



FCC CERTIFICATION

TEST REPORT

for the

SMARTRENT.COM, INC

FCC ID: 2AXMUAHH3ZW

WLL REPORT# 16693-01 REV 1

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Testing Certificate AT-1448



FCC Certification Test Report

for the

SmartRent.com, INC
Smart Rent Hub System

FCC ID: 2AXMUAHH3ZW

September 23, 2020

WLL Report# 16693-01 Rev 1

Prepared by:

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Vice President

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Steve Koster
President



Abstract

This report has been prepared on behalf of SmartRent.com, INC to support the attached Application for Equipment Authorization. The test report and application are submitted for an Intentional Radiator under Part 15.249 (10/2013) of the FCC Rules and Regulations. This Certification Test Report documents the test configuration and test results for the SmartRent.com, INC Smart Rent Hub System . The information provided on this report is only applicable to device herein documented.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 4840 Winchester Boulevard, Frederick MD 21703. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The ISED Canada number is 3035A for Washington Laboratories, Ltd. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Certificate AT-1448 as an independent FCC test laboratory.

The SmartRent.com, INC Smart Rent Hub System complies with the limits for a Digital Transmission System (DTS) Transmitter device under FCC Part 15.249.

Revision History	Description of Change	Date
Rev 0	Initial Release	September 23, 2020
Rev1	Reviewer Comments	October 13, 2020



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1 Equipment Under Test

1.1 EUT Identification & Description

Table 1: Device Summary

Model(s) Tested	<i>AH-HUB3</i> <i>Internal PWA manufacturing part number SMR19002_SMRHUB_X2</i>
EUT Specifications:	
Manufacturer:	<i>Allied Component Works, LLC</i>
Protocol: (BT, WiFi, WWAN, etc.)	<i>Z-Wave</i>
FCC ID:	<i>2AXMUAHH3ZW</i>
FCC Rule Parts:	<i>15.249</i>
Frequency Range:	<i>908-916 MHz</i>
Number of Channels:	<i>2</i>
Maximum Output Power:	<i>43880 uV/m @ 3 Meters</i>
Modulation type(s):	<i>FSK</i>
Occupied Bandwidth:	<i>116.5kHz</i>
Keying:	<i>Automatic</i>
Antenna Type Manufacturer, Model and Maximum Gain:	<i>Embedded antenna in PWB top metal layer</i>
Interface Cables:	<i>Power only</i>
Power Source & Voltage:	<i>Wall supply, 5V 1.2A (max)</i>

The SmartRent.com, INC Smart Rent Hub System is a Z-Wave and data processor component of a smart hub home.

1.2 Testing Algorithm

The Smart Rent Hub System was tested in a baseline configuration.



1.3 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Frederick, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The ISED Canada number is 3035A for Washington Laboratories, Ltd. Washington Laboratories, Ltd. has been accepted by the FCC, ISED and approved by ANAB under Testing Certificate AT-1448 as an independent FCC test laboratory.

1.4 Measurements

1.4.1 References

ANSI C63.2 (Jan-2016) Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 (Jan 2014) American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

ANSI C63.10 (Jun 2013) American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

ANSI C63.26 (Dec 2015) American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

1.5 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm \sqrt{\frac{a^2}{div_a^2} + \frac{b^2}{div_b^2} + \frac{c^2}{div_c^2} + \dots}$$

Where u_c = standard uncertainty

a, b, c, \dots = individual uncertainty elements

div_a, b, c = the individual uncertainty element divisor based on the probability distribution

Divisor = 1.732 for rectangular distribution

Divisor = 2 for normal distribution

Divisor = 1.414 for trapezoid distribution



Equation 2: Expanded Uncertainty

$$U = ku_c$$

Where:

U = expanded uncertainty

k = coverage factor

k ≤ 2 for 95% coverage (ANSI/NCSL Z540-2 Annex G)

uc = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 2 below.

Table 2: Expanded Uncertainty List

Scope	Standard(s)	Expanded Uncertainty
Conducted Emissions	CISPR11, CISPR22, CISPR32, CISPR14, FCC Part 15	±2.63 dB
Radiated Emissions	CISPR11, CISPR22, CISPR32, CISPR14, FCC Part 15	±4.55 dB



