



**FCC 47 CFR PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 8**

**BLUETOOTH LOW ENERGY  
CERTIFICATION TEST REPORT**

**FOR**

**Chamberlain Group Inc.**  
**Class 2 Permissive Change Report**

**BT LE Garage Door Sensor**

**MODEL NUMBER: 041D7924**

**REPORT NUMBER: 13N16052**

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Revision History

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Chamberlain Group Inc.  
845 Larch Av  
Elmhurst, IL 60126

**EUT DESCRIPTION:** BT LE Garage Door Sensor

**MODEL:** 041D7924

**SERIAL NUMBER:** prototype

**DATE TESTED:** September 09, 2013 – September 10, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
*CFR 47 Part 15 Subpart C	Pass
*INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
*INDUSTRY CANADA RSS-GEN Issue 3	Pass

\* Only Radiated Spurious Emissions Testing, Radiated Band edge Emissions and Peak power output tests were conducted. All other tests are not affected by the power change.

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, IL 60062, USA

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/Standards/scopes/1004140.htm>

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an Low Energy Blue Tooth transceiver. This device is identical to previously tested device except for power level output. Software setting was changed on this device from 4dBm power level to 0dBm power level to avoid potential chip non-linearity and saturation of the amplifier.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)	Comments
2402 - 2480	TX Modulated	1.27	1.34	Original Device
2402 - 2480	TX Modulated	-2.02	0.63	Reduced Power Device

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an internal PCB antenna with gain of less then 6dB. Based on Measured FS of fundamental emission (94.33dBuV/m @ 3m – 95.2dB = -0.97dBm EIRP) and measured output power the antenna gain is -2.27dBi.

### 5.4. SOFTWARE AND FIRMWARE

Device was programmed to transmit continuously by manufacturer on selected channels with 100% duty cycle. Power selection setting was at 0dBm

### WORST-CASE CONFIGURATION AND MODE

The EUT is normally installed on garage doors. The two possible orientations of the EUT are referred to as door opened and door closed. For radiated spurious emissions the EUT was tested in both orientations. Worst case orientation was found as door open position. All radiated spurious testing for Class 2 Permissive Change was done in door open position.

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

No Support Equipment required for testing

### I/O CABLES

No I/O cables

### TEST SETUP

Tested as stand-alone in both door open position.

## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

### Radiated Emissions – 10-Meter Chamber

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20121227	20131231
Spectrum Analyzer	Agilent	E4446A	s/n MY45300099	20130129	20150129
Antenna Array	UL	BOMS Assembly (1GHz-40GHz)	EMC4276	20111227	20131231

### Antenna Port Conducted Emissions

Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum analyzer	Agilent	PXA	EMC4360	20121226	20131226
Cable and Attenuator	-	-	-	*	*

\* measured at the time of testing

## 7. ANTENNA PORT TEST RESULTS

### 7.1. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

#### TEST PROCEDURE

FCC KDB Publication "558074 D01 DTS Meas Guidance v03r01", using option 9.1.1 RBW greater or equal to DTS bandwidth.

