

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR FCC CLASS B CERTIFICATION

Test Report No. : E076R-044

AGR No. : A073A-119

Applicant : HUMAX Co., Ltd.
Address : Humax Bldg., 212-1, Yubang-dong, Yongin-city, Gyunggi-do, 449-080, Korea

Manufacturer 1 : HUMAX Co., Ltd.
Address : Humax Bldg., 212-1, Yubang-dong, Yongin-city, Gyunggi-do, 449-080, Korea

Manufacturer 2 : DongGuan LiaoBu Anam Electronics Co., Ltd. (44372)
Address : Xin Cheng Management Ares, LiaoBu Town, 523426, DongGuan City, GuangDong
Province, People's Republic of China

Type of Equipment : DIREC TV Satellite Receiver

FCC ID : O6ZD12

Model Name : D12

Multiple Model Name : D12-500

Serial number : N/A

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

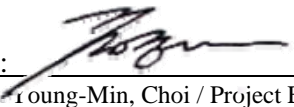
Date of Incoming : June 13, 2007


Date of Issuing : June 28, 2007

SUMMARY

The equipment complies with the requirements of *FCC CFR 47 PART 15 SUBPART B, Class B*.

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: 
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EMC Div.

Reviewed by: 
Y. K. Kwon / Director
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1. VERIFICATION OF COMPLIANCE

- APPLICANT : HUMAX Co., Ltd.
- ADDRESS : Humax Bldg., 212-1, Yubang-dong, Yongin-city, Gyunggi-do, 449-080, Korea
- CONTACT PERSON : Mr. Nam-Hoon, Baek / Engineer
- TELEPHONE NO : +82-31-776-6322
- FCC ID : O6ZD12
- MODEL NAME : D12
- BRAND NAME : DIRECTV
- SERIAL NUMBER : N/A
- DATE : June 28, 2007

DEVICE TYPE	TV INTERFACE DEVICE - Unintentional Radiator
E.U.T. DESCRIPTION	DIREC TV Satellite Receiver
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	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 15.101
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 D12 (referred to as the EUT in this report) is a DIREC TV Satellite Receiver. Product specification described herein was obtained from product data sheet or user’s manual.

CHASSIS TYPE	Metal
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz)	60 MHz and 10.111 MHz
POWER REQUIREMENT	AC 100 - 240V, 50/60Hz, 22W
NUMBER OF LAYERS	1 Layer: SMPS and Front Board 2 Layers: Main Board
EXTERNAL TERMINALS	Satellite In, Out to TV, Off-Air In, S-Video, Video Out(2), Audio Out(L/R)(2), USB, Phone Jack

Remark: The USB port shall be use in future according to the manufacturer’s specification.

2.2 Model Differences:

The difference(s) compared to the EUT is as follows:

	Model	Model Differences
Basic Model	D12	-
Multiple Model	D12-500	Only type designation according to buyer’s request.

2.3 Related Submittal(s) / Grant(s)

-. Original submittal only

2.4 Test System Details

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

Model	Manufacturer	FCC ID	Description	Connected to
D12	HUMAX Co., Ltd.	O6ZD12	DIREC TV Satellite Receiver (EUT)	-
SAM-14MV	KTV Global	N/A	Color Monitor	EUT
DM240	Redyne Comstream Corp.	N/A	Digital Video Modulator	EUT
BSG-200	N/A	N/A	Steam Generator	Modulator

2.5 Test Methodology

The measurement for radiated emission, line conducted emission, output signal level, output terminal conducted spurious emission and transfer switch isolation tests were performed in accordance with the procedures described 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)

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FCC-003 (Rev.0)

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(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)

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	HUMAX Co., Ltd.	DINO MAIN B/D REV0.5	N/A
Front Board	HUMAX Co., Ltd.	DINO FRONT B/D REV0.22	N/A
SMPS Board	DONG YANG E&P	PW611D	N/A

3.2 Mode of operation during the test

According to the requirements in Subpart B of Part 15, the measurement is made at each function of the EUT being connected with appropriate cables, signal generator and peripherals for termination.

