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Safety Certification - EMI - Telecom Environmental Simulation

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November 29, 2010

Cellvine
6 Yoni Netanyahu St POB 575
Yehuda, Israel 60376

Dear Ziv Shani,

Enclosed is the EMC test report for compliance testing of the Cellvine, 700LTE Over-The-Air Repeater as tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 27.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Cellvine\ EMC82453-FCC27)

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Cellvine
700LTE Over-The-Air Repeater

Electromagnetic Compatibility
Cover Page
CFR Title 47 Part 27 & Part 15 Subpart B

Electromagnetic Compatibility Criteria Test Report

for the

**Cellvine
700LTE Over-The-Air Repeater**

**Verified under
FCC Certification Rules
Title 47 of the CFR, Part 27**

MET Report: EMC82453-FCC27

November 29, 2010

Prepared For:

**Cellvine
6 Yoni Netanyahu St POB 575
Yehuda, Israel 60376**



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Tested Under

FCC Certification Rules
Title 47 of the CFR, Part 27

Manasi Bhandiwad, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 27 and Part 15 Subpart B of the FCC Rules under normal use and maintenance.

Shawn McMillen, Wireless Manager
Electromagnetic Compatibility Lab



Cellvine
700LTE Over-The-Air Repeater

Electromagnetic Compatibility
Report Status
CFR Title 47 Part 27 & Part 15 Subpart B

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	November 29, 2010	Initial Issue.



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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dBμA	Decibels above one microamp
dBμV	Decibels above one microvolt
dBμA/m	Decibels above one microamp per meter
dBμV/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μH	microhenry
μF	microfarad
μs	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane



I. Executive Summary



A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Cellvine 700LTE Over-The-Air Repeater, with the requirements of Part 27 and Part 15 Subpart B. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the 700LTE Over-The-Air Repeater. Cellvine should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the 700LTE Over-The-Air Repeater, has been **permanently** discontinued

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 27 and Part 15 Subpart B, in accordance with Cellvine, purchase order number C10-1306-01.

Reference	Description	Compliance
Part 15 Subpart B §15.107(a)	Conducted Emissions	Compliant
Part 15 Subpart B §15.109(a)	Radiated Emissions	Compliant
§2.1046; §27.50(h)	RF Power Output	Compliant
§2.1047	Modulation Limiting	Not Applicable
§2.1049	Occupied Bandwidth	Compliant
§2.1053; §2.1057, §27.53(l)	Spurious Emissions at Antenna Terminals	Compliant
§2.1053; §2.1057	Radiated Spurious Emissions	Compliant
§2.1055	Frequency Stability	Not Applicable

Table 1. Executive Summary of EMC Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Cellvine to perform testing on the 700LTE Over-The-Air Repeater, under Cellvine's purchase order number C10-1306-01.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Cellvine, 700LTE Over-The-Air Repeater.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	BDA-700UC-26-52-AA-MBX-VZW				
EUT Specifications:	Primary Power: 120V/60Hz				
	FCC ID: VUV-LTE700UC26				
	Type of Modulations:	OFDM			
	Equipment Code:	DSS			
	Peak RF Output Power:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 2px;">Downlink</th> <th style="text-align: center; padding: 2px;">Uplink</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 2px;">26.06 dBm</td> <td style="text-align: center; padding: 2px;">17.25dBm</td> </tr> </tbody> </table>	Downlink	Uplink	26.06 dBm
Downlink	Uplink				
26.06 dBm	17.25dBm				
EUT Frequency Range:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 2px;">Downlink</th> <th style="text-align: center; padding: 2px;">Uplink</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 2px;">751 MHz</td> <td style="text-align: center; padding: 2px;">782 MHz</td> </tr> </tbody> </table>	Downlink	Uplink	751 MHz	782 MHz
Downlink	Uplink				
751 MHz	782 MHz				
Analysis:	The results obtained relate only to the item(s) tested.				
Environmental Test Conditions:	Temperature: 15-35° C				
	Relative Humidity: 30-60%				
	Barometric Pressure: 860-1060 mbar				
Evaluated by:	Manasi Bhandiwad				
Date(s):	November 29, 2010				

Table 2. EUT Summary Table

B. References

CFR 47, Part 27	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 27: Rules and Regulations for Advanced Wireless Services
CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
ANSI C63.4:2003	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI/NCSL Z540-1-1994	Calibration Laboratories and Measuring and Test Equipment - General Requirements
ANSI/ISO/IEC 17025:2000	General Requirements for the Competence of Testing and Calibration Laboratories
EIA/TIA-603-Edition C 2004	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave., Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

D. Description of Test Sample

The Cellvine 700LTE Over-The-Air Repeater, is an in-building repeater for the 700MHz LTE band licensed to Verizon Wireless. It sends and receives through a donor antenna which is pointed to a nearby Verizon 700MHz LTE system tower and then receives/sends via its locally connected antenna to provide in-building service to wireless devices within the building environs. The EUT has only two channels, one on the uplink and one on the downlink.

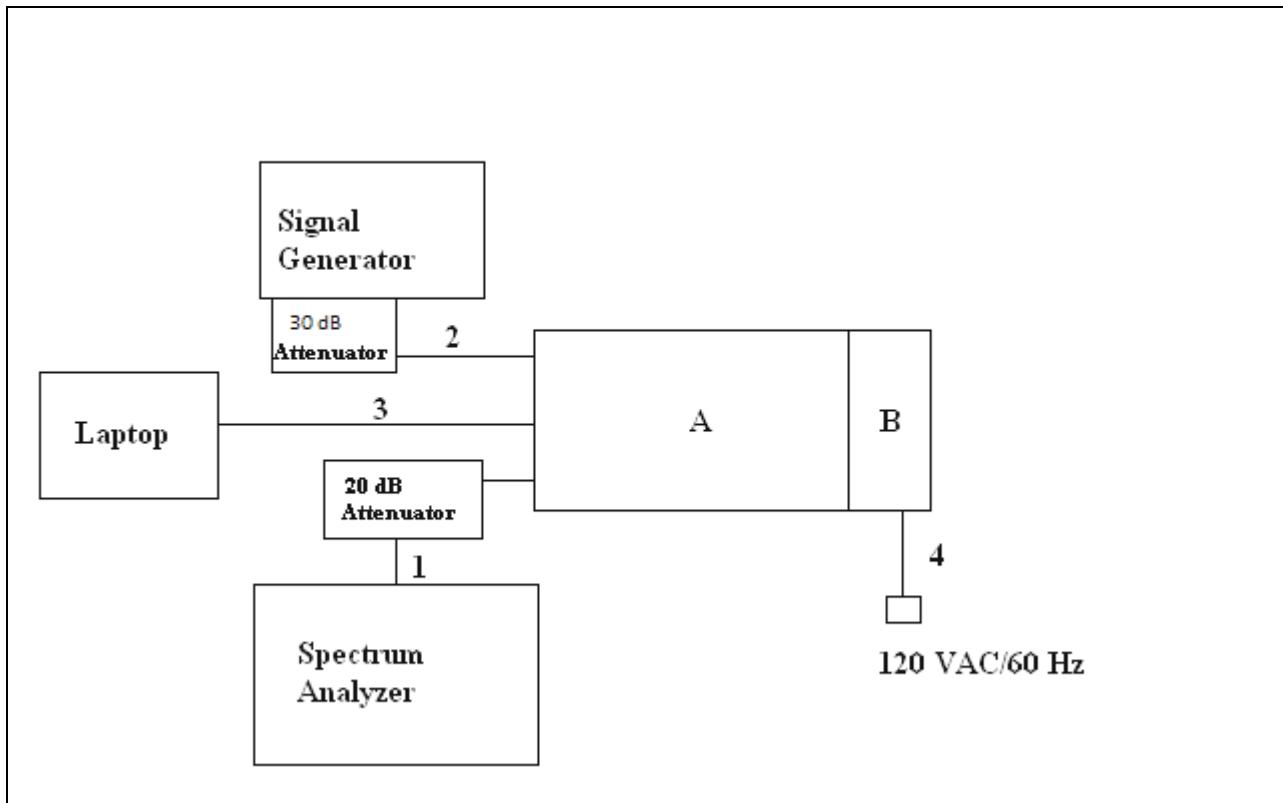


Figure 1. Block Diagram of Test Configuration (Conducted Measurement – Downlink)

