

Exhibit 6: Test Report

TEST REPORT FROM:

COMMUNICATION CERTIFICATION LABORATORY
1940 W. Alexander Street
Salt Lake City, Utah
84119-2039

Type of Report: Certification

TEST OF: M50

FCC ID: OEW-M50

To Part 24 Subpart E and Part 2 Subpart J
of the FCC Rules and Regulations

Test Report Serial No: 73-6674

Applicant:

interWAVE Communications, Inc.
656 Bair Island Road, Suite 108
Redwood City, CA 94063-2704

Date(s) of Test: December 8 - 11, 1998

Issue Date: March 5, 1999

Equipment Receipt Date: December 7, 1998

CERTIFICATION OF ENGINEERING REPORT

This report has been prepared by Communication Certification Laboratory to determine compliance of the device described below with the notification requirements of FCC Part 24, Subpart E. This report may be reproduced in full, partial reproduction may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

- Applicant: interWAVE Communications, Inc.
- Manufacturer: interWAVE Communications, Inc.
- Brand Name: WavXpress
- Model Number: M50
- FCC ID: OEW-M50

On this 5th day of March 1999, I, individually, and for Communication Certification Laboratory, certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

Although NVLAP has recognized that the Communication Certification Laboratory EMC testing facilities are in good standing, NVLAP does not endorse the product described in this report.

COMMUNICATION CERTIFICATION LABORATORY

Checked by: William S. Hurst, P.E.
Vice President

Tested by: Roger J. Midgley
EMC Engineering Manager

SECTION 1.0 CLIENT INFORMATION

1.1 Client Information:

Company Name: interWAVE Communications, Inc.
656 Bair Island Road, Suite 108
Redwood City, CA 94063-2704

Contact Name: Roderick E. Thorne
Title: Director, Hardware Engineering

SECTION 2.0 EQUIPMENT UNDER TEST (EUT)**2.1 Identification of EUT:**

Trade Name: WavXpress
Model Name or Number: M50
Serial Number: N/A
Options Fitted: N/A
Country of Manufacture: U.S.A.

2.2 Description of EUT:

The WavXpress Series M50 product family consists of a system of cards performing various functions which plug into the M50 chassis backplane and cabinet to create a number of specific product configurations, each designated by a particular model number. This document describes the configurations for the PCS1900 MHz Base Transceiver System (BTS) used for wireless mobile telephony employing the GSM radio interface protocol.

M50 Series 1900MHz Base Transceiver Station (BTS)

The functions of the BTS are defined in the system of ETSI specifications for the GSM wireless telephone system. Its basic role is to communicate with wireless mobile telephone hand sets over the radio interface and to establish a terrestrial land-line link to the BSC for system control functions and for eventual connection of the mobile traffic to the public telephone network.

There are three model numbers for the M50 Series 1900MHz BTS as follows:

M5124/2	1-TRX BTS
M5224/2	2-TRX BTS
M5324/2	3-TRX BTS

These models consist of the following cards:

340220 Clock Card: 1 each
340121 InterWave Processor Card: 1 each
340133 E1/T1 Card(s): 1 each
340119 Radio Frequency Distribution Card: 1 each
340145 Transceiver Card: 1, 2 or 3 per system
One of the following three types of power supply per unit shipped:
M640034 115VAC Power Supply
M640035 230VAC Power Supply
Exhibit 6

M640033 48VDC Power Supply

The M5324/2 was determined to be worst case configuration; therefore, this model was tested as representative on all three units. The M5324/2 was tested with all three power supplies.

2.3 Modification Incorporated/Special Accessories on EUT:

There were no modifications or special accessories required to comply with the specification.

SECTION 3.0 TEST SPECIFICATION, METHODS & PROCEDURES**3.1 Test Specification:**

Title: FCC PART 24, Subpart E (47 CFR 24).
Broadband Personal Communications Services
(PCS)

Purpose of Test: The tests were performed to demonstrate
Initial compliance.

3.2 Methods & Procedures (Applicable to the M50):**§ 24.51 (d) RF Hazard - (SAR)**

Applicants for type acceptance of transmitters that operate in these service must determine that the equipment complies with IEEE C95.1-1991 (ANSI/IEEE C95.1-1992), "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 200 GHz." (SAR) Measurement methods are specified in IEEE C95.3-1991, "Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave."

§ 2.1046 RF Power Output - § 24.232**§ 2.1046**

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.983 (d)(5).

§ 24.232

- (a) Base Stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 watts.
- (b) Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power

to the minimum necessary for successful communications.

§ 2.1047 Modulation Characteristics

The M50 uses digital modulation; therefore, this section does not apply.

§ 2.1049 Occupied Bandwidth

§ 2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions:

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through an filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

(i) Transmitters designed for other types of modulation - when modulated by an appropriate signal of sufficient amplitude to be representative of the type of service in which used. A description of the input signal should be supplied.

