



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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FCC ID/ IC ID:	MQOTT700-20000/ 2570A-TT700200	Test Report Date:	February 6, 2007
Platform:	N/A	RTL Work Order Number:	2007113
Model Name/ Model Number:	T5/TT-700-100_R WF	RTL Quote Number:	QRTL07-013
American National Standard Institute:	ANSI C63.4-2003 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
FCC Classification:	DTS – Part 15 Digital Transmission System (WLAN portion) DSS – Part 15 Spread Spectrum Transmitter (Bluetooth portion)		
FCC Rule Part(s):	FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System 10-01-05		
Industry Canada:	RSS-210: Low Power License-Exempt Communications Devices		
Digital Interface Information	Digital Interface was found to be compliant		
Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
2412-2462	0.093	N/A	10M3G7D
2402-2480	0.001	N/A	1M14FXD
2412-2462	0.060	N/A	16M7G7D

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 of FCC Part 2, FCC Part 15, FCC 97-114, ANSI C63.4, and Industry Canada RSS-210.

Signature: 

Date: February 6, 2007

Typed/Printed Name: Desmond A. Fraser

Position: President

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The test results relate only to the item(s) tested.*

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1 General Information

1.1 Scope

Applicable Standards:

- 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.
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

1.2 Description of EUT

Equipment Under Test	Body Worn Terminal	
Model	TT-700	
Power Supply	Battery operated	
Modulation Type	DSSS – WLAN	FHSS - Bluetooth
Transfer Rate	54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, and 1 Mbps	54 Mbps was found to be the highest power and was used in testing
Frequency Range	2412 – 2462 MHz	2402 – 2480 MHz
Antenna Connector Type	Internal	Internal
Antenna Types	Internal	Internal

1.3 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).

1.4 Related Submittal(s)/Grant(s)

This is a Class II permissive change application for an FCC grant originally issued on July 10, 2006 for Vocollect, Inc. Model # TT-700-100_R WF, FCC ID: MQOTT700-20000, IC: 2570A-TT700200 (certificate issued July 7, 2006).

The version of the product under review in this application enables g rate functionality that has always been in the product but was not previously enabled. No other change was made.

1.5 Modifications

No modifications were required for compliance.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

Table 2-1: Channels Tested for DSSS – 54 Mbps

Channel	Frequency
1	2412
6	2437
11	2462

2.2 Exercising the EUT

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.247) – DSSS WLAN

Standard	Test	Pass/Fail or N/A
FCC 15.209	Radiated Emissions	Pass
FCC 15.247(a)(2)	6 dB Bandwidth	Pass
FCC 15.247(b)	Maximum Peak Power Output	Pass
FCC 15.247(d)	Antenna Conducted Spurious Emissions	Pass
FCC 15.247(e)	Power Spectral Density	Pass
FCC 15.247(d)	Band Edge Measurement	Pass

2.4 Test System Details

The test sample was received on February 1, 2007. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

Table 2-3: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
T5 Talkman WLAN/Bluetooth Terminal	Vocollect, Inc.	TT-700-100_R WF	206323210	MQOTT700-20000	N/A	17760
T5 Talkman WLAN/Bluetooth Terminal	Vocollect, Inc.	TT-700-100_R WF	26495986	MQOTT700-20000	N/A	17759
Battery	Vocollect, Inc.	730022	135460010A	N/A	N/A	17762
Battery	Vocollect, Inc.	730022	1360102298	N/A	N/A	17761

