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CERTIFICATION TEST REPORT

Manufacturer: TrueCNC dba HolidayCoro.com
27719 Nelson Street
Spring, Texas 77373 USA

Applicant: Same as Above

Product Name: EasyLights FM Audio Transmitter

Product Description: Low Power FM Audio Transmitter for EasyLights Lighting System

Operating Voltage/Frequency: Battery-operated

Model: 931

FCC ID: 2ANC4HCELFM

Testing Commenced: July 16, 2018

Testing Ended: July 16, 2018

Summary of Test Results: **In Compliance**

The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications and/or manufacturer's statement. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Standards:

- ❖ **FCC Part 15 Subpart C, Section 15.239 – Operation in the band 88-108 MHz**
- ❖ **FCC Part 15 Subpart C, Section 15.215(c) – Additional provisions to the general radiated emission limitations**
- ❖ **FCC Part 15 Subpart A, Section 15.31(e) – Measurement Standards**
- ❖ **FCC Part 15 Subpart C, Section 15.209**



Order Number: F2LQ9749A

Applicant: TrueCNC dba HolidayCoro.com

Model: 931

Evaluation Conducted by:

Julius Chiller, EMC/Wireless Engineer

Report Reviewed by:

Ken Littell, Director of EMC & Wireless Operations

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1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

1.2 Measurement Procedure:

All measurements were performed according to the 2013 version of ANSI C63.10 and recommended FCC procedure of measurement of DTS operating under Section 15.239. A list of the measurement equipment can be found in Section 6.



1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor using a coverage factor of $k=2$. The Uncertainty for a laboratory are referred to as U_{lab} . For Radiated and Conducted Emissions, the Expanded Uncertainty is compared to the U_{cispr} values to determine if a specific margin is required to deem compliance.

U_{lab}

Measurement Range	Combined Uncertainty	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	2.54	5.07dB
Radiated Emissions <1 GHz @ 10m	2.55	5.09dB
Radiated Emissions 1 GHz to 2.7 GHz	1.81	3.62dB
Radiated Emissions 2.7 GHz to 18 GHz	1.55	3.10dB
AC Power Line Conducted Emissions, 150kHz to 30 MHz	1.38	2.76dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	1.66	3.32dB

U_{cispr}

Measurement Range	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	5.2dB
Radiated Emissions <1 GHz @ 10m	5.2dB
Radiated Emissions 1 GHz to 2.7 GHz	Under Consideration
Radiated Emissions 2.7 GHz to 18 GHz	Under Consideration
AC Power Line Conducted Emissions, 150kHz to 30 MHz	3.6dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	4.0dB

If U_{lab} is less than or equal to U_{cispr} , then:

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} in table 1, then:

- compliance is deemed to occur if no measured disturbance, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

Note: Only measurements listed in the tables above that relate to tests included in this Test Report are applicable.



Order Number: F2LQ9749A

Applicant: TrueCNC dba HolidayCoro.com

Model: 931

1.4 Document History:

Document Number	Description	Issue Date	Approved By
F2LQ9749A-01E	First Issue	July 16, 2018	K. Littell

**2 SUMMARY OF TEST RESULTS**

Test Name	Standard(s)	Results
Radiated Field Strength	CFR 47 Part 15.239(b)	Complies
Bandwidth of Emission	CFR 47 Part 15.239(a)	Complies
Radiated Emissions	FCC Part 15 Subpart C 15.209	Complies
Variation of Input Power	CFR Part 15.31(e)	Complies*

*15.31(e) was met by using new batteries.

Modifications Made to the Equipment
None



3 TABLE OF MEASURED RESULTS

Test	Low Channel 88.1 MHz	Mid Channel 96.3 MHz	High Channel 107.7 MHz
Max Field Strength of Fundamental	37.8 dB μ V/m (77.6 μ V/m)	43.8 dB μ V/m (154.8 μ V/m)	47.3 dB μ V/m (231.7 μ V/m)
Limit for Fundamental	48 dB μ V/m (250 μ V/m)	48 dB μ V/m (250 μ V/m)	48 dB μ V/m (250 μ V/m)
Bandwidth (kHz)	57	63	60
Bandwidth Limit (kHz)	200	200	200

Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.



