

# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

**Test Report No.** : W156R-D014  
**AGR No.** : A155A-050  
**Applicant** : LG Electronics USA  
**Address** : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 7632  
**Manufacturer** : LG Electronics Inc.  
**Address** : 222 LG-ro, Jinwi-Myeon, Pyeongtaek-Si, Gyeonggi-Do, 451-713, Korea  
**Type of Equipment** : WLAN Module  
**FCC ID.** : BEJ9QK-TWFMB008D  
**Model Name** : TWFM-B008D  
**Multiple Model Name** : N/A  
**Serial number** : N/A  
**Total page of Report** : 45 pages (including this page)  
**Date of Incoming** : May 08, 2015  
**Date of issue** : June 15, 2015

## SUMMARY

The equipment complies with the regulation; *FCC PART 15 SUBPART C Section 15.247*  
 This test report only contains the result of a single test of the sample supplied for the examination.  
 It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:   
 \_\_\_\_\_  
 Jae-Ho, Lee / Chief Engineer  
 ONETECH Corp.

Approved by:   
 \_\_\_\_\_  
 Sung-Ik, Han/ Managing Director  
 ONETECH Corp.

## CONTENTS

**PAGE**

<b>1. VERIFICATION OF COMPLIANCE .....</b>	<b>5</b>
<b>2. TEST SUMMARY.....</b>	<b>6</b>
<b>2.1 TEST ITEMS AND RESULTS .....</b>	<b>6</b>
<b>2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....</b>	<b>6</b>
<b>2.3 RELATED SUBMITTAL(S) / GRANT(S) .....</b>	<b>6</b>
<b>2.4 PURPOSE OF THE TEST .....</b>	<b>6</b>
<b>2.5 TEST METHODOLOGY.....</b>	<b>6</b>
<b>2.6 TEST FACILITY.....</b>	<b>6</b>
<b>3. GENERAL INFORMATION.....</b>	<b>7</b>
<b>3.1 PRODUCT DESCRIPTION.....</b>	<b>7</b>
<b>3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....</b>	<b>7</b>
<b>4. EUT MODIFICATIONS.....</b>	<b>7</b>
<b>5. SYSTEM TEST CONFIGURATION .....</b>	<b>8</b>
<b>5.1 JUSTIFICATION.....</b>	<b>8</b>
<b>5.2 PERIPHERAL EQUIPMENT .....</b>	<b>8</b>
<b>5.3 MODE OF OPERATION DURING THE TEST .....</b>	<b>9</b>
<b>5.4 CONFIGURATION OF TEST SYSTEM.....</b>	<b>10</b>
<b>5.5 ANTENNA REQUIREMENT .....</b>	<b>10</b>
<b>ANTENNAS LIST .....</b>	<b>10</b>
<b>6. PRELIMINARY TEST .....</b>	<b>11</b>
<b>6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....</b>	<b>11</b>
<b>6.2 GENERAL RADIATED EMISSIONS TESTS .....</b>	<b>11</b>
<b>7. 100 KHZ BANDWIDTH OUTSIDE THE FREQUENCY BAND.....</b>	<b>12</b>
<b>7.1 OPERATING ENVIRONMENT .....</b>	<b>12</b>
<b>7.2 TEST SET-UP FOR CONDUCTED MEASUREMENT .....</b>	<b>12</b>
<b>7.3 TEST SET-UP FOR RADIATED MEASUREMENT.....</b>	<b>12</b>
<b>7.4 TEST EQUIPMENT USED.....</b>	<b>12</b>
<b>7.5 TEST DATA FOR RADIATED EMISSION.....</b>	<b>13</b>
<b>7.5.1 Radiated Emission which fall in the Restricted Band.....</b>	<b>13</b>
<b>7.5.2 Spurious &amp; Harmonic Radiated Emission.....</b>	<b>25</b>

<b>8. RADIATED EMISSION TEST .....</b>	<b>37</b>
<b>8.1 OPERATING ENVIRONMENT .....</b>	<b>37</b>
<b>8.2 TEST SET-UP .....</b>	<b>37</b>
<b>8.3 TEST EQUIPMENT USED.....</b>	<b>37</b>
<b>8.4 TEST DATA FOR 802.11B WLAN MODE.....</b>	<b>38</b>
<i>8.4.1 Test data .....</i>	<i>38</i>
<b>8.5 TEST DATA FOR 802.11G WLAN MODE .....</b>	<b>40</b>
<i>8.5.1 Test data .....</i>	<i>40</i>
<b>8.6 TEST DATA FOR 802.11N_HT20 WLAN MODE.....</b>	<b>42</b>
<i>8.6.1 Test data .....</i>	<i>42</i>
<b>8.7 TEST DATA FOR 802.11N_HT40 WLAN MODE.....</b>	<b>44</b>
<i>8.7.1 Test data .....</i>	<i>44</i>

### Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W156R-D014	June 15, 2015	Initial Issue	All

## 1. VERIFICATION OF COMPLIANCE

Applicant : LG Electronics USA  
 Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 7632  
 Contact Person : Yongduk Kwon / Research Engineer  
 Telephone No. : +82-31-610-9606  
 FCC ID : BEJ9QK-TWFMB008D  
 Model Name : TWFM-B008D  
 Serial Number : N/A  
 Date : June 15, 2015

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Modular Transmitter, WLAN Module
THIS REPORT CONCERNS	Class II Permissive Change
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification, Modular Approval
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

## 2. TEST SUMMARY

### 2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (2)	Minimum 6 dB Bandwidth	PASS
15.247 (b) (3)	Maximum Peak Conducted Output Power	N/A (See Note 1)
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	Peak Power Spectral Density	N/A (See Note 1)
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	N/A (See Note 1)
15.203	Antenna Requirement	Met requirement / PASS

Note 1: The test is not performed because it is C2PC.

### 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

### 2.3 Related Submittal(s) / Grant(s)

Antennas are added. (NP8350 V3\_B, NP8350 V3) / C2PC.

### 2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247

### 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

### 2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862 Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-4617/ G-666/ T-1842 IC (Industry Canada) – Registration No. Site# 3736-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation No. 85

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

### 3. GENERAL INFORMATION

#### 3.1 Product Description

The LG Electronics USA , Model TWFM-B008D (referred to as the EUT in this report) is a WLAN Module. Product specification information described herein was obtained from product data sheet or user’s manual.