This model D12 has video/audio output terminals in RCA-type plugs, Satellite antenna input, TV antenna input and RF output terminal. Therefore, every measurement was investigated in the operation modes.

3.3 Cable Description

Ports Name	Shielded	Ferrite Bead	Metal Shell	Length (m)	Connected to
Satellite In	Y	N	BOTH END	10	Satellite ANT
Out to TV	Y	N	EUT END	1.5	-
Off-Air In	Y	N	EUT END	1.5	-
S-Video	Y	N	BOTH END	1.5	Color Monitor
Video Out	N	N	BOTH END	2.0	Color Monitor
Audio Out	N	N	BOTH END	2.0	Color Monitor
USB	Y	N	EUT END	1.5	-
Phone Jack	N	N	EUT END	5	-

3.4 Equipment Modifications

-. None

3.5 Configuration of Test System

3.5.1 Line Conducted Test

The EUT was connected to LISN, all supporting equipment were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.4: 2003 7.2.3 to determine the worse operating conditions.

3.5.2 Radiated Emission Test

Preliminary radiated emission test was conducted using the procedure in ANSI C63.4: 2003 8.3.1.1 to determine the worse operating conditions. Final radiated emission test was conducted at 3 meters open area test site.

3.5.3 Output Signal Level Test

The output voltage of video carrier frequency at the RF-output terminal of the EUT was measured at 3 and 4 channel connecting directly to a spectrum analyzer with 50ohm input impedance via 75-to-50ohm matching pad. Indicated voltage on screen of measuring instrument was converted to the voltage of 75ohm system.

Data conversion method is as follows.

$$V_{75}[\text{uV}] = 10^{(V_r + CF)/20}[\text{uV}]$$

here, V_{75} : Voltage at the RF-out terminal of 75ohm in uV,
 V_r : Voltage read at analyzer with 50ohm input-impedance in dBuV,
CF : Conversion Factor of the matching pad in dB.

3.5.4 Output Terminal Conducted Spurious Emission test

Any other spectrum at RF-output terminal appearing on frequencies removed by more than 4.6 MHz below or 7.4 MHz above the video carrier frequency of EUT was searched at 3 and 4 channel.

Data conversion method is as follows.

$$V_{75}[\text{uV}] = 10^{(V_r + CF + AT)/20}[\text{uV}]$$

here, V_{75} : Voltage at the RF-out terminal of 75ohm in uV,
 V_r : Voltage read at analyzer with 50ohm input-impedance in dBuV,
CF : Conversion Factor of the matching pad in dB,
AT : Attenuation of attenuator in dB.

3.5.5 Transfer Switch Isolation Test

As a transfer switch was equipped with EUT as an antenna-in, measurement of isolation were made at RF-input terminal with rated input impedance.

The maximum voltage of video carrier frequency of the EUT at the antenna input (RF-in) terminal of the switch was measured for both channels.

Data conversion method is as follows.

$$V_{75}[\text{uV}] = 10^{(V_r + CF - PG + AT)/20}[\text{uV}]$$

here, V_{75} : Voltage at the RF-out terminal of 75ohm in uV,
 V_r : Voltage read at analyzer with 50ohm input-impedance in dBuV,
 CF : Conversion Factor of the matching pad in dB,
 PG : Gain of pre-amplifier in dB,
 AT: Attenuation of attenuator in dB.

4. PRELIMINARY TEST

4.1 AC Power line Conducted Emission Test

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
CH. 3	X
CH. 4	

4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated.

