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

Test Report No.	**: E069R-004**
AGR No.	**: A069A-003**
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 RECIVER (FM Transmitter)**
FCC ID.	**: O6ZSV2**
Model Name	**: SV2**
Serial number	**: N/A**
Total page of Report	**: 18 pages (including this page)**
Date of Incoming	**: August 30, 2006**
Date of Issuing	**: September 12, 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.

HEAD OFFICE : #505 SK APT. Factory 223-28, Sangdaewon 1 Dong, Jungwon-Gu, Seongnam-City, Kyunggi-Do, 462-705, Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
EMC Testing Dept : 307-51 Daessangryung-Ri, Chowol-Eup, Kwangju-City, Kyunggi-Do, 464-860, Korea. (TEL: +82-31-765-8289, FAX: +82-31-766-2904)

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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 : +82-31-600-6322
-. BRAND NAME : SIRIUS SATELLITE RADIO
-. FCC ID : O6ZSV2
-. MODEL NO/NAME : SV2
-. SERIAL NUMBER : N/A
-. DATE : September 04, 2006

EQUIPMENT CLASS	DXX - Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	SATELLITE RADIO RECIVER (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.

-. The above equipment has external transmitting antenna, so the EUT shall be installed into at small, medium and large size vehicles and the cars were tested at in situ testing for getting compliance with the requirement, section 15.239, but the test was performed by another test lab. Please refer to another test report, which was issued by another test lab.

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2. GENERAL INFORMATION

2.1 Product Description

The Humax Co., Ltd., Model SV2 (referred to as the EUT in this report) is SATELLITE RADIO RECIVER that has the FM transmitter from 88.1 MHz to 107.9 MHz for audio signal of FM radio receiver. And the EUT has an external FM antenna. 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)	17MHz, 7.3728MHz and 7.6MHz
POWER REQUIREMENT	DC 5.2V, 1.5A
TX FREQUENCY RANGE	88.1 MHz ~ 107.9 MHz (Step freq. : 0.2 MHz)
NUMBER OF LAYERS	6 Layers
EXTERNAL CONNECTOR	DC In, Satellite Ant. In, Line out and 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
SV2	Humax Co., Ltd.	O6ZSV2	SATELLITE RADIO RECIVER(EUT)	-
DSG2000	frauhofer	N/A	DARS Simulator	-
-	-	N/A	Car Battery	EUT
-	-	N/A	Satellite Antenna	EUT
-	-	N/A	External FM 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)

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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 B/D	Humax Co., Ltd.	SV2 MAIN B/D REV:1.0	N/A

3.2 EUT exercise Software

The Model, SV2 is included a FM transmitter designed to operate on 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. Also the EUT can be operated with and without External FM transmitting antenna, so the test was performed at each configuration, but the worst test data were recorded in this report.

For setting maximum emission from the EUT, the configuration test setup was changed 4 times. Please refer to test setup photo. The emission for carrier frequency was recoded at each configuration but other spurious emissions were recoded at the worst case only.

3.3 Cable Description

Product Name	Power Cord Shielded (Y/N)	I/O cable Shielded (Y/N)	Length (M)
SATELLITE RADIO RECIVER(EUT)	N	-	1.0(P)
Satellite Receiving Antenna	N/A	N	6.0(D)
External FM Antenna	N/A	Y	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 RECIVER(EUT)	N	N/A	Y	EUT END
Satellite Antenna	N	N/A	N	N/A
External FM Antenna	Y	Opposite side of the EUT	N	N/A

3.5 Equipment Modifications

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

- N/A

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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.

In situ Radiated Emission Test:

According to the FCC Policy, the EUT shall be installed in small, medium, and large size vehicles because of external antenna on the EUT.

