KTL Test Report:	8R01147
Applicant:	Millennium Enterprises Limited 2402 Bank of America Tower, Suite 3625 12 Harcourt Road, Central Hong Kong
Equipment Under Test: (E.U.T.)	RFRM Receiver
FCC ID:	OHYRFRM
In Accordance With:	**FCC Part 15, Subpart B** Radio Receivers
Tested By:	KTL Ottawa Inc. 3325 River Road, R.R. 5 Ottawa, Ontario K1V 1H2
Authorized By:	
	T. Tidwell, Laboratory Manager
Date:	
Total Number of Pages:	28

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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. Measurement procedure ANSI C63.4-1992 was used for all tests. Radiated Emissions were measured on an open area test site.

☒	New Submission	☐	Production Unit
☐	Class II Permissive Change	☒	Pre-Production Unit

C	R	R	Equipment Code

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See " Summary of Test Data".

NVLAP LAB CODE: 100351-0

TESTED BY: _____ DATE: _____
Kevin Carr, Technologist

Summary Of Test Data

Name Of Test	Para. No.	Results
Antenna Conducted Emissions	15.111	Not Applicable
Radiated Emissions	15.109	Complies
Powerline Conducted Emissions	15.107	Not Applicable

Footnotes For N/A's:

Test Conditions:

Indoor	Temperature:	21 °C
	Humidity:	20 %
Outdoor	Temperature:	0 °C
	Humidity:	20 %

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

Manufacturer: Headwaters Research

Model No.: RFRM

Serial No.: None

Equipment Details

Frequency Range:	315 MHz (Fixed)
Number of Channels:	1
Operating Frequency(ies) of Sample:	315 MHz
Crystal Frequency(ies):	32.768 kHz, 608 kHz
Primary Power Requirement:	4 x AA Batteries
Bandwidth and Emission Designator:	Not Applicable
Intermediate Frequency(ies):	Not Applicable

Description of E.U.T.

The E.U.T. is a super-generative type receiver for use with Tx model RFTM.

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 comprised of three main modules:

1. Radio Receiver PCB
2. Logic / Control PCB
3. Keypad PCB

The receiver antenna is a 2 inch loaded vertical whip with a protective coating.

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) Positioned as per installation instructions.

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) Font end of receiver cohered using a CW signal generator feeding a dipole antenna.

Section 3. Equipment Configuration

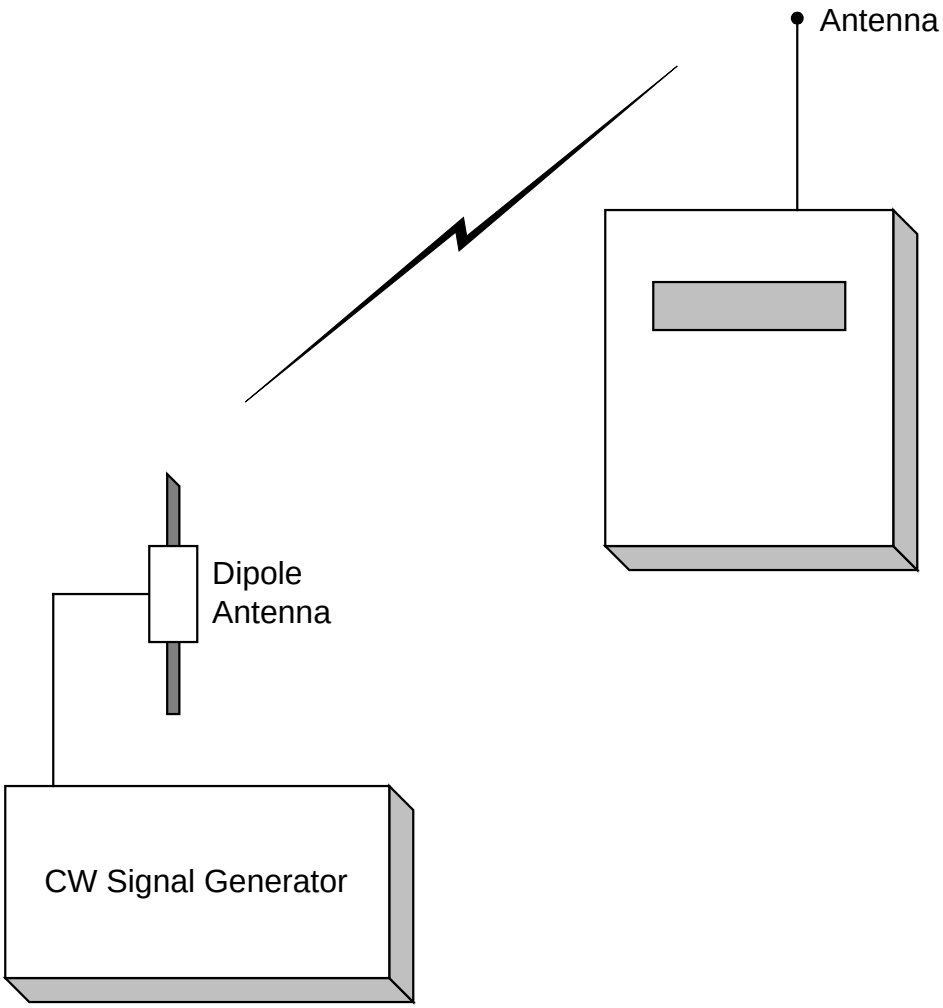
Equipment Configuration List:

Item	Description	Model No.	Serial.	Rev.
(A)	Receiver	RFRM	None	

Inter-connection Cables:

Not Applicable

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



Section 4. Receiver Antenna Conducted Emissions

NAME OF TEST: Receiver Antenna Conducted Emissions	PARA. NO.: 15.111
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply. See attached graphs and table.

Measurement Data: See attached graphs and table.

NOT APPLICABLE

Section 5(A). Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.109(a)
TESTED BY: Kevin Carr	DATE: January 3, 1999

Minimum Standard:

Frequency(MHz)	Field Strength (dBμV/m @ 3m)
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
Above 960	54.0

Test Results: Complies. The worst-case emission level is 35.0 dBμV/m @ 3m at 315.78 MHz. This is 11.0 dB below the specification limit.

Measurement Data: See attached table.

For super-regenerative receivers the receiver is cohered using a signal generator and dipole antenna.

Handheld equipment and equipment not designed to be mounted in any fixed orientation, the E.U.T. is tested in three orthogonal axis to obtain worst case results.

Test Data - Radiated Emissions

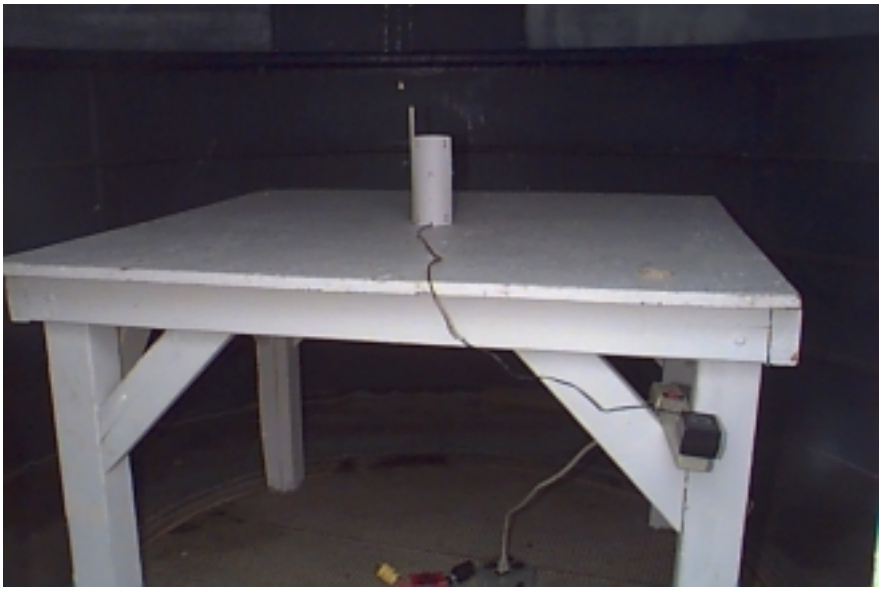
Test Distance (meters) : 3		**Range: A Tower**		**Receiver: ESVP**		**RBW(kHz): 120**		**Detector: Q-Peak**			
Freq. (MHz)	**Ant. ***	**Pol. (V/H)**	**Ant. HGT. (m)**	**Table (deg.)**	**RCVD Signal (dBµV/m)**	**Ant. Factor (dB)****	**Amp. Gain (dB)*****	**Dist. Corr. (dB)**	**Field Strength (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
315.78	E/D3	V			12.0	23.0			35.0	46.0	11.0
315.78	E/D3	H			3.5	23.0			26.5	46.0	19.5

