

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

Test Report No. : E077R-032

AGR No. : A069A-113R

Applicant : MTI Co., Ltd.  
Address : 166-10, Garak-dong, Songpa-gu, Seoul, Korea

Manufacturer : MTI Co., Ltd.  
Address : 166-10, Garak-dong, Songpa-gu, Seoul, Korea

Type of Equipment : Spread Spectrum Device (802.11b)

FCC ID. : SQD-APU11B01POE

Model Name : APU11B01 POE

Serial number : N/A

Total page of Report : 34 pages (including this page)

Date of Incoming : June 23, 2007

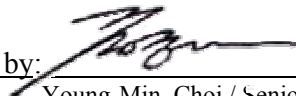
Date of issue : July 10, 2007

## SUMMARY

The equipment complies with the regulation; **FCC Part 15 Subpart C Section 15.247.**

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

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

Prepared by:   
Young-Min, Choi / Senior Engineer  
EMC Div.  
ONETECH Corp.

Reviewed by:   
Y. K. Kwon / Director  
EMC Div.  
ONETECH Corp.

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**1. VERIFICATION OF COMPLIANCE**

APPLICANT : MTI Co., Ltd.  
ADDRESS : 166-10, Garak-dong, Songpa-gu, Seoul, Korea  
CONTACT PERSON : Mr. Hoyoung Lee / Manager  
TELEPHONE NO : +82-2-421-4042  
FCC ID : SQD-APU11B01POE  
MODEL NAME : APU11B01 POE  
SERIAL NUMBER : N/A  
DATE : July 10, 2007

|                                                         |                                                |
|---------------------------------------------------------|------------------------------------------------|
| EQUIPMENT CLASS                                         | <b><i>DTS – DIGITAL TRNSMISSION SYSTEM</i></b> |
| KIND OF EQUIPMENT                                       | Spread Spectrum Device with WLAN (802.11b)     |
| 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 15.247           |
| MODIFICATIONS ON THE EQUIPMENT<br>TO ACHIEVE COMPLIANCE | None                                           |
| FINAL TEST WAS CONDUCTED ON                             | 3 METER(S) 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                |
|-------------------|-----------------------------------------------------|------------------------|
| 15.247 (a) (2)    | Minimum 6dB Bandwidth                               | Met the Limit / PASS   |
| 15.247 (b) (3)    | Maximum Peak Conducted Output Power                 | Met the Limit / PASS   |
| 15.247 (b) (5)    | Radio Frequency Exposure Level                      | Met the Limit / PASS   |
| 15.247 (c)        | 100 kHz Bandwidth Outside the Frequency Band        | Met the Limit / PASS   |
| 15.247 (c)        | Radiated Emission which fall in the Restricted Band | Met the Limit / PASS   |
| 15.247 (d)        | Peak Power Spectral Density                         | Met the Limit / PASS   |
| 15.209 and 15.109 | Radiated Emission Limits                            | Met the Limit / PASS   |
| 15.207 and 15.107 | Conducted Emission Limits                           | N/A (See Note)         |
| 15.203            | Antenna Requirement                                 | Met requirement / PASS |

Note: This test is not applicable, because the EUT is not directly connected to public low-voltage distribution system.

### 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 at a distance of 3 meters from EUT to the antenna.

### 2.6 Test Facility

The Electromagnetic compatibility measurement facilities are located on at 307-51 Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-080 Korea. Description details of test facilities were submitted to the Federal Communications Commission on August 30, 2005 (Registration Number: 92819 and 340658), accredited by KOLAS (Korea Laboratory Accreditation Scheme, No: 85) and approved by TUV, DNV and MIC (Ministry of Information and Communications in Korea) according to the requirement of ISO17025.

### 3. GENERAL INFORMATION

#### 3.1 Product Description

The MTI Co., Ltd., Model APU11B01 POE (referred to as the EUT in this report) is a Spread Spectrum Device that is an outdoor hardened, strand-mountable access point solution designed to extend the reach of the cable operators' hybrid fiber coax network utilizing wireless technologies from existing rights of ways. The product specification described herein was obtained from product data sheet or user's manual.

|                                                     |                                                                                                                                             |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| DEVICE TYPE                                         | Spread Spectrum Device (802.11b)                                                                                                            |
| OPERATING FREQUENCY                                 | 2412 – 2472 MHz                                                                                                                             |
| TEMPERATURE RANGE                                   | -40°C ~ +65°C                                                                                                                               |
| RF OUTPUT POWER                                     | Max. 20.30 dBm                                                                                                                              |
| NUMBER OF CHANNEL                                   | 11 Channels                                                                                                                                 |
| MAX. DATA TRANSFER RATE                             | 11 Mbps                                                                                                                                     |
| MODULATION TYPE                                     | DSSS                                                                                                                                        |
| USED ANTENNA                                        | Panel Antenna: NTA-2407 (Gain: 14 dBi)<br>Bidirectional Antenna: NTA-2412 (Gain: 9 dBi)<br>Omni directional Antenna: NTA-2400 (Gain: 7 dBi) |
| ANTENNA CONNECTOR TYPE                              | NTA-2401(SMA Female), NTA-2412(N Male), NTA-2400(N Female)                                                                                  |
| USED WLAN MODULE                                    | MFR: Universal Scientific Industrial Co., Ltd.                                                                                              |
|                                                     | Model No: MP-B-AG-00                                                                                                                        |
| LIST OF EACH OSC. OR CRYSTAL.<br>FREQ.(FREQ.>=1MHz) | 14.3 MHz and 25 MHz                                                                                                                         |
| NUMBER OF LAYER                                     | 6 Layers                                                                                                                                    |
| EXTERNAL CONNECTOR                                  | Antenna(N-female), PoE Ethernet(RJ-45)                                                                                                      |
| POWER REQUIREMENT                                   | DC 48V, 315 mA from a CSU PoE Injector                                                                                                      |

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

No other model differences have been mentioned.

### 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  | MTI Co., Ltd. | AP 6220-B4-R1-V2  | N/A    |
| WLAN Board  | USI           | MP-B-AG-00        | N/A    |
| Power Board | N/A           | N/A               | N/A    |

### 5.2 Peripheral equipment

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

| Model        | Manufacturer    | FCC ID              | Description                  | Connected to |
|--------------|-----------------|---------------------|------------------------------|--------------|
| APU11B01 POE | MTI Co., Ltd.   | SQD-<br>APU11B01POE | Spread Spectrum Device (EUT) | PC           |
| PP10L        | Dell Computer   | DoC                 | PC                           | -            |
| MO56UOA      | Dell Computer   | DoC                 | Mouse                        | PC           |
| AP-1203      | Nortel Networks | N/A                 | CSU PoE Injector             | EUT          |

### 5.3 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, WLAN was set at Low Channel (2412MHz), Middle Channel (2437MHz), and High Channel (2462MHz) with 11Mbps(802.11b) data rate. To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the antenna has maximum gain was used for the testing.

## 5.4 Configuration of Test System

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

**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 3meter open area test site.

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

## 5.5 Antenna Requirement

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

### Antenna Construction:

The transmitter antenna of the EUT is installed inside of 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 (Please check one only) |
|----------------|-------------------------------------------------------|
| TX mode        | X                                                     |

### 6.2 General Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

| Operation Mode | The Worse operating condition (Please check one only) |
|----------------|-------------------------------------------------------|
| TX mode        | X                                                     |

## 7. MINIMUM 6dB BANDWIDTH

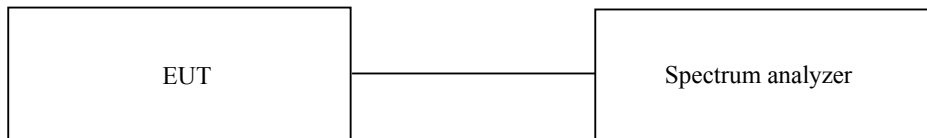
### 7.1 Operating environment

Temperature : 23 °C

Relative humidity : 36 %

### 7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



### 7.3 Test equipment used

| Model Number | Manufacturer | Description       | Serial Number | Last Cal.     |
|--------------|--------------|-------------------|---------------|---------------|
| ■ - 8564E    | HP           | Spectrum Analyzer | 3650A00756    | June 19, 2007 |

All test equipment used is calibrated on a regular basis.

