KTL Test Report:	0R02503
Applicant:	Digital Security Controls Ltd. 3301 Langstaff Road Vaughn, Ontario L4K 4L2
Equipment Under Test: **(E.U.T.)**	Ethernet Hub
In Accordance With:	**FCC Part 15, Subpart B** **Class B Certification**
Tested By:	KTL Ottawa Inc. 3325 River Road, R.R. 5 Ottawa, Ontario K1V 1H2
Authorized By:	
	K. Colborne, RF Group Manager
Date:	
Total Number of Pages:	27

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Section 1. Summary of Test Results

General:

All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15, Subpart B for Class B Digital Devices.

These tests were conducted using measurement procedures of ANSI C63.4-1992.

The equipment was tested for conducted emissions from 0.45 MHz to 30 MHz using a 50 microhenry line impedance stabilization network (L.I.S.N.) as described in ANSI C63.4-1992. Peripheral equipment was also operated through a 50 microhenry L.I.S.N.

The equipment was tested for radiated emissions from 30 MHz to 1000 MHz with extension to the 10th harmonic of any fundamental clock frequency in accordance with the requirements of FCC Part 15, Subpart B. Frequencies were initially identified in a large shielded room. Amplitude measurements were made on an outdoor Open Area Test Site. Details of the outdoor site are on file with the FCC.

Abstract:

Name Of Test	Para. No.	Results
Conducted Emissions	15.107	Complies
Radiated Emissions	15.109	Complies

THIS REPORT APPLIES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. None

NVLAP Lab Code: 100351-0

Test Performed By: _____ Date: _____
Chris Maidens, Test Technician

Measurement Uncertainty

Accuracy of Measurement

The measurement uncertainty was calculated using the methods described in NAMAS document NIS81 May 1994, with the confidence level of 95%.

Radiated Measurements

OATS #1 (A) 3 meter [UN9902B]

Contribution	Distribution	Uncertainty (+/-)
Field Strength Variation	Random	0.2089 dBµV^2
Measurement Equipment	Normal	0.3275 dBµV^2
Measurement Equipment	Rectangular	0.4167 dBµV^2
Total Combined Uncertainty		0.9762 dBµV^2

Expanded Uncertainty @ 95% Confidence = ± 2.0013 dBµV

OATS #1 (B) 10 meter [UN9906B]

Contribution	Distribution	Uncertainty (+/-)
Field Strength Variation	Random	0.1388 dBµV^2
Measurement Equipment	Normal	0.3275 dBµV^2
Measurement Equipment	Rectangular	0.4167 dBµV^2
Total Combined Uncertainty		0.9694 dBµV^2

Expanded Uncertainty @ 95% Confidence = ± 1.926 dBµV

OATS #2 (B) 3 meter [UN9912B]

Contribution	Distribution	Uncertainty (+/-)
Field Strength Variation	Random	0.4516 dBµV^2
Measurement Equipment	Normal	0.3275 dBµV^2
Measurement Equipment	Rectangular	0.4167 dBµV^2
Total Combined Uncertainty		1.0935 dBµV^2

Expanded Uncertainty @ 95% Confidence = ± 2.2417 dBµV

Radiated Measurements, continued

OATS #2 (C) 10 meter [UN9917B]

Contribution	Distribution	Uncertainty (+/-)
Field Strength Variation	Random	0.1211 dBµV^2
Measurement Equipment	Normal	0.3275 dBµV^2
Measurement Equipment	Rectangular	0.4167 dBµV^2
Total Combined Uncertainty		0.9302 dBµV^2

Expanded Uncertainty @ 95% Confidence = ± 1.9069 dBµV

Conducted Measurements

Shielded Room #1 [UN9920]

Contribution	Distribution	Uncertainty (+/-)
Amplitude Variation	Random	0.0400 dBµV^2
Measurement Equipment	Normal	0.7500 dBµV^2
Measurement Equipment	Rectangular	0.2500 dBµV^2
Total Combined Uncertainty		1.0198 dBµV^2

Expanded Uncertainty @ 95% Confidence = ± 2.0396 dBµV

Section 2. Equipment Under Test (E.U.T.)

Brand Name:	Ethernet Hub
Manufacturer:	Digital Security Controls Ltd.
Model No.:	UA215
Serial No.:	None
Date Received In Laboratory:	April 27, 2000
KTL Identification No.:	Item #'s 1, 4 & 6
Equipment Code:	JBP

☒ Production Unit ☐ Pre-Production Unit

Description of E.U.T.

The E.U.T. is an Ethernet Hub.

Modifications Incorporated in E.U.T.

The EUT has not been modified from what is described by the brand name and unique type identification stated above.

Theory of Operation

The E.U.T. is an Ethernet Hub.

Justification

The E.U.T. was configured for testing as per typical installation. Position and bundling of cables were investigated to establish maximum amplitude of emissions.

The following combinations were investigated to establish worst case configuration:

(1) Cable positioning.

Exercise Program

The E.U.T. exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise Mode:

(1) The E.U.T. was powered up and tested for emissions.

Section 3. Equipment Configuration

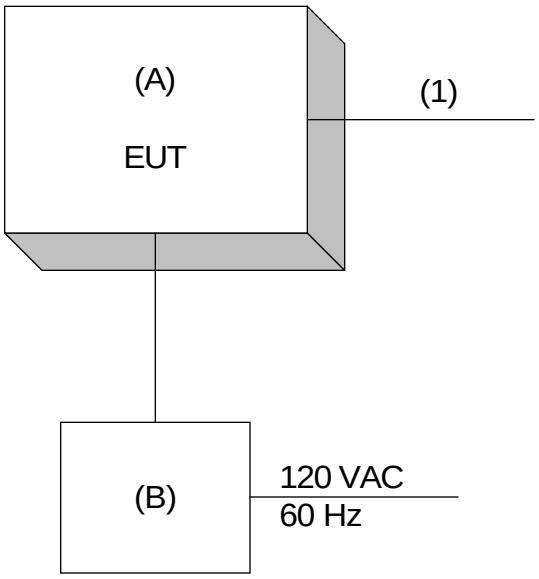
Equipment Configuration List:

Item	Description	FCC ID.	Model No.	Serial No.	Rev.
(A)	Ethernet Hub	None	UA215	None	—
(B)	Power Supply	None	CX09V500	None	X01X1

Inter-Connection Cables:

Item	Description	Length (m)
(1)	RJ45 Unshielded Cable (x4)	10.0

Configuration of the Equipment Under Test (E.U.T)



Section 4. Conducted Emissions

Para. No.: 15.107

Test Performed By: Chris Maidens	**Date of Test:** April 28, 2000

Test Conditions: Test Voltage: 120 VAC
Temperature: 22 °C
Humidity: 19 %

Minimum Standard:

Frequency (MHz)	**Maximum Powerline Conducted RF Voltage**	
	µV	**dBµV**
0.45 - 30.0	250	48

Test Results: Complies. See attached graphs and table.

