
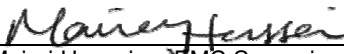




# Test Report

Curtis-Straus LLC, a wholly owned subsidiary of BV CPS

Report No	EM1484-2
Client	Doble Engineering Martin Grubner
Address	85 Walnut Street PO Box 9107 Watertown, MA 02472-4044
Phone	1-617-393-2958
Items tested	WIZ610wi module
FCC ID	QQO4010404
IC ID	3158A-4010404
FRN	0022034433
Equipment Type	Digital Transmission System
Equipment Code	DTS
Emission Designator	
FCC/IC Rule Parts	47 CFR 15.247, RSS 210 issue 8 and RSS GEN issue 3
Test Dates	August 14, 15, 16, 20, 23, 27, 28, 29, 30, and 31, 2012
Results	As detailed within this report
Prepared by	 Christopher Bramley – Test Engineer
Authorized by	 Mairaj Hussain – EMC Supervisor
Issue Date	10/19/2012
Conditions of Issue	This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 33 of this report.

Curtis-Straus LLC is accredited by the American Association for Laboratory Accreditation for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation.



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Form Final Report REV 7-20-07 (DW)



**Summary**

This test report supports an application for certification of a transmitter operating pursuant to 47 CFR 15.247 and RSS-210. The product is the WIZ610wi module. It is a transmitter that operates in the range 2400-2483.5MHz

We found that the product met the above requirements without modification. The test sample was received in good condition on August 14, 2012.



## Test Methodology

Radiated emission and AC Line conducted testing was performed according to the procedures specified in ANSI C63.4 (2003), FCC public notice regarding measurement procedure for DTS and RSS-GEN. Radiated Emissions were maximized by rotating the device around normal installation axes as well as varying the test antenna's height and polarity. The device antenna was maximized separately.

The module can be configured with three different cable lengths between the antenna connector on the board and the antenna. The module radiated emissions were tested with all three combination of antenna / cable.

Conducted emission at the antenna port was performed, as required by rule section.

The EUT operating voltage is 100-240Vac 50/60Hz.

The following bandwidths were used during radiated spurious and line conducted emissions.

Frequency	RBW	VBW
0.15-30MHz	9kHz	30kHz
30-1000MHz	120kHz	1MHz
1-25GHz	1MHz	3MHz

The unit used two different modulation schemes, 802.11b and 802.11g. The following channels were evaluated.

Low Channel = 2412MHz

Mid Channel = 2437MHz

High Channel = 2462MHz

**Product Tested - Configuration Documentation**

EUT Configuration						
Work Order: M1484-2						
Company: Doble Engineering						
Company Address: 85 Walnut Street, PO Box 9107						
Watertown, MA 02472-4044						
Contact: Martin Grubner						
Person Present: Martin Grubner						
MN			SN			
EUT: WIZ610wi Wireless Module			11028FD11BFE			
EUT Description: Wireless Module						
EUT Max Frequency: 2462MHz						
Support Equipment:			MN		SN	
Support Board	WIZ610wi EVB Rev1.0		Not Labeled			
Dell Monitor	E770S		MY-02010V-47803-142-BE88			
Dell PC	MTC2		HFMJM51			
Fellowes Keyboard	KB-2971		2H36500566B			
Microsoft Mouse	Not listed		00155848			
EUT Ports:						
No.						
Port Label	Port Type	No. of ports	Populated	Shielded	Ferrites	Length
Antenna Port	Antenna Port	1	1	Yes	None	12, 30.5, & 53cm



BUREAU  
VERITAS

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Testing Cert. No. 1627-01

## Statement of Conformity

The WIZ610wi module has been found to conform to the following parts of 47 CFR, RSS 210 and RSS GEN Issue 3 as detailed below:

RSS-GEN	RSS 210	Part 15	Comments
5.4		15.15(b)	There are no controls accessible to the user that varies the output power.
5.2		15.19	The label is shown in the label exhibit.
7.1.3 7.1.2		15.21	Information to the user is shown in the instruction manual exhibit.
		15.27	No special accessories are required for compliance.
4.1		15.31	The EUT was tested in accordance with the measurement standards in this section.
		15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
		15.35	The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.
7.1.2		15.203	The antenna for this device has a unique connection type.
	2.5	15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209.
7.2.4		15.207	EUT meets the AC Line conducted emissions requirements of 15.207.
	Annex 8	15.247	The unit complies with the requirements of 15.247
4.6.1			Occupied Bandwidth measurements were made.

**Test Results****6dB Bandwidth****LIMIT**

The minimum 6 dB bandwidth shall be at least 500 kHz. [15.247(a) (2)]

Engineer	TB
Site	3Min
Date	9-13-2012

**MEASUREMENTS / RESULTS**

<b>6dB Bandwidth</b>					
15:247(a)(2): Specifies that the minimum 6dB bandwidth shall be at least 500kHz.					
Frequency (MHz)	Mode	Data rate (Mbps)	6dB BW (MHz)	Limit (kHz)	Margin (MHz)
2412	11b	1	10.939	>500	-10.439
2437	11b	1	11.511	>500	-11.011
2462	11b	1	11.253	>500	-10.753
2412	11b	5.5	11.727	>500	-11.227
2437	11b	5.5	11.954	>500	-11.454
2462	11b	5.5	12.065	>500	-11.565
2412	11b	11	11.394	>500	-10.894
2437	11b	11	11.942	>500	-11.442
2462	11b	11	11.628	>500	-11.128
2412	11g	6	16.245	>500	-15.745
2437	11g	6	16.270	>500	-15.770
2462	11g	6	16.294	>500	-15.794
2412	11g	24	16.451	>500	-15.951
2437	11g	24	16.422	>500	-15.922
2462	11g	24	16.450	>500	-15.950
2412	11g	54	16.419	>500	-15.919
2437	11g	54	16.408	>500	-15.908
2462	11g	54	16.490	>500	-15.990
<b>Date:</b> 8/31/2012			<b>Analyzer:</b> #1327		
<b>Company:</b> Doble			<b>Attenuator:</b> PE7019-20 #791		
<b>EUT:</b> Wiznet radio module					

Rev. 8/30/2012

**Spectrum Analyzers / Receivers / Preselectors**  
SA EMI Chamber (1327)

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
9kHz-13.2 GHz	E4405B	Agilent	MY45103416	1327	I	5/30/2013

**Preamps / Couplers Attenuators / Filters**  
HF 20dB 50W Attenuator

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	6/1/2013

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



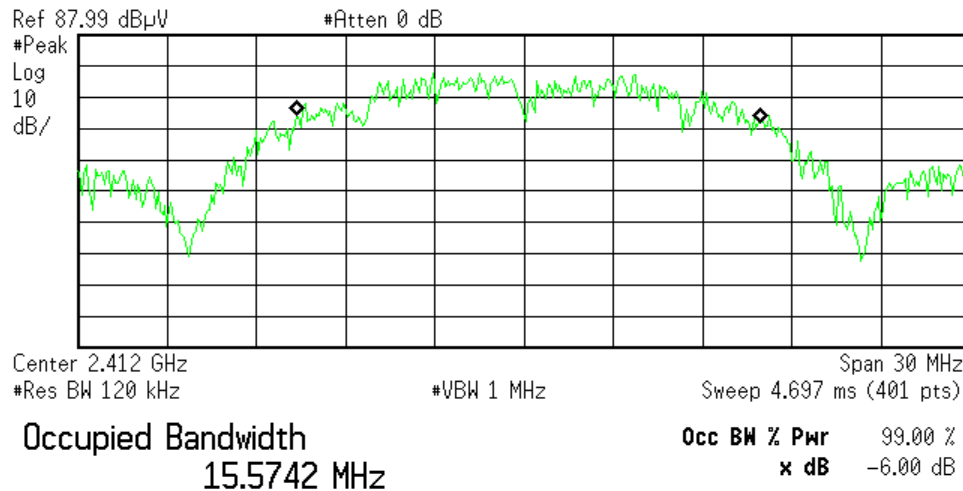
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## PLOT

\* Agilent 14:38:30 Sep 13, 2012

R T



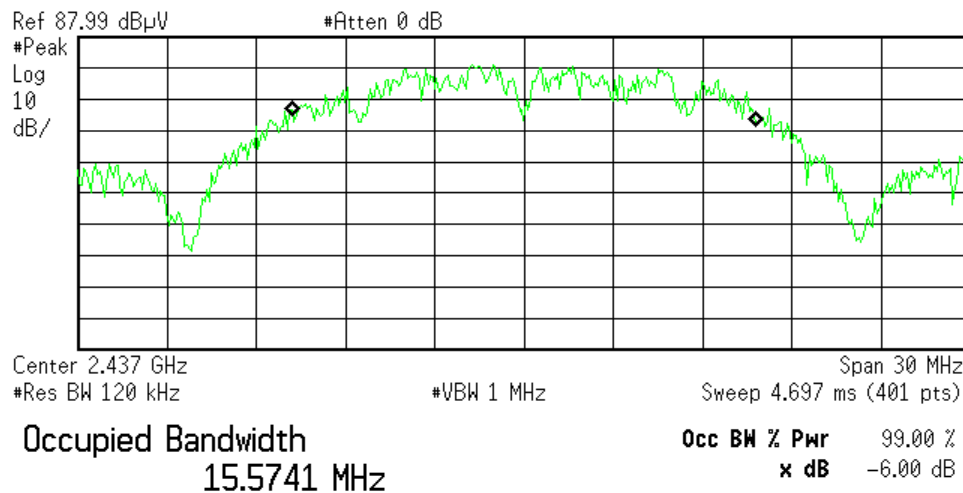
Transmit Freq Error 136.021 kHz  
x dB Bandwidth 10.939 MHz\*

