

# Application Submittal Report For Grant of Certification

FOR

Model: ISN-1 (Intelligent Sensor Node)  
903.1-926.85 MHz  
FHSS Transmission System

**FCC ID: 2AFK4-ISN1  
IC: 20563-ISN1**

FOR

**C2Ag, LLC**  
PO Box 315, 302 South Main Street  
Archie, MO 64725

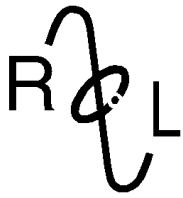
Test Report Number: 150806A  
IC Test Site Registration: 3041A-1

Authorized Signatory: *Scot D. Rogers*  
Scot D. Rogers

Rogers Labs, Inc.  
4405 W. 259th Terrace  
Louisburg, KS 66053  
Phone/Fax: (913) 837-3214  
Revision 1

C2Ag, LLC  
Model: ISN-1  
Test #: 150806A  
Test to: 47CFR (15.247), RSS-247  
File: C2Ag ISN1 TstRpt 150806A

FCC ID: 2AFK4-ISN1  
IC: 20563-ISN1  
SN: ENG1  
Date: November 10, 2015  
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# **ROGERS LABS, INC.**

4405 West 259<sup>th</sup> Terrace  
Louisburg, KS 66053  
Phone / Fax (913) 837-3214

## **Engineering Test Report For Grant of Certification Application**

FOR  
47CFR, PART 15C - Paragraph 15.247,  
Industry Canada RSS-247  
License Exempt FHSS Intentional Radiator

For

**C2Ag, LLC**  
PO Box 315, 302 South Main Street  
Archie, Mo. 64725

Model: ISN-1  
FHSS Transmission System  
Frequency Range 903.1-926.85 MHz  
FCC ID#: 2AFK4-ISN1  
IC: 20563-ISN1

Test Date: August 6, 2015

Certifying Engineer: *Scot D. Rogers*  
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## Revisions

Revision 1 Issued November 10 2015

## Forward

The following information is submitted for consideration in obtaining Grant of Certification for License Exempt FHSS Intentional Radiator operating under 47CFR Paragraph 15.247 and Industry Canada RSS-247 operations in the 902 – 928 MHz frequency band.

Name of Applicant: C2Ag, LLC  
 PO Box 315, 302 South Main Street  
 Archie, Mo. 64725

Model: ISN-1  
 FCC I.D.: 2AFK4-ISN1      IC: 20563-ISN1  
 Frequency Range: 903.1-926.85MHz  
 Operating Power: 0.99 Watts, Occupied Bandwidth 21.7 kHz

## Opinion / Interpretation of Results

Test Performed per 47CFR	Minimum Margin (dB)	Results
Antenna requirement per 47CFR 15.203	N/A	Complies
Restricted Bands (General Emissions)	-17.4	Complies
Radiated Emissions Restricted Bands (Tx)	-19.0	Complies
AC Line Conducted Emissions	N/A	Complies
Radiated Emissions (General Out-of-Band)	-13.2	Complies
Radiated Emissions per (harmonics)	-19.0	Complies

## Equipment Tested

Equipment	Model / PN	Serial Number	FCC Identifier	IC Identifier
EUT	ISN-1	ENG1	2AFK4-ISN1	20563-ISN1
Antenna	Laird OD9-5	N/A	N/A	N/A

Test results in this report relate only to the items tested

Note: Authorized for use with omnidirectional antenna offering gain not exceeding 5 dBi

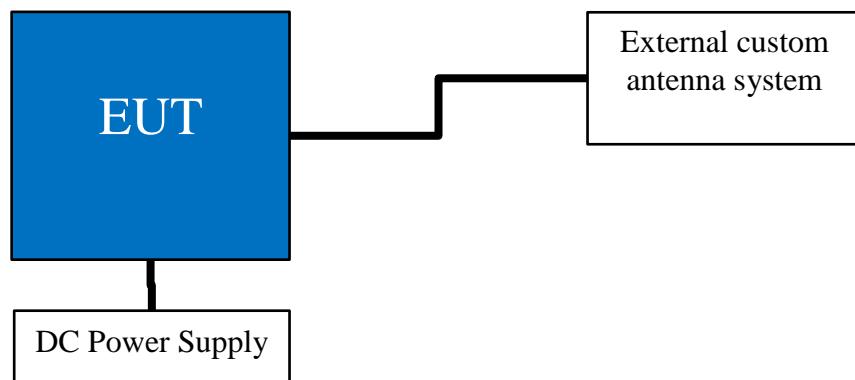
Rogers Labs, Inc. 4405 W. 259th Terrace Louisburg, KS 66053 Phone/Fax: (913) 837-3214 Revision 1	C2Ag, LLC Model: ISN-1 Test #: 150806A Test to: 47CFR (15.247), RSS-247 File: C2Ag ISN1 TstRpt 150806A	FCC ID: 2AFK4-ISN1 IC: 20563-ISN1 SN: ENG1 Date: November 10, 2015 Page 5 of 28
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## Equipment Function and Configuration

The EUT is a 903.1-926.85 MHz frequency hopping spread spectrum transceiver module. The design is used by the manufacturer as a radio module for incorporation into system equipment used in the agricultural industry. The module operates from direct current power only supplied from the supporting equipment. The design utilizes a custom antenna assembly including the antenna and cable supplied by C2AG and requires professional installation of the authorized antenna system. The manufacturer provided software which allowed testing personnel operational control of the transmitter for testing purposes. The EUT was arranged as described by the manufacturer ensuring worst-case emissions configuration for testing. The EUT offers no other interface connections than those documented in the configuration options presented. The module also incorporates transmitter module model: RN4020 FCC: T9JRN4020, IC: 6514A-RN4020. This module was functional during testing similar to end use operation. Measured emissions from the operational modes investigated presented compliant with regulations and addressed possible concern of co-located transmitter emissions.

For testing purposes, the EUT received power from external DC power supply and was configured to operate in available modes. During testing all interface connections were appropriately terminated. As requested by the manufacturer and required by regulations, the equipment was tested for emissions compliance using the available configurations with the worst-case data presented. Test results in this report relate only to the products described in this report.

### ***Equipment Configuration***



## Application for Certification

(1) Manufacturer: C2Ag, LLC  
PO Box 315, 302 South Main Street  
Archie, Mo. 64725

(2) Identification: Model: ISN-1  
FCC I.D.: 2AFK4-ISN1  
IC: 20563-ISN1

(3) Instruction Book:  
Refer to Exhibit for Instruction Manual.

(4) Description of Circuit Functions:  
Refer to Exhibit of Operational Description.

(5) Block Diagram with Frequencies:  
Refer to Exhibit of Operational Description.

(6) Report of Measurements:  
Report of measurements follows in this Report.

(7) Photographs: Construction, Component Placement, etc.:  
Refer to Exhibit for photographs of equipment.

(8) List of Peripheral Equipment Necessary for operation. The equipment operates from direct current power received from supporting equipment. The design incorporates antenna port for use with authorized antenna systems as documented in this report. The EUT offers no other connection ports than those presented in this filing

(9) Transition Provisions of 15.37 are not being requested.

(10) Not Applicable. The unit is not a scanning receiver.

