Engineering and Testing for EMC and Safety Compliance

Accredited under A2LA Testing Certificate # 2653.01

FCC & IC Certification Report

M/A-COM, Inc.
221 Jefferson Ridge Parkway
Lynchburg, VA 24501
Contact: Daryl Popowitch

Model: B510 Base Station
4940–4990 MHz

FCC ID: BV8MBASE
IC: 3670A-MBASE

February 18, 2009

Standards Referenced for this Report	
Part 2: 2008	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2008	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
RSS-111 Issue 2 2007	Broadband Public Safety Equipment Operating in the Band 4940-4990 MHz

Frequency Range (MHz)	Rated Peak Transmit Power (W)	Measured Frequency Tolerance (ppm)	Emission Designator
4940-4990 MHz	0.5	2.8	5M00X7D
4940-4990 MHz	0.5	2.8	10M0X7D

Report Prepared by Test Engineer: Daniel Baltzell

Document Number: 2008220

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1 General Information

The following Certification 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 **B510 Base Station; FCC ID: BV8MBASE and IC: 3670A-MBASE**. 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 FCC Rules and Regulations in CFR 47 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)

This is an original application report.

2 Tested System Details

The test sample was received on January 8, 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 B510 Base Station implements the 802.16-2004 protocol in 5 MHz and 10 MHz channel spacing.

The B510 Base Station used for testing was 24 VDC powered. This same radio was tested for Part 15 unintentional emissions; this data is contained in a separate DoC report and is available upon request.

The B510 Base Station shares the transceiver, power supply, front-end, and communication circuitry inside the chassis.

Model Tested	B510 Base Station
Frequency Band	4940–4990 MHz
Modulation Type	OFDM signal with QPSK, BPSK, 16 QAM, 64 QAM
Channel Bandwidth	5 MHz and 10 MHz
Primary Power	24 VDC +/- 3 V
Rated Transmitter Output Power	5uW to 0.5W (-3 dBm to +27 dBm)

Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
B510 Base Station	M/A-COM, Inc.	MAVM-MBASE	BS-014648-004	BV8MBASE	18770
Lightning Protector	iPolyphase	LSXL-ME	N/A	N/A	18781
50 ohm Termination	Mini Circuits	KARN-50-184	00833	N/A	18782

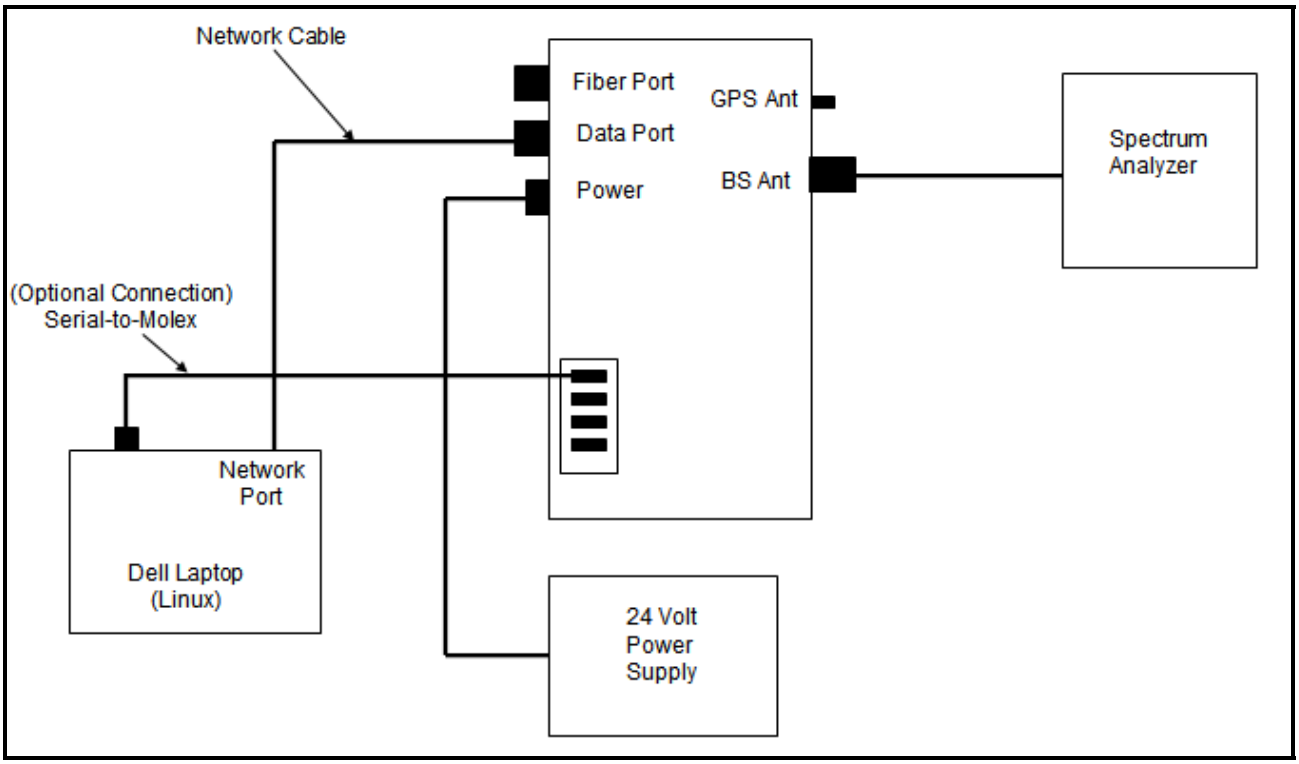
Table 2-2: Support Test Equipment

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Laptop	Dell	Latitude D630	ST:3LVXTF1	N/A	18774
AC Adapter	Dell	LA90PS0-00	Cn-ODF266-71615-7CQ-9B6D	N/A	18773

Table 2-3: Ports and Cabling (EUT)

Port	Connector/Cable Type	Quantity	Length (m)	Shield
24 VDC Power Port	2-pin industrial Conxall	1	1	Yes
Antenna Port	N female	1	N/A	Yes
GPS Antenna Port	TNC female	1	N/A	Yes
Data Port	RJ-45	1	1.8	Yes
Fiber Port	Fiber Optic	1	N/A	No
Optional Serial-to-Molex	Molex	1	1.8	No

Figure 2-1: Configuration of Tested System



3 FCC Rules and Regulations Part 2 §2.1033(c)(8) Voltages and Currents Through The Final Amplifying Stage

Nominal DC Voltage: 10 VDC
Current: 1.2 A

4 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

4.1 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 resolution bandwidth and video bandwidth were set to auto. 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 5 MHz for the 5 MHz BW band, or 8 MHz bandwidth for the 10 MHz BW band.

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.

4.2 Test Data

The EUT complies with 47CFR2.1046 and 90.1215(a). The EUT does not exceed 27 dBm at carrier frequency for 5 MHz BW or 30 dBm for 10 MHz BW.

Table 4-1: RF Power Output: Carrier Output Power – 5 MHz BW

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)
1	4942.5	26.93	27
5	4962.5	26.35	27
10	4987.5	26.34	27

Table 4-2: RF Power Output: Carrier Output Power – 10 MHz BW

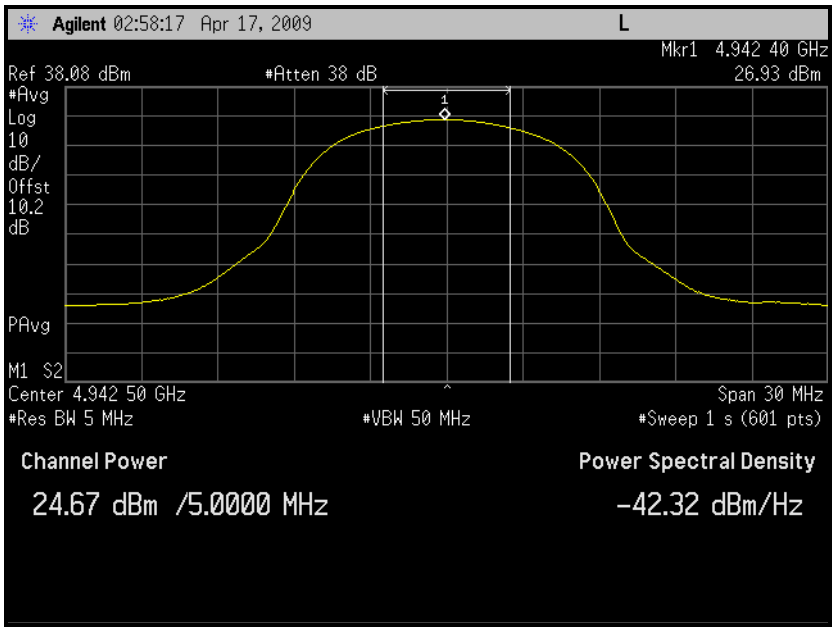
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)
1	4945.0	26.69	30
3	4965.0	26.62	30
5	4985.0	26.41	30

*Measurement accuracy: +/-.3 dB

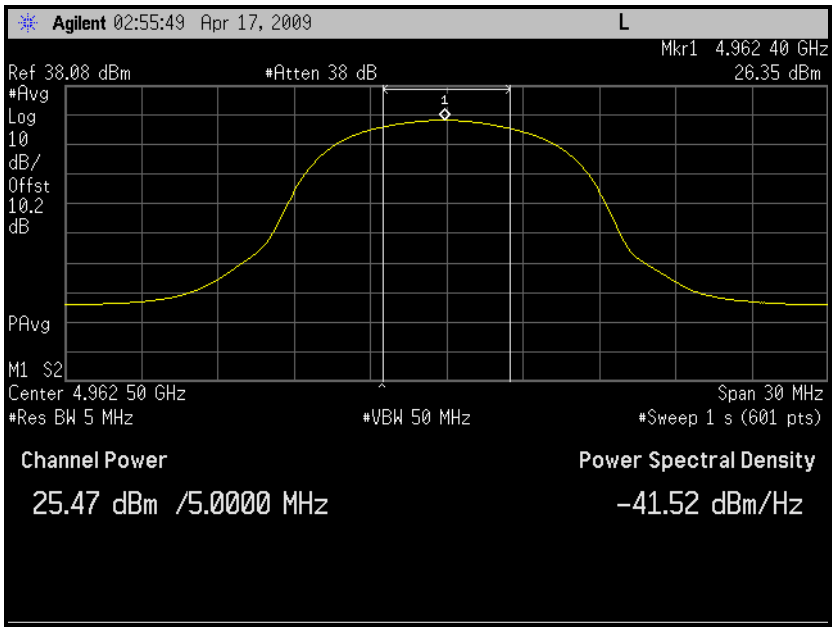
Table 4-3: RF Power Output (Rated Power)

Rated Power
0.5 W

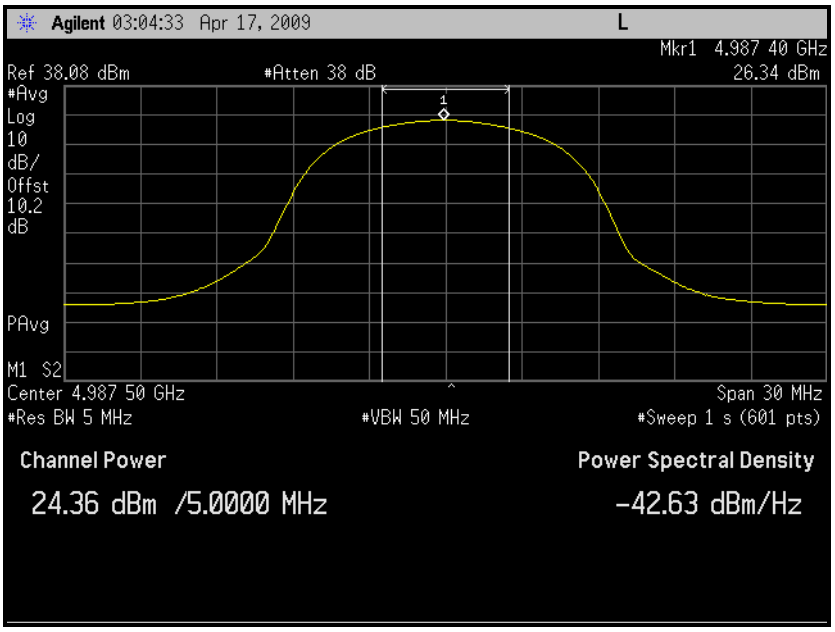
Plot 4-1: Channel Power Output; Channel 1 - 4942.5 MHz; 5 MHz BW



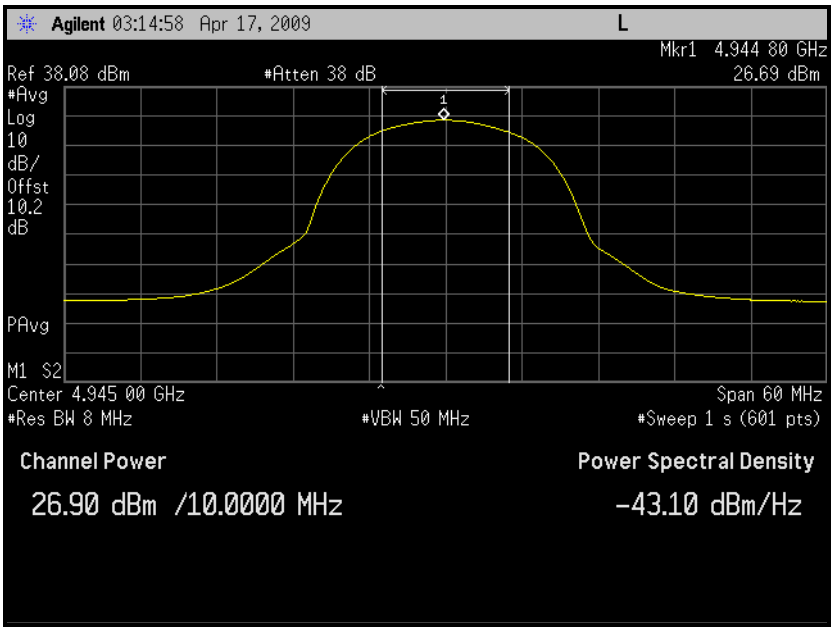
Plot 4-2: Channel Power Output; Channel 5 - 4962.5 MHz; 5 MHz BW



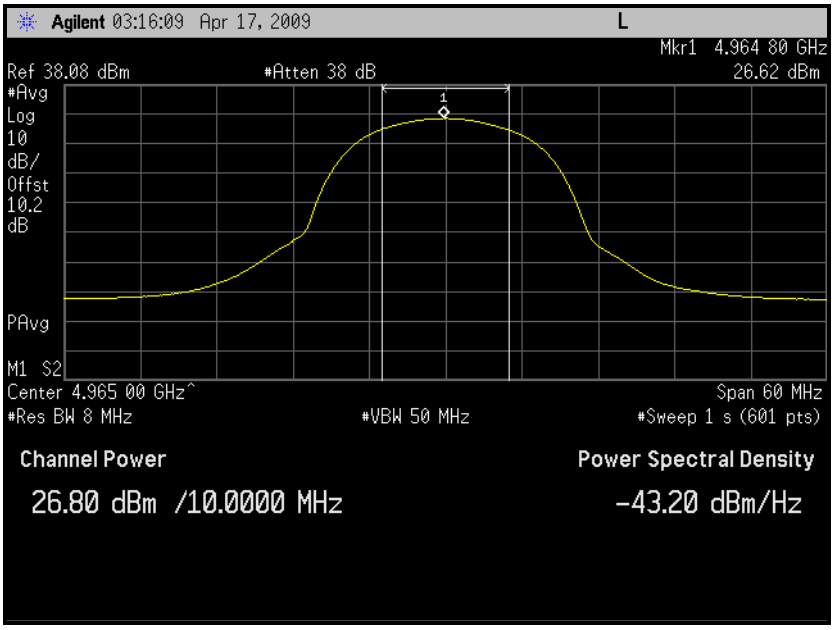
Plot 4-3: Channel Power Output; Channel 10 - 4987.5 MHz; 5 MHz BW



Plot 4-4: Channel Power Output; Channel 1 - 4945 MHz; 10 MHz BW



Plot 4-5: Channel Power Output; Channel 3 - 4965 MHz; 10 MHz BW



Plot 4-6: Channel Power Output; Channel 5 - 4985 MHz; 10 MHz BW

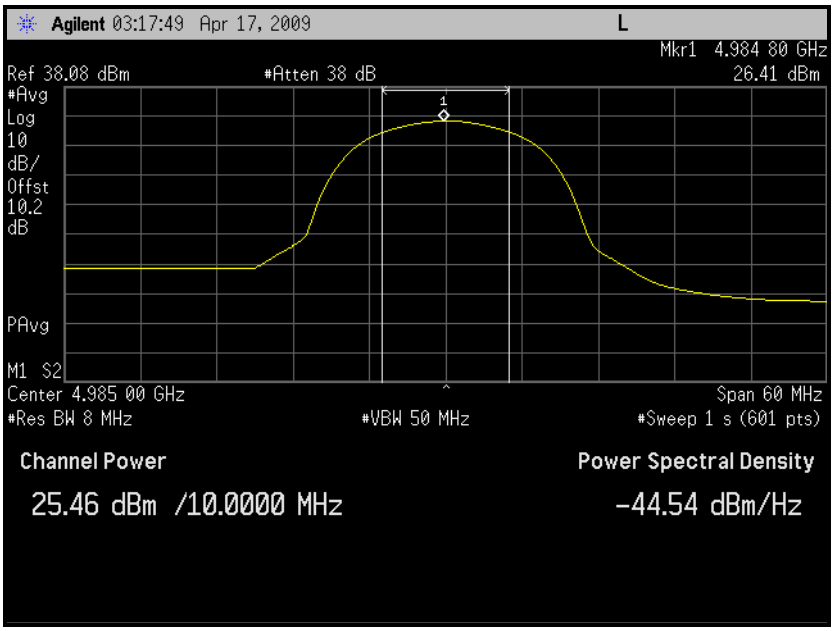
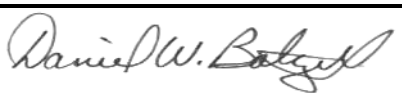


Table 4-4: Test Equipment for Testing RF Power Output – Conducted

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

5 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

5.1 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)

