TÜV AMERICA

MEASUREMENT AND TECHNICAL REPORT

DIRECTED ELECTRONICS INCORPORATED
1 Viper Way
Vista, CA 92083

DATE: 22 October 2002

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	554 IVU, Model 546	
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	
Transition Rules Request per 15.37?	Yes:	No: X*

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

(*) 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: 858 546 3999
Fax: 858 546 0364

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TÜV AMERICA, INC. 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 546 3999 FAX 858 546 0364

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: 2 way in-vehicle transceiver for automotive security and remote start systems.

EUT Name: 554 IVU

Model No.: 546 Serial No.: --

Product Options: --

Configurations to be tested: --

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: 5V (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: --

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

Other: --

Other Special Requirements

--

Typical Installation and/or Operating Environment

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

Automotive

EUT Power Cable

☐ Permanent OR ■ Removable Length (in meters): 3m
☐ Shielded OR ☐ Unshielded
☐ Not Applicable

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EUT Interface Ports and Cables

Interface				Shielding								
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (In meters)	Removable	Permanent
EXAMPLE: *RS232*	☐	■	*2*	■	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	■	☐
4 pin harness	■	■	1	☐	■	--	--	4 pin	--	3	■	☐

EUT Software.

Revision Level: --

Description: --

EUT Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing.
Consult with your TÜV Product Service Representative if additional assistance is required.

1. CW transmission.

EUT System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	**Model #**	**Serial #**	**FCC ID #**
Alarm main module and associated harnesses	554V	--	--

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)

Description	**Model #**	**Serial #**	**FCC ID #**
--			

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Oscillator Frequencies			
Frequency	Derived Frequency	Component # / Location	Description of Use
433.92 MHz	--	--	RF Carrier frequency

Power Supply			
Manufacturer	Model #	Serial #	Type
--			☐ Switched-mode: (Frequency) ______ ☐ Linear ☐ Other:

Power Line Filters		
Manufacturer	Model #	Location in EUT
--		

Critical EMI Components (Capacitors, ferrites, etc.)				
Description	Manufacturer	Part # or Value	Qty	Component # / Location
--				

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

--

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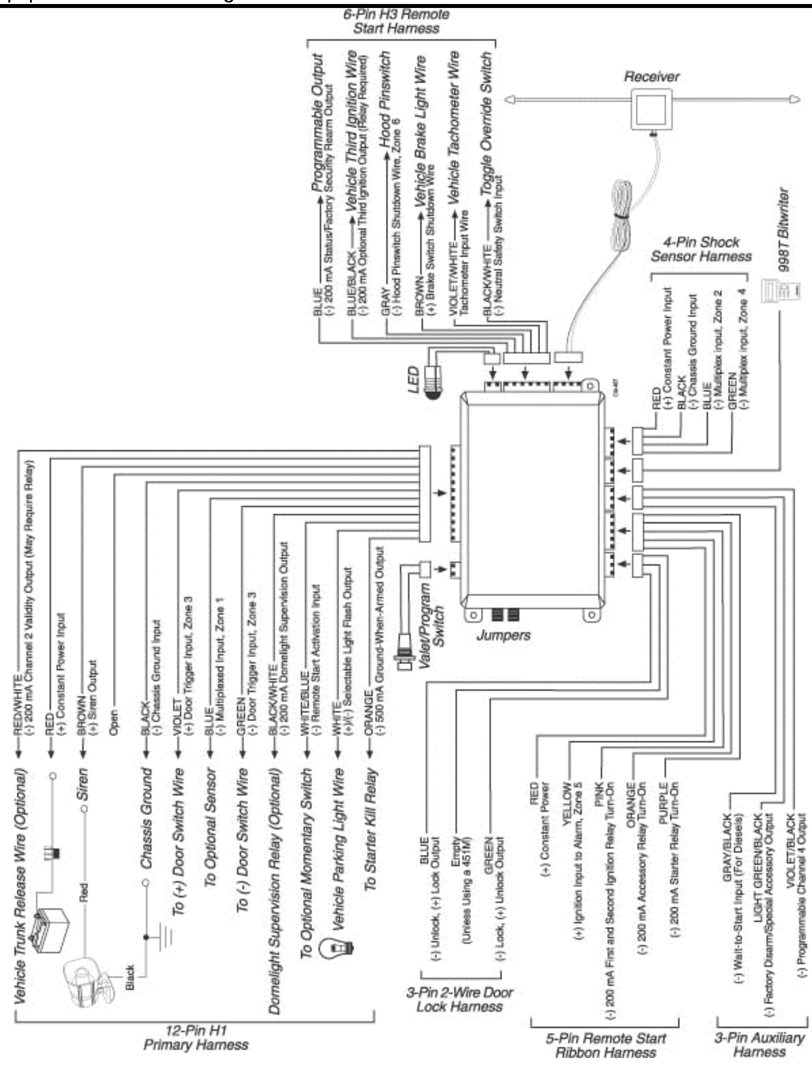
System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.



