COMPLIANCE WORLDWIDE INC.
TEST REPORT 504-11R2

In Accordance with the Requirements of

FCC PART 15.407, Subpart E
INDUSTRY CANADA RSS 210, ISSUE 8, ANNEX 9

Low Power License-Exempt Radio Communication Devices
Intentional Radiators

Issued to

Philips Medical Systems
3000 Minuteman Drive
Andover, MA 01810
978-659-2800

for the

Philips Telemetry System
MX40 Patient Worn Monitor
WLAN Radio

FCC ID: PQC-MX40SH2B4
IC: 3549B-MX40SH2B4

Report Issued on April 23, 2012

Tested by

Brian F. Breault

Reviewed by

Larry K. Stillings

Table of Contents

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

1. Scope

This test report certifies that the Philips Medical Telemetry System MX40 5 GHz Patient Worn Monitor (PWM) WLAN Radio, as tested, meets the FCC Part 15.407, Subpart E and Industry Canada RSS 210, Issue 7, Annex 9 requirements. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required. Revision R1 updates public exposure for time averaged source power. Revision R2 removes Receiver data.

2. Product Details

2.1. Manufacturer: Philips Medical Systems

2.2. Model Number: IntelliVue MX40 5 GHz (MX40-WL2)

2.3. Serial Number: US11400397

2.4. Description: The Patient Worn Monitor is a body worn patient monitor for ECG and SpO2 measurements. The device has a touch screen display which can display patient waveforms and/or numeric values locally or transmitted via several possible radio links to the hospital wireless network, a wireless bedside monitor, or to a CTS network for display on the IntelliVue Information Center. The device is capable of transmitting in the 2.4 GHz (ISM bands), 5.6 GHz (ISM bands) and/or the WMTS bands, 1395 MHz to 1400 MHz and 1427 MHz to 1432 MHz. The PWM contains an 802.11 a/b/g WLAN radio to communicate with a WLAN, an 802.15.4 SRR radio to communicate with a SRR equipped bedside monitor, or an optional 1.4 GHz or 2.4 GHz CTS radio to communicate with a Philips CTS network. Performance evaluation during immunity testing shall be done on the PWM display, the WLAN display, the IntelliVue Information Center display and the MP5 bedside monitor. The PWM will be configured with a 5 GHz 802.11a radio for this test plan.

2.5. Power Source: DC 3 volts – Three 1.5 VDC Alkaline AA Batteries (Voltage is regulated)

2.6. EMC Modifications: None

3.1. Operational Characteristics & Software

Operating Instructions for Test

Insert the batteries into the PWM battery compartment and allow the device to boot up to display ESC and SpO2 measurement parameters on the local display as well as the ROW and Wi-Fi PIC systems.

The PWM will need to be put into “TELEMETRY” mode during all testing to allow onboard display to be viewed. To do this, with the PWM running, press the middle “SMART KEY” button on the PWM front panel. When the “SMART KEY” menu comes up, press the “Mode: Telemetry” button. The state should change to “Mode: Monitor”.

Next, the WLAN radio needs to be enabled. While in the “SMART KEY” menu screen, press the double down arrow in the lower right of the Touch screen display to display the next menu screen. Now press the “Op Mode” button which will bring up the “Op Mode” selection screen. Now press the “Service” button which will bring up an “Op Mode” window where the password needs to be entered to change mode. The password, 4 6 3 0, shall be entered and then press the “Enter” button which will put the device into “Service” mode. Now press the “Wireless Setup” button,

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

3. Product Configuration

3.1. Operational Characteristics & Software (continued)

then press the "WLAN" button, then press the "WLAN Off" button, which will then change to read "WLAN On".

Now, the device is ready to be placed back into monitoring mode. To accomplish this, press the "X" in the "Service" screen, then press "X" in the Service screen again, then press "X" in the Service screen again. Now the "SMART KEY" window should be displayed. Press the "Op Mode" button which will bring up the "Op Mode" menu screen. Press the "Monitoring" button and the Patient Window should be displayed.

If it is not possible to enact change via the smart keys, press the middle "SMART KEY" button and then using the arrow on the right side of the "SMART KEY" screen scroll down and read the buttons to make sure the device is unlocked. If "Unlock" is displayed next to the "Op Mode" button, the device is locked. Press the "Unlock" button and it should now read "Lock". The menu keys should now work.

Simulator Setup:

Connect the MX40 PWM leadset to the Lionheart 2 according to color coding. Power on the Lionheart 2 simulator and press the "**Execute**" button. The Lionheart 2 comes up in ECG simulation at 80 bpm by default- it is also menu item "**34**". Connect the CTS network infrastructure and Philips Information Center hardware together as shown:

Central Station Setup:

Power on the CTS network infrastructure components. The Central station & Infrastructure will be pre-configured by R&D, such that on Power-up of the system the desired operation mode will be active displaying 3 ECG waveforms and an SpO2 waveform. Power on the M3150A PIC components. The Philips Information Center Central station software should load automatically within about 5 minutes. 3 patient windows should now have an ECG trace with a cardiotach reading of 80 bpm. SpO2 should also be displayed at 93% ±2%.

3.2. EUT Hardware

Blk Diag #	Manufactr	Model/Part # / Options	Serial Number	Input Voltage	Frq (Hz)	Description/Function
1	Philips	865351/MX40	US11400397	3 V	DC	Patient Worn Monitor w/WLAN CTS radio, PP3 build units

3.3. EUT Hardware/Software/Firmware Revision Level

EUT Model#	PCA#	Description	HW	SW	FW
MX40		PWM Main board	**Rev. 02**		A.00.33

3.4. EUT Cables/Transducers

Blk Diag Ltr	Manufacturer	Model/Part #	Length (m)	Shield Y/N	Description/Function
A	Philips	989803171871	0.8	Y	SpO2 connector/ECG leadset- 6 leads
B	Philips	M1191A	2	N	SpO2 patient transducer

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

3. Product Configuration (continued)

3.5. Support Equipment

Diag Blk #	Manufacturer	Model/Part # Options	Serial Number	Input Voltage	Input Frq.	Description/Function
2	Cisco	AIR AP1242AG-A-K9	FTX1050B5RU	48	DC	WLAN Access Point
		EADP-18FB B	DTH1213VF5E	100-240	50-60	AC Adapter for Access Point
3	Philips	M3154B	2UA610JXJK	100-240	50-60	InbteilliVue Information Center
4	Philips	LE1708	14AP1727A00	100-240	50-60	Display
5	Philips	865024/M8105A	DE74808392	100-240	50-60	MP5 Patient Bedside Monitor

3.6. Support Equipment Cables/Transducers

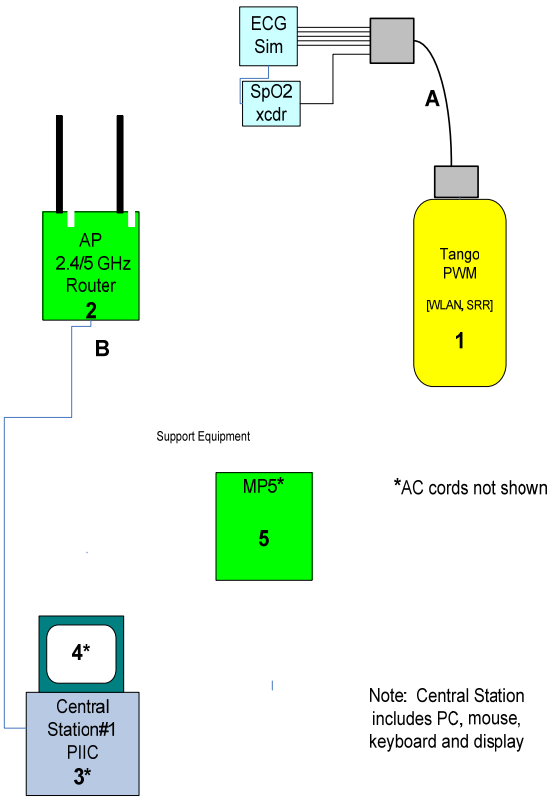
Blk Diag Ltr	Manufacturer	Model/Part #	Length (m)	Shield Y/N	Description/Function
C	NA	**NA**	Various	N	Cat 5 LAN cable

3.7. Miscellaneous

Manufacturer	Model/Part #	Description/Function
Duracell	NA	AA batteries

3.8. Block Diagram

Fig.1 Tango EMC Testing



Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Tests

Device	Manufacturer	Model No.	Serial No.	Cal Due
Spectrum Analyzer	Agilent	E4407B	MY45104493	12/22/2012
EMI Receiver	Hewlett Packard	8546A	3330A00115	10/31/2012
Spectrum Analyzer	Rohde & Schwarz	FSV40	100899	5/26/2012
Microwave Preamp	Hewlett Packard	8449B	3008A01323	12/1/2012
Bilog Antenna	Com-Power	AC-220	25509	8/30/2012
Horn Antenna	Electro-Metrics	EM-6961	6337	10/19/2012
Horn Antenna	Com-Power	AH-826	081051	6/30/2012
Horn Antenna	ComPower	AH-840	03075	7/20/2012
Loop Antenna	EMCO	6502	2197	7/21/2012
DMM / Temperature	Fluke	187	79690058	1/5/2013
5 GHz HP Filter	Micro-Tronics	HPM50112	14R	8/12/2012
Digital Barometer	Extech	SD700	Q590483	11/21/2012

4.2. Measurement & Equipment Setup

Test Dates:	Dec. 16, 2011 to Feb. 1, 2012
Test Engineer:	Brian Breault
Normal Site Temperature (15 - 35°C):	21.7
Relative Humidity (20 -75%RH):	33%
Frequency Range:	30 MHz to 40 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	120 kHz - 30 MHz to 1 GHz 1 MHz - Above 1 GHz
EMI Receiver Avg Bandwidth:	300 kHz - 30 MHz to 1 GHz 3 MHz - Above 1 GHz
Detector Function:	Peak, QP - 30 MHz to 1 GHz Peak, Avg - Above 1 GHz Unless otherwise specified.

4.3. Measurement Procedures

Test measurements were made in accordance FCC Part 15.407, IC RSS-210, Issue 8 Annex 9: Operation of license-exempt local area network (LE-LAN) devices in the bands 5150-5250 MHz, 5250-5350 MHz, 5470-5600 MHz, 5650-5725 MHz and 5725-5825 MHz.

The test procedures detailed in the Federal Communications Commission Office of Engineering and Technology Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E (FCC OET Publication Number 789033), dated 10/25/2011, were used to generate the data in this test report.

The test methods used to generate the data in this test report is in accordance with ANSI C63.4: 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

4. Measurements Parameters

4.3. Measurement Procedure (continued)

In accordance with ANSI C63.4-2003, section 13.1.4.1 c), the device under test was rotated through three orthogonal axes to determine which attitude produced the highest emission relative to the limit. The attitude that produced the highest emission relative to the limit was used for all radiated emission measurements and is detailed in this test report.

4.4. Measurement Uncertainty

The following uncertainties are expressed for an expansion/coverage factor of K=2.

RF Frequency	$\pm$ 1x10^{-8}
Radiated Emission of Transmitter	$\pm$ 4.55 dB
Radiated Emission of Receiver	$\pm$ 4.55 dB
Temperature	$\pm$ 0.91^{o} C
Humidity	$\pm$ 5%

5. Choice of Equipment for Test Suits

5.1 Choice of Model

This test report is based on the test samples supplied by the manufacturer and are reported by the manufacturer to be equivalent to the production units.

5.2 Presentation

This test sample was tested complete with all required ancillary equipment. Refer to Section 3 of this report for product equipment configuration.

5.3 Choice of Operating Frequencies

The MX40 Patient Worn Monitor 802.11a transmitter, as tested, operates on 20 channels, from channel 36 to channel 161.

In accordance with ANSI C63.4-2009, section 13.2.1, the choice of operating frequencies selected for the testing detailed in this report are outlined in the following tables:

802.11a

Frequency Band	Channel	Frequency (MHz)	Status
U-NII 1	36	5180	Tested
	40	5200	Tested
	44	5220	Not Tested
	48	5240	Tested
U-NII 2	52	5260	Tested
	56	5280	Not Tested
	60	5300	Not Tested
	64	5320	Tested

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

5. Choice of Equipment for Test Suits (continued)

5.3 Choice of Operating Frequencies (continued)

802.11a

Frequency Band	Channel	Frequency (MHz)	Status
U-NII 2 Extended	100	5500	Tested
	104	5520	Not Tested
	108	5540	Not Tested
	112	5560	Not Tested
	116	5580	Tested
	120	5600	Disabled
	124	5620	Disabled
	128	5640	Disabled
	132	5660	Not Tested
	136	5680	Not Tested
	140	5700	Tested
U-NII 3	149	5745	Tested
	153	5765	Tested
	157	5785	Not Tested
	161	5805	Tested

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

6. Measurement Summary

Test Requirement	FCC Part 15.407 Reference	IC RSS 210 Reference	Test Report Section	Result	Comment
Maximum Conducted Output Power	15.407(a)(1) 15.407(a)(3)	A.9.2 (1) A.9.2 (4)	7.1	Compliant	
Peak Power Spectral Density	15.407(a)(1) 15.407(a)(3)	A.9.2 (1) A.9.2 (4)	7.2	Compliant	
26 dB Emission Bandwidth	15.407(a)(1) 15.407(a)(3)	N/A	7.3	N/A	
99% Power Bandwidth	N/A	A.9.2 (1) A.9.2 (4)	7.4	N/A	IC RSS 210
Peak Excursion of the Modulation Envelope	15.407(a)(6)		7.5	Compliant	
Transmitter Spurious Radiated Emissions	15.209 15.407(b)(1) 15.407(b)(4)	A.9.2 (1) A.9.2 (4)	7.6	Compliant	
Receiver Spurious Radiated Emissions	15.209 15.407(b)(1) 15.407(b)(4)	RSS 213 6.8, RSS-Gen 4.10 & 7.2.3.1	7.7	Compliant	
Lower and Upper Band Edges	15.407(b)(1) 15.215 (c) 15.407(b)(4)	A.9.2 (1) A.9.2 (4)	7.9	Compliant	
Frequency Stability	15.407(g)	A13.15	7.10	Compliant	
Public Exposure to RF Energy Levels	15.407(f)	RSS-GEN 5.5, RSS 102	7.11	Compliant	(1.1307 (b)(1))
Power Line Conducted Emissions	15.207	RSS-Gen 7.2.4	N/A	Compliant	Battery operated equipment.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data

7.1. Justification for Test Methodology

Channel	Frequency	T_{ON}	T_{OFF}	T_{TOTAL}	Duty Cycle (x)	*T*
	(MHz)	(ms)	(ms)	(ms)	(%)	(ms)
36	5180	1.7948	1.0581	2.8529	62.91	0.34
40	5200	1.7998	1.3734	3.1732	56.72	0.38
48	5240	1.7993	0.7733	2.5726	69.94	0.63
52	5260	1.7488	1.3789	3.1276	55.91	0.33
64	5320	2.0085	0.7873	2.7958	71.84	0.89
100	5500	1.1221	1.6767	2.7988	40.09	0.32
116	5580	1.7598	1.3634	3.1231	56.35	0.33
140	5700	2.9034	0.7022	3.6056	80.52	1.14
149	5745	1.7558	1.3694	3.1251	56.18	0.33
153	5765	2.2272	0.86637	3.0936	71.99	0.95
161	5805	1.8348	1.3534	3.1882	57.55	2.35

The duty cycle values in the above table represent the best case duty cycle values that can be achieved due to the operational characteristics of the device under test. Therefore FCC OET Publication Number 789033, test method SA-3 (RMS detection with max hold) was used to determine the maximum conducted output power.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data

7.1. Maximum Conducted Output Power

Requirement: U-NII 1 (15.407(a)(1))

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or [4 dBm + 10 log B], where B is the 26–dB emission bandwidth in MHz.

U-NII 2 and U-NII 2 Extended (15.407(a)(2))

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

U-NII 3 (15.407(a)(3))

For the band 5.725–5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or [17 dBm + 10 log B], where B is the 26-dB emission bandwidth in MHz.

Conditions: Temperature: 21°C Relative Humidity: 31%

Conclusion: The maximum conducted output power over the frequency band of operation complies with the FCC Part 15.407 limits specified in section 7.3 of this test report.

Requirement: If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Conclusion: The transmit antenna for this product has a gain of 1.0 dBi. Therefore, this requirement does not apply to this product.

Procedure: This test was performed in accordance with the procedure detailed in FCC OET publication number 789033, Section C, Clause f: Method SA-3 (RMS detection with max hold).

For transmitters with non-removable antennas, the following equation was used to determine the output power from the measured field strength:

$$P = \frac{(E \times d)^2}{(30 \times G)}$$

P = the power in Watts (power has been converted to milliwatts in the table).
E = the measured maximum field in V/m
G = the numeric gain of the transmitting antenna over an isotropic radiator.
d = the distance in meters of the field strength measurement.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.2. Maximum Conducted Output Power

Measurement Results, U-NII 1:

Channel	Freq.	Integrated RMS Field Strength [1]	Distance	Antenna Gain[1]		Meas. RMS Output Power	Output Power Limit [2]	Result
	(MHz)	(dBµV/m)	(d)	(dBi)	(numeric)	(mW)	(mW)	
36	5180	109.40	3.0	1.00	1.259	20.75	50.0	Compliant
40	5200	109.54	3.0	1.00	1.259	21.43	50.0	Compliant
48	5240	109.29	3.0	1.00	1.259	20.24	50.0	Compliant

Measurement Results, U-NII 2:

Channel	Freq.	Integrated RMS Field Strength [1]	Distance	Antenna Gain[1]		Meas. RMS Output Power	Output Power Limit [2]	Result
	(MHz)	(dBµV/m)	(d)	(dBi)	(numeric)	(mW)	(mW)	
52	5260	109.42	3.0	1.00	1.259	20.85	250.0	Compliant
64	5320	109.74	3.0	1.00	1.259	22.45	250.0	Compliant

Measurement Results, U-NII 2 Extended:

Channel	Freq.	Integrated RMS Field Strength [1]	Distance	Antenna Gain[1]		Meas. RMS Output Power	Output Power Limit [2]	Result
	(MHz)	(dBµV/m)	(d)	(dBi)	(numeric)	(mW)	(mW)	
100	5500	112.57	3.0	1.00	1.259	43.06	250.0	Compliant
116	5580	112.86	3.0	1.00	1.259	46.04	250.0	Compliant
140	5700	113.01	3.0	1.00	1.259	47.66	250.0	Compliant

Measurement Results, U-NII 3:

Channel	Freq.	Integrated RMS Field Strength [1]	Distance	Antenna Gain[1]		Meas. RMS Output Power	Output Power Limit [2]	Result
	(MHz)	(dBµV/m)	(d)	(dBi)	(numeric)	(mW)	(mW)	
149	5745	114.22	3.0	1.00	1.259	62.97	1000.0	Compliant
153	5765	113.96	3.0	1.00	1.259	59.31	1000.0	Compliant
161	5805	114.46	3.0	1.00	1.259	66.55	1000.0	Compliant

[1] The Integrated RMS field strength was derived from the spectrum analyzer measurement M2 function result and converted to dBµV/m by adding 107. Reference the following screen captures.
[2] Reference section 6.3 for the 26 dB emissions bandwidth and the output power limit.

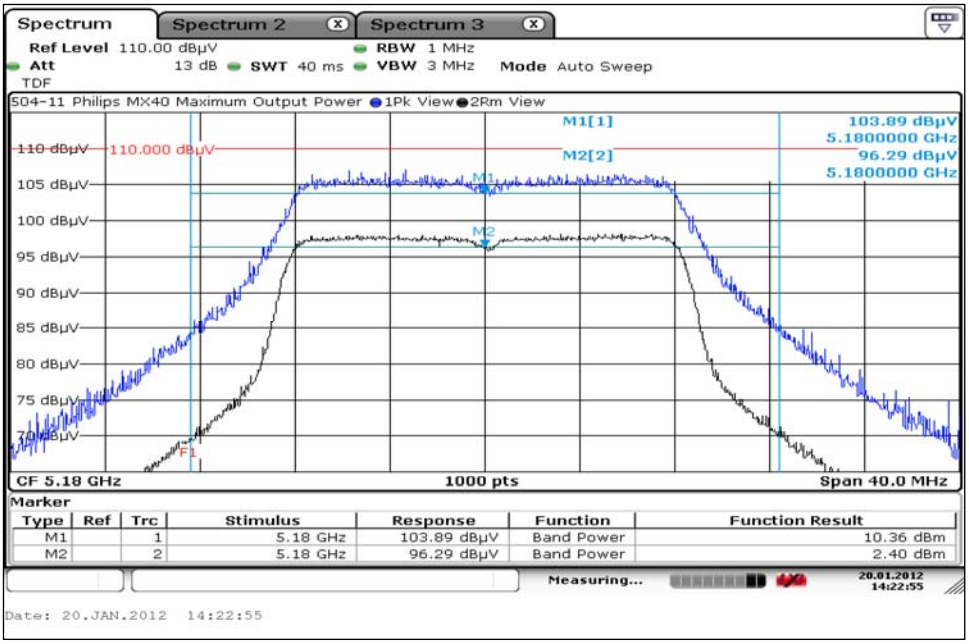
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

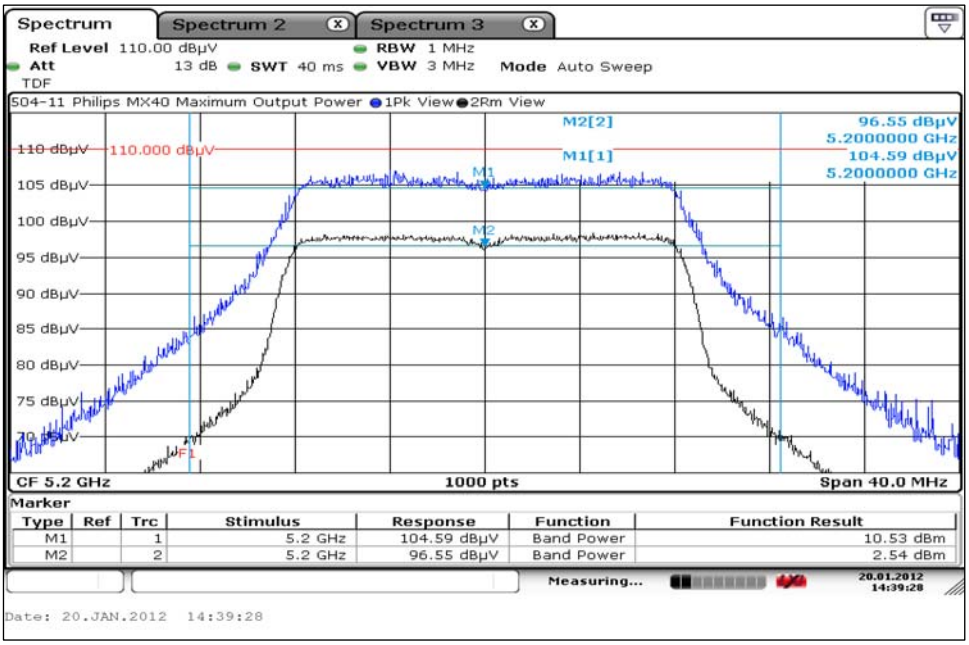
7.2 Maximum Conducted Output Power (continued)

7.2.1. U-NII 1 Band Measurement Plots

7.2.1.1. Channel 36



7.2.1.2. Channel 40



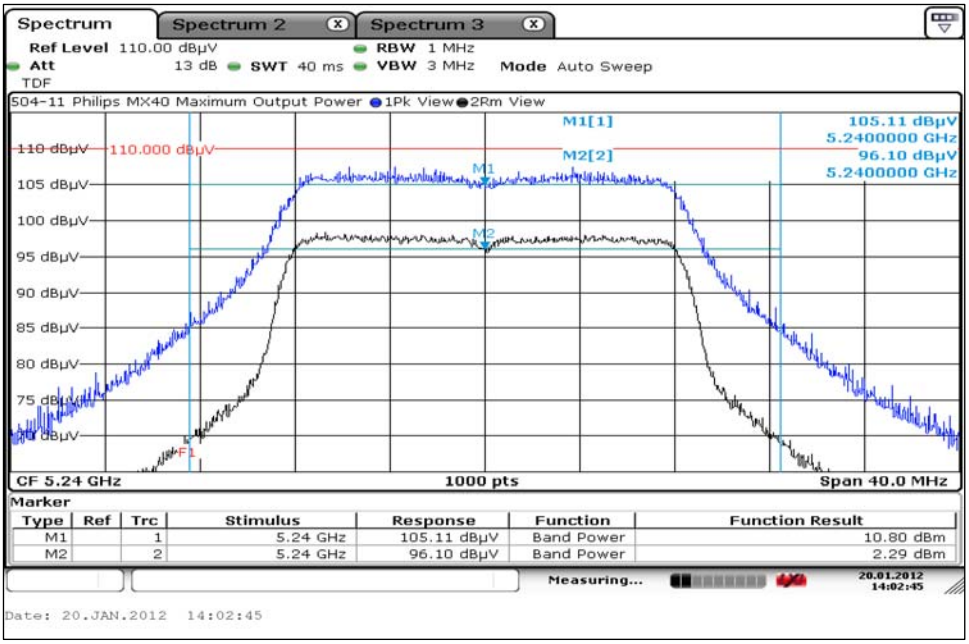
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.2 Maximum Conducted Output Power (continued)