C:\temp.gif file saved

## Low Channel – 802.11b

\* Agilent 14:47:19 Sep 13, 2012

R T



Transmit Freq Error 21.604 kHz  
x dB Bandwidth 11.511 MHz\*

C:\temp.gif file saved

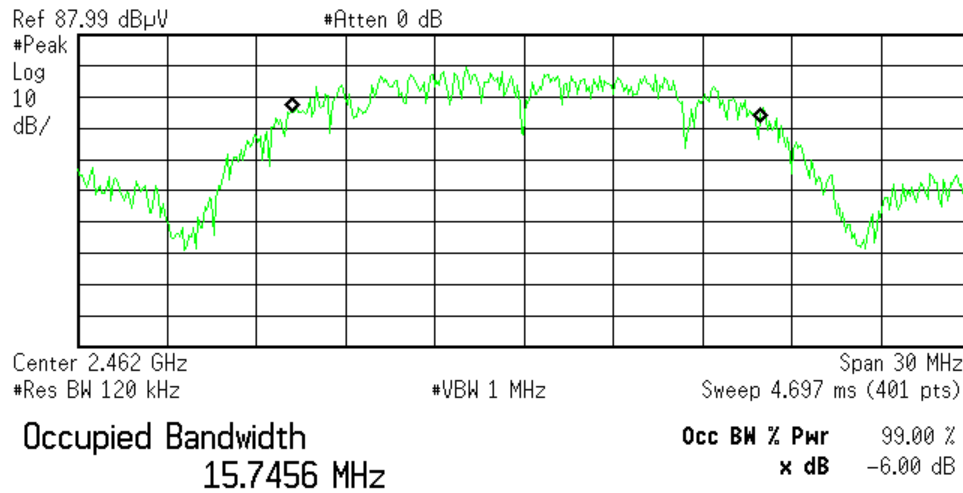
## Mid Channel – 802.11b





\* Agilent 14:49:16 Sep 13, 2012

R T



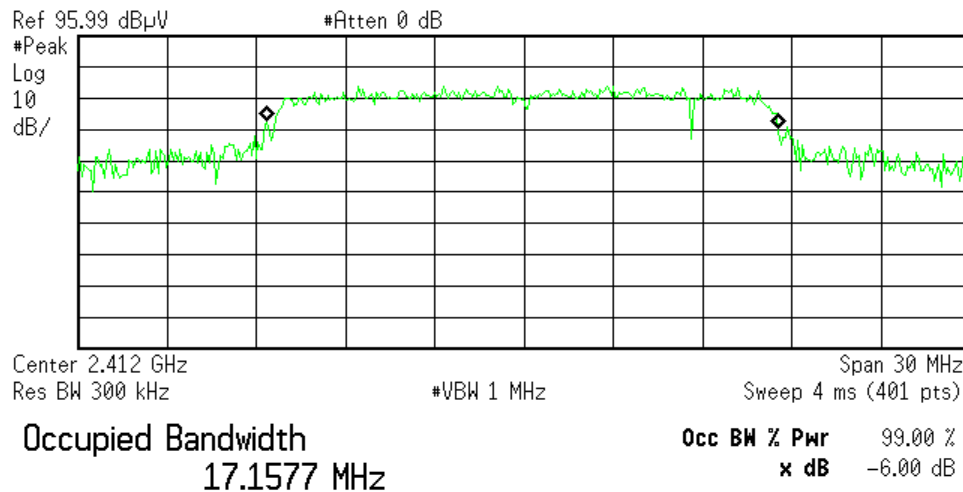
Transmit Freq Error 51.410 kHz  
x dB Bandwidth 11.253 MHz\*

C:\temp.gif file saved

## High Channel – 802.11b

\* Agilent 15:09:23 Sep 13, 2012

R T



Transmit Freq Error -45.966 kHz  
x dB Bandwidth 16.245 MHz\*

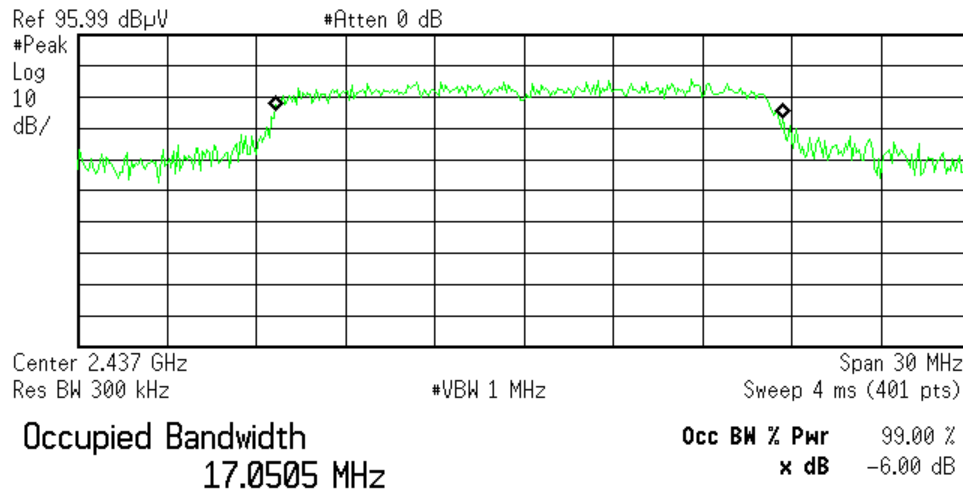
C:\temp.gif file saved

## Low Channel – 802.11g



\* Agilent 15:11:14 Sep 13, 2012

R T



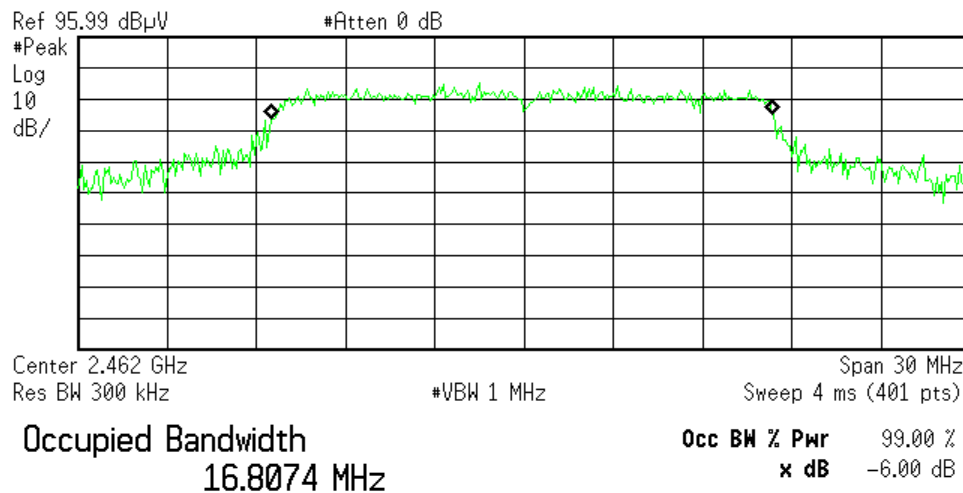
Transmit Freq Error 166.153 kHz  
x dB Bandwidth 16.270 MHz\*

C:\temp.gif file saved

## Mid Channel – 802.11g

\* Agilent 15:12:48 Sep 13, 2012

R T



Transmit Freq Error -49.246 kHz  
x dB Bandwidth 16.294 MHz\*

C:\temp.gif file saved

## High Channel – 802.11g



## Occupied Bandwidth and 26dB Bandwidth

### REQUIREMENT

When an occupied bandwidth 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.  
[RSS-GEN 4.6.1]

Engineer	TB
Site	3Min
Date	9-13-2012

### MEASUREMENTS / RESULTS

Occupied Bandwidth and 26dB Bandwidth				
Frequency (MHz)	Mode	Data rate (Mbps)	26dB BW (MHz)	Occupied BW (MHz)
2412	11b	1	19.264	15.6699
2437	11b	1	19.307	15.5067
2462	11b	1	19.269	15.4476
2412	11b	5.5	18.584	15.0967
2437	11b	5.5	18.529	15.1135
2462	11b	5.5	18.749	15.2468
2412	11b	11	19.090	15.1635
2437	11b	11	19.075	15.1507
2462	11b	11	19.104	15.2043
2412	11g	6	33.640	17.2228
2437	11g	6	33.037	16.8054
2462	11g	6	34.050	16.6949
2412	11g	24	31.067	17.3418
2437	11g	24	31.870	17.6074
2462	11g	24	32.873	17.7491
2412	11g	54	21.771	16.8784
2437	11g	54	22.436	16.8769
2462	11g	54	22.471	16.8008
Date: 8/31/2012			Analyzer: #1327	
Company: Doble			Attenuator: PE7019-20 #791	
EUT: Wiznet radio module				

Rev. 9/8/2012

#### Spectrum Analyzers / Receivers / Preselectors

SA EMI Chamber (1327)

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
9kHz-13.2 GHz	E4405B	Agilent	MY45103416	1327	I	5/30/2013

#### Preamps / Couplers Attenuators / Filters

HF 20dB 50W Attenuator

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	6/1/2013

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



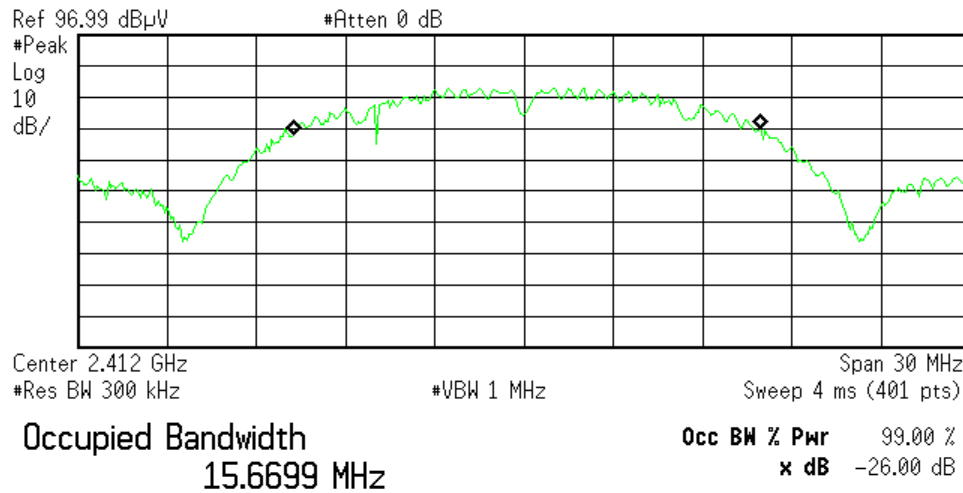
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## PLOTS

Agilent 14:14:06 Sep 13, 2012

R T



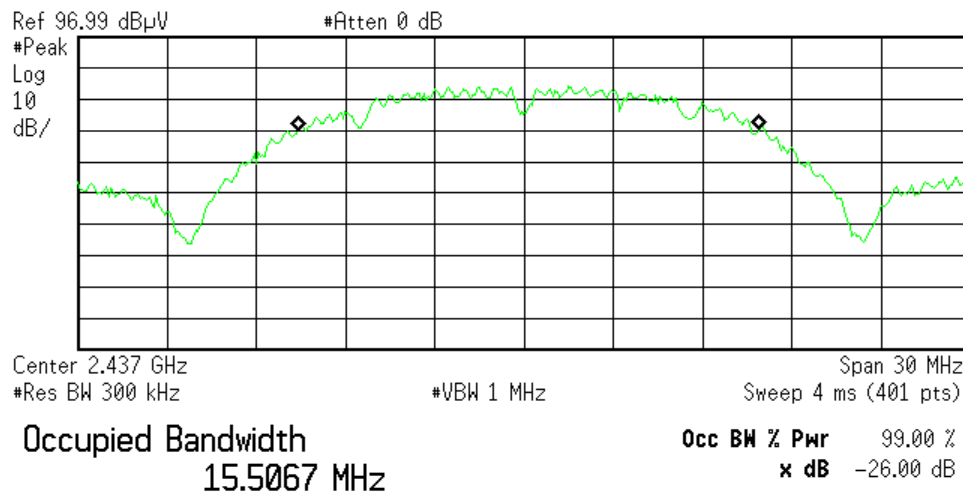
Transmit Freq Error 86.547 kHz  
x dB Bandwidth 19.320 MHz\*

