MEASUREMENT AND TECHNICAL REPORT

DIRECTED ELECTRONICS INCORPORATED
2560 Progress Street
Vista, CA 92083

DATE: 31 January 2003

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	Radar 2, Models 904070 and 904075	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: **Defer until:**	No: X
Company Name **agrees to notify the Commission by:** **of the intended date of announcement of the product so that the grant can be issued on that date.**	N/A	
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:

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1.0 GENERAL INFORMATION

1.1 Product Description

General Equipment Description -- *NOTE: This information will be input into your test report as shown below.*

EUT Description: Keyfob Transmitter

EUT Name: Radar 2

Model No.: 904070 and 904075 Serial No.: --

Product Options: --

Configurations to be tested: Normal Emissions

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 6V (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: --

Current (Amps/phase(max)): -- Current (Amps/phase(nominal)): --

Other: Battery operated by (2) CR2025 Battery Cells

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)

Automotive electronics, inc

EUT Power Cable: N/A

EUT Specifications and Requirements

Length: Width: Height: Weight:

EUT Interface Ports and Cables: N/A

EUT Operating Modes to be Tested : N/A

EUT System Components : N/A

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1.1 Product Description (continued)

Support Equipment : N/A
Power Supply: N/A
Power Line Filters: N/A
Critical EMI Components (Capacitors, ferrites, etc.): N/A
EMC Critical Detail -- : N/A

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1.1 Product Description (continued)

1. Learn routine for replacement transmitters

The Radar2 transmitter will be programmed-in to work with automotive security / convenience systems. These systems all use the same learn routine to program-in the replacement transmitter. Using two momentary switches (2) in the vehicle (valet switch) and the ignition key, the user will input a security code that allows access to the system's programming mode. Once in program mode, the user will need to transmit, pause and transmit again in order to program the transmitter into the system. A single continuous transmission will not work so a secondary transmitter in the vicinity of the receiver will not be programmed-in. The user has a maximum of 60 seconds to program up to four transmitters into the system. The system confirms the programming of transmitters via a series of audible chirps. The user can exit the programming mode at any time simply by removing the ignition. Exiting the learn routine is confirmed by a series of chirps. Directed electronics provides a tool called the "Wizard" to our authorized dealers. This tool allows to verify how many transmitters are programmed-in or to delete all currently programmed transmitters in the alarm system. This is accomplished through a temporary serial connection from the "Wizard" tool to the alarm system. And finally, Directed Electronics Radar2 compatible alarm systems will only learn Directed Electronics Radar2 transmitters.

Our systems provide interactive responses from the alarm system while programming replacement transmitters in. Tools provided from Directed Electronics to our authorized installers allow them to monitor what has been programmed-in the alarm system. Given these features and tools, the likelihood of having a transmitter get programmed-in unintentionally and not be known is very remote to impossible.

2. 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 Radar2 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 receivers operated by this transmitter are single band receivers tuned to 433.92MHz and only capable of receiving this frequency.

3. Data transmission duty cycle description

The Radar2 is a data transmission device. Their 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
Duty Cycle Measurements	15.231(b)(2)	Pass
Emissions Bandwidth	15.231(c)	Pass

Both Conducted and Radiated testing were performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8-M1983. Radiated testing was performed at an antenna-to-EUT distance of 3 meters (1 - 25 GHz).

1.5 Test Facility

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

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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 Block Diagram

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Equipment Modifications

None

2.5 Configuration of Test System

See Block Diagram

3.0 DEACTIVATION EQUIPMENT/DATA
RADIATED SPURIOUS EMISSIONS EQUIPMENT/DATA
DUTY CYCLE MEASUREMENTS EQUIPMENT/DATA
EMISSIONS BANDWIDTH EQUIPMENT/DATA

See following page(s).

