Unshielded, 3m)

Note:

1. The EUT may have a lot of colors for marketing requirement.
2. 2.4GHz WLAN, 5GHz WLAN and Bluetooth technology cannot transmit at same time.
3. The EUT incorporates a SISO function.

MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	1TX	1RX
802.11b	1 ~ 11Mbps	1TX	1RX
802.11g	6 ~ 54Mbps	1TX	1RX
802.11n (HT20)	MCS 0~7	1TX	1RX

4. The EUT must be supplied with a power adapter as following table:

Brand	Model No.	Spec.
logi	AD2063320	AC Input: 100-240V, 0.3A, 50/60Hz DC Output: 5.1V, 2.0A

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

Antenna No.	Antenna Type	Antenna Gain (dBi)	Frequency range (GHz to GHz)	Connecter Type
1	PIFA	-0.26	2.4~2.4835	NA
		2.62	5.15~5.25	
		2.62	5.25~5.35	
		0.18	5.47~5.725	
		-2.98	5.725~5.85	

6. The EUT was pre-tested under following test modes :

Pre-test Mode	Power
Mode A	Power from Battery
Mode B	**Power from Power adapter**

From the above modes, the worst emission was found in **Mode B**. Therefore only the test data of the modes were recorded in this report.

7. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

For 5180 ~ 5240MHz

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

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

For 5745 ~ 5825MHz:

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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

NOTE:
1. 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.

MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11n (HT20)		36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6
802.11n (HT20)		149 to 165	149, 157, 165	OFDM	BPSK	6.5

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.

MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	5180-5240 5745-5825	36 to 48 149 to 165	157	OFDM	BPSK	6

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.

MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	5180-5240 5745-5825	36 to 48 149 to 165	157	OFDM	BPSK	6

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.

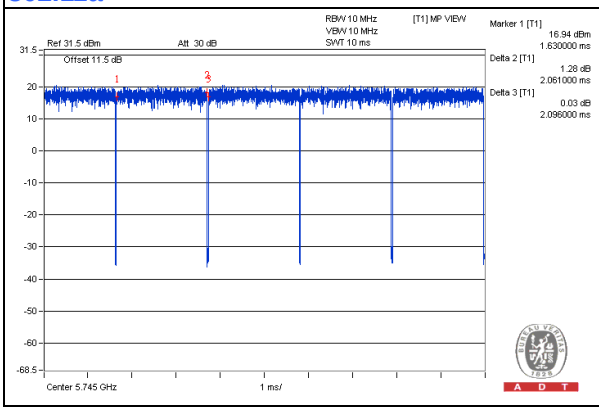
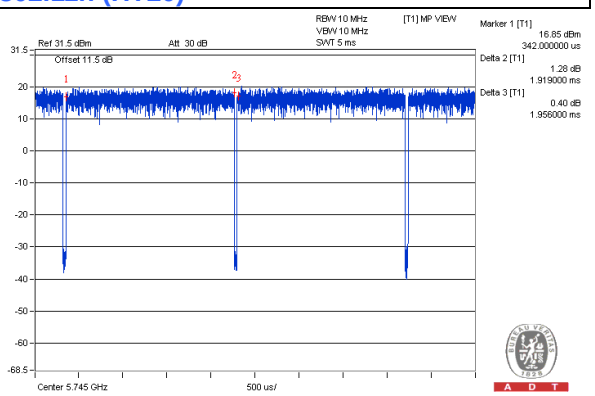
MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11n (HT20)		36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6
802.11n (HT20)		149 to 165	149, 157, 165	OFDM	BPSK	6.5

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	22deg. C, 65%RH	120Vac, 60Hz	Robert Cheng
RE<1G	28deg. C, 73%RH	120Vac, 60Hz	Jason Huang
PLC	25deg. C, 54%RH	120Vac, 60Hz	Jyunchun Lin
APCM	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is ≥ 98 %, duty factor is not required.
802.11a: Duty cycle = 2.061 ms/2.096 ms = 0.983
802.11n (HT20): Duty cycle = 1.919 ms/1.956 ms = 0.981

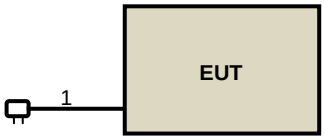
802.11a	802.11n (HT20)
	

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.

No.	Cable	Qty.	Length (m)	Shielded (Yes/ No)	Cores (Number)	Remark
1	Charging ring	1	3	Yes	0	Supplied by Client

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standard

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

FCC Part 15, Subpart E (15.407)
789033 D02 General UNII Test Procedure New Rules v01
ANSI C63.10-2009

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 v01	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)	PK:-27 (dBm/MHz) *1 PK:-17 (dBm/MHz) *2	PK: 68.2(dBμV/m) *1 PK:78.2 (dBμV/m) *2

NOTE: *1 beyond 10MHz of the band edge *2 within 10 MHz of band edge

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

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

4.1.2 Test Instruments

For Channel 48 test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210105	July 21, 2014	July 20, 2015
Horn_Antenna AISI	AIH.8018	0000320091110	Feb. 09, 2015	Feb. 08, 2016
Pre-Amplifier Agilent	8449B	3008A02578	June 23, 2015	June 22, 2016
RF Cable	NA	131205 131216 131217 SNMY23684/4	Jan. 16, 2015	Jan. 15, 2016
Spectrum Analyzer R&S	FSV40	100964	June 26, 2015	June 25, 2016
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Dec. 12, 2014	Dec. 11, 2015
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Feb. 05, 2015	Feb. 04, 2016
RF Cable	NA	329751/4 RF104-204	Dec. 11, 2014	Dec. 10, 2015
Software	ADT_Radiated_V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	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 966 Chamber No. G.
3. The FCC Site Registration No. is 966073.
4. The VCCI Site Registration No. is G-137.
5. The CANADA Site Registration No. is IC 7450H-2.
6. Tested Date: July 09, 2015

