



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-RTL8191SE-L |
| 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 RTL8191SE miniCard |
| Brand Name | Realtek |
| Model Name | RTL8191SE |
| Test Rule | 47 CFR FCC Part 15 Subpart C § 15.247 |
| Test Freq. Range | 2400 ~ 2483.5MHz |
| Received Date | Dec. 25, 2008 |
| Final Test Date | Mar. 25, 2009 |
| Submission Type | Class II Change |
| Multiple Listing | Please refer to section 3.7 |



Statement

Test result included in this report is for the Draft n and 802.11b/g part 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 C**.

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



Table of Contents

| | |
|--|-----------------|
| 1. CERTIFICATE OF COMPLIANCE | 1 |
| 2. SUMMARY OF THE TEST RESULT | 2 |
| 3. GENERAL INFORMATION | 3 |
| 3.1. Product Details | 3 |
| 3.2. Accessories | 5 |
| 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 Multiple Listing & Class II Change | 7 |
| 3.8. Table for Supporting Units | 7 |
| 3.9. Test Configurations..... | 8 |
| 4. TEST RESULT | 11 |
| 4.1. AC Power Line Conducted Emissions Measurement | 11 |
| 4.2. Radiated Emissions Measurement..... | 15 |
| 4.3. Antenna Requirements | 23 |
| 5. LIST OF MEASURING EQUIPMENTS | 24 |
| 6. TEST LOCATION | 25 |
| 7. TAF CERTIFICATE OF ACCREDITATION | 26 |
| APPENDIX A. PHOTOGRAPHS OF EUT | A1 ~ A17 |
| APPENDIX B. TEST PHOTOS | B1 ~ B5 |
| APPENDIX C. CO-LOCATION REPORT | C1 ~C3 |

History of This Test Report

Original Issue Date: Mar. 27, 2009

Report No.: FR8D2518-04

- No additional attachment.
- Additional attachment were issued as following record:

| Attachment No. | Issue Date | Description |
|----------------|------------|-------------|
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1. CERTIFICATE OF COMPLIANCE

Product Name : 802.11b/g/n RTL8191SE miniCard
Brand Name : Realtek
Model Name : RTL8191SE
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 Dec. 25, 2008 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.


Wayne Hsu

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 | 12.35 dB |
| - | 15.247(b)(3) | Maximum Conducted Output Power | - | - |
| - | 15.247(e) | Power Spectral Density | - | - |
| - | 15.247(a)(2) | 6dB Spectrum Bandwidth | - | - |
| 4.2 | 15.247(d) | Radiated Emissions | Complies | 7.54 dB |
| - | 15.247(d) | Band Edge Emissions | - | - |
| 4.3 | 15.203 | Antenna Requirements | Complies | - |

Note:

The RF module is verified. Please reference Sporton project number: 8D2518.

The module inserts to NB (ThinkPad X200 Tablet Series / Lenovo(Japan), Ltd), so this report tests above item.

| Test Items | Uncertainty | Remark |
|---|-----------------------|--------------------------|
| AC Power Line Conducted Emissions | ±2.3dB | Confidence levels of 95% |
| Maximum Conducted Output Power | ±0.8dB | Confidence levels of 95% |
| Power Spectral Density | ±0.5dB | Confidence levels of 95% |
| 6dB Spectrum Bandwidth | ±8.5×10 ⁻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°C | 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

Draft n

| Items | Description |
|--------------------------|--|
| Product Type | WLAN (1TX, 2RX) |
| Radio Type | Intentional Transceiver |
| Power Type | Modaule From Host System ; NoteBook From Power Adapter |
| Modulation | see the below table for draft n |
| Data Modulation | OFDM (BPSK / QPSK / 16QAM / 64QAM) |
| Data Rate (Mbps) | see the below table for Draft n |
| Frequency Range | 2400 ~ 2483.5MHz |
| Channel Number | 11 for 20MHz bandwidth ; 7 for 40MHz bandwidth |
| Channel Band Width (99%) | MCS0 (20MHz): 17.62 MHz ; MCS0 (40MHz): 37.70 MHz |
| Conducted Output Power | MCS0 (20MHz): 16.58 dBm ; MCS0 (40MHz): 16.58 dBm |
| Carrier Frequencies | Please refer to section 3.4 |
| Antenna | Please refer to section 3.3 |

802.11b/g

| Items | Description |
|--------------------------|---|
| Product Type | 802.11b: WLAN (1TX, 2RX) 802.11g: WLAN (1TX, 2RX) |
| Radio Type | Intentional Transceiver |
| Power Type | Modaule From Host System ; NoteBook From Power Adapter |
| 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 |
| Channel Band Width (99%) | 11b: 14.80 MHz ; 11g: 16.44 MHz |
| Conducted Output Power | 11b: 18.24 dBm ; 11g: 16.61 dBm |
| Carrier Frequencies | Please refer to section 3.4 |
| Antenna | Please refer to section 3.3 |

Antenna & Band width

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

Draft n spec

| MCS Index | Nss | Modulation | R | NBPCS | NCBPS | | NDBPS | | Datarate(Mbps) | | | |
|-----------|-----|------------|-----|-------|-------|-------|-------|-------|----------------|-------|---------|-------|
| | | | | | 20MHz | 40MHz | 20MHz | 40MHz | 800nsGI | | 400nsGI | |
| | | | | | | | | | 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 |

| Symbol | Explanation |
|--------|---|
| NSS | Number of spatial streams |
| R | Code rate |
| NBPCS | 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 (For Notebook) | Lenovo | 92P1213 | Input: 100-240V, 2.0-1.2A, 50/60Hz Output: 20V, 3.25A |

3.3. Table for Filed Antenna

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) | Remark |
|------------|------------|--------------|--------------|-----------|------------|--------|
| A-1 (Main) | Wistron NW | 25.90670.001 | PIFA Antenna | I-PEX | 1.32 | TX |
| A-2 (Aux) | Wistron NW | 25.90669.001 | PIFA Antenna | I-PEX | -1.53 | RX |
| B-1 (Main) | ACON | 25.90676.001 | PIFA Antenna | I-PEX | 0.64 | TX |
| B-2 (Aux) | ACON | 25.90675.001 | PIFA Antenna | I-PEX | -0.39 | RX |

Note:

(1) There are two Antenna Connectors of EUT.