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Test Conditions: **DEACTIVATION: FCC Part 15.231(a)**
RADIATED SPURIOUS EMISSIONS: FCC Part 15.231(b)
DUTY CYCLE MEASUREMENTS: FCC Part 15.231(b)(2)
EMISSIONS BANDWIDTH: FCC Part 15.231(c)

The following 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.	Cal Date
CBL6111	461	Bilog Antenna	Chase Electronics	1291	NCR
HP8566B	721	Spectrum Analyzer	Hewlett Packard	2542A12099	09/02

■ - Roof (Small Open Area Test Site), 3 meters

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Date
HP8566B	744	Spectrum Analyzer	Hewlett Packard	2618A02913	11/02
Cable 1	731	30' Cable	United Microwave Pro	--	NCR
Cable 2	6788	3' Cable	United Microwave Pro	--	NCR
3146	243	Log Periodic Antenna	EMCO	106X	04/02
3115	453	Double Ridge Guide Antenna	EMCO	9412-4364	12/02
FF6548-2	777	900 MHz High Pass Filter	Sage	006	NCR

Remarks:

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FCC CFR 47 15.231

Test Report #:	SC 300367	Test Area:	SR3, Roof OATS		
Test Method:	15.231	Date:	Jan. 24, 2003		
EUT Model #:	Radar2	EUT POWER:	6 Vdc Battery		
EUT Serial #:				Temperature:	24 °C
Manufacturer:				Air Pressure:	100.6 kPa
EUT	Keyfob Transmitter			Relative	41 %
Notes:	Test mode: Continuous Pulsed Transmitter			Page:	1 of 1

Notes:

15.231(a) Deactivation: Unit deactivates upon release of transmit button.
SR3, 1-24-03. Spectrum Analyzer #721 and Bilog Antenna #461.

15.231(b) Field Strength of Emissions: Unit meets requirements for fundamental, harmonics, and spurious emissions with regard to 15.205 Restricted Bands of Operations. Duty Cycle measured as 33.3 %, but worst case was determined as 57.6% by customer. No spurious emissions found other than those reported.
Roof 3- meter OATS, See equipment list.

15.231(c) Bandwidth was measured as 433.9 kHz which meets the requirement of being less than 1.08 MHz (0.25% of operating frequency)
SR3, 1-24-03. Spectrum Analyzer #721 and Bilog Antenna #461.

Tested by: A. Laudani (Printed) A. Laudani (Signature)

Reviewed by: J. Owen (Printed) (Signature)