(11) Not Applicable. The EUT does not operate in the 59 – 64 GHz frequency band.

(12) The equipment is not software defined and this section is not applicable.

## Applicable Standards & Test Procedures

In accordance with the 47CFR, dated October 1, 2014, Part 2, Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057, and applicable parts of paragraph 15, Part 15C Paragraph 15.247 and Industry Canada standard RSS-247 Issue 1 the following information is submitted. Test procedures used are the established Methods of Measurement of Radio-Noise Emissions as described in the ANSI C63.10-2013, FCC documents 558074 D01 DTS Meas Guidance v03r03 and DA00-705.

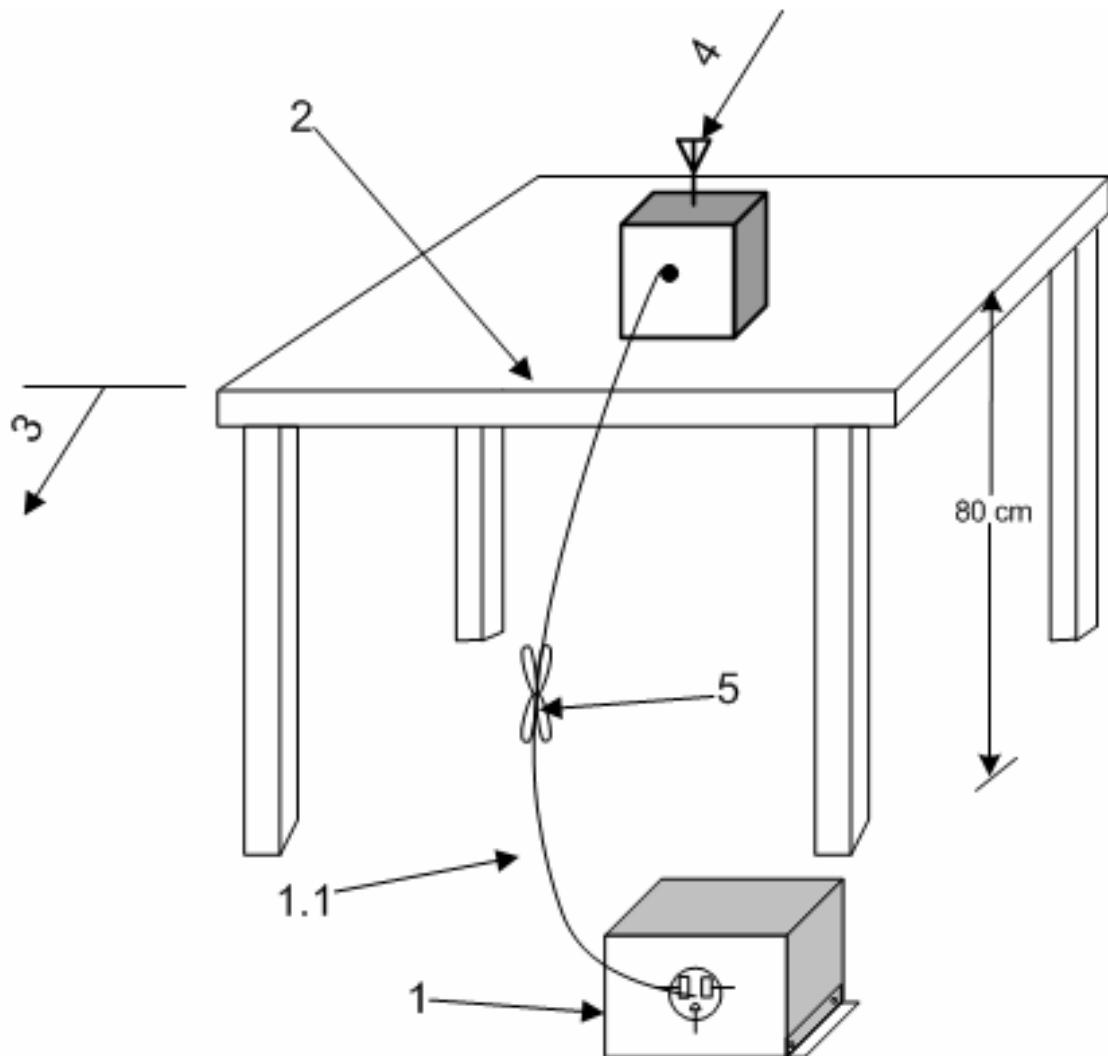
## Equipment Testing Procedures

### ***AC Line Conducted Emission Test Procedure***

The equipment operates solely from Direct Current (DC) Power and offers no provision for connection to utility AC power systems. Therefore, no AC power line conducted emissions test is required or performed.

### ***Radiated Emission Test Procedure***

The EUT was placed on a rotating 0.9 x 1.2-meter platform, elevated as required above the ground plane at a distance of 3 meters from the FSM antenna. Radiated emissions testing were performed as specified in ANSI C63.10-2013. EMI energy was maximized by equipment placement, raising and lowering the FSM antenna, changing the antenna polarization, and by rotating the turntable. Each emission was maximized before data was taken using a spectrum analyzer. The frequency spectrum from 9 kHz to 10,000 MHz was searched for during preliminary investigation. Refer to diagrams 1 and 2 showing typical test arrangement and photographs in the test setup exhibits for specific EUT placement during testing.



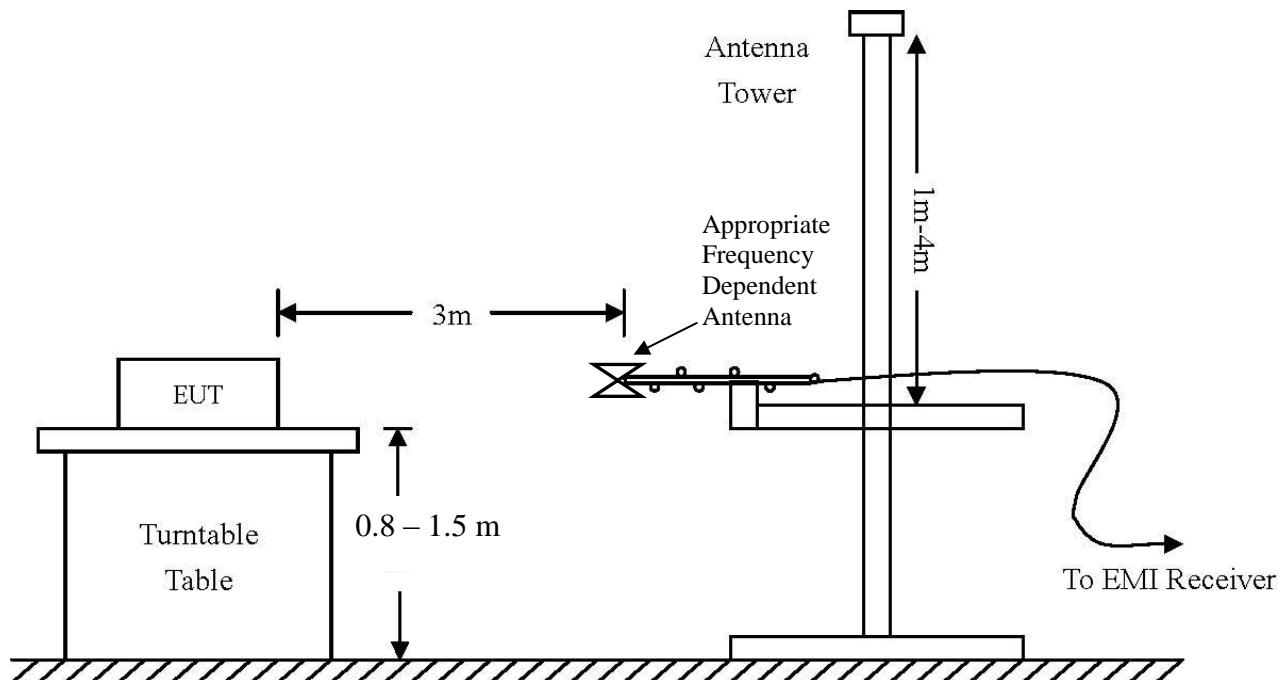
1. A LISN is optional for radiated measurements between 30 MHz to 1000 MHz, but not allowed for measurements below 30 MHz and above 1000 MHz (See 6.4.3, 6.5.1, and 6.6.3). If used, connect EUT to one LISN. Unused LISN measuring port connectors shall be terminated in  $50\Omega$ . LISN can be placed on top of, or immediately beneath, reference ground plane (see 6.2.2 and 6.2.3.1).
  - 1.1 LISN spaced at least 80 cm from nearest part of EUT chassis.
2. The EUT shall be placed in the center of the table to the extent possible (See 6.2.3.1 and 6.3.4).
3. A vertical conducting plane, if used for conducted tests per 6.2.2, shall be removed for radiated emission tests.
4. Antenna may be integral or detachable, depending on the EUT.
5. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.

