



# SPORTON International Inc.

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## FCC RADIO TEST REPORT

|                        |                                                                      |
|------------------------|----------------------------------------------------------------------|
| Applicant's company    | Realtek Semiconductor Corp.                                          |
| Applicant Address      | No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan |
| FCC ID                 | TX2-RTL8188EE                                                        |
| Manufacturer's company | Realtek Semiconductor Corp.                                          |
| Manufacturer Address   | No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan |

|                  |                                       |
|------------------|---------------------------------------|
| Product Name     | 802.11b/g/n RTL8188EE NGFFCard        |
| Brand Name       | Realtek                               |
| Model No.        | RTL8188EE                             |
| Test Rule        | 47 CFR FCC Part 15 Subpart C § 15.247 |
| Test Freq. Range | 2400 ~ 2483.5MHz                      |
| Received Date    | Jan. 19, 2012                         |
| Final Test Date  | May 06, 2014                          |
| Submission Type  | Class II Change                       |

### Statement

Test result included in this report is for the IEEE 802.11n and IEEE 802.11b/g of the product.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2009, 47 CFR FCC Part 15 Subpart C.**

The test equipment used to perform the test is calibrated and traceable to NML/ROC.



## Table of Contents

|                                                         |                |
|---------------------------------------------------------|----------------|
| <b>1. CERTIFICATE OF COMPLIANCE .....</b>               | <b>1</b>       |
| <b>2. SUMMARY OF THE TEST RESULT .....</b>              | <b>2</b>       |
| <b>3. GENERAL INFORMATION .....</b>                     | <b>3</b>       |
| 3.1. Product Details.....                               | 3              |
| 3.2. Accessories.....                                   | 4              |
| 3.3. Table for Filed Antenna.....                       | 5              |
| 3.4. Table for Carrier Frequencies .....                | 6              |
| 3.5. Table for Test Modes .....                         | 6              |
| 3.6. Table for Testing Locations.....                   | 7              |
| 3.7. Table for Class II Change .....                    | 7              |
| 3.8. Table for Supporting Units .....                   | 8              |
| 3.9. Test Configurations .....                          | 9              |
| <b>4. TEST RESULT .....</b>                             | <b>12</b>      |
| 4.1. AC Power Line Conducted Emissions Measurement..... | 12             |
| 4.2. Peak Output Power Measurement .....                | 16             |
| 4.3. Radiated Emissions Measurement .....               | 19             |
| 4.4. Emissions Measurement .....                        | 38             |
| 4.5. Antenna Requirements .....                         | 56             |
| <b>5. LIST OF MEASURING EQUIPMENTS .....</b>            | <b>57</b>      |
| <b>6. MEASUREMENT UNCERTAINTY.....</b>                  | <b>59</b>      |
| <b>APPENDIX A. TEST PHOTOS .....</b>                    | <b>A1 ~ A8</b> |
| <b>APPENDIX B. ANTENNA LIST</b>                         |                |

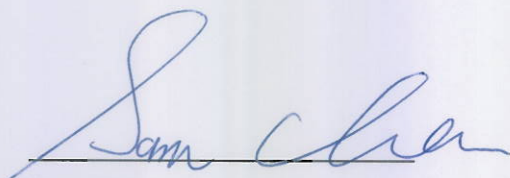
## History of This Test Report

| REPORT NO.  | VERSION | DESCRIPTION             | ISSUED DATE   |
|-------------|---------|-------------------------|---------------|
| FR211949-29 | Rev. 01 | Initial issue of report | Jun. 23, 2014 |
|             |         |                         |               |
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|             |         |                         |               |

## 1. CERTIFICATE OF COMPLIANCE

Product Name : 802.11b/g/n RTL8188EE NGFFCard  
Brand Name : Realtek  
Model No. : RTL8188EE  
Applicant : Realtek Semiconductor Corp.  
Test Rule Part(s) : 47 CFR FCC Part 15 Subpart C § 15.247

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Jan. 19, 2012 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.



Sam Chen

SPORTON INTERNATIONAL INC.

## 2. SUMMARY OF THE TEST RESULT

| Applied Standard: 47 CFR FCC Part 15 Subpart C |              |                                   |          |             |
|------------------------------------------------|--------------|-----------------------------------|----------|-------------|
| Part                                           | Rule Section | Description of Test               | Result   | Under Limit |
| 4.1                                            | 15.207       | AC Power Line Conducted Emissions | Complies | 12.74 dB    |
| 4.2                                            | 15.247(b)(3) | Peak Output Power                 | Complies | 4.38 dB     |
| 4.3                                            | 15.247(d)    | Radiated Emissions                | Complies | 2.53 dB     |
| 4.4                                            | 15.247(d)    | Band Edge Emissions               | Complies | 0.54 dB     |
| 4.5                                            | 15.203       | Antenna Requirements              | Complies | -           |

### 3. GENERAL INFORMATION

#### 3.1. Product Details

##### IEEE 802.11n

| Items               | Description                                                                            |
|---------------------|----------------------------------------------------------------------------------------|
| Product Type        | Diversity : WLAN (1TX, 1RX) ;<br>Fixed : WLAN (1TX, 1RX) ;<br>Single : WLAN (1TX, 1RX) |
| Radio Type          | Intentional Transceiver                                                                |
| Power Type          | From host system                                                                       |
| Modulation          | see the below table for IEEE 802.11n                                                   |
| Data Modulation     | OFDM (BPSK / QPSK / 16QAM / 64QAM)                                                     |
| Data Rate (Mbps)    | see the below table for IEEE 802.11n                                                   |
| Frequency Range     | 2400 ~ 2483.5MHz                                                                       |
| Channel Number      | 11 for 20MHz bandwidth ; 7 for 40MHz bandwidth                                         |
| Peak Output Power   | MCS0 (20MHz): 25.50 dBm ; MCS0 (40MHz): 24.52 dBm                                      |
| Carrier Frequencies | Please refer to section 3.4                                                            |
| Antenna             | Please refer to section 3.3                                                            |

##### IEEE 802.11b/g

| Items               | Description                                                                            |
|---------------------|----------------------------------------------------------------------------------------|
| Product Type        | Diversity : WLAN (1TX, 1RX) ;<br>Fixed : WLAN (1TX, 1RX) ;<br>Single : WLAN (1TX, 1RX) |
| Radio Type          | Intentional Transceiver                                                                |
| Power Type          | From host system                                                                       |
| Modulation          | DSSS for IEEE 802.11b ; OFDM for IEEE 802.11g                                          |
| Data Modulation     | DSSS (BPSK / QPSK / CCK) ; OFDM (BPSK / QPSK / 16QAM / 64QAM)                          |
| Data Rate (Mbps)    | DSSS (1/ 2/ 5.5/11) ; OFDM (6/9/12/18/24/36/48/54)                                     |
| Frequency Range     | 2400 ~ 2483.5MHz                                                                       |
| Channel Number      | 11                                                                                     |
| Peak Output Power   | 11b: 22.24 dBm ; 11g: 25.62 dBm                                                        |
| Carrier Frequencies | Please refer to section 3.4                                                            |
| Antenna             | Please refer to section 3.3                                                            |

| Items                | Description                               |                                                         |
|----------------------|-------------------------------------------|---------------------------------------------------------|
| Beamforming Function | <input type="checkbox"/> With beamforming | <input checked="" type="checkbox"/> Without beamforming |

#### Antenna and Band width

| Antenna         | Single (TX) |        |
|-----------------|-------------|--------|
| Band width Mode | 20 MHz      | 40 MHz |
| IEEE 802.11b    | V           | X      |
| IEEE 802.11g    | V           | X      |
| IEEE 802.11n    | V           | V      |

#### IEEE 11n Spec.

| Protocol                                                                                                                                                                                                                 | Number of Transmit Chains (NTX) | Data Rate / MCS |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------|
| 802.11n (HT20)                                                                                                                                                                                                           | 1                               | MCS 0-7         |
| 802.11n (HT40)                                                                                                                                                                                                           | 1                               | MCS 0-7         |
| <p>Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput).<br/>Then EUT support HT20 and HT40.</p> <p>Note 2: Modulation modes consist of below configuration: HT20/HT40: IEEE 802.11n</p> |                                 |                 |

### 3.2. Accessories

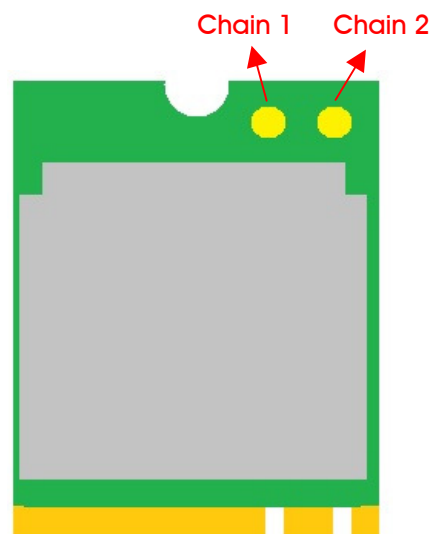
N/A

### 3.3. Table for Filed Antenna

| Ant. | Brand   | Model Name           | Antenna Type | Connector | Gain (dBi) |
|------|---------|----------------------|--------------|-----------|------------|
| 1    | LYNwave | ALA110-222050-300010 | PIFA Antenna | I-PEX     | 3.5        |

Note: There are 3 configurations of EUT.

| Configuration      | Type | Antenna Chain | Power Type | Description                                                                                                                                                                                                                                                                                                           |
|--------------------|------|---------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Config.1 Diversity | NGFF | 2 chains      | PCIE       | The EUT supports 1TX/1RX function, and it supports TX/RX diversity function.<br>Both Chain 1 and Chain 2 could be used as transmitting/receiving antenna, but only one of them could transmit/receive at the same time.<br>Chain 1 generated the worst case than Chain 2, so it is tested and recorded in the report. |
| Config. 2 Fixed    | NGFF | 2 chains      | PCIE       | The EUT supports 1TX/1RX function.<br>Only Chain 1 could be used as transmitting antenna.                                                                                                                                                                                                                             |
|                    |      |               | USB        | Both Chain 1 and Chain 2 could be used as receiving antenna, but only one of them could receive at the same time.                                                                                                                                                                                                     |
| Config. 3 Single   | NGFF | 1 chain       | PCIE       | The EUT supports 1TX/1RX function.                                                                                                                                                                                                                                                                                    |
|                    |      |               | USB        | Only Chain 1 could be used as transmitting/receiving antenna.                                                                                                                                                                                                                                                         |



### 3.4. Table for Carrier Frequencies

There are two bandwidth systems.

For 20MHz bandwidth systems, use Channel 1~Channel 11.

For 40MHz bandwidth systems, use Channel 3~Channel 9.

| Frequency Band | Channel No. | Frequency | Channel No. | Frequency |
|----------------|-------------|-----------|-------------|-----------|
| 2400~2483.5MHz | 1           | 2412 MHz  | 7           | 2442 MHz  |
|                | 2           | 2417 MHz  | 8           | 2447 MHz  |
|                | 3           | 2422 MHz  | 9           | 2452 MHz  |
|                | 4           | 2427 MHz  | 10          | 2457 MHz  |
|                | 5           | 2432 MHz  | 11          | 2462 MHz  |
|                | 6           | 2437 MHz  | -           | -         |

### 3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

| Test Items                                        | Mode         | Data Rate | Channel | Chain |
|---------------------------------------------------|--------------|-----------|---------|-------|
| AC Power Line Conducted Emissions                 | Normal Link  | -         | -       | -     |
| Peak Output Power                                 | 802.11n HT20 | MCS0      | 1/6/11  | 1     |
|                                                   | 802.11n HT40 | MCS0      | 3/6/9   | 1     |
|                                                   | 11b/BPSK     | 1 Mbps    | 1/6/11  | 1     |
|                                                   | 11g/BPSK     | 6 Mbps    | 1/6/11  | 1     |
| Radiated Emissions 9kHz~1GHz                      | Normal Link  | -         | -       | -     |
| Radiated Emissions 1GHz~10 <sup>th</sup> Harmonic | 802.11n HT20 | MCS0      | 1/6/11  | 1     |
|                                                   | 802.11n HT40 | MCS0      | 3/6/9   | 1     |
|                                                   | 11b/BPSK     | 1 Mbps    | 1/6/11  | 1     |
|                                                   | 11g/BPSK     | 6 Mbps    | 1/6/11  | 1     |
| Band Edge Emissions                               | 802.11n HT20 | MCS0      | 1/6/11  | 1     |
|                                                   | 802.11n HT40 | MCS0      | 3/6/9   | 1     |
|                                                   | 11b/BPSK     | 1 Mbps    | 1/6/11  | 1     |
|                                                   | 11g/BPSK     | 6 Mbps    | 1/6/11  | 1     |

Based on original output power to test Radiated Emission and Band Edge Emission.

The following test modes were performed for all tests:

#### For Conducted Emission test:

After pretest, Configuration 1 (Diversity) and Configuration 2 (Fixed) have been evaluated to be the worst case, so the measurement will follow these same test configurations.

Mode 1. NGFF + PCIE + Diversity + PIFA antenna

Mode 2. NGFF + PCIE + Fixed + PIFA antenna

Mode 3. NGFF + USB + Fixed + PIFA antenna

Mode 1 is the worst case, so it was selected to record in this test report.

#### For Radiated Emission test below 1GHz test:

After pretest, Configuration 1 (Diversity) and Configuration 2 (Fixed) have been evaluated to be the worst case, so the measurement will follow these same test configurations.

Mode 1. NGFF + PCIE + Diversity + PIFA antenna

Mode 2. NGFF + PCIE + Fixed + PIFA antenna

Mode 3. NGFF + USB + Fixed + PIFA antenna

Mode 1 is the worst case, so it was selected to record in this test report.

#### For Radiated Emission test above 1GHz test:

After pretest, Configuration 1 (Diversity) has been evaluated to be the worst case, so the measurement will follow this same test configuration.

Mode 1. NGFF + PCIE + Diversity + PIFA antenna

### 3.6. Table for Testing Locations

| Test Site Location |                                                                            |          |              |             |
|--------------------|----------------------------------------------------------------------------|----------|--------------|-------------|
| Address:           | No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C. |          |              |             |
| TEL:               | 886-3-656-9065                                                             |          |              |             |
| FAX:               | 886-3-656-9085                                                             |          |              |             |
| Test Site No.      | Site Category                                                              | Location | FCC Reg. No. | IC File No. |
| 03CH01-CB          | SAC                                                                        | Hsin Chu | 262045       | IC 4086D    |
| CO01-CB            | Conduction                                                                 | Hsin Chu | 262045       | IC 4086D    |

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC).

### 3.7. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR211949

Below is the table for the change of the product with respect to the original one.

| Modifications                                                                                                              | Performance Checking                                                         |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| 1. It adds 3 NGFF main source type configurations for the device.<br>2. There is no change in existing RF relevant portion | 1. AC Conducted Emissions<br>2. Radiated Emissions<br>3. Band Edge Emissions |

### 3.8. Table for Supporting Units

For Test Site No: 03CH01-CB

For below 1GHz test:

| Support Unit | Brand      | Model        | FCC ID           |
|--------------|------------|--------------|------------------|
| Notebook     | DELL       | E6220        | DoC              |
| Mouse        | Logitech   | M-U0026      | DoC              |
| Earphone     | SHYARO CHI | MIC-04       | N/A              |
| AP Router    | Planex     | GW-AP54SGX   | KA220030603014-1 |
| Test fixture | Realtek    | PCIE Adapter | N/A              |

For above 1GHz test:

| Support Unit | Brand   | Model        | FCC ID |
|--------------|---------|--------------|--------|
| Notebook     | DELL    | E6220        | DoC    |
| Test fixture | Realtek | PCIE Adapter | N/A    |

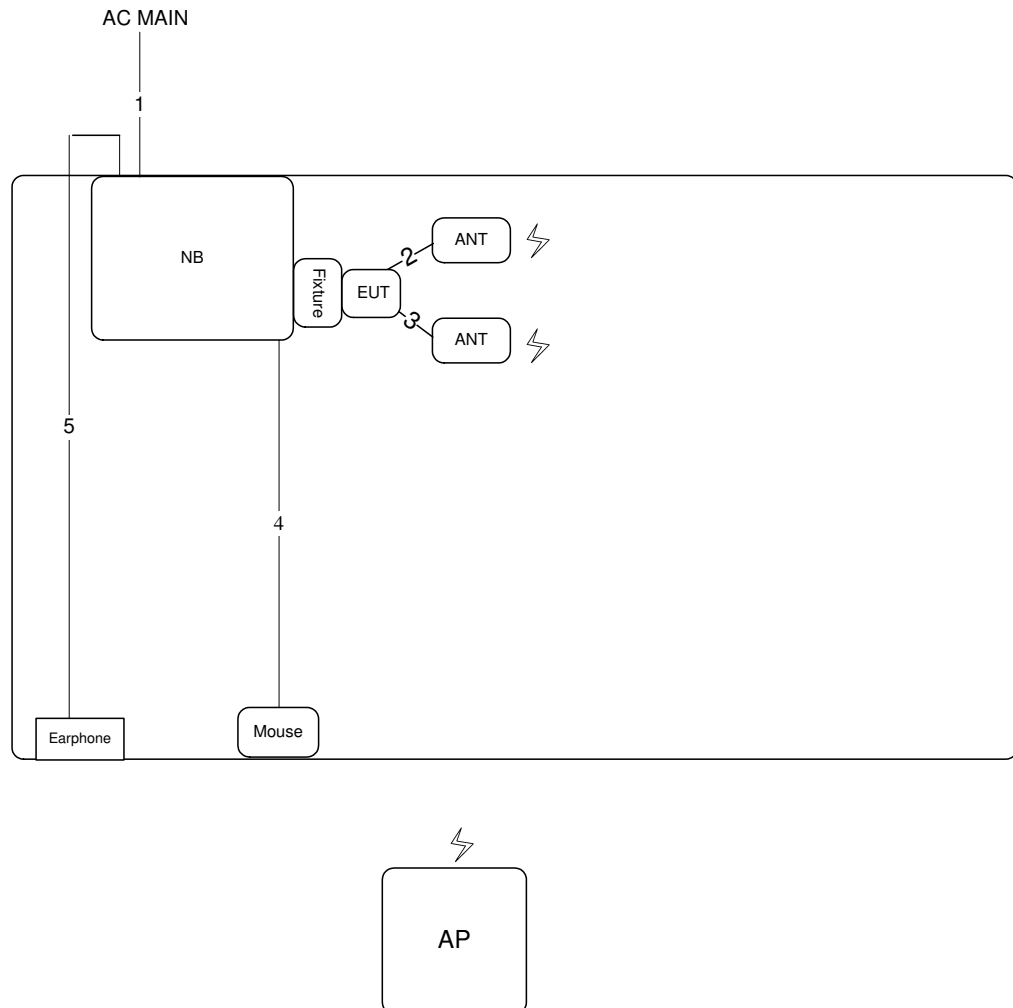
For Test Site No: CO01-CB

| Support Unit | Brand      | Model        | FCC ID           |
|--------------|------------|--------------|------------------|
| Notebook     | DELL       | E6430        | DoC              |
| Mouse        | Logitech   | M-U0026      | DoC              |
| Earphone     | SHYARO CHI | MIC-04       | N/A              |
| AP Router    | Planex     | GW-AP54SGX   | KA220030603014-1 |
| Test fixture | Realtek    | PCIE Adapter | N/A              |

