Amber Helm Development L.C.
92723 Michigan Hwy-152
Sister Lakes, Michigan 49047 USA
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EMC Test Report

CON01-WR2004TX
Issued: **February 22, 2020**

regarding

USA: CFR Title 47, Part 15.231 (Emissions)
Canada: IC RSS-210v10/GENv5 (Emissions)

for

A3C054338 Series

Category: RKE Transmitter

Judgments:
15.231 / RSS-210v10 Compliant
Testing Completed: February 22, 2020

TESTING
NVLAP LAB CODE 200129-0

Prepared for:

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Date of Issue: February 22, 2020

Revision History

Rev. No.	Date	Details	Revised By
r0	February 22, 2020	Initial Release.	J. Brunett
r1	March 2, 2020	Clarify samples description.	J. Brunett

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1 Test Report Scope and Limitations

1.1 Laboratory Authorization

Test Facility description and attenuation characteristics are on file with the FCC Laboratory, Columbia, Maryland (FCC Reg. No: US5348 and US5356) and with ISED Canada, Ottawa, ON (File Ref. No: 3161A and 24249).

1.2 Report Retention

For equipment verified to comply with the regulations herein, the manufacturer is obliged to retain this report with the product records for the life of the product, and no less than ten years. A copy of this Report will remain on file with this laboratory until March 2030.

1.3 Subcontracted Testing

This report does not contain data produced under subcontract.

1.4 Limitation of Results

The test results contained in this report relate only to the item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require reevaluation.

1.5 Copyright

1.6 Endorsements

This report shall not be used to claim product endorsement by any accrediting, regulatory, or governmental agency.

1.7 Test Location

The EUT was fully tested by **Amber Helm Development L.C.**, headquartered at 92723 Michigan Hwy-152, Sister Lakes, Michigan 49047 USA. Table 1 lists all sites employed herein. Specific test sites utilized are also listed in the test results sections of this report where needed.

Table 1: Test Site List.

Description	Location	Quality Num.
OATS (3 meter)	3615 E Grand River Rd., Williamston, Michigan 48895	OATSC

1.8 Traceability and Equipment Used

Pertinent test equipment used for measurements at this facility is listed in Table 2. The quality system employed at Amber Helm Development L.C. has been established to ensure all equipment has a clearly identifiable classification, calibration expiry date, and that all calibrations are traceable to the SI through NIST, other recognized national laboratories, accepted fundamental or natural physical constants, ratio type of calibration, or by comparison to consensus standards.

Table 2: Equipment List.

Description	Manufacturer/Model	SN	Quality Num.	Cal/Ver By / Date Due
Biconical	EMCO / 93110B	9802-3039	BICEMCO01	Keysight / Aug-2020
Log Periodic Antenna	EMCO / 3146	9305-3614	LOGEMCO01	Keysight / Aug-2020
BNC-BNC Coax	WRTL / RG58/U	001	CAB001-BLACK	AHD / Jul-2020
3.5-3.5MM Coax	PhaseFlex / PhaseFlex	001	CAB015-PURP	AHD / Jul-2020
Spectrum Analyzer	R & S / FSV30	101660	RSFSV30001	RS / Apr-2021
Spectrum Analyzer	R & S / FPC1000	101060	RSFPC1K01	RS / Jan-2021
Quad Ridge Horn	Singer / A6100	C35200	HQR1TO18S01	Keysight / Aug-2020

2 Test Specifications and Procedures

2.1 Test Specification and General Procedures

The goal of Continental Automotive is to demonstrate that the Equipment Under Test (EUT) complies with the Rules and/or Directives below. Detailed in this report are the results of testing the Continental Automotive A3C054338 Series for compliance to:

Country/Region	**Rules or Directive**	**Referenced Section(s)**
United States	Code of Federal Regulations	CFR Title 47, Part 15.231
Canada	ISED Canada	IC RSS-210v10/GENv5

It has been determined that the equipment under test is subject to the rules and directives above at the date of this testing. In conjunction with these rules and directives, the following specifications and procedures are followed herein to demonstrate compliance (in whole or in part) with these regulations.

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"
ANSI C63.10:2013	"American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
TP0102RA	"AHD Internal Document TP0102 - Radiated Emissions Test Procedure"
TP0106RC	"AHD Internal Document TP0106 - Emissions Measurement Procedures (above 40 GHz)"
ISED Canada	"The Measurement of Occupied Bandwidth"

3 Configuration and Identification of the Equipment Under Test

3.1 Description and Declarations

The equipment under test is a Remote Keyless Entry transmitter. The EUT is approximately 8 x 4 x 1.5 cm in dimension, and is depicted in Figure 1. It is powered by 3 VDC Lithium cell battery. In use, this device is a transmitter intended for remote control of automobile door locks, trunk, and remote start functionality. Table 3 outlines provider declared EUT specifications.

Figure 1: Photos of EUT.

Table 3: EUT Declarations.

