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Radio Test Report

FCC Part 27
(1712.4 MHz to 1752.6 MHz)

Model: CELFI-RSWU104

FCC ID:	YETCELFI-RSWU104
COMPANY:	Nextivity Incorporated 12230 World Trade Drive Suite 250 San Diego, CA 92128
TEST SITE(S):	Elliott Laboratories 684 W. Maude Avenue Sunnyvale, CA 94085
and	41039 Boyce Road. Fremont, CA. 94538-2435
REPORT DATE:	May 20, 2010
FINAL TEST DATES:	April 26, May 3 and May 12, 2010

AUTHORIZED SIGNATORY:

David W. Bare
Chief Engineer
Elliott Laboratories.

ACCREDITED

Testing Cert #2016-01

REVISION HISTORY

Rev#	Date	Comments	Modified By
1	5/20/2010	First release	

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SCOPE

Tests have been performed on the Nextivity Incorporated model CELFI-RSWU104, pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission and Industry Canada.

- Code of Federal Regulations (CFR) Title 47 Part 2
- CFR 47 Part 27

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003
ANSI TIA-603-C August 17, 2004

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the Nextivity Incorporated model CELFI-RSWU104 and therefore apply only to the tested sample. The sample was selected and prepared by Rama Akella of Nextivity Incorporated.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, the device requires certification. Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Nextivity Incorporated model CELFI-RSWU104 complied with the requirements of the standards and frequency bands declared in the scope of this test report.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS

FCC Part 27 (1710 – 1755 MHz Advanced Wireless Service)

FCC	Canada	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) §27.5 (i) (2)		Frequency range(s)	1712.4-1752.6 MHz	1710 – 1755 MHz	Complied
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 §27.50(d)		EIRP	0.309 Watts 24.9 dBm	1 Watt 30 dBm	Complied
§2.1033 (c) (4) §2.1047 §27.53(m)(4) (6)		Emission types	WCDMA	-	-
		Emission mask Note 3	< -13dBm at both band edges	-13dBm at band edge	Complied
§2.1049		Occupied Bandwidth	4.1 MHz	-	N/A
Transmitter spurious emissions					
§2.1051 §2.1053 §2.1057 §27.53(h)		At the antenna terminals	-21.2 dBm @ 1709.73 MHz	-13 dBm	Complied
		Field strength	-13.1dBm @ 3465.3MHz	-13 dBm eirp	Complied
Receiver spurious emissions					
15.109		At the antenna terminals	Note 2	2nW / 100kHz (-57dBm)	N/A
15.109		Field strength		See limit table on page 17	N/A
Other details					
§2.1055 §27.54		Frequency stability	0.2 ppm	100 ppm Note 1	Complied
§2.1093		RF Exposure	0.077 mW/cm^2 at 20cm	1.0 mW/cm^2	Complied
§2.1033 (c) (8)		Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	Refer to operational description	-	-
-	-	Antenna Gain		-	-

Notes
Note 1 – The requirement for frequency stability is that the signal remains within the allocated band. A limit of 100 ppm is being used to ensure the signal remains within the allocated band as defined by the spurious limits at the channel edges.
Note 2 – As the frequency of operation is above 960 MHz there are no technical requirements for spurious emissions from the receiver.
Note 3 – The measurement at the channel edge is made in a reference bandwidth of 1 MHz or at least 1% the emission bandwidth is used. For measurements more than 1MHz from the edge of the channel the measurement bandwidth is 1MHz.

EXTREME CONDITIONS

Frequency stability is determined over extremes of temperature and voltage. The extremes of voltage were 85 to 115 percent of the nominal value.

The extremes of temperature were -30°C to +50°C as specified in FCC §2.1055(a)(1).

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF frequency	Hz	25 to 7,000 MHz	1.7×10^{-7}
RF power, conducted	dBm	25 to 7,000 MHz	± 0.52 dB
Conducted emission of transmitter	dBm	25 to 40,000 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 40,000 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 40,000 MHz	± 2.5 dB
Radiated emission (field strength)	dBμV/m	25 to 1,000 MHz 1 to 40 GHz	± 3.6 dB ± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Nextivity Incorporated model CELFI-RSWU104 is part of a cellular repeater system that is designed to allow for cellular reception within a building. The CELFI-RSWU104 communicates with cellular towers in the 1710-1755 MHz band and can transmit to the CELFI-RSCU104 in the 5470-5725 MHz band. It was treated as table-top equipment during testing to simulate the end-user environment. The CELFI-RSWU104 is powered via external AC/DC adapters. The electrical rating of the adapters is 90-264VAC, 47-63 Hz, 1.0A Max.

The sample was received on April 12, 2010 and tested on April 26, May 3 and May 12, 2010. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Nextivity	CELFI-RSCU1	Cel-Fi Coverage Unit	Various	YETCELFI-RSCU104

OTHER EUT DETAILS

The communication in the U-NII bands is a nominally 40 MHz proprietary signal. The WU transmits in the 5470-5725 MHz band only and receives in the 5150-5350 MHz band in normal use. During CU synchronization, the WU receives in both 5150-5350 and 5470-5735 MHz bands. The CU transmits in the 5150-5350 MHz band and receives in the 5470-5725 MHz band. Once communication is established between the WU and CU, there is 100% usage of the TX channel for both the WU and CU.

ANTENNA SYSTEM

The antenna system consists of custom built antennas mounted inside the enclosure. They are not accessible or removable.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 17.4 cm wide by 13.3 cm deep by 5.9 cm high.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Elliott.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Dell	PP18L	Laptop	37670547493	-
Dell	HA65NS1-00	Power Adaptor	CN-OHN662-47890-870-A2C2	-

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Console (Serial)	Laptop USB	Multi-conductor	Shielded	1.5
AC Adapter Power	AC Mains	Direct Plug in	Unshielded	2.0
DC Power	AC Adapter	Two wire	Unshielded	2.0

Note: The USB port was not connected during testing. Nextivity stated that this is for loading code and therefore would not normally be connected.

EUT OPERATION

During emissions testing, the EUT was configured to transmit a modulated 100% duty cycle signal at the selected power and frequency.

TESTING

GENERAL INFORMATION

Radiated emissions measurements were taken at the Elliott Laboratories Semi Anechoic Chambers and/or Open Area Test Site(s) listed below. The sites conform to the requirements of ANSI C63.4: 2003 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are on file with the FCC and industry Canada.

