MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372
3162 BELICK STREET ● SANTA CLARA, CALIFORNIA 95054 ● PHONE (408 748-3585 ● FAX (510) 489-6372

June 27, 2011

Echelon Corporation
550 Meridian Avenue
San Jose, CA 95126

Dear James Smith,

Enclosed is the EMC Wireless test report for compliance testing of the Echelon Corporation, Edge Control Node (ECN) 70101-0026 as tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 22 Subpart H and RSS-132, Issue 2, September 2005 for Cellular Devices, Part 24 Subpart E and RSS-133, Issue 5, February 2009 for Broadband PCS Devices.

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: (\Echelon Corporation\EMCS31779-FCC22/24 Rev. 1)

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Electromagnetic Compatibility Criteria
Test Report

for the

Echelon Corporation
Model Edge Control Node (ECN) 70101-0026

Tested under
FCC Certification Rules
Title 47 of the CFR, Part 22 Subpart H & RSS-132, Issue 2, September 2005
for Cellular Devices,
Part 24 Subpart E & RSS-133, Issue 5, February 2009
for Broadband PCS Devices

MET Report: EMCS31779-FCC22/24 Rev. 1

June 27, 2011

Prepared For:

Echelon Corporation
550 Meridian Avenue
San Jose, CA 95126

Prepared By:
MET Laboratories, Inc.
914 W. Patapsco Ave
Baltimore, MD 21230

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for Broadband PCS Devices

Lionel Gabrillo, 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 22 Subpart H, Part 24 Subpart E of the FCC Rules and Industry Canada standards RSS-132, Issue 2, September 2005 and RSS-133, Issue 5, February 2009 under normal use and maintenance.

Shawn McMillen, Wireless Manager
Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	June 21, 2011	Initial Issue.
1	June 27, 2011	Revised to reflect engineer corrections.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Echelon Corporation Edge Control Node (ECN) 70101-0026, with the requirements of Part 22 Subpart H, Part 24 Subpart E 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 Edge Control Node (ECN) 70101-0026. Echelon Corporation should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Edge Control Node (ECN) 70101-0026, 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 22 Subpart H, Part 24 Subpart E and Part 15 Subpart B, in accordance with Echelon Corporation, purchase order number 32432.

Reference	IC Reference	Description	Compliance
§2.1046; §22.913, §24.232	RSS-132, Section 4.4 RSS-133, Section 6.4	RF Power Output	Compliant
§2.1047	RSS-132, Section 4.2 RSS-133 Section 6.2	Modulation Characteristics	Refer to FCC ID: N7N-MC5728
§2.1049	RSS-GEN, Section 4.6	Occupied Bandwidth	Refer to FCC ID: N7N-MC5728
§2.1051; §22.917, §24.238	RSS-132, Section 4.5 RSS-133, Section 6.5	Conducted Spurious Emissions at Antenna Terminals	Refer to FCC ID: N7N-MC5728
§2.1053; §22.917, §24.238	RSS-132, Section 4.5 RSS-133, Section 6.5	Radiated Spurious Emissions from the Cabinet	Compliant
§2.1055; §22.355, §24.135	RSS-132, Section 4.3 RSS-133, Section 6.3	Frequency Stability	Refer to FCC ID: N7N-MC5728
2-11-04/EAB/RF	RSS-132, Section 4.5.1 RSS-133, Section 6.5.1	Out of Band Rejection	Refer to FCC ID: N7N-MC5728

Table 1. Executive Summary of EMC Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Echelon Corporation to perform testing on the Edge Control Node (ECN) 70101-0026, under Echelon Corporation's purchase order number 32432.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Echelon Corporation, Edge Control Node (ECN) 70101-0026.

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

Model(s) Tested	Edge Control Node (ECN) 70101-0026	
Model(s) Covered:	Edge Control Node (ECN) 70101-0026	
EUT Specifications:	FCC ID: IZP70101-R003	
	Primary Power: 240 VAC, 60 Hz	
	Type of Modulations:	CDMA-8-PSK
	Equipment Code:	PCB
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Lionel Gabrillo	
Date(s):	June 27, 2011	

Table 2. EUT Summary Table

B. References

CFR 47, Part 22, Subpart H	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 22: Rules and Regulations for Cellular Devices.
CFR 47, Part 24, Subpart E	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 24: Rules and Regulations for Personal Communications Services
RSS-132, Issue 2, September 2005	Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz
RSS-133, Issue 5, February 2009	2 GHz Personal Communications Services
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-A-2001	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards

Table 3. Standard References

C. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick St., Santa Clara, CA 95054. 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).

D. Description of Test Sample

The Echelon Corporation Edge Control Node (ECN) 70101-0026, Equipment Under Test (EUT), is as follows:

The nBox is a telemetry device that is intended to collect data from electrical power usage data from electrical utility power meters, and gas meters. Electrical power meters can communicate over PLC band A or band C; or they can use 900 MHz ISM band. The nBox incorporates a cellphone module supporting IS-95/CDMA2000/EV-DO modes in the 850 cellular and PCS bands. We are using a Sierra Wireless MC-5728V module for this function (FCC ID N7N-MC5728).
The unit is a fixed stationary device, powered from the AC line, with a battery backup option. This unit is intended for mounting on a utility pole or on a pad mounted distribution transformer. The original unit has FCC ID number IZP70101-0002. Generic information on the product can be found on our web page at "http://www.echelon.com/metering/ecn.htm."

List of Interfaces
Ethernet
CDMA2000/EV-DO dual band Cell phone module (850 & 1900 MHz)
RS-232 2X

