

# Nextivity, Inc.

ADDENDUM TO TEST REPORT 95395-15

**Provider Specific Consumer Signal Booster  
Model: Cel-Fi D32-2/4**

**Tested To The Following Standards:**

**FCC PART 24E**

**Report No.: 95395-15A**

**Date of issue: May 8, 2014**



This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

Nextivity, Inc.  
12230 World Trade Dr  
San Diego, CA 92128

Representative: Michiel Lotter  
Customer Reference Number: 001889

**DATE OF EQUIPMENT RECEIPT:**

**DATE(S) OF TESTING:**

**REPORT PREPARED BY:**

Morgan Tramontin  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

Project Number: 95395

March 10, 2014

March 10 - April 2, 2014

### Revision History

**Original:** Testing of the Provider Specific Consumer Signal Booster, Cel-Fi D32-2/4 to FCC Part 24E.

**Addendum A:** To replace all test data, test plots and test setup photos for section 2.1055(a)(d) / 24.235 Frequency Stability.

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



**Steve Behm**  
*Director of Quality Assurance & Engineering Services*  
*CKC Laboratories, Inc.*

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):  
CKC Laboratories, Inc.  
110 Olinda Place  
Brea, CA 92823

### Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.00.14

### Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Brea A	US0060	SL2-IN-E-1146R	3082D-1	90473	A-0147

## SUMMARY OF RESULTS

### Standard / Specification: FCC Part(s) 2 / 24E

Test Procedure/Method	Description	Results
2.1046	RF Power Output	NA <sup>1</sup>
2.1047	Modulation Characteristics	NA <sup>2</sup>
2.1049 (I)	Occupied Bandwidth	Pass
2.1051 / 24.238(a)	Spurious Emissions at Antenna Terminals	Pass
2.1053 / 24.238(a)	Field Strength of Spurious Radiation	Pass
2.1055(a)(d) / 24.235	Frequency Stability	Pass

NA<sup>1</sup> = A different standard applies; see applicable test report.

NA<sup>2</sup> = Not applicable. See the section in the report for the reason.

## Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
None

## EQUIPMENT UNDER TEST (EUT)

### EQUIPMENT UNDER TEST

#### Provider Specific Consumer Signal Booster

Manuf: Nextivity, Inc.  
Model: Cel-Fi D32-2/4 CU  
Serial: 17540600036

#### Provider Specific Consumer Signal Booster

Manuf: Nextivity, Inc.  
Model: Cel-Fi D32-2/4 NU  
Serial: 174406000145

### PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

#### Signal Generator

Manuf: Agilent  
Model: E4438C  
Serial: MY42082260

#### Power Supply

Manuf: Hon-Kwang  
Model: HK-AX-120A150-US  
Serial: NA

#### Power Supply

Manuf: Hon-Kwang  
Model: HK-AX-120A150-US  
Serial: NA

## FCC PART(S) 2 / 24E

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) requirements for 47 CFR Part 2: Frequency Allocations and Radio Treaty Matters, General Rules and Regulations and Licensed Device falling under Part 24: Personal Communications Services.

### 2.1047 Modulation Characteristics

Not applicable because the EUT does not employ modulation characteristics.

### 2.1049(I) Occupied Bandwidth

#### Test Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Nextivity, Inc.**  
 Specification: **7.10 Occupied Bandwidth**  
 Work Order #: **95395** Date: 3/12/2014  
 Test Type: **Conducted Emissions** Time: 09:37:42  
 Equipment: **Provider Specific Consumer Signal Booster** Sequence#: 1  
 Manufacturer: Nextivity, Inc. Tested By: E. Wong  
 Model: Cel-Fi D32-2/4 110V 60Hz  
 S/N: 175406000036, 174406000145

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	9/4/2012	9/4/2014
T2	AN03430	Attenuator	75A-10-12	9/5/2013	9/5/2015
T3	ANP06543	Cable	32022-29094K-29094K-24TC	11/20/2013	11/20/2015

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Provider Specific Consumer Signal Booster*	Nextivity, Inc.	Cel-Fi D32-2/4 CU	175406000036
Provider Specific Consumer Signal Booster	Nextivity, Inc.	Cel-Fi D32-2/4 NU	174406000145

**Support Devices:**

Function	Manufacturer	Model #	S/N
Signal Generator	Agilent	E4433B	US40052164
Signal Generator	Agilent	E4438C	MY42082260
Power Supply	Hon-Kwang	HK-AX-120A150-US	NA
Power Supply	Hon-Kwang	HK-AX-120A150-US	NA

***Test Conditions / Notes:***

The EUT is a provider specific signal booster pair consisting of a Network unit (NU) and a Coverage unit (CU) using proprietary 5.8GHz Wireless interface.

The EUT is manufacturer configurable to operate in relay bandwidth of 5MHz, 10MHz, 15MHz and 20MHz within the CMRS band by setting the bandwidth and center frequency of programmable Spectrum Block Filter, Gain and other operational parameter based on received public land mobile network (PLMN) ID. For testing purposes, only spectrum block filter of 5MHz will be evaluated.

The two EUTs are placed on the test bench, connected via a coax cable, combiner and 50 dB attenuators. The unit not under evaluation is placed in a shielded enclosure to improve RF isolation.

UNII Tx /RX port of NU is connected to UNII TX/RX port of CU.

Evaluation is conducted at Donor power Port band 2 and band 4, Server port band 2 and band 4.

Signal: 4.1MHz AWGN.

UL = 1850-1915MHz, 1710-1755MHz

DL = 1930-1990MHz, 2110-2155MHz

Test environment conditions:

Temperature - 24°C

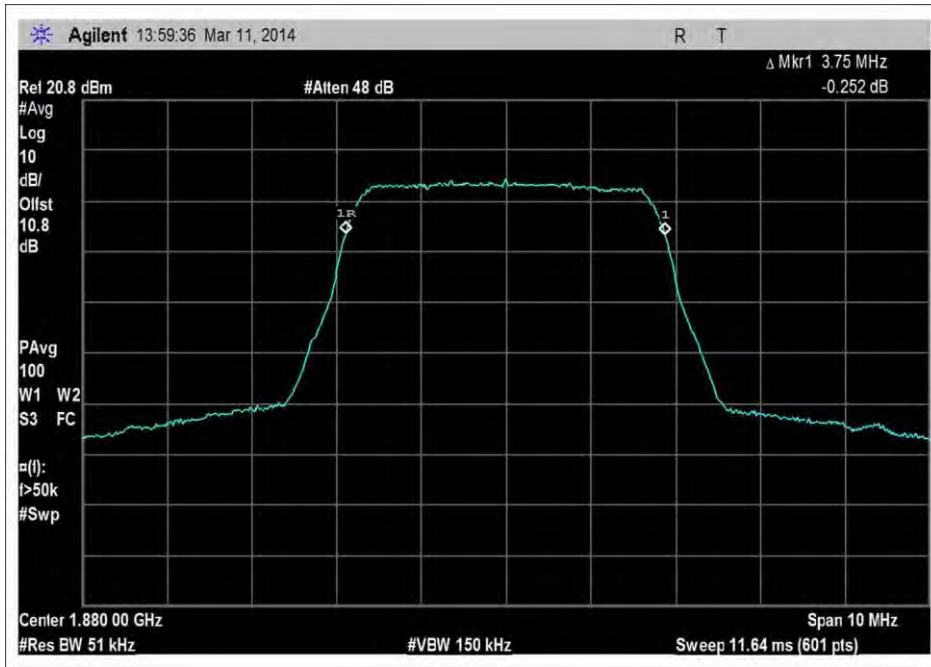
Relative Humidity - 21%

Pressure - 100kPa

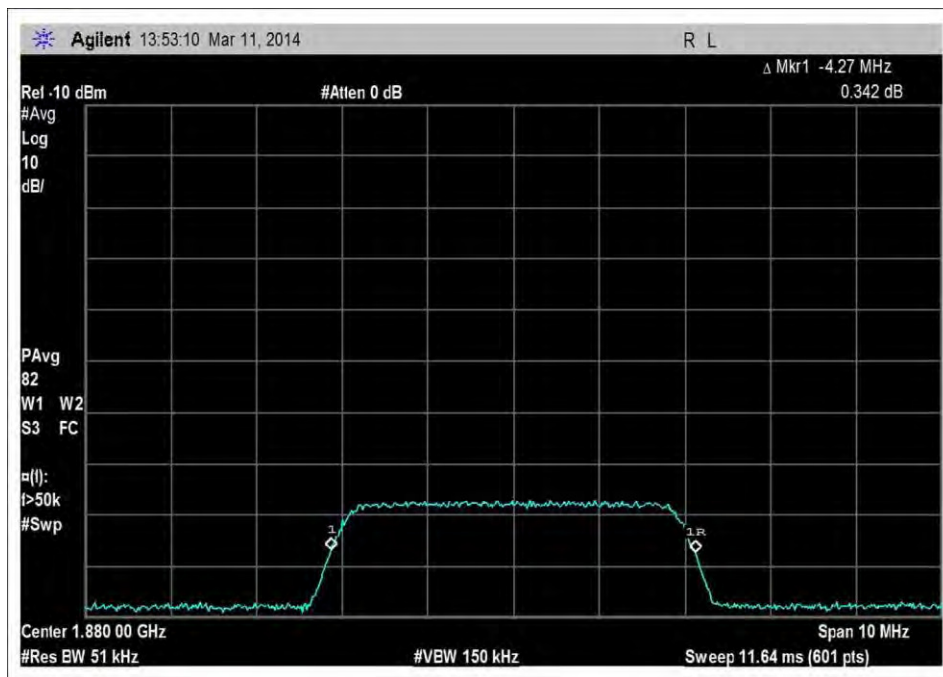
Testing is performed in accordance with Provider Specific Booster test procedure 935210 D04 Provider Specific Booster Measurement DR06-41704, dated 03/06/14.



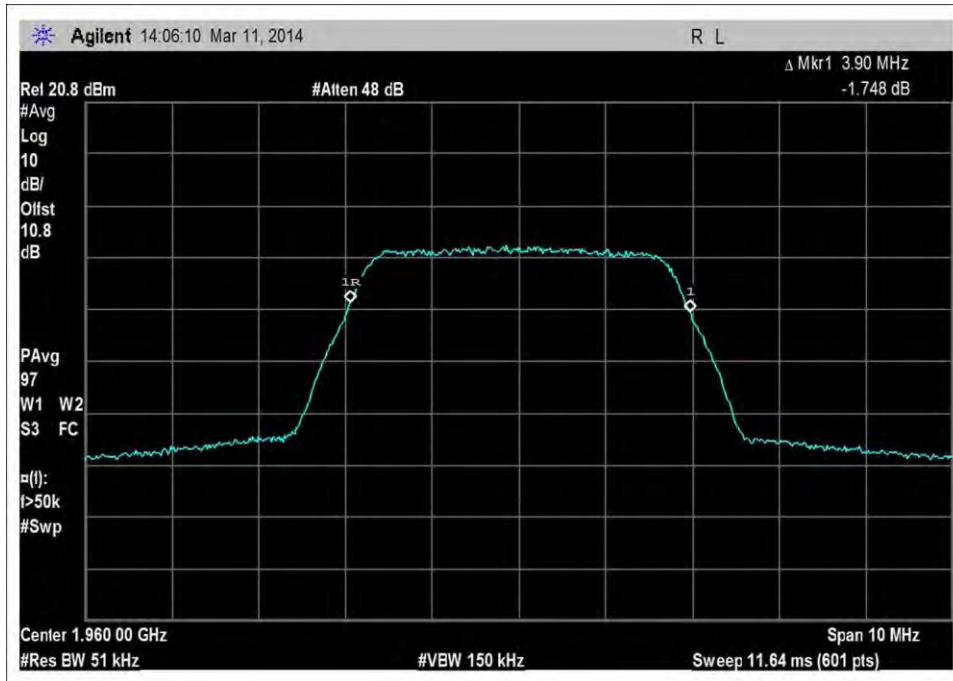
## Test Plots



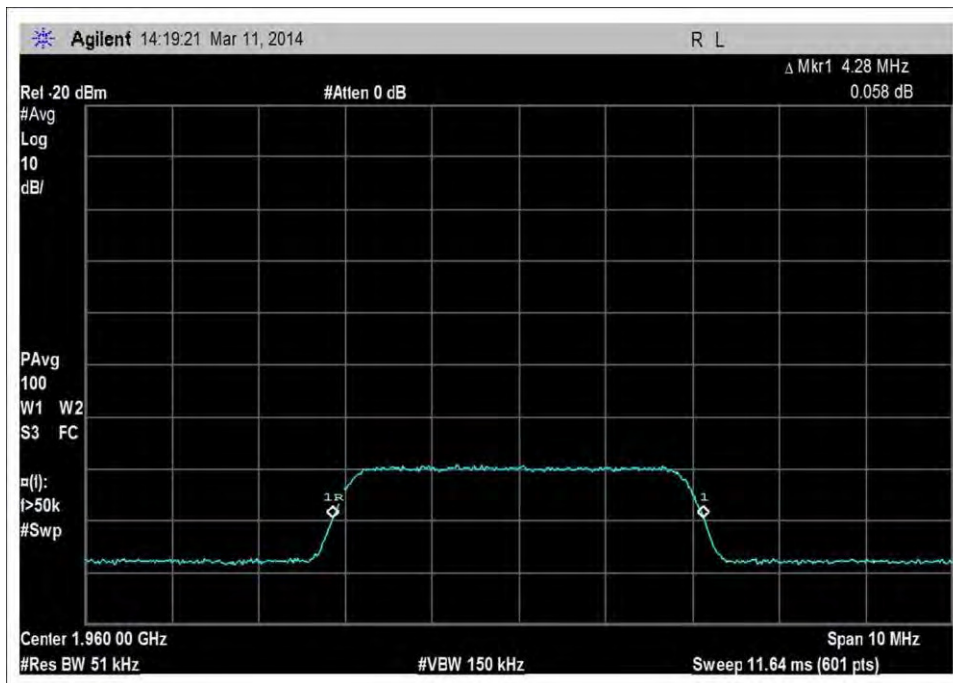
UL\_1850-1915MHz\_41AWGN\_output



UL\_1850-1915MHz\_41AWGN\_input



DL\_1930-1995MHz\_41AWGN\_output



DL\_1930-1995MHz\_41AWGN\_input\_-70dBm

**Test Setup Photo**



**2.1051 / 24.238(a) Spurious Emissions at Antenna Terminals**

**Test Data**

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Nextivity, Inc.**  
 Specification: **47 CFR §24.238 Spurious Emissions**  
 Work Order #: **95395** Date: 3/12/2014  
 Test Type: **Conducted Emissions** Time: 09:37:42  
 Equipment: **Provider Specific Consumer Signal Booster** Sequence#: 1  
 Manufacturer: Nextivity, Inc. Tested By: E. Wong  
 Model: Cel-Fi D32-2/4 110V 60Hz  
 S/N: 175406000036, 174406000145