### Diagram 1 Test arrangement for radiated emissions of tabletop equipment

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Louisburg, KS 66053  
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Revision 1

C2Ag, LLC  
Model: ISN-1  
Test #: 150806A  
Test to: 47CFR (15.247), RSS-247  
File: C2Ag ISN1 TstRpt 150806A

FCC ID: 2AFK4-ISON1  
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Frequency: 9 kHz-30 MHz	Frequency: 30 MHz- 1 GHZ	Frequency: Above 1 GHz
Loop Antenna	Broadband Biconilog	Horn
RBW = 9 kHz	RBW = 120 kHz	RBW = 1 MHz
VBW = 30 kHz	VBW = 500 kHz	VBW = 3 MHz
Sweep time = Auto	Sweep time = Auto	Sweep time = Auto
Detector = PK, QP	Detector = PK, QP	Detector = PK, AV
Antenna Height 1m	Antenna Height 1-4m	Antenna Height 1-4m

**Diagram 2 Test arrangement for radiated emissions tested on Open Area Test Site (OATS)**

## Test Site Locations

Conducted EMI      The AC power line conducted emissions testing performed in a shielded screen room located at Rogers Labs, Inc., 4405 W. 259<sup>th</sup> Terrace, Louisburg, KS

Radiated EMI      The radiated emissions tests were performed at the 3 meters, Open Area Test Site (OATS) located at Rogers Labs, Inc., 4405 W. 259<sup>th</sup> Terrace, Louisburg, KS

Site Registration      Refer to Annex for Site Registration Letters

NVLAP Accreditation      Lab code 200087-0

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## List of Test Equipment

A Rohde and Schwarz ESU40 and/or Hewlett Packard 8591EM was used as the measuring device for the emissions testing of frequencies below 1 GHz. A Rohde and Schwarz ESU40 and/or Hewlett Packard 8562A Spectrum Analyzer was used as the measuring device for testing the emissions at frequencies above 1 GHz. The analyzer settings used are described in the following table. Refer to the appendix for a complete list of test equipment.

AC Line Conducted Emissions (0.150 -30 MHz)		
RBW	AVG. BW	Detector Function
9 kHz	30 kHz	Peak / Quasi Peak
Emissions (30-1000 MHz)		
RBW	AVG. BW	Detector Function
120 kHz	300 kHz	Peak / Quasi Peak
Emissions (Above 1000 MHz)		
RBW	Video BW	Detector Function
100 kHz	100 kHz	Peak
1 MHz	1 MHz	Peak / Average

Equipment	Manufacturer	Model (SN)	Band	Cal Date	Due
<input type="checkbox"/> LISN	FCC	FCC-LISN-50-2-10(1PA) (160611)	.15-30MHz	6/15	5/16
<input checked="" type="checkbox"/> Cable	Time Microwave	750HF290-750 (L10M)	9kHz-40 GHz	10/14	10/15
<input type="checkbox"/> Cable	Belden	RG-58 (L1-CAT3-11509)	9kHz-30 MHz	10/14	10/15
<input type="checkbox"/> Cable	Belden	RG-58 (L2-CAT3-11509)	9kHz-30 MHz	10/14	10/15
<input type="checkbox"/> Antenna	ARA	BCD-235-B (169)	20-350MHz	10/14	10/15
<input type="checkbox"/> Antenna	EMCO	3147 (40582)	200-1000MHz	10/14	10/15
<input checked="" type="checkbox"/> Antenna	ETS-Lindgren	3117 (200389)	1-18 GHz	5/15	5/17
<input type="checkbox"/> Antenna	Com Power	AH-118 (10110)	1-18 GHz	10/14	10/16
<input type="checkbox"/> Antenna	Com Power	AH-840 (101046)	18-40 GHz	5/15	5/17
<input checked="" type="checkbox"/> Antenna	EMCO	6509 (9502-1374)	.001-30 MHz	10/14	10/15
<input checked="" type="checkbox"/> Antenna	Sunol	JB-6 (A100709)	30-1000 MHz	10/14	10/15
<input type="checkbox"/> Antenna	EMCO	3143 (9607-1277)	20-1200 MHz	5/15	5/16
<input type="checkbox"/> Analyzer	HP	8591EM (3628A00871)	9kHz-1.8GHz	5/15	5/16
<input type="checkbox"/> Analyzer	HP	8562A (3051A05950)	9kHz-110GHz	5/15	5/16
<input type="checkbox"/> Analyzer	HP External Mixers	11571, 11970	25GHz-110GHz	5/15	5/16
<input checked="" type="checkbox"/> Analyzer	Rohde & Schwarz	ESU40 (100108)	20Hz-40GHz	5/15	5/16
<input checked="" type="checkbox"/> Amplifier	Com-Power	PA-010 (171003)	100Hz-30MHz	10/14	10/15
<input checked="" type="checkbox"/> Amplifier	Com-Power	CPPA-102 (01254)	1-1000 MHz	10/14	10/15
<input checked="" type="checkbox"/> Amplifier	Com-Power	PAM-118A (551014)	0.5-18 GHz	10/14	10/15

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## Environmental Conditions

Ambient Temperature      22.4° C

Relative Humidity      51%

Atmospheric Pressure      1013.0 mb

## Units of Measurements

Conducted EMI      Data is in dB $\mu$ V; dB referenced to one microvolt

Radiated EMI      Data is in dB $\mu$ V/m; dB/m referenced to one microvolt per meter

Sample Calculation:

RFS = Radiated Field Strength, FSM = Field Strength Measured

A.F. = Receive antenna factor, Gain = amplification gains and/or cable losses

RFS (dB $\mu$ V/m @ 3m) = FSM (dB $\mu$ V) + A.F. (dB/m) - Gain (dB)

## Statement of Modifications and Deviations

No modifications to the EUT were required for the unit to demonstrate compliance with the 47CFR Part 15C and RSS-247 and Industry Canada RSS-247 emission requirements. There were no deviations to the specifications.