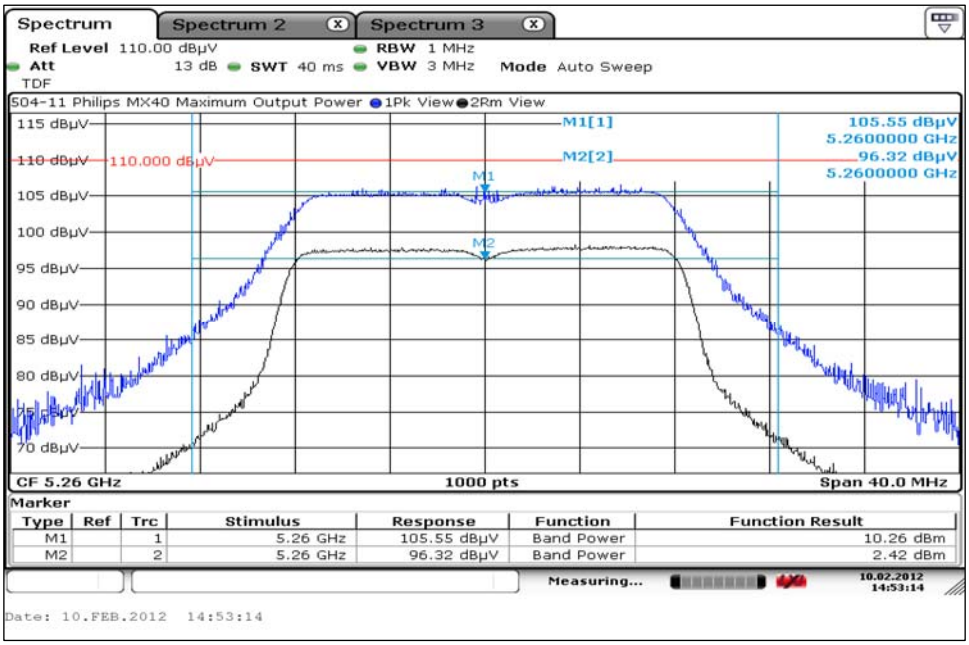
7.2.1. U-NII 1 Band Measurement Plots

7.2.1.3. Channel 48



7.2.2. U-NII 2 Band Measurement Plots

7.2.2.1. Channel 52



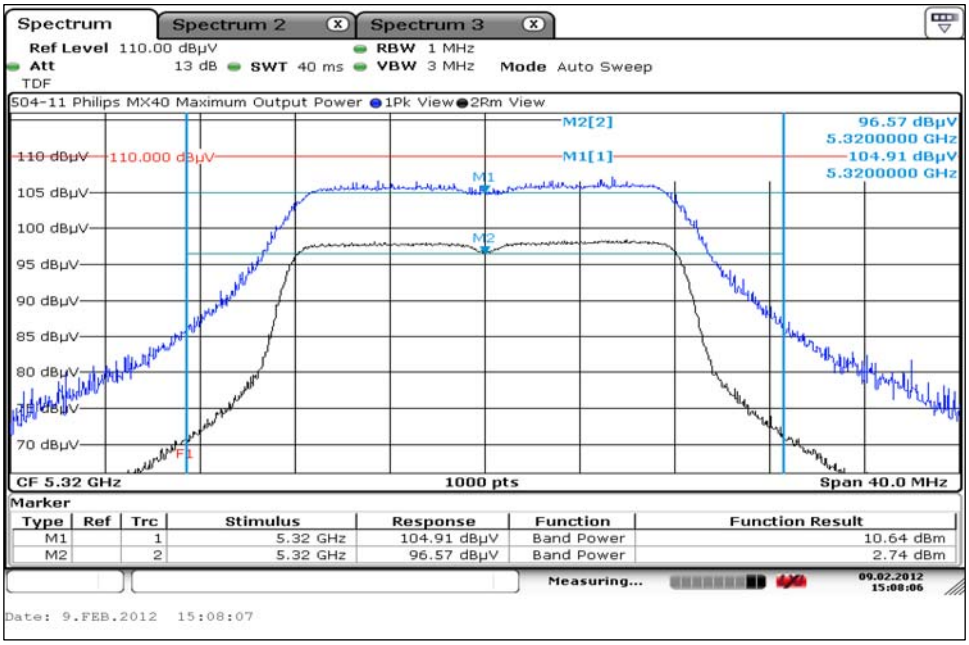
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.2 Maximum Conducted Output Power (continued)

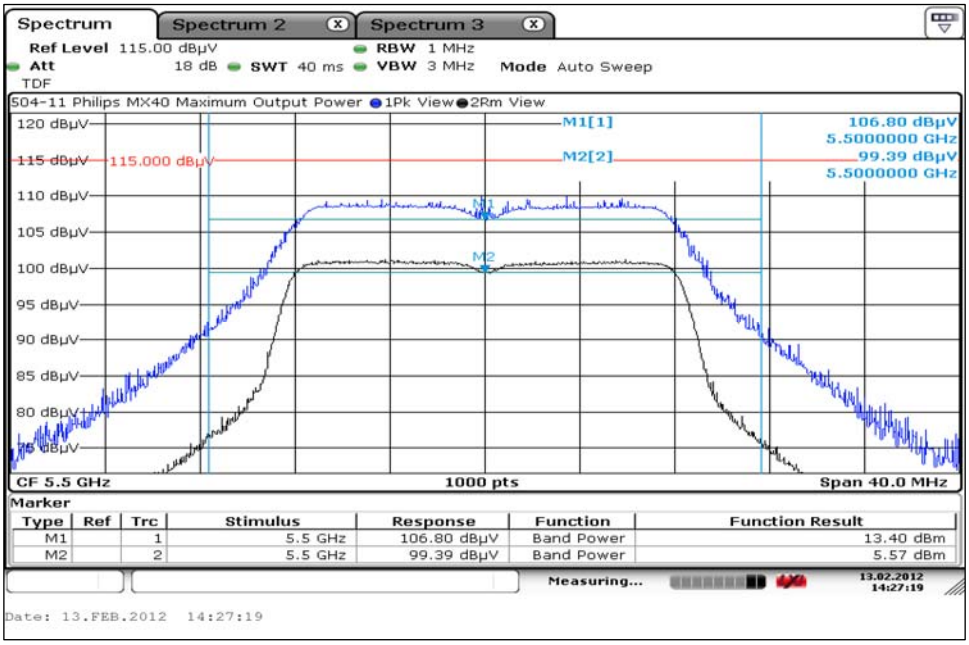
7.2.2. U-NII 2 Measurement Plots

7.2.2.2. Channel 64



7.2.3. U-NII 2 Extended Band Measurement Plots

7.2.3.1. Channel 100



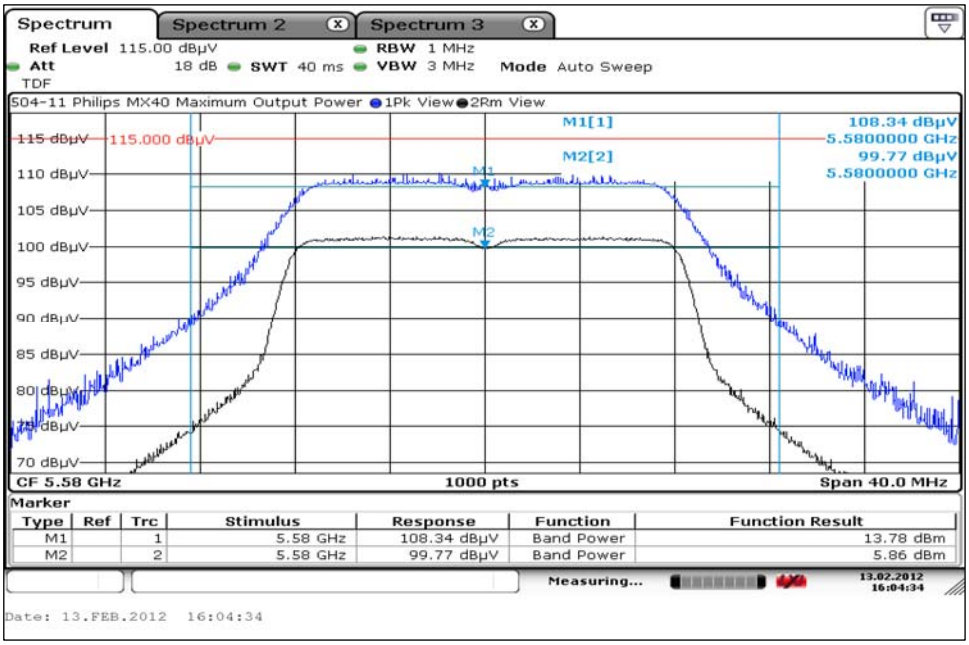
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

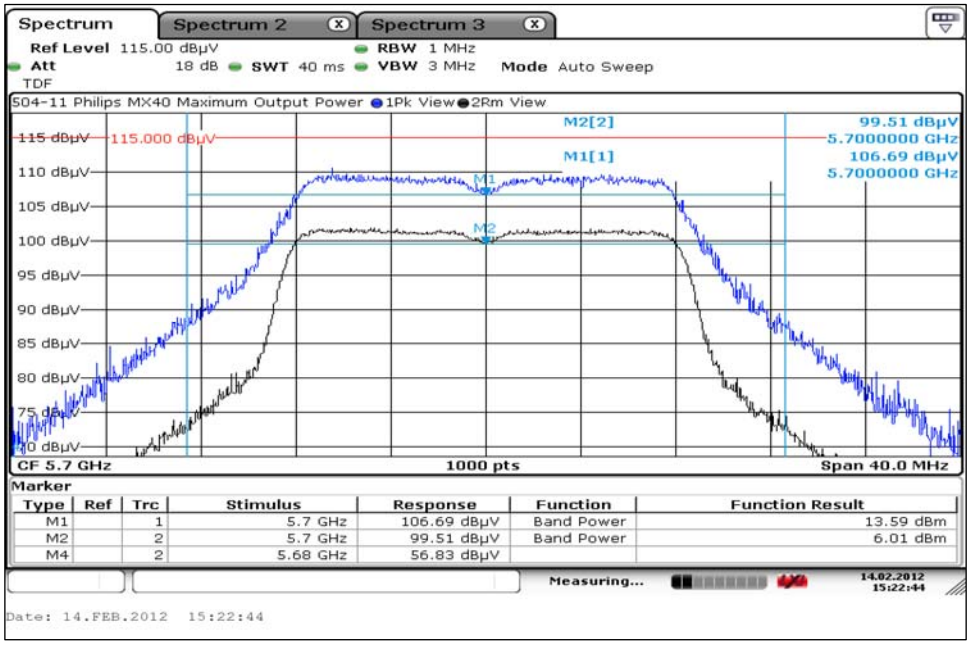
7.2 Maximum Conducted Output Power (continued)

7.2.3. U-NII 2 Extended Band Measurement Plots (continued)

7.2.3.2. Channel 116



7.2.3.3. Channel 140



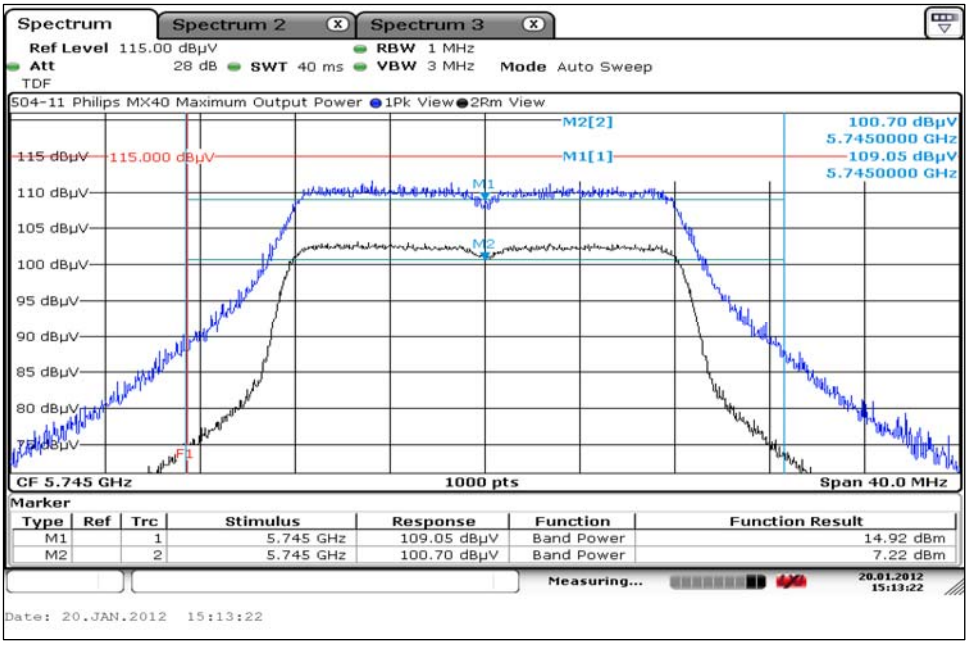
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

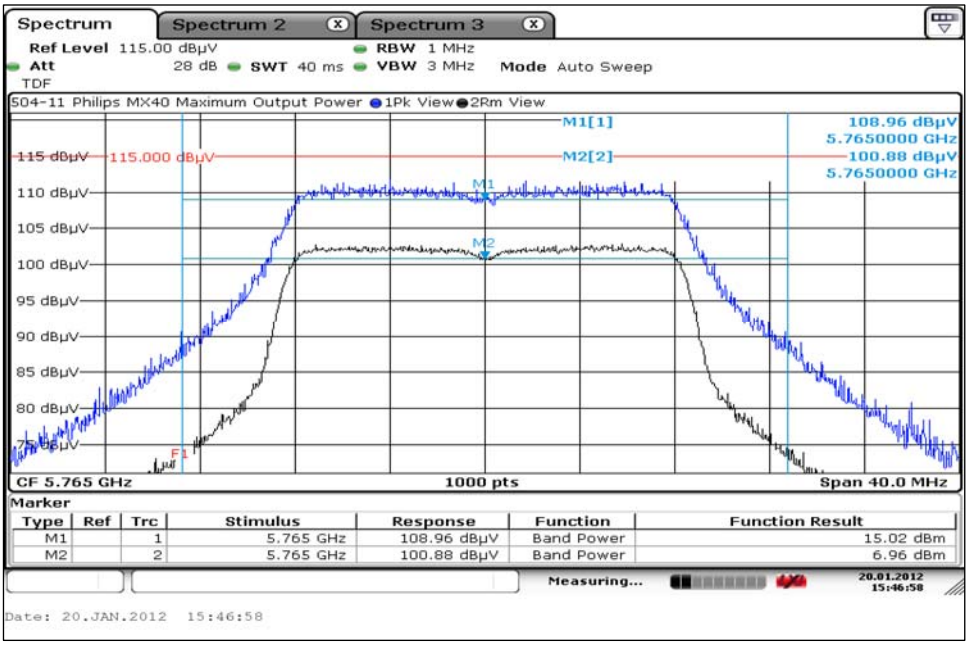
7.2 Maximum Conducted Output Power (continued)

7.2.4. U-NII 3 Band Measurement Plots

7.2.4.1. Channel 149



7.2.4.2. Channel 153



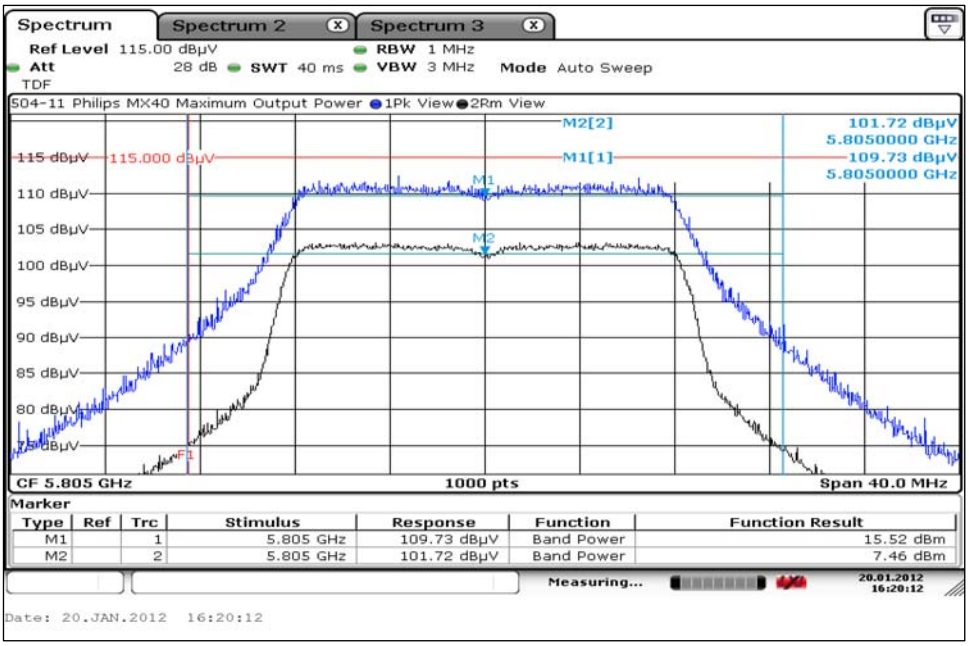
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.2 Maximum Conducted Output Power (continued)

7.2.4. U-NII 3 Band Measurement Plots (continued)

7.2.4.3. Channel 161



Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.3. Peak Power Spectral Density (15.407(a)(1)), (15.407(a)(2)) and (15.407(a)(3))

Requirement: U-NII 1 (15.407(a)(1))
For the band 5.15–5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band.

U-NII 2 and U-NII 2 Extended (15.407(a)(2))
For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band.

U-NII 3 (15.407(a)(3))
For the band For the 5.725–5.825 GHz, the peak power spectral density shall not exceed 17 dBm in any 1–MHz band.

Procedure: This test was performed in accordance with the procedure detailed in FCC OET publication number 789033, Section E: Peak Power Spectral Density.

The method to determine the output power from the measured field strength for transmitters with non-removable antennas outlined in Section 7.1 of this test report was utilized in this section.

Conditions: Temperature: 21°C Relative Humidity: 31%

Conclusion: For the band 5.15–5.25 GHz, the peak power spectral density did not exceed 4 dBm in any 1–MHz band.

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the peak power spectral density did not exceed 11 dBm in any 1 megahertz band.

For the band For the 5.725–5.825 GHz, the peak power spectral density did not exceed 17 dBm in any 1–MHz band.

Measurement Results, U-NII 1 Band:

Channel	Channel Frequency	Measured Frequency	Power Spectral Density	Limit	Margin	Result
	(MHz)	(MHz)	(dBm)	(dBm)	(dB)	
36	5180	5185.66	1.20	4.0	-2.80	Compliant
40	5200	5193.74	1.52	4.0	-2.48	Compliant
48	5240	5233.26	2.13	4.0	-1.87	Compliant

Measurement Results, U-NII 2 Band:

Channel	Channel Frequency	Measured Frequency	Power Spectral Density	Limit	Margin	Result
	(MHz)	(MHz)	(dBm)	(dBm)	(dB)	
52	5260	5263.78	2.08	11.0	-8.92	Compliant
64	5320	5325.78	2.27	11.0	-8.73	Compliant

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.3. Peak Power Spectral Density (continued)

Measurement Results, U-NII 2 Extended Band:

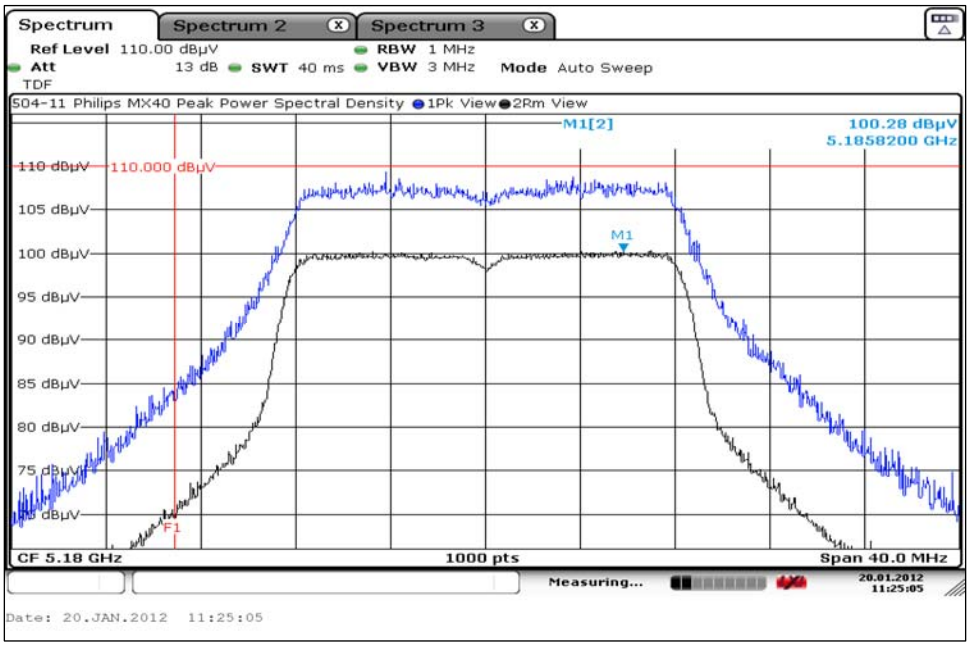
Channel	Channel Frequency	Measured Frequency	Power Spectral Density	Limit	Margin	Result
	(MHz)	(MHz)	(dBm)	(dBm)	(dB)	
100	5500	5495.82	4.97	11.0	-6.03	Compliant
116	5580	5575.74	5.16	11.0	-5.84	Compliant
140	5700	5695.30	5.63	11.0	-5.37	Compliant

Measurement Results, U-NII 3 Band:

Channel	Channel Frequency	Measured Frequency	Power Spectral Density	Limit	Margin	Result
	(MHz)	(MHz)	(dBm)	(dBm)	(dB)	
149	5745	5739.66	6.88	17.0	-10.1	Compliant
153	5765	5770.78	6.68	17.0	-10.3	Compliant
161	5805	5800.42	6.94	17.0	-10.1	Compliant

7.3.1. U-NII 1 Band Measurement Plots

7.3.1.1. Channel 36



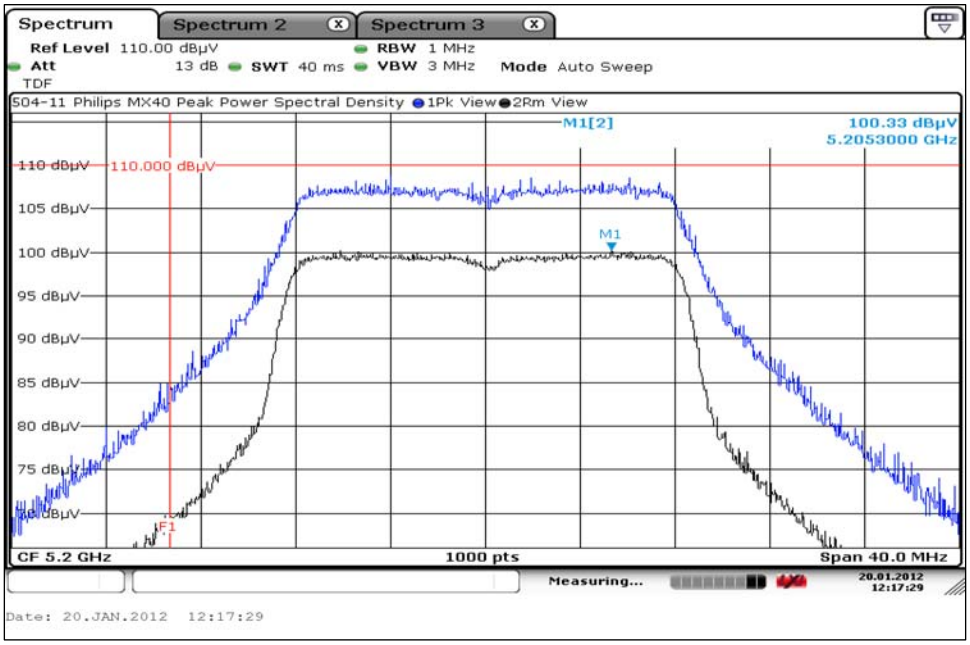
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