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

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:

TÜV AMERICA, INC
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 546 3999
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 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

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3.0 DEACTIVATION EQUIPMENT/DATA

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.

EMISSIONS BANDWIDTH EQUIPMENT/DATA

DUTY CYCLE MEASUREMENTS EQUIPMENT/DATA

See following page(s).

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3.1 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.

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Report No. SC204450

Test Conditions: Emissions

Photos taken? ■ Yes 8/26/02

15.231(b) Field Strength of Emissions

■ Roof, 3-meter open site

Test Equipment Used:

	Model Number	Prop. #	Description	Manufacturer	Serial No.	Cal. Dates
■	hp8566B	407	Spectrum Analyzer	Hewlett Packard	2311A02209	11/13/02
■	PreAmp 2-20 GHZ	719	PreAmp	TUV PS	na	n.c.r.
■	3115	251	Antenna, Horn	Electro Mechanics Co	2595	12/1/03
■	Cable 1	732	30 ' cable	United Microwave Products	na	n.c.r.
■	Cable 2	6788	3" cable	United Microwave Products	na	n.c.r.
■	Cable 3	656	10" cable	United Microwave Products	na	n.c.r.
■	hp8445B	809	Automatic Preselector	Hewlett Packard	1442A01127	n.c.r.
■	FF 6548-2	777	900 MHz High Pass Filter	Sage	006	n.c.r.
■	3146	243/6641	Antenna, Log Per.	Electro Mechanics Co	106X	4/11/03

Test Conditions:

15.231(a) Deactivation

15.231(c) Bandwidth

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

	Model Number	Prop. #	Description	Manufacturer	Serial No.	Cal. Dates
■	hp8566B	6676	Spectrum Analyzer	Hewlett Packard	2332A02751	8/5/03
■	CBL6111	460	Antenna, Bilog	Chase	1013	n.c.r.