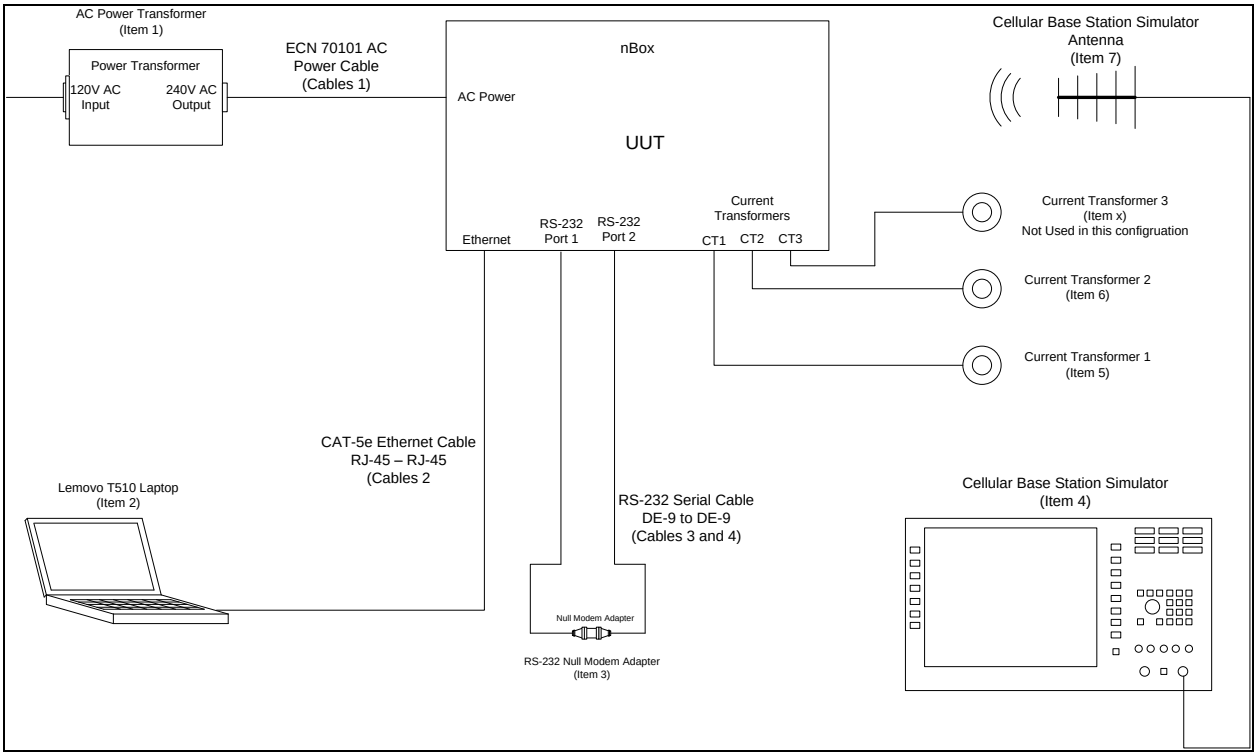


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

Ref. ID	Name / Description	Model Number	Serial Number
1	7xxx series Edge Control Node	770101-0026	0020, 0093, 0094

Table 4. Equipment Configuration

F. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number
1	Power Transformer 120V in 240V CT out	Echelon	NA
2	Laptop PC (Echelon Asset 105331)	Lenovo	T510
3	Null Modem Adapter	Pan Pacific	D25NM3
4	CDMA2000/EV-DO Base Station Simulator	Agilent or R&S	8960 series 10 or CMU200
5	Current Transformer	Dent Instruments	CT-RMV-16-1000
6	Current Transformer	Dent Instruments	CT-RMV-16-1000

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
1	AC Power	AC Power cable	1	6’	N	1
2	Ethernet	CAT-5e Ethernet cable with clamp on ferrites on the PC end.	1	6’	N	2
3	RS-232 Serial Port 1	DE-9 –DE-9 Serial Cable	1	6’	N	3
4	RS-232 Serial Port 2	DE-9 –DE-9 Serial Cable	1	6’	N	3

Table 6. Ports and Cabling Information

H. Mode of Operation

The CDMA2000/EV-DO cell phone module will be stimulated by the base station simulator.

The Ethernet port will be connected to a Lenovo laptop PC which will be used to control the UUT and provide

I. Method of Monitoring EUT Operation

The Base station simulator will indicate a loss of the session if the over the air connection to the CDMA2000/EV-DO cell phone module is lost.

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 Echelon Corporation upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1046 RF Power Output

Test Requirements: **§ 2.1046 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.

§ 22.913 Power and antenna height limits.

§ 22.913(a): The Effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 watts.

§ 24.232 Power and antenna height limits.

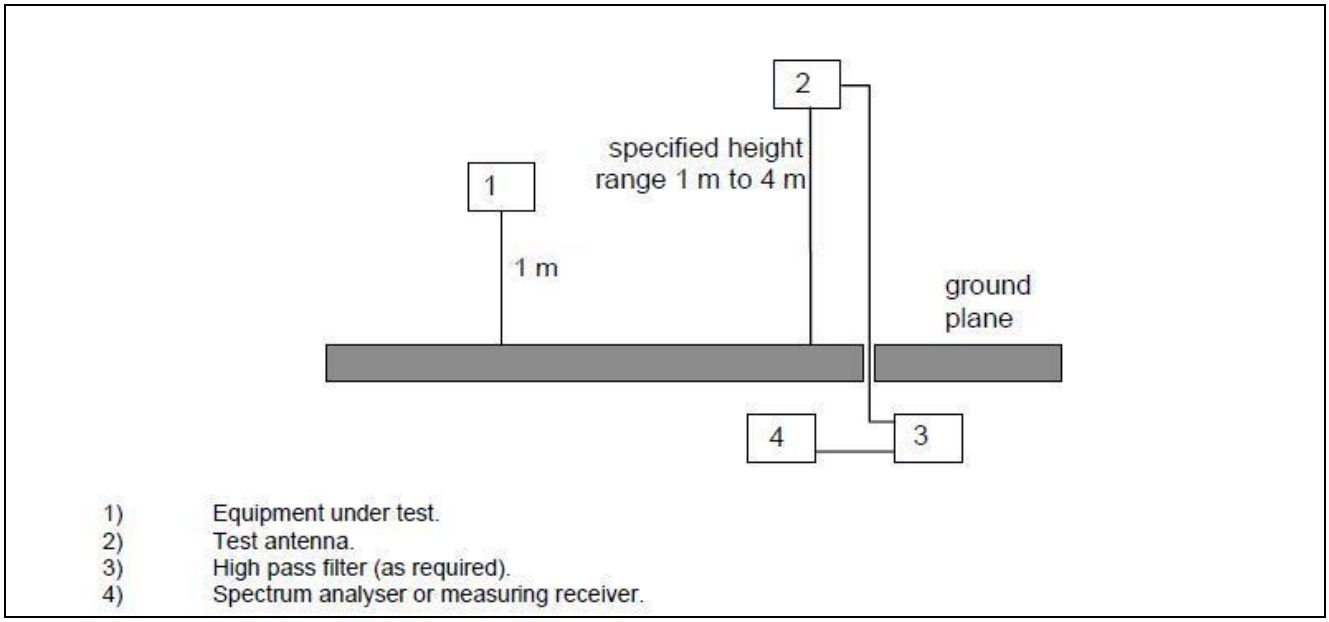
§ 24.232 (b): Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

Test Procedures: The EUT was setup on a turntable inside a semi anechoic chamber. This test was performed in all applicable modulations. The EUT was rotated about 360^0 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.