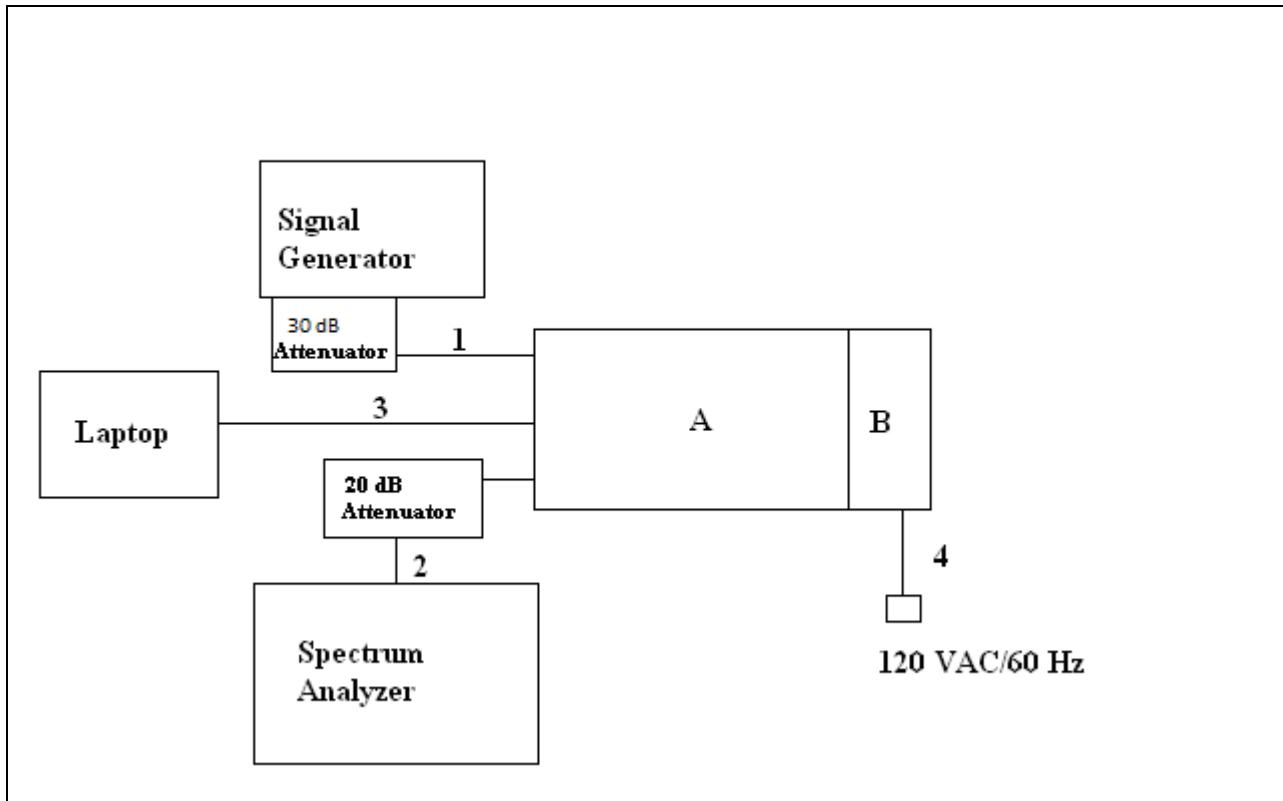


Figure 2. Block Diagram of Test Configuration (Conducted Measurement - Uplink)

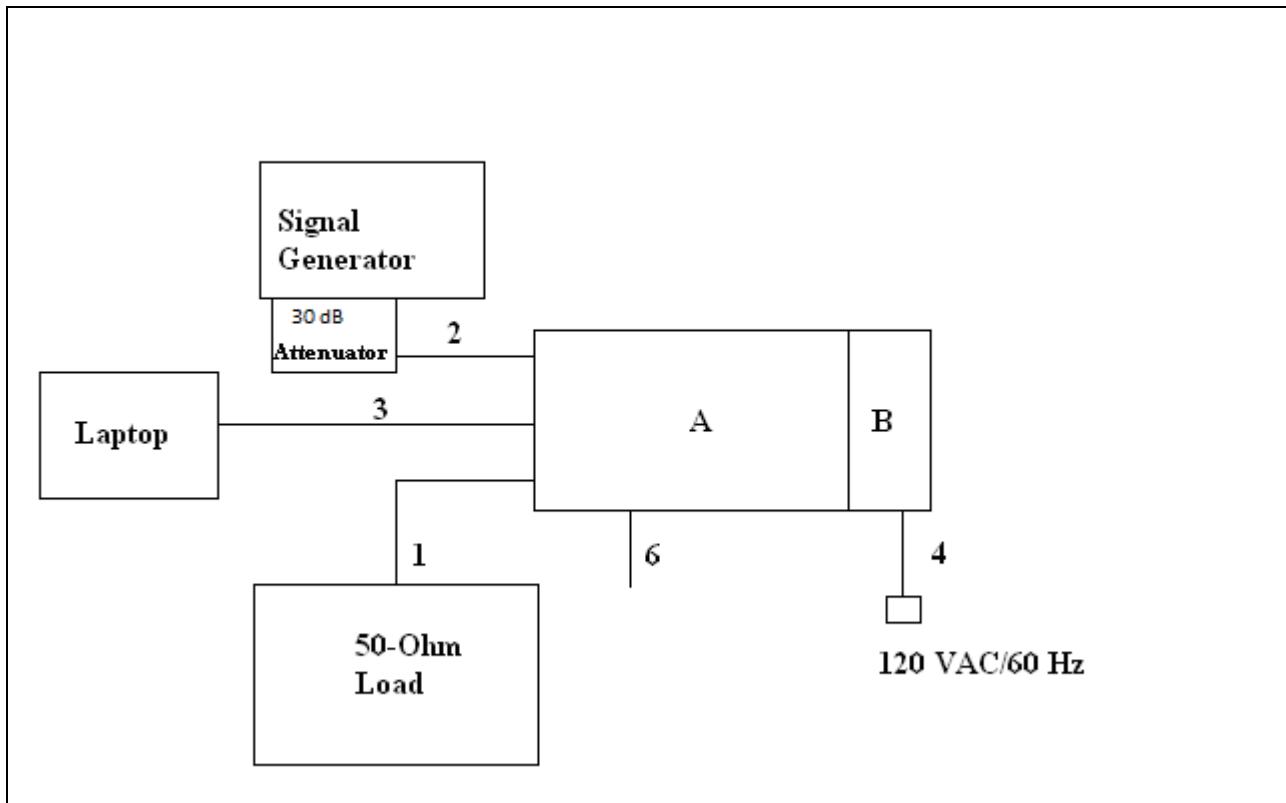


Figure 3. Block Diagram of Test Configuration (Radiated Measurement – Downlink)

