



Engineering and Testing for EMC and Safety Compliance



Accredited under A2LA testing certificate # 2653.01

Certification Application Report
FCC Part 15.247 & Industry Canada RSS-210

Test Lab:		Applicant:	
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FCC ID/ IC:	W9T-P10100/ 8174A-P10100	Test Report Date:	March 31, 2009
Platform:	N/A	RTL Work Order #:	2009105
Model Name/ Model #:	REALTOR® Lockbox NXT/ NXTW01	RTL Quote #:	QRTL09-110
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		
FCC Rule Part(s)/Guidance:	FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System (10-01-09), DA 00-705		
Industry Canada:	RSS-210 Issue 7: 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
2405 – 2480	0.002	N/A	2M66G7D

* power is 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 of FCC Part 2, FCC Part 15, ANSI C63.4 and Industry Canada RSS-210.

Signature: Desmond A. Fraser

Date: March 31, 2009

Typed/Printed Name: Desmond A. Fraser

Position: President

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1 General Information

1.1 Scope

This is an original certification application request.

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	Transceiver
Model Name	REALTOR® Lockbox NXT, Model # NXTW01
Power Supply	2 Li-Ion CR123A Batteries in Series
Modulation Type	Offset-QPSK (O-QPSK) with half-sine pulse shaping and 32-length block coding (spreading)
Frequency Range	2405–2480 MHz
Antenna Types	Two (diversity) -1 dBi printed line dipole PCB antennae

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 an original application for certification for SentriLock, LLC Model Name: REALTOR® Lockbox NXT, FCC ID: W9T-P10100, IC: 8174A- P10100.

1.5 Modifications

No modifications were made to the equipment during testing in order to achieve compliance with these standards.

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

Channel	Frequency
Low	2405
Middle	2440
High	2480

2.2 Exercising the EUT

The EUT was supplied with test firmware programmed with a high, mid, and low channel for testing. 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)

Standard	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	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
RSS-Gen	99% Bandwidth	N/A

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Client: SentriLock, LLC
Model: REALTOR® Lockbox NXT
Standards: FCC 15.247/IC RSS-210
ID's: W9T-P10100/8174A-P10100
Report #: 2009105

2.4 Test System Details

The test samples were received on March 27, 2009. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

Table 2-3: Equipment under Test

Part	Manufacturer	Model Name	Serial Number	FCC ID	Cable Description	RTL Bar Code
Transceiver	SentriLock, LLC	REALTOR® Lockbox NXT	00526727	W9T-P10100	N/A	18905
Transceiver	SentriLock, LLC	REALTOR® Lockbox NXT	00521696	W9T-P10100	N/A	18906

2.5 Configuration of Tested System

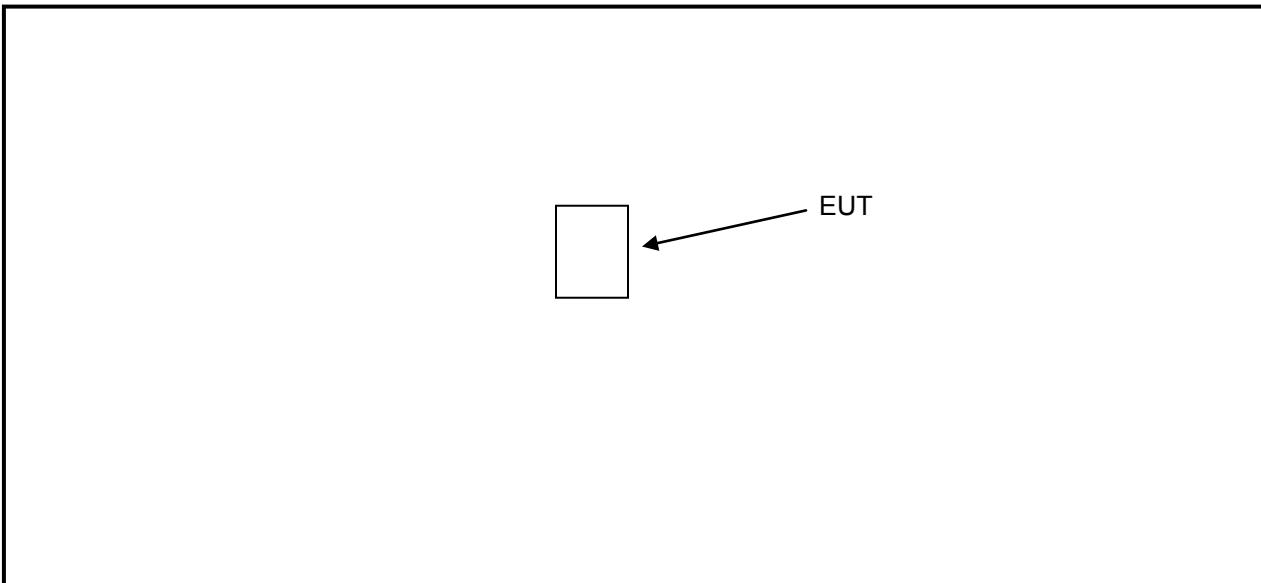


Figure 2-1: Configuration of System under Test

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Model: REALTOR® Lockbox NXT
Standards: FCC 15.247/IC RSS-210
ID's: W9T-P10100/8174A-P10100
Report #: 2009105

3 Peak Output Power - §15.247(b)(3); RSS-Gen

3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken.

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	11/5/09
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	11/5/09

3.2 Power Output Test Data

Table 3-2: Power Output Test Data

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
Low	2405	1.64
Middle	2440	1.95
High	2480	1.96

Test Personnel:

Dan Baltzell  March 27, 2009
Test Engineer Signature Date Of Test

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

4.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. A conducted antenna port delta measurement was performed from the highest peak in the restricted band to the peak of the fundamental, and subtracted from the radiated field strength; the result was compared to the limit.

