FCC MEASUREMENT REPORT

FCC PART 15 SUBPART B -UNINTENTIONAL RADIATORS
TV INTERFACE DEVICE CERTIFICATION

MEASUREMENT / TECHNICAL REPORT
TEST REPORT #: 99JAC006.FCC
Number of pages in Test Report : 22

On the
Model : DTR5000N
TV INTERFACE DEVICE

FCC ID : ON6DTR5000N

For
TELEMANN CO.,LTD.
6F Dongsin Bldg. 543, Dogok-dong, Kangnam-ku,
Seoul, Korea.

Jan 27, 2000

Prepared by:

JungAng EMC Ltd.
109-2, yepyung-ri, kumsa-myun, youju-kun,
Kyungki-do, Korea.
TEL : 82-347-764-0125
FAX : 82-347-764-0126

Prepared by :
Jae Ho Choi
Director /JAEMC

Approved by :
Tea Hyun Nam
President /JAEMC

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SCOPE

Scope - Measurement and determination of electromagnetic emission (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulation of the Federal Communication Commission under FCC Part 15 Certification.

Responsible Party	TELEMANN CO.,LTD
Contact Person	Sea Jin Han Tel No. : 82-2-579-9275 Fax No. : 82-2-579-2414
Manufacturer	TELEMANN CO.,LTD. 6F Dongsin Bldg. 543, Dogok-dong, Kangnam-ku, Seoul, Korea.

- Trade/model DTR5000N
- EUT Type TV interface device
- Classification FCC Class B
- Rule Part(s) FCC Part 15 & Part 2
  Test Procedure(s) ANSI C63.4(1992)
  Dates of Test Jan 27, 2000
- Place of Tests JungAang EMC Ltd.
- Test report No 99JAC006.FCC

* NOTE: Please refer to the duties and responsibilities of the Responsible Party attached.

INTRODUCTION

The measurement procedure described in American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment In the Range of 9KHz to 40GHz (ANSI C63.4-1992) was used in determining radiated and conducted emissions emanating from **TELEMANN CO.,LTD** Model:**DTR5000N**.

These measurement tests were conducted at **JungAng EMC LTD.**
The site address is 109-2, Yepyung-ri, Kumsa-myun, Youju-kun, Kyungki-do, Korea.
The area of **JungAng EMC LTD** test site is located in a mountain area
It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quite and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.
The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.4 on October 19, 1992.

PRODUCT INFORMATION

Equipment Description :

The Equipment Under Test (EUT)is the **TELEMANN CO.,LTD** Model : **DTR5000N**
TV Interface Device.

The **DTR5000N** is a high-performance IRD(Integrated Receiver Decoder). **DTR5000N** is fully Compliant with the MPEQ2 based DVB transmission standards for in-home reception of satellite Digital broadcast services such as digital TVs, radio channels and data.

The DTR5000N will support a great variety of data broadcast services such as the download of software, Internet services, and delivery of audio and/or video signals.
The STB then feeds this data directly to a computer of Server via a 10base T(optional 100base t)LAN connection.

EUT SPECIFICATION

- Fully compliant with MPEQ2 based DVB transmission standards
- Fully Universal Tuner with 950-2150MHz
- QPSK Demodulator
- Extended Symbol Rate(2-45MS/s)
- SCPC and MCPC, C-/Ku-bands
- Automatic Detection of Video Polarity
- Automatic Detection of Forward Error Correction
- Automatic Channel Surfing Function
- Automatic NTSC/PAL Detection
- Simple Video Converter(NTSC ↔ PAL)
- Lip-sync Error Correction Function.
- Wide PLL Modulator(CH21-69,PAL-B,G,I,D,K)
- Useful High Speed System Port for System Diagnostic and Upgarde
- DiSEqC1.0 LNB Control Software
- TV/VCR scart connectors
- Smart Card interface for CAS.
- Simultaneous decoding of up to Max. 32PIDs with the exception of A/V
- User-friendly defined On-screen-display(OSD)
- Ethernet(10Base T) or optional fast Ethernet(100Base T) output port for connection to LAN.

