



Engineering and Testing for EMC and Safety Compliance

**CLASS II PERMISSIVE CHANGE REPORT  
FCC PART 15.247 & INDUSTRY CANADA RSS-210**

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<b>FCC ID / IC ID:</b>	I28MD-RW4137 / 3798A-RW4137	<b>TEST REPORT DATE:</b>	February 15, 2006
<b>PLATFORM:</b>	N/A	<b>RTL WORK ORDER #:</b>	2006018
<b>MODEL:</b>	AN17444-1	<b>RTL QUOTE #:</b>	QRTL06-136
<b>Standards and Procedures:</b>	ANSI 63.4 and FCC 97-114 (DSSS)		
<b>FCC Classification:</b>	DTS		
<b>FCC Rule Part:</b>	Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System		
<b>Industry Canada Standard:</b>	RSS-210: Low Power License-Exempt Radio Communication Devices (All Frequency Bands)		
<b>Digital Interface Information</b>	Digital Interface was found to be compliant		
<b>Frequency Range (MHz)</b>	<b>Output Power*(W)</b>	<b>Frequency Tolerance</b>	<b>Emission Designator</b>
2412-2462	0.096	N/A	N/A

\* output power is maximum peak conducted

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to, or exclusions from the applicable parts or FCC Part 2, FCC Part 15, Industry Canada RSS-210, ANSI 63.4, and FCC 97-114 (DSSS).

Signature: 

Date: February 15, 2006

Typed/Printed Name: Desmond A. Fraser

Position: President

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## Table of Contents

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<b>1</b>	<b>General Information .....</b>	<b>4</b>
1.1	Scope .....	4
1.2	Test Facility .....	4
1.3	Related Submittal(s)/Grant(s) .....	4
1.4	Modifications.....	4
<b>2</b>	<b>Test Information .....</b>	<b>5</b>
2.1	Test Justification .....	5
2.2	Exercising the EUT .....	5
2.3	Test Result Summary .....	5
2.4	Test System Details .....	6
2.5	Configuration of Tested System .....	7
<b>3</b>	<b>Peak Output Power - FCC §15.247(b)(1); IC RSS-210 §6.2.2(o)(b).....</b>	<b>8</b>
3.1	Power Output Test Procedure .....	8
3.2	Power Output Test Data .....	8
3.3	Power Output Test Equipment.....	8
<b>4</b>	<b>Compliance with the Restricted Band Edge - FCC §15.247(c), §15.205; IC RSS-210 §6.3 .....</b>	<b>9</b>
4.1	Band Edge Test Procedure .....	9
4.2	Restricted Band Edge Plots.....	9
4.3	Band Edge Test Equipment.....	13
<b>5</b>	<b>Radiated Emissions Radiated Harmonics/Spurious Noise – FCC §15.247; IC RSS-210 §6.2.2(o)(e1); §6.3..</b>	<b>14</b>
5.1	Radiated Emissions Test Procedure for Harmonics/Spurious Noise .....	14
5.2	Radiated Emissions Harmonics/Spurious Test Data .....	14
5.3	Radiated Spurious Emissions Test Equipment.....	15
<b>6</b>	<b>Conclusion.....</b>	<b>16</b>

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### Figure Index

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---

Figure 2-1:	Worst Case Configuration of System under Test.....	7
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### Table Index

---

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Table 2-1:	Test Result Summary of FCC Rules and Regulations .....	5
Table 2-2:	Equipment under Test (EUT) .....	6
Table 2-3:	Additional Equipment Used for Testing.....	6
Table 3-1:	Power Output Test Data .....	8
Table 3-2:	Power Output Test Equipment.....	8
Table 4-1:	Band Edge Test Equipment.....	13
Table 5-1:	Radiated Emissions Harmonics/Spurious (Channel 1/2412 MHz) CQ17593-G1 Antenna.....	14
Table 5-2:	Radiated Emissions Harmonics/Spurious (Channel 6/2437 MHz) CQ17593-G1 Antenna.....	14
Table 5-3:	Radiated Emissions Harmonics/Spurious (Channel 11/2462 MHz) CQ17593-G1 Antenna.....	15
Table 5-4:	Radiated Spurious Emissions Test Equipment.....	15

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### Plot Index

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Plot 4-1:	Lower Band Edge: Delta Measurement.....	10
Plot 4-2:	Upper Band Edge: Delta Measurement.....	12

