F2 Labs
16740 Peters Road
Middlefield, Ohio 44062
United States of America
www.f2labs.com

CERTIFICATION TEST REPORT

Manufacturing Address:	Cansec International Ltd Beijing Jia An Electronics Technology Co., Ltd. No. 19 Gu Cheng West Street Shi Jing Shan District Beijing 100043, China
Applicant:	BEA Incorporated RIDC Park West 100 Enterprise Drive Pittsburgh, Pennsylvania 15275 USA
Product Name:	Push Plates with Integrated 900 MHz Wireless Technology
Product Description:	Transceiver pair operating in the ISM band (902-928 MHz), implementing frequency hopping, intended to be used as wireless door activation/sequencing devices in the pedestrian automatic door industry.
Model(s):	**Br2-900**
FCC ID:	**2ABWS-10BR2900**
Testing Commenced:	Jan. 25, 2017
Testing Ended:	Jan. 26, 2017
Summary of Test Results:	In Compliance
	The EUT complies with the FCC requirements when manufactured identically as the unit tested in this report, including any required modifications. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Standards:

- **FEDERAL REGISTER CFR 47, PART 15 – RADIO FREQUENCY DEVICES**
  - **Part 15 Subpart C, Section 15.231 - Periodic operation in the band 40.66–40.70 MHz and above 70 MHz**
  - **Part 15 Subpart C, Section 15.209 - Radiated emissions limits; general requirements**
  - **Part 15 Subpart C, Section 15.35 - Measurement detector functions and bandwidths**
  - **FCC15.207 - Conducted Limits**
- **ANSI C63.10:2013 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz**

Evaluation Conducted by:

Joe Knepper, EMC Proj. Eng.

Report Reviewed by:

Ken Littell, Director of EMC & Wireless Operations

F2 Labs
26501 Ridge Road
Damascus, MD 20872
Ph 301.253.4500
Fax 301.253.5179

F2 Labs
16740 Peters Road
Middlefield, OH 44062
Ph 440.632.5541
Fax 440.632.5542

TABLE OF CONTENTS

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 for Intermittent Transmitters and Receivers operating under Section 15.231. 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 Uncertainly	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.

Measurement	Uncertainty
Radiated RF Immunity 80 MHz to 1 GHz	2.12dB
Conducted Common Mode RF Immunity, CDN 150kHz to 80 MHz	1.72dB
Conducted Common Mode RF Immunity, BCI 150kHz to 80 MHz	2.06dB
Harmonic Emissions	6.25%
Flicker	.63%

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

1.4 Document History

Document Number	Description	Issue Date	Approved By
F2LQ9326-01E	First Issue	Feb. 10, 2017	K. Littell

2 SUMMARY OF TEST RESULTS

Standard(s)	Results
CFR 47 Part 15.231(a)(1)	Complies
CFR 47 Part 15.231(b) / Part 15.209	Complies
CFR 47 Part 15.231(b)(3)(c)	Complies
CFR 47 Part 15.31	Complies*
CFR 47 Part 15.207(a)	Complies

Note: Product has provisions for being operated from a source that may connect to an AC mains network or an AC to DC power supply. Voltage Variation testing in 15.31 was performed at the nominal voltage, and then the 85% and 115% of that voltage was tested also. The output power at the High, Mid, and Low channels was measured to verify how much the power and frequency were affected by the variation of the input power. No shift in frequency or power was measured at either of the varied voltages on any of the channels.

Modifications Made to the Equipment
No modifications were made to the EUT

3 ENGINEERING STATEMENT

This report has been prepared on behalf of BEA Incorporated to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.231 of the FCC Rules, using ANSI C63.10:2013 standards, with the modifications noted in Section 2 of this Test report. The test results found in this test report relate only to the items tested.

4 EUT INFORMATION AND DATA

4.1 Equipment Under Test:

Product: Push Plates with Integrated 900 MHz Wireless Technology
Serial No.: ENG2013
FCC ID: 2ABWS-10BR2900

4.2 Trade Name: BEA Incorporated

4.3 Power Supply:

DC powered (12-24VDC)

4.4 Applicable Rules:

CFR 47, Part 15.231, subpart C

4.5 Equipment Category:

Intermittent Transceiver

4.6 Antenna:

Wire antenna

4.7 Accessories:

N/A

4.8 Test Item Condition:

The equipment to be tested was received in good condition.

4.9 Testing Algorithm:

The EUT was set up in a normal operating manner, transmitting at low (908 MHz), mid (913 MHz) and high (918 MHz) channels. The EUT was powered via VDC power supply and was varied between the 12-24V range to determine worst case.

5 LIST OF MEASUREMENT INSTRUMENTATION

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166-E	AlbatrossProjects	B83117-DF435-T261	US140023	May 12, 2017
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Nov. 28, 2017
Pre-Amplifier	CL153	Keysight Tech.	83006A	MY39500791	June 6, 2017
Active 18” Loop Antenna	CL163	A.H. Systems, Inc.	EHA-52B	100	May 2, 2017
Horn Antenna	CL098	Emco	3115	9809-5580	Dec. 28, 2018
Antenna, JB3 Combination	CL175	Sunol Sciences	JB3	A030315	Apr. 1, 2017
Software:	EMC 32, Version 5.20.2		Software Verified: Jan. 25, 2017		
Software	Tile Version 1.0		Software Verified: Jan. 25, 2017		

6 FCC PART 15.231(a)(1)

6.1 Requirements:

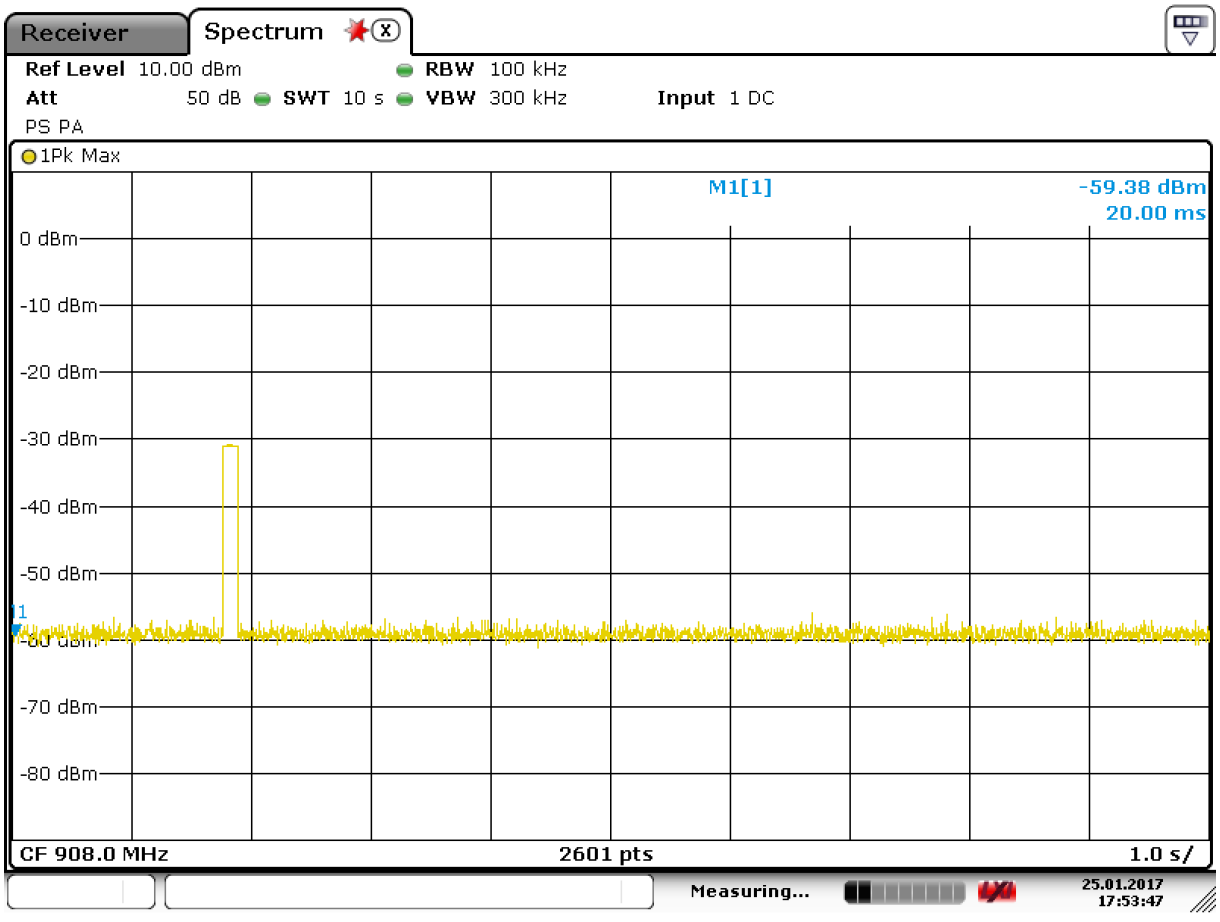
A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter with not more than 5 seconds of being released.

