ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR FCC CLASS B CERTIFICATION

Test report file number	**: E034R-020**
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	**: Digital Satellite Set-Top Box**
FCC ID.	**: O6ZF2-1003**
Model Name	**: F2-1003**
Multiple Model Name	**: N/A**
Serial number	**: N/A**
Total page of Report	**: 18 pages (including this page)**
Date of Incoming	**: March 05, 2003**
Date of Issuing	**: April 03, 2003**

SUMMARY

The equipment complies with the requirements of **FCC CFR 47 PART 15 SUBPART B, SECTION 15.101**. This test report contains only the result 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 Testing Dept : 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Kun, 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. Jung-Jae, Choi/ Engineering Manager
-. TELEPHONE NO : +82-31-600-6362
-. FCC ID : O6ZF2-1003
-. MODEL NO/NAME : F2-1003
-. SERIAL NUMBER : N/A
-. DATE : April 03, 2003

DEVICE TYPE	TV INTERFACE DEVICE - UNINTENTIONAL RADIATOR
E.U.T. DESCRIPTION	Digital Satellite Set-Top Box
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	MP-3, ANSI C63.4/1992
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

-. This device has shown compliance with the conducted emissions limits in 15.107 adopted under FCC 02-107 (ET Docket 98-80). The device may be marketed after July 11, 2005 affected by the 15.37(j) transition provisions.

-. 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.

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2. GENERAL INFORMATION

2.1 Product Description

The Humax Co., Ltd., Model F2-1003 (referred to as the EUT in this report) is a Digital Satellite Set-Top Box. 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)	27MHz, 4MHz (CPU B'D)
POWER REQUIREMENT	AC90-250V, 50/60Hz, MAX. 23W
NUMBER OF LAYERS	2 Layers
TUNER Type NO. / MFR	BS2S7HZ1219 / SHARP
RF MODULATOR Type NO. / MFR	RMVP13450WD / SAMSUNG
TYPE OF ANTENNA	75 Ohm, F-type connector
INPUT FREQUENCY	950 ~ 2150 MHz
EXTERNAL TERMINALS	LNB-Input, RCA Jack (Audio out (L/R), Video out), RF (TV Out/ ANT In), RS-232C

Model Differences:

The difference(s) compared to the EUT is as follows: none

2.2 Related Submittal(s) / Grant(s)

Original submittal only

2.3 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
F2-1003	Humax Co., Ltd.	O6ZF2-1003	Digital Satellite Set-Top Box (EUT)	-
CTV-1010XK	Korea Electronics	N/A	TELEVISION	EUT
N/A	-	-	Antenna for TV	EUT

2.4 Test Methodology

The measurement for Radiated Emission, Line Conducted Emission, Output signal levels and Output Terminal Conducted Spurious Emission were performed in accordance with the procedures described in MP-3 and ANSI C63.4/1992. Radiated testing was performed at a distance of 3 meters from EUT to the antenna.

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2.5 Test Facility

The open area test site and conducted measurement facilities are located on at 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Kun, Kyunggi-Do 464-080 Korea. Description details of test facilities were submitted to the Commission on January 18, 2002. (Registration Number: 92819)

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
CPU Board	Humax Co., Ltd.	F2-MICE/S-ME	N/A
Power Board	Dong Yang Instrument	PW208D	N/A

3.2 EUT exercise Software

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 and peripherals.

This model F2-1003 has video/audio output terminals in RCA-type plugs, LNB antenna input, TV antenna input and RF output terminal. Therefore, every measurement was investigated in the operation modes. The LNB input of the EUT was connected to a signal via Asia satellite system directly.

3.3 Cable Description

	Power Cord Shielded (Y/N)	I/O cable Shielded (Y/N)	Length (M)
Digital Satellite Set-Top Box (EUT)	N	Y	1.5(P), 10.0(D)
TELEVISION	N	N	1.5(P), 1.2(D)
Antenna for TV	N/A	N	0.8(D)

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

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3.4 Noise Suppression Parts on Cable

	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
Digital Satellite Set-Top Box (EUT)	N	N/A	-	-
TELEVISION	N	N/A	Y	BOTH END
Antenna for TV	N	N/A	Y	EUT END

3.5 Equipment Modifications

To achieve compliance to FCC part 15 rules, the following change(s) was made by ONETECH Corp. during compliance testing:

"There was no Modified items during EMI test"

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3.6 Configuration of Test System

3.6.1 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 C63.4/1992 7.2.3 to determine the worse operating conditions.

