

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

Test Report No. : E09NR-067

AGR No : A09NA-021

Applicant : Gaon-Int Co., LTD.

Address : Daelim Bldg., Suite 1501, 592-5, Dohwa1-dong, Nam-gu, Incheon, Korea

Manufacturer : RUIHUA ELECTRONICS FACTORY

Address : Xianxi Industrial Zone, Shatou Village, Changan Town, Dongguan City,  
Guangdong Province, China

Type of Equipment : Wireless Presenter Transmitter

FCC ID. : UP4-SP-800

Model Name : SP-800

Serial number : None

Total page of Report : 18 pages (including this page)

Date of Incoming : November 19, 2009

Date of issue : November 27, 2009


## SUMMARY

The equipment complies with the regulation; **FCC Part 15 Subpart C Section 15.249.**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

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### Revision History

| Issued Report No. | Issued Date       | Revisions     | Effect Section |
|-------------------|-------------------|---------------|----------------|
| E09NR-067         | November 27, 2009 | Initial Issue | All            |
|                   |                   |               |                |
|                   |                   |               |                |

## 1. VERIFICATION OF COMPLIANCE

APPLICANT : Gaon-Int Co., LTD.  
ADDRESS : Daelim Bldg., Suite 1501, 592-5, Dohwa1-dong, Nam-gu, Incheon, Korea  
CONTACT PERSON : Mr. Taejun, Kim / Director  
TELEPHONE NO : +82-32-246-1800  
FCC ID : UP4-SP-800  
MODEL NO/NAME : SP-800  
SERIAL NUMBER : N/A  
DATE : November 27, 2009

|   |  |
|---|--|
| EQUIPMENT CLASS   | <i><b>DXX - Part 15 Low Power Communication Device Transmitter</b></i> |
| KIND OF EQUIPMENT                                       | Wireless Presenter Transmitter   |
| THIS REPORT CONCERNS                                    | ORIGINAL GRANT   |
| MEASUREMENT PROCEDURES                                  | ANSI C63.4: 2003   |
| TYPE OF EQUIPMENT TESTED                                | PRE-PRODUCTION   |
| KIND OF EQUIPMENT<br>AUTHORIZATION REQUESTED            | CERTIFICATION  |
| EQUIPMENT WILL BE OPERATED<br>UNDER FCC RULES PART(S)   | FCC PART 15 SUBPART C Section 15.249                                   |
| MODIFICATIONS ON THE EQUIPMENT<br>TO ACHIEVE COMPLIANCE | No   |
| FINAL TEST WAS CONDUCTED ON                             | 3 m open area test site  |

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

## 2. TEST SUMMARY

### 2.1 Test items and results

| SECTION    | TEST ITEMS   | RESULTS                    |
|------------|--|----------------------------|
| 15.249 (a) | Field Strength of Emission                                 | Met the Limit / PASS       |
| 15.249 (d) | Emissions Radiated Outside of the Specified Frequency Band | Met the Limit / PASS       |
| 15.249 (e) | Radiated Emissions above 1 000 MHz                         | Met the Limit / PASS       |
| 15.209     | Radiated Emission Limits, General Requirement              | Met the Limit / PASS       |
| 15.207     | Conducted Limits   | Not Applicable (See Note)  |
| 15.203     | Antenna Requirement  | Met the Requirement / PASS |

Note: The Equipment under test shall be operated by DC battery.

### 2.2 Additions, deviations, exclusions from standards

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

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

Original submittal only

### 2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in section 2.1.

### 2.5 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4: 2003 and performed at a distance of 3 m from EUT to the antenna.