## Intentional Radiators

As per 47CFR, Subpart C, paragraph 15.247 and Industry Canada RSS-247 Issue 1 the following information is submitted.

### ***Antenna Requirements***

The design utilizes a custom antenna assembly including the antenna and cable supplied by C2AG. The design is marketed for professional installation and use as described in accompanying documentation. The antenna connection point complies with the unique antenna connection requirements.

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### **Restricted Bands of Operation**

Spurious emissions falling in the restricted frequency bands of operation were measured at a distance of three meters on the OATS. The EUT utilizes frequency determining circuitry, which generates harmonics falling in the restricted bands. Emissions were measured at the OATS, using appropriate antennas or pyramidal horns, amplification stages, and a spectrum analyzer. Emissions emanating from the support computer system in the restricted bands of operation are presented in Table 1. Emissions emanating from the transmitter module in restricted bands of operation are presented in Table 2. No other significant emission was observed which fell into the restricted bands of operation.

**Table 1 Radiated Emissions in Restricted Bands**

Frequency in MHz	Horizontal Peak (dB $\mu$ V/m)	Horizontal Quasi-Peak (dB $\mu$ V/m)	Horizontal Average (dB $\mu$ V/m)	Vertical Peak (dB $\mu$ V/m)	Vertical Quasi-Peak (dB $\mu$ V/m)	Vertical Average (dB $\mu$ V/m)	Limit @ 3m (dB $\mu$ V/m)
132.3	25.7	20.8	N/A	18.4	15.6	N/A	43.5
168.1	26.4	22.0	N/A	18.8	14.5	N/A	43.5
400.0	33.3	28.6	N/A	20.5	15.7	N/A	46.0
2709.3	52.0	N/A	34.8	51.8	N/A	34.6	54.0
2745.0	52.1	N/A	35.0	50.4	N/A	33.1	54.0
2780.4	52.2	N/A	35.0	50.3	N/A	31.0	54.0
4515.5	39.3	N/A	13.4	38.1	N/A	10.7	54.0
4575.0	38.3	N/A	10.4	37.4	N/A	12.2	54.0
4634.0	42.3	N/A	17.5	40.5	N/A	14.5	54.0
5418.6	41.4	N/A	11.9	41.4	N/A	12.0	54.0

Other emissions present had amplitudes at least 20 dB below the limit.

Quasi-Peak amplitude emissions are recorded above for frequency range of 30-1000 MHz.

Average amplitude emissions are recorded above for frequency range above 1000 MHz.

### **Summary of Results for Radiated Emissions in Restricted Bands**

The EUT demonstrated compliance with the radiated emissions requirements of 47CFR Part 15C Intentional Radiators. The EUT transmitter demonstrated a minimum margin of -17.4 dB below the requirements. Peak, Quasi-peak, and average amplitudes were checked for compliance with the regulations. Worst-case emissions are reported with other emissions found in the restricted frequency bands at least 20 dB below the requirements.

## ***General Radiated EMI Testing Procedure***

The EUT was arranged in the test configuration emulating worst-case equipment configuration and operated through available modes. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Investigations were performed to identify the frequencies, which produced the highest radiated emissions. Radiated emission investigations were performed from 9 kHz to 10,000 MHz with the EUT positioned in three orthogonal axes per regulations. Frequencies of interest were recorded for use during testing on the OATS. Each investigated emission was then maximized at the OATS site before final radiated emissions measurements were performed. Final data was taken with the EUT located at the open area test site at a distance of 3 meters between the EUT and the receiving antenna. Peak and average amplitudes of frequencies above 1000 MHz were compared to the required limits with worst-case data presented below. Measured emission levels were maximized by EUT placement on the table, changing cable location, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna polarization between horizontal and vertical. Antennas used were Loop from 0.009 to 30 MHz, Broadband Biconical from 30 MHz to 200 MHz, Log Periodic from 200 MHz to 1 GHz, and/or Biconilog from 30 MHz to 1000 MHz, and above 1 GHz, Double Ridge or Pyramidal Horns, notch filters and appropriate amplifiers and mixers were utilized.

**Table 2 General Radiated Emissions Data (worst-case)**

Frequency in MHz	Horizontal Peak (dB $\mu$ V/m)	Horizontal Quasi-Peak (dB $\mu$ V/m)	Horizontal Average (dB $\mu$ V/m)	Vertical Peak (dB $\mu$ V/m)	Vertical Quasi-Peak (dB $\mu$ V/m)	Vertical Average (dB $\mu$ V/m)	Limit @ 3m (dB $\mu$ V/m)
120.0	29.8	26.6	N/A	20.6	16.8	N/A	43.5
132.3	25.7	20.8	N/A	18.4	15.6	N/A	43.5
168.1	26.4	22.0	N/A	18.8	14.5	N/A	43.5
182.0	22.3	18.1	N/A	18.3	14.2	N/A	43.5
200.0	38.8	38.0	N/A	34.6	33.7	N/A	43.5
240.0	25.8	22.1	N/A	18.8	15.2	N/A	46.0
280.0	25.5	21.8	N/A	28.8	27.9	N/A	46.0
400.0	33.3	28.6	N/A	20.5	15.7	N/A	46.0

Other emissions present had amplitudes at least 20 dB below the limit.

Quasi-Peak amplitude emissions are recorded above for frequency range of 30-1000 MHz.

Average amplitude emissions are recorded above for frequency range above 1000 MHz.

### ***Summary of Results for General Radiated Emissions***

The EUT demonstrated compliance with the general radiated emissions requirements of 47CFR Part 15C. The EUT demonstrated a minimum margin of -5.5 dB below general radiated emissions requirements. There are no other significantly measurable emissions in the restricted bands other than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the requirements.

