

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

**Test Report No.** : E068R-025

**AGR No.** : A068A-085

**Applicant** : Humax Co., Ltd.

**Address** : Humax Building, 212-1, Yubang-Dong, Yongin-City, Gyunggi-Do, 449-080, Korea

**Manufacturer** : Humax Co., Ltd.

**Address** : Humax Building, 212-1, Yubang-Dong, Yongin-City, Gyunggi-Do, 449-080, Korea

**Type of Equipment** : Satellite Radio Receiver (Dock Unit) (FM Transmitter)

**FCC ID.** : O6ZS50-C3

**Model Name** : S50-C1

**Serial number** : N/A

**Total page of Report** : 15 pages (including this page)

**Date of Incoming** : August 09, 2006

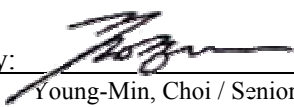
**Date of Issuing** : October 16, 2006

## 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 / Senior 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> .....	4
<b>2.2 MODEL DIFFERENCES</b> .....	4
<b>2.3 RELATED SUBMITTAL(S) / GRANT(S)</b> .....	4
<b>2.4 TEST SYSTEM DETAILS</b> .....	4
<b>2.5 TEST METHODOLOGY</b> .....	4
<b>2.6 TEST FACILITY</b> .....	4
<b>3. SYSTEM TEST CONFIGURATION</b> .....	<b>5</b>
<b>3.1 JUSTIFICATION</b> .....	5
<b>3.2 EUT EXERCISE SOFTWARE</b> .....	5
<b>3.3 CABLE DESCRIPTION</b> .....	5
<b>3.4 NOISE SUPPRESSION PARTS ON CABLE</b> .....	5
<b>3.5 EQUIPMENT MODIFICATIONS</b> .....	5
<b>3.6 CONFIGURATION OF TEST SYSTEM</b> .....	6
<b>3.7 ANTENNA REQUIREMENT</b> .....	6
<b>4. PRELIMINARY TEST</b> .....	<b>6</b>
<b>4.1 AC POWER LINE CONDUCTED EMISSION TEST</b> .....	6
<b>4.2 RADIATED EMISSION TEST</b> .....	6
<b>5. FINAL RESULT OF MEASUREMENT</b> .....	<b>7</b>
<b>5.1 RADIATED EMISSION TEST (WITHIN THE PERMITTED 200KHZ BAND)</b> .....	7
<b>5.2 RADIATED EMISSION TEST (OUTSIDE OF THE SPECIFIED 200KHZ BAND)</b> .....	8
<b>5.3 BANDWIDTH OF THE OPERATING FREQUENCY</b> .....	9
<b>6. FIELD STRENGTH CALCULATION</b> .....	<b>14</b>
<b>7. LIST OF TEST EQUIPMENT</b> .....	<b>15</b>

**1. VERIFICATION OF COMPLIANCE**

- APPLICANT : Humax Co., Ltd.
- ADDRESS : Humax Building, 212-1, Yubang-Dong, Yongin-City, Gyunggi-Do, 449-080, Korea
- CONTACT PERSON : Mr. Nam-Hoon, Baek / Engineer
- TELEPHONE NO : +82-31-776-6322
- BRAND NAME : SIRIUS SATELLITE RADIO
- FCC ID : O6ZS50-C3
- MODEL NO/NAME : S50-C1
- SERIAL NUMBER : N/A
- DATE : October 16, 2006

EQUIPMENT CLASS	DXX - Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	Satellite Radio Receiver (Dock Unit) (FM Transmitter)
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	Chapter 7 and 13 of ANSI C63.4: 2003
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SECTION 15.239
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
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 Humax Co., Ltd., Model S50-C1 (referred to as the EUT in this report) is Satellite Radio Receiver (Dock Unit) that has the FM transmitter from 88.1 MHz to 107.9 MHz for audio signal of FM radio receiver. Product specification described herein was obtained from product data sheet or user’s manual.

