Certification Application Report
FCC Part 15.249 & ISED RSS-210

Test Lab:	Applicant:
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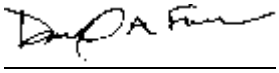
FCC ID	YL6-143B36S10RB	**Test Report Date**	June 25, 2019
IC	9111A-143B36S10RB	**RTL Work Order #**	2018190
Model #/HVIN	B36-S10	**RTL Quote #**	QRTL18-190A
American National Standard Institute	ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
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 (10/01/2017)		
ISED	RSS-210 Issue 9: Licence-Exempt Radio Apparatus: Category I Equipment RSS-Gen Issue 5: General Requirements for Compliance of Radio Apparatus		

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
908.4	N/A	N/A	90K9F1D
916.0	N/A	N/A	111KF1D

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, RSS-Gen, and ANSI C63.10.

Signature: 

Date: June 25, 2019

Typed/Printed Name: Desmond A. Fraser

Position: President

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1 General Information

1.1 Scope

This is an original FCC and ISED 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
- ISED RSS-210 Issue 9: Licence-Exempt Radio Apparatus: Category I Equipment
- ISED RSS-Gen Issue 5: General Requirements for Compliance of Radio Apparatus

1.2 Description of EUT

Equipment Under Test	Temperature Sensor
Model	B36-S10
Power Supply	3 VDC cell (CR123)
Modulation Type	2FSK
Frequency Range	908.4 and 916.0 MHz
Antenna Type	Internal Wire Monopole

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)

None.

1.5 Modifications

None.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), the following frequencies were tested.

Table 2-1: Channels Tested

Frequency (MHz)
908.4
916.0

2.2 Exercising the EUT

The EUT was programmed for continuous transmission at 908.4 and 916.0 MHz. The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The carrier was also checked to verify that information was being transmitted.

2.3 Test Result Summary

Table 2-2: Test Result Summary

Test	FCC Reference	ISED Reference	Pass/Fail or N/A
AC Power Conducted Emissions	15.207	RSS-Gen Issue 5 8.8	N/A
Radiated Emissions	15.209	RSS-Gen Issue 5 8.9/8.10	Pass
Field Strength of Fundamental and Harmonics	15.249(a)	RSS-210 Issue 9 B.10	Pass
99% Bandwidth	N/A	RSS-Gen Issue 5 6.6	Pass

2.4 Test System Details

The test samples were received on September 21, 2018. 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
908.4 MHz Transceiver	Alarm.com	B36-S10	KO13373/1813	YL6-143B36S10RB	N/A	22234
916.0 MHz Transceiver	Alarm.com	B36-S10	KO12785/1813	YL6-143B36S10RB	N/A	22235

Table 2-4: Auxiliary Equipment

Part	Manufacturer	Model	Serial Number	Cable Description	RTL Bar Code
USB-powered Controller Board	Alarm.com	LS0315.195435	N/A	Unshielded USB	22232

