

## **COMPLIANCE WORLDWIDE INC. TEST REPORT 291-07**

**In Accordance with the Requirements of**

**Industry Canada RSS 310, Issue 2  
Federal Communications Commission CFR Title 47 Part 15.249 Subpart C  
Radio Communication Devices  
Intentional Radiators**

**Issued to**

**Valeo Raytheon Systems, Inc.  
46 River Road  
Hudson, NH 03051-5227**


**Tel: (603) 578-8000**

**for**

**Blind-Spot Detection Sensor**

**FCC ID: UR8100261**

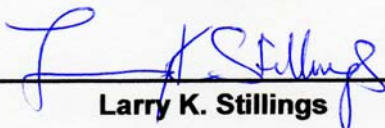
**Report Issued on October 10, 2007**

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**Brian F. Breault**

**Reviewed By**

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**Larry K. Stillings**

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## 1. Scope

This test report certifies that the Valeo Raytheon Systems, Inc. Blind-Spot Detection Sensor, as tested, meets the RSS 310 Rules and FCC Part 15.249, requirements. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

## 2. Product Details

- 2.1. Manufacturer:** Valeo Raytheon Systems, Inc.
- 2.2. Model Number:** Blind-Spot Detection System
- 2.3. Serial Number:** 6769135072010910
- 2.4. Description:** The Blind-Spot Detection system utilizes multi beam radar sensors located out of sight behind the bumper fascia. These sensors monitor the adjacent lanes of traffic on the left and right sides of the vehicle and alert the driver to the presence of objects of interest, such as cars, trucks and motorcycles, in the driver's blind spots.
- 2.5. Power Source:** 12 Volt DC (Automobile)
- 2.6. EMC Modifications:** Snubber filters on PC board Vias

## 3. Product Configuration

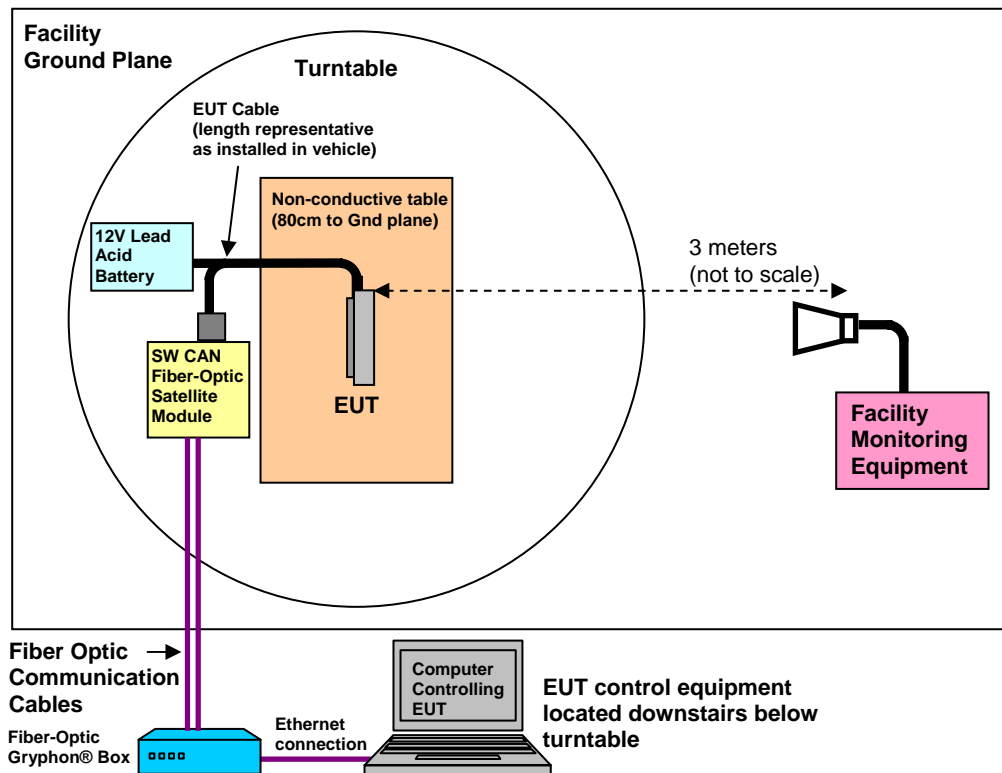
### 3.1. Operational Characteristics & Software

The Multi Beam Radar (MBR) is a frequency modulated continuous wave (FMCW) radar sensor module operating in the 24.0–24.25GHz band per FCC part 15, section 15.249. In order to ensure that the unit remains within the band limitations of 15.249, it undergoes a five point frequency calibration process every 256 milliseconds when it is operational. The unit is never operated without the frequency calibration process running when installed in a vehicle.

In order to satisfy test requirements, a special test feature has been incorporated so that the frequency sweep can be stopped at the low, mid and upper points of the band. This is accomplished by putting the Voltage Controlled Oscillator (VCO) control voltage at a fixed level that corresponds to the level determined by the last calibration. However, the software does not perform the frequency calibration process when the sweep is stopped. Consequently band edge compliance cannot be ensured in this mode of operation, and therefore it is critical that band edge compliance be verified with the unit in its operational mode. This special test feature is never enabled when the unit is installed in a vehicle.