C:\temp.gif file saved

## Low Channel – 802.11b

Agilent 14:11:55 Sep 13, 2012

R T



Transmit Freq Error 141.735 kHz  
x dB Bandwidth 19.240 MHz\*

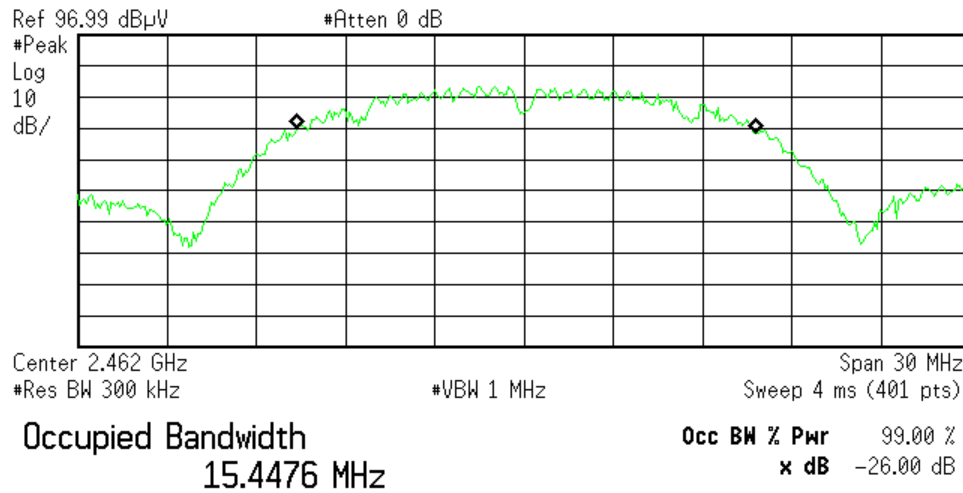
C:\temp.gif file saved

## Mid Channel – 802.11b



\* Agilent 14:10:04 Sep 13, 2012

R T



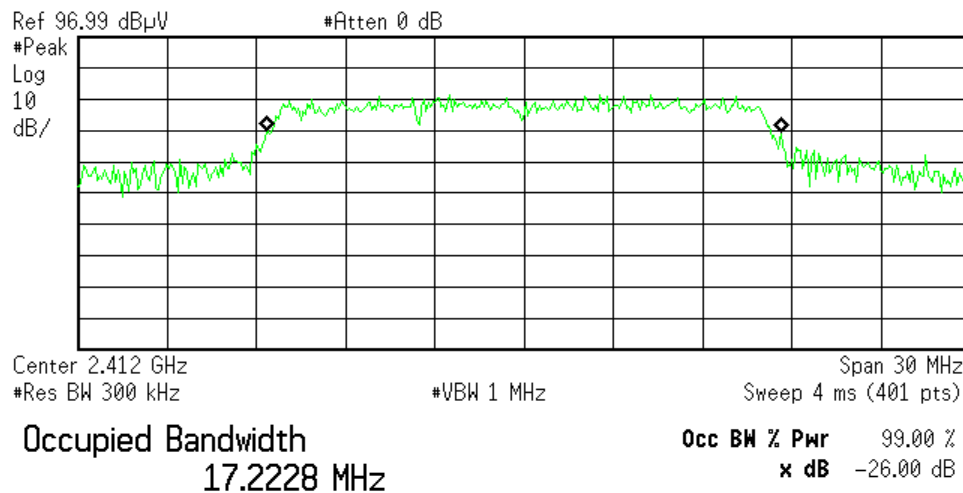
Transmit Freq Error 87.930 kHz  
x dB Bandwidth 18.858 MHz\*

C:\temp.gif file saved

## High Channel – 802.11b

\* Agilent 13:56:57 Sep 13, 2012

R T



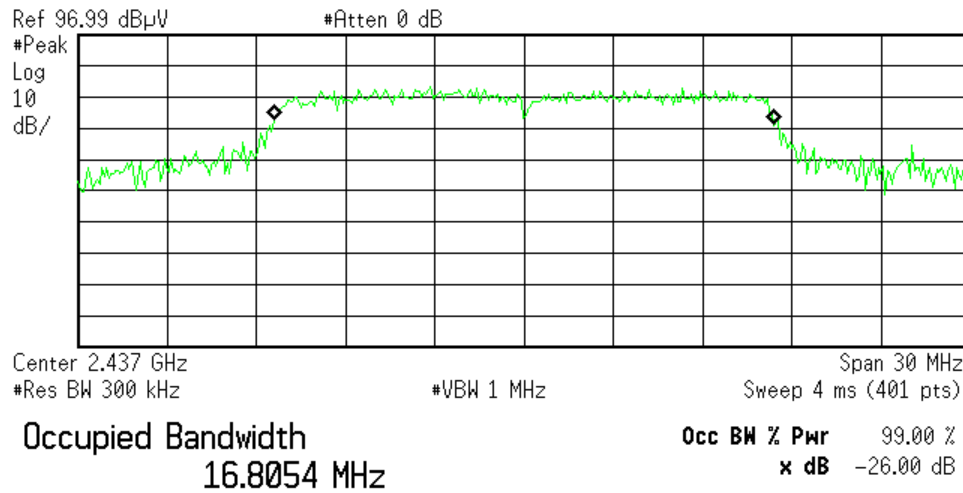
Transmit Freq Error 10.358 kHz  
x dB Bandwidth 29.848 MHz\*

## Low Channel – 802.11g



\* Agilent 14:03:27 Sep 13, 2012

R T



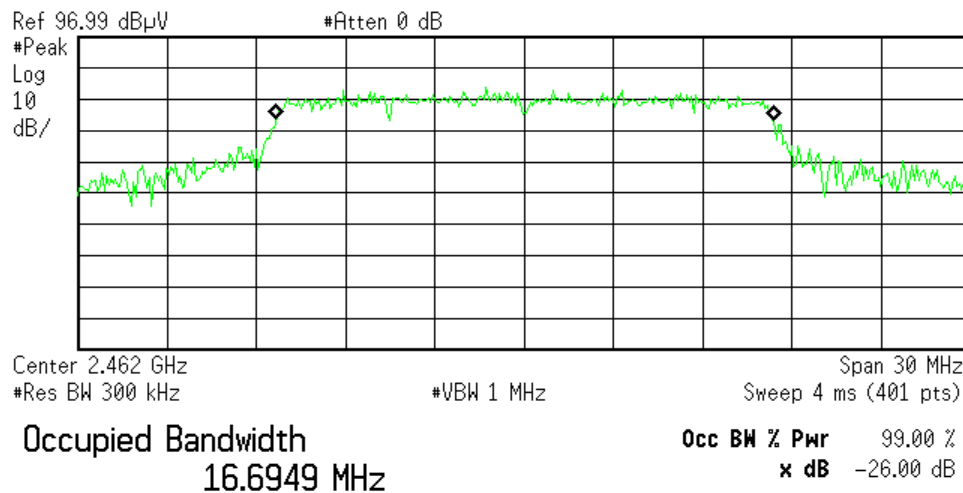
Transmit Freq Error 21.195 kHz  
x dB Bandwidth 29.455 MHz\*

C:\temp.gif file saved

## Mid Channel – 802.11g

\* Agilent 14:06:06 Sep 13, 2012

R T



Transmit Freq Error 48.400 kHz  
x dB Bandwidth 26.114 MHz\*

C:\temp.gif file saved

## High Channel – 802.11g



## Peak Power

### LIMIT

The maximum peak conducted output power of the intentional radiator shall not exceed the following: For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

[15.247(b) (3)]

Measurement procedure PK2

Engineer	TB
Site	3Min
Date	8-15-2012

## MEASUREMENTS / RESULTS

5.2.1 Maximum Peak Conducted Output Power Level										
channel (MHz)	mode	rate (Mbps)	power setting in ART (dBm)	measured power (dBm)	attenuator factor (dB)	dongle factor (dB)	adjusted power measurement (dBm)	limit (dBm)	margin (dB)	result
2412	11b	1	16	-1.53	19.98	0.9	19.35	30	-10.65	pass
2412	11b	5.5	16	-0.26	19.98	0.9	20.62	30	-9.38	pass
2412	11b	11	16	-0.17	19.98	0.9	20.71	30	-9.29	pass
2437	11b	1	16	-2.60	19.98	0.9	18.28	30	-11.72	pass
2437	11b	5.5	16	-1.69	19.98	0.9	19.19	30	-10.81	pass
2437	11b	11	16	-1.28	19.98	0.9	19.6	30	-10.4	pass
2462	11b	1	16	-3.10	20.02	0.9	17.82	30	-12.18	pass
2462	11b	5.5	16	-2.30	20.02	0.9	18.62	30	-11.38	pass
2462	11b	11	16	-1.89	20.02	0.9	19.03	30	-10.97	pass
2412	11g	6	14	-2.95	19.98	0.9	17.93	30	-12.07	pass
2412	11g	24	14	-2.65	19.98	0.9	18.23	30	-11.77	pass
2412	11g	54	14	-2.90	19.98	0.9	17.98	30	-12.02	pass
2437	11g	6	14	-3.10	19.98	0.9	17.78	30	-12.22	pass
2437	11g	24	14	-2.88	19.98	0.9	18	30	-12	pass
2437	11g	54	14	-2.74	19.98	0.9	18.14	30	-11.86	pass
2462	11g	6	14	-4.14	20.02	0.9	16.78	30	-13.22	pass
2462	11g	24	14	-3.96	20.02	0.9	16.96	30	-13.04	pass
2462	11g	54	14	-3.95	20.02	0.9	16.97	30	-13.03	pass

Rev. 8/10/2012

#### Spectrum Analyzers / Receivers / Preselectors

SA EMI Chamber (1327)

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
9kHz-13.2 GHz	E4405B	Agilent	MY45103416	1327	I	5/30/2013