Test Results: The EUT complies with the requirements of this section.

Test Engineer(s): Lionel Gabrillo

Test Date(s): 06/02/11



Block Diagram 1. RF Power Output Test Setup

800 MHz			
	Channel	**Frequency**	**ERP**
Low	1013	824.7	23.93
Mid	384	836.52	23.39
High	777	848.31	23.5

Table 7. RF Output Power, 800 MHz

1900 MHz			
	Channel	**Frequency**	**EIRP**
Low	25	1851.25	24.128
Mid	600	1880	25.207
High	1175	1908.75	26.107

Table 8. RF Output Power, 1900 MHz

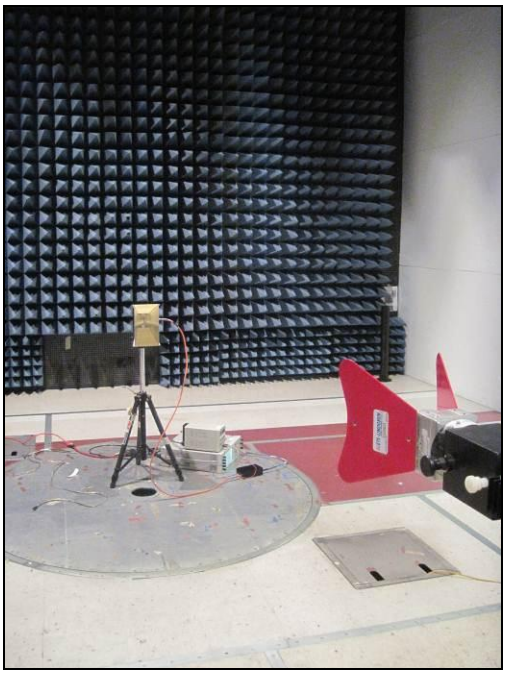
Agilent 8960 Series 10 Wireless Communications Test Set
Application: 1xEV-DO Terminal Test
Rev License: A.12.08

EVDO Release 0 – RTAP

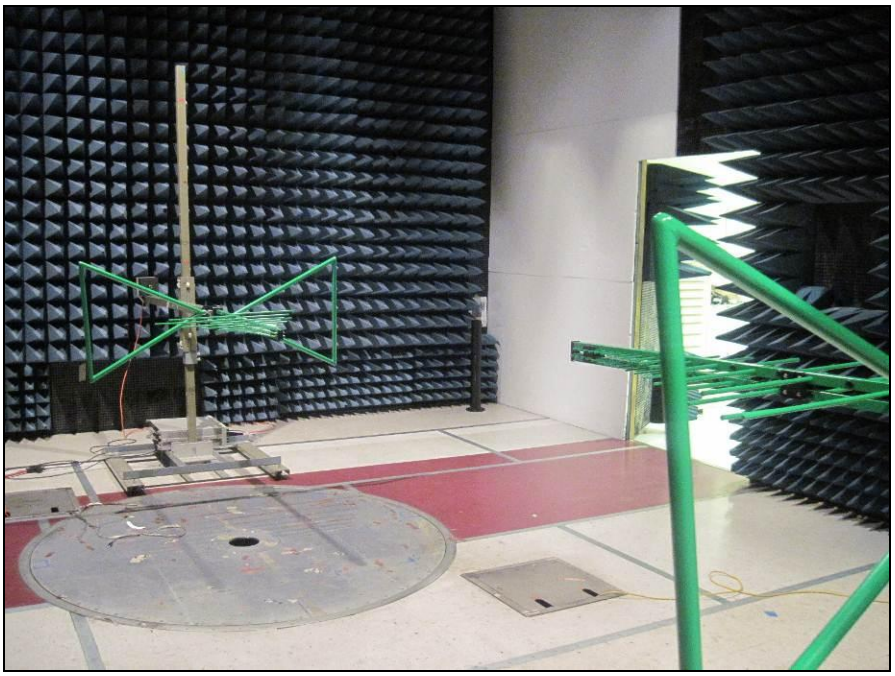
- Call Setup > Shift & Preset
- Call Control:
  - Access Network Info >Cell Parameters> Sector ID> 000000000> Subnet Mask> 0
  - Generator Info> Termination Parameters> Max Forward Packet Duration> 16 Slots
- Call Parameters:
  - Cell Power > -15.5 dBm/ 1.23MHz
  - Cell Band > (Select US Cellular or US PC)
  - Channel > (Enter channel number)
  - Application Config > Test Application Protocol > RTAP
  - RTAP Rate > 153.6 kbps
  - Rvs Power Ctrl > Active Bits
  - Protocol Rel > 0 (1xEV-DO)
- Press “Start Data Connection” once connected
  - Rvs Power Ctrl> All Up Bits

EVDO Release 0 – FTAP

- Call Setup > Shift & Preset
- Call Control:
  - Access Network Info >Cell Parameters> Sector ID> 000000000> Subnet Mask> 0
  - Generator Info> Termination Parameters> Max Forward Packet Duration> 16 Slots
- Call Parameters:
  - Cell Power > -15.5 dBm/ 1.23MHz
  - Cell Band > (Select US Cellular or US PC)
  - Channel > (Enter channel number)
  - Application Config > Test Application Protocol > FTAP
  - FTAP Rate > 307.2 kbps
  - Rvs Power Ctrl > Active Bits
  - Protocol Rel > 0 (1xEV-DO)
- Press “Start Data Connection” once connected
  - Rvs Power Ctrl> All Up Bits



Photograph 1. RF Power Output, Test Setup, 800 MHz



Photograph 2. RF Power Output, Test Setup, 1900 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

MPE

Since EUT has co-located antennas:

MPE Limit Calculation: EUT's operating frequencies @ 824.2 – 849.2 MHz; highest conducted power = ERP – Max Antenna Gain = 23.93 – 11.5 = *12.43dBm* (peak) therefore, **Limit for Uncontrolled exposure = Freq/1500 = 824.2/1500= 0.549 mW/cm^2 or 5.49 W/m^2**

EUT maximum antenna gain = *8.5 dBi + 10log(# of antennas) = 8.5 + 3.0 =11.5dBi*

Equation from page 18 of OET 65, Edition 97-01

$$S1 = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{PG / 4\pi S}$$

where, S1 = Power Density (Limit = 0.549 mW/cm^2)
P = Power Input to antenna (17.498mW)
G = Antenna Gain (14.125 numeric)
R = Minimum Distance between User and Antenna (20 cm)