General Declarations	
Equipment Type:	RKE Transmitter
Country of Origin:	USA
Nominal Supply:	3 VDC
Oper. Temp Range:	-40^{o}C to $+85^{o}$C
Frequency Range:	314.95 MHz
Antenna Dimension:	Not Declared
Antenna Type:	PCB Trace
Antenna Gain:	Integral
Number of Channels:	1
Channel Spacing:	N/A
Alignment Range:	Not Declared
Type of Modulation:	ASK, FSK
United States	
FCC ID Number:	M3N-A3C054388
Classification:	DSC
Canada	
IC Number:	7812A-A3C054338
Classification:	Remote Control Device, Vehicular Device

3.1.1 EUT Configuration

The EUT is configured for testing as depicted in Figure 2.

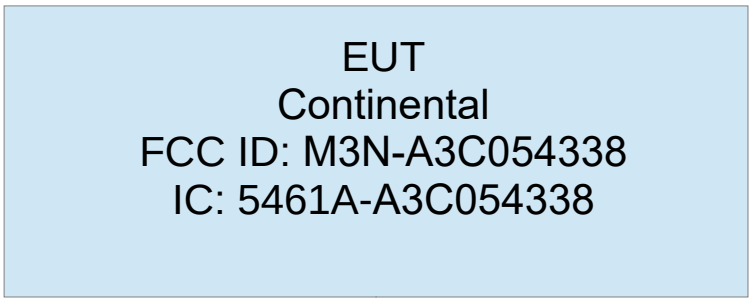

Figure 2: EUT Test Configuration Diagram.

3.1.2 Modes of Operation

This EUT is capable of transmitting in manual activated mode (normal button press) or when automatically activated (Passive Entry Passive Start / Comfort) wherein it responds to detection of an LF encoded signal. Both modes are evaluated herein, with the worst case (greatest) on-time demonstrated to be in the LF automatic response mode. The EUT is also tested with and without its removable key.

3.1.3 Variants

There are ten (10) minor housing variants of the EUT. All variants employ identical PCBs and circuitry, but the housings vary based on vehicle logo and the number of buttons populated in the housing. Two worst case variants were determined in pretesting, those being the 4-BTN chrome button variant (HVIN: A3C039099) and the 3-BTN plastic button variant (HVIN: A3C054334).

3.1.4 Test Samples

Four samples of the EUT were provided, including one normal operating sample of each button variant (4-BTN and 3-BTN) as well as two samples of the same button variants with CW software.

3.1.5 Functional Exerciser

Normal operating EUT functionality was verified by observation of transmitted signal.

3.1.6 Modifications Made

There were no modifications made to the EUT by this laboratory, however pretesting was performed after which the manufacturer selected the final power setting for the device (x09).

3.1.7 Production Intent

The EUT appears to be a production ready sample.

3.1.8 Declared Exemptions and Additional Product Notes

None.

4 Emissions

4.1 General Test Procedures

4.1.1 Radiated Test Setup and Procedures

Radiated electromagnetic emissions from the EUT are first pre-scanned in our screen room. Spectrum and modulation characteristics of all emissions are recorded. Instrumentation, including spectrum analyzers and other test equipment as detailed in Section 1.7 are employed. After pre-scan, emission measurements are made on the test site of record. If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in relevant test standards are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed if the resulting emissions appear to be worst-case in such a configuration. See Figure 3. All intentionally radiating elements that are not fixed-mounted in use are placed on the test table lying flat, on their side, and on their end (3-axes) and the resulting worst case emissions are recorded. If the EUT is fixed-mounted in use, measurements are made with the device oriented in the manner consistent with installation and then emissions are recorded. If the EUT exhibits spurious emissions due to internal receiver circuitry, such emissions are measured with an appropriate carrier signal applied.

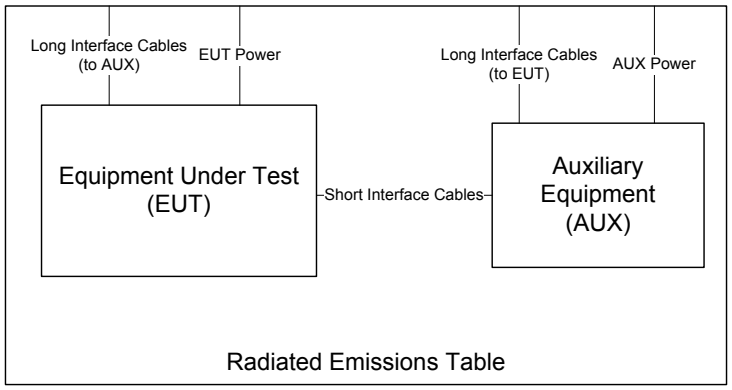

Figure 3: Radiated Emissions Diagram of the EUT.

For devices with intentional emissions below 30 MHz, a shielded loop antenna and/or E-field and H-Field broadband probes are used depending on the regulations. Shielded loops are placed at a 1 meter receive height at the desired measurement distance. For exposure in this band, the broadband probes employed are 10cm diameter single-axis shielded transducers and measurements are repeated and summed over three axes.