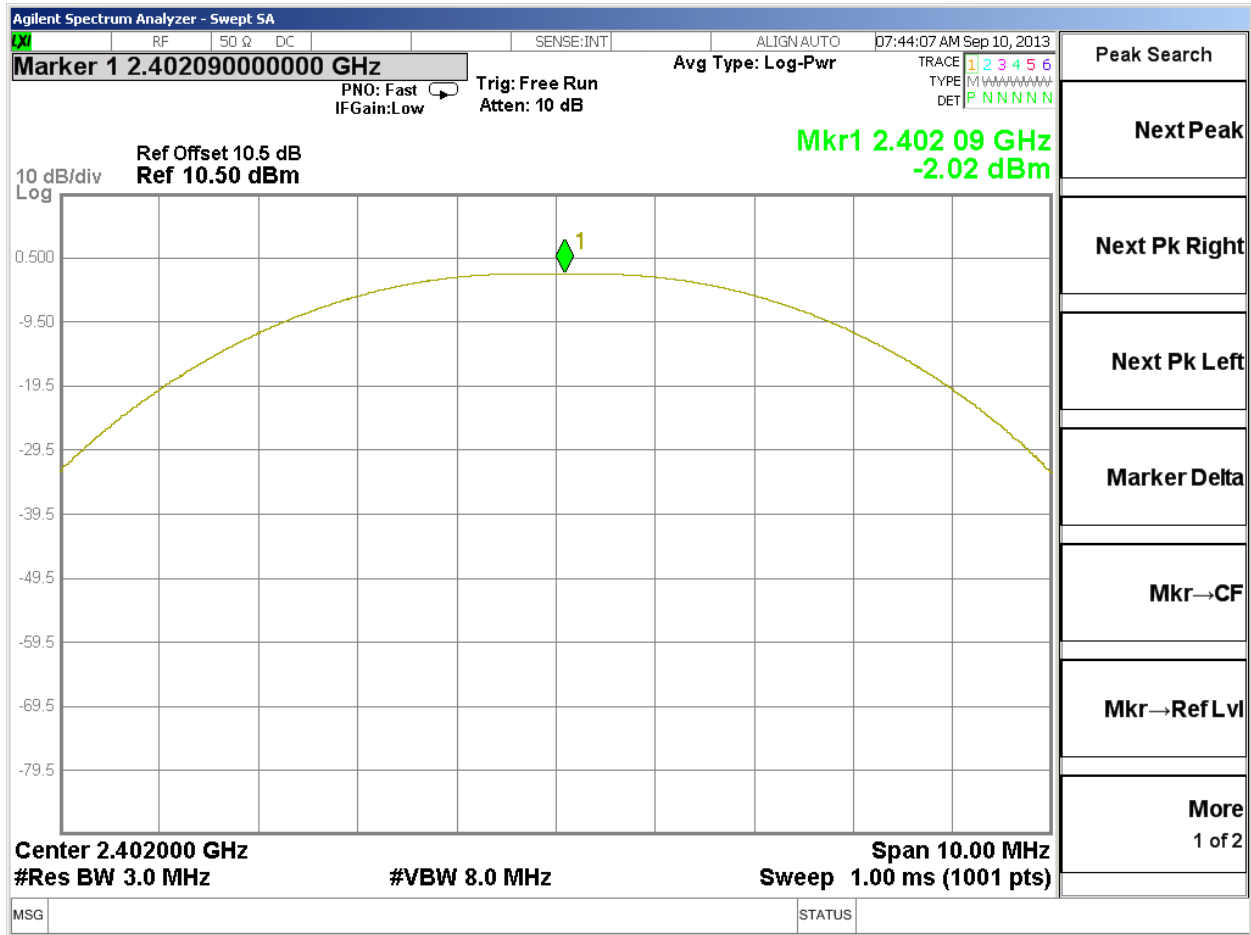
#### RESULTS – NEW MEASUREMENT DATA

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-2.020	30	-32.020
Middle	2440	-2.070	30	-32.070
High	2480	-2.450	30	-32.450

