



FOR THE SCOPE OF ACCREDITATION UNDER NVLAP LAB CODE 500051-0

TEST REPORT #090117

STANDARD: FCC PART 15

**SUBPART C--INTENTIONAL RADIATORS
SECTION 15. 249 OPERATION WITHIN THE BANDS 902-928 MHZ,
2400-2483.5 MHZ, AND 5725-5875 MHZ AND 24.0 TO 24.25 GHZ**

EQUIPMENT TESTED:

EMERSON CLIMATE TECHNOLOGIES CONTROL PRODUCTS

SENSOR PUCK

FCC ID: X6U-SEN-100

MODEL: SEN-100-W

TEST DATE: 09 JANUARY, 2017

1100 Falcon Avenue
Glencoe, MN 55336



CERTIFICATION SERVICES, INC.

Tele: 320-864-4444
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Prepared for: Emerson Climate Technologies Control Products
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Chanhassen, MN 55317

Test agent: International Certification Services, Inc.
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Test location: International Certification Services, Inc.
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Prepared by: International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336

International Certification Services represents to the client that testing is done in accordance with standard procedures applicable and that reported test results are accurate within generally accepted commercial ranges of accuracy.

- This report only applies to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. International Certification Services shall have no liability for any deductions, inferences or generalizations drawn by the client or others from this report.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.

1.0 TEST SUMMARY

TEST REPORT: #090117

COMPANY: Emerson Climate Technologies Control Products

AGENT: International Certification Services, Inc.

PHONE: 320-864-4444

TEST DATE: 09 January, 2017

EQUIPMENT UNDER TEST: Data Transmitting Board Assembly Model: SEN-100-W

GENERAL TEST SUMMARY: The testing was performed at International Certification Services, Inc. at 1100 Falcon Ave, Glencoe, MN 55336

VERIFICATION / CERTIFICATION STATUS: The Emerson Climate Technologies Control Products 917 Mhz Data Transmitting Board Assembly Model: SEN-100-W was found to be in compliance with the FCC Part 15 Subpart C, Section 15.249 requirements.

MODIFICATIONS NECESSARY: None

TESTED BY

Steve Wendlandt



WRITTEN BY

Duane R. Bagdons



2.0 Applicable Standards

47 CFR Ch.1

FCC Part 15

Radio Frequency Devices

Subpart C

Intentional Radiators

Section 15.249

Operation within the bands 902-928 Mhz 2400-2483.5 Mhz, 5725-5875 Mhz and 24.0 to 2425 Ghz.

2.1 Referenced Standards

ANSI C63.4-2014 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 Khz to 40 Ghz.

2.2 Equipment Units Tested

The equipment tested was a Emerson Climate Technologies Control Products battery powered digital modulated transmitter operating on 917 Mhz. The SEN-100-W is a Digital Modulated transmitter and not a frequency hopping transmitter. The antenna is laid out on the PC board

2.3 Equipment and Cable Configuration

See photo of the EUT test configuration setup in Attachment A

2.4 List of Test Equipment

<u>Test Equipment</u>	<u>Model</u>	<u>S/N</u>	<u>Calibration Due Date</u>
Spectrum Analyzer	Hewlett-Packard 8566B	2421A00458	04/07/17
Preamp	P0035	2443A03658	03/26/17
Biconical Antenna	EMCO Model 93110B	105799	04/17/17
Log Periodic Antenna (200-1000 MHz)	EMCO 3146	9111-3280	04/17/17
Horn Antenna (1-18 Ghz)	EMCO 3115	2334	08/17/18
Loop Antenna	EMCO 6512	8912-1074	06/25/17

The Calibration Interval on the above equipments is 2 years

Measurement cable losses, and antenna correction factors are included in the data sheets.

2.5 Units of Measurement.

All measurements were taken in dBuV/m with the antenna located at 3 meters distance from the EUT. Frequency measurements are recorded in Mhz

2.6 Location of Test Site

The open area test site (OATS) measurement facility used to collect the data was International Certification Services, Inc. at 1100 Falcon Ave in Glencoe, MN 55336. This site has been certified to be in spec of the normalized site attenuation per ANSI C63.4-2014. (FCC registration number: US5349)

2.7 Measurement Procedures

The antenna was placed at a distance of 3 meters from the EUT. The EUT was set on an insulating table in the OATS site and rotated through all orientations to determine the worst case EUT position. The antenna was then positioned vertical and horizontal to determine which antenna polarity orientation was worst case. Then certification data was recorded at all the transmitter frequencies from the fundamental to the 10th harmonic at an antenna height variation of from 1-4 meters.

