Engineering and Testing for EMC and Safety Compliance

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Class II Permissive Change Report

Model: VIDA Broadband High Power Client
4940-4990 MHz

M/A-COM, Inc.
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FCC ID: BV8VIDA-BB-CL
IC: 3670A-VIDABBCL

February 16, 2009

Standards Referenced for this Report	
Part 2: 2007	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2007	Private Land Mobile Radio Services
ANSI TIA-603-C-2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA/EIA – 102.CAAA; 2002	Digital C4FM/CQPSK Transceiver Measurement Methods
Industry Canada RSS-111 Issue 1 June 2006	Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41- 960 MHz

Frequency Range	Rated Peak Transmit Power (W)	Measured Frequency Tolerance (ppm)	Emission Designator
4940-4990 MHz	0.5	12.2	5M00X7D
4940-4990 MHz	0.5	12.2	10M0X7D

Report Prepared by Test Engineer: Daniel Baltzell

Document Number: 2008221

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1 General Information

The following FCC Class II Permissive Change & IC Reassessment report is prepared on behalf of **M/A-COM, Inc.** in accordance with the Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was the **VIDA Broadband High Power Client 4940-4990 MHz; FCC ID: BV8VIDA-BB-CL**, **IC: 3670A-VIDABBCL**. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with the applicable portions of FCC Rules and Regulations CFR 47 Parts 2 and 90, and Industry Canada RSS-111. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

1.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

1.2 Related Submittal(s)/Grant(s)

Under this FCC Class II Permissive Change & IC Reassessment, the 10 MHz bandwidth operation was enabled via configuration settings in the existing software. No hardware changes were made to enable this mode.

The original FCC grant and IC certificate were issued April 12, 2007 under Rheintech document number 2007133. The original certification included 3 models, MAVM-VMXCH, MAVM-VMCHH, and MAVM-VMCHN. This FCC Class II Permissive Change & IC Reassessment applies to these three models.

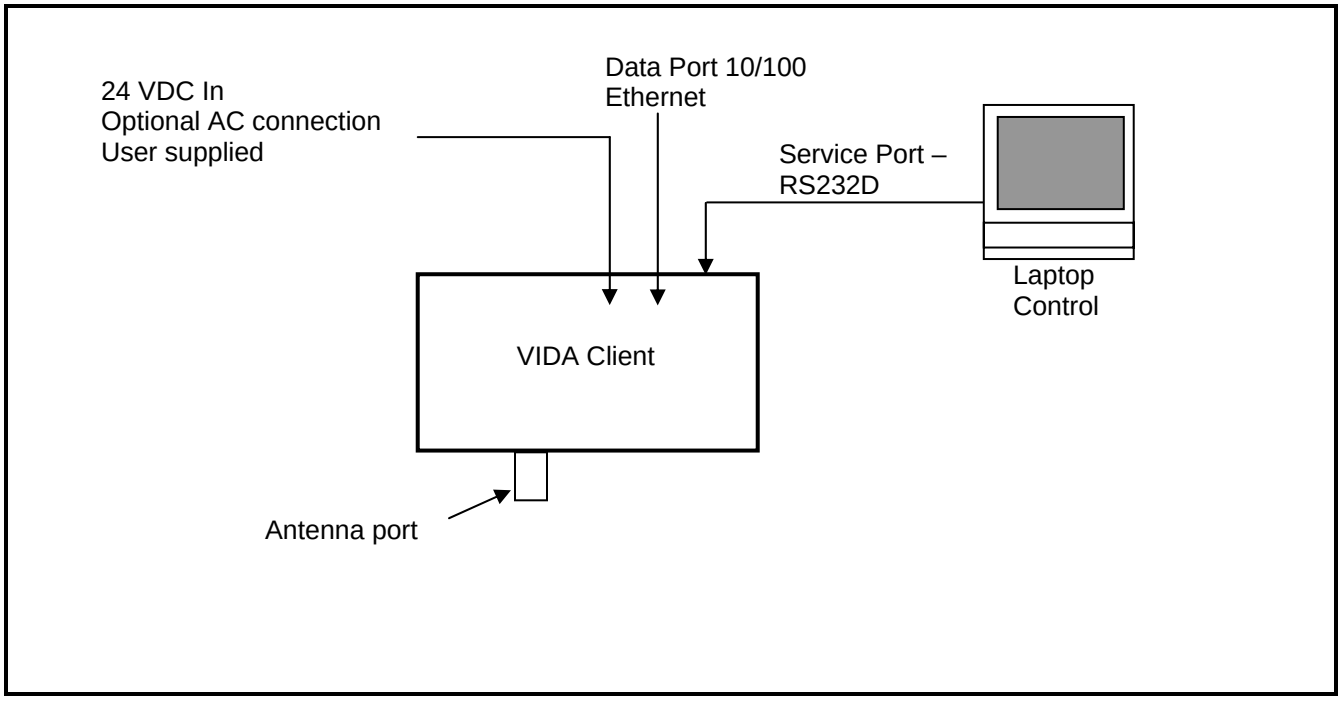
2 Tested System Details

The test sample was received on January 12, 2009. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable. The device was programmed for multiple modes of operation and modulation types.

Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	Serial Number	FCC ID	Cable	RTL Bar Code
Radio	M/A-COM, Inc.	VIDA Broadband High Power Client 4940-4990 MHz, System, MAVM-VMXCH	BS-010700-002	BV8VIDA-BB-CL	N/A	18772

Figure 2-1: Configuration of Tested System



3 FCC Rules and Regulations Part 2 §2.1046(a): RF Power Output: Conducted; Part 90 §90.1215(a): Peak Output Power; RSS-111 §4.3: Transmitter Output Power and Channel Bandwidth

§90.1215: The transmitting power of stations operating in the 4940-4990 MHz band must not exceed the maximum limits in this section.

