NVLAP Lab Code 200087-0

ROGERS LABS, INC.
4405 West 259th Terrace
Louisburg, KS 66053
Phone / Fax (913) 837-3214

47CFR, PART 15C - Intentional Radiators
47CFR Paragraph 15.231 and
Industry Canada RSS-GEN Issue 5 and RSS-210 Issue 10
Application For Grant of Certification
PMN: Xi-Fi PIR Capsule

433-435 MHz (DSC) Module
Remote Control Transmitter

FCC ID: 2AZIS-XCM1
IC: 27132-XCM1
EiKO Global, LLC

18000 W 105th St
Olathe, KS 66061

FCC Designation: US5305
ISED Registration: 3041A-1

Test Report Number: 210419
Test Date: April 19, 2021

Authorized Signatory: Scot D Rogers
Scot D. Rogers

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Revisions

Revision 2 Issued November 17, 2021 – replaced references to PMN, footer and pages 1, 5, 6

Revision 1 Issued October 7, 2021

Executive Summary

License Exempt Intentional Radiator operating under Title 47 of the Code of Federal Regulations (47CFR) Paragraph 15.231, Industry Canada RSS-210 Issue 10 and RSS-GEN Issue 5, Remote Control Transmitter operations in the 433-435 GHz frequency band.

Name of Applicant: EiKO Global, LLC
18000 W 105th St
Olathe, KS 66061

PMN: Xi-Fi PIR Capsule HVIN: XCM1

FCC ID: 2AZIS-XCM1 IC: 27132-XCM1

Operating Frequency Range: 433-435 MHz

Operational communication modes

Peak Power (dBµV/m@3m)	Average power (dBµV/m@3m)	99% OBW (kHz)
93.5	77.3	76.9

This report addresses EUT Operation as Remote-Control Transmitter operation across 433-435 MHz

Opinion / Interpretation of Results

Tests Performed	Margin (dB)	Results
Restricted Bands 47CFR 15.205, RSS-210 4.1	-10.3	Complies
Emissions as per 47CFR 15.207, RSS-GEN 8.8	N/A	Complies
Radiated Emissions 47CFR 15.209, RSS-GEN 8.9	-17.9	Complies
Harmonic Emissions per 47CFR 15.231, RSS-210 A.1	-6.0	Complies

Equipment Tested

PMN: Xi-Fi PIR Capsule HVIN: XCM1

EiKO Global, LLC
18000 W 105th St
Olathe, KS 66061

Equipment	Model / PN	Serial Number
EUT 1	Xi-Fi PIR Capsule	ENG1
EUT 2	Xi-Fi PIR Capsule	ENG2

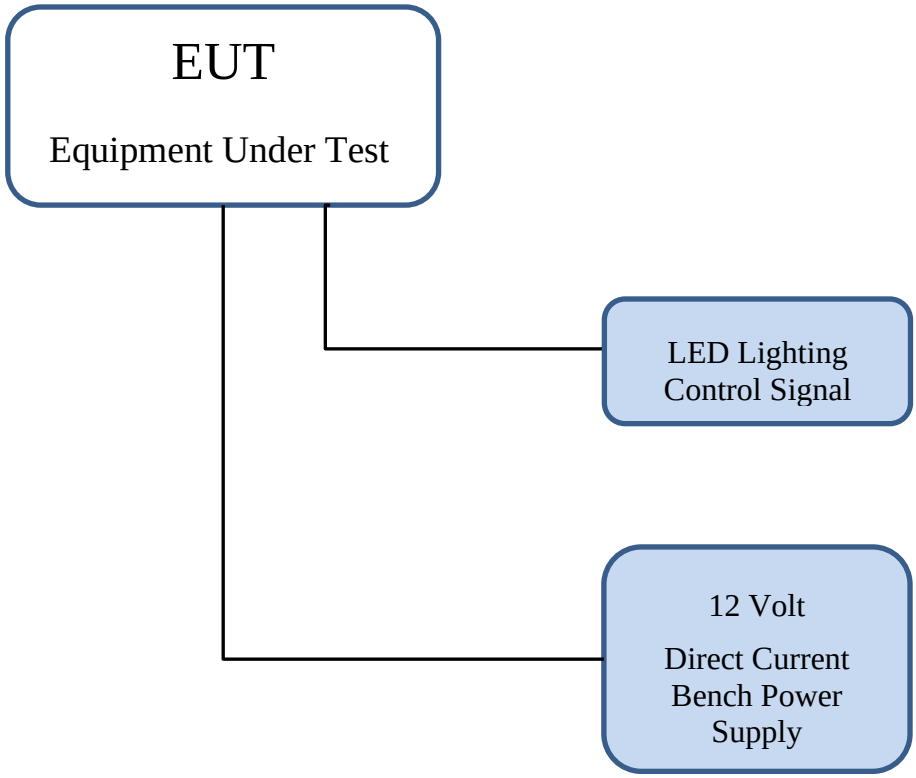
Software: V3 Antenna: 433 MHz wire coil (0 dBi)

Equipment Function

The Xi-Fi PIR Capsule is designed for installation in commercial LED lighting products. The design incorporates two radio frequency transmitters, one for motion sensing and the other providing Remote Control ability. The unit also uses InfraRed (IR) remote control providing ability to configure and control remotely. The EUT provides a 24.0-24.25 GHz transmitter used to sense motion in the field and a 433-435 MHz Remote Control Transmitter provided for periodic operation with associated equipment. The device is typically mounted in LED lighting fixtures located in parking garage or walking area which illuminate an area. The 433-435 MHz transmitter provides Remote Control Transmitter capability to associated fixtures to automate the lighting installation. The EUT also provides motion sensing of approaching objects and triggers signal to engage the lighting system. The EUT operates solely from direct current power provided from installation enclosure and offers no provision for connection with utility AC Power system. The modular design provides ability to mount into existing fixtures as retro fit or new lighting products. The test samples were provided with test software enabling continuous operation. The EUT module was tested in a stand-alone configuration and arranged as described by the manufacturer for testing purposes. The EUT offers no other interface connections than those presented in configuration option as presented below. For testing purposes, the EUT received power from a

bench direct current power supply. During testing, the test system was configured to operate in a manufacturer defined mode. As requested by the manufacturer the equipment was tested for emissions compliance using the available configurations with the worse-case data presented. Test results in this report relate only to the products described in this report.

Equipment Configuration



Application for Certification

(1) Manufacturer: EiKO Global, LLC
18000 W 105th St
Olathe, KS 66061

(2) Identification: PMN: Xi-Fi PIR Capsule HVIN: XCM1
FCC ID: 2AZIS-XCM1 IC: 27132-XCM1

(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 12-volt direct current power provided from installation. The design provides a signaling wire to change illumination of lighting fixture. The EUT provides no other interface or communication options as presented in this filing.

(9) Transition Provisions of 47CFR 15.37 are not 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.

(13) Applications for certification of U-NII devices in the 5.15-5.35 GHz and the 5.47-5.85 GHz bands must include a high-level operational description of the security procedures that control the radio frequency operating parameters and ensure that unauthorized modifications cannot be made. This requirement is not applicable to his DTS device.

(14) Contain at least one drawing or photograph showing the test set-up for each of the required types of tests applicable to the device for which certification is requested. These drawings or photographs must show enough detail to confirm other information contained in the test report. Any photographs used must be focused originals without glare or dark spots and must clearly show the test configuration used. This information is provided in this report and Test Setup Exhibits provided with the application filing.

Applicable Standards

The following information is submitted in accordance with the eCFR (electronic Title 47 of the Code of Federal Regulations) (47CFR), dated April 19, 2021: Part 2, Subpart J, Part 15C Paragraph 15.231, RSS-210 Issue 10, and RSS-GEN Issue 5. Test procedures used are the established Methods of Measurement of Radio-Noise Emissions as described in ANSI C63.10-2013. This report documents compliance for the EUT operations as Remote-Control Transmitter Module.

