



EMC Measurement / Technical Report

FCC Test Specification : FCC Part 15, Subpart C §15.231

Type of Authorization : Certification

Manufacturer : Ameriphone, Inc.

Equipment Under Test : Remote Wireless Transmitter
Model Dialogue ER Transmitter

Test Report No. : FR1462

Purchase Order No. : KC130

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EMC Measurement / Technical Report

Document No. FR1462

From

**Garwood Laboratories, Inc.
World Compliance Division**

Test for

Ameriphone, Inc.

**Remote Wireless Transmitter
Model Dialogue ER Transmitter**

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MEASUREMENT / TECHNICAL REPORT SUMMARY

Manufacturer Company Address City, State, Zip Country Contact Name Phone Fax	Ameriphone, Inc. 12082 Western Avenue Garden Grove, CA 92841 USA Peter Lee 714-897-0808 714-897-4703
Type of Authorization	Certification for a Low Power Transmitter
Applicable FCC Rules	Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 0 to 19 (10-1-98 Edition). The following subparts are applicable to the results in this test report: Part 15, Subpart C – Intentional Radiators § 15.231 Periodic Operation in the band 40.66-40.70 MHz and above 70 MHz § 15.203 Antenna requirements § 15.207 Conducted limits § 15.209 Radiated emission limits; general requirements Part 2, Subpart J – Equipment Authorization Procedures Certification sections
Equipment Under Test	Remote Wireless Transmitter Model Dialogue ER Transmitter
Summary of Data	The EUT complied with all the applicable FCC rules as listed above.

EMC Test Laboratory Facility Address City, State, Zip Code Country Contact Name Title Phone Fax	Garwood Laboratories Incorporated World Compliance Division 565 Porter Way Placentia, CA 92870 USA Jason Armstrong General Manager (714) 572-2027 (714) 572-2025
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1. GENERAL INFORMATION

1.1 Product Description

<i>Equipment Under Test</i>	Remote Wireless Transmitter
<i>Model Number</i>	Dialogue ER Transmitter
<i>Description</i>	The ER remote wireless transmitter is a digitally coded miniature radio transmitter, with its own distinct serial number and manufacturing code. The EUT is a manually operated transmitter. The small LED indicator shown through the button will be lit when the button is pressed, indicating that the transmitter is transmitting. The EUT stops transmitting when the button is released. The EUT derives its operating voltage from two self-contained 3-Volt batteries. The transmission format utilized by the EUT is PWM, Pulse Width Modulation.
<i>EUT Transmitting Frequency</i>	433.92 MHz

1.2 Related Submittal(s)/ Grant(s)

Peripherals tested with the EUT, which contain FCC ID numbers can be located in the table in Section 3.6 of this report.

1.3 Tested System Description

The Tested System was configured with all typical peripherals (or terminations) and operated to generate the maximum emissions during the test. Refer to Section 3.5 and Section 3.6 for the configuration of the EUT during testing, support/peripheral equipment used during testing and cabling information. FCC ID numbers are included if available for a tested system component.



1.4 Test Methodology

Conducted emissions tests were performed according to the general provisions of ANSI C63.4-1992 (American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz).

The Equipment Under Test (EUT) was setup in a typical configuration inside a shielded enclosure to perform the conducted emissions measurements. The EUT was powered from the 50 μ H/50 Ω Line Impedance Stabilization Networks (LISN). The LISN's unused connections were terminated with 50-ohm loads. The amplitude level (dB μ V) of the emissions was maximized by varying the modes of operation of the EUT and its cables. The frequency range of 450 kHz to 30 MHz was measured with the receiver in peak detection.

The test for unwanted emissions was performed according to the general provisions of ANSI C63.4-1992 (American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz).

The EUT was setup on a non-conductive table, 1.0 x 1.5m, in the Open Area Test Site. The test for unwanted emissions was performed at an EUT to receiving antenna distance of 3 meters. The radiated emissions were maximized by rotating the turntable 360 degrees and varying the antenna height from 1 to 4 meters. The field strength of the fundamental frequency and harmonics, up to the 10th harmonic, were measured utilizing a BiLog and Double Ridge Guide Horn antenna. Measurements were made in both vertical and horizontal antenna polarizations.