(a) The peak transmit power should not exceed:

Channel Bandwidth (MHz)	Low Power Device Peak Transmitter Power (dBm)	High Power Device Peak Transmitter Power (dBm)
1……	7.0	20.0
5……	14.0	27.0
10……	17.0	30.0
15……	18.8	31.8
20……	20.0	33.0

3.1 Test Procedure

TIA-603-C Section 2.2.1

The EUT transmitter output was connected through an appropriate 50 ohm attenuator to a spectrum analyzer. The peak transmit power was measured as a conducted emission over the interval of continuous transmission in terms of an RMS equivalent voltage with a 1 second sweep and a resolution bandwidth of 8 MHz.

A 10 dB attenuator was used between the EUT and the spectrum analyzer for all power measurements. No cable was used between the EUT and the analyzer.

The system loss was measured to be 10.2 dB and entered as an offset into the spectrum analyzer.

3.2 Test Data

The EUT complies with 47CFR2.1046 and 90.1215(a). The EUT does not exceed 30 dBm at carrier frequency.

Table 3-1: RF Power Output: Carrier Output Power

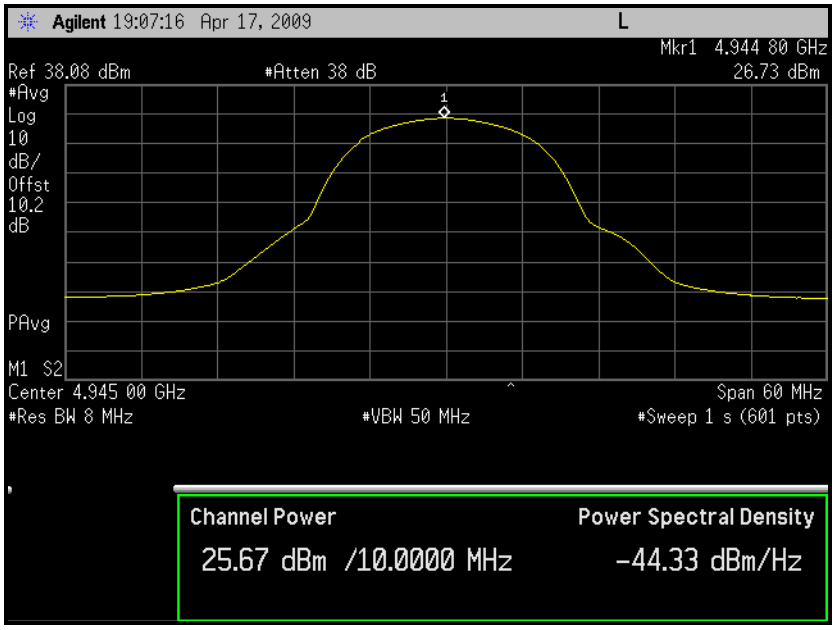
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)
1	4945	26.73	30
3	4965	26.54	30
5	4985	26.45	30

*Measurement accuracy: +/-.3 dB

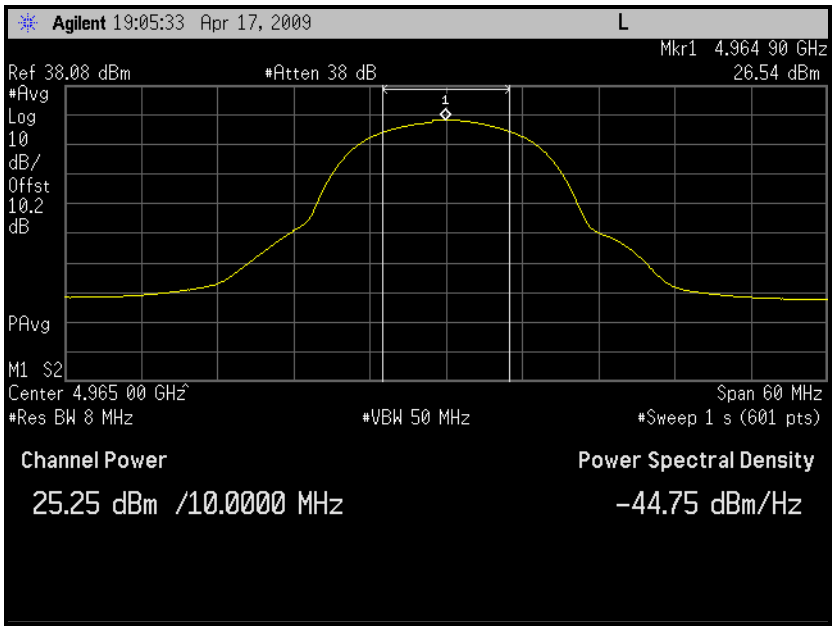
Table 3-2: RF Power Output (Rated Power)

Rated Power
0.5 W

Plot 3-1: Channel Power Output; Channel 1 - 4945 MHz



Plot 3-2: Channel Power Output; Channel 3 - 4965 MHz



Plot 3-3: Channel Power Output; Channel 5 - 4985 MHz

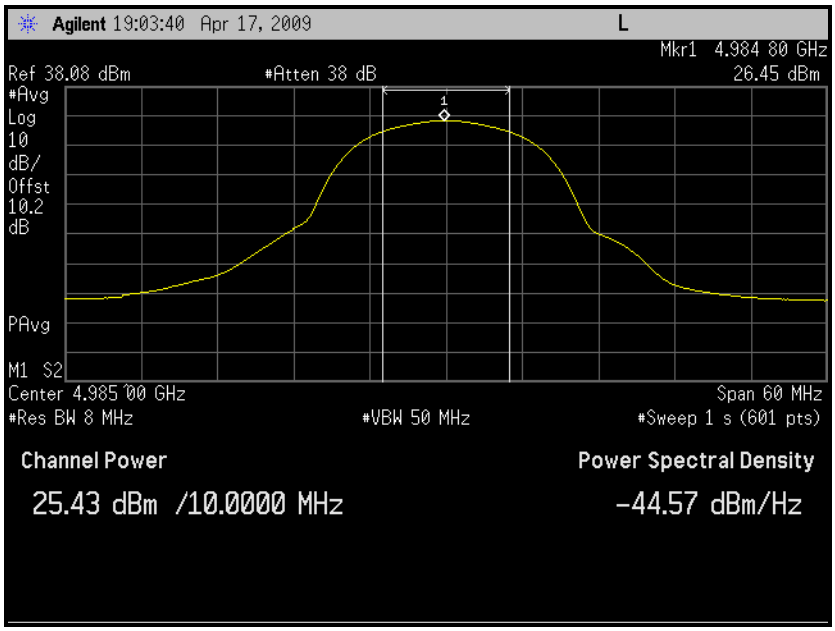


Table 3-3: Test Equipment for Testing RF Power Output – Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901413	Agilent Technologies	E4448	Spectrum Analyzer	US44020346	7/31/09
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	12/3/09

