MEASUREMENT AND TECHNICAL REPORT

DIRECTED ELECTRONCS INCORPORATED
1 Viper Way
Vista, CA 92081

DATE: 12 April 2004

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	BOA Transmitter, Model 474B	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: **Defer until:**	No: X
Company Name **agrees to notify the Commission by:**	N/A	

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37?	Yes:	No: X*

(*) FCC Part 15, Paragraph(s) **15.231(a), 15.231(b), 15.231(c)**

Report Prepared by:

TÜV AMERICA, INC
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 678 1400
Fax: 858 546 0364

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TÜV AMERICA, INC. 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 678 1400 FAX 858 546 0364

1.0 GENERAL INFORMATION

1.1 Product Description

General Equipment Description

EUT Description: Keyfob Transmitter

EUT Name: BOA Transmitter

Model No.: 474B Serial No.: --

Power Requirements

Voltage: 3V (Battery)

Typical Installation and/or Operating Environment

Automotive remote control keyfob.

EUT Power Cable

■ Not Applicable

EUT Operating Modes to be Tested

1. Continuous transmission with typical modulation applied to RF carrier.

Oscillator Frequencies

Frequency	Derived Frequency	Component # / Location	Description of Use
433.92 MHz	--	--	--

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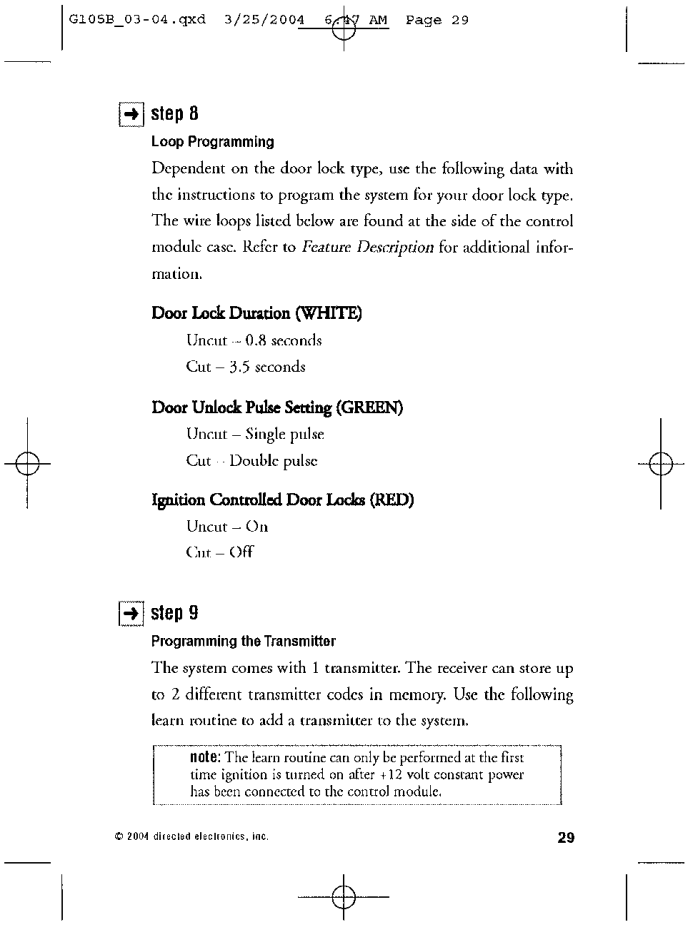
1.1 Product Description (continued)

Learn routine for replacement transmitters



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step 8

Loop Programming

Dependent on the door lock type, use the following data with the instructions to program the system for your door lock type. The wire loops listed below are found at the side of the control module case. Refer to *Feature Description* for additional information.