Measurement Data: See attached graphs and table.

Method Of Measurement: (Procedure ANSI C63.4-1992)

Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR Quasi-Peak detector.

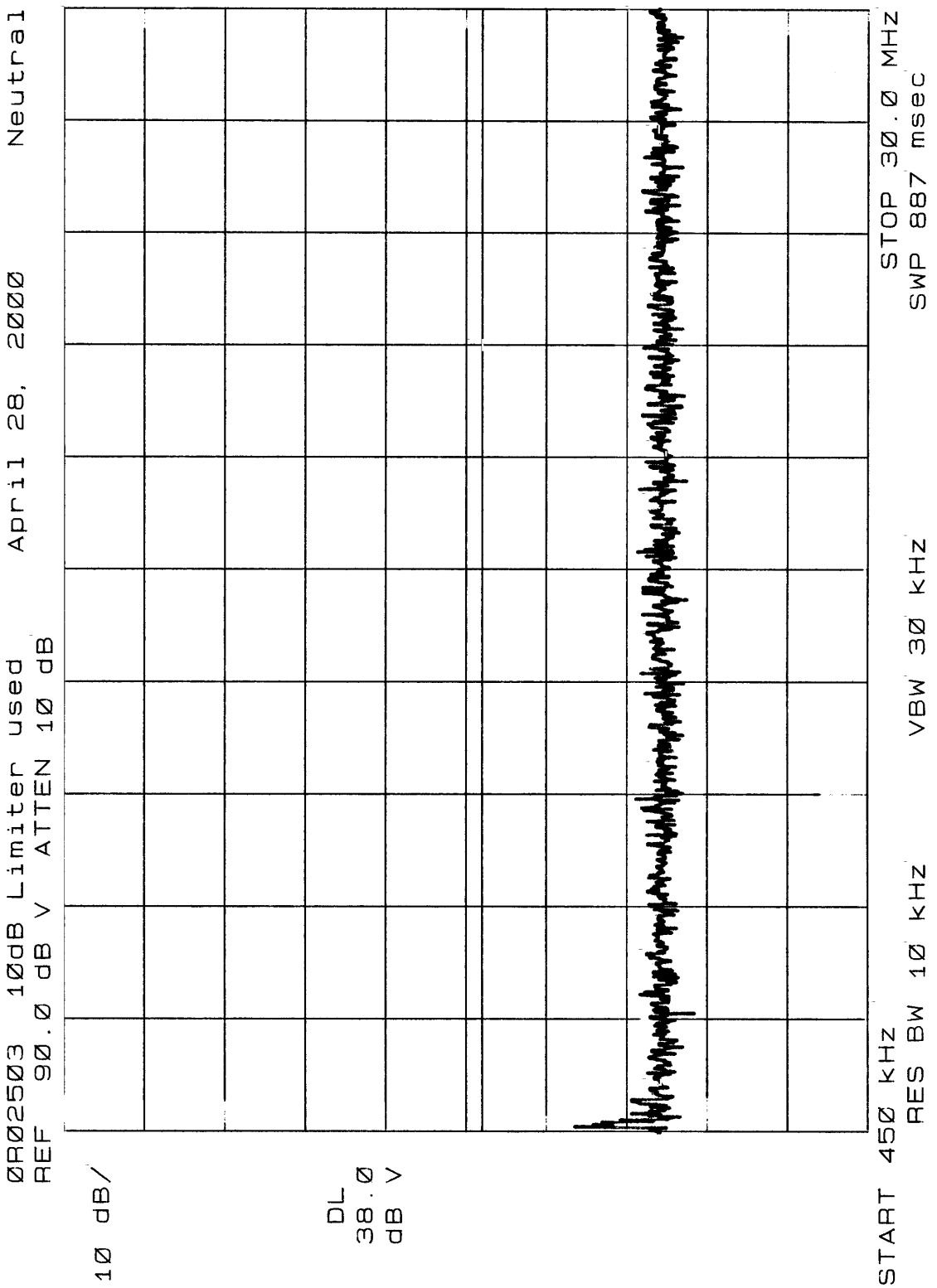
Broadband emissions are identified by switching the receiver detector function from Quasi-Peak to Average. If the amplitude of the emission drops by 6 dB or more then the emission is classified as broadband and the Quasi-Peak level is reduced by a factor of 13 dB.