EMI suppression device(s) added and/or modified during testing:

Not

DESCRIPTION OF TESTS

Conducted Emissions

The line-conducted facility is located inside a 3.0×4.0×2.5 shielded enclosure. It is manufactured by Daeil EMC Engineering.
The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-6.
A 1m×1.5m×0.8m wooden table is placed 0.4m away from the vertical wall and 1.5m away from the side wall of the shielded room.
PMM L3-25 and KWE-242C Line-Impedance Stabilization Networks(LISNs) are bonded to the shielded room. The EUT is powered from the PMM LISN and the support equipment is powered from the KEW LISN. Power to the LISNs are filtered by a high-current, high-insertion loss Sangshin power line filters(100dB 14KHz-10GHz).
The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure. All electrical cables are shielded by braided tinned copper zipper tubing with inner diameter of 1/2". If the EUT is a DC-powered device, power will be derived from the source power it normally will be connected to the PMM LISN.
All interconnecting cables more than 1 meter were shortened by non-inductive bundling(serpentine fashion) to a 1-metre length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their operating condition.
The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.
The receiver was scanned from 450KHz to 30MHz with 20msec sweep time.
The frequency producing the maximum level was reexamined using EMI/Field Intensity Meter and Quasi-Peak adapter. The detector function was set to CISPR Quasi-Peak adapter. The bandwidth of the receiver was set to 9KHz.
The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.
Each emission was maximized by; switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; whichever determined the worst-case emission.

Radiated Emissions

Preliminary measurements were made indoors at 1 meter using broadband antennas, broadband

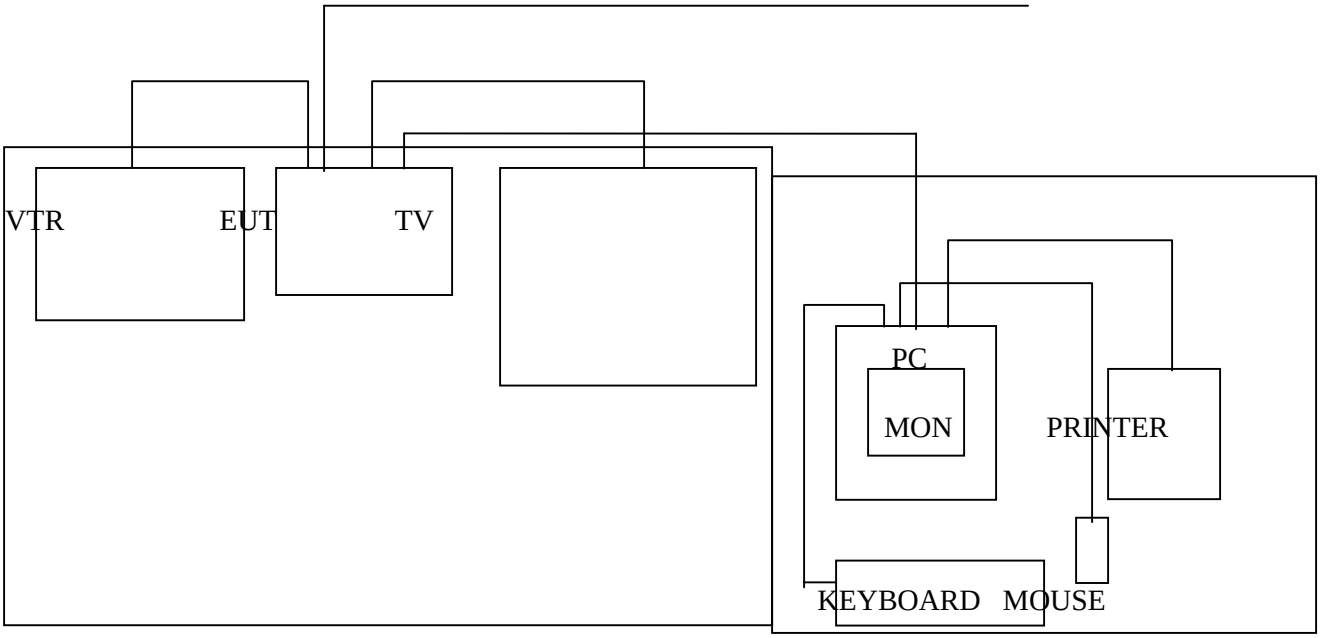
amplifier, and spectrum analyzer to determine the frequency producing the maximum EME.
Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated.
The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were note for each frequency found.
The spectrum was scanned from 30 to 300MHz using biconical antenna and 300 to 1000MHz using log-spiral antenna.