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1.5 Test Facility

The Open Area Test Site (OATS) and measurement facilities used to collect the test data are located at Garwood Laboratories, Inc. World Compliance Division test facility in Placentia, CA. This facility has been fully described in a report submitted to the FCC and accepted in a letter dated 28 January 2000 (31040/SIT 1300F2) registration #90681.

The test facility is also recognized and accredited from following accreditation organizations:

NVLAP

Garwood Laboratories, Inc. is recognized under the National Voluntary Laboratory Accreditation Program (NVLAP/NIST) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. NVLAP Code: 200119-0, Effective through December 31, 2000.

FCC

This site has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Reference : 31040/SIT 1300F2, Registration #90681, January 28, 2000. With the above and NVLAP, Garwood Laboratories is an authorized test laboratory for the DoC process.

Technology International (I²T)

Garwood Laboratories, Inc. has been assessed in accordance with ISO Guide 25 and with ITI's assessment criteria. Based upon this assessment, Technology International (Europe), Ltd. Has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC). The scope of the approval was provided on a Schedule of Assessment supplied with a certificate and is available upon request. Certificate #99-051, Dated: May 5, 1999.

ACA

Garwood Laboratories, Inc. can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation and the MRA (Mutual Recognition Agreement) between the US and Australia.

VCCI

Garwood Laboratories, Inc. has been accepted as a member to the VCCI. Our conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures. Registration C574, C575, C576, R561 Effective through February 4, 2000 (Renewal Pending).

Industry Canada

Garwood Laboratories, Inc. is registered by Industry Canada for performance of measurements and complies with RSP 100. Reference IC 3298, Dated: March 11, 1999.

BSMI (Formerly known as BCIQ)

Garwood Laboratories, Inc. can perform testing for Taiwan to the CNS requirements. This is as a result of our NVLAP accreditation and the MRA (Mutual Recognition Agreement) between the US and Taiwan.

Nmi (Nederlands Meetinstituut)

Garwood Laboratories, Inc. has entered into a cooperative agreement with Nmi Certin B.V. of the Netherlands. There are a Notified Body for the RATTE Directive and Maritime Directive as well as a Competent Body for the EMC Directive.



2. PRODUCT LABELING

2.1 FCC ID Label

All devices authorized under the certification procedures are required to display an identification label showing the FCC Identifier (FCC ID) under which they are authorized.

Example:

FCC ID: XXX123

XXX = Indicates manufacturer's Grantee Code

123 = Indicates manufacturer's Equipment Product Code

In addition, the manufacturer (or importer) is responsible for having the compliance label produced, and for having it affixed to each unit that is marketed or imported.

FCC Compliance Label:

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference including interference that may cause undesired operation.

2.2 Location of Label on EUT

As stated in §15.19, the label shall be located in a conspicuous location on the device. When the device is so small or for such use that it is not practicable to place the compliance label on it, the information required should be placed in a prominent location in the instruction manual or pamphlet supplied to the user. Alternatively, the compliance label can be placed on the container in which the device is marketed. However, the FCC identifier must be displayed on the device.

2.3 Information to the user

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



3. SYSTEM TEST CONFIGURATION

3.1 Justification

The EUT was used in a system configured for testing in a typical fashion, as a customer would normally use it.

3.2 EUT Exercise Software/Equipment

The following operating mode was used during testing to exercise the functions of the EUT.

1. The button on the Dialogue ER Transmitter was pressed. This enabled the transmit function of the EUT.

3.3 Special Accessories

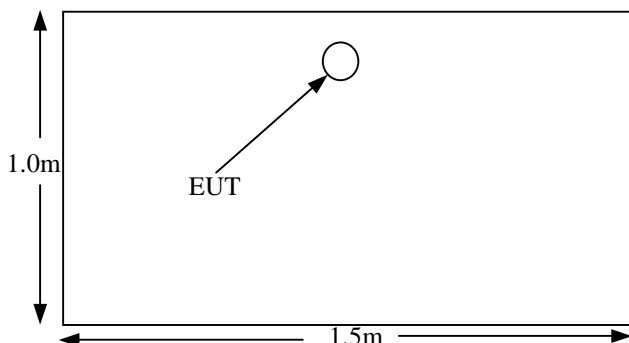
The EUT requires no special accessories to comply with the limits.