5.2 Test Data

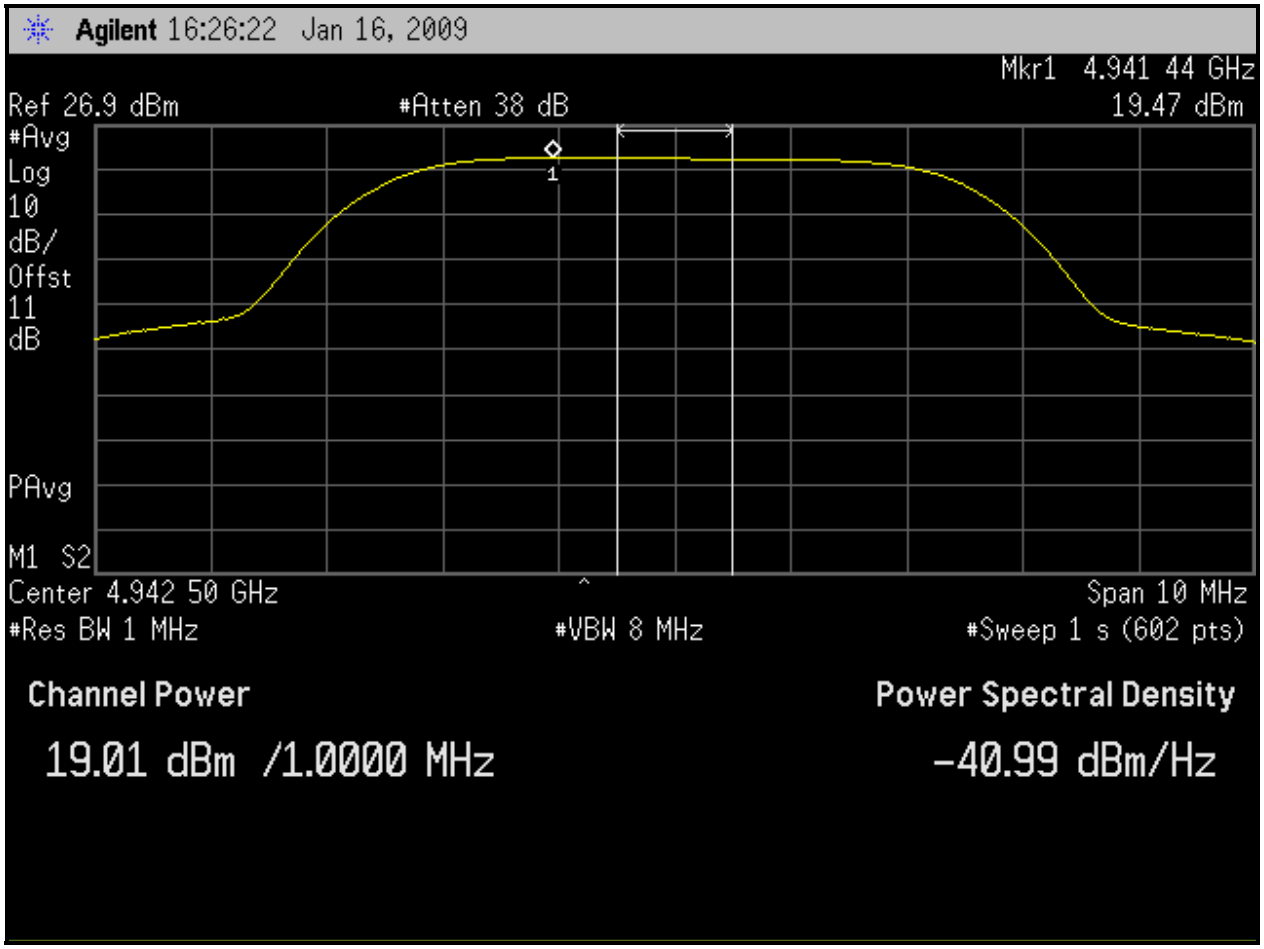
The EUT complies with 47CFR2.1046 and 90.1215(a). The EUT does not exceed 21 dBm at carrier frequency.

Table 5-1: RF Power Output: Peak Power Spectral Density

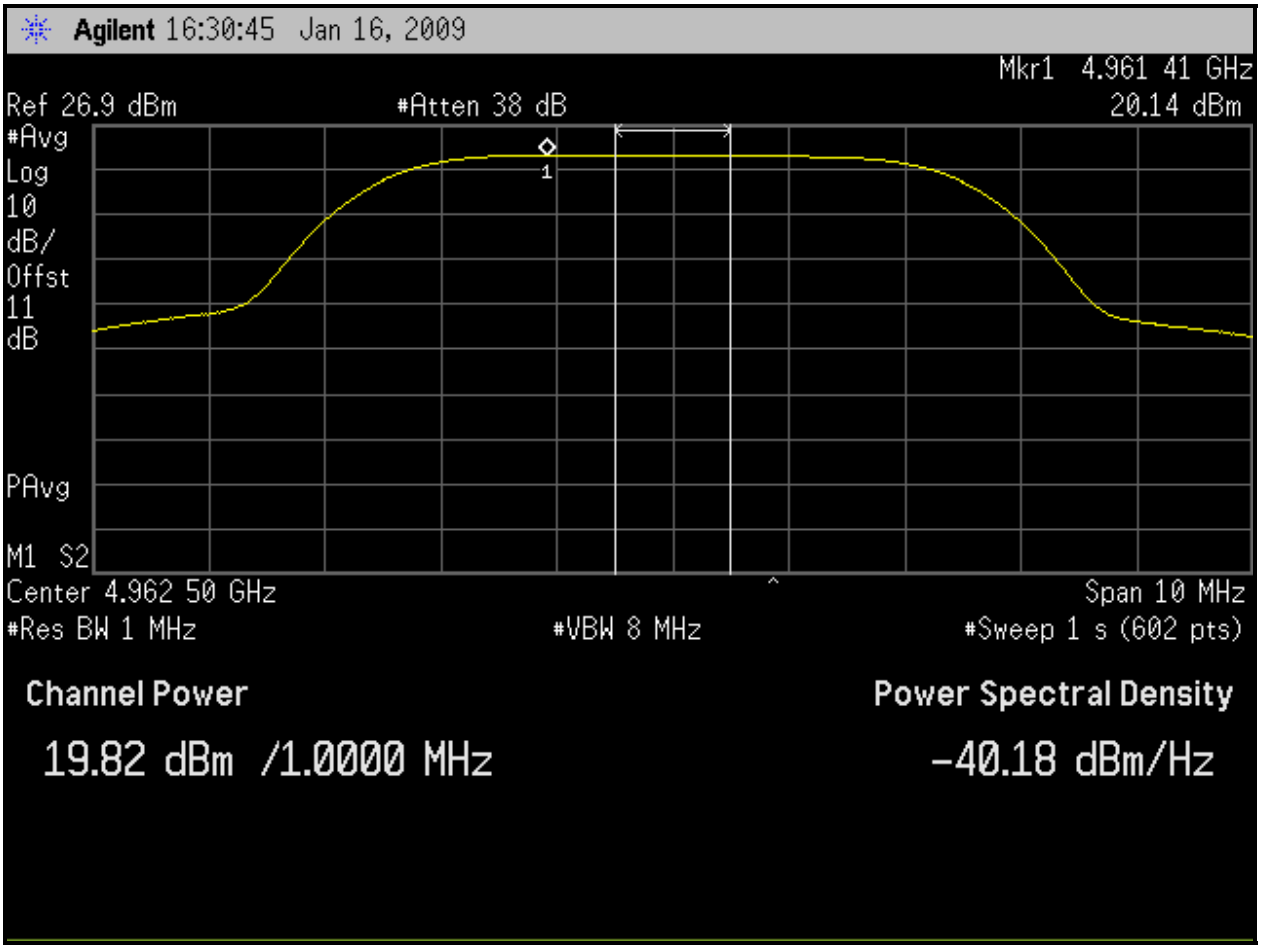
Channel	Frequency (MHz)	Channel BW (MHz)	Measured Peak Power Spectral Density (dBm per one MHz)	Limit (dBm per one MHz)
1	4942.5	5	19.47	21
5	4962.5	5	20.14	21
10	4987.5	5	20.27	21
1	4945.0	10	18.93	21
3	4965.0	10	18.83	21
5	4985.0	10	18.85	21

* Measurement accuracy: +/-.3 dB

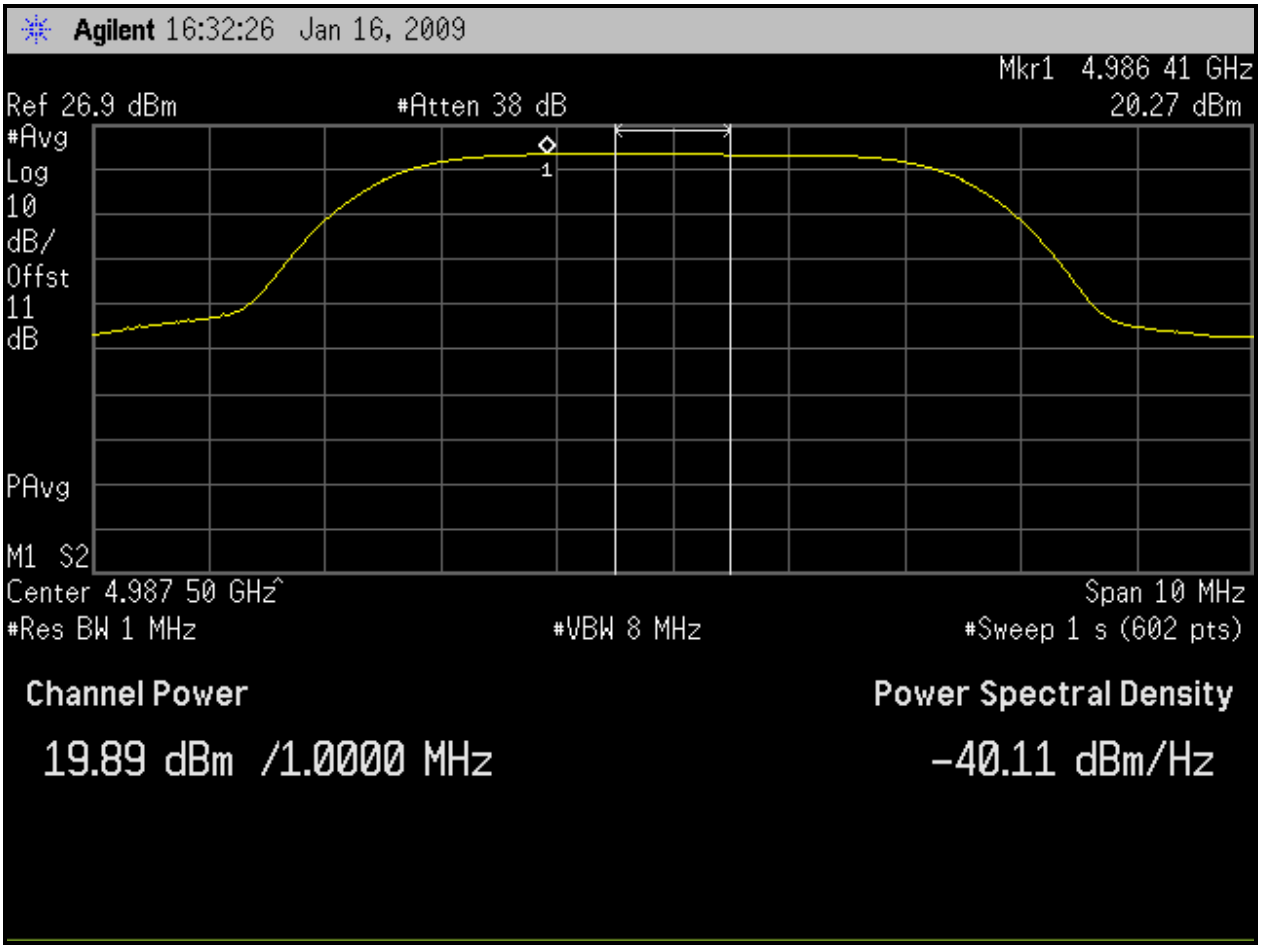
Plot 5-1: Peak Power Spectral Density; Channel 1 - 4942.5 MHz



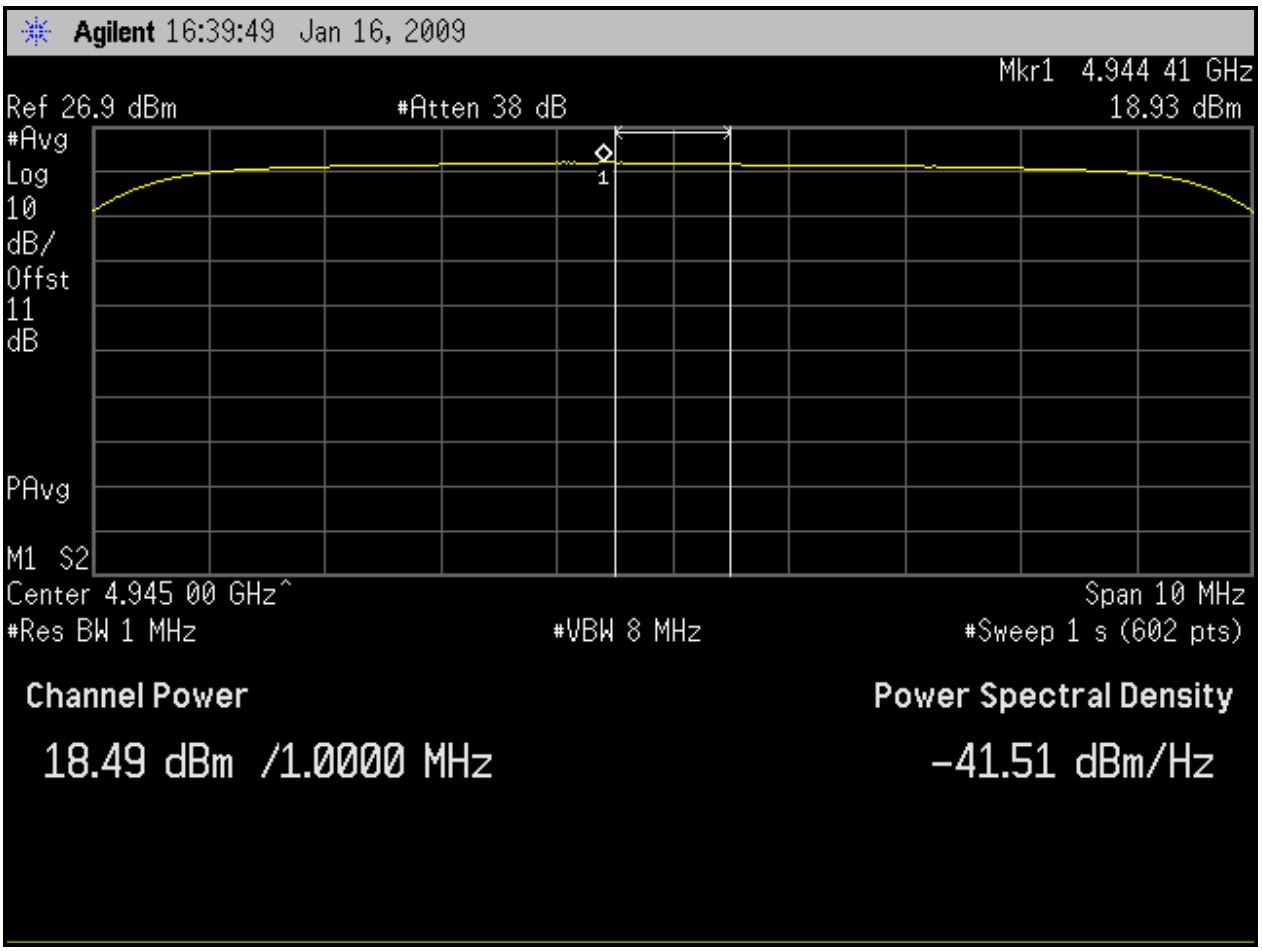
Plot 5-2: Peak Power Spectral Density; Channel 5 - 4962.5 MHz



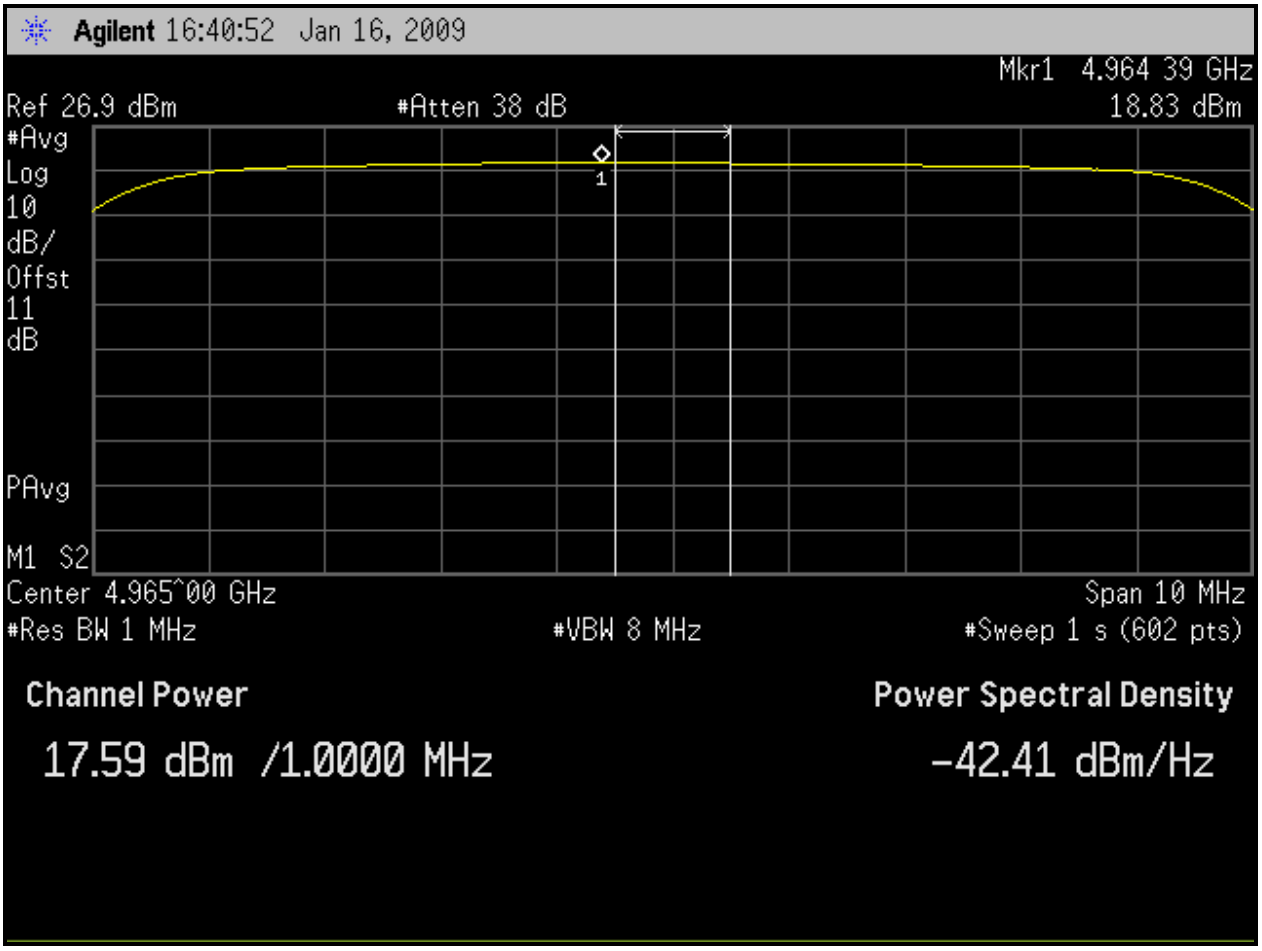
Plot 5-3: Peak Power Spectral Density; Channel 10 - 4987.5 MHz