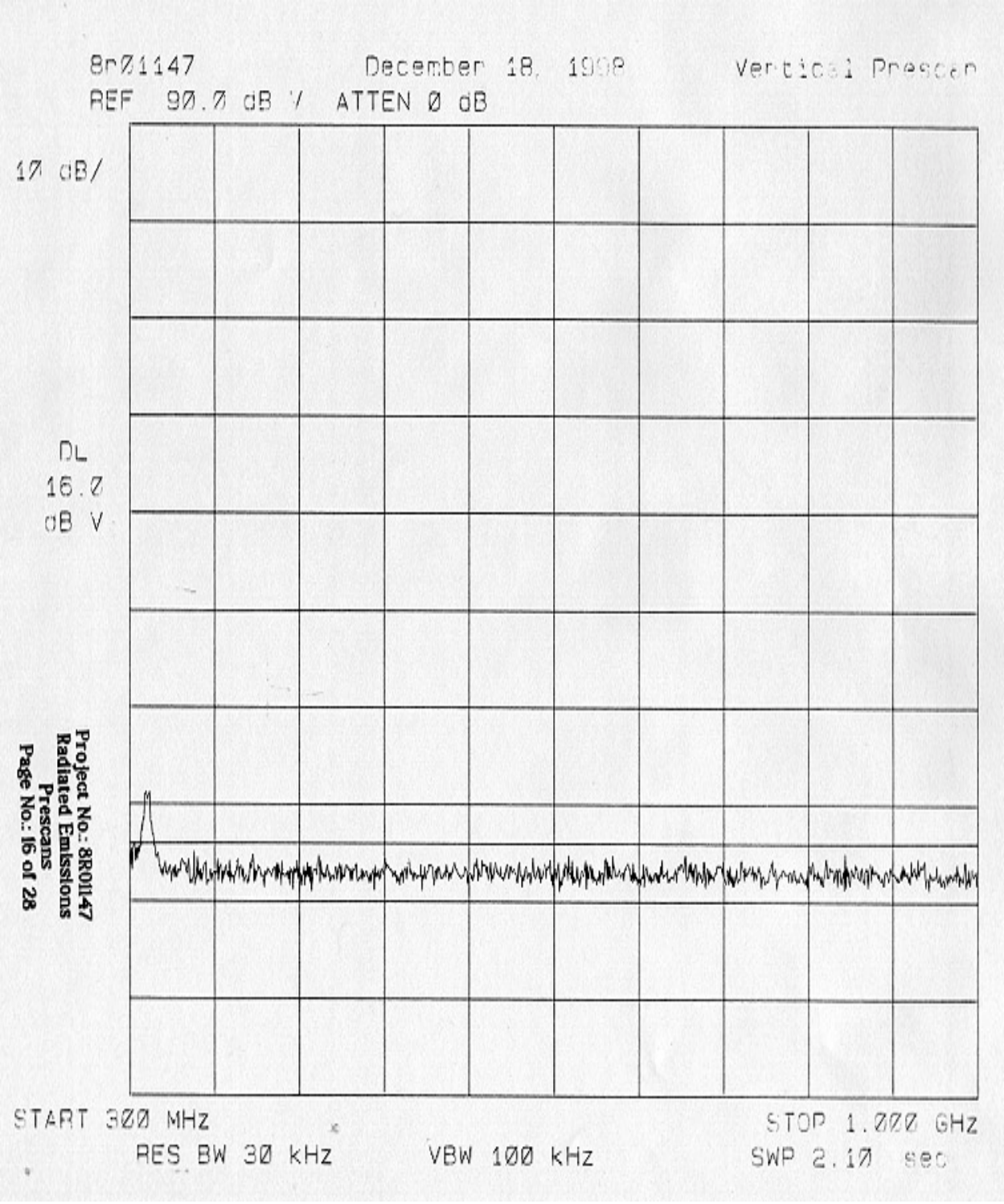
Notes:
B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
* Re-measured using dipole antenna. ( ) Denotes failing emission level.
(1) 120 kHz, Q-Peak, (2) 10 kHz, Peak, (3) 100 kHz RGW, 300 kHz VBW, Peak,
(4) 300 kHz RBW, 1 MHz VBW, Peak, (5) 1 MHz RBW, 3 MHz VBW, Peak, (6) 1 MHz RBW, 10 Hz VBW, Peak