### 3.9. Test Configurations

#### 3.9.1. AC Power Line Conduction Emissions Test Configuration

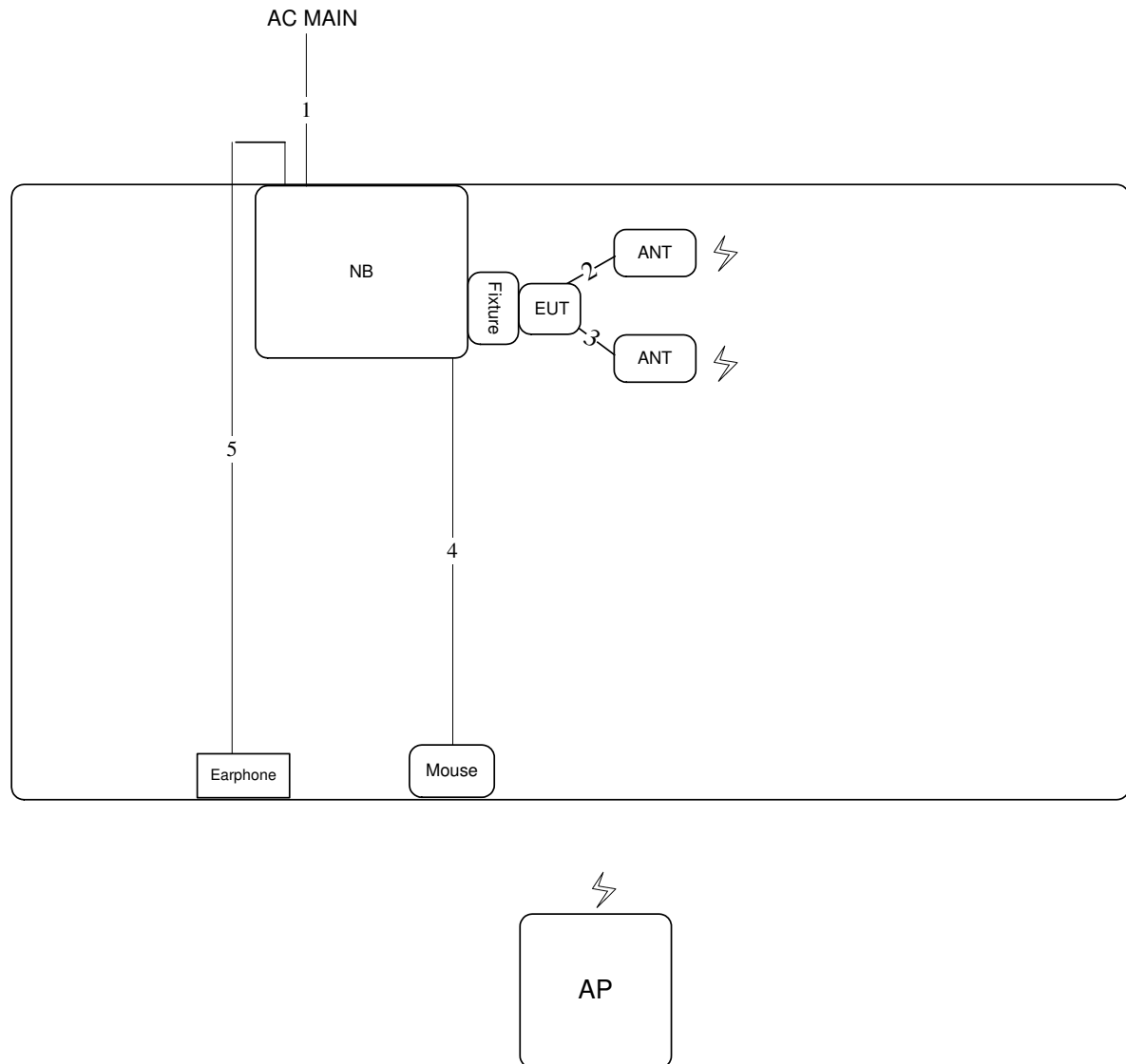
Test Mode: Mode 1



| Item | Connection  | Shield | Length |
|------|-------------|--------|--------|
| 1    | Power Cable | No     | 1.8m   |
| 2    | ANT Cable   | Yes    | 0.3m   |
| 3    | ANT Cable   | Yes    | 0.3m   |
| 4    | USB Cable   | Yes    | 1.8m   |
| 5    | Audio Cable | No     | 1.5m   |

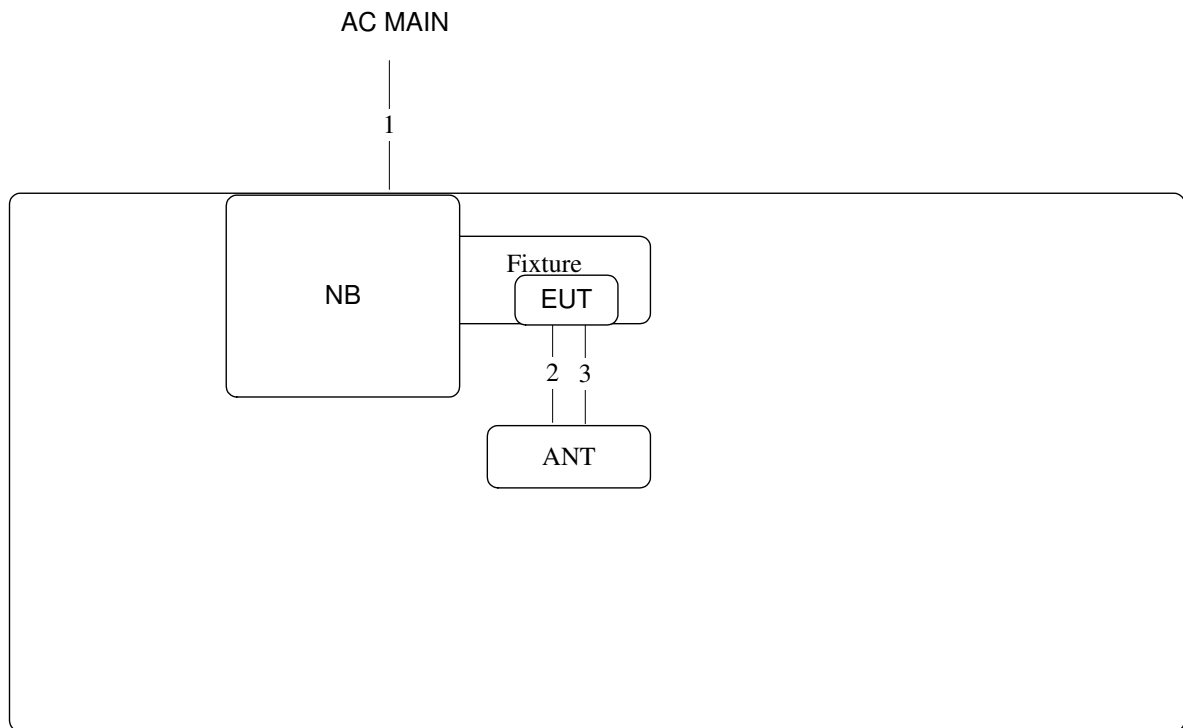
### 3.9.2. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz / Mode 1



| Item | Connection  | Shield | Length |
|------|-------------|--------|--------|
| 1    | Power Cable | No     | 1.8m   |
| 2    | ANT Cable   | Yes    | 0.3m   |
| 3    | ANT Cable   | Yes    | 0.3m   |
| 4    | USB Cable   | Yes    | 1.8m   |
| 5    | Audio Cable | No     | 1.5m   |

Test Configuration: above 1GHz / Mode 1



| Item | Connection  | Shield | Length |
|------|-------------|--------|--------|
| 1    | Power Cable | No     | 1.8m   |
| 2    | ANT Cable   | Yes    | 0.3m   |
| 3    | ANT Cable   | Yes    | 0.3m   |

## 4. TEST RESULT

### 4.1. AC Power Line Conducted Emissions Measurement

#### 4.1.1. Limit

For this product which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

| Frequency (MHz) | QP Limit (dBuV) | AV Limit (dBuV) |
|-----------------|-----------------|-----------------|
| 0.15~0.5        | 66~56           | 56~46           |
| 0.5~5           | 56              | 46              |
| 5~30            | 60              | 50              |

#### 4.1.2. Measuring Instruments and Setting

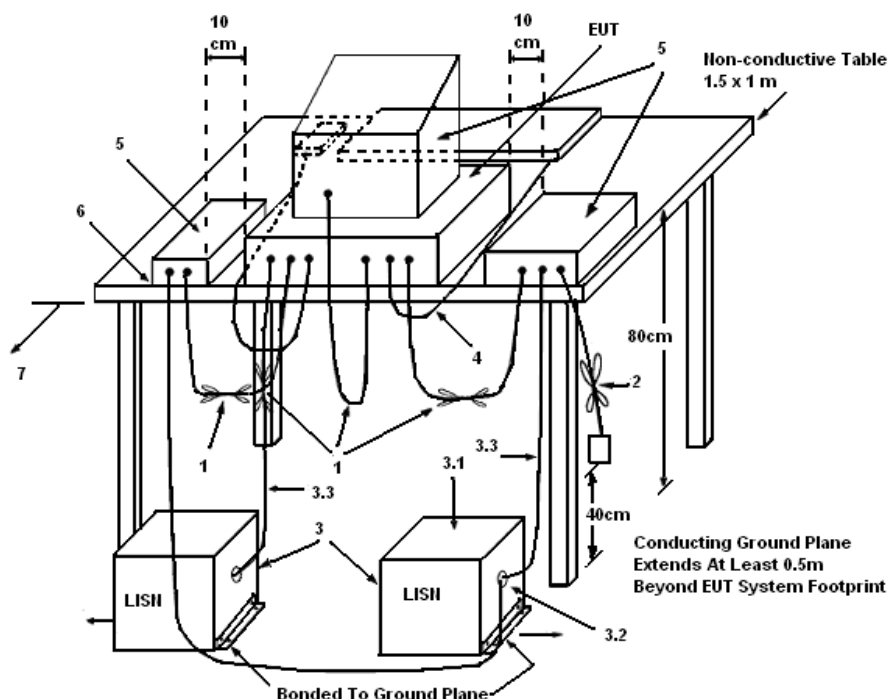
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

| Receiver Parameters | Setting  |
|---------------------|----------|
| Attenuation         | 10 dB    |
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

#### 4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

#### 4.1.4. Test Setup Layout



**LEGEND:**

- (1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- (2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- (3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50  $\Omega$ . LISN can be placed on top of, or immediately beneath, reference ground plane.
  - (3.1) All other equipment powered from additional LISN(s).
  - (3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
  - (3.3) LISN at least 80 cm from nearest part of EUT chassis.
- (4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
- (5) Non-EUT components of EUT system being tested.
- (6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- (7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

#### 4.1.5. Test Deviation

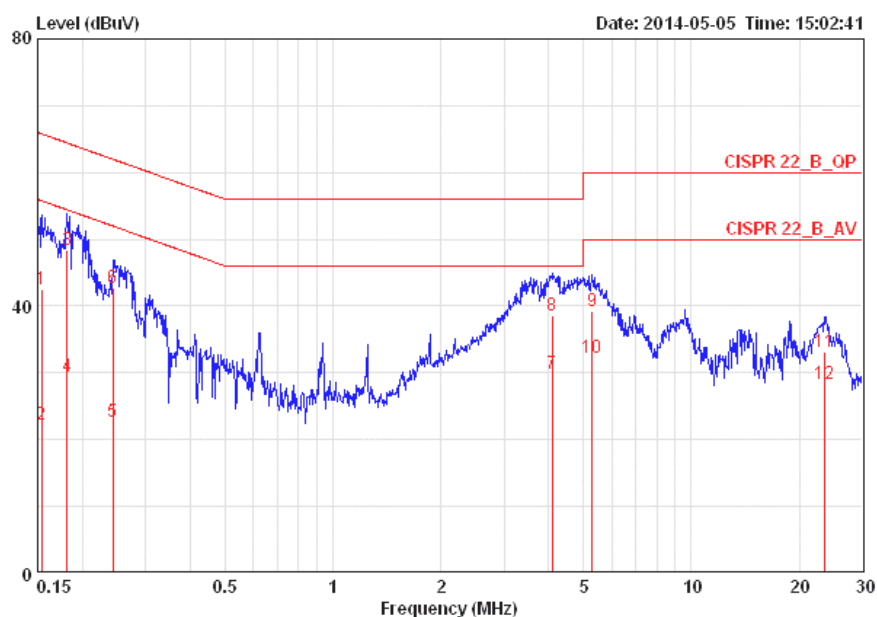
There is no deviation with the original standard.

#### 4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

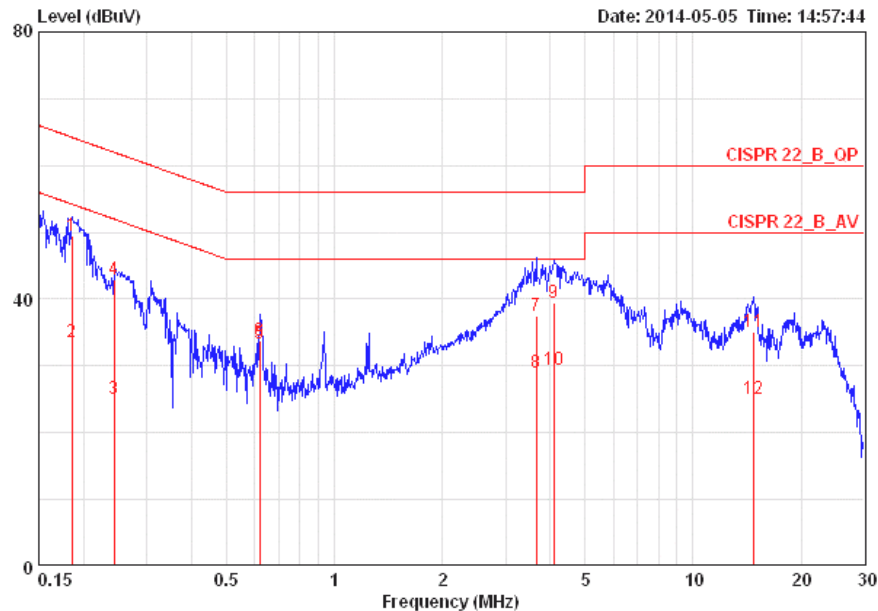
#### 4.1.7. Results of AC Power Line Conducted Emissions Measurement

|               |             |           |        |
|---------------|-------------|-----------|--------|
| Temperature   | 25°C        | Humidity  | 52%    |
| Test Engineer | Hank Yang   | Phase     | Line   |
| Configuration | Normal Link | Test Mode | Mode 1 |



|    | Freq    | Level | Over Limit | Limit Line | LISN Factor | Read Level | Cable Loss | Pol/Phase | Remark  |
|----|---------|-------|------------|------------|-------------|------------|------------|-----------|---------|
|    | MHz     | dBuV  | dB         | dBuV       | dB          | dBuV       | dB         |           |         |
| 1  | 0.15403 | 42.47 | -23.31     | 65.78      | 0.08        | 42.23      | 0.16       | LINE      | QP      |
| 2  | 0.15403 | 22.33 | -33.45     | 55.78      | 0.08        | 22.09      | 0.16       | LINE      | AVERAGE |
| 3  | 0.18152 | 48.40 | -16.01     | 64.42      | 0.08        | 48.16      | 0.16       | LINE      | QP      |
| 4  | 0.18152 | 29.53 | -24.88     | 54.42      | 0.08        | 29.29      | 0.16       | LINE      | AVERAGE |
| 5  | 0.24293 | 22.63 | -29.37     | 52.00      | 0.08        | 22.38      | 0.17       | LINE      | AVERAGE |
| 6  | 0.24293 | 42.62 | -19.38     | 62.00      | 0.08        | 42.37      | 0.17       | LINE      | QP      |
| 7  | 4.092   | 29.89 | -16.11     | 46.00      | 0.15        | 29.44      | 0.30       | LINE      | AVERAGE |
| 8  | 4.092   | 38.55 | -17.45     | 56.00      | 0.15        | 38.10      | 0.30       | LINE      | QP      |
| 9  | 5.277   | 39.27 | -20.73     | 60.00      | 0.17        | 38.77      | 0.33       | LINE      | QP      |
| 10 | 5.277   | 32.32 | -17.68     | 50.00      | 0.17        | 31.82      | 0.33       | LINE      | AVERAGE |
| 11 | 23.636  | 33.17 | -26.83     | 60.00      | 0.40        | 32.21      | 0.56       | LINE      | QP      |
| 12 | 23.636  | 28.25 | -21.75     | 50.00      | 0.40        | 27.29      | 0.56       | LINE      | AVERAGE |