Plot 5-4: Peak Power Spectral Density; Channel 1 - 4945 MHz



Plot 5-5: Peak Power Spectral Density; Channel 3 - 4965 MHz



Plot 5-6: Peak Power Spectral Density; Channel 5 - 4985 MHz

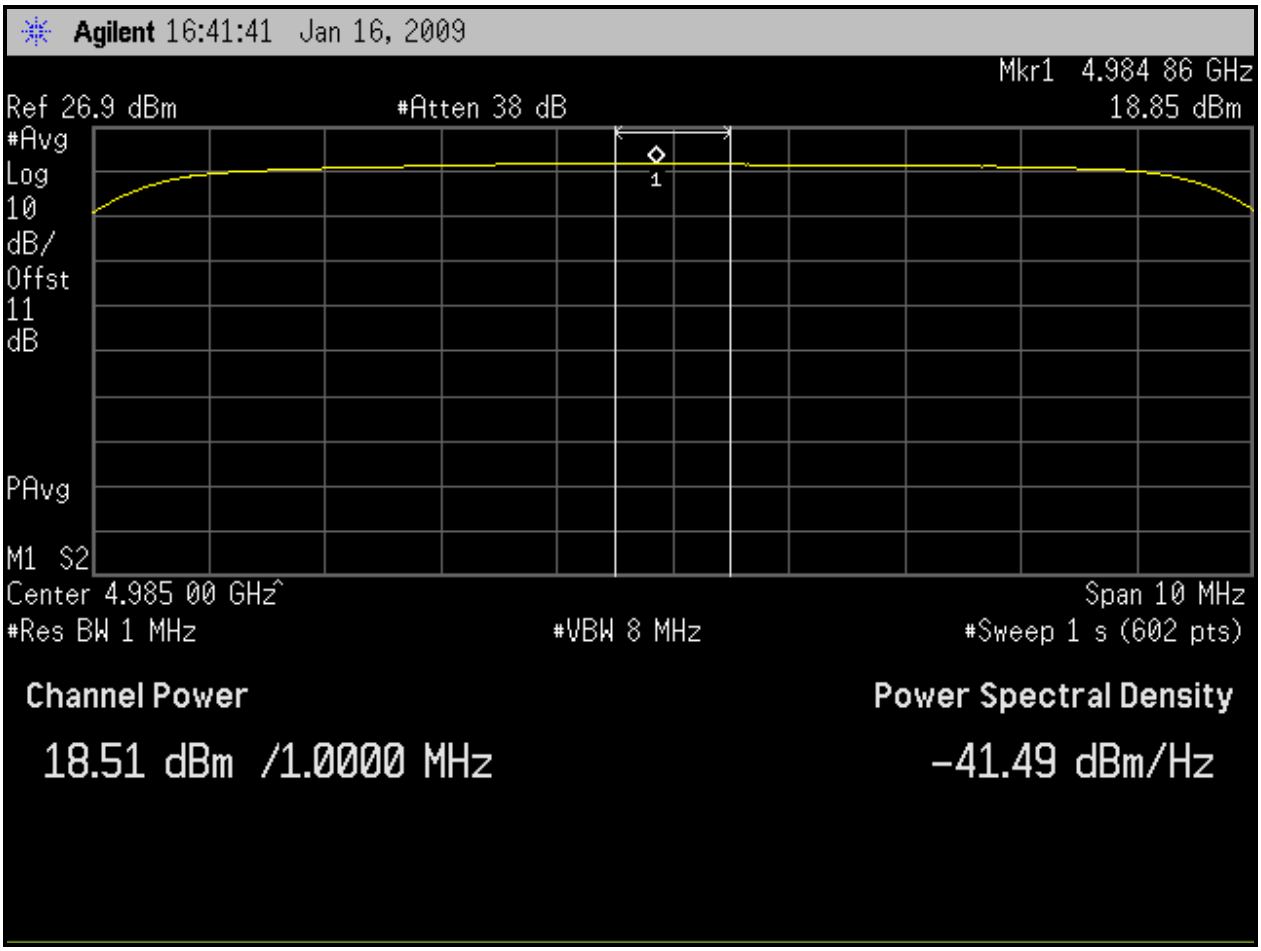


Table 5-2: Test Equipment for Testing Peak Power Spectral Density

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 16, 2009
Test Engineer	Signature	Date Of Tests

6 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.

6.1 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 (47 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.

6.2 Reference Level Measurements

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

5 MHz Bandwidth

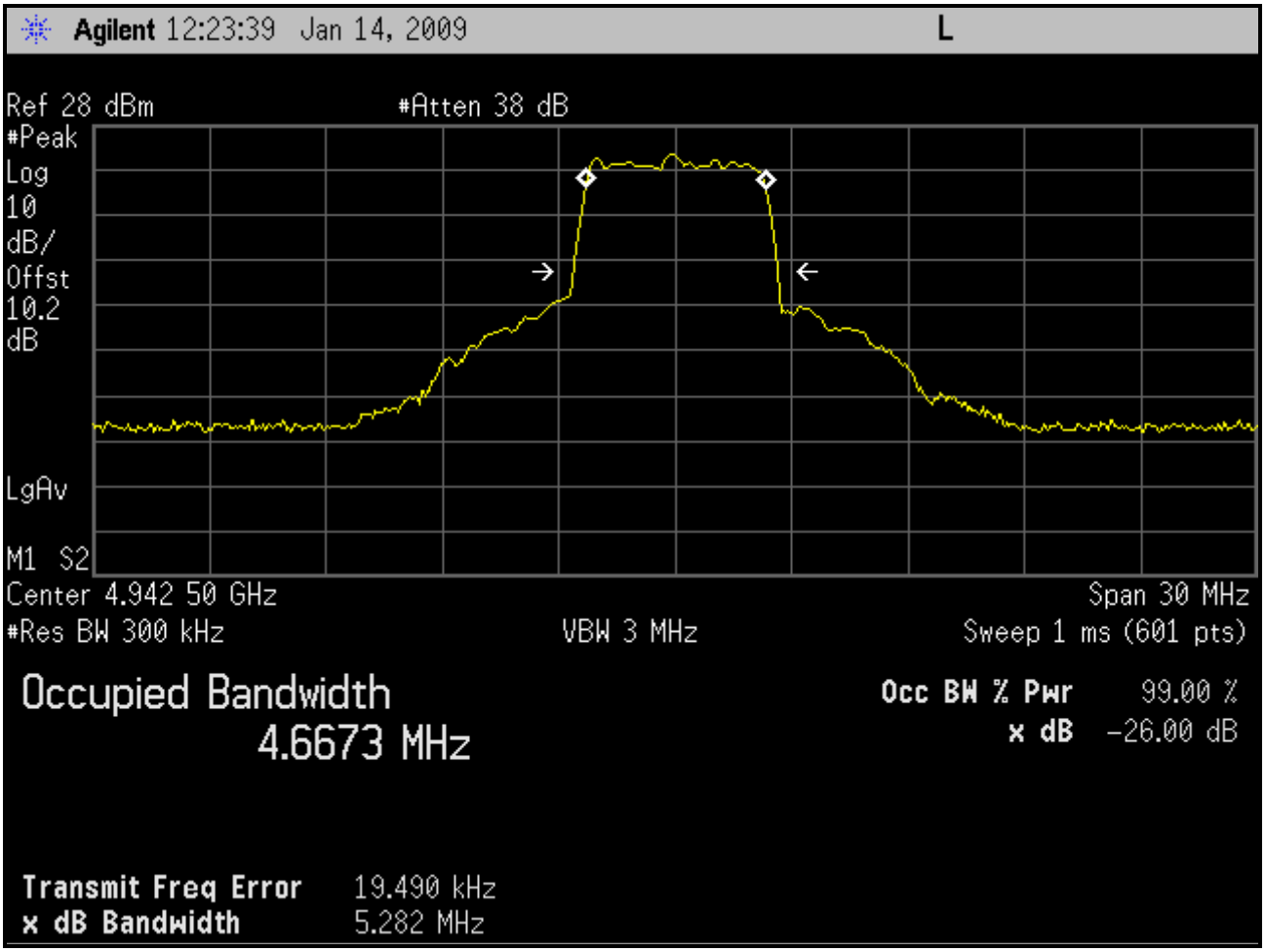
Channel	RBW (kHz)	VBW (kHz)	Level (dBm)
1	47	30	10.93
5	47	30	11.10
10	47	30	12.62

10 MHz Bandwidth

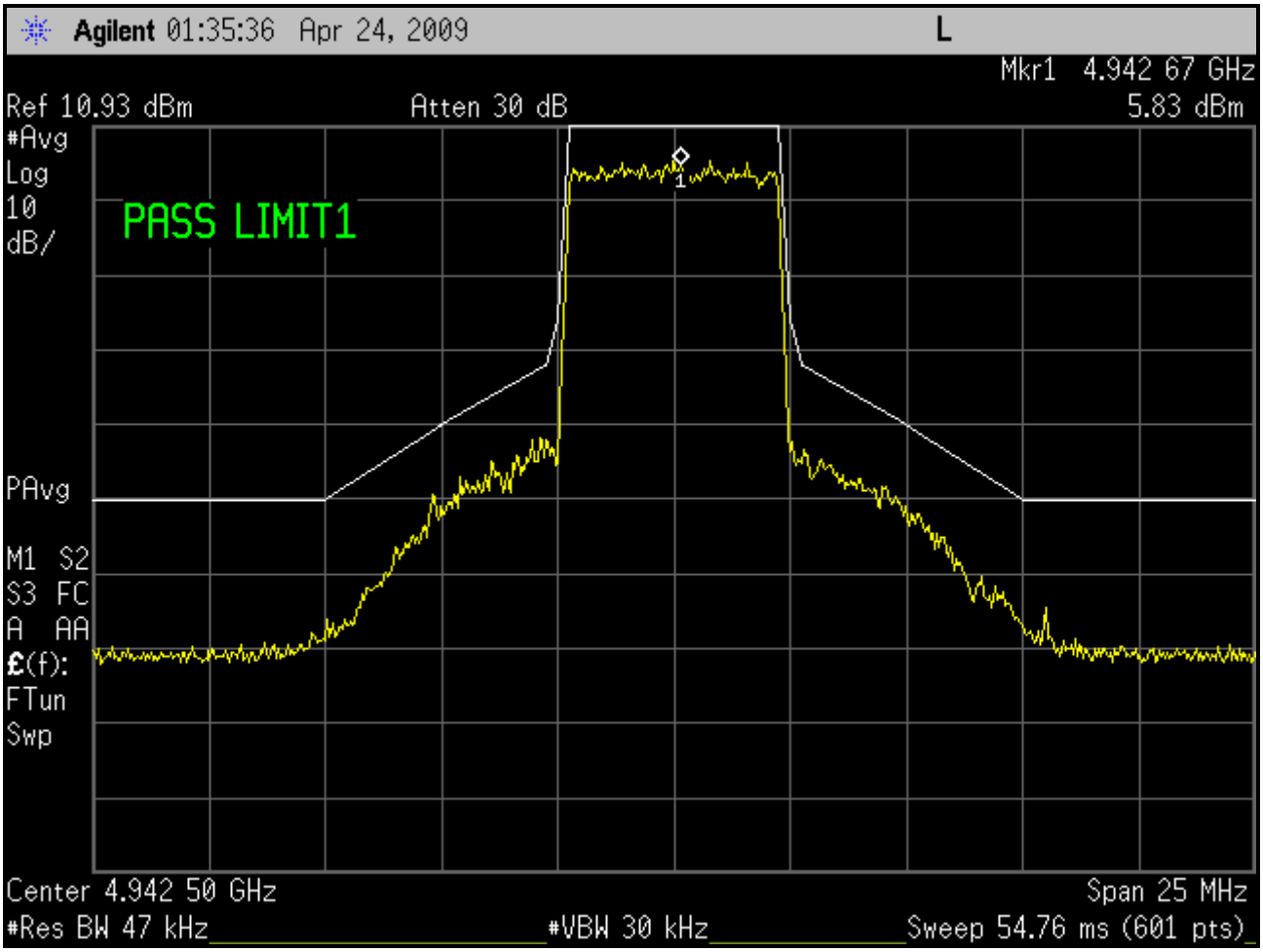
Channel	RBW (kHz)	VBW (kHz)	Level (dBm)
1	91	30	12.62
3	91	30	13.68
5	91	30	13.63

6.3 In Band Spurious Test Data

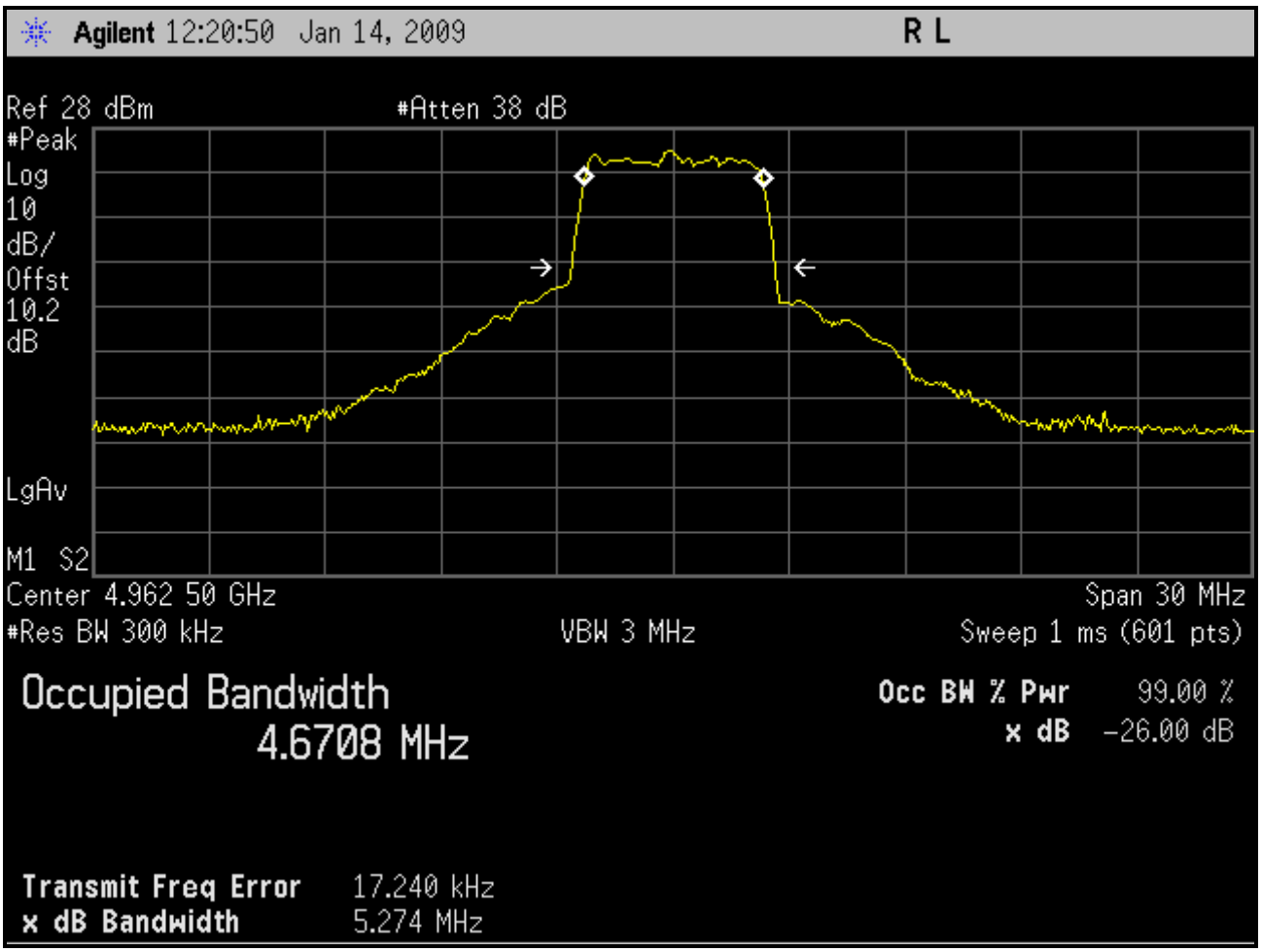
Plot 6-1: Occupied Bandwidth; Channel 1 - 4942.5 MHz (5 MHz BW)