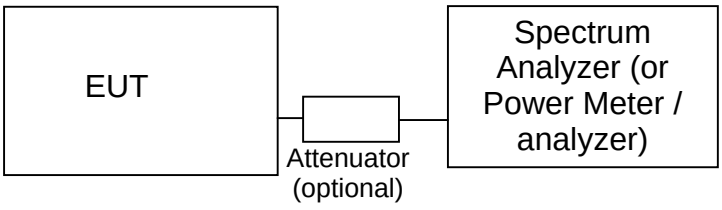
Site	Registration Numbers		Location
	FCC	Canada	
Chamber 4	211948	IC 2845B-4	41039 Boyce Road Fremont, CA 94538-2435
Chamber 5	211948	IC 2845B-5	

In the case of Open Area Test Sites, ambient levels are at least 6 dB below the specification limits with the exception of predictable local TV, radio, and mobile communications traffic.

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

RF PORT MEASUREMENT PROCEDURES

Conducted measurements are performed with the EUT's rf input/output connected to the input of a spectrum analyzer, power meter or modulation analyzer. When required an attenuator, filter and/or dc block is placed between the EUT and the spectrum analyzer to avoid overloading the front end of the measurement device. Measurements are corrected for the insertion loss of the attenuators and cables inserted between the rf port of the EUT and the measurement equipment.



Test Configuration for Antenna Port Measurements

For devices with an integral antenna the output power and spurious emissions are measured as a field strength at a test distance of (typically) 3m and then converted to an eirp using a substitution measurement. All other measurements are made as detailed below but with the test equipment connected to a measurement antenna directed at the EUT.

OUTPUT POWER

Output power is measured using a power meter and an average sensor head, a spectrum analyzer or a power meter and peak power sensor head as required by the relevant rule part(s). Where necessary measurements are gated to ensure power is only measured over periods that the device is transmitting.

Power measurements made directly on the rf power port are, when appropriate, converted to an EIRP by adding the gain of the highest gain antenna that can be used with the device under test, as specified by the manufacturer.

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN. The measurement bandwidth is set to be at least 1% of the instrument's frequency span.

CONDUCTED SPURIOUS EMISSIONS

Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode measurements). Where the limits are expressed as an average power the spectrum analyzer is tunes to that frequency with a narrow span (wide enough to capture the emission and its sidebands) and the resolution and video bandwidths are adjusted as required by the reference measurement standards. For transmitter measurements the appropriate detector (average, peak, normal ,sample, quasi-peak) is used when making measurements for licensed devices. For receiver conducted spurious measurements the detector is set to peak.

TRANSMITTER MASK MEASUREMENTS

The transmitter mask measurements are made using resolution bandwidths as specified in the pertinent rule part(s). Where narrower bandwidths are used the measurement is corrected to account for the reduced bandwidth by either using the adjacent channel power function of the spectrum analyzer to sum the power across the required measurement bandwidth. The frequency span of the analyzer is set to ensure the fundamental signal and all significant sidebands are displayed.

The top of the mask may be set by the total output power of the signal, the power of the unmodulated signal or the peak value of the signal in the reference bandwidth being used for the mask measurement.

FREQUENCY STABILITY

The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The temperature is varied across the specified frequency range in 10 degree increments with frequency measurements made at each temperature step. The EUT is allowed enough time to stabilize at each temperature variation.

The spectrum analyzer is configured to give a 5- or 6-digit display for the marker-frequency function. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. Where possible the device is set to transmit an unmodulated signal. Where this is not possible the frequency drift is determined by finding a stable point on the signal (e.g. the null at the centre of an OFDM signal) or by calculating a centre frequency based on the upper and lower XdB points (where X is typically 6dB or 10dB) on the signal’s skirts.

RADIATED EMISSIONS MEASUREMENTS

Receiver radiated spurious emissions measurements are made in accordance with ANSI ANSI C63.4:2003 by measuring the field strength of the emissions from the device at a specific test distance and comparing them to a field strength limit. Where the field strength limit is specified at a longer distance than the measurement distance the measurement is extrapolated to the limit distance.

Transmitter radiated spurious emissions are initially measured as a field strength. The eirp or erp limit as specified in the relevant rule part(s) is converted to a field strength at the test distance and the emissions from the EUT are then compared to that limit. Emissions within 20dB of this limit are the subjected to a substitution measurement.

All radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in either an anechoic chamber or on an OATS during which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed across the complete frequency range of interest and at each operating frequency identified in the reference standard. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit. For transmitter spurious emissions, where the limit is expressed as an effective radiated power, the eirp or erp is converted to a field strength limit.

Final measurements are made on an OATS or in a semi-anechoic chamber at the significant frequencies observed during the preliminary scan(s) using the same process of rotating the EUT and raising/lowering the measurement antenna to find the highest level of the emission. The field strength is recorded and, for receiver spurious emissions, compared to the field strength limit. For the final measurement the appropriate detectors (average, peak, normal, sample, quasi-peak) are used. For receiver measurements below 1GHz the detector is a Quasi-Peak detector, above 1GHz a peak detector is used and the peak value (RB=VB=1MHz) and average value (RB=1MHz, VB=10Hz) are recorded.

For transmitter spurious emissions, the radiated power of all emissions within 20dB of the calculated field strength limit are determined using a substitution measurement. The substitution measurement is made by replacing the EUT with an antenna of known gain (typically a dipole antenna or a double-ridged horn antenna), connected to a signal source. The output power of the signal generator is adjusted until the maximum field strength from the substitution antenna is similar to the field strength recorded from the EUT. The erp of the EUT is then calculated.

INSTRUMENTATION

An EMI receiver as specified in CISPR 16-1-1 is used for radiated emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary.

For measurements above the frequency range of the receivers and for all conducted measurements a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis.

Measurement bandwidths for the test instruments are set in accordance with the requirements of the standards referenced in this document.

Software control is used to correct the measurements for transducer factors (e.g. antenna) and the insertion loss of cables, attenuators and other series elements to obtain the final measurement value. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are exported in a graphic and/or tabular format, as appropriate.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the EUT antenna port or receiving antenna and the test receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A combination of biconical, log periodic or bi-log antennas are used to cover the range from 30 MHz to 1000 MHz. Broadband antennas or tuned dipole antennas are used over the entire 25 to 1000 MHz frequency range as the reference antenna for substitution measurements. Above 1000 MHz, a dual-ridge guide horn antenna or octave horn antenna are used as reference and measurement antennas.