2.8 Reporting Measurement Data

See data sheets and plots in Attachment B.

2.9 Radiated Emissions Data

The frequency and amplitude of the tuned frequency of the EUT along with the frequencies and amplitudes of the harmonics up to the 10th harmonic are reported in the data sheets in Attachment B. This information is plotted against the limit of section 15.249 of FCC Part 15 subpart C. Both Horizontal and Vertical antenna polarities as well as antenna heights of 1 to 4 meters were observed.

The Final Level, expressed in dBuV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBuV) and adding the antenna correction factor and cable loss factor (Factor dB) and subtracting the preamp gain. This result then has the FCC limit subtracted from it to provide the margin which gives the tabular data as shown in the data sheets in Attachment B.

Example:

<u>Frequency</u> <u>(MHz)</u>	<u>Level</u> <u>(dBuV)</u>	+	<u>Factor</u> <u>(dB)</u>	=	<u>Corr Data</u> <u>(dBuV/m)</u>	-	<u>FCC Limit</u> <u>(dBuV/m)</u>	=	<u>Margin</u> <u>(dB)</u>
100.0	20.6	+	11.0	=	31.6	-	43.5	=	-11.9

2.10 Operating Frequency Data for Intentional Radiators

All operating frequencies and harmonic frequencies and ambient temperature at which all data was taken is recorded in the data sheets in Attachment B.

2.11 Summary of Results

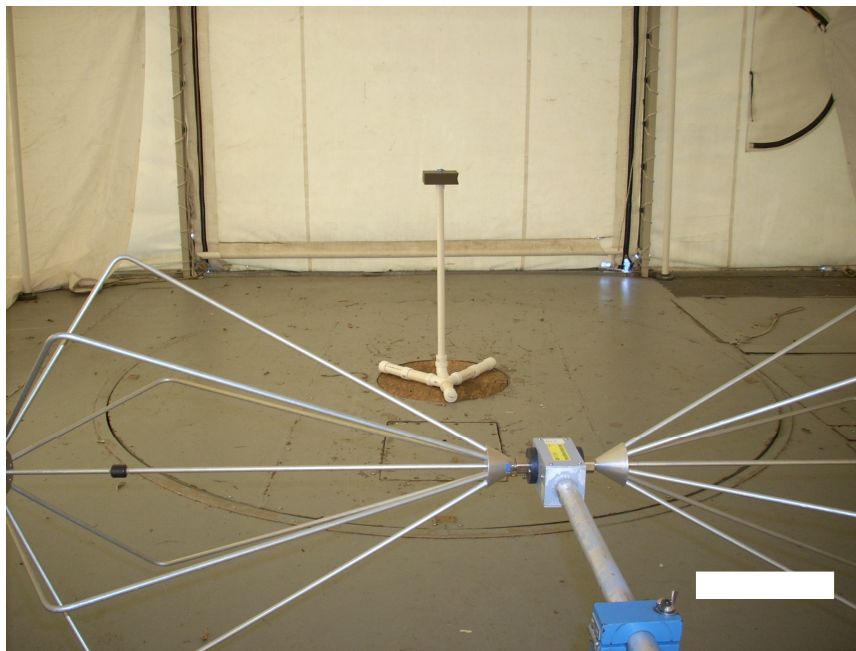
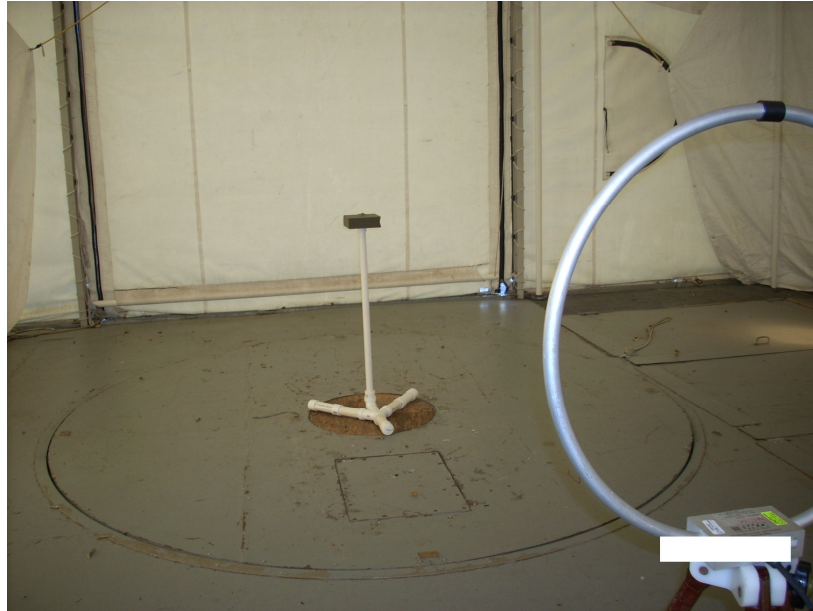
The EUT passed the requirements of FCC Part 15 Subpart C, Section 15.249 with a maximum field strength of 80.27 dBuV/m at the fundamental frequency of 917.12 Mhz against a limit of 93.98 dBuV/m. No modifications were necessary to accomplish this compliance.