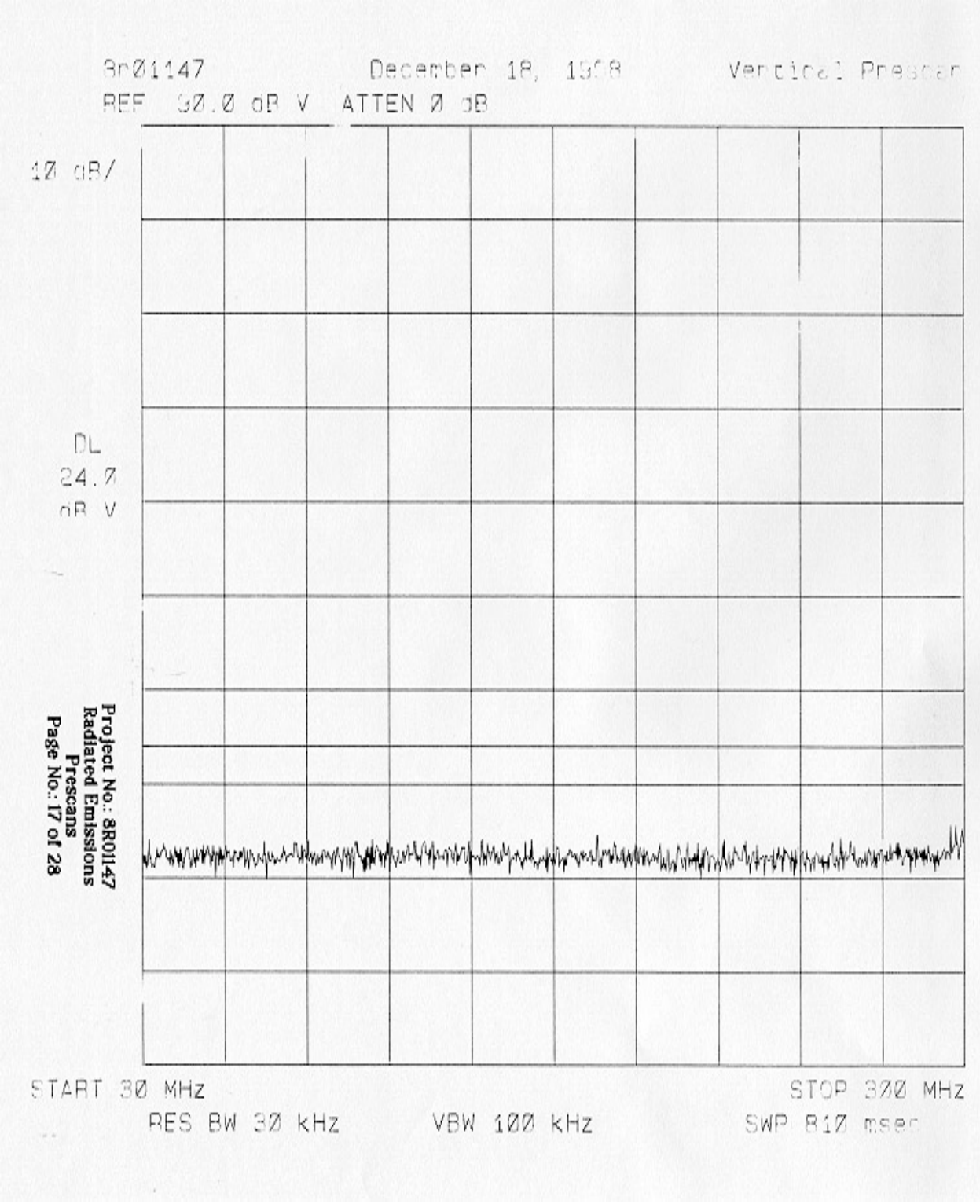
Radiated Photographs (Worst Case Configuration)

