

# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR FCC CERTIFICATION

**Test Report No.** : E075R-001

**AGR No.** : A072A-038

**Applicant** : 2MTECH Inc.

**Address** : 7th Block, 1st Lot, Naksan-ri, Waegwan-eup, Chilgok-gun, Gyeongsangbuk-do,  
718-801, Korea

**Manufacturer** : 2MTECH Inc.

**Address** : 7th Block, 1st Lot, Naksan-ri, Waegwan-eup, Chilgok-gun, Gyeongsangbuk-do,  
718-801, Korea

**Type of Equipment** : T-DMB(DAB) Navigation System (FM Transmitter)

**FCC ID.** : UJO-ZAMM-TM110

**Model Name** : ZAMM-TM110

**Serial number** : N/A

**Total page of Report** : 17 pages (including this page)


**Date of Incoming** : April 03, 2007


**Date of Issuing** : May 01, 2007

## SUMMARY

The equipment complies with the regulation of *FCC CRF 47 PART 15, SUBPART C, SECTION 15.239*.

This test report contains only the results of a single test of the sample supplied for the examination. It is not a general valid assessment of the features of the respective products of the mass-production.

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

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

## ***CONTENTS***

Page

|                                                                                 |           |
|---------------------------------------------------------------------------------|-----------|
| <b>1. VERIFICATION OF COMPLIANCE .....</b>                                      | <b>3</b>  |
| <b>2. GENERAL INFORMATION.....</b>                                              | <b>4</b>  |
| <b>2.1 PRODUCT DESCRIPTION.....</b>                                             | <b>4</b>  |
| <b>2.2 MODEL DIFFERENCES.....</b>                                               | <b>4</b>  |
| <b>2.3 RELATED SUBMITTAL(S) / GRANT(S).....</b>                                 | <b>4</b>  |
| <b>2.4 TEST SYSTEM DETAILS .....</b>                                            | <b>4</b>  |
| <b>2.5 TEST METHODOLOGY .....</b>                                               | <b>5</b>  |
| <b>2.6 TEST FACILITY .....</b>                                                  | <b>5</b>  |
| <b>3. SYSTEM TEST CONFIGURATION.....</b>                                        | <b>6</b>  |
| <b>3.1 JUSTIFICATION.....</b>                                                   | <b>6</b>  |
| <b>3.2 EUT EXERCISE SOFTWARE .....</b>                                          | <b>6</b>  |
| <b>3.3 CABLE DESCRIPTION .....</b>                                              | <b>6</b>  |
| <b>3.4 EQUIPMENT MODIFICATIONS .....</b>                                        | <b>7</b>  |
| <b>3.5 CONFIGURATION OF TEST SYSTEM .....</b>                                   | <b>7</b>  |
| <b>3.6 ANTENNA REQUIREMENT .....</b>                                            | <b>7</b>  |
| <b>4. PRELIMINARY TEST .....</b>                                                | <b>8</b>  |
| <b>4.1 AC POWER LINE CONDUCTED EMISSION TEST .....</b>                          | <b>8</b>  |
| <b>4.2 RADIATED EMISSION TEST .....</b>                                         | <b>8</b>  |
| <b>5. FINAL RESULT OF MEASUREMENT .....</b>                                     | <b>9</b>  |
| <b>5.1 RADIATED EMISSION TEST (WITHIN THE PERMITTED 200 KHZ BAND).....</b>      | <b>9</b>  |
| <b>5.2 RADIATED EMISSION TEST (OUTSIDE OF THE SPECIFIED 200 KHZ BAND) .....</b> | <b>10</b> |
| <b>5.3 BANDWIDTH OF THE OPERATING FREQUENCY .....</b>                           | <b>11</b> |
| <b>5.4 TUNING RANGE OF THE OPERATING FREQUENCY .....</b>                        | <b>14</b> |
| <b>6. FIELD STRENGTH CALCULATION .....</b>                                      | <b>16</b> |
| <b>7. LIST OF TEST EQUIPMENT .....</b>                                          | <b>17</b> |