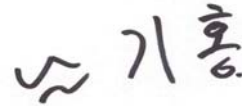
**7.4 Test data**

-. Test Date : June 28, 2007

-. Test Result : Pass

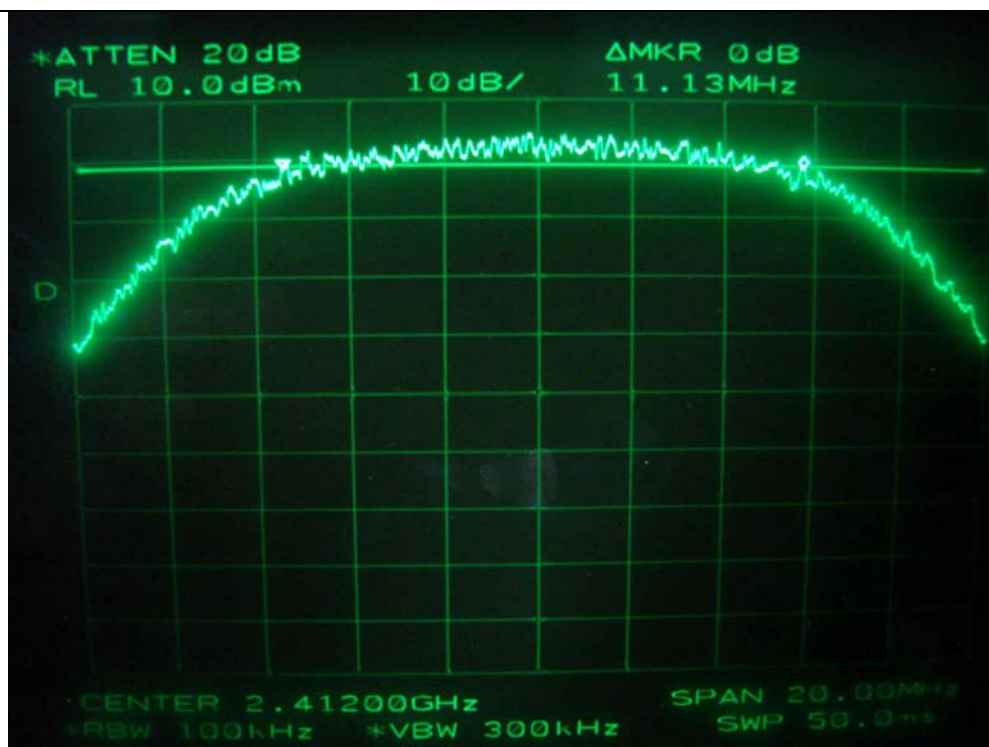
| CHANNEL | FREQUENCY(MHz) | MEASURED VLAUE (kHz) | LIMIT (kHz) | MARGIN (kHz) |
|---------|----------------|----------------------|-------------|--------------|
| Low     | 2412           | 11130                | 500         | -10630       |
| Middle  | 2437           | 11100                | 500         | -10600       |
| High    | 2462           | 11130                | 500         | -10630       |

Remark: See next page for an overview sweep performed with peak detector.

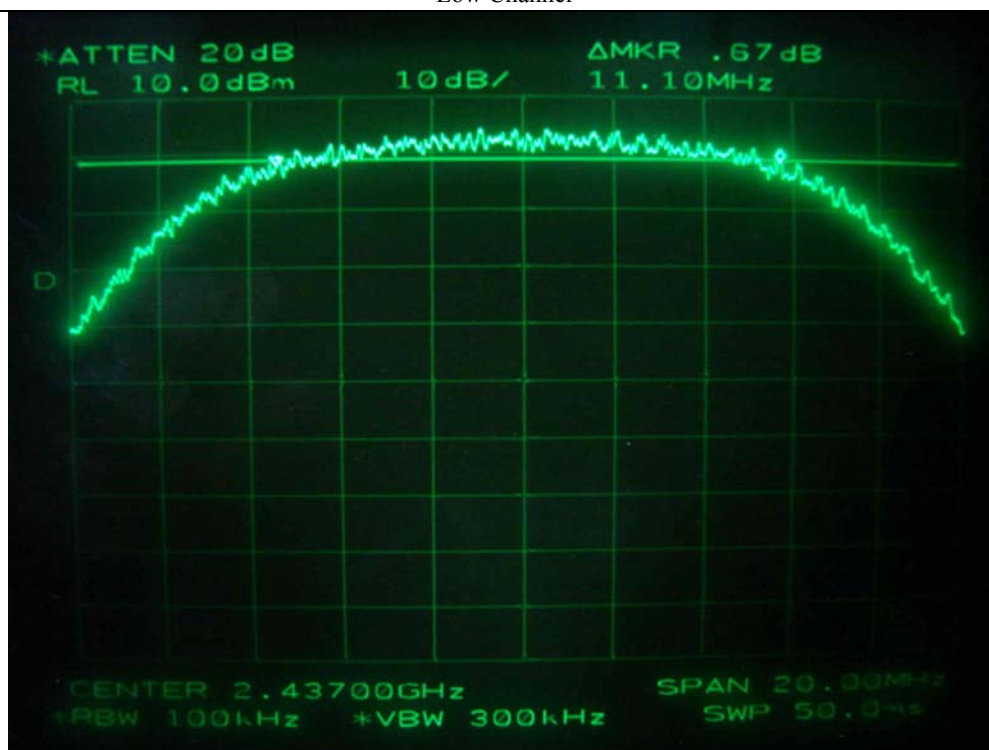


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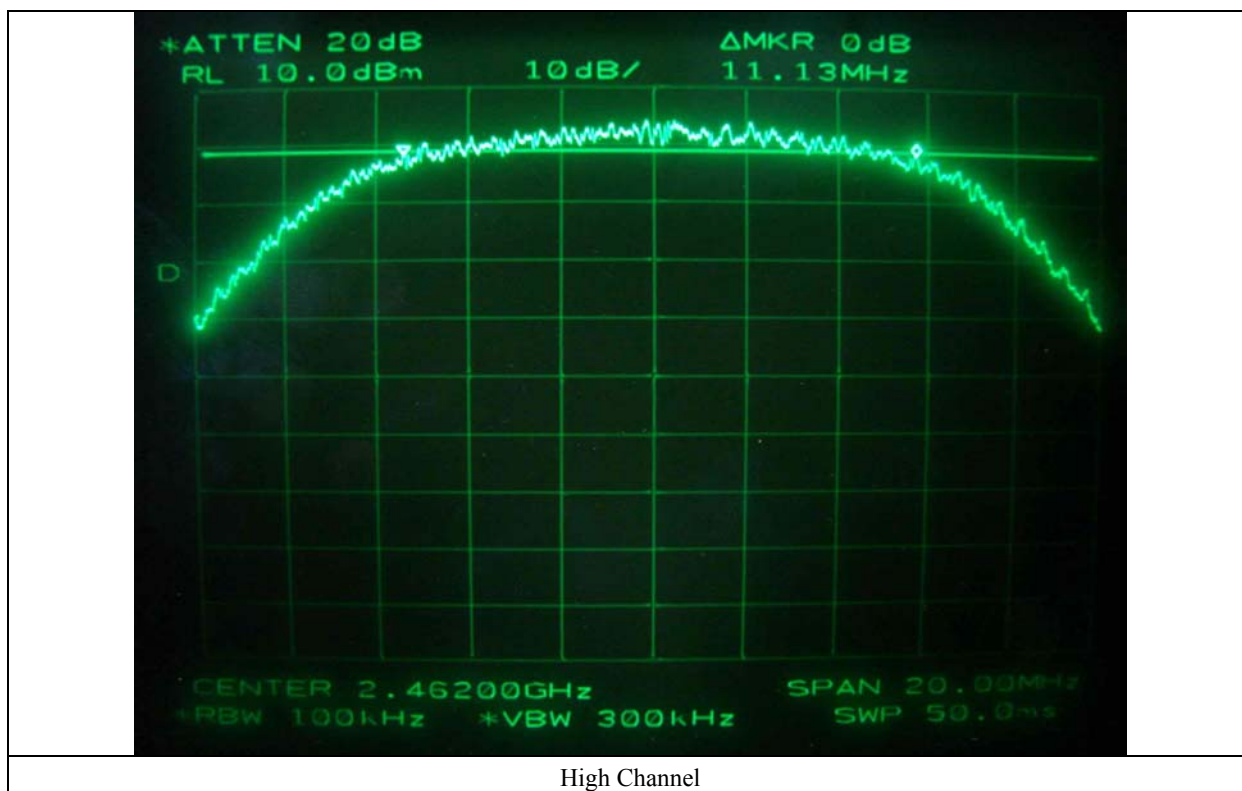
Tested by: Ki-Hong, Nam / Test Engineer



Low Channel



Middle Channel



## 8. MAXIMUM PEAK OUTPUT POWER

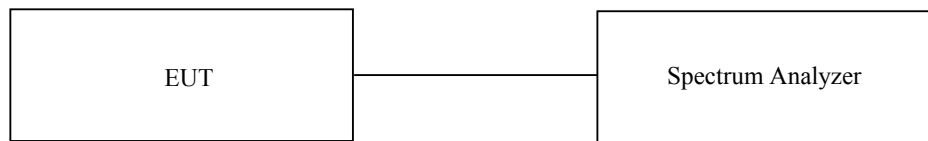
### 8.1 Operating environment

Temperature : 23 °C

Relative humidity : 36 %

### 8.2 Test set-up

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT. The spectrum analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth. The EUT was operating in transmit mode at the appropriate center frequency.



### 8.3 Test equipment used

| Model Number | Manufacturer | Description       | Serial Number | Last Cal.     |
|--------------|--------------|-------------------|---------------|---------------|
| ■ - 8564E    | HP           | Spectrum Analyzer | 3650A00756    | June 19, 2007 |

All test equipment used is calibrated on a regular basis.