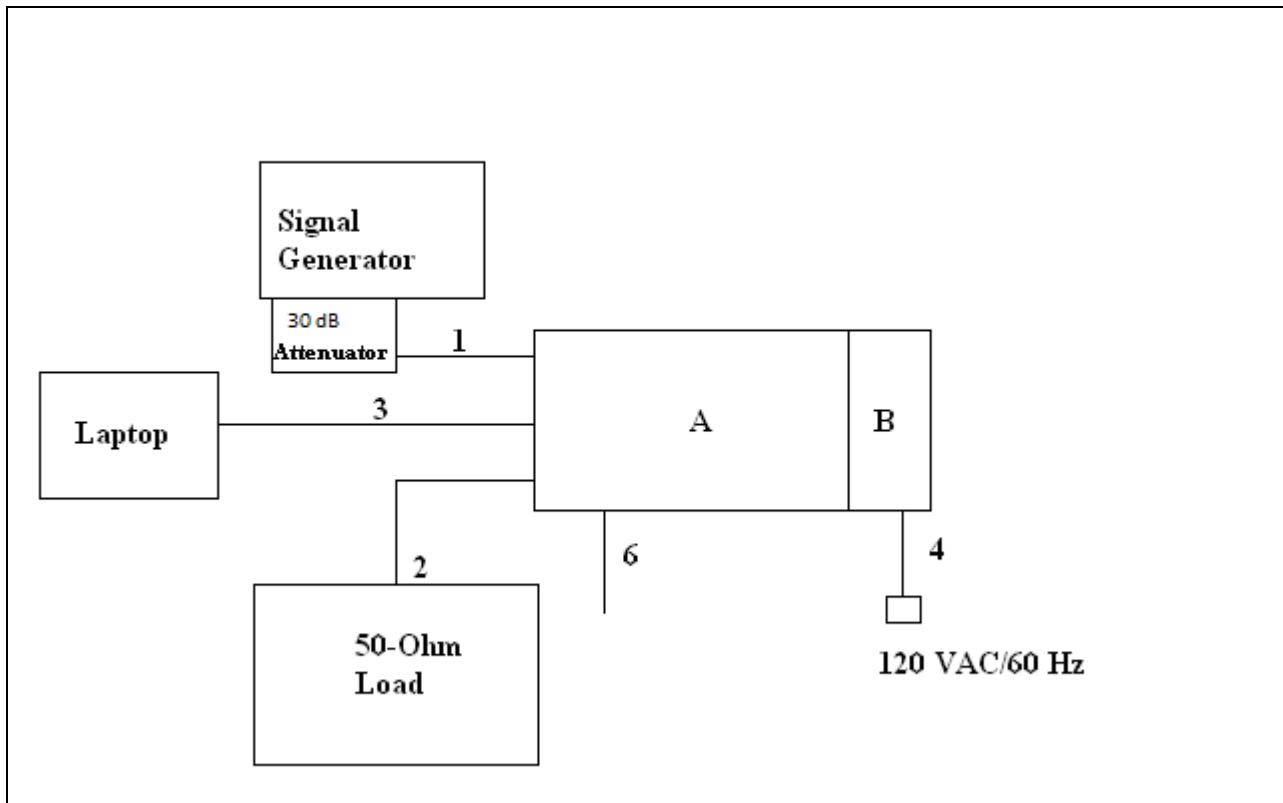


Figure 4. Block Diagram of Test Configuration (Radiated Measurement - Uplink)

E. Equipment Configuration

Ref. ID	Name / Description	Model Number	Serial Number
A	700 MHz LTE Mini Repeater	BDA-700UC-26-52-AA-MBX-VZW	S/N : 0000001

Table 4. Equipment Configuration

F. Support Equipment

Ref. ID	Name / Description	Manufacturer	Model Number	Serial Number
B	Power Supply	Mean Well	PS-120	RA 69206014

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
1	SERVICE	PORT	1		Y	N-Type Female connector
2	DONOR	PORT	1		Y	N-Type Female connector
3	Duplexer-N/A	Port	1		Y	N-Type Female connector
4	COM	PORT	1	1	Y	RJ 45 Female
5	DC IN	PORT	1	2	Y	LTE PAXE
6	COM	Cross Ethernet cable	1	5	Y	RJ 45 Male
7	SNMP-N/A	PORT	1	1	Y	RJ 45 Female

Table 6. Ports and Cabling Information

H. Mode of Operation

A Repeater receives signals from a base station, amplifies the signals and retransmits them to service area. It also receives, amplifies and retransmits signals in the opposite direction. Both directions are served simultaneously. In order to receive and transmit signals in both directions, the Repeater is connected to a donor antenna directed towards the base station and to a service antenna directed towards the area to be covered.

I. Method of Monitoring EUT Operation

Control of the Repeaters is performed using a desktop or laptop computer equipped with standard browser (no special software) which can communicate with the Repeaters, either locally or remotely via modem (optional).

J. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Cellvine upon completion of testing.

III. Electromagnetic Compatibility Criteria for Unintentional Radiators

Electromagnetic Compatibility Criteria for Unintentional Radiators

§ 15.107 Conducted Emissions Limits

Test Requirement(s): **15.107 (a)** “Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.”

15.107 (b) “For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.”

Frequency range (MHz)	15.107(b), Class A Limits (dB μ V)		15.107(a), Class B Limits (dB μ V)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15- 0.5	79	66	66 - 56	56 - 46
0.5 – 5.0	73	60	56	46
5.0 - 30	73	60	60	50

Note 1 — The lower limit shall apply at the transition frequencies.

Table 7. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Section 15.107(a) (b)

Test Procedures:

The EUT was placed on a 0.8m-high wooden table inside a chamber. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a $50\Omega/50\mu$ H LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were measured using a quasi-peak and/or average detector as appropriate.

Test Results:

The EUT was found compliant with the Class A requirement(s) of this section. Measured emissions were below applicable limits.

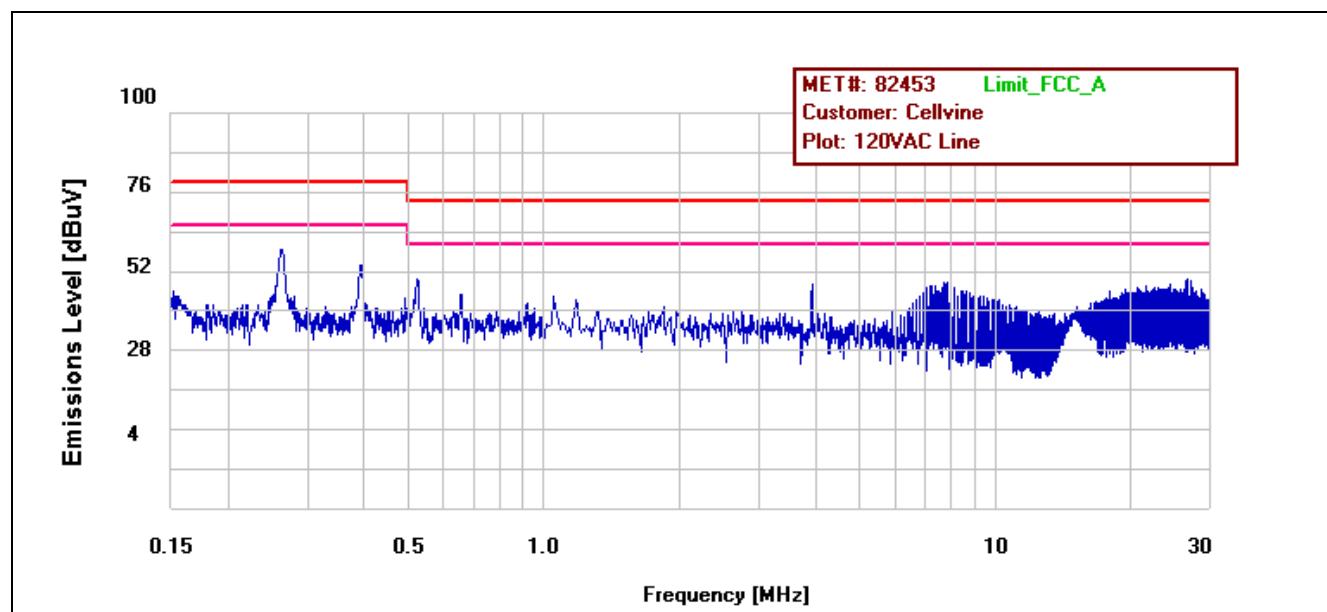
Test Engineer(s): Minh Ly

Test Date(s): 06/29/10

Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120VAC Line	0.261	57.72	79	-21.28	Pass	58.27	66	-7.73	Pass
120VAC Line	0.393	53.05	79	-25.95	Pass	51.87	66	-14.13	Pass
120VAC Line	0.523	48.95	73	-24.05	Pass	47.42	60	-12.58	Pass

