MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 W PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230 ● PHONE (410) 354-3300 ● FAX (410) 354-3313

Cellvine
6 Yoni Netanyahu St.
Yehuda, 60376

July 23, 2008

Dear Ziv Shani,

Enclosed is the EMC test report for compliance testing of the Cellvine, TDD Mini Repeater, tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 27 Subpart M for Broadband Radio Service (BRS) Devices and Part 15 Subpart B for a Class A Digital Device.

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 feel free to contact me.

Sincerely yours,

MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Cellvine\EMC24698-FCC27)

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Electromagnetic Compatibility Criteria
Test Report

For the

Cellvine
TDD Mini Repeater

Tested under

FCC Certification Rules
Title 47 of the CFR, Part 27 Subpart M and Part 15 Subpart B for a Class A

MET Report: EMC24698-FCC27

July 23, 2008

Prepared For:

Cellvine
6 Yoni Netanyahu St.
Yehuda, 60376

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

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MET Report : EMC24698-FCC27

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 Part 27 M and Part 15 Subpart B of the FCC Rules under normal use and maintenance.

Shawn McMillen,
Wireless Manager, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	July 23, 2008	Initial Issue.

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List of Terms and Abbreviations

AC	**Alternating Current**
ACF	**Antenna Correction Factor**
Cal	**Calibration**
d	**Measurement Distance**
dB	**Decibels**
dBµV	**dB micro Volts**
dBµV/m	**dB micro Volt per meter**
DC	**Direct Current**
DCF	**Distance Correction Factor**
E	**Electric Field**
EUT	**Equipment Under Test**
EIRP	**Effective Isotropic Radiated Power**
f	**Frequency**
FCC	**Federal Communications Commission**
GHz	**Giga Hertz**
Hz	**Hertz**
IEC	**International Electro-technical Commission**
kHz	**kilohertz**
kV	**kilo Volt**
LISN	**Line Impedance Stabilization Network**
MHz	**Mega Hertz**
RF	**Radio Frequency**
RMS	**Root-Mean-Square**
SNF	**Spectrum Analyzer Noise Floor**
V/m	**Volts per meter**

1. Testing Summary

Name of Test	FCC Rule Part/Section	Results
RF Power Output	2.1046; 27.50(h)	Compliant
Modulation Characteristics	2.1047	Not Applicable
Occupied Bandwidth	2.1049	Compliant
Band-Edge Channel Power	27.53	Not Applicable
Spurious Emissions at Antenna Terminals	2.1051; 27.53(l)	Compliant
Radiated Spurious Emissions	2.1053	Compliant
Frequency Stability over Temperature Variations	2.1055	Compliant
Inter-modulation and Out of Band Rejection (Filter Response)	27.64 (b)	Compliant
Conducted Emission, Class A	15.107 (a)	Compliant
Radiated Emission Class A	15.109 (a)	Compliant

Table 1. Summary of Test Results

2. Equipment Configuration

2.1. Overview

MET Laboratories, Inc. was contracted by Cellvine to perform testing on TDD Mini Repeater, under Cellvine purchase order number 760.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Cellvine, TDD Mini Repeater.

In accordance with §2.955(a) (3), the following data is presented in support of the verification of the Cellvine, TDD Mini Repeater.

Cellvine should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the TDD Mini Repeater has been **permanently** discontinued, as per §2.955(b).

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

Model(s) Tested:	TDD Mini Repeater			
Model(s) Covered:	TDD Mini Repeater			
EUT Specifications:	Primary Power: 120 VAC, 60 Hz Secondary Power: 7.5 VDC			
	FCC ID: VUVTDDMR2516			
	Type of Modulations:	CDMA, W-CDMA		
	Emission Designator		1.25 MHz Signal	5 MHz Signal
		DL	1M30F9W	5M15F9W
		UL	1M32F9W	5M16F9W
	Average Output Power:		1.25 MHz Signal	5 MHz Signal
		DL	18.40 dBm	18.49 dBm
		UL	18.69 dBm	18.34 dBm
	Equipment Code:	TNB		
	EUT Frequency Ranges:	DL: 2505 – 2685 MHz UL: 2505 – 2685 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):	July 23, 2008			

Note: Uplink and downlink frequencies are the same.

2.2. 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 semi-anechoic chamber. In accordance with §2.948(a) (3), a complete site description is contained at MET Laboratories. In accordance with §2.948(d), MET Laboratories has been accredited by A2LA (Certificate Number 591.02).

2.3. Description of Test Sample

The TDD Mini Repeater has been designed to enhance and extend cellular coverage into small size buildings, restaurants, underground areas, office buildings and other similar indoor environments.
The unit is very simple to install and can be set to automatically obtain maximal coverage.
The unit has a build in controller that can be access by a local USB port by a remote terminal using a modem (Optional).
The unit is supplied with adjustable frequency center filter with fixed bandwidth of 10 MHz . The Center frequency selection can be set
anywhere Inside the band 2500-2690 MHz in 200Khz Resolution.

The unit will receive a synchronization TLL signal from the DL BTS transmission using IP Wireless 3G broadband wireless modem –
Model # UE PCMCIA V1 (FD)
FCC ID :PKTPCMCIAFD

2.4. Mode of Operation

A signal generator was used on the up-link and downlink to pass signals during testing. A 1.25 MHz CDMA signal and a 5 MHz W-CDMA signal were used.

Photograph 1. Photograph of EUT

2.5. Equipment Configuration

The EUT was set up as outlined in Figure 1 and Figure 2. All equipment incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number
1	TDD MINI REPEATER	VUV-BDA-TDD/ANT-KIT-AA

Table 2. Equipment Configuration

2.6. 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	AC /DC SWITCHING ADAPTER 110VAC 7.5V 5A	KTEC	KSAFHO750500W1EU

Table 3. Support Equipment

2.7. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded Y/N	Termination Box ID & Port ID
1	BASE	RF CABLE SMA-M-SMA-M	1	10	Y	BASE
2	MOBILE	RF CABLE SMA-M-SMA-M	1	10	Y	MOBILE
3	UART	LOCAL COMMUNICATION CABLE USB-MINI USB	1	1.5	Y	LAPTOP/PC USB

Table 4. Ports and Cabling Information

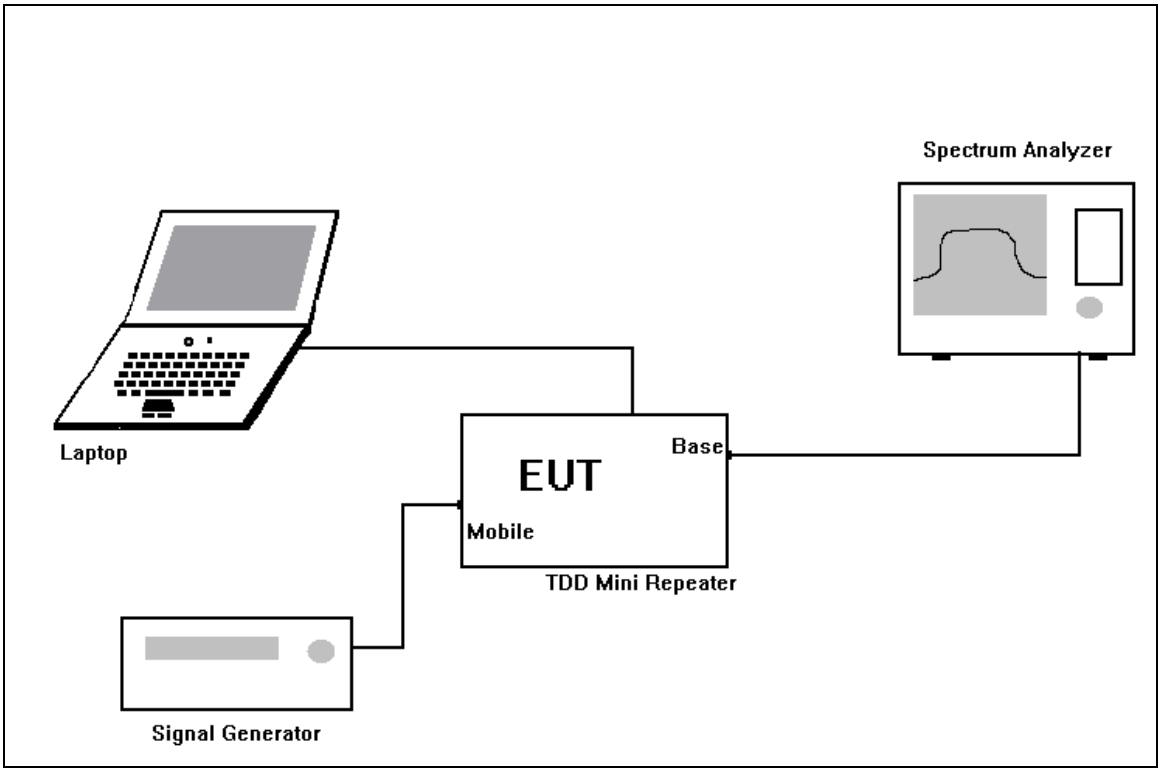


Figure 1. Block Diagram of Test Configuration , Up-Link Test Configuration

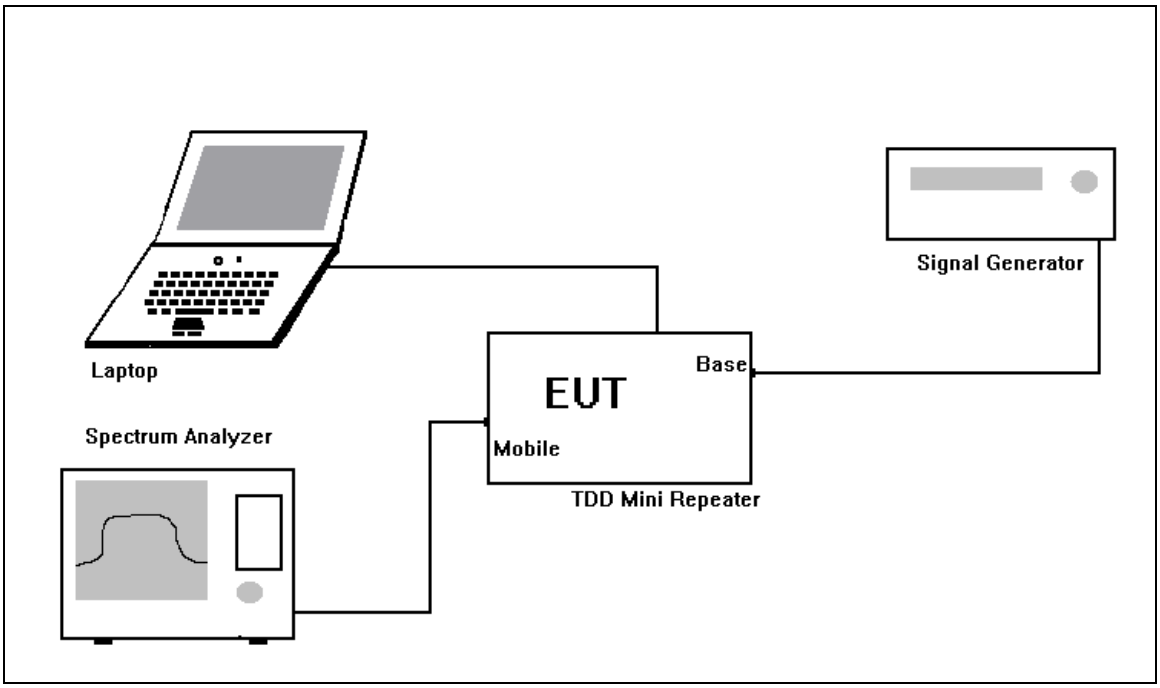


Figure 2. Block Diagram of Test Configuration, Downlink Test Configuration

2.8. Method of Monitoring EUT Operation

Control of the Repeaters is performed using a desktop or laptop computer equipped with Cellvine, Operation Software Terminal, which can communicate with the Repeaters, Via locally port.

2.9. Modifications

2.9.1) Modifications to the EUT

No modifications were made to the EUT.

2.9.2) Modifications to the Test Standard

No modifications were made to the test standard.

2.10. Disposition of EUT

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

3. Electromagnetic Compatibility Unintentional Radiators

3.1. Conducted Emission 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 5. 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 5. 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 (dBµV)		15.107(a), Class B Limits (dBµV)	
	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.				
Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz.				

Table 5. 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 semi-anechoic chamber. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a 50Ω/50µH 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 re-measured using a quasi-peak and/or average detector as appropriate.

Test Results: The EUT was compliant with the Class A requirement(s) of this section.

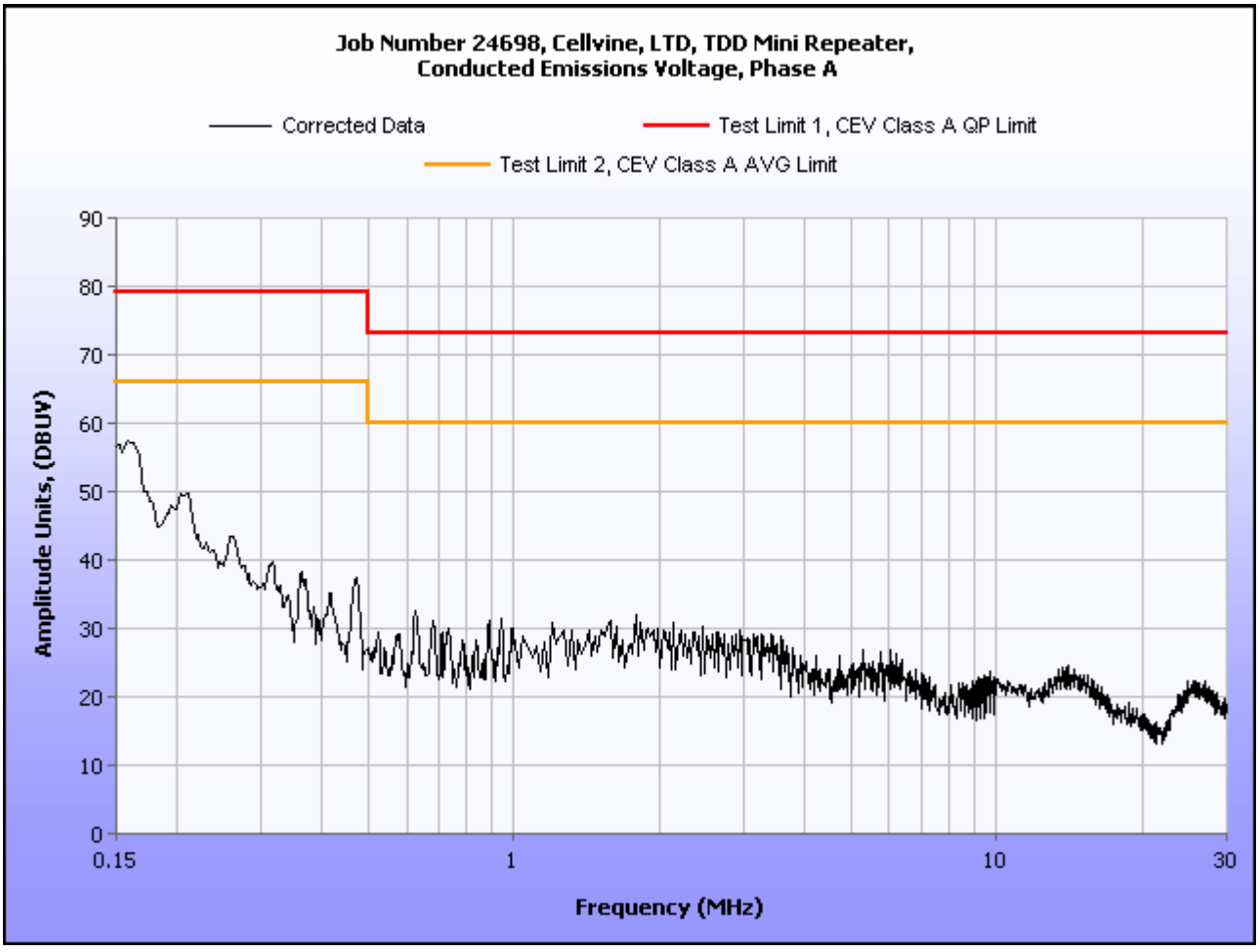
Test Engineer: Dusmantha Tennakoon

Test Date(s): July 8, 2008

Conducted Emissions - Voltage, AC Power, Phase Line

Frequency (MHz)	Quasi-Peak Amplitude (dBµV)	Quasi-Peak Limit (dBµV)	Quasi-Peak Margin (dBµV)	Average Amplitude (dBµV)	Average Limit (dBµV)	Average Margin (dBµV)
0.1568	52.18656	79	-26.8134	35.59656	66	-30.4034
0.2098	44.6	79	-34.4	35.68	66	-30.32
0.5239	29.79	73	-43.21	27.48	60	-32.52
3.559	24.26	73	-48.74	23.13	60	-36.87
14.09	17.73	73	-55.27	13.74	60	-46.26
20.42	15.43328	73	-57.5667	10.93328	60	-49.0667

Table 6. Conducted Emissions - Voltage, AC Power, Phase Line

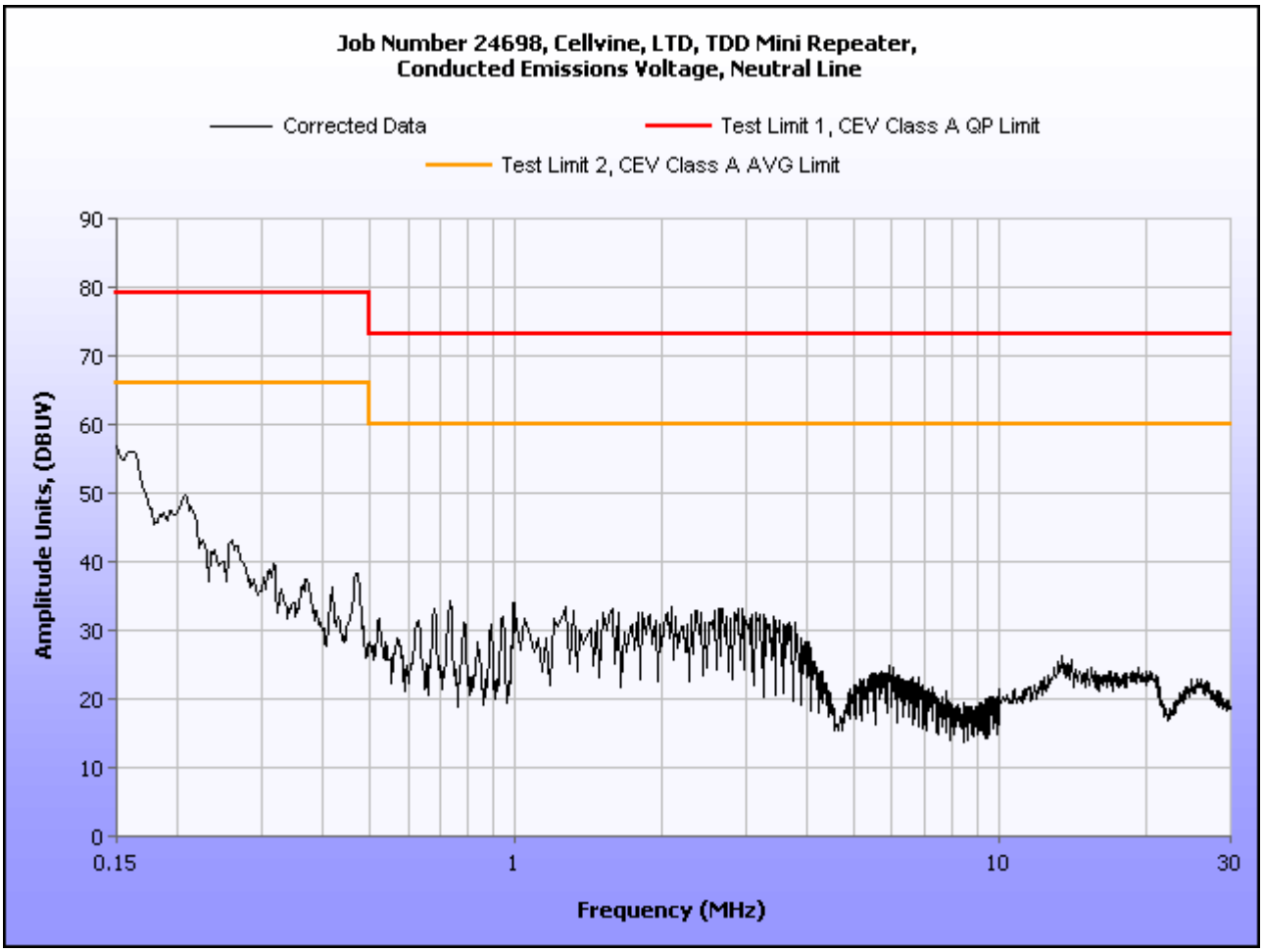


Plot 1. Conducted Emission, Phase Line Plot

Conducted Emissions - Voltage, AC Power, Neutral Line

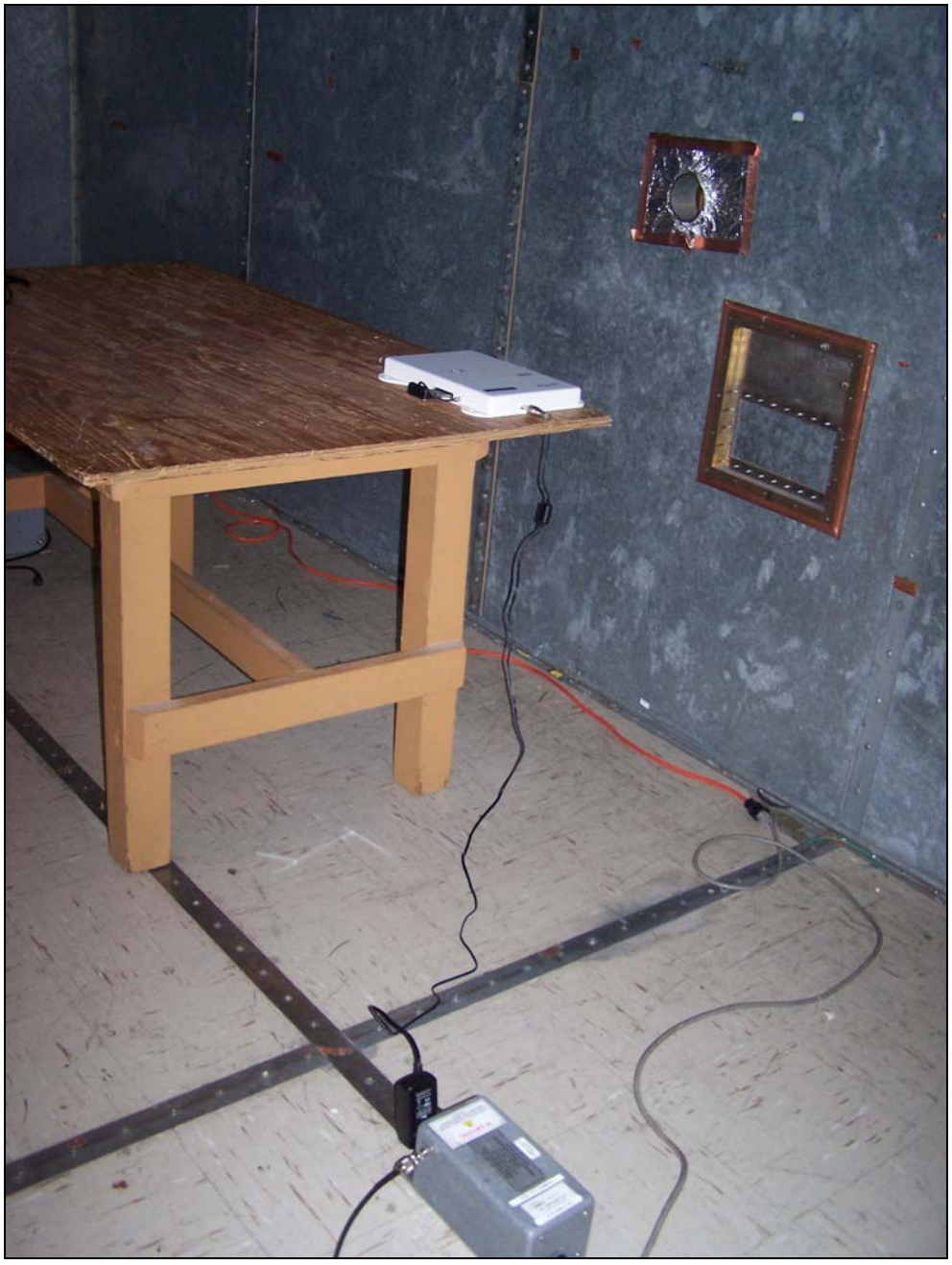
Frequency (MHz)	Quasi-Peak Amplitude (dBµV)	Quasi-Peak Limit (dBµV)	Quasi-Peak Margin (dBµV)	Average Amplitude (dBµV)	Average Limit (dBµV)	Average Margin (dBµV)
0.1561	52.77537	79	-26.2246	37.88537	66	-28.1146
0.4705	35.71	79	-43.29	35.62	66	-30.38
0.994	31.54	73	-41.46	31.37	60	-28.63
2.931	31.76	73	-41.24	31.07	60	-28.93
13.5	22.24	73	-50.76	17.36	60	-42.64
19.89	19.17	73	-53.83	15.86	60	-44.14

Table 7. Conducted Emissions - Voltage, AC Power, Neutral Line



Plot 2. Conducted Emission, Neutral Line Plot

Conducted Emission Limits Test Setup



Photograph 2. Conducted Emissions Test Setup

3. Electromagnetic Compatibility Unintentional Radiators

3.2. Radiated Emissions 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 8.

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 8.