Equipment Testing Procedures

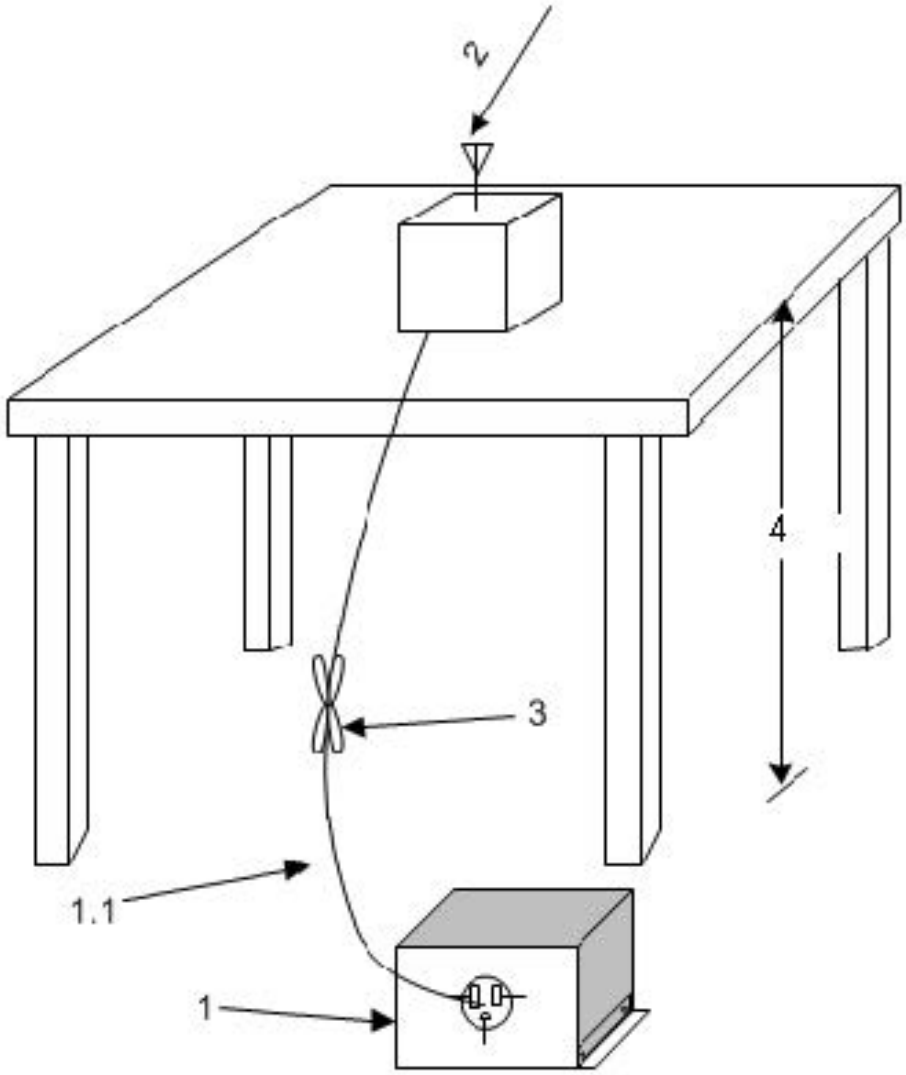
AC Line Conducted Emission Test Procedure

The design operates from direct current power only and offers no provision for connection with Utility AC Power systems. Therefore, no AC Line Conducted Emissions Testing was required or performed.

Radiated Emission Test Procedure

Radiated emissions testing was performed as required in 47CFR 15C, RSS-210 Issue 10, RSS-GEN and specified in ANSI C63.10-2013. 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. EMI energy was maximized by equipment placement permitting orientation in three orthogonal axes, raising, and lowering the FSM antenna, changing the antenna polarization, and by rotating the turntable. Each emission was maximized before data was taken and recorded. The frequency spectrum from 9 kHz to 5 GHz was searched for emissions during preliminary investigation. Refer to diagrams one and two showing typical test setup. Refer to photographs in the test setup exhibit for specific EUT placement during testing.

Diagram 1 Test arrangement for radiated emissions of tabletop equipment



1—A LISN is optional for radiated measurements between 30 MHz and 1000 MHz but not allowed for measurements below 30 MHz and above 1000 MHz (see 6.3.1). If used, then connect EUT to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. The LISN may be placed on top of, or immediately beneath, the reference ground plane (see 6.2.2 and 6.2.3.2).

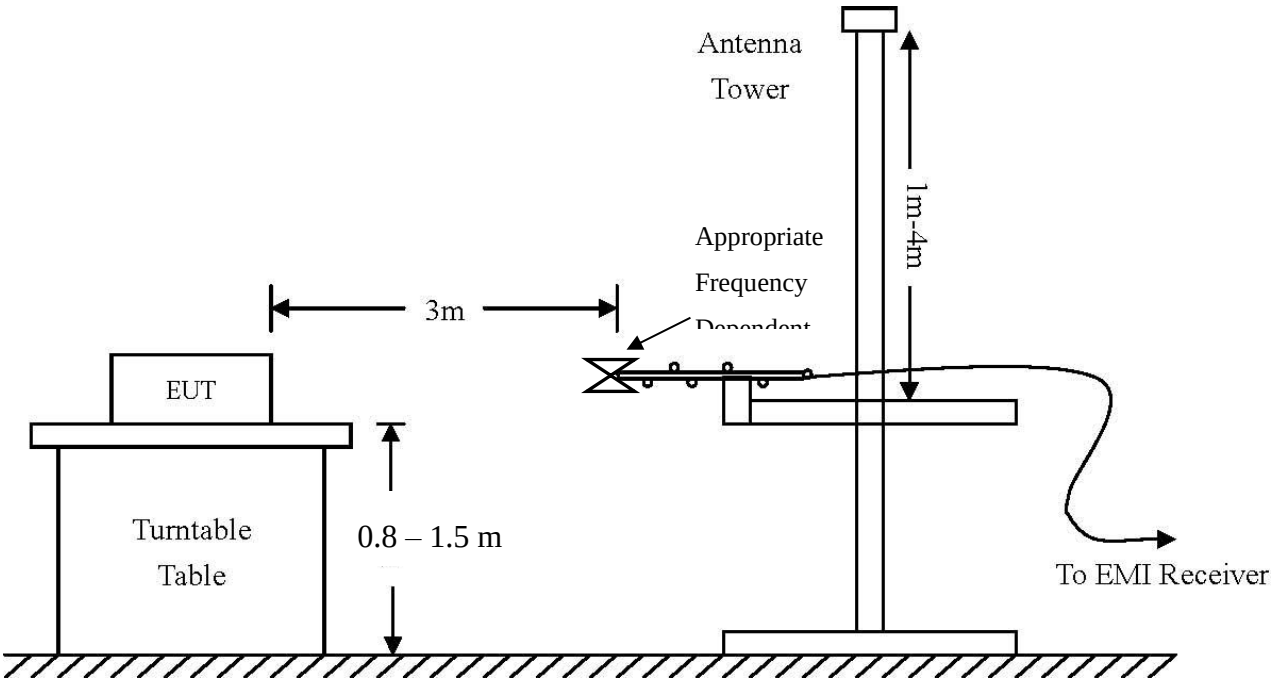
1.1—LISN spaced at least 80 cm from the nearest part of the EUT chassis.

2—Antenna can be integral or detachable, depending on the EUT (see 6.3.1).

3—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 (see 6.3.1).

4—For emission measurements at or below 1 GHz, the table height shall be 80 cm. For emission measurements above 1 GHz, the table height shall be 1.5 m for measurements, except as otherwise specified (see 6.3.1 and 6.6.3.1).