Table 8. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

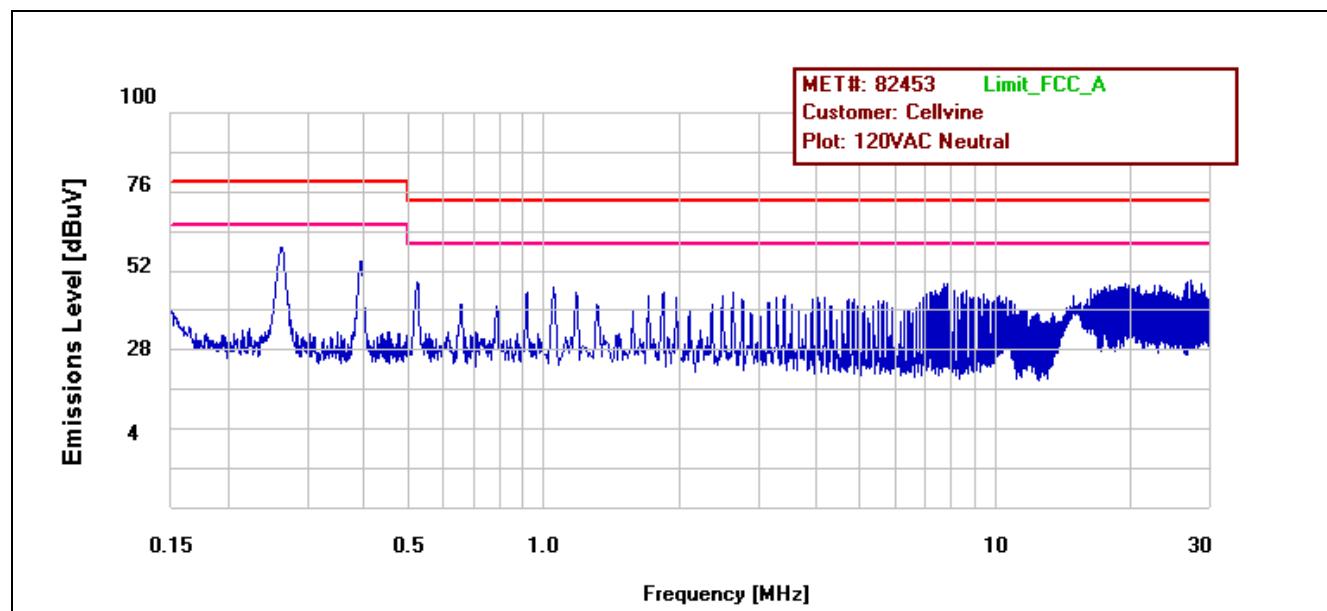


Plot 1. Conducted Emissions, Phase Line

Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120VAC Neutral	0.262	58.35	79	-20.65	Pass	55.49	66	-10.51	Pass
120VAC Neutral	0.392	53.91	79	-25.09	Pass	52.18	66	-13.82	Pass
120VAC Neutral	0.523	47.97	73	-25.03	Pass	47.51	60	-12.49	Pass

Table 9. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)



Plot 2. Conducted Emissions, Neutral Line

Conducted Emission Limits Test Setup



Photograph 1. Conducted Emissions, Test Setup

Radiated Emission Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 10.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 10.

Frequency (MHz)	Field Strength (dB μ V/m)	
	§15.109 (b), Class A Limit (dB μ V) @ 10m	§15.109 (a), Class B Limit (dB μ V) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 10. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a 0.8m-high acrylic table inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 3 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

(Emissions measured at 3m were normalized using an inverse proportionality factor of 20dB per decade for comparison to the 10 m limit.)

Test Results: The EUT was found Compliant with the Class A requirement(s) of this section. Measured emissions were below applicable limits

Test Engineer(s): Len Knight

Test Date(s): 10/19/10

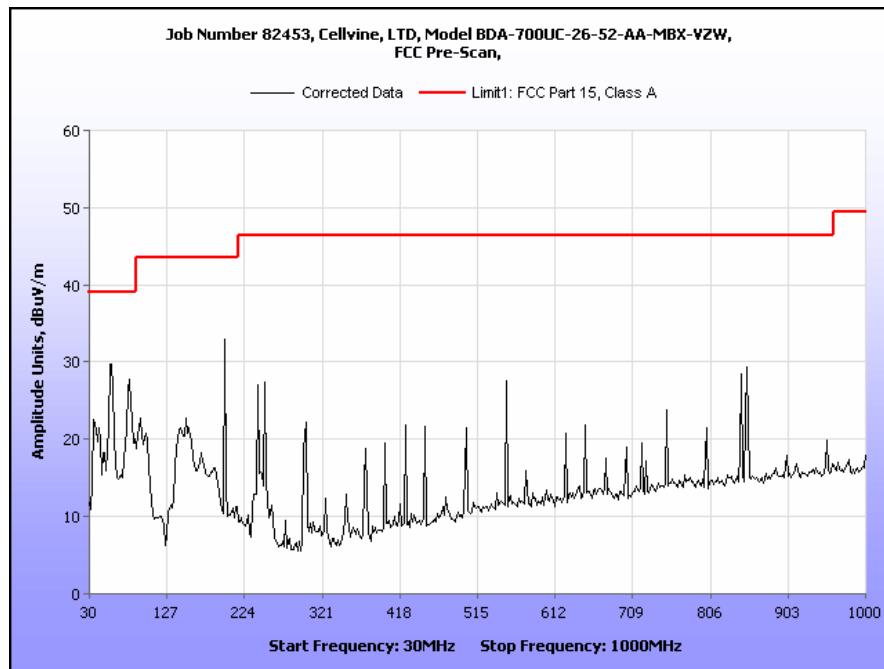
Radiated Emissions Limits Test Results, Class A

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
42.36473	41	H	1.75	8.30	8.90	0.23	10.46	6.97	39.00	-32.03
42.36473	201	V	1.80	14.64	8.90	0.23	10.46	13.31	39.00	-25.69
56.753507	21	H	1.63	11.04	9.90	0.23	10.46	10.71	39.00	-28.29
56.753507	334	V	1.02	29.49	9.90	0.23	10.46	29.16	39.00	-9.84
80.08016	263	H	3.25	16.73	7.39	0.23	10.46	13.89	39.00	-25.11
80.08016	363	V	1.00	24.09	7.39	0.23	10.46	21.25	39.00	-17.75
200.01587	285	H	1.43	30.81	10.20	0.23	10.46	30.78	43.50	-12.72
200.01587	-1	V	1.02	27.80	10.20	0.23	10.46	27.77	43.50	-15.73
239.60922	274	H	1.29	26.48	11.46	0.39	10.46	27.87	46.40	-18.53
239.60922	76	V	1.01	16.14	11.46	0.39	10.46	17.53	46.40	-28.87
450	200	H	1.90	15.87	16.40	1.00	10.46	22.81	46.40	-23.59
450	164	V	1.23	10.96	16.40	1.00	10.46	17.90	46.40	-28.50

Table 11. Radiated Emissions Limits, Test Results, FCC Limits

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
42.36473	41	H	1.75	8.30	8.90	0.23	10.46	6.97	40.00	-33.03
42.36473	201	V	1.80	14.64	8.90	0.23	10.46	13.31	40.00	-26.69
56.753507	21	H	1.63	11.04	9.90	0.23	10.46	10.71	40.00	-29.29
56.753507	334	V	1.02	29.49	9.90	0.23	10.46	29.16	40.00	-10.84
80.08016	263	H	3.25	16.73	7.39	0.23	10.46	13.89	40.00	-26.11
80.08016	363	V	1.00	24.09	7.39	0.23	10.46	21.25	40.00	-18.75
200.01587	285	H	1.43	30.81	10.20	0.23	10.46	30.78	40.00	-9.22
200.01587	-1	V	1.02	27.80	10.20	0.23	10.46	27.77	40.00	-12.23
239.60922	274	H	1.29	26.48	11.46	0.39	10.46	27.87	47.00	-19.13
239.60922	76	V	1.01	16.14	11.46	0.39	10.46	17.53	47.00	-29.47
450	200	H	1.90	15.87	16.40	1.00	10.46	22.81	47.00	-24.19
450	164	V	1.23	10.96	16.40	1.00	10.46	17.90	47.00	-29.10

Table 12. Radiated Emissions Limits, Test Results, ICES-003 Limits



Plot 3. Radiated Emissions Limits, Pre-Scan

Radiated Emission Limits Test Setup



Photograph 2. Radiated Emission Limits Test Setup

IV. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1046 RF Power Output

Test Requirements: § 2.1046, §27.50(h) Measurements required: RF power output:

§ 2.1046 (a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

§ 2.1046 (b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters, the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and as applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

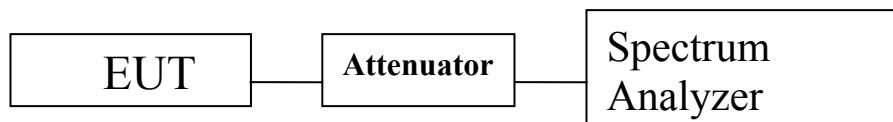
§ 2.1046 (c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

Test Procedures: As required by 47 CFR 2.1046, RF power output measurements were made at the RF output terminals using an attenuator and spectrum analyzer or power meter. This test was performed in all applicable modulations.