Operation Mode	The Worse operating condition (Please check one only)
CH. 3	X
CH. 4	

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 Conducted Emission Test

Humidity Level : 44 % Temperature: 21 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.107 (a)
Type of Test : CLASS B
Result : PASSED BY -9.63 dB at 0.41 MHz under average mode

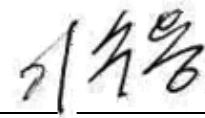
EUT : DIREC TV Satellite Receiver Date: June 13, 2007
Operating Condition : CH. 3
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

Frequency (MHz)	Line	Peak (dBuV)		Margin (dB)
		Emission level	Q.P Limits	
0.41	H	44.96	57.65	-12.69
0.81	N	42.67	56.00	-13.33
3.45	N	44.48	56.00	-11.52
7.97	N	46.69	60.00	-13.31
8.03	H	46.50	60.00	-13.50
24.85	H	46.76	60.00	-13.24
Frequency (MHz)	Line	Average (dBuV)		Margin (dB)
		Emission level	Limits	
0.41	H	38.02	47.65	-9.63
3.45	N	31.96	46.00	-14.04
7.97	N	29.13	50.00	-20.87
24.85	H	26.99	50.00	-23.01

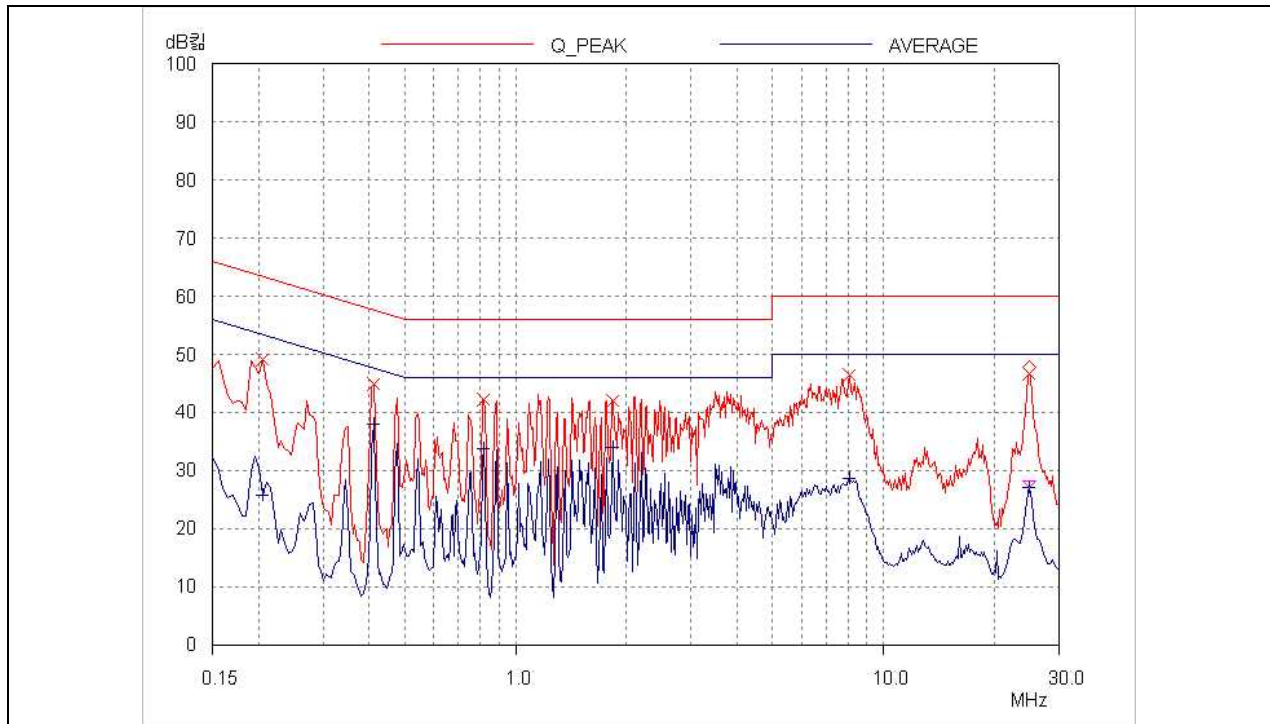
Line Conducted Emission Tabulated Data

Remark : "H": Hot Line, "N": Neutral line

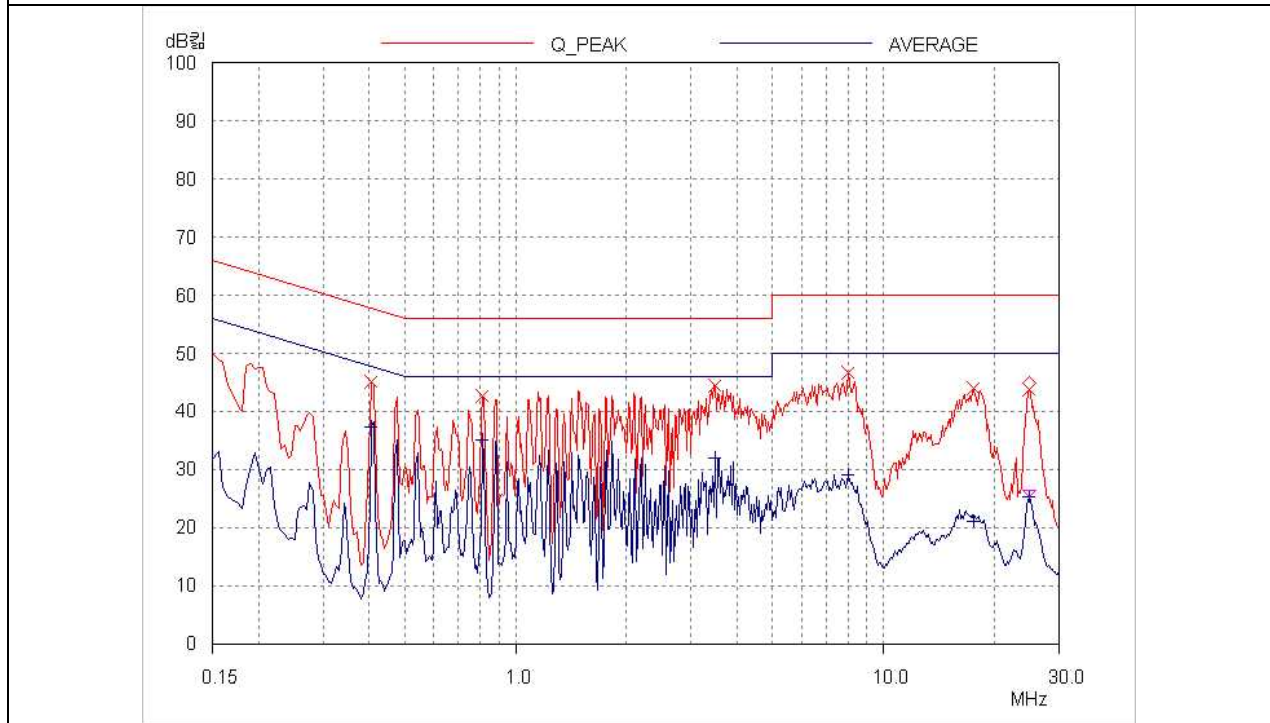
See next page for an overview sweep performed with peak and average detector.