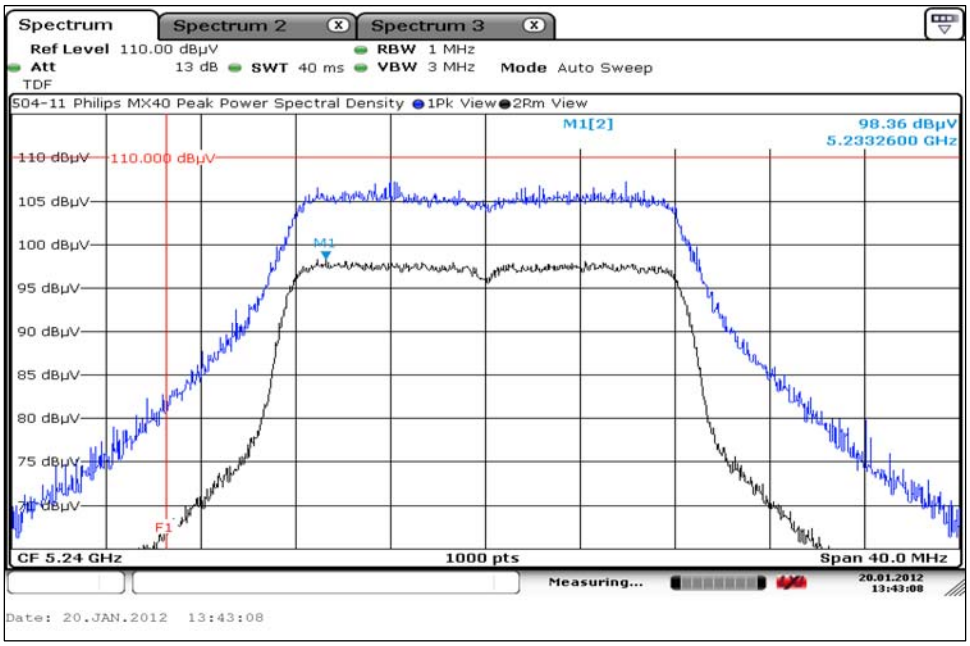
7.3. Peak Power Spectral Density (continued)

7.3.1. U-NII 1 Band Measurement Plots

7.3.1.2. Channel 40



7.3.1.3. Channel 48



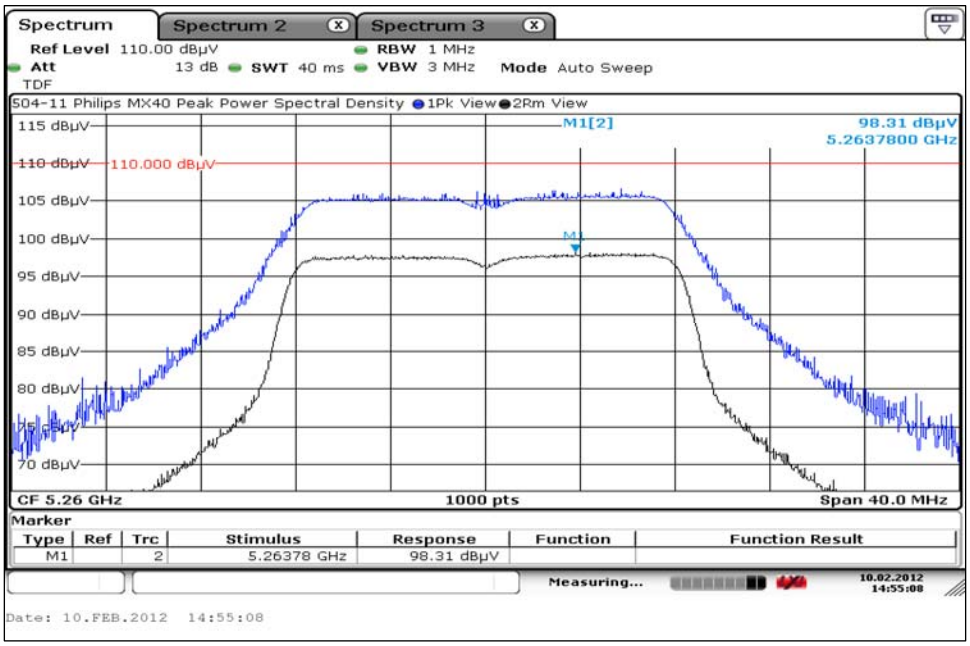
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

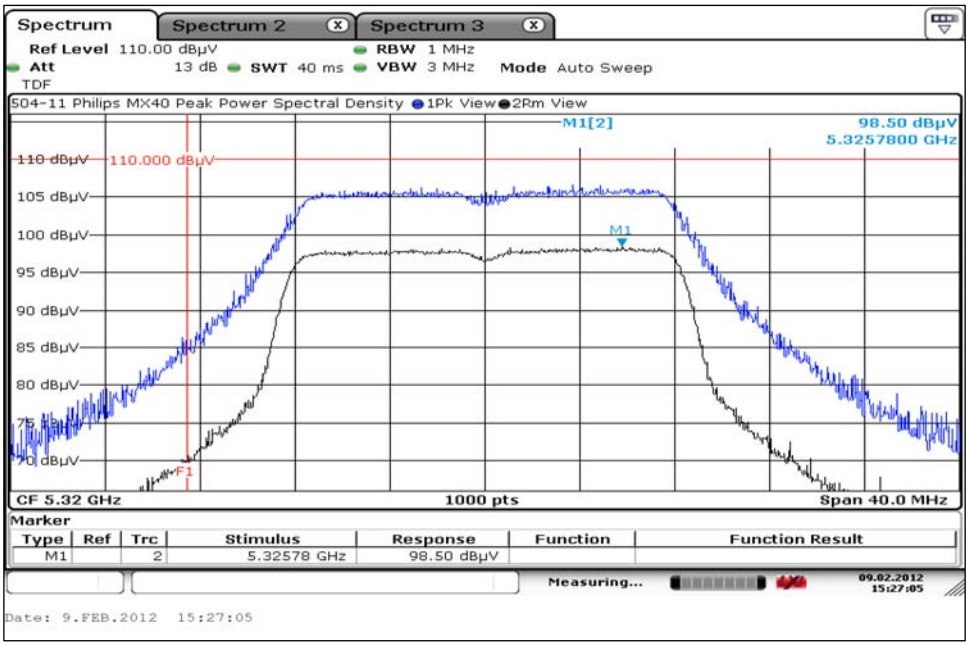
7.3. Peak Power Spectral Density (continued)

7.3.2. U-NII 2 Band Measurement Plots

7.3.2.1. Channel 52



7.3.2.2. Channel 64



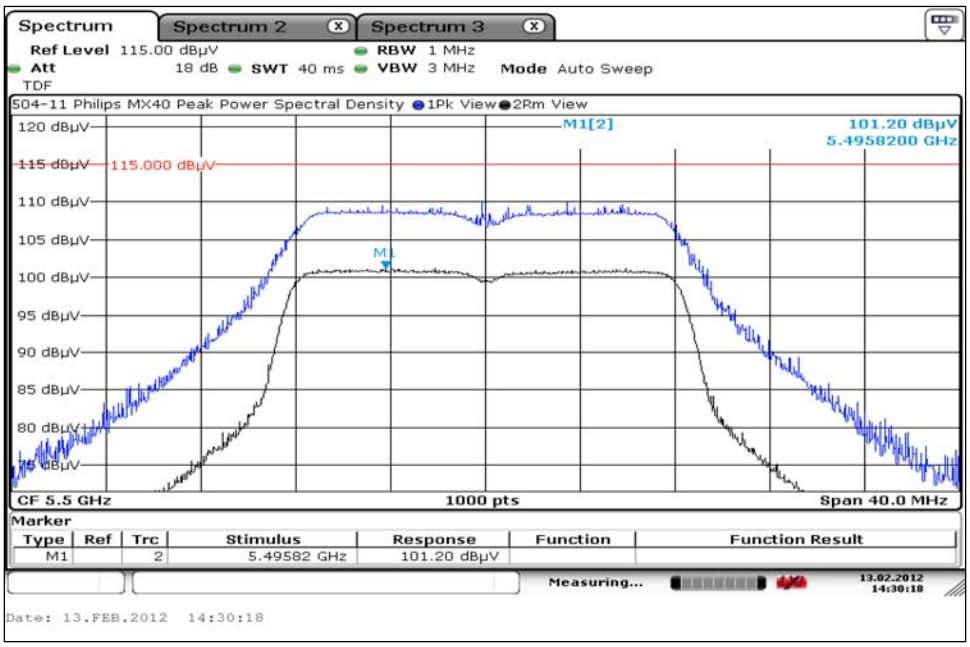
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

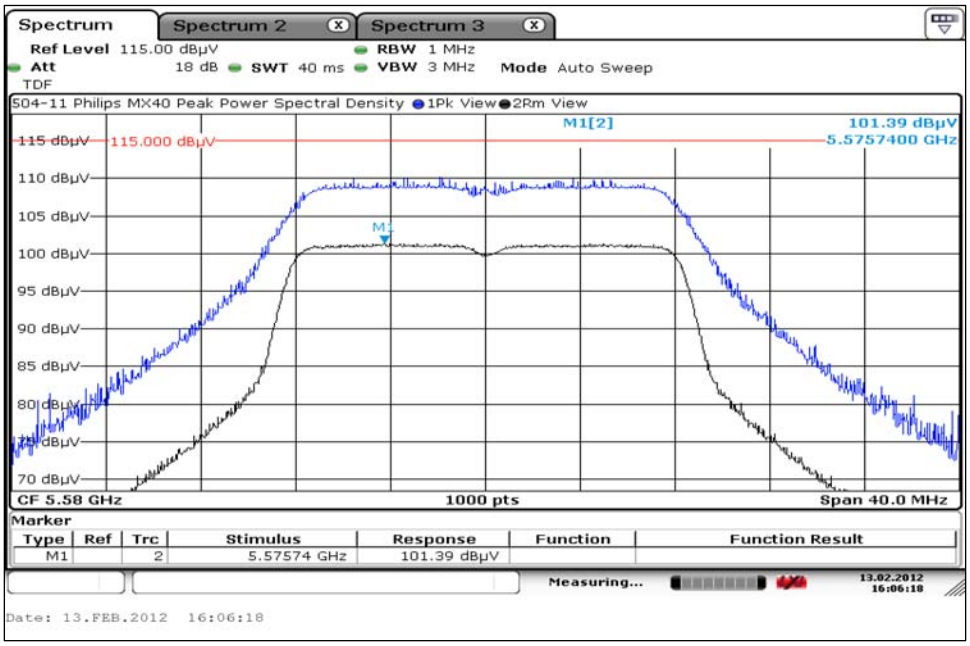
7.3. Peak Power Spectral Density (continued)

7.3.3. U-NII 2 Extended Band Measurement Plots

7.3.3.1. Channel 100



7.3.3.2. Channel 116



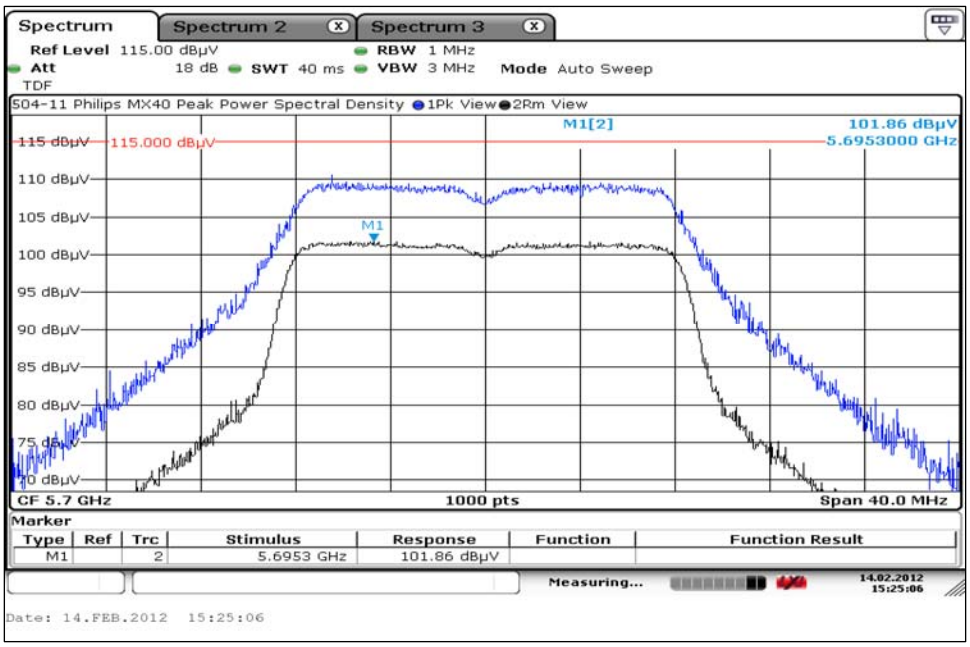
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.3. Peak Power Spectral Density (continued)

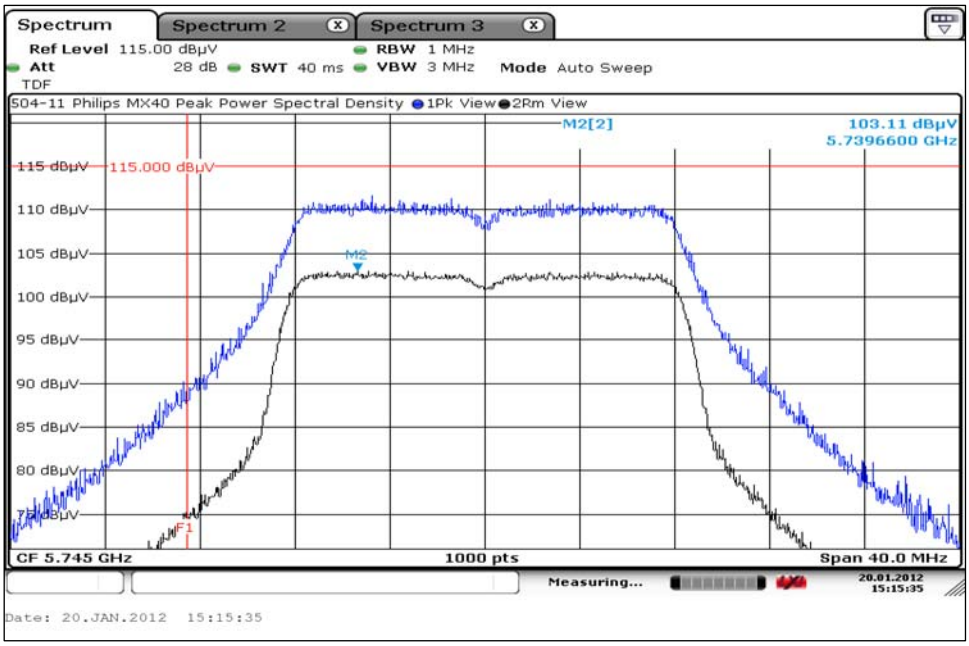
7.3.3. U-NII 2 Extended Band Measurement Plots (continued)

7.3.3.3. Channel 140



7.3.4. U-NII 3 Measurement Plots

7.3.4.1. Channel 149



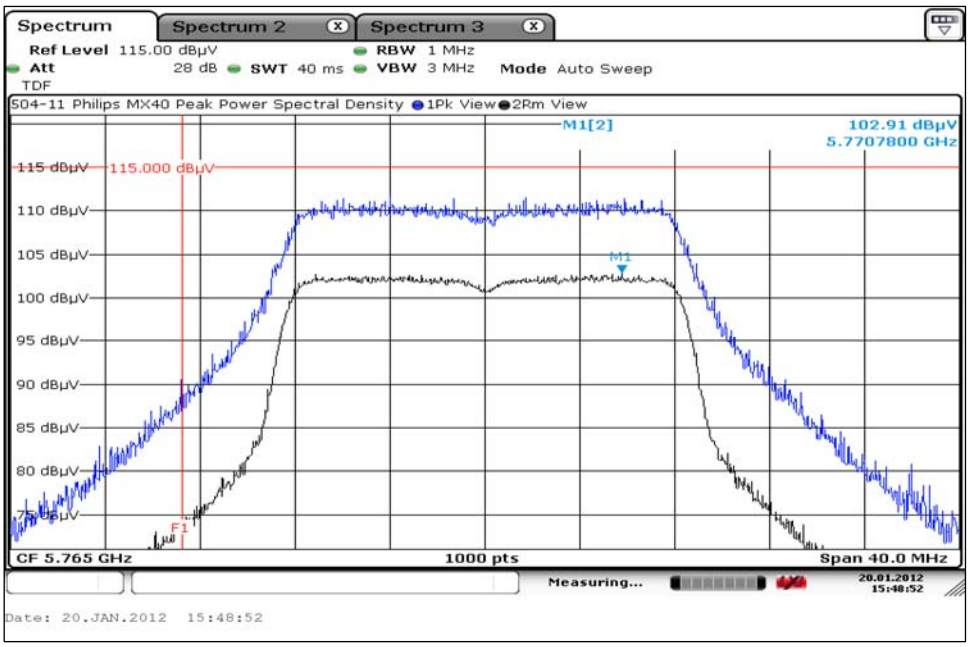
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

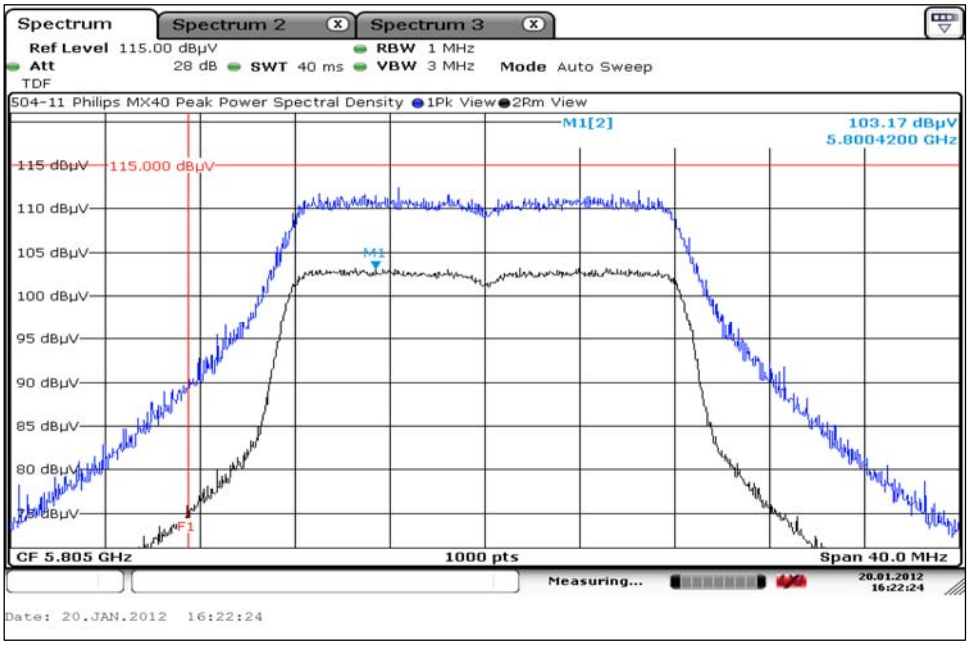
7.3. Peak Power Spectral Density (continued)

7.3.4. U-NII 3 Band Measurement Plots (continued)

7.3.4.2. Channel 153



7.3.4.3. Channel 161



Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.4. 26 dB Emission Bandwidth (15.407(a)(1)), (15.407(a)(2)) and (15.407(a)(3))

Requirement: U-NII 1 (15.407(a)(1))

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz.

U-NII 2 and U-NII 2 Extended (15.407(a)(2))

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where
B is the 26 dB emission bandwidth in megahertz.

U-NII 3 (15.407(a)(3))

For the band 5.725–5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz

Procedure: This test was performed in accordance with the procedure detailed in FCC OET publication number 789033, Section D: Emission Bandwidth.

Conditions: Temperature: 21°C Relative Humidity: 31%

Conclusion: For the band 5.15–5.25 GHz, the default power limit of 50 mW was determined to be the lower power limit.

For the band 5.25–5.35 GHz and 5.47–5.725 GHz, the default power limit of 250 mW was determined to be the lower power limit.
For the band 5.725–5.825 GHz, the default power limit of 1 W was determined to be the lower power limit.

Measurement Results, U-NII 1 Band:

Channel	Frequency	26 dB Bandwidth	Power Limit (dBm)		Lesser Limit
	(MHz)	(MHz)	(Based on BW)	50 mW	(mW)
36	5180	24.12	17.8	17.0	50.0
40	5200	23.84	17.8	17.0	50.0
48	5240	24.56	17.9	17.0	50.0

Measurement Results, U-NII 2 Band:

Channel	Frequency	26 dB Bandwidth	Power Limit (dBm)		Lesser Limit
	(MHz)	(MHz)	(Based on BW)	250 mW	(mW)
52	5260	24.72	24.9	24.0	250
64	5700	25.16	25.0	24.0	250

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.4. 26 dB Emission Bandwidth (continued)

Measurement Results, U-NII 2 Extended Band:

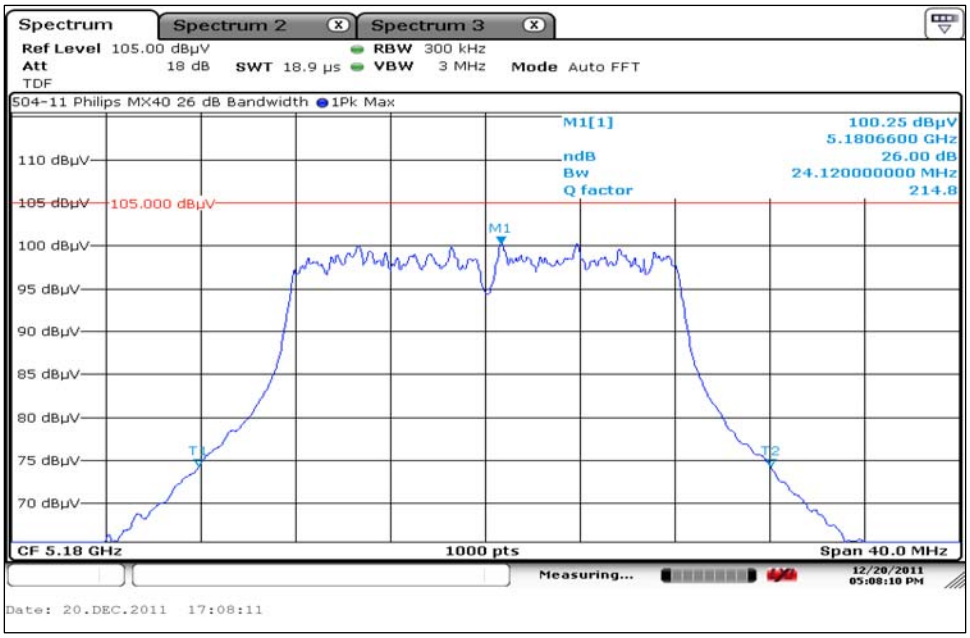
Channel	Frequency	26 dB Bandwidth	Power Limit (dBm)		Lesser Limit
	(MHz)	(MHz)	(Based on BW)	250 mW	(mW)
100	5500	23.38	24.7	24.0	250
116	5580	24.84	25.0	24.0	250
140	5700	25.20	25.0	24.0	250

Measurement Results, U-NII 3 Band:

Channel	Frequency	26 dB Bandwidth	Power Limit (dBm)		Lesser Limit
	(MHz)	(MHz)	(Based on BW)	1000 mW	(mW)
149	5745	22.96	30.6	30.0	1000
153	5765	24.64	30.9	30.0	1000
161	5805	22.96	30.6	30.0	1000

