
EMI TEST REPORT

Test Report No. : 23CE0014-YW-1

Applicant : Samsung Electronics Co., Ltd.

Type of equipment : Video Cassette Recorder

Model number : SLV-N700

Test standard : FCC Part 15 Subpart B

Test result : Complied

1. This test report shall not be reproduced except in full or partial, without the written approval of A-Pex International Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this test report are traceable to the national or international standards.
5. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

Date of test : October 4, 11, 15, 16, 17 and 18, 2002

Tested by:


Hisayuki Kioka
Group Leader of EMC Section


Seigo Kakehi


Sadahiko Tanaka

Approved by:


Kazutoyo Nakanishi
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Contents

	Page
Section 1 : Client information	3
Section 2 : Equipment under test (E.U.T.)	3
Section 3 : Test specification, procedures & results	4
Section 4 : Operation of E.U.T. during tests	6
Section 5 : Conducted emission	7
Section 6 : Radiated emission	8
Section 7 : Antenna terminal voltage	10
Section 8 : RF output level / spurious emission	11
Section 9 : Antenna transfer switch	12
Section 10 : Picture sensitivity	13
Section 11 : Noise figure	14

Contents of Appendixes

Appendix 1 : Photographs of test set up	16
Appendix 2 : Data of EMI tests	23
Appendix 3: Test instruments	94

Section 1 : Client information

Company name : Samsung Electronics Co., Ltd.
Brand Name : SONY
Address : 416 Maetan-3dong, Paldal-Gu, Suwon City, Kyungki-Do, 442-742 KOREA
Telephone number : +82 31 200 5754
Facsimile number : +82 31 200 3458
Contact person : Jong UK Kim

Section 2 : Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of equipment : Video Cassette Recorder
Model number : SLV-N700
Rating : AC 120 V / 60 Hz
Receipt Date of Sample : October 2, 2002
Condition of EUT : Production Prototype

2.2 Product description

Model: SLV-N700 (referred to as the EUT in this report) is a Video Cassette Recorder.
The EUT specifications is as follows.

Tuner section

Channel coverage
VHF 2 to 13
UHF 14 to 69
CATV A-8 to A-1, A to W, W+1 to W+84
Antenna
75-ohm antenna terminal for VHF/ UHF

Inputs and outputs

LINE IN 1 and LINE-2 IN
VIDEO IN, phono jack (1 each)
Input signal: 1 Vp-p, 75 ohms, unbalanced, sync negative
AUDIO IN, phono jacks (2 each)
Input level: 327 mVrms
Input impedance: more than 47 kilohms
LINE OUT
VIDEO OUT, phono jack (1)
Output signal: 1 Vp-p, 75 ohms, unbalanced, sync negative
AUDIO OUT, phono jacks (2)
Standard output: 327 mVrms
Load impedance: 47 kilohms
Output impedance: less than 10 kilohms

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Section 3 : Test specification, procedures and results

3.1 Test specification

Test specification: FCC Part 15 Subpart B

Title : FCC 47 CFR Part 15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures & results

Item	Test procedure	Limits	Worst margin	Result
Conducted emission	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	250 uV *)	14.8 dB (6.9381 MHz, L1, AV input + Rec. Line-1)	Complied
Radiated emission	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	30-88 MH: 100 uV/m 88-216 MHz: 150 uV/m 216-960 MHz: 200 uV/m above 960 MHz: 500 uV/m	0.6 dB (32.23 MHz, Vertical, AV1 + Rec. REAR 5V p-p)	Complied
Antenna terminal voltage	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	2 nW (at 75 ohm)	15.9 dB (1081.5 MHz, TV mode)	Complied
RF output level	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	Video signal: 3000 uV Aural signal: 671 uV	3.0 dB (61.25MHz, 3ch, TV reception + Rec. 25dBmV)	Complied
Spurious emission		94.8 uV	17.4dB (122.5MHz, AV input + Rec. Line-1, 5V p-p)	Complied
Transfer switch	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	9.5 dB	3.0 dB (122.5MHz, AV input + Rec. Line-1, 1V p-p)	Complied
Picture sensitivity	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	8 dB	3.4 dB	Complied
Noise figure	FCC/OET MP:2:1986	14 dB	5.3 dB (32ch, 579.25MHz)	Complied

*) Limits on CISPR 22 are applied to conducted emission.

3.3 Additions or deviations to standard

No addition, deviation or exclusion has been made from standards.