For other channel test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	Aug. 11, 2014	Aug. 10, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Feb. 09, 2015	Feb. 08, 2016
RF Cable	8D-FB	CHHCAB-001-1 CHHCAB-001-2	Oct. 05, 2014	Oct. 04, 2015
	RF-141	CHHCAB-004	Oct. 05, 2014	Oct. 04, 2015
Horn_Antenna AISI	AIH.8018	0000220091110	Feb. 06, 2015	Feb. 05, 2016
Pre-Amplifier Agilent	8449B	3008A01923	Oct. 28, 2014	Oct. 27, 2015
RF Cable	NA	131206 131213 131215 SNMY23685/4	Jan. 16, 2015	Jan. 15, 2016
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Dec. 12, 2014	Dec. 11, 2015
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Feb. 05, 2015	Feb. 04, 2016
RF Cable	NA	329751/4 RF104-204	Dec. 11, 2014	Dec. 10, 2015
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
Power Meter Anritsu	ML2495A	1014008	Apr. 28, 2015	Apr. 27, 2016
Power Sensor Anritsu	MA2411B	0917122	Apr. 28, 2015	Apr. 27, 2016
Spectrum Analyzer R&S	FSP 40	100060	May 08, 2015	May 07, 2016
Temperature & Humidity Chamber GIANTFORCE	GTH-150-40-S P-AR	MAA0812-008	Jan. 12, 2015	Jan. 11, 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 966 Chamber No. H.
3. The FCC Site Registration No. is 797305.
4. The CANADA Site Registration No. is IC 7450H-3.
5. Tested Date: June 05 to 12, 2015

4.1.3 Test Procedure

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:

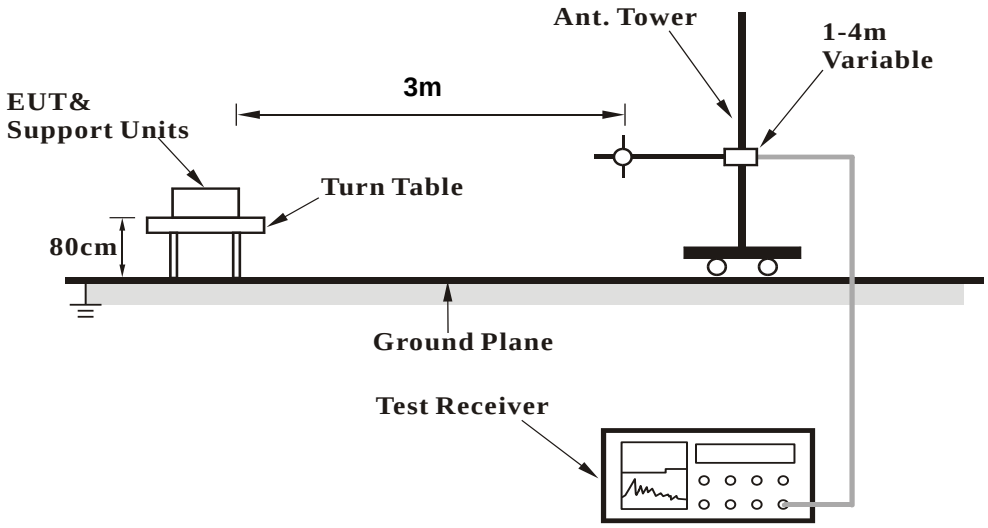
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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/duty cycle)).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle ≥ 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

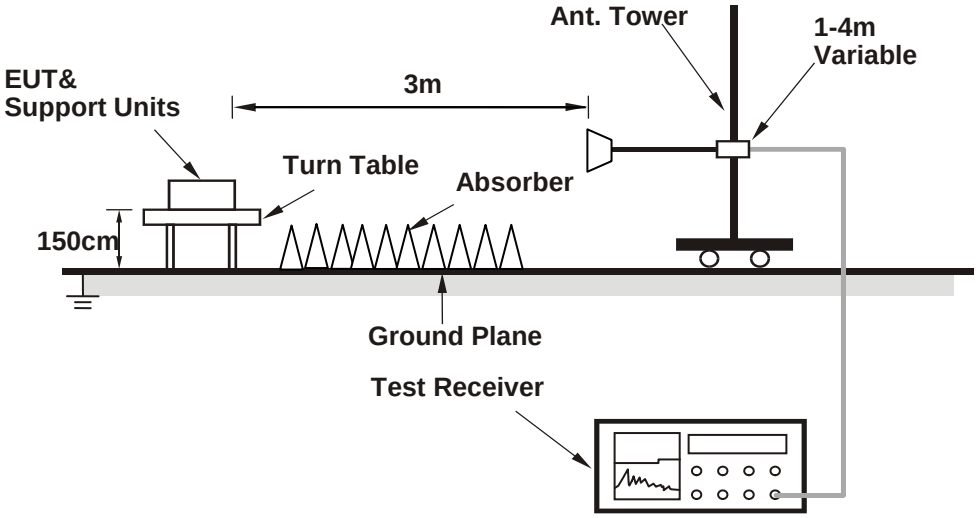
No deviation.

4.1.5 Test Setup

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT Operating Condition

1. Placed the EUT on testing table.
2. Controlling software (Cosole [paste11abgn Tx command.txt]) has been activated to set the EUT under transmission/receiving condition continuously.