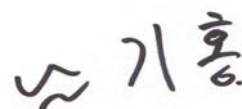
**8.4 Test data**

-. Test Date : June 28, 2007

-. Test Result : Pass

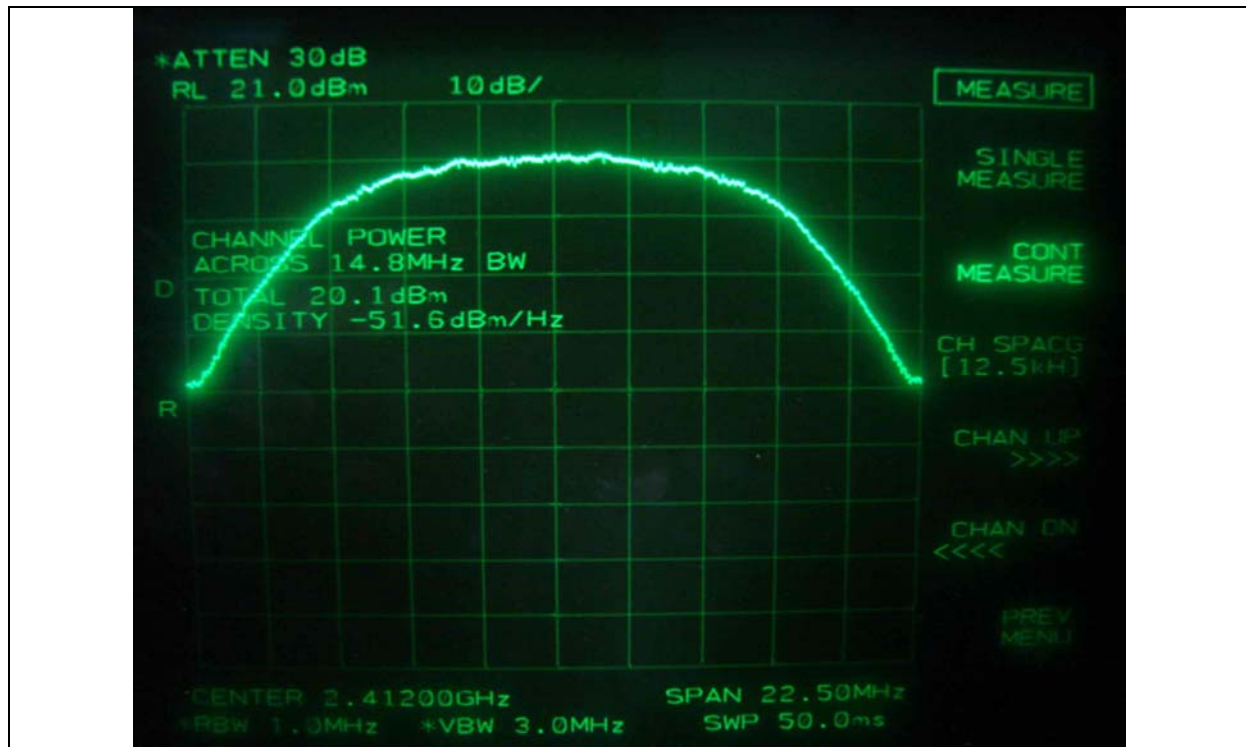
| CHANNEL | FREQUENCY<br>(MHz) | 99% Occupied<br>Bandwidth (MHz) | MEASURED<br>VLAUE (dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|---------------------------------|-------------------------|----------------|----------------|
| Low     | 2412               | 14.81                           | 20.10                   | 30.0           | -9.90          |
| Middle  | 2437               | 14.81                           | 20.30                   | 30.0           | -9.70          |
| High    | 2462               | 14.81                           | 20.10                   | 30.0           | -9.90          |

Remark: See next page for an overview sweep performed with peak detector.

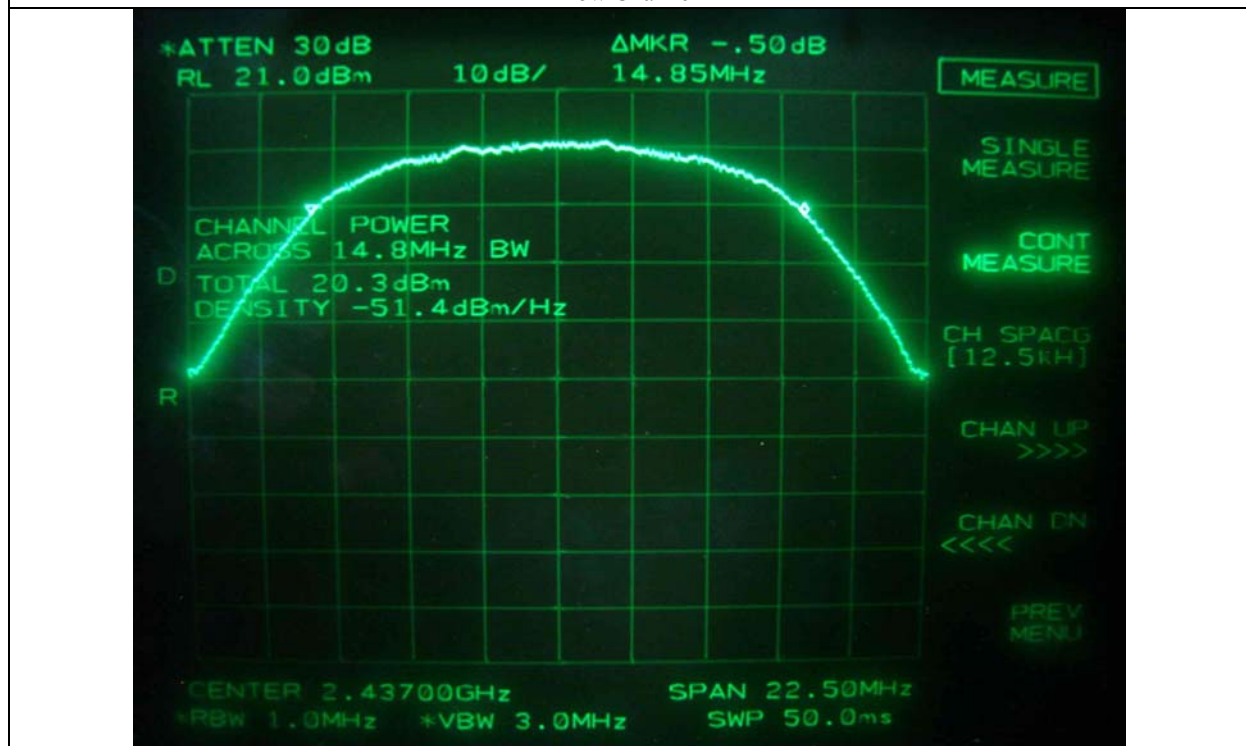


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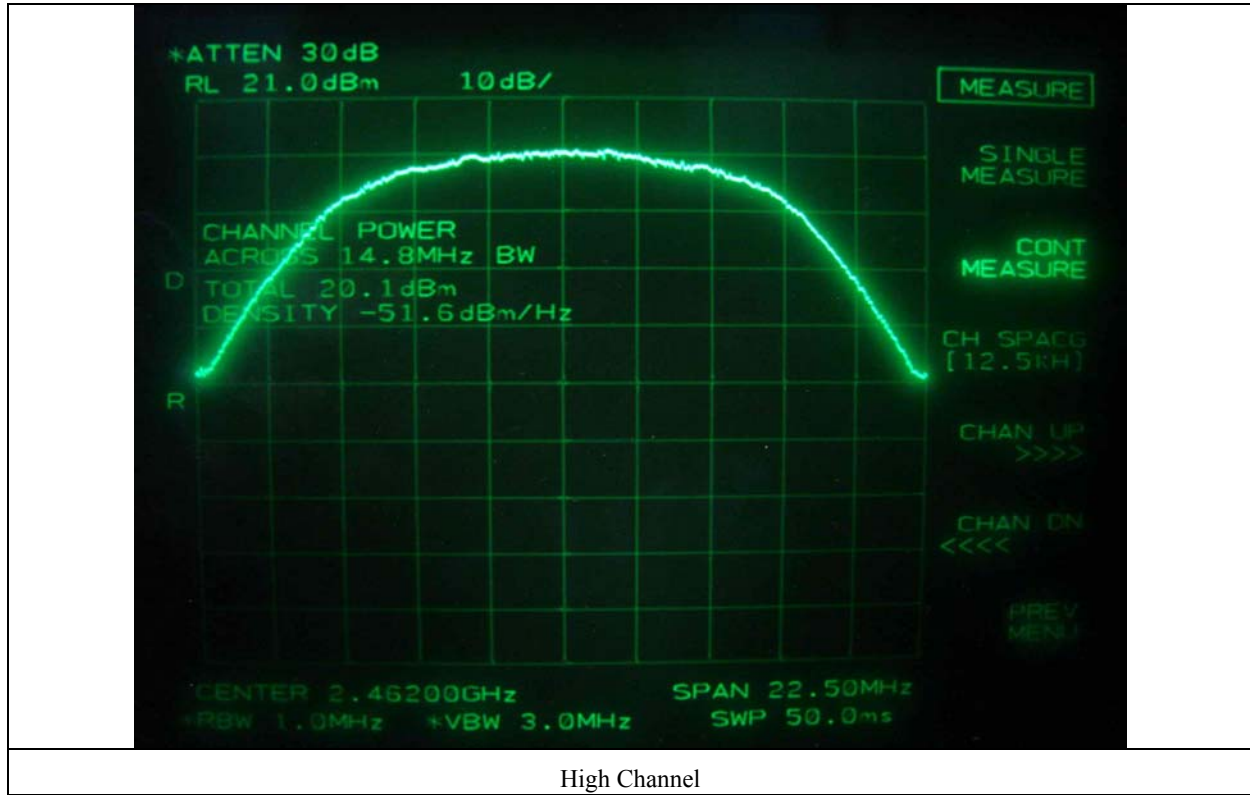
Tested by: Ki-Hong, Nam / Test Engineer



Low Channel



Middle Channel



## 9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

### 9.1 Operating environment

Temperature : 22 °C  
Relative humidity : 39 %

### 9.2 Test set-up for conducted measurement

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



### 9.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3meters, open-field test site. The EUT was placed on a non-conductive turntable approximately 0.8 meters above the ground plane.

