



849 NW State Road 45
Newberry, FL 32669 USA
Ph: 888.472.2424 or 352.472.5500
Fax: 352.472.2030
Email: info@timcoengr.com
Website: www.timcoengr.com

FCC PART 15.Subpart H White Spaces System

PART 1 TEST REPORT

Fixed TVBD Device Part 1

Applicant	Carlson Wireless Technologies Inc.
Address	2700 Foster Ave. Arcata Ca 95521 USA
FCC ID	OPA-RC2-CPE
Model Number	RC2
Product Description	White Space Fixed TVBD
Date Sample Received	1/25/2013
Date Tested	1/30/2013
Tested By	Sushant Kadimdivan/ Mario de Aranzeta
Approved By	Mario de Aranzeta
Report Number	C\CARLSON\841AUT13\841AUT13TestReport.doc
Test Results	☒ PASS ☐ FAIL

THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN
APPROVAL OF TIMCO ENGINEERING, INC.



Testing Certificate # 0955-01

TABLE OF CONTENT

GENERAL REMARKS	3
GENERAL INFORMATION	4
EMC EQUIPMENT LIST	5
TEST PROCEDURES	6
§15.207 & §15.709(C)(5) POWER LINE CONDUCTED INTERFERENCE	7
§15.209 RADIATION INTERFERENCE	10
§15.709(A) POWER LIMITS FIXED TVBD	16
§15.709(A)(3)(I) TRANSMITTER POWER CONTROL FIXED TVBD	20
§15.709(C)(1) EMISSION LIMITS AT THE BAND EDGE FOR TVBDS	21
§15.709(C)(4) EMISSION IN THE BAND OF 602-620MHZ LIMITS FOR TVBDS	32
PRODUCT PHOTOS	42

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

Summary

The device under test does:

- ☒ fulfill the general approval requirements as identified in this test report
☐ not fulfill the general approval requirements as identified in this test report

Attestations

The scope of this document is to report the results of the Fixed TVBD Part 1 Radio Frequency Certification Tests. There are three (3) components of the White Spaces technology;

- **TV Band devices (Fixed TVBD for Certification).**
- **TV Bands Database**
- **TV Band System,** Made up of Fixed TVBD's database, and layer of interaction between the devices and the databases.

To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.



Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669

Authorized Signatory Name:



Mario de Aranzeta C.E.T.
Compliance Engineer/ Lab. Supervisor

Date: July 23, 2013

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

GENERAL INFORMATION

Device Under Test (DUT) Description

General:

White space transceiver for broadband data transfer.

DUT Specification

Applicable Standard	Part 15 Subpart H TV Band White Space Fixed Device		
DUT Description	Transceiver		
FCC ID	OPA-RC2-CPE		
Application:	Rural Broadband		
Operating Frequency	473 to 599 and 623 to 695 MHz		
Number of channels	CH14 – 35 and 39 – CH51		
Bridged Ethernet Port:	RJ45		
Transmit Power:	23 dBm		
DUT Power Source	☐ 110–120Vac/50– 60Hz		
	☒ DC Power UE-POE-33		
	☐ Battery Operated Exclusively		
Test Item	☐ Prototype	☐ Pre-Production	☒ Production
Type of Equipment	☒ Fixed - WGF	☐ Mobile – WG1	☐ Portable – WG2
	☐ Fixed - WSF	☐ Mobile – WS1	☐ Portable – WS2
Antenna Connector	F Connector		
Antenna	Log Periodic UHF FOR CPE (Carlson Part Number: 057-470-786-F) 9dBi gain		
Network Port	RJ 45		
Serial Port	-		
Indicators	☐ Power Indicator		
	☐ Alarm Indicator		
	☐ Transmit Indicator		

Test Facility	Timco Engineering Inc. 849 NW State Road 45 Newberry, FL 32669 USA.
Test Conditions	Temperature: 26°C Relative humidity: 50%
Test Exercise	The DUT was placed in a mode allowing channel changes and allowing a continuous transmit mode of operation.

Compliance with 15.209 limits requires a Laird 28A2736-0A2 ferrite to be applied to the RJ45 cable directly at the output of the EUT.

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	3/24/12	3/24/14
AC Voltmeter	HP	400FL	2213A14499	CAL 6/12/11	6/12/13
Frequency Counter	HP	5385A	2730A03025	CAL 8/17/11	8/17/13
Hygro-Thermometer	Extech	445703	0602	CAL 6/15/11	6/15/13
Modulation Analyzer	HP	8901A	3435A06868	CAL 7/18/11	7/18/13
Digital Multimeter	Fluke	FLUKE-77	35053830	CAL 9/9/11	9/9/13
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 10/28/11	10/28/13
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 10/28/11	10/28/13
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 10/28/11	10/28/13
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 10/28/11	10/28/13
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 7/3/12	7/3/14
Antenna	ETS	3117	35923	12/7/2011	12/7/2014
Antenna	Electro metrics	LPA-25	1122	5/04/2011	5/04/2013
Antenna	Electro metrics	BIA-25	1171	6/13/2012	6/13/2014
Spectrum Analyzer	Rohde & Schwarz	ESIB40	100274	3/16/2012	3/16/2014
Band pass filter	EWT	612	Z1	12/31/2011	12/31/2013

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

TEST PROCEDURES

RF Test: Certification Test Procedures for TV Band (White Spaces) Devices Authorized under Subpart H of the Part 15 Rules, 416721 DO1 White Space Test Procedures v02.

Power Line Conducted Interference: The procedure used was ANSI C63.4-2009 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30 MHz.

Radiation Interference: ANSI C63.4-2009 using a spectrum analyzer, a preselector, a quasi-peak adapter, and an appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz with an appropriate sweep speed and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3 MHz above 1 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

Formula of Conversion Factors: The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBμV) to the antenna correction factor supplied by the antenna manufacturer plus the coax loss. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

Freq (MHz)	Meter Reading	+ ACF	+ CL = FS
33	20 dBμV	+ 10.36 dB	+ 0.5 = 30.86 dBμV/m @ 3m

Occupied Bandwidth: A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to -10 dBm per division.

Bandwidth 6.0dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW)=1 MHz and the video bandwidth (VBW) =3 MHz and the span set as shown on plot.

Power Output: The RF power output was measured at the antenna feed point using a spectrum analyzer

Antenna Conducted Emissions: The RBW=100 kHz, VBW=300 kHz and the span set to 10 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

ANSI C63.4-2009 10.1 Measurement Procedures: The DUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The DUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes. Emissions attenuated more than 20 dB below the permissible value are not reported.

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

§15.203 Antenna Requirements:

Requirement:

The device will be required to be professionally installed. It is not a consumer device.

§15.207 & §15.709(c)(5) POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Part 15.207

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBμV)	Average Limits (dBμV)
0.15 – 0.5	66 – 56 *	56 – 46 *
0.5 – 5.0	56	46
5.0 – 30	60	50
* Decrease with logarithm of frequency		

Test Data: The following plots represent the emissions read for power line conducted. Both lines were observed. The device was put in transmit mode.

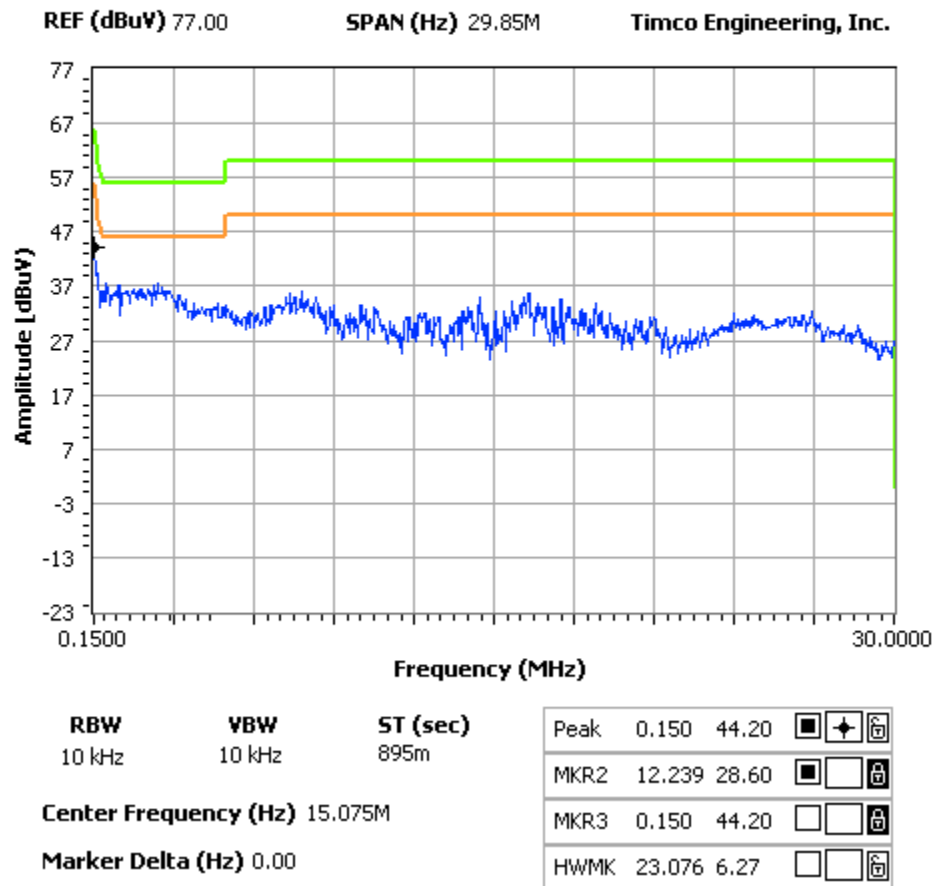
POWERLINE CONDUCTED PLOTS

Peak Detector, Line 1

NOTES:

UE Electronic
Model # UE POE-33 Line1

FCC 15.207



APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

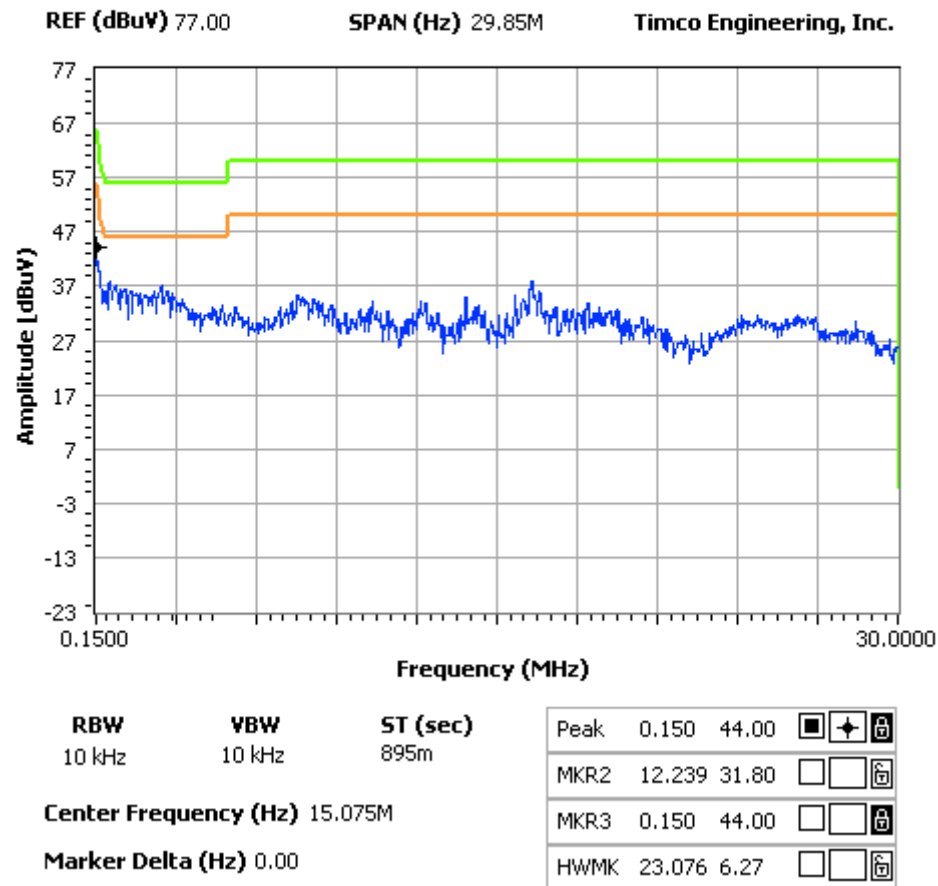
POWERLINE CONDUCTED PLOTS

Peak Detector, Line 2

NOTES:

UE Electronic
Model # UE POE-33 Line2

FCC 15.207



APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

§15.209 RADIATION INTERFERENCE

Rules Part No.: 15.709(c)(3) Emission Limits for TVBD's, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) $\mu\text{V/m}$ @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu\text{V/m}$ @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu\text{V/m}$ @ 30 meters
30 – 88	40.0 dB $\mu\text{V/m}$ @ 3 meters
80 – 216	43.5 dB $\mu\text{V/m}$ @ 3 meters
216 – 960	46.0 dB $\mu\text{V/m}$ @ 3 meters
Above 960	54.0 dB $\mu\text{V/m}$ @ 3 meters

Emissions were measured from 9 kHz or the lowest frequency generated through the 10th harmonic.
The transceiver was tuned to 3 places (low channel, mid channel, and high channel) in the band and measurements made.

