Nextivity, Inc.

ADDENDUM TO TEST REPORT 95395-17

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

Tested To The Following Standards:

FCC Part 27 Subpart L

Report No.: 95395-17A

Date of issue: May 8, 2014

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

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.

Testing the Future
CKC LABORATORIES, INC.

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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

REPORT PREPARED BY:

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

Project Number: 95395

DATE OF EQUIPMENT RECEIPT: March 10, 2014
DATE(S) OF TESTING: March 10 – April 10, 2014

Revision History

Original: Testing of the Provider Specific Consumer Signal Booster, Cel-Fi D32-2/4 to FCC Part 27L
Addendum A: To replace all test data, test plots and setup photos for section 2.1055(a)(d) / 27.54 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 / 27 Subpart L

Test Procedure/Method	Description	Results
2.1046	RF Power Output	NA[1]
2.1049(I)	Occupied Bandwidth	Pass
2.1051 / 27.53(m)	Spurious Emissions at Antenna Terminals	Pass
2.1053 / 27.53(m)	Field Strength of Spurious Radiation	Pass
2.1055(a)(d) / 27.54	Frequency Stability	Pass

NA[1] = A different standard applies; see applicable test report.

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: 175406000036

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 / 27

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 27: Miscellaneous Wireless Communication Services.

2.1049(I) Occupied Bandwidth

Test Conditions / Setup

Test Location: CKC Laboratories • 110 Olinda Place • Brea, CA 92823 • 714-993-6112

Customer:	**Nextivity, Inc.**		
Specification:	**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 provider specific signal booster pair consisted 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 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.

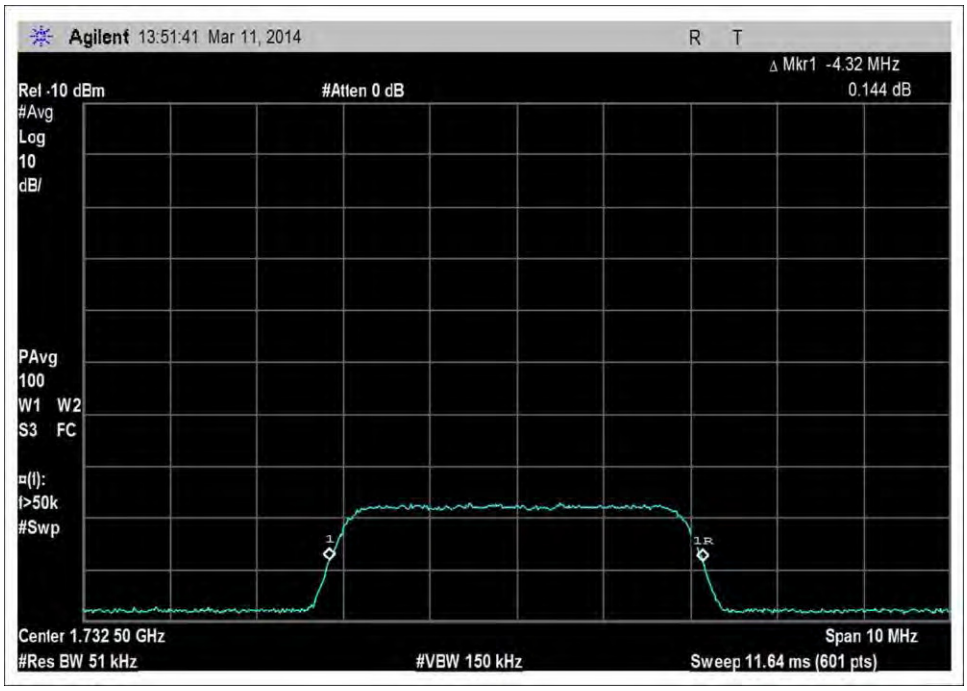
Signal: 4.1MHz AWGN.

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

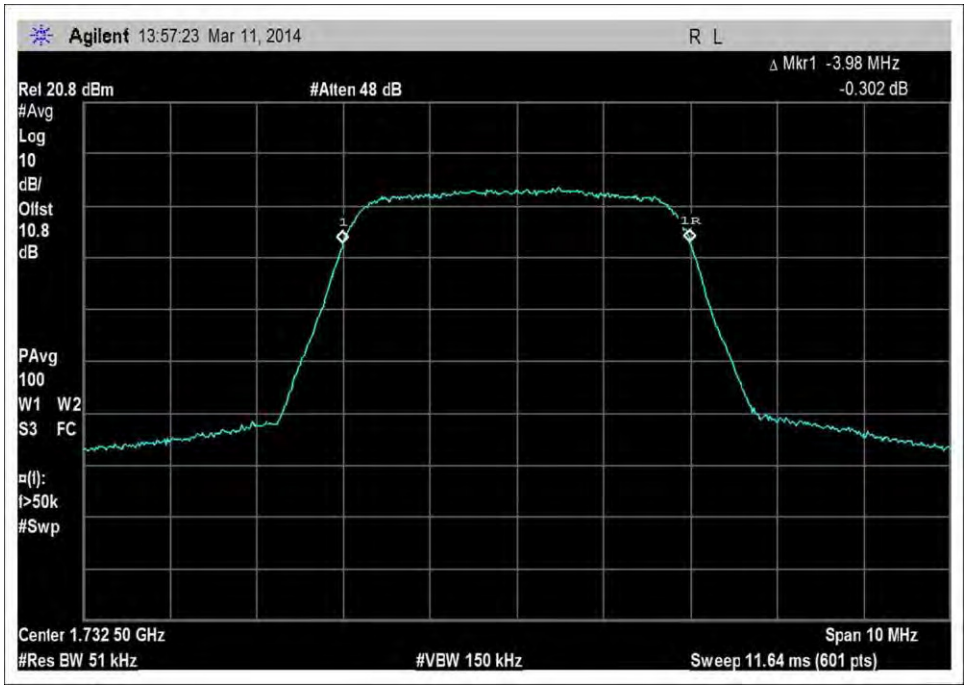
Test environment conditions:
Temperature - 24°C
Relative Humidity - 21%
Pressure - 100kPa