Frequency (MHz)	Field Strength (dBµV/m)	
	§15.109 (b), Class A Limit (dBµV) @ 10m	§15.109 (a),Class B Limit (dBµV) @ 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 8. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed 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 compliant with the Class A requirement(s) of this section.

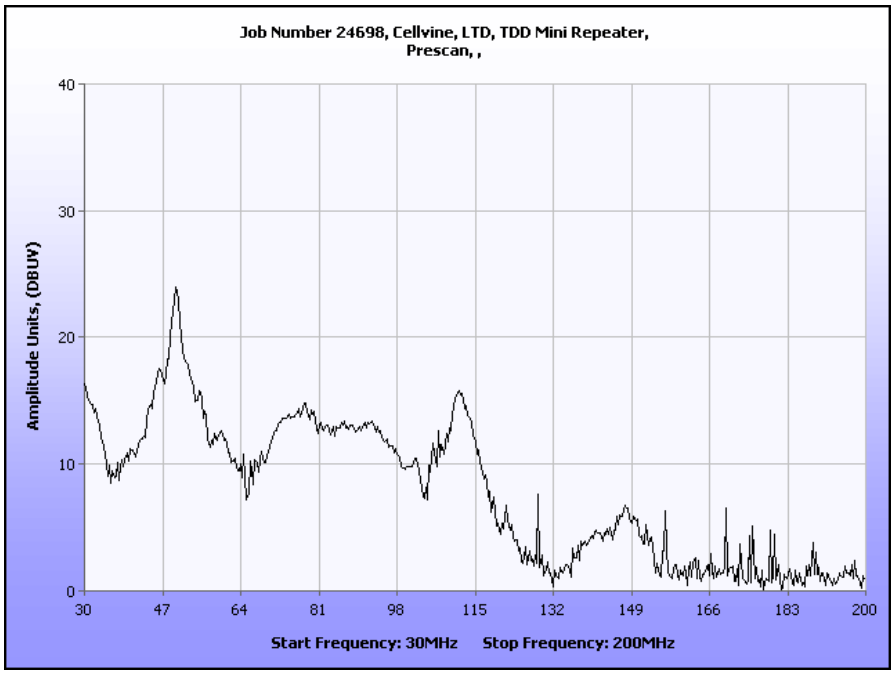
Test Engineer(s): Dusmantha Tennakoon

Test Date(s): July 2, 2008

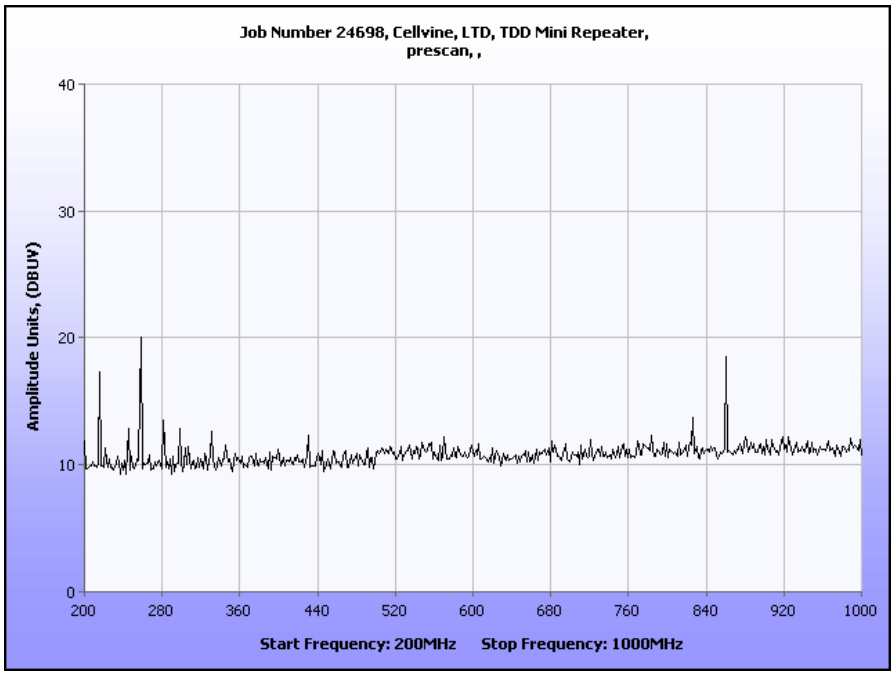
Radiated Emissions Limits Test Results, 30 MHz to 1 GHz, Class A

Frequency (MHz)	Antenna Polarity (H/V)	EUT Azimuth (Degrees)	Antenna Height (m)	Uncorrected Amplitude QP Detector (dBuV)	Antenna Correction Factor (dB/m) (+)	Cable Loss (dB) (+)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.135	H	0	2.50	12.25	19.60	0.70	22.09	39.00	-16.91
30.135	V	314	1.00	12.32	18.50	0.70	21.06	39.00	-17.94
49.760	H	0	3.25	10.98	12.40	0.70	13.62	39.00	-25.38
49.760	V	59	1.00	20.30	11.60	0.70	22.14	39.00	-16.86
112.610	H	204	1.00	7.04	11.60	1.03	9.21	43.50	-34.29
112.610	V	0	1.00	11.20	12.50	1.03	14.27	43.50	-29.23
258.019	H	0	2.55	19.02	12.90	1.25	22.71	46.40	-23.69
258.019	V	260	1.18	15.14	12.80	1.25	18.73	46.40	-27.67
860.144	H	341	1.95	18.20	22.80	2.13	32.67	46.40	-13.73
860.144	V	179	1.00	15.04	22.10	2.13	28.81	46.40	-17.59
960.000	H	0	1.00	5.80	23.60	2.20	21.14	46.40	-25.26
960.000	V	0	1.00	5.87	22.60	2.20	20.21	46.40	-26.19

Table 9. Radiated Emissions Limits Test Results, 30 MHz to 1 GHz, Class A

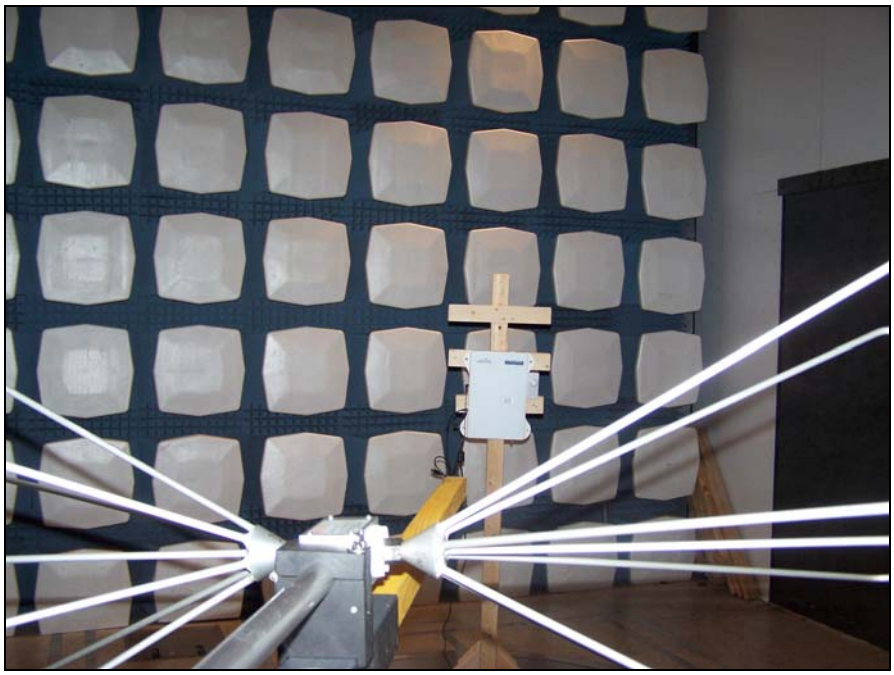


Plot 3. Radiated Emissions Limits Test Setup, 30 MHz – 200 MHz

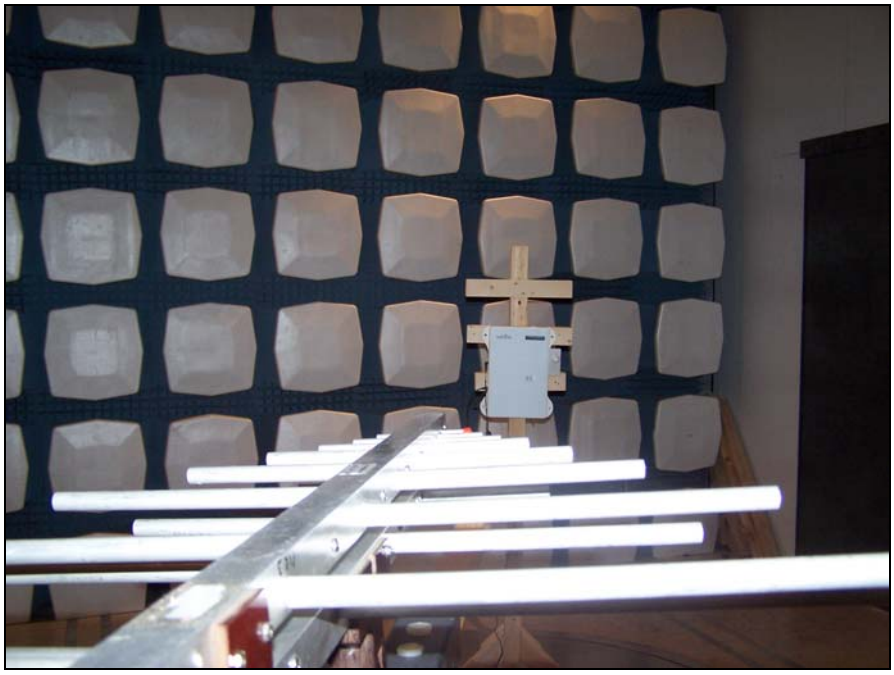


Plot 4. Radiated Emissions Limits Test Setup, 200 MHz – 1 GHz

Radiated Emission Limits Test Setup



Photograph 3. Radiated Emission Limits Test Setup, 30 MHz – 200 MHz



Photograph 4. Radiated Emission Limits Test Setup, 200 MHz – 1 GHz

4. Electromagnetic Compatibility Criteria Intentional Radiators

4.1. RF Power Output

Test Requirement(s): §2.1046 and §27.50(h)

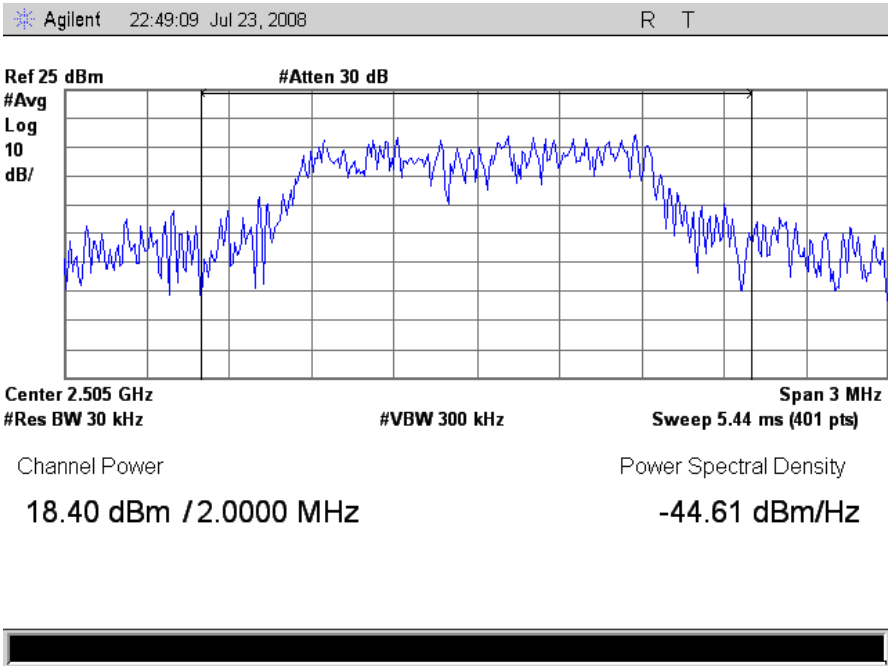
Test Procedures: *RF power output measurement* was made at the RF output terminal using a spectrum analyzer for uplink and downlink.

Test Results: Equipment complies with 47CFR 2.1046 and 27.50(h).

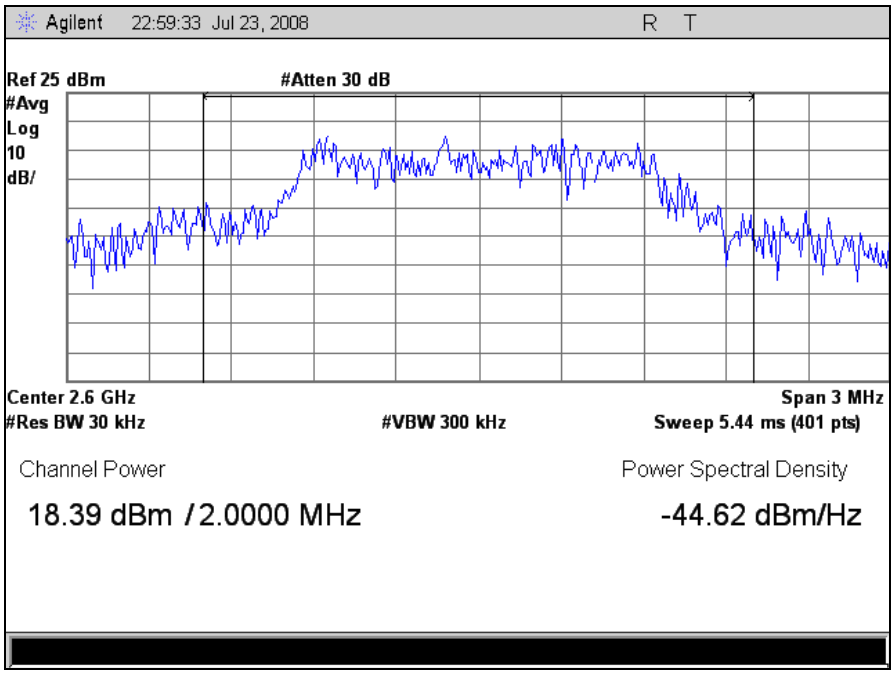
The following page show measurements of RF Power output which is recorded below:

Test Engineer(s): Dusmantha Tennakoon

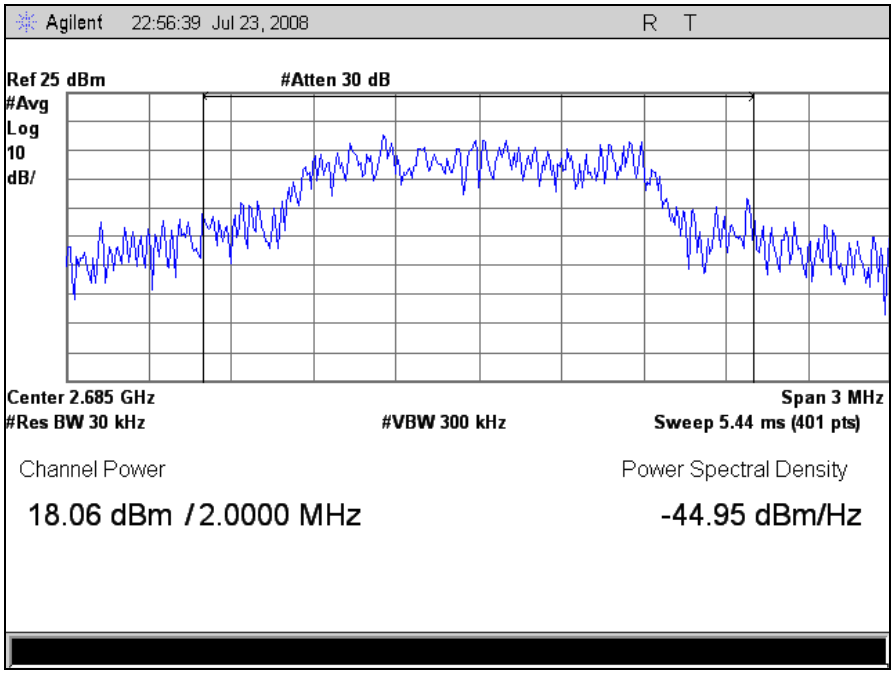
Test Date(s): July 2, 2008



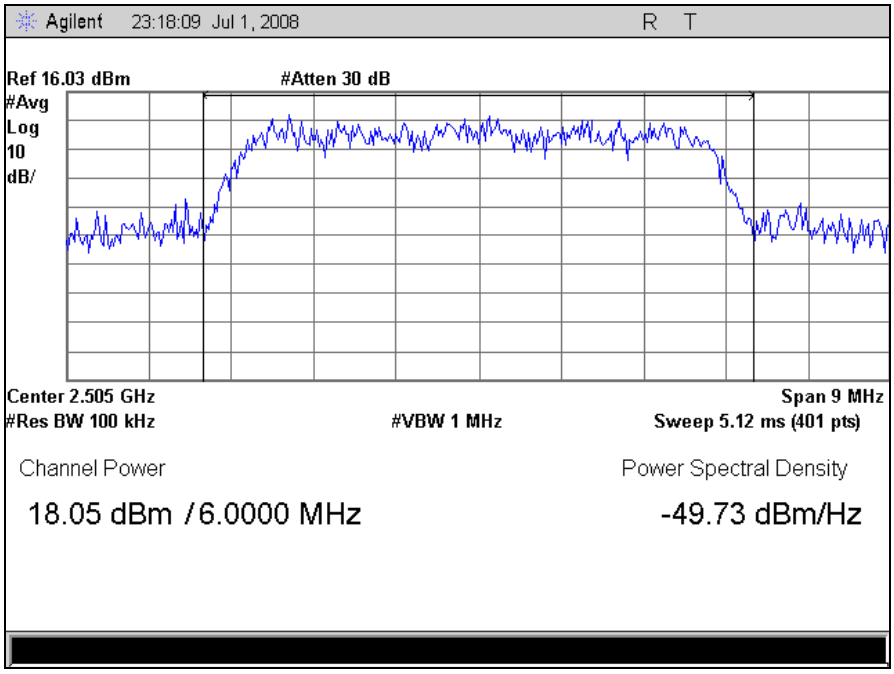
Plot 5. RF Power Output, Downlink, 1.25 MHz Signal, Low Channel



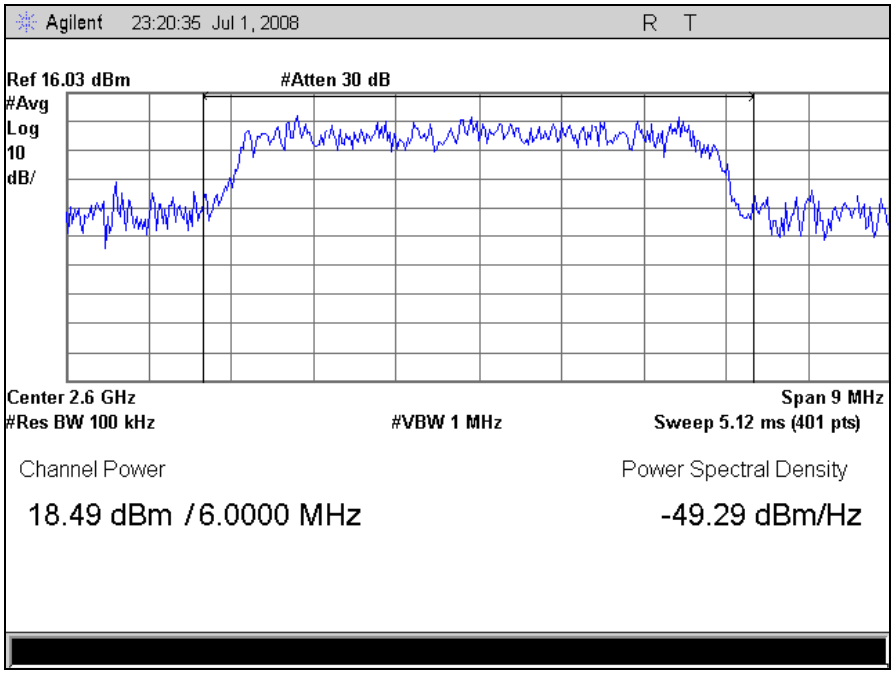
Plot 6. RF Power Output, Downlink, 1.25 MHz Signal, Mid Channel



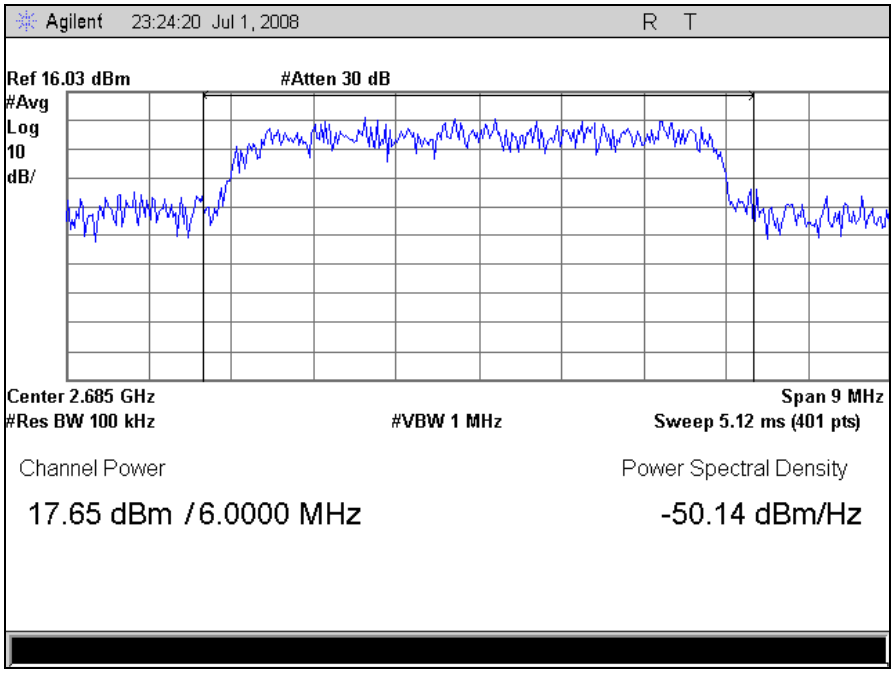
Plot 7. RF Power Output, Downlink, 1.25 MHz Signal, High Channel



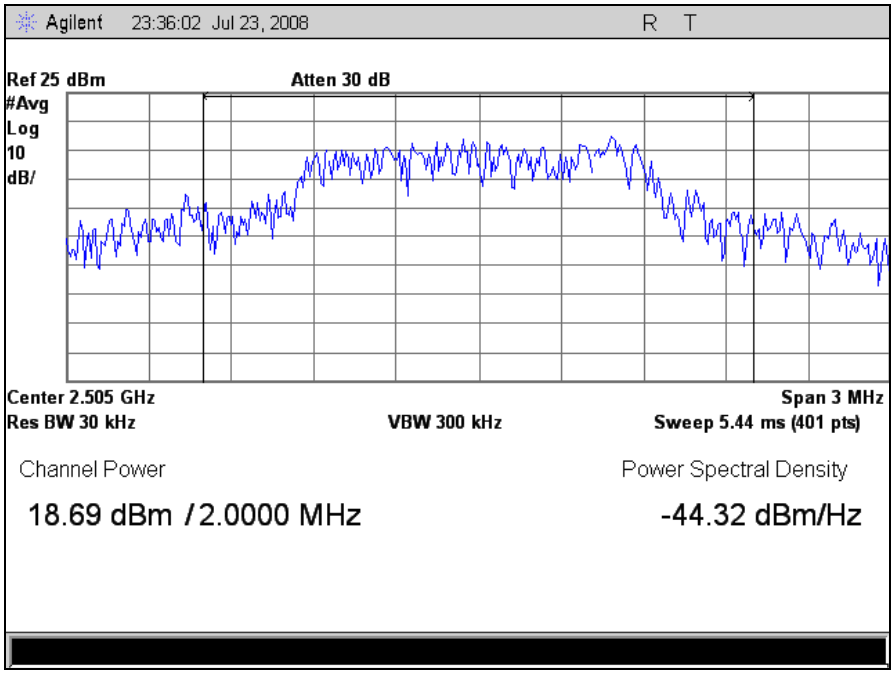
Plot 8. RF Power Output, Downlink, 5 MHz Signal, Low Channel