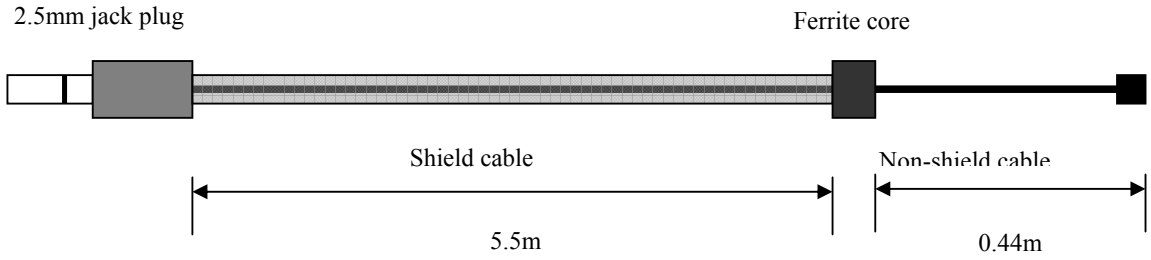
3.7 Antenna Requirement

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:

The external FM antenna which shall be supplied by the responsible party shall be used according to user's guide.

Used External Transmitting FM Antenna Construction



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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

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5. FINAL RESULT OF MEASURMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level. The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical at each test setup configuration.

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

5.1.1 Test data with External FM Transmitting Antenna

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 – 3.77 dB at 88.1 MHz

EUT : SATELLITE RADIO RECIVER Date: September 12, 2006

Operating Condition : Transmit the RF signal with maximum audio level.

Distance : 3 Meter

Radiated Emission			Ant	Correction Factors		Total	Limit	Margin
Freq. (MHz)	Amp. (dBuV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Amp. (dBuV/m)	(dBuV/m)	(dB)
88.10	34.18	Peak	V	7.89	1.74	43.81	48.00	-4.19
88.10	34.60	Peak	H	7.89	1.74	44.23	48.00	-3.77
98.30	28.69	Peak	V	9.73	1.90	40.32	48.00	-7.68
98.30	28.36	Peak	H	9.73	1.90	39.99	48.00	-8.01
107.90	28.27	Peak	V	11.07	1.90	41.24	48.00	-6.76
107.90	27.02	Peak	H	11.07	1.90	39.99	48.00	-8.01

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

Tested by: Sue-Yong, Lee/ Engineer

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5.1.2 Test data without External FM Transmitting Antenna

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 – 3.99 dB at 98.3 MHz

EUT : SATELLITE RADIO RECIVER Date: September 12, 2006

Operating Condition : Transmit the RF signal with maximum audio level.

Distance : 3 Meter

Radiated Emission			Ant	Correction Factors		Total	Limit	Margin
Freq. (MHz)	Amp. (dBuV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Amp. (dBuV/m)	(dBuV/m)	(dB)
88.10	27.51	Peak	V	7.89	1.74	37.14	48.00	-10.86
88.10	32.18	Peak	H	7.89	1.74	41.81	48.00	-6.19
98.30	31.69	Peak	V	9.73	1.90	43.32	48.00	-4.68
98.30	32.38	Peak	H	9.73	1.90	44.01	48.00	-3.99
107.90	26.80	Peak	V	11.07	1.90	39.77	48.00	-8.23
107.90	26.34	Peak	H	11.07	1.90	39.31	48.00	-8.69

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

Tested by: Sue-Yong, Lee/ Engineer

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

5.2.1 Test Data with External FM Transmitting Antenna

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 –4.31 dB at 171.40 MHz

EUT : SATELLITE RADIO RECIVER Date: September 01, 2006
Operating Condition : Transmit the RF signal with maximum audio level.
Frequency range : 30MHz – 1000MHz
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)
Distance : 3 Meter

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)
147.20	20.40	V	14.51	2.33	37.24	43.52	-6.28
171.40	21.44	V	15.31	2.46	39.21	43.52	-4.31
195.60	19.12	H	16.04	2.80	37.96	43.52	-5.56
238.12	15.66	V	17.01	3.21	35.88	46.02	-10.14
545.60	15.11	H	19.52	5.32	39.95	46.02	-6.07

Tested by: Sue-Yong, Lee/ Engineer

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5.2.2 Test Data without External FM Transmitting Antenna

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 –6.00 dB at 47.44 MHz

EUT : SATELLITE RADIO RECIVER Date: September 01, 2006

Operating Condition : Transmit the RF signal with maximum audio level.