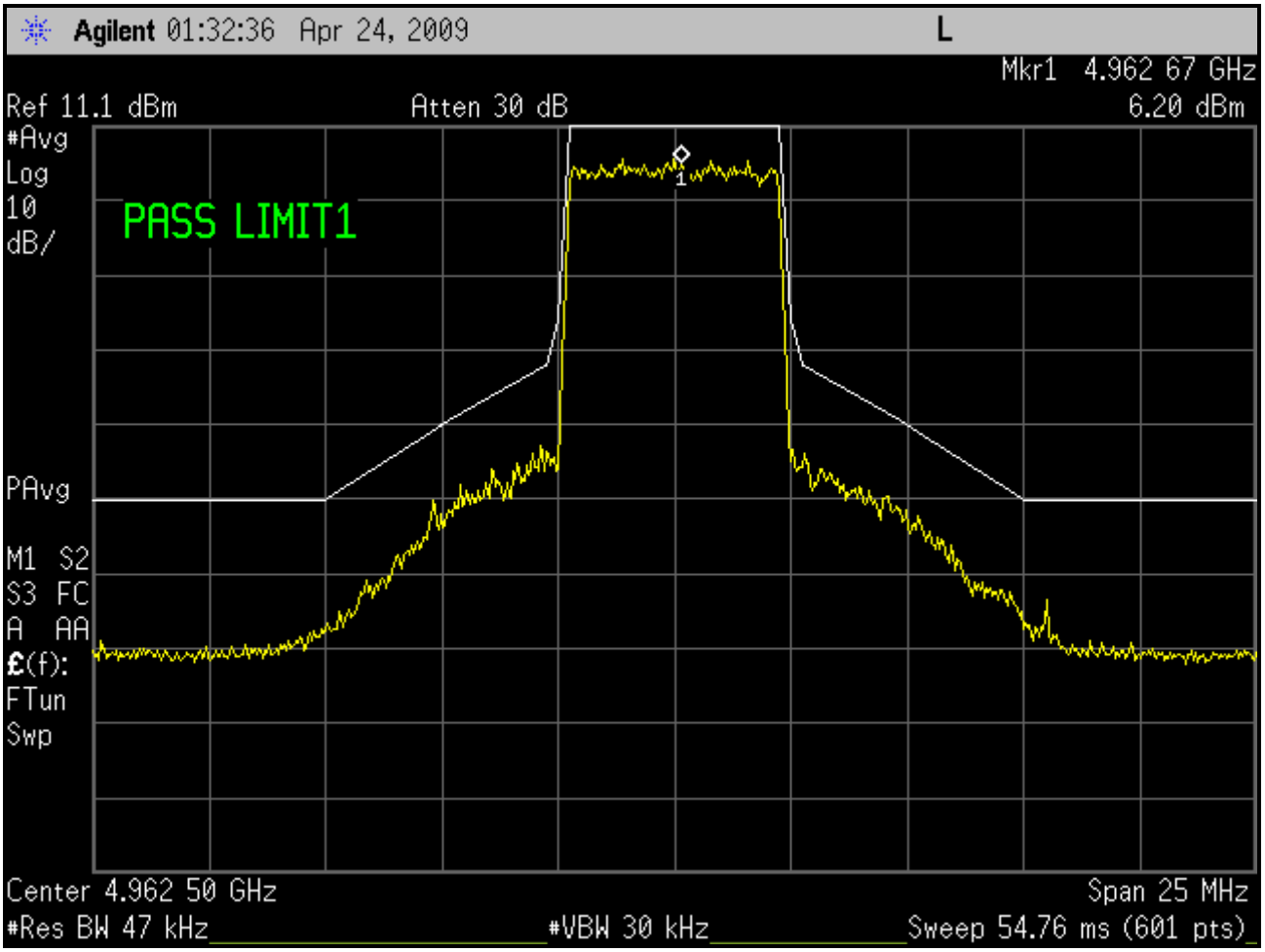
Plot 6-2: Emissions Mask M; Channel 1 - 4942.5 MHz (5 MHz BW)



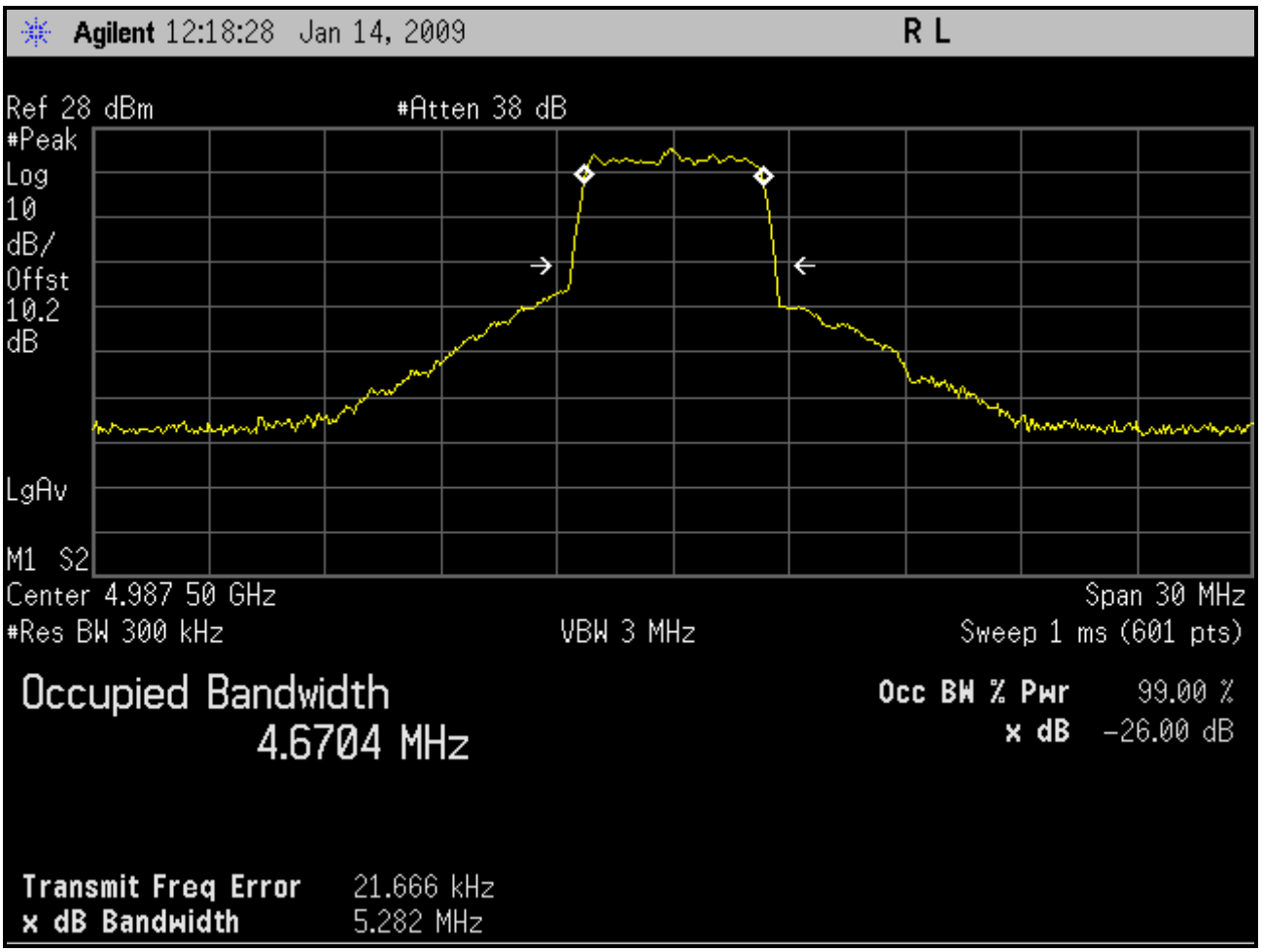
Plot 6-3: Occupied Bandwidth; Channel 5 - 4962.5 MHz (5 MHz BW)



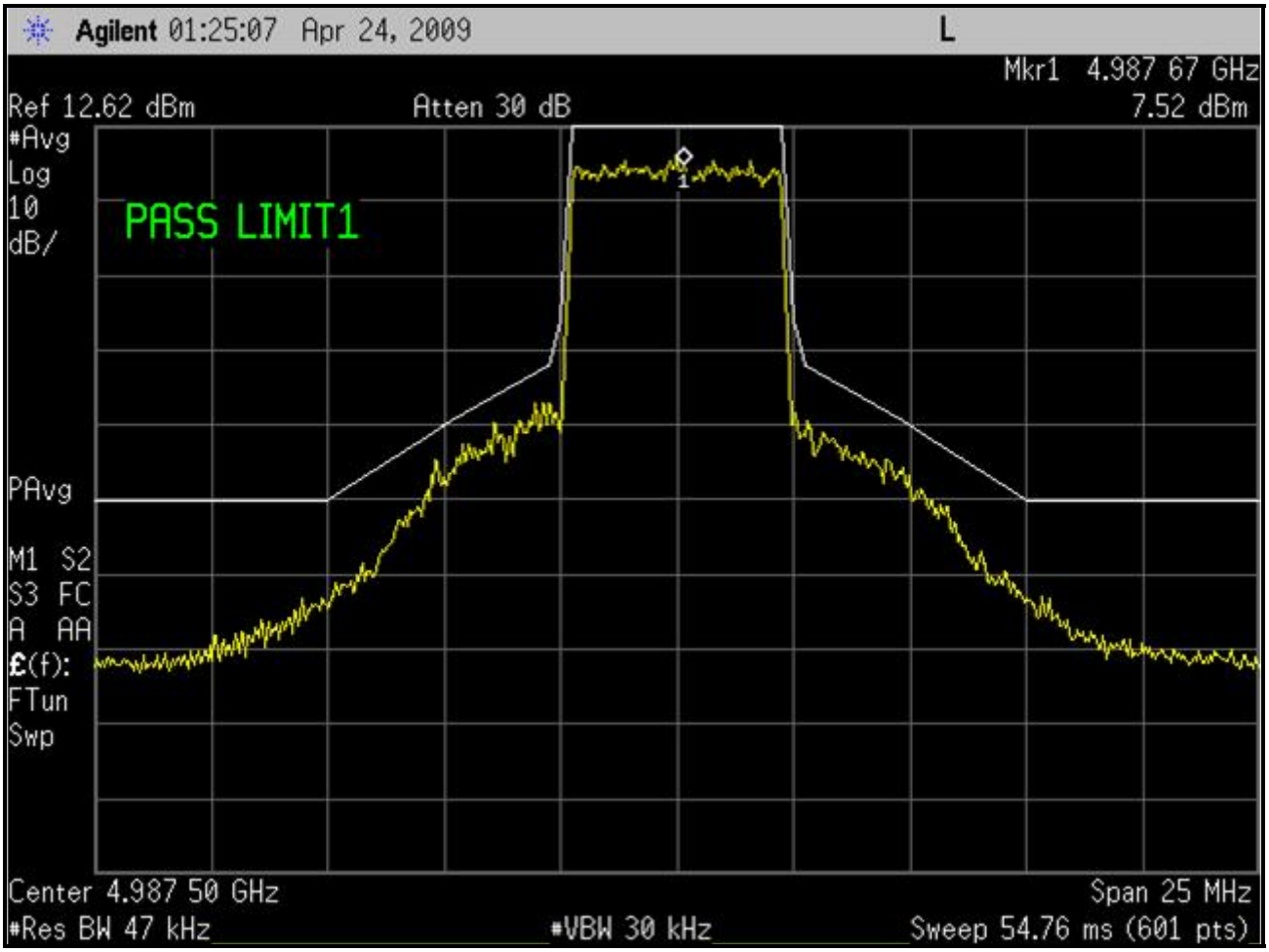
Plot 6-4: Emissions Mask M; Channel 5 - 4962.5 MHz (5 MHz BW)



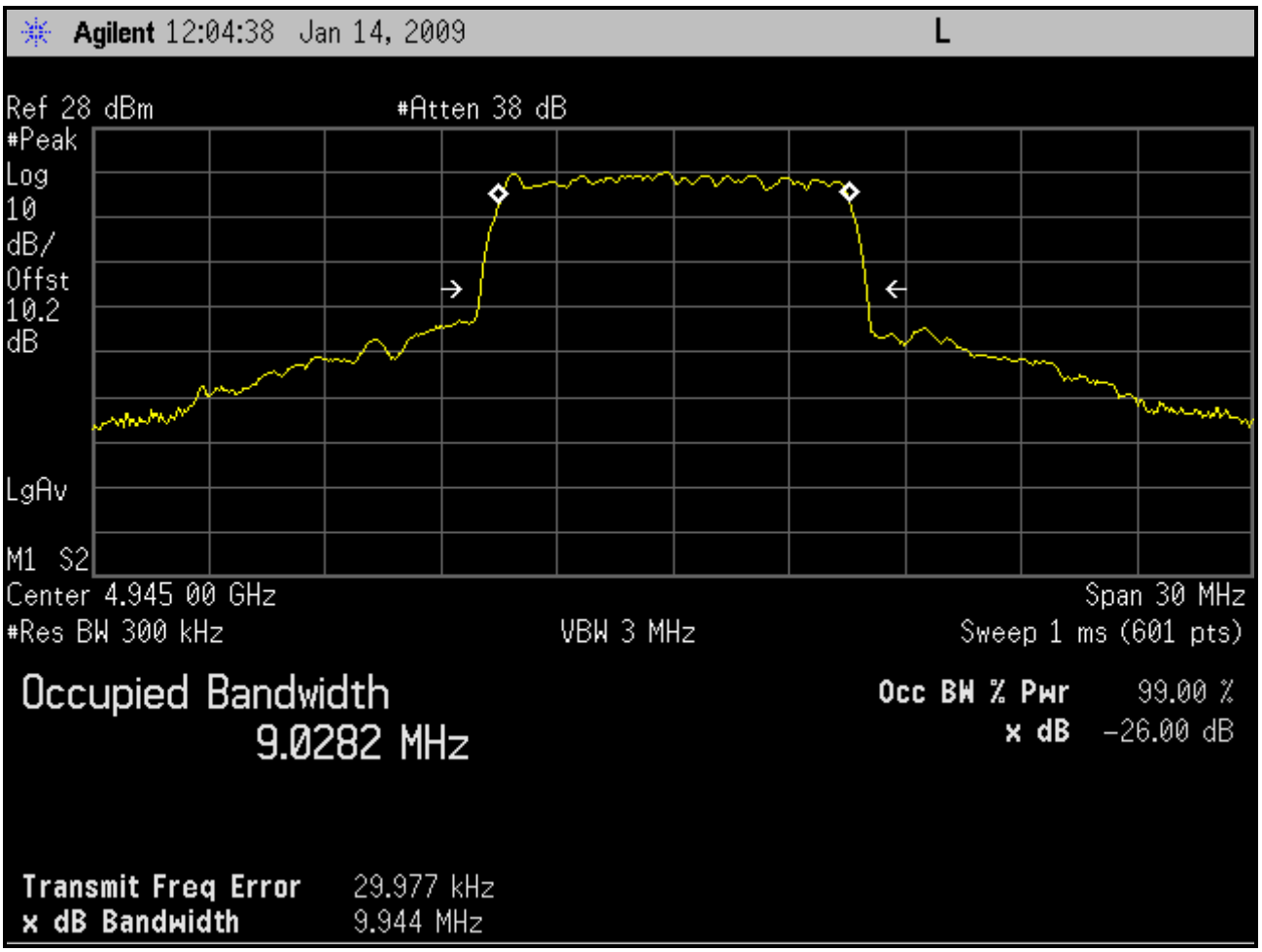
Plot 6-5: Occupied Bandwidth; Channel 10 - 4987.5 MHz (5 MHz BW)



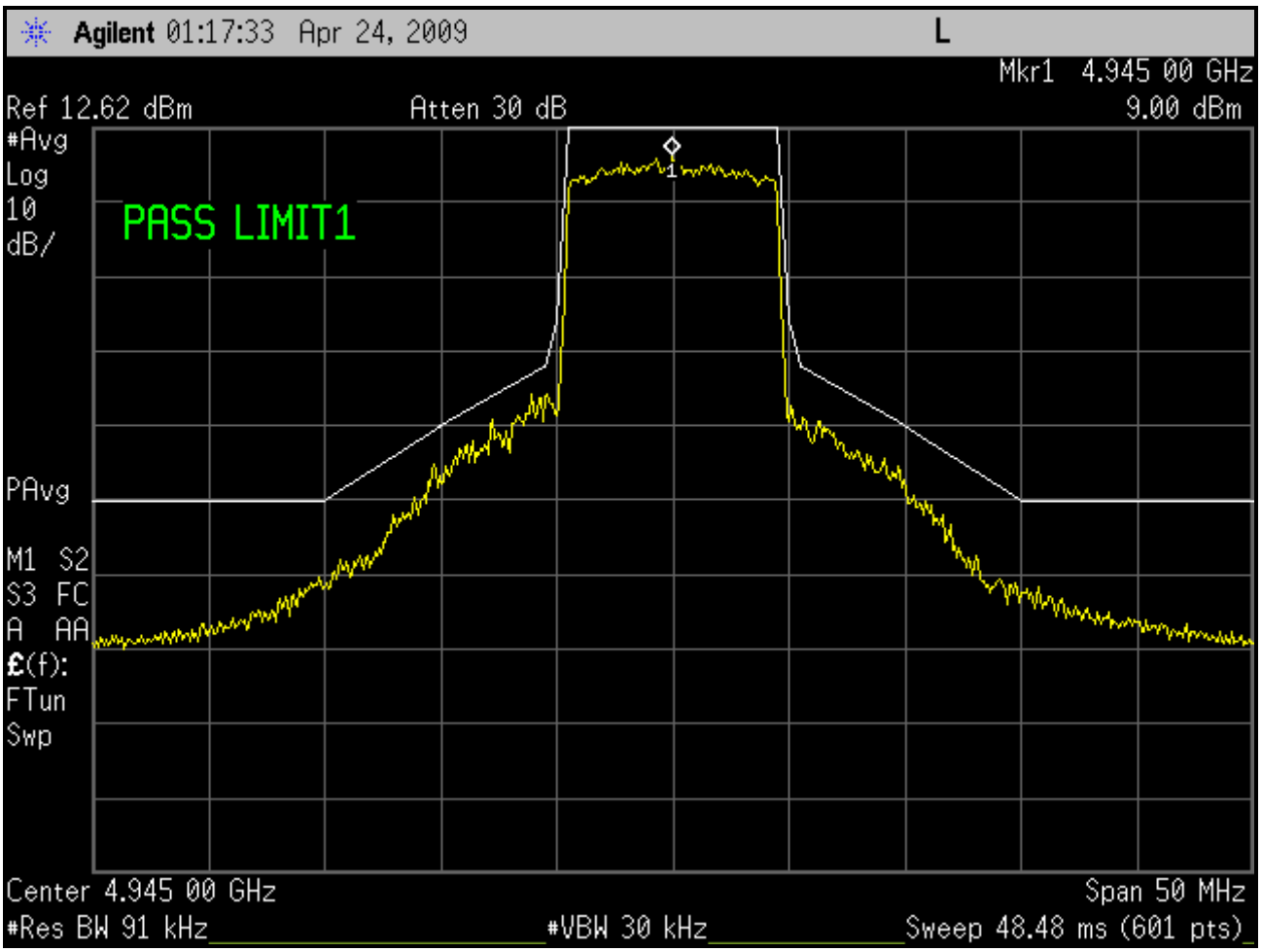
Plot 6-6: Emissions Mask M; Channel 10 - 4987.5 MHz (5 MHz BW)