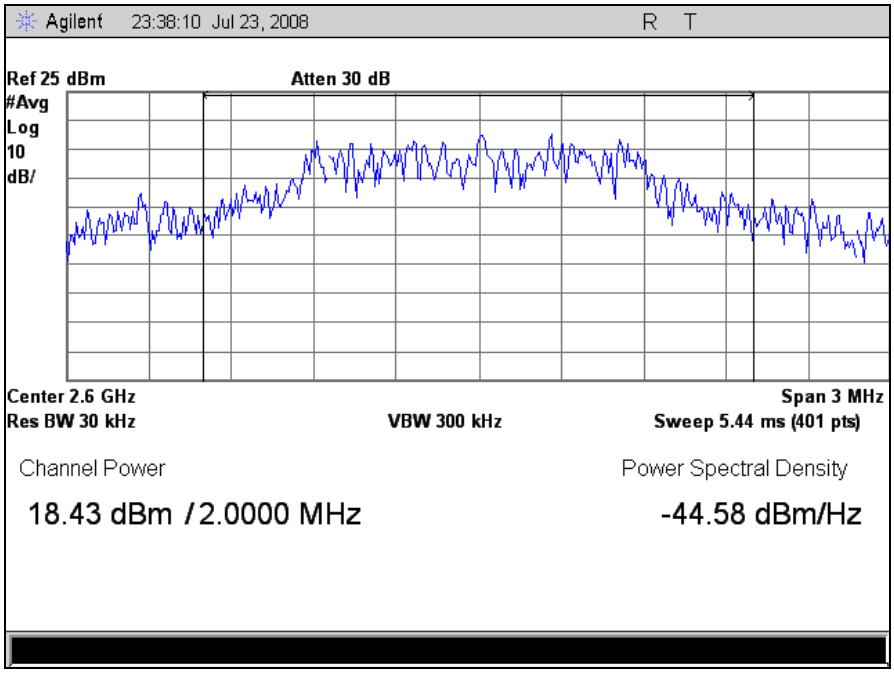
Plot 9. RF Power Output, Downlink, 5 MHz Signal, Mid Channel



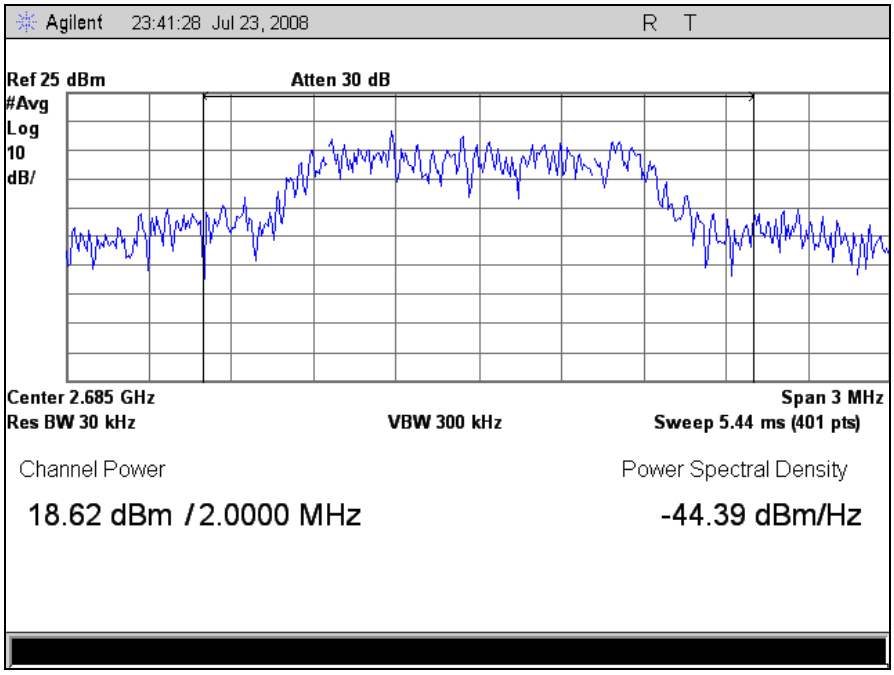
Plot 10. RF Power Output, Downlink, 5 MHz Signal, High Channel



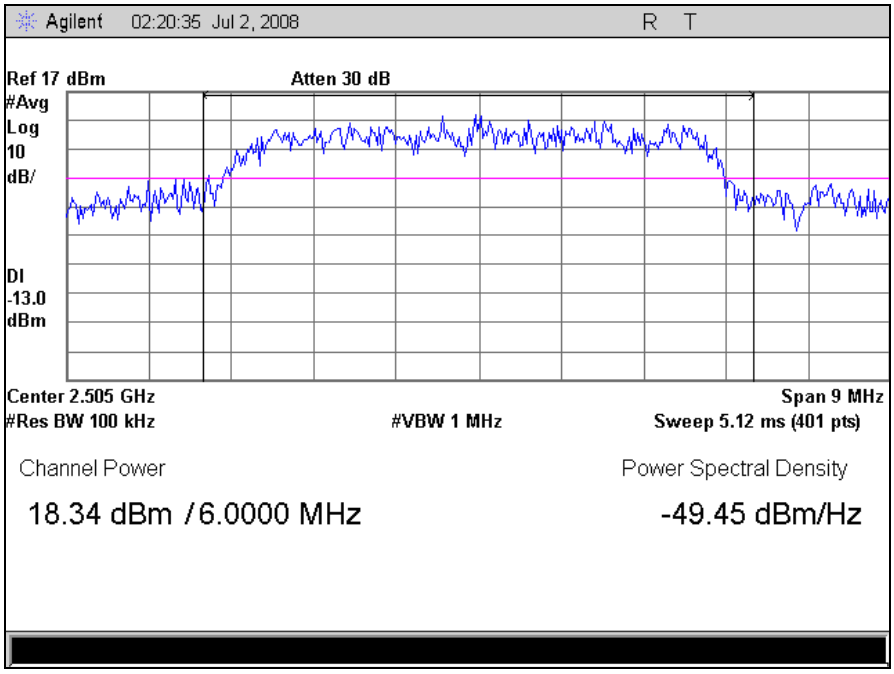
Plot 11. RF Power Output, Uplink, 1.25 MHz Signal, Low Channel



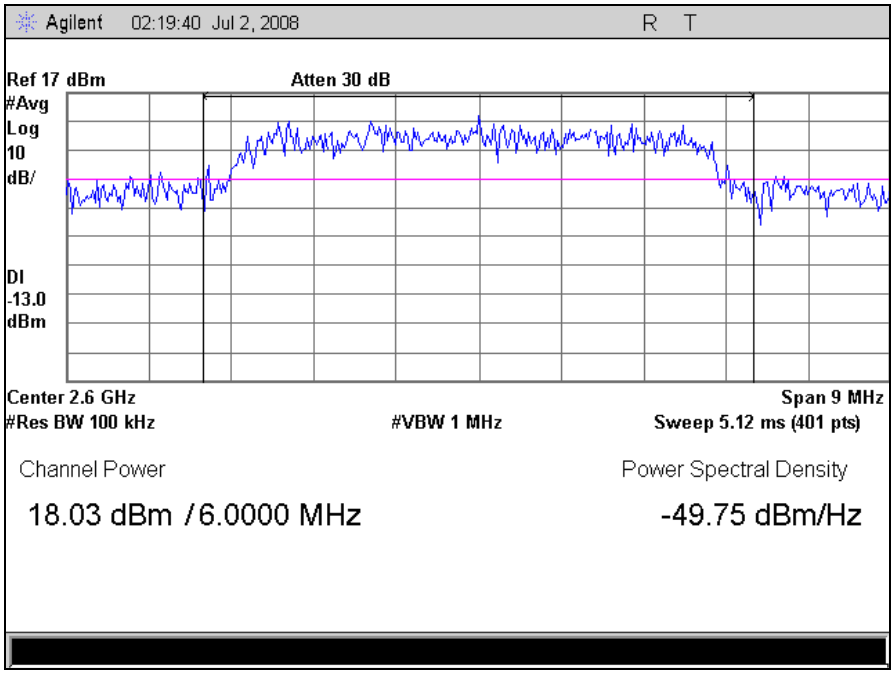
Plot 12. RF Power Output, Uplink, 1.25 MHz Signal, Mid Channel



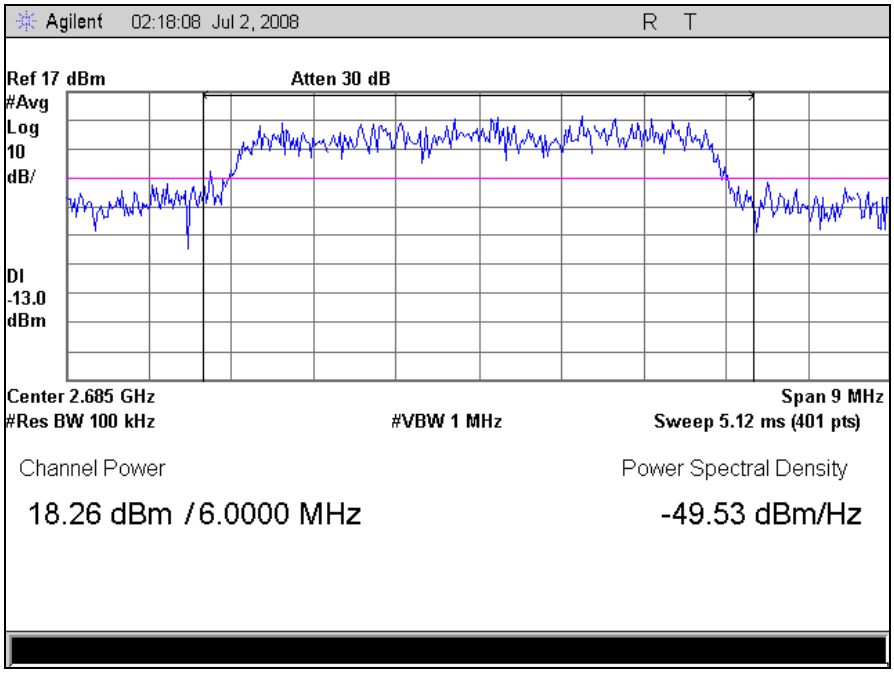
Plot 13. RF Power Output, Uplink, 1.25 MHz Signal, High Channel



Plot 14. RF Power Output, Uplink, 5 MHz Signal, Low Channel



Plot 15. RF Power Output, Uplink, 5 MHz Signal, Mid Channel



Plot 16. RF Power Output, Uplink, 5 MHz Signal, High Channel

4. Electromagnetic Compatibility Intentional Radiators

4.3. § 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.

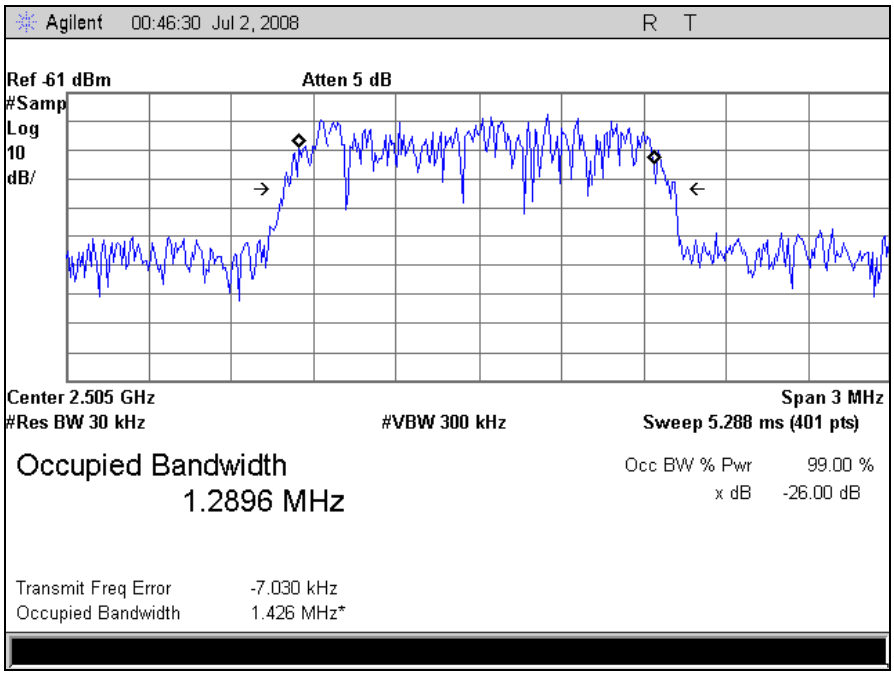
Test Procedures: As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made with a Spectrum Analyzer connected to the RF ports for both Uplink and Downlink

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.

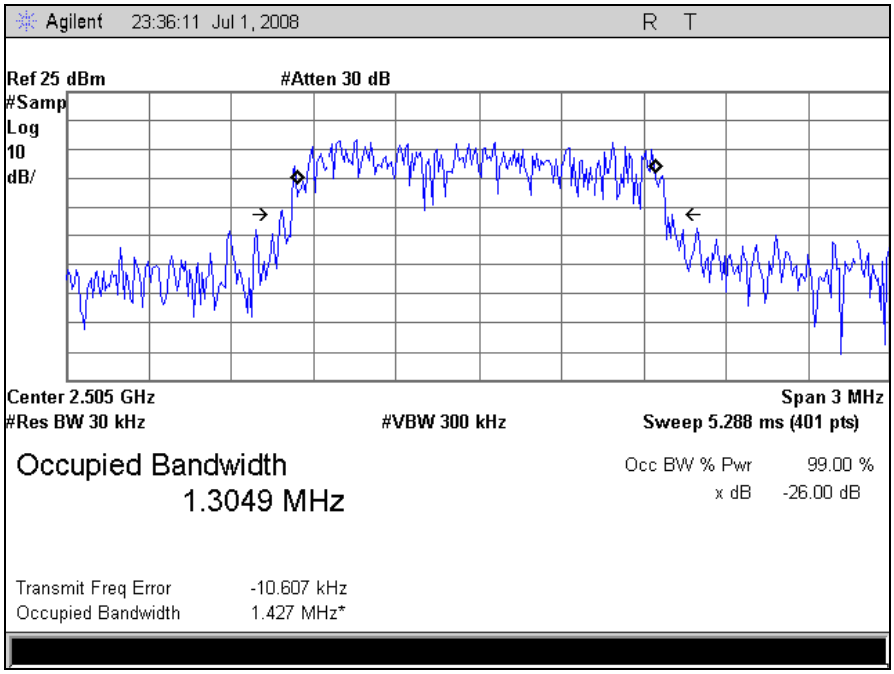
Test Results: Equipment complies with Section 2.1049. The following pages show measurements of 99% and -26 dB Occupied Bandwidth plots.

Test Engineer(s): Dusmantha Tennakoon

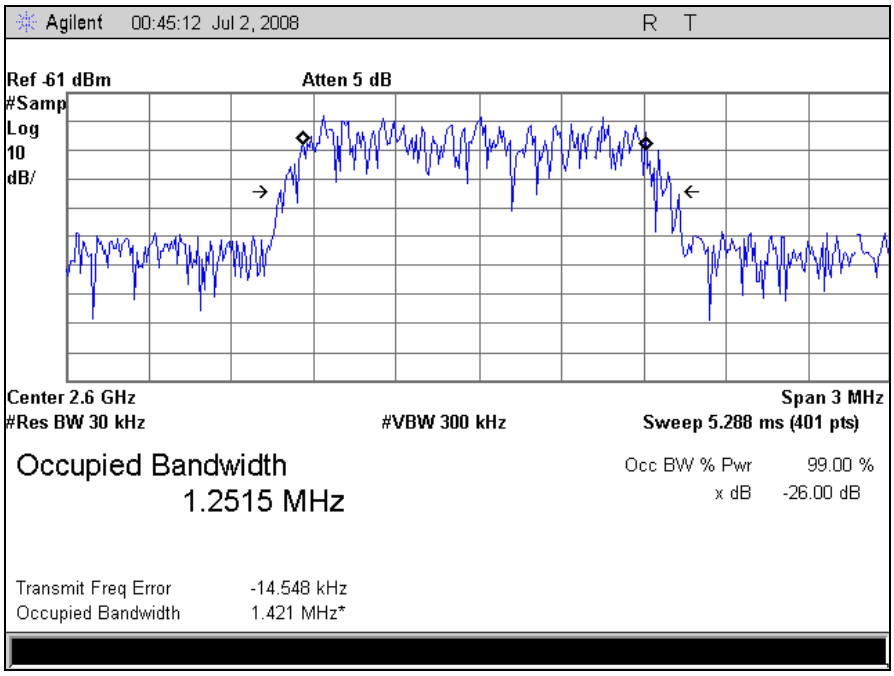
Test Date(s): July 2, 2008



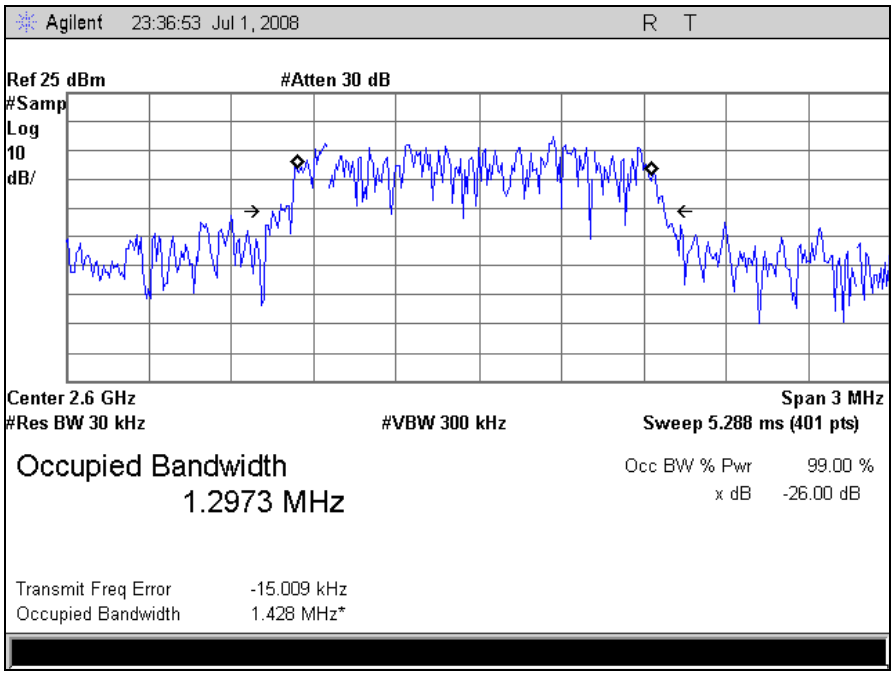
Plot 17. Occupied Bandwidth, Downlink, 1.25 MHz Signal, Low Channel, Mod. In



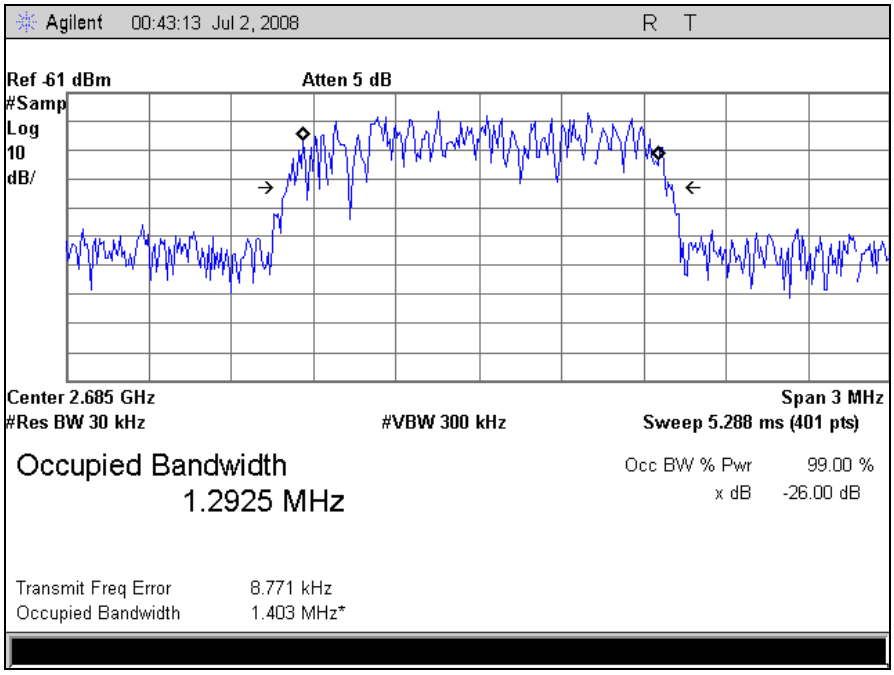
Plot 18. Occupied Bandwidth, Downlink, 1.25 MHz Signal, Low Channel, Mod. Out



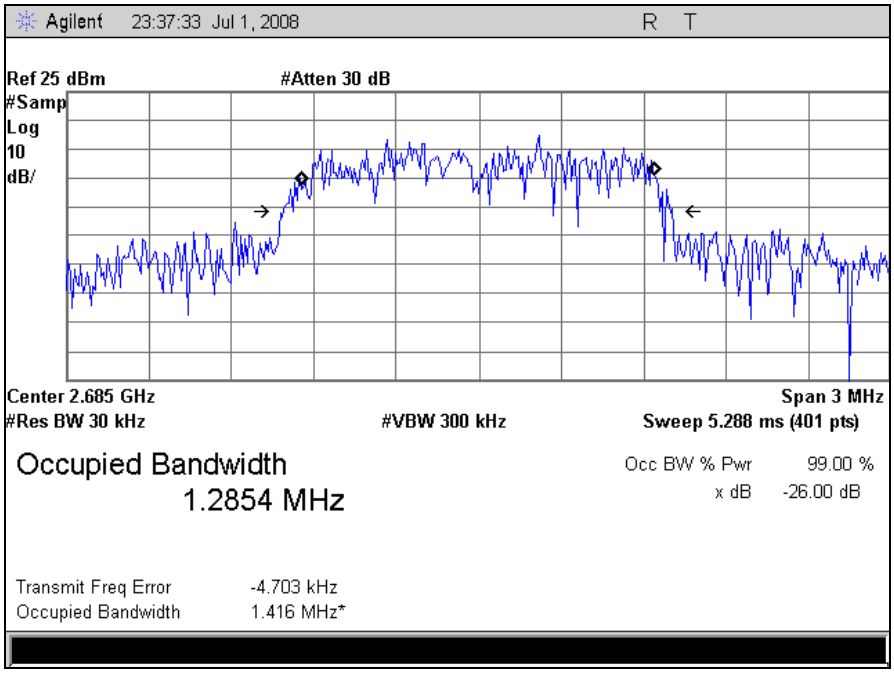
Plot 19. Occupied Bandwidth, Downlink, 1.25 MHz Signal, Mid Channel, Mod. In



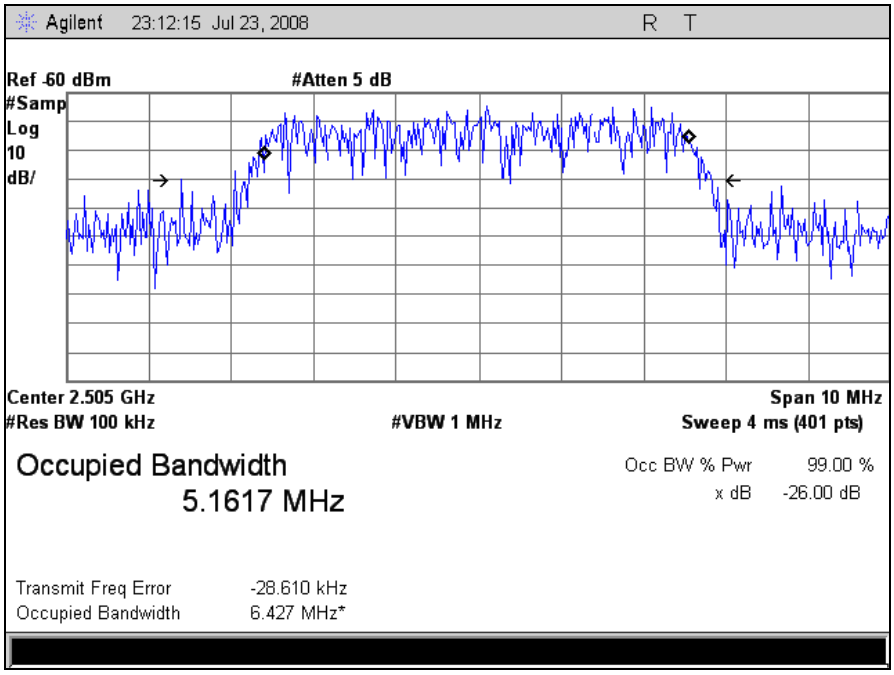
Plot 20. Occupied Bandwidth, Downlink, 1.25 MHz Signal, Mid Channel, Mod. Out



