**SPORTON International Inc.**
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# FCC RADIO TEST REPORT

| | |
|---|---|
| Applicant's company | **Wistron NeWeb Corporation** |
| Applicant Address | 20 Park Avenue II, Hsinchu Science Park, Hsinchu 308,Taiwan,R.O.C. |
| FCC ID | **NKR-DTVDCCK** |
| Manufacturer's company | **Wistron NeWeb Corporation** |
| Manufacturer Address | 20 Park Avenue II, Hsinchu Science Park, Hsinchu 308,Taiwan,R.O.C. |

| | |
|---|---|
| Product Name | DirecTV Cinema Connection Kit |
| Brand Name | DirecTV |
| Model Name | DCAW1R0-01 |
| Test Rule Part(s) | 47 CFR FCC Part 15 Subpart E § 15.407 |
| Test Freq. Range | 5150 ~ 5350MHz / 5470 ~ 5725MHz |
| Received Date | Mar. 08, 2011 |
| Final Test Date | Mar. 14, 2011 |
| Submission Type | Class II Change |
| Class II Change | Please refer to section 3.7 |


## Statement

**Test result included is for the 802.11n and 802.11a (5150 ~ 5350MHz / 5470 ~ 5725MHz) 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 C63.4-2003** and **47 CFR FCC Part 15 Subpart E**.

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

Testing Laboratory
1190

# Table of Contents

# History of This Test Report

Original Issue Date: Mar. 18, 2011

Report No.: FR0O2833-02AA

■ No additional attachment.

□ Additional attachment were issued as following record:

| Attachment No. | Issue Date | Description |
|---|---|---|
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Certificate No.: CB10003088

# 1. CERTIFICATE OF COMPLIANCE

| | | |
|---|---|---|
| Product Name | : | DirecTV Cinema Connection Kit |
| Brand Name | : | DirecTV |
| Model Name | : | DCAW1R0-01 |
| Applicant | : | Wistron NeWeb Corporation |
| Test Rule Part(s) | : | 47 CFR FCC Part 15 Subpart E § 15.407 |

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Mar. 08, 2011 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.

Jordan Hsiao 2011.3.22

Jordan Hsiao
SPORTON INTERNATIONAL INC.

## 2. SUMMARY OF THE TEST RESULT

| Applied Standard: 47 CFR FCC Part 15 Subpart E | | | | |
|---|---|---|---|---|
| Part | Rule Section | Description of Test | Result | Under Limit |
| 4.1 | 15.207 | AC Power Line Conducted Emissions | Complies | 9.75 dB |
| - | 15.407(a) | 26dB Spectrum Bandwidth | - | - |
| - | 15.407(a) | Maximum Conducted Output Power | - | - |
| - | 15.407(a) | Power Spectral Density | - | - |
| - | 15.407(a) | Peak Excursion | - | - |
| 4.2 | 15.407(b) | Radiated Emissions | Complies | 3.02 dB |
| - | 15.407(b) | Band Edge Emissions | - | - |
| - | 15.407(g) | Frequency Stability | - | - |
| 4.3 | 15.203 | Antenna Requirements | Complies | - |

| Test Items | Uncertainty | Remark |
|---|---|---|
| AC Power Line Conducted Emissions | ±2.3dB | Confidence levels of 95% |
| Maximum Conducted Output Power | ±0.5dB | Confidence levels of 95% |
| Power Spectral Density | ±0.5dB | Confidence levels of 95% |
| Peak Excursion | ±0.5dB | Confidence levels of 95% |
| 26dB Spectrum Bandwidth / Frequency Stability | $\pm 8.5\times10^{-8}$ | Confidence levels of 95% |
| Radiated Emissions (9kHz~30MHz) | ±0.8dB | Confidence levels of 95% |
| Radiated Emissions (30MHz~1000MHz) | ±1.9dB | Confidence levels of 95% |
| Radiated / Band Edge Emissions (1GHz~18GHz) | ±1.9dB | Confidence levels of 95% |
| Radiated Emissions (18GHz~40GHz) | ±1.9dB | Confidence levels of 95% |
| Temperature | ±0.7℃ | Confidence levels of 95% |
| Humidity | ±3.2% | Confidence levels of 95% |
| DC / AC Power Source | ±1.4% | Confidence levels of 95% |

# 3. GENERAL INFORMATION

## 3.1. Product Details

**IEEE 802.11n**

| Items | Description |
|---|---|
| Product Type | WLAN (3TX, 3RX) |
| Radio Type | Intentional Transceiver |
| Power Type | From Power Adapter |
| 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 | 5150 ~ 5350MHz / 5470 ~ 5725MHz |
| Channel Number | 19 for 20MHz bandwidth ; 9 for 40MHz bandwidth |
| Channel Band Width (99%) | MCS0 (20MHz): 17.76 MHz ; MCS0 (40MHz): 38.20 MHz |
| Conducted Output Power | Band 1: MCS8 (20MHz): 14.19 dBm ; MCS0 (40MHz): 15.98 dBm<br>Band 2: MCS0 (20MHz): 21.12 dBm ; MCS0 (40MHz): 20.89 dBm<br>Band 3: MCS0 (20MHz): 21.77 dBm ; MCS0 (40MHz): 22.88 dBm |
| Carrier Frequencies | Please refer to section 3.4 |
| Antenna | Please refer to section 3.3 |

**IEEE 802.11a**

| Items | Description |
|---|---|
| Product Type | WLAN (1TX, 3RX) |
| Radio Type | Intentional Transceiver |
| Power Type | From Power Adapter |
| Modulation | OFDM for IEEE 802.11a |
| Data Modulation | OFDM (BPSK / QPSK / 16QAM / 64QAM) |
| Data Rate (Mbps) | OFDM (6/9/12/18/24/36/48/54) |
| Frequency Range | 5150 ~ 5350MHz / 5470 ~ 5725MHz |
| Channel Number | 11a: 19 |
| Channel Band Width (99%) | 11a: 17.28 MHz |
| Conducted Output Power | Band 1: 15.79 dBm ; Band 2: 18.26 dBm ; Band 3: 18.48 dBm |
| Carrier Frequencies | Please refer to section 3.4 |
| Antenna | Please refer to section 3.3 |