### 2.6 Test Facility

The open area test site and conducted measurement facilities are located on at 307-51 Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. Description details of test facilities were submitted to the Commission on August 21, 2008. (Registration Number: 340658)

### 3. GENERAL INFORMATION

#### 3.1 Product Description

The Gaon-Int Co., LTD., Model: SP-800 (referred to as the EUT in this report) is a Wireless Presenter Transmitter. The associated receiver of EUT is manufactured by Gaon-Int Co., Ltd., and shall be subject to DoC procedure by another test report. Product specification information described herein was obtained from product data sheet or user's manual.

|   |  |
|---|--|
| DEVICE TYPE                                       | Portable Device                            |
| OPERATING FREQUENCY                               | 2 421 MHz ~ 2 460 MHz                      |
| RATED RF OUTPUT POWER                             | 0 dBm                                      |
| USED RF CHIP                                      | Mfr.: Nordic CLSI ASA / Model No.: nRF2402 |
| ANTENNA   | PCB Pattern Antenna (Peak Gain: -1.33 dBi) |
| CHANNEL   | 40 Channels                                |
| MODULATION METHOD                                 | GFSK                                       |
| Tx DATA SPEED                                     | 1 Mbps                                     |
| LIST OF EACH OSC. OR<br>CRY. FREQ.(FREQ.>= 1 MHz) | 12 MHz                                     |
| NUMBER OF LAYER                                   | 2 Layers                                   |
| POWER REQUIREMENT                                 | DC 3 V from AAA type battery               |

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

-. None

### 4. EUT MODIFICATIONS

-. None

## 5. SYSTEM TEST CONFIGURATION

### 5.1 Justification

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

| DEVICE TYPE | MANUFACTURER       | MODEL/PART NUMBER | FCC ID |
|-------------|--------------------|-------------------|--------|
| Main Board  | Gaon-Int Co., LTD. | FP-350 Rev_W2     | N/A    |
| Laser Board | N/A                | N/A               | N/A    |

### 5.3 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested: None

### 5.4 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting and receiving mode is programmed. For final testing, the EUT was set at Low Channel (2 421 MHz), Middle Channel (2 440 MHz), and High Channel (2 460 MHz). To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

### 5.5 Configuration of Test System

**Line Conducted Test:** It is not need to test this requirement, because the EUT shall be operated by DC battery.

**Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.4: 2003 8.3.1.1 and 13.1.4.1 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m open area test site.

The turntable was rotated through 360° and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

### 5.6 Antenna Requirement

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

#### Antenna Construction:

The antenna of the EUT is a chip antenna on the main board in the EUT, so no consideration of replacement by the user.

## 6. PRELIMINARY TEST

### 6.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

| Operation Mode  | The Worse operating condition |
|---|-------------------------------|
| It is not need to test this requirement, because the EUT shall be operated by DC battery. |                               |

### 6.2 General Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

| Operation Mode               | The Worse operating condition |
|------------------------------|-------------------------------|
| Continuous Transmitting Mode | X                             |



## 7. RADIATED EMISSION TEST

### 7.1 Test set-up

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

The frequency spectrum from 30 MHz to 10<sup>th</sup> harmonic frequency of carrier frequency was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

Test set-up photos are included in appendix I.

### 7.2 Measurement uncertainty

Radiated emission electric field intensity, 30 MHz ~ 300 MHz :  $\pm 4.43$  dB

Radiated emission electric field intensity, 300 MHz ~ 1 000 MHz :  $\pm 3.80$  dB

Radiated emission electric field intensity, 1 000 MHz ~ 3 000 MHz:  $\pm 4.4$  dB

Measurement uncertainty is calculated in accordance with WECC 19-1990. The measurement uncertainty is given with a confidence of 95 % with the coverage factor,  $k = 2$ .

