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March 23, 2011

Fiber-Span
3434 Rt. 22 W. Suite 140
Branchburg, New Jersey 08876

Dear David Thomson,

Enclosed is the EMC test report for compliance testing of the Fiber-Span, FS42R-700-5 as tested to the requirements of the Title 47 of the CFR, Part 15, Subpart B for a Class A Digital Device and FCC Part 27 for Miscellaneous Wireless Communication Services.

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: (\Fiber-Span\ EMC30864C-FCC27 Rev. 1)

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Fiber-Span
FS42R-700-5

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

Electromagnetic Compatibility Criteria Test Report

for the

**Fiber-Span
FS42R-700-5**

Verified under
FCC Certification Rules
Title 47 of the CFR, Parts 15 Subpart B
for Class A Digital Devices
&
Title 47 of the CFR, Part 27

MET Report: EMC30864C-FCC27 Rev. 1

March 23, 2011

Prepared For:

**Fiber-Span
3434 Rt. 22 W. Suite 140
Branchburg, New Jersey 08876**



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for Class A Digital Devices
&
Title 47 of the CFR, Part 27

Dusmantha Tennakoon
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 the FCC Rules Parts 15B, Part 27 under normal use and maintenance.

Shawn McMillen, Wireless Manager
Electromagnetic Compatibility Lab



Fiber-Span
FS42R-700-5

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

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	March 7, 2011	Initial Issue.
1	March 23, 2011	Revised to reflect correct EUT name and add FCC ID.



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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
μ s	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



Fiber-Span
FS42R-700-5

Executive Summary
CFR Title 47 Part 27 & Part 15 Subpart B

I. Executive Summary



A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Fiber-Span FS42R-700-5, 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 FS42R-700-5. Fiber-Span should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the FS42R-700-5, 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 Fiber-Span, purchase order number 5861.

Reference	Description	Compliance
Part 15 Subpart B §15.109(a)	Conducted Emissions for a Class A Digital Device	Compliant
Part 15 Subpart B §15.107(a)	Radiated Emissions for a Class A Digital Device	Compliant
§2.1046; §27.50(b)	RF Power Output	Compliant
§2.1047	Modulation Characteristics	Not Applicable
§2.1049	Occupied Bandwidth	Compliant
§2.1051; §2.1057, §27.53(c)(f)	Spurious Emissions at Antenna Terminals	Compliant
§2.1053; §2.1057; §27.53(c)(f)	Radiated Spurious Emissions	Compliant
§2.1055	Frequency Stability	Not Applicable
FCC guidance on Amplifiers	Intermodulation Products	Compliant
FCC guidance on Amplifiers	Filter Response	Compliant

Table 1. Executive Summary of EMC Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Fiber-Span to perform testing on the FS42R-700-5, under Fiber-Span's purchase order number 5861.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Fiber-Span, FS42R-700-5.

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

Model(s) Tested:	FS42R-700-5			
EUT Specifications:	Primary Power: 120V/60Hz			
	FCC ID: Q4VFS42R-700-5			
	Type of Modulations:	QAM		
	Equipment Code:	TNB		
	Avg. RF Output Power:	Downlink	Uplink	
		0.214 W	0.0000037 W	
	EUT Frequency Range:	Downlink	Uplink	
		728.7-756.3 MHz	Band 1	698.7-715.3 MHz
			Band 2	776.7-786.3 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:	Dusmantha Tennakoon			
Date(s):	March 23, 2011			

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
ICES-003, Issue 4 February 2004	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 EUT is a FS42R-700-5. This module is part of the RFN system. The RFN has three (3) antenna ports. The RF from the 700 MHz module is split between the 3 ports as follows:

1. Antenna port 1 – full power
2. Antenna port 2 – full power – 6 dB
3. Antenna port 3 – full power

The Fiber-Span Remote Fiber Node (RFN), model FS47R consists of a chassis mainframe with up to six (6) optional plug-in service modules. Each Service Module provides dedicated support for one of the following wireless services:

- 700 MHz commercial band
- 800/900 MHz iDEN
- 850 MHz Cellular
- 1.9GHz PCS
- 2.1GHz AWS
- GHz WiFi

A seventh module (shown in the attached block diagram) will be available for future WiMAX support.

The RFN is intended for use with associated Headend equipment, including the FTU-RF, and RIS units which provide the necessary signal feed for all wireless services via optical fiber.

The RFN and associated Headend Equipment are intended to provide, via optical fiber links, a means of extending the reach of a Wireless Service Provider's BTS to areas otherwise obscured from their signal, such as subways, underground shopping areas, etc.

The output of the RFN is common to all Service Modules, and terminates in three antenna ports. Except for signal level, all signals appear at all three ports.

Operation is bi-directional in nature, and varies somewhat, depending on the requirements of the particular technology supported by the specific plug-in Service Module.

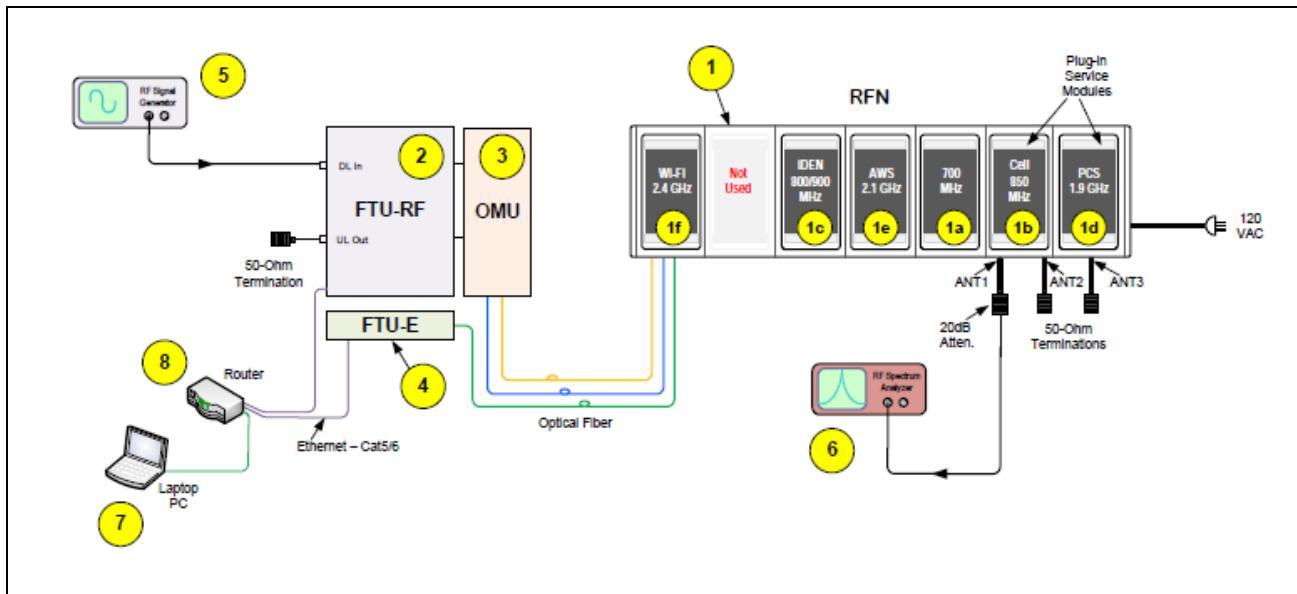


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

Ref. ID	Name / Description	Model Number	Serial Number
1a	Service Module, 700 MHz, 5W, SBY1	FS424-700-5	2656-06

Table 4. Equipment Configuration

F. Support Equipment

Ref. ID	Name / Description	Manufacturer	Model Number	Serial Number
2	FTU-RF	Fiber-Span	N/A	2656-20
3	OMU	Fiber-Span	N/A	2656-27
4	FTU-E	IMC Networks	856-1047	N/A
7	Laptop PC (w/CAN Tools S/W)	N/A	N/A	N/A
8	Router	N/A	N/A	N/A

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	ANT 1	RF Coaxial cable	1	1	Y	6
1	ANT 2	50-Ohm Termination	1	N/A	Y	N/A
1	ANT 3	50-Ohm Termination	1	N/A	Y	N/A

Table 6. Ports and Cabling Information

H. Mode of Operation

RFN is normally connected to the associated Headend Equipment – the FTU-RF and RIS units, via optical fiber.

Each optional wireless service supported operates independently, and may be removed without affecting the others installed in the mainframe option chassis.

The RFN receives an RF input signal in the downlink direction from an associated BTS (normally supplied by Wireless Service Provider). This connection is made via coaxial cable and connector at the RIS unit.

I. 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.

J. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Fiber-Span 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):

Jeffrey Pratt

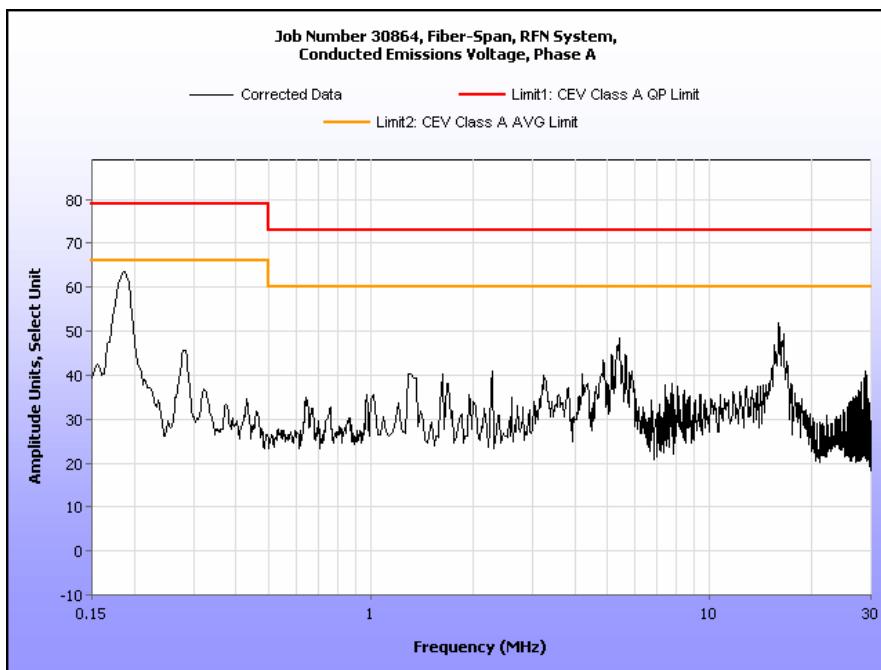
Test Date(s):

02/24/11

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

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.325	39.04	0	39.04	79	-39.96	35.08	0	35.08	66	-30.92
1.27	22.37	0	22.37	73	-50.63	19.83	0	19.83	60	-40.17
5.22	34.17	0.06	34.23	73	-38.77	29.51	0.06	29.57	60	-30.43
7.91	20.7	0	20.7	73	-52.3	13.56	0	13.56	60	-46.44
15.86	31.51	0	31.51	73	-41.49	18.16	0	18.16	60	-41.84
16.41	42.43	0	42.43	73	-30.57	39.17	0	39.17	60	-20.83