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	69.9 PK	74.0	-4.1	1.10 H	202	63.43	6.47
2	5150.00	47.5 AV	54.0	-6.5	1.10 H	202	41.03	6.47
3	*5180.00	104.3 PK			1.10 H	202	97.65	6.65
4	*5180.00	94.9 AV			1.10 H	202	88.25	6.65
5	#10360.00	57.7 PK	74.0	-16.3	1.39 H	175	43.49	14.21
6	#10360.00	45.0 AV	54.0	-9.0	1.39 H	175	30.79	14.21
7	15540.00	57.8 PK	74.0	-16.2	1.45 H	175	39.04	18.76
8	15540.00	49.1 AV	54.0	-4.9	1.45 H	175	30.34	18.76
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	5150.00	70.2 PK	74.0	-3.8	1.27 V	60	63.73	6.47
2	5150.00	49.4 AV	54.0	-4.6	1.27 V	60	42.93	6.47
3	*5180.00	106.5 PK			1.27 V	60	99.85	6.65
4	*5180.00	97.1 AV			1.27 V	60	90.45	6.65
5	#10360.00	58.6 PK	74.0	-15.4	1.64 V	90	44.39	14.21
6	#10360.00	45.4 AV	54.0	-8.6	1.64 V	90	31.19	14.21
7	15540.00	57.2 PK	74.0	-16.8	1.34 V	215	38.44	18.76
8	15540.00	48.9 AV	54.0	-5.1	1.34 V	215	30.14	18.76

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	104.6 PK			1.03 H	209	97.83	6.77
2	*5200.00	95.3 AV			1.03 H	209	88.53	6.77
3	#10400.00	57.4 PK	74.0	-16.6	1.35 H	172	43.18	14.22
4	#10400.00	45.0 AV	54.0	-9.0	1.35 H	172	30.78	14.22
5	15600.00	57.8 PK	74.0	-16.2	1.41 H	153	39.46	18.34
6	15600.00	49.3 AV	54.0	-4.7	1.41 H	153	30.96	18.34
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	107.0 PK			1.35 V	65	100.23	6.77
2	*5200.00	97.0 AV			1.35 V	65	90.23	6.77
3	#10400.00	58.6 PK	74.0	-15.4	1.66 V	89	44.38	14.22
4	#10400.00	45.3 AV	54.0	-8.7	1.66 V	89	31.08	14.22
5	15600.00	57.8 PK	74.0	-16.2	1.40 V	217	39.46	18.34
6	15600.00	49.2 AV	54.0	-4.8	1.40 V	217	30.86	18.34

REMARKS:

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

CHANNEL	TX Channel 48	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	104.4 PK			1.11 H	188	95.80	8.60
2	*5240.00	94.9 AV			1.11 H	188	86.30	8.60
3	5350.00	66.4 PK	74.0	-7.6	1.04 H	189	57.60	8.80
4	5350.00	43.7 AV	54.0	-10.3	1.04 H	189	34.90	8.80
5	#10480.00	56.6 PK	74.0	-17.4	1.32 H	162	42.13	14.47
6	#10480.00	44.4 AV	54.0	-9.6	1.32 H	162	29.93	14.47
7	15720.00	57.0 PK	74.0	-17.0	1.42 H	164	37.96	19.04
8	15720.00	48.4 AV	54.0	-5.6	1.42 H	164	29.36	19.04
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	107.3 PK			1.34 V	61	98.70	8.60
2	*5240.00	97.1 AV			1.34 V	61	88.50	8.60
3	5350.00	66.9 PK	74.0	-7.1	1.20 V	62	58.10	8.80
4	5350.00	45.8 AV	54.0	-8.2	1.20 V	62	37.00	8.80
5	#10480.00	58.6 PK	74.0	-15.4	1.61 V	62	44.13	14.47
6	#10480.00	45.2 AV	54.0	-8.8	1.61 V	62	30.73	14.47
7	15720.00	56.6 PK	74.0	-17.4	1.31 V	215	37.56	19.04
8	15720.00	48.3 AV	54.0	-5.7	1.31 V	215	29.26	19.04

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5715.00	58.2 PK	74.0	-15.8	1.05 H	169	50.82	7.38
2	#5715.00	43.5 AV	54.0	-10.5	1.05 H	169	36.12	7.38
3	#5725.00	73.0 PK	78.2	-5.2	1.05 H	169	65.62	7.38
4	*5745.00	101.9 PK			1.05 H	169	94.52	7.38
5	*5745.00	91.4 AV			1.05 H	169	84.02	7.38
6	11490.00	57.0 PK	74.0	-17.0	1.44 H	187	42.48	14.52
7	11490.00	44.4 AV	54.0	-9.6	1.44 H	187	29.88	14.52
8	#17235.00	57.7 PK	74.0	-16.3	1.43 H	166	33.94	23.76
9	#17235.00	49.0 AV	54.0	-5.0	1.43 H	166	25.24	23.76
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	#5715.00	59.7 PK	74.0	-14.3	1.65 V	86	52.32	7.38
2	#5715.00	44.8 AV	54.0	-9.2	1.65 V	86	37.42	7.38
3	**#5725.00**	**75.1 PK**	**78.2**	**-3.1**	**1.65 V**	**86**	**67.72**	**7.38**
4	*5745.00	103.6 PK			1.65 V	86	96.22	7.38
5	*5745.00	93.5 AV			1.65 V	86	86.12	7.38
6	11490.00	57.8 PK	74.0	-16.2	1.64 V	89	43.28	14.52
7	11490.00	44.9 AV	54.0	-9.1	1.64 V	89	30.38	14.52
8	#17235.00	57.8 PK	74.0	-16.2	1.32 V	202	34.04	23.76
9	#17235.00	49.3 AV	54.0	-4.7	1.32 V	202	25.54	23.76

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5785.00	105.1 PK			1.04 H	185	97.72	7.38
2	*5785.00	94.9 AV			1.04 H	185	87.52	7.38
3	11570.00	58.0 PK	74.0	-16.0	1.34 H	159	43.43	14.57
4	11570.00	45.1 AV	54.0	-8.9	1.34 H	159	30.53	14.57
5	#17355.00	57.8 PK	74.0	-16.2	1.44 H	166	33.74	24.06
6	#17355.00	49.2 AV	54.0	-4.8	1.44 H	166	25.14	24.06
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5785.00	108.2 PK			1.34 V	58	100.82	7.38
2	*5785.00	97.9 AV			1.34 V	58	90.52	7.38
3	11570.00	57.7 PK	74.0	-16.3	1.50 V	83	43.13	14.57
4	11570.00	44.9 AV	54.0	-9.1	1.50 V	83	30.33	14.57
5	#17355.00	56.8 PK	74.0	-17.2	1.33 V	200	32.74	24.06
6	#17355.00	48.4 AV	54.0	-5.6	1.33 V	200	24.34	24.06

