MEASUREMENT AND TECHNICAL REPORT

DIRECTED ELECTRONICS INCORPORATED
1 Viper Way
Vista, CA 92083

DATE: 26 July 2006

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	7601 V/P/X	
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) 15.247(a); 15.247(b); 15.247(c); 15.247(d); 15.207(a) and 15.209(a)
(*) Canadian Standard(s) RSS-Gen 7.2 and RSS-210, Annexes 7 and 8
(*) FCC 15.35; ANSI C63.4

Report Prepared by:

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

TÜV AMERICA

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1.0 GENERAL INFORMATION

1.1 Product Description

Company: Directed Electronics, Inc.

Address: 1 Viper Way

Vista, CA 92081

Contact: Minas Minassian Position: RF Engineer

Phone: (760) 598-6200 Fax: (760) 598-6400

E-mail Address: minas.minassian@directed.com

General Equipment Description

EUT Description: Hand held keyfob transceiver for car alarm and convenience systems.

EUT Name: Venom SST HHU

Model No.: 7641V, 7641P, 7641X Serial No.: N/A

Product Options: N/A

Configurations to be tested: 1

EUT Specifications and Requirements

Length: 3.10" Width: 1.42" Height: 0.63" Weight: N/A

Power Requirements

Voltage: 6V (2 x CR2025)

# of Phases: N/A

Other Special Requirements: N/A

Typical Installation and/or Operating Environment:

EUT Power Cable: Not Applicable

EUT Interface Ports and Cables

Interface				Shielding								
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
None	☐	☐		☐	☐						☐	☐

EUT Software: N/A

EUT Operating Modes to be Tested

1. Continuous modulated transmission
2. The System is a digital modulation design under FCC part 15.247

EUT System Components

Description	Model #	Serial #	FCC ID #
Keyfob	7641V, 7641P, 7641X	N/A	EZSDEI7641

Oscillator Frequencies

Frequency	***Derived Frequency***	***Component # / Location***	***Description of Use***
14.75806452 MHz	915MHz		Transmitter RF carrier

Power Supply: N/A

Power Line Filters: N/A

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

System Configuration Block Diagram - No connections or setup, just the self contained keyfob.

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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

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1.4 Test Methodology

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

TEST SUMMARY		
Test Description	**Paragraph Number**	**Pass/Fail (P/F)**
Bandwidth	15.247(a)(2) RSS 210, Annex 8, A8.2	Pass 603 kHz
Peak Output Power	15.247(b) RSS 210, Annex 8, A8.4	Pass 0.10325 W
Directional Gain antennas > 6 dBi	15.247(b)(3)	N/A
RF Conducted Emissions	15.247(c) RSS 210, Annex 8, A8.5	Pass
Radiated Spurious Emissions – Restricted Bands (1GHz to 25GHz)	15.247(c); RSS 210, Annex 8, A8.5	Pass with DC
Peak Power Spectral Density	15.247(d); RSS 210, Annex 8, A8.2	Pass
Bandedge	15.247(c) RSS 210, Annex 7, A7.3	Pass
Processing Gain	15.247(e)	N/A
Conducted Emissions	15.207(a); RSS-Gen 7.2.2	N/A
Radiated Emissions	15.209(a); RSS-Gen 7.2	Pass - No emissions detected between 30-1000 MHz
Pulse Duty Cycle Correction Factor	FCC 15.35(c); ANSI C63.4:2003, Clause 13.1.4.2	Pass

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

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1.5 Test Facility

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

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10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 678 1400
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

3.0 BANDWIDTH EQUIPMENT/DATA (15.247(a); RSS 210, Annex 8, A8.2)
PEAK OUTPUT POWER EQUIPMENT/DATA (15.247(b); RSS 210, Annex 8, A8.4)
RF CONDUCTED EMISSIONS EQUIPMENT/DATA (15.247(c); RSS 210, Annex 8, A8.5)
RADIATED SPURIOUS EMISSIONS EQUIPMENT/DATA (15.247(c); RSS 210, Annex 8, A8.5)
BANDEDGE EQUIPMENT/DATA (15.247(d); RSS 210, Annex 7, A7.3)
PULSE DUTY CYCLE CORRECTION FACTOR (FCC 15.35(c); ANSI C63.4:2003, Clause 13.1.4.2)

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
■ - Roof (Small Open Area Test Site)

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Date Cal'ed
-QW-01182835-JO	6851	Quinstar Pre-amplifier 1-18 GHz	Quinstar	QLJ-01182835-JO	Verified
AA-190-10.00.0	7490	30' Coaxial Cable	United Microwave	--	N/A
E4440A	7500	Spectrum Analyzer	Hewlett Packard	MY42510441	02/06
E4440A	6814	Spectrum Analyzer	Hewlett Packard	MY42510441	02/06
3115	6669	Double Ridge Antenna	EMCO	9412-4364	08/05
CBL6111	6527	Bilog Antenna	Chase Electronics	1013	Verified
FF6549-1	783	2000 MHz High Pass Filter	Sage	008	N/A

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

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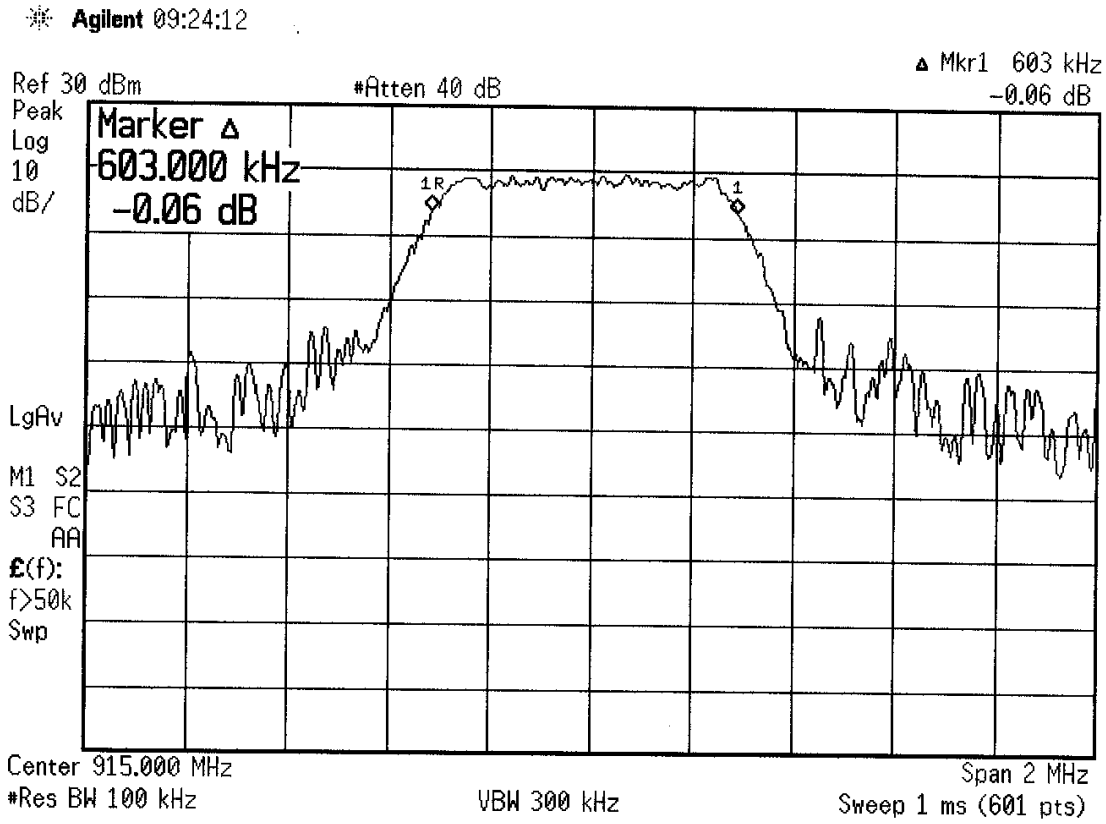
Bandwidth, 15.247(a)(2)



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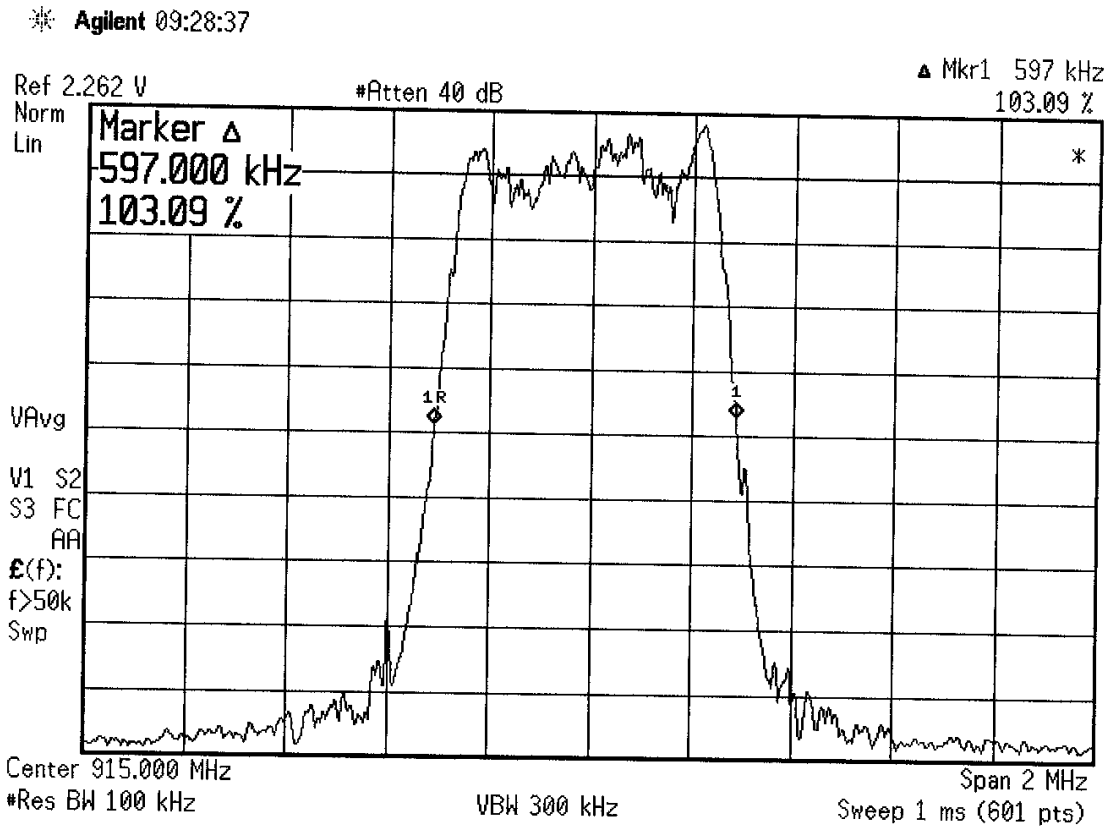
Bandwidth, RSS 210, Annex 8, A8.2