**Antenna & Band width**

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

**IEEE 802.11n spec**

| MCS Index | Nss | Modulation | R | NBPSC | NCBPS | | NDBPS | | Datarate(Mbps) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 800nsGI | | 400nsGI | |
| | | | | | 20MHz | 40MHz | 20MHz | 40MHz | 20MHz | 40MHz | 20MHz | 40MHz |
| 0 | 1 | BPSK | 1/2 | 1 | 52 | 108 | 26 | 54 | 6.5 | 13.5 | 7.200 | 15 |
| 1 | 1 | QPSK | 1/2 | 2 | 104 | 216 | 52 | 108 | 13.0 | 27.0 | 14.400 | 30 |
| 2 | 1 | QPSK | 3/4 | 2 | 104 | 216 | 78 | 162 | 19.5 | 40.5 | 21.700 | 45 |
| 3 | 1 | 16-QAM | 1/2 | 4 | 208 | 432 | 104 | 216 | 26.0 | 54.0 | 28.900 | 60 |
| 4 | 1 | 16-QAM | 3/4 | 4 | 208 | 432 | 156 | 324 | 39.0 | 81.0 | 43.300 | 90 |
| 5 | 1 | 64-QAM | 2/3 | 6 | 312 | 648 | 208 | 432 | 52.0 | 108.0 | 57.800 | 120 |
| 6 | 1 | 64-QAM | 3/4 | 6 | 312 | 648 | 234 | 486 | 58.5 | 121.5 | 65.000 | 135 |
| 7 | 1 | 64-QAM | 5/6 | 6 | 312 | 648 | 260 | 540 | 65.0 | 135.0 | 72.200 | 150 |
| 8 | 2 | BPSK | 1/2 | 1 | 104 | 216 | 52 | 108 | 13.0 | 27.0 | 14.444 | 30 |
| 9 | 2 | QPSK | 1/2 | 2 | 208 | 432 | 104 | 216 | 26.0 | 54.0 | 28.889 | 60 |
| 10 | 2 | QPSK | 3/4 | 2 | 208 | 432 | 156 | 324 | 39.0 | 81.0 | 43.333 | 90 |
| 11 | 2 | 16-QAM | 1/2 | 4 | 416 | 864 | 208 | 432 | 52.0 | 108.0 | 57.778 | 120 |
| 12 | 2 | 16-QAM | 3/4 | 4 | 416 | 864 | 312 | 648 | 78.0 | 162.0 | 86.667 | 180 |
| 13 | 2 | 64-QAM | 2/3 | 6 | 624 | 1296 | 416 | 864 | 104.0 | 216.0 | 115.556 | 240 |
| 14 | 2 | 64-QAM | 3/4 | 6 | 624 | 1296 | 468 | 972 | 117.0 | 243.0 | 130.000 | 270 |
| 15 | 2 | 64-QAM | 5/6 | 6 | 624 | 1296 | 520 | 1080 | 130.0 | 270.0 | 144.444 | 300 |

Note:

The data rate of IEEE 802.11n 20MHz for 5GHz Band 1 is MCS8, the data rate of IEEE 802.11n 40MHz for 5GHz Band 1 is MCS0.

| Symbol | Explanation |
|---|---|
| NSS | Number of spatial streams |
| R | Code rate |
| NBPSC | Number of coded bits per single carrier |
| NCBPS | Number of coded bits per symbol |
| NDBPS | Number of data bits per symbol |
| GI | guard interval |

## 3.2. Accessories

| Power | Brand | Model | Rating |
|---|---|---|---|
| Adapter | DIRECTV | MT18-E120150-A1 | Input: 120VAC, 60Hz, 0.8A<br>Output: 12VDC, 1.5A |
| Others | | | |
| Coaxial Cable*2, Shielded, 150cm | | | |
| Cradle | | | |

## 3.3. Table for Filed Antenna

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) | Remark |
|---|---|---|---|---|---|---|
| A(J2) | Airgain | M2450DLCM | Embedded Antenna | U.FL | 2.30 | TX/RX |
| B(J3) | Airgain | M2450DLCM | Embedded Antenna | U.FL | 2.30 | TX/RX |
| C(J4) | Airgain | M2450DLCM | Embedded Antenna | U.FL | 2.30 | TX/RX |

Note: The EUT has three antennas {Ant. A (J2), Ant. B (J3), Ant. C (J4)}.

**For IEEE 802.11n mode (3TX/3RX):**

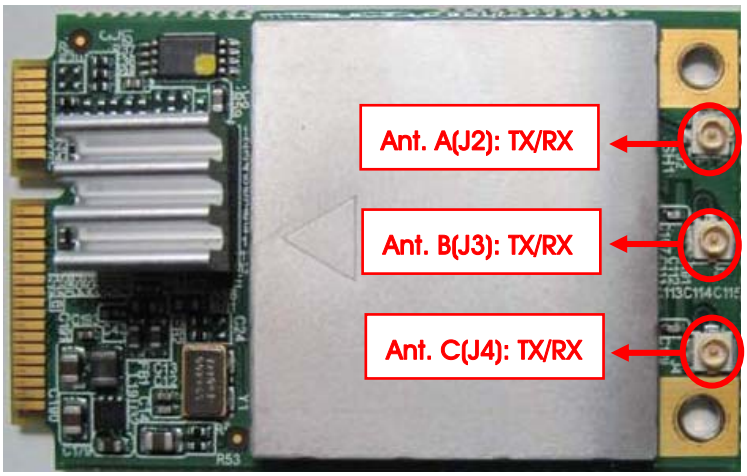
Ant. A & Ant. B & Ant. C could both transmit/receive simultaneously.

**For IEEE 802.11a mode (1TX/3RX):**

The EUT supports the antenna with TX diversity function for IEEE 802.11a mode.

Ant. A and Ant. B and Ant. C can be used as transmitting or receiving antenna.

Due to Ant. A & Ant. B & Ant. C are identical and the Ant. A generated the worst test result, all the tests were base on this setting and recorded in this report.



## 3.4. Table for Carrier Frequencies

**Frequency Allocation for 802.11a**

There are two bandwidth systems for IEEE 802.11n.

For both 20MHz bandwidth systems, use Channel 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140.

For both 40MHz bandwidth systems, use Channel 38, 46, 54, 62, 102, 110, 118, 126, 134.

| Frequency Band | Channel No. | Frequency | Channel No. | Frequency |
|---|---|---|---|---|
| 5150~5250 MHz Band 1 | 36 | 5180 MHz | 44 | 5220 MHz |
| | 38 | 5190 MHz | 46 | 5230 MHz |
| | 40 | 5200 MHz | 48 | 5240 MHz |
| 5250~5350 MHz Band 2 | 52 | 5260 MHz | 60 | 5300 MHz |
| | 54 | 5270 MHz | 62 | 5310 MHz |
| | 56 | 5280 MHz | 64 | 5320 MHz |
| 5470~5725 MHz Band 3 | 100 | 5500 MHz | 120 | 5600 MHz |
| | 102 | 5510MHz | 124 | 5620 MHz |
| | 104 | 5520 MHz | 126 | 5630 MHz |
| | 108 | 5540 MHz | 128 | 5640 MHz |
| | 110 | 5550 MHz | 132 | 5660 MHz |
| | 112 | 5560 MHz | 134 | 5670 MHz |
| | 116 | 5580 MHz | 136 | 5680 MHz |
| | 118 | 5590 MHz | 140 | 5700 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.