2.5 Configuration of Tested System

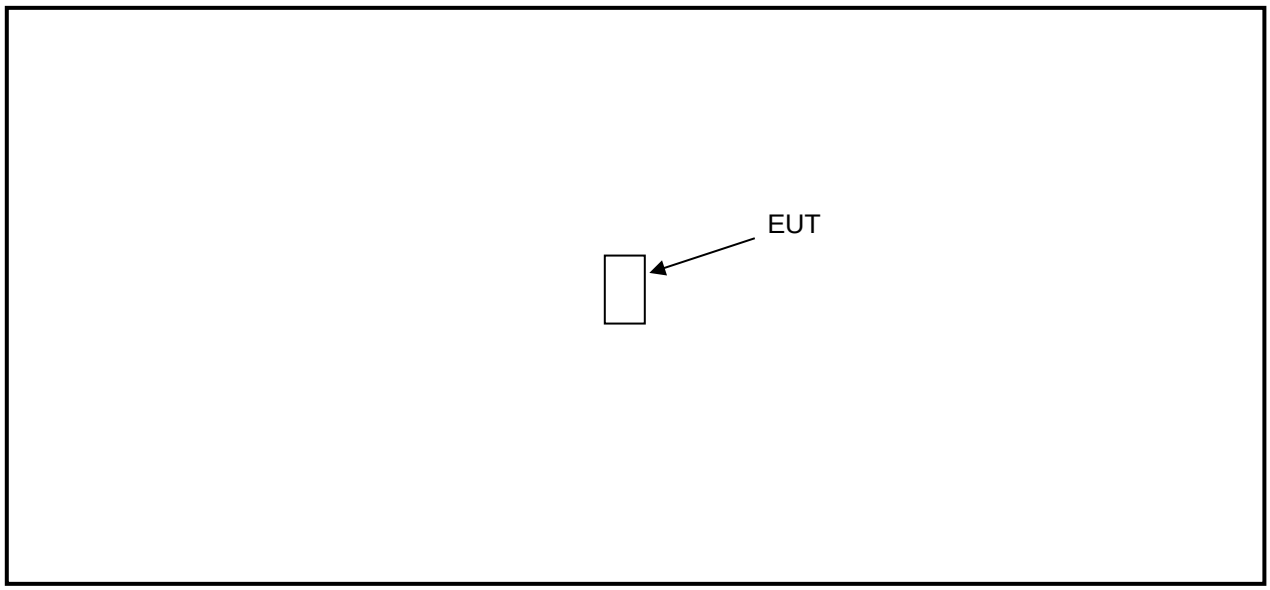


Figure 2-1: Configuration of System Under Test

3 Radiated Emissions – FCC 15.209, 15.249(a); ISED RSS-210 B.10; RSS-Gen Issue 5 8.9/8.10

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.

3.1.1 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 m (< 1 GHz) / 1.5 m (> 1 GHz) above the ground plane. The spectrum was examined from 9 kHz to the 10th harmonic of the highest fundamental transmitter frequency (9.16 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.

Reduced power level setting were required to achieve passing fundamental quasi-peak results, a setting of 32 was used for 908.4 MHz, and a setting of 35 was used for 916.0 MHz.

A duty cycle correction factor of -7.5 dB (=20*LOG(0.42)) was used to arrive at average levels for the harmonics measured.

Plot 3-1: Duty cycle plot in 100 ms (42 ms)