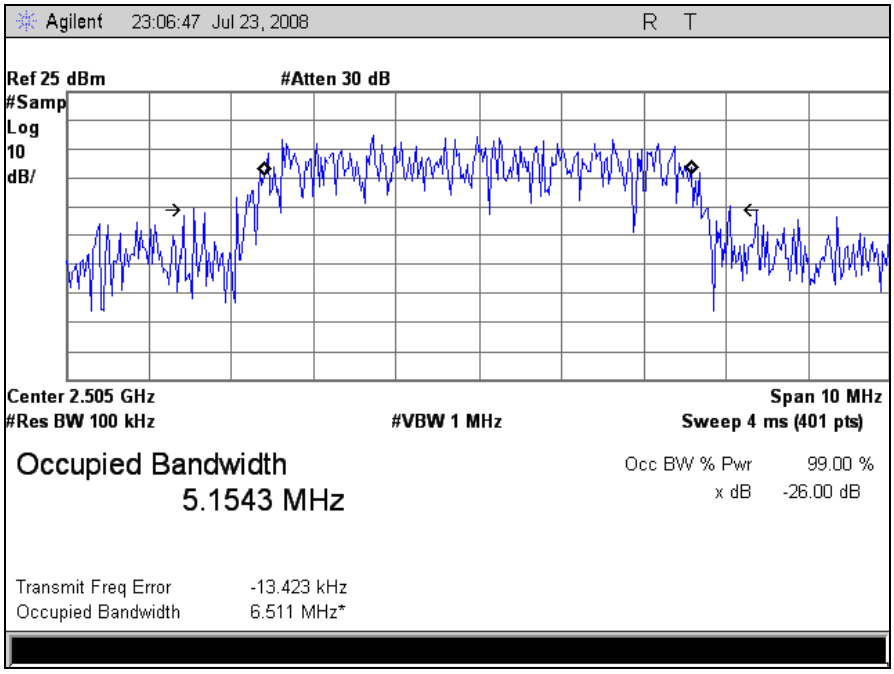
Plot 21. Occupied Bandwidth, Downlink, 1.25 MHz Signal, High Channel, Mod. In



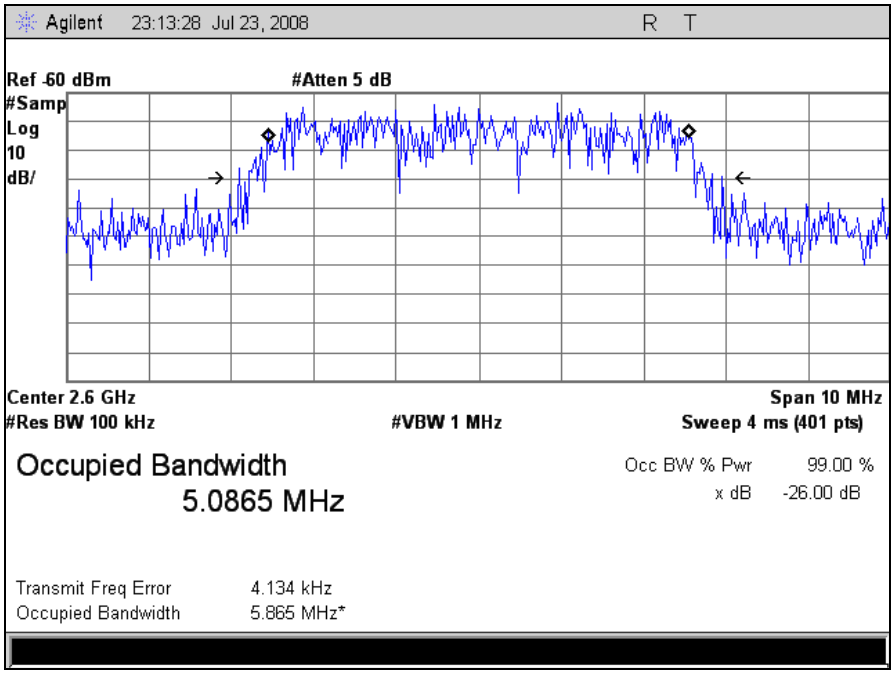
Plot 22. Occupied Bandwidth, Downlink, 1.25 MHz Signal, High Channel, Mod. Out



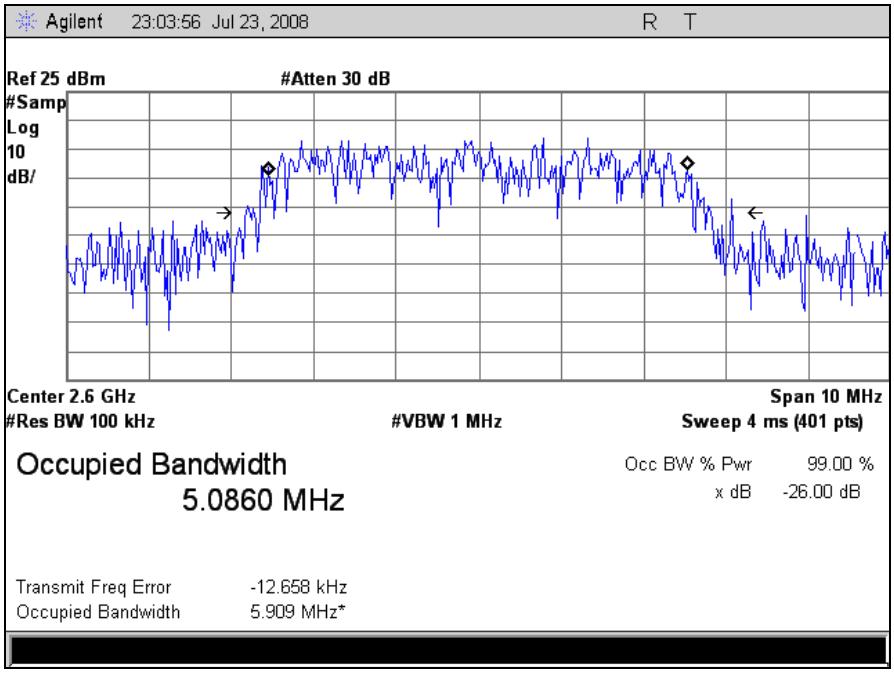
Plot 23. Occupied Bandwidth, Downlink, 5 MHz Signal, Low Channel, Mod. In



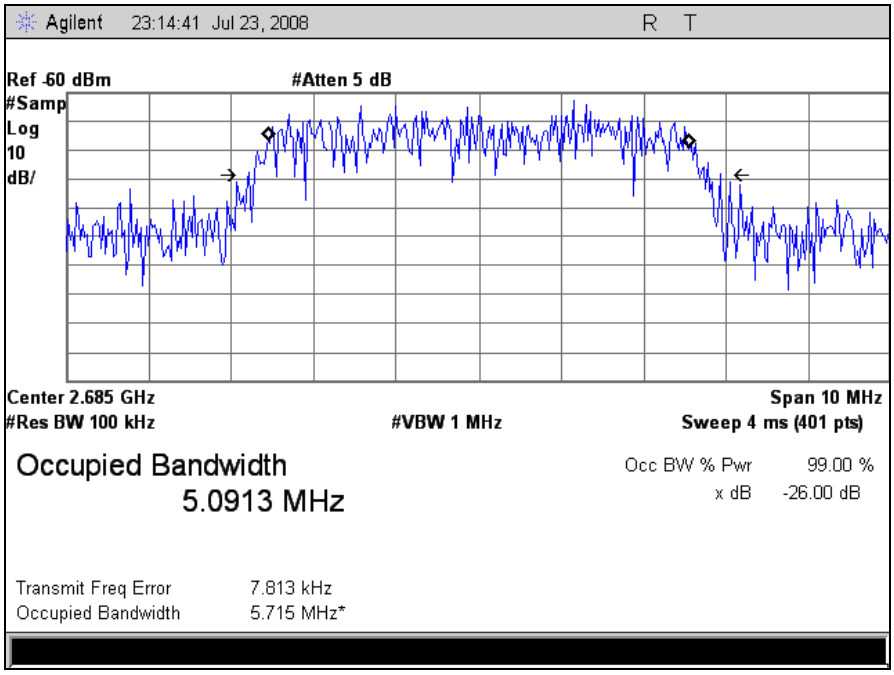
Plot 24. Occupied Bandwidth, Downlink, 5 MHz Signal, Low Channel, Mod. Out



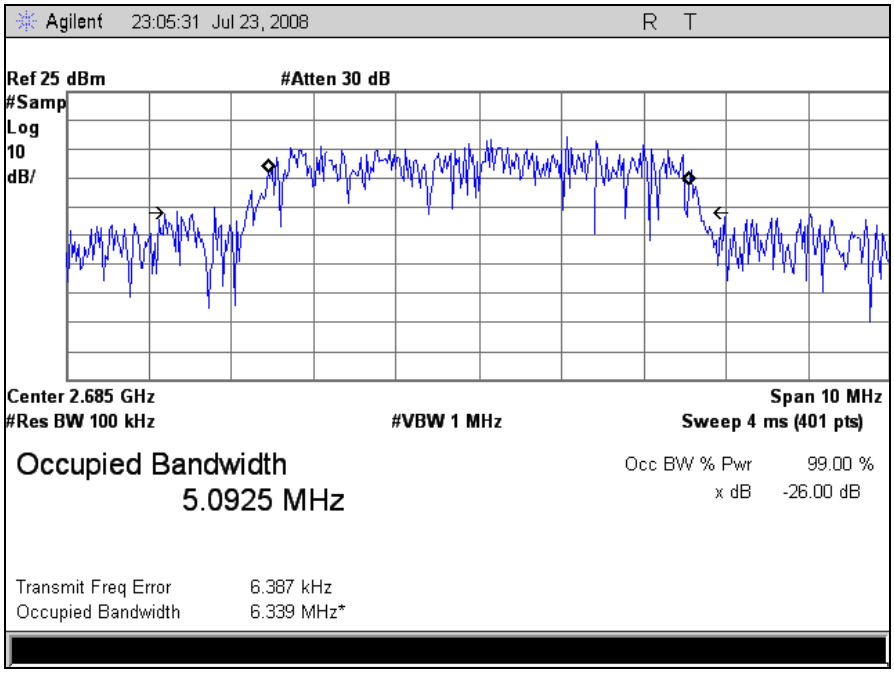
Plot 25. Occupied Bandwidth, Downlink, 5 MHz Signal, Mid Channel, Mod. In



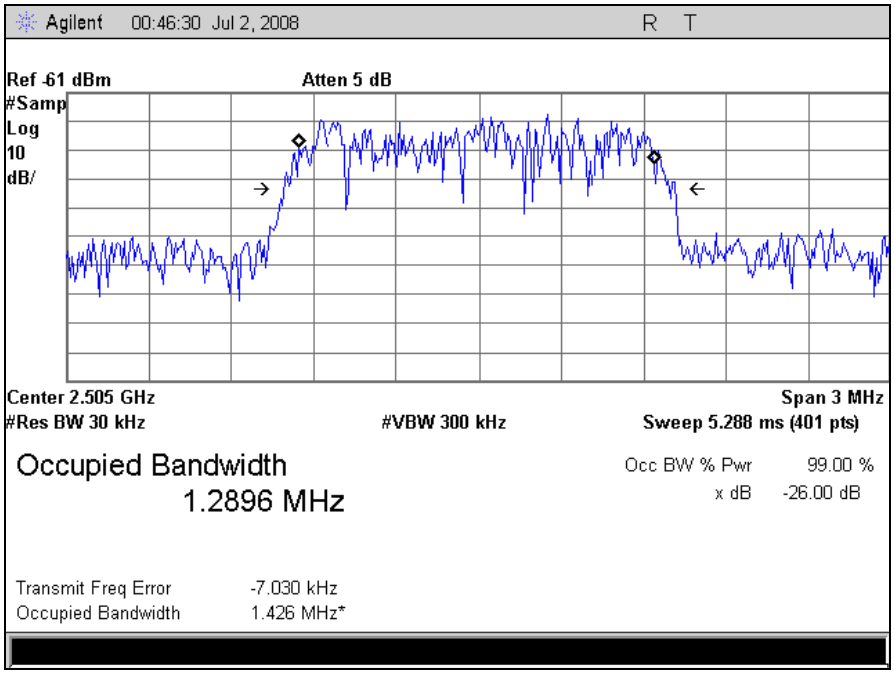
Plot 26. Occupied Bandwidth, Downlink, 5 MHz Signal, Mid Channel, Mod. Out



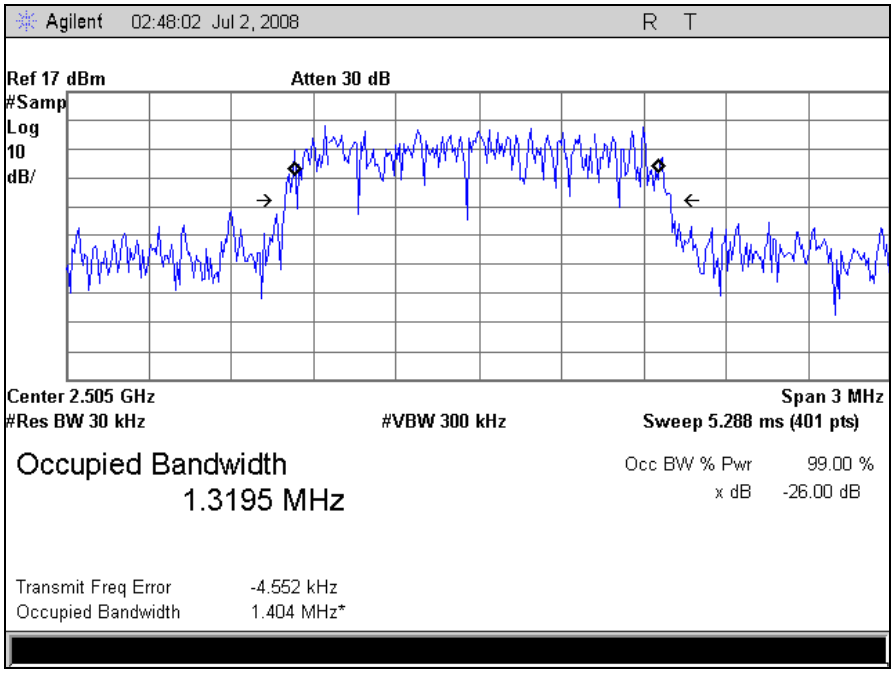
Plot 27. Occupied Bandwidth, Downlink, 5 MHz Signal, High Channel, Mod. In



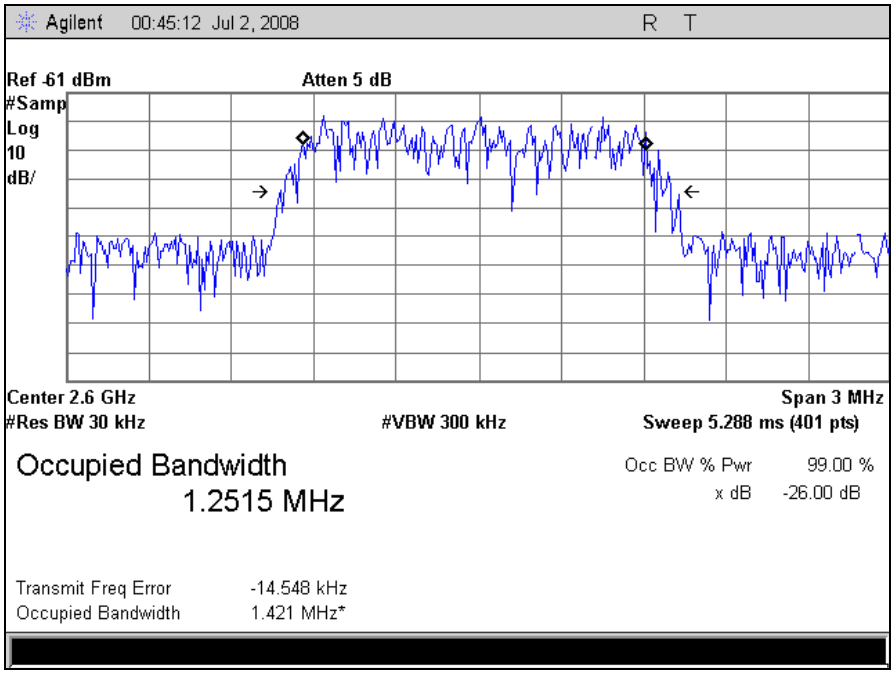
Plot 28. Occupied Bandwidth, Downlink, 5 MHz Signal, High Channel, Mod. Out



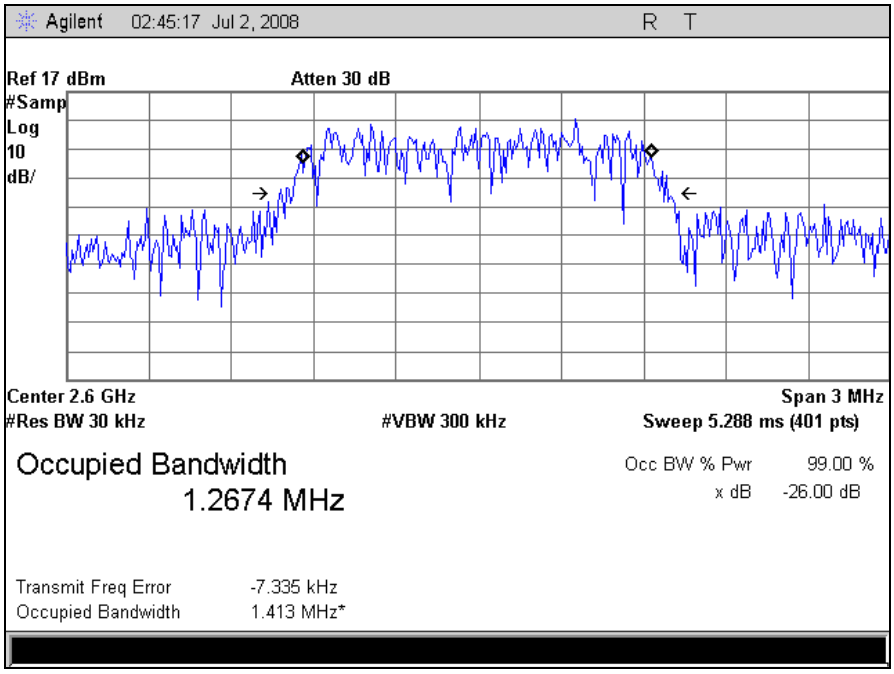
Plot 29. Occupied Bandwidth, Uplink, 1.25 MHz Signal, Low Channel, Mod. In



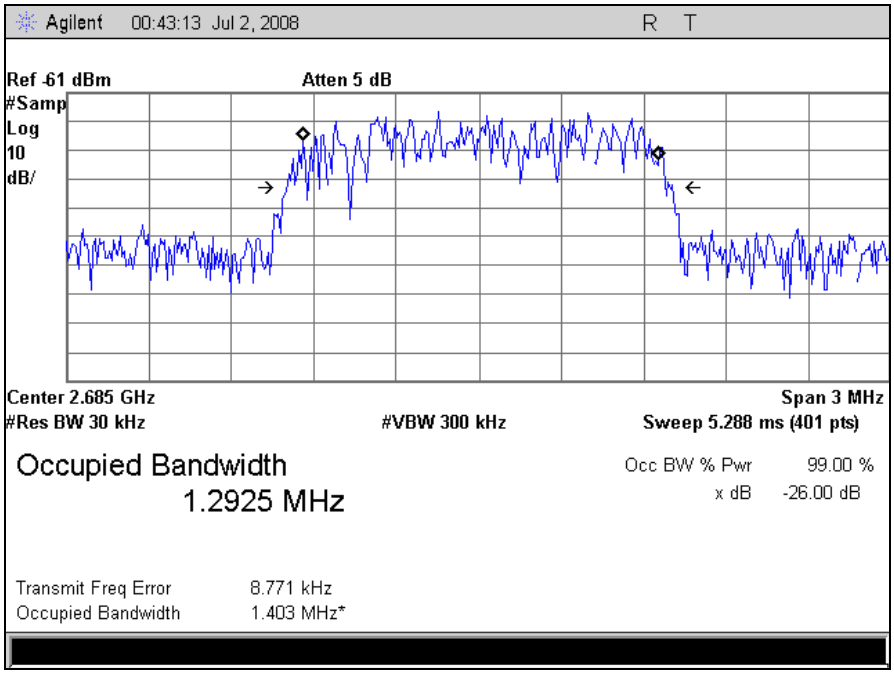
Plot 30. Occupied Bandwidth, Uplink, 1.25 MHz Signal, Low Channel, Mod. Out



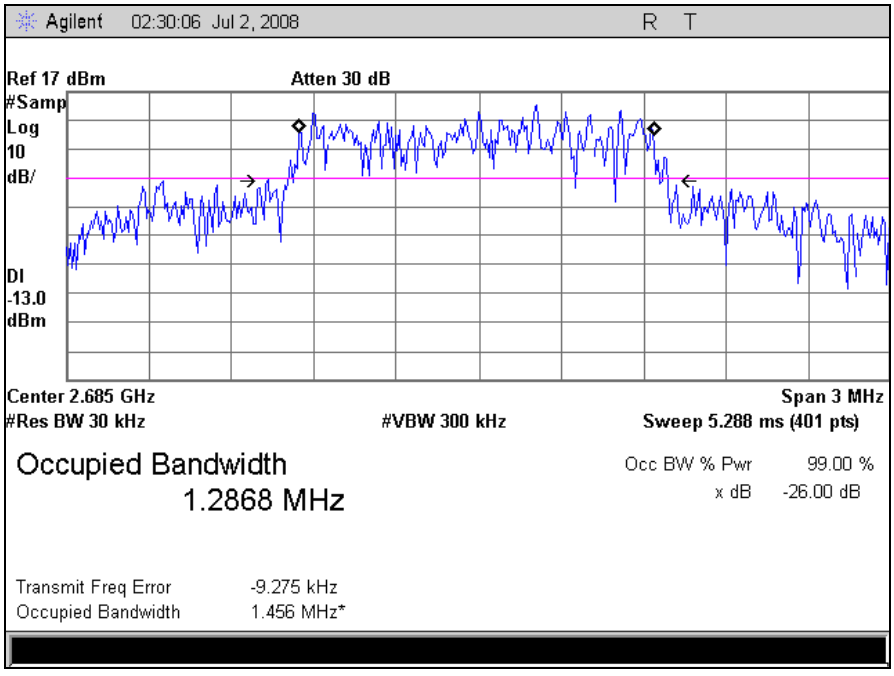
Plot 31. Occupied Bandwidth, Uplink, 1.25 MHz Signal, Mid Channel, Mod. In



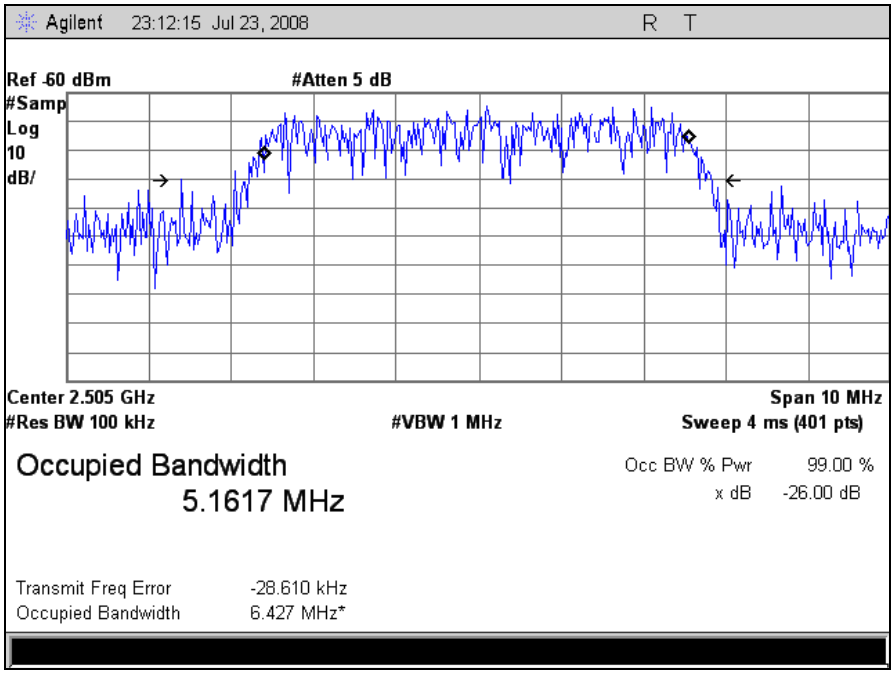
Plot 32. Occupied Bandwidth, Uplink, 1.25 MHz Signal, Mid Channel, Mod. Out