#### Preamps / Couplers Attenuators / Filters

HF 20dB 50W Attenuator

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	6/1/2013

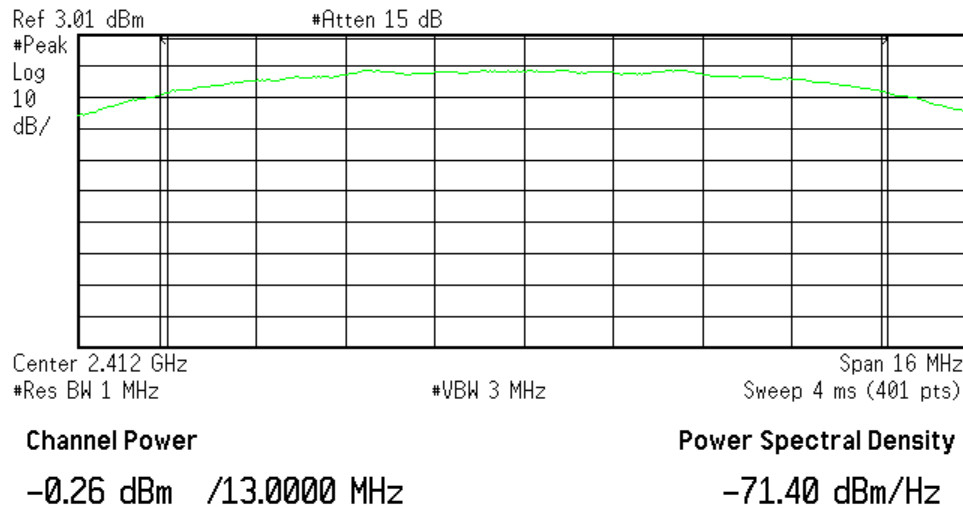
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