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. For both horizontal and vertical polarizations, the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected. The EUT is then rotated through 360^o in azimuth until the highest emission is detected. The test antenna is then raised and lowered one last time from 1 to 4 m and the worst case value is recorded. Emissions above 1 GHz are characterized using standard gain or broadband ridge-horn antennas on our OATS with a 4×5 m rectangle of ECCOSORB absorber covering the OATS ground screen and a 1.5m table height. Care is taken to ensure that test receiver resolution and video bandwidths meet the regulatory requirements, and that the emission bandwidth of the EUT is not reduced. Photographs of the test setup employed are depicted in Figure 4.

Where regulations allow for direct measurement of field strength, power values (dBm) measured on the test receiver / analyzer are converted to dBμV/m at the regulatory distance, using

$$E_{dist} = 107 + P_R + K_A - K_G + K_E - C_F$$

where P_R is the power recorded on spectrum analyzer, in dBm, K_A is the test antenna factor in dB/m, K_G is the combined pre-amplifier gain and cable loss in dB, K_E is duty correction factor (when applicable) in dB, and C_F is a distance conversion (employed only if limits are specified at alternate distance) in dB. This field strength value is then compared with the regulatory limit. If effective isotropic radiated power (EIRP) is computed, it is computed as

$$EIRP(dBm) = E_{3m}(dB\mu V/m) - 95.2.$$

When presenting data at each frequency, the highest measured emission under all possible EUT orientations (3-axes) is reported.

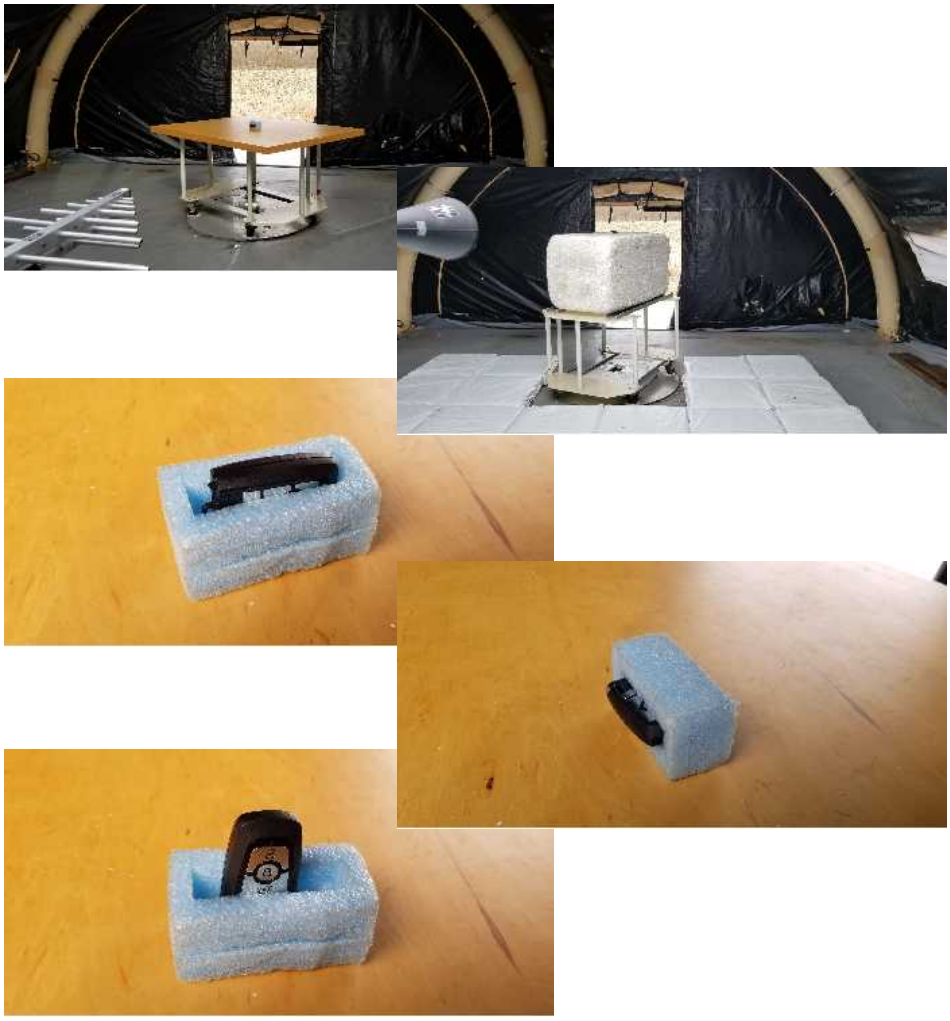

Figure 4: Radiated Emissions Test Setup Photograph(s).

4.1.2 Conducted Emissions Test Setup and Procedures

The EUT is not subject to measurement of power line conducted emissions as it is powered solely by its internal battery.

4.1.3 Power Supply Variation

Tests at extreme supply voltages are made if required by the procedures specified in the test standard, and results of this testing are detailed in this report.

In the case the EUT is designed for operation from a battery power source, the extreme test voltages are evaluated over the range specified in the test standard; no less than ±10% of the nominal battery voltage declared by the manufacturer. For all battery operated equipment, worst case intentional and spurious emissions are re-checked employing a new (fully charged) battery.