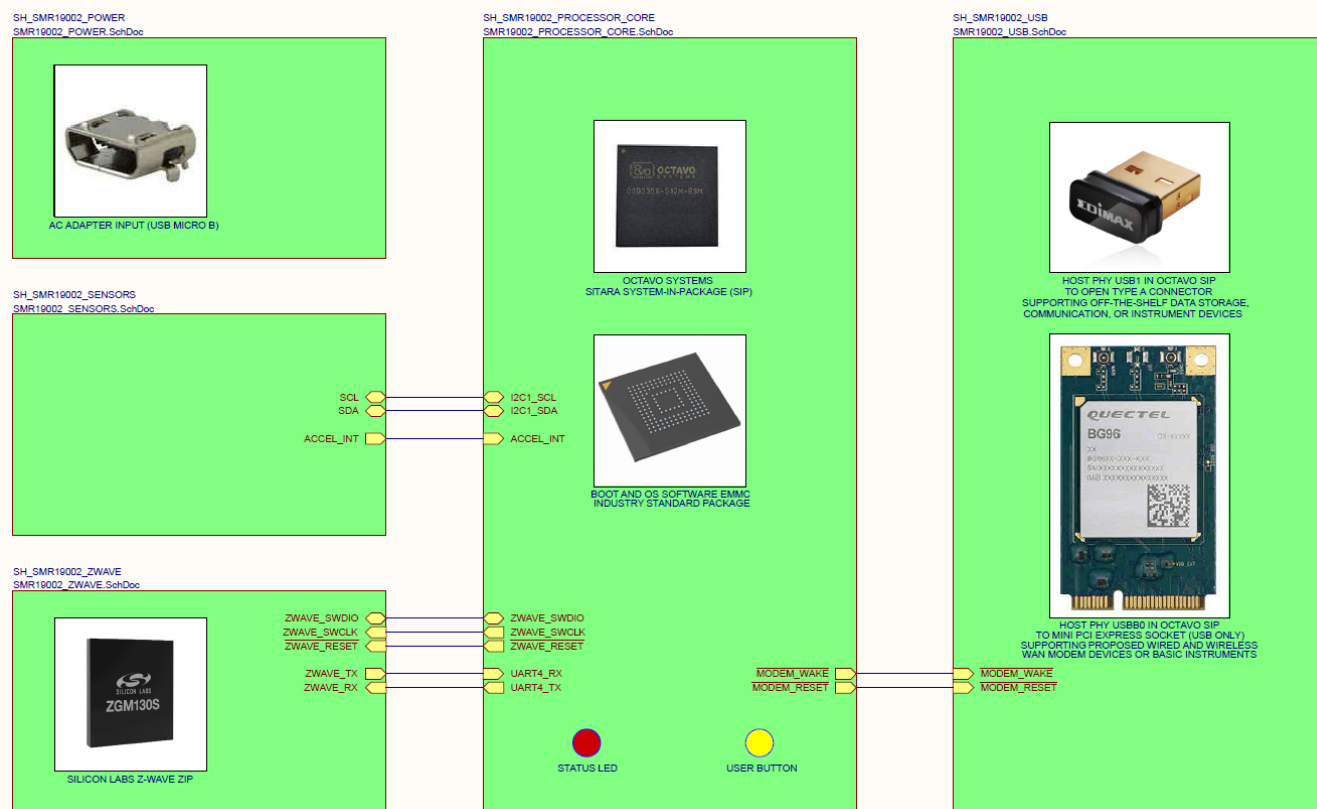
1.6 Test Configuration

The Smart Rent Hub System was configured as shown in figure 1.

Table 3: System Configuration List

Name / Description	Model Number	Part Number	Serial Number
Smart Rent Hub System	AH-HUB3	SMR19002_SMRHUB_X2	18170-0002

Figure 1: Test Configuration





2 Introduction

2.1 Compliance Statement

The SmartRent.com, INC Smart Rent Hub System complies with the limits for a Frequency Transmitter device under FCC Part 15.249 (10/2013).

2.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed in accordance with the 2014 version of ANSI C63.10. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

The Table Below shows the results of testing for compliance with a Digital Transmission system device in accordance with FCC Part 15.249 10/201. Full test results are shown in subsequent sub-sections.

Table 4: Test Summary Table

FCC Rule Part	Description	Result
2.1049	Occupied Bandwidth	Pass
15.249 (a)	General Field Strength Limits	Pass
15.207	AC Conducted Emissions	Pass



2.3 15.249(a) Fundamental Field Strength

The table below shows the fundamental emission, measured at 3 meters using quasi-peak detection

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)
908.40	V	30.0	1.8	86.7	2.4	28466.2	50000.0	-4.9
916.00	V	30.0	1.8	86.8	2.6	29411.5	50000.0	-4.6
908.00	H	30.0	1.8	90.5	2.3	43880.0	50000.0	-1.1
916.00	H	30.0	1.8	89.6	2.6	40599.1	50000.0	-1.8



2.4 Occupied Bandwidth

At full modulation, the occupied bandwidth was measured as shown.

Table 5 provides a summary of the Occupied Bandwidth Results. These plots show the fundamental emission is contained within the 902-928MHz band.