7.4.1. U-NII 1 Band Measurement Plots

7.4.1.1. Channel 36



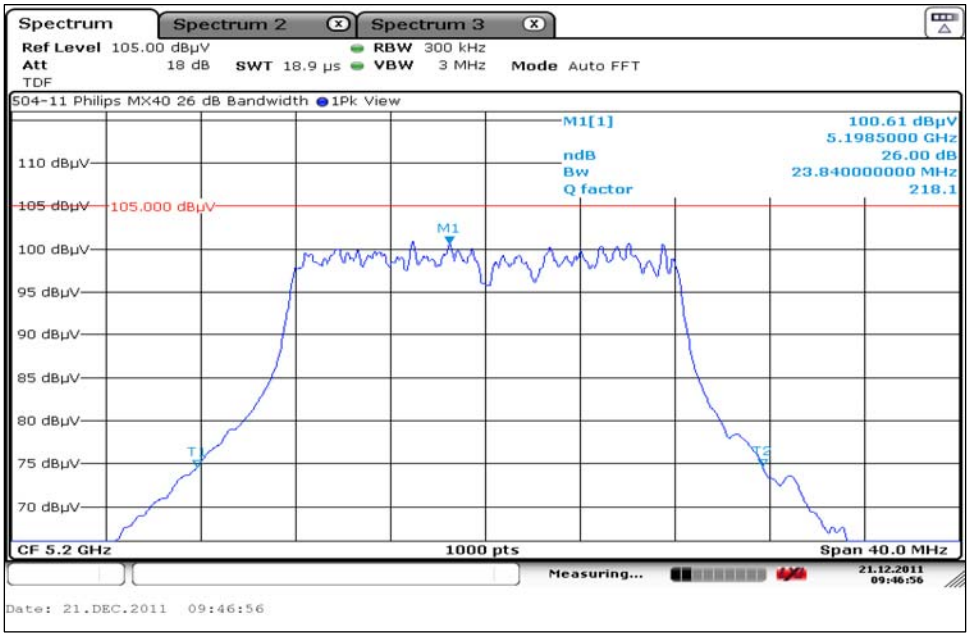
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

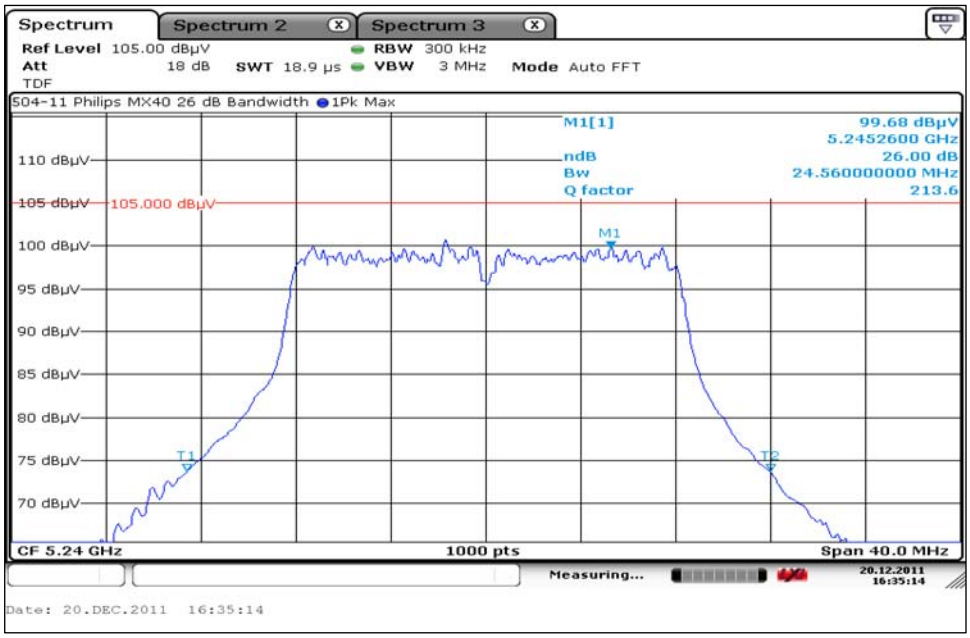
7.4. 26 dB Emission Bandwidth (continued)

7.4.1. U-NII 1 Band Measurement Plots (continued)

7.4.1.2. Channel 40



7.4.1.3. Channel 48



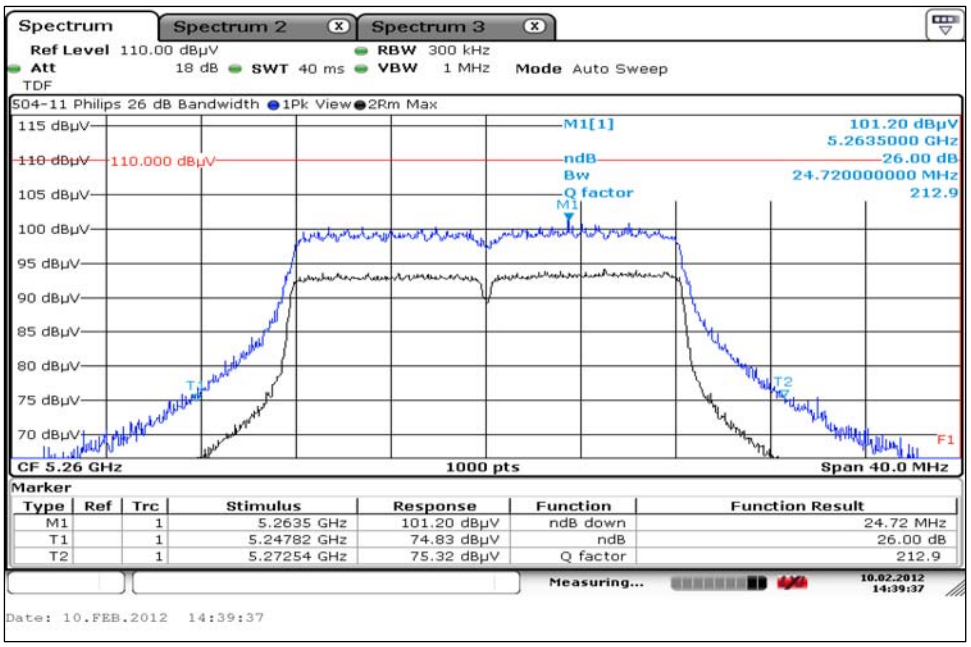
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

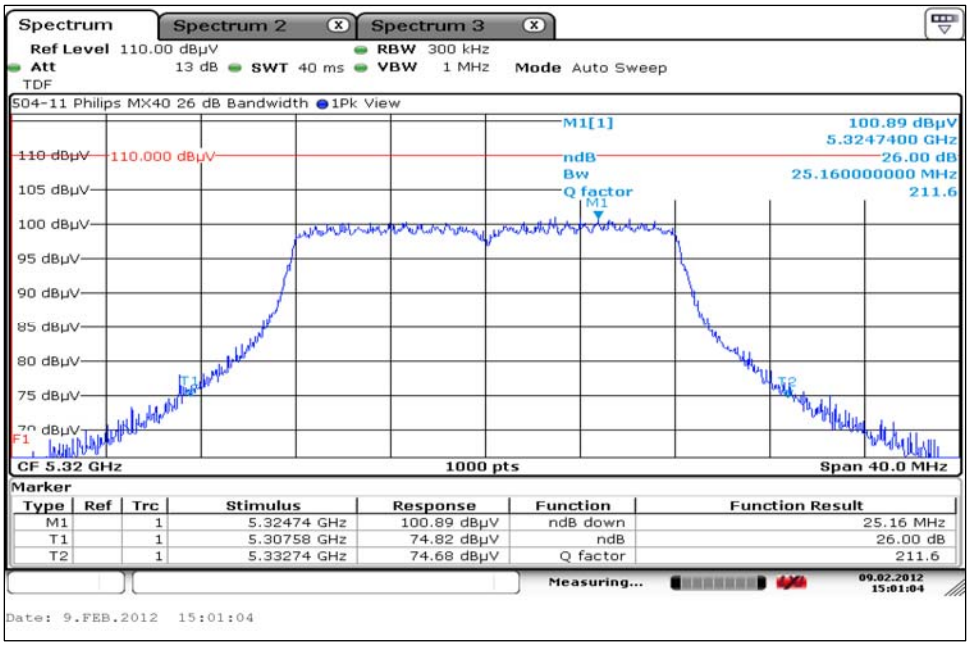
7.4. 26 dB Emission Bandwidth (continued)

7.4.2. U-NII 2 Band Measurement Plots

7.4.2.1. Channel 52



7.4.2.2. Channel 64



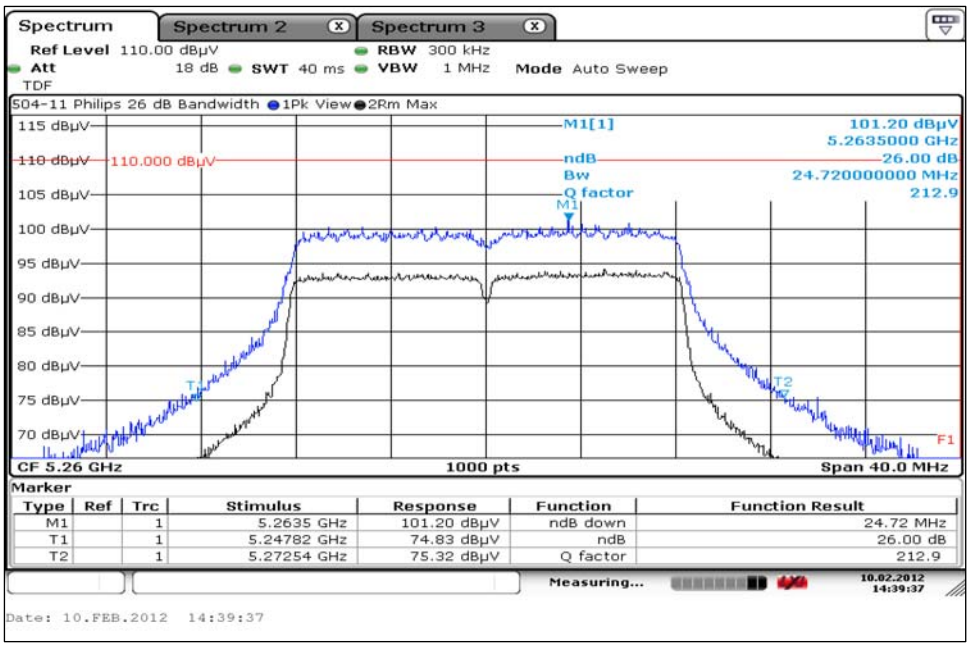
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

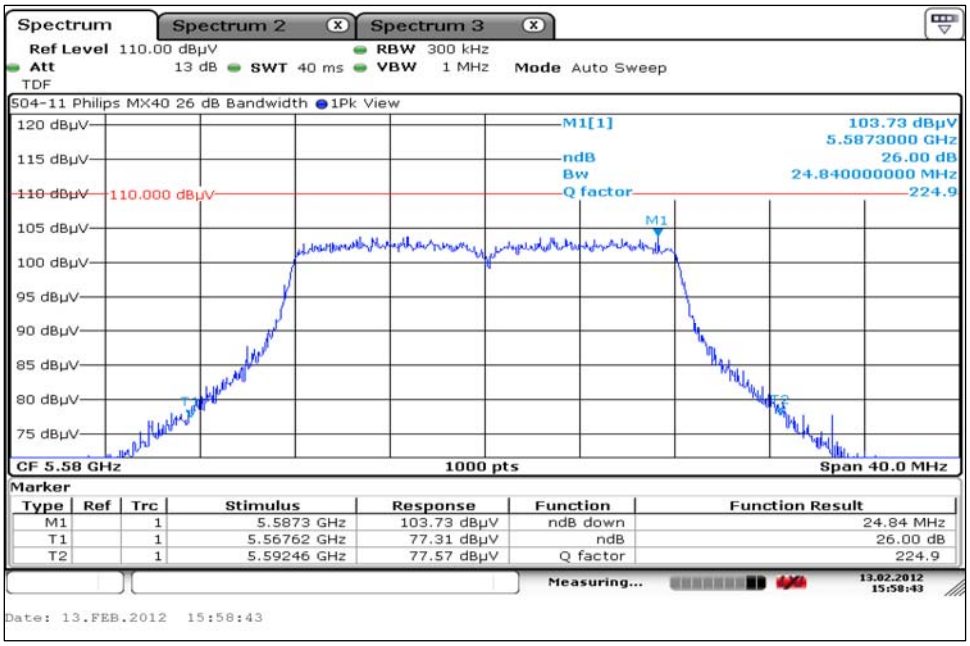
7.4. 26 dB Emission Bandwidth (continued)

7.4.3. U-NII 2 Extended Band Measurement Plots

7.4.3.1. Channel 100



7.4.3.2. Channel 116



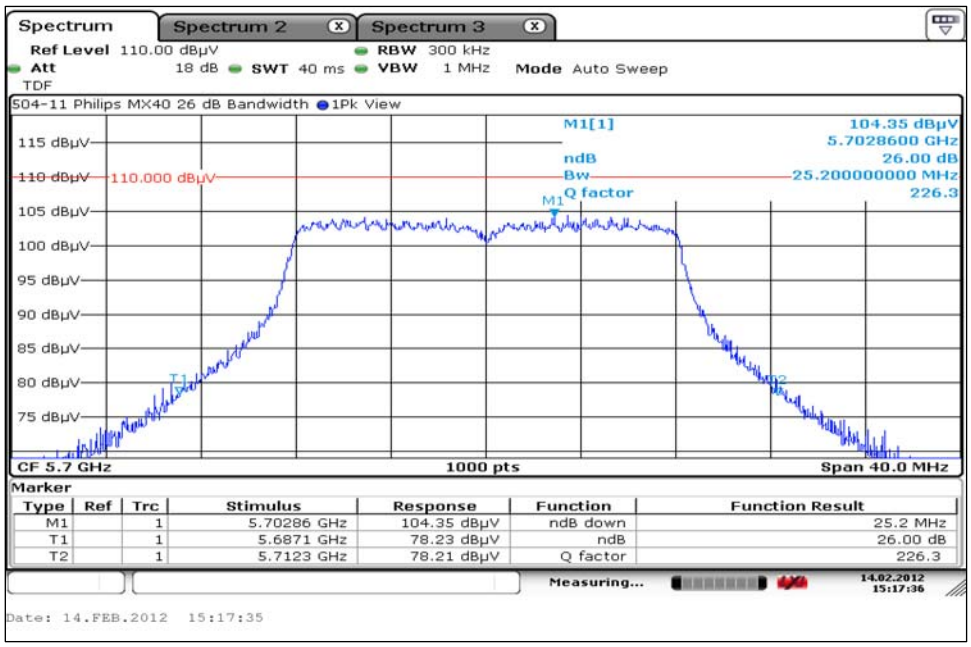
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.4. 26 dB Emission Bandwidth (continued)

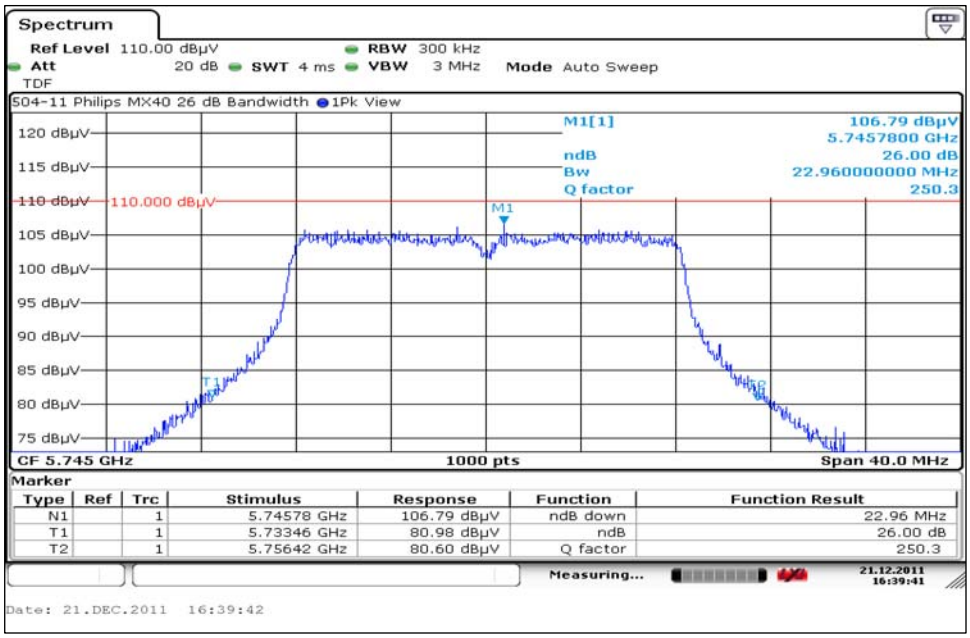
7.4.3. U-NII 2 Extended Band Measurement Plots (continued)

7.4.3.3. Channel 140



7.4.4. U-NII 3 Band Measurement Plots

7.4.4.1. Channel 149



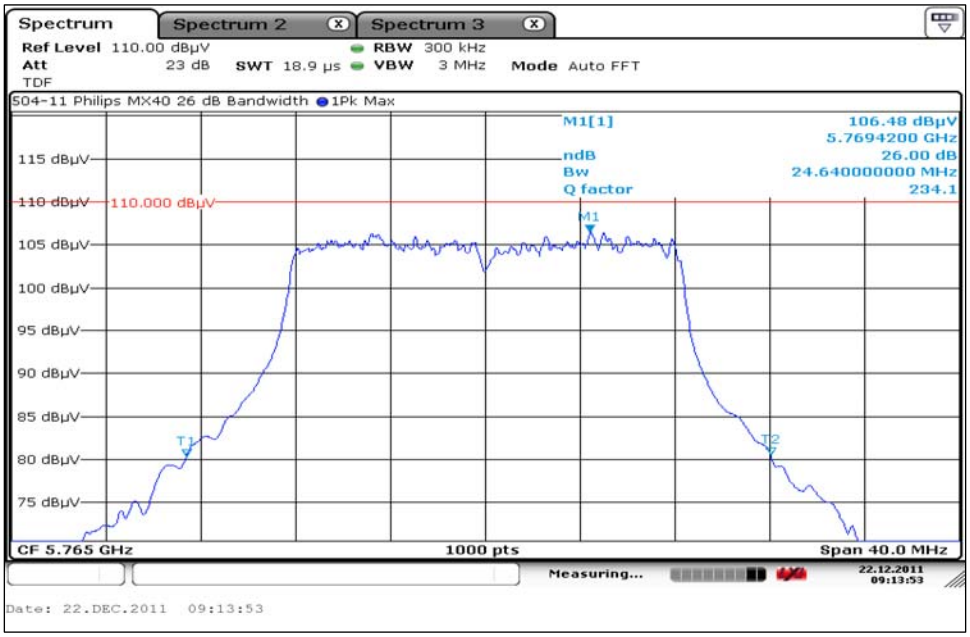
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

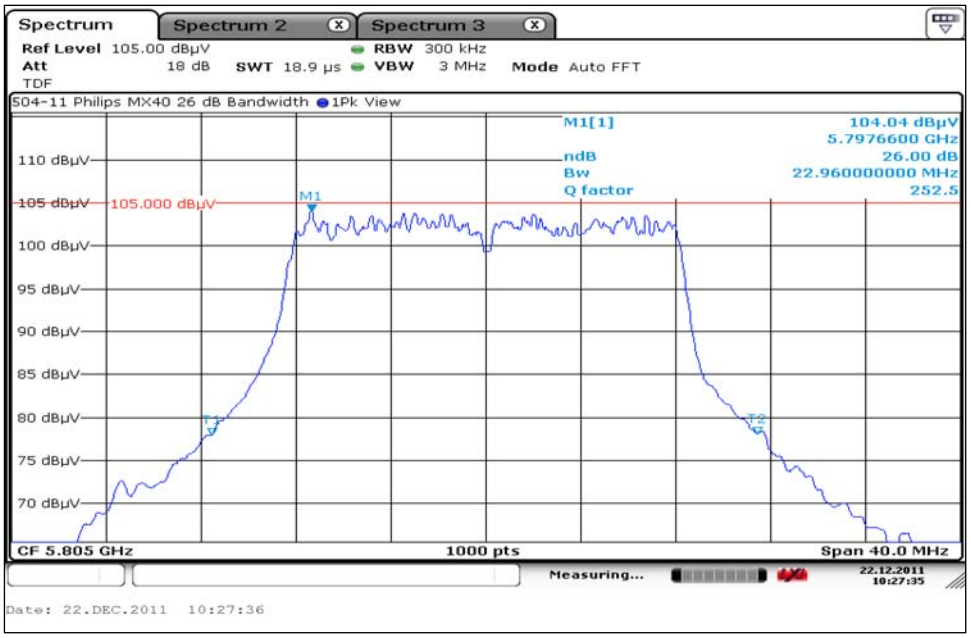
7.4. 26 dB Emission Bandwidth (15.407(a)(1)) (continued)

7.4.4. U-NII 3 Band Measurement Plots (continued)

7.4.4.2. Channel 153



7.4.4.3. Channel 161



Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.5. 99% Power Bandwidth (IC RSS 210)

Requirement: When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

Conditions: Temperature: 21°C Relative Humidity: 31%

Conclusion: The device under test meets the required 99% bandwidth.

Measurement Results, U-NII 1 Band:

Channel	Frequency (MHz)	Measured 99% Power Bandwidth (MHz)	Result
36	5180	17.12	Compliant
40	5200	17.04	Compliant
48	5240	17.00	Compliant

Measurement Results, U-NII 2 Band:

Channel	Frequency (MHz)	Measured 99% Power Bandwidth (MHz)	Result
52	5260	17.60	Compliant
64	5320	17.52	Compliant

Measurement Results, U-NII 2 Extended Band:

Channel	Frequency (MHz)	Measured 99% Power Bandwidth (MHz)	Result
100	5500	17.44	Compliant
116	5580	17.40	Compliant
140	5700	17.56	Compliant

Measurement Results, U-NII 3 Band:

Channel	Frequency (MHz)	Measured 99% Power Bandwidth (MHz)	Result
Low	5745	17.08	Compliant
Middle	5765	16.92	Compliant
High	5805	17.24	Compliant

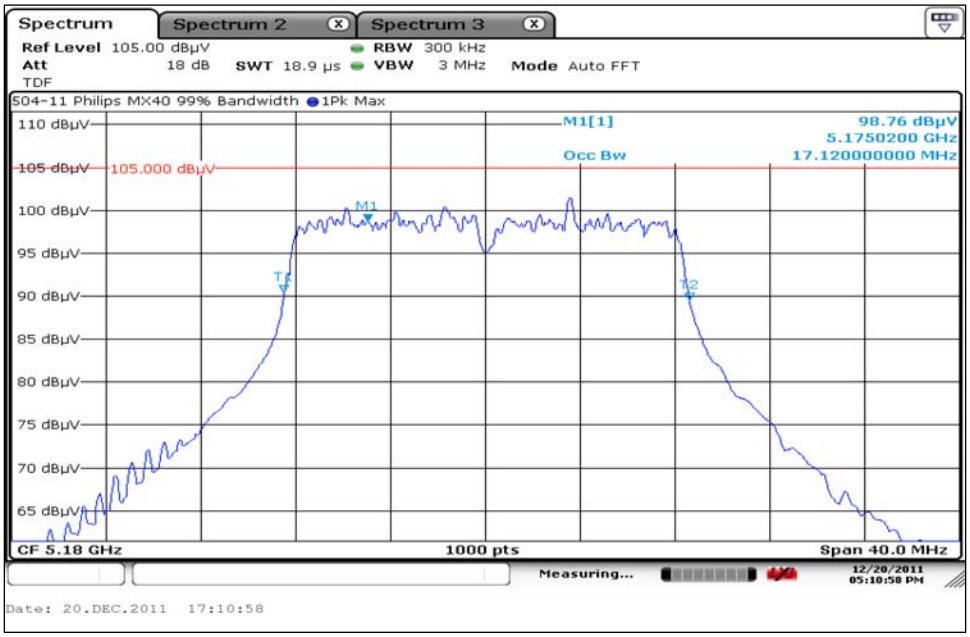
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

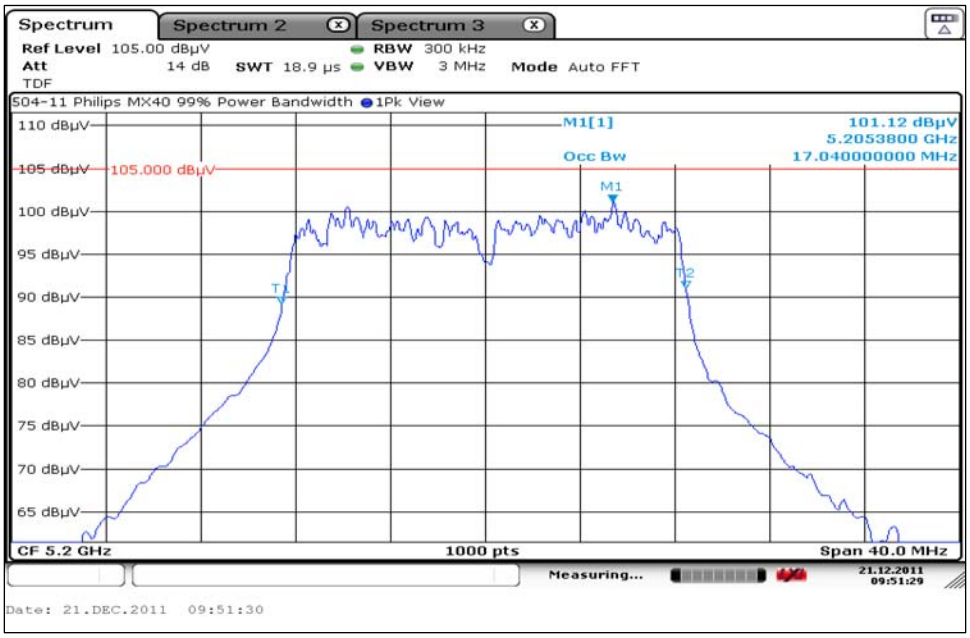
7.5. 99% Power Bandwidth (continued)