Tested by: Sue-Yong, Lee / Test Engineer



HOT LINE



NEUTRAL LINE

5.2 Radiated Emission Test

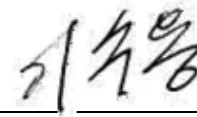
The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical.

Humidity Level : 32 % Temperature : 22 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART B, Section 15.109 (a)
 Type of Test : TV INTERFACE DEVICE
 Result : PASSED BY -4.92 dB at 663.56.76 MHz

EUT : DIREC TV Satellite Receiver Date: June 13, 2007
 Operating Condition : CH. 3
 Frequency range : 30MHz – 1000MHz
 Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)
 Distance : 3 Meter

Frequency (MHz)	Reading (dBuV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBuV/m)	Limits (dBuV/m)	Margin (dB)
90.2	22.10	Peak	V	8.59	2.40	33.09	43.52	-10.43
122.1	18.40	Peak	V	13.14	2.68	34.22	43.52	-9.30
216	12.20	Peak	H	17.02	3.53	32.75	43.52	-10.77
297	16.46	Peak	H	19.11	3.65	39.22	46.02	-6.80
663.56	13.45	Peak	V	21.47	6.18	41.10	46.02	-4.92
829.45	10.37	Peak	V	22.43	6.98	39.78	46.02	-6.24

Radiated Emission Tabulated Data



Tested by: Sue-Yong, Lee / Test Engineer

This is the additional radiated emission test due to the local oscillator of the satellite receiver part in the EUT.