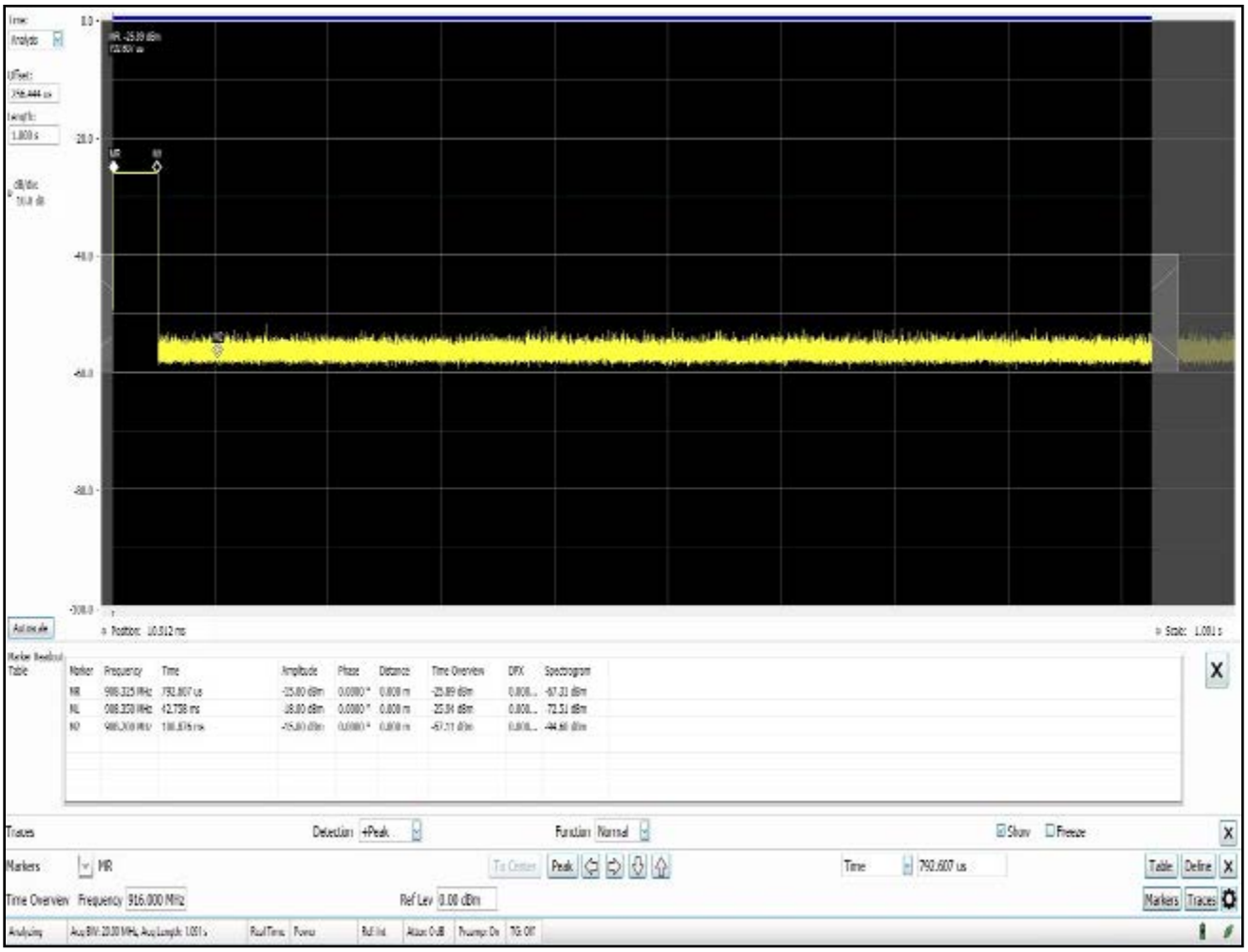


Table 3-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900791	Chase	CBL6112	Antenna (30 MHz – 2 GHz)	2099	10/4/20
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	4/9/19
900321	EMCO	3161-03	Horn Antenna (4 - 8.2 GHz)	9528-1020	4/9/19
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1024	4/9/19
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	4/26/21
901729	Insulated Wire Inc.	KPS-1503-3150-KPR	SMK RF Cables 20’	NA	8/21/19

3.2 Radiated Emissions Test Results

Table 3-2: Radiated Emissions Test Data – Quasi-Peak

Emission Frequency (MHz)	Quasi-Peak Detector Level (dBuV/m) (120 kHz RBW/ 300 kHz VBW)	Site Correction Factor (dB/m)	Quasi-Peak Corrected (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Margin (dB)
908.4	70.3	23.2	93.5	94.0	-0.5
916.0	70.5	23.2	93.7	94.0	-0.3

Note: Testing performed at 3m

3.3 Radiated Emissions Harmonics/Spurious Test Data

Table 3-3: Radiated Emissions Harmonics/Spurious – 908.4 MHz; Peak

Emission Frequency (MHz)	Peak Detector (dBuV/m) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Corrected (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
1816.8	18.8	31.3	50.1	74.0	-23.9
2725.2	30.3	26.4	56.7	74.0	-17.3
3633.6	19.3	28.1	47.4	74.0	-26.6
4542.0	23.6	33.8	57.4	74.0	-16.6
5450.4	18.1	34.1	52.2	74.0	-21.8
6358.8	20.7	35.0	55.7	74.0	-18.3
7267.2	18.6	35.7	54.3	74.0	-19.7
8175.6	16.1	41.1	57.2	74.0	-16.8
9084.0	9.2	41.9	51.1	74.0	-22.9