Test Results: The EUT complies with the requirements of this section. The EUT conducted power does not exceed limit at the carrier frequency.

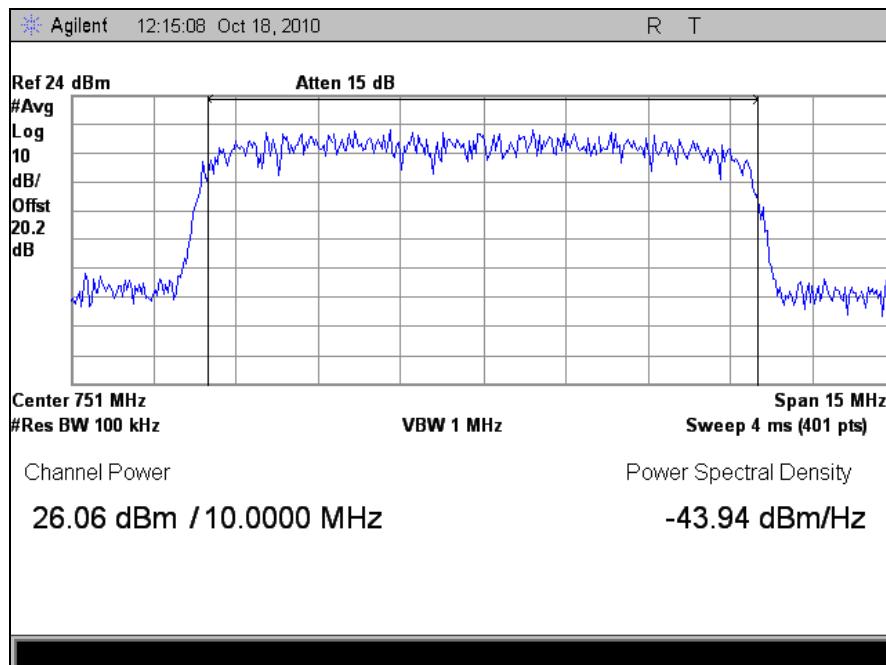
Test Engineer(s): Manasi Bhandiwad

Test Date(s): 10/18/10

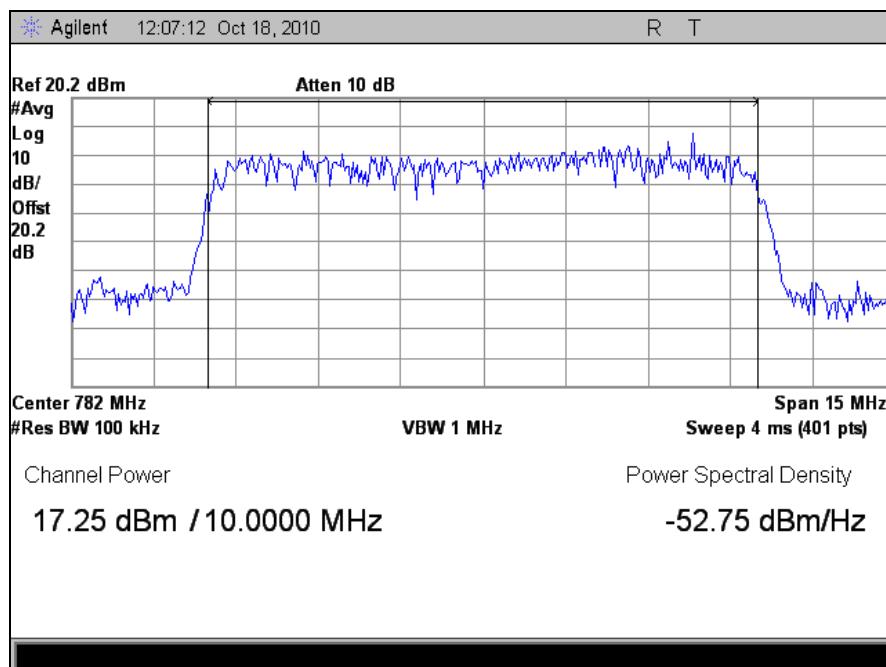


Block Diagram 1. RF Power Output Test Setup

RF Power Output Test Results



Plot 4. Output Power, Downlink



Plot 5. Output Power, Uplink

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1047 Modulation Characteristics

Test Requirement(s): § 2.1047 Measurements required: Modulation characteristics

§ 2.1047 (a): Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

Test Results: Not applicable. The EUT does not amplify analog voice.

§ 2.1049 Occupied Bandwidth

Test Requirement(s):

§ 2.1049 Measurements required: Occupied bandwidth: The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

Test Procedures:

As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made with a Spectrum Analyzer connected to the RF ports for both Uplink and Downlink

The modulation characteristics of signal generator's carrier was measured first at a maximum RF level prescribed by the OEM. The signal generator was then connected to either the Uplink or Downlink input at the appropriate RF level. The resulting modulated signal through the EUT was measured and compared against the original signal.

Test Results:

The EUT complies with the requirements of this section.

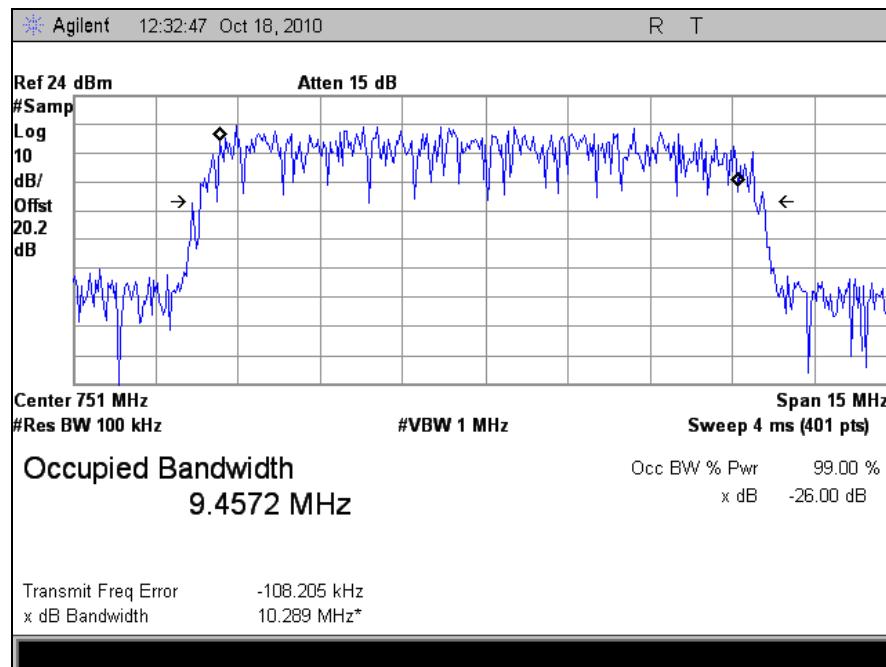
Test Engineer(s):

