COMPLIANCE WORLDWIDE INC.
TEST REPORT 301-12

In Accordance with the Requirements of
Federal Communications Commission CFR Title 47 Part 15.249, Subpart C
Industry Canada RSS 310, Issue 3

Low Power License-Exempt Radio Communication Devices
Intentional Radiators

Issued to

Continental Automotive
ADC Automotive Distance Control Systems GmbH
Peter-Dornier-Str. 10
D-88131 Lindau/Bodensee
Germany

for the

SRR2-B Automotive Sensor

FCC ID: OAYSRR2B

Report Issued on July 20, 2012

Tested by

Brian F. Breault

Reviewed by

Larry K. Stillings

Table of Contents

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1. Scope

This test report certifies that the Continental Automotive SRR2-B Automotive Sensor, as tested, meets the FCC Part 15, Subpart C and Industry Canada RSS 310, Issue 3 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: Continental Automotive
2.2. Model Number: SRR2-B
2.3. Serial Number: 0A2C73480200
2.4. Description: Automotive Blind Spot Detection Sensor
2.5. Power Source: 12 Volts DC (Automotive Application)
2.6. Hardware Revs.: B
2.7. Software Rev.: N/A
2.8. EMC Modifications: None

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3. Product Configuration

3.1. Support Equipment

Device	Manufacturer	Model	Serial No.	Comment
Mode Switch Box	Continental Automotive	N/A	2011-01-27 (Creation Date)	Provides all setup functions for the SRR2-B Radar Sensor.

3.2. Cables

Cable Type (See Note)	Length	Shield	From	To
Custom Interface Cable	1 Meter	No	Mode Switch Box	SRR2-B Radar Sensor

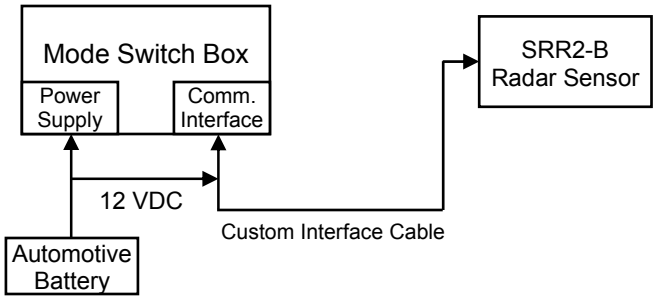
3.3. Operational Characteristics & Software

Continental Automotive provided a Mode Switch Box to control the SRR2-B Radar Sensor. The box provides five operational modes:

- Normal mode, bandwidth 182 MHz
- Normal mode, bandwidth 188 MHz
- CW mode, center frequency
- CW mode, lower frequency
- CW mode, upper frequency

Included with the Mode Switch Box, Continental Automotive provided a six page user's manual that details the setup and the five modes of operation listed above. This manual provides a complete reference for configuring the Mode Switch Box and the SRR2-B Radar Sensor.

3.4. Block Diagram



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4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due
Spectrum Analyzer 100 Hz to 26.5 GHz	Agilent Tech	E4407B	MY45104493	12/22/2012
Spectrum Analyzer 100 Hz to 26.5 GHz	Agilent Tech	E7405A	MY45115430	5/11/2014
Spectrum Analyzer 20 Hz to 40 GHz	Rohde & Schwarz	FSV40	100899	5/26/2013
EMI Receiver 9 kHz to 6.5 GHz	Hewlett Packard	8546A	3330A00115	6/8/2014
Microwave Preamp 1 to 26.5 GHz	Hewlett Packard	8449B	3008A01323	12/1/2012
Microwave Preamp 2 to 50 GHz	Hewlett Packard	83050A	3331A00404	10/20/2012
Notch Filter 24.0 – 24.25 GHz	K&L Microwave	5NSP-00002	001	CBU
Bilog Antenna 30 MHz – 2 GHz	Com-Power	AC-220	25509	8/31/2012
Horn Antenna 1 to 18 GHz	Electro-Metrics	EM-6961	6337	10/19/2012
Horn Antenna 1 to 18 GHz	Com-Power	AH-118	10078	8/28/2014
Horn Antenna 18 to 26.5 GHz	Com-Power	AH-826	081051	8/27/2014
Horn Antenna 18 to 40 GHz	Com-Power	AH-840	03075	8/27/2014
Horn Antenna 18 to 40 GHz	Com-Power	AH-840	101032	04/6/2013
Horn Antenna 18 to 26.5 GHz WR42 to 3.5mm Adapter	Hughes Hewlett Packard	45820H-2020 K281C	037 3032A10738	Not Req'd
External Mixer WR28 Horn Antenna 26.5 to 40 GHz WR28 to 3.5mm Adapter	Hewlett Packard Alpha Industries Hewlett Packard	11970A 861A/599 R281A	3003A08210 324 03197	Not Req'd
External Mixer WR22 Horn Antenna 33 to 50 GHz WR22 to 3.5mm Adapter	Hewlett Packard Alpha Industries Hewlett Packard	11970Q 861B/383 Q281B	3003A01273 133 00116	Not Req'd
External Mixer WR19 External Mixer WR19 Horn Antenna 40 to 60 GHz WR19 to 1.85mm Adapter	Hewlett Packard Rohde & Schwarz M/A Com Baytron Hewlett Packard	11970U FS-Z60 3-19-720 U281A	2332A00425 100128 N/A 00209	Not Req'd
External Mixer WR12 Horn Antenna 50 to 75 GHz WR12 to 1.85mm Adapter	Hewlett Packard Aerowave Hewlett Packard	11970V 15-7025 V281B	2521A00357 N/A 00369	Not Req'd
External Mixer WR10 Horn Antenna 75 to 110 GHz	Hewlett Packard Alpha Industries	11970W 861A/387	2521A00230 359	Not Req'd
Anechoic Chamber 3 Meter – Free Space	Keene Ray Proof	S-81	R-2338	Not Req'd
DMM / Temperature	Fluke	187	79690058	1/5/2013
DC Variable Source 60 Volt, 3 Amp	Hewlett Packard	6296A	7M0599	1/5/2013
3 dB & 10 dB Attenuators DC to 40 GHz	Narda	4768-3 4768-10	9610 9806	Not Req'd
Barometric Pressure / Humidity / Temperature Data Logger	Extech Instruments	SD700	Q590483	5/1/2013

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4. Measurements Parameters

4.2. Measurement & Equipment Setup

Test Dates:	6/29/2012 - 7/23/2012
Test Engineers:	Larry Stillings/Brian Breault
Normal Site Temperature (15 - 35°C):	21.6
Relative Humidity (20 -75%RH):	35
Frequency Range:	150 kHz to 100 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	9 kHz – 150 kHz to 30 MHz 120 kHz – 30 MHz to 1 GHz 1 MHz – Above 1 GHz
EMI Receiver Average Bandwidth:	30 kHz – 150 kHz to 30 MHz 300 kHz – 30 MHz to 1 GHz 3 MHz – Above 1 GHz
Detector Function:	Peak, Quasi-Peak & Average

4.3. Measurement Procedure

Test measurements were made in accordance FCC Part 15.249, IC RSS-310, Section 3.10: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5850 MHz, and 24.00 - 24.25 GHz.