6.2 Test Data

Test Date:	Jan. 25, 2017	**Test Engineer(s):**	J. Knepper
Standards:	CFR 47 Part 15.231(a)(1);	**Air Temperature:**	29.7ºC
		Relative Humidity:	52%

Low Channel

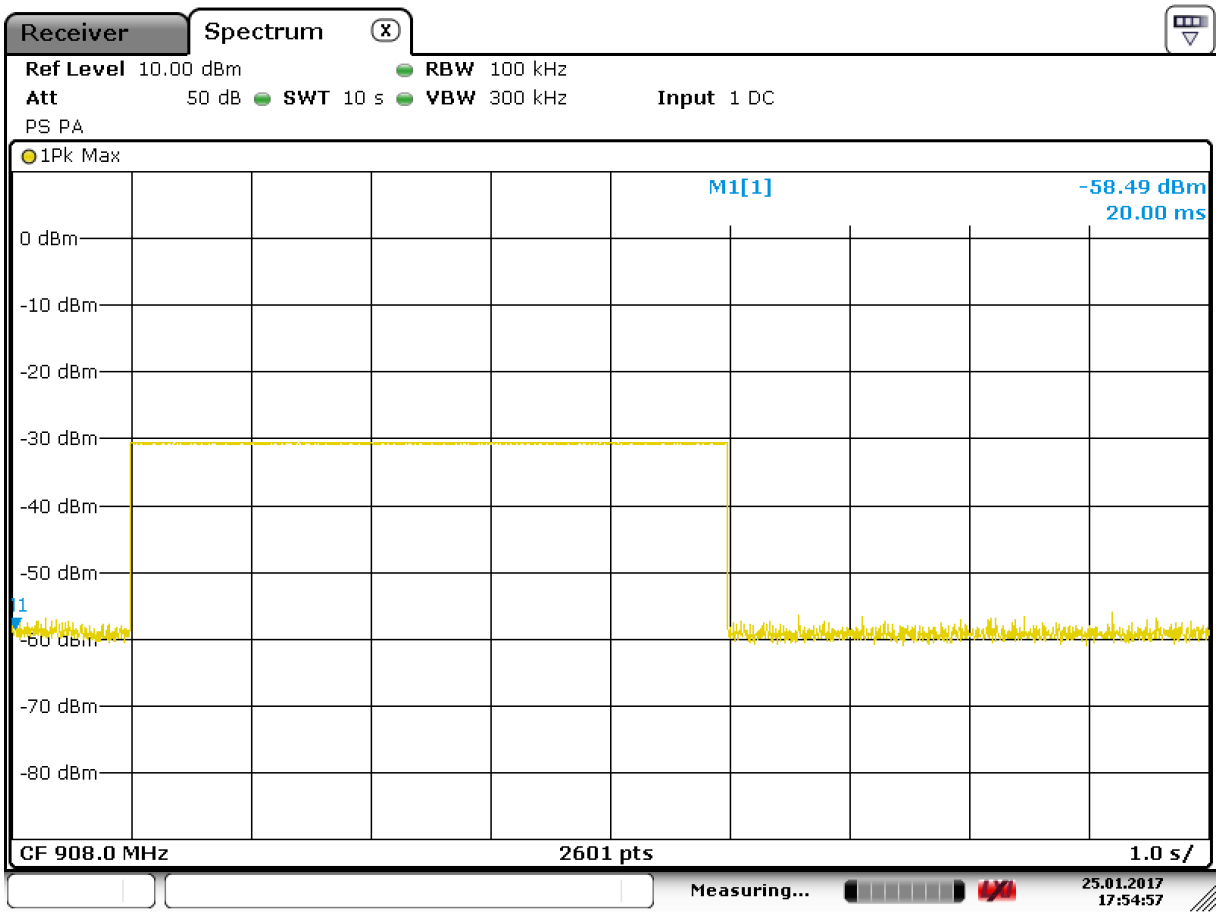
The following plot is of a single press and release of the manual push button. This is to show that the transmission ceased in less than 5 seconds of release.



Date: 25.JAN.2017 17:53:47

Low Channel, cont'd

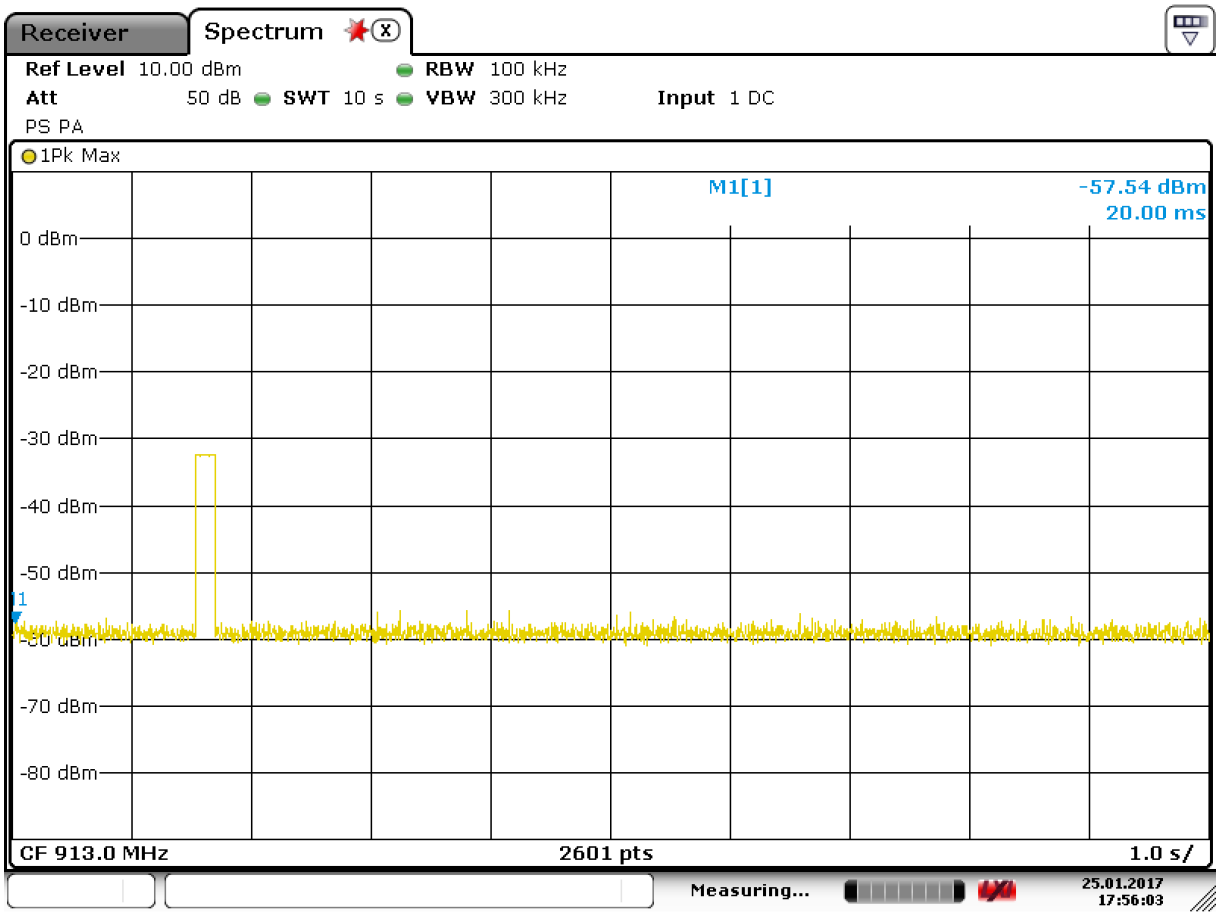
The following plot is of a press and hold for five seconds then release of the manual push button, showing that the transmission ceased prior to 5 seconds of release.