Final measurements were made outdoors at 3 or 10 meter test range using dipole antenna.
The test equipment was placed on a wooden and plastic bench situated on a 1.5×2 meter area adjacent to measurement area.
Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
Each frequency found during pre-scan measurements was re-examined and investigated during EMI/Field Intensity Meter and Quasi-Peak Adapter.
The detector function was set to CISPR Quasi-Peak mode and the bandwidth of the receiver was set to 120KHz depending on the frequency or type of signal.

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements.
The EUT, support equipment and interconnecting cables were re-configured to the set-up producing
The maximum emission for the frequency and were placed on top of a 0.8-metre high non-metallic 1×1.5 meter table.
The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission.
The turntable containing the system was rotated, the antenna height was varied 1 to 4 meter and stopped at the azimuth or height producing the maximum emission.
Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, an powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission.

SUPPORT EQUIPMENT USED

Receiver antenna



System Configuration Diagram

TESTED SYSTEM DETAILS

Peripherals and EUT : TEST TABLE AREA

Description	Model Name	Serial No.	Manufacturer	FCC ID
TV Interface device	DTR5000N	-	TELEMANN	EUT
TV	DCT-2102S	DCT98302	DAYTEK	None
VTR	SV-300WD	61RH200039	SAMSUNG	None
Printer	C2106A	312761901	HP	B94C2106X
PC	DESKPRO	7836BVD20016	COMPAQ	DoC
Monitor	VX700	M902080938	GateWay	BGBTFV8705K
Keyboard	RT235BTW	B13BCOL39GU17U	COMPAQ	AQ6-22K15
Mouse	M-S34	4862A011	COMPAQ	DZL211029

TEST DATA

Conducted Emissions

Model No: DTR5000N

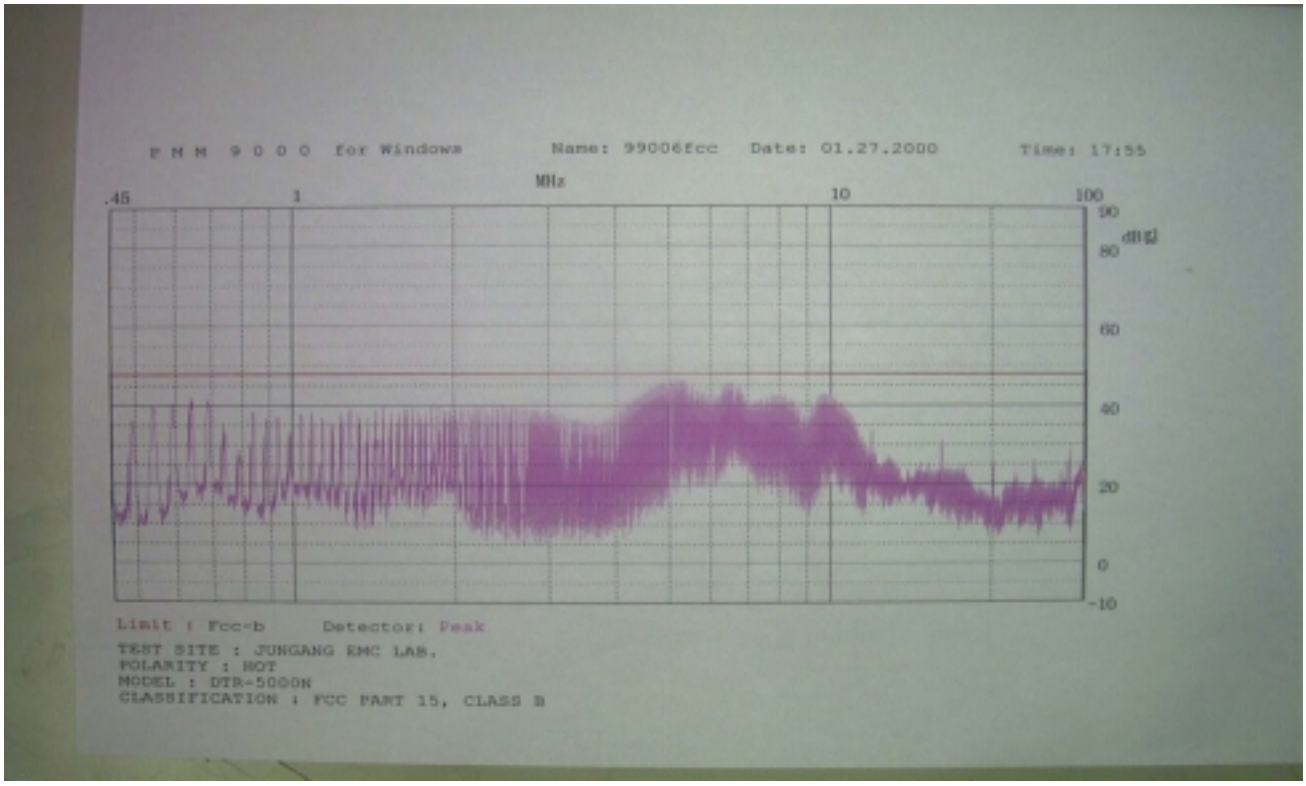
FREQ(MHz)	LEVEL (dBμV)	LINE	LIMIT (μV)	(μV)	MARGIN (dB)
0.637	**42.5**	**H**	**250**	**133.35**	**-5.5**
4.907	**45.7**	**H**		**192.75**	**-2.3**
5.350	**46.5**	**H**		**211.35**	**-1.5**
6.480	**46.6**	**N**		**213.79**	**-1.4**
7.900	**43.0**	**N**		**141.25**	**-5.0**
9.720	**43.8**	**N**		**154.88**	**-4.2**

