



**FCC 47 CFR PART 15 SUBPART C  
INDUSTRY CANADA RSS-247 ISSUE 2**

**PERMISSIVE CHANGE  
CERTIFICATION TEST REPORT**

**FOR**

**GDO with 900MHz FHSS Transceiver and 2.4GHz WiFi Module**

**MODEL NUMBER: 001D8850**

**FCC ID: HBW1D8088-1  
IC: 2666A-1D8088**

**REPORT NUMBER: 11752100A**

**ISSUE DATE: June 2, 2017**

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NVLAB LAB CODE: 100414-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--		Initial Issue	

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** The Chamberlain Group, Inc.  
300 Windsor Dr  
Oak Brook, IL 60523, US

**EUT DESCRIPTION:** GDO with 900MHz FHSS Transceiver and 2.4GHz WiFi Module

**MODEL:** 001D8850

**SERIAL NUMBER:** non-serialized

**DATE TESTED:** May 1, 2017 to May 12, 2017

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 2	Pass
INDUSTRY CANADA RSS-GEN Issue 4	Pass

UL LLC 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 LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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, or any agency of the U.S. Government.

Approved & Released For  
UL LLC By: Jeff Moser



PROGRAM MANAGER  
UL LLC

Tested By: Bart Mucha



STAFF ENGINEER  
UL LLC

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, RSS-GEN Issue 4, RSS-247 Issue 2.

## 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 NBK is accredited by NVLAP, Laboratory Code 100414-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/>

## 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

#### Sample Calculations

Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)

Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)

Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test	Range	Equipment	Uncertainty k=2
Radiated Emissions	30-200MHz	Bicon 10m Horz	4.27dB
Radiated Emissions	30-200MHz	Bicon 10m Vert	4.28dB
Radiated Emissions	200-1000MHz	LogP 10m Horz	3.33dB
Radiated Emissions	200-1000MHz	LogP 10m Vert	3.39dB
Radiated Emissions	30-200MHz	Bicon 3m Horz	3.30dB
Radiated Emissions	30-130MHz	Bicon 3m Vert	4.84dB
Radiated Emissions	130-200MHz	Bicon 3m Vert	4.94dB
Radiated Emissions	200-1000MHz	LogP 3m Horz	3.46dB
Radiated Emissions	200-1000MHz	LogP 3m Vert	4.98dB
Radiated Emissions	1-6GHz	Horn	5.02dB
Radiated Emissions	6-18GHz	Horn	5.34dB
Radiated Emissions	18-26GHz	Horn	6.60dB
Conducted Ant Port	30MHz-26GHz	Spectrum Analyzer	2.94
Occupied Channel Bandwidth	30MHz-26GHz	Spectrum Analyzer	± 0.39 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an Garage Door Operator with FHSS transceiver operating between 902MHz – 928MHz. The GDO also contains a modular WiFi transceiver, FCC ID: COFWMNBM11 / IC: 10239A-WMNBM11

The radio circuit and area around the radio circuit is identical to the originally certified device. The only change is where one side of the board was extended to allow for additional connectors for additional accessories.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
902.25	12.118	16.29
914.75	11.459	13.99
926.75	10.946	12.43

\* highest power recorded for original EUT and contained in original FCC test report FCC ID: HBW1D8808-1

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an wire antenna, with a peak gain of -2 dBi determined by simulation.

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 127A0491, Rev B

## **5.5. CONFIGURATION AND MODE**

For Line conducted emissions and Radiated Emissions between 9kHz and 1GHz EUT was set to hop on all channels.

Radiated emission between 1GHz and 10GHz were performed with the EUT set to transmit on low, middle and high channels individually.

The EUT was oriented in a normal installation position (gear up).



## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
EUT	Chamberlain Group IN	001D8088-1	non-serialized	HBW1D8088-1
Photo Eyes	Chamberlain Group IN	Generic	non-serialized	N/A
Wall Control	Chamberlain Group IN	Generic	non-serialized	N/A
Door Lock	Chamberlain Group IN	Generic	non-serialized	N/A

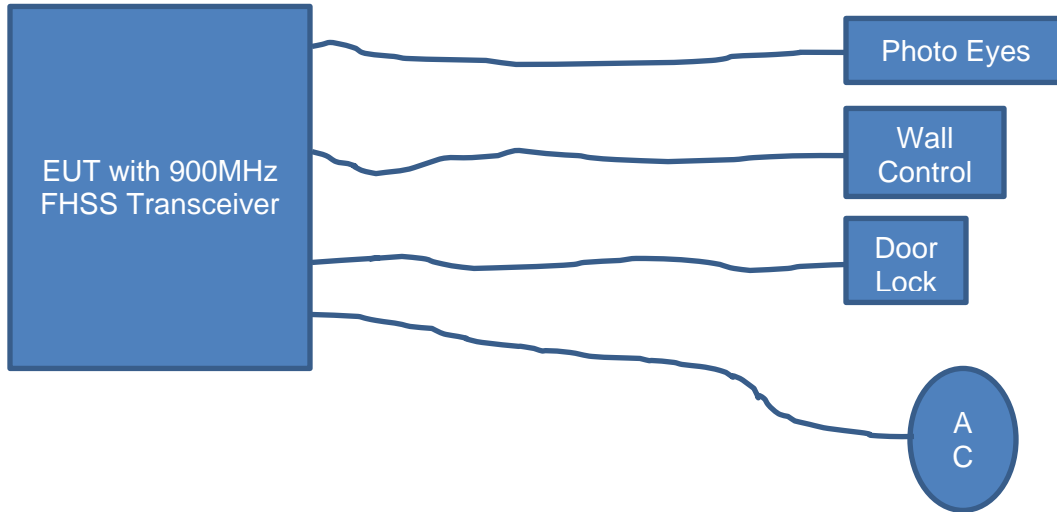
### I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	PHoto EYes	1	custom	solid wire	1m	none
2	Wall Control	1	custom	solid wire	1m	none
3	Door Lock	1	custom	solid wire	1m	none

### TEST SETUP

The wireless device is part of the main board of the GDO.

**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List					
Description	Manufacturer	Model	Eqp. No.	Cal Date	Cal Due
Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014		
Conducted Software	UL	UL EMC	Ver 9.5, May 17 2012		
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	12/2/2016	12/31/2017
Bicon Antenna	Chase	VBA6106A	EMC4078	2/15/2017	2/28/2018
Log-P Antenna	Chase	UPA6109	EMC4258	5/11/2016	5/31/2017
Loop Antenna	EMCO	6502/1	EMC4026	5/22/2016	5/31/2017
Antenna Array	UL	BOMS	EMC4276	11/15/2016	11/15/2017
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	12/24/2016	12/31/2017
EMI Test Receiver	Rohde & Schwarz	ESR	EMC4377	12/30/2016	12/31/2017
Transient Limiter	Electro-Metrics	EM7600-2	EMC4224	N/A	N/A
"Behind Attenuator"					
High Pass Filter	Solar Electronics	2803-150	EMC4327	N/A	N/A
Attenuator	HP	8494B	2831A00838	N/A	N/A
LISN - L1	Solar	8602-50-TS-50-N	EMC4066	12/30/2016	12/31/2017

## 7. MEASUREMENT METHODS

ANSI C63.10:2013 and specific references are listed under procedure for each test.

## 7.1. DUTY CYCLE

### LIMITS

Measured for the purpose of:

a) if device cannot be set to 100% duty cycle when operating on individual channels (low, mid and high) measure the duty cycle and apply to the radiated spurious emissions measurements in restricted bands.

b) in hopping mode it is likely that the same channel will be only used for few mS out of 100mS. In that case per part 15.35 (c) measurement of the total on time of an individual channel over 100mS can be conducted and duty cycle factor determined. That duty cycle factor can be applied to peak level of the radiated emission to show average level.

### PROCEDURE

ANSI C63.10, section 7.8.4

### ON TIME AND DUTY CYCLE RESULTS

The duty cycle results are from the original test report, FCC ID: HBW1D8808-1 and the table is copied below.

Mode	Number of TX in 100mS	TX Duration in 100mS	Duty Cycle Correction (dB) $20 \times \log\left(\frac{TX(ms)}{100ms}\right)$
TX Hopping Short Packet	1	1.305	-37.69
TX Hopping Long Packet	1	3.048	-30.32

Per the operational descriptions there is a rare worst case possibility where transmission may take place when two short pulses and one long pulse is transmitted within 100mS window. This case is almost impossible to capture. If this case ever happens the duty cycle correction factor will decrease from -30.32dB to -24.95dB based on the measured individual pulse lengths. This is slightly less than what is reported by the manufacturer in the operational description. The manufacturer uses theoretical values for the TX duration where measured values are used in this test report.