**1. VERIFICATION OF COMPLIANCE**

-. APPLICANT : 2MTECH Inc.  
-. ADDRESS : 7th Block, 1st Lot, Naksan-ri, Waegwan-eup, Chilgok-gun, Gyeongsangbuk-do, 718-801, Korea  
-. CONTACT PERSON : Mr. Chul-Gu, Jung / Assistant Manager  
-. TELEPHONE NO : +82-54-977-2500  
-. BRAND NAME : ZAMM  
-. FCC ID : UJO-ZAMM-TM110  
-. MODEL NAME : ZAMM-TM110  
-. SERIAL NUMBER : N/A  
-. DATE : May 01, 2007

|                                                         |                                               |
|---------------------------------------------------------|-----------------------------------------------|
| DEVICE TYPE                                             | Low Power Communication Device Transmitter    |
| E.U.T. DESCRIPTION                                      | T-DMB(DAB) Navigation System (FM Transmitter) |
| THIS REPORT CONCERNS                                    | ORIGINAL GRANT                                |
| MEASUREMENT PROCEDURES                                  | Charter 7 and 13 of 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 SECTION 15.239                    |
| MODIFICATIONS ON THE EQUIPMENT<br>TO ACHIEVE COMPLIANCE | Yes                                           |
| FINAL TEST WAS CONDUCTED ON                             | 3 METER 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. GENERAL INFORMATION

### 2.1 Product Description

The 2MTECH Inc., Model ZAMM-TM110 (referred to as the EUT in this report) is a T-DMB(DAB) Navigation System that has the FM transmitter from 88.5 MHz to 107.5 MHz for audio signal of FM radio receiver. This test report only covers for FM transmitting mode. The PC peripheral device mode will be issued by Declaration of Conformity report. Product specification described herein was obtained from product data sheet or user's manual.

|                                                 |                                                                                                                                                                                      |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CHASSIS TYPE                                    | Plastic                                                                                                                                                                              |
| LIST OF EACH OSC. OR<br>CRY. FREQ.(FREQ.>=1MHz) | 7.3728 MHz on CPU Board<br>24.576 MHz on Video Input Processor, Audio Codec Chip and DMB RF Chip<br>24.276 MHz and 27 MHz on DMB Baseband Chip<br>12 MHz on IR Receiver Control Chip |
| POWER REQUIREMENT                               | DC 12V, 1.5A from a car battery                                                                                                                                                      |
| TX FREQUENCY RANGE                              | 88.5 MHz ~ 107.5 MHz (range into 200 kHz Step)                                                                                                                                       |
| NUMBER OF LAYERS                                | 8 Layers                                                                                                                                                                             |
| EXTERNAL CONNECTOR                              | Video/Audio In (2EA) , EAR, USB, DMB ANT., DC In, SD Card                                                                                                                            |

### 2.2 Model Differences

-. None

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

-. Original submittal only

### 2.4 Test System Details

The model numbers for all the equipments which were used in the tested system is:

| Model      | Manufacturer     | FCC ID         | Description                        | Connected to |
|------------|------------------|----------------|------------------------------------|--------------|
| ZAMM-TM110 | 2MTECH Inc.      | UJO-ZAMM-TM110 | T-DMB(DAB) Navigation System (EUT) | -            |
| DVD2000    | Taeyoung Telstar | N/A            | DVD Player                         | EUT          |
| N/A        | Ga-on Int.       | N/A            | Memory Stick                       | EUT          |
| N/A        | N/A              | N/A            | Earphone                           | EUT          |
| N/A        | Sandisk          | N/A            | SD Memory                          | EUT          |

## 2.5 Test Methodology

The radiated testing was performed according to the procedures in chapter 7, 13 of ANSI C63.4: 2003 and performed at a distance of 3 meters 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, 464-080, Korea. Description details of test facilities were submitted to the Commission on August 30, 2005. (Registration Number: 340658)

### 3. SYSTEM TEST CONFIGURATION

#### 3.1 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  | 2MTECH       | TM110G            | N/A    |
| LCD         | N/A          | LTE700WQ-F05-2BS  | N/A    |
| GPS Antenna | N/A          | RGM-3311          | N/A    |

#### 3.2 EUT exercise Software

The Model, ZAMM-TM110 is included a FM transmitter designed to operate on function in the 88.5 ~ 107.5 MHz. The EUT has audio input ports, so the input ports were connected to a DVD player and than the movie file was transmitted with maximum audio output level during the test.