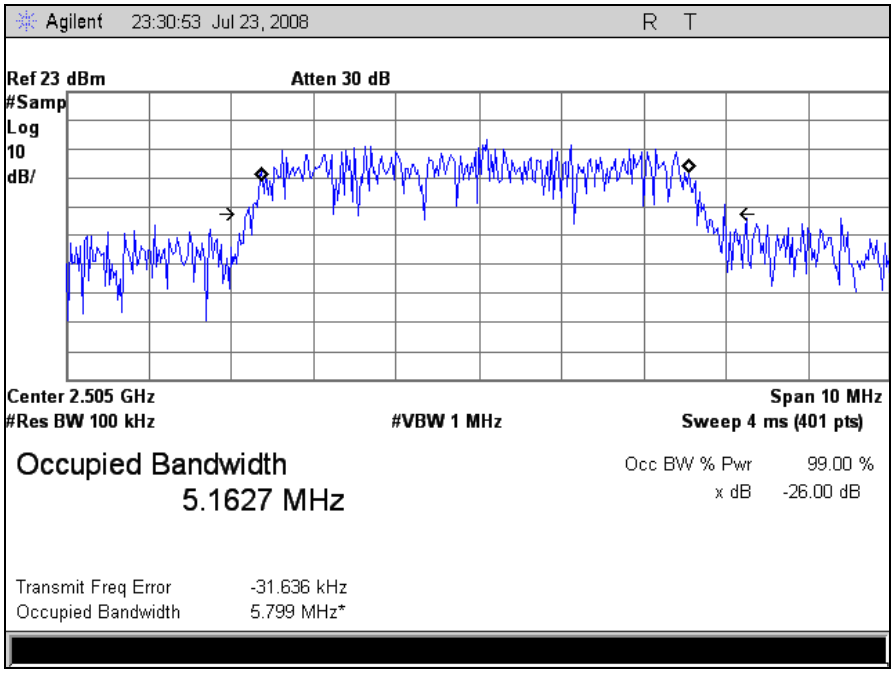
Plot 33. Occupied Bandwidth, Uplink, 1.25 MHz Signal, High Channel, Mod. In



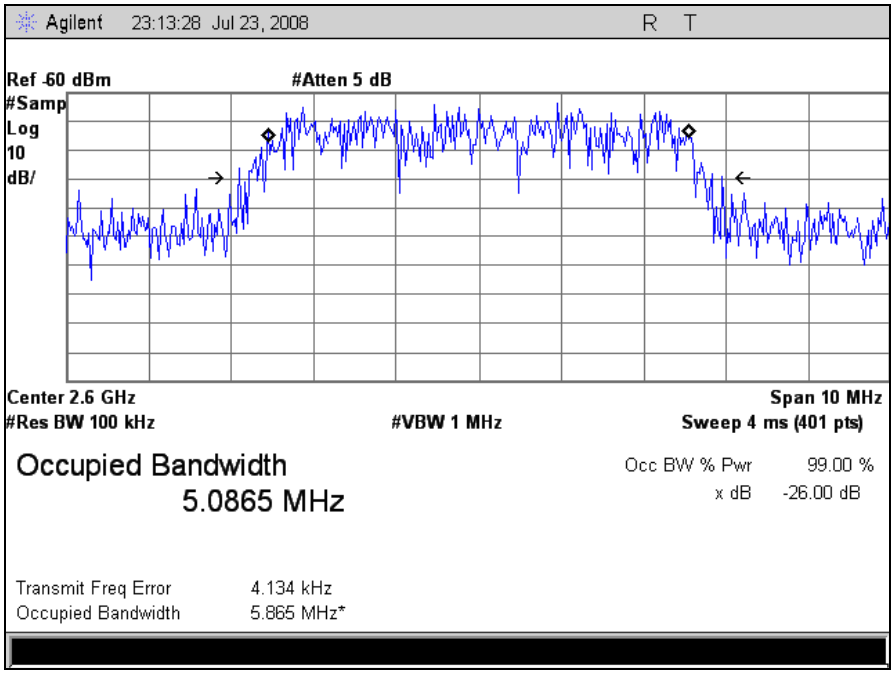
Plot 34. Occupied Bandwidth, Uplink, 1.25 MHz Signal, High Channel, Mod. Out



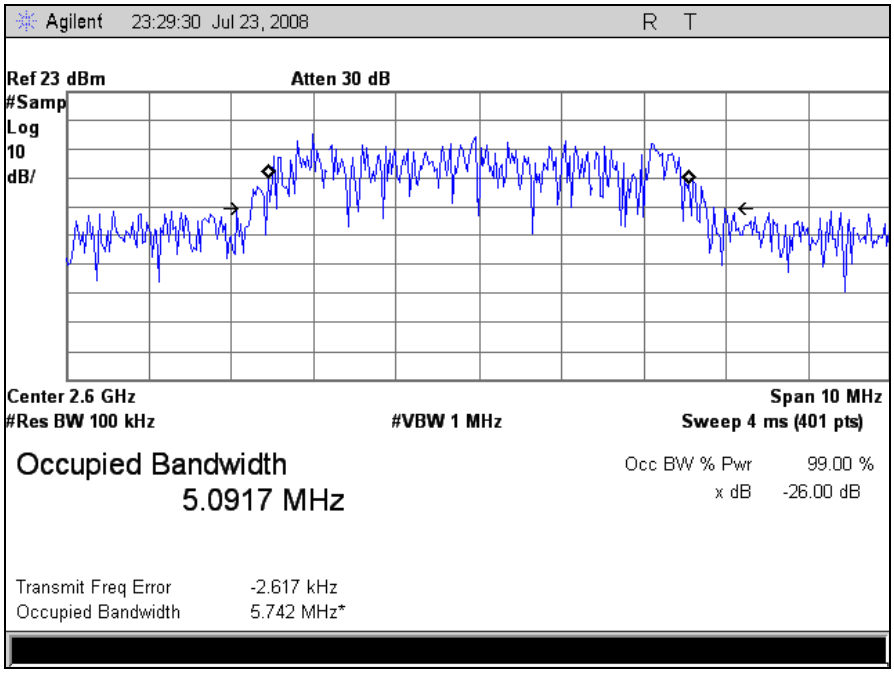
Plot 35. Occupied Bandwidth, Uplink, 5 MHz Signal, Low Channel, Mod. In



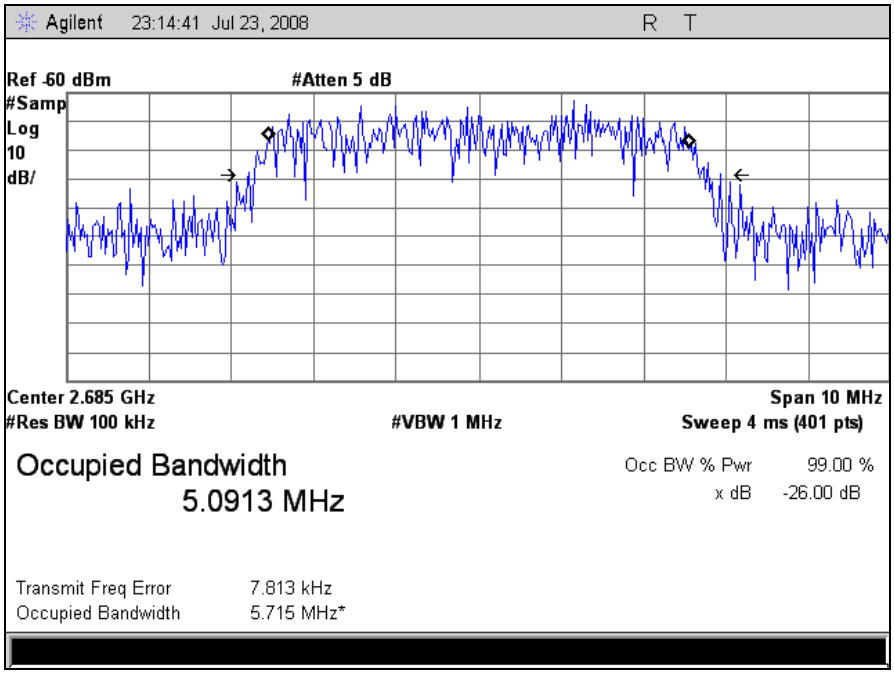
Plot 36. Occupied Bandwidth, Uplink, 5 MHz Signal, Low Channel, Mod. Out



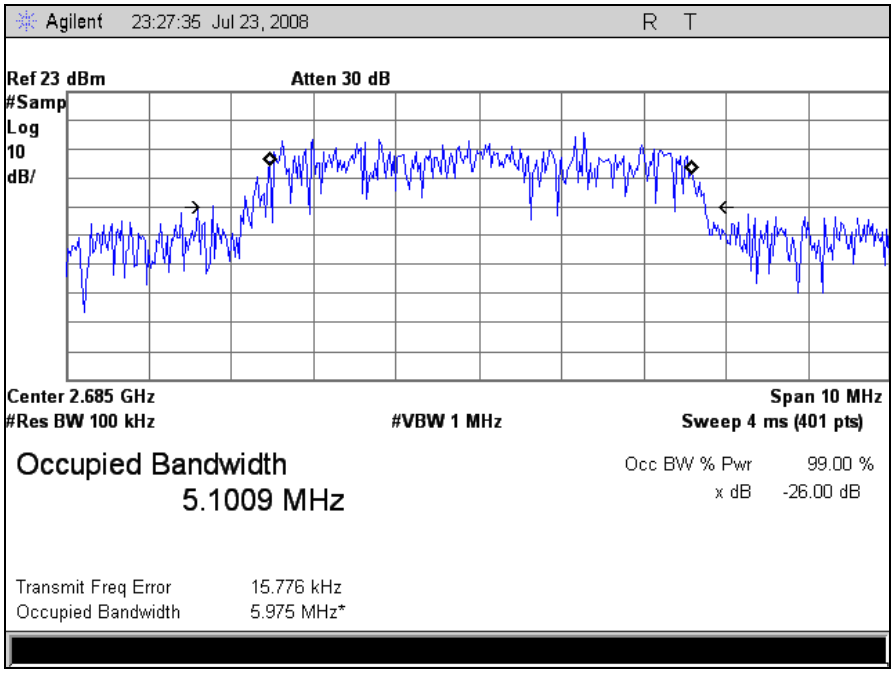
Plot 37. Occupied Bandwidth, Uplink, 5 MHz Signal, Mid Channel, Mod. In



Plot 38. Occupied Bandwidth, Uplink, 5 MHz Signal, Mid Channel, Mod. Out



Plot 39. Occupied Bandwidth, Uplink, 5 MHz Signal, High Channel, Mod. In



Plot 40. Occupied Bandwidth, Uplink, 5 MHz Signal, High Channel, Mod. Out

4. Electromagnetic Compatibility Intentional Radiators

4.4. § 2.1051 Spurious Emissions at Antenna Terminals

Test Requirement(s): **§ 2.1051and 27.53(l) 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.

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

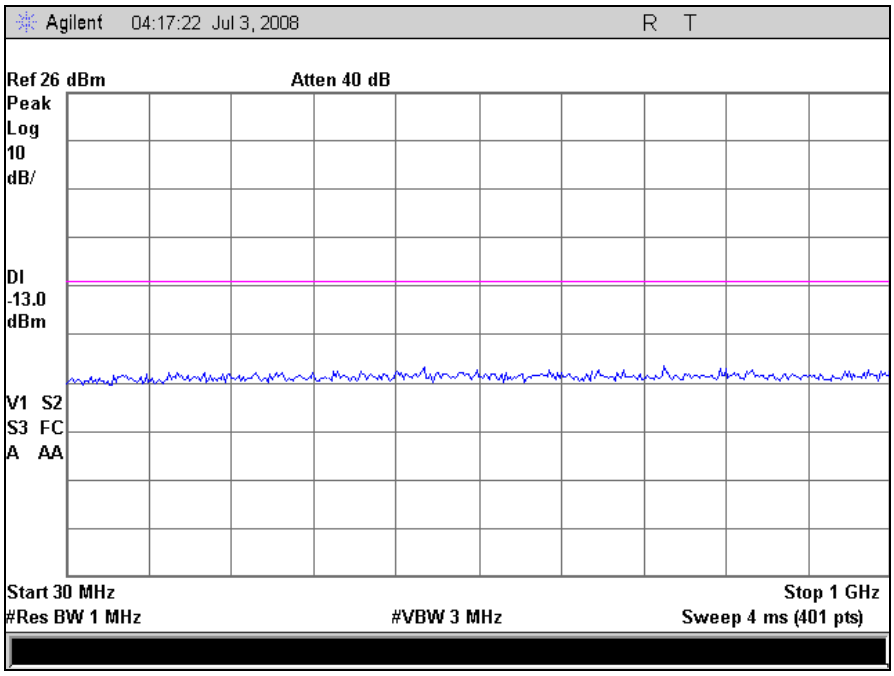
The inter-modulation requirements were performed in a similar manner as described above. The spectrum analyzer was set to 100KHz RBW and 300KHz VBW. Two modulated carriers were injected into the EUT. One carrier was set at the band edge of either the Uplink or Downlink band and the other at carrier set at 6MHz deviation from the first carrier. The in band spurious emissions were investigated.

Test Results: Equipment complies with Section 2.1051 and 27.53(g). The following pages show measurements of Spurious Emission plots

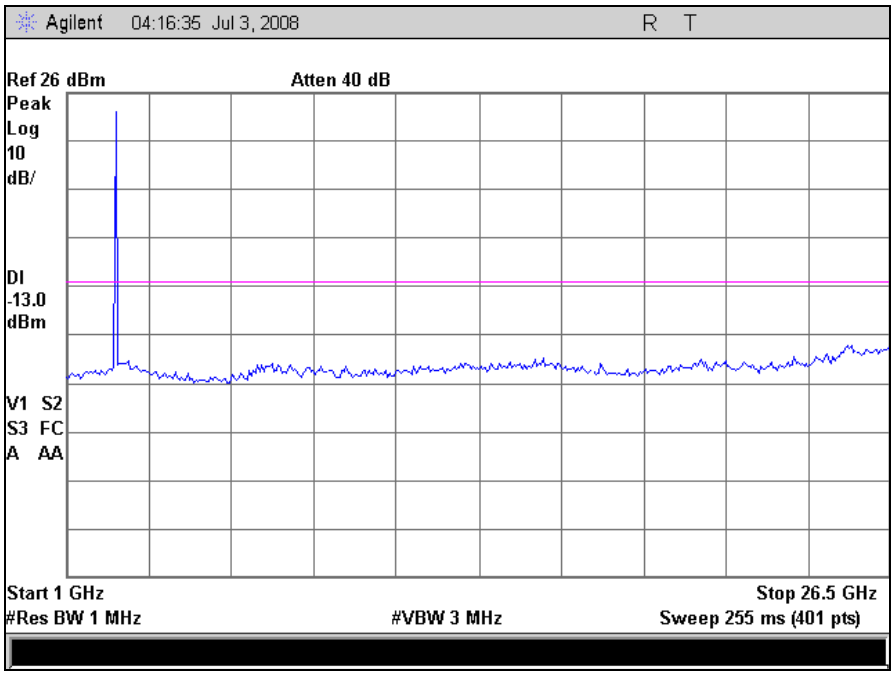
The following analysis and plots are included below to illustrate compliance with the required rule parts.

Test Engineer(s): Dusmantha Tennakoon

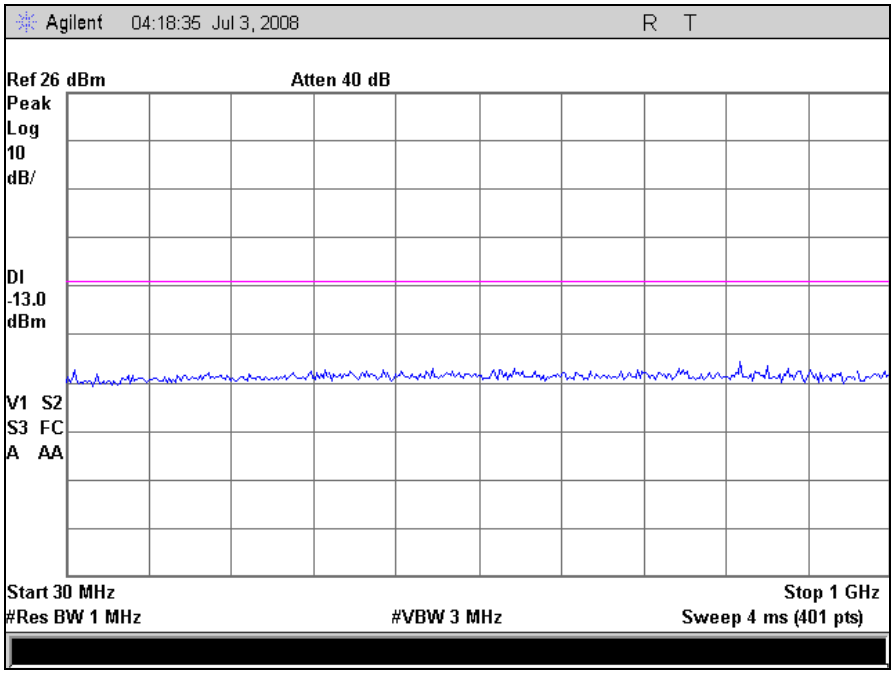
Test Date(s): July 2, 2008



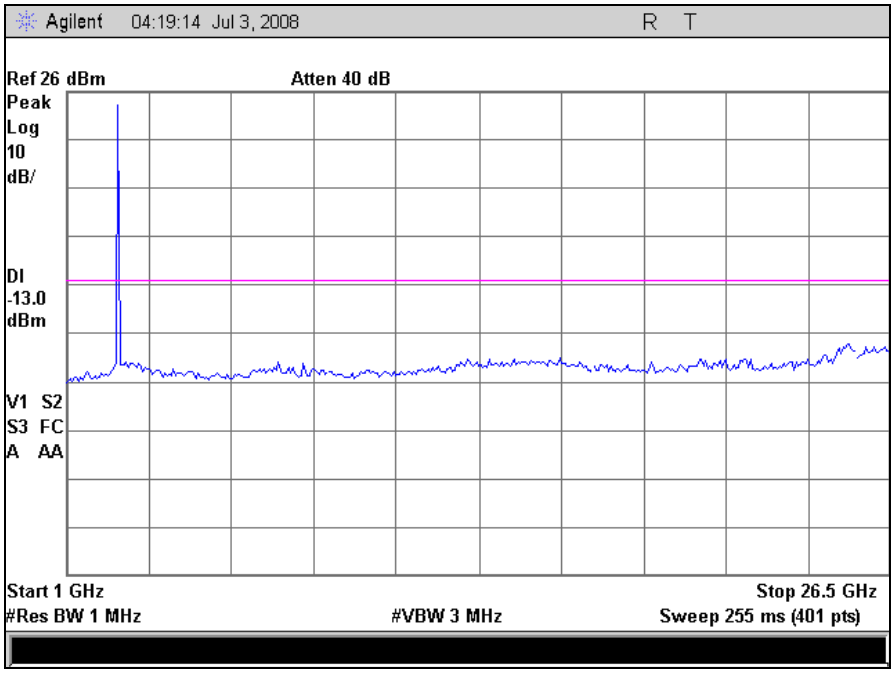
Plot 41. Conducted Spurious, Downlink, 1.25 MHz Signal, Low Channel, 30 MHz – 1 GHz



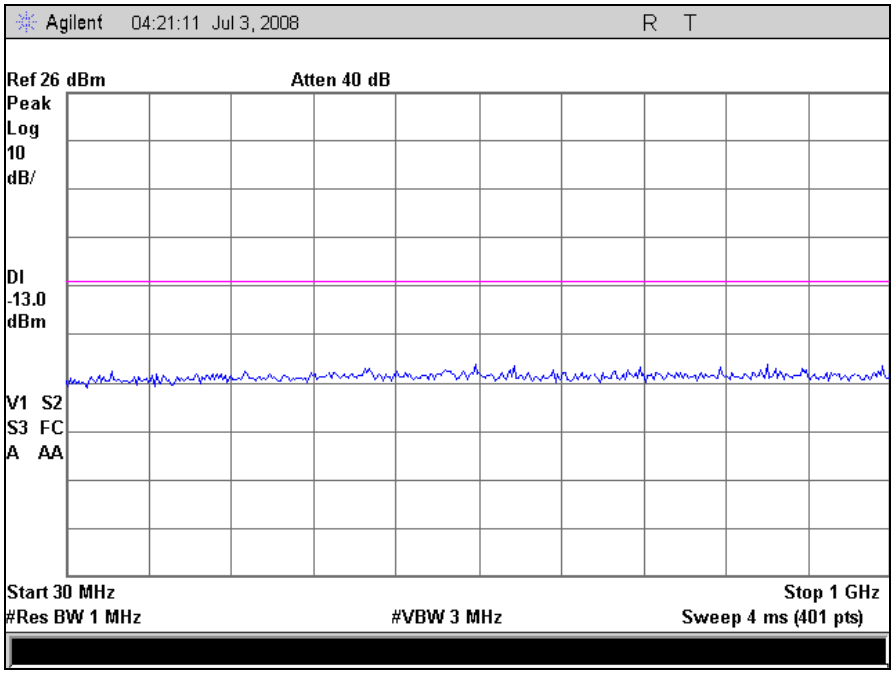
Plot 42. Conducted Spurious, Downlink, 1.25 MHz Signal, Low Channel, 1 GHz – 26.6 GHz



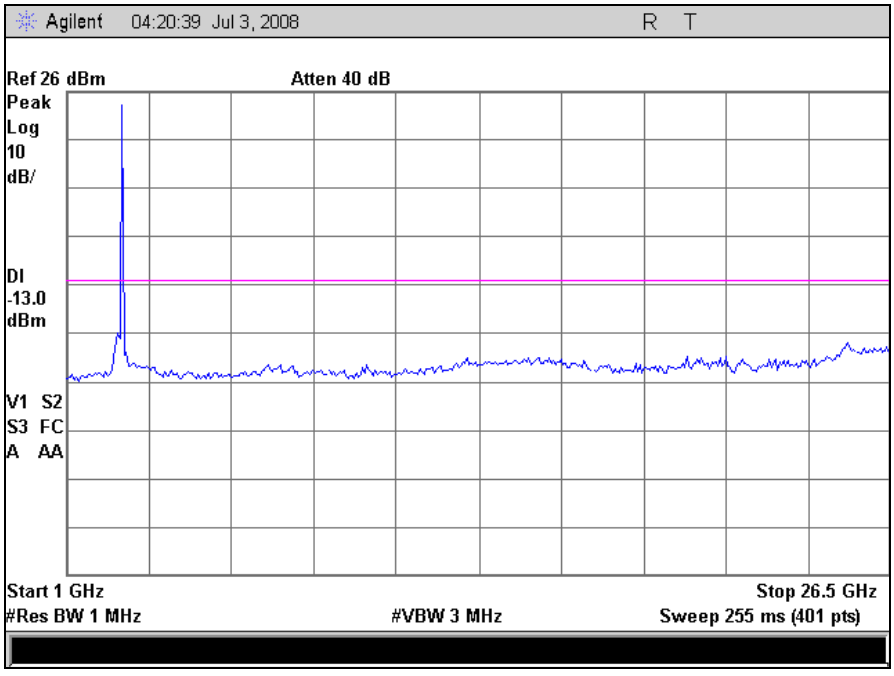
Plot 43. Conducted Spurious, Downlink, 1.25 MHz Signal, Mid Channel, 30 MHz – 1 GHz



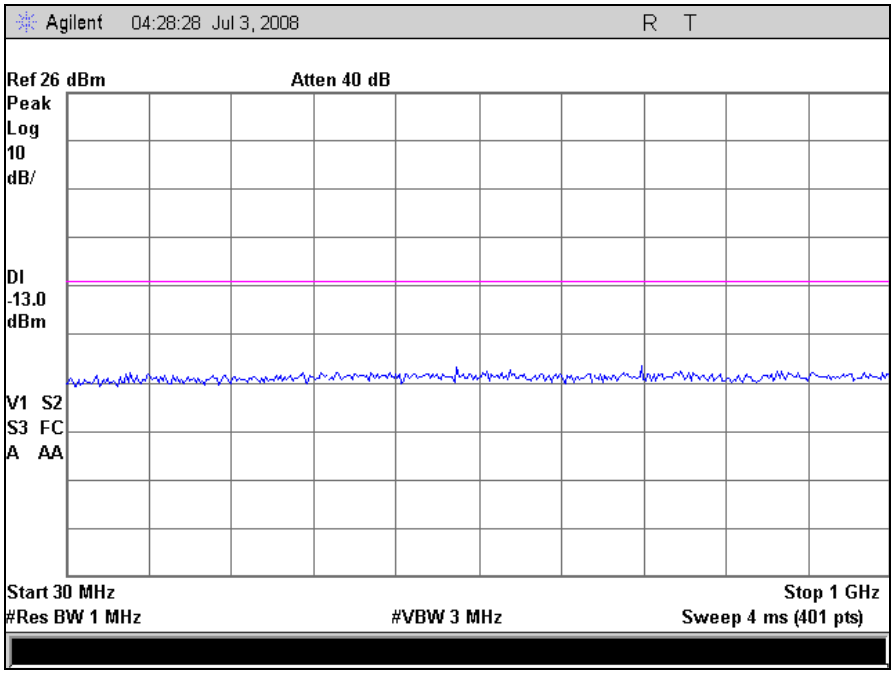
Plot 44. Conducted Spurious, Downlink, 1.25 MHz Signal, Mid Channel, 1 GHz – 26.5 GHz