Connector 1: Ant. A-1 / Ant. B-1

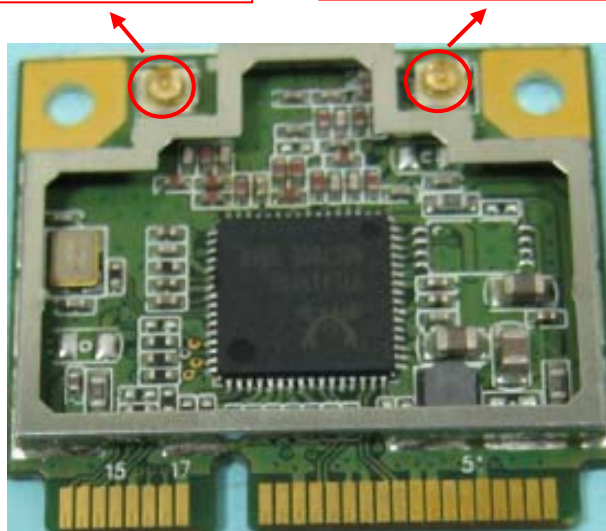
Connector 2: Ant. A-2 / Ant. B-2

The EUT have two antenna connectors, the Connector 1 have TX function, Connector 2 have only RX function.

(2) Due to Ant. A-1 is the highest gain value among PIFA antennas, only Ant. A-1 was tested and recorded in this report.

Connector 2: Ant. A-2 / Ant. B-2: RX

Connector 1: Ant. A-1 / Ant. B-1: TX



3.4. Table for Carrier Frequencies

There are two bandwidth systems for draft n.

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

For both 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 | Antenna |
|---|-------------|-----------|---------|---------|
| AC Power Line Conducted Emissions | Normal Link | - | - | - |
| Radiated Emissions 9kHz~1GHz | Normal Link | - | - | - |
| Radiated Emissions 1GHz~10 th Harmonic | MCS8/20MHz | 6.5 Mbps | 1/6/11 | A-1 |
| | MCS8/40MHz | 13.5 Mbps | 3/6/9 | A-1 |
| | 11b/BPSK | 1 Mbps | 1/6/11 | A-1 |
| | 11g/BPSK | 6 Mbps | 1/6/11 | A-1 |

Note:

This Modular is restricted only on the platform ThinkPad X200 Tablet Series(Model No.) from Lenovo(Japan), Ltd.(Brand Name).

The platform ThinkPad X200 Tablet Series(Model No.) is a Notebook, which was defined as a mobile device.

The Notebook could be applied with one Bluetooth module; therefore SAR compliance assessment (please refer to Sporton project number: FA8D2518-04) and Co-location (please refer to Appendix C) tests are added for simultaneously transmit between wireless LAN and Bluetooth module function.

| Interface | Brand | Model | FCC ID |
|------------------|----------------------|----------------|--------------|
| Bluetooth module | Broadcom Corporation | BCM92046MD_GEN | QDS-BRCM1033 |

3.6. Table for Testing Locations

| Test Site No. | Site Category | Location | FCC Reg. No. | IC File No. | VCCI Reg. No |
|---------------|---------------|----------|--------------|-------------|--------------|
| 03CH03-HY | SAC | Hwa Ya | 101377 | IC 4088 | - |
| CO04-HY | Conduction | Hwa Ya | 101377 | IC 4088 | - |

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 Multiple Listing & Class II Change

This product is an extension of original one reported under Sporton project number: 8D2518-03
Below is the table for the change of the product with respect to the original one.

| Modifications | Performance Checking |
|--|--|
| 1. This Module is restricted only on the platform ThinkPad X200 Tablet Series from Lenovo(Japan), Ltd. The platform ThinkPad X200 Tablet Series is a Notebook, which was defined as a mobile device. 2. The Notebook could be applied with one Bluetooth module; therefore SAR compliance assessment and Co-location tests are added for simultaneously transmit between wireless LAN and Bluetooth module function. | Radiated Emissions AC Conducted Emissions |

Following is the simple information for Bluetooth module:

| Interface | Brand | Model | FCC ID |
|------------------|----------------------|----------------|--------------|
| Bluetooth module | Broadcom Corporation | BCM92046MD_GEN | QDS-BRCM1033 |

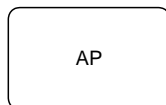
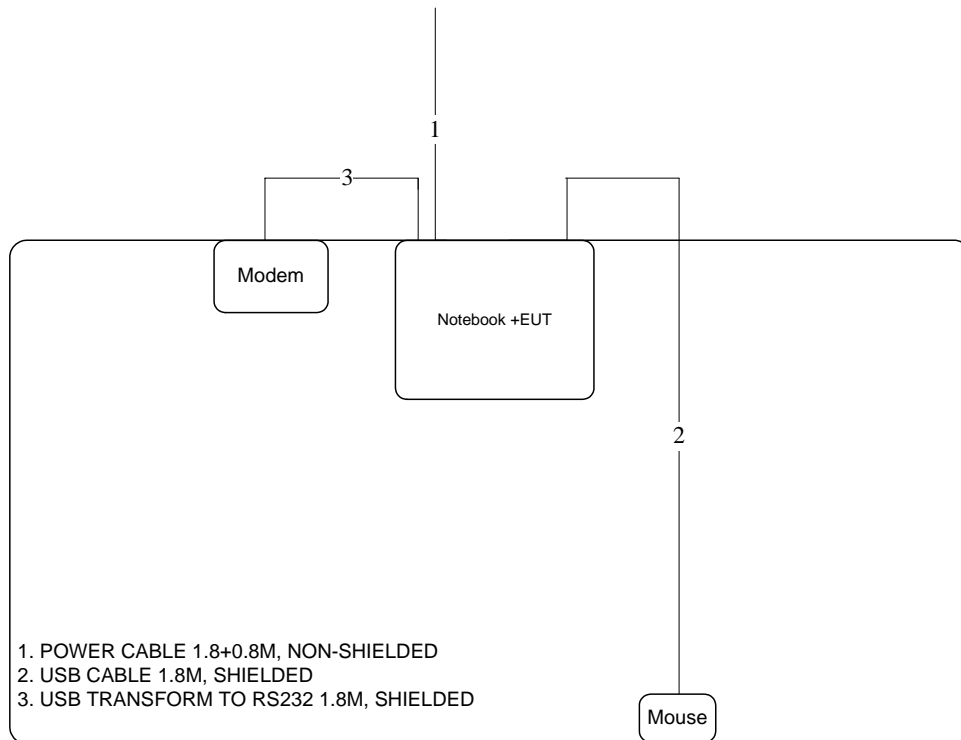
3.8. Table for Supporting Units

| Support Unit | Brand | Model | FCC ID |
|------------------|----------------------|----------------|--------------|
| Modem | ACEEX | DM1414 | IFAXDM1414 |
| Mouse | HP | M-UAE96 | DoC |
| Notebook | lenovo | ThinkPad X200 | PU5-X200T |
| Wireless AP | Planex | GW-AP54SGX | N/A |
| Bluetooth module | Broadcom Corporation | BCM92046MD_GEN | QDS-BRCM1033 |