#### 3.3 Cable Description

| Ports Name   | Shielded | Ferrite Bead | Metal Hood | Length (m)      | Connected to |
|--------------|----------|--------------|------------|-----------------|--------------|
| Video In (1) | N        | N            | BOTH END   | 1.5             | DVD Player   |
| Video In (2) | N        | N            | BOTH END   | 1.5             | DVD Player   |
| EAR          | N        | N            | EUT END    | 1.5             | Headphone    |
| USB          | N/A      | N/A          | EUT END    | Direct Inserted | Memory Stick |
| DMB Ant.     | N        | N            | EUT END    | 1.5             | DMB Ant.     |
| DC In        | N        | N            | EUT END    | 1.2             | Car Battery  |
| SD Card      | N/A      | N/A          | EUT END    | Direct Inserted | SD Card      |
| Audio In (1) | N        | N            | BOTH END   | 1.5             | DVD Player   |
| Audio In (2) | N        | N            | BOTH END   | 1.5             | DVD Player   |

### 3.4 Equipment Modifications

- The shield can was added to the FC2501 in the main board.
- The shield can was added to the T1(Transformer) in the main board.
- The ground of GPS part was connected to the ground of PCB by copper tape.
- The ground of PCB (Top, left and right sides) was connected to the ground of LCD by gasket.
- The ground of rear LCD was reinforced.
- The ground pattern of JK2 and JK3 was extended in the main board.
- The ground of JK4 was reinforced.
- The C206, C207, C214 and C215 were changed from 0.33uF to 10uF on the main board.
- The EMC 805 of main board was removed and then shorted.
- The C900(1uF) / C901(10nF) / C902(1nF) were added in the power line.
- The rating of R515 was changed from 200 ohm to 0 ohm on the FM Transmitter line.
- The rating of R516 (200 ohm) was removed on the FM Transmitter line.
- The rating of R517 (200 ohm) was changed to C (300pF) on the FM Transmitter line.

### 3.5 Configuration of Test System

**Line Conducted Test:** It is not need to test this requirement, because the EUT shall be operated by car 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 meter open area test site.

**Occupied Bandwidth Measurement:**

This measurement is performed with the antenna located close enough to give a full-scale deflection of the modulated carrier on the spectrum analyzer.

### 3.6 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:**

FM transmitter antenna of the EUT is fixed inside the EUT, no consideration of replacement by the user.

## 4. PRELIMINARY TEST

### 4.1 AC Power line Conducted Emission Test

During Preliminary Test, the following operating mode was investigated

| Operation Mode                                                                             | The Worse operating condition (Please check one only) |
|--------------------------------------------------------------------------------------------|-------------------------------------------------------|
| It is not need to test this requirement, because the EUT shall be operated by car battery. |                                                       |

### 4.2 Radiated Emission Test

During Preliminary Test, the following operating mode was investigated

| Operation Mode                      | The Worse operating condition (Please check one only) |
|-------------------------------------|-------------------------------------------------------|
| Transmit the RF Signal continuously | X                                                     |



## 5. FINAL RESULT OF MEASUREMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level

### 5.1 Radiated Emission Test (Within the permitted 200 kHz band)

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

Humidity Level : 38 % Temperature: 15 °C  
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.239 (b)  
Type of Test : Low Power Communication Device Transmitter  
Result : PASSED BY -1.90 dB at 98.00 MHz under average mode