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	9/4/2012	9/4/2014
T2	AN03430	Attenuator	75A-10-12	9/5/2013	9/5/2015
T3	ANP06543	Cable	32022-29094K-29094K-24TC	11/20/2013	11/20/2015
T4	ANdBm	Unit Conversion		2/10/2014	2/10/2016

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Provider Specific Consumer Signal Booster	Nextivity, Inc.	Cel-Fi D32-2/4 CU	175406000036
Provider Specific Consumer Signal Booster	Nextivity, Inc.	Cel-Fi D32-2/4 NU	174406000145

**Support Devices:**

Function	Manufacturer	Model #	S/N
Signal Generator	Agilent	E4438C	MY42082260
Power Supply	Hon-Kwang	HK-AX-120A150-US	NA
Power Supply	Hon-Kwang	HK-AX-120A150-US	NA

**Test Conditions / Notes:**

The EUT is a provider specific signal booster pair consisting of a Network unit (NU) and a Coverage unit (CU) using proprietary 5.8 GHz Wireless interface.

The EUT is manufacturer configurable to operate in relay bandwidth of 5 MHz, 10MHz, 15 MHz and 20 MHz within the CMRS band by setting the bandwidth and center frequency of programmable Spectrum Block Filter , Gain and other operational parameter based on received public land mobile network (PLMN) ID. For testing purposes, only spectrum block filter of 5 MHz will be evaluated.

The two EUTs are placed on the test bench, connected via a coax cable, combiner and 50 dB attenuators. The unit not under evaluation is placed in a shielded enclosure to improve RF isolation. UNII Tx /RX port of NU is connected to UNII TX/RX port of CU.

Evaluation is conducted at Donor Port and Server Port.

Signal: 4.1MHz AWGN.

UL = 1850-1915MHz  
DL = 1930-1990MHz

Frequency range of measurement = 9kHz - 20GHz.  
9kHz - 150kHz;RBW=200Hz,VBW=200Hz; 150kHz - 30MHz;RBW=9kHz,VBW=9kHz;  
30MHz - 1000MHz;RBW=120kHz,VBW=120kHz; 1000MHz - 20000MHz;RBW=1MHz,VBW=1MHz.

Test environment conditions:  
Temperature - 24°C  
Relative Humidity - 21%  
Pressure - 100kPa

Testing is performed in accordance with Provider Specific Booster test procedure 935210 D04 Provider Specific Booster Measurement DR06-41704, dated 03/06/14.

**Summary: No emissions were found, presented data represents noise floor level.**

Ext Attn: 0 dB

**Measurement Data:**

Reading listed by margin.

Test Lead: Ant Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	14430.000 M	-65.1	+0.0	+9.4	+1.2	+107.0	+0.0	52.5	94.0	-41.5	Ant P
DL 1930-1995MHz											
2	13620.000 M	-69.9	+0.0	+9.5	+1.1	+107.0	+0.0	47.7	94.0	-46.3	Ant P
UL 1850-1910MHz											

### Limit line for Spurious Conducted Emission

$$\text{Required Attenuation} = 43 + 10 \log P \text{ dB}$$

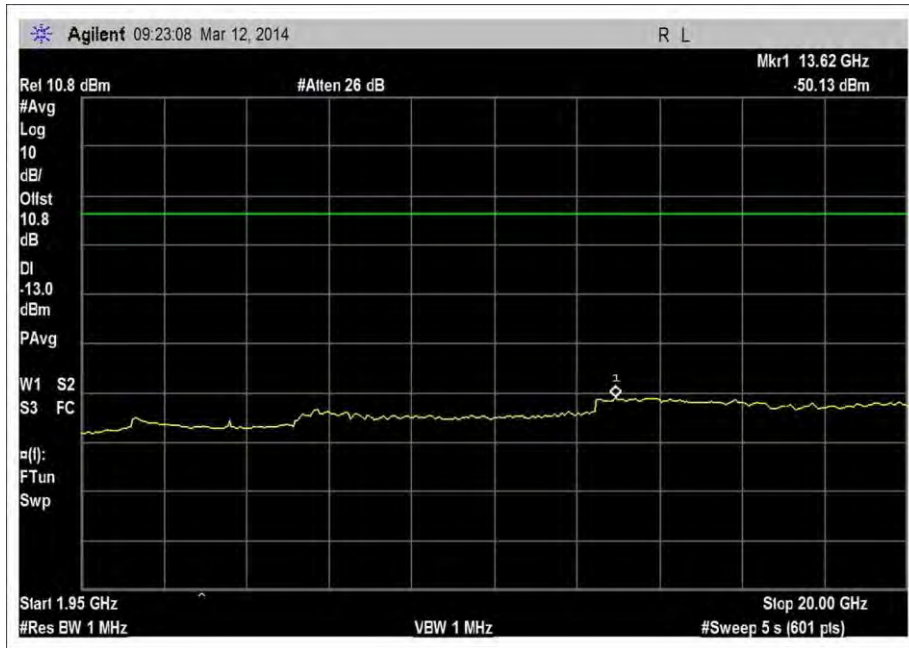
$$\text{Limit line (dBuV)} = V_{\text{dBuV}} - \text{Attenuation}$$

$$\begin{aligned} V_{\text{dBuV}} &= 20 \log \frac{V}{1 \times 10^{-6}} \\ &= 20 (\log V - \log 1 \times 10^{-6}) \\ &= 20 \log V - 20 \log 1 \times 10^{-6} \\ &= 20 \log V - 20(-6) \\ &= 20 \log V + 120 \end{aligned}$$

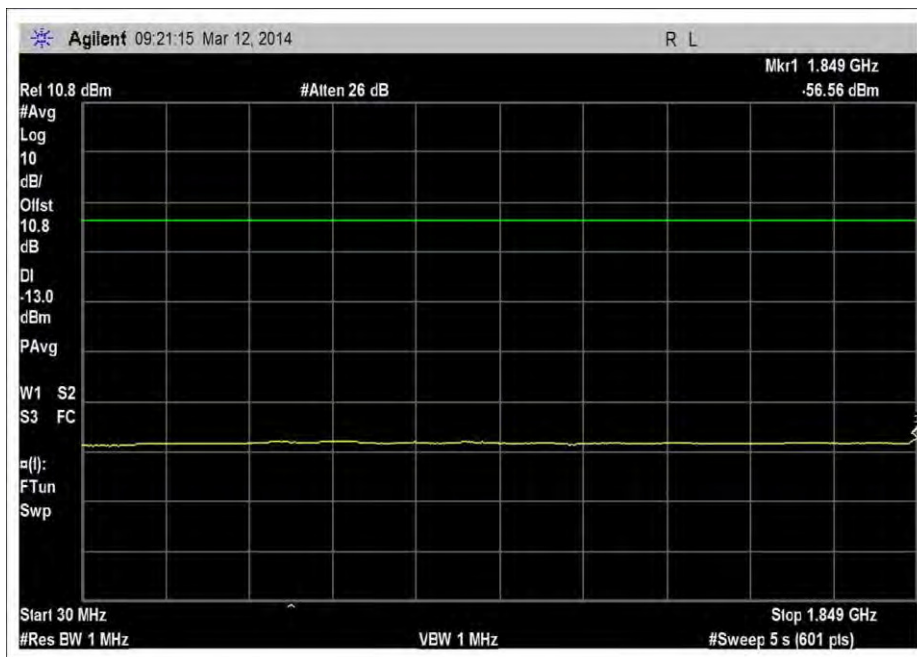
$$\begin{aligned} \text{Attenuation} &= 43 + 10 \log P \\ &= 43 + 10 \log \frac{V^2}{R} \\ &= 43 + 10 (\log V^2 - \log R) \\ &= 43 + 10 (2 \log V - \log R) \\ &= 43 + 20 \log V - 10 \log R \end{aligned}$$