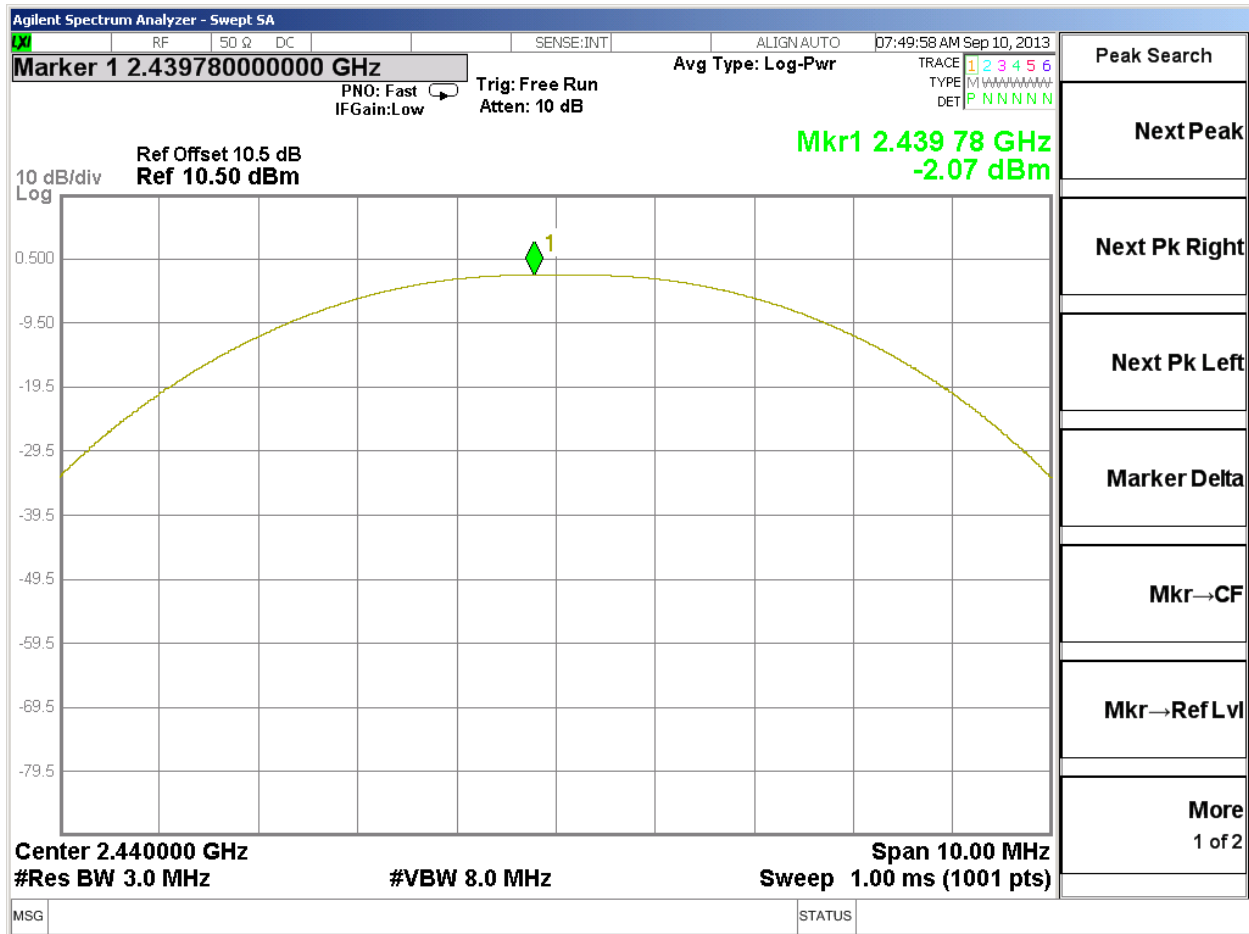


**OUTPUT POWER**

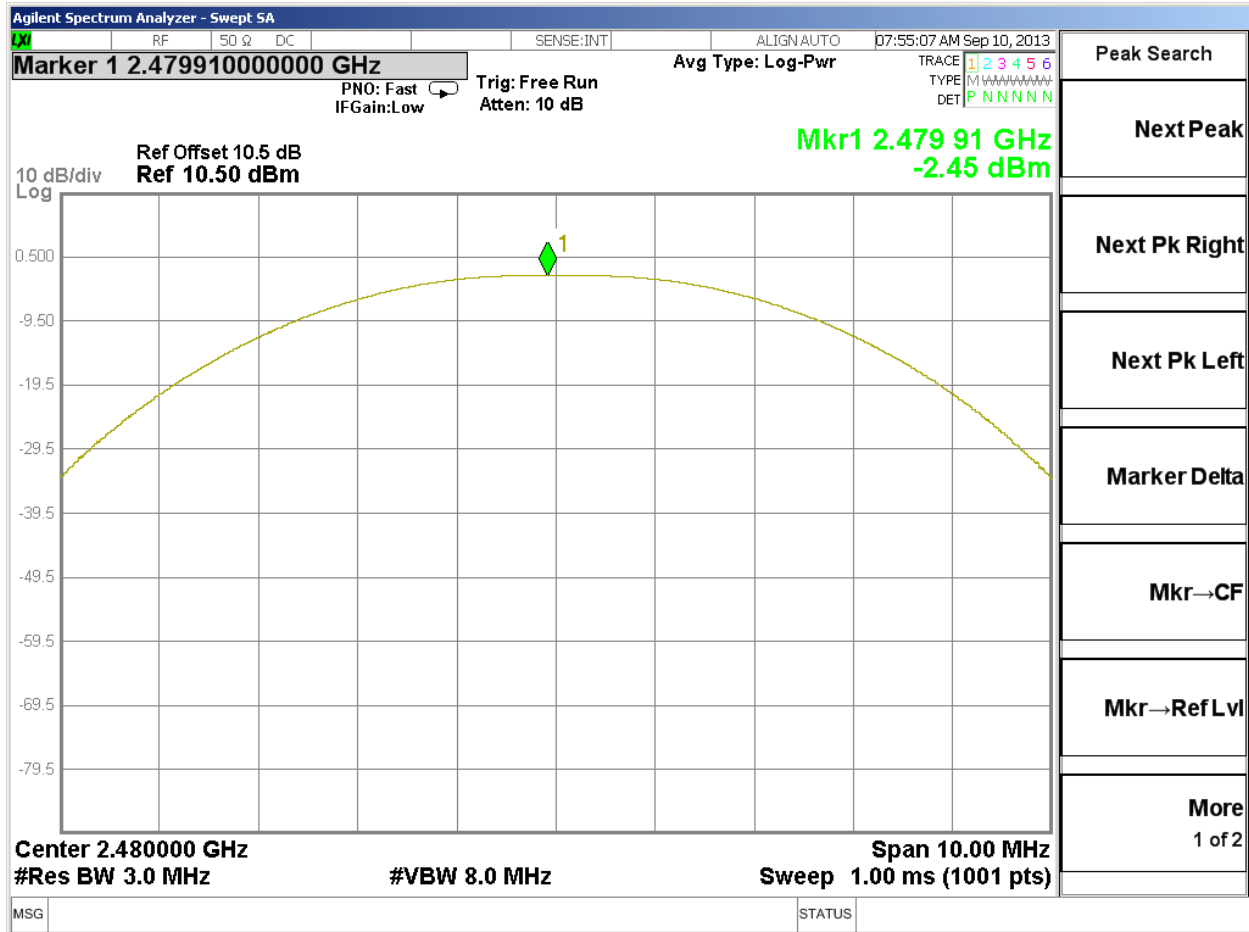
Low Channel



Middle Channel



High Channel



## RADIATED TEST RESULTS

### 7.2. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4:2003. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

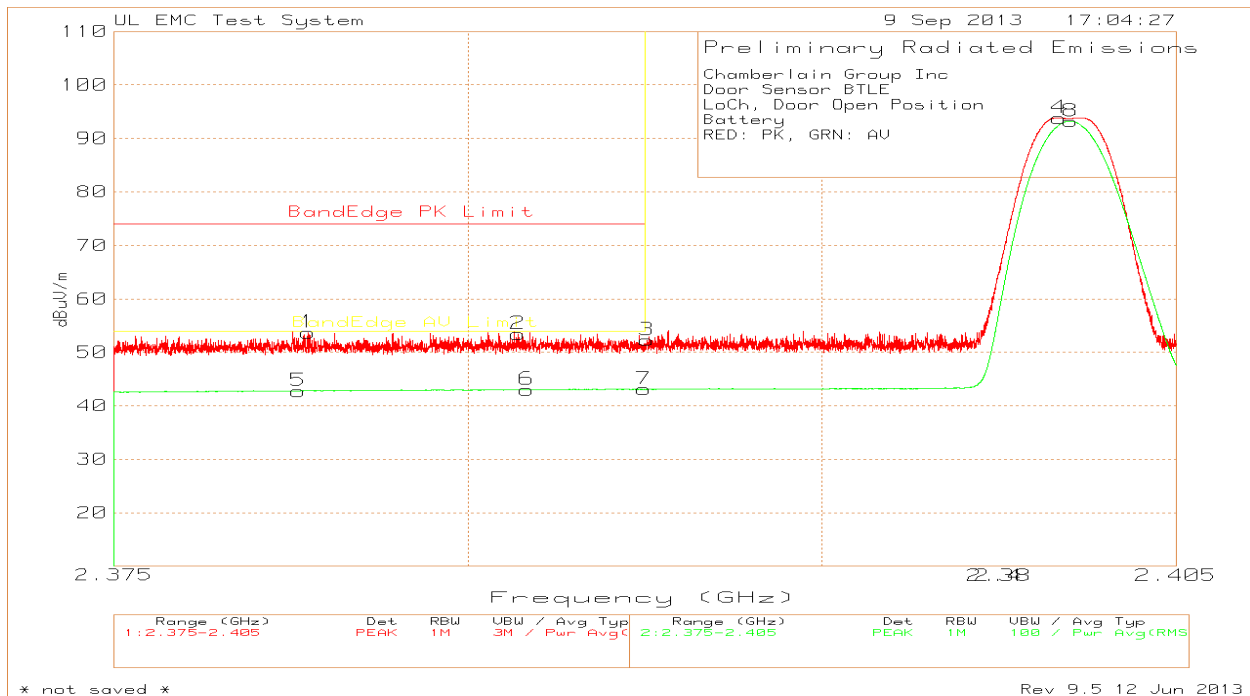
For measurements above 1 GHz (band-edge only) the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 3 kHz (pulse on-time is 400uS) for average measurements. There were no harmonics measured above 1GHz and compliance is based on peak pre-scan data.