EUT : T-DMB(DAB) Navigation System

Date: April 12, 2007

Distance : 3 Meter

| Radiated Emission |                |                | Ant  | Correction Factors |               | Total            | Limit<br>(dBuV/m) | Margin<br>(dB) |
|-------------------|----------------|----------------|------|--------------------|---------------|------------------|-------------------|----------------|
| Freq.<br>(MHz)    | Amp.<br>(dBuV) | Detect<br>Mode | Pol. | Ant.<br>(dBuV/m)   | Cable<br>(dB) | Amp.<br>(dBuV/m) |                   |                |
| 88.50             | 34.00          | Quasi-Peak     | H    | 8.27               | 2.37          | 44.64            | 48.00             | -3.36          |
| 98.00             | 32.40          | Quasi-Peak     | H    | 10.00              | 2.40          | 44.80            | 48.00             | -3.20          |
| 107.50            | 30.80          | Quasi-Peak     | H    | 11.34              | 2.48          | 44.62            | 48.00             | -3.38          |
| 88.50             | 35.20          | Average        | H    | 8.27               | 2.37          | 45.84            | 48.00             | -2.16          |
| 98.00             | 33.70          | Average        | H    | 10.00              | 2.40          | 46.10            | 48.00             | -1.90          |
| 107.50            | 32.10          | Average        | H    | 11.34              | 2.48          | 45.92            | 48.00             | -2.08          |

Radiated Emission Tabulated Data

  
Tested by: In-Sub, Youn / Test Engineer

## 5.2 Radiated Emission Test (Outside of the specified 200 kHz band)

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

Humidity Level : 42 % Temperature: 18 °C  
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209 (a)  
 Type of Test : Low Power Communication Device Transmitter  
 Result : PASSED BY -2.13 dB at 378.90MHz

EUT : T-DMB(DAB) Navigation System Date: April 12, 2007  
 Frequency range : 30MHz – 1000MHz  
 Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)  
 Distance : 3 Meter  
 Remark : Other emissions

| Radiated Emission |                | Ant  | Correction Factors |               | Total            | FCC               |                |
|-------------------|----------------|------|--------------------|---------------|------------------|-------------------|----------------|
| Freq.<br>(MHz)    | Amp.<br>(dBuV) | Pol. | Ant.<br>(dBuV/m)   | Cable<br>(dB) | Amp.<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) |
| 100.60            | 20.30          | H    | 10.44              | 2.41          | 33.15            | 43.52             | -10.37         |
| 107.30            | 19.80          | V    | 11.32              | 2.47          | 33.59            | 43.52             | -9.93          |
| 182.45            | 18.70          | H    | 15.82              | 2.90          | 37.42            | 43.52             | -6.10          |
| 264.52            | 17.60          | H    | 17.85              | 3.71          | 39.16            | 46.02             | -6.86          |
| 270.00            | 19.70          | V    | 17.96              | 3.86          | 41.52            | 46.02             | -4.50          |
| 378.90            | 22.40          | H    | 16.92              | 4.57          | 43.89            | 46.02             | -2.13          |
| 434.20            | 18.90          | H    | 18.51              | 4.84          | 42.25            | 46.02             | -3.77          |
| 622.50            | 16.40          | H    | 20.31              | 5.94          | 42.65            | 46.02             | -3.37          |