3.4 Confirmation

A-Pex International Co., Ltd. hereby confirms that E.U.T., in the configuration tests, complies with the specifications FCC Part15 Subpart B.

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3.5 Uncertainty

Conducted emission (150 kHz – 30 MHz)

The measurement uncertainty (with a 95% confidence level) for this test was ± 1.74 dB.

The data listed in this test report has enough margin, more than site margin.

Radiated emission

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ± 4.4 dB.

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ± 4.8 dB.

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is ± 5.8 dB.

The data listed in this test report has enough margin, more than site margin.

Antenna terminal voltage

The measurement uncertainty (with a 95% confidence level) for this test was ± 3.48 dB.

The data listed in this test report has enough margin, more than site margin.

RF output level test / spurious emission test

The measurement uncertainty (with a 95% confidence level) for this test was ± 3.48 dB.

The data listed in this test report may exceed the test limit because it does not have enough margin.

Antenna transfer switch

The measurement uncertainty (with a 95% confidence level) for this test was ± 3.48 dB.

The data listed in this test report may exceed the test limit because it does not have enough margin.

Picture sensitivity test

The measurement uncertainty (with a 95% confidence level) for this test was ± 1.0 dB.

The data listed in this test report has enough margin, more than site margin.

Noise Figure Test

The measurement uncertainty (with a 95% confidence level) for this test was ± 1.2 dB.

The data listed in this test report has enough margin, more than site margin.

3.7 Test location

A-Pex International Co., Ltd. Yokowa Lab. No.2 and No.3 Test site

108 Yokowa-cho, Ise-shi, Mie-ken, 516-1106 JAPAN

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No.2 Test site

This site has been fully described in a report submitted to FCC office, and listed on October 26, 2002.

(Registration number: 90411)

*NVLAP Lab. Code : 200109-0

No.3 Test site

This site has been fully described in a report submitted to FCC office, and listed on September 12, 2002.

(Registration number: 90412)

*NVLAP Lab. Code : 200109-0

3.8 Test setup, Data of EMI & Test instruments

Please refer to Appendix 1 to 3.

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Section 4 : Operation of E.U.T. during tests

4.1 Operating modes

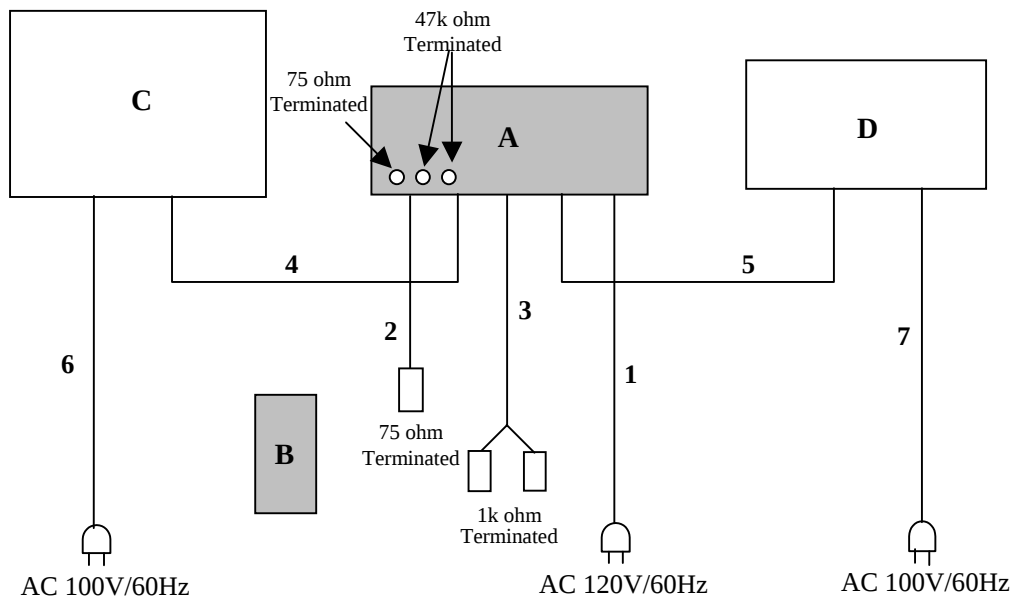
The EUT exercise program used during testing was designed exercise the various system components in a manner similar to typical use.