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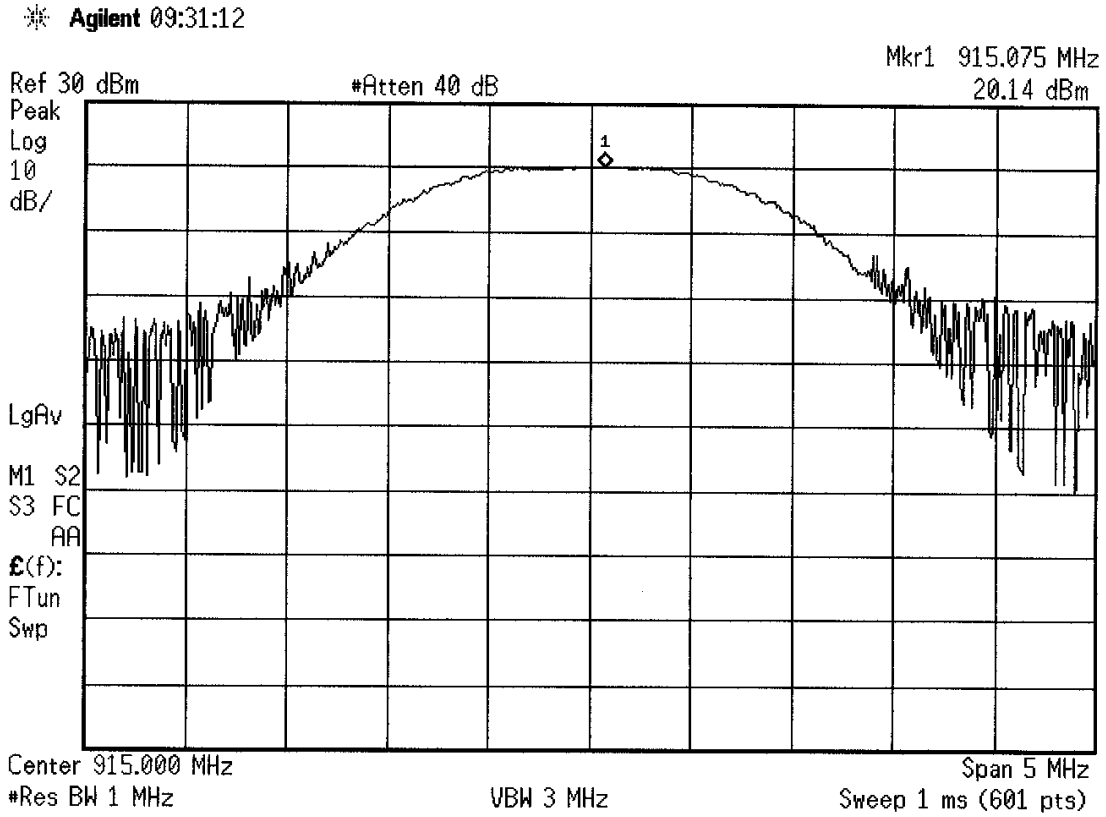
Output Power, 15.247(b); RSS-210, Annex 8, A8.4



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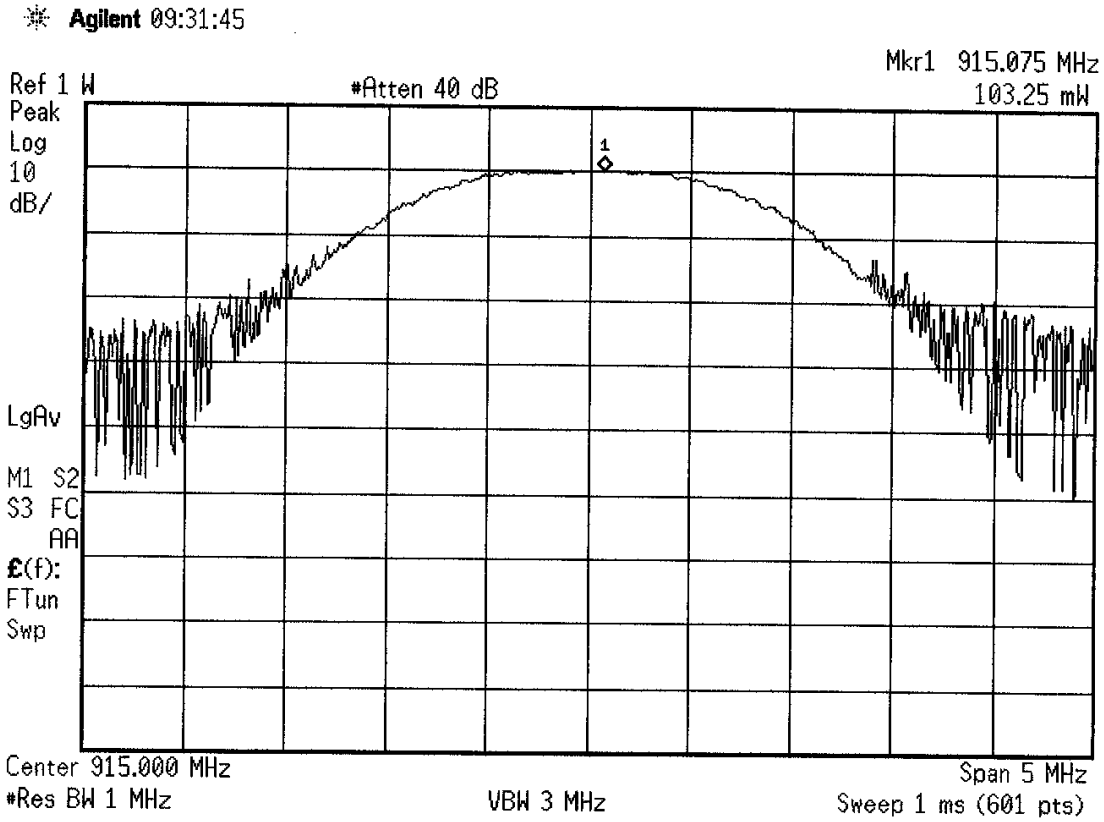
Output Power, 15.247(b); RSS-210, Annex 8, A8.4