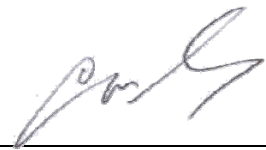
  
 Tested by: In-Sub, Youn / Test Engineer

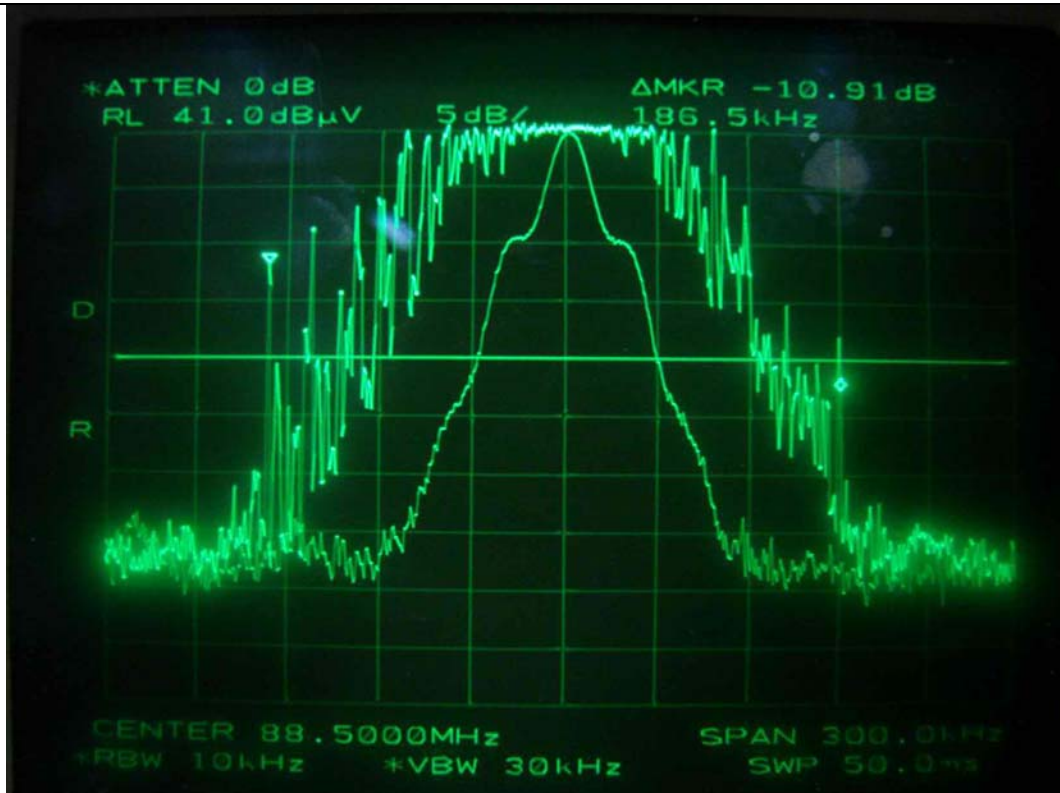
## 5.3 Bandwidth of the operating frequency

Humidity Level : 38 % Temperature: 15 °C  
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.239 (a)  
 Result : PASSED