### ***Operation in the Band 902 – 928 MHz***

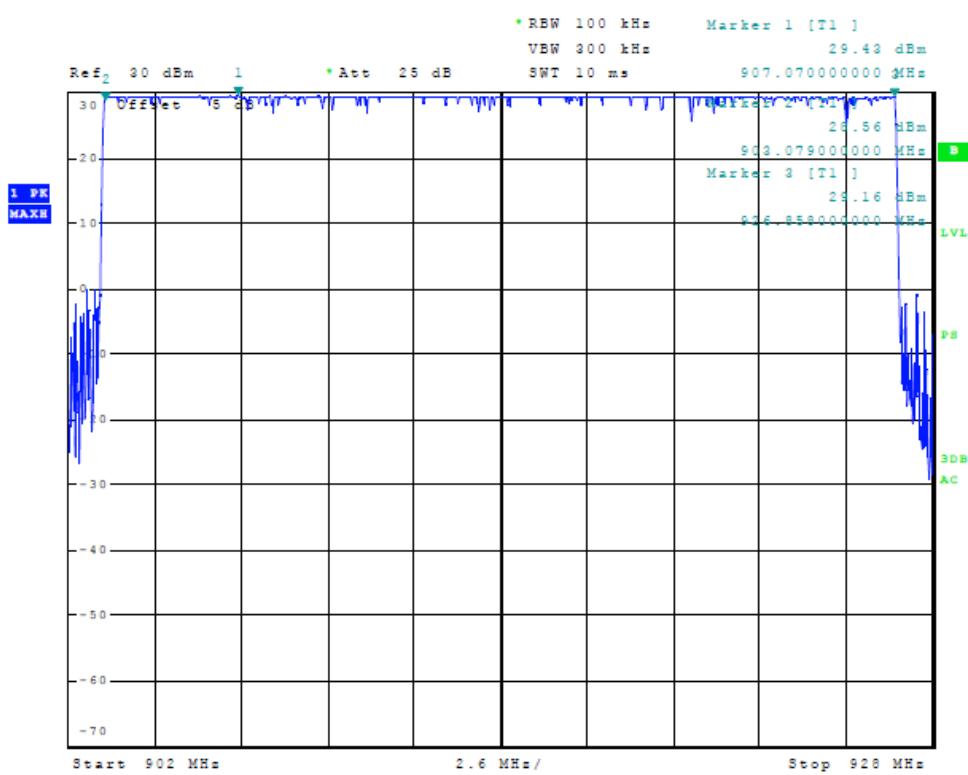
The power output was measured both at the antenna connection port and at the open area test site at a three-meter distance with the authorized antenna system. Band edge and harmonic radiated emission measurements were taken while EUT was operated in both DSS and test modes. Data presented below represents worst-case emissions from all modes investigated during testing.

Harmonic emissions measurement data presented in table seven includes the Duty Cycle correction Factor (DCF) reduction of -19.4 dB (as authorized in 47 CFR paragraph 15.35(b) and RSS-GEN paragraph 4.5). The DCF was calculated using the absolute maximum transmitter on time (10.6 mS) over a 100 millisecond period ( $20\log [10.6/100] = -19.4$ ).

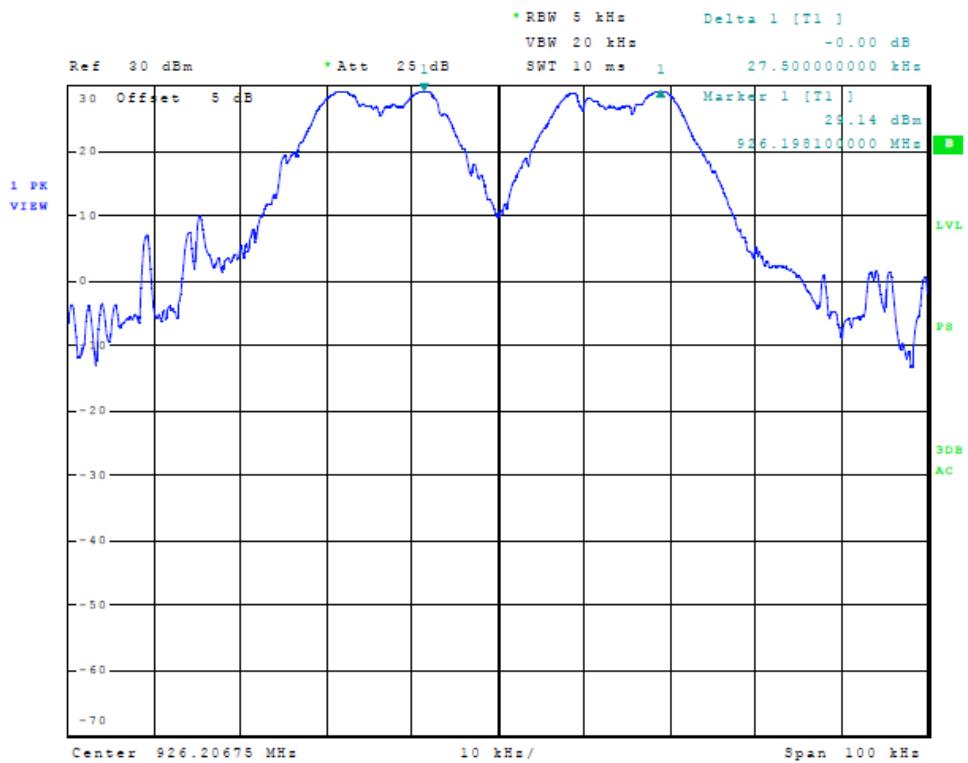
Dwell Time on channel: The units resides on channel 32 times over 18 seconds, each time transmitting for 10.62 mS which equates to average time of occupancy of less than 340 mS demonstrating compliance with regulations.

Figures three through nine present antenna conducted emissions across the frequency spectrum.

Dwell Time on channel: The transmitter resides on a channel 17 times over 20 seconds, each time transmitting for 10.7 mS which equates to average time of occupancy of 182 mS which is less than 400 mS requirement demonstrating compliance with regulations. Additional Frequency Hopping detail may be found in the operational description exhibits.