Frequency range : 30MHz – 1000MHz

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

Distance : 3 Meter

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)
47.44	20.37	V	12.03	1.60	34.00	40.00	-6.00
71.67	26.47	V	5.70	1.53	33.70	40.00	-6.30
171.64	18.94	V	15.31	2.47	36.72	43.52	-6.80
196.10	15.15	V	16.06	2.80	34.01	43.52	-9.51
506.76	10.44	H	19.21	5.47	35.12	46.02	-10.90

Tested by: Sue-Yong, Lee/ Engineer

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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 RECIVER Date: September 01, 2006

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)
88.1	192.0	200	-8.0
98.3	197.1	200	-2.9
107.9	192.6	200	-7.4

Tested by: Sue-Yong, Lee/ Engineer

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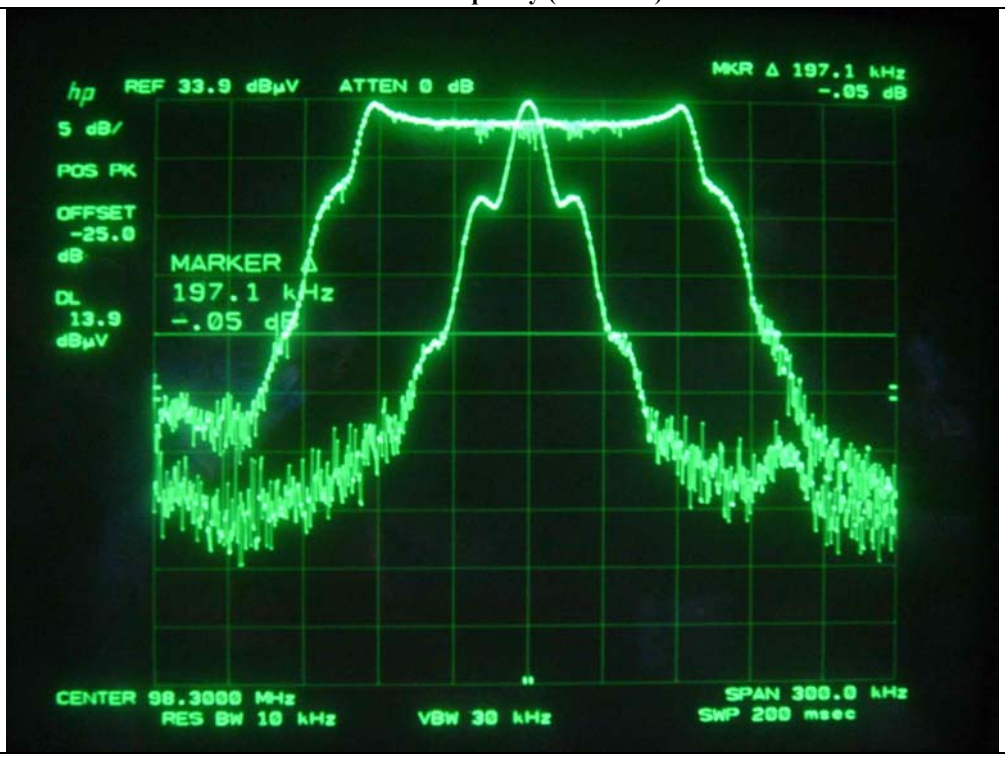
Bottom Frequency (88.1MHz)



Middle Frequency (98.3MHz)