CHASSIS TYPE	Plastic
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz)	7.6 MHz and 17 MHz
POWER REQUIREMENT	DC 12V from a car battery
TX FREQUENCY RANGE	88.1 MHz ~ 107.9 MHz (Step freq. : 0.2 MHz)
NUMBER OF LAYERS	6 Layers: Front Board, 8 Layers: Rear Board
EXTERNAL CONNECTOR	DC In, Antenna In, Audio Out, FM Out

**2.2 Model Differences**

- The difference(s) compared to the EUT is as follows: 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
S50-C1	Humax Co., Ltd.	O6ZS50-C3	Satellite Radio Receiver (Dock Unit)(EUT)	-
DSG2000	frauhofer	N/A	DARS Simulator	-
-	-	N/A	Car Battery	EUT
-	-	N/A	Satellite Antenna	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 426-1 Daessangryung-Ri, Chowol-Eup, Kwangju-City, Kyunggi-Do, 464-080, Korea. Description details of test facilities were submitted to the Commission on April 04, 2003. (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
Front Board	Humax Co., Ltd.	XENA FRONT Board	N/A
Rear Board	Humax Co., Ltd.	XENA REAR Board	N/A

#### 3.2 EUT exercise Software

The Model, S50-C1 is included a FM transmitter designed to operate on transmitting function in the 88.1 ~ 107.9 MHz. The EUT does not have an audio input port, so the internal 1 kHz modulation signal was transmitted with maximum audio level.

#### 3.3 Cable Description

Product Name	Power Cord Shielded (Y/N)	I/O cable Shielded (Y/N)	Length (M)
Satellite Radio Receiver (Dock Unit)(EUT)	N	-	1.8(P)
Satellite Antenna	N/A	N	6.0(D)

\* The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

#### 3.4 Noise Suppression Parts on Cable

Product Name	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
Satellite Radio Receiver (Dock Unit)(EUT)	N	N/A	Y	EUT END
Satellite Antenna	N	N/A	N	N/A

#### 3.5 Equipment Modifications

To achieve compliance to FCC regulation, the following change(s) was made by HUMAX during compliance testing

- Shorten the length of a transmission antenna.

**3.6 Configuration of Test System**

**Line Conducted Test:** It needs not to test this requirement, because the power of the EUT supplies from a 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.

**3.7 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 power of the EUT is supplied from a 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 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 : 45 % Temperature: 25 °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 - 4.57 dB at 98.3 MHz

EUT : Satellite Radio Receiver (Dock Unit) Date: August 09, 2006  
 Operating Condition : Transmit the RF signal.  
 Distance : 3 Meter

Radiated Emission			Ant	Correction Factors		Total	Limit (dBuV/m)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Amp. (dBuV/m)		
88.10	30.15	Peak	V	7.89	1.74	39.78	48.00	-8.22
88.10	30.80	Peak	H	7.89	1.74	40.43	48.00	-7.57
98.30	28.60	Peak	V	9.73	1.90	40.23	48.00	-7.77
98.30	31.80	Peak	H	9.73	1.90	43.43	48.00	-4.57
107.90	25.20	Peak	V	11.07	1.90	38.17	48.00	-9.83
107.90	29.30	Peak	H	11.07	1.90	42.27	48.00	-5.73

Radiated Emission Tabulated Data

Remark: Because the frequency range of the EUT is more than 10 MHz, so three channels (near top, near middle and near bottom) were tested.

Average detector mode was not measured, because peak emission values were under average limit.



**Tested by: Sue-Yong, Lee/ Engineer**

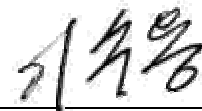
**5.2 Radiated Emission Test (Outside of the specified 200 kHz band)**

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

Humidity Level : 45 % Temperature: 25 °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 -7.86 dB at 547.40 MHz