3.6.2 Radiated Emission Test

Preliminary radiated emission test were conducted using the procedure in ANSI C63.4/1992 8.3.1.1 to determine the worse operating conditions. Final radiated emission test were conducted at 3-meter open area test site.

3.6.3 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.

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

here, V_{75} : Voltage at the RF-out terminal of 75ohm in uV,

Vr : Voltage read at analyzer with 50ohm input-impedance in dBuV,

CF : Conversion Factor of the matching pad in dB.

3.6.4 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.

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

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.

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3.6.5 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.

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

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	

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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.

5.1 Conducted Emission Test

Humidity Level : 49 % Temperature : 19 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART B, Section 15.107 (a)

Type of Test : TV INTERFACE DEVICE

Result : PASSED BY –4.58 dB at 5.28 MHz at average mode

EUT : Digital Satellite Set-Top Box Date: March 05, 2003

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	
0.53	H	47.88	56.00	-8.12
1.72	H	45.56	56.00	-10.44
2.06	N	45.54	56.00	-10.46
4.58	H	49.22	56.00	-6.78
4.85	N	50.03	56.00	-5.97
15.14	N	49.10	56.00	-10.90
Frequency (MHz)	**Line**	**Average (dBuV)**		**Margin (dB)**
		Emission level	**Limits**	
0.53	H	38.33	46.00	-7.67
1.72	H	38.18	46.00	-7.82
2.06	N	38.18	46.00	-7.82
4.58	H	40.72	46.00	-5.28
4.85	N	40.63	46.00	-5.37
15.14	N	42.37	46.00	-7.63