$$\begin{aligned} \text{Limit line} &= V_{\text{dBuV}} - \text{Attenuation} \\ &= 20 \log V + 120 - (43 + 20 \log V - 10 \log R) \\ &= 20 \log V + 120 - 43 - 20 \log V + 10 \log R \\ &= 20 \log V + 120 - 43 - 20 \log V + 10 \log R \\ &= 120 - 43 + 10 \log 50 \quad \text{Note : } R = 50 \Omega \\ &= 120 - 43 + 16.897 \\ &= 94 \text{ dBuV at any power level} \end{aligned}$$

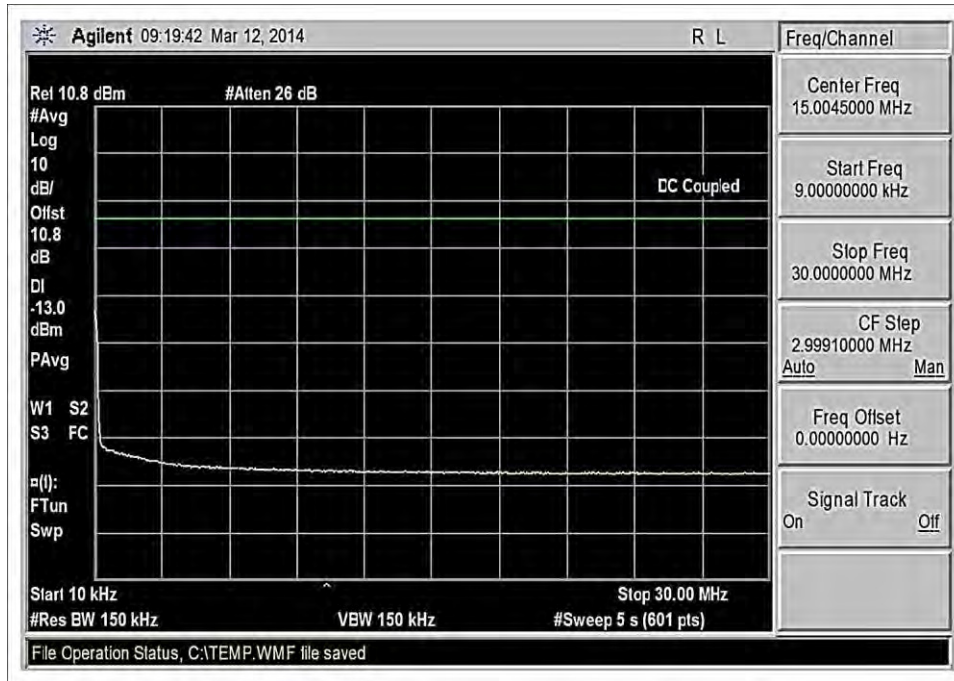
## Test Plots



UL\_1850-1915MHz\_1949-20000MHz

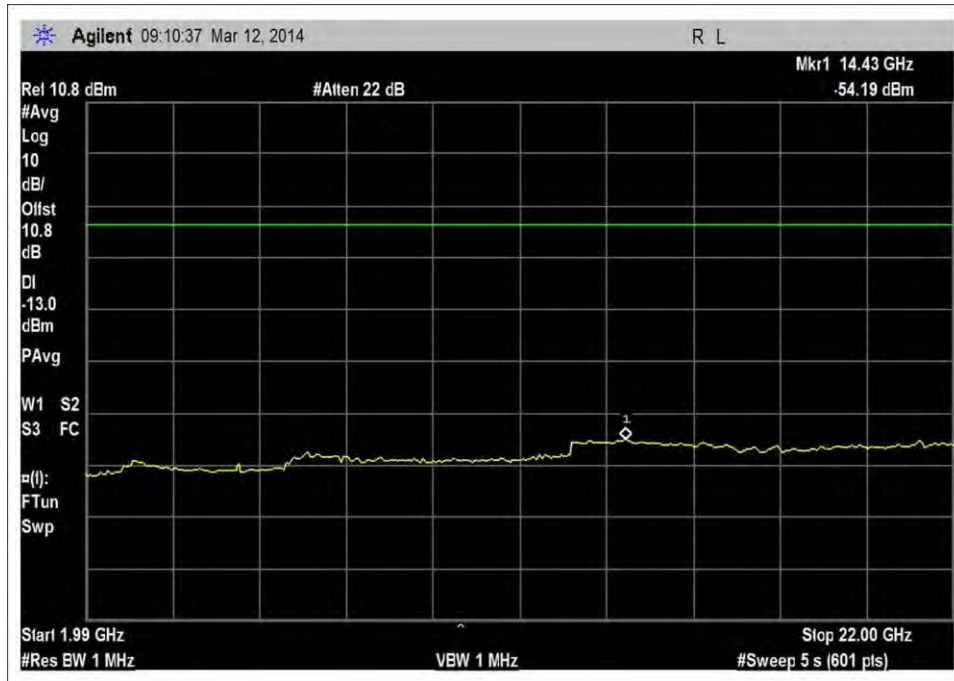


UL\_1850-1915MHz\_30-1849MHz

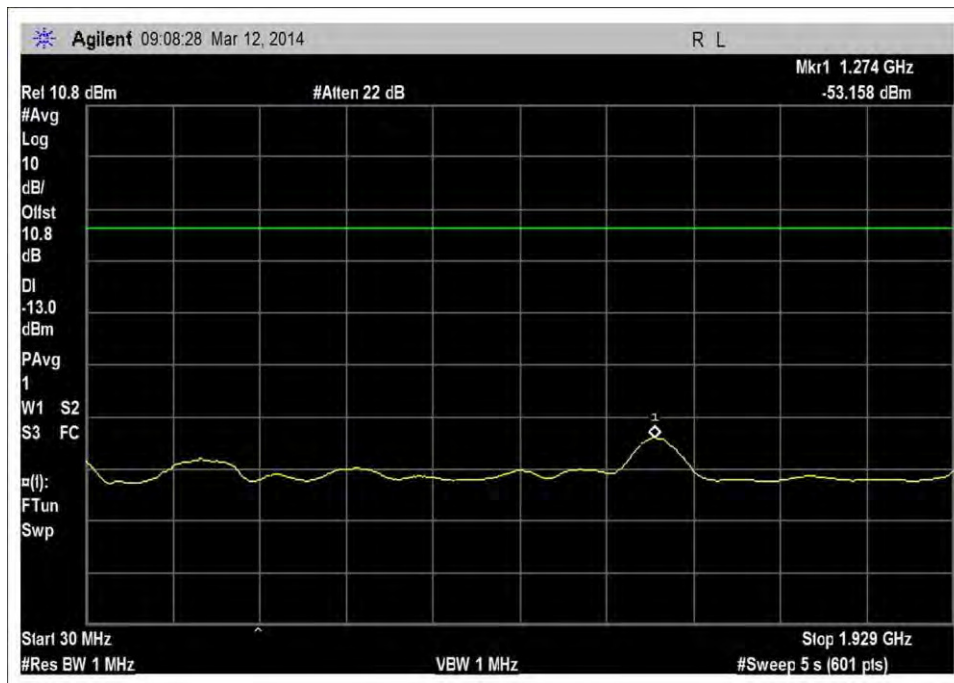


UL\_1850-1915MHz\_9kHz-30MHz

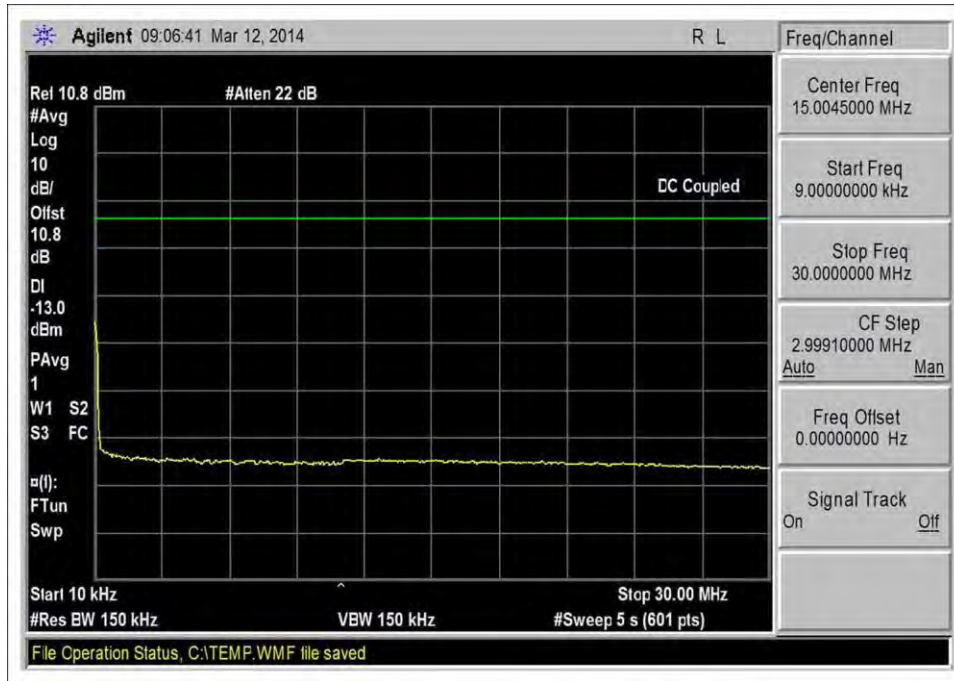




DL\_1930-1995MHz\_1991-22000MHz

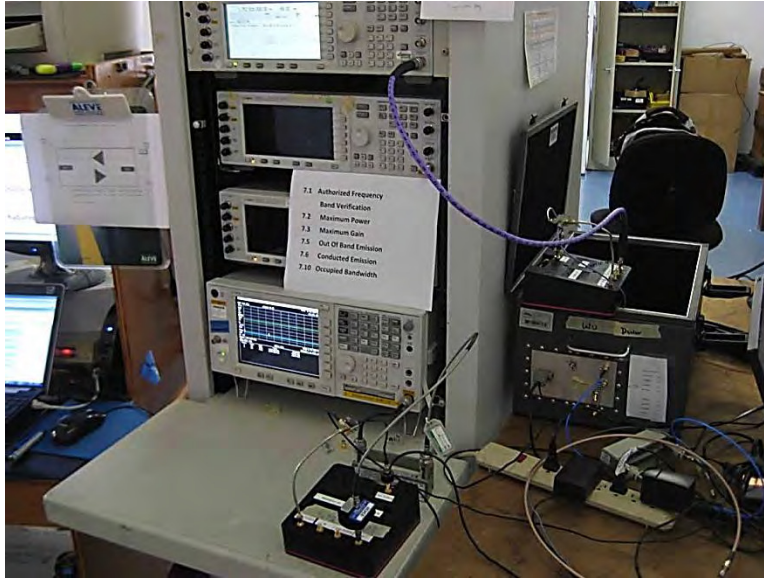


DL\_1930-1995MHz\_30-1929MHz



DL\_1930-1995MHz\_9kHz-30MHz

**Test Setup Photo**



**2.1053 / 24.238(a) Field Strength of Spurious Radiation**

**Test Data**

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Nextivity, Inc.**  
 Specification: **47 CFR §24.238 Spurious Emissions**  
 Work Order #: **95395** Date: 3/20/2014  
 Test Type: **Radiated Scan** Time: 10:17:56  
 Equipment: **Provider Specific Consumer Signal Booster** Sequence#: 2  
 Manufacturer: Nextivity, Inc. Tested By: E. Wong  
 Model: Cel-Fi D32-2/4  
 S/N: 175406000036, 174406000145

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	2/6/2013	2/6/2015
	AN01995	Biconilog Antenna	CBL6111C	5/16/2012	5/16/2014
	ANP05198	Cable-Amplitude 15 to 45degC (dB)	8268	12/11/2012	12/11/2014