3.4 Equipment Modifications

No modifications were made to achieve the required specification limit.



3.5 Configuration of Tested System



The Ameriphone remote wireless transmitter was tested as a stand-alone system

3.6 Details of Tested System

The following table lists the accessory/peripheral equipment used during testing of the EUT. FCC ID numbers are included if available for a tested system component.

<i>Accessory/Peripheral Equipment</i>			
<i>Item No.</i>	<i>Manufacturer</i>	<i>Description</i>	<i>Identification Numbers</i>
1	None	None	Model No: Not applicable Serial No.: Not applicable

The EUT was tested as a stand-alone system. No accessory/peripheral equipment was used during testing.

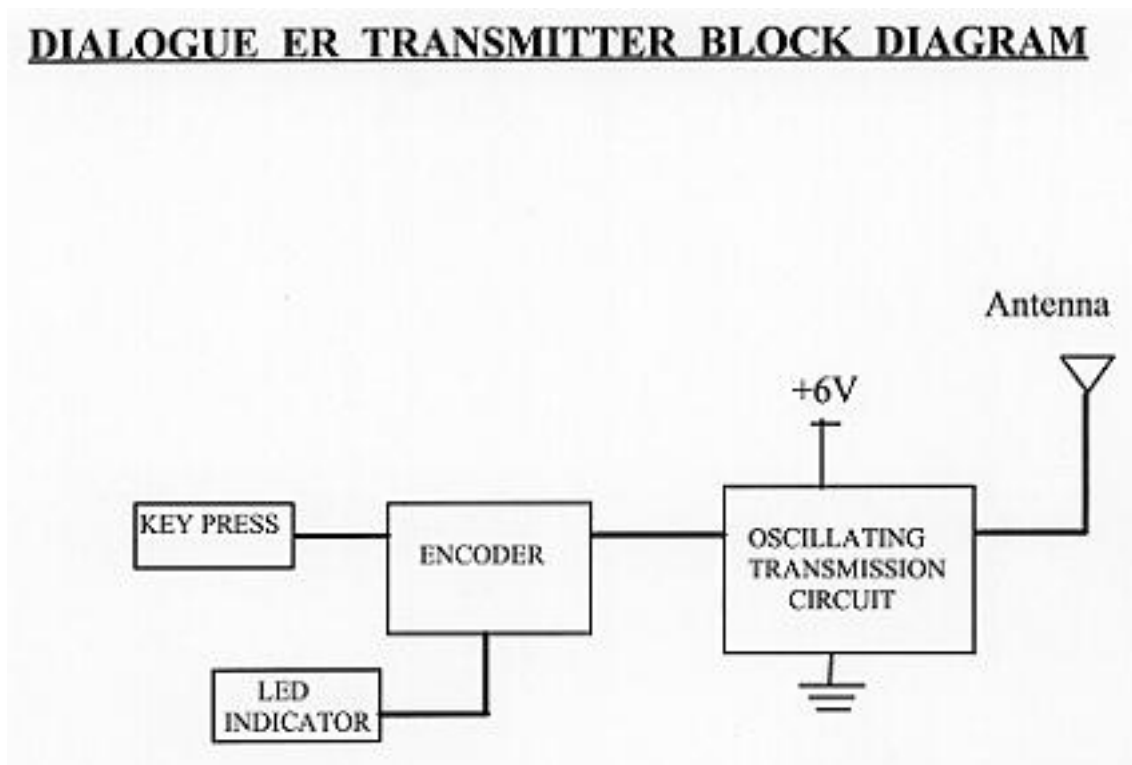
The following table lists all of the cabling details for the tested system.

