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Testing of

Electromagnetic Emissions

per

USA:	**CFR Title 47, Part 15.249**	(Emissions)
USA:	**CFR Title 47, Part 2.1091;2.1093**	(Exposure)
Canada:	**ISED RSS-210/GENe**	(Emissions)
Canada:	**ISED RSS-102**	(Exposure)

are herein reported for

Lionel, LLC
LC Sound Car

Test Report No.: 20170220-RPTLION10050Ar1

Applicant/Provider:
Lionel, LLC
6301 Performance Drive, Concord NC 28027 United States
Phone: (586) 421-9022, Fax: (704) 455-8940
Contact Person: Jim Rohde; jrohde@lionel.com

Data Recorded by: Dr. Joseph Brunett, EMC-002790-NE

Reviewed by: Dr. Joseph Brunett, EMC-002790-NE

Prepared by: Dr. Joseph Brunett, EMC-002790-NE

Date of Issue: February 20, 2017

Results of testing completed on (or before) February 15, 2017 are as follows.

Emissions: The transmitter intentional emissions **COMPLY** with the regulatory limit(s) by no less than 16.8 dB. Transmit chain spurious or harmonic emissions **COMPLY** by no less than 4.2 dB. Unintentional spurious emissions from digital circuitry **COMPLY** with radiated emission limit(s) by at least 10.3 dB. AC Power Line conducted emissions **COMPLY** by at least 23.1 dB.

Revision History

Rev. No.	Date	Details	Revised By
r0	February 20, 2017	Initial Release.	J. Brunett
r1	March 12, 2017	Typo correction.	J. Brunett

Contents

List of Tables

List of Figures

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: 688478) and with ISED Canada, Ottawa, ON (File Ref. No: IC8719A-1 and IC22227-1).

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 February 2027.

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 **Willow Run (WR) Test Labs, Inc.**, 7117 Fieldcrest Dr., Brighton, Michigan 48116 USA. Table 1 lists all site(s) employed herein. Specific test sites utilized are also listed in the test results sections of this report.

Table 1: Test Site List.

Description	Location	Quality Num.
OATS (3 meter)	8501 Beck Rd. Bldg 2227, Belleville MI 48111	OATSA

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 Willow Run (WR) Test Labs, Inc. 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.	Last Cal By / Date Due
Spectrum Analyzer	Rhode-Schwarz / FSV30	101660	RSFSV30001	RS / May-2018
Spectrum Analyzer	Rhode-Schwarz / FSV4	101222	RSFSV4001	RS / Mar-2018
Biconical	EMCO / 93110B	9802-3039	BICEMCO01	Lib. Labs / Aug-2017
Log Periodic Antenna	EMCO / 3146	9305-3614	LOGEMCO01	Lib. Labs/ April-2017
LS-Band Horn	JEF / NRL Std.	001	HRN15001	WRTL / Jul-2017
Quad Ridge Horn	ETS Lind. / 3164-04	00066988	HRNQR316401	Lib. Labs / April-2017
Quad Ridge Horn	Singer / A6100	C35200	HQR2TO18S01	Lib. Labs / April-2017
K-Band Horn	JEF / NRL Std.	001	HRNK01	WRTL / Jul-2017

2 Test Specifications and Procedures

2.1 Test Specification and General Procedures

The ultimate goal of Lionel, LLC 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 Lionel, LLC LC Sound Car for compliance to:

Country/Region	**Rules or Directive**	**Referenced Section(s)**
United States	Code of Federal Regulations	CFR Title 47, Part 15.249
Canada	ISED Canada	ISED RSS-210/GENe

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 (USA)	"American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
CFR 47 2.1091/1093	"447498 D01 General RF Exposure Guidance v06: RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices"
ISED Canada	"The Measurement of Occupied Bandwidth"
ICES-003; Issue 6 (2016)	"Information Technology Equipment (ITE) Limits and methods of measurement"
ISED Canada RSS-102	"Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)"

3 Configuration and Identification of the Equipment Under Test

3.1 Description and Declarations

The equipment under test is an remote control train car. The EUT is approximately 40 x 8 x 10 cm (approx.) in dimension, and is depicted in Figure 1. It is powered by 8-18 VAC wall transformer. In use, this device is a HO scale train car used in Lionel train sets. Table 3 outlines provider declared EUT specifications.

Figure 1: Photos of EUT.

Table 3: EUT Declarations.

