



KTL Ottawa

Safety - EMI - Telecom - ISO Guide 25

ENGINEERING TEST REPORT

**ON:
THE VTECH ENGINEERING CANADA LTD.
"VT9111 CORDLESS PHONE FAMILY LISTED WITH VT9115"**

**IN ACCORDANCE WITH:
FCC PART 15, SUBPART B
RADIO RECEIVERS**

PROJECT NO.: 8R00732

TESTED FOR:

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TESTED BY:

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NVLAP LAB CODE: 100351-0

JULY 1998

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This report applies only to the items tested.

EQUIPMENT: Cordless Phone

TABLE OF CONTENTS

Section 1. Summary of Test Results

General
Summary of Tests

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

Equipment Details
Description of E.U.T.
Modifications Incorporated in E.U.T.
Theory of Operation
Justification
Exercise Program

Section 3. Equipment Configuration

Equipment Configuration List
Inter-connection Cables
Configuration of the Equipment Under Test (E.U.T.) Block Diagram

Section 4. Receiver Antenna Conducted Emissions

Test Conditions
Test Results
Receiver Antenna Conducted Plots

Section 5. Radiated Emissions

Test Conditions
Test Results
Test Data-Radiated Emissions
Radiated Photographs
Radiated Emissions Plots

Section 6. Powerline Conducted Emissions

Test Conditions
Test Results
Powerline Conducted Photographs
Powerline Conducted Plots

EQUIPMENT: Cordless Phone

TABLE OF CONTENTS, continued

Section 7. Sample Calculations

Conducted Emissions
Radiated Emissions

Section 8. Block Diagrams

Conducted Emissions
Radiated Emissions

Section 9. Test Equipment List

Equipment List - Powerline Conducted Emissions
Equipment List - Radiated Emissions

EQUIPMENT: Cordless Phone

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.

Abstract:

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

The antenna is not detachable; therefore, Paragraph 15.111 was not performed.



NVLAP Lab Code: 100351-0

TESTED BY:
Tom Tidwell, Senior Technologist

DATE: 29 July 1998

APPROVED BY:
W. Waterhouse, RF Engineering Lab Manager

DATE: July 31, 1998

EQUIPMENT: Cordless Phone

Description of E.U.T.

The E.U.T. is a 900 MHz analogue cordless telephone. The receive portion of the RF circuits is a super-heterodyne design.

Description of Modification for Class II Permissive Change

(1) **Receiver Section:**

Temic U2765B IC is used to replace current discrete mixer (Siemens CF739R) and demodulator IC (Motorola MC13156)

(2) **Transmit Section:**

Used a buffered PLL IC (Toshiba TB31202BFN). Two buffer transistors removed.

(3) **Change of PCB Layout and Shielding:**

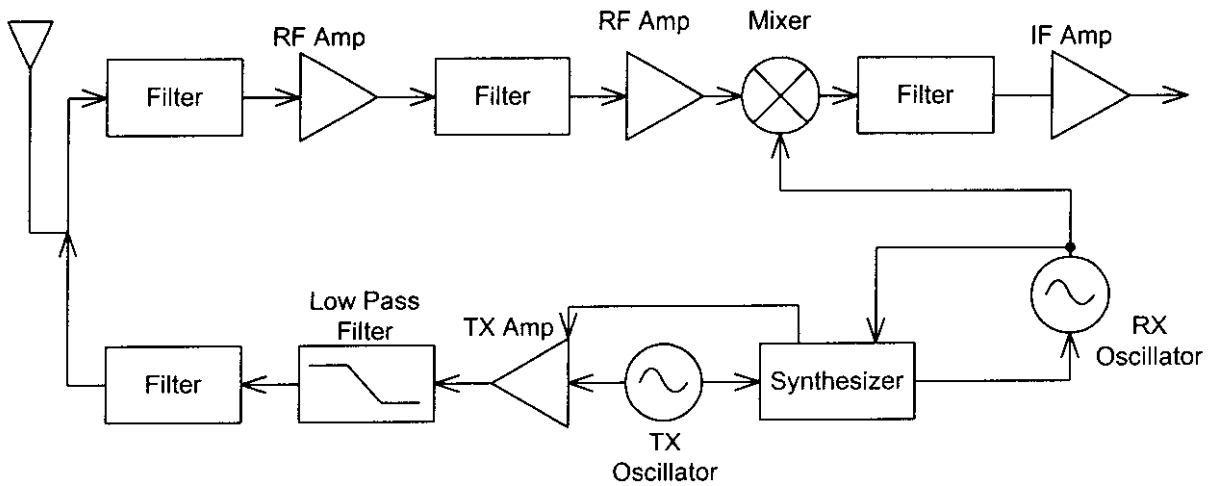
The PCB layout and shield can partitions are changed to accommodate Temic IC U2765B