<i>Cabling of The Tested System</i>					
<i>Item No.</i>	<i>Description</i>	<i>Length (m)</i>	<i>Type Shielded-S Unshielded-US</i>	<i>Connected From</i>	<i>Connected To</i>
A	None	-	-	-	-

There were no cables connected to the EUT during testing.



4. BLOCK DIAGRAM(S) OF EUT





5. TEST MEASUREMENT AND EUT PHOTOS

Photo: Radiated Emissions (Front View)

Photo: Radiated Emissions (Rear View)



EUT (Top View)



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EUT (Rear View)



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EUT PCB Side 1



EUT PCB Side 2



6. TEST DATA

6.1 Conducted Emissions Limits

<i>FCC Pt.15 Subpart C, §15.207</i>		
<i>Frequency (MHz)</i>	<i>Quasi Peak Limit (dBμV)</i>	<i>Remarks</i>
0.45 – 30.0	48.0	None

6.2 Conducted Emissions Results

The EUT derives its operating voltage from a 6VDC battery; therefore, the conducted emissions test was not performed.



6.3 General Radiated Emissions Requirements

Emissions that are radiated outside of the specified frequency bands, except for harmonics, should be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limits in §15.209, whichever is the lesser attenuation.

6.4 General Radiated Emissions Results

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable, preamplifier and antenna corrections), the corrected reading, plus the limit.

<i>Worst-Case Radiated Emissions from 30 – 1000MHz</i>				
	<i>Frequency (MHz)</i>	<i>Detection Mode</i>	<i>Corrected Reading (dBμV/m)</i>	<i>Delta to the 3m Limit (dB)</i>
1.	NDS	-	-	-

NDS: There were no detectable signals from the EUT from 30 – 1000MHz.



6.5 Field Strength of Emissions Requirement

<i>FCC Part 15, Subpart C, § 15.231</i>		
Fundamental Frequency (MHz)	Field Strength of Fundamental (μ V/m)	Field Strength of Spurious Emissions (μ V/m)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750*	125 to 375*
174-260	3,750	375
260-470	3,750 to 12,500*	375 to 1,250*
Above 470	12,500	1,250

*Linear Interpolations. The following formula was used to calculate the limit:

$$(125/3) \times f \text{ (MHz)} - (21250/3) \mu\text{V/m} = \text{Limit,}$$

for a test distance of 3 meters, where f (MHz) is the EUT's fundamental frequency.

The fundamental frequency of the EUT is 433.92 MHz. The applicable limits for the EUT are those listed for the fundamental frequency falling within the frequency band of 260-470 MHz.



6.6 Summary Table for Highest Field Strength Levels

The following table lists the fundamental and harmonic emission frequencies, spectrum analyzer measured levels, correction factor (includes cable loss, preamplifier gain and antenna factor), the corrected reading, and the specification limit.

EUT Name: Remote Wireless Transmitter

EUT Model: Dialogue ER Transmitter

Operating Frequency: 433.92 MHz

Field Strength of Emissions from an Intentional Radiator (Reference: FCC Pt.15 Subpart C, §15.231)

FCC Limit for the Fundamental: $(125/3) \times f \text{ (MHz)} - (21250/3) \mu\text{V/m @ 3meters} = 10,995.8 \mu\text{V/m}$