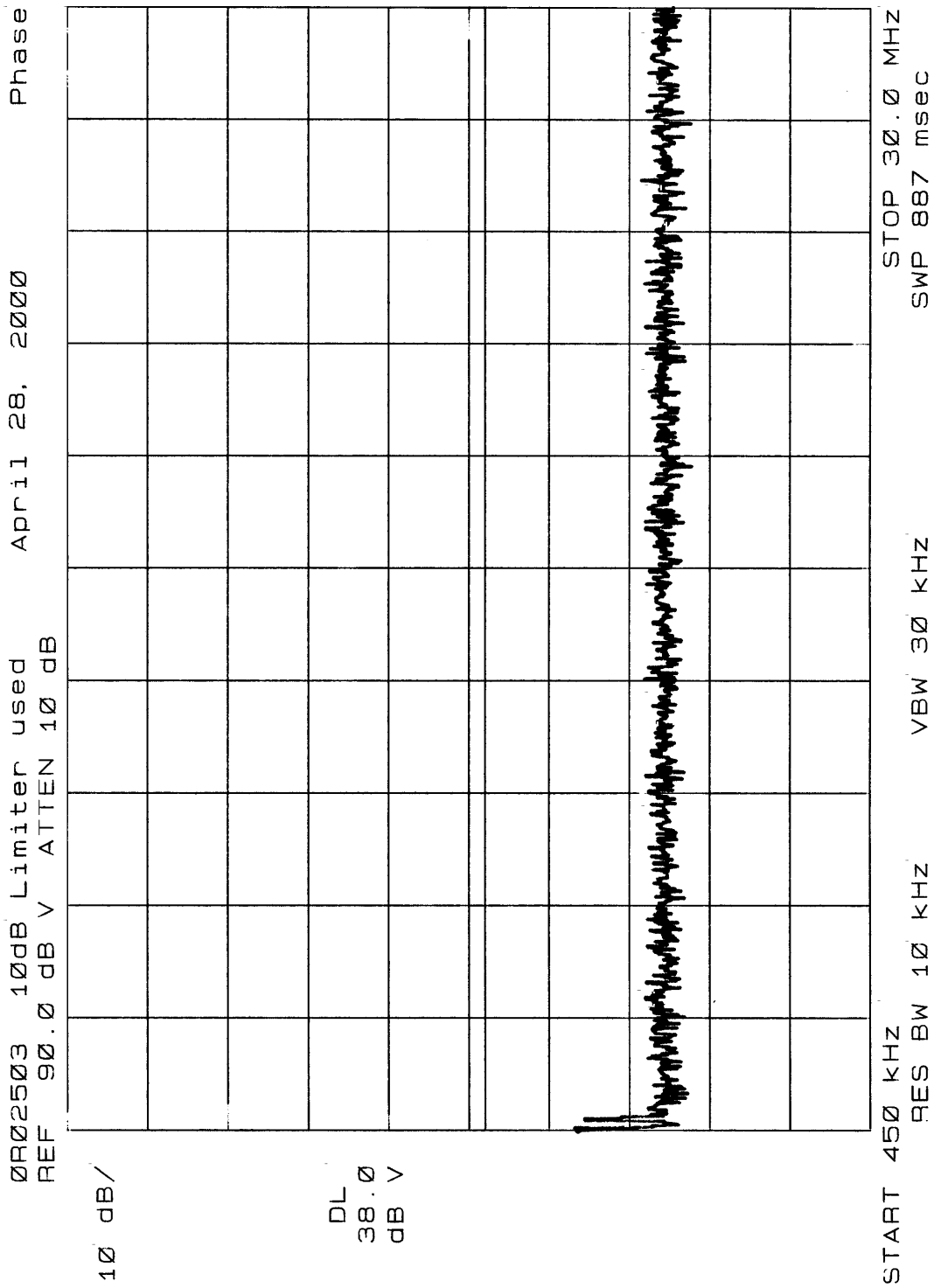
All emissions within 10 dB of limit have been recorded.

Measurement Data

Conductor	Frequency (MHz)	CISPR (dBµV)	Average (dBµV)	BB/NB	BB Corr. (dB)	Result (dBµV)

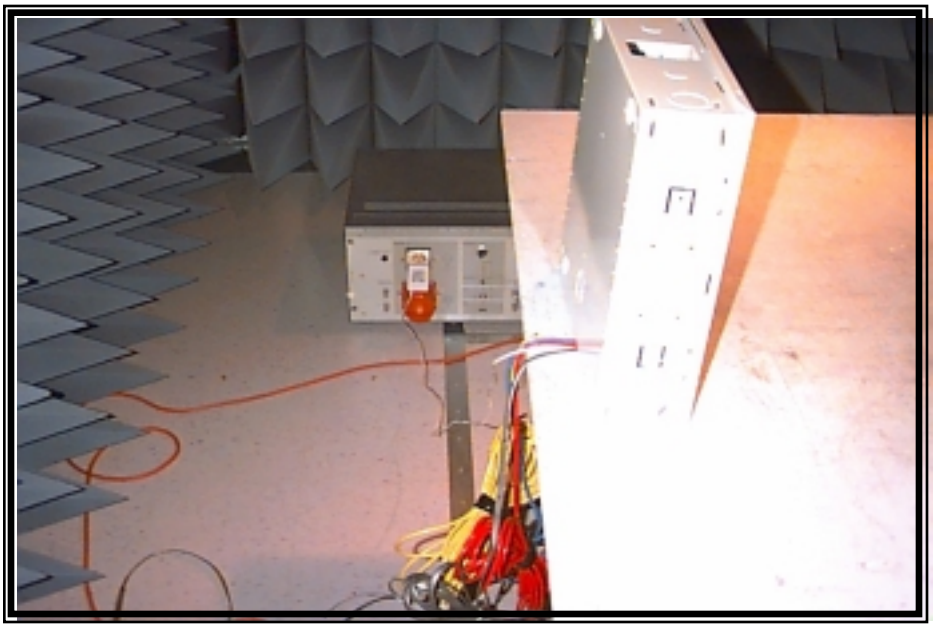
NO EMISSIONS DETECTED WITHIN 10 dB OF LIMIT


0R02503 10dB Limiter used April 28, 2000 Neutral
REF 90.0 dB V ATTEN 10 dB
10 dB/
DL
38.0
dB V
START 450 kHz
RES BW 10 kHz
VBW 30 kHz
STOP 30.0 MHz
SWP 887 msec