§ 2.1051 Spurious Emissions at Antenna Terminals - § 24.238

§ 2.1051

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminal when properly loaded with a suitable artificial antenna.

§ 24.238 (a)

- (a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 plus 10 log (P) dB.

Criteria

The reference level for spurious emissions at the antenna terminals was taken from the measured output power (1.23 Watts); therefore, the spurious must be attenuated at least $43 + 10 \log_{10}(1.23) = 43.9$ dB. The measured output power was 30.9 dBm therefore, the criteria is $30.9 - 43.9 = -13.0$ dBm.

§ 2.1053 Field Strength of Spurious Radiation - § 24.238**§ 2.1053**

Measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation.

§ 24.238 (a)

- (a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 plus 10 log (P) dB.

Criteria

Field strength measurements of radiated spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements must not exceed $43 + 10 \log_{10}$ (mean output power in watts).

The reference level for spurious radiation was taken at an ideal dipole excited by the rated output power according to the following relationship:

$$E = \frac{\sqrt{(49.2)(Pt)}}{R}$$

Note: Reference Data for Radio Engineers, Pg. 676.
International Telephone and Telephone Corporation,
Fourth Edition.

Where E = electric Field Intensity in Volts/Meter
Pt = Transmitter Power in Watts
R = Measurements distance in Meters

Field Strength Limit (1.23 Watts)

$$E = \frac{\sqrt{(49.2)(1.23)}}{3} = 2.59 \text{ Volts / Meter} = 128.3 \text{ dBuV / m}$$

In this case, the rated power of 1.23 watts requires a minimum attenuation of $43 + 10 \log 1.23 = 43.9$ dB below the reference level of 128.3 dB μ V/m calculated above; therefore, the criteria is 84.4 db μ V/m (128.3 - 43.9).

§ 2.1055 Frequency Stability - § 24.235

§ 2.1055

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From -30° to +50° centigrade for all equipment except that specified in paragraphs (a)(2) and (3) of this section.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(2) For hand carried, battery powered equipment, reduce

primary supply voltage to the battery operation end point which shall be specified by the manufacturer.

§ 24.235

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

3.2.3 Test Procedure

The line conducted and radiated emissions testing was performed according to the procedures in ANSI C63.4 (1992). Testing was performed at CCL's Wanship open area test site #2, located at 550 West Wanship Road, Wanship, UT. This site has been fully described in a report submitted to the FCC, and was accepted in a letter dated October 29, 1997 (31040/SIT).

CCL participates in the National Voluntary Laboratory Accreditation Program (NVLAP) and has been accepted under NVLAP Lab Code:100272-0, which is effective until September 30,1999.

For radiated emissions testing that is performed at distances closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

SECTION 4.0 OPERATION OF EUT DURING TESTING**4.1 Operating Environment:**

Power Supply: 120 VAC, 220 VAC or 48 VDC
AC Mains Frequency: 50/60 Hz
Current Rating: 8 A, 4 A, 15 A

4.2 Operating Modes:

Each mode of operation was exercised to produce worst case emissions. The M5324/2 was determined to be worst case configuration; therefore, this model was tested as representative on all three units. The M5324/2 was tested with all three power supplies. The worst case emissions were with the M5324/2 powered up in the transmit mode.

4.3 EUT Exercise Software:

The M5324/2 used internal firmware to produce the worst case emissions.

SECTION 5.0 SUMMARY OF TEST RESULTS**5.1 FCC PART 24, Subpart E****5.1.1 Summary of Tests:**

Section	Test Performed	Frequency Range (MHz)	Result
24.232 / 2.1046	Maximum Transmitter Power	1930 - 1990	Complied
2.1047	Modulation Characteristics	1930 - 1990	Complied
2.1049	Emission Bandwidth	1930 - 1990	Complied
24.238 / 2.1051	Unwanted Radiation (Antenna Conducted Spurious)	30 - 20,000	Complied
24.238 / 2.1053	Unwanted Radiation (Radiated Spurious)	30 - 20,000	Complied
24.235 / 2.1055	Frequency Stability	1930 - 1990	Complied
	Line Conducted Emissions (Hot Lead to Ground)	0.45 to 30	Complied
	Line Conducted Emissions (Neutral Lead to Ground)	0.45 to 30	Complied

5.2 Result

In the configuration tested, the EUT complied with the requirements of the specification.

SECTION 6.0 MEASUREMENTS, EXAMINATIONS AND DERIVED RESULTS**6.1 General Comments:**

This section contains the test results only. Details of the test methods used and a list of the test equipment used during the measurements can be found in Appendix 1 of this report.

6.2 Test Results:

The M5324/2 operates in Blocks A through F from 1930 MHz to 1990 MHz; therefore, testing was performed with the M5324/2 tuned to 1930.2 MHz, 1960.0 MHz and 1989.8 MHz.

6.3 RF Power Output

The M5324/2 is equipped with three different antenna ports; therefore, RF output power testing was performed on all three ports.

