



Electromagnetic Compatibility Test Report

Tests Performed on a Westell

Ultraline Router, Model A90-9150V60-10

Radiometrics Document RP-7438



<i>Product Detail:</i> FCC ID: CH8MXX50 Equipment type: Digital Transmission System			
<i>Test Standards:</i> US CFR Title 47, Chapter I, FCC Part 15 Subpart C FCC Part 15 CFR Title 47: 2012 This report concerns: Certification for Original Grant FCC Part 15.247			
<i>Tests Performed For:</i> Westell 750 N. Commons Dr. Aurora, IL 60504		<i>Test Facility:</i> Radiometrics Midwest Corporation 12 East Devonwood Romeoville, IL 60446	
<i>Test Date(s): (Month-Day-Year)</i> December 5, 6 and 10, 2012 and January 17 thru 24, 2013			
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0	December 20, 2012		
1	January 18, 2013	All	Joseph Strzelecki
2	January 24, 2013	Cover, 10.3, 10.4, 10.5, 10.6, 10.7	Joseph Strzelecki
3	January 24, 2013	5, 9, 10.5	Joseph Strzelecki
4	January 24, 2013	Cover, 4.2	Joseph Strzelecki

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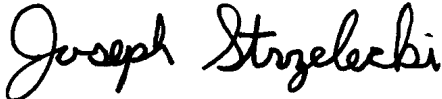
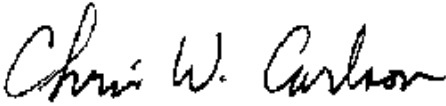
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RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router

1 ADMINISTRATIVE DATA

<i>Equipment Under Test:</i> A Westell, Ultraline Router Model: A90-9150V60-10 Serial Number: 12AK098313352 This will be referred to as the EUT in this Report	
<i>Date EUT Received at Radiometrics: (Month-Day-Year)</i> December 5, 2013	<i>Test Date(s): (Month-Day-Year)</i> December 5, 6 and 10, 2012 and January 17 thru 24, 2013
<i>Test Report Written By:</i> Joseph Strzelecki Senior EMC Engineer	<i>Test Witnessed By:</i> Greg Bella Westell
<i>Radiometrics' Personnel Responsible for Test:</i> 	<i>Test Report Approved By</i> 
Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is an Ultraline router, Model A90-9150V60-10, manufactured by Westell. The detailed test results are presented in a separate section. The following is a summary of the test results.

Test Results

Environmental Phenomena	Frequency Range	FCC Section	Test Result
6 dB Bandwidth Test;	2400 to 2483 MHz	15.247 a	Pass
20 dB Bandwidth Test;	2400 to 2483 MHz	15.247 a	Pass
Peak Output Power	2400 to 2483 MHz	15.247 b	Pass
Band-edge Compliance of RF Conducted Emissions	2400 to 2483 MHz	15.247 d	Pass
Spurious RF Conducted Emissions	30 MHz to 25 GHz	15.247 d	Pass
Spurious Radiated Emissions	30 MHz to 25 GHz	15.247 d	Pass
Power Spectral Density	2400 to 2483 MHz	15.247 e	Pass
Conducted Emissions, AC Mains	0.15 - 30 MHz	15.207	Pass
Radiated Emissions (Unintentional Radiation Receive mode)	30 MHz to 12.5 GHz	15.109	Pass

2.1 RF Exposure Compliance Requirements

Since the average power output is 99 mW and is not handheld, the EUT meets the FCC requirement for RF exposure. There are no power level adjustments accessible by the end user. The detailed calculations for RF Exposure are presented in a separate document.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is an UltraLine Router, Model A90-9150V60-10, manufactured by Westell. The EUT was in good working condition during the tests, with no known defects.

3.1.1 FCC Section 15.203 Antenna Requirements

The antenna is two half wave monopoles. The antennas have a reverse polarity connector type that is not readily available to the general public. Therefore, it meets the 15.203 Requirements.

3.2 Related Submittals

Westell is not submitting any other products simultaneously for equipment authorization related to the EUT.

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations. Power was supplied at 115 VAC, 60 Hz single-phase to its external power supply.

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Ultraline Router	E	Westell, Inc.	A90-9150V60-10	12AK098313352
2	EUT Power Supply	E	Westell, Inc.	MT18-9120150-A1	2612101791022107PJ
3	Notebook Computer	S	Lenova	T420	R8-VLM3L
4	Notebook Computer	S	Gateway	PEW91	020040360B9901601
5	Notebook Computer	S	Dell	D620 (PP18L)	17171005069
6	Notebook Computer	S	Dell	D620 (PP18L)	25886676421
7	DSLAM	S	Broadcom	IPDSLAMV4	AFE6505

* Type: E = EUT, S = Support Equipment; H = Host Computer

List of System Cables

QTY	Length (m)	Cable Description	Connected to	Shielded?
1	1.8	Low Voltage Power Cord	Power to Host system	No
4	10	Ethernet Cable	EUT and PC's and Ethernet Hub	No
1	10	ADSL Cable	Host and Moca LAN	No

Laptop 3 was sending full speed TCP/IP traffic to Laptop 3 using IPERF DOS utility.

Laptop 5 and 6 was linked up to the EUT at 100Mb/s.

VDSL was in sync between the Broadcom DSLAM and EUT.

4.2 EUT Operating Modes

Environmental Phenomena	Channels Tested	Mode	Data Mbps	Antenna Mode	Notes
Bandwidth Test	1, 6, 11	802.11b	1.0	Diversity	Note 1
Bandwidth Test	1, 6, 11	802.11g	6.0	Diversity	Note 1
Bandwidth Test	1, 6, 11	802.11n	6.5	Diversity	Note 1
Peak Output Power	1, 6, 11	802.11b	1.0	Diversity	Note 1
Peak Output Power	1, 6, 11	802.11g	6.0	Diversity	Note 1
Peak Output Power	1, 6, 11	802.11n	6.5	Diversity	Note 1
Band-edge Compliance of RF Conducted Emissions	1, 6, 11	802.11b	1.0	Diversity	Note 1
Band-edge	1, 6, 11	802.11g	6.0	Diversity	Note 1
Band-edge	1, 6, 11	802.11n	6.5	Diversity	Note 1
RF Conducted Emissions	1, 6, 11	802.11b	1.0	Diversity	Note 1
RF Conducted Emissions	1, 6, 11	802.11g	6.0	Diversity	Note 1
RF Conducted Emissions	1, 6, 11	802.11n	6.5	Diversity	Note 1
Radiated Emissions (> 1 GHz)	1, 6, 11	802.11b	1.0	Diversity	Note 1
Radiated Emissions (> 1 GHz)	1, 6, 11	802.11g	6.0	Diversity	Note 1
Radiated Emissions (> 1 GHz)	1, 6, 11	802.11n	6.5	Diversity	Note 1
Power Spectral Density	1, 6, 11	802.11b	1.0	Diversity	Note 1
Power Spectral Density	1, 6, 11	802.11g	6.0	Diversity	Note 1
Power Spectral Density	1, 6, 11	802.11n	6.5	Diversity	Note 1
Conducted Emissions, AC Mains	6	802.11b	1.0	Diversity	Note 1 & 2
Radiated Emissions Below 1 GHz	6	802.11b	1.0	Diversity	Note 1 & 2

Note 1: During preliminary testing, diversity mode was found to be worst cast for these tests.

Note 2: During preliminary testing, 802.11b mode Channel 6 was found to be worst cast for these tests.

4.3 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.4 Equipment Modifications

One antenna cable was taped to the corner of the housing. This was the cable closest to Ethernet jacks. See internal EUT photos for details.

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2012	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-2009	2009	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
FCC KDB662911	2012	Emissions Testing of Transmitters with Multiple Outputs in the Same Band KDB662911 D01 v01r02; 9/26/12
FCC 558074	2012	Measurement of Digital Transmission Systems Operating under Section 15.247; D01 DTS Meas Guidance v01

The test procedures used are in accordance with the Industry Canada RSS-212 and ANSI document C63.4-2009, "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2005 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber A: Is an anechoic chamber that measures 24' L X 12' W X 12' H. The walls and ceiling are fully lined with ferrite absorber tiles. The floor has a 10' x 10' section of ferrite absorber tiles located in the center. Panashield of Rowayton, Connecticut manufactured the chamber. The enclosure is NAMAS certified.

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC3124A-1.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification. The results relate only to the EUT listed herein. Any modifications made to the EUT subsequent to the indicated test date will invalidate the data and void this certification.

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9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Dates
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	01/24/12
AMP-20	Avantek	Pre-amplifier	SF8-0652	15221	8-18GHz	12 Mo.	01/24/12
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	01/24/12
AMP-29	HP / Agilent	Amplifier	11975A	2304A00158	2-8 GHz	12 Mo.	11/06/12
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	12/05/13
ANT-44	Impossible Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	12/14/11
ANT-48	RMC	Std. Gain Horn	HW2020	1001	18-26.5 GHz	12 Mo.	04/05/12
HPF-01	Solar	High Pass Filter	7930-100	HPF-1	0.15-30MHz	24 Mo.	01/24/12
HPF-03	Mini-Circuits	High Pass Filter	VHP-39	HPF-03	3-10 GHz	24 Mo.	02/18/11
LSN-01	Electrometrics	50 uH LISN	FCC/VDE 50/2	1001	0.01-30MHz	24 Mo.	06/14/11
LSN-03	Farnell	50 uH LISN	1EXLSN30B	000314	0.01-30MHz	24 Mo.	06/14/11
MXR-02	HP / Agilent	Harmonic Mixer	11970K	2332A00489	18-26.5GHz	12 Mo.	11/06/12
REC-03	Anritsu	Spectrum Analyzer	MS2601B	MT94589	0.01-2200MHz	12 Mo.	04/02/12
REC-08	Hewlett Packard	Spectrum Analyzer	8566B	2648A13481 2209A01436	30Hz-22GHz	24 Mo.	10/28/11

Note: All calibrated equipment is subject to periodic checks.

10 TEST SECTIONS

10.1 AC Conducted Emissions

The tests and limits are in accordance with FCC section 15.207 and RSS Gen section 7.2.2.

A computer-controlled analyzer was used to perform the conducted emissions measurements. The frequency range was divided into 500 subranges equally spaced on a logarithmic scale. The computer recorded the peak of each subrange. This data was then plotted on semi-log graph paper generated by the computer and plotter. Adjusting the positions of the cables and orientation of the test system then maximizes the highest emissions.

Mains Conducted emission measurements were performed using a 50 Ohm/50 uH Line Impedance Stabilization Network (LISN) as the pick-up device. Measurements were repeated on both leads within the power cord. If the EUT power cord exceeded 80 cm in length, the excess length of the power cord was made into a 30 to 40 cm bundle near the center of the cord. The LISN was placed on the floor at the base of the test platform and electrically bonded to the ground plane.

FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBuV)	
	Quasi-Peak	Average
0.150 - 0.50*	66 - 56	56 - 46
0.5 - 5.0	56	46
5.0 - 30	60	50
* The limit decreases linearly with the logarithm of the frequency in this range.		

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The initial step in collecting conducted data is a peak detector scan and the plotting of the measurement range. Significant peaks are then marked as shown on the following table, and these signals are then measured with the quasi-peak detector. The following represents the worst case emissions from the host WIFI gateway (with the EUT connected) power cord, after testing all modes of operation.

Test Dates : January 18, 2013

The Amplitude is the final corrected value with cable and LISN Loss.

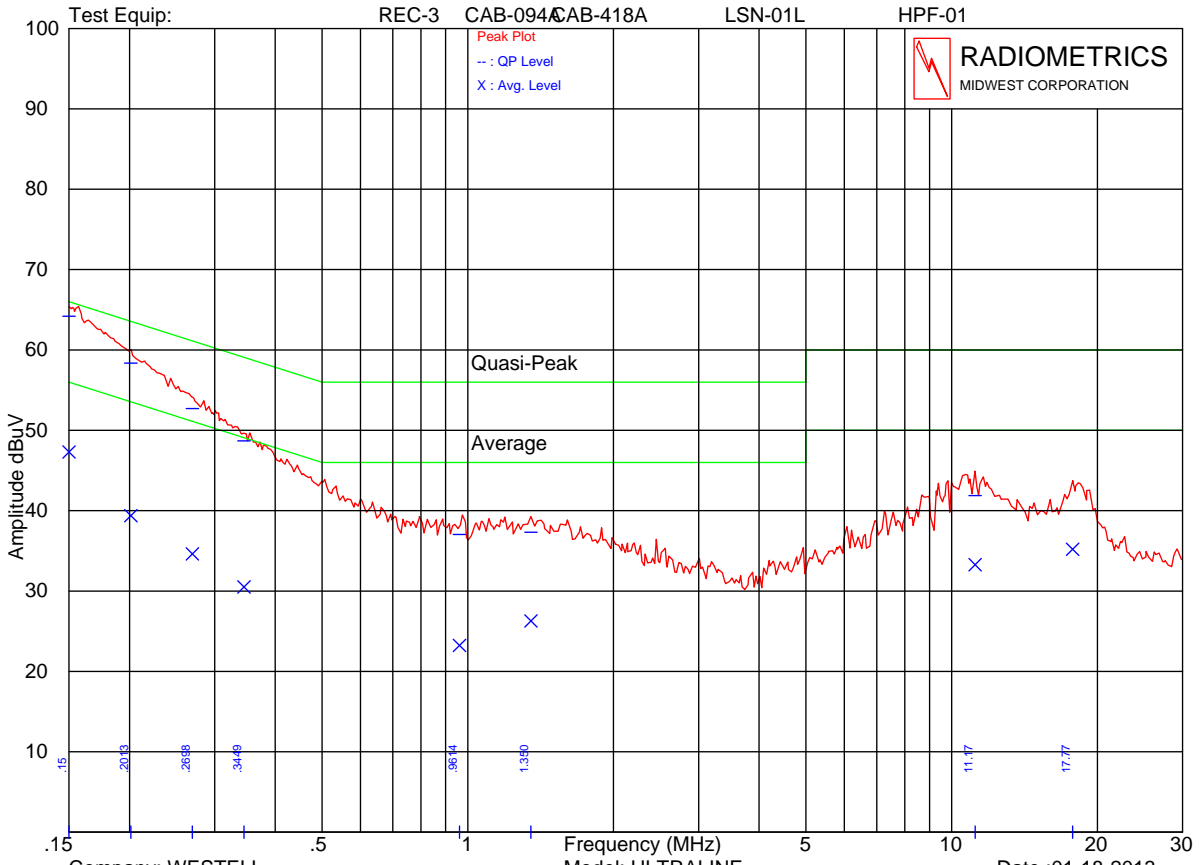
Lead Tested	Frequency MHz	QP Amplitude	QP Limit	Average Amplitude	Average Limit
AC Neutral	0.150	64.2Q	66.0	47.3	56.0
AC Neutral	0.201	58.4Q	63.6	39.4	53.6
AC Neutral	0.270	52.7Q	61.1	34.6	51.1
AC Neutral	0.345	48.7Q	59.1	30.5	49.1
AC Neutral	0.961	37.0Q	56.0	23.2	46.0
AC Neutral	1.350	37.3Q	56.0	26.3	46.0
AC Neutral	11.180	41.9Q	60.0	33.3	50.0
AC Neutral	17.777	43.8P	60.0	35.2	50.0
AC Hot	0.151	64.4Q	66.0	48.1	56.0
AC Hot	0.185	60.1Q	64.3	40.9	54.3
AC Hot	0.210	57.7Q	63.2	40.2	53.2
AC Hot	0.330	49.8P	59.4	31.2	49.4
AC Hot	1.264	37.0Q	56.0	25.4	46.0
AC Hot	1.521	40.4P	56.0	25.3	46.0
AC Hot	10.608	46.2P	60.0	35.0	50.0
AC Hot	18.589	45.4P	60.0	34.5	50.0

The above are the worst case results with three frequencies test for each EUT

* QP readings are quasi-peak with a 9 kHz bandwidth and no video filter.

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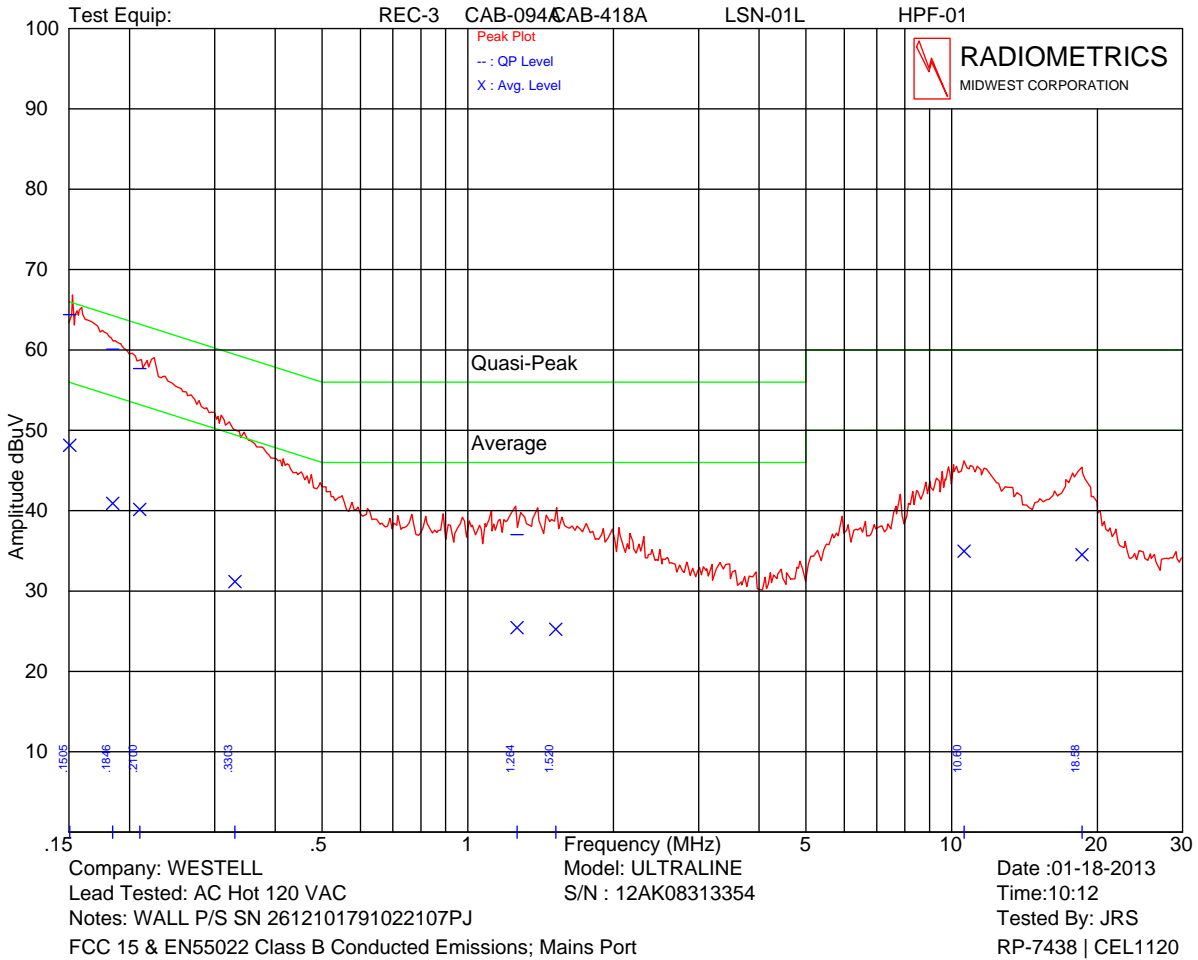
Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: WESTELL
 Lead Tested: AC Neutral 120 VAC
 Notes: WALL P/S SN 2612101791022107PJ
 FCC 15 & EN55022 Class B Conducted Emissions; Mains Port

Model: ULTRALINE
 S/N : 12AK08313354

Date :01-18-2013
 Time:10:22
 Tested By: JRS
 RP-7438 | CEL2120



Judgment: Passed by 1.6 dB

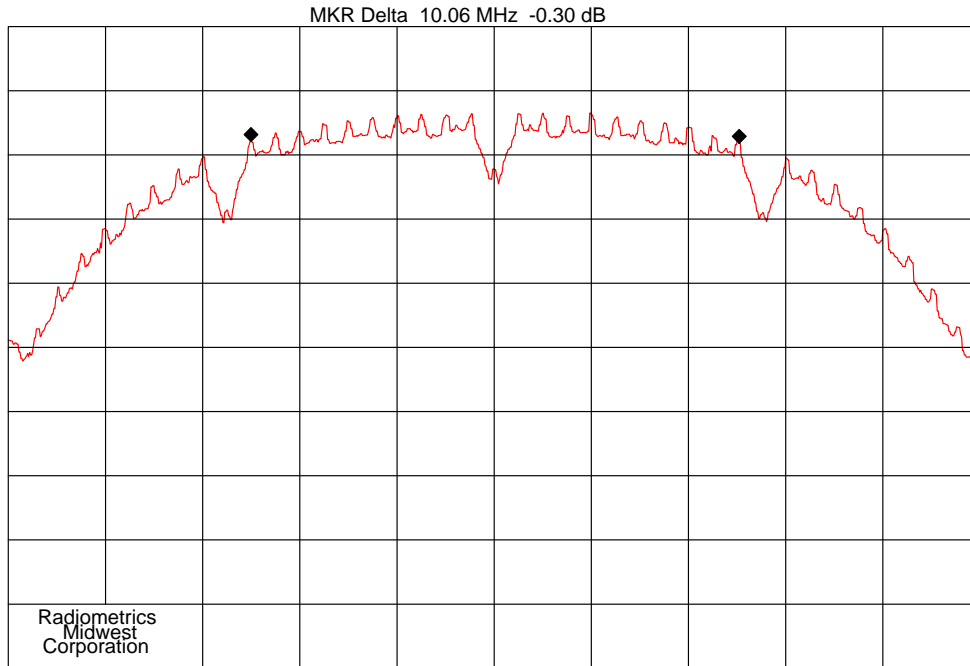
10.2 Occupied Bandwidth Data

The occupied bandwidth of the RF output was measured using a spectrum analyzer. The bandwidth was measured using the peak detector function and a narrow resolution bandwidth.