The spectrum from 30 MHz to 25 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

### 7.3. TX ABOVE 1 GHz FOR BLUETOOTH LOW ENERGY MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (DOOR OPEN, LOW CHANNEL, HORIZONTAL)



Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	AF dB/m	CF dB	Level dBuV/m	Limit	Margin (dB)	Height [cm]	Polarity
1	2.3805	27.62	PK	21.8	4.3	53.72	74	-20.28	99	H
2	2.3864	27.23	PK	21.8	4.42	53.45	74	-20.55	99	H
3	2.390	26.04	PK	21.8	4.48	52.32	74	-21.68	99	H
4	2.4017	67.76	PK	21.8	4.27	93.83	n/a	n/a	99	H
Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	AF dB/m	CF dB	Level dBuV/m	Limit	Margin (dB)	Height [cm]	Polarity
5	2.3802	16.69	LinAV	21.8	4.3	42.79	54	-11.21	99	H
6	2.3867	16.84	LinAV	21.8	4.42	43.06	54	-10.94	99	H
7	2.390	16.82	LinAV	21.8	4.48	43.1	54	-10.9	99	H
8	2.402	67.16	LinAV	21.8	4.26	93.22	n/a	n/a	99	H

PK - Peak detector  
 LnAv - Linear Average detector  
 AF - Antenna Factor, CF - Cable Factor

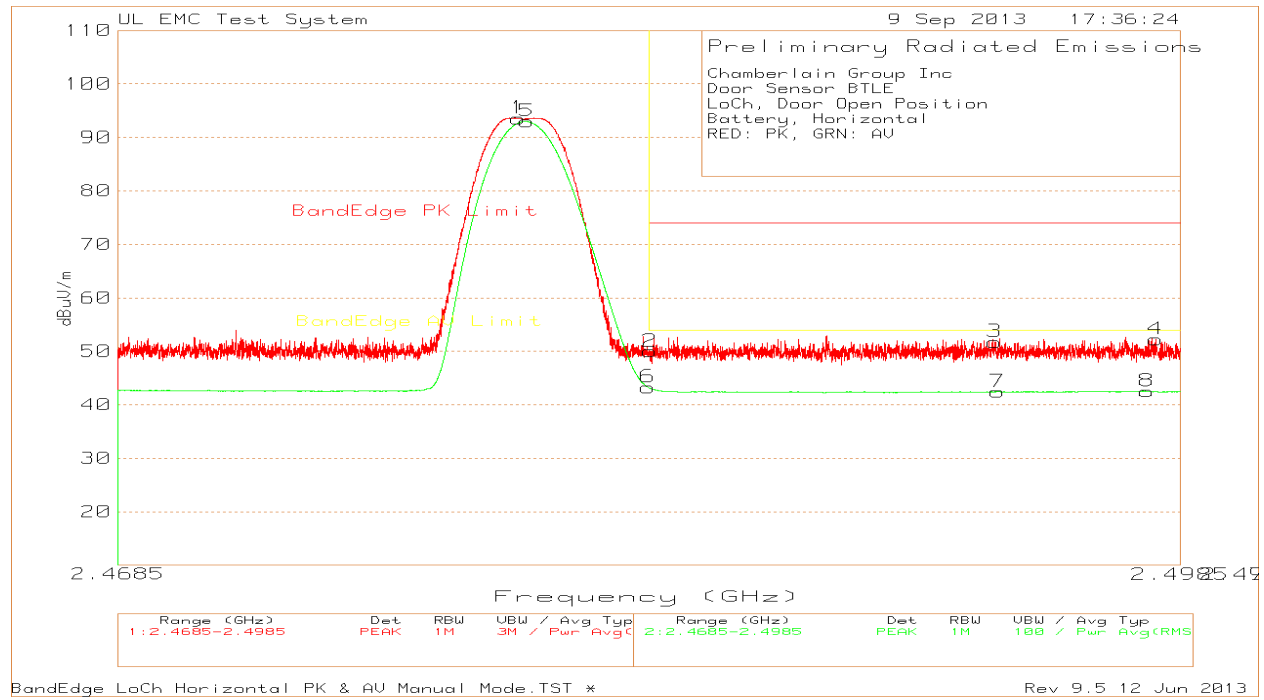
**RESTRICTED BANDEGE (DOOR OPEN, LOW CHANNEL, VERTICAL)**



Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	AF dB/m	CF dB	Level dBuV/m	Limit	Margin (dB)	Height [cm]	Polarity
1	2.3817	26.3	PK	21.8	4.34	52.44	74	-21.56	100	V
2	2.39	28	PK	21.8	4.48	54.28	74	-19.72	100	V
3	2.4017	50.91	PK	21.8	4.27	76.98	n/a	n/a	100	V
Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	AF dB/m	CF dB	Level dBuV/m	Limit	Margin (dB)	Height [cm]	Polarity
4	2.3814	16.78	LinAV	21.8	4.33	42.91	54	-11.09	100	V
5	2.39	16.85	LinAV	21.8	4.48	43.13	54	-10.87	100	V
6	2.402	50.03	LinAV	21.8	4.26	76.09	n/a	n/a	100	V

PK - Peak detector  
 LnAv - Linear Average detector  
 AF - Antenna Factor, CF - Cable Factor