Manasi Bhandiwad

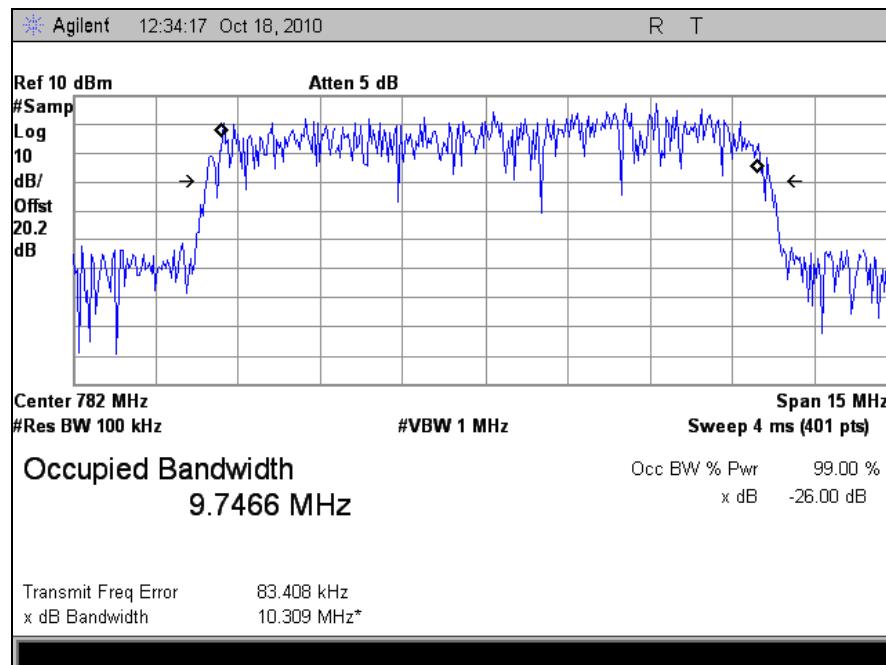
Test Date(s):

10/18/10

Occupied Bandwidth



Plot 6. Occupied Bandwidth, Downlink



Plot 7. Occupied Bandwidth, Uplink

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1053 Radiated Spurious Emissions

Test Requirement(s): § 2.1053 Measurements required: Field strength of spurious radiation.

§ 2.1053 (a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

§ 2.1053 (b): The measurements specified in paragraph (a) of this section shall be made for the following equipment:

- (1)** Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.
- (2)** All equipment operating on frequencies higher than 25 MHz.
- (3)** All equipment where the antenna is an integral part of, and attached directly to the transmitter.
- (4)** Other types of equipment as required, when deemed necessary by the Commission.

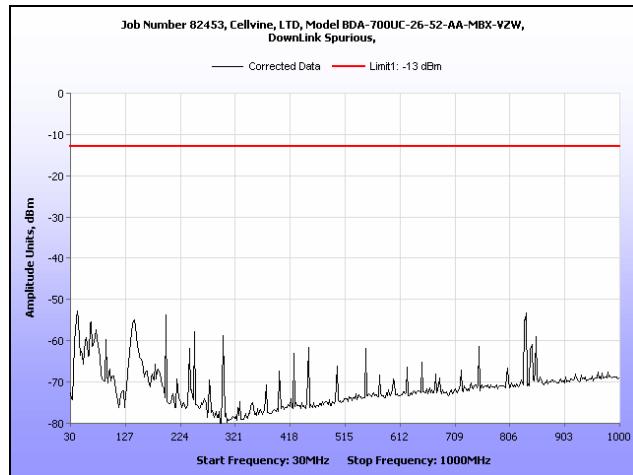
Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 10 meter semi-anechoic chamber. The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was rotated about 360° and the receiving antenna scanned from 1-4m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10th or 40GHz, which ever was the lesser, were investigated.

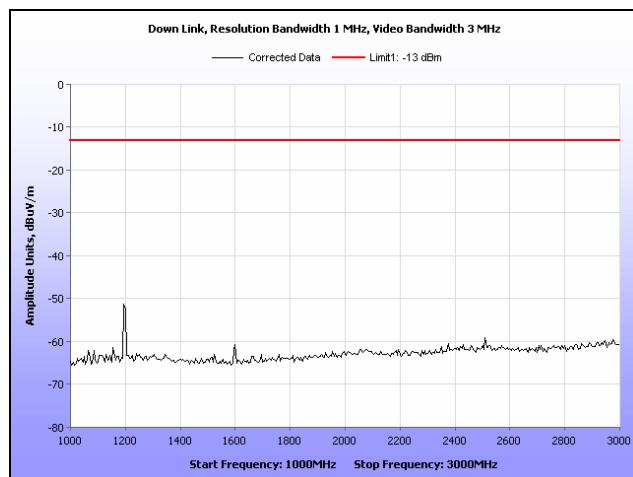
Test Results: The EUT complies with the requirements of this section. All emissions were measured at the noise floor of the spectrum analyzer.

Test Engineer(s): Len Knight

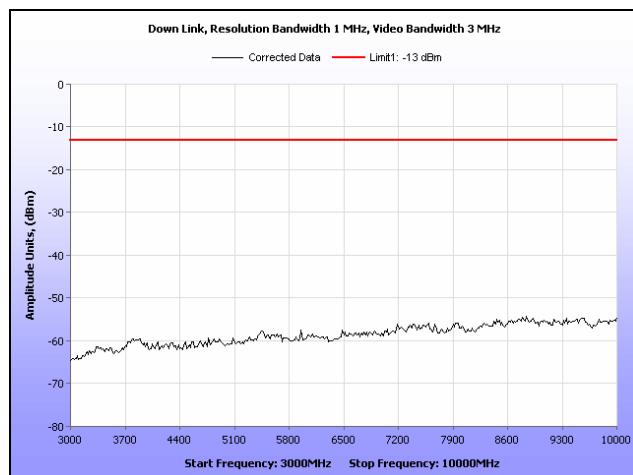
Test Date(s): 10/19/10



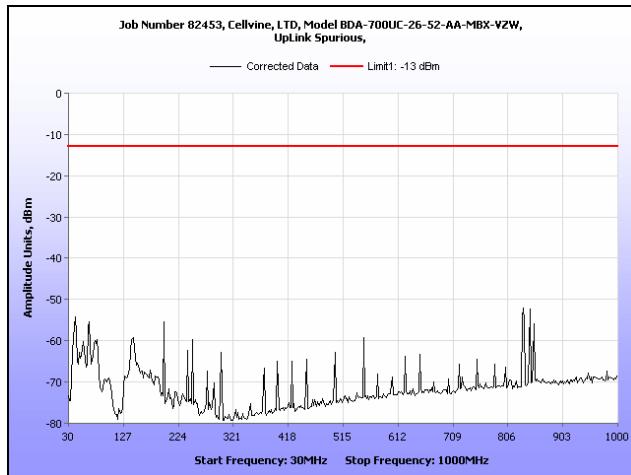
Plot 8. Radiated Spurious Emissions, Downlink, 30 MHz – 1 GHz



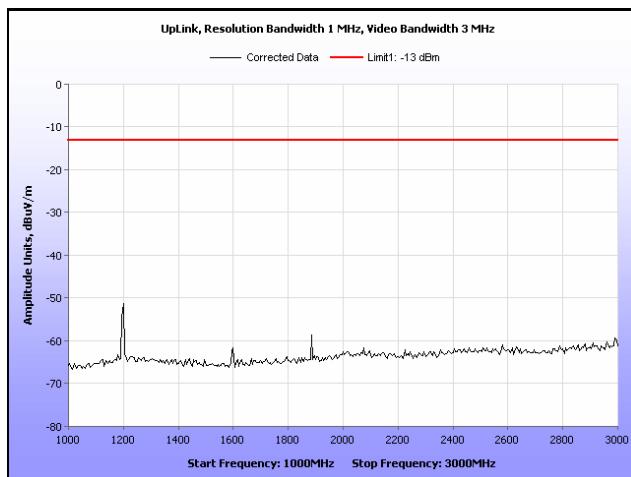
Plot 9. Radiated Spurious Emissions, Downlink, 1 GHz – 3 GHz



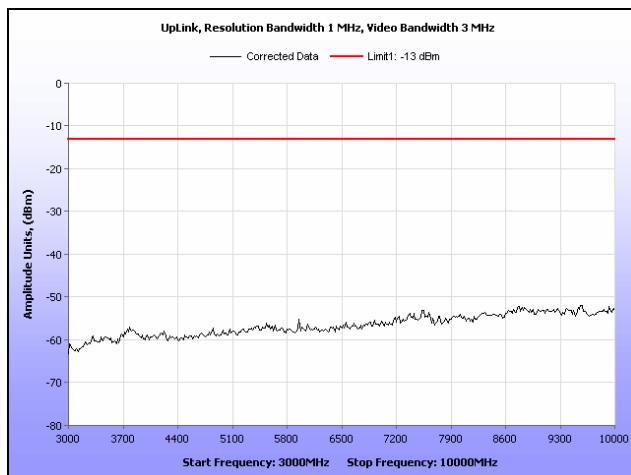
Plot 10. Radiated Spurious Emissions, Downlink, 3 GHz – 10 GHz



