

## MEASUREMENT AND TECHNICAL REPORT

DIRECTED ELECTRONCS INCORPORATED  
 1 Viper Way  
 Vista, CA 92081

**DATE: 12 April 2004**

<b>This Report Concerns:</b>	Original Grant: <input checked="" type="checkbox"/>	Class II Change: <input type="checkbox"/>
<b>Equipment Type:</b>	BOA Transmitter, Model 474B	
<b>Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?</b>	Yes: <input type="checkbox"/>	No: <input checked="" type="checkbox"/>
<b>Company Name agrees to notify the Commission by:</b>	N/A	
<b>of the intended date of announcement of the product so that the grant can be issued on that date.</b>		
<b>Transition Rules Request per 15.37?</b>	Yes: <input type="checkbox"/>	No: <input checked="" type="checkbox"/>
(*) FCC Part 15, Paragraph(s) <b>15.231(a), 15.231(b), 15.231(c)</b>		
<b>Report Prepared by:</b>	<b>TÜV AMERICA, INC</b> <b>10040 Mesa Rim Road</b> <b>San Diego, CA 92121-2912</b> <b>Phone: 858 678 1400</b> <b>Fax: 858 546 0364</b>	

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**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	--	--	--

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 **PRG** 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 BCA 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:

$$(12 \times 400\text{us}) + (66 \times 800\text{us}) = 57.60\text{ms within a 100ms period}$$

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.

**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

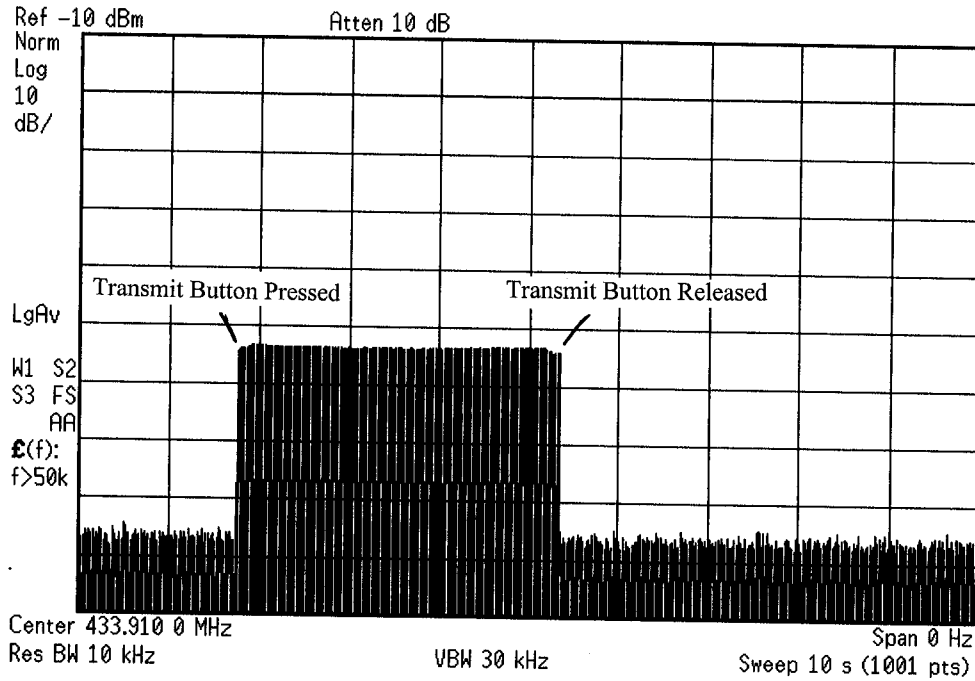
**Test Equipment Used:**

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

**Remarks:** (\*) No Calibration Required.

3.2 DATA

\* Agilent 10:35:37 Apr 5, 2004



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:

$$\text{Corrected Meter Reading Limit (CMRL)} = \text{SAR} + \text{AF} + \text{CL} - \text{AG} - \text{DC}$$

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:

$$\text{CMRL} = 29.4 \text{ dBuV} + 9.2 \text{ dB} - 1.4 \text{ dB} - 20 \text{ dB/M} - 0.0 \text{ dB}$$

$$\text{CMRL} = 20.0 \text{ dBuV/M}$$

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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**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