A broadband antenna was used to receive the modulated signal. The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The spectrum analyzer display was digitized and plotted. A limit was drawn on the plots based on the level of the modulated carrier. The plots of the occupied bandwidth for the EUT are supplied on the following page.

Channel	802.11b	802.11g	802.11N	802.11b	802.11g	802.11N
	Antenna 1			Antenna 2		
1	10.06	16.44	17.64	10.10	16.46	17.54
6	10.20	16.58	17.82	10.24	16.54	17.86
11	10.26	16.64	17.68	10.26	16.64	17.72

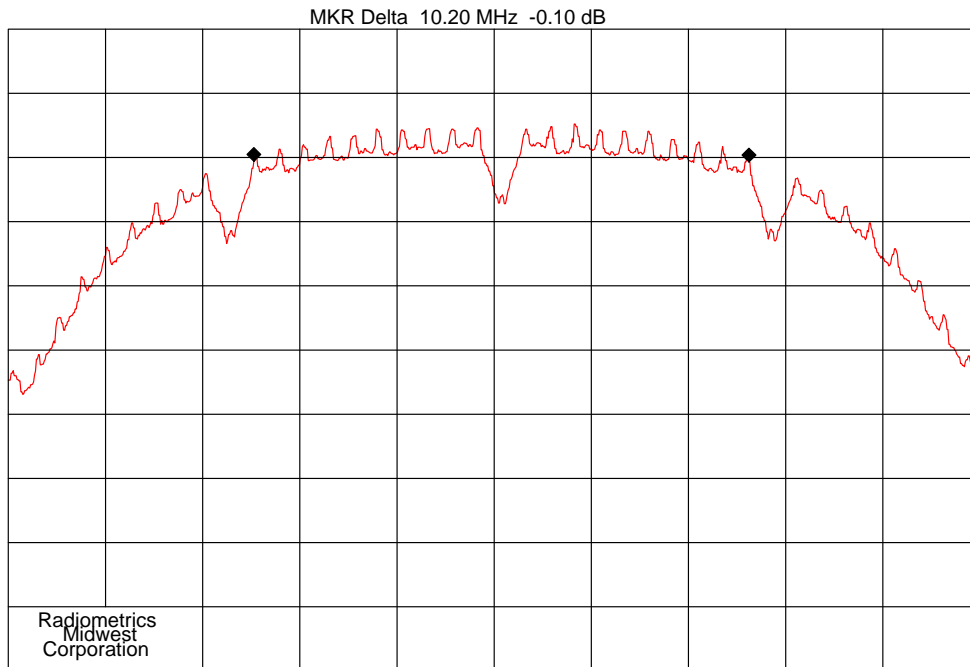
Figure 1. Occupied Bandwidth Plots



Company: Netgear-Westell
 CENTER 2.412 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT1 Bandwidth, Ch1 802.11b

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 10:33

Date : 01-24-2013
 SPAN 20.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BW1b1



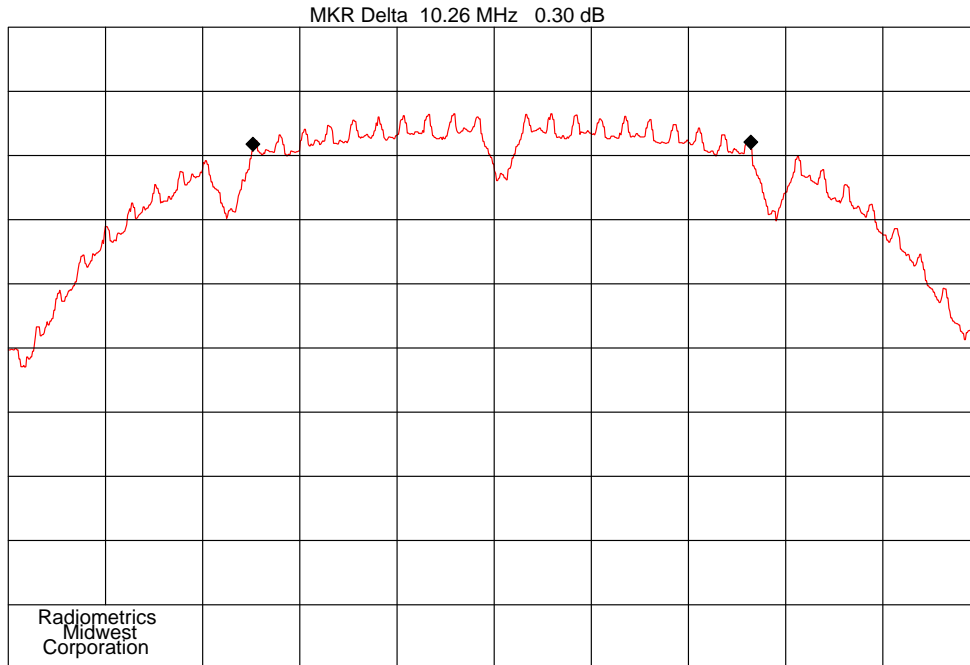
Company: Netgear-Westell
 CENTER 2.437 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT1 Bandwidth, Ch 6 802.11b

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 12:57

Date : 01-24-2013
 SPAN 20.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BW-1b6

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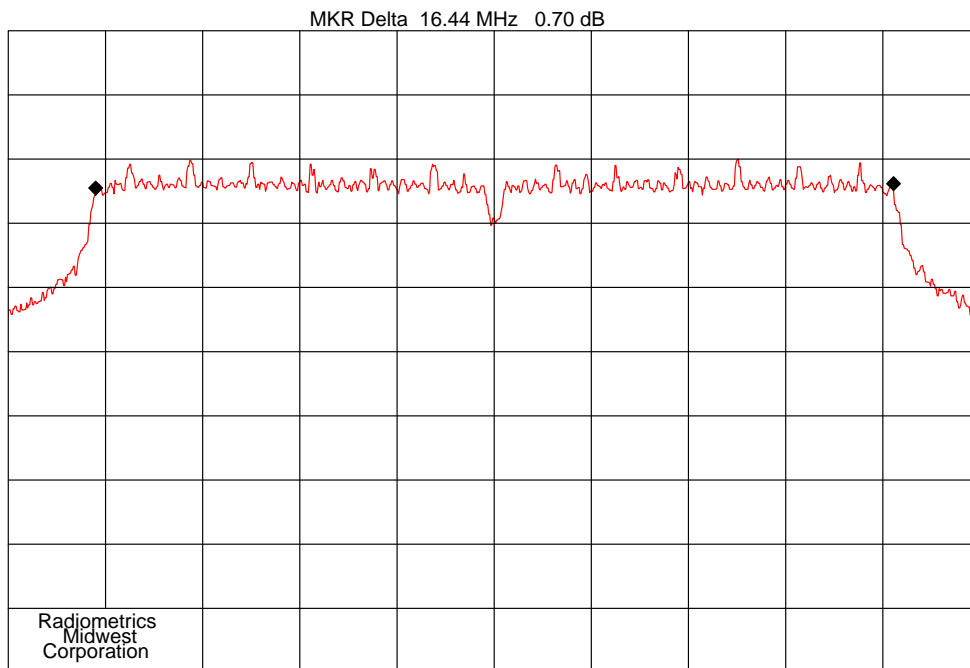
Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: Netgear-Westell
CENTER 2.462 0 GHz
RES BW 100 kHz
10 dB/
Notes: ANT1 Bandwidth, Ch 11 802.11b

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 11:44

Date : 01-24-2013
SPAN 20.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW-1b11



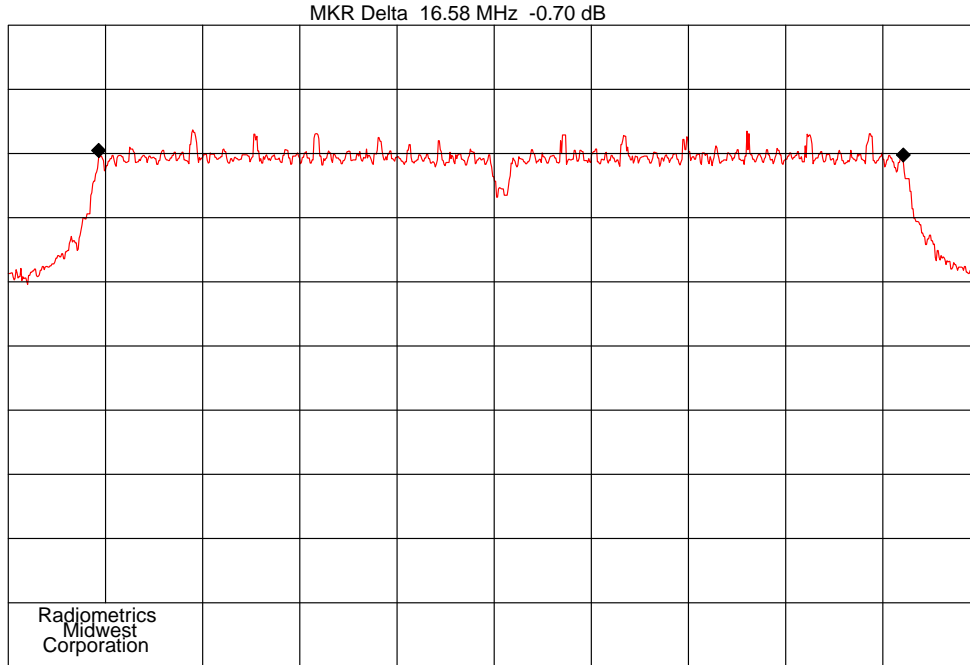
Company: Netgear-Westell
CENTER 2.412 0 GHz
RES BW 100 kHz
10 dB/
Notes: ANT1 Bandwidth, Ch1 802.11g

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 10:31

Date : 01-24-2013
SPAN 20.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW1g1

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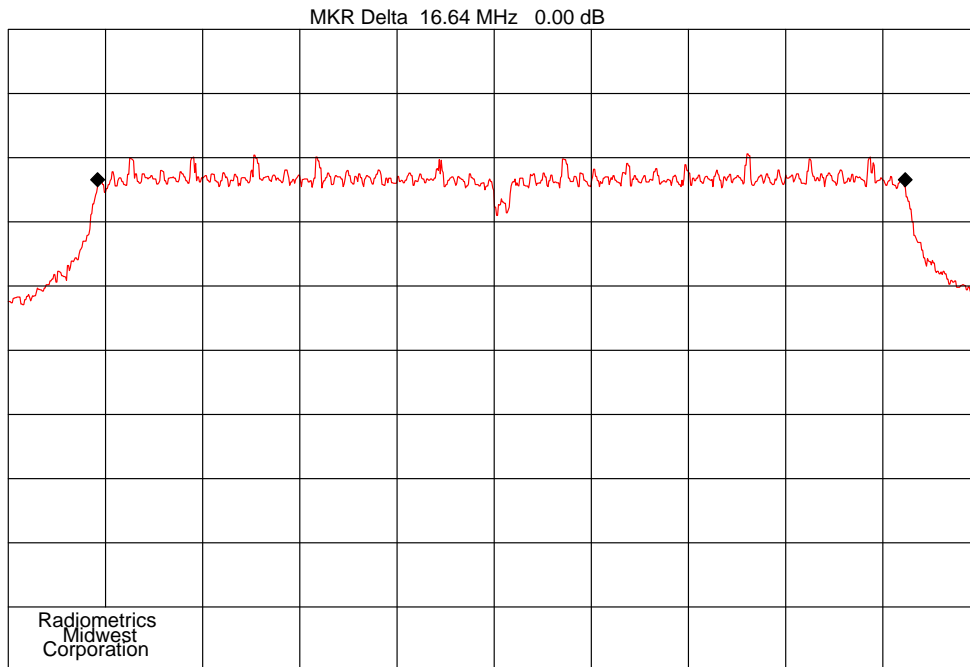
Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: Netgear-Westell
 CENTER 2.437 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT1 Bandwidth, Ch 6 802.11g

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 13:14

Date : 01-24-2013
 SPAN 20.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BW-1g6



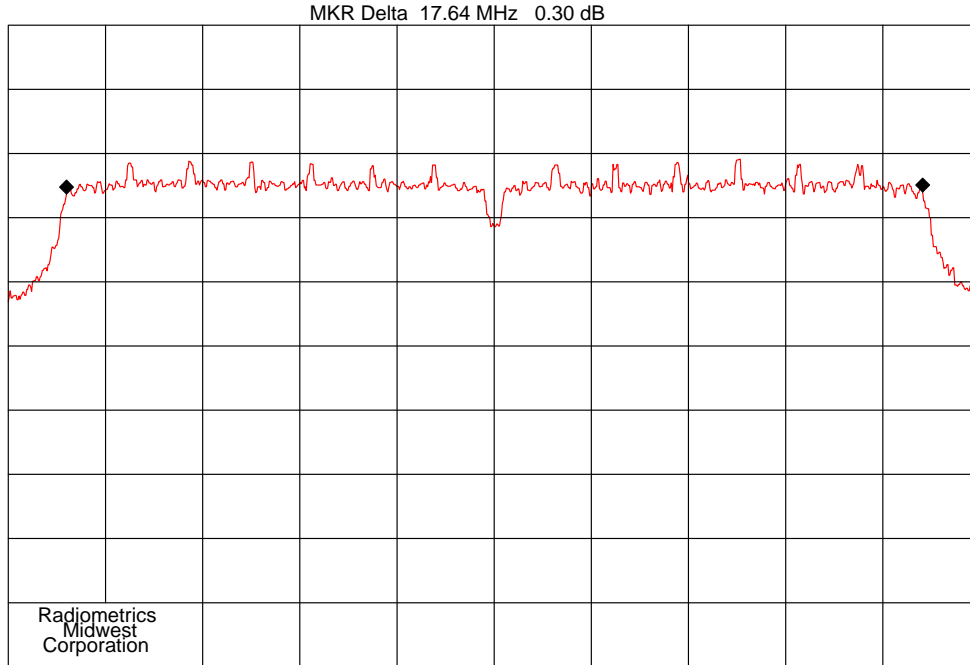
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 CENTER 2.462 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT1 Bandwidth, Ch 11 802.11g

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 11:56

Date : 01-24-2013
 SPAN 20.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BW-1g11

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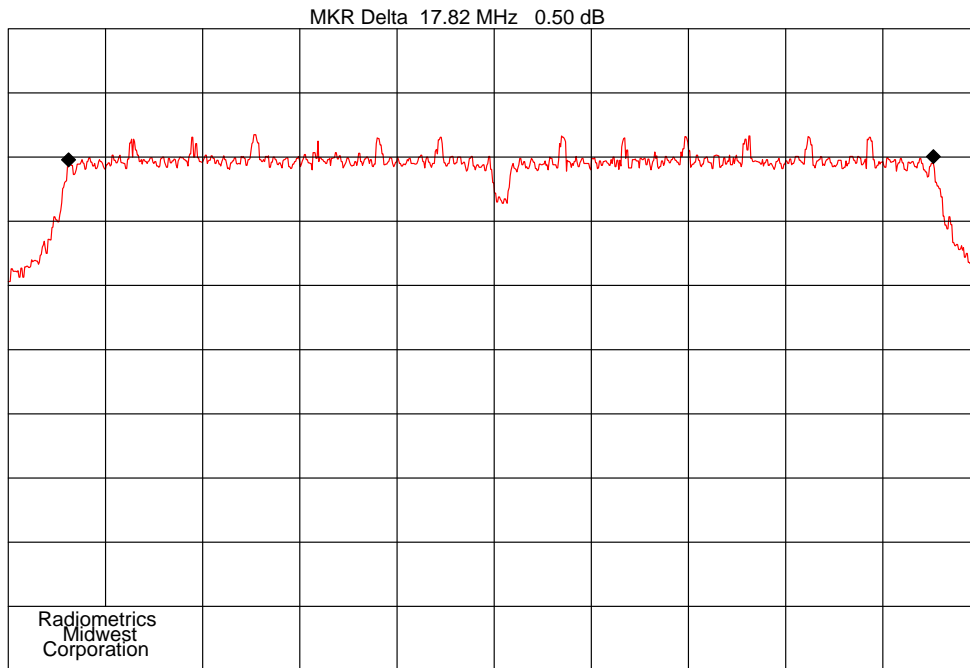


Company: Netgear-Westell
CENTER 2.412 0 GHz
RES BW 100 kHz
10 dB/

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 10:46

Date : 01-24-2013
SPAN 20.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW1N1

Notes: ANT1 Bandwidth, Ch1 802.11N



Company: Netgear-Westell
CENTER 2.437 0 GHz
RES BW 100 kHz
10 dB/

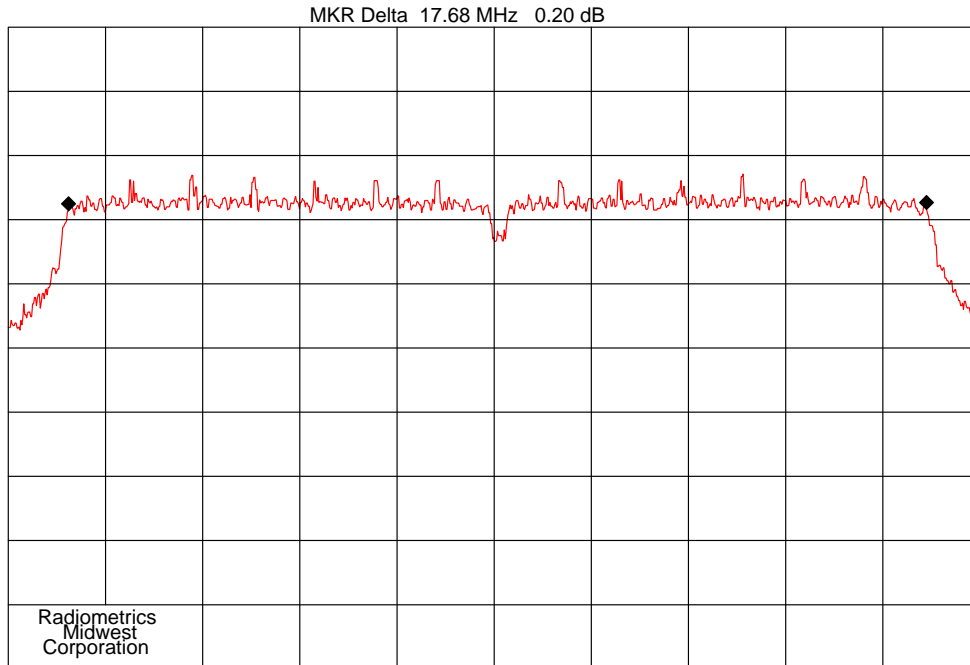
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 13:36

Date : 01-24-2013
SPAN 20.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW-1n6

Notes: ANT1 Bandwidth, Ch 6 802.11N

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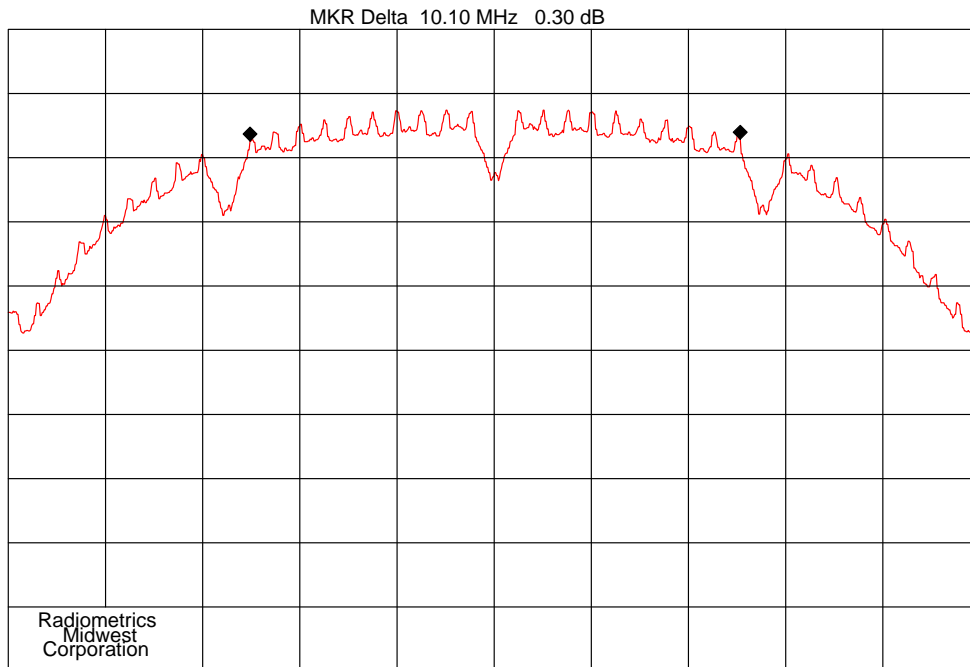
Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: Netgear-Westell
 CENTER 2.462 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT1 Bandwidth, Ch 11 802.11N