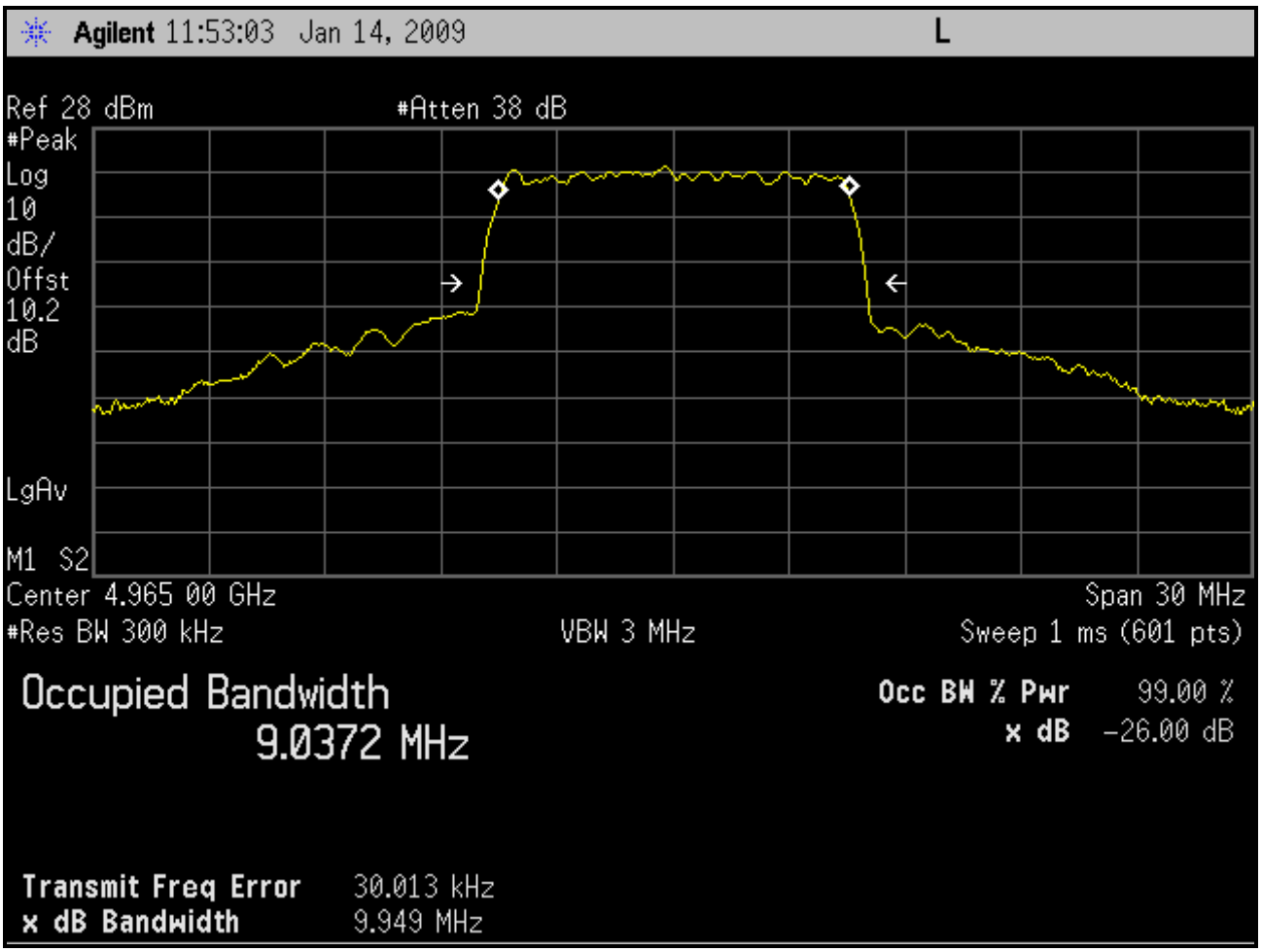
Plot 6-7: Occupied Bandwidth; Channel 1 - 4945 MHz (10 MHz BW)



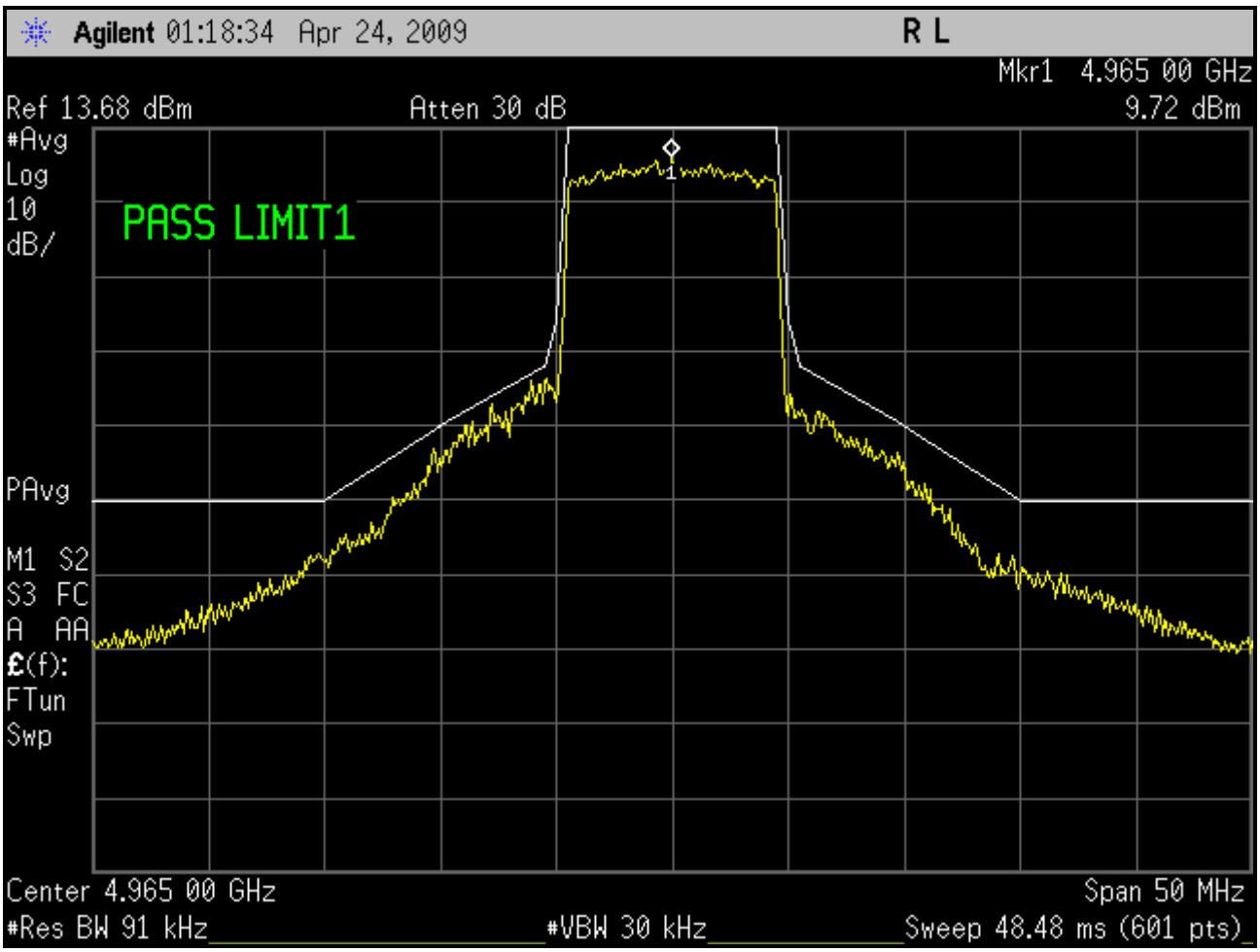
Plot 6-8: Emissions Mask M; Channel 1 - 4945 MHz (10 MHz BW)



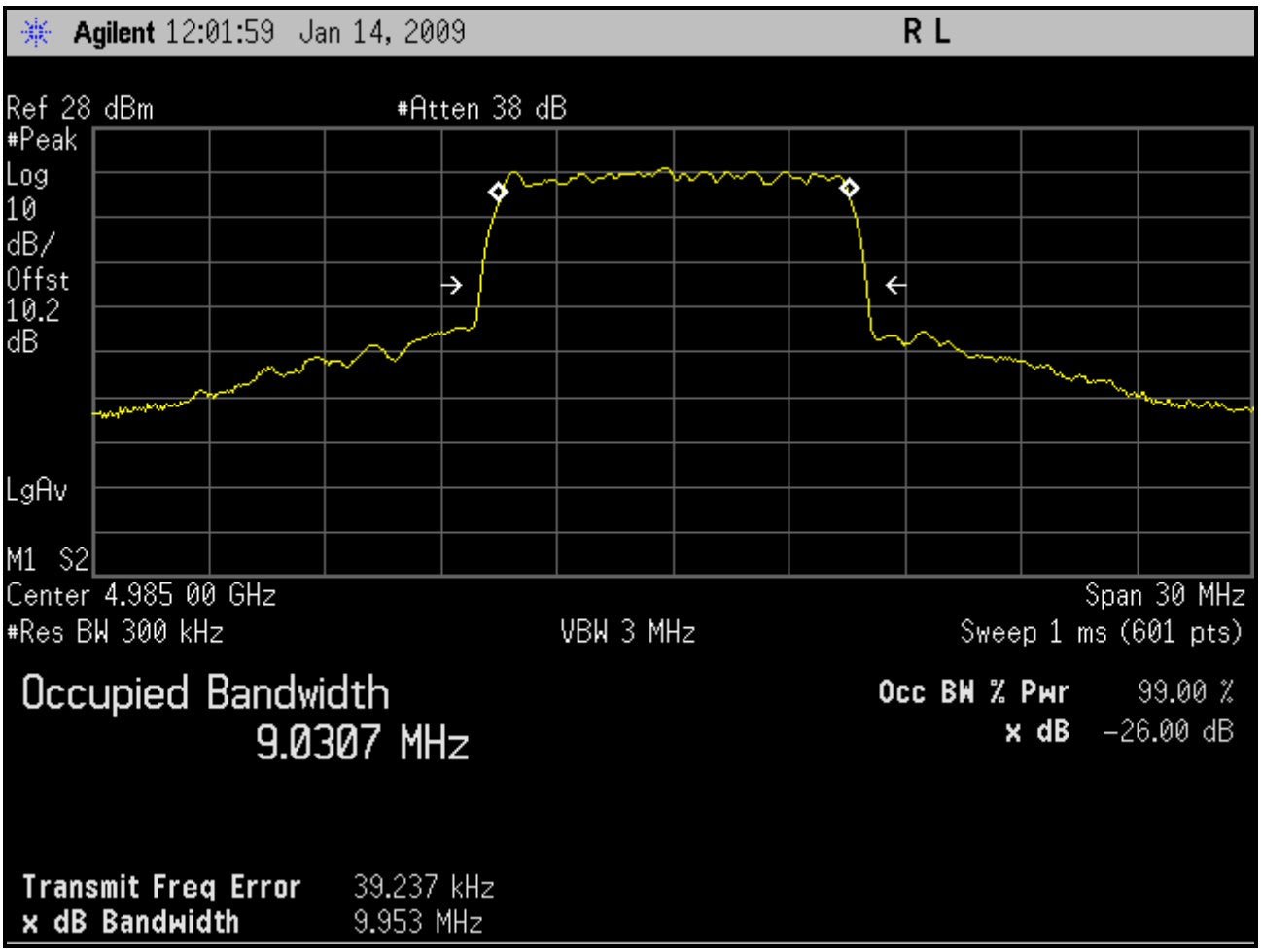
Plot 6-9: Occupied Bandwidth; Channel 3 – 4965 MHz (10 MHz BW)



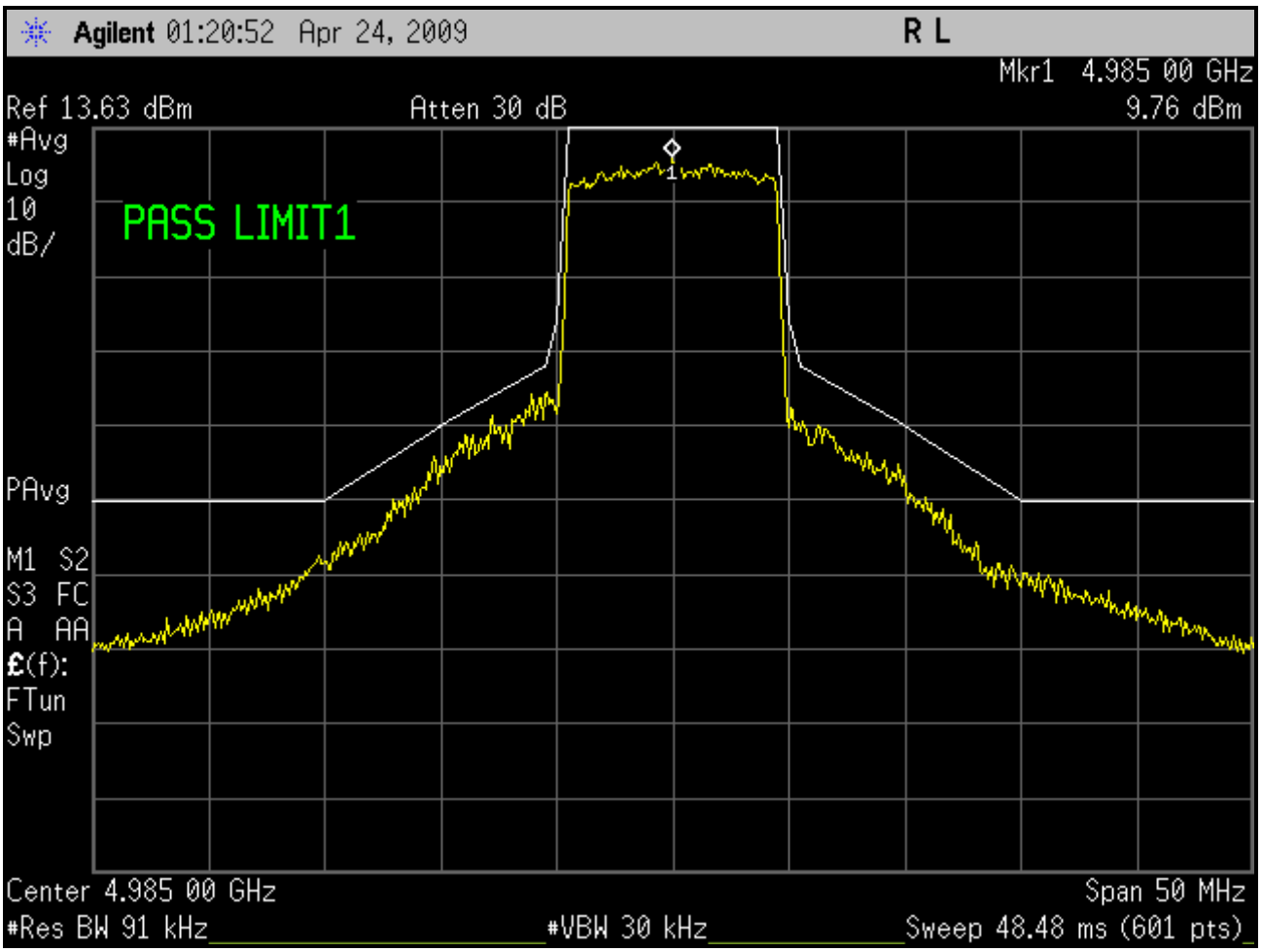
Plot 6-10: Emissions Mask M; Channel 3 - 4965 MHz (10 MHz BW)



Plot 6-11: Occupied Bandwidth; Channel 5 - 4985 MHz (10 MHz BW)

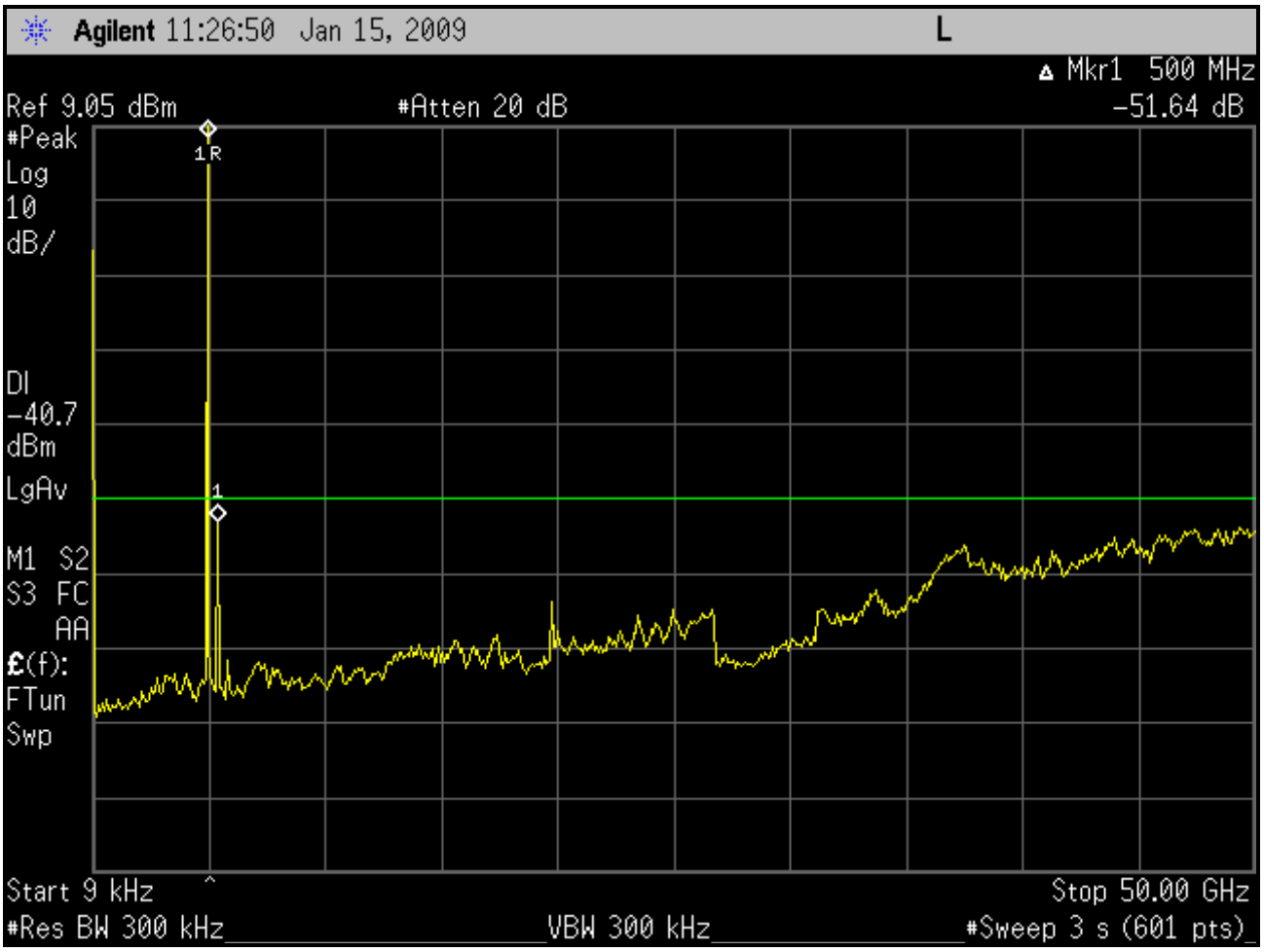


Plot 6-12: Emissions Mask M; Channel 5 - 4985 MHz (10 MHz BW)