General Declarations			
Equipment Type:	Wireless Train Car	**Country of Origin:**	China
Nominal Supply:	8-18 VAC	**Oper. Temp Range:**	Not Declared
Frequency Range:	2404 – 2476 MHz	**Antenna Dimension:**	Not Declared
Antenna Type:	PCB trace	**Antenna Gain:**	Integral
Number of Channels:	18	**Channel Spacing:**	Not Declared
Alignment Range:	Not Declared	**Type of Modulation:**	GFSK
United States			
FCC ID Number:	LIV-LCANNCOACH	**Classification:**	DXT
Canada			
IC Number:	7032A-LCANNCOACH	**Classification:**	Remote Control Device, Low Power Device (2400-2483.5 MHz)

3.1.1 EUT Configuration

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

3.1.2 Modes of Operation

When automatically activated by button press of a paired remote control, the EUT transmits acknowledgement signals to a paired Lionel train controller.

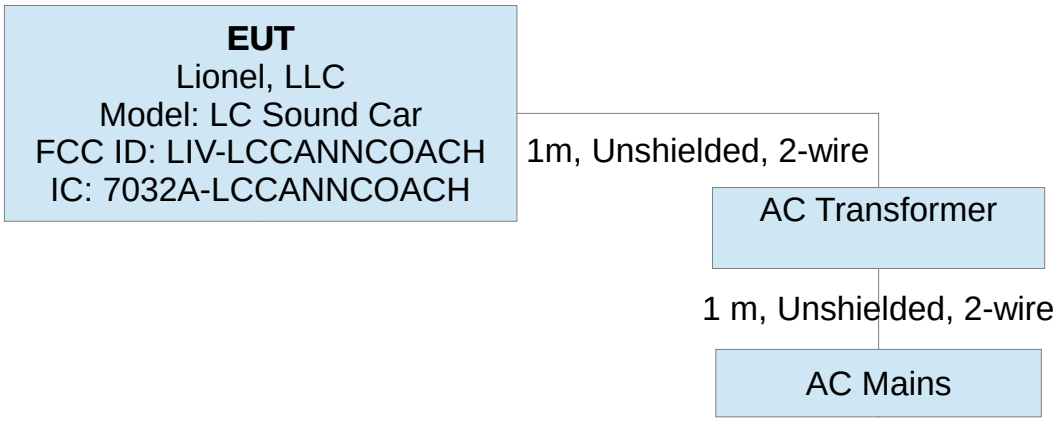


Figure 2: EUT Test Configuration Diagram.

3.1.3 Variants

There is only a single electrical variant of the EUT.

3.1.4 Test Samples

One sample was provided with custom software to enable continuous modulated transmission of both the radio under test and the BLE modular radio included in the EUT.

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, modifications to the DC power supply circuitry were made by the Lionel engineer to bring the EUT power line conducted emissions in line with the Class B regulations.

3.1.7 Production Intent

The EUT appears to be production ready.

3.1.8 Declared Exemptions and Additional Product Notes

In addition to the 2404-2476 MHz radio tested herein, the EUT employs a BLE modular radio to interface with other train control systems. That BLE radio is a pre-approved module (FCC ID:2AH7AKW2541A, IC: 21416-KW2541A) and has been tested along with the radio in this report for intermodulation products and RF exposure to confirm co-location requirements are met.

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 shielded anechoic chamber or GTEM test cell. 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.

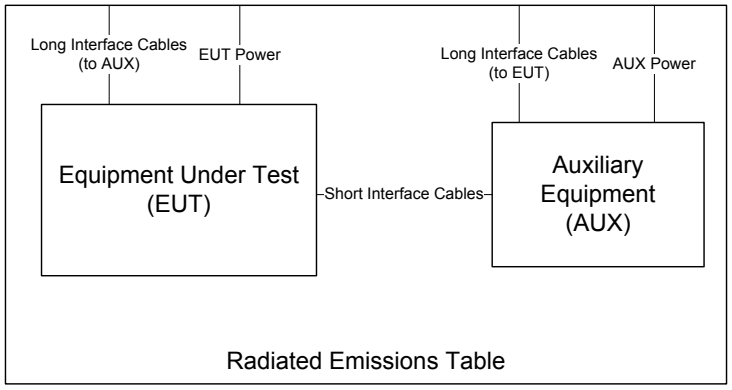


Figure 3: Radiated Emissions Diagram of the EUT.

If the EUT exhibits spurious emissions due to internal receiver circuitry, such emissions are measured with an appropriate carrier signal applied. For devices with intentional emissions below 30 MHz, a shielded loop antenna is used. It is placed at a 1 meter receive height. Emissions between 30 MHz and 1 GHz are measured using tuned dipoles and/or 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 horn or broadband ridge-horn antennas on our OATS with a 4×5 m rectangle of H-4 absorber placed over the ground screen covering the OATS ground screen. 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.