The sequence in used : * TV reception + Rec. mode (0 dBmV input / 25 dBmV input)
* AV input + Rec. mode (Line-1 / Line-2) (1 Vp-p input / 5 Vp-p input)
* Playback mode

Operation : The EUT was tested at above operation mode.
(Using a video tape with a typical TV signal recorded on it, if necessary.)

Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals



* Cabling was taken into consideration and test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Video Cassette Recorder	SLV-N700	—	Samsung Electronics Co., Ltd.	EUT
B	Remote Controller	—	—	Samsung Electronics Co., Ltd.	EUT
C	TV Monitor	PVM-1454Q	—	SONY	—
D	TV Generator	408	—	Leader Electronics	—

List of cable used

No.	Item	Length (m)	Shield	Backshell material
1	AC Power Cable	1.6	N	Polyvinyl chloride
2	RF Output Cable	1.0	Y	Polyvinyl chloride
3	Audio Output Cable	1.5	Y	Polyvinyl chloride
4	Video Output Cable	1.5	Y	Polyvinyl chloride
5	Coaxial Cable	1.5	Y	Polyvinyl chloride
6	AC Power Cable	1.8	N	Polyvinyl chloride
7	AC Power Cable	1.8	N	Polyvinyl chloride

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Section 5 : Conducted emission

5.1 Operation environment

The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7m.

Date : October 17, 2002
Temperature : 22°C
Humidity : 51 %

5.2 Test configuration

EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop was at least 80 cm from any other grounded conducting surface. EUT was located 80cm from LISN and excess AC cable was bundled in center. I/O cables and AC cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40m long and were hanged at a 40cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, were individually connected through a LISN to the input power source. All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

A drawing of the set up is shown in figure 1 and photographs in Appendix 1.

5.3 Test conditions

Frequency range : 0.15 MHz – 30 MHz
EUT position : Table top
EUT operation mode: TV reception + Rec. mode, AV input + Rec. mode (Line-1/ Line-2), Playback mode

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection has been performed. The measurements have been performed with a quasi-peak detector and if required, with an average detector. EUT and desired signal generator should connect through 20 dB attenuator.

The conducted emission measurements were made with the following detector function of the test receiver.

Detector Type : QP
IF Bandwidth : 10 kHz

5.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer: Sadahiko Tanaka

Section 6 : Radiated emission

6.1 Operation environment

The test was carried out in an open site.

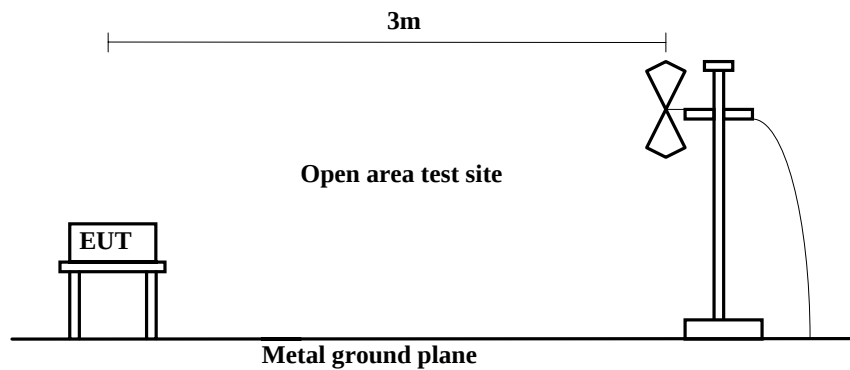
Date : October 4, 2002
Temperature : 25°C
Humidity : 46 %

6.2 Test configuration

EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The rear of EUT was aligned and flushed with rear of tabletop. AC cables were bundled in center. I/O cables were hanged 40 cm height to the ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

A drawing of the set up is shown in figure 2 and photographs in Appendix 1.

Figure 2. Radiated emission



6.3 Test conditions

Frequency range : 30 MHz – 2000 MHz
Test distance : 3 m
EUT position : Table top
EUT operation mode: TV reception + Rec. mode, AV input + Rec. mode (Line-1/ Line-2), Playback mode

6.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on an open test site with a ground plane and at a distance of 3 m.

Pre check measurements were performed within a search coil at high level of 80MHz – 90MHz, 270MHz – 290MHz and 500MHz – 700MHz in a shielded room to distinguish disturbances of EUT from the ambient noise. Measurements were performed with quasi-peak detector and average detector.

The measuring antenna height was varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detector function of the test receiver and spectrum analyzer.

	<u>30-1000MHz (Test receiver)</u>	<u>1000-2000MHz (Spectrum analyzer)</u>
Detector Type	: QP	AV
IF Bandwidth	: 120 kHz	RBW 1 MHz / VBW 10Hz

6.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer: Seigo Kakehi

Section 7 : Antenna terminal voltage

7.1 Operation environment

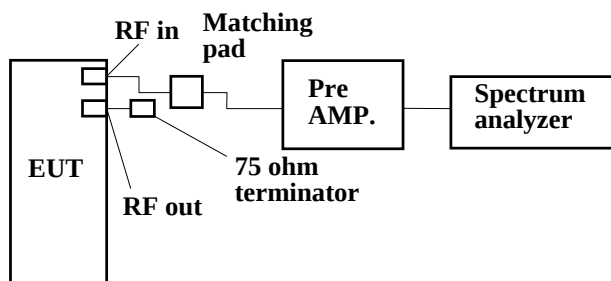
The test was carried out in a shielded room the size of 3.6 x 7.2 x 2.4 m.

Date : October 18, 2002
Temperature : 24°C
Humidity : 63 %

7.2 Test configuration

The EUT was placed on a non-metallic platform 0.8 m above a reference ground plane.
A drawing of the set up is shown in figure 3 and photographs in Appendix 1.

Figure 3. Antenna terminal voltage



7.3 Test conditions

Frequency range : 30 MHz – 2000 MHz
EUT position : Table top
EUT operation mode: Tuning mode (TV receiver/ CATV receiver mode)

7.4 Test procedure

Connect EUT and spectrum analyzer through pre-amplifier. Set EUT to CH investigation mode then measure the voltage of local leakage from antenna terminal. Spectrum analyzer should be hold in maximum mode during the measurement.

Detector Type : Peak (30-2000 MHz)

7.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer: Sadahiko Tanaka

Section 8 : RF output level / spurious emission

8.1 Operation environment

The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7 m.

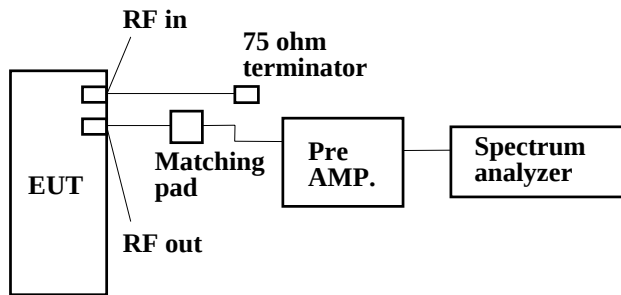
Date : October 15, 2002 : October 16, 2002
Temperature : 23 °C : 21°C
Humidity : 57 % : 54 %

8.2 Test configuration

The EUT was placed on a non-metallic platform 0.8 m above a reference ground plane.

A drawing of the set up is shown in figure 4 and photographs in Appendix 1.

Figure 4. RF output level



8.3 Test conditions

EUT position : Table top

EUT operation mode: TV reception + Rec. mode, AV input + Rec. mode (Line-1/ Line-2), Playback mode

8.4 Test procedure

EUT was connected spectrum analyzer through matching pad by accessory cable. RF channel selected 3ch or 4ch. Picture carrier, sound carrier and spurious levels are measured. Both sound carrier levels (upper and lower side bands) of modulator output are measured.

Detector Type : Peak

8.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer: Hisayuki Kioka

Section 9 : Antenna transfer switch

9.1 Operation environment

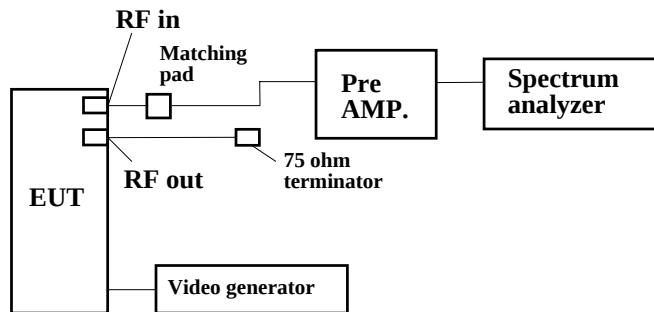
The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7 m.

Date : October 15, 2002
Temperature : 23 °C
Humidity : 57 %

9.2 Test configuration

The EUT was placed on a non-metallic platform 0.8 m above a reference ground plane.
A drawing of the set up is shown in figure 5 and photographs in Appendix 1.