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 12:37

Date : 01-24-2013
 SPAN 20.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BW-1N11



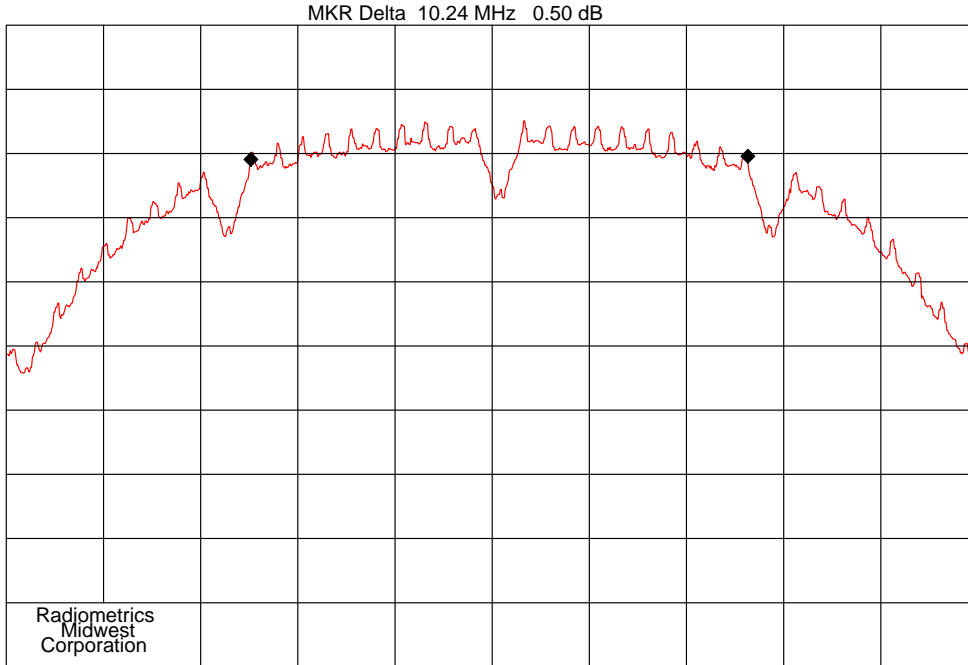
Company: Netgear-Westell
 CENTER 2.412 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Bandwidth, Ch1 802.11b

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 11:18

Date : 01-24-2013
 SPAN 20.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BW2b1

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

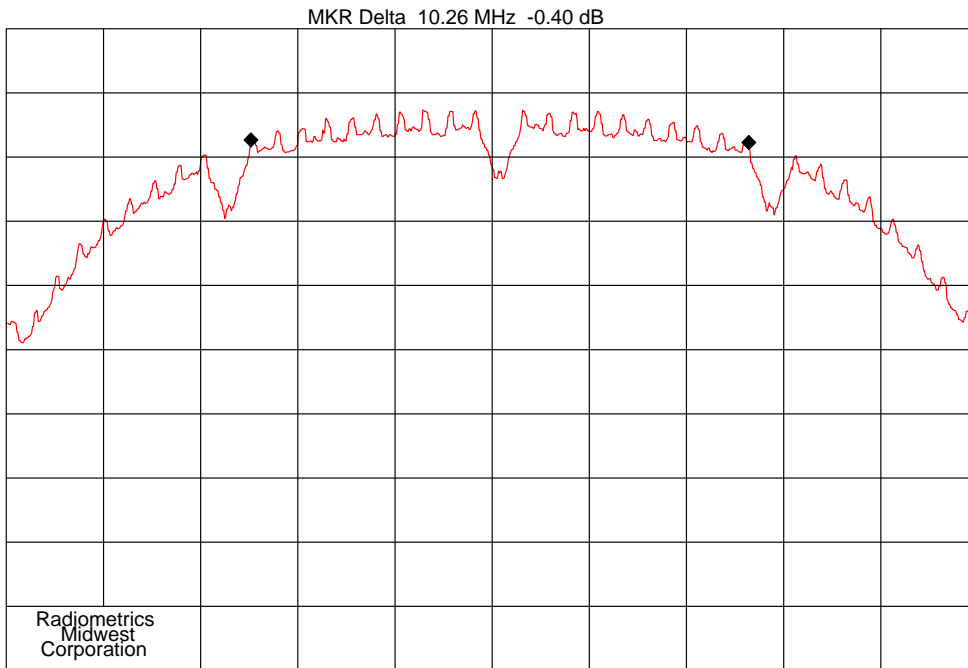
Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: Netgear-Westell
 CENTER 2.437 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Bandwidth, Ch 6 802.11b

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 13:04

Date : 01-24-2013
 SPAN 20.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BW-2b6



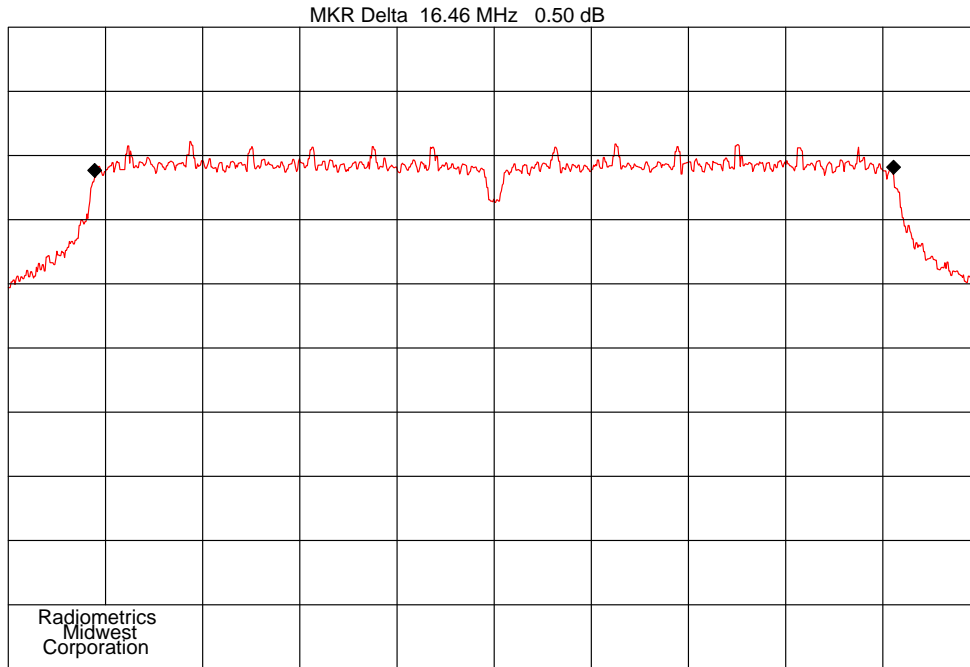
Company: Netgear-Westell
 CENTER 2.462 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Bandwidth, Ch 11 802.11b

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 11:33

Date : 01-24-2013
 SPAN 20.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BW-2b11

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router

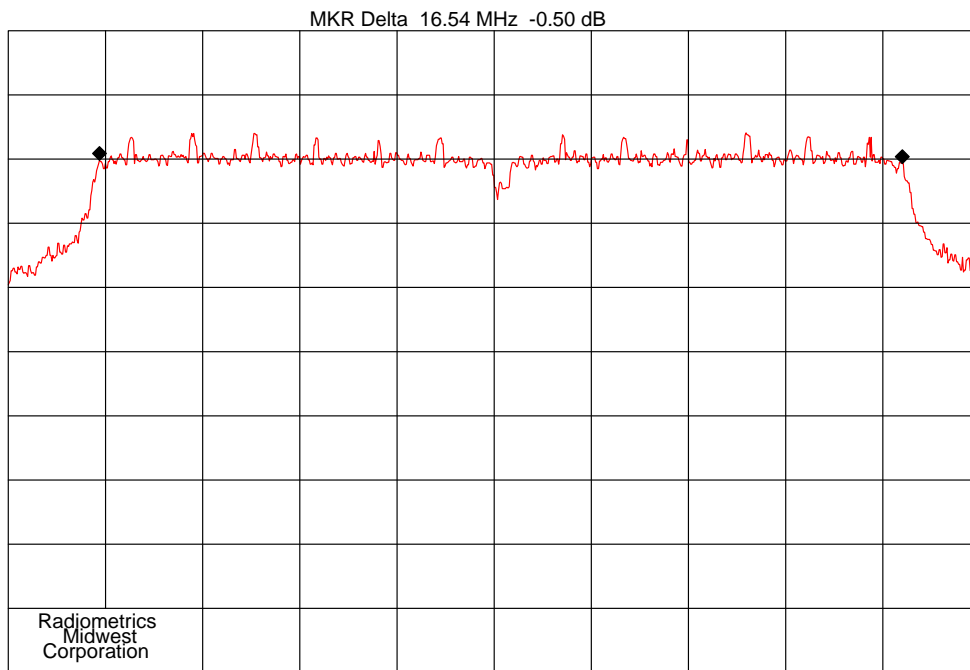


Company: Netgear-Westell
CENTER 2.412 0 GHz
RES BW 100 kHz
10 dB/

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 11:14

Date : 01-24-2013
SPAN 20.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW2g1

Notes: ANT2 Bandwidth, Ch1 802.11g



Company: Netgear-Westell
CENTER 2.437 0 GHz
RES BW 100 kHz
10 dB/

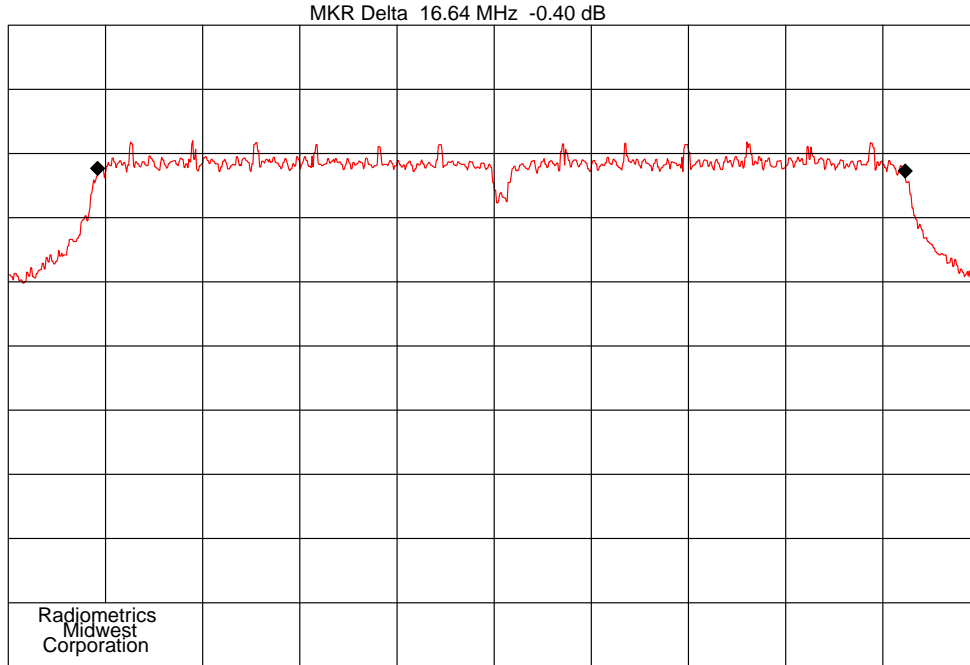
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 13:26

Date : 01-24-2013
SPAN 20.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW2g6

Notes: ANT2 Bandwidth, Ch 6 802.11g

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

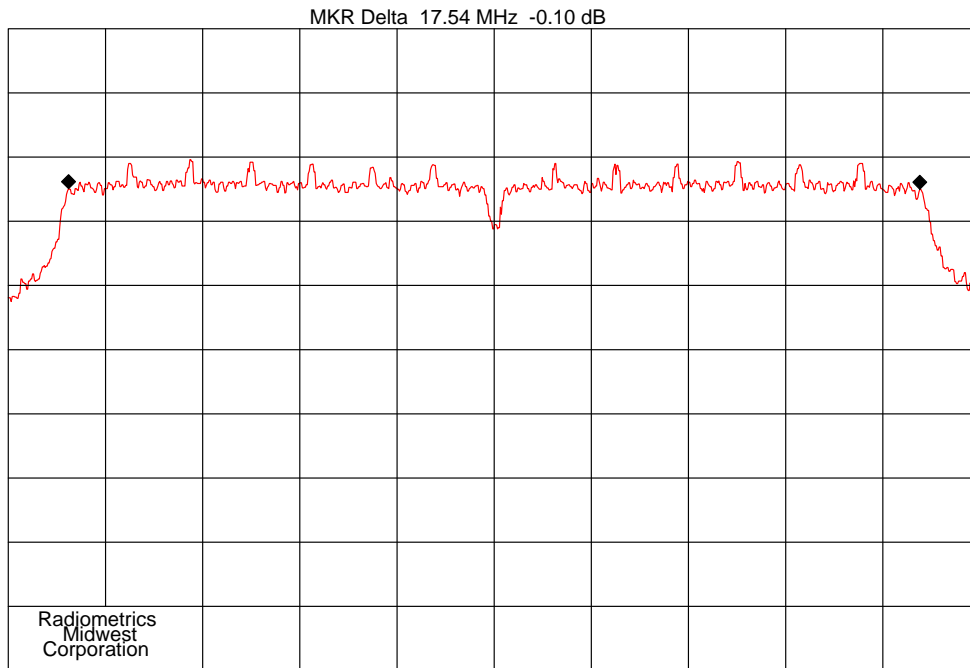
Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: Netgear-Westell
 CENTER 2.462 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Bandwidth, Ch 11 802.11g

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 12:00

Date : 01-24-2013
 SPAN 20.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BW-2g11



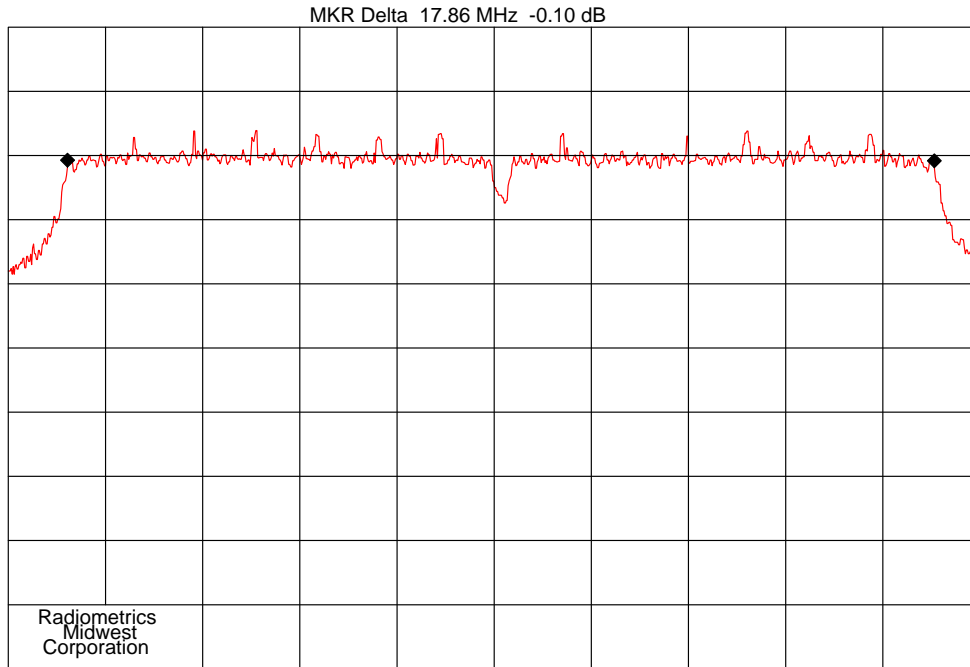
Company: Netgear-Westell
 CENTER 2.412 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Bandwidth, Ch1 802.11N

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 11:00

Date : 01-24-2013
 SPAN 20.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BW2N1

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router

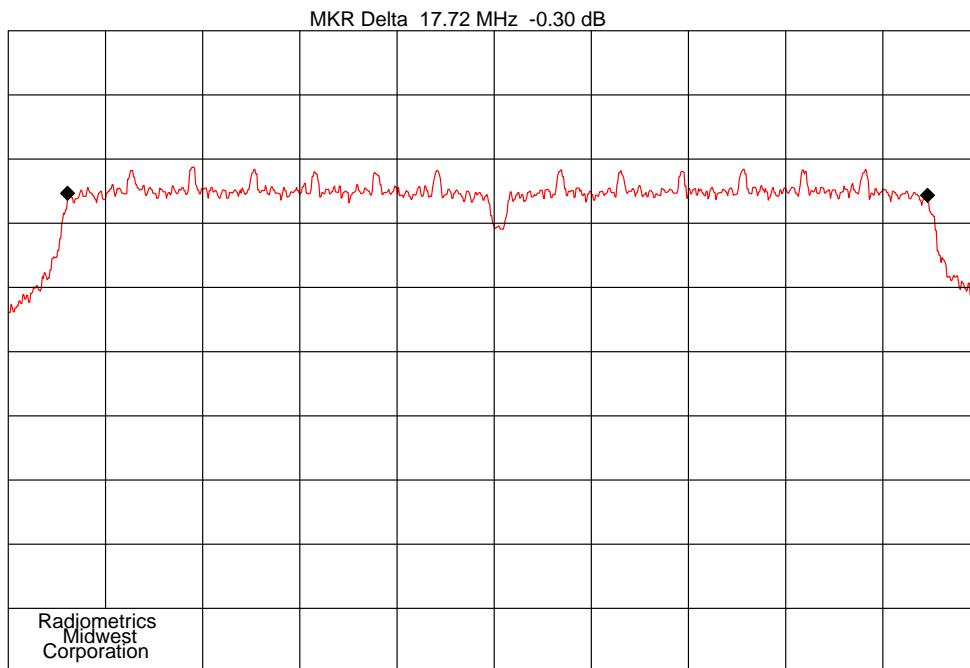


Company: Netgear-Westell
CENTER 2.437 0 GHz
RES BW 100 kHz
10 dB/

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 13:29

Date : 01-24-2013
SPAN 20.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW-2n6

Notes: ANT2 Bandwidth, Ch 6 802.11N



Company: Netgear-Westell
CENTER 2.462 0 GHz
RES BW 100 kHz
10 dB/

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 12:25

Date : 01-24-2013
SPAN 20.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW-2N11

Notes: ANT2 Bandwidth, Ch 11 802.11N

10.3 Peak Output Power

Radiated tests were performed to show compliance with this requirement. The FCC procedures from power output option 2, Method #3 were used.

The transmitter's peak power was calculated using the following equation:

$$P = (E \times d)^2 / (30)$$

Where: E = the measured maximum peak field strength in V/m.

d = Distance in meters from which the field strength was measured. (3 meters)

P = The EUT power in watts

The Field Strength was measured using the procedures described in section 10.9, with the exception of the resolution and video bandwidths. The spectrum analyzer was set to the following settings:

Span = 3 MHz ; RBW = 1 MHz (> the 20 dB bandwidth of the emission being measured)

VBW = 3 MHz; Sweep = auto; Detector function = peak; Trace = max hold

BW correction factor = 10*Log (EBW/1 MHz)

Since the gain of the antenna is always less than 6dB, the limit is not reduced.

Function	Freq MHz	Peak dBuV/m	Peak V/m	Test Dist meters	Uncorrected Power Watts	BW Corr. dB	EUT Power dBm	Limit dBm	Margin dB
802.11b	2412	111.4	0.372	3	0.0414	10.2	26.4	30	3.6
802.11b	2437	110.6	0.339	3	0.0344	10.1	25.5	30	4.5
802.11b	2462	112.7	0.432	3	0.0559	10.1	27.6	30	2.4
802.11g	2412	107.1	0.226	3	0.0154	12.2	24.1	30	5.9
802.11g	2437	110.3	0.327	3	0.0321	12.2	27.3	30	2.7
802.11g	2462	106.1	0.202	3	0.0122	12.2	23.1	30	6.9
802.11N	2412	107.4	0.234	3	0.0165	12.5	24.7	30	5.3
802.11N	2437	112	0.398	3	0.0475	12.5	29.3	30	0.7
802.11N	2462	106.6	0.214	3	0.0137	12.5	23.9	30	6.1

This includes the gain of the antennas

Overall Test result: Pass by 0.7 dB

10.3.1 Average Output Power

These measurements were made with an 18 GHz crystal RF detector. FCC part 15 does not have limits on average power. The purpose of this is for RF Exposure Compliance requirements. The EUT is under 20 mW in order to be exempt from SAR testing.

Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement.