4 ENGINEERING STATEMENT

This report has been prepared on behalf of TrueCNC dba HolidayCoro.com to provide documentation for the testing described herein. This equipment has been tested and found to comply with part 15.239 of the FCC Rules using ANSI C63.10 2013 standard. The test results found in this test report relate only to the items tested.



5 EUT INFORMATION AND DATA

5.1 Equipment Under Test:

Product: EasyLights FM Audio Transmitter

Model: 931

Serial No.: None Specified

FCC ID: 2ANC4HCELFM

5.2 Trade Name:

TrueCNC dba HolidayCoro.com

5.3 Power Supply:

Battery-operated

5.4 Applicable Rules:

CFR 47, Part 15.239

5.5 Equipment Category:

Radio Transmitter

5.6 Antenna:

Integral, non-rechargeable

5.7 Accessories:

Programming PCB, Batteries

5.8 Test Item Condition:

The equipment to be tested was received in good condition.

5.9 Testing Algorithm:

EUT was set up in a normal operating mode. EUT was placed on an 80cm and 1.5m high table on the turntable of a semi-anechoic chamber, 3m from the measuring antenna. The EUT was operated on low (88.1 MHz), mid (96.3 MHz) and high (107.7 MHz) channels. Settings: Power, 80; Ant Cap, 34; Deviation, 5000 Hz.

**6 LIST OF MEASUREMENT INSTRUMENTATION**

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166-E	Albatross Projects	B83117-DF435-T261	US140023	Jan. 9, 2019
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Nov. 17, 2018
Horn Antenna	CL098	Emco	3115	9809-5580	Dec. 28, 2018
JB Combination Antenna	CL175	Sunol Sciences	JB3	A030315	Oct. 11, 2019
Amplifier w/Monopole & 18" Loop	CL163-L	AH Systems, Inc.	EHA-52B	100	June 4, 2019
Pre-Amplifier	CL153	Keysight Tech.	83006A	MY39500791	Sept. 20, 2018
Pre-Amplifier	CL136	Hewlett Packard	8447E	1937A01894	Mar. 26, 2019
Temp/Hum. Recorder	CL232	Extech	445814	01	Mar. 22, 2019
Software:	EMC 32, Version 8.53.0		Software Verified: July 16, 2018		
Software:	Tile Version 3.4.B.3.		Software Verified: July 16, 2018		



7 FCC PART 15.239(b) – RADIATED FIELD STRENGTH

7.1 Requirements:

The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters ($250\text{uv/m} = 48\text{dbuv/m}$). The emission limit is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.



7.2 Radiated Field Strength

Test Date:	July 16, 2018	Test Engineer:	J. Chiller
Standards:	CFR 47 Part 15.239(b)	Air Temperature:	22.1°C
		Relative Humidity:	46%

MaxPeak, E.I.R.P.

Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
88.100000	H	47.3	-8.1	39.20	68.0	-28.8
96.300000	H	51.2	-6.4	44.80	68.0	-23.2
107.700000	H	51.3	-3.1	48.20	68.0	-19.8

Average, E.I.R.P.

Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
88.100000	H	45.9	-8.1	37.80	48.0	-10.2
96.300000	H	50.2	-6.4	43.80	48.0	-4.2
107.700000	H	50.4	-3.1	47.30	48.0	-0.7



8 FCC PART 15.215(c)

8.1 Requirements:

§15.215 Additional provisions to the general radiated emission limitations.