	ANP05050	Cable	RG223/U	1/21/2013	1/21/2015
	AN00309	Preamp	8447D	3/29/2012	3/29/2014
	AN00314	Loop Antenna	6502	6/29/2012	6/29/2014
T2	AN00786	Preamp	83017A	6/20/2012	6/20/2014
T3	AN00849	Horn Antenna	3115	4/13/2012	4/13/2014
T4	ANP05563	Cable	ANDL-1-PNMN-48	8/7/2012	8/7/2014
T5	AN02946	Cable	32022-2-2909K-36TC	7/31/2013	7/31/2015
T6	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	6/5/2013	6/5/2015
	AN01413	Horn Antenna-ANSI C63.5 (dB/m)	84125-80008	11/9/2012	11/9/2014
	AN02749	High Pass Filter	9SH10-1000/T10000-O/O	9/25/2013	9/25/2015

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Provider Specific Consumer Signal Booster	Nextivity, Inc.	Cel-Fi D32-2/4 CU	175406000036
Provider Specific Consumer Signal Booster	Nextivity, Inc.	Cel-Fi D32-2/4 NU	174406000145

**Support Devices:**

Function	Manufacturer	Model #	S/N
Signal Generator	Agilent	E4438C	MY42082260
Power Supply	Hon-Kwang	HK-AX-120A150-US	NA
Power Supply	Hon-Kwang	HK-AX-120A150-US	NA

***Test Conditions / Notes:***

The EUT is a provider specific signal booster pair consisting of a Network unit (NU) and a Coverage unit (CU) using proprietary 5.8GHz Wireless interface.

The EUT is manufacturer configurable to operate in relay bandwidth of 5MHz, 10MHz, 15MHz and 20MHz within the CMRS band by setting the bandwidth and center frequency of programmable Spectrum Block Filter , Gain and other operational parameter based on received public land mobile network (PLMN) ID. For testing purposes, only spectrum block filter of 5MHz will be evaluated.