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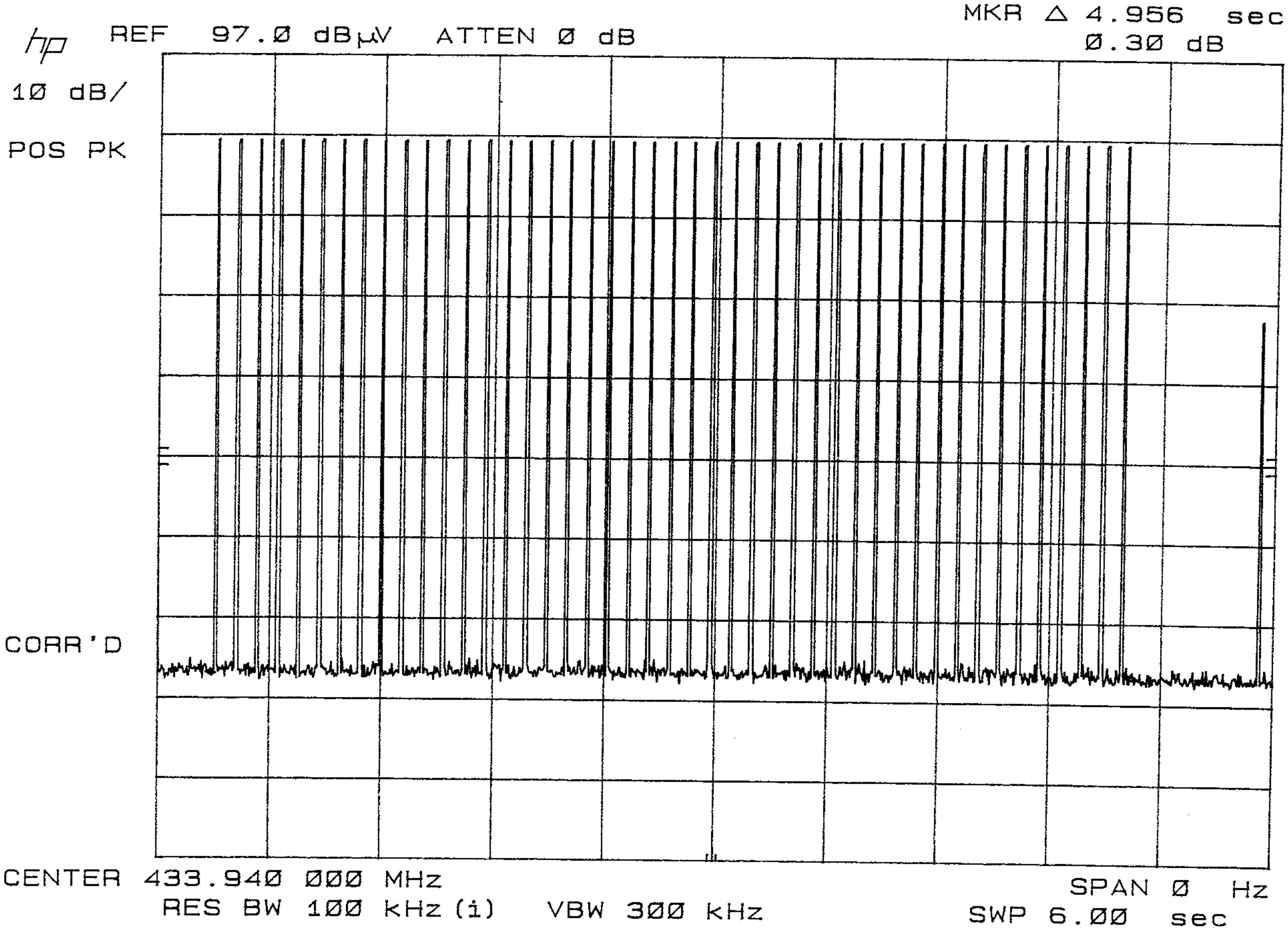
SC-204450
DIRECTED ELECTRONICS
FCC CFR 47 PART 15.231(a) Deactivation

554 In Vehicle UNIT

Unit Deactivates within Five Seconds

Aug. 26, 2002
TEST ENGR: AAL
Test Room: SR3



REPORT No: SC204450 TESTER: Alan Laudani SPEC: FCC Part 15 para 15.231(b)
FCC Part 15 para 15.205(a)

CUSTOMER: Directed Electronics TEST DIST: 3 Meters

E U T: 554 IVU TEST SITE: Roof

EUT MODE: Transmit BICONICAL: N/A

DATE: Aug. 26, 2002 LOG: 243

NOTES: Duty Cycle= 10% OTHER: 251

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 + Preselector Loss

NO EMISSIONS FOUND OTHER THAN RECORDED BELOW:

v.beta231

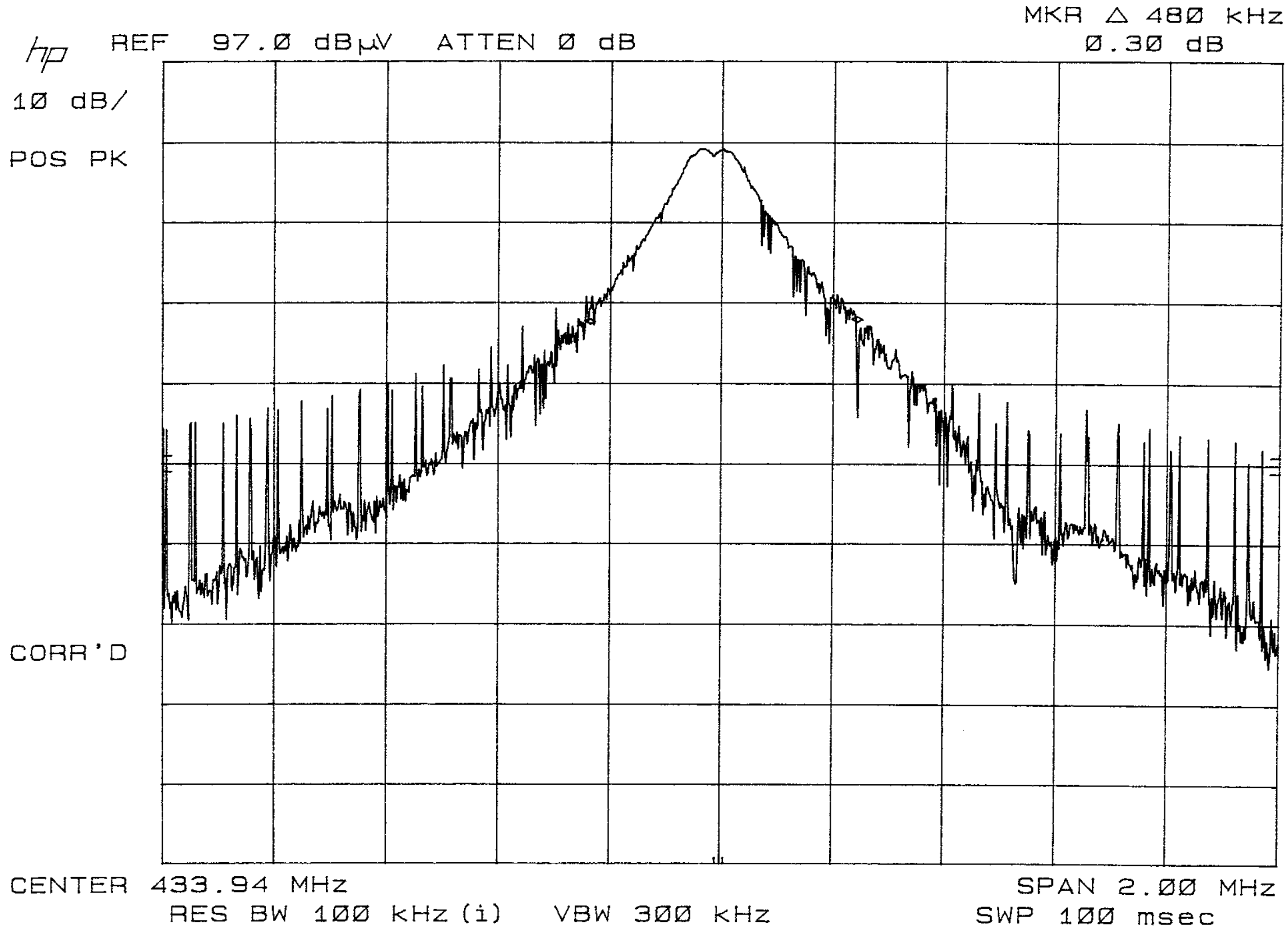
FREQ (MHz)	VERT. (dBuv)		HORIZ (dBuv)		CF (dB/m)	MAX LEVEL (dBuV/m)		SPEC LIMIT (dBuV/m)		MARGIN (dB)		EUT Rotation	Antenna Height	Notes
	pk	DCav	pk	DCav		pk	av	pk	av	pk	av			
433.890	71.7	51.7	79.1	59.1	16.9	**96.0**	**76.0**	100.8	80.8	-4.8	-4.8	15	2.4	
867.780	40.5	20.5	43.0	23.0	23.5	**66.5**	**46.5**	80.8	60.8	-14.3	-14.3	10	1.6	
1301.670	62.0	42.0	59.1	39.1	-10.8	**51.2**	**31.2**	74.0	54.0	-22.8	-22.8	285	1.2	
1735.560	69.9	49.9	66.4	46.4	-5.1	**64.8**	**44.8**	80.8	60.8	-16.0	-16.0	350	1.1	
2169.450	69.1	49.1	63.6	43.6	0.2	**69.3**	**49.3**	80.8	60.8	-11.5	-11.5	345	1.2	
2603.340	67.4	47.4	59.2	39.2	1.7	**69.1**	**49.1**	80.8	60.8	-11.7	-11.7	290	1.4	
3037.230	69.8	49.8	61.6	41.6	3.8	**73.6**	**53.6**	80.8	60.8	-7.2	-7.2	270	1.2	
3471.120	53.5	33.5	49.2	29.2	4.7	**58.2**	**38.2**	80.8	60.8	-22.6	-22.6	305	1.6	
3905.010	56.9	36.9	49.5	29.5	6.1	**63.0**	**43.0**	74.0	54.0	-11.0	-11.0	285	1.6	
4338.900	39.9	19.9	43.3	23.3	5.1	**48.4**	**28.4**	74.0	54.0	-25.6	-25.6	295	1.3	

SC-204450
DIRECTED ELECTRONICS
FCC CFR 47 PART 15.231(c) BANDWIDTH

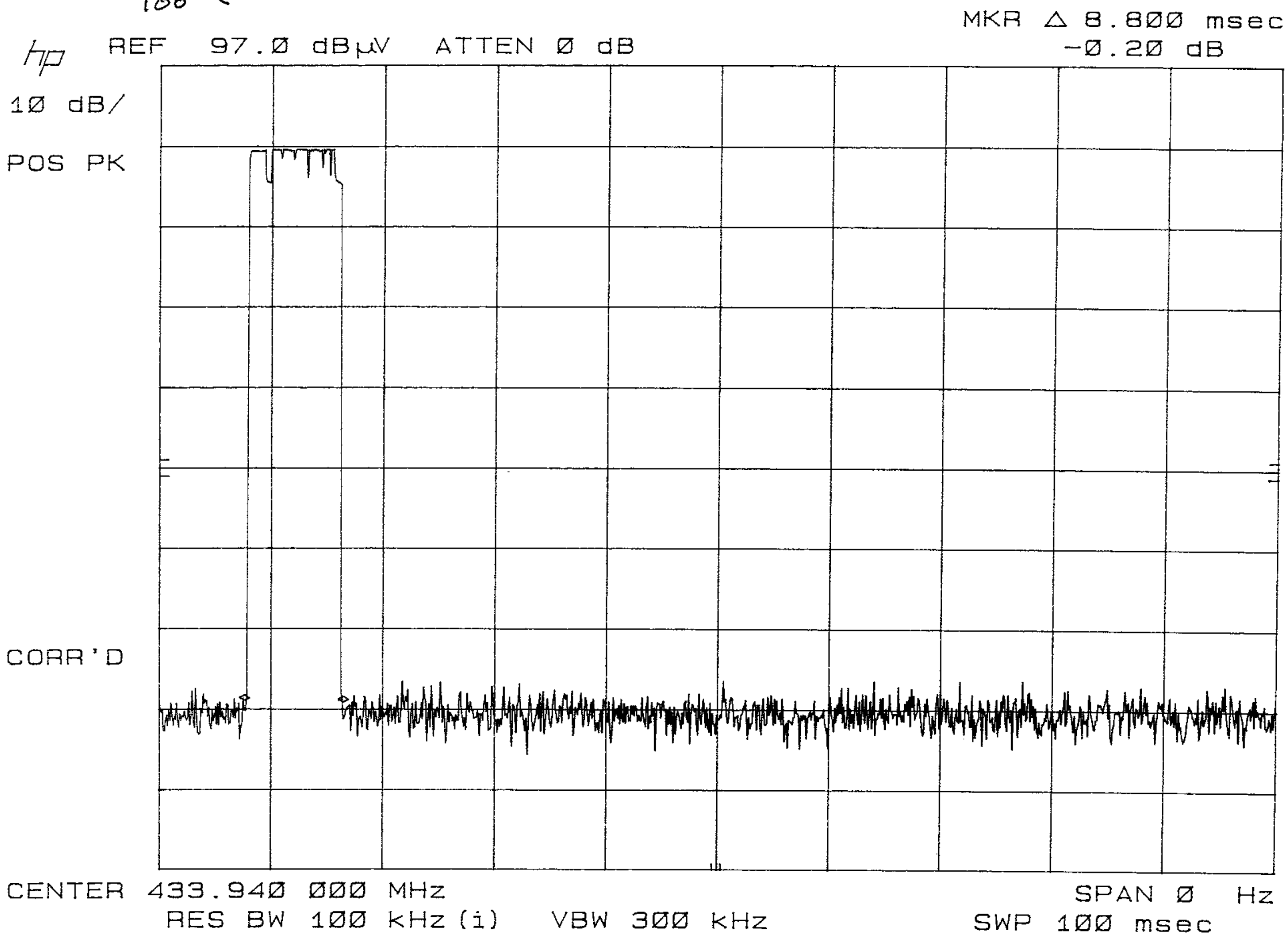
554 IN VEHICLE UNIT

Spec = 0.25 of 433.92 MHz

Aug. 26, 2002
TEST ENGR: AAL
Test Room: SR3



mn.
Duty cycle $\frac{8.8}{100} \leq 10\%$



Pulse Duty Cycle Correction Factor: FCC 15.35(c) and ANSI C63.4:2000 Appendix I.4.

Calculation:

Average Reading = Peak Reading (dBuV/m) + 20log(duty cycle)

Where duty cycle correction is allowed, the following methods are employed to determine the correction factored allowed:

1) Turn on the transmitter and set it to transmit the pulse train continuously.
2) Tune the spectrum analyzer to the transmitter frequency and set the spectrum analyzer resolution bandwidth wide enough to encompass all significant components of the signal of interest. Video bandwidth is set to the widest bandwidth available.
3) Set the spectrum analyzer vertical scale to the linear mode and the frequency span to zero hertz moving if necessary the antenna closer to the device to obtain a convenient signal level.
4) Connect a storage scope to the video output of the spectrum analyzer. This will be used to demodulate and detect the pulse train.
5) Adjust the oscilloscope settings to observe the pulse train, and determine the number and width of the pulses, as well as the of the period.
6) Adjust the transmitter controls, jumper wires, or software to maximize the transmitted duty cycle.
7) Measure the pulse width by determining the time difference between the two half-voltage points on the pulse.
8) When the pulse train is less than 100 mS, including blanking intervals, calculate the duty cycle by averaging the sum of the pulse widths over one complete pulse train. When the pulse train exceeds 100 mS, calculate the duty cycle by averaging the sum of the pulse widths over the 100 mS width with the highest average value.
9) The duty cycle is the value of the sum of the pulse widths in one period or 100 mS, divided by the length of the period or 100 mS.
10) The result is the duty cycle and the factor is derived by multiplying the log(10) of the duty cycle by 20. This factor is then added to the peak detector reading and then compared to the average detector limit.

Period (mS) = 8.8 (default is 100 mS)

Long Pulse (mS) = Not Measured

Nr. Of Long Pulses Not Counted

Short Pulse (mS) = Not Measured

Nr. Of Short Pulses Not Counted

Duty Cycle = 8.8% (21.1dB) (Maximum Allowance is 20 dB)

TÜV AMERICA, INC. 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 546 3999 FAX 858 546 0364

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 Technician:

Alan Laudani
(EMC Technician)

TÜV AMERICA, INC. 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 546 3999 FAX 858 546 0364