ATTACHMENT A

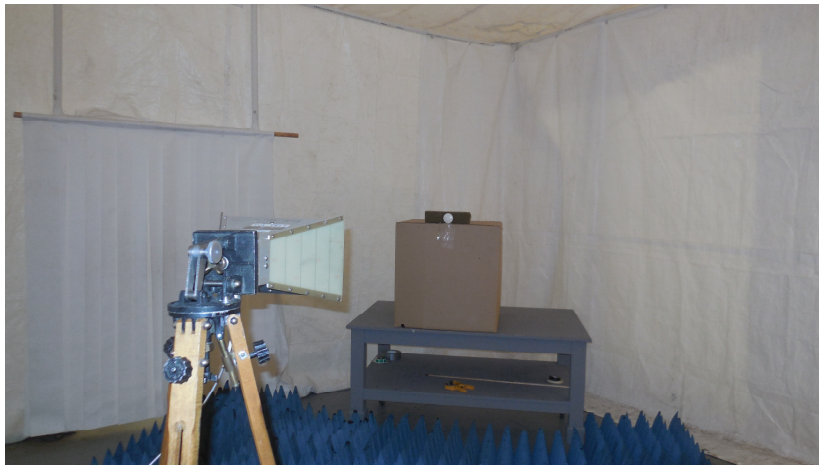
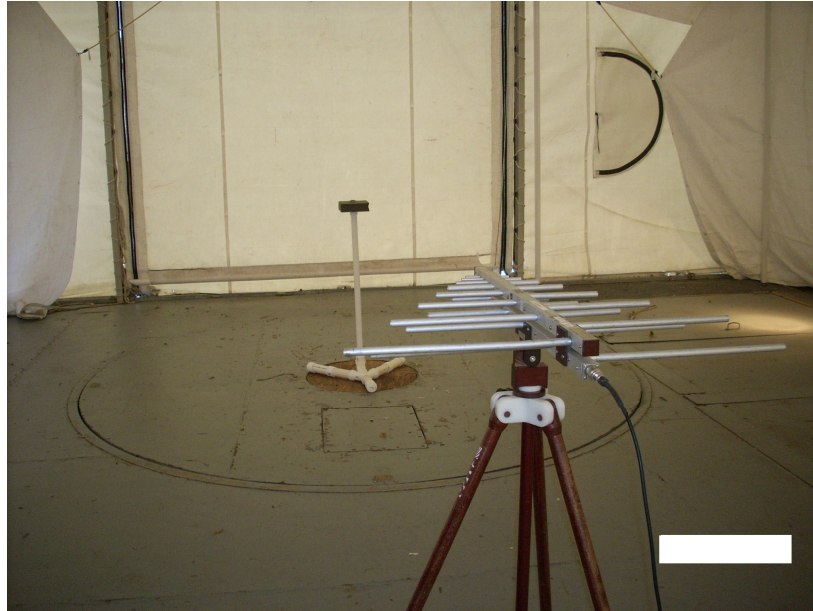
RADIATED MEASUREMENT