**Figure 3 of Antenna Port Conducted Emissions (Frequency band)**

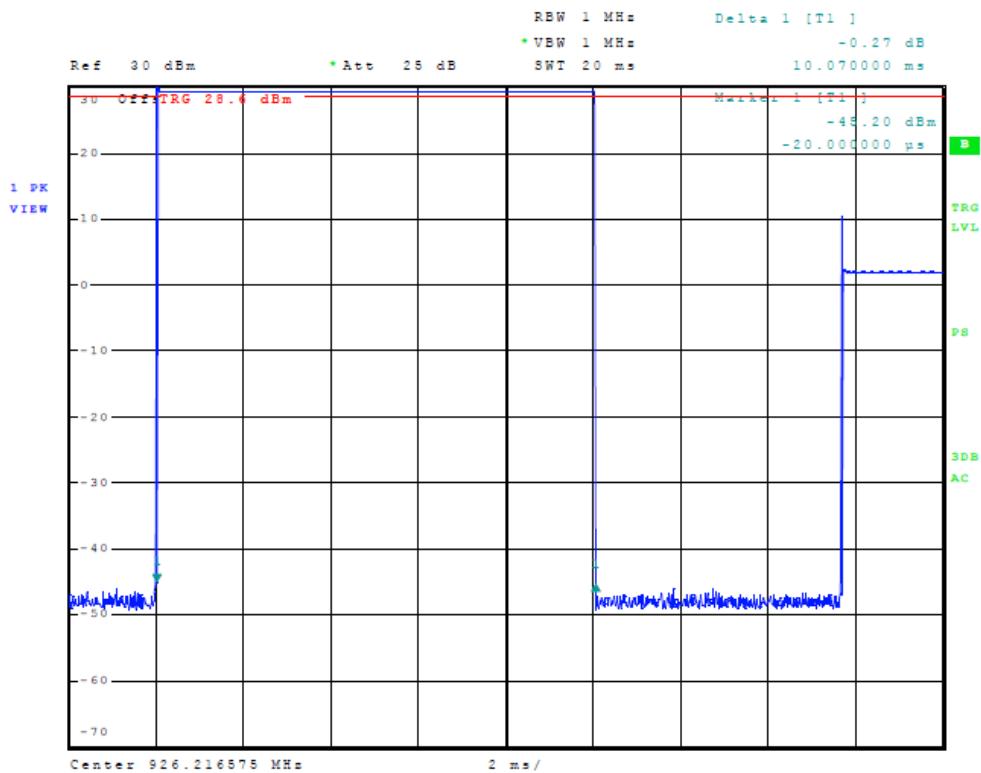


**Figure 4 of Antenna Port Conducted Emissions (Channel Separation)**

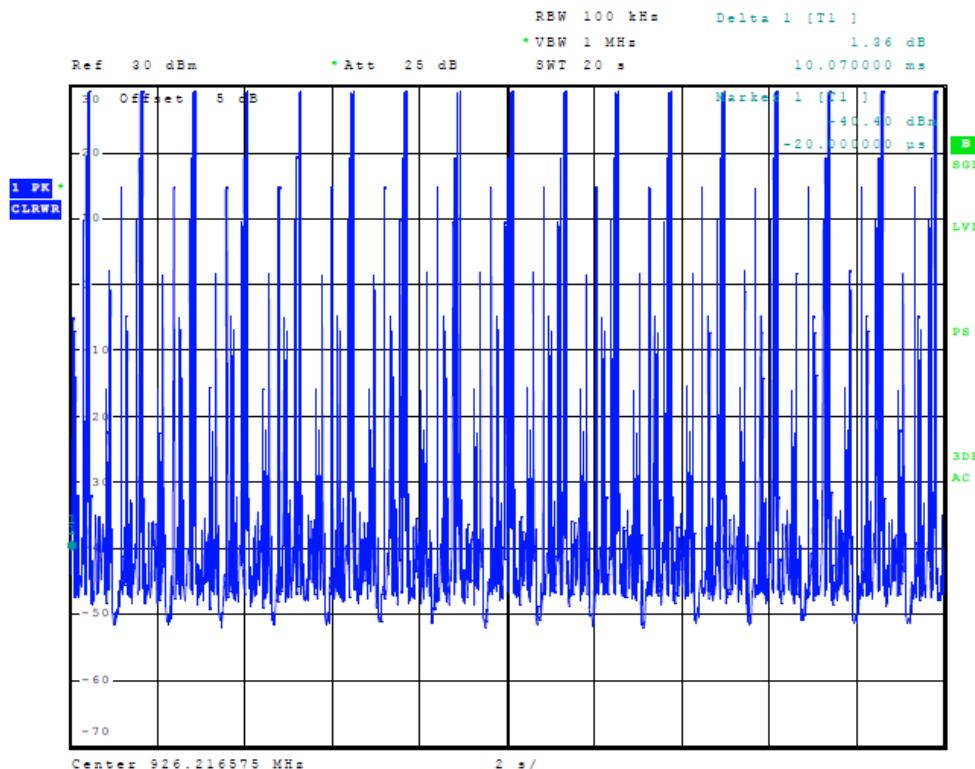
Rogers Labs, Inc.  
 4405 W. 259th Terrace  
 Louisburg, KS 66053  
 Phone/Fax: (913) 837-3214  
 Revision 1

C2Ag, LLC  
 Model: ISN-1  
 Test #: 150806A  
 Test to: 47CFR (15.247), RSS-247  
 File: C2Ag ISN1 TstRpt 150806A

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**Figure 5 of Antenna Port Conducted Emissions (Dwell Time on Channel)**

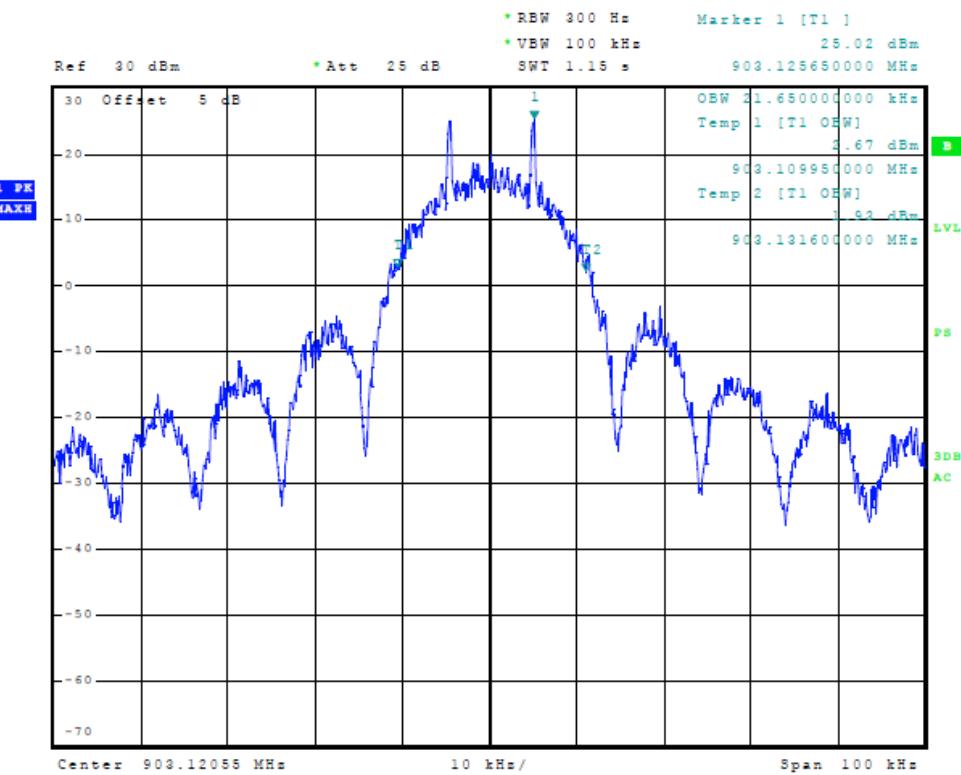


**Figure 6 of Antenna Port Conducted Emissions (number of Times on Channel)**

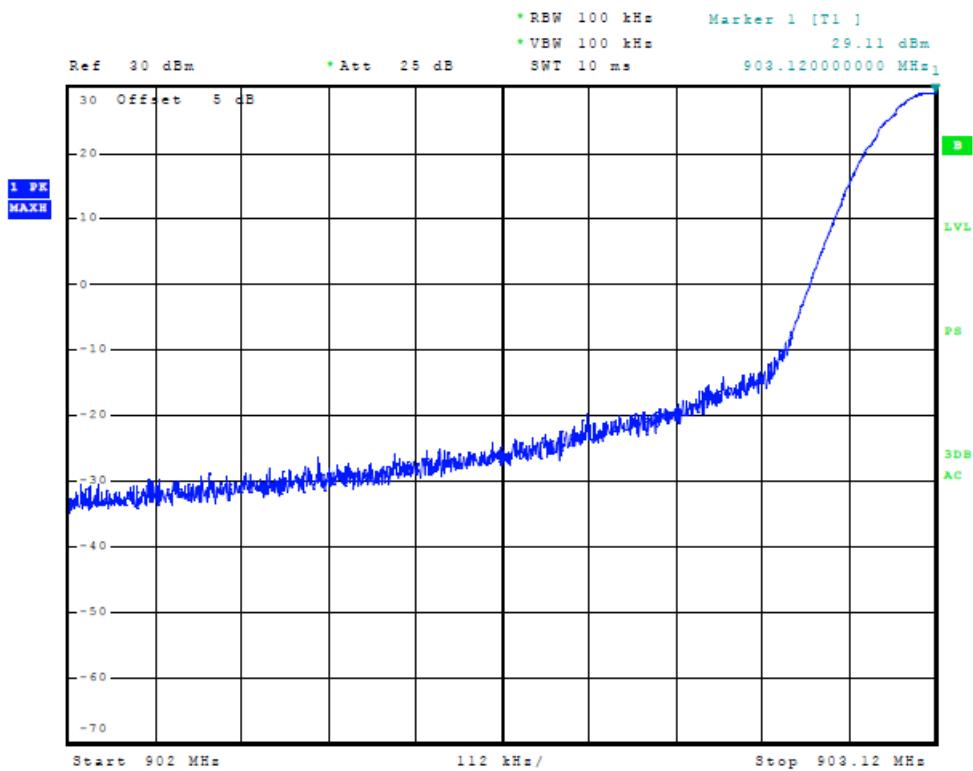
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**Figure 7 of Antenna Port Conducted Emissions (Occupied Bandwidth)**