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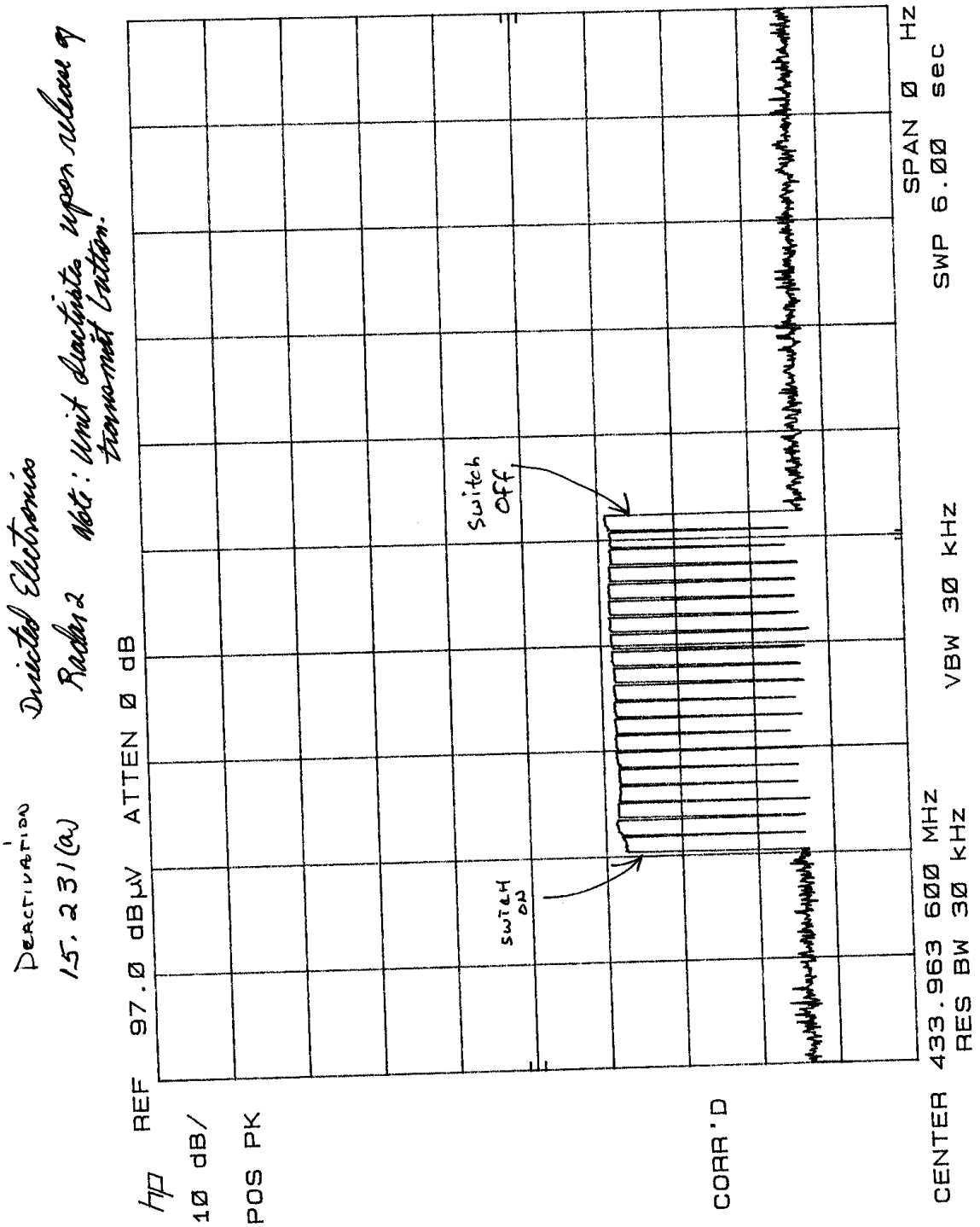
Deactivation
15.231(a)
Daiichi Electronics
Radio 2
Note: Unit deactivate upon release of transmit button.
hp
REF 97.0 dBµV
ATTEN 0 dB
10 dB/
POS PK
switch off
switch on
CORR'D
CENTER 433.963 600 MHz
RES BW 30 kHz
VBW 30 kHz
SPAN 0 Hz
SWP 6.00 sec

REPORT No: SC300367 TESTER: Alan Laudani SPEC: FCC Part 15 para 15.231(b)

CUSTOMER: Directed Electronics Inc. TEST DIST: 3 Meters

E U T: Radar2 TEST SITE: Roof

EUT MODE: Transmit BICONICAL: N/A

DATE: Jan. 24, 2003 LOG: 243

NOTES: Duty Cycle= 57.6% 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 (> 1GHz)

No spurious emissions found other than those reported. v.beta231

FREQ (MHz)	VERT. (dBuv) pk	DCav	HORIZ (dBuv) pk	DCav	CF (dB/m)	MAX LEVEL (dBuV/m) pk	av	SPEC LIMIT (dBuV/m) pk	av	MARGIN (dB) pk	av	EUT Rotation	Antenna Height
433.952	52.9	48.1	63.7	58.9	16.9	**80.6**	**75.8**	100.8	80.8	-20.2	-5.0	208	2.0
867.904	32.0	27.2	38.1	33.3	23.5	**61.6**	**56.8**	80.8	60.8	-19.2	-4.0	202	1.1
1301.856	65.6	60.8	62.4	57.6	-12.5	**53.1**	**48.3**	74.0	54.0	-20.9	-5.7	237	1.0
1735.808	52.4	47.6	53.4	48.6	-9.1	**44.3**	**39.5**	80.8	60.8	-36.5	-21.3	185	1.0
2169.760	58.7	53.9	56.4	51.6	-6.8	**51.9**	**47.1**	80.8	60.8	-28.9	-13.7	133	1.3
2603.712	63.1	58.3	62.1	57.3	-5.1	**58.0**	**53.3**	80.8	60.8	-22.8	-7.6	97	1.2
3037.664	48.2	43.4	47.6	42.8	-2.5	**45.7**	**40.9**	80.8	60.8	-35.1	-19.9		
3471.616	44.1	39.3	44.8	40.0	-0.9	**43.9**	**39.1**	80.8	60.8	-36.9	-21.7		
3905.568	46.1	41.3	46.5	41.7	-0.2	**46.3**	**41.5**	74.0	54.0	-27.7	-12.5		
4339.520	46.0	41.2	46.7	41.9	-1.3	**45.4**	**40.7**	74.0	54.0	-28.6	-13.3		