Line Conducted Emission Tabulated Data

Remark : "H": Hot Line, "N": Neutral line, "P": Peak detect

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

Tested by: Sue-Yong, Lee / Test Engineer

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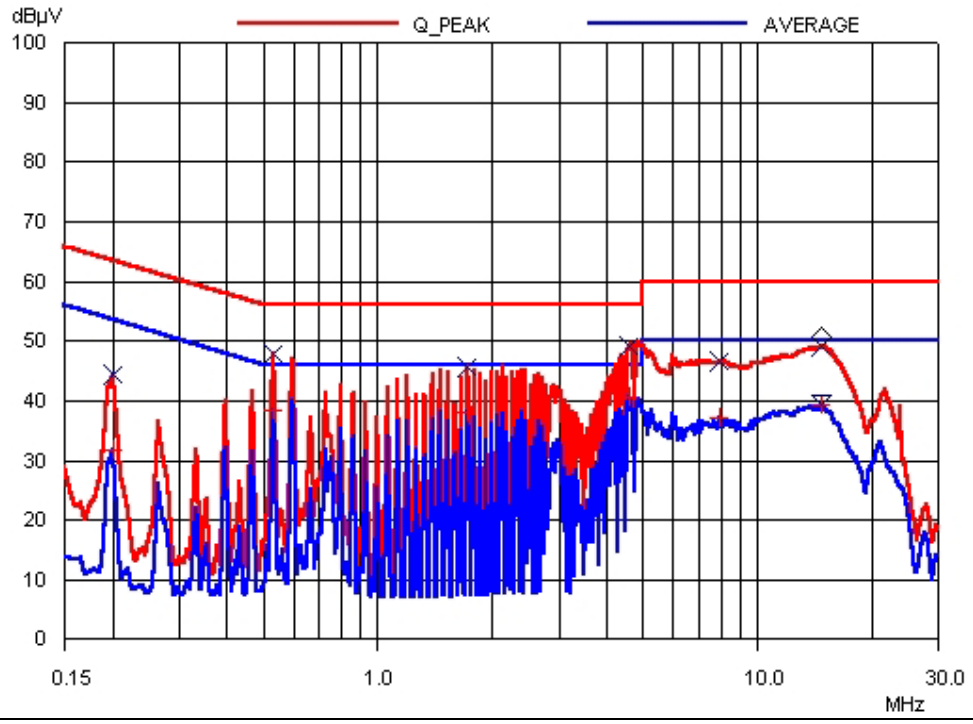
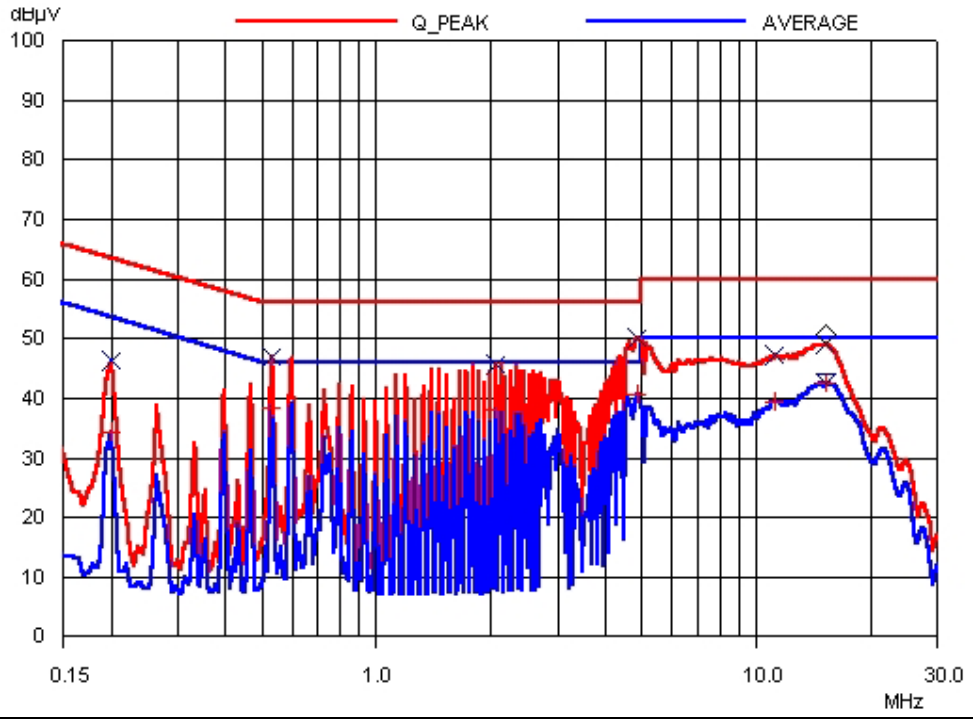


HOT LINE



NEUTRAL LINE

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5.2 Radiated Emission Test

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

Humidity Level : 51 % Temperature : 19 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART B, Section 15.109 (a)
Type of Test : TV INTERFACE DEVICE
Result : PASSED BY –4.94 dB at 789.75 MHz

EUT : Digital Satellite Set-Top Box Date: March 11, 2003
Operating Condition : CH. 3
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)
Distance : 3 Meter

Radiated Emission		Ant	Correction Factors		Total	FCC CLASS B	
Freq. (MHz)	Amp. (dBuV)	Pol.	Ant. (dBuV/m)	Cable (dB)	Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
81.86	14.60	H	6.89	1.04	22.53	40.00	-17.47
94.31	18.20	V	10.12	1.13	29.45	43.50	-14.05
97.82	19.90	V	11.45	1.14	32.49	43.50	-11.01
117.02	11.20	V	13.29	1.22	25.71	43.50	-17.79
120.62	16.30	V	13.44	1.23	30.97	43.50	-12.53
256.60	13.10	V	12.30	1.85	27.25	46.00	-18.75
273.40	11.10	H	12.85	1.89	25.84	46.00	-20.16
365.00	19.20	H	14.54	2.35	36.09	46.00	-9.91
384.60	12.00	H	14.84	2.41	29.25	46.00	-16.75
728.98	16.22	V	20.77	3.46	40.45	46.00	-5.55
789.75	16.31	V	21.08	3.67	41.06	46.00	-4.94

Radiated Emission Tabulated Data

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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	1429.5	-	H	-	-	-	54.00	-
955	1434.5	-	H	-	-	-	54.00	-
960	1439.4	-	H	-	-	-	54.00	-

*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	2859.0	-	H	-	-	-	54.00	-
955	2	2869.0	-	H	-	-	-	54.00	-
960	2	2878.8	-	H	-	-	-	54.00	-

Remark: There was no found any emission during the above test.
IF = 479.5MHz.