S1 = (17.498*14.125)/(4*3.14*20^2) = 247.172/5024 = 0.049 mW/cm^2
S1 < 0.549 mW/cm^2 ,

MPE Limit Calculation: EUT's operating frequencies @ 1850-1910 MHz; highest conducted power = EIRP – Antenna Gain = 26.107 – 8.4 = 17.71*dBm* (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = *5.4 dBi + 10log(# of antennas) = 5.4 + 3.0 = 8.4dBi*

Equation from page 18 of OET 65, Edition 97-01

$$S2 = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{PG / 4\pi S}$$

where, S2 = Power Density (Limit = 1 mW/cm^2)
P = Power Input to antenna (59.020mW)
G = Antenna Gain (6.918 numeric)
R = Minimum Distance between User and Antenna (20 cm)

S2 = (59.020*6.918)/(4*3.14*20^2) = 408.319/5024 = 0.082 mW/cm^2
S2 < 1 mW/cm^2 ,

MPE Limit Calculation: EUT's operating frequencies @ 2400-2483.5 MHz; highest conducted power = *28.86dBm* (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = *4.3dBi + 10log(# of antennas) = 4.3 + 3.0 = 7.3dBi*

Equation from page 18 of OET 65, Edition 97-01

$$S3 = PG / 4\pi R^2 \qquad \text{or} \qquad R = \sqrt{PG / 4\pi S}$$

where, S3 = Power Density (Limit = 1 mW/cm^2)
P = Power Input to antenna (770.96mW)
G = Antenna Gain (5.383 numeric)
R = Minimum Distance between User and Antenna (20 cm)

$S3 = (770.96*5.383)/(4*3.14*20^2) = 4150.08/5024 = 0.826$ mW/cm^2
$S3 < 1$ mW/cm^2

MPE Limit Calculation: EUT's operating frequencies @ 5725-5850 MHz; highest conducted power = *28.915dBm* (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = *4 dBi + 10log(# of antennas) = 4.0 + 3.0 = 7.0dBi.*

Equation from page 18 of OET 65, Edition 97-01

$$S4 = PG / 4\pi R^2 \qquad \text{or} \qquad R = \sqrt{PG / 4\pi S}$$

where, S4 = Power Density (Limit = 1 mW/cm^2)
P = Power Input to antenna (780.78mW)
G = Antenna Gain (5.024 numeric)
R = Minimum Distance between User and Antenna (20 cm)

$S4 = (780.78*5.024)/(4*3.14*20^2) = 3922.64/5024 = 0.781$ mW/cm^2
$S4 < 1$ mW/cm^2

For Co-located Antennas:

S1 + S2 + S3 + S4 < 1mW/cm2

Since,
0.049 mW/cm2 + 0.082 mW/cm2 + 0.826 mW/cm2 + 0.781 mW/cm2 > 1 mW/cm2

The Minimum Distance between User and Antennas is

R = (√P1G1 / (4*3.14*0.549)) + (√(P2G2 + P3G3 + P4G4) / (4*3.14*1))
= (√247.17/3.79) + ((408.32 + 4130.48 + 3903.91)/ 12.56)
= 27.15 cm

§ 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 Results: Refer to FCC ID: N7N-MC5728

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.

§ 22.917 Emission limitations Cellular equipment, § 24.238 Emission limitations for Broadband PCS equipment: The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

§ 22.917 (a), § 24.238 (a): Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P).

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".

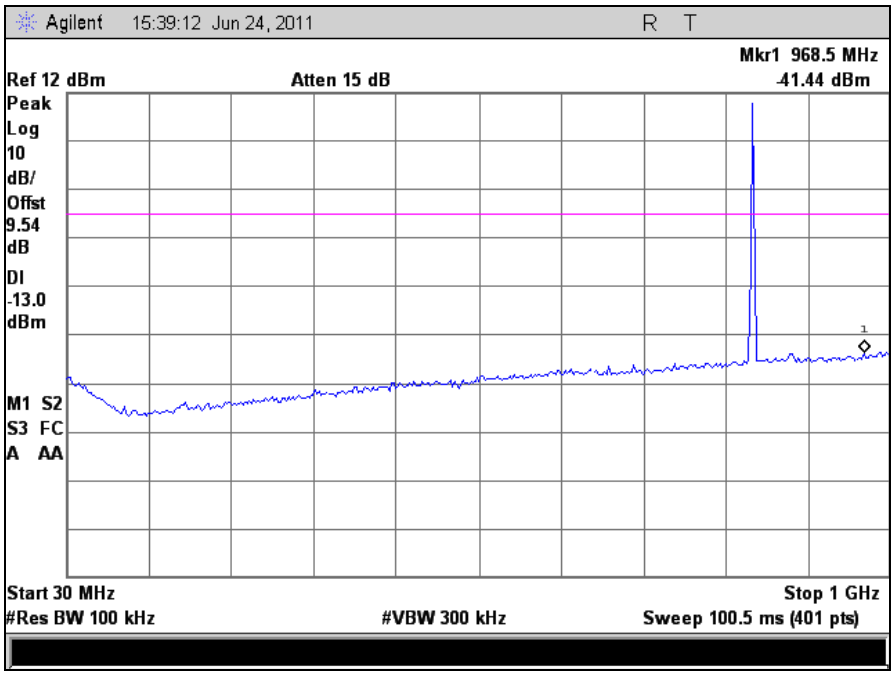
Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber. The EUT was set at a distance of 3m from the receiving antenna. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360^0 and the receiving antenna scanned from 1-4m in order to capture the maximum emission. Harmonic emissions up to the 10^{th} or 40GHz, which ever was the lesser, were investigated.

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 100kHz RBW and 300kHz VBW for 30MHz – 1GHz emissions and 1MHz RBW and 3MHz VBW for above 1GHz emissions. The spectrum was investigated from 30MHz to the 10^{th} harmonic of the carrier.