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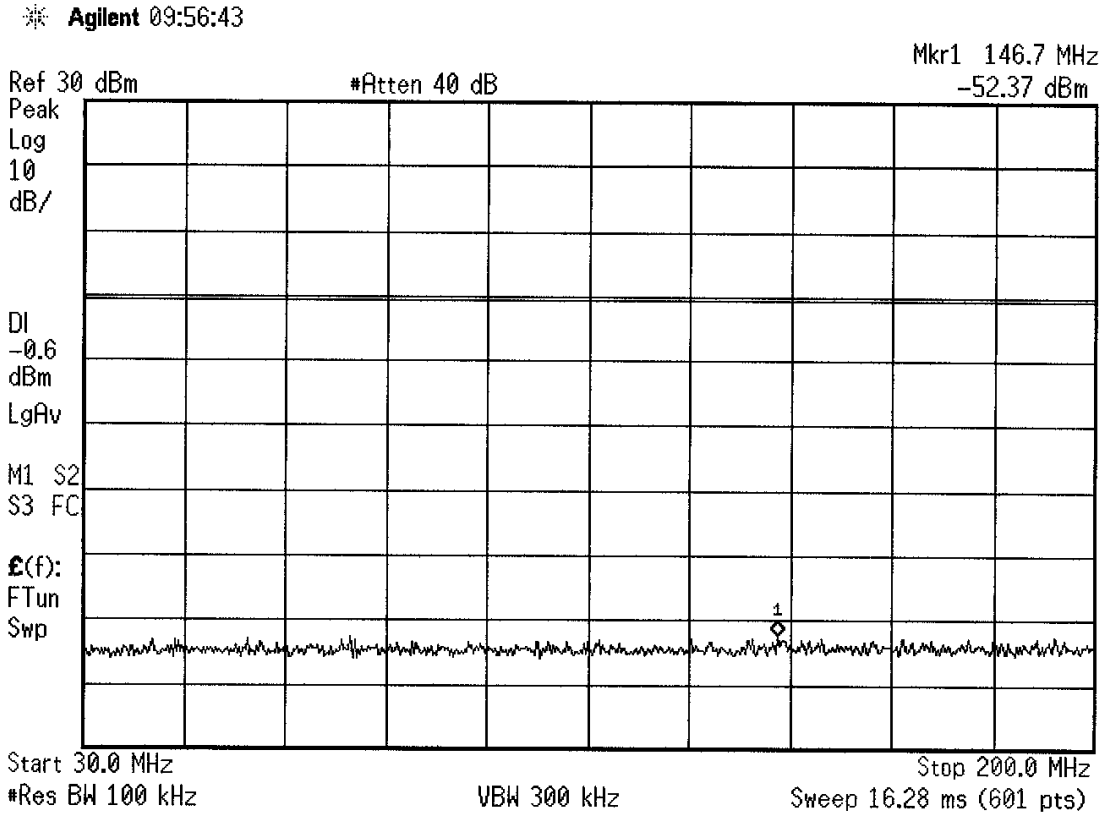
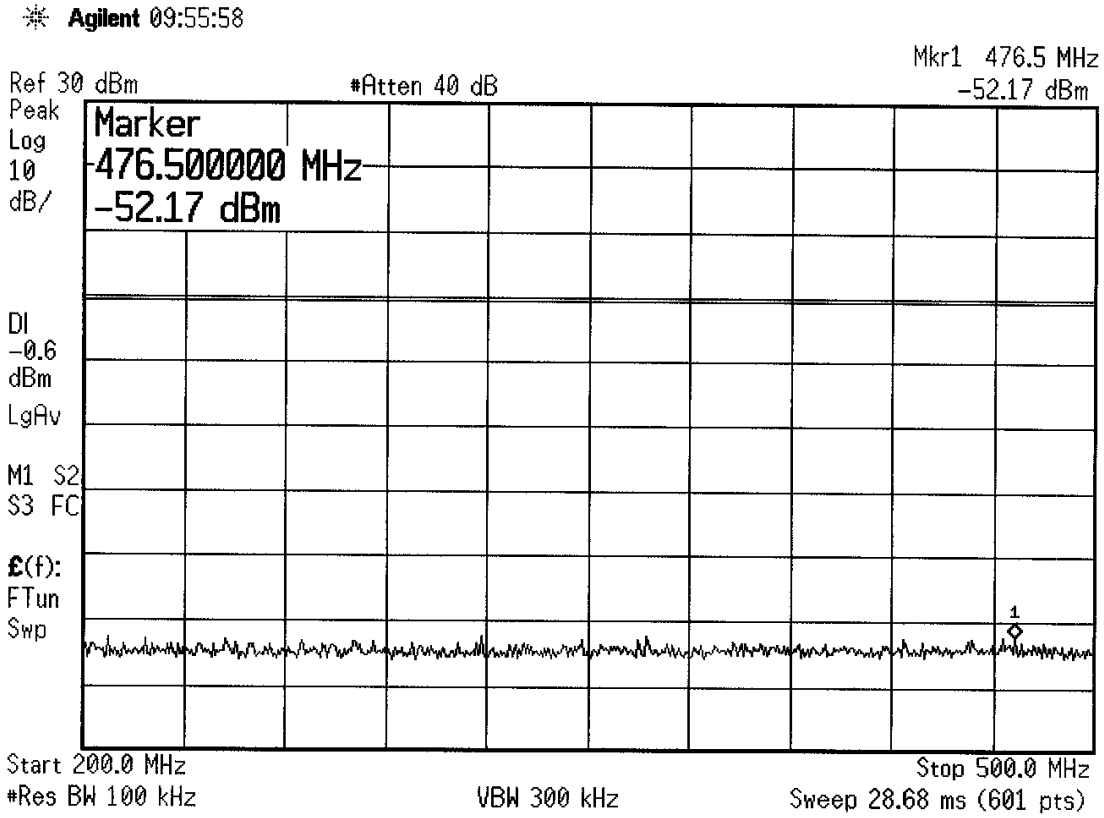
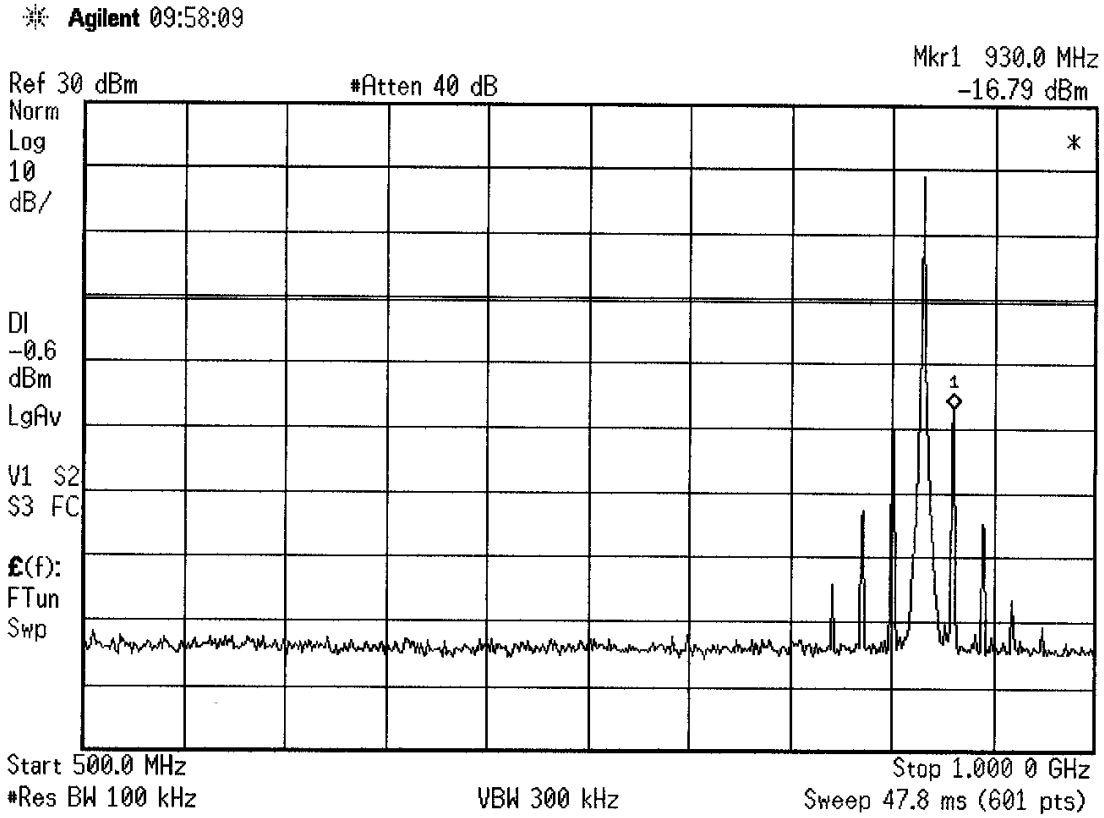
RF Conducted Spurious, 15.247(c); RSS 210, Annex 8, A8.5



RF Conducted Spurious, 15.247(c); RSS 210, Annex 8, A8.5



RF Conducted Spurious, 15.247(c); RSS 210, Annex 8, A8.5 RF



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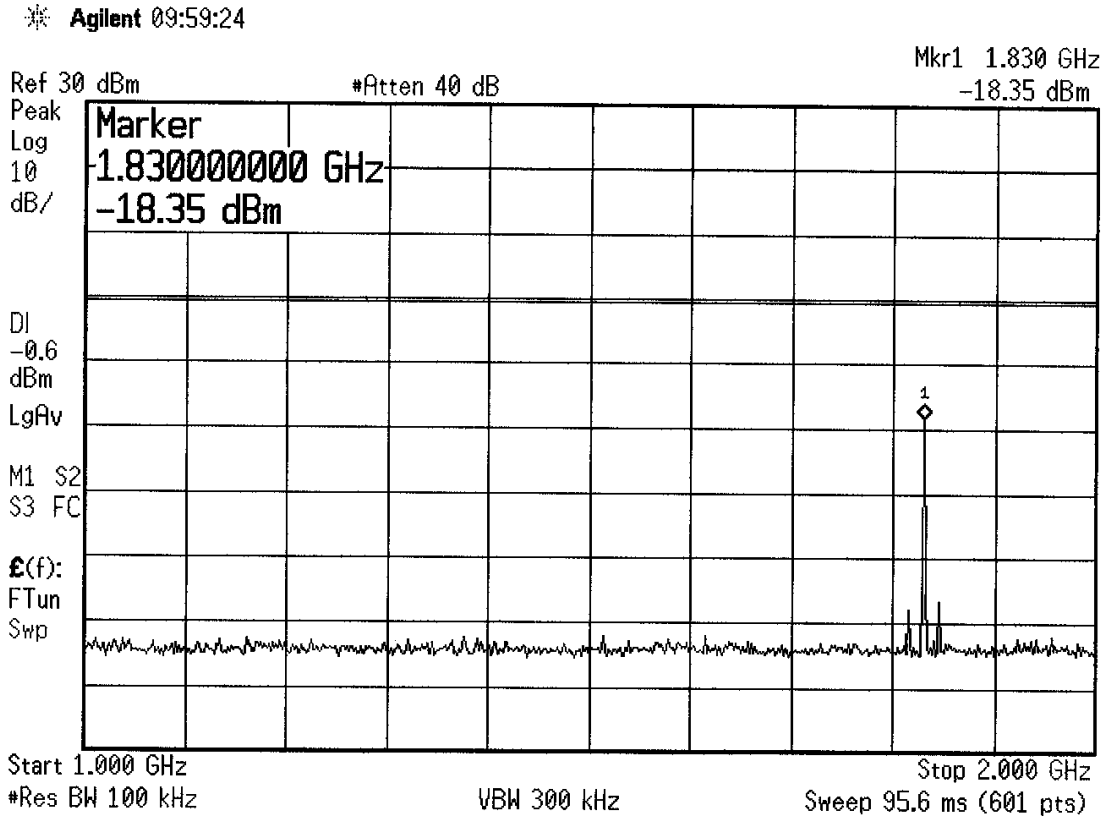
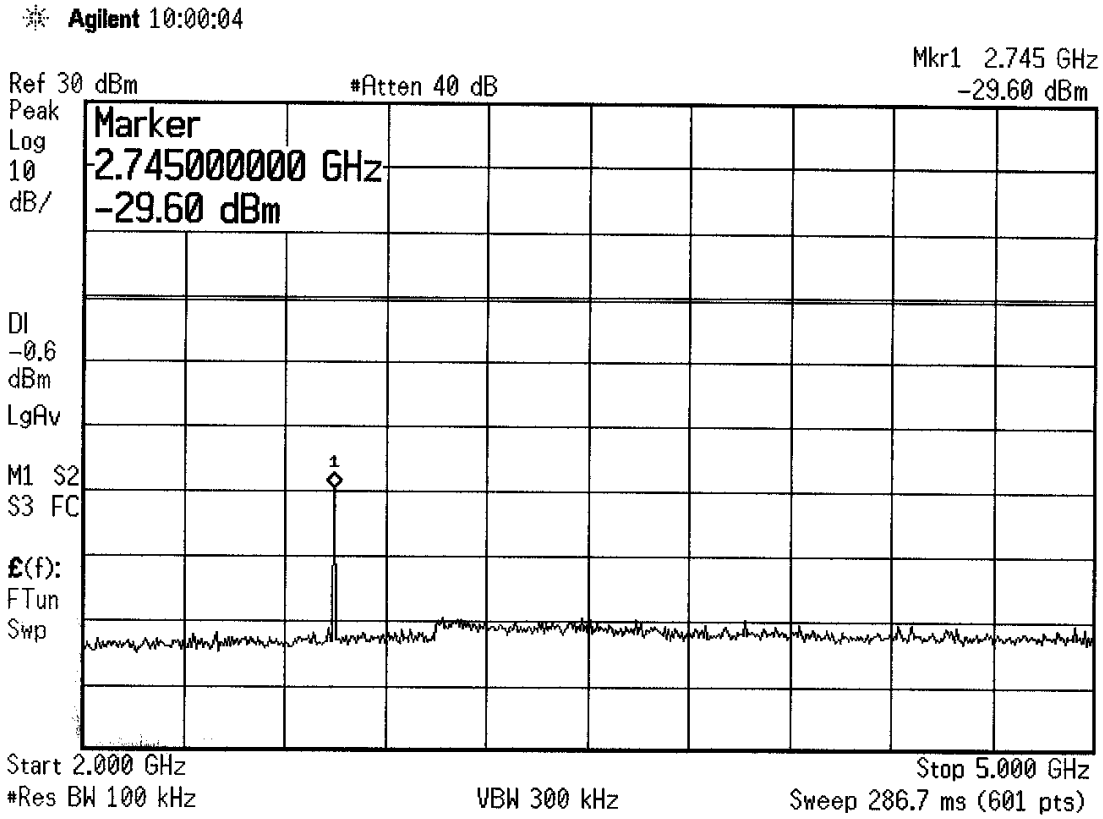
Conducted Spurious, 15.247(c); RSS 210, Annex 8, A8.5