Test Personnel:

Daniel Baltzell		January 13, 2009
Test Engineer	Signature	Date Of Tests

4 FCC Rules and Regulations Part 90 §90.1215(a): Peak Power Spectral Density; RSS-111 §4.3: Transmitter Output Power and Channel Bandwidth

High power devices are limited to a peak power spectral density of 21 dBm per 1 MHz.

The peak power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device can not be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

Limit determined by antenna gain:

Antenna Gain (dBi)	Limit (dBm)
Up to 26 dBi	21

4.1 Test Procedure

The EUT transmitter output was connected through the appropriate 50 ohm attenuator to a spectrum analyzer. Resolution bandwidth was set to 1% of occupied bandwidth and video bandwidth was set to a value greater than the resolution bandwidth. Peak search was used to find peak spectral density within 5 MHz signal bandwidth and centered within the 1 MHz span of measurement; the spectrum analyzer integrated measurement plot was taken.

10 dB attenuation was used between the EUT and the spectrum analyzer for all PSD measurements. No cable was used between the EUT and the analyzer.

Path loss was calculated as follows (checked across the frequency band of interest):

The system loss was measured by using a signal generator and reference cable. The attenuation was first measured with a reference cable, then measured in combination with the attenuators.

Loss (reference cable/attenuators) – Loss (reference cable) = Attenuator loss

10.9 dB – 0.7 dB = 10.2 dB total system loss (relative offset entered into analyzer)

4.2 Test Data

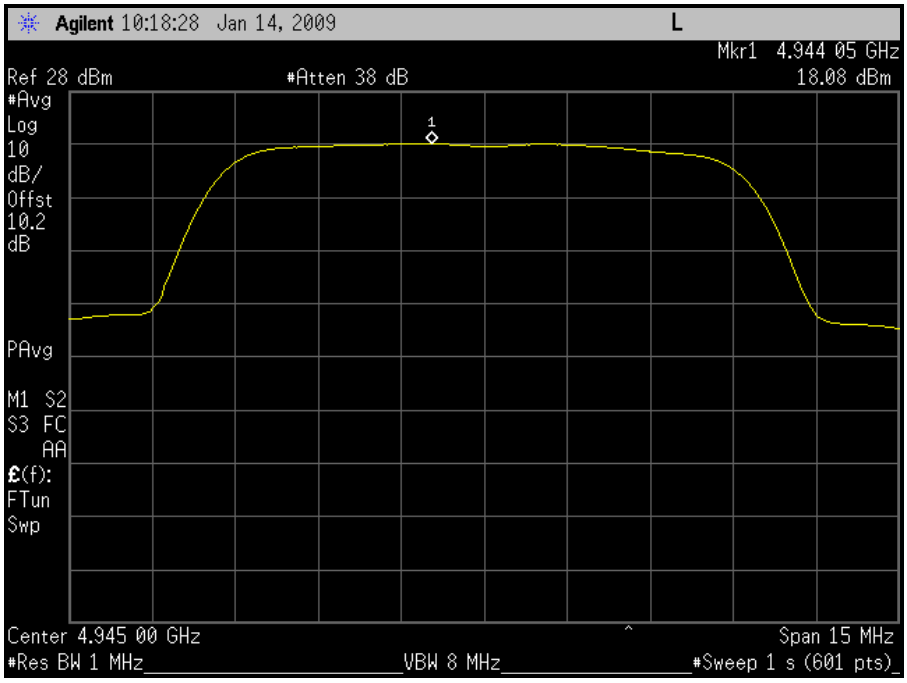
The EUT complies with 47CFR2.1046 and 90.1215(a). The EUT does not exceed 21 dBm at carrier frequency.

Table 4-1: RF Power Output: Peak Power Spectral Density

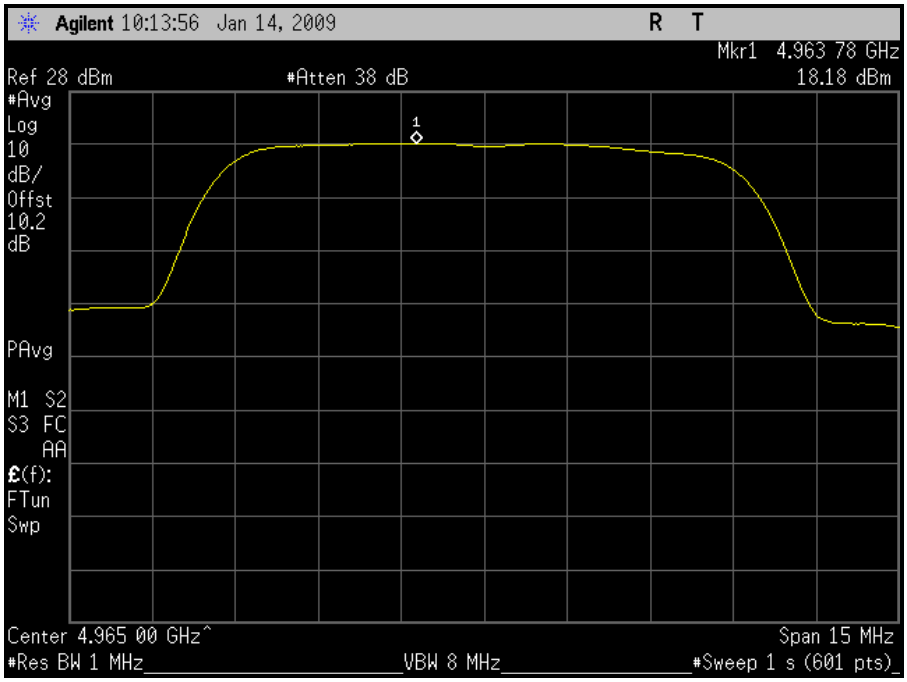
Channel	Frequency (MHz)	Channel BW (MHz)	Measured Peak Power Spectral Density (dBm per one MHz)	Limit (dBm per one MHz)
1	4945	10	18.08	21
3	4965	10	18.18	21
5	4985	10	18.11	21