Table 4-1: Band Edge Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	7/31/09
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter Antenna Mast, polarizing	Outdoor Range 1	Not Required
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/17/09
901517	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/17/09
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	6/14/10
900321	EMCO	3161-03	Horn Antenna (4.0-8.2 GHz)	9508-1020	6/14/10
900323	EMCO	3160-07	Horn Antenna (8.2-12.4 GHz)	9605-1054	6/14/10
900356	EMCO	3160-08	Horn Antenna (12.4-18 GHz)	9607-1044	6/14/10
900325	EMCO	3160-9	Horn Antennas (18-26.5 GHz)	9605-1051	6/14/10
901365	MITEQ	JS4-00102600-41-5P	Amplifier, (0.1-26 GHz), 30dB gain	N/A	3/4/10

4.2 Band Edge Test Results

4.2.1 Calculation of Lower Band Edge

73.7 dBuV/m is the field strength measurement, from which the delta measurement of 40.5 dB is subtracted, resulting in a level of 33.2 dB. This level has a margin of 20.8 dB below the limit of 54 dBuV/m.

Calculation: $73.7 \text{ dBuV/m} - 40.5 \text{ dB} - 54 \text{ dBuV/m} = -20.8 \text{ dB}$

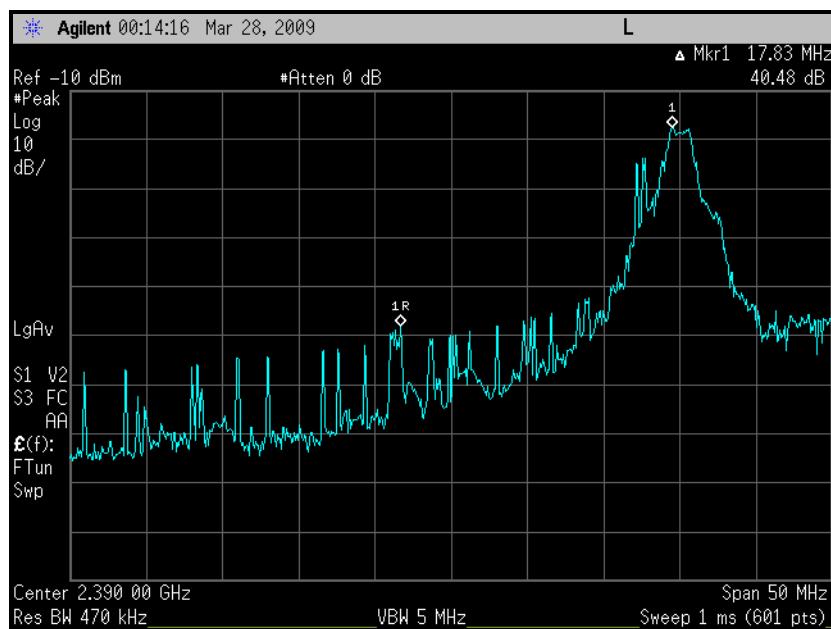
Peak Field Strength of Lower Band Edge (1 MHz RBW/8 MHz VBW) = 93.7 dBuV/m

Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 73.7 dBuV/m

Delta measurement = 40.5 dB

4.2.2 Lower Band Edge Plot

Plot 4-1: Lower Band Edge



4.2.3 Calculation of Upper Band Edge

72.4 dBuV/m is the field strength measurement, from which the delta measurement of 33.6 dB is subtracted (reference hopping plot), resulting in a level of 38.8 dB. This level has a margin of 15.2 dB below the limit of 54 dBuV/m.

Calculation: $72.4 \text{ dBuV/m} - 33.6 \text{ dB} - 54 \text{ dBuV/m} = -15.2 \text{ dB}$

Peak Field Strength of Lower Band Edge (1 MHz RBW/8 MHz VBW) = 92.4 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 72.4 dBuV/m
Delta measurement = 33.6 dB

4.2.4 Upper Band Edge Plot

Plot 4-2: Upper Band Edge



Test Personnel:

Daniel W. Baltzell
Test Engineer

Signature

March 28, 2009
Date Of Test

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Client: SentriLock, LLC
Model: REALTOR® Lockbox NXT
Standards: FCC 15.247/IC RSS-210
ID's: W9T-P10100/8174A-P10100
Report #: 2009105

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

5.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions per FCC 15.247(c) were 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 1 MHz. The modulated carrier was identified at the following frequencies: 2405 MHz, 2440 MHz and 2480 MHz.

No harmonics or spurs were found within 20 dB of the limit 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 other data is being reported.

Table 5-1: Antenna Conducted Spurious Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer (3 Hz–50 GHz)	US44020346	7/31/09

Test Personnel:

Dan Baltzell		March 28, 2009
Test Engineer	Signature	Date Of Test

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

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 300 Hz. The device was modulated. The minimum 6 dB bandwidths are presented below.