The frequency spectrum from 30MHz to 25GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 and 4.0 meters in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

### 9.4 Test equipment used

| Model Number     | Manufacturer    | Description            | Serial Number | Last Cal.         |
|------------------|-----------------|------------------------|---------------|-------------------|
| ■ - 8564E        | Hewlett-Packard | Spectrum Analyzer      | 3650A00756    | June 19, 2007     |
| ■ - 8447D        | Hewlett-Packard | Amplifier              | 2727A04987    | June 19, 2007     |
| □ - 83051A       | Agilent         | Preamplifier           | 3950M00201    | June 20, 2007     |
| ■ - F-40-5000-RF | RLC Electronics | Highpass Filter        | 0425          | July 15, 2006     |
| ■ - MA220        | HD              | Turn Table             | N/A           | N/A               |
| ■ - HD240        | HD              | Antenna Mast           | N/A           | N/A               |
| ■ - BBHA9120D    | Schwarzbeck     | Horn Antenna           | BBHA9120D294  | July 03, 2006(2Y) |
| ■ - YSE 500B     | YoungShin Eng.  | Frequency Converter    | 950413001     | N/A               |
| ■ - ETCR-10      | DaeHa           | Automatic Voltage Com. | N/A           | N/A               |

All test equipment used is calibrated on a regular basis.

## 9.5. Test data for conducted emission



Low Channel



High Channel

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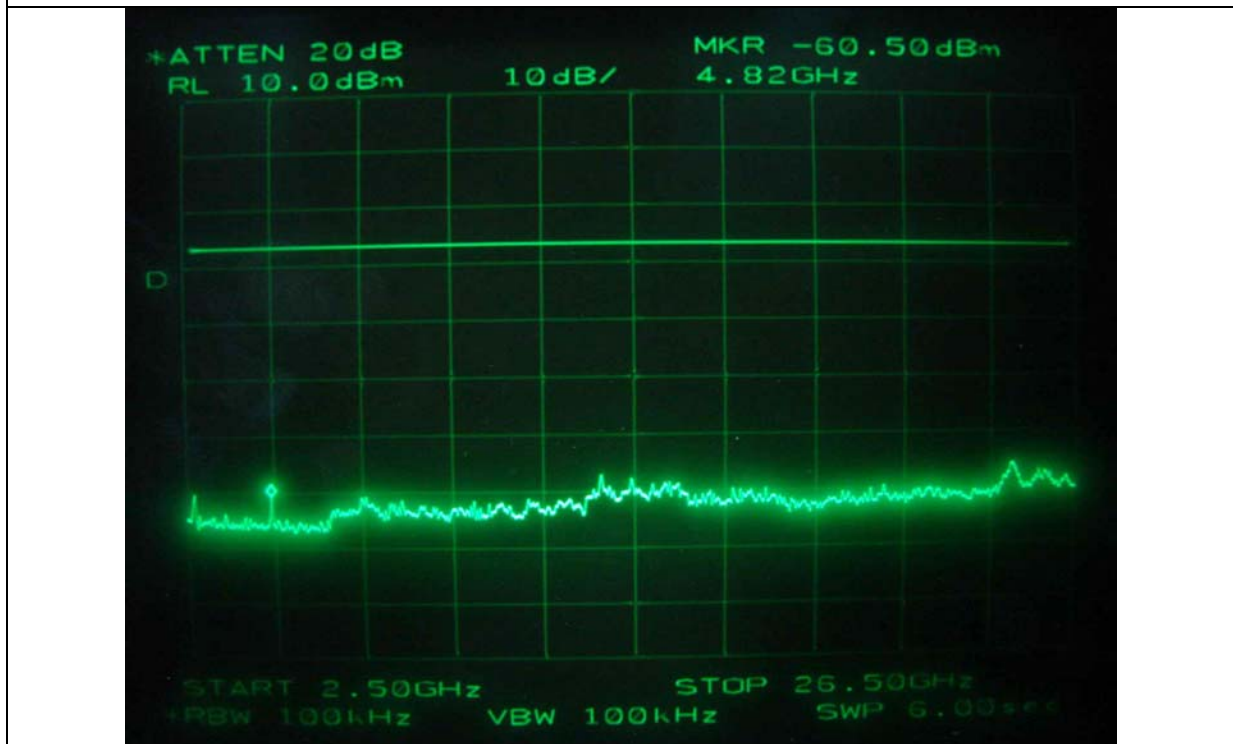
EMC-003 (Rev.0)

**HEAD OFFICE** : #505 SK APT. Factory 223-28, Sangdaewon 1 dong, Jungwon-gu, Seongnam-si, Gyeonggi-do, 462-705, Korea  
(TEL: +82-31-746-8500, FAX: +82-31-746-8700)

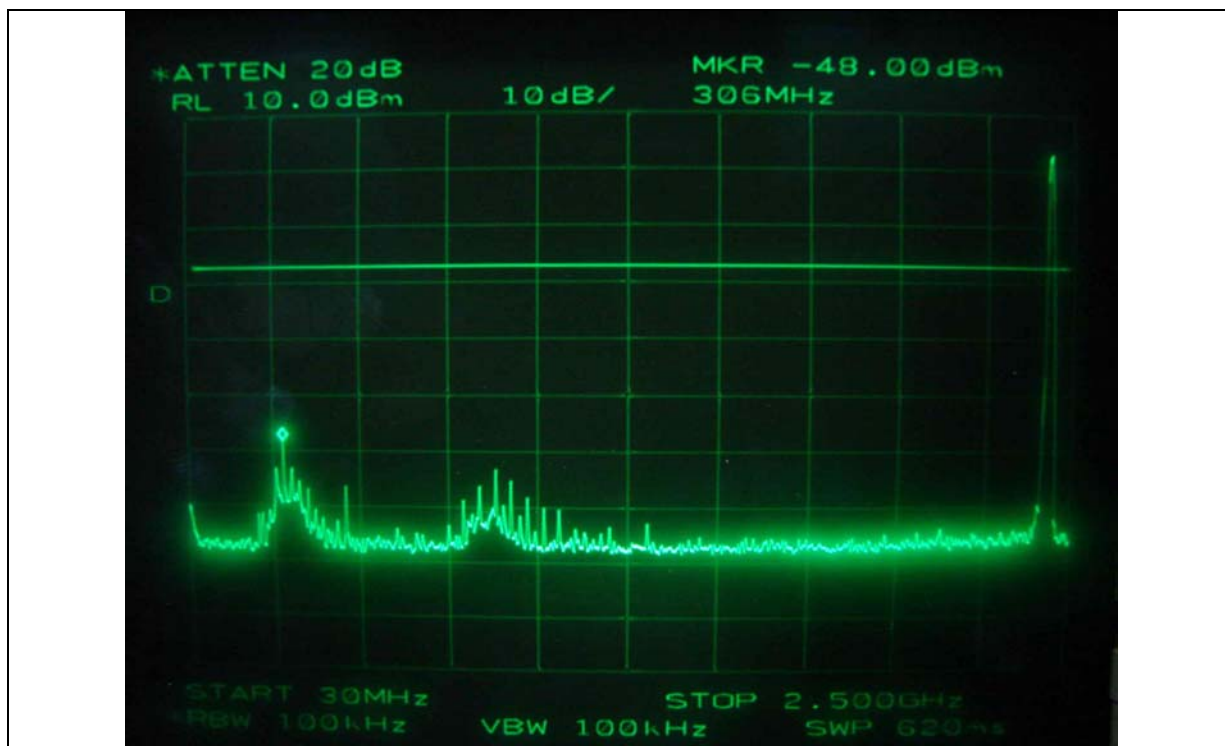
**EMC Testing Dept** : 307-51 Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-860, Korea. (TEL: +82-31-765-8289, FAX: +82-31-766-2904)