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

Test Data



UL_1710-1755MHz_41AWGN_input



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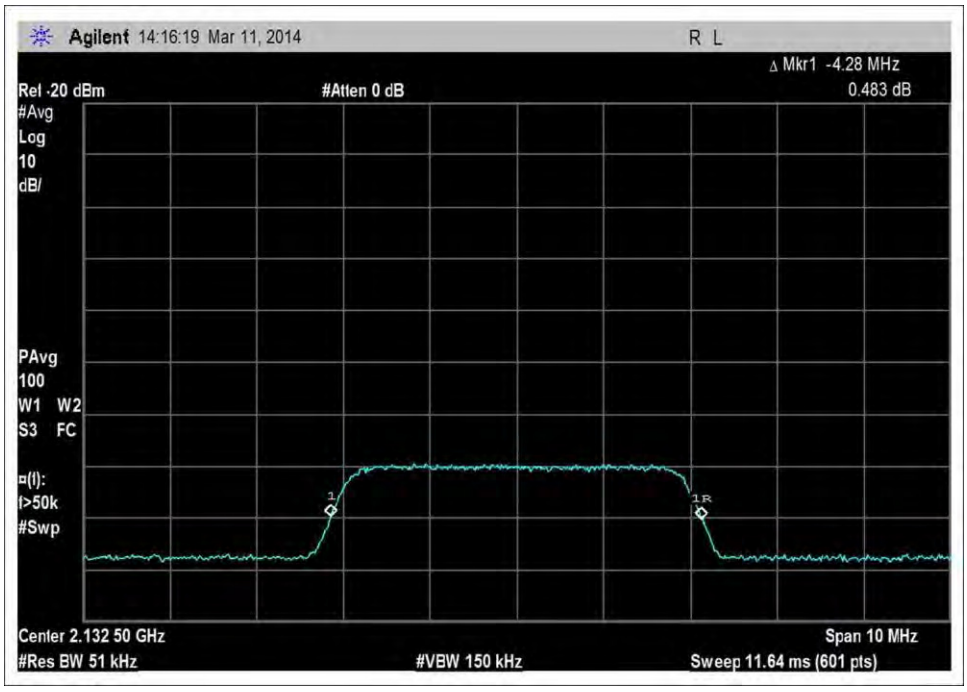
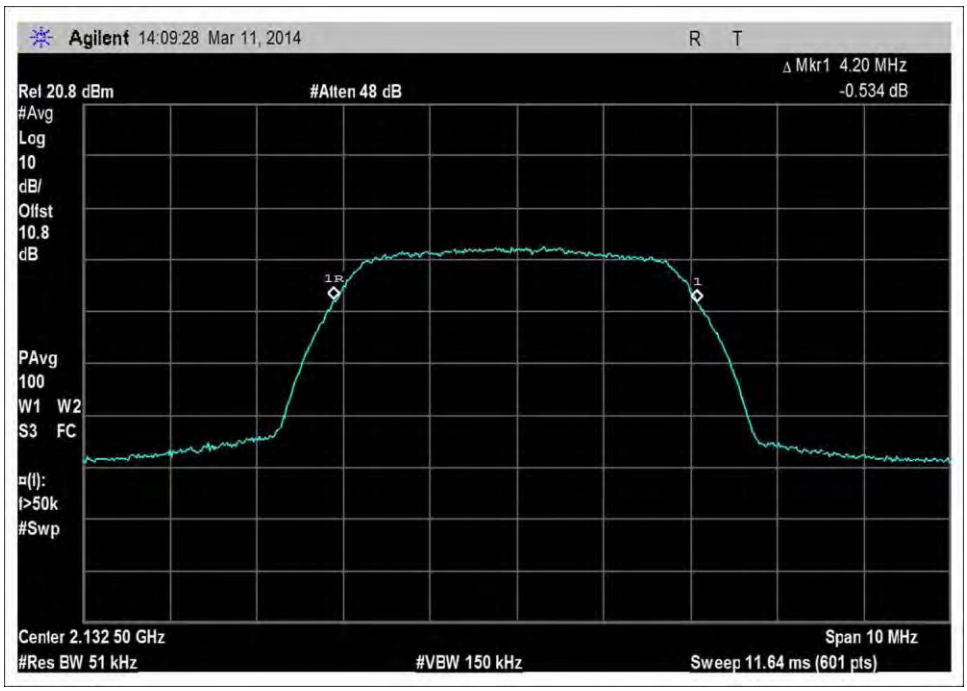
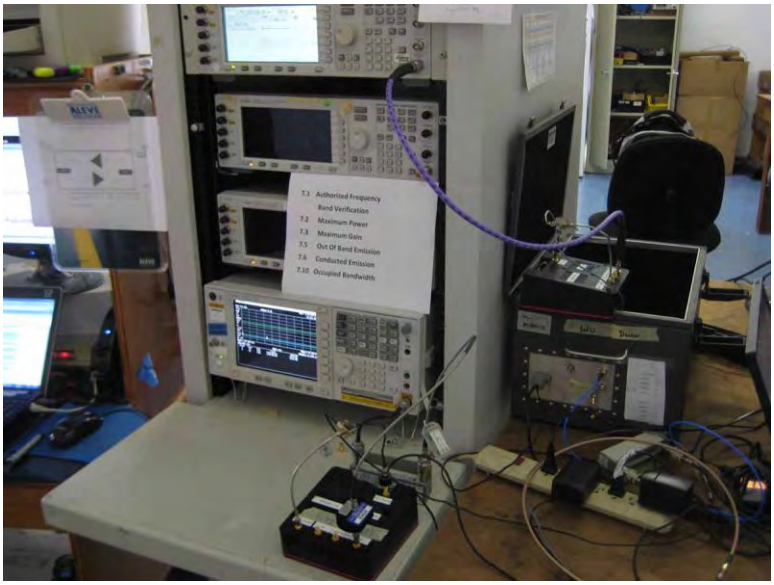


DL_2110-2155MHz_41AWGN_input_-70dBm



DL_2110-2155MHz_41AWGN_output

Test Setup Photo



Antenna Port Measurement

2.1051 / 27.53(m) Spurious Emissions at Antenna Terminals

Test Conditions / Setup

Test Location: CKC Laboratories • 110 Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **Nextivity, Inc.**
Specification: **47 CFR §27.53(m) 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 provider specific signal booster pair consisted 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 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 is conducted at Donor Port and Server Port.