Transmitting at 1930.2 MHz Antenna Port 1			
Power Level	Nominal (dBm)	Measured (dBm)	Difference (dB)
0	30.0	30.1	0.1
1	28.0	28.2	0.2
2	26.0	26.2	0.2
3	24.0	24.4	0.4
4	22.0	22.5	0.5
5	20.0	20.6	0.6
6	18.0	19.0	1.0

Transmitting at 1960.0 MHz Antenna Port 1			
Power Level	Nominal (dBm)	Measured (dBm)	Difference (dB)
0	30.0	30.9	0.9
1	28.0	28.8	0.8
2	26.0	26.9	0.9
3	24.0	24.9	0.9
4	22.0	23.0	1.0
5	20.0	21.1	1.1
6	18.0	19.4	1.4

Transmitting at 1989.8 MHz Antenna Port 1			
Power Level	Nominal (dBm)	Measured (dBm)	Difference (dB)
0	30.0	30.5	-1.2
1	28.0	28.6	0.2
2	26.0	26.6	0.4
3	24.0	24.7	0.3
4	22.0	22.8	0.3
5	20.0	20.9	0.3
6	18.0	19.2	0.3

Transmitting at 1930.2 MHz Antenna Port 2			
Power Level	Nominal (dBm)	Measured (dBm)	Difference (dB)
0	30.0	30.5	0.5
1	28.0	28.8	0.8
2	26.0	26.5	0.5
3	24.0	24.6	0.6
4	22.0	22.9	0.9
5	20.0	21.1	1.1
6	18.0	19.4	1.4

Transmitting at 1960.0 MHz Antenna Port 2			
Power Level	Nominal (dBm)	Measured (dBm)	Difference (dB)
0	30.0	30.4	0.4
1	28.0	28.5	0.5
2	26.0	26.6	0.6
3	24.0	24.9	0.9
4	22.0	23.0	1.0
5	20.0	20.9	0.9
6	18.0	19.0	1.0

Transmitting at 1989.8 MHz Antenna Port 2			
Power Level	Nominal (dBm)	Measured (dBm)	Difference (dB)
0	30.0	30.2	0.2
1	28.0	28.4	0.4
2	26.0	26.4	0.4
3	24.0	24.4	0.4
4	22.0	22.5	0.5
5	20.0	20.5	0.5
6	18.0	19.1	1.1

Transmitting at 1930.2 MHz Antenna Port 3			
Power Level	Nominal (dBm)	Measured (dBm)	Difference (dB)
0	30.0	30.1	0.1
1	28.0	28.2	0.2
2	26.0	26.2	0.2
3	24.0	24.4	0.4
4	22.0	22.5	0.5
5	20.0	20.6	0.6
6	18.0	19.0	1.0

Transmitting at 1960.0 MHz Antenna Port 3			
Power Level	Nominal (dBm)	Measured (dBm)	Difference (dB)
0	30.0	30.9	0.9
1	28.0	28.8	0.8
2	26.0	26.9	0.9
3	24.0	24.9	0.9
4	22.0	23.0	1.0
5	20.0	21.1	1.1
6	18.0	19.4	1.4

Transmitting at 1989.8 MHz Antenna Port 3			
Power Level	Nominal (dBm)	Measured (dBm)	Difference (dB)
0	30.0	30.5	-1.2
1	28.0	28.6	0.2
2	26.0	26.6	0.4
3	24.0	24.7	0.3
4	22.0	22.8	0.3
5	20.0	20.9	0.3
6	18.0	19.2	0.3

6.4 Modulation Characteristics

The M5324/2 uses digital modulation; therefore, this section does not apply.

6.5 Occupied Bandwidth

The M5324/2 is equipped with three different antenna ports; therefore, occupied bandwidth testing was performed on all three ports.

Antenna Port 1	
Frequency (MHz)	Bandwidth (kHz)
1930.2	315.0
1960.0	314.0
1989.8	309.0

Antenna Port 2	
Frequency (MHz)	Bandwidth (kHz)
1930.2	317.0
1960.0	315.0
1989.8	315.0

Antenna Port 3	
Frequency (MHz)	Bandwidth (kHz)
1930.2	308.0
1960.0	309.0
1989.8	312.0

6.6 Conducted Spurious Emissions

Conducted spurious emissions testing was performed with the device tuned to the channel closest to the lower and upper band edge.

Measurements within the 1 MHz band immediately outside and adjacent to the frequency block were performed using a 10 kHz RBW and 30 kHz VBW. The conducted spurious emissions were tested at all three-antenna ports. The worst case emissions were with the M5324/2 transmitting from antenna port 1. The data below represents worst case emissions.