4.2 Intentional Emissions

4.2.1 Fundamental Emission Pulsed Operation

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Duty cycle is reported for all relevant modes of operation. The test equipment employed includes RSFPC1K01, LOGEMCO01.

Measurement Results The details and results of testing the EUT are summarized in Table 4. Plots showing the measurements made to obtain these values are provided in Figure 5.

Table 4: Fundamental Emission Pulsed Operation.

Detector	Span	IF Bandwidth	Video Bandwidth
Pk	0	1 MHz	3 MHz

Test Date:	21-Feb-20
Test Engineer:	J. Brunett
EUT:	Conti A3C054338 SERIES
EUT Mode:	See below.
Meas. Distance:	10 cm

FCC/IC

R0	Test Freq. (MHz)	EUT Test Mode*	Overall Transmission: Min. Repetition Rate (sec)	Overall Transmission: Max. No. of Frames	Overall Transmission: Total Transmission Length (sec)	Internal Frame Characteristics: Max. Frame Length (ms)	Internal Frame Characteristics: Min. Frame Period (ms)	Internal Frame Characteristics: Frame Encoding	Computed Duty Cycle (%)	Computed Duty Cycle (dB)
R1	314.95	Manual Activated RKE (subfigure 5(a))	single	6	0.560	50.56	101.0	The EUT can transmit 6 OOK frames. Each frame has a maximum length of 50.56ms with a 50% manchester duty cycle and greater than 100ms frame period.	25.3	-11.9
R2	314.95	Auto Activated, PEPS (subfigure 5(b))	single	2	0.029	13.60	-	In the worse case, the EUT transmits two (2) 13.6 ms long FSK frames, both occuring within the first 100 ms window.	27.2	**-11.3**
R3										
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10

Example Calculation: Lowest Duty (%) =(2 x 13.60 ms) / 100 ms = 27.2 % on-time.

Figure 5(a): Fundamental Emission Pulsed Operation.