EQUIPMENT: Cordless Phone

Theory of Operation

The E.U.T. is an analogue cordless telephone. Modulation is FM. Carrier deviation is ± 25 kHz for voice and ± 40 kHz for MSK administrative data. The base and handset both have permanently attached antennas. The base antenna is a $\frac{1}{2}$ wave antenna with 0 dBi gain while the handset has a $\frac{1}{4}$ wave antenna with -3 dBi gain.

System Diagram



EQUIPMENT: Cordless Phone

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) Base Set Mounted Horizontally.
- (2) Base Set Mounted Vertically.
- (3) Handset Oriented Vertically.
- (4) Handset Oriented Horizontally on Face.
- (5) Handset Oriented Horizontally on Edge.

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: Not Applicable

EQUIPMENT: Cordless Phone

Section 3. Equipment Configuration

Equipment Configuration List:

Item	Description	Model No.	Serial.	Rev.
(A)	Base Set	VT9111	1	
(B)	AC Adaptor	FIL-11-180-090	None	
(C)	Loop Simulator	CLI-001	None	

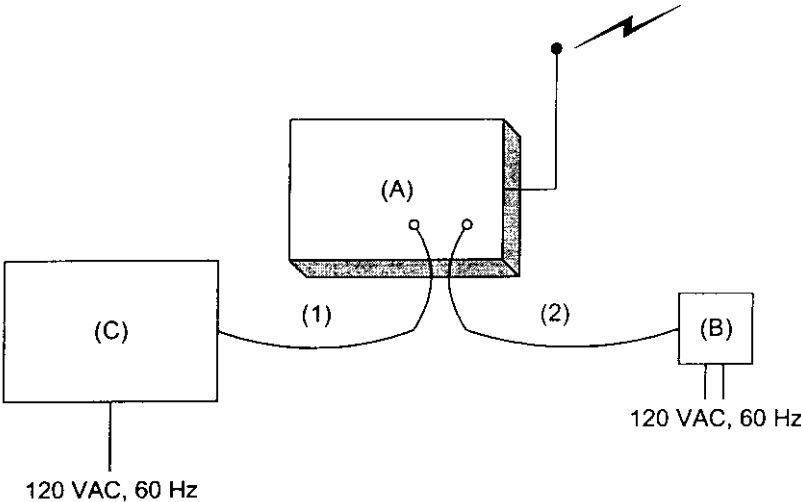
Inter-connection Cables:

Item	Description	Length (m)
(1)	2 Conductor Phone Cord	3.0
(2)	2 Conductor Power Cord	2.0