2.5 Configuration of Tested System

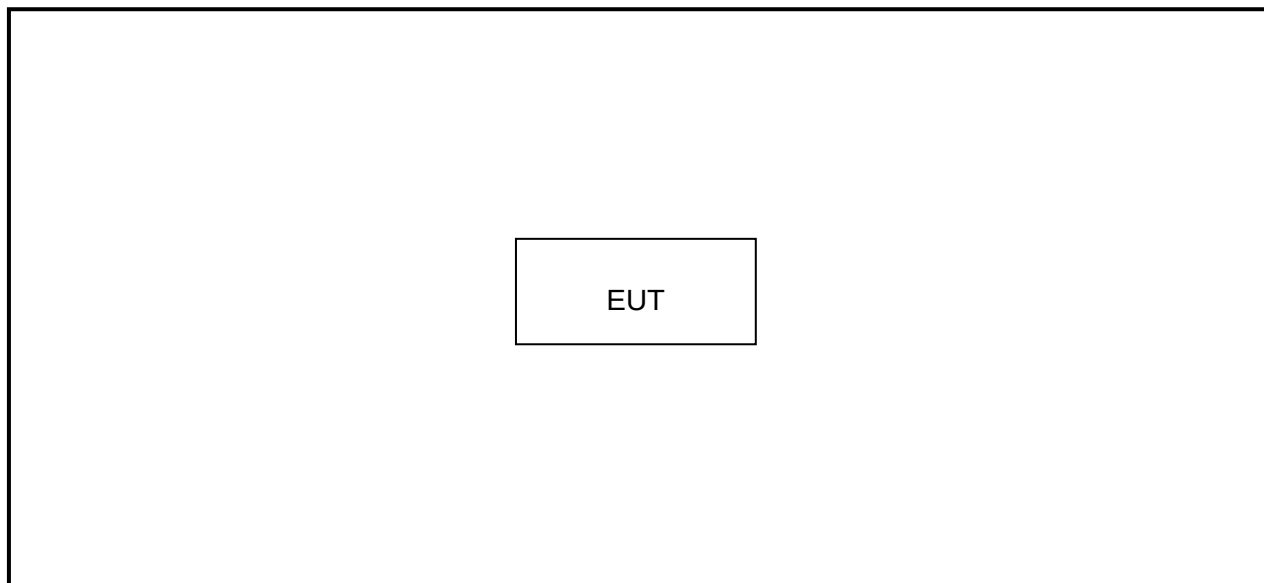


Figure 2-1: Configuration of System Under Test

3 Peak Output Power – FCC §15.247(b)(1); RSS-210 §A8.4(4)

3.1 Power Output Test Procedure

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

Table 3-1: Power Output Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	10/3/07
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	10/3/07

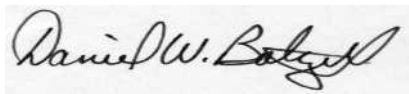
3.2 Power Output Test Data

Table 3-2: Power Output Test Data – DSSS WLAN 802.11g

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
1	2412	17.8
6	2437	17.7
11	2462	17.5

Test Personnel:

Daniel W. Baltzell
EMC Test Engineer



Signature

February 2, 2007
Date Of Test

4 Compliance with the Band Edge – FCC §15.247(d); RSS-210 §2.2

4.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. Peak (1 MHz RBW/VBW) and average (1 MHz RBW/10 Hz VBW) radiated measurements were taken with a suitable span to encompass the peak of the fundamental. A delta measurement was performed from the highest peak in the restricted band to the peak of the fundamental, and subtracted from the field strength; the result was compared to the limit in the restricted band (54 dBuV/m).

Table 4-1: Band Edge Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 KHz – 6.5 GHz)	3325A00159	2/28/07
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	5/20/07

4.2 Restricted Band Edge Test Results

4.2.1 Calculation of Lower Band Edge – DSSS WLAN

105.9 dBuV/m is the field strength measurement, from which the delta measurement of 53.2 dB is subtracted (reference plots), resulting in a level of 52.7 dB. This level has a margin of 1.3 dB below the limit of 54 dBuV/m.

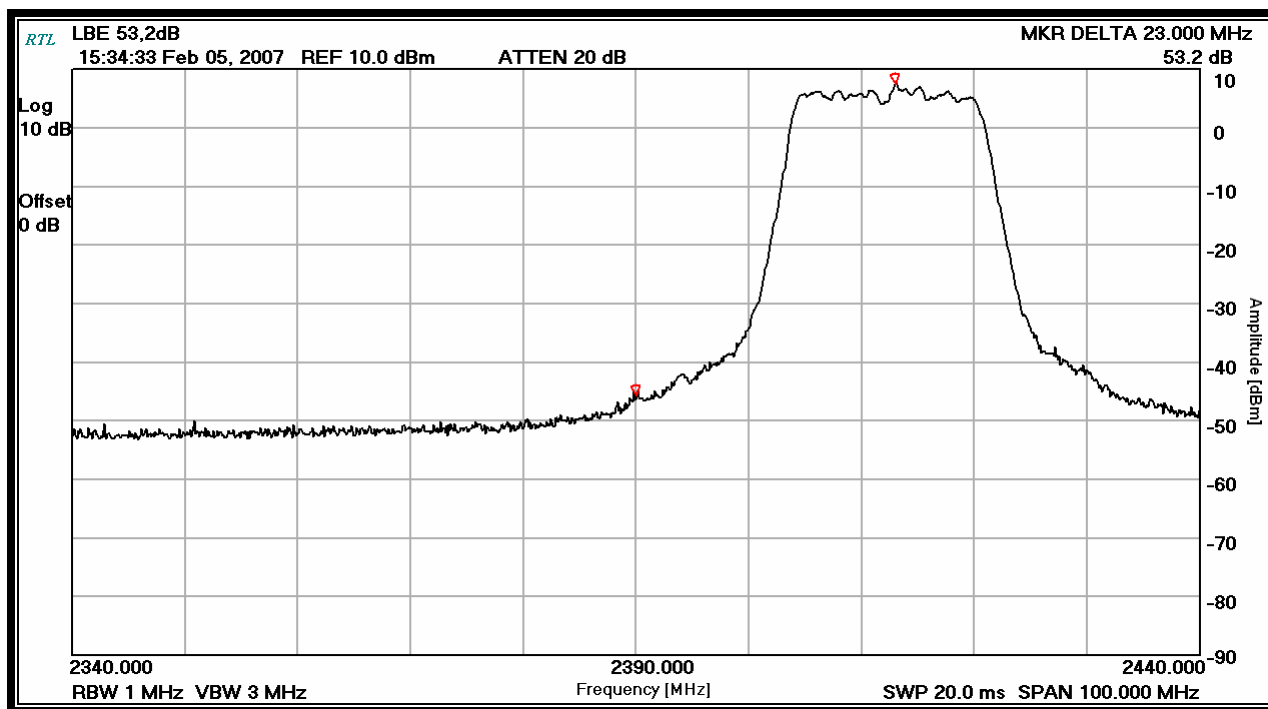
Calculation: $105.9 \text{ dBuV/m} - 53.2 \text{ dB} - 54 \text{ dBuV/m} = -1.3 \text{ dB}$

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 108.9 dBuV/m

Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 105.9 dBuV/m

Delta measurement = 53.2 dB

Plot 4-1: Lower Band Edge: Average Measurement Channel 1 (TX Frequency: 2412 MHz)



4.2.2 Calculation of Upper Band Edge – DSSS WLAN

105.6 dBuV/m is the field strength measurement, from which the delta measurement of 52.7 dB is subtracted (reference plots), resulting in a level of 52.9 dB. This level has a margin of 1.1 dB below the limit of 54 dBuV/m.