### 7.3 Test equipment used

| Model Number    | Manufacturer    | Description          | Serial Number | Valid Calibration |
|-----------------|-----------------|----------------------|---------------|-------------------|
| ■ - ESiB26      | Rohde & Schwarz | EMI Test Receiver    | 100296        | Apr. 03, 2010     |
| ■ - 8566B       | HP              | Spectrum Analyzer    | 3407A08547    | June 16, 2010     |
| ■ - 8564E       | Hewlett-Packard | Spectrum Analyzer    | 3650A00756    | June 15, 2010     |
| ■ - 8447D       | Hewlett Packard | Amplifier            | 2727A04987    | June 15, 2010     |
| ■ - 83051A      | Agilent         | RF Amplifier         | 3950M00201    | June 15, 2010     |
| ■ - 83650L      | Hewlett-Packard | Signal Generator     | 3844A00415    | June 16, 2010     |
| ■ - VHA9103     | Schwarzbeck     | Biconical Antenna    | 91031852      | Feb. 13, 20107    |
| ■ - 9108-A(494) | Schwarzbeck     | Log Periodic Antenna | 62281001      | Feb. 13, 2010     |
| ■ - 3121C       | EMCO            | Dipole Antenna       | 9002-530      | Nov. 16, 2011     |
| ■ - BBHA9120D   | Schwarzbeck     | Horn Antenna         | BBHA9120D294  | June 17, 2011     |
| ■ - MA240       | HD GmbH         | Antenna Master       | N/A           | N/A               |
| ■ - HD100       | HD GmbH         | Position Controller  | N/A           | N/A               |
| ■ - DS420S      | HD GmbH         | Turn Table           | N/A           | N/A               |

All test equipment used is calibrated on a regular basis.

## 7.4 Final Result of Measurement

### 7.4.1 Field Strength of the Fundamental Frequency

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 38 % R.H. Temperature: 16 °C  
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(a)  
Result : PASSED BY -14.39 dB at 2 460.00 MHz

EUT : Wireless Presenter Transmitter Date: November 23 ~ 24, 2009  
Operating Condition : TX mode  
Distance : 3 m

| Channel | Radiated Emissions  |                  |             | Ant  | Correction Factors |            | Total              | FCC Limit      |             |
|---------|---------------------|------------------|-------------|------|--------------------|------------|--------------------|----------------|-------------|
|         | Carrier Freq. (MHz) | Amplitude (dBμV) | Detect Mode | Pol. | Antenna (dB/m)     | Cable (dB) | Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| Low     | 2 421.00            | 54.80            | Peak        | H    | 27.14              | 5.02       | 86.96              | 113.98         | -27.02      |
|         |                     | 40.80            | Average     | H    |                    |            | 72.96              | 93.98          | -21.02      |
|         |                     | 60.10            | Peak        | V    |                    |            | 92.26              | 113.98         | -21.72      |
|         |                     | 46.20            | Average     | V    |                    |            | 78.36              | 93.98          | -15.62      |
| Middle  | 2 440.00            | 55.70            | Peak        | H    | 27.19              | 5.03       | 87.92              | 113.98         | -26.06      |
|         |                     | 41.30            | Average     | H    |                    |            | 73.52              | 93.98          | -20.46      |
|         |                     | 59.60            | Peak        | V    |                    |            | 91.82              | 113.98         | -22.16      |
|         |                     | 45.70            | Average     | V    |                    |            | 77.92              | 93.98          | -16.06      |
| High    | 2 460.00            | 56.00            | Peak        | H    | 27.24              | 5.05       | 88.29              | 113.98         | -25.69      |
|         |                     | 41.70            | Average     | H    |                    |            | 73.99              | 93.98          | -19.99      |
|         |                     | 61.10            | Peak        | V    |                    |            | 93.39              | 113.98         | -20.59      |
|         |                     | 47.30            | Average     | V    |                    |            | 79.59              | 93.98          | -14.39      |

\*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

Tested by: In-Sub, Youn / Project Engineer

#### 7.4.2 Emissions Conducted Outside of the Specified Frequency Bands

Humidity Level : 38 %R.H. Temperature: 16 °C  
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(d)  
Result : PASS

EUT : 2.4 GHz Band Low-Power Data Date: November 23 ~ 24, 2009  
Communication System Transmitter