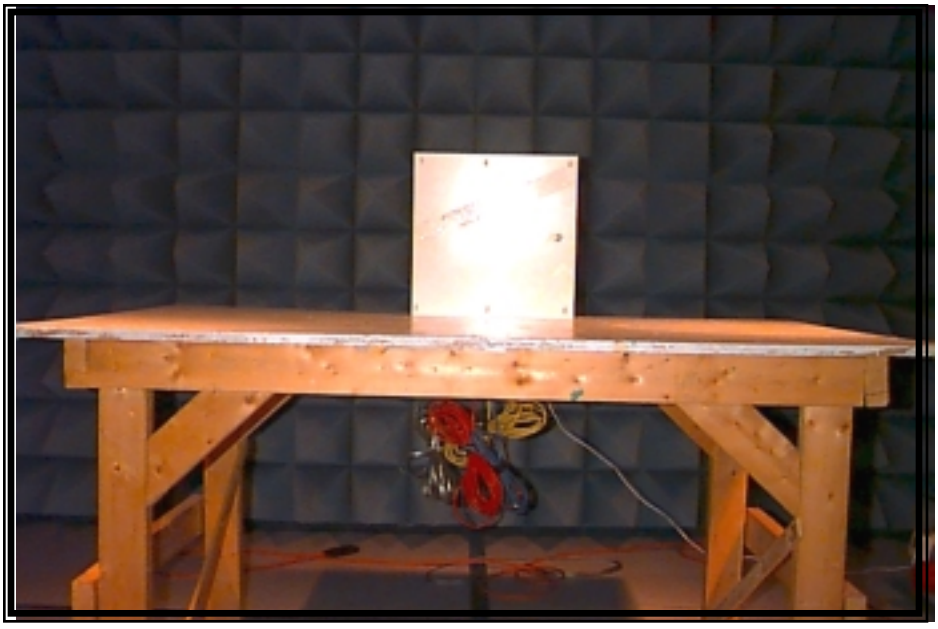

Phase
April 28, 2000
0R02503 10dB Limiter used
REF 90.0 dB V ATTEN 10 dB
10 dB/
DL
38.0
dB V
START 450 kHz
RES BW 10 kHz
VBW 30 kHz
STOP 30.0 MHz
SWP 887 msec

Conducted Photographs

Side View



Front View



Section 5. Radiated Emissions

Para. No.: 15.109

Test Performed By: Chris Maidens	**Date of Test:** April 28, 2000

Test Conditions: Test Voltage: 120 VAC
Temperature: 18 °C
Humidity: 19 %

Minimum Standard:

Frequency (MHz)	**Maximum Field Strength at 3m**	
	µV/m	**dBµV/m**
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

Test Results: Complies. The worst-case emission level is 34.0 dBµV/m @ 3m at 149.998 MHz. This is 9.5 dB below the specification limit.

Measurement Data: See attached table.

The equipment was prescanned in a shielded room using a spectrum analyzer and broadband antenna. A list of frequencies was compiled for investigation in the open field. The equipment was then moved to an open area test site where amplitude measurements were made at a distance of 3 meters. The bandwidth was set to 120 kHz and the detector function was CISPR Quasi-Peak.

All fundamental clock frequencies were measured to the 10^{th} harmonic.

Test Data - Radiated Emissions

Test Distance (meters) : 3		Range: B Tower		Receiver: ESVS 30		RBW(kHz): 120		Detector: Q-Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
149.998	B/C1	V			18.9	15.1			34.0	43.5	9.5
149.998	B/C1	H			16.8	15.1			31.9	43.5	11.6
319.996	L/P	V			13.0	18.9			31.9	46.0	14.1
319.996	L/P	H			15.3	18.9			34.2	46.0	11.8
349.995	L/P	V			10.7	19.4			30.1	46.0	15.9
349.995	L/P	H			11.8	19.4			31.2	46.0	14.8

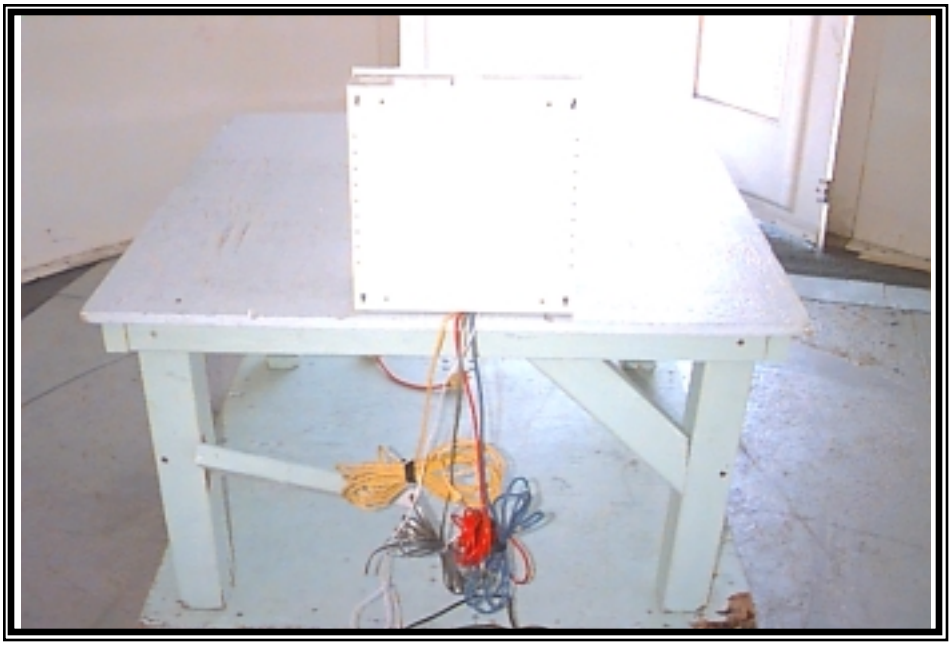
Notes:

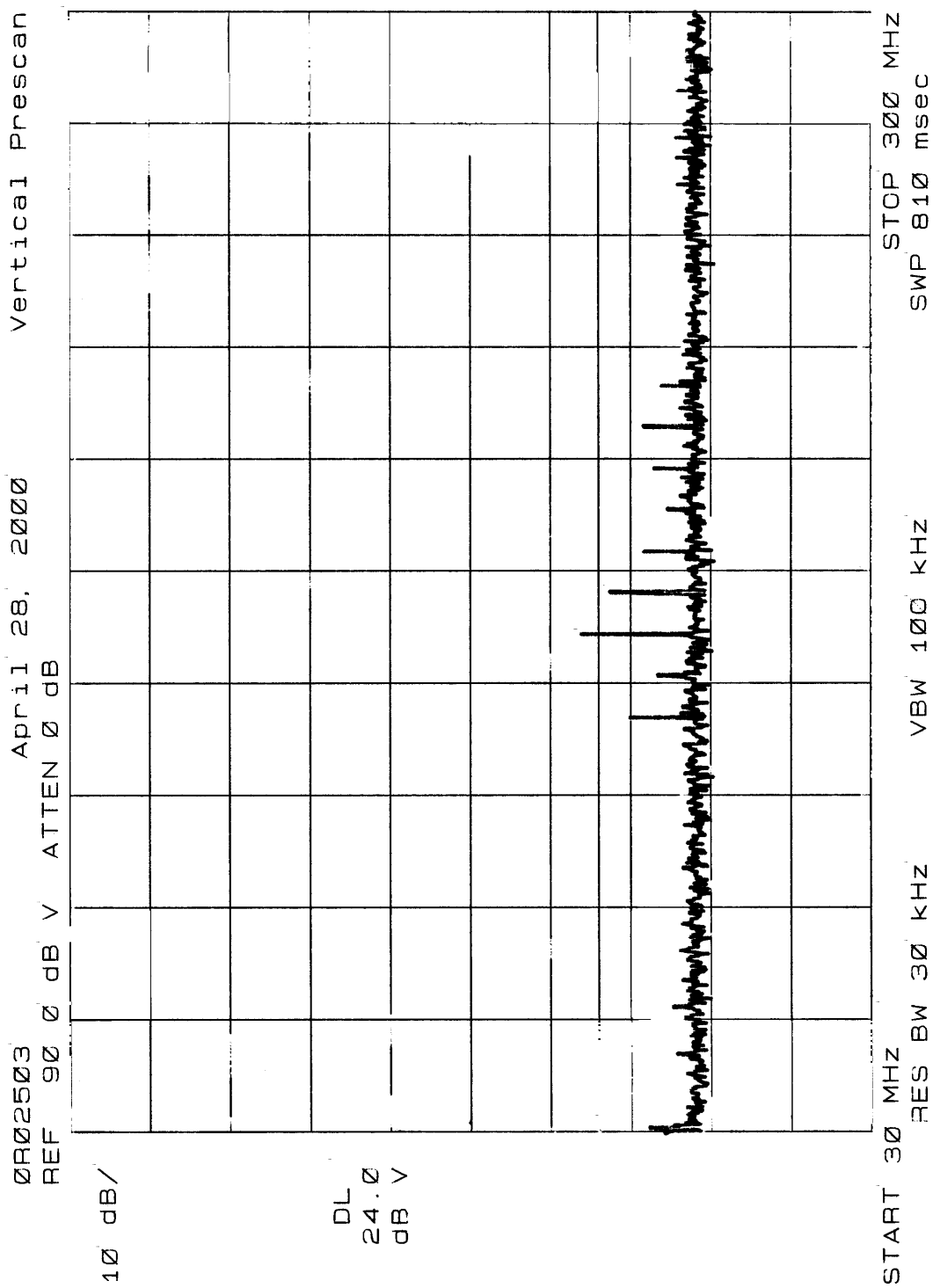
B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
* Re-measured using dipole antenna.
** Includes cable loss when amplifier is not used.
*** Includes cable loss.
( ) Denotes failing emission level.
N.D. = Not Detected