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### Appendix Index

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Appendix A:	RF Exposure; IC RSS-210 §14.....	17
Appendix B:	Antenna Specifications .....	18
Appendix C:	Change Description Letter .....	19
Appendix D:	IC Agency and Listing Requirements Letters.....	21
Appendix E:	Test Photographs .....	22
Appendix F:	External Photographs .....	24

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### Photograph Index

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Photograph 1:	Radiated Emissions - Front View .....	22
Photograph 2:	Radiated Emissions - Rear View .....	23
Photograph 3:	Top of Antenna CQ17593-G1 .....	24
Photograph 4:	Bottom of Antenna CQ17593-G1 .....	25

## **1 General Information**

### **1.1 Scope**

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

IC RSS-210 Section 6.2.2(o): Frequency Hopping, Direct Spread Spectrum, and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

### **1.2 Test Facility**

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 2003).

### **1.3 Related Submittal(s)/Grant(s)**

This is a request for a Class II Permissive Change per FCC 2.1043(b)(2) for the previously certified Zebra Technologies Corp., Model Number: AN17444-1, FCC ID: I28MD-RW4137, IC: 3798A-RW4137. The change is the addition of an antenna, Model CQ17593-G1, for use in the RW-220 host.

### **1.4 Modifications**

No modifications were implemented to meet the testing criteria.

## 2 Test Information

### 2.1 Test Justification

The EUT was tested in all three orthogonal planes in order to determine worst case emissions. Channel 1 at 2412 MHz, Channel 6 at 2437 MHz, and Channel 11 at 2462 MHz were tested and investigated from 9 kHz to 24 GHz. Data for all three channels is presented in this report.

The worst case data presented in this report represents the highest data rate at 11 MBPS. Data rates of 5.5 MBPS, 2 MBPS and 1 MBPS were investigated and found to be in compliance. The change in envelope did not cause the EUT to be non-compliant in any of the aforementioned modes.

### 2.2 Exercising the EUT

The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that the information was being transmitted. There were no deviations from the test standard(s) and/or methods.

### 2.3 Test Result Summary

**Table 2-1: Test Result Summary of FCC Rules and Regulations**

STANDARD	TEST	PASS/FAIL OR N/A
FCC 15.205	Compliance with the Restricted Band Edge	Pass
FCC 15.209	Radiated Emissions	Pass
FCC 15.247(b)	Power Output	Pass

## 2.4 Test System Details

The test sample was received on February 14, 2006. The FCC Identifiers for all equipment, and descriptions of all cables used in the tested system, are shown in the following table.

**Table 2-2: Equipment under Test (EUT)**

Part	Manufacturer	Model #	Serial Number	FCC ID	Cable Description	RTL Bar Code
Wireless LAN Adapter (EUT)	Symbol Technologies, Inc.	AN17444-1	00A0F8CD2253	I28MD-RW4137	N/A	17050
Antenna	Zebra Technologies, Corp.	CQ17593-G1	1054703GS	N/A	7 cm shielded with ferrite	17040

**Table 2-3: Additional Equipment Used for Testing**

Part	Manufacturer	Model #	Serial Number	FCC ID	Cable Description	RTL Bar Code
Wireless Printer	Zebra Technologies, Corp.	QL-320	XXJK05-18-5016	I28MD-8TC2TY2	N/A	17038
7.4 VDC Battery	Zebra Technologies, Corp.	AT16004-1	N/A	N/A	N/A	17037
Battery Charger	Zebra Technologies, Corp.	L172	N/A	N/A	2m shielded	16162