### 3. Product Configuration (continued)

#### 3.2. Block Diagram



### 4. Measurements Parameters

#### 4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due
Spectrum Analyzer	Hewlett Packard	8593E	3829A03887	3/07/2008
Spectrum Analyzer	Agilent	E4407B	MY45108355	11/22/2008
Microwave Preamplifier	Hewlett Packard	8449B	3008A01323	9/21/2008
Biconilog Antenna	Com-Power	AC220	25509	8/3/2008
Horn Antenna	Electro-Metrics	EM-6961	6337	8/24/2008
Horn Antenna	Com-Power	AH-840	3075	8/24/2008
Mixer Horn Antenna	Hewlett Packard Alpha Industries	11970A 861A/599	3003A08210 324	Not Req'd
Mixer Horn Antenna	Hewlett Packard M/A Com Baytron	11970U 3-19-720	2332A00425 N/A	Not Req'd
Mixer Horn Antenna	Hewlett Packard Aerowave	11970V 15-7025	2521A00357 N/A	Not Req'd
Mixer Horn Antenna	Hewlett Packard Alpha Industries	11970W 861A/387	2521A00230 359	Not Req'd

#### 4. Measurements Parameters (continued)

##### 4.2. Measurement & Equipment Setup

Test Date:	10/01/2007
Test Engineer:	Larry K. Stillings Brian F. Breault
Normal Site Temperature (15 - 35°C):	20.6
Relative Humidity (20 - 75%RH):	35
Frequency Range:	30.0 MHz – 100 GHz
Measurement Distance:	3 Meters <sup>1</sup>
EMI Receiver IF Bandwidth:	30 – 1000 MHz: 100 kHz Above 1 GHz : 1 MHz
EMI Receiver Avg Bandwidth:	30 – 1000 MHz: 300 kHz Above 1 GHz : 3 MHz
Detector Function:	30 – 1000 MHz: Quasi-Pk Above 1 GHz : Average

<sup>1</sup> See the footnotes for each section of this report for any variances in the measurement distance.

##### 4.3. Measurement Procedure

Test measurements were made in accordance FCC Part 15.249: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

The test methods used to generate the data in this test report is in accordance with ANSI C63.4: 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. Above 30 GHz, the FCC Millimeter Wave Test Procedures were followed.

In accordance with ANSI C63.4-2003, section 13.1.4.1, c), the device under test was rotated through three orthogonal axes to determine which attitude produced the highest emission relative to the limit. The attitude that produced the highest emission relative to the limit was used for all radiated emission measurements. This procedure was implemented for both the fundamental field strength measurements and spurious measurements.

## 5. Measurement Summary

Test Requirement	FCC Rule Requirement	Test Report Section	Result	Comment
Antenna Requirement	15.203	N.A	Compliant	Unit has an internal PCB etched antenna.
Radiated Field Strength of Fundamental	15.249 (a)	6.1	Compliant	
Radiated Field Strength of Harmonics	15.249 (a)	6.2	Compliant	
Occupied Bandwidth		6.3	Compliant	
99% Bandwidth	RSS 310	6.4	Compliant	
Band Edge Measurements	15.249 (d), 15.209	6.5	Compliant	
Spurious Radiated Emissions	15.249 (d), 15.209	6.6	Compliant	
Conducted Emissions	15.207	N/A	N/A	DUT is powered by the automotive electrical system.

## 6. Measurement Data

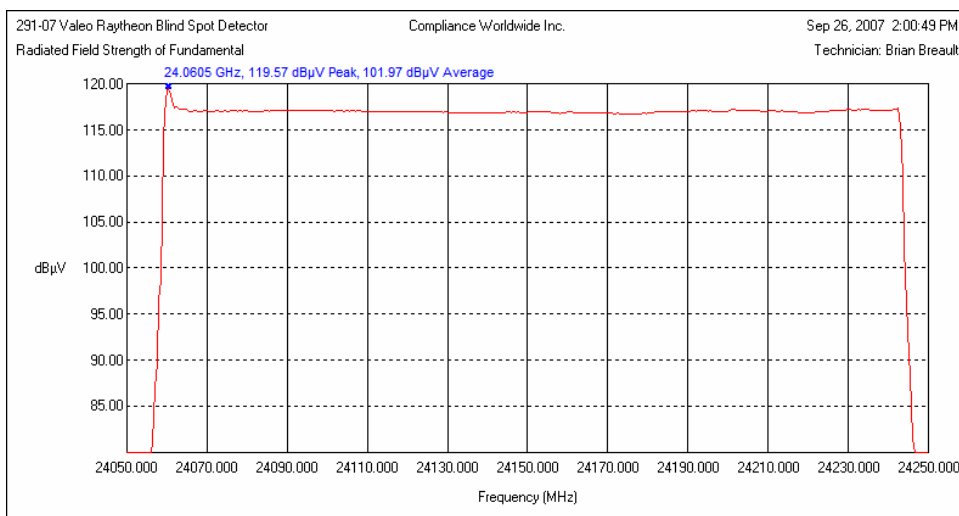
### 6.1. Radiated Field Strength of Fundamental (15.249, Section (a))

Requirement: The 3 meter field strength of the fundamental emissions from intentional radiators operated within the 24.0 to 24.25 GHz frequency bands shall comply with the following requirement: 250 millivolts/meter (108 dB $\mu$ V/m), average mode measurement. The peak may not exceed the average by more than 20 dB.