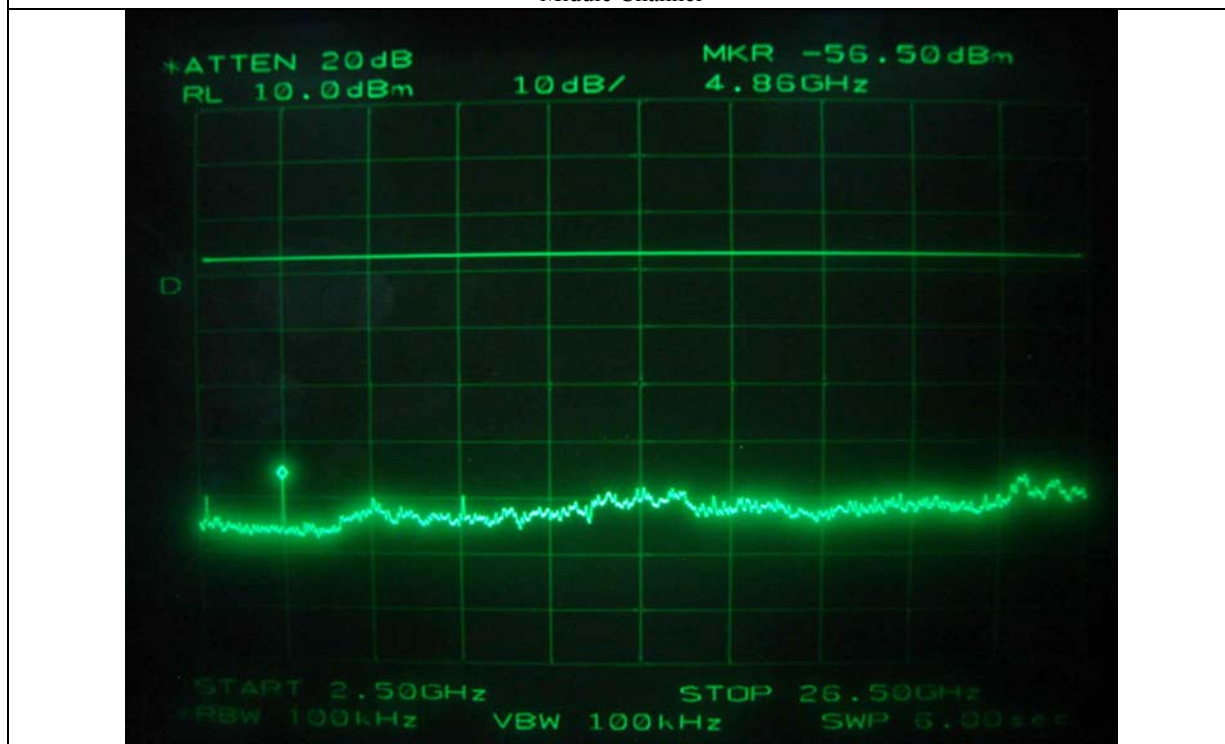
Low Channel



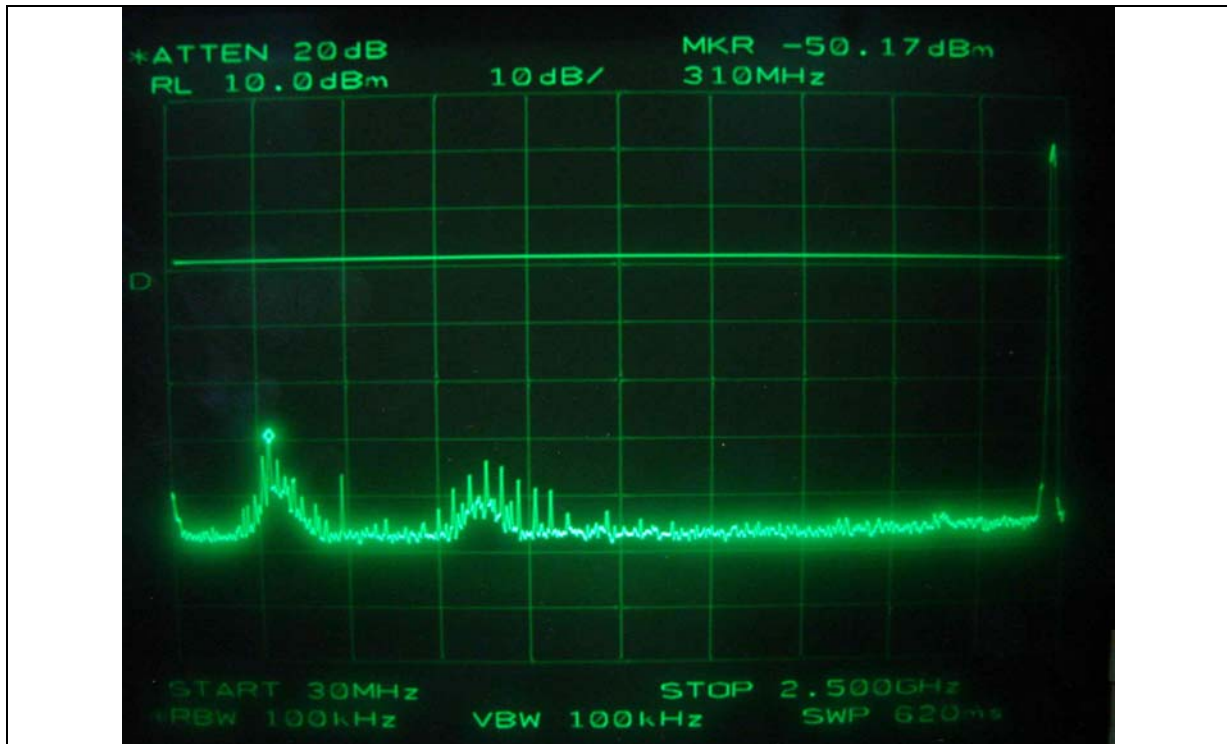
Low Channel



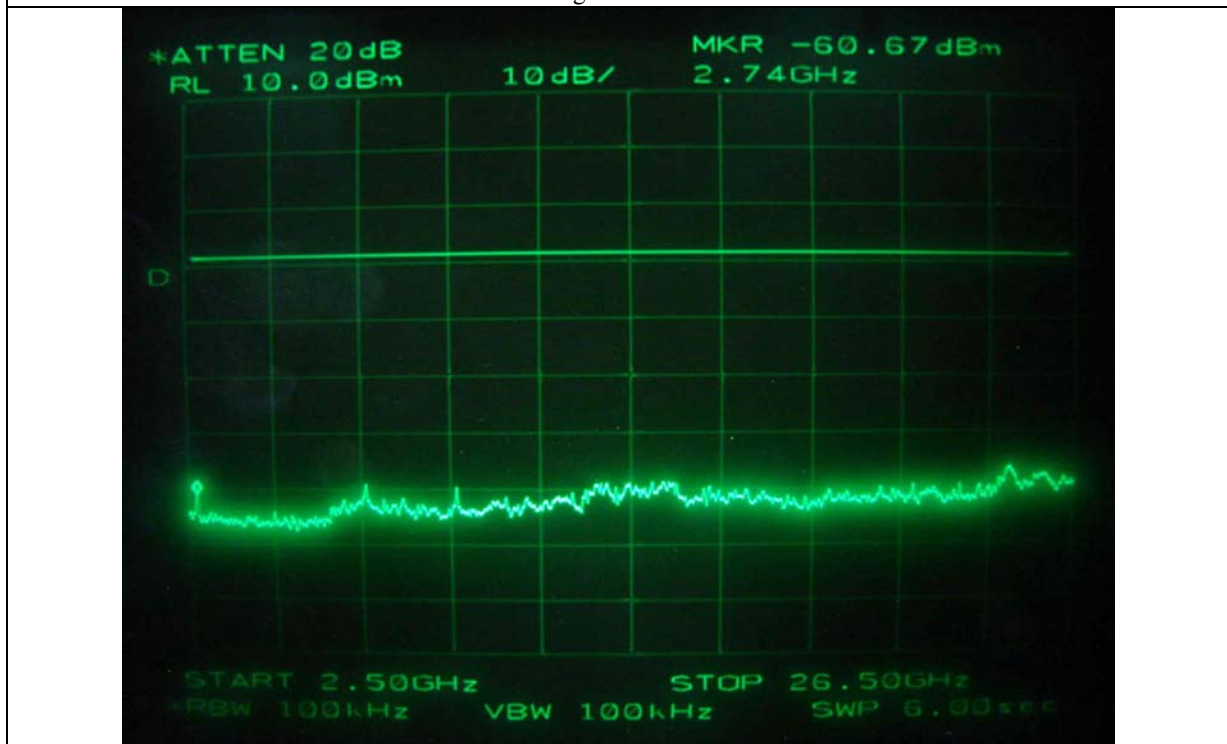
Middle Channel



Middle Channel



High Channel



High Channel

## 9.6. Test data for radiated emission

### 9.6.1 Radiated Emission which fall in the Restricted Band

- Test Date : July 09, 2007
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10Hz for Average Mode
- Frequency range : 1 GHz ~ 25GHz
- Measurement distance : 3m
- Operating Condition : Low / High Channel
- Result : PASSED BY -20.46 dB at Low Channel (11 Mbps)

| Frequency<br>(MHz)                   | Reading<br>(dBuV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | Amp<br>Gain | Dist.<br>Factor | Total<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) |
|--------------------------------------|-------------------|------------------|--------------------|----------------|---------------|-------------|-----------------|-------------------|--------------------|----------------|
| Test Data for Low Channel (1 Mbps)   |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2389.60                              | 36.00             | Peak             | H                  | 27.64          | 3.83          | 26.1        |                 | 41.37             | 74.00              | -32.63         |
|                                      | 24.33             | Average          | H                  |                |               |             |                 | 29.70             | 54.00              | -24.30         |
|                                      | 48.00             | Peak             | V                  |                |               |             |                 | 53.37             | 74.00              | -20.63         |
|                                      | 27.33             | Average          | V                  |                |               |             |                 | 32.70             | 54.00              | -21.30         |
| Test Data for Low Channel (2 Mbps)   |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2389.60                              | 36.10             | Peak             | H                  | 27.64          | 3.83          | 26.1        |                 | 41.47             | 74.00              | -32.53         |
|                                      | 24.50             | Average          | H                  |                |               |             |                 | 29.87             | 54.00              | -24.13         |
|                                      | 48.00             | Peak             | V                  |                |               |             |                 | 53.37             | 74.00              | -20.63         |
|                                      | 27.50             | Average          | V                  |                |               |             |                 | 32.87             | 54.00              | -21.13         |
| Test Data for Low Channel (5.5 Mbps) |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2389.60                              | 36.17             | Peak             | H                  | 27.64          | 3.83          | 26.1        |                 | 41.54             | 74.00              | -32.46         |
|                                      | 24.50             | Average          | H                  |                |               |             |                 | 29.87             | 54.00              | -24.13         |
|                                      | 48.10             | Peak             | V                  |                |               |             |                 | 53.47             | 74.00              | -20.53         |
|                                      | 27.67             | Average          | V                  |                |               |             |                 | 33.04             | 54.00              | -20.96         |
| Test Data for Low Channel (11 Mbps)  |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2389.60                              | 36.33             | Peak             | H                  | 27.64          | 3.83          | 26.1        |                 | 41.70             | 74.00              | -32.30         |
|                                      | 24.67             | Average          | H                  |                |               |             |                 | 30.04             | 54.00              | -23.96         |
|                                      | 48.17             | Peak             | V                  |                |               |             |                 | 53.54             | 74.00              | -20.46         |
|                                      | 27.83             | Average          | V                  |                |               |             |                 | 33.20             | 54.00              | -20.80         |