7.5.1. U-NII 1 Band Measurement Plots

7.5.1.1. Channel 36



7.5.1.2. Channel 40



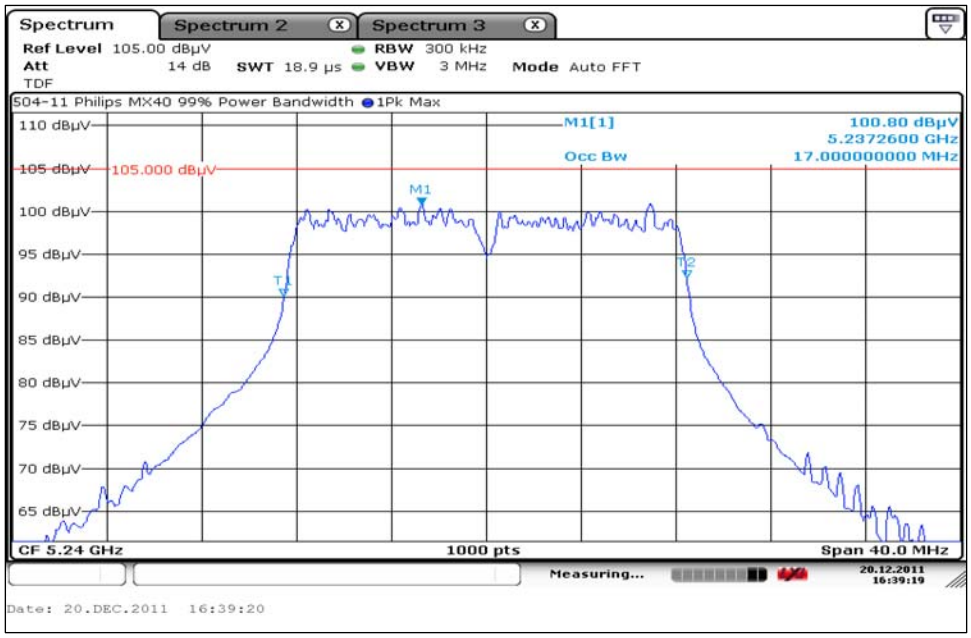
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.5. 99% Power Bandwidth (IC RSS 210) (continued)

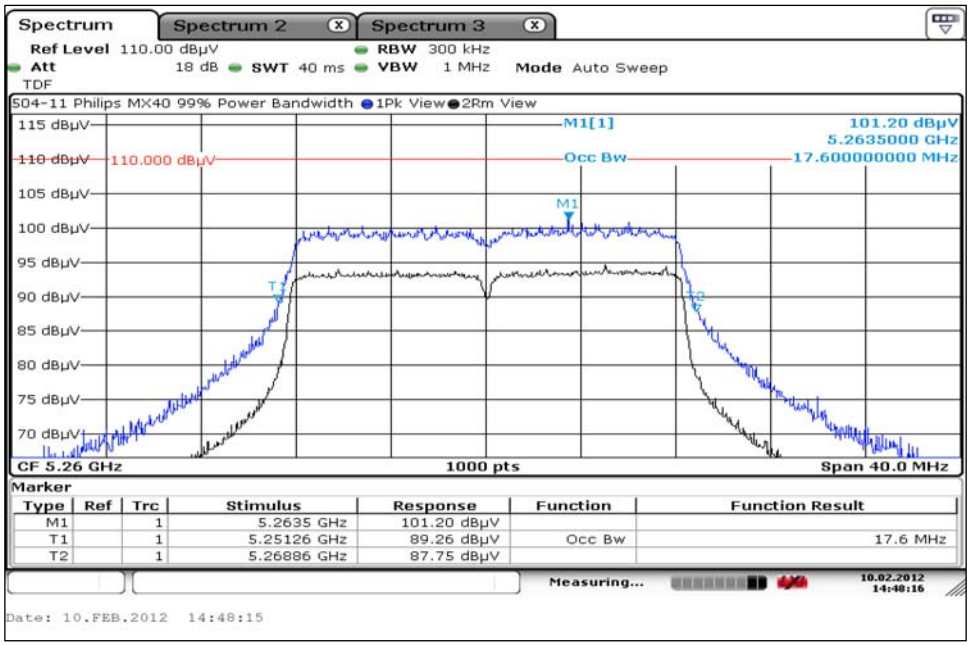
7.5.1. U-NII 1 Band Measurement Plots (continued)

7.5.1.3. Channel 48



7.5.2. U-NII 2 Band Measurement Plots

7.5.2.1. Channel 52



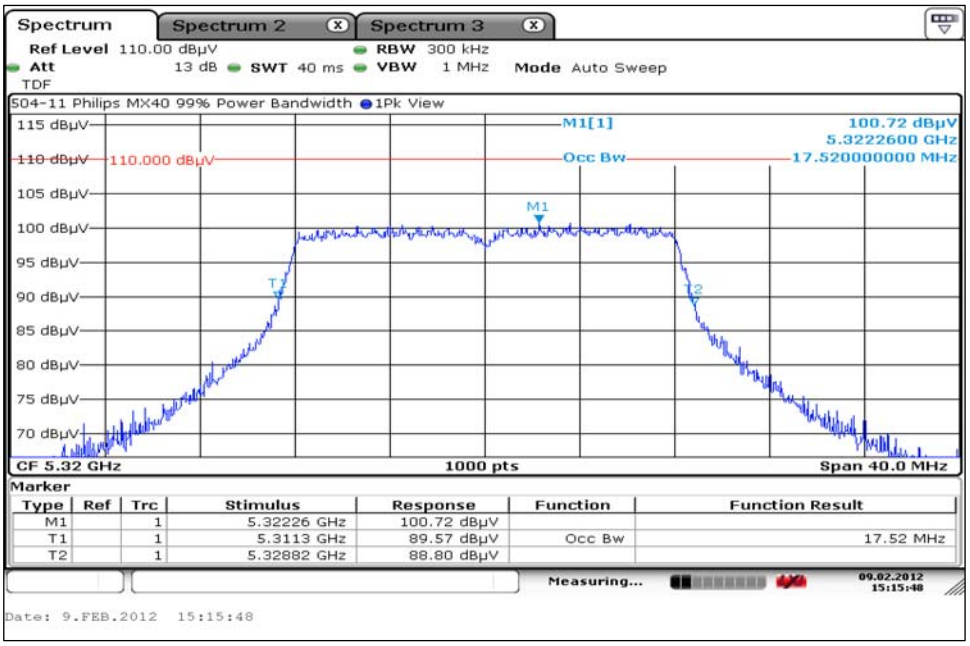
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.5. 99% Power Bandwidth (IC RSS 210) (continued)

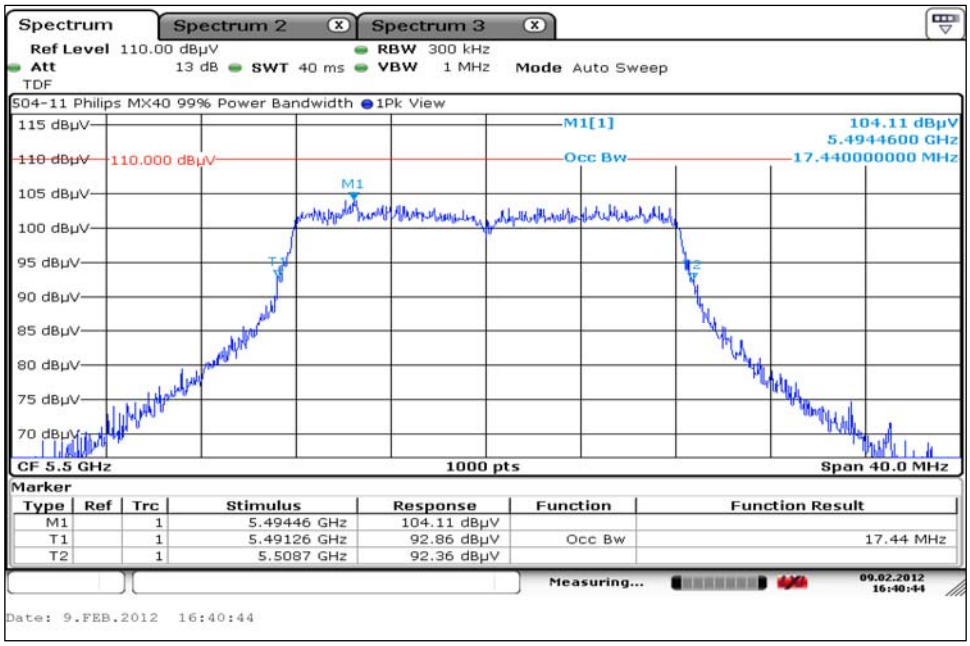
7.5.2. U-NII 2 Band Measurement Plots (continued)

7.5.2.2. Channel 64



7.5.3. U-NII 2 Extended Band Measurement Plots

7.5.3.1. Channel 100



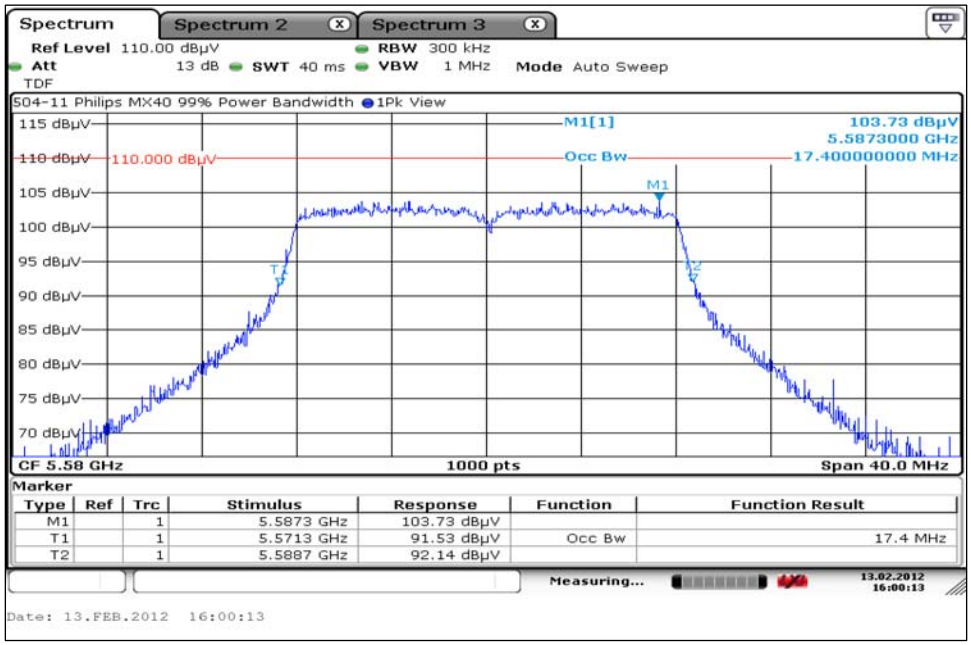
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

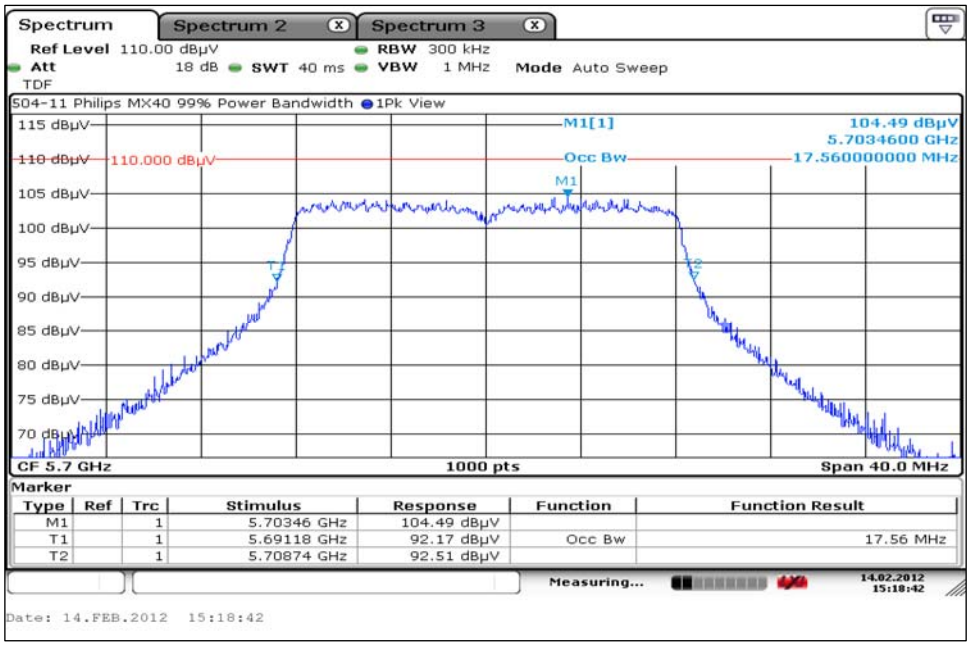
7.5. 99% Power Bandwidth (IC RSS 210) (continued)

7.5.3. U-NII 2 Extended Band Measurement Plots (continued)

7.5.3.2. Channel 116



7.5.3.3. Channel 140



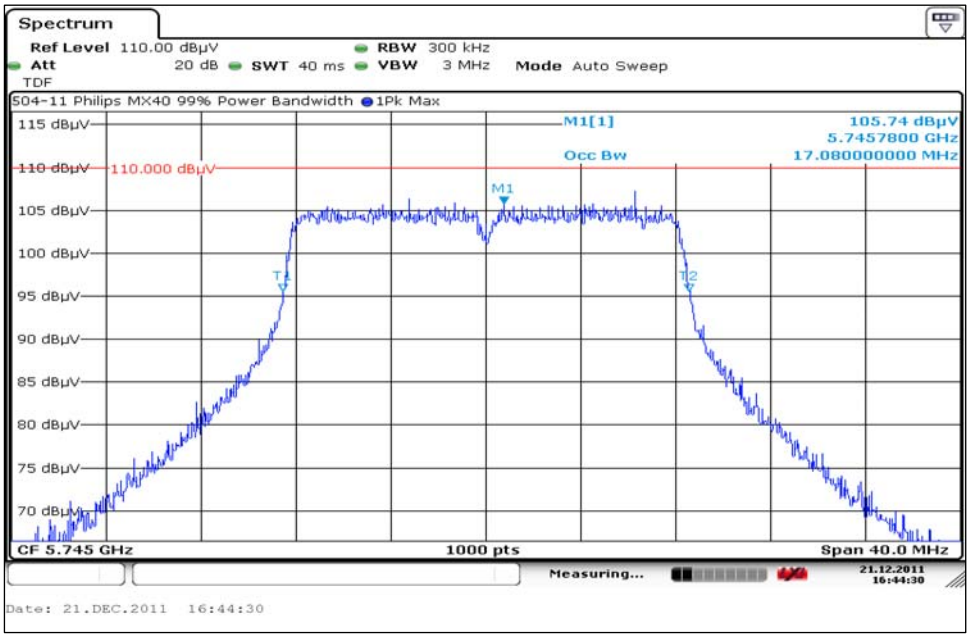
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

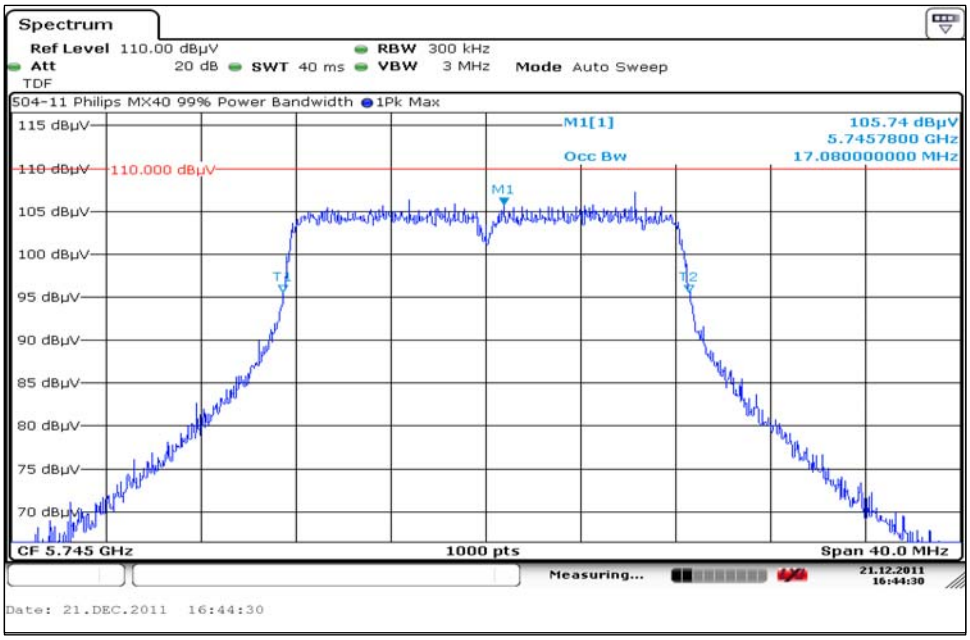
7.5. 99% Power Bandwidth (IC RSS 210) (continued)

7.5.4. U-NII 3 Band Measurement Plots (continued)

7.5.4.1. Channel 149



7.5.4.2. Channel 153



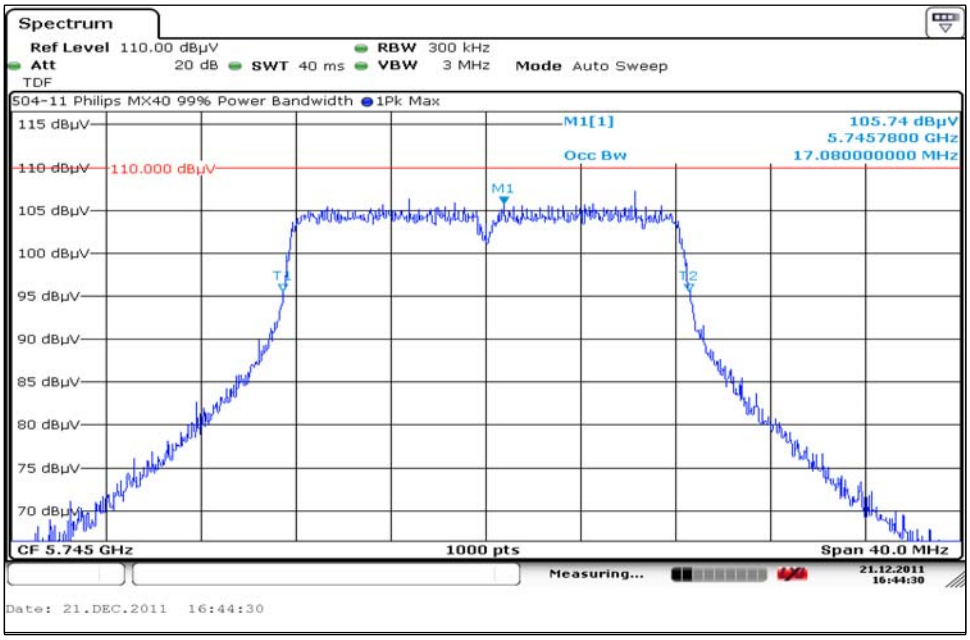
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.5. 99% Power Bandwidth (IC RSS 210) (continued)

7.5.4. U-NII 3 Band Measurement Plots (continued)

7.5.4.3. Channel 161



Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.6. Peak Excursion of the Modulation Envelope (15.407(a)(6))

Requirement: (15.407(a)(6) all bands)
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission band-width whichever is less.

Procedure: This test was performed in accordance with the procedure detailed in FCC OET publication number 789033, Section F: Peak Excursion Measurement.

Conditions: Temperature: 21°C Relative Humidity: 31%

Conclusion: The device under test does not exceed 13 dB across any 1 MHz bandwidth.

Measurement Results, U-NII 1 Band

Channel	Channel Frequency	Peak Excursion	Limit	Result
	MHz	dB	dB	
36	5180	8.50	13.00	Compliant
40	5200	9.09	13.00	Compliant
48	5240	8.90	13.00	Compliant

Measurement Results, U-NII 2 Band

Channel	Channel Frequency	Peak Excursion	Limit	Result
	MHz	dB	dB	
52	5260	8.32	13.00	Compliant
64	5320	8.12	13.00	Compliant

Measurement Results, U-NII 2 Extended Band

Channel	Channel Frequency	Peak Excursion	Limit	Result
	MHz	dB	dB	
100	5500	8.76	13.00	Compliant
116	5580	8.75	13.00	Compliant
140	5700	8.70	13.00	Compliant

Measurement Results, U-NII 3 Band

Channel	Channel Frequency	Peak Excursion	Limit	Result
	MHz	dB	dB	
149	5745	8.48	13.00	Compliant
153	5765	8.81	13.00	Compliant
161	5805	9.23	13.00	Compliant

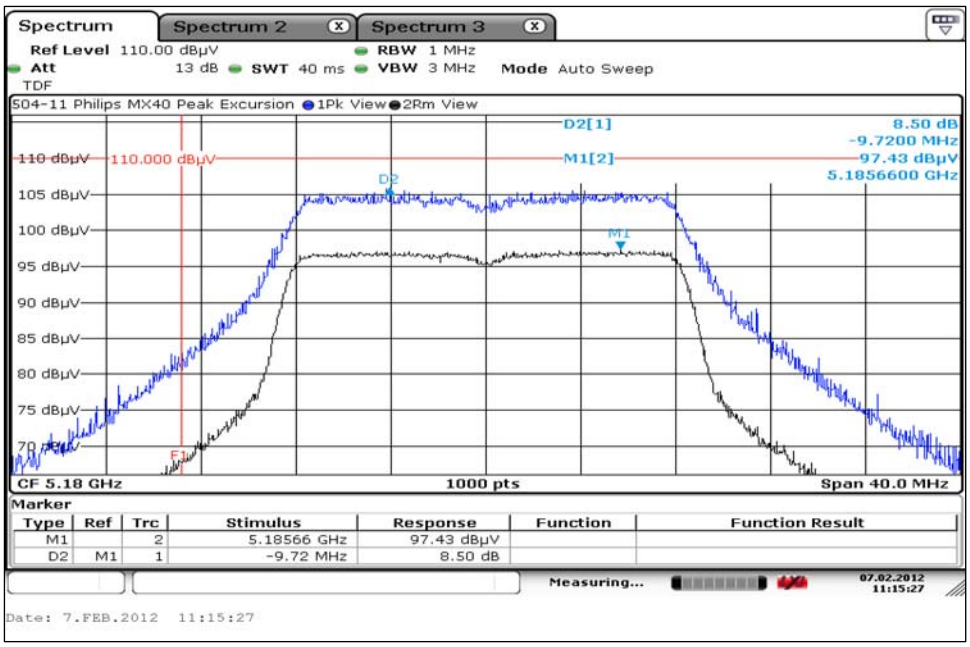
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

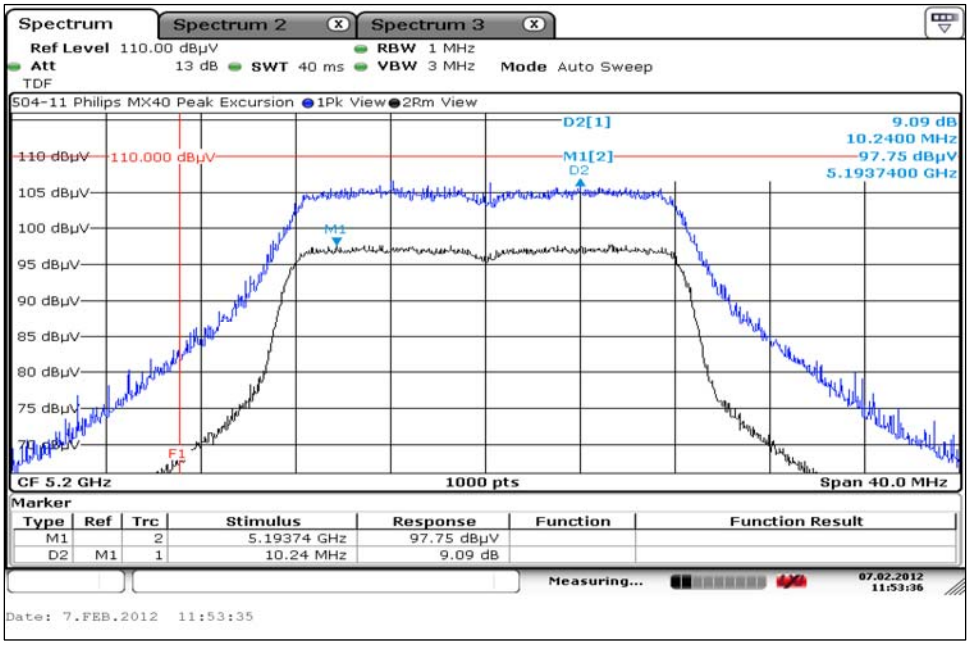
7.6. Peak Excursion of the Modulation Envelope (continued)