EUT : Satellite Radio Receiver (Dock Unit) Date: August 09, 2006  
 Operating Condition : Transmit the RF signal.  
 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. (MHz)	Amp. (dBuV)	Pol.	Ant. (dB/m)	Cable (dB)	Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
238.34	16.87	V	17.01	3.21	37.09	46.02	-8.93
370.13	15.13	H	16.30	4.28	35.71	46.02	-10.31
382.73	13.45	H	16.46	4.33	34.24	46.02	-11.78
547.40	13.32	H	19.53	5.31	38.16	46.02	-7.86
573.63	26.15	V	19.80	5.30	37.16	46.02	-8.86
671.49	8.10	V	21.77	6.00	35.87	46.02	-10.15



Tested by: Sue-Yong, Lee/ Engineer

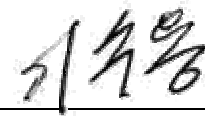


**5.3 Bandwidth of the operating frequency**

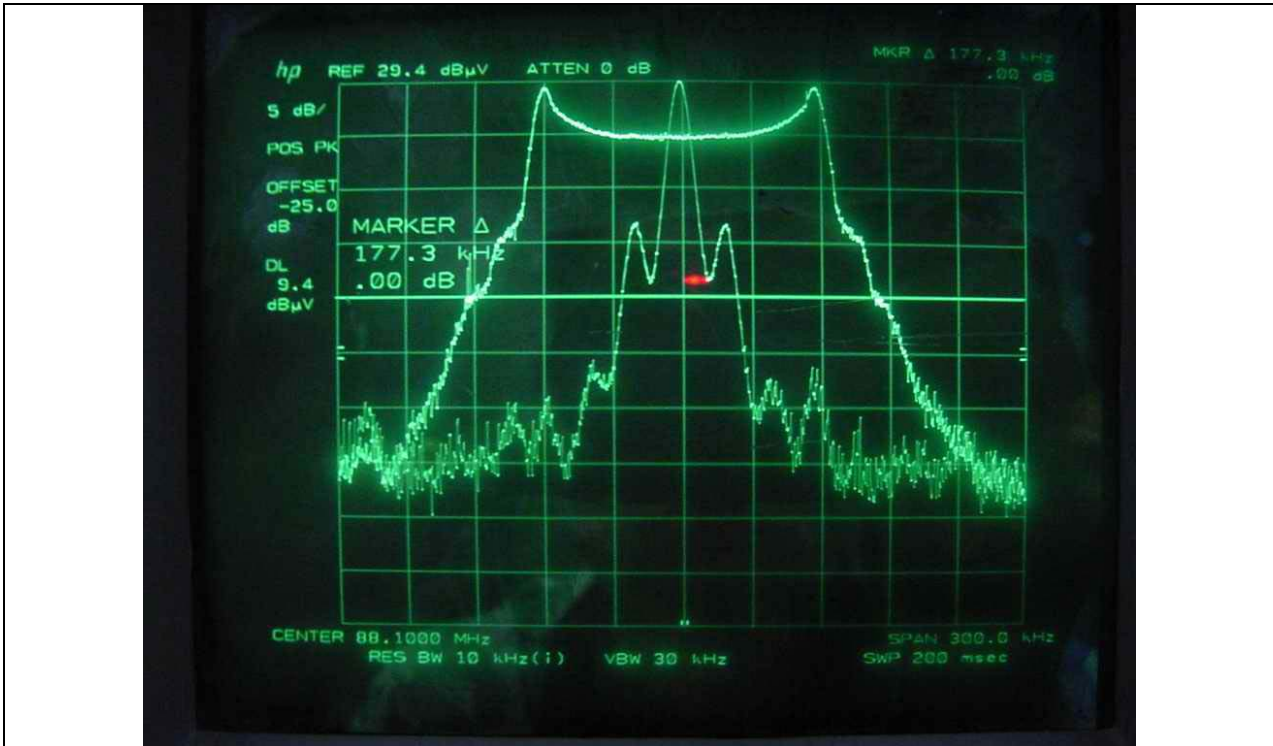
Humidity Level : 45 % Temperature : 25 °C  
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.239 (a)  
 Result : PASSED

EUT : Satellite Radio Receiver (Dock Unit) Date: August 18, 2006  
 Operating Condition : Transmit the RF signal with maximum audio volume level.  
 Please refer to clause 3.5 in this report for more detail operating and test procedure.  
 Minimum Resolution  
 Bandwidth : 10 kHz  
 Remark : Refer to test data in next page.