Tabulated test data for Restricted Band

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

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EMC-003 (Rev.0)

**HEAD OFFICE** : #505 SK APT. Factory 223-28, Sangdaewon 1 dong, Jungwon-gu, Seongnam-si, Gyeonggi-do, 462-705, Korea  
(TEL: +82-31-746-8500, FAX: +82-31-746-8700)

**EMC Testing Dept** : 307-51 Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-860, Korea. (TEL: +82-31-765-8289, FAX: +82-31-766-2904)

-Continued

| Frequency<br>(MHz)                    | Reading<br>(dBuV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | Amp<br>Gain | Dist.<br>Factor | Total<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) |
|---------------------------------------|-------------------|------------------|--------------------|----------------|---------------|-------------|-----------------|-------------------|--------------------|----------------|
| Test Data for High Channel (1 Mbps)   |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2483.64                               | 34.92             | Peak             | H                  | 27.59          | 3.83          | 26.1        |                 | 40.24             | 74.00              | -33.77         |
|                                       | 23.10             | Average          | H                  |                |               |             |                 | 28.42             | 54.00              | -25.59         |
|                                       | 43.50             | Peak             | V                  |                |               |             |                 | 48.82             | 74.00              | -25.19         |
|                                       | 26.25             | Average          | V                  |                |               |             |                 | 31.57             | 54.00              | -22.44         |
| Test Data for High Channel (2 Mbps)   |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2483.64                               | 35.00             | Peak             | H                  | 27.59          | 3.83          | 26.1        |                 | 40.32             | 74.00              | -33.69         |
|                                       | 23.17             | Average          | H                  |                |               |             |                 | 28.49             | 54.00              | -25.52         |
|                                       | 43.67             | Peak             | V                  |                |               |             |                 | 48.99             | 74.00              | -25.02         |
|                                       | 26.33             | Average          | V                  |                |               |             |                 | 31.65             | 54.00              | -22.36         |
| Test Data for High Channel (5.5 Mbps) |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2483.64                               | 35.17             | Peak             | H                  | 27.59          | 3.83          | 26.1        |                 | 40.49             | 74.00              | -33.52         |
|                                       | 23.33             | Average          | H                  |                |               |             |                 | 28.65             | 54.00              | -25.36         |
|                                       | 43.67             | Peak             | V                  |                |               |             |                 | 48.99             | 74.00              | -25.02         |
|                                       | 26.50             | Average          | V                  |                |               |             |                 | 31.82             | 54.00              | -22.19         |
| Test Data for High Channel (11 Mbps)  |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2483.64                               | 35.17             | Peak             | H                  | 27.59          | 3.83          | 26.1        |                 | 40.49             | 74.00              | -33.52         |
|                                       | 23.50             | Average          | H                  |                |               |             |                 | 28.82             | 54.00              | -25.19         |
|                                       | 43.83             | Peak             | V                  |                |               |             |                 | 49.15             | 74.00              | -24.86         |
|                                       | 26.83             | Average          | V                  |                |               |             |                 | 32.15             | 54.00              | -21.86         |

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Tested by: Ki-Hong, Nam / Test Engineer

### 9.6.2 Spurious & Harmonic Radiated Emission

- Test Date : July 09, 2007
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10Hz for Average Mode
- Frequency range : 1 GHz ~ 25 GHz
- Measurement distance : 3m
- Result : PASSED BY -22.80 dB at Low Channel

| Frequency<br>(MHz)                   | Reading<br>(dBuV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | Amp<br>Gain | Dist.<br>Factor | Total<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) |
|--------------------------------------|-------------------|------------------|--------------------|----------------|---------------|-------------|-----------------|-------------------|--------------------|----------------|
| Test Data for Low Channel (1 Mbps)   |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2412.00                              | 69.00             | Peak             | H                  | 27.33          | 3.83          |             |                 | 100.16            | -                  |                |
|                                      | 81.33             | Peak             | V                  |                |               |             |                 | 112.49            | -                  |                |
| 4824.00                              | 33.50             | Peak             | H                  | 31.30          | 6.55          | 26.10       |                 | 45.25             | 74.00              | -28.75         |
|                                      | 23.67             | Average          | H                  |                |               |             |                 | 35.42             | 54.00              | -18.58         |
|                                      | 32.17             | Peak             | V                  |                |               |             |                 | 43.92             | 74.00              | -30.08         |
|                                      | 23.10             | Average          | V                  |                |               |             |                 | 34.85             | 54.00              | -19.15         |
| Test Data for Low Channel (5.5 Mbps) |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2412.00                              | 69.10             | Peak             | H                  | 27.33          | 3.83          |             |                 | 100.26            | -                  |                |
|                                      | 81.67             | Peak             | V                  |                |               |             |                 | 112.83            | -                  |                |
| 4824.00                              | 33.50             | Peak             | H                  | 31.30          | 6.55          | 26.10       |                 | 45.25             | 74.00              | -28.75         |
|                                      | 23.83             | Average          | H                  |                |               |             |                 | 35.58             | 54.00              | -18.42         |
|                                      | 32.17             | Peak             | V                  |                |               |             |                 | 43.92             | 74.00              | -30.08         |
|                                      | 23.17             | Average          | V                  |                |               |             |                 | 34.92             | 54.00              | -19.08         |
| Test Data for Low Channel (11 Mbps)  |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2412.00                              | 69.17             | Peak             | H                  | 27.33          | 3.83          |             |                 | 100.33            | -                  |                |
|                                      | 81.83             | Peak             | V                  |                |               |             |                 | 112.99            | -                  |                |
| 4824.00                              | 33.67             | Peak             | H                  | 31.30          | 6.55          | 26.10       |                 | 45.42             | 74.00              | -28.58         |
|                                      | 23.83             | Average          | H                  |                |               |             |                 | 35.58             | 54.00              | -18.42         |
|                                      | 32.33             | Peak             | V                  |                |               |             |                 | 44.08             | 74.00              | -29.92         |
|                                      | 23.17             | Average          | V                  |                |               |             |                 | 34.92             | 54.00              | -19.08         |

Tabulated test data for Restricted Band

| Frequency<br>(MHz)                      | Reading<br>(dBuV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | Amp<br>Gain | Dist.<br>Factor | Total<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) |
|-----------------------------------------|-------------------|------------------|--------------------|----------------|---------------|-------------|-----------------|-------------------|--------------------|----------------|
| Test Data for Middle Channel (1 Mbps)   |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2437.00                                 | 69.33             | Peak             | H                  | 27.40          | 3.83          |             |                 | 100.56            | -                  |                |
|                                         | 82.10             | Peak             | V                  |                |               |             |                 | 113.33            | -                  |                |
| 4874.00                                 | 33.67             | Peak             | H                  | 31.37          | 6.55          | 26.10       |                 | 45.53             | 74.00              | -28.47         |
|                                         | 23.33             | Average          | H                  |                |               |             |                 | 35.19             | 54.00              | -18.81         |
|                                         | 32.67             | Peak             | V                  |                |               |             |                 | 44.53             | 74.00              | -29.47         |
|                                         | 23.00             | Average          | V                  |                |               |             |                 | 34.86             | 54.00              | -19.14         |
| Test Data for Middle Channel (5.5 Mbps) |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2437.00                                 | 69.97             | Peak             | H                  | 27.40          | 3.83          |             |                 | 100.90            | -                  |                |
|                                         | 82.33             | Peak             | V                  |                |               |             |                 | 113.56            | -                  |                |
| 4874.00                                 | 33.67             | Peak             | H                  | 31.37          | 6.55          | 26.10       |                 | 45.53             | 74.00              | -28.47         |
|                                         | 23.33             | Average          | H                  |                |               |             |                 | 35.19             | 54.00              | -18.81         |
|                                         | 32.50             | Peak             | V                  |                |               |             |                 | 44.36             | 74.00              | -29.64         |
|                                         | 23.00             | Average          | V                  |                |               |             |                 | 34.86             | 54.00              | -19.14         |
| Test Data for Middle Channel (11 Mbps)  |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2437.00                                 | 69.83             | Peak             | H                  | 27.40          | 3.83          |             |                 | 101.06            | -                  |                |
|                                         | 82.50             | Peak             | V                  |                |               |             |                 | 113.73            | -                  |                |
| 4874.00                                 | 33.83             | Peak             | H                  | 31.37          | 6.55          | 26.10       |                 | 45.69             | 74.00              | -28.31         |
|                                         | 23.50             | Average          | H                  |                |               |             |                 | 35.36             | 54.00              | -18.64         |
|                                         | 32.83             | Peak             | V                  |                |               |             |                 | 44.69             | 74.00              | -29.31         |
|                                         | 23.33             | Average          | V                  |                |               |             |                 | 35.19             | 54.00              | -18.81         |