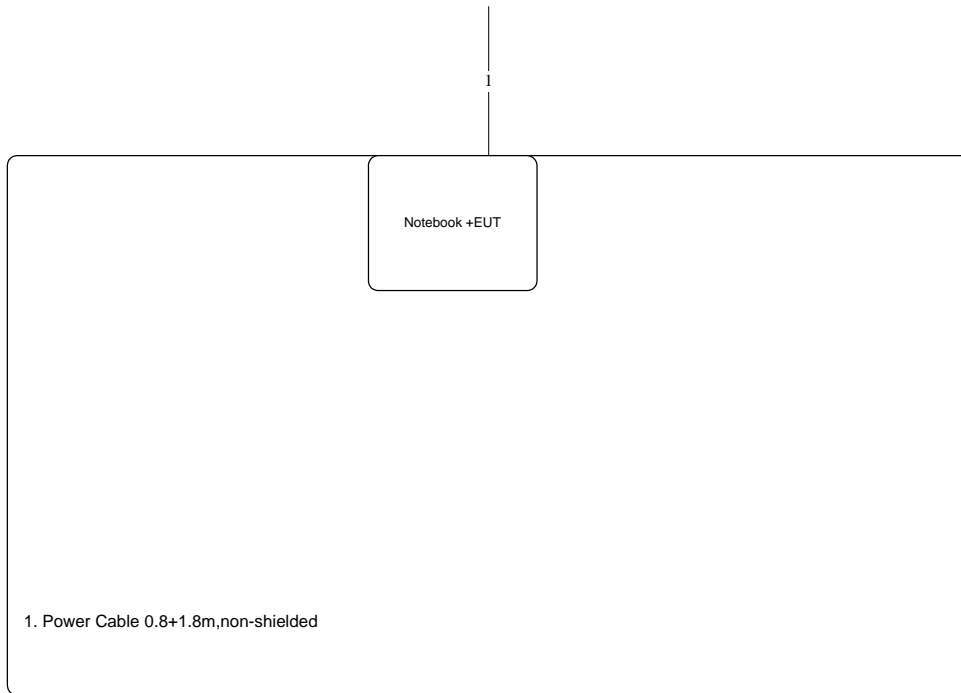
3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration

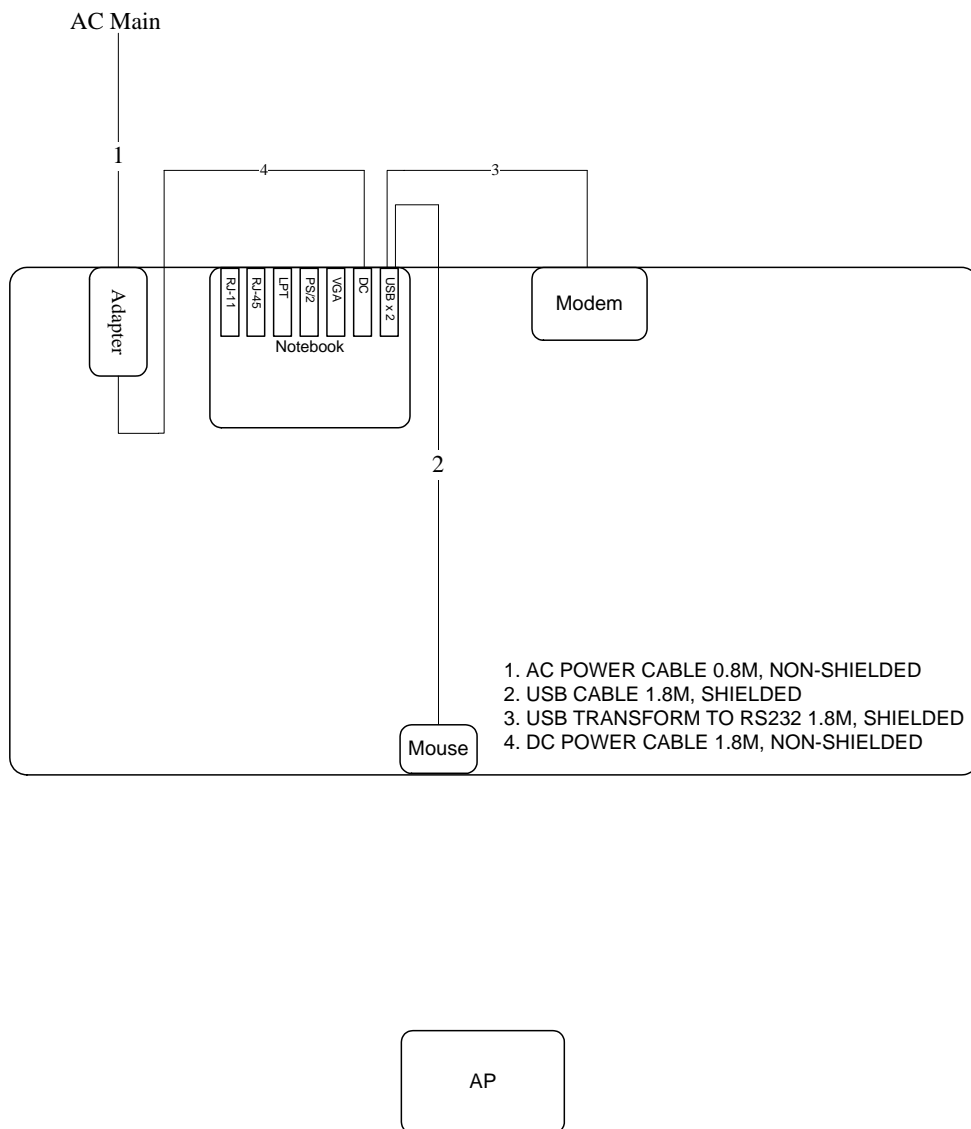
Test Configuration: 9KHz~1GHz



Test Configuration: above 1GHz



3.9.2. AC Power Line Conduction Emissions Test Configuration



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

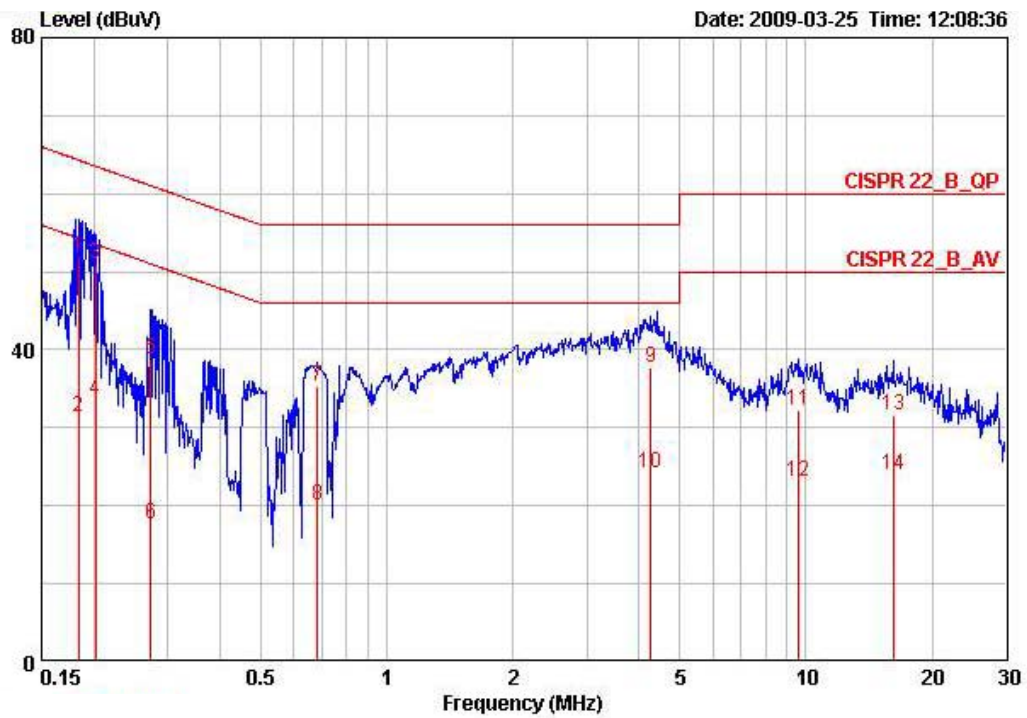
1. Configure the EUT according to ANSI C63.4. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization 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.

4.1.6. EUT Operation during Test

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

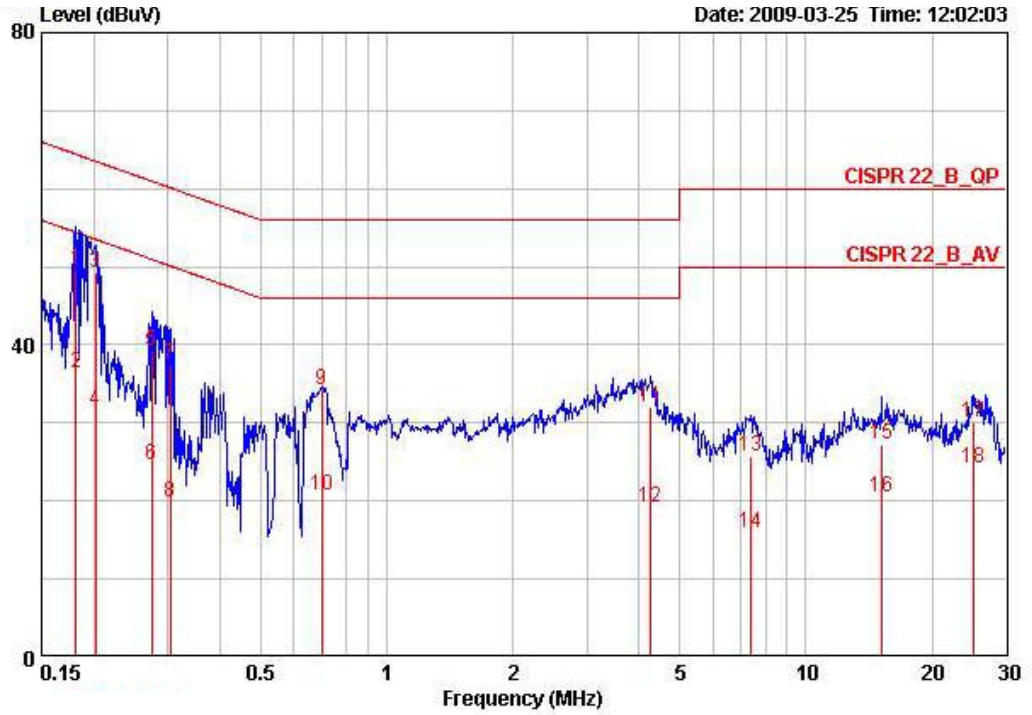
4.1.7. Results of AC Power Line Conducted Emissions Measurement

| | | | |
|---------------|-------------|----------|------|
| Temperature | 20.6°C | Humidity | 48% |
| Test Engineer | Howar Sung | Phase | Line |
| Configuration | Normal Link | | |



| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|----|---------|-------|------------|------------|------------|-------------|------------|---------|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.18403 | 51.95 | -12.35 | 64.30 | 51.69 | 0.06 | 0.20 | QP |
| 2 | 0.18403 | 31.39 | -22.91 | 54.30 | 31.13 | 0.06 | 0.20 | AVERAGE |
| 3 | 0.20181 | 51.11 | -12.43 | 63.54 | 50.86 | 0.05 | 0.20 | QP |
| 4 | 0.20181 | 33.64 | -19.90 | 53.54 | 33.39 | 0.05 | 0.20 | AVERAGE |
| 5 | 0.27297 | 38.88 | -22.15 | 61.03 | 38.64 | 0.04 | 0.20 | QP |
| 6 | 0.27297 | 17.65 | -33.38 | 51.03 | 17.41 | 0.04 | 0.20 | AVERAGE |
| 7 | 0.68263 | 35.23 | -20.77 | 56.00 | 35.00 | 0.03 | 0.20 | QP |
| 8 | 0.68263 | 20.16 | -25.84 | 46.00 | 19.93 | 0.03 | 0.20 | AVERAGE |
| 9 | 4.269 | 37.80 | -18.20 | 56.00 | 37.38 | 0.12 | 0.30 | QP |
| 10 | 4.269 | 24.17 | -21.83 | 46.00 | 23.75 | 0.12 | 0.30 | AVERAGE |
| 11 | 9.603 | 32.29 | -27.71 | 60.00 | 31.65 | 0.34 | 0.30 | QP |
| 12 | 9.603 | 23.05 | -26.95 | 50.00 | 22.41 | 0.34 | 0.30 | AVERAGE |
| 13 | 16.140 | 31.53 | -28.48 | 60.00 | 30.50 | 0.63 | 0.40 | QP |
| 14 | 16.140 | 23.93 | -26.08 | 50.00 | 22.90 | 0.63 | 0.40 | AVERAGE |

| | | | |
|---------------|-------------|----------|---------|
| Temperature | 20.6°C | Humidity | 48% |
| Test Engineer | Howar Sung | Phase | Neutral |
| Configuration | Normal Link | | |



| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|----|---------|-------|------------|------------|------------|-------------|------------|---------|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.18152 | 49.61 | -14.81 | 64.42 | 49.32 | 0.09 | 0.20 | QP |
| 2 | 0.18152 | 36.40 | -18.02 | 54.42 | 36.11 | 0.09 | 0.20 | AVERAGE |
| 3 | 0.20181 | 49.18 | -14.36 | 63.54 | 48.90 | 0.08 | 0.20 | QP |
| 4 | 0.20181 | 31.66 | -21.88 | 53.54 | 31.38 | 0.08 | 0.20 | AVERAGE |
| 5 | 0.27442 | 39.30 | -21.69 | 60.98 | 39.02 | 0.08 | 0.20 | QP |
| 6 | 0.27442 | 24.70 | -26.29 | 50.98 | 24.42 | 0.08 | 0.20 | AVERAGE |
| 7 | 0.30509 | 37.57 | -22.53 | 60.10 | 37.30 | 0.07 | 0.20 | QP |
| 8 | 0.30509 | 19.90 | -30.20 | 50.10 | 19.63 | 0.07 | 0.20 | AVERAGE |
| 9 | 0.70096 | 34.17 | -21.83 | 56.00 | 33.90 | 0.07 | 0.20 | QP |
| 10 | 0.70096 | 20.65 | -25.35 | 46.00 | 20.38 | 0.07 | 0.20 | AVERAGE |
| 11 | 4.269 | 32.10 | -23.90 | 56.00 | 31.64 | 0.16 | 0.30 | QP |
| 12 | 4.269 | 19.28 | -26.72 | 46.00 | 18.82 | 0.16 | 0.30 | AVERAGE |
| 13 | 7.368 | 25.68 | -34.32 | 60.00 | 25.00 | 0.31 | 0.38 | QP |
| 14 | 7.368 | 15.80 | -34.20 | 50.00 | 15.12 | 0.31 | 0.38 | AVERAGE |
| 15 | 15.146 | 27.18 | -32.82 | 60.00 | 26.20 | 0.58 | 0.40 | QP |
| 16 | 15.146 | 20.44 | -29.56 | 50.00 | 19.46 | 0.58 | 0.40 | AVERAGE |
| 17 | 25.209 | 30.10 | -29.90 | 60.00 | 28.32 | 1.18 | 0.60 | QP |
| 18 | 25.209 | 24.24 | -25.76 | 50.00 | 22.46 | 1.18 | 0.60 | AVERAGE |

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Radiated Emissions Measurement

4.2.1. Limit

20dBc 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 (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 | 10th carrier harmonic |
| RB / VB (Emission in restricted band) | 1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average |
| RB / VB (Emission in non-restricted band) | 1MHz / 3MHz for peak |

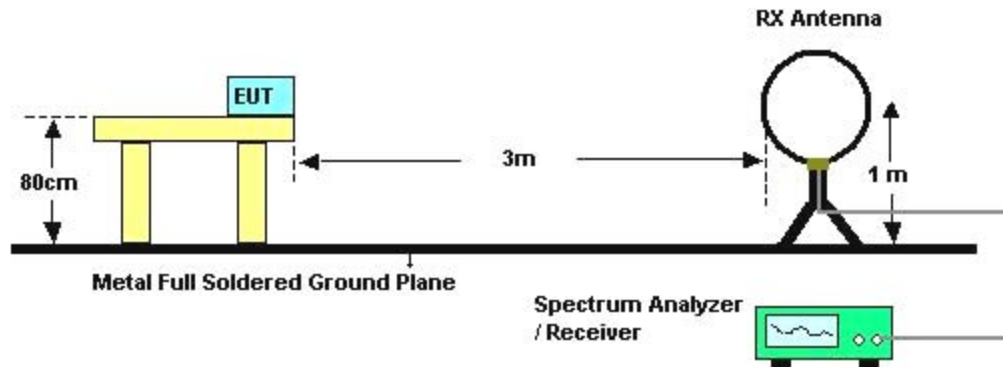
| Receiver Parameter | Setting |
|------------------------|----------------------------------|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

4.2.3. Test Procedures

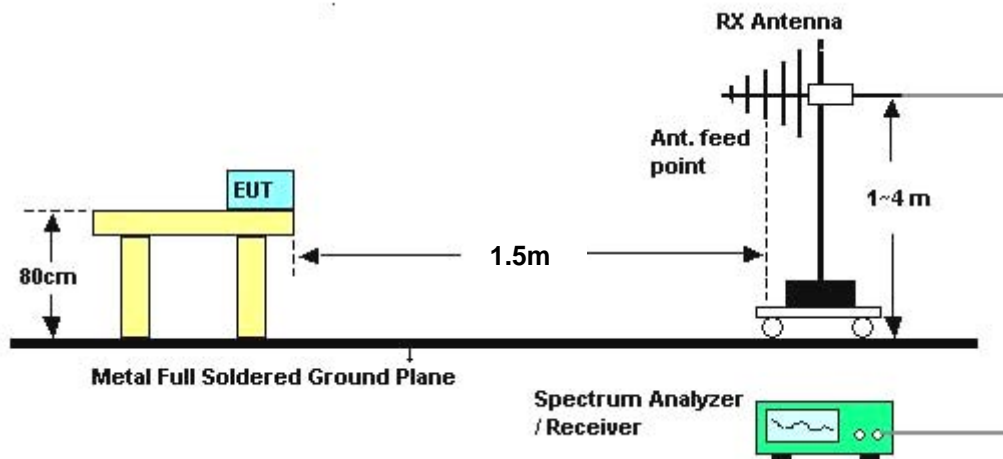
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1.5m.