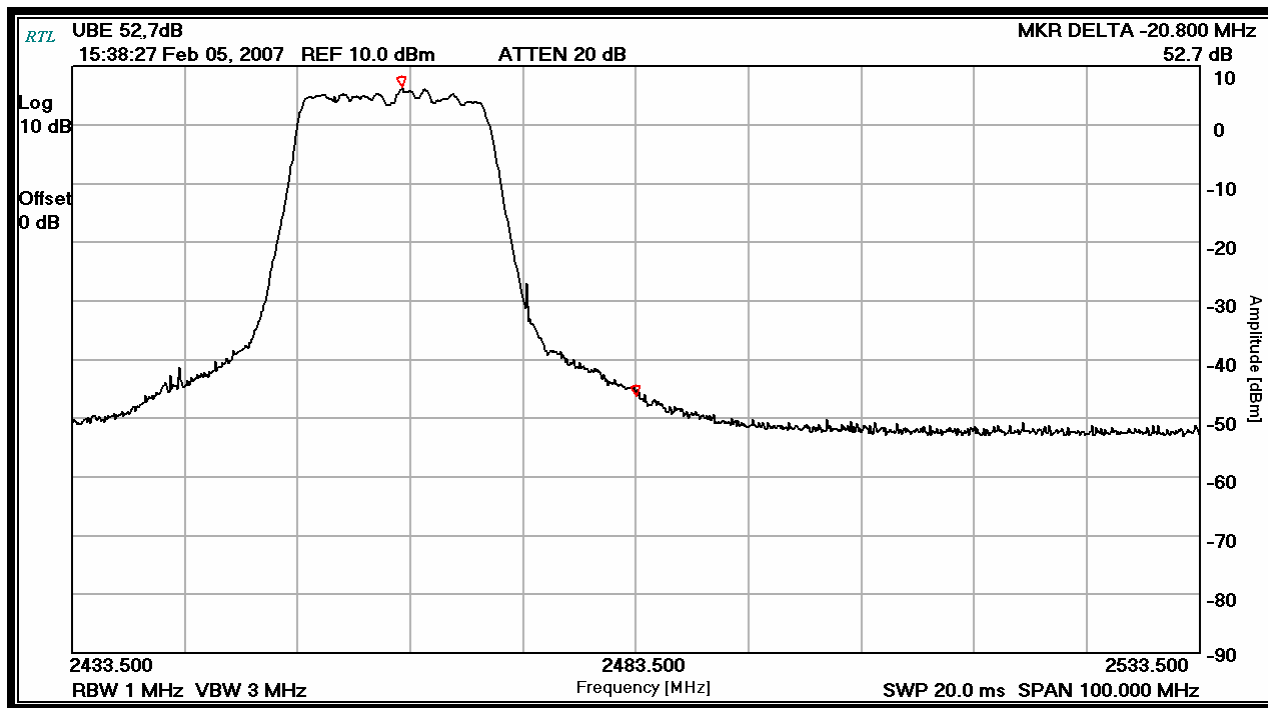
Calculation: $105.6 \text{ dBuV/m} - 52.7 \text{ dB} - 54 \text{ dBuV/m} = -1.1 \text{ dB}$

Peak Field Strength of Upper Band Edge (1 MHz RBW/1 MHz VBW) = 108.6 dBuV/m

Average Field Strength of Upper Band Edge (1 MHz RBW/10 Hz VBW) = 105.6 dBuV/m

Delta measurement = 52.7 dB

Plot 4-2: Upper Band Edge: Average Measurement Channel 11 (TX Frequency: 2462 MHz)



Test Personnel:

Daniel W. Baltzell
Test Engineer

Signature

February 5, 2007
Date Of Tests

5 Antenna Conducted Spurious Emissions – FCC §15.247(d); RSS-Gen

5.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions per FCC 15.247(c) was measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. The modulated carrier was identified at the following frequencies: 2412 MHz, 2437 MHz and 2462 MHz.

5.2 Antenna Conducted Spurious Emissions Test Results – DSSS WLAN

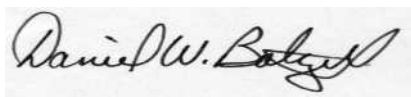
No harmonics or spurs were found within 20 dB of the carrier level from the carrier to the 10th harmonic of the carrier frequency (note that we are reporting power as peak). Per FCC 15.31(o), no data is being reported.