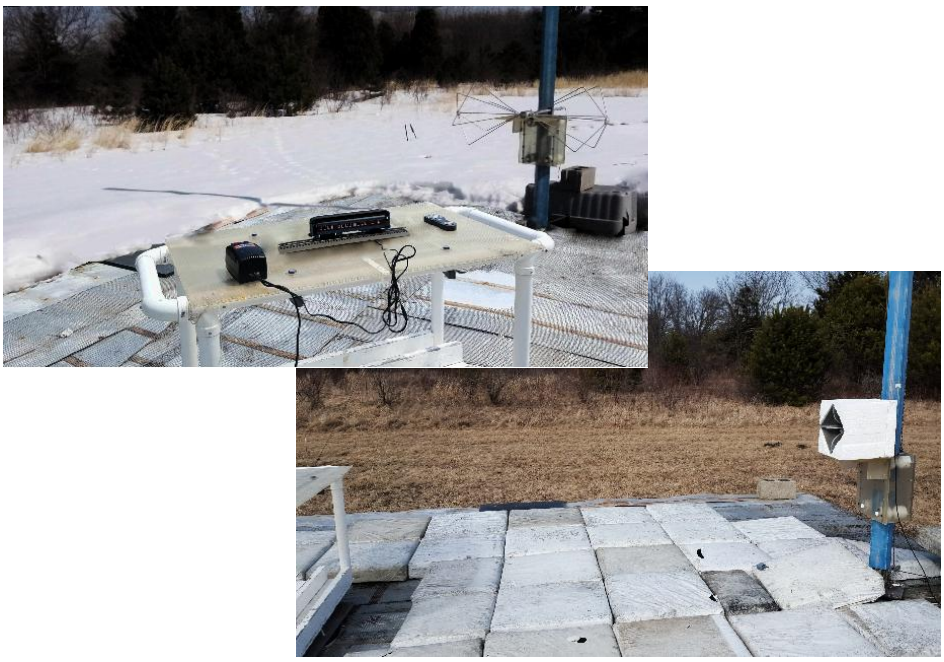


Figure 4: Radiated Emissions Test Setup Photograph(s).

4.1.2 Conducted Emissions Test Setup and Procedures

AC Port Conducted Spurious For this device, AC power line conducted emissions are measured in our screen room. If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.4 / CISPR 22 are employed. Alternatively, an on-table layout more representative of actual use may be employed if the resulting emissions appear to be worst-case in such a configuration. See Figure 5.

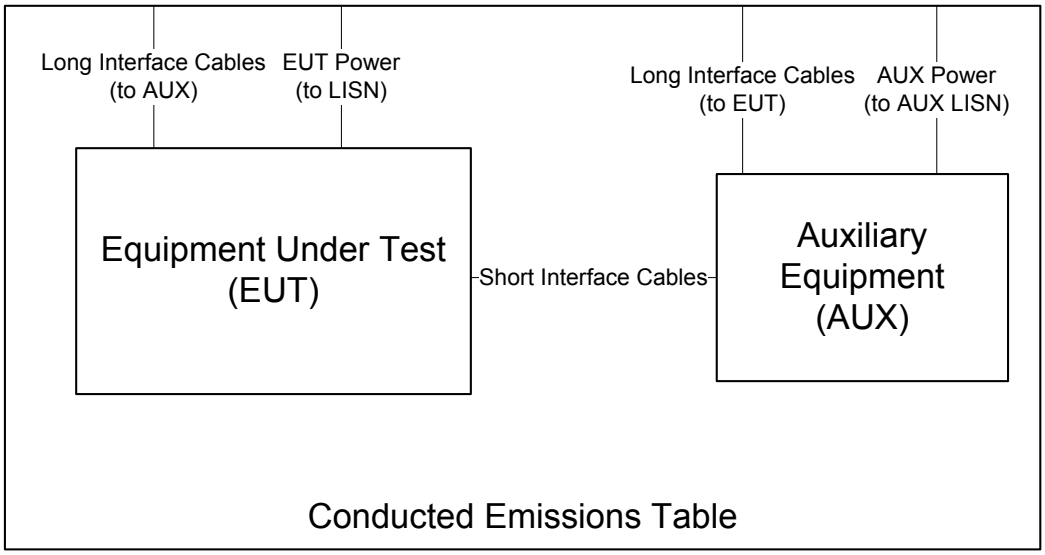


Figure 5: Conducted Emissions Setup Diagram of the EUT.

Conducted emissions are measured and recorded for each AC mains power source over the spectrum 0.15 MHz to 30 MHz for both the ungrounded (HI/PHASE) and grounded (LO/GND) conductors with the EUT placed in its highest current draw operating mode(s). The test receiver is set to peak-hold mode in order to record the peak emissions throughout the course of functional operation. Only if an emission exceeds or is near the limit are quasi-peak and average detection applied. Photographs of the test setup employed are depicted in Figure 6.