Meas. <sup>1</sup>	Frequency (GHz)	Amplitude <sup>2</sup> (dB $\mu$ V/m @ 3M)		Avg Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
		Peak	Average						
1	24.0595	119.95	102.35	108	-5.65	V	100	5	Passed
2	24.1513	119.73	102.13	108	-5.87	V	100	5	Passed
3	24.2439	119.97	102.37	108	-5.63	V	100	5	Passed

- Three points representing the low, middle and high points of the device under test were taken across the span of the measured signal in non-sweeping mode. Refer to Section 3.1 for additional information regarding sweeping vs. non-sweeping modes.
- Amplitude values include all correction factors.

#### 6.1.1. Peak Radiated Field Strength of Fundamental



Meas. <sup>1</sup>	Frequency (GHz)	Amplitude <sup>2</sup> (dB $\mu$ V/m @ 3M)		Avg Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
		Peak	Average						
1	24.06050	119.57	101.97	108.0	-6.03	H	100	5	Passed

- Unit was in normal operational (sweeping) mode.
- Amplitude values include all correction factors.

## 6. Measurement Data (continued)

### 6.2. Radiated Field Strength of Harmonics (15.249, Section (a))

Requirement: The 3 meter field strength of the harmonic emissions from intentional radiators operated within the 24.0 to 24.25 frequency bands shall comply with the following: 2500 microvolts/meter (68 dB $\mu$ V/m), average mode measurement. Peak field strength may not be greater than 20 dB above the average limit (88 dB $\mu$ V/m).

Peak Reading – 1 MHz RBW / 3 MHz VBW

Average Reading – 1 MHz RBW / 10 Hz VBW

#### 6.2.1. Measurement made with unit in normal operating mode.

1. Refer to Section 3.1 for information regarding sweeping vs. non-sweeping modes.
2. Corr. Fact. = Cable Loss + Antenna Factor + Distance Correction.

Frequency (MHz)	Amplitude (dB $\mu$ V)		Corr. Fact. (dB)	Amplitude (dB $\mu$ V/m)		Average Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg		Peak	Avg						
48.12625 <sup>1</sup>	44.38	25.74	34.31	78.69	60.05	67.96	-7.91	V	105	345	Passed
72	There were no measurable emissions at 72 GHz										Passed
96	There were no measurable emissions at 96 GHz										Passed

<sup>1</sup> – Measurement as taken at 1 meter. Cable Loss + Antenna Factor = 43.85 dB. Distance Correction = -9.54 dB.

#### 6.2.2. Measurement made with unit frequency sweep stopped.

1. Refer to Section 3.1 for information regarding sweeping vs. non-sweeping modes.
2. Corr. Fact. = Cable Loss + Antenna Factor + Distance Correction.

Band	Freq. (GHz)	Amplitude (dB $\mu$ V)		Corr. Factor (dB)	Amplitude (dB $\mu$ V/m)		Limit (dB $\mu$ V/m)	Margin (dB)	Pol (H/V)	El. (cm)	Az. (deg)
		Peak	Avg		Peak	Avg					
Low	48.1184	42.19	30.26	34.31	76.50	64.57	67.96	-3.39	V	107	290
Mid	48.2998	41.25	29.75	34.31	75.56	64.06	67.96	-3.90	V	107	290
High	48.4809	39.96	28.32	34.31	74.27	62.63	67.96	-5.33	V	107	290

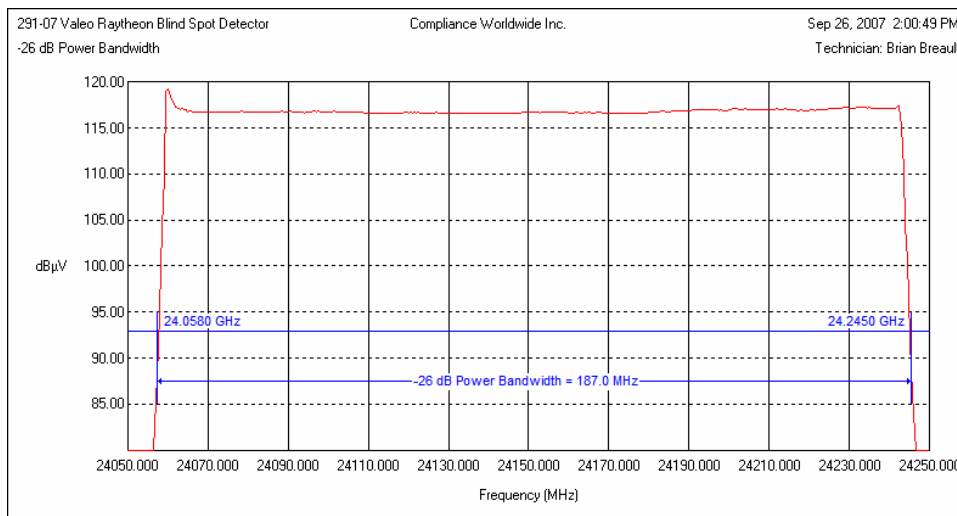
<sup>1</sup> – Measurement as taken at 1 meter. Cable Loss + Antenna Factor = 43.85 dB. Distance Correction = -9.54 dB.