## PLOTS

\* Agilent 10:11:03 Aug 15, 2012

R T

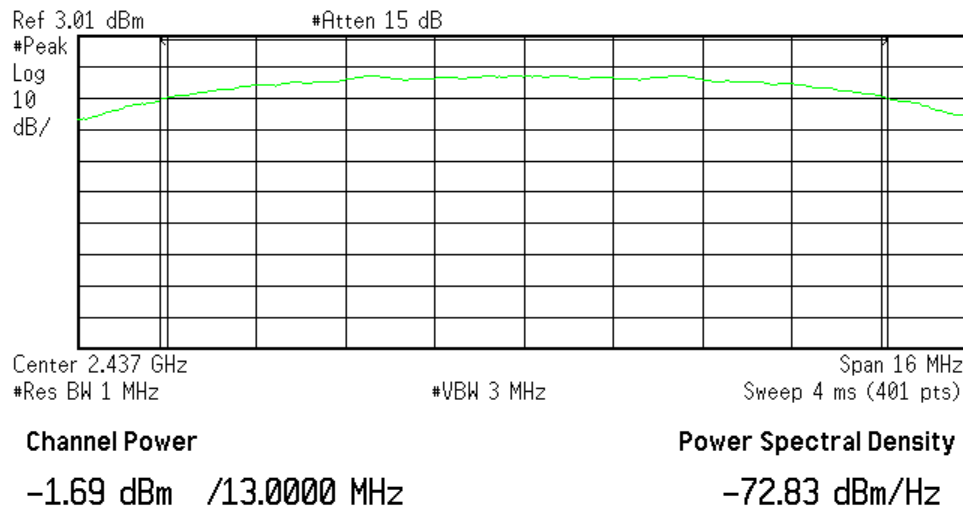


C:\temp.gif file saved

## Low Channel – 802.11b

\* Agilent 10:17:10 Aug 15, 2012

R T



C:\temp.gif file saved

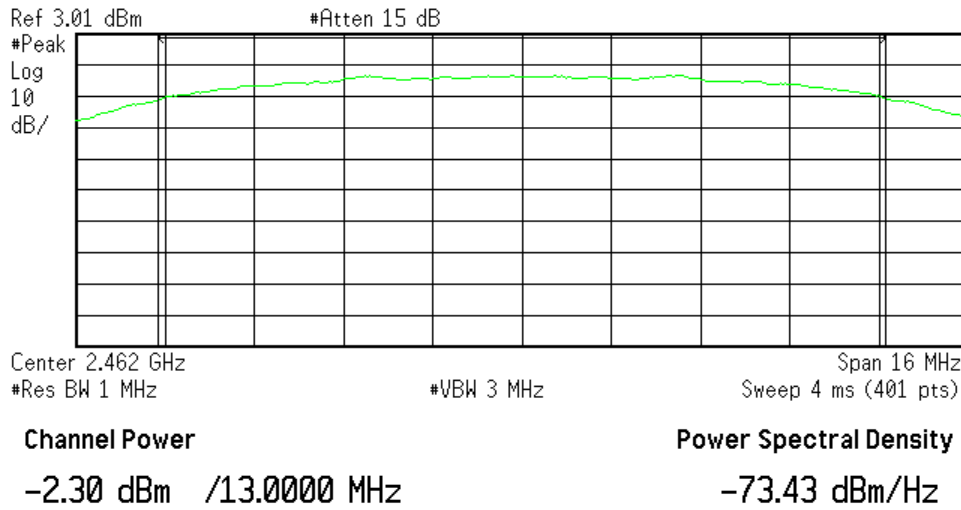
## Mid Channel – 802.11b





Agilent 10:26:20 Aug 15, 2012

R T

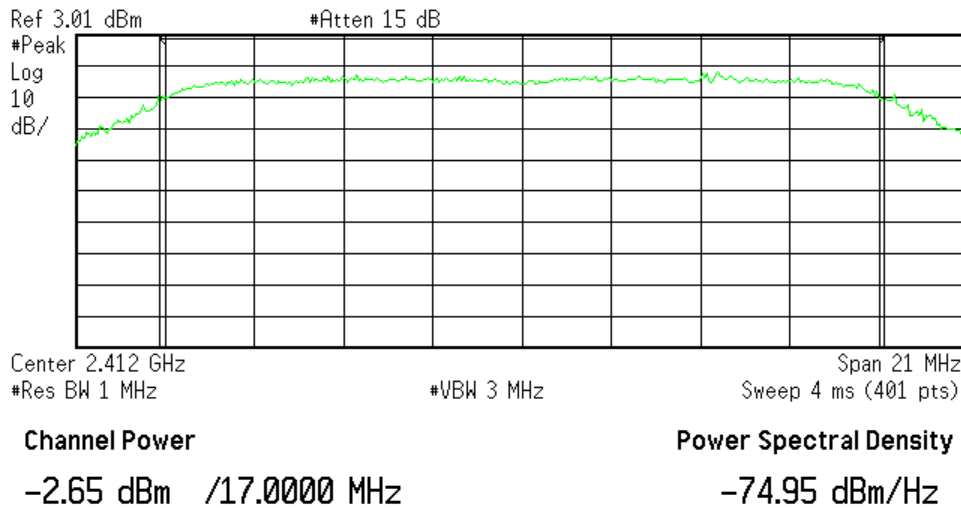


C:\temp.gif file saved

### High Channel – 802.11b

Agilent 11:05:43 Aug 15, 2012

R T



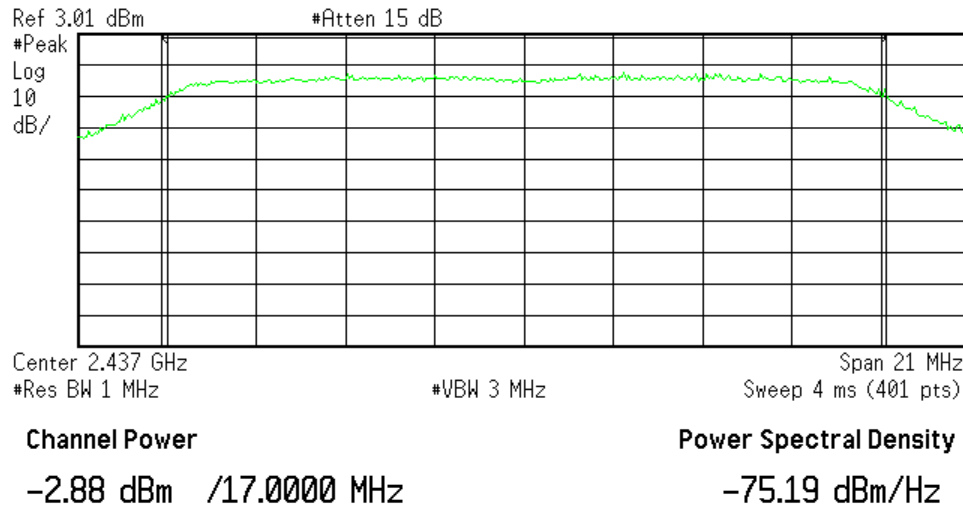
C:\temp.gif file saved

### Low Channel – 802.11g



Agilent 10:48:23 Aug 15, 2012

R T

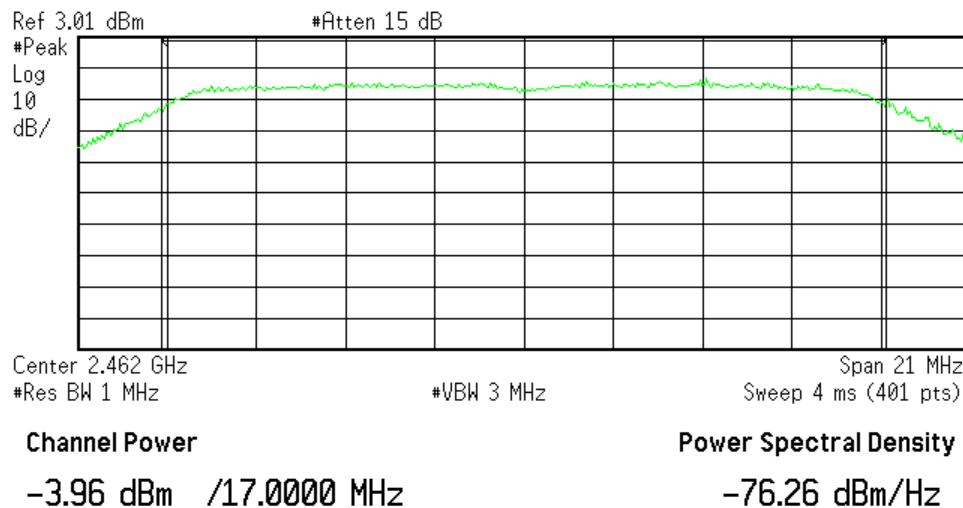


C:\temp.gif file saved

### Mid Channel – 802.11g

Agilent 10:39:32 Aug 15, 2012

R T



C:\temp.gif file saved

### High Channel – 802.11g



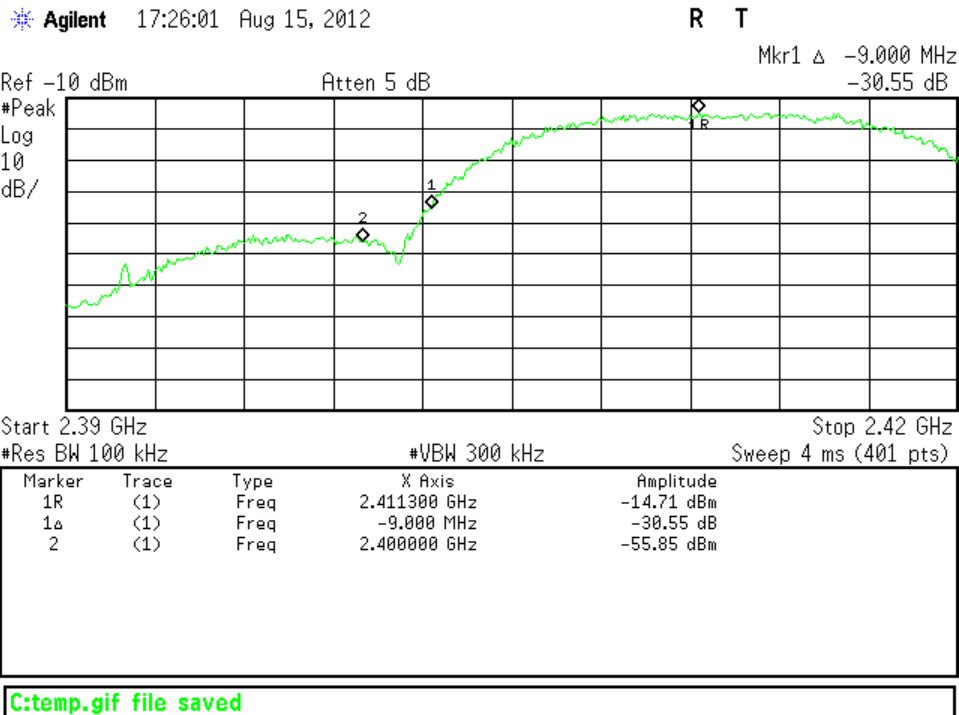
## Band Edge Measurements

### LIMITS

"In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits." [15.247(d)]

Engineer	TB
Site	3Min
Date	8-15-2012

### PLOTS



Low Band Edge – 802.11b

\* Agilent 17:23:27 Aug 15, 2012

R T

Mkr2 2.483500 GHz  
-75.59 dBm

Ref -10 dBm

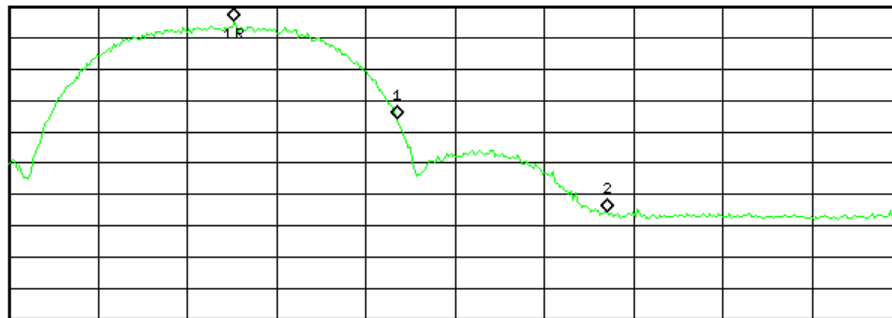
Atten 5 dB

#Peak

Log

10

dB/



Start 2.45 GHz

Stop 2.5 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 5.18 ms (401 pts)

Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Freq	2.462625 GHz	-14.69 dBm
1Δ	(1)	Freq	9.125 MHz	-31.42 dB
2	(1)	Freq	2.483500 GHz	-75.59 dBm

C:\temp.gif file saved

## High Band Edge – 802.11b

\* Agilent 17:30:43 Aug 15, 2012

R T

Mkr1 Δ -8.700 MHz  
-30.58 dB

Ref -10 dBm

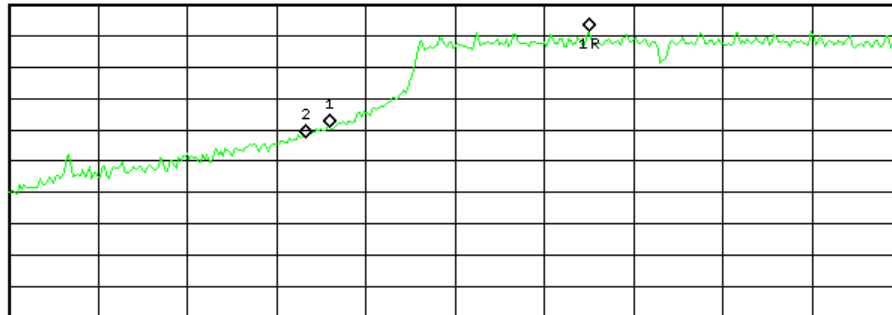
Atten 5 dB

#Peak

Log

10

dB/



Start 2.39 GHz

Stop 2.42 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 4 ms (401 pts)

Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Freq	2.409500 GHz	-18.72 dBm
1Δ	(1)	Freq	-8.700 MHz	-30.58 dB
2	(1)	Freq	2.400000 GHz	-52.58 dBm

C:\temp.gif file saved

## Low Band Edge – 802.11g



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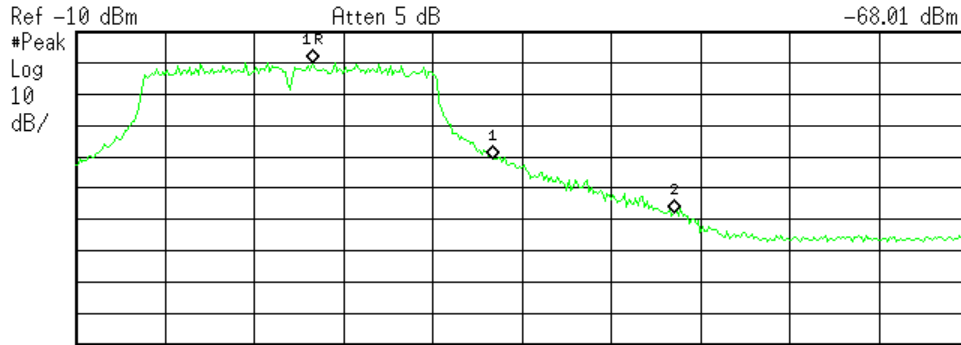
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Agilent 17:34:07 Aug 15, 2012

R T

Mkr2 2.483500 GHz  
-68.01 dBm



Start 2.45 GHz Stop 2.5 GHz  
#Res BW 100 kHz #VBW 300 kHz Sweep 5.18 ms (401 pts)

Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Freq	2.463250 GHz	-20.03 dBm
1Δ	(1)	Freq	10.125 MHz	-30.57 dB
2	(1)	Freq	2.483500 GHz	-68.01 dBm

C:\temp.gif file saved

## High Band Edge – 802.11g

Rev. 8/10/2012

**Spectrum Analyzers / Receivers / Preselectors**  
SA EMI Chamber (1327)

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
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**Preamps / Couplers Attenuators / Filters**  
HF 20dB 50W Attenuator

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	6/1/2013

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



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## Radiated Spurious Emissions

### LIMITS

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

[15.247(d)]

### MEASUREMENTS / RESULTS

Radiated Emissions Table												
Date: 20-Aug-12			Company: Doble			Work Order: M1484						
Engineer: Edward Breen			EUT Desc: Wiznet radio module			EUT Operating Voltage/Frequency: 120V/60Hz						
Temp: 25.1°C			Humidity: 29%			Pressure: 1005mBar						
Frequency Range: 30-1000MHz						Measurement Distance: 3 m						
Notes: 11b, 2412MHz, 11Mbps, 16dBm Continuous transmit mode												
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Pream p Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--			FCC Class B		
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
V	50	34.5	20.0	8.4	0.6	23.5	---	---	---	40.0	-16.5	Pass
V	94	33.5	19.9	8.7	0.8	23.1	---	---	---	43.5	-20.4	Pass
V	125	31.5	19.9	14.1	1.0	26.7	---	---	---	43.5	-16.8	Pass
V	184	36.2	19.9	11.3	1.2	28.8	---	---	---	43.5	-14.7	Pass
V	250	38.7	19.8	11.5	1.4	31.8	---	---	---	46.0	-14.2	Pass
H	276	46.5	19.7	13.2	1.5	41.5	---	---	---	46.0	-4.5	Pass
H	368	40.8	19.3	14.9	1.7	38.1	---	---	---	46.0	-7.9	Pass
H	400	37.3	19.8	15.5	1.8	34.8	---	---	---	46.0	-11.2	Pass
H	460	35.8	19.7	17.0	2.0	35.1	---	---	---	46.0	-10.9	Pass
Table Result: Pass by -4.5 dB Worst Freq: 276.0 MHz												
Test Site: EMI Chamber 1			Cable 1: Asset #1505			Cable 2: Asset #1507						
Analyzer: Gold			Preamp: Red			Antenna: Red-White						

Radiated Emissions Table												
Date: 20-Aug-12			Company: Doble				Work Order: M1484					
Engineer: Edward Breen			EUT Desc: Wiznet radio module				EUT Operating Voltage/Frequency: 120V/60Hz					
Temp: 25.1°C			Humidity: 29%				Pressure: 1005mBar					
Frequency Range: 30-1000MHz							Measurement Distance: 3 m					
Notes: 11g, 2412MHz, 54Mbps, 14dBm Continuous transmit mode												
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Pream p Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	---			FCC Class B		
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
V	50	34.7	20.0	8.3	0.6	23.6	---	---	---	40.0	-16.4	Pass
V	94	32.9	19.9	8.5	0.8	22.3	---	---	---	43.5	-21.2	Pass
V	125	31.4	19.9	14.1	1.0	26.6	---	---	---	43.5	-16.9	Pass
V	184	36.8	19.9	11.3	1.2	29.4	---	---	---	43.5	-14.1	Pass
H	230	35.8	19.6	11.2	1.5	28.9	---	---	---	46.0	-17.1	Pass
V	250	39.3	19.8	11.5	1.4	32.4	---	---	---	46.0	-13.6	Pass
H	276	46.5	19.7	13.2	1.5	41.5	---	---	---	46.0	-4.5	Pass
V	300	33.7	19.7	13.3	1.6	28.9	---	---	---	46.0	-17.1	Pass
H	350	37.2	19.5	14.2	1.7	33.6	---	---	---	46.0	-12.4	Pass
H	368	40.0	19.3	14.9	1.7	37.3	---	---	---	46.0	-8.7	Pass
H	400	37.1	19.8	15.5	1.8	34.6	---	---	---	46.0	-11.4	Pass
H	460	33.4	19.7	17.0	2.1	32.8	---	---	---	46.0	-13.2	Pass
H	828	27.8	19.2	21.5	2.8	32.9	---	---	---	46.0	-13.1	Pass
H	920	31.2	18.9	22.1	2.9	37.1	---	---	---	46.0	-8.9	Pass
Table Result: Pass by -4.5 dB Worst Freq: 276.0 MHz												
Test Site: EMI Chamber 1			Cable 1: Asset #1505				Cable 2: Asset #1507					
Analyzer: Gold			Preamp: Red				Antenna: Red-White					