The antenna calibration factors are included in site factors that are programmed into the test receivers and instrument control software when measuring the radiated field strength.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

Table mounted devices are placed on a non-conductive table at a height of 80 centimeters above the floor. Floor mounted equipment is placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. The EUT is positioned on a motorized turntable to allow it to be rotated during testing to determine the angel with the highest level of emissions.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS

Measurements are compared directly to the conducted emissions specification limit (decibel form). The calculation is as follows:

$$R_r - S = M$$

where:

R_r = Measured value in dBm
S = Specification Limit in dBm
M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH

Measurements of radiated field strength are compared directly to the specification limit (decibel form). The receiver and/or control software corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor is used when measurements are made at a test distance that is different to the specified limit distance by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB
D_m = Measurement Distance in meters
D_s = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_S = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS –RADIATED POWER

The erp/eirp limits for transmitter spurious measurements are converted to a field strength in free space using the following formula:

$$E = \frac{\sqrt{30\ P\ G}}{d}$$

where:

E = Field Strength in V/m
P = Power in Watts
G = Gain of isotropic antenna (numeric gain) = 1
D = measurement distance in meters

The field strength limit is then converted to decibel form (dBuV/m) and the margin of a given emission peak relative to the limit is calculated (refer to *SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH*).

When substitution measurements are required (all signals with less than 20dB of margin relative to the calculated field strength limit) the eirp of the spurious emission is calculated using:

$$P_{EUT} = P_S - (E_S - E_{EUT})$$

and

$$P_S = G + P_{in}$$

where:

P_S = effective isotropic radiated power of the substitution antenna (dBm)
P_{in} = power input to the substitution antenna (dBm)
G = gain of the substitution antenna (dBi)
E_S = field strength the substitution antenna (dBm) at eirp P_S
E_{EUT} = field strength measured from the EUT

Where necessary the effective isotropic radiated power is converted to effective radiated power by subtracting the gain of a dipole (2.2dBi) from the eirp value.

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

Appendix A Test Equipment Calibration Data

Radio Antenna Port (Power and Spurious Emissions), 26-Apr-10

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	1070	06-May-10
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	12-May-10
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	22-Oct-10
Rohde & Schwarz	EMI Test Receiver	ESIB7	1538	15-Oct-10

Signal Substitutions, 03-May-10

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18GHz	3115	868	10-Jun-10
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	1070	06-May-10
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	14-Apr-11
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	10-Jun-10
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	17-Sep-10
Anritsu	Signal Generator, 10MHz-20GHz	68347C	1785	18-Nov-10
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1786	05-Feb-11

Frequency Stability, 12-May-10

Manufacturer	Description	Model #	Asset #	Cal Due
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	06-Jan-11
Thermotron	Temp Chamber (w/ F4 Watlow Controller)	S1.2	2170	29-Jun-10

Appendix B Test Data

T79040 14 Pages

Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		-
Emissions Standard(s):	FCC Part 15 and 27	Class:	B
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

Nextivity, Inc.

Model

Cel-Fi

Date of Last Test: 5/12/2010

Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

FCC Part 27

Power, Occupied Bandwidth, Frequency Stability and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

With the exception of the radiated spurious emissions tests, all measurements are made with the EUT's rf port connected to the measurement instrument via an attenuator or dc-block if necessary. All amplitude measurements are adjusted to account for the attenuation between EUT and measuring instrument. For frequency stability measurements the EUT was place inside an environmental chamber.

Radiated measurements are made with the EUT located on a non-conductive table, 3m from the measurement antenna.

Ambient Conditions:

Temperature: 19.4 °C

Rel. Humidity: 40 %

Summary of Results

Run #	Spacing	Test Performed	Limit	Pass / Fail	Result / Margin
1	100 kHz	Output Power	1 Watt EIRP	Pass	24.9 dBm EIRP (0.309 W)
2	100 kHz	99% or Occupied Bandwidth	-	-	4.1 MHz
3	100 kHz	Spurious Emissions (conducted)	-13 dBm	Pass	All emissions less than -13dBm
4	100 kHz	Spurious emissions (radiated)	-13 dBm	Pass	-13.1dBm @ 3465.3MHz (-0.1dB)
5	100 kHz	Frequency Stability	193ppm	Pass	0.2ppm

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Radio Test Data

Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

Run #1: Output Power

Date: 4/26/2010 Engineer: Rafael Varelas Location: FT Chamber #5

Cable + Combiner Loss: 7.0 dB Attenuator: 10.4 dB Total Loss: 17.4 dB

Cable ID(s): EL441, EL412, 1876 Attenuator IDs: 2100

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W	Output Power Peak (dBm)[3]	Output Power Peak mW
Max	1712.4	18.9	77.6	6.0	Pass	24.9	0.309	26.5	446.7
Max	1732.4	18.8	75.0	6.0	Pass	24.8	0.299	27.3	537.0
Max	1752.6	18.9	77.6	6.0	Pass	24.9	0.309	28.1	645.7

Note 1:	Output power measured using an average power meter
Note 2:	Power setting - the software power setting used during testing, included for reference only.
Note 3:	Output power measured using a spectrum analyzer with RBW=10MHz, VB=10 MHz, included for referenece only

Radio Test Data

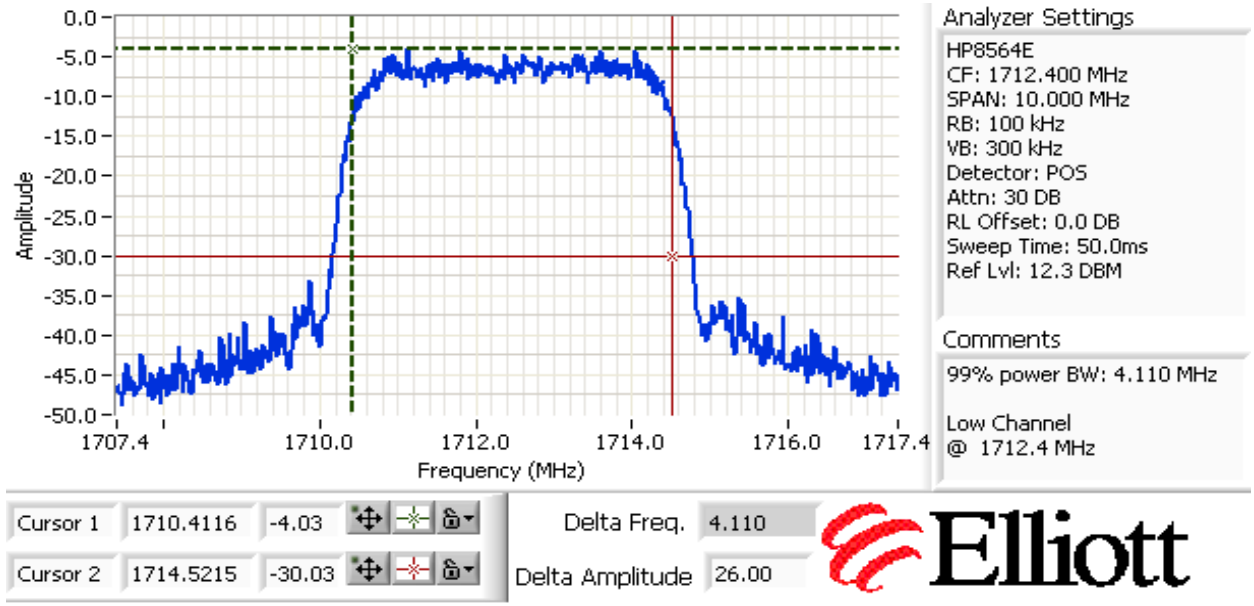
Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