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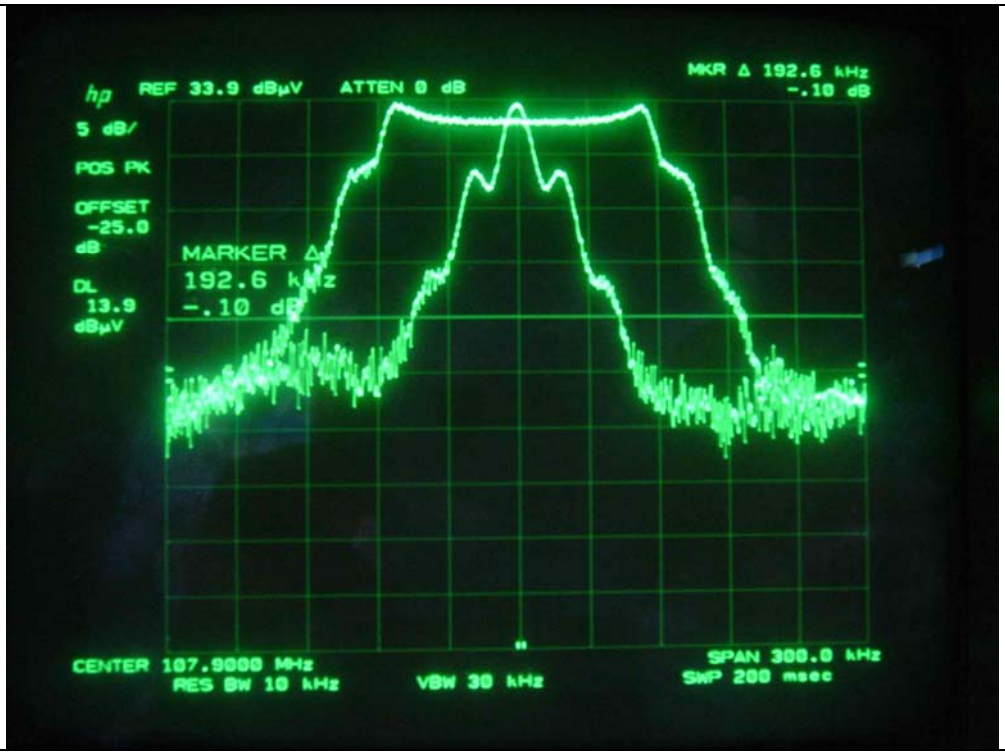

Top Frequency (107.9MHz)

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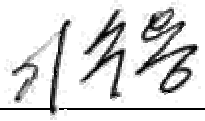
5.4 Tuning Range of the operating frequency

Humidity Level	: 41 %	Temperature: 17 °C
Limits apply to	: FCC CFR 47, PART 15, SUBPART C, SECTION 15.239 (a)	
Result	: PASSED	

EUT	: Digital Satellite Radio Date: August 30, 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/ Test Engineer

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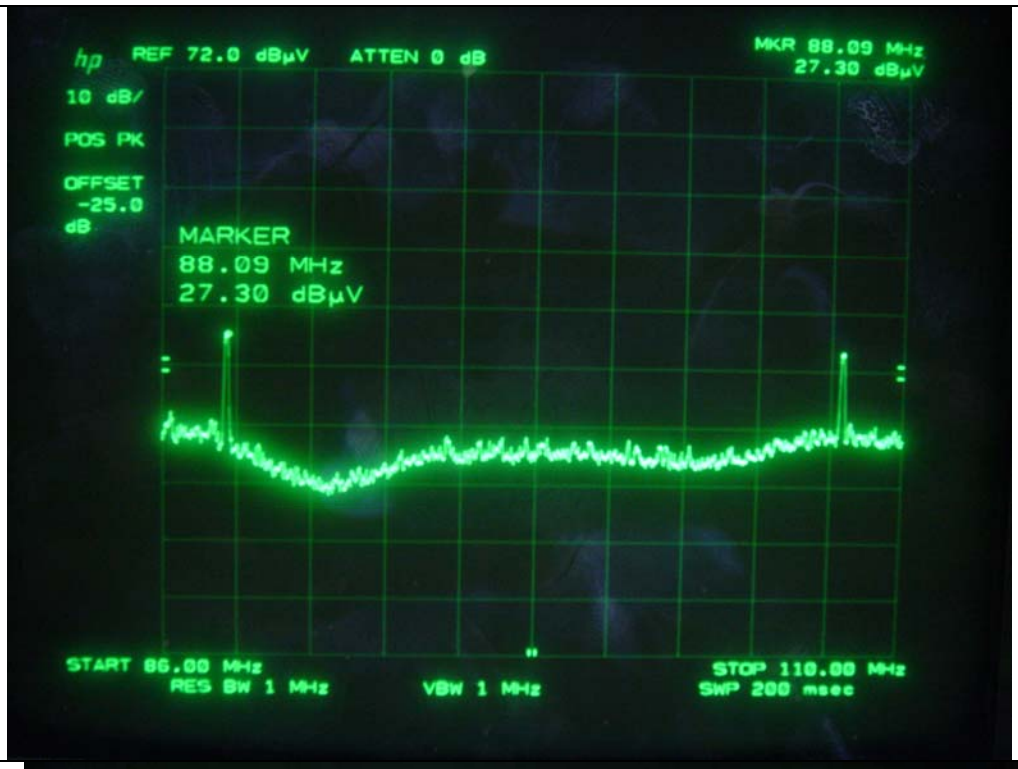