* Measurement accuracy: +/-.3 dB

Plot 4-1: Peak Power Spectral Density; Channel 1 - 4945 MHz



Plot 4-2: Peak Power Spectral Density; Channel 3 - 4965 MHz



Plot 4-3: Peak Power Spectral Density; Channel 5 - 4985 MHz

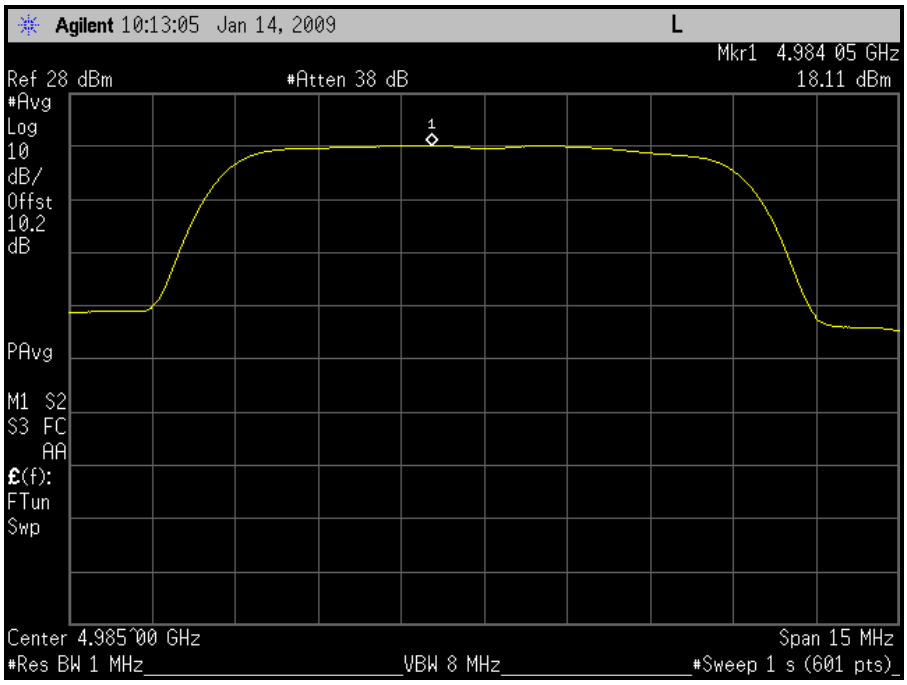


Table 4-2: Test Equipment for Testing Peak Power Spectral Density

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901413	Agilent Technologies	E4448	Spectrum Analyzer	US44020346	7/31/09
900819	Weinschel Corp	2	10 dB Attenuator; 5 W	BF0830	12/3/09

Test Personnel:

Daniel Baltzell		January 14, 2009
Test Engineer	Signature	Date Of Tests

5 FCC Rules and Regulations Part 90 §90.210(m) and Part 2 §2.1049: Occupied Bandwidth (Emissions Masks) and Conducted Spurious Emissions; RSS-111 §4.4: Transmitter Unwanted Emissions

§90.210(m) Emission Mask M: For high power transmitters (greater than 20 dBm) operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

(1) On any frequency removed from the assigned frequency between 0–45% of the authorized bandwidth (BW): 0 dB
(2) On any frequency removed from the assigned frequency between 45–50% of the authorized bandwidth: 568 log (% of (BW)/45) dB
(3) On any frequency removed from the assigned frequency between 50–55% of the authorized bandwidth: 26 + 145 log (% of (BW)/50) dB
(4) On any frequency removed from the assigned frequency between 55–100% of the authorized bandwidth: 32 + 31 log (% of (BW)/55) dB attenuation
(5) On any frequency removed from the assigned frequency between 100–150% of the authorized bandwidth: 40 + 57 log (% of (BW)/100) dB attenuation
(6) On any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 50 or 55+ 10 log (P) dB, whichever is the lesser attenuation

The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least 1% of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density is the power measured within the resolution bandwidth of the measurement device divided by the resolution bandwidth of the measurement device. Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth of at least one percent of the occupied bandwidth.

Additionally, testing to the latest FCC interpretation was followed: With regard to the L and M masks in Part 90.210, the rule indicates using a minimum RBW of 1% of the bandwidth to determine the reference level, and a minimum RBW of 1% of the bandwidth to determine the mask skirts. The mask should be developed using the same resolution bandwidth throughout, for the reference level and the mask skirts.

5.1 Test Procedure

TIA-603-C Section 2.2.11, 2.2.13 (with FCC deviations)

The EUT transmitter was connected to a spectrum analyzer through an appropriate 50 ohm attenuator. The reference level for the mask was set using the highest average power of the fundamental emission measured across the channel bandwidth using a RBW of at least 1% of the occupied bandwidth of the fundamental emission (91 kHz for this test) and a VBW of 30 kHz.

A 10 dB attenuator was used between the EUT and the spectrum analyzer for measurements. No cable was used between the EUT and the analyzer.

Path loss was calculated to be 10.2 dB and entered as an offset of the mask.