## 6. Measurement Data (continued)

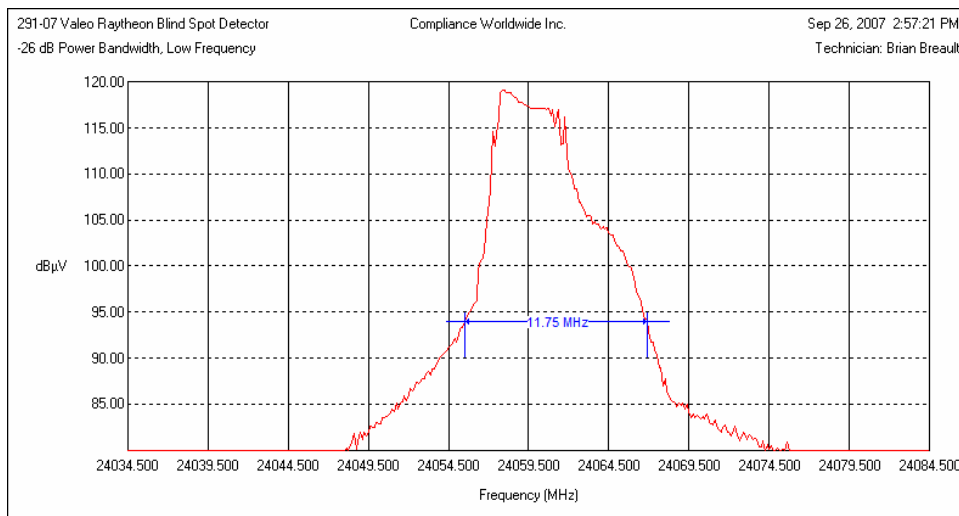
### 6.3 Occupied Bandwidth

Requirement: The occupied bandwidth measurements on an intentional radiator shall be made in accordance with the requirements outlined in ANSI C63.4-2003, Section 13.1.7.

#### 6.3.1. Occupied Bandwidth, Normal Operation -26 dB Bandwidth = 187 MHz



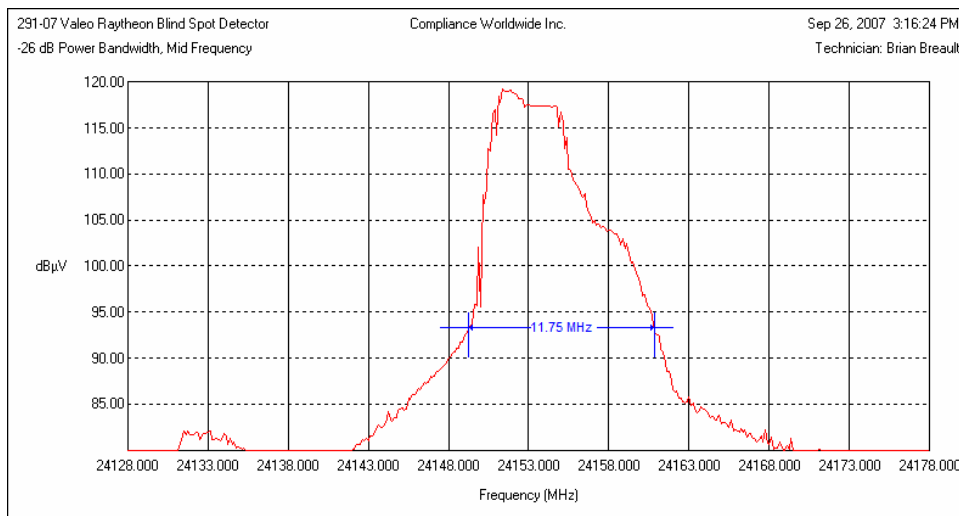
#### 6.3.2. Occupied Bandwidth, Non-Sweeping Operation, Low Frequency -26 dB Bandwidth = 11.75 MHz