Tabulated test data for Restricted Band

| Frequency<br>(MHz)                    | Reading<br>(dBuV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | Amp<br>Gain | Dist.<br>Factor | Total<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) |
|---------------------------------------|-------------------|------------------|--------------------|----------------|---------------|-------------|-----------------|-------------------|--------------------|----------------|
| Test Data for High Channel (1 Mbps)   |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2462.00                               | 69.00             | Peak             | H                  | 27.48          | 3.83          |             |                 | 100.31            | -                  |                |
|                                       | 81.00             | Peak             | V                  |                |               |             |                 | 112.31            | -                  |                |
| 4924.00                               | 33.17             | Peak             | H                  | 31.44          | 6.62          | 26.10       |                 | 45.13             | 74.00              | -28.87         |
|                                       | 22.67             | Average          | H                  |                |               |             |                 | 34.63             | 54.00              | -19.37         |
|                                       | 32.83             | Peak             | V                  |                |               |             |                 | 44.79             | 74.00              | -29.21         |
|                                       | 22.50             | Average          | V                  |                |               |             |                 | 34.46             | 54.00              | -19.54         |
| Test Data for High Channel (5.5 Mbps) |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2462.00                               | 69.17             | Peak             | H                  | 27.48          | 3.83          |             |                 | 100.48            | -                  |                |
|                                       | 81.33             | Peak             | V                  |                |               |             |                 | 112.64            | -                  |                |
| 4924.00                               | 33.00             | Peak             | H                  | 31.44          | 6.62          | 26.10       |                 | 44.96             | 74.00              | -29.04         |
|                                       | 22.83             | Average          | H                  |                |               |             |                 | 34.79             | 54.00              | -19.21         |
|                                       | 32.83             | Peak             | V                  |                |               |             |                 | 44.79             | 74.00              | -29.21         |
|                                       | 22.50             | Average          | V                  |                |               |             |                 | 34.46             | 54.00              | -19.54         |
| Test Data for High Channel (11 Mbps)  |                   |                  |                    |                |               |             |                 |                   |                    |                |
| 2462.00                               | 69.33             | Peak             | H                  | 27.48          | 3.83          |             |                 | 100.64            | -                  |                |
|                                       | 81.50             | Peak             | V                  |                |               |             |                 | 112.81            | -                  |                |
| 4924.00                               | 33.33             | Peak             | H                  | 31.44          | 6.62          | 26.10       |                 | 45.29             | 74.00              | -28.71         |
|                                       | 22.83             | Average          | H                  |                |               |             |                 | 34.79             | 54.00              | -19.21         |
|                                       | 33.00             | Peak             | V                  |                |               |             |                 | 44.96             | 74.00              | -29.04         |
|                                       | 22.67             | Average          | V                  |                |               |             |                 | 34.63             | 54.00              | -19.37         |

Tabulated test data for Restricted Band

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

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Tested by: Ki-Hong, Nam / Test Engineer

## 10. PEAK POWER SPECTRUL DENSITY

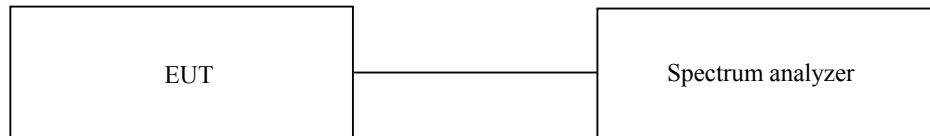
### 10.1 Operating environment

Temperature : 23 °C  
Relative humidity : 36 %

### 10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 3 kHz, the video bandwidth is set to 3 times the resolution bandwidth, and sweep time was set to span / 3 kHz. The sweep time was allowed to be longer than span / 3 kHz for a full response of the mixer in the spectrum analyzer.

The maximum level from the EUT in a 3 kHz bandwidth was measured with above condition.



### 10.3 Test equipment used

| Model Number | Manufacturer | Description       | Serial Number | Last Cal.     |
|--------------|--------------|-------------------|---------------|---------------|
| ■ - 8564E    | HP           | Spectrum Analyzer | 3650A00756    | June 19, 2007 |

All test equipment used is calibrated on a regular basis.

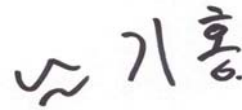
**10.4 Test data**

-. Test Date : June 28, 2007

-. Test Result : Pass

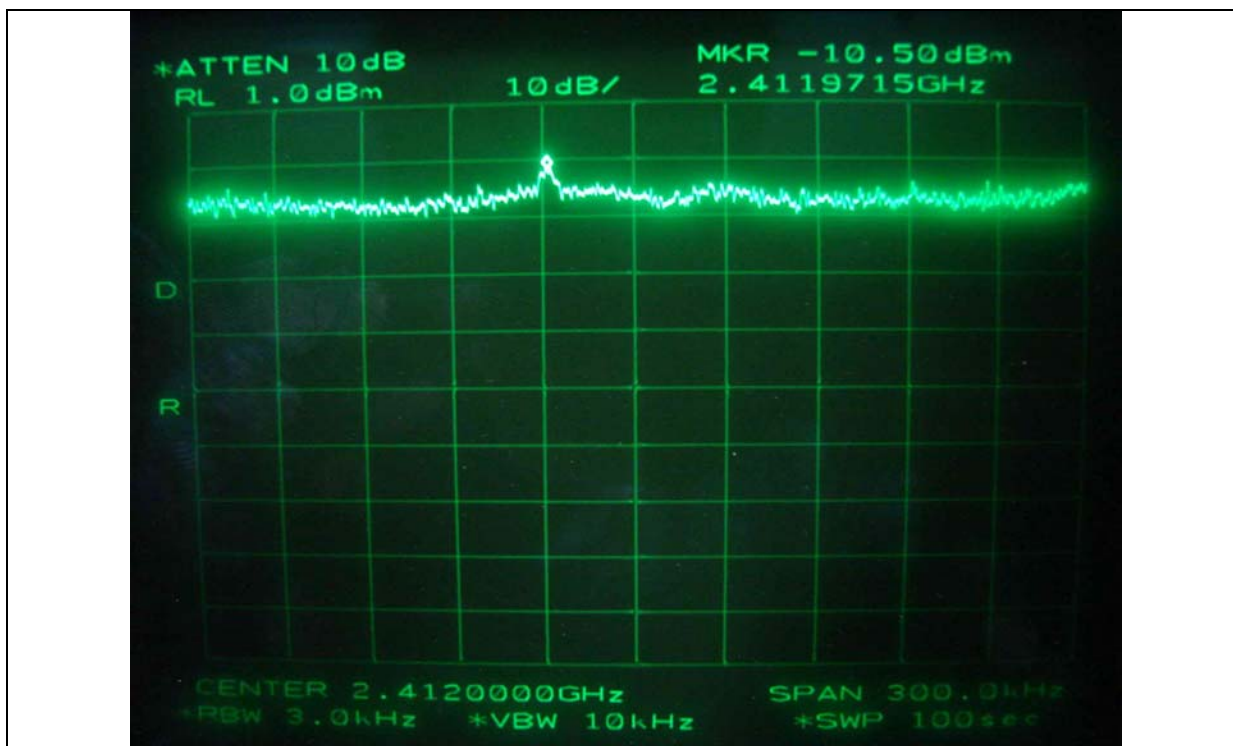
| CHANNEL | FREQUENCY(MHz) | MEASURED VLAUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---------|----------------|----------------------|-------------|-------------|
| Low     | 2412           | -10.50               | 8.00        | -18.50      |
| Middle  | 2437           | -11.17               | 8.00        | -19.17      |
| High    | 2462           | -11.00               | 8.00        | -19.00      |

Remark: See next page for measurement data.