Figure 6: Conducted Emissions Test Setup Photograph(s).

4.1.3 Power Supply Variation

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

In the case of this EUT, measurements of the worst-case radiated emissions are performed with the supply voltage varied by no less than 85% and 115% of the nominal rated value for devices connecting to AC power mains.

4.1.4 Thermal Variation

Tests at extreme temperatures are made if required by the procedures specified in the test standard, and results of this testing are detailed in this report. The provider has declared that the EUT is designed for operation over the temperature range Not Declared. Before any temperature measurements are made, the equipment is allowed to reach a thermal balance in the test chamber, temperature and humidity are recorded, and thermal balance is verified via a thermocouple–based probe.

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 RSFSV30001, HRN15001.

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 7.

Table 4: Fundamental Emission Pulsed Operation.

Frequency Range	**Det**	**IFBW**	**VBW**		
f > 1 000 MHz	Pk	5 MHz	5 MHz	**Test Date:**	10-Feb-17
				Test Engineer:	Joseph Brunett
				EUT	LC SOUND CAR
				Meas. Distance:	10cm

Pulsed Operation / Duty Cycle

Transmit Mode	Symbol Rate (Msym/s)	Data Rate* (Mbps)	Voltage (V)	Oper. Freq (MHz)	Cycle Time* (ms)	On-Time* (ms)	Duty Cycle (%)	Field Strength Duty Correction** (dB)	Exposure Duty Correction*** (dB)
GFSK	-	-	120.0	2440.0	20.05	0.15	0.743	42.6	21.3

* Measurement of cycle time and on-time were verified to be independent of IFBW for IFBW >= 1 MHz for all modulations and channels.
** E-field duty cycle correction (due to burst-modulated carrier) computed as 20*Log(On-Time/Cycle-Time)
** Exposure duty cycle correction (due to burst-modulated carrier) computed as 10*Log(On-Time/Cycle-Time)

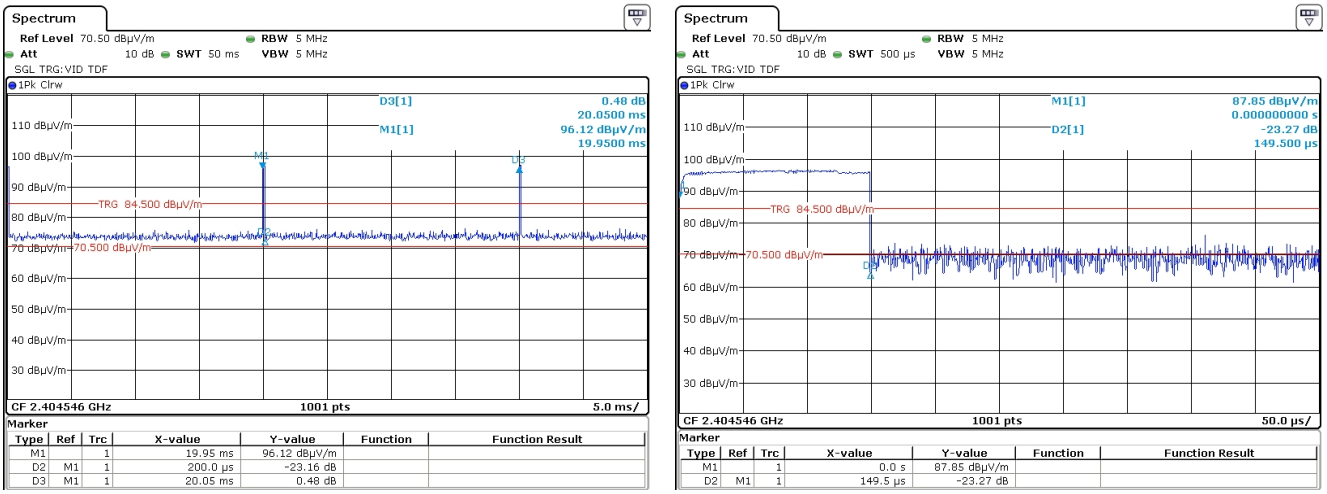


Figure 7: Fundamental Emission Pulsed Operation.