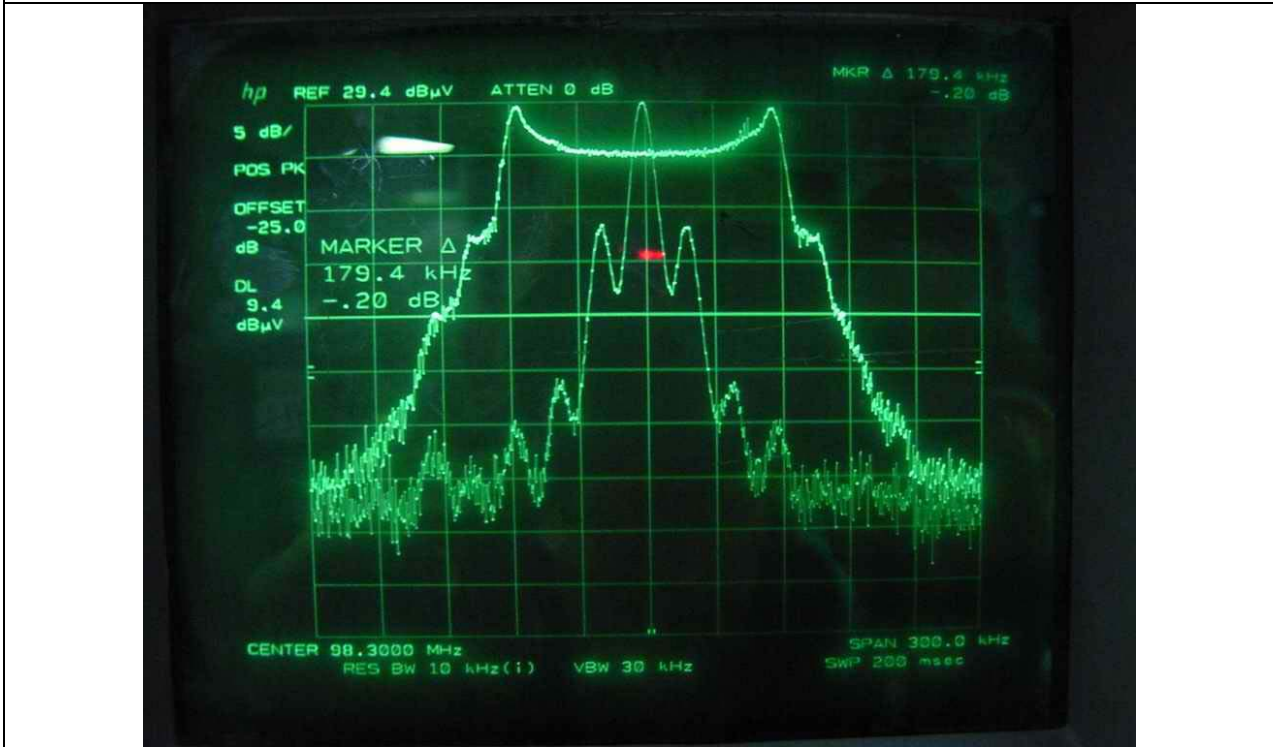
Frequency(MHz)	Measured Value(kHz)	Limit(kHz)	Margin(kHz)
88.1	177.3	200	-22.7
98.3	179.4	200	-20.6
107.9	178.8	200	-21.2