Transmitting at 1930.2 MHz			
Frequency Range (MHz)	Frequency (MHz)	Corrected Level (dBm)	Criteria (dBm)
30 - 200	119.6	-33.5	-13.0
200 - 500	234.8	-46.6	-13.0
500 - 1000	781.0	-45.1	-13.0
1000 - 1929	1084.7	-28.9	-13.0
1929 - 1930 **	1929.9	-45.6	-13.0
1990 - 1991 **	1990.8	-48.6	-13.0
1991 - 2000	1992.4	-45.2	-13.0
2000 - 4000	3860.5	-55.8	-13.0
4000 - 6000	5790.7	-53.3	-13.0
6000 - 8000	7720.9	-59.8 *	-13.0
8000 - 20,000	9651.1	-58.6 *	-13.0
* Noise Floor			
** RBW 10 kHz, VBW 30 kHz			

Transmitting at 1930.2 MHz			
Frequency Range (MHz)	Frequency (MHz)	Corrected Level (dBm)	Criteria (dBm)
30 - 200	179.2	-30.5	-13.0
200 - 500	435.8	-50.5	-13.0
500 - 1000	554.0	-50.2	-13.0
1000 - 1929	1173.9	-31.7	-13.0
1929 - 1930 **	1929.9	-44.6	-13.0
1990 - 1991 **	1990.8	-47.6	-13.0
1991 - 2000	1992.4	-45.2	-13.0
2000 - 4000	3979.6	-42.5	-13.0
4000 - 6000	5969.4	-41.0	-13.0
6000 - 8000	7959.2	-59.8 *	-13.0
8000 - 20,000	9949.0	-58.6 *	-13.0
* Noise Floor			
** RBW 10 kHz, VBW 30 kHz			

6.7 Radiated Spurious Emissions

The radiated spurious emissions were tested with all three-antenna ports terminated with 50 Ω loads. The worst case emissions were with the M5324/2 transmitting from antenna port 1. The data below represents worst case emissions.

Transmitting at 1930.2 MHz					
Frequency MHz	Polarity H/V	Uncorr Level dB μ V	Correction Factor dB	Corrected Level dB μ V/m	Criteria dB μ V/m
1006.0	V	15.0	25.5	40.5	84.4
1145.0	V	14.4	26.1	40.5	84.4
1460.0	V	13.7	27.7	41.4	84.4
1629.0	V	11.4	28.3	39.7	84.4
3860.0	V	10.7	35.5	46.2	84.4
5790.0	V	12.4	39.3	51.7	84.4
7720.0	V	12.2	41.5	53.7	84.4
9658.0	V	10.8 *	43.5	54.3	84.4
1006.0	H	15.5	25.5	41.0	84.4
1145.0	H	12.9	26.1	39.0	84.4
1460.0	H	11.4	27.7	39.1	84.4
1629.0	H	10.7	28.3	39.0	84.4
3860.0	H	10.3	35.5	45.8	84.4
5790.0	H	11.5	39.3	50.8	84.4
7720.0	H	11.6	41.5	53.1	84.4
9658.0	H	10.8 *	43.5	54.3	84.4
* Noise Floor Note 1: There were no emissions detected above 10,000 MHz. Note 2: All the radiated emissions detected between 30 MHz and 1000 MHz were greater than 20 dB below the criteria.					

Transmitting at 1960.0 MHz					
Frequency MHz	Polarity H/V	Uncorr Level dB μ V	Correction Factor dB	Corrected Level dB μ V/m	Criteria dB μ V/m
1006.0	V	15.0	25.5	40.5	84.4
1145.0	V	14.4	26.1	40.5	84.4
1460.0	V	13.7	27.7	41.4	84.4
1629.0	V	11.4	28.3	39.7	84.4
3920.0	V	8.9	35.5	44.4	84.4
5880.0	V	10.8	39.3	50.1	84.4
7840.0	V	10.8	41.5	52.3	84.4
9800.0	V	10.8 *	43.5	54.3	84.4
1006.0	H	15.5	25.5	41.0	84.4
1145.0	H	12.9	26.1	39.0	84.4
1460.0	H	11.4	27.7	39.1	84.4
1629.0	H	10.7	28.3	39.0	84.4
3920.0	H	10.7	35.5	46.2	84.4
5880.0	H	12.4	39.3	51.7	84.4
7840.0	H	12.2	41.5	53.7	84.4
9800.0	H	10.8 *	43.5	54.3	84.4
* Noise Floor Note 1: There were no emissions detected above 10,000 MHz. Note 2: All the radiated emissions detected between 30 MHz and 1000 MHz were greater than 20 dB below the criteria.					