4.2.2 Fundamental Emission Bandwidth

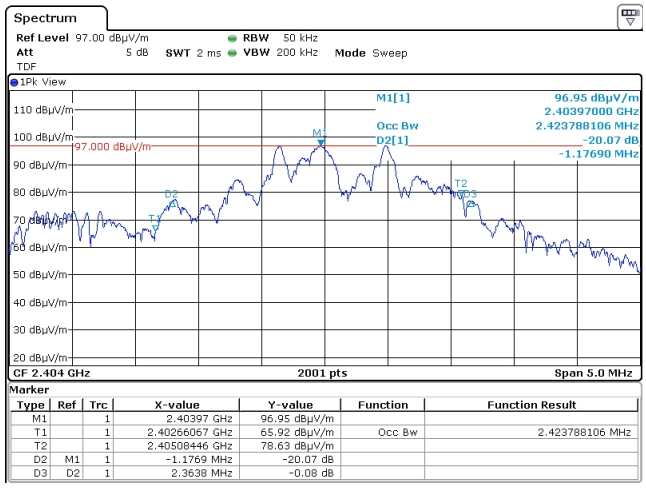
Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Emission bandwidth (EBW) of the 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, HRN15001.

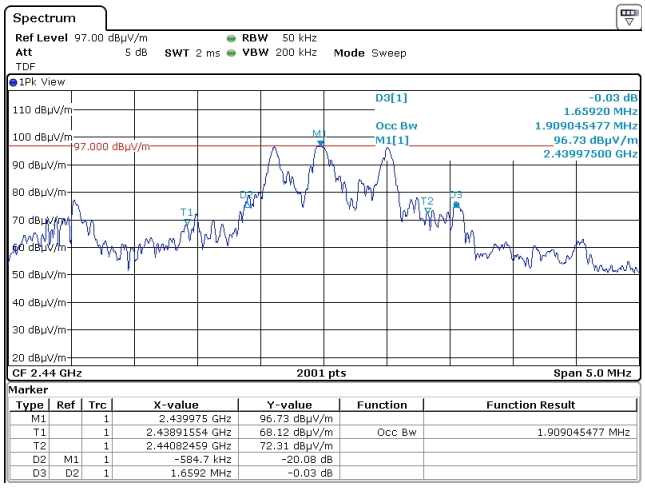
Measurement Results The details and results of testing the EUT are summarized in Table 5. Plots showing the measurements made to obtain these values are provided in Figure 8.

Table 5: Fundamental Emission Bandwidth.

Frequency Range	**Det**	**IFBW**	**VBW**	**Span**	**Test Date:**	10-Feb-17
f > 1 000 MHz	Pk	100 kHz	100 kHz	10 MHz	**Test Engineer:**	Joseph Brunett
					EUT	LC SOUND CAR
					Meas. Distance:	10 cm

Occupied Bandwidth									
Transmit Mode	Symbol Rate (Msym/s)	Data Rate (Mbps)	Voltage (V)	Oper. Freq (MHz)	99% OBW (MHz)	20 dB EBW (MHz)			Pass/Fail
GFSK	-	-	120.0	2404.0	2.424	2.364			Pass
				2440.0	1.909	1.659			
				2476.0	1.807	1.744			





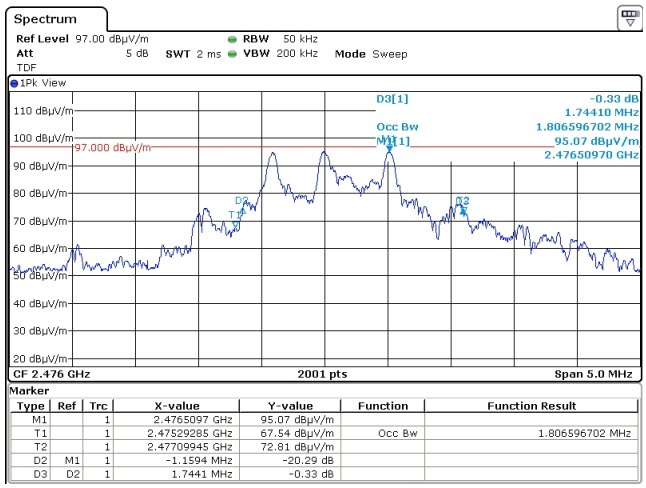


Figure 8: Fundamental Emission Bandwidth.

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, HRN15001.

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

Table 6: Fundamental Emission Field Strength.

Frequency Range	Det	IF Bandwidth	Video Bandwidth
25 MHz ≤ f ≤ 1 000 MHz	Pk/QPk	120 kHz	300 kHz
f > 1 000 MHz	Pk/Avg	1 MHz	3 MHz

Test Date: 10-Feb-17
Test Engineer: Joseph Brunett
EUT: LC SOUND CAR
Mode: Cont. Mod. Tx.
Meas. Distance: 3m

FCC/IC

#	Freq. Start MHz	Freq. Stop MHz	Ant. Used	Ant. Pol.	Pr (Pk) dBm	Pr (Avg)* dBm	Ka dB/m	Kg dB	E3(Pk) dBµV/m	E3 Pk Lim dBµV/m	E3(Avg) dBµV/m	E3 Avg Lim dBµV/m	Pass dB	Comments
1	2404.0	2404.0	HRNQR316401	H/V			21.4	-0.4	97.2	114.0	54.6	94.0	**16.8**	flat
2	2440.0	2440.0	HRNQR316401	H/V			21.5	-0.4	97.0	114.0	54.4	94.0	17.0	flat
3	2476.0	2476.0	HRNQR316401	H/V			21.7	-0.4	95.3	114.0	52.7	94.0	18.7	flat
4														
5														

*Avg computed from Pk measurement by applying duty cycle.