The test methods used to generate the data in this test report is in accordance with ANSI C63.4:2009, 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

4.4. Choice of Operating Frequencies

The Continental Automotive SRR2-B Radar Sensor employs a pulse modulated sweeping signal from 24.05 to 24.23 GHz.

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5. Measurements Summary

Test Requirement	FCC Rule Requirement	IC Rule Requirement	Test Report Section	Result	Comment
Antenna Requirement	15.203	RSS-GEN 7.1.4	6.1	Compliant	Unit has an internal PCB antenna.
Radiated Field Strength of Fundamental	15.249 (a),(c)	RSS-310 3.10	6.2	Compliant	
Radiated Field Strength of Harmonics	15.249 (a),(c)	RSS-310 3.10	6.3	Compliant	
Band Edge Measurements	15.249 (d) 15.209	RSS-310 3.10	6.4	Compliant	
Spurious Radiated Emissions	15.249 (d), 15.209	RSS-GEN 4.9	6.5	Compliant	
Occupied Bandwidth	ANSI C63.4 § 13.1.7	N/A	6.6	Compliant	
99% Bandwidth	IC RSS-GEN	RSS-GEN 4.6.1	6.7	Compliant	
Conducted Emissions	15.207	RSS-GEN 7.2.4	N/A	Not Required	DUT operates off of an automotive battery only.
Public Exposure to Radio Frequency Energy Levels	15.319 (i) 2.1091 FCC OET Bulletin 65	RSS-GEN 5.5, RSS 102	6.9	Compliant	

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6. Measurement Data

6.1. Antenna Requirement (Section 15.203)

Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

Result: The unit under test employs a permanent, non-user accessible internal PCB antenna.

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6. Measurement Data

6.2. Radiated Field Strength of Fundamental (15.249, Section (a), (c)), IC RSS-310 3.10

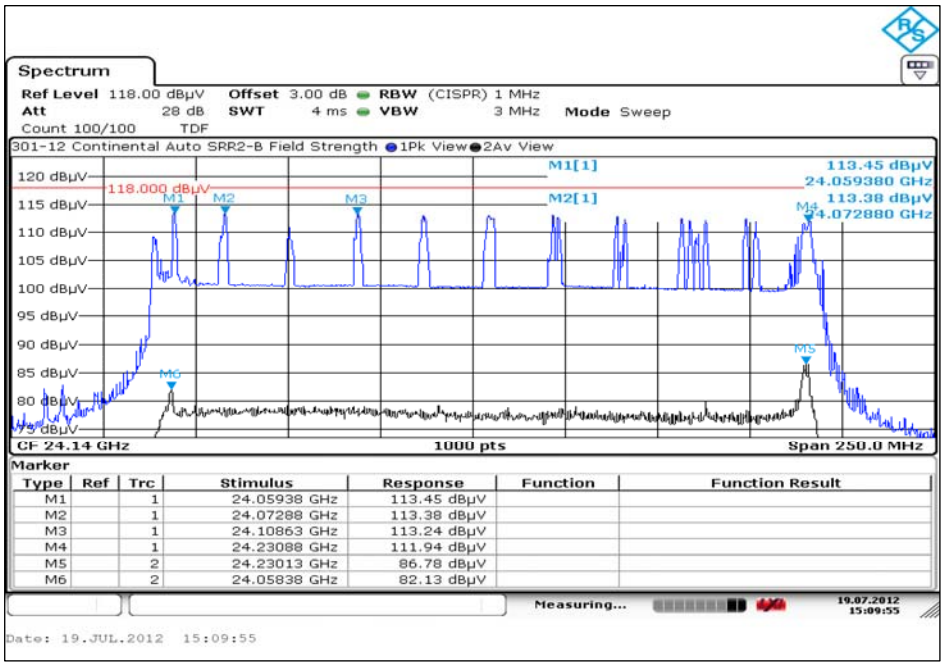
Requirement: The 3 meter field strength of the fundamental emissions from intentional radiators operated within the 24.00 – 24.25 GHz frequency bands shall comply with the following requirement: 250 millivolts/meter (108 dBµV/m), average mode measurement, 128 dBµV/m Peak mode measurement at 3 meters.

Test Results: The Continental Automotive SRR2-B worst case field strength measurements meet the average and peak requirements.

Composite Worst Case Data

Freq. (GHz)	Amplitude[1] (dBµV/m)		Limit (dBµV/m)		Margin (dB)		Ant Pol.	Ant Height	Turntable Azimuth
	Peak	Avg	Peak	Avg	Peak	Avg	H/V	cm	Deg
24.0594	113.45	N/A	128	108	-14.55	N/A	V	110	5
24.2301	N/A	82.13	128	108	N/A	-25.87	V	110	5

[1] All correction factors are included in the measurement values



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6. Measurement Data (continued)

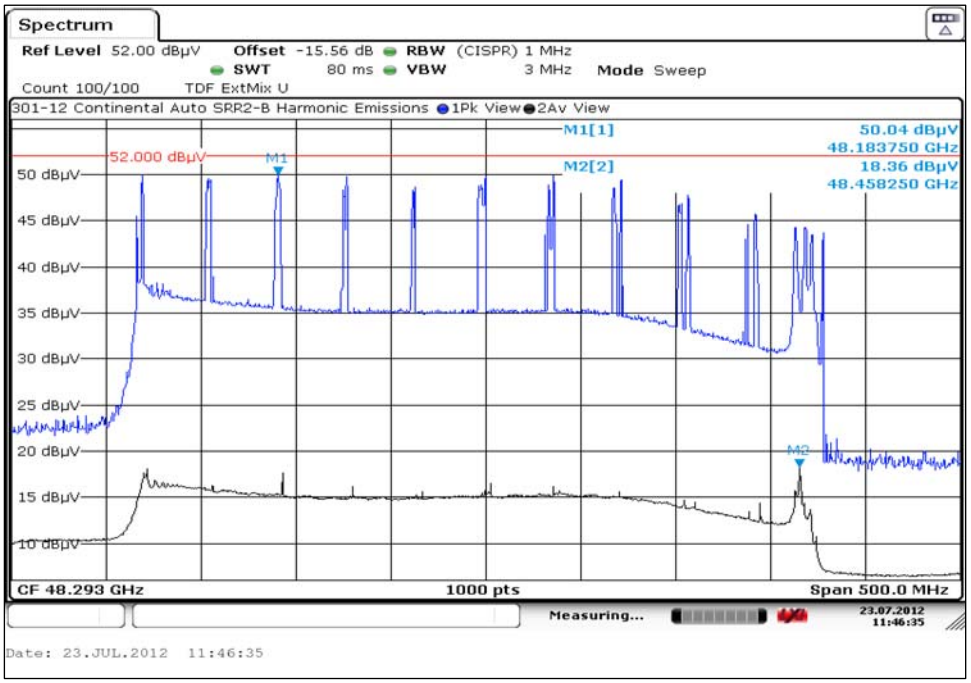
6.3. Radiated Field Strength of Harmonics (15.249, Section (a)), IC RSS-310 3.10