Signal: 4.1MHz AWGN.

UL = 1710-1755MHz
DL = 2110-2155MHz

Frequency range of measurement = 9kHz - 22GHz.
9kHz-150kHz;RBW=200Hz,VBW=200Hz,
150kHz-30MHz;RBW=9kHz,VBW=9kHz;
30MHz-1000MHz;RBW=120kHz,VBW=120kHz
1000MHz-22000MHz;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	14410.000 M	-61.1	+0.0	+9.4	+1.2	+107.0	+0.0	56.5	94.0	-37.5	Ant P
									UL 1710-1755MHz		
2	14430.000 M	-65.1	+0.0	+9.4	+1.2	+107.0	+0.0	52.5	94.0	-41.5	Ant P
									DL 2110-2155MHz		

Test Data

LIMIT LINE FOR SPURIOUS CONDUCTED EMISSION

REQUIRED ATTENUATION = 43+10 LOG P DB

Limit line (dBuV) = V_{dBuv} - Attenuation

$$V_{dBuV} = 20\,Log\,\frac{V}{1\,x\,10^{-6}}$$
$$= 20\left(Log\,V - Log\,1\,x\,10^{-6}\right)$$
$$= 20\,Log\,V - 20\,Log 1\,x\,10^{-6}$$
$$= 20\,Log\,V - 20\left(-6\right)$$
$$= 20\,Log\,V + 120$$

$$Attenuation = 43 + 10\,\mathrm{Log\,P}$$
$$= 43 + 10\,\mathrm{Log}\,\frac{\mathrm{V}^2}{R}$$
$$= 43 + 10\left(\mathrm{Log\,V^2 - Log\,R}\right)$$
$$= 43 + 10\left(2\,\mathrm{Log\,V - Log\,R}\right)$$
$$= 43 + 20\,\mathrm{Log\,V} - 10\,\mathrm{Log\,R}$$

Limit line = V_{dBuv} - Attenuation

= 20 Log V + 120 – (43 + 20 Log V – 10Log R)

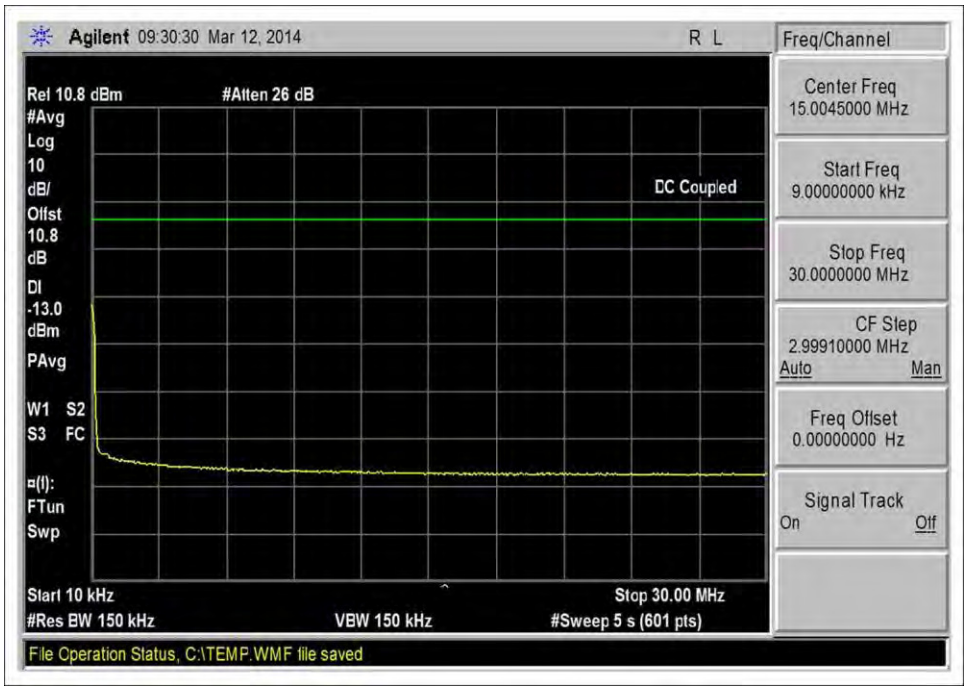
= 20 Log V + 120 – 43 – 20 Log V + 10Log R