Date: 25.JAN.2017 17:54:56

Mid Channel

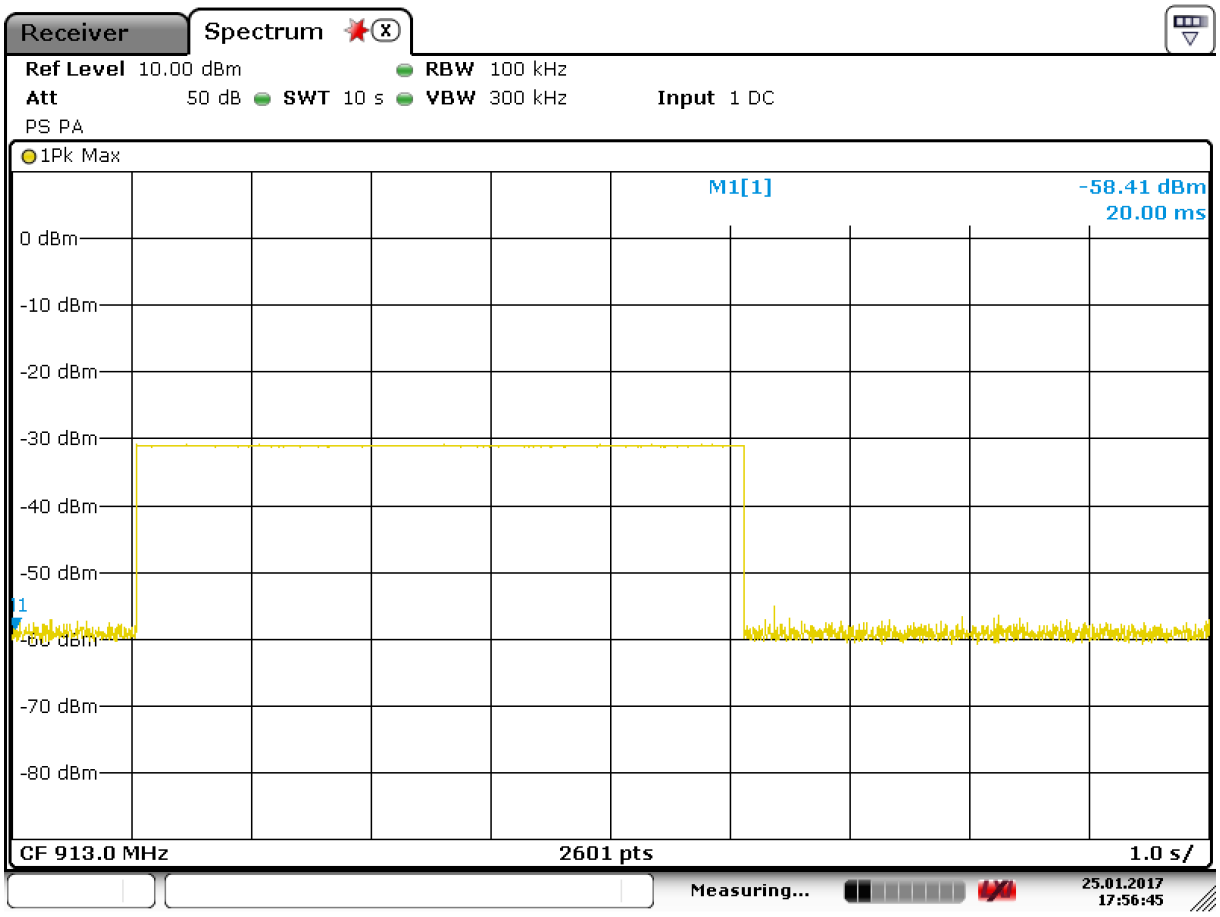
The following plot is of a single press and release of the manual push button, showing that the transmission ceased prior to 5 seconds of release.



Date: 25.JAN.2017 17:56:04

Mid Channel, cont'd

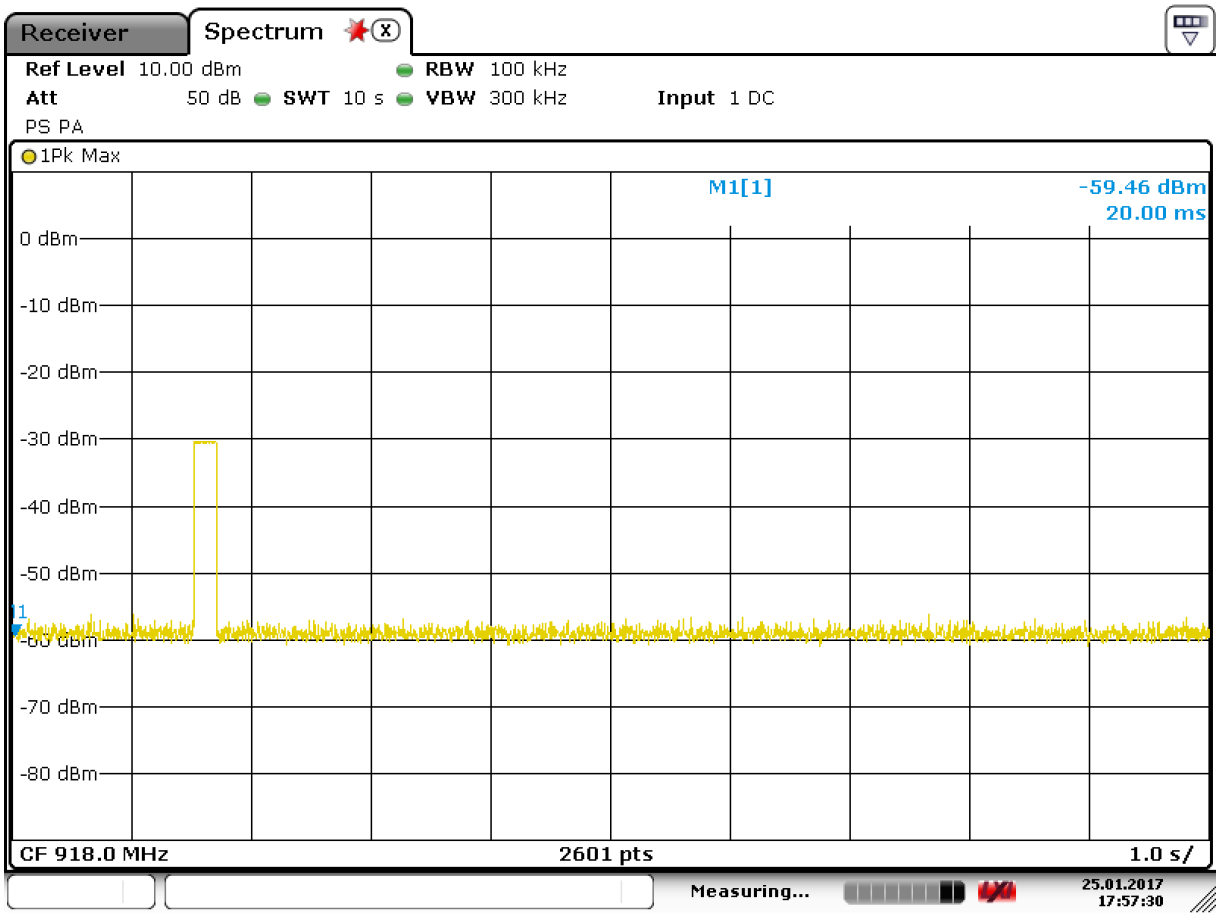
The following plot is of a press and hold for five seconds then release of the manual push button. This is to show that the transmission ceased in less than 5 seconds of release.