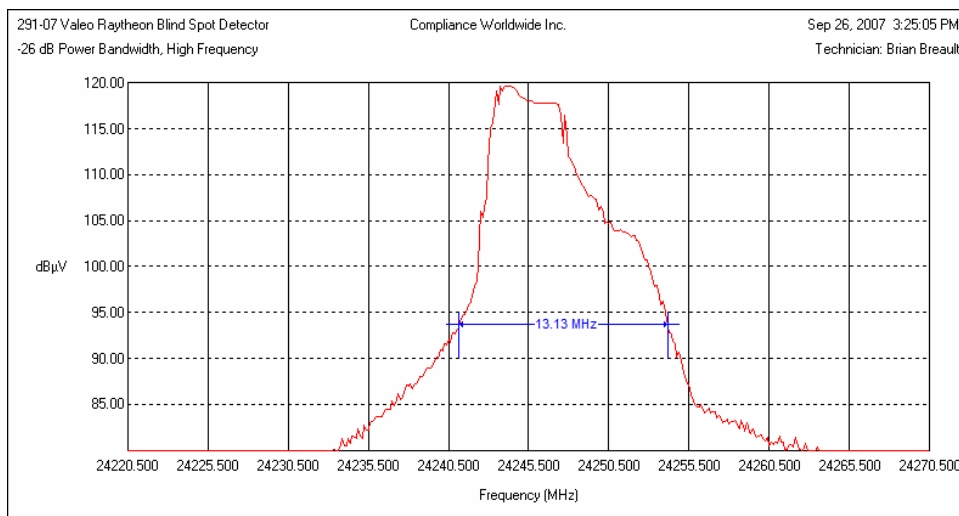
## 6. Measurement Data (continued)

### 6.3. Occupied Bandwidth (continued)

#### 6.3.3. Occupied Bandwidth, Non-Sweeping Operation, Middle Frequency -26 dB Bandwidth = 11.75 MHz



#### 6.3.4. Occupied Bandwidth, Non-Sweeping Operation, High Frequency -26 dB Bandwidth = 13.13 MHz

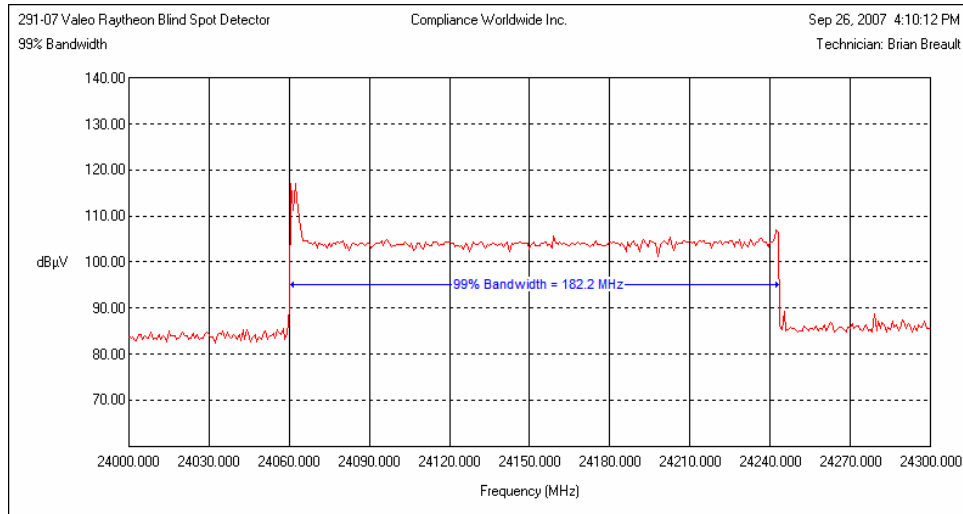


## 6. Measurement Data (continued)

### 6.4. 99% Bandwidth

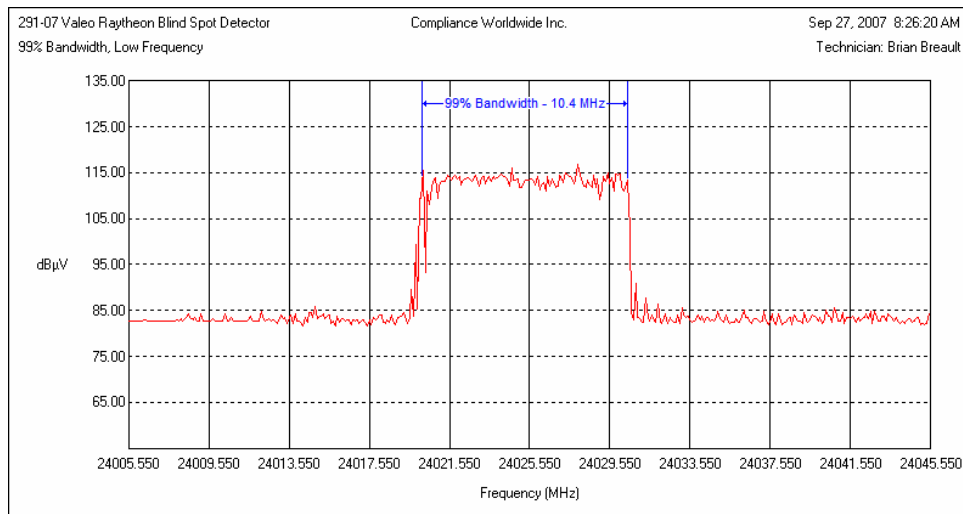
#### 6.4.1. 99% Bandwidth, Normal Operation