(a) The regulations in §§15.217 through 15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in §15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

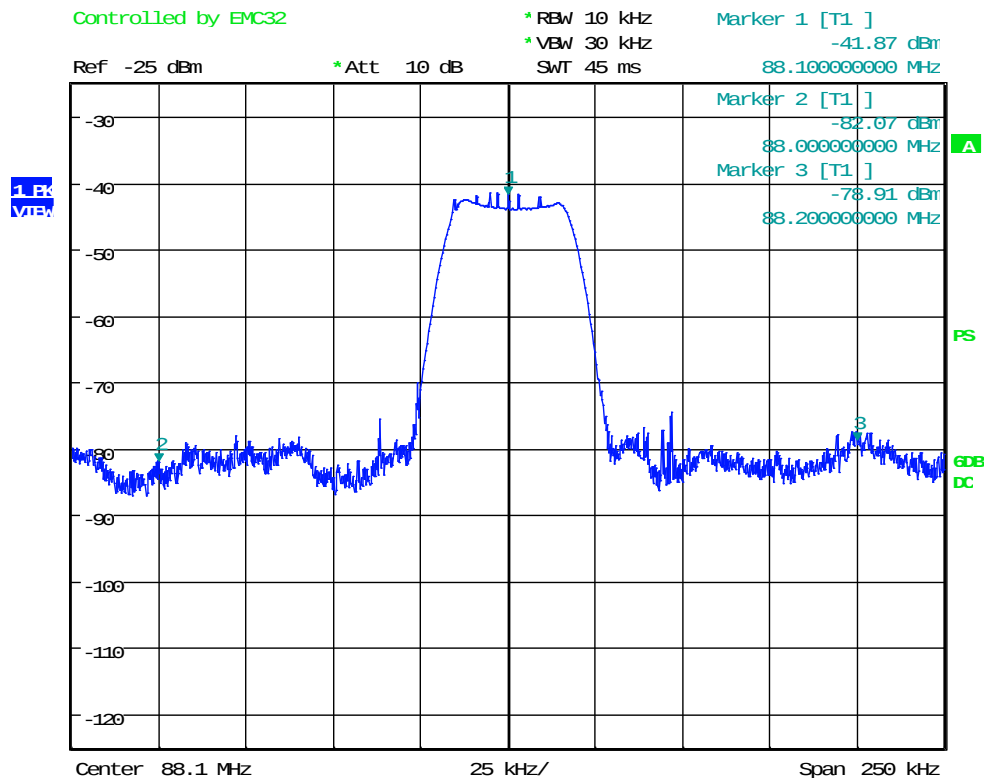
Bandwidth measurements were made at the low (88.1), mid (96.3) and upper (107.7) MHz frequencies. The bandwidth was measured using the analyzer's marker function.



8.2 Bandwidth of Emission Test Data

Test Date(s):	July 16, 2018	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.239(a)	Air Temperature:	22.1°C
		Relative Humidity:	48%

