

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

Test Report No. : E077R-026

AGR No. : A07A-035

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 (FM Transmitter)

FCC ID. : O6ZSV4

Model Name : SV4

Serial number : N/A

Total page of Report : 16 pages (including this page)

Date of Incoming : June 26, 2007

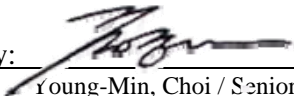
Date of Issuing : August 20, 2007

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.

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CONTENTS

	PAGE
1. VERIFICATION OF COMPLIANCE	3
2. GENERAL INFORMATION	4
2.1 PRODUCT DESCRIPTION	4
2.2 MODEL DIFFERENCES	4
2.3 RELATED SUBMITTAL(S) / GRANT(S)	4
2.4 TEST SYSTEM DETAILS	4
2.5 TEST METHODOLOGY	4
2.6 TEST FACILITY	4
3. SYSTEM TEST CONFIGURATION	5
3.1 JUSTIFICATION	5
3.2 MODE OF OPERATION DURING THE TEST	5
3.3 CABLE DESCRIPTION	5
3.4 EQUIPMENT MODIFICATIONS	5
3.5 CONFIGURATION OF TEST SYSTEM	5
3.6 ANTENNA REQUIREMENT	6
4. PRELIMINARY TEST	6
4.1 AC POWER LINE CONDUCTED EMISSION TEST	6
4.2 RADIATED EMISSION TEST	6
5. FINAL RESULT OF MEASUREMENT	7
5.1 RADIATED EMISSION TEST (WITHIN THE PERMITTED 200 KHZ BAND)	7
5.2 RADIATED EMISSION TEST (FOR HARMONIC FREQUENCIES)	8
5.3 RADIATED EMISSION TEST (OUTSIDE OF THE SPECIFIED 200 KHZ BAND)	9
5.3 BANDWIDTH OF THE OPERATING FREQUENCY	10
5.4 TUNING RANGE OF THE OPERATING FREQUENCY	13
6. FIELD STRENGTH CALCULATION	15
7. LIST OF TEST EQUIPMENT	16

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. Il-Kwon, Lee / Engineer
- TELEPHONE NO : +82-31-776-6321
- BRAND NAME : N/A
- FCC ID : O6ZSV4
- MODEL NO/NAME : SV4
- SERIAL NUMBER : N/A
- DATE : August 20, 2007

EQUIPMENT CLASS	DXX - Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	Satellite Radio Receiver (FM Transmitter)
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	Charter 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.

2. GENERAL INFORMATION

2.1 Product Description

The Humax Co., Ltd., Model SV4 (referred to as the EUT in this report) is Satellite Radio Receiver that has the FM modulator 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)	7.3728MHz
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 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
SV4	Humax Co., Ltd.	O6ZSV4	Satellite Radio Receiver (EUT)	-
DSG2000	frahofer	N/A	DARS Simulator	-
-	-	N/A	Car Battery	EUT
-	-	N/A	Satellite Antenna	EUT
-	-	N/A	External FM Antenna	EUT

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4: 2003. Radiated testing was 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 B/D	Humax Co., Ltd.	SV4 MAIN B/D REV:0.3	N/A

3.2 Mode of operation during the test

The Model, SV4 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 signals of DARS Simulator and the internal 1 kHz modulation were transmitted with maximum audio level and the worst emission and bandwidth were recorded in this report.

For setting maximum emission from the EUT, the configuration test setup was changed for getting maximum emission levels, but the worst test data were recorded in this report.

3.3 Cable Description

Ports Name	Shielded	Ferrite Bead	Metal Shell	Length (m)	Connected to
DC In	N	N	EUT END	1.2	Car Adaptor
Satellite Antenna In	N	N	BOTH END	1.5	GPS Antenna
Audio Out	N	N	EUT END	1.5	Line
FM Out	N	N	EUT END	1.5	External FM Antenna

3.4 Equipment Modifications

-. None

3.5 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 meters 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.