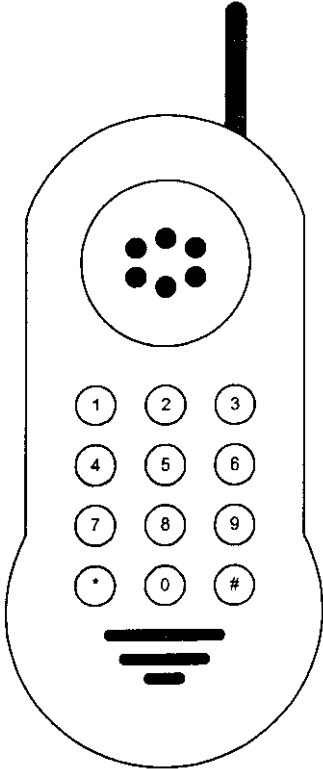
EQUIPMENT: Cordless Phone

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

Base



Handset



EQUIPMENT: *Cordless Phone*

Section 4. Receiver Antenna Conducted Emissions

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

Test Conditions: Test Voltage: _____ VAC
Temperature: _____ °C
Humidity: _____ %

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

Measurement Data: See attached graphs and table.

NOT APPLICABLE

EQUIPMENT: Cordless Phone

Section 5(A). Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.109(a)
TESTED BY: Tom Tidwell	DATE: July 22, 1998

Test Conditions: (Base) Test Voltage: 120 Vac
(Handset) Test Voltage: 3.6 Vdc
Temperature: 25 °C
Humidity: 51%

Minimum Standard:

Frequency(MHz)	Field Strength (dB μ V/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 37.8 dB μ V/m @ 3m at 915.7 MHz. This is 8.2dB 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.