The whitespace TVBD must meet 15.207 and 15.209 requirements.

Test Data: All values are peak unless noted.
Items mark with an * designate a frequency in a restricted band.
Measurement Distance is 3m.

Intentional Radiated Emissions

CH14 TX RADIATED

Tuned Frequency MHz	Emission Frequency MHz	Ant. Polarity	Field Strength dBμV/m	Margin dB
473.0	31.02	V	27.9	12.1
473.0	37.98	V	29.8	10.2
473.0	36.1	V	29.7	10.3
473.0	39.8	V	28.1	11.9
473.0	49.3	V	26.2	13.8
473.0	55.6	V	28.8	11.2
473.0	65.6	V	29.2	10.8
473.0	131.4	V	30.6	12.9
473.0	147.8	V	28.9	14.6
473.0	156.0	V	30.3	13.2
473.0	178.8	V	28.4	15.1
473.0	200.0	V	32.25	11.25
473.0	31.0	H	19.3	20.7
473.0	35.8	H	18.9	21.1
473.0	65.6	H	21	19
473.0	91.0	H	26.3	17.2
473.0	108.8	H	31.8	11.7
473.0	131.4	H	34.2	9.3
473.0	155.6	H	34.3	9.2
473.0	159.6	H	33.3	10.2
473.0	177.6	H	32.4	11.1
473.0	200.0	H	37.6	5.9
473.0	227.9	V	32.3	13.7
473.0	260.3	V	33.2	12.8
473.0	292.2	V	36.3	9.7
473.0	325.8	V	39.7	6.3
473.0	400.4	V	33.1	12.9
473.0	431.6	V	31.3	14.7
473.0	531.1	V	37.6	8.4
473.0	545.1	V	37.3	8.7
473.0	633.3	V	36.1	9.9
473.0	710.4	V	43.3	2.7
473.0	216.0	H	35.2	8.3
473.0	227.3	H	35.0	11
473.0	264.1	H	32.6	13.4
473.0	325.0	H	33.1	12.9
473.0	390.8	H	29.6	16.4
473.0	581.6	H	26.3	19.7
473.0	709.8	H	32.4	13.6
473.0	975.9	H	32.1	21.9

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

Tuned Frequency MHz	Emission Frequency MHz	Ant. Polarity	Field Strength dBμV/m	Margin dB
473.0	1,419.00	H	43.23	10.77
473.0	1,892.00	V	44.48	9.52
473.0	2,365.00	V	47.19	6.81
473.0	2,838.00	V	47.06	6.94
473.0	3,311.00	V	46.94	7.06
473.0	3,784.00	V	47.69	6.31
473.0	4,257.00	V	48.84	5.16
473.0	4,725.00	V	48.30	5.70

Items mark with an * designate a frequency in a restricted band.

Peak detector used unless noted otherwise.

CH33 TX RADIATED

Tuned Frequency MHz	Emission Frequency MHz	Ant. Polarity	Field Strength dBμV/m	Margin dB
587.0	35.6	V	30.7	9.3
587.0	65.7	V	30.0	10
587.0	131.2	V	32.6	10.9
587.0	199.9	V	35.8	7.7
587.0	91.7	H	28.1	15.4
587.0	109.0	H	31.9	11.6
587.0	129.5	H	31.0	12.5
587.0	182.3	H	33.8	9.7
587.0	200.0	H	40.1	3.4
587.0	227.6	V	33.5	12.5
587.0	258.0	V	33.6	12.4
587.0	292.0	V	29.7	16.3
587.0	325.0	V	30.2	15.8
587.0	440.5	V	36.8	9.2
587.0	465.7	V	39.4	6.6
587.0	519.8	V	37.6	8.4
587.0	537.9	V	35.7	10.3
587.0	546.9	V	34.4	11.6
587.0	646.1	V	34.5	11.5
587.0	708.6	V	38.2	7.8
587.0	735.5	V	34.5	11.5
587.0	826.5	V	37.1	8.9
587.0	994.8	V	32.1	21.9
587.0	224.0	H	38.2	7.8
587.0	253.0	H	36.6	9.4
587.0	389.2	H	31.6	14.4
587.0	520.6	H	33.9	12.1
587.0	849.3	H	41.4	4.6
587.0	943.3	H	40.8	5.2
587.0	1,171.00	V	48.68	5.32
587.0	1,173.00	H	43.19	10.81
587.0	1,760.00	H	45.22	8.78
587.0	1,761.00	V	45.92	8.08
587.0	2,348.00	V	46.24	7.76
587.0	4,113.00	V	47.90	6.10
587.0	5,868.00	V	49.55	4.45

Items mark with an * designate a frequency in a restricted band.

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

CH51 TX RADIATED

Tuned Frequency MHz	Emission Frequency MHz	Ant. Polarity	Field Strength dBμV/m	Margin dB
695.0	31.3	V	29.3	10.7
695.0	65.8	V	30.3	9.7
695.0	131.5	V	31.1	12.4
695.0	136.5	V	29.7	13.8
695.0	148.1	V	30.8	12.7
695.0	154.8	V	31.5	12
695.0	178.2	V	29.1	14.4
695.0	186.5	V	29.0	14.5
695.0	200.0	V	32.9	10.6
695.0	31.3	H	20.0	20
695.0	91.7	H	26.7	16.8
695.0	108.7	H	31.7	11.8
695.0	131.5	H	32.0	11.5
695.0	146.0	H	30.8	12.7
695.0	154.7	H	30.4	13.1
695.0	186.1	H	30.5	13
695.0	200.0	H	32.9	10.6
695.0	245.6	V	30.3	15.7
695.0	256.0	V	29.8	16.2
695.0	400.0	V	36.1	9.9
695.0	578.3	V	40.6	5.4
695.0	634.5	V	38.5	7.5
695.0	241.6	H	34.6	11.4
695.0	348.0	H	26.7	19.3
695.0	445.0	H	25.0	21
695.0	522.1	H	26.4	19.6
695.0	826.0	H	28.6	17.4
695.0	1,390.00	H	45.82	8.18
695.0	1,390.00	V	47.82	6.18
695.0	2,085.00	H	46.53	7.47
695.0	2,092.00	V	45.24	8.76
695.0	2,779.00	H	46.77	7.23
695.0	2,780.00	V	45.47	8.53
695.0	3,473.00	H	46.92	7.08
695.0	3,475.00	V	47.43	6.57
695.0	4,170.00	H	47.59	6.42
695.0	5,560.00	V	48.17	5.83
695.0	6,945.00	V	51.05	2.95

Items mark with an * designate a frequency in a restricted band.

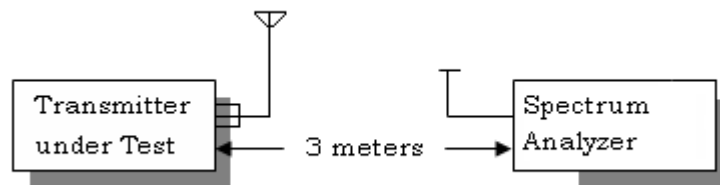
Emissions were measured from 9 kHz or the lowest frequency generated to the 10th Harmonic.

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

Method of Measuring Radiated Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was ANSI standard C63.4-2009 & the FCC/OET Guidance on Measurements for White Space devices 416721 D01 Whitespace Procedures v02

§15.709(a) Power Limits Fixed TVBD

Test Procedure: 15.709(a)(2), 15.709(a)(5)(ii), 416721 D01 Whitespace Procedures v02

Requirements: 15.709(a)(2), 15.709(a)(5)(ii)

Conducted measurement Limits (Fixed Devices)		
Antenna gain (dBi)	6 MHz power (dBm)	PSD 100 kHz (dBm)
≤6	30	12.6
9	27	9.6

Test Data:

Refer next page.

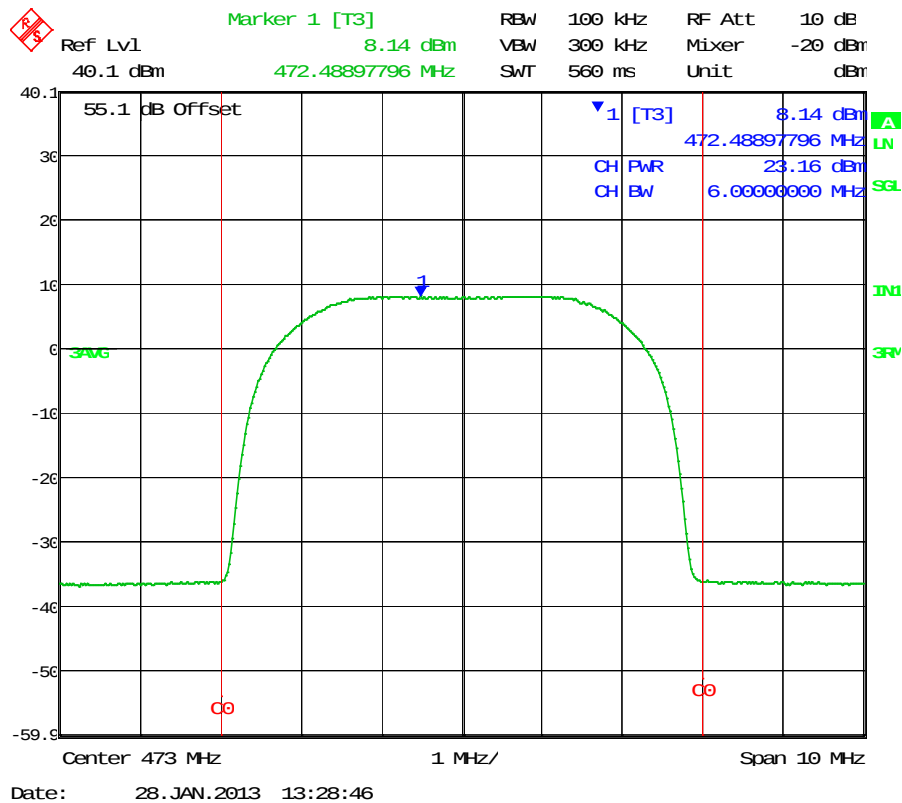
CONDUCTED RESULTS:

0 Test Results #1 Low of the Band:

Channel Frequency: 473 MHz

Measured Channel Power: (Conducted) 23.16 dBm

Highest in-band PSD: (Conducted) 8.14 dBm



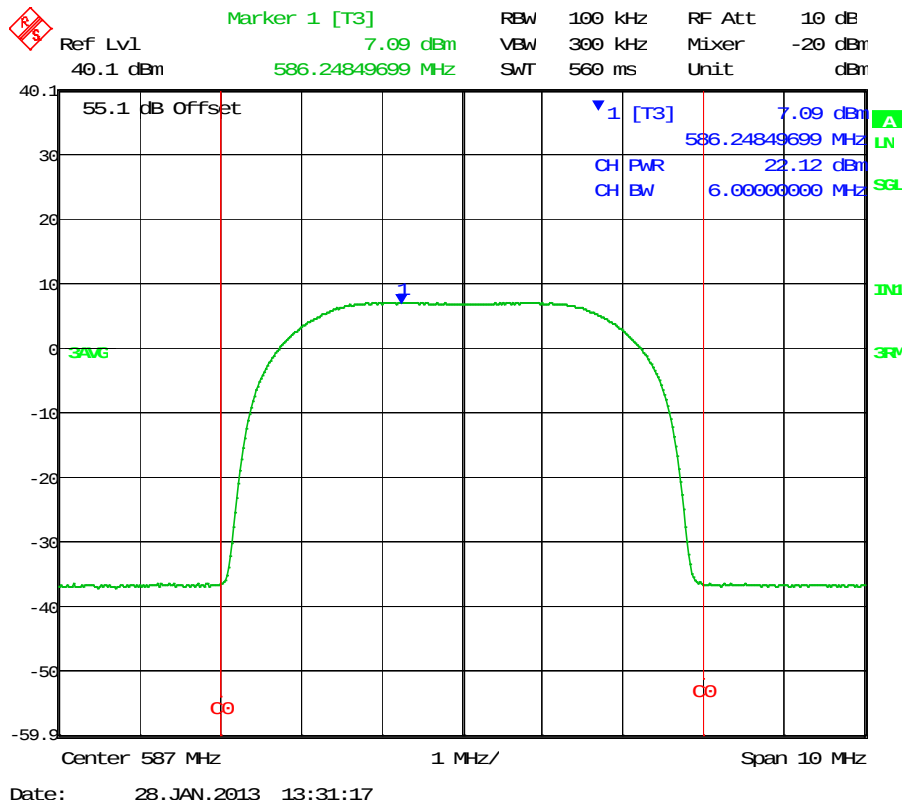
Results: **PASS, The maximum gain of the antenna is 9 dBi**

Test Results #2 Middle of the Band:

Channel Frequency: 587 MHz

Measured Channel Power: (Conducted) 22.12 dBm

Highest in-band PSD: (Conducted) 7.09 dBm



Results: **PASS, The maximum gain of the antenna is 9 dBi**

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

§15.709(a)(3)(i) Transmitter Power Control Fixed TVBD

Data:

Channel	Center (MHz)	TX Attn value	PA ATTN VALUE
14	473	15	3
33	587	15	3
51	695	15	0

The attenuator values described represent the maximum transmit power values when the device was tested.