Evaluation of CU

CU is placed on the Styrofoam platform. NU placed in a shielded enclosure to improve RF isolation. DL RF signal from a base station simulator is sent to the NU via an antenna placed inside the shielded enclosure. The applied DL signal is send to the CU via 5.8GHz link and transmitted via the unit under test.

Evaluation of NU

NU is placed on the Styrofoam platform. CU placed in a shielded enclosure to improve RF isolation. DL RF signal from a base station simulator is sent to the NU via an antenna placed in close proximity of the NU. On the CU side, UL signal is sent to the CU via an antenna placed in the shielded enclosure.

The UL signal is sent to the NU via 5.8GHz link and transmitted via the unit under test.

Laptop is connected to maintenance port for configuration and monitoring purposes.

Signal: 4.1MHz AWGN.

Frequency range

UL = 1850-1915MHz

DL = 1930-1990MHz

UL = 1880MHz

DL = 1960MHz

Frequency range of measurement = 9kHz- 20GHz.

9kHz - 150kHz;RBW=200Hz,VBW=200Hz; 150kHz - 30MHz;RBW=9kHz,VBW=9kHz;

30MHz - 1000MHz;RBW=120kHz,VBW=120kHz; 1000MHz - 20000MHz;RBW=1MHz,VBW=1MHz.

Test environment conditions:

Temperature - 24°C

Relative Humidity - 21%

Pressure - 100kPa

Testing is performed in accordance with Provider Specific Booster test procedure 935210 D04 Provider Specific Booster Measurement DR06-41704, dated 03/06/14.

Ext Attn: 0 dB

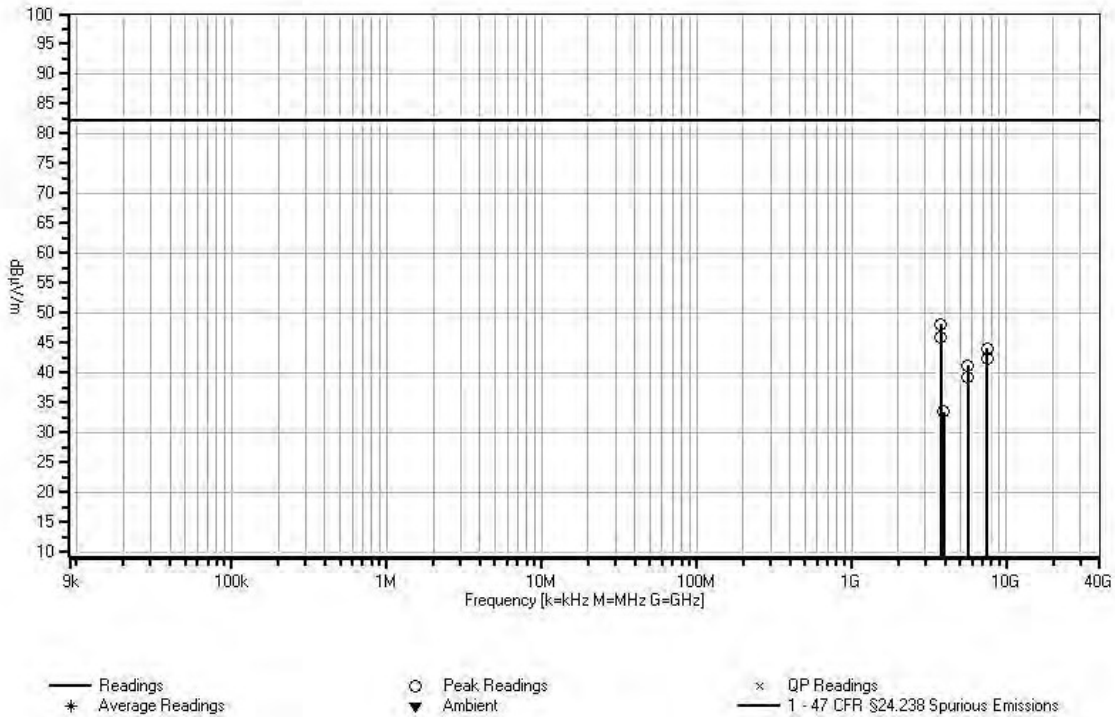
**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	3758.800M	48.9	+0.0 +0.8	-38.1 +0.4	+32.1	+4.1	+0.0	48.2	82.2 UL_1880MHz	-34.0	Vert
2	3759.670M	46.6	+0.0 +0.8	-38.1 +0.4	+32.1	+4.1	+0.0	45.9	82.2 UL_1880MHz	-36.3	Horiz
3	7520.200M	38.1	+0.0 +1.2	-37.3 +0.0	+35.7	+6.4	+0.0	44.1	82.2 UL_1880MHz	-38.1	Vert
4	7520.000M	36.4	+0.0 +1.2	-37.3 +0.0	+35.7	+6.4	+0.0	42.4	82.2 UL_1880MHz	-39.8	Horiz
5	5639.000M	37.9	+0.0 +1.2	-37.3 +0.2	+33.8	+5.4	+0.0	41.2	82.2 UL_1880MHz	-41.0	Vert
6	5639.830M	35.9	+0.0 +1.2	-37.3 +0.2	+33.8	+5.4	+0.0	39.2	82.2 UL_1880MHz	-43.0	Horiz
7	3919.670M	34.4	+0.0 +1.0	-38.0 +0.3	+31.7	+4.1	+0.0	33.5	82.2 DL_1960MHz_noise floor	-48.7	Vert

Date: 3/20/2014 Time: 10:17:56 Nextivity, Inc. WO#: 95395  
47 CFR §24.238 Spurious Emissions Test Distance: 3 Meters Sequence#: 2 Ext ATTN: 0 dB



**Test Setup Photos**



Coverage Unit



Coverage Unit



Network Unit



Network Unit



**2.1055 (a)(d)/ 24.235 Frequency Stability**

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Nextivity, Inc.**  
 Specification: 7.15 Frequency Stability, 24.135  
 Work Order #: **95395** Date: 3/12/2014  
 Test Type: **Conducted Emissions** Time: 09:37:42  
 Equipment: **Provider Specific Consumer Signal Booster** Sequence#: 1  
 Manufacturer: Nextivity, Inc. Tested By: E. Wong  
 Model: Cel-Fi D32-2/4 110V 60Hz  
 S/N: 175406000036, 174406000145

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	9/4/2012	9/4/2014
T2	AN03430	Attenuator	75A-10-12	9/5/2013	9/5/2015
T3	ANP06543	Cable	32022-29094K-29094K-24TC	11/20/2013	11/20/2015
	AN01878	Temperature Chamber	S 1.2 Mini-Max	4/2/2013	4/2/2015
	AN02549	Data Acquisition	34970A	10/9/2012	10/9/2014
	AN01849	HP 20 Channel Multiplexer Card	34901A	10/9/2012	10/9/2014

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Provider Specific Consumer Signal Booster*	Nextivity, Inc.	Cel-Fi D32-2/4 CU	175406000036
Provider Specific Consumer Signal Booster	Nextivity, Inc.	Cel-Fi D32-2/4 NU	174406000145

**Support Devices:**

Function	Manufacturer	Model #	S/N
Signal Generator	Agilent	E4438C	MY42082260
Power Supply	Hon-Kwang	HK-AX-120A150-US	NA
Power Supply	Hon-Kwang	HK-AX-120A150-US	NA

**Test Conditions / Notes:**

The EUT is provider specific signal booster pair consisted of a Network unit (NU) and a Coverage unit (CU) using proprietary 5.8 GHz Wireless interface.