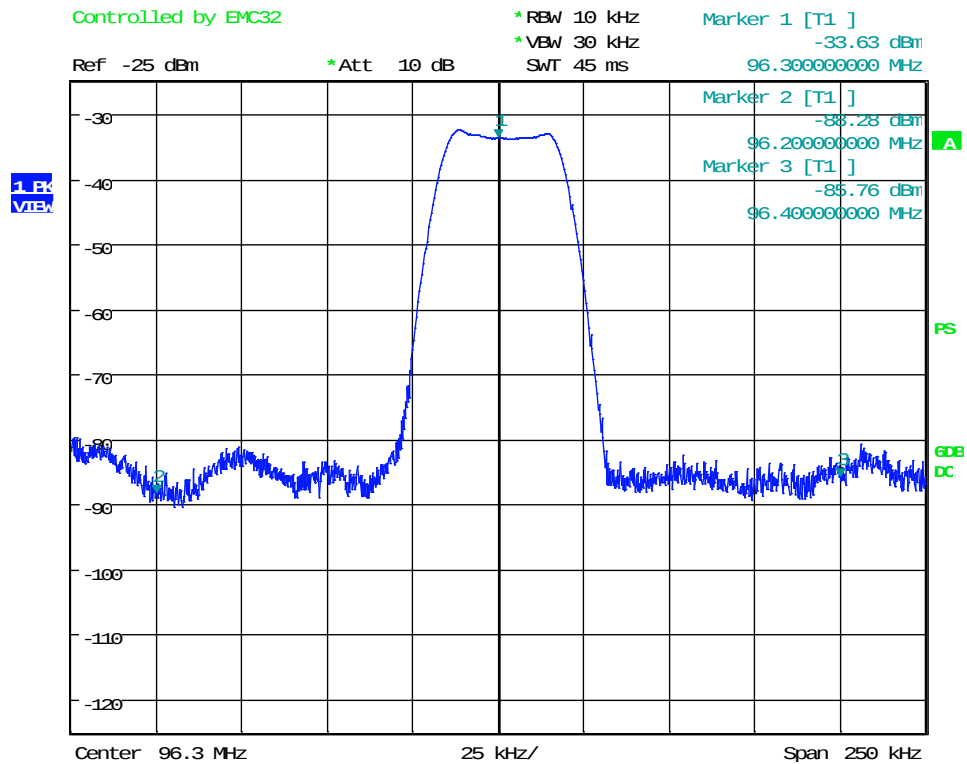
Low Channel



Date: 16.JUL.2018 13:16:20



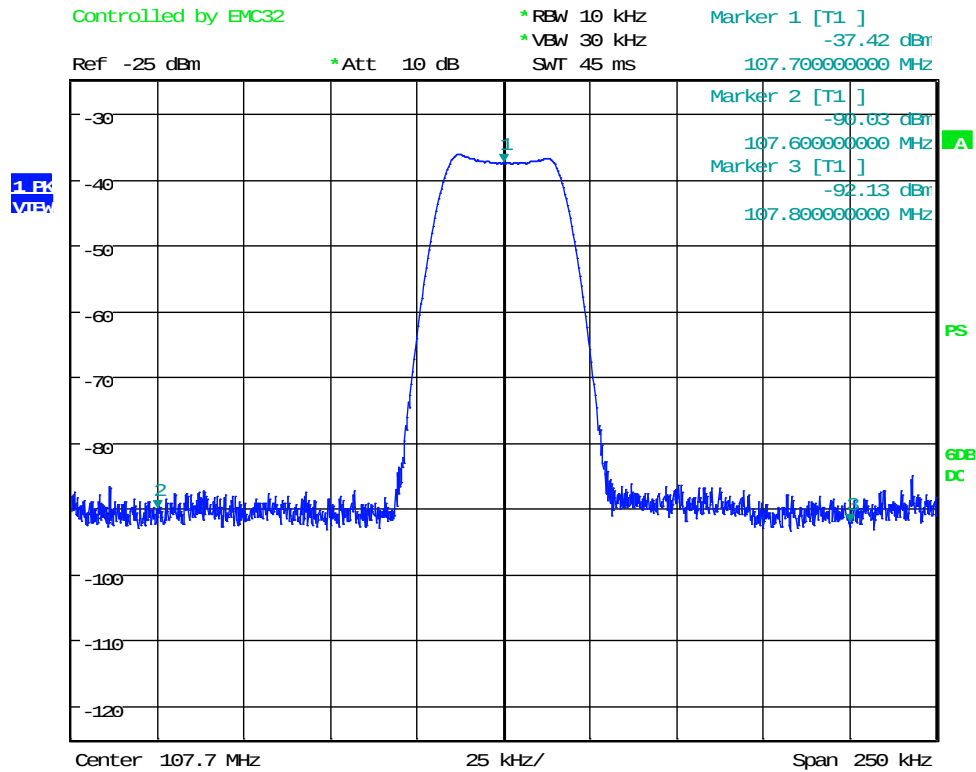
Mid Channel



Date: 16.JUL.2018 13:14:18



High Channel



Date: 16.JUL.2018 13:13:01



9 FCC PART 15.239(c) – FIELD STRENGTH OF EMISSIONS FROM INTENTIONAL RADIATORS

The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in §15.209.