4.2.4 Exposure and Potential Health Hazard

To demonstrate compliance with with regulations that place limitations on human electromagnetic field exposure for both the general public and for workers, we compute EIRP from measured emission data. These levels are compared with limits placed by the directives and recommendations detailed in Section 2.1. Table 7 details the results of these computations.

Table 7: Electromagnetic Field Exposure.

USA REF: 2.1091/1093, 447498 D01 General RF Exposure Guidance v06
IC REF: RSS-102 Issue 5
Min. Sep. Distance: <5mm

Test Date: 10-Feb-17
Test Engineer: Joseph Brunett
EUT: LC SOUND CAR
EUT Mode: Cont. Mod. Tx.
Meas. Distance: 3 meters

							Canada			**USA**		
Radio	Freq. MHz	E3m* Pk dBuV/m	EIRP*** Pk dBm	Exposure Duty dB	Worst Case EIRP(Avg)** dBm	mW	Calculated SAR Threshold (Avg)*** mW	1-g SAR Body Power Threshold Exclusion Limit (Avg) mW	10-g SAR Extremity Power Threshold Exclusion Limit (Avg) mW	Calculated SAR Threshold (Avg)	1-g SAR Body Power Threshold Exclusion Limit (Avg)	10-g SAR Extremity Power Threshold Exclusion Limit (Avg)
BLE Module	2402.0	92.3	-2.9	-	-11.9	0.06						
	2440.0	90.7	-4.5	-	-13.0	0.05						
	2480.0	90.7	-4.5	-	-13.0	0.05						
DXT Radio	2404.0	97.2	2.0	21.3	-19.3	0.01	**0.08**	4.0	10.0	**0.02**	3.0	7.5
	2440.0	97.0	1.8	21.3	-19.5	0.01	**0.06**	4.0	10.0	**0.02**	3.0	7.5
	2476.0	95.3	0.1	21.3	-21.2	0.01	**0.06**	4.0	10.0	**0.02**	3.0	7.5

*As Measured / Computed from highest fundamental emission, see fundamental emission section of this report.
**Only RMS level is required, RMS/6min << Pk, Peak emission employed to demonstrate compliance.
***Sum of Worst Case EIRP from both radios at low, middle, and high channels assuming both transmit at the same channel at a given time.

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, HRN15001, HQR2TO18S01,HRNK01.

Measurement Results The details and results of testing the EUT are summarized in Table 8.

Table 8: Transmit Chain Spurious Emissions.

Frequency Range	Det	IF Bandwidth	Video Bandwidth
25 MHz ≤ f ≤ 1 000 MHz	Pk/QPk	120 kHz	300 kHz
f > 1 000 MHz	Pk/Avg	1 MHz	3 MHz

Test Date:	10-Feb-17
Test Engineer:	Joseph Brunett
EUT:	LC SOUND CAR
Mode:	Cont. Mod. Tx.
Meas. Distance:	3m