5.2 Reference Level Measurements

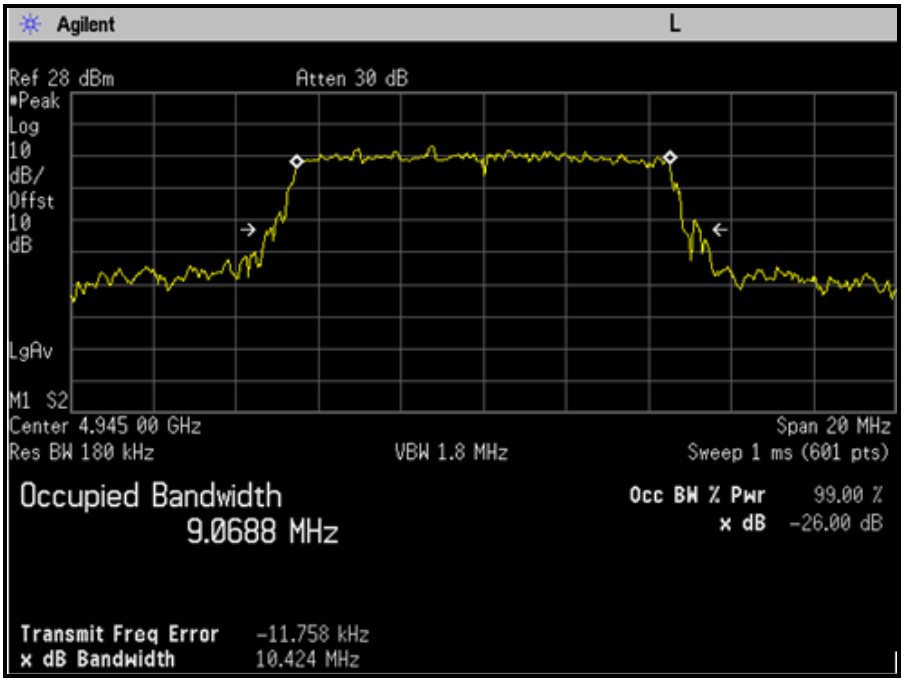
The following measurements were taken in order to determine the reference level for the mask measurements.

Table 5-1: Mask Levels Used for Mask – 10 MHz Bandwidth

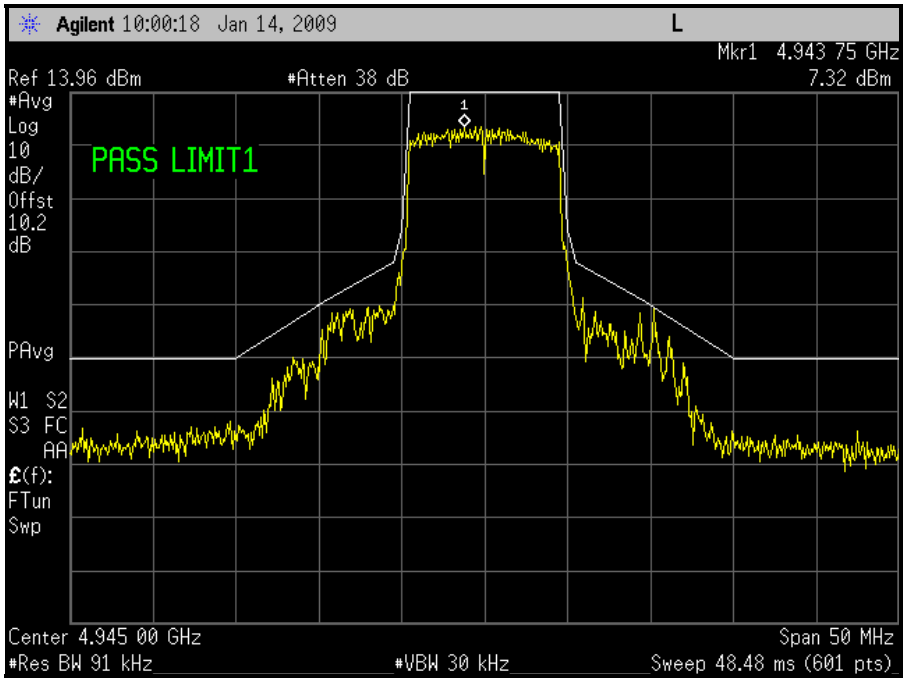
Channel	RBW (kHz)	VBW (kHz)	Level (dBm)
1	91	30	13.96
3	91	30	12.31
5	91	30	13.27

5.3 In Band Spurious Test Data

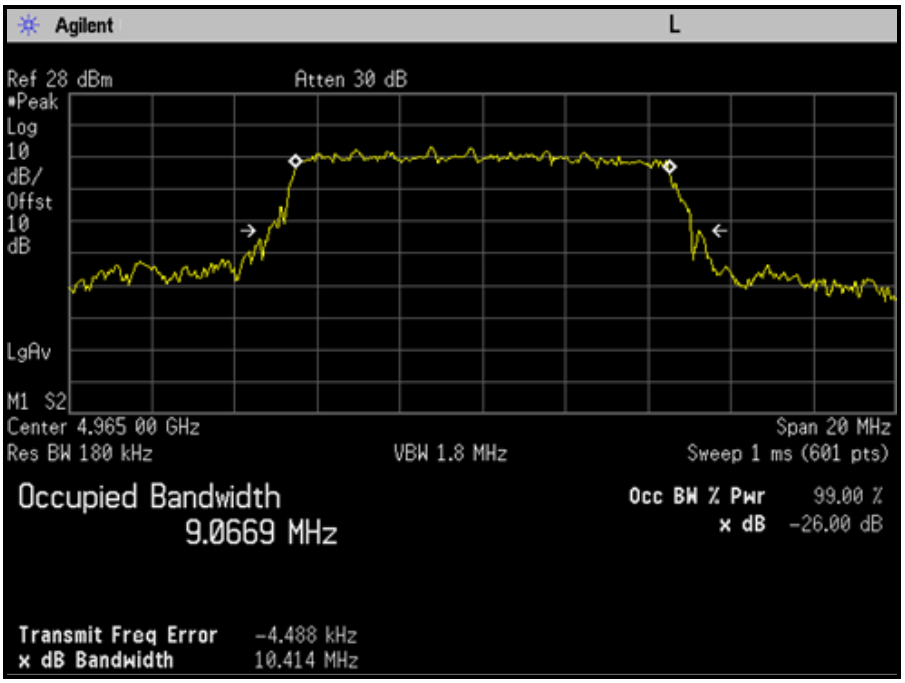
Plot 5-1: Occupied Bandwidth; Channel 1 - 4945 MHz