Date: 25.JAN.2017 17:56:45

High Channel

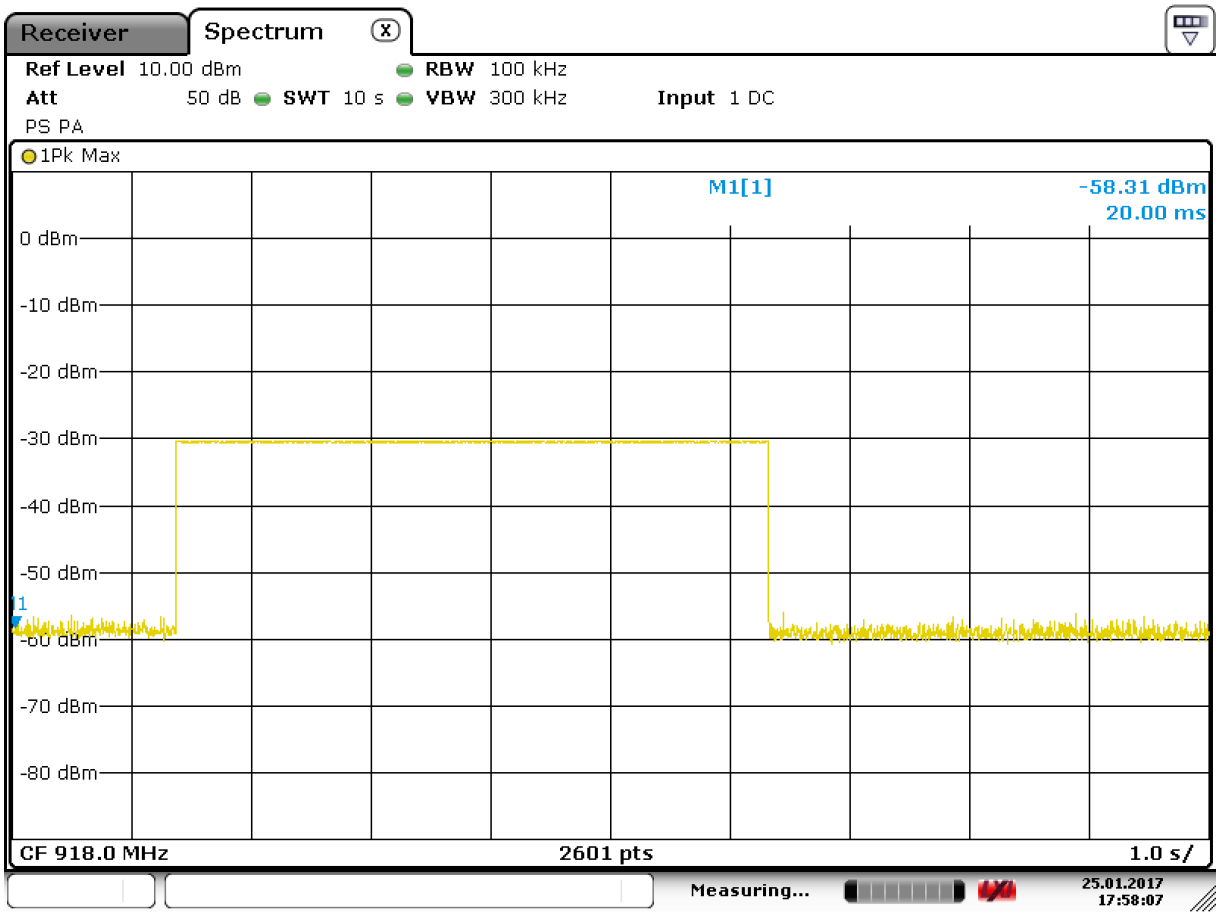
The following plot is of a single press and release of the manual push button, showing that the transmission ceased prior to 5 seconds of release.



Date: 25.JAN.2017 17:57:30

High Channel, cont'd

The following plot is of a press and hold for five seconds then release of the manual push button. This is to show that the transmission ceased in less than 5 seconds of release.



Date: 25.JAN.2017 17:58:07

7 FCC PART 15.231(b)

7.1 Requirements:

Field strength of emissions, fundamental and spurious using quasi peak detector.

Limit for fundamental frequency above 470 MHz is: 12,500 µV/m.

Limits for spurious emissions were those specified in 15.209 and 15.231.

While the equipment was energized, the receiving antenna was scanned from 1.0 meter to 4.0 meters in both vertical and horizontal polarities while the turntable was adjusted 360 degrees to determine the maximum field strength.

Emissions test was checked with various wall plates, and the emissions went down. Testing without a wall plate attached was the worst case. Wires were connected to the relay ports and looped back to simulate a loaded relay.

The equipment was fully exercised and was positioned for maximum emissions in all 3 orthogonal positions. The EUT antenna was positioned flat against the plastic tabletop and it was verified, by placing a foam support between the table and the antenna, that the table had no effect on the emissions at these frequency ranges.

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.

There were no emissions from the EUT other than the fundamental emission and so spurious emissions were limited to band edges.

7.2 Test Data

Test Date(s):	Jan. 25-26, 2017	**Test Engineer(s):**	J. Knepper
Standards:	CFR 47 Part 15.231(b); 15.209; C63.10:2013, Section 13.3	**Air Temperature:**	19.4ºC
		Relative Humidity:	52%

Low Channel

Low Channel - MaxPeak

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
902.000000	V	10.4	31.3	41.70	81.9	-40.2
902.000000	H	11.1	31.8	42.90	81.9	-39.0
908.000000	H	54.7	31.9	86.60	101.9	-15.3
908.000000	V	46.2	31.5	77.70	101.9	-24.2
928.000000	H	10.0	32.2	42.20	81.9	-39.7
928.000000	V	11.0	31.9	42.90	81.9	-39.0

Low Channel - Average

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Avg w/DCCF	Limit (dBµV/m)	Margin (dB)
902.000000	V	-2.5	31.3	28.80	18.30	61.9	-43.6
902.000000	H	-2.6	31.8	29.20	18.80	61.9	-43.1
908.000000	H	51.4	31.9	83.30	72.80	81.9	-9.1
908.000000	V	42.7	31.5	74.20	63.80	81.9	-18.1
928.000000	H	-2.5	32.2	29.70	19.20	61.9	-42.7
928.000000	V	-2.6	31.9	29.30	18.80	61.9	-43.1