TEST SET UP

**Emerson Climate Technologies Control Products
Model: SEN-100-W
Radiated Emissions
Test Configuration**

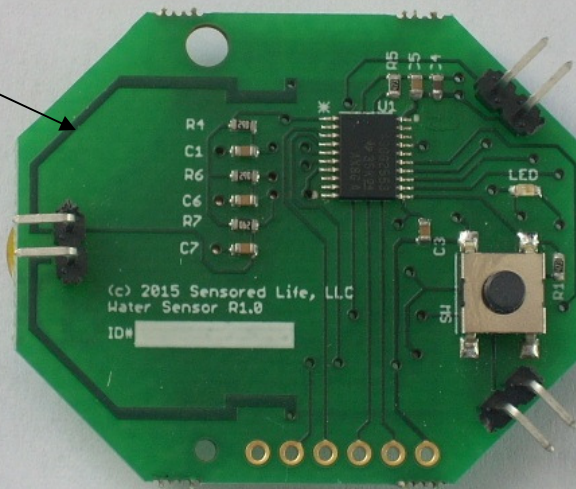


**Emerson Climate Technologies Control Products
Model: SEN-100-W
Radiated Emissions
Test Configuration**



Emerson Climate Technologies Control Products
Model: SEN-100-W
PC Board (Side 1)