Table 5: Occupied Bandwidth Results

Frequency	Bandwidth (kHz)	Pass/Fail
Low Channel: 908.4 MHz	87.4	Pass
High Channel: 916 MHz	116.5	Pass

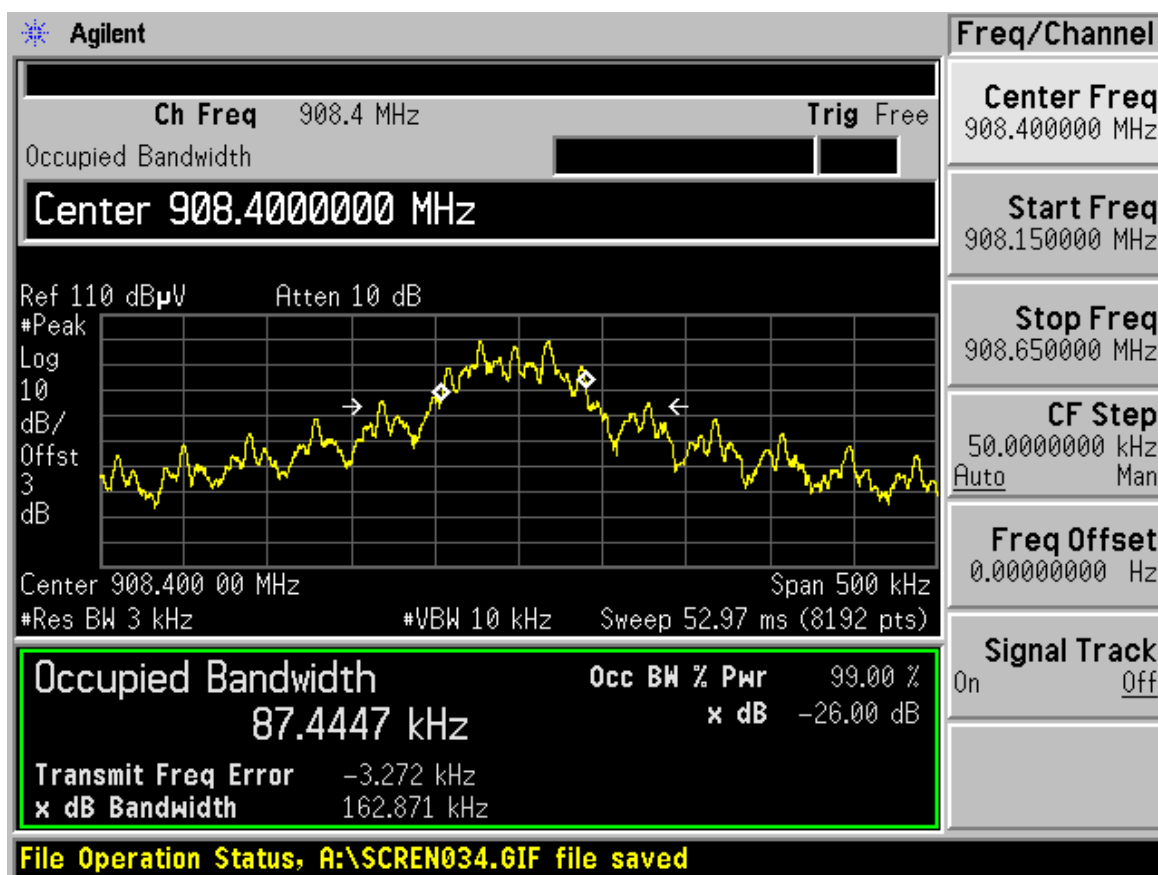


Figure 2: Occupied Bandwidth, Low Channel

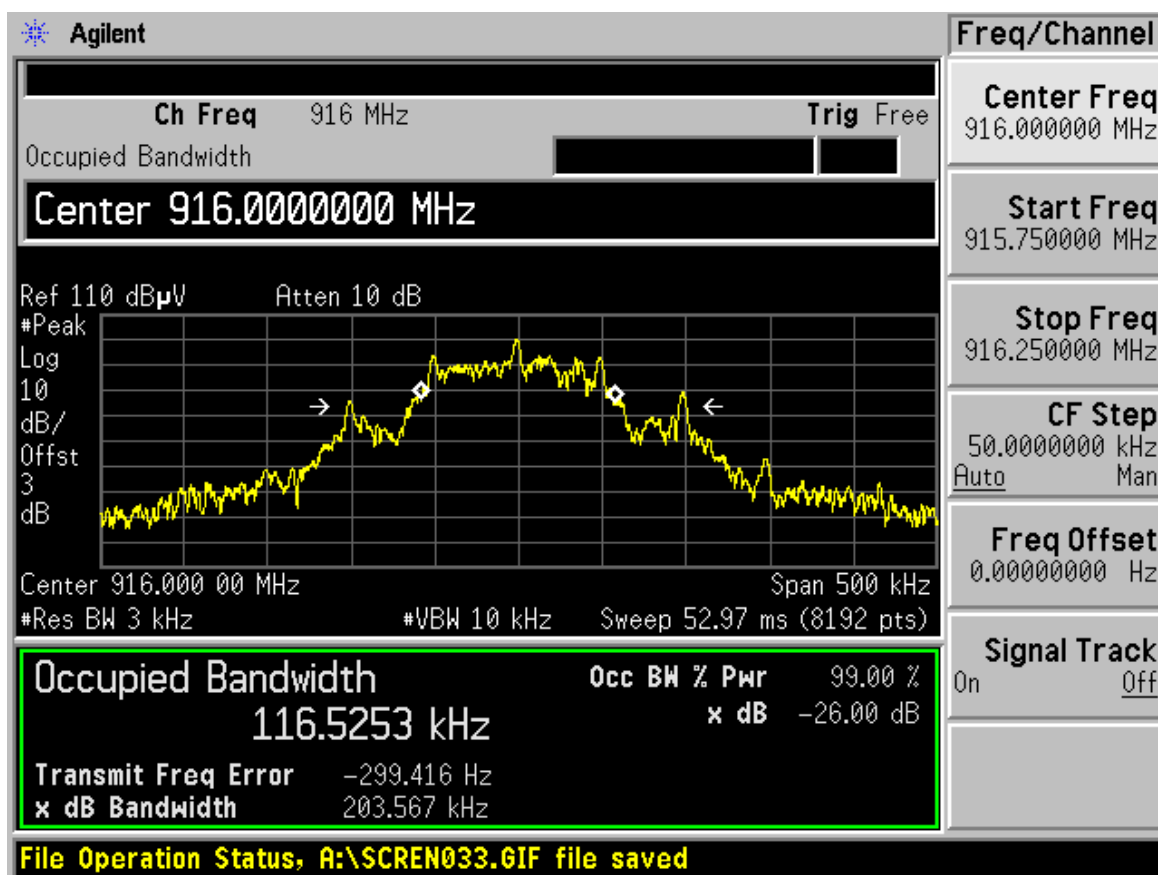


Figure 3: Occupied Bandwidth, High Channel



2.5 Band Edge

At full modulation, at both at high and low channels the Band Edge was measured.

Table 6 provides a summary of the Band Edge Results. These plots show the fundamental emission is contained within the 902-928MHz band.

Table 6: Band Edge Results

Frequency	dBc	Pass/Fail
Low Channel: 908.4 MHz	55.6	Pass
High Channel: 916 MHz	52.0	Pass