Plot 11. Radiated Spurious Emissions, Uplink, 30 MHz – 1 GHz



Plot 12. Radiated Spurious Emissions, Uplink, 1 GHz – 3 GHz



Plot 13. Radiated Spurious Emissions, Uplink, 3 GHz – 10 GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1051 Spurious Emissions at Antenna Terminals

Test Requirement(s):

§ 2.1051 Measurements required: Spurious emissions at antenna terminals: The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

Test Procedures:

A modulated carrier generated by the signal generator carrier was connected to either the Uplink or Downlink RF port at a maximum level as determined by the OEM. A spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured. The spectrum analyzer was set to 1MHz RBW and 3MHz VBW. The spectrum was investigated from 30MHz to the 10th harmonic of the carrier.

Test Results:

The EUT complies with the requirements of this section. There were no detectable spurious emissions for this EUT.

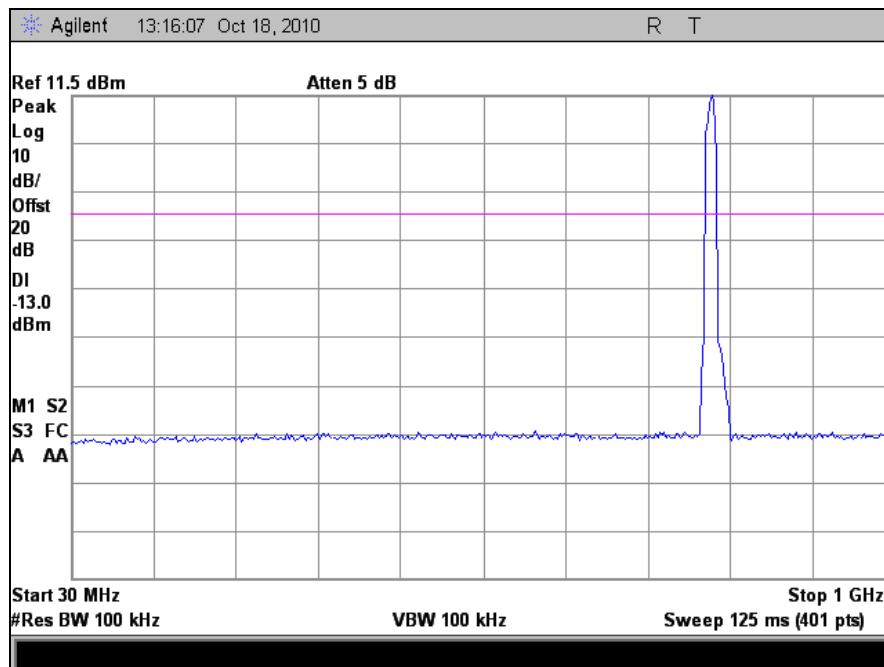
Test Engineer(s):

Manasi Bhandiwad

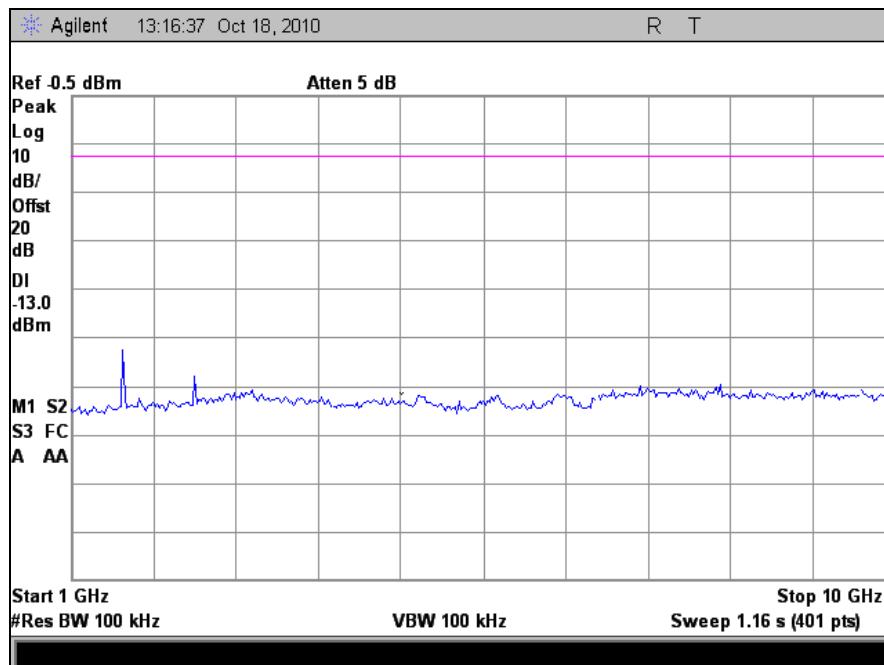
Test Date(s):

10/18/10

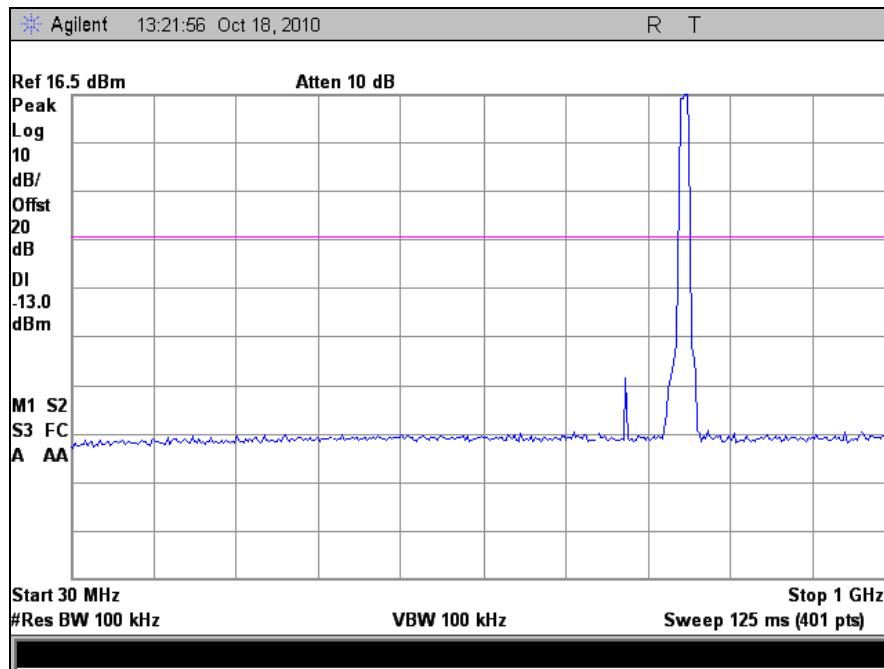
Spurious Emissions at Antenna Terminals Test Results