**<For Band 1>:**

| Test Items | Mode | | Data Rate | Channel | Antenna |
|---|---|---|---|---|---|
| AC Power Conducted Emission | Normal Link | | Auto | - | A+B+C |
| Max. Conducted Output Power | MCS8/20MHz | Band 1 | 13Mbps | 36/40/48 | A, B, C / A+B+C |
| | MCS0/40MHz | Band 1 | 13.5Mbps | 38/46 | A, B, C / A+B+C |
| | 11a/BPSK | Band 1 | 6Mbps | 36/40/48 | A |
| 26dB Spectrum Bandwidth<br>99% Occupied Bandwidth<br>Measurement<br>Power Spectral Density<br>Peak Excursion | MCS8/20MHz | Band 1 | 13Mbps | 36/40/48 | A+B+C |
| | MCS0/40MHz | Band 1 | 13.5Mbps | 38/46 | A+B+C |
| | 11a/BPSK | Band 1 | 6Mbps | 36/40/48 | A |
| Radiated Emission Below 1GHz | Normal Link | | Auto | - | A+B+C |
| Radiated Emission Above 1GHz | MCS8/20MHz | Band 1 | 13Mbps | 36/40/48 | A+B+C |
| | MCS0/40MHz | Band 1 | 13.5Mbps | 38/46 | A+B+C |
| | 11a/BPSK | Band 1 | 6Mbps | 36/40/48 | A |
| Band Edge Emission | MCS8/20MHz | Band 1 | 13Mbps | 36/40 | A+B+C |
| | MCS0/40MHz | Band 1 | 13.5Mbps | 38/46 | A+B+C |
| | 11a/BPSK | Band 1 | 6Mbps | 36/40 | A |
| Frequency Stability | Un-modulation | | - | 40 | A |

<For Band 2~Band 3>:

| Test Items | Mode | | Data Rate | Channel | Antenna |
|---|---|---|---|---|---|
| AC Power Conducted Emission | Normal Link | | Auto | - | A+B+C |
| Max. Conducted Output Power | MCS0/20MHz | Band 2 | 6.5Mbps | 52/60/64 | A, B, C / A+B+C |
| | | Band 3 | 6.5Mbps | 100/116/140 | A, B, C / A+B+C |
| | MCS0/40MHz | Band 2 | 13.5Mbps | 54/62 | A, B, C / A+B+C |
| | | Band 3 | 13.5Mbps | 102/110/134 | A, B, C / A+B+C |
| | 11a/BPSK | Band 2 | 6Mbps | 52/60/64 | A |
| | | Band 3 | 6Mbps | 100/116/140 | A |
| 26dB Spectrum Bandwidth<br>99% Occupied Bandwidth<br>Measurement<br>Power Spectral Density<br>Peak Excursion | MCS0/20MHz | Band 2 | 6.5Mbps | 52/60/64 | A+B+C |
| | | Band 3 | 6.5Mbps | 100/116/140 | A+B+C |
| | MCS0/40MHz | Band 2 | 13.5Mbps | 54/62 | A+B+C |
| | | Band 3 | 13.5Mbps | 102/110/134 | A+B+C |
| | 11a/BPSK | Band 2 | 6Mbps | 52/60/64 | A |
| | | Band 3 | 6Mbps | 100/116/140 | A |
| Radiated Emission Below 1GHz | Normal Link | | Auto | - | A+B+C |
| Radiated Emission Above 1GHz | MCS0/20MHz | Band 2 | 6.5Mbps | 52/60/64 | A+B+C |
| | | Band 3 | 6.5Mbps | 100/116/140 | A+B+C |
| | MCS0/40MHz | Band 2 | 13.5Mbps | 54/62 | A+B+C |
| | | Band 3 | 13.5Mbps | 102/110/134 | A+B+C |
| | 11a/BPSK | Band 2 | 6Mbps | 52/60/64 | A |
| | | Band 3 | 6Mbps | 100/116/140 | A |
| Band Edge Emission | MCS0/20MHz | Band 2 | 6.5Mbps | 60/64 | A+B+C |
| | | Band 3 | 6.5Mbps | 100/140 | A+B+C |
| | MCS0/40MHz | Band 2 | 13.5Mbps | 54/62 | A+B+C |
| | | Band 3 | 13.5Mbps | 102/110/134 | A+B+C |
| | 11a/BPSK | Band 2 | 6Mbps | 60/64 | A |
| | | Band 3 | 6Mbps | 100/140 | A |
| Frequency Stability | Un-modulation | | - | 60 | N/A |

NOTE: All the test modes were listed as below.

Test Mode 1: EUT put vertically on the table + Cradle

Test Mode 2: EUT put horizontally on the table

Due to Mode 1 generated the worst test result, so it was recorded in this report.

## 3.6. Table for Testing Locations

| Test Site No. | Site Category | Location | FCC Reg. No. | IC File No. | VCCI Reg. No |
|---|---|---|---|---|---|
| 03CH01-CB | SAC | Hsin Chu | 187376 | IC 4086D | - |
| CO01-CB | Conduction | Hsin Chu | 187376 | IC 4086D | - |

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

Please refer section 6 for Test Site Address.

## 3.7. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FD0O2833

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

| Modifications | Description | Performance Checking |
|---|---|---|
| Remove component | This modification removed thermal PAD and metal sheet of EUT. | AC Conducted Emissions<br>Radiated Emissions below 1GHz |

## 3.8. Table for Supporting Units

| Support Unit | Brand | Model | FCC ID |
|---|---|---|---|
| Notebook | DELL | D400 | E2K24GBRL |
| Notebook | DELL | D505 | E2K24GBRL |
| Notebook | DELL | D505 | E2K24GBRL |
| Mouse | FIRST PRICE | FP-M02 | DoC |
| Modem | ACEEX | DM1414 | IFAXDM1414 |
| DIRECT TV | WNEWEB | J713 | N/A |
| DIRECT TV | WNEWEB | J713 | N/A |
| DIRECT TV AP | WNEWEB | J715 | N/A |

## 3.9. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

**Power Parameters of IEEE 802.11n MCS8 20MHz Ant. A / Ant. B / Ant. C**

| Test Software Version | DUT GUI | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency | 5180 MHz | 5200 MHz | 5240 MHz | 5260 MHz | 5300 MHz | 5320 MHz | 5500 MHz | 5580 MHz | 5700 MHz |
| IEEE 802.11n 20MHz | 21/22/21 | 23/24/23 | 23/24/23 | 11/13/11 | 13/13/11 | 15/16/14 | 12/12/11 | 12/12/11 | 11/11/11 |

**Power Parameters of IEEE 802.11n MCS0 40MHz Ant. A / Ant. B / Ant. C**

| Test Software Version | DUT GUI | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency | 5190 MHz | 5230 MHz | 5270 MHz | 5310 MHz | 5510 MHz | 5550 MHz | 5670 MHz |
| IEEE 802.11n 40MHz | 19/21/20 | 20/21/20 | 9/11/10 | 17/19/17 | 14/15/13 | 10/10/9 | 6/5/5 |

**Power Parameters of IEEE 802.11a Ant. A**

| Test Software Version | DUT GUI | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency | 5180 MHz | 5200 MHz | 5240 MHz | 5260 MHz | 5300 MHz | 5320 MHz | 5500 MHz | 5580 MHz | 5700 MHz |
| IEEE 802.11a | 17 | 17 | 17 | 20.5 | 21 | 11 | 21 | 24 | 25 |