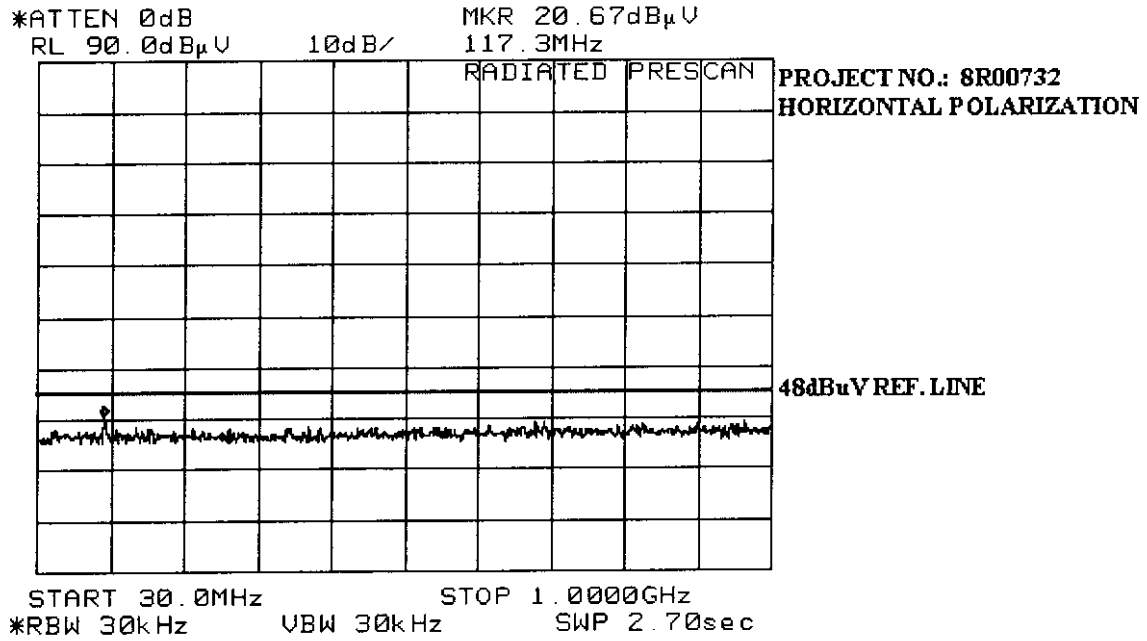
EQUIPMENT: Cordless Phone

Test Data - Radiated Emissions

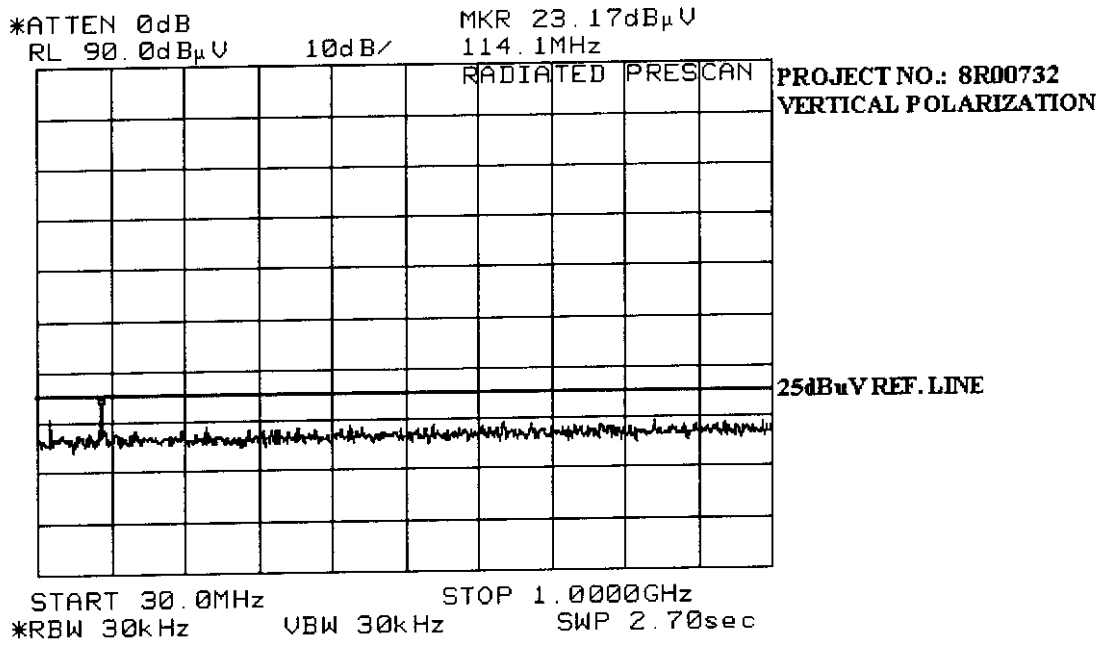
Test Distance (meters) : 3		Range: A Tower		Receiver: ESVP		RBW(kHz): As Per Table		Detector: As Per Table			
Freq. (MHz)	Ant. *	Pol. (V/H)	BW & Det.	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
913.0	E/D4	V	3		1.9	34.7			36.6	46.0	9.4
913.0	E/D4	H	3		-2.7	34.7			32.0	46.0	14.0
915.7	E/D4	V	3		3.1	34.7			37.8	46.0	8.2
915.7	E/D4	H	3		-2.3	34.7			32.4	46.0	13.6
914.35	E/D4	V	3		-3.5	34.7			31.2	46.0	14.8
914.35	E/D4	H	3		-5.4	34.7			29.3	46.0	16.7
917.05	E/D4	V	3		1.1	34.7			35.8	46.0	10.2
917.05	E/D4	H	3		0.6	34.7			35.3	46.0	10.7

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

EQUIPMENT: Cordless Phone



EQUIPMENT: Cordless Phone



EQUIPMENT: Cordless Phone

Section 5(B). Radiated Emissions

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

Test Conditions: Test Voltage: _____ VAC
 Temperature: _____ °C
 Humidity: _____ %

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

Frequency (MHz)	Field Strength (dBµV/m @ 3m)
30-90	320 (50.1 dBµV/m)
90-130	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)

NOT APPLICABLE

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.