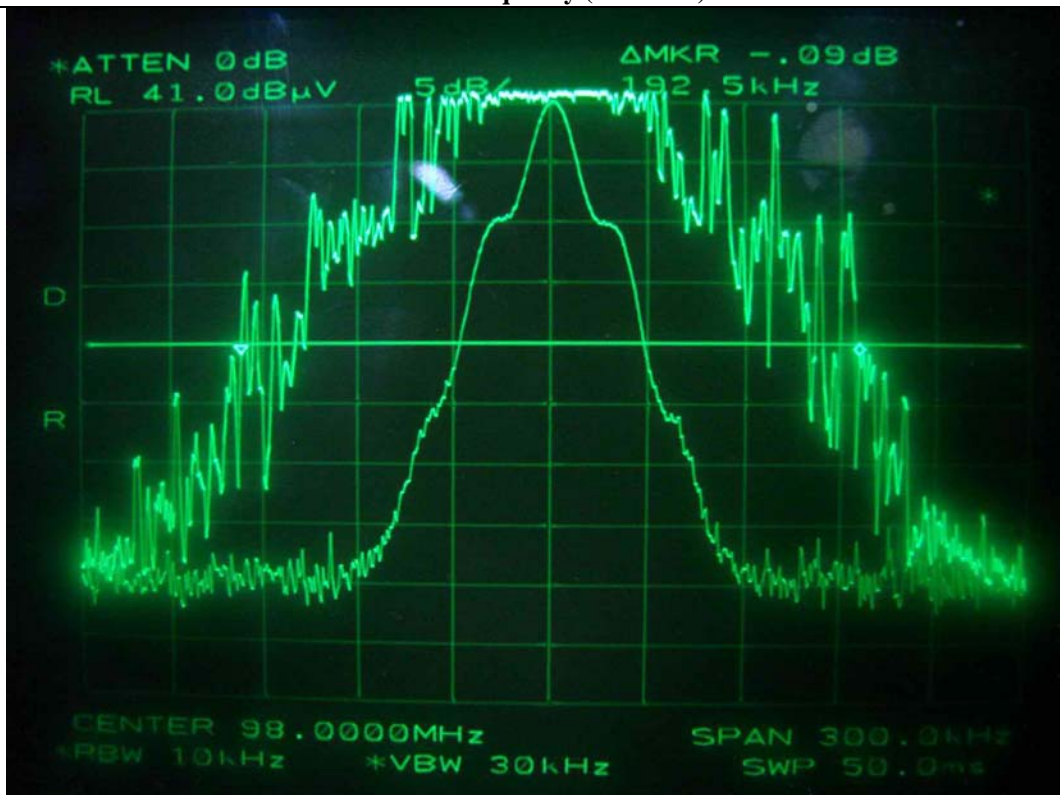
EUT : T-DMB(DAB) Navigation System Date: April 12, 2007  
 Operating Condition : Transmit the RF signal.  
 Minimum Resolution  
 Bandwidth : 10 kHz  
 Remark : Refer to test data in next page.

| Frequency (MHz) | Measured Value (kHz) | Limit (kHz) | Margin (kHz) |
|-----------------|----------------------|-------------|--------------|
| 88.5            | 186.5                | 200         | -13.5        |
| 98.0            | 192.5                |             | -7.5         |
| 107.5           | 187.0                |             | -13.0        |