**Figure 8 of Antenna Port Conducted Emissions (Low Band Edge)**

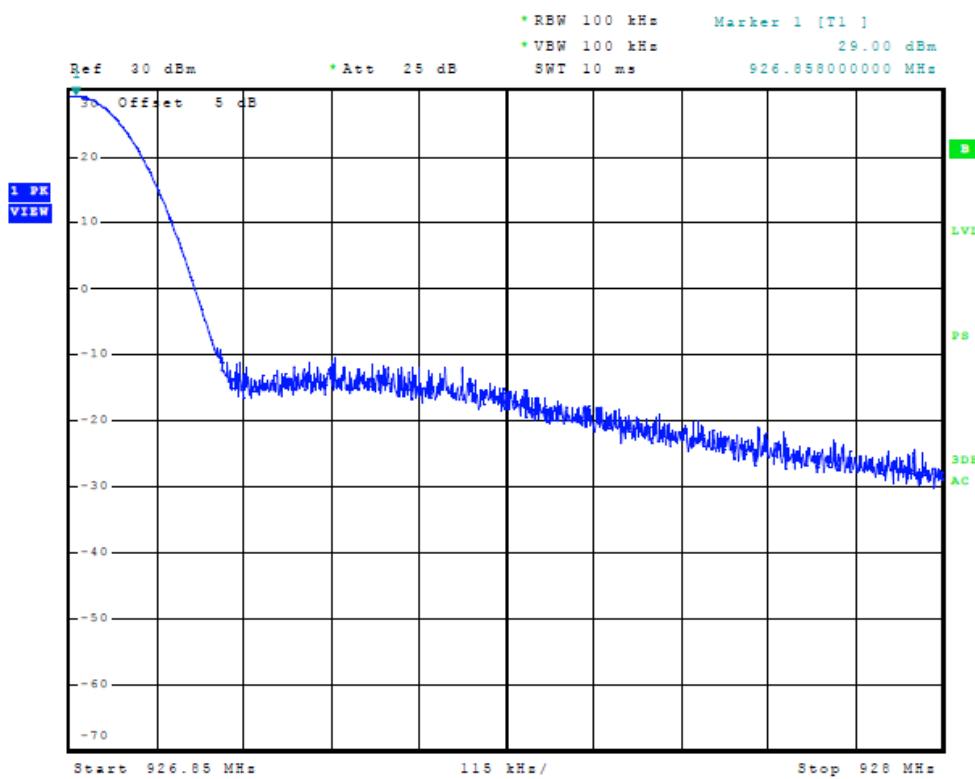


Figure 9 of Antenna Port Conducted Emissions (High Band Edge)

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## Transmitter Emissions Data

**Table 6 Transmitter Radiated Emission Data**

Frequency in MHz	Horizontal Peak (dB $\mu$ V/m)	Horizontal Quasi-Peak (dB $\mu$ V/m)	Horizontal Average (dB $\mu$ V/m)	Vertical Peak (dB $\mu$ V/m)	Vertical Quasi-Peak (dB $\mu$ V/m)	Vertical Average (dB $\mu$ V/m)	Limit @ 3m (dB $\mu$ V/m)
903.1	--	--	--	--	--	--	--
1806.2	52.2	N/A	35.0	50.2	N/A	33.1	54.0
2709.3	52.0	N/A	34.8	51.8	N/A	34.6	54.0
3612.4	41.7	N/A	22.7	42.5	N/A	24.8	54.0
4515.5	39.3	N/A	13.4	38.1	N/A	10.7	54.0
5418.6	41.4	N/A	11.9	41.4	N/A	12.0	54.0
915.0	--	--	--	--	--	--	--
1830.0	51.8	N/A	34.6	51.0	N/A	33.8	54.0
2745.0	52.1	N/A	35.0	50.4	N/A	33.1	54.0
3660.0	37.9	N/A	14.3	40.8	N/A	19.8	54.0
4575.0	38.3	N/A	10.4	37.4	N/A	12.2	54.0
5490.0	44.2	N/A	17.0	43.2	N/A	14.4	54.0
926.9	--	--	--	--	--	--	--
1853.6	52.4	N/A	34.9	51.0	N/A	33.8	54.0
2780.4	52.2	N/A	35.0	50.3	N/A	31.0	54.0
3707.2	40.2	N/A	18.1	40.2	N/A	15.3	54.0
4634.0	42.3	N/A	17.5	40.5	N/A	14.5	54.0
5560.8	43.1	N/A	16.9	40.9	N/A	11.7	54.0

Other emissions present had amplitudes at least 20 dB below the limit.

Quasi-Peak amplitude emissions are recorded above for frequency range of 30-1000 MHz.

Average amplitude emissions are recorded above for frequency range above 1000 MHz.

### Table 7 Transmitter Antenna Conducted Emissions Data

The antenna conducted output power and 20-dB bandwidth were measured while operating in available modes for the lowest, middle and highest available channels. The data reported below represents the worst-case operational conditions.

Operational Mode	Frequency MHz	Antenna Conducted Output Power dBm	Antenna Conducted Output Power Watts	Occupied Bandwidth kHz
Hop Set	903.1	29.94	0.986	21.7
Hop Set	915.0	29.83	0.962	21.6
Hop Set	926.9	29.85	0.966	21.6

### ***Summary of Results for Radiated Emissions of Intentional Radiator***

The EUT demonstrated antenna conducted output power of 986 Milliwatts (0.99 Watts) at antenna port. The EUT demonstrated a minimum radiated emission margin of -19.0 dB below the restricted emissions requirements. The EUT tested was observed in compliance with the radiated emissions requirements of 47CFR Part 15.247 and Industry Canada RSS-247 Intentional Radiators. There were no other significantly measurable emissions observed in restricted bands other than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the requirements. There were no deviations or exceptions to the requirements.

## Annex

- Annex A Measurement Uncertainty Calculations
- Annex B Rogers Labs Test Equipment List
- Annex C Rogers Qualifications
- Annex D FCC Site Registration Letter
- Annex E Industry Canada Site Registration Letter

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## Annex A Measurement Uncertainty Calculations

Measurement uncertainty calculations were made for the laboratory. Result of measurement uncertainty calculations are recorded below for AC line conducted and radiated emission measurements.