Door Lock Duration (WHITE)

Uncut – 0.8 seconds
Cut – 3.5 seconds

Door Unlock Pulse Setting (GREEN)

Uncut – Single pulse
Cut – Double pulse

Ignition Controlled Door Locks (RED)

Uncut – On
Cut – Off

step 9

Programming the Transmitter

The system comes with 1 transmitter. The receiver can store up to 2 different transmitter codes in memory. Use the following learn routine to add a transmitter to the system.

note: The learn routine can only be performed at the first time ignition is turned on after +12 volt constant power has been connected to the control module.

note: If power is lost to the control module (battery disconnected), the transmitters must be relearned.

The following is the basic sequence of steps to remember whenever programming this unit:

1. Connect +12V constant power (H1/2).
2. **Key.** Turn the ignition to the ON position.

note: If the WHITE wire at the control module is not cut the doors will lock 3-seconds after turning the ignition on.

3. **Program.** Wait 5-seconds (the door will lock if the WHITE wire at the control module is not cut), press and hold the PROG button on the transmitter, until—(see step 4).

note: To ensure proper system operation, use the transmitter at a distance of greater than 18 inches from the control module.

4. **Lock/Unlock.** The door locks will cycle (Lock/Unlock) to acknowledge programming of this transmitter.

note: A second transmitter can only be added to the system immediately after programming the first transmitter.

To add a second transmitter (within 5-seconds of programming the first transmitter, after the Lock/Unlock cycle):

1. **Program.** Press and hold the PROG button on the additional transmitter, until—(see step 2).
2. **Lock/Unlock.** The door locks will cycle (Lock/Unlock) to acknowledge programming of this transmitter.

➔ step 10

Testing the system

With all the previous steps completed, the operation of the system can now be tested.

> **note:** The transmitter(s) must be learned to the system prior to completion of this test. See the *Transmitter/Receiver Learn Routine* section of this guide.

Close all the doors and press the button on the transmitter to lock the doors, the system should flash the parking lights once. Press the button on the transmitter to unlock the doors. The parking lights should flash twice and the factory disarm output will activate (if connected).

This completes the testing, if all functions do not work correctly check your wiring against the manual and verify all connections. If you still experience problems contact BOA Technical Support at **1-800-873-1314**.

1.1 Product Description (continued)

System transmission frequency range

This transmitter is a single frequency device. It's SAW resonator based and the transmission frequency is determined by the SAW resonator. The resonator used in the 473S/474S has a center frequency of 433.92 MHz +/-75 KHz. This means the single transmission frequency will always be locked at 433.92MHz only with a +/-75 KHz tolerance for its center.

Furthermore, the receiver operated by this transmitter is a single band receiver tuned to 433.92MHz and only capable of receiving this frequency.

Data transmission duty cycle description

The 474B is a data transmission device. Its protocol consists of 12 preamble bits (400us each) and 66 data bits (400us or 800us each, they are random) for a total of 78 bits. So the calculation for the duty cycle becomes:

(12 x 400us)+(66x800us)= 57.60ms within a 100ms period

The worst case scenario calculation is assured by the fact that we used 800us for all 66 data bits as they can be either
400us or 800us.

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1.2 Related Submittal Grant

None

1.3 Tested System Details

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system are:

None

1.4 Test Methodology

Purpose of Test: To demonstrate compliance with the following tests.

TEST	FCC CFR 47#	PASS/FAIL
Deactivation	15.231(a)	Pass
Radiated Spurious Emissions	15.231(b)	Pass
Emissions Bandwidth	15.231(c)	Pass
Duty Cycle Measurements	ANSI C63.4, Appendix 14, Para. 10	Pass

1.5 Test Facility

The open area test site and conducted measurement data were tested by:

TÜV AMERICA, INC
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 678 1419
Fax: 858 546 0364

The Test Site Data and performance comply with ANSI C63.4 and are registered with the FCC, 7435 Oakland Mills Road, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was initially tested for FCC emissions in the following configuration:

See Test Setup Photos Exhibit.

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Equipment Modifications

None

2.5 Configuration of Test System

See Test Setup Photos Exhibit.