**RESTRICTED BANDEDGE (DOOR OPEN (worst case), HIGH CHANNEL, HORIZONTAL)**

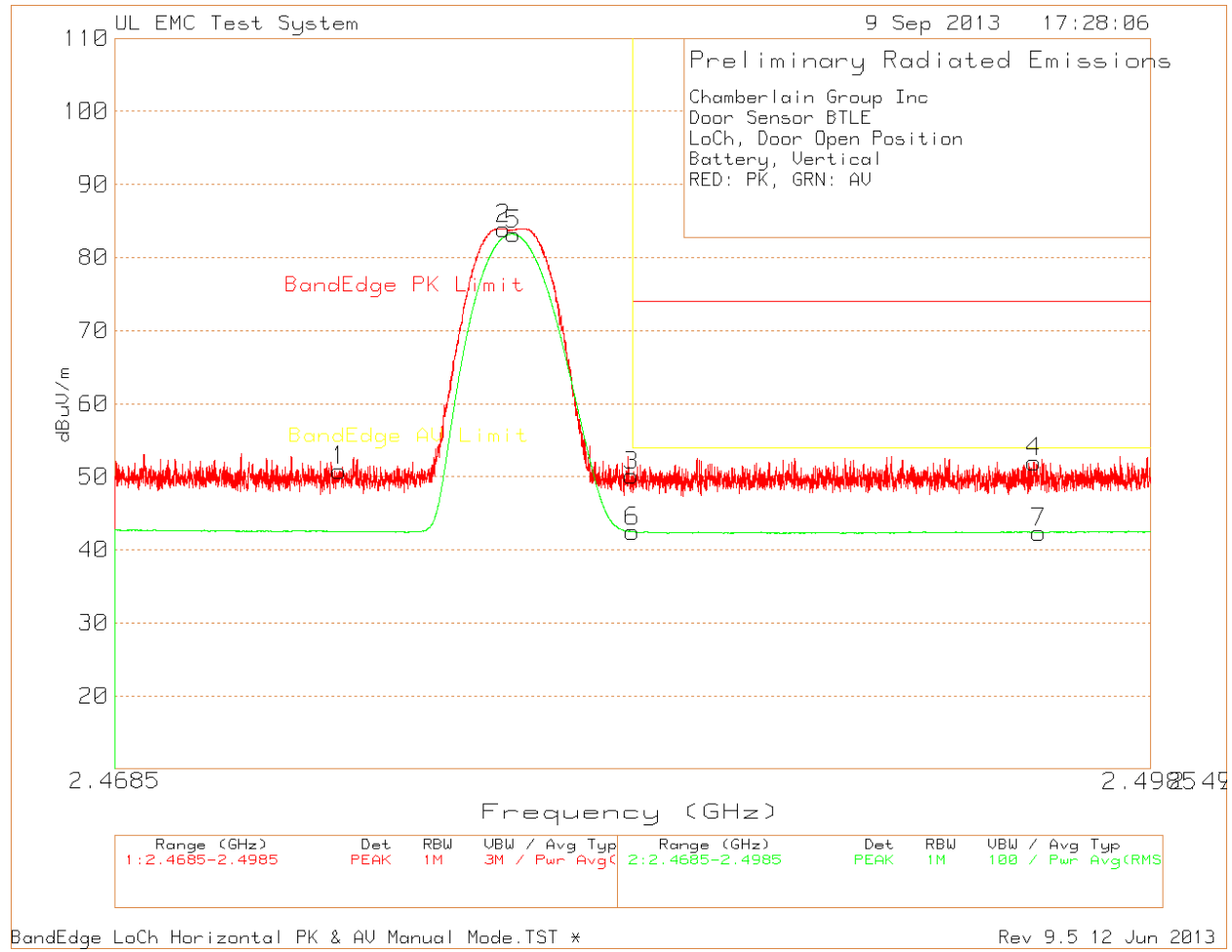


BandEdge LoCh Horizontal PK & AV Manual Mode.TST \* Rev 9.5 12 Jun 2013

Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	AF dB/m	CF dB	Level dBuV/m	Limit	Margin (dB)	Height [cm]	Polarity
1	2.4798	67.83	PK	22	3.77	93.6	n/a	n/a	99	H
2	2.4835	24.12	PK	22.1	3.77	49.99	74	-24.01	99	H
3	2.4933	25.79	PK	22.1	3.86	51.75	74	-22.25	99	H
4	2.4978	26.19	PK	22.1	3.93	52.22	74	-21.78	99	H
Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	AF dB/m	CF dB	Level dBuV/m	Limit	Margin (dB)	Height [cm]	Polarity
5	2.4801	67.21	LinAV	22	3.77	92.98	n/a	n/a	99	V
6	2.4835	17.41	LinAV	22.1	3.77	43.28	54	-10.72	99	V
7	2.4934	16.47	LinAV	22.1	3.86	42.43	54	-11.57	99	V
8	2.4976	16.52	LinAV	22.1	3.93	42.55	54	-11.45	99	V

PK - Peak detector  
 LinAv - Linear Average detector  
 AF - Antenna Factor, CF - Cable Factor