## 8. RADIATED TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-247 Clause 5.5

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

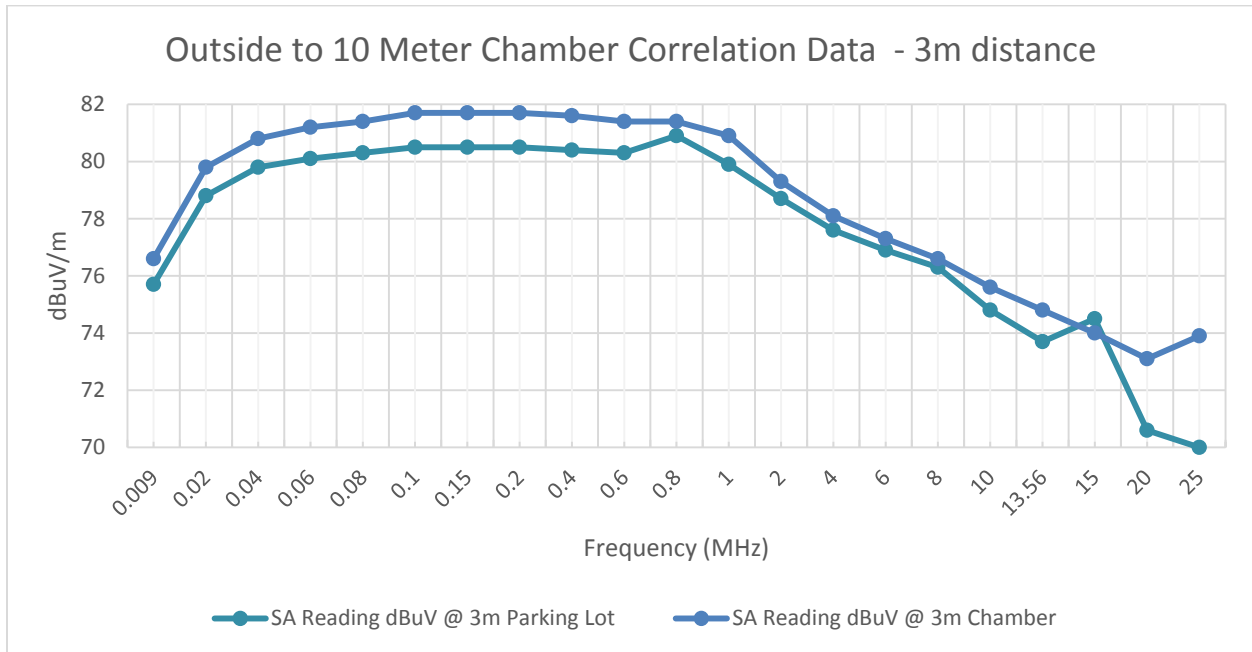
#### PROCEDURE

ANSI C63.10:2013, Section 11.12

## 8.2. RADIATED SPUROUS EMSSIONS

### 8.2.1. SPURIOUS EMISSIONS 9kHz-30MHz Open Field to 10 Meter Chamber Correlation Data

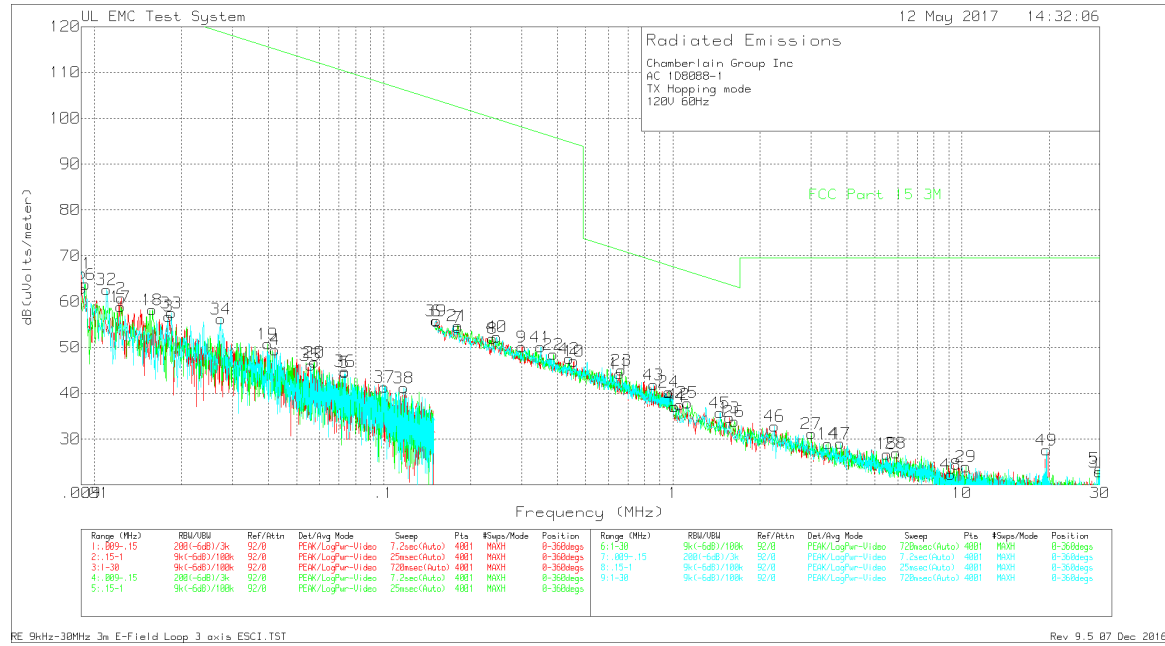
Correlation Data for measurements 9kHz-30MHz between Outside and 10m semi-anechoic chamber in at Underwriter Laboratories in Northbrook, IL.



Correlation measurements were conducted using a signal source with an antenna outside in open area (parking lot). Immediately following the measurements the same setup was moved inside the 10 meter semi-anechoic chamber and the measurements were repeated. The above plot shows the difference in levels measured between outside and the 10 meter semi anechoic chamber.

### 8.2.2. Spurious Emissions 9kHz – 30MHz (single plot maybe used if eut set to hopping mode)

Plot





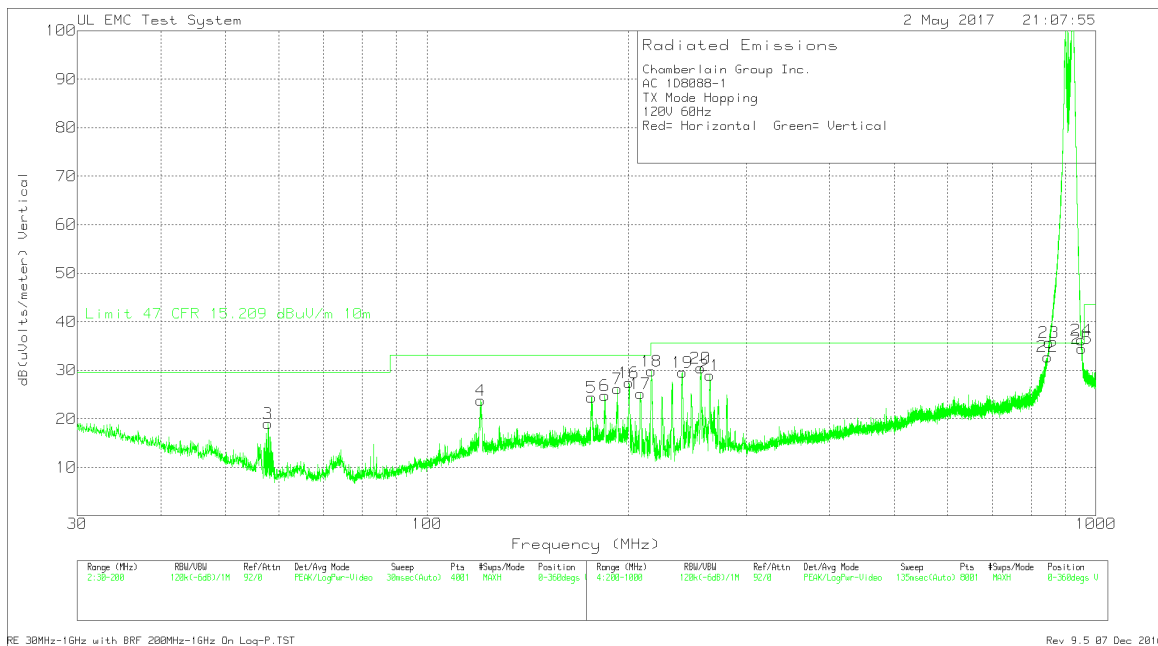
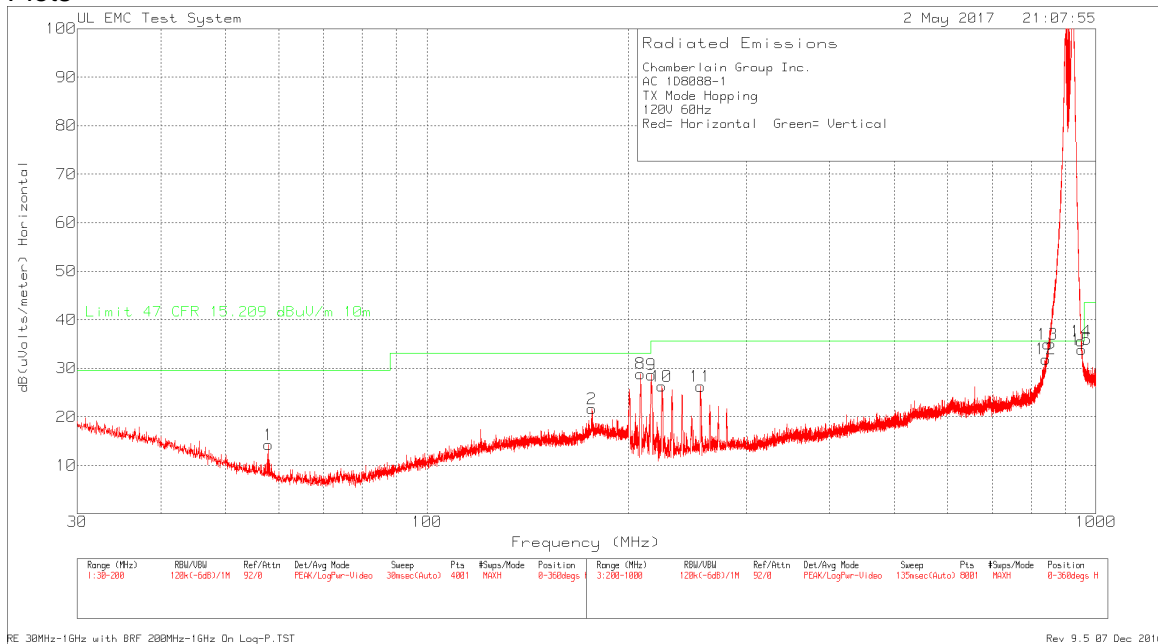
Data