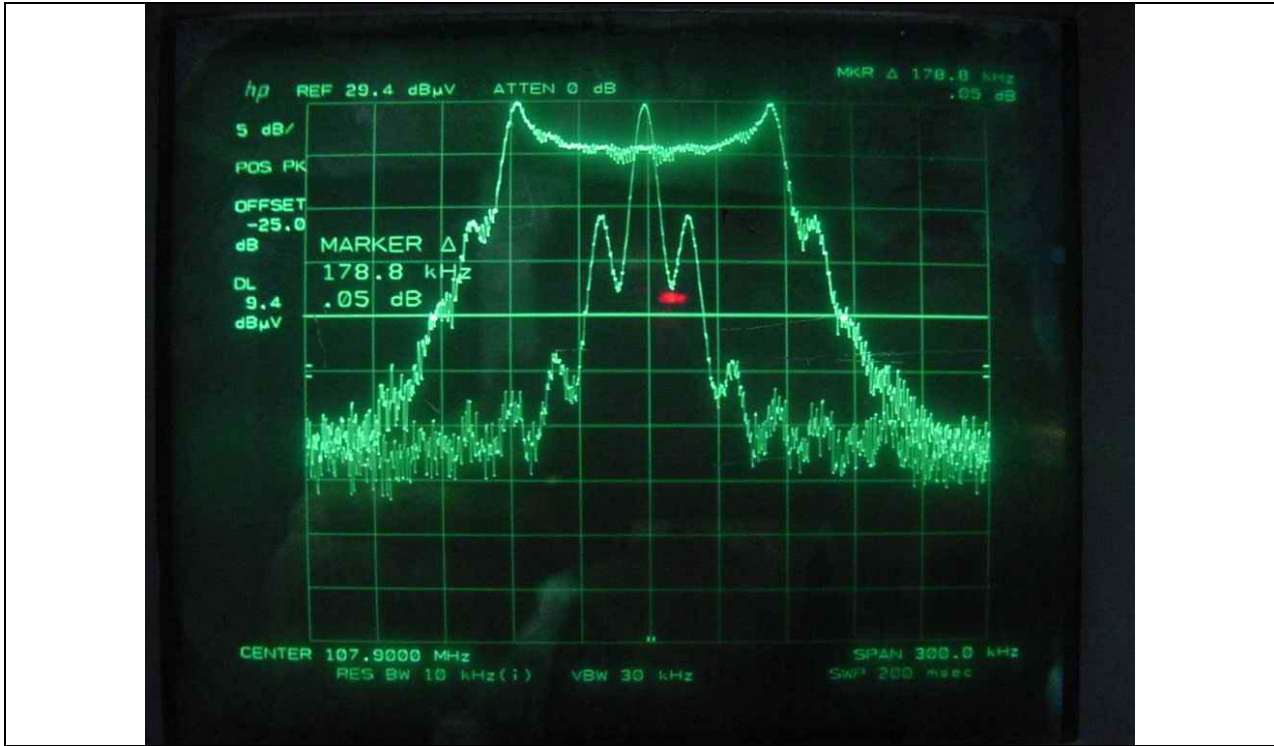
Tested by: Sue-Yong, Lee/ Engineer



**Bottom Frequency (88.1MHz)**



**Middle Frequency (98.3MHz)**



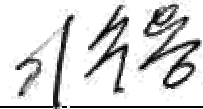
**Top Frequency (107.9MHz)**

**5.4 Tuning Range of the operating frequency**

Humidity Level : 40 % Temperature: 21 °C  
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.239 (a)  
Result : PASSED