Transmitting at 1989.8 MHz					
Frequency MHz	Polarity H/V	Uncorr Level dB μ V	Correction Factor dB	Corrected Level dB μ V/m	Criteria dB μ V/m
1006.0	V	15.0	25.5	40.5	84.4
1145.0	V	14.4	26.1	40.5	84.4
1460.0	V	13.7	27.7	41.4	84.4
1629.0	V	11.4	28.3	39.7	84.4
3986.0	V	10.5	35.5	46.0	84.4
5969.0	V	11.6	39.3	50.9	84.4
7959.0	V	12.5	41.5	54.0	84.4
9951.0	V	10.8 *	43.5	54.3	84.4
1006.0	H	15.5	25.5	41.0	84.4
1145.0	H	12.9	26.1	39.0	84.4
1460.0	H	11.4	27.7	39.1	84.4
1629.0	H	10.7	28.3	39.0	84.4
3986.0	H	11.2	35.5	46.7	84.4
5969.0	H	11.9	39.3	51.2	84.4
7959.0	H	12.5	41.5	54.0	84.4
9951.0	H	10.8 *	43.5	54.3	84.4
* Noise Floor Note 1: There were no emissions detected above 10,000 MHz. Note 2: All the radiated emissions detected between 30 MHz and 1000 MHz were greater than 20 dB below the criteria.					

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor from the measured reading. The basic equation with a sample calculation is as follows:

Calculation: Corr. Level (dB μ V) = Uncorr Level (dB μ V) +

Correction Factor (dB)

Correction Factor = Antenna Factor (dB) + Cable
Factor (dB)

Assume a receiver reading of 32.5 dB μ V is obtained. The Antenna Factor of 14.4 and a Cable Factor of 1.1 is added, giving field strength of 48.0 dB μ V.

6.8 Frequency Stability

The M5324/2 operates in Blocks A through F from 1930 MHz to 1990 MHz; therefore, testing was performed with the M5324/2 tuned to 1960.0 MHz.

The manufacturer specifies the lowest temperature the device will operate is -5 C⁰; therefore, the frequency stability testing was only performed to -5 C⁰.

Transmitting at 1960.0 MHz				
Temp (C ⁰)	Transmit Frequency (MHz)	Measured Frequency Mean (MHz)	Deviation (ppm)	Criteria (ppm)
-5.0	1960.0	1960.007037	-0.18	N/A
0.0	1960.0	1960.007136	-0.24	N/A
10.0	1960.0	1960.006637	0.02	N/A
20.0 (85% Nominal Voltage)	1960.0	1960.006556	0.06	N/A
20.0 (Nominal Voltage)	1960.0	1960.006676	Reference	N/A
20.0 (115% Nominal Voltage)	1960.0	1960.006660	0.01	N/A
30.0	1960.0	1960.006177	0.25	N/A
40.0	1960.0	1960.007564	-0.45	N/A
50.0	1960.0	1960.007853	-0.60	N/A

Exhibit 6

Sample Calculation

$$\text{Deviation (percent)} = \frac{\text{FM} - \text{TF}}{\text{TF}} \times 10^6$$

FM = Frequency Measured

TF = Intended Transmit Frequency

6.9 Line Conducted Emissions**6.9.1 Line Conducted Data - (Hot Lead) 120 VAC**

Frequency MHz	Detector	Measured Level dB μ V	Class A Limit dB μ V
0.62	Peak	33.9	60.0
0.92	Peak	33.1	60.0
1.56	Peak	30.0	60.0
9.60	Peak	31.2	69.5
13.37	Peak	30.1	69.5
29.78	Peak	35.2	69.5

Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for this test was: ± 3.3 dB.

Comments

A detailed description of the test method and test equipment used to perform this measurement can be found in Appendix 1 of this report.

RESULT

The EUT complied with the specification limit by a margin of 26.1 dB.

6.9.2 Line Conducted Data - (Neutral Lead) 120 VAC

Frequency MHz	Detector	Measured Level dB μ V	Class A Limit dB μ V
0.74	Peak	26.3	60.0
9.43	Peak	28.6	69.5
10.08	Peak	28.0	69.5
13.66	Peak	30.1	69.5
28.64	Peak	28.6	69.5
29.78	Peak	36.1	69.5

Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for this test was: ± 3.3 dB.

Comments

A detailed description of the test method and test equipment used to perform this measurement can be found in Appendix 1 of this report.

RESULT

The EUT complied with the specification limit by a margin of 33.4 dB.

6.9.3 Line Conducted Data - (Hot Lead) 220 VAC

Frequency MHz	Detector	Measured Level dB μ V	Class A Limit dB μ V
9.24	Peak	41.9	69.5
10.27	Peak	37.0	69.5
11.30	Peak	47.9	69.5
12.32	Peak	37.8	69.5
13.36	Peak	53.5	69.5
17.43	Peak	37.7	69.5
25.65	Peak	31.3	69.5

Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for this test was: ± 3.3 dB.

Comments

A detailed description of the test method and test equipment used to perform this measurement can be found in Appendix 1 of this report.

RESULT

The EUT complied with the specification limit by a margin of 16.0 dB.

6.9.4 Line Conducted Data - (Neutral Lead) 220 VAC

Frequency MHz	Detector	Measured Level dB μ V	Class A Limit dB μ V
9.24	Peak	42.0	69.5
10.27	Peak	37.7	69.5
11.30	Peak	48.2	69.5
12.32	Peak	38.4	69.5
13.36	Peak	54.0	69.5
17.42	Peak	37.4	69.5

Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for this test was: ± 3.3 dB.