Chamberlain Group Inc									
AC 1D8088-1									
TX Hopping mode									
120V 60Hz									
Trace MArkers									
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	Limit 47 CFR Part 15.209 dBuV/m	Margin (dB)	Azimuth [Degs]
Parallel to EUT									
1	0.009035	40.46	Pk	22.4	0	62.86	128.47	-65.61	0-360
2	0.01236	40.37	Pk	20.3	0	60.67	125.75	-65.08	0-360
3	0.018065	39.39	Pk	17.4	0	56.79	122.45	-65.66	0-360
4	0.04211	35.97	Pk	13.5	0	49.47	115.1	-65.63	0-360
5	0.073365	32.72	Pk	11.8	0	44.52	110.29	-65.77	0-360
6	0.15256	44.44	Pk	11.3	0	55.74	103.93	-48.19	0-360
7	0.18089	43.03	Pk	11.3	0	54.33	102.45	-48.12	0-360
8	0.23818	40.63	Pk	11.3	0	51.93	100.06	-48.13	0-360
9	0.30091	38.75	Pk	11.3	0	50.05	98.03	-47.98	0-360
10	0.4548	35.66	Pk	11.3	0	46.96	94.45	-47.49	0-360
11	0.65502	32.87	Pk	11.4	0	44.27	71.28	-27.01	0-360
12	1.058	25.99	Pk	11.4	0.1	37.49	67.11	-29.62	0-360
13	1.57275	23.06	Pk	11.5	0.1	34.66	63.67	-29.01	0-360
14	3.436	17.36	Pk	11.5	0.1	28.96	69.54	-40.58	0-360
15	5.5095	15.31	Pk	11.3	0.1	26.71	69.54	-42.83	0-360
Perpendicular to Eut									
16	0.00928	41.63	Pk	22.1	0	63.73	128.23	-64.5	0-360
17	0.012325	38.51	Pk	20.3	0	58.81	125.77	-66.96	0-360
18	0.01586	39.67	Pk	18.5	0	58.17	123.58	-65.41	0-360
19	0.03966	36.91	Pk	13.8	0	50.71	115.62	-64.91	0-360
20	0.057545	34.4	Pk	12.3	0	46.7	112.39	-65.69	0-360
21	0.18035	43.4	Pk	11.3	0	54.7	102.48	-47.78	0-360
22	0.38664	37.15	Pk	11.3	0	48.45	95.86	-47.41	0-360
23	0.66354	33.57	Pk	11.4	0	44.97	71.17	-26.2	0-360
24	0.96813	28.76	Pk	11.4	0.1	40.26	67.89	-27.63	0-360
25	1.12325	26.39	Pk	11.4	0.1	37.89	66.59	-28.7	0-360
26	1.63075	22.21	Pk	11.5	0.1	33.81	63.36	-29.55	0-360
27	3.0155	19.57	Pk	11.5	0.1	31.17	69.54	-38.37	0-360
28	5.92275	15.52	Pk	11.3	0.1	26.92	69.54	-42.62	0-360
29	10.34163	13.03	Pk	10.7	0.2	23.93	69.54	-45.61	0-360
30	29.81875	14.45	Pk	8	0.3	22.75	69.54	-46.79	0-360
Parallel to Ground									
31	0.009035	43.73	Pk	22.4	0	66.13	128.47	-62.34	0-360
32	0.01103	41.63	Pk	21	0	62.63	126.73	-64.1	0-360
33	0.01845	40.33	Pk	17.2	0	57.53	122.27	-64.74	0-360
34	0.02734	40.81	Pk	15.4	0	56.21	118.85	-62.64	0-360
35	0.0559	33.81	Pk	12.3	0	46.11	112.65	-66.54	0-360
36	0.073575	32.98	Pk	11.8	0	44.78	110.26	-65.48	0-360
37	0.10079	29.84	Pk	11.5	0	41.34	107.53	-66.19	0-360
38	0.117465	29.78	Pk	11.4	0	41.18	106.2	-65.02	0-360
39	0.15213	44.48	Pk	11.3	0	55.78	103.95	-48.17	0-360
40	0.24606	40.97	Pk	11.3	0	52.27	99.78	-47.51	0-360
41	0.34947	38.75	Pk	11.3	0	50.05	96.73	-46.68	0-360
42	0.4384	36.24	Pk	11.3	0	47.54	94.77	-47.23	0-360
43	0.85844	30.33	Pk	11.4	0.1	41.83	68.93	-27.1	0-360
44	1.0145	25.58	Pk	11.4	0.1	37.08	67.48	-30.4	0-360
45	1.45675	24.22	Pk	11.4	0.1	35.72	64.34	-28.62	0-360
46	2.247	21.2	Pk	11.5	0.1	32.8	69.54	-36.74	0-360
47	3.7985	17.46	Pk	11.5	0.1	29.06	69.54	-40.48	0-360
48	9.14175	11.21	Pk	10.8	0.2	22.21	69.54	-47.33	0-360
49	19.61075	18.06	Pk	9.3	0.2	27.56	69.54	-41.98	0-360
50	29.97825	15.22	Pk	8	0.3	23.52	69.54	-46.02	0-360