Run #2: Signal Bandwidth

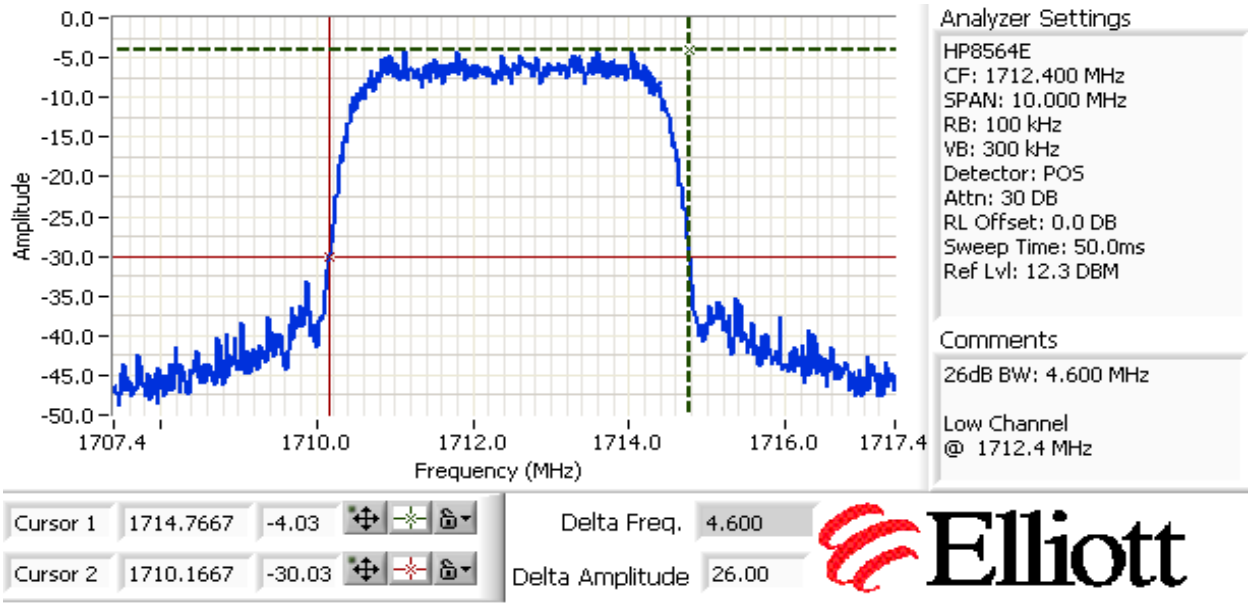
Date: 4/26/2010 Engineer: Rafael Varelas Location: FT Chamber #5

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz) 26dB	99%
Max	1712.4	100kHz	4.6	4.1
Max	1732.4	100kHz	4.58	4.12
Max	1752.6	100kHz	4.56	4.12

Note 1: 99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB



Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A



Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

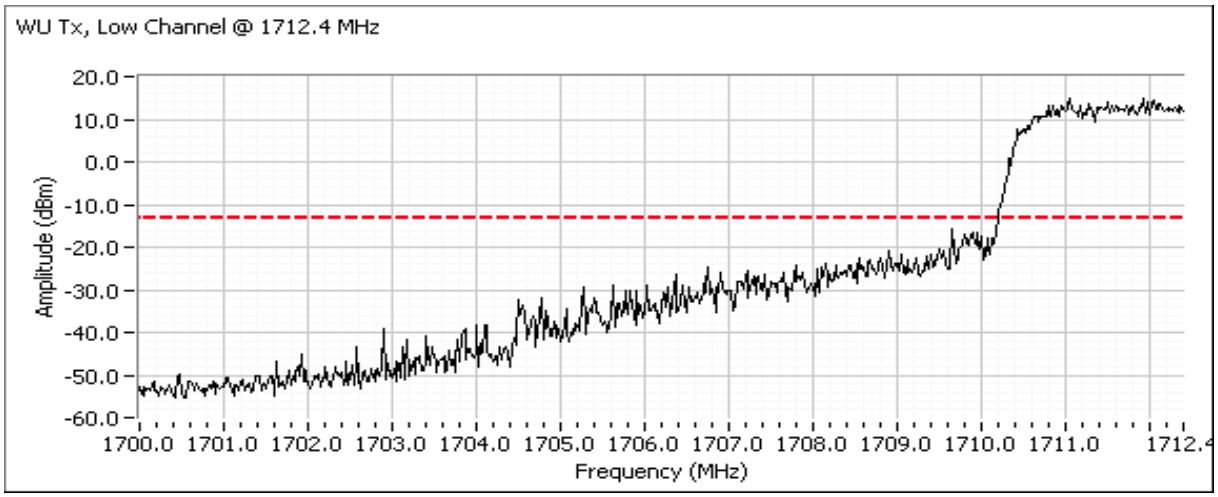
Run #3: Out of Band Spurious Emissions, Conducted

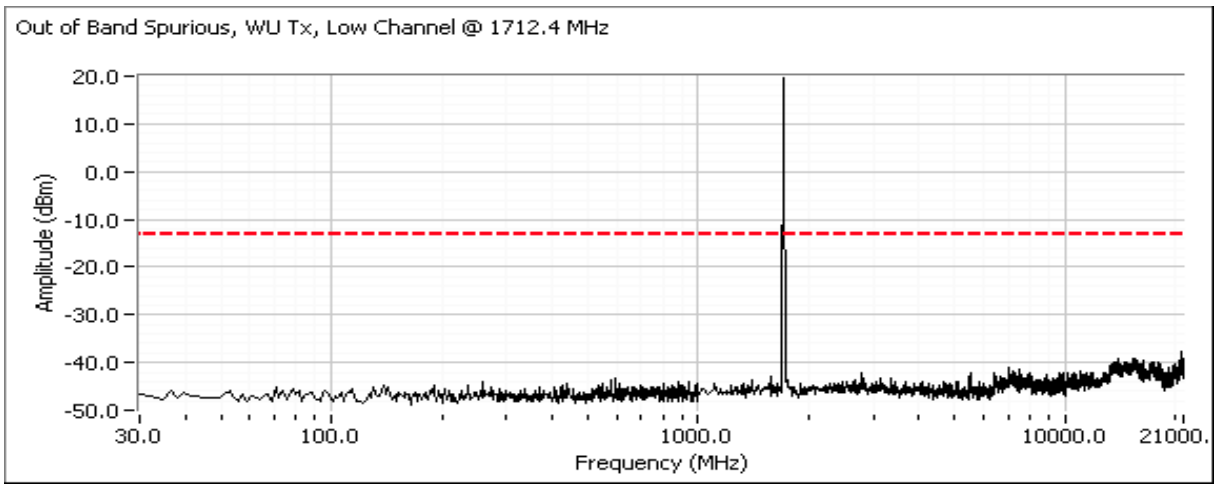
Date: 4/26/2010 Engineer: Rafael Varelas Location: FT Chamber #5