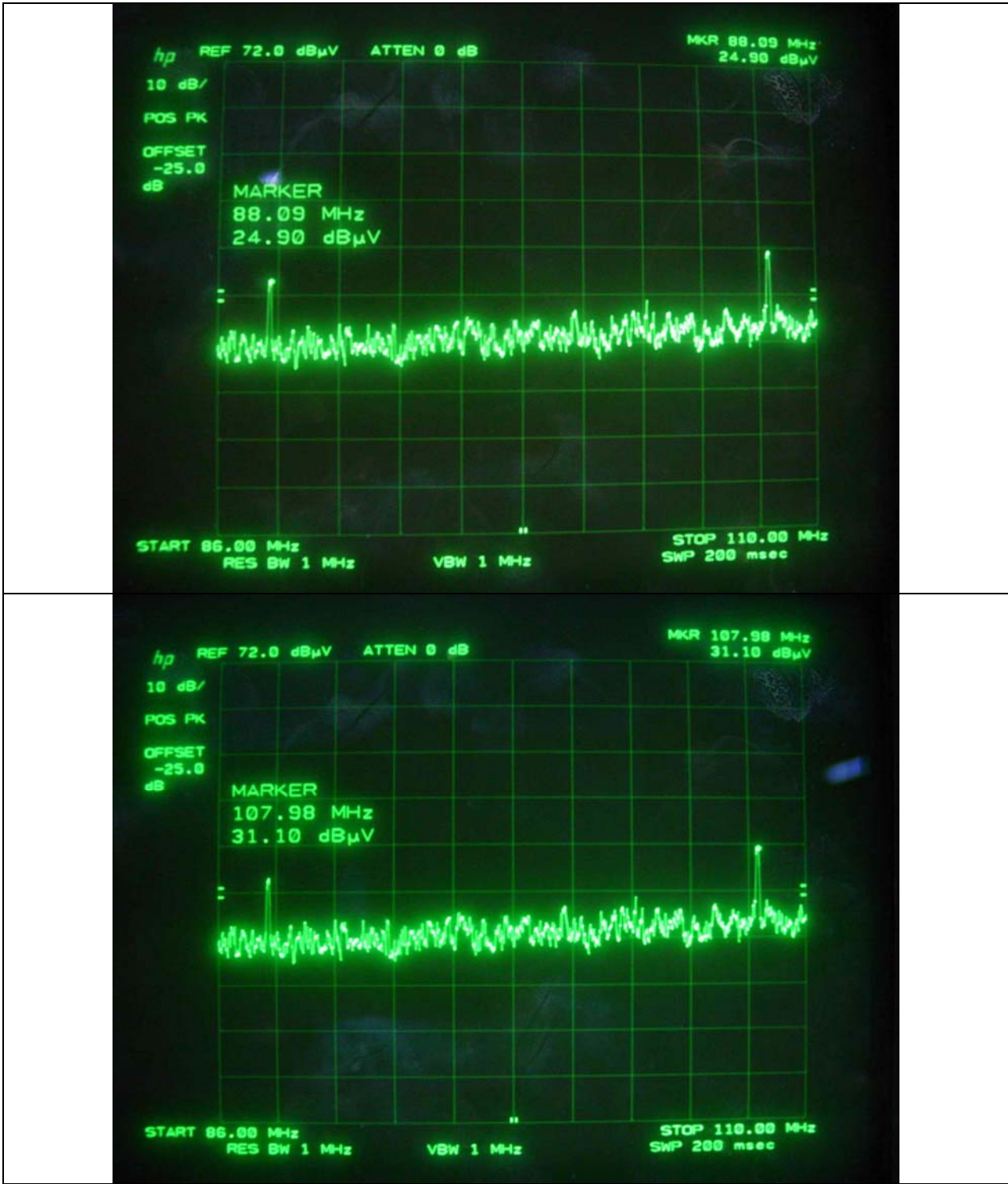
---

EUT : Digital Satellite Radio Date: October 16, 2006  
Operating Condition : The lowest and highest frequency was adjusted by manual using button on the EUT or remote controller 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: Sue-Young, Lee/ 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	ESVS 10	827864/005	DEC/05	12MONTH	■
2.	Test receiver	R/S	ESHS 10	834467/007	MAY/06	12MONTH	■
3.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	VULB9163 166	MAY/06	12MONTH	
4.	Biconical antenna	EMCO	3110	9003-1121	FEB/06	12MONTH	
		Schwarzbeck	VHA9103	91031852	FEB/06		■
5.	Log Periodic antenna	EMCO	3146	9001-2614	FEB/06	12MONTH	
		Schwarzbeck	9108-A(494)	62281001	FEB/06		■
6.	LISN	EMCO	3825/2	9109-1867	JUL/06	12MONTH	
				9109-1869	JUL/06		
		Schwarzbeck	NSLK 8126	8126-404	AUG/05		
7.	Position Controller	HD GmbH	HD100	N/A	N/A	N/A	■
8.	Turn Table	HD GmbH	DS420S	N/A	N/A	N/A	■
9.	Antenna Master	HD GmbH	MA240	N/A	N/A	N/A	■