

FCC CERTIFICATION TEST REPORT

for

Ducati Automazione srl
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FCC ID: OLS137925764

August 18, 1999

WLL PROJECT #: 5259X

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FCC ID: OLS137925764

1.0 Introduction

This report has been prepared on behalf of Ducati Automazione Srl to support the attached Application for Equipment Authorization. The test and application are submitted for a Periodic Intentional Radiator Device under Part 15.231 of the FCC Rules and Regulations. The Equipment Under Test was the Handheld Remote Security Gate/Garage Door opener low power transmitter.

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 Ducati Automazione srl Handheld Remote Security Gate/Garage Door Opener complies with the limits for a Periodic Low Power Intentional Radiator.

2.0 Description of Equipment Under Test (EUT)

The Ducati Automazione srl Handheld Remote Security Gate/Garage Door Opener Transmitter (EUT) is a low power transmitter intended for remote security gate access. The EUT transmits an encoded security code to a remote receiver which supplies energy to the gate actuators/motors, thereby opening and closing the security (driveway) gates or garage door.

2.1 On-board Oscillators

The Ducati Automazione srl Handheld Remote Security Gate/Garage Door Opener Transmitter contains a 433.92MHz SAW oscillator.

3.0 Test Configuration

To complete the test configuration required by the FCC, the transmitter was tested in all three orthogonal planes. All testing was performed at 12VDC via internal battery.

3.1 Testing Algorithm

The transmitter was turned on and constantly transmitting. The system was tested in all three orthogonal planes. Worst case emissions are recorded in the data tables.

3.2 Conducted Emissions Testing

Conducted emissions testing is not required as the EUT 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. Biconilog and standard gain horn 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. Both the horizontal and vertical field components were measured.

The output from the antenna was connected, via a preselector or 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 (1 MHz for measurements above 1 GHz), with all post-detector filtering no less than 10 times the measurement bandwidth.

3.3.1 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a level 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 dB (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:	AFddB
Electric Field:	$EdB\mu V/m = VdB\mu V + AFcdB/m + AFddB\mu V$
To convert to linear units:	$E\mu V/m = \text{antilog}(EdB\mu V/m/20)$

Data is recorded in Table 1.

Table 1**FCC Part 15.231 3M Radiated Emissions Data – Site 2**

CLIENT: Ducati Automazione srl
 FCC ID: OLS137925764
 DATE: 7/11/00
 BY: Steve Koster
 JOB #: 5259X

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	Afd	E-Field	E-Field	Limit	Margin
MHz	H/V	Degree	Height m	(QP) dBuV	dB/m	dB	dBuV/m	uV/m	uV/m	dB
433.88	V	90.0	1.5	46.7	19.4	-12.6	53.5	472.1	10996.3	-27.3
433.88	H	90.0	1.0	50.8	19.4	-12.6	57.6	756.8	10996.3	-23.2
867.75	H	90.0	1.3	23.2	27.5	-12.6	38.1	80.5	1099.6	-22.7
867.75	V	180.0	2.5	23.5	27.5	-12.6	38.4	83.3	1099.6	-22.4
1301.57	H	22.5	1.2	52.5	-8.8	-12.6	31.1	36.0	500.0	-22.9
1301.57	V	225.0	1.0	53.6	-8.8	-12.6	32.2	40.8	500.0	-21.8
1735.51	V	225.0	1.0	54.5	-5.6	-12.6	36.3	65.4	1099.6	-24.5
1735.51	H	180.0	1.2	57.4	-5.6	-12.6	39.2	91.3	1099.6	-21.6
2169.38	H	270.0	1.0	53.0	-3.5	-12.6	36.9	69.8	1099.6	-23.9
2169.38	V	225.0	1.0	53.6	-3.5	-12.6	37.5	74.8	1099.6	-23.3
2603.26	H	225.0	1.0	54.3	-2.5	-12.6	39.2	91.7	1099.6	-21.6
2603.26	V	135.0	1.0	54.4	-2.5	-12.6	39.3	92.7	1099.6	-21.5
3037.14	H	180.0	1.0	52.5	-1.6	-12.6	38.3	82.2	1099.6	-22.5
3037.14	V	180.0	1.0	53.6	-1.6	-12.6	39.4	93.3	1099.6	-21.4
3471.01	H	270.0	1.0	53.1	-1.6	-12.6	38.9	88.1	1099.6	-21.9
3471.01	V	90.0	1.0	53.5	-1.6	-12.6	39.3	92.3	1099.6	-21.5
3904.89	H	270.0	1.0	51.6	-1.6	-12.6	37.4	74.1	500.0	-16.6
3904.89	V	180.0	1.0	51.9	-1.6	-12.6	37.7	76.7	500.0	-16.3
4338.77	V	225.0	1.0	51.1	-0.8	-12.6	37.7	76.5	500.0	-16.3
4338.77	H	180.0	1.0	51.4	-0.8	-12.6	38.0	79.2	500.0	-16.0

Table 1 (Continued)

FCC Part 15.231 3M Radiated Emissions Data – Site 2

CLIENT: Ducati Automazione srl
 FCC ID: OLS137925764
 DATE: 7/11/00
 BY: Steve Koster
 JOB #: 5259X

Peak Measurements Above 1 GHz

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin
MHz	H/V	Degree	Height m	(QP) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB
1301.57	H	22.5	1.2	52.5	-8.8	43.7	153.4	5000.0	-30.3
1301.57	V	225.0	1.0	53.6	-8.8	44.8	174.2	5000.0	-29.2
1735.51	V	225.0	1.0	54.5	-5.6	48.9	278.8	5000.0	-25.1
1735.51	H	180.0	1.2	57.4	-5.6	51.8	389.3	5000.0	-22.2
2169.38	H	270.0	1.0	53.0	-3.5	49.5	297.7	5000.0	-24.5
2169.38	V	225.0	1.0	53.6	-3.5	50.1	319.0	5000.0	-23.9
2603.26	H	225.0	1.0	54.3	-2.5	51.8	391.1	5000.0	-22.1
2603.26	V	135.0	1.0	54.4	-2.5	51.9	395.6	5000.0	-22.0
3037.14	H	180.0	1.0	52.5	-1.6	50.9	350.8	5000.0	-23.1
3037.14	V	180.0	1.0	53.6	-1.6	52.0	398.1	5000.0	-22.0
3471.01	H	270.0	1.0	53.1	-1.6	51.5	375.8	5000.0	-22.5
3471.01	V	90.0	1.0	53.5	-1.6	51.9	393.6	5000.0	-22.1
3904.89	H	270.0	1.0	51.6	-1.6	50.0	316.2	5000.0	-24.0
3904.89	V	180.0	1.0	51.9	-1.6	50.3	327.3	5000.0	-23.7
4338.77	V	225.0	1.0	51.1	-0.8	50.3	326.5	5000.0	-23.7
4338.77	H	180.0	1.0	51.4	-0.8	50.6	337.9	5000.0	-23.4

Table 2

System Under Test

FCC ID: OLS137925764

EUT: Ducati Automazione srl Handheld Remote Security Gate/Garage Door Opener Low Power Transmitter; M/N: 6203; S/N: N/A; FCC ID: OLS137925764

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:

Hewlett-Packard Spectrum Analyzer: HP8564E
Hewlett-Packard Spectrum Analyzer: HP8568B
Hewlett-Packard Spectrum Analyzer: HP8593A
Hewlett-Packard Quasi-Peak Adapter: HP85650A
Hewlett-Packard Preselector: HP85685A
Hewlett-Packard Preamplifier: HP8449B
Antenna Research Associates, Inc. Biconical Log Periodic Antenna: LPB-2520A (Site 2)
Antenna Research Associates, Inc. Horn Antenna: DRG-118/A
Solar 50 Ω /50 μ H Line Impedance Stabilization Network: 8012-50-R-24-BNC
Solar 50 Ω /50 μ H Line Impedance Stabilization Network: 8028-50-TS-24-BNC
AH Systems, Inc. Portable Antenna Mast: AMS-4 (Site 2)
AH Systems, Inc. Motorized Turntable (Site 2)
RG-214 semi-rigid coaxial cable
RG-223 double-shielded coaxial cable

EXHIBIT 1

DUTY CYCLE CALCULATIONS

The following page shows spectrum analyzer plots 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.

Plot 1 shows that the transmitter has a pulse train period of 53.3 ms and consists of 2 lengths of pulses. The pulse widths are measured on Plots 2 and 3. From these plots, the following duty cycle correction factor is calculated.

ON TIME PER PULSE TRAIN:

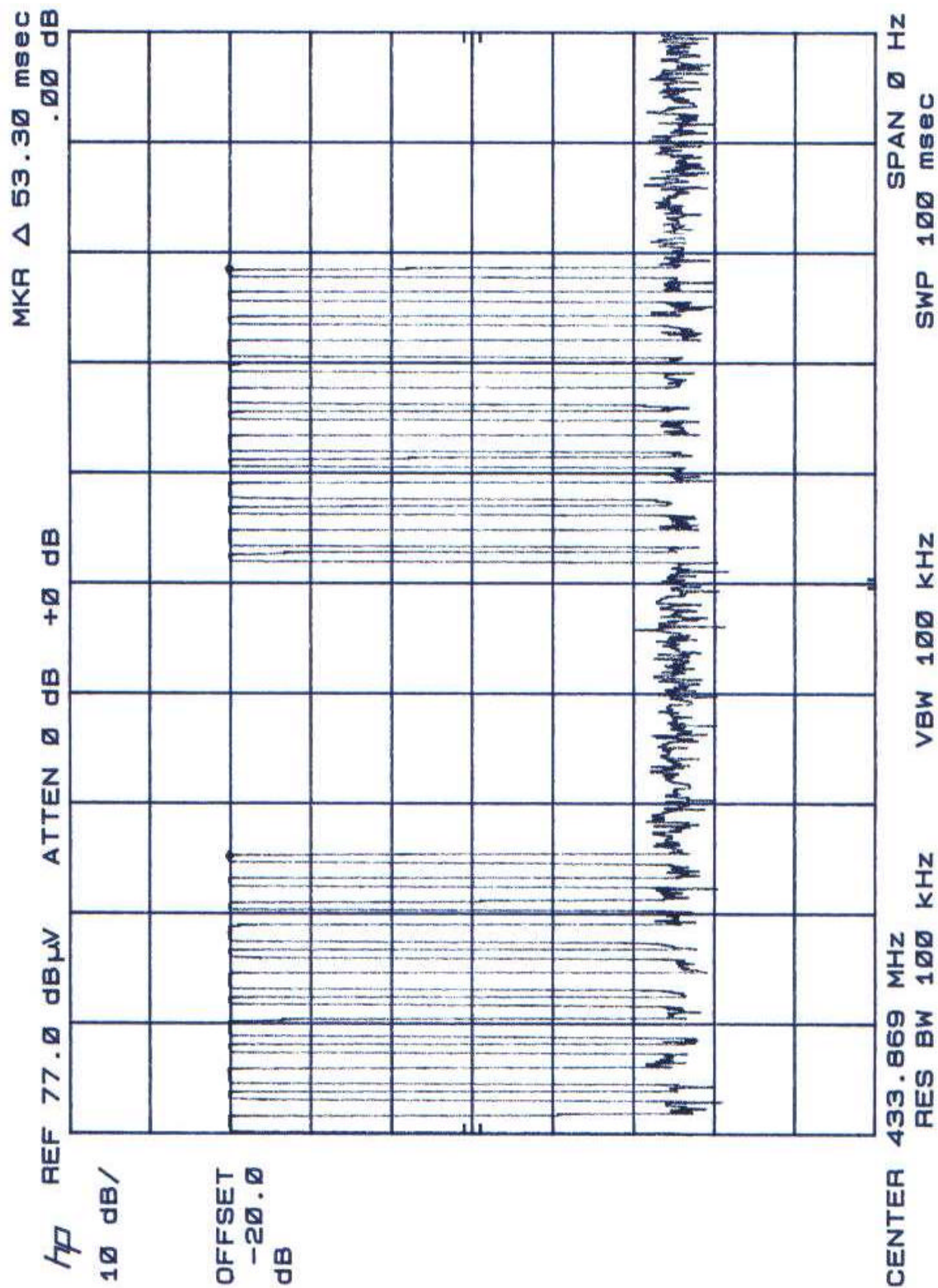
$$(8 \times 650 \text{ us}) + (5 \times 1.45 \text{ ms}) = 12.45 \text{ ms ON TIME PER 53.3 ms Pulse Train}$$

$$= 12.45 \text{ ms} / 53.3 \text{ ms} = 0.234 \text{ Duty Cycle}$$

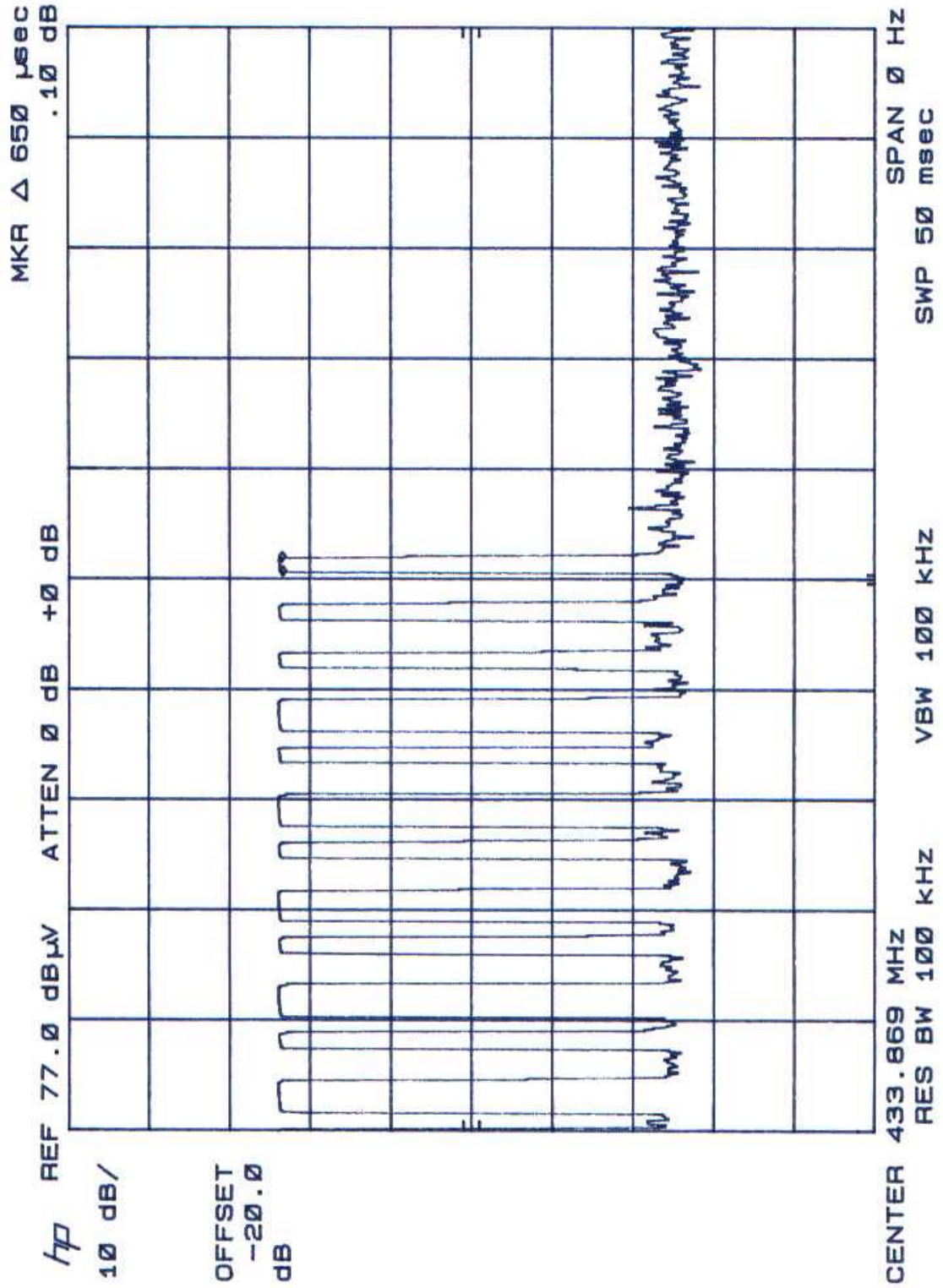
$$= 23.4\% \text{ Duty Cycle}$$

$$= -12.6 \text{ dB AFd}$$

Duty Cycle Plot 1



Duty Cycle Plot 2



Duty Cycle Plot 3

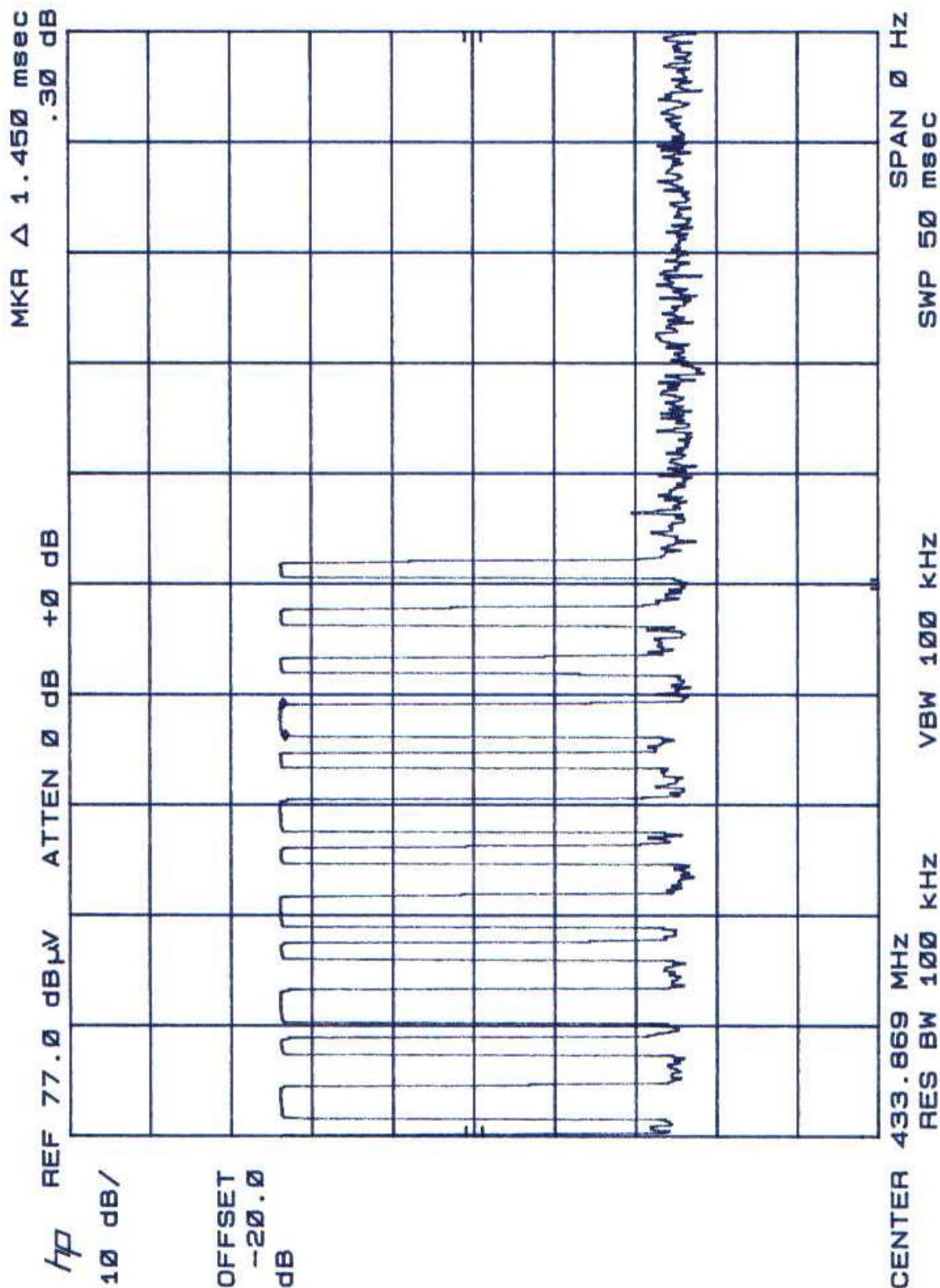


EXHIBIT 2

CARRIER BANDWIDTH DATA

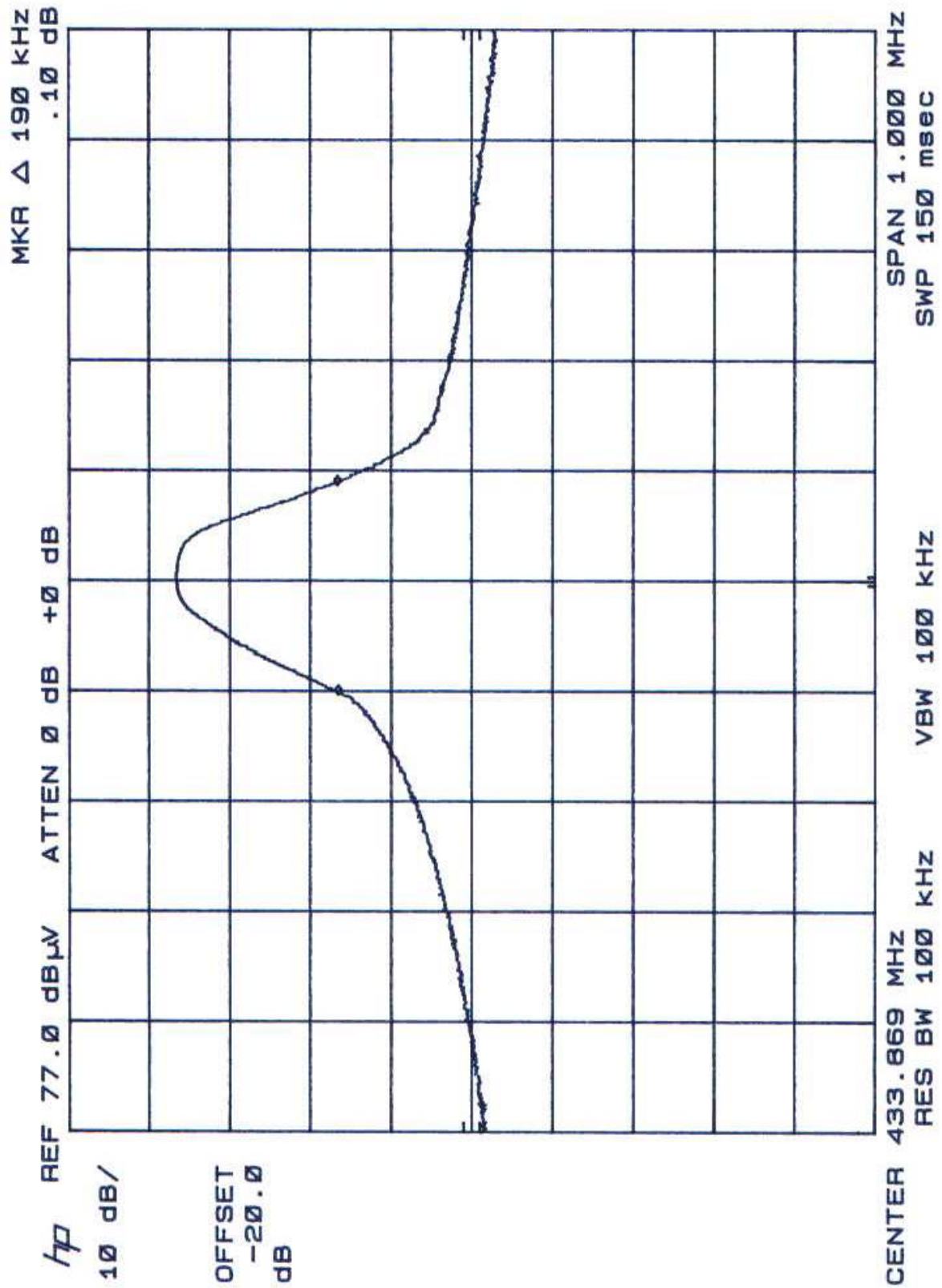
The 20 dB modulated bandwidth shall be no wider than 0.25% of the center frequency.

$$\text{Bandwidth Limit} = \text{Carrier Frequency} \times .0025$$

$$\text{Bandwidth Limit} = 433.8 \text{ MHz} \times .0025 = 1.0845 \text{ MHz}$$

$$\text{Measured EUT Bandwidth} = 190 \text{ kHz}$$

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