														FCC/IC
#	Freq. Start MHz	Freq. Stop MHz	Ant. Used	Ant. Pol.	Pr (Pk) dBm	Pr (Avg)* dBm	Ka dB/m	Kg dB	E3(Pk) dBµV/m	E3 Pk Lim dBµV/m	E3(Avg) dBµV/m	E3 Avg Lim dBµV/m	Pass dB	Comments
1	Fundamental Restricted Band Edge (Low Side)													
2	2400.0	2400.0	HRNQR316401	H/V			21.3	-0.4	69.8	74.0	38.6	54.0	**4.2**	flat
3	Fundamental Restricted Band Edge (High Side)													
4	2483.5	2483.5	HRNQR316401	H/V			21.8	-0.4	63.9	74.0	30.3	54.0	10.1	flat
5	Harmonic / Spurious Emissions													
6	4808.0	4804.0	HQR2TO18S01	H/V			35.5	-0.8	16.3	74.0	-26.3	54.0	57.7	flat
7	4880.0	4805.0	HQR2TO18S01	H/V			35.5	-0.8	19.2	74.0	-23.4	54.0	54.8	flat
8	4950.0	4806.0	HQR2TO18S01	H/V			35.5	-0.8	21.1	74.0	-21.5	54.0	52.9	flat
9	4000.0	6000.0	HQR2TO18S01	H/V			32.8	-0.8	22.4	74.0	-20.2	54.0	51.6	flat
10	7212.0	7212.0	HQR2TO18S01	H/V			33.3	-1.2	11.8	74.0	-30.8	54.0	62.2	flat
11	7320.0	7320.0	HQR2TO18S01	H/V			33.4	-1.2	10.9	74.0	-31.7	54.0	63.1	flat
12	7425.0	7425.0	HQR2TO18S01	H/V			33.4	-1.2	19.8	74.0	-22.8	54.0	54.2	flat
13	6000.0	8400.0	HQR2TO18S01	H/V			34.3	-1.2	25.1	74.0	-17.5	54.0	48.9	flat
14	8400.0	12500.0	HQR2TO18S01	H/V			35.6	-2.0	28.9	74.0	-13.7	54.0	45.1	flat
15	12500.0	18000.0	HQR2TO18S01	H/V			34.3	-3.1	32.1	74.0	-10.5	54.0	41.9	flat
16	18000.0	26500.0	HRNK001	H/V			33.7	-3.9	45.1	74.0	2.5	54.0	28.9	flat
17														
18														
19														
20														

*Avg computed from Pk by applying duty cycle, except for at band edge where average value was measured directly using SA.

4.3.2 Radiated Digital Spurious

The results for the measurement of digital spurious emissions (emissions arising from digital circuitry) at the nominal voltage and temperature are provided in Table 9. Radiation from digital components has been measured to 1000 MHz or to the highest frequency required by the applied standards, whichever is greater.

Table 9: Radiated Digital Spurious Emissions.

Frequency Range	Det	IF Bandwidth	Video Bandwidth		
25 MHz ≤ f ≤ 1 000 MHz	Pk/QPk	120 kHz	300 kHz	**Test Date:**	10-Feb-17
f > 1 000 MHz	Pk	1 MHz	3 MHz	**Test Engineer:**	Mitch Overbeck
f > 1 000 MHz	Avg	1 MHz	10kHz	**EUT:**	LC SOUND CAR
				EUT Mode:	Normal Operating
				Meas. Distance:	3 meters

Digital Spurious Emissions FCC/IC + CE(CISPR)

	Test	Antenna		Pr (Pwr Rx.)*				E-Field @ 3m**		FCC/IC Class B		CE Class B		FCC/IC Class A		CE Class A		
#	Freq. MHz	QN Used	Test Pol.	Pk dBm	QPk/Avg dBm	Ka dB/m	Kg dB	Pk dBµV/m	QPk/Avg dBµV/m	E3lim dBµV/m	Pass dB	E3lim dBµV/m	Pass dB	E3lim dBµV/m	Pass dB	E3lim dBµV/m	Pass dB	Comments
1	36.5	BICEMCO01	V	-53.5		11.5	36.1	28.9		40.0	11.1	40.5	11.6	49.5	20.6	50.5	21.6	
2	38.5	BICEMCO01	H	-54.2		11.1	36.1	27.8		40.0	12.2	40.5	12.7	49.5	21.7	50.5	22.7	
3	67.9	BICEMCO01	V	-52.3		7.7	35.4	27.0		40.0	13.0	40.5	13.5	49.5	22.5	50.5	23.5	
4	68.3	BICEMCO01	H	-53.4		7.7	35.4	25.9		40.0	14.1	40.5	14.6	49.5	23.6	50.5	24.6	
5	133.3	BICEMCO01	H	-52.9		11.1	34.0	31.2		43.5	12.3	40.5	9.3	54.0	22.8	50.5	19.3	
6	145.8	BICEMCO01	V	-54.0		12.1	33.8	31.3		43.5	12.2	40.5	9.2	54.0	22.7	50.5	19.2	
7	240.0	BICEMCO01	H	-56.8		14.7	32.2	32.6		46.0	13.4	47.5	14.9	56.9	24.3	57.5	24.9	
8	240.0	BICEMCO01	V	-54.9		14.7	32.2	34.5		46.0	11.5	47.5	13.0	56.9	22.4	57.5	23.0	
9	262.5	LOGEMCO01	V	-54.2		12.8	31.9	33.7		46.0	12.3	47.5	13.8	56.9	23.2	57.5	23.8	
10	265.4	LOGEMCO01	H	-56.1		12.9	31.9	31.9		46.0	14.1	47.5	15.6	56.9	25.0	57.5	25.6	
11	336.0	LOGEMCO01	V	-58.1		14.5	30.9	32.5		46.0	13.5	47.5	15.0	56.9	24.4	57.5	25.0	
12	365.8	LOGEMCO01	H	-57.4		15.1	30.6	34.1		46.0	11.9	47.5	13.4	56.9	22.8	57.5	23.4	
13	440.0	LOGEMCO01	H	-68.5		16.4	29.8	25.2		46.0	20.8	47.5	22.3	56.9	31.7	57.5	32.3	noise
14	450.0	LOGEMCO01	V	-70.8		16.6	29.6	23.2		46.0	22.8	47.5	24.3	56.9	33.7	57.5	34.3	noise
15	525.0	LOGEMCO01	H	-68.5		17.9	28.9	27.5		46.0	18.5	47.5	20.0	56.9	29.4	57.5	30.0	noise
16	625.0	LOGEMCO01	H	-70.0		19.4	27.9	28.5		46.0	17.5	47.5	19.0	56.9	28.4	57.5	29.0	noise
17	960.0	LOGEMCO01	H	-70.0		23.4	24.7	35.7		46.0	**10.3**	47.5	11.8	56.9	21.2	57.5	21.8	noise
18																		
19																		
20																		

