



Engineering Solutions & Electromagnetic Compatibility Services

**Certification Application Report
FCC Part 15.249 & Industry Canada RSS-210**

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FCC ID/IC	W9T-BTRLBEX/ 8174A-BTRLBEX	Test Report Date	August 16, 2016
Platform	N/A	RTL Work Order #	2016095
Model	Bluetooth® REALTOR® Lockbox-EX	RTL Quote #	QRTL16-095A
American National Standard Institute	ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
FCC Classification	DXT – Part 15 Low Power Transceiver		
FCC Rule Part(s)/ Guidance	15.249: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz, October 1, 2015		
Industry Canada	RSS-210 Issue 8: License-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment		
Digital Interface Information	Digital Interface was found to be compliant		
Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
2402 – 2480	N/A	N/A	1M25FXD

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, RSS-210, and ANSI C63.10.

Signature: 

Date: August 16, 2016

Typed/Printed Name: Desmond A. Fraser

Position: President

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These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANAB. Refer to certificate and scope of accreditation AT-1445.

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1 General Information

1.1 Scope

This is an original certification application request.

Applicable Standards:

- FCC Part 15.249: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz
- Industry Canada RSS-210: License-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment

1.2 Description of EUT

Equipment Under Test	Transceiver
Model	Bluetooth® REALTOR® Lockbox-EX
Power Supply	3.6 VDC AA size cell Thionyl Chloride Lithium
Modulation Type	GFSK
Frequency Range	2402 – 2480 MHz
Antenna Connector Type	F-Type PCB 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.

1.4 Related Submittal(s)/Grant(s)

This is an original certification application for Sentrilock, LLC Model: Bluetooth REALTOR Lockbox-EX, FCC ID: W9T-BTRLBEX; IC: 8174A-BTRLBEX. The Industry Canada certification includes a Family Certification for two HVIN's, SL30671 and SL30704, the standard model and the all-mount model respectively.

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	2402
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, at the maximum power. 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.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.249)

Standard	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	N/A
FCC 15.209	Radiated Emissions	Pass
FCC 15.249(a)	Field Strength of Fundamental and Harmonics	Pass
RSS-Gen	20 dB Bandwidth	Pass

2.4 Test System Details

The test samples were received on May 13, 2014. 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	Serial Number	FCC ID	Cable Description	RTL Bar Code
Transceiver with SMA connection	Sentrilock, LLC	Bluetooth REALTOR Lockbox-EX	00712293	W9T-BTRLBEX	N/A	21445
Transceiver	Sentrilock, LLC	Bluetooth REALTOR Lockbox-EX	00713155	W9T-BTRLBEX	N/A	21446