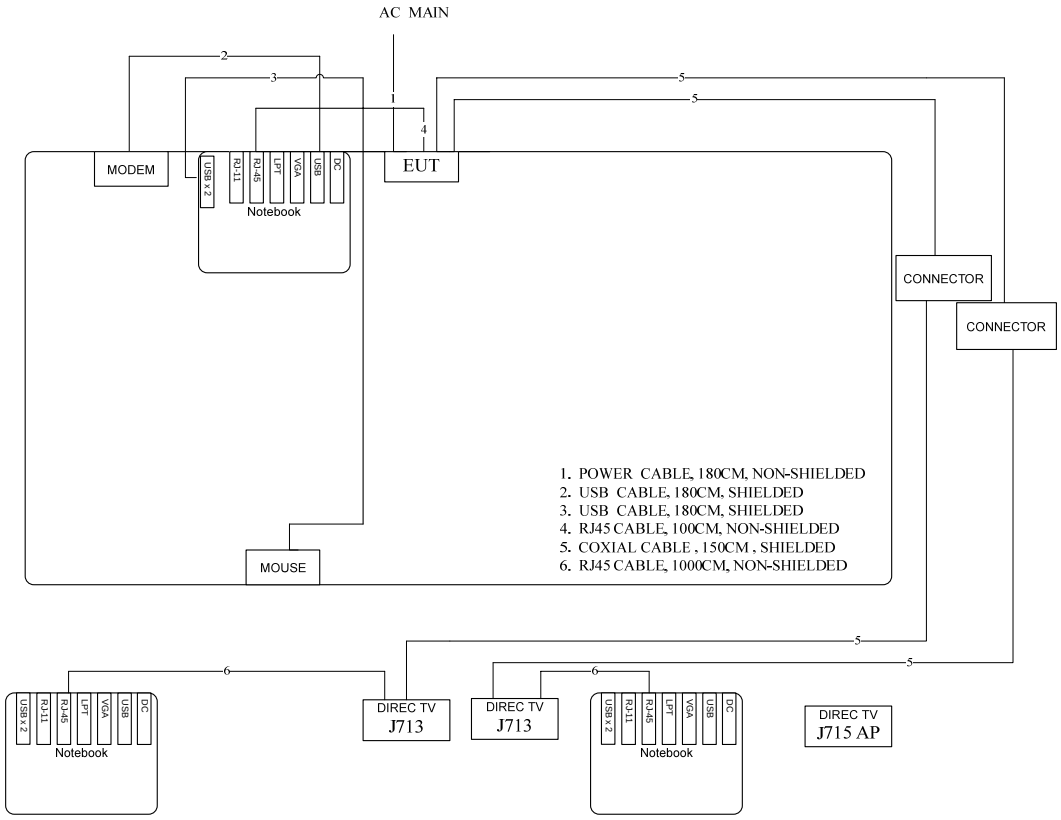
During the test, "DUT GUI" under WIN XP was executed the test program to control the EUT continuously transmit RF signal.

## 3.10. Test Configurations

### 3.10.1. Radiation Emissions Test Configuration

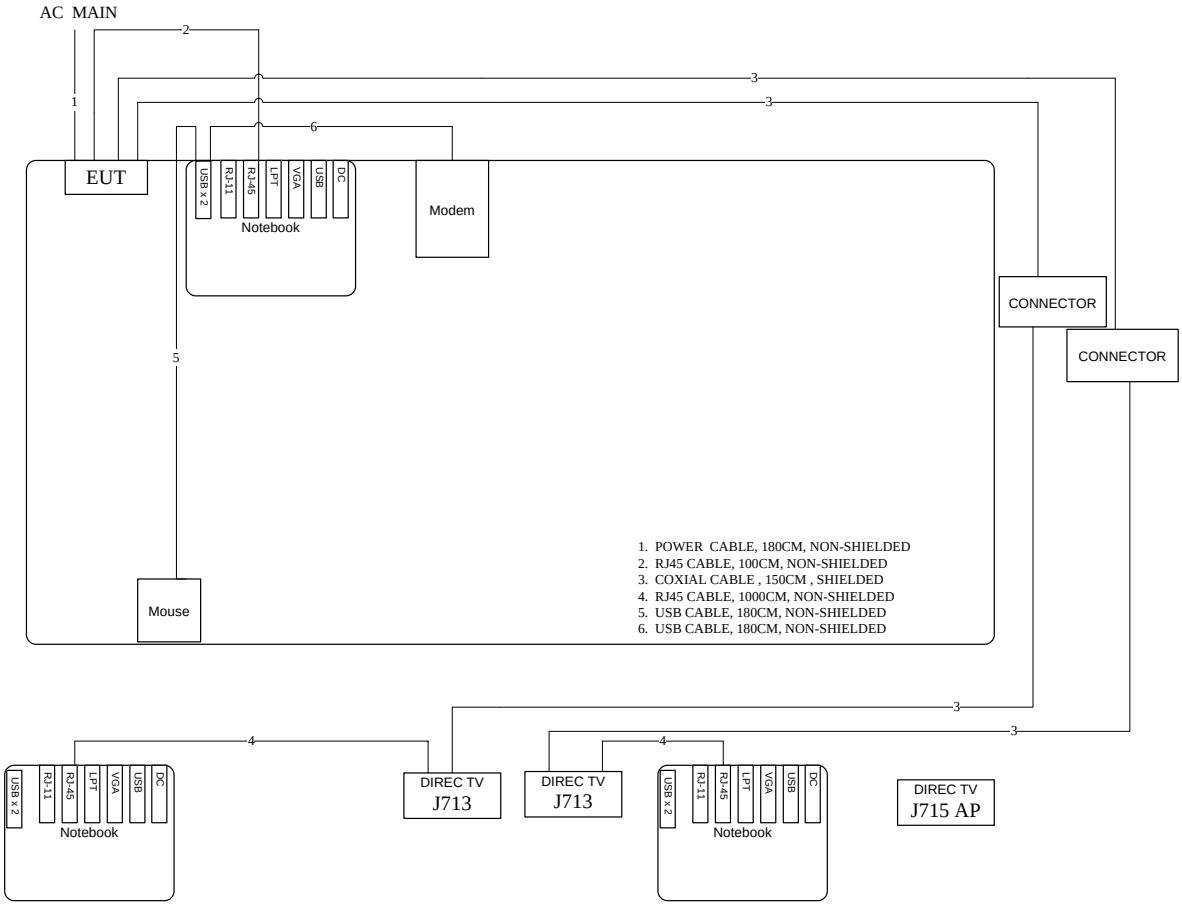
Test Configuration: 9kHz~1GHz

Test Mode: Mode 1



## 3.10.2. AC Power Line Conduction Emissions Test Configuration

### Test Mode: Mode 1



# 4. TEST RESULT

## 4.1. AC Power Line Conducted Emissions Measurement

### 4.1.1. Limit

For this product that is designed to connect 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