Table 3-4: Radiated Emissions Harmonics/Spurious – 908.4 MHz; Average

Emission Frequency (MHz)	Average Detector (dBuV/m) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Average Corrected (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
1816.8	11.3	31.3	42.6	54.0	-11.4
2725.2	22.8	26.4	49.2	54.0	-4.8
3633.6	11.8	28.1	39.8	54.0	-14.2
4542.0	16.1	33.8	49.8	54.0	-4.2
5450.4	10.6	34.1	44.6	54.0	-9.4
6358.8	13.2	35.0	48.2	54.0	-5.8
7267.2	11.1	35.7	46.8	54.0	-7.2
8175.6	8.6	41.1	49.7	54.0	-4.3
9084.0	1.7	41.9	43.6	54.0	-10.4

Table 3-5: Radiated Emissions Harmonics/Spurious – 916.0 MHz; Peak

Emission Frequency (MHz)	Peak Detector (dBuV/m) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Corrected (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
1832.0	19.2	31.8	51.0	74.0	-23.0
2748.0	29.8	26.4	56.2	74.0	-17.8
3664.0	22.6	28.2	50.8	74.0	-23.2
4580.0	21.8	33.7	55.5	74.0	-18.5
5496.0	19.1	34.1	53.2	74.0	-20.8
6412.0	21.4	35.1	56.5	74.0	-17.5
7328.0	22.1	35.7	57.8	74.0	-16.2
8244.0	14.0	41.2	55.2	74.0	-18.8
9160.0	9.5	41.9	51.4	74.0	-22.6

Table 3-6: Radiated Emissions Harmonics/Spurious – 916.0 MHz; Average

Emission Frequency (MHz)	Average Detector (dBuV/m) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Average Corrected (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
1832.0	11.7	31.8	43.5	54.0	-10.5
2748.0	22.3	26.4	48.7	54.0	-5.3
3664.0	15.1	28.2	43.3	54.0	-10.7
4580.0	14.3	33.7	48.0	54.0	-6.0
5496.0	11.6	34.1	45.6	54.0	-8.4
6412.0	13.9	35.1	48.9	54.0	-5.1
7328.0	14.6	35.7	50.3	54.0	-3.7
8244.0	6.5	41.2	47.7	54.0	-6.3
9160.0	2.0	41.9	43.9	54.0	-10.1

Note: Testing performed at 3m

Measurement uncertainty: Measurement uncertainties shown for these tests are expanded uncertainties expressed at 95% confidence level using a coverage factor k = 2. +4.6 dB

Result: Pass

Test Personnel

Daniel W. Baltzell		October 10, 2018
Test Engineer	Signature	Date of Test

4 AC Conducted Emissions - FCC 15.207; ISED RSS-Gen Issue 5 8.8: Conducted Limits

Device is battery operated, no AC conducted emissions are required.

5 99% Bandwidth – ISED RSS-Gen Issue 5 6.6

5.1 99% Bandwidth Test Procedure

The 99% bandwidth per RSS-Gen was measured using a 50-ohm spectrum analyzer, per C63.10 6.9.2. The modulated carrier was adjusted on the analyzer with the RBW 1-5% of the occupied bandwidth and the span 1-5 times the occupied bandwidth. The sweep time was auto and allowed through several sweeps with the max hold function used in peak detector mode. The table below contains the bandwidth measurement results.

Table 5-1: 99% Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer (20 Hz – 50 GHz)	1166.1660.50	4/26/21