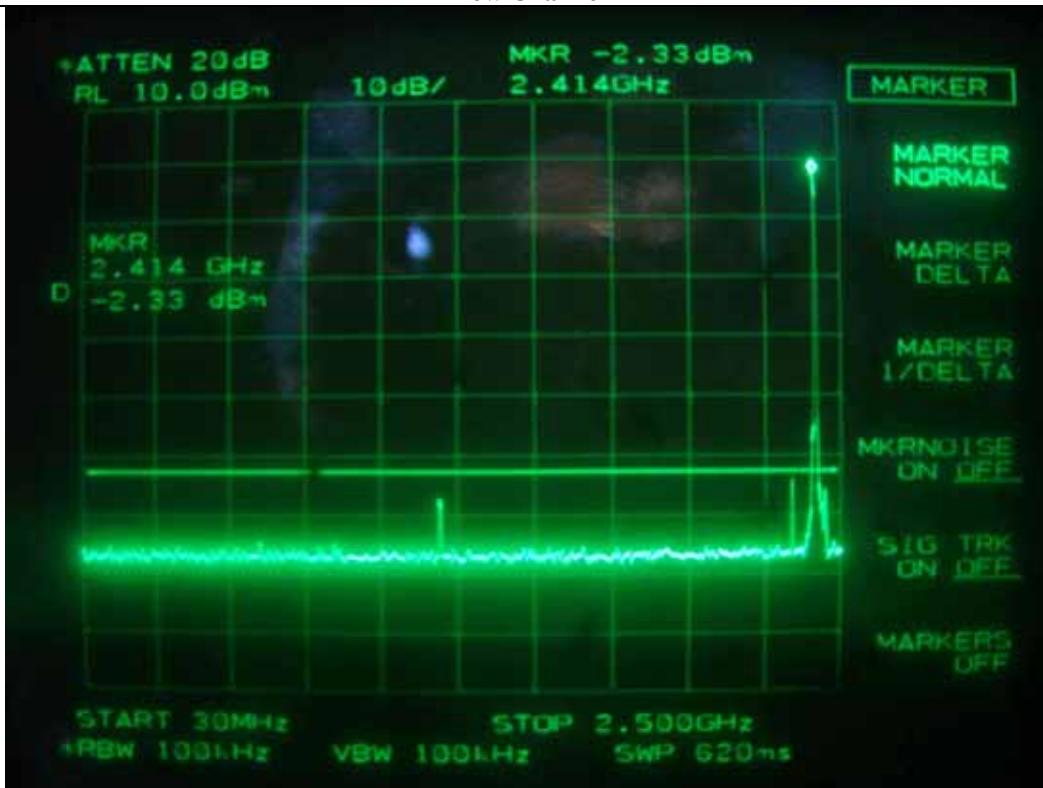
Operating Condition : TX mode

Distance : 3 m

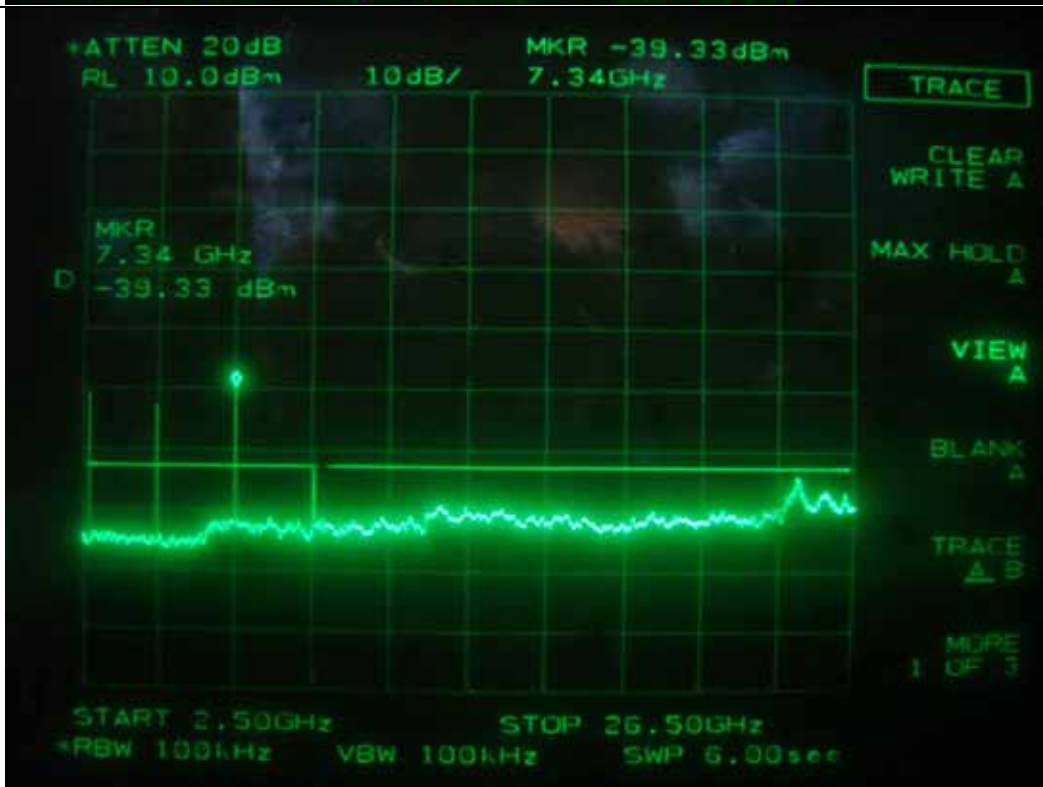
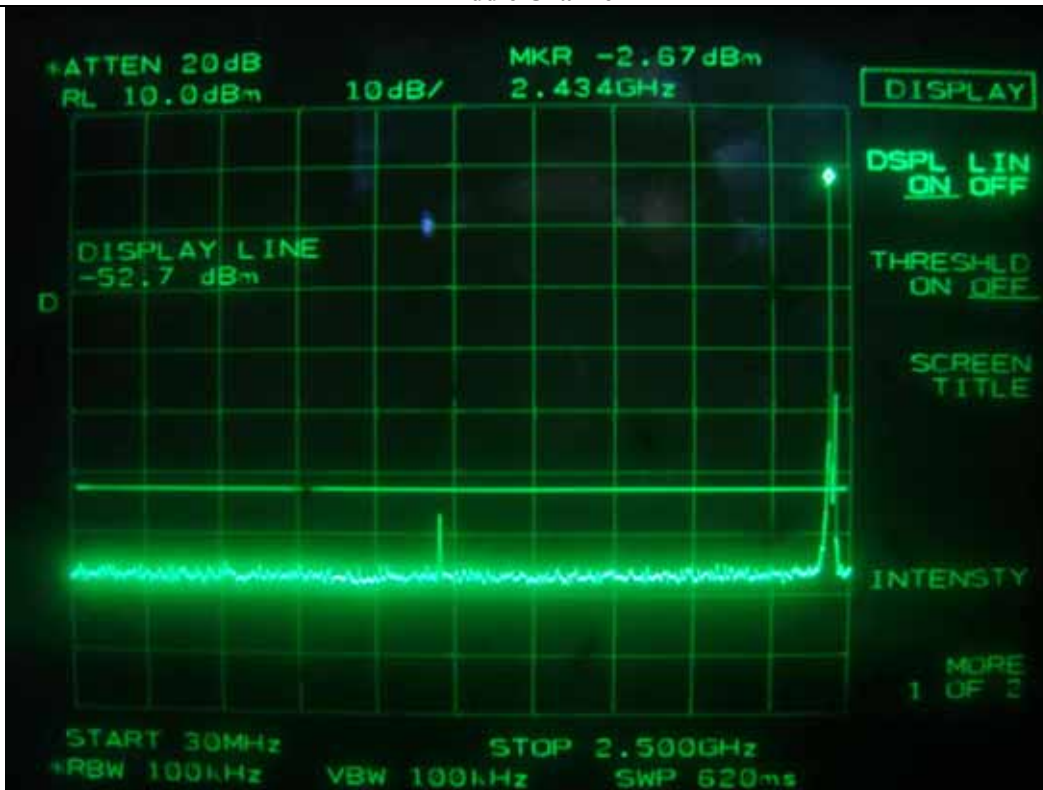
| Channel | Radiated Emissions  |                  |             | Ant  | Correction Factors |            | Total              | FCC Limit      |             |
|---------|---|------------------|-------------|------|--------------------|------------|--------------------|----------------|-------------|
|         | Carrier Freq. (MHz)   | Amplitude (dBμV) | Detect Mode | Pol. | Antenna (dB/m)     | Cable (dB) | Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| Low     | Spurious frequencies except harmonics have margin more than 50 dB, and were scanned up to 26.5 GHz.<br>See next page for graph data, which was obtained by conducted measurement. |                  |             |      |                    |            |                    |                |             |
| Middle  |   |                  |             |      |                    |            |                    |                |             |
| High    |   |                  |             |      |                    |            |                    |                |             |