2.5 Configuration of Tested System

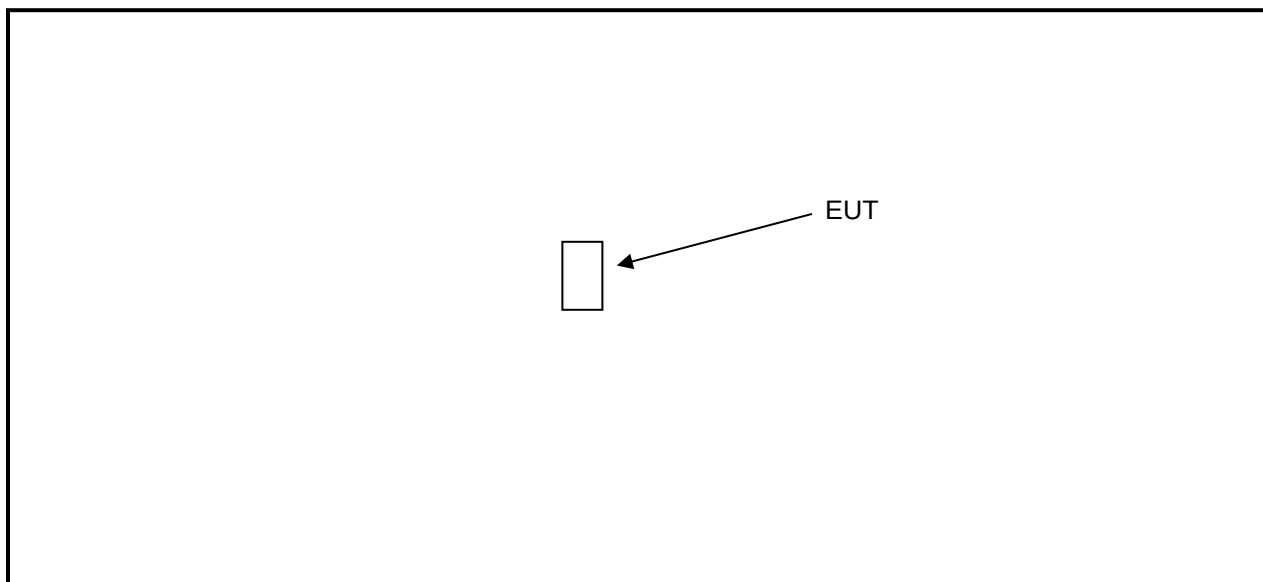


Figure 2-1: Configuration of System Under Test

3 Radiated Emissions – FCC 15.209, 15.249(a); RSS-210 A2.9; RSS-Gen

3.1 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.

3.2 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 3-1: 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	3/4/15
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1-26.5 GHz)	3008A00505	8/27/14
901629	Teledyne Cougar	A4C2123	Amplifier	003-003	9/4/14
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901592	Insulated Wire Inc.	KPS-1503-3600-KPR	SMK RF Cables 20'	NA	8/27/14
901593	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/27/14
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	4/20/15
900321	EMCO	3161-03	Horn Antenna (4.0-8.2 GHz)	9508-1020	4/20/15
900323	EMCO	3160-07	Horn Antenna (8.2-12.4 GHz)	9605-1054	4/20/15
900356	EMCO	3160-08	Horn Antenna (12.4-18 GHz)	9607-1044	4/20/15
900325	EMCO	3160-9	Horn Antenna (18-26.5 GHz)	9605-1051	4/19/15
901581	Rohde & Schwarz	1166.1660.50	Spectrum Analyzer	2001006	11/13/14
900724	Antenna Research Associates, Inc.	LPB-2520	BiLog Antenna (25-1000 MHz)	1037	4/19/15

3.3 Radiated Emissions Test Results

3.3.1 Fundamental Radiated Emissions Test Data

Table 3-2: Fundamental Radiated Emissions

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV/m) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Corrected (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
2402	94.1	-9.0	85.1	94.0	-8.9
2440	93.8	-9.1	84.7	94.0	-9.3
2480	94.4	-9.1	85.3	94.0	-8.7

**testing performed at 3m*

3.3.2 Radiated Emissions Harmonics/Spurious Test Data

Table 3-3: Radiated Emissions Harmonics/Spurious - 2402 MHz (Peak)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV/m) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Corrected (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
4803.591	39.7	-1.1	38.6	74.0	-35.4
4806.163	51.7	-1.1	50.6	74.0	-23.4
7205.503	43.7	0.8	44.5	74.0	-29.5
7206.737	43.1	0.8	43.9	74.0	-30.1
7210.103	44.2	0.8	45.0	74.0	-29.0
9608.849	43.3	6.7	50.0	74.0	-24.0
12010.000*	35.2	9.8	45.0	74.0	-29.0
14412.000*	33.3	14.8	48.1	74.0	-25.9
16814.000*	34.3	16.2	50.5	74.0	-23.5
19216.000*	34.6	20.6	55.2	74.0	-18.8
21618.000*	34.3	21.8	56.1	74.0	-17.9
24020.000*	31.8	20.5	52.3	74.0	-21.7