Pk - Peak detector

### 8.2.3. SPURIOUS EMISSIONS 30 TO 1000 MHz – Hopping Mode

Plots

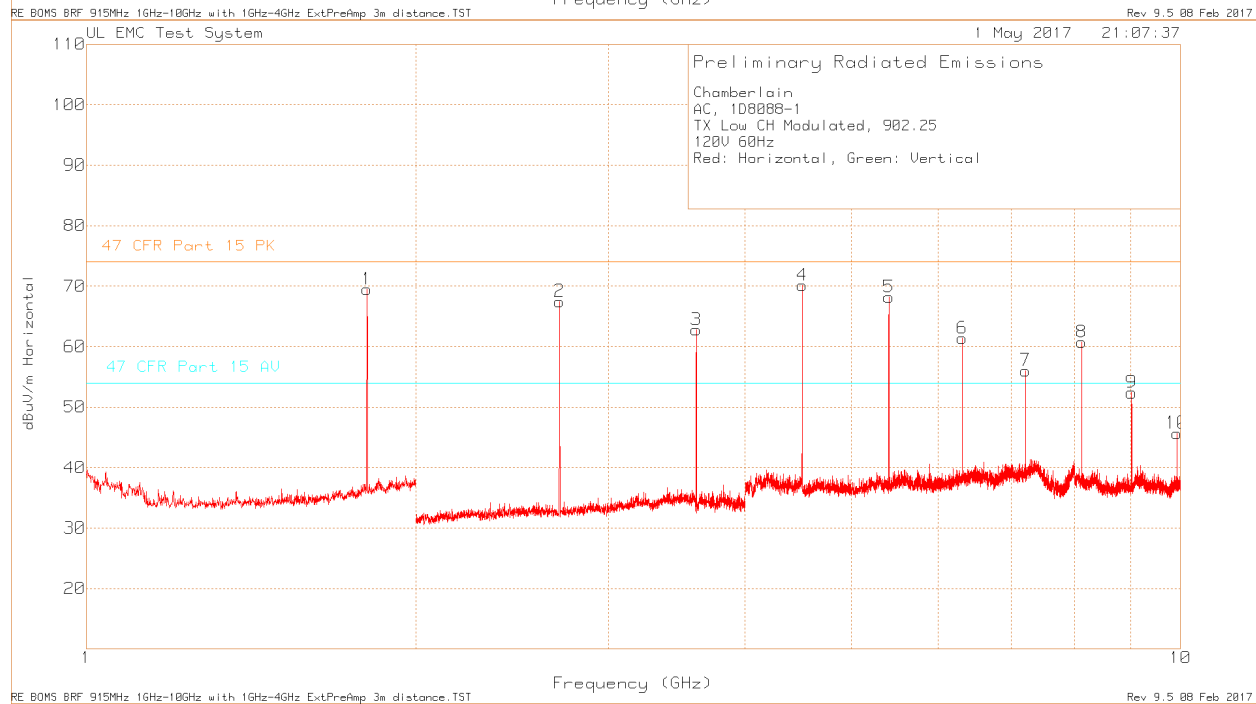
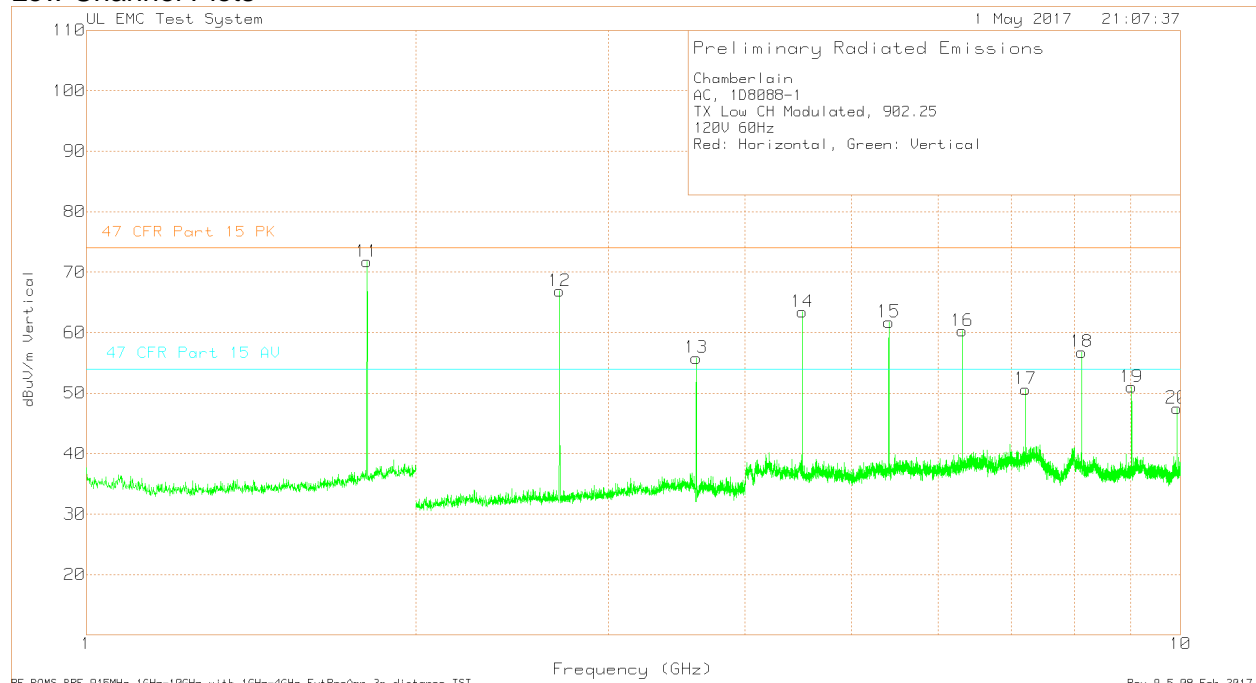


Data

Chamberlain Group Inc.												
AC 1D8088-1												
TX Mode Hopping												
120V 60Hz												
Red= Horizontal Green= Vertical												
Trace MArkers												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Band Reject Filter dB	Level dBuV/m	Limit 47 CFR 15.209 dBuV/m 10m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	58.0075	36.97	Pk	7.3	-30	-	14.27	29.55	-15.28	0-360	398	H
2	176.2425	35.62	Pk	15.3	-29.3	-	21.62	33.07	-11.45	0-360	248	H
3	57.795	41.65	Pk	7.4	-30	-	19.05	29.55	-10.5	0-360	398	V
4	120.3125	40.32	Pk	13.2	-29.7	-	23.82	33.07	-9.25	0-360	101	V
5	176.2	38.45	Pk	15.3	-29.3	-	24.45	33.07	-8.62	0-360	101	V
6	184.4875	38.03	Pk	15.9	-29.1	-	24.83	33.07	-8.24	0-360	101	V
7	192.5625	39.18	Pk	15.9	-28.9	-	26.18	33.07	-6.89	0-360	101	V
8	208.5	47.29	Pk	11	-29.5	0.1	28.89	33.07	-4.18	0-360	299	H
9	216.5	46.95	Pk	11	-29.4	0.1	28.65	35.57	-6.92	0-360	199	H
10	224.4	44.73	Pk	10.8	-29.3	0.1	26.33	35.57	-9.24	0-360	299	H
11	256.3	43.06	Pk	12.3	-29.2	0.1	26.26	35.57	-9.31	0-360	399	H
12	841.4	30.7	Pk	22.6	-27.8	6.4	31.9	-	-	0-360	399	H
13	847.3	31.14	Pk	22.5	-27.8	9.1	34.94	-	-	0-360	399	H
14	950.8	29.89	Pk	23.3	-27.4	9.8	35.59	-	-	0-360	299	H
15	952.6	30.04	Pk	23.4	-27.2	7.6	33.84	-	-	0-360	199	H
16	200.5	45.61	Pk	11.2	-29.6	0.2	27.41	33.07	-5.66	0-360	99	V
17	208.5	43.6	Pk	11	-29.5	0.1	25.2	33.07	-7.87	0-360	302	V
18	216.6	48.15	Pk	11	-29.4	0.1	29.85	35.57	-5.72	0-360	199	V
19	240.9	47.34	Pk	11.4	-29.3	0.1	29.54	35.57	-6.03	0-360	99	V
20	256.6	47.28	Pk	12.3	-29.2	0.1	30.48	35.57	-5.09	0-360	99	V
21	264.9	45.66	Pk	12.3	-29.1	0.1	28.96	35.57	-6.61	0-360	99	V
22	846.4	29.48	Pk	22.5	-27.8	8.6	32.78	-	-	0-360	302	V
23	850.3	30.25	Pk	22.6	-27.7	10.6	35.75	-	-	0-360	99	V
24	951.4	31.13	Pk	23.3	-27.3	9.1	36.23	-	-	0-360	302	V
25	953	31.06	Pk	23.4	-27.2	7.2	34.46	-	-	0-360	399	V
Pk - Peak detector												
Radiated Emission Data												
	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Band Reject Filter dB	Level dBuV/m	Limit 47 CFR 15.209 dBuV/m 10m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
	208.5406	44.05	Qp	11	-29.5	0.1	25.65	33.07	-7.42	179	352	H
	200.4863	43.09	Qp	11.2	-29.6	0.2	24.89	33.07	-8.18	34	101	V
	216.47334	44.24	Qp	11	-29.4	0.1	25.94	35.57	-9.63	88	187	V
	256.28442	44.42	Qp	12.3	-29.2	0.1	27.62	35.57	-7.95	355	102	V
Qp - Quasi-Peak detector												