Rev. 8/20/2012

Spectrum Analyzers / Receivers / Preselectors  
Gold

Range  
100Hz-26.5 GHz

MN  
E4407B

Mfr  
Agilent

SN  
MY45113816

Asset  
1284

Cat  
I

Calibration Due  
2/3/2013

Radiated Emissions Sites  
EMI Chamber 1

FCC Code  
719150

IC Code  
2762A-6

VCCI Code  
A-0015

Cat  
II

Calibration Due  
2/16/2014

Preamps / Couplers / Attenuators / Filters  
Red

Range  
0.009-2000MHz

MN  
ZF1-1000-LN

Mfr  
CS

SN  
N/A

Asset  
798

Cat  
II

Calibration Due  
4/13/2013

Antennas  
Red-White Billog

Range  
30-2000MHz

MN  
JB1

Mfr  
Sunol

SN  
A091604-1

Asset  
1105

Cat  
I

Calibration Due  
1/28/2013

Cables  
Asset #1505  
Asset #1507

Range  
9kHz - 18GHz  
9kHz - 26.5GHz

Mfr  
Florida RF  
Florida RF

SN  
C3166-1  
72457642

Asset  
831  
1345

Cat  
II  
II

Calibration Due  
2/9/2013  
1/31/2013

Meteorological Meters  
Weather Clock (Pressure Only)  
CHAMBER1 Thermohygrometer

MN  
BA928  
35519-044

Mfr  
Oregon Scientific  
Control Company

SN  
C3166-1  
72457642

Asset  
831  
1345

Cat  
I  
II

Calibration Due  
3/28/2013  
8/19/2013

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Band Edge / Harmonics / Spurious Emissions														
Date: 8/28/2012 & 8/29/2012				Company: Doble Engineering						Work Order: M1484				
Engineer: MH/CR				EUT Desc: Wiznet Module						EUT Operating Voltage/Frequency: 5VDC				
Temp: 24.8°C				Humidity: 35%						Pressure: 1001mBar				
Frequency Range: 1 -25GHz									Measurement Distance: 3 m and 1m above 10GHz					
Notes: * Reading taken at an OATS All three antenna dongles were evaluated. 802.11(b) & (g) modes evaluated														
Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average		
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
H	2390.0	50.5	35.0	19.7	28.6	3.3	62.7	47.2	74.0	-11.3	Pass	54.0	-6.8	Pass
H	2483.5	76.6	58.2	39.7	29.0	5.0	70.9	52.5	74.0	-3.1	Pass	54.0	-1.5	Pass
H*	4820.0	39.9	31.6	17.5	33.3	5.0	60.7	52.4	74.0	-13.3	Pass	54.0	-1.6	Pass
Table Result: Pass by -1.5 dB Worst Freq: 2483.5 MHz														
Test Site: EMI Chamber 2					Cable 1: Asset #1505					Cable 2: EMIR-HIGH-13				
Analyzer: Asset #1328					Preamp: Red-Blue					Antenna: Black Horn				
Test Site: 1DCC-OATS-3M-I					Cable 1: EMIR-HIGH-22									
Analyzer: Rental SA#2					Preamp: Brown & 18-26.5GHz PA					Antenna: Black Horn & 18-26.5GHz Horn				

Rev.9/8/2012

<b>Spectrum Analyzers / Receivers / Preselectors</b> SA EMI Chamber (1328)	<b>Range</b> 9kHz-13.2 GHz	<b>MN</b> E4405B	<b>Mfr</b> Agilent	<b>SN</b> MY44210241	<b>Asset</b> 1328	<b>Cat</b> I	<b>Calibration Due</b> 3/20/2013
<b>Radiated Emissions Sites</b> EMI Chamber 2	<b>FCC Code</b> 719150	<b>IC Code</b> 2762A-7	<b>VCCI Code</b> A-0015			<b>Cat</b> II	<b>Calibration Due</b> 2/15/2014
<b>Preamps / Couplers Attenuators / Filters</b> Red-Blue	<b>Range</b> 1-18GHz	<b>MN</b> PE2-38-218-4R5-17-15-SFF	<b>Mfr</b> CS	<b>SN</b> NA	<b>Asset</b> 1257	<b>Cat</b> II	<b>Calibration Due</b> 12/13/2012
<b>Antennas</b> Black Horn	<b>Range</b> 1-18GHz	<b>MN</b> 3115	<b>Mfr</b> EMCO	<b>SN</b> 9703-5148	<b>Asset</b> 56	<b>Cat</b> I	<b>Calibration Due</b> 6/29/2013
<b>Cables</b> Asset #1505 REMI-High-13	<b>Range</b> 9kHz - 18GHz 9kHz - 26.5GHz		<b>Mfr</b> Florida RF C-S			<b>Cat</b> II II	<b>Calibration Due</b> 2/9/2013 1/31/2013
<b>Meteorological Meters</b> Weather Clock (Pressure Only) CHAMBER2 Thermohygrometer		<b>MN</b> BA928 35519-044	<b>Mfr</b> Oregon Scientific Control Company	<b>SN</b> C3166-1 72457639	<b>Asset</b> 831 1347	<b>Cat</b> I II	<b>Calibration Due</b> 3/28/2013 8/19/2013

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## Conducted Spurious Emissions

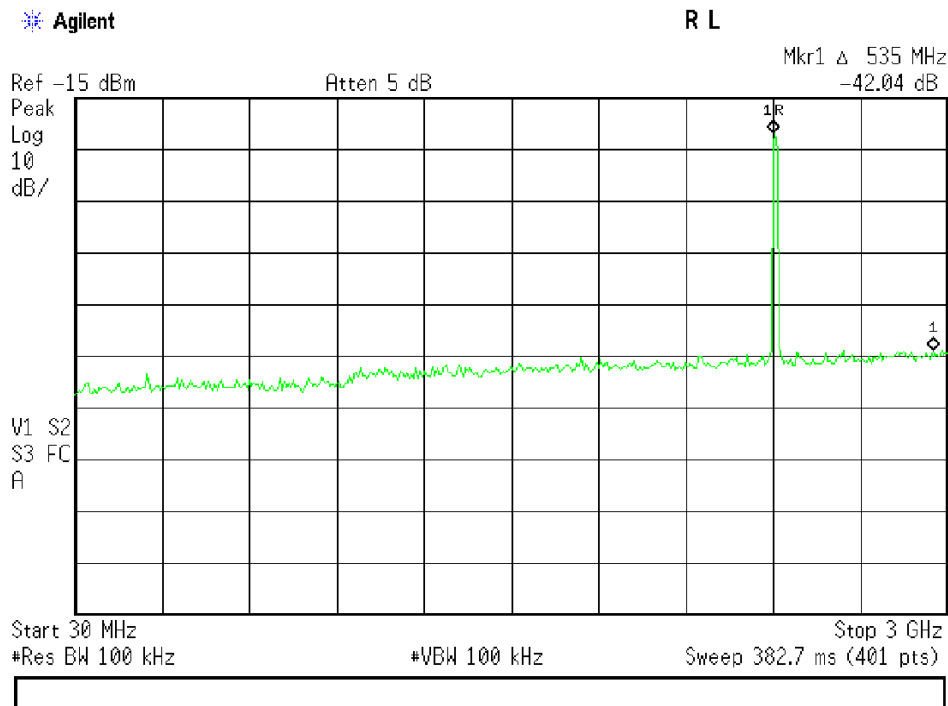
### LIMITS

*In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth that contains the highest level of desired power...*

[15.247(d)]