|               |             |           |         |
|---------------|-------------|-----------|---------|
| Temperature   | 25°C        | Humidity  | 52%     |
| Test Engineer | Hank Yang   | Phase     | Neutral |
| Configuration | Normal Link | Test Mode | Mode 1  |



|    | Freq    | Level | Over   | Limit | LISN   | Read  | Cable | Pol/Phase | Remark  |
|----|---------|-------|--------|-------|--------|-------|-------|-----------|---------|
|    | MHz     | dBuV  | Limit  | Line  | Factor | Level | Loss  |           |         |
|    | MHz     | dBuV  | dB     | dBuV  | dB     | dBuV  | dB    |           |         |
| 1  | 0.18541 | 49.38 | -14.86 | 64.24 | 0.08   | 49.14 | 0.16  | NEUTRAL   | QP      |
| 2  | 0.18541 | 33.51 | -20.73 | 54.24 | 0.08   | 33.27 | 0.16  | NEUTRAL   | AVERAGE |
| 3  | 0.24293 | 25.16 | -26.83 | 52.00 | 0.08   | 24.91 | 0.17  | NEUTRAL   | AVERAGE |
| 4  | 0.24293 | 42.90 | -19.09 | 62.00 | 0.08   | 42.65 | 0.17  | NEUTRAL   | QP      |
| 5  | 0.62054 | 33.26 | -12.74 | 46.00 | 0.09   | 32.98 | 0.19  | NEUTRAL   | AVERAGE |
| 6  | 0.62054 | 33.68 | -22.32 | 56.00 | 0.09   | 33.40 | 0.19  | NEUTRAL   | QP      |
| 7  | 3.661   | 37.51 | -18.49 | 56.00 | 0.15   | 37.06 | 0.29  | NEUTRAL   | QP      |
| 8  | 3.661   | 29.10 | -16.90 | 46.00 | 0.15   | 28.65 | 0.29  | NEUTRAL   | AVERAGE |
| 9  | 4.092   | 39.42 | -16.58 | 56.00 | 0.16   | 38.96 | 0.30  | NEUTRAL   | QP      |
| 10 | 4.092   | 29.33 | -16.67 | 46.00 | 0.16   | 28.87 | 0.30  | NEUTRAL   | AVERAGE |
| 11 | 14.750  | 35.00 | -25.00 | 60.00 | 0.30   | 34.25 | 0.44  | NEUTRAL   | QP      |
| 12 | 14.750  | 25.14 | -24.86 | 50.00 | 0.30   | 24.39 | 0.44  | NEUTRAL   | AVERAGE |

Note:

Level = Read Level + LISN Factor + Cable Loss.

## 4.2. Peak Output Power Measurement

### 4.2.1. Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceed 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

### 4.2.2. Measuring Instruments and Setting

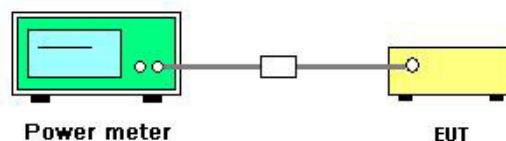
Please refer to section 5 of equipments list in this report. The following table is the setting of the peak power meter.

| Power Meter Parameter | Setting                                                    |
|-----------------------|------------------------------------------------------------|
| Bandwidth             | 50MHz bandwidth is greater than the EUT emission bandwidth |
| Detector              | Peak                                                       |

### 4.2.3. Test Procedures

| Spectrum Parameter     | Setting                                                                                             |
|------------------------|-----------------------------------------------------------------------------------------------------|
| RF Output Power Method | <input checked="" type="checkbox"/> ANSI C63.10 clause 6.10.2.1 (a) power meter method              |
| RF Output Power Method | <input type="checkbox"/> ANSI C63.10 clause 6.10.2.1 (b) channel integration method                 |
| RF Output Power Method | <input type="checkbox"/> ANSI C63.10 clause 6.10.3.1 Method 1 - spectral trace averaging            |
| RF Output Power Method | <input type="checkbox"/> ANSI C63.10 clause 6.10.3.2 Method 2 - zero-span mode with trace averaging |

### 4.2.4. Test Setup Layout



### 4.2.5. Test Deviation

There is no deviation with the original standard.

### 4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.2.7. Test Result of Peak Output Power

|               |               |                |              |
|---------------|---------------|----------------|--------------|
| Temperature   | 25°C          | Humidity       | 63%          |
| Test Engineer | Sean Ku       | Configurations | IEEE 802.11n |
| Test Date     | Feb. 10, 2012 |                |              |

##### Configuration IEEE 802.11n MCS0 20MHz / Chain 1

| Channel | Frequency | Conducted Power (dBm) | Max. Limit (dBm) | Result   |
|---------|-----------|-----------------------|------------------|----------|
| 1       | 2412 MHz  | 24.92                 | 30.00            | Complies |
| 6       | 2437 MHz  | 25.50                 | 30.00            | Complies |
| 11      | 2462 MHz  | 24.52                 | 30.00            | Complies |

##### Configuration IEEE 802.11n MCS0 40MHz / Chain 1

| Channel | Frequency | Conducted Power (dBm) | Max. Limit (dBm) | Result   |
|---------|-----------|-----------------------|------------------|----------|
| 3       | 2422 MHz  | 24.52                 | 30.00            | Complies |
| 6       | 2437 MHz  | 24.23                 | 30.00            | Complies |
| 9       | 2452 MHz  | 23.82                 | 30.00            | Complies |

|                      |               |                       |                |
|----------------------|---------------|-----------------------|----------------|
| <b>Temperature</b>   | 25°C          | <b>Humidity</b>       | 63%            |
| <b>Test Engineer</b> | Sean Ku       | <b>Configurations</b> | IEEE 802.11b/g |
| <b>Test Date</b>     | Feb. 10, 2012 |                       |                |

#### Configuration IEEE 802.11b / Chain 1

| Channel | Frequency | Conducted Power (dBm) | Max. Limit (dBm) | Result   |
|---------|-----------|-----------------------|------------------|----------|
| 1       | 2412 MHz  | 21.21                 | 30.00            | Complies |
| 6       | 2437 MHz  | 22.05                 | 30.00            | Complies |
| 11      | 2462 MHz  | 22.24                 | 30.00            | Complies |

#### Configuration IEEE 802.11g / Chain 1

| Channel | Frequency | Conducted Power (dBm) | Max. Limit (dBm) | Result   |
|---------|-----------|-----------------------|------------------|----------|
| 1       | 2412 MHz  | 25.19                 | 30.00            | Complies |
| 6       | 2437 MHz  | 25.62                 | 30.00            | Complies |
| 11      | 2462 MHz  | 24.96                 | 30.00            | Complies |

### 4.3. Radiated Emissions Measurement

#### 4.3.1. Limit

30dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies<br>(MHz) | Field Strength<br>(micorvolts/meter) | Measurement Distance<br>(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                                |

#### 4.3.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter                          | Setting                                       |
|---------------------------------------------|-----------------------------------------------|
| Attenuation                                 | Auto                                          |
| Start Frequency                             | 1000 MHz                                      |
| Stop Frequency                              | 10th carrier harmonic                         |
| RBW / VBW (Emission in restricted band)     | 1MHz / 3MHz for Peak, 1MHz / 10Hz for Average |
| RBW / VBW (Emission in non-restricted band) | 100kHz / 300kHz for peak                      |

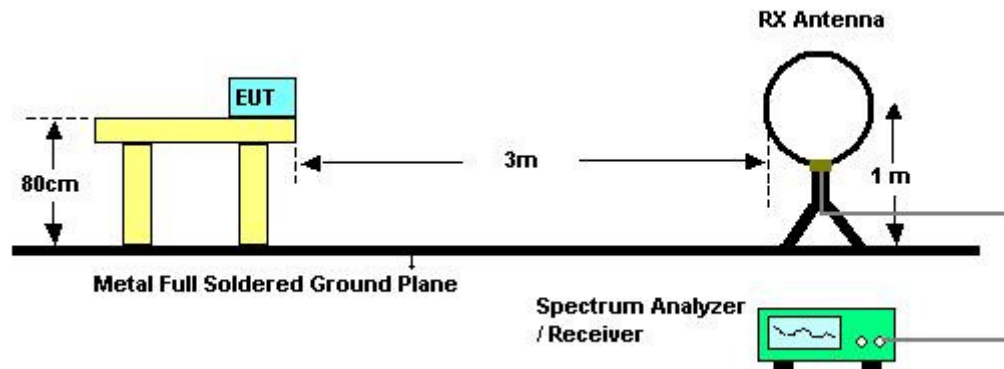
| Receiver Parameter     | Setting                           |
|------------------------|-----------------------------------|
| Attenuation            | Auto                              |
| Start ~ Stop Frequency | 9kHz~150kHz / RBW 200Hz for QP    |
| Start ~ Stop Frequency | 150kHz~30MHz / RBW 9kHz for QP    |
| Start ~ Stop Frequency | 30MHz~1000MHz / RBW 120kHz for QP |

#### 4.3.3. Test Procedures

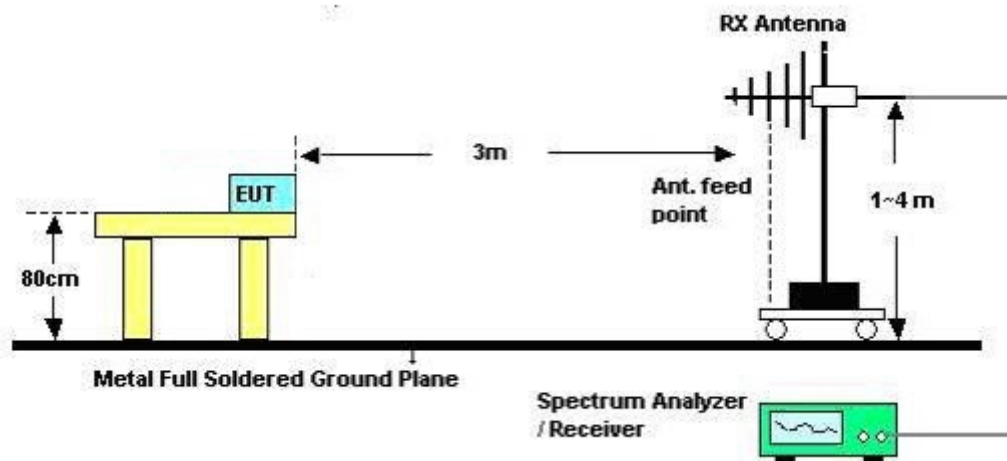
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 m to 4 m) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

#### 4.3.4. Test Setup Layout

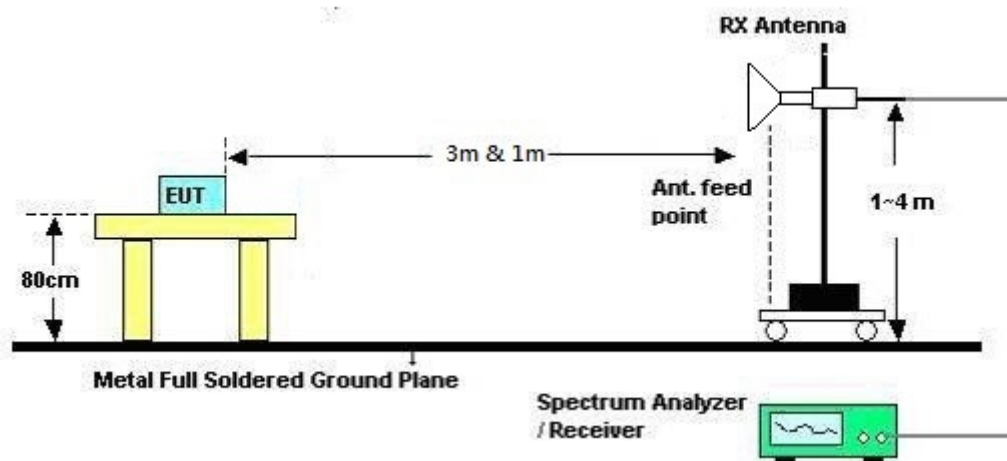
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



#### **4.3.5. Test Deviation**

There is no deviation with the original standard.

#### **4.3.6. EUT Operation during Test**

The EUT was programmed to be in continuously transmitting mode.

#### 4.3.7. Results of Radiated Emissions (9kHz~30MHz)

|               |               |                |             |
|---------------|---------------|----------------|-------------|
| Temperature   | 25°C          | Humidity       | 58%         |
| Test Engineer | Kenneth Huang | Configurations | Normal Link |
| Test Date     | May 06, 2014  | Test Mode      | Mode 1      |

| Freq.<br>(MHz) | Level<br>(dBuV) | Over Limit<br>(dB) | Limit Line<br>(dBuV) | Remark   |
|----------------|-----------------|--------------------|----------------------|----------|
| -              | -               | -                  | -                    | See Note |

**Note:**

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

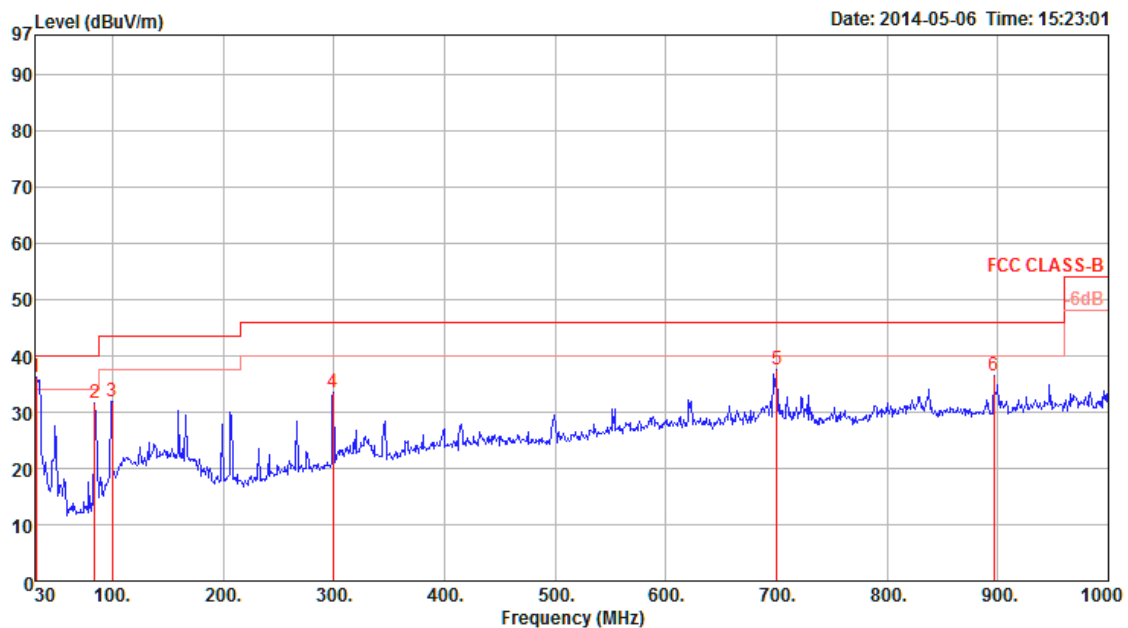
Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

#### 4.3.8. Results of Radiated Emissions (30MHz~1GHz)

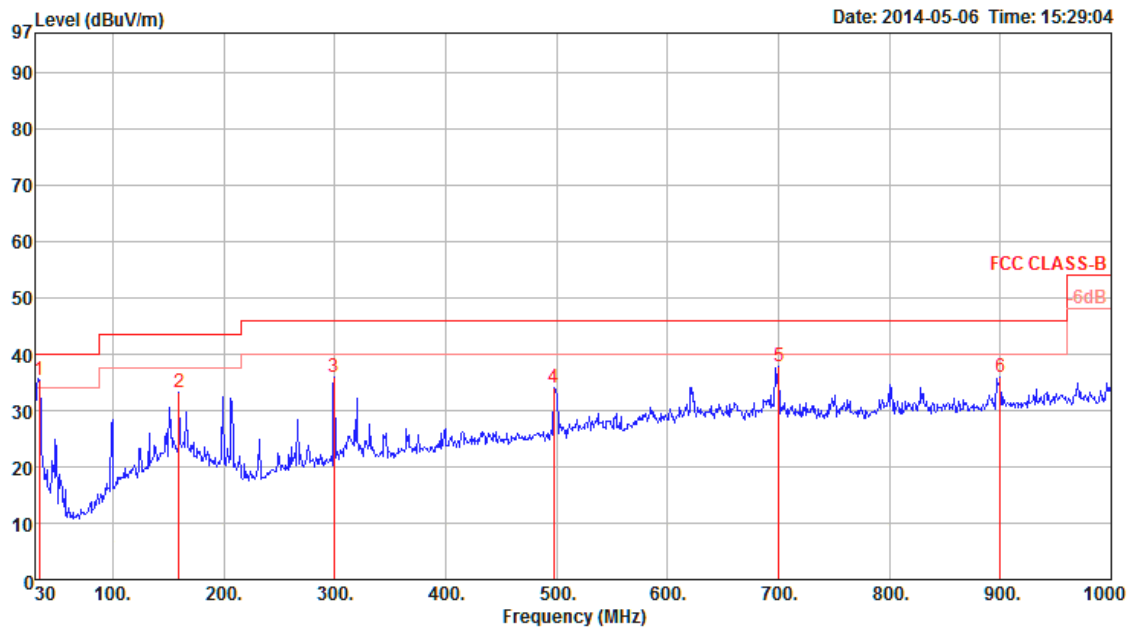
|               |               |                |             |
|---------------|---------------|----------------|-------------|
| Temperature   | 25°C          | Humidity       | 58%         |
| Test Engineer | Kenneth Huang | Configurations | Normal Link |
| Test Mode     | Mode 1        |                |             |