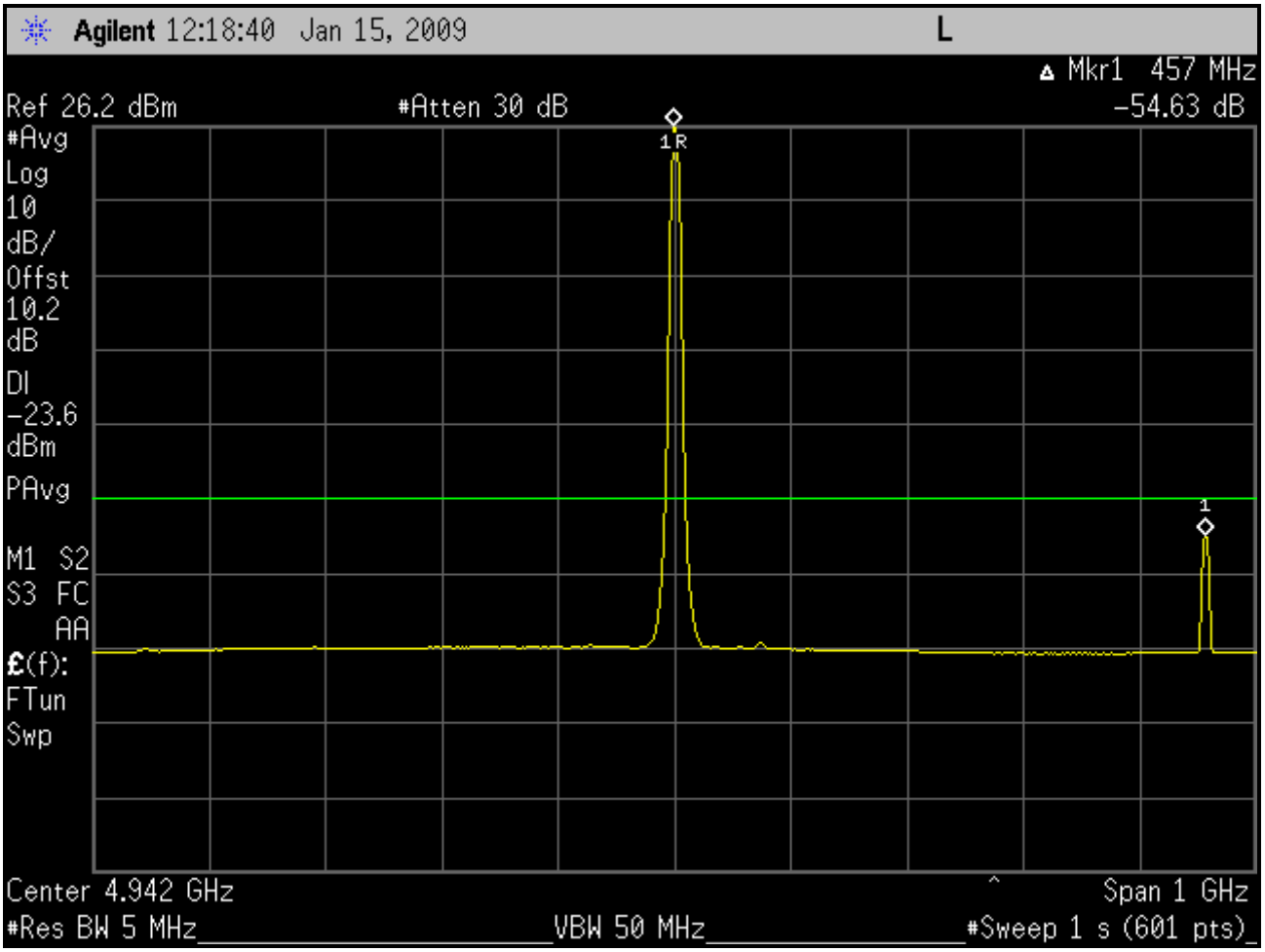


6.4 Out of Band Spurious Test Data

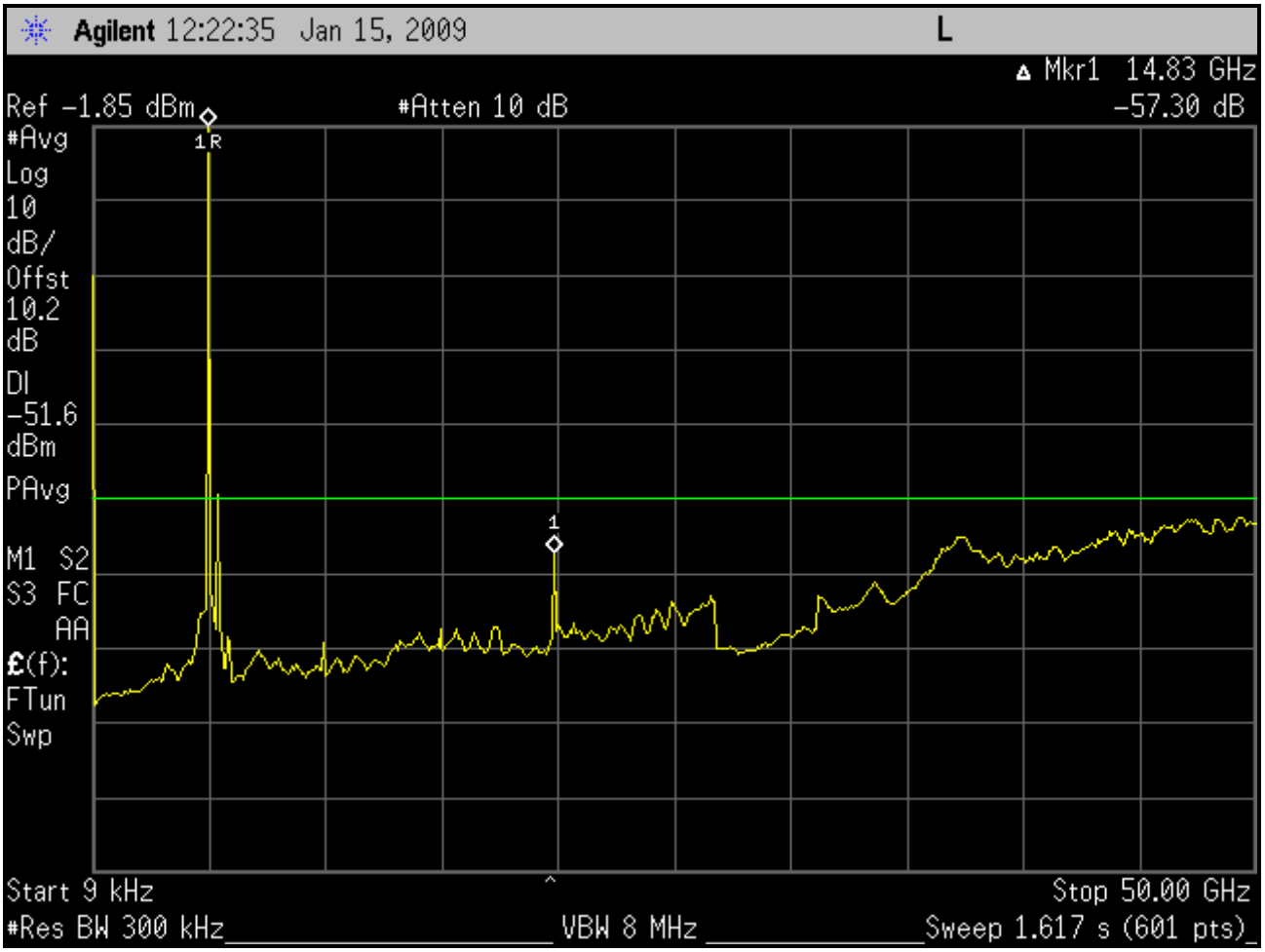
Plot 6-13: Conducted Spurious Emissions; Channel 1 – 4942.5 MHz (5 MHz BW; Full Band)



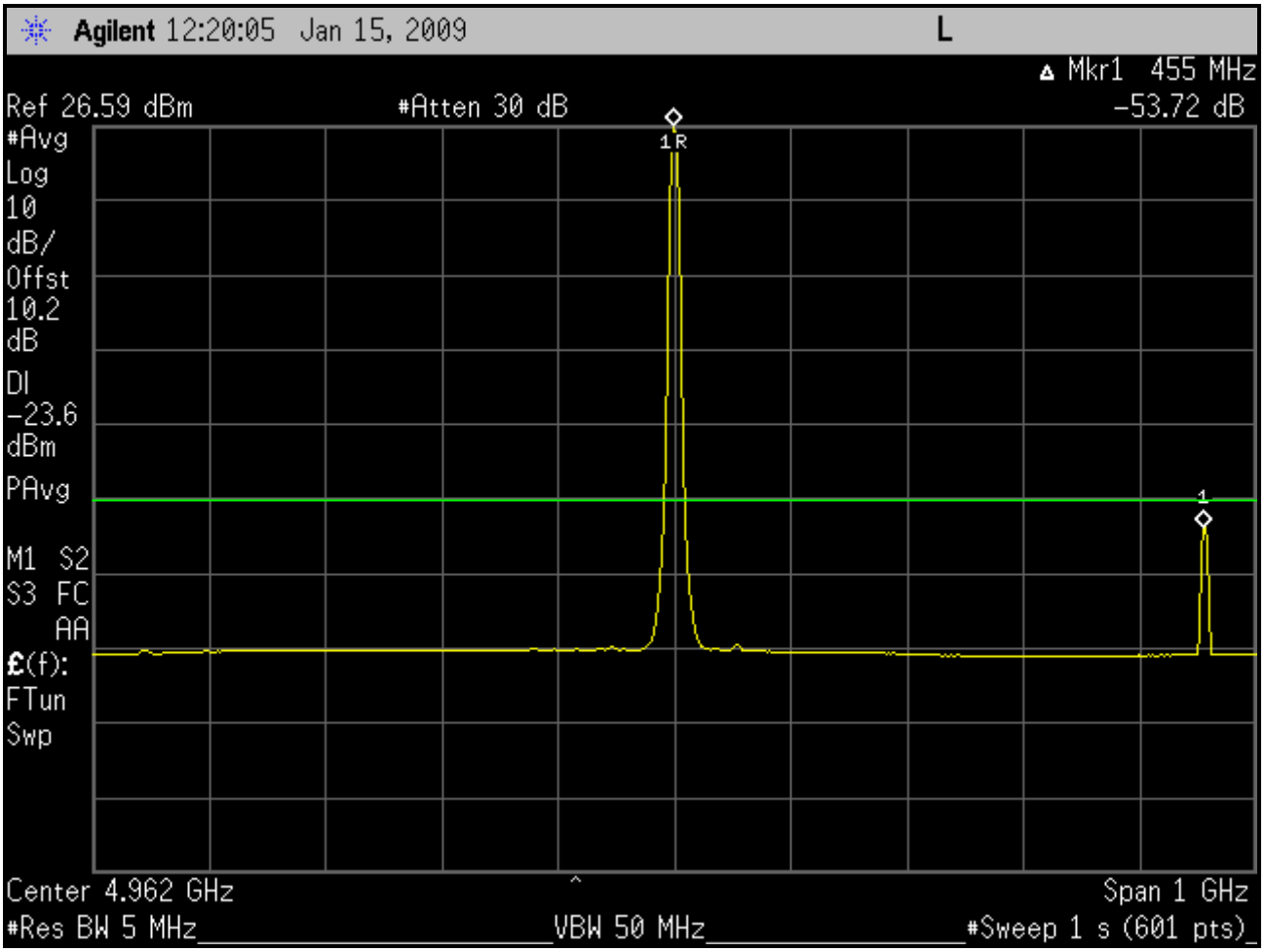
Plot 6-14: Conducted Spurious Emissions; Channel 1 – 4942.5 MHz (5 MHz BW; LO)



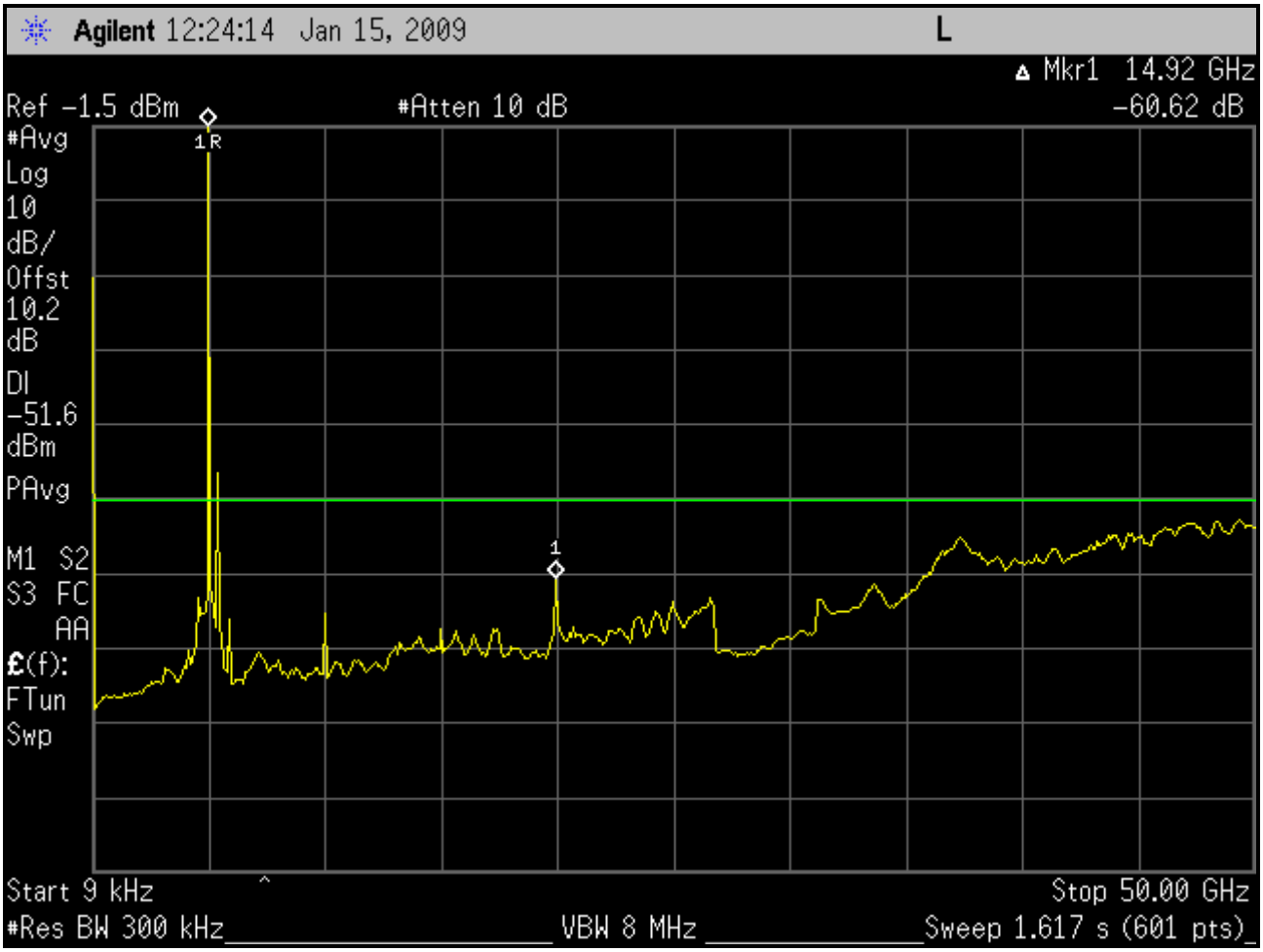
Plot 6-15: Conducted Spurious Emissions; Channel 5 – 4962.5 MHz (5 MHz BW; Full Band)