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



Test Site Locations

Conducted EMI	AC line conducted emissions testing performed in a shielded screen room located at Rogers Labs, Inc., 4405 West 259th Terrace, Louisburg, KS
Antenna port	Antenna port conducted emissions testing was performed in a shielded screen room located at Rogers Labs, Inc., 4405 West 259th 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 West 259th Terrace, Louisburg, KS

Registered Site information: FCC Site: US5305, ISED: 3041A, CAB Identifier: US0096

NVLAP Accreditation Lab code 200087-0

Units of Measurements

Conducted EMI Data presented in dBµV; dB referenced to one microvolt

Antenna port Conducted Data is in dBm; dB referenced to one milliwatt

Radiated EMI Data presented in dBµV/m; dB referenced to one microvolt per meter

Note: Radiated limit may be expressed for measurement in dBµV/m when the measurement is taken at a distance of 3 or 10 meters. Data taken for this report was taken at distance of 3 meters. Sample calculation demonstrates corrected field strength reading for Open Area Test Site using the measurement reading and correcting for receive antenna factor, cable losses, and amplifier gains.

Sample Calculation:

RFS = Radiated Field Strength, FSM = Field Strength Measured

A.F. = Receive antenna factor, Losses = attenuators/cable losses, Gain = amplification gains

RFS (dBµV/m @ 3m) = FSM (dBµV) + A.F. (dB/m) + Losses (dB) - Gain (dB)

Environmental Conditions

Ambient Temperature	22.7° C
Relative Humidity	26 %
Atmospheric Pressure	1025.2 mb

Statement of Modifications and Deviations

No modifications to the EUT were required for the equipment to demonstrate compliance with the 47CFR Part 15C, Industry Canada RSS-210 Issue 10, and RSS-GEN Issue 5 emission requirements. There were no deviations to the specifications.

Intentional Radiators

The following information is submitted supporting compliance with the requirements of 47CFR, Subpart C, paragraph 15.231, Industry Canada RSS-210 Issue 10, and RSS-GEN Issue 5.

Antenna Requirements

The EUT incorporates integral wire coil antenna system. Production equipment offers no provision for connection to alternate antenna system. The antenna connection point complies with the unique antenna connection requirements. There are no deviations or exceptions to the specification.

Restricted Bands of Operation

47CFR 15.205, RSS-GEN 8.10

Spurious emissions falling in the restricted frequency bands of operation were measured at the OATS. The EUT utilizes frequency, determining circuitry, which generates harmonics falling in the restricted bands. Emissions were investigated at the OATS, using appropriate antennas or pyramidal horns, amplification stages, and a spectrum analyzer. Peak and average amplitudes of frequencies above 1000 MHz were compared to the required limits with worst-case data presented below. Test procedures of ANSI C63.10-2013 were used during testing. No other significant emission was observed which fell into the restricted bands of operation. Computed emission values consider the received radiated field strength, receive antenna correction factor, amplifier gain stage, and test system cable losses.

Table 1 Radiated Emissions in Restricted Frequency Bands Data

Frequency in MHz	Horizontal Peak (dBµV/m)	Horizontal Average (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Average (dBµV/m)	Limit @ 3m (dBµV/m)	Horizontal Margin (dB)	Vertical Margin (dB)
1301.4	47.4	43.7	45.3	40.3	54.0	-10.3	-13.7
1304.5	44.2	38.4	45.4	40.8	54.0	-15.6	-13.2
3897.9	46.9	33.6	46.8	33.5	54.0	-20.4	-20.5
3904.2	47.3	33.4	47.0	33.7	54.0	-20.6	-20.3
3913.4	46.9	33.6	46.2	33.4	54.0	-20.4	-20.6
4331.0	46.7	33.5	47.2	35.4	54.0	-20.5	-18.6
4338.0	46.5	33.4	46.0	32.9	54.0	-20.6	-21.1
4348.2	46.1	33.1	47.1	36.1	54.0	-20.9	-17.9

Other emissions present had amplitudes at least 20 dB below the limit. Peak and Quasi-Peak amplitude emissions are recorded for frequency below 1000 MHz. Peak and Average amplitude emissions are recorded 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 and RSS-210 Issue 10 Intentional Radiator requirements. The EUT demonstrated a worst-case minimum margin of -10.3 dB below the emissions requirements in restricted frequency bands. 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.

AC Line Conducted

47CFR 15.207, RSS-GEN 8.8

The design operates from direct current power only and offers no provision for connection with Utility AC Power systems. Therefore, no AC Line Conducted Emissions Testing was required or performed.

General Radiated Emissions

47CFR 15.209, RSS-210 A.1, and RSS-GEN 8.9

The EUT was arranged in a typical equipment configuration and operated through all available mode during testing. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Test procedures of ANSI C63.10-2013 were used during testing. Radiated emissions measurements were performed to identify the frequencies, which produced the highest emissions. Each radiated emission was then maximized at the OATS location before final radiated measurements were performed. Final data was taken with the EUT located on the OATS at 3 meters distance between the EUT and the receiving antenna. The frequency spectrum from 9 kHz to 5,000 MHz was searched for general radiated emissions. Measured emission levels were maximized by EUT placement on the table, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna position between horizontal and vertical polarization. Antennas used were Loop from 9 kHz to 30 MHz, Broadband Biconical from 30 to 200 MHz, Biconilog from 30 to 1000 MHz, Log Periodic from 200 MHz to 1 GHz and or double Ridge or pyramidal horns and mixers above 1 GHz, notch filters and appropriate amplifiers and external mixers were utilized.

Table 2 General Radiated Emissions Data

Frequency (MHz)	Horizontal Peak (dBµV/m)	Horizontal Quasi-Peak (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Quasi-Peak (dBµV/m)	Limit @ 3m (dBµV/m)	Horizontal Margin (dB)	Vertical Margin (dB)
40.3	25.3	21.1	25.8	21.1	40.0	-20.9	-20.9
52.1	32.1	22.1	31.4	21.5	40.0	-17.9	-18.5
60.1	28.7	20.3	29.7	20.6	40.0	-19.7	-19.4
78.3	30.8	19.9	29.4	20.2	40.0	-20.1	-19.8
156.0	30.5	20.6	29.1	19.4	40.0	-19.4	-20.6
208.3	26.1	21.7	21.6	15.4	40.0	-18.3	-24.6
283.5	23.7	16.9	22.2	16.7	47.0	-30.1	-30.3
354.4	25.7	20.1	28.0	21.5	47.0	-26.9	-25.5

Other emissions present had amplitudes at least 20 dB below the limit. Peak and Quasi-Peak amplitude emissions are recorded for frequency range below 1000 MHz. Peak and Average amplitude emissions are recorded for frequency range above 1000 MHz.

Summary of Results for General Radiated Emissions

The EUT demonstrated compliance with the radiated emissions requirements of 47CFR Part 15C paragraph 15.209, RSS-210 Issue 10, and RSS-GEN Issue 5 Intentional Radiators. The EUT configuration demonstrated a minimum margin of -17.9 dB below the requirements. Other emissions were present with amplitudes at least 20 dB below the Limits.

Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

47CFR 15.231, Periodic Operation RSS-210 Annex A.1, Momentarily Operated devices

The transmitter provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video, and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500 **(71.5 to 81.9 dBµV/m)**	[1]375 to 1,250 **(51.5 to 61.9 dBµV/m)**
Above 470	12,500	1,250

[1]Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Transmitter Emissions Testing Procedure

47CFR 15.231, Periodic Operation RSS-210 Annex A.1, Momentarily Operated devices

Test procedures of ANSI C63.10-2013 were used during testing. The Transmitter output power: harmonics and general emissions were measured on an Open Area Test Site @ 3 meters. The EUT was placed on a turn table elevated as required above the ground plane and at a distance of 3 meters from the FSM antenna. The table permitting the equipment placement orientation in three orthogonal axes for emission maximization. The peak and average amplitude of frequencies of interest were measured using a spectrum analyzer. The amplitude of each emission was then recorded from the analyzer display. Plots were taken of transmitter performance for reference. The amplitude of each radiated emission was measured on the OATS at a distance of 3 meters from the FSM antenna testing was performed on sample representative of production with integral antenna with worst-case data provided. The amplitude of each radiated emission was maximized by equipment orientation and placement on the turn table, raising and lowering the FSM (Field Strength Measuring) antenna, changing the FSM antenna polarization, and by rotating the turntable. A Loop antenna was used for measuring emissions from 0.009 to 30 MHz, Biconilog Antenna for 30 to 1000 MHz, Double-Ridge, Pyramidal Horn Antennas from 1 GHz to 40 GHz, and/or external mixers above 40 GHz. Emissions were measured in dBµV/m @ 3 meters.