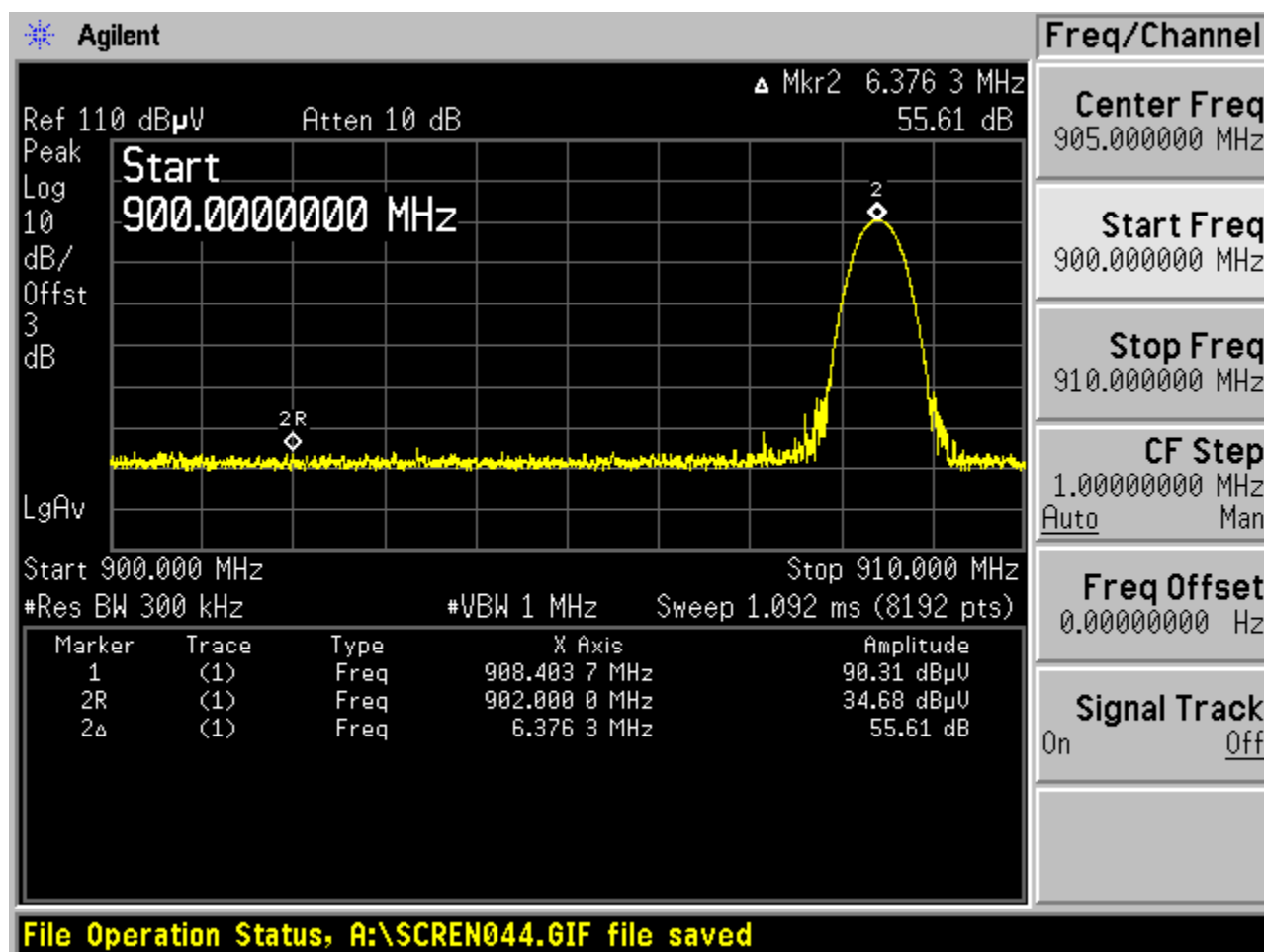


Figure 4: Band Edge – Low Channel

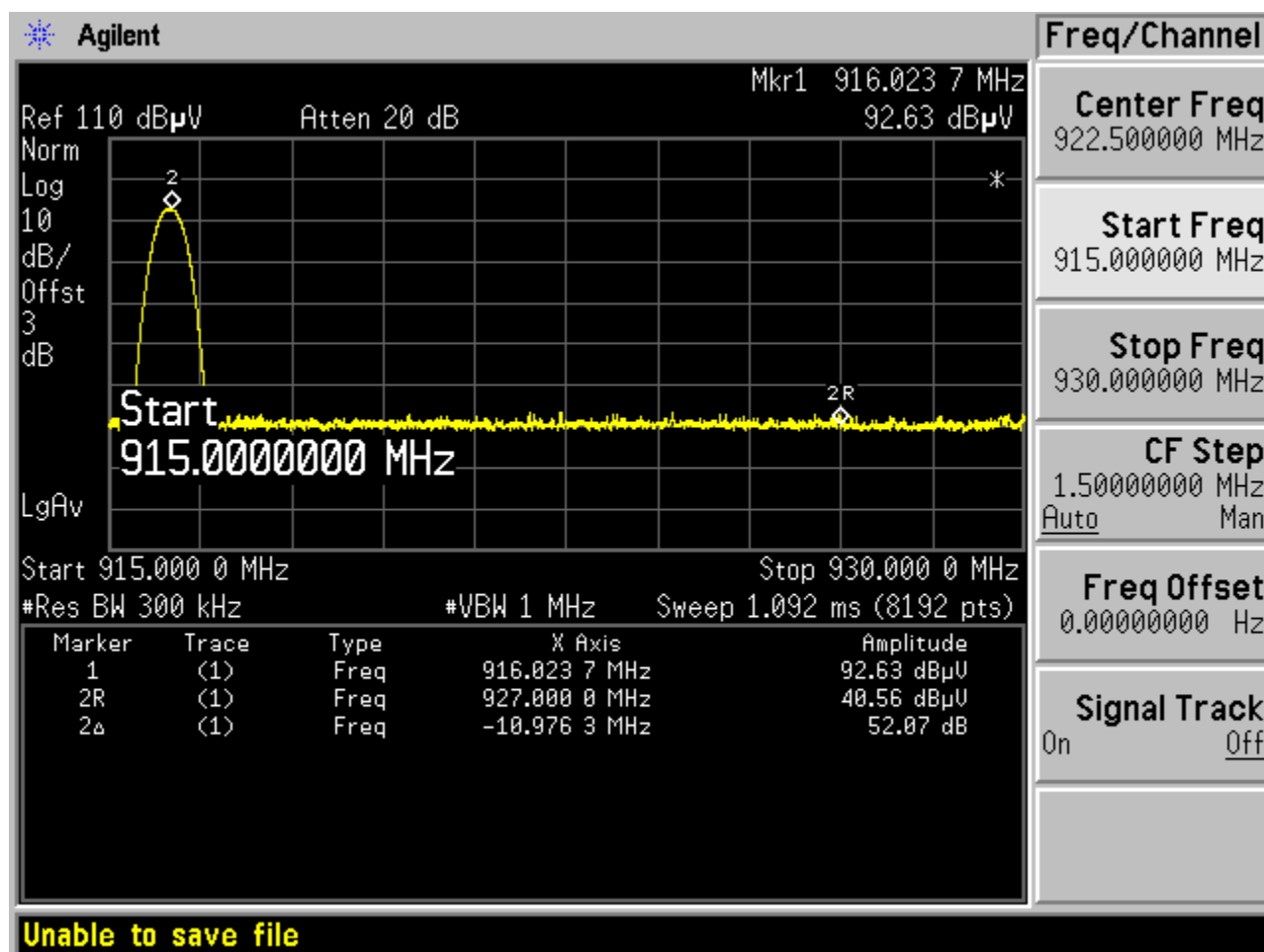


Figure 5: Band Edge – High Channel



2.6 Radiated Spurious Emissions:

The EUT must comply with the requirements for radiated spurious emissions that fall within the restricted bands. These emissions must meet the limits specified in §15.209 and §15.35(b) for peak measurements.