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

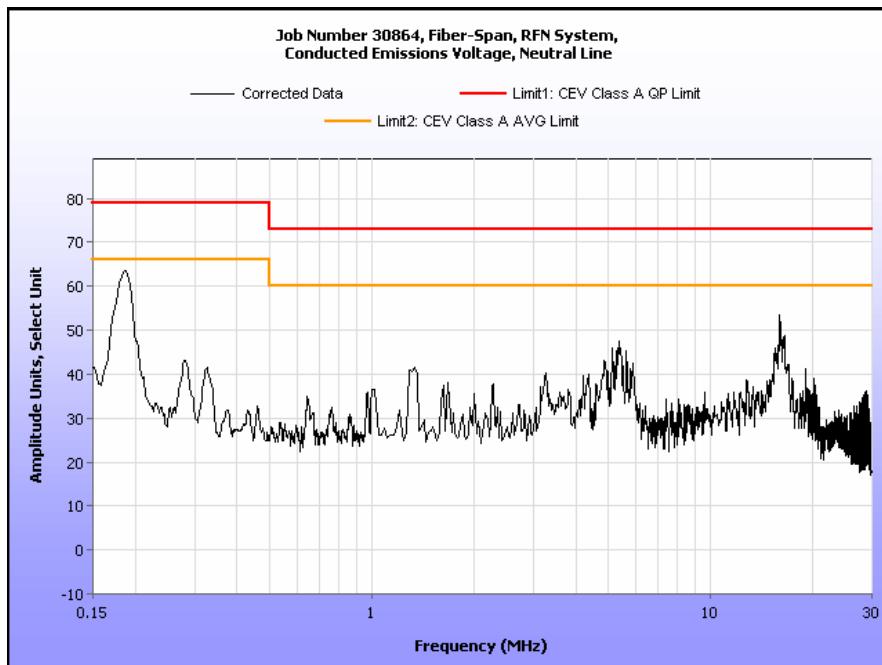


Plot 1. Conducted Emissions, Phase Line

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

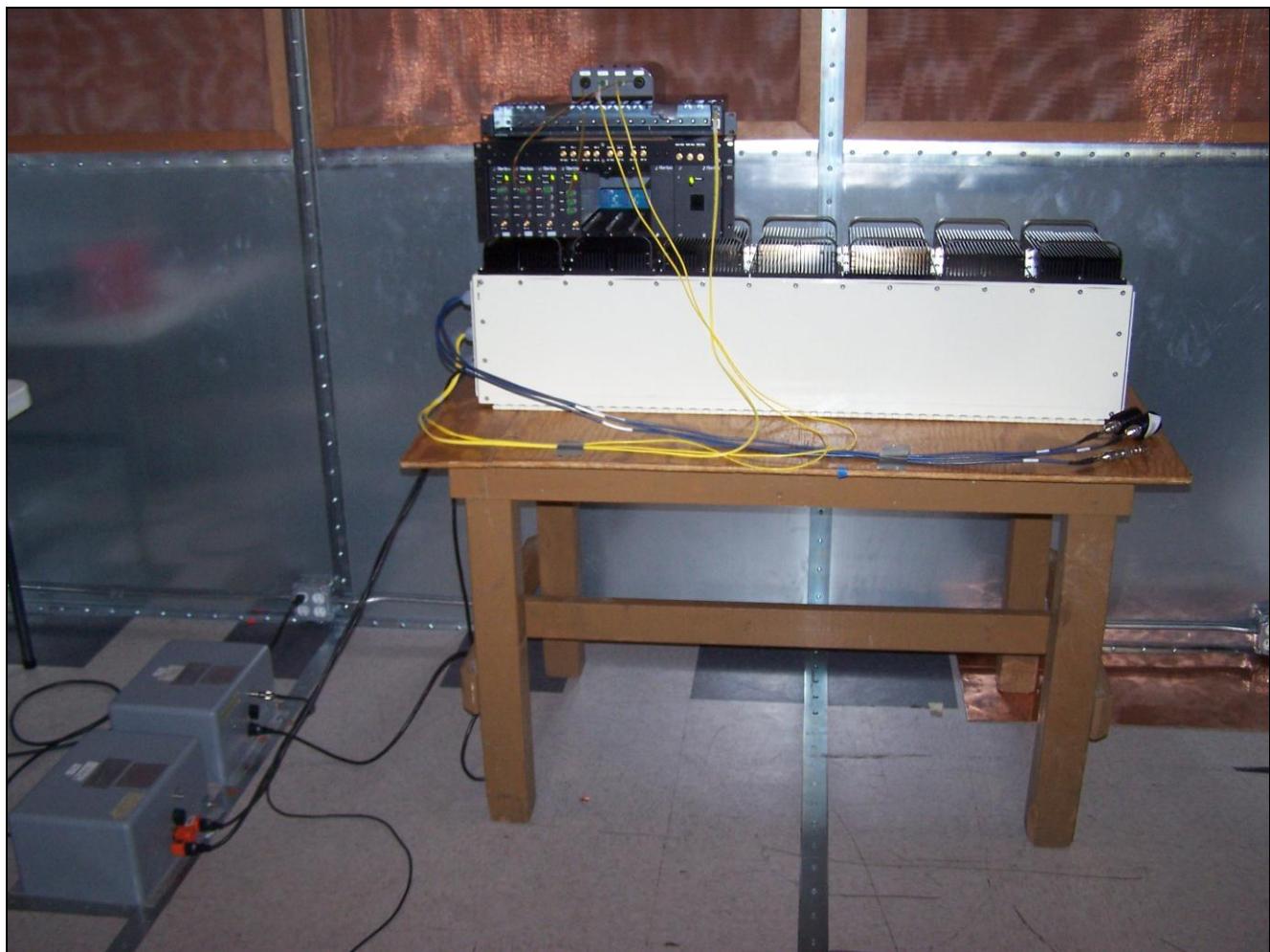
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.323	40.94	0	40.94	79	-38.06	38.59	0	38.59	66	-27.41
1.32	35.36	0	35.36	73	-37.64	32.94	0	32.94	60	-27.06
4.8	26.64	0.05	26.69	73	-46.31	20.34	0.05	20.39	60	-39.61
5.1	33.75	0.06	33.81	73	-39.19	22.88	0.06	22.94	60	-37.06
16.38	37.59	0	37.59	73	-35.41	23.8	0	23.8	60	-36.2
16.79	34.54	0	34.54	73	-38.46	21.49	0	21.49	60	-38.51

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.

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

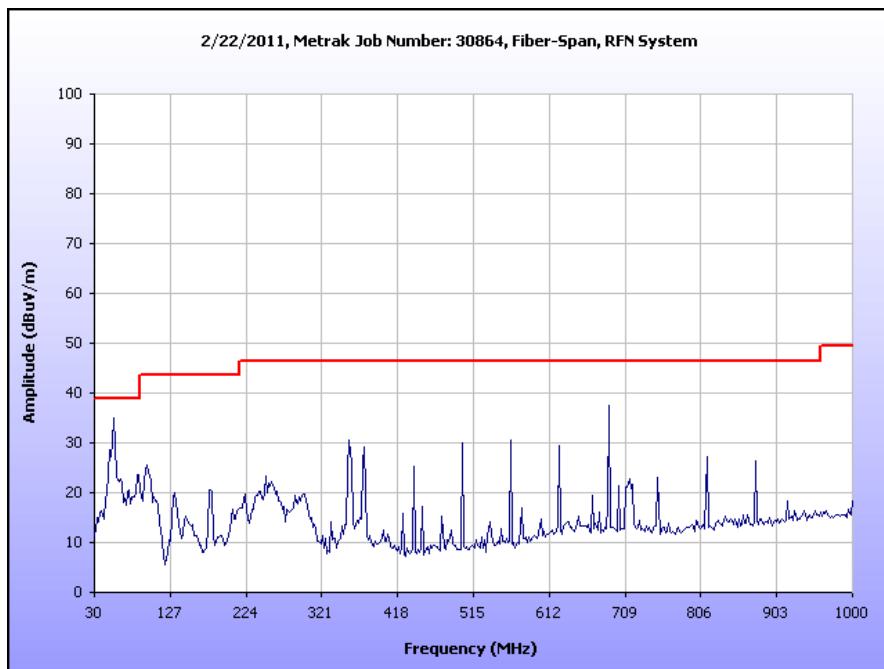
Test Engineer(s): Dusmantha Tennakoon

Test Date(s): 02/22/11

Radiated Emissions Limits Test Results, Class A

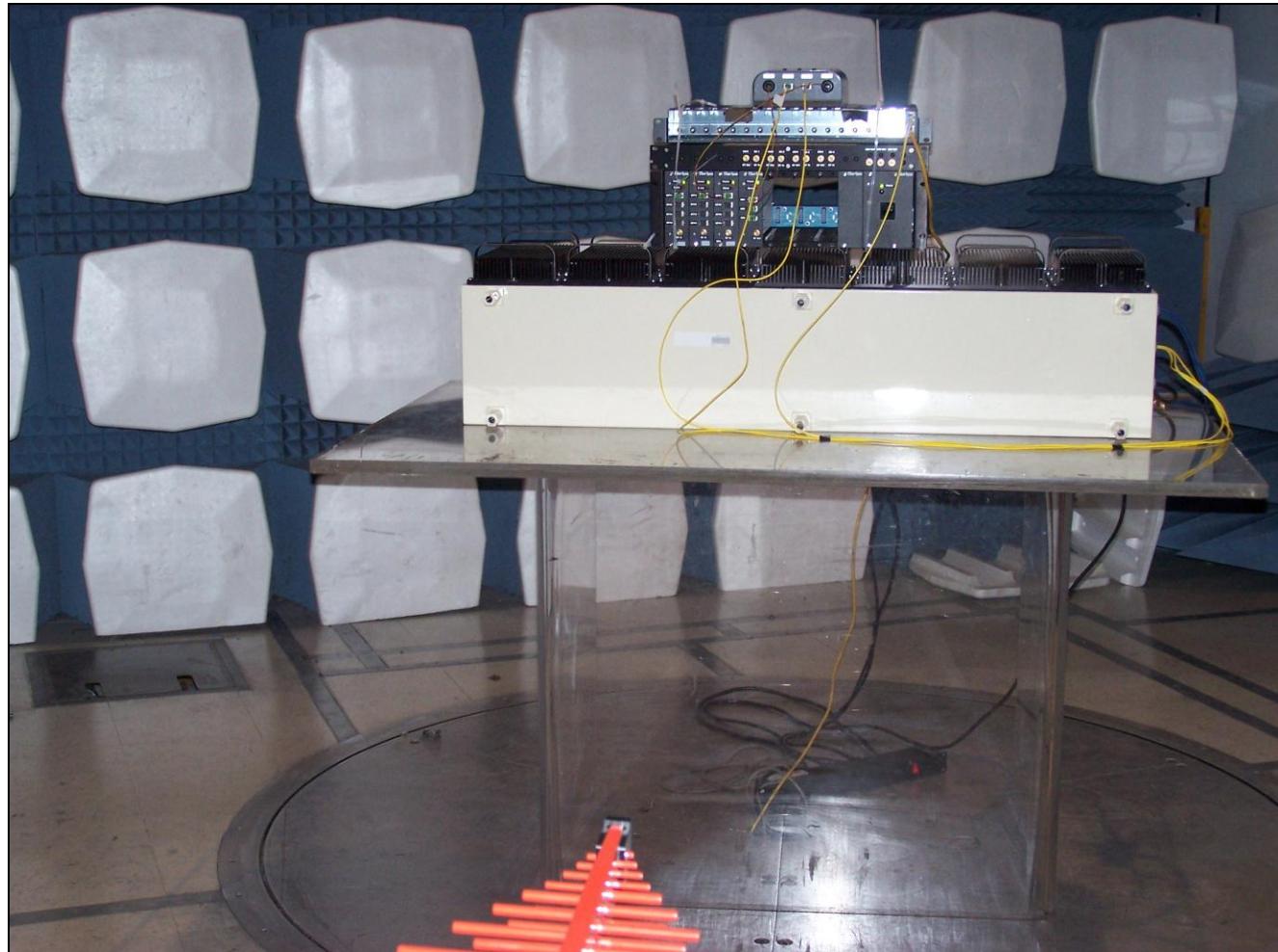
Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
55.713928	22	H	3.86	25.21	7.46	0.23	10.46	22.44	39.00	-16.56
55.713928	308	V	1.00	31.60	7.46	0.23	10.46	28.83	39.00	-10.17
687.51653	136	H	1.00	25.92	20.50	1.50	10.46	37.46	46.40	-8.94
687.51653	329	V	1.00	22.62	20.50	1.50	10.46	34.16	46.40	-12.24
356.37575	189	H	1.00	27.13	15.33	0.83	10.46	32.83	46.40	-13.57
356.37575	331	V	1.00	25.69	15.33	0.83	10.46	31.39	46.40	-15.01
562.51353	125	H	1.16	21.96	18.80	1.09	10.46	31.39	46.40	-15.01
562.51353	134	V	1.00	21.60	18.80	1.09	10.46	31.03	46.40	-15.37
97.96994	121	H	1.95	22.66	9.79	0.23	10.46	22.22	43.50	-21.28
97.96994	360	V	1.00	25.50	9.79	0.23	10.46	25.06	43.50	-18.44
499.98747	248	H	1.00	19.41	18.00	1.00	10.46	27.95	46.40	-18.45
499.98747	124	V	1.00	23.92	18.00	1.00	10.46	32.46	46.40	-13.94

Table 11. Radiated Emissions Limits, Test Results



Plot 3. Radiated Emissions, 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(b) 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.