3.6 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:

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

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. 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)

Humidity Level : 43 % Temperature: 27 °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 – 6.28 dB at 98.1 MHz

EUT : Satellite Radio Receiver Date: August 20, 2007
 Operating Condition : Transmit the RF signal with maximum audio level.
 Distance : 3 Meter

Radiated Emission			Ant	Correction Factors		Total	Limit (dBuV/m)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)	Detect Mode	Pol.	Ant. (dBuV/m)	Cable (dB)	Amp. (dBuV/m)		
88.1	31.30	Peak	H	8.19	2.36	41.85	68.00	-26.15
	27.10	Average	H			37.65	48.00	-10.35
98.1	33.10	Peak	H	10.02	2.40	45.52	68.00	-22.48
	29.30	Average	H			41.72	48.00	-6.28
107.9	30.20	Peak	H	11.39	2.48	44.07	68.00	-23.93
	26.40	Average	H			40.27	48.00	-7.73



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5.2 Radiated Emission Test (For Harmonic Frequencies)

Humidity Level : 43 % Temperature: 27 °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 -9.02 dB at 196.2 MHz under peak mode

EUT : Satellite Radio Receiver Date: August 20, 2007
 Operating Condition : Transmit the RF signal with maximum audio level.
 Distance : 3 Meter

Radiated Emission			Ant	Correction Factors		Total	Limit (dBuV/m)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)	Detect Mode	Pol.	Ant. (dBuV/m)	Cable (dB)	Amp. (dBuV/m)		
176.2	14.30	Peak	H	15.64	2.90	32.84	43.52	-10.68
	11.00	Average	H			29.54	43.52	-13.98
196.2	15.00	Peak	H	16.29	3.21	34.50	43.52	-9.02
	11.50	Average	H			31.00	43.52	-12.52
215.8	13.10	Peak	H	17.01	3.53	33.64	43.52	-9.88
	9.80	Average	H			30.34	43.52	-13.18

It was not observed any emissions up to 10th harmonic frequencies of fundamental frequency except above test data.



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5.3 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 : 41 % Temperature: 24 °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 -3.97 dB at 544.00 MHz

EUT : Satellite Radio Receiver Date: June 20, 2007
 Operating Condition : Transmit the RF signal with maximum audio level.
 Frequency range : 30MHz – 2000MHz
 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)
70.01	26.50	V	5.70	1.80	34.00	40.00	-6.00
160.50	15.10	V	15.22	2.81	33.13	43.52	-10.39
244.00	17.30	H	17.51	3.37	38.18	46.02	-7.84
544.00	17.50	H	19.07	5.48	42.05	46.02	-3.97
700.00	11.50	H	22.27	6.40	40.17	46.02	-5.85
823.60	12.10	H	22.20	6.94	41.24	46.02	-4.78



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5.3 Bandwidth of the operating frequency

Humidity Level : 41 % Temperature: 24 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.239 (a)
 Result : PASSED

EUT : Satellite Radio Receiver Date: June 20, 2007
 Operating Condition : Transmit the RF signal with DARS Simulator and internal 1 kHz modulation signal,
 but 1 kHz signal was observed as the worst data.
 Minimum Resolution
 Bandwidth : 10 kHz
 Remark : Refer to test data in next page.