7.6.1. U-NII 1 Band Measurement Plots

7.6.1.1. Channel 36



7.6.1.2. Channel 40



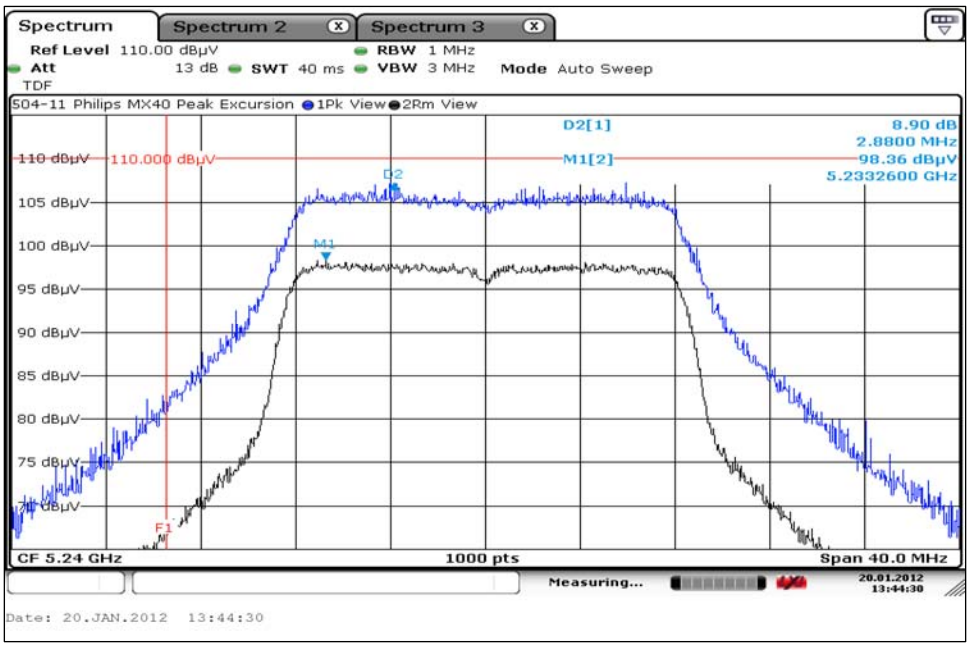
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.6. Peak Excursion of the Modulation Envelope (continued)

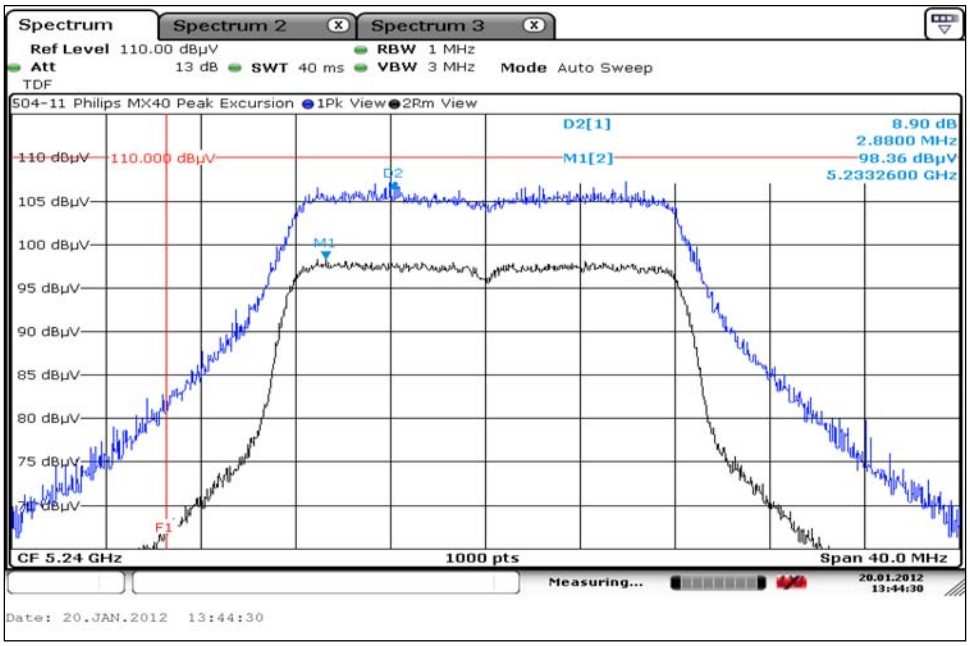
7.6.1. U-NII 1 Band Measurement Plots (continued)

7.6.1.3. Channel 48



7.6.2. U-NII 2 Band Measurement Plots

7.6.2.1. Channel 52



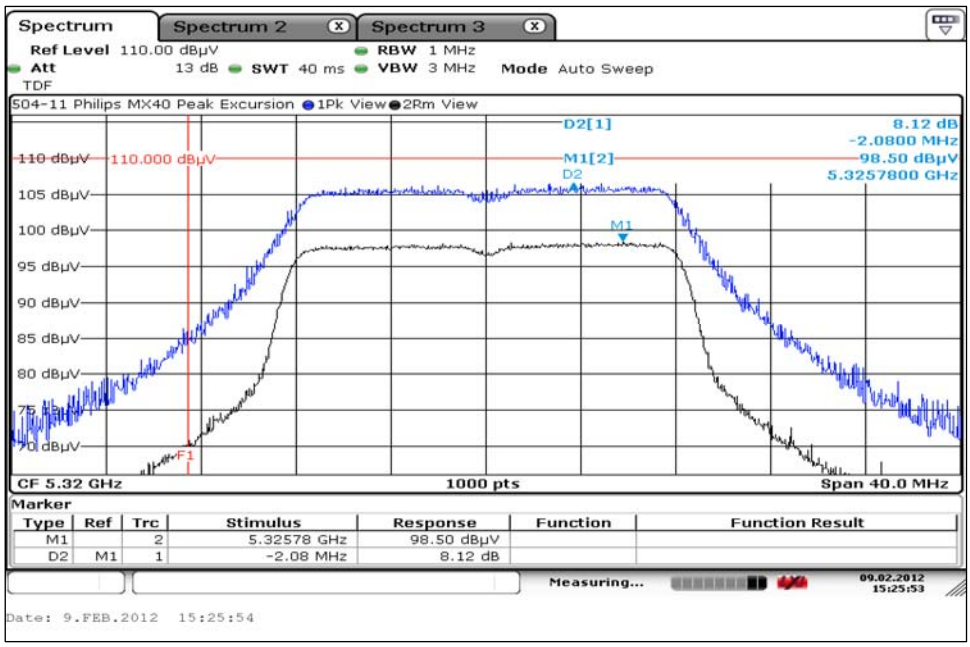
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.6. Peak Excursion of the Modulation Envelope (continued)

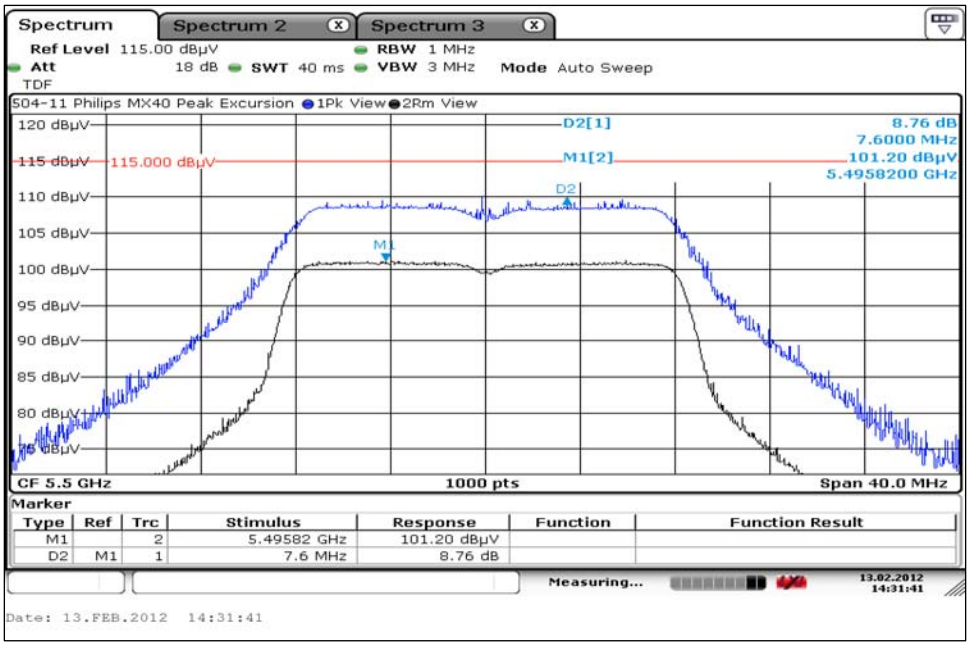
7.6.2. U-NII 2 Band Measurement Plots (continued)

7.6.2.2. Channel 64



7.6.3. U-NII 2 Extended Band Measurement Plots

7.6.3.1. Channel 100



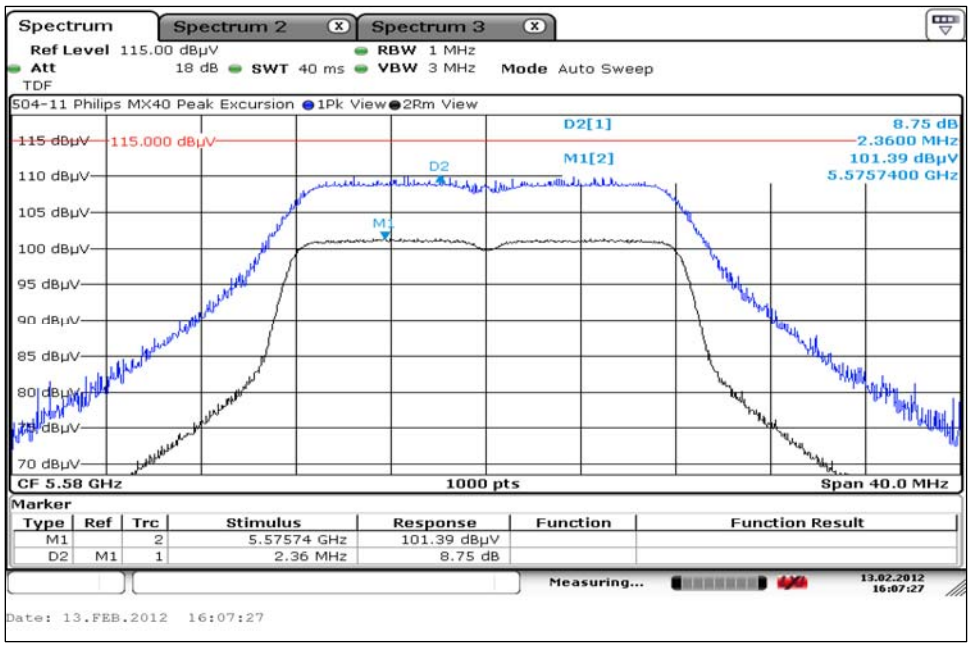
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

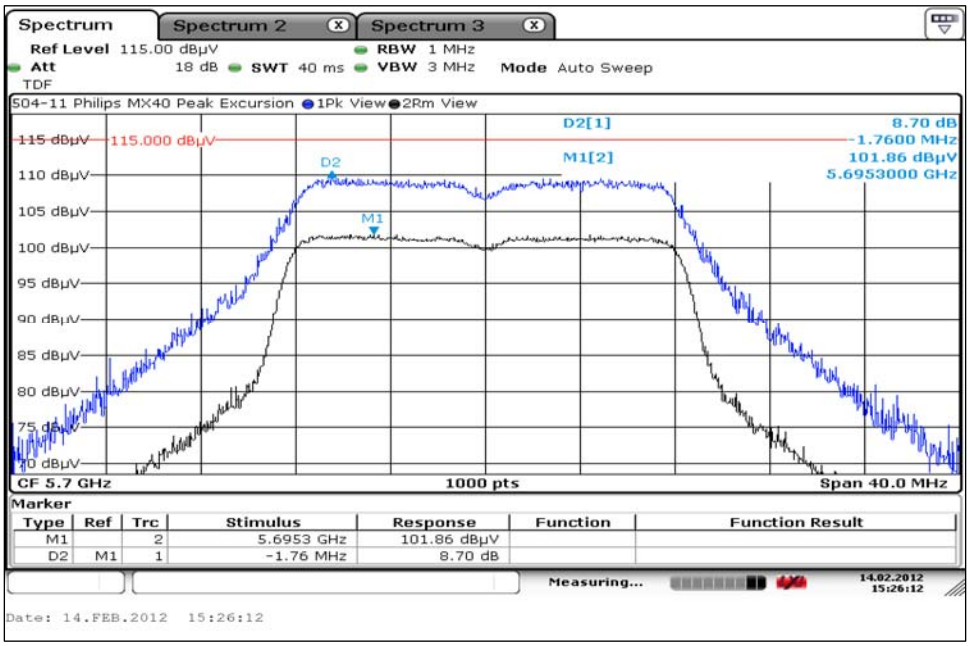
7.6. Peak Excursion of the Modulation Envelope (continued)

7.6.3. U-NII 2 Extended Band Measurement Plots (continued)

7.6.3.2. Channel 116



7.6.3.3. Channel 140



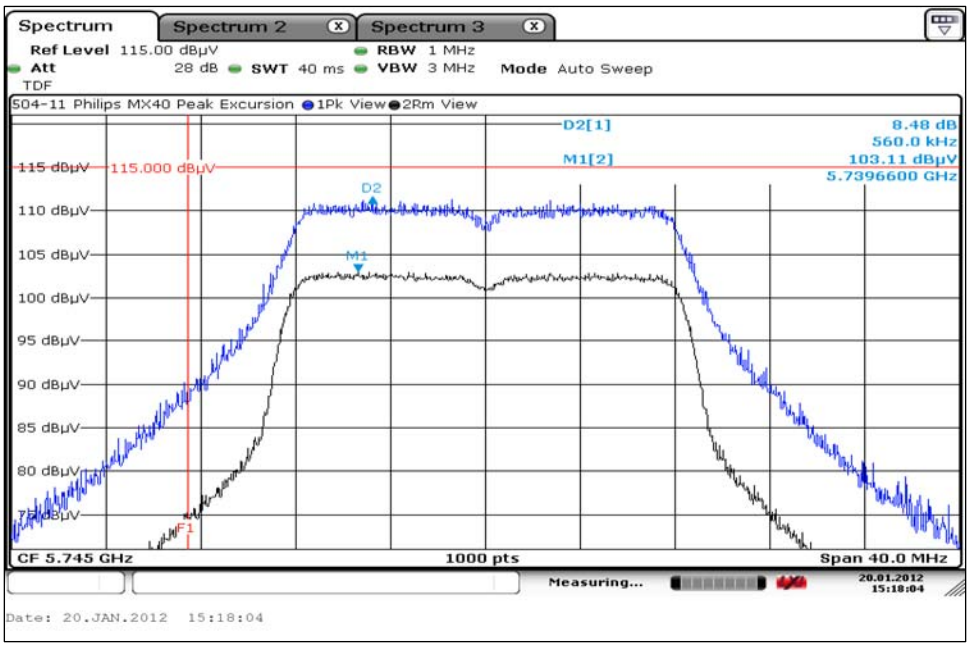
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

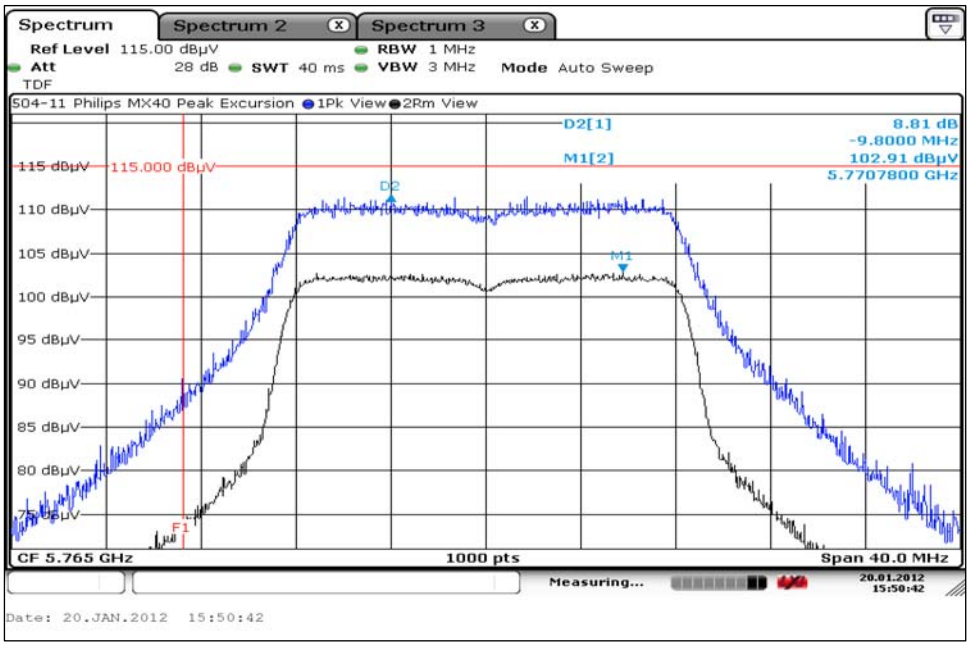
7.6. Peak Excursion of the Modulation Envelope (continued)

7.6.4. U-NII 3 Band Measurement Plots

7.6.4.1. Channel 149



7.6.4.2. Channel 153



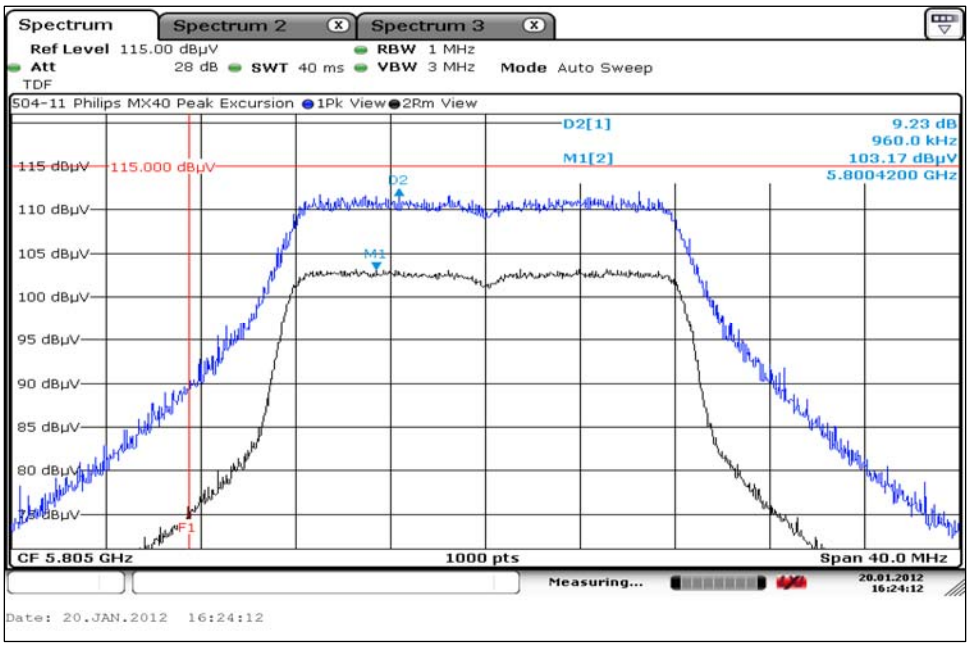
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.6. Peak Excursion of the Modulation Envelope (continued)

7.6.4. U-NII 3 Band Measurement Plots (continued)

7.6.4.3. Channel 161



Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.7. Transmitter Spurious Radiated Emissions (32 kHz to 40 GHz)

Requirement: (15.209) The Emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency Range (MHz)	Distance (Meters)	Limit (dBµV/m)[1]
0.009 to 0.490	3	108.5 to 73.8
0.490 to 1.705	3	73.8 to 62.9
1.705 to 30	3	69.5
30 to 88	3	40.0
88 to 216	3	43.5
216 to 960	3	46.0
>960	3	54.0

[1] Measurements in the 9 to 90 kHz, 110 to 490 kHz and above 1000 MHz ranges employ an average detector. Otherwise a quasi-peak detector is used.

Procedure: This test was performed in accordance with the procedure detailed in FCC OET publication number 789033, Section G: Unwanted Emissions Measurement and FCC 47CFRPart 15.209: Radiated Emission Limits; General Requirements.

In accordance with ANSI C63.4-2003, section 13.4.1, c), the device under test was rotated through three orthogonal axes to determine which attitude produced the highest emission relative to the limit. The attitude that produced the highest emission relative to the limit was used for all radiated emission measurements and is detailed in this test report.

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

Conditions: Temperature: 21°C Relative Humidity: 31%

Conclusion: The Emissions from the DUT did not exceed the field strength levels specified in the above table.