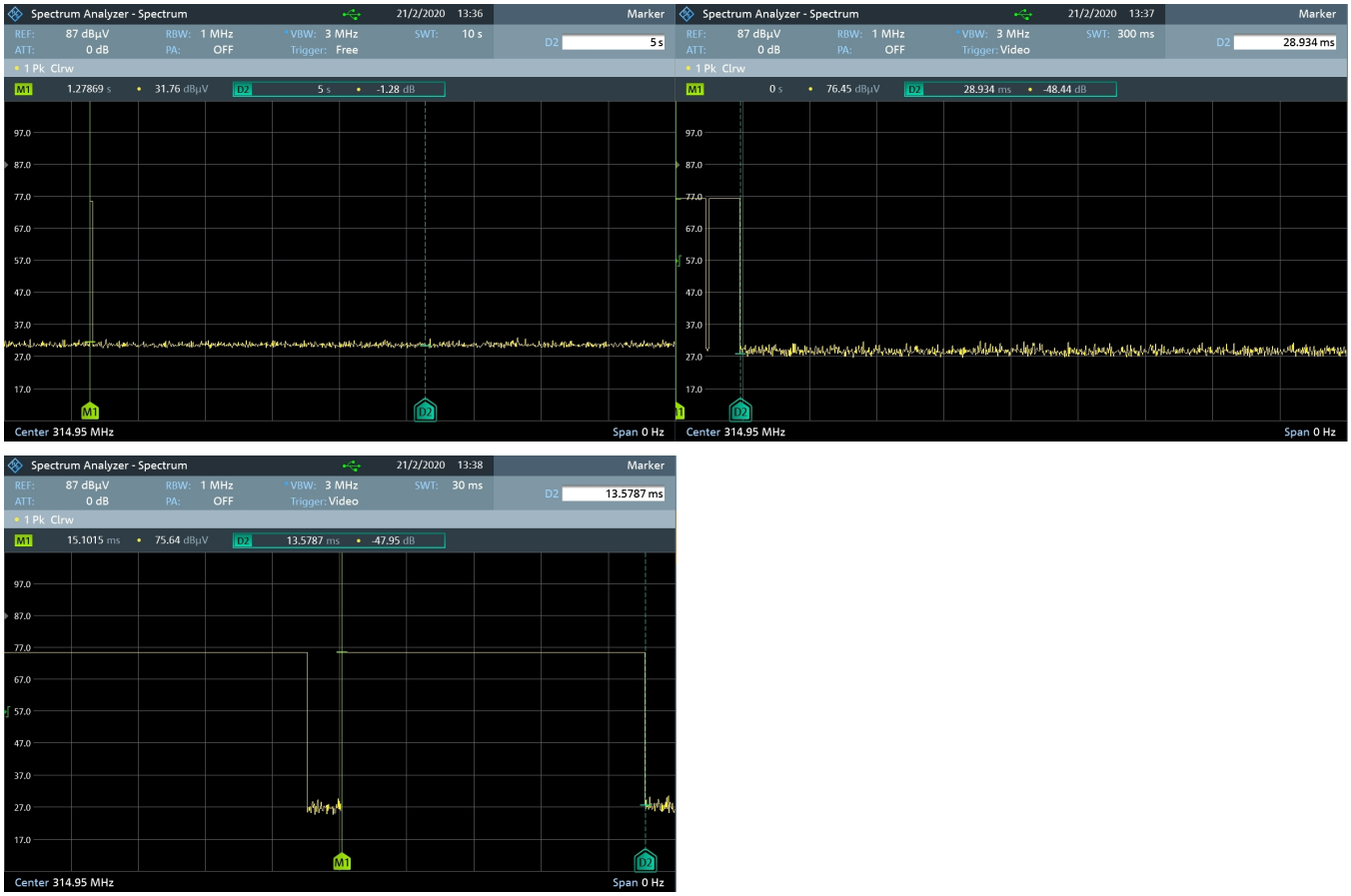

Figure 5(b): Fundamental Emission Pulsed Operation.

4.2.2 Fundamental Emission Bandwidth

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Emission bandwidth (EBW) of the EUT is measured with the device placed in the test mode(s) with the shortest available frame length and minimum frame spacing. The 20 dB EBW is measured as the max-held peak-detected signal when the IF bandwidth is greater than or equal to 1% of the receiver span. For complex modulations other than ASK and FSK, the 99% emission bandwidth per IC test procedures has a different result, and is also reported. The test equipment employed includes RSFSV30001, LOGEMCO01.

Measurement Results The details and results of testing the EUT are summarized in Table 5. Plots showing the measurements made to obtain these values are provided in Figure 6.

Table 5: Fundamental Emission Bandwidth.

Detector	IF Bandwidth	Video Bandwidth
Pk	10 kHz	30 kHz

Test Date:	21-Feb-20
Test Engineer:	J. Brunett
EUT:	Conti A3C054338 SERIES
EUT Mode:	FSK Modulated
Meas. Distance:	10 cm

FCC/IC

R0	Mode	Center Frequency (MHz)	20 dB EBW (MHz)	EBW Limit (MHz)	99% OBW (MHz)		
R1	RKE (OOK)	314.95	0.080	0.787	0.696		
R2	PEPS (FSK)	314.95	0.078	0.787	0.394		
R3							
#	C1	C2	C3	C4	C5	C7	C8

(ROW) (COLUMN) NOTE:

R0 C8 Per KDB 926416, for FCC 15.231 non-sweeping devices, total bandwidth is sum of the individual occupied 20 dB bandwidths. At most the manuf. uses 3 channels. Device bandwidth is restricted to 0.0025 (.25%) of the center frequency. Three Maximum 20dB EBWs summation is 0.064 MHz + 0.064 MHz + 0.066 MHz = 0.194 MHz

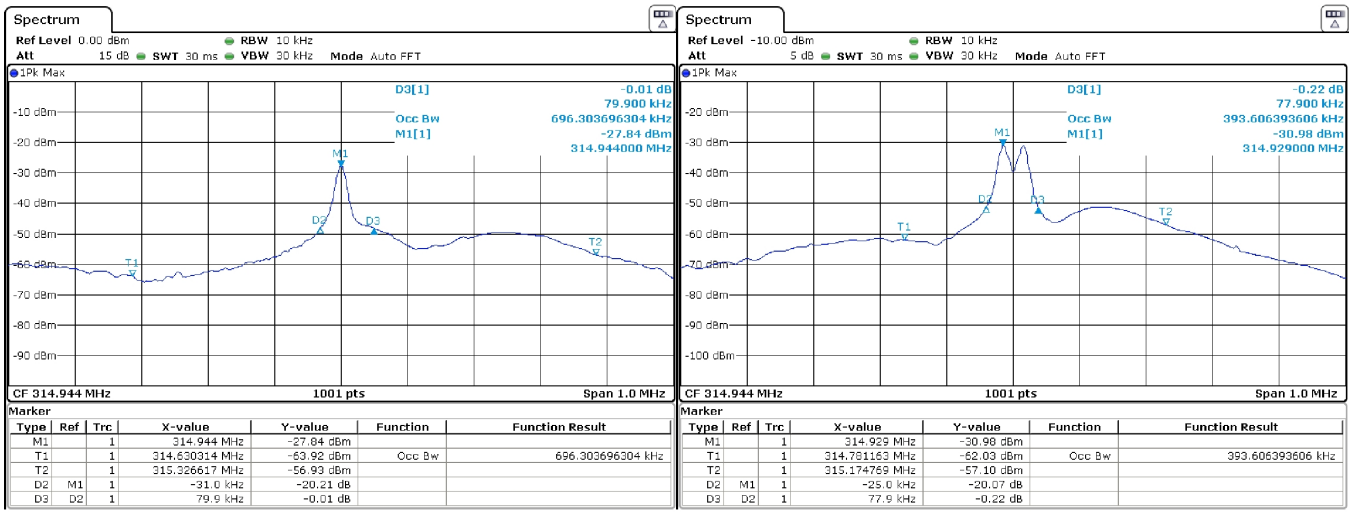

Figure 6: Fundamental Emission Bandwidth.