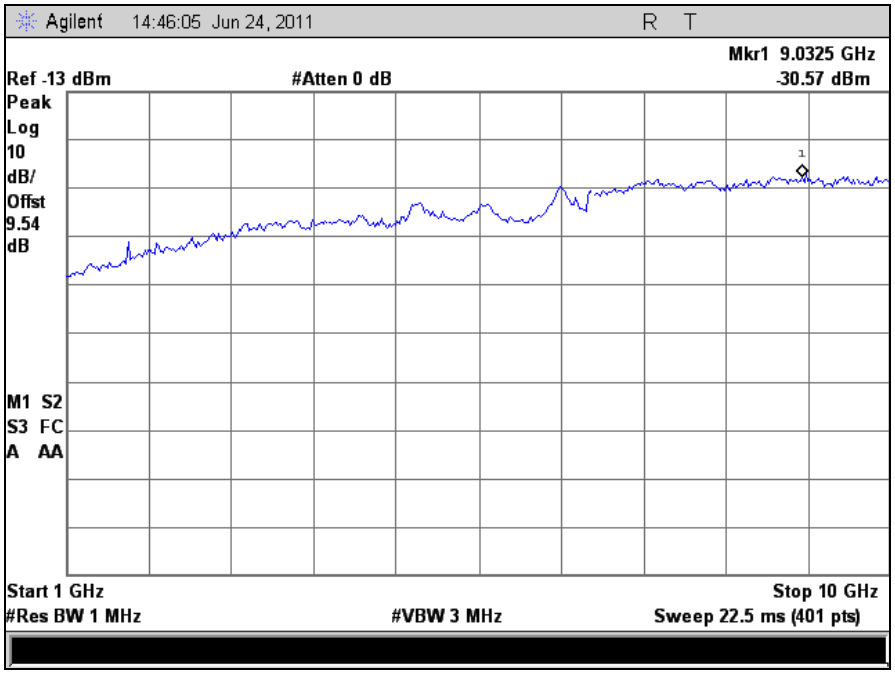
Test Results: The EUT complies with the requirements of this section. No Spurious Emissions were seen above 18GHz.

Test Engineer: Lionel Gabrillo

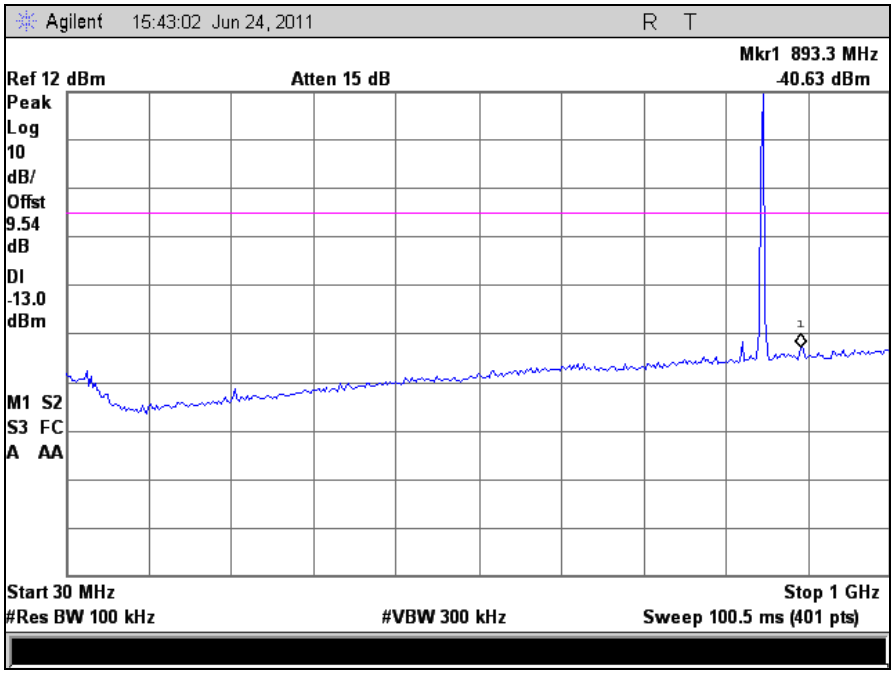
Test Date(s): 06/02/11



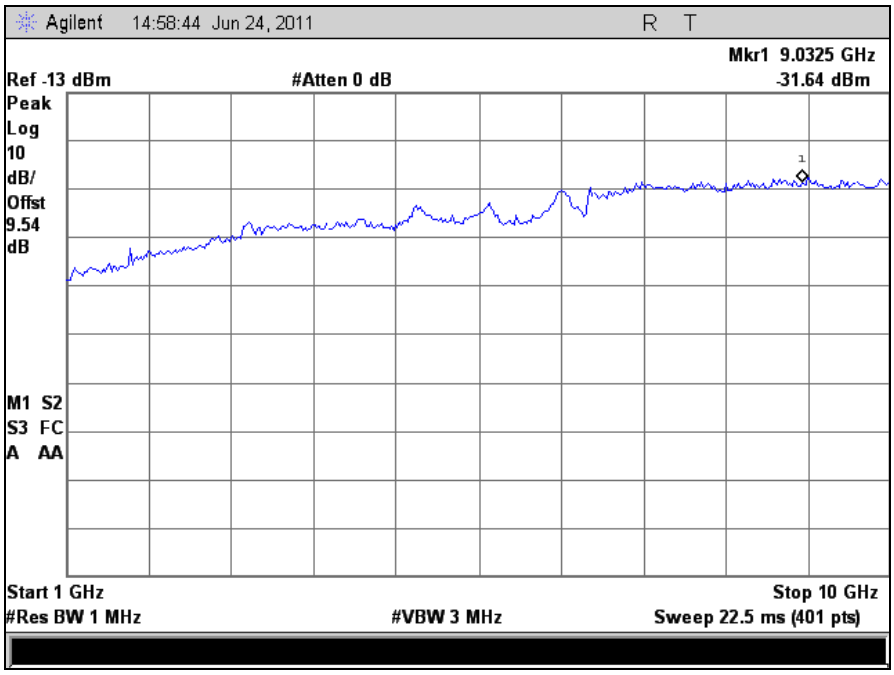
Plot 1. Radiated Spurious Emissions, Channel 384, 836.52 MHz, 30 MHz – 1 GHz



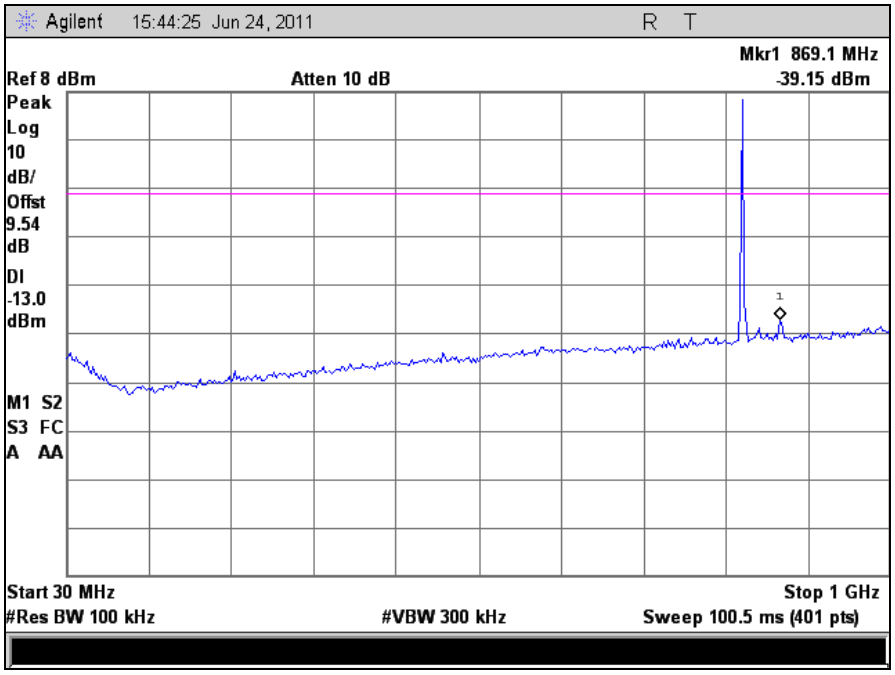
Plot 2. Radiated Spurious Emissions, Channel 384, 836.52 MHz, 1 GHz – 10 GHz