Table 6-1: 6 dB Bandwidth Test Equipment

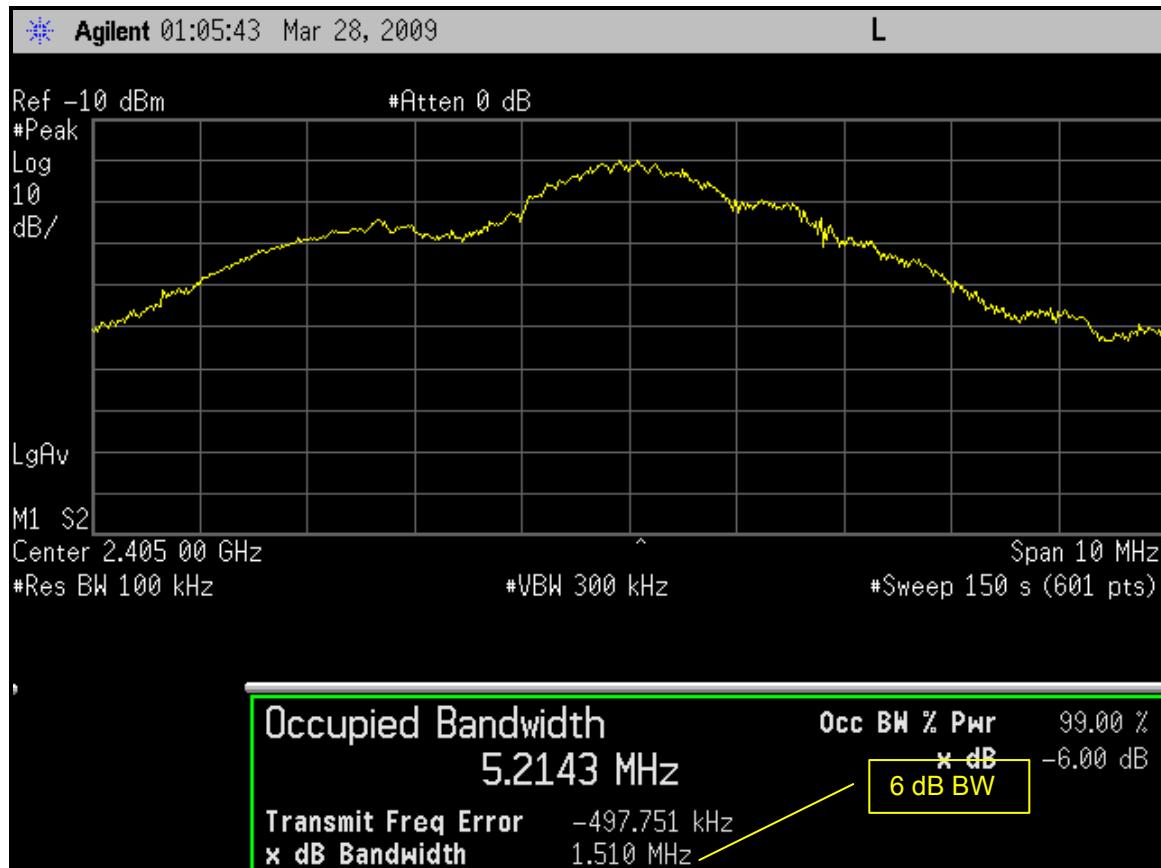
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer (3 Hz–50 GHz)	US440203416	7/31/09

6.2 6 dB Bandwidth Test Results

Table 6-2: 6 dB Bandwidth Test Data

Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
2405	1.51	0.5	Pass
2440	1.59	0.5	Pass
2480	1.75	0.5	Pass