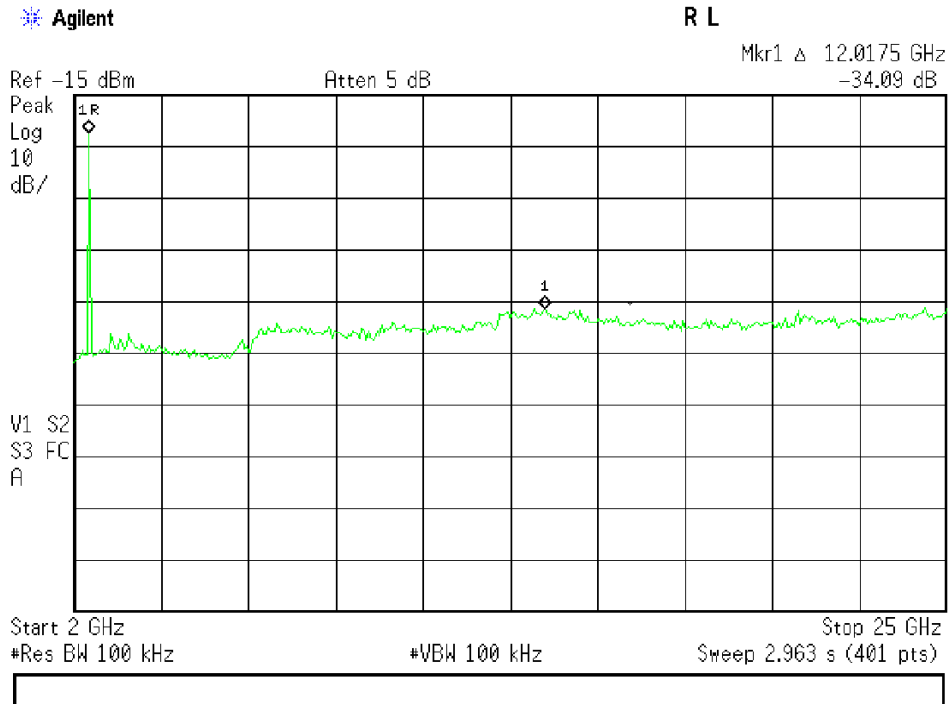
Engineer	CR
Site	3Min
Date	8-13-2012

### MEASUREMENTS / RESULTS

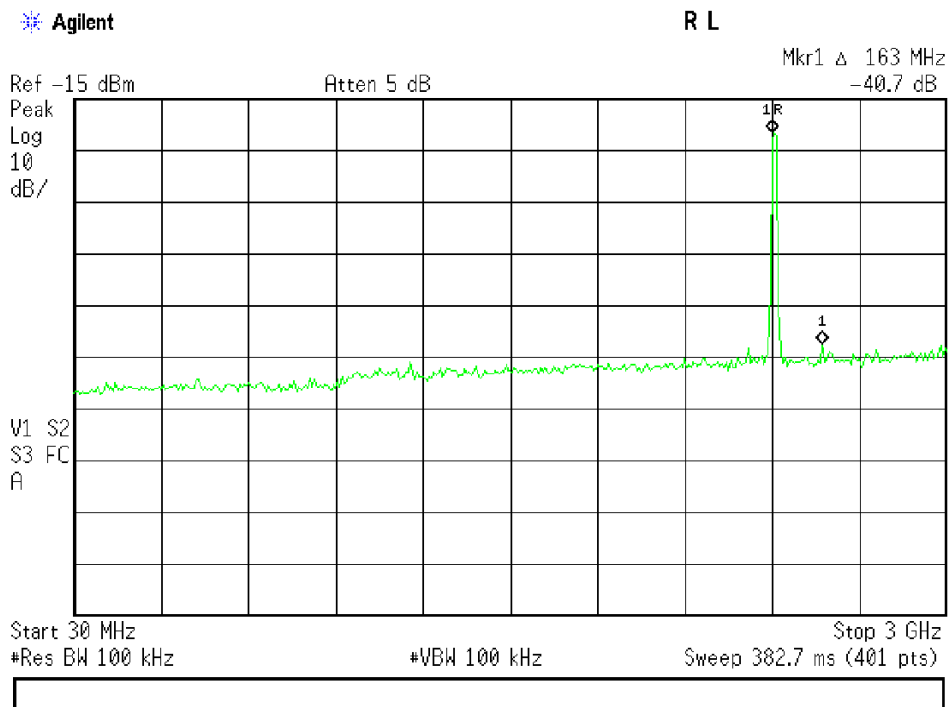


802.11b – 30MHz – 3GHz





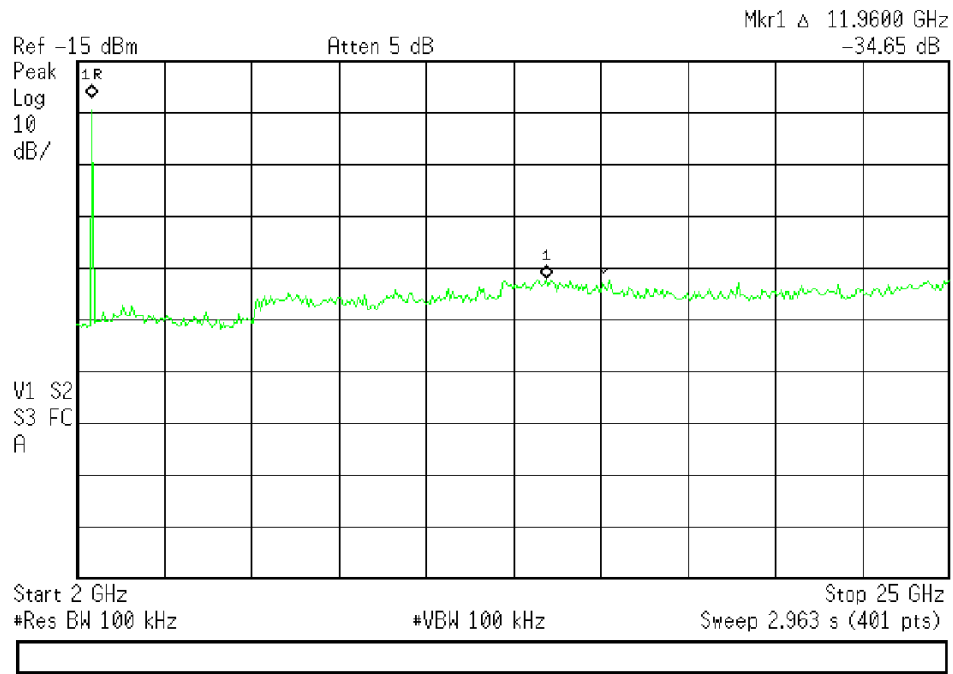
### 802.11b – 2GHz – 25GHz



### 802.11g – 30MHz – 3GHz

Agilent

R L



802.11g – 2GHz – 25GHz

## Power Spectral Density

### LIMIT

...the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.  
[15.247(e)]

Engineer	TB
Site	3Min
Date	8-15-2012

### MEASUREMENTS / RESULTS

#### 5.3 Maximum Power Spectral Density Level: Peak

channel (MHz)	mode	rate (Mbps)	power setting in ART (dBm)	measured peak 100kHz RBW (dBm)	attenuator factor (dB)	dongle factor (dB)	adjusted power measurement (dBm)	bandwidth correction factor adjustment (dBm)	limit (dBm)	margin (dB)	result
2412	11b	1	16	-14.92	19.98	0.9	5.96	-9.24	8	-17.24	pass
2412	11b	5.5	16	-13.94	19.98	0.9	6.94	-8.26	8	-16.26	pass
2412	11b	11	16	-13.84	19.98	0.9	7.04	-8.16	8	-16.16	pass
2437	11b	1	16	-15.87	19.98	0.9	5.01	-10.19	8	-18.19	pass
2437	11b	5.5	16	-15.37	19.98	0.9	5.51	-9.69	8	-17.69	pass
2437	11b	11	16	-14.43	19.98	0.9	6.45	-8.75	8	-16.75	pass
2462	11b	1	16	-16.69	20.02	0.9	4.23	-10.97	8	-18.97	pass
2462	11b	5.5	16	-16.22	20.02	0.9	4.7	-10.5	8	-18.5	pass
2462	11b	11	16	-15.17	20.02	0.9	5.75	-9.45	8	-17.45	pass
2412	11g	6	14	-19.34	19.98	0.9	1.54	-13.66	8	-21.66	pass
2412	11g	24	14	-18.75	19.98	0.9	2.13	-13.07	8	-21.07	pass
2412	11g	54	14	-18.56	19.98	0.9	2.32	-12.88	8	-20.88	pass
2437	11g	6	14	-19.14	19.98	0.9	1.74	-13.46	8	-21.46	pass
2437	11g	24	14	-19.13	19.98	0.9	1.75	-13.45	8	-21.45	pass
2437	11g	54	14	-18.86	19.98	0.9	2.02	-13.18	8	-21.18	pass
2462	11g	6	14	-20.70	20.02	0.9	0.22	-14.98	8	-22.98	pass
2462	11g	24	14	-20.44	20.02	0.9	0.48	-14.72	8	-22.72	pass
2462	11g	54	14	-20.46	20.02	0.9	0.46	-14.74	8	-22.74	pass

Rev. 8/10/2012

#### Spectrum Analyzers / Receivers / Preselectors

SA EMI Chamber (1327)

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
9kHz-13.2 GHz	E4405B	Agilent	MY45103416	1327	I	5/30/2013

#### Preamps / Couplers Attenuators / Filters

HF 20dB 50W Attenuator

Range	MN	Mfr	SN	Asset	Cat	Calibration Due
0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	6/1/2013

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## PLOTS

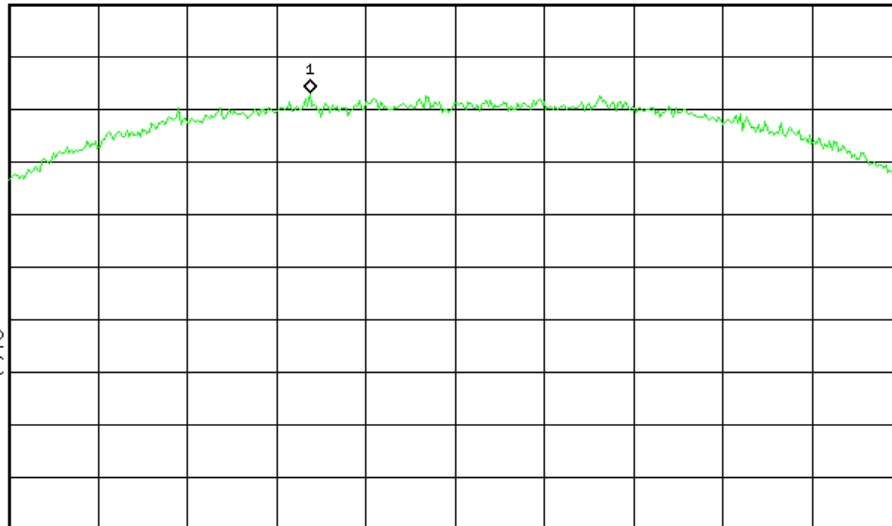
\* Agilent 12:13:11 Aug 15, 2012

R T

Mkr1 2.40940 GHz  
-13.94 dBm

Ref 3.01 dBm

#Atten 15 dB

#Peak  
Log  
10  
dB/V1 S2  
S3 FC

Center 2.412 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 16 MHz  
Sweep 4 ms (401 pts)

C:\temp.gif file saved

## Low Channel – 802.11b

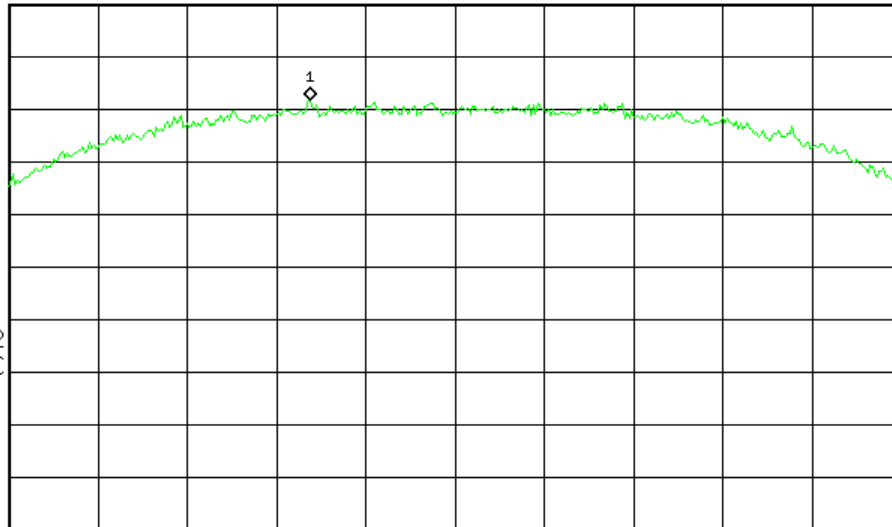
\* Agilent 12:11:47 Aug 15, 2012

R T

Mkr1 2.43440 GHz  
-15.37 dBm

Ref 3.01 dBm

#Atten 15 dB

#Peak  
Log  
10  
dB/V1 S2  
S3 FC

Center 2.437 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 16 MHz  
Sweep 4 ms (401 pts)