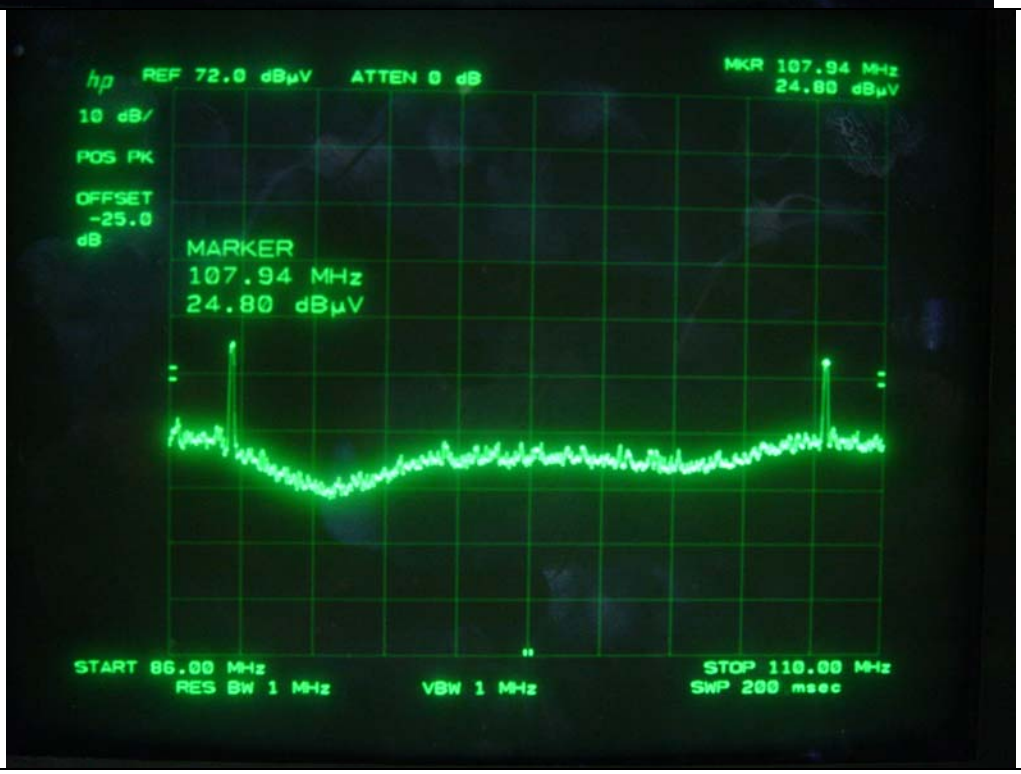

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6. FIELD STRENGTH CALCULATION

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)

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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	■

HEAD OFFICE : #505 SK APT. Factory 223-28, Sangdaewon 1 Dong, Jungwon-Gu, Seongnam-City, Kyunggi-Do, 462-705, Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
EMC Testing Dept : 307-51 Daessangryung-Ri, Chowol-Eup, Kwangju-City, Kyunggi-Do, 464-860, Korea. (TEL: +82-31-765-8289, FAX: +82-31-766-2904)