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5825.00	103.0 PK			1.08 H	181	95.69	7.31
2	*5825.00	92.1 AV			1.08 H	181	84.79	7.31
3	#5850.00	69.4 PK	78.2	-8.8	1.08 H	181	62.15	7.25
4	#5860.00	58.5 PK	74.0	-15.5	1.08 H	181	51.28	7.22
5	#5860.00	43.9 AV	54.0	-10.1	1.08 H	181	36.68	7.22
6	11650.00	57.6 PK	74.0	-16.4	1.42 H	184	42.93	14.67
7	11650.00	45.1 AV	54.0	-8.9	1.42 H	184	30.43	14.67
8	#17475.00	57.9 PK	74.0	-16.1	1.39 H	160	33.88	24.02
9	#17475.00	49.0 AV	54.0	-5.0	1.39 H	160	24.98	24.02
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	*5825.00	105.2 PK			1.64 V	86	97.89	7.31
2	*5825.00	94.4 AV			1.64 V	86	87.09	7.31
3	#5850.00	72.6 PK	78.2	-5.6	1.64 V	86	65.35	7.25
4	#5860.00	60.0 PK	74.0	-14.0	1.64 V	86	52.78	7.22
5	#5860.00	44.9 AV	54.0	-9.1	1.64 V	86	37.68	7.22
6	11650.00	58.7 PK	74.0	-15.3	1.60 V	87	44.03	14.67
7	11650.00	45.8 AV	54.0	-8.2	1.60 V	87	31.13	14.67
8	#17475.00	56.6 PK	74.0	-17.4	1.36 V	228	32.58	24.02
9	#17475.00	48.4 AV	54.0	-5.6	1.36 V	228	24.38	24.02

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) 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	70.4 PK	74.0	-3.6	1.06 H	172	63.93	6.47
2	5150.00	47.8 AV	54.0	-6.2	1.06 H	172	41.33	6.47
3	*5180.00	103.8 PK			1.06 H	172	97.15	6.65
4	*5180.00	94.4 AV			1.06 H	172	87.75	6.65
5	#10360.00	57.7 PK	74.0	-16.3	1.32 H	181	43.49	14.21
6	#10360.00	45.0 AV	54.0	-9.0	1.32 H	181	30.79	14.21
7	15540.00	57.7 PK	74.0	-16.3	1.42 H	183	38.94	18.76
8	15540.00	49.3 AV	54.0	-4.7	1.42 H	183	30.54	18.76
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	70.3 PK	74.0	-3.7	1.29 V	74	63.83	6.47
2	5150.00	49.5 AV	54.0	-4.5	1.29 V	74	43.03	6.47
3	*5180.00	105.7 PK			1.28 V	54	99.05	6.65
4	*5180.00	96.9 AV			1.28 V	54	90.25	6.65
5	#10360.00	58.0 PK	74.0	-16.0	1.67 V	77	43.79	14.21
6	#10360.00	44.6 AV	54.0	-9.4	1.67 V	77	30.39	14.21
7	15540.00	56.7 PK	74.0	-17.3	1.23 V	205	37.94	18.76
8	15540.00	48.6 AV	54.0	-5.4	1.23 V	205	29.84	18.76

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	104.3 PK			1.12 H	179	97.53	6.77
2	*5200.00	94.9 AV			1.12 H	179	88.13	6.77
3	#10400.00	56.7 PK	74.0	-17.3	1.36 H	159	42.48	14.22
4	#10400.00	44.2 AV	54.0	-9.8	1.36 H	159	29.98	14.22
5	15600.00	56.9 PK	74.0	-17.1	1.50 H	180	38.56	18.34
6	15600.00	48.7 AV	54.0	-5.3	1.50 H	180	30.36	18.34
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	107.4 PK			1.23 V	63	100.63	6.77
2	*5200.00	97.2 AV			1.23 V	63	90.43	6.77
3	#10400.00	58.9 PK	74.0	-15.1	1.60 V	83	44.68	14.22
4	#10400.00	45.9 AV	54.0	-8.1	1.60 V	83	31.68	14.22
5	15600.00	57.0 PK	74.0	-17.0	1.24 V	211	38.66	18.34
6	15600.00	48.7 AV	54.0	-5.3	1.24 V	211	30.36	18.34

REMARKS:

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

CHANNEL	TX Channel 48	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	102.8 PK			1.10 H	175	94.20	8.60
2	*5240.00	93.7 AV			1.10 H	175	85.10	8.60
3	5350.00	66.4 PK	74.0	-7.6	1.08 H	182	57.60	8.80
4	5350.00	43.5 AV	54.0	-10.5	1.08 H	182	34.70	8.80
5	#10480.00	57.0 PK	74.0	-17.0	1.30 H	166	42.53	14.47
6	#10480.00	44.1 AV	54.0	-9.9	1.30 H	166	29.63	14.47
7	15720.00	58.2 PK	74.0	-15.8	1.42 H	179	39.16	19.04
8	15720.00	49.5 AV	54.0	-4.5	1.42 H	179	30.46	19.04
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	106.7 PK			1.32 V	64	98.10	8.60
2	*5240.00	96.7 AV			1.32 V	64	88.10	8.60
3	5350.00	66.4 PK	74.0	-7.6	1.15 V	60	57.60	8.80
4	5350.00	45.3 AV	54.0	-8.7	1.15 V	60	36.50	8.80
5	#10480.00	58.2 PK	74.0	-15.8	1.61 V	67	43.73	14.47
6	#10480.00	45.0 AV	54.0	-9.0	1.61 V	67	30.53	14.47
7	15720.00	57.5 PK	74.0	-16.5	1.32 V	196	38.46	19.04
8	15720.00	49.2 AV	54.0	-4.8	1.32 V	196	30.16	19.04