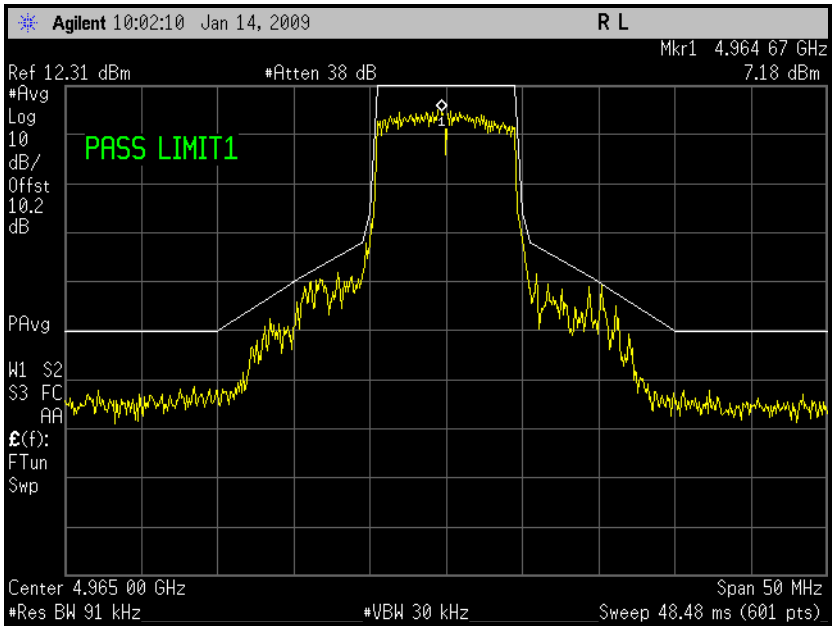
Plot 5-2: Emissions Mask M; Channel 1 - 4945 MHz



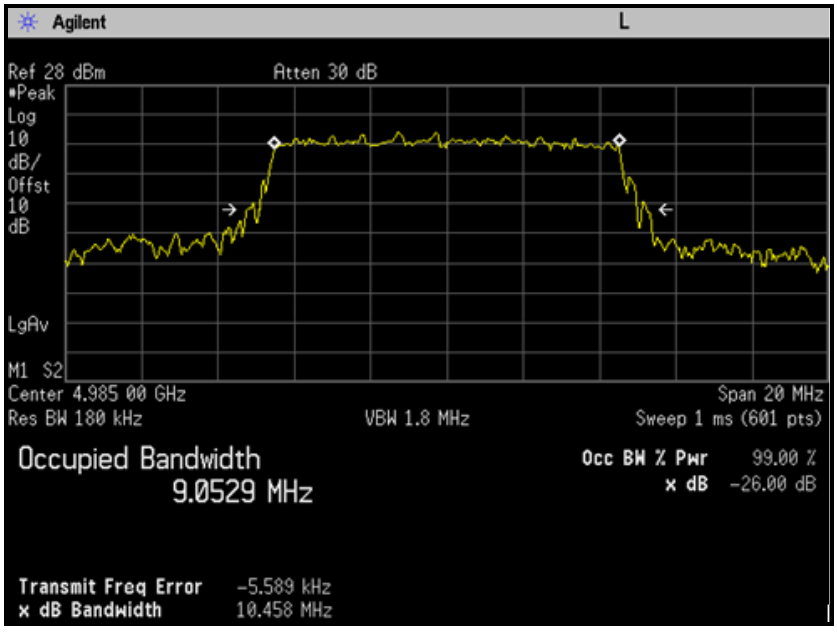
Plot 5-3: Occupied Bandwidth; Channel 3 - 4965 MHz



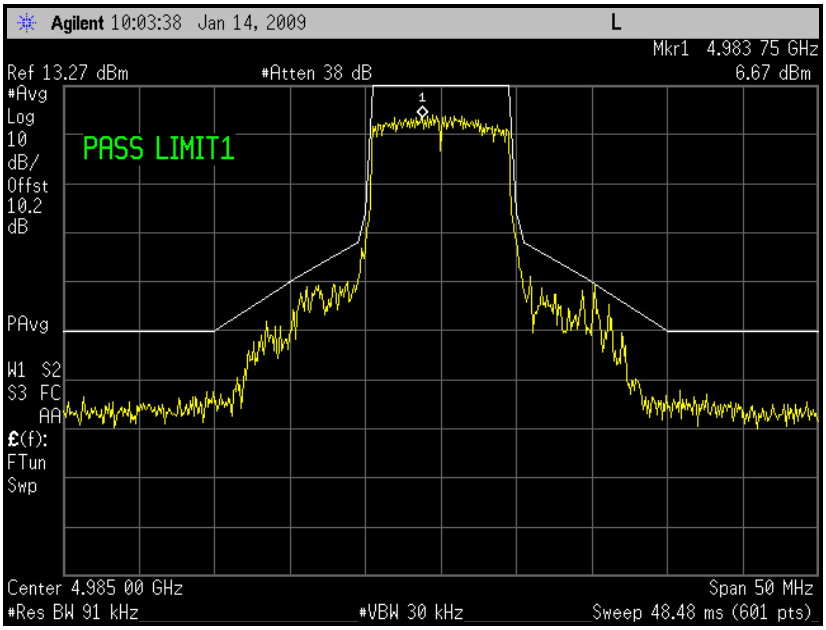
Plot 5-4: Emissions Mask M; Channel 3 - 4965 MHz