§27.50(b) The following power and antenna height limits apply to transmitters operating in the 746-764 MHz and 776-794 MHz bands:

- (1) Fixed and base stations transmitting a signal in the 746-747 and 762-764 MHz bands must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (HAAT), except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section;
- (2) Fixed and base stations transmitting a signal in the 747-762 MHz and 777-792 MHz bands with an emission bandwidth of 1 MHz or less must not exceed an ERP of 1000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section;
- (3) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 747-762 MHz and 777-792 MHz bands with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section;
- (4) Fixed and base stations transmitting a signal in the 747-762 MHz and 777-792 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;
- (5) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 747-762 MHz and 777-792 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna

heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section;

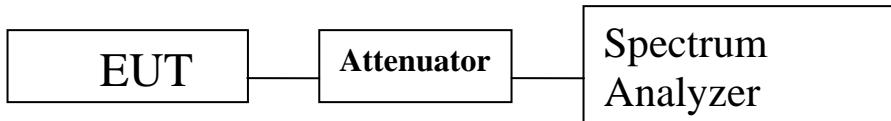
- (6) Licensees of fixed or base stations transmitting a signal in the 747-762 or 777-792 MHz bands at an ERP greater than 1000 watts must comply with the provisions set forth in paragraph (b)(8) of this section and Sec. 27.55(c);
- (7) Licensees seeking to operate a fixed or base station located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 747-762 MHz or 777-792 MHz bands at an ERP greater than 1000 watts must:
 - (i) Coordinate in advance with all licensees authorized to operate in the 698-764 MHz and 776-794 MHz bands within 120 kilometers (75 miles) of the base or fixed station; and
 - (ii) Coordinate in advance with all regional planning committees, as identified in Sec. 90.527 of this chapter, with jurisdiction within 120 kilometers (75 miles) of the base or fixed station;
- (8) Licensees authorized to transmit in the 747-762 or 777-792 MHz bands and intending to operate a base or fixed station at a power level permitted under the provisions of paragraph (b)(6) of this section must provide advanced notice of such operation to the Commission and to licensees authorized in their area of operation. Licensees who must be notified are all licensees authorized to operate in the 764-776 MHz and 794-806 MHz bands under part 90 of this chapter within 75 km of the base or fixed station and all regional planning committees, as identified in Sec. 90.527 of this chapter, with jurisdiction within 75 km of the base or fixed station. Notifications must provide the location and operating parameters of the base or fixed station, including the station's ERP, antenna coordinates, antenna height above ground, and vertical antenna pattern, and such notifications must be provided at least 90 days prior to the commencement of station operation;
- (9) Control stations and mobile stations transmitting in the 747-762 MHz band and the 776-794 MHz band and fixed stations transmitting in the 776-777 MHz band and the 792-794 MHz band are limited to 30 watts ERP;
- (10) Portable stations (hand-held devices) transmitting in the 747-762 MHz band and the 776-794 MHz band are limited to 3 watts ERP;
- (11) For transmissions in the 746-747 MHz, 762-764 MHz, 776-777 MHz, and 792-794 MHz bands, maximum composite transmit power shall be measured over any interval of continuous transmission using instrumentation calibrated in terms of RMS-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, etc., so as to obtain a true maximum composite measurement for the emission in question over the full bandwidth of the channel; and
- (12) For transmissions in the 747-762 MHz and 777-792 MHz bands, licensees may employ equipment operating in compliance with either the measurement techniques described in paragraph (b)(11) of this section or a Commission-approved average power technique. In both instances, equipment employed must be authorized in accordance with the provisions of Sec. 27.51.

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. 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. Power was measured on port 1 and then the combined power on all 3 ports was calculated. The plots below show the power on port 1.

Test Engineer(s): Dusmantha Tennakoon

Test Date(s): 02/18/11

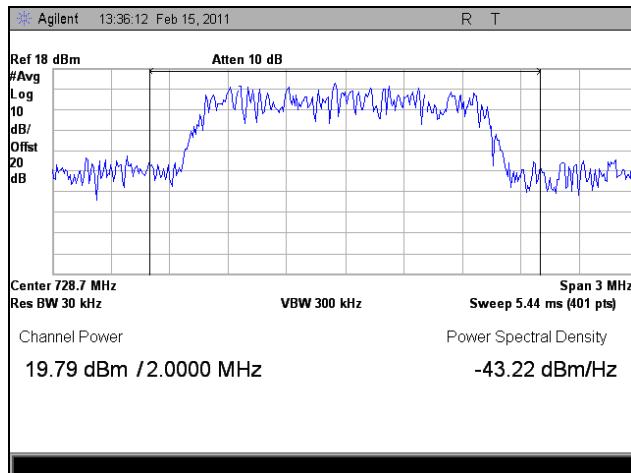


Block Diagram 1. RF Power Output Test Setup

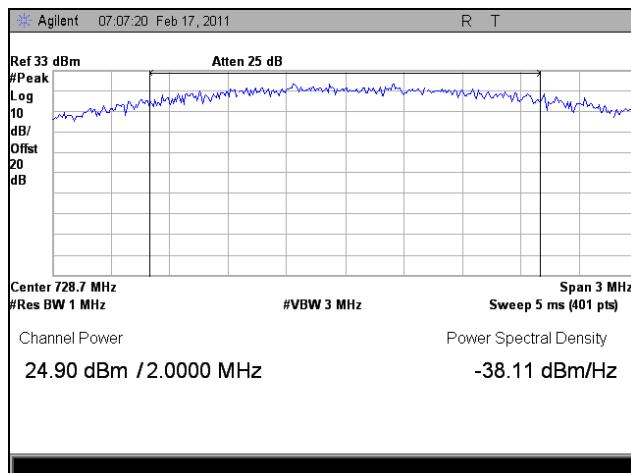
Link		Modulation	Frequency (MHz)	Power In (dBm)	Avg Power Out Port 1 (dBm)	Peak Power Out Port 1(dBm)	Total Summed Avg Power on 3 Ports (dBm)	Gain (dB)
DL	Band 1	LTE	728.70	-19.8	19.79	24.90	23.314	39.6
			742.00	-19.8	18.19	23.53	21.714	38.0
			756.30	-19.8	19.77	25.47	23.294	39.6
UL	Band 1	LTE	698.70	-45	-29.03	-23.76	-25.506	16.0
			707.00	-45	-28.62	-23.33	-25.096	16.4
			715.30	-45	-27.88	-22.45	-24.356	17.1
	Band 2	LTE	776.70	-45	-29.12	-23.41	-25.596	15.9
			782.00	-45	-28.01	-22.46	-24.486	17.0
			786.30	-45	-28.42	-22.30	-24.896	16.6