  
Tested by: In-Sub, Youn / Project Engineer

Low Channel

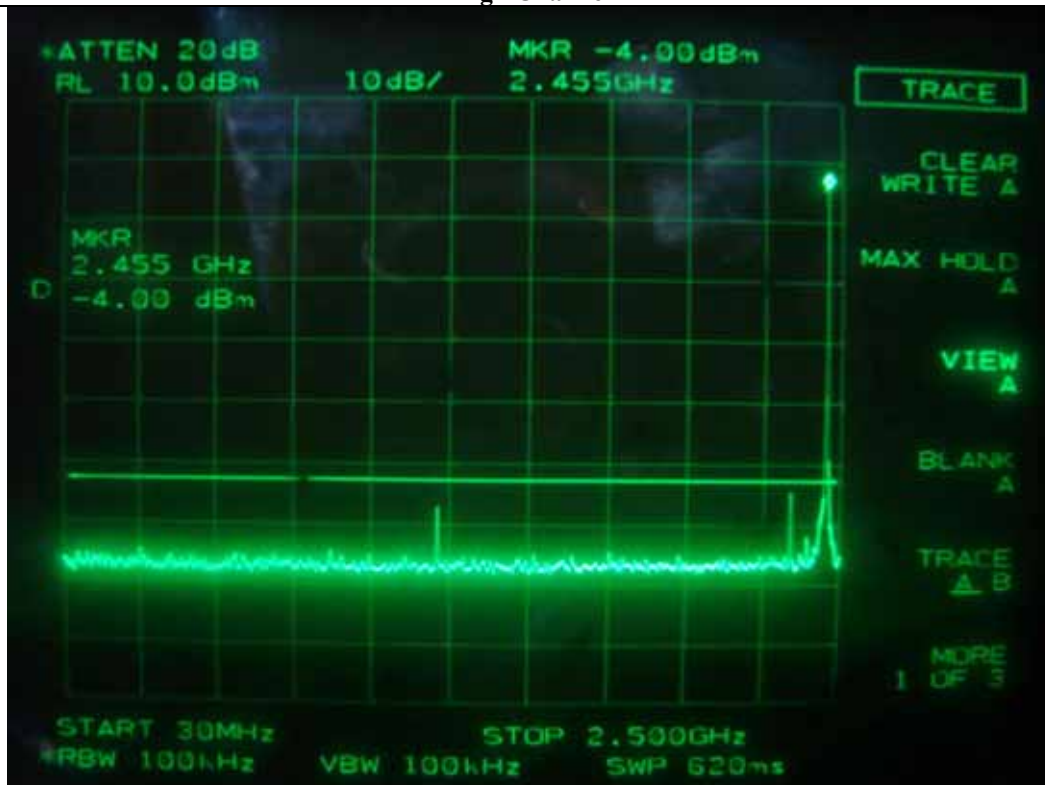


Middle Channel





High Channel



### 7.4.3 Emissions Radiated Outside of the Specified Frequency Bands

#### 7.4.3.1 Test Data for Spurious except for Harmonic above 1 000 MHz

Humidity Level : 38 % R.H. Temperature: 16 °C  
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(d)  
Result : PASSED BY -18.14 dB at 2 575.91