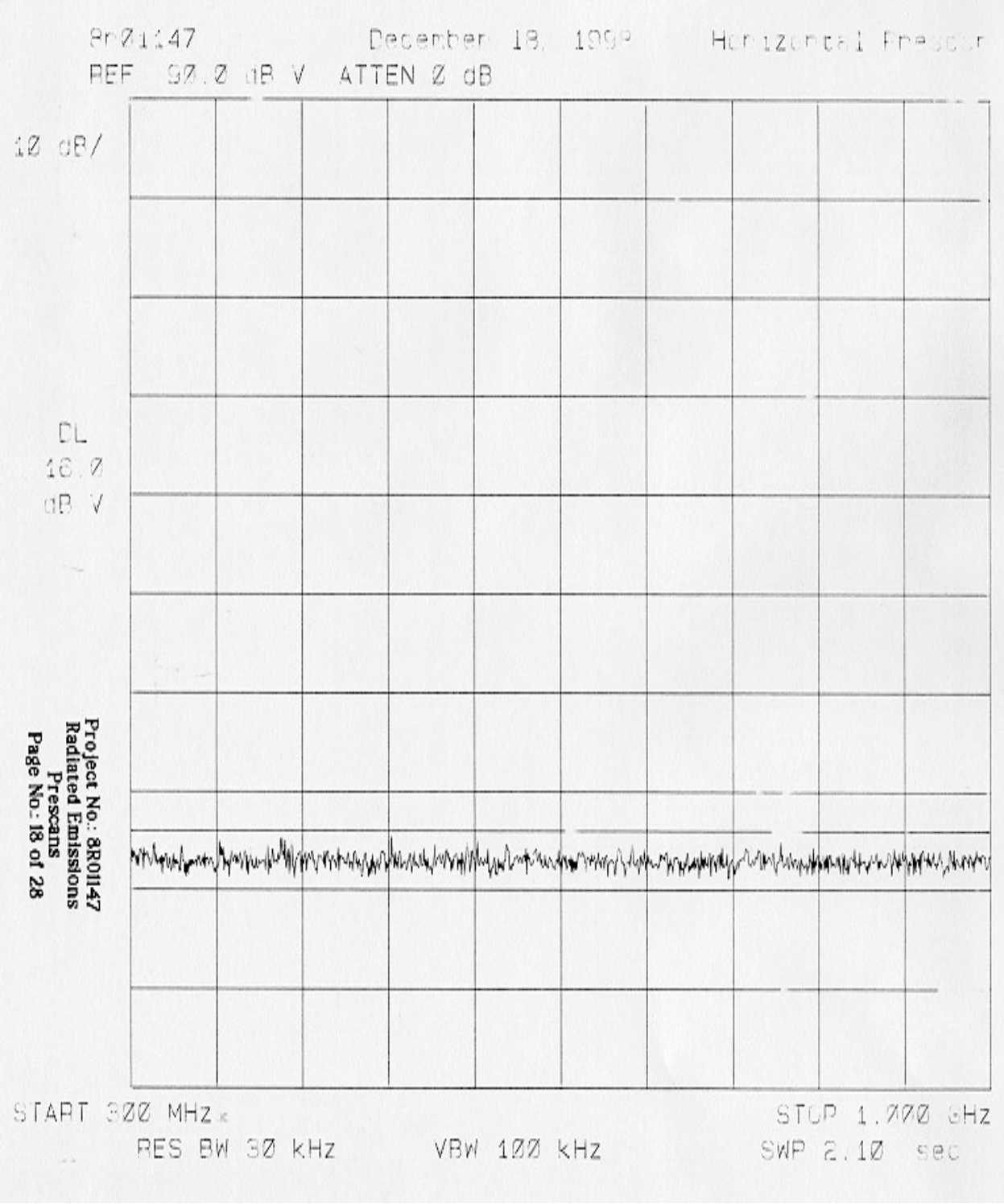
Front View

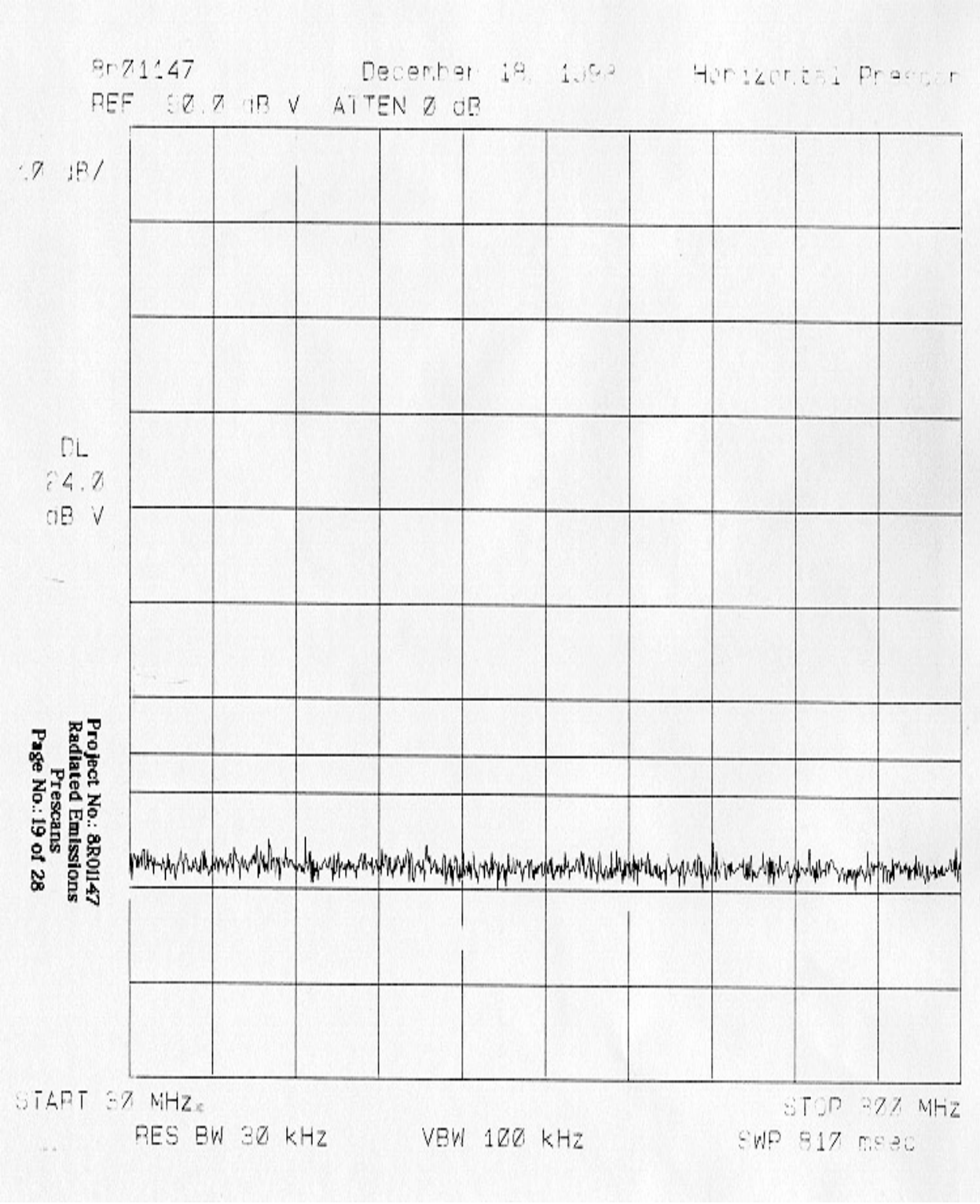
Rear View




8r01147
December 18, 1998
Vertical Prescan
REF 90.0 dB V
ATTEN 0 dB
10 dB/
DL
16.0
dB V
Project No.: 8R01147
Radiated Emissions
Prescans
Page No.: 16 of 28
START 300 MHz
STOP 1.000 GHz
RES BW 30 kHz
VBW 100 kHz
SWP 2.10 sec


8R01147
December 18, 1998
Vertical Prescan
REF 30.0 dBµV
ATTEN 0 dB
10 dB/
DL
24.0
dBµV
Project No.: 8R01147
Radiated Emissions
Prescans
Page No.: 17 of 28
START 30 MHz
STOP 300 MHz
RES BW 30 kHz
VBW 100 kHz
SWP 810 msec


Pr01147 December 18, 1998 Horizontal Prescan
REF 90.0 dB V ATTEN 0 dB
10 dB/
DL
16.0
dB V
Project No.: 8R01147
Radiated Emissions
Prescans
Page No: 18 of 28
START 300 MHz
STOP 1.000 GHz
RES BW 30 kHz
VBW 100 kHz
SWP 2.10 sec


8R01147
REF 80.0 dB V
ATTEN 0 dB
10 dB/
DL
24.0
dB V
Project No.: 8R01147
Radiated Emissions
Prescans
Page No.: 19 of 28
START 30 MHz
RES BW 30 kHz
VBW 100 kHz
STOP 800 MHz
SWP 817 msec

Section 5(B). Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.109(b)
TESTED BY:	DATE:

NOT APPLICABLE

Minimum Standard: Equipment manufactured or imported before June 23, 1999 is permitted the following limits:

Frequency (MHz)	Field Strength (dBµV/m @ 3m)
30-70	320 (50.1 dBµV/m)
70-130	500 (54.0 dBµV/m)
130-174	500 - 1500 dBµV/m)
174-260	1500 (63.5 dBµV/m)
260-470	1500 - 5000 (linear interpolation)
Above 470	5000 (74.0 dBµV/m)

Test Results: Complies / Does Not Comply. The worst-case emission level is _____ dBµV/m @ 3m at _____ MHz. This is _____ dB above/below the specification limit.

Measurement Data: See attached table.