Table 12. RF Power Output, Test Results

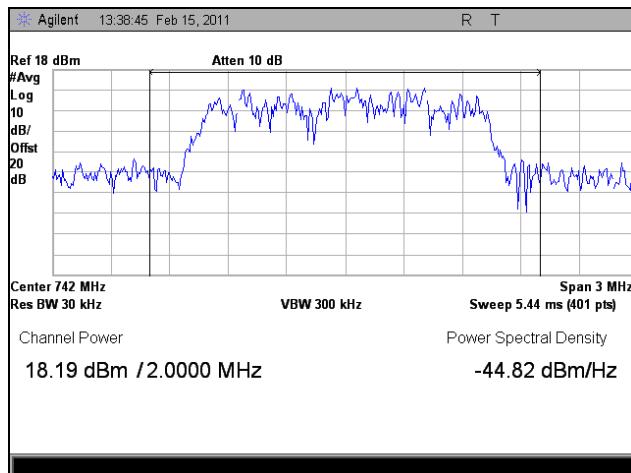
RF Power Output Test Results



Plot 4. 728.7 MHz, Output Power, Downlink, Average

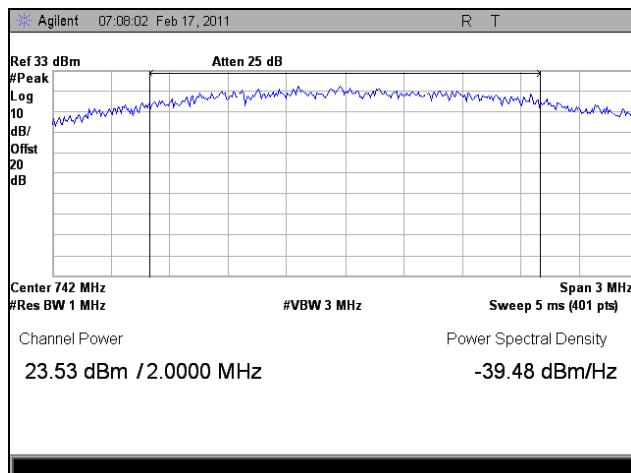


Plot 5. 728.7 MHz, Output Power, Downlink, Peak

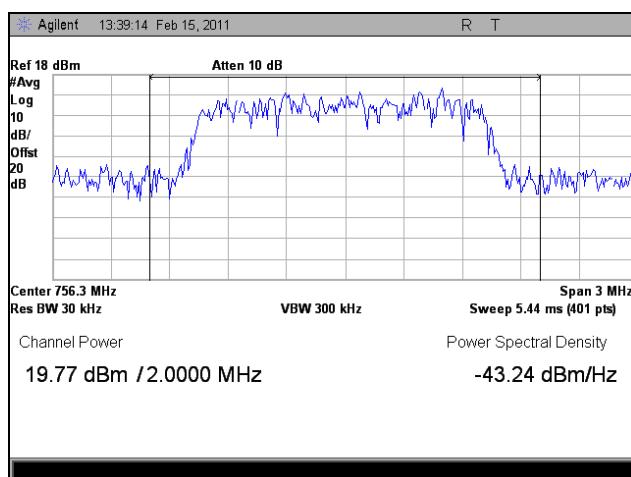


Plot 6. 742 MHz, Output Power, Downlink, Average

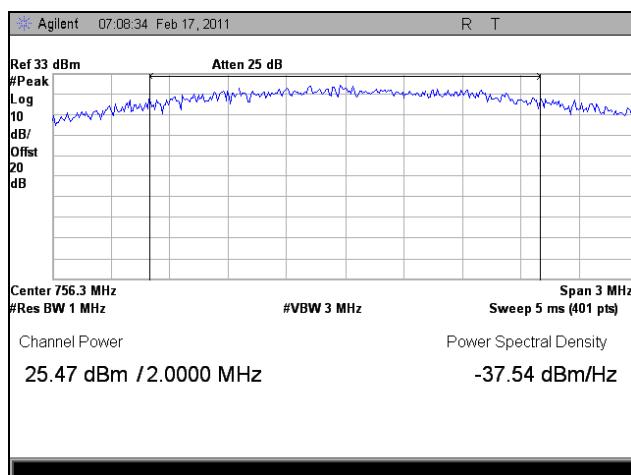
RF Power Output Test Results



Plot 7. 742 MHz, Output Power, Downlink, Peak

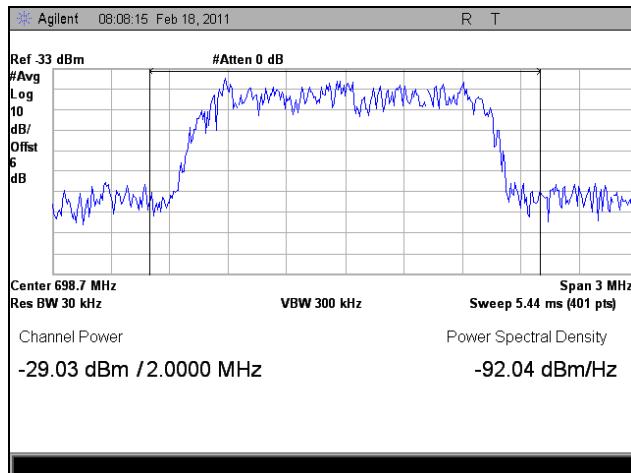


Plot 8. 756.3 MHz, Output Power, Downlink, Average

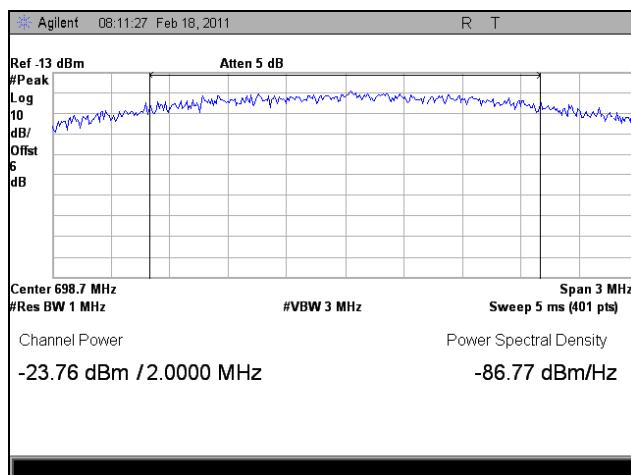


Plot 9. 756.3 MHz, Output Power, Downlink, Peak

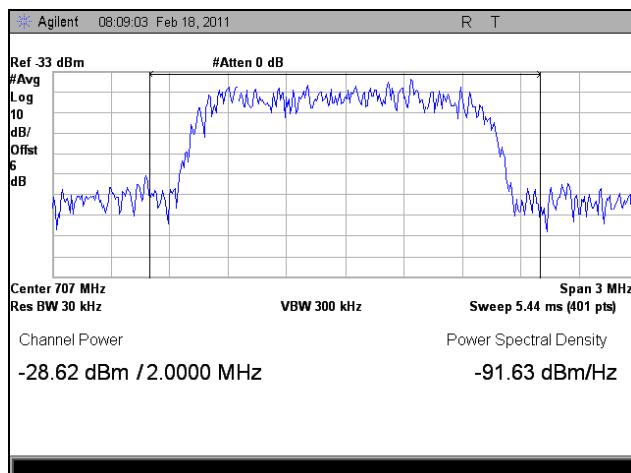
RF Power Output Test Results



Plot 10. 698.7 MHz, Output Power, Uplink, Band 1, Average

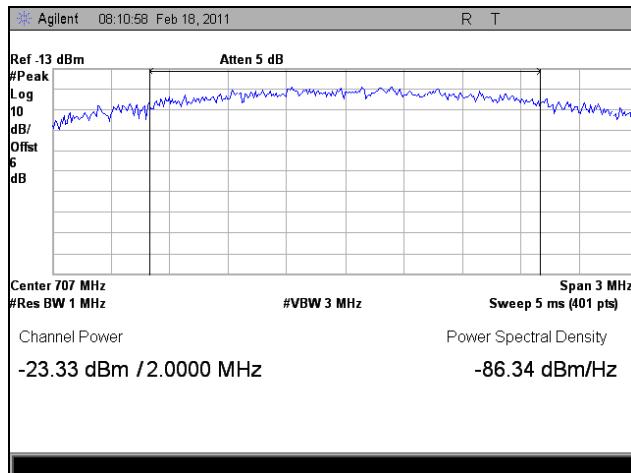


Plot 11. 698.7 MHz, Output Power, Uplink, Band 1, Peak

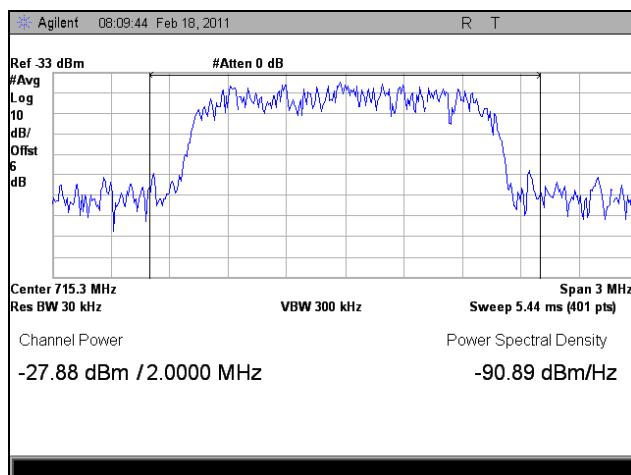


Plot 12. 707 MHz, Output Power, Uplink, Band 1, Average

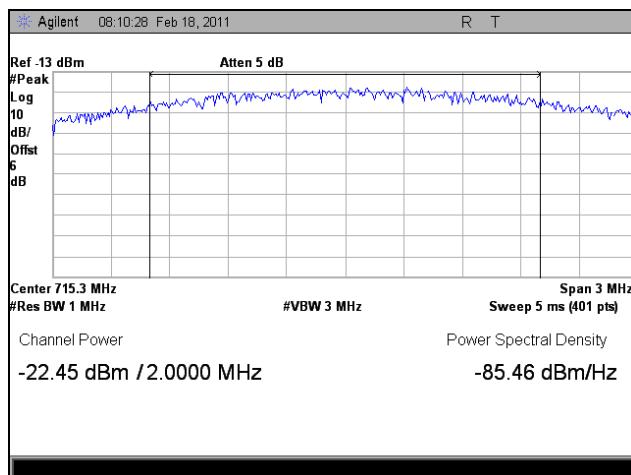
RF Power Output Test Results



Plot 13. 707 MHz, Output Power, Uplink, Band 1, Peak

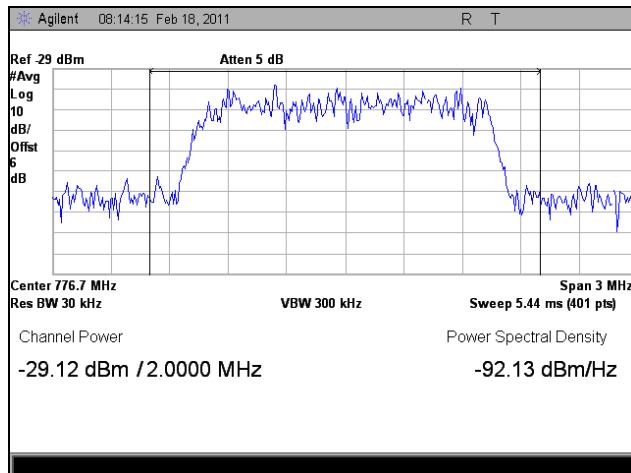


Plot 14. 715.3 MHz, Output Power, Uplink, Band 1, Average

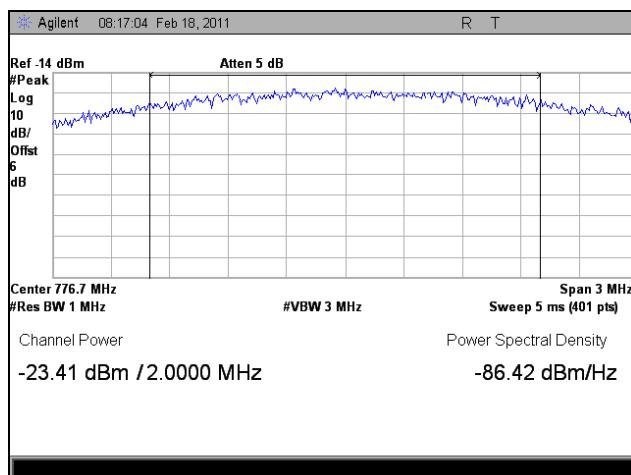


Plot 15. 715.3 MHz, Output Power, Uplink, Band 1, Peak

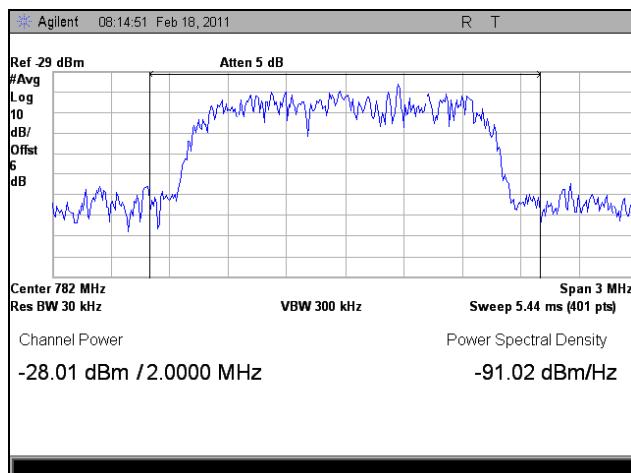
RF Power Output Test Results



Plot 16. 776.7 MHz, Output Power, Uplink, Band 2, Average

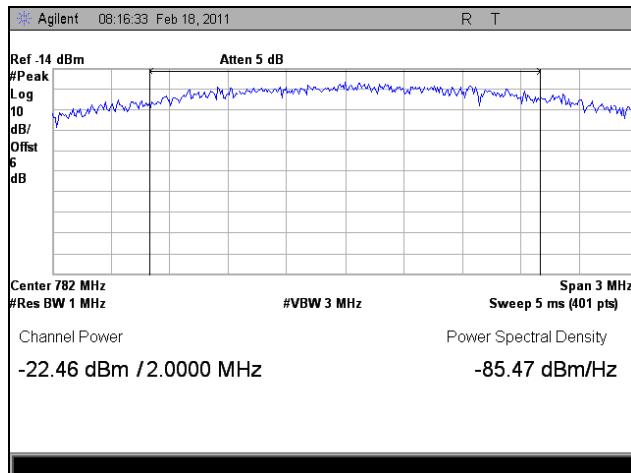


Plot 17. 776.7 MHz, Output Power, Uplink, Band 2, Peak

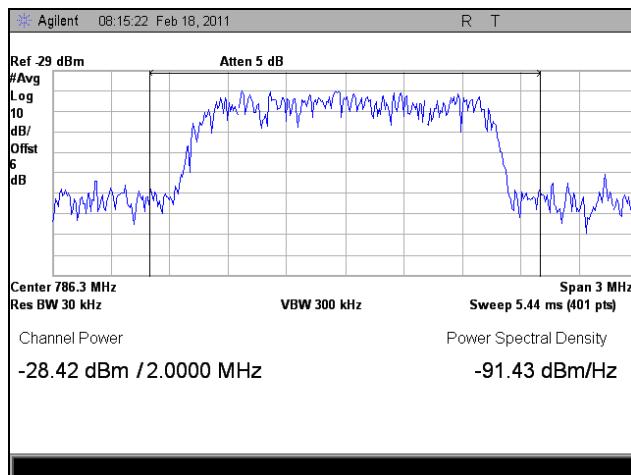


Plot 18. 782 MHz, Output Power, Uplink, Band 2, Average

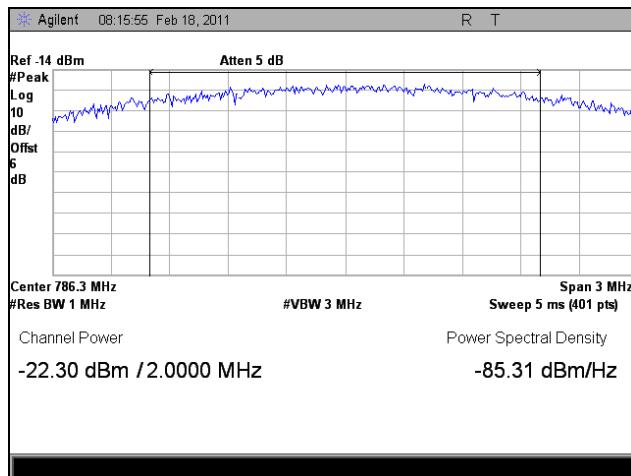
RF Power Output Test Results



Plot 19. 782 MHz, Output Power, Uplink, Band 2, Peak



Plot 20. 786.3 MHz, Output Power, Uplink, Band 2, Average



Plot 21. 786.3 MHz, Output Power, Uplink, Band 2, Peak



Photograph 3. RF Power Output, Test Setup Photos

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 device 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.

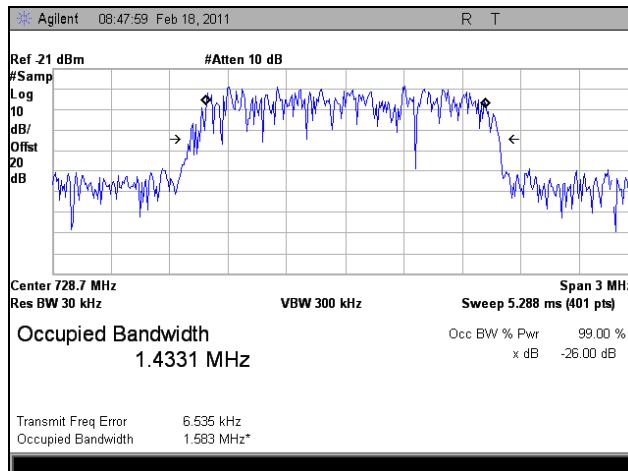
Test Engineer(s):

Dusmantha Tennakoon

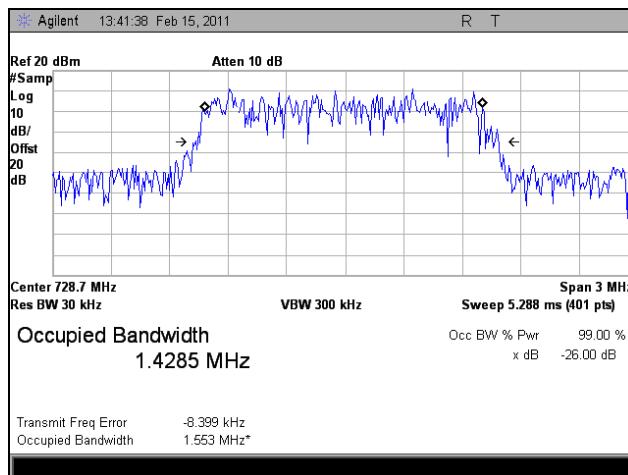
Test Date(s):

02/18/11

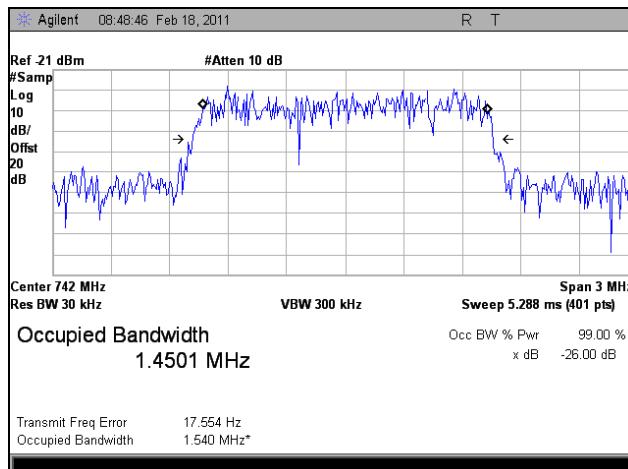
Occupied Bandwidth



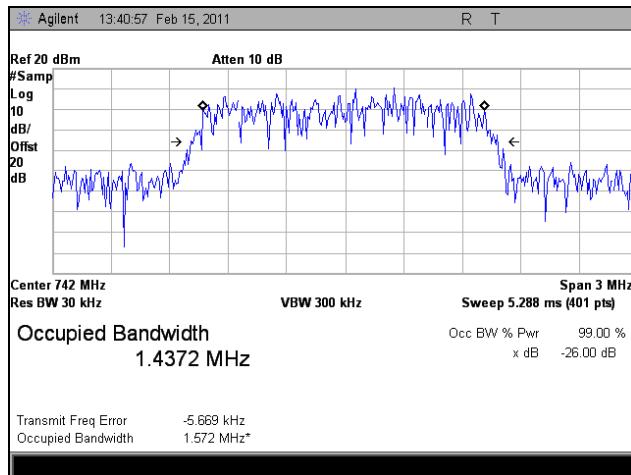
Plot 22. 728.7 MHz, Occupied Bandwidth, Downlink, In