= 20 Log V + 120 – 43 – 20 Log V + 10Log R

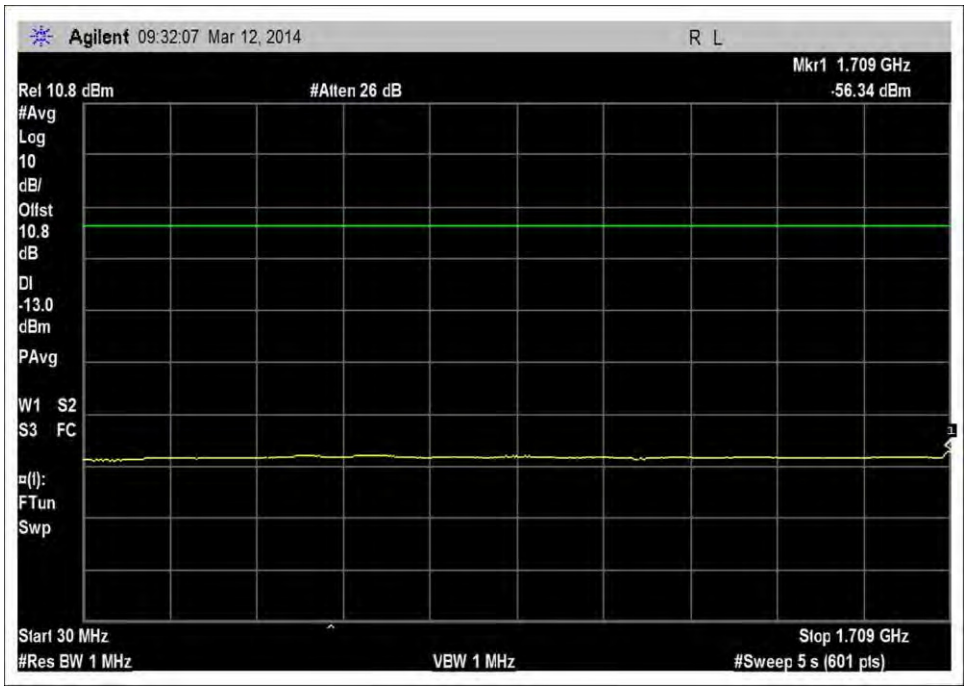
= 120 – 43 + 10 Log 50 Note : R = 50 Ω

= 120 –43 + 16.897

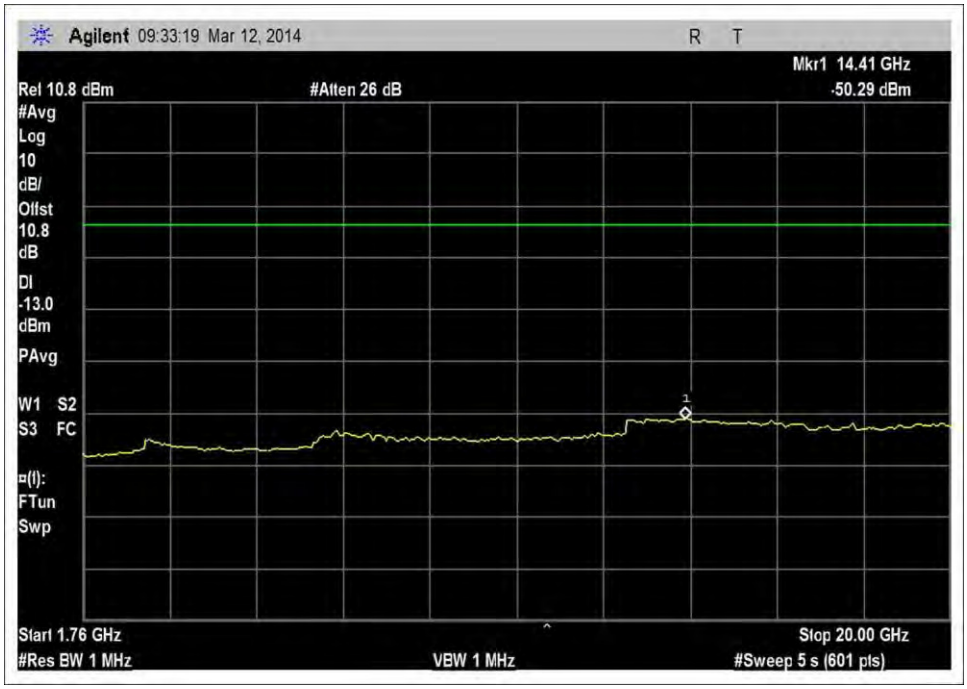
= 94 dBuV at any power level



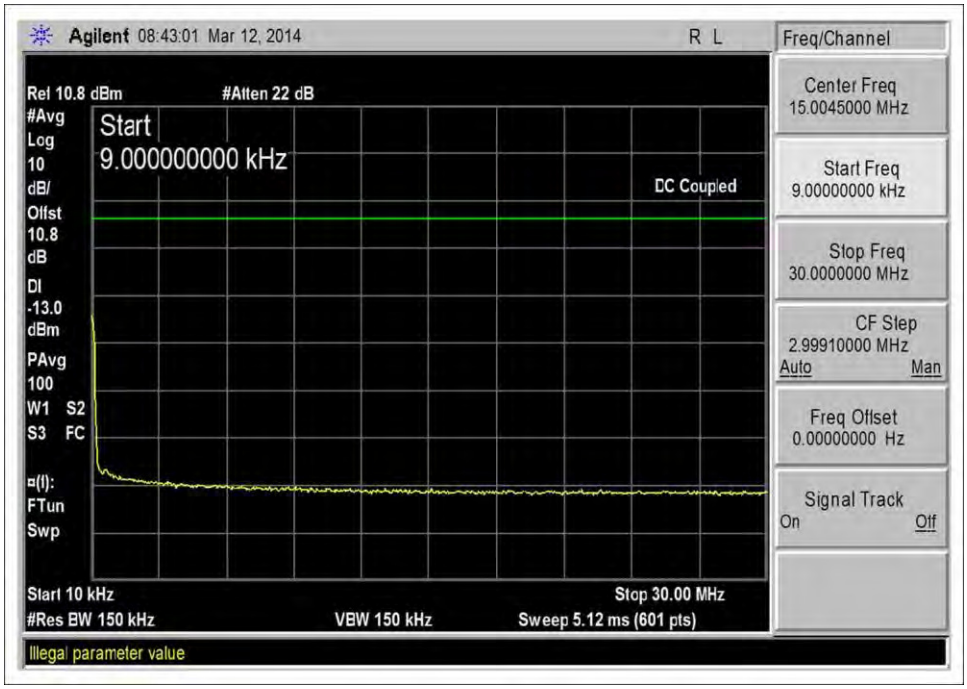
UL_1710-1755MHz_9kHz-30MHz



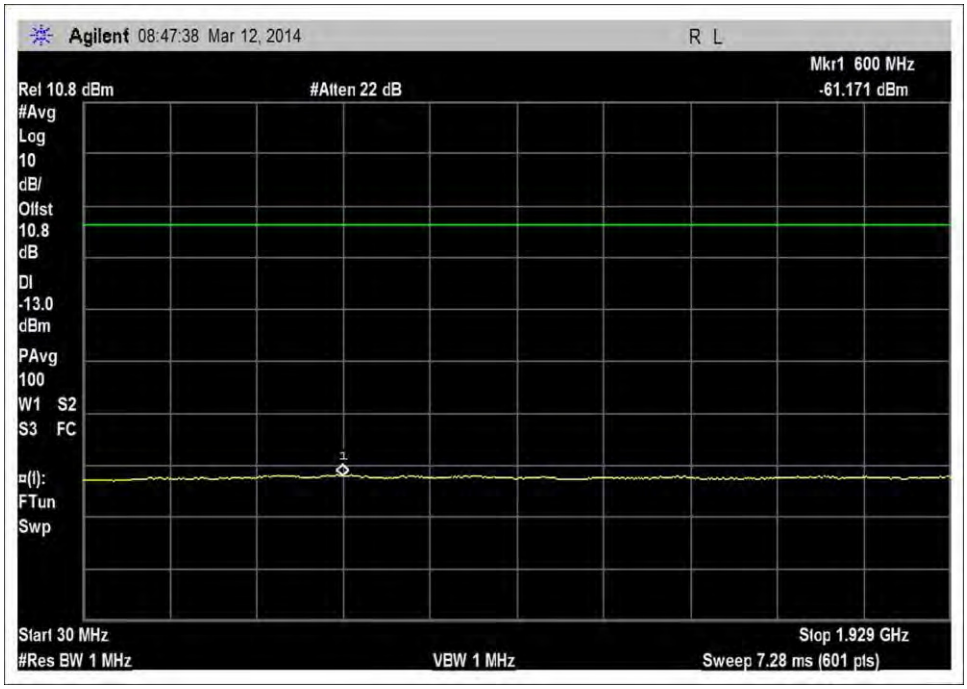
UL_1710-1755MHz_30-1709MHz



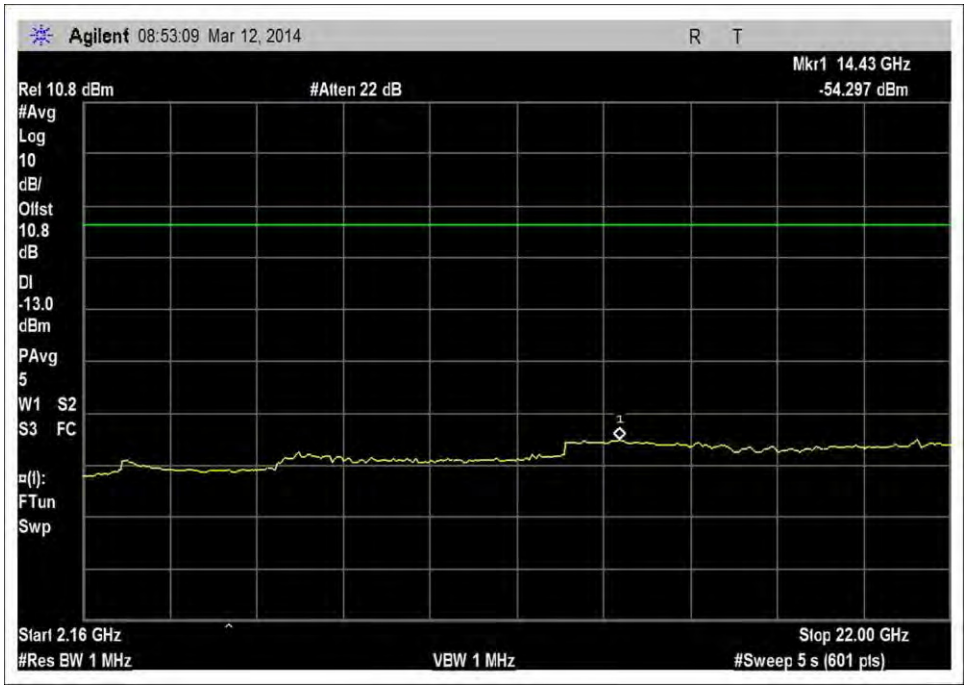
UL_1710-1755MHz_1756-20000MHz



DL_2110-2155MHz_9kHz-30MHz

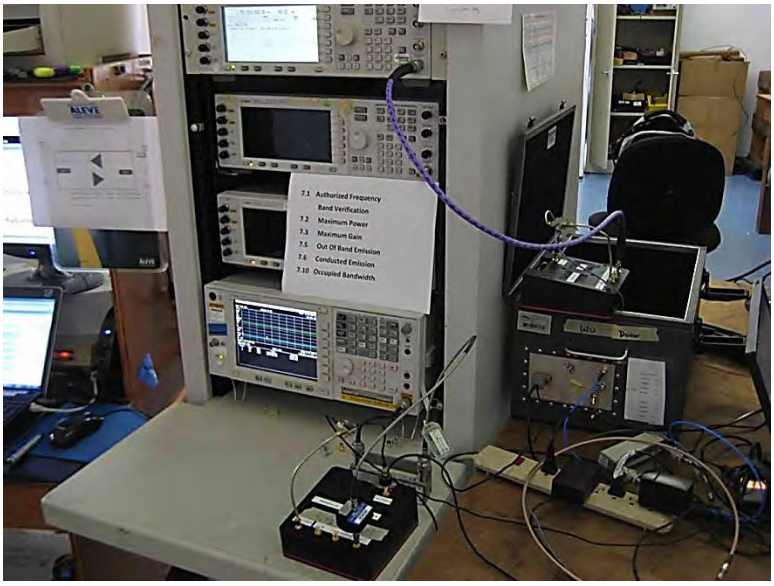


DL_2110-2155MHz_30-2109MHz



DL_2110-2155MHz_2156-22000MHz

Test Setup Photo



Antenna Port Measurement

2.1053 / 27.53(m) Field Strength of Spurious Radiation

Test Conditions / Setup

Test Location: CKC Laboratories • 110 Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **Nextivity, Inc.**
Specification: **47 CFR §27.53(m) 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 provider specific signal booster pair consisted 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 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 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 send to the NU via 5.8 GHz link and transmitted via the unit under test.

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

Signal: 4.1 MHz AWGN.
Freq Range
UL = 1710-1755MHz
DL = 1 2110-2155MHz
UL: 1732.5MHz
DL: 2132.5MHz

Frequency range of measurement = 9 kHz- 22 GHz
9kHz -150kHz; RBW=200Hz, VBW=200Hz
150kHz-30MHz RBW=9kHz, VBW=9kHz
30MHz-1000MHz; RBW=120kHz, VBW=120kHz
1000MHz-2000MHz; RBW=1MHz, VBW=1MHz