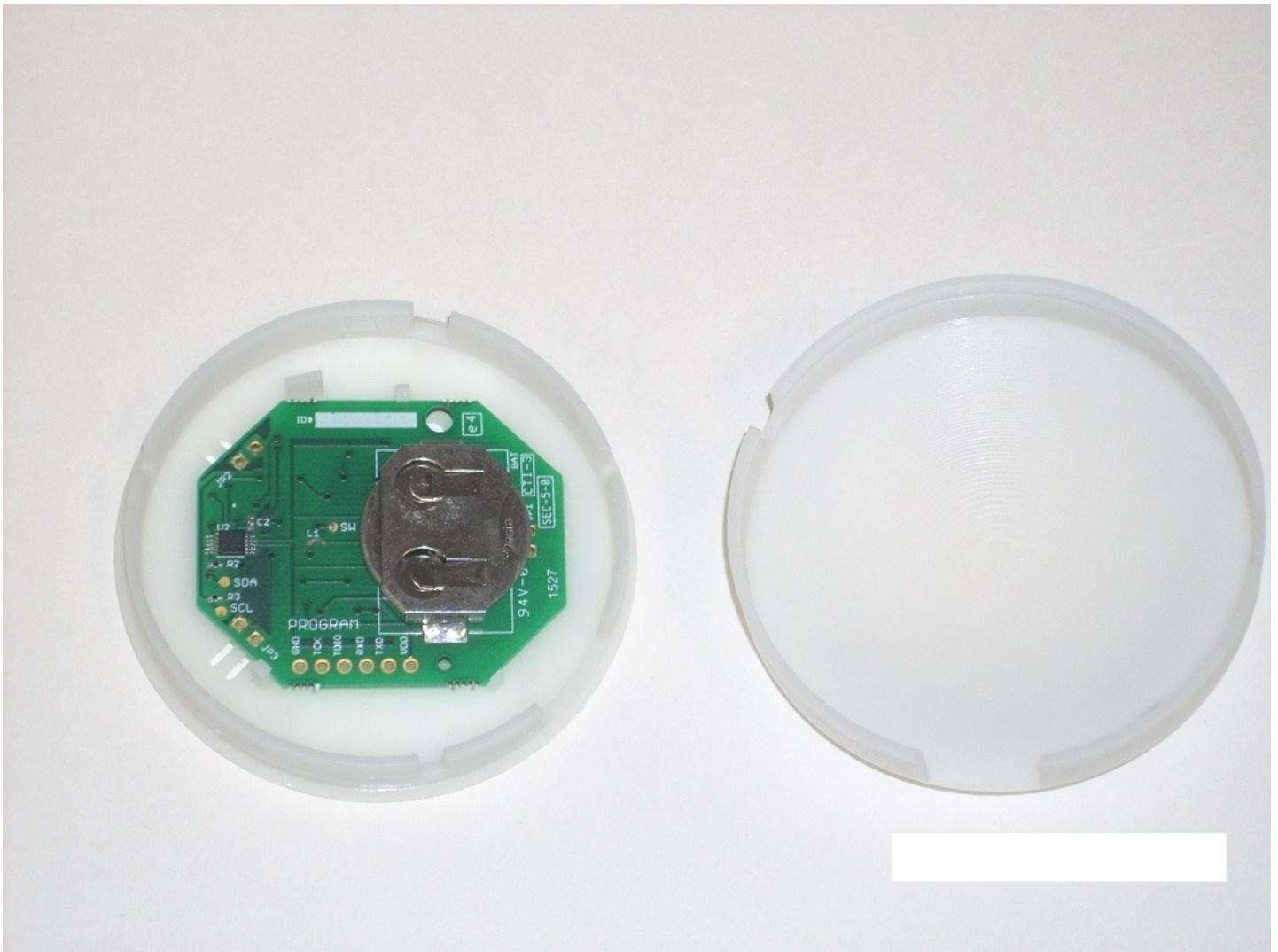
PC Trace Antenna



Emerson Climate Technologies Control Products
Model: SEN-100-W
PC Board (Side 2)



Emerson Climate Technologies Control Products
Model: SEN-100-W
Assembly



Emerson Climate Technologies Control Products
Model: SEN-100-W
Label and Location



ATTACHMENT B

DETAILED TEST DATA SHEETS

Emerson Climate Technologies Control Products
 Data Transmitting Board Assembly
 Sensor Puck
 Model: SEN-100-W
 Temperature: 50 Deg F.
 Humidity: 69 % R.H.

Test Technician: Duane R. Bagdons

Center Frequency: 917 Mhz

Preliminary testing was done to determine what antenna polarity and antenna height generated the highest signal levels. Tests were performed at this test configuration and then each frequency was maximized to 0-360 degrees orientation and antenna height of 1-4 meters.

Worst Case orientation measurements:

Freq (Mhz)	dBuV/m	Antenna Polarity	degree of rotation
917	63.9	V	0
917	68.1	V	90
917	65.2	V	180
917	63.6	V	270
917	71.5	H	0
917	78.1	H	90
917	80.27	H	180
917	76.2	H	270

The worst case orientation of the EUT is 180 degrees with the antenna in Horizontal orientation.

FCC 15.249 (a) Field Strength of Fundamental

Frequency (Mhz)	Corrected Amplitude (dBuV/m) Peak Detected	FCC 15.249 Limit (dBuV/m)	Margin (dB)
917.12	80.2784	93.98	-13.70

FCC 15.249 (a) Field Strength of Harmonics

Freq (MHz)	Corrected Amplitude (AVG detected) dBuV/m	Antenna Distance (m)	Antenna Polarity	FCC 15.249 LIMIT (dBuV/m)	Margin (dB)
2751	45.26	3	H	53.98	-8.72

No other harmonics were observed.

FCC 15.249 (b): N/A

FCC 15.249 (c) All radiated Emissions tests were performed at an antenna distance of 3 meters.

FCC 15.249 (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

NOTE: No signals were observed below or above the fundamental frequency.

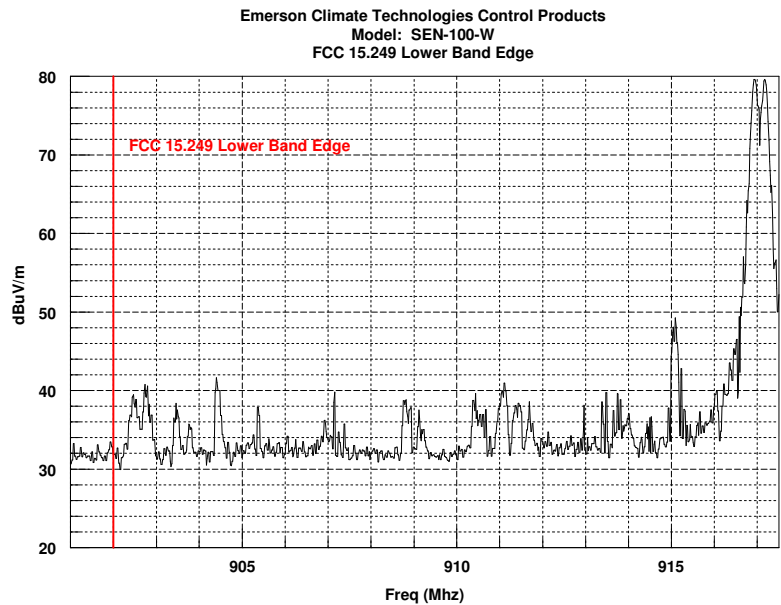
FCC 15.249 (e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Freq (MHz)	Corrected Amplitude (Peak detected) dBuV/m	Corrected Amplitude (AVG detected) dBuV/m	Antenna Distance (m)	Antenna Polarity	FCC 15.249 (Peak-Average difference) LIMIT (dBuV/m)	Difference (dB)
2751	61.4	45.26	3	H	20	16.14