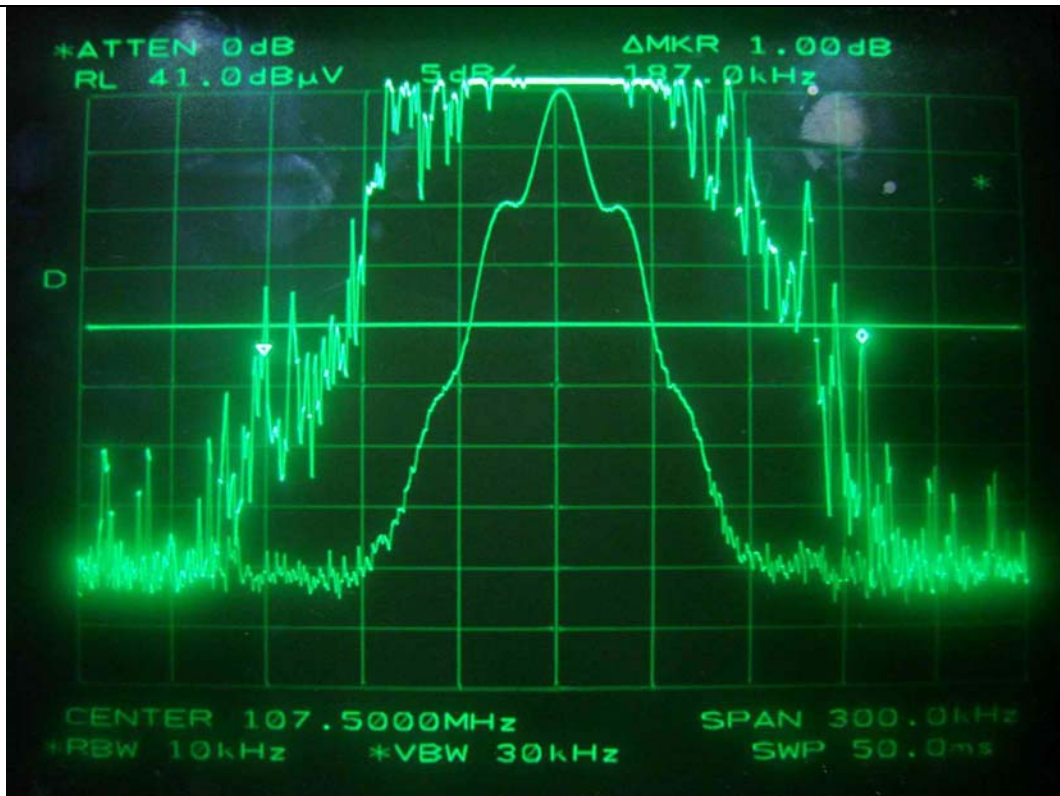
  
 Tested by: In-Sub, Youn / Test Engineer



Bottom Frequency (88.5MHz)



Middle Frequency (98.0MHz)



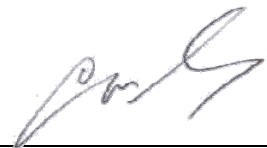
Top Frequency(107.5 MHz)

**5.4 Tuning Range of the operating frequency**

Humidity Level : 38 % Temperature: 15 °C  
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.239 (a)  
Result : PASSED

---

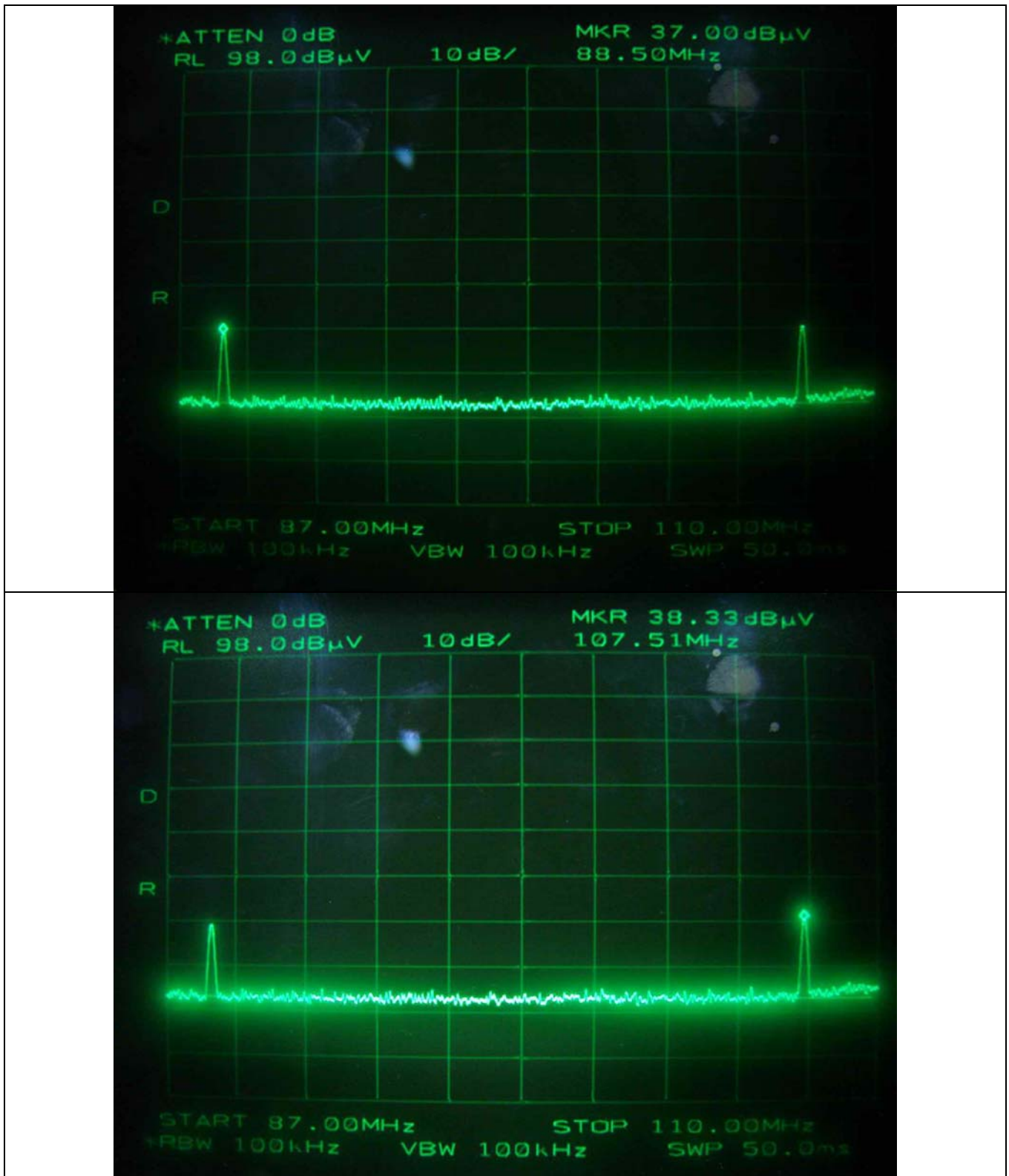
EUT : T-DMB(DAB) Navigation System Date: April 12, 2007  
Operating Condition : The lowest and highest frequency was adjusted by manual using up/down button on the side of the EUT and the spectrum was in max hold mode for capturing the spectrum.  
Test Result : Met the requirement. Refer to test data in next page.