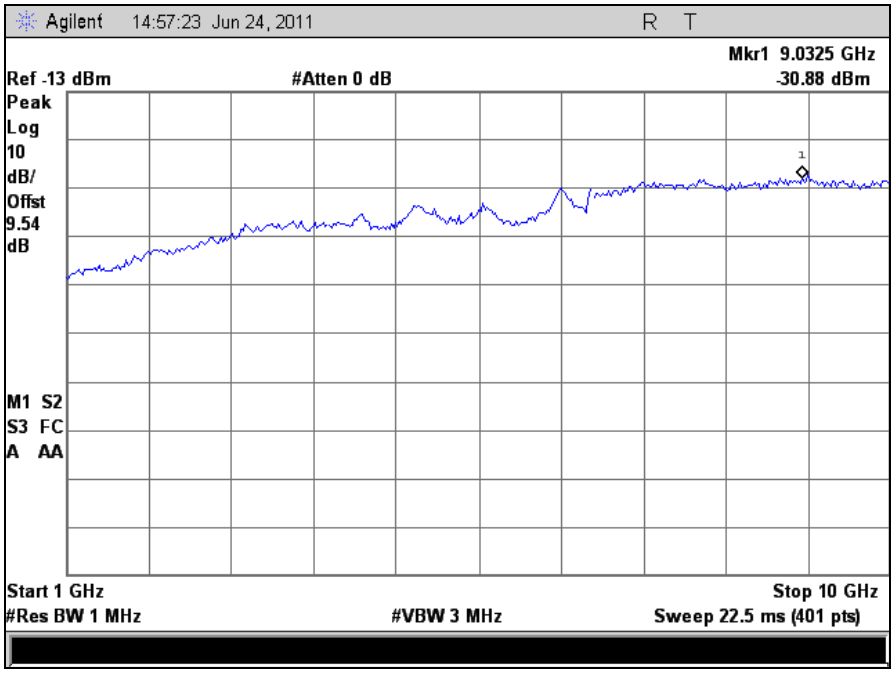
Plot 3. Radiated Spurious Emissions, Channel 777, 848.31 MHz, 30 MHz – 1 GHz



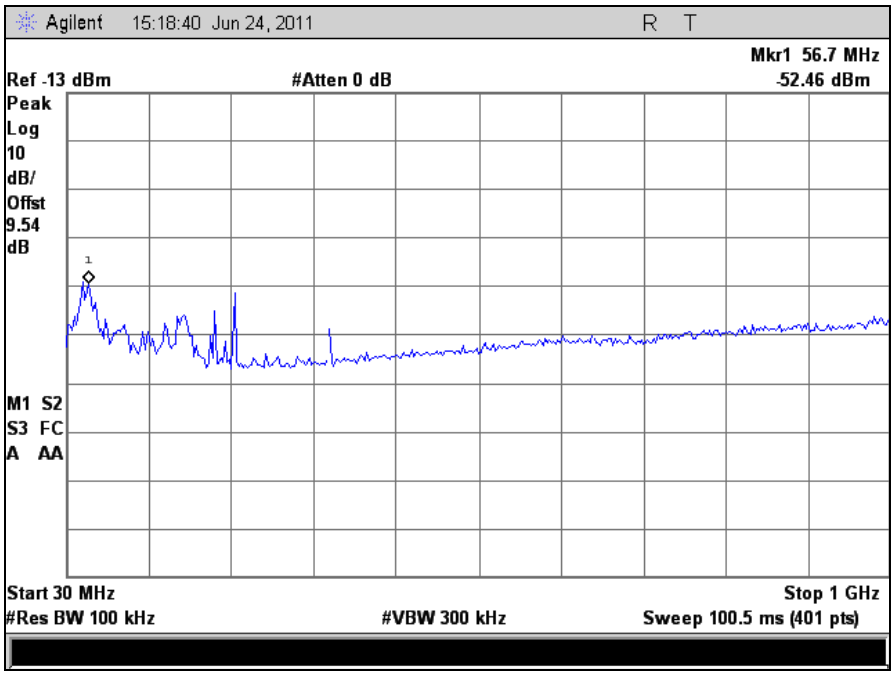
Plot 4. Radiated Spurious Emissions, Channel 777, 848.31 MHz, 1 GHz – 10 GHz



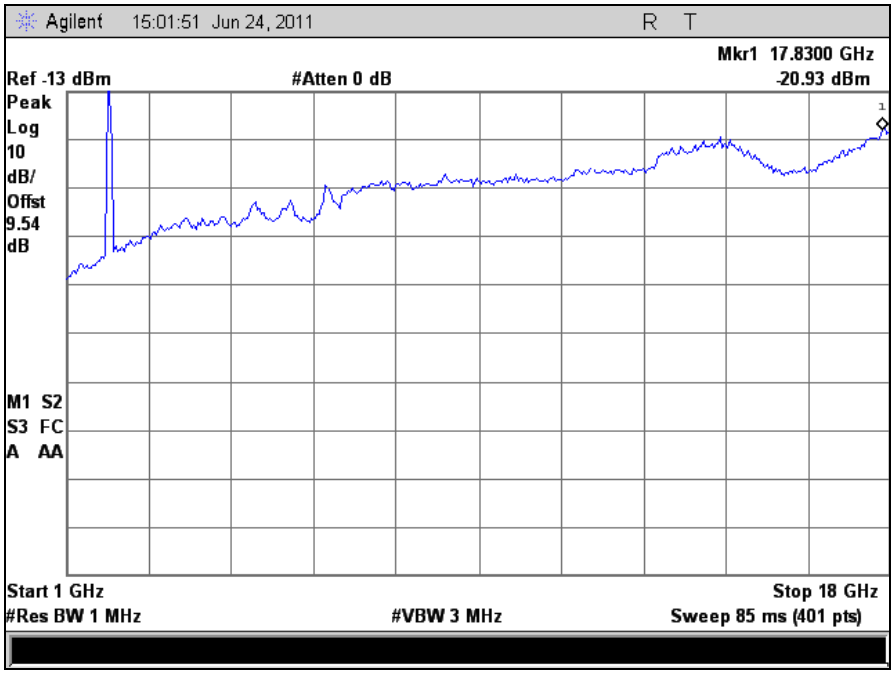
Plot 5. Radiated Spurious Emissions, Channel 1013, 824.7 MHz, 30 MHz – 1 GHz