Comments

A detailed description of the test method and test equipment used to perform this measurement can be found in Appendix 1 of this report.

RESULT

The EUT complied with the specification limit by a margin of 15.5 dB.

APPENDIX 1 TEST PROCEDURES AND TEST EQUIPMENT**Radiated Interference Emissions:**

The radiated emission from the intentional radiator was measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings. A preamplifier with a fixed gain of 26 dB and a power amplifier with a fixed gain of 22 dB were used to increase the sensitivity of the measuring instrumentation. The quasi-peak adapter uses a bandwidth of 120 kHz, with the spectrum analyzer's resolution bandwidth set at 1 MHz, for readings in the 30 to 1000 MHz frequency range. For peak emissions above 1000 MHz the spectrum analyzer's resolution bandwidth was set to 1 MHz and the video bandwidth was set to 3 MHz. For average emissions above 1000 MHz the spectrum analyzer's resolution bandwidth was set to 1 MHz and the video bandwidth was set to 1 Hz.

A biconilog antenna was used to measure the frequency range of 30 to 1000 MHz and a Double Ridge Guide Horn antenna was used to measure the frequency range 1 GHz to 10 GHz, at a distance of 3 meters from the EUT. The readings obtained by these antennas are correlated to the levels obtained with a tuned dipole antenna by adding antenna factors.

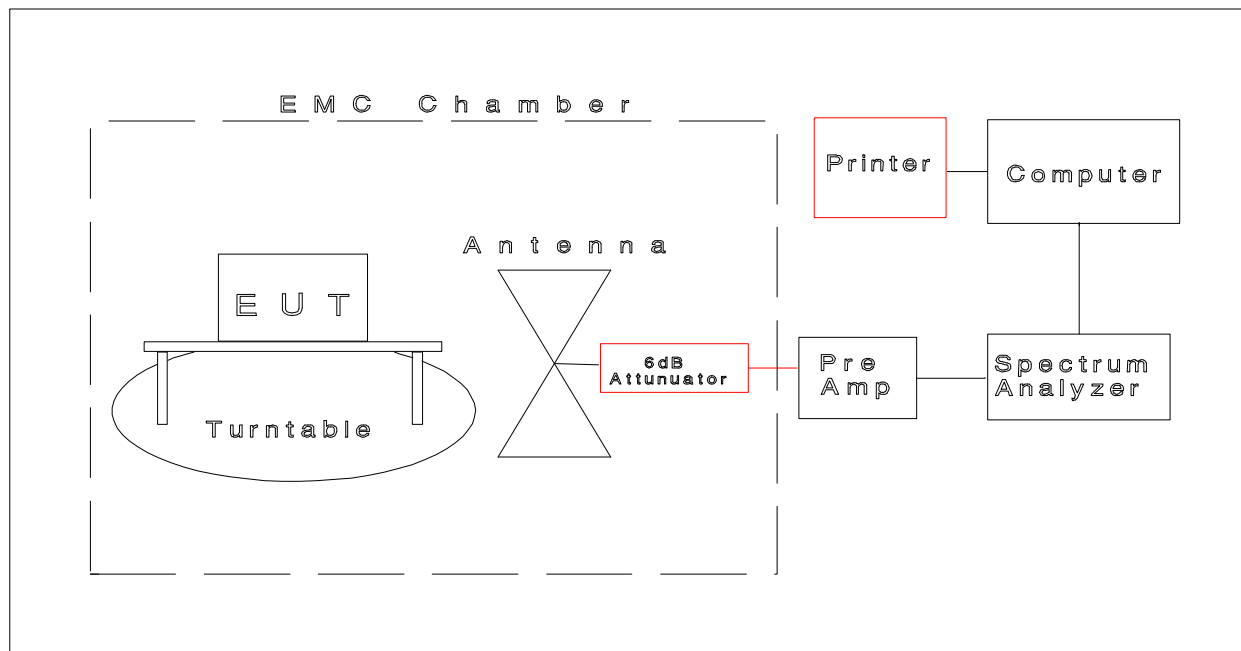
The configuration of the intentional radiator was varied to find the maximum radiated emission. The EUT was connected to the peripherals listed in Section 2.4 via the interconnecting cables listed in Section 2.5. These interconnecting cable were manipulated manually by a technician to obtain worst case radiated emissions. The intentional radiator was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Where there were multiple interface ports all of the same type, cables are either placed on all of the ports or cables added to these ports until the emissions do not increase by more than 2 dB.

Desktop intentional radiator is measured on a non-conducting table one meter above the ground plane. The table is placed on a turntable which is level with the ground plane. The turntable has slip rings, which supply AC power to the intentional radiator. For equipment normally placed on floors, the equipment shall be placed directly on the turntable.