##### Horizontal



|   | Freq   | Level  | Limit  | Over   | Read  | Cable | Antenna | Preamp | Remark | T/Pos | A/Pos | Pol/Phase  |
|---|--------|--------|--------|--------|-------|-------|---------|--------|--------|-------|-------|------------|
|   | MHz    | dBuV/m | dBuV/m | dB     | dBuV  | Loss  | Factor  | Factor |        | deg   | cm    |            |
| 1 | 30.97  | 36.28  | 40.00  | -3.72  | 44.11 | 0.85  | 19.30   | 27.98  | Peak   | 0     | 400   | HORIZONTAL |
| 2 | 84.32  | 31.63  | 40.00  | -8.37  | 49.93 | 1.37  | 8.22    | 27.89  | Peak   | 0     | 400   | HORIZONTAL |
| 3 | 99.84  | 31.84  | 43.50  | -11.66 | 46.76 | 1.50  | 11.40   | 27.82  | Peak   | 0     | 400   | HORIZONTAL |
| 4 | 299.66 | 33.49  | 46.00  | -12.51 | 44.01 | 2.51  | 13.80   | 26.83  | Peak   | 0     | 400   | HORIZONTAL |
| 5 | 700.27 | 37.65  | 46.00  | -8.35  | 40.57 | 4.16  | 20.00   | 27.08  | Peak   | 0     | 400   | HORIZONTAL |
| 6 | 896.21 | 36.51  | 46.00  | -9.49  | 37.29 | 4.58  | 21.48   | 26.84  | Peak   | 0     | 400   | HORIZONTAL |

### Vertical



|   | Freq   | Level  | Limit  | Over   | Read  | CableAntenna | Preamp |       | T/Pos | A/Pos | Pol/Phase |
|---|--------|--------|--------|--------|-------|--------------|--------|-------|-------|-------|-----------|
|   | MHz    | dBuV/m | dBuV/m | dB     | dBuV  | dB           | dB/m   | dB    | deg   | cm    |           |
| 1 | 33.88  | 35.32  | 40.00  | -4.68  | 44.91 | 0.90         | 17.50  | 27.99 | 0     | 100   | VERTICAL  |
| 2 | 159.98 | 33.12  | 43.50  | -10.38 | 48.05 | 1.88         | 10.60  | 27.41 | 0     | 100   | VERTICAL  |
| 3 | 299.66 | 35.90  | 46.00  | -10.10 | 46.42 | 2.51         | 13.80  | 26.83 | 0     | 100   | VERTICAL  |
| 4 | 497.54 | 33.98  | 46.00  | -12.02 | 40.79 | 3.37         | 17.75  | 27.93 | 0     | 100   | VERTICAL  |
| 5 | 700.27 | 37.72  | 46.00  | -8.28  | 40.64 | 4.16         | 20.00  | 27.08 | 0     | 100   | VERTICAL  |
| 6 | 900.09 | 36.05  | 46.00  | -9.95  | 36.78 | 4.60         | 21.50  | 26.83 | 0     | 100   | VERTICAL  |

### Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

#### 4.3.9. Results for Radiated Emissions (1GHz~10<sup>th</sup> Harmonic)

|               |               |                |                                       |
|---------------|---------------|----------------|---------------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                                   |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11n MCS0 HT20 CH 1 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                                |

##### Horizontal

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss Factor | Preamp Factor | Remark | T/Pos   | A/Pos | Pol/Phase      |
|---|---------|--------|------------|------------|------------|--------------------------|---------------|--------|---------|-------|----------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                       | dB/m          | dB     | deg     | cm    |                |
| 1 | 4823.74 | 45.68  | 74.00      | -28.32     | 43.49      | 4.21                     | 32.56         | 34.58  | Peak    | 236   | 100 HORIZONTAL |
| 2 | 4823.80 | 37.30  | 54.00      | -16.70     | 35.11      | 4.21                     | 32.56         | 34.58  | Average | 236   | 100 HORIZONTAL |

##### Vertical

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss Factor | Preamp Factor | Remark | T/Pos   | A/Pos | Pol/Phase    |
|---|---------|--------|------------|------------|------------|--------------------------|---------------|--------|---------|-------|--------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                       | dB/m          | dB     | deg     | cm    |              |
| 1 | 4823.79 | 45.01  | 74.00      | -28.99     | 42.82      | 4.21                     | 32.56         | 34.58  | Peak    | 12    | 100 VERTICAL |
| 2 | 4823.83 | 42.01  | 54.00      | -11.99     | 39.82      | 4.21                     | 32.56         | 34.58  | Average | 12    | 100 VERTICAL |

|               |               |                |                                       |
|---------------|---------------|----------------|---------------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                                   |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11n MCS0 HT20 CH 6 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                                |

### Horizontal

|   | Freq    | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark | T/Pos   | A/Pos | Pol/Phase |            |
|---|---------|--------|---------------|---------------|---------------|-----------------------------|------------------|--------|---------|-------|-----------|------------|
|   | MHz     | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB     | deg     | cm    |           |            |
| 1 | 4873.59 | 43.65  | 74.00         | -30.35        | 41.34         | 4.22                        | 32.66            | 34.57  | Peak    | 192   | 100       | HORIZONTAL |
| 2 | 4873.88 | 36.58  | 54.00         | -17.42        | 34.27         | 4.22                        | 32.66            | 34.57  | Average | 193   | 100       | HORIZONTAL |
| 3 | 7310.08 | 35.57  | 54.00         | -18.43        | 27.98         | 5.34                        | 37.07            | 34.82  | Average | 300   | 100       | HORIZONTAL |
| 4 | 7310.93 | 48.51  | 74.00         | -25.49        | 40.92         | 5.34                        | 37.07            | 34.82  | Peak    | 300   | 100       | HORIZONTAL |

### Vertical

|   | Freq    | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark | T/Pos   | A/Pos | Pol/Phase |          |
|---|---------|--------|---------------|---------------|---------------|-----------------------------|------------------|--------|---------|-------|-----------|----------|
|   | MHz     | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB     | deg     | cm    |           |          |
| 1 | 4873.85 | 41.90  | 54.00         | -12.10        | 39.59         | 4.22                        | 32.66            | 34.57  | Average | 32    | 100       | VERTICAL |
| 2 | 4873.92 | 43.95  | 74.00         | -30.05        | 41.64         | 4.22                        | 32.66            | 34.57  | Peak    | 32    | 100       | VERTICAL |
| 3 | 7310.39 | 48.85  | 74.00         | -25.15        | 41.26         | 5.34                        | 37.07            | 34.82  | Peak    | 173   | 100       | VERTICAL |
| 4 | 7311.92 | 36.00  | 54.00         | -18.00        | 28.42         | 5.34                        | 37.07            | 34.83  | Average | 173   | 100       | VERTICAL |

|               |               |                |                                        |
|---------------|---------------|----------------|----------------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                                    |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11n MCS0 HT20 CH 11 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                                 |

### Horizontal

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Factor | Preamp Factor | Remark  | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|-------------------|--------|---------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m   | dB            |         | deg   | cm    |            |
| 1 | 4923.83 | 38.32  | 54.00      | -15.68     | 35.88      | 4.23              | 32.76  | 34.55         | Average | 60    | 100   | HORIZONTAL |
| 2 | 4924.03 | 46.51  | 74.00      | -27.49     | 44.07      | 4.23              | 32.76  | 34.55         | Peak    | 60    | 100   | HORIZONTAL |
| 3 | 7386.85 | 48.31  | 54.00      | -5.69      | 40.61      | 5.36              | 37.18  | 34.84         | Average | 242   | 100   | HORIZONTAL |
| 4 | 7386.90 | 36.08  | 74.00      | -37.92     | 28.38      | 5.36              | 37.18  | 34.84         | Peak    | 242   | 100   | HORIZONTAL |

### Vertical

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Factor | Preamp Factor | Remark  | T/Pos | A/Pos | Pol/Phase |
|---|---------|--------|------------|------------|------------|-------------------|--------|---------------|---------|-------|-------|-----------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m   | dB            |         | deg   | cm    |           |
| 1 | 4923.81 | 42.09  | 54.00      | -11.91     | 39.65      | 4.23              | 32.76  | 34.55         | Average | 43    | 100   | VERTICAL  |
| 2 | 4924.49 | 43.28  | 74.00      | -30.72     | 40.84      | 4.23              | 32.76  | 34.55         | Peak    | 43    | 100   | VERTICAL  |
| 3 | 7386.12 | 49.12  | 74.00      | -24.88     | 41.42      | 5.36              | 37.18  | 34.84         | Peak    | 152   | 100   | VERTICAL  |
| 4 | 7386.96 | 36.15  | 54.00      | -17.85     | 28.45      | 5.36              | 37.18  | 34.84         | Average | 152   | 100   | VERTICAL  |

|               |               |                |                                       |
|---------------|---------------|----------------|---------------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                                   |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11n MCS0 HT40 CH 3 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                                |

#### Horizontal

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamplifier Factor | Remark  | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB                  |         | deg   | cm    |            |
| 1 | 4843.84 | 47.00  | 74.00      | -27.00     | 44.78      | 4.21       | 32.59          | 34.58               | Peak    | 305   | 100   | HORIZONTAL |
| 2 | 4843.85 | 38.45  | 54.00      | -15.55     | 36.23      | 4.21       | 32.59          | 34.58               | Average | 305   | 100   | HORIZONTAL |

#### Vertical

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamplifier Factor | Remark  | T/Pos | A/Pos | Pol/Phase |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------------|---------|-------|-------|-----------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB                  |         | deg   | cm    |           |
| 1 | 4843.71 | 49.33  | 74.00      | -24.67     | 47.11      | 4.21       | 32.59          | 34.58               | Peak    | 96    | 100   | VERTICAL  |
| 2 | 4843.86 | 42.11  | 54.00      | -11.89     | 39.89      | 4.21       | 32.59          | 34.58               | Average | 96    | 100   | VERTICAL  |

|               |               |                |                                       |
|---------------|---------------|----------------|---------------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                                   |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11n MCS0 HT40 CH 6 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                                |

### Horizontal

|   | Freq    | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark | T/Pos   | A/Pos | Pol/Phase |            |
|---|---------|--------|---------------|---------------|---------------|-----------------------------|------------------|--------|---------|-------|-----------|------------|
|   | MHz     | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB     | deg     | cm    |           |            |
| 1 | 4871.24 | 41.97  | 54.00         | -12.03        | 39.66         | 4.22                        | 32.66            | 34.57  | Average | 120   | 100       | HORIZONTAL |
| 2 | 4873.80 | 44.00  | 74.00         | -30.00        | 41.69         | 4.22                        | 32.66            | 34.57  | Peak    | 120   | 100       | HORIZONTAL |
| 3 | 7311.00 | 48.19  | 74.00         | -25.81        | 40.60         | 5.34                        | 37.07            | 34.82  | Peak    | 131   | 100       | HORIZONTAL |
| 4 | 7311.70 | 35.49  | 54.00         | -18.51        | 27.91         | 5.34                        | 37.07            | 34.83  | Average | 131   | 100       | HORIZONTAL |

### Vertical

|   | Freq    | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark | T/Pos   | A/Pos | Pol/Phase |          |
|---|---------|--------|---------------|---------------|---------------|-----------------------------|------------------|--------|---------|-------|-----------|----------|
|   | MHz     | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB     | deg     | cm    |           |          |
| 1 | 4873.84 | 41.97  | 54.00         | -12.03        | 39.66         | 4.22                        | 32.66            | 34.57  | Average | 118   | 100       | VERTICAL |
| 2 | 4873.86 | 44.00  | 74.00         | -30.00        | 41.69         | 4.22                        | 32.66            | 34.57  | Peak    | 118   | 100       | VERTICAL |
| 3 | 7310.70 | 35.58  | 54.00         | -18.42        | 27.99         | 5.34                        | 37.07            | 34.82  | Average | 138   | 100       | VERTICAL |
| 4 | 7311.47 | 48.26  | 74.00         | -25.74        | 40.68         | 5.34                        | 37.07            | 34.83  | Peak    | 138   | 100       | VERTICAL |

|               |               |                |                                       |
|---------------|---------------|----------------|---------------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                                   |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11n MCS0 HT40 CH 9 / Chain 1 |
| Test Date     | Apr. 22, 2014 | Test Mode      | Mode 1                                |

#### Horizontal

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | Remark  | A/Pos | T/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            |         | cm    | deg   |            |
| 1 | 4903.74 | 47.56  | 74.00      | -26.44     | 43.30      | 5.95       | 33.51          | 35.20         | Peak    | 100   | 46    | HORIZONTAL |
| 2 | 4903.84 | 40.46  | 54.00      | -13.54     | 36.20      | 5.95       | 33.51          | 35.20         | Average | 100   | 46    | HORIZONTAL |

#### Vertical

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | Remark  | A/Pos | T/Pos | Pol/Phase |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------|---------|-------|-------|-----------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            |         | cm    | deg   |           |
| 1 | 4903.85 | 43.20  | 54.00      | -10.80     | 38.94      | 5.95       | 33.51          | 35.20         | Average | 100   | 287   | VERTICAL  |
| 2 | 4903.85 | 49.13  | 74.00      | -24.87     | 44.87      | 5.95       | 33.51          | 35.20         | Peak    | 100   | 287   | VERTICAL  |

#### Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

|               |               |                |                             |
|---------------|---------------|----------------|-----------------------------|
| Temperature   | 25°C          | Humidity       | 58%                         |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11b CH 1 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                      |

### Horizontal

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamplifier Factor | Remark  | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB                  |         | deg   | cm    |            |
| 1 | 4823.83 | 50.18  | 74.00      | -23.82     | 47.99      | 4.21       | 32.56          | 34.58               | Peak    | 121   | 100   | HORIZONTAL |
| 2 | 4823.86 | 45.89  | 54.00      | -8.11      | 43.70      | 4.21       | 32.56          | 34.58               | Average | 121   | 100   | HORIZONTAL |

### Vertical

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamplifier Factor | Remark  | T/Pos | A/Pos | Pol/Phase |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------------|---------|-------|-------|-----------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB                  |         | deg   | cm    |           |
| 1 | 4823.84 | 51.06  | 54.00      | -2.94      | 48.87      | 4.21       | 32.56          | 34.58               | Average | 91    | 100   | VERTICAL  |
| 2 | 4823.86 | 53.67  | 74.00      | -20.33     | 51.48      | 4.21       | 32.56          | 34.58               | Peak    | 91    | 100   | VERTICAL  |

|               |               |                |                             |
|---------------|---------------|----------------|-----------------------------|
| Temperature   | 25°C          | Humidity       | 58%                         |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11b CH 6 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                      |

### Horizontal

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamplifier Factor | Remark  | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB                  |         | deg   | cm    |            |
| 1 | 4873.74 | 45.60  | 74.00      | -28.40     | 43.29      | 4.22       | 32.66          | 34.57               | Peak    | 60    | 108   | HORIZONTAL |
| 2 | 4873.87 | 38.32  | 54.00      | -15.68     | 36.01      | 4.22       | 32.66          | 34.57               | Average | 60    | 108   | HORIZONTAL |
| 3 | 7311.53 | 37.50  | 54.00      | -16.50     | 29.92      | 5.34       | 37.07          | 34.83               | Average | 272   | 100   | HORIZONTAL |
| 4 | 7311.87 | 48.79  | 74.00      | -25.21     | 41.21      | 5.34       | 37.07          | 34.83               | Peak    | 272   | 100   | HORIZONTAL |

### Vertical

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamplifier Factor | Remark  | T/Pos | A/Pos | Pol/Phase |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------------|---------|-------|-------|-----------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB                  |         | deg   | cm    |           |
| 1 | 4873.83 | 48.05  | 74.00      | -25.95     | 45.74      | 4.22       | 32.66          | 34.57               | Peak    | 255   | 108   | VERTICAL  |
| 2 | 4873.86 | 41.95  | 54.00      | -12.05     | 39.64      | 4.22       | 32.66          | 34.57               | Average | 255   | 108   | VERTICAL  |
| 3 | 7311.00 | 50.65  | 74.00      | -23.35     | 43.06      | 5.34       | 37.07          | 34.82               | Peak    | 177   | 100   | VERTICAL  |
| 4 | 7311.63 | 40.54  | 54.00      | -13.46     | 32.96      | 5.34       | 37.07          | 34.83               | Average | 177   | 100   | VERTICAL  |

|               |               |                |                              |
|---------------|---------------|----------------|------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                          |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11b CH 11 / Chain 1 |
| Test Date     | Apr. 22, 2014 | Test Mode      | Mode 1                       |