DEVICE TYPE	WLAN Module		
FREQUENCY RANGE	2 412 MHz ~ 2 462 MHz_20 MHz BW		
	2 422 MHz ~ 2 452 MHz_40 MHz BW		
MAX. RF OUTPUT POWER	2 400 MHz ~ 2 483.5 MHz Band	Antenna 0	Wi-Fi 802.11b(22.26 dBm) Wi-Fi 802.11g (23.11 dBm) Wi-Fi 802.11n_20 MHz (23.53 dBm) Wi-Fi 802.11n_40 MHz (24.78 dBm)
		Antenna 1	Wi-Fi 802.11b(21.11 dBm) Wi-Fi 802.11g (22.26 dBm) Wi-Fi 802.11n_20 MHz (22.64 dBm) Wi-Fi 802.11n_40 MHz (23.55 dBm)
MODULATION TYPE	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11a/g/n(HT20)/n(HT40): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)		
Antenna Gain	NP8350 V3_B : -0.79 dBi (tested)		
	NP8350 V3 : -1.08 dBi		
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	20 MHz		

#### 3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

### 4. EUT MODIFICATIONS

-. None

## 5. SYSTEM TEST CONFIGURATION

### 5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	LG Electronics Inc.	TWFM-B008D	BEJ9QK-TWFMB008D

### 5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
TWFM-B008D	LG Electronics Inc.	WLAN Module (EUT)	Notebook PC
Pavilion g6	HP	Notebook PC	EUT
Series PPP009L-E	LITE-ON TECHNOLOGY CO, LTD.	ADAPTER	Notebook PC



### 5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting mode is programmed.

#### **-2.4 GHz Band**

The worse case data rate for each modulation is determined 1 Mbps(Ant.0) / 1 Mbps(Ant.1) for IEEE 802.11b, 12 Mbps(Ant.0) / 12 Mbps(Ant.1) for IEEE 802.11g, 13 Mbps(Ant.0) / 13 Mbps(Ant.1) for HT20, 121 Mbps(Ant.0)/ 13.5 Mbps(Ant1) for HT40.

### 5.4 Configuration of Test System

**Line Conducted Test:** The EUT was connected to USB and the power of USB was connected to Notebook PC. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

**Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter open area test site.  
The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

### 5.5 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

**Antenna Construction:**

The transmitter antenna of the EUT is a PIFA antenna, so no consideration of replacement by the user.

**Antennas list**

Model	Type	Frequency band	Gain (dBi)	Note
NP8740	PCB antenna	2.4 GHz band	3.70	Original antenna
		5.15 GHz band	4.09	
		5.8 GHz band	5.58	
NP8350 V3_B		2.4 GHz band	-0.79	Additional antenna1 by C2PC (Tested)
		5.15 GHz band	3.69	
		5.8 GHz band	2.88	
NP8350 V3		2.4 GHz band	-1.08	Additional antenna2 by C2PC
		5.15 GHz band	1.14	
		5.8 GHz band	2.04	

## 6. PRELIMINARY TEST

### 6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	-

### 6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

## 7. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

### 7.1 Operating environment

Temperature : 24 °C  
 Relative humidity : 50 % R.H.

### 7.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution and video bandwidth is set to 100 kHz, and peak detection was used.



### 7.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m, open-field test site. The EUT was placed on a non-conductive turntable above the ground plane.

The frequency spectrum from 30 MHz to 40 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

### 7.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Jul. 30, 2014 (1Y)
■ -	ESCI	Rohde & Schwarz	Test Receiver	101012	Nov. 03, 2014 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 29, 2015 (1Y)
■ -	SCU-18	Rohde & Schwarz	Pre-Amplifier	10041	Nov. 25, 2014 (1Y)
■ -	DT3000	Innco System	Turn Table	930611	N/A
■ -	MA4000-EP	Innco System	Antenna Master	3320611	N/A
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Jul. 10, 2014 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Sep. 05, 2013 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Sep. 05, 2013 (2Y)

All test equipment used is calibrated on a regular basis.

**7.5 Test data for radiated emission**

**7.5.1 Radiated Emission which fall in the Restricted Band**

**7.5.1.1 Test data for 802.11b WLAN Mode**

**7.5.1.1.1 Test data for Antenna 0**

- . Test Date : June 07, 2015
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 30 MHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Result : PASSED

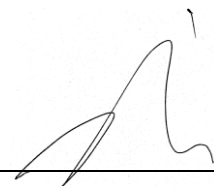
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 388.25	67.36	Peak	H	27.10	7.50	43.00	58.96	74.00	15.04
	36.62	Average	H				28.22	54.00	25.78
2 389.03	66.57	Peak	V	27.10	7.50	43.00	58.17	74.00	15.83
	45.50	Average	V				37.10	54.00	16.90
<b>Test Data for High Channel</b>									
2 484.66	53.82	Peak	H	27.10	7.50	43.00	45.42	74.00	28.58
	42.66	Average	H				34.26	54.00	19.74
2 485.46	51.57	Peak	V	27.10	7.50	43.00	43.17	74.00	30.83
	39.37	Average	V				30.97	54.00	23.03

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.1.1.2 Test data for Antenna 1**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 30 MHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED


Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 388.60	54.44	Peak	H	27.10	7.50	43.00	46.04	74.00	27.96
	41.50	Average	H				33.10	54.00	20.90
2 389.23	51.70	Peak	V				43.30	74.00	30.70
	39.12	Average	V				30.72	54.00	23.28
<b>Test Data for High Channel</b>									
2 483.99	54.03	Peak	H	27.10	7.50	43.00	45.63	74.00	28.37
	42.53	Average	H				34.13	54.00	19.87
2 484.66	52.01	Peak	V				43.61	74.00	30.39
	39.77	Average	V				31.37	54.00	22.63

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.1.1.3 Test data for Multiple transmit**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 30 MHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

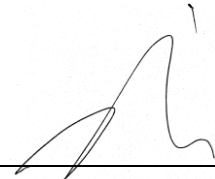
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 389.37	68.41	Peak	H	27.10	7.50	43.00	60.01	74.00	13.99
	39.05	Average	H				30.65	54.00	23.35
2 389.85	67.13	Peak	V				58.73	74.00	15.27
	46.29	Average	V				37.89	54.00	16.11
<b>Test Data for High Channel</b>									
2 484.06	56.12	Peak	H	27.10	7.50	43.00	47.72	74.00	26.28
	43.07	Average	H				34.67	54.00	19.33
2 484.38	53.81	Peak	V				45.41	74.00	28.59
	40.26	Average	V				31.86	54.00	22.14