Table 5-1: Antenna Conducted Spurious Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	9/13/07

Test Personnel:

Daniel W. Baltzell
Test Engineer



Signature

February 2, 2007
Date Of Test

6 6 dB Bandwidth – FCC §15.247(a)(2); RSS-210 §A8.2

6.1 6 db Bandwidth Test Procedure – Minimum 6 db Bandwidth

The minimum 6 dB bandwidths per FCC 15.247(a)(2) were measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 1 MHz. The device was modulated. The minimum 6 dB bandwidths are presented below.

Table 6-1: 6 dB Bandwidth Test Equipment

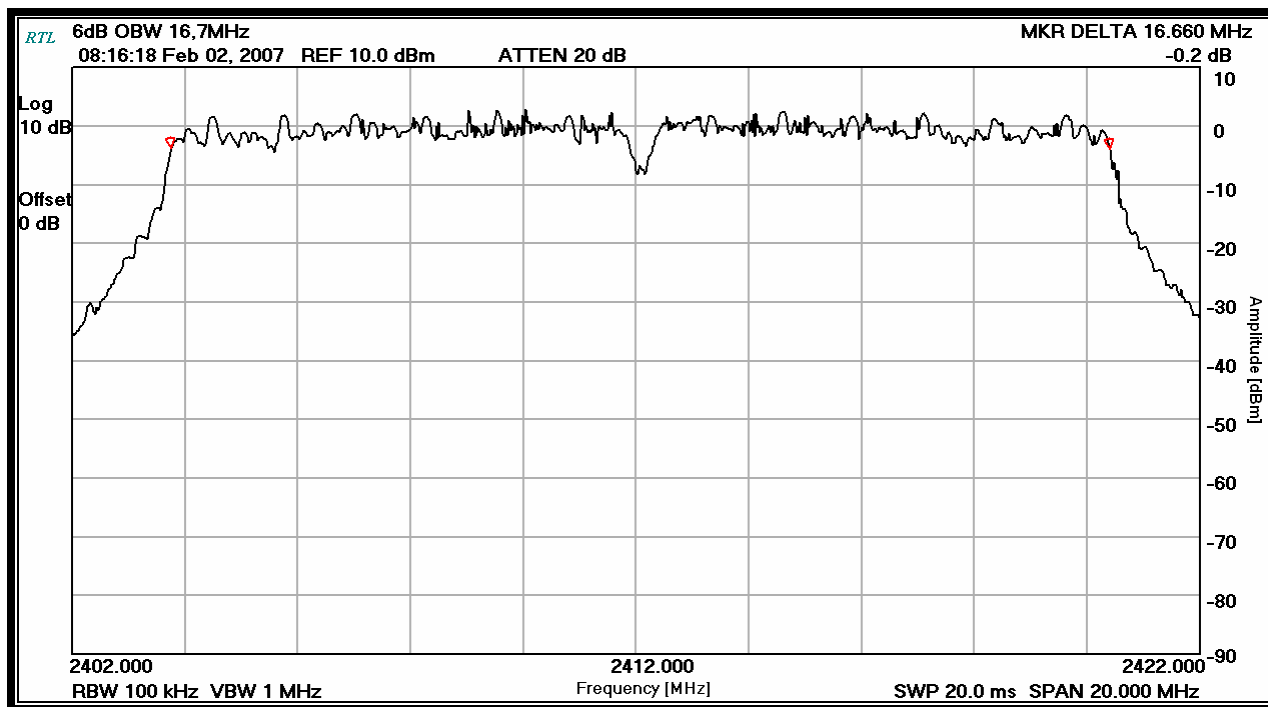
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900930/900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	9/13/07