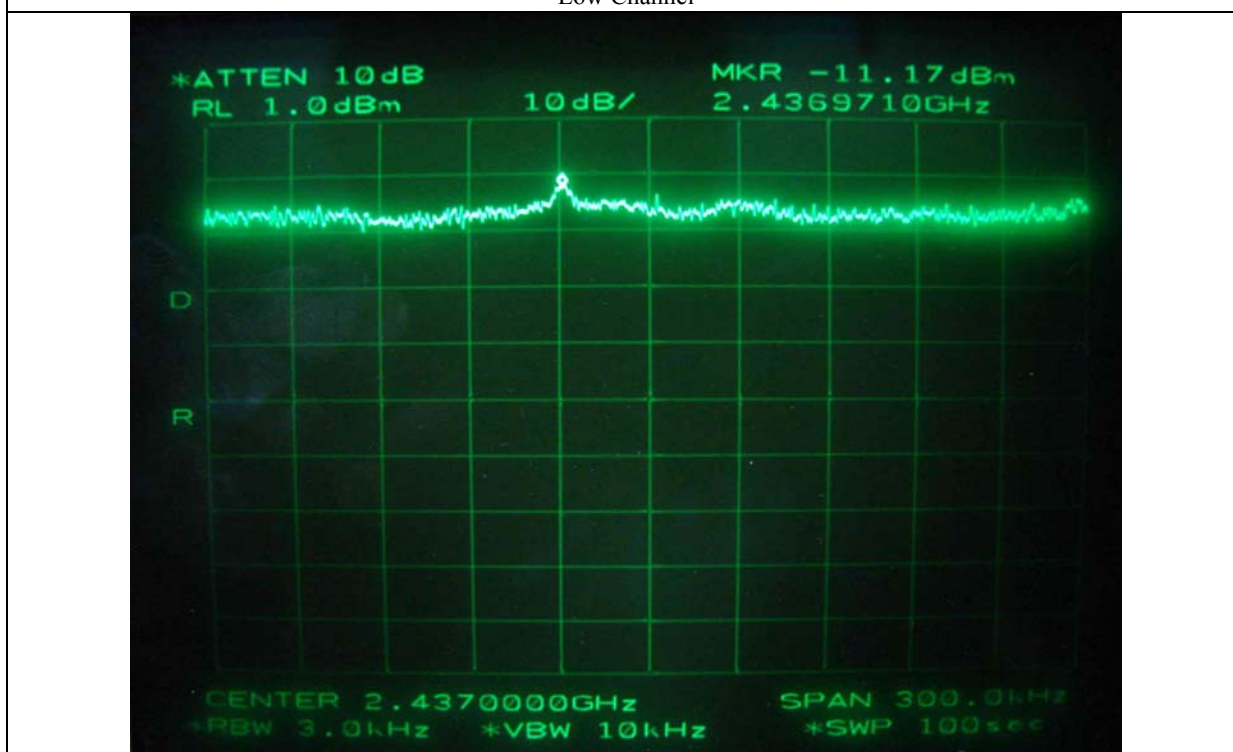


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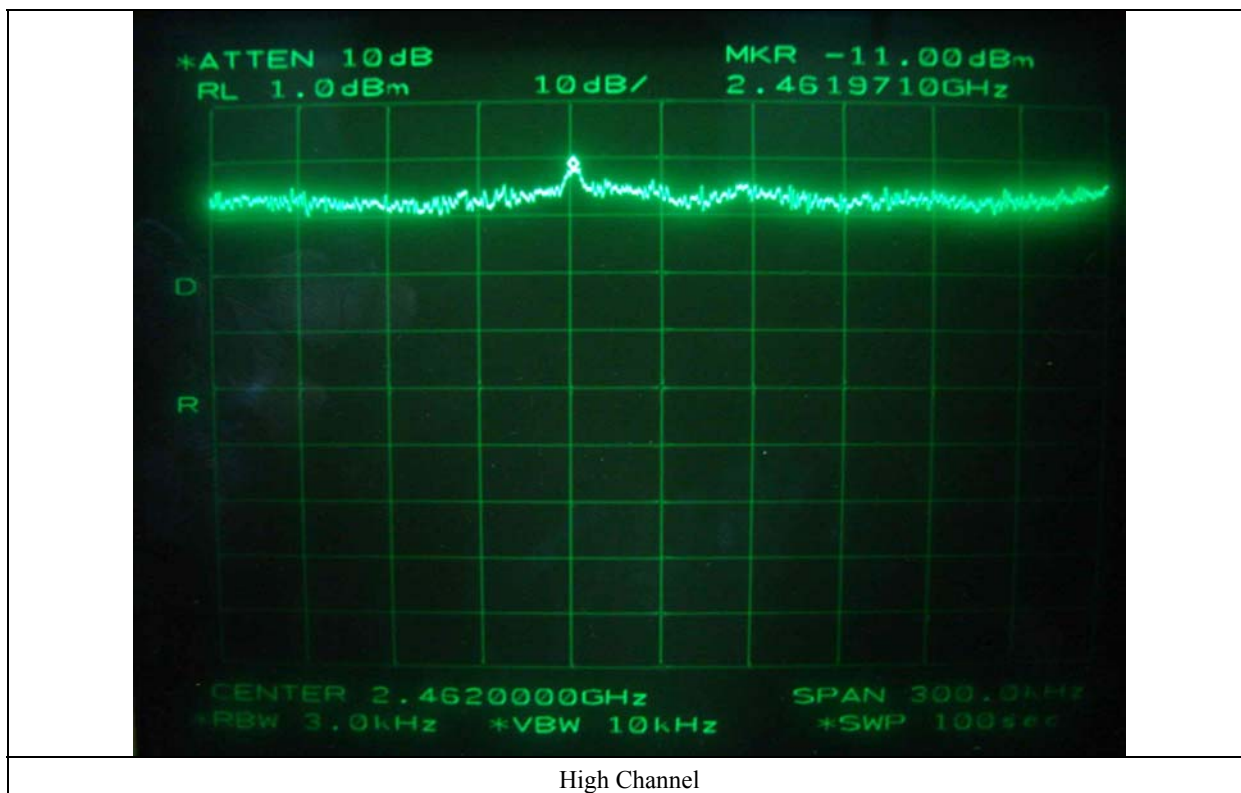
Tested by: Ki-Hong, Nam / Test Engineer



Low Channel



Middle Channel



## 11. MAXIMUM PERMISSIBLE EXPOSURE

### 11.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment is 1mW/cm<sup>2</sup>.

The electric field generated for a 1mW/cm<sup>2</sup> exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 3770, \text{ because } 1\text{mW} / \text{cm}^2 = 10\text{W} / \text{m}^2$$

Where

S = Power density in mW/cm<sup>2</sup>, Z = Impedance of free space, 377Ω

E = Electric field strength in Volts/m, G = Numeric antenna gain, and d = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (3770 * S)}$$

Changing to units of mW and cm, using P (mW) = P (W) / 1000, d (cm) = 100 \* d (m)

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm<sup>2</sup>

### 9.2 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

| Peak Output Power |        | Antenna Gain |        | Calculated RF Exposure<br>Separation Distance (cm) |
|-------------------|--------|--------------|--------|----------------------------------------------------|
| (dBm)             | (mW)   | Log          | Linear |                                                    |
| 20.3              | 107.15 | 7            | 5.01   | 6.53                                               |
|                   |        | 9            | 7.94   | 8.23                                               |
|                   |        | 14           | 25.12  | 14.63                                              |

According to above table, separation distance,  $D = 0.282 * \sqrt{107.15 * 25.12} = 14.63 \text{ cm}$ .

Following Caution on the manual will be described.

“CAUTION: Exposure to Radio Frequency Radiation.

Antenna shall be mounted in such a manner to minimize the potential for human contact during normal operation. The antenna should not be contacted during operation to avoid the possibility of exceeding the FCC radio frequency exposure limit.”

## 12. RADIATED EMISSION TEST FOR DIGITAL DEVICE PART

### 12.1 Operating environment

Temperature : 23 °C

Relative humidity : 33 %

### 12.2 Test set-up

The radiated emissions measurements were on the 3 meters, 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 30MHz to 1000MHz 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 and 4.0 meters in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

The test set-up photos are included in appendix VI.

### 12.3 Test equipment used

| Model Number    | Manufacturer    | Description          | Serial Number | Last Cal.     |
|-----------------|-----------------|----------------------|---------------|---------------|
| ■ - ESVS10      | Rohde & Schwarz | EMI Test Receiver    | 827864/005    | Dec. 21, 2006 |
| ■ - 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           |
| ■ - VHA9103     | Schwarzbeck     | Biconical Antenna    | 91031852      | Feb. 08, 2007 |
| ■ - 9108-A(494) | Schwarzbeck     | Log Periodic Antenna | 62281001      | Feb. 08, 2007 |

All test equipment used is calibrated on a regular basis.

**12.4 Test data**

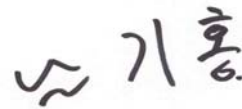
- Test Date : July 04, 2007
- Resolution bandwidth : 120 kHz
- Frequency range : 30MHz ~ 1000MHz
- Measurement distance : 3m
- Test result : Passed by -4.51 dB at 360.80 MHz at Middle Channel

| Frequency<br>(MHz)                  | Reading<br>(dBuV) | Ant. Pol.<br>(H/V) | Ant. Factor<br>(dB/m) | Cable<br>Loss | Emission<br>Level(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) |
|-------------------------------------|-------------------|--------------------|-----------------------|---------------|---------------------------|--------------------|----------------|
| <b>Test Data for Low Channel</b>    |                   |                    |                       |               |                           |                    |                |
| 61.65                               | 20.50             | V                  | 7.21                  | 1.80          | 29.51                     | 40.00              | -10.49         |
| 108.35                              | 18.60             | H                  | 11.45                 | 2.48          | 32.53                     | 43.52              | -10.99         |
| 113.28                              | 15.80             | V                  | 12.10                 | 2.57          | 30.47                     | 43.52              | -13.05         |
| 264.20                              | 14.10             | H                  | 17.84                 | 3.70          | 35.64                     | 46.02              | -10.38         |
| 360.80                              | 20.40             | H                  | 16.38                 | 4.46          | 41.24                     | 46.02              | -4.78          |
| 429.33                              | 16.90             | H                  | 18.38                 | 4.82          | 40.10                     | 46.02              | -5.92          |
| <b>Test Data for Middle Channel</b> |                   |                    |                       |               |                           |                    |                |
| 61.65                               | 20.22             | V                  | 7.21                  | 1.80          | 29.23                     | 40.00              | -10.77         |
| 108.35                              | 18.50             | H                  | 11.45                 | 2.48          | 32.43                     | 43.52              | -11.09         |
| 113.28                              | 15.67             | V                  | 12.10                 | 2.57          | 30.34                     | 43.52              | -13.18         |
| 264.20                              | 14.33             | H                  | 17.84                 | 3.70          | 35.87                     | 46.02              | -10.15         |
| 360.80                              | 20.67             | H                  | 16.38                 | 4.46          | 41.51                     | 46.02              | -4.51          |
| 429.33                              | 17.00             | H                  | 18.38                 | 4.82          | 40.20                     | 46.02              | -5.82          |

| Test Data for High Channel |       |   |       |      |       |       |        |
|----------------------------|-------|---|-------|------|-------|-------|--------|
| 61.65                      | 20.67 | V | 7.21  | 1.80 | 29.68 | 40.00 | -10.32 |
| 108.35                     | 18.50 | H | 11.45 | 2.48 | 32.43 | 43.52 | -11.09 |
| 113.28                     | 15.67 | V | 12.10 | 2.57 | 30.34 | 43.52 | -13.18 |
| 264.20                     | 14.00 | H | 17.84 | 3.70 | 35.54 | 46.02 | -10.48 |
| 360.80                     | 20.50 | H | 16.38 | 4.46 | 41.34 | 46.02 | -4.68  |
| 429.33                     | 17.00 | H | 18.38 | 4.82 | 40.20 | 46.02 | -5.82  |

Tabulated test data for Radiated Electromagnetic Field

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



Tested by: Ki-Hong, Nam / Test Engineer