** testing performed at 1m, interpolated to 3m*

Table 3-4: Radiated Emissions Harmonics/Spurious - 2440 MHz (Peak)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV/m) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Corrected (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
4880.000	45.0	-1.0	44.0	74.0	-30.0
4882.083	54.0	-1.0	53.0	74.0	-21.0
7320.000	43.0	0.9	43.9	74.0	-30.1
9760.000	43.0	6.9	49.9	74.0	-24.1
12200.000*	34.2	11.2	45.4	74.0	-28.6
14640.000*	33.5	14.8	48.3	74.0	-25.7
17080.000*	34.2	16.7	50.9	74.0	-23.1
19520.000*	34.3	20.2	54.5	74.0	-19.5
21960.000*	32.7	22.0	54.7	74.0	-19.3
12200.000*	30.5	21.2	51.7	74.0	-22.3

* testing performed at 1m, interpolated to 3m

Table 3-5: Radiated Emissions Harmonics/Spurious - 2480 MHz (Peak)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV/m) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Corrected (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
4958.064	48.8	-1.0	47.8	74.0	-26.2
4960.000	43.1	-1.0	42.1	74.0	-31.9
7440.000	42.7	1.1	43.8	74.0	-30.2
9920.000	43.9	7.0	50.9	74.0	-23.1
12400.000*	35.9	12.6	48.5	74.0	-25.5
14880.000*	33.7	15.1	48.8	74.0	-25.2
17360.000*	33.9	16.5	50.4	74.0	-23.6
19840.000*	35.0	20.6	55.6	74.0	-18.4
22320.000*	31.6	21.8	53.4	74.0	-20.6
24800.000*	30.8	22.4	53.2	74.0	-20.8

* testing performed at 1m, interpolated to 3m

Table 3-6: Radiated Emissions Harmonics/Spurious - 2402 MHz (Average)

Emission Frequency (MHz)	Average Analyzer Reading (dBuV/m) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Corrected (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4803.591	32.3	-1.1	31.2	54.0	-22.8
4806.163	48.9	-1.1	47.8	54.0	-6.2
7205.503	27.6	0.8	28.4	54.0	-25.6
7206.737	29.0	0.8	29.8	54.0	-24.2
7210.103	28.7	0.8	29.5	54.0	-24.5
9608.849	36.1	6.7	42.8	54.0	-11.2
12010.000*	20.4	9.8	30.2	54.0	-23.8
14412.000*	18.5	14.8	33.3	54.0	-20.7
16814.000*	19.9	16.2	36.1	54.0	-17.9
19216.000*	20.7	20.6	41.3	54.0	-12.7
21618.000*	20.5	21.8	42.3	54.0	-11.7
24020.000*	17.9	20.5	38.4	54.0	-15.6

* testing performed at 1m, interpolated to 3m

Table 3-7: Radiated Emissions Harmonics/Spurious - 2440 MHz (Average)

Emission Frequency (MHz)	Average Analyzer Reading (dBuV/m) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Corrected (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4880.000	33.5	-1.0	32.5	54.0	-21.5
4882.083	48.9	-1.0	47.9	54.0	-6.1
7320.000	28.9	0.9	29.8	54.0	-24.2
9760.000	34.8	6.9	41.7	54.0	-12.3
12200.000*	20.1	11.2	31.3	54.0	-22.7
14640.000*	19.6	14.8	34.4	54.0	-19.6
17080.000*	19.9	16.7	36.6	54.0	-17.4
19520.000*	20.1	20.2	40.3	54.0	-13.7
21960.000*	18.3	22.0	40.3	54.0	-13.7

* testing performed at 1m, interpolated to 3m

Table 3-8: Radiated Emissions Harmonics/Spurious - 2480 MHz (Average)

Emission Frequency (MHz)	Average Analyzer Reading (dBuV/m) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Corrected (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4958.064	48.0	-1.0	47.0	54.0	-7.0
4960.000	32.9	-1.0	31.9	54.0	-22.1
7440.000	29.6	1.1	30.7	54.0	-23.3
9920.000	31.1	7.0	38.1	54.0	-15.9
12400.000*	20.0	12.6	32.6	54.0	-21.4
14880.000*	19.8	15.1	34.9	54.0	-19.1
17360.000*	19.8	16.5	36.3	54.0	-17.7
19840.000*	20.0	20.6	40.6	54.0	-13.4
22320.000*	17.6	21.8	39.4	54.0	-14.6
24800.000*	16.8	22.4	39.2	54.0	-14.8