Measurement Uncertainty	U <sub>(E)</sub>	U <sub>(lab)</sub>
3 Meter Horizontal 30-200 MHz Measurements	2.08	4.16
3 Meter Vertical 30-200 MHz Measurements	2.16	4.33
3 Meter Vertical Measurements 200-1000 MHz	2.99	5.97
10 Meter Horizontal Measurements 30-200 MHz	2.07	4.15
10 Meter Vertical Measurements 30-200 MHz	2.06	4.13
10 Meter Horizontal Measurements 200-1000 MHz	2.32	4.64
10 Meter Vertical Measurements 200-1000 MHz	2.33	4.66
3 Meter Measurements 1-6 GHz	2.57	5.14
3 Meter Measurements 6-18 GHz	2.58	5.16
AC Line Conducted	1.72	3.43

## Annex B Rogers Labs Test Equipment List

List of Test Equipment	Calibration	Date	Due
Spectrum Analyzer: Rohde & Schwarz ESU40		5/15	5/16
Spectrum Analyzer: HP 8562A, HP Adapters: 11518, 11519, and 11520		5/15	5/16
Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W			
Spectrum Analyzer: HP 8591EM		5/15	5/16
Antenna: EMCO Biconilog Model: 3143		5/15	5/16
Antenna: Sunol Biconilog Model: JB6		10/14	10/15
Antenna: EMCO Log Periodic Model: 3147		10/14	10/15
Antenna: Com Power Model: AH-118		10/14	10/16
Antenna: Com Power Model: AH-840		5/15	5/17
Antenna: Antenna Research Biconical Model: BCD 235		10/14	10/15
Antenna: EMCO 6509		10/14	10/15
LISN: Compliance Design Model: FCC-LISN-2.Mod.cd, 50 µHy/50 ohm/0.1 µf		10/14	10/15
R.F. Preamp CPPA-102		10/14	10/15
Attenuator: HP Model: HP11509A		10/14	10/15
Attenuator: Mini Circuits Model: CAT-3		10/14	10/15
Attenuator: Mini Circuits Model: CAT-3		10/14	10/15
Cable: Belden RG-58 (L1)		10/14	10/15
Cable: Belden RG-58 (L2)		10/14	10/15
Cable: Belden 8268 (L3)		10/14	10/15
Cable: Time Microwave: 4M-750HF290-750		10/14	10/15
Cable: Time Microwave: 10M-750HF290-750		10/14	10/15
Frequency Counter: Leader LDC825		2/15	2/16
Oscilloscope Scope: Tektronix 2230		2/15	2/16
Wattmeter: Bird 43 with Load Bird 8085		2/15	2/16
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140		2/15	2/16
R.F. Generators: HP 606A, HP 8614A, HP 8640B		2/15	2/16
R.F. Power Amp 65W Model: 470-A-1010		2/15	2/16
R.F. Power Amp 50W M185- 10-501		2/15	2/16
R.F. Power Amp A.R. Model: 10W 1010M7		2/15	2/16
R.F. Power Amp EIN Model: A301		2/15	2/16
LISN: Compliance Eng. Model 240/20		2/15	2/16
LISN: Fischer Custom Communications Model: FCC-LISN-50-16-2-08		2/15	2/16
Antenna: EMCO Dipole Set 3121C		2/15	2/16
Antenna: C.D. B-101		2/15	2/16
Antenna: Solar 9229-1 & 9230-1		2/15	2/16
Audio Oscillator: H.P. 201CD		2/15	2/16
ELGAR Model: 1751		2/15	2/16
ELGAR Model: TG 704A-3D		2/15	2/16
ESD Test Set 2010i		2/15	2/16
Fast Transient Burst Generator Model: EFT/B-101		2/15	2/16
Field Intensity Meter: EFM-018		2/15	2/16
KEYTEK Ecat Surge Generator		2/15	2/16
Shielded Room 5 M x 3 M x 3.0 M			

## **Annex C Rogers Qualifications**

### **Scot D. Rogers, Engineer**

#### **Rogers Labs, Inc.**

Mr. Rogers has approximately 17 years' experience in the field of electronics. Engineering experience includes six years in the automated controls industry and remaining years working with the design, development and testing of radio communications and electronic equipment.

#### **Positions Held**

Systems Engineer: A/C Controls Mfg. Co., Inc. 6 Years

Electrical Engineer: Rogers Consulting Labs, Inc. 5 Years

Electrical Engineer: Rogers Labs, Inc. Current

#### **Educational Background**

- 1) Bachelor of Science Degree in Electrical Engineering from Kansas State University.
- 2) Bachelor of Science Degree in Business Administration Kansas State University.
- 3) Several Specialized Training courses and seminars pertaining to Microprocessors and Software programming.

*Scot D. Rogers*

Scot D. Rogers

**Annex D FCC Site Registration Letter**

**FEDERAL COMMUNICATIONS COMMISSION**

**Laboratory Division**

**7435 Oakland Mills Road  
Columbia, MD 21046**

April 16, 2015

Registration Number: 90910

Rogers Labs, Inc.  
4405 West 259th Terrace  
Louisburg, KS 66053

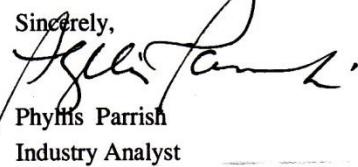
Attention: Scot Rogers,

Re: Measurement facility located at Louisburg  
3 & 10 meter site  
Date of Renewal: April 16, 2015

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website [www.fcc.gov](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

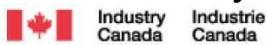
Sincerely,  
  
Phyllis Parrish  
Industry Analyst

Rogers Labs, Inc.  
4405 W. 259th Terrace  
Louisburg, KS 66053  
Phone/Fax: (913) 837-3214  
Revision 1

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IC: 20563-ISN1  
SN: ENG1  
Date: November 10, 2015  
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## **Annex E Industry Canada Site Registration Letter**



June 08, 2015

OUR FILE: 46405-3041  
Authorization No: 010277847-001

Rogers Labs Inc.  
4405 West 259th Terrace  
Louisburg, KS  
USA  
66053

**Attention:** Mr. Scot D. Rogers

Dear Sir:

The Bureau has received your application for the renewal of 3m OATS. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought (**Site# 3041A-1**). Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please keep for your records the following information;

- The company address code associated to the site(s) located at the above address is: **3041A**

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2009 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2009 or later shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 metre OATS or 3 metre chamber). If the test facility is not accredited to ANSI C63.4-2009 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to exceed **three years**. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL; [http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h\\_tt00052e.html](http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tt00052e.html).

If you have any questions, you may contact the Bureau by e-mail at [cetification.bureau@ic.gc.ca](mailto:cetification.bureau@ic.gc.ca) Please reference our file and submission number above for all correspondence.

Yours sincerely,

Bill Payn  
For: Wireless Laboratory Manager  
Certification and Engineering Bureau  
3701 Carling Ave., Building 94  
P.O. Box 11490, Station AH@  
Ottawa, Ontario K2H 8S2  
Email: certification.bureau@ic.gc.ca

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