NOTE: During the pre-scan evaluation, the EUT was rotated in all three orthogonal positions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions.



9.1 Test Data – Spurious Emissions

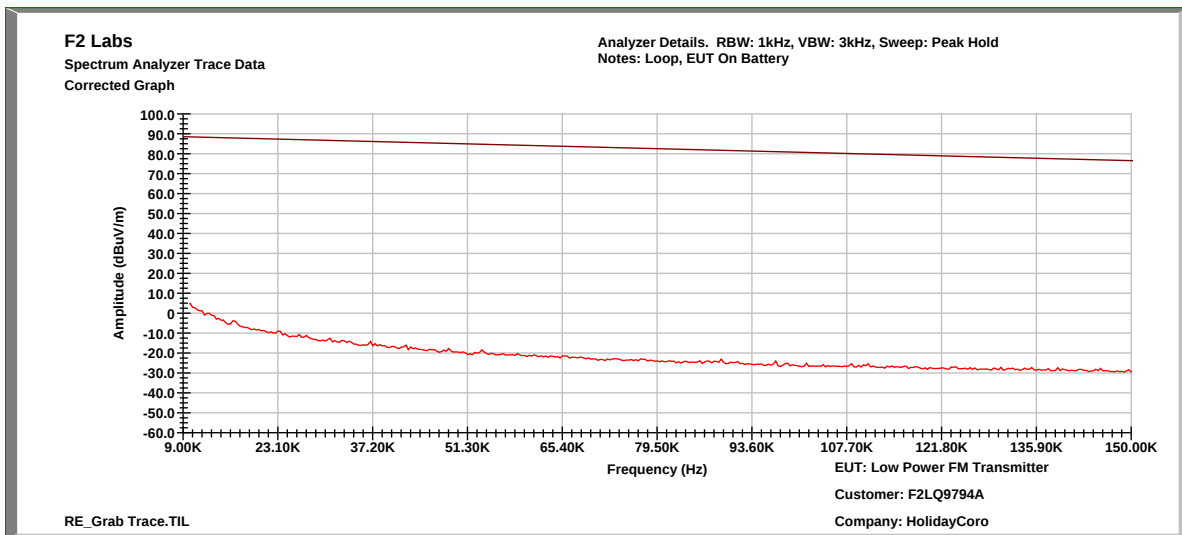
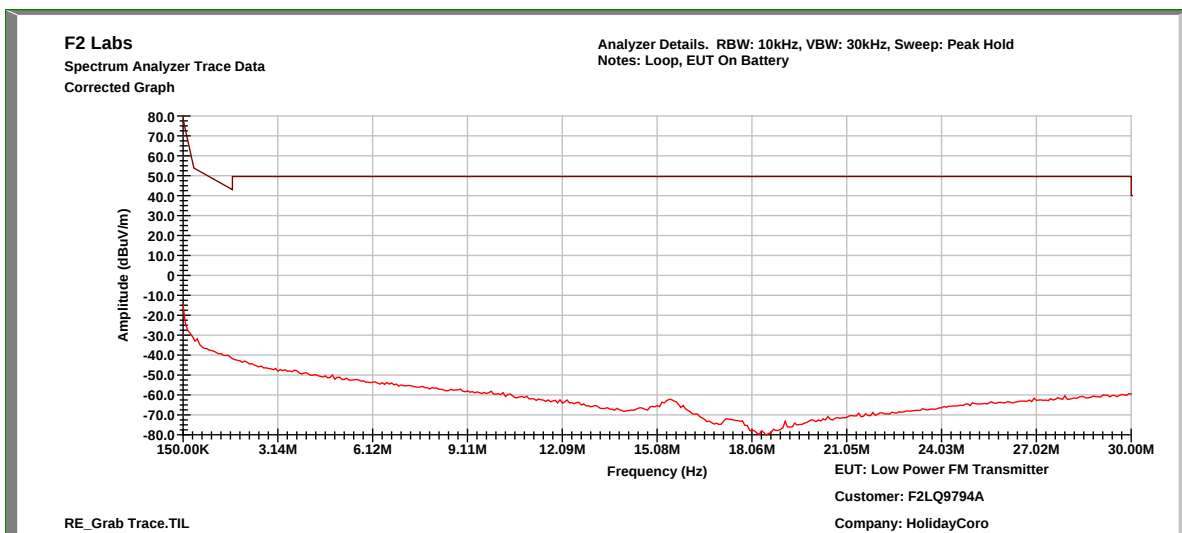
Notes: Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all three orthogonal positions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. At some frequencies, no emissions from the EUT were measurable over the ambient noise floor. The readings did not change with EUT on and EUT off.