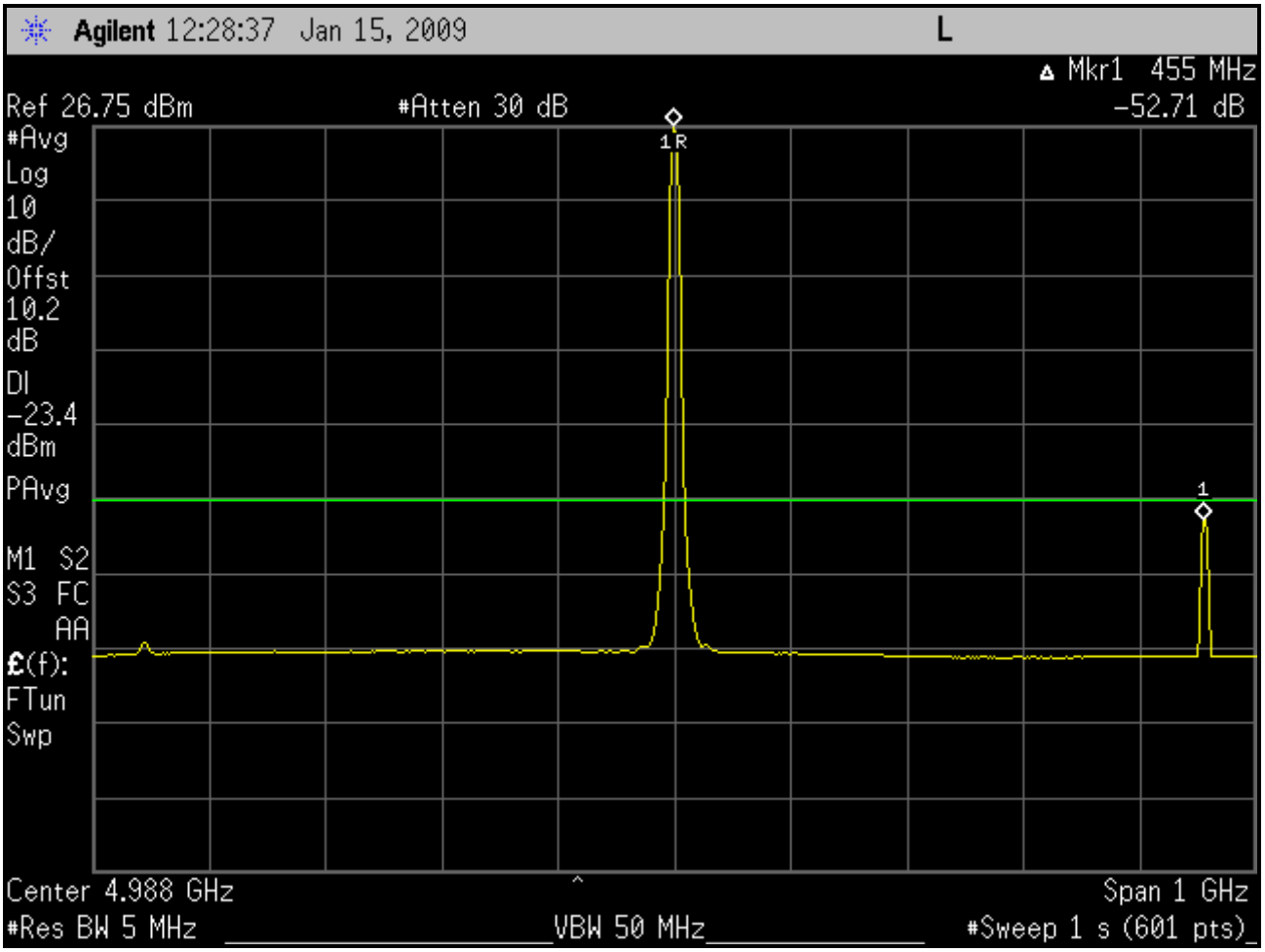
Plot 6-16: Conducted Spurious Emissions; Channel 5 – 4962.5 MHz (5 MHz BW; LO)



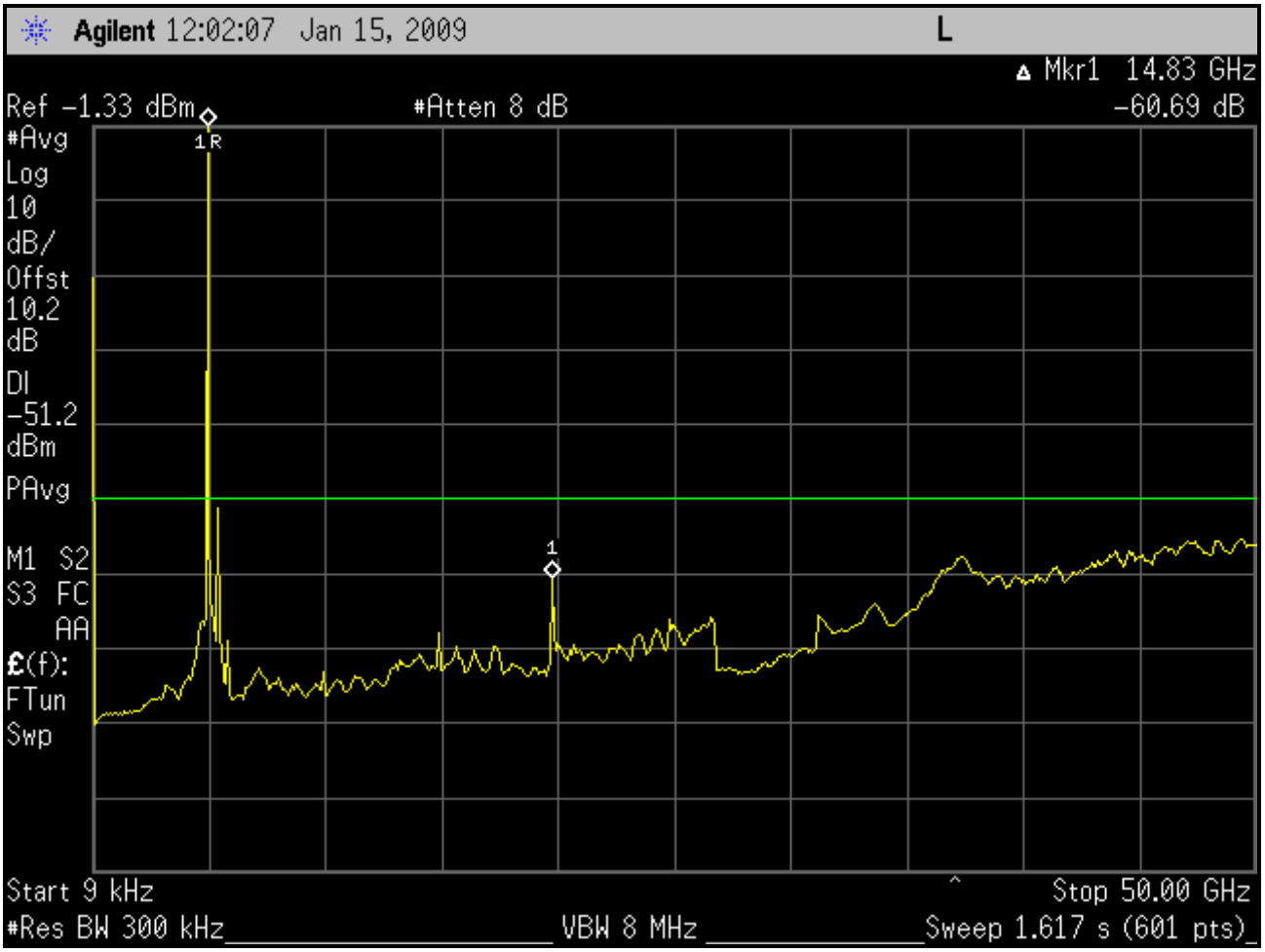
Plot 6-17: Conducted Spurious Emissions; Channel 10 – 4987.5 MHz (5 MHz BW; Full Band)



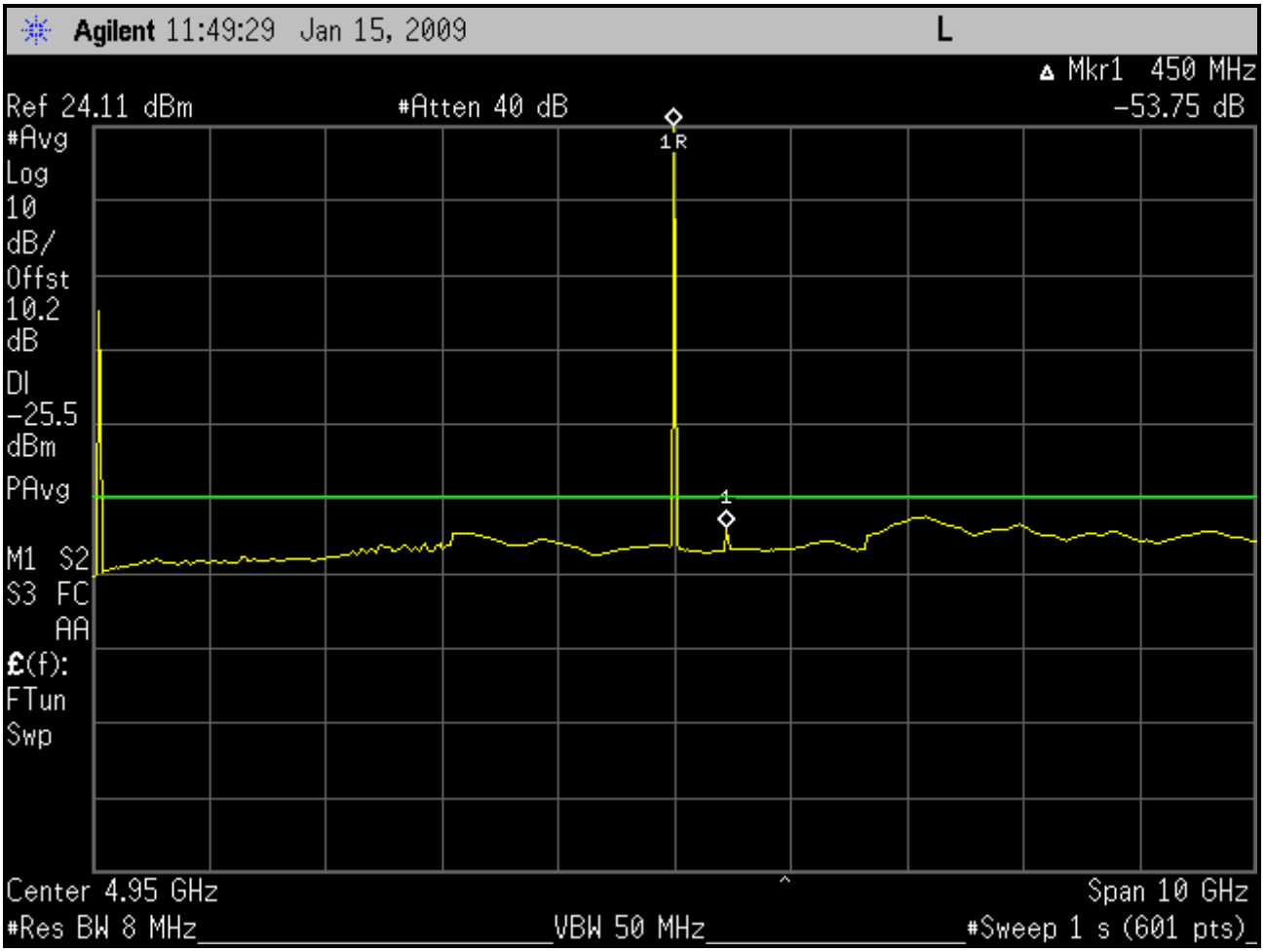
Plot 6-18: Conducted Spurious Emissions; Channel 10 – 4987.5 MHz (5 MHz BW; LO)



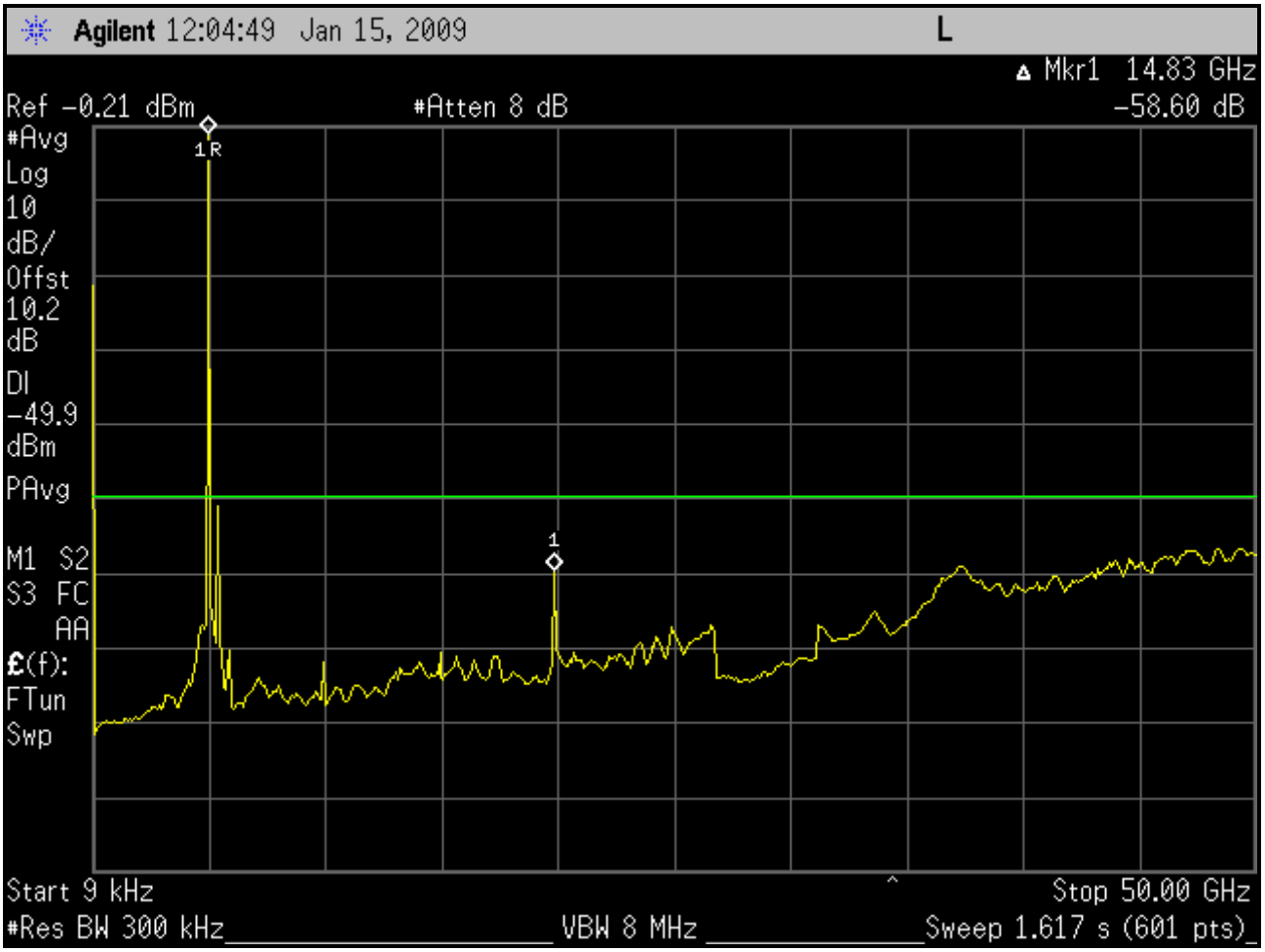
Plot 6-19: Conducted Spurious Emissions; Channel 1 – 4945 MHz (10 MHz BW; Full Band)



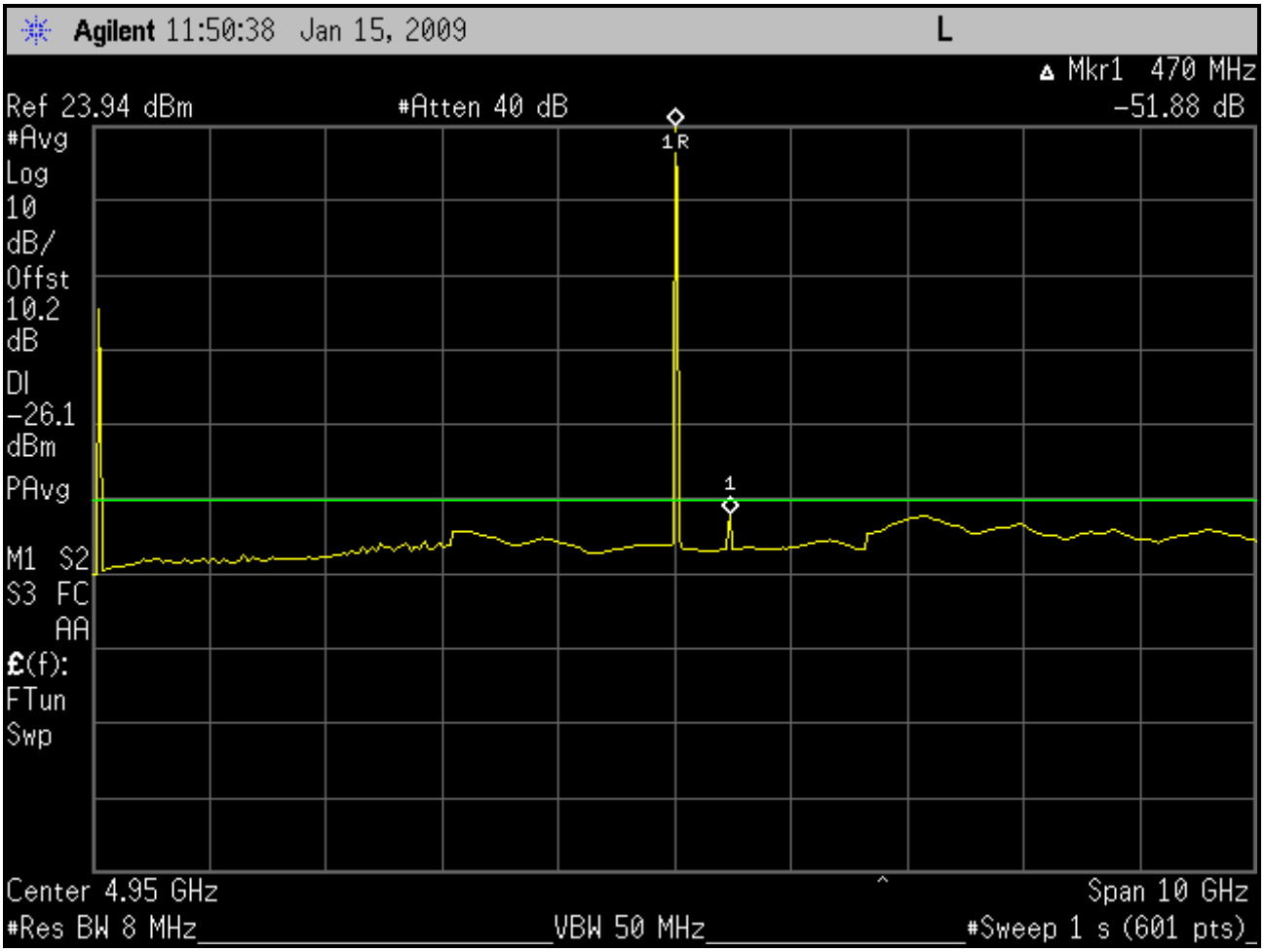
Plot 6-20: Conducted Spurious Emissions; Channel 1 – 4945 MHz (10 MHz BW; LO)