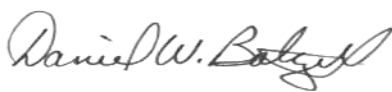
* testing performed at 1m, interpolated to 3m

3.3.3 Radiated Emissions Digital Test Data

Table 3-9: Digital Radiated Emissions Test Data (Standard)

Temperature: 64°F Humidity: 85%										
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
20.022	Qp	H	0	1.0	19.5	21.6	41.1	49.5	-8.4	Pass
26.022	Qp	V	0	1.0	18.7	21.9	40.6	49.5	-8.9	Pass
31.859	Qp	V	0	1.0	50.8	-24.3	26.5	40.0	-13.5	Pass
57.997	Qp	V	0	1.0	57.5	-32.4	25.1	40.0	-14.9	Pass
63.990	Qp	V	0	1.0	53.6	-32.1	21.5	40.0	-18.5	Pass
70.048	Qp	V	0	1.0	59.3	-31.7	27.6	40.0	-12.4	Pass
76.041	Qp	V	0	1.0	59.3	-31.4	27.9	40.0	-12.1	Pass
78.013	Qp	V	0	1.0	49.1	-31.3	17.8	40.0	-22.2	Pass
96.009	Qp	V	0	1.0	46.4	-30.3	16.1	43.5	-27.4	Pass
128.205	Qp	V	0	1.0	50.1	-30.6	19.5	43.5	-24.0	Pass
192.147	Av	V	0	1.0	54.8	-31.6	23.2	43.5	-20.3	Pass
224.038	Av	V	0	1.0	40.5	-30.3	10.2	46.0	-35.8	Pass
255.929	Av	H	0	1.0	35.6	-28.7	6.9	46.0	-39.1	Pass
287.981	Av	H	0	1.0	36.7	-28.0	8.7	46.0	-37.3	Pass
320.192	Av	V	0	1.0	47.8	-27.0	20.8	46.0	-25.2	Pass

Test Personnel:

Daniel W. Baltzell		May 14-16, 2014
Test Engineer	Signature	Dates of Tests

4 AC Conducted Emissions - FCC 15.207; RSS-Gen 7.2.4: Conducted Limits

No AC line conducted tests are required since the device is powered solely by a 3 VDC AA size cell.

5 20 dB Bandwidth – IC RSS-Gen

5.1 20 dB Bandwidth Test Procedure

The minimum 20 dB bandwidths per RSS-Gen were measured using a 50-ohm spectrum analyzer. The modulated carrier was adjusted on the analyzer so that it was displayed entirely on the spectrum analyzer. The sweep time was auto and allowed through several sweeps with the max hold function used in peak detector mode. The resolution bandwidth was set to 100 kHz, and the video bandwidth set to 1 MHz. The table below contains the bandwidth measurement results.

Table 5-1: 20 dB Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	1166.1660.50	Spectrum Analyzer	2001006	11/13/14