5.2 99% Bandwidth Test Data

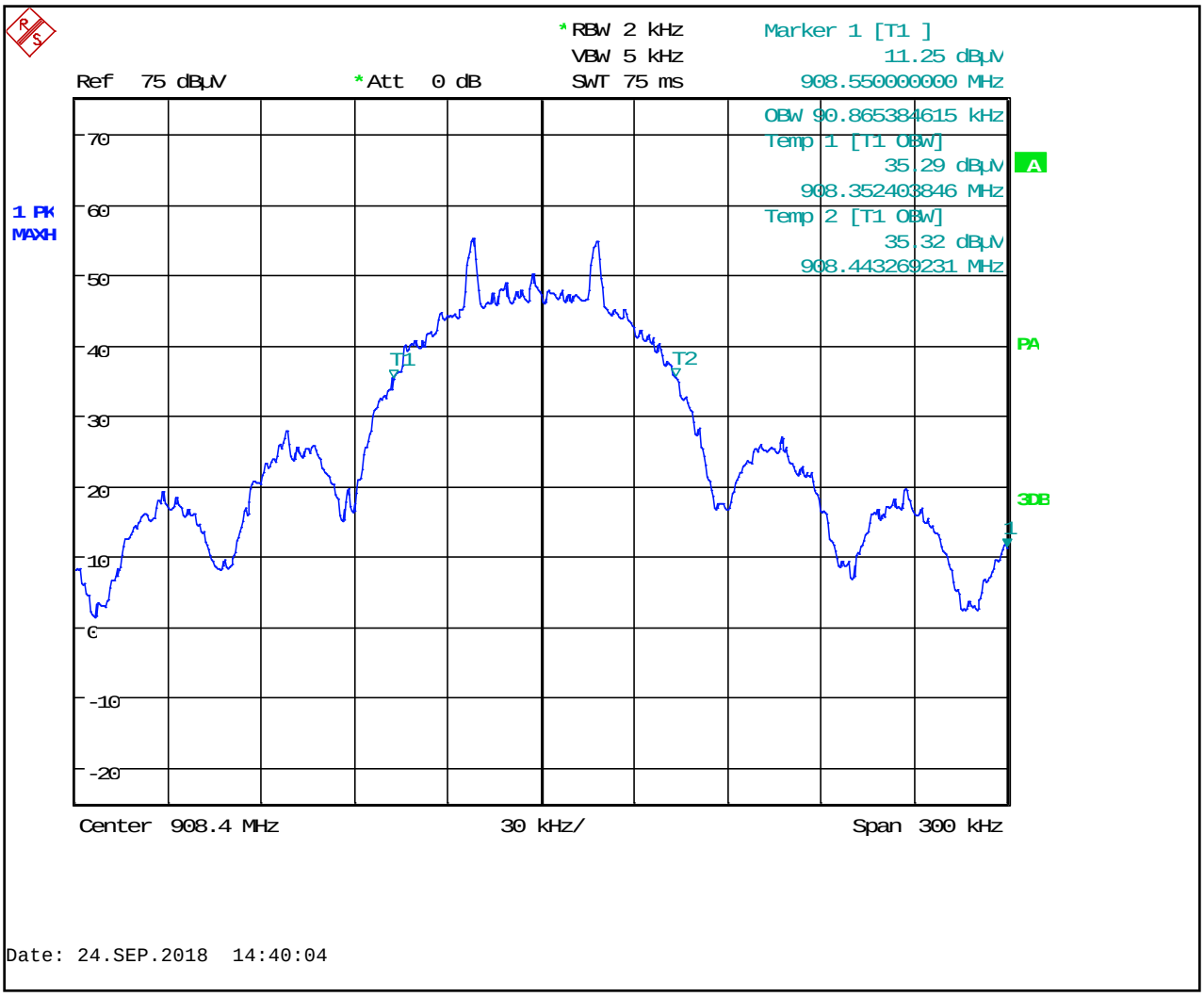
Table 5-2: 99% Bandwidth Test Data

99% bandwidths

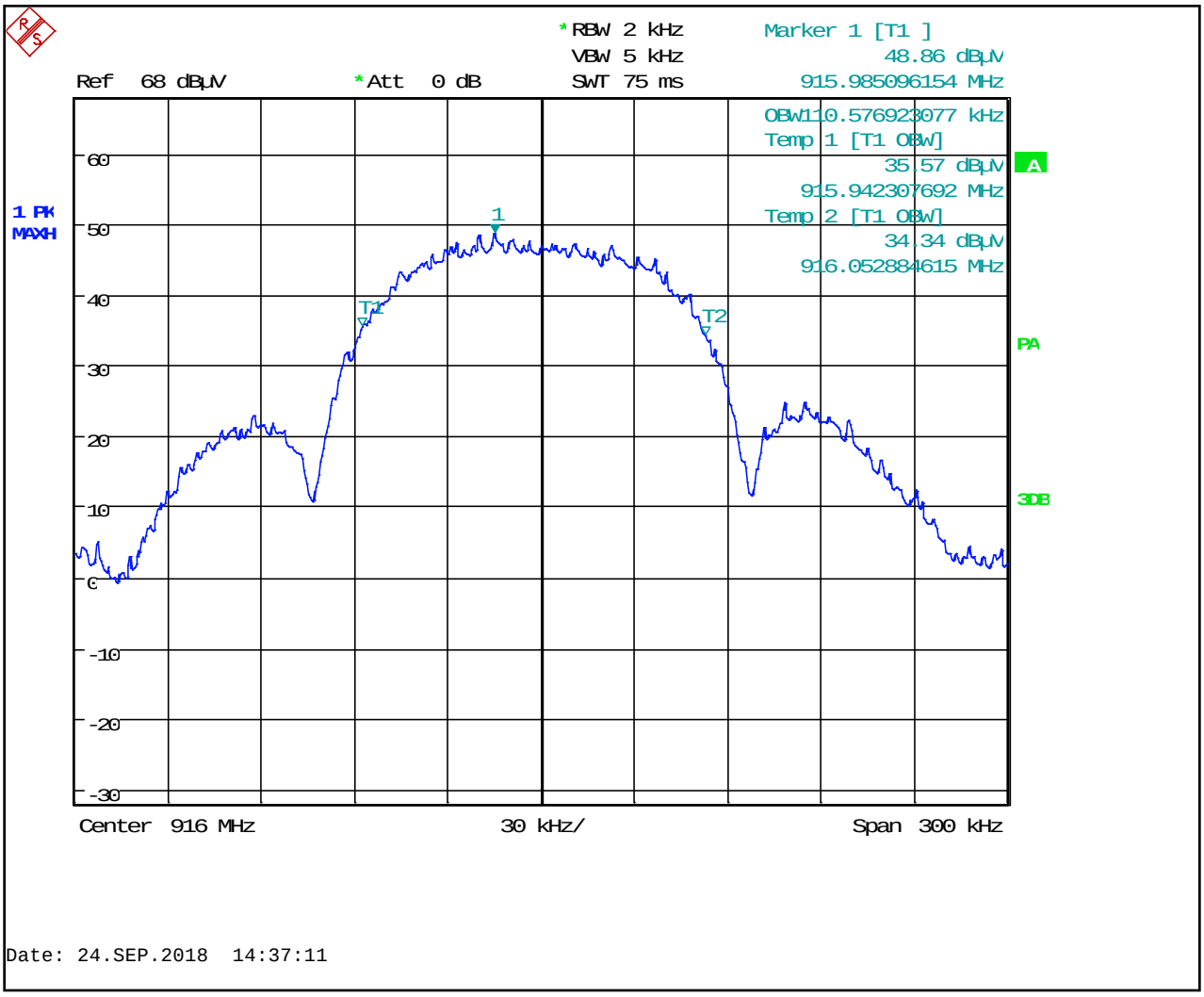
Frequency (MHz)	Bandwidth (kHz)
908.4	90.9
916.0	110.6

5.3 99% Bandwidth Plots

Plot 5-1: 99% Bandwidth; 908.4 MHz



Plot 5-2: 99% Bandwidth; 916.0 MHz



Test Personnel

Dan Baltzell		September 24, 2018
Test Engineer	Signature	Date of Test

6 Conclusion

The data in this measurement report shows that the EUT as tested, Alarm.com Incorporated Model: B36-S10, FCC ID: YL6-143B36S10RB, IC: 9111A-143B36S10RB, complies with the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and ISED RSS-210 and RSS-Gen.