§15.709(c)(1) Emission Limits at the band edge for TVBDs

Requirement: 15.709 (c) (ii), 15.709(c)(2) Emission Limits for TVBDs

Conducted measurement Limits (Fixed Devices)	
Antenna gain (dBi)	Adjacent Channel (dBm)
≤6	-42.8
9	-45.8

Test Data:

The measurements were made with 10 kHz RBW at the band edges, up to 200 kHz, to avoid capturing in-band signals. Since 15.709(c)(2) specifically calls out for a 100 kHz RBW, the measurements performed using 10 kHz bandwidth were integrated to show total power over two 100 kHz blocks. Beyond 200 kHz displacement, an RBW of 100 kHz was used for measurements.

Conducted measurements

Ch	Center (MHz)	Attn value	fL-6 MHz to fL-200 kHz (dBm)	fL-200 kHz to fL-100 kHz (dBm)	fL-100 kHz to fL (dBm)
14	473	35	-46.15	-47.4	-46.65
33	587	28	-46.09	-47.8	-46.11
51	695	18	-46.41	-47.2	-46.67

Ch	Center (MHz)	Attn value	fH to fH+100 kHz (dBm)	fH+100 kHz to fH+200 kHz (dBm)	fH+200kHz to fH+6 MHz (dBm)
14	473	35	-46.6	-47.3	-45.83
33	587	28	-46.08	-47.91	-46.2
51	695	18	-48.63	-48.87	-46.85

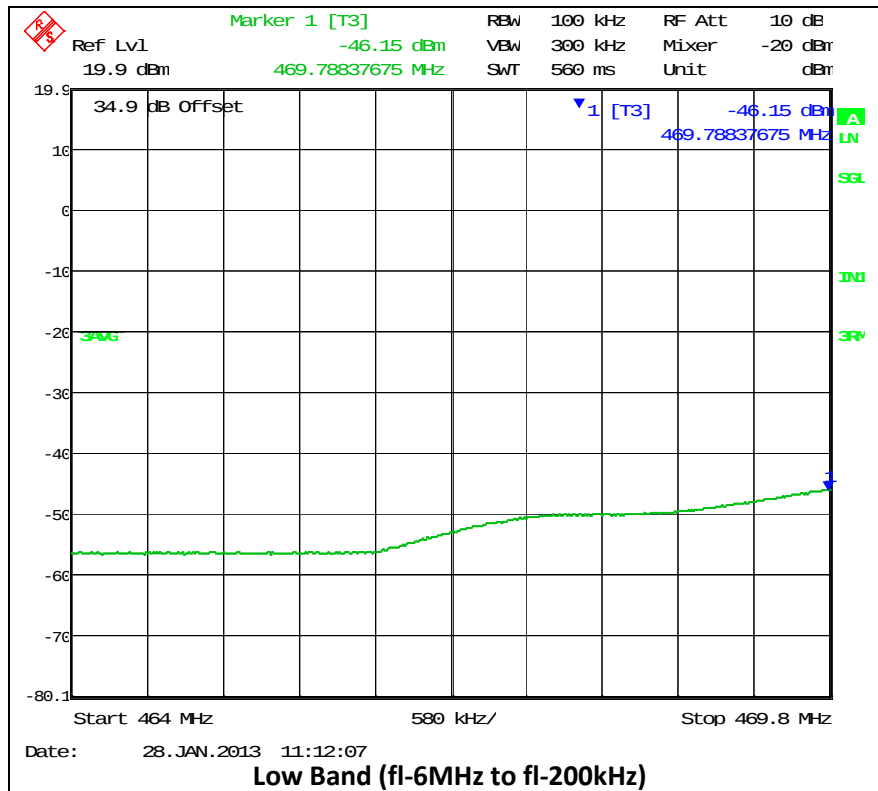
APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

Conducted Plots

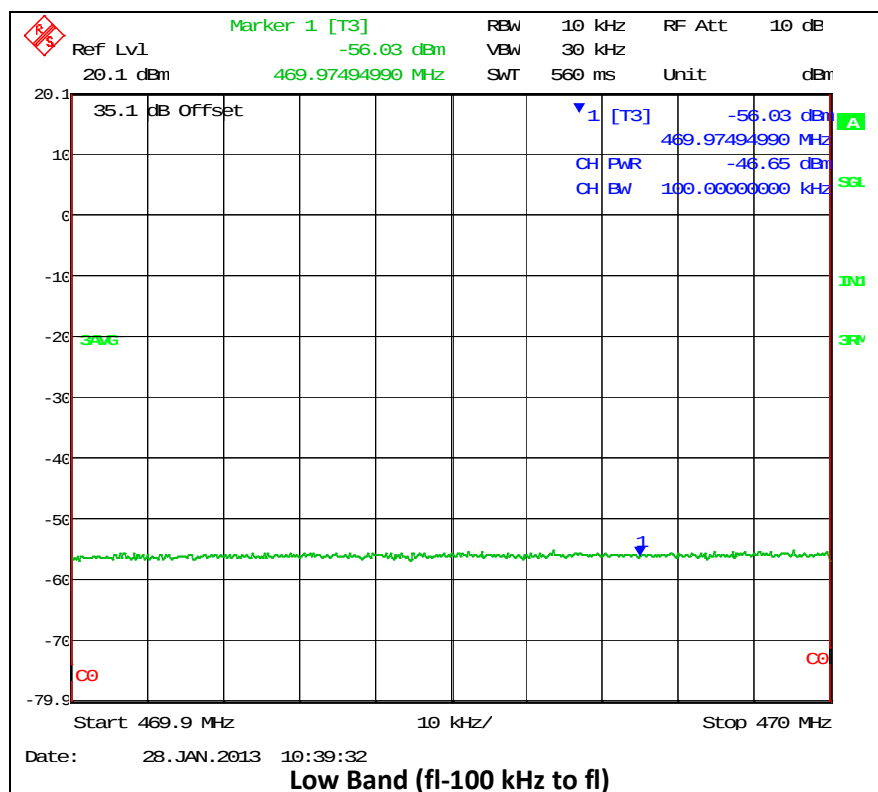
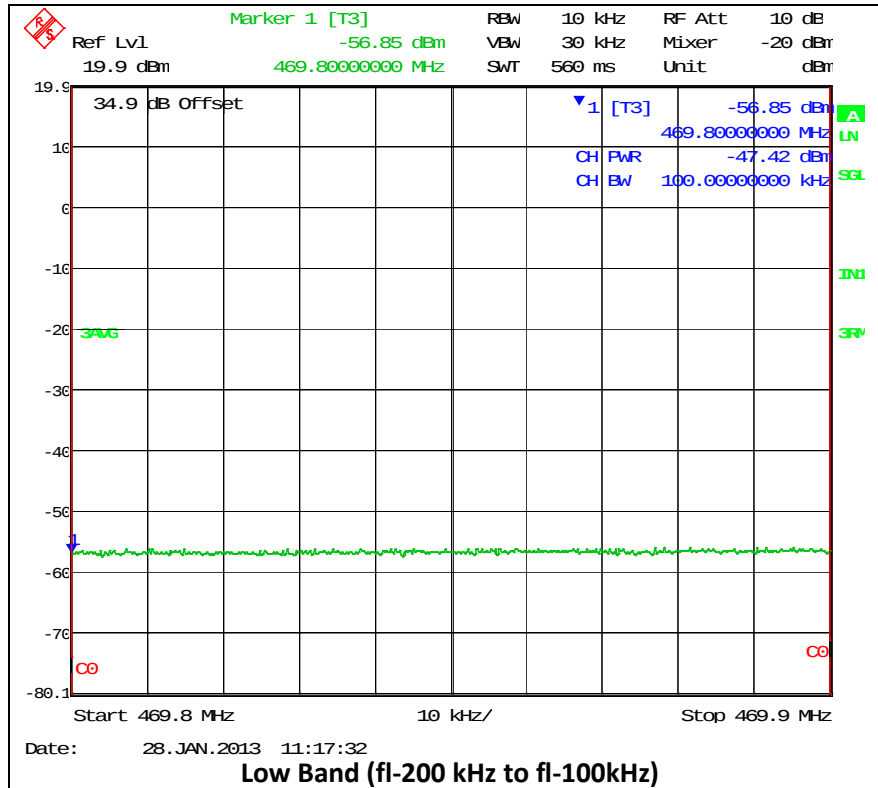
0 Test Results #1 Low of the Band:



APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

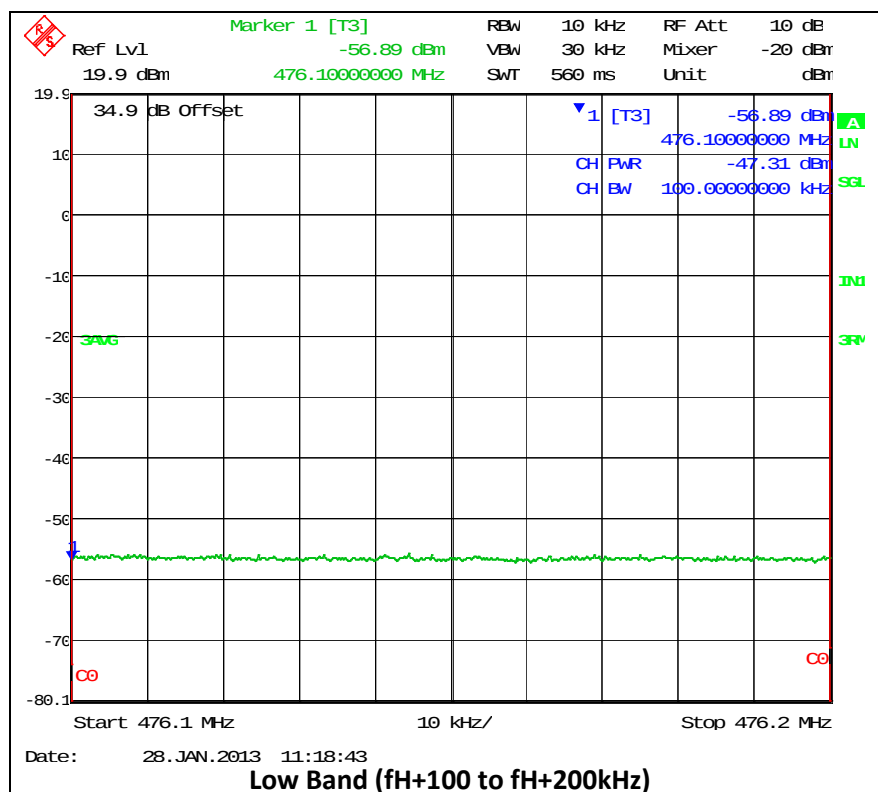
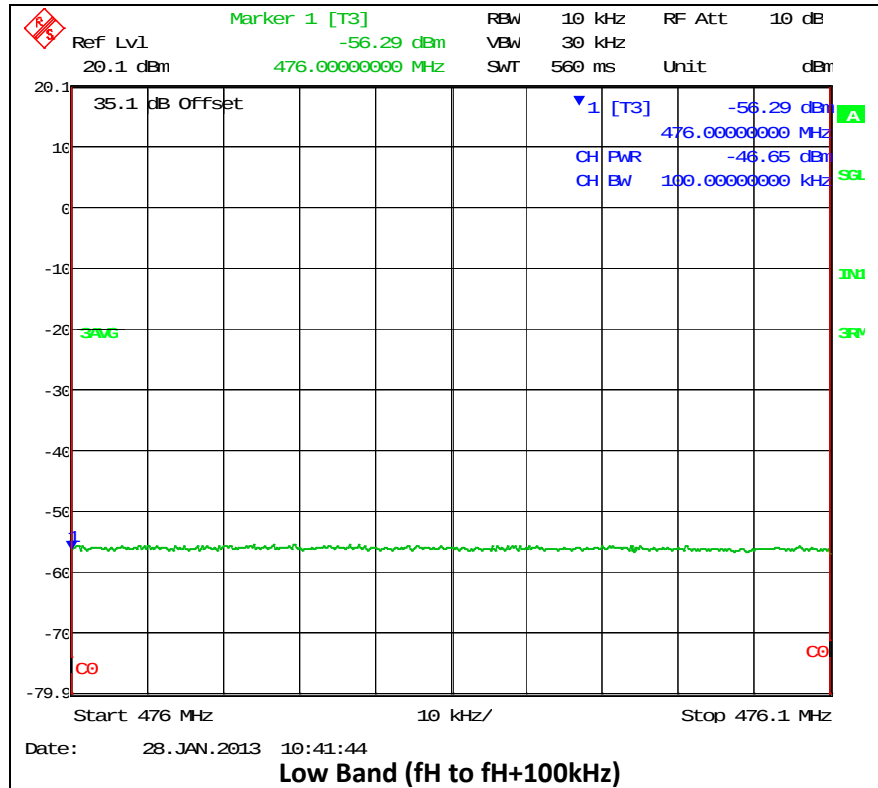
REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