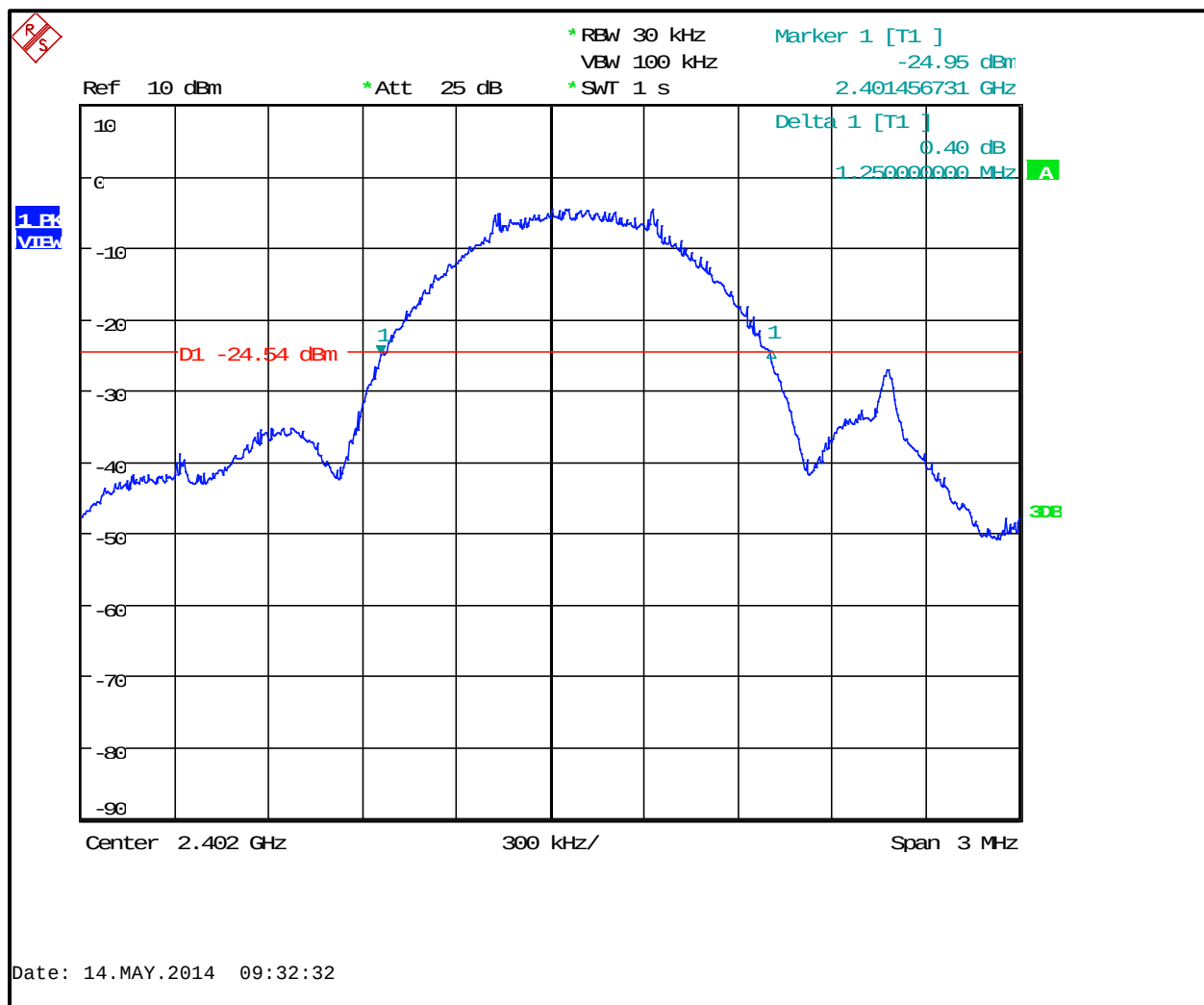
5.2 20 dB Modulated Bandwidth Test Data

Table 5-2: 20 dB Modulated Bandwidth Test Data