RF Conducted Spurious, 15.247(c); RSS 210, Annex 8, A8.5



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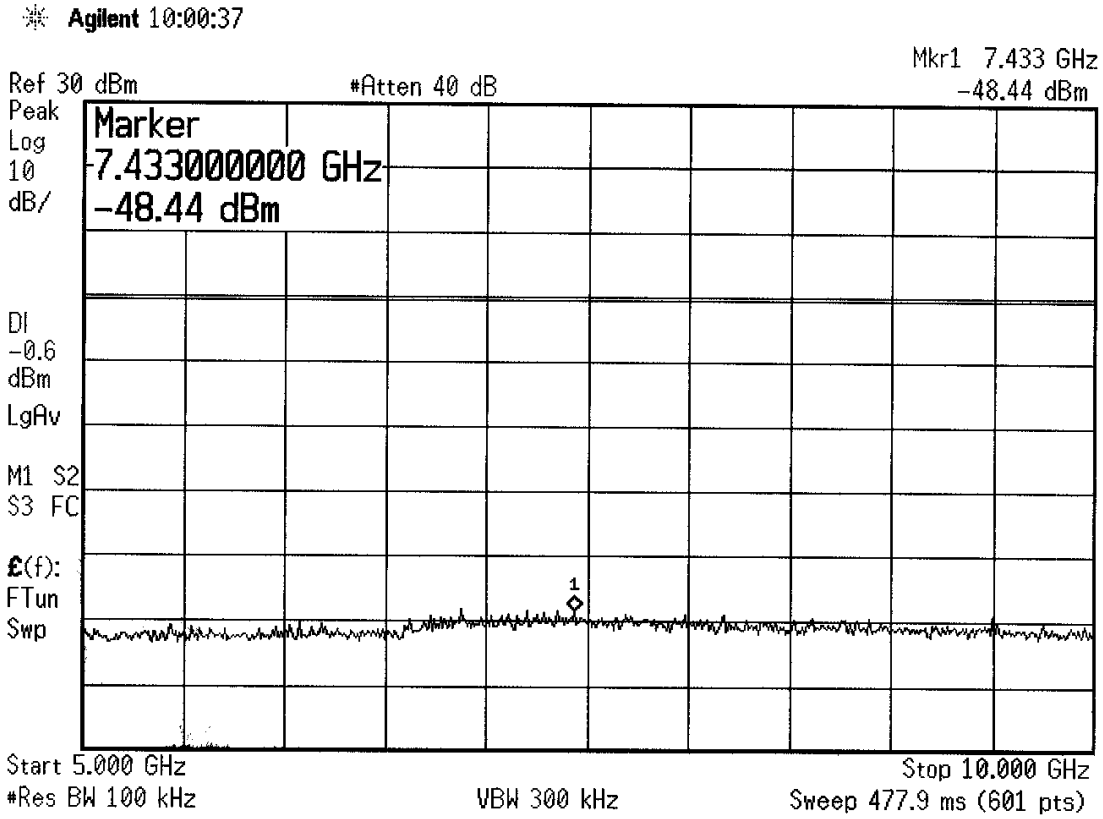
RF Conducted Spurious, 15.247(c); RSS 210, Annex 8, A8.5



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Radiated Spurious Emissions, 15.247(c); 15.209(a); Rss 210, Annex 8, A8.5

REPORT No: SC602954 TESTER: Jim Owen SPEC: FCC Part 15 para 15.209(a) /15.247(c)

CUSTOMER: Directed Electroncis TEST DIST: 3 Meters

E U T: 7641 VPX TEST SITE: Roof

EUT MODE: Transmit DTS 915MHz BICONICAL: N/A

DATE: July 26, 2006 LOG: N/A

NOTES: Duty Cycle Correction = 5dB applied to Margin OTHER: 453

above 1GHz: RBW & VBW 1 MHz for Pk; RBW 1MHz and VBW 10Hz for AVG

No emissions detected between 30-1000 MHz.

v.beta1

FREQ (MHz)	VERTICAL (dBuv) pk	VERTICAL (dBuv) av	HORIZONTAL (dBuv) pk	HORIZONTAL (dBuv) av	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
2745	73.7	57.7	66.89	54.1	-0.583	**73.12**	**57.1**	74	54	-5.88	-1.88	206
3660	60.2	49.2	66	52.7	3.904	**69.9**	**56.6**	74	54	-9.1	-2.4	0
4575	51.6	40	54.3	43.1	4.13	**58.43**	**47.2**	74	54	-20.6	-11.8	0
7320	50.1	37.8	48.5	36.3	10.512	**60.61**	**48.3**	74	54	-18.4	-10.7	214
8235	44.9	32	41.6		12.317	**57.22**	**44.3**	74	54	-21.8	-14.7	160
9150	51.2	36.1	49.7	36	14.55	**65.75**	**50.7**	74	54	-13.3	-8.35	160

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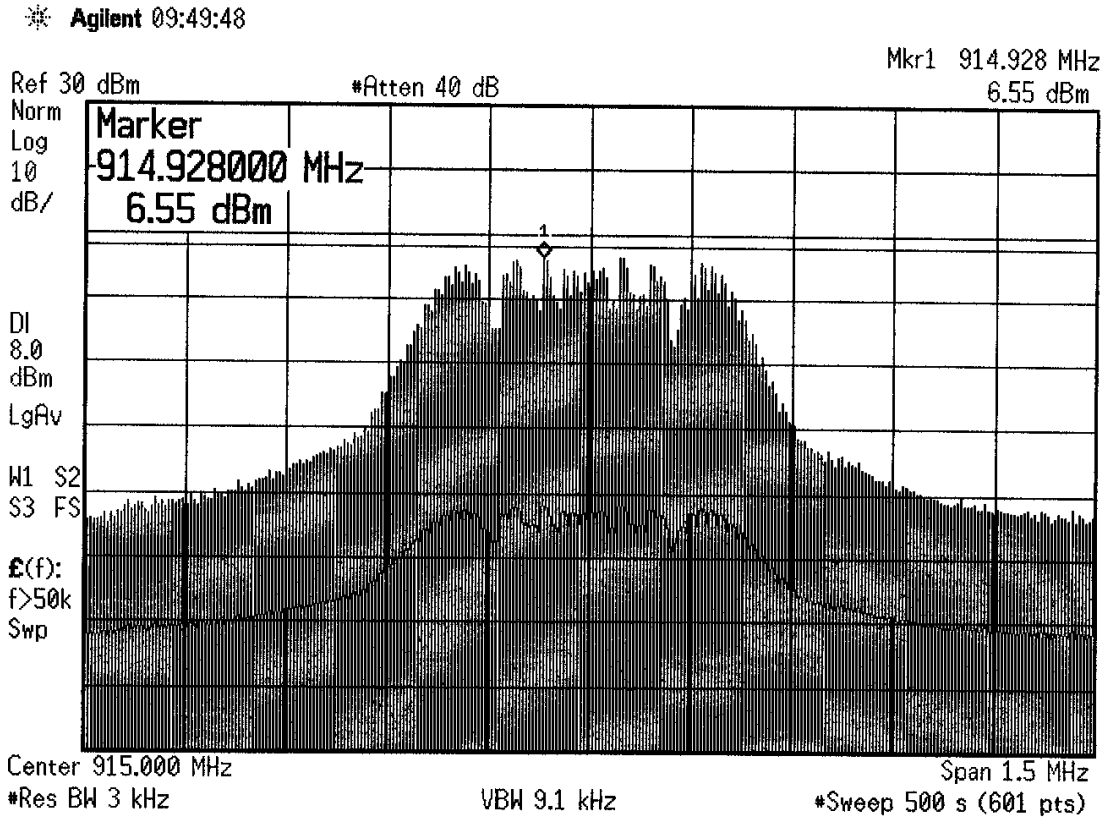
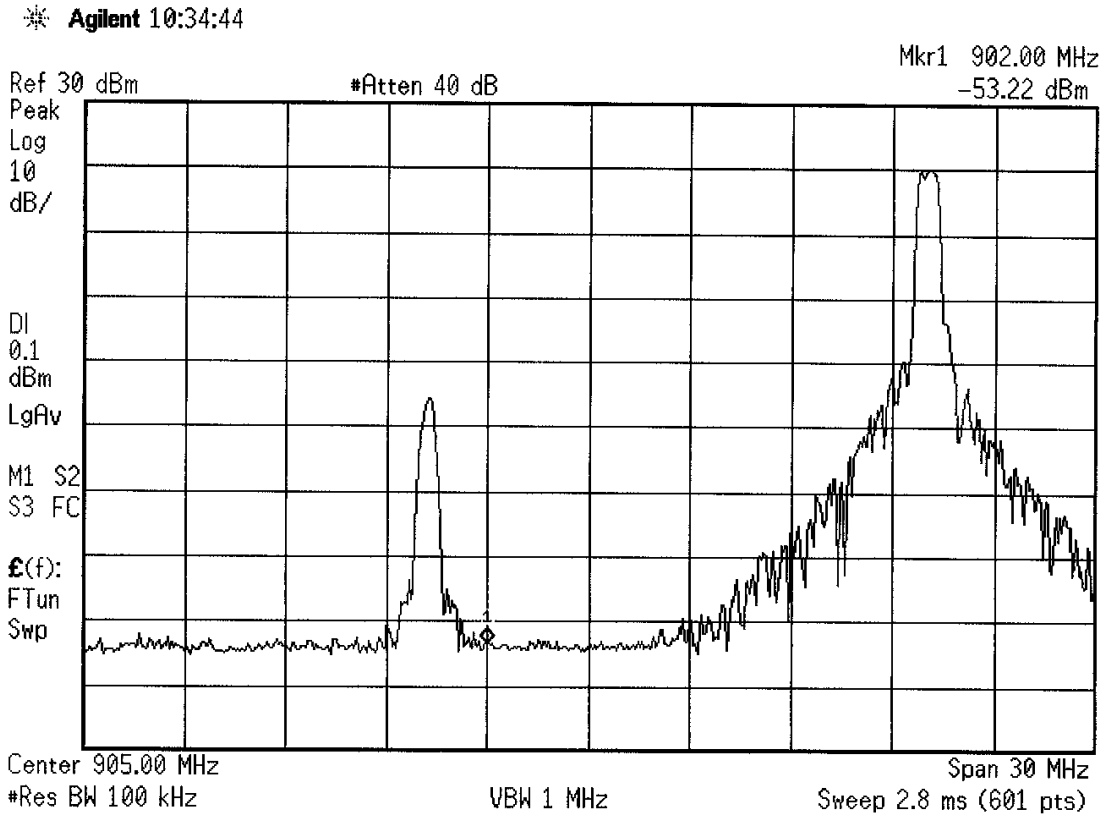
Power Spectral Density, 15.247(d); RSS 210, Annex 8, A8.2