## 2.5 Configuration of Tested System

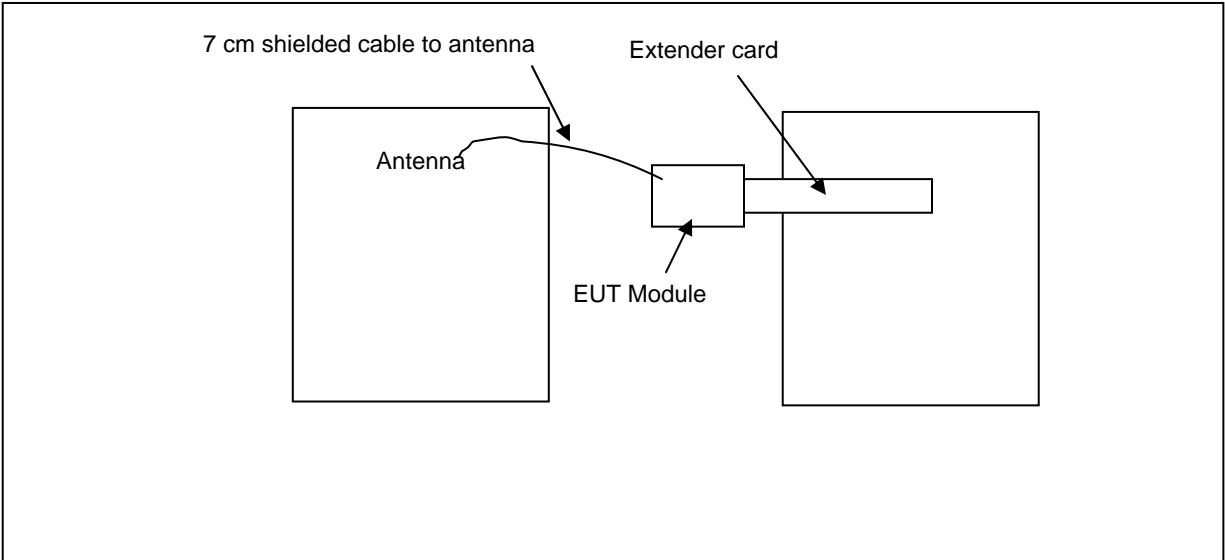


Figure 2-1: Worst Case Configuration of System under Test

### 3 Peak Output Power - FCC §15.247(b)(1); IC RSS-210 §6.2.2(o)(b)

#### 3.1 Power Output Test Procedure

The conducted output power of the EUT was measured using an Agilent 4416A EPM-P Series Power Meter with an E9323A Peak and Average Power Sensor.

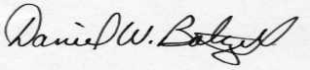
#### 3.2 Power Output Test Data

Table 3-1: Power Output Test Data

CHANNEL	PEAK POWER CONDUCTED OUTPUT (dBm)
1	19.8
6	18.2
11	17.8

\*Measurement accuracy is +/-1.5 dB

#### TEST PERSONNEL:

Daniel W. Baltzell Test Engineer	 Signature	February 14, 2006 Date Of Test
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#### 3.3 Power Output Test Equipment

Table 3-2: Power Output Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	9/21/06
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	9/21/06
900819	Weinschel Corporation	BF0830	Attenuator 10 db	N/A	12/2/08



#### **4 Compliance with the Restricted Band Edge - FCC §15.247(c), §15.205; IC RSS-210 §6.3**

##### **4.1 Band Edge Test Procedure**

Compliance with the band edges was performed using the FCC's "Radiated Measurement at a Band Edge" guidance document. The final data derived below were from radiated measurements only. The data shown in this report represents the worst case at 11 MBPS. Data rates of 5.5 MBPS, 2 MBPS, and 1 MBPS were investigated and found to be in compliance.

##### **4.2 Restricted Band Edge Plots**

###### **Calculation of Lower Band Edge**

The level 100.3 dBuV/m is the average field strength measurement, from which the delta measurement of 49.7 dB is subtracted (reference plot), which is equivalent to a level of 50.6 dB. This level has a margin of 3.4 dB under the limit of 54 dBuV/m.