Frequency (MHz)	Limit	Result
1712.4	-13dBm	Pass
1732.4	-13dBm	Pass
1752.6	-13dBm	Pass

The limit is taken from FCC Part 27.53(h), (1 MHz RB and 3 MHz VB), for BE plots 100kHz RB and 100kHz VB were used
At bandedges, RW can be lowered to 1% of the 26dB bandwidth

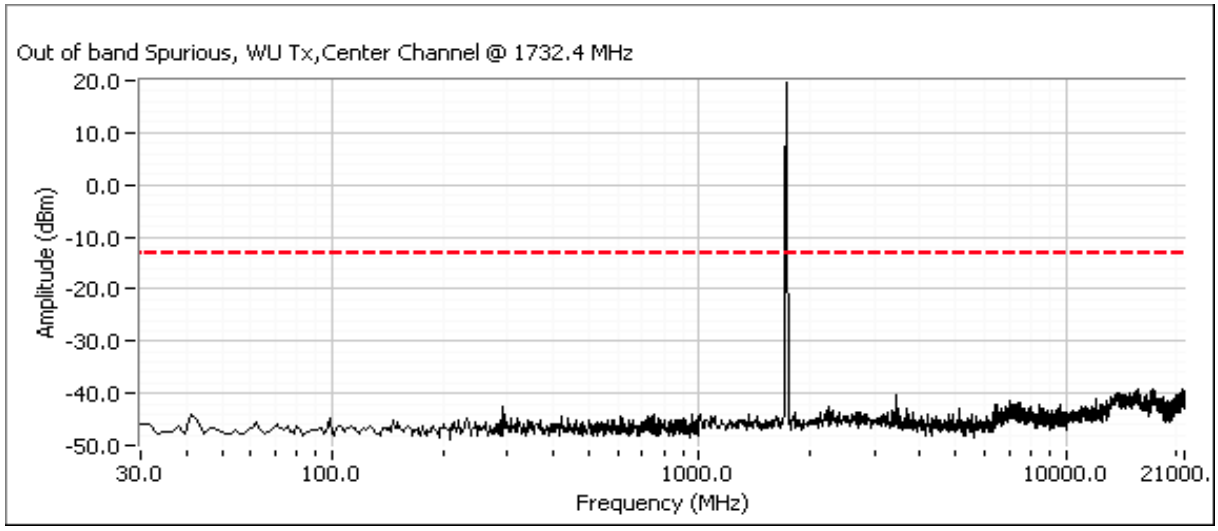
Plots for low channel, power setting(s) = Max