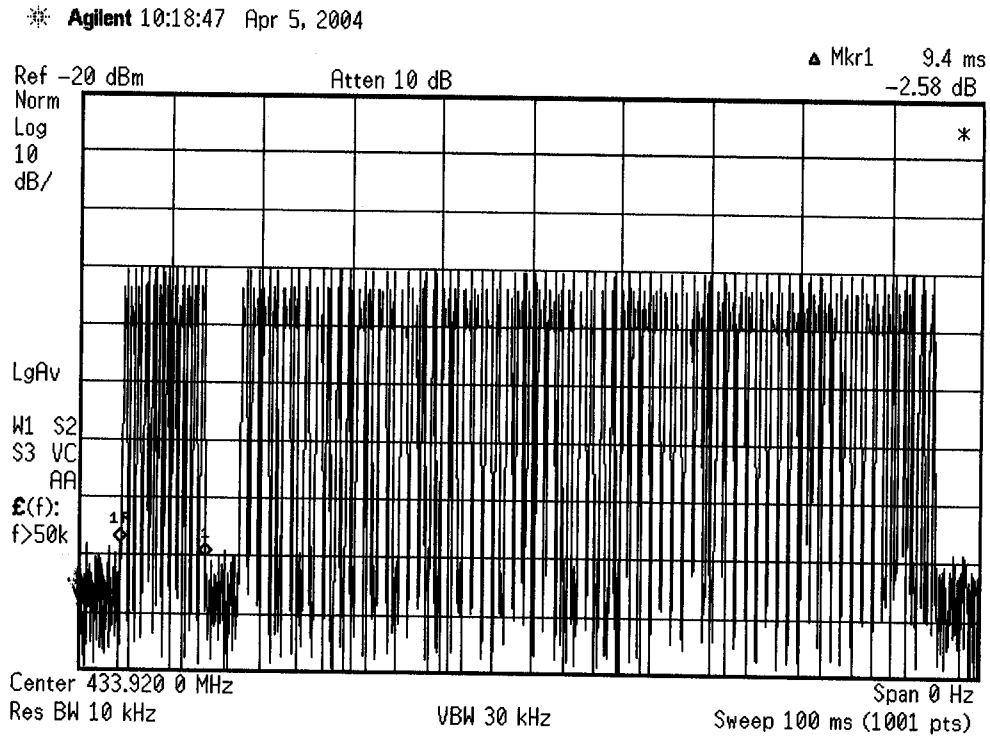
■ - SR 3, Shielded Room, 12' x 20' x 8', Metal Chamber

**Test Equipment Used:**

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

**Remarks:** (\*) No Calibration Required.

5.2 DATA



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TECH/ENGR: AAL  
LOCATION: SR3