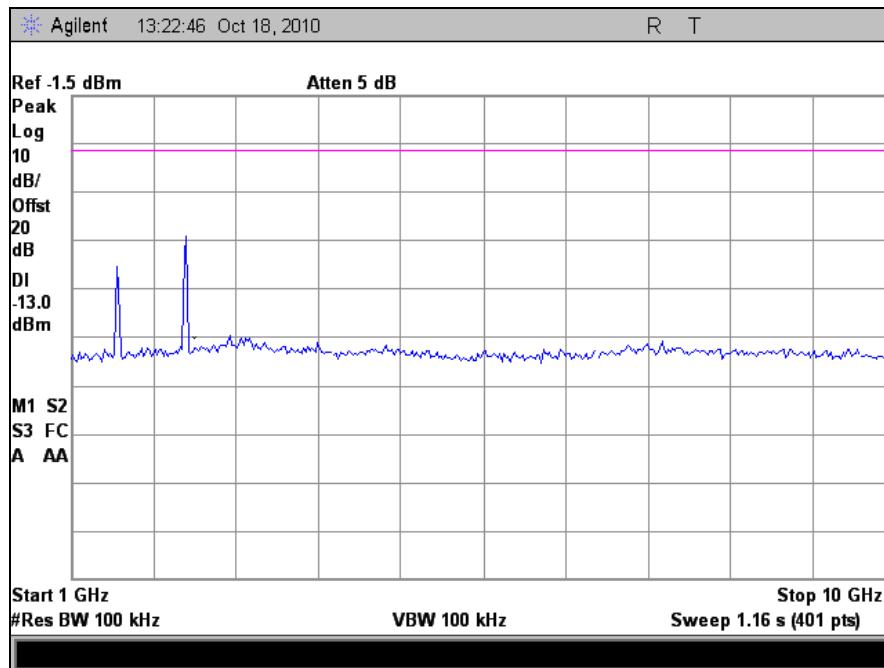
Plot 14. Conducted Spurious Emissions, Downlink, 30 MHz – 1 GHz



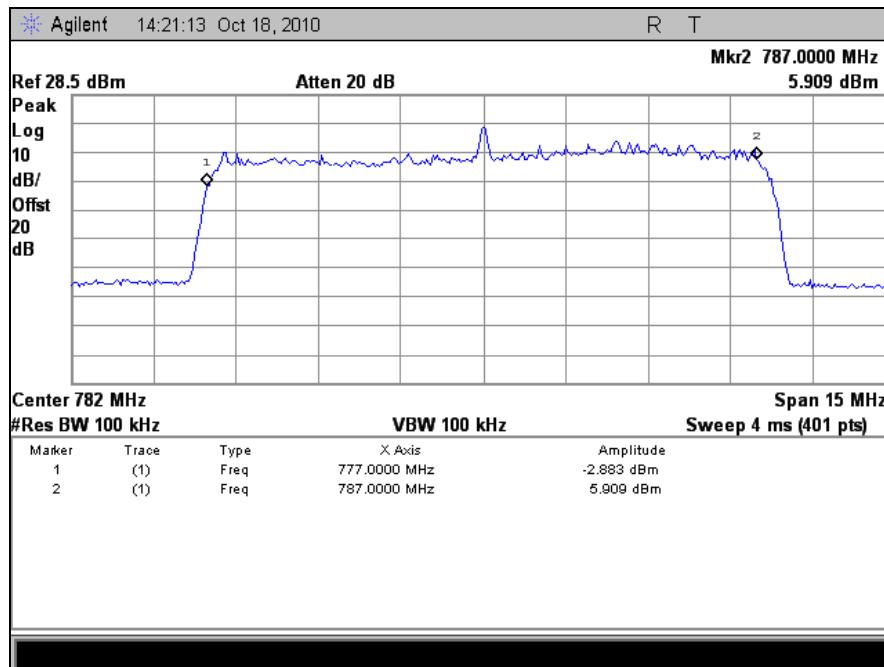
Plot 15. Conducted Spurious Emissions, Downlink, 1 GHz – 10 GHz



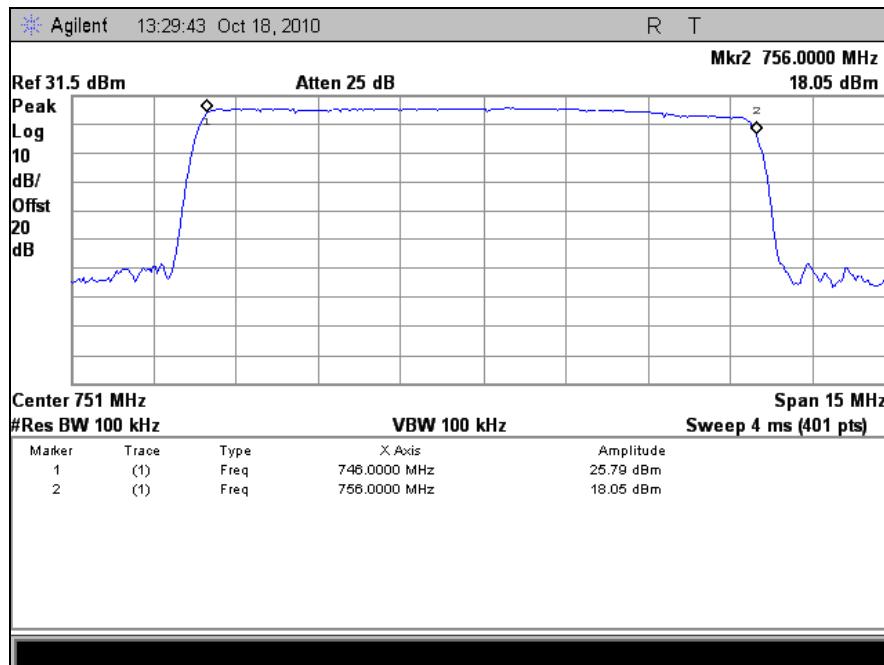
Plot 16. Conducted Spurious Emissions, Uplink, 30 MHz – 1 GHz



Plot 17. Conducted Spurious Emissions, Uplink, 1 GHz – 10 GHz



Plot 18. Downlink, Filter Response



Plot 19. Uplink, Filter Response

Electromagnetic Compatibility Criteria for Intentional Radiators

§2.1055 Frequency Stability over Temperature and Voltage Variations

Test Requirement(s): §2.1055(a)(1)

Test Procedures: As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

The EUT was placed in the Environmental Chamber and support equipments are outside the chamber on a table. A CW signal was injected into the EUT at the appropriate RF level. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations. The frequency drift was investigated for every 10[°]C increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -30 to 50[°]C.

Voltage supplied to EUT is 120 VAC reference temperature was done at 20[°]C. The voltage was varied by $\pm 15\%$ of nominal

Test Results: Not Applicable. The EUT does not have frequency translation.



Cellvine
700LTE Over-The-Air Repeater

Test Equipment
CFR Title 47 Part 27 & Part 15 Subpart B

IV. Test Equipment



Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1S2460	SPECTRUM ANALYZER	AGILENT	E4407B	04/30/2010	04/30/2011
1S2464	LINE IMPEDANCE STABILIZATION NETWORK	SOLAR ELECTRONICS	9252-50-R24-BNC	09/23/2009	09/23/2010
1S2519	DIGITAL THERMO/HYGROMETER	CONTROL COMPANY	11-661-7D	12/2/2009	12/2/2011
1S2488	SCREEN ROOM	UNIVERSAL	CUSTOM	01/20/2010	01/20/2011
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	08/23/2010	08/23/2013
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	05/25/2010	05/25/2011
1T4619	THERMO-HYGROMETER	CONTROL COMPANY	S6-627-9	11/07/2008	11/07/2010
1S2485	BILOG ANTENNA	TESEQ	CBL 6112D	05/07/2010	05/07/2011
1T4742	PRE-AMPLIFIER- HIGH FREQUENCY	MITEQ	AFS42-01001800-30-10P-42	SEE NOTE	
1T2665	HORN ANTENNA	EMCO	3115	07/15/2010	07/15/2011

Table 13. Test Equipment



Cellvine
700LTE Over-The-Air Repeater

Electromagnetic Compatibility
Exhibits
CFR Title 47 Part 27 & Part 15 Subpart B

V. Certification & User's Manual Information



Certification & User's Manual Information

A. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of emitting radio-frequency energy by radiation, conduction, or other means. Radio-frequency devices include, but are not limited to:

- (a) The various types of radio communication transmitting devices described throughout this chapter.
- (b) *The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.*
- (c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.
- (d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

- (a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:
 - (1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or
 - (2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.
- (d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.



(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

- (i) *Compliance testing;*
- (ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;
- (iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;
- (iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production stages; or
- (v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.



Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

- (a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.¹ *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer,* be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.
- (b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

- (a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.
- (b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

¹ In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.



Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

- (a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.
 - (1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.
 - (i) *If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.*
 - (ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.
 - (2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.



Certification & User's Manual Information

Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) *In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:*

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 27, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



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End of Report
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End of Report