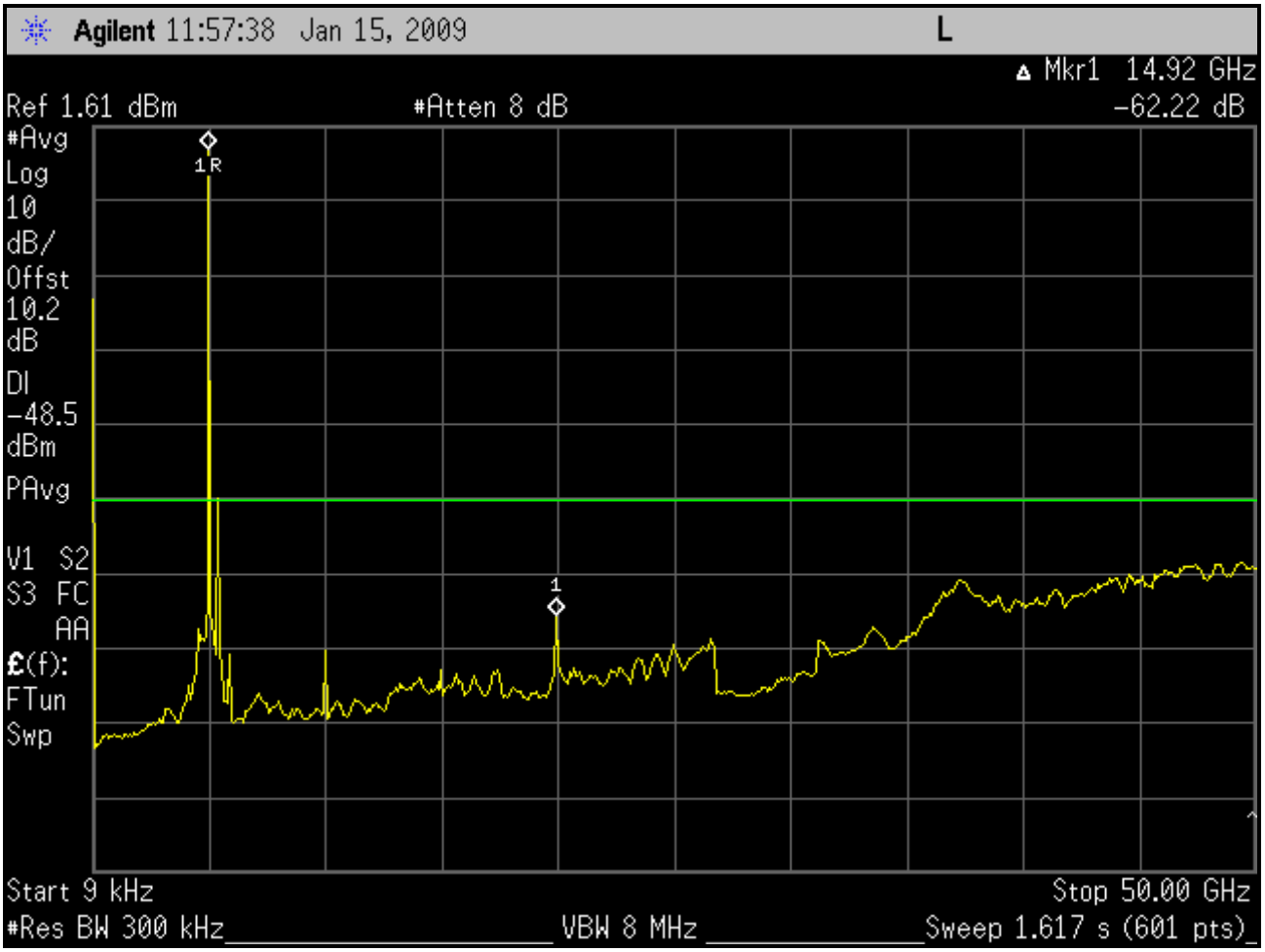
Plot 6-21: Conducted Spurious Emissions; Channel 3 – 4965 MHz (10 MHz BW; Full Band)



Plot 6-22: Conducted Spurious Emissions; Channel 3 – 4965 MHz (10 MHz BW; LO)



Plot 6-23: Conducted Spurious Emissions; Channel 5 – 4985 MHz (10 MHz BW; Full Band)



Plot 6-24: Conducted Spurious Emissions; Channel 5 – 4985 MHz (10 MHz BW; LO)

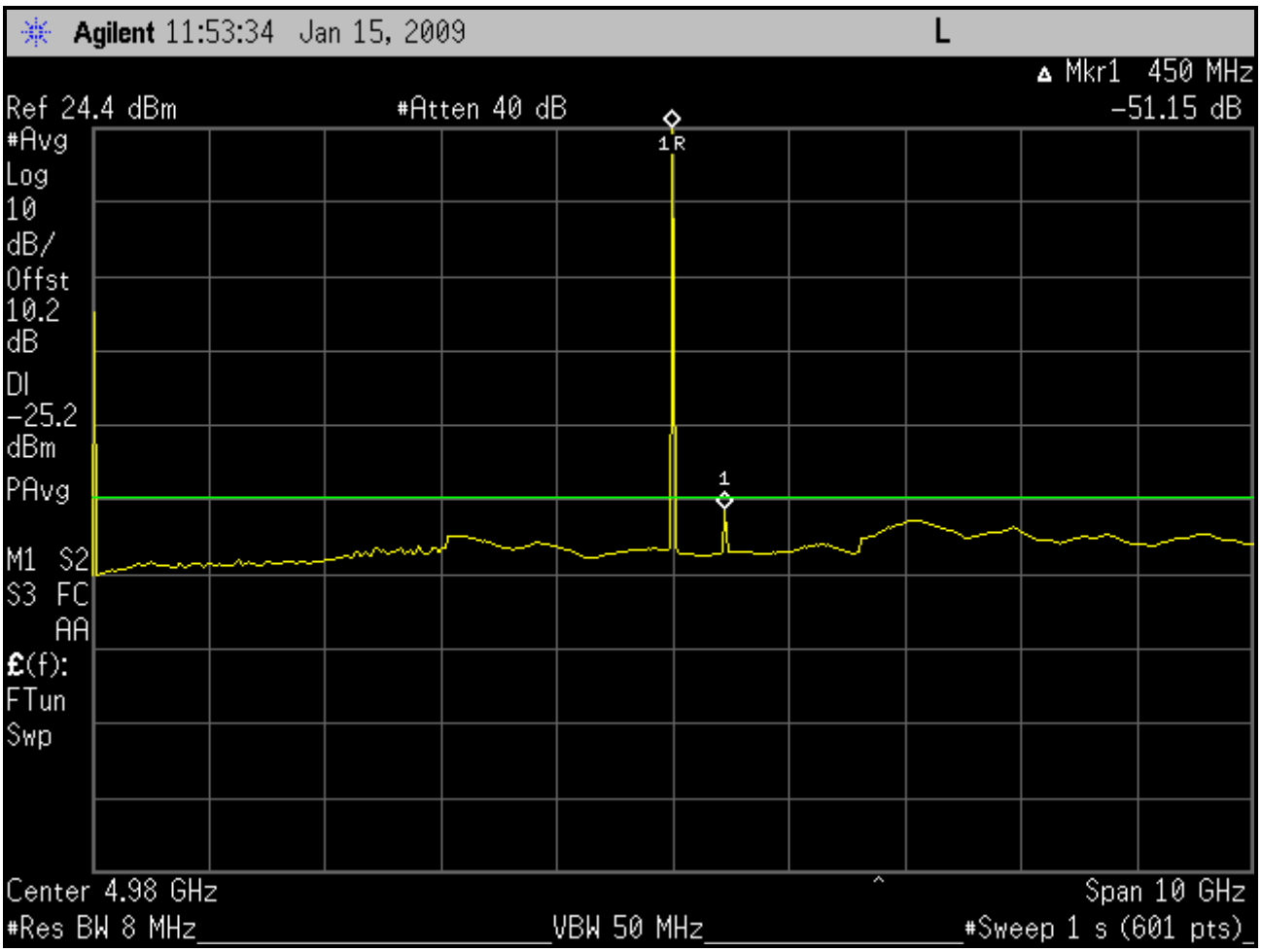


Table 6-1: Test Equipment for Testing Occupied Bandwidth/Conducted Spurious Emissions

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
900819	Weinschel Corp	2	10 dB Attenuator; 5 W	BF0830	12/3/09

Test Personnel:

Daniel Baltzell		January 14-16, 2009
Test Engineer	Signature	Date Of Tests

7 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

7.1 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 conductive 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 10^{th} 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: 22.9 dBm

Spurious limit = 22.9 dBm – 50 dB = -27.1 dBm

7.2 Test Data

7.2.1 CFR 47 Part 90.210 Requirements

The worst-case emissions test data are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

Table 7-1: Field Strength of Spurious Radiation: Channel 1 – 4942.5 MHz (5 MHz BW)

Limit = 50 dBc or -23.1dBm
Conducted Power (Avg) = 26.93 dBm = 0.493 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	EIRP (dBm)	Limit	Margin (dB)
5398.5	49.3	-32.5	13.1	8.5	-37.2	-23.1	-14.1
9885.0	43.5	-35.4	17.4	9.3	-43.5	-23.1	-20.4
10797.0	38.3	-39.0	17.1	9.6	-46.5	-23.1	-23.4
14827.5	39.2	-31.3	18.5	10.3	-39.5	-23.1	-16.5
16195.5	35.9	-38.1	19.6	14.4	-43.3	-23.1	-20.2

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

Table 7-2: Field Strength of Spurious Radiation: Channel 5 – 4962.5 MHz (5 MHz BW)

Limit = 50 dBc or -23.7 dBm
Conducted Power (Avg) = 26.35 dBm = 0.432 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	EIRP (dBm)	Limit	Margin (dB)
5418.5	49.6	-41.5	13.1	8.5	-46.2	-23.7	-22.5
9925.0	44.2	-34.2	17.4	9.3	-42.3	-23.7	-18.6
10837.0	38.5	-38.1	17.1	9.6	-45.6	-23.7	-22.0
14887.5	39.1	-31.7	18.5	10.3	-39.9	-23.7	-16.3

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

Table 7-3: Field Strength of Spurious Radiation: Channel 10 – 4987.5 MHz (5 MHz BW)

Limit = 50 dBc or -23.7 dBm
Conducted Power (Avg) = 26.34 dBm = 0.431 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	EIRP (dBm)	Limit	Margin (dB)
5443.5	50.7	-40.9	13.0	8.5	-45.4	-23.7	-21.8
9975.0	43.2	-34.1	17.3	9.2	-42.2	-23.7	-18.5
10887.1	38.0	-37.3	17.2	9.6	-44.9	-23.7	-21.2
14962.5	39.9	-31.4	18.6	10.6	-39.4	-23.7	-15.7

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

Table 7-4: Field Strength of Spurious Radiation: Channel 1 – 4945 MHz (10 MHz BW)

Limit = 50 dBc or -23.3 dBm
Conducted Power (Avg) = 26.69 dBm = 0.467 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	EIRP (dBm)	Limit	Margin (dB)
9890.0	41.4	-37.6	17.4	9.3	-45.7	-23.3	-22.4
14835.0	38.7	-32.3	18.6	10.3	-40.6	-23.3	-17.3

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

Table 7-5: Field Strength of Spurious Radiation: Channel 3 – 4965 MHz (10 MHz BW)

Limit = 50 dBc or -23.4 dBm
Conducted Power (Avg) = 26.62 dBm = 0.459 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	EIRP (dBm)	Limit	Margin (dB)
9930.0	41.7	-36.9	17.4	9.2	-45.0	-23.4	-21.7
14895.0	38.1	-32.3	18.5	10.5	-40.4	-23.4	-17.0

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

Table 7-6: Field Strength of Spurious Radiation: Channel 5 – 4985 MHz (10 MHz BW)

Limit = 50 dBc or -23.6 dBm
Conducted Power (Avg) = 26.41 dBm = 0.438 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	EIRP (dBm)	Limit	Margin (dB)
9970.0	42.3	-35.3	17.4	9.2	-43.4	-23.6	-19.8
14955.0	37.5	-34.2	18.5	10.5	-42.3	-23.6	-18.7

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

Table 7-7: 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	2/9/10
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 30, 2009
Test Engineer	Signature	Date Of Tests

8 FCC Rules and Regulation Part 90 §90.213(a) and Part 2 §2.1055: Frequency Stability; RSS-111 §4.2: Transmitter Frequency Stability

§90.213(a): Unless noted elsewhere, transmitters used in the services governed by this part must have minimum frequency stability as specified in table (see 90.213 for table).

Above 2450 MHz, the frequency stability is to be specified in the station authorization.

For equipment authorization purposes, this is a reporting requirement only.

8.1 Test Procedure

TIA-603-C-2004, section 2.3.1 and 2.3.2.

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +60°C, and normalized to 20°C, 24 VDC.

The temperature was initially set to -30°C and a 2-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10°C through the range. A ½ hour period was observed to stabilize the EUT at each measurement step, and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied +/-15% nominal and range of input voltages.

The worst-case test data are shown below in Table 8-1 and Table 8-2.

8.2 Frequency Stability Test Data

8.2.1 Frequency Stability/Temperature Variation

Table 8-1: Frequency Stability/Temperature Variation – Channel 1 - 4942.5 MHz; 5 MHz BW

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	4942.499129	-0.2
-20	4942.500512	0.1
-10	4942.492517	-1.5
0	4942.492537	-1.5
10	4942.492024	-1.6
20	4942.500000	0.0
30	4942.498415	-0.3
40	4942.499027	-0.2
50	4942.500005	0.0

Table 8-2: Frequency Stability/Temperature Variation – Channel 5 - 4962.5 MHz; 5 MHz BW

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	4962.501102	0.2
-20	4962.503526	0.7
-10	4962.495019	-1.0
0	4962.495160	-1.0
10	4962.494690	-1.1
20	4962.500000	0.0
30	4962.499592	-0.1
40	4962.500085	0.0
50	4962.502576	0.5

Table 8-3: Frequency Stability/Temperature Variation – Channel 10 - 4987.5 MHz; 5 MHz BW

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	4987.499177	-0.2
-20	4987.501225	0.2
-10	4987.493571	-1.3
0	4987.493364	-1.3
10	4987.493830	-1.2
20	4987.500000	0.0
30	4987.502553	0.5
40	4987.500734	0.1
50	4987.500460	0.1

Table 8-4: Frequency Stability/Temperature Variation – Channel 1 - 4945 MHz; 10 MHz BW

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	4944.986199	-2.8
-20	4944.989342	-2.2
-10	4944.986404	-2.7
0	4944.989741	-2.1
10	4944.993719	-1.3
20	4945.000000	0.0
30	4944.994465	-1.1
40	4944.986361	-2.8
50	4944.986963	-2.6

Table 8-5: Frequency Stability/Temperature Variation – Channel 3 - 4965 MHz; 10 MHz BW

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	4965.000568	0.1
-20	4964.992003	-1.6
-10	4964.990660	-1.9
0	4964.993581	-1.3
10	4964.994610	-1.1
20	4965.000000	0.0
30	4964.993097	-1.4
40	4964.987531	-2.5
50	4964.990889	-1.8

Table 8-6: Frequency Stability/Temperature Variation – Channel 5 - 4985 MHz; 10 MHz BW

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	4984.997796	-0.4
-20	4985.001085	0.2
-10	4984.991954	-1.6
0	4984.992625	-1.5
10	4984.995634	-0.9
20	4985.000000	0.0
30	4984.993118	-1.4
40	4984.989069	-2.2
50	4984.990304	-1.9

8.2.2 Frequency Stability/Voltage Variation

Table 8-7: Frequency Stability/Voltage Variation – Channel 1 - 4942.5 MHz; 5 MHz BW

Voltage (VAC)	Measured Frequency (MHz)	ppm
20.40	4942.495554	-0.9
24.00	4942.500000	0.0
27.60	4942.498362	-0.3

Table 8-8: Frequency Stability/Voltage Variation – Channel 5 - 4962.5 MHz; 5 MHz BW

Voltage (VAC)	Measured Frequency (MHz)	ppm
20.40	4962.501060	0.2
24.00	4962.500000	0.0
27.60	4962.502459	0.5

Table 8-9: Frequency Stability/Voltage Variation – Channel 10 - 4987.5 MHz; 5 MHz BW

Voltage (VAC)	Measured Frequency (MHz)	ppm
20.40	4987.499504	-0.1
24.00	4987.500000	0.0
27.60	4987.499680	-0.1

Table 8-10: Frequency Stability/Voltage Variation – Channel 1 - 4945 MHz; 10 MHz BW

Voltage (VAC)	Measured Frequency (MHz)	ppm
20.40	4944.995004	-1.0
24.00	4945.000000	0.0
27.60	4944.994823	-1.0

Table 8-11: Frequency Stability/Voltage Variation – Channel 3 - 4965 MHz; 10 MHz BW

Voltage (VAC)	Measured Frequency (MHz)	ppm
20.40	4964.998380	-0.3
24.00	4965.000000	0.0
27.60	4964.998173	-0.4

Table 8-12: Frequency Stability/Voltage Variation – Channel 5 - 4985 MHz; 10 MHz BW

Voltage (VAC)	Measured Frequency (MHz)	ppm
20.40	4984.996680	-0.7
24.00	4985.000000	0.0
27.60	4984.996369	-0.7

Table 8-13: Test Equipment for Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	7/31/09
901413	Agilent Technologies	E4448	Spectrum Analyzer	US44020346	7/31/09
900819	Weinschel Corp	2	10 dB Attenuator; 5 W	BF0830	12/3/09
901428	Meterman	33XR	Digital Multimeter	050401946	11/5/09
901517	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	10/17/09

Test Personnel:

Daniel Baltzell		January 14-16, 2009
Test Engineer	Signature	Date Of Tests

9 Conclusion

The data in this measurement report shows that the **M/A-COM, Inc**. Model **B510 Base Station, FCC ID: BV8MBASE**, **IC: 3670A-MBASE,** complies with all the applicable requirements of FCC Parts 90, 15 and 2 and Industry Canada RSS-111.