### Horizontal

|   | Freq    | Level  | Limit | Over   | Read  | Cable | Antenna | Preamp |         | A/Pos | T/Pos |            |
|---|---------|--------|-------|--------|-------|-------|---------|--------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | Line  | Limit  | Level | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase  |
| 1 | 4923.70 | 50.81  | 74.00 | -23.19 | 46.46 | 5.97  | 33.58   | 35.20  | Peak    | 101   | 93    | HORIZONTAL |
| 2 | 4923.84 | 45.42  | 54.00 | -8.58  | 41.07 | 5.97  | 33.58   | 35.20  | Average | 101   | 93    | HORIZONTAL |
| 3 | 7386.01 | 50.41  | 74.00 | -23.59 | 42.09 | 7.17  | 36.61   | 35.46  | Peak    | 120   | 318   | HORIZONTAL |
| 4 | 7386.02 | 37.88  | 54.00 | -16.12 | 29.56 | 7.17  | 36.61   | 35.46  | Average | 120   | 318   | HORIZONTAL |

### Vertical

|   | Freq    | Level  | Limit | Over   | Read  | Cable | Antenna | Preamp |         | A/Pos | T/Pos |           |
|---|---------|--------|-------|--------|-------|-------|---------|--------|---------|-------|-------|-----------|
|   | MHz     | dBuV/m | Line  | Limit  | Level | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase |
| 1 | 4923.84 | 51.47  | 54.00 | -2.53  | 47.12 | 5.97  | 33.58   | 35.20  | Average | 100   | 282   | VERTICAL  |
| 2 | 4923.88 | 54.40  | 74.00 | -19.60 | 50.05 | 5.97  | 33.58   | 35.20  | Peak    | 100   | 282   | VERTICAL  |
| 3 | 7384.60 | 53.86  | 74.00 | -20.14 | 45.54 | 7.17  | 36.61   | 35.46  | Peak    | 171   | 186   | VERTICAL  |
| 4 | 7386.48 | 45.06  | 54.00 | -8.94  | 36.74 | 7.17  | 36.61   | 35.46  | Average | 171   | 186   | VERTICAL  |

|               |               |                |                             |
|---------------|---------------|----------------|-----------------------------|
| Temperature   | 25°C          | Humidity       | 58%                         |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11g CH 1 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                      |

### Horizontal

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | Remark  | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            |         | deg   | cm    |            |
| 1 | 4823.54 | 46.22  | 74.00      | -27.78     | 44.03      | 4.21       | 32.56          | 34.58         | Peak    | 285   | 100   | HORIZONTAL |
| 2 | 4823.85 | 38.41  | 54.00      | -15.59     | 36.22      | 4.21       | 32.56          | 34.58         | Average | 286   | 100   | HORIZONTAL |

### Vertical

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | Remark  | T/Pos | A/Pos | Pol/Phase |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------|---------|-------|-------|-----------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            |         | deg   | cm    |           |
| 1 | 4823.87 | 41.89  | 54.00      | -12.11     | 39.70      | 4.21       | 32.56          | 34.58         | Average | 157   | 100   | VERTICAL  |
| 2 | 4824.15 | 44.36  | 74.00      | -29.64     | 42.17      | 4.21       | 32.56          | 34.58         | Peak    | 157   | 100   | VERTICAL  |

|               |               |                |                             |
|---------------|---------------|----------------|-----------------------------|
| Temperature   | 25°C          | Humidity       | 58%                         |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11g CH 6 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                      |

### Horizontal

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamplifier Factor | Remark  | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB                  |         | deg   | cm    |            |
| 1 | 4873.70 | 45.55  | 74.00      | -28.45     | 43.24      | 4.22       | 32.66          | 34.57               | Peak    | 317   | 100   | HORIZONTAL |
| 2 | 4873.88 | 37.48  | 54.00      | -16.52     | 35.17      | 4.22       | 32.66          | 34.57               | Average | 317   | 100   | HORIZONTAL |
| 3 | 7310.83 | 48.95  | 74.00      | -25.05     | 41.36      | 5.34       | 37.07          | 34.82               | Peak    | 193   | 100   | HORIZONTAL |
| 4 | 7312.13 | 35.20  | 54.00      | -18.80     | 27.62      | 5.34       | 37.07          | 34.83               | Average | 193   | 100   | HORIZONTAL |

### Vertical

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamplifier Factor | Remark  | T/Pos | A/Pos | Pol/Phase |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------------|---------|-------|-------|-----------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB                  |         | deg   | cm    |           |
| 1 | 4873.85 | 41.27  | 54.00      | -12.73     | 38.96      | 4.22       | 32.66          | 34.57               | Average | 94    | 100   | VERTICAL  |
| 2 | 4874.11 | 48.34  | 74.00      | -25.66     | 46.03      | 4.22       | 32.66          | 34.57               | Peak    | 94    | 100   | VERTICAL  |
| 3 | 7303.53 | 35.64  | 54.00      | -18.36     | 28.05      | 5.34       | 37.07          | 34.82               | Average | 102   | 100   | VERTICAL  |
| 4 | 7312.13 | 50.76  | 74.00      | -23.24     | 43.18      | 5.34       | 37.07          | 34.83               | Peak    | 102   | 100   | VERTICAL  |

|               |               |                |                              |
|---------------|---------------|----------------|------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                          |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11g CH 11 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                       |

#### Horizontal

|   | Freq    | Level  | Limit  | Over   | Read  | Cable | Antenna | Preamp | Remark  | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|--------|--------|-------|-------|---------|--------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m | dB     | dBuV  | dB    | dB/m    | dB     |         | deg   | cm    |            |
| 1 | 4923.83 | 39.42  | 54.00  | -14.58 | 36.98 | 4.23  | 32.76   | 34.55  | Average | 284   | 100   | HORIZONTAL |
| 2 | 4923.90 | 47.06  | 74.00  | -26.94 | 44.62 | 4.23  | 32.76   | 34.55  | Peak    | 284   | 100   | HORIZONTAL |
| 3 | 7386.36 | 36.15  | 54.00  | -17.85 | 28.45 | 5.36  | 37.18   | 34.84  | Average | 217   | 100   | HORIZONTAL |
| 4 | 7386.46 | 48.65  | 74.00  | -25.35 | 40.95 | 5.36  | 37.18   | 34.84  | Peak    | 217   | 100   | HORIZONTAL |

#### Vertical

|   | Freq    | Level  | Limit  | Over   | Read  | Cable | Antenna | Preamp | Remark  | T/Pos | A/Pos | Pol/Phase |
|---|---------|--------|--------|--------|-------|-------|---------|--------|---------|-------|-------|-----------|
|   | MHz     | dBuV/m | dBuV/m | dB     | dBuV  | dB    | dB/m    | dB     |         | deg   | cm    |           |
| 1 | 4923.84 | 41.73  | 54.00  | -12.27 | 39.29 | 4.23  | 32.76   | 34.55  | Average | 93    | 171   | VERTICAL  |
| 2 | 4924.69 | 49.89  | 74.00  | -24.11 | 47.45 | 4.23  | 32.76   | 34.55  | Peak    | 93    | 171   | VERTICAL  |
| 3 | 7385.37 | 51.12  | 74.00  | -22.88 | 43.42 | 5.36  | 37.18   | 34.84  | Peak    | 132   | 100   | VERTICAL  |
| 4 | 7385.42 | 36.34  | 54.00  | -17.66 | 28.64 | 5.36  | 37.18   | 34.84  | Average | 132   | 100   | VERTICAL  |

#### Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

## 4.4. Emissions Measurement

### 4.4.1. Limit

30dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies<br>(MHz) | Field Strength<br>(micorvolts/meter) | Measurement Distance<br>(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                                |

### 4.4.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| Spectrum Parameter                          | Setting                                       |
|---------------------------------------------|-----------------------------------------------|
| Attenuation                                 | Auto                                          |
| Span Frequency                              | 100 MHz                                       |
| RBW / VBW (Emission in restricted band)     | 1MHz / 3MHz for Peak, 1MHz / 10Hz for Average |
| RBW / VBW (Emission in non-restricted band) | 100 kHz / 300 kHz for Peak                    |

### 4.4.3. Test Procedures

For Radiated band edges Measurement:

- The test procedure is the same as section 4.3.3, only the frequency range investigated is limited to 100MHz around band edges.

For Radiated Out of Band Emission Measurement:

- The radiated emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.  
Only worst data of each operating mode is presented.

### 4.4.4. Test Setup Layout

For Radiated band edges Measurement:

This test setup layout is the same as that shown in section 4.3.4.

For Radiated Out of Band Emission Measurement:

This test setup layout is the same as that shown in section 4.3.4.

#### **4.4.5. Test Deviation**

There is no deviation with the original standard.

#### **4.4.6. EUT Operation during Test**

The EUT was programmed to be in continuously transmitting mode.

#### 4.4.7. Test Result of Band Edge and Fundamental Emissions

|               |               |                |                                              |
|---------------|---------------|----------------|----------------------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                                          |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11n MCS0 HT20 CH 1, 6, 11 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                                       |

##### Channel 1

|   | Freq    | Level  | Limit  | Over  | Read  | CableAntenna | Preamp | Remark       | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|--------|-------|-------|--------------|--------|--------------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m | dB    | dBuV  | dB           | dB/m   | dB           | deg   | cm    |            |
| 1 | 2390.00 | 68.27  | 74.00  | -5.73 | 37.44 | 2.91         | 27.92  | 0.00 Peak    | 84    | 148   | HORIZONTAL |
| 2 | 2390.00 | 52.04  | 54.00  | -1.96 | 21.21 | 2.91         | 27.92  | 0.00 Average | 84    | 148   | HORIZONTAL |
| 3 | 2408.83 | 108.41 |        |       | 77.59 | 2.92         | 27.90  | 0.00 Peak    | 84    | 148   | HORIZONTAL |
| 4 | 2420.00 | 98.78  |        |       | 67.97 | 2.93         | 27.88  | 0.00 Average | 84    | 148   | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 2412 MHz.

##### Channel 6

|   | Freq    | Level  | Limit  | Over   | Read  | CableAntenna | Preamp | Remark       | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|--------|--------|-------|--------------|--------|--------------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m | dB     | dBuV  | dB           | dB/m   | dB           | deg   | cm    |            |
| 1 | 2355.20 | 58.82  | 74.00  | -15.18 | 27.96 | 2.89         | 27.97  | 0.00 Peak    | 83    | 144   | HORIZONTAL |
| 2 | 2362.40 | 45.81  | 54.00  | -8.19  | 14.95 | 2.89         | 27.97  | 0.00 Average | 83    | 144   | HORIZONTAL |
| 3 | 2444.33 | 110.04 |        |        | 79.24 | 2.94         | 27.86  | 0.00 Peak    | 83    | 144   | HORIZONTAL |
| 4 | 2445.00 | 100.42 |        |        | 69.62 | 2.94         | 27.86  | 0.00 Average | 83    | 144   | HORIZONTAL |
| 5 | 2483.50 | 44.67  | 54.00  | -9.33  | 13.89 | 2.96         | 27.82  | 0.00 Average | 83    | 144   | HORIZONTAL |
| 6 | 2484.30 | 59.70  | 74.00  | -14.30 | 28.92 | 2.96         | 27.82  | 0.00 Peak    | 83    | 144   | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 2437 MHz.

##### Channel 11

|   | Freq    | Level  | Limit  | Over  | Read  | CableAntenna | Preamp | Remark       | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|--------|-------|-------|--------------|--------|--------------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m | dB    | dBuV  | dB           | dB/m   | dB           | deg   | cm    |            |
| 1 | 2459.00 | 109.02 |        |       | 78.23 | 2.95         | 27.84  | 0.00 Peak    | 84    | 148   | HORIZONTAL |
| 2 | 2463.50 | 98.63  |        |       | 67.84 | 2.95         | 27.84  | 0.00 Average | 84    | 148   | HORIZONTAL |
| 3 | 2483.50 | 52.19  | 54.00  | -1.81 | 21.41 | 2.96         | 27.82  | 0.00 Average | 84    | 148   | HORIZONTAL |
| 4 | 2485.90 | 73.30  | 74.00  | -0.70 | 42.52 | 2.96         | 27.82  | 0.00 Peak    | 84    | 148   | HORIZONTAL |

Item 1, 2 are the fundamental frequency at 2462 MHz.

|               |               |                |                                             |
|---------------|---------------|----------------|---------------------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                                         |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11n MCS0 HT40 CH 3, 6, 9 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                                      |

### Channel 3

|   | Freq    | Level  | Limit  | Over  | Read  | CableAntenna | Preamp |        | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|--------|-------|-------|--------------|--------|--------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m | dB    | dBuV  | Loss         | Factor | Factor | deg   | cm    |            |
| 1 | 2387.60 | 66.35  | 74.00  | -7.65 | 35.52 | 2.91         | 27.92  | 0.00   | 86    | 148   | HORIZONTAL |
| 2 | 2390.00 | 52.40  | 54.00  | -1.60 | 21.57 | 2.91         | 27.92  | 0.00   | 86    | 148   | HORIZONTAL |
| 3 | 2426.33 | 95.25  |        |       | 64.44 | 2.93         | 27.88  | 0.00   | 86    | 148   | HORIZONTAL |
| 4 | 2432.33 | 105.36 |        |       | 74.55 | 2.93         | 27.88  | 0.00   | 86    | 148   | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 2422 MHz.

### Channel 6

|   | Freq    | Level  | Limit  | Over   | Read  | CableAntenna | Preamp |        | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|--------|--------|-------|--------------|--------|--------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m | dB     | dBuV  | Loss         | Factor | Factor | deg   | cm    |            |
| 1 | 2389.60 | 61.48  | 74.00  | -12.52 | 30.65 | 2.91         | 27.92  | 0.00   | 85    | 144   | HORIZONTAL |
| 2 | 2390.00 | 46.13  | 54.00  | -7.87  | 15.30 | 2.91         | 27.92  | 0.00   | 85    | 144   | HORIZONTAL |
| 3 | 2446.33 | 95.62  |        |        | 64.82 | 2.94         | 27.86  | 0.00   | 85    | 144   | HORIZONTAL |
| 4 | 2447.33 | 105.62 |        |        | 74.82 | 2.94         | 27.86  | 0.00   | 85    | 144   | HORIZONTAL |
| 5 | 2483.50 | 50.15  | 54.00  | -3.85  | 19.37 | 2.96         | 27.82  | 0.00   | 85    | 144   | HORIZONTAL |
| 6 | 2485.50 | 65.59  | 74.00  | -8.41  | 34.81 | 2.96         | 27.82  | 0.00   | 85    | 144   | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 2437 MHz.

### Channel 9

|   | Freq    | Level  | Limit  | Over  | Read  | CableAntenna | Preamp |        | T/Pos | A/Pos | Pol/Phase  |
|---|---------|--------|--------|-------|-------|--------------|--------|--------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m | dB    | dBuV  | Loss         | Factor | Factor | deg   | cm    |            |
| 1 | 2461.33 | 94.67  |        |       | 63.88 | 2.95         | 27.84  | 0.00   | 82    | 146   | HORIZONTAL |
| 2 | 2462.67 | 104.79 |        |       | 74.00 | 2.95         | 27.84  | 0.00   | 82    | 146   | HORIZONTAL |
| 3 | 2483.50 | 52.34  | 54.00  | -1.66 | 21.56 | 2.96         | 27.82  | 0.00   | 82    | 146   | HORIZONTAL |
| 4 | 2485.90 | 67.42  | 74.00  | -6.58 | 36.64 | 2.96         | 27.82  | 0.00   | 82    | 146   | HORIZONTAL |

Item 1, 2 are the fundamental frequency at 2452 MHz.

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

|               |               |                |                                    |
|---------------|---------------|----------------|------------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                                |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11b CH 1, 6, 11 / Chain 1 |
| Test Date     | Apr. 22, 2014 | Test Mode      | Mode 1                             |

#### Channel 1

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | Remark  | A/Pos | T/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|-------------------|----------------|---------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            |         | cm    | deg   |            |
| 1 | 2385.60 | 52.04  | 54.00      | -1.96      | 19.90      | 4.09              | 28.05          | 0.00          | Average | 150   | 260   | HORIZONTAL |
| 2 | 2386.00 | 60.64  | 74.00      | -13.36     | 28.50      | 4.09              | 28.05          | 0.00          | Peak    | 150   | 260   | HORIZONTAL |
| 3 | 2411.00 | 112.79 |            |            | 80.59      | 4.11              | 28.09          | 0.00          | Peak    | 150   | 260   | HORIZONTAL |
| 4 | 2411.20 | 108.86 |            |            | 76.66      | 4.11              | 28.09          | 0.00          | Average | 150   | 260   | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 2412 MHz.

#### Channel 6

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | Remark  | A/Pos | T/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|-------------------|----------------|---------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            |         | cm    | deg   |            |
| 1 | 2359.20 | 48.52  | 54.00      | -5.48      | 16.48      | 4.07              | 27.97          | 0.00          | Average | 147   | 262   | HORIZONTAL |
| 2 | 2359.20 | 58.73  | 74.00      | -15.27     | 26.69      | 4.07              | 27.97          | 0.00          | Peak    | 147   | 262   | HORIZONTAL |
| 3 | 2437.80 | 114.68 |            |            | 82.37      | 4.13              | 28.18          | 0.00          | Peak    | 147   | 262   | HORIZONTAL |
| 4 | 2438.60 | 110.60 |            |            | 78.29      | 4.13              | 28.18          | 0.00          | Average | 147   | 262   | HORIZONTAL |
| 5 | 2484.70 | 46.20  | 54.00      | -7.80      | 13.78      | 4.16              | 28.26          | 0.00          | Average | 147   | 262   | HORIZONTAL |
| 6 | 2484.70 | 57.44  | 74.00      | -16.56     | 25.02      | 4.16              | 28.26          | 0.00          | Peak    | 147   | 262   | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 2437 MHz.