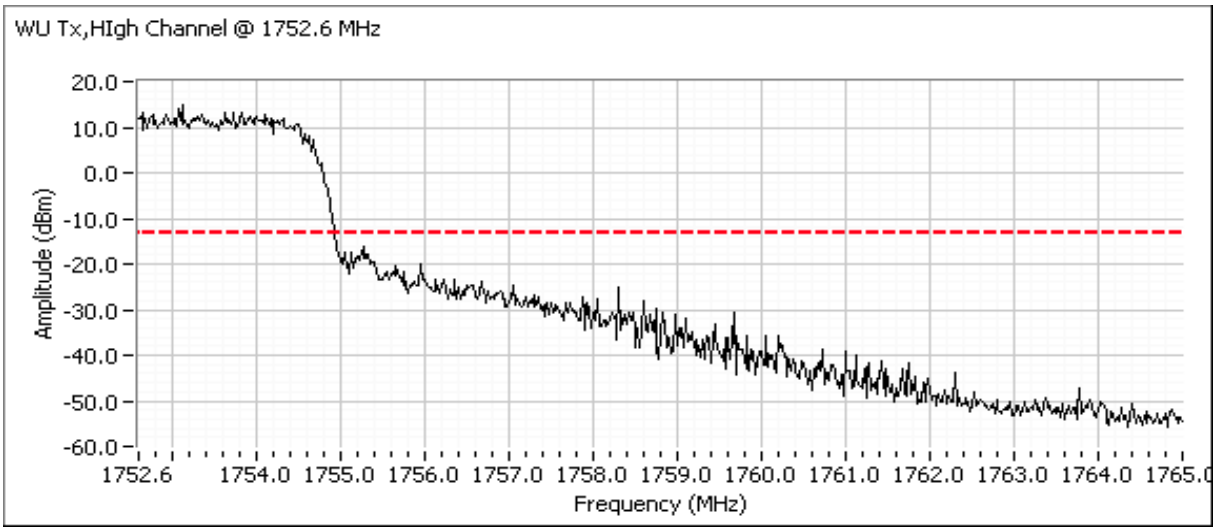


Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

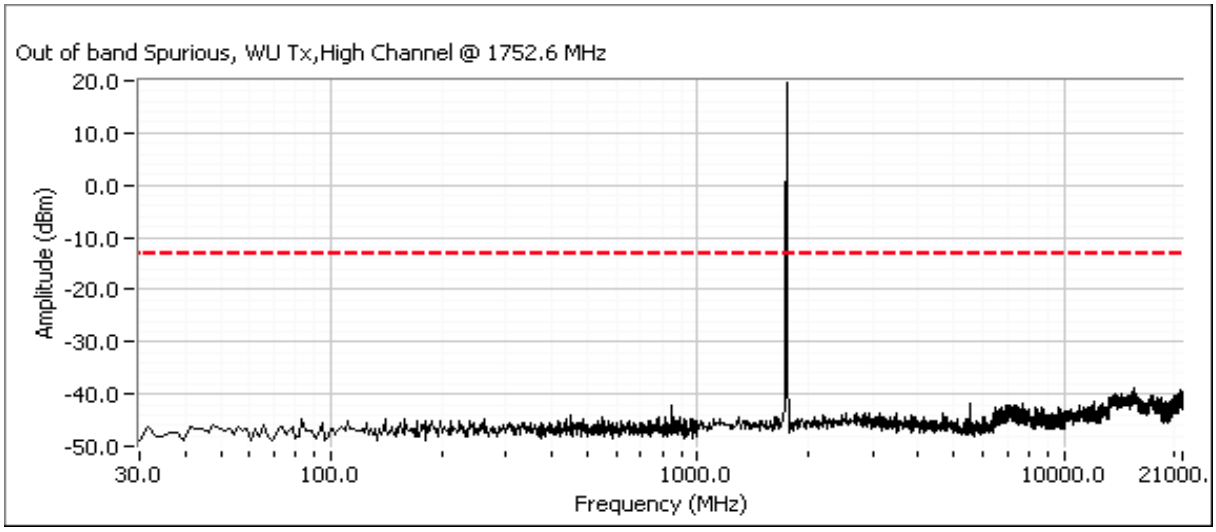
Plots for center channel, power setting(s) = Max



Plots for high channel, power setting(s) = Max



Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A



Frequency MHz	Level dBm	Lead	Limit	Margin	Detector QP/Ave	Comments
1709.733	-21.2	RF Port	-13.0	-8.2	Ave	RB = 50 kHz, VB = 100 KHz
1755.234	-20.6	RF Port	-13.0	-7.6	Ave	RB = 50 kHz, VB = 100 KHz

Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

Run #4: Out of Band Spurious Emissions, Radiated

Conducted limit (dBm): -13
Approximate field strength limit @ 3m: 82.3

The limit is taken from FCC Part 27.53(h), (1 MHz RB and 3 MHz VB)

Run #5a - Preliminary measurements - chamber scans

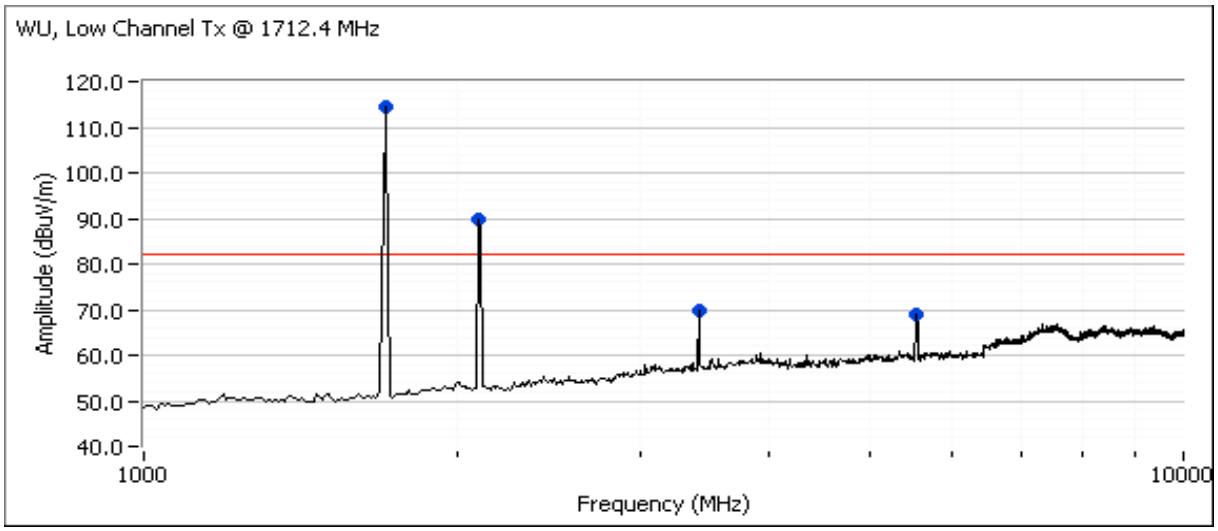
Date: 5/3/2010 Engineer: Rafael Varelas Location: FT Chamber #4

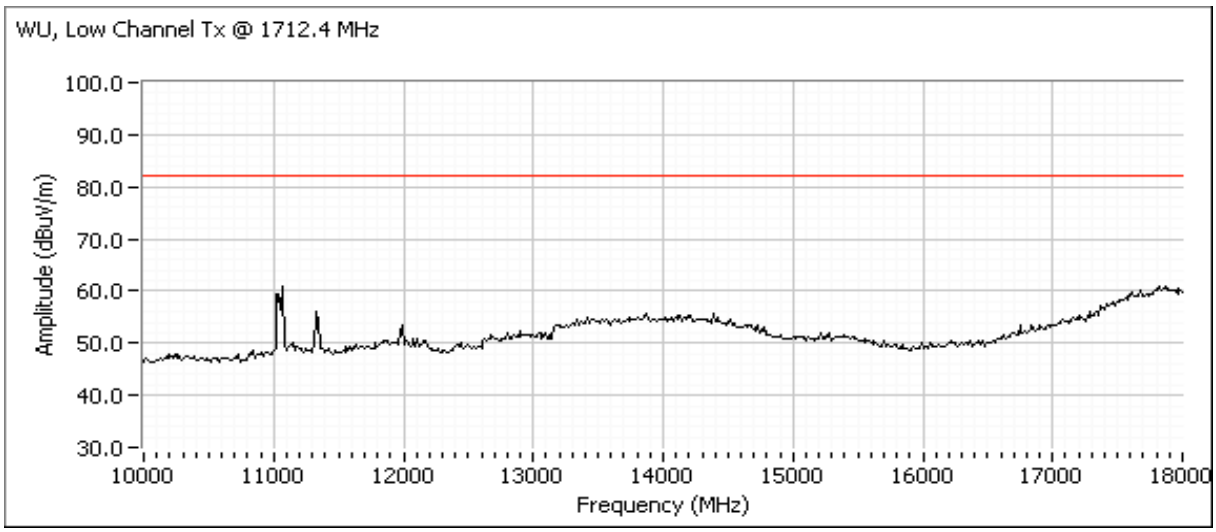
Frequency	Level	Pol	FCC 90.210		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
1712.880	114.5	V	-	-	Peak	94	1.9	Fundamental	Low
2111.740	89.9	H	-	-	Peak	120	1.6	ESG Generator	Low
3424.910	69.6	V	82.2	-12.6	Peak	75	1.9		Low
5515.290	68.8	H	82.2	-13.4	Peak	172	1.9	WiFi	Low
1731.220	114.7	V	-	-	Peak	78	1.9	Fundamental	Middle
2133.050	88.2	V	-	-	Peak	77	1.0	ESG Generator	Middle
3465.100	73.0	V	82.2	-9.2	Peak	85	1.9		Middle
5537.490	67.8	V	82.2	-14.4	Peak	202	1.6	WiFi	Middle
5669.250	67.8	V	82.2	-14.4	Peak	201	1.0	WiFi	Middle
11120.000	61.6	V	82.2	-20.6	Peak	59	1.3	WiFi	Middle
12126.800	58.2	V	82.2	-24.0	Peak	347	1.9		Middle
1753.390	113.7	V	-	-	Peak	67	1.3	Fundamental	High
2152.560	88.8	H	-	-	Peak	147	1.3	ESG Generator	High
3504.740	72.3	V	82.2	-9.9	Peak	60	1.3		High
5565.530	71.9	V	82.2	-10.3	Peak	118	1.6	WiFi	High
11094.000	67.1	V	82.2	-15.1	Peak	135	1.0	WiFi	High
11346.670	56.8	H	82.2	-25.4	Peak	265	1.9		High