**RESTRICTED BANDEDGE (DOOR OPEN (worst case), HIGH CHANNEL, VERTICAL)**



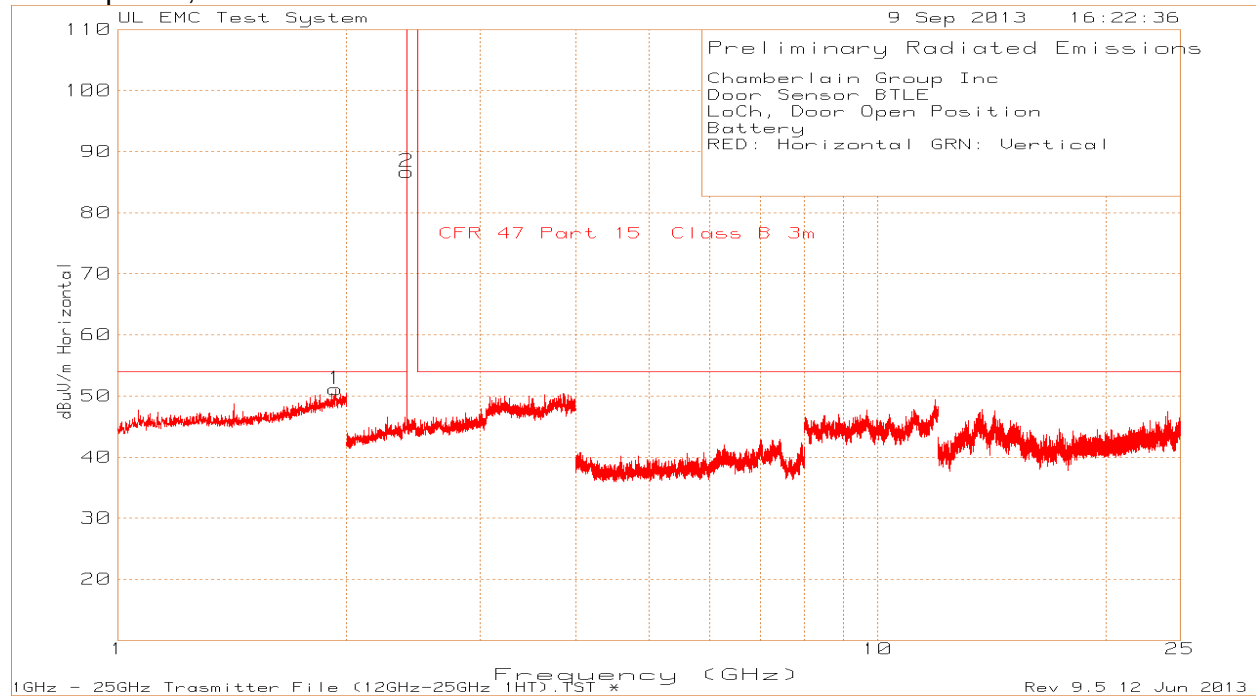
Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	AF dB/m	CF dB	Level dBuV/m	Limit	Margin (dB)	Height [cm]	Polarity
1	2.475	25	PK	22	3.81	50.81	n/a	n/a	165	V
2	2.4798	58.14	PK	22	3.77	83.91	n/a	n/a	165	V
3	2.4835	24.26	PK	22.1	3.77	50.13	74	-23.87	165	V
4	2.4951	26.02	PK	22.1	3.89	52.01	74	-21.99	165	V
Marker No.	Test Frequency (GHz)	Meter Reading dBuV	Detector	AF dB/m	CF dB	Level dBuV/m	Limit	Margin (dB)	Height [cm]	Polarity
5	2.4801	57.42	LinAV	22	3.77	83.19	n/a	n/a	165	V
6	2.4835	16.64	LinAV	22.1	3.77	42.51	54	-11.49	165	V
7	2.4953	16.42	LinAV	22.1	3.89	42.41	54	-11.59	165	V

PK - Peak detector  
 LnAv - Linear Average detector  
 AF - Antenna Factor, CF - Cable Factor



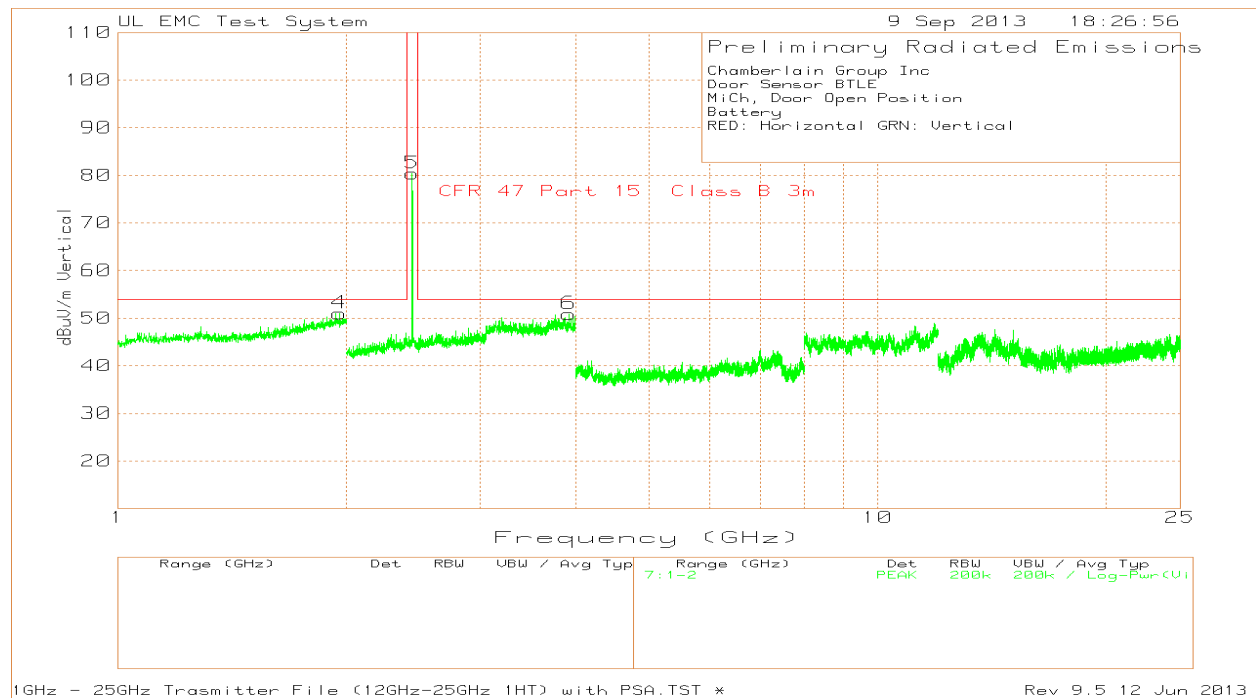
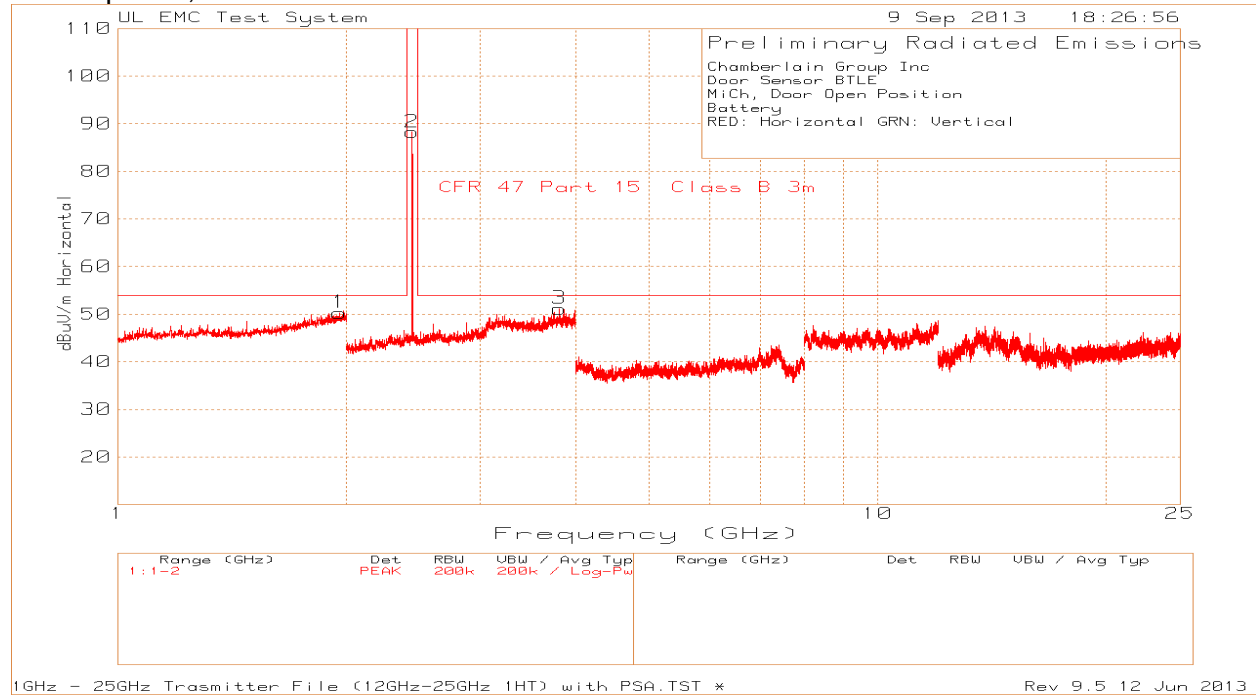
**HARMONICS AND SPURIOUS EMISSIONS**