FCC Limit for the Harmonics: $1,099.6 \mu\text{V/m}$

Polarity (V or H)	Frequency (MHz)	S.A. Reading Peak (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Peak Field Strength at 3 meters (dBμV/m)	Peak Field Strength at 3 meters (μV/m)	Average Field Strength at 3 meters (μV/m)	FCC Limit at 3 meters (μV/m)
V	433.9	68.9	N/A	N/A	N/A	68.9	2786.12	702.10224	10995.8
H	433.9	77	N/A	N/A	N/A	77	7079.45	1784.0214	10995.8
V	867.8	59.1	N/A	N/A	N/A	59.1	901.57	227.19564	1099.6
H	867.8	56.3	N/A	N/A	N/A	56.3	653.13	164.58876	1099.6
V	1301.7	55.8	36.78	25.95	6.65	51.62	381.06	96.02712	1099.6
H	1301.7	53.2	36.78	25.95	6.65	49.02	282.49	71.18748	1099.6
V	1735.6	40.6	35.48	27.55	8.25	40.92	111.17	28.01484	1099.6
H	1735.6	34.7	35.48	27.55	8.25	35.02	56.36	14.20272	1099.6
V	2169.5	38.3	35.22	29.3	9.9	42.28	130.02	32.76504	1099.6
H	2169.5	37.5	35.22	29.3	9.9	41.48	118.58	29.88216	1099.6
V	2603.4	NDS	35.61	30	11	**	**	**	1099.6
H	2603.4	NDS	35.61	30	11	**	**	**	1099.6
V	3037.3	NDS	36.4	31.7	11.9	**	**	**	1099.6
H	3037.3	NDS	36.4	31.7	11.9	**	**	**	1099.6
V	3471.2	NDS	36.05	32.7	13.7	**	**	**	1099.6
H	3471.2	NDS	36.05	32.7	13.7	**	**	**	1099.6
V	3905.1	NDS	35.7	34	14.6	**	**	**	1099.6
H	3905.1	NDS	35.7	34	14.6	**	**	**	1099.6
V	4339	NDS	35.64	34.4	16.3	**	**	**	1099.6
H	4339	NDS	35.64	34.4	16.3	**	**	**	1099.6

- Average emission measurements were employed and the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions were followed. The total on time for the EUT was calculated to be 25.2ms. Please refer to Appendix B for a plot of the Duty Cycle Calculation.



6.7 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier gain

Example:

Assume a receiver reading of 52.5 dB μ V is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$



6.8 Occupied Bandwidth

Requirement:

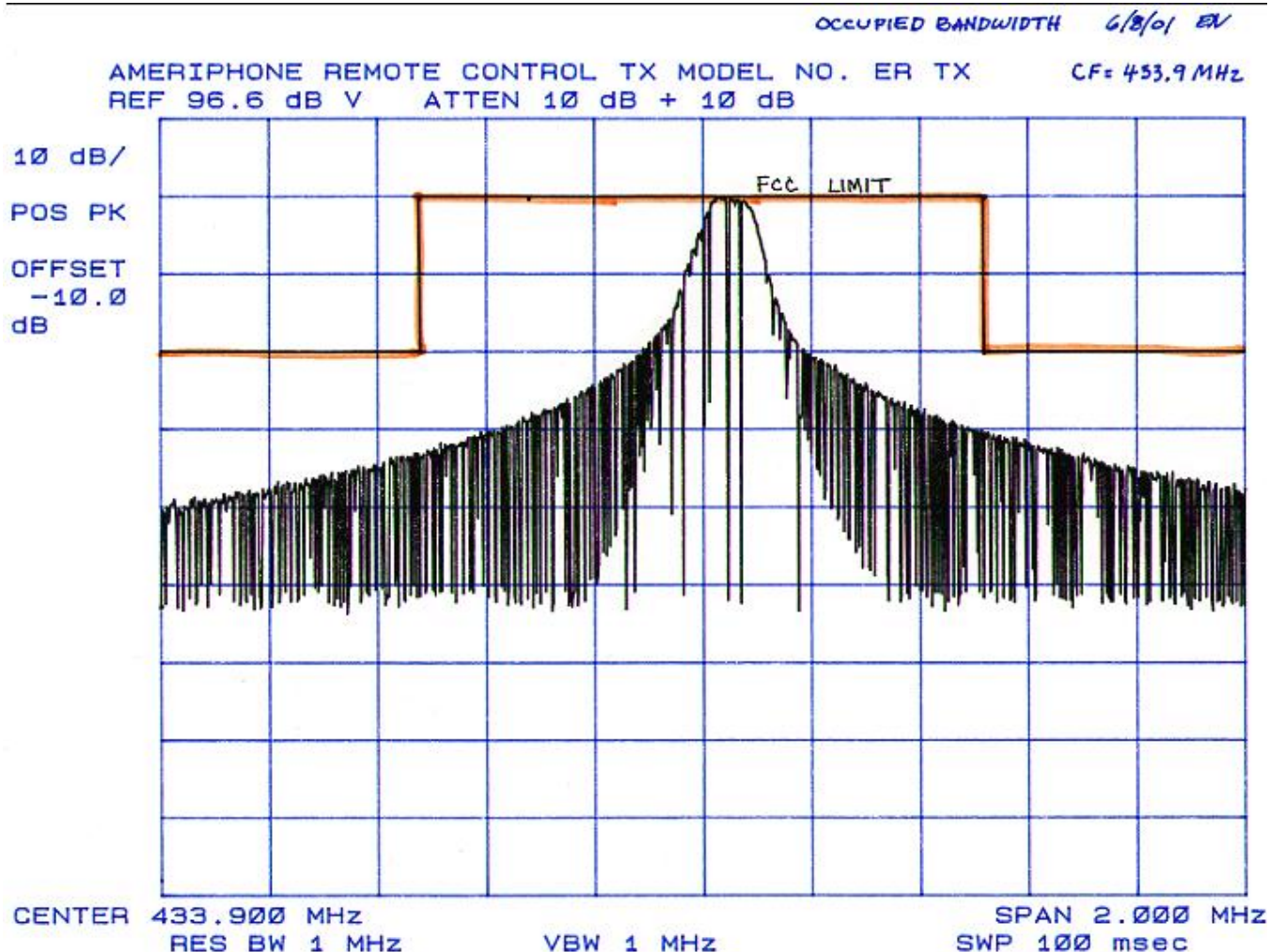
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. The bandwidth is determined at the points 20 dB down from the modulated carrier.