Where emissions from the EUT were visible within 20dB of the limit, at least 6 of the highest frequencies were measured per ANSI 63.4 in a 3-meter anechoic chamber. Frequencies below 1GHz were measured using a quasi-peak detector. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions. Some of the frequencies did not change with the EUT on or off. At those frequencies, the test distance was shortened to 1 meter and still no emissions from the EUT were visible or over the ambient or limit. Frequencies were scanned from 9kHz to 10 GHz and the highest emissions are listed below.

Note: Spurious emissions in these EUTs were tested for all three channels. The results that follow are from the one that was deemed worst-case: 107.7 MHz (High Channel).

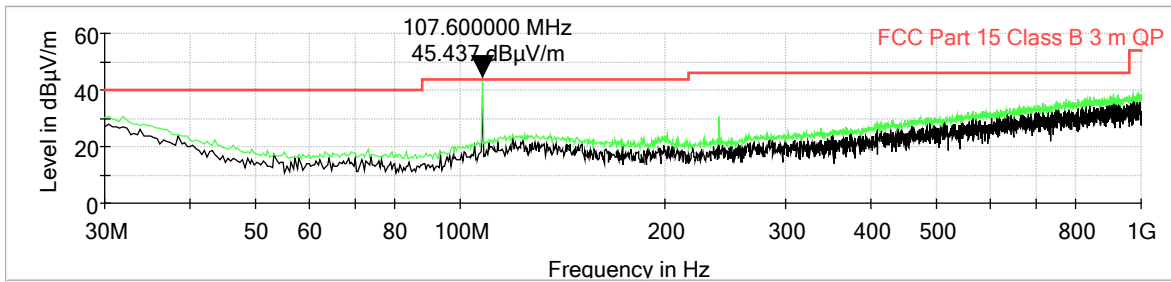


Test Date(s):	July 16, 2018	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.239(c)	Air Temperature:	20.9°C
Results:	Complies	Relative Humidity:	43%

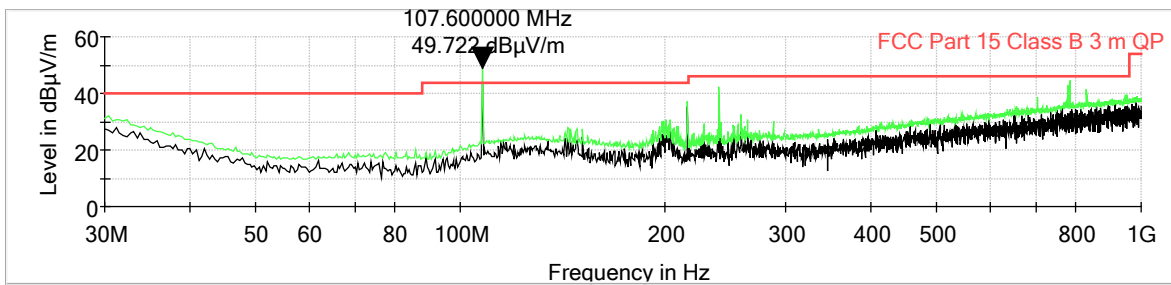
0.009 MHz to 0.15 MHz, High Channel**0.15 MHz to 30.0 MHz, High Channel**