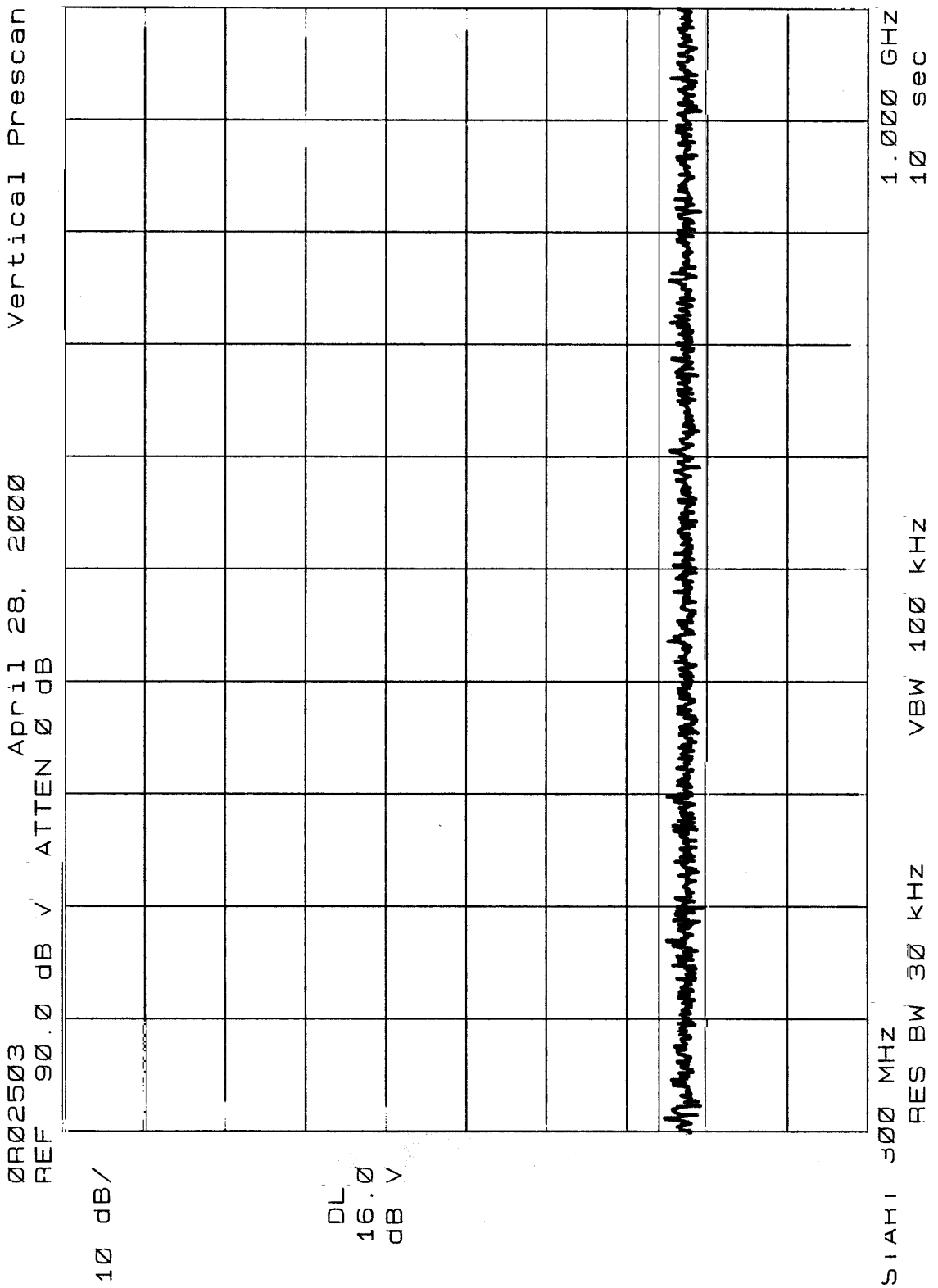
Radiated Photographs

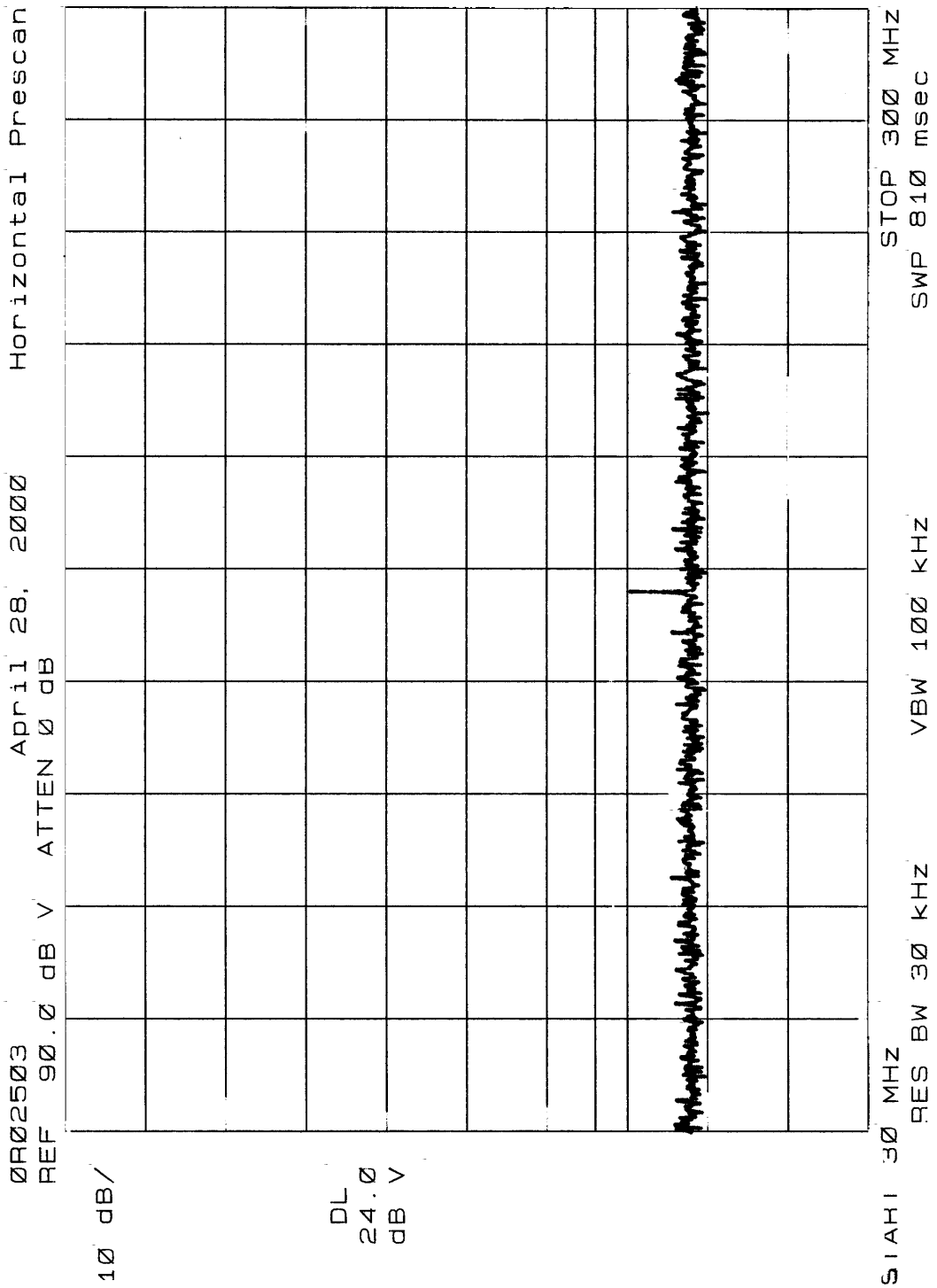
Front View

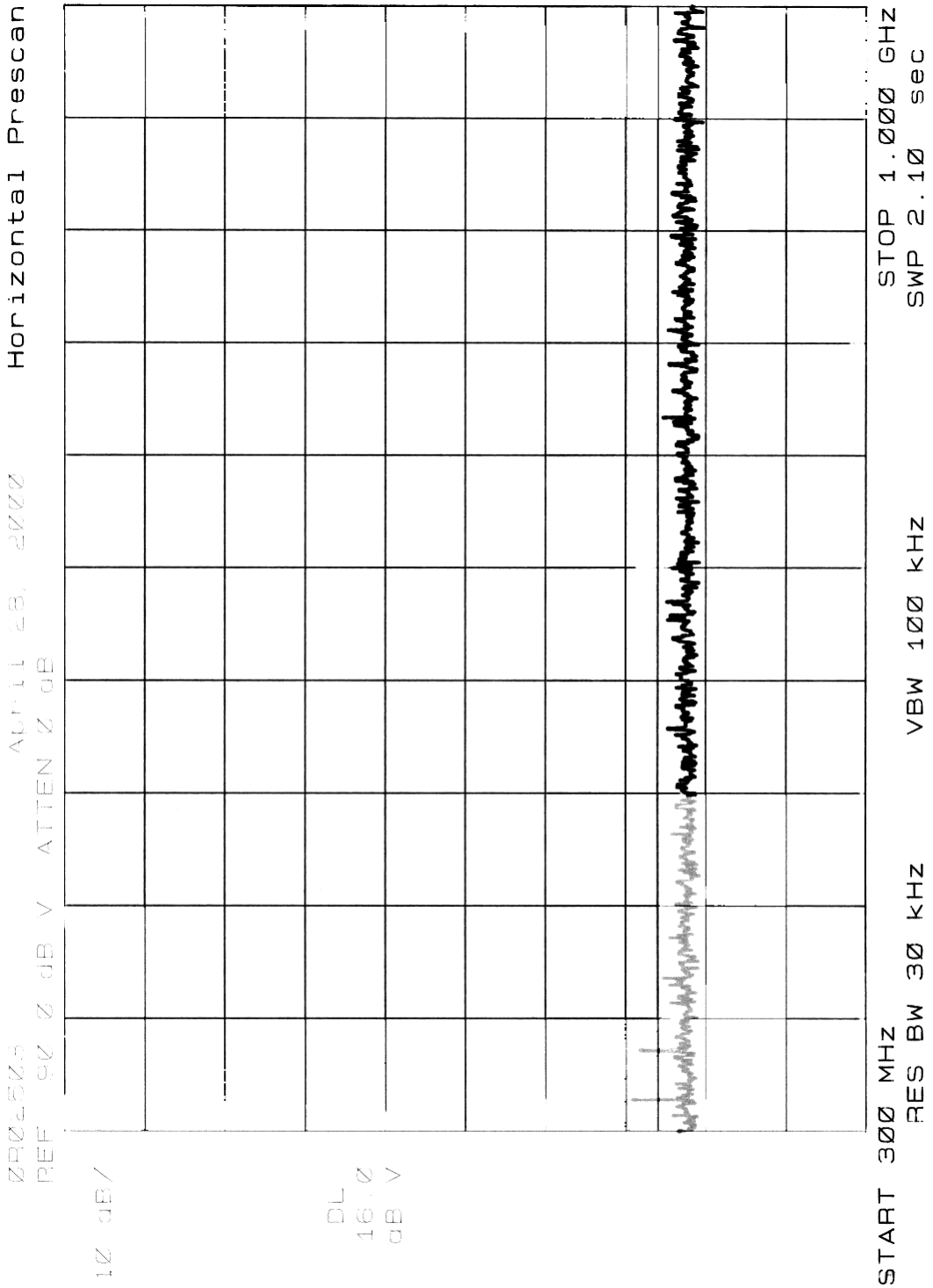
Rear View




Vertical Prescan
April 28, 2000
ØR02503
REF 90 Ø dB V ATTEN Ø dB
10 dB/
DL
24.Ø
dB V
START 30 MHz
RES BW 30 kHz
VBW 100 kHz
STOP 300 MHz
SWP 810 msec


Vertical Prescan
April 28, 2000
0R02503
REF 90.0 dB V ATTEN 0 dB
10 dB/
DL
16.0
dB V
START 300 MHz
RES BW 30 kHz
VBW 100 kHz
1.000 GHz
10 sec


Horizontal Prescan
April 28, 2000
0R02503
REF 90.0 dB V ATTEN 0 dB
10 dB/
DL
24.0
dB V
START 30 MHz
RES BW 30 kHz
VBW 100 kHz
STOP 300 MHz
SWP 810 msec


Horizontal Prescan
STOP 1.000 GHz
SWP 2.10 sec
VBW 100 kHz
RES BW 30 kHz
START 300 MHz

Prescan Data

Project Number : 0R02503
Project Filename : 0R02503.LST
Date : April 28, 2000
Start Frequency : 30 MHz
Stop Frequency : 1000 MHz
Display Line Value: 24 (30-300 MHz), 16 (300-1000MHz) dBuV

Vertical Prescan

Top Emissions below 300 MHz from the vertical prescan list:

150.03 MHz, 24.3 dBuV.