Requirement: The 3 meter field strength of the harmonic emissions from intentional radiators operated within the 24.0 to 24.25 GHz frequency bands shall comply with the following: 500 microvolts/meter (54 dBµV/m), average mode measurement. Peak field strength may not be greater than 20 dB above the average limit (74 dBµV/m).

Composite Worst Case Data

Frequency (GHz)	Pk Amp[1] (dBµV/m)	Av Amp[1] (dBµV/m)	Pk Limit (dBµV/m)	Av Limit (dBµV/m)	Margin (dB)	Polarity (H/V)	Result
48.1838	50.04	N/A	74	N/A	-23.96	V	Compliant
48.4583	N/A	18.36	N/A	54	-35.64	V	Compliant

[1] All correction factors are included in the measurement values. Measurement was taken at 0.5 meters



Note: There were no other measurable harmonics to 100 GHz.

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6. Measurement Data (continued)

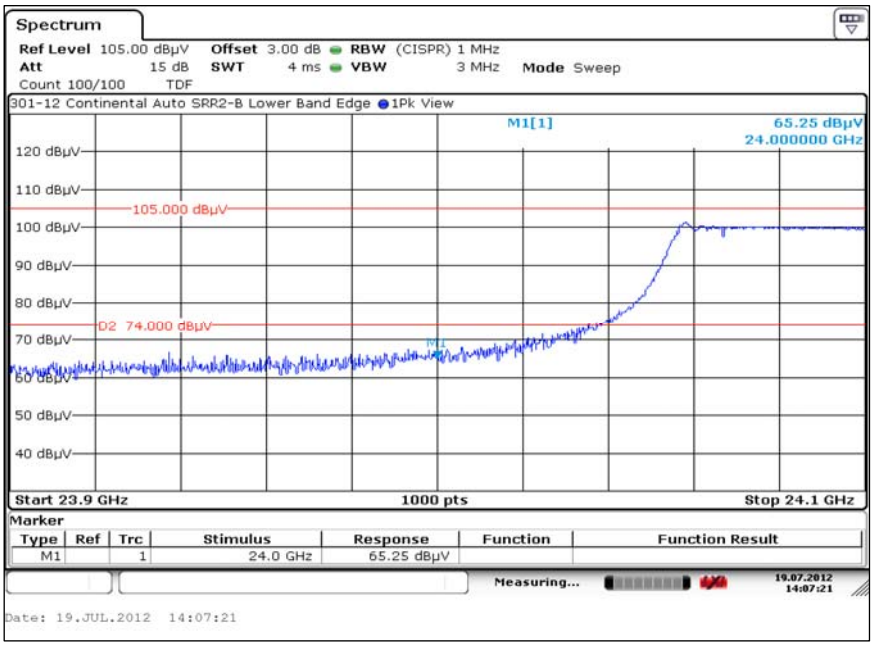
6.4. Band Edge Measurements

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.

Test Results: The Continental Automotive SRR2-B meets the applicable band edge requirements.

Frequency (GHz)	Band Edge (dBµV/m)			Limit (dBµV/m)	Margin (dB)	Result
	Freq GHz	Peak	Average	Average		
24.15	24.00	65.25	47.42	54	-6.58	Compliant
	24.25	71.63	51.34	54	-2.66	Compliant

6.4.1. Band Edge Measurements - Lower Band Edge, Peak Detector



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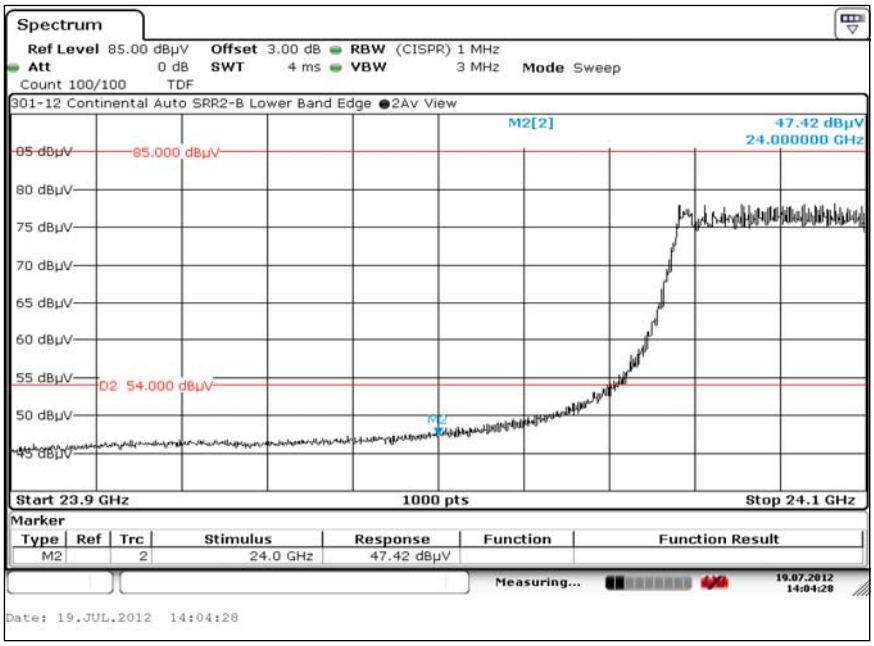
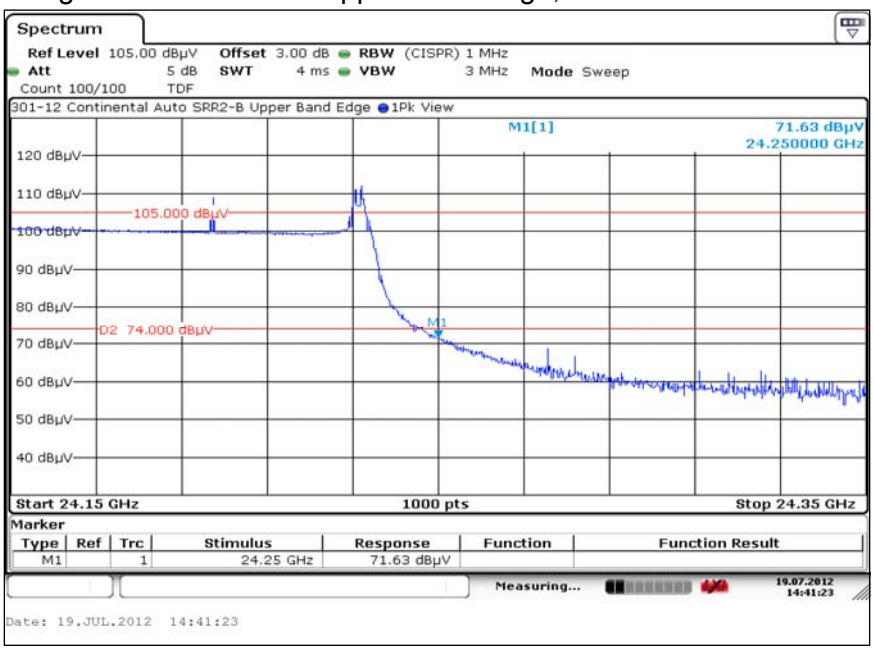
6. Measurement Data (continued)