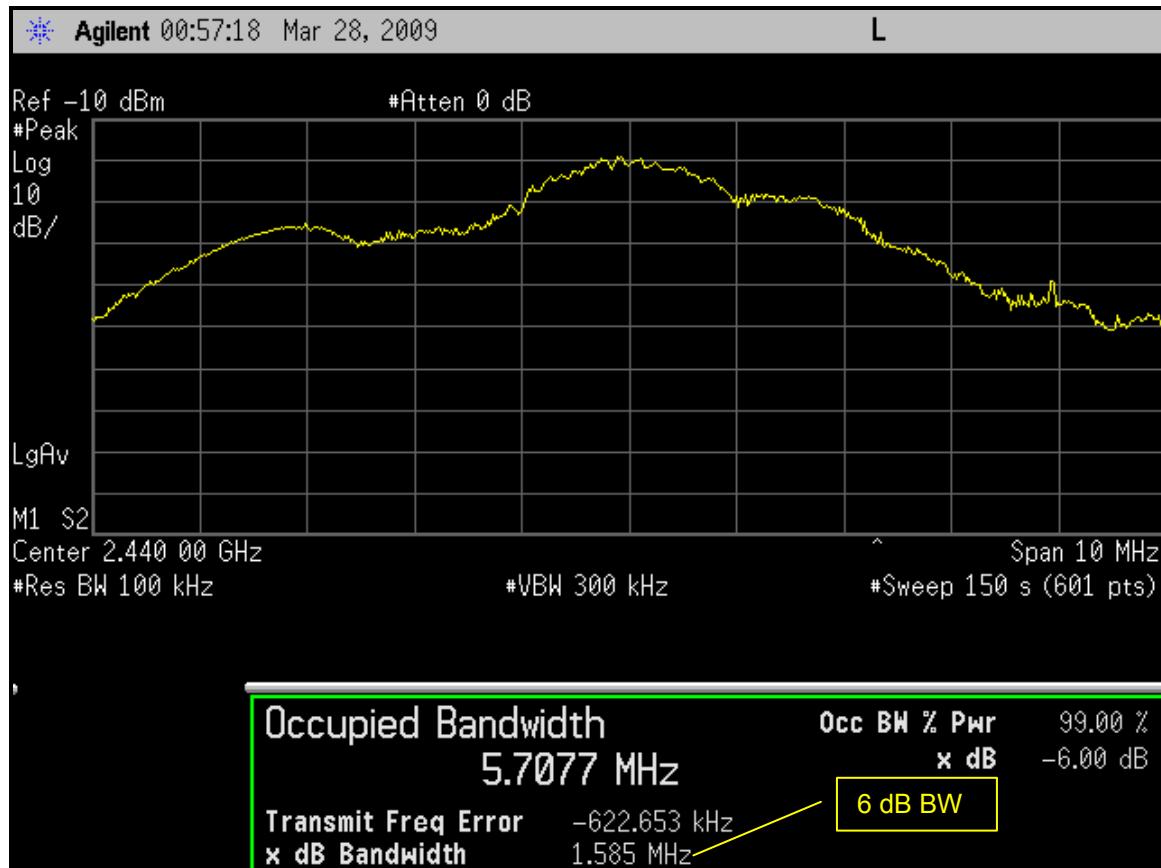
Plot 6-1: 6 dB Bandwidth – 2405 MHz



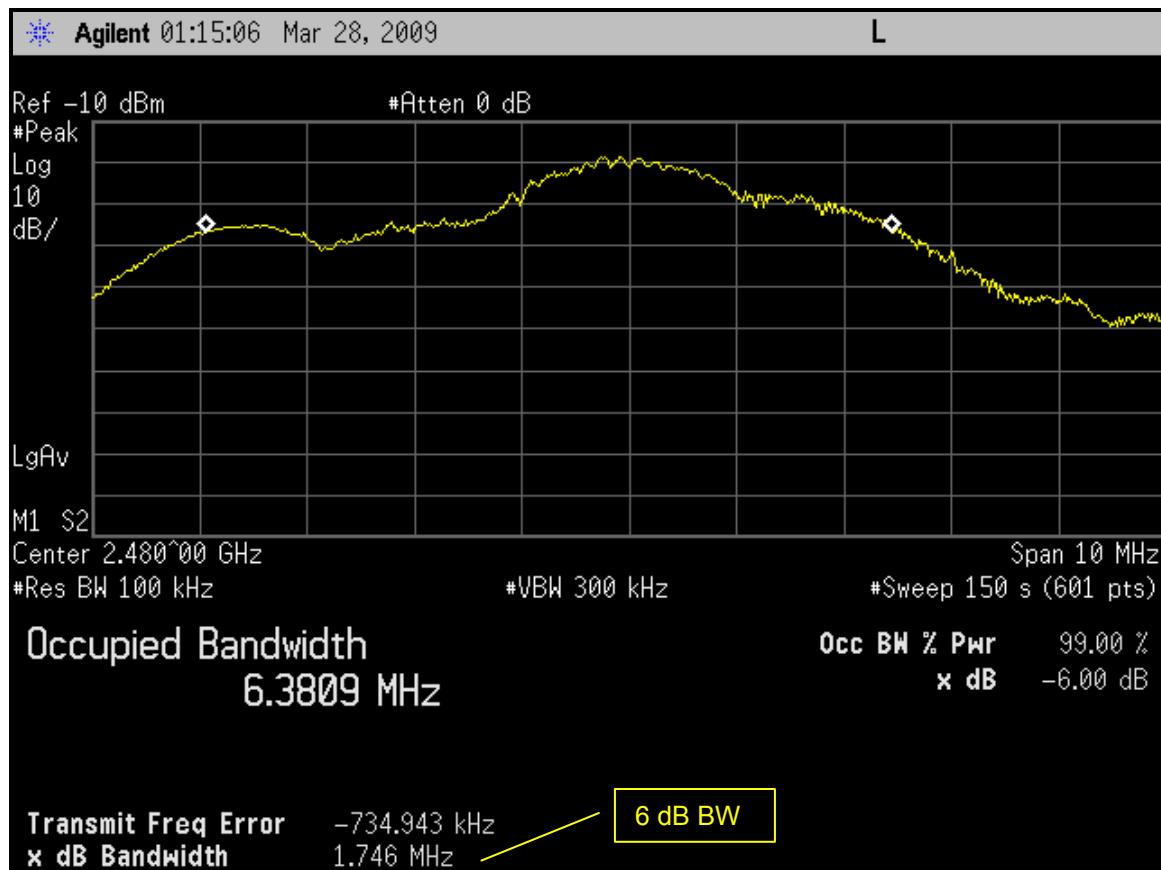
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Plot 6-2: 6 dB Bandwidth – 2440 MHz



Plot 6-3: 6 dB Bandwidth – 2480 MHz



Test Personnel:

Dan Baltzell
Test Engineer

Daniel W. Baltzell

Signature

March 28, 2009
Date Of Test

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

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 100 seconds. The spectral lines were resolved for the modulated carriers at 2405, 2440 and 2480 MHz. 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
901413	Agilent Technologies	E4448A	Spectrum Analyzer (3 Hz–50 GHz)	US440203416	7/31/09

7.2 Power Spectral Density Test Data

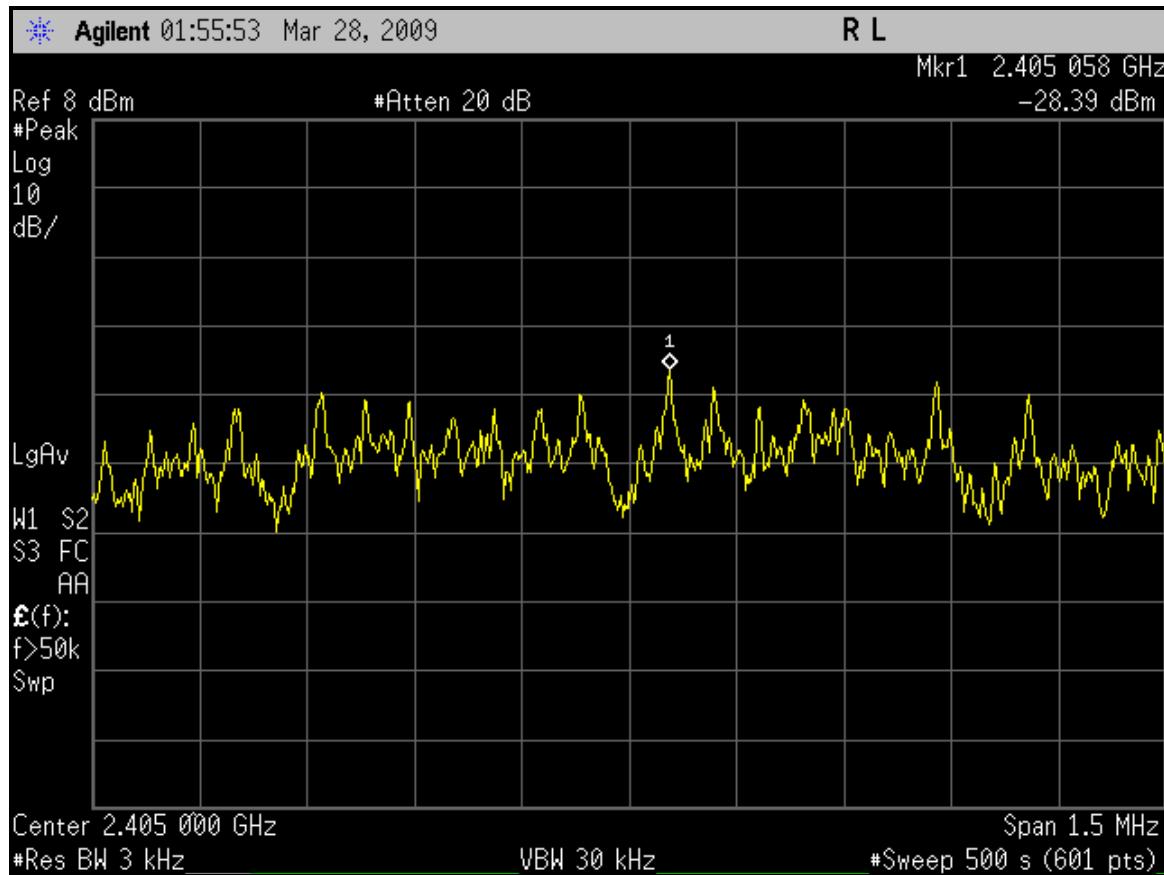
Table 7-2: Power Spectral Density Test Data

Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
2405	-28.4	8	Pass
2440	-29.0	8	Pass
2480	-30.0	8	Pass

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Report #: 2009105

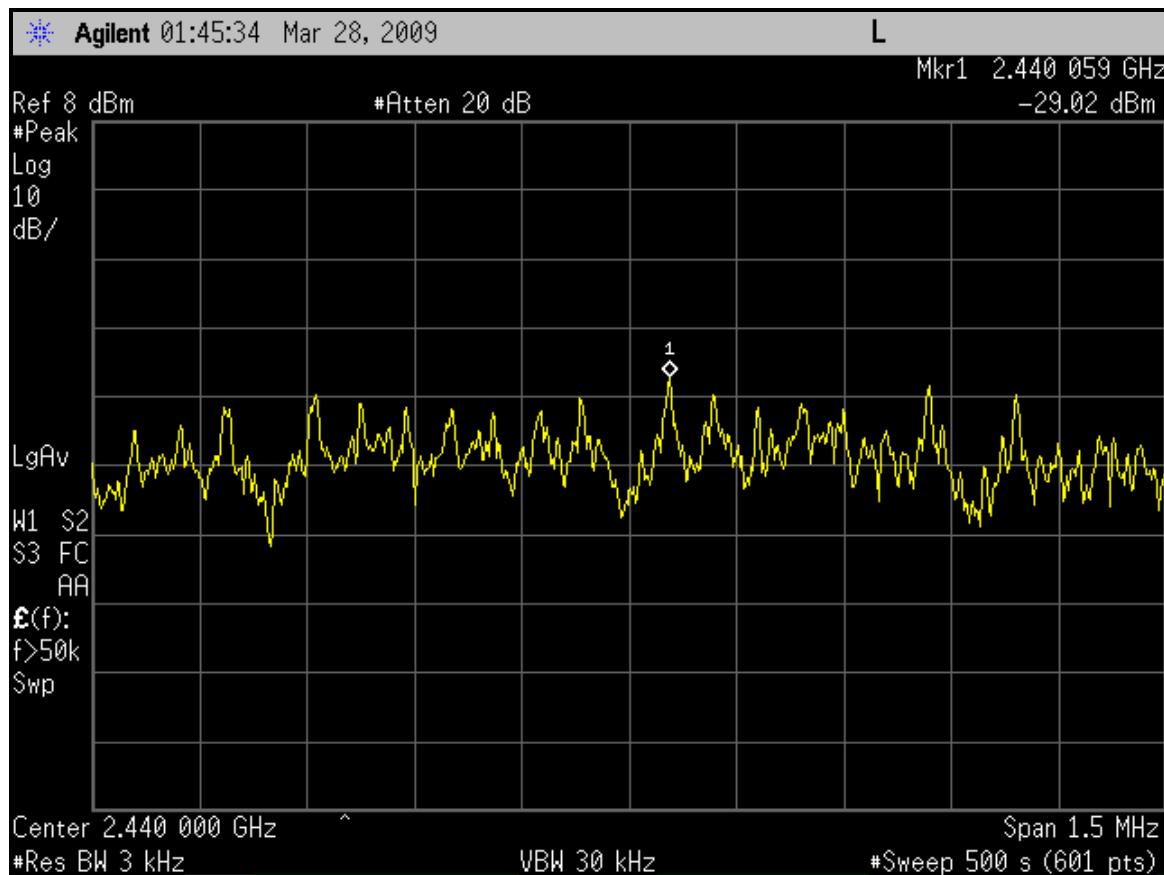
Plot 7-1: Power Spectral Density – 2405 MHz