**99% Bandwidth = 182.2 MHz**



#### 6.4.2. 99% Bandwidth, Non-Sweeping Operation, Low Frequency

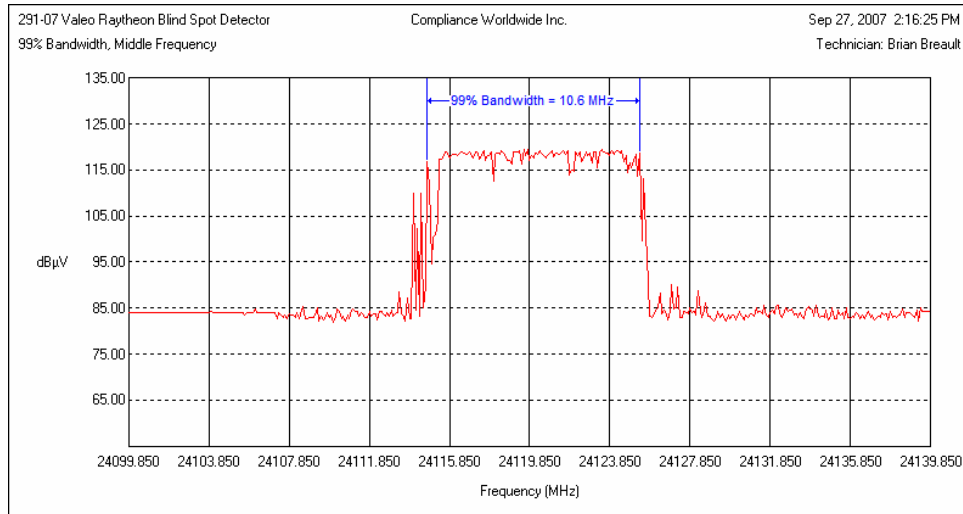
**99% Bandwidth = 10.40 MHz**



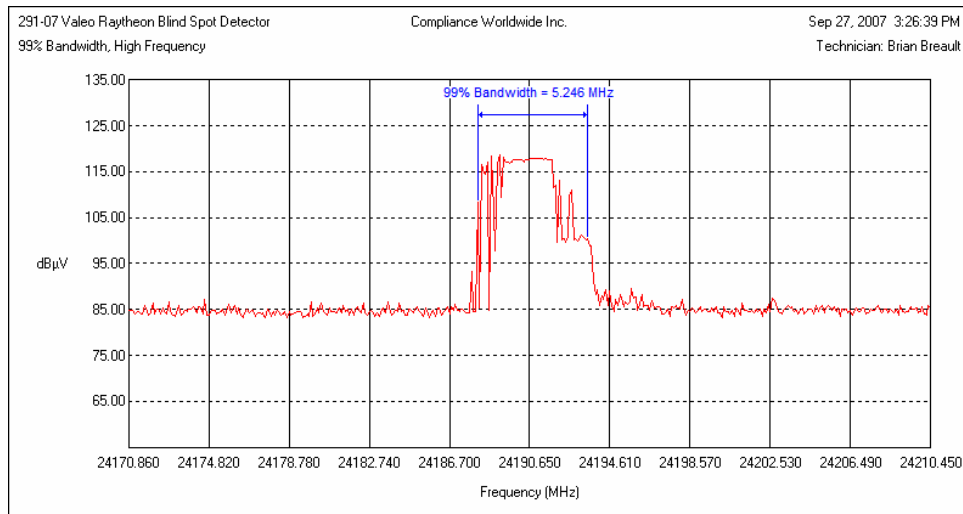
## 6. Measurement Data (continued)

### 6.4. 99% Bandwidth (continued)

#### 6.4.3. 99% Bandwidth, Non-Sweeping Operation, Middle Frequency 99% Bandwidth = 10.60 MHz



#### 6.4.4. 99% Bandwidth, Non-Sweeping Operation, High Frequency 99% Bandwidth = 5.246 MHz



## 6. Measurement Data (continued)

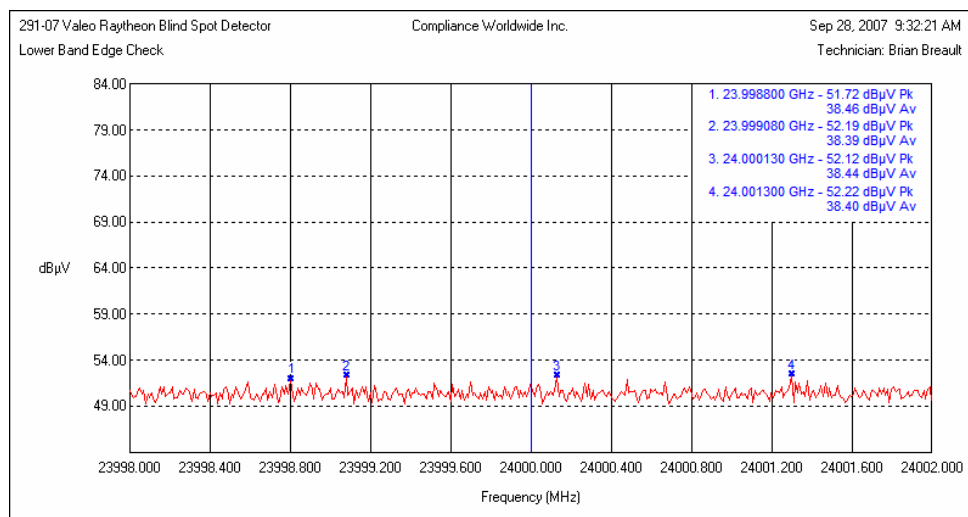
### 6.5. Band Edge Measurements

Requirement: Emissions radiated outside of the specified frequency band of 24 GHz to 24.25 GHz, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