#### Channel 11

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | Remark  | A/Pos | T/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|-------------------|----------------|---------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            |         | cm    | deg   |            |
| 1 | 2463.00 | 112.13 |            |            | 79.77      | 4.14              | 28.22          | 0.00          | Peak    | 146   | 265   | HORIZONTAL |
| 2 | 2463.60 | 108.24 |            |            | 75.88      | 4.14              | 28.22          | 0.00          | Average | 146   | 265   | HORIZONTAL |
| 3 | 2487.90 | 62.05  | 74.00      | -11.95     | 29.58      | 4.17              | 28.30          | 0.00          | Peak    | 146   | 265   | HORIZONTAL |
| 4 | 2488.10 | 53.41  | 54.00      | -0.59      | 20.94      | 4.17              | 28.30          | 0.00          | Average | 146   | 265   | HORIZONTAL |

Item 1, 2 are the fundamental frequency at 2462 MHz.

|               |               |                |                                    |
|---------------|---------------|----------------|------------------------------------|
| Temperature   | 25°C          | Humidity       | 58%                                |
| Test Engineer | Kenneth Huang | Configurations | IEEE 802.11g CH 1, 6, 11 / Chain 1 |
| Test Date     | Apr. 21, 2014 | Test Mode      | Mode 1                             |

#### Channel 1

|   | Freq    | Level  | Limit  | Over  | Read  | CableAntenna | Preamp |      | T/Pos   | A/Pos | Pol/Phase      |
|---|---------|--------|--------|-------|-------|--------------|--------|------|---------|-------|----------------|
|   | MHz     | dBuV/m | dBuV/m | dB    | dBuV  | dB           | dB/m   | dB   | deg     | cm    |                |
| 1 | 2389.80 | 69.93  | 74.00  | -4.07 | 39.10 | 2.91         | 27.92  | 0.00 | Peak    | 80    | 146 HORIZONTAL |
| 2 | 2390.00 | 51.77  | 54.00  | -2.23 | 20.94 | 2.91         | 27.92  | 0.00 | Average | 80    | 146 HORIZONTAL |
| 3 | 2413.50 | 108.98 |        |       | 78.16 | 2.92         | 27.90  | 0.00 | Peak    | 80    | 146 HORIZONTAL |
| 4 | 2419.33 | 99.55  |        |       | 68.73 | 2.92         | 27.90  | 0.00 | Average | 80    | 146 HORIZONTAL |

Item 3, 4 are the fundamental frequency at 2412 MHz.

#### Channel 6

|   | Freq    | Level  | Limit  | Over   | Read  | CableAntenna | Preamp |      | T/Pos   | A/Pos | Pol/Phase      |
|---|---------|--------|--------|--------|-------|--------------|--------|------|---------|-------|----------------|
|   | MHz     | dBuV/m | dBuV/m | dB     | dBuV  | dB           | dB/m   | dB   | deg     | cm    |                |
| 1 | 2356.80 | 46.58  | 54.00  | -7.42  | 15.72 | 2.89         | 27.97  | 0.00 | Average | 79    | 146 HORIZONTAL |
| 2 | 2358.80 | 58.58  | 74.00  | -15.42 | 27.72 | 2.89         | 27.97  | 0.00 | Peak    | 79    | 146 HORIZONTAL |
| 3 | 2438.33 | 108.84 |        |        | 78.04 | 2.94         | 27.86  | 0.00 | Peak    | 79    | 146 HORIZONTAL |
| 4 | 2444.33 | 99.33  |        |        | 68.53 | 2.94         | 27.86  | 0.00 | Average | 79    | 146 HORIZONTAL |
| 5 | 2483.90 | 43.51  | 54.00  | -10.49 | 12.73 | 2.96         | 27.82  | 0.00 | Average | 79    | 146 HORIZONTAL |
| 6 | 2488.70 | 54.92  | 74.00  | -19.08 | 24.15 | 2.97         | 27.80  | 0.00 | Peak    | 79    | 146 HORIZONTAL |

Item 3, 4 are the fundamental frequency at 2437 MHz.

#### Channel 11

|   | Freq    | Level  | Limit  | Over  | Read  | CableAntenna | Preamp |      | T/Pos   | A/Pos | Pol/Phase      |
|---|---------|--------|--------|-------|-------|--------------|--------|------|---------|-------|----------------|
|   | MHz     | dBuV/m | dBuV/m | dB    | dBuV  | dB           | dB/m   | dB   | deg     | cm    |                |
| 1 | 2463.33 | 108.59 |        |       | 77.80 | 2.95         | 27.84  | 0.00 | Peak    | 80    | 144 HORIZONTAL |
| 2 | 2464.00 | 98.93  |        |       | 68.14 | 2.95         | 27.84  | 0.00 | Average | 80    | 144 HORIZONTAL |
| 3 | 2483.50 | 51.98  | 54.00  | -2.02 | 21.20 | 2.96         | 27.82  | 0.00 | Average | 80    | 144 HORIZONTAL |
| 4 | 2483.70 | 73.46  | 74.00  | -0.54 | 42.68 | 2.96         | 27.82  | 0.00 | Peak    | 80    | 144 HORIZONTAL |

Item 1, 2 are the fundamental frequency at 2462 MHz.

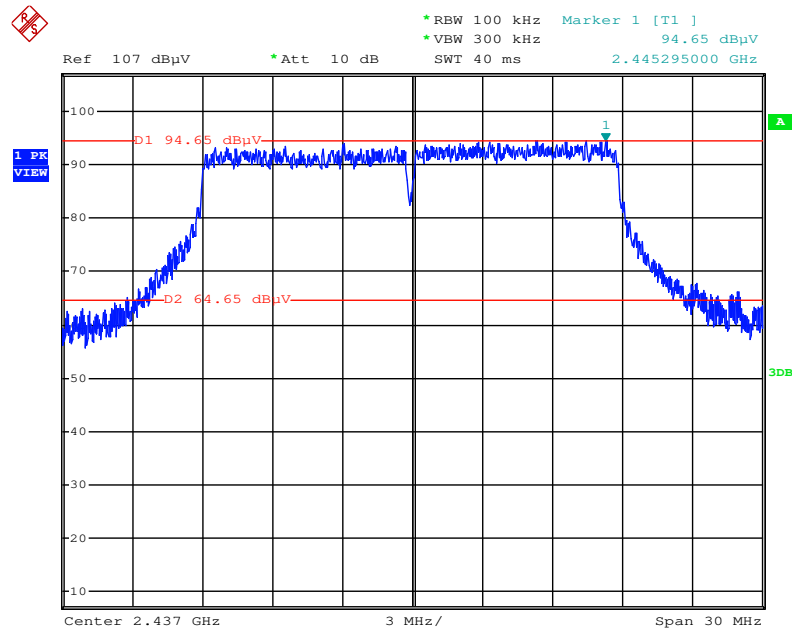
Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

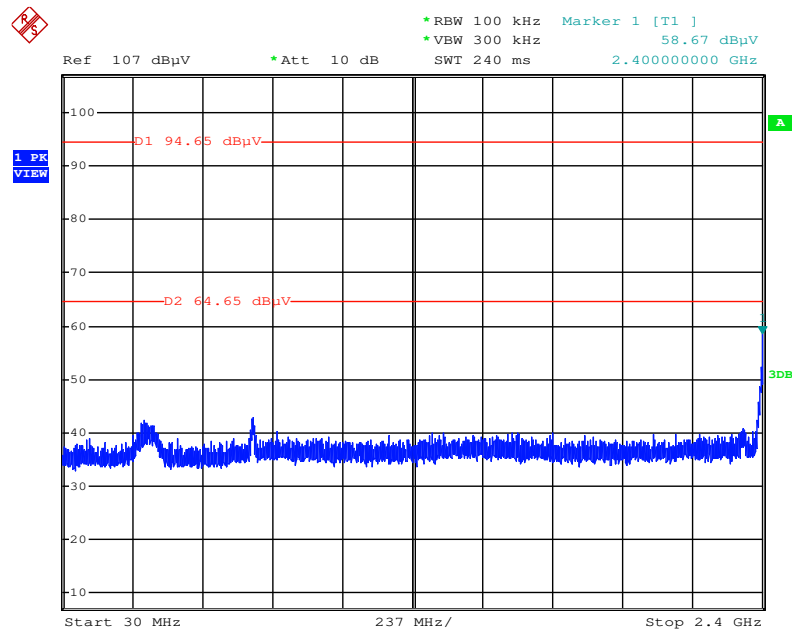
# For Emission not in Restricted Band

## Plot on Configuration IEEE 802.11n MCS0 HT20 / Reference Level



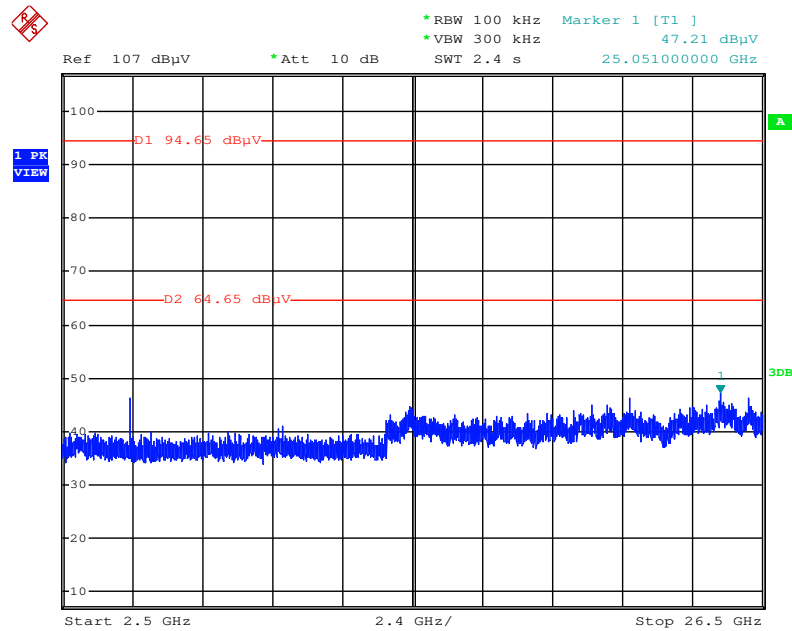
Date: 22.APR.2014 22:39:40

## Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 1 / 30MHz~2400MHz (down 30dBc)



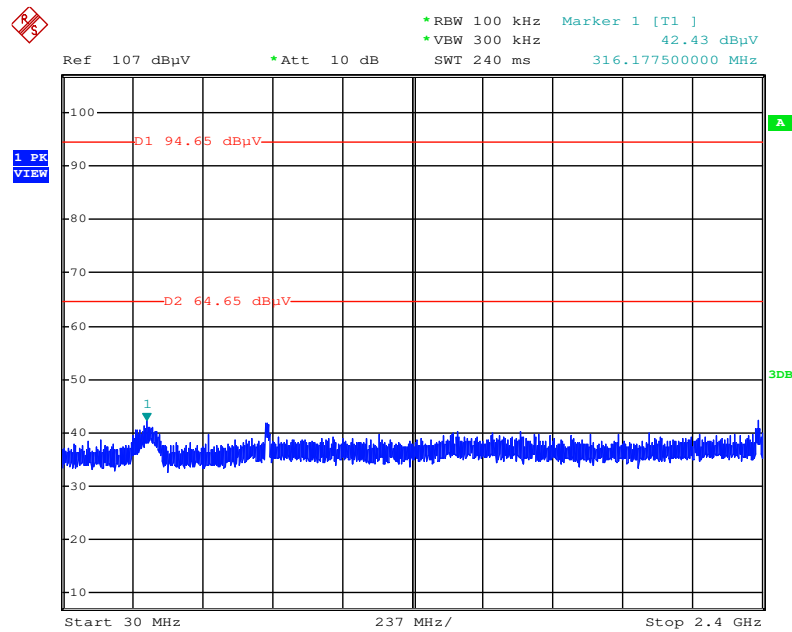
Date: 22.APR.2014 22:40:36

### Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 1 / 2500MHz~26500MHz (down 30dBc)



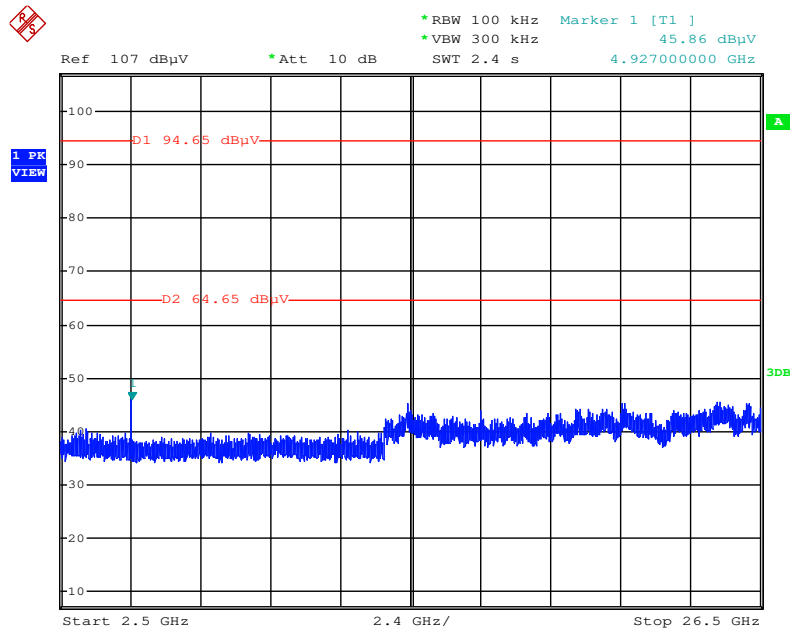
Date: 22.APR.2014 22:41:36

### Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 11 / 30MHz~2400MHz (down 30dBc)



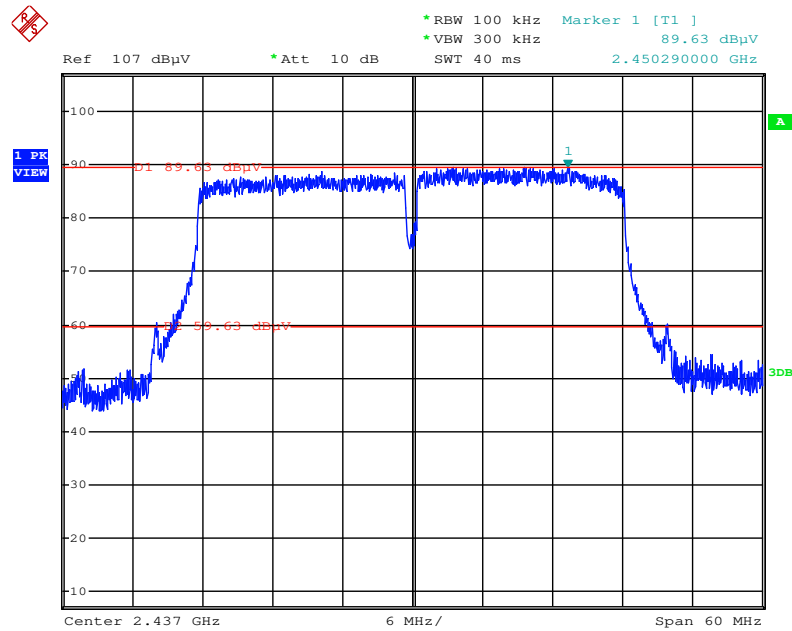
Date: 22.APR.2014 22:42:56

# Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 11 / 2500MHz~26500MHz (down 30dBc)



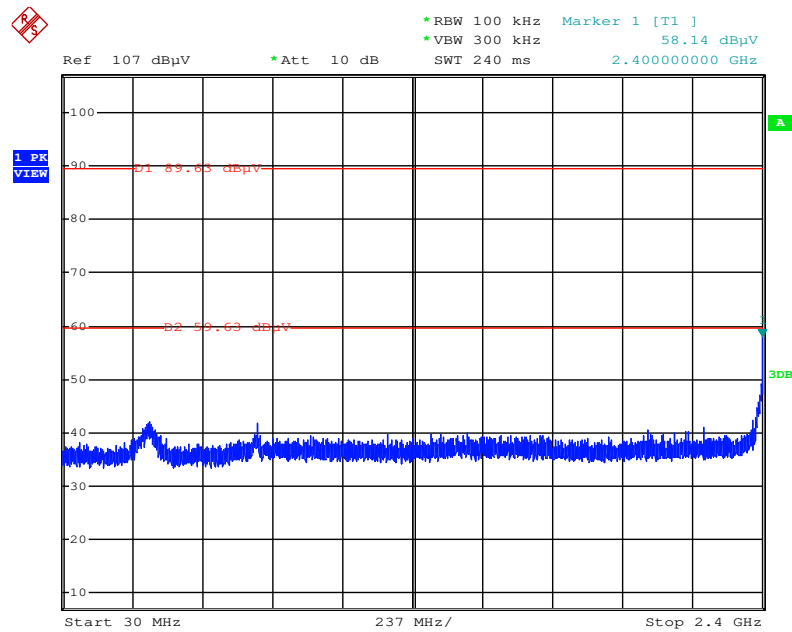
Date: 22.APR.2014 22:43:40

### Plot on Configuration IEEE 802.11n MCS0 HT40 / Reference Level



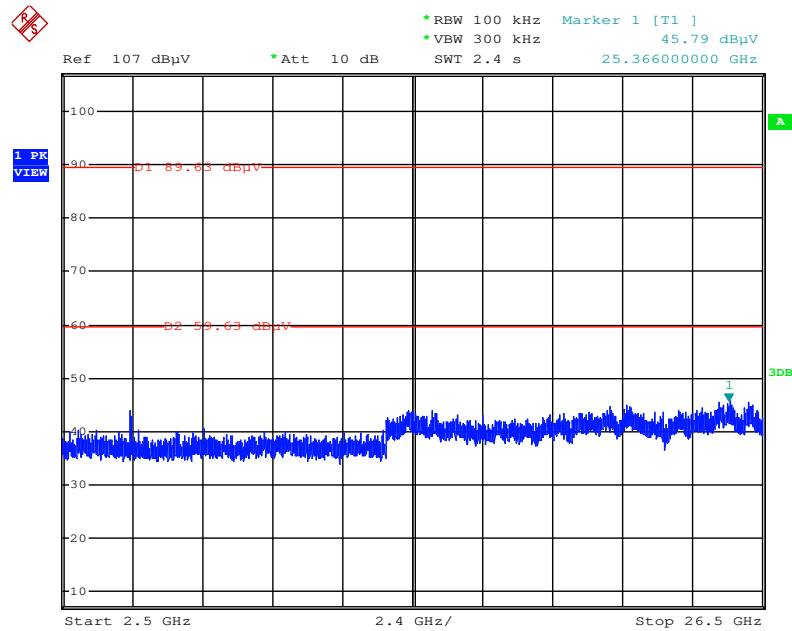
Date: 22.APR.2014 22:23:35

### Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 3 / 30MHz~2400MHz (down 30dBc)