4.2.3 Fundamental Emission Field Strength

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Fundamental emissions are measured at the regulatory distance on our OATS. The test equipment employed includes RSFSV30001, LOGEMCO01.

Measurement Results The details and results of testing the EUT are summarized in Table 6.

Table 6: Fundamental Emission Field Strength.

EUT Modes:	a1	4BTN CHROME, CW (x09), Key In	a5				
	a2	4BTN CHROME, CW (x09), Key Out	a6				
Test Date(s):	2/	a3	3BTN PLAST, CW (x09), Key In	a7			
Test Engineer:	J. Brunett	a4	3 BTN PLAST, CW (x09), Key Out	a8			

	Frequency		Site						EUT			Test Antenna				Cable	Receiver				Field Strength @ DR						EIRP		Details
	Start	Stop	Temp. (C) Hum.	Table Angle	MR	DR	N/F	CF	Mode see table	Volt.	Dim	Pol.	Ant. Height	Dim.	Ka	Kg	Rx Power Pk	Rx Power Avg	Bandwidth RBW	Bandwidth VBW	Pk Meas.	Pk Limit USA	Pk Limit CAN	Avg Calc.	Avg Limit USA	Avg Limit CAN	Pk Calc.		
R0	MHz	MHz	%	deg	m			dB	table	(V)	cm	H/V	m	cm	dB/m	dB	dBm		MHz		dBuV/m						dBm		
R1	SETUP		OATSC						A3C054338 SERIES			EMCOLOG				CAB001	RSFSV30001				NOTES: H-POL - FLAT, V-POL SIDE Worst Case Orient								
R2	314.5	314.5	3 / 53	0.0	3.0	3.0		0.0	a1	3.0	8.0	H	1.0	100.0	14.1	-0.1			0.12	0.30	84.3	95.6	95.6	73.0	75.6	75.6	-10.8		2.6
R3	314.5	314.5	3 / 53	90.0	3.0	3.0		0.0	a1	3.0	8.0	V	2.0	100.0	14.1	-0.1			0.12	0.30	82.3	95.6	95.6	71.0	75.6	75.6	-12.8		4.6
R4	SETUP		OATSC						A3C054338 SERIES			EMCOLOG				CAB001	RSFSV30001				NOTES: H-POL - FLAT, V-POL SIDE Worst Case Orient								
R5	314.5	314.5	3 / 53	0.0	3.0	3.0		0.0	a2	3.0	8.0	H	1.0	100.0	14.1	-0.1			0.12	0.30	86.1	95.6	95.6	74.8	75.6	75.6	-9.0		**.8**
R6	314.5	314.5	3 / 53	90.0	3.0	3.0		0.0	a2	3.0	8.0	V	2.0	100.0	14.1	-0.1			0.12	0.30	84.0	95.6	95.6	72.7	75.6	75.6	-11.1		2.9
R7																													
R8	SETUP		OATSC						A3C054338 SERIES			EMCOLOG				CAB001	RSFSV30001				NOTES: H-POL - FLAT, V-POL SIDE Worst Case Orient								
R9	314.5	314.5	3 / 53	0.0	3.0	3.0		0.0	a3	3.0	8.0	H	1.0	100.0	14.1	-0.1			0.12	0.30	85.9	95.6	95.6	74.6	75.6	75.6	-9.2		**1.0**
R10	314.5	314.5	3 / 53	90.0	3.0	3.0		0.0	a3	3.0	8.0	V	2.0	100.0	14.1	-0.1			0.12	0.30	84.0	95.6	95.6	72.7	75.6	75.6	-11.1		2.9
R11	SETUP		OATSC						A3C054338 SERIES			EMCOLOG				CAB001	RSFSV30001				NOTES: H-POL - FLAT, V-POL SIDE Worst Case Orient								
R12	314.5	314.5	3 / 53	0.0	3.0	3.0		0.0	a4	3.0	8.0	H	1.0	100.0	14.1	-0.1			0.12	0.30	83.1	95.6	95.6	71.8	75.6	75.6	-12.0		3.8
R13	314.5	314.5	3 / 53	90.0	3.0	3.0		0.0	a4	3.0	8.0	V	2.0	100.0	14.1	-0.1			0.12	0.30	81.2	95.6	95.6	69.9	75.6	75.6	-13.9		5.7
R14																													
R15																													
R16																													
R17																													
R18																													
R19																													
R20																													
R21																													
R22																													
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R24																													
R25																													
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29

(ROW)	(COLUMN)	NOTE:
R0	C5	MR is Measurement Range, which is reduced from DR to achieve necessary SNR.
R0	C6	DR is the regulatory Desired Range measurement distance.
R0	C7	N/F is Near-Field / Far-Field distance computed for max of EUT Antenna Dimension (C10) when applicable.
R0	C8	CF is computed using a 20 dB/decade Decay Rate.
R0	C18/19	When E-field or EIRP is reported directly from Spectrum Analyzer, Antenna Factors and Cable losses are included directly in SA settings and Pr is not reported.