#### 6.5.1. Measurement Results – Lower Band Edge

While the device under test was running in its normal operating mode, a span of 4 MHz, centered at the lower band edge frequency of 24 GHz, was investigated. The worst case emissions in each of the two bandwidths (1 MHz) just outside the lower band edge were measured and recorded. In addition, the worst case emissions in each of the two bandwidths just inside the lower band edge were measured and recorded.

Freq. (GHz)	Amplitude (dBμV/m)		Limit (dBμV/m)	Margin (dB)	Result	Comment
	Peak	Average				
23.99880	51.72	38.46	54	-15.5	Passed	Second bandwidth outside the lower band edge.
23.99908	52.19	38.39	54	-15.6	Passed	First bandwidth outside the lower band edge.
24.00130	52.12	38.44	N/A	N/A	N/A	First bandwidth inside the lower band edge.
24.00130	52.22	38.40	N/A	N/A	N/A	Second bandwidth inside the lower band edge.



## 6. Measurement Data (continued)

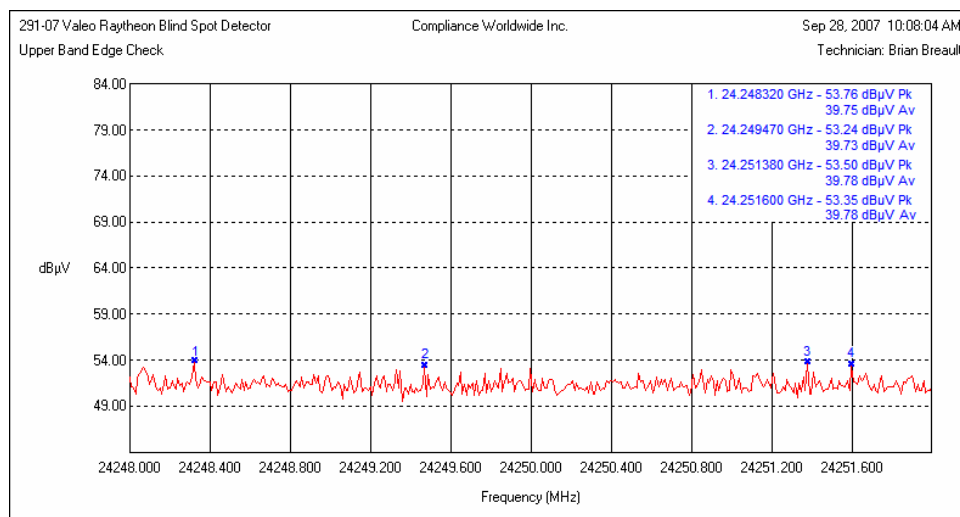
### 6.5. Band Edge Measurements (continued)

Requirement: Emissions radiated outside of the specified frequency band of 24 GHz to 24.25 GHz, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

#### 6.5.2. Measurement Results – Upper Band Edge

While the device under test was running in its normal operating mode, a span of 4 MHz, centered at the upper band edge frequency of 24.25 GHz, was investigated. The worst case emissions in each of the two bandwidths (1 MHz) just outside the upper band edge were measured and recorded. In addition, the worst case emissions in each of the two bandwidths just inside the upper band edge were measured and recorded.

Freq. (GHz)	Amplitude (dBμV/m)		Limit (dBμV/m)	Margin (dB)	Result	Comment
	Peak	Average				
23.99880	53.76	39.75	54	-14.25	Passed	Second bandwidth inside the upper band edge.
23.99908	53.24	39.73	54	-14.27	Passed	First bandwidth inside the upper band edge.
24.00130	53.50	39.78	N/A	N/A	N/A	First bandwidth outside the upper band edge.
24.00130	53.35	39.78	N/A	N/A	N/A	Second bandwidth outside the upper band edge.



## 6. Measurement Data (continued)

### 6.6. Spurious Radiated Emissions, 30 MHz to EUT 10<sup>th</sup> Harmonic or 100 GHz, whichever is the lower value. (15.249, Section (d))

Requirement: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

#### 6.6.1. Spurious Radiated Emissions, 30 MHz to EUT 10<sup>th</sup> Harmonic Test Setup

##### 6.6.1.1. Regulatory Limit: FCC Part 209, Quasi-Peak & Average (above 1 GHz)

Frequency Range (MHz)	Distance (Meters)	Limit (dBμV/m)
30 to 88	3	40.0
88 to 216	3	43.5
216 to 960	3	46.0
Above 960	3	54.0

##### 6.6.1.2. Measurement Equipment Used to Perform Test

The Measurement equipment used to perform spurious emissions testing is listed in section 4.1.