Test Data - Radiated Emissions

Test Distance (meters) :		Range:		Receiver:		RBW(kHz):		Detector:			
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)

NOT APPLICABLE

Notes:
B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
* Re-measured using dipole antenna. ( ) Denotes failing emission level.
(1) 120 kHz, Q-Peak, (2) 10 kHz, Peak, (3) 100 kHz RBW, 300 kHz VBW, Peak,
(4) 300 kHz RBW, 1 MHz VBW, Peak, (5) 1 MHz RBW, 3 MHz VBW, Peak, (6) 1 MHz RBW, 10 Hz VBW, Peak

Radiated Photographs (Worst Case Configuration)

FRONT VIEW

NOT APPLICABLE

REAR VIEW

Section 6. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.107
TESTED BY:	DATE:

Minimum Standard: The RF energy feed back to the power lines shall not exceed 48 dBµV on any frequency between 0.45 MHz and 30 MHz inclusive.

Test Results: Complies / Does Not Comply. See attached graphs.

Measurement Data: See attached graphs.

NOT APPLICABLE

Powerline Conducted Photographs (Worst Case Configuration)

FRONT VIEW

REAR VIEW

Section 7. 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

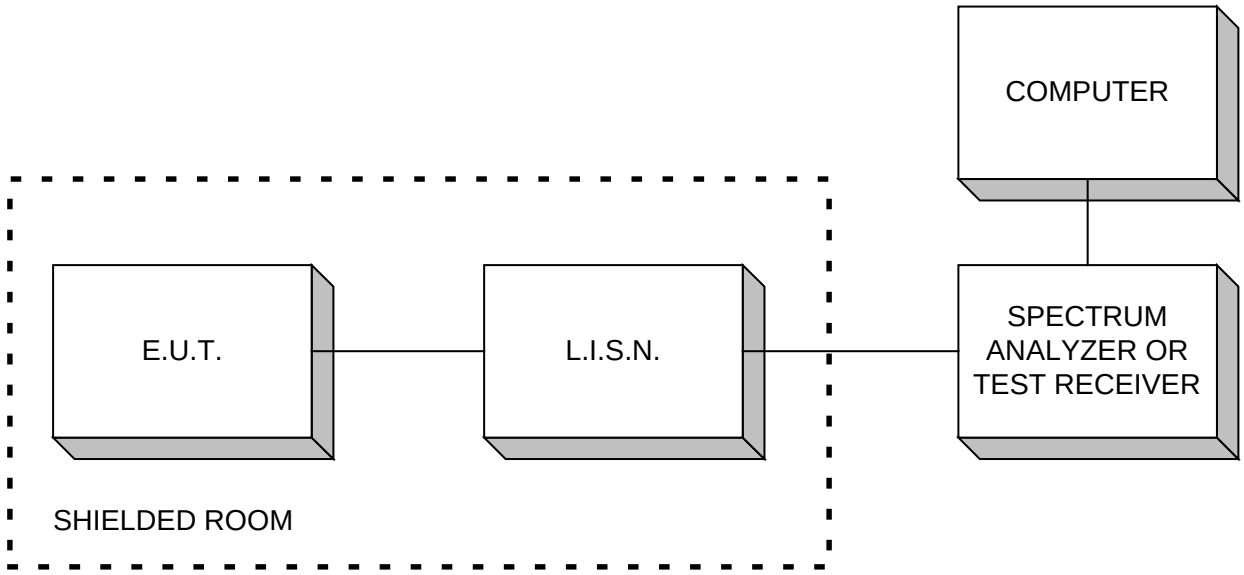
Radiated Emissions

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

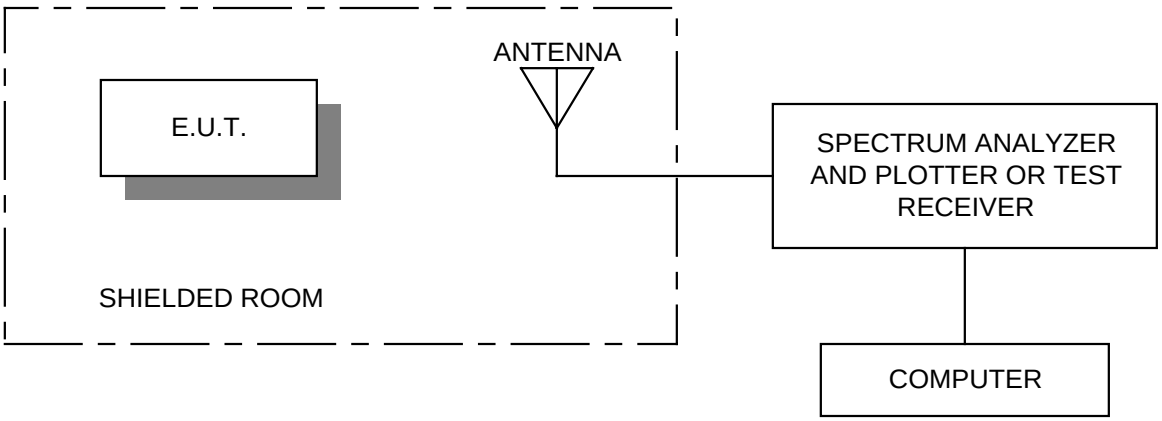
i.e. Received Signal = 25 dBµV @ 100 MHz
Antenna Factor & Cable Loss = 9.8 dB
Field Intensity = 25 + 9.8 = 34.8 dBµV/m @ 3 m