Note:

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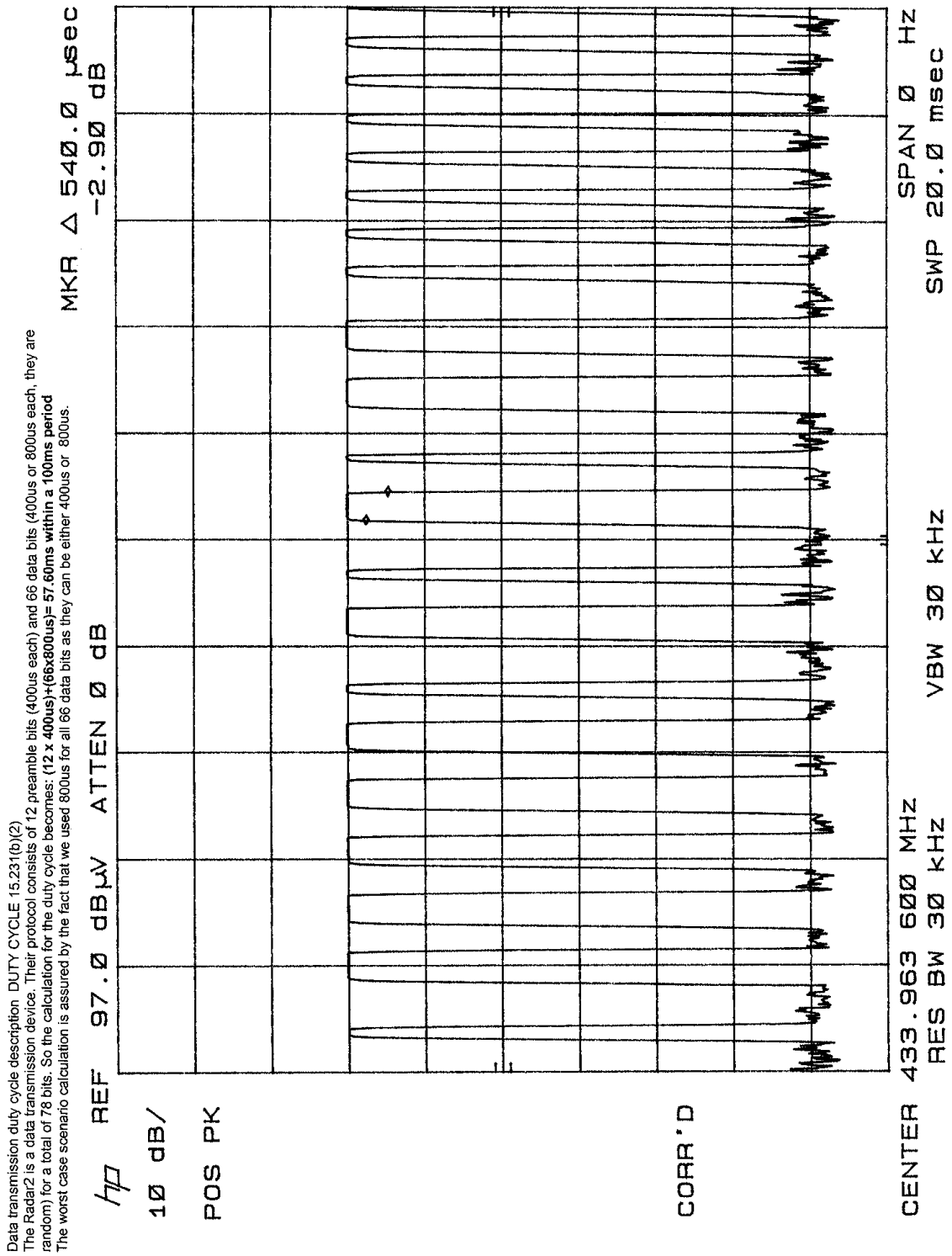