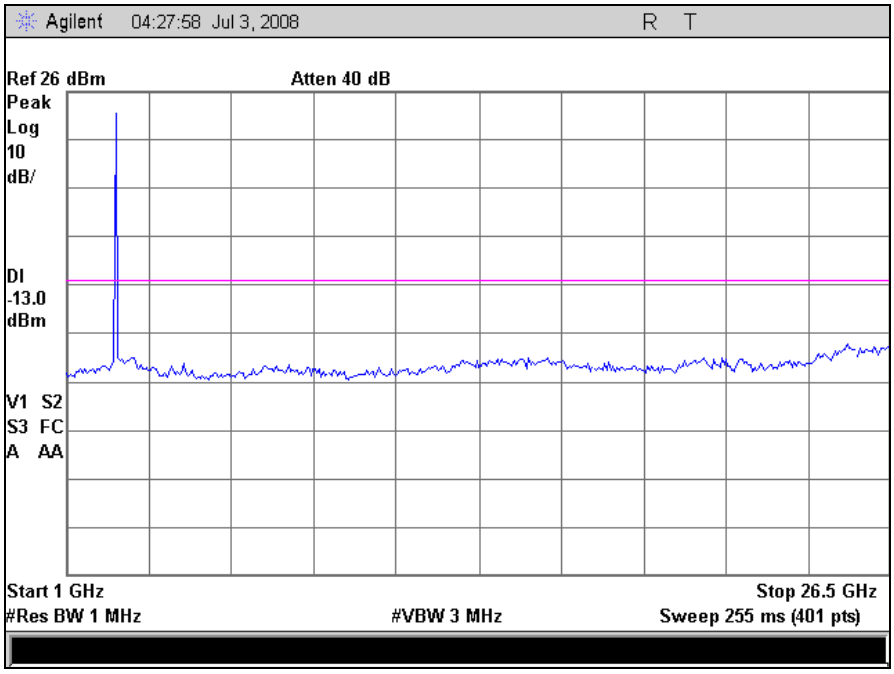
Plot 45. Conducted Spurious, Downlink, 1.25 MHz Signal, High Channel, 30 MHz – 1 GHz



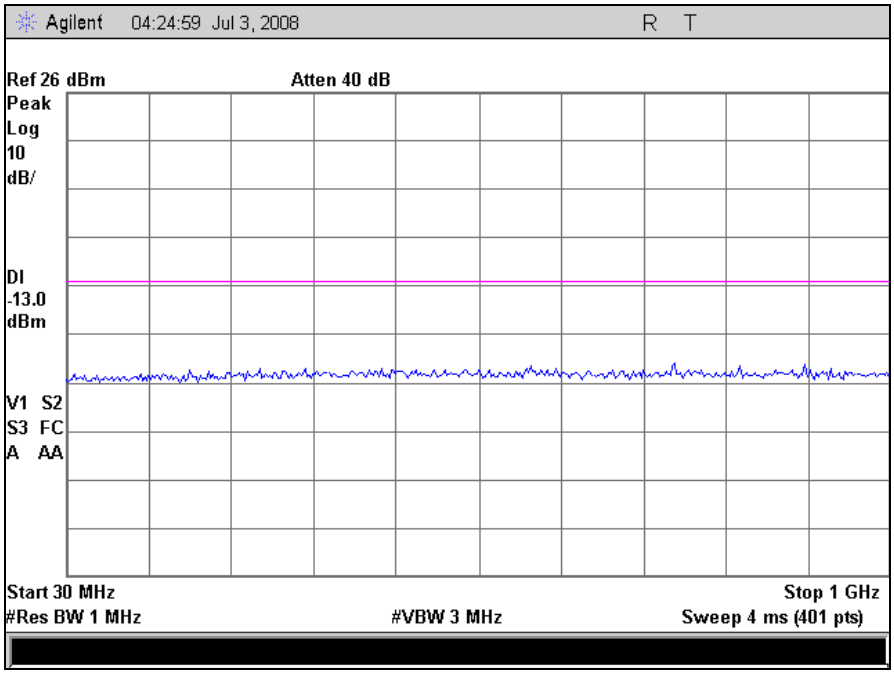
Plot 46. Conducted Spurious, Downlink, 1.25 MHz Signal, High Channel, 1 GHz – 26.5 GHz



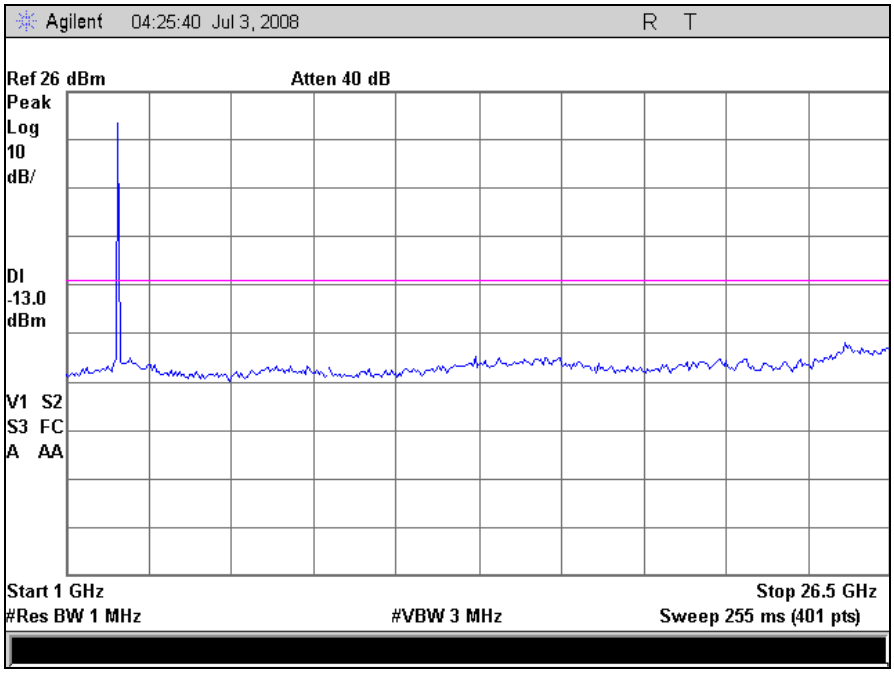
Plot 47. Conducted Spurious, Downlink, 5 MHz Signal, Low Channel, 30 MHz – 1 GHz



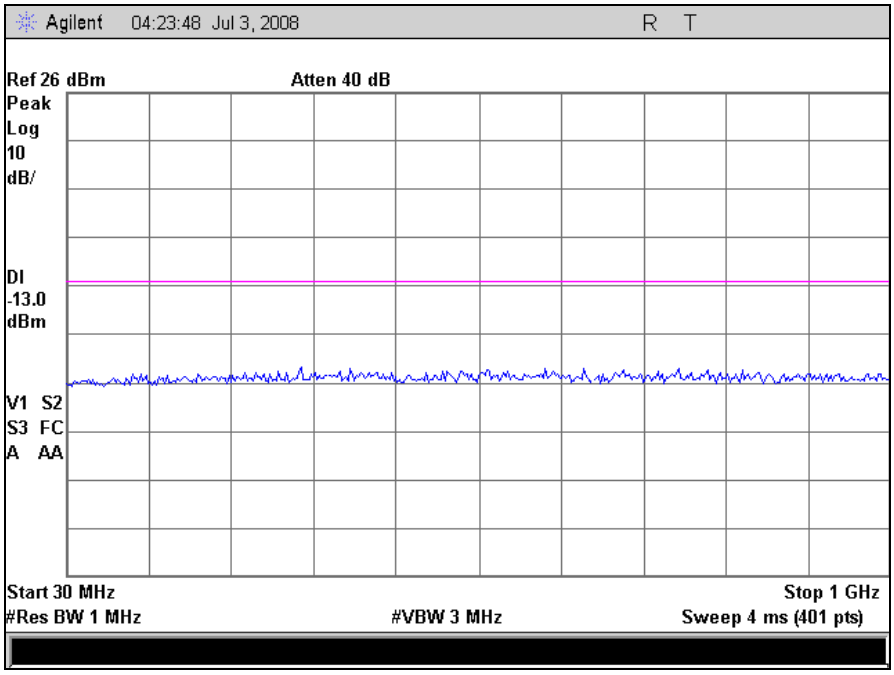
Plot 48. Conducted Spurious, Downlink, 5 MHz Signal, Low Channel, 1 GHz – 26.5 GHz



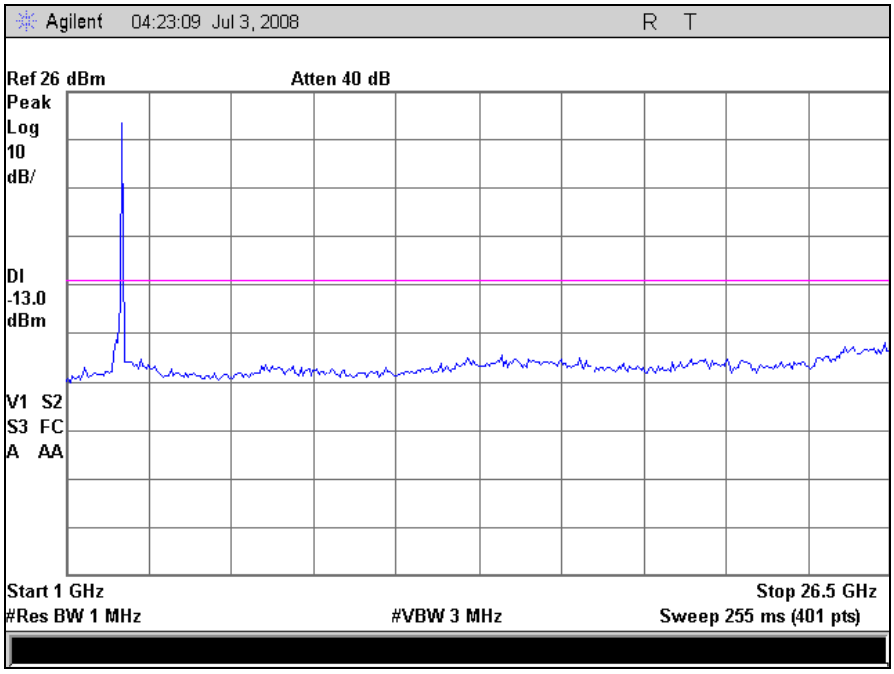
Plot 49. Conducted Spurious, Downlink, 5 MHz Signal, Mid Channel, 30 MHz – 1 GHz



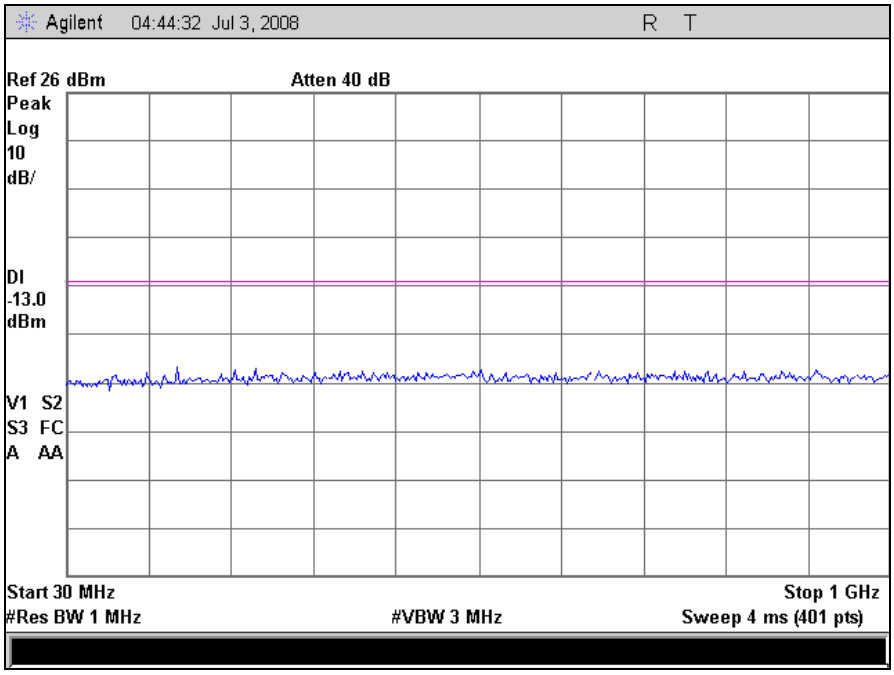
Plot 50. Conducted Spurious, Downlink, 5 MHz Signal, Mid Channel, 1 GHz – 26.5 GHz



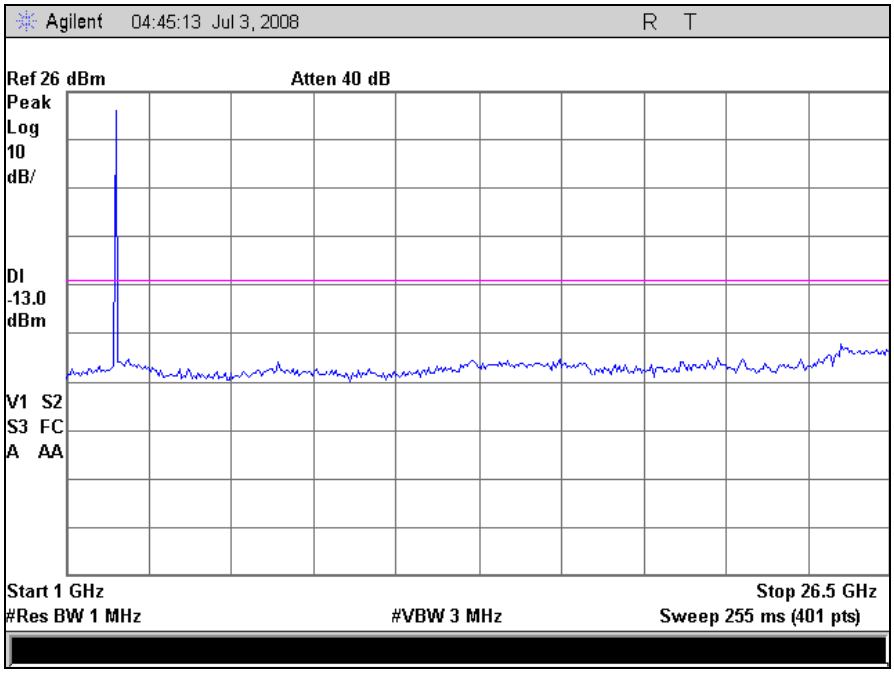
Plot 51. Conducted Spurious, Downlink, 5 MHz Signal, High Channel, 30 MHz – 1 GHz



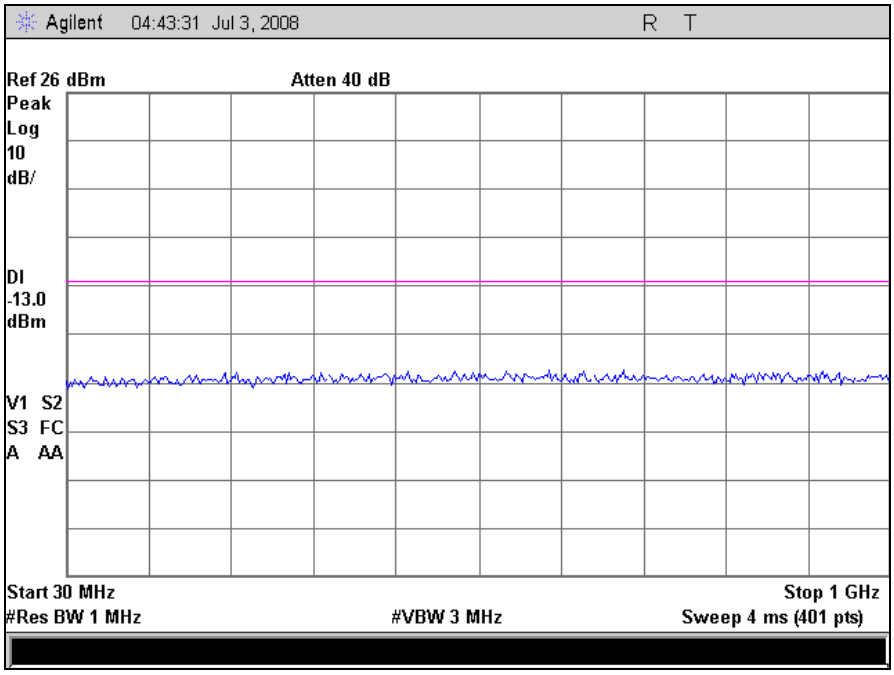
Plot 52. Conducted Spurious, Downlink, 5 MHz Signal, High Channel, 1 GHz – 26.5 GHz



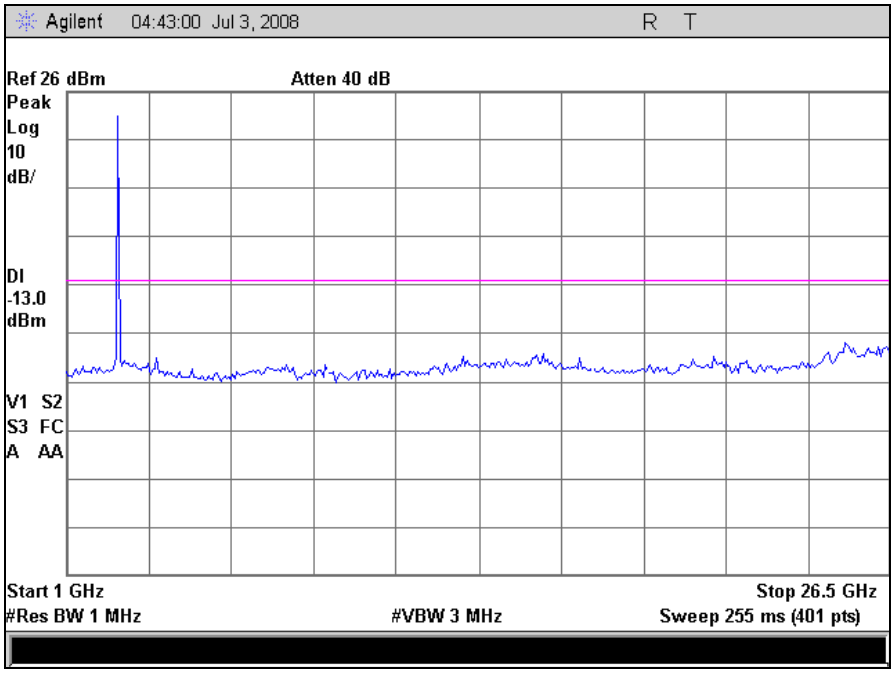
Plot 53. Conducted Spurious, Uplink, 1.25 MHz Signal, Low Channel, 30 MHz – 1 GHz



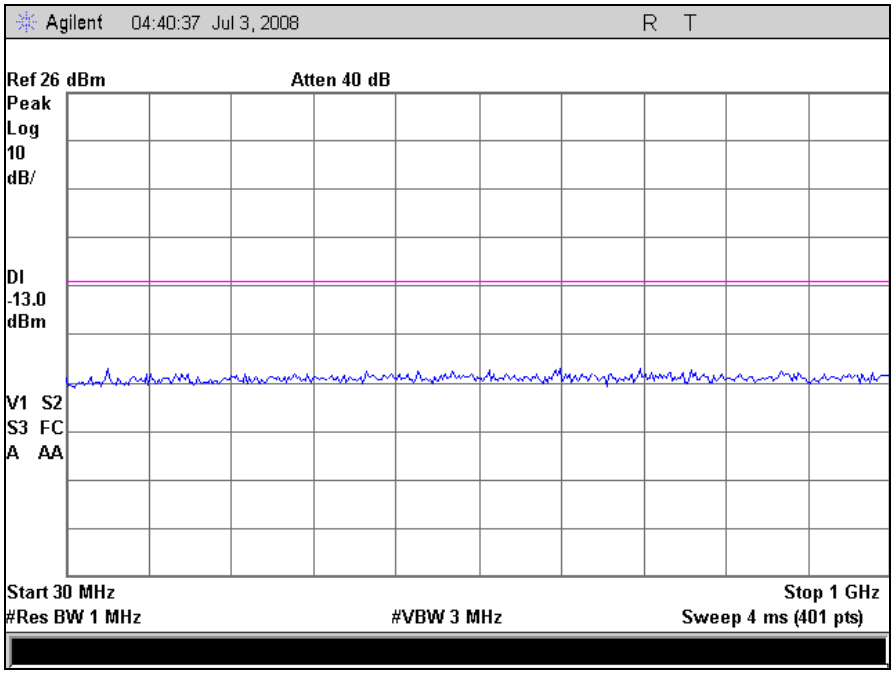
Plot 54. Conducted Spurious, Uplink, 1.25 MHz Signal, Low Channel, 1 GHz – 26.5 GHz



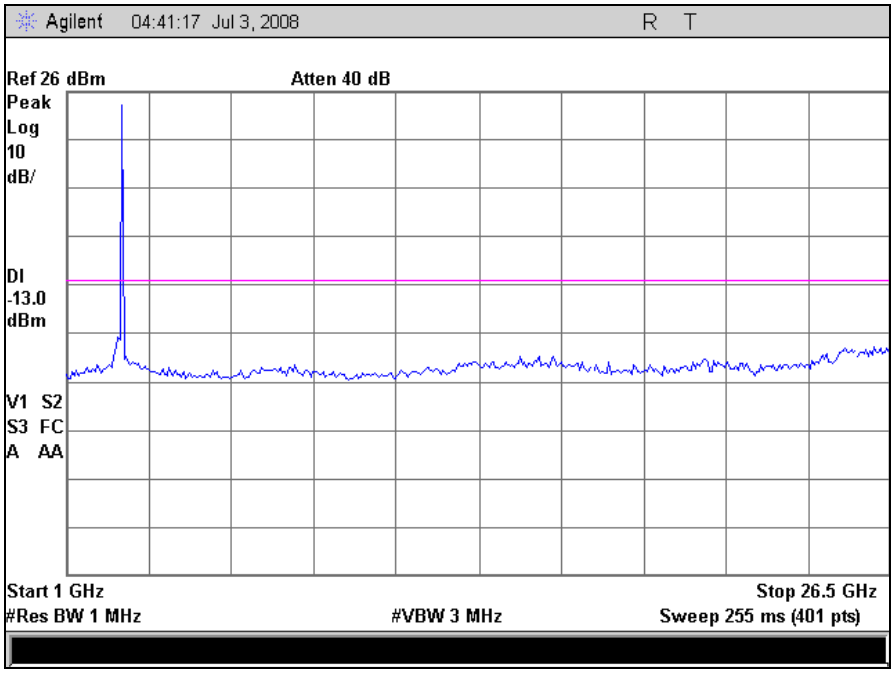
Plot 55. Conducted Spurious, Uplink, 1.25 MHz Signal, Mid Channel, 30 MHz – 1 GHz



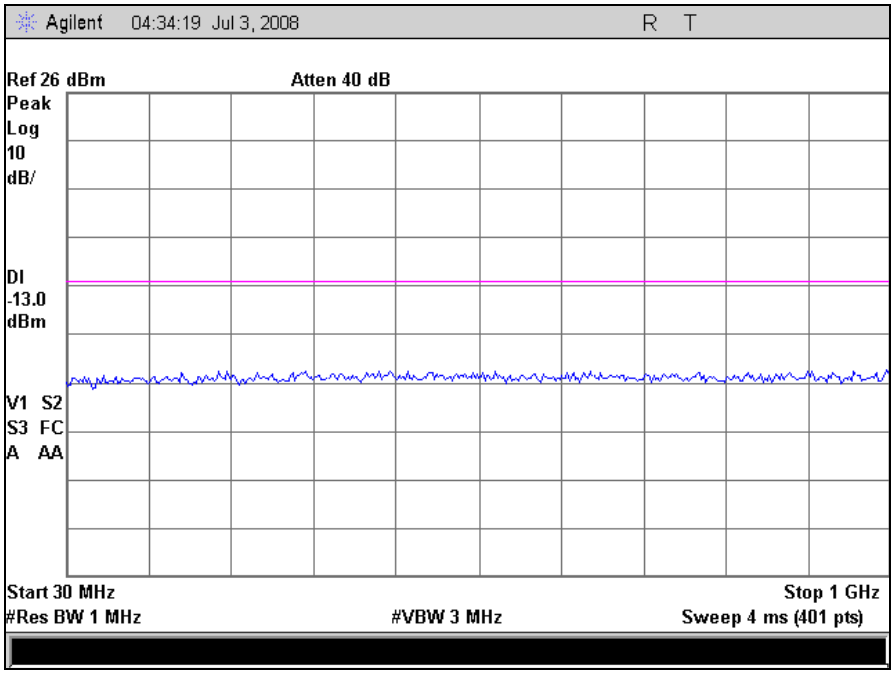
Plot 56. Conducted Spurious, Uplink, 1.25 MHz Signal, Mid Channel, 1 GHz – 26.5 GHz