Plots were taken of transmitter performance for reference presenting compliance with the specifications.

Figure 1 Plot of Transmitter Emissions Operation in 433-435 MHz

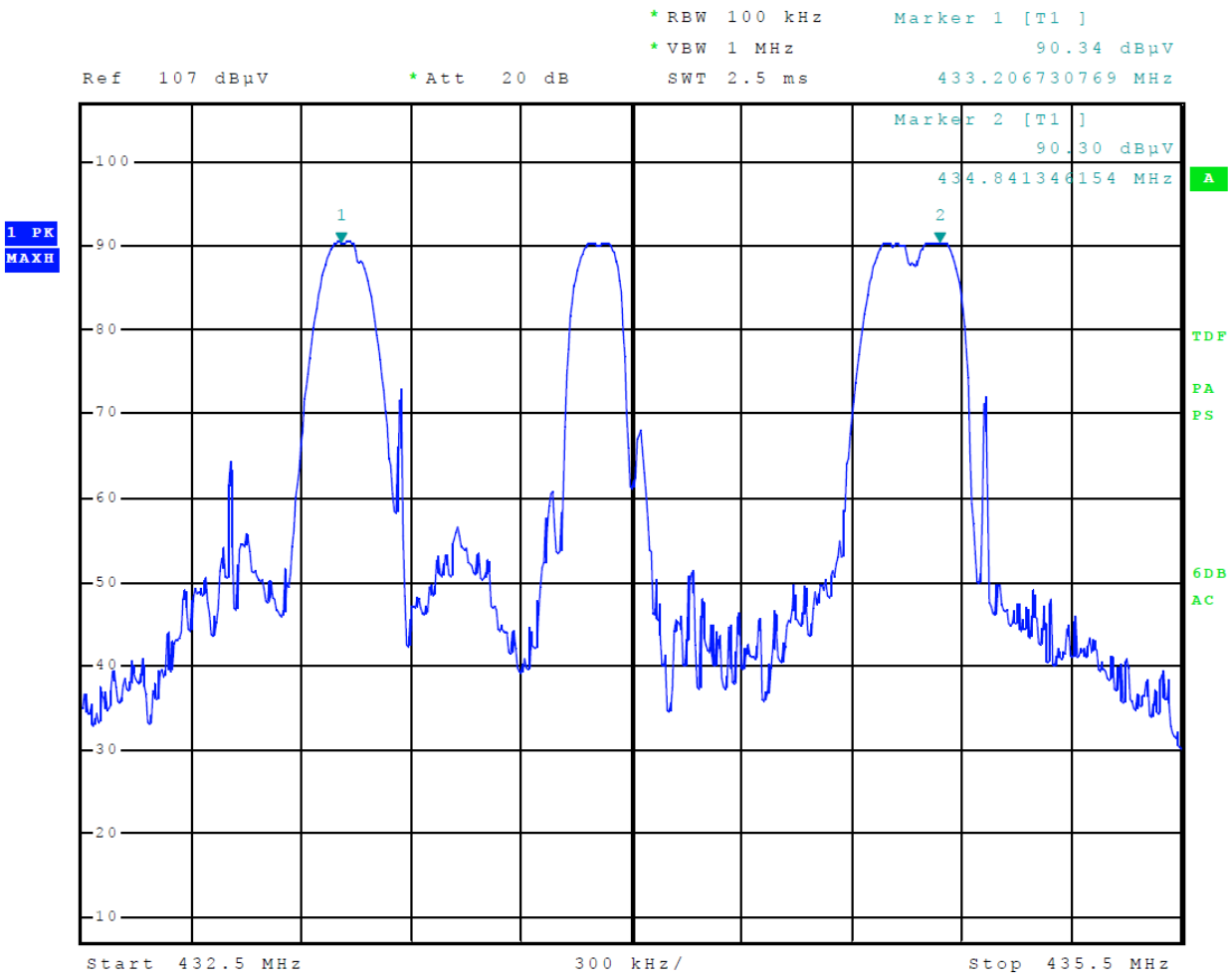
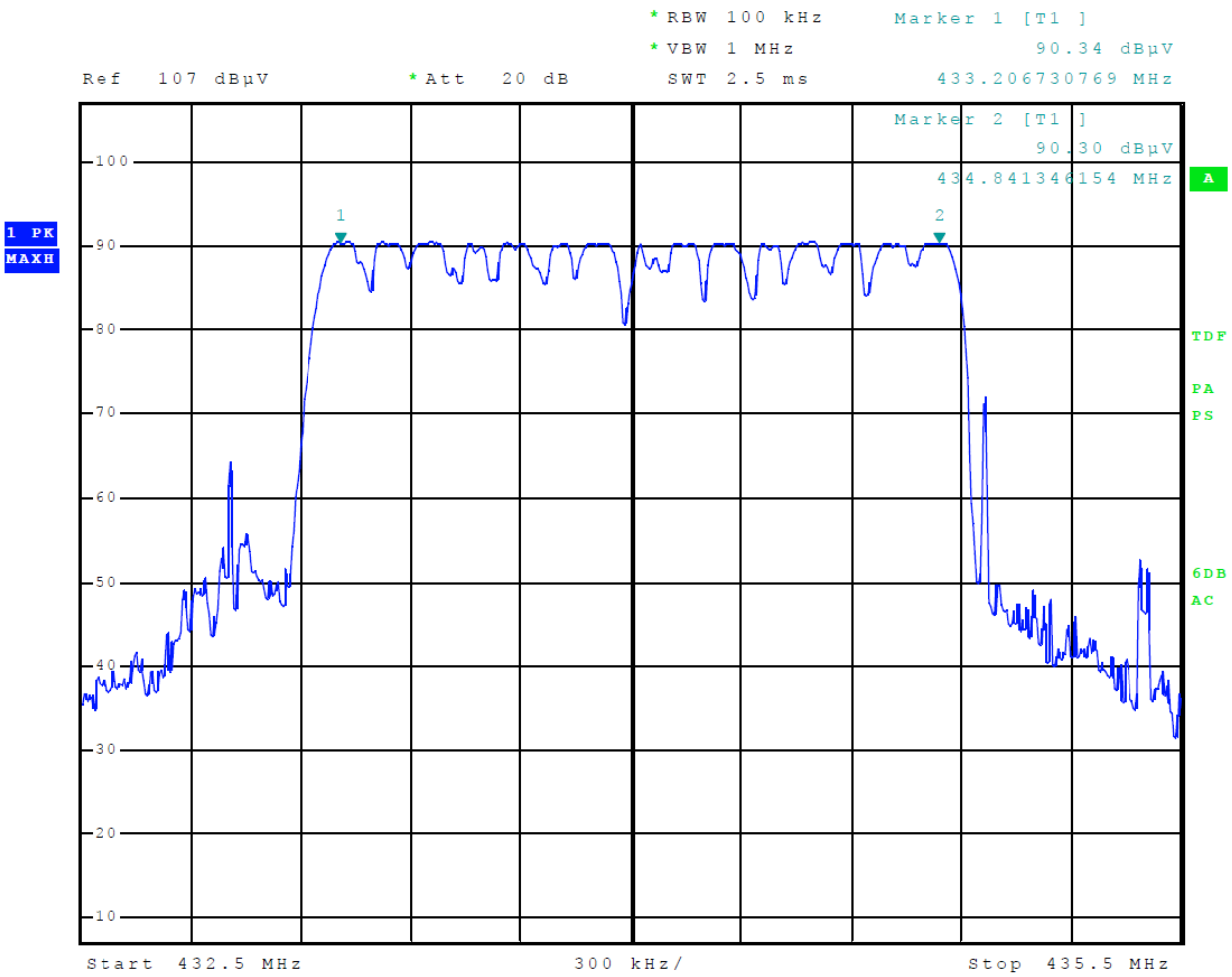