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: $E=\sqrt{(30PG)}/d$. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than **20dB** of margin relative to this field strength limit is determined using substitution measurements.
Note 2:	Measurements are made with the antenna port terminated.

Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

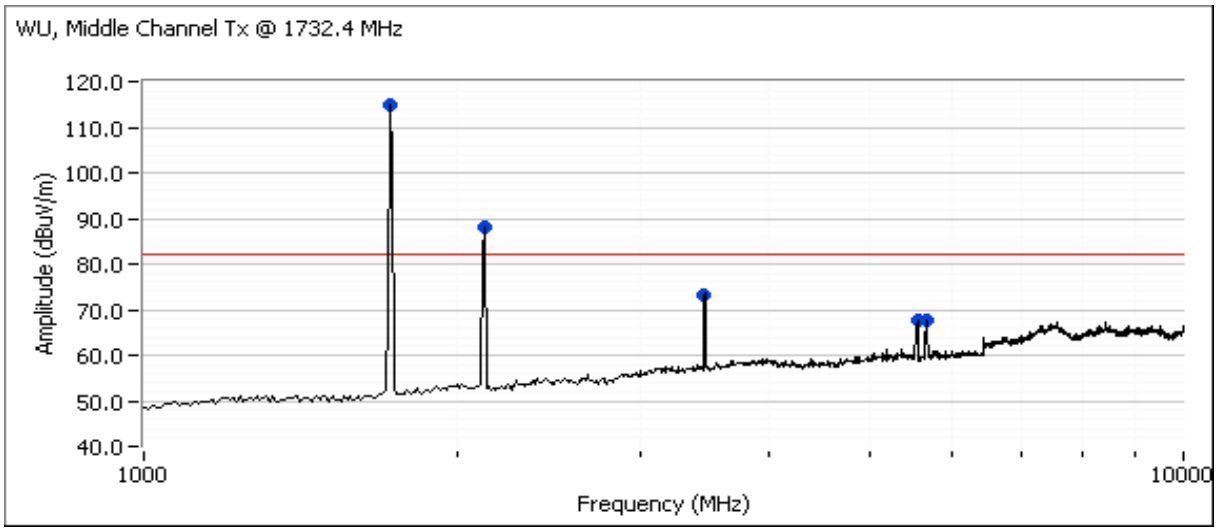
Plots for low channel, power setting(s) = Max

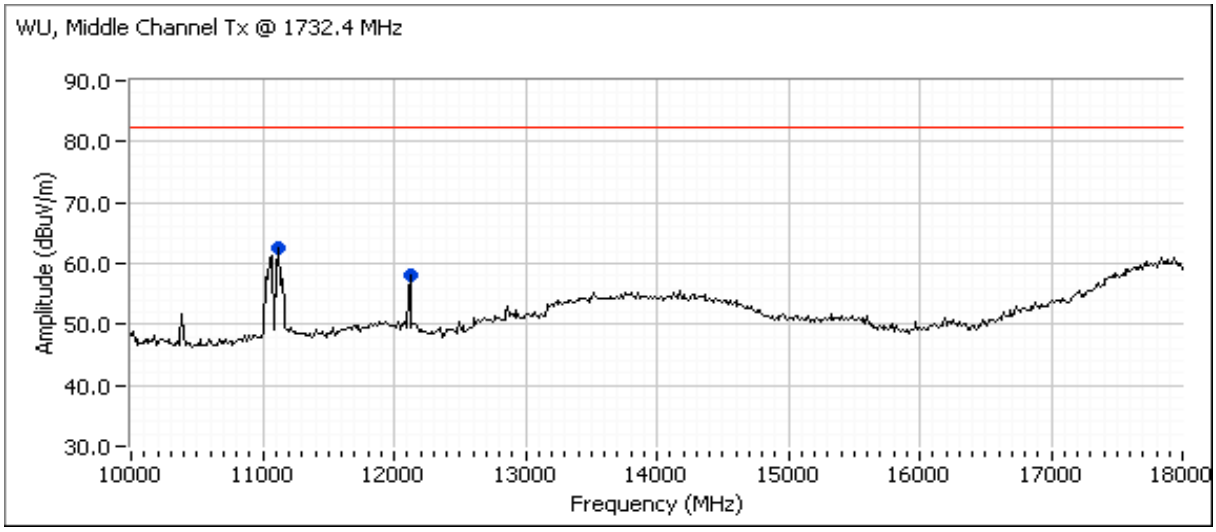




Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

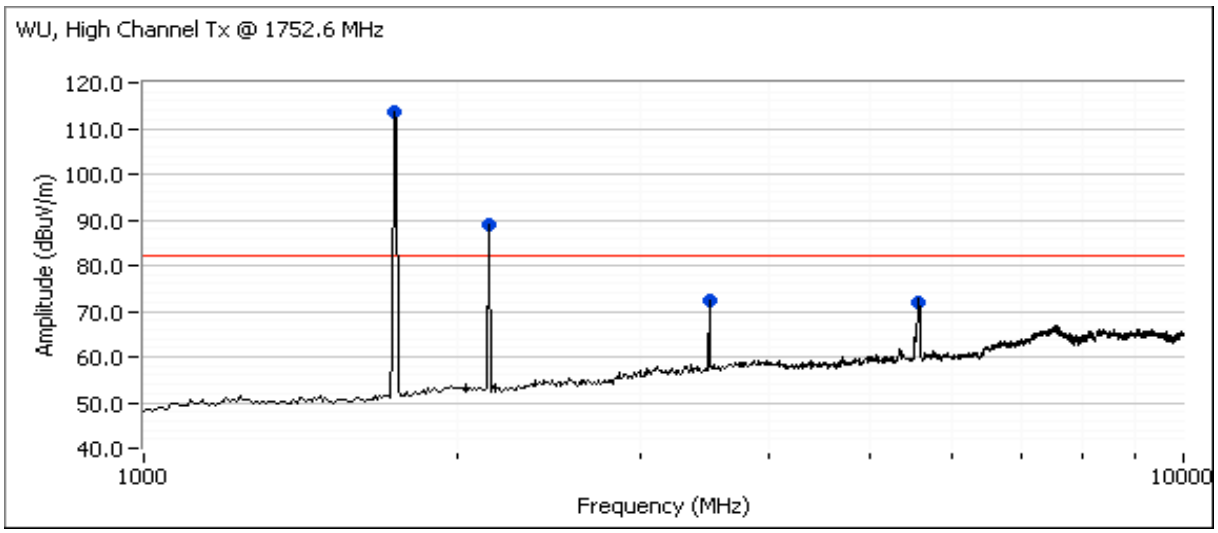
Plots for center channel, power setting(s) = Max