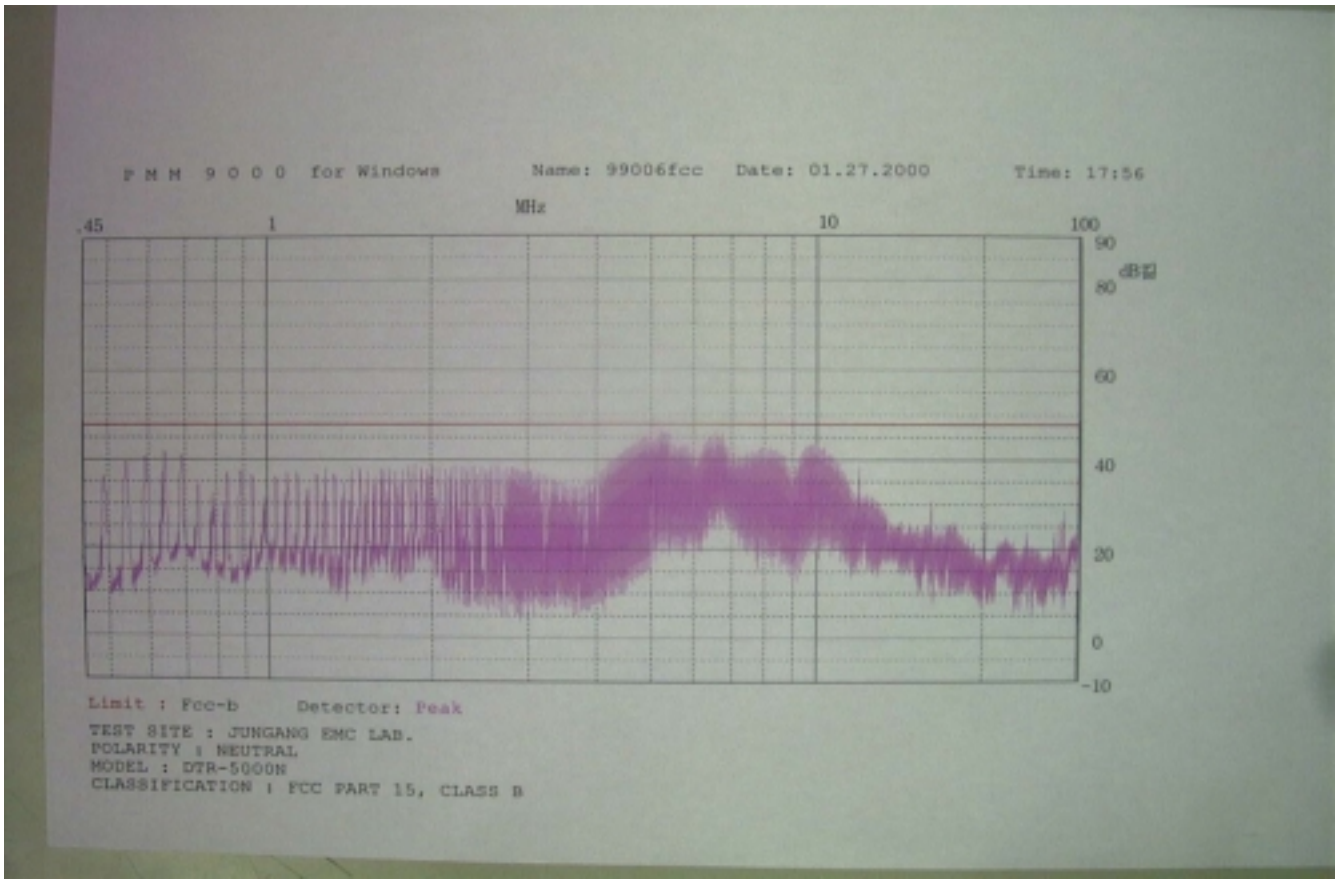
Table 1. Line Conducted Emission Tabulated Data