6.4. Band Edge Measurements (continued)

6.4.2. Band Edge Measurements - Lower Band Edge, Average Detector



6.4.3. Band Edge Measurements - Upper Band Edge, Peak Detector



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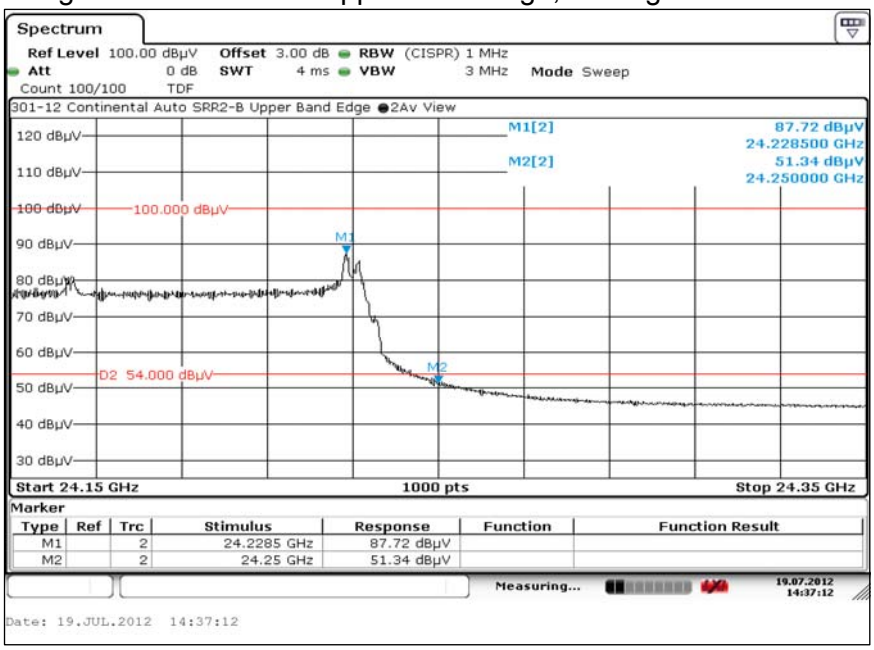
6. Measurement Data (continued)

6.4. Band Edge Measurements (continued)

6.4.4. Band Edge Measurements - Upper Band Edge, Average Detector



6.5. Spurious Radiated Emissions, 150 kHz to 100 GHz (15.249, Section (d)), IC RSS-GEN

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.

Test Note: All correction factors are included in the measurement results.

Regulatory Limit: FCC Part 209, Quasi-Peak

Frequency Range (MHz)	Distance (Meters)	Limit (dBµV/m)
0.009 to 0.490	3	128.5 to 93.8
0.490 to 1.705	3	73.8 to 63.0
1.705 to 30	3	69.5
30 to 88	3	40.0
88 to 216	3	43.5
216 to 960	3	46.0
>960	3	54.0

[1] Measurements in the 9 to 90 kHz, 110 to 490 kHz and above 1000 MHz ranges employ an average detector.

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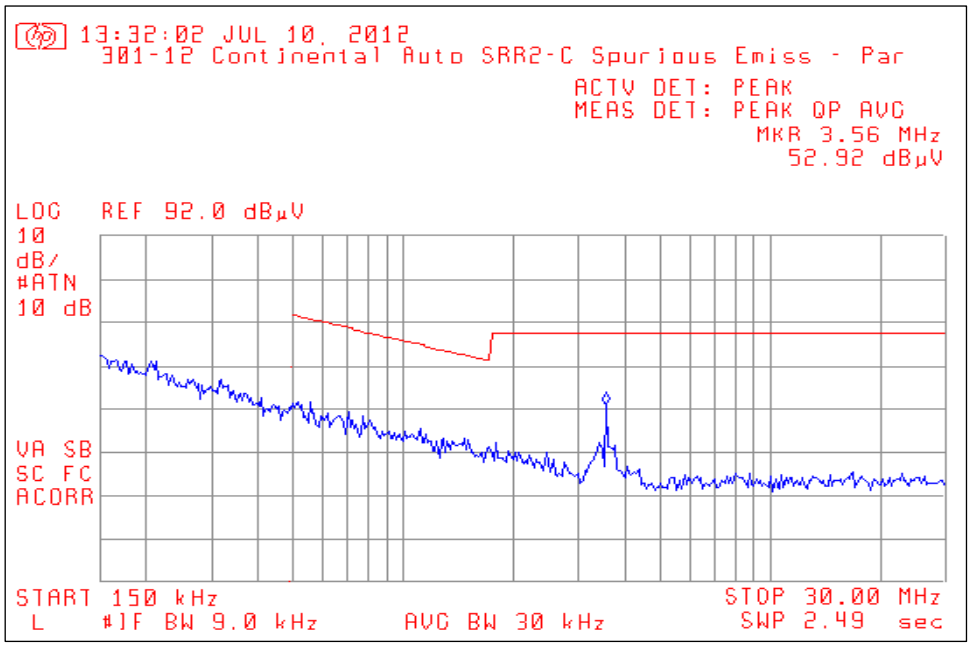
6. Measurement Data (continued)