The average voltage level from the crystal detector. Using this level, the transmitter's power spectral density was calculated using the following equation:

$$P = (E \times d)^2 / (30)$$

Where: E = the measured maximum Average field strength in V/m.

d = Distance in meters from which the field strength was measured. (3 meters)

P = The EUT power in watts

	Freq.	Average Reading at Detector	Atten Loss	Ant, Amp & cable	Total	Field Strength	Test Distance	EquivalentPower	
Mode	MHz	dBuV	dB	dB	dBm	dBuV/m	meters	mW	dBm
802.11b	2412	101.2	10.0	3.8	8.0	115.0	3.0	94.9	19.8
802.11b	2437	100.9	10.0	4	7.9	114.9	3.0	92.7	19.7
802.11b	2462	100.9	10.0	4.3	8.2	115.2	3.0	99.3	20.0
802.11g	2412	96.4	10.0	3.8	3.2	110.2	3.0	31.4	15.0
802.11g	2437	100.4	10.0	4	7.4	114.4	3.0	82.6	19.2
802.11g	2462	96.2	10.0	4.3	3.5	110.5	3.0	33.7	15.3
802.11N	2412	97.5	10.0	1.7	2.2	109.2	3.0	25.0	14.0
802.11N	2437	102.5	10.0	1.8	7.3	114.3	3.0	80.7	19.1
802.11N	2462	98.8	10.0	2	3.8	110.8	3.0	36.1	15.6

The average power output is 99.3 mW, This device is certified as a typical mobile device only.

10.4 Power Spectral Density

FCC document 558074 D01 DTS Meas Guidance v01 PSD option 1 was used for this test. KDB 662911 D01v01r02 was used for the multiple output. No external attenuator was used. The spectrum analyzer was set to the following settings:

RBW = 3 kHz; VBW = 10 kHz

Detector function = Peak

Test Date: 1-24-2013

Ant		Freq	Reading (dBm)	Cable Loss	Corr fact #	Total Power (dBm)	Limit	Margin
ANT	Mode	MHz	dBm	dB	dB	dBm	dBm	dB
1	802.11b	2412	-9.2	0.2	3.0	-6.0	8.0	14.0
1	802.11b	2437	-8.0	0.2	3.0	-4.8	8.0	12.8
1	802.11b	2462	-9.2	0.2	3.0	-6.0	8.0	14.0
1	802.11g	2412	-14.0	0.2	3.0	-10.8	8.0	18.8
1	802.11g	2437	-10.6	0.2	3.0	-7.4	8.0	15.4
1	802.11g	2462	-14.3	0.2	3.0	-11.1	8.0	19.1
1	802.11n	2412	-13.0	0.2	3.0	-9.8	8.0	17.8
1	802.11n	2437	-10.5	0.2	3.0	-7.3	8.0	15.3
1	802.11n	2462	-13.8	0.2	3.0	-10.6	8.0	18.6
2	802.11b	2412	-8.9	0.2	3.0	-5.7	8.0	13.7
2	802.11b	2437	-8.9	0.2	3.0	-5.7	8.0	13.7
2	802.11b	2462	-9.3	0.2	3.0	-6.1	8.0	14.1
2	802.11g	2412	-14.7	0.2	3.0	-11.5	8.0	19.5
2	802.11g	2437	-10.0	0.2	3.0	-6.8	8.0	14.8
2	802.11g	2462	-14.0	0.2	3.0	-10.8	8.0	18.8
2	802.11n	2412	-12.7	0.2	3.0	-9.5	8.0	17.5
2	802.11n	2437	-10.6	0.2	3.0	-7.4	8.0	15.4
2	802.11n	2462	-13.9	0.2	3.0	-10.7	8.0	18.7

Judgement pass by 12.8 dB

Correction factor for two ports: $10 \log(N_{ANT})$ dB, where N_{ANT} is the number of outputs

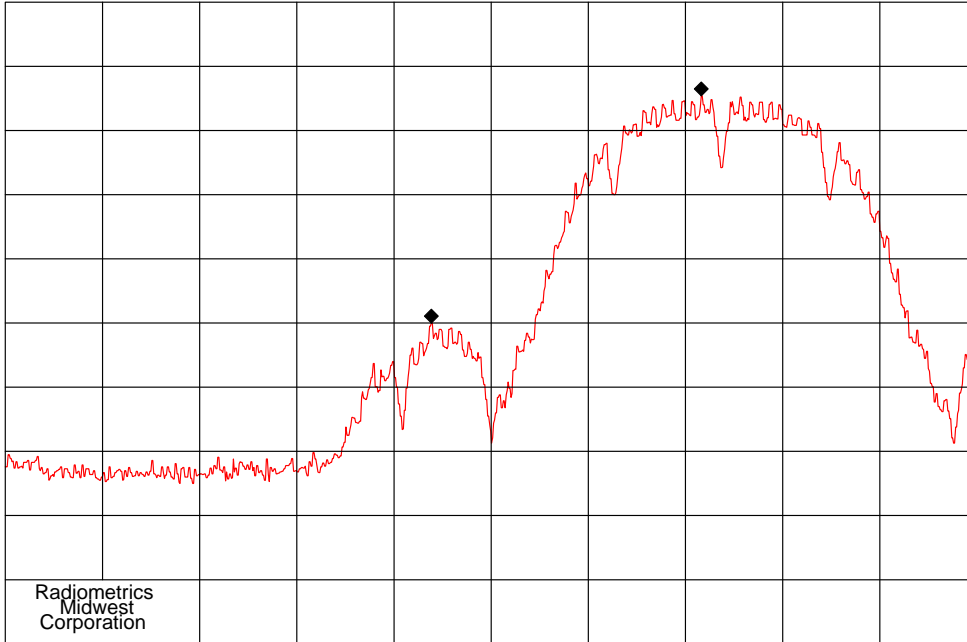
10.5 Band-edge Compliance of RF Conducted Emissions

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation at the band-edge, with the EUT set to the lowest frequency. The trace was allowed to stabilize. The delta is required to be at least 20 dB.

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router

MKR Delta -13.90 MHz -35.40 dB



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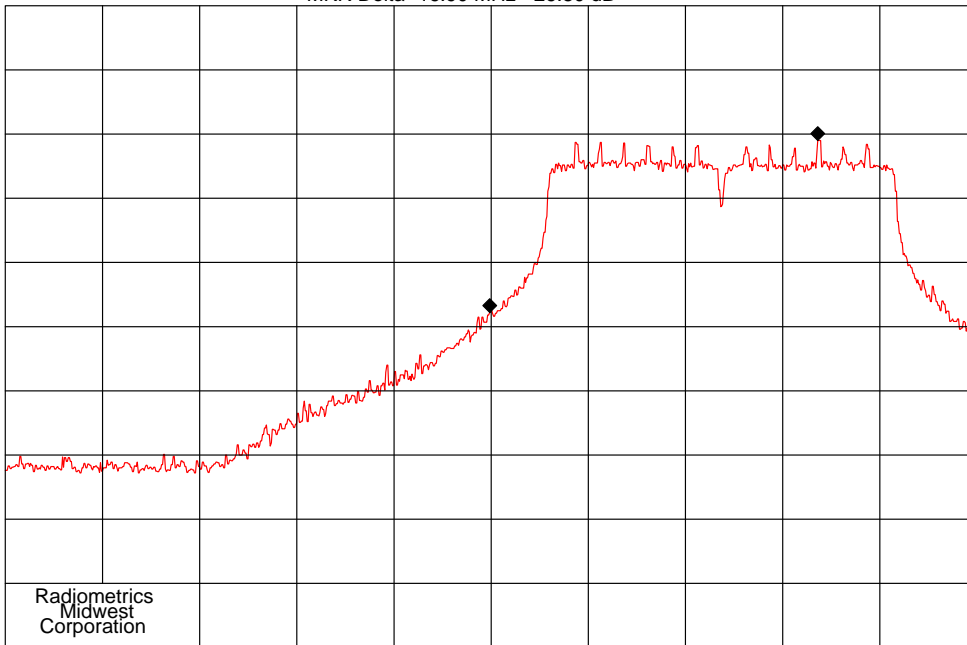
Company: Netgear-Westell
CENTER 2.400 0 GHz
RES BW 100 kHz
10 dB/

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 10:13

Date : 01-24-2013
SPAN 50.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BE1b1

Notes: Band Edge; 2400 MHz, Ch1 802.11b ANT1

MKR Delta -16.90 MHz -26.80 dB



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
CENTER 2.400 0 GHz
RES BW 100 kHz
10 dB/

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 10:53

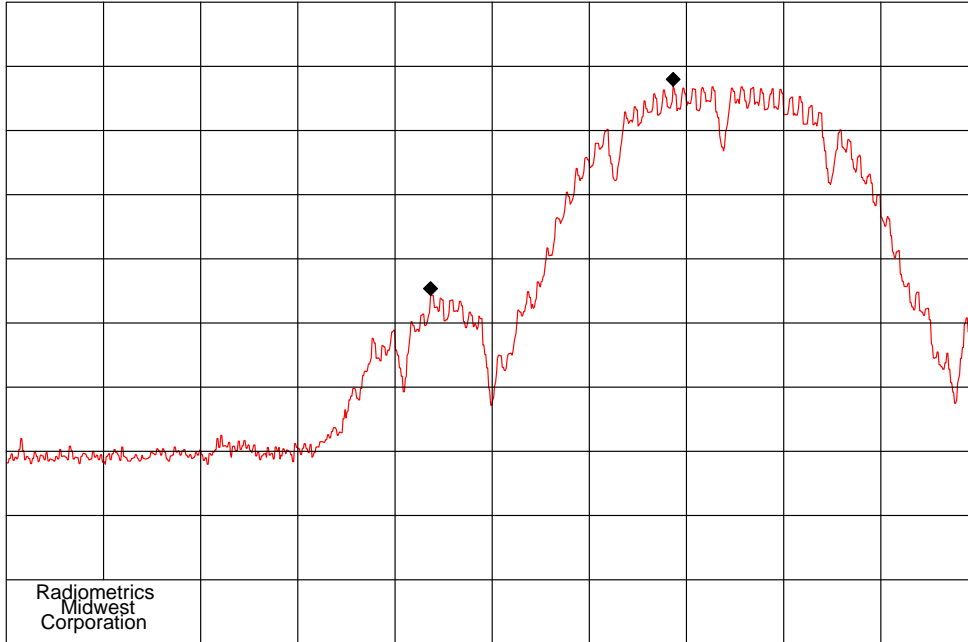
Date : 01-24-2013
SPAN 50.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BEL1N1

Notes: ANT1 Band Edge 2400 MHz, Ch1 802.11N

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router

MKR Delta -12.50 MHz -32.60 dB

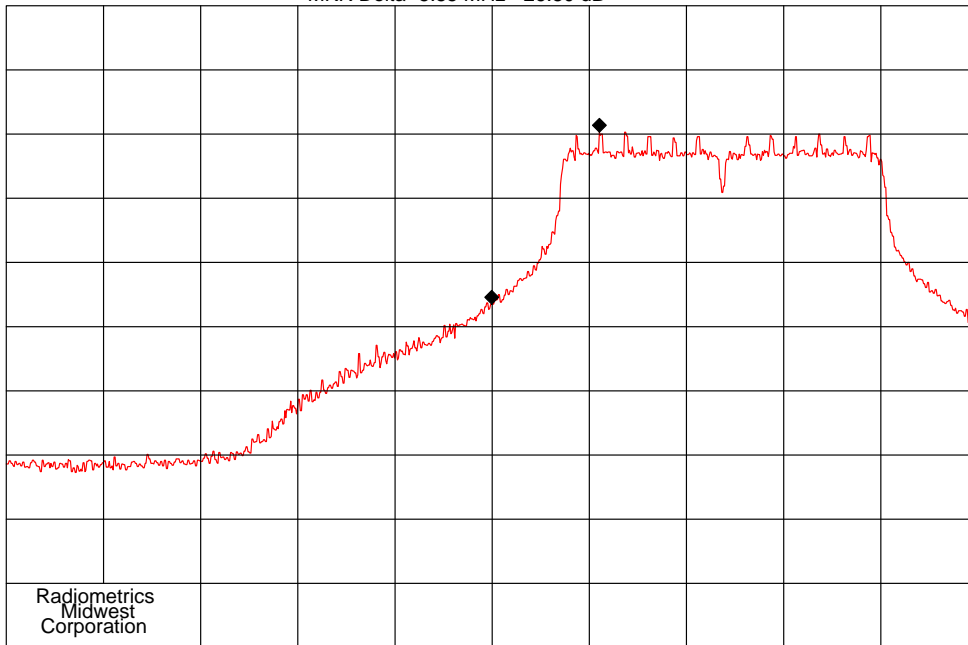


Company: Netgear-Westell
 CENTER 2.400 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Band Edge 2400 MHz, Ch1 802.11b

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 11:20

Date : 01-24-2013
 SPAN 50.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BEL2b1

MKR Delta -5.55 MHz -26.80 dB



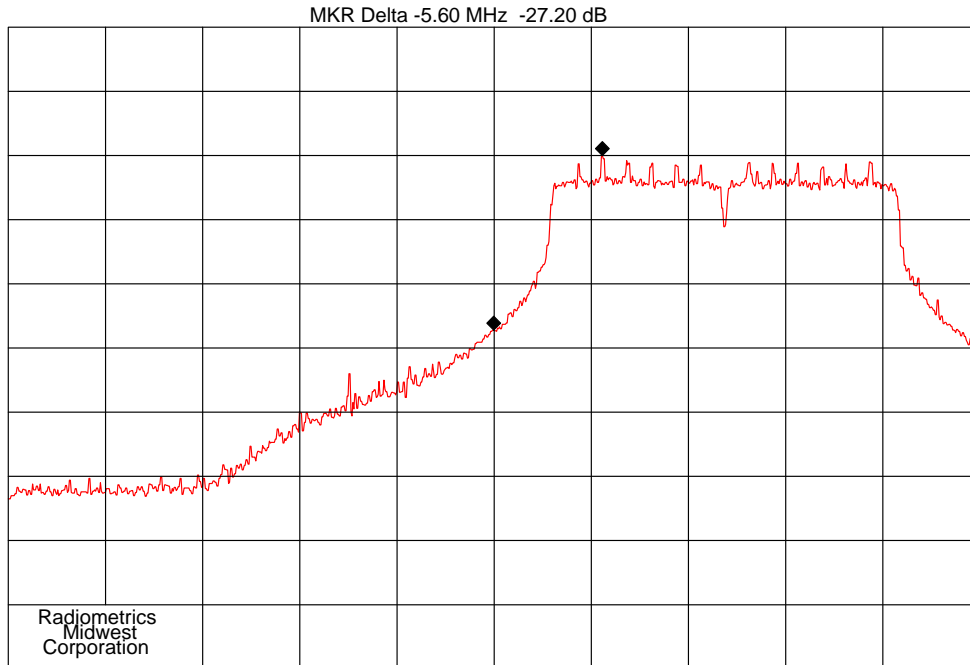
Company: Netgear-Westell
 CENTER 2.400 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Band Edge 2400 MHz, Ch1 802.11g

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 11:05

Date : 01-24-2013
 SPAN 50.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BEL2g1

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

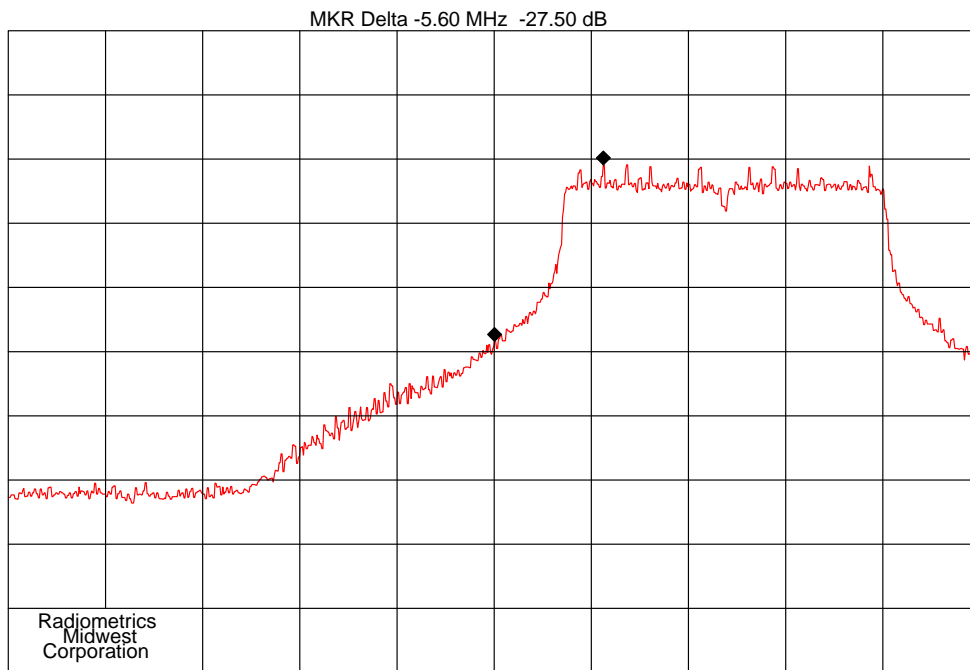
Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: Netgear-Westell
 CENTER 2.400 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Band Edge 2400 MHz, Ch1 802.11N

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 10:56

Date : 01-24-2013
 SPAN 50.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BEL2N1



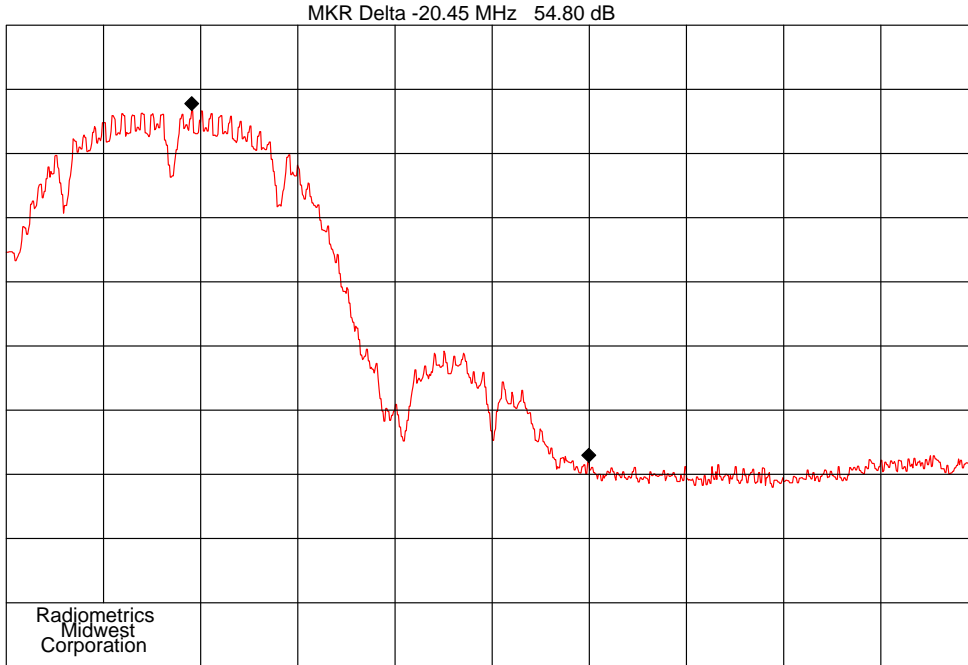
Company: Netgear-Westell
 CENTER 2.400 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT1 Band Edge, Ch1 802.11g

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 10:38

Date : 01-24-2013
 SPAN 50.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: Be1g1

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

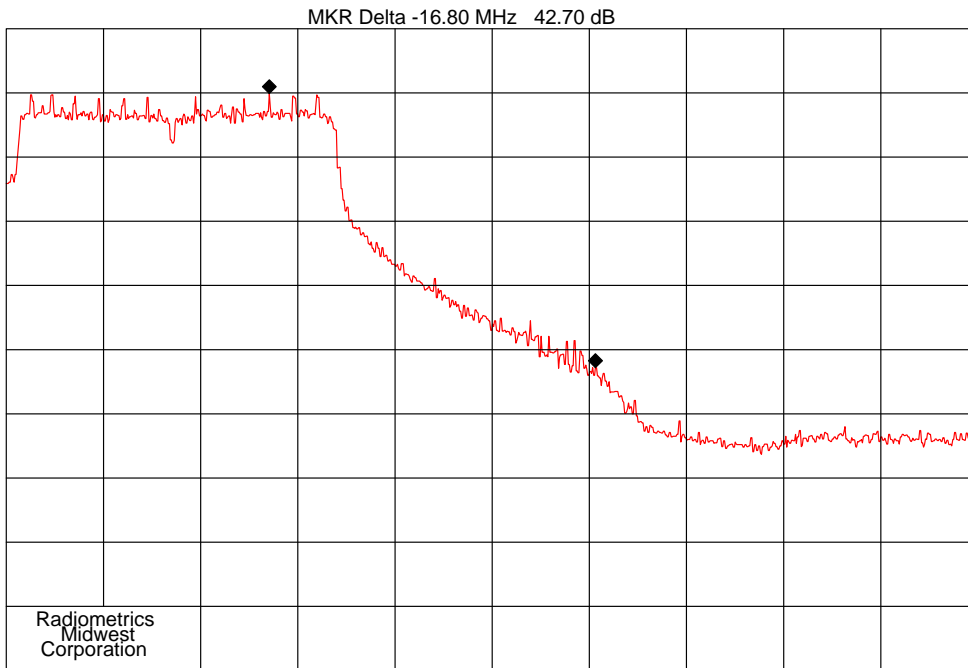
Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: Netgear-Westell
 CENTER 2.478 5 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT1 Band Edge 2483.5 MHz, Ch 11 802.11b