The EUT is manufacturer configurable to operate in relay bandwidth of 5 MHz, 10MHz, 15 MHz and 20 MHz within the CMRS band by setting the bandwidth and center frequency of programmable Spectrum Block Filter , Gain and other operational parameter based on received public land mobile network (PLMN) ID. For testing purposes, only spectrum block filter of 5 MHz will be evaluated.

The two EUT are placed on the test bench, connected via coax cable, combiner and 50 dB attenuators. The unit not under evaluation is placed in shielded enclosure to improve RF isolation.

UNII Tx /RX port of NU is connected to UNII TX/RX port of CU.

Evaluation are conducted at Donor power Port band 2 and band 4, Server port band 2 and band 4

Signal : 4.1 MHz AWGN.

UL= 1850-1915 MHz, 1710-1755MHz,  
DL= 1930-1990 MHz, 2110-2155MHz.

Test environment conditions: 24°C, 21% Relative Humidity, 100kPa

Testing is performed in accordance with Provider Specific Booster test procedure 935210 D04 Provider Specific Booster Measurement DR06-41704, dated 03/06/2014.

**With the following deviation:**

Due to the narrowband rejection circuit, a 4.1MHz AWGN signal was used instead of CW. The measured frequency at -10dBc was used as reference frequency at nominal voltage and room temperature. Frequency deviation in MHz was measured at each temperature and voltage extreme and compared again the maximum allowed deviation to ensure the fundamental emission stays within the authorized frequency block.

The maximum allowable deviation is measured with compliant Out of Band Emission (OBE) measurement ( ie same RF output power level and OBE as measured in 7.5) using the blockedge frequency as reference frequency point and then adjust the center frequency of the spectrum analyzer to the point where 1MHz outside the authorized freq block increased and reached the OBE limit of -13dBm.

The frequency difference between the blockedge frequency and (blockedge freq + offset) frequency Compliant and the later condition is the maximum allowable frequency drift to ensure the fundamental emission stays within the authorized frequency block.

## Test Data

### Summary

Pass, the device complies with the requirement, stays within the authorized frequency block with measured frequency drift of not exceeding the maximum allowable freq drift of 257kHz Uplink 1850-1915MHz band , 420kHz in the 1930-1955MHz band.

Procedure Sec #	Guidance Description	FCC Sec #	FCC Rule Description
7.15	Frequency Stability <sup>1</sup>	2.1055 / 22/24/27 <sup>1</sup>	Frequency Stability <sup>1</sup>

*§24.235 Frequency stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.*

Result

### Frequency Stability

**Date:** 26-Mar-14  
**Test Engineer:** E. Wong

**Operating Voltage:** 110 VDC/VAC  
**Frequency Limit:** 0.257 MHz 0.420MHz

#### Temperature Variations

Channel Frequency:	UL 1880 (MHz)	Dev. (MHz)
	<b>1877.87500</b>	
Temp (C) Voltage		
-30 110	1877.94200	0.067000
-20 110	1877.91700	0.042000
-10 110	1877.94200	0.067000
0 110	1877.92500	0.050000
10 110	1877.92500	0.050000
20 110	1877.92500	0.050000
30 110	1877.91700	0.042000
40 110	1877.91700	0.042000
50 110	1877.92500	0.050000

DL 1960	Dev. (MHz)
<b>1957.90000</b>	
1957.90800	0.008000
1957.90800	0.008000
1957.90800	0.008000
1957.91700	0.017000
1957.91700	0.017000
1957.91700	0.017000
1957.91700	0.017000
1957.92500	0.025000
1957.90800	0.008000

#### Voltage Variations (±15%)

20	93.5	1877.92500	0.050000
20	110	1877.92500	0.050000
20	126.5	1877.93300	0.058000

1957.92500	0.025000
1957.91700	0.017000
1957.91700	0.017000

<b>Max Deviation (MHz)</b>	<b>0.067000</b>
Max Deviation (%)	0.003568
<b>PASS</b>	

	<b>0.025000</b>
	0.001277
<b>PASS</b>	

To calculate Frequency drift limit:

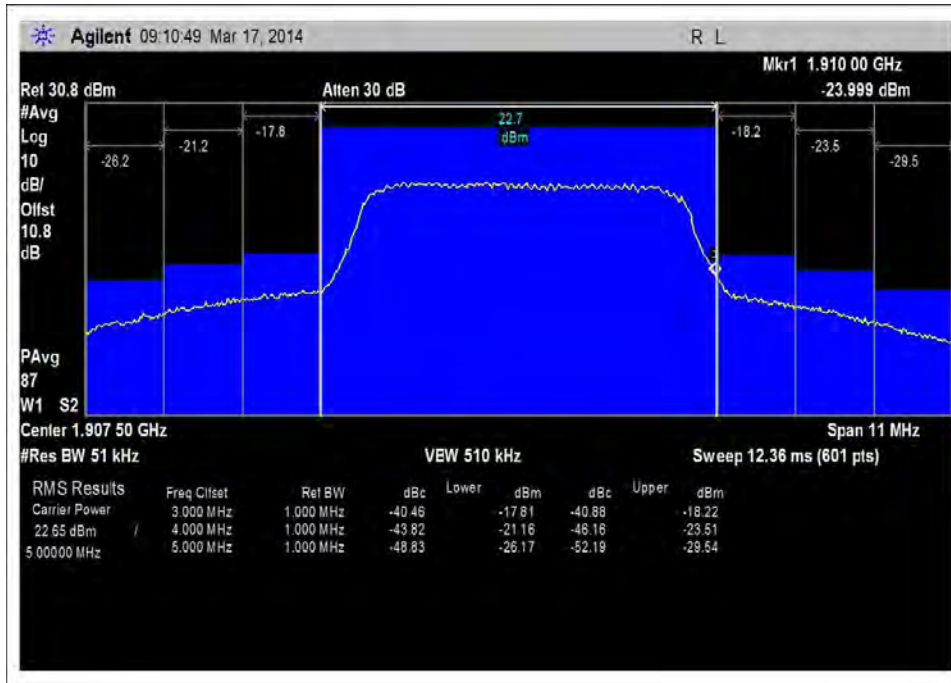
The Provider specific booster employs unique product design where the frequency of the transmitted signal and the relayed spectrum block filter is determined by an oscillator. The device can only transmit at predetermined frequency IAW with 3GPP channel plan and the device can only transmit a wide band signal. The temperature stability test described below evaluates frequency drift of both the regenerated signal and the spectrum block filter.

Due to the limitation of equipment setup, the temperature stability was evaluated by measuring the frequency drift at temperature extreme and compared against a maximum allowable temperature drift at nominal temperature. ( Freq drift limit) instead of a real time “out of block” measurement at temperature extreme.