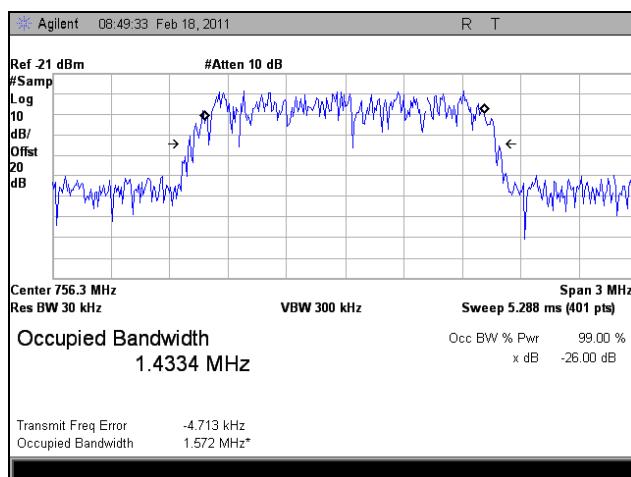
Plot 23. 728.7 MHz, Occupied Bandwidth, Downlink, Out



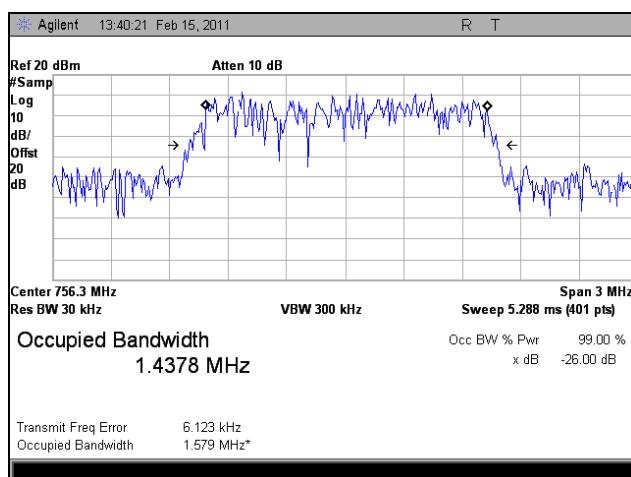
Plot 24. 742 MHz, Occupied Bandwidth, Downlink, In



Plot 25. 742 MHz, Occupied Bandwidth, Downlink, Out

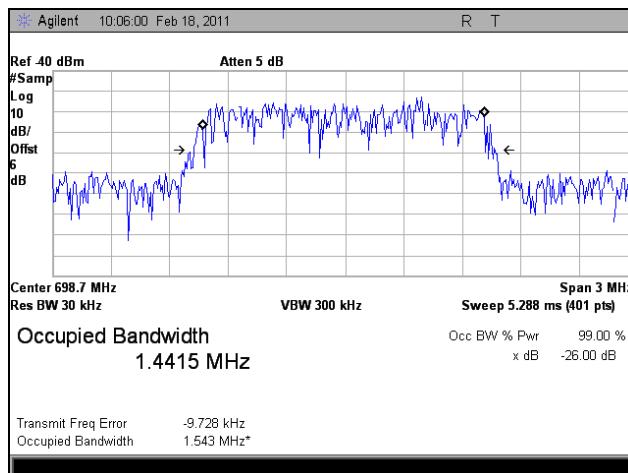


Plot 26. 756.3 MHz, Occupied Bandwidth, Downlink, In

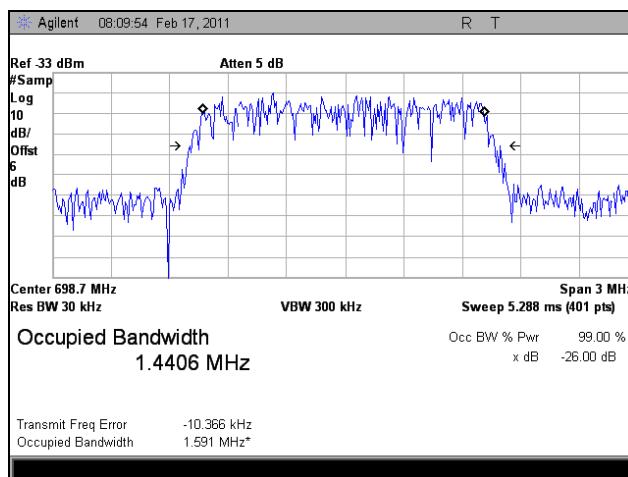


Plot 27. 756.3 MHz, Occupied Bandwidth, Downlink, Out

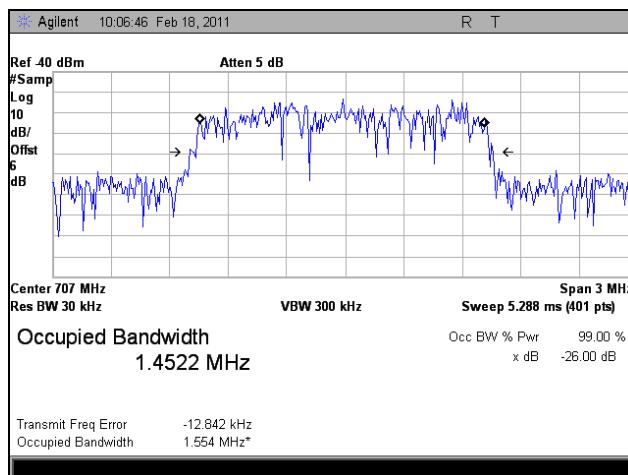
Occupied Bandwidth



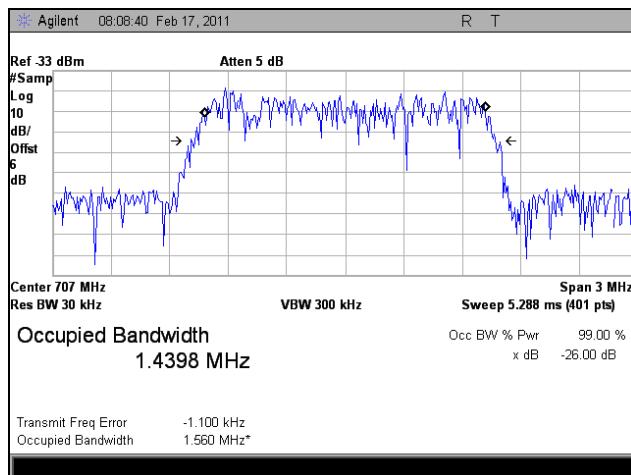
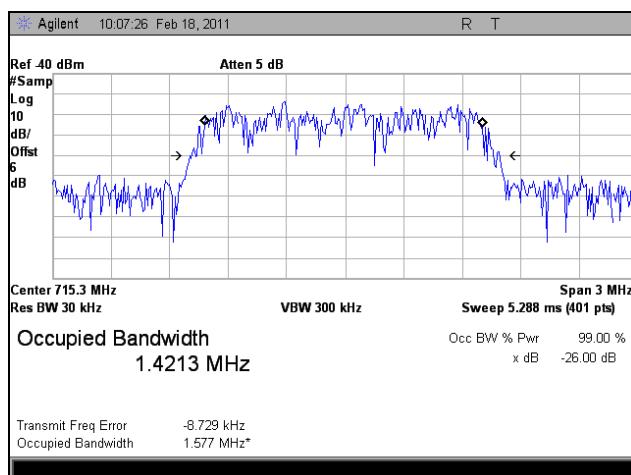
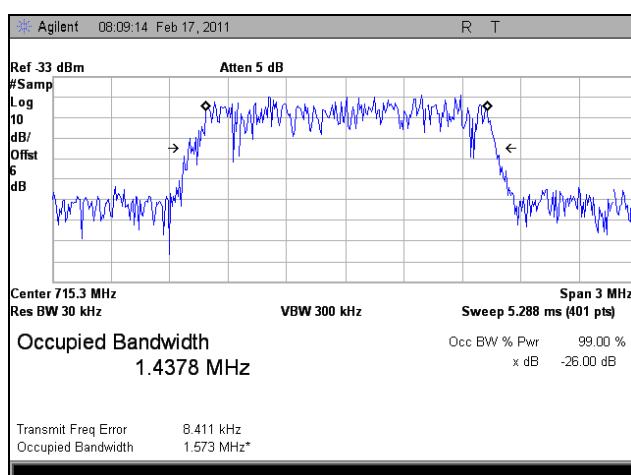
Plot 28. 698.7 MHz, Occupied Bandwidth, Uplink Band 1, In



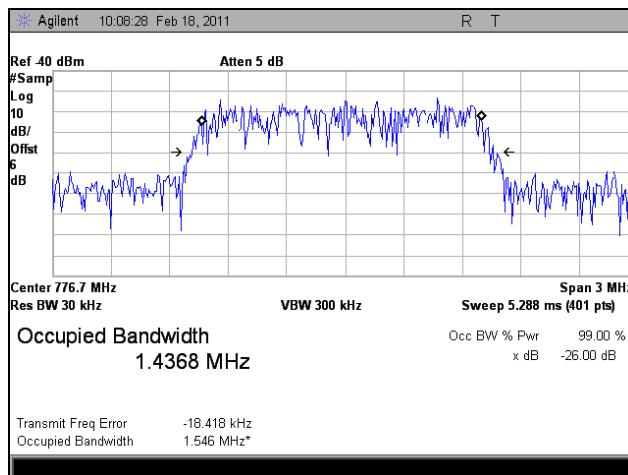
Plot 29. 698.7 MHz, Occupied Bandwidth, Uplink Band 1, Out



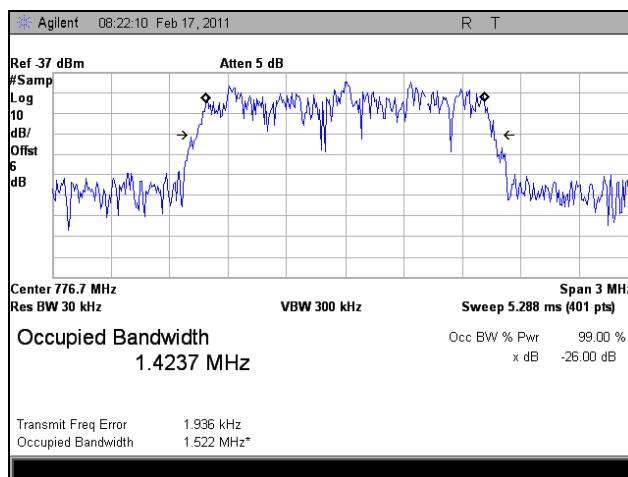
Plot 30. 707 MHz, Occupied Bandwidth, Uplink Band 1, In


Plot 31. 707 MHz, Occupied Bandwidth, Uplink Band 1, Out

Plot 32. 715.3 MHz, Occupied Bandwidth, Uplink Band 1, In

Plot 33. 715.3 MHz, Occupied Bandwidth, Uplink Band 1, Out

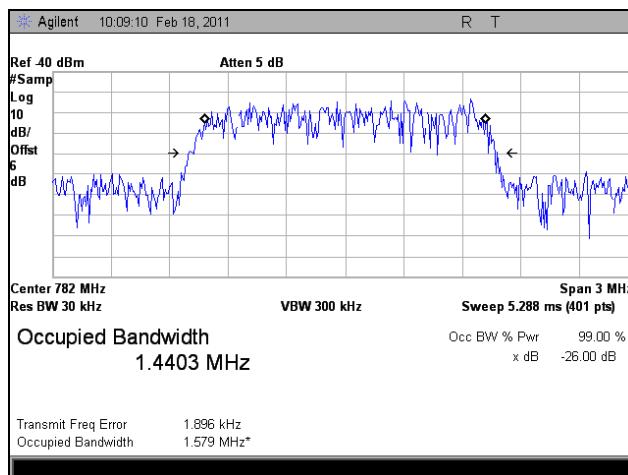
Occupied Bandwidth



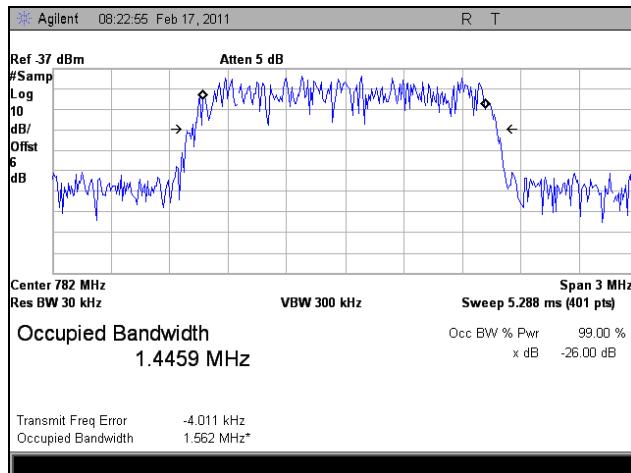
Plot 34. 776.7 MHz, Occupied Bandwidth, Uplink Band 2, In