Type of Equipment	Manufacturer	Model Number	Serial Number
Anechoic Chamber	CCL	N/A	N/A
Test Software	CCL	Radiated Emissions	Revision 1.3
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711
Quasi-Peak Detector	Hewlett Packard	8565A	3107A01582
Biconilog Antenna	EMCO	3141	1045
Double Ridged Guide Antenna	EMCO	3115	9409-4355
Radiated Emissions Cable Anechoic Chamber	CCL	Cable B	N/A
Pre-Amplifier	Hewlett Packard	8447D	1937A03151
Power-Amplifier	Hewlett Packard	8447E	2434A01975
6 dB Attenuator	Hewlett Packard	8491A	32835

All the equipment listed above is calibrated every 12 months by an independent calibration laboratory or by CCL personal following outlined calibration procedures.

R a d i a t e d E m i s s i o n s T e s t

**Line Conducted Emissions:**

The line-conducted emission from the digital apparatus was measured using a spectrum analyzer with a quasi-peak adapter for peak, quasi-peak and average readings. The quasi-peak adapter uses a bandwidth of 9 kHz, with the spectrum analyzer's resolution bandwidth set at 100 kHz, for readings in the 450 kHz to 30 MHz frequency range.

The line conducted emissions measurements are performed in a screen room using a (50 Ω /50 μ H) Line Impedance Stabilization Network (LISN).

Where mains flexible power cords are longer than 1 m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

Where the EUT is a collection of digital apparatus with each digital apparatus having its own power cord, the point of connection for the LISN is determined from the following rules:

- a) Each power cord, which is terminated in a mains supply plug,

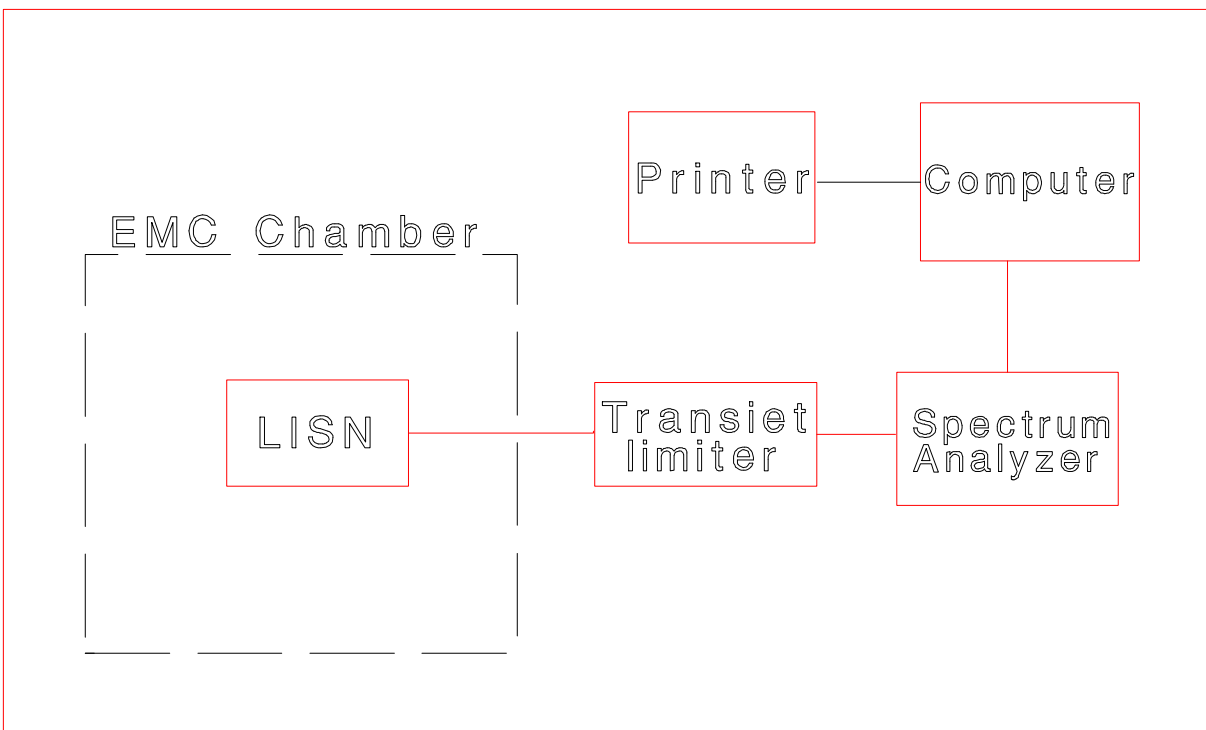
- shall be tested separately.
- b) Power cords, which are not specified by the manufacturer to be connected via a host unit, shall be tested separately.
 - c) Power cords which are specified by the manufacturer to be connected via a host unit or other power supplying equipment shall be connected to that host unit and the power cords of that host unit connected to the LISN and tested.

Desktop digital apparatus are placed on a non-conducting table at least 80 cm from the metallic floor. The equipment is placed a minimum of 40 cm from all walls. Floor standing equipment is placed directly on the earth grounded floor.