Mid Channel

Mid Channel - MaxPeak

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
902.000000	V	10.0	31.3	41.30	81.9	-40.6
902.000000	H	9.8	31.8	41.60	81.9	-40.3
913.000000	H	54.6	32.0	86.60	101.9	-15.3
913.000000	V	46.5	31.6	78.10	101.9	-23.8
928.000000	H	10.2	32.2	42.40	81.9	-39.5
928.000000	V	10.5	31.9	42.40	81.9	-39.5

Mid Channel - Average

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Avg w/DCCF	Limit (dBµV/m)	Margin (dB)
902.000000	V	-2.6	31.3	28.70	18.20	61.9	-43.7
902.000000	H	-2.6	31.8	29.20	18.70	61.9	-43.2
913.000000	H	51.3	32.0	83.30	72.80	81.9	-9.1
913.000000	V	43.0	31.6	74.60	64.10	81.9	-17.8
928.000000	H	-2.5	32.2	29.70	19.20	61.9	-42.7
928.000000	V	-2.2	31.9	29.70	19.20	61.9	-42.7

High Channel

High Channel - MaxPeak

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
902.000000	V	10.1	31.3	41.40	81.9	-40.5
902.000000	H	8.3	31.8	40.10	81.9	-41.8
918.000000	V	46.2	32.0	78.20	101.9	-23.7
918.000000	H	55.0	31.6	86.60	101.9	-15.3
928.000000	H	10.4	32.2	42.60	81.9	-39.3
928.000000	V	10.1	31.9	42.00	81.9	-39.9

High Channel - Average

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Avg w/DCCF	Limit (dBµV/m)	Margin (dB)
902.000000	V	-2.5	31.3	28.80	18.30	61.9	-43.6
902.000000	H	-2.8	31.8	29.00	18.30	61.9	-43.6
918.000000	V	42.8	32.0	74.80	64.30	81.9	-17.6
918.000000	H	51.7	31.6	83.30	72.80	81.9	-9.1
928.000000	H	-2.5	32.2	29.70	19.20	61.9	-42.7
928.000000	V	-2.6	31.9	29.30	18.80	61.9	-43.1

8 FCC Part 15.231(b)(3)(c)

8.1 Requirements:

The bandwidth of the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier. 908 MHz bandwidth must be no wider than 4.54 MHz; 913 MHz no wider than 4.566 MHz, and 918 MHz no wider than 4.59 MHz.

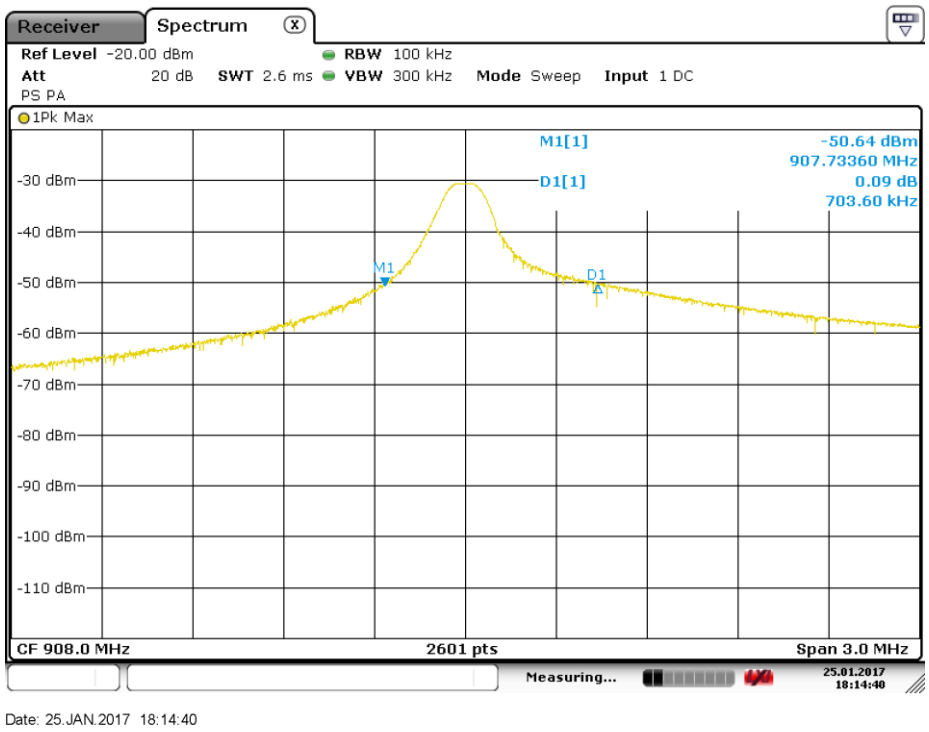
8.2 Test Data – OCCUPIED BANDWIDTH (-20dB)

Test Date:	Jan. 25, 2017	**Test Engineer:**	J. Knepper
Standards:	CFR 47 Part 15.231(b)(3)(c)	**Air Temperature:**	19.8ºC
		Relative Humidity:	51%

Occupied Bandwidth, Low Channel: 0.7036 MHz
Occupied Bandwidth, Mid Channel: 0.7001 MHz
Occupied Bandwidth, High Channel: 0.6424 MHz

Low Channel

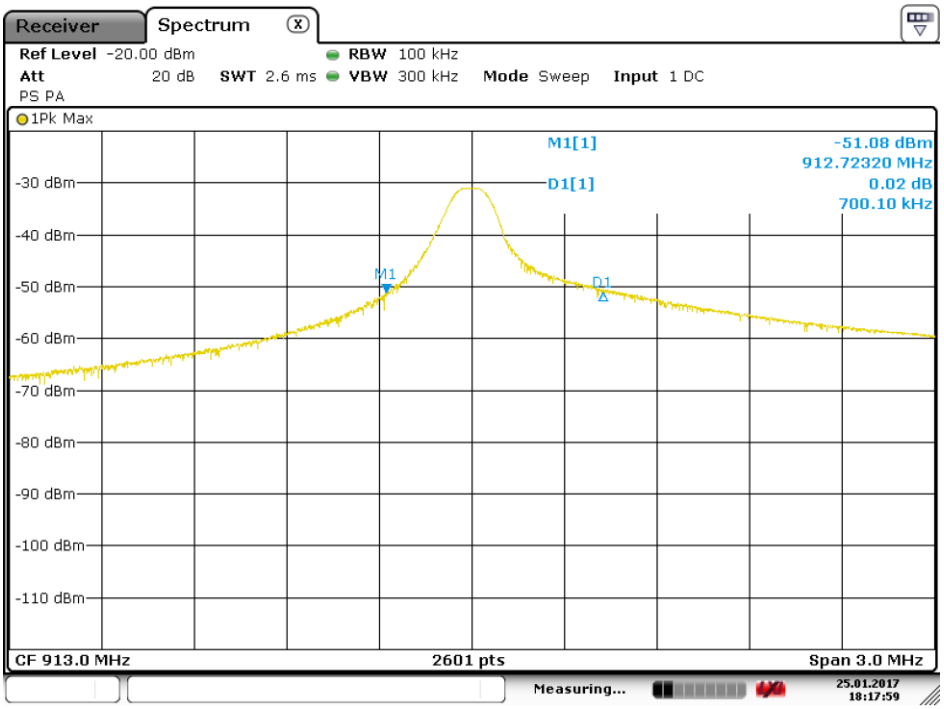
.