EQUIPMENT: Cordless Phone

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 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

EQUIPMENT: Cordless Phone

Radiated Photographs (Worst Case Configuration)

FRONT VIEW

NOT APPLICABLE

REAR VIEW

EQUIPMENT: Cordless Phone

Section 6. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.107
TESTED BY: Tom Tidwell	DATE: July 22, 1998

Test Conditions: Test Voltage: 120 VAC
Temperature: 25 °C
Humidity: 51 %

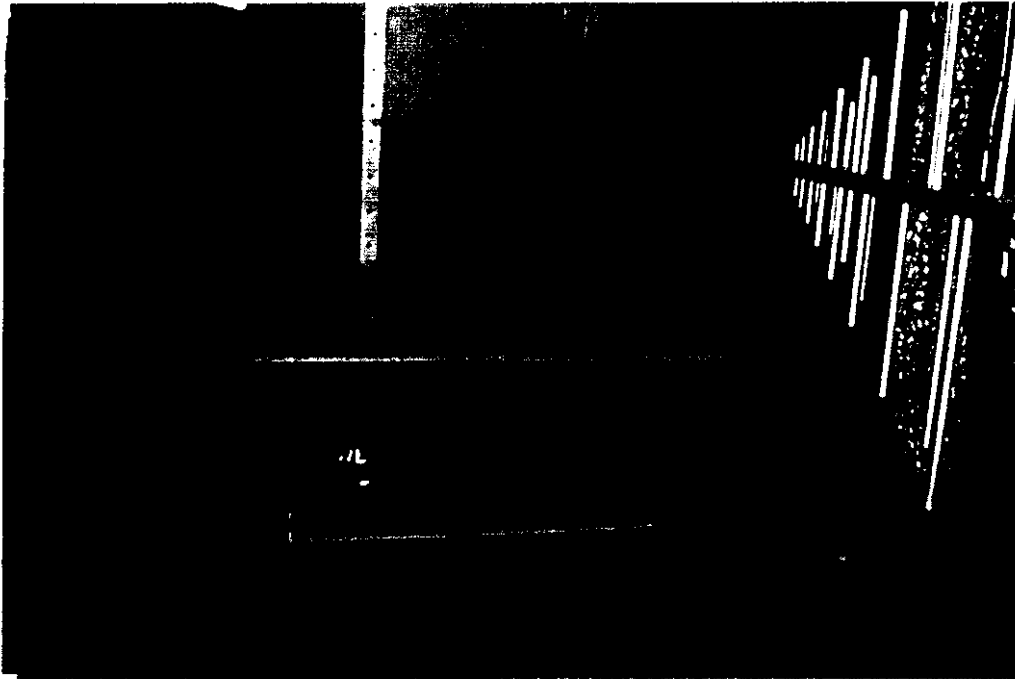
Minimum Standard: The RF energy feed back into the power lines shall not exceed 48 dB μ V on any frequency between 0.45 MHz and 30 MHz inclusive.

Test Results: Complies. See attached graphs.

Measurement Data: See attached graphs.

CONDUCTED PHOTOGRAPHS (Worst Case)