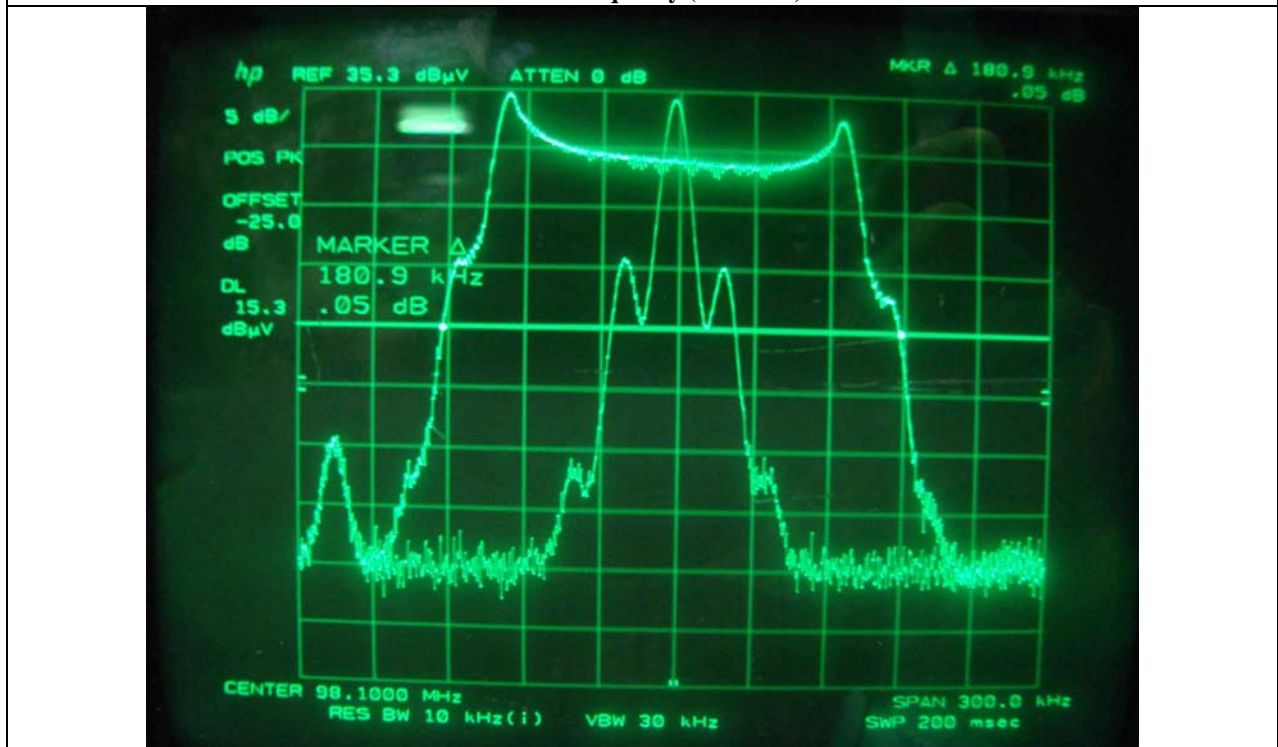
Frequency(MHz)	Measured Value(kHz)	Limit(kHz)	Margin(kHz)
88.1	179.1	200	-20.9
98.1	180.9	200	-19.1
107.9	181.8	200	-18.2



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Bottom Frequency (88.1MHz)



Middle Frequency (98.1MHz)



Top Frequency (107.9MHz)