### 8.2.1. SPURIOUS EMISSIONS 1GHz TO 10GHz

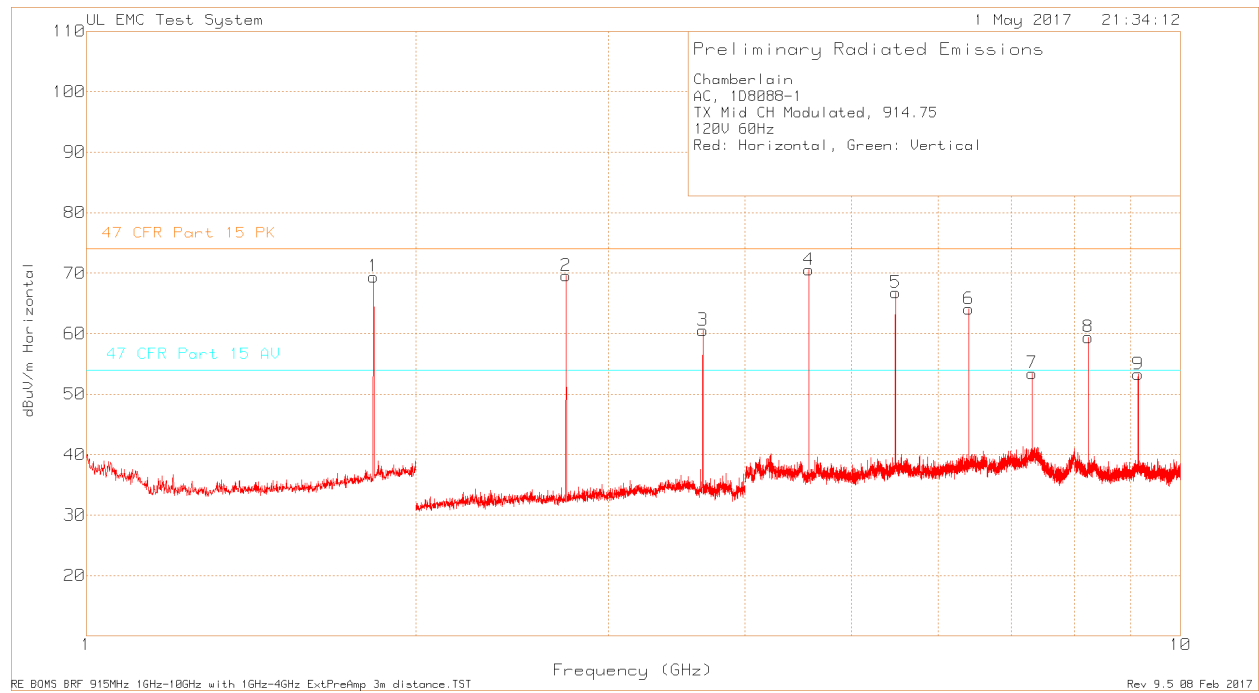
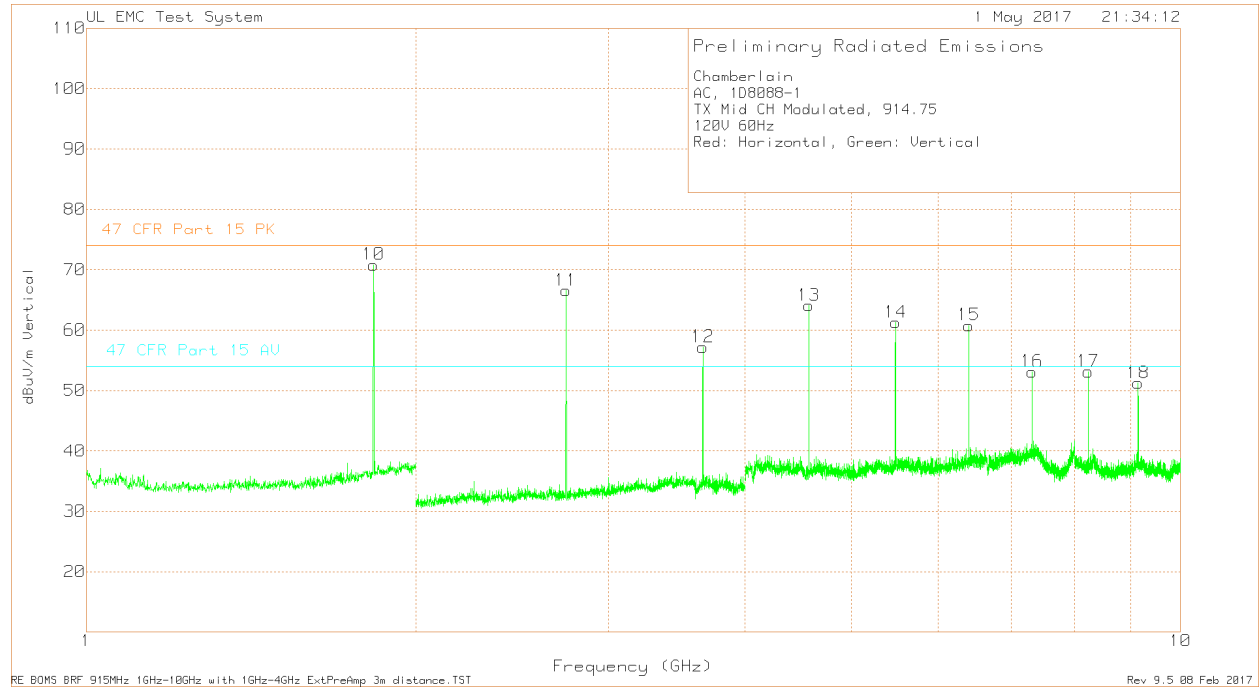
#### Low Channel Plots



Low Channel Data

Chamberlain																
AC, 1D8088-1																
TX Low CH Modulated, 902.25																
120V 60Hz																
Red: Horizontal, Green: Vertical																
Trace MArkers																
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	BRF Factor dB	Path Factor dB	Peak Level dBuV/m	Peak Limit 15.209 dBuV/m	Peak Margin (dB)	Hopping Duty Cycle Factor dB	Average Level with Duty Cycle Factor dBuV/m	Average Limit 15.209 dBuV/m	Average Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.805	97.16	Pk	26.8	0.4	-54.88	69.48	N/A	N/A	N/A	N/A	N/A	N/A	0-360	98	H
2	*2.706	96.32	Pk	22.1	N/A	-50.94	67.48	74	-6.52	-24.95	42.53	54	-11.47	0-360	200	H
3	*3.609	89.92	Pk	23.2	N/A	-50.34	62.78	74	-11.22	-24.95	37.83	54	-16.17	0-360	150	H
4	*4.511	94.17	Pk	27.8	N/A	-51.86	70.11	74	-3.89	-24.95	45.16	54	-8.84	0-360	149	H
5	*5.413	90.56	Pk	27.9	N/A	-50.26	68.2	74	-5.8	-24.95	43.25	54	-10.75	0-360	149	H
6	6.316	79.9	Pk	29.2	N/A	-47.74	61.36	N/A	N/A	N/A	N/A	N/A	N/A	0-360	149	H
7	7.218	72.59	Pk	29.8	N/A	-46.35	56.04	N/A	N/A	N/A	N/A	N/A	N/A	0-360	149	H
8	*8.119	72.31	Pk	36.2	N/A	-47.75	60.76	74	-13.24	-24.95	35.81	54	-18.19	0-360	150	H
9	*9.022	66.07	Pk	36.1	N/A	-49.78	52.39	74	-21.61	-24.95	27.44	54	-26.56	0-360	150	H
10	9.925	57.56	Pk	36.4	N/A	-48.28	45.68	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	H
11	1.805	99.43	Pk	26.8	0.4	-54.88	71.75	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	V
12	*2.706	95.75	Pk	22.1	N/A	-50.94	66.91	74	-7.09	-24.95	41.96	54	-12.04	0-360	200	V
13	*3.609	82.97	Pk	23.2	N/A	-50.34	55.83	74	-18.17	-24.95	30.88	54	-23.12	0-360	150	V
14	*4.511	87.47	Pk	27.8	N/A	-51.86	63.41	74	-10.59	-24.95	38.46	54	-15.54	0-360	200	V
15	*5.413	84.11	Pk	27.9	N/A	-50.26	61.75	74	-12.25	-24.95	36.8	54	-17.2	0-360	200	V
16	6.316	78.83	Pk	29.2	N/A	-47.74	60.29	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	V
17	7.219	67.19	Pk	29.8	N/A	-46.34	50.65	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	V
18	*8.12	68.38	Pk	36.2	N/A	-47.78	56.8	74	-17.2	-24.95	31.85	54	-22.15	0-360	150	V
19	*9.022	64.69	Pk	36.1	N/A	-49.78	51.01	74	-22.99	-24.95	26.06	54	-27.94	0-360	150	V
20	9.926	59.4	Pk	36.4	N/A	-48.29	47.51	N/A	N/A	N/A	N/A	N/A	N/A	0-360	200	V
* Indicates frequency in restricted band. No limit applies outside of the restricted band.																
Pk - Peak detector																