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3.0 DEACTIVATION EQUIPMENT/DATA

3.1 EQUIPMENT

Test Conditions: DEACTIVATION: FCC Part 15.231(a)

The DEACTIVATION measurements were performed at the San Diego Testing Facility:

☐ - Test not applicable

■ - SR 3, Shielded Room, 12' x 20' x 8', Metal Chamber

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Date Cal'ed
E4440A	6814	Spectrum Analyzer	Agilent	MY42510441	08/03
CBL61111	460	Biconical Antenna	Chase	1013	NCR*

Remarks: (*) No Calibration Required.

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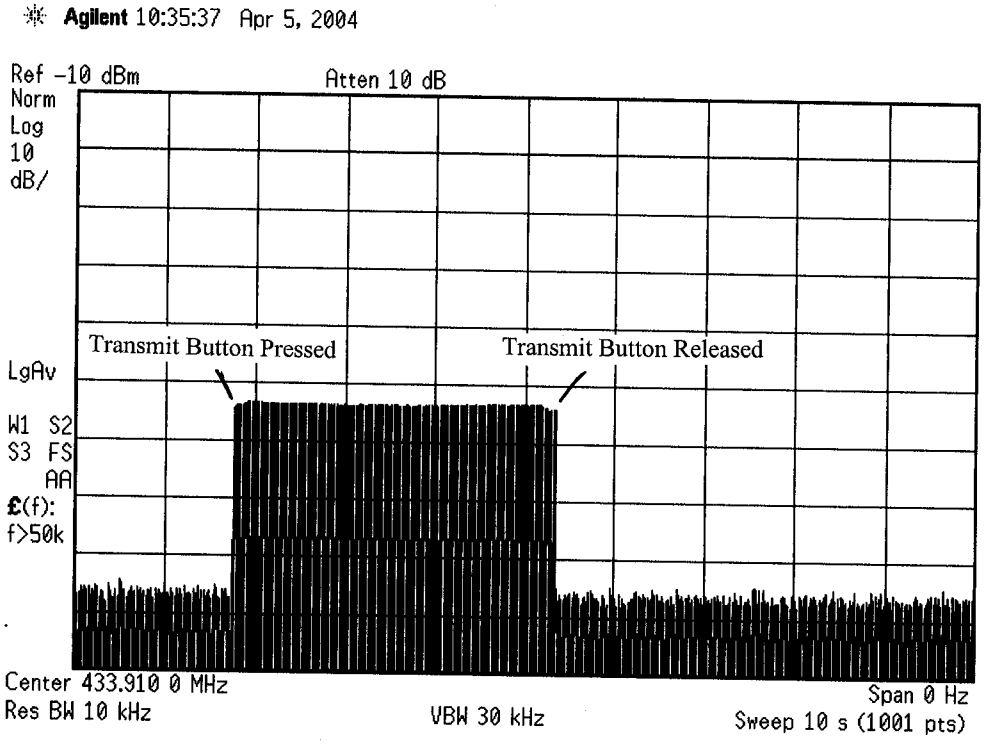
3.2 DATA



SC401611
DIRECTED ELECTRONICS
MODEL 474B

Apr. 6, 2004
TECH/ENGR: AAL
LOCATION: SR3

FCC 47 Part 15.231 (a) Deactivation
Transmitting stops as push button is released.
EUT Complies.

4.0 RADIATED SPURIOUS EMISSIONS EQUIPMENT/DATA

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

4.1 FIELD STRENGTH CALCULATION

If a preamplifier was used during the Radiated Emission Testing, it is required that the amplifier gain must be subtracted from the Spectrum Analyzer (Meter) Reading. In addition, a correction factor for the antenna, cable used and a distance factor, if any, must be applied to the Meter Reading before a true field strength reading can be obtained. In the automatic measurement, these considerations are automatically presented as a part of the print out. In the case of manual measurements and for greater efficiency and convenience, instead of using these correlation factors for each meter reading, the specification limit was modified to reflect these correlation factors at each frequency value so that the meter readings can be compared directly to the modified specification limit. This modified specification limit is referred to as the "Corrected Meter Reading Limit" or simply the CMRL, which is the actual field strength present at the antenna. The quantity can be derived in the following manner:

Corrected Meter Reading Limit (CMRL) = SAR + AF + CL - AG - DC

Where, SAR = Spectrum Analyzer Reading
AF = Antenna Factor
CL = Cable Loss
AG = Amplifier Gain (if any)
DC = Distance Correction (if any)

Assume the following situation: A meter reading of 29.4 dBuV was obtained from a Class A computing device measured at 83 MHz. Assume an antenna factor of 9.2 dB, a cable loss of 1.4 dB and amplifier gain of 20.0 dB at 83 MHz. The final field strength would be determined as follows:

CMRL = 29.4 dBuV + 9.2dB = 1.4 dB - 20 dB/M - 0.0 dB

CMRL = 20.0 dBuV/M

This result is well below the FCC and CSA Class A limit of 29.5 dbuV/m at 83 MHz.

For the manual mode of measurement, a table of corrected meter reading limit was used to permit immediate comparison of the meter reading to determine if the measure emission amplitude exceeded the specification limit at that specific frequency.

4.2 EQUIPMENT

Test Conditions: RADIATED SPURIOUS EMISSIONS: FCC Part 15.231(b)

The RADIATED SPURIOUS EMISSIONS measurements were performed at the San Diego Testing Facility:

☐ **- Test not applicable**

■ - Roof (Small Open Area Test Site)
■ - SR 3, Shielded Room, 12' x 20' x 8', Metal Chamber

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Date Cal'ed
HP8566B	744	Spectrum Analyzer	Hewlett Packard	2618A02913	01/04
FF6548-2	783	2000 MHz High Pass Filter	Sage		NCR*
3115	453	Horn Antenna	EMCO		02/04
3146	244	Log Periodic Antenna	EMCO		07/03
AMF-5D-010180-35-10P	719	Preamplifier	Miteq	549460	NCR*
CBL61111	460	Biconical Antenna	Chase	1013	NCR*

Remarks: (*) No Calibration Required.

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4.3 DATA

REPORT No: SC401611 TESTER: Alan Laudani SPEC: FCC Part 15 para 15.231(b)

CUSTOMER: Directed Electronics TEST DIST: 3 Meters

E U T: Model 474B TEST SITE: Roof

EUT MODE: Transmit (continuous pulse) BICONICAL: N/A

DATE: April 6, 2004 LOG: 244

NOTES: Duty Cycle= 56.7% OTHER: 453

above 1GHz: RBW & VBW 1 MHz for Pk; AVG = PK - 20LOG(Duty Cycle)

below 1GHz: RBW & VBW 100 kHz for Pk; AVG = PK - 20LOG(Duty Cycle)

CF = Antenna Factor + Cable Loss - Preamplifier Gain Temp.: 15°C R.H. 71%

FCC Part 15.205 referenced for restricted band frequencies.

From 30 MHz to 4340 MHz – no other emissions detected.