4.3 Unintentional Emissions

4.3.1 Transmit Chain Spurious Emissions

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Spurious radiated emissions measurements are performed to 10 times the highest fundamental operating frequency. The test equipment employed includes RSFSV30001, LOGEMCO01, HQR1TO18S01.

Measurement Results The details and results of testing the EUT are summarized in Table 7.

Table 7: Transmit Chain Spurious Emissions.

EUT Modes: a1 a5
a2 4BTN CHROME, CW (x09), Key Out a6
Test Date(s): 12/12-16/2019 a3 3BTN PLAST, CW (x09), Key In a7
Test Engineer: J. Brunett a4 a8

	Frequency		Site						EUT			Test Antenna				Cable	Receiver				Field Strength @ DR						EIRP		Details
	Start	Stop	Temp. (C) Hum.	Table Angle	MR	DR	N/F	CF	Mode see table	Volt.	Dim	Pol.	Ant. Height	Dim.	Ka	Kg	Rx Power Pk	Rx Power Avg	Bandwidth RBW	Bandwidth VBW	Pk Meas.	Pk Limit USA	Pk Limit CAN	Qpk / Avg Calc.	Qpk / Avg Limit USA	Qpk / Avg Limit CAN	Calc.		Pass Fail
R0	MHz	MHz	%	deg	m			dB	table	(V)	cm	H/V	m	cm	dB/m	dB	dBm		MHz		dBuV/m						dBm		dB
R1	SETUP		OATSC						A3C054338 SERIES			EMCOLOG				CAB001	RSFSV30001				NOTES: H-POL - FLAT, V-POL END Worst Case Orient								
R2	629.9	629.9	3 / 53	0.0	3.0	3.0		0.0	a2	3.0	8.0	H	1.2	100.0	10.5	-0.1			0.12	0.30	39.2	75.6	75.6	27.9	55.6	55.6	-56.0		27.7
R3	629.9	629.9	3 / 53	90.0	3.0	3.0		0.0	a2	3.0	8.0	V	1.4	100.0	10.5	-0.1			0.12	0.30	33.7	75.6	75.6	22.4	55.6	55.6	-61.5		33.2
R4	944.9	944.9	3 / 53	0.0	3.0	3.0		0.0	a2	3.0	8.0	H	1.0	100.0	16.7	-0.2			0.12	0.30	28.7	75.6	75.6	17.4	55.6	55.6	-66.5		38.2
R5	944.9	944.9	3 / 53	90.0	3.0	3.0		0.0	a2	3.0	8.0	V	1.1	100.0	16.7	-0.2			0.12	0.30	30.2	75.6	75.6	18.9	55.6	55.6	-65.0		36.7
R6																													
R7	SETUP		OATSC						A3C054338 SERIES			HQR1TO18S01				CAB015	RSFSV30001				NOTES: Max all EUT orientations and test antenna polarizations.								
R8	1259.3	1259.3	3 / 53	all	3.0	3.0	0.2	0.0	a2	3.0	8.0	H/V	all	15.0	21.5	-0.2			1.00	3.00	41.2	74.0	74.0	29.9	54.0	54.0	-54.0		24.1
R9	1573.8	1573.8	3 / 53	all	3.0	3.0	0.2	0.0	a2	3.0	8.0	H/V	all	15.0	25.2	-0.2			1.00	3.00	41.2	74.0	74.0	29.9	54.0	54.0	-54.0		24.1
R10	1888.2	1888.2	3 / 53	all	3.0	3.0	0.3	0.0	a2	3.0	8.0	H/V	all	15.0	27.9	-0.2			1.00	3.00	46.8	74.0	74.0	35.5	54.0	54.0	-48.4		18.5
R11	2202.7	2202.7	3 / 53	all	3.0	3.0	0.3	0.0	a2	3.0	8.0	H/V	all	15.0	29.7	-0.3			1.00	3.00	53.4	74.0	74.0	42.1	54.0	54.0	-41.8		11.9
R12	2517.1	2517.1	3 / 53	all	3.0	3.0	0.4	0.0	a2	3.0	8.0	H/V	all	15.0	30.9	-0.3			1.00	3.00	46.8	74.0	74.0	35.5	54.0	54.0	-48.4		18.5
R13	2831.6	2831.6	3 / 53	all	3.0	3.0	0.4	0.0	a2	3.0	8.0	H/V	all	15.0	31.6	-0.3			1.00	3.00	47.7	74.0	74.0	36.4	54.0	54.0	-47.5		17.6
R14	3146.0	3146.0	3 / 53	all	3.0	3.0	0.5	0.0	a2	4.0	8.0	H/V	all	15.0	31.8	-0.3			1.00	3.00	49.7	74.0	74.0	38.4	54.0	54.0	-45.5		15.6
R15																													
R16	SETUP		OATSC						AM83VLTA			EMCOLOG				CAB001	RSFSV30001				NOTES: H-POL - FLAT, V-POL END Worst Case Orient								
R17	629.9	629.9	3 / 53	0.0	3.0	3.0		0.0	a3	3.0	8.0	H	1.2	100.0	19.5	-0.1			0.12	0.30	38.9	75.6	75.6	27.6	55.6	55.6	-60.4		28.0
R18	629.9	629.9	3 / 53	90.0	3.0	3.0		0.0	a3	3.0	8.0	V	1.4	100.0	19.5	-0.1			0.12	0.30	37.2	75.6	75.6	25.9	55.6	55.6	-62.1		29.7
R19	944.9	944.9	3 / 53	0.0	3.0	3.0		0.0	a3	3.0	8.0	H	1.0	100.0	23.2	-0.2			0.12	0.30	29.8	75.6	75.6	18.5	55.6	55.6	-65.4		37.1
R20	944.4	944.4	3 / 53	90.0	3.0	3.0		0.0	a3	3.0	8.0	H	1.1	100.0	23.1	-0.2			0.12	0.30	25.7	75.6	75.6	14.4	55.6	55.6	-69.5		41.2
R21																													
R22	SETUP		OATSC						AM83VLTA			HQR1TO18S01				CAB015	RSFSV30001				NOTES: Max all EUT orientations and test antenna polarizations.								
R23	1258.8	1258.8	3 / 53	all	3.0	3.0	0.2	0.0	a3	3.0	8.0	H/V	all	15.0	21.5	-0.2			1.00	3.00	46.1	74.0	74.0	34.8	54.0	54.0	-49.1		19.2
R24	1573.3	1573.3	3 / 53	all	3.0	3.0	0.2	0.0	a3	3.0	8.0	H/V	all	15.0	25.2	-0.2			1.00	3.00	42.0	74.0	74.0	30.7	54.0	54.0	-53.2		23.3
R25	1887.7	1887.7	3 / 53	all	3.0	3.0	0.3	0.0	a3	3.0	8.0	H/V	all	15.0	27.9	-0.2			1.00	3.00	44.9	74.0	74.0	33.6	54.0	54.0	-50.3		20.4
R26	2202.2	2202.2	3 / 53	all	3.0	3.0	0.3	0.0	a3	3.0	8.0	H/V	all	15.0	29.7	-0.3			1.00	3.00	51.5	74.0	74.0	40.2	54.0	54.0	-43.7		13.8
R27	2516.6	2516.6	3 / 53	all	3.0	3.0	0.4	0.0	a3	3.0	8.0	H/V	all	15.0	30.9	-0.3			1.00	3.00	49.2	74.0	74.0	37.9	54.0	54.0	-46.0		16.1
R28	2831.1	2831.1	3 / 53	all	3.0	3.0	0.4	0.0	a3	4.0	8.0	H/V	all	15.0	31.6	-0.3			1.00	3.00	49.7	74.0	74.0	38.4	54.0	54.0	-45.5		15.6
R29	3145.5	3145.5	3 / 53	all	3.0	3.0	0.5	0.0	a3	4.0	8.0	H/V	all	15.0	31.8	-0.3			1.00	3.00	52.5	74.0	74.0	41.2	54.0	54.0	-42.7		**12.8**
R30	No other spurious emissions observed within 20 dB of Limit.																												
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29