Figure 2 Plot of Transmitter Operation (15 channels)



Transmitter Emissions Data

Table 3 Transmitter Radiated Emissions

Frequency in MHz	Horizontal Peak (dBµV/m)	Horizontal Average (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Average (dBµV/m)	Limit @ 3m (dBµV/m)	Horizontal Margin (dB)	Vertical Margin (dB)
433.1	93.5	77.3	92.9	76.7	80.8	-3.5	-4.1
866.2	45.6	40.2	47.7	42.2	60.8	-20.6	-18.6
1299.3	48.4	45.3	46.3	41.7	60.8	-15.5	-19.1
1732.4	48.1	43.8	46.3	40.7	60.8	-17.0	-20.1
2165.5	51.1	47.5	49.8	45.3	60.8	-13.3	-15.5
2598.6	55.2	52.6	62.9	54.5	60.8	-8.2	-6.3
3031.7	52.4	46.9	50.5	43.7	60.8	-13.9	-17.1
433.8	93.3	77.1	93.1	76.8	80.8	-3.7	-4.0
867.6	47.5	41.4	48.5	42.3	60.8	-19.4	-18.5
1301.4	47.4	43.7	45.3	40.3	60.8	-17.1	-20.5
1735.2	47.8	42.9	46.5	40.8	60.8	-17.9	-20.0
2169.0	52.5	48.8	52.8	49.8	60.8	-12.0	-11.0
2602.8	56.7	51.4	62.3	54.8	60.8	-9.4	-6.0
3036.6	51.9	46.5	50.3	43.5	60.8	-14.3	-17.3
434.8	93.3	77.1	93.2	76.9	80.8	-3.7	-3.9
869.6	48.3	42.6	48.6	44.1	60.8	-18.2	-16.7
1304.5	44.2	38.4	45.4	40.8	60.8	-22.4	-20.0
1739.3	45.6	38.5	47.4	41.0	60.8	-22.3	-19.8
2174.1	53.1	46.2	52.8	46.6	60.8	-14.6	-14.2
2608.9	60.9	54.4	62.3	54.5	60.8	-6.4	-6.3
3043.8	51.6	46.5	50.5	44.1	60.8	-14.3	-16.7

Other emissions present had amplitudes at least 20 dB below the limit. Peak and Quasi-Peak amplitude emissions are recorded for frequency range below 1000 MHz. Peak and Average amplitude emissions are recorded for frequency range above 1000 MHz.

Summary of Results for Transmitter Radiated Emissions of Intentional Radiator

The EUT demonstrated compliance with the radiated emissions requirements of FCC 47CFR Part 15.231, Industry Canada RSS-210 Issue 10, and RSS-GEN Issue 5 Intentional Radiator regulations. The EUT worst-case test sample configuration demonstrated minimum average margin of -3.5 dB below the average emission limit for the fundamental. The EUT worst-case configuration demonstrated minimum radiated harmonic emission margin of -6.0 dB below the limit. No other radiated emissions were found in the restricted bands less than 20 dB below limits than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the limits.

Occupied Bandwidth

47CFR 15.231(c), RSS-210 Annex A.1.3

The occupied bandwidth of momentarily operated devices shall be less than or equal to 0.25% of the center frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the occupied bandwidth shall be less than or equal to 0.5% of the center frequency.

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier

Occupied Bandwidth Testing Procedure

The 99% occupied bandwidth, which is the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers radiated are equal to 0.5 percent of the total mean power radiated by a given emission. Test procedures of ANSI C63.10-2013 were used during testing. The spectrum analyzer resolution bandwidth was set to 1% to 5% of the Occupied Bandwidth. The spectrum analyzer video bandwidth was set to 3 times the resolution bandwidth. The sweep rate was coupled. Refer to figures 3 and 4 displaying plots of the occupied bandwidth measurements.

Table 4 Occupied Bandwidth Results

Channel Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)
433.2	76.9	1,085
433.8	76.8	1,085
434.8	76.8	1,085

The EUT demonstrated compliance with the requirements. There are no deviations to the specifications.