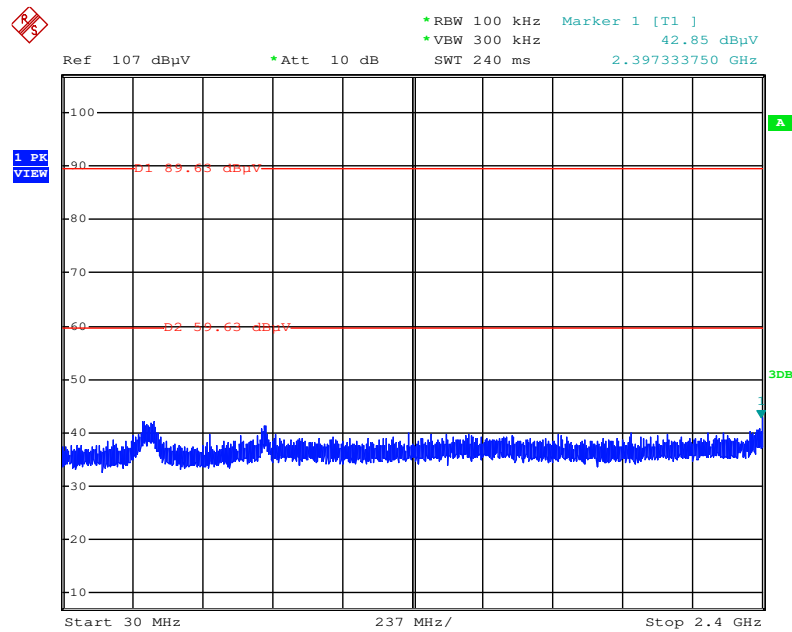
Date: 22.APR.2014 22:34:21

### Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 3 / 2500MHz~26500MHz (down 30dBc)



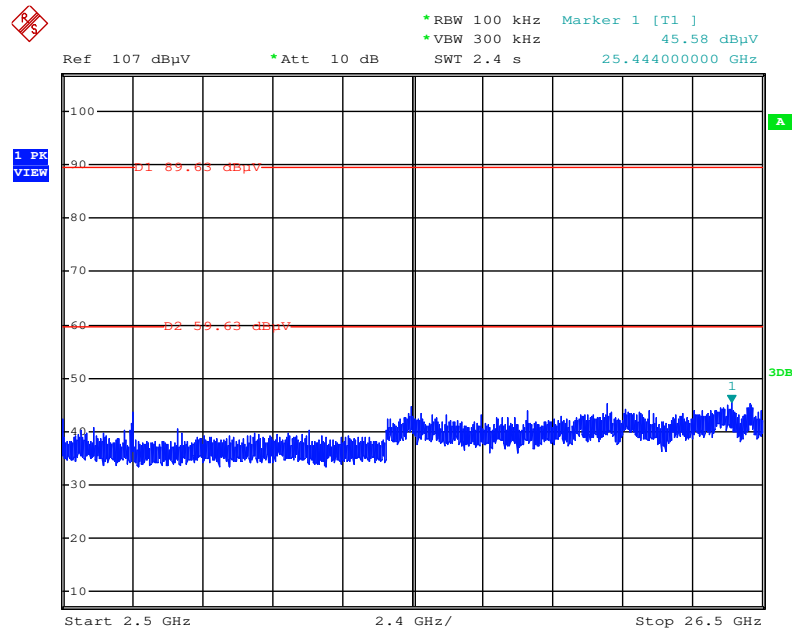
Date: 22.APR.2014 22:35:45

### Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 9 / 30MHz~2400MHz (down 30dBc)



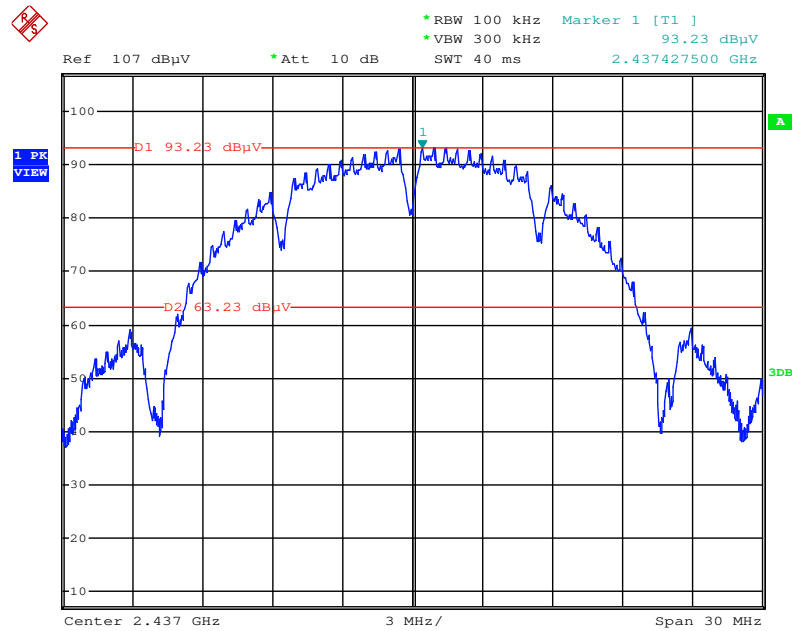
Date: 22.APR.2014 22:37:11

# Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 9 / 2500MHz~26500MHz (down 30dBc)