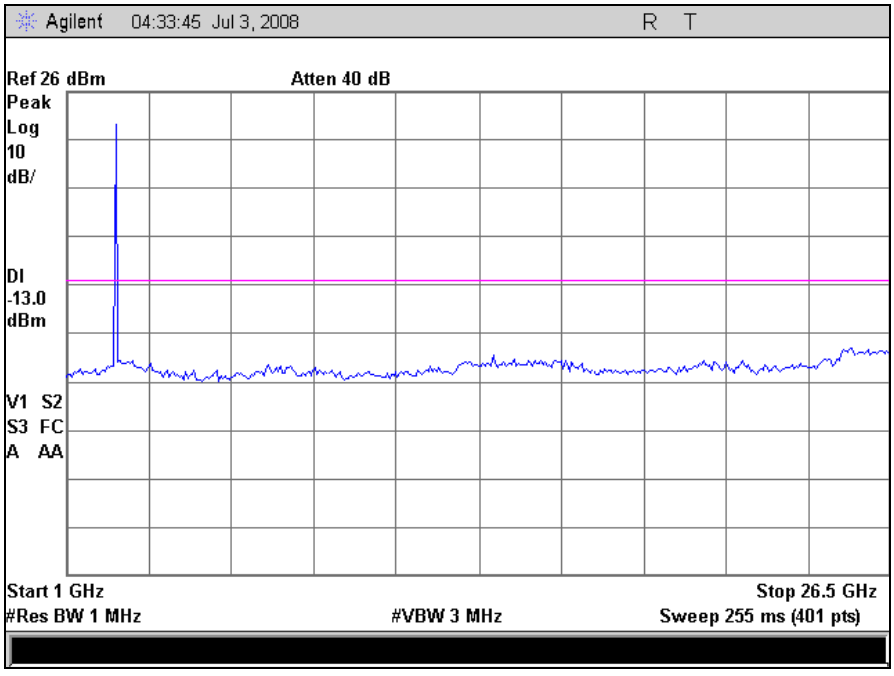
Plot 57. Conducted Spurious, Uplink, 1.25 MHz Signal, High Channel, 30 MHz – 1 GHz



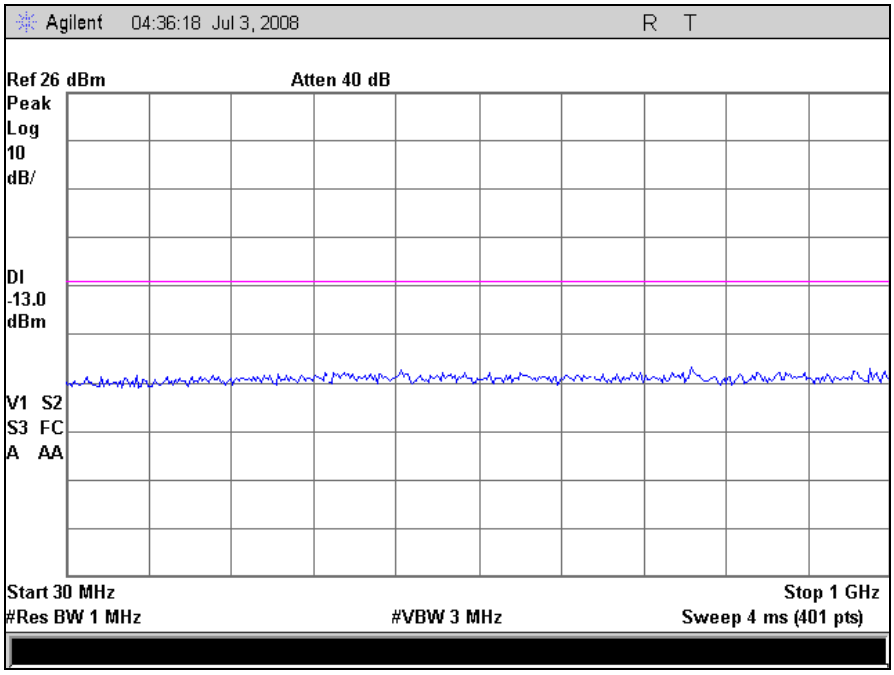
Plot 58. Conducted Spurious, Uplink, 1.25 MHz Signal, High Channel, 1 GHz – 26.5 GHz



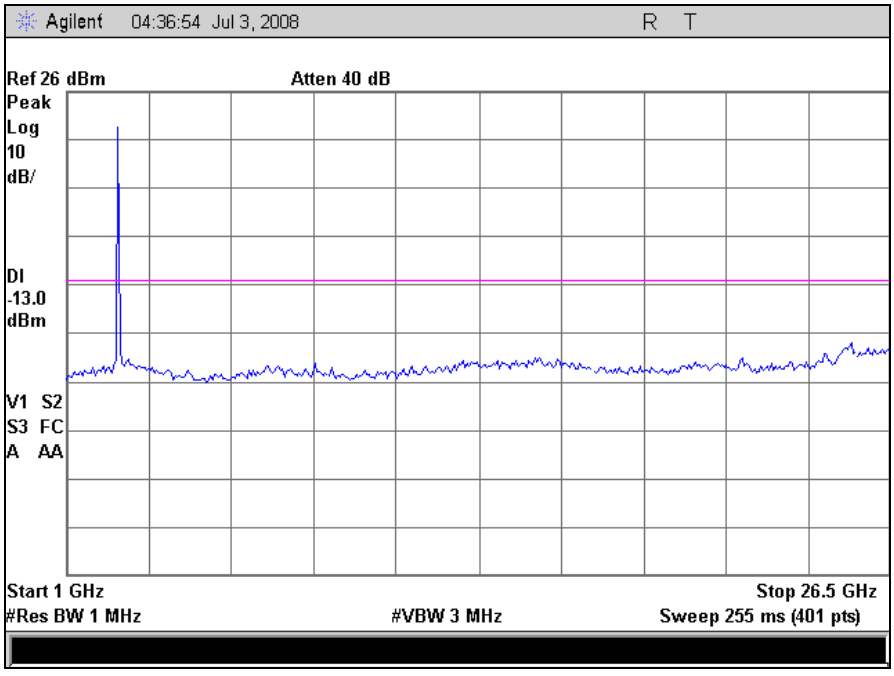
Plot 59. Conducted Spurious, Uplink, 5 MHz Signal, Low Channel, 30 MHz – 1 GHz



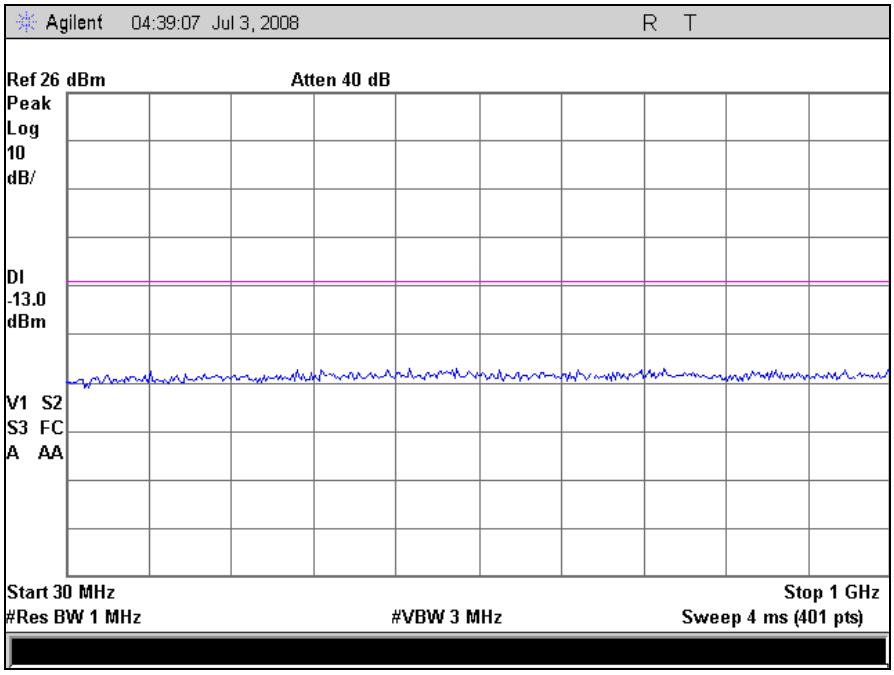
Plot 60. Conducted Spurious, Uplink, 5 MHz Signal, Low Channel, 1 GHz – 26.5 GHz



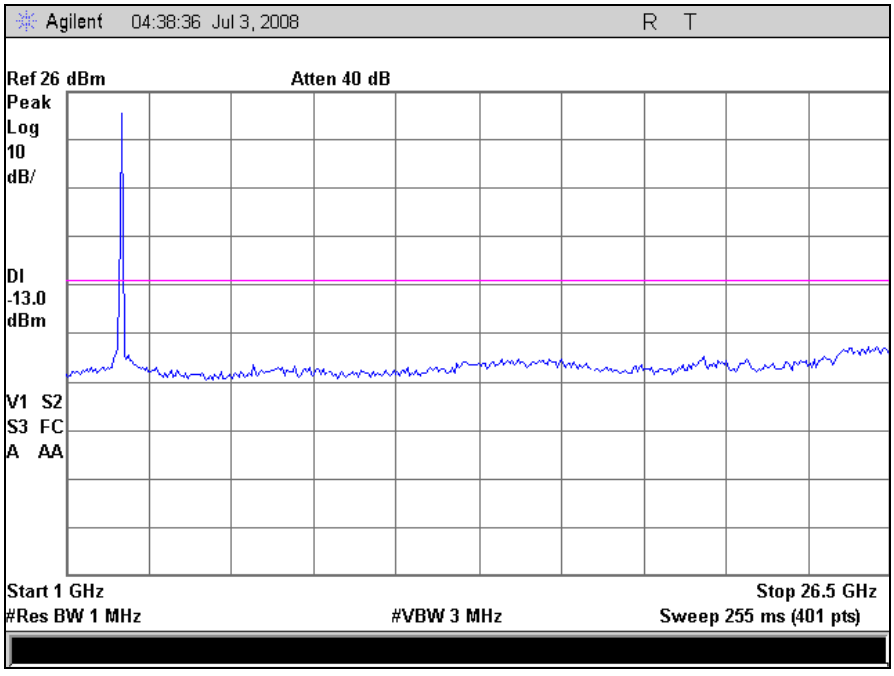
Plot 61. Conducted Spurious, Uplink, 5 MHz Signal, Mid Channel, 30 MHz – 1 GHz



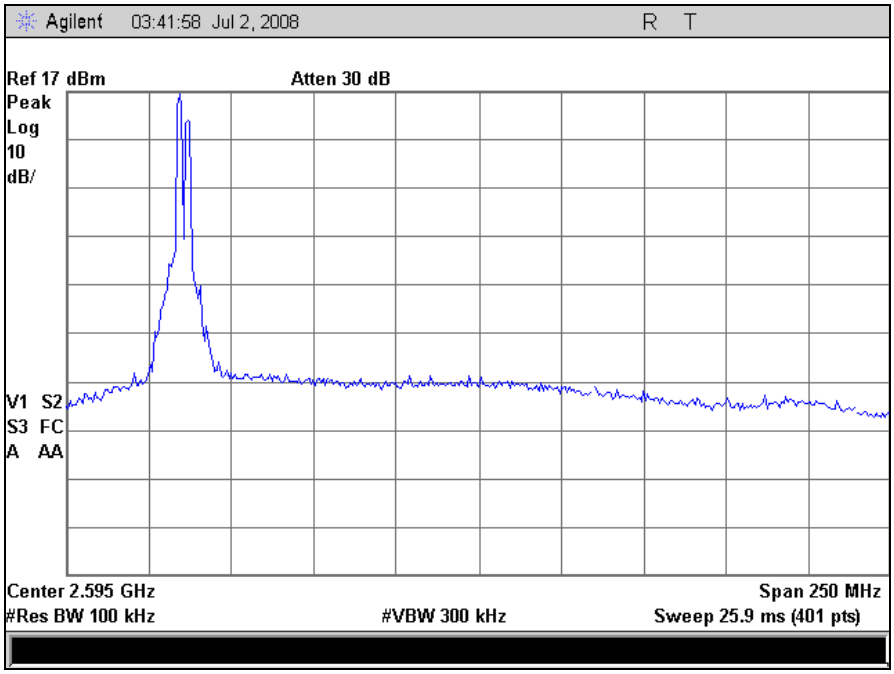
Plot 62. Conducted Spurious, Uplink, 5 MHz Signal, Mid Channel, 1 GHz – 26.5 GHz



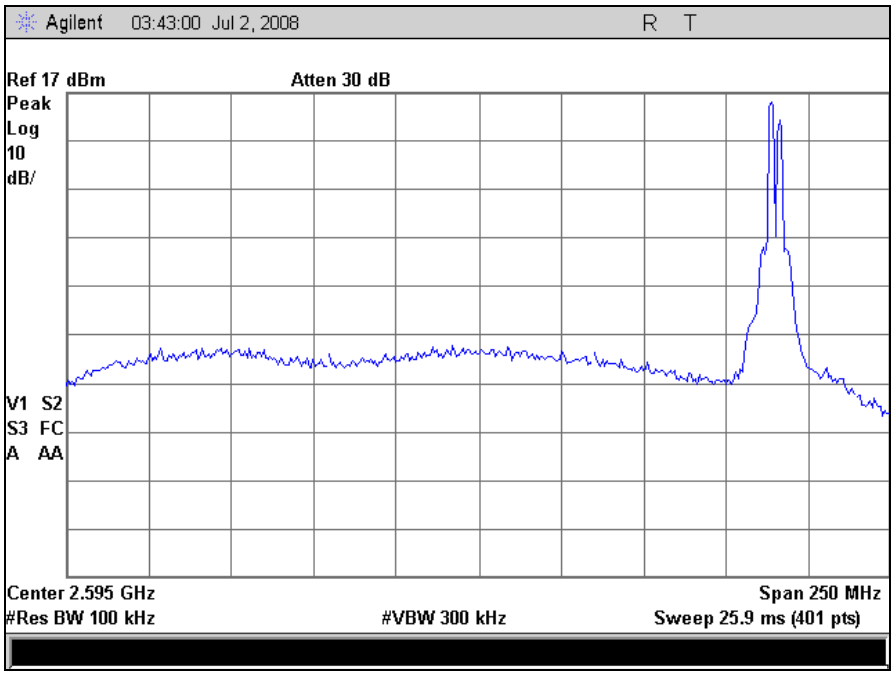
Plot 63. Conducted Spurious, Uplink, 5 MHz Signal, High Channel, 30 MHz – 1 GHz



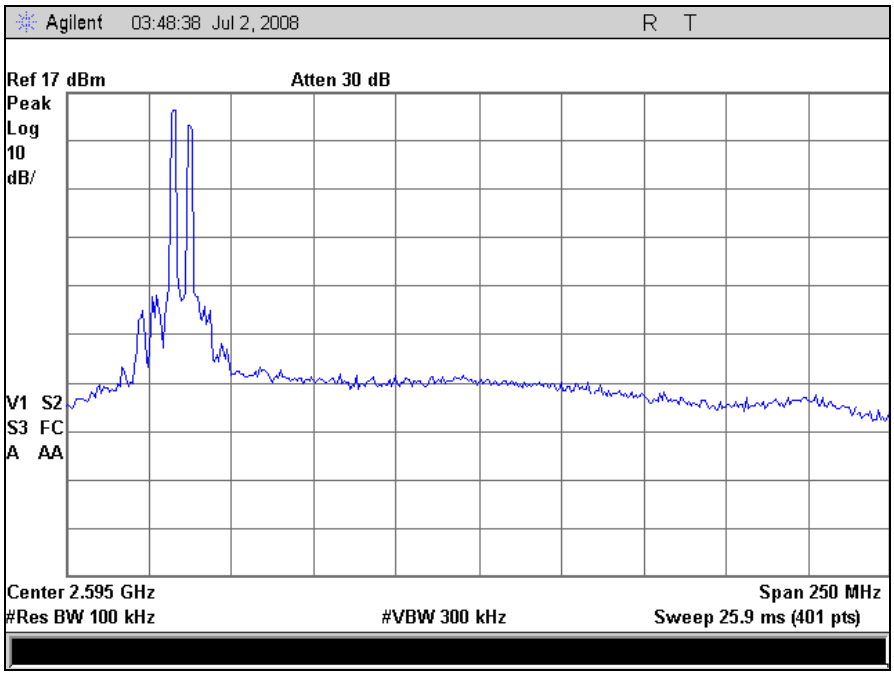
Plot 64. Conducted Spurious, Uplink, 5 MHz Signal, High Channel, 1 GHz – 26.5 GHz



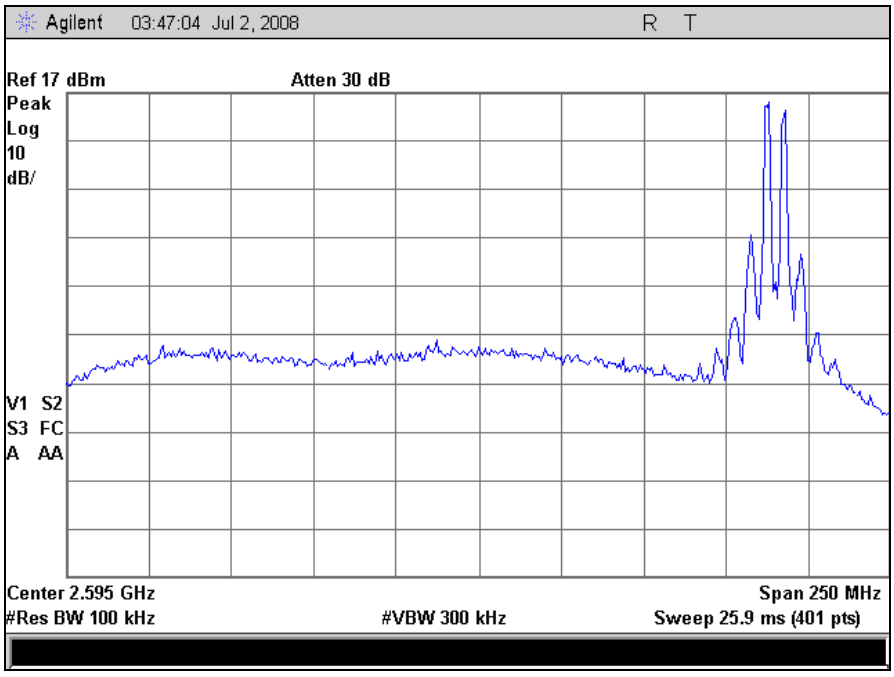
Plot 65. Inter-modulation, Downlink, 1.25 MHz Signal, Low Band



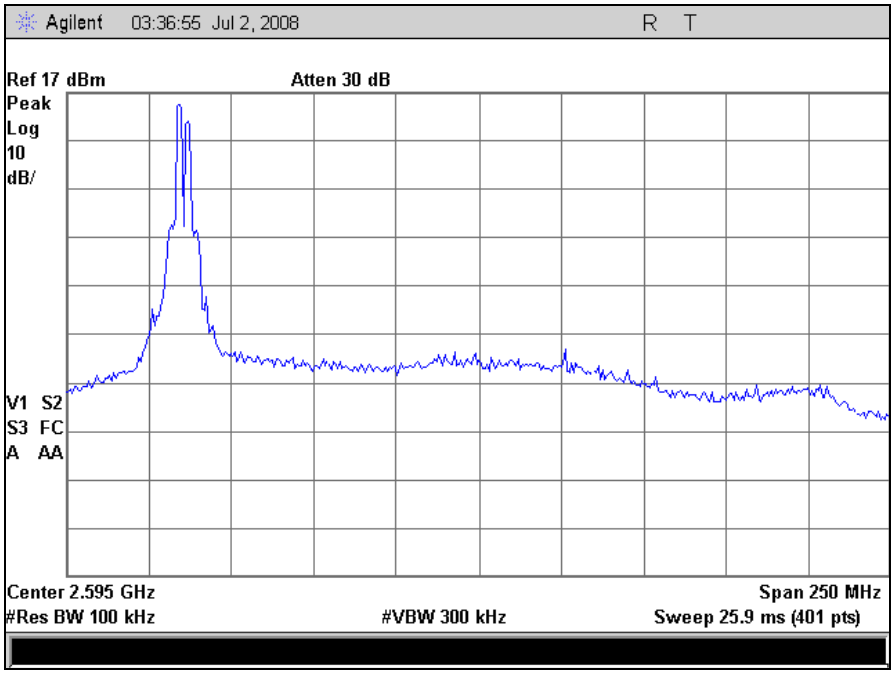
Plot 66. Inter-modulation, Downlink, 1.25 MHz Signal, High Band



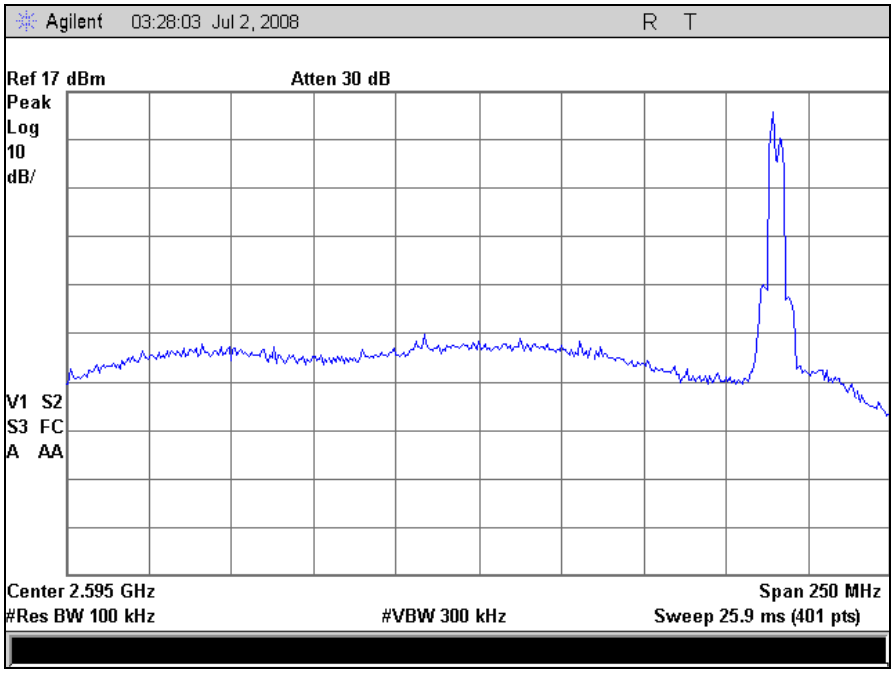
Plot 67. Inter-modulation, Downlink, 5 MHz Signal, Low Band



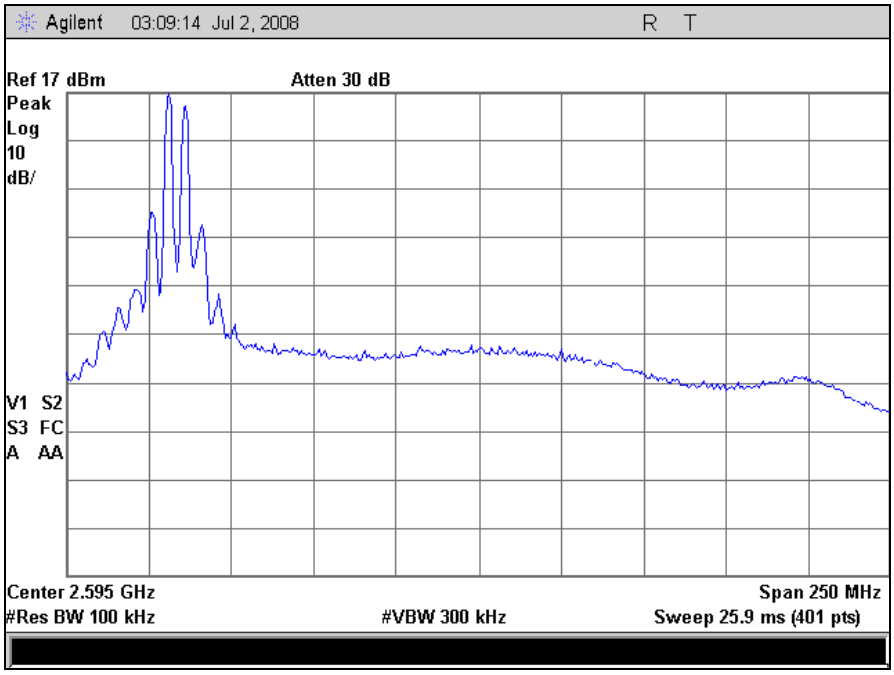
Plot 68. Inter-modulation, Downlink, 5 MHz Signal, High Band