Figure 3 Plot of Transmitter Emissions 99% Occupied Bandwidth

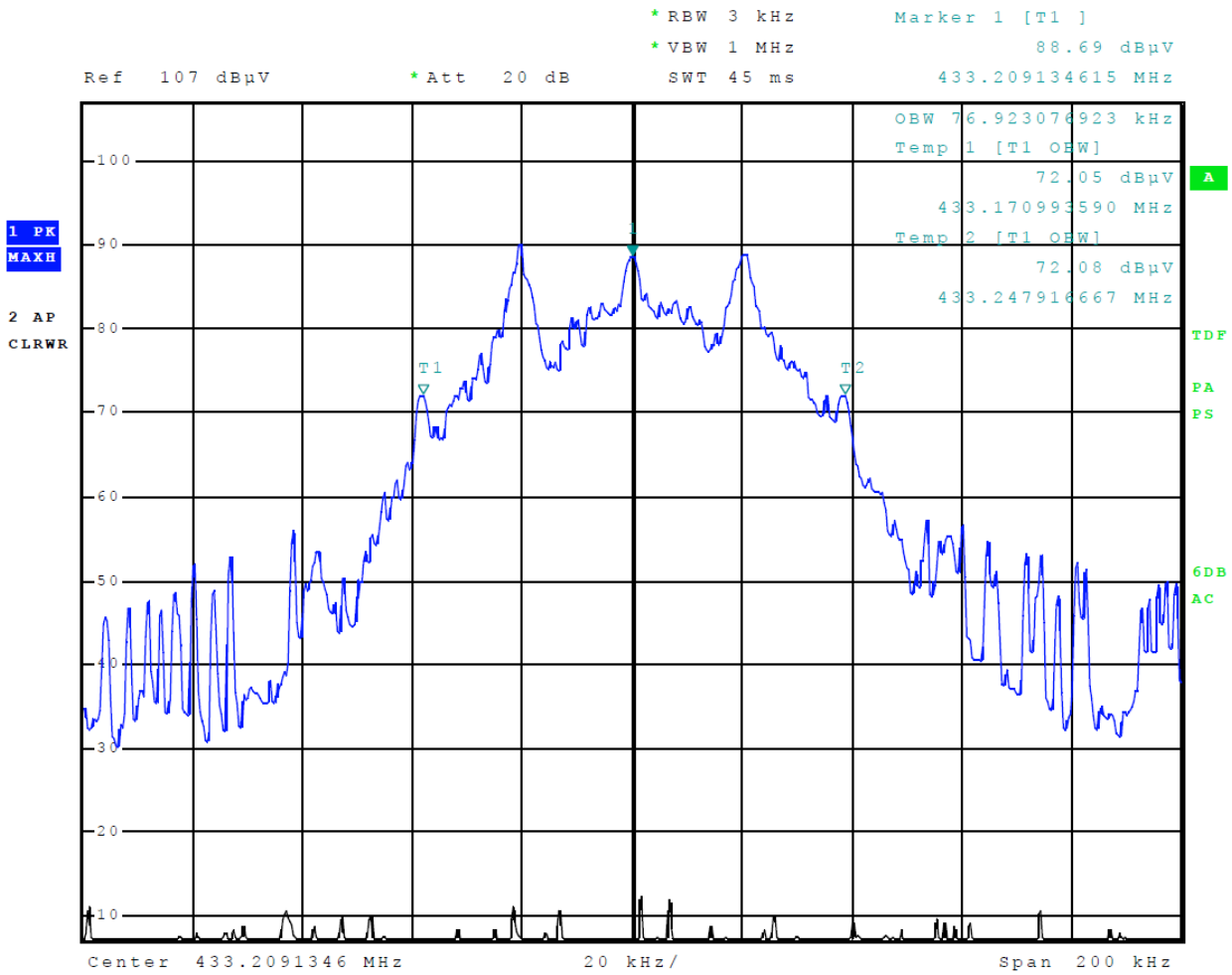
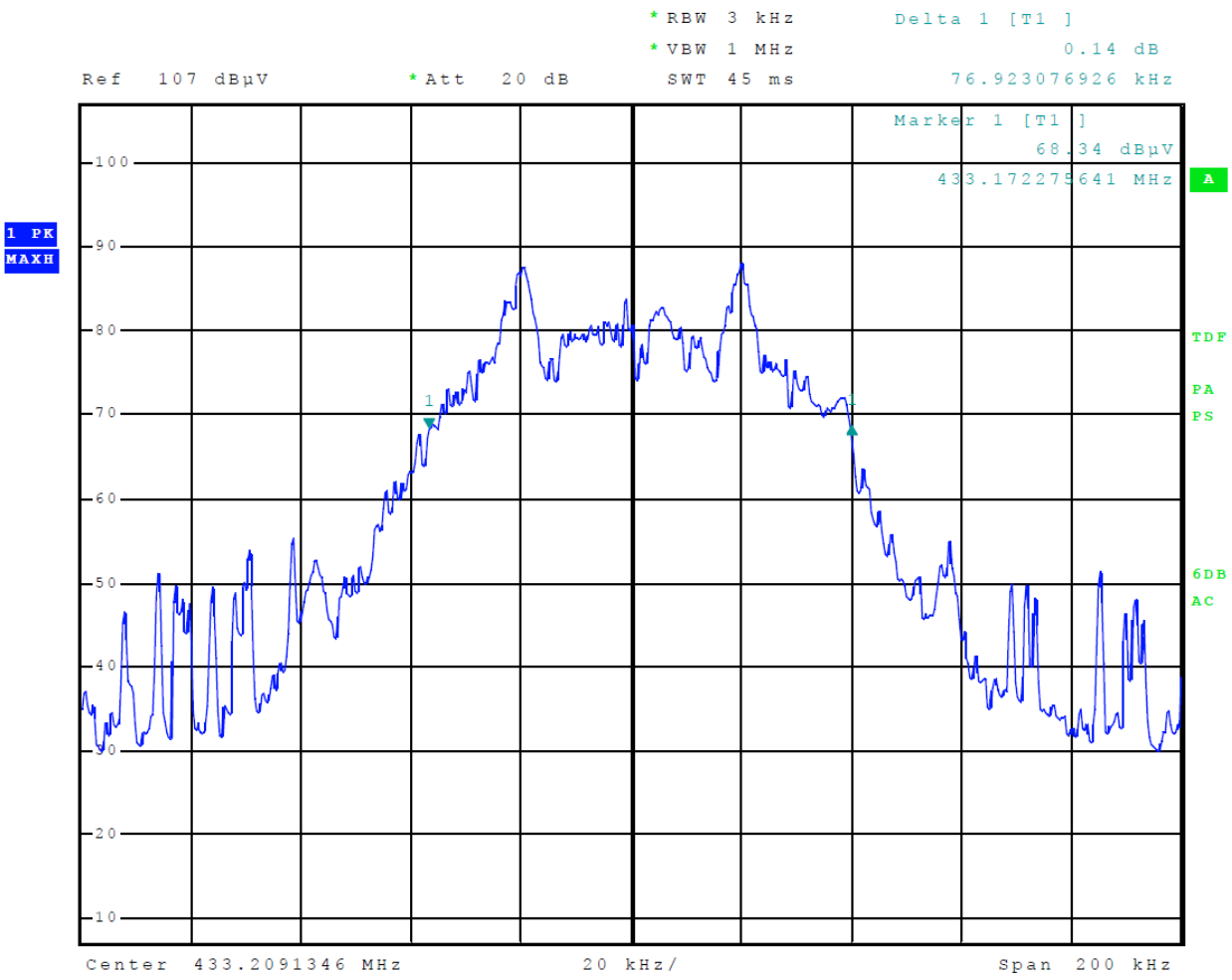


Figure 4 Plot of Transmitter Emissions 20-dB Occupied Bandwidth



Transmission Time

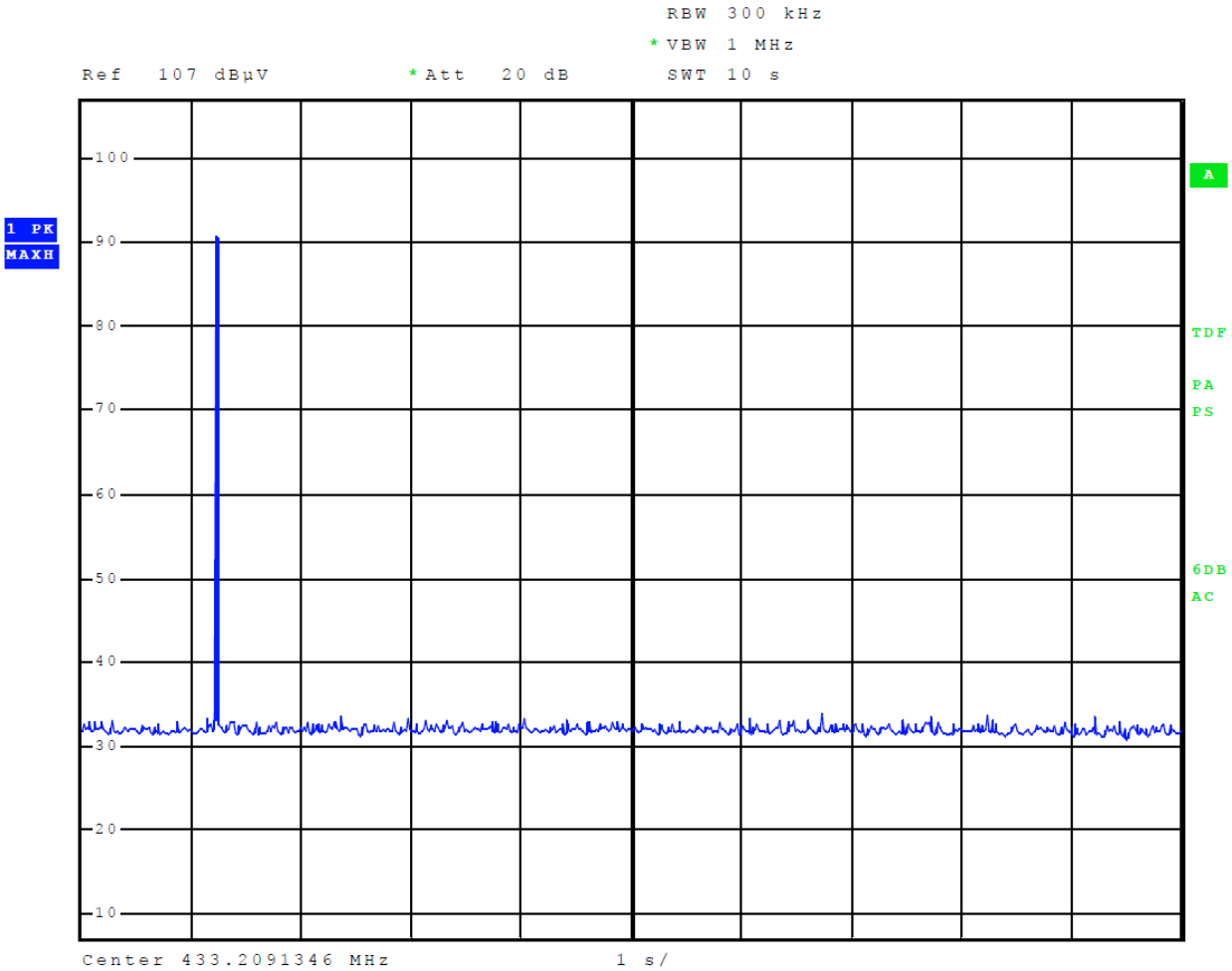
47CFR 15.231(a)(2), RSS-210 Annex A.1.1

A transmitter activated automatically shall cease transmission within 5 seconds after activation

Transmission Time Testing Procedure

Test procedures of ANSI C63.10-2013 were used during testing. The transmitter output was coupled to the spectrum analyzer with resolution bandwidth set to 300 kHz and video bandwidth set to 1 MHz. The sweep time was set to 10 seconds and the span set to zero-span mode on the spectrum analyzer.