Note :
1. All modes of operation were investigated and the worst-case emission are reported.
See attached Plots
2. The limit for Class B digital device is 250uV from 450KHz to 30MHz.
3. Line H = Hot Line N = Neutral

** Measurement using CISPR quasi-peak mode

PLOTS OF EMISSIONS





Radiated Emission

Model No: DTR5000N

Freq. (MHz)	Level* (dBμV)	AFCL* (dB)	POL (H/V)	Limit (μV)	F/S (μV/m)	Margin** (dB)
54.00	**24.40**	**11.90**	**V**	**100**	**65.3**	**-3.7**
60.05	**19.60**	**12.07**	**V**		**38.3**	**-8.3**
144.70	**15.40**	**17.55**	**V**	**150**	**44.4**	**-10.6**
157.48	**15.90**	**17.21**	**V**		**45.2**	**-10.4**
170.60	**11.90**	**17.33**	**V**		**28.9**	**-14.3**
202.49	**13.60**	**17.47**	**H**		**35.8**	**-12.4**
249.36	**14.20**	**17.87**	**H**	**200**	**40.1**	**-13.9**
299.27	**14.50**	**18.19**	**H**		**43.1**	**-13.3**
336.03	**13.40**	**19.70**	**H**		**45.1**	**-12.9**
349.15	**20.80**	**20.37**	**H**		**114.4**	**-4.8**
375.02	**11.60**	**19.96**	**H**		**37.8**	**-14.4**
432.29	**11.80**	**20.67**	**V**		**42.0**	**-13.5**
470.30	**10.80**	**21.70**	**H**		**42.2**	**-13.5**
565.32	**11.70**	**23.78**	**V**		**59.4**	**-10.5**

Table 2. Radiated Measurements at 3meters.

Note :
1. All modes of operation were investigated and the worst-case emission are reported.
2. The limit for Class B digital device is 100uV from 30MHz to 88MHz and 150uV from 88MHz to 216MHz and 200μV from 216MHz to 960MHz and 500μV from above 960MHz.

* AFCL = Antenna Factor and Cable Loss
** Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz.
The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

TV interface device Conducted Emission

1. Output Terminal Conducted Signal Level

Channel Number	Emission Frequency (MHz)	Output Level (uV)	FCC Limit (uV)
3	61.25	1435.49	2999.6
3	56.78	270.40	671.2
3	65.76	263.63	671.2
4	67.25	1477.41	2999.6
4	62.77	246.32	671.2
4	71.75	236.32	671.2

Rules part : 15.115(b)(1)(ii)

Requirements : Maximum video output signal that appears at the output terminals is 346.6(R)½ and 75.5 (R)½ for the sound signal.
For a 75 ohm system the maximum video is 2999.82 uvolts (A) and 671.15 uvolts (B) for the sound. Emission removed by more than 4.6MHz below or 7.4MHz above the video carrier frequency shall not exceed 10.95(R)½ Where R is the terminating resistance.
This would be 94.83 uvlots(C) for 75 ohm system. A 75 to 50 ohm Matching pad with a 6dB loss was used for the measurement.

Test Procedure : This unit was tested in accordance with ANSI C63.4 1992 paragraph 12.2.5. The receiver was connected to a LNBF/SATELLITE ANTENNA. The unit was tested on the MCM frequency(11.5GHz) and the highest Output was recorded. The output was measured at the end of a one(1) Meter long cable, that would normally be connected to the television receiver.