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Report #: 2009105

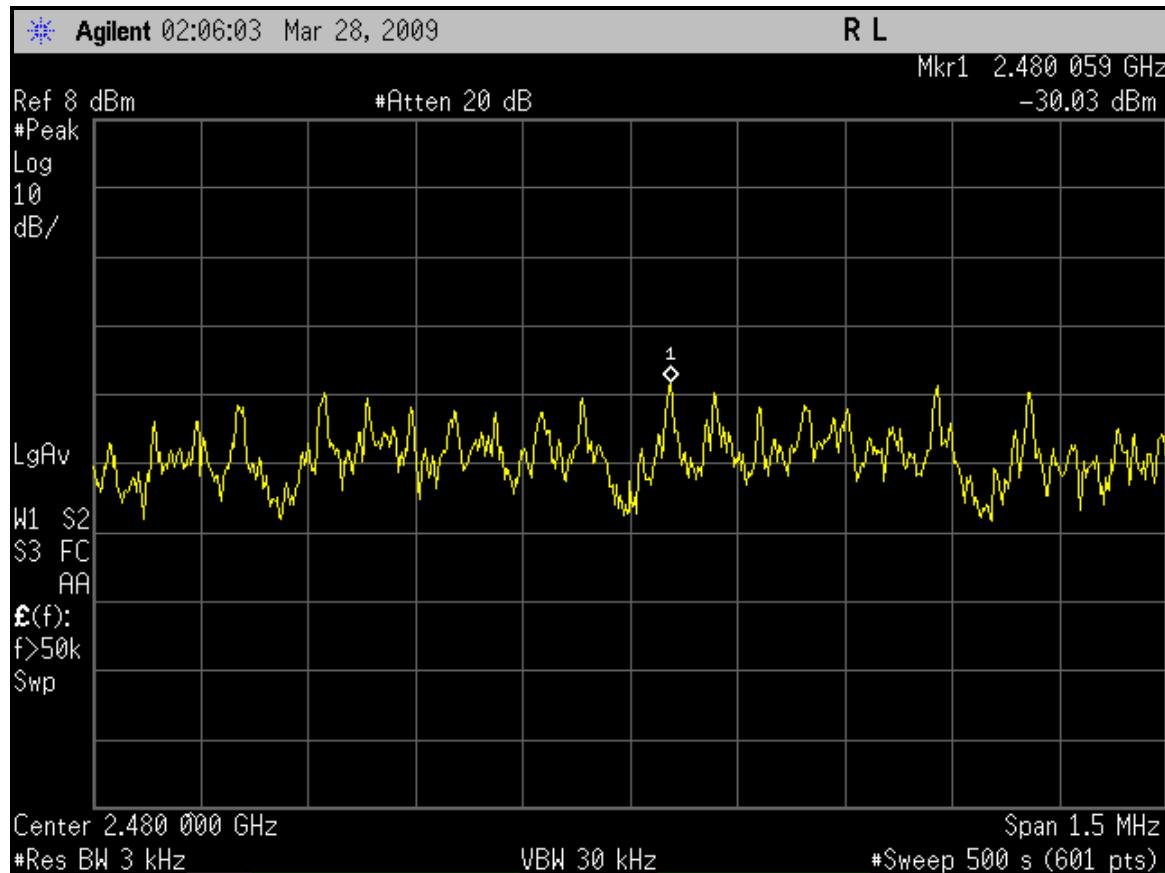
Plot 7-2: Power Spectral Density – 2440 MHz



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Standards: FCC 15.247/IC RSS-210
ID's: W9T-P10100/8174A-P10100
Report #: 2009105

Plot 7-3: Power Spectral Density – 2480 MHz



Test Personnel:

Dan Baltzell
Test Engineer

Daniel W. Baltzell

Signature

March 28, 2009
Date Of Test

8 Conducted Emissions Measurement Limits – FCC §15.207; RSS-Gen

No conducted emissions tests were performed as the EUT is battery operated.

9 Radiated Emissions - §15.209; RSS-210 §6.2.1

9.1 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.

9.2 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 9-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna (9 kHz-30 MHz)	827525/019	9/15/09
901365	MITEQ	JS4-00102600-41-5P	Amplifier, (0.1-26 GHz), 30dB gain	N/A	3/4/10
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40dB (30 MHz-2 GHz)	1006	6/2/09
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS-09302008	RF cable, 20'	NA	10/17/09
901517	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	10/17/09
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz-6.5 GHz)	3325A00159	4/15/09
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	7/31/09
900772	EMCO	3161-02	Horn Antenna (2-4 GHz)	9804-1044	06/14/10
900321	EMCO	3161-03	Horn Antenna (4.0-8.2 GHz)	9508-1020	06/14/10
900323	EMCO	3160-07	Horn Antenna (8.2-12.4 GHz)	9605-1054	06/14/10
900356	EMCO	3160-08	Horn Antenna (12.4-18 GHz)	9607-1044	06/14/10
900325	EMCO	3160-9	Horn Antennas (18-26.5 GHz)	9605-1051	06/14/10

9.3 Radiated Emissions Test Results

9.3.1 Radiated Emissions Digital Test Data

Table 9-2: Digital Radiated Emissions Test Data

Temperature: 54°F Humidity: 97%										
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
31.304	Qp	H	0	1.0	33.1	-7.2	25.9	40.0	-14.1	Pass
32.000	Qp	V	0	1.0	33.0	-7.6	25.4	40.0	-14.6	Pass
896.000	Qp	V	0	1.0	24.9	0.3	25.2	46.0	-20.8	Pass
928.000	Qp	H	0	1.0	24.6	1.1	25.7	46.0	-20.3	Pass
1088.000	Av	V	0	1.0	26.6	2.9	29.5	54.0	-24.5	Pass
1376.000	Av	V	0	1.0	26.0	6.6	32.6	54.0	-21.4	Pass

9.3.2 Radiated Emissions Harmonics/Spurious Test Data

Table 9-3: Radiated Emissions Harmonics/Spurious - 2405 MHz

Fundamental amplitude = 93.7 dBuV/m

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (-20dB duty cycle correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4810.0	52.0	32.0	-0.4	31.6	54.0	-22.4
7215.0	56.0	36.0	2.1	38.1	73.7	-35.6
9620.0	42.9	22.9	9.5	32.4	73.7	-41.3

Table 9-4: Radiated Emissions Harmonics/Spurious - 2440 MHz

Fundamental amplitude = 92.9 dBuV/m

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (-20dB duty cycle correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4880.0	56.1	36.1	-0.3	35.8	54.0	-18.2
7320.0	55.7	35.7	1.7	37.4	54.0	-16.6