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

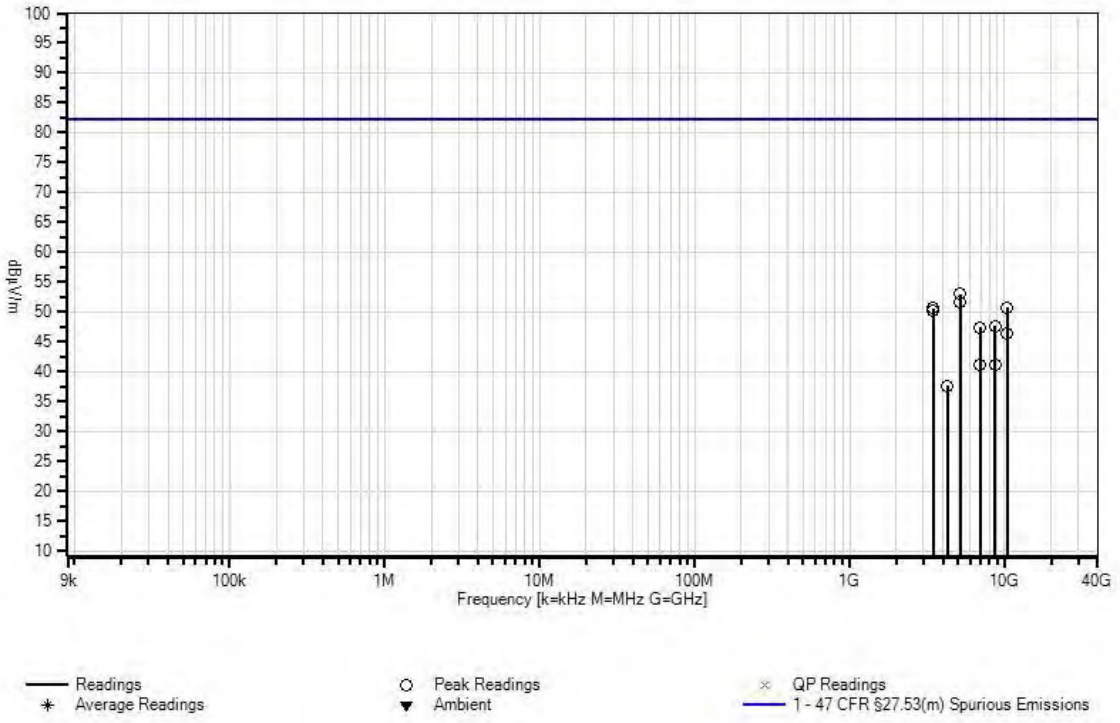
Testing is performed in accordance with Provider Specific Booster test procedure 935210 D04 Provider Specific Booster Measurement DR06-41704, dated 03/06/14.

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	5196.580M	50.5	+0.0 +1.2	-37.5 +0.2	+33.6	+5.0	+0.0	53.0	82.2 UL_1732.5MHz	-29.2	Vert
2	5197.420M	49.1	+0.0 +1.2	-37.5 +0.2	+33.6	+5.0	+0.0	51.6	82.2 UL_1732.5MHz	-30.6	Horiz
3	10393.420 M	40.7	+0.0 +1.5	-36.2 +0.0	+36.9	+7.8	+0.0	50.7	82.2 UL_1732.5MHz	-31.5	Vert
4	3465.420M	51.2	+0.0 +0.9	-38.4 +0.5	+32.5	+3.9	+0.0	50.6	82.2 UL_1732.5MHz	-31.6	Horiz
5	3464.580M	50.9	+0.0 +0.9	-38.4 +0.5	+32.5	+3.9	+0.0	50.3	82.2 UL_1732.5MHz	-31.9	Vert
6	8661.420M	40.6	+0.0 +1.3	-37.1 +0.1	+36.1	+6.7	+0.0	47.7	82.2 UL_1732.5MHz	-34.5	Vert
7	6929.420M	42.9	+0.0 +1.2	-37.2 +0.0	+34.5	+6.0	+0.0	47.4	82.2 UL_1732.5MHz	-34.8	Vert
8	10393.420 M	36.4	+0.0 +1.5	-36.2 +0.0	+36.9	+7.8	+0.0	46.4	82.2 UL_1732.5MHz	-35.8	Horiz
9	8661.420M	34.1	+0.0 +1.3	-37.1 +0.1	+36.1	+6.7	+0.0	41.2	82.2 UL_1732.5MHz	-41.0	Horiz
10	6929.420M	36.6	+0.0 +1.2	-37.2 +0.0	+34.5	+6.0	+0.0	41.1	82.2 UL_1732.5MHz	-41.1	Horiz
11	4265.000M	38.9	+0.0 +0.8	-37.9 +0.2	+31.3	+4.3	+0.0	37.6	82.2 DL 2132.5MHz	-44.6	Horiz

Date: 3/20/2014 Time: 10:17:56 Nextivity, Inc. WO#: 95395
47 CFR §27.53(m) Spurious Emissions Test Distance: 3 Meters Sequence#: 2 Ext ATTN: 0 dB



Test Data

LIMIT LINE FOR SPURIOUS RADIATED EMISSION

REQUIRED ATTENUATION = 43+10 LOG P (DB)

For radiated spurious emission measured at 3 meter test distance,

Required attenuation = 43+10 Log $P_{t\ at\ 3\ meter}$ dB
Limit line (dBuV) = E_{dBuv} - Attenuation

E_{dBuv} = Measured field strength at 3 meter in dBuV/m

Power Density (Isotropic)

$$P_D = \frac{P_t}{4\pi r^2}$$

P_D = Power Density in Watts /m^2
Pt = Average Transmit Power
r = Test distance

Field Intensity E (V/m)

$$E = \sqrt{P_D \times 377}$$

$$E = \frac{\sqrt{P_t \times 377}}{4\pi r^2}$$

$$E = \sqrt{\frac{P_t \times 30}{r^2}}$$

$$P_t = \left(\frac{E^2 \text{ x } r^2}{30} \right)$$

10 Log P_t = 10 Log E^2 (V/m)+ 10 Log r^2 – 10 Log 30

10 Log P_t = 20 Log E (V/m) + 20 Log r – 10 Log 30

At 3 meter, r = 3 m

10 Log P_t = 20 Log E (V/m) + 20 Log 3 – 10 Log 30

10 Log P_t = 20 Log E (V/m) + 9.54 – 14.77

10 Log P_t = 20 Log E (V/m) - 5.23

Since 20 Log E (V/m) = 20 Log E (uV/m) –120

10 Log P_t = 20 Log E (uV/m) - 120 - 5.23

10 Log P_t = 20 Log E (uV/m) –125.23

Limit line (dBuV) at 3 meter = E_{dBuv} – Attenuation

= E_{dBuv} - (43+10 Log $P_{t \text{ at 3 meter}}$)