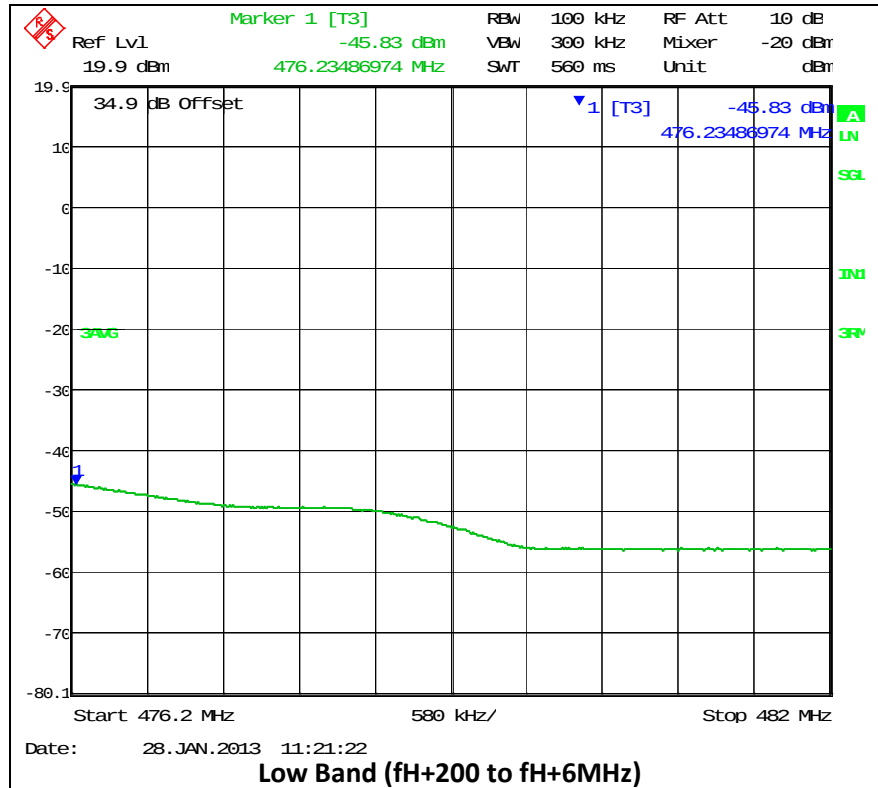
REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

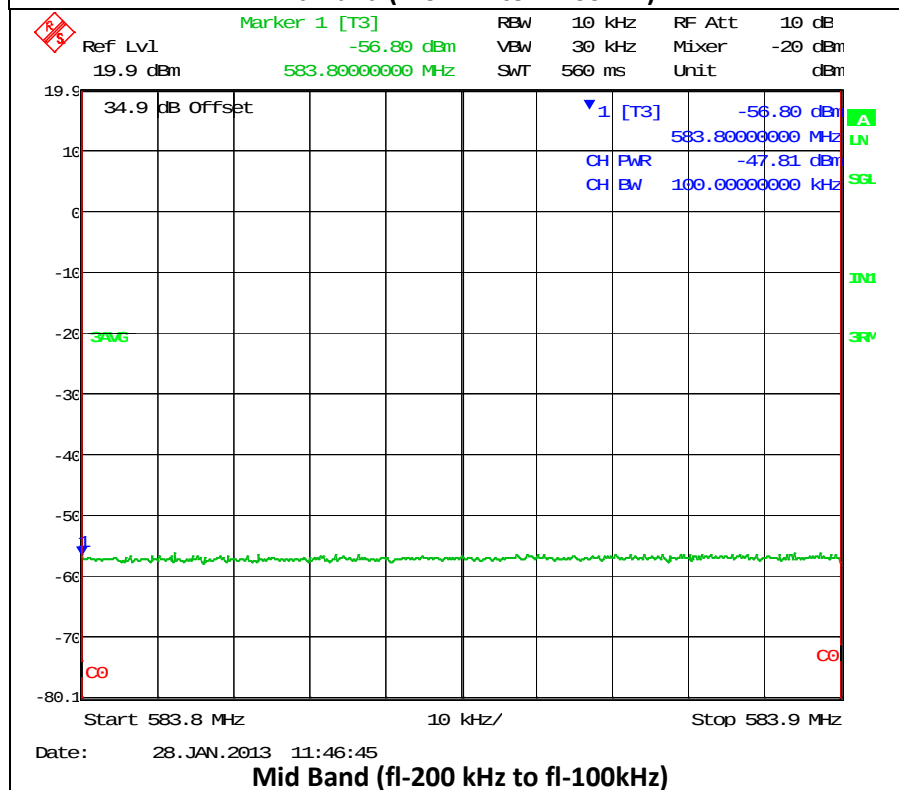
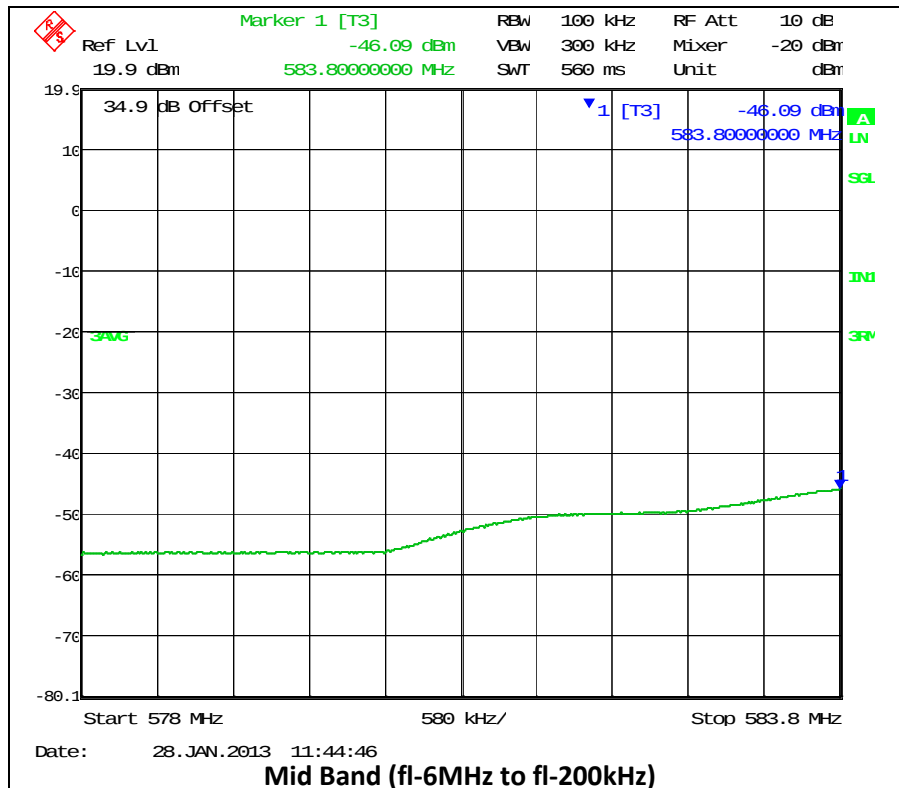


APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

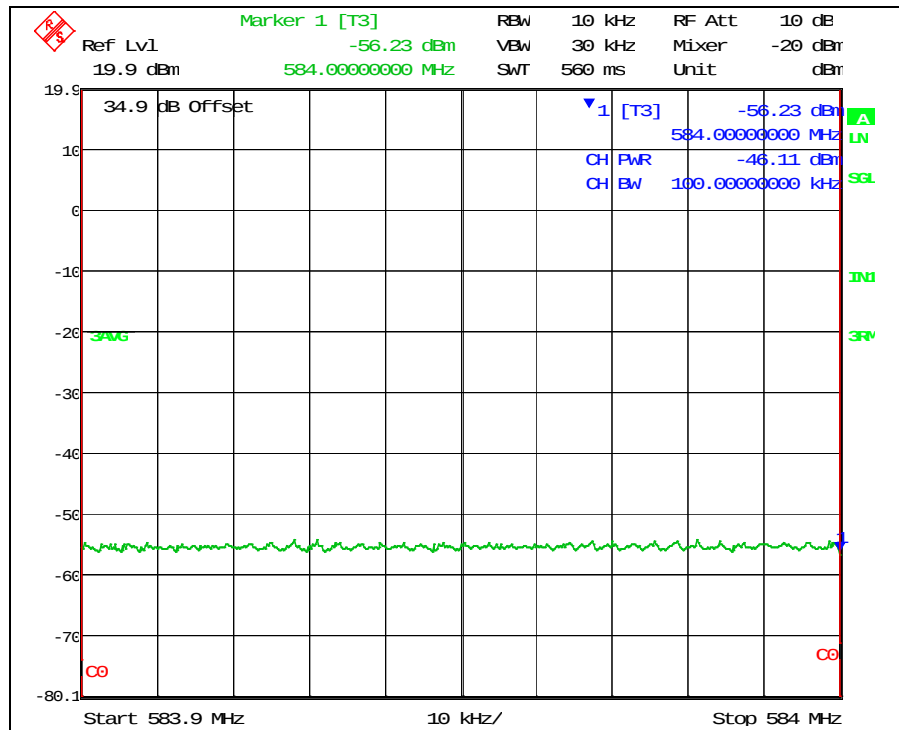
0 Test Results #2 Mid of the Band:



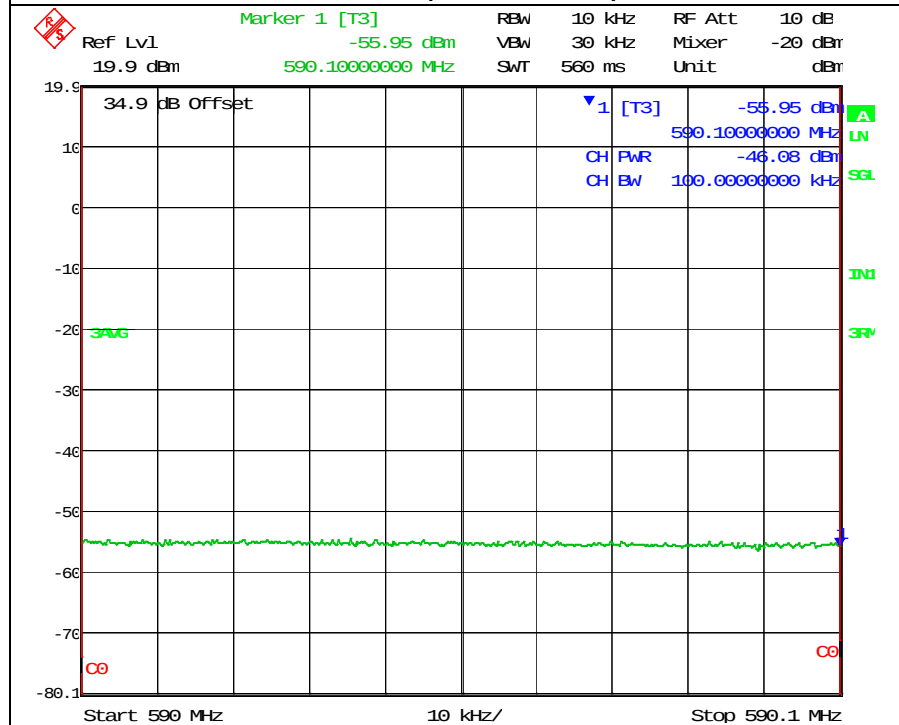
APPLICANT.: Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



Mid Band (fl-100 kHz to fl)