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5715.00	58.3 PK	74.0	-15.7	1.09 H	166	50.92	7.38
2	#5715.00	43.9 AV	54.0	-10.1	1.09 H	166	36.52	7.38
3	#5725.00	72.8 PK	78.2	-5.4	1.09 H	166	65.42	7.38
4	*5745.00	101.3 PK			1.09 H	166	93.92	7.38
5	*5745.00	90.5 AV			1.09 H	166	83.12	7.38
6	11490.00	57.7 PK	74.0	-16.3	1.35 H	171	43.18	14.52
7	11490.00	45.3 AV	54.0	-8.7	1.35 H	171	30.78	14.52
8	#17235.00	58.1 PK	74.0	-15.9	1.44 H	172	34.34	23.76
9	#17235.00	49.2 AV	54.0	-4.8	1.44 H	172	25.44	23.76
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	#5715.00	59.2 PK	74.0	-14.8	1.61 V	96	51.82	7.38
2	#5715.00	44.6 AV	54.0	-9.4	1.61 V	96	37.22	7.38
3	#5725.00	74.2 PK	78.2	-4.0	1.60 V	77	66.82	7.38
4	*5745.00	102.9 PK			1.63 V	87	95.52	7.38
5	*5745.00	92.9 AV			1.63 V	87	85.52	7.38
6	11490.00	58.4 PK	74.0	-15.6	1.61 V	98	43.88	14.52
7	11490.00	45.2 AV	54.0	-8.8	1.61 V	98	30.68	14.52
8	#17235.00	57.5 PK	74.0	-16.5	1.36 V	200	33.74	23.76
9	#17235.00	49.1 AV	54.0	-4.9	1.36 V	200	25.34	23.76

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5785.00	103.1 PK			1.07 H	187	95.72	7.38
2	*5785.00	93.9 AV			1.07 H	187	86.52	7.38
3	11570.00	58.0 PK	74.0	-16.0	1.35 H	157	43.43	14.57
4	11570.00	45.1 AV	54.0	-8.9	1.35 H	157	30.53	14.57
5	#17355.00	57.3 PK	74.0	-16.7	1.43 H	162	33.24	24.06
6	#17355.00	48.8 AV	54.0	-5.2	1.43 H	162	24.74	24.06
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5785.00	106.9 PK			1.26 V	45	99.52	7.38
2	*5785.00	96.7 AV			1.26 V	45	89.32	7.38
3	11570.00	59.0 PK	74.0	-15.0	1.49 V	68	44.43	14.57
4	11570.00	45.7 AV	54.0	-8.3	1.49 V	68	31.13	14.57
5	#17355.00	57.0 PK	74.0	-17.0	1.38 V	205	32.94	24.06
6	#17355.00	48.8 AV	54.0	-5.2	1.38 V	205	24.74	24.06

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5825.00	103.7 PK			1.06 H	174	96.39	7.31
2	*5825.00	92.6 AV			1.06 H	174	85.29	7.31
3	#5850.00	69.8 PK	78.2	-8.4	1.06 H	174	62.55	7.25
4	#5860.00	58.2 PK	74.0	-15.8	1.06 H	174	50.98	7.22
5	#5860.00	43.5 AV	54.0	-10.5	1.06 H	174	36.28	7.22
6	11650.00	56.0 PK	74.0	-18.0	1.36 H	171	41.33	14.67
7	11650.00	43.9 AV	54.0	-10.1	1.36 H	171	29.23	14.67
8	#17475.00	57.4 PK	74.0	-16.6	1.41 H	189	33.38	24.02
9	#17475.00	49.2 AV	54.0	-4.8	1.41 H	189	25.18	24.02
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	*5825.00	105.7 PK			1.56 V	83	98.39	7.31
2	*5825.00	94.7 AV			1.56 V	83	87.39	7.31
3	#5850.00	72.7 PK	78.2	-5.5	1.61 V	71	65.45	7.25
4	#5860.00	59.7 PK	74.0	-14.3	1.62 V	90	52.48	7.22
5	#5860.00	44.7 AV	54.0	-9.3	1.62 V	90	37.48	7.22
6	11650.00	58.1 PK	74.0	-15.9	1.62 V	102	43.43	14.67
7	11650.00	45.0 AV	54.0	-9.0	1.62 V	102	30.33	14.67
8	#17475.00	57.1 PK	74.0	-16.9	1.35 V	183	33.08	24.02
9	#17475.00	48.7 AV	54.0	-5.3	1.35 V	183	24.68	24.02

REMARKS:

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

Below 1GHz Data:

802.11a

CHANNEL	TX Channel 157	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	Below 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	265.47	33.7 QP	46.0	-12.4	1.00 H	28	46.99	-13.34
2	550.02	41.6 QP	46.0	-4.4	1.50 H	337	47.94	-6.30
3	638.00	40.8 QP	46.0	-5.2	1.00 H	326	44.78	-4.01
4	726.02	40.1 QP	46.0	-5.9	1.00 H	29	43.12	-2.98
5	770.01	41.3 QP	46.0	-4.7	1.00 H	234	43.28	-1.95
6	857.99	41.2 QP	46.0	-4.8	1.50 H	116	41.79	-0.62
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	74.43	34.2 QP	40.0	-5.8	1.00 V	326	50.51	-16.29
2	374.01	40.5 QP	46.0	-5.5	1.50 V	285	50.69	-10.22
3	550.02	41.4 QP	46.0	-4.6	1.00 V	360	47.72	-6.30
4	638.00	40.6 QP	46.0	-5.4	1.00 V	21	44.64	-4.01
5	682.03	40.0 QP	46.0	-6.0	1.00 V	17	43.64	-3.61
6	726.02	41.3 QP	46.0	-4.7	1.50 V	68	44.32	-2.98
7	770.01	41.6 QP	46.0	-4.4	2.00 V	59	43.57	-1.95

REMARKS:

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

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	100375	May 06, 2015	May 05, 2016
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 15, 2014	Sep. 14, 2015
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100071	Nov. 10, 2014	Nov. 09, 2015
RF Cable	5D-FB	COCCAB-001	Mar. 09, 2015	Mar. 08, 2016
50 ohms Terminator	N/A	EMC-03	Sep. 22, 2014	Sep. 21, 2015
50 ohms Terminator	N/A	EMC-02	Sep. 30, 2014	Sep. 29, 2015
Software BVADT	BVADT_Cond_ V7.3.7.3	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. C.
3 The VCCI Con C Registration No. is C-3611.
4 Tested Date: June 08, 2015