30.0 MHz to 1000 MHz, High Channel, Vertical

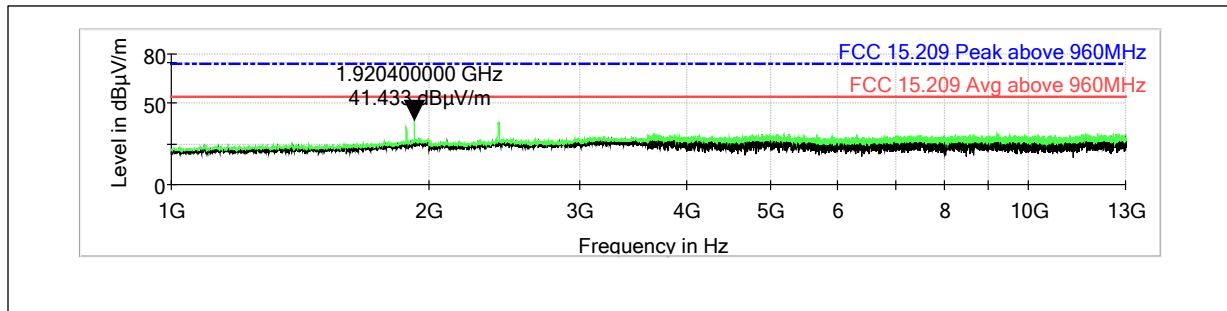


30.0 MHz to 1000 MHz, High Channel, Horizontal

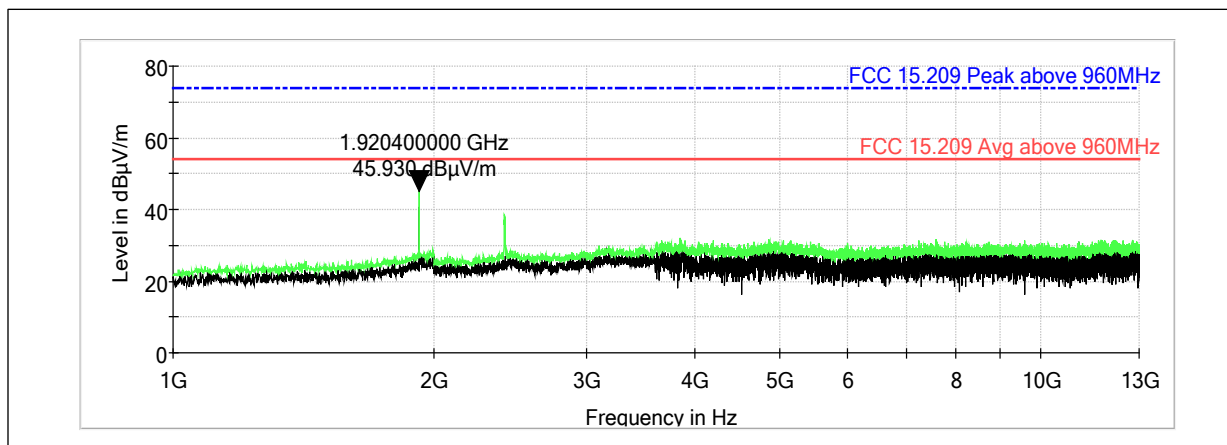




1 GHz to 13 GHz, High Channel, Vertical



1 GHz to 13 GHz, High Channel, Horizontal



**Measurements****Peak**

Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Cable Loss & Antenna Factor (dB)	Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1881.000000	V	34.9	-4.3	30.60	74.0	-43.4
1920.000000	V	35.5	-4.3	31.20	74.0	-42.8
1922.000000	H	55.5	-4.3	51.20	74.0	-22.8
2411.000000	V	48.5	-4.6	43.90	74.0	-30.1

Average

Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Cable Loss & Antenna Factor (dB)	Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1881.000000	V	21.9	-4.3	17.60	54.0	-36.4
1920.000000	V	22.3	-4.3	18.00	54.0	-36.0
1922.000000	H	23.8	-4.3	19.50	54.0	-34.5
2411.000000	V	24.5	-4.6	19.90	54.0	-34.1