Occupied Requirement for the EUT:

$$433.92 \text{ MHz} \times 0.0025 = 1.0848 \text{ MHz (Should not exceed 1.0848MHz)}$$

Test Result:

The EUT complied with the occupied bandwidth requirement.





APPENDIX A - TEST EQUIPMENT USED

The absolute performance calibration of equipment requiring calibration is performed on an as needed basis in accordance with MIL-STD 45662A. However, calibration periods do not exceed one (1) year. The test equipment is capable of making measurements within tolerances of at least +/- 2dB amplitude and +/- 2% frequency deviation. Equipment certifications showing traceability to NIST (National Institute of Standards and Technology) are maintained on file at Garwood Laboratories, Inc. Placentia, CA. All equipment is checked and verified for proper operation before and after each series of tests.

A.1 Specific Equipment Used

<i>Test</i>	<i>Instrument</i>	<i>MFG / Model No.</i>	<i>Asset No.</i>	<i>CAL. Due Date</i>
<i>Conducted Emission Test</i>				
	EMI Receiver System	Hewlett Packard	System 1	02/25/01
	RF Coax Cable	Pasternack / RG 223	20170	03/05/01
	Line Impedance Stabilization Network	FCC / LISN-50-25-2	20073	06/10/00
<i>Radiated Emission Test</i>				
	EMI Receiver System	Hewlett Packard	System 3	02/05/01
	RF Coax Cable	Times Microwave / LMR 600	20180	03/05/01
	BiLog Antenna	Chase / CBL6111A	20062	07/09/00
	Pre-Amplifier	ISCI / RFPA/Z FL-2000	20007	03/05/01
	Spectrum Analyzer	Hewlett Packard / 8566B	20257	02/24/01
	Preamplifier (Above 1000MHz)	Hewlett Packard / 8449B	20003	10/14/00
	Double Ridge Guide Horn Antenna	Emco / 3115	20056	01/13/01