4.2.3 Test Procedure

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

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

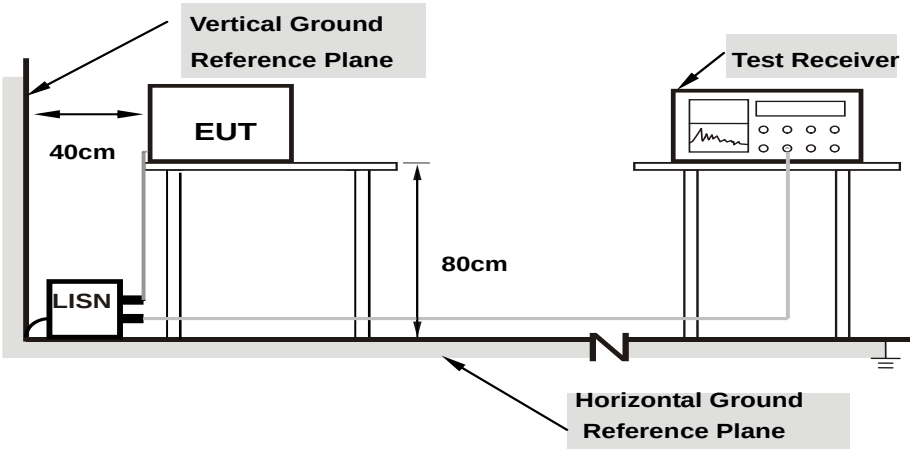
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Condition

Same as 4.1.6.

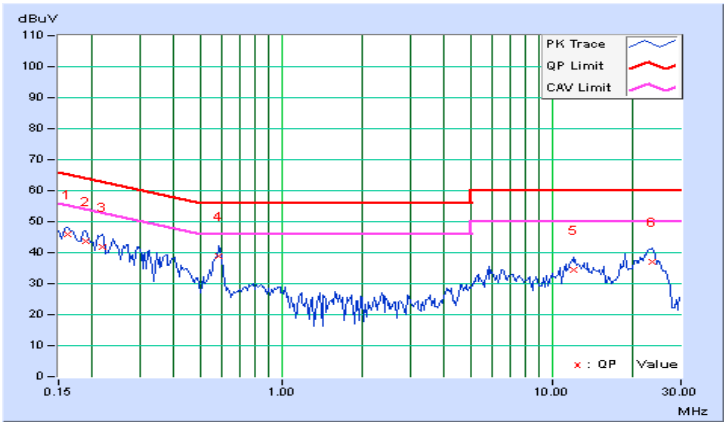
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	0.14	45.90	32.17	46.04	32.31	65.38	55.38	-19.33	-23.06
2	0.18906	0.15	43.67	31.44	43.82	31.59	64.08	54.08	-20.26	-22.49
3	0.21641	0.15	41.82	29.71	41.97	29.86	62.96	52.96	-20.98	-23.09
4	**0.58750**	**0.18**	**38.63**	**32.22**	**38.81**	**32.40**	**56.00**	**46.00**	**-17.19**	**-13.60**
5	12.03906	0.82	33.62	26.59	34.44	27.41	60.00	50.00	-25.56	-22.59
6	23.60156	1.24	35.94	28.15	37.18	29.39	60.00	50.00	-22.82	-20.61

REMARKS:

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

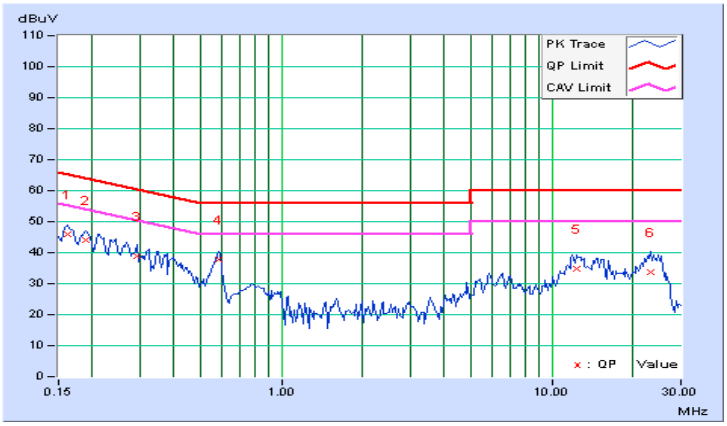


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	0.14	45.86	31.56	46.00	31.70	65.38	55.38	-19.37	-23.67
2	0.18906	0.15	43.75	30.73	43.90	30.88	64.08	54.08	-20.18	-23.20
3	0.29453	0.17	38.57	25.62	38.74	25.79	60.40	50.40	-21.66	-24.61
4	0.58750	0.21	37.56	28.82	37.77	29.03	56.00	46.00	-18.23	-16.97
5	12.40625	0.90	34.09	23.50	34.99	24.40	60.00	50.00	-25.01	-25.60
6	23.32422	1.33	32.30	24.43	33.63	25.76	60.00	50.00	-26.37	-24.24

REMARKS:

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



4.3 Transmit Power Measurment

4.3.1 Limits of Transmit Power Measurement

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

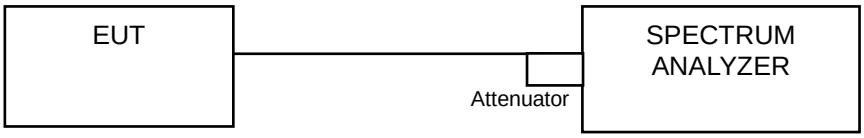
*B is the 26 dB emission bandwidth in megahertz

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

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

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

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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 Condition

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

4.3.7 Test Result

Power Output:

802.11a

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
36	5180	27.102	14.33	24	Pass
40	5200	30.974	14.91	24	Pass
48	5240	31.696	15.01	24	Pass
149	5745	35.318	15.48	30	Pass
157	5785	65.163	18.14	30	Pass
165	5825	45.29	16.56	30	Pass