**Door Opened, Low Channel**



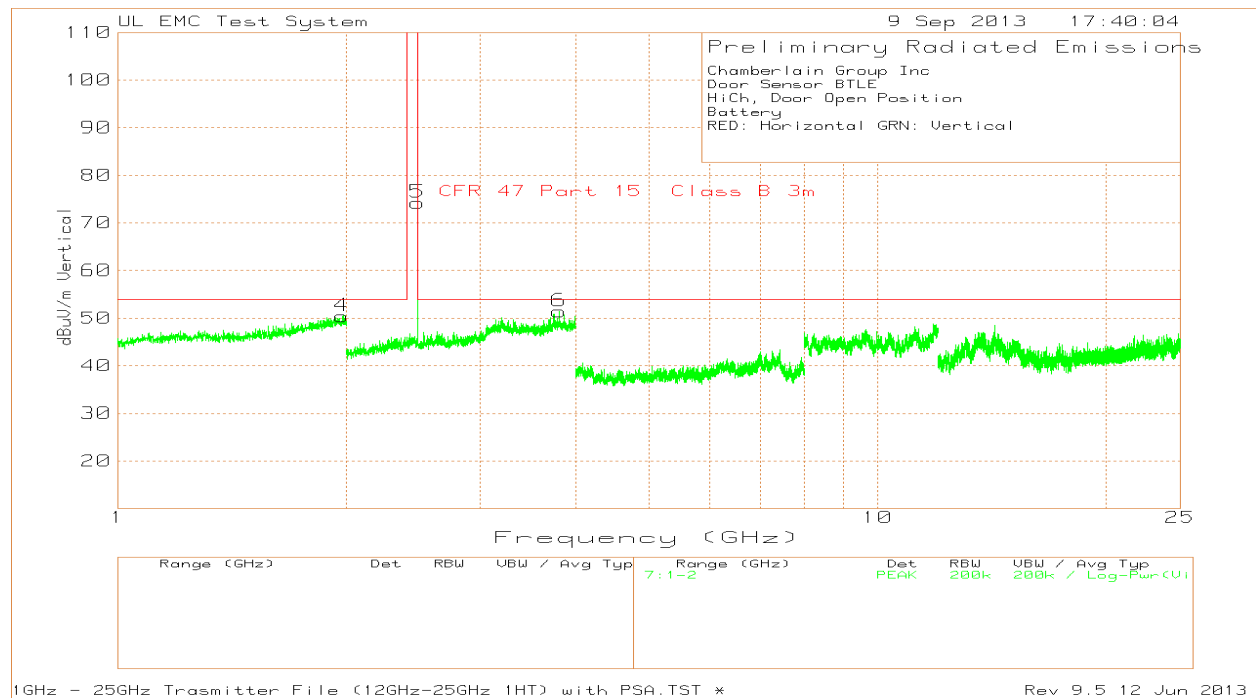
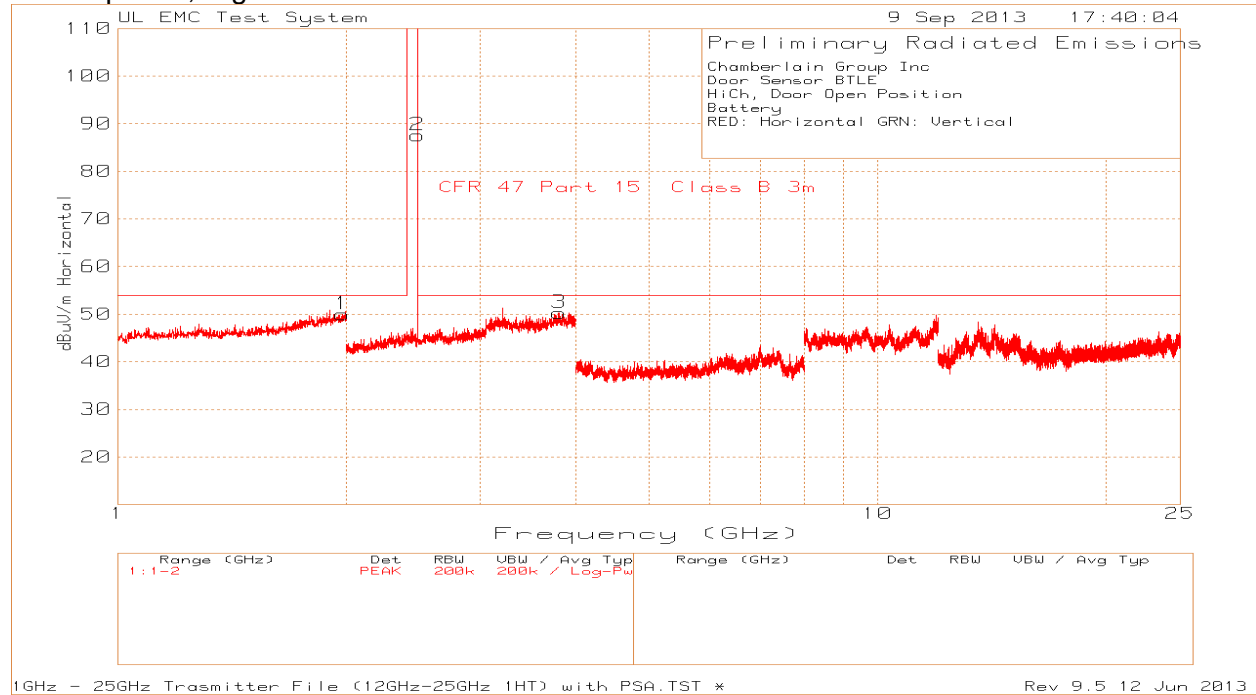
Based on peak pre-scan data there is no spurious emissions recorded above the noise floor.