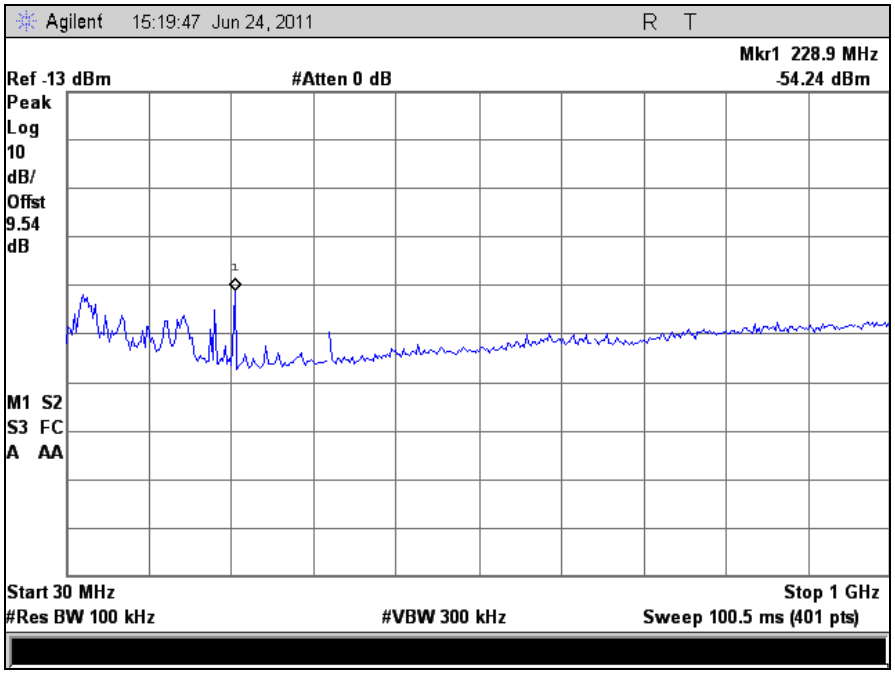
Plot 6. Radiated Spurious Emissions, Channel 1013, 824.7 MHz, 1 GHz – 10 GHz



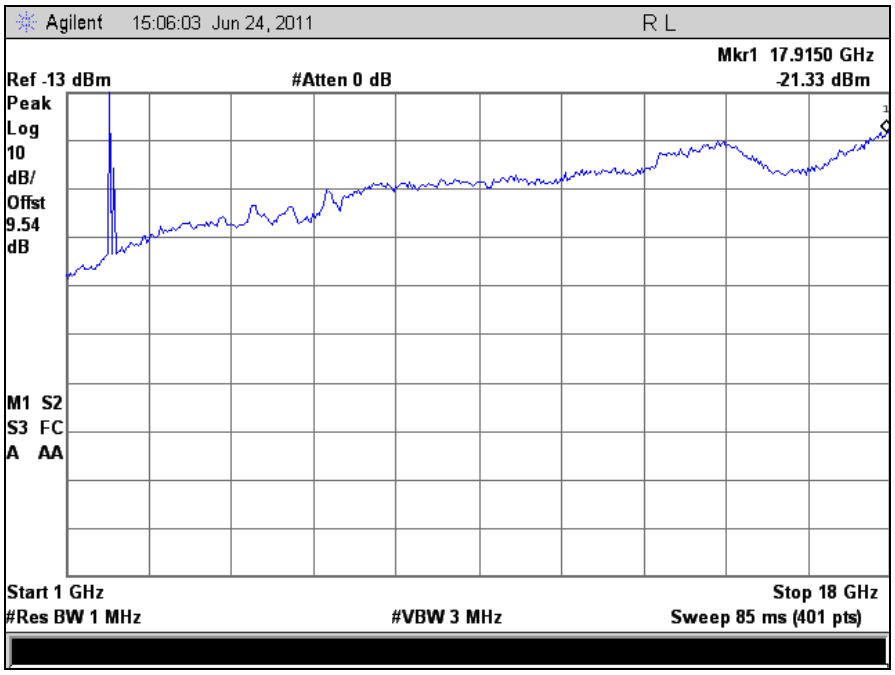
Plot 7. Radiated Spurious Emissions, Channel 25, 1851.25 MHz, 30 MHz – 1 GHz



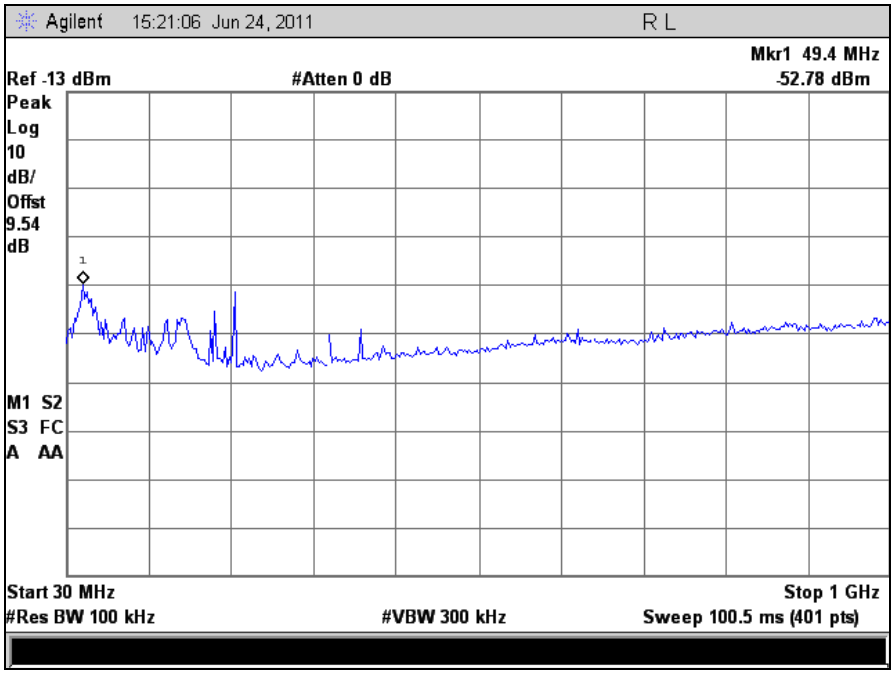
Plot 8. Radiated Spurious Emissions, Channel 25, 1851.25 MHz, 1 GHz – 18 GHz