##### 6.6.1.3. Measurement & Equipment Setup

Test Date:	10/082007
Test Engineer:	Brian Breault
Site Temperature (°C):	21.0
Relative Humidity (%RH):	36
Frequency Range:	30 MHz to 1 GHz
EMI Receiver IF Bandwidth :	120 kHz
EMI Receiver Avg Bandwidth:	300 kHz
Detector Functions:	Peak and Quasi-Peak
Frequency Range:	1 GHz to 10 <sup>th</sup> Harmonic
EMI Receiver IF Bandwidth :	1 MHz
EMI Receiver Avg Bandwidth:	3 MHz
Detector Functions:	Peak and Average
Antenna Height:	1 to 4 meters
Measurement Distance:	3 Meters <sup>1</sup>

<sup>1</sup> See the footnotes for each section of this report for any variances in the measurement distance.

##### 6.6.1.4. Test Procedure

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz. Above 30 GHz, the FCC Millimeter Wave Test Procedures were followed.

## 6. Measurement Data (continued)

### 6.6. Spurious Radiated Emissions, 30 MHz to EUT 10<sup>th</sup> Harmonic (15.249, Section (d))

#### 6.6.2. Spurious Radiated Emissions, 30 MHz – 1 GHz Test Results

There were no measurable spurious emissions from 30 MHz to 1 GHz.

#### 6.6.3. Spurious Radiated Emissions, 1 GHz – 30 GHz Test Results

Peak Reading – 1 MHz RBW/3 MHz VBW

Average Reading – 1 MHz RBW/10 Hz VBW

Freq. (GHz)	Amplitude (dBμV)		Corr. Factor (dB)	Amplitude (dBμV/m)		Limit (dBμV/m)	Margin (dB)	Pol (H/V)	El. (cm)	Az. (deg)
	Peak	Avg		Peak	Avg					
1.507500	59.55	41.34	-9.28	50.27	32.06	54	-21.94	H	152	75
4.511680	58.10	39.04	0.56	58.66	39.60	54	-14.40	H	100	5
4.511830	52.80	37.08	0.56	53.36	37.64	54	-16.36	H	139	5
4.531050	53.97	37.25	0.56	54.53	37.81	54	-16.19	H	156	355
12.029500	44.18	34.07	10.86	55.04	44.93	54	-9.07	H	100	270
12.031500	45.91	34.60	10.86	56.77	45.46	54	-8.54	H	100	270
12.076000	41.87	31.62	10.86	52.73	42.48	54	-11.52	H	100	270
12.121000	41.38	30.71	10.86	52.24	41.57	54	-12.43	H	100	270

Multiple points were taken across the bandwidth of the emission. Measurement distance = 3 meters.

#### 6.6.4. Spurious Radiated Emissions, 30 GHz – 100 GHz Test Results

##### 6.6.4.1. Measurement made with unit in normal operating mode.

1. Refer to Section 3.1 for information regarding sweeping vs. non-sweeping modes.
2. Corr. Fact. = Cable Loss + Antenna Factor + Distance Correction.

Freq. (GHz)	Amplitude (dBμV)		Corr. Factor (dB)	Amplitude (dBμV/m)		Limit (dBμV/m)	Margin (dB)	Pol (H/V)	El. (cm)	Az. (deg)
	Peak	Avg		Peak	Avg					
36.0975	39.27	22.31	27.42	61.58	49.73	54	-4.27	V	100	345

Measurement taken at 1 meter. Cable Loss + Antenna Factor = 36.87 dB. Distance Correction = -9.45 dB.

##### 6.6.4.2. Measurement made with unit frequency sweep stopped.

1. Refer to Section 3.1 for information regarding sweeping vs. non-sweeping modes.
2. Corr. Fact. = Cable Loss + Antenna Factor + Distance Correction.

Band	Freq. (GHz)	Amplitude (dBμV)		Corr. Factor (dB)	Amplitude (dBμV/m)		Limit (dBμV/m)	Margin (dB)	Pol (H/V)	El. (cm)	Az. (deg)
		Peak	Avg		Peak	Avg					
Low	36.0858	30.77	22.92	27.42	58.19	50.34	54	-3.66	V	100	345
Mid	36.2237	29.19	21.62	27.42	56.61	49.04	54	-4.96	V	100	345
High	36.3628	27.83	19.61	27.42	55.25	47.03	54	-6.97	V	100	345

Measurements taken at 1 meter. Cable Loss + Antenna Factor = 36.87 dB. Distance Correction = -9.45 dB.

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**7. Test Site Description**

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with Federal Communications Commission (FCC) and Industry Canada standards. A description of the test sites is on file with the FCC (registration number **96392**) and Industry Canada (file number **IC 3023A-1**).

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

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

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