Distance extrapolation factor = $20 \log (\text{specific distanc [3m]} / \text{test distance [1.5m]})$ (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 | 24.3°C | Humidity | 56% |
| Test Engineer | Johnson Chang | Configurations | Normal Link |

| Freq. (MHz) | Level (dBuV) | Over Limit (dB) | Limit Line (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.

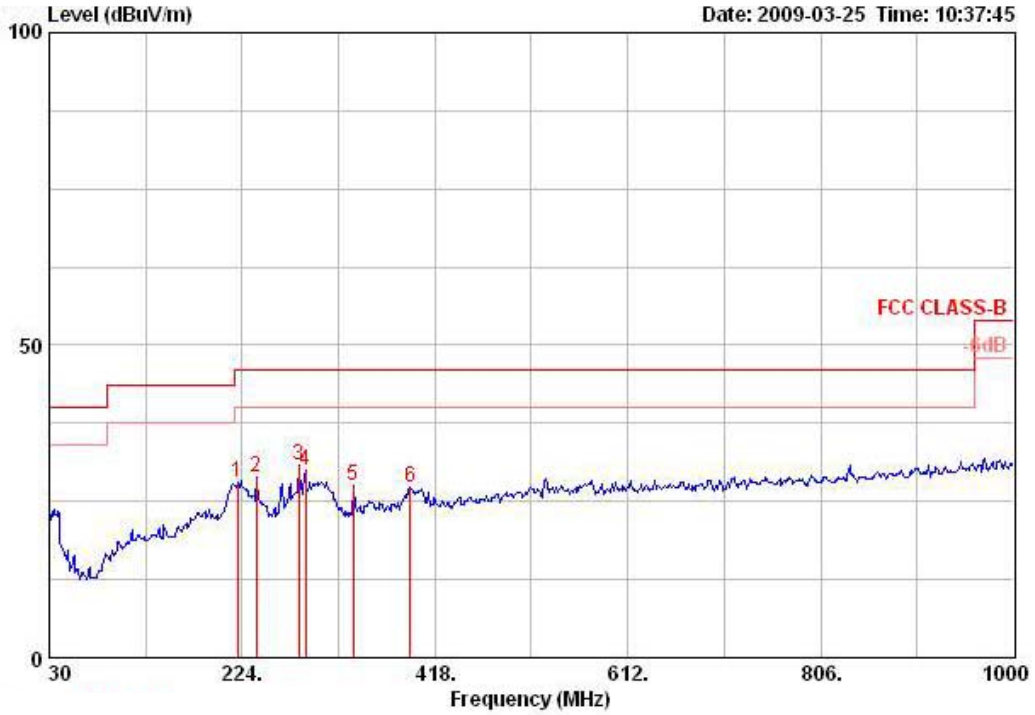
Distance extrapolation factor = $40 \log(\text{specific distance} / \text{test distance})$ (dB);

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

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

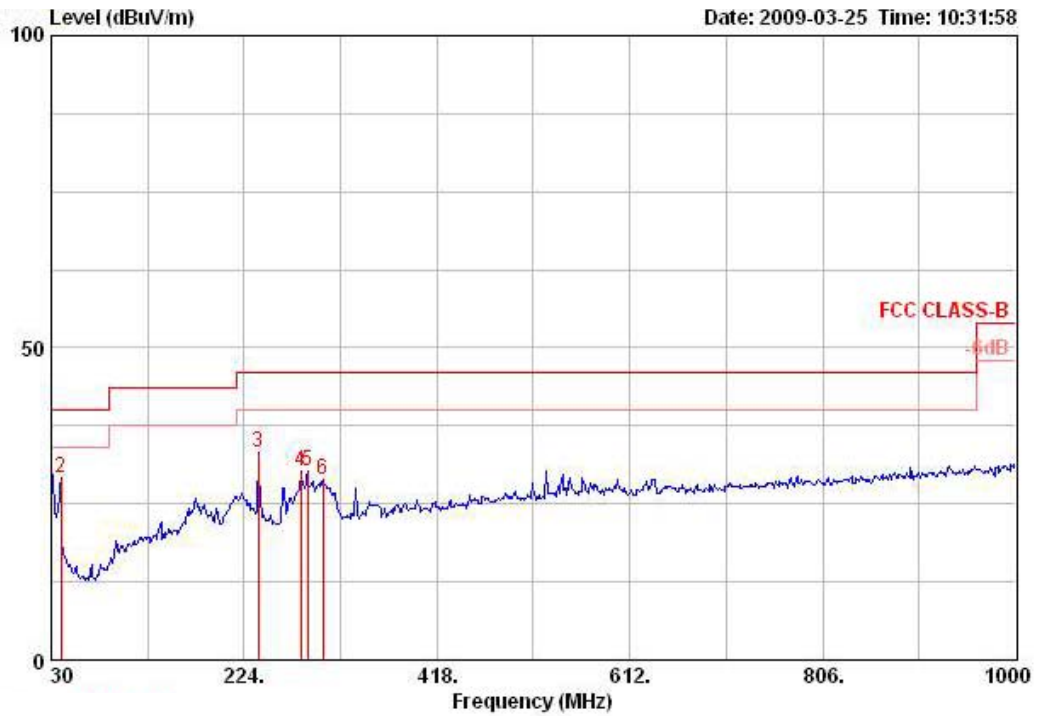
| | | | |
|---------------|-----------|----------------|-------------|
| Temperature | 24.3°C | Humidity | 56% |
| Test Engineer | Roy Huang | Configurations | Normal Link |