---

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





## 6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses

+ Meter reading (dBuV)

+ Cable Loss (dB)

+ Antenna Factor (Loss) (dB/meter)

---

= Corrected Reading (dBuV/meter)

- Specification Limit (dBuV/meter)

= dB Relative to Spec (+/- dB)



**7. LIST OF TEST EQUIPMENT**

| No. | EQUIPMENTS               | MFR.        | MODEL       | SER. NO.     | LAST CAL | DUE CAL | USE |
|-----|--------------------------|-------------|-------------|--------------|----------|---------|-----|
| 1.  | Test receiver            | R/S         | ESVS10      | 827864/005   | DEC/06   | 12MONTH | ■   |
| 2.  | Test receiver            | R/S         | ESHS 10     | 834467/007   | MAY/06   | 12MONTH |     |
| 3.  | Spectrum analyzer        | HP          | 8566B       | 3407A08547   | JUN/06   | 12MONTH |     |
|     |                          | R/S         | FSP         | 100017       | JUN/06   |         | ■   |
| 4.  | TRILOG Broadband Antenna | Schwarzbeck | VULB9163    | VULB9163 166 | MAY/06   | 12MONTH |     |
| 5.  | Biconical antenna        | EMCO        | 3110        | 9003-1121    | FEB/06   | 12MONTH |     |
|     |                          | Schwarzbeck | VHA9103     | 91031852     | FEB/07   |         | ■   |
| 6.  | Log Periodic antenna     | EMCO        | 3146        | 9001-2614    | FEB/06   | 12MONTH |     |
|     |                          | Schwarzbeck | 9108-A(494) | 62281001     | FEB/07   |         | ■   |
| 7.  | LISN                     | EMCO        | 3825/2      | 9109-1867    | JUN/06   | 12MONTH |     |
|     |                          |             |             | 9109-1869    | JUN/06   |         |     |
|     |                          | Schwarzbeck | NSLK 8128   | 8128-216     | JUL/06   |         |     |
| 8.  | Position Controller      | HD GmbH     | HD100       | N/A          | N/A      | N/A     | ■   |
| 9.  | Turn Table               | HD GmbH     | DS420S      | N/A          | N/A      | N/A     | ■   |
| 10. | Antenna Master           | HD GmbH     | MA240       | N/A          | N/A      | N/A     | ■   |
| 11. | RF Amplifier             | HP          | 8447D       | 2727A04987   | JUN/06   | 12MONTH | ■   |