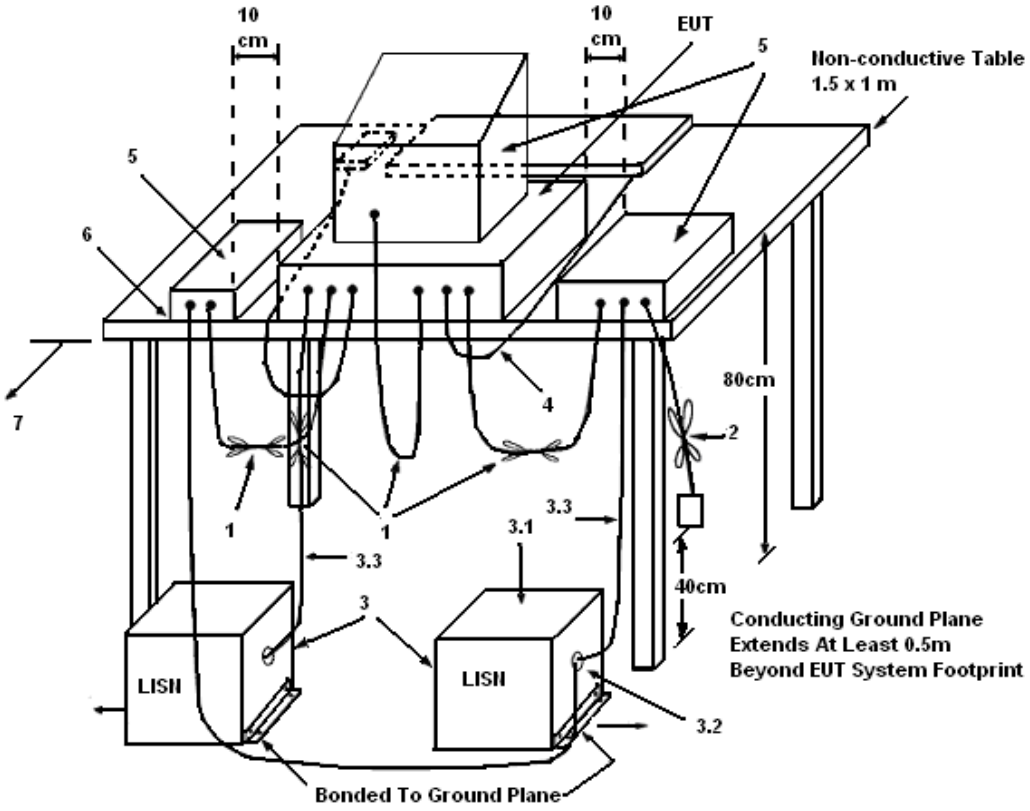
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

| 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 C63.4. 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 Ω. 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

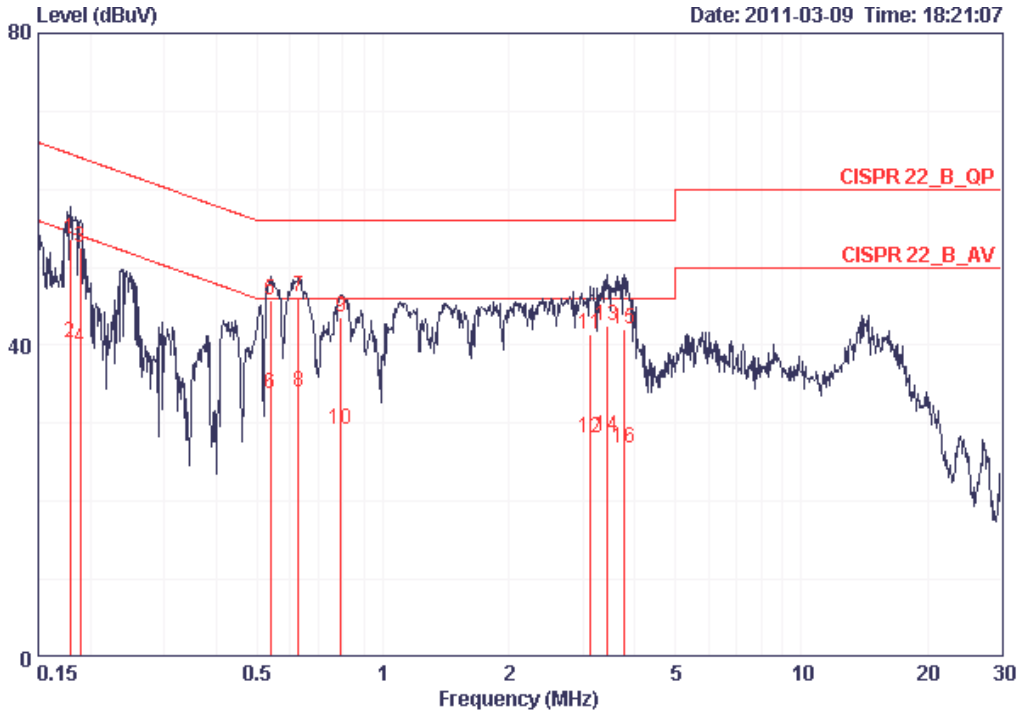
There is no deviation with the original standard.

### 4.1.6. EUT Operation during Test

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

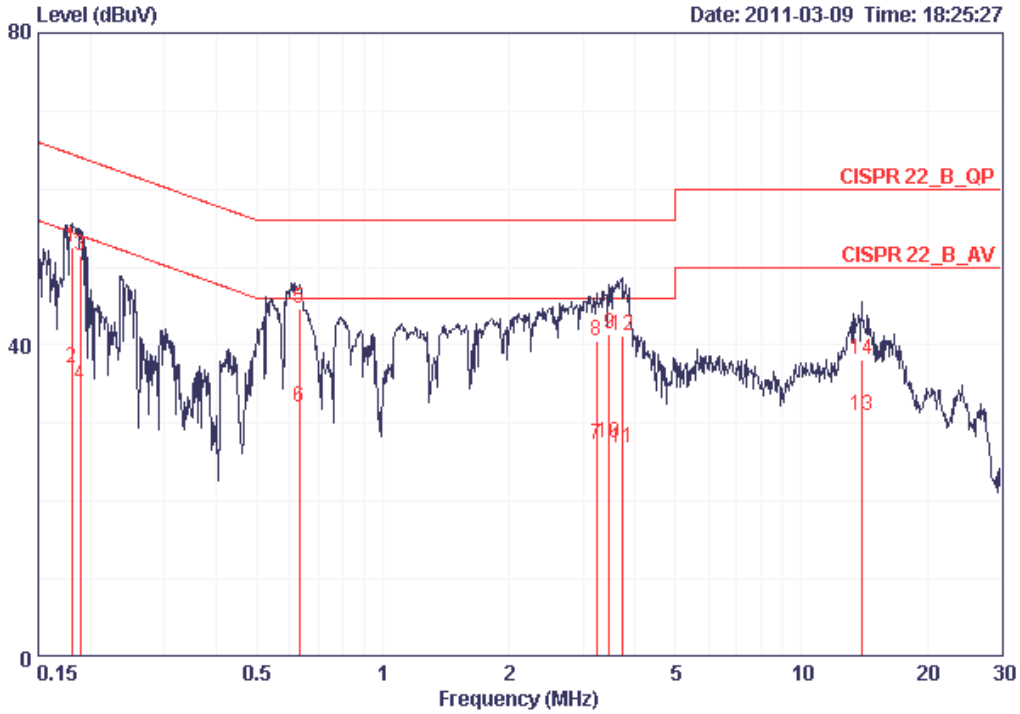
### 4.1.7. Results of AC Power Line Conducted Emissions Measurement

| Temperature | 21°C | Humidity | 61% |
|---|---|---|---|
| Test Engineer | Peter Wu | Phase | Line |
| Configuration | Normal Link / Mode 1 | | |




| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 @ | 0.17866 | 53.54 | -11.01 | 64.55 | 53.28 | 0.06 | 0.20 | QP |
| 2 | 0.17866 | 40.38 | -14.17 | 54.55 | 40.12 | 0.06 | 0.20 | AVERAGE |
| 3 | 0.18938 | 52.51 | -11.55 | 64.06 | 52.26 | 0.05 | 0.20 | QP |
| 4 | 0.18938 | 39.64 | -14.42 | 54.06 | 39.39 | 0.05 | 0.20 | AVERAGE |
| 5 @ | 0.53782 | 45.73 | -10.27 | 56.00 | 45.50 | 0.03 | 0.20 | QP |
| 6 | 0.53782 | 33.80 | -12.20 | 46.00 | 33.57 | 0.03 | 0.20 | AVERAGE |
| 7 @ | 0.62715 | 46.25 | -9.75 | 56.00 | 46.02 | 0.03 | 0.20 | QP |
| 8 | 0.62715 | 34.05 | -11.95 | 46.00 | 33.82 | 0.03 | 0.20 | AVERAGE |
| 9 | 0.79180 | 43.56 | -12.44 | 56.00 | 43.33 | 0.03 | 0.20 | QP |
| 10 | 0.79180 | 29.29 | -16.71 | 46.00 | 29.06 | 0.03 | 0.20 | AVERAGE |
| 11 | 3.123 | 41.48 | -14.52 | 56.00 | 41.17 | 0.08 | 0.23 | QP |
| 12 | 3.123 | 28.11 | -17.89 | 46.00 | 27.80 | 0.08 | 0.23 | AVERAGE |
| 13 | 3.436 | 42.46 | -13.54 | 56.00 | 42.08 | 0.09 | 0.29 | QP |
| 14 | 3.436 | 28.24 | -17.76 | 46.00 | 27.86 | 0.09 | 0.29 | AVERAGE |
| 15 | 3.759 | 42.14 | -13.86 | 56.00 | 41.74 | 0.10 | 0.30 | QP |
| 16 | 3.759 | 26.92 | -19.08 | 46.00 | 26.52 | 0.10 | 0.30 | AVERAGE |

| Temperature | 21°C | Humidity | 61% |
|---|---|---|---|
| Test Engineer | Peter Wu | Phase | Neutral |
| Configuration | Normal Link / Mode 1 | | |




| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.18056 | 52.48 | -11.98 | 64.46 | 52.19 | 0.09 | 0.20 | QP |
| 2 | 0.18056 | 37.15 | -17.31 | 54.46 | 36.86 | 0.09 | 0.20 | AVERAGE |
| 3 | 0.18938 | 51.36 | -12.70 | 64.06 | 51.08 | 0.08 | 0.20 | QP |
| 4 | 0.18938 | 34.77 | -19.29 | 54.06 | 34.49 | 0.08 | 0.20 | AVERAGE |
| 5 @ | 0.63048 | 44.76 | -11.24 | 56.00 | 44.49 | 0.07 | 0.20 | QP |
| 6 | 0.63048 | 32.15 | -13.85 | 46.00 | 31.88 | 0.07 | 0.20 | AVERAGE |
| 7 | 3.241 | 27.20 | -18.80 | 46.00 | 26.82 | 0.12 | 0.25 | AVERAGE |
| 8 | 3.241 | 40.61 | -15.39 | 56.00 | 40.23 | 0.12 | 0.25 | QP |
| 9 | 3.472 | 41.48 | -14.52 | 56.00 | 41.06 | 0.13 | 0.29 | QP |
| 10 | 3.472 | 27.55 | -18.45 | 46.00 | 27.13 | 0.13 | 0.29 | AVERAGE |
| 11 | 3.720 | 26.72 | -19.28 | 46.00 | 26.29 | 0.13 | 0.30 | AVERAGE |
| 12 | 3.720 | 41.29 | -14.71 | 56.00 | 40.86 | 0.13 | 0.30 | QP |
| 13 | 13.915 | 31.03 | -18.97 | 50.00 | 30.09 | 0.54 | 0.40 | AVERAGE |
| 14 | 13.915 | 38.10 | -21.90 | 60.00 | 37.16 | 0.54 | 0.40 | QP |

Note:

Level = Read Level + LISN Factor + Cable Loss.

## 4.2. Radiated Emissions Measurement

### 4.2.1. Limit

For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the 5.470-5.725 GHz band: all emissions outside of the 5.470-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz (78.3dBuV/m at 3m); for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). In addition, 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 (MHz) | Field Strength (micorvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

### 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 spectrum analyzer and receiver.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 40 GHz |
| RB / VB (Emission in restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |
| RB / VB (Emission in non-restricted band) | 1000KHz / 1000KHz for peak |

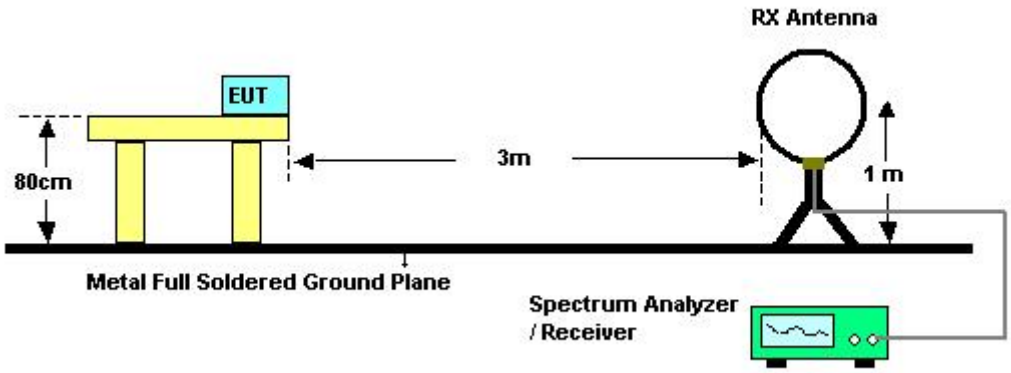
| Receiver Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

### 4.2.3. Test Procedures

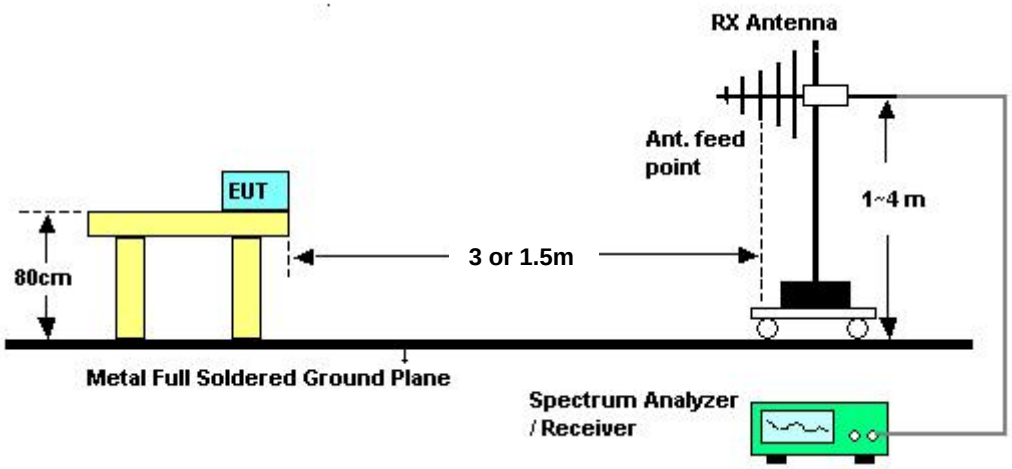
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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 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.