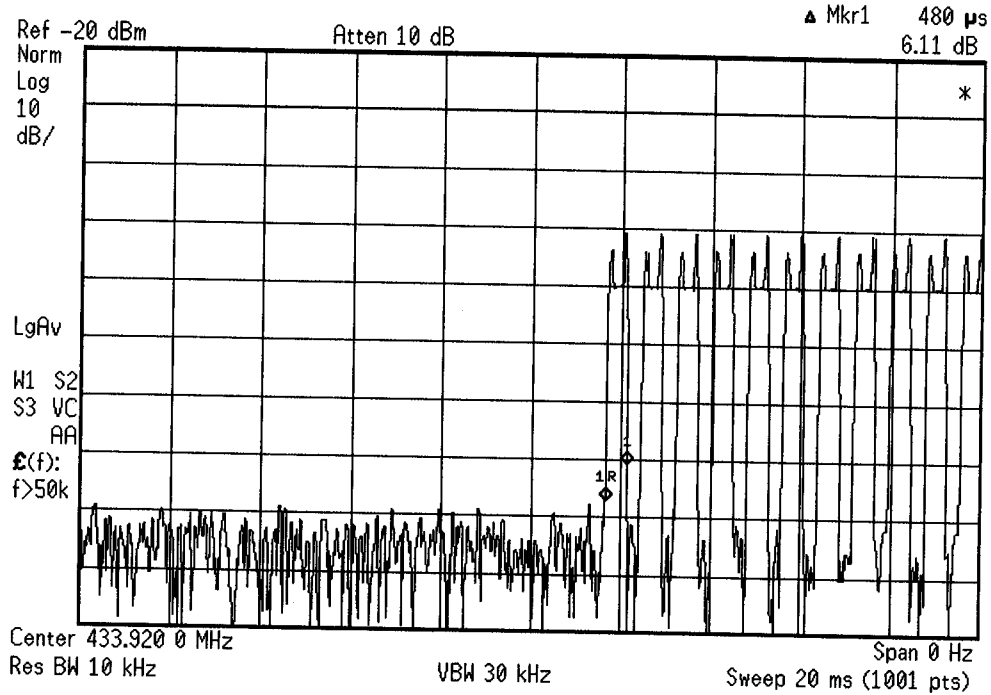
FCC 47 Part 15.231 (b) Duty Cycle

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 %



\* Agilent 10:24:05 Apr 5, 2004



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MODEL 474B

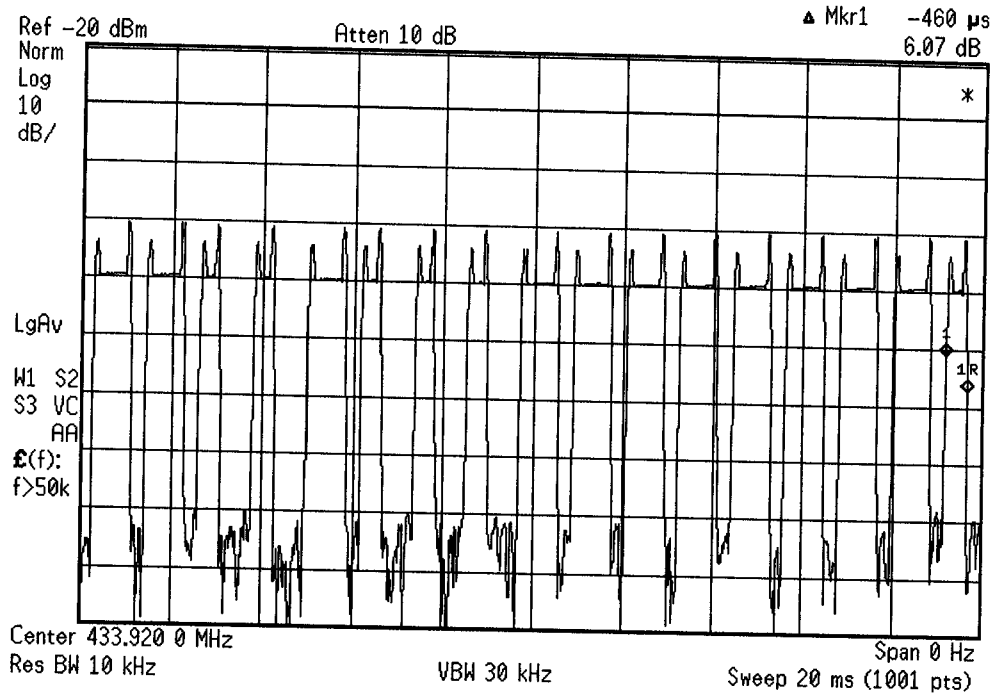
Apr. 6, 2004  
TECH/ENGR: AAL  
LOCATION: SR3