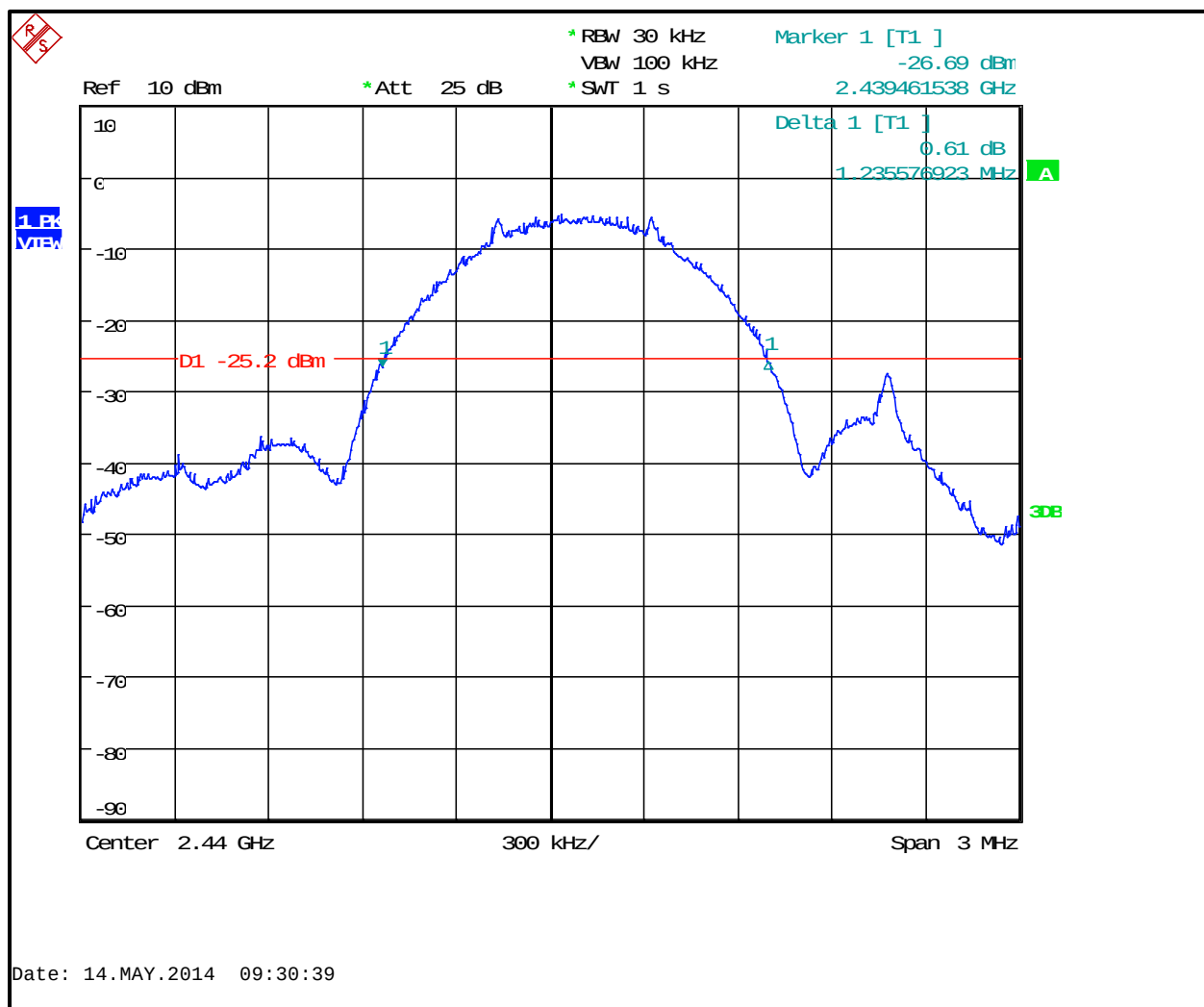
Minimum 20 dB bandwidths	
Channel	20 dB Bandwidth (MHz)
2	1.25
40	1.24
80	1.25