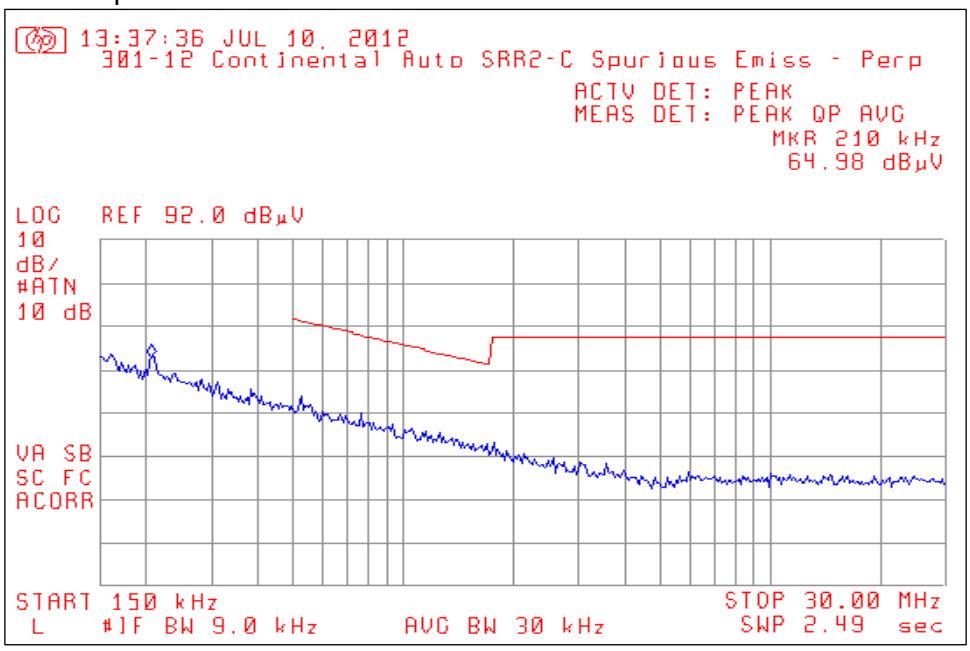
6.5. Spurious Radiated Emissions, 150 kHz to 100 GHz (15.249, Section (d)), IC RSS-GEN

6.5.1. Test Results, 150 kHz to 30 MHz

6.5.1.1. Parallel Antenna



6.5.1.2. Perpendicular Antenna



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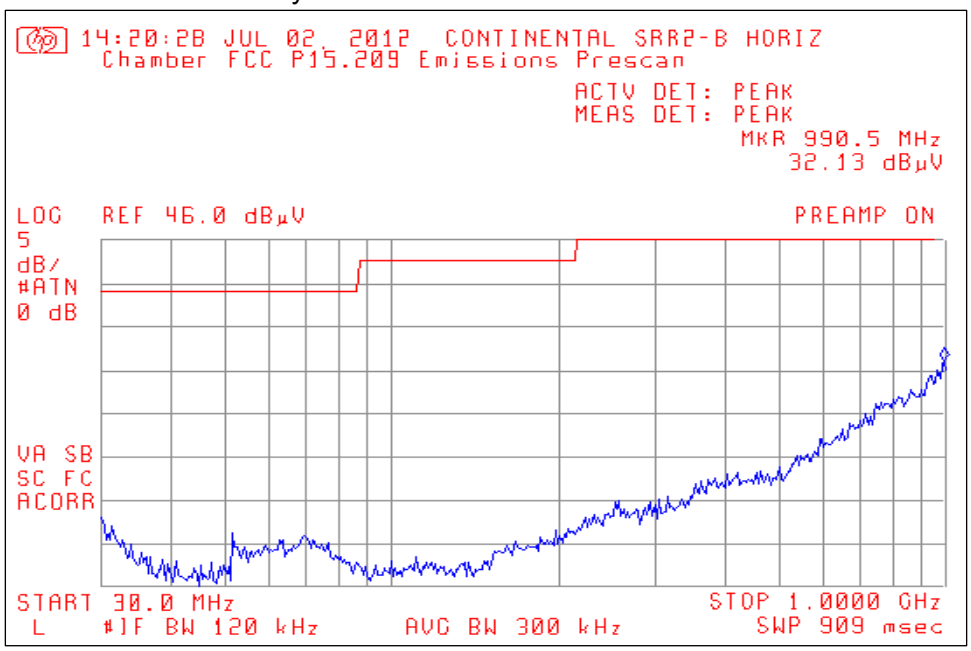
6. Measurement Data (continued)

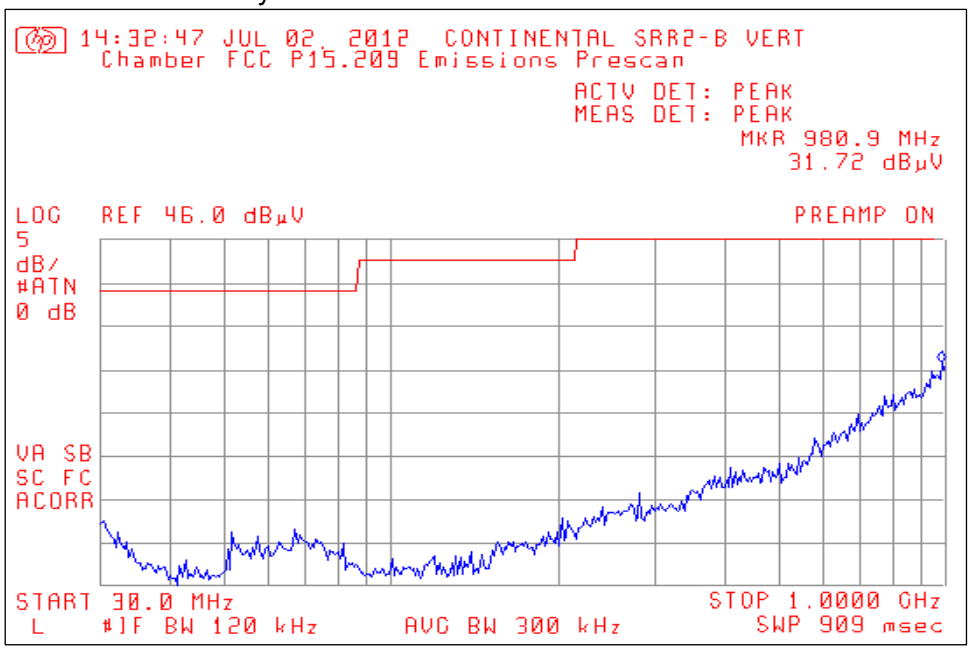
6.5. Spurious Radiated Emissions, 150 kHz to 100 GHz (15.249, Section (d)), IC RSS-GEN