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 11:38

Date : 01-24-2013
 SPAN 50.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BEH1b11



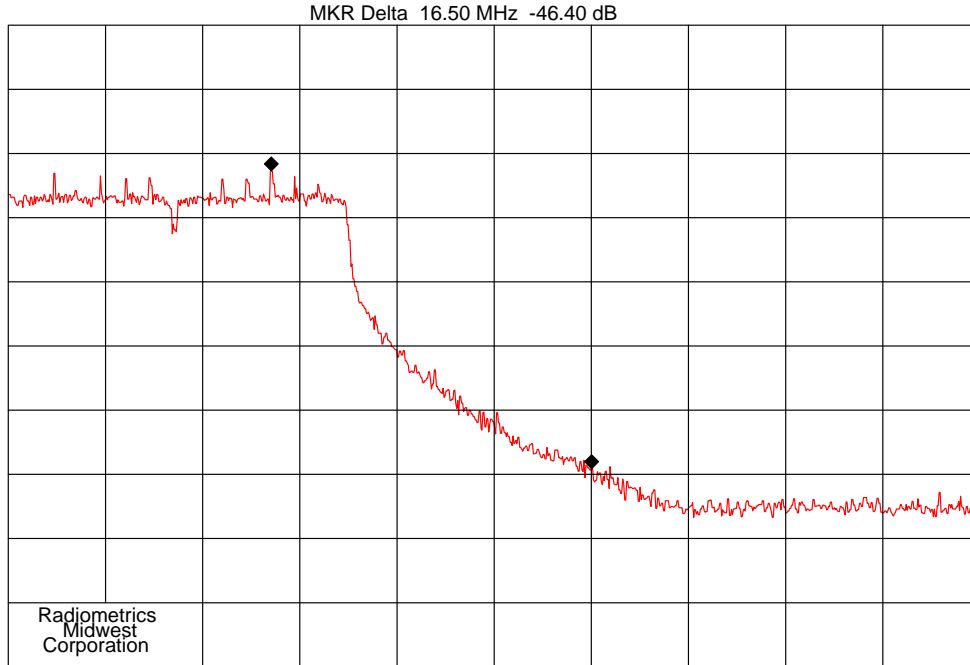
Company: Netgear-Westell
 CENTER 2.478 5 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT1 Band Edge 2483.5 MHz, Ch 11 802.11g

ITEM : MB97
 REF 10.0 dBm
 VBW 300 kHz
 Time: 11:54

Date : 01-24-2013
 SPAN 50.0 MHz
 ATTEN 20 dB
 SWP 20.0 msec
 File: BEH1g11

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

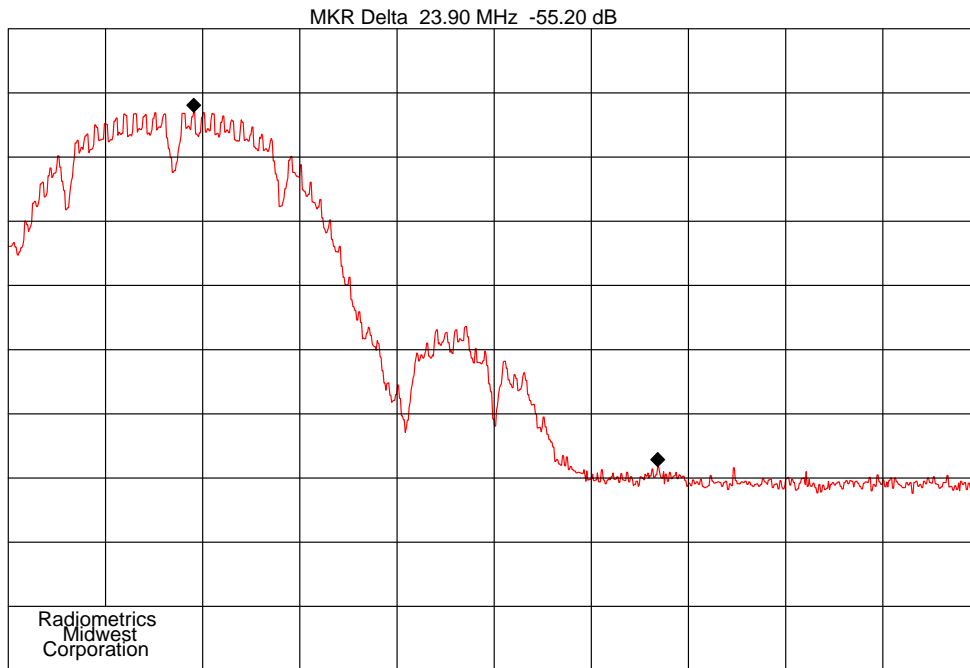
Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: Netgear-Westell
 CENTER 2.478 5 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT1 Band Edge 2483.5 MHz, Ch 11 802.11N

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 12:34

Date : 01-24-2013
 SPAN 50.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BEH1N11



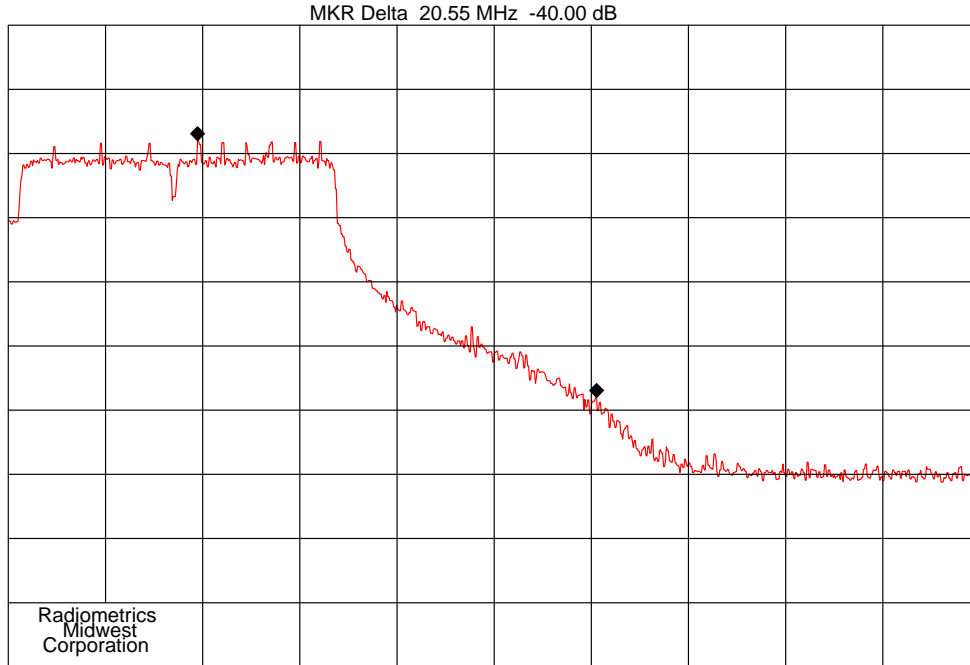
Company: Netgear-Westell
 CENTER 2.478 5 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Band Edge 2483.5 MHz, Ch 11 802.11b

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 11:36

Date : 01-24-2013
 SPAN 50.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BEH2b11

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

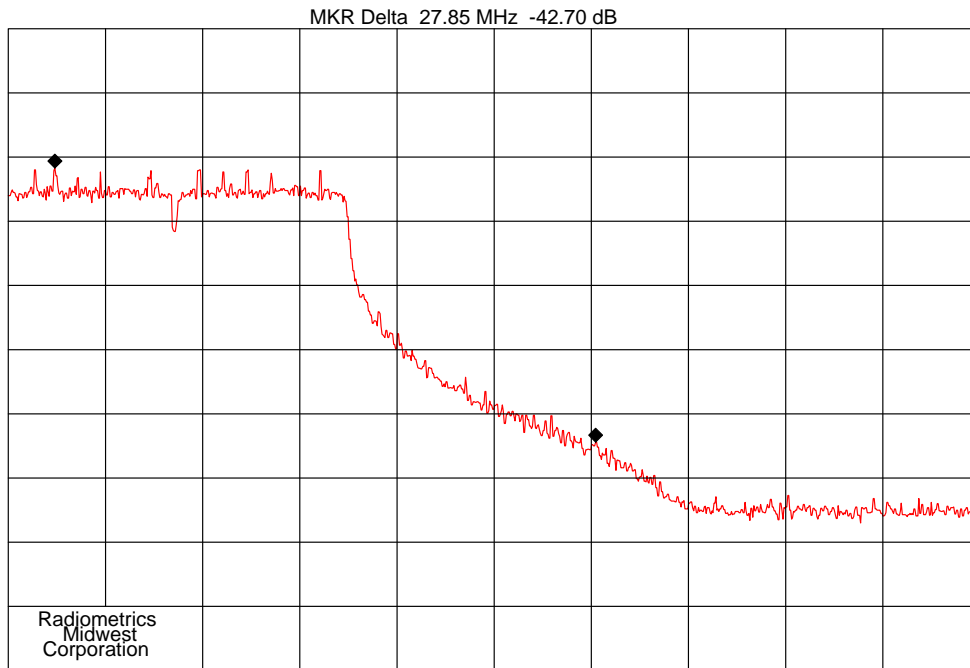
Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: Netgear-Westell
 CENTER 2.478 5 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Band Edge 2483.5 MHz, Ch 11 802.11g

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 12:02

Date : 01-24-2013
 SPAN 50.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BEH2g11



Company: Netgear-Westell
 CENTER 2.478 5 GHz
 RES BW 100 kHz
 10 dB/
 Notes: ANT2 Band Edge 2483.5 MHz, Ch 11 802.11N

ITEM : MB97
 REF 20.0 dBm
 VBW 300 kHz
 Time: 12:31

Date : 01-24-2013
 SPAN 50.0 MHz
 ATTEN 30 dB
 SWP 20.0 msec
 File: BEH2N11

Antenna 1

Channel	Band Edge Delta Readings in dB			
	802.11b	802.11g	802.11n	Limit
2400 Lower Band edge Channel 1	35.4	27.5	26.8	20
2483.5 Upper Band edge Channel 11	54.8	42.7	46.4	20

Antenna 2

Channel	Band Edge Delta Readings in dB			
	802.11b	802.11g	802.11n	Limit
2400 Lower Band edge Channel 1	32.6	26.8	27.2	20
2483.5 Upper Band edge Channel 11	55.2	40.0	42.7	20

Judgement Pass by 6.8 dB

10.6 Spurious RF Conducted Emissions

This measurement was made with both antenna ports connected up to 2.5 GHz.

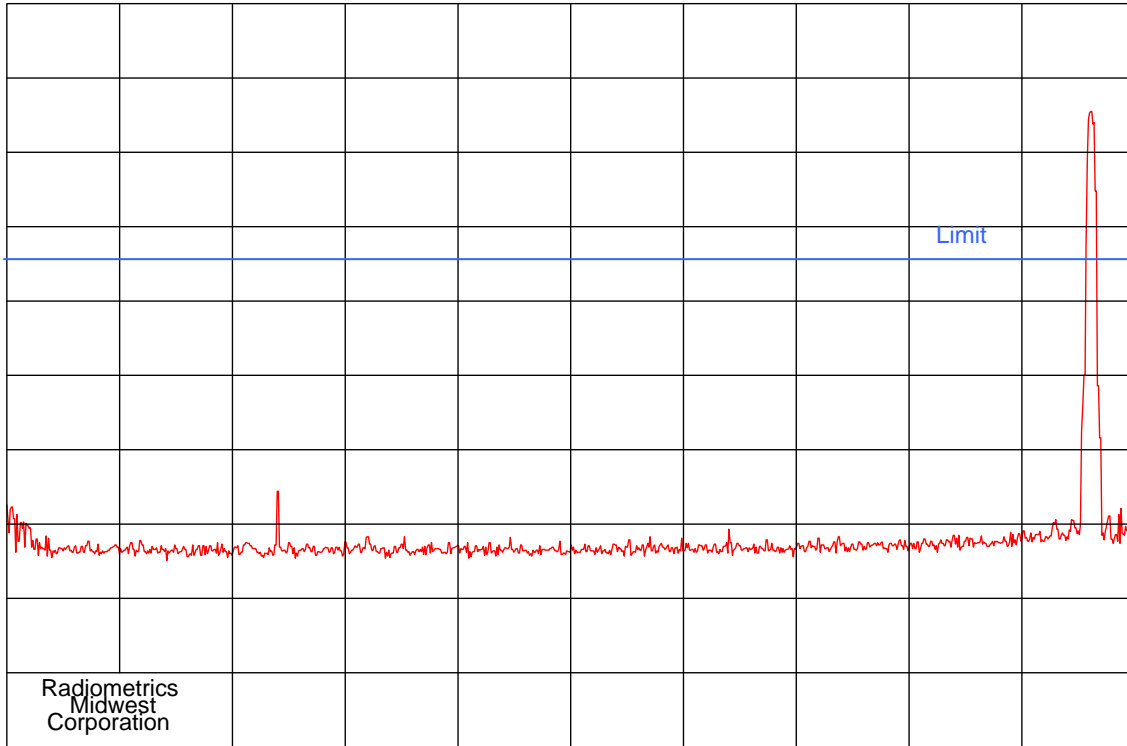
Radiated emissions were used from 2.5 to 25 GHz

10.6.1 Direct Coaxial Measurements (1 MHz to 2.5 GHz)

The spectrum analyzer was set to the MAX HOLD mode to record all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic. The trace was allowed to stabilize. The first two plots were made while stepping through three frequencies (Low middle and high).

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

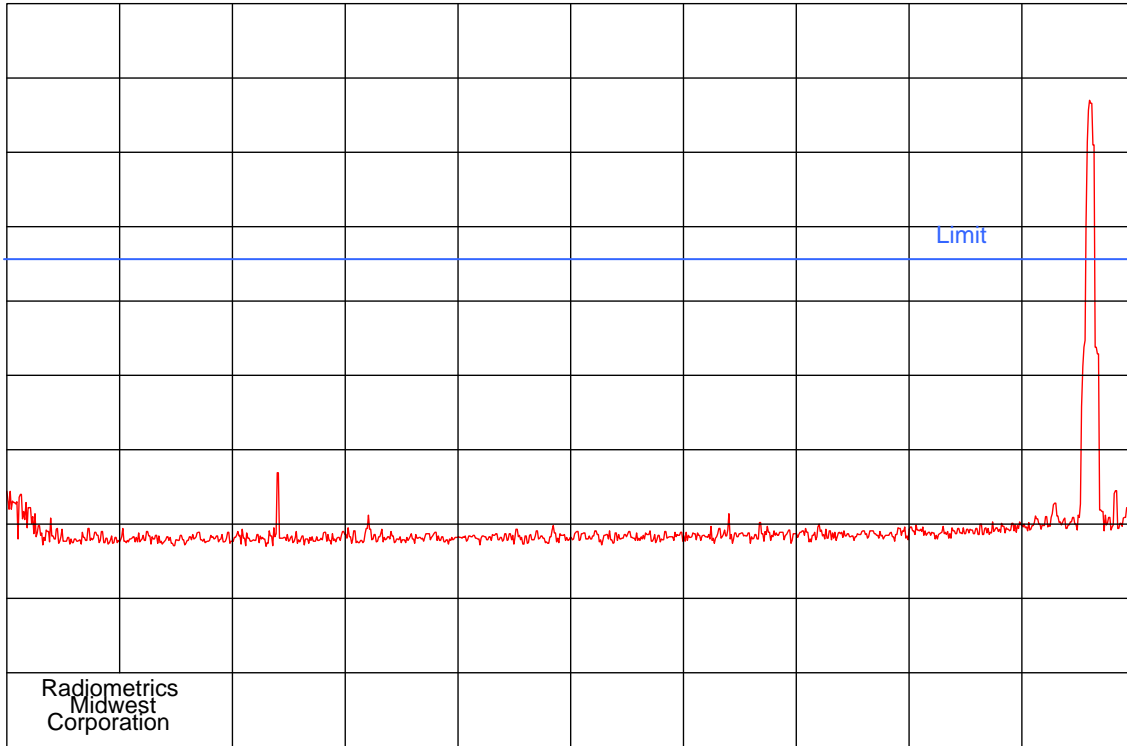
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 10:23

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: AC1B1

Notes: ANT1 port Cond Emissions, Ch1 802.11b

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
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Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

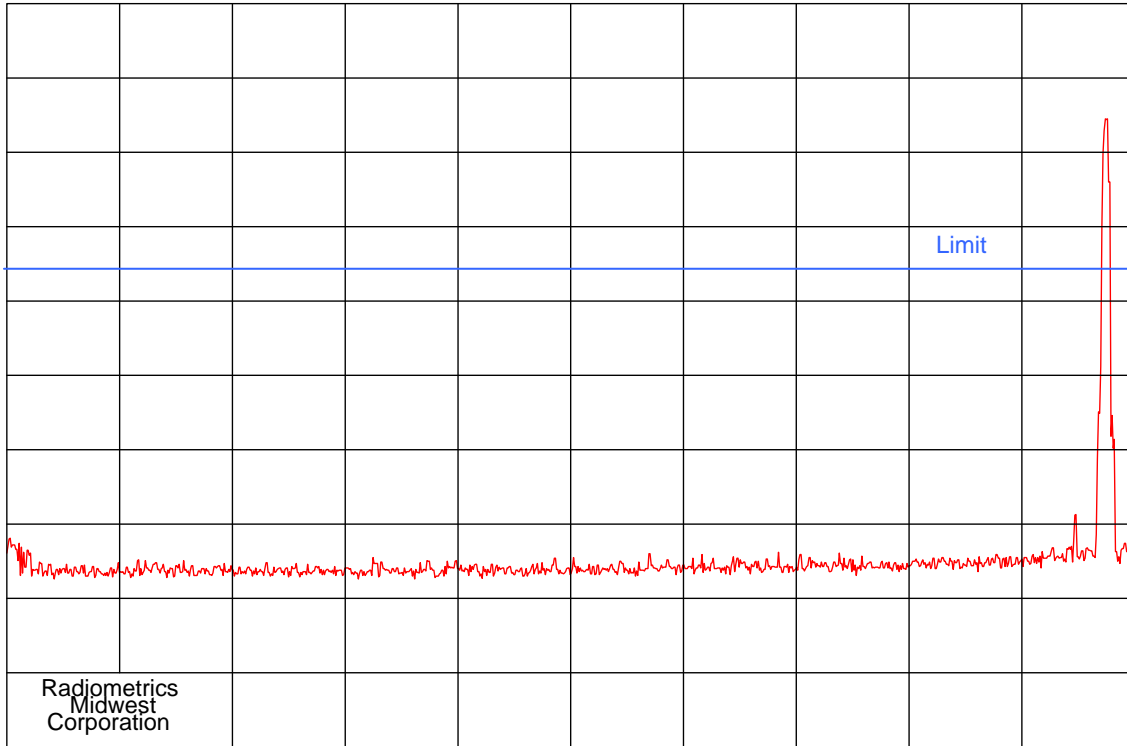
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 11:21

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: AC2b1

Notes: ANT2 port Cond Emissions, Ch1 802.11b

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

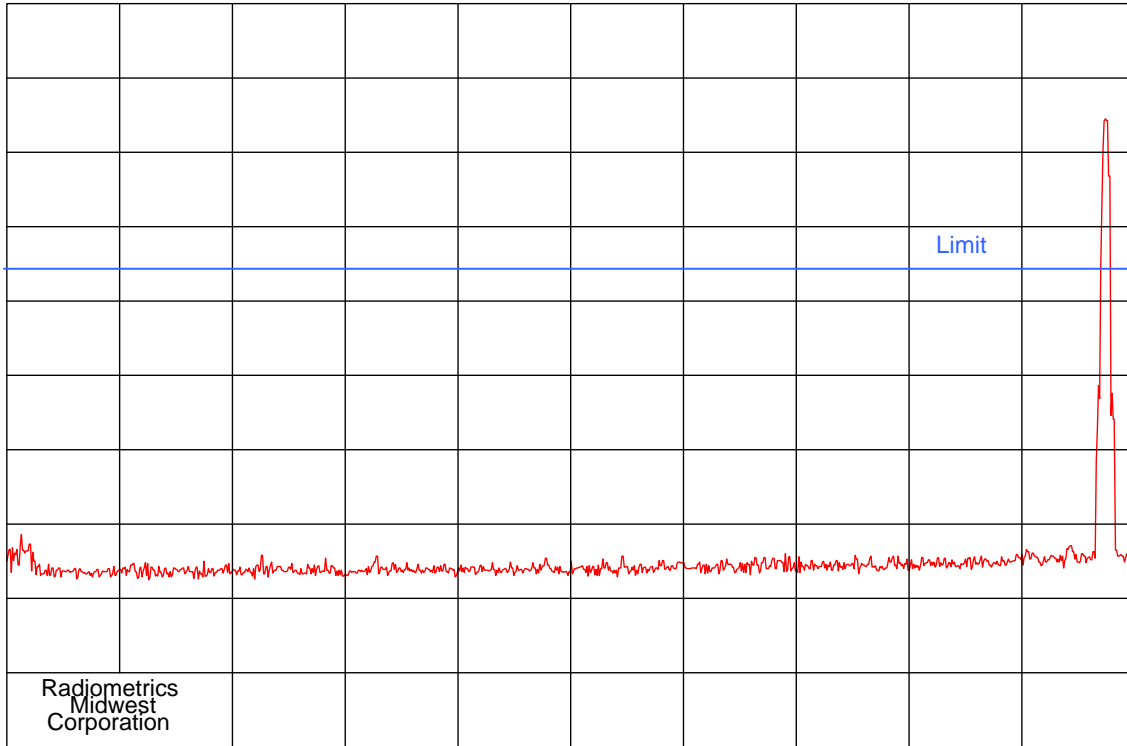
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 12:59