2. Output Terminal Conducted Signal Level & Interference Level

Channel Number	Emission Frequency (MHz)	Output Level (uV)	FCC Limit (uV)
3	-	The disturbance noise were not detectable	94.83
4	-	The disturbance noise were not detectable	94.83

Rules part : 15.115(b)(1)(ii) & 15.115(b)(2)(ii)

Requirements : Maximum video output signal that appears at the output terminals is 346.6(R)½ and 75.5 (R)½ for the sound signal.
For a 75 ohm system the maximum video is 2999.82 uvolts (A) and 671.15 uvolts (B) for the sound. Emission removed by more than 4.6MHz below or 7.4MHz above the video carrier frequency shall not exceed 10.95(R)½ Where R is the terminating resistance.
This would be 94.83 uvlots(C) for 75 ohm system. A 75 to 50 ohm Matching pad with a 6dB loss was used for the measurement.

Test Procedure : This unit was tested in accordance with ANSI C63.4 1992 paragraph 12.2.5. The receiver was connected to a LNBF/SATELLITE ANTENNA. The unit was tested on the MCM frequency(11.5GHz) and the highest Output was recorded. The output was measured at the end of a one(1) Meter long cable, that would normally be connected to the television receiver.

3. Transfer Switch Isolation

Channel Number	Emission Frequency (MHz)	Output Level (uV)	FCC Limit (uV)
3	61.25	The disturbance noise were not detectable	2.996
3	61.25	The disturbance noise were not detectable	2.996
4	67.25	The disturbance noise were not detectable	2.996
4	67.25	The disturbance noise were not detectable	2.996

Rules part : 15.115(c)(1)(ii)

Requirements : For a 75 ohm system it is 2.996 uvolts(R)
Measurements were made with the switch in both positions.
A 75 to 50 ohm Matching pad was used to match the receiver to the
The matching pad has a 6dB loss.

Test Procedure : This unit was tested in accordance with ANSI C63.4 1992 paragraph 12.2.6. The receiver was connected to a LNBF/SATELLITE ANTENNA. . The output was measured at the end of a one(1)meter long cable, that would normally be connected to the television receiver.

SAMPLE CALCULATIONS

$$dB\mu V = 20 \log_{10} (\mu V/m)$$

$$\mu V = 10^{(dB\mu V/20)}$$

EX. 1.

@ 6.48MHz Class B limit = 250 μV = 48 dBμV

Reading = 46.6 dBμV (calibrated level)

$10^{(46.6/20)}$ = 213.79 μV

Margin = 46.6 – 48 = -1.4
1.4 dB below limit

EX. 2.

@ 54.0MHz Class B limit = 100 μV/m = 40.0dBμV/m

Reading = 24.4dBμV(calibrated level)
Antenna factor + Cable Loss = 11.9 dB
Total = 36.3dBμV/m

Margin = 36.3 – 40.0 = -3.7
3.7 dB below limit

LIST OF TEST EQUIPMENT

The listing below denotes the test equipment utilized for the test(s)

Nomenclature	Manufactury Model Number	Serial Number	Calibration Date
Signal Analyzer (9kHz – 1.2GHz)	PMM PMM 9000	3100J70602	99 / 9 / 30
Spectrum Analyzer (9kHz – 2.6GHz)	ADVANTEST R3261C	61720002	00 / 01 / 19
Amplifier (0.1MHz-1.3GHz)	HP 8774D	2944A08872	99 / 04 / 21
Biconical Antenna	PMM BC01	0020J70501	99 / 08 / 30
Log Periodic Antenna	PMM LP01	0020J70501	99 / 08 / 30
Double-Ridged Horn Antenna	electro-metrics	2847	00 / 01 / 19
Dipole Antenna	SWALZBECK VHA9103	3608	99 / 06 / 29
Dipole Antenna	SWALZBECK UHA9105	4277	99 / 06 / 29
Loop Antenna	CHASE HLA6120	1116	99 / 06 / 29
Plotter	HP 7475A	7475A	N / A
Shield Room 4m x 3.5m x 2.4m	MYUNGJIN EMC 907-MJCO-12		
Turn Table	Dail EMC JAC-2		
Antenna Master	Dail EMC JAC-1		