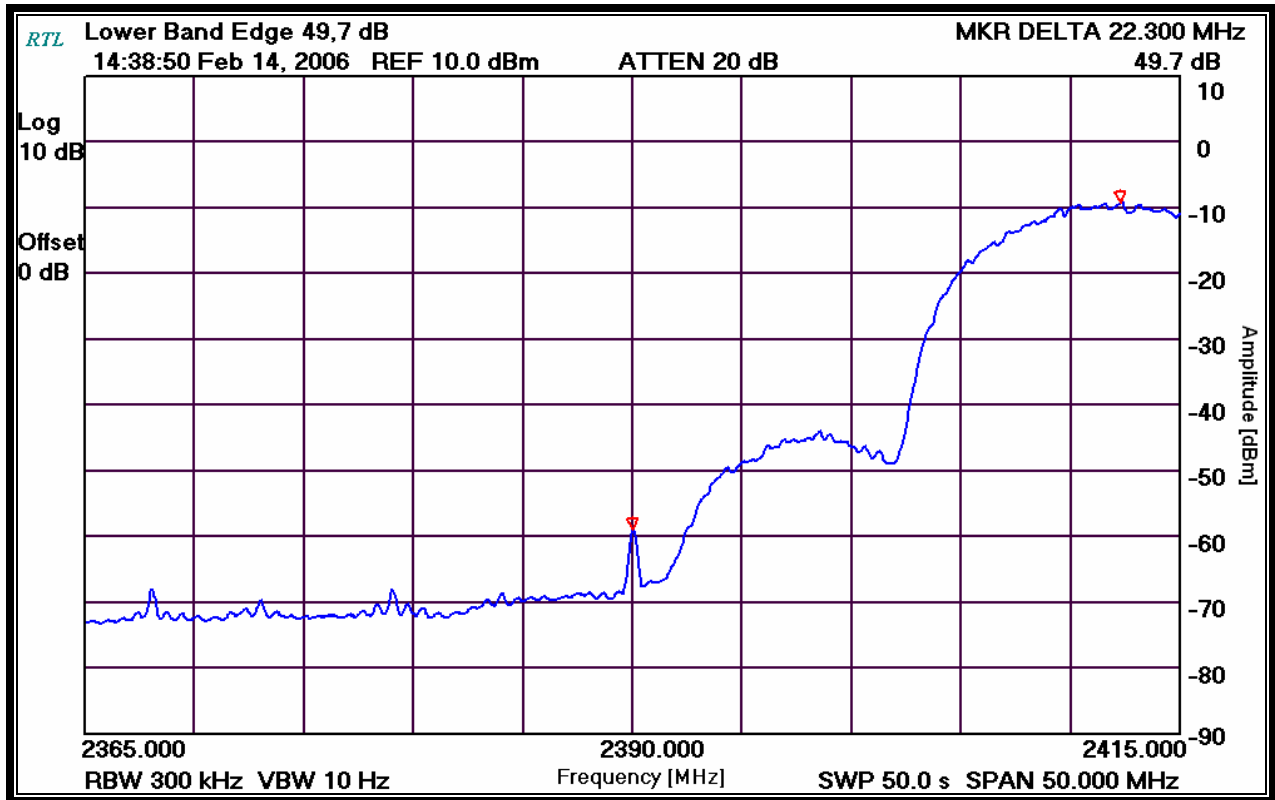
Calculation:  $100.3 \text{ dBuV/m} - 49.7 \text{ dB} - 54 \text{ dBuV/m} = -3.4 \text{ dB}$

Peak field strength of Channel 1 (1 MHz RBW/1 MHz VBW) = 107.4 dBuV/m  
Average field strength of Channel 1 (1 MHz RBW/10 Hz VBW) = 100.3 dBuV/m

Delta measurement: 49.7 dB

Channel Number: 1  
Frequency (MHz): 2412  
Resolution Bandwidth (kHz): 300  
Video Bandwidth (Hz): 10  
Sweep Time (s): 50

Plot 4-1: Lower Band Edge: Delta Measurement



TEST PERSONNEL:

Daniel W. Baltzell  
Test Engineer

Signature

February 14, 2006  
Date Of Test

### **Calculation of Upper Band Edge**

The level 94.6 dBuV/m is the average field strength measurement, from which the delta measurement of 50.6 dB is subtracted (reference plots), which is equivalent to a level of 44.0 dB. This level has a margin of 10.0 dB below the limit of 54 dBuV/m.