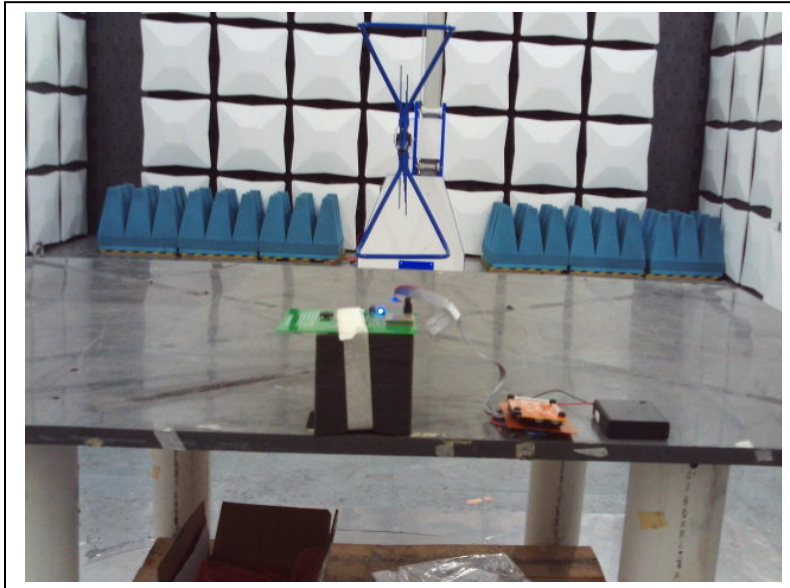
QuasiPeak

Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Cable Loss & Antenna Factor (dB)	Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
144.072000	H	23.9	-1.9	22.00	43.5	-21.5
203.436000	H	30.2	-2.0	28.20	43.5	-15.3
215.372000	H	39.9	-3.2	36.70	43.5	-6.8
239.996000	V	32.9	-2.1	30.80	46.0	-15.2
239.996000	H	44.4	-2.1	42.30	46.0	-3.7
258.144000	H	32.8	-1.8	31.00	46.0	-15.0



10 PHOTOGRAPHS

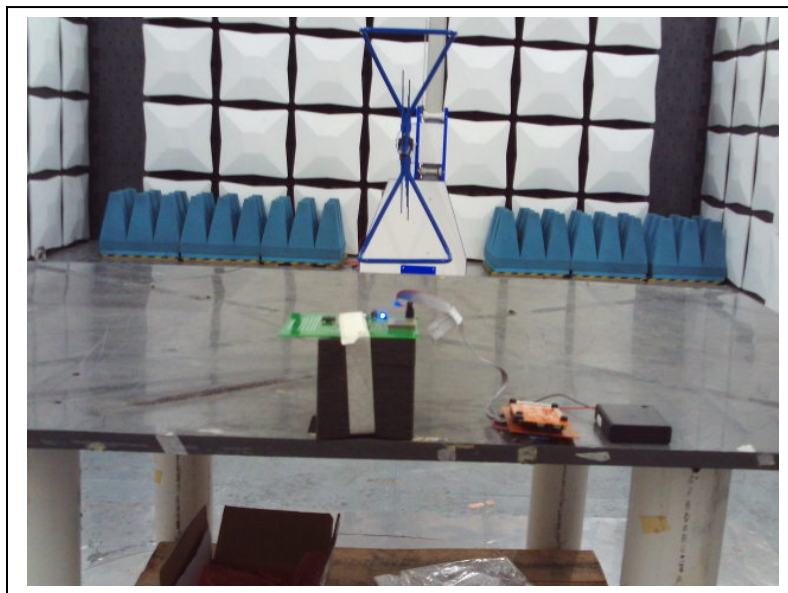
RF Output Power, Bandwidth of Emission



Radiated Emissions: Loop Antenna, 0.009 MHz to 30 MHz



Radiated Emissions: 30 MHz to 1000 MHz





Radiated Emissions Above 1 GHz