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Client: SentriLock, LLC
Model: REALTOR® Lockbox NXT
Standards: FCC 15.247/IC RSS-210
ID's: W9T-P10100/8174A-P10100
Report #: 2009105

Table 9-5: Radiated Emissions Harmonics/Spurious - 2480 MHz

Fundamental amplitude = 92.4 dBuV/m

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (-20dB duty cycle correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4960.0	54.4	34.4	-0.3	34.1	54.0	-19.9
7441.5	50.3	30.3	2.2	32.5	54.0	-21.5

Test Personnel:

Daniel W. Baltzell
Test Engineer



Signature

March 29, 2009
Date Of Test

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 Report #: 2009105

10 99% Bandwidth - RSS-Gen §4.6.1

Table 10-1: 99% Bandwidth Test Equipment

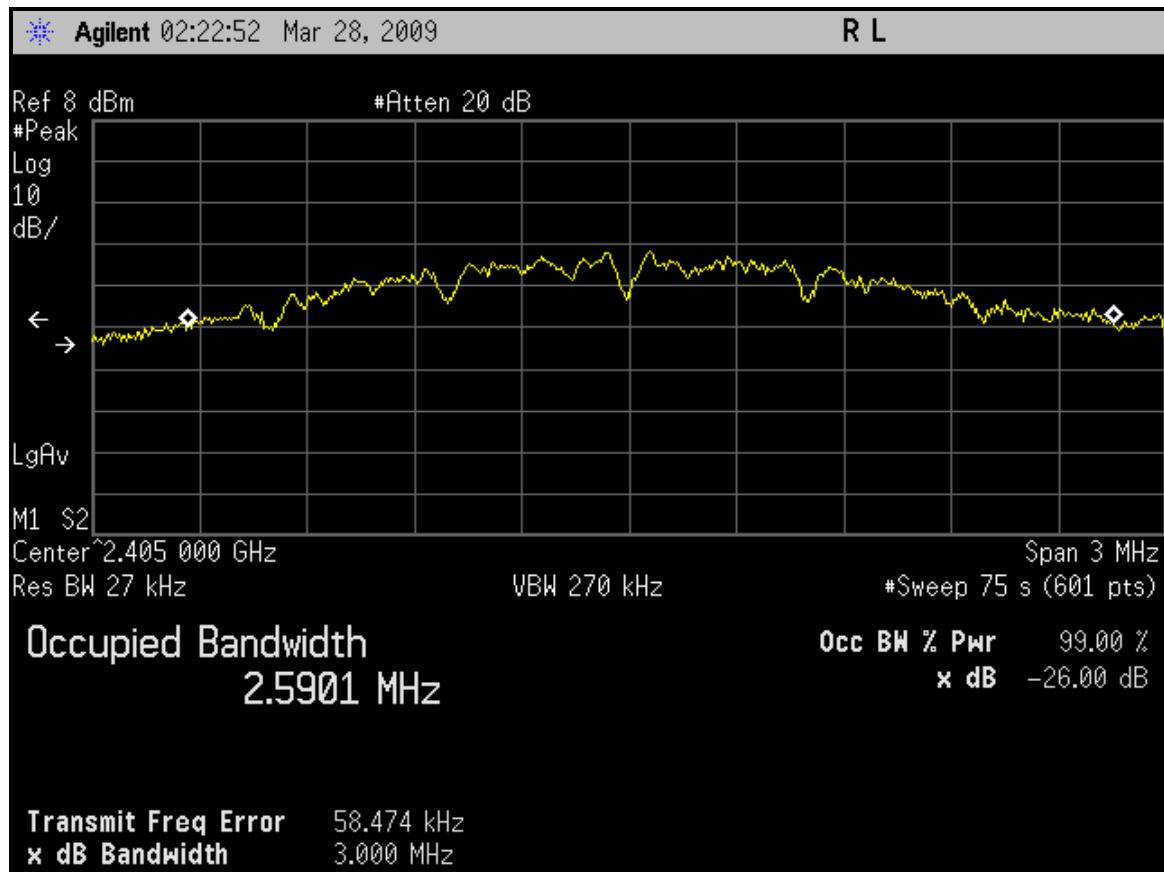
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	7/31/09