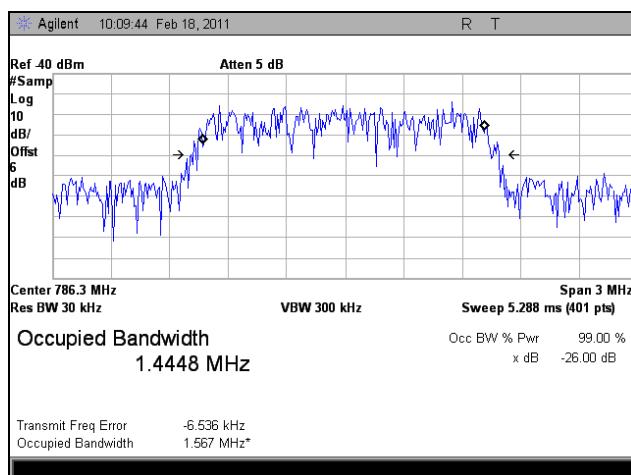
Plot 35. 776.7 MHz, Occupied Bandwidth, Uplink Band 2, Out



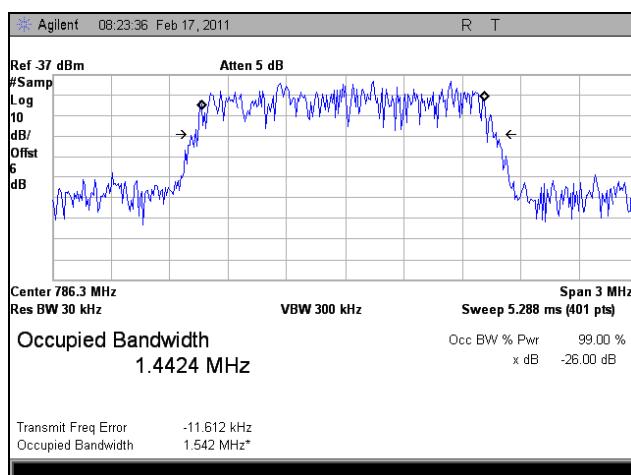
Plot 36. 782 MHz, Occupied Bandwidth, Uplink Band 2, In



Plot 37. 782 MHz, Occupied Bandwidth, Uplink Band 2, Out



Plot 38. 786.3 MHz, Occupied Bandwidth, Uplink Band 2, In



Plot 39. 786.3 MHz, Occupied Bandwidth, Uplink Band 2, Out

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1053 Radiated Spurious Emissions

Test Requirement(s): **§ 2.1053, 27.53(c)(f) Measurements required: Field strength of spurious radiation.**

The emissions outside of the band shall be attenuated below the transmitter power (P) by at least $43 + 10\log(P)$ dB

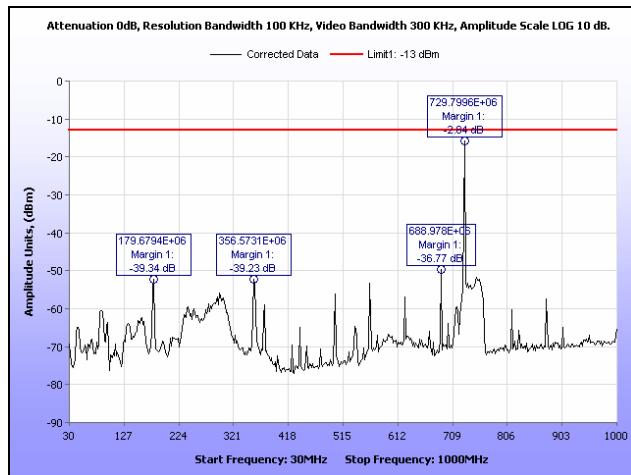
Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber. The EUT was set at a distance of 1m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. A signal generator was connected to the appropriate end of the EUT to mimic a DL or UL signal. A CW was used for testing. The EUT was rotated about 360° and the receiving antenna scanned from 1-4m in order to capture the maximum emission.

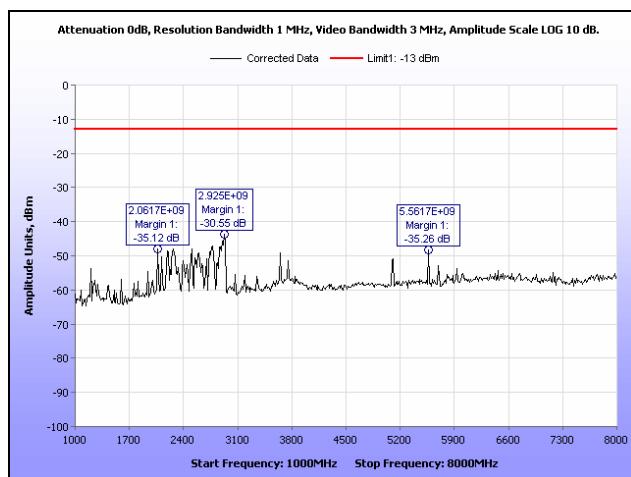
Test Results: The EUT complies with the requirements of this section for downlink. The uplink is via fiber optic cable. Antenna substitution was not performed since there were no emissions within 6 dB of the limit.

Test Engineer(s): Dusmantha Tennakoon

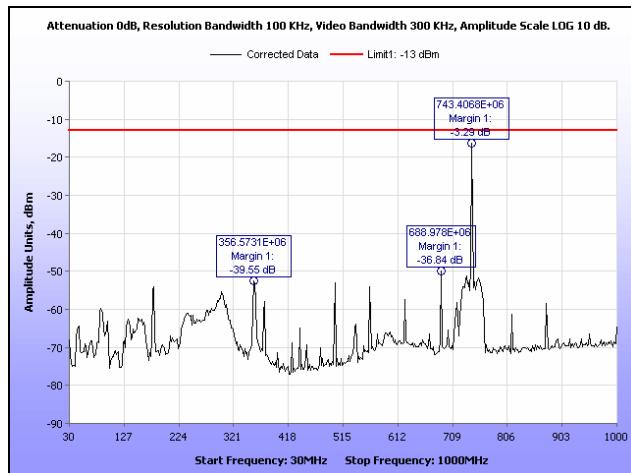
Test Date(s): 02/23/11



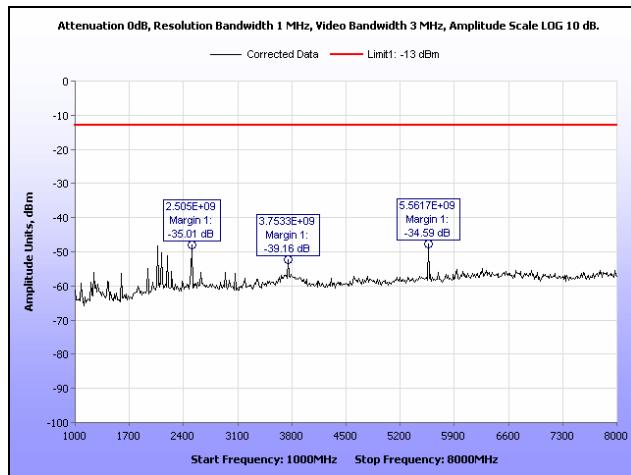
Plot 40. 728.7 MHz, Radiated Spurious Emissions, Downlink, 30 MHz – 1 GHz



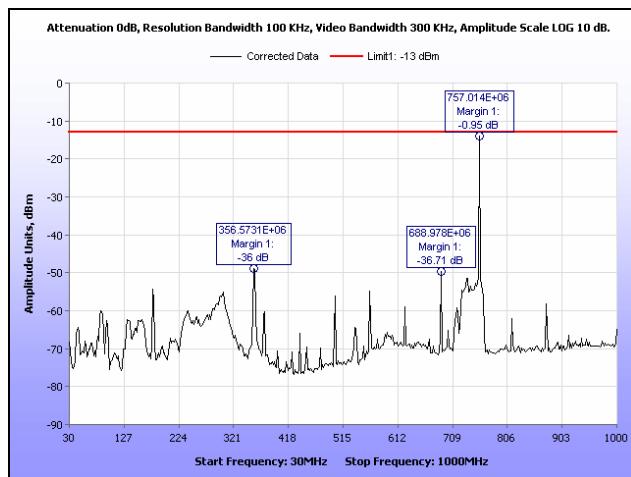
Plot 41. 728.7 MHz, Radiated Spurious Emissions, Downlink, 1 GHz – 8 GHz



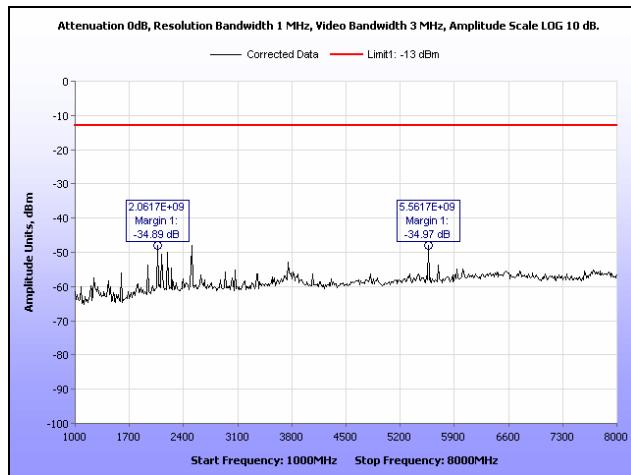
Plot 42. 742 MHz, Radiated Spurious Emissions, Downlink, 30 MHz – 1 GHz



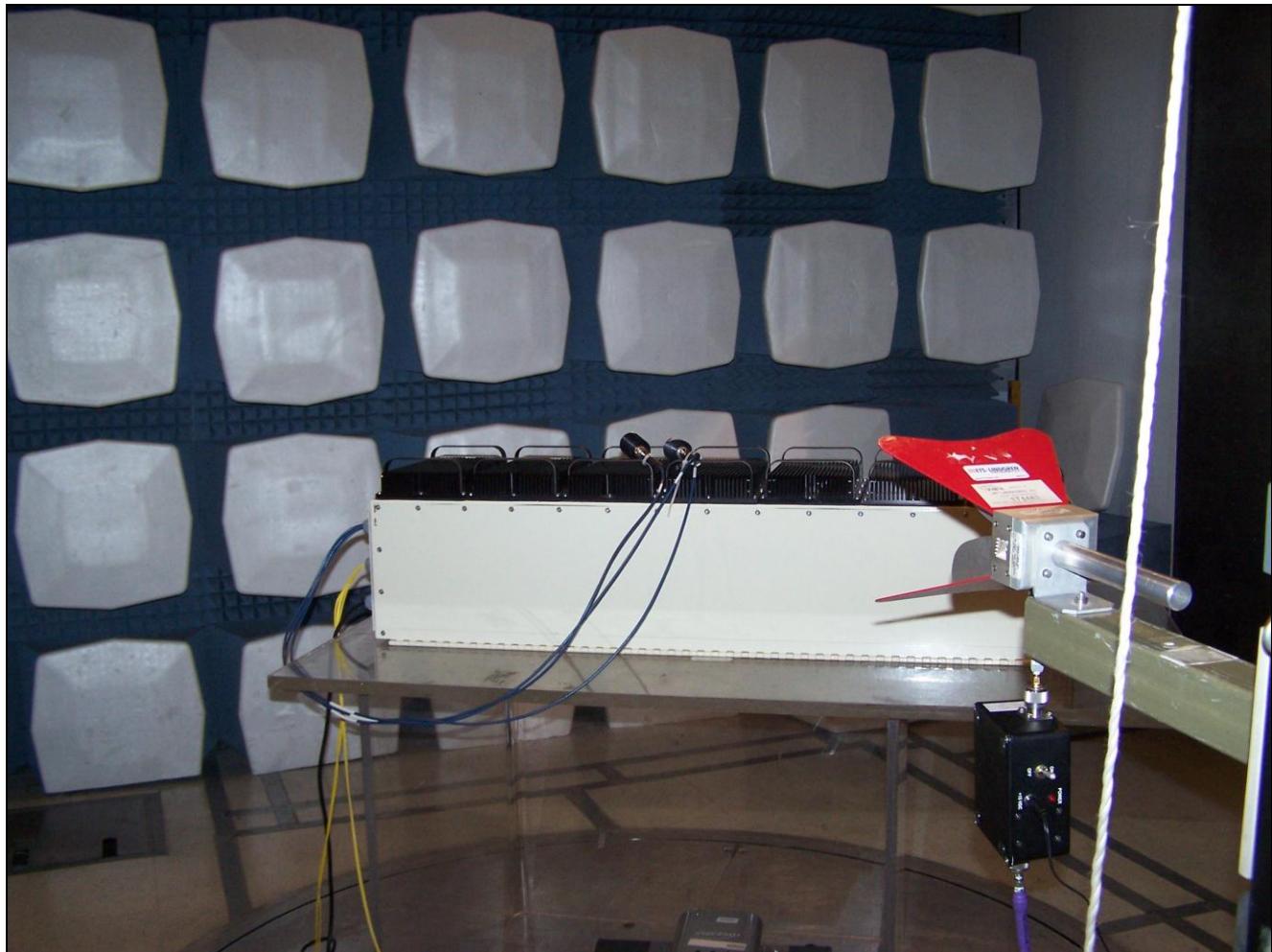
Plot 43. 742 MHz, Radiated Spurious Emissions, Downlink, 1 GHz – 8 GHz