2.6.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-2014. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The emissions were measured using the following resolution bandwidths:

Table 7: Spectrum Analyzer Settings

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>100 kHz
>1000 MHz	1 MHz	<10 Hz (Avg.), 1MHz (Peak)



Table 8: Radiated Emission Test Data, Low Frequency Data (<1GHz)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)
48.00	V	180.0	3.0	32.7	-16.7	6.3	100.0	-24.0
72.00	V	180.0	2.0	37.0	-17.0	10.1	100.0	-19.9
144.00	V	180.0	1.8	30.4	-12.1	8.3	150.0	-25.2
168.00	V	180.0	1.8	45.2	-12.7	42.4	150.0	-11.0
192.00	V	180.0	1.8	46.5	-12.9	48.0	150.0	-9.9
216.00	V	180.0	1.8	45.7	-13.2	42.0	200.0	-13.5
48.00	H	180.0	3.0	47.6	-16.7	34.9	100.0	-9.1
72.00	H	180.0	2.0	47.3	-17.0	32.9	100.0	-9.7
144.00	H	180.0	1.8	47.7	-12.1	60.5	150.0	-7.9
168.00	H	180.0	1.8	49.0	-12.7	66.0	150.0	-7.1
192.00	H	180.0	1.8	51.0	-12.9	80.6	150.0	-5.4
216.00	H	180.0	1.8	47.4	-13.2	51.1	200.0	-11.8

Note: Same for both channels



Table 9: Radiated Emission Test Data, High Frequency Data >1GHz, Low Channel – Average

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBUV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
1816.00	V	0.0	1.8	34.5	-6.1	26.3	500.0	-25.6	AVG
2725.20	V	0.0	1.8	31.2	-1.1	31.9	500.0	-23.9	AVG
3633.60	V	0.0	1.8	32.1	1.1	45.9	500.0	-20.7	AVG
4542.00	V	0.0	1.8	31.2	3.3	53.4	500.0	-19.4	AVG
5450.40	V	0.0	1.8	30.2	6.0	64.8	500.0	-17.7	AVG
6358.80	V	0.0	1.8	29.1	6.5	60.1	500.0	-18.4	AVG
7267.20	V	0.0	1.8	31.9	9.6	118.3	500.0	-12.5	AVG
8175.60	V	0.0	1.8	31.7	9.4	113.3	500.0	-12.9	AVG
9084.00	V	0.0	1.8	32.7	11.6	164.3	500.0	-9.7	AVG
1816.00	H	0.0	1.8	34.5	-6.1	26.3	500.0	-25.6	AVG
2725.20	H	0.0	1.8	32.1	-1.1	35.4	500.0	-23.0	AVG
3633.60	H	0.0	1.8	32.0	1.1	45.4	500.0	-20.8	AVG
4542.00	H	0.0	1.8	31.1	3.3	52.8	500.0	-19.5	AVG
5450.40	H	0.0	1.8	30.1	6.0	64.1	500.0	-17.8	AVG
7267.20	H	0.0	1.8	31.9	9.6	118.3	500.0	-12.5	AVG
8175.60	H	0.0	1.8	21.7	9.4	35.8	500.0	-22.9	AVG
9084.00	H	0.0	1.8	32.6	11.6	162.4	500.0	-9.8	AVG



Table 10: Radiated Emission Test Data, High Frequency Data >1GHz, Low Channel – Peak

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
1816.00	V	0.0	1.8	51.9	-6.1	194.8	5000.0	-28.2	Peak
2725.20	V	0.0	1.8	51.5	-1.1	329.9	5000.0	-23.6	Peak
3633.60	V	0.0	1.8	52.8	1.1	498.0	5000.0	-20.0	Peak
4542.00	V	0.0	1.8	51.1	3.3	527.6	5000.0	-19.5	Peak
5450.40	V	0.0	1.8	49.9	6.0	626.0	5000.0	-18.0	Peak
6358.80	V	0.0	1.8	51.3	6.5	769.3	5000.0	-16.3	Peak
7267.20	V	0.0	1.8	52.7	9.6	1296.6	5000.0	-11.7	Peak
8175.60	V	0.0	1.8	51.9	9.4	1159.2	5000.0	-12.7	Peak
9084.00	V	0.0	1.8	54.2	11.6	1952.6	5000.0	-8.2	Peak
1816.00	H	0.0	1.8	51.3	-6.1	181.8	5000.0	-28.8	Peak
2725.20	H	0.0	1.8	52.0	-1.1	349.5	5000.0	-23.1	Peak
3633.60	H	0.0	1.8	53.4	1.1	535.5	5000.0	-19.4	Peak
4542.00	H	0.0	1.8	53.1	3.3	664.2	5000.0	-17.5	Peak
5450.40	H	0.0	1.8	52.6	6.0	854.2	5000.0	-15.3	Peak
6358.80	H	0.0	1.8	52.7	6.5	909.1	5000.0	-14.8	Peak
7267.20	H	0.0	1.8	55.8	9.6	1852.7	5000.0	-8.6	Peak
8175.60	H	0.0	1.8	54.7	9.4	1600.2	5000.0	-9.9	Peak