Horizontal



| | Freq | Level | Over Limit | Limit Line | Read Antenna | Cable Loss | Preamp | Remark | Ant Pos | Table Pos | Pol/Phase |
|-----|---------|--------|------------|------------|--------------|------------|--------|------------|---------|-----------|------------|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | cm | deg | |
| 1 | 219.150 | 28.00 | -18.00 | 46.00 | 42.80 | 10.48 | 1.78 | 27.06 Peak | 100 | 0 | HORIZONTAL |
| 2 | 238.550 | 28.92 | -17.08 | 46.00 | 42.18 | 11.91 | 1.85 | 27.02 Peak | 100 | 0 | HORIZONTAL |
| 3 @ | 281.230 | 30.84 | -15.16 | 46.00 | 42.61 | 13.14 | 2.03 | 26.94 Peak | 100 | 0 | HORIZONTAL |
| 4 | 288.020 | 29.90 | -16.10 | 46.00 | 41.55 | 13.22 | 2.05 | 26.93 Peak | 100 | 0 | HORIZONTAL |
| 5 | 335.550 | 27.38 | -18.62 | 46.00 | 38.03 | 14.33 | 2.17 | 27.15 Peak | 100 | 0 | HORIZONTAL |
| 6 | 392.780 | 27.16 | -18.84 | 46.00 | 36.55 | 15.88 | 2.29 | 27.55 Peak | 100 | 0 | HORIZONTAL |

Vertical



| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos | Pol/Phase |
|-----|---------|--------|------------|------------|------------|----------------|------------|---------------|--------|---------|-----------|-----------|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg | |
| 1 @ | 30.000 | 30.12 | -9.88 | 40.00 | 38.66 | 18.76 | 0.50 | 27.80 | Peak | 400 | 0 | VERTICAL |
| 2 @ | 39.700 | 29.06 | -10.94 | 40.00 | 43.05 | 13.11 | 0.70 | 27.80 | Peak | 400 | 0 | VERTICAL |
| 3 @ | 238.550 | 33.33 | -12.67 | 46.00 | 46.59 | 11.91 | 1.85 | 27.02 | Peak | 400 | 0 | VERTICAL |
| 4 | 281.230 | 30.12 | -15.88 | 46.00 | 41.89 | 13.14 | 2.03 | 26.94 | Peak | 400 | 0 | VERTICAL |
| 5 | 288.020 | 30.21 | -15.79 | 46.00 | 41.86 | 13.22 | 2.05 | 26.93 | Peak | 400 | 0 | VERTICAL |
| 6 | 303.540 | 28.75 | -17.25 | 46.00 | 40.09 | 13.46 | 2.11 | 26.92 | Peak | 400 | 0 | VERTICAL |

Note:

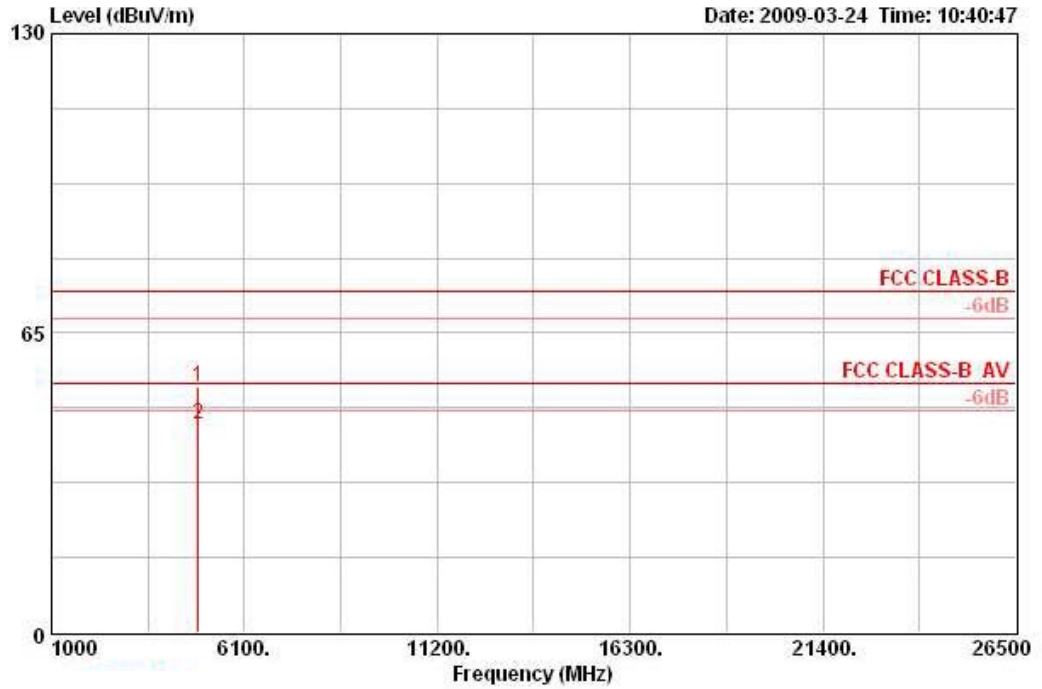
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

4.2.9. Results for Radiated Emissions (1GHz~10th Harmonic)

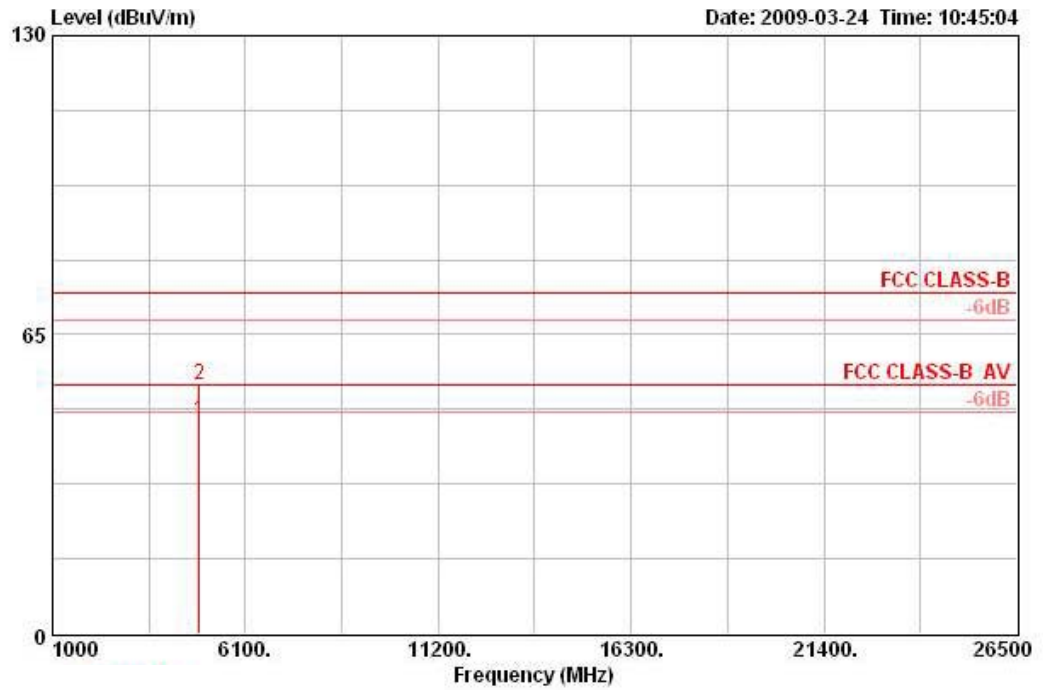
| | | | |
|---------------|---------------|----------------|-------------------------|
| Temperature | 24.3°C | Humidity | 56% |
| Test Engineer | Johnson Chang | Configurations | 802.11b CH 6 / Ant. A-1 |