6.2 6 db Bandwidth Test Results – DSSS WLAN 802.11g

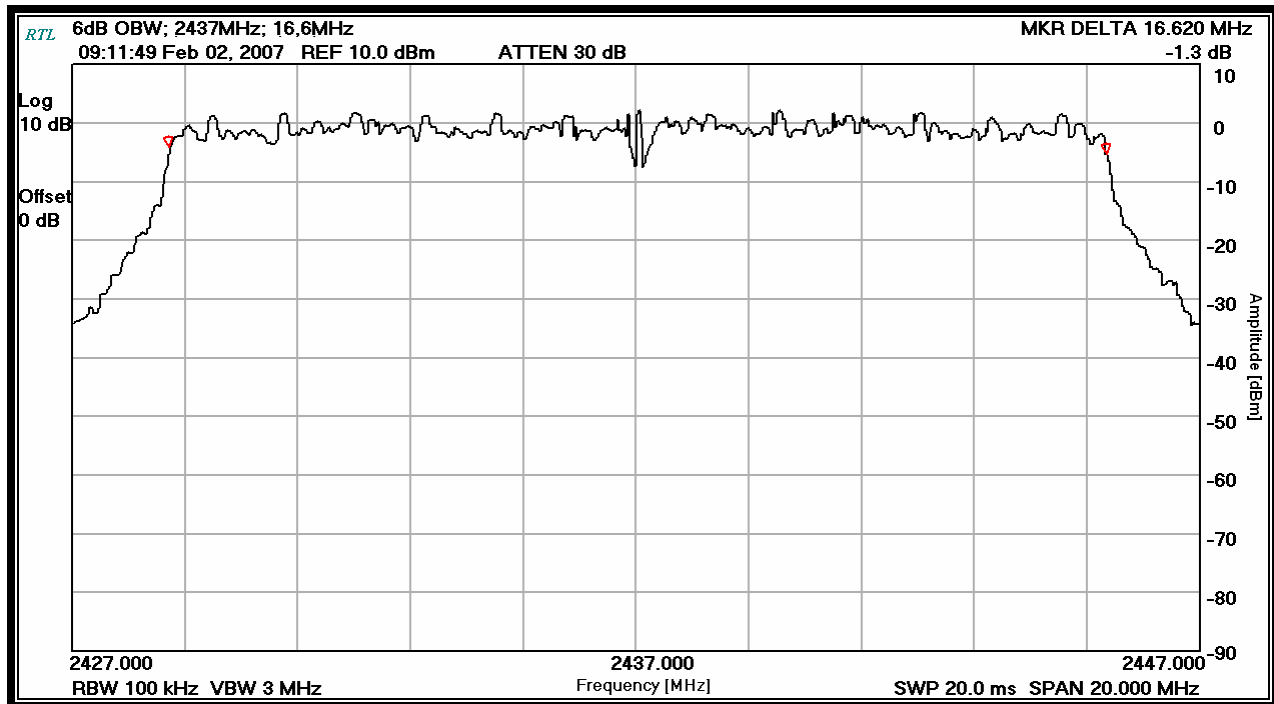
Table 6-2: 6 db Bandwidth Test Data – DSSS WLAN 802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
1	2412	16.7	0.5	Pass
6	2437	16.6	0.5	Pass
11	2462	16.6	0.5	Pass

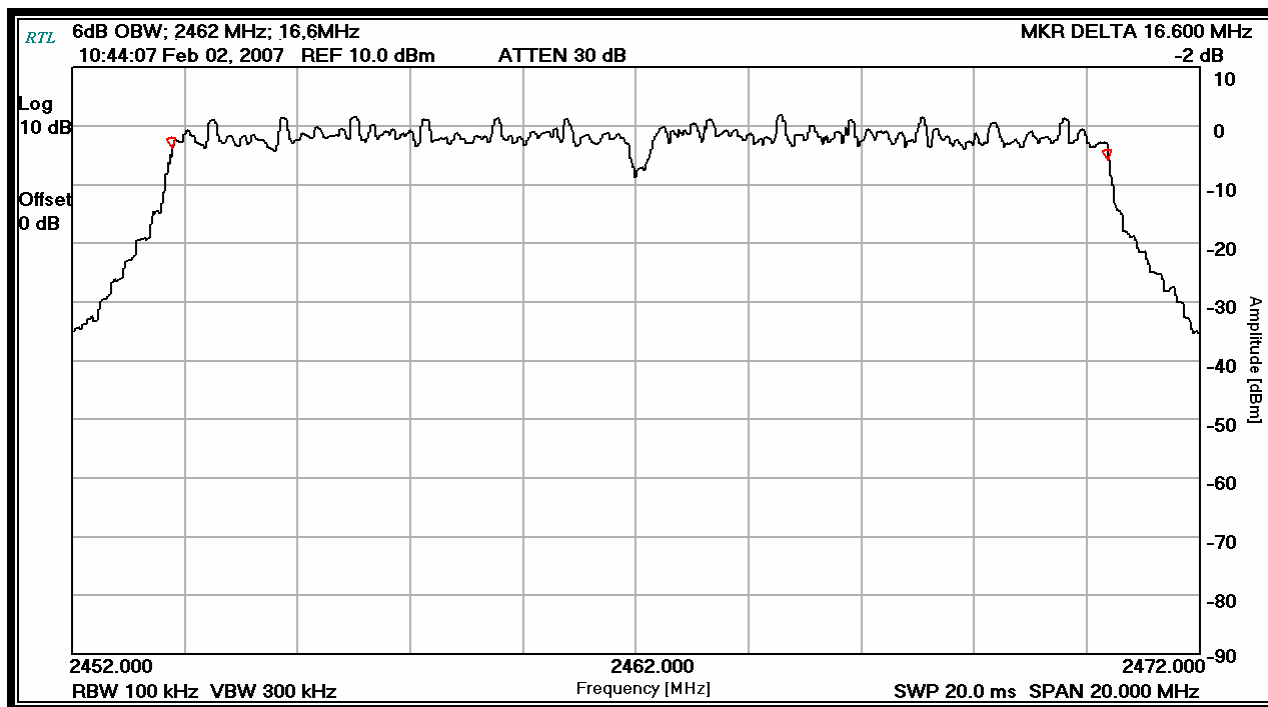
Plot 6-1: 6 dB Bandwidth Channel 1 (TX Frequency: 2412 MHz)



Plot 6-2: 6 dB Bandwidth Channel 6 (TX Frequency: 2437 MHz)



Plot 6-3: 6 dB Bandwidth Channel 11 (TX Frequency: 2462 MHz)



Test Personnel:

Daniel W. Baltzell
Test Engineer

Signature

February 2, 2007
Date Of Tests

7 Power Spectral Density – FCC §15.247(e); RSS-210 §A8.2

7.1 Power Spectral Density Test Procedure

The power spectral density per FCC 15.247(d) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 3 kHz, the video bandwidth set at 30 kHz, and the sweep time set at 500 seconds. The spectral lines were resolved for the modulated carriers at 2.412 GHz, 2.437 GHz, and 2.462 GHz respectively. These levels are below the +8 dBm limit. See the power spectral density table and plots.