10.1 99% Bandwidth Test Data

Table 10-2: 99% Bandwidth Test Data

Frequency (MHz)	99% Bandwidth (MHz)
2405	2.59
2440	2.60
2480	2.66

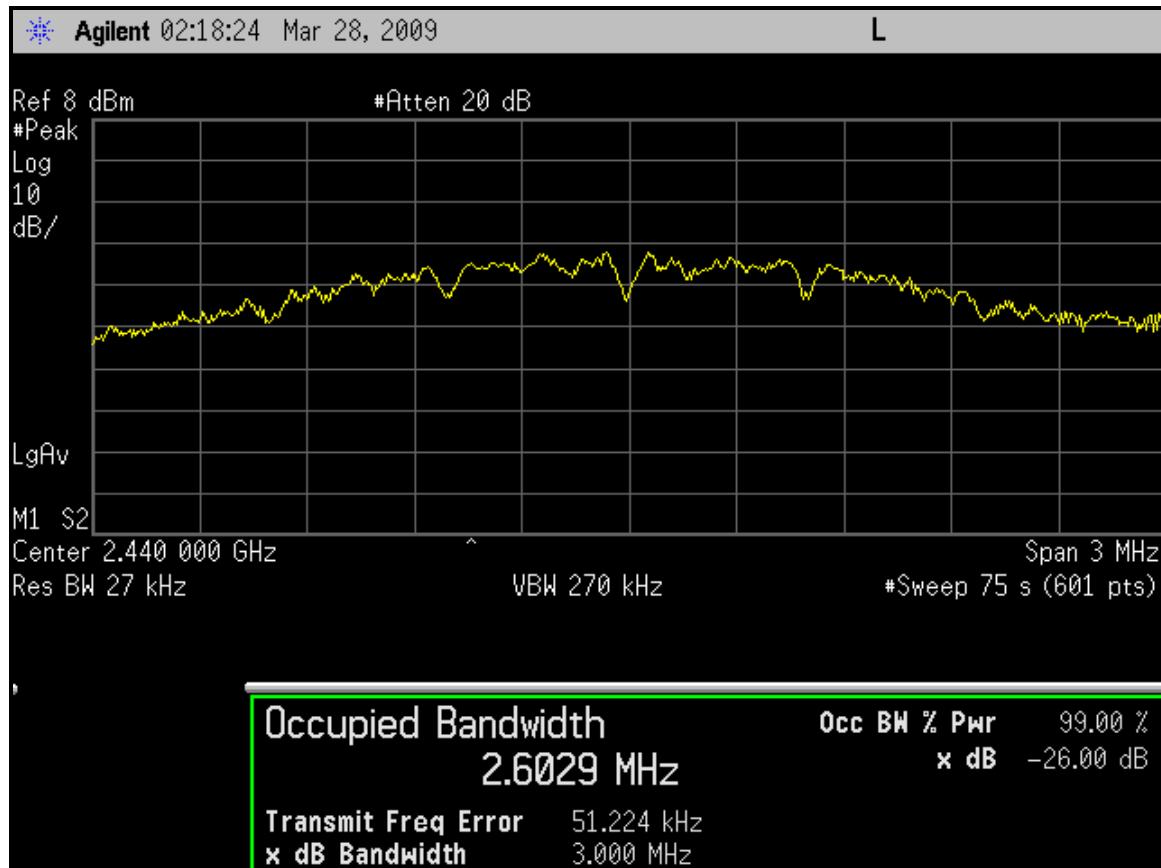
Plot 10-1: 99% Bandwidth – 2405 MHz



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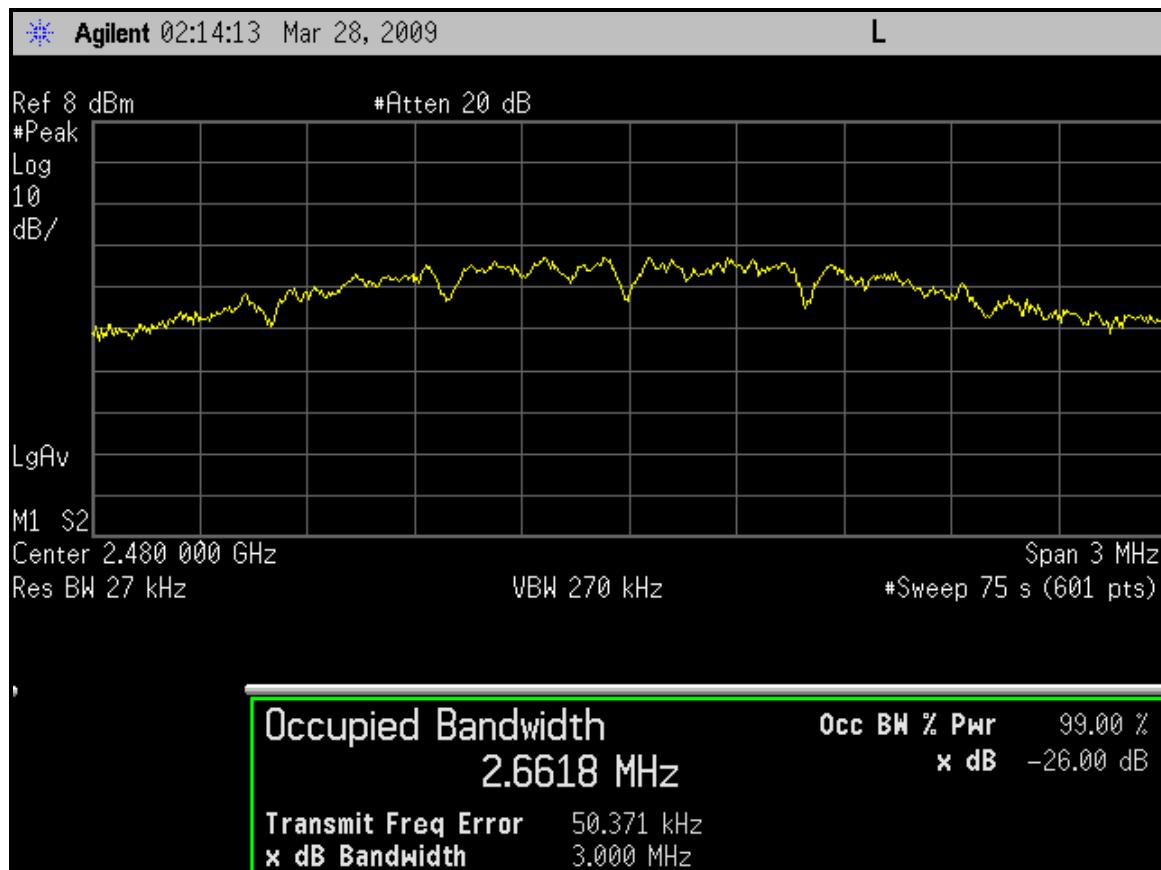
Plot 10-2: 99% Bandwidth – 2440 MHz



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Plot 10-3: 99% Bandwidth – 2480 MHz



Test Personnel:

Dan Baltzell
Test Engineer

Daniel W. Baltzell

Signature

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Date Of Test

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11 Conclusion

The data in this measurement report shows that the EUT as tested, Sentrilock, LLC, Model REALTOR® Lockbox NXT, FCC ID: W9T-P10100, IC: 8174A- P10100, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations and IC RSS-210.