v.beta231

FREQ (MHz)	VERT. (dBuv)		HORIZ (dBuv)		CF (dB/m)	MAX LEVEL (dBuV/m)		SPEC LIMIT (dBuV/m)		MARGIN (dB)		EUT Rotation	Antenna Height	Notes
	pk	DCav	pk	DCav		pk	av	pk	av	pk	av			
433.920	54.5	49.6	64.4	59.5	16.4	**80.8**	**75.9**	100.8	80.8	-20.0	-5.0	0	1	
867.840	32.1	27.2	37.7	32.8	22.7	**60.4**	**55.5**	80.8	60.8	-20.4	-5.3	130	1	
1301.760	64.2	59.3	62.4	57.5	-12.5	**51.7**	**46.8**	74.0	54.0	-22.3	-7.2	339	1.5	
1735.680	64.4	59.5	66.9	62.0	-9.1	**57.8**	**52.9**	80.8	60.8	-23.0	-7.9	11	1	
2169.600	52.3	47.4	64.2	59.3	-6.8	**57.4**	**52.4**	80.8	60.8	-23.4	-8.4	100	1.1	
2603.520	55.7	50.8	52.3	47.4	-5.1	**50.6**	**45.7**	80.8	60.8	-30.2	-15.1	0	1	
3037.440	57.4	52.5	59.9	55.0	-2.5	**57.4**	**52.5**	80.8	60.8	-23.4	-8.3	75	1.3	
3471.360	58.6	53.7	58.4	53.5	-0.9	**57.7**	**52.8**	80.8	60.8	-23.1	-8.1	15	1	
3905.280	51.7	46.8	52.8	47.9	-0.2	**52.6**	**47.6**	74.0	54.0	-21.4	-6.4	250	1.1	
4339.200	48.1	43.2	49.7	44.8	-1.3	**48.4**	**43.5**	74.0	54.0	-25.6	-10.5	300	1.3	

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5.0 DUTY CYCLE EQUIPMENT/DATA

5.1 EQUIPMENT

Test Conditions: DUTY CYCLE: FCC Part 15.231(b)

The DUTY CYCLE measurements were performed at the San Diego Testing Facility:

☐ **- Test not applicable**

■ - SR 3, Shielded Room, 12' x 20' x 8', Metal Chamber

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Date Cal'ed
E4440A	6814	Spectrum Analyzer	Agilent	MY42510441	08/03
CBL61111	460	Biconical Antenna	Chase	1013	NCR*

Remarks: (*) No Calibration Required.

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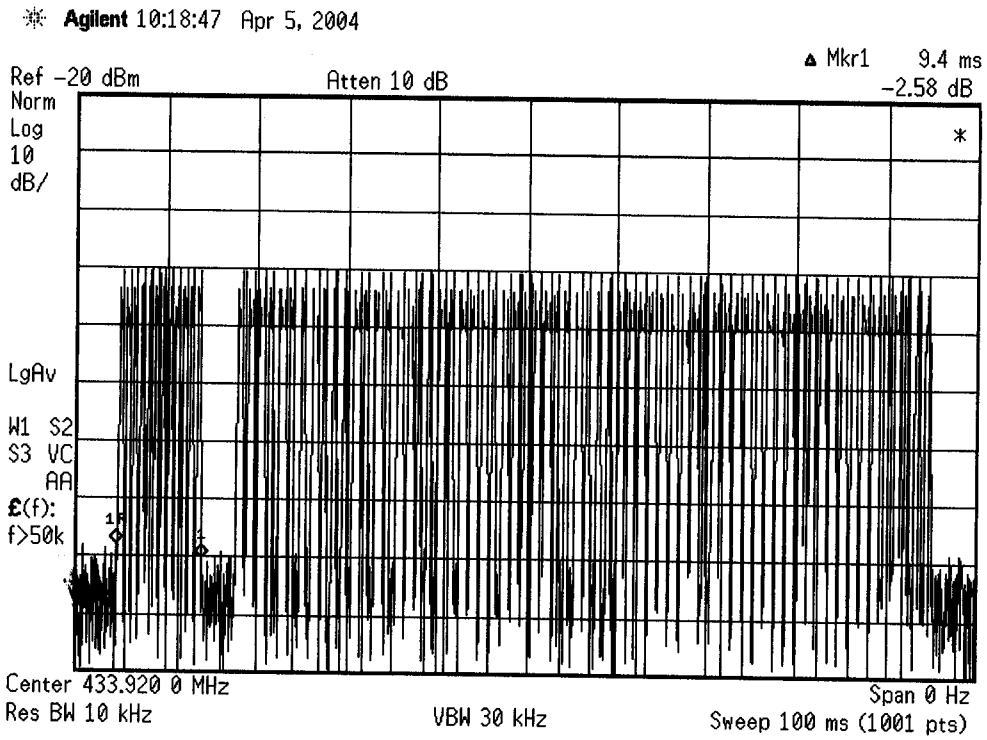
5.2 DATA