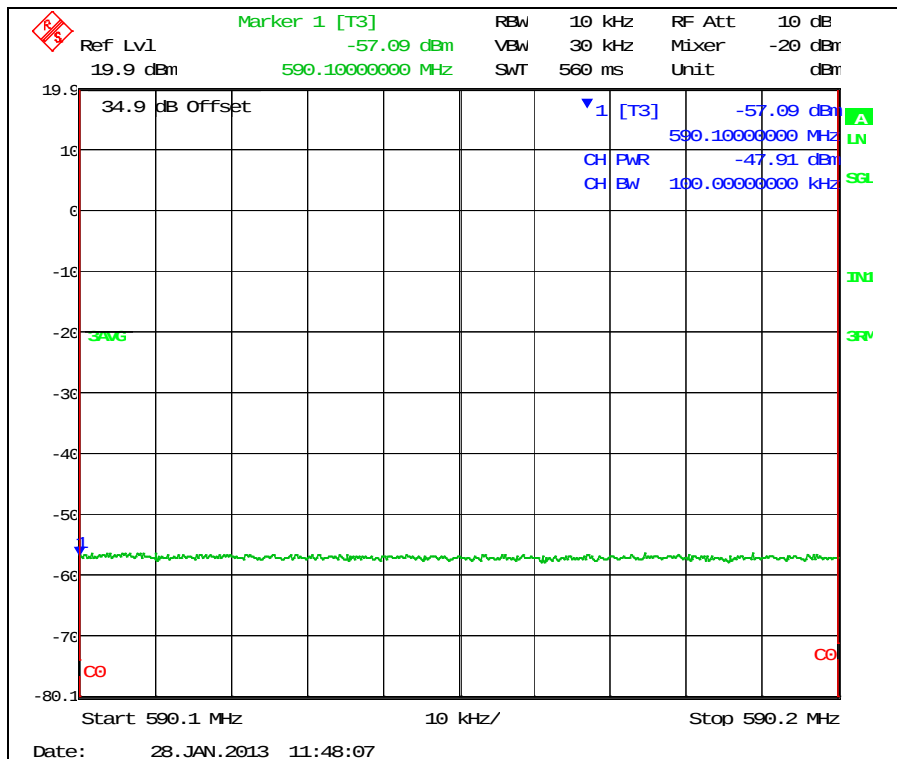


Mid Band (fH to fH+100kHz)

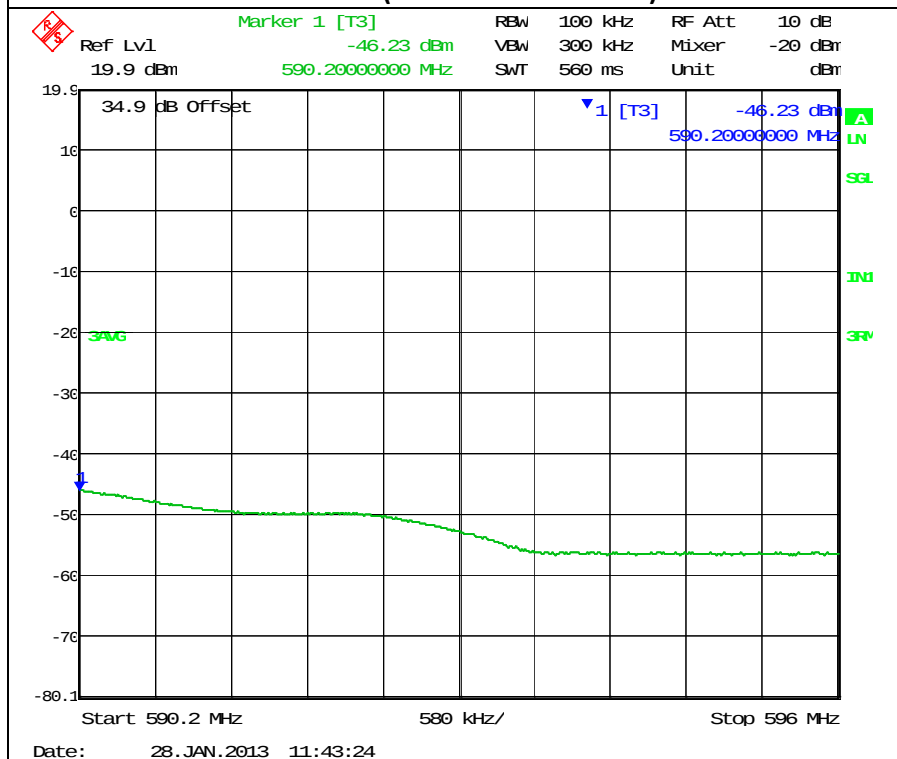
APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



Mid Band (fH+100 to fH+200kHz)



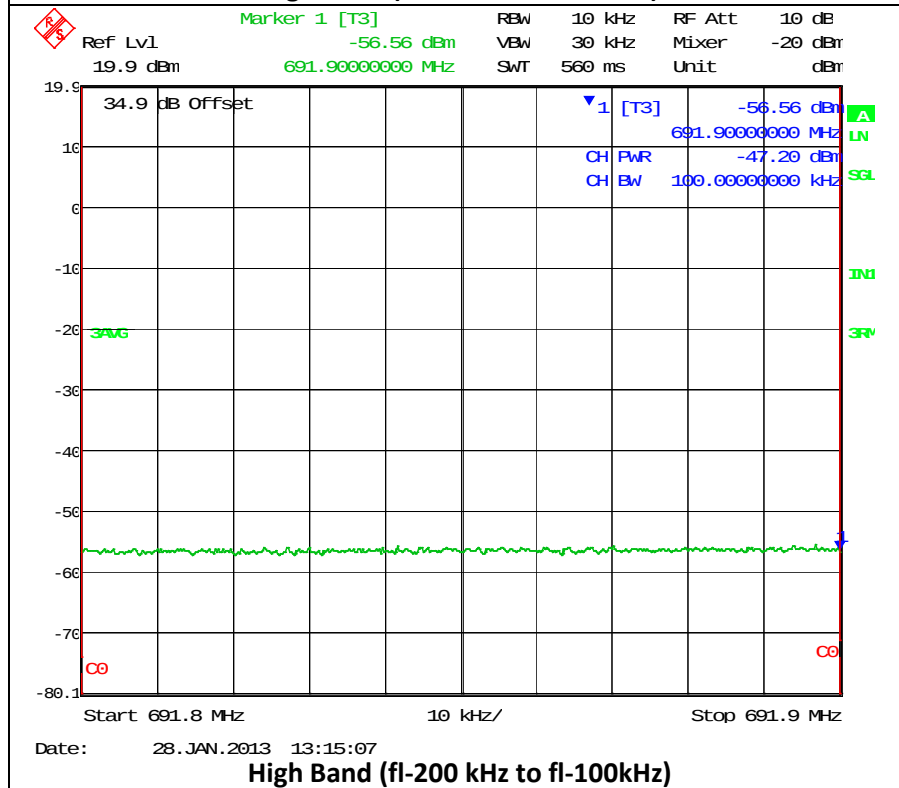
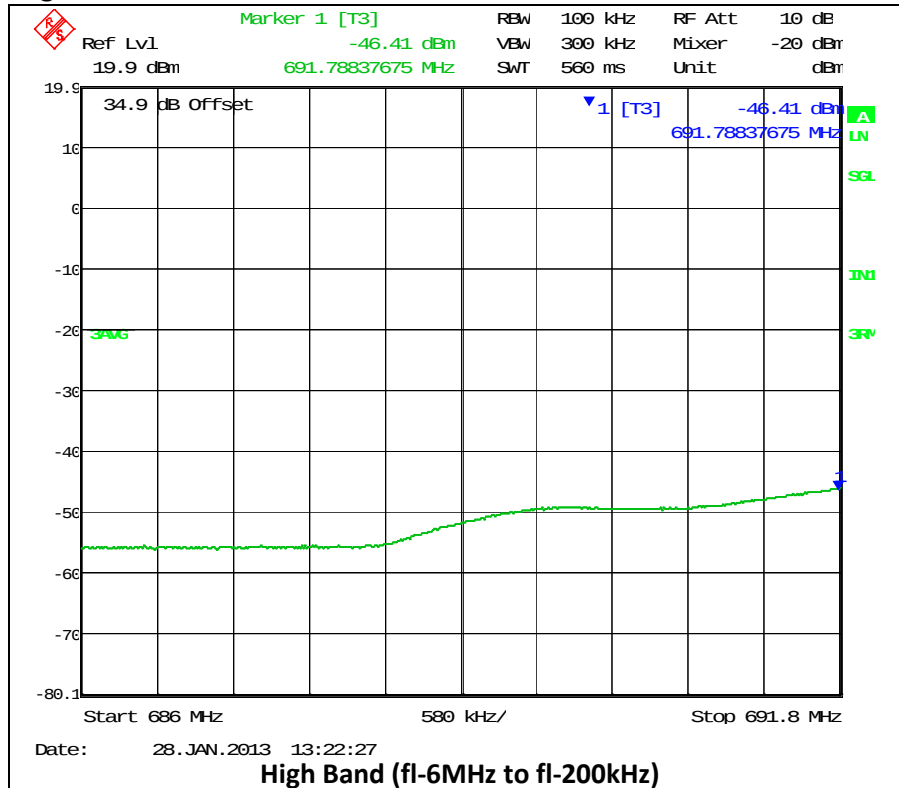
Mid Band (fH+200 to fH+6MHz)

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

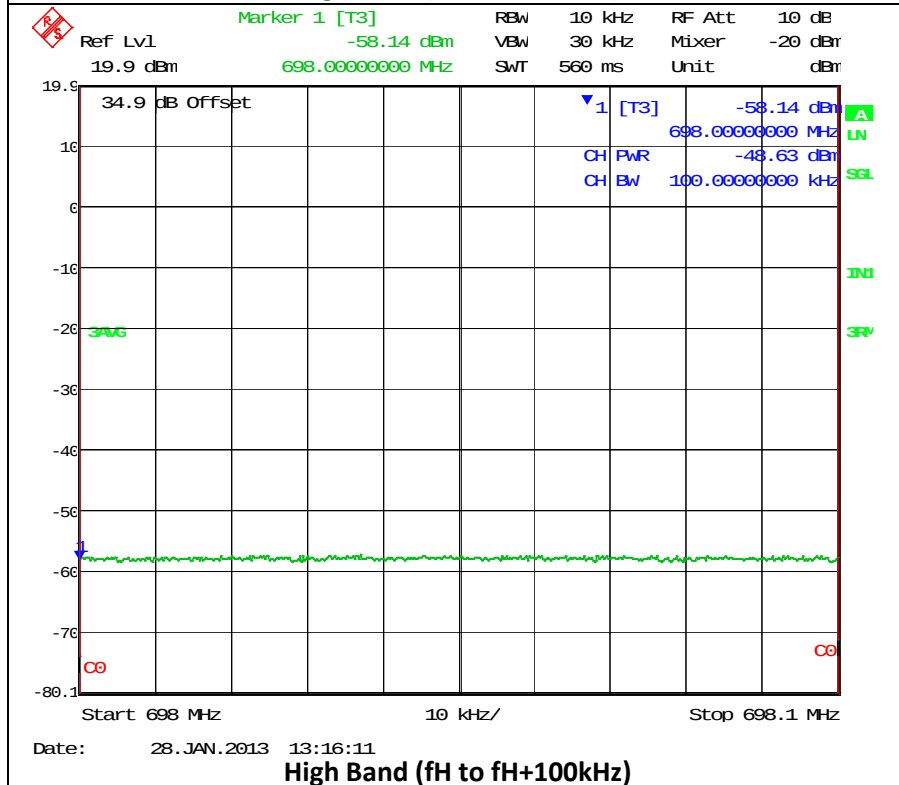
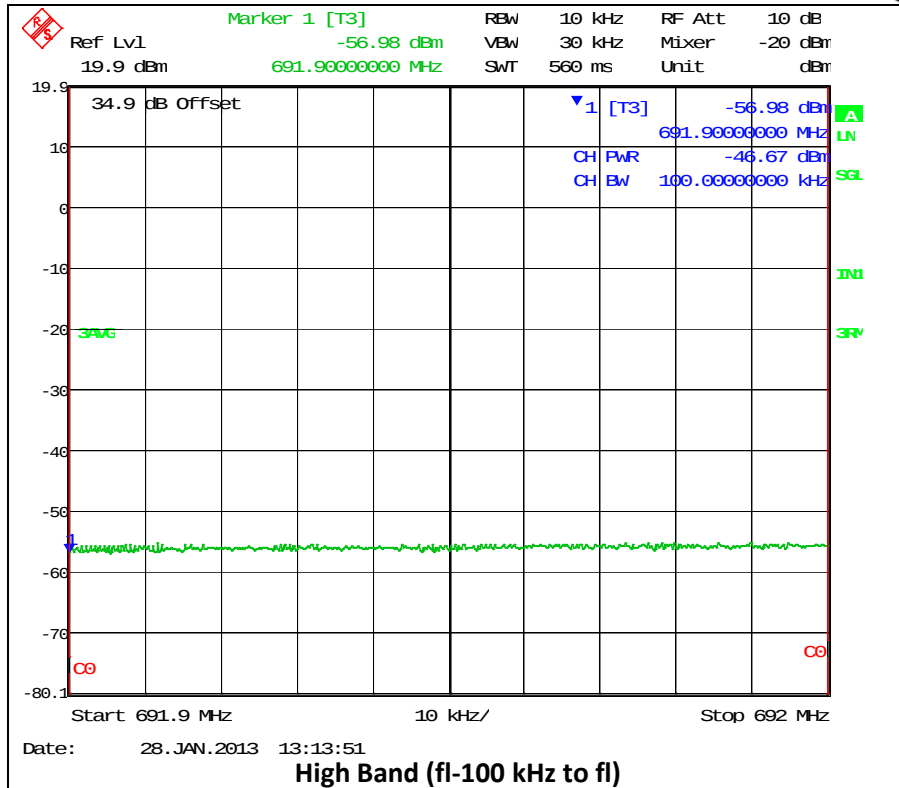
0 Test Results #2 High Band:



APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

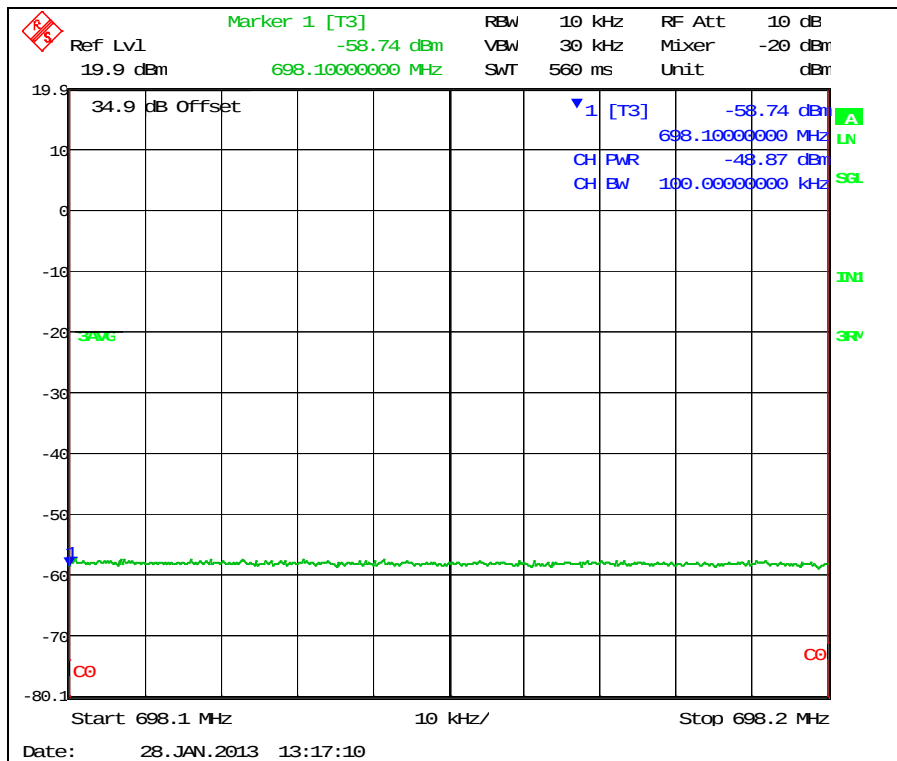
REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



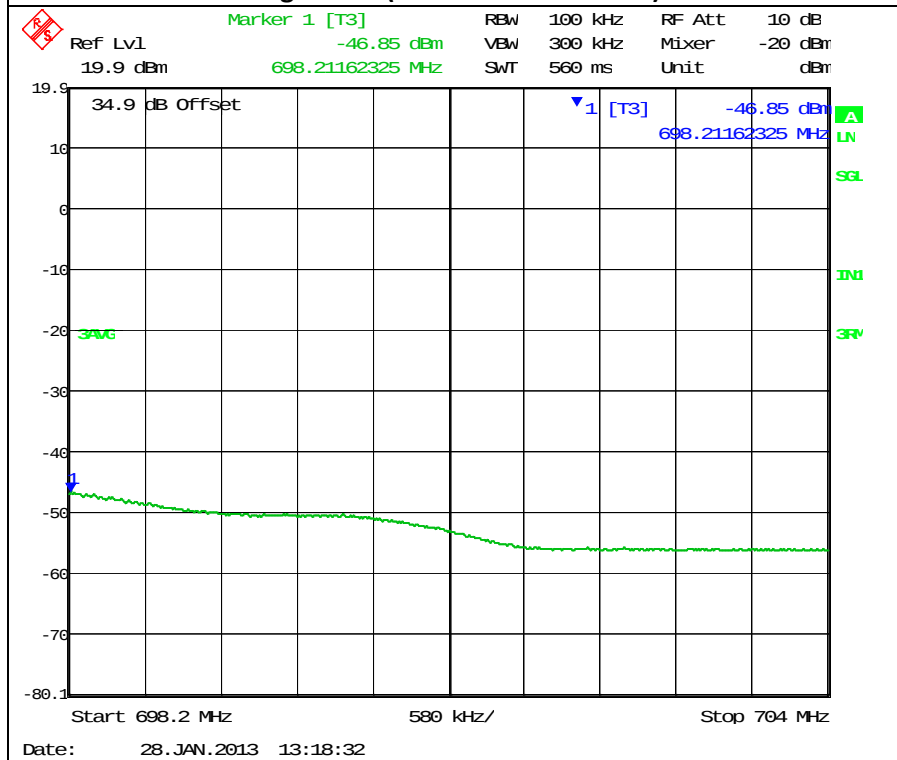
APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



High Band (fH+100 to fH+200kHz)



High Band (fH+200 to fH+6MHz)

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

§15.709(c)(4) Emission in the band of 602-620MHz Limits for TVBDs

Requirements:

Frequency MHz	Field Strength dBμV/m/120kHz
602-607	120-5[F(MHz)-602]
607-608	95
608-614	30
614-615	95
615-620	120-5[620-F(MHz)]

Worst case limits for the respective bands,

Frequency MHz	Field Strength dBμV/m/120kHz
602-607	95 (@607 MHz)
607-608	95
608-614	30
614-615	95
615-620	95 (@615 MHz)

Test Data:

Note:

The testing distance was 1m. Quasi-peak detector was used for measurement in the 608-614 MHz band.

- 602-620 MHz Emissions (with TX at CH 35)

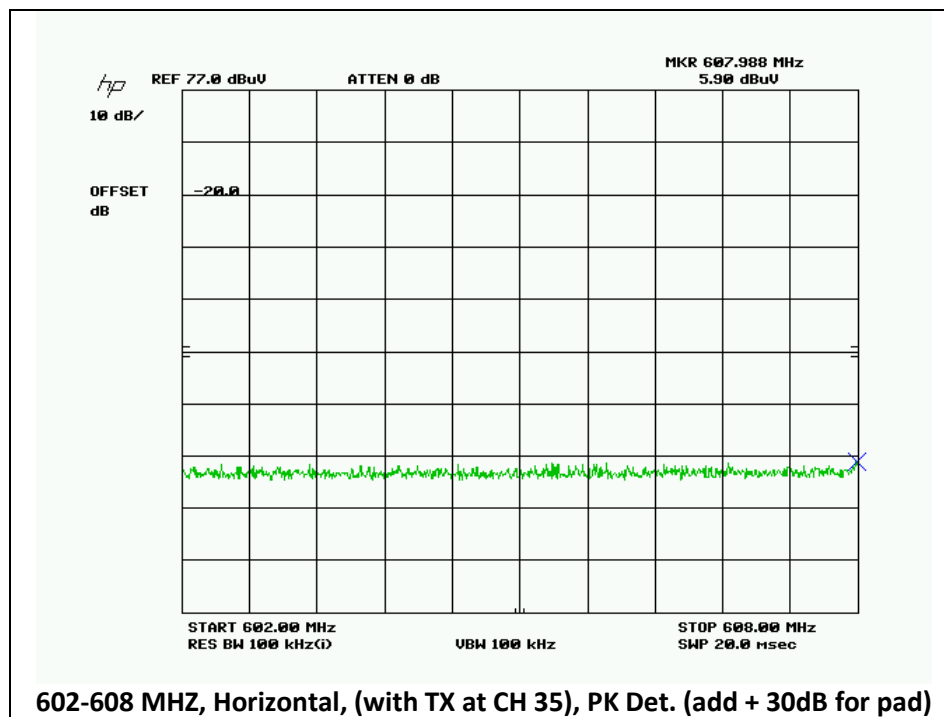
Emission Frequency MHz	Meter Reading dBμV	Det.	Ant. Pol.	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Worst Case Limit dBμV/m
602.10	44.4	PK	V	1.60	19.82	65.82	95
607.90	35.9	PK	H	1.61	19.88	57.39	95
608.01	7.7	QP	H	1.61	19.88	29.17	30
608.03	7.4	QP	V	1.61	19.88	28.87	30
616.22	36.3	PK	V	1.62	19.96	57.88	95
619.18	37.1	PK	H	1.62	19.99	58.71	95

- 602-620 MHz Emissions (with TX at CH 39)

Emission Frequency MHz	Meter Reading dBμV	Det.	Ant. Pol.	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Worst Case Limit dBμV/m
607.18	36.3	PK	H	1.61	19.87	57.78	95
607.90	36.7	PK	V	1.61	19.88	58.19	95
608.02	7.4	QP	V	1.61	19.88	28.87	30
608.10	6.8	QP	H	1.61	19.88	28.31	30
616.92	36.1	PK	H	1.62	19.97	57.69	95
619.65	64.7	PK	V	1.62	20.00	86.32	95

Plots:

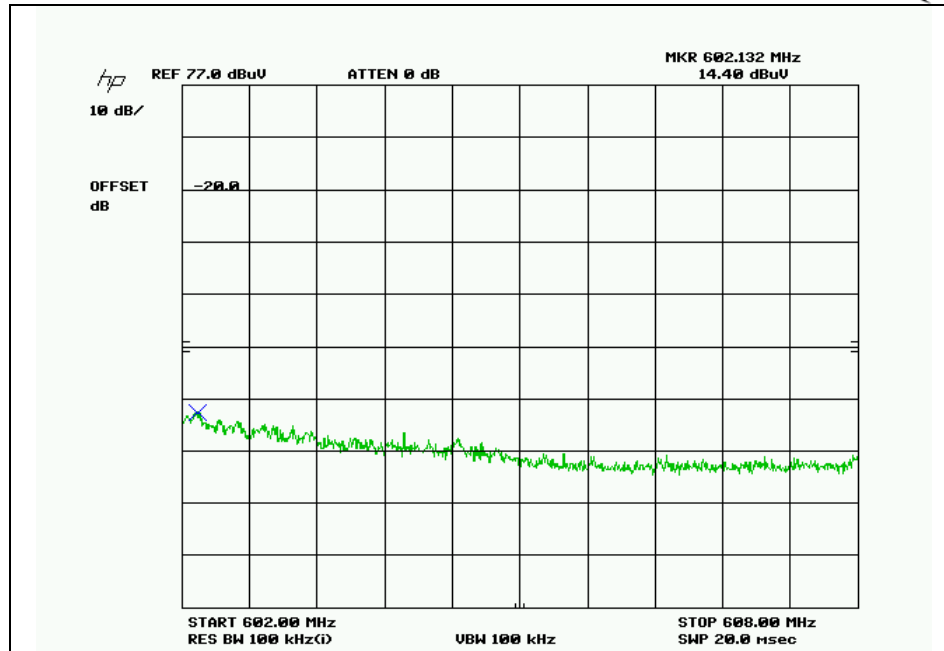
- 602-620 MHz Emissions (with TX at CH 35)



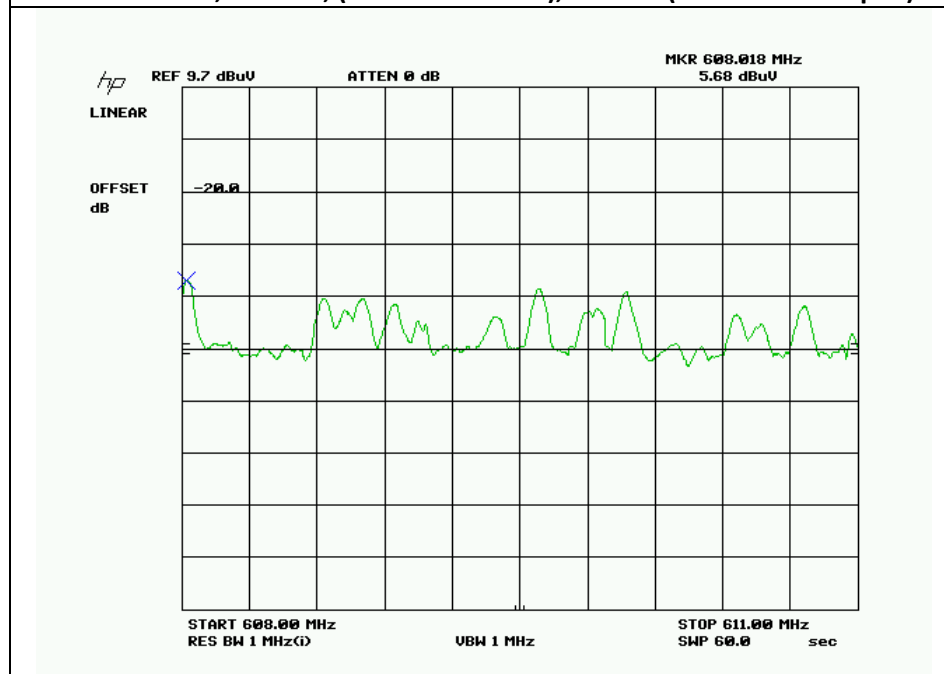
APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



