

FCC CERTIFICATION TEST REPORT

for

DigiCall Technologies (PTY) LTD
P.O. Box 227
Strathavon 2031, South Africa

FCC ID: OXSPEN100A

March 7, 2000

WLL PROJECT #: 5349X

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DigiCall Technologies (PTY) LTD

FCC ID: OXSPEN100A

1.0 Introduction

This report has been prepared on behalf of DigiCall Technologies (PTY) LTD to support the attached Application for Equipment Authorization. The test and application are submitted for a Periodic Intentional Radiator under Part 15.231 of the FCC Rules and Regulations. The Equipment Under Test was the Model VIB100A.

All measurements herein were performed according to the 1992 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and field Strength Instrumentation. Calibration checks are made periodically to verify proper performance of the measuring instrumentation.

All measurements are performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

All results reported herein relate only to the equipment tested. The measurement uncertainty of the data contained herein is ± 2.3 dB. Refer to Appendix A for Statement of Measurement Uncertainty. This report shall not be used to claim product endorsement by NVLAP or any agency of the US Government.

1.1 Summary

The DigiCall Technologies (PTY) LTD Model VIB100A complies with the limits for a Periodic Intentional Radiator under Part 15.231 of the FCC Rules and Regulations.

2.0 Description of Equipment Under Test (EUT)

The DigiCall Technologies (PTY) LTD Model (EUT) is a Low Power Periodic Intentional Radiator designed for use in restaurants for the purpose of a customer call system. The battery powered transmitter is manually operated and used with the DigiCall Paging Receiver which was tested under the FCC DOC program. The transmitter transmits a fixed length code to a receiver and causes it to turn on the vibrate condition. After the transmitter button is released, the transmitter ceases transmission within 850 ms. Power to the transmitter is provided by 2 "AA" batteries.

2.1 On-board Oscillators

The DigiCall Technologies (PTY) LTD Model contains a 4 MHz oscillator and a 433.92 MHz SAW oscillators.

3.0 Test Configuration

To complete the test configuration required by the FCC, the transmitter was programmed to continuously transmit and was tested in all three orthogonal planes. All testing was performed at 3 VDC.

Worst case emissions are recorded in the data tables.

3.2 Conducted Emissions Testing

Conducted emissions testing was not performed since the unit is battery powered.

3.3 Radiated Emissions Testing

The EUT was placed on an 80 cm high 1 x 1.5 meters non-conductive motorized turntable for radiated testing on a 3 meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Biconical and log periodic broadband antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-1992. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The output from the antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The detector function was set to quasi-peak or peak, as appropriate. The measurement bandwidth on the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth. For measurements above 1000 MHz, the measurement bandwidth was set to 1 MHz and the video bandwidth was also set to 1 MHz.

3.3.1 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limits, it is necessary to account for various calibration factors that are supplied with the antennas and other measurement accessories. These factors are grouped into a composite antenna factor (AFc) and are supplied in the AFc column of Table 1. The AFc in dB/m and AFd (duty cycle factor) in dBμV (see Exhibit 1) are algebraically added to the Spectrum Analyzer Voltage in dBμV to obtain the Radiated Electric Field in dBμV/m. This level is then compared with the limit.

Example:

Spectrum Analyzer Voltage:	VdBμV
Composite Antenna Factor:	AFcdB/m
Duty Cycle Factor:	AFddBμV
Electric Field:	$EdB\mu V/m = VdB\mu V + AFcdB/m + AFddB\mu V$
To convert to linear units:	$E\mu V/m = \text{antilog}(EdB\mu V/m/20)$

Worst case emissions data are recorded in Table 1.