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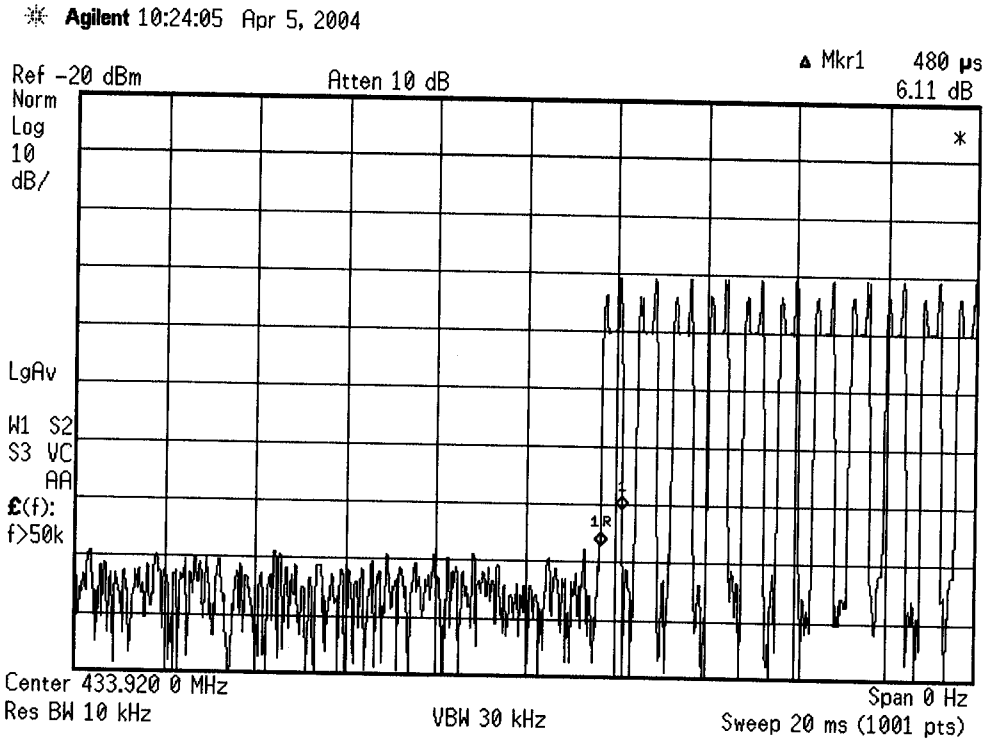
DIRECTED ELECTRONICS
MODEL 474B

Apr. 6, 2004
TECH/ENGR: AAL
LOCATION: SR3

FCC 47 Part 15.231 (b) Duty Cycle

Duty Cycle = 56.7 %

11 events X 480 us = 5.28 ms
46 events X 888 us = 40.85 ms
23 events X 460 us = 10.50 ms
Total of 56.7 ms in 100 ms = .567 x 100 % = 56.7 %