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.1.2 Test data for 802.11g WLAN Mode**

**7.5.1.2.1 Test data for Antenna 0**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 30 MHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

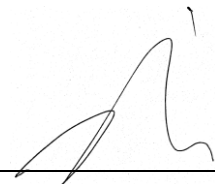
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 387.61	49.30	Peak	H	27.10	7.50	43.00	40.90	74.00	33.10
	36.84	Average	H				28.44	54.00	25.56
2 389.86	51.91	Peak	V	27.10	7.50	43.00	43.51	74.00	30.49
	35.27	Average	V				26.87	54.00	27.13
<b>Test Data for High Channel</b>									
2 483.79	50.17	Peak	H	27.10	7.50	43.00	41.77	74.00	32.23
	37.25	Average	H				28.85	54.00	25.15
2 484.06	48.81	Peak	V	27.10	7.50	43.00	40.41	74.00	33.59
	35.97	Average	V				27.57	54.00	26.43

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**



**7.5.1.2.2 Test data for Antenna 1**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 30 MHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

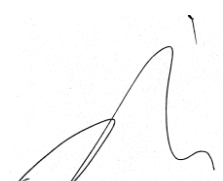
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 388.33	48.97	Peak	H	27.10	7.50	43.00	40.57	74.00	33.43
	35.98	Average	H				27.58	54.00	26.42
2 389.86	51.00	Peak	V				42.60	74.00	31.40
	35.00	Average	V				26.60	54.00	27.40
<b>Test Data for High Channel</b>									
2 484.06	49.95	Peak	H	27.10	7.50	43.00	41.55	74.00	32.45
	36.68	Average	H				28.28	54.00	25.72
2 484.06	48.81	Peak	V				40.41	74.00	33.59
	35.44	Average	V				27.04	54.00	26.96

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.1.2.3 Test data for Multiple transmit**

- . Test Date : June 07, 2015
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 30 MHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Result : PASSED

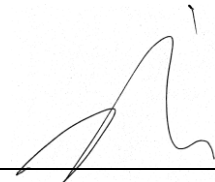
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 389.95	51.39	Peak	H	27.10	7.50	43.00	42.99	74.00	31.01
	38.02	Average	H				29.62	54.00	24.38
2 389.95	51.34	Peak	V				42.94	74.00	31.06
	36.02	Average	V				27.62	54.00	26.38
<b>Test Data for High Channel</b>									
2 488.38	52.80	Peak	H	27.10	7.50	43.00	44.40	74.00	29.60
	38.33	Average	H				29.93	54.00	24.07
2 488.31	51.21	Peak	V				42.81	74.00	31.19
	36.39	Average	V				27.99	54.00	26.01

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.1.3 Test data for 802.11n\_HT20 WLAN Mode**

**7.5.1.3.1 Test data for Antenna 0**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 30 MHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 389.77	48.57	Peak	H	27.10	7.50	43.00	40.17	74.00	33.83
	36.62	Average	H				28.22	54.00	25.78
2 389.86	51.03	Peak	V				42.63	74.00	31.37
	35.39	Average	V				26.99	54.00	27.01
<b>Test Data for High Channel</b>									
2 483.99	51.09	Peak	H	27.10	7.50	43.00	42.69	74.00	31.31
	38.16	Average	H				29.76	54.00	24.24
2 483.73	50.05	Peak	V				41.65	74.00	32.35
	36.80	Average	V				28.40	54.00	25.60

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.1.3.2 Test data for Antenna 1**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 30 MHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

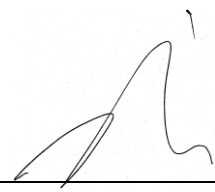
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 387.25	49.10	Peak	H	27.10	7.50	43.00	40.70	74.00	33.30
	35.91	Average	H				27.51	54.00	26.49
2 389.14	50.77	Peak	V				42.37	74.00	31.63
	34.97	Average	V				26.57	54.00	27.43
<b>Test Data for High Channel</b>									
2 483.99	48.28	Peak	H	27.10	7.50	43.00	39.88	74.00	34.12
	35.77	Average	H				27.37	54.00	26.63
2 484.06	50.38	Peak	V				41.98	74.00	32.02
	37.07	Average	V				28.67	54.00	25.33

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.1.3.3 Test data for Multiple transmit**

- . Test Date : June 07, 2015
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 30 MHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Result : PASSED

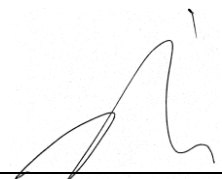
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 388.42	50.91	Peak	H	27.10	7.50	43.00	42.51	74.00	31.49
	38.05	Average	H				29.65	54.00	24.35
2 389.95	50.42	Peak	V				42.02	74.00	31.98
	35.80	Average	V				27.40	54.00	26.60
<b>Test Data for High Channel</b>									
2 483.73	51.23	Peak	H	27.10	7.50	43.00	42.83	74.00	31.17
	40.18	Average	H				31.78	54.00	22.22
2 483.60	50.14	Peak	V				41.74	74.00	32.26
	37.54	Average	V				29.14	54.00	24.86

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.1.4 Test data for 802.11n\_HT40 WLAN Mode**

**7.5.1.4.1 Test data for Antenna 0**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 30 MHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

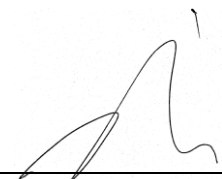
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 388.33	55.69	Peak	H	27.10	7.50	43.00	47.29	74.00	26.71
	40.13	Average	H				31.73	54.00	22.27
2 388.41	52.67	Peak	V				44.27	74.00	29.73
	37.00	Average	V				28.60	54.00	25.40
<b>Test Data for High Channel</b>									
2 483.53	58.20	Peak	H	27.10	7.50	43.00	49.80	74.00	24.20
	45.05	Average	H				36.65	54.00	17.35
2 483.53	54.96	Peak	V				46.56	74.00	27.44
	41.90	Average	V				33.50	54.00	20.50

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.1.4.2 Test data for Antenna 1**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 30 MHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

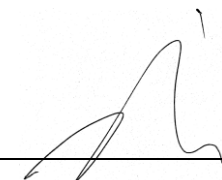
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 389.41	50.49	Peak	H	27.10	7.50	43.00	42.09	74.00	31.91
	36.89	Average	H				28.49	54.00	25.51
2 389.95	51.71	Peak	V				43.31	74.00	30.69
	35.43	Average	V				27.03	54.00	26.97
<b>Test Data for High Channel</b>									
2 483.93	54.51	Peak	H	27.10	7.50	43.00	46.11	74.00	27.89
	43.47	Average	H				35.07	54.00	18.93
2 483.93	51.96	Peak	V				43.56	74.00	30.44
	40.54	Average	V				32.14	54.00	21.86

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



Tested by: Jun-Hui, Lee / Senior Engineer

**7.5.1.4.3 Test data for Multiple transmit**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 30 MHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

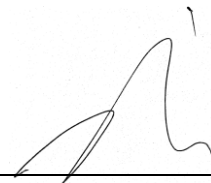
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 387.52	52.79	Peak	H	27.10	7.50	43.00	44.39	74.00	29.61
	39.11	Average	H				30.71	54.00	23.29
2 387.52	50.90	Peak	V				42.50	74.00	31.50
	36.49	Average	V				28.09	54.00	25.91
<b>Test Data for High Channel</b>									
2484.131	59.15	Peak	H	27.10	7.50	43.00	50.75	74.00	23.25
	46.06	Average	H				37.66	54.00	16.34
2484.131	56.88	Peak	V				48.48	74.00	25.52
	42.74	Average	V				34.34	54.00	19.66

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**



### 7.5.2 Spurious & Harmonic Radiated Emission

#### 7.5.2.1 Test data for 802.11b WLAN Mode

##### 7.5.2.1.1 Test data for Antenna 0

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

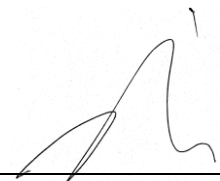
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 824.00	43.10	Peak	H	30.70	11.10	42.50	42.40	73.98	31.58
	33.21	Average	H				32.51	53.98	21.47
	42.21	Peak	V				41.51	73.98	32.47
	33.40	Average	V				32.70	53.98	21.28
<b>Test Data for Middle Channel</b>									
4 874.00	43.13	Peak	H	30.70	11.20	42.40	42.63	73.98	31.35
	33.49	Average	H				32.99	53.98	20.99
	43.18	Peak	V				42.68	73.98	31.30
	33.52	Average	V				33.02	53.98	20.96
<b>Test Data for High Channel</b>									
4 924.00	43.23	Peak	H	30.80	11.80	42.30	43.53	73.98	30.45
	33.65	Average	H				33.95	53.98	20.03
	42.87	Peak	V				43.17	73.98	30.81
	32.54	Average	V				32.84	53.98	21.14

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.2.1.2 Test data for Antenna 1**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

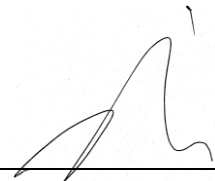
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 824.00	43.41	Peak	H	30.70	11.10	42.50	42.71	73.98	31.27
	32.52	Average	H				31.82	53.98	22.16
	42.94	Peak	V				42.24	73.98	31.74
	32.56	Average	V				31.86	53.98	22.12
<b>Test Data for Middle Channel</b>									
4 874.00	42.74	Peak	H	30.70	11.20	42.40	42.24	73.98	31.74
	32.23	Average	H				31.73	53.98	22.25
	43.53	Peak	V				43.03	73.98	30.95
	52.51	Average	V				52.01	53.98	1.97
<b>Test Data for High Channel</b>									
4 924.00	43.82	Peak	H	30.80	11.80	42.30	44.12	73.98	29.86
	33.02	Average	H				33.32	53.98	20.66
	43.21	Peak	V				43.51	73.98	30.47
	32.69	Average	V				32.99	53.98	20.99

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.2.1.3 Test data for Multiple transmit**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

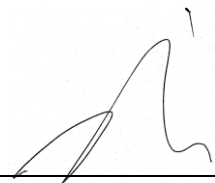
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 824.00	43.28	Peak	H	30.70	11.10	42.50	42.58	73.98	31.40
	33.61	Average	H				32.91	53.98	21.07
	43.12	Peak	V				42.42	73.98	31.56
	33.45	Average	V				32.75	53.98	21.23
<b>Test Data for Middle Channel</b>									
4 874.00	43.95	Peak	H	30.70	11.20	42.40	43.45	73.98	30.53
	32.32	Average	H				31.82	53.98	22.16
	43.34	Peak	V				42.84	73.98	31.14
	33.74	Average	V				33.24	53.98	20.74
<b>Test Data for High Channel</b>									
4 924.00	43.58	Peak	H	30.80	11.80	42.30	43.88	73.98	30.10
	33.22	Average	H				33.52	53.98	20.46
	43.82	Peak	V				44.12	73.98	29.86
	32.31	Average	V				32.61	53.98	21.37

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.2.2 Test data for 802.11g WLAN Mode**

**7.5.2.2.1 Test data for Antenna 0**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

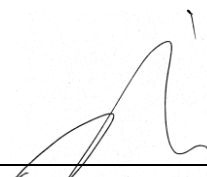
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 824.00	43.12	Peak	H	30.70	11.10	42.50	42.42	73.98	31.56
	33.09	Average	H				32.39	53.98	21.59
	42.89	Peak	V				42.19	73.98	31.79
	32.48	Average	V				31.78	53.98	22.20
<b>Test Data for Middle Channel</b>									
4 874.00	43.57	Peak	H	30.70	11.20	42.40	43.07	73.98	30.91
	32.55	Average	H				32.05	53.98	21.93
	43.98	Peak	V				43.48	73.98	30.50
	33.21	Average	V				32.71	53.98	21.27
<b>Test Data for High Channel</b>									
4 924.00	42.83	Peak	H	30.80	11.80	42.30	43.13	73.98	30.85
	32.68	Average	H				32.98	53.98	21.00
	43.16	Peak	V				43.46	73.98	30.52
	33.09	Average	V				33.39	53.98	20.59

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.2.2.2 Test data for Antenna 1**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

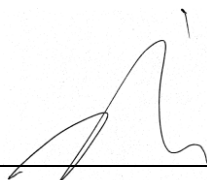
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 824.00	43.33	Peak	H	30.70	11.10	42.50	42.63	73.98	31.35
	33.12	Average	H				32.42	53.98	21.56
	43.72	Peak	V				43.02	73.98	30.96
	33.00	Average	V				32.30	53.98	21.68
<b>Test Data for Middle Channel</b>									
4 874.00	43.45	Peak	H	30.70	11.20	42.40	42.95	73.98	31.03
	32.64	Average	H				32.14	53.98	21.84
	42.68	Peak	V				42.18	73.98	31.80
	33.45	Average	V				32.95	53.98	21.03
<b>Test Data for High Channel</b>									
4 924.00	43.16	Peak	H	30.80	11.80	42.30	43.46	73.98	30.52
	32.44	Average	H				32.74	53.98	21.24
	43.88	Peak	V				44.18	73.98	29.80
	33.51	Average	V				33.81	53.98	20.17

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.2.2.3 Test data for Multiple transmit**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

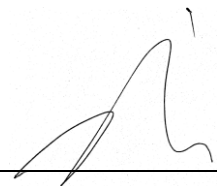
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 824.00	43.05	Peak	H	31.70	11.10	42.50	42.35	73.98	31.63
	33.45	Average	H				32.75	53.98	21.23
	43.90	Peak	V				43.20	73.98	30.78
	33.10	Average	V				32.40	53.98	21.58
<b>Test Data for Middle Channel</b>									
4 874.00	43.07	Peak	H	31.70	11.20	42.40	42.57	73.98	31.41
	32.53	Average	H				32.03	53.98	21.95
	43.14	Peak	V				42.64	73.98	31.34
	33.10	Average	V				32.60	53.98	21.38
<b>Test Data for High Channel</b>									
4 924.00	42.60	Peak	H	30.80	11.80	42.30	42.90	73.98	31.08
	32.31	Average	H				32.61	53.98	21.37
	43.17	Peak	V				43.47	73.98	30.51
	32.62	Average	V				32.92	53.98	21.06

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.2.3 Test data for 802.11n\_HT20 WLAN Mode**

**7.5.2.3.1 Test data for Antenna 0**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

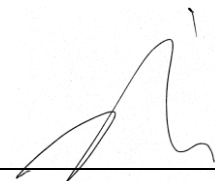
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 824.00	43.58	Peak	H	30.70	11.10	42.50	42.88	73.98	31.10
	32.16	Average	H				31.46	53.98	22.52
	44.00	Peak	V				43.30	73.98	30.68
	32.75	Average	V				32.05	53.98	21.93
<b>Test Data for Middle Channel</b>									
4 874.00	43.23	Peak	H	30.70	11.20	42.40	42.73	73.98	31.25
	32.50	Average	H				32.00	53.98	21.98
	42.72	Peak	V				42.22	73.98	31.76
	32.59	Average	V				32.09	53.98	21.89
<b>Test Data for High Channel</b>									
4 924.00	43.01	Peak	H	30.80	11.80	42.30	43.31	73.98	30.67
	33.56	Average	H				33.86	53.98	20.12
	43.21	Peak	V				43.51	73.98	30.47
	33.16	Average	V				33.46	53.98	20.52

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.2.3.2 Test data for Antenna 1**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

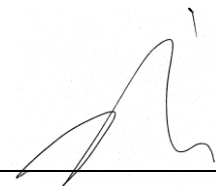
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 824.00	43.38	Peak	H	30.70	11.10	42.50	42.68	73.98	31.30
	33.72	Average	H				33.02	53.98	20.96
	42.55	Peak	V				41.85	73.98	32.13
	33.76	Average	V				33.06	53.98	20.92
<b>Test Data for Middle Channel</b>									
4 874.00	43.46	Peak	H	30.70	11.20	42.40	42.96	73.98	31.02
	33.32	Average	H				32.82	53.98	21.16
	43.41	Peak	V				42.91	73.98	31.07
	33.18	Average	V				32.68	53.98	21.30
<b>Test Data for High Channel</b>									
4 924.00	42.97	Peak	H	31.80	11.80	42.30	43.27	73.98	30.71
	32.35	Average	H				32.65	53.98	21.33
	42.55	Peak	V				42.85	73.98	31.13
	33.44	Average	V				33.74	53.98	20.24

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**



**7.5.2.3.3 Test data for Multiple transmit**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

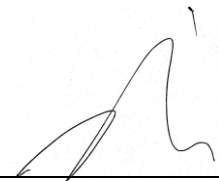
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 824.00	42.54	Peak	H	30.70	11.10	42.50	41.84	73.98	32.14
	33.80	Average	H				33.10	53.98	20.88
	43.56	Peak	V				42.86	73.98	31.12
	32.62	Average	V				31.92	53.98	22.06
<b>Test Data for Middle Channel</b>									
4 874.00	42.67	Peak	H	30.70	11.20	42.40	42.17	73.98	31.81
	32.98	Average	H				32.48	53.98	21.50
	43.09	Peak	V				42.59	73.98	31.39
	32.42	Average	V				31.92	53.98	22.06
<b>Test Data for High Channel</b>									
4 924.00	42.81	Peak	H	30.80	11.80	42.30	43.11	73.98	30.87
	32.49	Average	H				32.79	53.98	21.19
	43.23	Peak	V				43.53	73.98	30.45
	33.46	Average	V				33.76	53.98	20.22

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.2.4 Test data for 802.11n\_HT40 WLAN Mode**

**7.5.2.4.1 Test data for Antenna 0**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

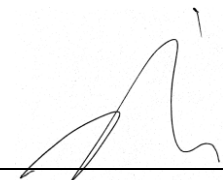
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 844.00	43.15	Peak	H	30.70	11.10	42.50	42.45	73.98	31.53
	32.48	Average	H				31.78	53.98	22.20
	43.09	Peak	V				42.39	73.98	31.59
	33.38	Average	V				32.68	53.98	21.30
<b>Test Data for Middle Channel</b>									
4 874.00	42.67	Peak	H	30.70	11.20	42.40	42.17	73.98	31.81
	33.72	Average	H				33.22	53.98	20.76
	44.08	Peak	V				43.58	73.98	30.40
	32.85	Average	V				32.35	53.98	21.63
<b>Test Data for High Channel</b>									
4 904.00	43.35	Peak	H	30.80	11.80	42.30	43.65	73.98	30.33
	32.64	Average	H				32.94	53.98	21.04
	43.53	Peak	V				43.83	73.98	30.15
	32.77	Average	V				33.07	53.98	20.91