(ROW)	(COLUMN)	NOTE:
R0	C5	MR is Measurement Range, which is reduced from DR to achieve necessary SNR.
R0	C6	DR is the regulatory Desired Range measurement distance.
R0	C7	N/F is Near-Field / Far-Field distance computed for max of EUT Antenna Dimension (C10) and Test Antenna dimension (C12), where applicable.
R0	C8	CF is computed using a 20 dB/decade Decay Rate.
R0	C18/19	When E-field or EIRP is reported directly from Spectrum Analyzer, Antenna Factors and Cable losses are included directly in SA settings and Pr is not reported.

4.3.2 Radiated Digital Spurious

The results for the measurement of digital spurious emissions are not reported herein as all digital emissions were greater than 20 dB below the regulatory limit. Radiation from digital components was measured to 4 GHz, or to five times the maximum digital component operating frequency, whichever is greater.

5 Measurement Uncertainty and Accreditation Documents

The maximum values of measurement uncertainty for the laboratory test equipment and facilities associated with each test are given in the table below. This uncertainty is computed for a 95.45% confidence level based on a coverage factor of $k = 2$.

Table 8: Measurement Uncertainty.

Measured Parameter	Measurement Uncertainty†
Radio Frequency	$\pm(f_{Mkr}/10^7 + RBW/10 + (SPN/(PTS-1))/2 + 1\,\text{Hz})$
Conducted Emm. Amplitude	$\pm 1.9\,\text{dB}$
Radiated Emm. Amplitude $(30 - 200\,\text{MHz})$	$\pm 4.0\,\text{dB}$
Radiated Emm. Amplitude $(200 - 1000\,\text{MHz})$	$\pm 5.2\,\text{dB}$
Radiated Emm. Amplitude $(f > 1000\,\text{MHz})$	$\pm 3.7\,\text{dB}$

†Ref: CISPR 16-4-2:2011+A1:2014


United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200129-0

AHD (Amber Helm Development, L.C.)
Sister Lakes, MI

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 17025:2005. 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).

2019-06-28 through 2020-06-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

Figure 7: Accreditation Documents