Bandedge, Low, 15.247(a); RSS 210, Annex 7, A7(3)



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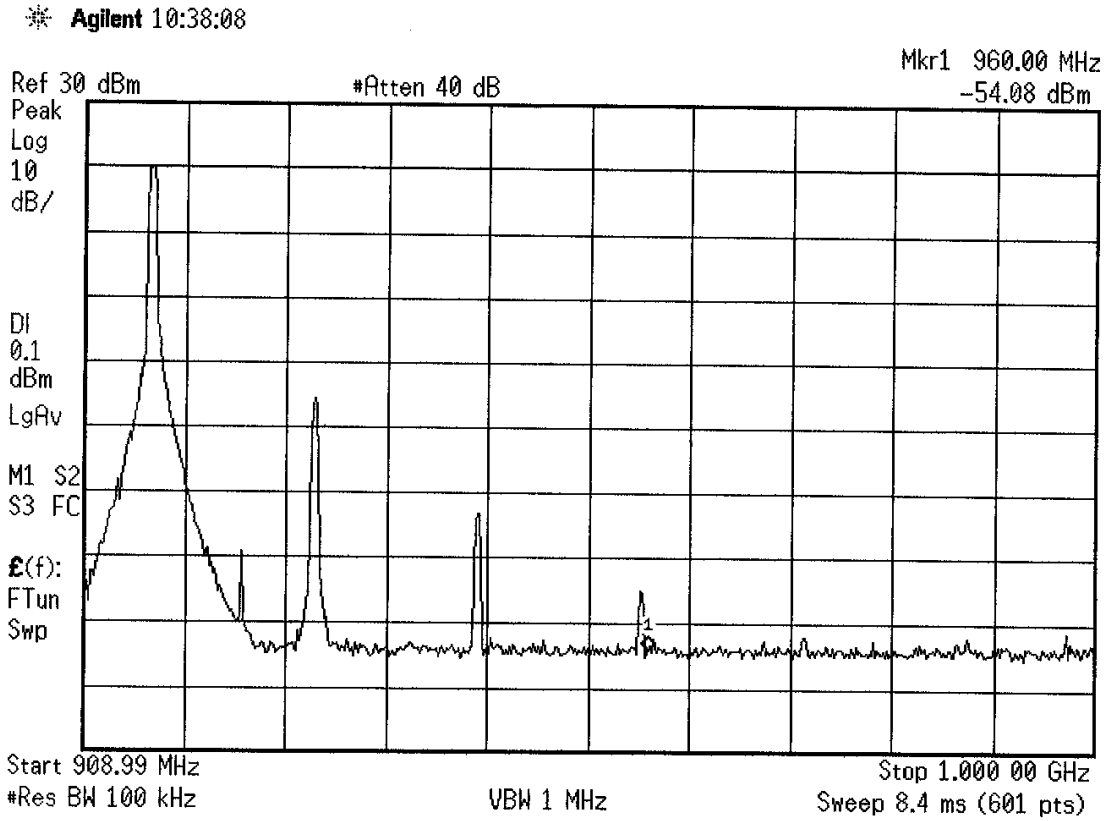
Bandedge, High, 15.247(a); RSS 210, Annex 7, A7(3)



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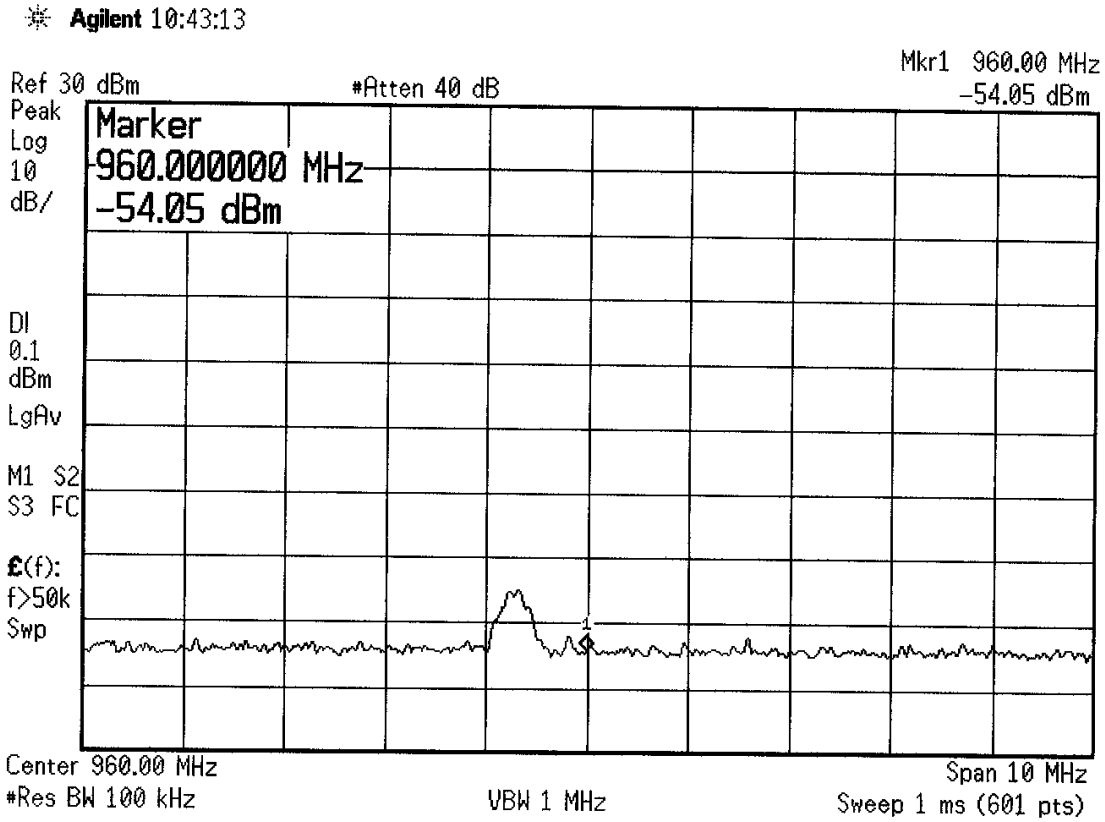
Bandedge, High, 15.247(a); RSS 210, Annex 7, A7(3)



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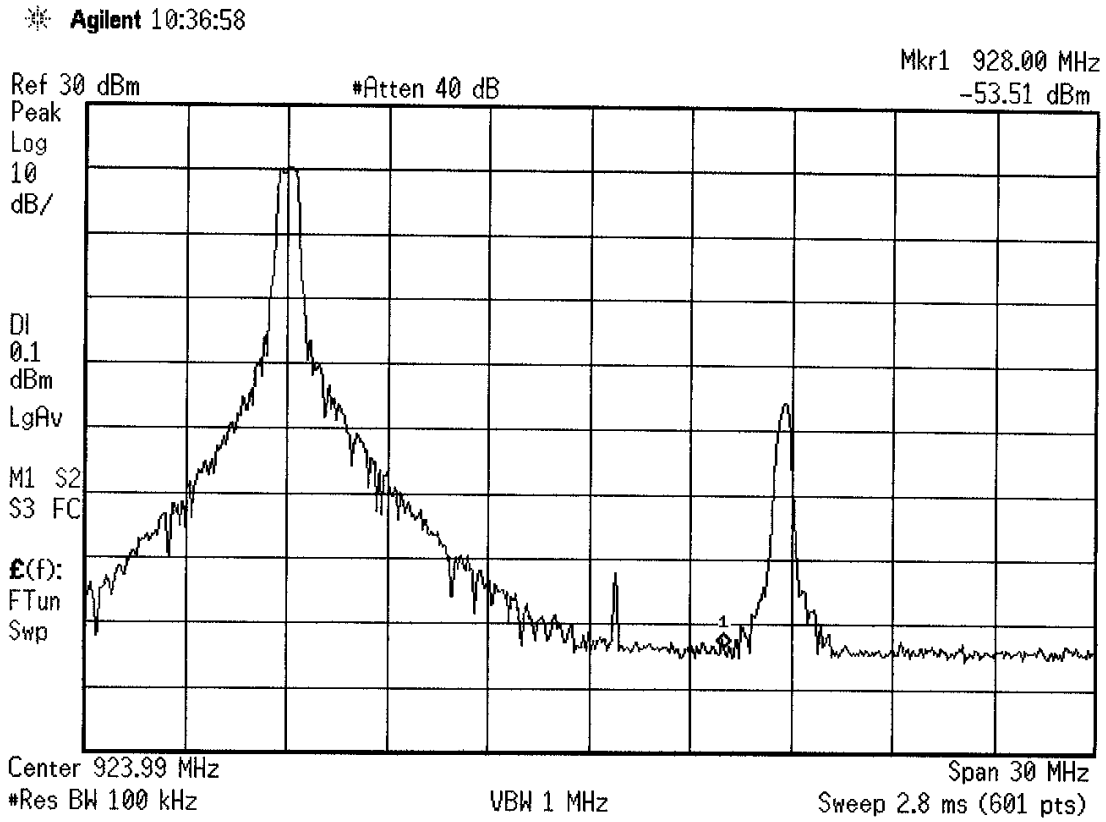
Bandedge, High, 15.247(a); RSS 210, Annex 7, A7(3)



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Pulse Duty Cycle (FCC 15.35(c) and ANSI C63.4) (Pages 25 - 34)