Table 11: Radiated Emission Test Data, High Frequency Data >1GHz, High Channel - Average

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
1832.00	V	0.0	1.8	35.0	-5.9	28.4	500.0	-24.9	AVG
2748.00	V	0.0	1.8	31.5	-1.0	33.4	500.0	-23.5	AVG
3661.00	V	0.0	1.8	32.3	1.2	47.4	500.0	-20.5	AVG
4580.00	V	0.0	1.8	30.6	3.5	50.4	500.0	-19.9	AVG
5496.00	V	0.0	1.8	29.6	6.0	60.5	500.0	-18.3	AVG
6412.00	V	0.0	1.8	28.7	6.5	57.8	500.0	-18.7	AVG
7328.00	V	0.0	1.8	31.7	9.4	113.3	500.0	-12.9	AVG
8244.00	V	0.0	1.8	31.5	9.5	112.8	500.0	-12.9	AVG
9160.00	V	0.0	1.8	32.9	11.8	172.0	500.0	-9.3	AVG
1832.00	H	0.0	1.8	33.7	-5.9	24.5	500.0	-26.2	AVG
2748.00	H	0.0	1.8	31.5	-1.0	33.4	500.0	-23.5	AVG
3661.00	H	0.0	1.8	32.9	1.2	50.8	500.0	-19.9	AVG
4580.00	H	0.0	1.8	30.6	3.5	50.4	500.0	-19.9	AVG
5496.00	H	0.0	1.8	29.5	6.0	59.8	500.0	-18.4	AVG
6412.00	H	0.0	0.0	28.7	6.5	57.8	500.0	-18.7	AVG
7328.00	H	0.0	1.8	28.7	9.4	80.2	500.0	-15.9	AVG
8244.00	H	0.0	1.8	31.6	9.5	114.1	500.0	-12.8	AVG
9160.00	H	0.0	1.8	31.5	11.8	146.4	500.0	-10.7	AVG



Table 12: Radiated Emission Test Data, High Frequency Data >1GHz, High Channel – Peak

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
1832.00	V	0.0	1.8	56.9	-5.9	353.8	5000.0	-23.0	Peak
2748.00	V	0.0	1.8	56.7	-1.0	607.0	5000.0	-18.3	Peak
3661.00	V	0.0	1.8	57.7	1.2	882.1	5000.0	-15.1	Peak
4580.00	V	0.0	1.8	56.9	3.5	1041.7	5000.0	-13.6	Peak
5496.00	V	0.0	1.8	57.5	6.0	1501.7	5000.0	-10.4	Peak
6412.00	V	0.0	1.8	52.9	6.5	932.0	5000.0	-14.6	Peak
7328.00	V	0.0	1.8	55.4	9.4	1734.9	5000.0	-9.2	Peak
8244.00	V	0.0	1.8	54.2	9.5	1539.0	5000.0	-10.2	Peak
9160.00	V	0.0	1.8	54.0	11.8	1951.7	5000.0	-8.2	Peak
1832.00	H	0.0	1.8	54.5	-5.9	268.4	5000.0	-25.4	Peak
2748.00	H	0.0	1.8	51.0	-1.0	314.9	5000.0	-24.0	Peak
3661.00	H	0.0	1.8	50.1	1.2	369.4	5000.0	-22.6	Peak
4580.00	H	0.0	1.8	50.5	3.5	498.6	5000.0	-20.0	Peak
5496.00	H	0.0	1.8	52.3	6.0	825.2	5000.0	-15.6	Peak
6412.00	H	0.0	1.8	52.3	6.5	874.8	5000.0	-15.1	Peak
7328.00	H	0.0	1.8	55.3	9.4	1705.2	5000.0	-9.3	Peak
8244.00	H	0.0	1.8	52.1	9.5	1208.5	5000.0	-12.3	Peak
9160.00	H	0.0	1.8	51.5	11.8	1463.5	5000.0	-10.7	Peak