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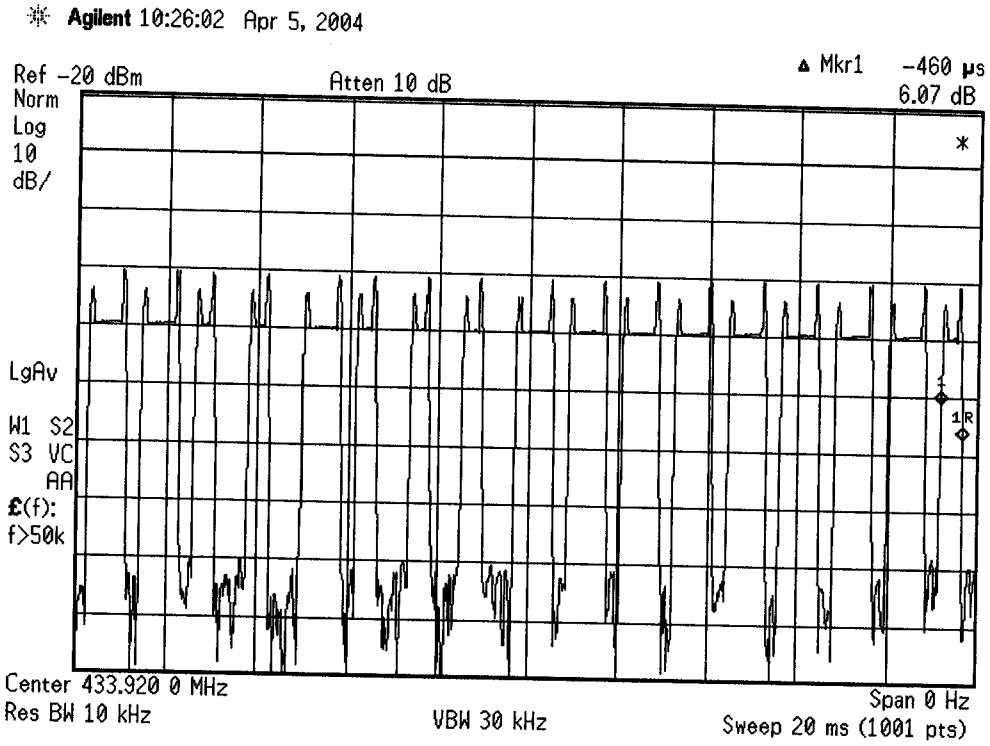

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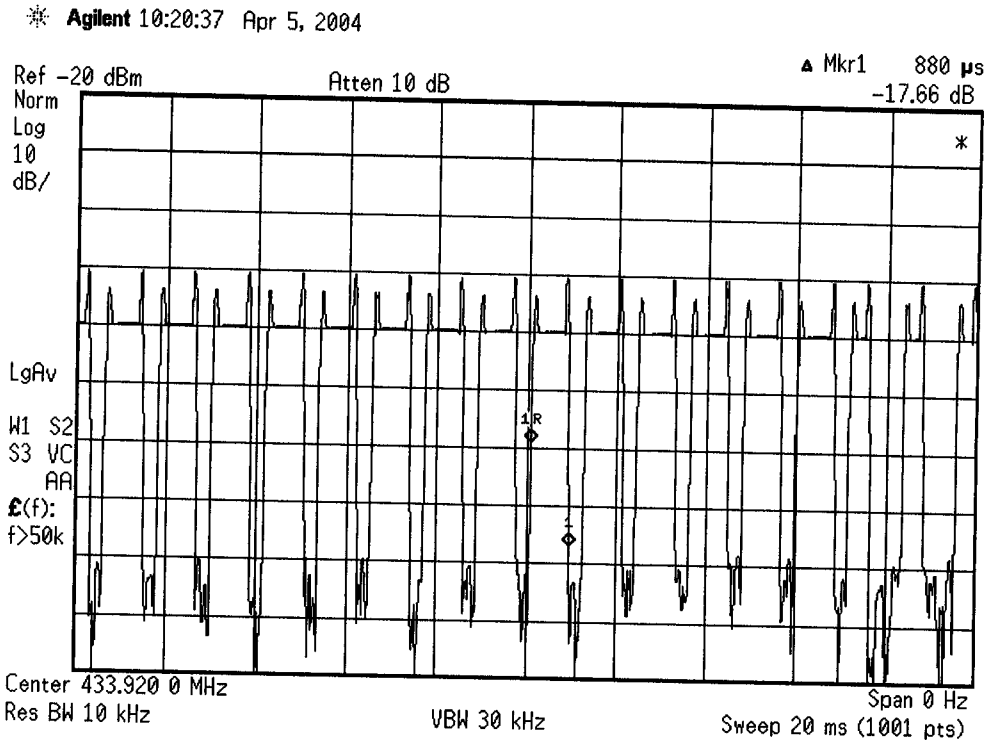