Data transmission duty cycle description DUTY CYCLE 15.231(b)(2)
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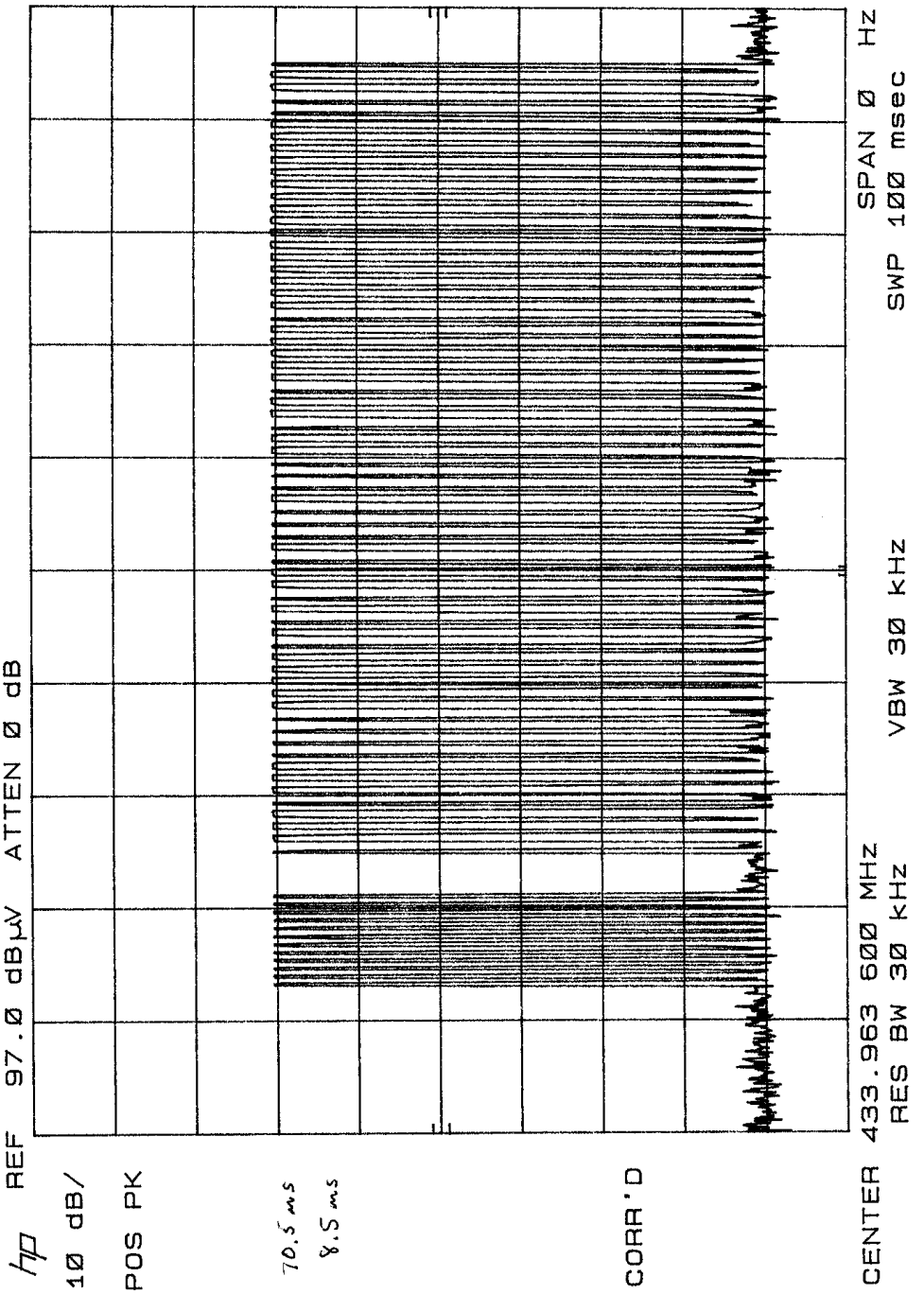