Plot 44. 756.3 MHz, Radiated Spurious Emissions, Downlink, 30 MHz – 1 GHz



Plot 45. 756.3 MHz, Radiated Spurious Emissions, Downlink, 1 GHz – 8 GHz



Photograph 4. Radiated Emissions, Test Setup, Above 1 GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1051 Spurious Emissions at Antenna Terminals

Test Requirement(s): § 2.1051, 27.53(c)(f) **Measurements required: Spurious emissions at antenna terminals:**

The emissions outside of the band shall be attenuated below the transmitter power (P) by at least $43 + 10\log(P)$ dB

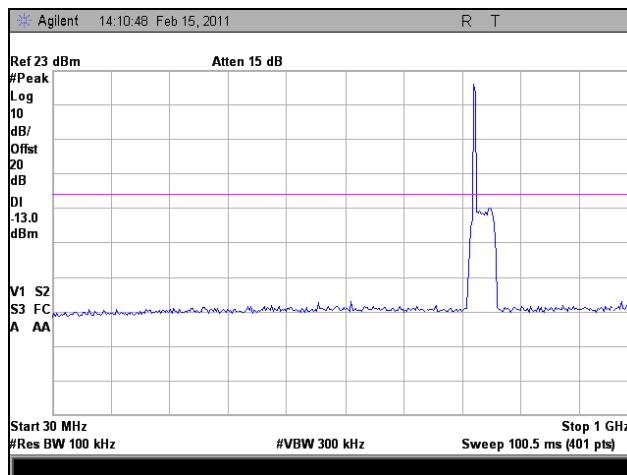
Test Procedures: A modulated carrier generated by the signal generator carrier was connected to either the Uplink or Downlink RF port at a maximum level as determined by the OEM. A spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured. The spectrum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

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

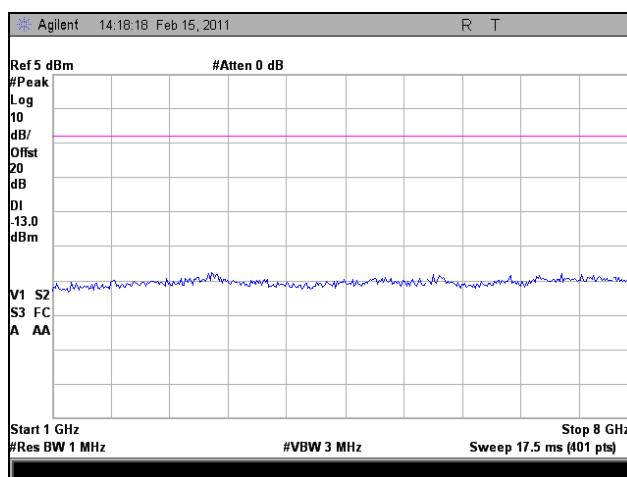
Test Engineer(s): Dusmantha Tennakoon

Test Date(s): 02/18/11

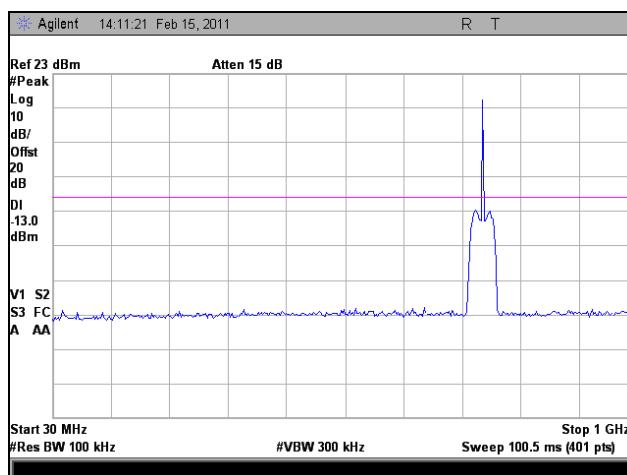
Spurious Emissions at Antenna Terminals Test Results



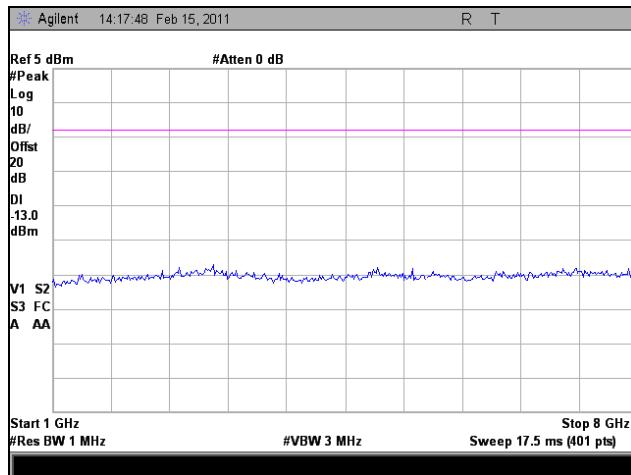
Plot 46. 728.7 MHz, Conducted Spurious Emissions, Downlink, 30 MHz – 1 GHz



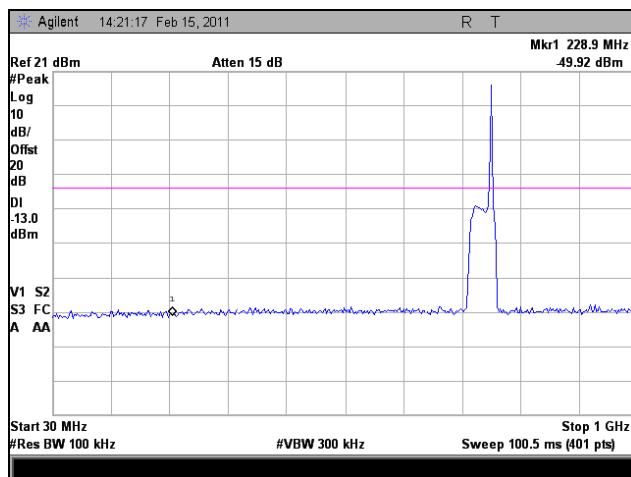
Plot 47. 728.7 MHz, Conducted Spurious Emissions, Downlink, 1 GHz – 8 GHz



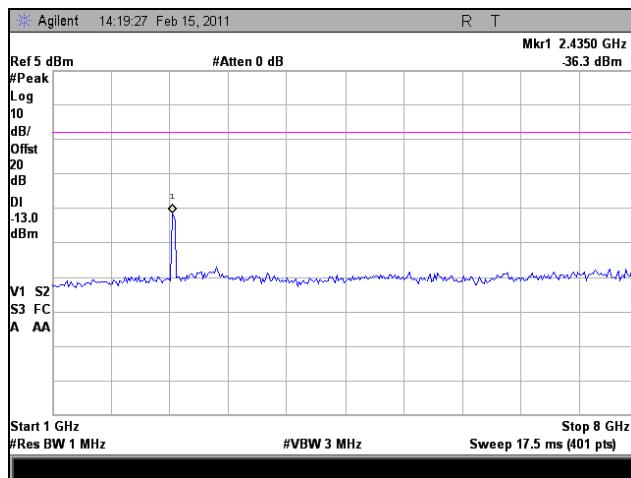
Plot 48. 742 MHz, Conducted Spurious Emissions, Downlink, 30 MHz – 1 GHz



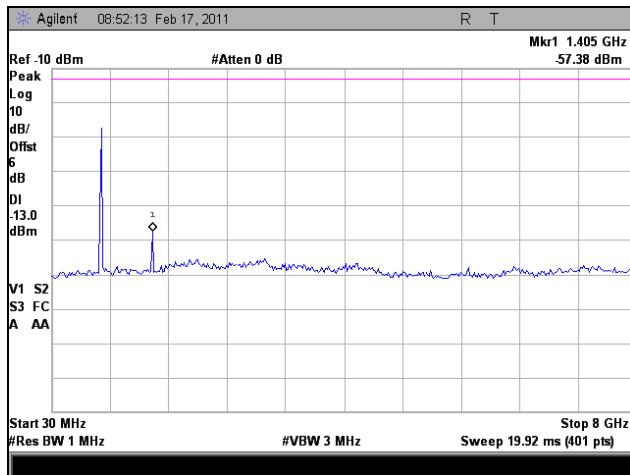
Plot 49. 742 MHz, Conducted Spurious Emissions, Downlink, 1 GHz – 8 GHz



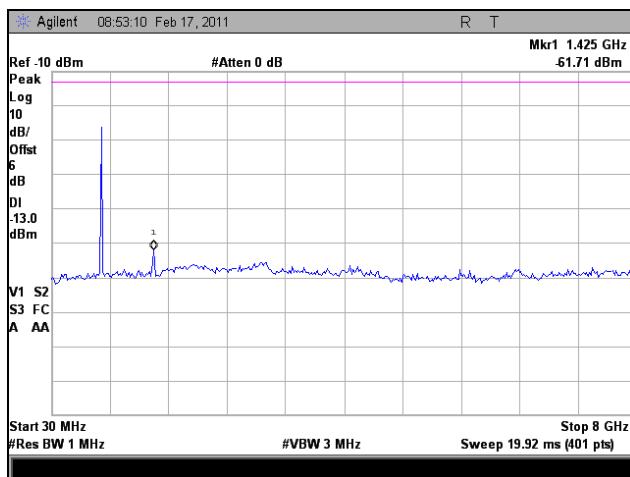
Plot 50. 756.3 MHz, Conducted Spurious Emissions, Downlink, 30 MHz – 1 GHz



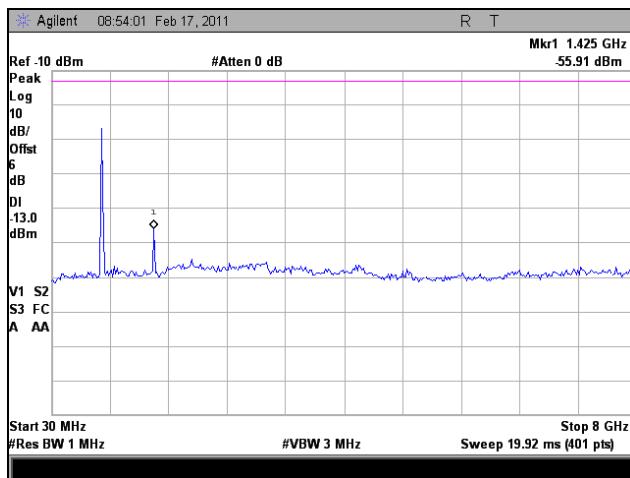
Plot 51. 756.3 MHz, Conducted Spurious Emissions, Downlink, 1 GHz – 8 GHz



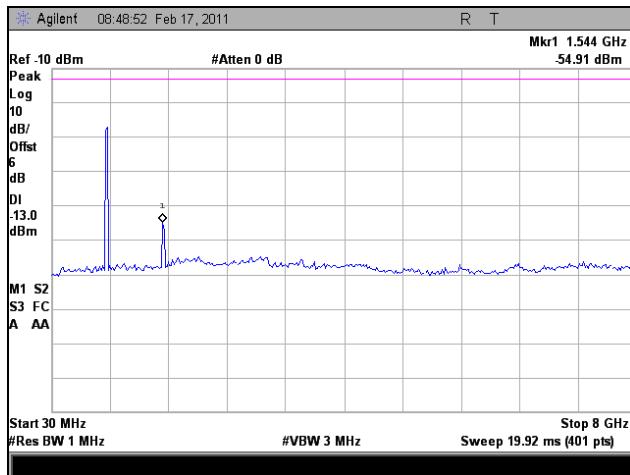
Plot 52. 698.7 MHz, Conducted Spurious Emissions, Uplink, Band 1, 30 MHz – 8 GHz