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) =	90	(100 ms Maximum)
B)	Long Pulse (ms) =	.7667	
C)	Nr. Of Long Pulses	30.1 (estimated)	
D)	Short Pulse (ms) =	.383	
E)	Nr. Of Short Pulses	38.7 (estimated)	
F)	Duty Cycle =	.44 = 7.1dB*	(Maximum Allowance is 20 dB)

Comments : *Client opted to use 5dB Duty Cycle Correction and is applied to Margin on data record

$$\text{Duty Cycle (F)} = 20 \times \log\left(\frac{\text{Nr. of Long Pulses} \times \text{Long Pulse} + \text{Nr. of Short Pulses} \times \text{Short Pulse}}{\text{Period}}\right)$$

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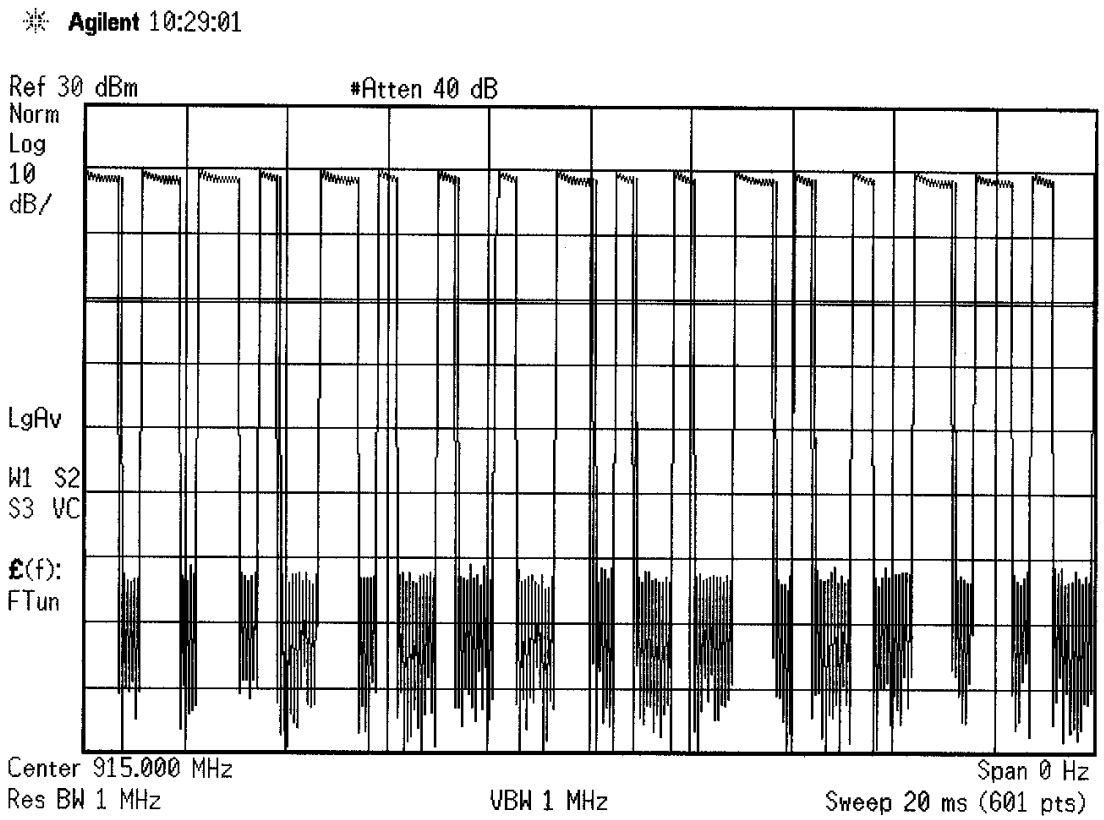