Figure 5 Plot of Time Period: Release to Termination of Transmission



Duty Cycle

47CFR 15.231, RSS-210 Annex A.1

(c) The measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to Supplier's Declaration of Conformity.

A transmitter that has been activated automatically shall cease transmission within 5 seconds of activation.

Duty Cycle Testing Procedure

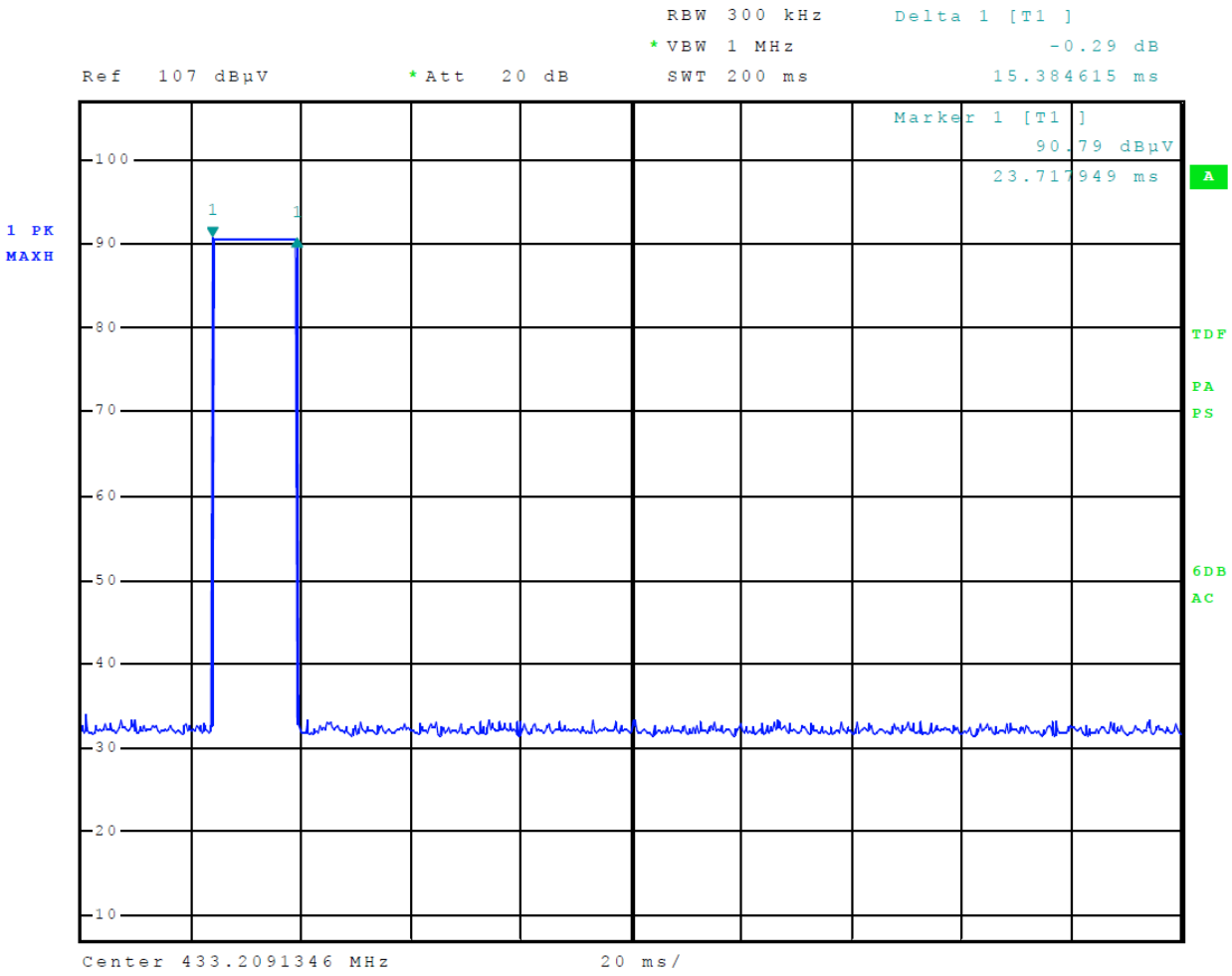
Test procedures of ANSI C63.10-2013 were used during testing. The spectrum analyzer resolution bandwidth was set to 300 kHz and video bandwidth set to 1 MHz with the sweep rate coupled. The transmitter output was coupled to the spectrum analyzer. The sweep time was coupled and the zero-span mode on the spectrum analyzer was used measure the ON and OFF times of the transmitted signal.

The Duty Cycle was calculated:

Average Reading = Peak amplitude reading (dBµV/m) + 20 * log (Duty Cycle), Where Duty cycle is # of pulses * Pulse width / 100 or T

Period (mS)	Pulse Width (mS)	# Of Pulses	Duty Cycle	20*log (Duty Cycle)
100	15.4	1	0.154	-16.25

Figure 6 Plot of Transmitter Pulse Width



Annex

- Annex A Measurement Uncertainty Calculations
- Annex B Test Equipment
- Annex C Rogers Qualifications
- Annex D Laboratory Certificate of Accreditation

Annex A Measurement Uncertainty Calculations

The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16–4. Result of measurement uncertainty calculations are recorded below. Component and process variability of production devices similar to those tested may result in additional deviations. The manufacturer has the sole responsibility of continued compliance.

Measurement	Expanded Measurement Uncertainty $U_{(lab)}$
3 Meter Horizontal 0.009-1000 MHz Measurements	4.16
3 Meter Vertical 0.009-1000 MHz Measurements	4.33
3 Meter Measurements 1-18 GHz	5.14
3 Meter Measurements 18-40 GHz	5.16
10 Meter Horizontal Measurements 0.009-1000 MHz	4.15
10 Meter Vertical Measurements 0.009-1000 MHz	4.32
AC Line Conducted	1.75
Antenna Port Conducted power	1.17
Frequency Stability	1.00E-11
Temperature	1.6˚C
Humidity	3%