Date: 25.JAN.2017 18:14:40

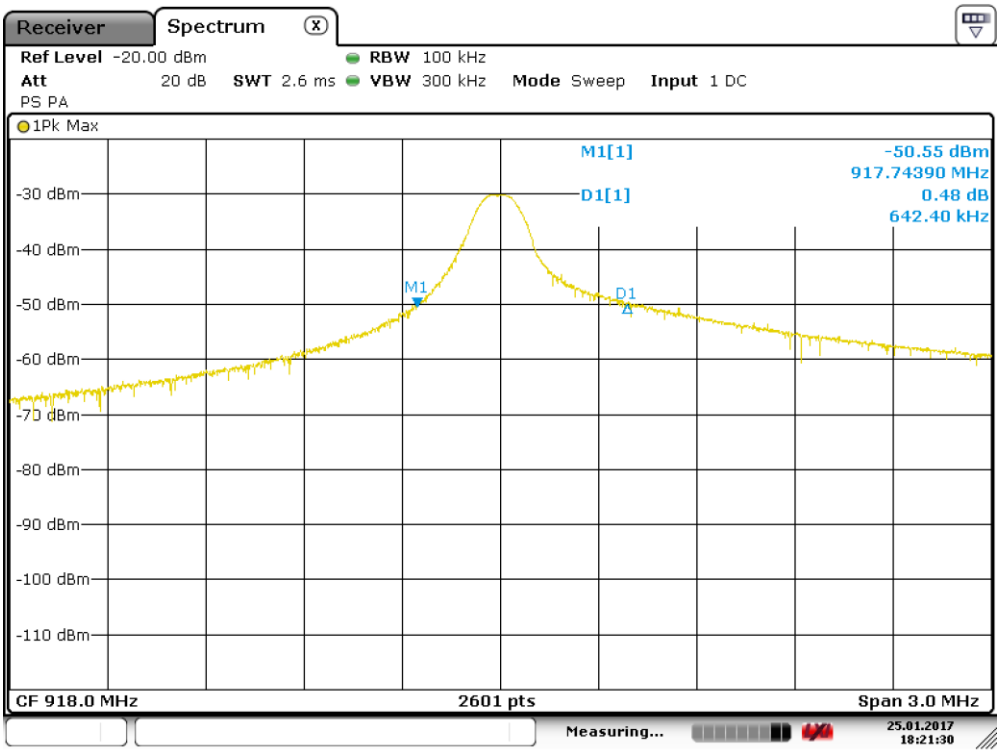
Mid Channel

.



Date: 25.JAN.2017 18:17:59

High Channel



Date: 25.JAN.2017 18:21:29

9 15.35(c) - DUTY CYCLE

A duty cycle correction factor was added to the Radiated Emissions average measurement.

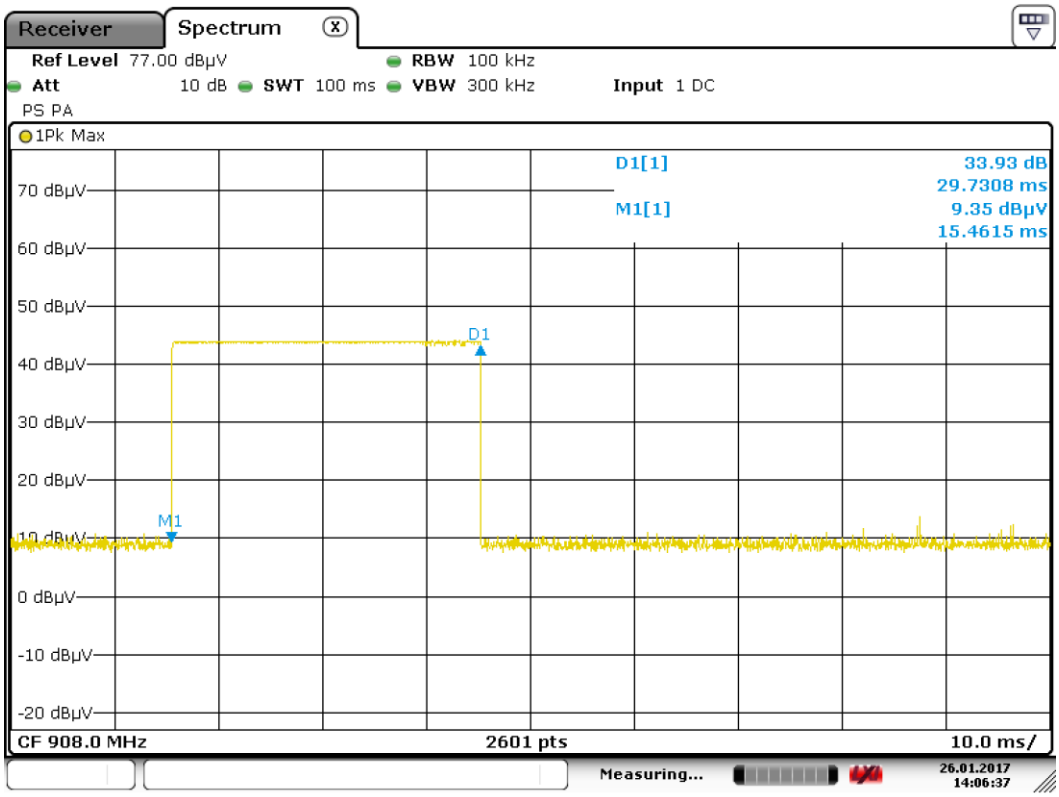
The formula used was: DCCF = $20 \log\left(\frac{29.76ms}{100ms}\right)$ = -10.5

9.2 Test Data

Test Date(s):	Jan. 26, 2017	Test Engineer(s):	J. Knepper
Standards:	CFR 47 Part 15.231	Air Temperature:	20.1ºC
		Relative Humidity:	55%

Low Channel

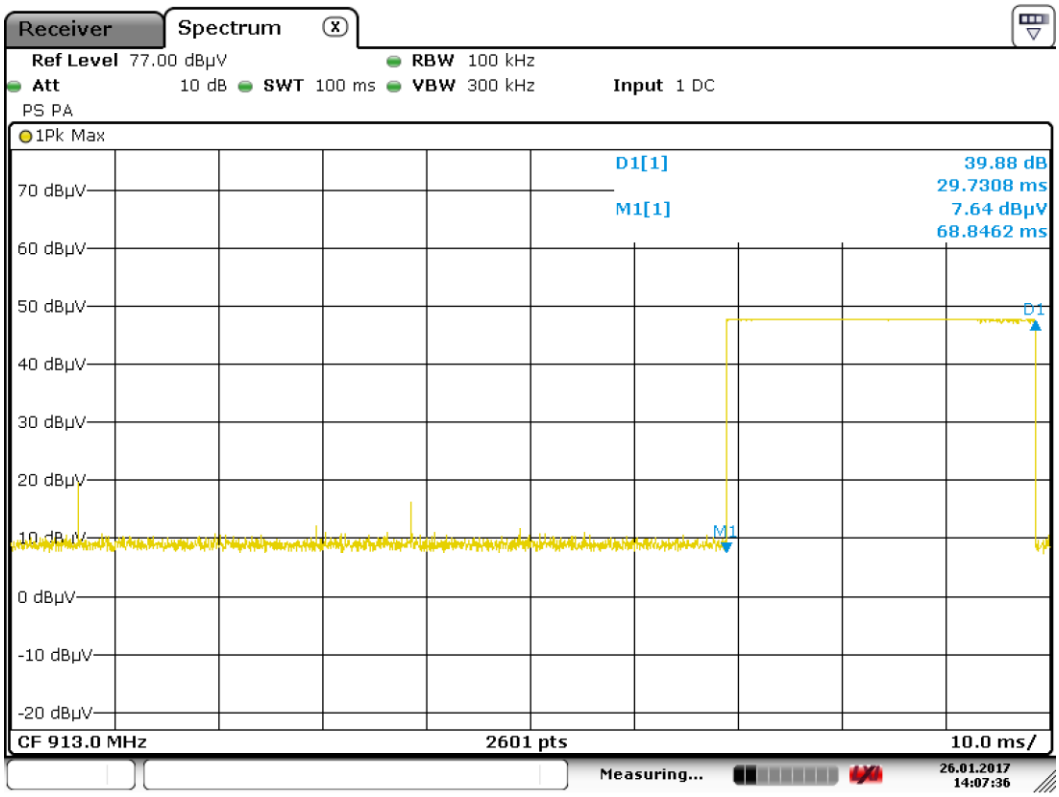
The following plot is of a single press and release of the manual push button three times, showing the Duty Cycle.