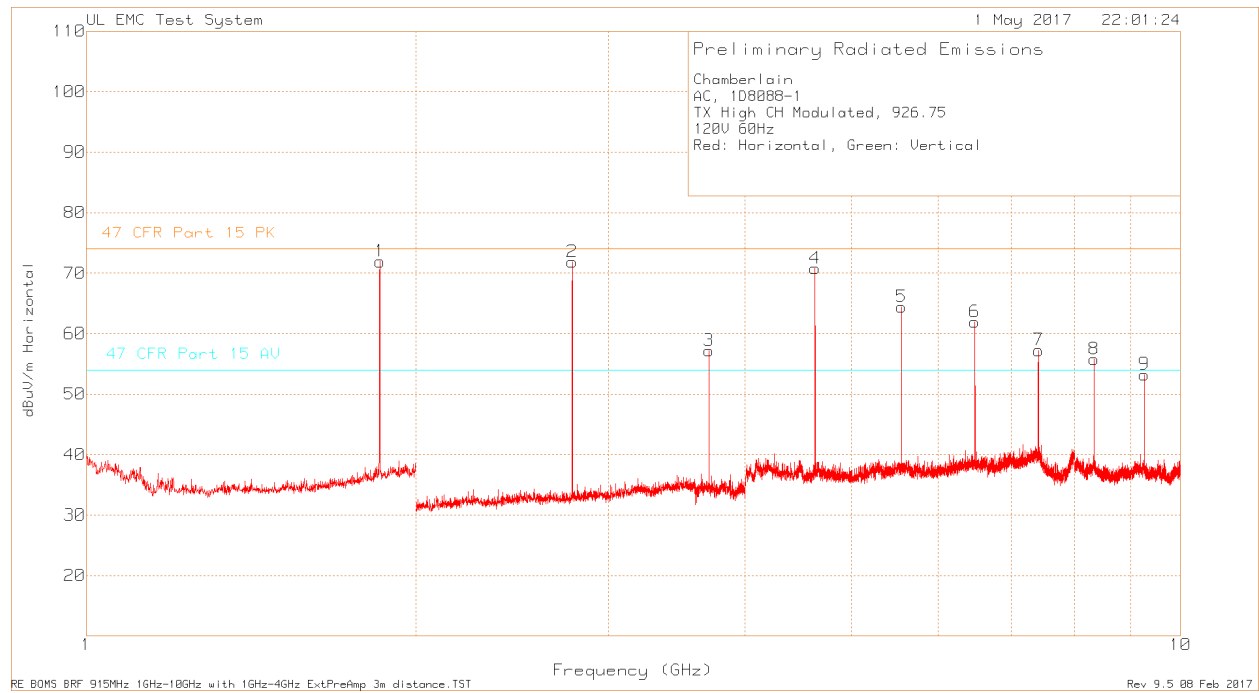
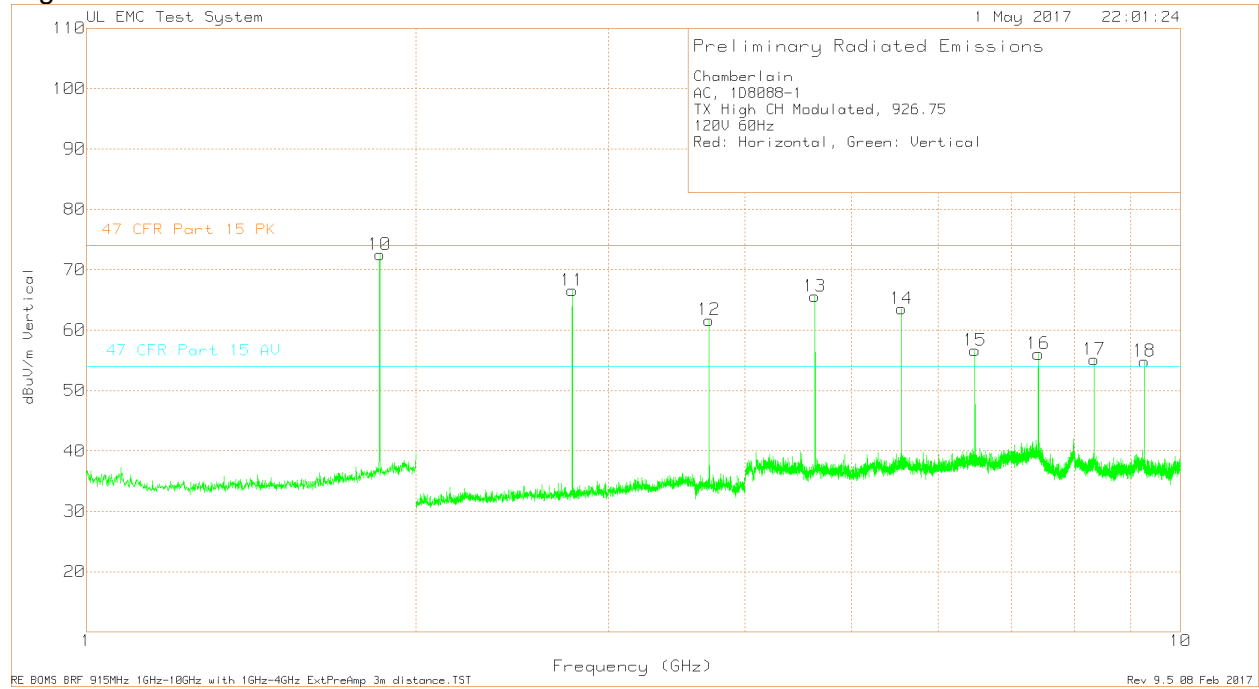
### Middle Channel Plots



Middle Channel Data

Chamberlain																
AC, 1D8088-1																
TX Mid CH Modulated, 914.75																
120V 60Hz																
Red: Horizontal, Green: Vertical																
Trace MARKers																
Marker No.	Test Frequency (GHz)	Meter Reading (dBUV)	Detector	Antenna Factor dB/m	BRF Factor dB	Path Factor dB	Peak Level dBUV/m	Peak Limit 15.209 dBUV/m	Peak Margin (dB)	Hopping Duty Cycle Factor dB	Average Level with Duty Cycle Factor dBUV/m	Average Limit 15.209 dBUV/m	Average Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.83	96.69	Pk	27	0.4	-54.66	69.43	N/A	N/A	N/A	N/A	N/A	N/A	0-360	98	H
2	*2.744	98.36	Pk	22.1	N/A	-50.89	69.57	74	-4.43	-24.95	44.62	54	-9.38	0-360	150	H
3	*3.659	86.55	Pk	23.4	N/A	-49.39	60.56	74	-13.44	-24.95	35.61	54	-18.39	0-360	200	H
4	*4.573	94.75	Pk	27.7	N/A	-51.86	70.59	74	-3.41	-24.95	45.64	54	-8.36	0-360	100	H
5	5.488	88.72	Pk	28.1	N/A	-50.06	66.76	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	H
6	6.403	82.54	Pk	29.2	N/A	-47.68	64.06	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	H
7	*7.318	68.87	Pk	30.6	N/A	-46.01	53.46	74	-20.54	-24.95	28.51	54	-25.49	0-360	150	H
8	*8.233	71.68	Pk	36.4	N/A	-48.68	59.4	74	-14.6	-24.95	34.45	54	-19.55	0-360	150	H
9	*9.148	65.34	Pk	36.3	N/A	-48.38	53.26	74	-20.74	-24.95	28.31	54	-25.69	0-360	200	H
10	1.83	98.09	Pk	27	0.4	-54.66	70.83	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	V
11	*2.744	95.33	Pk	22.1	N/A	-50.89	66.54	74	-7.46	-24.95	41.59	54	-12.41	0-360	200	V
12	*3.659	83.2	Pk	23.4	N/A	-49.39	57.21	74	-16.79	-24.95	32.26	54	-21.74	0-360	200	V
13	*4.574	88.27	Pk	27.7	N/A	-51.86	64.11	74	-9.89	-24.95	39.16	54	-14.84	0-360	200	V
14	5.489	83.19	Pk	28.1	N/A	-50.04	61.25	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	V
15	6.403	79.28	Pk	29.2	N/A	-47.68	60.8	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	V
16	*7.318	68.53	Pk	30.6	N/A	-46.01	53.12	74	-20.88	-24.95	28.17	54	-25.83	0-360	200	V
17	*8.232	65.44	Pk	36.4	N/A	-48.7	53.14	74	-20.86	-24.95	28.19	54	-25.81	0-360	200	V
18	*9.147	63.31	Pk	36.3	N/A	-48.38	51.23	74	-22.77	-24.95	26.28	54	-27.72	0-360	200	V
* Indicates frequency in restricted band. No limit applies outside of the restricted band.																
Pk - Peak detector																