Table 7-1: Power Spectral Density Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	9/13/07

7.2 Power Spectral Density Test Data – DSSS WLAN; 802.11g

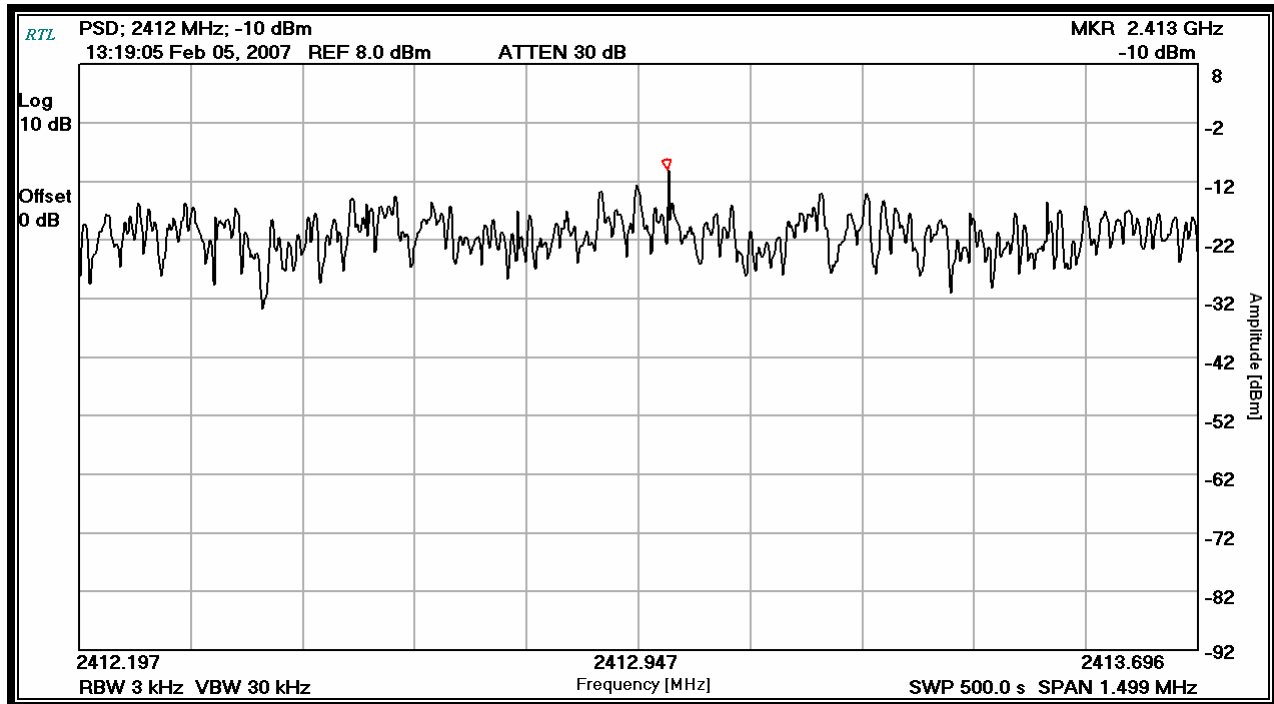
Table 7-2: Power Spectral Density Test Data – DSSS WLAN; 802.11g

Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
1	2412	-10.0	8	Pass
6	2437	-11.4	8	Pass
11	2462	-13.1	8	Pass

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Client: Vocollect, Inc.
Model #: TT-700-100_R WF
Standards: FCC 15.247 & RSS-210
FCC ID: MQOTT700-20000
Report #: 2007113