= E_{dBuv} - 43 - 10 Log $P_{t \text{ at 3 meter}}$

= E_{dBuv} - 43 – (20 Log E (uV/m) –125.23)

= E_{dBuv} - 43 - 20 Log E (uV/m) + 125.23

= E_{dBuv} - 20 Log E (uV/m) + 82.23

Since 20 Log E (uV/m) = E in dBuV/m

= ~~E_{dBuv}~~ - ~~E_{dBuv}~~ + 82.23

Radiated Emission limit 3 meter = 82.23 dBuV at any power level measured in dBuV

Test Setup Photos

Coverage Unit

Coverage Unit

Network Unit

Network Unit

2.1055(a)(d) / 27.54 Frequency Stability

Test Conditions / Setup

Test Location: CKC Laboratories • 110 Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **Nextivity, Inc.**
Specification: 7.15 Frequency Stability, 27.54
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 275kHz in the uplink 1710-1755MHz band and 420kHz in the Dl 2110-2115MHz band.

Procedure Sec #	Guidance Description	FCC Sec #	FCC Rule Description
7.15	Frequency Stability[1]	2.1055 / 22/24/27[1]	Frequency Stability[1]

§27.54 Frequency stability.

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Result

Frequency Stability

Date: 26-Mar-14
Test Engineer: E. Wong
Device Model #:
Operating Voltage: 110 **VDC/VAC**
Frequency Limit: 0.275 **MHz** 0.420 **MHz**

Temperature Variations

Reference Frequency:		UL 1752.5 1730.40000	Dev. (MHz)	DL 2132.5 (MHz) 2130.30800	Dev. (MHz)
Temp (C)	Voltage				
-30	110	1730.32500	0.075000	2130.33300	0.025000
-20	110	1730.41700	0.017000	2130.33300	0.025000
-10	110	1730.42500	0.025000	2130.31700	0.009000
0	110	1730.41700	0.017000	2130.32500	0.017000
10	110	1730.41700	0.017000	2130.33300	0.025000
20	110	1730.42200	0.022000	2130.32500	0.017000
30	110	1730.41700	0.017000	2130.33300	0.025000
40	110	1730.43300	0.033000	2130.33300	0.025000
50	110	1730.42500	0.025000	2130.31700	0.009000

Voltage Variations (±15%)

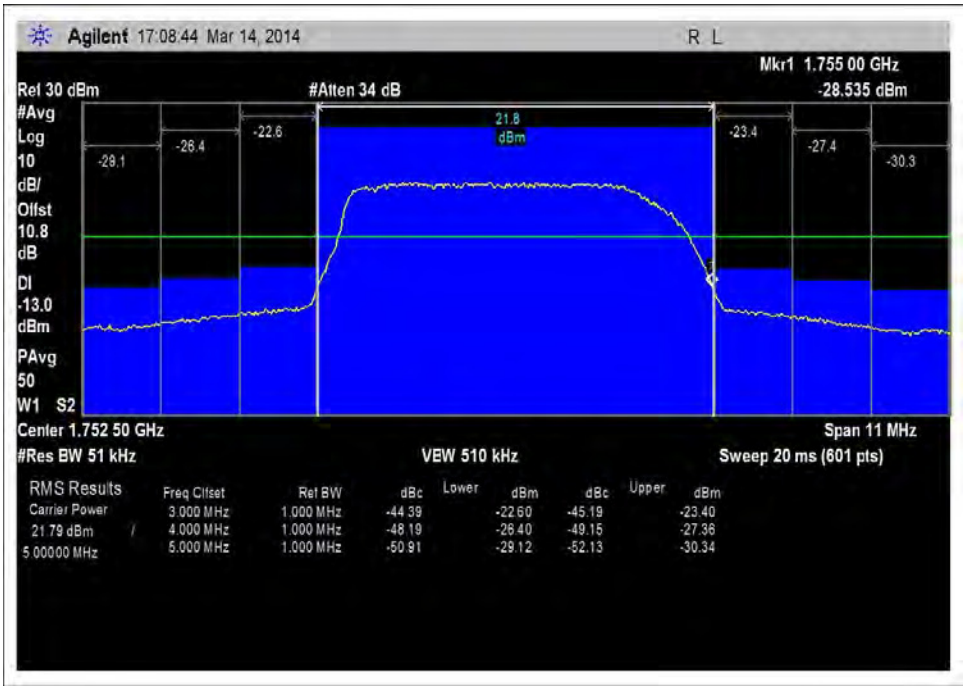
20	93.5	1730.43300	0.033000	2130.33300	0.025000
20	110	1730.42200	0.022000	2130.32500	0.017000
20	126.5	1730.43300	0.033000	2130.32500	0.017000

Max Deviation (MHz)			**0.075000**		**0.025000**
Max Deviation (%)			0.004334		0.001174
			PASS		**PASS**

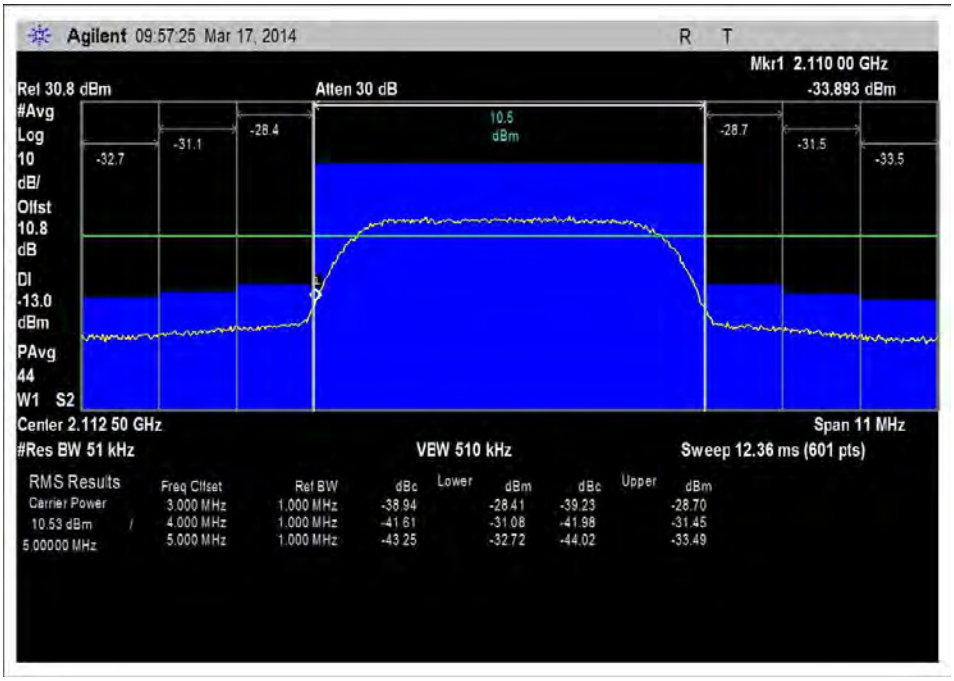
To calculate Frequency drift limit:
The Provider specific booster employs unique product design where the frequency of transmitted signal and the relayed spectrum block filter is determined by an oscillator. The device can only transmit at predetermined frequency IAW with 3GPP channel plan and the device 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 band was measure first, (note: the cursors presented on the plots are set at band edges 2110MHz DL, 1755MHz UL)