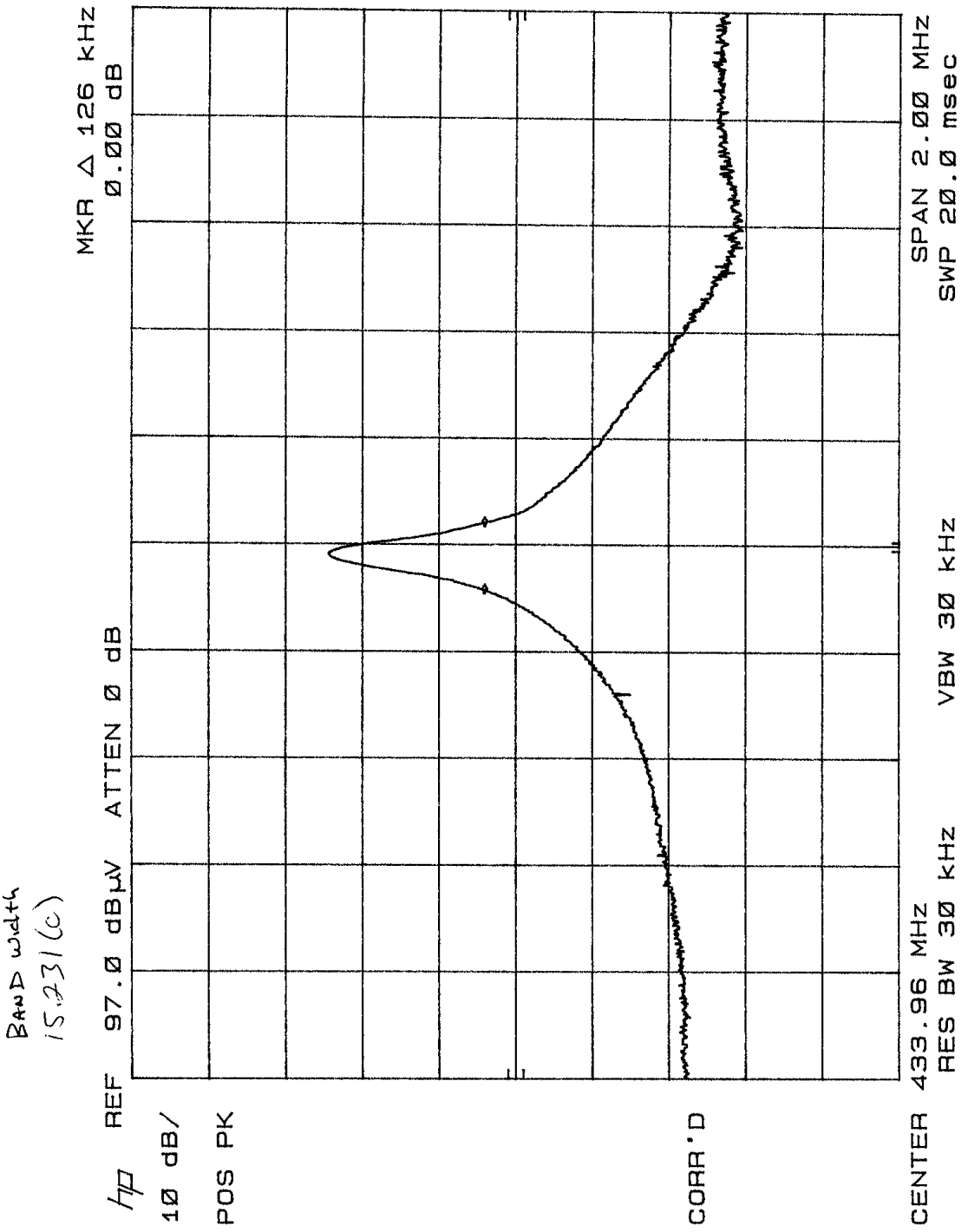
MKR Δ 126 kHz
0.00 dB
REF 97.0 dBµV ATTEN 0 dB
10 dB/
POS PK
CORR'D
CENTER 433.96 MHz
RES BW 30 kHz
VBW 30 kHz
SPAN 2.00 MHz
SWP 20.0 msec
Band width
15.231(c)

4.0 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. -

Responsible Engineer:

Jim Owen
(EMC Chief Engineer)

Responsible Engineer:

Alan Laudani
(EMC Engineer)

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