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MODEL 474B

Apr. 6, 2004
TECH/ENGR: AAL
LOCATION: SR3

FCC 47 Part 15.231 (b) Duty Cycle

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11 events X 480 us = 5.28 ms
46 events X 888 us = 40.85 ms
23 events X 460 us = 10.50 ms
Total of 56.7 ms in 100 ms = .567 x 100 % = 56.7 %

6.0 EMISSIONS BANDWIDTH EQUIPMENT/DATA

6.1 EQUIPMENT

Test Conditions: EMISSIONS BANDWIDTH: FCC Part 15.231(c)

The EMISSIONS BANDWIDTH measurements were performed at the San Diego Testing Facility in:

☐ **- Test not applicable**

■ - SR 3, Shielded Room, 12' x 20' x 8', Metal Chamber

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Date Cal'ed
E4440A	6814	Spectrum Analyzer	Agilent	MY42510441	08/03
CBL61111	460	Biconical Antenna	Chase	1013	NCR*

Remarks: (*) No Calibration Required.

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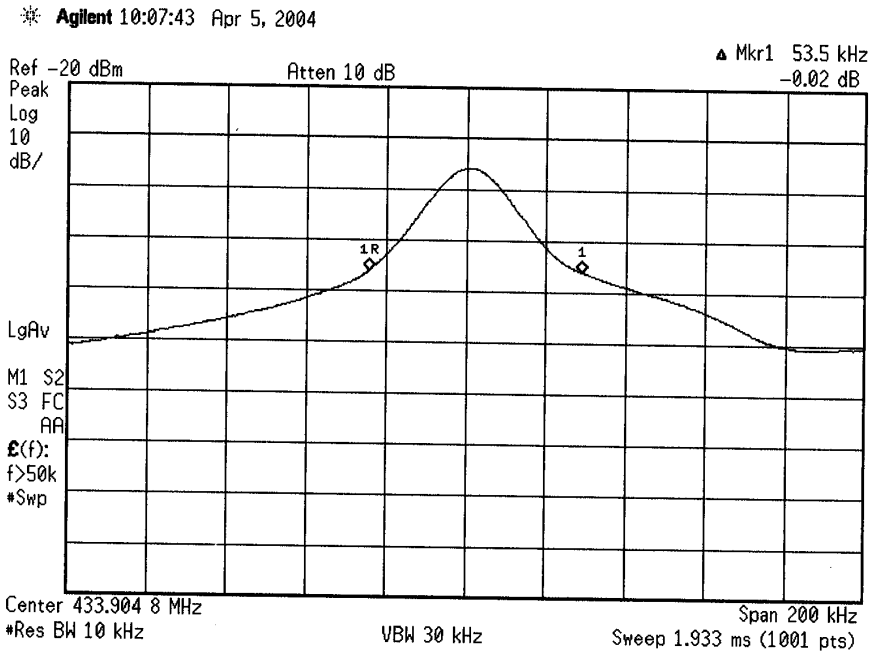
6.2 DATA



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MODEL 474B

Apr. 6, 2004
TECH/ENGR: AAL
LOCATION: SR3

FCC 47 Part 15.231 (c) Emission Bandwidth
Limit = -20 dB Bandwidth (1 MHz = 0.25% of Frequency)
EUT Complies.

7.0 ATTESTATION STATEMENT

GENERAL REMARKS:

SUMMARY:

All tests were performed per CFR 47, Part(s) 15.231(a), 15.231(b), 15.231(c)

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, Part(s) 15.231(a), 15.231(b), 15.231(c)

- TÜV AMERICA, INC. -

Reviewing Engineer:

Jim Owen
(EMC Chief Engineer)

Test Engineer:

Alan Laudani
(EMC Engineer)

TÜV AMERICA, INC. 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 678 1400 FAX 858 546 0364