Full Emission List below 300 MHz:

150.03 MHz, 24.3 dBuV. Peak.

Top Emissions above 300 MHz from the vertical prescan list:

Full Emission List above 300 MHz:

Horizontal Prescan

Top Emissions below 300 MHz from the horizontal prescan list:

Full Emission List below 300 MHz:

Top Emissions above 300 MHz from the horizontal prescan list:

320.05 MHz, 17.9 dBuV.
320.01 MHz, 17.8 dBuV.
349.99 MHz, 16 dBuV.

Full Emission List above 300 MHz:

320.01 MHz, 17.8 dBuV. Peak.
320.05 MHz, 17.9 dBuV. Peak.
349.99 MHz, 16 dBuV. Peak.

Section 6. Sample Calculations

Conducted Emissions

If the Quasi-Peak to Average ratio is greater than 6 dB, then the emission is classified as broadband and its Quasi-Peak level is reduced by 13 dB for comparison to the limit.

i.e. Quasi-Peak level = 40 dBµV
Average level = 34 dBµV
Corrected level = 40 - 13 = 27 dBµV

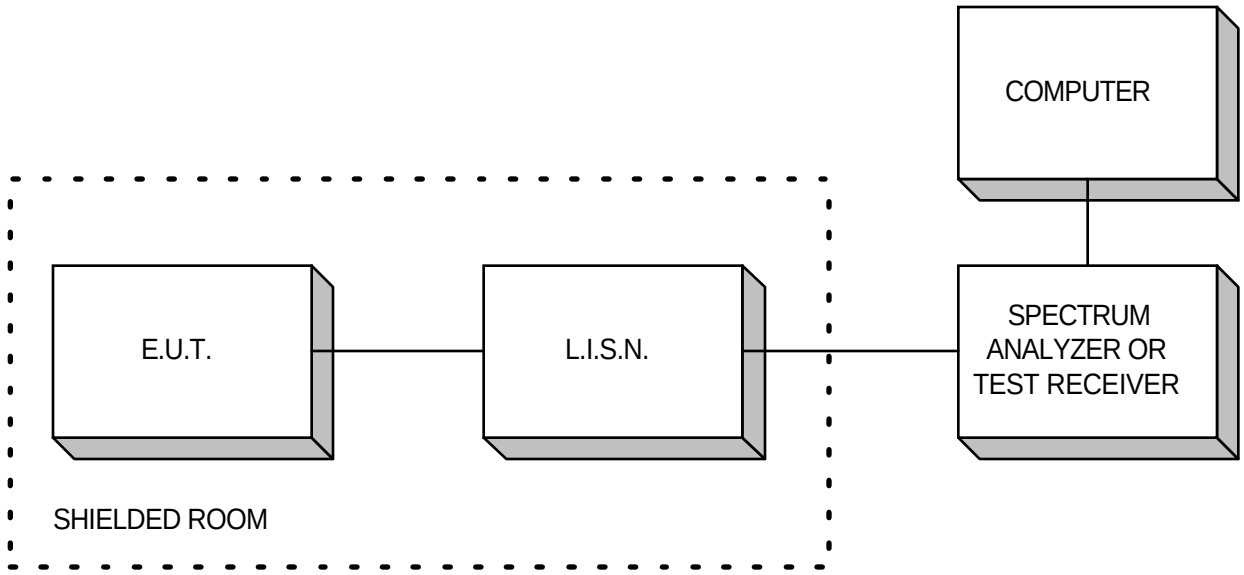
Radiated Emissions

Emissions are measured at a distance of 3 meters and corrected for antenna factor and cable loss.