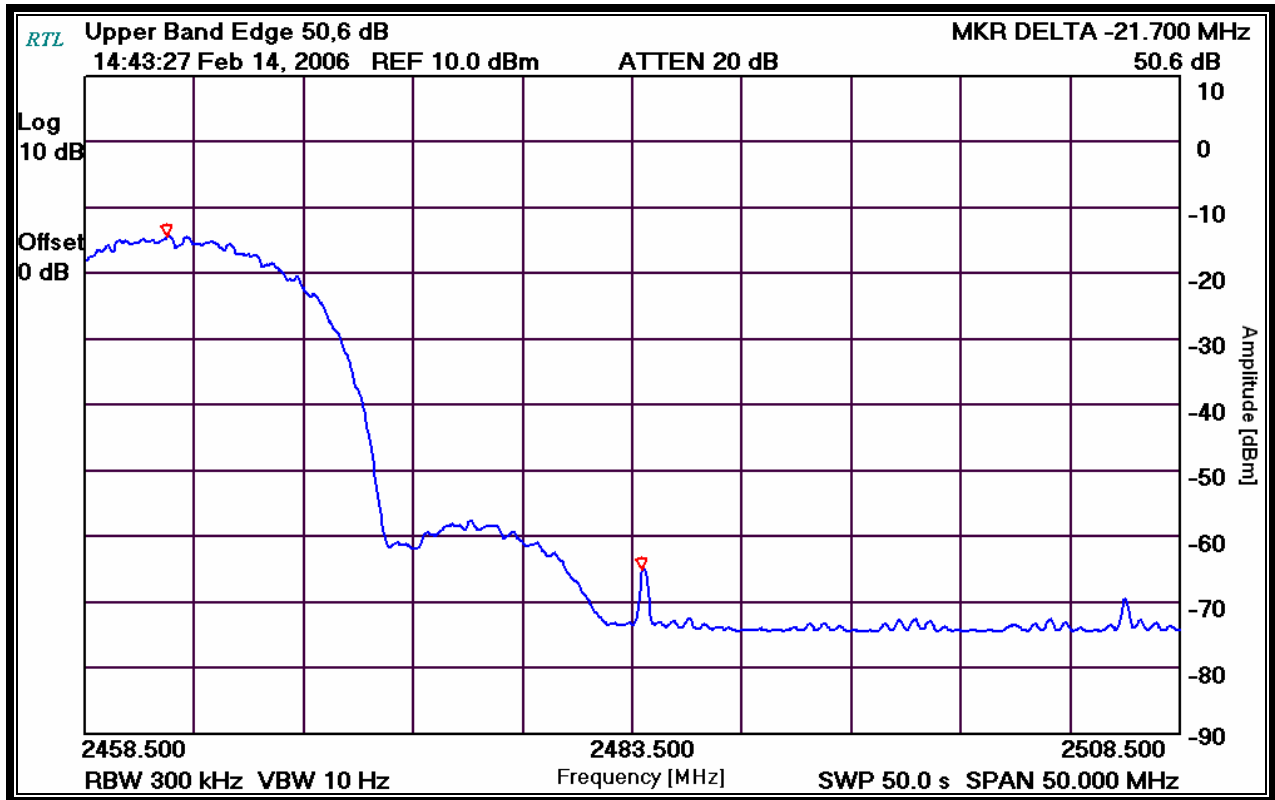
Calculation:  $94.6 \text{ dBuV/m} - 50.6 \text{ dB} - 54 \text{ dBuV/m} = -10.0 \text{ dB}$

Peak field strength of Channel 1 (1 MHz RBW/1 MHz VBW) = 101.6 dBuV/m  
Average field strength of Channel 1 (1 MHz RBW/10 Hz VBW) = 94.6 dBuV/m

Delta measurement: 50.6 dB

Channel Number: 11  
Frequency (MHz): 2462  
Resolution Bandwidth (kHz): 300  
Video Bandwidth (Hz): 10  
Sweep Time (s): 50

Plot 4-2: Upper Band Edge: Delta Measurement



TEST PERSONNEL:

Daniel W. Baltzell  
Test Engineer

Signature

February 14, 2006  
Date Of Test

### 4.3 Band Edge Test Equipment

**Table 4-1: Band Edge Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900878	Rhein Tech Labs	AM3-1197-0005	3 meter Antenna Mast, Polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Labs	WRT-000-0003	Wood Rotating Table	N/A	Not Required
901424	IW Microwave Products	KPS-1503-2400-KPS	High Frequency RF Cables	240"	12/11/06
901425	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	12/11/06
900772	EMCO	3161-02	Horn Antenna	9804-1044	5/20/07
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	5/20/06
901020	Hewlett Packard	8564E	Spectrum Analyzer (30 Hz - 40 GHz)	3943A01719	9/14/06
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	4/5/06
900819	Weinschel Corporation	BF0830	Attenuator 10 db	N/A	12/2/08

**5 Radiated Emissions Radiated Harmonics/Spurious Noise – FCC §15.247; IC RSS-210 §6.2.2(o)(e1); §6.3**

**5.1 Radiated Emissions Test Procedure for Harmonics/Spurious Noise**

Radiated Spurious Emissions apply to harmonics and spurious emissions that fall in the restricted bands when the EUT is configured in the transmit mode. The restricted bands are listed in Part 15.205. The maximum permitted average field strength for the restricted band is listed in Part 15.209. The EUT was tested in three orthogonal planes from 10 kHz to the 10<sup>th</sup> harmonic of the fundamental. The data in this report represents the worst case modes.