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE1b6

Notes: ANT1 port Cond Emissions, Ch 6 802.11b

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



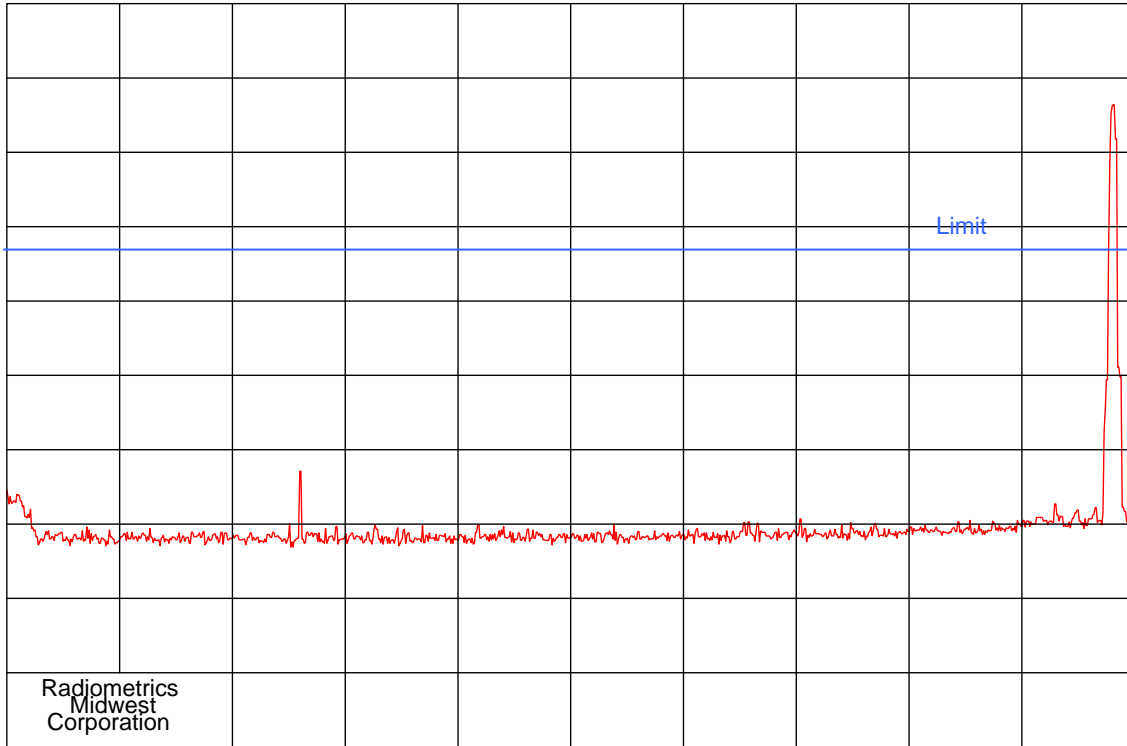
Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/
Notes: ANT2 port Cond emissions, Ch 6 802.11b

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 13:00

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE2b6

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

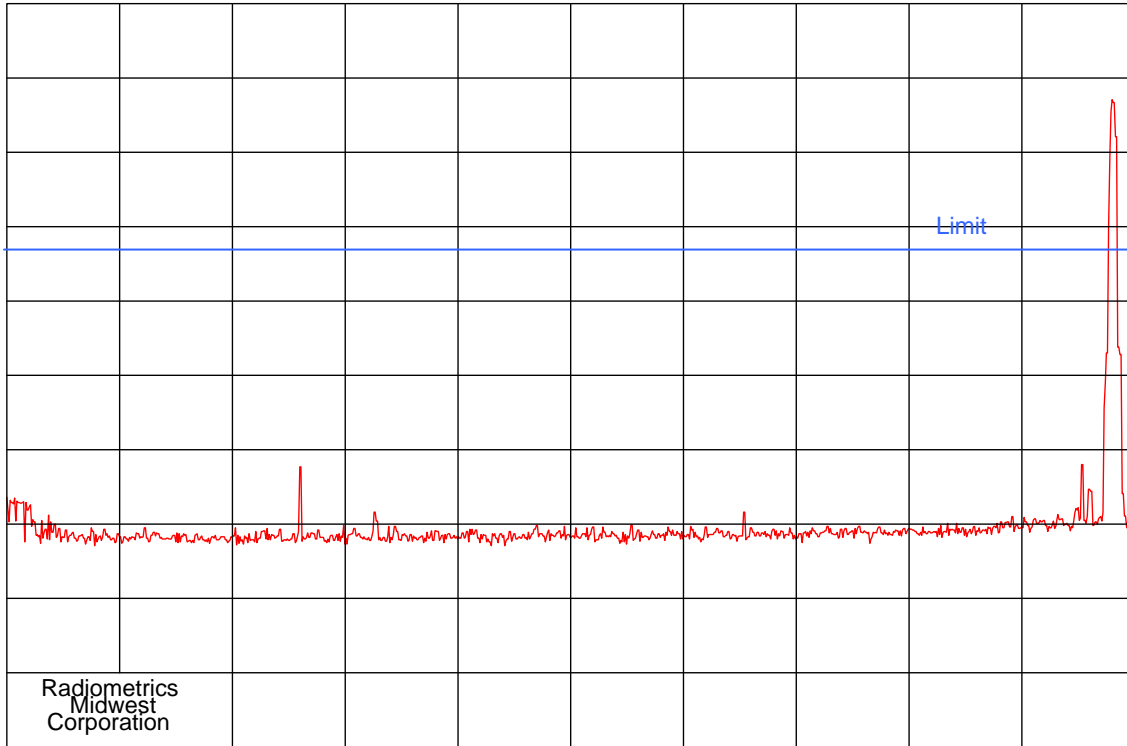
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 11:45

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE1b11

Notes: ANT1 Port Cond Emissions, Ch 11 802.11b

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

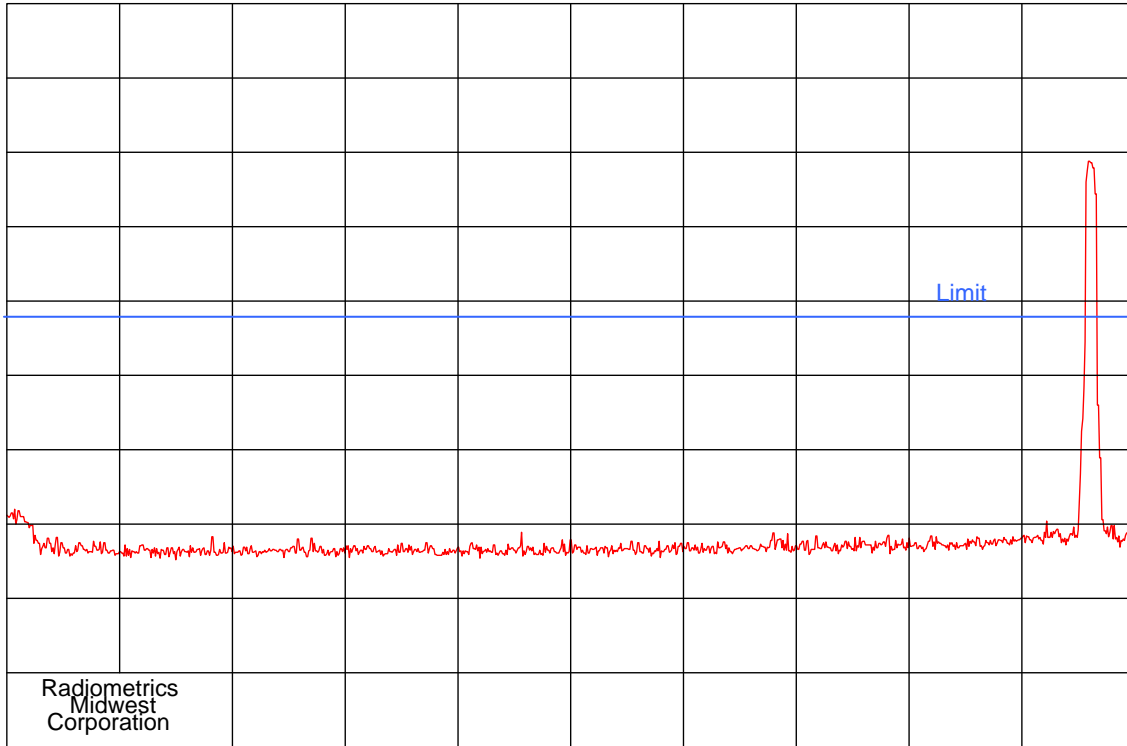
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 11:31

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE2b11

Notes: ANT2 Port Cond Emissions, Ch 11 802.11b

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

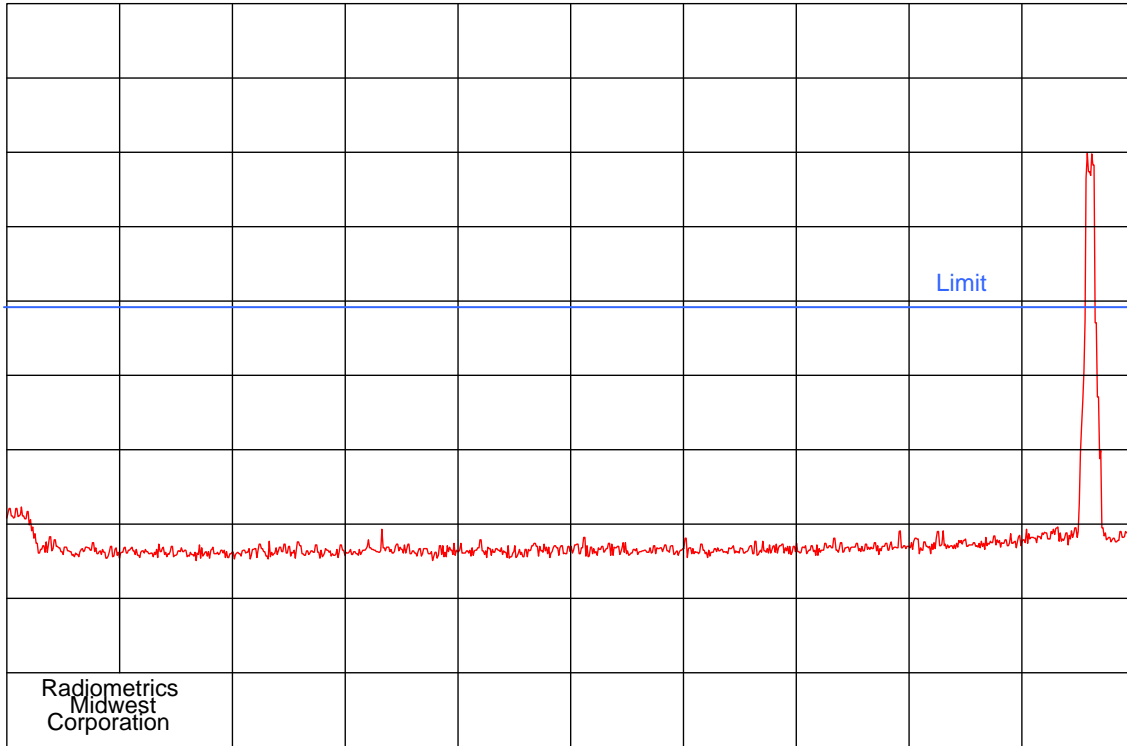
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 10:40

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: AC1g1

Notes: ANT1 port Cond Emissions, Ch1 802.11g

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

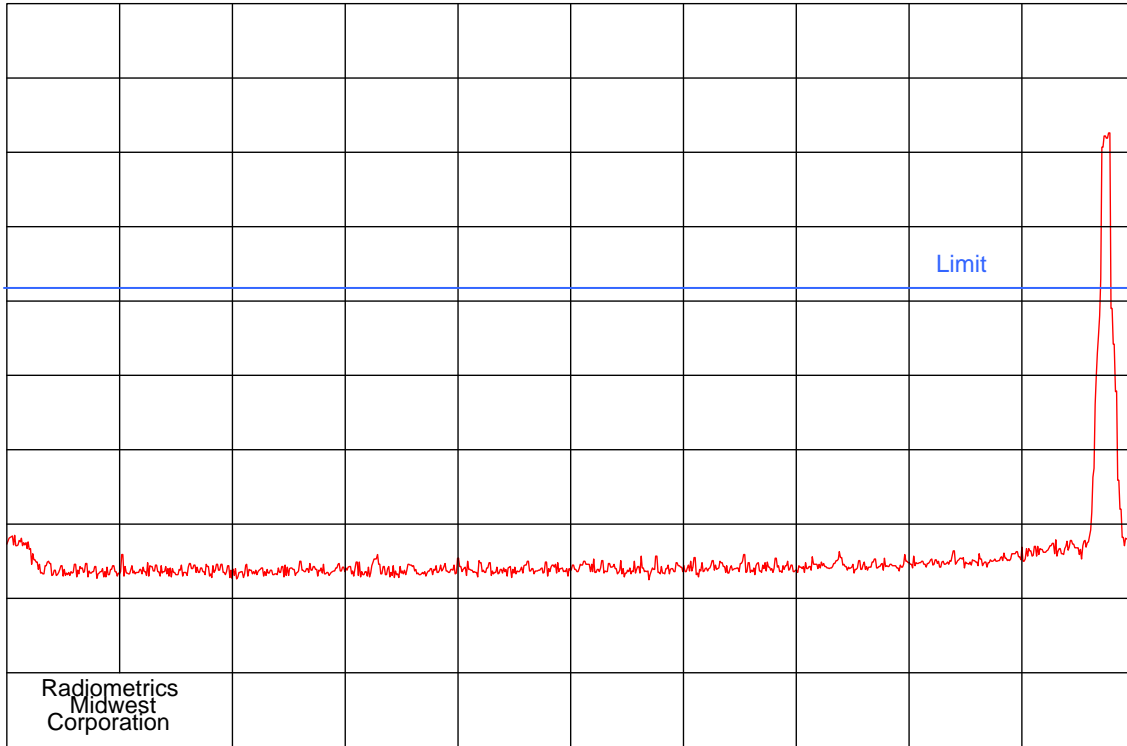
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 11:03

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: AC2g1

Notes: ANT2 Port Cond Emissions, Ch1 802.11g

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

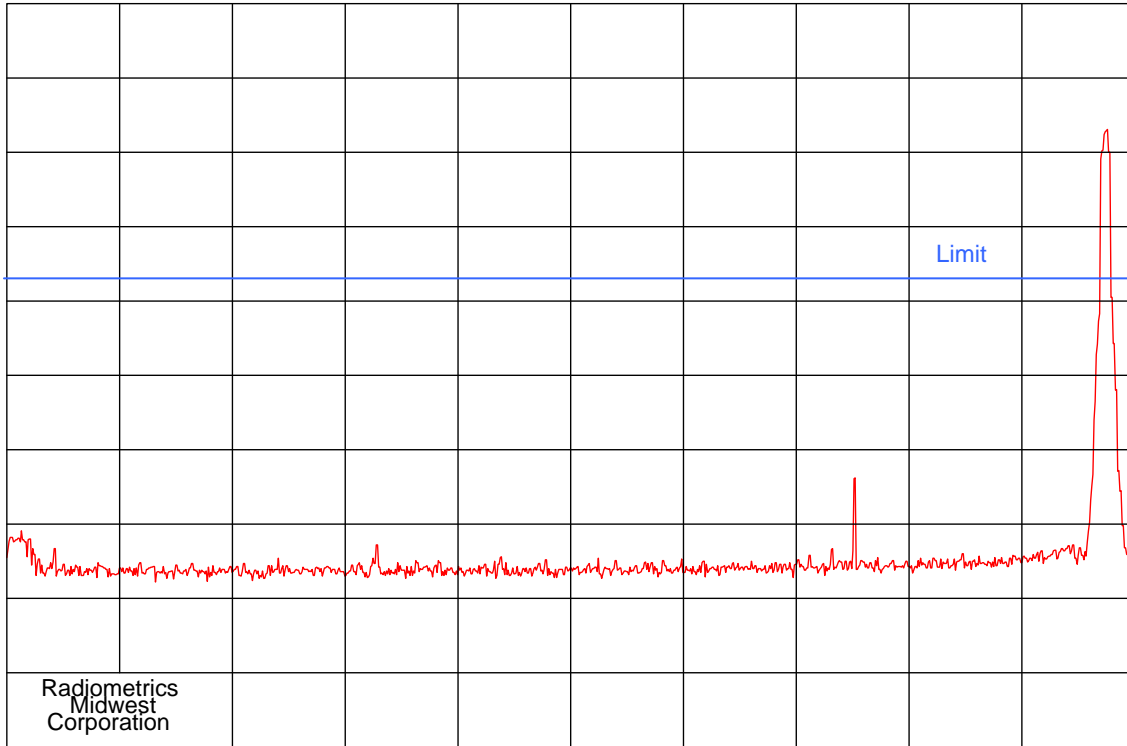
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 13:15

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: BW-1g6

Notes: ANT1 port Conducted Emissions, Ch 6 802.11g

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

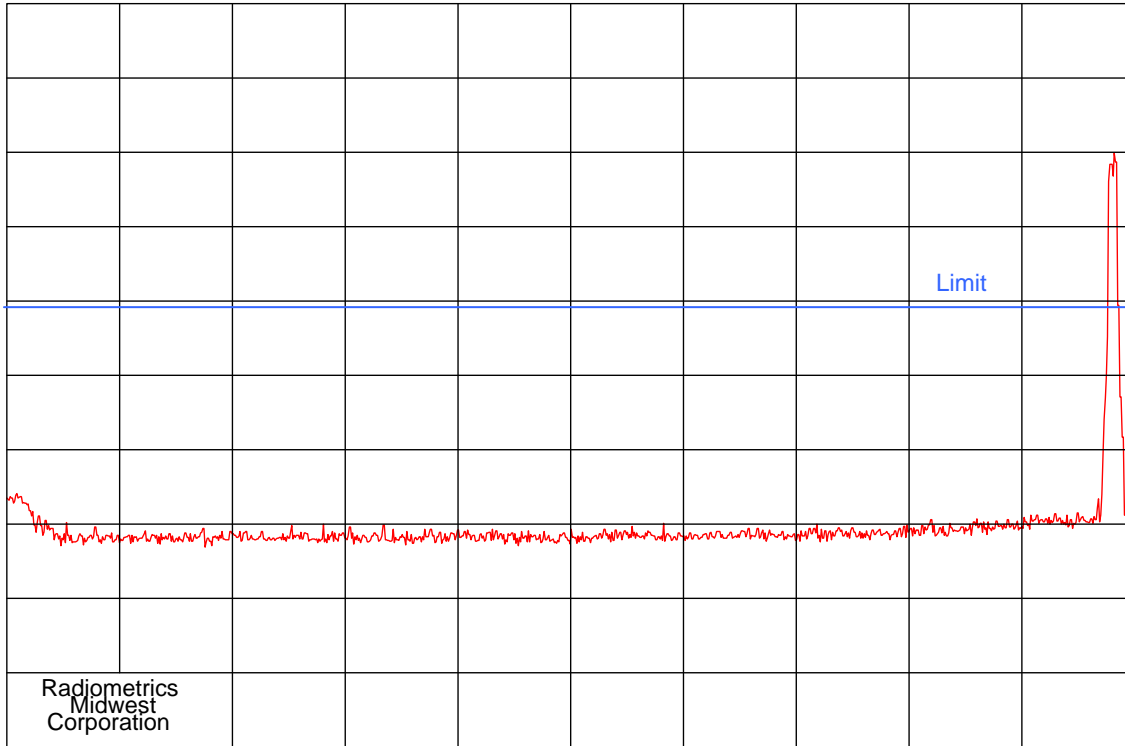
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 13:07