Section 8. Block Diagrams

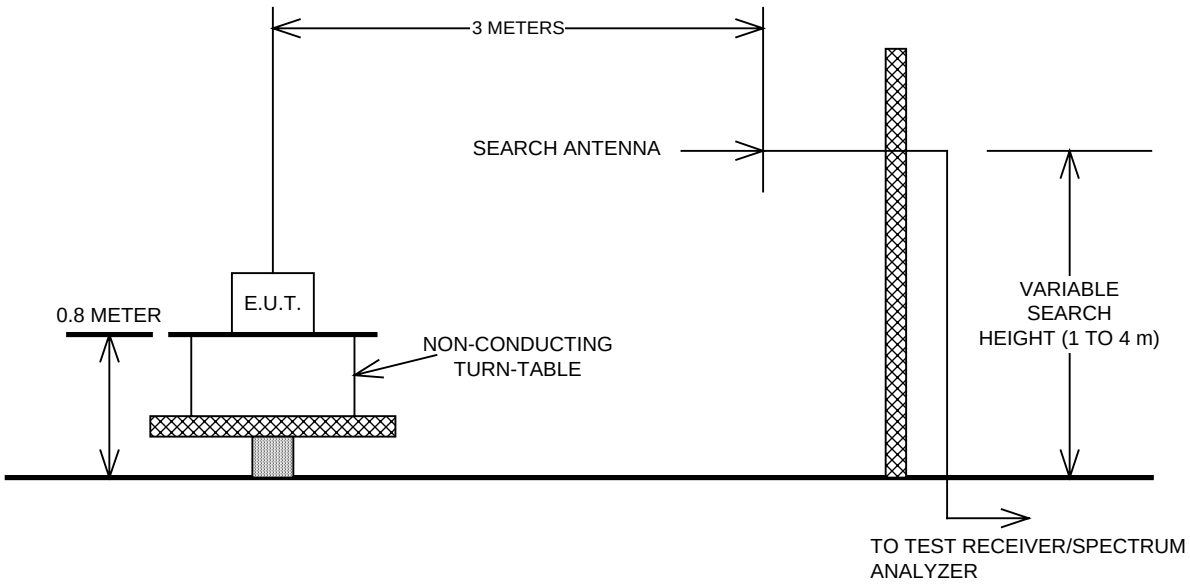
Conducted Emissions



Radiated Prescan



Outdoor Test Site For Radiated Emissions



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

Section 9. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	May 20/98	May 20/99	
1 Year	Spectrum Analyzer-**2**	Hewlett Packard	8566B	1950A00400	July 22/98	July 22/99	
1 Year	Spectrum Analyzer Display-**2**	Hewlett Packard	85662A	1950A01177	July 22/98	July 22/99	
1 Year	Receiver	Rohde & Schwarz	ESVP	892661/014	Mar. 31/98	Mar. 31/99	
1 Year	Receiver	Rohde & Schwarz	ESVS-30	843710/002	Oct. 27/98	Oct. 27/99	
	Biconilog Antenna	EMCO	3143	1038	NCR	NCR	
2 Year	Horn Antenna	EMCO #2	3115	4336	Oct. 30/97	Oct. 30/99	
1 Year	Log Periodic Antenna	EMCO	LPA-25	1141	July 27/98	July 27/99	
1 Year	Dipole Antenna Set	EMCO	3121C	1029	Nov. 18/98	Nov. 18/99	
1 Year	Biconical (1) Antenna	EMCO	3109	9204-2708	July 27/98	July 27/99	
1 Year	Digital Storage Oscilloscope	Tektronix	TDS544A	B012005	July 23/98	July 23/99	
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Aug. 4/98	Aug. 4/99	
1 Year	Low Noise Amplifier	DBS Microwave	DWT-13035	9623	Aug. 4/98	Aug. 4/99	

NA: Not Applicable
NCR: No Cal Required