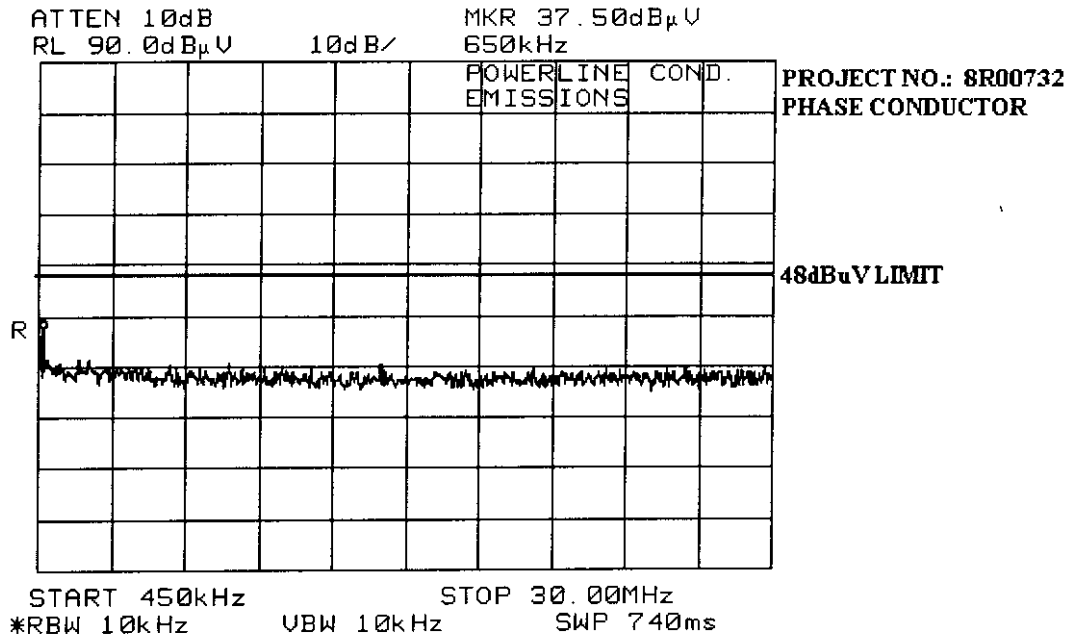
FRONT VIEW



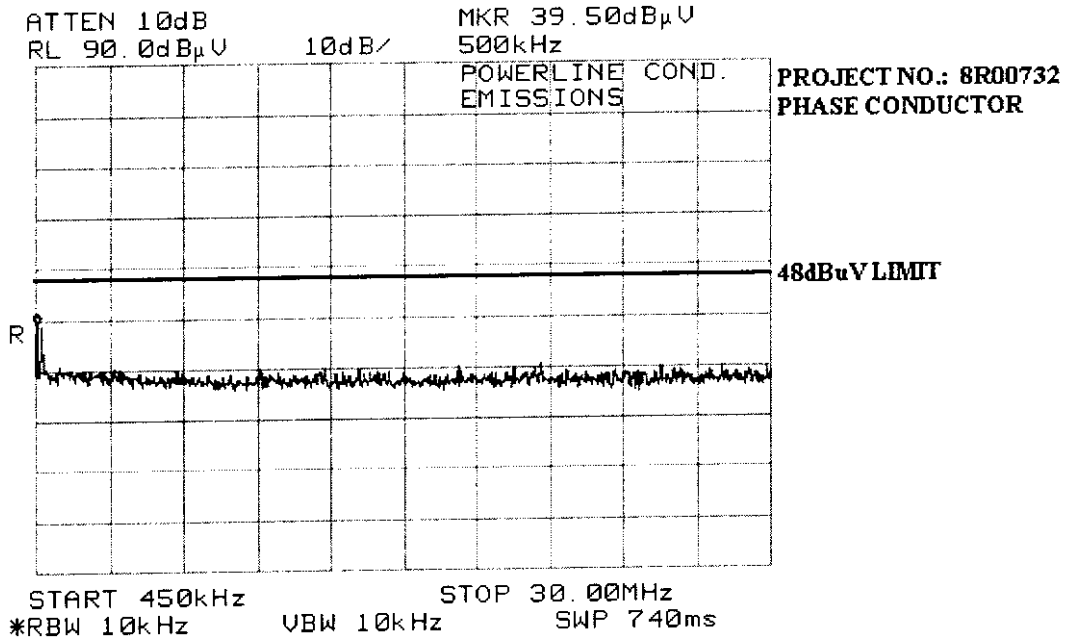
SIDE VIEW



EQUIPMENT: Cordless Phone



EQUIPMENT: Cordless Phone



EQUIPMENT: Cordless Phone

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 dB μ V
 Average level = 34 dB μ V
 Corrected level = 40 - 13 = 27 dB μ V