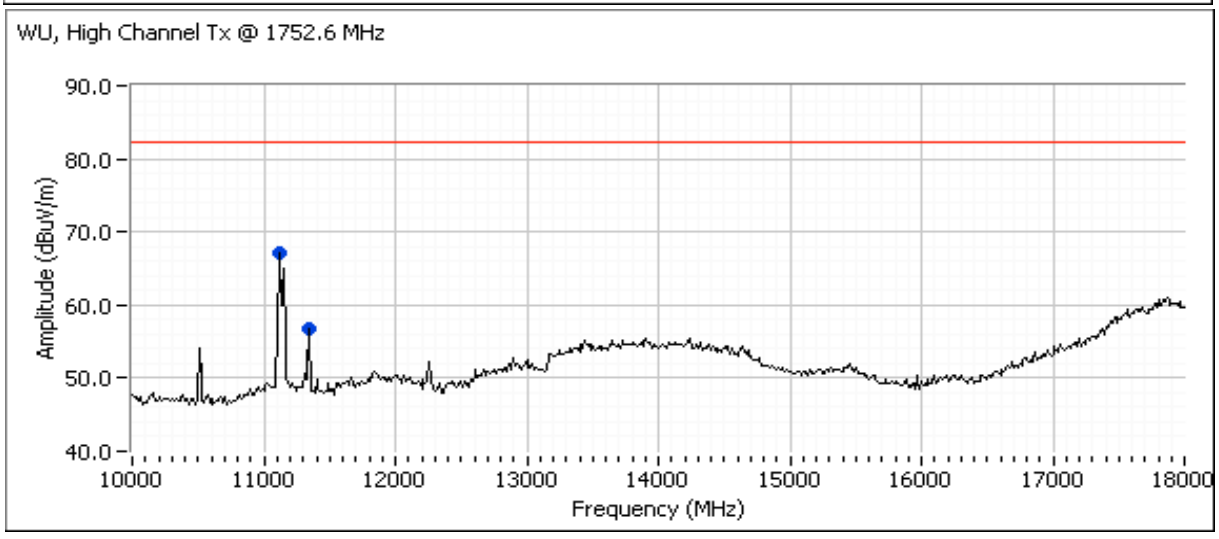




Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

Plots for high channel, power setting(s) = Max





Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

Run #4b: - Final Field Strength Measurements and Substitution Measurements

Date: 5/3/2010 Engineer: Rafael Varelas Location: FT Chamber #4

EUT Field Strength

Frequency	Level	Pol	FCC 90.210		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
3426.140	86.2	V	82.2	**4.0**	PK	117	1.5	RB 1 MHz; VB: 1 MHz	Low
3465.330	86.5	V	82.2	**4.3**	PK	65	1.4	RB 1 MHz; VB: 1 MHz	Middle
3504.640	83.6	V	82.2	**1.4**	PK	61	1.4	RB 1 MHz; VB: 1 MHz	High

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than **20dB** of margin relative to this field strength limit is determined using substitution measurements.
Note 2:	Measurements are made with the antenna port terminated.

Substitution measurements

Vertical

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
3465.330	-17.0	9.3	91.9	99.6	86.5	-13.1	-15.3	-13.0		-0.1
3426.140	-16.9	9.2	92.2	99.9	86.2	-13.7	-15.9	-13.0		-0.7
3504.640	-17.0	9.3	91.7	99.4	83.6	-15.8	-18.0	-13.0		-2.8

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

Client:	Nextivity, Inc.	Job Number:	J78899
Model:	Cel-Fi	T-Log Number:	T79040
		Account Manager:	Sheareen Washington
Contact:	Rama Akella		
Standard:	FCC Part 15 and 27	Class:	N/A

Run #5: Frequency Stability

Date: 5/12/2010 Engineer: Mehran Birgani Location: Radio Lab

Nominal Frequency: 1752.6000 MHz

Frequency Stability Over Temperature

The EUT was soaked at each temperature for a minimum of 30 minutes prior to making the measurements to ensure the EUT and chamber had stabilized at that temperature.

Temperature	Frequency Measured	Drift	
(Celsius)	(MHz)	(Hz)	(ppm)
-30	1752.599640	-360	-0.2
-20	1752.599749	-251	-0.1
-10	1752.600000	0	0.0
0	1752.599985	-15	0.0
10	1752.599985	-15	0.0
20	1752.600150	150	0.1
30	1752.600125	125	0.1
40	1752.600139	139	0.1
50	1752.600136	136	0.1
	Worst case:	-360	-0.2

Frequency Stability Over Input Voltage

Nominal Voltage is 120VAC.

Voltage	Frequency Measured	Drift	
(AC)	(MHz)	(Hz)	(ppm)
102.0	1752.600085	85	0.0
138.0	1752.600180	180	0.1
	Worst case:	180	-0.2

Note 1:	Maximum drift of fundamental frequency was 0 Hz before it shut down at 86.4 VAC.

Appendix C Photographs

Uploaded as a separate exhibit

Appendix D Proposed FCC ID Label & Label Location

Uploaded as a separate exhibit

Appendix E Detailed Photographs

Uploaded as a separate exhibit

Appendix F Operator's Manual

Uploaded as a separate exhibit

Appendix G Block Diagram

Uploaded as a separate exhibit

Appendix H Schematic Diagrams

Uploaded as a separate exhibit

Appendix I Theory of Operation

Uploaded as a separate exhibit

Appendix J Tune-up Procedure

Uploaded as a separate exhibit

Appendix K Parts List

Uploaded as a separate exhibit