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE2g6

Notes: ANT2 port conducted Emissions, Ch 6 802.11g

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

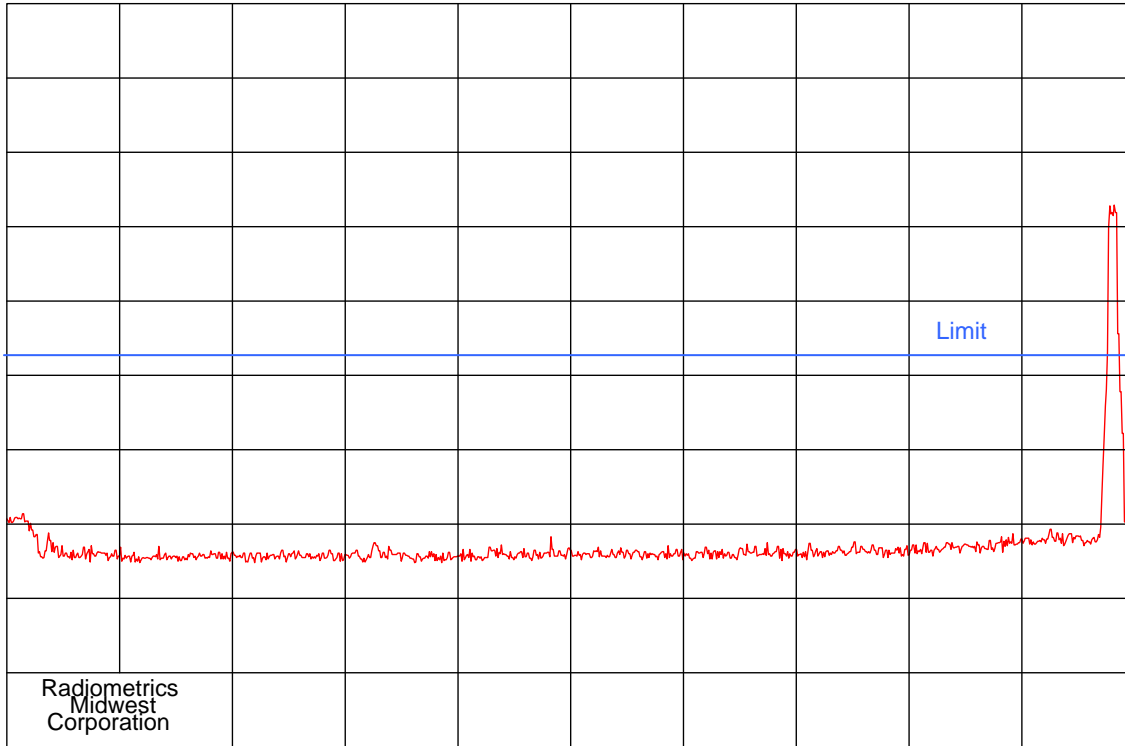
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 11:49

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE1g11

Notes: ANT1 Port Cond Emissions, Ch 11 802.11g

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

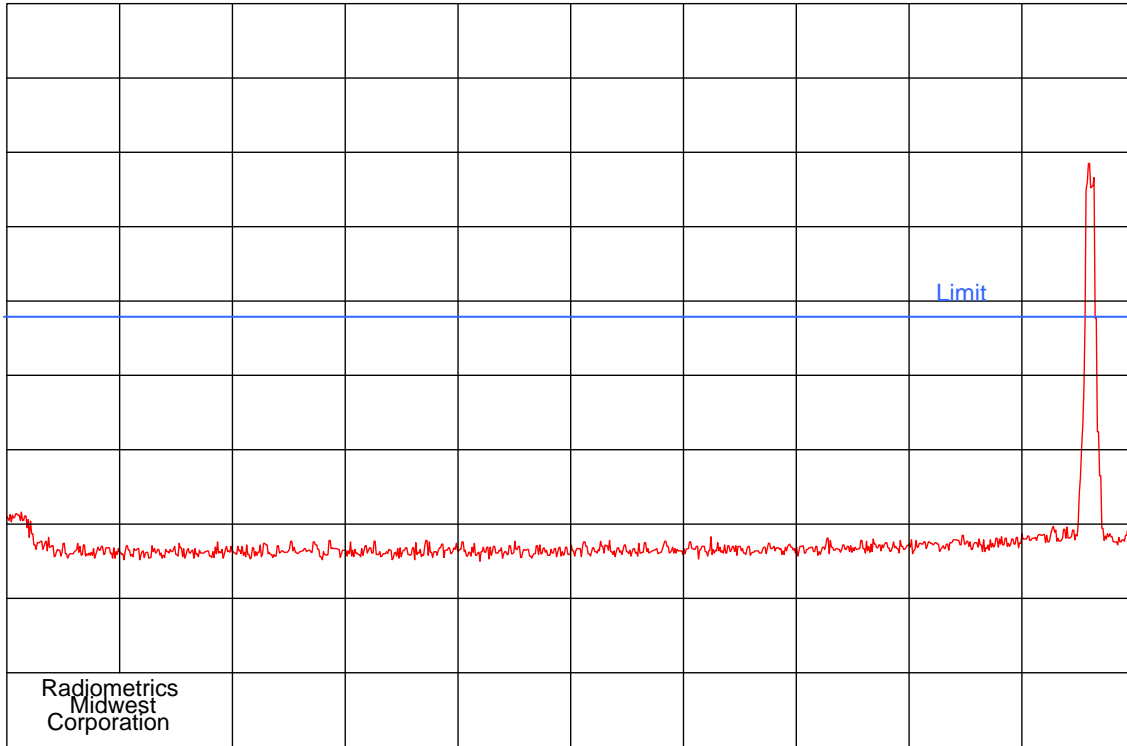
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 12:03

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE2g11

Notes: ANT2 port Cond Emissions, Ch 11 802.11g

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

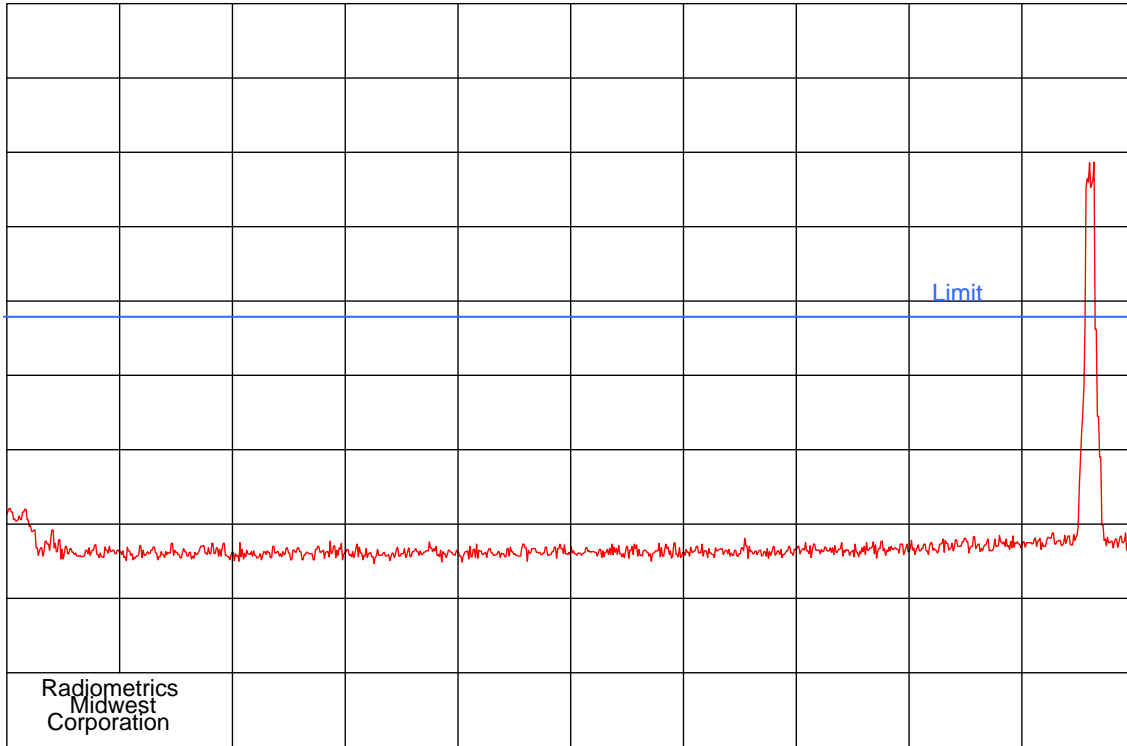
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 10:47

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: AC1N1

Notes: ANT1 Port Cond Emissions, Ch1 802.11N

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

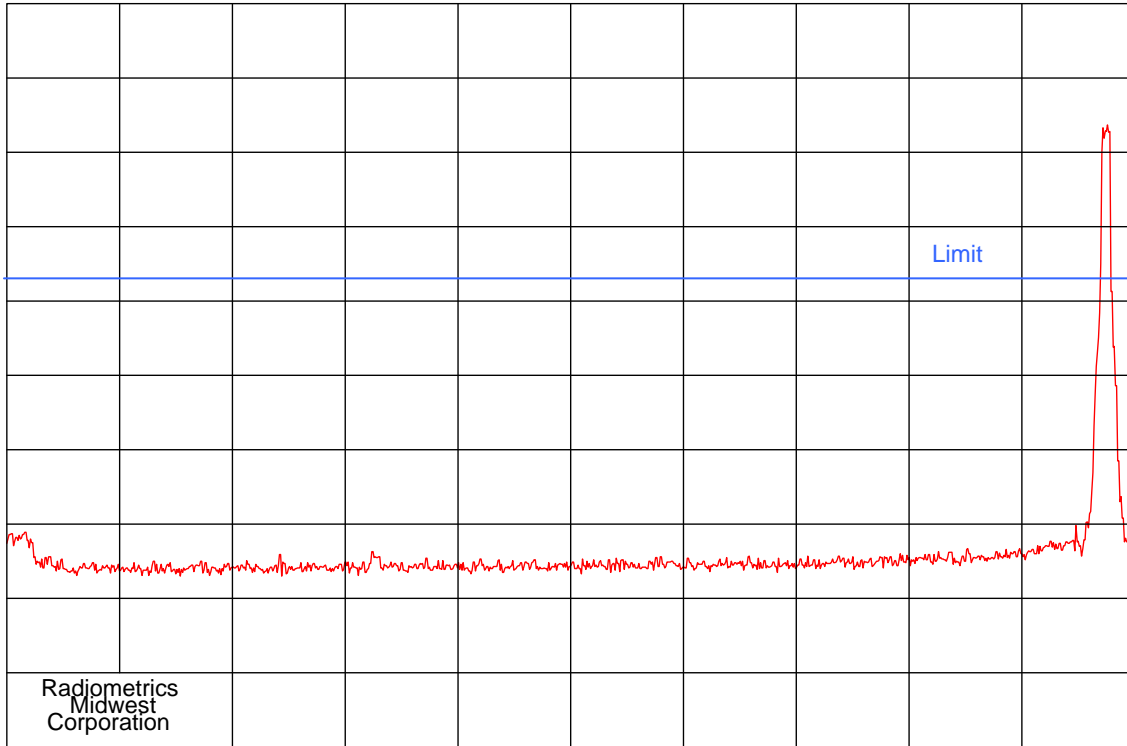
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 11:01

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: AC2N1

Notes: ANT2 Port Cond Emissions, Ch1 802.11N

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

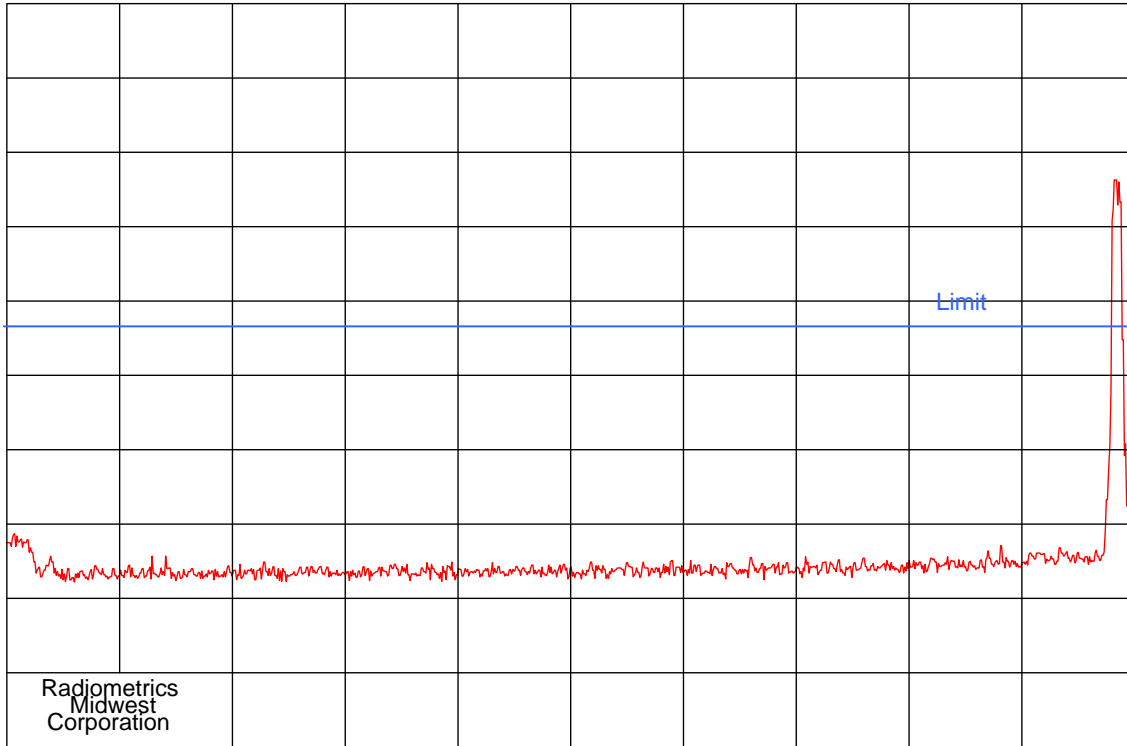
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 13:39

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE1n6

Notes: ANT1 Port Conducted Emissions, Ch 6 802.11N

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

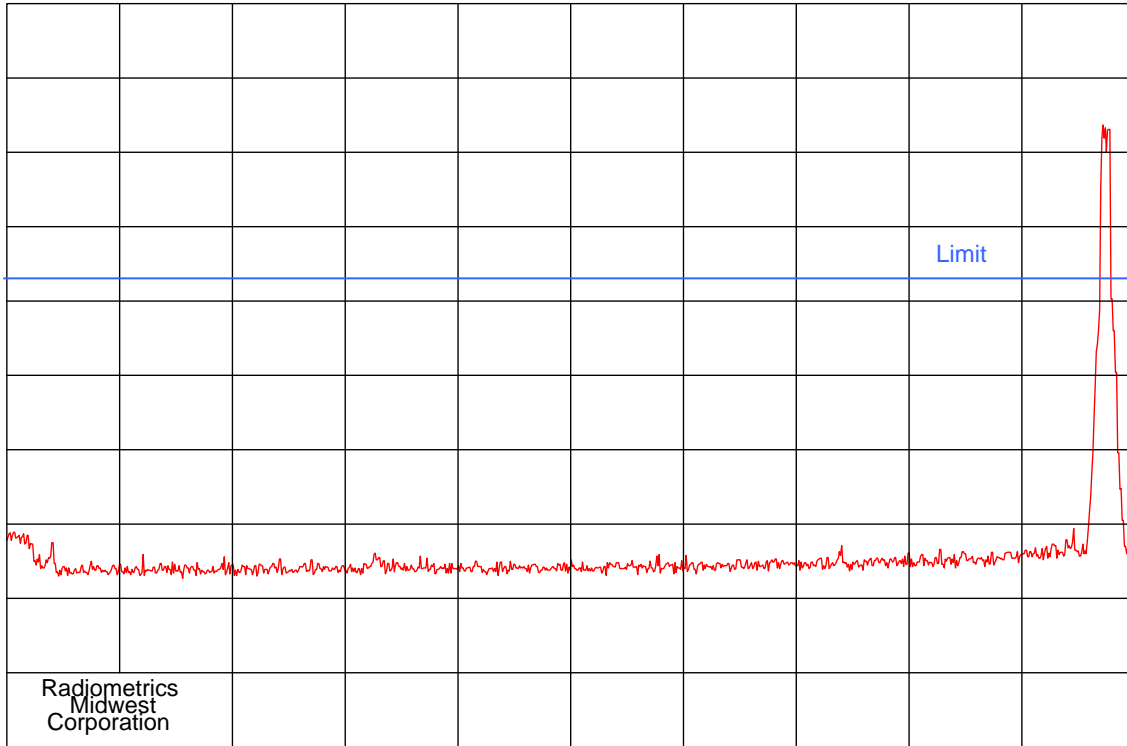
ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 12:35

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE1N11

Notes: ANT1 port cond Emissions, Ch 11 802.11N

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router



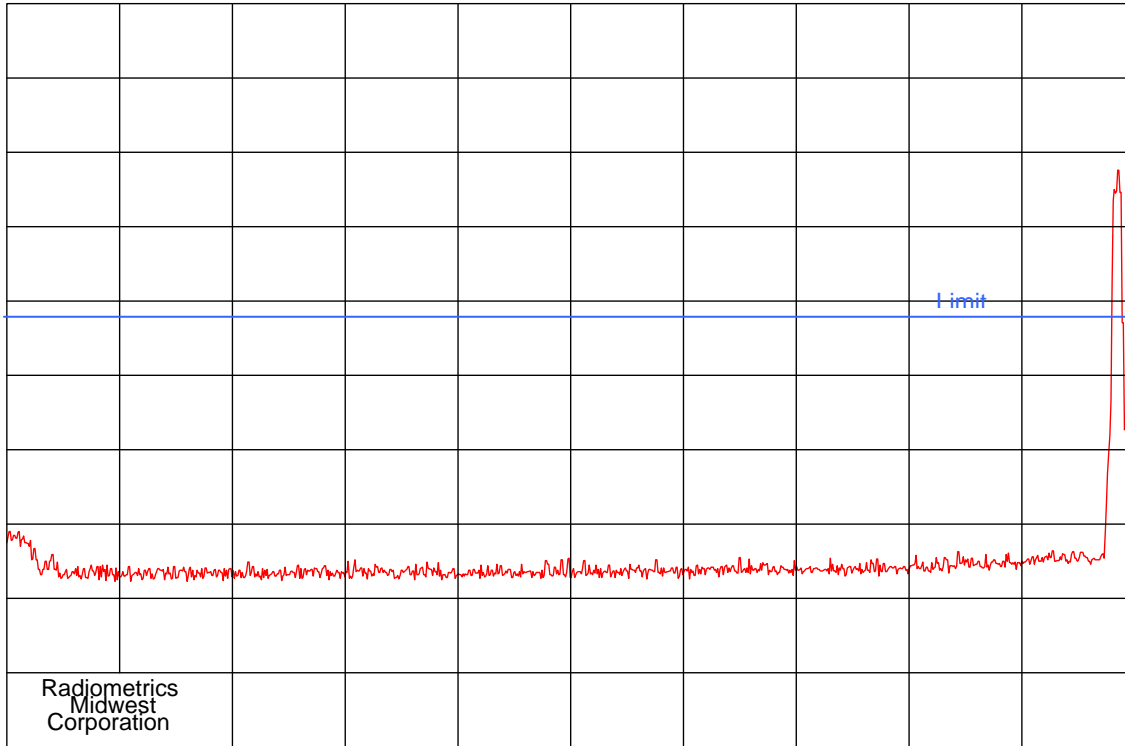
Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 13:30

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE2n6

Notes: ANT2 port Cond Emissions, Ch 6 802.11N



Radiometrics
Midwest
Corporation

Company: Netgear-Westell
START 1 MHz
RES BW 100 kHz
10 dB/
Notes: ANT2 port cond Emissions, Ch 11 802.11N

ITEM : MB97
REF 20.0 dBm
VBW 300 kHz
Time: 12:29

Date : 01-24-2013
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: ACE2N11

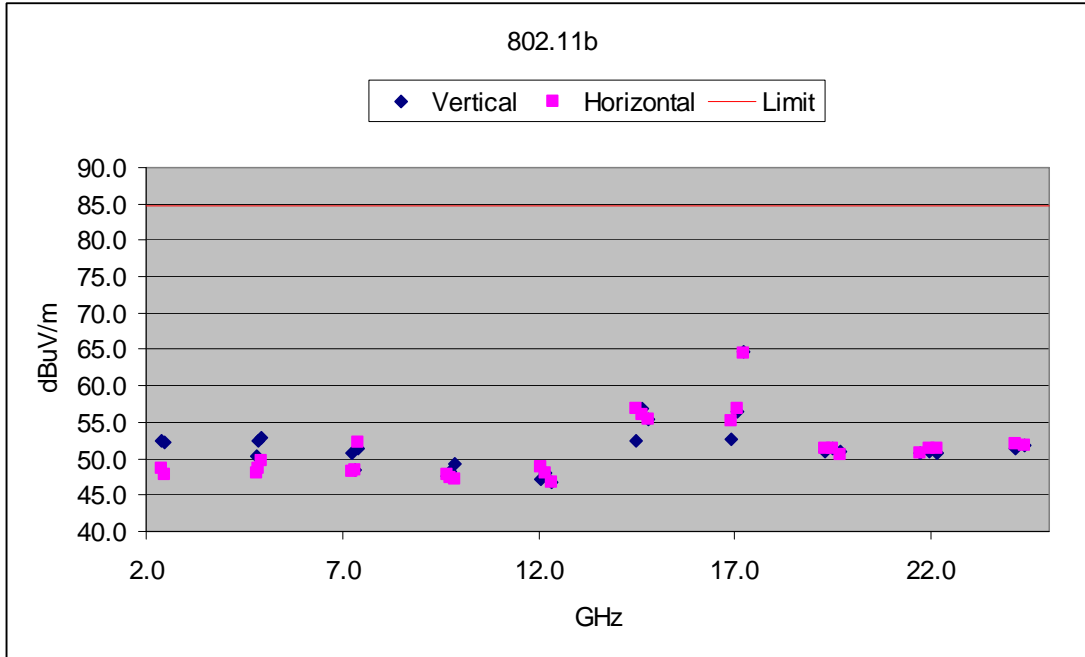
Judgement: Pass by at least 20 dB

10.6.2 Spurious RF Emissions; Radiated Method (2.5 - 25 GHz)

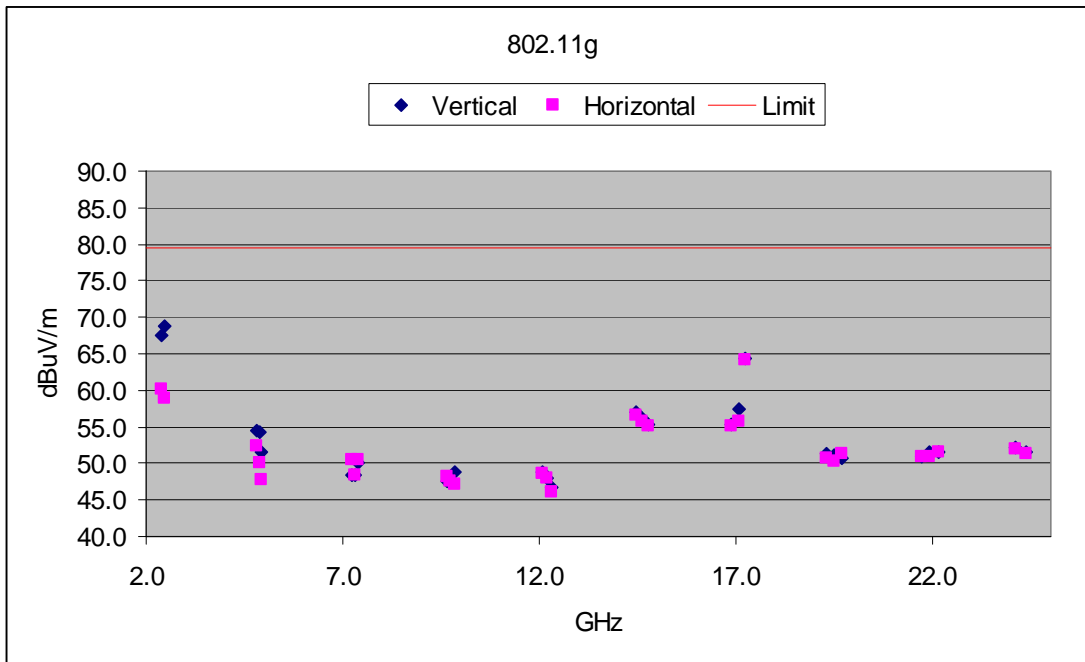
Radiated tests were performed to show compliance with this requirement from 2.5 to 25 GHz.