Horizontal



| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Preamp Factor | Cable Loss | Remark | Pol/Phase | Table Pos | Ant Pos |
|---|----------|--------|------------|------------|------------|----------------|---------------|------------|---------|------------|-----------|---------|
| | MHz | dBUV/m | dB | dBUV/m | dBUV | dB/m | dB | dB | | | deg | cm |
| 1 | 4873.790 | 53.30 | -20.70 | 74.00 | 48.45 | 33.48 | 35.20 | 6.56 | PEAK | HORIZONTAL | 107 | 100 |
| 2 | 4873.950 | 45.27 | -8.73 | 54.00 | 40.43 | 33.48 | 35.20 | 6.56 | AVERAGE | HORIZONTAL | 107 | 100 |

Vertical



| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Preamp Factor | Cable Loss | Remark | Pol/Phase | Table Pos | Ant Pos |
|---|----------|--------|------------|------------|------------|----------------|---------------|------------|---------|-----------|-----------|---------|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | | deg | cm |
| 1 | 4873.990 | 46.46 | -7.54 | 54.00 | 41.62 | 33.48 | 35.20 | 6.56 | AVERAGE | VERTICAL | 347 | 192 |
| 2 | 4874.140 | 54.24 | -19.76 | 74.00 | 49.40 | 33.48 | 35.20 | 6.56 | PEAK | VERTICAL | 347 | 192 |

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 |
|--------------------------|----------------|---------------|-------------|----------------------|------------------|-----------------------|
| EMC Receiver | R&S | ESCS 30 | 100174 | 9kHz – 2.75GHz | Apr. 16, 2008 | Conduction (CO04-HY) |
| LISN | MessTec | NNB-2/16Z | 99079 | 9kHz – 30MHz | Mar. 31, 2008 | Conduction (CO04-HY) |
| LISN (Support Unit) | EMCO | 3810/2NM | 9703-1839 | 9kHz – 30MHz | Mar. 22, 2009 | Conduction (CO04-HY) |
| RF Cable-CON | UTIFLEX | 3102-26886-4 | CB049 | 9kHz – 30MHz | Apr. 20, 2008 | Conduction (CO04-HY) |
| ISN | SCHAFFNER | ISN ST08 | 21653 | 9kHz – 30MHz | Mar. 27, 2008 | Conduction (CO04-HY) |
| EMI Filter | LINDGREN | LRE-2030 | 2651 | < 450 Hz | N/A | Conduction (CO04-HY) |
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 30 MHz - 1 GHz 3m | Jun. 14, 2008 | Radiation (03CH03-HY) |
| Amplifier | SCHAFFNER | COA9231A | 18667 | 9 kHz - 2 GHz | Jan. 23, 2009 | Radiation (03CH03-HY) |
| Amplifier | Agilent | 8449B | 3008A02120 | 1 GHz - 26.5 GHz | Jul. 21, 2008 | Radiation (03CH03-HY) |
| Amplifier | MITEQ | AMF-6F-260400 | 9121372 | 26.5 GHz - 40 GHz | Jan. 22, 2008* | Radiation (03CH03-HY) |
| Spectrum Analyzer | R&S | FSP40 | 100004 | 9 kHz - 30 GHz | Oct. 06, 2008 | Radiation (03CH03-HY) |
| Loop Antenna | R&S | HFH2-Z2 | 860004/001 | 9 kHz - 30 MHz | Jul. 28, 2008* | Radiation (03CH03-HY) |
| Bilog Antenna | SCHAFFNER | CBL 6112D | 22237 | 30 MHz – 1 GHz | Jul. 12, 2008 | Radiation (03CH03-HY) |
| Horn Antenna | EMCO | 3115 | 6741 | 1GHz ~ 18GHz | Apr. 29, 2008 | Radiation (03CH03-HY) |
| Horn Antenna | SCHWARZBECK | BBHA9170 | BBHA9170154 | 15 GHz - 40 GHz | Jan.16, 2009 | Radiation (03CH03-HY) |
| RF Cable-R03m | Jye Bao | RG142 | CB021 | 30 MHz - 1 GHz | Jan. 05, 2009 | Radiation (03CH03-HY) |
| RF Cable-HIGH | SUHNER | SUCOFLEX 106 | 03CH03-HY | 1 GHz - 40 GHz | Jan. 05, 2009 | Radiation (03CH03-HY) |
| Turn Table | HD | DS 420 | 420/650/00 | 0 – 360 degree | N/A | Radiation (03CH03-HY) |
| Antenna Mast | HD | MA 240 | 240/560/00 | 1 m - 4 m | N/A | Radiation (03CH03-HY) |

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

Note: *Calibration Interval of instruments listed above is two year.

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 2 nd 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. : L1190-070110

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, 2007 to January 09, 2010 |
| Accredited Scope | : Testing Field, see described in the Appendix |
| Specific Accreditation Program | : Accreditation Program for Designated Testing Laboratory for Commodities Inspection : Accreditation Program for Telecommunication Equipment Testing Laboratory |


Jay-San Chen
President, Taiwan Accreditation Foundation
Date : January 10, 2007

PI, total 9 pages

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