The fundamental and 2nd harmonic frequencies of the local oscillator of the satellite receiver part was tested on a near top, middle and bottom tuning frequencies of the EUT according to section 15.31(m) and 15.33(b)(3).

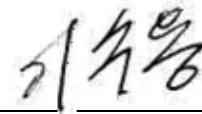
Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Freq. to which tuned (MHz)	OSC. Freq (MHz)	Ampl. (dBuV)	Pol.	Ant. (dBuV)	Cable (dB)	Ampl (dBuV/m)	Limit (dBuV/m)	Margin (dB)
950	950	-	H/V	-	-	-	46.02	-
955	955	-	H/V	-	-	-	46.02	-
960	960	-	H/V	-	-	-	46.02	-

*Harmonics RF Radiation

Radiated Emissions				Ant	Correction Factors		Total	FCC Limit	
Freq. to which tuned (MHz)	Ham.	Freq. (MHz)	Ampl. (dBuV)	Pol.	Ant. (dBuV)	Cable (dB)	Ampl (dBuV/m)	Limit (dBuV/m)	Margin (dB)
950	2	1900	-	H/V	-	-	-	46.02	-
955	2	1910	-	H/V	-	-	-	46.02	-
960	2	1920	-	H/V	-	-	-	46.02	-

Remark: There was no found any emission during the above test.

IF = 479.5MHz.



Tested by: Sue-Yong, Lee / Test Engineer

5.3. Antenna Power conduction Data

This test is the power conduction test at the antenna terminal due to the local oscillator of the satellite receiver part in the EUT.

The fundamental and 2nd harmonic frequencies of the local oscillator were tested on a near top, middle and bottom tuned frequencies of the EUT according to section 15.111(a), 15.31(m) and 15.33(b)(3).

The EUT antenna terminal connected to a resistive termination equal to the impedance specified or employed for the antenna, the power at the antenna terminal at any frequency within the range of measurements specified in section 15.33 shall not exceed 2.0 nanowatts. (2.0 nW = 50.1dBuV)

Operating Condition : Tuning the selected frequency

Detector : Span : 10 MHz SWP : 2 sec
RBW : 100 kHz VBW : 300 kHz

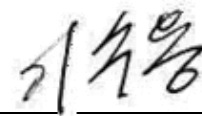
Freq. to which tuned (MHz)	OSC. Freq (MHz)	Measured Value (dBuV)	Imp. Mat. +Ca. Loss (dB)	Total (dBuV)	Limit (dBuV)	Margin (dBuV)
950	950	13.9	+6.0	19.9	50.10	-30.2
955	955	14.1	+6.0	20.1	50.10	-30.0
960	960	14.1	+6.0	20.1	50.10	-30.0

*Harmonics RF Radiation

Freq. to which tuned (MHz)	Har.	OSC. Freq (MHz)	Measured Value (dBuV)	Imp. Mat. +Ca. Loss (dB)	Total (dBuV)	Limit (dBuV)	Margin (dBuV)
950	2	1900	-	+6.0	-	50.10	-
955	2	1910	-	+6.0	-	50.10	-
960	2	1920	-	+6.0	-	50.10	-

Remark: There was no found any emission during the above test.

IF = 479.5MHz.