Date: 26.JAN.2017 14:06:38

Mid Channel

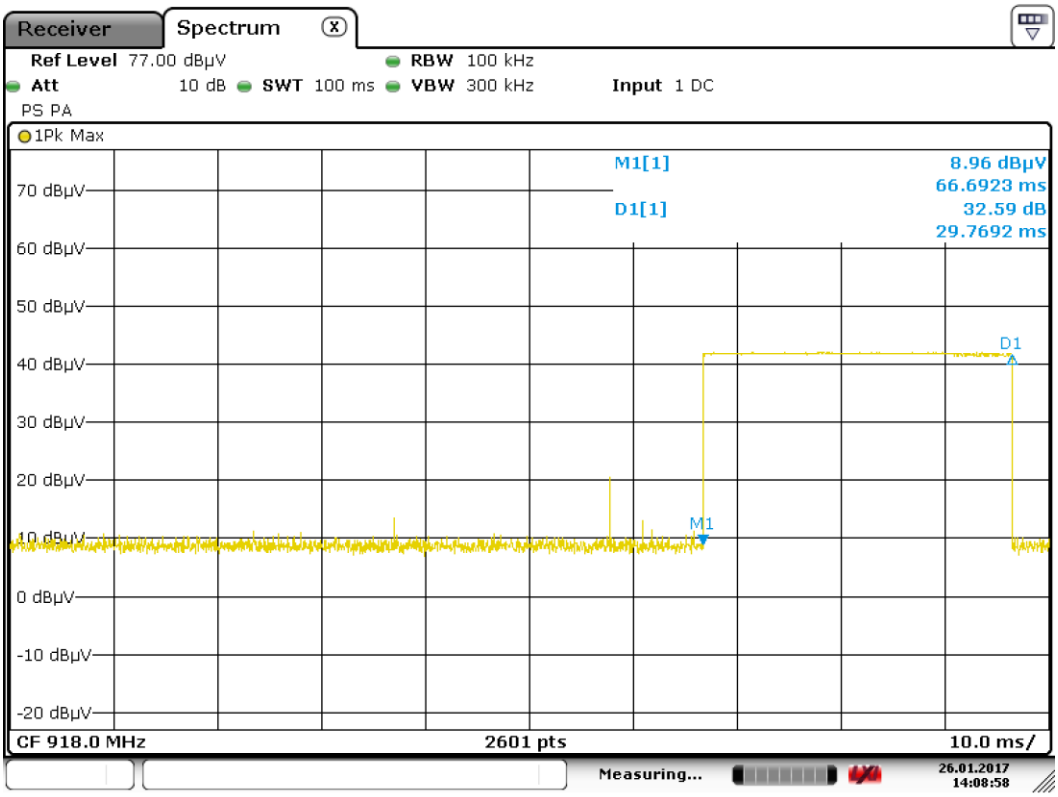
The following plot is of a single press and release of the manual push button, showing the Duty Cycle.



Date: 26.JAN.2017 14:07:36

High Channel

The following plot is of a single press and release of the manual push button one time, showing the Duty Cycle.



Date: 26.JAN.2017 14:08:58

10 CONDUCTED EMISSIONS

10.1 Requirements

In accordance with FCC CFR 47 Part 15.207(a), “Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

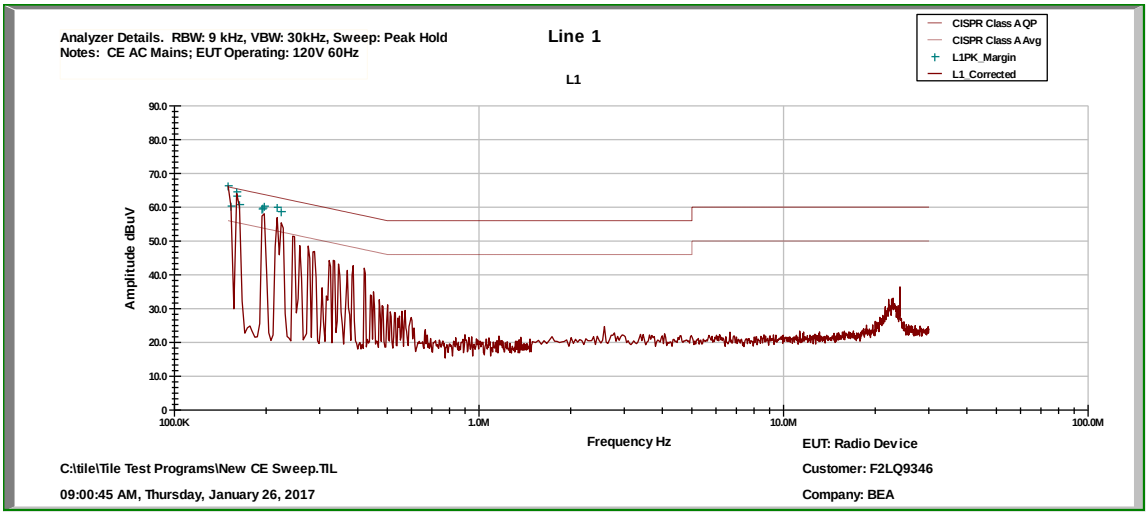
10.2 Procedure

The EUT was placed on a 1.0 x 1.5 meter non-conductive table, 0.8 meter above a horizontal ground plane and 0.4 meter from a vertical ground plane. Power was provided to the EUT through a LISN bonded to a 3 x 2 meter ground plane. The LISN and peripherals were supplied power through a filtered AC power source. The output of the LISN was connected to the input of the receiver via a transient limiter, and emissions in the range 150 kHz to 30 MHz were measured. The measurements were recorded using the quasi-peak and average detectors as directed by the standard, and the resolution bandwidth during testing was 9 kHz. The raw measurements were corrected to allow for attenuation from the LISN, transient limiter and cables.