### High Channel Plots





High Channel Data

Chamberlain																
AC, 1D8088-1																
TX High CH Modulated, 926.75																
120V 60Hz																
Red: Horizontal, Green: Vertical																
Trace Markers																
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	BRF Factor dB	Path Factor dB	Peak Level dBuV/m	Peak Limit 15.209 dBuV/m	Peak Margin (dB)	Hopping Duty Cycle Factor dB	Average Level with Duty Cycle Factor dBuV/m	Average Limit 15.209 dBuV/m	Average Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.854	98.87	Pk	27.3	0.4	-54.65	71.92	N/A	N/A	N/A	N/A	N/A	N/A	0-360	98	H
2	*2.78	100.41	Pk	22.2	N/A	-50.73	71.88	74	-2.12	-24.95	46.93	54	-7.07	0-360	150	H
3	*3.707	83.25	Pk	23.5	N/A	-49.6	57.15	74	-16.85	-24.95	32.2	54	-21.8	0-360	150	H
4	*4.634	94.83	Pk	27.7	N/A	-51.73	70.8	74	-3.2	-24.95	45.85	54	-8.15	0-360	150	H
5	5.56	85.56	Pk	28.3	N/A	-49.48	64.38	N/A	N/A	N/A	N/A	N/A	N/A	0-360	100	H
6	6.487	80.23	Pk	29.1	N/A	-47.42	61.91	74	-12.09	-24.95	36.96	54	-17.04	0-360	150	H
7	*7.415	73.42	Pk	31	N/A	-47.18	57.24	74	-16.76	-24.95	32.29	54	-21.71	0-360	150	H
8	*8.34	66.52	Pk	36.5	N/A	-47.24	55.78	74	-18.22	-24.95	30.83	54	-23.17	0-360	200	H
9	9.268	65.44	Pk	36.4	N/A	-48.61	53.23	N/A	N/A	N/A	N/A	N/A	N/A	0-360	200	H
10	1.854	99.45	Pk	27.3	0.4	-54.65	72.5	N/A	N/A	N/A	N/A	N/A	N/A	0-360	200	V
11	*2.78	95.12	Pk	22.2	N/A	-50.73	66.59	74	-7.41	-24.95	41.64	54	-12.36	0-360	150	V
12	*3.707	87.76	Pk	23.5	N/A	-49.6	61.66	74	-12.34	-24.95	36.71	54	-17.29	0-360	200	V
13	*4.633	89.66	Pk	27.7	N/A	-51.74	65.62	74	-8.38	-24.95	40.67	54	-13.33	0-360	150	V
14	5.56	84.74	Pk	28.3	N/A	-49.48	63.56	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	V
15	6.488	74.95	Pk	29.1	N/A	-47.41	56.64	N/A	N/A	N/A	N/A	N/A	N/A	0-360	150	V
16	*7.414	72.24	Pk	31	N/A	-47.18	56.06	74	-17.94	-24.95	31.11	54	-22.89	0-360	200	V
17	*8.341	65.86	Pk	36.5	N/A	-47.25	55.11	74	-18.89	-24.95	30.16	54	-23.84	0-360	200	V
18	9.268	67.06	Pk	36.4	N/A	-48.61	54.85	N/A	N/A	N/A	N/A	N/A	N/A	0-360	200	V
* Indicates frequency in restricted band. No limit applies outside of the restricted band.																
Pk - Peak detector																

## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	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.

### TEST PROCEDURE

ANSI C63.10:2013, Section 6.2

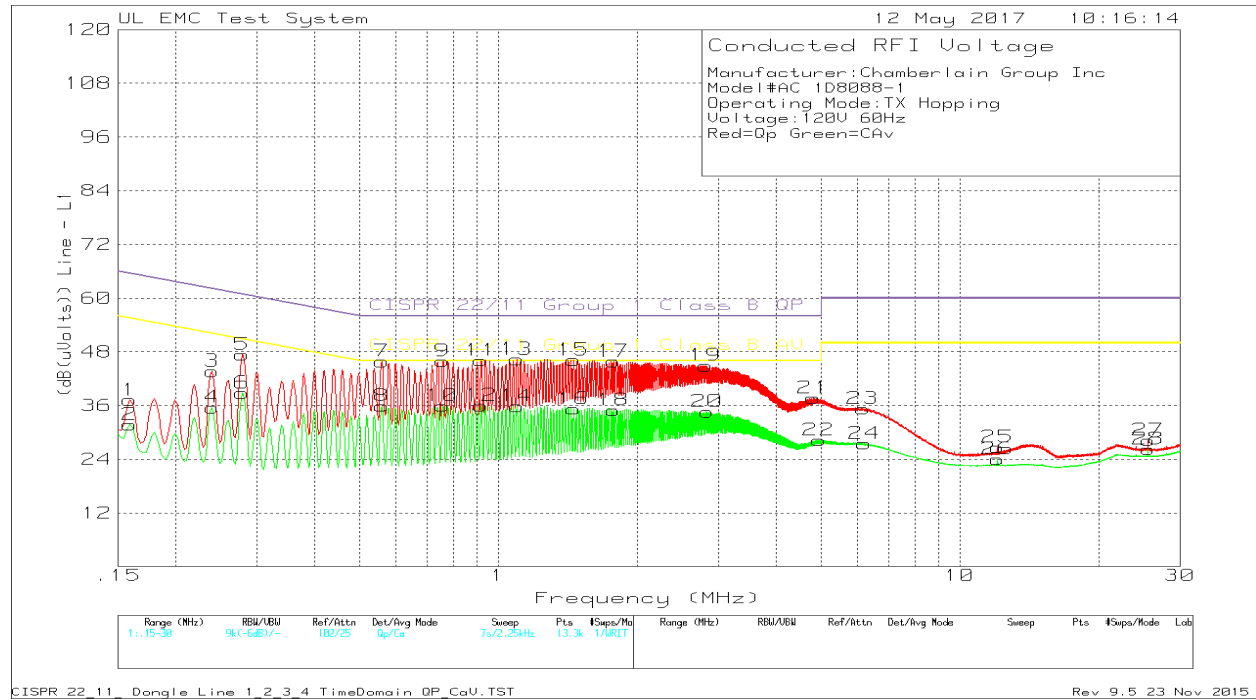
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

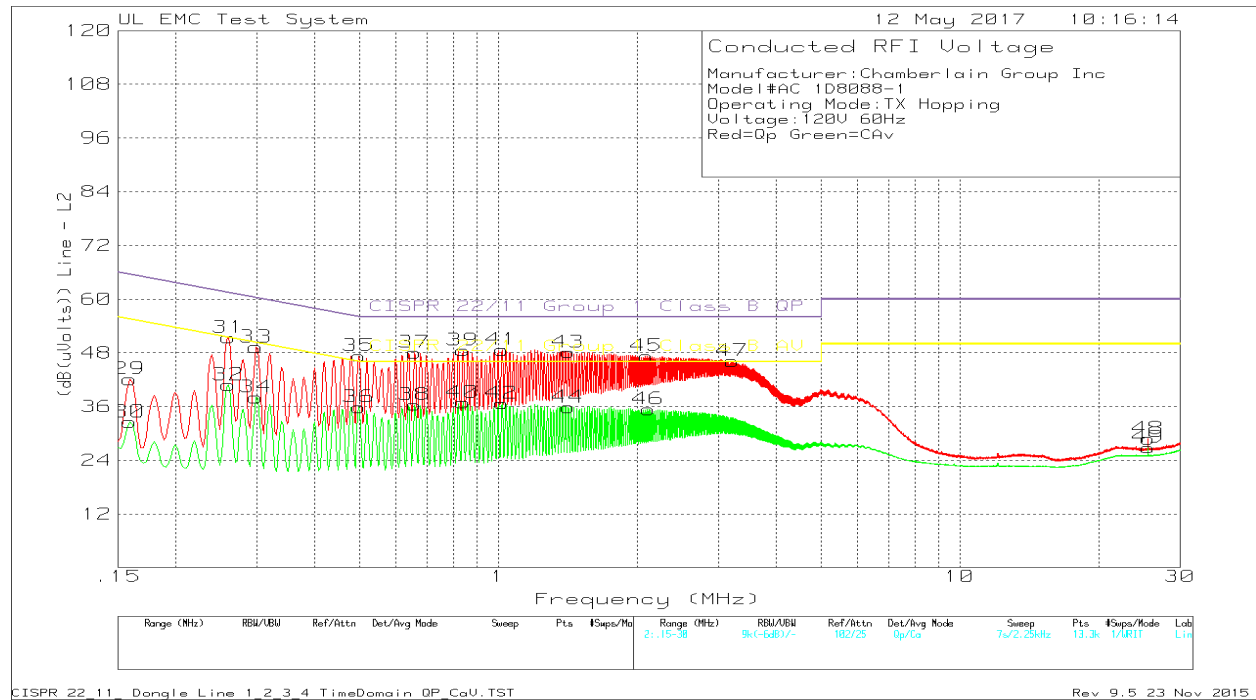
Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