6.5.2. Test Results, 30 MHz to 1 GHz

6.5.2.1. Horizontal Polarity



6.5.2.2. Vertical Polarity



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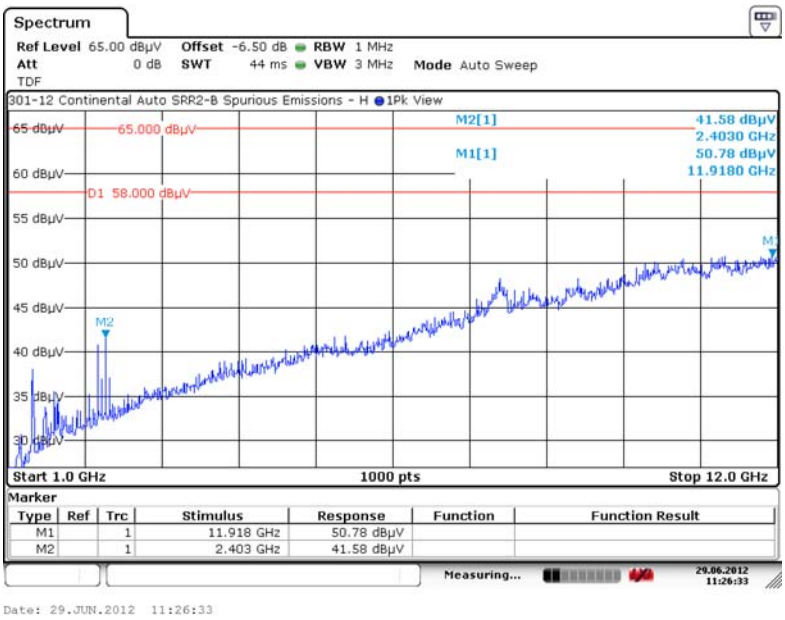
6. Measurement Data (continued)

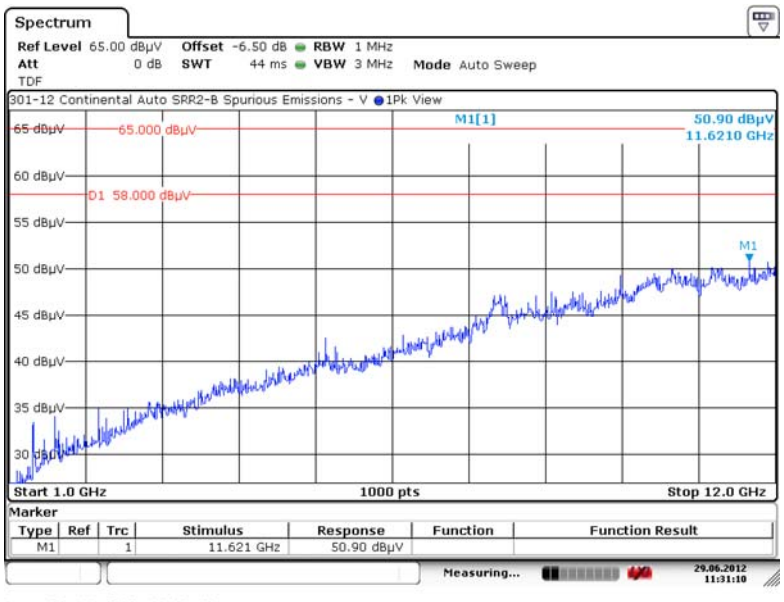
6.5. Spurious Radiated Emissions, 150 kHz to 100 GHz (15.249, Section (d)), IC RSS-GEN

6.5.3. Test Results, 1 to 12 GHz

6.5.3.1. Horizontal Polarity



6.5.3.2. Vertical Polarity



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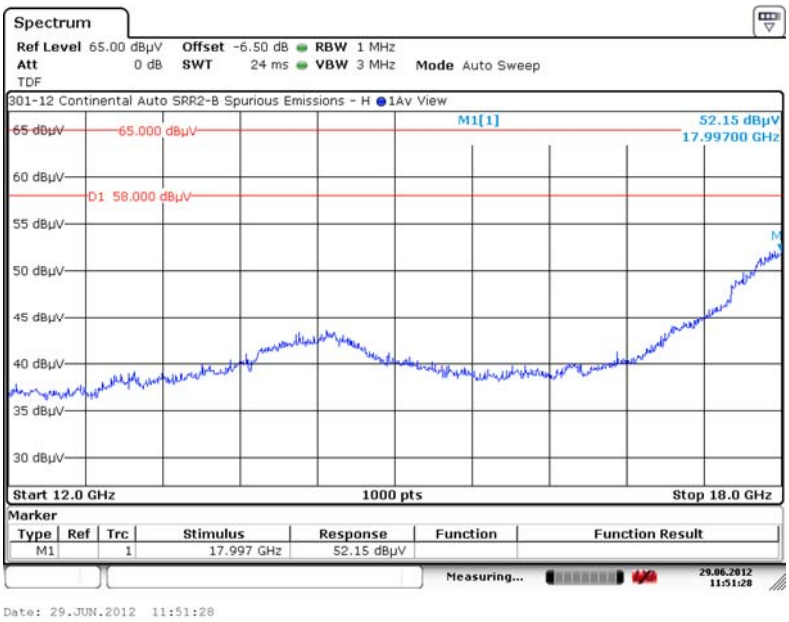
6. Measurement Data (continued)

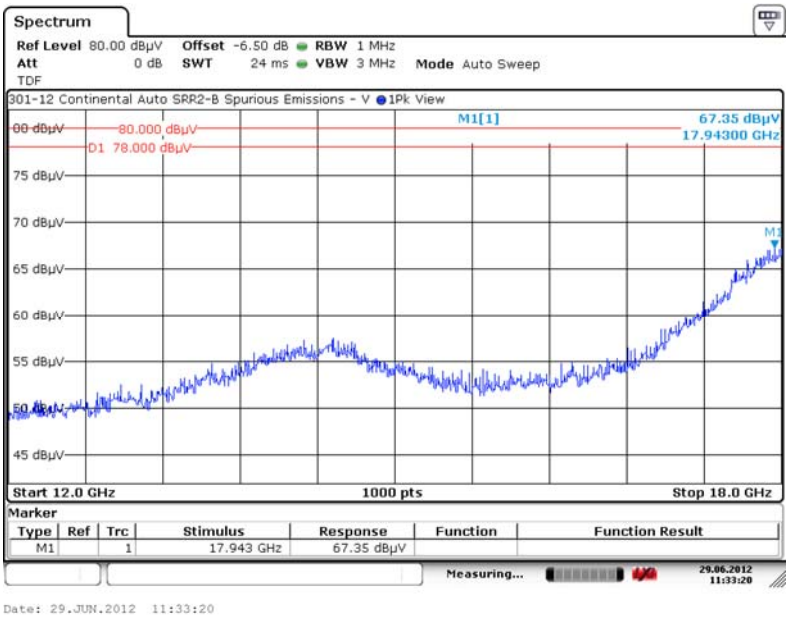
6.5. Spurious Radiated Emissions, 150 kHz to 100 GHz (15.249, Section (d)), IC RSS-GEN