Door Opened, Middle Channel



Based on peak pre-scan data there is no spurious emissions recorded above the noise floor.

Door Opened, High Channel



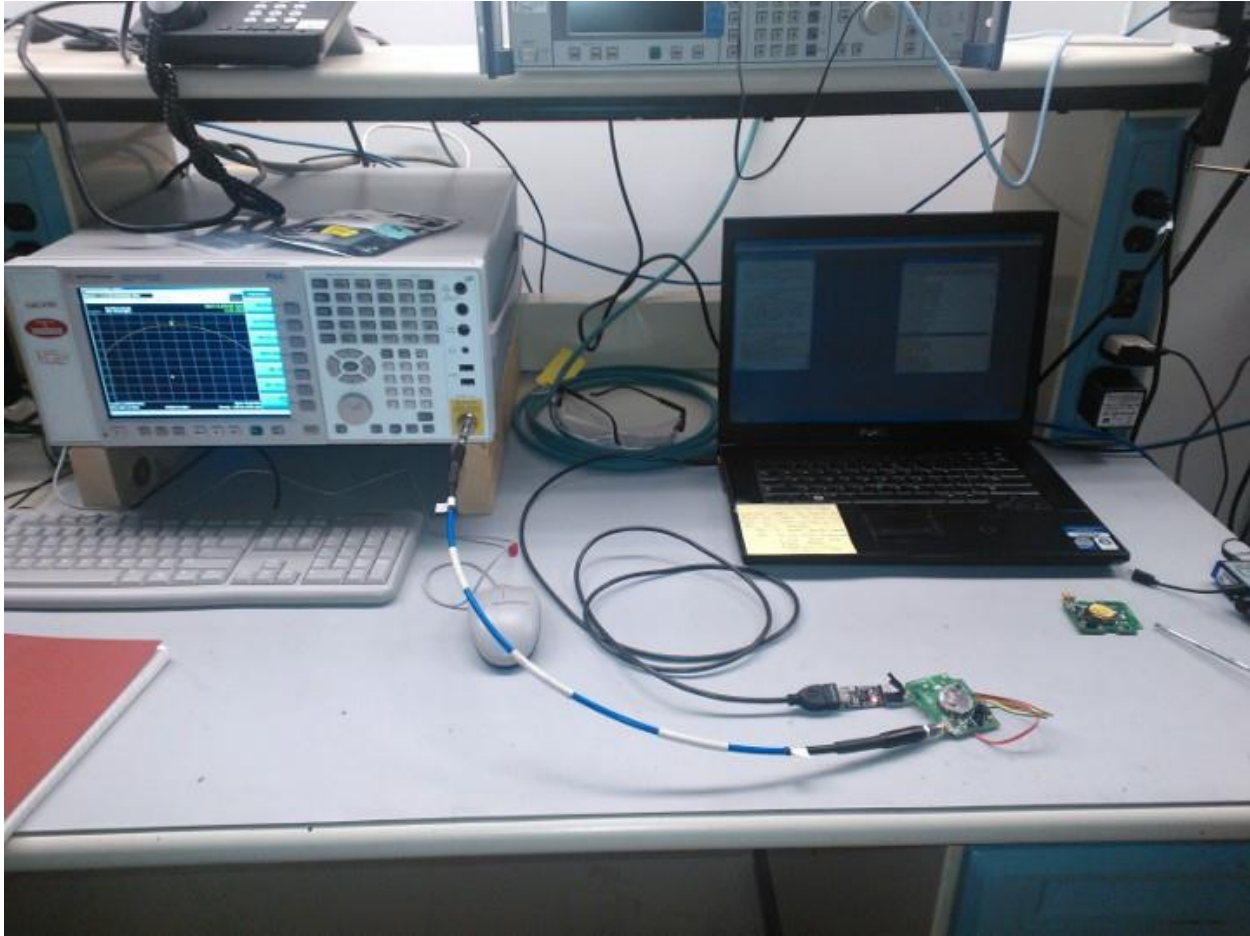
Based on peak pre-scan data there is no spurious emissions recorded above the noise floor.

## 8. SETUP PHOTOS

Radiated Emissions Door Open Position



### Antenna Port Measurements



## END OF REPORT