**LINE 1 RESULTS - PLOT**



**LINE 2 RESULTS - PLOT**



Line Conducted Emissions data

Manufacturer:Chamberlain Group Inc											
Model#AC 1D8088-1											
Operating Mode:TX Hopping											
Voltage:120V 60Hz											
Red=Qp Green=CAv											
Trace Markers											
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	LISN Factor dB	Path Factor dB	Dougle Factor dB	Level dBuV	QP Limit 47 CFR Part 15.207 dBuV	Margin (dB)	Av Limit 47 CFR Part 15.207 dBuV	Margin (dB)
Line											
1	0.159	24.31	Qp	0.1	12.8	0	37.21	65.52	-28.31	55.52	
2	0.159	18.83	Ca	0.1	12.8	0	31.73	65.52	-33.79	55.52	-23.79
3	0.24	32.34	Qp	0	11.3	0	43.64	62.1	-18.46	52.1	
4	0.24	24.25	Ca	0	11.3	0	35.55	62.1	-26.55	52.1	-16.55
5	0.27825	36.36	Qp	0	11	0	47.36	60.87	-13.51	50.87	
6	0.27825	27.79	Ca	0	11	0	38.79	60.87	-22.08	50.87	-12.08
7	0.5595	35.29	Qp	0	10.6	0	45.89	56	-10.11	46	
8	0.5595	25.3	Ca	0	10.6	0	35.9	56	-20.1	46	-10.1
9	0.7575	35.33	Qp	0	10.6	0	45.93	56	-10.07	46	
10	0.7575	25.34	Ca	0	10.6	0	35.94	56	-20.06	46	-10.06
11	0.91725	35.47	Qp	0	10.6	0	46.07	56	-9.93	46	
12	0.91725	25.38	Ca	0	10.6	0	35.98	56	-20.02	46	-10.02
13	1.09725	35.69	Qp	0	10.6	0	46.29	56	-9.71	46	
14	1.09725	25.26	Ca	0	10.6	0	35.86	56	-20.14	46	-10.14
15	1.45725	35.53	Qp	0	10.6	0	46.13	56	-9.87	46	
16	1.45725	24.67	Ca	0	10.6	0	35.27	56	-20.73	46	-10.73
17	1.77675	35.21	Qp	0	10.6	0	45.81	56	-10.19	46	
18	1.77675	24.36	Ca	0	10.6	0	34.96	56	-21.04	46	-11.04
19	2.814	34.32	Qp	0	10.6	0	44.92	56	-11.08	46	
20	2.83425	24.02	Ca	0	10.6	0	34.62	56	-21.38	46	-11.38
21	4.812	26.87	Qp	0	10.7	0.1	37.67	56	-18.33	46	
22	4.9515	17.47	Ca	0	10.7	0.1	28.27	56	-27.73	46	-17.73
23	6.1665	24.42	Qp	0	10.8	0.1	35.32	60	-24.68	50	
24	6.20925	16.61	Ca	0	10.8	0.1	27.51	60	-32.49	50	-22.49
25	12.05925	15.29	Qp	0	11.1	0.3	26.69	60	-33.31	50	
26	12.05925	12.62	Ca	0	11.1	0.3	24.02	60	-35.98	50	-25.98
27	25.59975	15.54	Qp	-0.1	11.7	1.1	28.24	60	-31.76	50	
28	25.59975	13.56	Ca	-0.1	11.7	1.1	26.26	60	-33.74	50	-23.74
Neutral											
29	0.159	28.72	Qp	0.1	13.3	0	42.12	65.52	-23.4		
30	0.159	19.15	Ca	0.1	13.3	0	32.55	65.52	-32.97	55.52	-22.97
31	0.26025	39.73	Qp	0	11.7	0	51.43	61.42	-9.99		
32	0.26025	29.13	Ca	0	11.7	0	40.83	61.42	-20.59	51.42	-10.59
33	0.2985	37.87	Qp	0	11.4	0	49.27	60.28	-11.01		
34	0.2985	26.68	Ca	0	11.4	0	38.08	60.28	-22.2	50.28	-12.2
35	0.49875	36.11	Qp	0	11.2	0	47.31	56.02	-8.71		
36	0.49875	24.65	Ca	0	11.2	0	35.85	56.02	-20.17	46.02	-10.17
37	0.6585	36.94	Qp	0	11.1	0	48.04	56	-7.96		
38	0.6585	25.31	Ca	0	11.1	0	36.41	56	-19.59	46	-9.59
39	0.8385	37.46	Qp	0	11.1	0	48.56	56	-7.44		
40	0.8385	25.79	Ca	0	11.1	0	36.89	56	-19.11	46	-9.11
41	1.0185	37.6	Qp	0	11.1	0	48.7	56	-7.3		
42	1.0185	25.63	Ca	0	11.1	0	36.73	56	-19.27	46	-9.27
43	1.41675	37.04	Qp	0	11.1	0	48.14	56	-7.86		
44	1.41675	24.72	Ca	0	11.1	0	35.82	56	-20.18	46	-10.18
45	2.09625	36.19	Qp	0	11.1	0	47.29	56	-8.71		
46	2.1165	24.29	Ca	0	11.1	0	35.39	56	-20.61	46	-10.61
47	3.2145	34.96	Qp	0	11.2	0	46.16	56	-9.84		
48	25.59975	15.68	Qp	-0.1	12.2	1	28.78	60	-31.22		
49	25.59975	13.74	Ca	-0.1	12.2	1	26.84	60	-33.16	50	-23.16
Qp - Quasi-Peak detector											
Ca - CISPR Average detection											

## 10. SETUP PHOTOS

### Line Conducted Emissions



Radiated Emissions 9kHz-30MHz

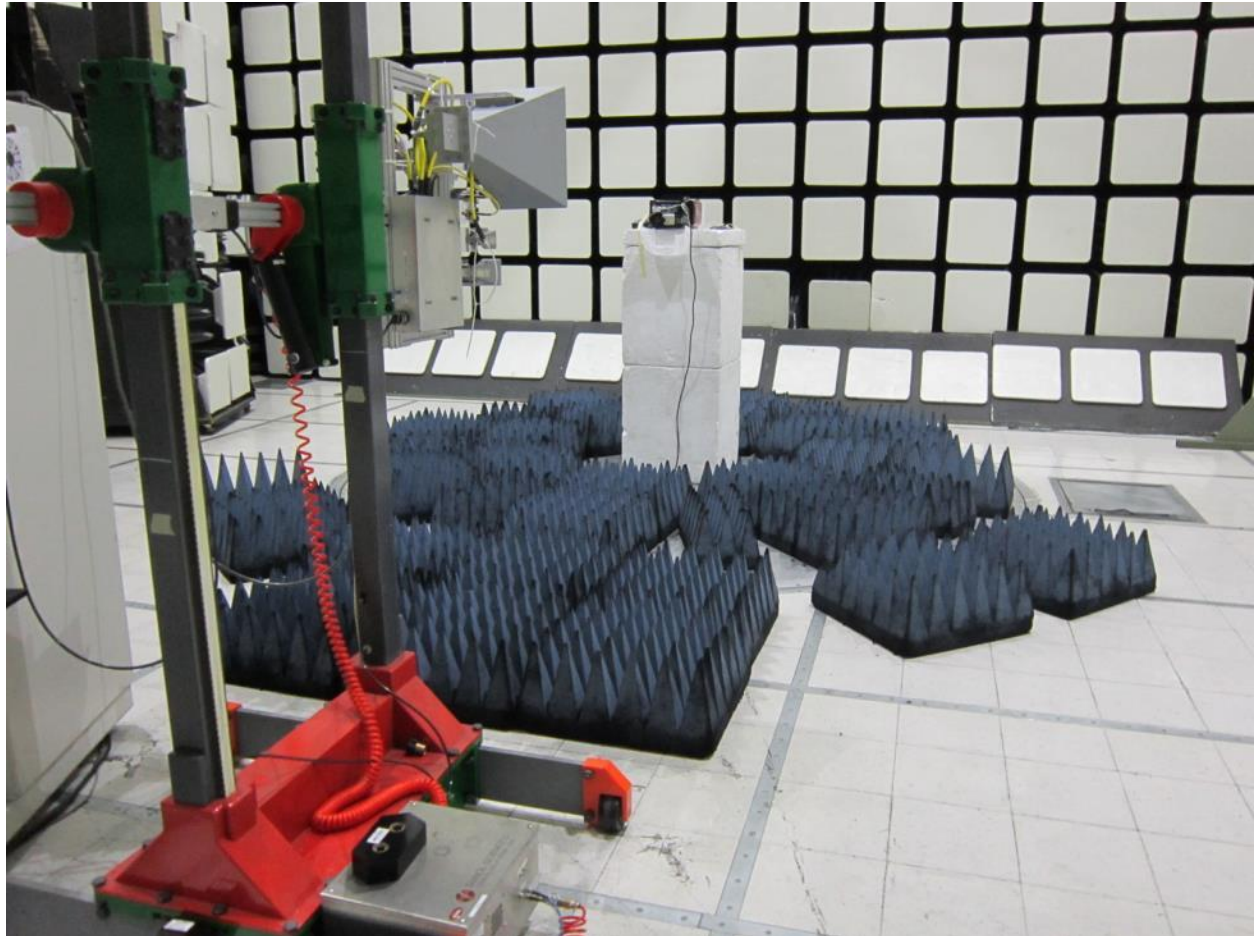




Radiated Emissions 30MHz – 1GHz



Radiated Emissions 1GHz – 10GHz



**END OF REPORT**