EUT : 2.4 GHz Band Low-Power Data Date: November 23 ~ 24, 2009  
Communication System Transmitter  
Operating Condition : TX mode  
Distance : 3 m

| Frequency<br>(MHz)           | Reading<br>(dBμV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | Amp<br>Gain | Total<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) |
|------------------------------|-------------------|------------------|--------------------|----------------|---------------|-------------|-------------------|--------------------|----------------|
| Test Data for Low Channel    |                   |                  |                    |                |               |             |                   |                    |                |
| 2 334.22*                    | 41.20             | Peak             | H                  | 26.90          | 4.95          | 29.07       | 43.98             | 73.98              | -30.00         |
|                              | 30.90             | Average          | H                  |                |               |             | 33.68             | 53.98              | -20.30         |
|                              | 42.70             | Peak             | V                  |                |               |             | 45.48             | 73.98              | -28.50         |
|                              | 32.20             | Average          | V                  |                |               |             | 34.98             | 53.98              | -19.00         |
| 2 387.88*                    | 40.90             | Peak             | H                  | 27.05          | 4.99          | 28.98       | 43.96             | 73.98              | -30.02         |
|                              | 30.50             | Average          | H                  |                |               |             | 33.56             | 53.98              | -20.42         |
|                              | 41.60             | Peak             | V                  |                |               |             | 44.66             | 73.98              | -29.32         |
|                              | 31.30             | Average          | V                  |                |               |             | 34.36             | 53.98              | -19.62         |
| Test Data for Middle Channel |                   |                  |                    |                |               |             |                   |                    |                |
| 2 334.48*                    | 39.50             | Peak             | H                  | 26.90          | 4.95          | 29.07       | 42.28             | 73.98              | -31.70         |
|                              | 29.80             | Average          | H                  |                |               |             | 32.58             | 53.98              | -21.40         |
|                              | 40.70             | Peak             | V                  |                |               |             | 43.48             | 73.98              | -30.50         |
|                              | 30.20             | Average          | V                  |                |               |             | 32.98             | 53.98              | -21.00         |
| 2 387.89*                    | 38.80             | Peak             | H                  | 27.05          | 4.99          | 28.98       | 41.86             | 73.98              | -32.12         |
|                              | 28.90             | Average          | H                  |                |               |             | 31.96             | 53.98              | -22.02         |
|                              | 39.90             | Peak             | V                  |                |               |             | 42.96             | 73.98              | -31.02         |
|                              | 30.20             | Average          | V                  |                |               |             | 33.26             | 53.98              | -20.72         |

Tabulated test data for Restricted Band

| Test Data for High Channel |       |         |   |       |      |       |       |       |        |
|----------------------------|-------|---------|---|-------|------|-------|-------|-------|--------|
| 2 387.89*                  | 40.18 | Peak    | H | 27.05 | 4.99 | 28.98 | 43.24 | 73.98 | -30.74 |
|                            | 29.60 | Average | H |       |      |       | 32.66 | 53.98 | -21.32 |
|                            | 41.67 | Peak    | V |       |      |       | 44.73 | 73.98 | -29.25 |
|                            | 31.90 | Average | V |       |      |       | 34.96 | 53.98 | -19.02 |
| 2 575.91*                  | 41.25 | Peak    | H | 27.56 | 5.15 | 28.67 | 45.29 | 73.98 | -28.69 |
|                            | 30.30 | Average | H |       |      |       | 34.34 | 53.98 | -19.64 |
|                            | 42.30 | Peak    | V |       |      |       | 46.34 | 73.98 | -27.64 |
|                            | 31.80 | Average | V |       |      |       | 35.84 | 53.98 | -18.14 |