802.11n (HT20)

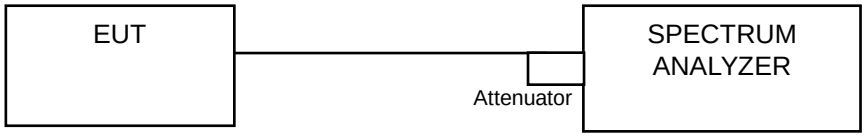
Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
36	5180	26.182	14.18	24	Pass
40	5200	30.061	14.78	24	Pass
48	5240	30.69	14.87	24	Pass
149	5745	34.356	15.36	30	Pass
157	5785	64.565	18.10	30	Pass
165	5825	44.361	16.47	30	Pass

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 Procedure

For U-NII-1 band:

Using method SA-1

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

For U-NII-3:

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

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Condition

Same as Item 4.3.6.

4.4.7 Test Results

For U-NII-1 Band

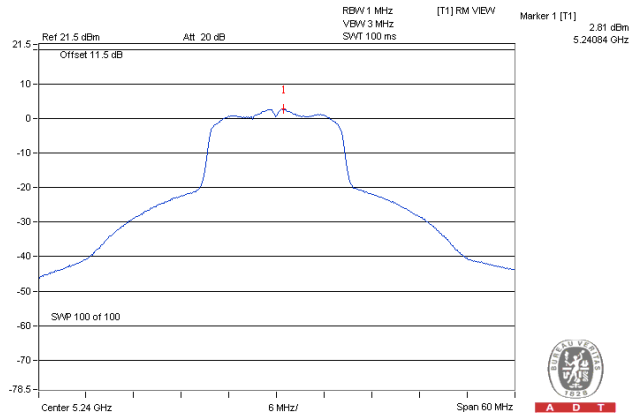
802.11a

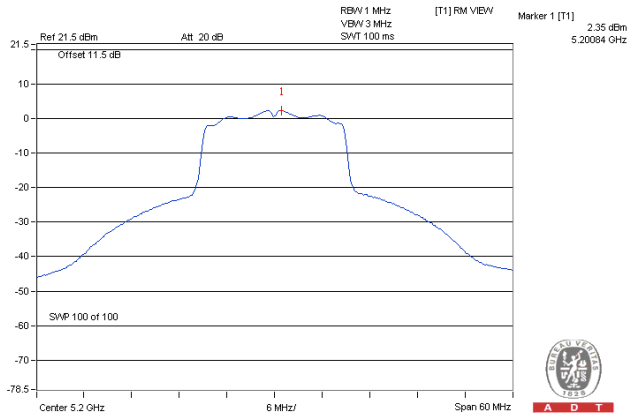
Chan.	Chan. Freq. (MHz)	PSD (dBm)	MAX. Limit (dBm)	Pass / Fail
36	5180	1.87	11	Pass
40	5200	2.67	11	Pass
48	5240	2.81	11	Pass

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	PSD (dBm)	MAX. Limit (dBm)	Pass / Fail
36	5180	1.86	11	Pass
40	5200	2.35	11	Pass
48	5240	1.82	11	Pass

Spectrum Plot of Worst Value	
802.11a – CH 48	**802.11n (HT20) – CH 40**





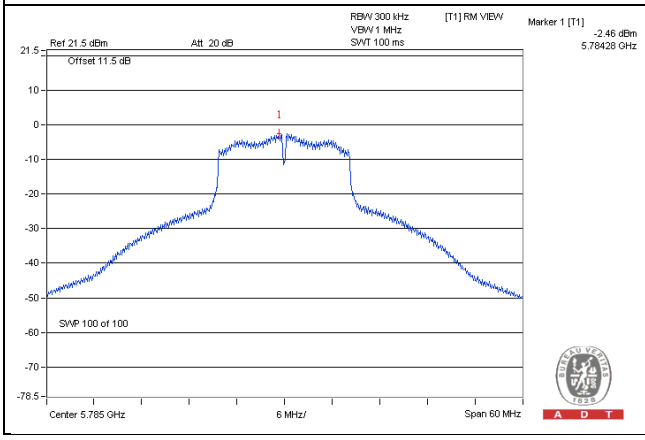
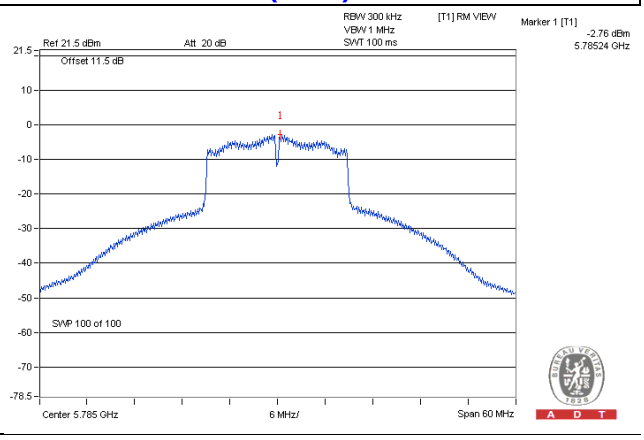
For U-NII-3 Band

802.11a

Chan.	Chan. Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
149	5745	-4.68	-2.46	30	Pass
157	5785	-2.46	-0.24	30	Pass
165	5825	-3.57	-1.35	30	Pass

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
149	5745	-5.03	-2.81	30	Pass
157	5785	-2.76	-0.54	30	Pass
165	5825	-3.92	-1.70	30	Pass