Type of Equipment	Manufacturer	Model Number	Serial Number
Anechoic Chamber	CCL	N/A	N/A
Test Software	CCL	Conducted Emissions	Revision 1.2
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711
Quasi-Peak Detector	Hewlett Packard	8565A	3107A01582
LISN	EMCO	3825/2	9507-1893
Conductance Cable Anechoic Chamber	CCL	Cable A	N/A
Transient Limiter	Hewlett Packard	11947A	3107A00895

All the equipment listed above is calibrated every 12 months by an independent calibration laboratory or by CCL personal following outlined calibration procedures.

Line Conducted Emissions Test



FCC Sections 24.232 and 24.238 Peak Transmit Power, Bandwidth and Antenna Conducted Spurious Emissions

The EUT was directly connected to the spectrum analyzer via the antenna output port as shown in the block diagram below. The peak transmit power, emission bandwidth and antenna conducted spurious emissions were measured as per sections 2.985, 2.989 and 2.991. The measurements were performed on three channels, as per 47 CFR 15.31(m), one near the bottom of the spectrum, one near the middle of the spectrum and one near the top of the spectrum. The M5324/2 was tested with one time slot active, this represents a typical configuration.

Testing for these sections were performed as per ANSI-C63.4 1992, Methods of Measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.

The spectrum analyzer's resolution bandwidth and video bandwidth were set as follows:

Peak Transmit Power

RBW = 1 MHz

VBW = 3 MHz

Emission Bandwidth

RBW = 3 kHz

VBW = 10 kHz

Antenna Conducted Spurious Emissions

RBW = 1 MHz

VBW = 3 MHz

Type of Equipment	Manufacturer	Model Number	Serial Number
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711
Quasi-Peak Detector	Hewlett Packard	8565A	3107A01582
Low Loss Cable (1 dB)	N/A	N/A	N/A

All the equipment listed above is calibrated every 12 months by an independent calibration laboratory or by CCL personal following outlined calibration procedures.

Test Configuration Block Diagram



FCC Section 24.235 Carrier Frequency Stability

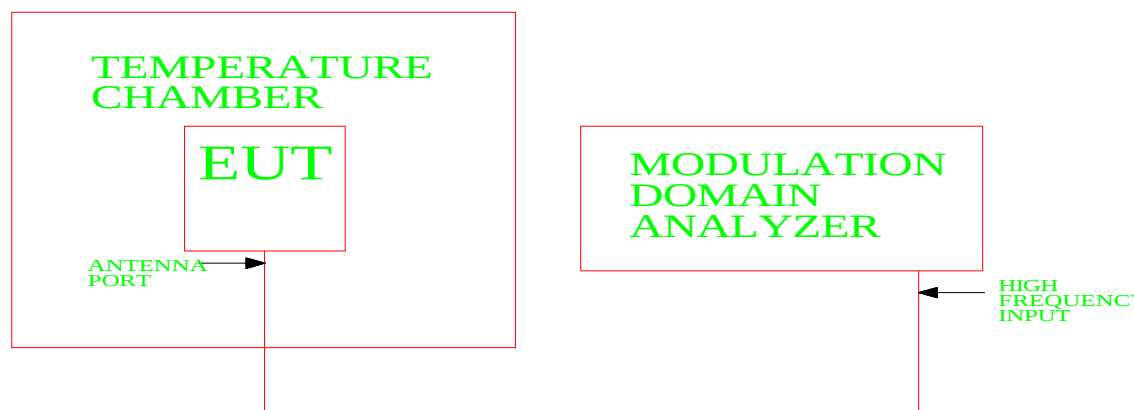
The EUT was placed inside of a temperature chamber and directly connected to the modulation domain analyzer via the antenna output port as shown in the block diagram below. The handset was connected to a computer that was used to control the handset to permit it to transmit on predetermined channels. The carrier frequency stability was measured as per section 6.2.2 of ANSI C63.17-1997 Editor's Draft 2.A (January 24, 1997).

The EUT was placed inside of the temperature chamber at 20°C for one hour in order to stabilize the temperature of the chamber and the EUT. This measurement was recorded as a reference for the measurements at the other temperatures and the battery voltage extremes using the modulation domain analyzer.

The modulation domain analyzer's settings were set as follows:

Carrier Frequency Stability

Mode:	Frequency Measurement
Y Axis:	Frequency
Center Frequency:	nominal carrier center frequency
X Axis:	Time
Time Setting:	625 μ s
Measurement Interval:	10 μ s
No. of Measurements:	1000
Trigger:	RF Envelope



Type of Equipment	Manufacturer	Model Number	Serial Number
Modulation Domain Analyzer	Hewlett Packard	53310A	3121A00765
Low Loss Cable (1 dB)	N/A	N/A	N/A
Temperature Chamber	Tenney Engineering, Inc.	Tenney Jr.	11184-83

All the equipment listed above is calibrated every 12 months by an independent calibration laboratory or by CCL personal following outlined calibration procedures.