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.2.4.2 Test data for Antenna 1**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

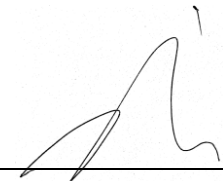
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 844.00	43.34	Peak	H	30.70	11.10	42.50	42.64	73.98	31.34
	33.65	Average	H				32.95	53.98	21.03
	42.79	Peak	V				42.09	73.98	31.89
	32.40	Average	V				31.70	53.98	22.28
<b>Test Data for Middle Channel</b>									
4 874.00	43.25	Peak	H	30.70	11.20	42.40	42.75	73.98	31.23
	32.62	Average	H				32.12	53.98	21.86
	43.84	Peak	V				43.34	73.98	30.64
	33.21	Average	V				32.71	53.98	21.27
<b>Test Data for High Channel</b>									
4 904.00	42.91	Peak	H	30.80	11.80	42.30	43.21	73.98	30.77
	33.58	Average	H				33.88	53.98	20.10
	43.12	Peak	V				43.42	73.98	30.56
	32.40	Average	V				32.70	53.98	21.28

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

**7.5.2.4.3 Test data for Multiple transmit**

- Test Date : June 07, 2015
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

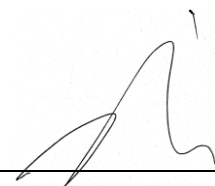
Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 844.00	43.54	Peak	H	30.70	11.10	42.50	42.84	73.98	31.14
	33.44	Average	H				32.74	53.98	21.24
	43.70	Peak	V				43.00	73.98	30.98
	32.47	Average	V				31.77	53.98	22.21
<b>Test Data for Middle Channel</b>									
4 874.00	42.91	Peak	H	30.70	11.20	42.40	42.41	73.98	31.57
	33.67	Average	H				33.17	53.98	20.81
	43.01	Peak	V				42.51	73.98	31.47
	32.41	Average	V				31.91	53.98	22.07
<b>Test Data for High Channel</b>									
4 904.00	42.66	Peak	H	30.80	11.80	42.30	42.96	73.98	31.02
	33.64	Average	H				33.94	53.98	20.04
	43.02	Peak	V				43.32	73.98	30.66
	33.17	Average	V				33.47	53.98	20.51

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



**Tested by: Jun-Hui, Lee / Senior Engineer**

## 8. RADIATED EMISSION TEST

### 8.1 Operating environment

Temperature : 22 ~ 23 °C  
 Relative humidity : 54 ~ 55 % R.H.

### 8.2 Test set-up

The radiated emissions measurements were on the 3 m, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

### 8.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Jul. 30, 2014 (1Y)
■ - ESCI	Rohde & Schwarz	Test Receiver	101012	Nov. 03, 2014 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 29, 2015 (1Y)
■ - SCU-18	Rohde & Schwarz	Pre-Amplifier	10041	Nov. 25, 2014 (1Y)
■ - DT3000	Innco System	Turn Table	930611	N/A
■ - MA4000-EP	Innco System	Antenna Master	3320611	N/A
■ - VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Jul. 10, 2014 (2Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Sep. 05, 2013 (2Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Sep. 05, 2013 (2Y)

All test equipment used is calibrated on a regular basis.

8.4 Test data for 802.11b WLAN Mode

8.4.1 Test data

8.4.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 54 ~ 55 % R.H. Temperature: 22 ~ 23 °C

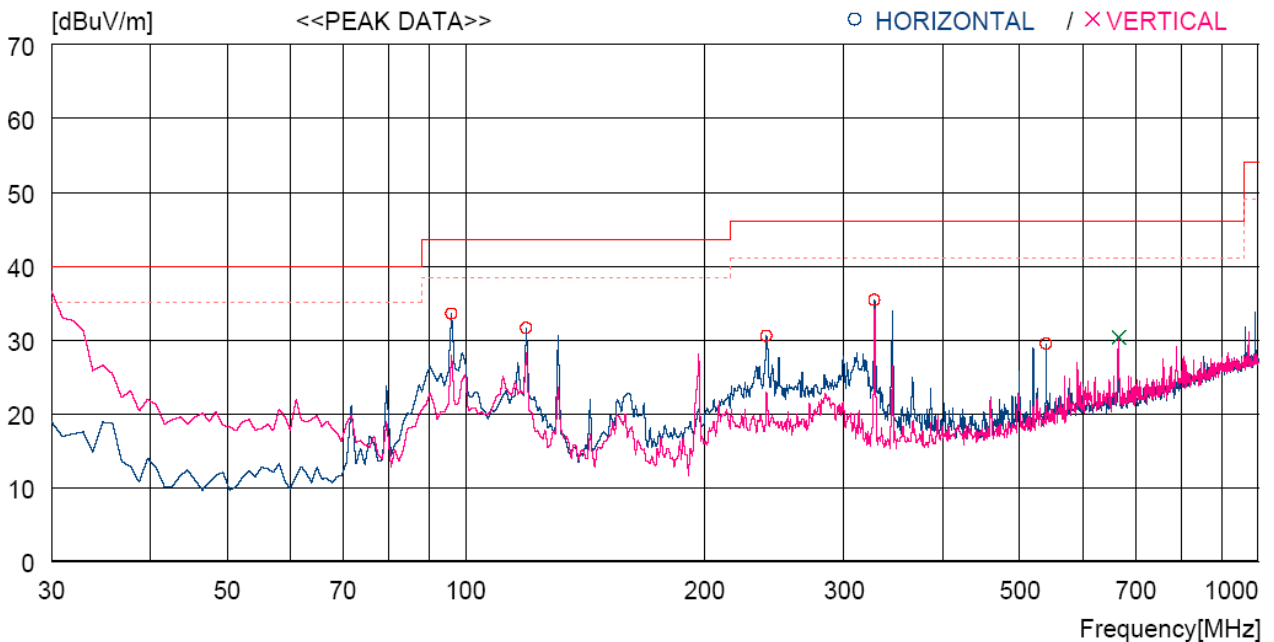
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : WLAN Module Date: June 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

-Ant0, Ant1 and Multiple transmit with Low, Middle and High Channels were tested, but the worst data were recorded.