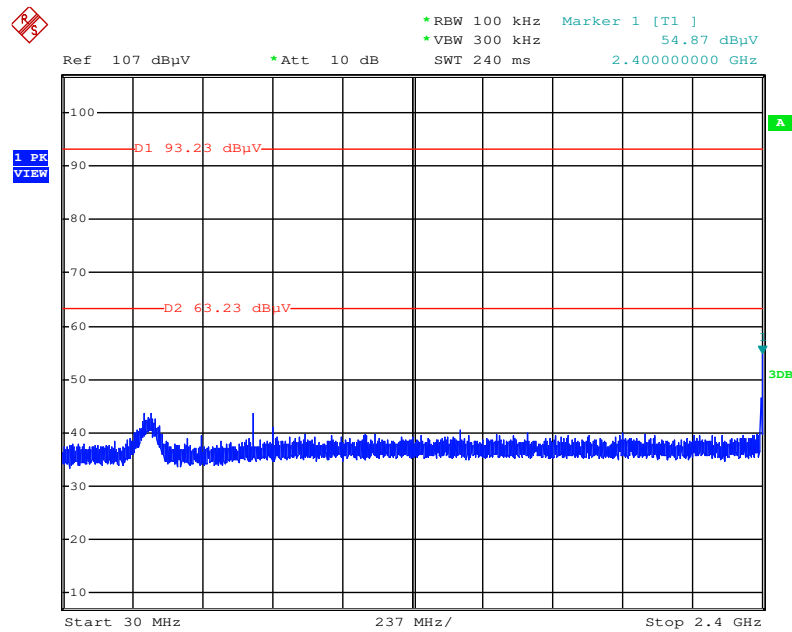
Date: 22.APR.2014 22:37:49

### Plot on Configuration IEEE 802.11b / Reference Level



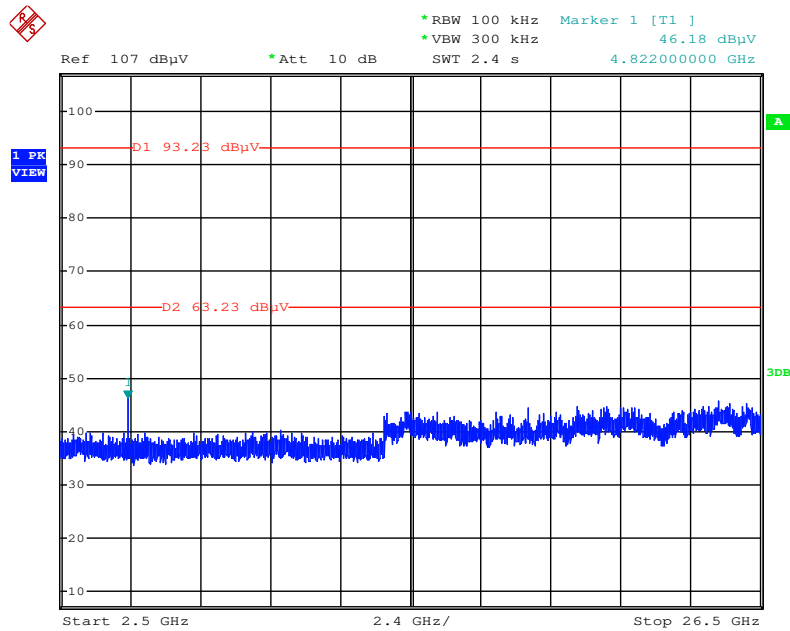
Date: 22.APR.2014 22:54:02

### Plot on Configuration IEEE 802.11b / CH 1 / 30MHz~2400MHz (down 30dBc)



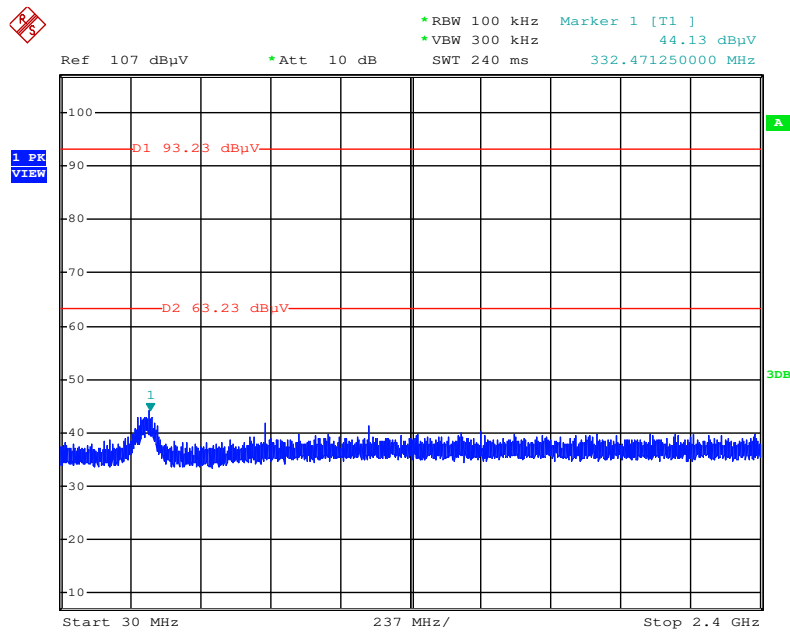
Date: 22.APR.2014 22:56:12

### Plot on Configuration IEEE 802.11b / CH 1 / 2500MHz~26500MHz (down 30dBc)



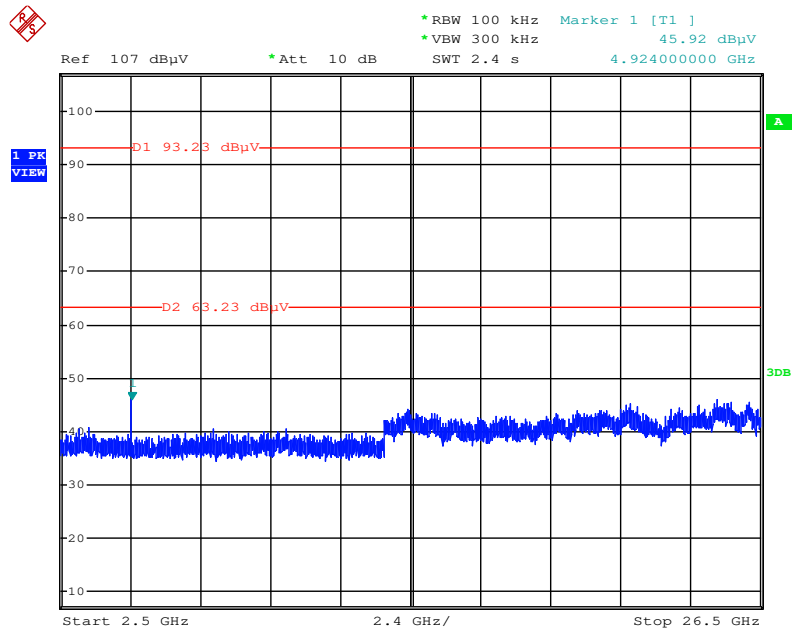
Date: 22.APR.2014 22:57:01

### Plot on Configuration IEEE 802.11b / CH 11 / 30MHz~2400MHz (down 30dBc)



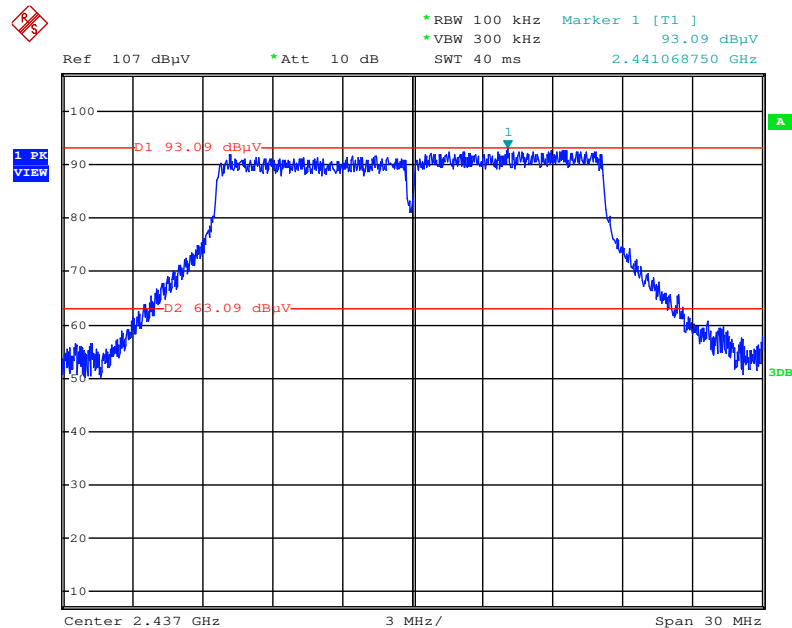
Date: 22.APR.2014 22:58:15

# Plot on Configuration IEEE 802.11b / CH 11 / 2500MHz~26500MHz (down 30dBc)



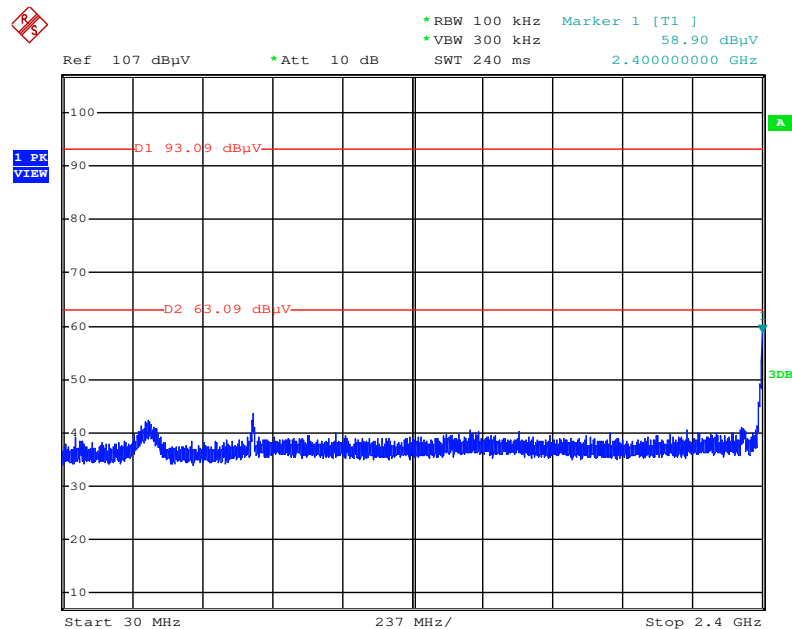
Date: 22.APR.2014 22:59:09

### Plot on Configuration IEEE 802.11g / Reference Level



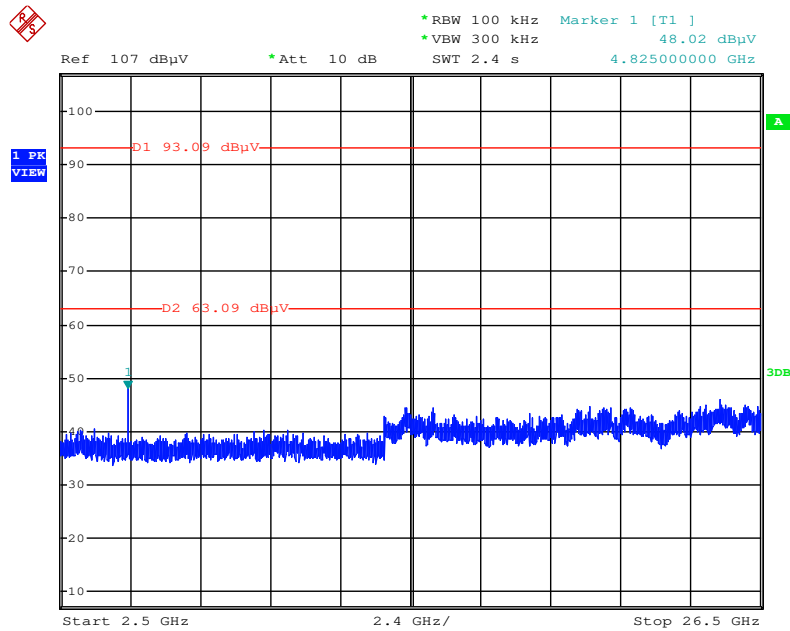
Date: 22.APR.2014 22:45:47

### Plot on Configuration IEEE 802.11g / CH 1 / 30MHz~2400MHz (down 30dBc)



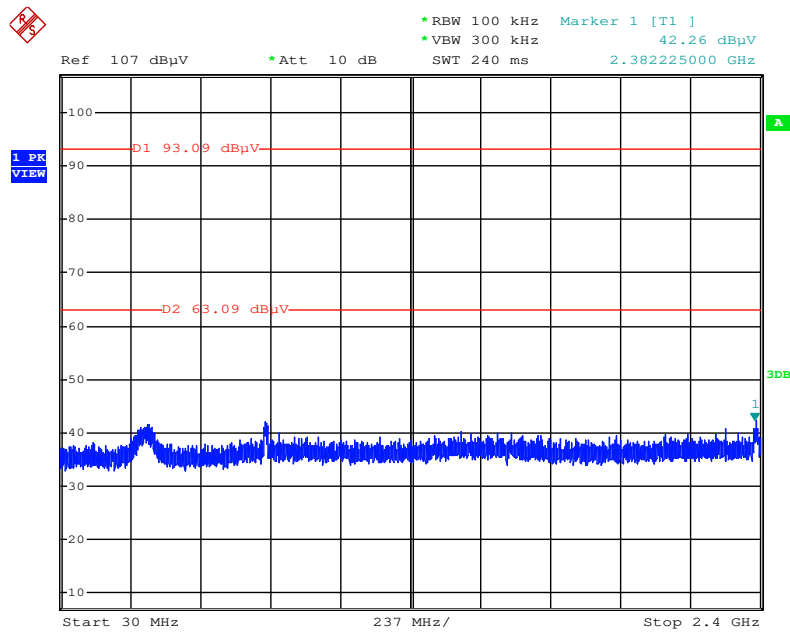
Date: 22.APR.2014 22:47:55

### Plot on Configuration IEEE 802.11g / CH 1 / 2500MHz~26500MHz (down 30dBc)



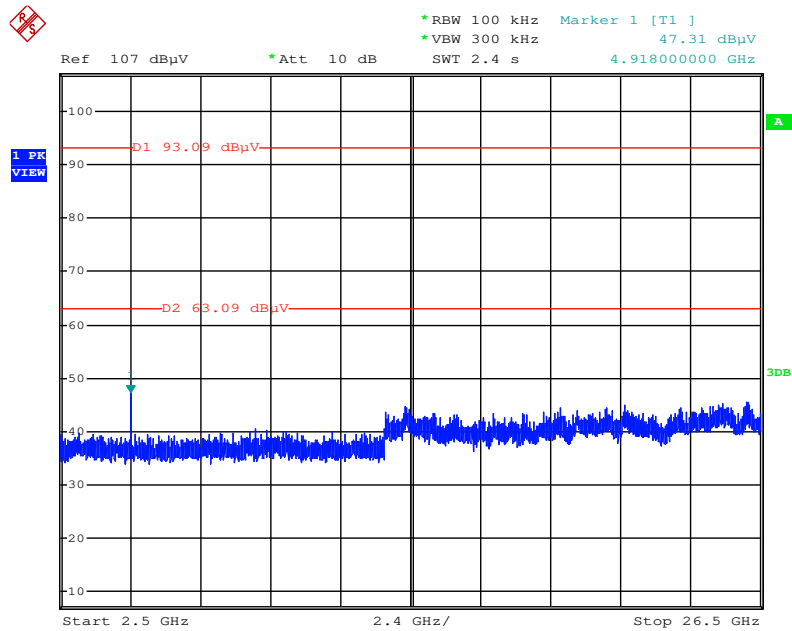
Date: 22.APR.2014 22:48:44

### Plot on Configuration IEEE 802.11g / CH 11 / 30MHz~2400MHz (down 30dBc)



Date: 22.APR.2014 22:50:00

# Plot on Configuration IEEE 802.11g / CH 11 / 2500MHz~26500MHz (down 30dBc)



Date: 22.APR.2014 22:50:53

## **4.5. Antenna Requirements**

### **4.5.1. Limit**

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### **4.5.2. Antenna Connector Construction**

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

## 5. LIST OF MEASURING EQUIPMENTS

| Instrument         | Manufacturer | Model No.        | Serial No.  | Characteristics  | Calibration Date | Remark                |
|--------------------|--------------|------------------|-------------|------------------|------------------|-----------------------|
| EMI Test Receiver  | R&S          | ESCS 30          | 100355      | 9kHz ~ 2.75 GHz  | Apr. 23, 2014    | Conduction (CO01-CB)  |
| LISN               | F.C.C.       | FCC-LISN-50-16-2 | 04083       | 150kHz ~ 100 MHz | Nov. 23, 2013    | Conduction (CO01-CB)  |
| LISN               | Schwarzbeck  | NSLK 8127        | 8127478     | 9kHz ~ 30MHz     | Nov. 11, 2013    | Conduction (CO01-CB)  |
| COND Cable         | Woken        | Cable            | 01          | 150kHz ~ 30 MHz  | Dec. 04, 2013    | Conduction (CO01-CB)  |
| Software           | Audix        | E3               | 5.410e      | -                | N.C.R.           | Conduction (CO01-CB)  |
| BILOG ANTENNA      | Teseq GmbH   | CBL 6112D        | 35236       | 30MHz ~ 2GHz     | Nov. 29, 2013    | Radiation (03CH01-CB) |
| Loop Antenna       | Teseq        | HLA 6120         | 24155       | 9kHz - 30 MHz    | Nov. 05, 2012*   | Radiation (03CH01-CB) |
| Horn Antenna       | EMCO         | 3115             | 00075790    | 750MHz~18GHz     | Nov. 01, 2013    | Radiation (03CH01-CB) |
| Horn Antenna       | SCHWARZBEAK  | BBHA 9170        | BBHA9170252 | 15GHz ~ 40GHz    | Dec. 17, 2013    | Radiation (03CH01-CB) |
| Pre-Amplifier      | Agilent      | 8447D            | 2944A10991  | 0.1MHz ~ 1.3GHz  | Nov. 12, 2013    | Radiation (03CH01-CB) |
| Pre-Amplifier      | Agilent      | 8449B            | 3008A02310  | 1GHz ~ 26.5GHz   | Dec. 16, 2013    | Radiation (03CH01-CB) |
| Pre-Amplifier      | WM           | TF-130N-R1       | 923365      | 26GHz ~ 40GHz    | Oct. 23, 2013    | Radiation (03CH01-CB) |
| Spectrum analyzer  | R&S          | FSP40            | 100019      | 9kHz~40GHz       | Dec. 02, 2013    | Radiation (03CH01-CB) |
| EMI Test Receiver  | Agilent      | N9038A           | MY52260123  | 9kHz ~ 8GHz      | Dec. 12, 2013    | Radiation (03CH01-CB) |
| Turn Table         | INN CO       | CO 2000          | N/A         | 0 ~ 360 degree   | N.C.R.           | Radiation (03CH01-CB) |
| Antenna Mast       | INN CO       | CO2000           | N/A         | 1 m - 4 m        | N.C.R.           | Radiation (03CH01-CB) |
| RF Cable-low       | Woken        | Low Cable-1      | N/A         | 30 MHz - 1 GHz   | Nov. 17, 2013    | Radiation (03CH01-CB) |
| RF Cable-high      | Woken        | High Cable-3     | N/A         | 1 GHz - 40 GHz   | Nov. 17, 2013    | Radiation (03CH01-CB) |
| RF Cable-high      | Woken        | High Cable-4     | N/A         | 1 GHz - 40 GHz   | Nov. 17, 2013    | Radiation (03CH01-CB) |
| Signal analyzer    | R&S          | FSV40            | 100979      | 9kHz~40GHz       | Sep. 26, 2011    | Conducted (TH01-CB)   |
| Thermo-Hygro Meter | N/A          | HC 520           | #1          | 15~70 degree     | Nov. 02, 2011    | Conducted (TH01-CB)   |
| RF Power Divider   | HP           | 11636A           | 00306       | 2GHz ~ 18GHz     | N/A              | Conducted (TH01-CB)   |
| RF Power Splitter  | Anaren       | 44100            | 1839        | 2GHz ~ 18GHz     | N/A              | Conducted (TH01-CB)   |
| RF Power Splitter  | Anaren       | 42100            | 17930       | 2GHz ~ 18GHz     | N/A              | Conducted (TH01-CB)   |
| RF Cable-high      | Woken        | High Cable-7     | -           | 1 GHz ~ 26.5 GHz | Nov. 17, 2011    | Conducted (TH01-CB)   |
| RF Cable-high      | Woken        | High Cable-8     | -           | 1 GHz ~ 26.5 GHz | Nov. 17, 2011    | Conducted (TH01-CB)   |

| Instrument    | Manufacturer | Model No.     | Serial No. | Characteristics  | Calibration Date | Remark              |
|---------------|--------------|---------------|------------|------------------|------------------|---------------------|
| RF Cable-high | Woken        | High Cable-9  | -          | 1 GHz – 26.5 GHz | Nov. 17, 2011    | Conducted (TH01-CB) |
| RF Cable-high | Woken        | High Cable-10 | -          | 1 GHz – 26.5 GHz | Nov. 17, 2011    | Conducted (TH01-CB) |
| RF Cable-high | Woken        | High Cable-11 | -          | 1 GHz – 26.5 GHz | Nov. 17, 2011    | Conducted (TH01-CB) |
| RF Cable-high | Woken        | High Cable-12 | -          | 1 GHz – 26.5 GHz | Nov. 17, 2011    | Conducted (TH01-CB) |
| RF Cable-high | Woken        | High Cable-13 | -          | 1 GHz – 26.5 GHz | Nov. 17, 2011    | Conducted (TH01-CB) |
| Power Sensor  | Anritsu      | MA2411B       | 0917223    | 300MHz~40GHz     | Nov. 01, 2011    | Conducted (TH01-CB) |
| Power Meter   | Anritsu      | ML2495A       | 1035008    | 300MHz~40GHz     | Nov. 01, 2011    | Conducted (TH01-CB) |

Note: Calibration Interval of instruments listed above is one year.

“\*” Calibration Interval of instruments listed above is two years.

N.C.R. means Non-Calibration required.

## 6. MEASUREMENT UNCERTAINTY

### Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

| Contribution                                                       | Uncertainty of $x_i$ |      |                               | $u(x_i)$ |
|--------------------------------------------------------------------|----------------------|------|-------------------------------|----------|
|                                                                    | Value                | Unit | Probability Distribution<br>k |          |
| Receiver reading                                                   | 0.026                | dB   | normal(k=2)                   | 0.013    |
| Cable loss                                                         | 0.002                | dB   | normal(k=2)                   | 0.001    |
| AMN/LISN specification                                             | 1.200                | dB   | normal(k=2)                   | 0.600    |
| Mismatch<br>Receiver VSWR 1 =<br>AMN/LISN VSWR 2 =                 | -0.080               | dB   | U-shaped                      | 0.060    |
| Combined standard uncertainty $U_c(y)$                             |                      |      |                               | 1.2      |
| Measuring uncertainty for a level of confidence of 95% $U=2U_c(y)$ |                      |      |                               | 2.4      |

### Uncertainty of Radiated Emission Measurement (30MHz ~ 1,000MHz)

| Contribution                                                       | Uncertainty of $x_i$ |      |                               | $u(x_i)$ |
|--------------------------------------------------------------------|----------------------|------|-------------------------------|----------|
|                                                                    | Value                | Unit | Probability Distribution<br>k |          |
| Receiver reading                                                   | $\pm 0.173$          | dB   | k=1                           | 0.086    |
| Cable loss                                                         | $\pm 0.174$          | dB   | k=2                           | 0.087    |
| Antenna gain                                                       | $\pm 0.169$          | dB   | k=2                           | 0.084    |
| Site imperfection                                                  | $\pm 0.433$          | dB   | Triangular                    | 0.214    |
| Pre-amplifier gain                                                 | $\pm 0.366$          | dB   | k=2                           | 0.183    |
| Transmitter antenna                                                | $\pm 1.200$          | dB   | Rectangular                   | 0.600    |
| Signal generator                                                   | $\pm 0.461$          | dB   | Rectangular                   | 0.231    |
| Mismatch                                                           | $\pm 0.080$          | dB   | U-shape                       | 0.040    |
| Spectrum analyzer                                                  | $\pm 0.500$          | dB   | Rectangular                   | 0.250    |
| Combined standard uncertainty $U_c(y)$                             |                      |      |                               | 1.778    |
| Measuring uncertainty for a level of confidence of 95% $U=2U_c(y)$ |                      |      |                               | 3.555    |

### Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

| Contribution                                                       | Uncertainty of $x_i$ |      |                            | $u(x_i)$ |
|--------------------------------------------------------------------|----------------------|------|----------------------------|----------|
|                                                                    | Value                | Unit | Probability Distribution k |          |
| Receiver reading                                                   | $\pm 0.191$          | dB   | k=1                        | 0.095    |
| Cable loss                                                         | $\pm 0.169$          | dB   | k=2                        | 0.084    |
| Antenna gain                                                       | $\pm 0.191$          | dB   | k=2                        | 0.096    |
| Site imperfection                                                  | $\pm 0.582$          | dB   | Triangular                 | 0.291    |
| Pre-amplifier gain                                                 | $\pm 0.304$          | dB   | k=2                        | 0.152    |
| Transmitter antenna                                                | $\pm 1.200$          | dB   | Rectangular                | 0.600    |
| Signal generator                                                   | $\pm 0.461$          | dB   | Rectangular                | 0.231    |
| Mismatch                                                           | $\pm 0.080$          | dB   | U-shape                    | 0.040    |
| Spectrum analyzer                                                  | $\pm 0.500$          | dB   | Rectangular                | 0.250    |
| Combined standard uncertainty $U_c(y)$                             |                      |      |                            | 1.839    |
| Measuring uncertainty for a level of confidence of 95% $U=2U_c(y)$ |                      |      |                            | 3.678    |

### Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

| Contribution                                                       | Uncertainty of $x_i$ |      |                            | $u(x_i)$ |
|--------------------------------------------------------------------|----------------------|------|----------------------------|----------|
|                                                                    | Value                | Unit | Probability Distribution k |          |
| Receiver reading                                                   | $\pm 0.186$          | dB   | k=1                        | 0.093    |
| Cable loss                                                         | $\pm 0.167$          | dB   | k=2                        | 0.083    |
| Antenna gain                                                       | $\pm 0.190$          | dB   | k=2                        | 0.095    |
| Site imperfection                                                  | $\pm 0.488$          | dB   | Triangular                 | 0.244    |
| Pre-amplifier gain                                                 | $\pm 0.269$          | dB   | k=2                        | 0.134    |
| Transmitter antenna                                                | $\pm 1.200$          | dB   | Rectangular                | 0.600    |
| Signal generator                                                   | $\pm 0.461$          | dB   | Rectangular                | 0.231    |
| Mismatch                                                           | $\pm 0.080$          | dB   | U-shape                    | 0.040    |
| Spectrum analyzer                                                  | $\pm 0.500$          | dB   | Rectangular                | 0.250    |
| Combined standard uncertainty $U_c(y)$                             |                      |      |                            | 1.771    |
| Measuring uncertainty for a level of confidence of 95% $U=2U_c(y)$ |                      |      |                            | 3.541    |

### Uncertainty of Conducted Emission Measurement

| Contribution                                                         | Uncertainty of $x_i$ |      |                            | $u(x_i)$ |
|----------------------------------------------------------------------|----------------------|------|----------------------------|----------|
|                                                                      | Value                | Unit | Probability Distribution k |          |
| Cable loss                                                           | $\pm 0.038$          | dB   | k=2                        | 0.019    |
| Attenuator                                                           | $\pm 0.047$          | dB   | k=2                        | 0.024    |
| Power Meter specification                                            | $\pm 0.300$          | dB   | Triangular                 | 0.150    |
| Power Sensor specification                                           | $\pm 0.300$          | dB   | Rectangular                | 0.150    |
| Signal generator                                                     | $\pm 0.461$          | dB   | Rectangular                | 0.231    |
| Mismatch                                                             | $\pm 0.080$          | dB   | U-shape                    | 0.040    |
| Spectrum analyzer                                                    | $\pm 0.500$          | dB   | Rectangular                | 0.250    |
| Combined standard uncertainty $U_c(y)$                               |                      |      |                            | 0.863    |
| Measuring uncertainty for a level of confidence of 95% $U = 2U_c(y)$ |                      |      |                            | 1.726    |