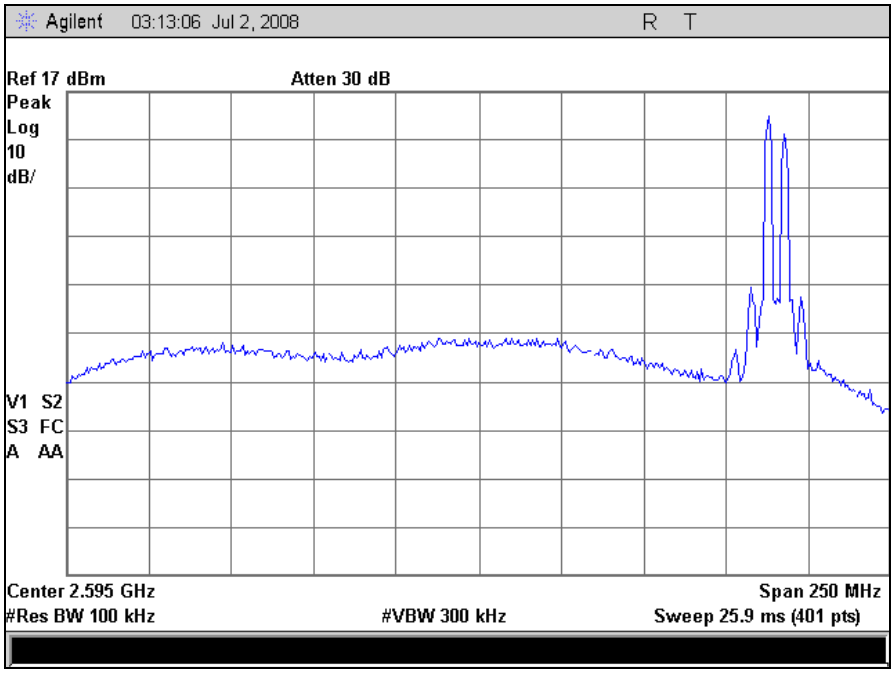
Plot 69. Inter-modulation, Uplink, 1.25 MHz Signal, Low Band



Plot 70. Inter-modulation, Uplink, 1.25 MHz Signal, High Band



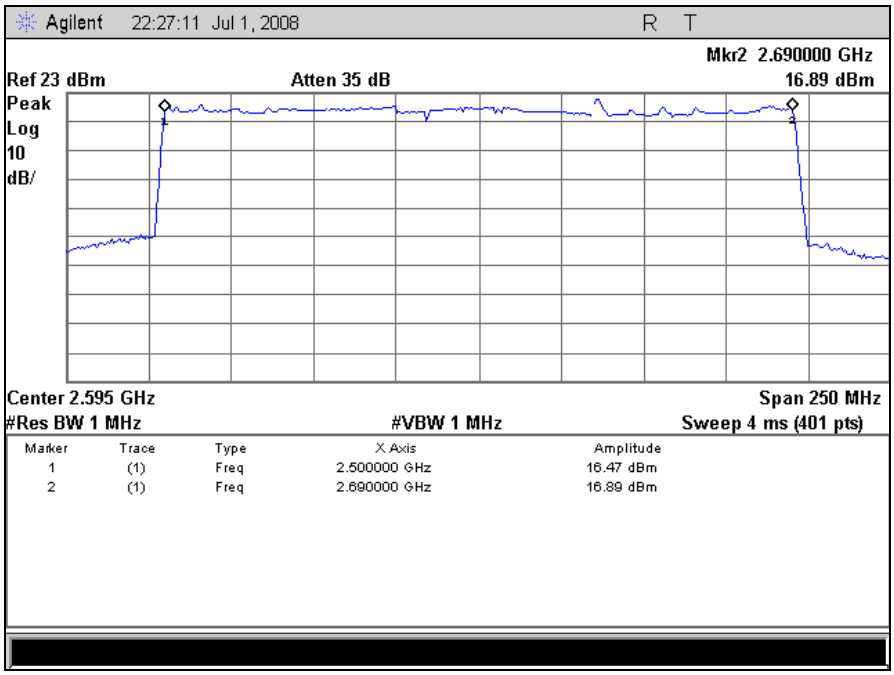
Plot 71. Inter-modulation, Uplink, 5 MHz Signal, Low Band



Plot 72. Inter-modulation, Uplink, 5 MHz Signal, High Band

Electromagnetic Compatibility Criteria for Intentional Radiators

2-11-04/EAB/RF Out of Band Rejection



Plot 73. Out of Band Rejection

4. Electromagnetic Compatibility Intentional Radiators

4.5. Radiated Emissions (Substitution Method)

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

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

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

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

Test Procedures:

As required by 47 CFR 2.1053, the *field strengths of radiated spurious emissions* 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 (equivalent to an Open Area Test Site). The distance between the EUT and the test antenna was 3 meter. The EUT's RF port was connected to a dummy load. The intensities of the radiated emissions were maximized by rotating the turntable 360 degrees and varying the receive antenna from 1 to 4m. Measurements were made with the receive antenna in both horizontal and vertical polarizations.

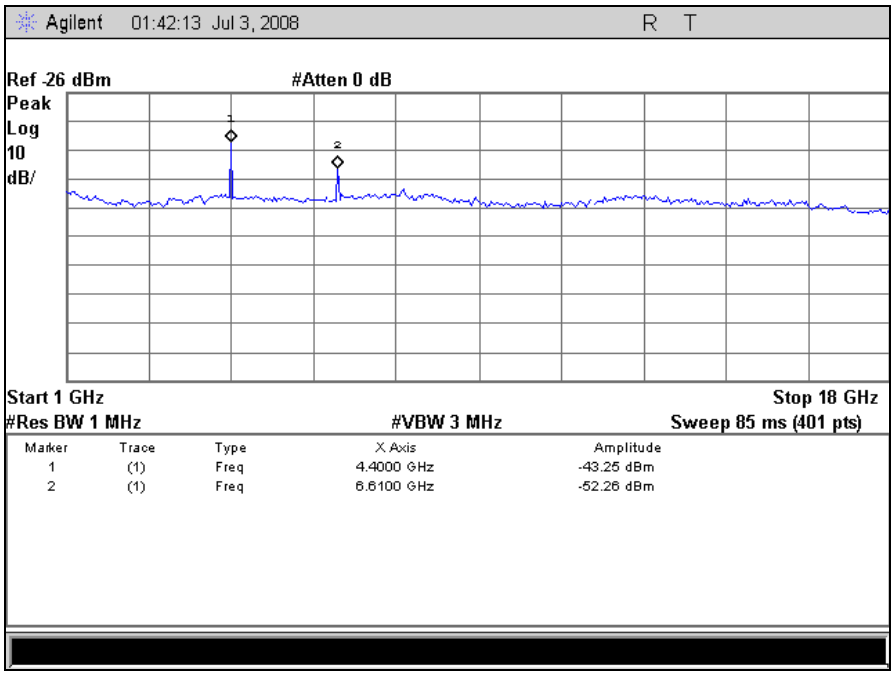
In order to determine the magnitude of the radiated emissions, a calibrated antenna source was positioned in place of the EUT and fed with a modulated carrier equal to that of the EUT. The effective isotropic radiated power of each emission was determined by adding the forward power to the substitution antenna at the previously recorded amplitude, and adding the gain of the antenna at the given frequency.

Test Results:

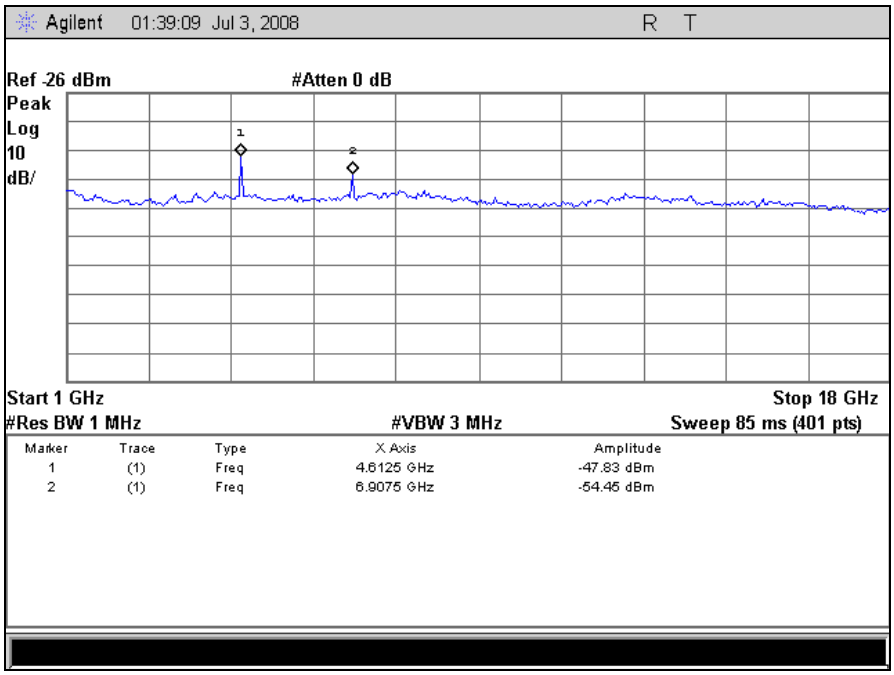
Equipment complies with Section 2.1053. The limit for spurs is -13 dBm. Measurements revealed that no spurs came even close to this limit. Therefore, measurements using substitution method were not performed. Also, testing was performed using a CW signal with a 5 MHz OB. The following plots have not been corrected. Measurements were made with a pre-amp.

Test Engineer: Dusmantha Tennakoon

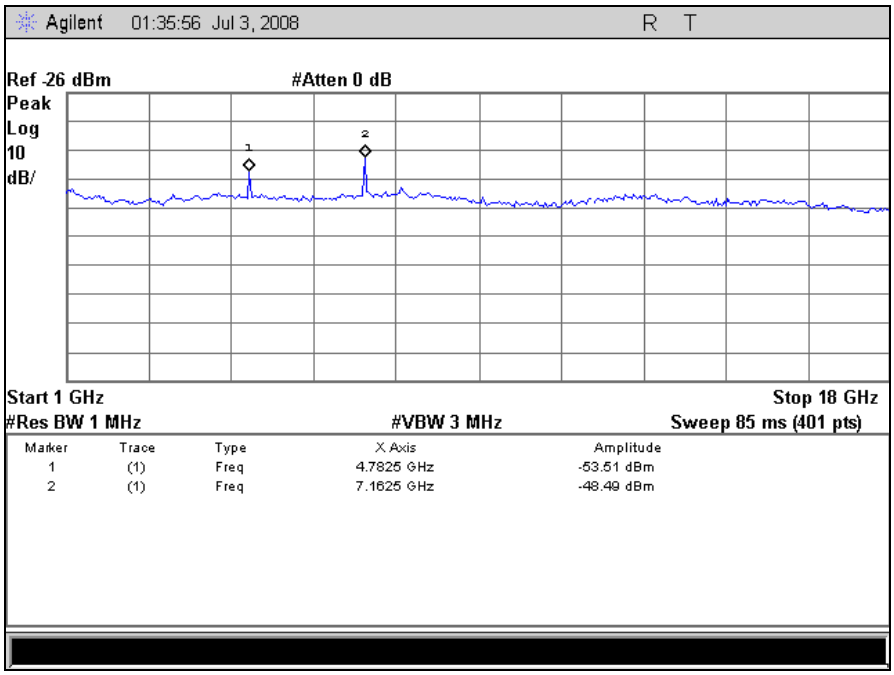
Test Date(s): July 2, 2008



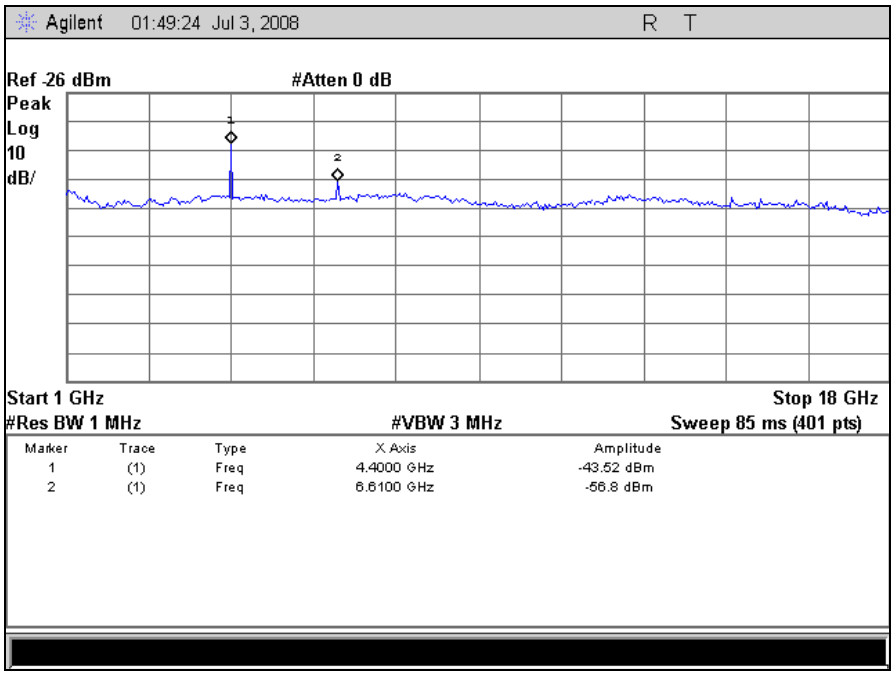
Plot 74. Radiated Spurious, Downlink, Low Channel, 1 – 18 GHz



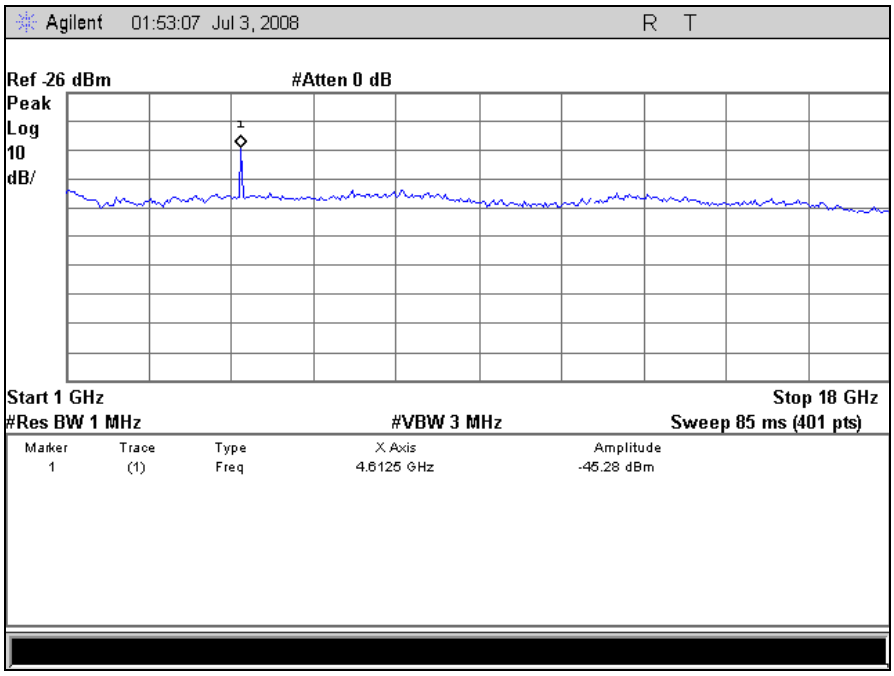
Plot 75. Radiated Spurious, Downlink, Mid Channel, 1 – 18 GHz



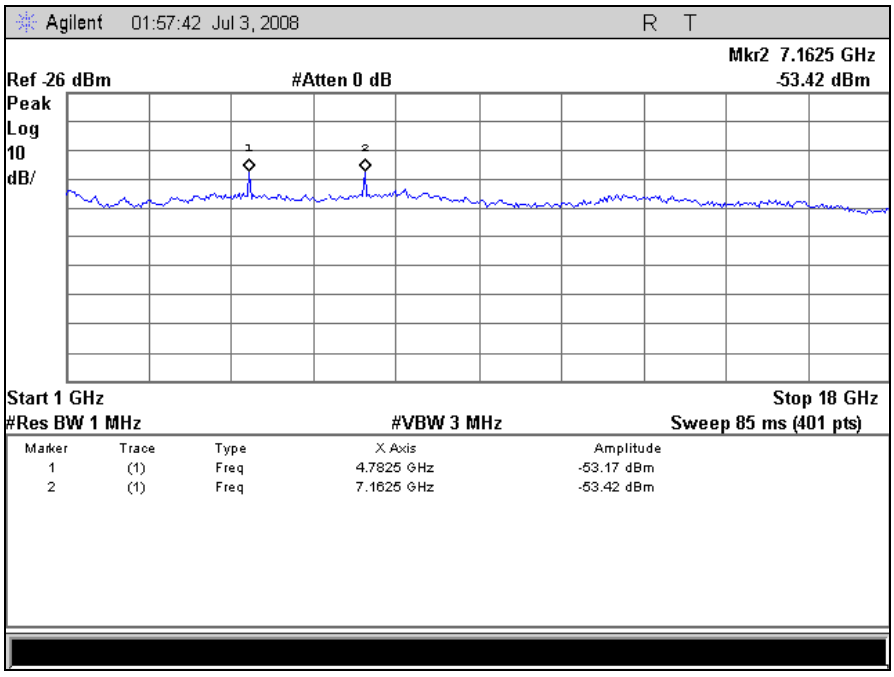
Plot 76. Radiated Spurious, Downlink, High Channel, 1 – 18 GHz



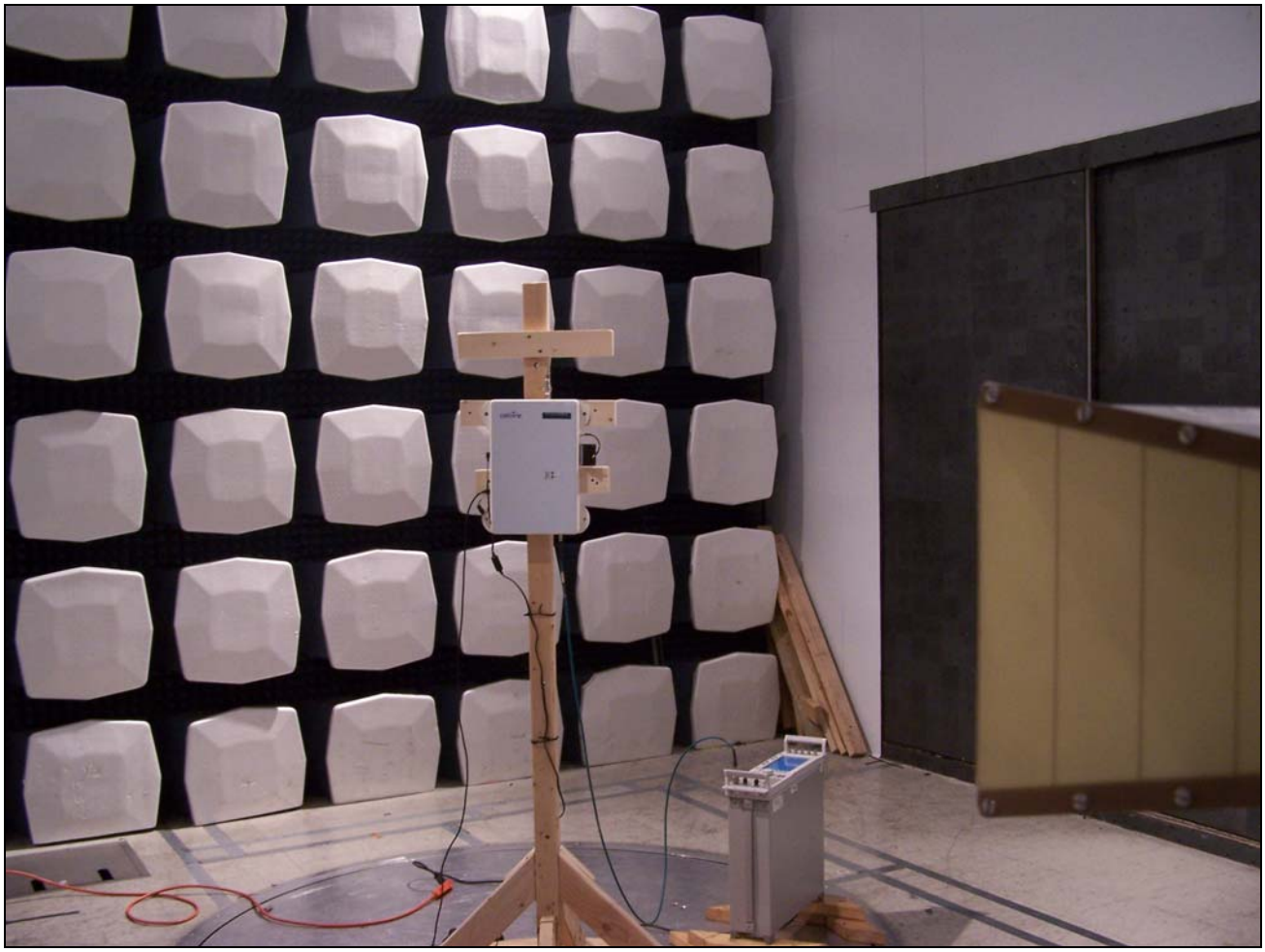
Plot 77. Radiated Spurious, Uplink, Low Channel, 1 – 18 GHz



Plot 78. Radiated Spurious, Uplink, Mid Channel, 1 – 18 GHz



Plot 79. Radiated Spurious, Uplink, High Channel, 1 – 18 GHz



Photograph 5. Radiated Emissions Test Setup

4. Electromagnetic Compatibility Intentional Radiators

4.6. Frequency Stability

Test Requirement(s): §2.1055

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

The EUT was incapable of generating a CW signal in order to use a frequency counter. As a result, alternative measures were taken in order to demonstrate that the fundamental emissions stayed within the authorized frequency block.

The EUT was placed in the Environmental Chamber and the support equipment was placed outside the chamber. The temperature chamber was set from -30 to 50^{C} in 10^{C} increment. The EUT was allowed sufficient time at each temperature setting in order to stabilize. At each temperature level the transmitter was set to the lowest and highest frequencies to the transmit band. The resulting carriers were captured on a spectrum analyzer in order to detect if fundamental emissions remained within the authorized frequency block.

In addition, the voltage supplied to EUT was varied by ± 15 % of nominal voltage. These tests were carried out at normal room temperatures.

Test Results: Equipment is not applicable with Section 2.1055. There is no frequency translation of any sort in this device. The unit only amplifies the received signal. No other characteristics of the signal are changed.

5. 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
1T4214	SHIELD ROOM #4	UNIVERSAL SHIELD INC	N/A	01/25/2008	01/25/2009
1T4621	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4402B	02/29/2008	03/01/2009
1T4079	LISN; SWITCH	SOLAR	8012-50-R-24-BNC	04/22/2008	04/22/2009
1T4578	THERMO/HYGROMETER	CONTROL COMPANY	S6-627-9	09/24/2006	09/24/2008
1T4502	COMB GENERATOR	COM-POWER	CGC-255	08/30/2007	08/30/2008
1T2342	LPA ANTENNA	EMCO	3146	04/25/2008	04/25/2009
1T4635	BICONNICAL ANTENNA	EMCO	3110	04/24/2008	04/24/2009
1T4632	THERMO/HYGROMETER	CONTROL COMPANY	S6-627-9	09/25/2007	09/25/2009
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	04/18/2008	04/18/2009
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	02/17/2006	01/17/2009
1T4612	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4407B	01/04/2008	01/04/2009
1T4299	SIGNAL GENERATOR	HEWLETT PACKARD	E4432B	10/24/2007	10/24/2008
1T2665	HORN ANTENNA	EMCO	3115	05/07/2008	05/07/2009
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4592	RF FILTER KIT	VARIOUS	N/A	SEE NOTE	
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	02/17/2006	01/17/2009

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

6. Certification Label & User's Manual Information

6.2. 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.

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, or the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant, whichever is applicable.

§ 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.

§ 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.

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

(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

6.2. 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:

(ii 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.

(ii 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.

(ii 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.