Radiated Emissions

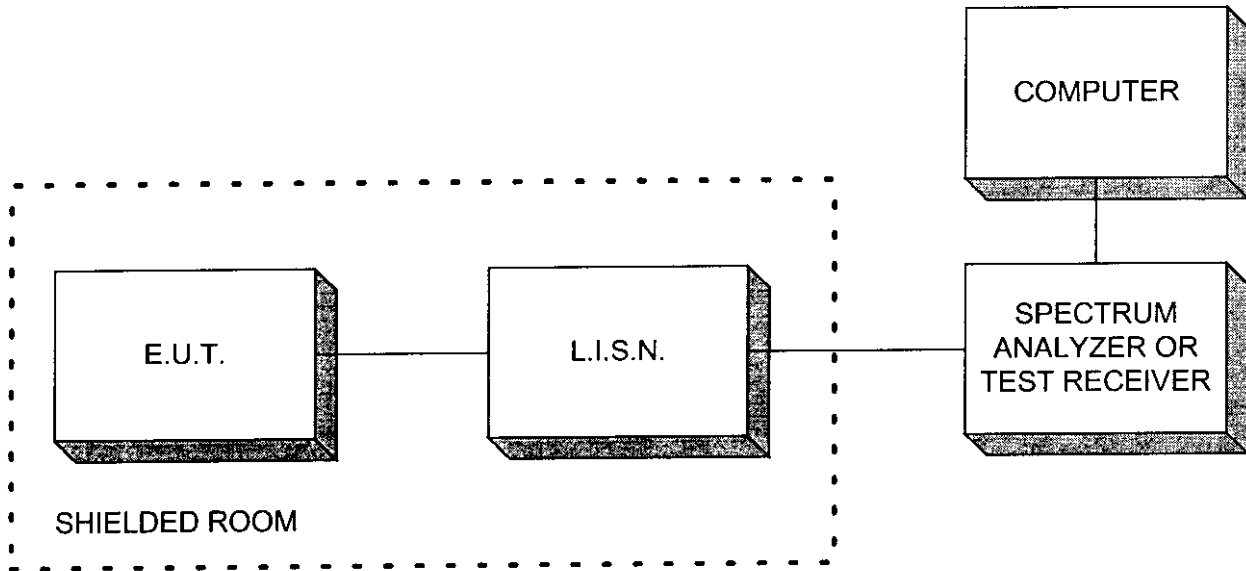
Emissions are measured at a distance of 3 meters and corrected for antenna factor and cable loss.