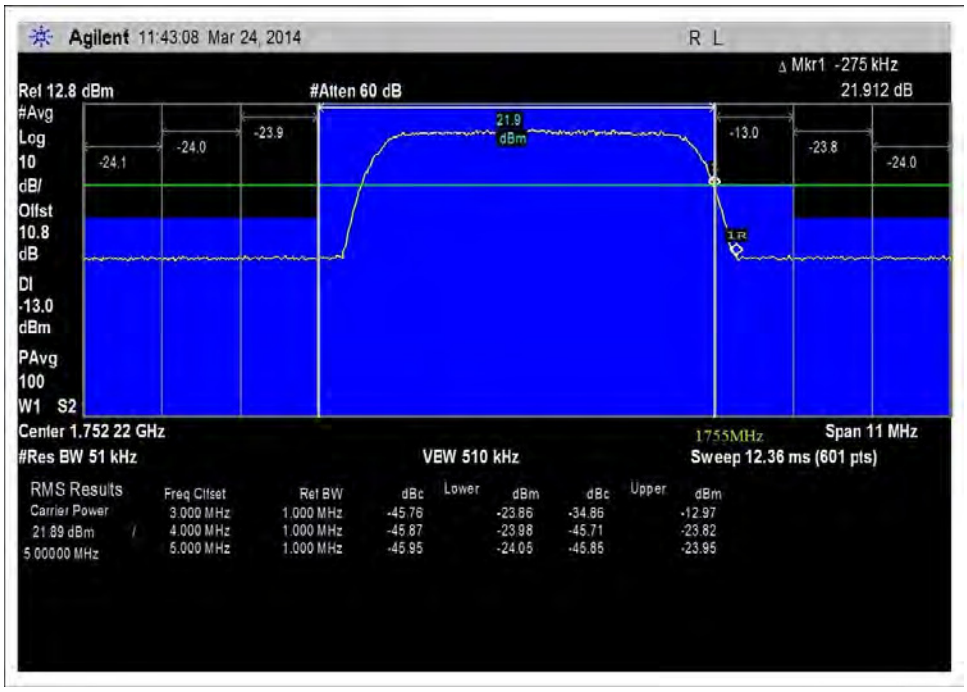
Test Plots



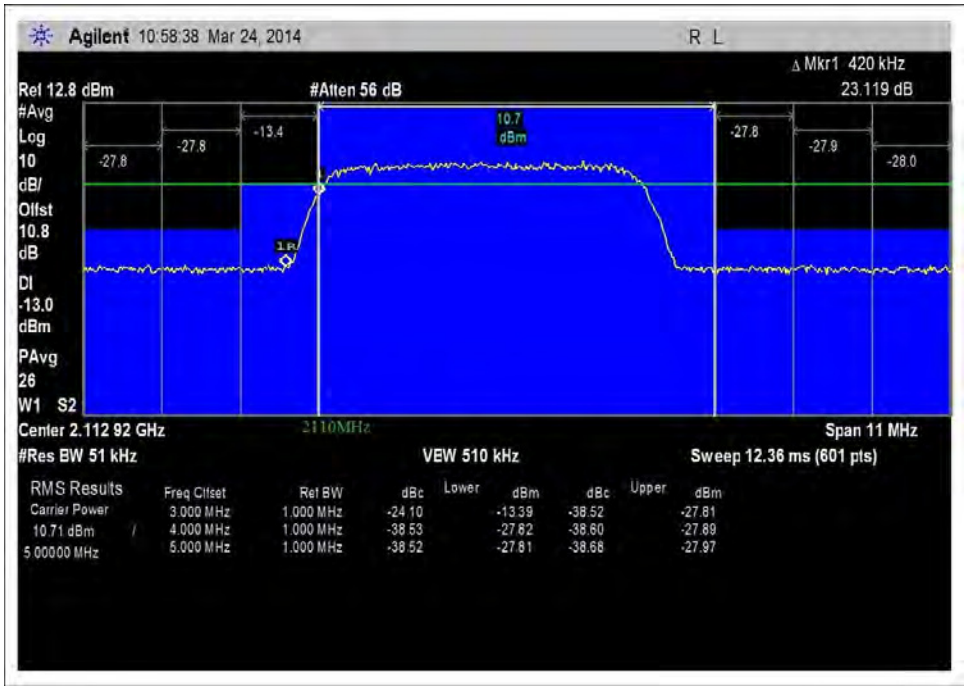
UL 1710-1755, cursor set at 1755MHz. Channel power 1 MHz outside the band is -23.4dBm



DL 2100-2155MHz, cursor set at 2110MHz. Channel power 1 MHz outside the band is -28.4dBm
Step 2, 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 1710-1755MHz, cursor set at 1755.275MHz. Channel power 1 MHz outside the band is – 13 Bm, meaning the max allowed frequency drift is 0.275MHz before the worst case emission exceeds the OBE limit.



DL 2110-2155MHz, cursor set at 2109.58MHz. 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 Photo(s)

Temperature Test 1

Temperature Test 2

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	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/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.