Table 2**FCC 15.231 3M Radiated Emissions Data – Site 2**

CLIENT: DigiCall
 FCC ID: OXSPEN100A
 TYPE/PART: Low power/15.231
 DATE: 11/8/99
 BY: Herb Meadows
 JOB #: 5349X

Frequency	Polarity	Azimuth	Antenna	SA Level	Afd	AFc	E-Field	E-Field	Limit	Margin
MHz	H/V	Degree	Height m	(Peak) dBuV	dB	dB/m	dBuV/m	uV/m	uV/m	dB
433.94	H	90.00	1.0	56.1	-4.4	19.4	71.1	3581.5	10959.0	-9.7
433.94	V	157.50	1.0	50.4	-4.4	19.4	65.4	1858.1	10959.0	-15.4
867.90	H	202.50	1.0	26.6	-4.4	27.5	49.7	306.1	1096.0	-11.1
867.90	V	0.00	1.0	23.0	-4.4	27.5	46.1	202.2	1096.0	-14.7
1301.80	H	225.00	1.0	58.7	-4.4	-10.3	44.0	158.5	500.0	-10.0
1301.80	V	90.00	1.0	59.1	-4.4	-10.3	44.4	166.0	500.0	-9.6
1735.84	H	180.00	1.0	57.8	-4.4	-7.5	45.9	197.2	1096.0	-14.9
1735.84	V	202.50	1.0	58.5	-4.4	-7.5	46.6	213.8	1096.0	-14.2
2169.80	H	270.00	1.0	61.1	-4.4	-5.8	50.9	350.8	1096.0	-9.9
2169.80	V	225.00	1.0	62.8	-4.4	-5.8	52.6	426.6	1096.0	-8.2
2603.70	H	135.00	1.0	58.3	-4.4	-5.1	48.8	275.4	1096.0	-12.0
2603.70	V	90.00	1.0	56.3	-4.4	-5.1	46.8	218.8	1096.0	-14.0
3037.50	H	0.00	1.0	45.1	-4.4	-4.4	36.3	65.3	1096.0	-24.5
3037.50	V	0.00	1.0	46.0	-4.4	-4.4	37.2	72.4	1096.0	-23.6
3471.70	H	180.00	1.0	49.1	-4.4	-3.9	40.8	109.6	1096.0	-20.0
3471.70	V	157.50	1.0	51.0	-4.4	-3.9	42.7	136.5	1096.0	-18.1
3905.60	H	135.00	1.0	49.6	-4.4	-3.4	41.8	123.0	500.0	-12.2
3905.60	V	180.00	1.0	48.9	-4.4	-3.4	41.1	113.5	500.0	-12.9
4339.00	H	135.00	1.0	48.8	-4.4	-3.0	41.4	117.5	500.0	-12.6
4339.00	V	180.00	1.0	49.9	-4.4	-3.0	42.5	133.4	500.0	-11.5

Table 2

System Under Test

FCC ID: OXSPEN100A

EUT: DigiCall Low Power Transmitter; FCC ID: OXSPEN100A

Table 3

Interface Cables Used

The EUT is battery powered and has no I/O cables.

Table 4
Measurement Equipment Used

The following equipment is used to perform measurements:

Equipment	Serial Number	Date Calibrated	Calibration Due
Antenna Research Associates, Inc. Biconical Log Periodic Antenna LPB-2520A (Site 2)	1118	5/13/99	5/13/00
Antenna Research Associates, Inc. Horn Antenna DRG-118/A	1010	9/10/99	9/10/00
Hewlett-Packard Preamplifier: HP 8449B	3008A00729	12/14/98	12/14/99
Hewlett-Packard Quasi-Peak Adapter: HP 85650A (Site 2)	3303A01786	6/23/99	6/23/00
Hewlett-Packard RF Preselector: HP 85685A (Site 2)	3221A01395	6/23/99	6/23/00
Hewlett-Packard Spectrum Analyzer: HP 8564E	3643A00657	11/9/98	11/9/00
Hewlett-Packard Spectrum Analyzer: HP 8568B (Site 2)	2926U07140	6/23/99	6/23/00
Hewlett-Packard Spectrum Analyzer: HP 8593A	3009A00739	5/26/99	5/26/00

EXHIBIT 1

DUTY CYCLE CALCULATIONS

The following page shows a spectrum analyzer plot of the transmitter coding. The following calculations show the worst case 100 ms duty cycle correction used for calculating the average level of the carrier, harmonics, and emissions.

The pulse train of the transmitter consists of an initial wide pulse of 1.29 ms, followed by narrower pulses of 640 us and 260 us. The pulse train period is 18.5 ms.