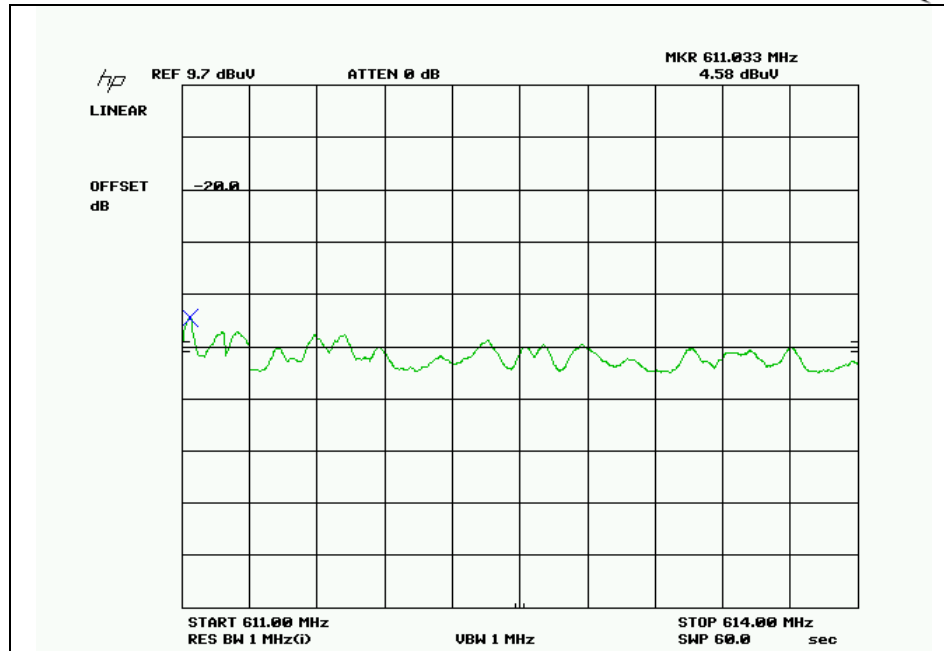
602-608 MHz, Vertical, (with TX at CH 35), PK Det. (add + 30dB for pad)



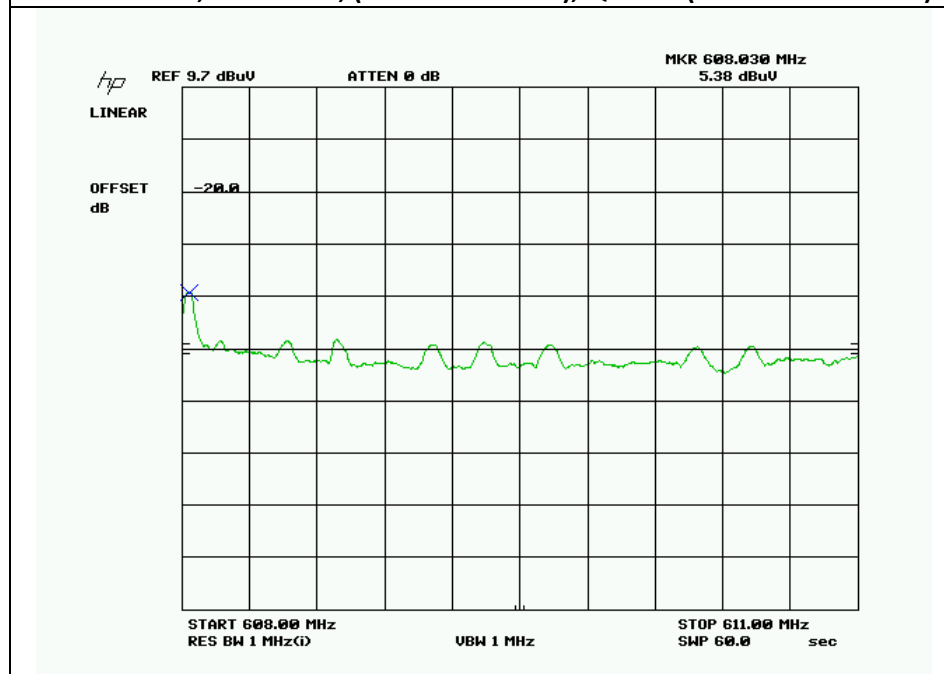
APPLICANT. : Carlson Wireless Technologies Inc.

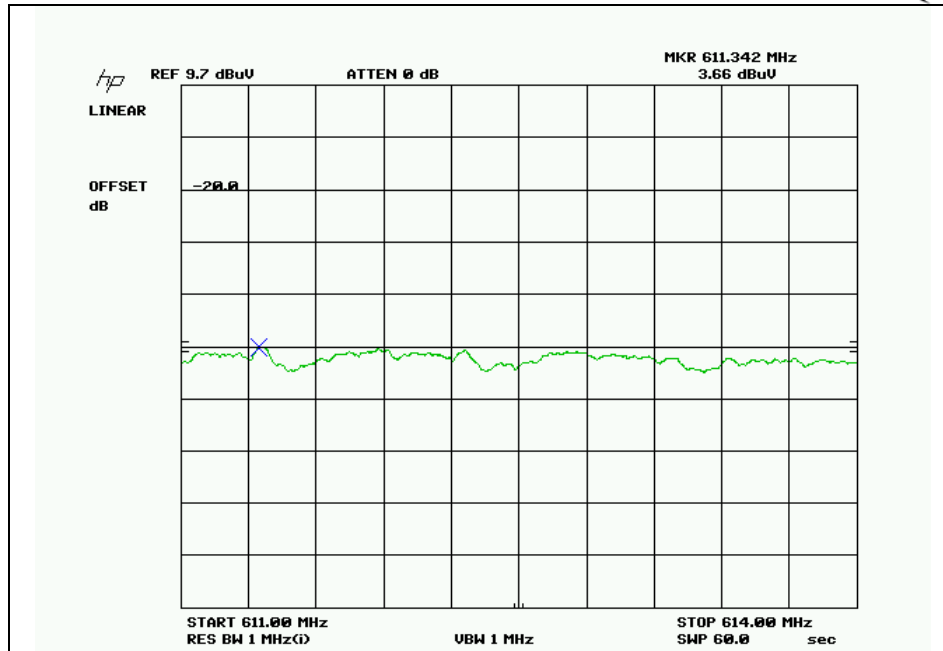
FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

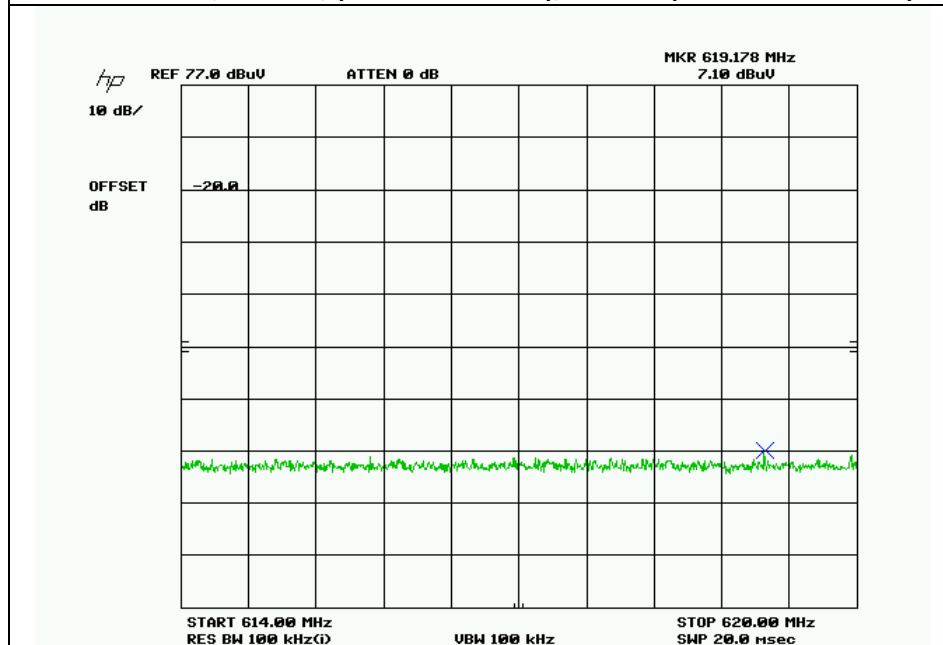


608-614 MHZ, Horizontal, (with TX at CH 35), QP Det. (add + 2dB for filter)





608-614 MHZ, Vertical, (with TX at CH 35), QP Det. (add + 2dB for filter)

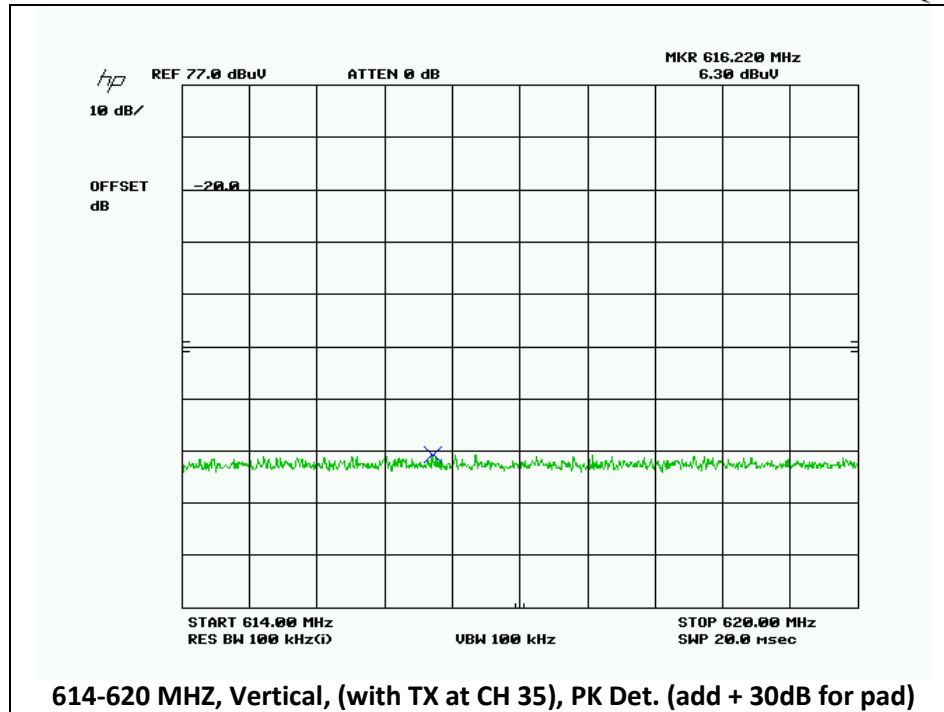


614-620 MHZ, Horizontal, (with TX at CH 35), PK Det. (add + 30dB for pad)

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

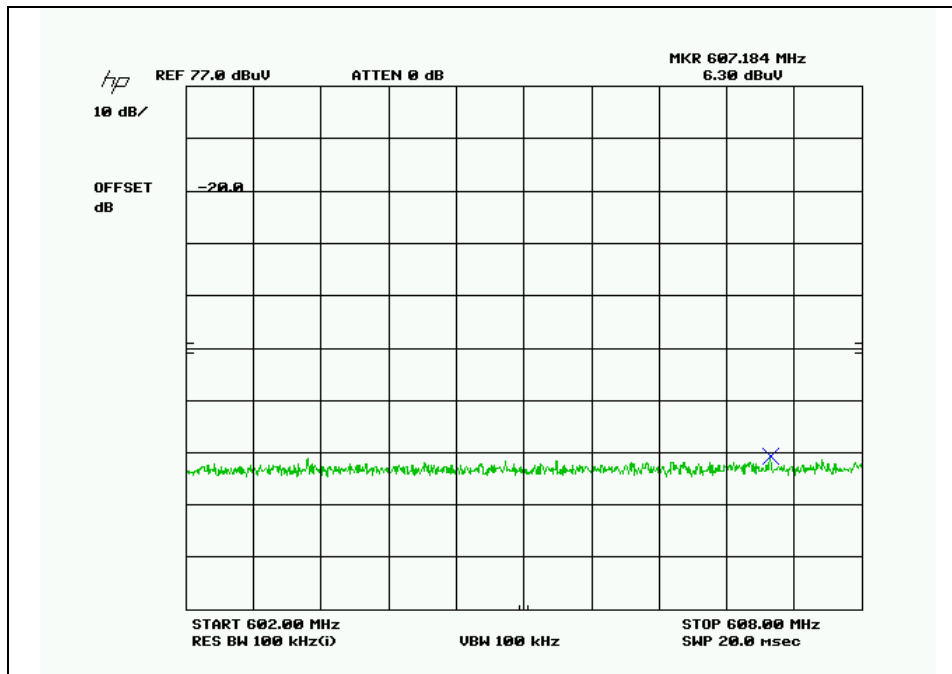


APPLICANT. : Carlson Wireless Technologies Inc.