The EUT was tested in continuous mode and peak readings were made from 2.5 GHz up through the 10th harmonic. The limit is 20 dB lower than the peak of the lowest fundamental. The data is shown graphically.

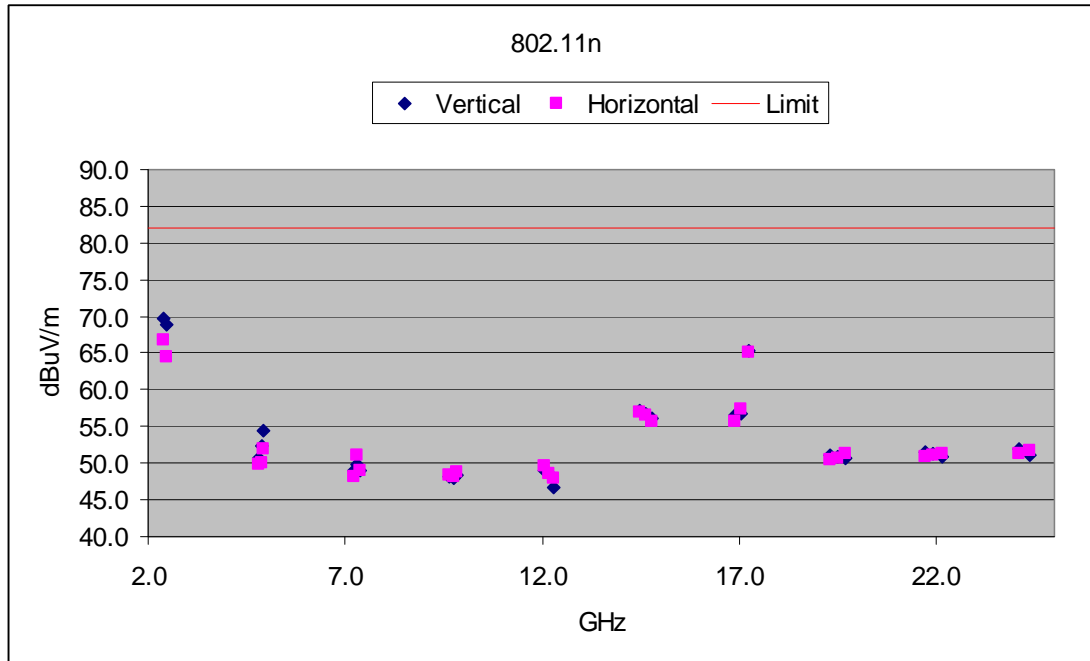
Test Date: 12/05/12



Judgement: Pass by 20.0 dB



Judgement: Pass by 15.9 dB



Judgement: Pass by 12.4 dB

10.7 Spurious Radiated Emissions Test Results

The following spectrum analyzer settings were used.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

A Video Bandwidth of 10 Hz was used for Average measurements above 1 GHz.

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router

10.7.1 Emissions Above 2 GHz

This Section has the Fundamental and Harmonic data from the radio portion of the product

802.11b/g Results;
Test Date: 12-05-12

hrm	Tx	802.11b		802.11g		802.11b		802.11g		EUT	Peak	Ave	Peak	Ave	Margin	
		Peak	Ave	Peak	Ave	Peak	Ave	Peak	Ave							Corr.
#	Freq	Vertical Polarization				Horizontal Polarization				Fact.	Freq MHz	dBuV/m		dBuV/m		Limit
1	2412	103.0	100.2	98.7	91.3	99.3	96.3	96.2	86.7	8.4	2412	111.4	108.6	125	125	13.6
be	2412	44.0	41.2	59.1	44.0	40.3	37.3	51.7	42.2	8.4	2390	67.5	52.4	74	54	1.6
2	2412	39.8	38.1	43.9	29.6	37.6	33.9	41.9	32.8	10.5	4824	54.4	48.6	74	54	5.4
3	2412	39.5	35.4	37.0	26.5	37.0	28.4	39.2	36.4	11.3	7236	50.8	47.7	94	74	26.3
4	2412	37.4	32.6	37.6	27.6	37.7	27.7	38.1	37.0	10.1	9648	48.2	47.1	94	74	26.9
5	2412	35.6	30.1	37.2	26.4	37.2	26.7	37.0	35.8	11.6	12060	48.8	47.4	74	54	6.6
1	2437	102.1	98.0	101.8	92.3	96.2	92.4	95.5	84.6	8.5	2437	110.6	106.5	125	125	14.4
2	2437	42.2	39.5	44.1	33.9	38.5	37.4	39.8	30.1	10.2	4874	54.3	49.7	74	54	4.3
3	2437	37.0	26.5	37.0	27.6	37.0	28.6	37.0	26.5	11.5	7311	48.5	40.1	74	54	13.9
4	2437	38.4	27.5	37.8	27.1	37.6	27.9	37.6	26.8	9.9	9748	48.3	37.8	94	74	36.2
5	2437	37.3	26.6	37.3	28.4	37.2	26.3	37.1	26.4	10.8	12185	48.1	39.2	74	54	14.8
1	2462	104.1	101.3	97.5	90.5	99.8	96.7	90.8	81.4	8.6	2462	112.7	109.9	125	125	12.3
be	2462	43.6	40.8	60.2	43.1	39.3	36.2	50.3	36.2	8.6	2483.5	68.8	51.7	74	54	2.3
2	2462	42.9	38.8	41.6	32.3	39.9	35.5	37.9	29.9	9.9	4924	52.8	48.7	74	54	5.3
3	2462	39.5	36.3	38.1	29.8	40.3	36.7	38.6	28.4	11.9	7386	52.2	48.6	74	54	5.4
4	2462	39.3	35.1	38.8	29.7	37.1	33.9	37.2	28.6	10	9848	49.3	45.1	94	74	28.9
5	2462	37.1	26.5	37.0	27.5	37.0	26.5	36.4	26.0	9.7	12310	46.8	37.2	74	54	16.8
Column numbers (see below for explanations)																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

- Column #1. Harmonic Number or BE = Band Edge
- Column #2. Frequency of Transmitter.
- Column #3. Columns 3 to 10 are the uncorrected readings from the spectrum analyzer
- Column #7. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor + High pass filter (for harmonics only)
- Column #8. Frequency of Tested Emission
- Column #9. Highest peak field strength at listed frequency.
- Column #10. Highest Average field strength at listed frequency.
- Column #11. Peak Limit. Non restricted bands limits set to 94 dBuV/m. The fundamental was tested with a direct connect so there is no radiated emissions limit.
- Column #12. Average Limit. Non restricted bands limits set to 74 dBuV/m. There is no fundamental average limit.
- Column #13. The margin (last column) is the worst case margin under the peak or average limits for that row.

There were no emissions detected from 12.5 to 25 GHz within 10 dB of the limits.
Judgement: Pass by 1.6 dB

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router

802.11N Results

Test Date: 12-05-12

		802.11N		802.11N			EUT	Peak	Ave	Peak	Ave	Margin
hrm	Tx	Peak	Ave	Peak	Ave	Corr.	Emission	Tot. FS		Limit		Under
#	Freq	Vertical Polarization				Fact.	Freq MHz	dBuV/m		dBuV/m		Limit
1	2412	99.0	91.3	93.8	85.2	8.4	2412	107.4	99.7	125	125	17.6
be	2412	61.3	44.2	58.4	39.8	8.4	2390	69.7	52.6	74	54	1.4
2	2412	40.2	32.1	39.4	29.9	10.5	4824	50.7	42.6	74	54	11.4
3	2412	37.6	30.5	36.8	30.1	11.3	7236	48.9	41.8	94	74	32.2
4	2412	38.0	28.2	38.2	27.7	10.1	9648	48.3	38.3	94	74	35.7
5	2412	37.5	26.7	38.1	26.8	11.6	12060	49.7	38.4	74	54	15.6
1	2437	103.5	93.6	98.5	88.7	8.5	2437	112.0	102.1	125	125	13.0
2	2437	42.1	35.1	39.8	31.6	10.2	4874	52.3	45.3	74	54	8.7
3	2437	38.4	28.0	39.5	30.0	11.5	7311	51.0	41.5	74	54	12.5
4	2437	38.0	27.3	38.2	27.2	9.9	9748	48.1	37.2	94	74	36.9
5	2437	37.8	26.5	37.7	26.5	10.8	12185	48.6	37.3	74	54	16.7
1	2462	98.0	90.2	93.5	84.1	8.6	2462	106.6	98.8	125	125	18.4
be	2462	60.2	42.8	55.9	36.0	8.6	2483.5	68.8	51.4	74	54	2.6
2	2462	44.6	36.1	42.1	33.6	9.9	4924	54.5	46.0	74	54	8.0
3	2462	37.0	26.5	37.0	26.5	11.9	7386	48.9	38.4	74	54	15.6
4	2462	38.4	21.0	38.7	27.5	10	9848	48.7	37.5	94	74	36.5
5	2462	37.0	26.5	38.2	26.5	9.7	12310	47.9	36.2	74	54	17.8
Column numbers (see below for explanations)												
1	2	3	4	5	6	7	8	9	10	11	12	13

- Column #1. Harmonic Number or BE = Band Edge
- Column #2. Frequency of Transmitter.
- Column #3. Columns 3 to 6 are the uncorrected readings from the spectrum analyzer
- Column #7. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor + High pass filter (for harmonics only)
- Column #8. Frequency of Tested Emission
- Column #9. Highest peak field strength at listed frequency.
- Column #10. Highest Average field strength at listed frequency.
- Column #11. Peak Limit. Non restricted bands limits set to 94 dBuV/m. The fundamental was tested with a direct connect so there is no radiated emissions limit.
- Column #12. Average Limit. Non restricted bands limits set to 74 dBuV/m. There is no fundamental average limit.
- Column #13. The margin (last column) is the worst case margin under the peak or average limits for that row.

There were no emissions detected from 12.5 to 25 GHz within 10 dB of the limits.
Judgement: Pass by 1.4 dB

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router

10.7.2 Radiated Emissions

This Data is the Non harmonic Emissions data from the Product.

Company	Westell, Inc.	Specification	FCC Part 15.247
Model	A90-9150V60-10	Test Date	January 17, 2013
Serial Number	002163FB6959	Test Distance	3 Meters
Test Personnel	Joseph Strzelecki	Test Location	Chamber E
Notes	Corr. Factors = cable loss - preamp gain - distance factor.		
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal		
Notes	This is the worst case emissions from the different transmit frequencies The product was transmitting and receiving information during the test.		

Freq. MHz	Reading dBuV	Detector Function	Polarity	Factor dB	Field Strength dBuV/m		Margin Under Limit dB
					EUT	Limit	
35.6	29.9	P	H/44	-11.5	18.4	40.0	21.6
66.4	41.9	P	H/44	-18.5	23.4	40.0	16.6
68.4	44.6	P	H/44	-19.0	25.6	40.0	14.4
90.4	36.6	P	H/44	-18.6	18.0	43.5	25.5
120.8	36.3	P	H/44	-11.6	24.7	43.5	18.8
146.4	47.3	P	H/44	-15.8	31.5	43.5	12.0
175.8	56.6	Q	H/44	-15.6	41.0	43.5	2.5
179.4	57.2	Q	H/44	-15.9	41.3	43.5	2.2
184.1	57.9	Q	H/44	-15.8	42.1	43.5	1.4
189.6	57.9	Q	H/44	-15.2	42.7	43.5	0.8
190.9	54.9	Q	H/44	-15.0	39.9	43.5	3.6
207.6	53.1	P	H/44	-14.6	38.5	43.5	5.0
219.2	45.3	P	H/44	-13.1	32.2	46.0	13.8
234.0	49.7	P	H/44	-12.8	36.9	46.0	9.1
255.8	48.0	P	H/44	-12.7	35.3	46.0	10.7
293.9	44.8	P	H/44	-12.8	32.0	46.0	14.0
309.6	44.2	P	H/44	-12.0	32.2	46.0	13.8
320.2	41.3	P	H/44	-11.8	29.5	46.0	16.5
399.7	42.6	P	H/44	-9.4	33.2	46.0	12.8
464.7	36.7	P	H/44	-7.3	29.4	46.0	16.6
475.4	35.1	P	H/44	-6.7	28.4	46.0	17.6
495.0	35.2	P	H/44	-6.9	28.3	46.0	17.7
505.0	38.1	P	H/44	-6.4	31.7	46.0	14.3
530.2	41.0	P	H/44	-5.8	35.2	46.0	10.8
550.4	35.4	P	H/44	-4.5	30.9	46.0	15.1
565.5	39.5	P	H/44	-4.5	35.0	46.0	11.0
600.8	36.5	P	H/44	-4.2	32.3	46.0	13.7
636.1	40.1	P	H/44	-3.1	37.0	46.0	9.0
636.7	40.1	P	H/44	-3.1	37.0	46.0	9.0
699.9	35.1	P	H/44	-3.3	31.8	46.0	14.2
742.5	33.1	P	H/44	-2.5	30.6	46.0	15.4
795.2	32.9	P	H/44	-2.1	30.8	46.0	15.2
896.5	30.1	P	H/44	0.2	30.3	46.0	15.7
907.8	32.3	P	H/44	1.1	33.4	46.0	12.6
954.2	29.5	P	H/44	1.4	30.9	46.0	15.1
1024.8	28.8	P	H/44	2.9	31.7	54.0	22.3

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Testing of the Westell, Model A90-9150V60-10, UltraLine Router

Freq. MHz	Reading dBuV	Detector Function	Polarity	Factor dB	Field Strength dBuV/m		Margin Under Limit dB
					EUT	Limit	
44.0	48.2	Q	V/44	-12.1	36.1	40.0	3.9
59.3	52.8	Q	V/44	-16.3	36.5	40.0	3.5
64.8	48.0	P	V/44	-18.1	29.9	40.0	10.1
70.9	58.1	Q	V/44	-19.4	38.7	40.0	1.3
77.2	57.1	Q	V/44	-19.9	37.2	40.0	2.8
79.2	58.6	Q	V/44	-19.8	38.8	40.0	1.2
81.2	54.7	Q	V/44	-19.6	35.1	40.0	4.9
87.2	52.6	Q	V/44	-18.9	33.7	40.0	6.3
94.4	55.6	P	V/44	-18.0	37.6	43.5	5.9
98.4	57.2	P	V/44	-17.4	39.8	43.5	3.7
119.2	47.8	P	V/44	-11.8	36.0	43.5	7.5
164.0	52.7	P	V/44	-15.1	37.6	43.5	5.9
166.7	57.7	Q	V/44	-15.5	42.2	43.5	1.3
183.2	56.8	P	V/44	-15.8	41.0	43.5	2.5
183.8	58.0	Q	V/44	-15.8	42.2	43.5	1.3
199.2	56.1	P	V/44	-15.0	41.1	43.5	2.4
200.9	53.2	Q	V/44	-15.0	38.2	43.5	5.3
205.6	52.8	P	V/44	-14.8	38.0	43.5	5.5
224.8	45.4	P	V/44	-12.7	32.7	46.0	13.3
226.1	45.7	P	V/44	-12.7	33.0	46.0	13.0
250.2	43.2	P	V/44	-13.0	30.2	46.0	15.8
300.0	46.8	P	V/44	-12.6	34.2	46.0	11.8
300.6	45.6	P	V/44	-12.5	33.1	46.0	12.9
361.1	38.9	P	V/44	-10.5	28.4	46.0	17.6
388.5	41.7	P	V/44	-9.6	32.1	46.0	13.9
397.5	41.7	P	V/44	-9.5	32.2	46.0	13.8
423.8	41.5	P	V/44	-8.4	33.1	46.0	12.9
458.5	40.0	P	V/44	-8.0	32.0	46.0	14.0
493.8	40.6	P	V/44	-6.9	33.7	46.0	12.3
530.0	41.5	P	V/44	-5.9	35.6	46.0	10.4
566.0	37.6	P	V/44	-4.5	33.1	46.0	12.9
636.0	36.9	P	V/44	-3.1	33.8	46.0	12.2
662.0	34.2	P	V/44	-2.8	31.4	46.0	14.6
742.0	33.2	P	V/44	-2.5	30.7	46.0	15.3
814.0	38.1	P	V/44	-0.3	37.8	46.0	8.2
879.0	37.0	P	V/44	-0.1	36.9	46.0	9.1
953.0	31.4	P	V/44	1.5	32.9	46.0	13.1
1150.0	11.3	A	H	26.6	37.9	54.0	16.1
1318.0	17.5	A	H	27.0	44.5	54.0	9.5
1450.0	22.6	P	H	27.0	49.6	74.0	24.4
1450.0	14.9	A	H	27.0	41.9	54.0	12.1
1570.0	11.6	A	H	27.2	38.8	54.0	15.2
1690.0	22.7	P	H	28.0	50.7	74.0	23.3
1690.0	14.2	A	H	28.0	42.2	54.0	11.8
1915.0	17.5	A	H	29.2	46.7	54.0	7.3
1915.0	23.9	P	H	29.2	53.1	74.0	20.9
2358.8	21.2	P	H	30.1	51.3	74.0	22.7

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Westell, Model A90-9150V60-10, UltraLine Router

Freq. MHz	Reading dBuV	Detector Function	Polarity	Factor dB	Field Strength dBuV/m		Margin Under Limit dB
					EUT	Limit	
2358.8	16.1	A	H	30.1	46.2	54.0	7.8
2760.4	17.5	A	H	31.2	48.7	54.0	5.3
3248.8	16.1	P	H	33.5	49.6	74.0	24.4
3248.8	12.4	A	H	33.5	45.9	54.0	8.1
3775.0	19.7	P	H	35.2	54.9	74.0	19.1
3775.0	13.4	A	H	35.2	48.6	54.0	5.4
1058.8	14.2	A	V	26.0	40.2	54.0	13.8
1081.3	13.2	A	V	26.1	39.3	54.0	14.7
1447.5	25.2	P	V	27.0	52.2	74.0	21.8
1448.7	1.9	A	V	27.0	28.9	54.0	25.1
1621.3	16.2	A	V	27.4	43.6	54.0	10.4
1750.0	17.3	A	V	28.4	45.7	54.0	8.3
1921.3	20.5	P	V	29.2	49.7	74.0	24.3
1921.3	14.4	A	V	29.2	43.6	54.0	10.4
2520.0	15.2	A	V	31.0	46.2	54.0	7.8
2926.5	12.3	A	V	31.8	44.1	54.0	9.9
3249.3	19.0	P	V	33.5	52.5	74.0	21.5
3249.3	8.4	A	V	33.5	41.9	54.0	12.1

Judgment: Passed by 0.8 dB

No other emissions were detected from the EUT within 10 dB of the limit from 30 MHz to 12.5 GHz except as shown in section 10.7.1