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "\*" Frequency fall in restricted band



**Tested by: In-Sub, Youn / Project Engineer**



### 7.4.3.2 Test Data for Harmonic

Humidity Level : 38 % R.H. Temperature: 16 °C  
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(a)  
Result : PASSED BY -12.35 dB at 4 842.10 MHz

EUT : 2.4 GHz Band Low-Power Data Date: November 23 ~ 24, 2009  
Communication System Transmitter  
Operating Condition : TX mode  
Distance : 3 m

| Frequency<br>(MHz)                              | Reading<br>(dBμV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | Amp<br>Gain | Total<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) |
|---|-------------------|------------------|--------------------|----------------|---------------|-------------|-------------------|--------------------|----------------|
| Test Data for Low Channel                       |                   |                  |                    |                |               |             |                   |                    |                |
| 4 842.10*                                       | 35.80             | Peak             | H                  | 31.17          | 7.17          | 28.77       | 45.33             | 73.98              | -28.65         |
|   | 26.50             | Average          | H                  |                |               |             | 36.03             | 53.98              | -17.95         |
|   | 42.60             | Peak             | V                  |                |               |             | 52.13             | 73.98              | -21.85         |
|   | 32.10             | Average          | V                  |                |               |             | 41.63             | 53.98              | -12.35         |
| Other frequencies were not found up to 26.5GHz. |                   |                  |                    |                |               |             |                   |                    |                |
| Test Data for Middle Channel                    |                   |                  |                    |                |               |             |                   |                    |                |
| 4 880.00*                                       | 38.90             | Peak             | H                  | 31.19          | 7.21          | 28.73       | 48.57             | 73.98              | -25.41         |
|   | 29.00             | Average          | H                  |                |               |             | 38.67             | 53.98              | -15.31         |
|   | 42.30             | Peak             | V                  |                |               |             | 51.97             | 73.98              | -22.01         |
|   | 31.90             | Average          | V                  |                |               |             | 41.57             | 53.98              | -12.41         |
| Other frequencies were not found up to 26.5GHz. |                   |                  |                    |                |               |             |                   |                    |                |
| Test Data for High Channel                      |                   |                  |                    |                |               |             |                   |                    |                |
| 4 920.10*                                       | 36.80             | Peak             | H                  | 31.25          | 7.25          | 28.70       | 46.60             | 73.98              | -27.38         |
|   | 25.10             | Average          | H                  |                |               |             | 34.90             | 53.98              | -19.08         |
|   | 41.30             | Peak             | V                  |                |               |             | 51.10             | 73.98              | -22.88         |
|   | 30.10             | Average          | V                  |                |               |             | 39.90             | 53.98              | -14.08         |
| Other frequencies were not found up to 26.5GHz. |                   |                  |                    |                |               |             |                   |                    |                |

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "\*" Frequency fall in restricted band

  
Tested by: In-Sub, Youn / Project Engineer

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EMC-003(Rev.1)

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EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea. (TEL: 82-31-765-8289 FAX: 82-31-766-2904)

### 7.4.3.3 Test Data for Spurious except for Harmonic below 1 000 MHz

Humidity Level : 38 % R.H. Temperature: 16 °C  
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(d)  
Result : PASS

EUT : 2.4 GHz Band Low-Power Data Date: November 23 ~ 24, 2009  
Communication System Transmitter  
Operating Condition : TX mode  
Distance : 3 m

| Frequency<br>(MHz)                              | Reading<br>(dBμV) | Ant. Pol.<br>(H/V) | Ant. Factor<br>(dB/m) | Cable<br>Loss | Emission<br>Level(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) |
|---|-------------------|--------------------|-----------------------|---------------|---------------------------|--------------------|----------------|
| It was not observed any emissions from the EUT. |                   |                    |                       |               |                           |                    |                |

Tabulated test data for Radiated Electromagnetic Field

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



Tested by: In-Sub, Youn / Project Engineer