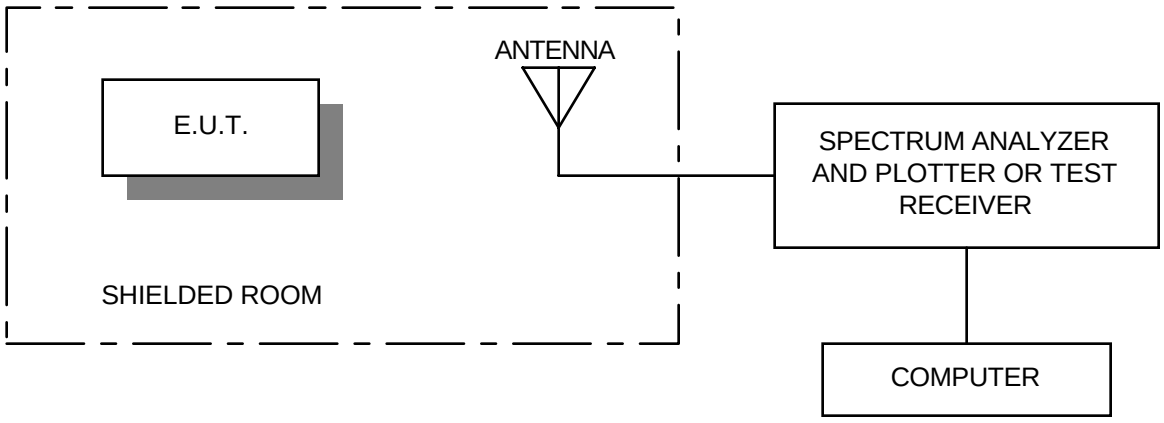
i.e. Received Signal = 25 dBµV @ 100 MHz
Antenna Factor & Cable Loss = 9.8 dB
Field Intensity = 25 + 9.8 = 34.8 dBµV/m @ 3 m

Section 7. Block Diagrams

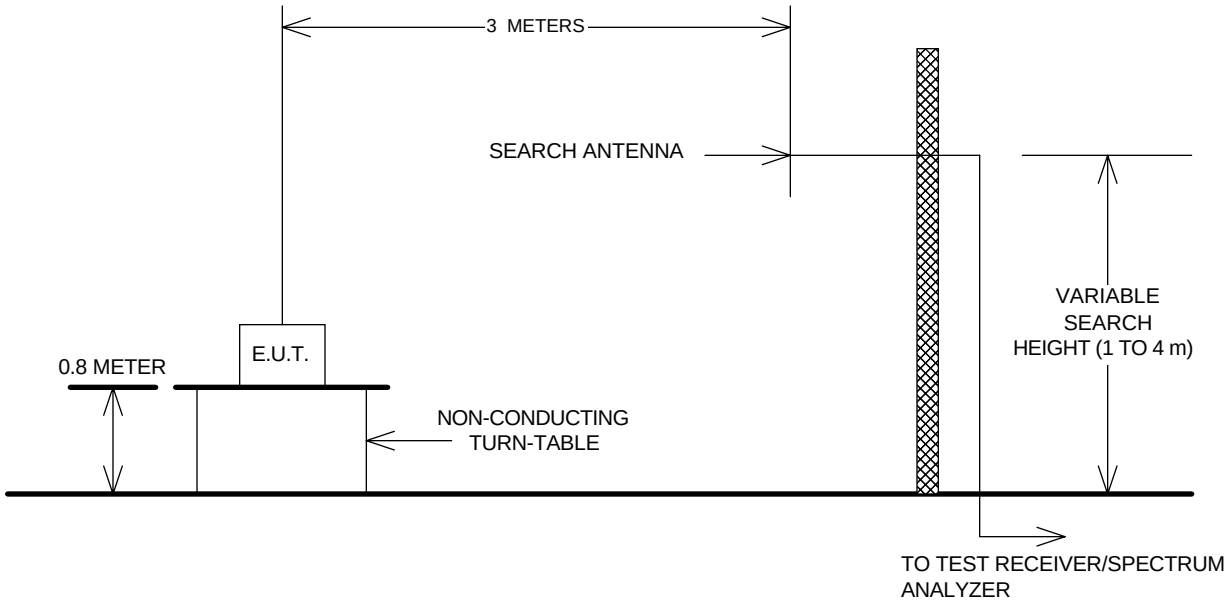
Conducted Emissions



Radiated Prescan



Outdoor Test Site For Radiated Emissions



The spectrum was searched up to the 10th harmonic of the fundamental frequency of operation.

Section 8. Test Equipment List

TEST EQUIPMENT LIST

Equipment List - Conducted Emissions - Shielded Room #1

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
1Year	LISN	Rohde & Schwarz	ESH2-Z5	890485/017	Aug. 24/99	Aug. 24/00
1 Year	Spectrum Analyzer	Hewlett-Packard	8566B	2311A02238	Nov. 6/99	Nov. 6/00
1 Year	Spectrum Analyzer Display	Hewlett-Packard	85662A	2314A04759	Nov. 6/99	Nov. 6/00
	Plotter	Hewlett-Packard	7550A	28484 15123	N/A	N/A
1 Year	Transient Limiter	Hewlett-Packard	1194 7A	3107A01766	Oct. 7/99	Oct. 7/00

Equipment List - Radiated Emissions

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
	Biconilog Antenna	EMCO	3143	9404-1039	NCR	NCR
1Year	Receiver	Rohde & Schwarz	ESVS-30	843710/002	Oct. 29/99	Oct. 29/00
1 Year	Spectrum Analyzer	Hewlett-Packard	8566B	2311A02238	Nov. 6/99	Nov. 6/00
1 Year	Spectrum Analyzer Display	Hewlett-Packard	85662A	2314A04759	Nov. 6/99	Nov. 6/00
	Plotter	Hewlett-Packard	7550A	28484 15123	N/A	N/A
1 Year	Log Periodic Antenna	EMCO	LPA-25	1141	Aug. 4/99	Aug. 4/00

Note: N/A = Not Applicable
NCR = No Cal Required
COU = CAL On Use