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 %

\* Agilent 10:26:02 Apr 5, 2004



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MODEL 474B

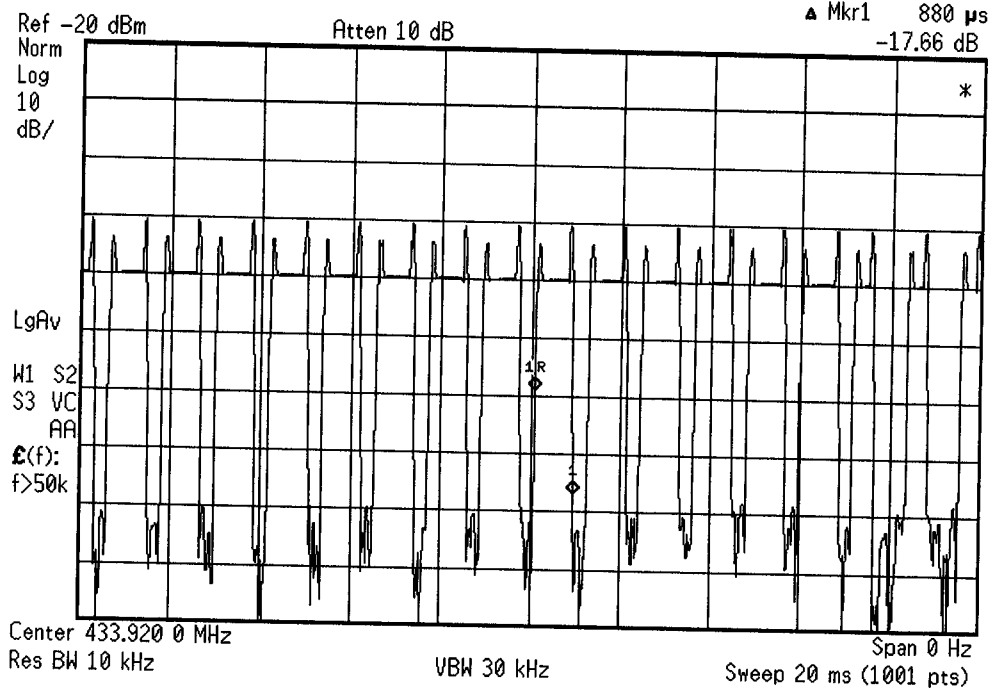
Apr. 6, 2004  
TECH/ENGR: AAL  
LOCATION: SR3

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 %

\* Agilent 10:20:37 Apr 5, 2004



SC401611  
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 %

Report No. SC401611-03

**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

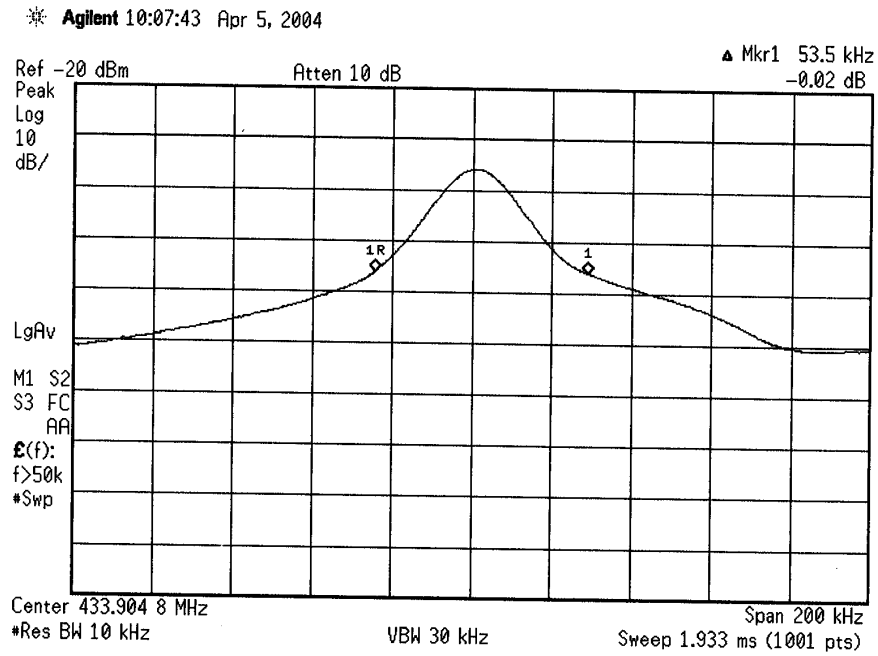
■ - SR 3, Shielded Room, 12' x 20' x 8', Metal Chamber

**Test Equipment Used:**

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

**Remarks:** (\*) No Calibration Required.

6.2 DATA



SC401611  
DIRECTED ELECTRONICS  
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.

Report No. SC401611-03

**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)