C:\temp.gif file saved

## Mid Channel – 802.11b

\* Agilent 12:26:54 Aug 15, 2012

R T

Mkr1 2.46468 GHz  
-16.22 dBm

Ref 3.01 dBm

#Atten 15 dB

#Peak  
Log  
10  
dB/V1 S2  
S3 FC

Center 2.462 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 16 MHz  
Sweep 4 ms (401 pts)

C:\temp.gif file saved

## High Channel – 802.11b

\* Agilent 12:53:44 Aug 15, 2012

R T

Mkr1 2.4107400 GHz  
-18.75 dBm

Ref 0 dBm

#Atten 10 dB

#Peak  
Log  
10  
dB/V1 S2  
S3 FC

Center 2.412 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 21 MHz  
Sweep 4 ms (401 pts)

C:\temp.gif file saved

## Low Channel – 802.11g



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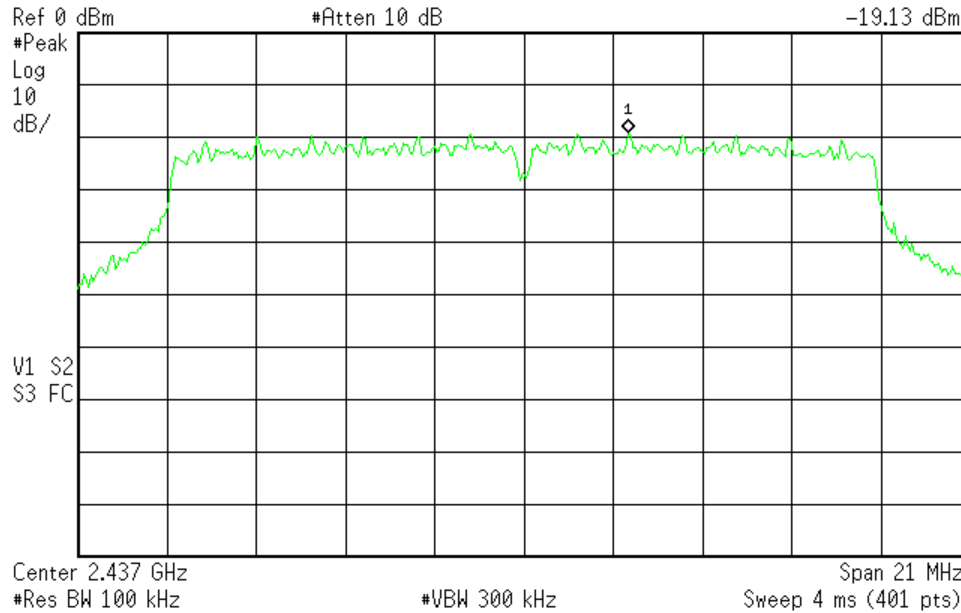
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Agilent 12:48:16 Aug 15, 2012

R T

Mkr1 2.4394675 GHz  
-19.13 dBm



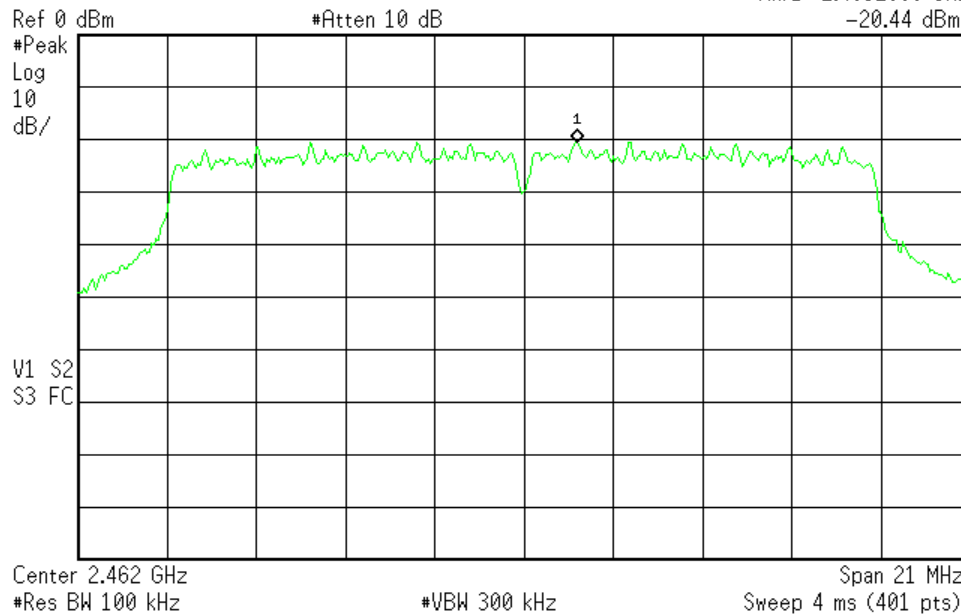
C:\temp.gif file saved

### Mid Channel – 802.11g

Agilent 12:33:38 Aug 15, 2012

R T

Mkr1 2.4632600 GHz  
-20.44 dBm



C:\temp.gif file saved

### High Channel – 802.11g



## AC Line Conducted Emissions LIMITS

Frequency of emission (MHz)	Quasi-peak limit (dBμV)	Average limit (dBμV)
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

[47 CFR 15.207(a)]

## MEASUREMENTS / RESULTS

AC Side of a DC Supply Conducted Emissions																	
Date: 28-Aug-12 Engineer: Karl Klemm Temp: 24.5 °C					Company: Doble Engineering EUT Desc: F6150-SV with WiFi Module (Wiznet wireless (B+G)) Humidity: 41%					Work Order: M1484 Pressure: 1000 mBar							
Notes: WiFi module only - powered by an AC/DC adapter																	
Frequency Range: 0.15-30MHz																	
EUT Input Voltage/Frequency: 230Vac, 50Hz																	
Frequency (MHz)	Quasi-Peak Readings		Average Readings		LISN Factors		Cable Factor (dB)	ATTN Factor (dB)	FCC/CISPR Class B			FCC/CISPR Class B					
	OP1 (dBuV)	QP2 (dBuV)	AVG1 (dBuV)	AVG2 (dBuV)	L1 (dB)	L2 (dB)			OP Limit (dB)	Margin (dB)	Result (Pass/Fail)	AVG Limit (dB)	Margin (dB)	Result (Pass/Fail)			
	0.49	33.3	23.6	16.9	13.8	-0.6			-0.2	-0.1	-19.9	56.2	-2.4	Pass	46.2	-8.8	Pass
	0.86	24.8	19.7	10.9	6.9	-0.5			-0.1	-0.1	-19.9	56.0	-10.8	Pass	46.0	-14.7	Pass
	1.64	26.7	15.9	9.8	4.5	-0.3			-0.1	-0.1	-19.8	56.0	-9.1	Pass	46.0	-16.0	Pass
	0.15	37.3	39.7	2.8	2.3	-1.2			-0.5	-0.1	-19.9	66.0	-5.8	Pass	56.0	-32.1	Pass
	0.16	35.3	38.6	11.5	6.8	-1.0			-0.4	-0.1	-19.9	65.4	-6.4	Pass	55.4	-22.9	Pass
	0.53	30.4	22.0	15.1	11.9	-0.6			-0.2	-0.1	-19.9	56.0	-5.1	Pass	46.0	-10.4	Pass
	Result: Pass					Worst Margin: -2.4 dB					Frequency: 0.49 MHz						
	Measurement Device: 230VAC LISN Asset 1492					Cable: CEMI-07					Spectrum Analyzer: Black						
					Attenuator: 20dB Attenuator-38					Site: CEMI 1							

<b>Spectrum Analyzers / Receivers / Preselectors</b> Black	<b>Range</b> 9kHz-12.8GHz	<b>MN</b> 8596E	<b>Mfr</b> Agilent	<b>SN</b> 3710A00944	<b>Asset</b> 337	<b>Cat</b> I	<b>Calibration Due</b> 12/2/2012
<b>LISNs/Measurement Probes</b> 230VAC LISN Asset 1492	<b>Range</b> 10kHz-50MHz	<b>MN</b> 9252-50-R-24-BNC	<b>Mfr</b> Solar	<b>SN</b> 84713	<b>Asset</b> 1492	<b>Cat</b> I	<b>Calibration Due</b> 5/10/2013
<b>Conducted Test Sites (Mains / Telco)</b> CEMI 1	<b>FCC Code</b> 719150		<b>VCCI Code</b> A-0015			<b>Cat</b> III	<b>Calibration Due</b> NA
<b>Cables</b> CEMI-07	<b>Range</b> 9kHz - 2GHz		<b>Mfr</b> C-S			<b>Cat</b> II	<b>Calibration Due</b> 5/1/2013
<b>Meteorological Meters</b> Weather Clock (Pressure Only) CEMI1 Thermohyrometer		<b>MN</b> BA928 35519-044	<b>Mfr</b> Oregon Scientific Control Company	<b>SN</b> C3166-1 72457738	<b>Asset</b> 831 1335	<b>Cat</b> I II	<b>Calibration Due</b> 3/28/2013 8/19/2013

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



## Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radiated Emissions (30-1000MHz)		
NIST	5.6dB	N/A
CISPR	4.6dB	5.2dB (Ucisprr)
Radiated Emissions (1-26.5GHz)	4.6dB	N/A
Radiated Emissions (above 26.5GHz)	4.9dB	N/A
Magnetic Radiated Emissions	5.6dB	N/A
Conducted Emissions		
NIST	3.9dB	N/A
CISPR	3.6dB	3.6dB (Ucisprr)
Telco Conducted Emissions (Current)	2.9dB	N/A
Telco Conducted Emissions (Voltage)	4.4dB	N/A
Electrostatic Discharge	11.5%	N/A
Radiated RF Immunity (Uniform Field)	1.6dB	N/A
Electrical Fast Transients	23.1%	N/A
Surge	23.1%	N/A
Conducted RF Immunity	3dB	N/A
Magnetic Immunity	12.8%	N/A
Dips and Interrupts	2.3V	N/A
Harmonics	3.5%	N/A
Flicker	3.5%	N/A
Radio frequency (@ 2.4GHz)	$3.23 \times 10^{-8}$	$1 \times 10^{-7}$
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation:		
• Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	3.4% 0.3dB	5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		



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## Conditions Of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "BUREAU VERITAS," "BUREAU VERITAS CONSUMER PRODUCTS SERVICES," "BVCPS," "MTL," "ACTS," "MTL-ACTS" and "CURTIS-STRAUS" (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only where such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.



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13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.

14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.

15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B) NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE, OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.\$10,000, WHICHEVER IS THE LESSER AMOUNT.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

Rev.160009121(2)\_#684340 v13CS