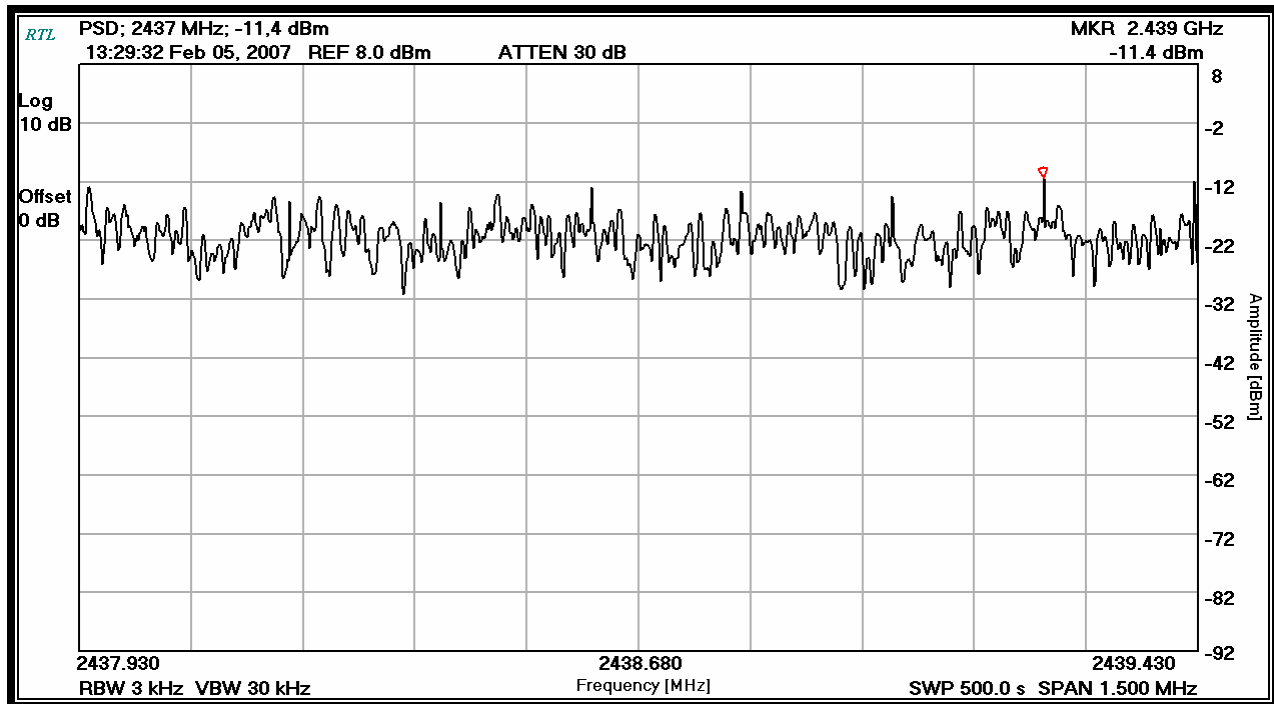
Plot 7-1: Power Spectral Density: Channel 1 (2412 MHz)



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<http://www.rheintech.com>

Client: Vocollect, Inc.
Model #: TT-700-100_R WF
Standards: FCC 15.247 & RSS-210
FCC ID: MQOTT700-20000
Report #: 2007113

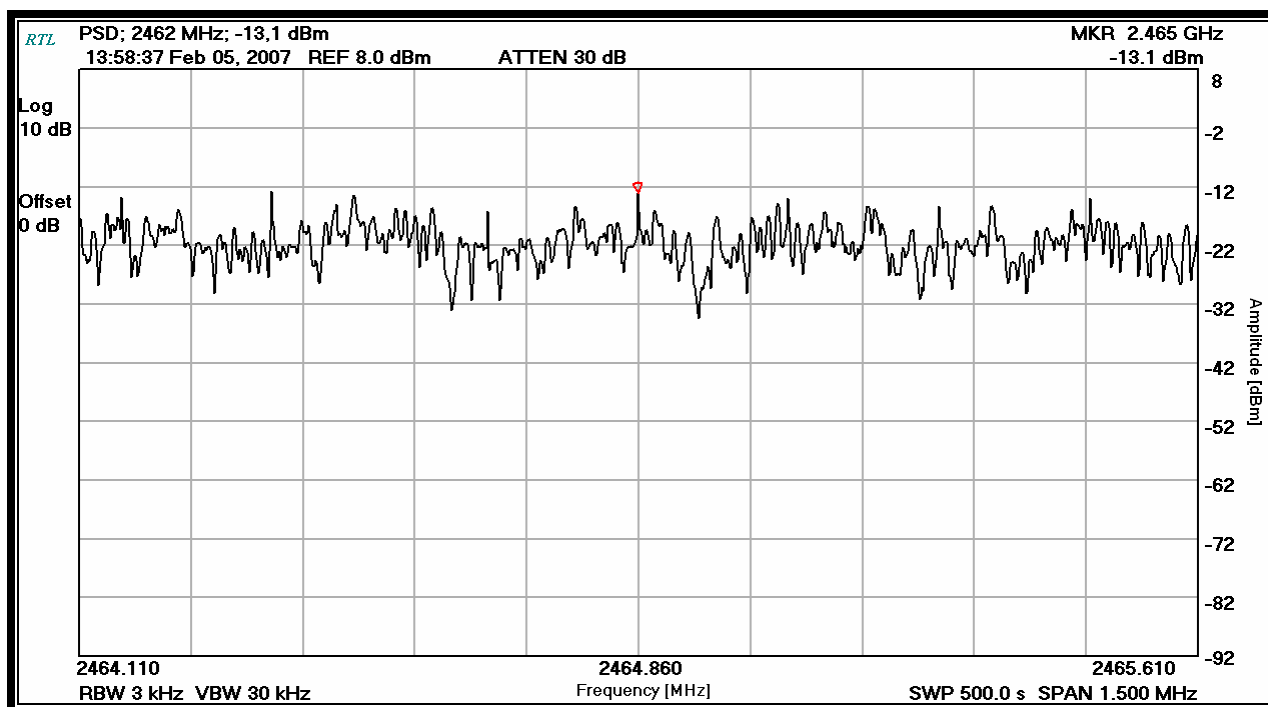
Plot 7-2: Power Spectral Density: Channel 6 (2437 MHz)



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Client: Vocollect, Inc.
Model #: TT-700-100_R WF
Standards: FCC 15.247 & RSS-210
FCC ID: MQOTT700-20000
Report #: 2007113