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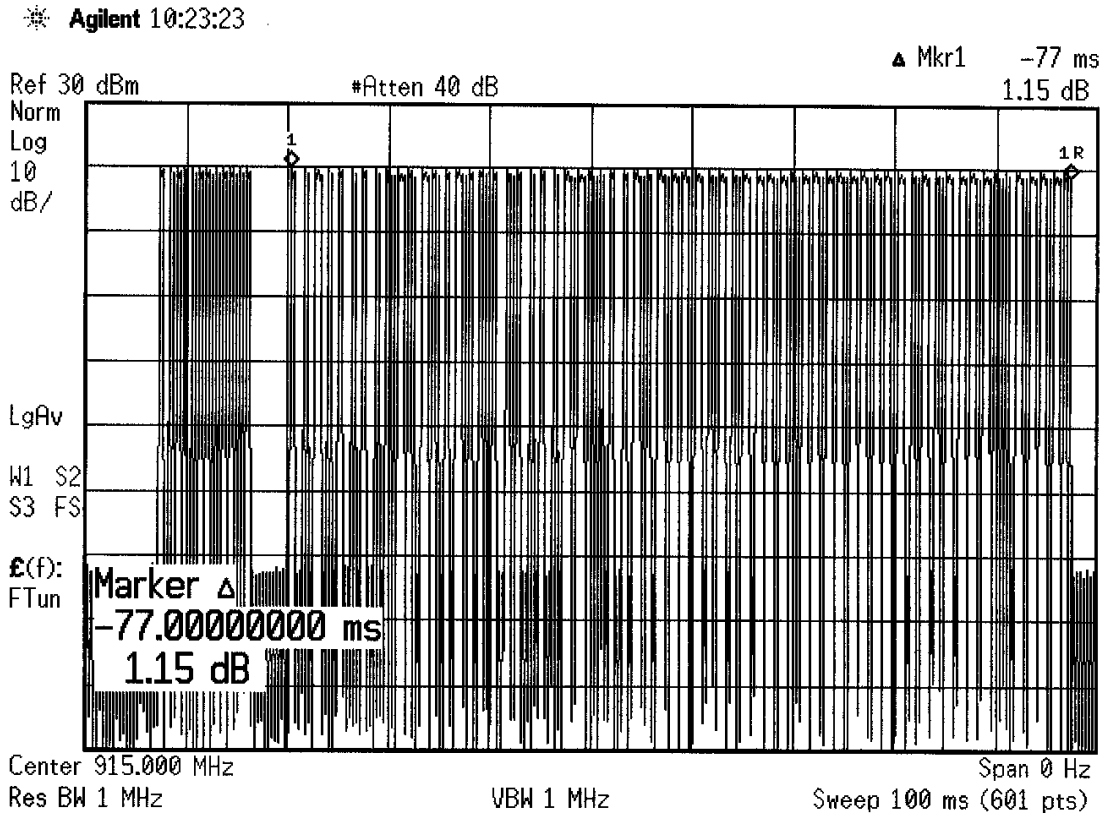
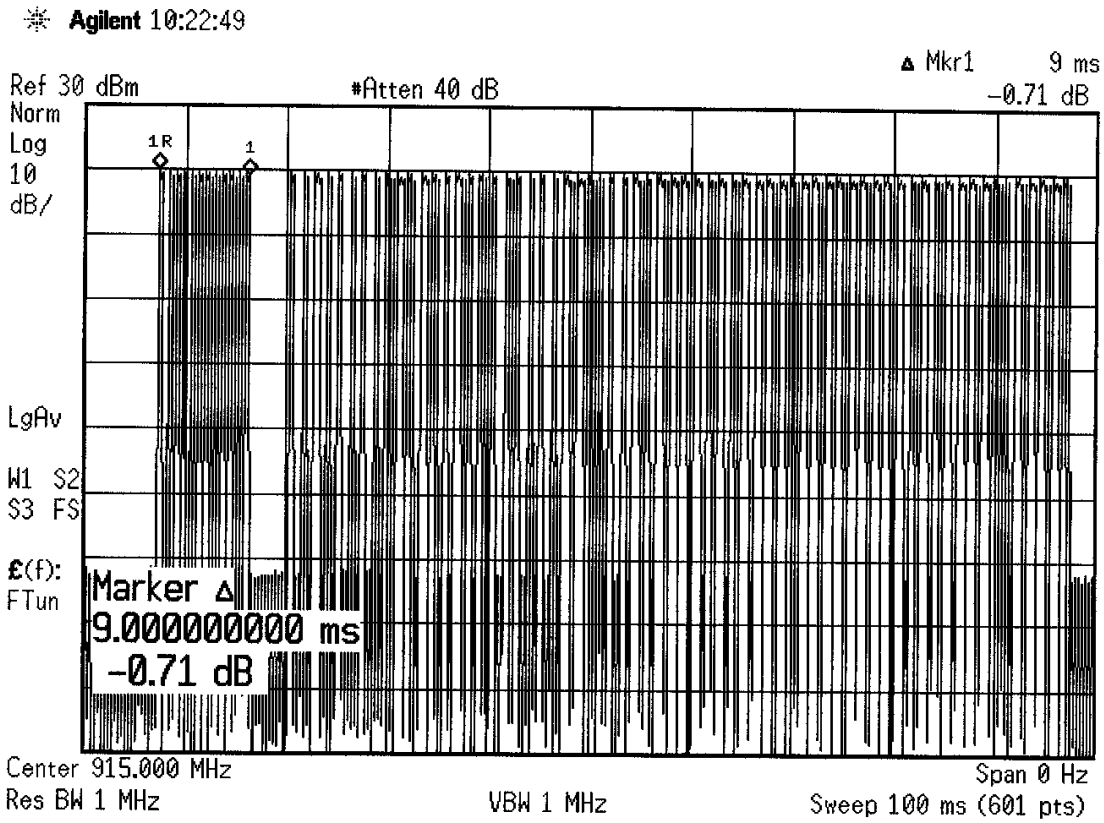
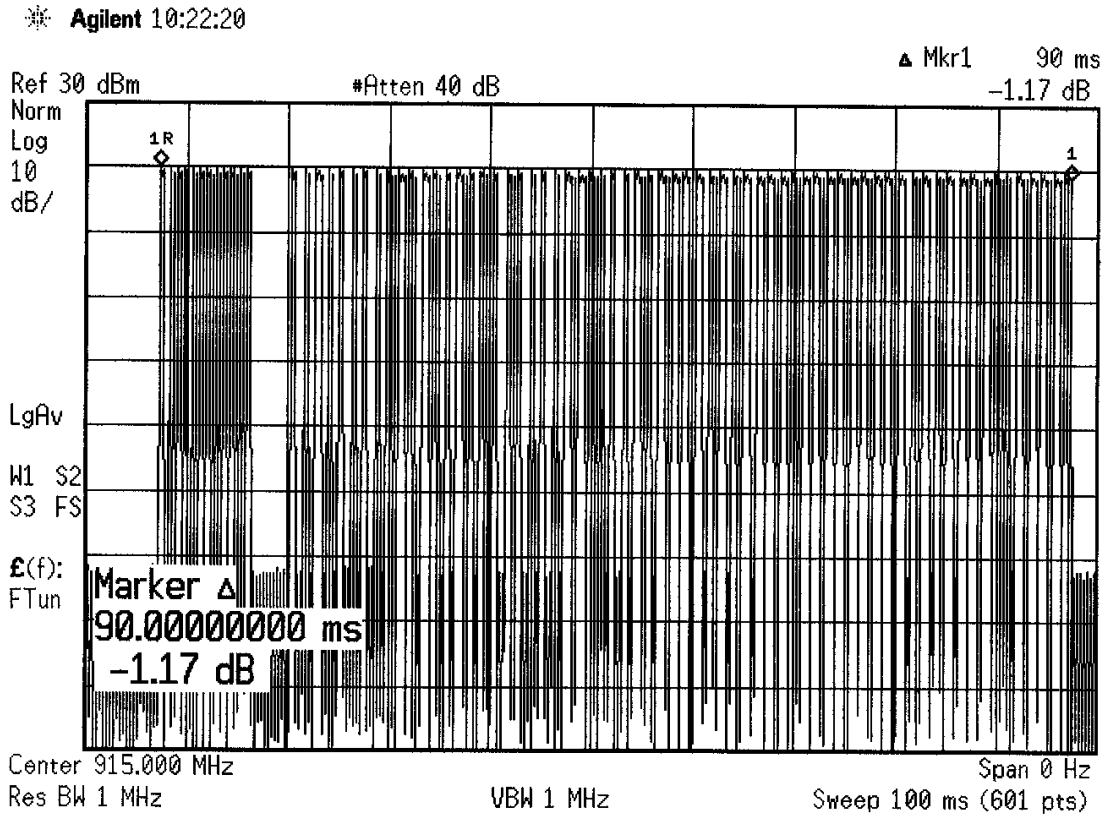
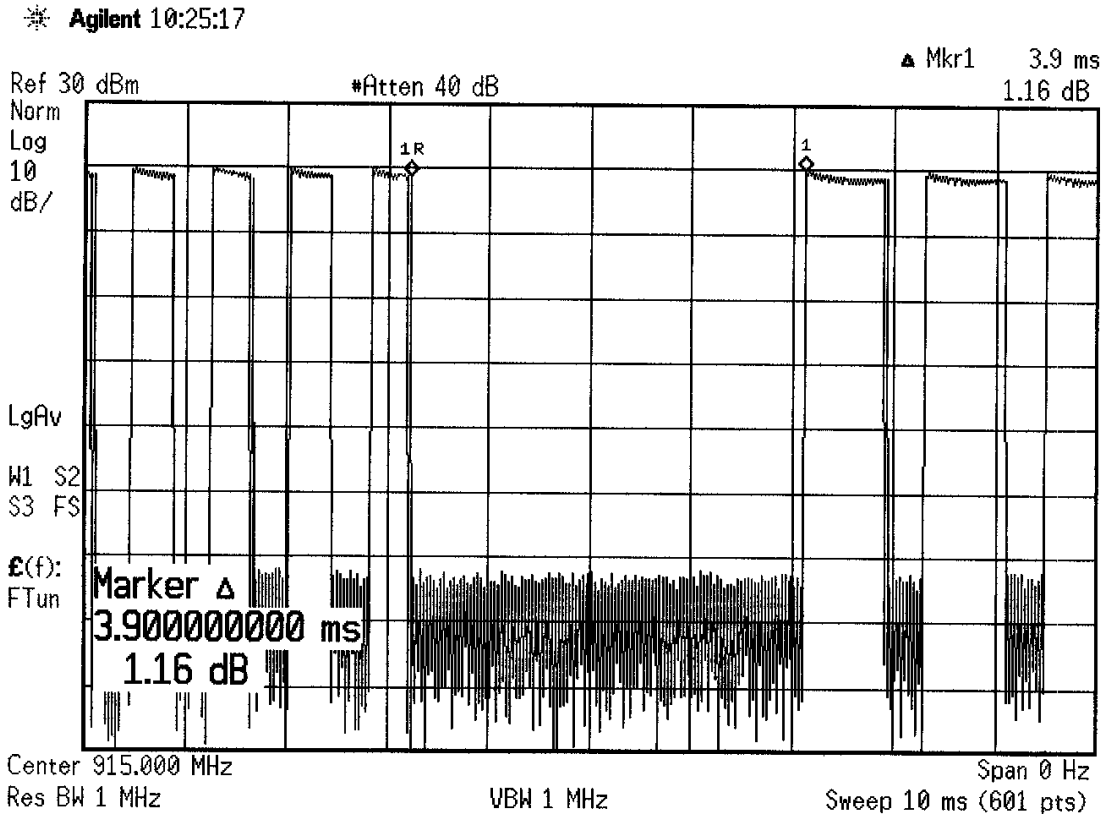
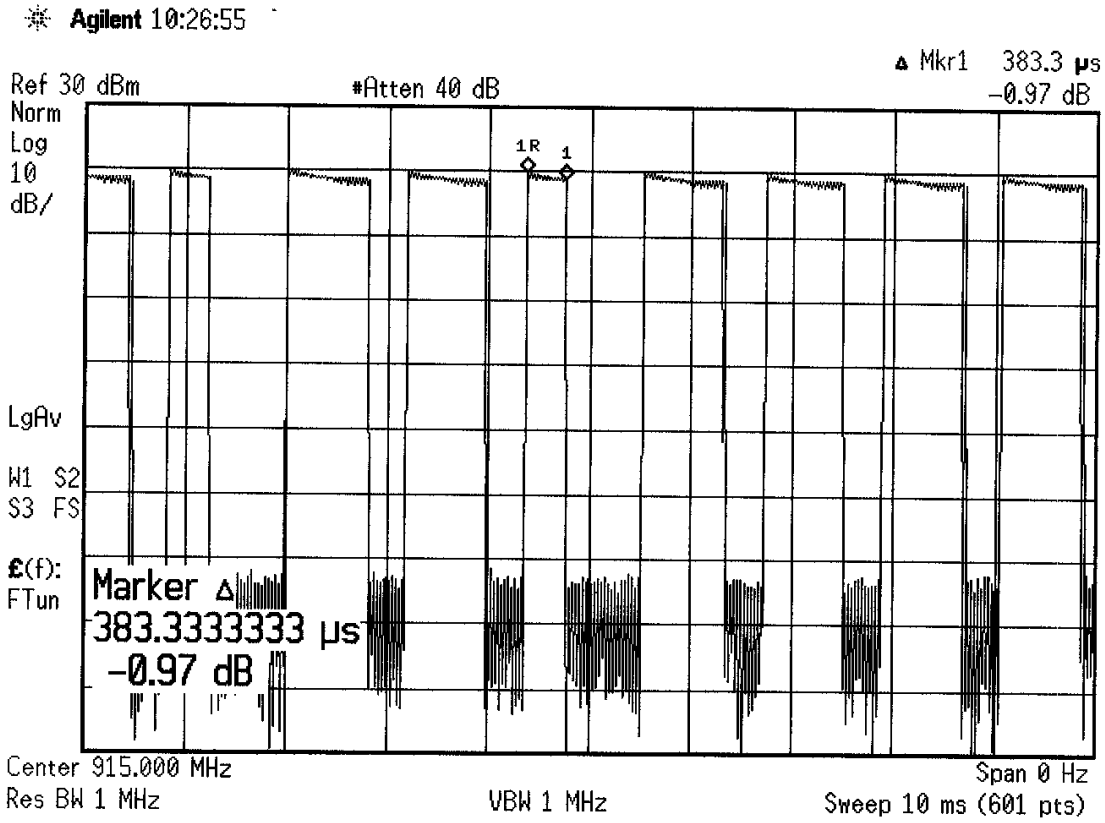
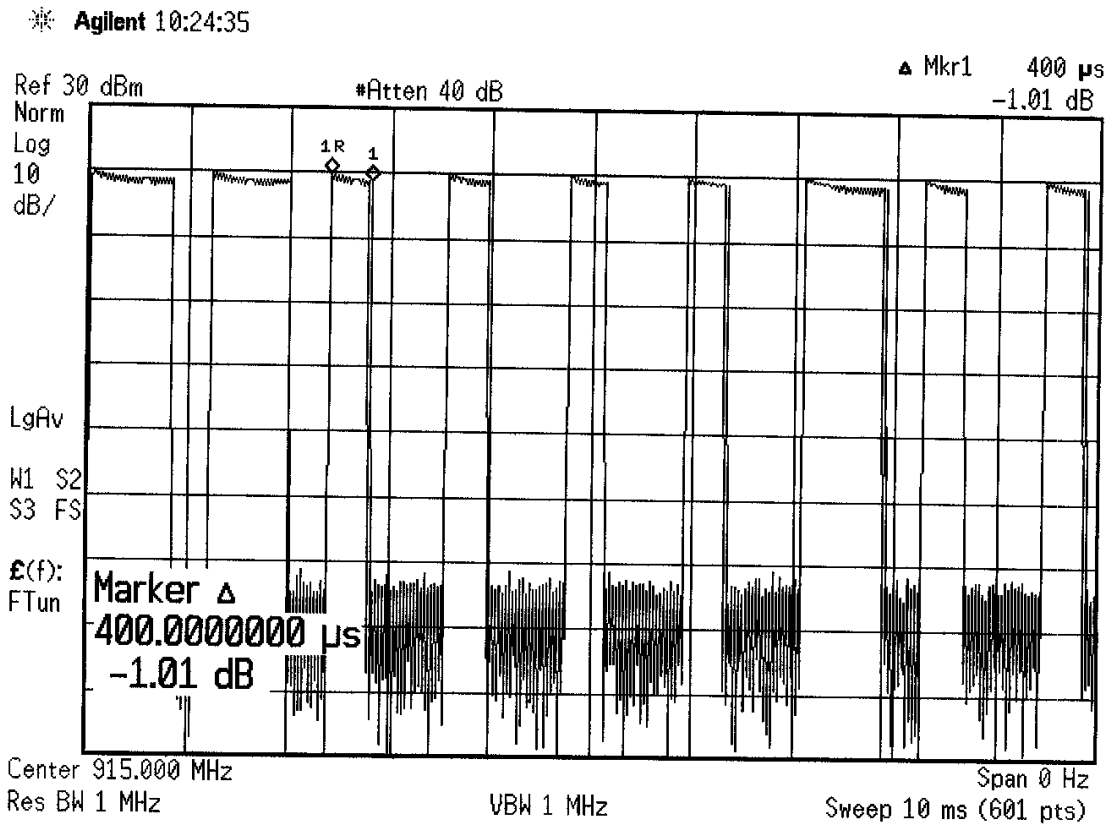