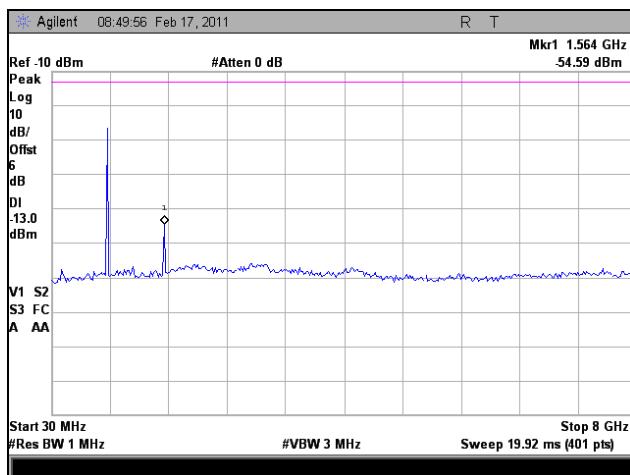
Plot 53. 707 MHz, Conducted Spurious Emissions, Uplink, Band 1, 30 MHz – 8 GHz



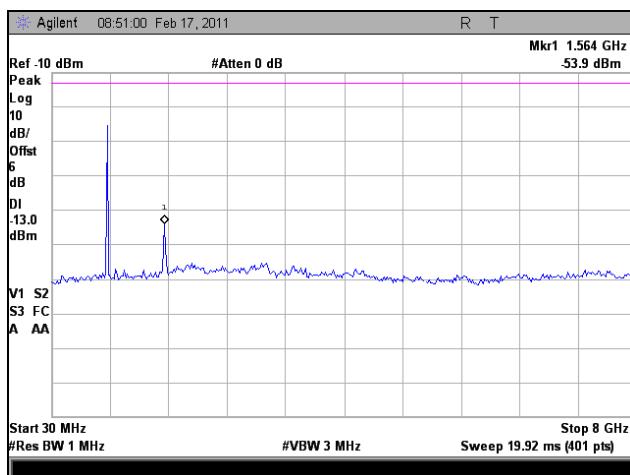
Plot 54. 715.3 MHz, Conducted Spurious Emissions, Uplink, Band 1, 30 MHz – 8 GHz



Plot 55. 776.7 MHz, Conducted Spurious Emissions, Uplink, Band 2, 30 MHz – 8 GHz



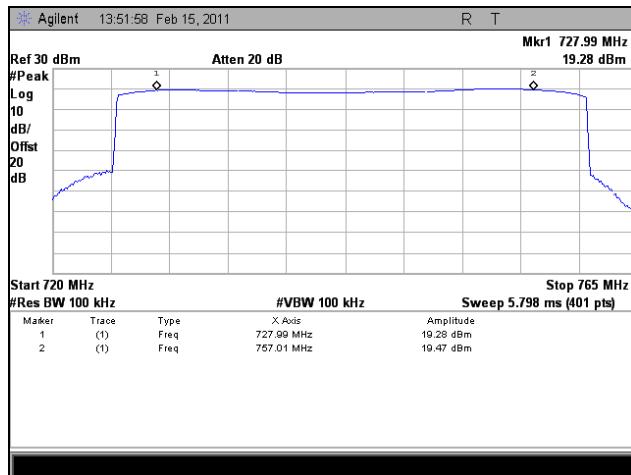
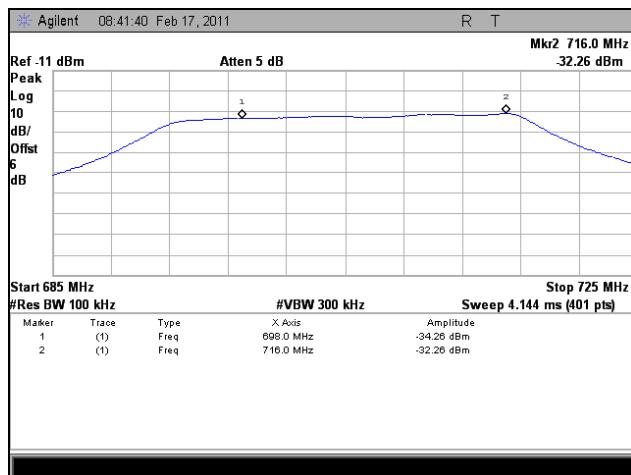
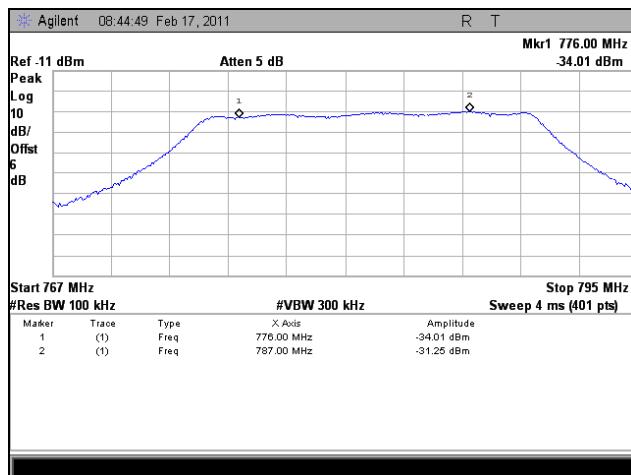
Plot 56. 782 MHz, Conducted Spurious Emissions, Uplink, Band 2, 30 MHz – 8 GHz

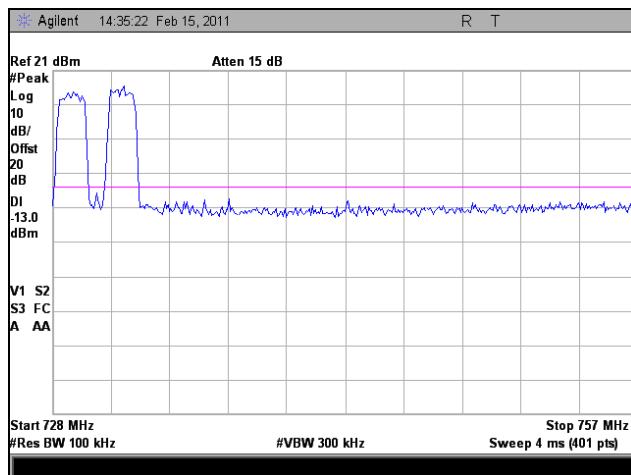


Plot 57. 786.3 MHz, Conducted Spurious Emissions, Uplink, Band 2, 30 MHz – 8 GHz

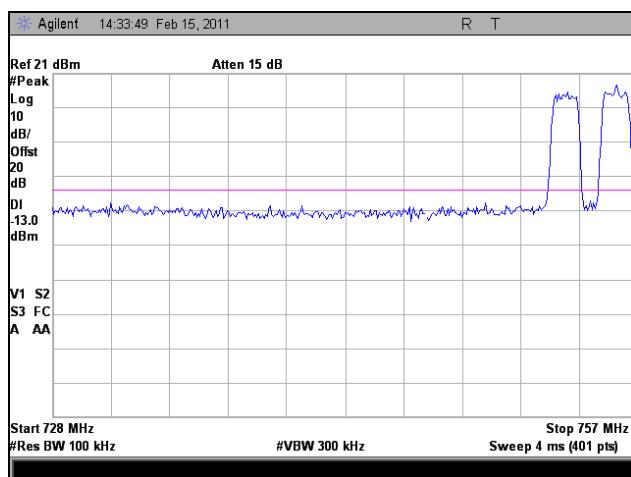


Photograph 5. Conducted Spurious Emissions, Test Setup

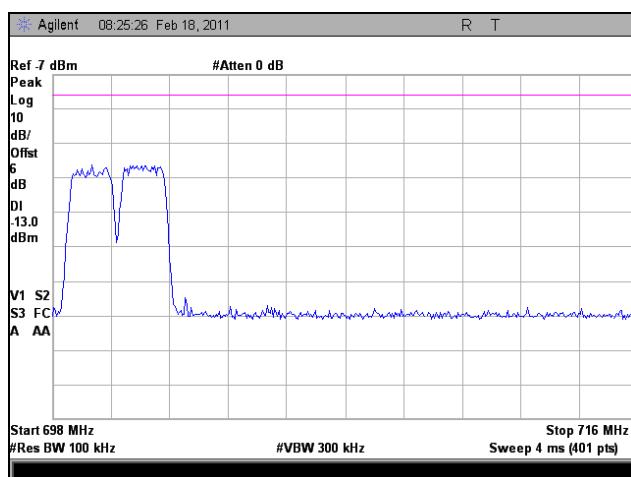

Plot 58. Downlink, Filter Response

Plot 59. Uplink, Band 1, Filter Response

Plot 60. Uplink, Band 2, Filter Response



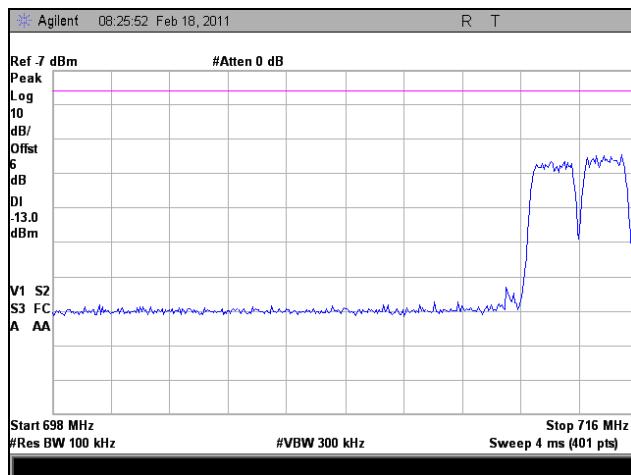
Plot 61. Intermodulation, Downlink, Low



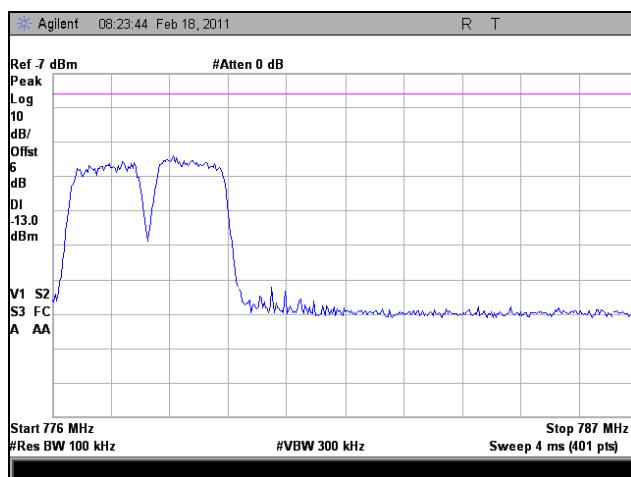
Plot 62. Intermodulation, Downlink, High



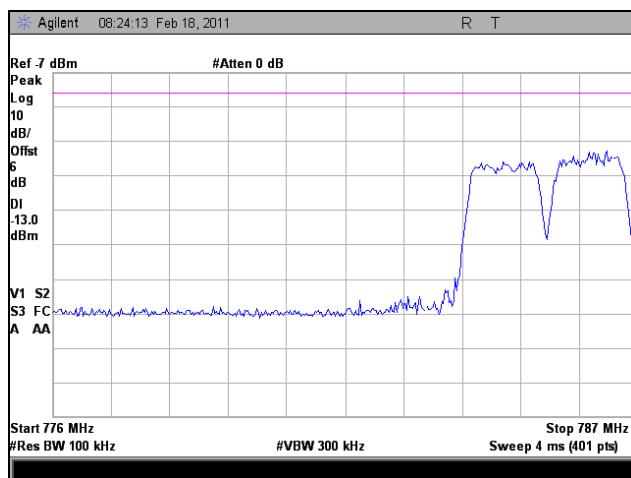
Plot 63. Intermodulation, Uplink, Band 1, Low



Plot 64. Intermodulation, Uplink, Band 1, High



Plot 65. Intermodulation, Uplink, Band 2, Low



Plot 66. Intermodulation, Uplink, Band 2, High

Electromagnetic Compatibility Criteria for Intentional Radiators

§2.1055 Frequency Stability over Temperature and Voltage Variations

Test Requirement(s): §2.1055

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



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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
1T4621	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4402B	05/10/2010	05/10/2011
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	08/23/2010	08/23/2011
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	05/25/2010	05/25/2011
1T4299	SIGNAL GENERATOR	HEWLETT PACKARD	E4432B	01/04/2011	01/04/2012
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	06/08/2010	06/08/2011
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	11/3/2010	11/3/2011
1T4414	MICROWAVE PRE-AMPLIFIER	A.H. SYSTEMS	PAM-0118	SEE NOTE	
1T4354	SIGNAL GENERATOR	HEWLETT PACKARD	83752A	03/11/2010	03/11/2011
1T4592	RF FILTER KIT	VARIOUS	N/A	SEE NOTE	

Table 13. Test Equipment

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



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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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