10.3 Conducted Emissions Test Data

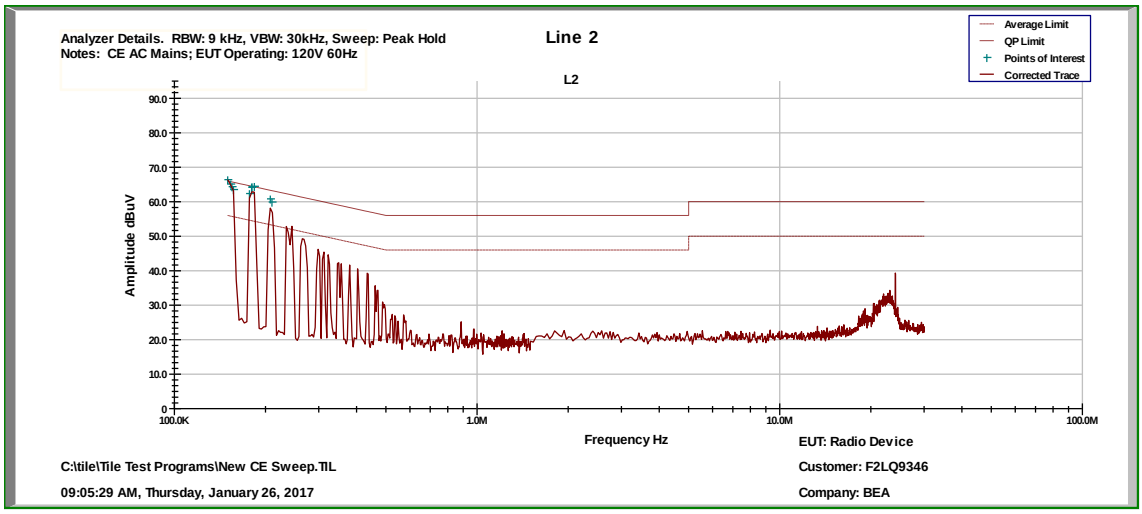
Test Date(s)	Jan. 26, 2017	**Test Engineer:**	J. Knepper
Rule:	15.207	**Air Temperature:**	19.1º C
Test Results:	Pass	**Relative Humidity:**	53%

Conducted Test – Line 1: 0.15 MHz to 30.0 MHz



Top Discrete Measurements								
No.	**Conductor**	**Frequency (MHz)**	**Detector**	**Level (dBµV)**	**Adjustment (dB)**	**Results (dBµV)**	**Limit (dBµV)**	**Margin (dB)**
1	Line 1	0.15	Quasi-Peak	49.220	11.782	61.002	66	-4.998
		0.15	Average	14.358	11.782	26.140	56	-29.860
2	Line 1	0.153375	Quasi-Peak	48.780	11.725	60.505	65.816	-5.31
		0.153375	Average	10.777	11.725	22.502	55.816	-33.314
3	Line 1	0.16	Quasi-Peak	48.710	11.614	60.324	65.464	-5.140
		0.16	Average	11.908	11.614	23.522	55.464	-31.942
4	Line 1	0.160125	Quasi-Peak	48.170	11.613	59.783	65.458	-5.68
		0.160125	Average	8.130	11.613	19.743	55.458	-35.715
5	Line 1	0.1635	Quasi-Peak	48.150	11.573	59.723	65.284	-5.561
		0.1635	Average	10.788	11.573	22.361	55.284	-32.923
6	Line 1	0.195	Quasi-Peak	43.220	11.279	54.499	63.821	-9.322
		0.195	Average	7.537	11.279	18.816	53.821	-35.005
7	Line 1	0.19725	Quasi-Peak	43.090	11.247	54.337	63.726	-9.389
		0.19725	Average	8.153	11.247	19.400	53.726	-34.326
8	Line 1	0.2175	Quasi-Peak	40.580	11.083	51.663	62.914	-11.251
		0.2175	Average	3.855	11.083	14.938	52.914	-37.976
9	Line 1	0.22425	Quasi-Peak	39.390	11.035	50.425	62.66	-12.235
		0.22425	Average	3.267	11.035	14.302	52.66	-38.358

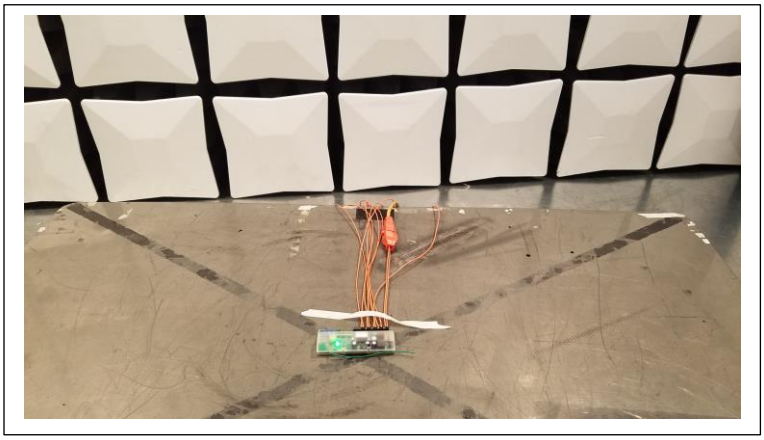
Conducted Test – Line 2: 0.15 MHz to 30.0 MHz



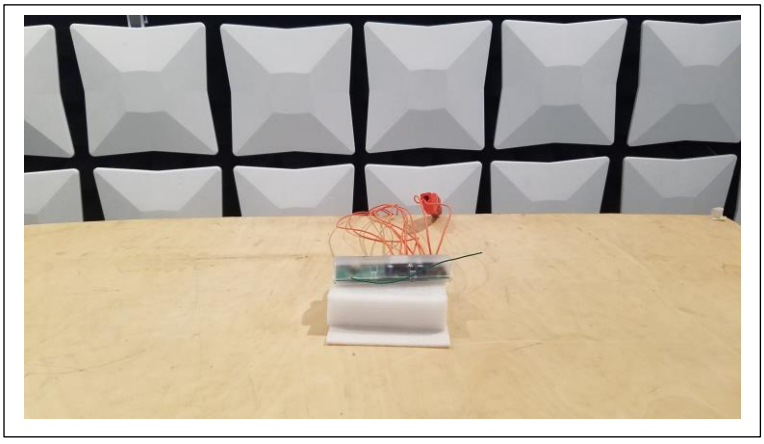
Top Discrete Measurements								
No.	Conductor	Frequency (MHz)	Detector	Level (dBµV)	Adjustment (dB)	Results (dBµV)	Limit (dBµV)	Margin (dB)
1	Line 2	0.15	Quasi-Peak	49.070	11.782	60.852	66	-5.148
		0.15	Average	14.847	11.782	26.629	56	-29.371
2	Line 2	0.153375	Quasi-Peak	49.020	11.725	60.745	65.816	-5.071
		0.153375	Average	14.608	11.725	26.333	55.816	-29.483
3	Line 2	0.155	Quasi-Peak	49.060	11.698	60.758	65.728	-4.970
		0.155	Average	14.460	11.698	26.158	55.728	-29.570
4	Line 2	0.15675	Quasi-Peak	49.060	11.669	60.729	65.636	-4.907
		0.15675	Average	15.375	11.669	27.044	55.636	-28.592
5	Line 2	0.177	Quasi-Peak	46.720	11.420	58.140	64.626	-6.49
		0.177	Average	12.835	11.420	24.255	54.626	-30.371
6	Line 2	0.18	Quasi-Peak	46.400	11.386	57.786	64.486	-6.700
		0.18	Average	12.245	11.386	23.631	54.486	-30.855
7	Line 2	0.180375	Quasi-Peak	46.310	11.385	57.695	64.469	-6.774
		0.180375	Average	12.295	11.385	23.680	54.469	-30.789
8	Line 2	0.18375	Quasi-Peak	45.450	11.373	56.823	64.315	-7.492
		0.18375	Average	12.027	11.373	23.400	54.315	-30.915
9	Line 2	0.207375	Quasi-Peak	42.000	11.155	53.155	63.311	-10.156
		0.207375	Average	7.338	11.155	18.493	53.311	-34.818
10	Line 2	0.21	Quasi-Peak	41.740	11.137	52.877	63.205	-10.328
		0.21	Average	6.747	11.137	17.884	53.205	-35.321

11 PHOTOGRAPHS

**Radiated Spurious Emissions, <1 GHz,
15.231(a)(1), Occupied Bandwidth, Duty Cycle**



Radiated Spurious Emissions, >1 GHz



Conducted Emissions