Tested by: Sue-Yong, Lee / Test Engineer

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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

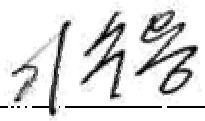
Freq. to which tuned (MHz)	OSC. Freq (MHz)	Measured Value (dBuV)	Imp. Mat. +Ca. Loss (dB)	Total (dBuV)	Limit (dBuV)	Margin (dBuV)
950	1429.5	-	6.0	-	50.10	-
955	1434.5	-	6.0	-	50.10	-
960	1439.4	-	6.0	-	50.10	-

*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	2859.0	-	6.0	-	50.10	-
955	2	2869.0	-	6.0	-	50.10	-
960	2	2878.8	-	6.0	-	50.10	-

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

IF = 479.5MHz.



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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 : 53 % Temperature : 18 °C

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

EUT : DIGITAL SATELLITE RECEIVER Date: March 11, 2003

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	60.3	6.0	2065.4	3000	-3.24
4	67.20	60.9	6.0	2213.1	3000	-2.64

-. Audio signal

CH	Freq.(MHz)	Reading(dBuV)	M/P Loss(dB)	Signal Level(uV)	Limit(uV)	Margin(dB)
3	65.91	44.1	6.0	319.9	671	-6.43
4	71.91	44.7	6.0	342.8	671	-5.83

MP = Impedance Matching Pad

*Sample Calculation at 61.25MHz = $10^{[(60.3+6.0)/20]}$ = 2065.4uV

*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

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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 : 53 % Temperature : 18 °C

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

EUT : DIGITAL SATELLITE RECEIVER Date: March 11, 2003

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	47.75	13.10	6.0	9.02	95	-20.45
	122.50	18.00		15.85		-15.55
	183.72	12.00		7.94		-21.55
	245.02	9.40		5.89		-24.15
	306.24	9.20		5.75		-24.35
	367.49	10.10		6.38		-23.45
	428.72	7.70		4.84		-25.85
	489.92	7.30		4.62		-26.25
4	134.48	12.40	6.0	8.32	95	-21.15
	201.75	21.60		23.99		-11.95
	269.01	17.90		15.67		-15.65
	336.25	16.80		13.80		-16.75
	403.45	14.30		10.35		-19.25
	470.72	14.00		10.00		-19.55
	807.02	9.60		6.03		-23.95

* Sample Calculation at 122.2MHz = $10^{[(7.9 + 6.0)/20]}$ = 4.95uV

*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

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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 : 53 % Temperature : 18 °C

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

EUT : DIGITAL SATELLITE RECEIVER Date: March 11, 2003

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

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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	APR/02	12MONTH	■
2.	Test receiver	R/S	ESHS 10	834467/007	NOV/02	12MONTH	■
3.	Spectrum analyzer	HP	8566B	3407A08547	AUG/02	12MONTH	■
4.	Spectrum analyzer	HP	8568B	3109A05456	APR/02	12MONTH	■
5.	RF preselector	HP	85685A	3107A01264	APR/02	12MONTH	■
6.	Quasi-Peak Adapter	HP	85650A	3107A01542	APR/02	12MONTH	■
7.	Matching Pad	TME	ZT-130	9F 954	N/A	N/A	■
8.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	VULB9163 166	FEB/03	12MONTH	■
9.	Biconical antenna	EMCO	3104C	9109-4441 9109-4443 9109-4444	APR/02	12MONTH	■
10.	Log Periodic antenna	EMCO	3146	9109-3213 9109-3214 9109-3217	APR/02	12MONTH	■
11.	LISN	EMCO	3825/2	9109-1867 9109-1869	AUG/02	12MONTH	■
12.	Position Controller	EMCO	1090	9107-1038	N/A	N/A	■
13.	Turn Table	EMCO	1080-1.21	9109-1576	N/A	N/A	■
14.	Antenna Master	EMCO	1070-1	9109-1624	N/A	N/A	■

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