6.5.4. Test Results, 12 to 18 GHz

6.5.4.1. Horizontal Polarity



6.5.4.2. Vertical Polarity



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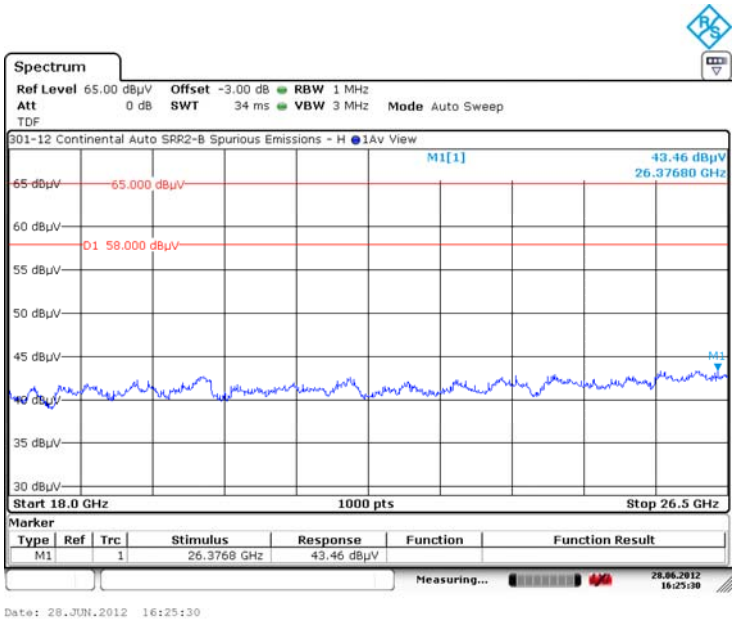
6. Measurement Data (continued)

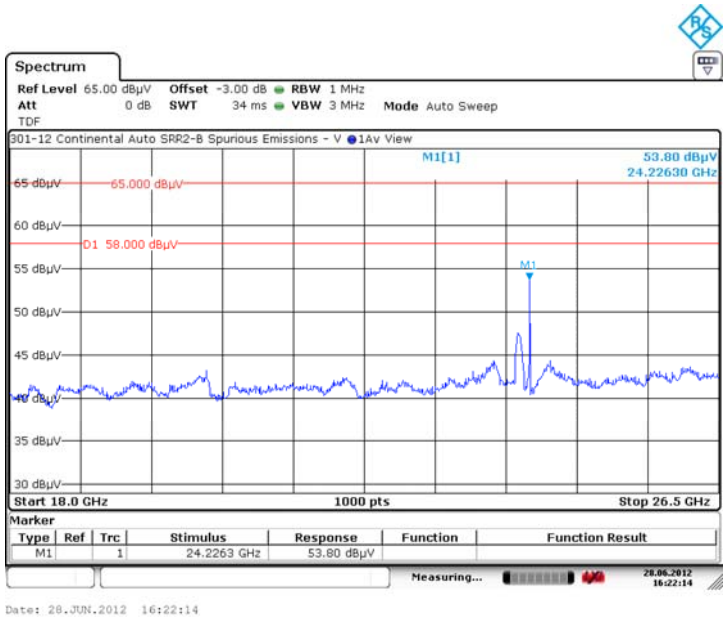
6.5. Spurious Radiated Emissions, 150 kHz to 100 GHz (15.249, Section (d)), IC RSS-GEN

6.5.5. Test Results, 18 to 26.5 GHz

6.5.5.1. Horizontal Polarity



6.5.5.2. Vertical Polarity



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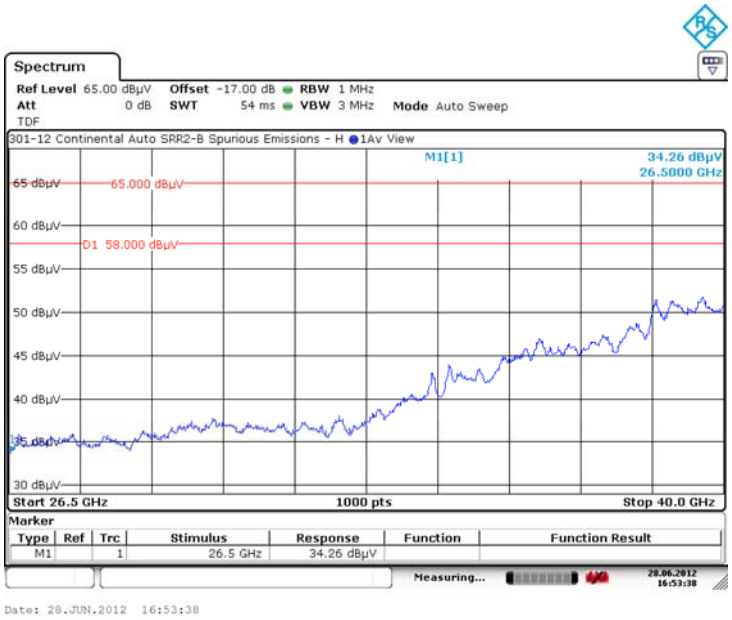
6. Measurement Data (continued)

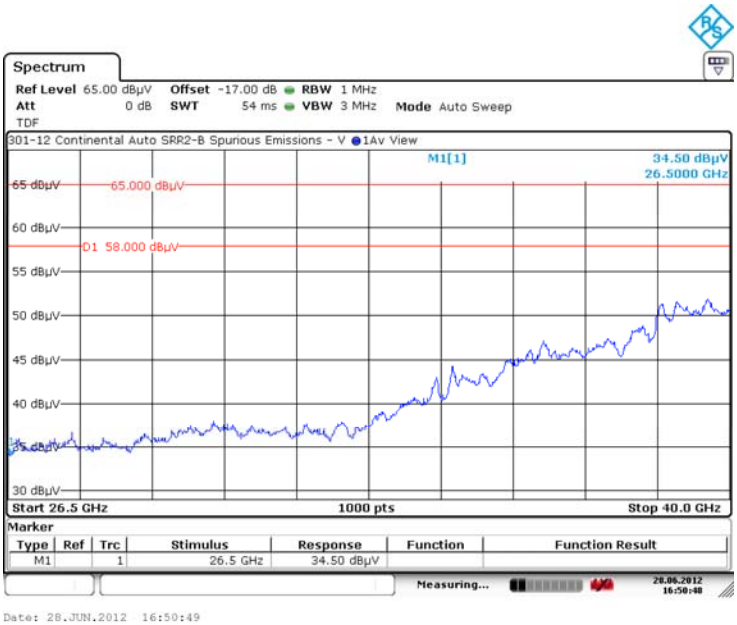
6.5. Spurious Radiated Emissions, 150 kHz to 100 GHz (15.249, Section (d)), IC RSS-GEN