Plot 5-5: Occupied Bandwidth; Channel 5 - 4985 MHz

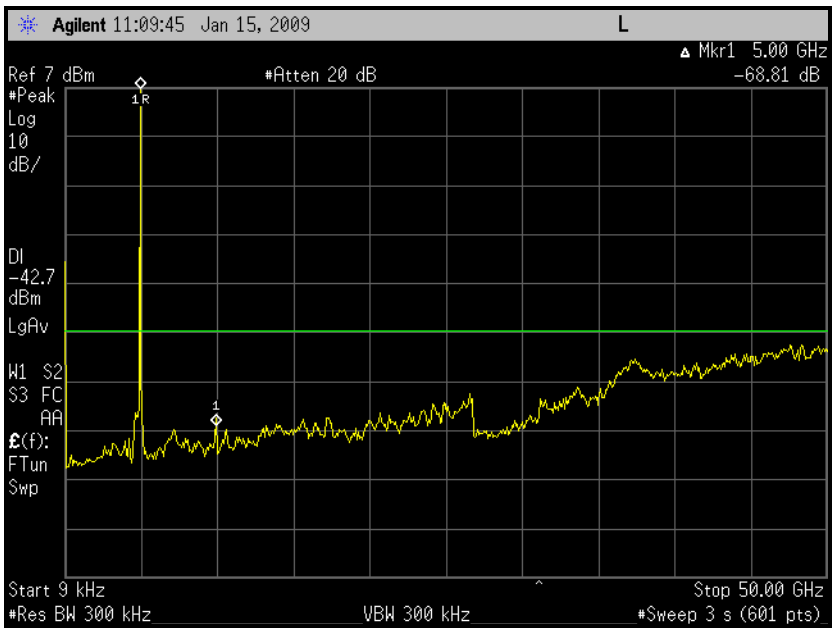


Plot 5-6: Emissions Mask M; Channel 5 - 4985 MHz

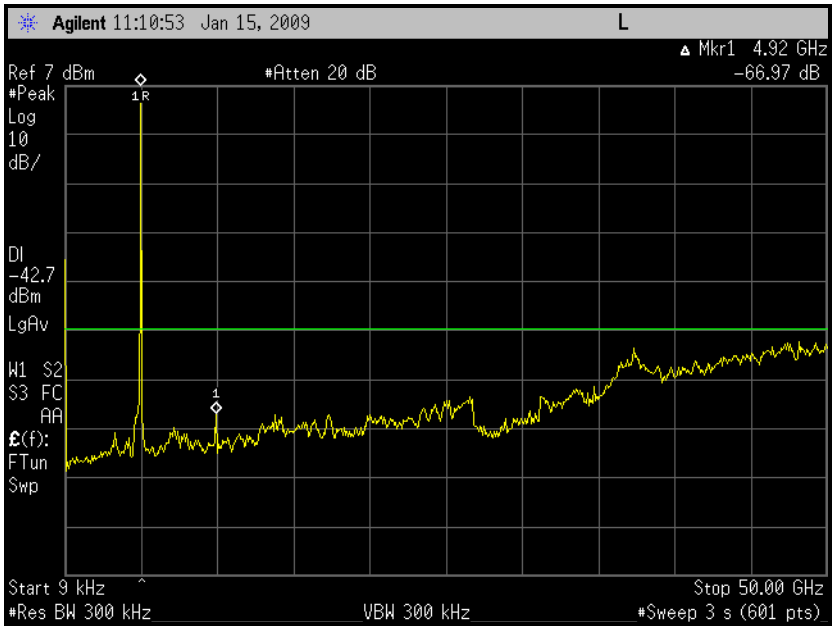


5.4 Out of Band Spurious Test Data

Plot 5-7: Conducted Spurious Emissions; Channel 1 – 4945 MHz



Plot 5-8: Conducted Spurious Emissions; Channel 3 – 4965 MHz



Plot 5-9: Conducted Spurious Emissions; Channel 5 – 4985 MHz

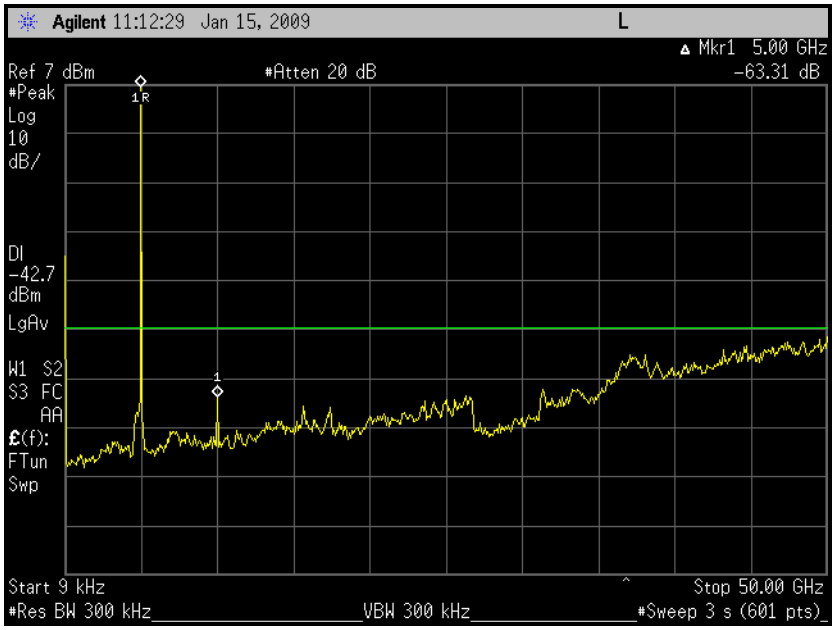
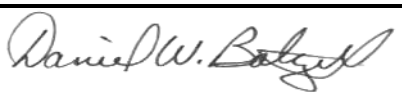


Table 5-2: Test Equipment for Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	7/31/09
900819	Weinschel Corp.	2	10 dB Attenuator; 5 W	BF0830	12/3/09

Test Personnel:

Daniel Baltzell		January 14 and 15, and February 16, 2009
Test Engineer	Signature	Dates Of Tests

6 FCC Rules and Regulations Part 90 §90.210(l) and Part 2 §2.1053(a): Field Strength of Spurious Radiation; RSS-111 §3.3: Transmitter Unwanted Emissions

§90.210(l): Emission Mask M: For high power transmitters (20 dBm or greater) operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

On any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 50 dB

6.1 Test Procedure

TIA-603-C-2004, section 2.2.12

The EUT was set to center channel and output power was set to maximum.