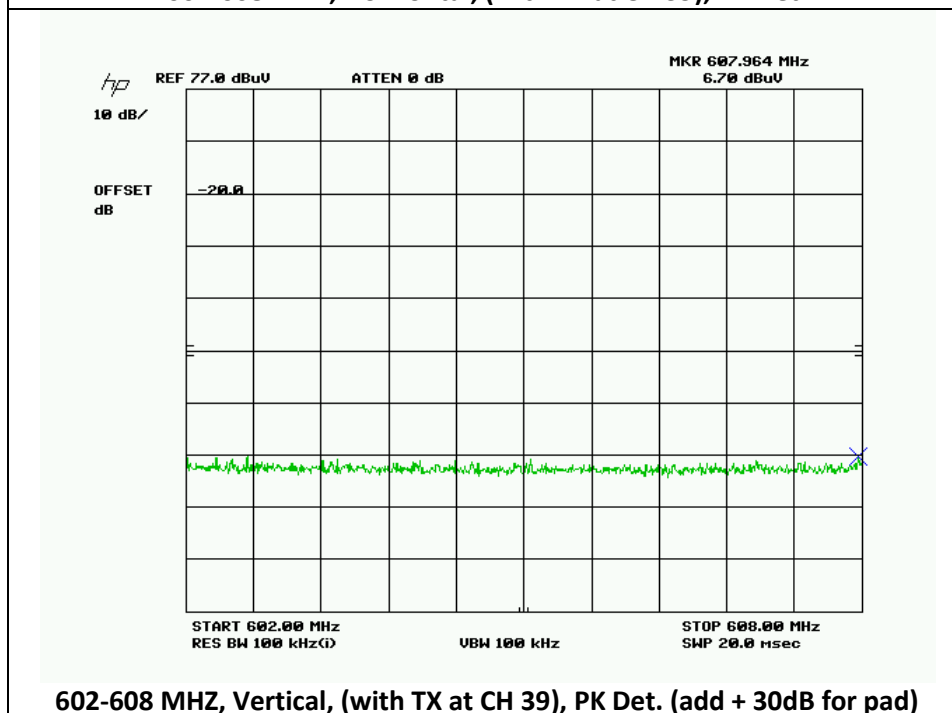
FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc

- 602-620 MHz Emissions (with TX at CH 39)



602-608 MHz, Horizontal, (with TX at CH 39), PK Det.

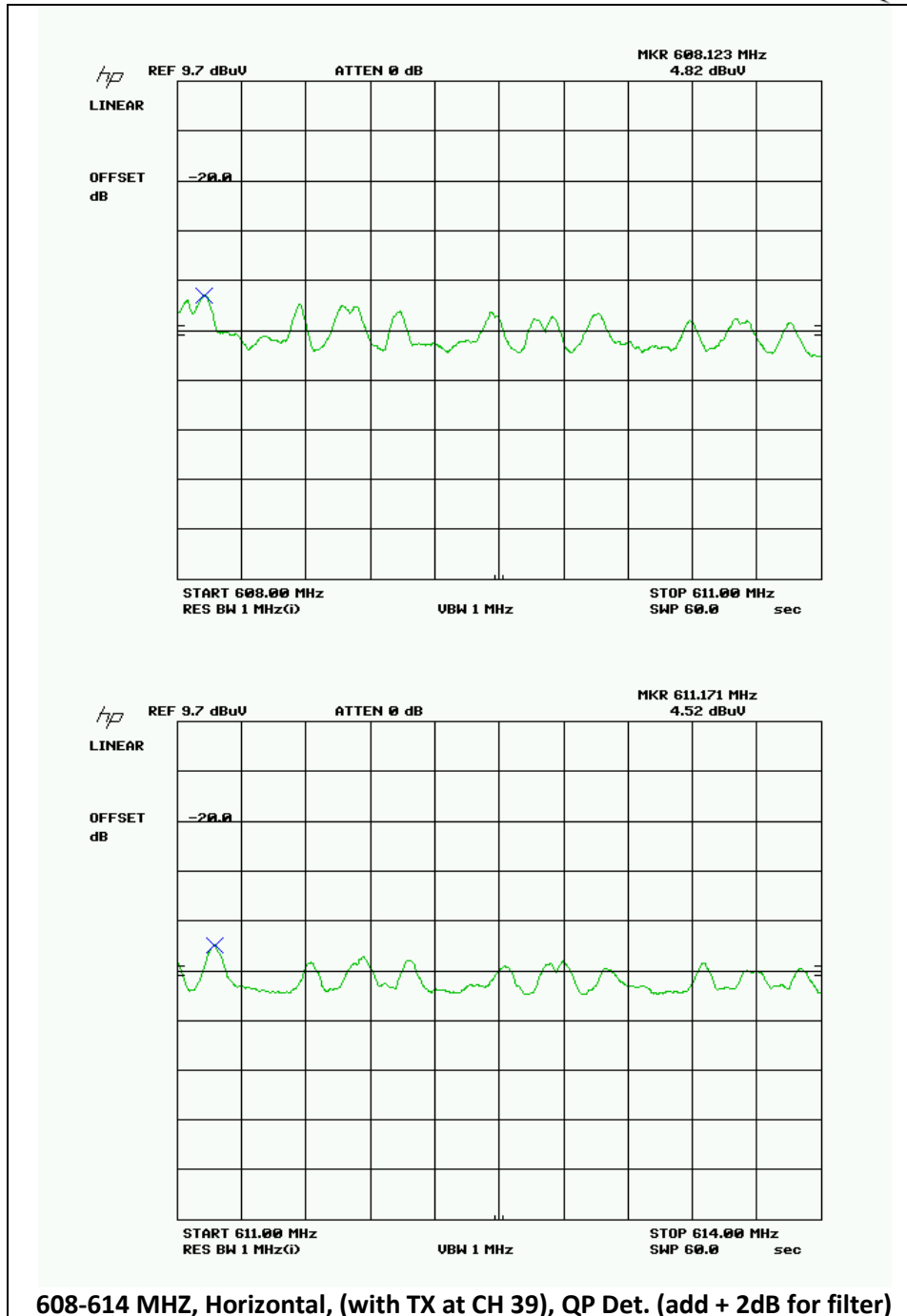


602-608 MHz, Vertical, (with TX at CH 39), PK Det. (add + 30dB for pad)

APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

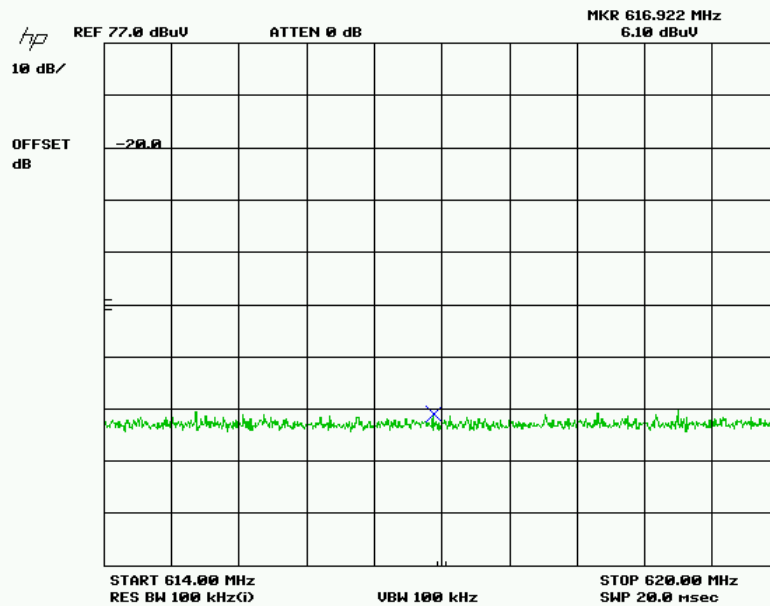
REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



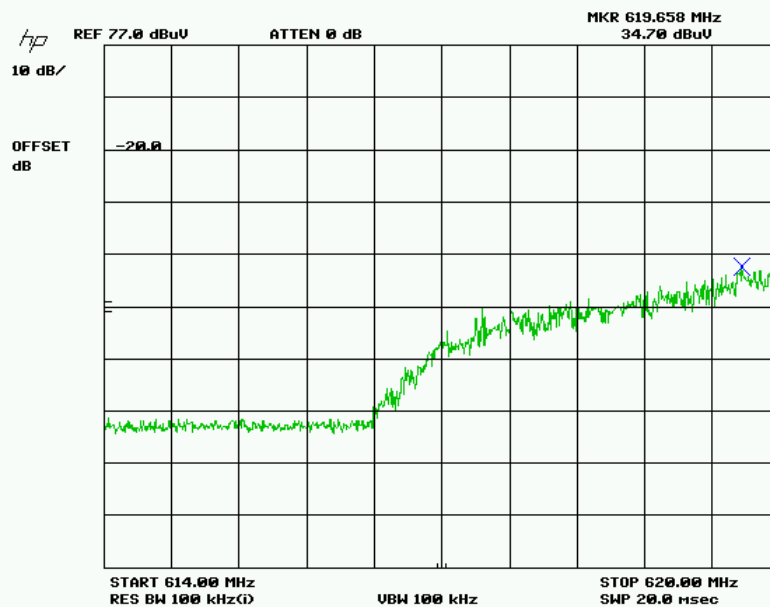
APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



614-620 MHZ, Horizontal, (with TX at CH 39), PK Det. (add + 30dB for pad)



614-620 MHZ, Vertical, (with TX at CH 39), PK Det(add + 30dB for pad)

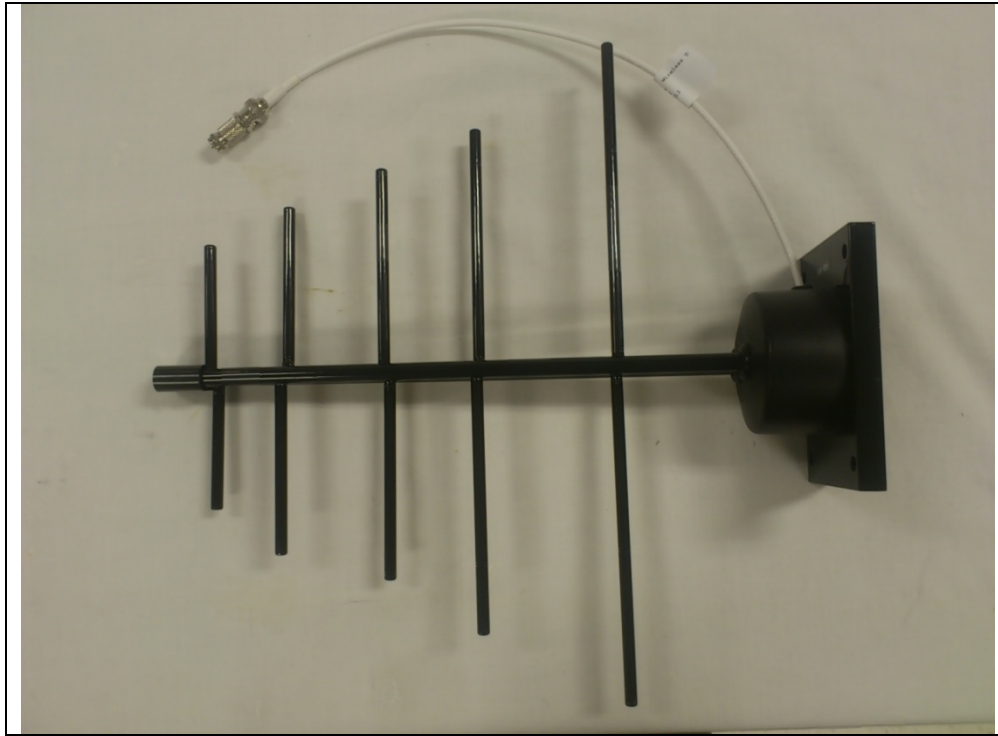
Product Photos



APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc



APPLICANT. : Carlson Wireless Technologies Inc.

FCC ID: OPA-RC2-CPE

REPORT: V:\C\CARLSON\841UT13\841AUT13 PART1 TestReport_Rev1.doc