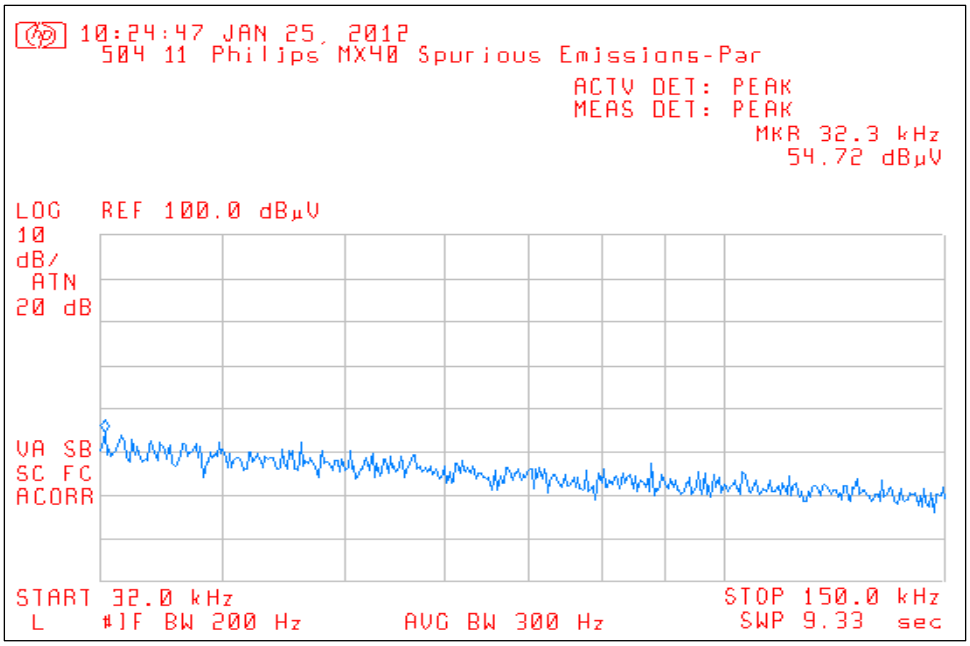
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

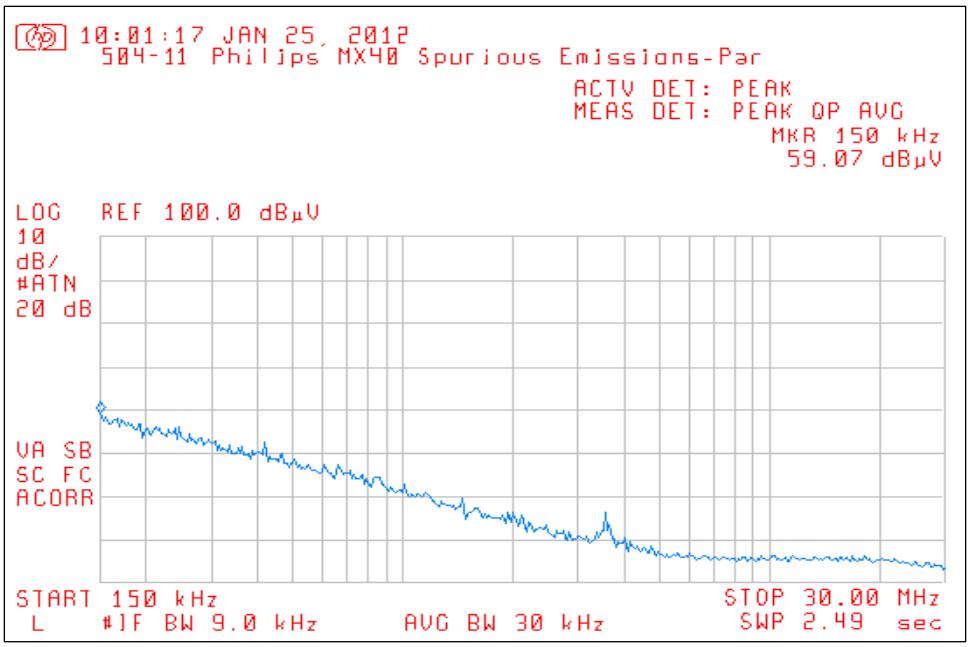
7. Measurement Data (continued)

7.7. Transmitter Spurious Radiated Emissions (32 kHz to 40 GHz) (continued)

7.7.1. Spurious Radiated Emissions (32 kHz to 30 MHz) Test Results

7.7.1.1. Measurement Results – Parallel Antenna





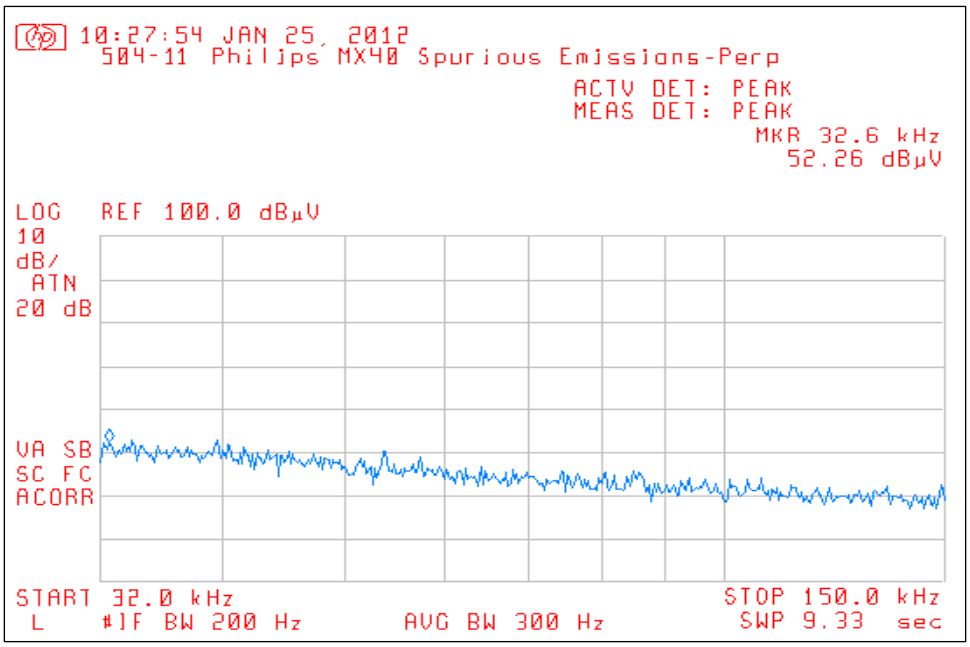
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

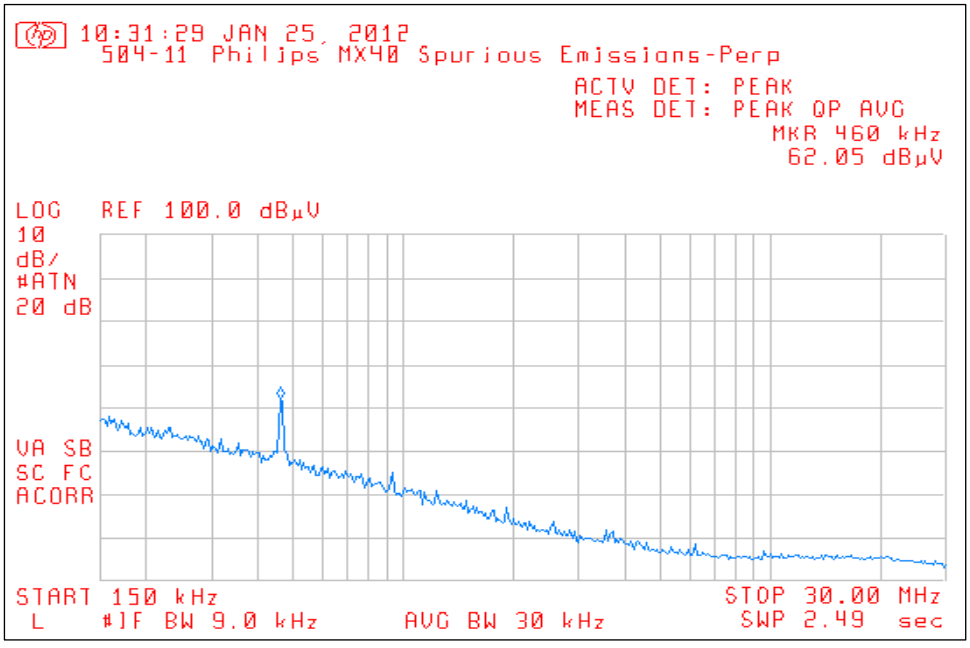
7. Measurement Data (continued)

7.7. Transmitter Spurious Radiated Emissions (32 kHz to 40 GHz) (continued)

7.7.1. Spurious Radiated Emissions (32 kHz to 30 MHz) Test Results

7.7.1.2. Measurement Results – Perpendicular Antenna





Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.7. Transmitter Spurious Radiated Emissions (32 kHz to 40 GHz) (continued)

7.7.2. Spurious Radiated Emissions (30 MHz – 1 GHz) Test Results

Note: This table represents a composite list of the worst case of all orthogonal positions of the device under test.

Freq. (MHz)	Field Strength (dBµV/m)		Limit (dBµV/m)	Margin (dB)	Antenna Polarity (H/V)	Result
	Peak	Quasi-Peak	Quasi-Peak			
135.3985	50.60	36.40	43.50	-7.10	H	Compliant
137.4003	47.10	34.20	43.50	-9.30	H	Compliant
137.6572	47.00	34.70	43.50	-8.80	H	Compliant
138.7191	48.40	35.50	43.50	-8.00	H	Compliant
138.7192	48.40	35.50	43.50	-8.00	H	Compliant
345.1862	49.20	37.60	46.00	-8.40	V	Compliant
348.0989	55.50	42.70	46.00	-3.30	H	Compliant
348.1244	54.70	42.30	46.00	-3.70	H	Compliant
348.3193	49.30	37.50	46.00	-8.50	H	Compliant
348.3244	50.90	37.30	46.00	-8.70	H	Compliant
348.3711	53.30	41.00	46.00	-5.00	H	Compliant
348.5996	53.00	41.20	46.00	-4.80	H	Compliant
348.8620	52.50	38.60	46.00	-7.40	H	Compliant
348.9519	49.50	37.30	46.00	-8.70	H	Compliant
349.0434	52.20	39.90	46.00	-6.10	H	Compliant
349.0583	50.80	37.50	46.00	-8.50	V	Compliant
349.3193	49.30	37.50	46.00	-8.50	V	Compliant
349.5782	51.70	40.40	46.00	-5.60	V	Compliant
349.8469	53.70	42.70	46.00	-3.30	H	Compliant
349.8841	49.60	37.10	46.00	-8.90	H	Compliant
351.0684	49.70	38.10	46.00	-7.90	H	Compliant

7.7.3. Spurious Radiated Emissions (Above 1 GHz) Test Results

There were measurable no transmitter spurious emissions other than the emissions tabled in sections 6.6.4.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.7. Transmitter Spurious Radiated Emissions (32 kHz to 40 GHz) (continued)

7.7.4. Transmitter Spurious Radiated Emissions (Harmonic Meas.) Test Results

7.7.4.1. U-NII 1 Band

Freq. (MHz) [1]	Field Strength (dBµV/m) [2]		Limit (dBµV/m)		Margin (dBµV/m)		Antenna Polarity (H/V)	Result
	Peak	Average	Peak	Average	Peak	Average		
10360.000	55.24	42.26	74.00	54.00	-18.76	-11.74	V	Compliant
10400.000	54.75	42.03	74.00	54.00	-19.25	-11.97	V	Compliant
10480.000	55.16	42.26	74.00	54.00	-18.84	-11.74	H	Compliant
15540.000	59.24	46.41	74.00	54.00	-14.76	-7.59	H	Compliant
15600.000	58.12	46.21	74.00	54.00	-15.88	-7.79	H	Compliant
15720.000	58.47	46.10	74.00	54.00	-15.53	-7.90	H	Compliant
20720.000	57.51	46.71	74.00	54.00	-16.49	-7.29	H	Compliant
20800.000	57.30	45.80	74.00	54.00	-16.70	-8.20	V	Compliant
20960.000	59.67	47.00	74.00	54.00	-14.33	-7.00	V	Compliant
25900.000	51.49	40.64	74.00	54.00	-22.51	-13.36	V	Compliant
26000.000	52.91	41.67	74.00	54.00	-21.09	-12.33	H	Compliant
26200.000	52.55	41.52	74.00	54.00	-21.45	-12.48	H	Compliant
31080.000	60.85	49.54	74.00	54.00	-13.15	-4.46	H	Compliant
31200.000	60.13	48.79	74.00	54.00	-13.87	-5.21	H	Compliant
31440.000	61.26	49.07	74.00	54.00	-12.74	-4.93	H	Compliant
36260.000	59.00	47.47	74.00	54.00	-15.00	-6.53	H	Compliant
36400.000	57.65	46.29	74.00	54.00	-16.35	-7.71	V	Compliant
36680.000	58.41	47.06	74.00	54.00	-15.59	-6.94	H	Compliant

[1] Measurements made at 25900 MHz, 26000 MHz, 26200 MHz, 36260 MHz, 36400 MHz, and 36680 MHz were taken at 1 meter and extrapolated to 3 meters.

[2] All correction factors are stored in the spectrum analyzer and applied to this column entry.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.7. Transmitter Spurious Radiated Emissions (32 kHz to 40 GHz) (continued)

7.7.4. Transmitter Spurious Radiated Emissions (Harmonic Meas.) Test Results

7.7.4.2. U-NII 2 Band

Freq. (MHz) [1]	Field Strength (dBµV/m) [2]		Limit (dBµV/m)		Margin (dBµV/m)		Antenna Polarity (H/V)	Result
	Peak	Average	Peak	Average	Peak	Average		
10520.000	55.50	41.80	125.20	105.20	-69.70	-63.40	V	Compliant
10640.000	56.59	43.00	74.00	54.00	-17.41	-11.00	H	Compliant
15780.000	59.23	45.85	74.00	54.00	-14.77	-8.15	H	Compliant
15960.000	59.02	46.91	74.00	54.00	-14.98	-7.09	H	Compliant
21040.000	55.37	42.15	74.00	54.00	-18.63	-11.85	H	Compliant
21280.000	58.13	43.65	74.00	54.00	-15.87	-10.35	H	Compliant
26300.000	61.17	47.28	74.00	54.00	-12.83	-6.72	H	Compliant
26600.000	60.06	46.95	74.00	54.00	-13.94	-7.05	V	Compliant
31560.000	59.94	47.08	74.00	54.00	-14.06	-6.92	H	Compliant
31920.000	63.17	50.60	74.00	54.00	-10.83	-3.40	V	Compliant
36820.000	58.13	44.84	74.00	54.00	-15.87	-9.16	H	Compliant
37240.000	59.00	45.95	74.00	54.00	-15.00	-8.05	V	Compliant

[1] Measurements made at 368200 MHz and 37240 MHz were taken at 1 meter and extrapolated to 3 meters.

[2] All correction factors are stored in the spectrum analyzer and applied to this column entry.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.7. Transmitter Spurious Radiated Emissions (32 kHz to 40 GHz) (continued)

7.7.4. Transmitter Spurious Radiated Emissions (Harmonic Meas.) Test Results

7.7.4.3. U-NII 2 Extended Band

Freq. (MHz) [1]	Field Strength (dBµV/m) [2]		Limit (dBµV/m)		Margin (dBµV/m)		Antenna Polarity (H/V)	Result
	Peak	Average	Peak	Average	Peak	Average		
11000.000	56.24	43.07	74.00	54.00	-17.76	-10.93	H	Compliant
11160.000	55.20	41.80	74.00	54.00	-18.80	-12.20	V	Compliant
11400.000	56.13	42.23	74.00	54.00	-17.87	-11.77	H	Compliant
16500.000	60.60	47.34	74.00	54.00	-13.40	-6.66	H	Compliant
16740.000	60.63	48.03	74.00	54.00	-13.37	-5.97	H	Compliant
17100.000	63.78	50.56	74.00	54.00	-10.22	-3.44	H	Compliant
22000.000	55.35	41.86	74.00	54.00	-18.65	-12.14	V	Compliant
22320.000	53.74	40.64	74.00	54.00	-20.26	-13.36	V	Compliant
22800.000	53.79	40.22	74.00	54.00	-20.21	-13.78	V	Compliant
27500.000	59.93	46.54	74.00	54.00	-15.64	-7.46	H	Compliant
27900.000	60.30	46.11	74.00	54.00	-13.70	-7.89	H	Compliant
28500.000	58.73	45.48	74.00	54.00	-15.27	-8.52	H	Compliant
33000.000	55.63	43.06	74.00	54.00	-18.37	-10.94	H	Compliant
33480.000	53.77	41.58	74.00	54.00	-20.23	-12.42	V	Compliant
34200.000	54.18	41.85	74.00	54.00	-19.82	-12.15	V	Compliant
38500.000	60.43	46.76	74.00	54.00	-13.57	-7.24	H	Compliant
39060.000	59.28	46.33	74.00	54.00	-14.72	-7.67	H	Compliant
39900.000	60.71	47.14	74.00	54.00	-13.29	-6.86	V	Compliant

[1] Measurements made at 33000 MHz, 33480 MHz, 34200 MHz, 38500 MHz, 39060 MHz and 39900 MHz were taken at 1 meter and extrapolated to 3 meters.

[2] All correction factors are stored in the spectrum analyzer and applied to this column entry.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.7. Transmitter Spurious Radiated Emissions (32 kHz to 40 GHz) (continued)

7.7.4. Transmitter Spurious Radiated Emissions (Harmonic Meas.) Test Results

7.7.4.4. U-NII 3 Band

Freq. (MHz) [1]	Field Strength (dBµV/m) [2]		Limit (dBµV/m)		Margin (dBµV/m)		Antenna Polarity (H/V)	Result
	Peak	Average	Peak	Average	Peak	Average		
11490.000	55.51	44.49	74.00	54.00	-18.49	-9.51	H	Compliant
11530.000	55.14	44.63	74.00	54.00	-18.86	-9.37	V	Compliant
11610.000	56.41	44.34	74.00	54.00	-17.59	-9.66	V	Compliant
17235.000	57.93	48.43	74.00	54.00	-16.07	-5.57	V	Compliant
17295.000	55.73	45.32	74.00	54.00	-18.27	-8.68	V	Compliant
17415.000	57.03	46.28	74.00	54.00	-16.97	-7.72	H	Compliant
22980.000	54.45	42.94	74.00	54.00	-19.55	-11.06	V	Compliant
23060.000	56.39	44.94	74.00	54.00	-17.61	-9.06	V	Compliant
23220.000	53.99	42.86	74.00	54.00	-20.01	-11.14	H	Compliant
28725.000	61.62	51.05	74.00	54.00	-12.38	-2.95	H	Compliant
28825.000	60.43	50.38	74.00	54.00	-13.57	-3.62	H	Compliant
29025.000	53.38	42.46	74.00	54.00	-20.62	-11.54	H	Compliant
34470.000	58.11	48.64	74.00	54.00	-15.89	-5.36	H	Compliant
34590.000	58.54	47.86	74.00	54.00	-15.46	-6.14	V	Compliant
34830.000	59.01	49.47	74.00	54.00	-14.99	-4.53	V	Compliant

[1] Measurements made at 17235 MHz, 17295 MHz, 17415 MHz, 23060 MHz, 29025 MHz, 34590 MHz, and 34830 MHz were taken at 1 meter and extrapolated to 3 meters.

[2] All correction factors are stored in the spectrum analyzer and applied to this column entry.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.8. Band Edge Measurements

Requirement: U-NII 1 Band (15.407(b)(1))

For transmitters operating in the5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.

U-NII 2 Band (15.407(b)(2))

For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15–5.25 GHz band.

U-NII 2 Extended Band (15.407(b)(3))

For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

U-NII 3 Band (15.407(b)(4))

For transmitters operating in the 5.725–5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of –17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of –27 dBm/MHz.

General (15.215(c))

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Procedure: This test was performed in accordance with the procedure detailed in FCC OET publication number 789033, Section G: Unwanted Emissions Measurement.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.8. Band Edge Measurements

Conditions: Temperature: 21°C Relative Humidity: 31%

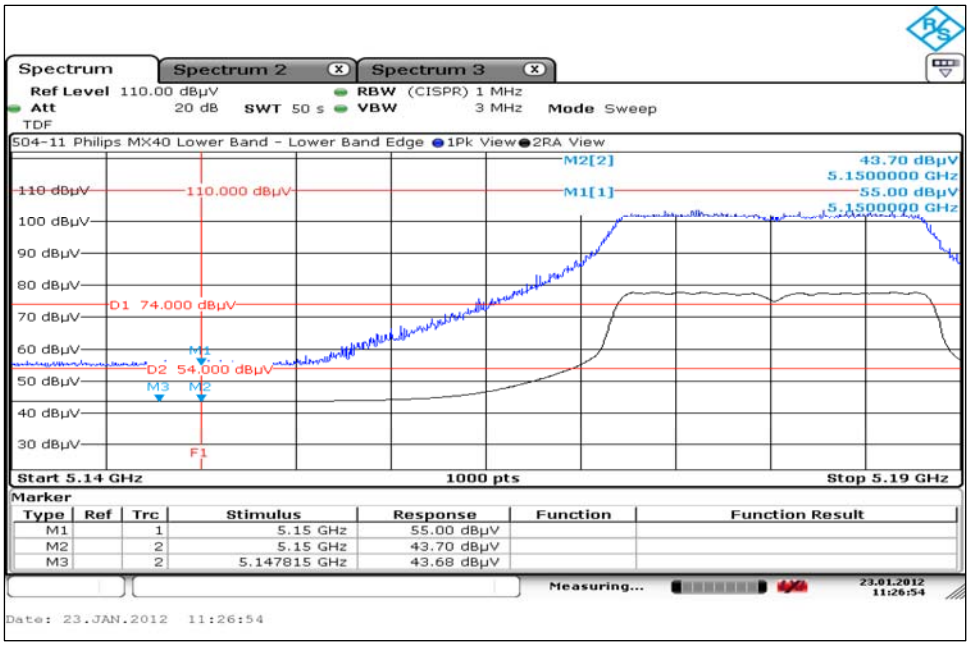
Conclusion: The device under test meets the requirements detailed in parts 15.407(b)(1), 15.407(b)(2), 15.407(b)(3), 15.407(b)(4) and 15.215(c) of the FCC Part 15.407 requirements.

7.8.1. U-NII 1 Band

Lower and Upper Band Edge

Freq. (MHz)	Field Strength (dBµV/m)	Band Edge Frequency (MHz)	Field Strength (dBµV/m)		15.407 Limit		Margin (dB)	Result
	Peak		Peak	Average	EIRP	dBµV/m		
5180	105.3	5150	55.00	43.70	-27 dBm/MHz	68.20	-24.50	Compliant
5240	105.3	5350	56.64	44.35	-27 dBm/MHz	68.20	-23.85	Compliant

7.8.1.1. U-NII 1 Band, Lower Band Edge Measurement Plot



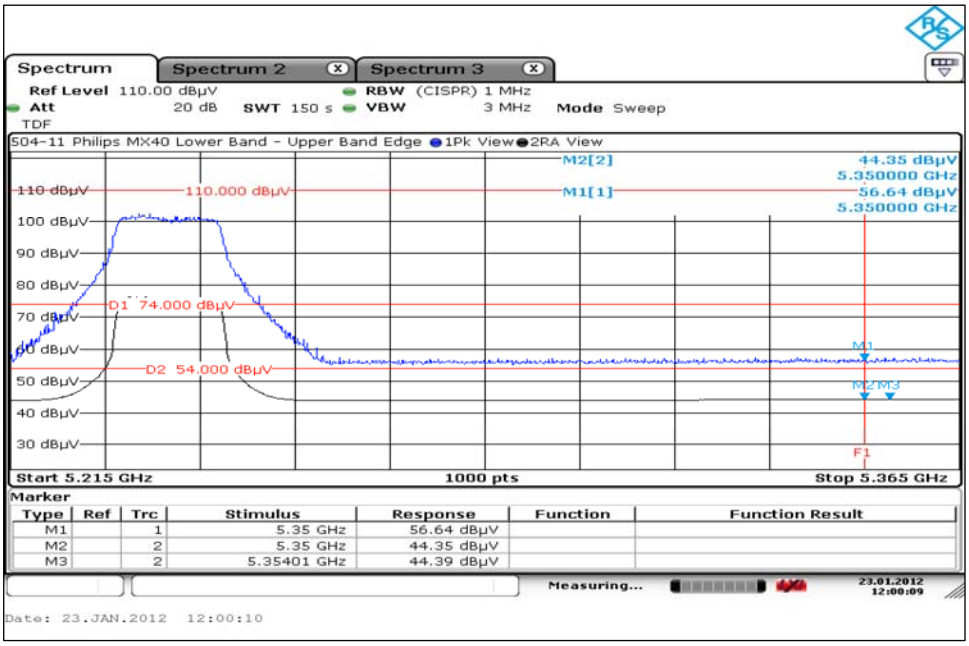
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.8. Band Edge Measurements (continued)

7.8.1. U-NII 1 Band (continued)

7.8.1.2. U-NII 1 Band, Upper Band Edge Measurement Plot



7.8.2. U-NII 2 Band

Lower and Upper Band Edge

Freq. (MHz)	Field Strength (dBµV/m)	Band Edge Frequency (MHz)	Field Strength (dBµV/m)		15.407 Limit		Margin (dB)	Result
	Peak		Peak	Average	EIRP	dBµV/m		
5260	106.63	5150	55.39	45.34	-27 dBm/MHz	68.2	-22.86	Compliant
5320	106.62	5350	61.44	47.98	-27 dBm/MHz	68.2	-20.22	Compliant

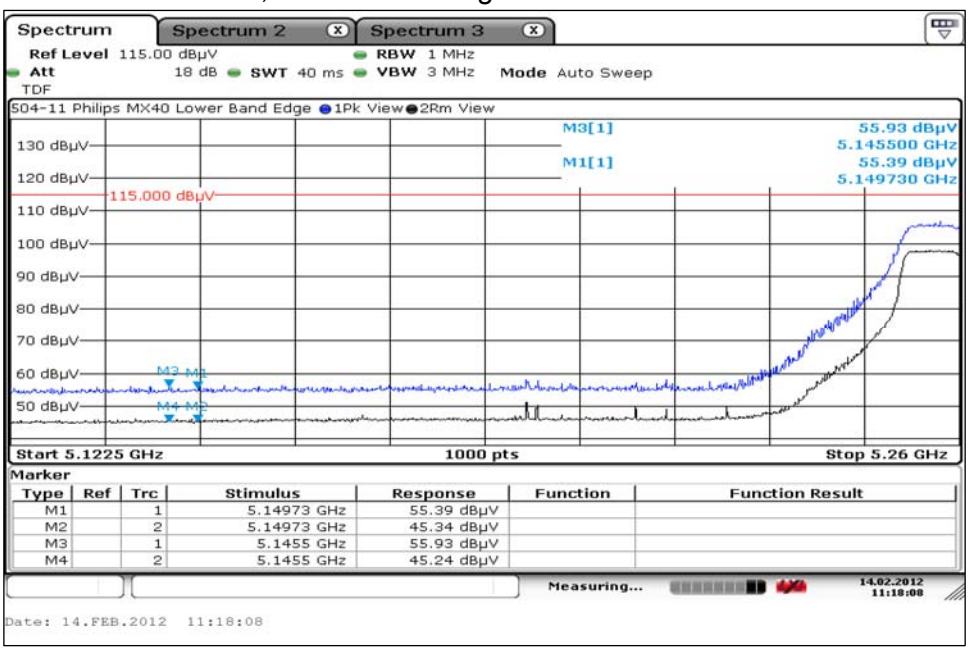
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