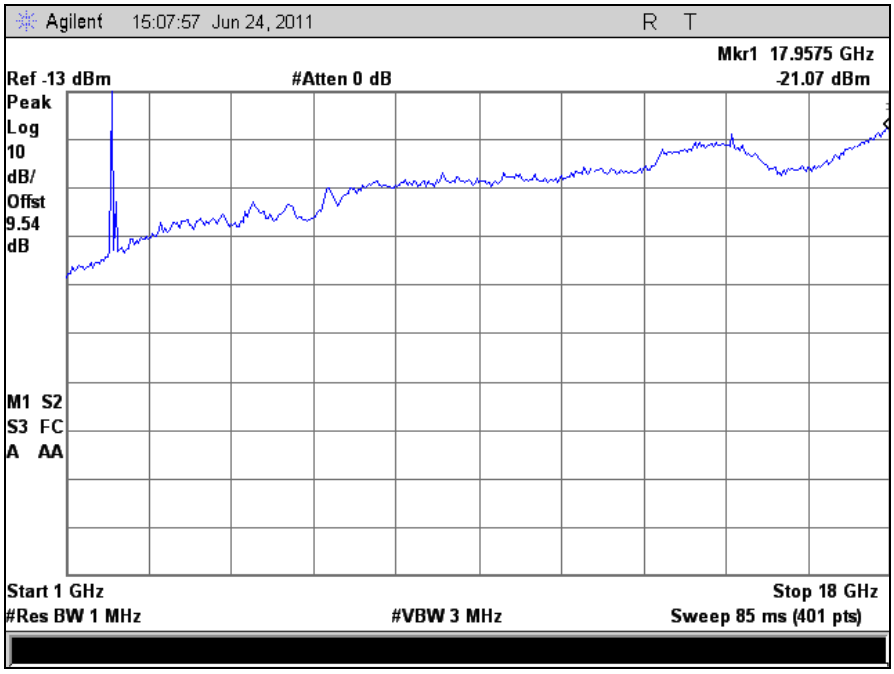
Plot 9. Radiated Spurious Emissions, Channel 600, 1880 MHz, 30 MHz – 1 GHz



Plot 10. Radiated Spurious Emissions, Channel 600, 1880 MHz, 1 GHz – 18 GHz



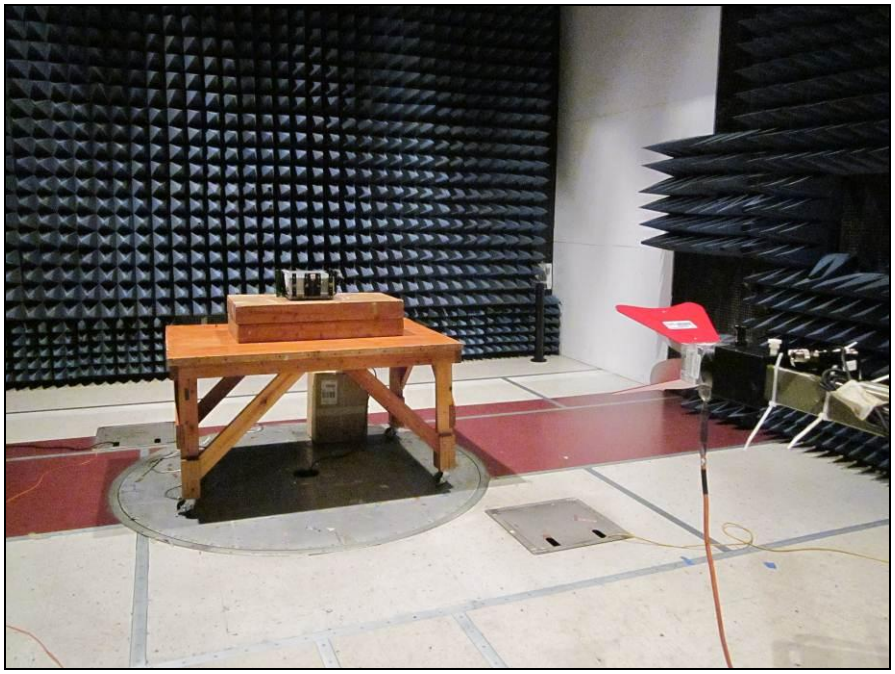
Plot 11. Radiated Spurious Emissions, Channel 1175, 1908.75 MHz, 30 MHz – 1 GHz



Plot 12. Radiated Spurious Emissions, Channel 1175, 1908.75 MHz, 1 GHz – 18 GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

Photograph 3. Radiated Emissions, Test Setup, 30 MHz – 1 GHz



Photograph 4. Radiated Emissions, Test Setup, 1 GHz – 18 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.

§ 22.917, §24.238 Emission limitations for Broadband PCS equipment: The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

§ 22.917 (a), § 24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

Test Results: Refer to FCC ID: N7N-MC5728

Electromagnetic Compatibility Criteria for Intentional Radiators

Filter Response

Test Results: Refer to FCC ID: N7N-MC5728

Electromagnetic Compatibility Criteria for Intentional Radiators

Inter-Modulation

Test Results: Refer to FCC ID: N7N-MC5728

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 #	Equipment	Manufacturer	Model#	Cal Date	Cal Due
1S2482	5 METER CHAMBER	PANASHIELD	641431	11/13/2010	11/13/2011
1S2484	BILOG ANTENNA	TESEQ	CBL6112D	3/1/2011	3/1/2013
1S2460	SPECTRUM ANALYZER	AGILENT	E4407B	7/13/2010	7/13/2011
1S2198	HORN ANTENNA	EMCO	3115	9/22/2010	9/22/2011
1S2269	RF SIGNAL GENERATOR	HEWLETT PACKARD	E4432B	6/22/2010	6/22/2011
1S2447	AMPLIFIER	MINI- CURCUITS	ZHL-4240W-SMA	SEE NOTE	

Table 9. Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

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 states; 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 90, 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 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.

End of Report