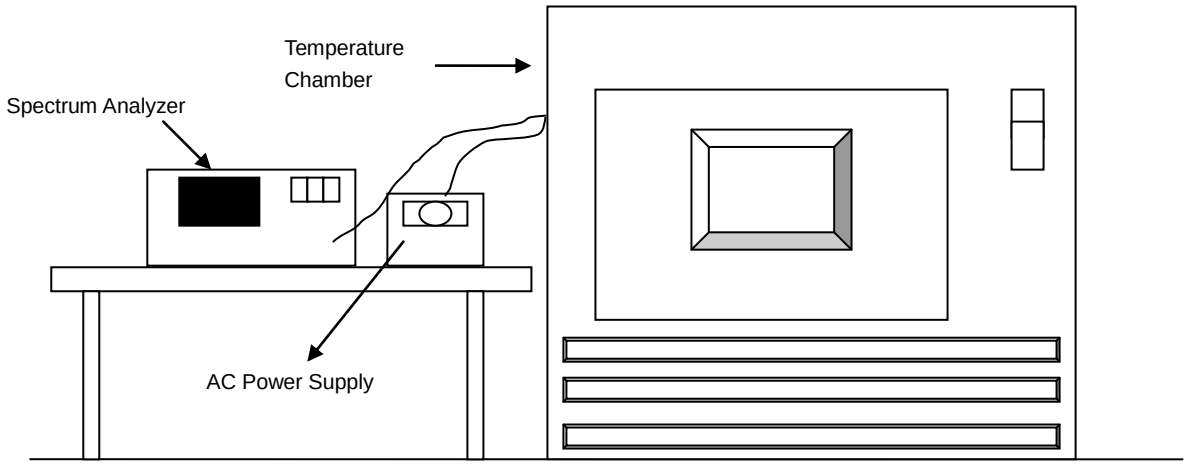
Spectrum Plot of Worst Value	
802.11a – CH 157	**802.11n (HT20) – CH 157**
	

4.5 Frequency Stability Measurement

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

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

4.5.5 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

FREQUEMCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5180MHz									
TEMP. (℃)	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	5179.9855	-0.00028	5179.9841	-0.00031	5179.9815	-0.00036	5179.9825	-0.00034
40	120	5179.9993	-0.00001	5180.0024	0.00005	5179.9977	-0.00004	5179.9982	-0.00003
30	120	5180.0258	0.00050	5180.0248	0.00048	5180.0256	0.00049	5180.0253	0.00049
20	120	5180.0232	0.00045	5180.025	0.00048	5180.0223	0.00043	5180.0247	0.00048
10	120	5179.979	-0.00041	5179.9773	-0.00044	5179.9784	-0.00042	5179.9805	-0.00038
0	120	5179.9943	-0.00011	5179.9934	-0.00013	5179.9923	-0.00015	5179.9913	-0.00017
-10	120	5179.9912	-0.00017	5179.9926	-0.00014	5179.9935	-0.00013	5179.9918	-0.00016
-20	120	5179.9769	-0.00045	5179.9778	-0.00043	5179.9759	-0.00047	5179.9761	-0.00046
-30	120	5179.9766	-0.00045	5179.979	-0.00041	5179.9778	-0.00043	5179.9768	-0.00045

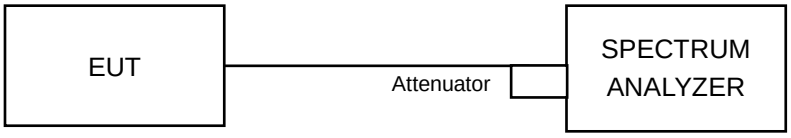
FREQUEMCY STABILITY VERSUS VOLTAGE									
OPERATING FREQUENCY: 5180MHz									
TEMP. (℃)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5180.0233	0.00045	5180.0249	0.00048	5180.0217	0.00042	5180.0238	0.00046
	120	5180.0232	0.00045	5180.025	0.00048	5180.0223	0.00043	5180.0247	0.00048
	102	5180.0239	0.00046	5180.0256	0.00049	5180.0225	0.00043	5180.0246	0.00047

4.6 6dB Bandwidth Measurment

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

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

4.6.5 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

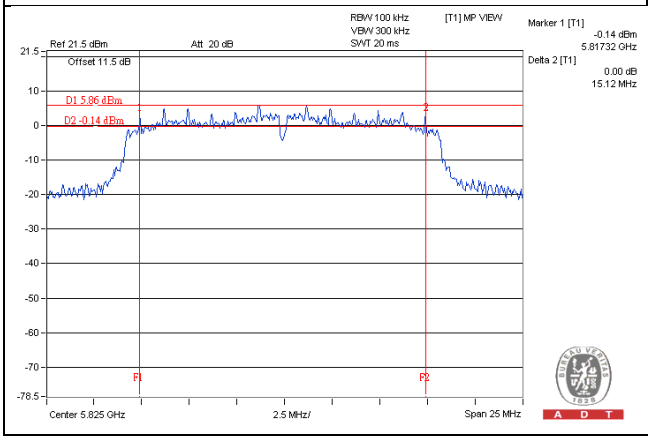
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
149	5745	15.16	0.5	Pass
157	5785	15.73	0.5	Pass
165	5825	15.12	0.5	Pass

802.11n (HT20)

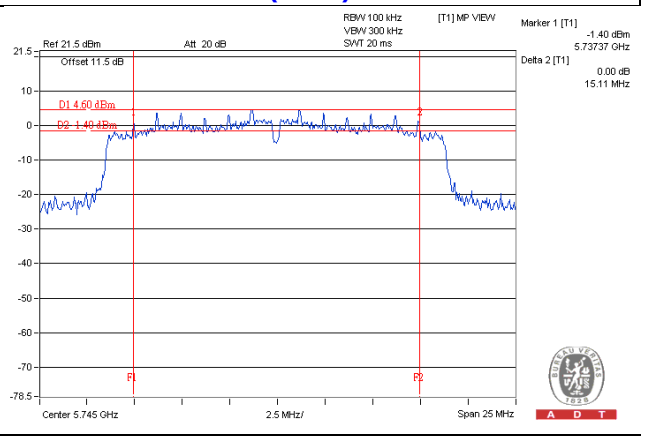
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
149	5745	15.11	0.5	Pass
157	5785	15.12	0.5	Pass
165	5825	15.16	0.5	Pass

Spectrum Plot of Worst Value

802.11a – CH 165



802.11n (HT20) – CH 149



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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Web Site: www.bureauveritas-adt.com

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

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