6.5.6. Test Results, 26.5 to 40 GHz

6.5.6.1. Horizontal Polarity



6.5.6.2. Vertical Polarity



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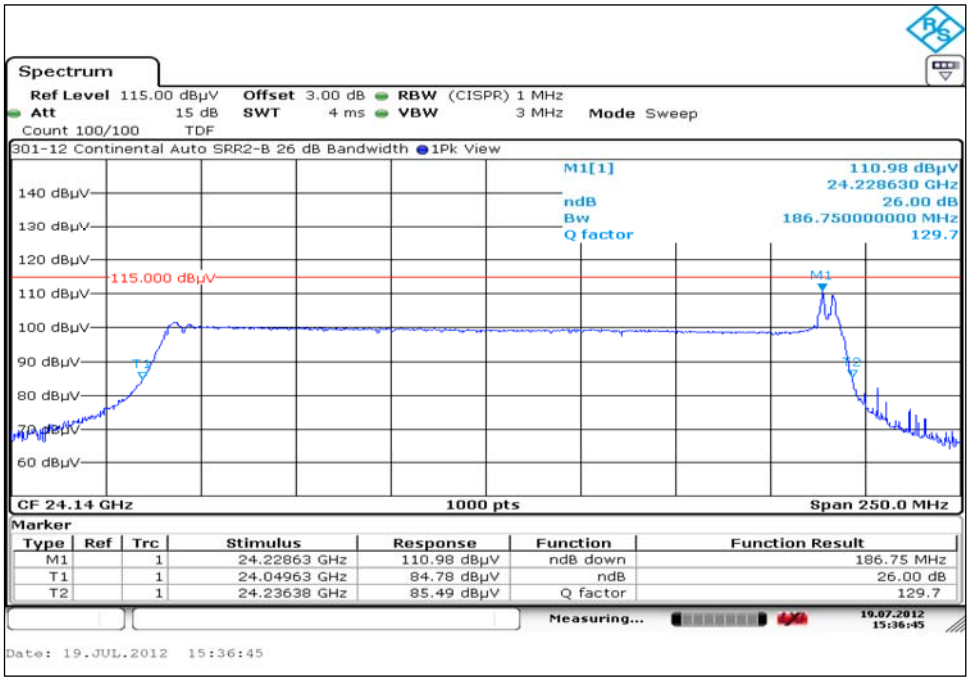
6. Measurement Data (continued)

6.6 Occupied Bandwidth (ANSI C63.4, Section 13.7)

Requirement: The occupied bandwidth measurements on an intentional radiator shall be made in accordance with the requirements outlined in ANSI C63.4-2009, Section 13.7. If no bandwidth requirement is specified by the procuring or regulatory agency, measure the bandwidth at –26 dB with respect to the reference level. The resolution bandwidth was set according to Table 5 in Section 13.7 of ANSI C63.4-2009.

Frequency (GHz)	-26 dB Bandwidth (MHz)	Result
24.15	186.75	Compliant

6.6.1. Occupied Bandwidth Plot



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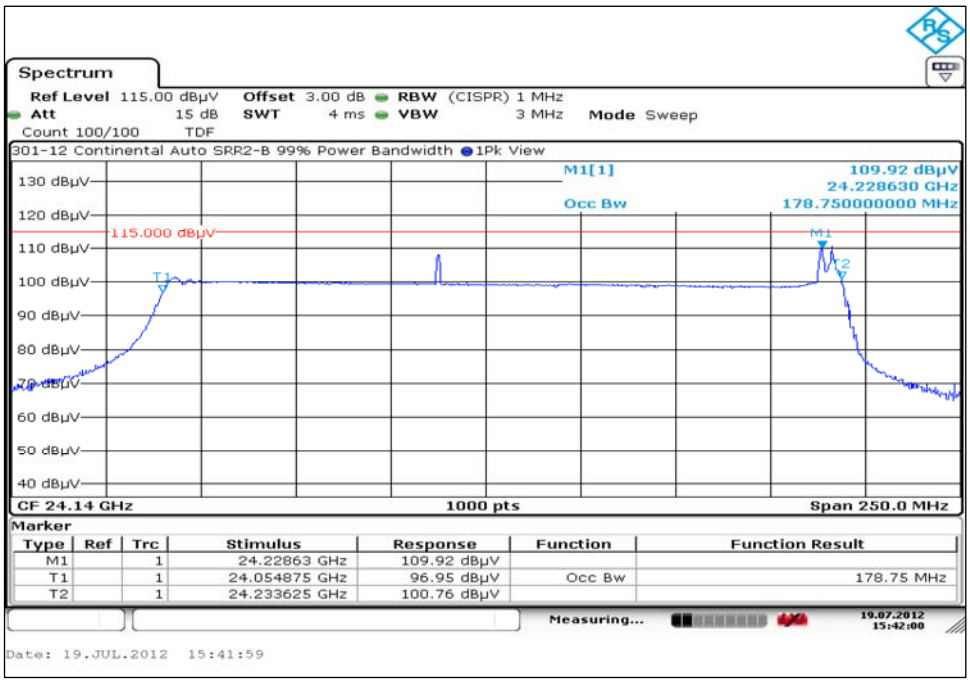
6. Measurement Data (continued)

6.7. 99% Power Bandwidth (RSS GEN 4.6.1)

Requirement: When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured. The measurement bandwidth used shall be 1 to 3 % of the measurement span.

Channel Frequency	99% Power Bandwidth	Result
GHz	MHz	
24.15	178.75	Compliant

6.7.1. 99% Bandwidth Plot



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6. Measurement Data (continued)

6.9. Public Exposure to Radio Frequency Energy Levels (15.247(i) (1.1307 (b)(1)) RSS-GEN 5.5, RSS 102

Note: The following equation is used to determine the output power from the measured worst case field strength:

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

P = the power in Watts.
E = the measured maximum field in V/m
G = the numeric gain of the transmitting antenna over an isotropic radiator.
d = the distance in meters of the field strength measurement.

Channel	Frequency	Peak Field Strength	Distance	Antenna Gain[1]	Measured Output Power
	(GHz)	(dBµV/m)	(m)	(dBi)	(mW)
ISM	24.15	113.45	3.0	12.200	4.00

Channel	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm²)	Result
				(mW/cm^2)	(W/m^2)		
	(1)	(2)	(3)	(4)		(5)	
ISM	20	6.02	0.50	0.0008930	0.0089300	1	Compliant

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

PD = Power Density (mW/cm2)
OP = DUT Output Power (dBm)
AG = DUT Antenna Gain (dBi)
d = MPE Distance (cm)

1. Reference CFR 2.1093(b): For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.
2. Sections 6.2 of this test report.
3. Antenna gain data provided by the client.
4. Power density is calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.

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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.

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