Agilent 10:23:23
Ref 30 dBm
#Atten 40 dB
Mkr1 -77 ms
1.15 dB
Norm
Log
10
dB/
1
1R
LgAv
W1 S2
S3 FS
£(f):
FTun
Marker Δ
-77.00000000 ms
1.15 dB
Center 915.000 MHz
Span 0 Hz
Res BW 1 MHz
VBW 1 MHz
Sweep 100 ms (601 pts)

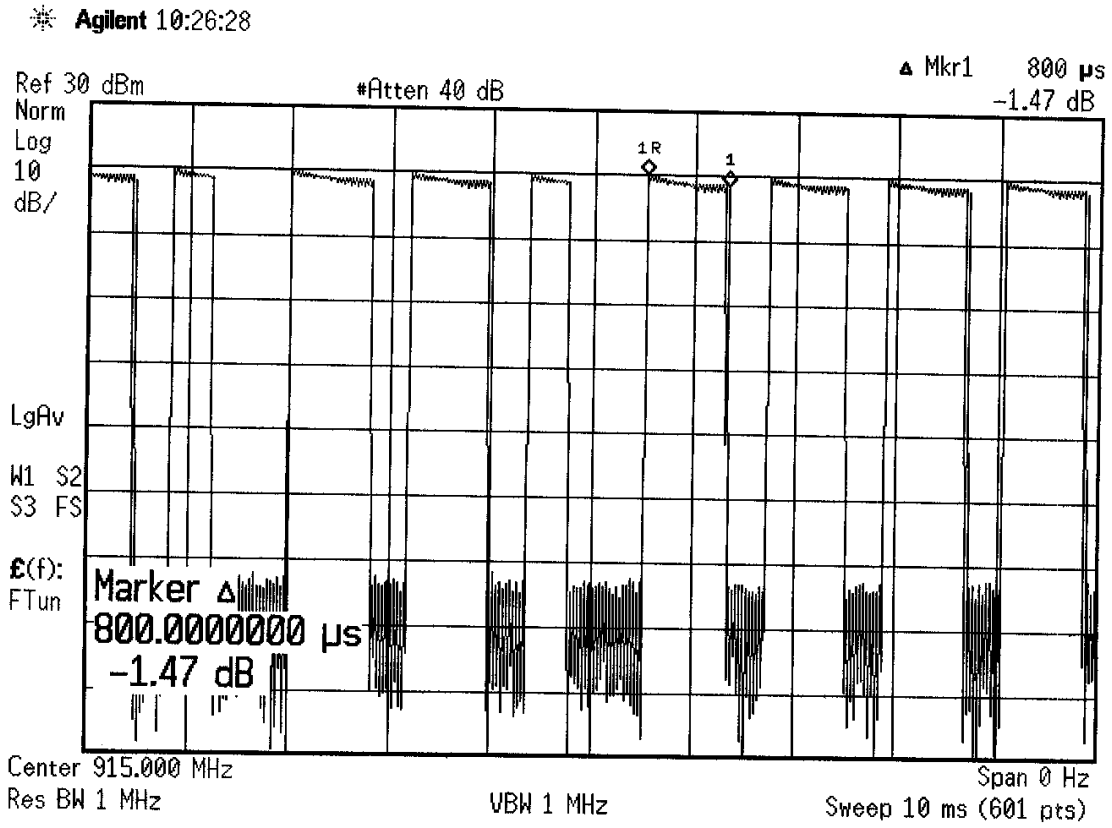

Agilent 10:22:49
Ref 30 dBm
#Atten 40 dB
Mkr1 9 ms
-0.71 dB
Norm
Log
10
dB/
1R
1
LgAv
W1 S2
S3 FS
£(f):
FTun
Marker Δ
9.000000000 ms
-0.71 dB
Center 915.000 MHz
Res BW 1 MHz
VBW 1 MHz
Span 0 Hz
Sweep 100 ms (601 pts)

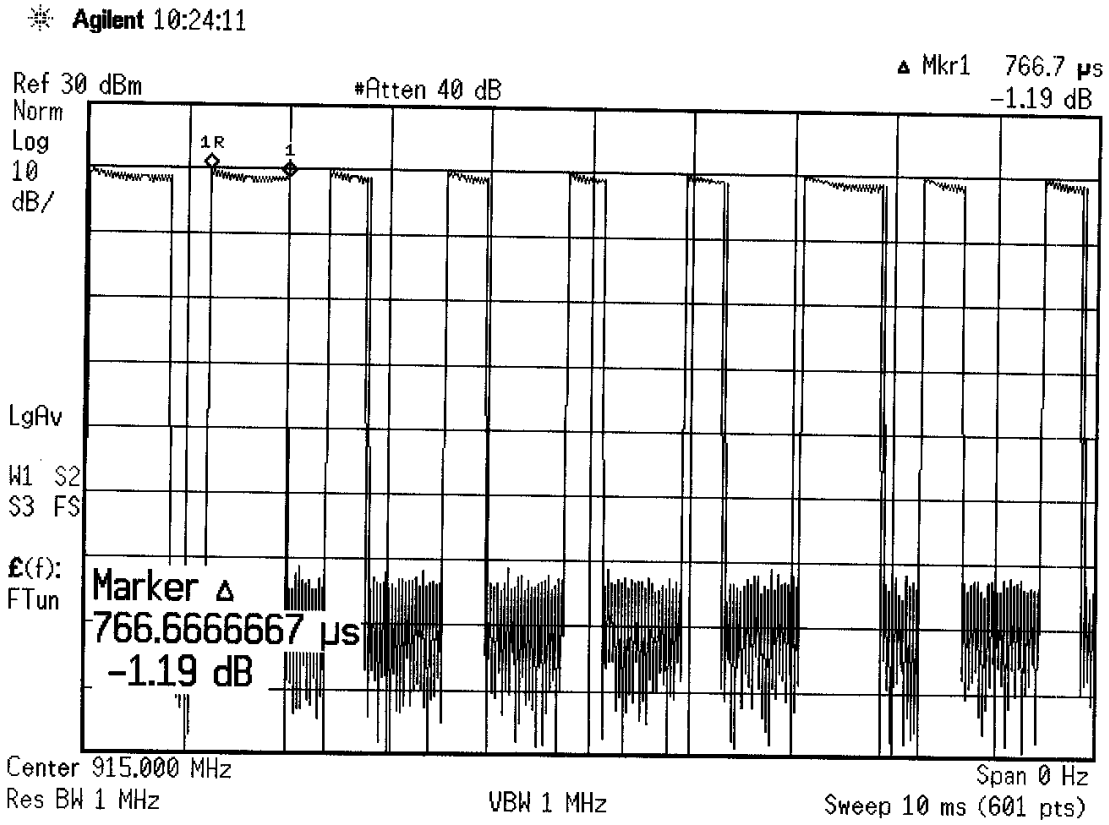

Agilent 10:22:20
Ref 30 dBm
#Atten 40 dB
Mkr1 90 ms
-1.17 dB
Norm
Log
10
dB/
1R
1
LgAv
W1 S2
S3 FS
£(f):
FTun
Marker Δ
90.00000000 ms
-1.17 dB
Center 915.000 MHz
Res BW 1 MHz
VBW 1 MHz
Span 0 Hz
Sweep 100 ms (601 pts)


Agilent 10:25:17
Mkr1 3.9 ms
1.16 dB
Ref 30 dBm
#Atten 40 dB
Norm
Log
10
dB/
1R
1
LgAv
W1 S2
S3 FS
£(f):
FTun
Marker Δ
3.900000000 ms
1.16 dB
Center 915.000 MHz
Res BW 1 MHz
VBW 1 MHz
Span 0 Hz
Sweep 10 ms (601 pts)


Agilent 10:26:55
Ref 30 dBm
#Atten 40 dB
Mkr1 383.3 µs
-0.97 dB
Norm
Log
10
dB/
1R 1
LgAv
W1 S2
S3 FS
£(f):
FTun
Marker Δ
383.3333333 µs
-0.97 dB
Center 915.000 MHz
Res BW 1 MHz
VBW 1 MHz
Span 0 Hz
Sweep 10 ms (601 pts)


Agilent 10:24:35
Ref 30 dBm
#Atten 40 dB
Mkr1 400 µs
-1.01 dB
Norm
Log
10
dB/
1R 1
LgAv
W1 S2
S3 FS
£(f):
FTun
Marker Δ
400.0000000 µs
-1.01 dB
Center 915.000 MHz
Res BW 1 MHz
VBW 1 MHz
Span 0 Hz
Sweep 10 ms (601 pts)


Agilent 10:26:28
Ref 30 dBm
#Atten 40 dB
Mkr1 800 µs
-1.47 dB
Norm
Log
10
dB/
1R
1
LgAv
W1 S2
S3 FS
£(f):
FTun
Marker Δ
800.0000000 µs
-1.47 dB
Center 915.000 MHz
Res BW 1 MHz
VBW 1 MHz
Span 0 Hz
Sweep 10 ms (601 pts)



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4.0 ATTESTATION STATEMENT

GENERAL REMARKS:

SUMMARY:

All tests were performed per: CFR 47, Part(s) Paragraph(s) 15.247(a); 15.247(b); 15.247(c); 15.247(d); 15.207(a) and 15.209(a)
Canadian Standard(s) Canadian Standard(s) RSS-Gen 7.2 and RSS-210 Annexes 7 and 8

■ - **Performed**

The Equipment Under Test

■ - **Fulfills** the requirements of: CFR 47, Part(s) Paragraph(s) 15.247(a); 15.247(b); 15.247(c); 15.247(d); 15.207(a) and 15.209(a)
Canadian Standard(s) Canadian Standard(s) RSS-Gen 7.2 and RSS-210 Annexes 7 and 8

Testing Start Date: 26 July 2006

Testing End Date: 26 July 2006

- TÜV AMERICA, INC. -

Reviewing Engineer:

Jim Owen
(EMC Manager)

Test Engineer:

David Gray
(EMC Engineer In Charge)

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