The EUT was placed on a non conducting table 80 cm above the ground plane. The antenna-to-EUT distance is 3 m. The EUT is rotated through 360 degrees to maximize emissions. The antenna is scanned in both vertical and horizontal polarizations. The spurious emissions levels were measured and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half-wave dipole.

The EUT was scanned from 30 MHz to the 10th harmonic of the fundamental. The spectrum analyzer resolution bandwidth was set to 1 MHz, and the video bandwidth was set to 1 MHz.

The spurious radiated emission limit is calculated as follows:

Average output power: 26.73 dBm

Spurious limit = 26.73 dBm – 50 db = -23.27 dBm

6.2 Test Data

Table 6-1: Field Strength of Spurious Radiation: Channel 1 – 4945 MHz (10 MHz BW)

Limit = 50 dBc or -27.1 dBm
Conducted Power (Avg) = 26.73 dBm = 0.471 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	EIRP (dBm)	Limit	Margin (dB)
4135.000	41.9	-48.5	18.0	8.2	-58.3	-23.3	-35.0
4270.000	37.4	-54.5	17.7	8.6	-63.6	-23.3	-40.3
8270.000	44.2	-32.0	19.3	9.3	-42.0	-23.3	-18.7
9890.000	52.5	-24.7	19.9	9.3	-35.3	-23.3	-12.0
14835.000	45.8	-24.5	21.3	10.3	-35.5	-23.3	-12.2

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

Table 6-2: Field Strength of Spurious Radiation: Channel 3 – 4965 MHz (10 MHz BW)

Limit = 50 dBc or -23.5 dBm
Conducted Power (Avg) = 26.54 dBm = 0.451 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	EIRP (dBm)	Limit	Margin (dB)
4155.000	38.7	-52.0	18.0	8.3	-61.7	-23.5	-38.2
4270.000	34.2	-57.9	17.7	8.6	-67.0	-23.5	-43.5
8310.000	43.6	-33.8	19.3	9.4	-43.7	-23.5	-20.2
9930.000	61.2	-15.9	19.9	9.2	-26.6	-23.5	-3.1
14895.000	46.4	-23.6	21.3	10.5	-34.4	-23.5	-10.9

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

Table 6-3: Field Strength of Spurious Radiation: Channel 5 – 4985 MHz (10 MHz BW)

Limit = 50 dBc or -23.55 dBm
Conducted Power (Avg) = 26.45 dBm = 0.442 W

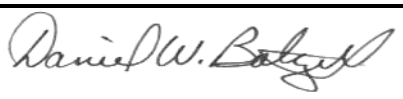
Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	EIRP (dBm)	Limit	Margin (dB)
4175.000	36.2	-55.1	17.9	8.4	-64.6	-23.6	-41.0
4270.000	37.6	-54.7	17.7	8.0	-64.4	-23.6	-40.8
8350.000	44.7	-34.1	19.3	9.3	-44.1	-23.6	-20.5
9970.000	60.7	-15.3	19.9	9.2	-26.0	-23.6	-2.4
14955.000	49.6	-21.3	21.3	10.6	-32.0	-23.6	-8.4

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

Table 6-4: Test Equipment for Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900791	Chase	CBL6111B	Bilog antenna (30 MHz – 2000 MHz)	N/A	12/12/10
901413	Agilent Technologies	E4448	Spectrum Analyzer	US44020346	7/31/09
900928	Hewlett Packard	83752A	Synthesized Sweeper, 0.01 to 20 GHz	3610A00866	12/7/09
900321	EMCO	3161-03	Horn Antennas (4 – 8 GHz)	9508-1020	6/14/10
900323	EMCO	3160-07	Horn Antennas (8.2 – 12 GHz)	9605-1054	6/14/10
900356	EMCO	3160-08	Horn Antennas (12.4 – 18 GHz)	9607-1044	6/14/10
901218	EMCO	3160-09	Horn Antenna (18 - 26 GHz)	960281-003	6/19/10
901160	Advanced Technical Materials	42-251-6	Adapter, WG-Coax	B082204	6/19/10
900126	Hewlett Packard	11970A	Harmonic Mixer (26.5 - 40 GHz)	2332A01199	10/29/09
901303	EMCO	3160-10	Horn Antenna (26.5 - 40.0 GHz)	960452-007	6/19/10
901262	ETS	3160-9	Double ridged Guide Antenna (1 - 18 GHz)	6748	5/1/11
901426	Insulated Wire Inc.	KPS-1503-3600-KPS	RF cable, 30'	NA	10/17/09
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS-09302008	RF cable, 20'	NA	10/17/09
901517	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	10/17/09

Test Personnel:

Daniel Baltzell		January 21, 2009
Test Engineer	Signature	Date Of Tests

7 Conclusion

The data in this measurement report shows that the **M/A-COM, Inc**. Model **VIDA Broadband High Power Client 4940-4990 MHz; FCC ID: BV8VIDA-BB-CL, IC: 3670A-VIDABBCL,** complies with all the applicable requirements of Parts 90 and 2 of the FCC Rules, and Industry Canada RSS-111, and meets the requirements of a FCC Class II Permissive Change and an IC Reassessment.