Annex B Test Equipment

Equipment	Manufacturer	Model (SN)	Band	Cal Date(m/d/y)	Due
☐ LISN	FCC	FCC-LISN-50-25-10(1PA) (160611)	.15-30MHz	4/6/2021	4/6/2022
☐ LISN	Compliance Design	FCC-LISN-2.Mod.cd,(126)	.15-30MHz	10/14/2020	10/14/2021
☒ Cable	Huber & Suhner Inc.	Sucoflex102ea(L10M)(303073)	9kHz-40 GHz	10/14/2020	10/14/2021
☐ Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303069)	9kHz-40 GHz	10/14/2020	10/14/2021
☒ Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303070)	9kHz-40 GHz	10/14/2020	10/14/2021
☐ Cable	Belden	RG-58 (L1-CAT3-11509)	9kHz-30 MHz	10/14/2020	10/14/2021
☐ Cable	Belden	RG-58 (L2-CAT3-11509)	9kHz-30 MHz	10/14/2020	10/14/2021
☒ Antenna	Com Power	AL-130 (121055)	.001-30 MHz	10/14/2020	10/14/2021
☐ Antenna:	EMCO	6509	.001-30 MHz	10/14/2020	10/14/2022
☐ Antenna	ARA	BCD-235-B (169)	20-350MHz	10/14/2020	10/14/2021
☐ Antenna:	Schwarzbeck Model	VHBB 9124 (1468)		10/14/2020	10/14/2022
☒ Antenna	Sunol	JB-6 (A100709)	30-1000 MHz	10/14/2020	10/14/2021
☐ Antenna	ETS-Lindgren	3147 (40582)	200-1000MHz	10/14/2020	10/14/2022
☐ Antenna:	Schwarzbeck Model:	VULP 9118 A (VULP 9118 A-534)		10/14/2020	10/14/2022
☒ Antenna	ETS-Lindgren	3117 (200389)	1-18 GHz	4/21/2020	4/21/2022
☐ Antenna	Com Power	AH-118 (10110)	1-18 GHz	10/14/2020	10/14/2022
☐ Antenna	Com Power	AH-840 (101046)	18-40 GHz	4/6/2021	4/6/2023
☒ Analyzer	Rohde & Schwarz	ESU40 (100108)	20Hz-40GHz	3/2/2021	3/2/2022
☒ Analyzer	Rohde & Schwarz	ESW44 (101534)	20Hz-44GHz	1/12/2021	1/12/2022
☐ Analyzer	Rohde & Schwarz	FS-Z60, 90, 140, and 220	40GHz-220GHz	12/22/2017	12/22/2027
☒ Amplifier	Com-Power	PA-010 (171003)	100Hz-30MHz	10/14/2020	10/14/2021
☒ Amplifier	Com-Power	CPPA-102 (01254)	1-1000 MHz	10/14/2020	10/14/2021
☒ Amplifier	Com-Power	PAM-118A (551014)	0.5-18 GHz	10/14/2020	10/14/2021
☐ Amplifier	Com-Power	PAM-840A (461328)	18-40 GHz	10/14/2020	10/14/2021
☐ Power Meter	Agilent	N1911A with N1921A	0.05-40 GHz	4/6/2021	4/6/2022
☐ Generator	Rohde & Schwarz	SMB100A6 (100150)	20Hz-6 GHz	4/6/2021	4/6/2022
☐ Generator	Rohde & Schwarz	SMBV100A6 (260771)	20Hz-6 GHz	4/6/2021	4/6/2022
☐ RF Filter	Micro-Tronics	BRC50722 (009).9G notch	30-18000 MHz	4/6/2021	4/6/2022
☐ RF Filter	Micro-Tronics	HPM50114 (017)1.5G HPF	30-18000 MHz	4/6/2021	4/6/2022
☐ RF Filter	Micro-Tronics	HPM50117 (063) 3G HPF	30-18000 MHz	4/6/2021	4/6/2022
☐ RF Filter	Micro-Tronics	HPM50105 (059) 6G HPF	30-18000 MHz	4/6/2021	4/6/2022
☐ RF Filter	Micro-Tronics	BRM50702 (172) 2G notch	30-18000 MHz	4/6/2021	4/6/2022
☐ RF Filter	Micro-Tronics	BRC50703 (G102) 5G notch	30-18000 MHz	4/6/2021	4/6/2022
☐ RF Filter	Micro-Tronics	BRC50705 (024) 5G notch	30-18000 MHz	4/6/2021	4/6/2022
☐ Attenuator	Fairview	SA6NFNF100W-40 (1625)	30-18000 MHz	4/6/2021	4/6/2022
☐ Attenuator	Mini-Circuits	VAT-3W2+ (1436)	30-6000 MHz	4/6/2021	4/6/2022
☐ Attenuator	Mini-Circuits	VAT-3W2+ (1445)	30-6000 MHz	4/6/2021	4/6/2022
☐ Attenuator	Mini-Circuits	VAT-3W2+ (1735)	30-6000 MHz	4/6/2021	4/6/2022
☐ Attenuator	Mini-Circuits	VAT-6W2+ (1438)	30-6000 MHz	4/6/2021	4/6/2022
☐ Attenuator	Mini-Circuits	VAT-6W2+ (1736)	30-6000 MHz	4/6/2021	4/6/2022
☒ Weather station	Davis	6312 (A81120N075)		11/4/2020	11/4/2021

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List of Test Equipment				Calibration Date (m/d/y)	Due
☐ Antenna:	Schwarzbeck Model VHBB 9124 (9124-627)			4/21/2020	4/21/2022
☐ Antenna:	Schwarzbeck Model: VULP 9118 A (VULP 9118 A-534)			4/21/2020	4/21/2022
☐ Frequency Counter: Leader LDC-825 (8060153				4/6/2021	4/6/2022
☐ LISN: Com-Power Model LI-220A				10/14/2020	10/14/2021
☐ LISN: Com-Power Model LI-550C				10/14/2020	10/14/2021
☐ ISN: Com-Power Model ISN T-8				4/6/2021	4/6/2022
☐ LISN: Fischer Custom Communications Model: FCC-LISN-50-16-2-08				4/6/2021	4/6/2022
☐ Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303072)	9kHz-40 GHz	10/14/2020	10/14/2021
☐ Cable	Huber & Suhner Inc.	Sucoflex102ea(L1M)(281183)	9kHz-40 GHz	10/14/2020	10/14/2021
☐ Cable	Huber & Suhner Inc.	Sucoflex102ea(L4M)(281184)	9kHz-40 GHz	10/14/2020	10/14/2021
☐ Cable	Huber & Suhner Inc.	Sucoflex102ea(L10M)(317546)	9kHz-40 GHz	10/14/2020	10/14/2021
☐ Cable	Time Microwave	4M-750HF290-750 (4M)	9kHz-24 GHz	10/14/2020	10/14/2021
☐ RF Filter	Micro-Tronics	BRC17663 (001) 9.3-9.5 notch	30-1800 MHz	4/6/2021	4/6/2022
☐ RF Filter	Micro-Tronics	BRC19565 (001) 9.2-9.6 notch	30-1800 MHz	10/16/2018	4/6/2022
☐ Analyzer	HP	8562A (3051A05950)	9kHz-125GHz	4/6/2021	4/6/2022
☐ Analyzer	HP External Mixers	11571, 11970	25GHz-110GHz	4/18/2015	4/18/2025
☐ Analyzer	HP	8591EM (3628A00871)		4/21/2020	4/21/2022
☐ Wave Form Generator Keysight		33512B (MY57400128)		4/21/2020	4/6/2022
☐ Antenna: Solar 9229-1 & 9230-1				2/22/2021	2/22/2022
☐ CDN: Com-Power Model CDN325E				10/14/2020	10/14/2021
☐ Injection Clamp Luthi Model EM101				10/14/2020	10/14/2021
☐ Oscilloscope Scope: Tektronix MDO 4104				2/22/2021	2/22/2022
☐ EMC Transient Generator HVT TR 3000				2/22/2021	2/22/2022
☐ AC Power Source (Ametech, California Instruments)				2/22/2021	2/22/2022
☐ Field Intensity Meter: EFM-018				2/22/2021	2/22/2022
☐ ESD Simulator: MZ-15				2/22/2021	2/22/2022
☐ R.F. Power Amp ACS 230-50W				not required	
☐ R.F. Power Amp EIN Model: A301				not required	
☐ R.F. Power Amp A.R. Model: 10W 1010M7				not required	
☐ R.F. Power Amp A.R. Model: 50U1000				not required	
☐ Tenney Temperature Chamber				not required	
☒ Shielded Room				not required	

Annex C Rogers Qualifications

Scot D. Rogers, Engineer

Rogers Labs, Inc.

Mr. Rogers has 35 years' experience in the field of electronics. Work experience includes working 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.

Annex D Laboratory Certificate of Accreditation

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200087-0

Rogers Labs, Inc.
Louisburg, KS

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2021-02-19 through 2022-03-31
Effective Dates

For the National Voluntary Laboratory Accreditation Program