No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	95.960	52.7	11.2	2.7	33.1	33.5	43.5	10	400	0
2	119.240	50.9	10.3	3.5	33.1	31.6	43.5	11.9	300	359
3	239.520	47.2	12.1	4.1	32.9	30.5	46.0	15.5	100	359
4	327.790	49.3	14.2	4.8	32.9	35.4	46.0	10.6	100	359
5	540.220	38.2	18.1	6.3	33.2	29.4	46.0	16.6	200	0
----- Vertical -----										
6	666.316	37.1	19.5	7.0	33.3	30.3	46.0	15.7	100	271

**8.4.1.2 Test data for Below 30 MHz**

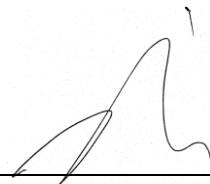
- . Test Date : June 09, 2015
- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

**8.4.1.3 Test data for above 1 GHz**

- . Test Date : June 09, 2015
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



**Tested by: Jun-Hui, Lee / Senior Engineer**

8.5 Test data for 802.11g WLAN Mode

8.5.1 Test data

8.5.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 54 ~ 55 % R.H. Temperature: 22 ~ 23 °C

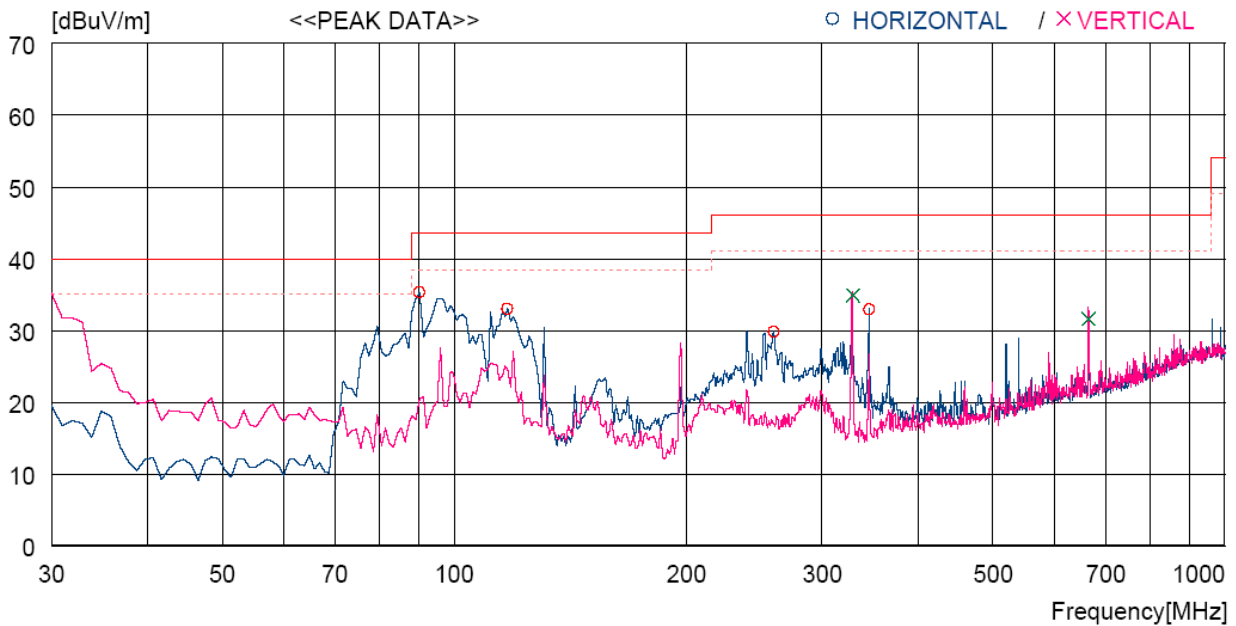
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : WLAN Module Date: June 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

-Ant0, Ant1 and Multiple transmit with Low, Middle and High Channels were tested, but the worst data were recorded.



No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	90.140	55.7	10.1	2.6	33.1	35.3	43.5	8.2	200	39
2	117.300	52.3	10.5	3.3	33.1	33.0	43.5	10.5	200	0
3	259.890	46.0	12.6	4.1	32.9	29.8	46.0	16.2	200	0
4	345.250	46.4	14.6	4.8	32.9	32.9	46.0	13.1	100	359
----- Vertical -----										
5	328.760	49.3	14.2	4.3	32.9	34.9	46.0	11.1	200	167
6	665.346	40.0	19.5	5.0	32.9	31.6	46.0	14.4	100	0



**8.5.1.2 Test data for Below 30 MHz**

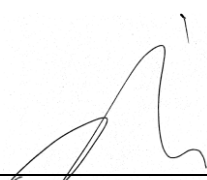
- . Test Date : June 09, 2015
- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

**12.4.1.3 Test data for above 1 GHz**

- . Test Date : June 09, 2015
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.									




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**Tested by: Jun-Hui, Lee / Senior Engineer**

8.6 Test data for 802.11n\_HT20 WLAN Mode

8.6.1 Test data

8.6.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 54 ~ 55 % R.H. Temperature: 22 ~ 23 °C

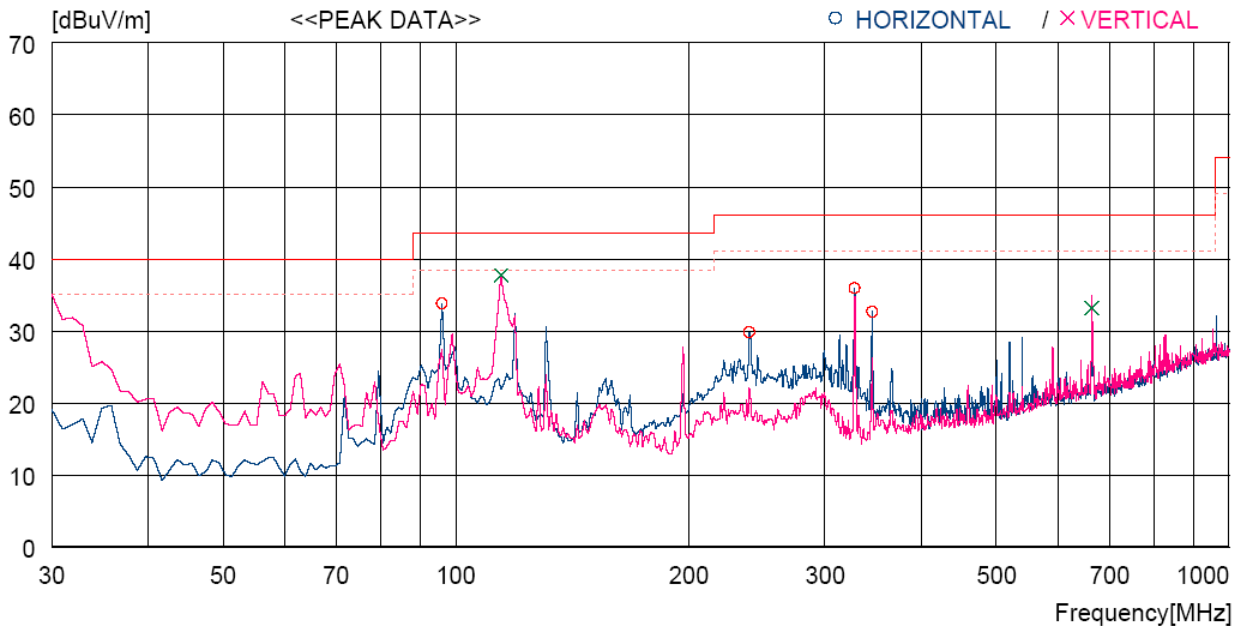
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : WLAN Module Date: June 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