### 4.2.4. Test Setup Layout

**For radiated emissions below 30MHz**




**For radiated emissions above 30MHz**




Above 5GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

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

| Temperature | 25.6°C | Humidity | 56% |
|---|---|---|---|
| Test Engineer | Magic Lai | | |
| Evaluating Date | Mar. 14, 2011 | | |

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

Note:

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

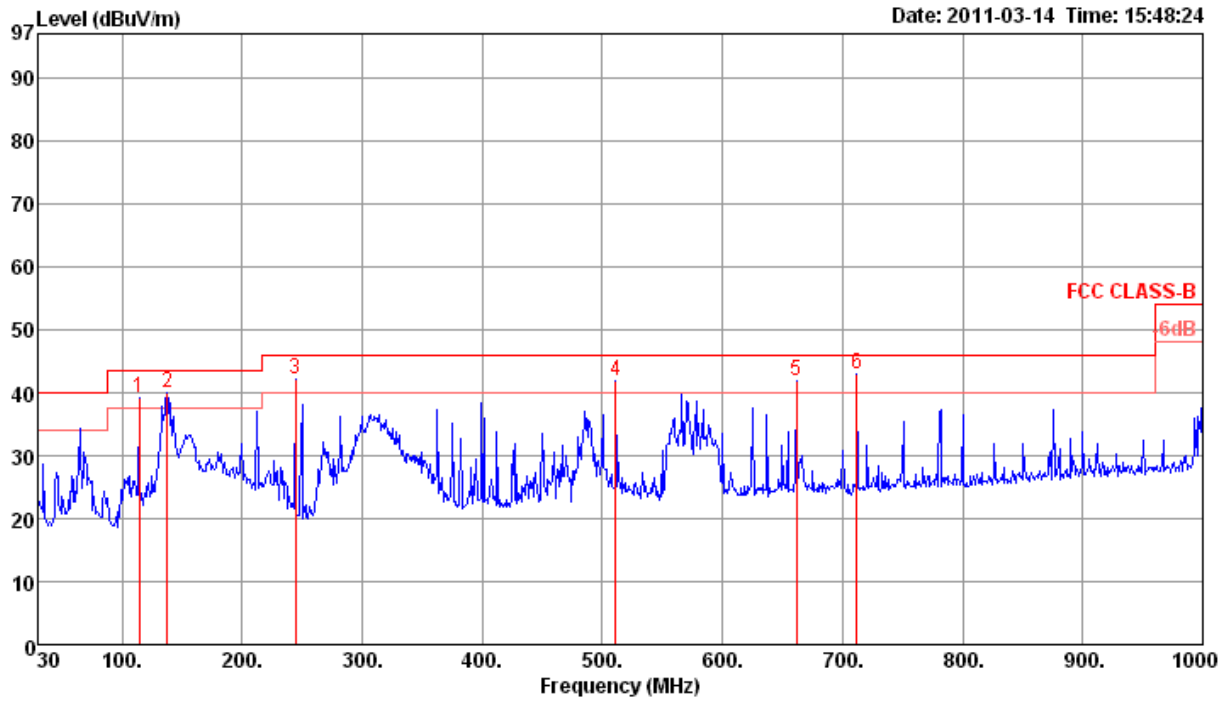
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

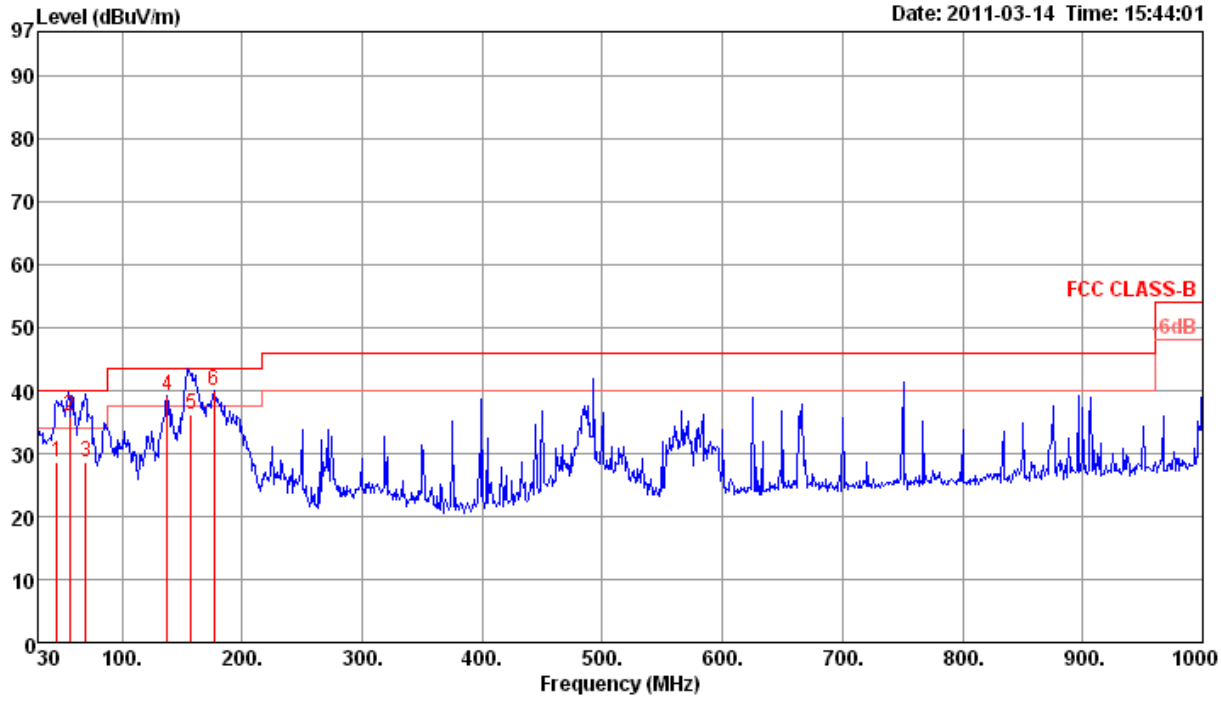
| Temperature | 25.6°C | Humidity | 56% |
|---|---|---|---|
| Test Engineer | Magic Lai | Configurations | Normal Link / Mode 1 |

*Horizontal*




| | | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Preamp Factor | Antenna Factor | T/Pos | A/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB/m | deg | cm | | |
| 1 | ! | 114.39 | 39.18 | 43.50 | -4.32 | 53.42 | 1.20 | 27.53 | 12.09 | 0 | 100 | Peak | HORIZONTAL |
| 2 | ! | 137.67 | 39.90 | 43.50 | -3.60 | 53.60 | 1.38 | 27.41 | 12.33 | 0 | 100 | Peak | HORIZONTAL |
| 3 | ! | 244.37 | 42.17 | 46.00 | -3.83 | 54.96 | 1.88 | 27.01 | 12.34 | 0 | 100 | Peak | HORIZONTAL |
| 4 | ! | 511.12 | 41.86 | 46.00 | -4.14 | 49.49 | 2.72 | 28.10 | 17.75 | 0 | 100 | Peak | HORIZONTAL |
| 5 | ! | 661.47 | 41.97 | 46.00 | -4.03 | 47.59 | 3.45 | 28.04 | 18.97 | 0 | 100 | Peak | HORIZONTAL |
| 6 | p | 711.91 | 42.98 | 46.00 | -3.02 | 48.41 | 3.35 | 27.95 | 19.17 | 0 | 100 | Peak | HORIZONTAL |