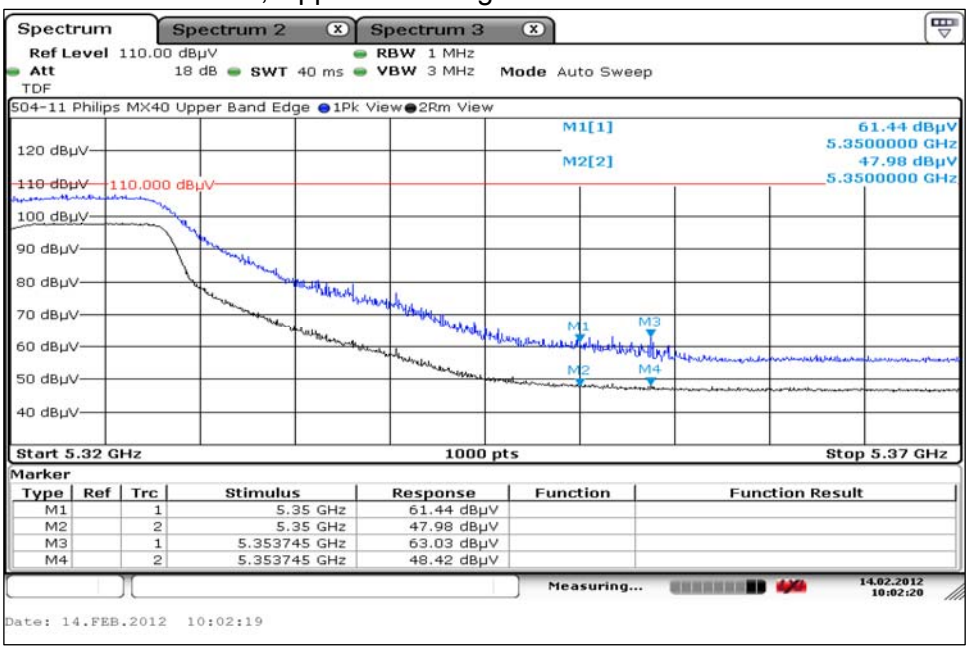
7.8. Band Edge Measurements (continued)

7.8.2. U-NII 2 Band (continued)

7.8.2.1. U-NII 2 Band, Lower Band Edge Measurement Plot



7.8.2.2. U-NII 2 Band, Upper Band Edge Measurement Plot



Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

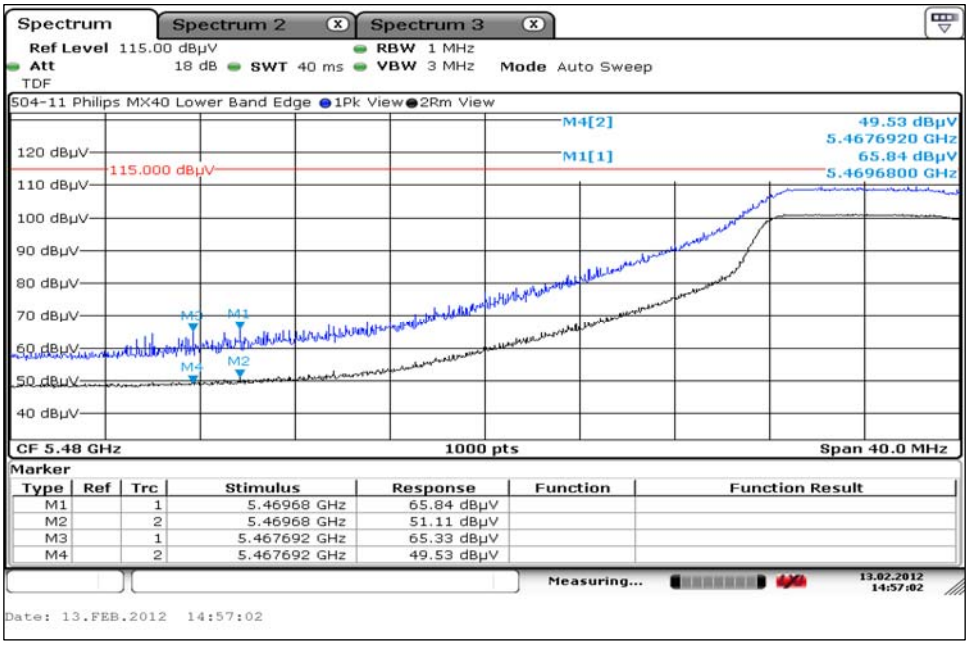
7.8. Band Edge Measurements (continued)

7.8.3. U-NII 2 Extended Band

Lower and Upper Band Edge

Freq. (MHz)	Field Strength (dBµV/m)	Band Edge Frequency (MHz)	Field Strength (dBµV/m)		15.407 Limit		Margin (dB)	Result
	Peak		Peak	Average	EIRP	dBµV/m		
5500	111.44	5470	65.84	51.11	-27 dBm/MHz	68.2	-17.09	Compliant
5700	110.56	5725	68.38	53.58	-27 dBm/MHz	68.2	-14.62	Compliant

7.8.3.1. U-NII 2 Extended Band, Lower Band Edge Measurement Plot



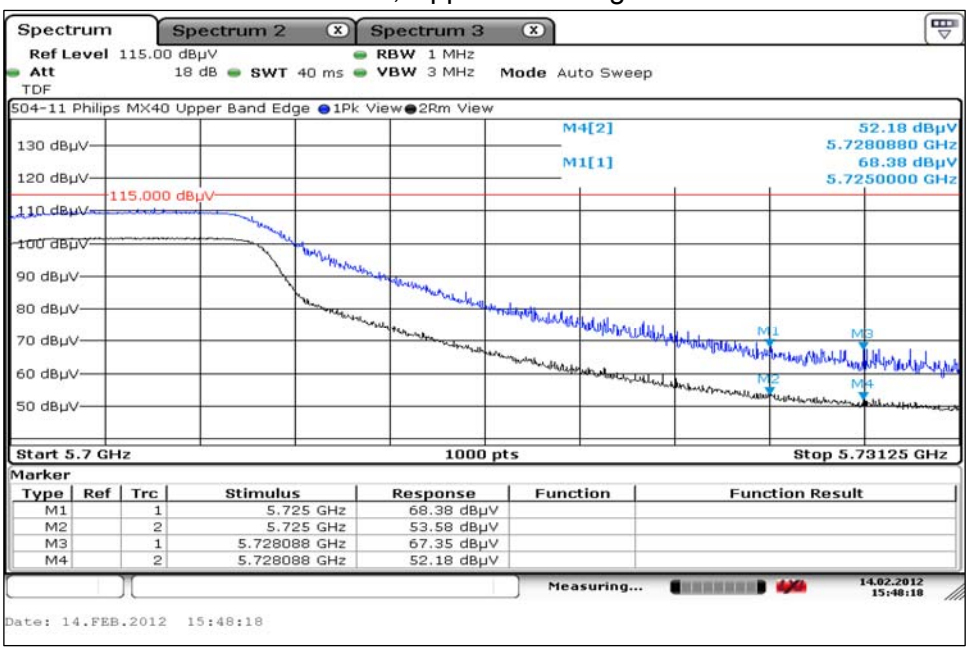
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.8. Band Edge Measurements (continued)

7.8.3. U-NII 2 Extended Band (continued)

7.8.3.2. U-NII 2 Extended Band, Upper Band Edge Measurement Plot



7.8.4. U-NII 3 Band

Lower Band Edge

Freq. (MHz)	Band	Freq. (MHz)	Field Strength (dBµV/m)		15.407 Limit		Margin (dB)	Result
					EIRP	dBµV/m		
			Peak	Average	(dBm/MHz)	Average		
5745	1st 10 MHz Band	5725	70.69	46.50	-17 dBm/MHz	78.2	-31.70	Compliant
	2nd 10 MHz Band	5715	60.82	45.07	-27 dBm/MHz	68.2	-23.13	Compliant

Upper Band Edge

Freq. (MHz)	Band	Freq. (MHz)	Field Strength (dBµV/m)		15.407 Limit		Margin (dB)	Result
					EIRP	dBµV/m		
			Peak	Average	(dBm/MHz)	Average		
5805	1st 10 MHz Band	5825	70.41	45.90	-17 dBm/MHz	78.2	-32.30	Compliant
	2nd 10 MHz Band	5835	58.61	44.59	-27 dBm/MHz	68.2	-23.61	Compliant

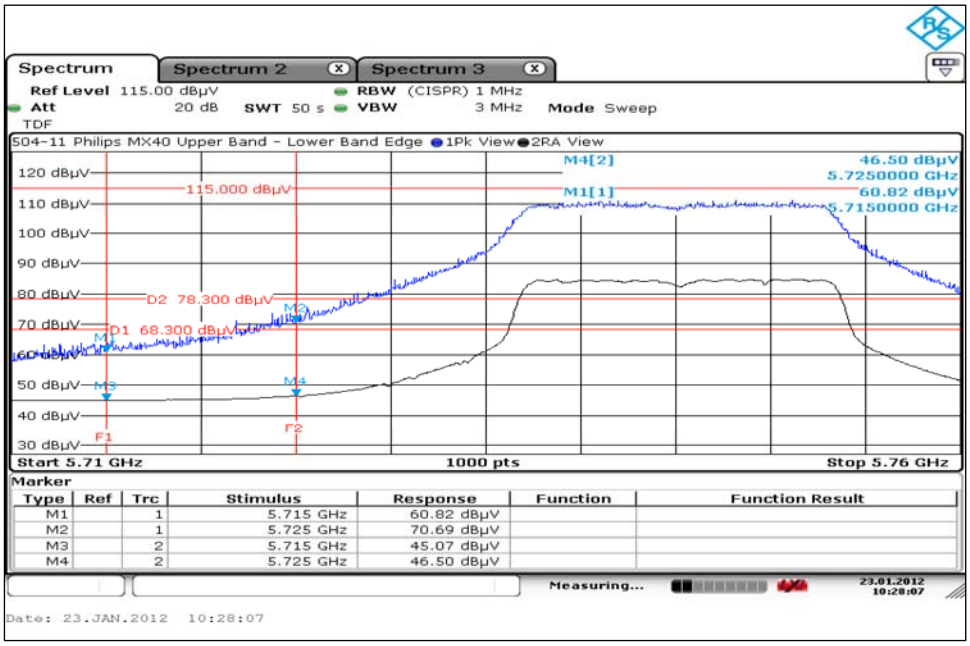
Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

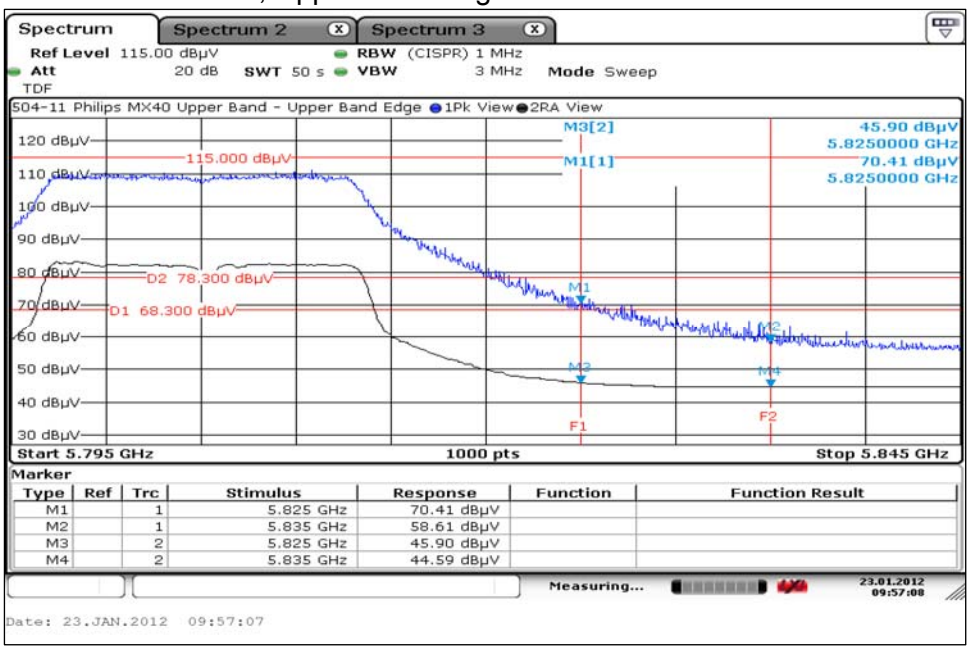
7.8. Band Edge Measurements (continued)

7.8.4. U-NII 3 Band (continued)

7.8.4.1. U-NII 3 Band Lower Band Edge Measurement Plot



7.8.4.1. U-NII 3 Band, Upper Band Edge Measurement Plot



Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.9. Frequency Stability (15.407(g))

Requirement: Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Procedure: This test was performed in accordance with the procedure detailed in FCC OET publication number 789033, Section G: Unwanted Emissions Measurement.

Conditions: Temperature: 21°C (Nominal) Relative Humidity: 31% (Nominal)

Conclusion: The device under test is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

U-NII 1 Band:

Channel	Channel Frequency	Temperature	Voltage	Measured Frequency	Frequency Offset	
	(MHz)	(°C)	(VDC)	(MHz)	(MHz)	(%)
36	5180	Nominal	Nominal	5180.0220		
		0	Nominal	5180.0220	0.000	0.0000
			Low	5180.0220	0.000	0.0000
		37	Nominal	5180.0220	0.000	0.0000
			Low	5180.0220	0.000	0.0000
40	5200	Nominal	Nominal	5200.0485		
		0	Nominal	5200.0508	2.300	0.0442
			Low	5200.0505	2.000	0.0385
		37	Nominal	5200.0505	2.000	0.0385
			Low	5200.0505	2.000	0.0385
48	5240	Nominal	Nominal	5240.0220		
		0	Nominal	5240.0210	1.000	0.0191
			Low	5240.0220	0.000	0.0000
		37	Nominal	5240.0220	0.000	0.0000
			Low	5240.0220	0.000	0.0000

U-NII 2 Band:

Channel	Channel Frequency	Temperature	Voltage	Measured Frequency	Frequency Offset	
	(MHz)	(°C)	(VDC)	(MHz)	(MHz)	(%)
52	5260	Nominal	Nominal	5260.0001		
		0	Nominal	5260.0003	0.200	0.0038
			Low	5260.0003	0.200	0.0038
		37	Nominal	5260.0010	0.950	0.0181
			Low	5260.0000	0.050	0.0010
64	5320	Nominal	Nominal	5320.0000		
		0	Nominal	5320.0001	-0.050	0.0009
			Low	5320.0001	0.050	0.0009
		37	Nominal	5320.0030	3.000	0.0564
			Low	5320.0001	0.100	0.0019

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.9. Frequency Stability (continued)

U-NII 2 Extended Band:

Channel	Channel Frequency	Temperature	Voltage	Measured Frequency	Frequency Offset	Frequency Offset
	(MHz)	(°C)	(VDC)	(MHz)	(MHz)	(%)
100	5500	Nominal	Nominal	5500.0000	0.000	0.0000
		0	Nominal	5500.0003	0.000	0.0000
			Low	5500.0003	0.250	0.0045
		37	Nominal	5500.0000	0.000	0.0000
			Low	5500.0003	0.250	0.0045
116	5580	Nominal	Nominal	5580.0250		
		0	Nominal	5580.0275	0.250	0.0045
			Low	5579.9750	0.000	0.0000
		37	Nominal	5579.9750	0.000	0.0000
			Low	5579.9750	0.000	0.0000
140	5700	Nominal	Nominal	5700.0250		
		0	Nominal	5700.0250	0.000	0.0000
			Low	5700.0251	0.050	0.0009
		37	Nominal	5699.9750	0.000	0.0000
			Low	5700.0251	0.050	0.0009

U-NII 3 Band:

Channel	Channel Frequency	Temperature	Voltage	Measured Frequency	Frequency Offset	Frequency Offset
	(MHz)	(°C)	(VDC)	(MHz)	(MHz)	(%)
149	5745	Nominal	Nominal	5745.0220		
		0	Nominal	5745.0215	0.500	0.0087
			Low	5745.0220	0.000	0.0000
		37	Normal	5745.0215	0.500	0.0087
			Low	5745.0220	0.000	0.0000
153	5765	Nominal	Nominal	5765.0435		
		0	Nominal	5765.0420	1.500	0.0260
			Low	5765.0435	0.000	0.0000
		37	Nominal	5765.0420	1.500	0.0260
			Low	5765.0410	2.500	0.0434
161	5805	Nominal	Nominal	5805.0217		
		0	Nominal	5805.0217	0.000	0.0000
			Low	5805.0217	0.000	0.0000
		37	Nominal	5805.0217	0.000	0.0000
			Low	5805.0217	0.000	0.0000

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.10. Public Exposure to Radio Frequency Energy Levels

Requirement: (15.407(f))

U-NII devices are subject to the radio frequency radiation exposure requirements specified in 47CFR 1.1307(b), FCC 47 CFR 2.1091 and 47 CFR 2.1093, as appropriate. All equipment shall be considered to operate in a ‘‘general population/uncontrolled’’ environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request

Procedure: The power density is calculated from the peak field strength and device antenna gain.

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

PD	Power Density	mW/cm^2
OP	DUT Output Power	dBm
AG	DUT Antenna Gain	dBi
d	MPE Distance	cm

Conclusion: The device under test is meets radio frequency radiation exposure requirements specified in 47CFR 1.1307(b), § 2.1091 and § 2.1093.

Power Calculated from Peak Field Strength

Channel	Frequency	Field Strength	Distance	Antenna Gain[1]	Measured Output Power		Time Averaged Power
	(MHz)	(dBµV/m)	(m)	(dBi)	(mW)	(dBm)	(mW)
36	5180	108.53	3.0	1.0	16.99	12.30	0.0002718
40	5200	108.82	3.0	1.0	18.16	12.59	0.0002906
48	5240	109.29	3.0	1.0	20.24	13.06	0.0003238
52	5260	109.42	3.0	1.0	20.85	13.19	0.0003336
64	5320	107.00	3.0	1.0	11.94	10.77	0.0001911
100	5500	112.57	3.0	1.0	43.06	16.34	0.0006890
116	5580	112.86	3.0	1.0	46.04	16.63	0.0007366
140	5700	113.01	3.0	1.0	47.66	16.78	0.0007625
149	5745	114.22	3.0	1.0	62.97	17.99	0.0010075
153	5765	113.96	3.0	1.0	59.31	17.73	0.0009489
161	5805	114.46	3.0	1.0	66.55	18.23	0.0010647

[1] Taken from the antenna manufacture's data guide.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

7. Measurement Data (continued)

7.10. Public Exposure to Radio Frequency Energy Levels (continued)

Channel Frequency	MPE Distance (cm)	DUT Output Power (dBm)	Time Averaged Power	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm2)	Result
					(mW/cm2)	(W/m2)		
	(1)	(2)	dBm	(3)	(4)		(5)	
5180	2.5	12.30	-35.66	1.0	0.000004	0.00004	1	Compliant
5200	2.5	12.59	-35.37	1.0	0.000005	0.00005	1	Compliant
5240	2.5	13.06	-34.90	1.0	0.000005	0.00005	1	Compliant
5260	2.5	13.19	-34.77	1.0	0.000005	0.00005	1	Compliant
5320	2.5	10.77	-37.19	1.0	0.000003	0.00003	1	Compliant
5500	2.5	16.34	-31.62	1.0	0.000011	0.00011	1	Compliant
5580	2.5	16.63	-31.33	1.0	0.000012	0.00012	1	Compliant
5700	2.5	16.78	-31.18	1.0	0.000012	0.00012	1	Compliant
5745	2.5	17.99	-29.97	1.0	0.000016	0.00016	1	Compliant
5765	2.5	17.73	-30.23	1.0	0.000015	0.00015	1	Compliant
5805	2.5	18.23	-29.73	1.0	0.000017	0.00017	1	Compliant

1. Reference CFR 2.1093(b): For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 2.5 centimeters of the body of the user.
2. Peak field strength values derived from measurements taken for Section 6.1 of this test report.
3. Data supplied by the client.
4. Power density is calculated from field strength measurement and antenna gain. Reference the procedure outlined above.
5. Reference FCC 47CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.

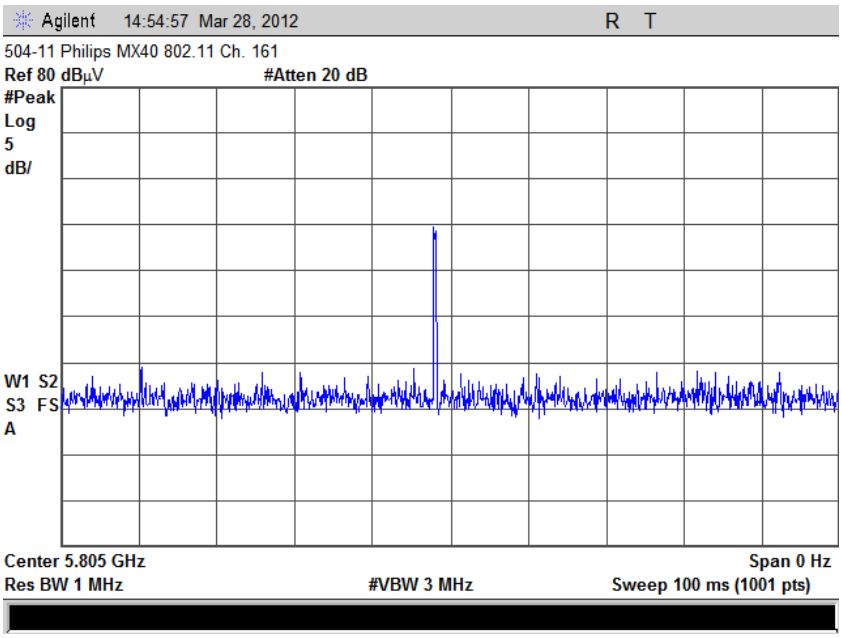
The transmitter covered in this test report can be operated with other transmitters within the device. A separate Public Exposure Exhibit will be generated for its co-location.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

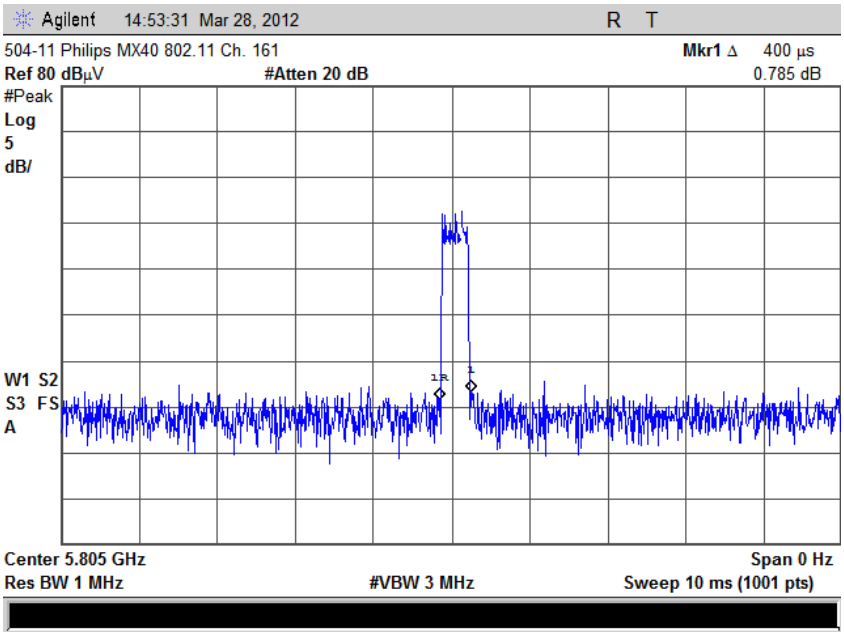
7.10. Public Exposure to Radio Frequency Energy Levels (15.407(f) (1.1307 (b)(1)) RSS-GEN 5.5, RSS 102 (continued)

Time Average Reduction = 20 $\log_{10}$ (.400 ms / 100 ms) = -47.96 dB.

7.10.1 Determination of time averaged output power – 1 Pulse per 100 ms period.



7.10.2 Determination of time averaged output power – Pulse width = 400 µs.



Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com

8. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with Federal Communications Commission (FCC) and Industry Canada standards. A description of the test sites is on file with the FCC (registration number **96392**) and Industry Canada (file number **IC 3023)**.

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022.

Both sites are designed to test products or systems 1.5 meter W x 1.5 meter L x 2.0 meter H, floor standing or table top.

Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
(603) 887 3903 Fax 887 6445
http://www.cw-inc.com