Figure 5. Transfer switch



9.3 Test conditions

EUT position : Table top
EUT operation mode: AV input + Rec. mode (Line-1/ Line-2), Playback mode

9.4 Test procedure

EUT was connected spectrum analyzer through matching pad by accessory cable. RF channel selected 3ch or 4ch. Interference signals were measured from RF input terminal.

Detector Type : Peak

9.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer: Hisayuki Kioka

Section 10 : Picture sensitivity

10.1 Operation environment

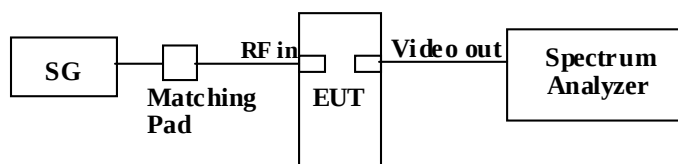
The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7 m.

Date : October 11, 2002
Temperature : 23 °C
Humidity : 58 %

10.2 Test configuration

The EUT was placed on a non-metallic platform 0.8 m above a reference ground plane.
A drawing of the set up is shown in figure 6 and photographs in Appendix 1.

Figure 6. Picture sensitivity



10.3 Test conditions

EUT position : Table top
EUT operation mode: TV reception + Rec. mode

10.4 Test procedure

Signal generator setup is as follows, (Example: 2ch – 55.25 MHz, AM, 1 kHz, 30 %)
The EUT was tuned to appropriate channel.
Output level of signal generator was adjusted to near the frequency output level of EUT output.
EUT output level was adjusted to maximum output level by frequency adjustment of signal generator.
Signal generator output level was adjusted to reference output level of EUT and output level had read.

10.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer: Hisayuki Kioka

Section 11 : Noise figure

11.1 Operating environment

The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7 m.

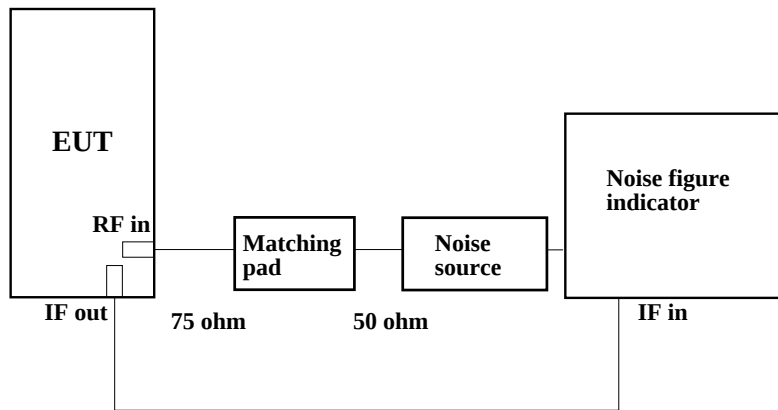
Date : October 11, 2002
Temperature : 23 °C
Humidity : 58 %

11.2 Test configuration

The EUT was placed on a non-metallic table.

A drawing of the set up is shown in figure 7 and photographs in Appendix 1.

Figure 7. Noise figure



11.3 Test conditions

EUT position : Table top
EUT operation mode: TV reception + Rec. mode

11.4 Test procedure

This test should be performed in a shielded room or an low noise environment. Connect solid state noise source to antenna input terminal of EUT. Connect IF output terminal of EUT to noise meter through ceramic condenser. Measurement has been performed for VHF,UHF, Mid-band and Super-band receiver range.

11.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer: Hisayuki Kioka

Appendix 1 : Photographs of test set up

Page 16 : Test set up of conducted emission

Page 17 : Test set up of radiated emission

Page 18 : Test set up of antenna terminal voltage

Page 19 : Test set up of RF output level / spurious emission

Page 20 : Test set up of antenna transfer switch

Page 21 : Test set up of picture sensitivity

Page 22 : Test set up of noise figure

Appendix 2 : Data of EMI tests

Page 23 - 43 : Conducted emission

Page 44 - 58 : Radiated emission

Page 59 - 60 : Antenna terminal voltage

Page 61 - 81 : RF output level / spurious emission

Page 82 - 91 : Antenna transfer switch

Page 92 : Picture sensitivity

Page 93 : Noise figure

Appendix 3 : Test instruments

Page 94 : Test instruments

Conducted emission



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Radiated emission



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Antenna terminal voltage



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RF output level / spurious emission



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Antenna transfer switch



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Picture sensitivity



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Noise figure



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