*Vertical*




| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Preamp Factor | Antenna Factor | T/Pos | A/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB/m | deg | cm | | |
| 1 | 46.08 | 28.62 | 40.00 | -11.38 | 46.00 | 0.70 | 27.80 | 9.72 | 172 | 160 | QP | VERTICAL |
| 2 q | 56.78 | 35.82 | 40.00 | -4.18 | 55.49 | 0.80 | 27.77 | 7.30 | 7 | 100 | QP | VERTICAL |
| 3 | 70.24 | 28.52 | 40.00 | -11.48 | 48.80 | 0.80 | 27.72 | 6.64 | 5 | 212 | QP | VERTICAL |
| 4 ! | 137.67 | 39.28 | 43.50 | -4.22 | 52.98 | 1.38 | 27.41 | 12.33 | 0 | 400 | Peak | VERTICAL |
| 5 | 157.48 | 36.15 | 43.50 | -7.35 | 49.99 | 1.49 | 27.31 | 11.98 | 189 | 100 | QP | VERTICAL |
| 6 p | 176.47 | 39.99 | 43.50 | -3.51 | 52.50 | 1.58 | 27.22 | 13.13 | 0 | 400 | Peak | 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.

## 4.3. Antenna Requirements

### 4.3.1. 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.

### 4.3.2. 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 | 100377 | 9kHz ~ 2.75GHz | Sep. 01, 2010 | Conduction (CO01-CB) |
| LISN | F.C.C. | FCC-LISN-50-16-2 | 04083 | 150kHz ~ 100MHz | Apr. 24, 2010 | Conduction (CO01-CB) |
| V- LISN | Schwarzbeck | NSLK 8127 | 8127-478 | 9K ~ 30MHz | Oct. 30, 2010 | Conduction (CO01-CB) |
| PULSE LIMITER | R&S | ESH3-Z2 | 100430 | 9K~30MHz | Jan. 04, 2011 | Conduction (CO01-CB) |
| COND Cable | - | Cable | - | 0.15MHz~30MHz | Dec. 01, 2010 | Conduction (CO01-CB) |
| BILOG ANTENNA | Schaffner | CBL6112D | 22021 | 20MHz ~ 2GHz | Oct. 17, 2010 | Radiation (03CH01-CB) |
| Horn Antenna | EMCO | 3115 | 00075790 | 750MHz~18GHz | Nov. 13, 2010 | Radiation (03CH01-CB) |
| Horn Antenna | SCHWARZBEAK | BBHA 9170 | BBHA9170252 | 15GHz ~ 40GHz | Oct. 08, 2010 | Radiation (03CH01-CB) |
| Pre-Amplifier | Agilent | 8447D | 2944A10991 | 0.1MHz ~ 1.3GHz | Nov. 17, 2010 | Radiation (03CH01-CB) |
| Pre-Amplifier | Agilent | 8449B | 3008A02310 | 1GHz ~ 26.5GHz | Nov. 06, 2010 | Radiation (03CH01-CB) |
| Pre-Amplifier | WM | TF-130N-R1 | 923365 | 26.5GHz ~ 40GHz | Nov. 17, 2010 | Radiation (03CH01-CB) |
| Spectrum analyzer | R&S | FSP | 100304 | 9kHz ~ 40GHz | Nov. 06, 2010 | Radiation (03CH01-CB) |
| EMI Test Receiver | R&S | ESCS 30 | 100355 | 9KHz ~ 2.75GHz | Mar. 06, 2011 | Radiation (03CH01-CB) |
| Loop Antenna | R&S | HFH2-Z2 | 860004/001 | 9 kHz - 30 MHz | Sep. 09, 2010* | Radiation (03CH01-CB) |
| Turn Table | INN CO | CO 2000 | N/A | 0 ~ 360 degree | N/A | Radiation (03CH01-CB) |
| Antenna Mast | INN CO | CO2000 | N/A | 1 m - 4 m | N/A | Radiation (03CH01-CB) |
| RF Cable-low | Woken | Low Cable-1 | - | 30 MHz - 1 GHz | Nov. 17, 2010 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-1 | - | 1 GHz – 26.5 GHz | Nov. 17, 2010 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-2 | - | 1 GHz – 26.5 GHz | Nov. 17, 2010 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-3 | - | 1 GHz - 40 GHz | Nov. 17, 2010 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-4 | - | 1 GHz - 40 GHz | Nov. 17, 2010 | Radiation (03CH01-CB) |

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

Note: For "*" Calibration Interval of instruments listed above is two years.

# 6. TEST LOCATION

| | | | |
|---|---|---|---|
| SHIJR | ADD | : | 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C. |
| | TEL | : | 886-2-2696-2468 |
| | FAX | : | 886-2-2696-2255 |
| HWA YA | ADD | : | No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. |
| | TEL | : | 886-3-327-3456 |
| | FAX | : | 886-3-318-0055 |
| LINKOU | ADD | : | No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C |
| | TEL | : | 886-2-2601-1640 |
| | FAX | : | 886-2-2601-1695 |
| DUNGHU | ADD | : | No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C. |
| | TEL | : | 886-2-2631-4739 |
| | FAX | : | 886-2-2631-9740 |
| JUNGHE | ADD | : | 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. |
| | TEL | : | 886-2-8227-2020 |
| | FAX | : | 886-2-8227-2626 |
| NEIHU | ADD | : | 4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C. |
| | TEL | : | 886-2-2794-8886 |
| | FAX | : | 886-2-2794-9777 |
| JHUBEI | ADD | : | 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 |

# 7. TAF CERTIFICATE OF ACCREDITATION

Certificate No. : L1190-091230

財團法人全國認證基金會
Taiwan Accreditation Foundation

## Certificate of Accreditation

This is to certify that

**Sporton International Inc.**
**EMC & Wireless Communications Laboratory**
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

**is accredited in respect of laboratory**

| | | |
|---|---|---|
| **Accreditation Criteria** | : | ISO/IEC 17025:2005 |
| **Accreditation Number** | : | 1190 |
| **Originally Accredited** | : | December 15, 2003 |
| **Effective Period** | : | January 10, 2010 to January 09, 2013 |
| **Accredited Scope** | : | Testing Field, see described in the Appendix |
| **Specific Accreditation Program** | : | Accreditation Program for Designated Testing Laboratory for Commodities Inspection<br>Accreditation Program for Telecommunication Equipment Testing Laboratory<br>Accreditation Program for BSMI Mutual Recognition Arrangment with Foreign Authorities |

Jay-San Chen
President, Taiwan Accreditation Foundation
Date : December 30, 2009

P1, total 22 pages

The Appendix forms an integral part of this Certificate, which shall be invalid when use without the Appendix