ON TIME PER PULSE TRAIN ms:

$$(1 \times 1.29 \text{ ms}) + (13 \times 0.64 \text{ ms}) + (6 \times 0.26 \text{ ms}) = 11.17 \text{ ms On Time Per Pulse Train}$$

$$= 11.17/18.5 = 60.37\% \text{ DUTY CYCLE}$$

$$= -4.4 \text{ dB}$$

Duty Cycle Pulse Train

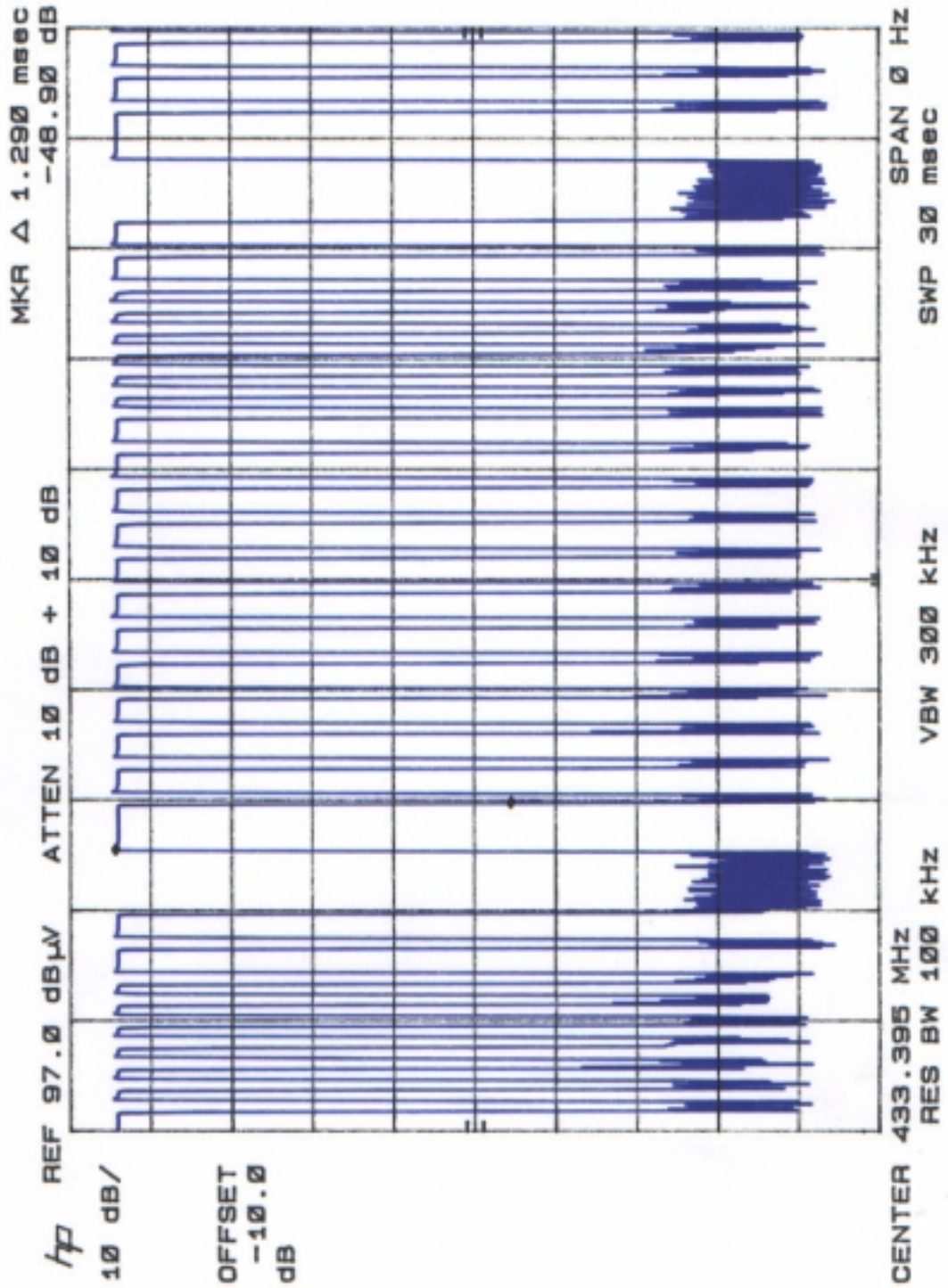


EXHIBIT 2

CARRIER BANDWIDTH DATA

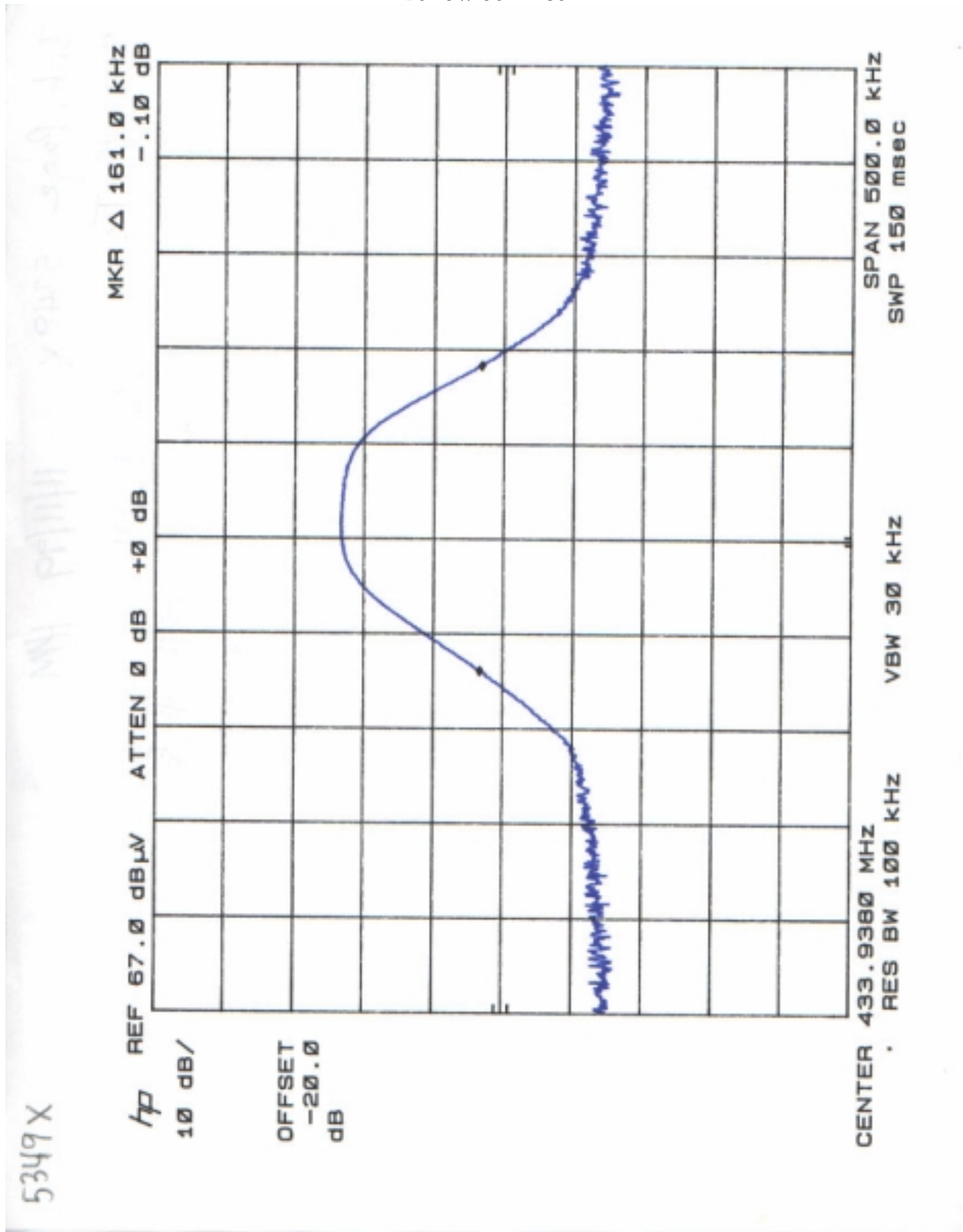
The 20 dB modulated bandwidth shall be no wider than 0.25% of the center frequency.

Bandwidth Limit = Carrier Frequency x .0025

Bandwidth Limit = 433.92 MHz x .0025 = 1.084 MHz

Measured EUT Bandwidth = 161 kHz

Bandwidth Plot



Appendix A

Statement of Measurement Uncertainty

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ± 2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5 (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB.