MEASUREMENT AND TECHNICAL REPORT

DIRECTED ELECTRONICS INCORPORATED
1 Viper Way
Vista, CA 92083

DATE: 16 October 2006

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	Transceiver 6511T IVU	
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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Phone: 858 678 1400
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1.0 GENERAL INFORMATION

1.1 Product Description

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

EUT Name: 6511T IVU (In Vehicle Unit)

Model No.: 6511T Serial No.: N/A

Product Options: N/A

Configurations to be tested: 1

EUT Specifications and Requirements

Length: 1.7” Width: 12.06” Height: 0.46” Weight: 0.8oz

Power Requirements

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

# of Phases: N/A

Typical Installation and/or Operating Environment: Automotive

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EUT Power Cable: N/A

EUT Interface Ports and Cables

Interface				Shielding								
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
4 pin harness	☒	☒	1	☐	☒			4 pin		3	☒	☐

EUT Software: N/A

EUT Operating Modes to be Tested: Continuous modulated transmission

EUT System Components -

Description	Model #	Serial #	FCC ID #
In Vehicle Transceiver	6511T	N/A	EZSDEI6511

Oscillator Frequencies

Frequency	*Derived Frequency*	*Component # / Location*	*Description of Use*
48.213333 MHz	433.92MHz		Transmitter RF carrier
47.02444 MHz	423.22MHz		Receiver LO
10.7MHz	10.7MHz		IF Frequency

Power Supply: N/A

Power Line Filters: N/A

Critical EMI Components (Capacitors, ferrites, etc.) : N/A

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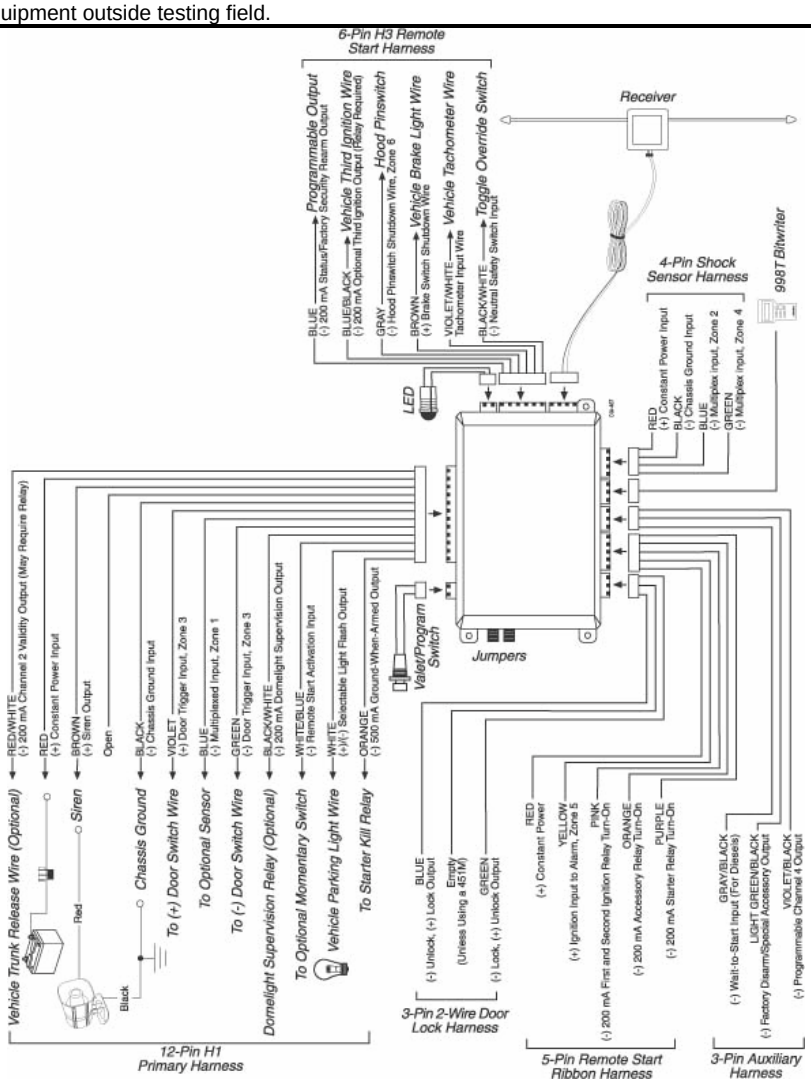
System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.



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 Description	Paragraph Number	Pass/Fail
Deactivation	15.231(a)	Pass
Field Strength of Fundamental	15.231(b)	Pass
Emissions Bandwidth	15.231(c)	Pass
Field Strength of Emissions	15.231(e)	N/A

Testing was performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8-M1983.

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 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

3.0 DEACTIVATION EQUIPMENT/DATA
FIELD STRENGTH OF FUNDAMENTAL EQUIPMENT/DATA
EMISSION BANDWIDTH EQUIPMENT/DATA
FIELD STRENGTH OF EMISSIONS EQUIPMENT/DATA

Test Conditions: DEACTIVATION: FCC Part 15.231(a)
FIELD STRENGTH OF FUNDAMENTAL: FCC Part 15.231(b)
EMISSION BANDWIDTH: FCC Part 15.231(c)
FIELD STRENGTH OF EMISSIONS: FCC Part 15.231(e)

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

☐ **- Test not applicable**

■ - Roof (Small Open Area Test Site)

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Date Cal'ed
3146	6641	Log Periodic Antenna	EMCO	106X	07/06
3115	6669	Double Ridge Antenna	EMCO	9412-4364	08/06
AMF-5D-010180-35-10P	6786	Preamplifier	Miteq	549460	Verified
FF6549-1	777	High Pass Filter	Sage	004	Verified
FF6549-1	777	High Pass Filter	Sage	004	Verified
AA-19030.00.0	7492	30' Coaxial Cable	United Microwave	--	N/A
E4440A	7500	Spectrum Analyzer	Hewlett Packard	MY43362168	01/06

Remarks: One year calibration cycle for all test equipment and sites.

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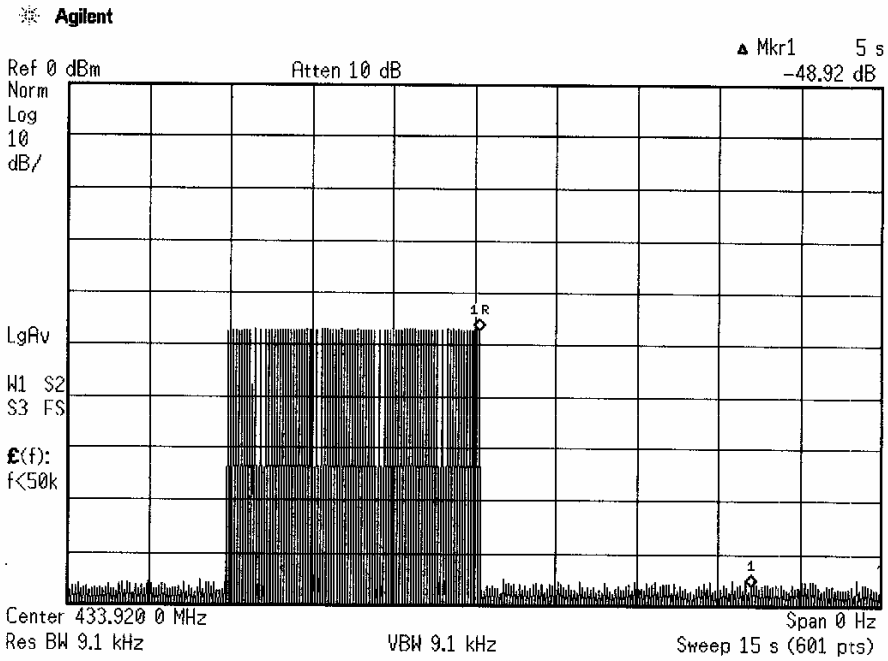
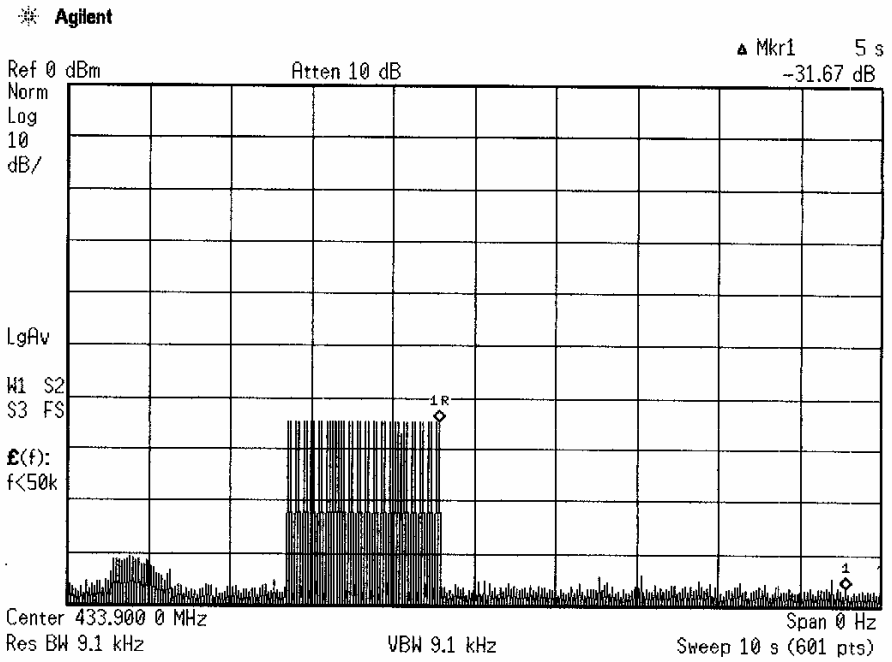
FCC Part 15.231(a) – Deactivation



FCC Part 15.231(a) – Deactivation



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FCC Part 15.231(b) - Field Strength of Fundamental

REPORT No: SC605587 TESTER: Jim Owen SPEC: FCC Part 15 para 15.231(b)

CUSTOMER: Directed Electronics TEST DIST: 3 Meters

E U T: 6511T IVU TEST SITE: Roof

EUT MODE: Transmit BICONICAL: N/A

DATE: September 26, 2006 LOG: 243

NOTES: Duty Cycle= 15% 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 + Preselector Loss

v.beta231

FREQ (MHz)	VERT. (dBuv) pk	VERT. (dBuv) DCav	HORIZ (dBuv) pk	HORIZ (dBuv) DCav	CF (dB/m)	MAX LEVEL (dBuV/m) pk	MAX LEVEL (dBuV/m) av	SPEC LIMIT (dBuV/m) pk	SPEC LIMIT (dBuV/m) av	MARGIN (dB) pk	MARGIN (dB) av	EUT Rotation	Antenna Height	Notes
433.925	73.8	57.3	79.5	63.0	16.9	**96.4**	**79.9**	100.8	80.8	-4.4	-0.9	203	2.6	
867.850	21.3	4.8	16.6	0.1	23.5	**44.8**	**28.3**	80.8	60.8	-36.0	-32.5			ambient
1301.775	56.6	40.1	60.9	44.4	-12.4	**48.5**	**32.0**	80.8	60.8	-32.3	-28.8			
1735.700	49.8	33.3	54.3	37.8	-9.0	**45.3**	**28.8**	80.8	60.8	-35.5	-32.0	303	1.2	
2169.625	56.2	39.7	47.8	31.3	-6.7	**49.5**	**33.0**	80.8	60.8	-31.3	-27.8	285	2.2	
2603.550	39.0	22.5	40.3	23.8	-4.9	**35.4**	**19.0**	80.8	60.8	-45.4	-41.9			ambient
3037.475	40.8	24.3	39.1	22.6	-2.3	**38.5**	**22.1**	80.8	60.8	-42.3	-38.8			ambient
3471.400	37.7	21.2	38.4	21.9	-0.6	**37.8**	**21.3**	80.8	60.8	-43.0	-39.5			ambient
3905.325	36.9	20.4	36.2	19.7	0.1	**37.0**	**20.5**	80.8	60.8	-43.9	-40.3			ambient
4339.250	37.4	20.9	36.4	19.9	-1.0	**36.4**	**19.9**	80.8	60.8	-44.4	-40.9			ambient
289.3	30.2	13.7	37	20.5	14.7	**51.7**	**35.3**	80.8	60.8	-29.1	-25.6			
385.7	25.9	9.4	36.4	19.9	15.9	**52.3**	**35.8**	80.8	60.8	-28.5	-25.0	185	1	

Pulse Duty Cycle Correction Factor

FCC 15.35(c) and ANSI C63.4:2003 Clause 13.1.4.2.

Calculation:

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

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

1) Turn on the transmitter and set it to transmit the pulse train continuously.
2) Tune the spectrum analyzer (Agilent E4440A) to the transmitter frequency and set the 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 SPAN to zero. Set the SWEEP to 100 ms. This will be used to demodulate and detect the pulse train.
4) Set the TRIGger to Video. Spin the data control wheel to move the green trigger threshold line to the middle of the pulse amplitude.
5) Set the TRIGGER DELAY (page 2 of the TRIG menu) to center the pulse in the display.
6) If able, 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 rise and fall of the pulse. Use Marker Delta.
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) When the pulse train consists of long and short pulses measure samples of each with sweep times sufficiently small enough to allow measurement. Count the number of long and short pulses in one period or 100 ms. Multiply the number of long pulses times the long pulse width and the number of short pulses times the short time width. Sum the products.
10) 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. This should result in a decimal fraction between 0.10 and 0.99. The result is the duty cycle.
11) Multiply the logarithm (base 10) of the duty cycle by 20 to create the duty cycle factor. The duty cycle factor is then added to the peak detector reading and then compared to the average detector limit.

A)	Period (ms) =	40.33 (100 ms Maximum)
B)	Long Pulse (ms) =	.632
C)	Nr. Of Long Pulses	3.3 (estimated)
D)	Short Pulse (ms) =	.281
E)	Nr. Of Short Pulses	37.7 (estimated)
F)	Duty Cycle =	.1374 = 17.2dB* (Maximum Allowance is 20 dB)

Comments : Client requested using 15% for Duty Cycle Correction Factor = 16.5dB

Duty Cycle (F) = 20 x log (Nr. of Long Pulses x Long Pulse + Nr. of Short Pulses x Short Pulse) / Period

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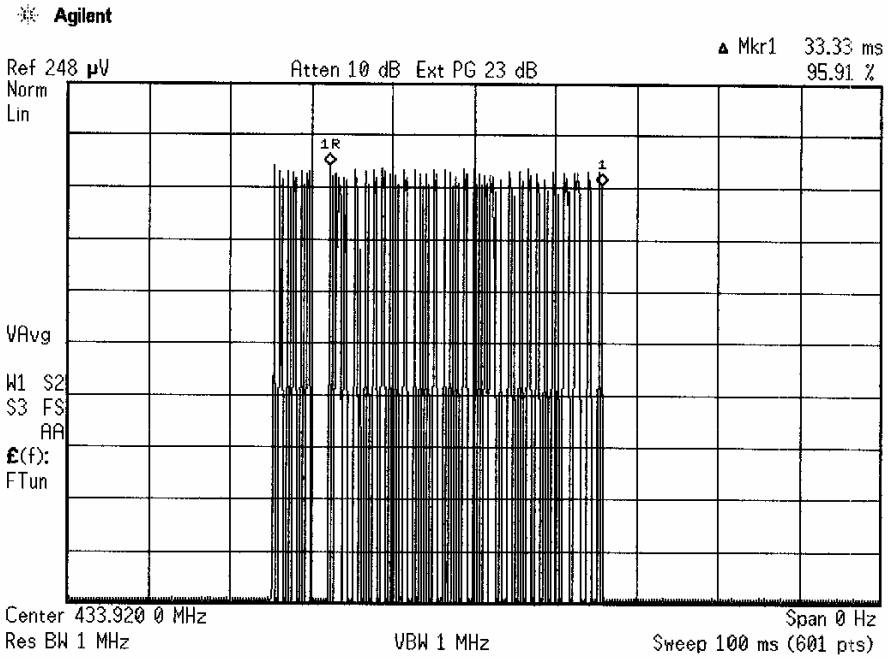
FCC Part 15.231(b) - Duty Cycle



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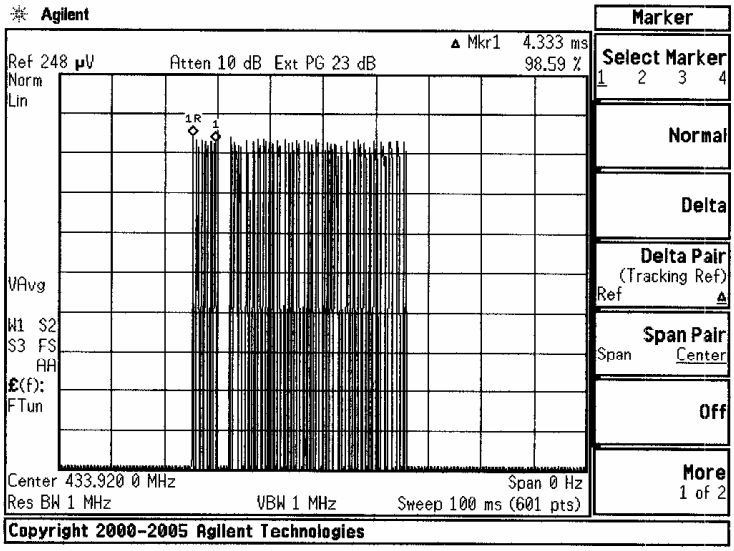

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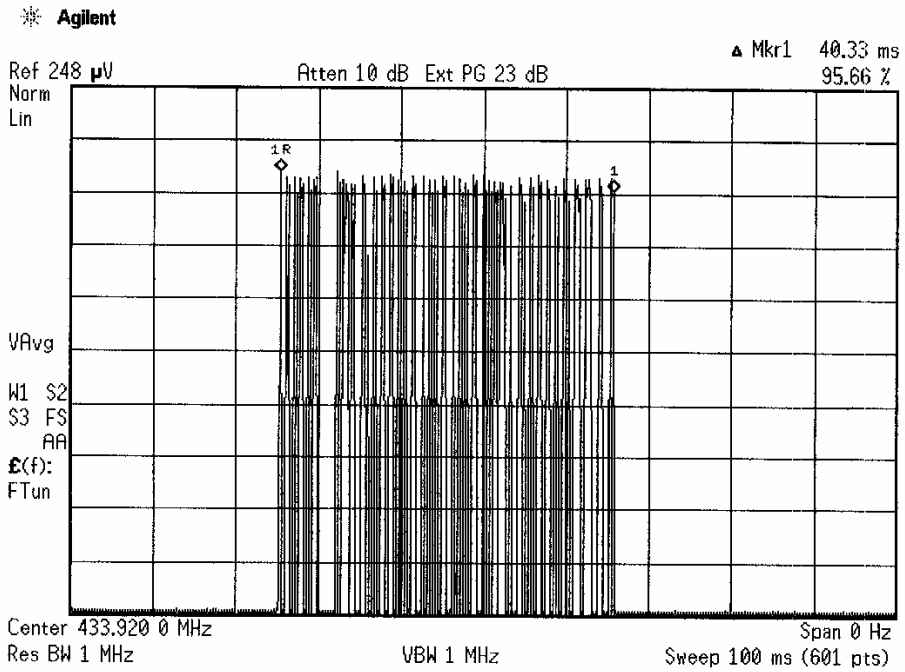

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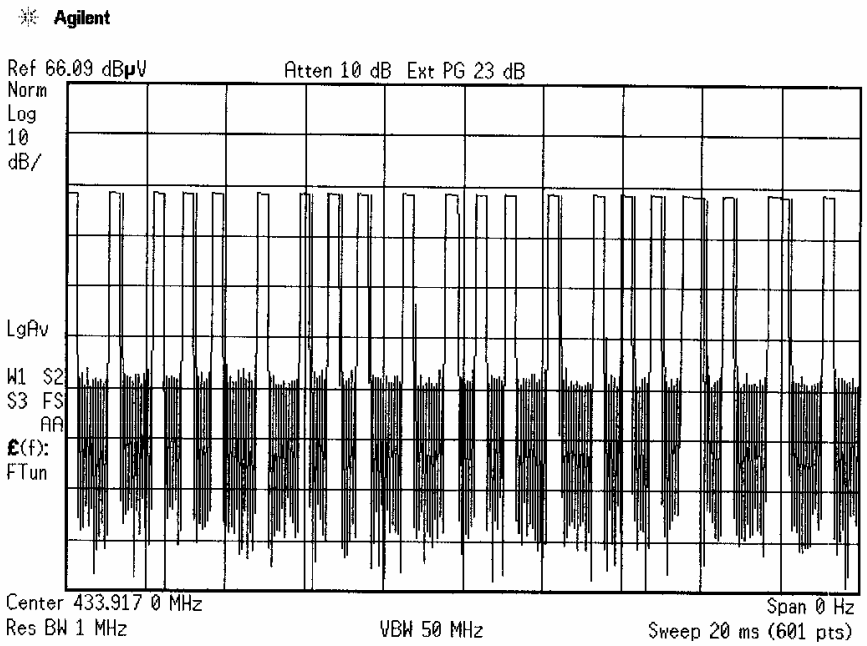

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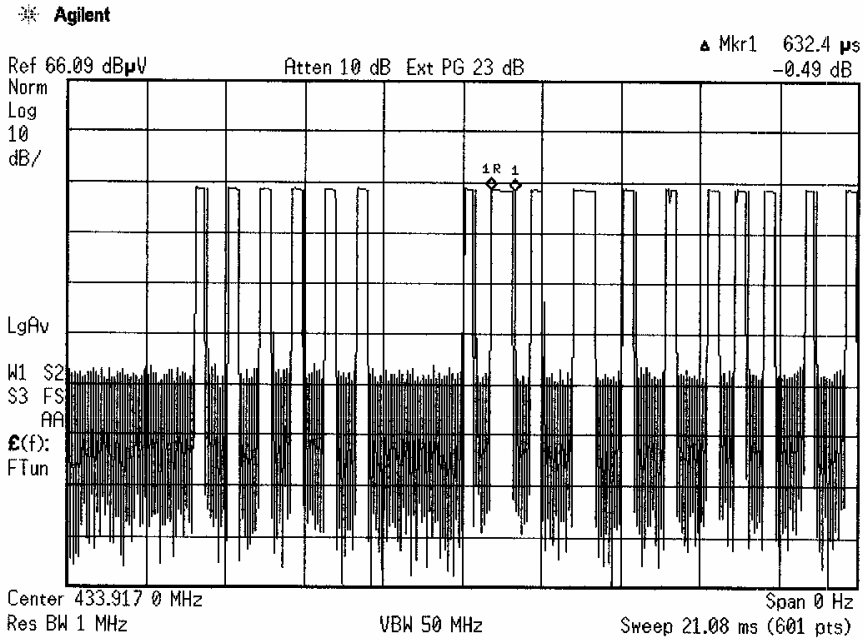

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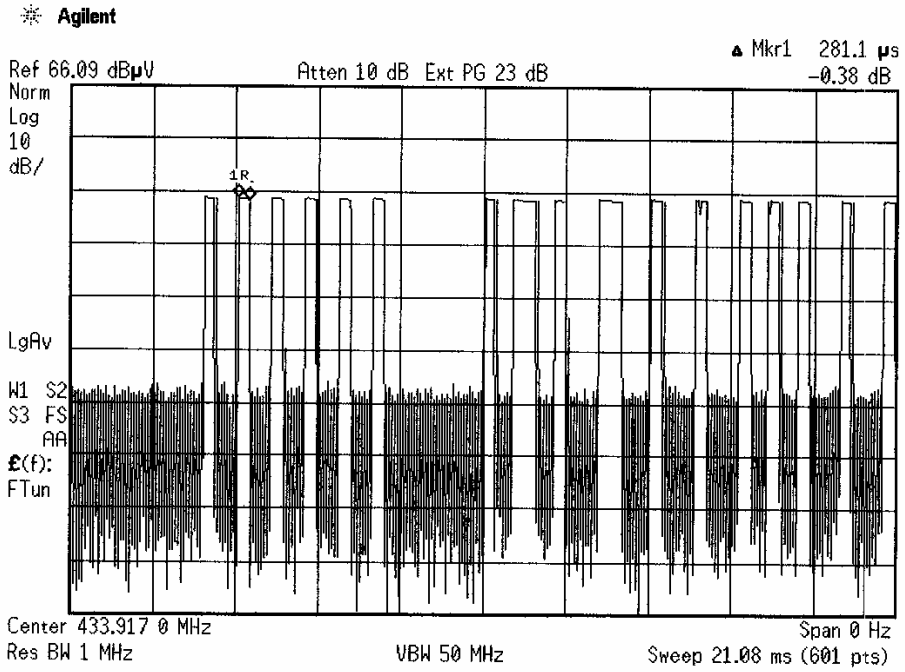
FCC Part 15.231(b) - Duty Cycle



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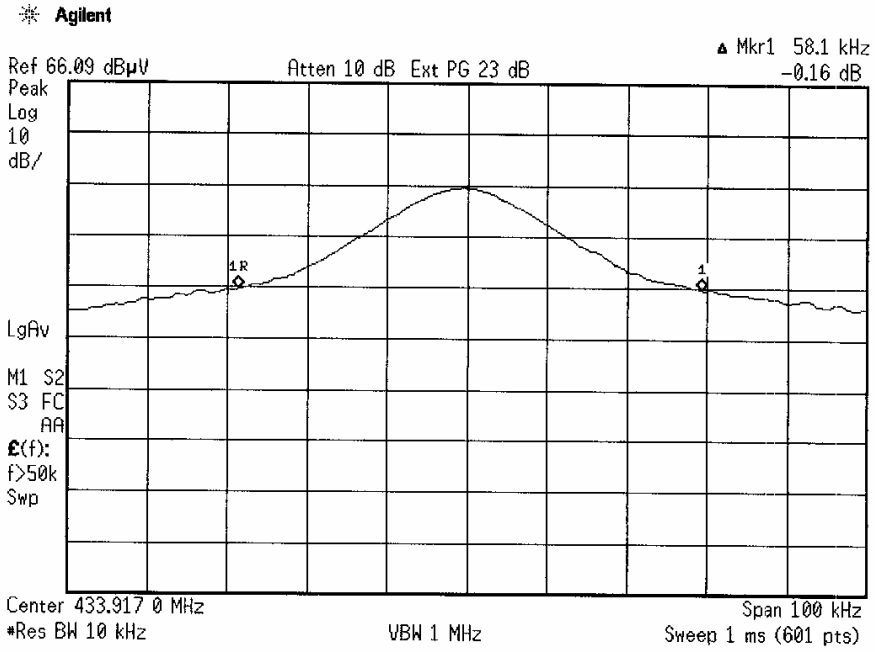
FCC Part 15.231(c) - Emission Bandwidth



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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)

Testing Start Date: 12 October 2006

Testing End Date: 12 October 2006

- TÜV AMERICA, INC. -

Reviewing Engineer:

David Gray
(EMC Engineer)

Test Engineer:

Jim Owen
(EMC Engineer)

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