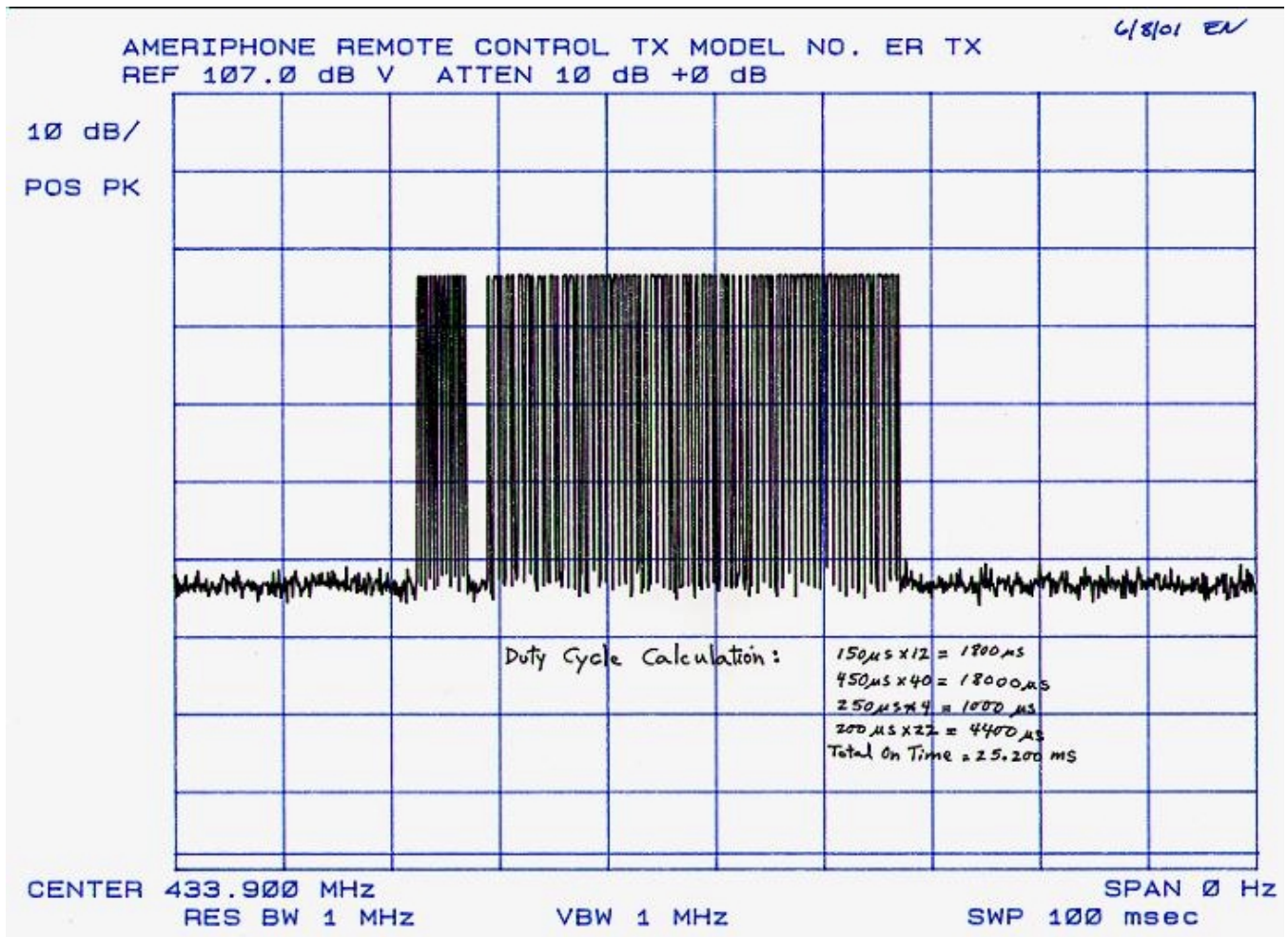


APPENDIX B – SUPPLEMENTAL TEST DATA

<i>Test Type</i>	<i>Basic Standard</i>	<i>Details</i>	<i>Data Format</i>	<i>Page No.</i>
Duty Cycle Calculation	FCC Pt.15 §15.35	Provisions in §15.35 for averaging pulsed emissions and limiting peak emissions were followed. Total on time of the EUT is 25.2ms	Plotted	D1



D1





ATTACHMENTS

INDEX OF ATTACHMENTS

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