5.3 20 dB Bandwidth Plots

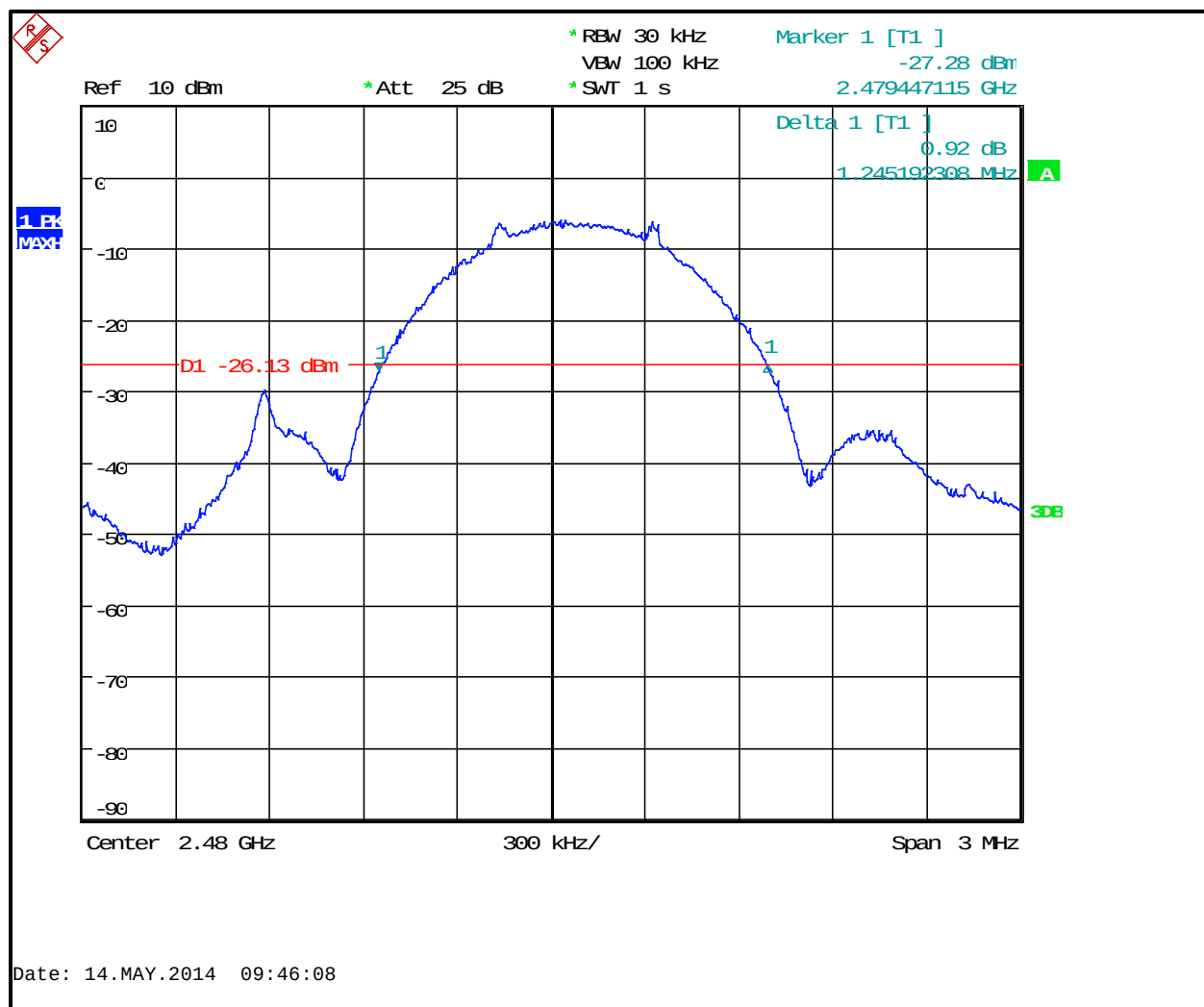
Plot 5-1: 20 dB Bandwidth - 2402 MHz



Plot 5-2: 20 dB Bandwidth - 2440 MHz



Plot 5-3: 20 dB Bandwidth - 2480 MHz



Test Personnel:

Daniel W. Baltzell
 Test Engineer

Daniel W. Baltzell

Signature

May 14, 2014
 Date of Test

Rhein Tech Laboratories, Inc.
360 Herndon Parkway
Suite 1400
Herndon, VA 20170
<http://www.rheintech.com>

Client: Sentrilock, LLC
Model: Bluetooth® REALTOR® Lockbox-EX
Standards: FCC 15.249/IC RSS-210
IDs: W9T-BTRLBEX/8174A-BTRLBEX
Report #: 2016095DXT

6 Conclusion

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