-Ant0, Ant1 and Multiple transmit with Low, Middle and High Channels were tested, but the worst data were recorded.



No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	95.960	53.0	11.2	2.7	33.1	33.8	43.5	9.7	200	179
2	239.520	46.5	12.1	4.1	32.9	29.8	46.0	16.2	100	130
3	327.790	49.8	14.2	4.8	32.9	35.9	46.0	10.1	100	145
4	345.250	46.1	14.6	4.8	32.9	32.6	46.0	13.4	100	359
----- Vertical -----										
5	114.390	57.0	10.7	3.1	33.1	37.7	43.5	5.8	100	24
6	664.376	41.6	19.5	5.0	32.9	33.2	46.0	12.8	100	251

**8.6.1.2 Test data for Below 30 MHz**

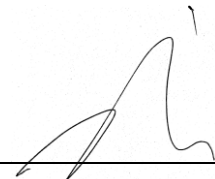
- . Test Date : June 09, 2015
- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

**8.4.1.3 Test data for above 1 GHz**

- . Test Date : June 09, 2015
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



**Tested by: Jun-Hui, Lee / Senior Engineer**

**8.7 Test data for 802.11n\_HT40 WLAN Mode**

**8.7.1 Test data**

**8.7.1.1 Test data for 30 MHz ~ 1 000 MHz**

Humidity Level : 54 ~ 55 % R.H. Temperature: 22 ~ 23 °C

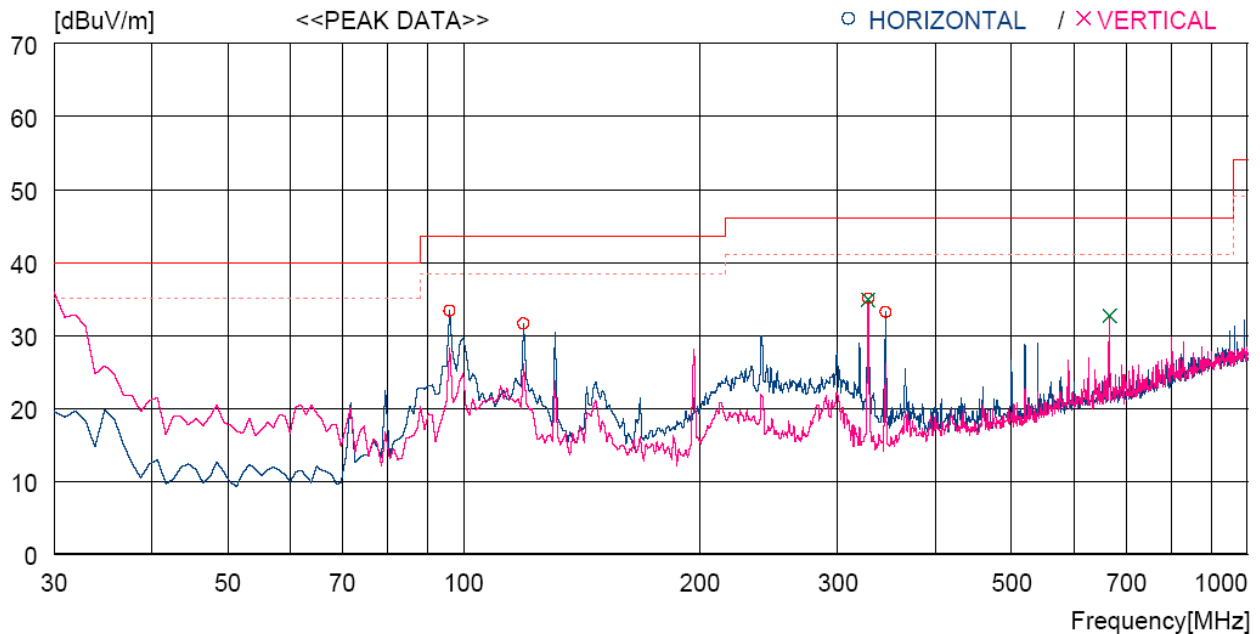
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : WLAN Module Date: June 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

-Ant0, Ant1 and Multiple transmit with Low, Middle and High Channels were tested, but the worst data were recorded.



No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	95.960	52.5	11.2	2.7	33.1	33.3	43.5	10.2	200	157
2	119.240	50.9	10.3	3.5	33.1	31.6	43.5	11.9	300	173
3	328.760	48.9	14.2	4.8	32.9	35.0	46.0	11	100	359
4	345.250	46.5	14.6	5.0	32.9	33.2	46.0	12.8	100	359
----- Vertical -----										
5	327.790	48.8	14.2	4.8	32.9	34.9	46.0	11.1	200	359
6	666.316	39.5	19.5	7.0	33.3	32.7	46.0	13.3	100	200

**8.7.1.2 Test data for Below 30 MHz**

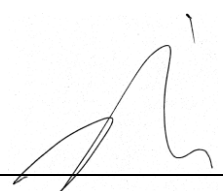
- . Test Date : June 09, 2015
- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

**8.4.1.3 Test data for above 1 GHz**

- . Test Date : June 09, 2015
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



**Tested by: Jun-Hui, Lee / Senior Engineer**