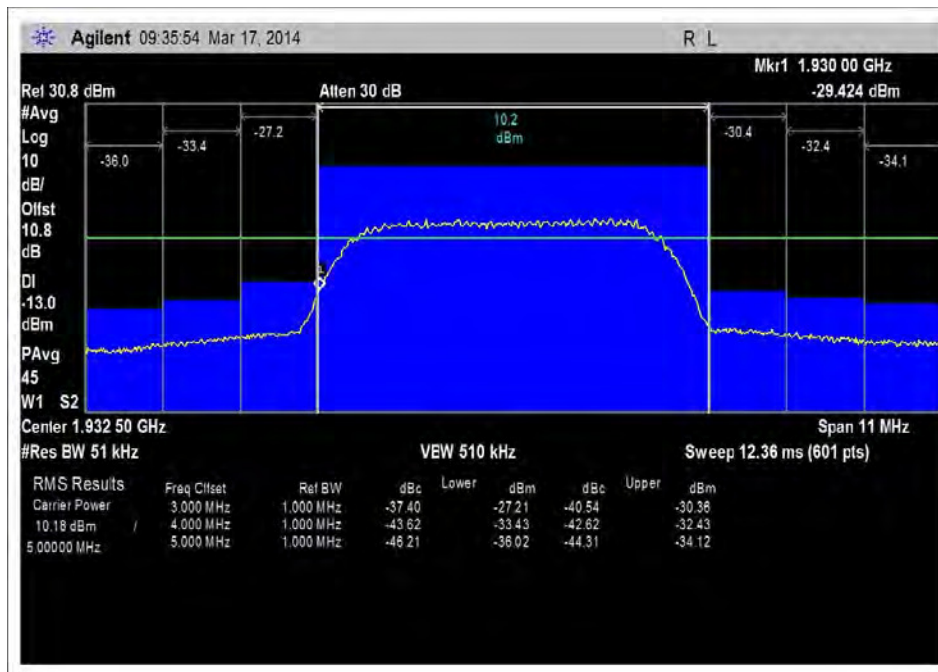
The following Out of Band Emission plot was captured at nominal temperature. The power integration of the Adjacent Chanel Power of the spectrum analyzer was used for this measurement.

The worst case out of band emission at 1 MHz outside the authorized frequency block was measure ( note: the cursors presented on the plots are set at 1910MHz DL, 1930MHz UL).

## Test Plots

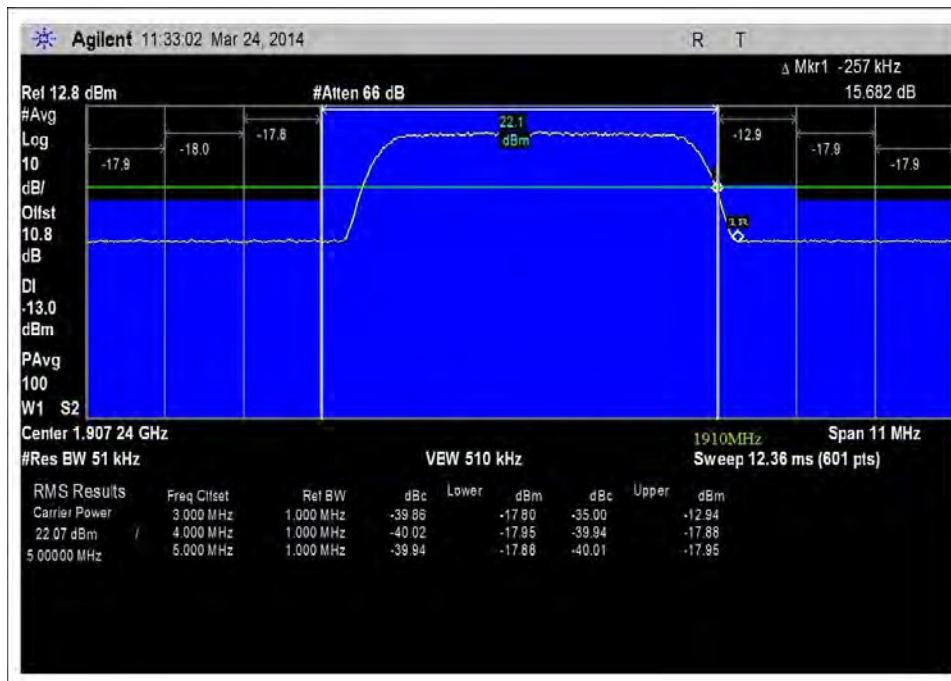


UL 1850-1910MHz, cursor set at 1910MHz. Channel power 1 MHz outside the band is -18.2dBm

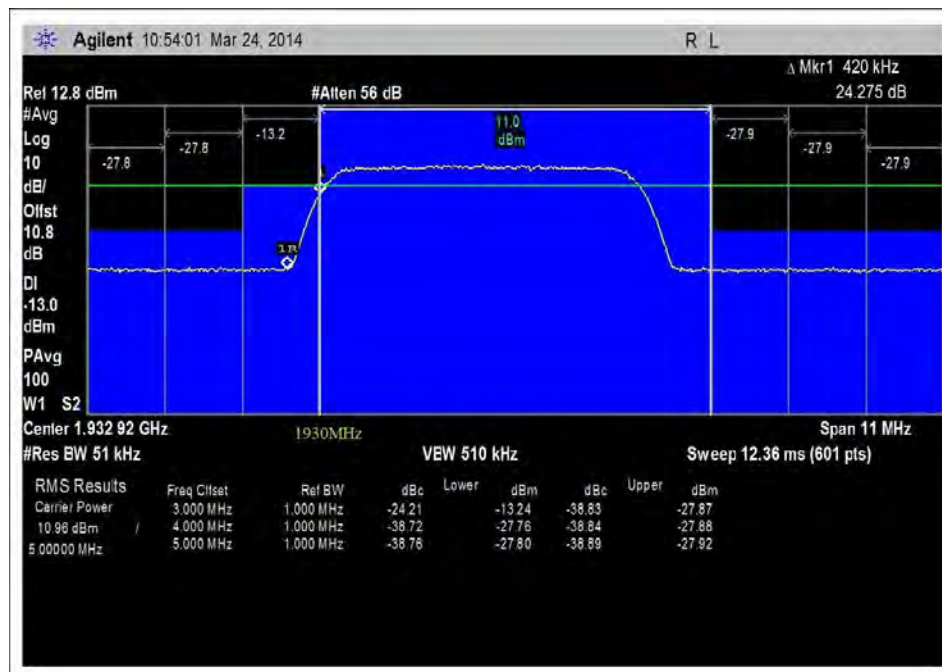


DL 1930-1995MHz, cursor set at 1930MHz. Channel power 1 MHz outside the band is -27.2dBm

To determine the Frequency drift limit, the Center frequency of the spectrum analyzer was adjusted until the channel power 1 MHz outside the band is -13dBm/MHz.



UL 1850-1910MHz, cursor 1R set at 1910.257MHz. Channel power 1 MHz outside the band is – 13 Bm, meaning the max allowed frequency drift is 0.257MHz before the worst case emission exceeds the OBE limit.



DL 1930-1995MHz, cursor 1R set at 1929.58MHz. Channel power 1 MHz outside the band is – 13 Bm, meaning the max allowed frequency drift is 0.420MHz before the worst case emission exceeds the OBE limit.

**Test Setup Photos**



## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

### Emissions Test Details

**TESTING PARAMETERS**

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

**CORRECTION FACTORS**

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBμV/m, the spectrum analyzer reading in dBμV was corrected by using the following formula. This reading was then compared to the applicable specification limit.



SAMPLE CALCULATIONS		
	Meter reading	(dB $\mu$ V)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dB $\mu$ V/m)

**TEST INSTRUMENTATION AND ANALYZER SETTINGS**

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

**SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS**

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

**Peak**

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

**Quasi-Peak**

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

**Average**

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.