FCC 15.249 (f): (d) Prior to May 25, 1991, person shall import, market or operate intentional radiators within the band 902–905 MHz under the provisions of § 15.249. Until that date, the Commission will not issue a grant of equipment authorization for equipment operating under § 15.249 if the equipment is designed to permit operation within the band 902– 905 MHz.

N/A

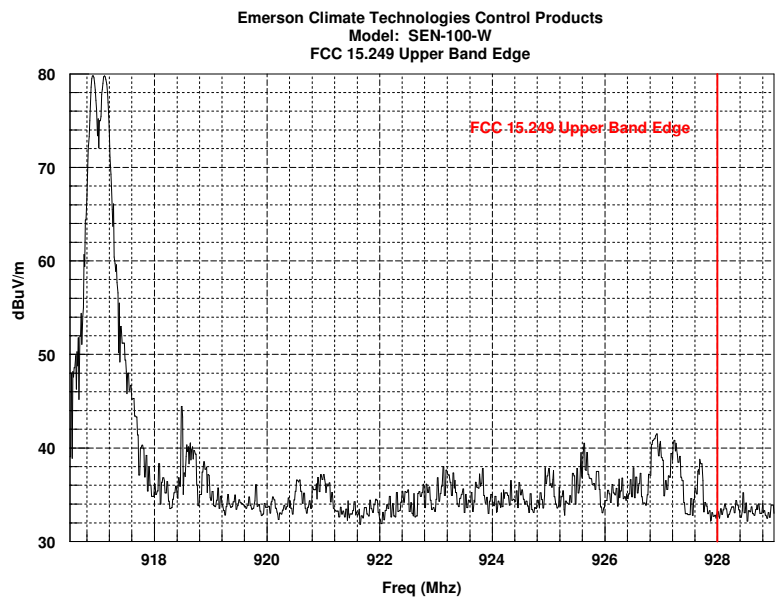
Lower Band Edge:



International Certification Services, Inc.

January 09, 2017

Upper Band Edge:



International Certification Services, Inc.

January 09, 2017

FCC 15.205 Restricted Band Emissions:

The RF spectrum in the bands of 0.09 to .11 Mhz thru 17700 to 21400 Mhz were observed and no signals were detected within 20 dB of the allowed limit of FCC 15.209 (53.979 dBuV/m at 3 meters) other than the harmonic at 2751 Mhz mentioned in FCC 15.249 (a) above.

ATTACHMENT C

**PRODUCT DATA SHEET OR PRODUCT INFORMATION FORM AS SUPPLIED
BY THE CUSTOMER**

COMPANY NAME: Emerson Climate Technologies Control Products

CUSTOMER REPRESENTATIVE: International Certification Services, Inc.

EQUIPMENT DESCRIPTION: Data Transmitter Board Assembly (Sensor Puck)

MODEL NUMBER: SEN-100-W

SERIAL NUMBER: N/A

TYPE OF TEST:

- ☐ Development
- ☐ Initial Design Verification
- ☐ Design Change (as described below)
- ☒ Production Sample (Audit Test)

OSCILLATOR FREQUENCIES: 1 Mhz

POWERLINE INTERFACE:

Frequency: DC
Voltage: 3 VDC

POWER SUPPLY:

Battery: CR2032

POWER CABLE: None

POWER LINE FILTER: None

CABINET SHIELDING PROVISION:

Plastic enclosure.

SOFTWARE AND / OR OPERATING MODES:

Texas Instruments Code Composer Studio Version: 5.5.0.00077.
Diagnostics code for the SEN-100-W. The test code is embedded within the 80017XXX-99
Production code.

INTERFACING EQUIPMENT OR SIMULATORS: None

I/O CABLES: None