*QPk detection below 1 GHz, Avg detection at or above 1 GHz with receiver bandwidth as specified at top of table.

** When E-field is reported directly from Spectrum Analyzer, Antenna Factors and Cable losses are included directly in SA settings.

4.3.3 Conducted Emissions Test Results - AC Power Port(s)

The results of emissions from the EUT's AC mains power port(s) are reported in Table 10.

Table 10: AC Mains Power Conducted Emissions Results.

Frequency Range	**Det**	**IF Bandwidth**	**Video Bandwidth**	**Test Date:**	10-Feb-17
150kHz ≤ f ≤ 30 MHz	Pk/QPk/Avg	9 kHz	30 kHz	**Test Engineer:**	Mitch Overbeck
				EUT Mode:	Normal Operating
				EUT:	LC SOUND CAR
				Meas. Distance:	AC Mains Conducted

AC Mains Power Conducted Emissions														
	Freq.	Line	Vmeas			Class A Qpk		Class A Avg		Class B Qpk		Class B Avg		
			Pk	Qpk	Avg	Vlim*	Margin	Vlim*	Margin	Vlim*	Margin	Vlim*	Margin	
#	MHz	Side	dBuV	dBuV	dBuV	dBuV	dB	dBuV	dB	dBuV	dB	dBuV	dB	Comments
1	0.17	Hi	32.5	22.7	11.6	79.0	56.3	66.0	54.4	65.1	42.4	55.1	43.5	
2	1.20	Hi	26.4	20.4	22.9	73.0	52.6	60.0	37.1	48.7	28.3	46.0	**23.1**	
3	4.86	Hi	15.8	23.9	17.1	73.0	57.2	60.0	44.2	56.0	40.2	46.0	30.2	
4	11.93	Hi	24.6	16.8	10.7	73.0	56.2	60.0	49.3	60.0	43.2	50.0	39.3	
5	20.22	Hi	20.3	8.6	24.2	73.0	64.4	60.0	39.7	60.0	51.4	50.0	29.7	
6	0.17	Lo	14.4	36.2	20.2	79.0	64.6	66.0	51.6	65.1	50.7	55.1	40.7	
7	1.12	Lo	21.6	32.7	16.2	73.0	51.4	60.0	43.8	56.0	34.4	46.0	29.8	
8	2.65	Lo	16.5	16.1	29.0	73.0	56.9	60.0	43.5	56.0	39.9	46.0	29.5	
9	11.93	Lo	10.1	22.7	22.8	73.0	62.9	60.0	49.9	60.0	49.9	50.0	39.9	
10	17.62	Lo	27.0	18.2	14.2	73.0	54.8	60.0	45.8	60.0	41.8	50.0	35.8	
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														

**In all cases, VPk ≥ VQpk ≥ VAve. If VPk < Vavg limit, then VQPk limit and Vavg limit are met.*

5 Measurement Uncertainty

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 11: 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	$\pm 1.8\,\text{dB}$
Radiated Emm. Amplitude $(30 - 200\,\text{MHz})$	$\pm 2.7\,\text{dB}$
Radiated Emm. Amplitude $(200 - 1000\,\text{MHz})$	$\pm 2.5\,\text{dB}$
Radiated Emm. Amplitude $(f > 1000\,\text{MHz})$	$\pm 3.7\,\text{dB}$
DC and Low Frequency Voltages	$\pm 2\%$
Temperature	$\pm 0.5°\text{C}$
Humidity	$\pm 5\%$

[†]Ref: CISPR 16-4-2:2011+A1:2014