Tested by: Sue-Yong, Lee / Test Engineer

5.4 Output Terminal Signal Level Test

The following table shows that the all modes of operation and worst-case emissions were investigated

Humidity Level : 38 %

Temperature : 19 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART B (Section 15.115)

EUT : DIREC TV Satellite Receiver

Date: June 23, 2007

Detector : Span : 10MHz SWP : 2 sec
RBW : 100kHz VBW : 300kHz

Output Impedance of RF-Output Terminal: 75ohm

- . Video signal

CH	Freq.(MHz)	Reading(dBuV)	M/P Loss(dB)	Signal Level(uV)	Limit(uV)	Margin(dB)
3	61.25	56.8	+6.0	1380.38	3000	-6.74
4	67.27	58.9	+6.0	1757.92	3000	-4.64

- . Audio signal

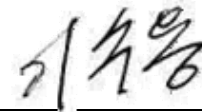
CH	Freq.(MHz)	Reading(dBuV)	M/P Loss(dB)	Signal Level(uV)	Limit(uV)	Margin(dB)
3	56.70	45.0	+6.0	354.81	671	-5.53
	65.79	45.9	+6.0	393.55	671	-4.63
4	62.73	46.2	+6.0	407.38	671	-4.33
	71.82	45.7	+6.0	384.59	671	-4.83

MP = Impedance Matching Pad

*Sample Calculation at 61.18MHz = $10^{((56.8+6.0)/20)}$ = 1380.38uV

*Margin [dB] = 20 log (R/L) where, R : Signal Level, [uV] or [uV/m],

L : Corresponding Limit, [uV] or [uV/m].



Tested by: Sue-Yong, Lee / Test Engineer

5.5 Output Terminal Conducted Spurious Emissions Test

The following table shows that frequency range of 30MHz to 1000MHz removed by more than 4.6 MHz below or 7.4 MHz above the video carrier frequency of EUT was investigated at each channel.

Humidity Level : 38 % Temperature : 19 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART B (Section 15.115)

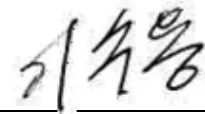
EUT : DIREC TV Satellite Receiver Date: June 23, 2007
Detector : Span : 10MHz SWP : 2 sec
RBW : 100kHz VBW : 300kHz

Output Impedance of RF-Output Terminal: 75ohm

CH.	Freq. (MHz)	Reading (dBuV)	M/P Loss (dB)	Output Level (uV)	Limit (uV)	Margin (dB)
3	330.7	29.2	6.0	57.54	95	-4.35
	344.3	26.8		43.65		-6.75
	405.4	30.2		64.57		-3.35
	830.2	29.4		58.88		-4.15
4	163.9	28.3	6.0	51.88	95	-5.25
	330.7	30.1		63.83		-3.45
	412.2	29.5		59.57		-4.05
	830.2	28.9		55.59		-4.65

* Sample Calculation at 108.6MHz = $10^{[(29.20 + 6.0)/20]} = 57.54\mu V$

*Margin [dB] = 20 log (R/L) where, R : Output Level, [uV] or [uV/m],
L : Corresponding Limit, [uV] or [uV/m].



Tested by: Sue-Yong, Lee / Test Engineer

5.6 Transfer Switch Isolation Test

The following table shows that the maximum voltage of video carrier frequency of the EUT at the antenna input (RF-in) terminal of the switch was measured for both channels.

Humidity Level : 38 % Temperature : 19 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART B (Section 15.115)

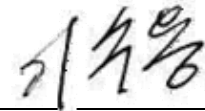
EUT : DIREC TV Satellite Receiver Date: June 23, 2007
Detector : Span : 1 MHz SWP : 30 msec
RBW : 10 kHz VBW : 30 kHz

Output Impedance of RF-Output Terminal: 75ohm

CH.	Freq. (MHz)	Meter Reading (dBuV)	M/P Loss (dB)	Preamp Gain(dB)	Attn. (dB)	Signal Level (uV)	Limit (uV)	Margin (dB)
“There was no found any emission during the above test”								

Note : To clarify the emissions emanated from RF output terminal the EUT, RF pre-amplifier was utilized.

The gain of pre-amplifier at each frequency measured from the EUT was obtained after sufficient warm-up for stabilization of gain.



Tested by: Sue-Yong, Lee / 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/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/07		■
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	■