Plot 7-3: Power Spectral Density: Channel 11 (2462 MHz)



Test Personnel:

Daniel W. Baltzell
Test Engineer

Signature

February 5, 2007
Date Of Test

8 Radiated Emissions – FCC §15.209; RSS-210 §A8.5 and RSS-Gen

8.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

8.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10th harmonic of the highest fundamental transmitter frequency (24.8 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 8-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Antenna (Loop, 9 kHz - 30 MHz)	827525/019	9/15/09
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	11/01/07
901365	Miteq	JS4-00102600-41-5P	Amplifier, 15 V, 0.1 - 26 GHz, 28 dB gain	1094152	3/24/07
900905	Rhein Tech Labs	PR-1040	OATS 1 Preamplifier 40 dB (30 MHz – 2 GHz)	1006	3/15/07
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901425	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	12/5/07
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	12/5/07
901242	Rhein Tech Labs	WRT-000-0003	Wood rotating table	N/A	Not Required
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
900356	EMCO	3160-08	Horn Antenna (12.4 - 18 GHz)	9607-1044	5/20/07
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	5/20/07
901218	EMCO	3301B	Horn Antenna (18 - 26.5 GHz)	960281-003	5/20/07
900392	Hewlett Packard	1197OK	Harmonic Mixer (18 – 26.5 GHz)	3525A00159	11/27/07
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	9/13/07
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	9/13/07
900889	Hewlett Packard	85685A	RF Preselector (20 Hz - 2 GHz)	3146A01309	4/12/07
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 KHz – 6.5 GHz)	3325A00159	2/28/07

8.3 Radiated Emissions Test Results

8.3.1 Radiated Emissions Digital/Receiver Test Data

Table 8-2: Digital/Receiver Radiated Emissions Test Data

Temperature: 11°F Humidity: 31%										
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emissions Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
134.372	Qp	V	0	1.0	43.8	-17.0	26.8	43.5	-16.7	Pass
287.515	Qp	V	90	1.0	37.0	-13.9	23.1	46.0	-22.9	Pass
344.028	Qp	H	90	1.0	43.4	-12.0	31.4	46.0	-14.6	Pass
352.130	Qp	V	90	1.0	33.6	-11.6	22.0	46.0	-24.0	Pass
385.395	Qp	V	90	1.5	36.8	-10.9	25.9	46.0	-20.1	Pass
393.165	Qp	H	90	1.0	43.0	-10.3	32.7	46.0	-13.3	Pass
491.464	Qp	H	90	1.0	42.9	-8.2	34.7	46.0	-11.3	Pass
648.448	Qp	V	90	1.5	37.8	-5.3	32.5	46.0	-13.5	Pass

Test Personnel:

Daniel W. Baltzell
Test Engineer



Signature

February 5, 2007
Date Of Test

8.3.2 Radiated Emissions Harmonics/Spurious Test Data - WLAN DSSS 802.11g

Table 8-3: Radiated Emissions Harmonics/Spurious Channel 1 (TX Frequency: 2412 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4824.0	35.7	21.0	6.5	27.5	54.0	-26.5
7236.0	36.7	23.3	8.4	31.7	91.9	-60.2
9648.0	35.6	21.8	14.1	35.9	91.9	-56.0
12060.0	34.0	21.2	14.6	35.8	54.0	-18.2
14472.0	38.3	25.0	19.5	44.5	54.0	-9.5
16884.0	38.1	24.8	20.8	45.6	91.9	-46.3

Table 8-4: Radiated Emissions Harmonics/Spurious Channel 6 (TX Frequency: 2437 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4874.0	33.0	18.7	6.6	25.3	54.0	-28.7
7311.0	35.3	21.9	8.0	29.9	54.0	-24.1
9748.0	34.4	21.3	14.1	35.4	89.5	-54.1
12185.0	33.9	20.8	15.6	36.4	54.0	-17.6
14622.0	38.5	25.1	20.2	45.3	89.5	-44.2
17059.0	37.6	24.6	21.3	45.9	89.5	-43.6

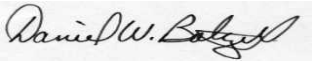
Table 8-5: Radiated Emissions Harmonics/Spurious Channel 11 (TX Frequency: 2462 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4924.0	32.9	19.2	6.6	25.8	54.0	-28.2
7386.0	34.9	22.3	8.0	30.3	54.0	-23.7
9848.0	34.2	21.3	14.1	35.4	88.6	-53.2
12310.0	33.8	21.6	15.4	37.0	54.0	-17.0
14772.0	38.2	24.8	19.4	44.2	88.6	-44.4
17234.0	37.1	24.5	20.3	44.8	88.6	-43.8

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Client: Vocollect, Inc.
Model #: TT-700-100_R WF
Standards: FCC 15.247 & RSS-210
FCC ID: MQOTT700-20000
Report #: 2007113

Test Personnel:

Daniel W. Baltzell		February 6, 2007
Test Engineer	Signature	Date Of Test

9 Conclusion

The data in this measurement report shows that the EUT as tested, Vocollect, Inc. Model # TT-700-100_R WF, FCC ID: MQOTT700-20000, IC: 2570A-TT700200, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and Industry Canada RSS-210.