**5.2 Radiated Emissions Harmonics/Spurious Test Data**

**Table 5-1: Radiated Emissions Harmonics/Spurious (Channel 1/2412 MHz) CQ17593-G1 Antenna**

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2450.000	32.7	23.7	25.8	49.5	80.3	-30.8
2477.972	31.3	22.0	25.9	47.9	80.3	-32.4
4824.000	44.0	31.5	10.3	41.8	54.0	-12.2
7236.000	43.7	31.8	10.2	42.0	80.3	-38.3
9648.000	45.0	32.7	12.6	45.3	80.3	-35.0
12060.000	43.0	30.5	15.9	46.4	54.0	-7.6

Fundamental Field Strength (100.3 dBuV/m)

**Table 5-2: Radiated Emissions Harmonics/Spurious (Channel 6/2437 MHz) CQ17593-G1 Antenna**

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2365.807	36.7	21.0	25.6	46.6	54.0	-7.4
2502.940	33.3	23.5	25.7	49.2	77.5	-28.3
4874.000	44.7	31.8	9.8	41.6	54.0	-12.4
7311.000	44.8	31.8	9.7	41.5	54.0	-12.5
9748.000	44.8	32.5	12.6	45.1	77.5	-32.4
12185.000	44.3	31.5	14.6	46.1	54.0	-7.9

Fundamental Field Strength (97.5 dBuV/m)

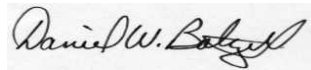
**Table 5-3: Radiated Emissions Harmonics/Spurious (Channel 11/2462 MHz) CQ17593-G1 Antenna**

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2352.012	33.3	23.5	25.7	49.2	54.0	-4.8
2367.800	27.2	21.3	25.6	46.9	54.0	-7.1
2400.000	34.2	25.7	25.6	51.3	74.6	-23.3
2528.000	32.2	23.0	25.8	48.8	54.0	-5.2
4924.000	42.3	32.3	10.1	42.4	54.0	-11.6
7386.000	42.3	31.7	11.3	43.0	74.6	-31.6
9848.000	44.0	33.5	13.4	46.9	74.6	-27.7
12310.000	41.7	32.2	13.9	46.1	74.6	-28.5

Fundamental Field Strength (94.6 dBuV/m)

**TEST PERSONNEL:**

Daniel W. Baltzell  
 Test Engineer



Signature

February 14, 2007  
 Date Of Test

**5.3 Radiated Spurious Emissions Test Equipment**

**Table 5-4: Radiated Spurious Emissions Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900878	Rhein Tech Labs	AM3-1197-0005	3 Meter Antenna Mast, Polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Labs	WRT-000-0003	Wood Rotating Table	N/A	Not Required
901424	IW Microwave Products	KPS-1503-2400-KPS	High Frequency RF Cables	240"	12/11/06
901425	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	12/11/06
900772	EMCO	3161-02	Horn Antenna (2 – 4 GHz)	9804-1044	5/20/07
900321	EMCO	3161-03	Horn Antennas (4-8,2 GHz)	9508-1020	5/20/07
900323	EMCO	3160-7	Horn Antennas (8,2-12,4 GHz)	9605-1054	5/20/07
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	5/20/07
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	5/20/06
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	9/14/06

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<http://www.rheintech.com>

Client: Zebra Technologies  
Model: AN17444-1  
FCC/IC: Part 15.247/RSS-210  
FCC ID: I28MD-RW4137  
Report#: 2006018

## **6 Conclusion**

The data in this measurement report shows that the Zebra Technologies Corp. Model # AN17444-1, FCC ID: I28MD-RW4137, with antenna CQ17593-G1, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules, Industry Canada RSS-210, ANSI 63.4 and FCC 97-114 (DSSS).