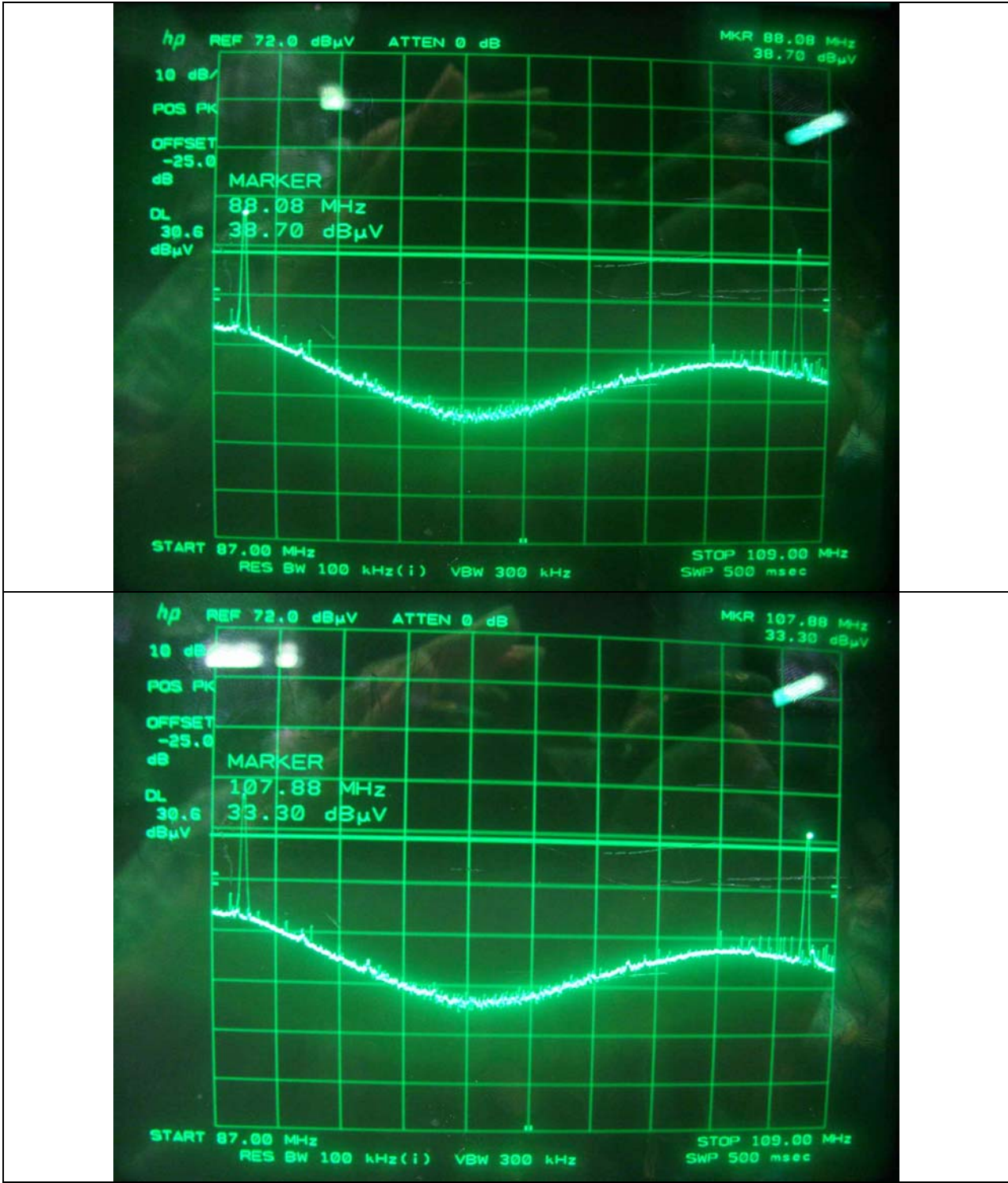
5.4 Tuning Range of the operating frequency

Humidity Level : 41 % Temperature: 21 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.239 (a)
Result : PASSED

EUT : Satellite Radio Receiver Date: June 21, 2007
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: Eung-Chan, Kim / Test Engineer



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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)

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/07	12MONTH	■
3.	Spectrum analyzer	HP	8566B	2516A01677	JUN/07	12MONTH	■
4.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	VULB9163 202	AUG/06	12MONTH	
5.	Biconical antenna	EMCO	3110	9003-1121	JUN/07	12MONTH	
		Schwarzbeck	VHA9103	91031852	FEB/07		■
6.	Log Periodic antenna	Schwarzbeck	9108-A(494)	62281001	FEB/07	12MONTH	
7.	LISN	EMCO	3825/2	9109-1867	JUN/07	12MONTH	
				9109-1869	JUN/07		
		Schwarzbeck	NSLK 8126	8126-404	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/07	12MONTH	■