2.7 AC Conducted Emissions (FCC Part §15.207)

2.7.1 Requirements

Test Arrangement: Table Top

Compliance Standard: FCC Class B

FCC Compliance Limits		
Frequency	Quasi-peak	Average
0.15 - 0.5MHz	66 to 56dB μ V	56 to 46dB μ V
0.5 - 5MHz	56dB μ V	46dB μ V
5 - 30MHz	60dB μ V	50dB μ V

2.7.2 Test Procedure

The EUT was placed on an 80 cm high 1 X 1.5 m non-conductive table above a ground plane. Power to the EUT was provided through a Solar Corporation 50 Ω /50 μ H Line Impedance Stabilization Network bonded to a 3 X 2 meter ground plane. The LISN has its AC input supplied from a filtered AC power source. Power was supplied to the peripherals through a second LISN. The peripherals were placed on the table in accordance with ANSI C63.4-2003. Power and data cables were moved about to obtain maximum emissions.

The 50 Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 150 kHz to 30 MHz were measured. The detector function was set to quasi-peak, peak, or average as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth. For average measurements the post-detector filter was set to 10 Hz.

At frequencies where quasi-peak or peak measurements comply with the average limit, no average measurements need be performed.

At frequencies where quasi-peak or peak measurements comply with the average limit, no average measurements need be performed. The Conducted emissions level to be compared to the FCC limit is calculated as shown in the following example.

Example:

Spectrum Analyzer Voltage: VdB μ V

LISN Correction Factor: LISN dB

Cable Correction Factor: CF dB

Electric Field: EdB μ V = V dB μ V + LISN dB + CF dB



2.7.3 Test Data

The EUT complied with the Class B Conducted Emissions requirements. The following tables provide the test results for phase and neutral line power line conducted emissions.

Conducted Emissions was tested with the 916MHz radio in the “transmit on” state.

Table 13: Conducted Emissions Data 120VAC, Transmit On

NEUTRAL										
Frequency (MHz)	Level QP (dBμV)	Level AVG (dBμV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBμV)	Level Corr Avg (dBμV)	Limit QP (dBμV)	Limit AVG (dBμV)	Margin QP (dB)	Margin AVG (dB)
0.157	35.4	22.0	10.2	0.2	45.8	32.4	65.6	55.6	-19.8	-23.2
0.422	29.9	22.8	10.2	0.3	40.4	33.3	57.4	47.4	-17.0	-14.1
0.366	38.8	23.3	10.2	0.3	49.2	33.7	58.6	48.6	-9.4	-14.9
0.502	27.5	21.2	10.2	0.2	38.0	31.7	56.0	46.0	-18.0	-14.3
0.650	19.4	14.0	10.3	0.4	30.0	24.6	56.0	46.0	-26.0	-21.4
1.300	10.6	5.9	10.2	0.3	21.1	16.4	56.0	46.0	-34.9	-29.6

PHASE										
Frequency (MHz)	Level QP (dBμV)	Level AVG (dBμV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBμV)	Level Corr Avg (dBμV)	Limit QP (dBμV)	Limit AVG (dBμV)	Margin QP (dB)	Margin AVG (dB)
0.157	47.0	31.1	10.2	0.2	57.4	41.5	65.6	55.6	-8.2	-14.2
0.225	39.6	25.0	10.2	0.1	49.8	35.2	62.6	52.6	-12.8	-17.4
0.237	39.1	25.4	10.2	0.1	49.3	35.6	62.2	52.2	-12.9	-16.6
0.251	37.6	22.6	10.2	0.1	47.9	32.9	61.7	51.7	-13.9	-18.8
0.263	35.5	22.7	10.2	0.1	45.8	32.9	61.3	51.3	-15.6	-18.4
0.362	31.7	22.8	10.2	0.3	42.1	33.2	58.7	48.7	-16.5	-15.4
0.555	21.8	12.2	10.2	0.4	32.4	22.8	56.0	46.0	-23.6	-23.2
0.679	25.8	10.5	10.3	0.4	36.5	21.2	56.0	46.0	-19.5	-24.8



3 Test Equipment

Table 14 shows a list of the test equipment used for measurements along with the calibration information.

Table 14: Test Equipment List

Test Name:	Conducted Emissions Voltage	Test Date:	9/9/2020
Asset #	Manufacturer/Model	Description	Cal. Due
00528	AGILENT	E4446A	1/21/2021
00125	SOLAR	8028-50-TS-24-BNC	9/10/2021
00126	SOLAR	8028-50-TS-24-BNC	9/10/2021

Test Name:	Radiated Emissions 15.249	Test Date:	09/08/2020
Asset #	Manufacturer/Model	Description	Cal. Due
00382	SUNOL SCIENCES CORPORATION	JB1	12/1/2020
00004	ARA	DRG-118/A	9/1/2021
00627	AGILENT	8449B	8/31/2021
00276	ELECTRO-METRICS	BPA-1000	6/19/2021
00528	AGILENT	E4446A	1/21/2021
00367	PAR ELECTRONICS	UHF-806-902	CNR