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

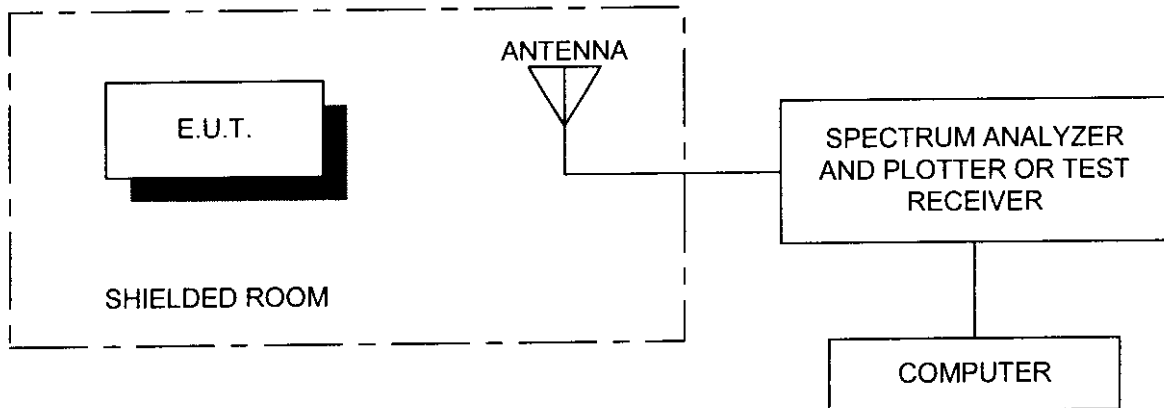
EQUIPMENT: Cordless Phone

Section 8. Block Diagrams

Conducted Emissions

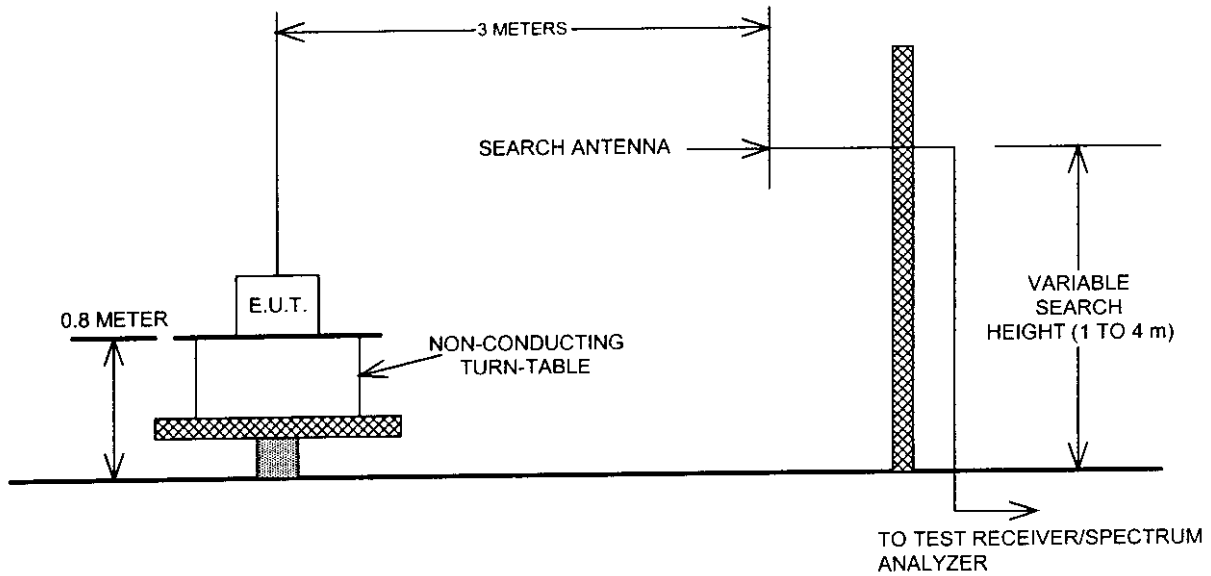


Radiated Prescan



EQUIPMENT: *Cordless Phone*

Outdoor Test Site For Radiated Emissions



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

*EQUIPMENT: Cordless Phone***Section 9. Test Equipment List****Equipment List - Conducted Emissions - Shielded Room #2**

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
1Year	LISN	Tegam	95300-50	T-128556	July 24/97	July 24/98
1Year	Spectrum analyzer	Hewlett-Packard	8565E	FA000981	May 20/98	May 20/99
	Plotter	Hewlett-Packard	7470A	2210A08836	N/A	N/A

Equipment List - Radiated Emissions

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
	Biconilog Antenna	EMCO	3143	9404-1039	NCR	NCR
1Year	Dipole Antenna Set	EMCO	3121C	1029	Oct. 28/97	Oct. 28/98
1Year	Receiver	Rohde & Schwarz	ESVP	892661/014	Mar. 31/98	Mar. 31/99
1Year	Spectrum Analyzer	Hewlett-Packard	8565E	FA000981	May 20/98	May 20/99
2 Year	Horn Antenna	EMCO	3115	4336	Oct. 30/97	Oct. 30/99
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Oct. 24/97	Oct. 24/98

Note: N/A = Not Applicable
NCR = No Cal Required